

An El Niño Southern Oscillation (ENSO) Based Precipitation Climatology for the United States Affiliated Pacific Islands (USAPI) using the PERSIANN Climate Data Record (CDR)

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Abstract

The United States Affiliated Pacific Islands (USAPI) are highly susceptible to extreme precipitation events such as drought and flooding, which directly affect their freshwater availability. Precipitation distribution differs by sub-region, and is predominantly influenced by phases of the El Niño Southern Oscillation (ENSO). This project provided an updated ENSO-based climatology of long-term precipitation patterns for each USAPI Exclusive Economic Zone (EEZ) using the NOAA PERSIANN Climate Data Record (CDR). This data provided a 30-year record (1984-2015) of daily precipitation at 0.25° resolution, which was used to calculate monthly, seasonal, and yearly precipitation. Maps showing percent departure from normal (30 year average) were made for each three month season based on the Oceanic Niño Index (ONI) for five ENSO phases (moderate-strong El Niño and La Niña, weak El Niño and La Niña, and neutral).

1. Introduction

There are over 2000 islands in the U.S.-Affiliated Pacific Islands (USAPI), which are highly susceptible to extreme events such as drought and floods (Schroeder et al. 2012). These extreme events directly influence the quality of freshwater and the overall availability of freshwater resources by island communities. Accessibility to fresh water is heavily dependent upon the amount and rate of precipitation received within a given month, season, or year (Kruk et al. 2015). Due to the location of the USAPI, many of the islands experience dramatic variations in precipitation during the different phases of the El Niño Southern Oscillation (ENSO). The ENSO is an oceanic-atmospheric phenomenon that influences precipitation distribution around the world (Rasmusson and Wallace 1983; Ropelewski and Halpert 1987). Rainfall in the Tropics region is especially affected by strong ENSO events (Schroeder et al. 2012; Kruk et al. 2015). During strong warm ENSO phases, such as the 1997/1998 El Niño event, extremes in precipitation distribution have significant socioeconomic impacts throughout the USAPI (Hamnett et al. 1999; Schroeder et al. 2012). This event in particular was responsible for crop losses across the USAPI except in Guam, water rationing in the Marshall Islands and Federal States of Micronesia, wildfires in Pohnpei, Chuuk, Yap, Palau, and Guam, and loss of livestock in the Northern Mariana Islands (Hamnett et al. 1999; Schroeder et al. 2012).

This atlas utilizes the publically available PERSIANN Climate Data Record (CDR) to compliment station data by offering a large spatial scope of rainfall averages. The PERSIANN-CDR provides a 30-year record of global daily precipitation at 0.25° resolution (Hsu et al. 2014). This high-resolution CDR is used for an in-depth analysis of precipitation within the USAPI. The end products of this atlas complement the existing literature of how the likelihood of precipitation changes within five specific ENSO phases, defined using the Oceanic Niño Index (ONI).

Daily PERSIANN-CDR precipitation data is available from January 1983 to present. This atlas incorporates a 30-year study period from 1 January 1985 through 31 December 2014. This time period agrees with the World Meteorological Organization definition of climatological standard normals (WMO 2012). By incorporating this length of record, the analysis depicts trends within the precipitation data which can be visually referenced through detailed maps and tables.

The contents of the atlas are laid out in the following order and will be discussed further in more detail:

First, a graph of Oceanic Niño Index (ONI) values is presented (Table 1) with the average values of September-October-November (SON) through January-February-March (JFM) displayed. This is intended to illustrate the methodology that defines how specific ENSO phases are organized by corresponding years. This is followed by Table 2 showing the pre and post years chosen by ENSO phase using the aforementioned method.

PERSIANN-CDR precipitation values were examined through verification with *in situ* stations from the Global Historical Climatology Network (GHCN). Station locations and Pacific Island Exclusive Economic Zones (EEZs) are displayed on Figure 1. Mean annual precipitation values were computed for station locations and corresponding pixels. The station locations as well as mean

annual precipitation values (1985-2014) are displayed on Table 3, followed by comparison charts showing the results of the mean annual and mean monthly comparisons (Figures 2 and 3).

The first set of maps (Figure 4) show the PERSIANN-CDR mean seasonal precipitation values organized by three month time periods (DJF, JFM, FMA....NDJ). These maps highlight the spatial distribution of rainfall throughout the Pacific basin for each three month period calculated by averaging the three month seasonal sums from 1985 to 2014. Within these maps, the seasonal shift of rainfall associated with the Inter Tropical Convergence Zone (ITCZ) is visually evident as well as the seasonal shift of rainfall associated with the South Pacific Convergence Zone (SPCZ). These maps are useful in the manner that they display baseline seasonal precipitation patterns over the entire study period of 1985-2014.

The second set of maps (Figure 5) show each three month seasonal average precipitation change for each of the five defined ENSO phases (moderate-strong La Niña and El Niño, weak La Niña and El Niño, and neutral) for all of the EEZs of the USAPI. Within each two-panel map, the top map shows the average precipitation change for the three month season preceding the onset of the specific ENSO phase (Year 0), and the bottom map shows the average precipitation change following the onset of the specific ENSO phase (Year +1). These maps show the areas within the EEZs that are abnormally wet (turquoise/green) or dry (tan/brown) for the three month season during a specific ENSO phase. Additionally, these maps show how the precipitation varies from a pre ENSO to a post ENSO phase. This is important when determining how the different ENSO phases influence precipitation patterns.

The third set of maps (Figure 6) show the same precipitation changes as Figure 5, but scaled down to the specific EEZ in order to better visualize the precipitation patterns associated with the specific ENSO phases.

The map section of the atlas is followed by Table 4, which shows the average percent change of precipitation from the PERSIANN-CDR for each *in situ* Level 1 NOAA station location, as defined by Kruk et al. 2013, in the specific EEZ. The results show the percent change for each three month season preceding (Year 0) and following (Year +1) each of the five defined phases of ENSO (moderate-strong La Niña and El Niño, weak La Niña and El Niño, and neutral). Each table is labeled with the station name in the upper left corner of the table.

Finally, Figure 5 shows time series graphs of precipitation changes from the mean seasonal PERSIANN-CDR climatology for each *in situ* Level 1 GHCN station in the specific EEZ. The results show the percent change for each three month season preceding (ENSO (0) Year) and following (ENSO (+1) Year) each of the five phases of the ENSO (moderate-strong La Niña and El Niño, weak La Niña and El Niño, and neutral). These time series graphs are intended to allow for direct comparison of precipitation patterns within a given season for years preceding and following a specific phase of the ENSO.

2. Data and Methodology

Global daily PERSIANN-CDR precipitation data at a 0.25° resolution was downloaded via ftp protocol from NOAA's National Centers for Environmental Information (NCEI). Monthly precipitation from January 1985 through December 2014 was obtained by summing daily PERSIANN-CDR precipitation data for each month. Annual precipitation amounts were obtained by summing the monthly precipitation. Three month seasonal amounts were also calculated by summing monthly precipitation values. The 30-year mean annual precipitation was calculated by averaging the annual precipitation from 1985 through 2014. Additionally, all monthly averages were calculated over the entire 30-year study period. Monthly, seasonal, and annual anomalies were calculated using the 30-year average PERSIANN-CDR data. These anomalies were used to make anomalous wet and dry maps for each USAPI EEZ.

Station precipitation data from the Global Historical Climatology Network (GHCN) through NCEI was utilized for verification purposes. Daily precipitation for thirty-six stations was downloaded from the GHCN server (Table 3). Level 1 stations have a complete 30-year record from 1985-2014. Level 2 stations have record length of at least 20 years and 75% minimum percent data completeness (Kruk et al. 2013). R statistical software was then used to calculate monthly and yearly sums. These sums were then used to calculate monthly and yearly averages ("normals") over the 30-year study period. Previous compilation of monthly climate normals from 1981-2010 for GHCN stations are available through NCEI. The 1981-2010 monthly precipitation normals were compared to station data for the same time period in order to ensure data quality and accuracy of the computation process. The 30-year mean precipitation for each station was then compared to the mean 30-year PERSIANN-CDR precipitation for the station location. After using the individual pixel, the average of the surrounding eight pixels were then included into a separate smoothed average for the annual mean precipitation values. The annual precipitation value, single pixel value, and the value of the smoothed pixels were then compared.

The Ocean Niño Index (ONI) monthly data was obtained from NOAA's Climate Prediction Center. The ONI is a 3-month running mean value of ERSST.v4 sea-surface temperature (SST) anomalies in the Niño 3.4 region (5°N - 5°S , 120° - 170°W). For each station, a subset of the data was created by breaking down the months by ONI phase. The frequency of above or below the 30-year average precipitation based on each ONI phase was then counted to ensure that the PERSIANN-CDR anomalies agreed with the station anomalies. These anomalies were then mapped based on the EEZ region for each USAPI for five defined ENSO phases (Table 2). ONI values were averaged over a period from September-October-November (SON) through January-February-March (JFM) to classify each winter season by ENSO phase (Table 1).

3. Data Access

Product	Type	Spatial	Temporal	Website
PERSIANN-CDR Precipitation	Satellite	0.25°	Daily	http://www.ncdc.noaa.gov/cdr/operationalcdrs.html
GHCN Station Precipitation	<i>In Situ</i>	Point	Daily	http://www1.ncdc.noaa.gov/pub/data/ghcn/daily
Oceanic Nino Index	Model	-	3 month	http://www.cpc.ncep.noaa.gov/products/analysis_monitoring/ensostuff/ensoyears.shtml
World Exclusive Economic Zones	Shape File	-	-	http://www.marineregions.org/downloads.php

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Table 1. ONI values 1984-2014 with averaged value of SON through JFM.

Year	DJF	JFM	FMA	MAM	AMJ	MJJ	JJA	JAS	ASO	SON	OND	NDJ	<u>Averaged ONI Values SON-JFM</u>
1984	-0.5	-0.3	-0.3	-0.4	-0.4	-0.4	-0.3	-0.2	-0.3	-0.6	-0.9	-1.1	-0.84
1985	-0.9	-0.7	-0.7	-0.7	-0.7	-0.6	-0.4	-0.4	-0.4	-0.3	-0.2	-0.3	-0.32
1986	-0.4	-0.4	-0.3	-0.2	-0.1	0	0.2	0.4	0.7	0.9	1	1.1	1.06
1987	1.1	1.2	1.1	1	0.9	1.1	1.4	1.6	1.6	1.4	1.2	1.1	1
1988	0.8	0.5	0.1	-0.3	-0.8	-1.2	-1.2	-1.1	-1.2	-1.4	-1.7	-1.8	-1.58
1989	-1.6	-1.4	-1.1	-0.9	-0.6	-0.4	-0.3	-0.3	-0.3	-0.3	-0.2	-0.1	-0.06
1990	0.1	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.4	0.3	0.4	0.4	0.36
1991	0.4	0.3	0.2	0.2	0.4	0.6	0.7	0.7	0.7	0.8	1.2	1.4	1.3
1992	1.6	1.5	1.4	1.2	1	0.8	0.5	0.2	0	-0.1	-0.1	0	0.06
1993	0.2	0.3	0.5	0.7	0.8	0.6	0.3	0.2	0.2	0.2	0.1	0.1	0.12
1994	0.1	0.1	0.2	0.3	0.4	0.4	0.4	0.4	0.4	0.6	0.9	1	0.82
1995	0.9	0.7	0.5	0.3	0.2	0	-0.2	-0.5	-0.7	-0.9	-1	-0.9	-0.88
1996	-0.9	-0.7	-0.6	-0.4	-0.2	-0.2	-0.2	-0.3	-0.3	-0.4	-0.4	-0.5	-0.44
1997	-0.5	-0.4	-0.2	0.1	0.6	1	1.4	1.7	2	2.2	2.3	2.3	2.14
1998	2.1	1.8	1.4	1	0.5	-0.1	-0.7	-1	-1.2	-1.2	-1.3	-1.4	-1.3
1999	-1.4	-1.2	-1	-0.9	-0.9	-1	-1	-1	-1.1	-1.2	-1.4	-1.6	-1.44
2000	-1.6	-1.4	-1.1	-0.9	-0.7	-0.7	-0.6	-0.5	-0.6	-0.7	-0.8	-0.8	-0.72
2001	-0.7	-0.6	-0.5	-0.3	-0.2	-0.1	0	-0.1	-0.1	-0.2	-0.3	-0.3	-0.22
2002	-0.2	-0.1	0.1	0.2	0.4	0.7	0.8	0.9	1	1.2	1.3	1.1	1.02
2003	0.9	0.6	0.4	0	-0.2	-0.1	0.1	0.2	0.3	0.4	0.4	0.4	0.34
2004	0.3	0.2	0.1	0.1	0.2	0.3	0.5	0.7	0.7	0.7	0.7	0.7	0.66
2005	0.6	0.6	0.5	0.5	0.4	0.2	0.1	0	0	-0.1	-0.4	-0.7	-0.5
2006	-0.7	-0.6	-0.4	-0.2	0	0.1	0.2	0.3	0.5	0.8	0.9	1	0.74
2007	0.7	0.3	0	-0.1	-0.2	-0.2	-0.3	-0.6	-0.8	-1.1	-1.2	-1.3	-1.26
2008	-1.4	-1.3	-1.1	-0.9	-0.7	-0.5	-0.3	-0.2	-0.2	-0.3	-0.5	-0.7	-0.6
2009	-0.8	-0.7	-0.4	-0.1	0.2	0.4	0.5	0.6	0.7	1	1.2	1.3	1.18
2010	1.3	1.1	0.8	0.5	0	-0.4	-0.8	-1.1	-1.3	-1.4	-1.3	-1.4	-1.3
2011	-1.3	-1.1	-0.8	-0.6	-0.3	-0.2	-0.3	-0.5	-0.7	-0.9	-0.9	-0.8	-0.78
2012	-0.7	-0.6	-0.5	-0.4	-0.3	-0.1	0.1	0.3	0.4	0.4	0.2	-0.2	-0.1
2013	-0.4	-0.5	-0.3	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2	-0.3	-0.36
2014	-0.5	-0.6	-0.4	-0.2	0	0	0	0	0.2	0.4	0.6	0.6	

Table 2. ENSO phases and years based on the averaged ONI values of SON through JFM.

Mod-Strong La Niña ONI ≤ -1.0	Weak La Niña $-1.0 < \text{ONI} \leq -0.5$	Neutral $-0.5 < \text{ONI} < 0.5$	Weak El Niño $0.5 \leq \text{ONI} < 1.0$	Mod-Strong El Niño ONI ≥ 1.0
88/89	84/85	85/86	94/95	86/87
98/99	95/96	89/90	04/05	87/88
99/00	00/01	90/91	06/07	91/92
07/08	05/06	92/93		97/98
10/11	08/09	93/94		02/03
	11/12	96/97		09/10
		01/02		
		03/04		
		12/13		
		13/14		

Figure 1. Map of verification station locations with Exclusive Economic Zones (EEZs) outlined.

U.S. AFFILIATED PACIFIC ISLANDS

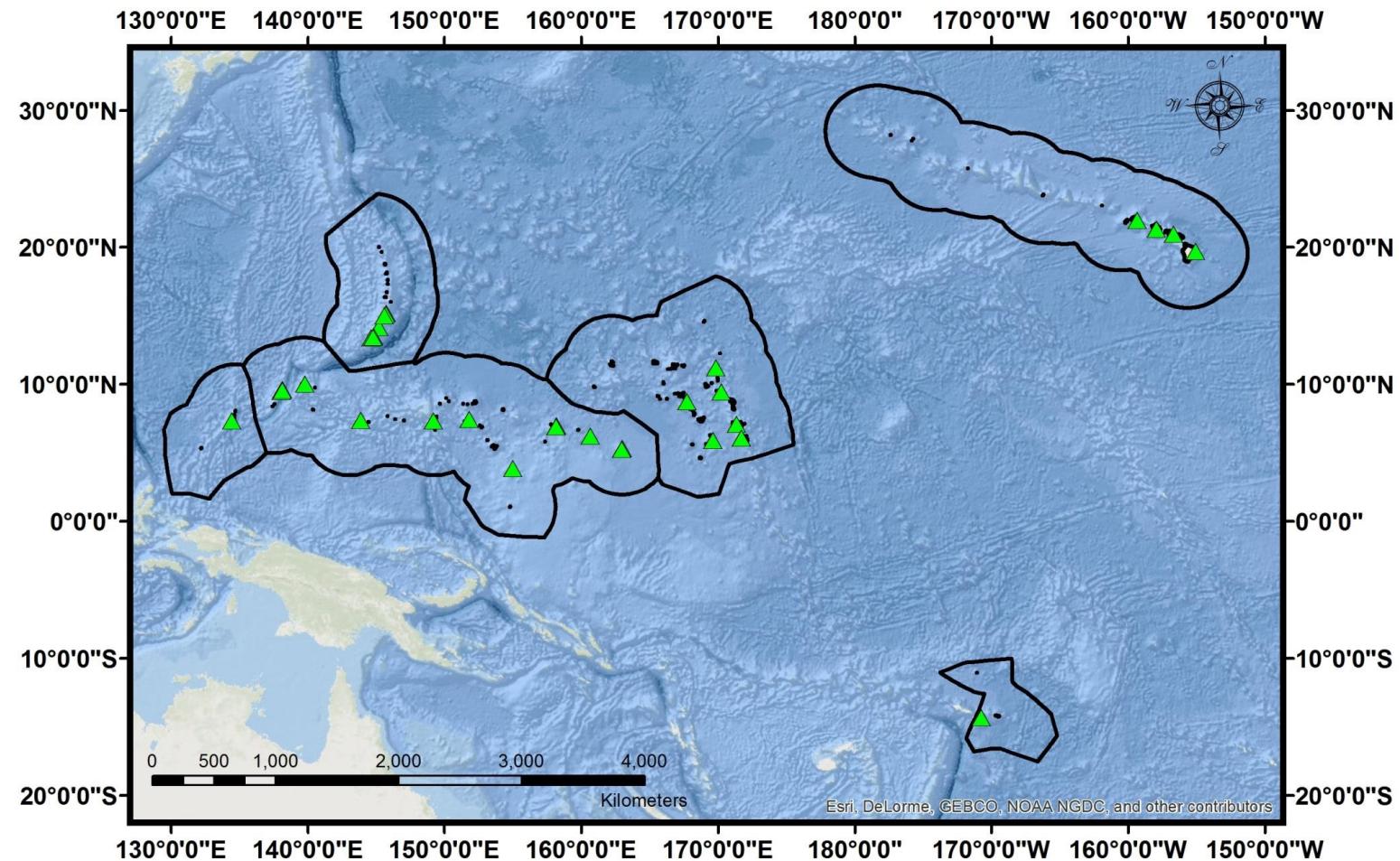


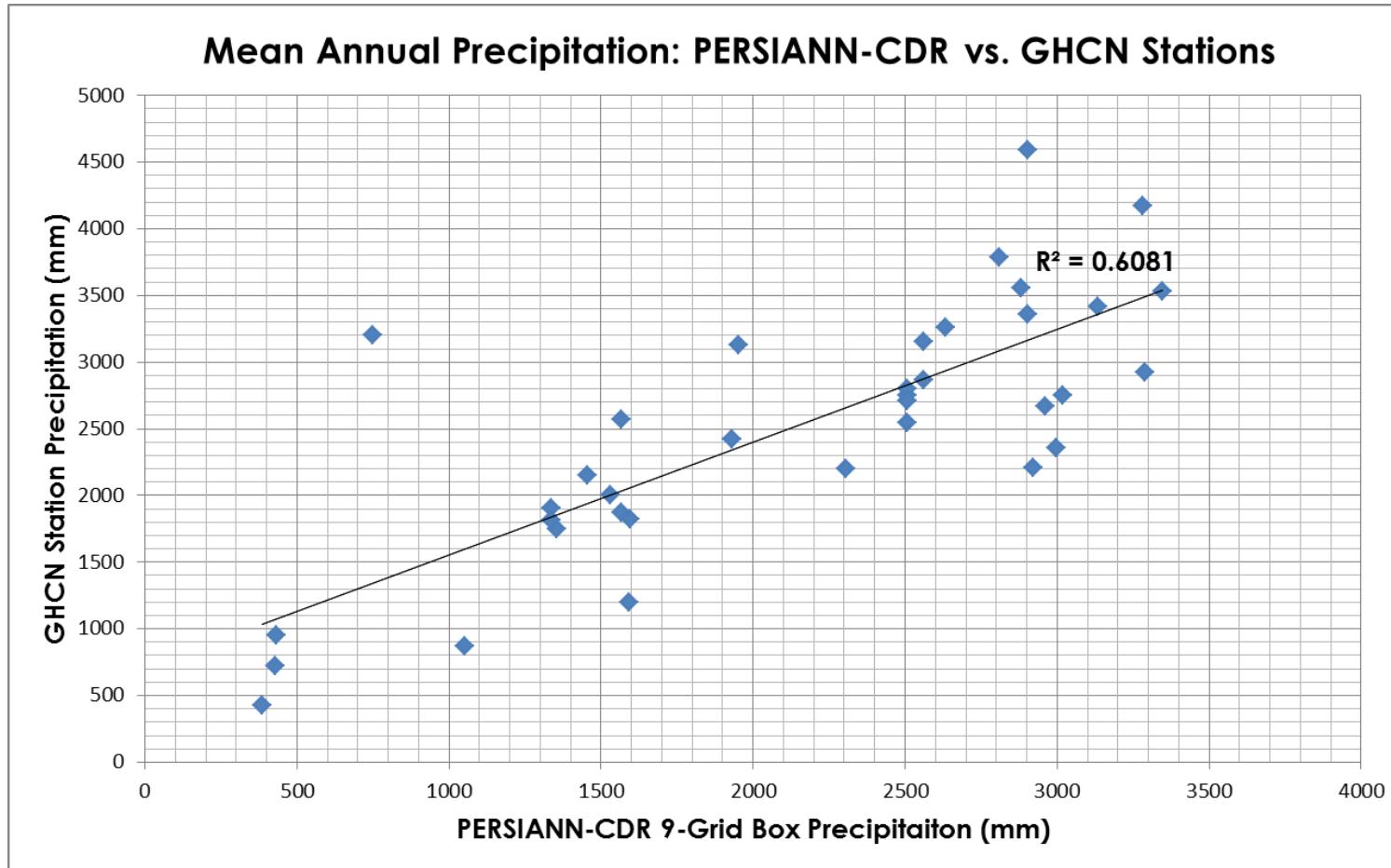
Table 3. List of GHCN Stations used in verification analysis with 1985-2014 mean annual precipitation values compared to PERSIANN-CDR 1-grid box over station and sensitivity analysis of surrounding grid boxes. Countries and states are as follows: American Samoa (AS), Commonwealth of the Northern Mariana Islands (MP), Federal States of Micronesia (FM), Guam (GU), Hawaii (HI), Republic of the Marshall Islands (MH), Republic of Palau (PW).

NOAA STATION INFORMATION						30-YEAR MEAN (1985-2014)	
<u>Level 1 Stations</u>							
Location	GHCN ID	Latitude	Longitude	Elevation (m)	Station (mm)	PERSIANN 1-Grid Box (mm)	PERSIANN 9-Grid Box (mm)
AS PAGO PAGO WSO AP	AQW00061705	-14.3306	-170.7136	3.7	3131	1955	1953
FM YAP ISLAND WSO AP	FMW00040308	9.4833	138.0833	13.4	3151	2557	2560
FM POHNPEI WSO	FMW00040504	6.9667	158.2167	36.6	4595	2901	2903
FM CHUUK WSO AP	FMW00040505	7.4500	151.8333	1.5	3557	2871	2881
GUAM INTL AP	GQW00041415	13.4836	144.7961	77.4	2574	1575	1566
PW KOROR WSO	PSW00040309	7.3333	134.4833	28.7	3785	2821	2808
MH KWAJALEIN	RMW00040604	8.7333	167.7333	2.1	2424	1923	1929
MH MAJURO WBAS AP	RMW00040710	7.0833	171.3833	3.0	3262	2636	2632
HI HILO INTL AP	USW00021504	19.7192	-155.0531	11.6	3200	781	751
HI HONOLULU INTL AP	USW00022521	21.3239	-157.9294	2.1	427	385	384
HI LIHUE WSO AP	USW00022536	21.9839	-159.3405	30.5	954	441	432

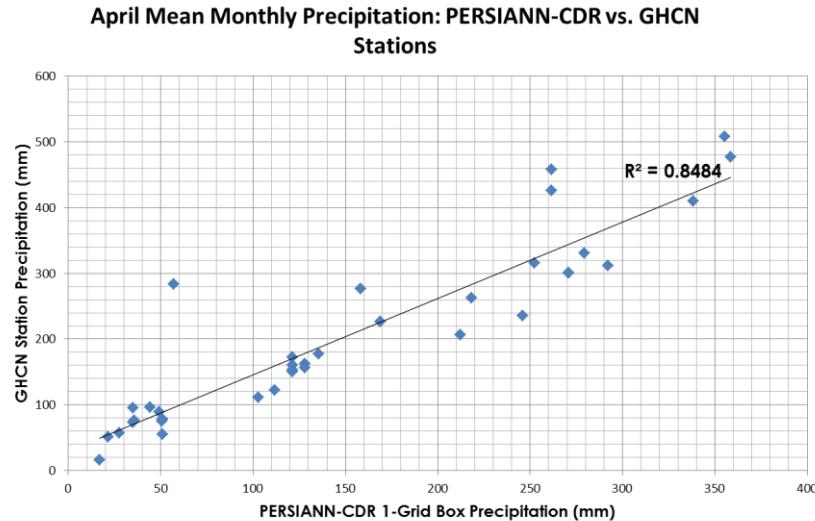
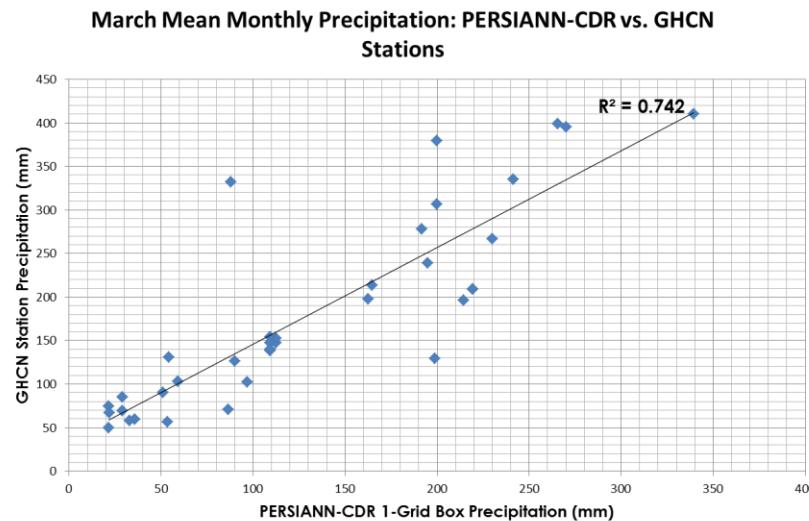
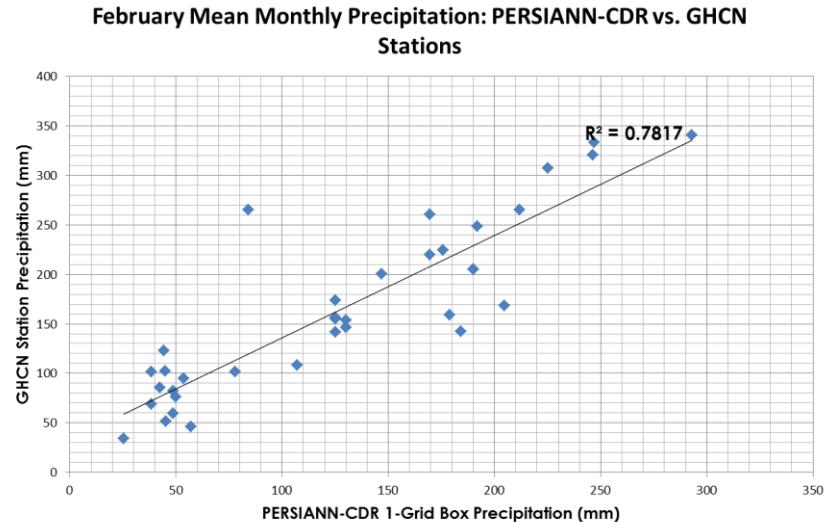
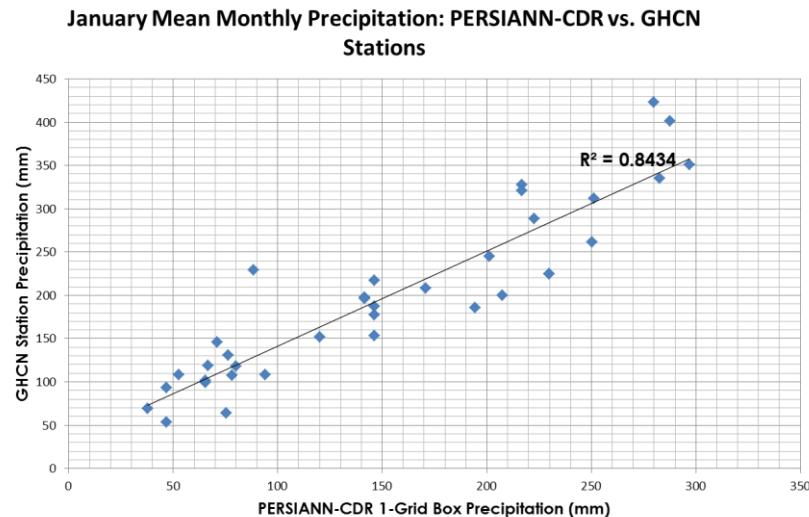
<u>Level 2 Stations</u>							
Location	GHCN ID	Latitude	Longitude	Elevation (m)	Station (mm)	PERSIANN 1-Grid Box (mm)	PERSIANN 9-Grid Box (mm)
MP CAPITOL HILL 1	CQC00914080	15.2136	145.7497	252.1m	1909	1323	1335
MP ROTA AP	CQC00914801	14.1717	145.2428	179.2m	2153	1463	1457
MP SAIPAN INTL AP	CQC00914855	15.1189	145.7294	65.5m	1814	1323	1335

MP TINIAN	CQC00914874	15.0000	145.6333	81.7m	1752	1346	1356
FM LUWEECH	FMC00914429	9.4833	138.0833	10.1m	2862	2557	2560
FM MAAP	FMC00914446	9.6053	138.1786	14.9m	2751	2513	2508
FM NORTH FANIF	FMC00914585	9.5742	138.1108	3.0m	2798	2513	2508
FM NUKUORO	FMC00914590	3.8500	155.0167	2.4m	3533	3348	3348
FM PALIKIR	FMC00914710	6.9269	158.1572	85.3m	3359	2901	2903
FM PINGELAP	FMC00914720	6.2167	160.7000	2.4m	3419	3139	3136
FM POLOWAT	FMC00914761	7.3500	149.2000	2.1m	2212	2901	2922
FM RUMUNG	FMC00914808	9.6244	138.1592	19.8m	2708	2513	2508
FM TAMIL	FMC00914831	9.5500	138.1500	21.3m	2544	2513	2508
FM TOFOL	FMC00914843	5.3264	163.0050	14.9m	2921	3294	3289
FM ULITHI	FMC00914892	10.0333	139.8000	1.8m	2200	2282	2304
FM UTWA	FMC00914898	5.2739	162.9742	4.0m	4175	3307	3282
FM WOLEAI ATOLL	FMC00914911	7.3833	143.9167	2.1m	2671	2948	2961
GU AGAT	GQC00914001	13.3894	144.6575	3.0m	1824	1606	1594
GU DEDEDO	GQC00914156	13.5200	144.8472	106.7m	2002	1528	1531
GU MANGILAO	GQC00914468	13.4528	144.7981	18.3m	1872	1575	1566
MH JALUIT	RMC00914304	5.9167	169.6500	1.8m	2748	3014	3020
MH MILI	RMC00914487	6.0833	171.7333	3.0m	2356	2997	2997
MH UTIRIK	RMC00914895	11.2300	169.8500	2.0m	867	1043	1050
MH WOTJE	RMC00914903	9.4667	170.2500	1.8m	1197	1592	1592
HI KAPALUA W MAUI AP	USC00513317	20.9625	-156.6753	73.2m	719	427	430

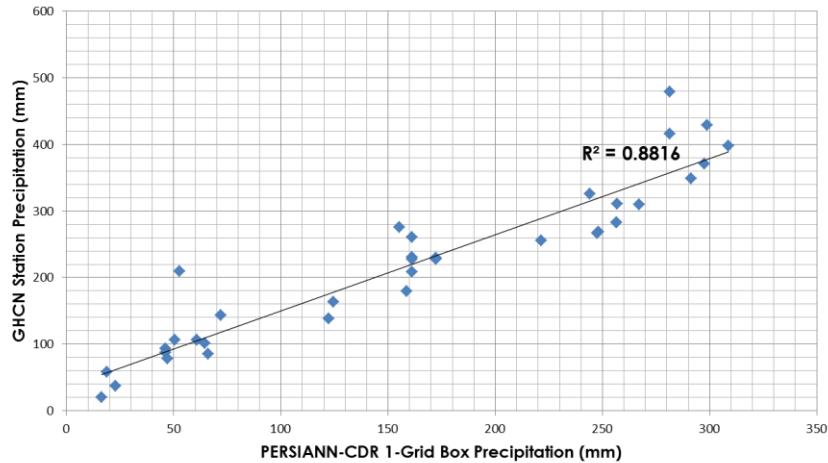
Figure 2. GHCN mean annual precipitation values (1985-2014) compared to PERSIANN-CDR 9-grid box average surrounding station.



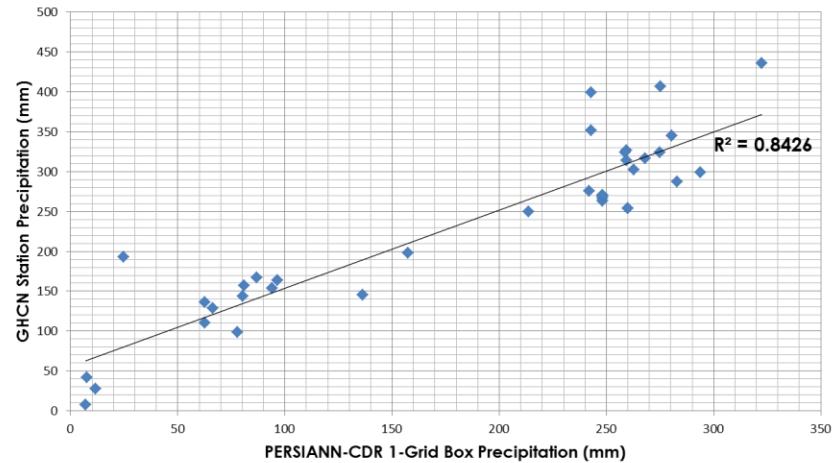
Figures 3. Mean monthly precipitation comparison of GHCN station values to PERSIANN-CDR 1-grid box values.



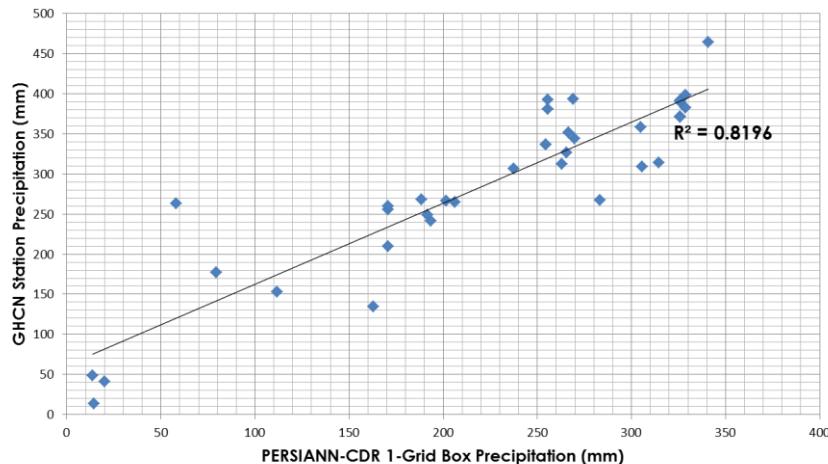
May Mean Monthly Precipitation: PERSIANN-CDR vs. GHCN Stations



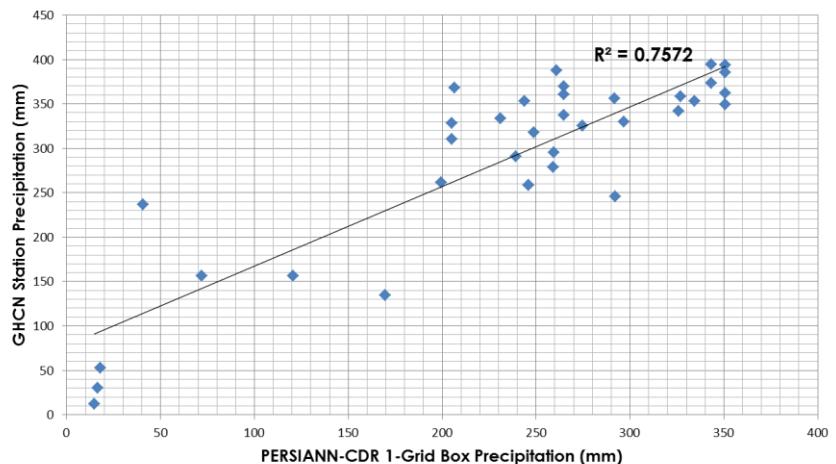
June Mean Monthly Precipitation: PERSIANN-CDR vs. GHCN Stations



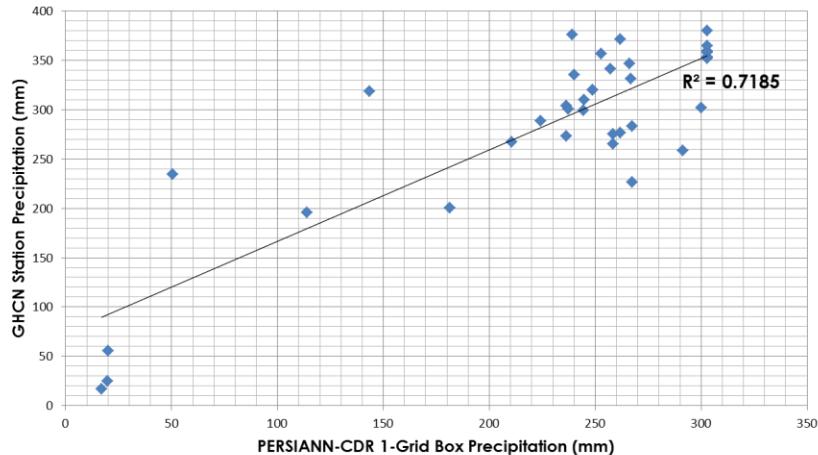
July Mean Monthly Precipitation: PERSIANN-CDR vs. GHCN Stations



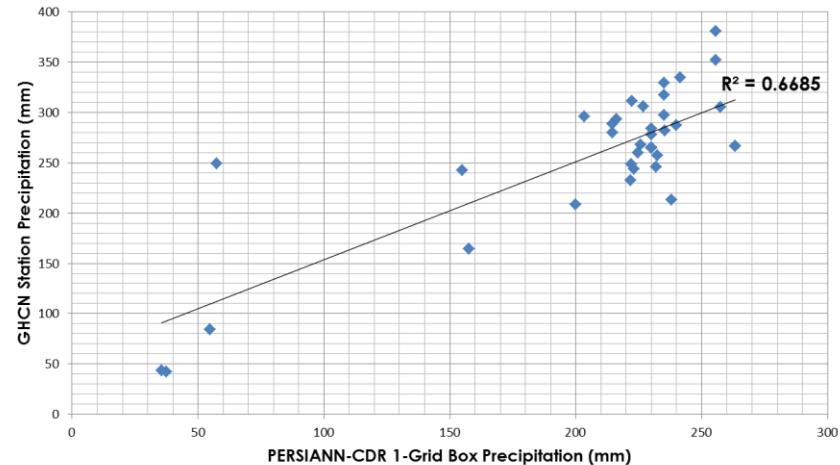
August Mean Monthly Precipitation: PERSIANN-CDR vs. GHCN Stations



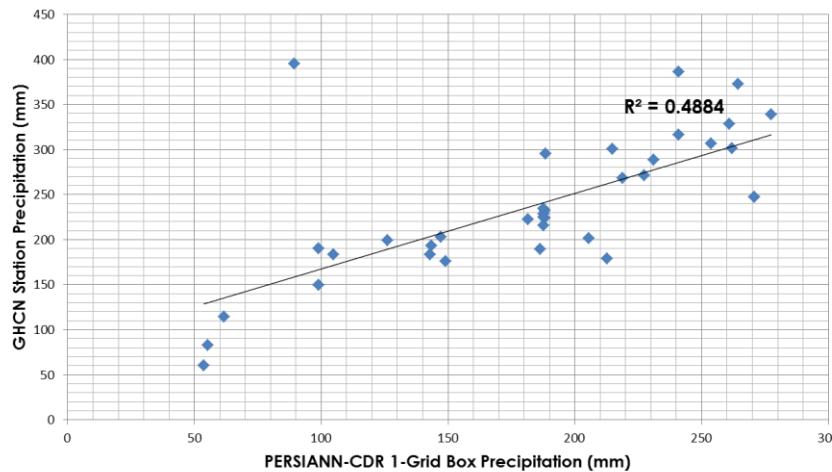
September Mean Monthly Precipitation: PERSIANN-CDR vs. GHCN Stations



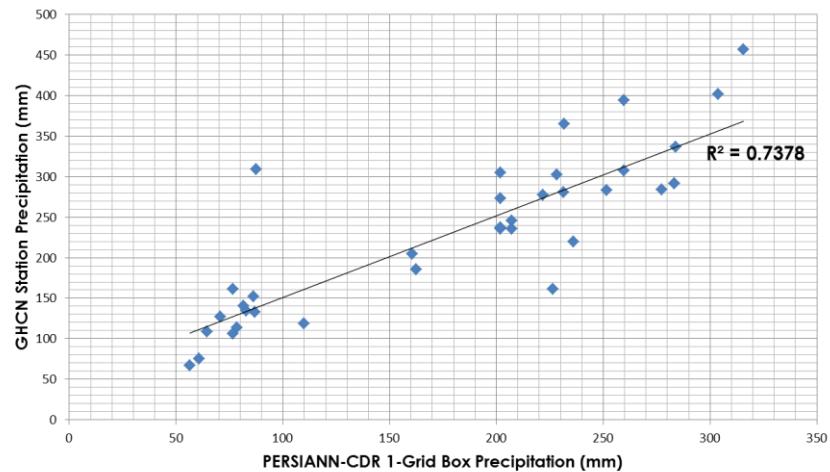
October Mean Monthly Precipitation: PERSIANN-CDR vs. GHCN Stations



November Mean Monthly Precipitation: PERSIANN-CDR vs. GHCN Stations



December Mean Monthly Precipitation: PERSIANN-CDR vs. GHCN Stations



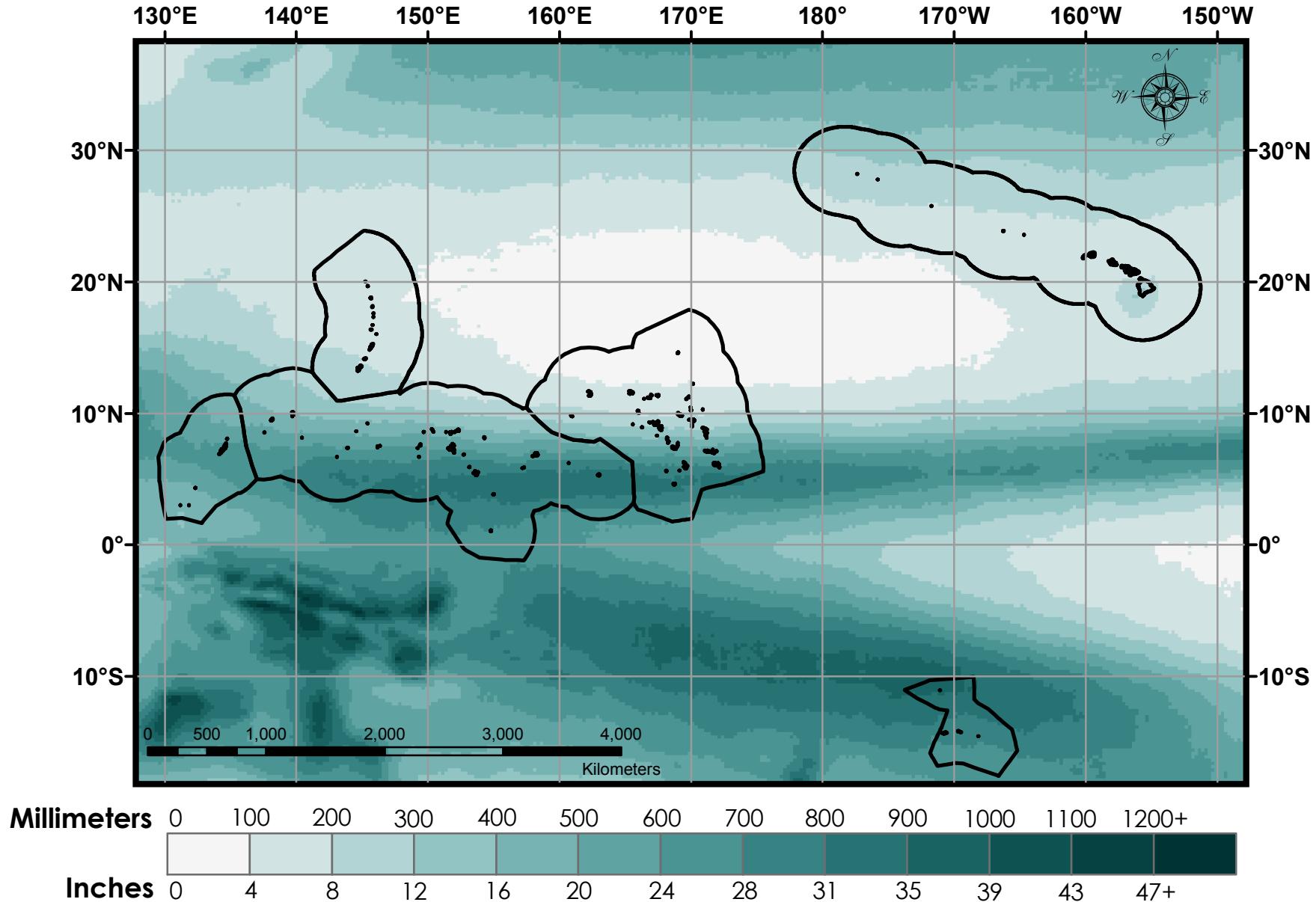
The following maps show 30-year average (January 1985 through December 2014) precipitation for each three month season for all of the Exclusive Economic Zones (EEZ) of the U.S. Affiliated Pacific Islands (USAPI).

These maps show the areas across the region that receive more precipitation (turquoise/green) or less precipitation (white) for the three month season. Additionally, these maps show how precipitation patterns change as the Inter Tropical Convergence Zone shifts.

All of the maps show precipitation at a 0.25° resolution from the NOAA PERSIANN-CDR.

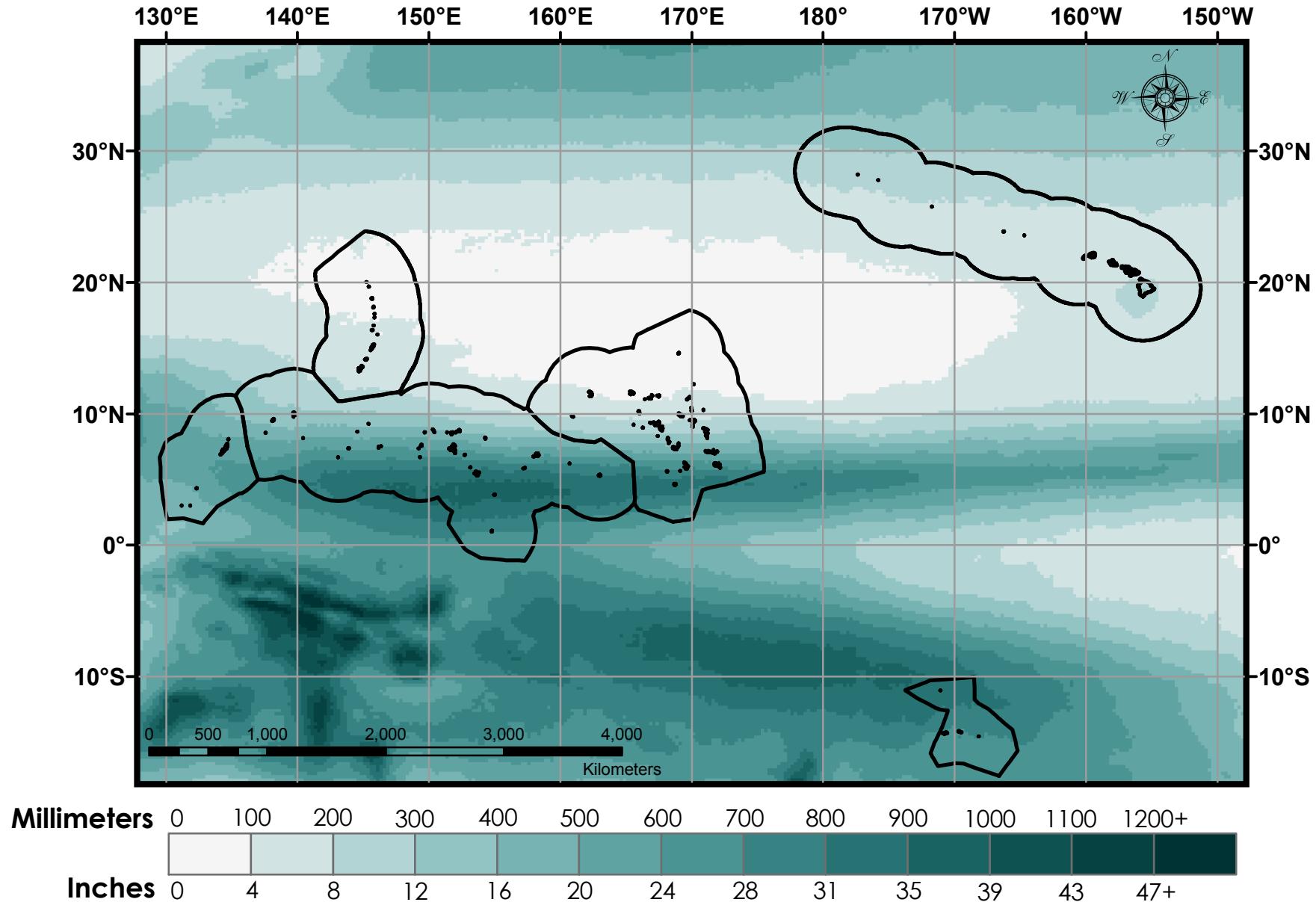
30-Year Mean Seasonal Precipitation for DJF

16



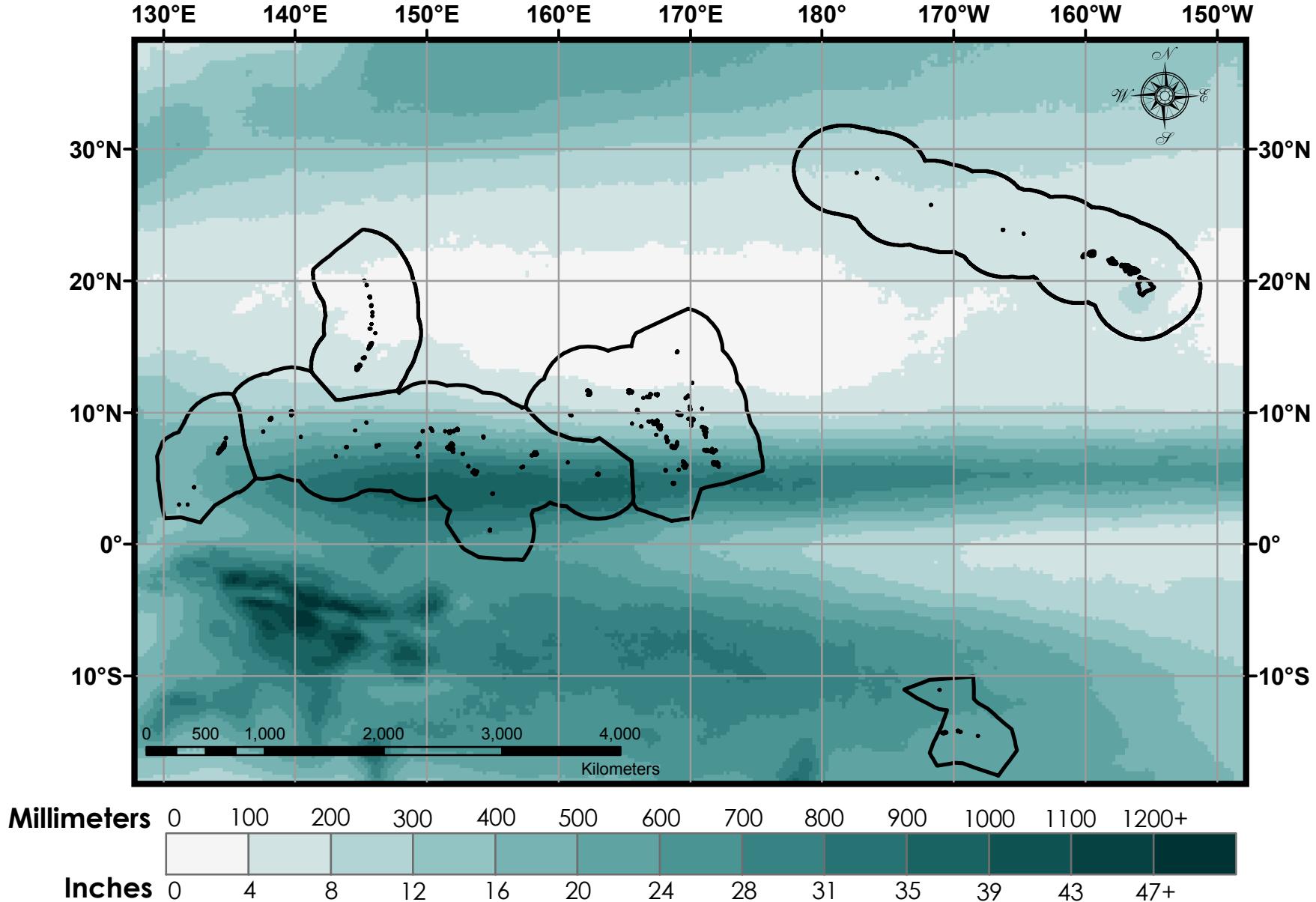
30-Year Mean Seasonal Precipitation for JFM

17



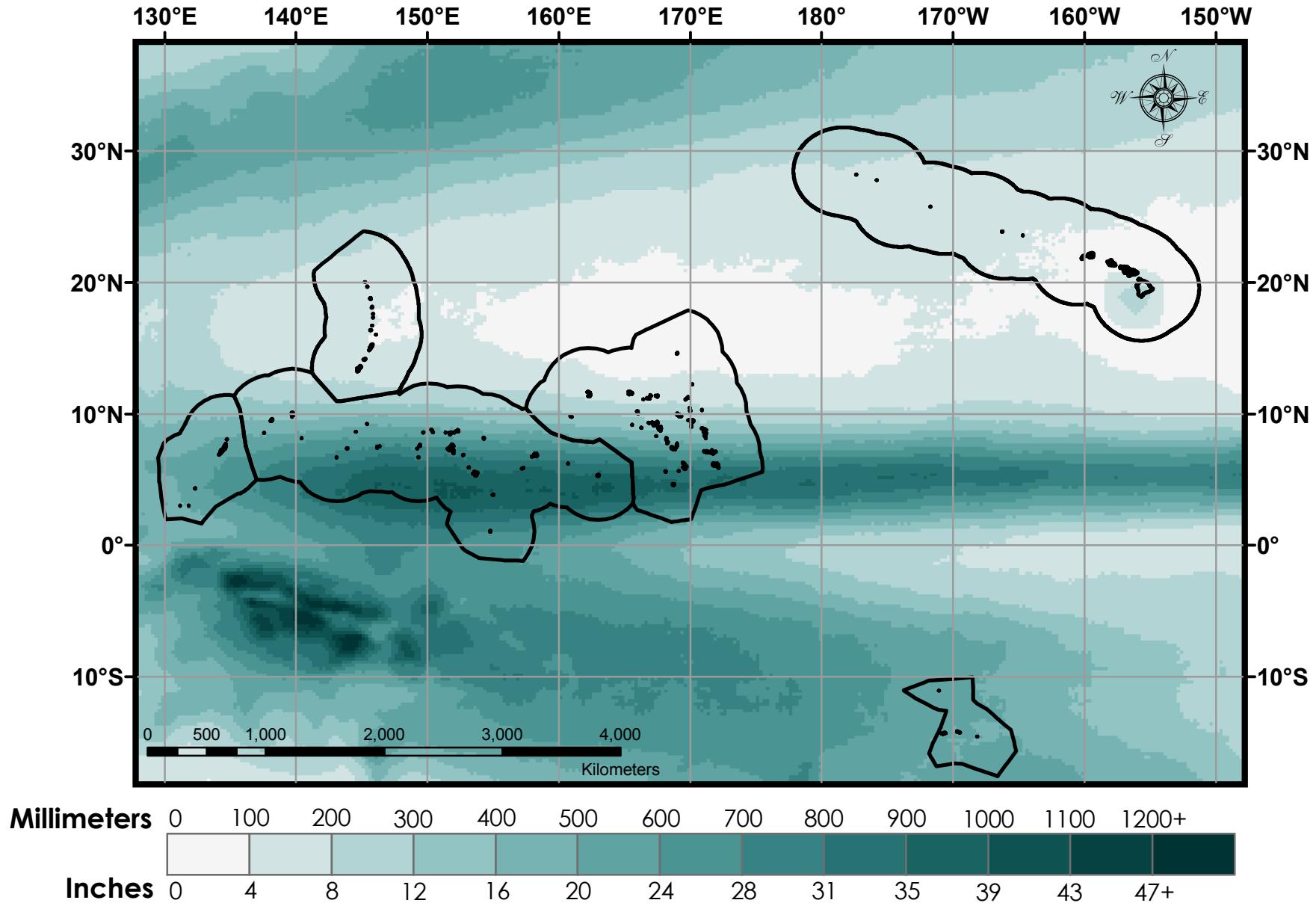
30-Year Mean Seasonal Precipitation for FMA

18



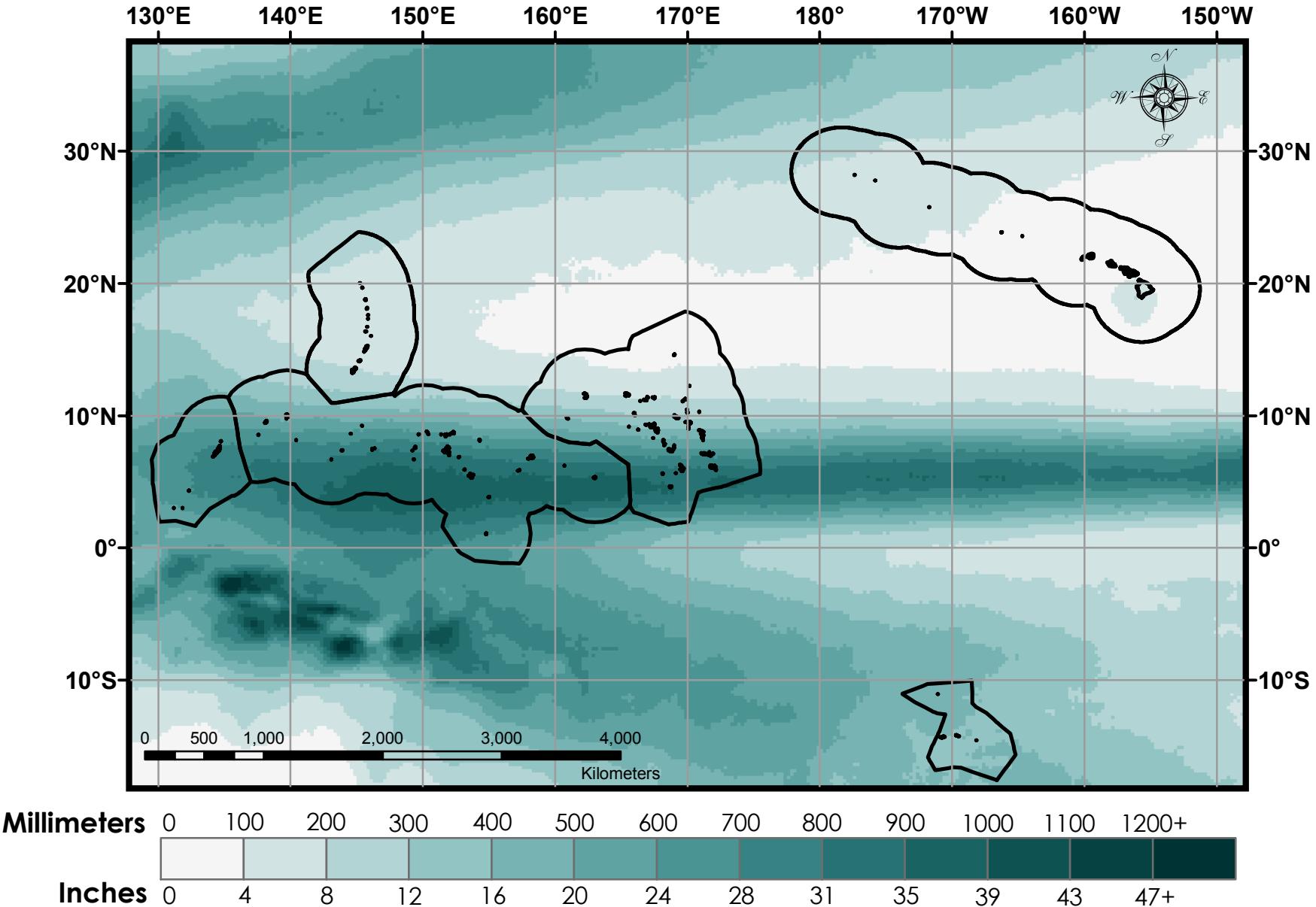
30-Year Mean Seasonal Precipitation for MAM

19



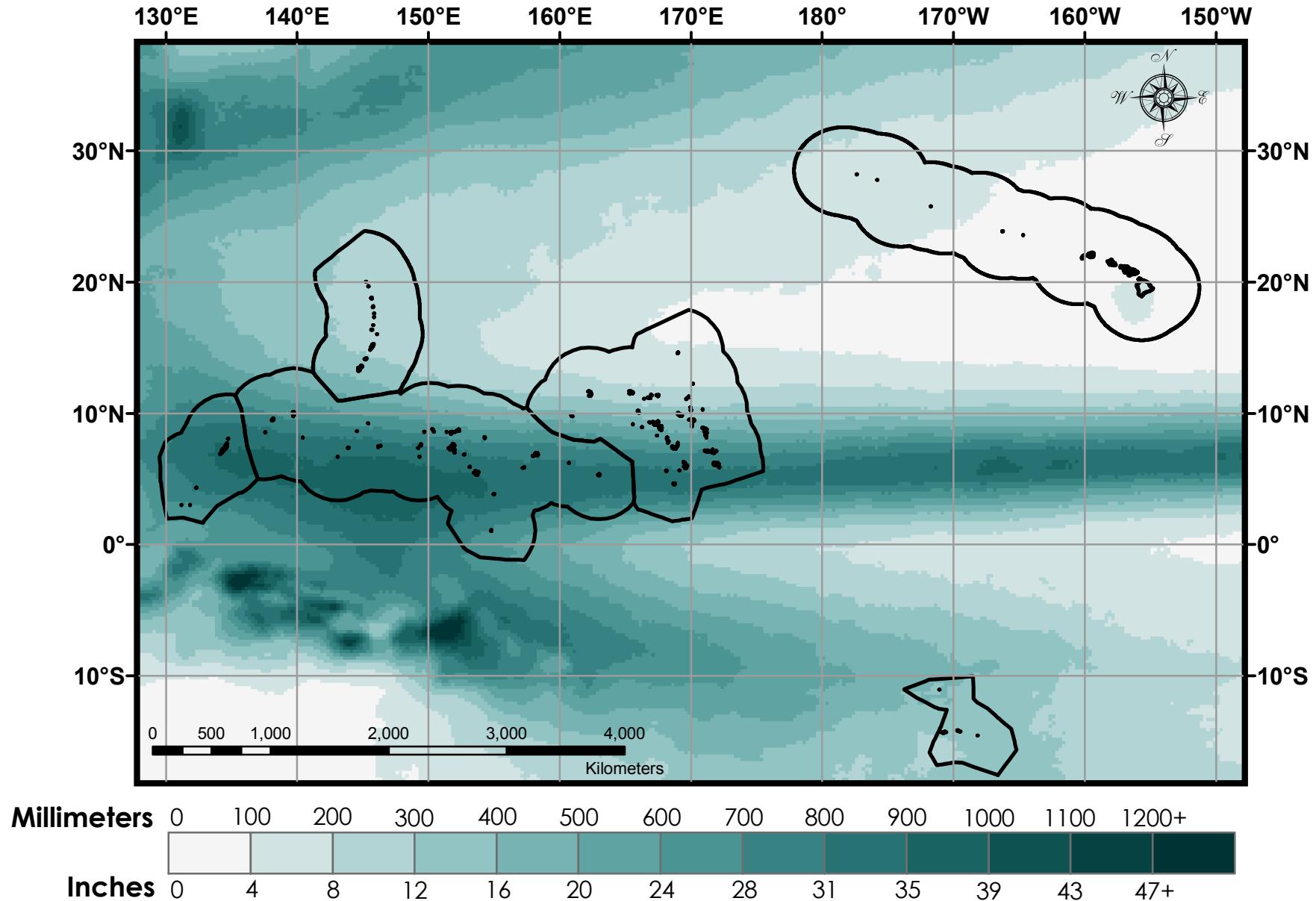
30-Year Mean Seasonal Precipitation for AMJ

20



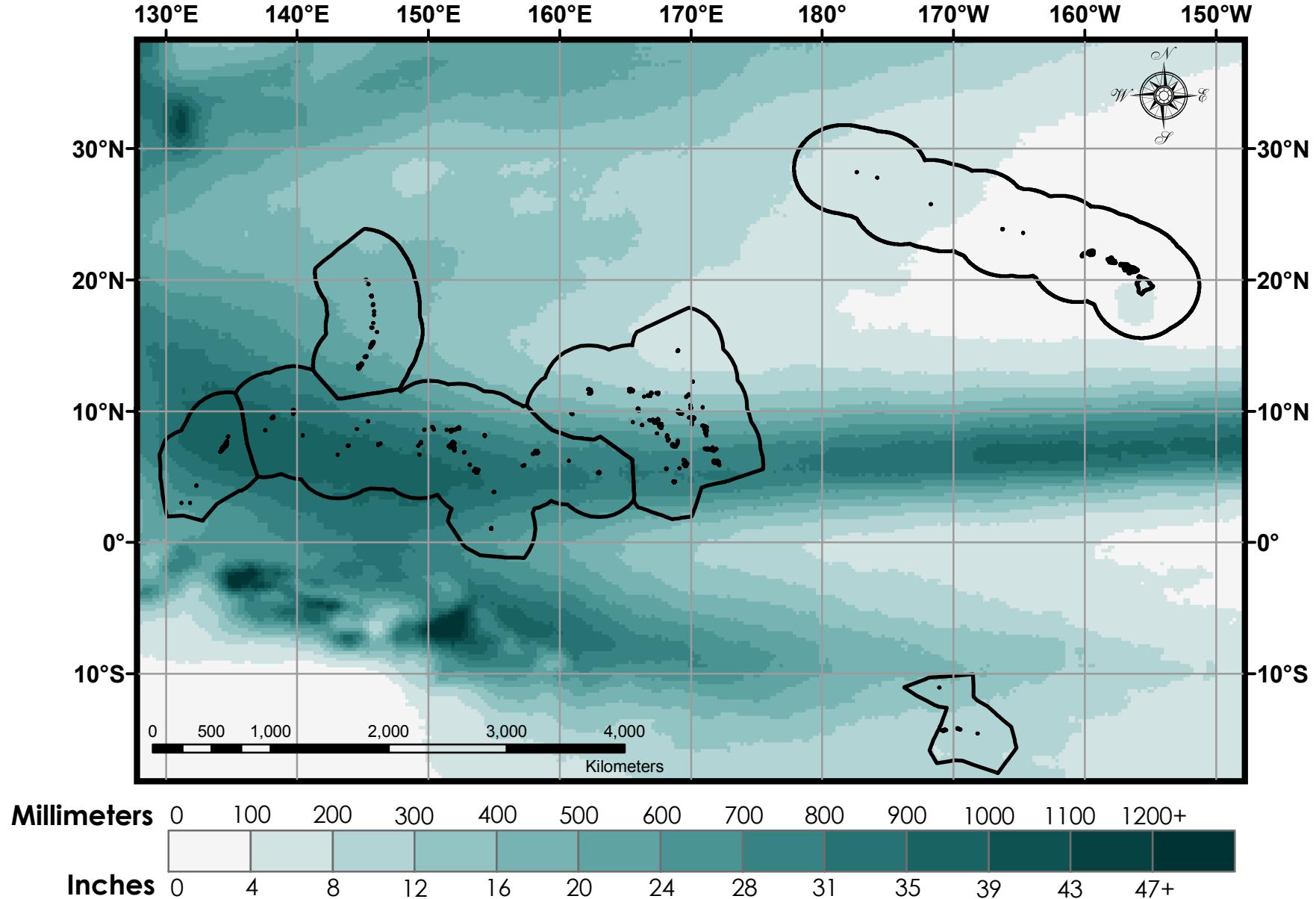
30-Year Mean Seasonal Precipitation for MJJ

21



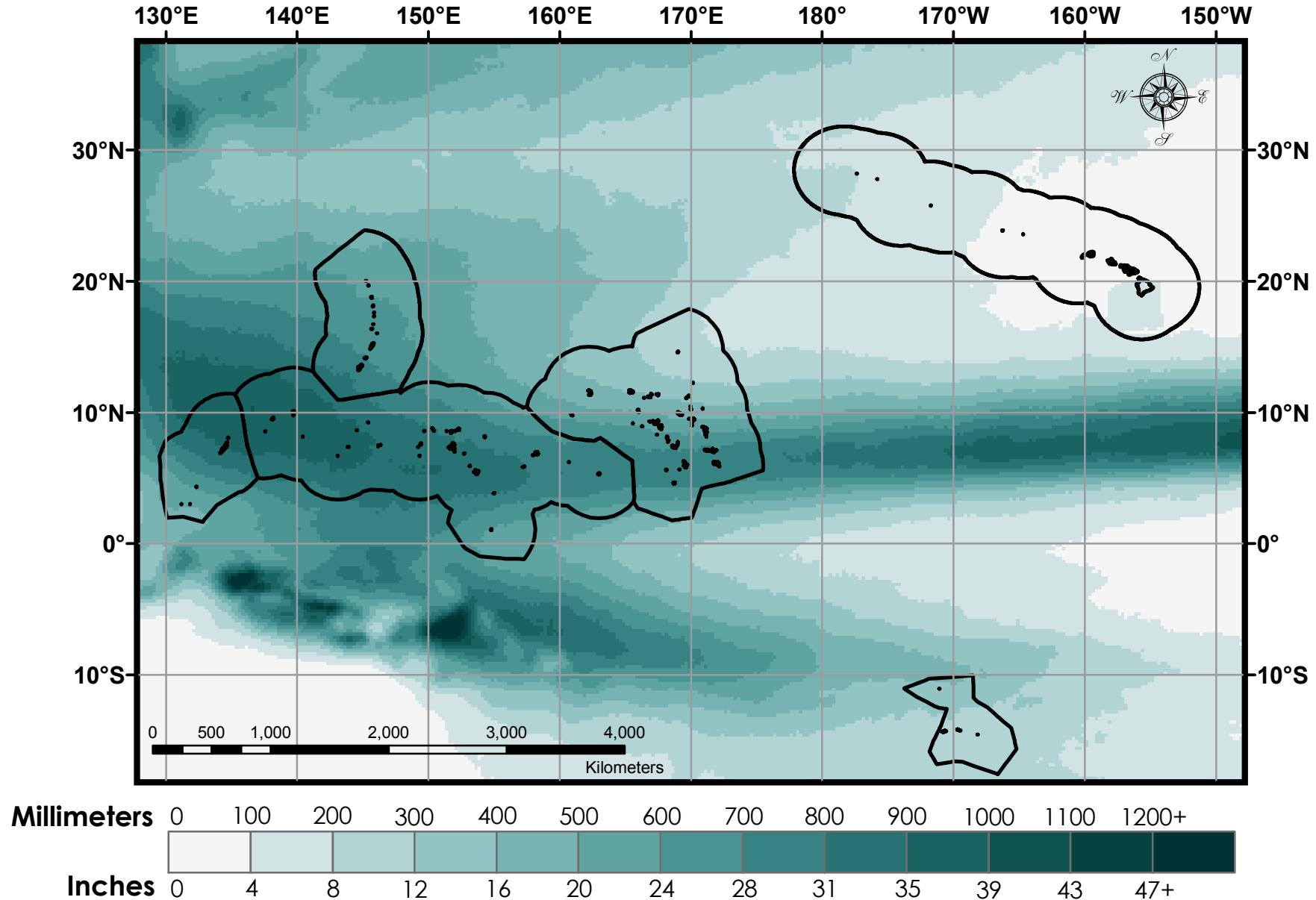
30-Year Mean Seasonal Precipitation for JJA

22



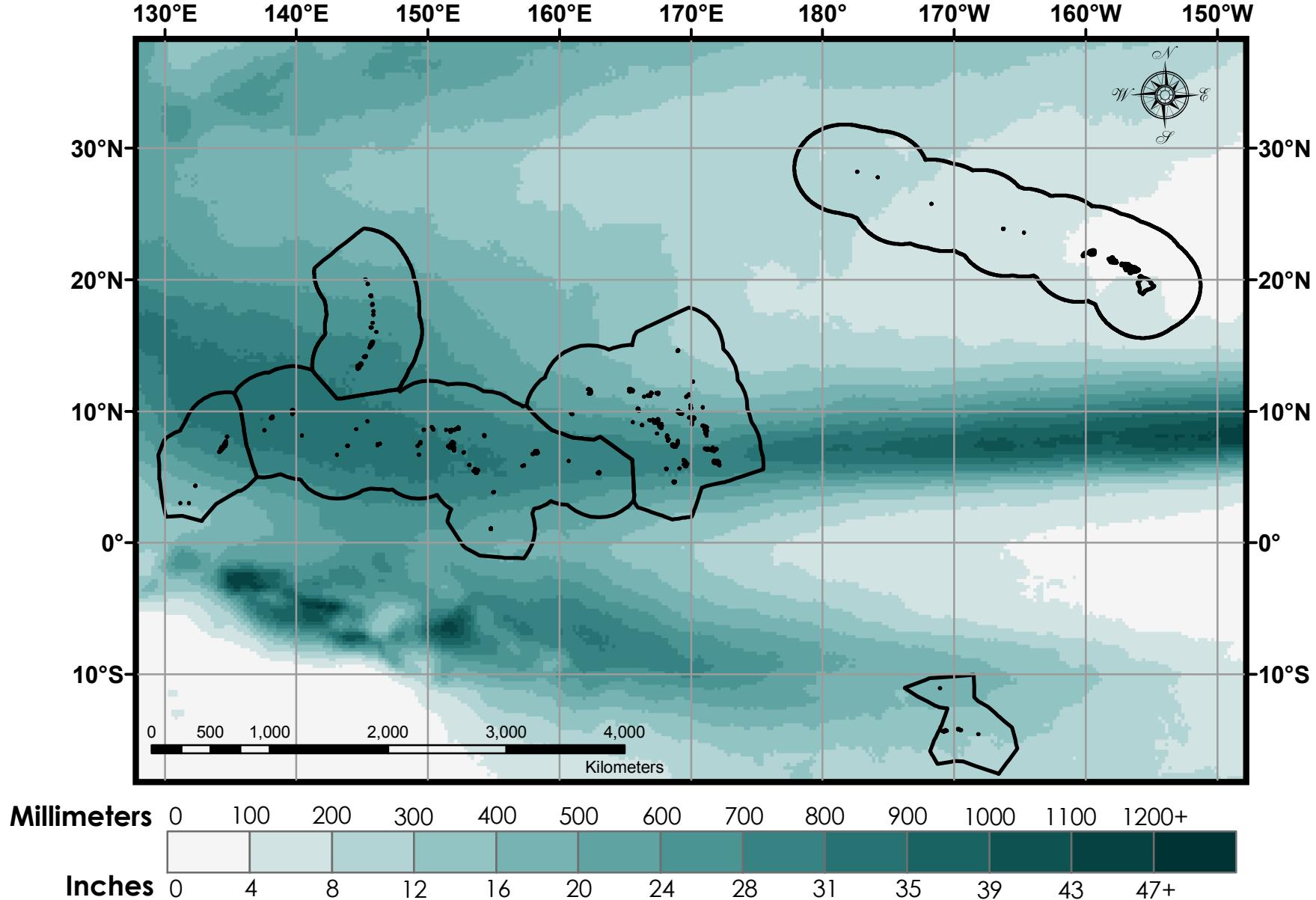
30-Year Mean Seasonal Precipitation for JAS

23



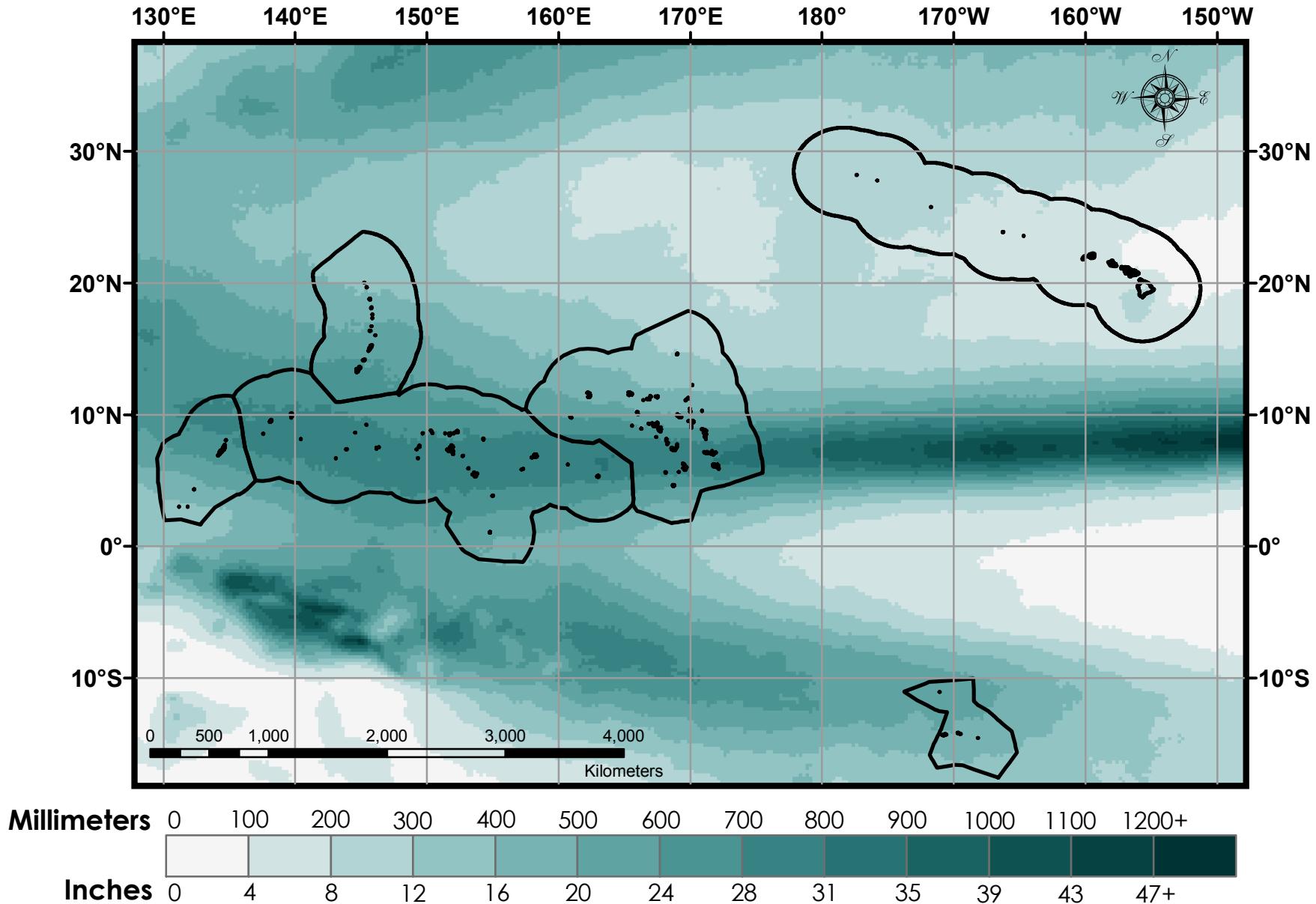
30-Year Mean Seasonal Precipitation for ASO

24



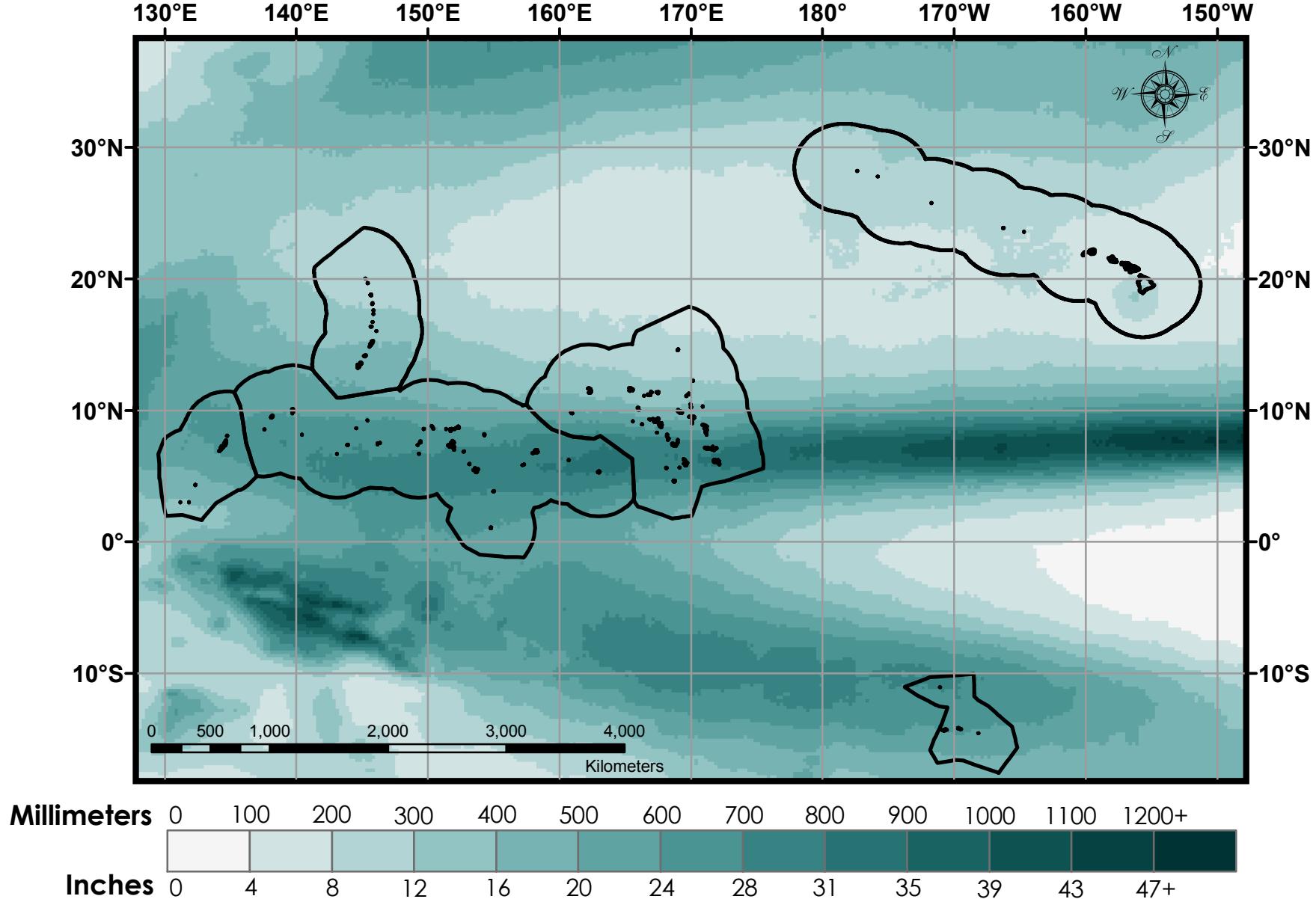
30-Year Mean Seasonal Precipitation for SON

25



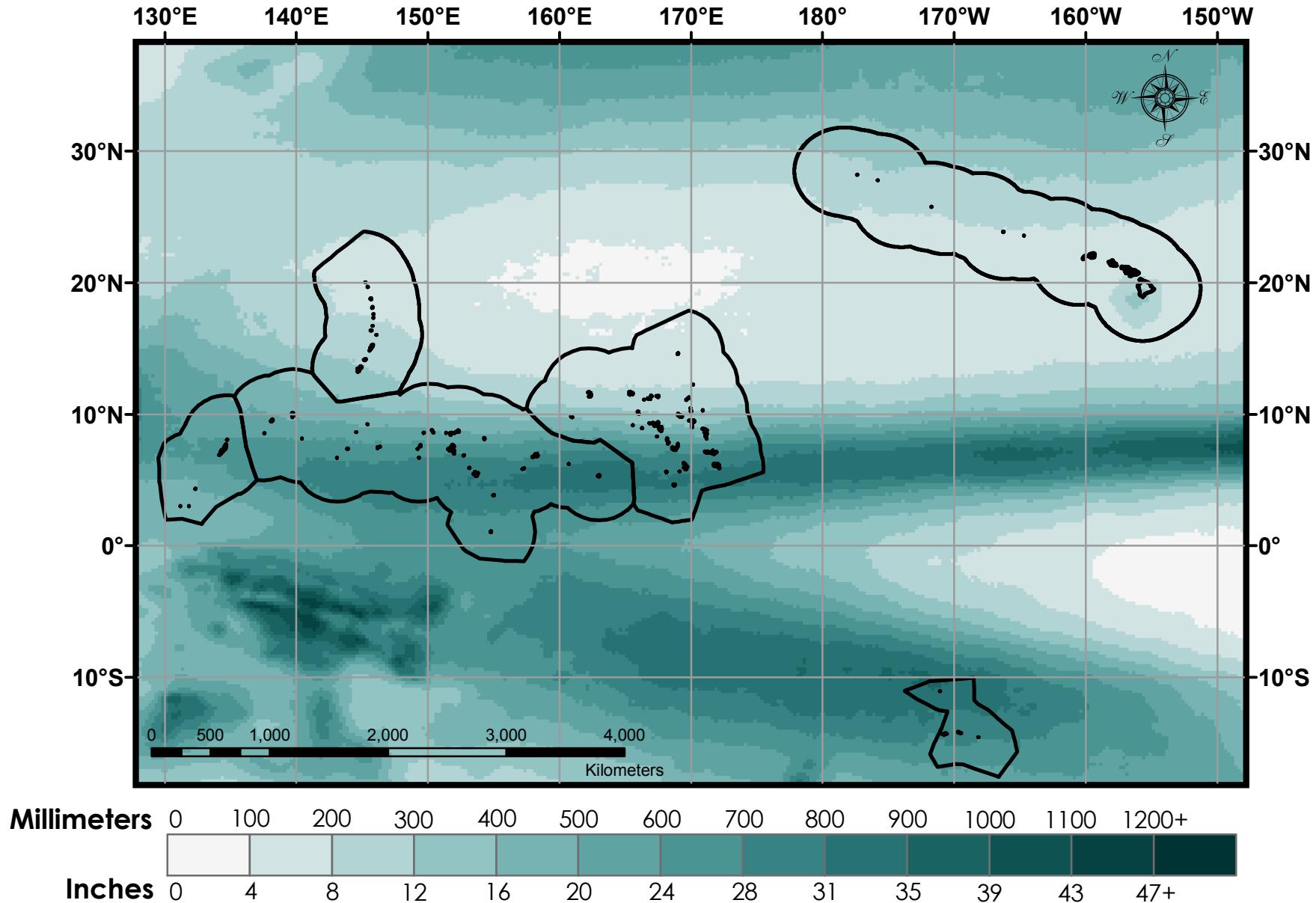
30-Year Mean Seasonal Precipitation for OND

26



30-Year Mean Seasonal Precipitation for NDJ

27



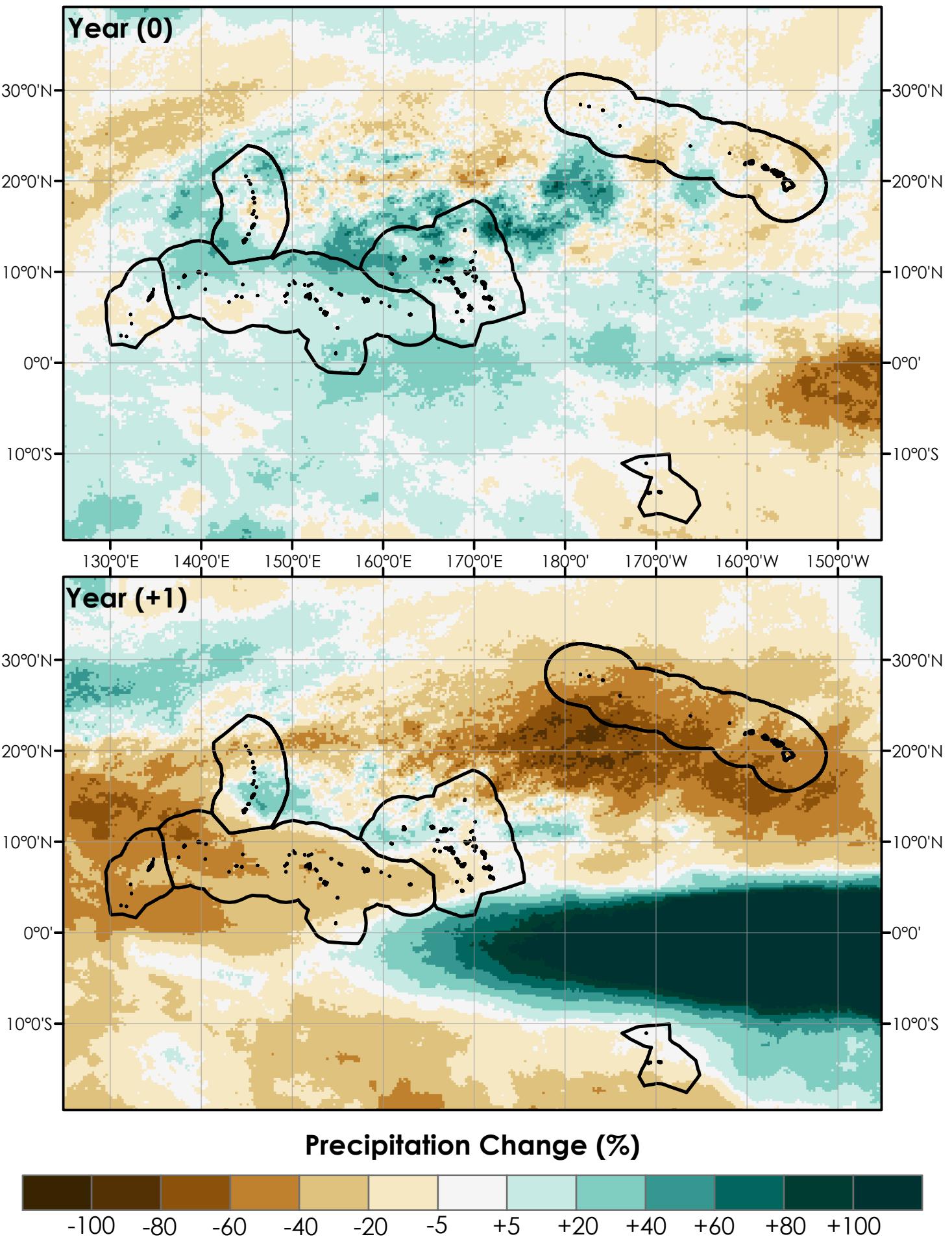
The following two-panel maps show each three month seasonal average precipitation change for each of the five ENSO phases (moderate-strong La Niña and El Niño, weak La Niña and El Niño, and neutral) for all of the Exclusive Economic Zone (EEZ) of the U.S. Affiliated Pacific Islands (USAPI). Within each two-panel map, the top map shows the average precipitation change for the three month season preceding (Year (0)) the onset of the specific ENSO phase, which is listed in the title, and the bottom map shows the average precipitation change following (Year (+1)) the onset of the specific ENSO phase.

These maps show the areas within the EEZ that are abnormally wet (turquoise/green) or dry (tan/brown) for the three month season during a specific ENSO phase. Additionally, these maps show how the precipitation varies from a pre ENSO to a post ENSO phase. This is important when determining how the different ENSO phases influence precipitation patterns.

All of the maps show precipitation at a 0.25° resolution from the NOAA PERSIANN-CDR. The “normal” is the 30-year average precipitation from January 1985 through December 2014.

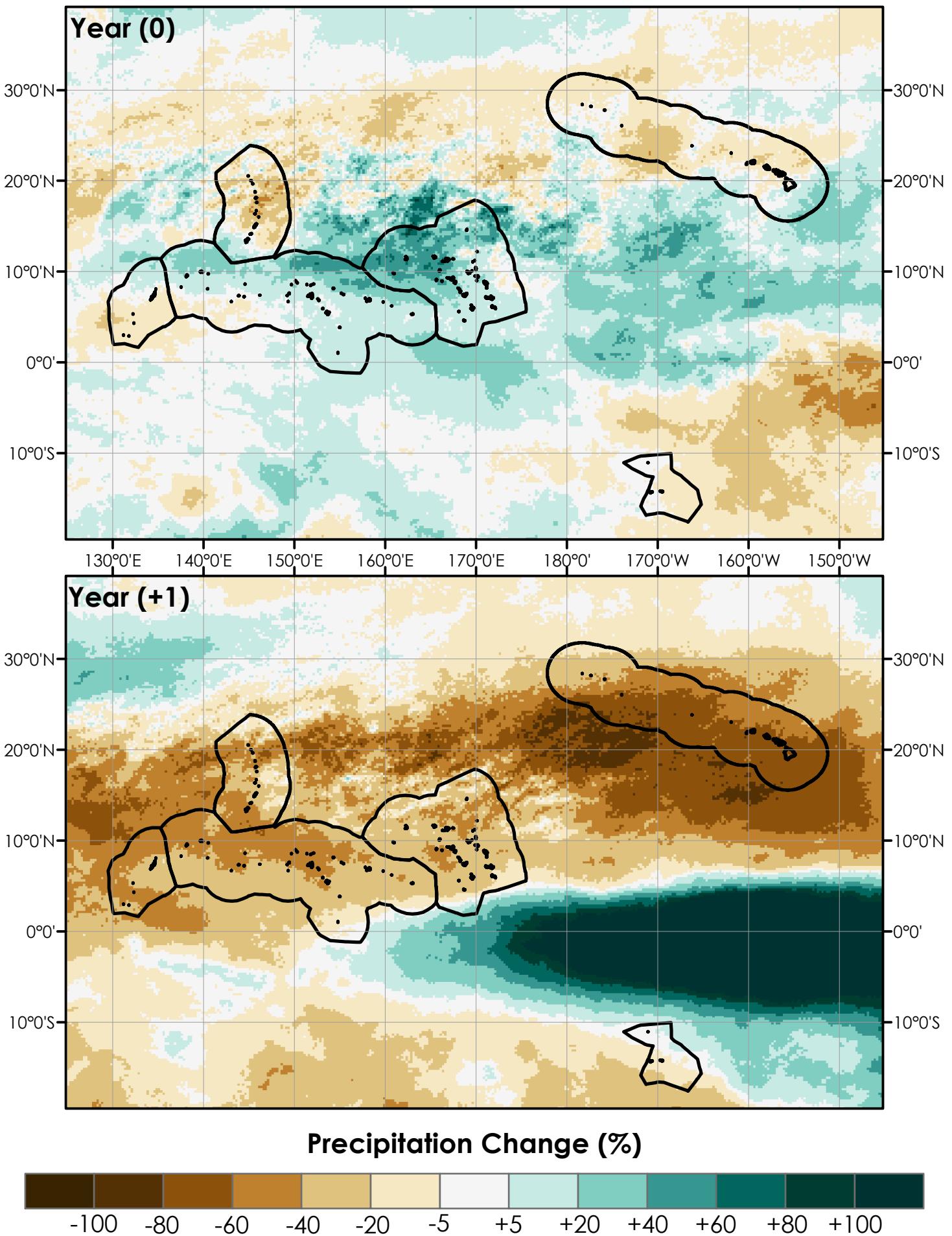
Moderate-Strong El Niño for DJF

29



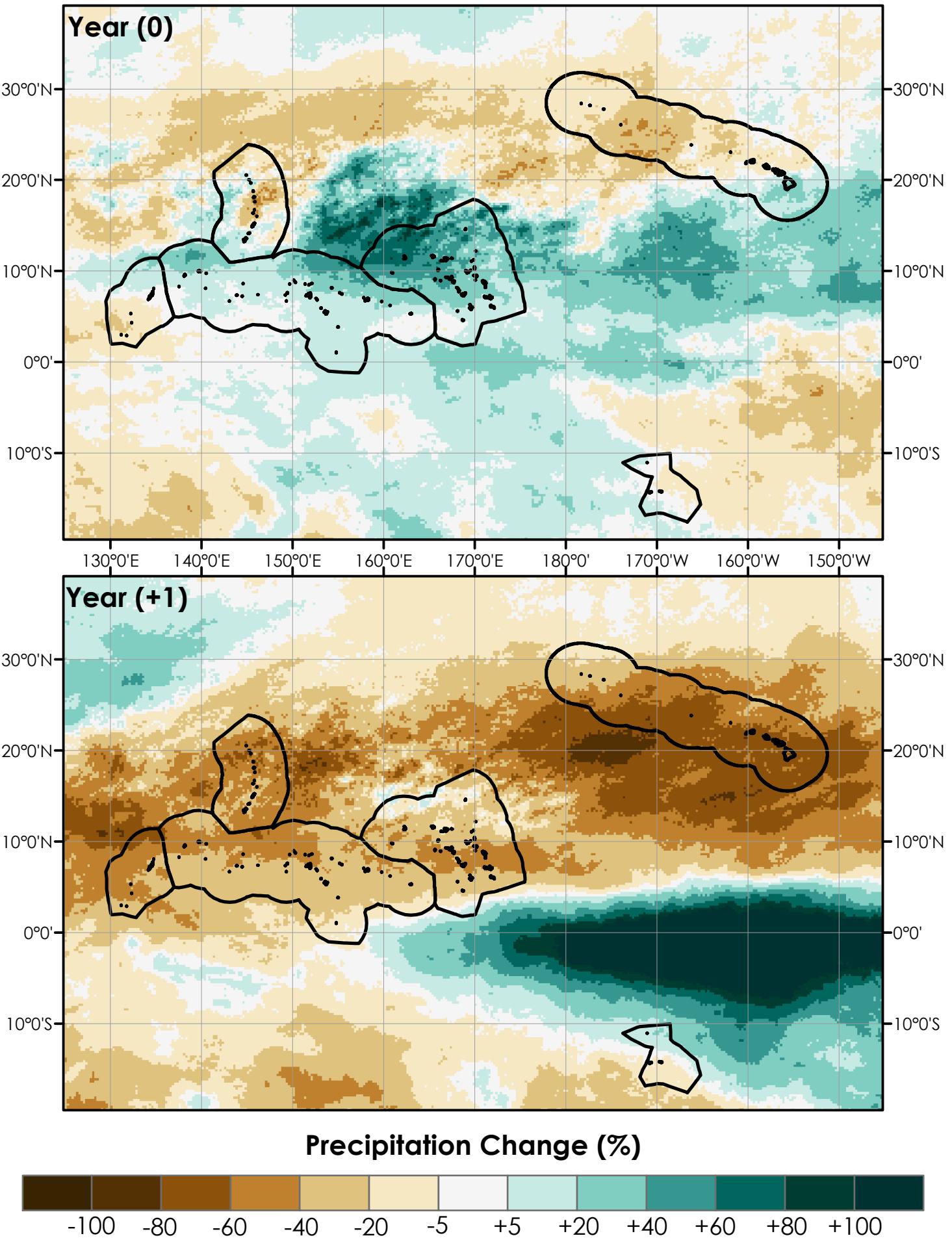
Moderate-Strong El Niño for JFM

30



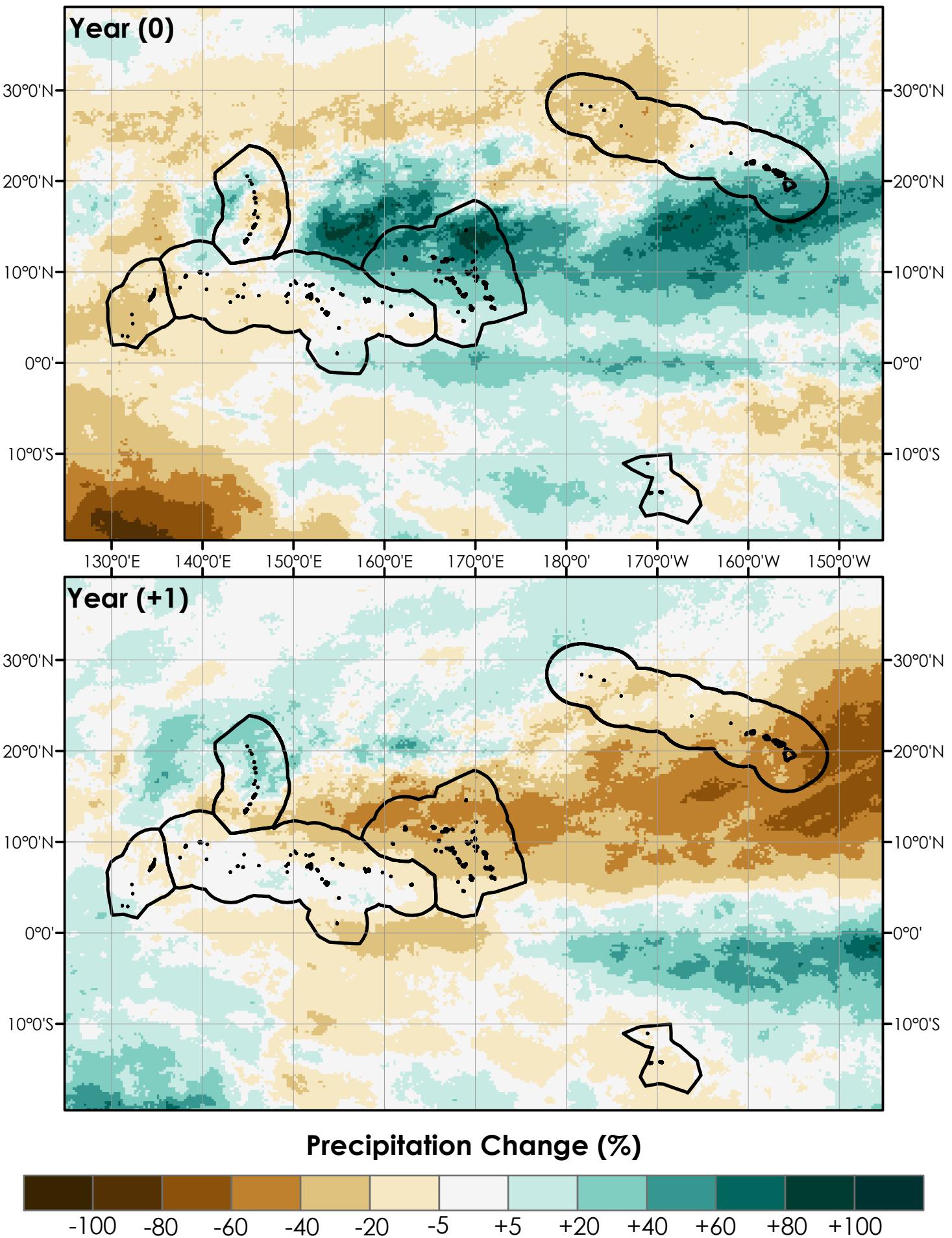
Moderate-Strong El Niño for FMA

31



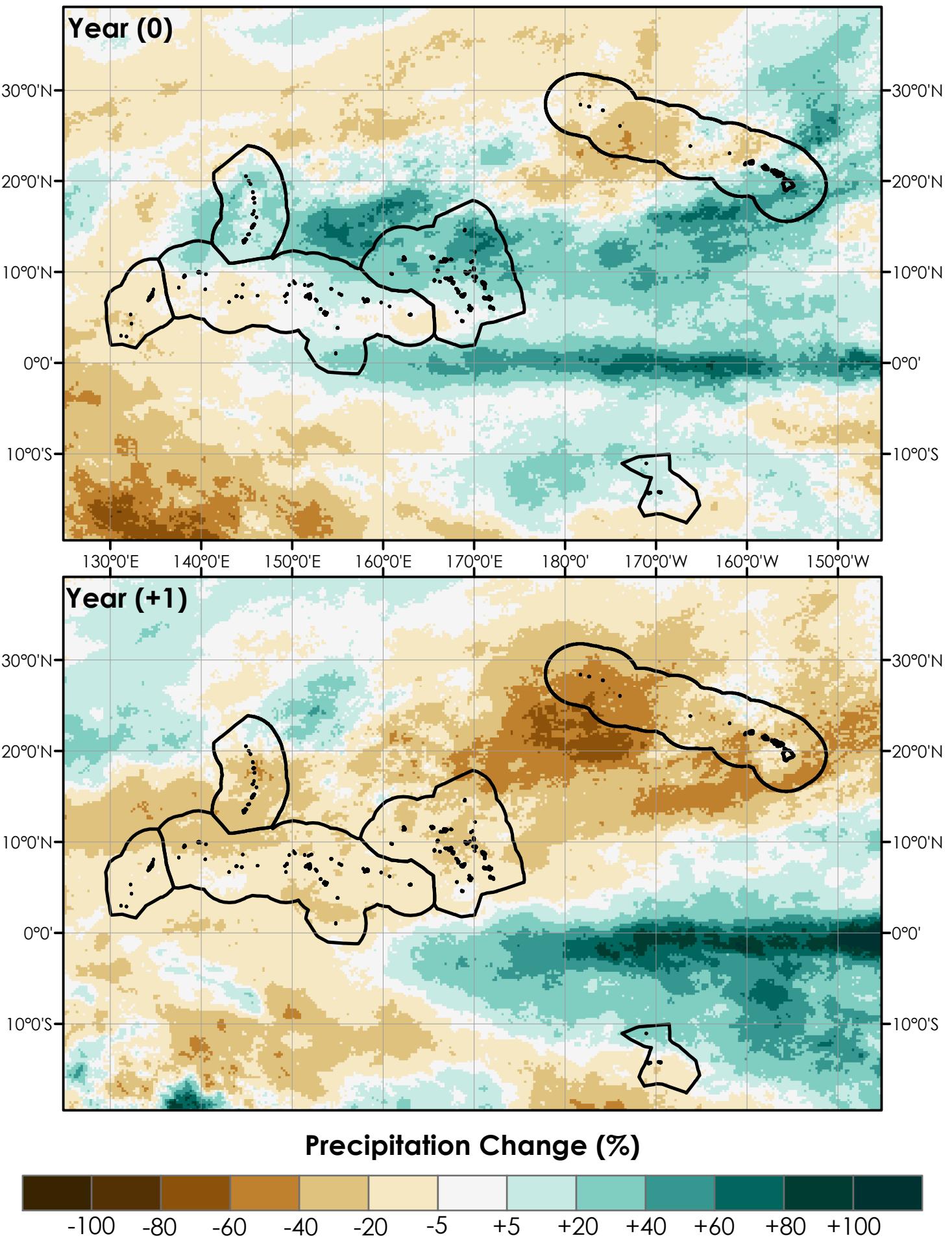
Moderate-Strong El Niño for MAM

32



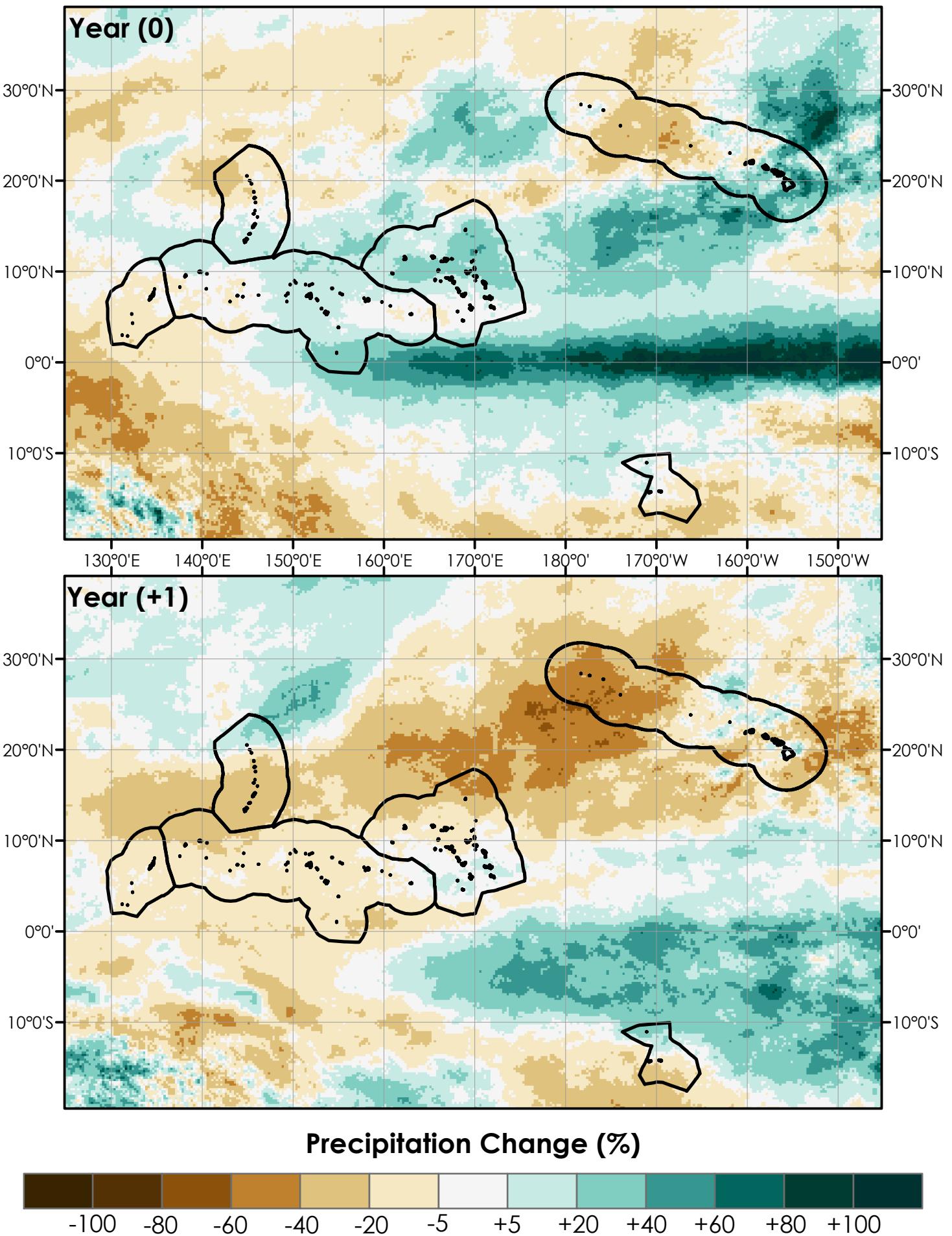
Moderate-Strong El Niño for AMJ

33



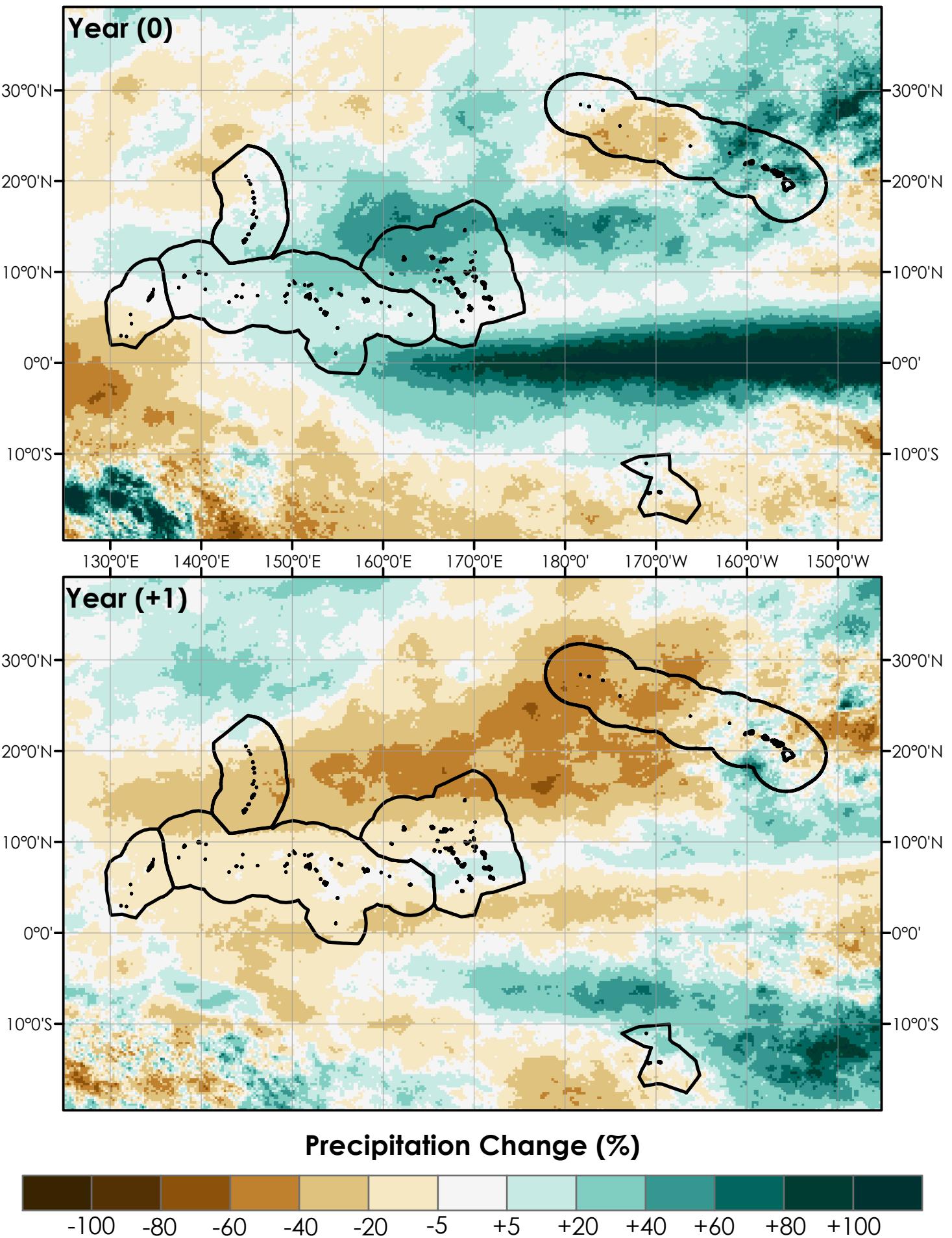
Moderate-Strong El Niño for MJJ

34



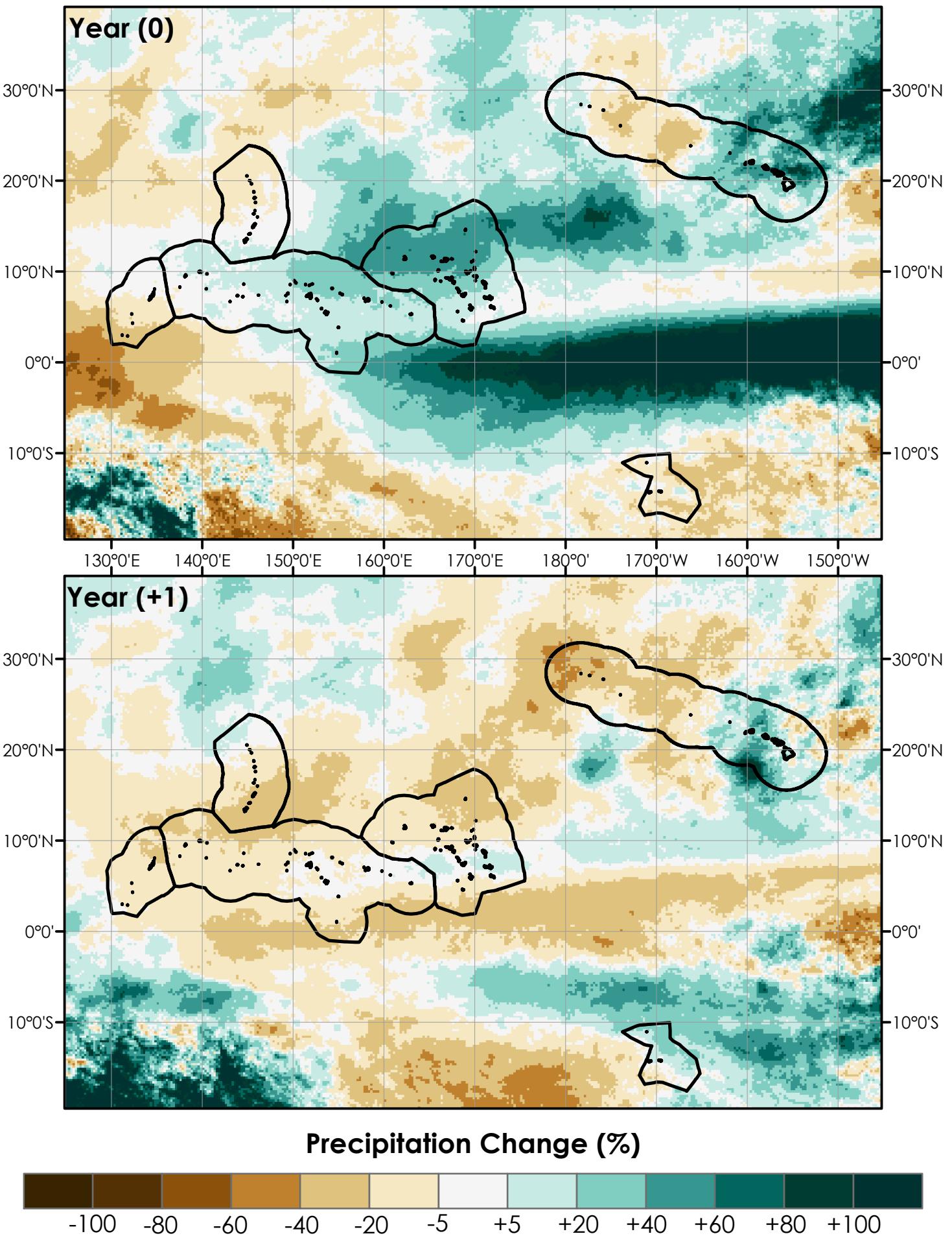
Moderate-Strong El Niño for JJA

35



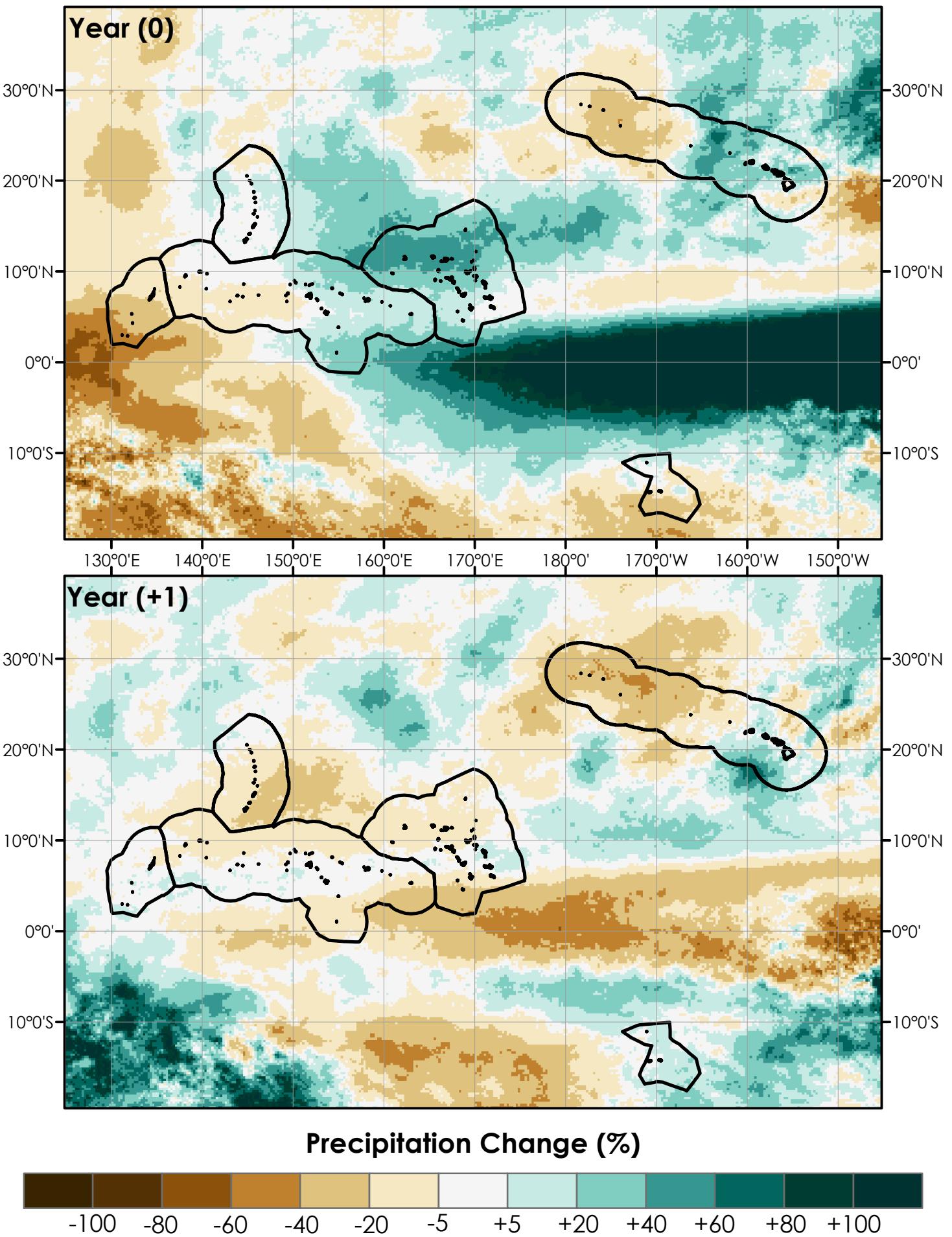
Moderate-Strong El Niño for JAS

36



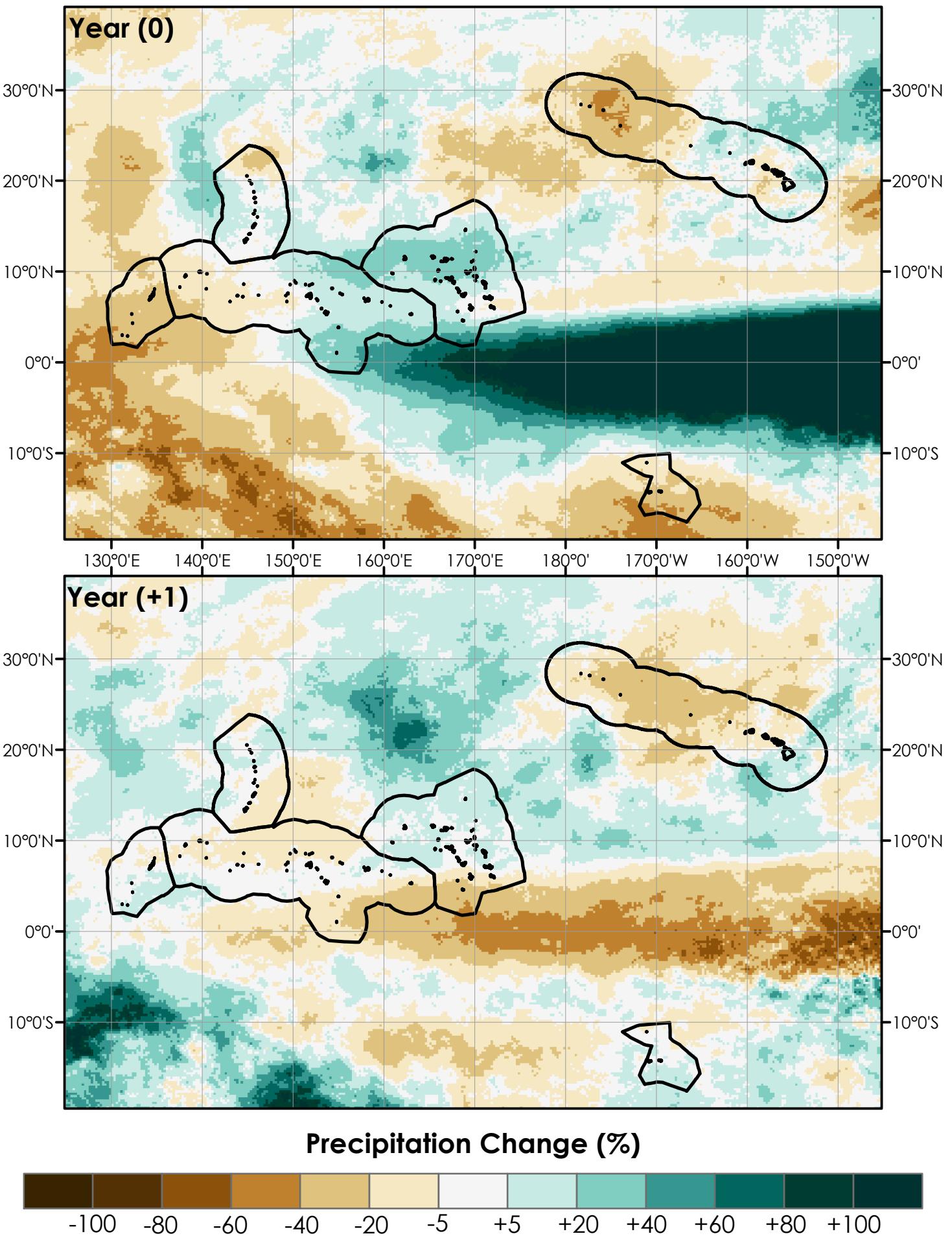
Moderate-Strong El Niño for ASO

37



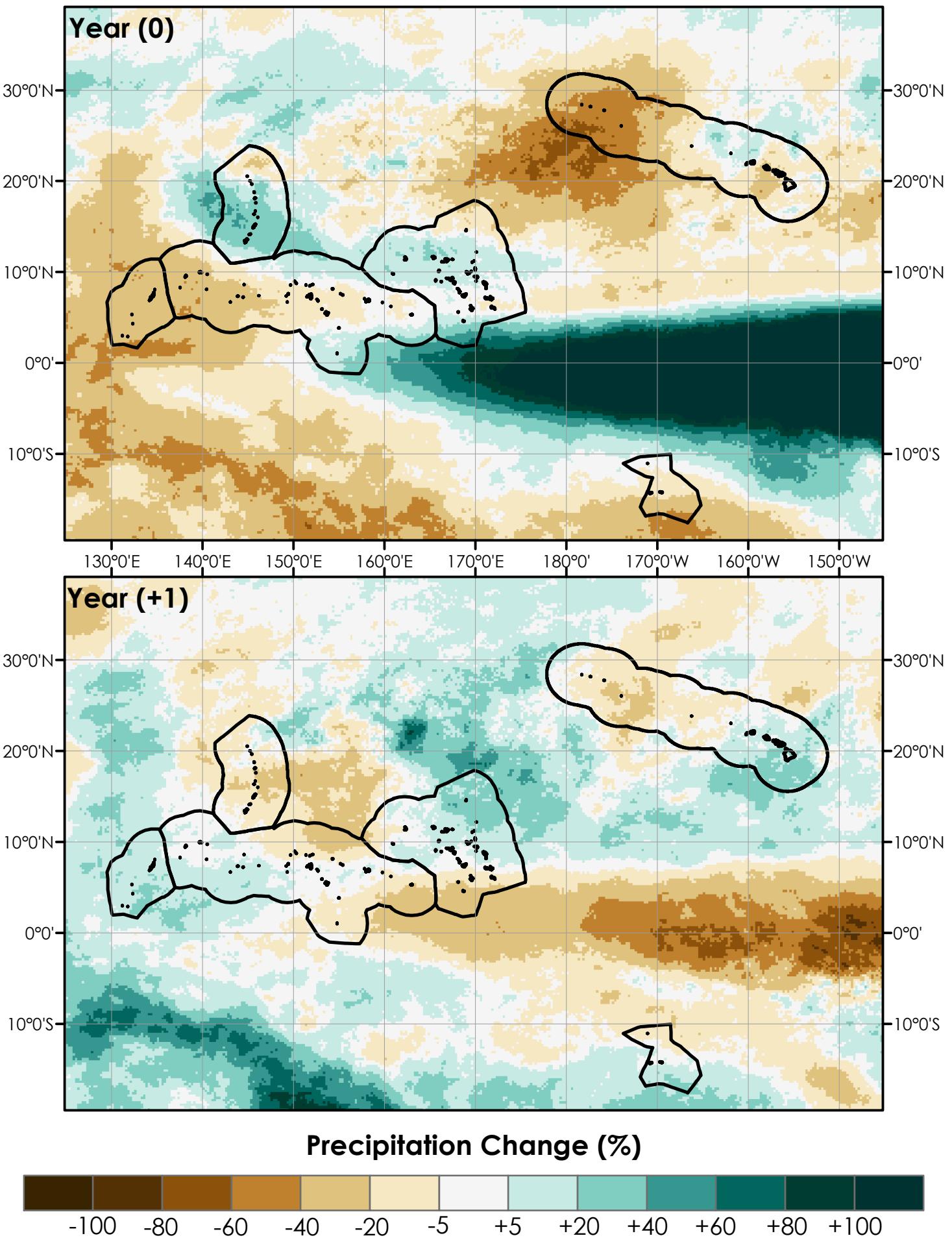
Moderate-Strong El Niño for SON

38



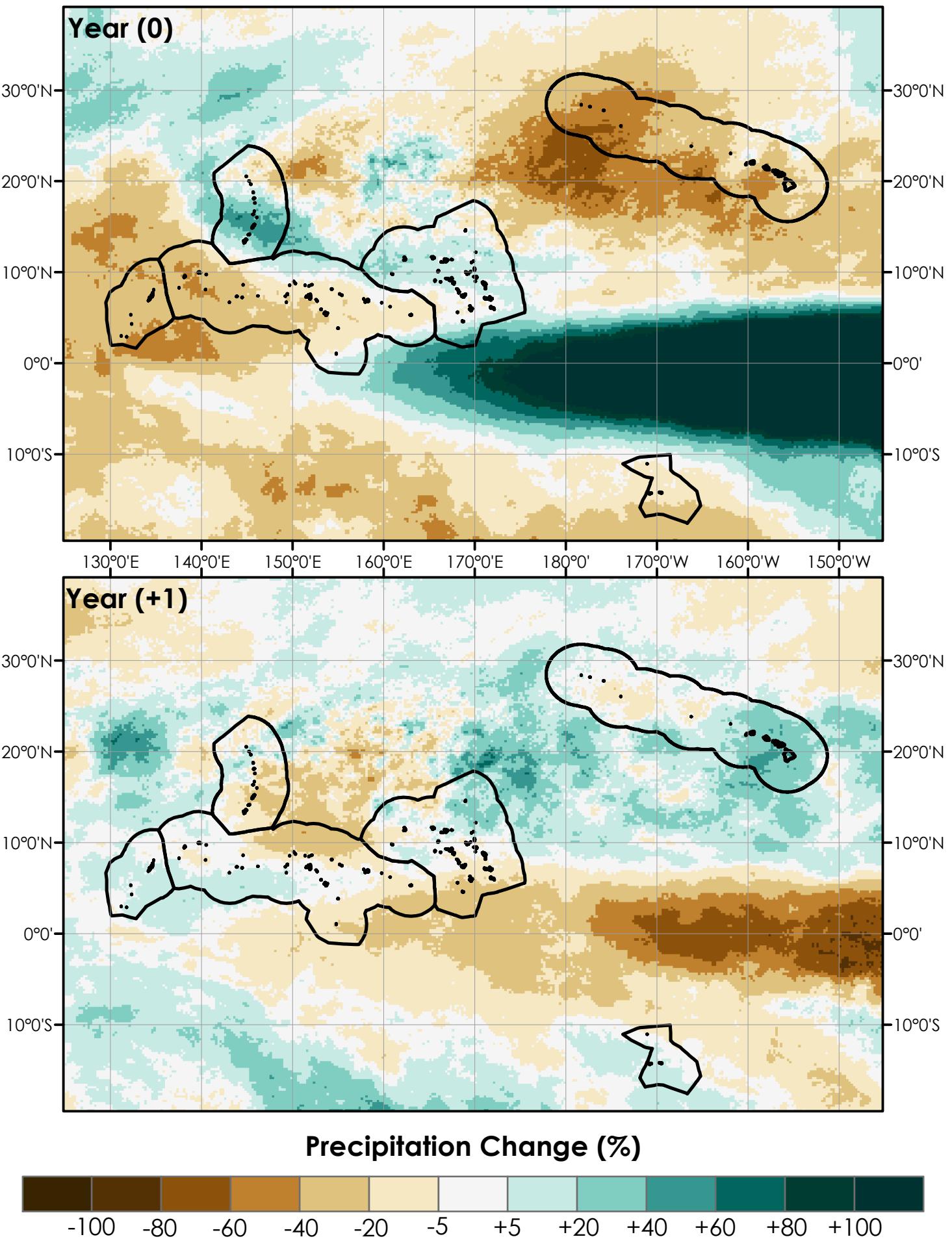
Moderate-Strong El Niño for OND

39



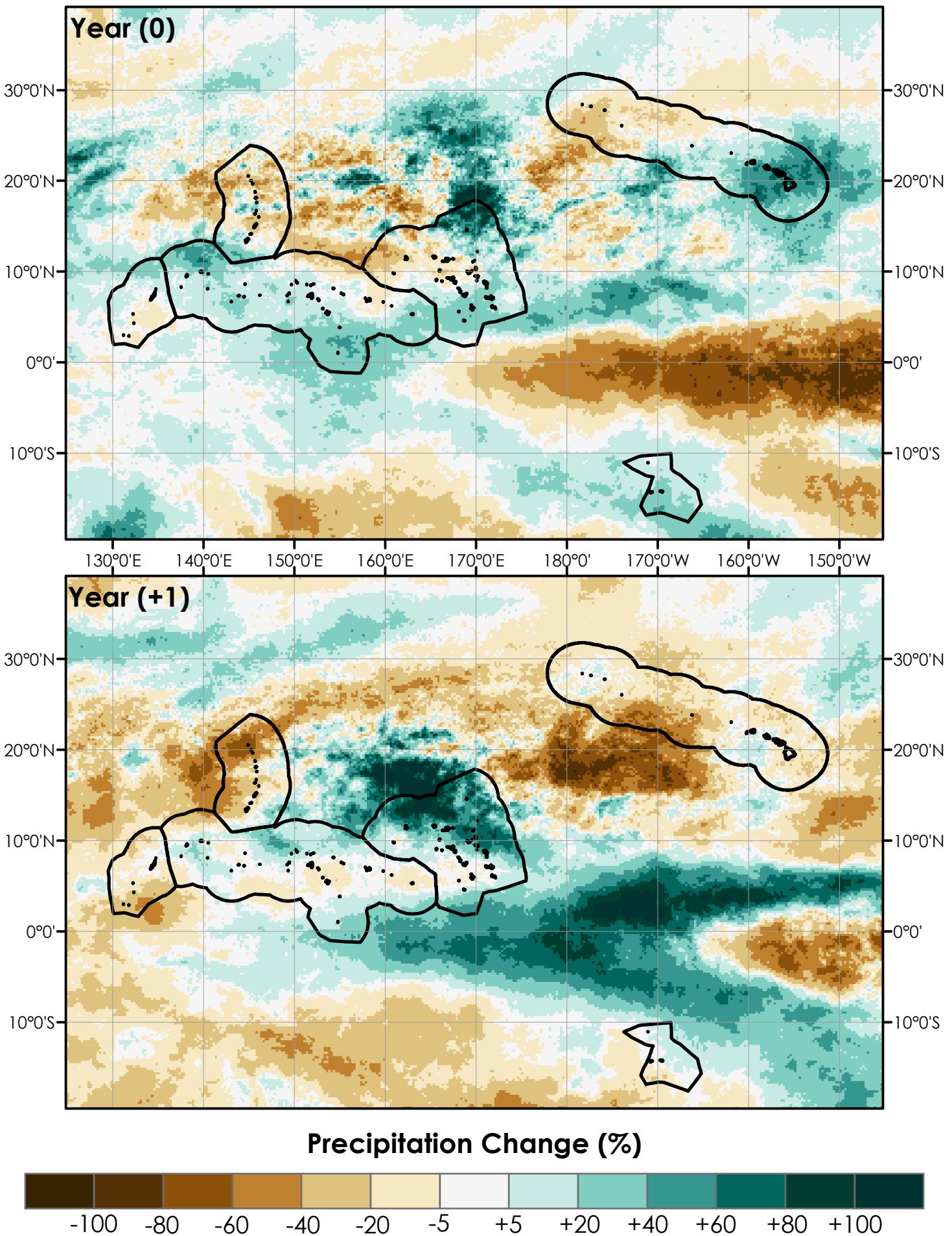
Moderate-Strong El Niño for NDJ

40



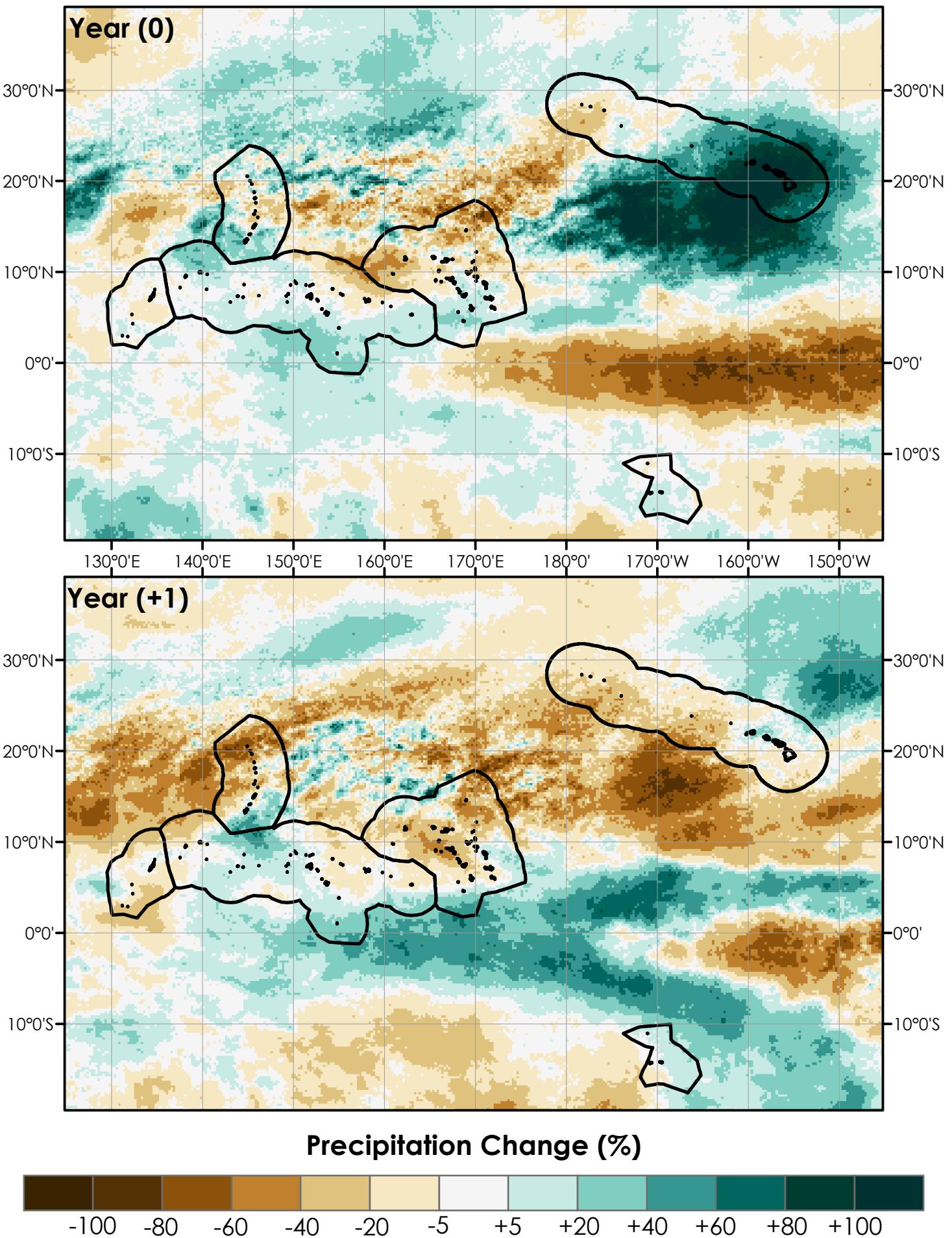
Weak El Niño for DJF

41



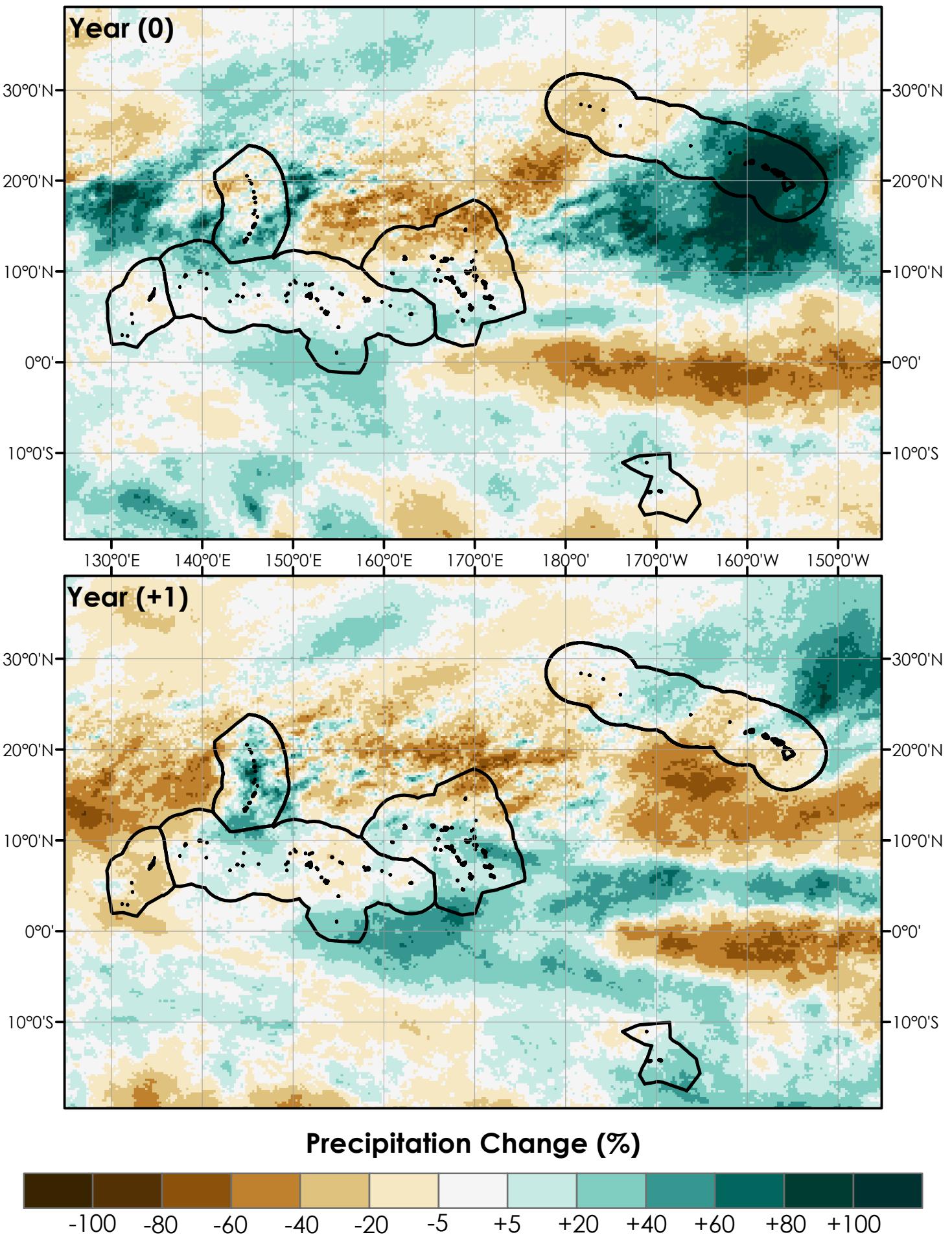
Weak El Niño for JFM

42



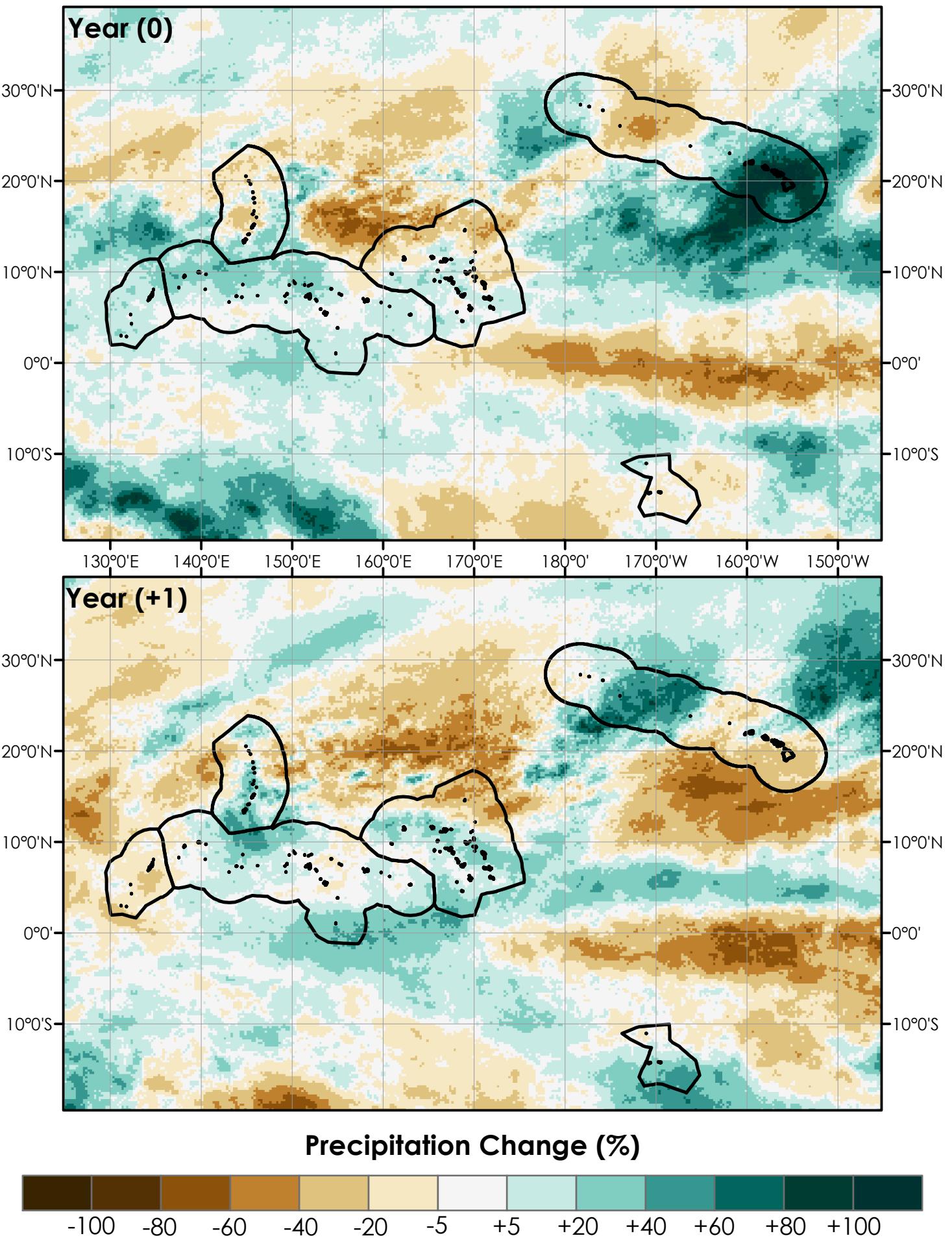
Weak El Niño for FMA

43



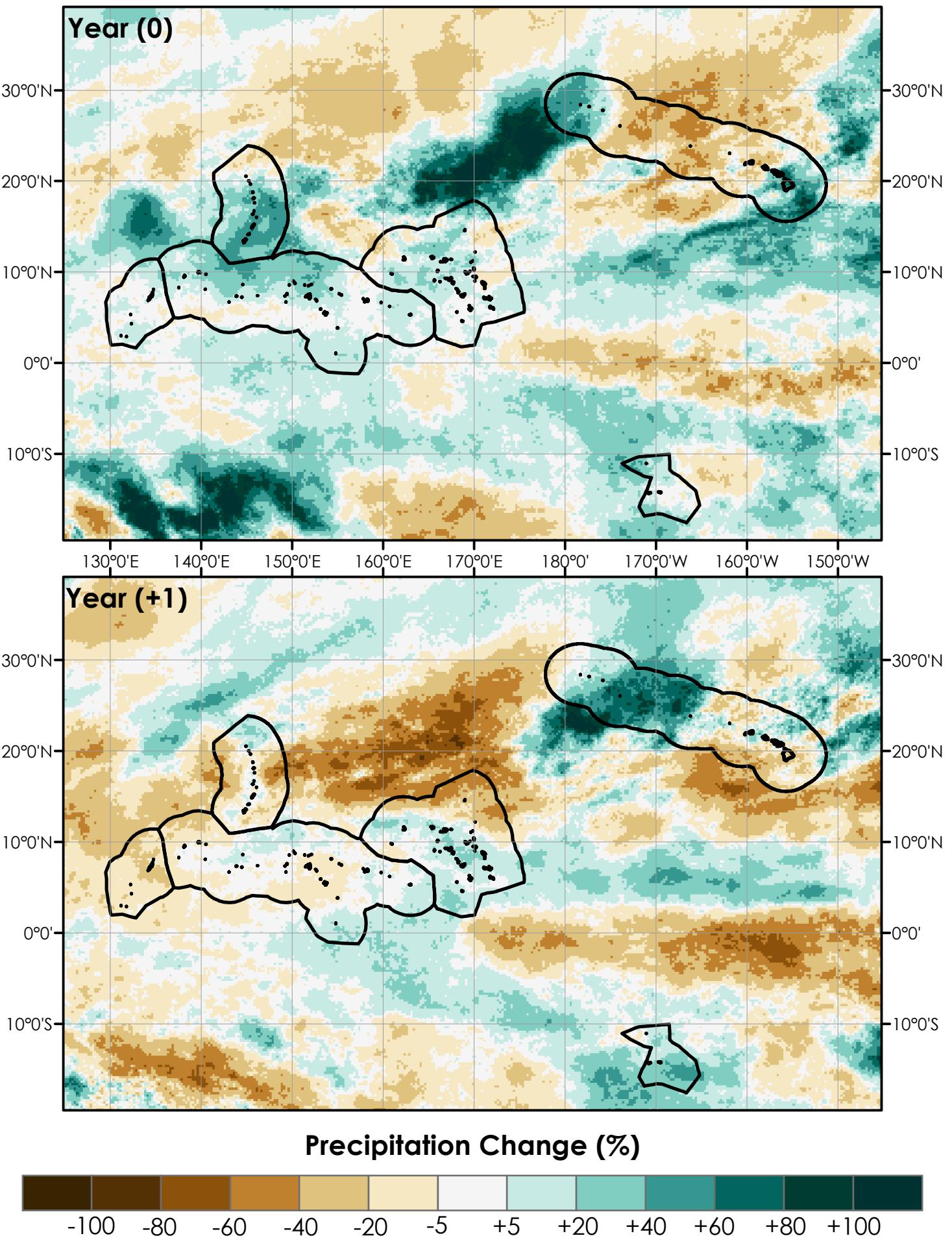
Weak El Niño for MAM

44



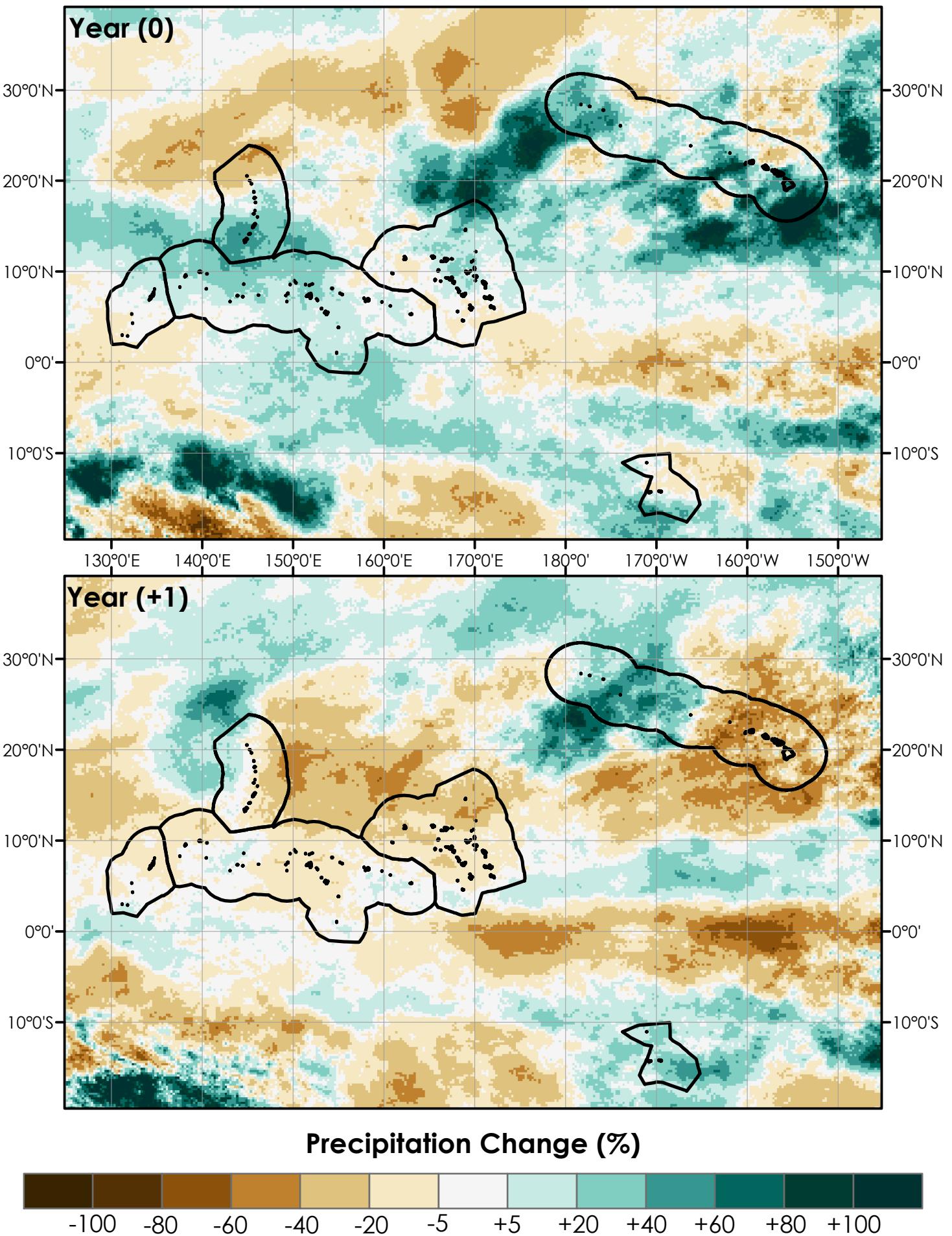
Weak El Niño for AMJ

45



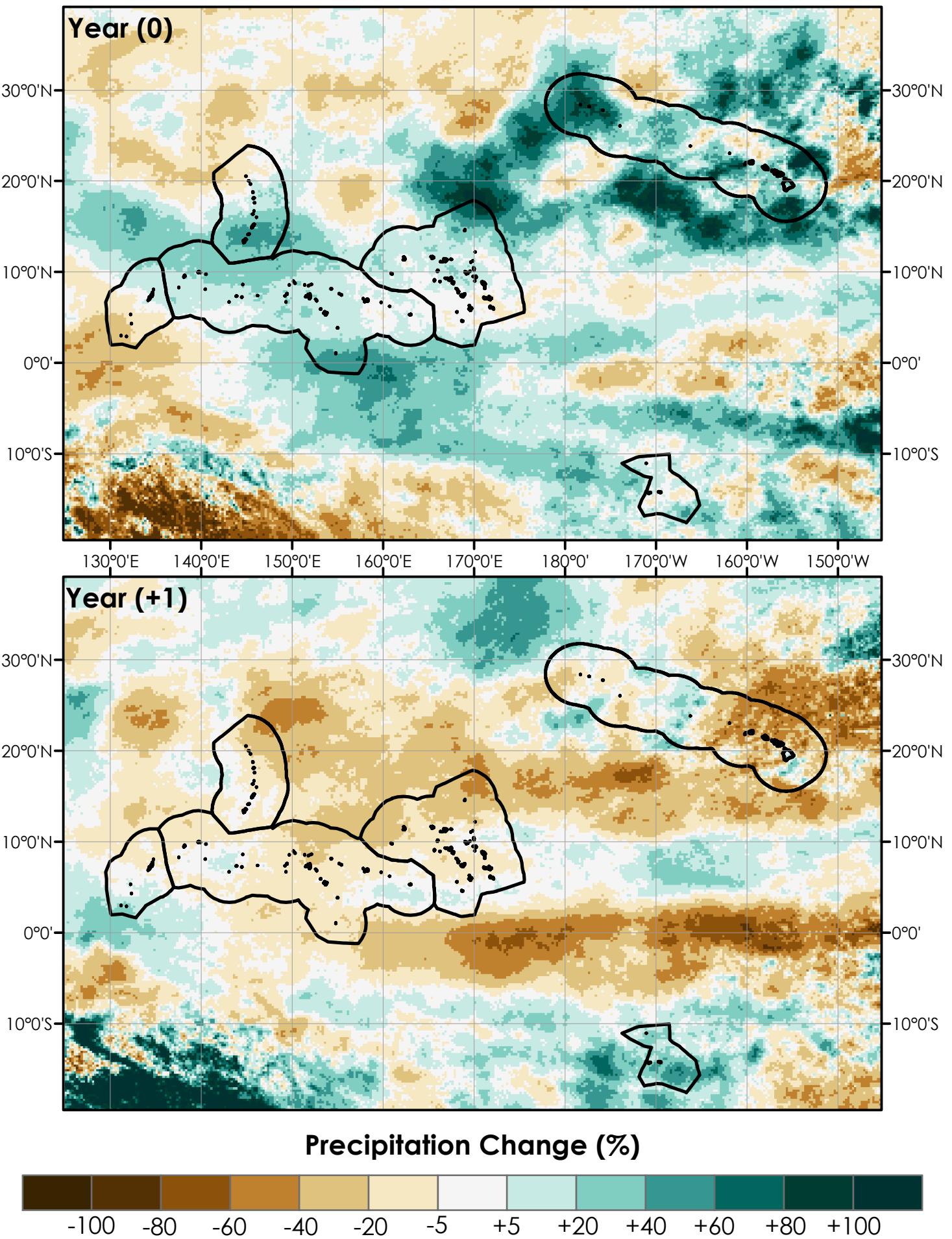
Weak El Niño for MJJ

46



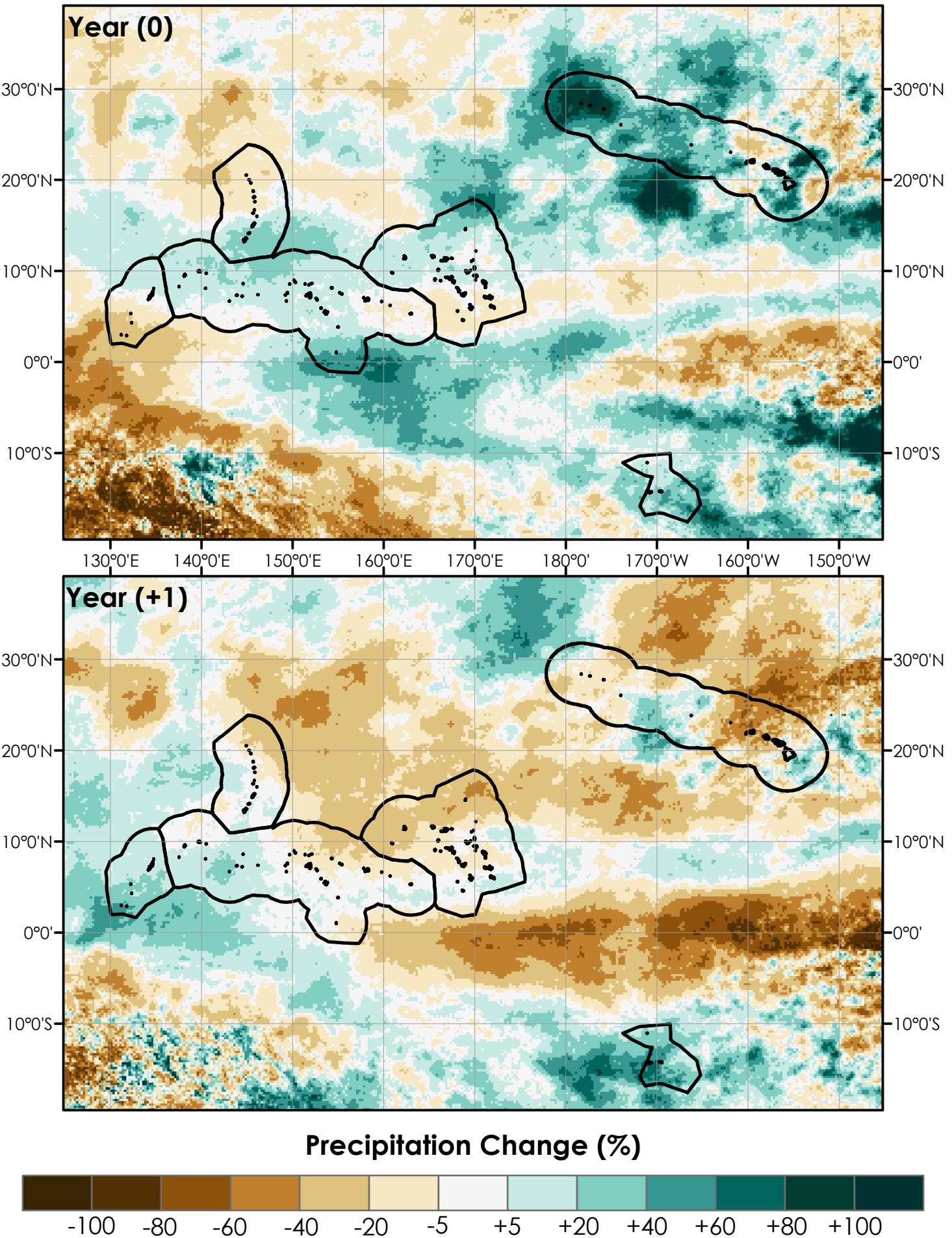
Weak El Niño for JJA

47



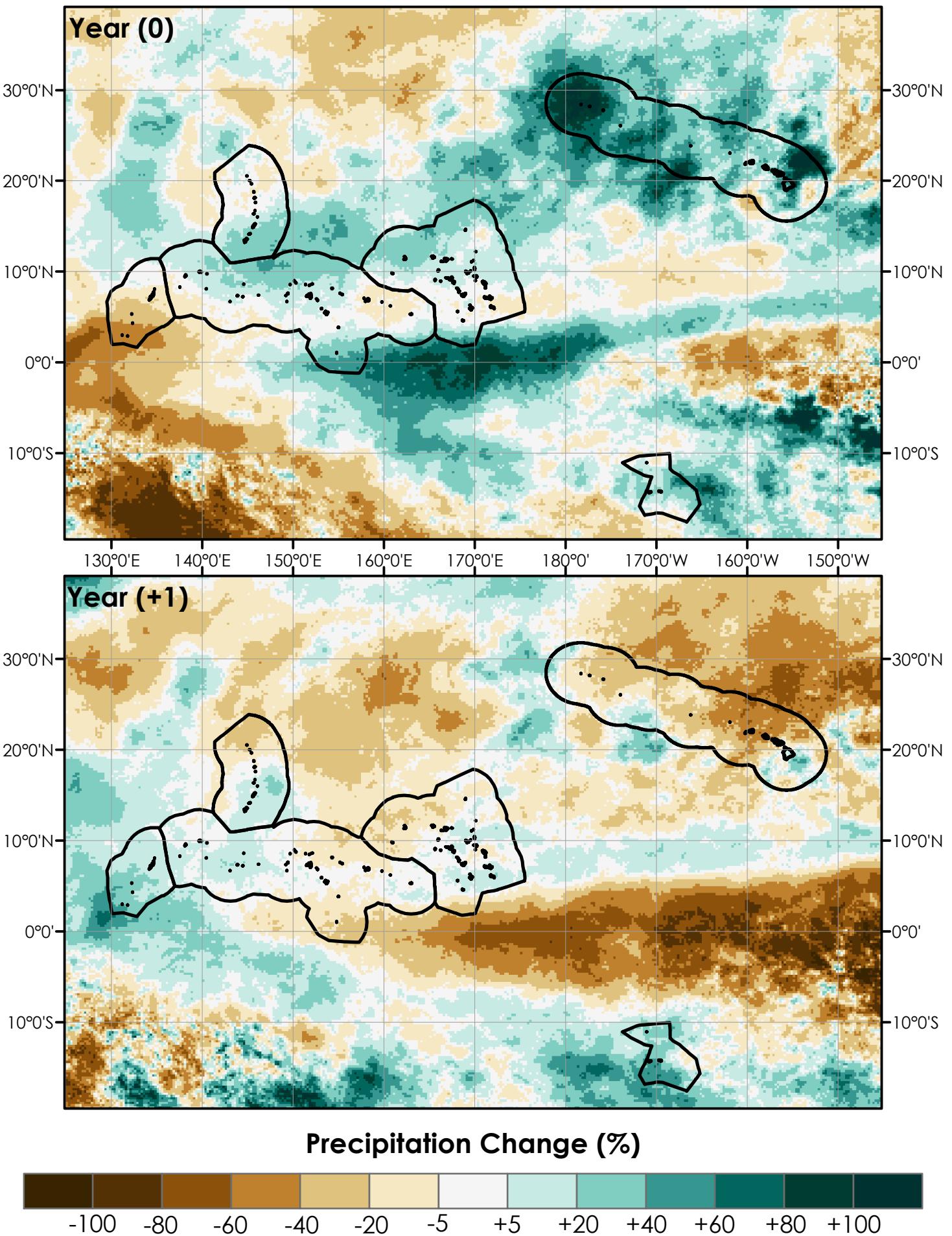
Weak El Niño for JAS

48



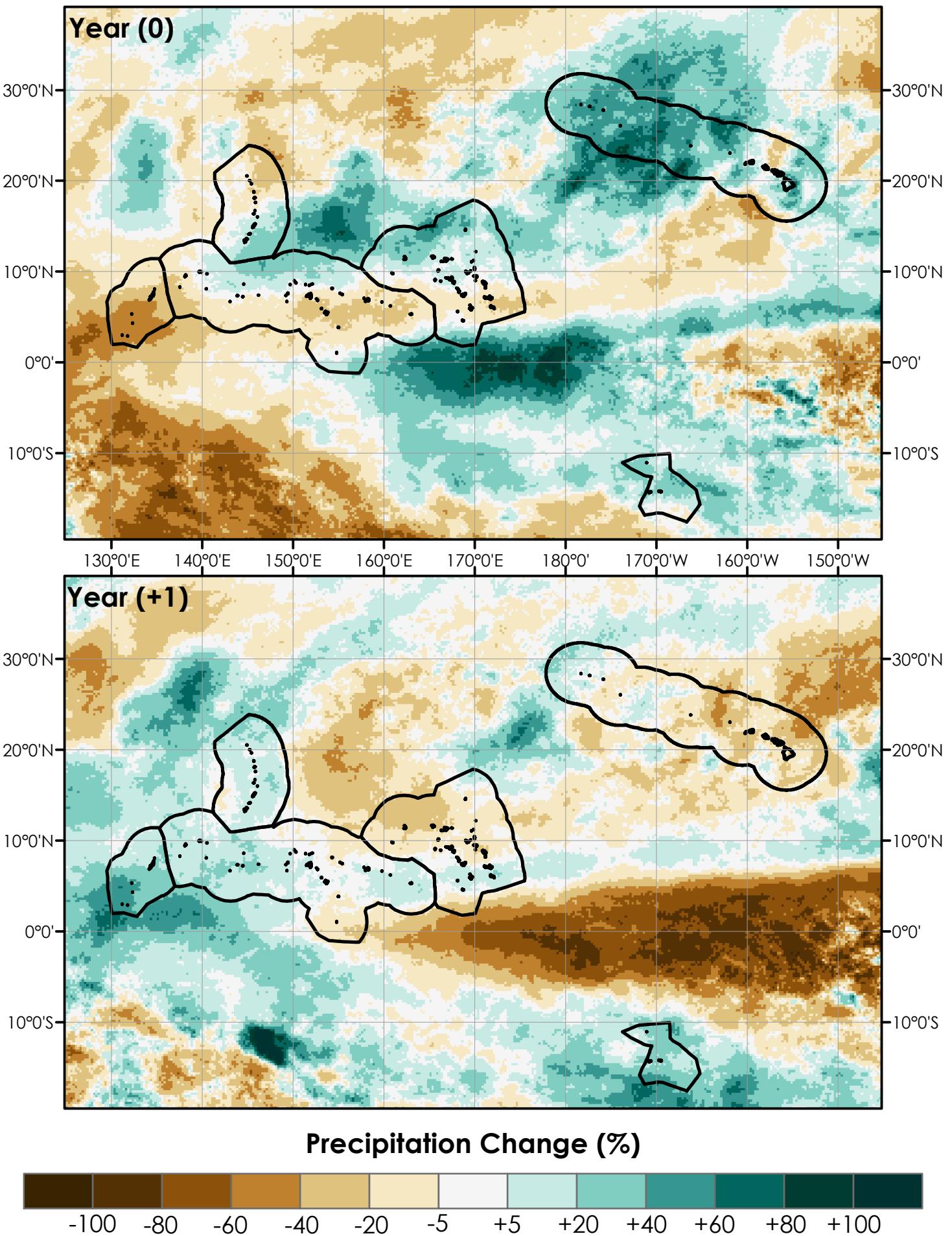
Weak El Niño for ASO

49



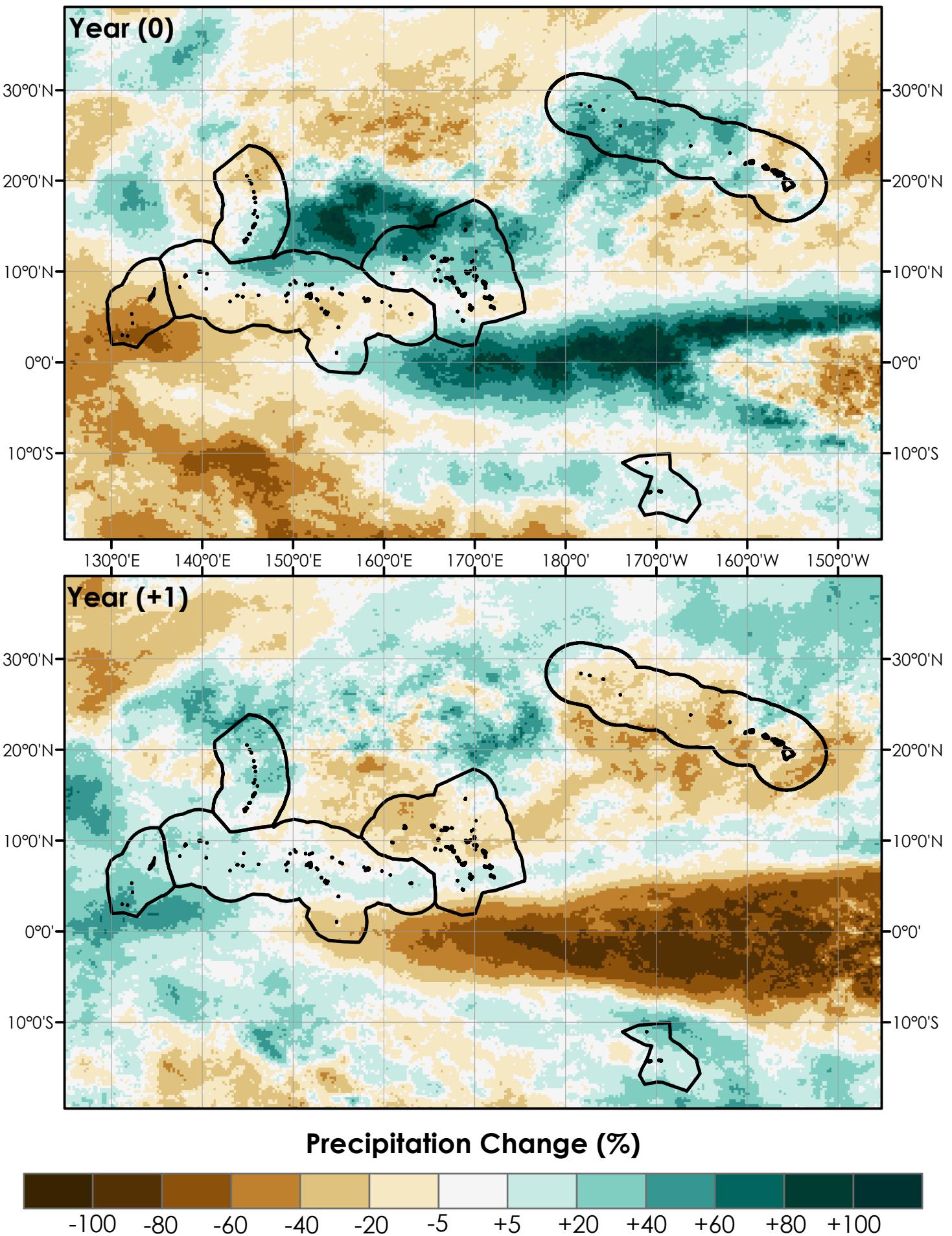
Weak El Niño for SON

50



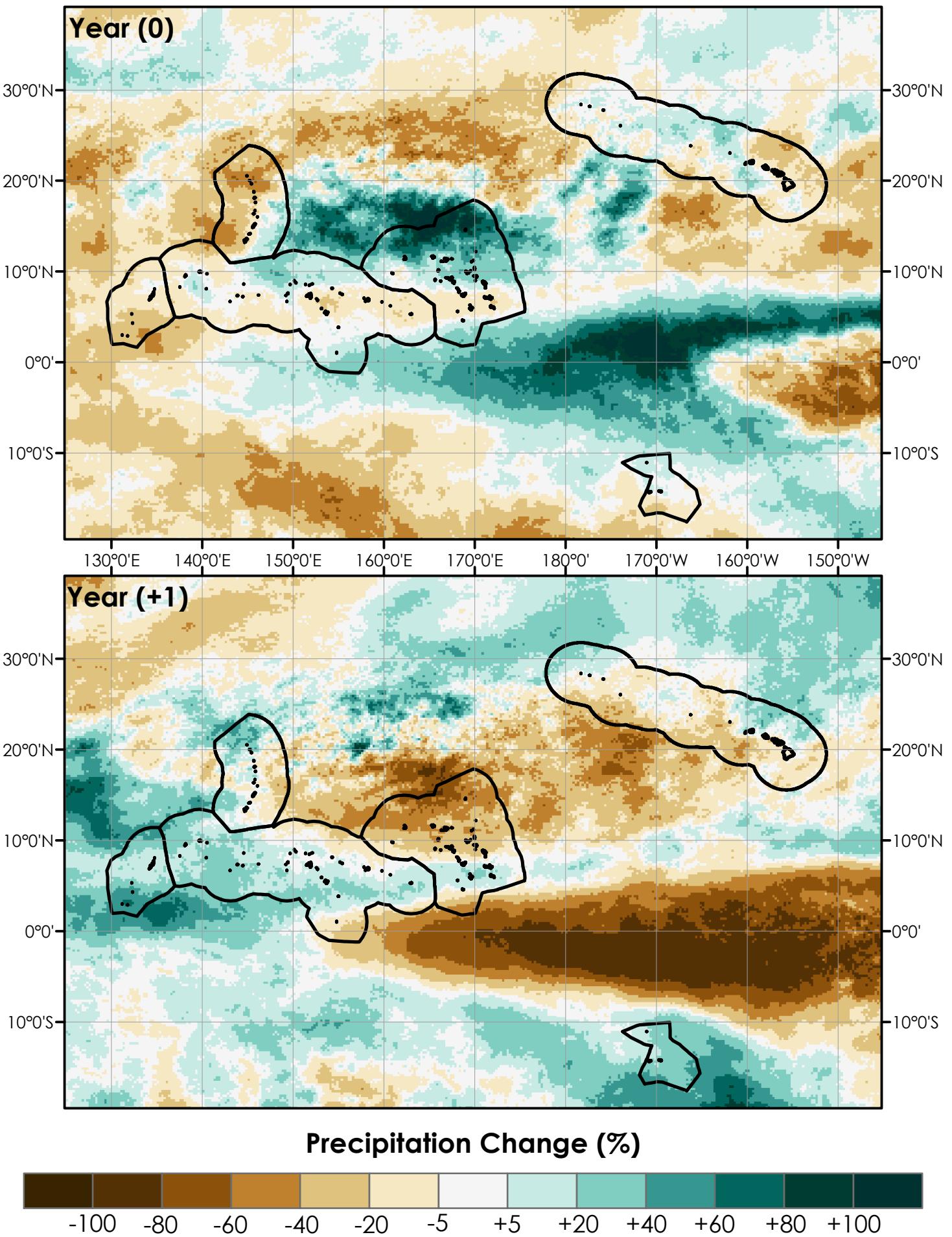
Weak El Niño for OND

51



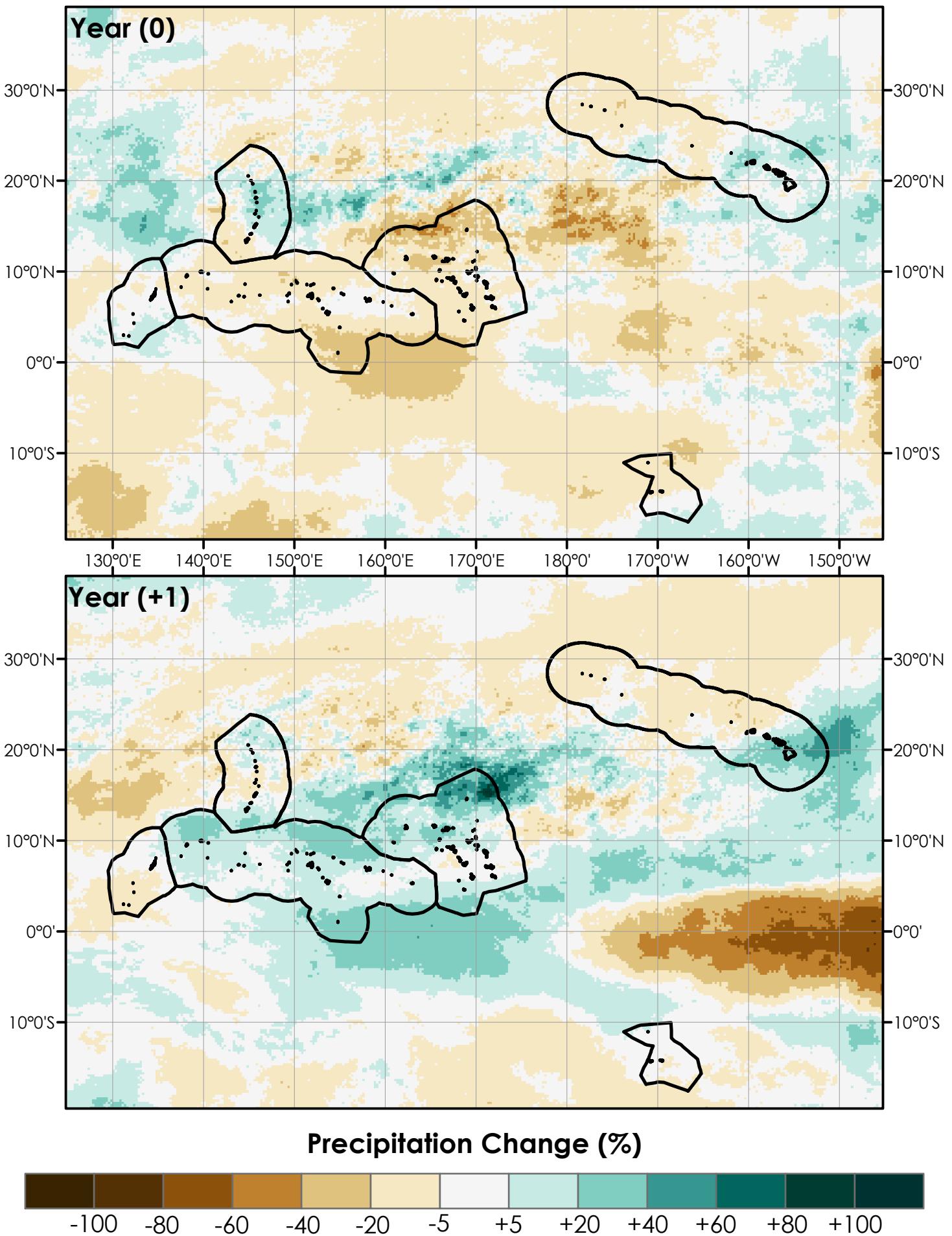
Weak El Niño for NDJ

52



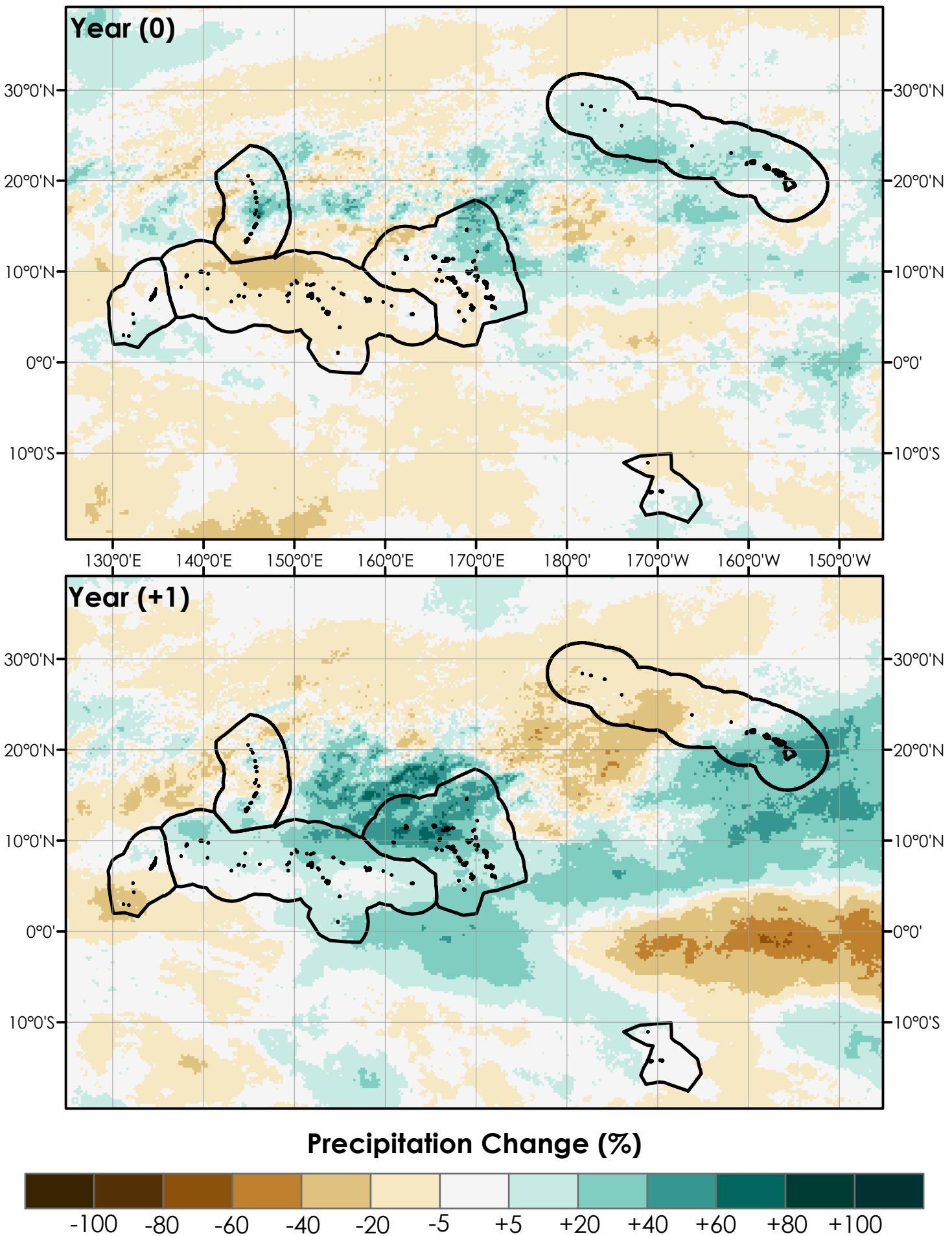
Neutral for DJF

53



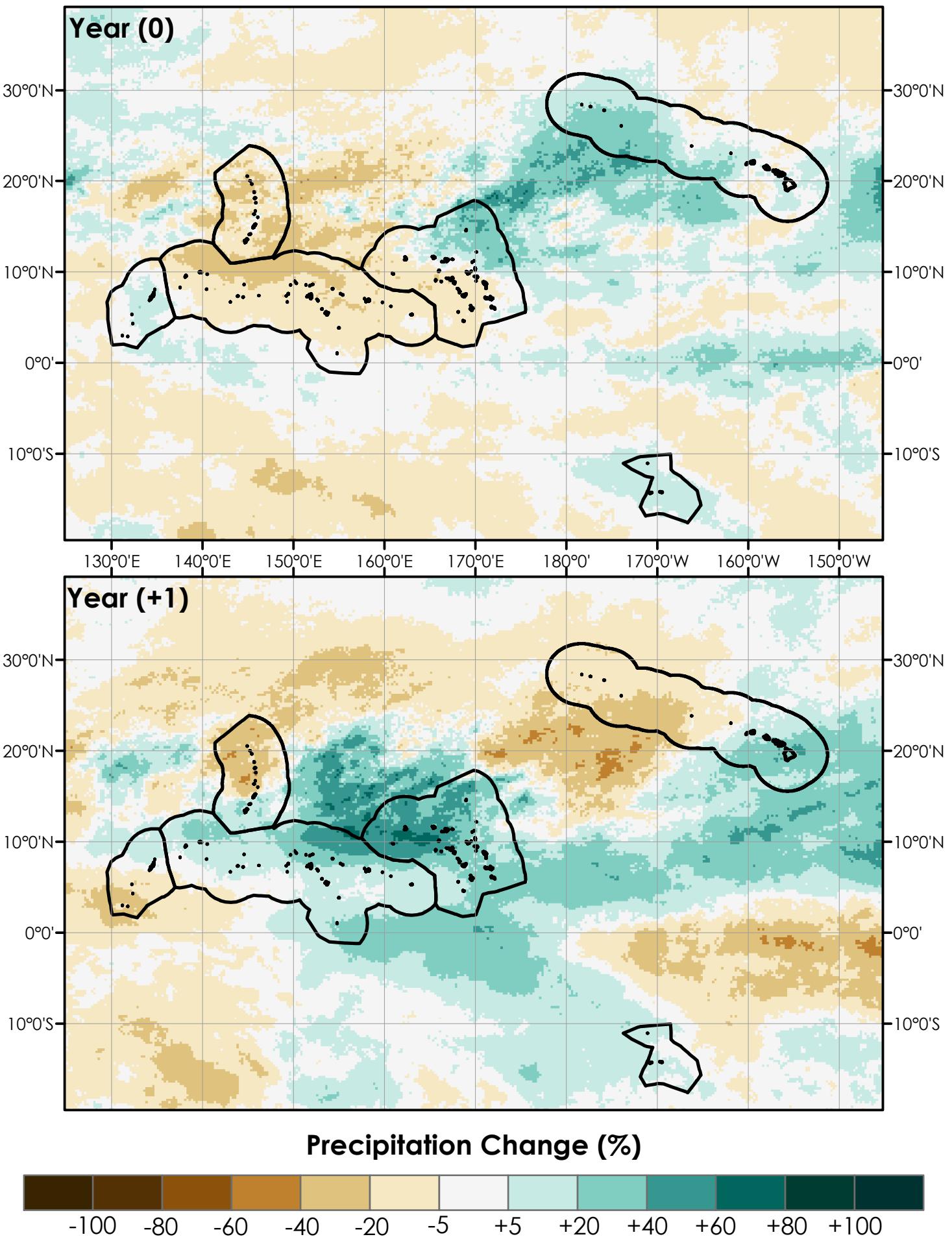
Neutral for JFM

54



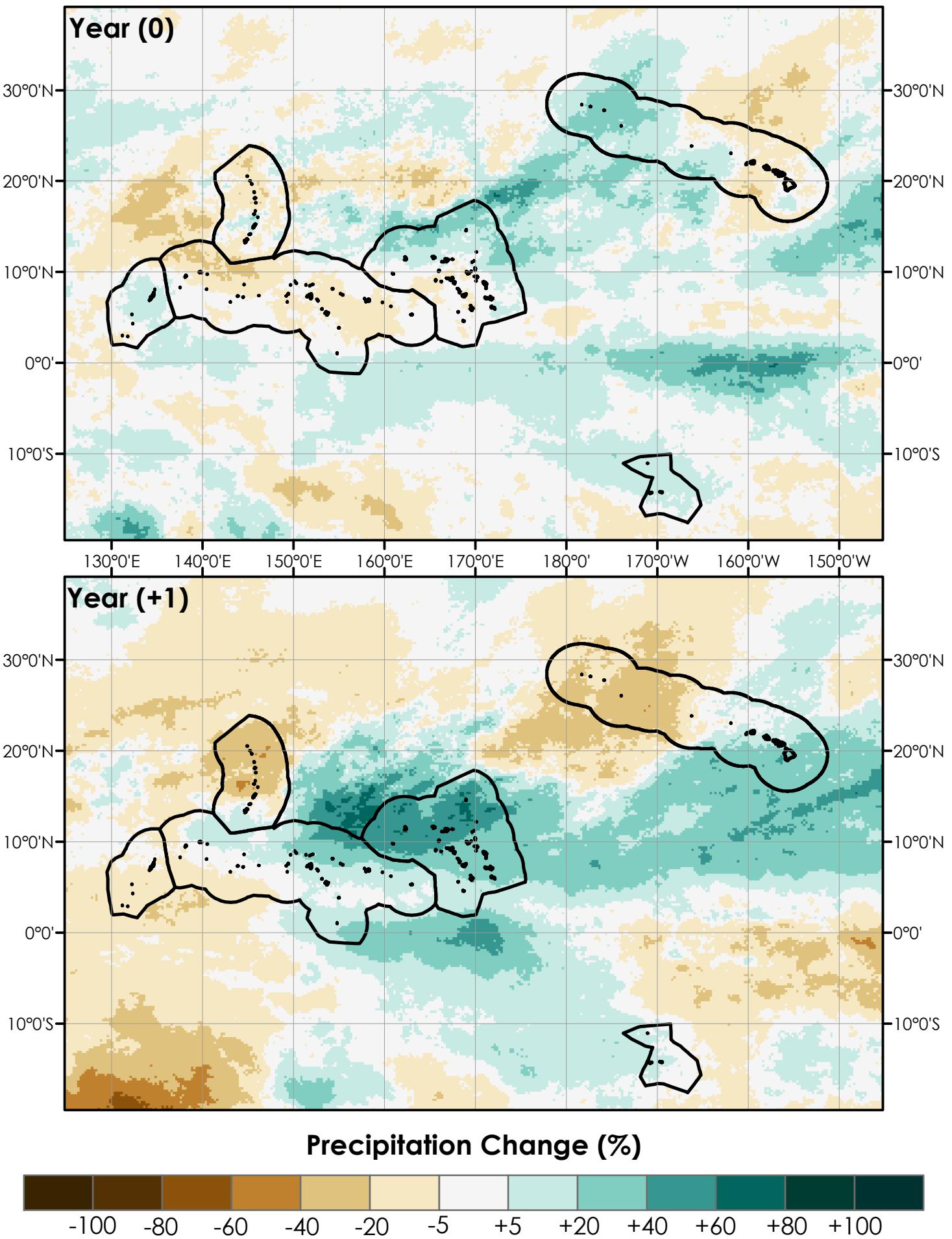
Neutral for FMA

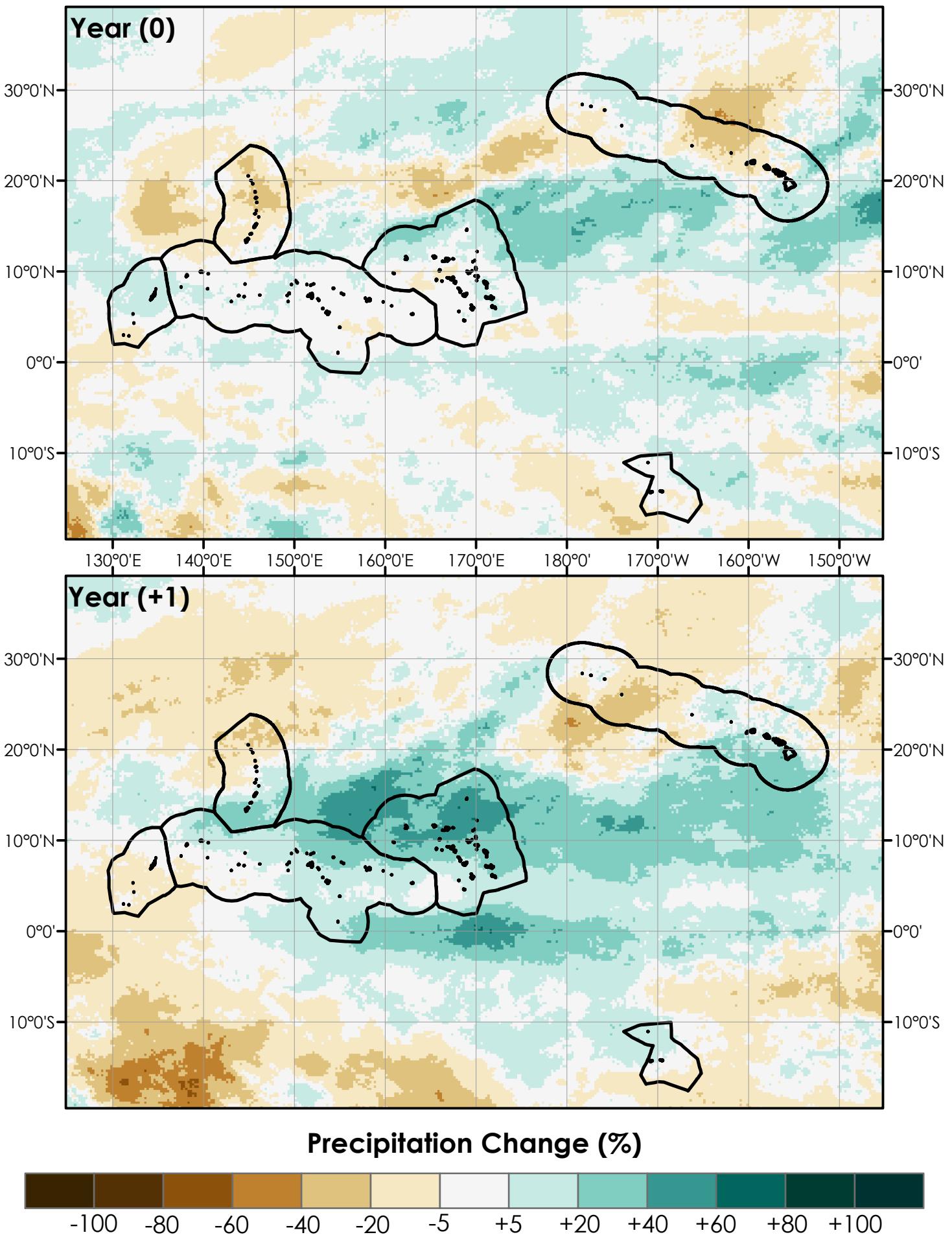
55



Neutral for MAM

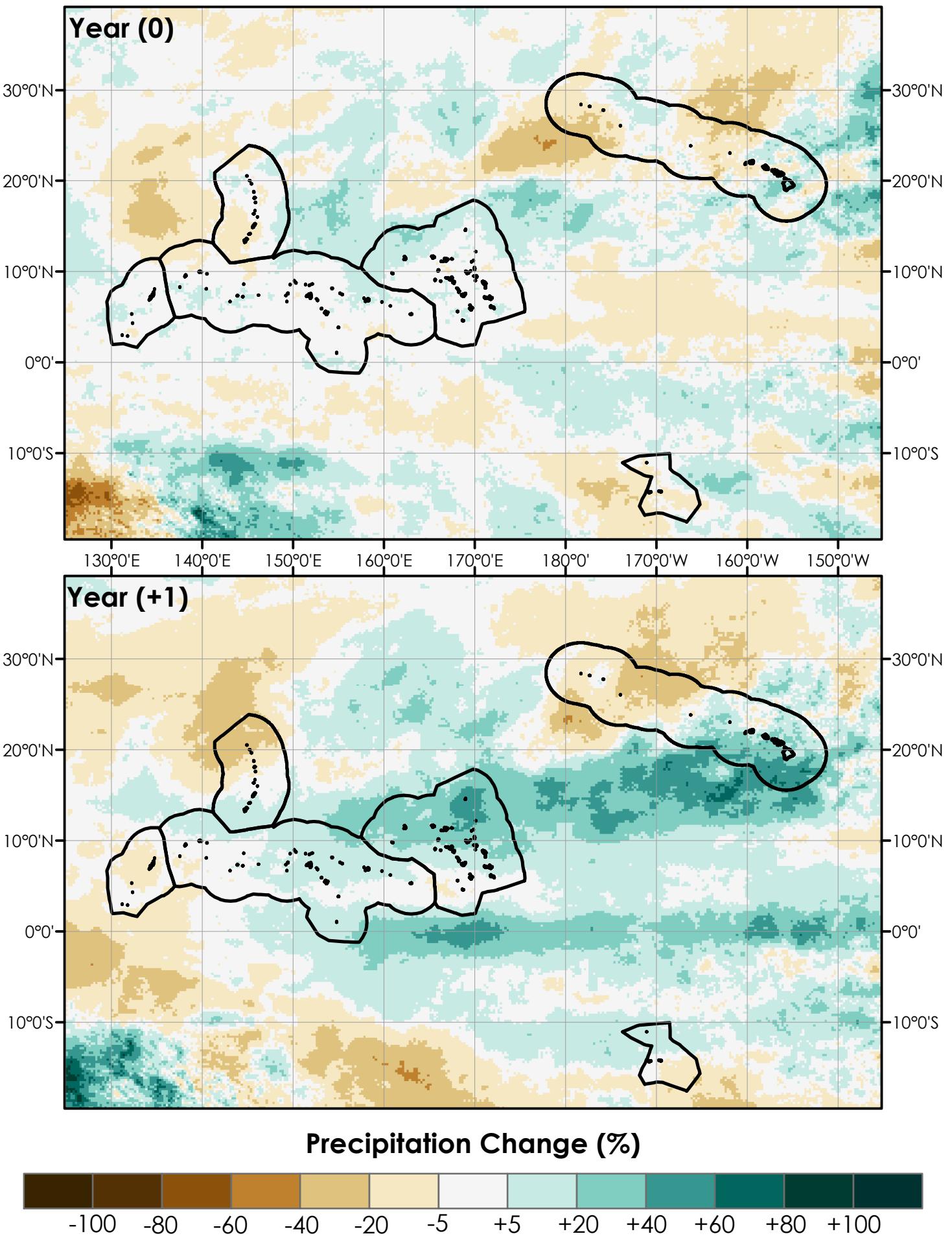
56

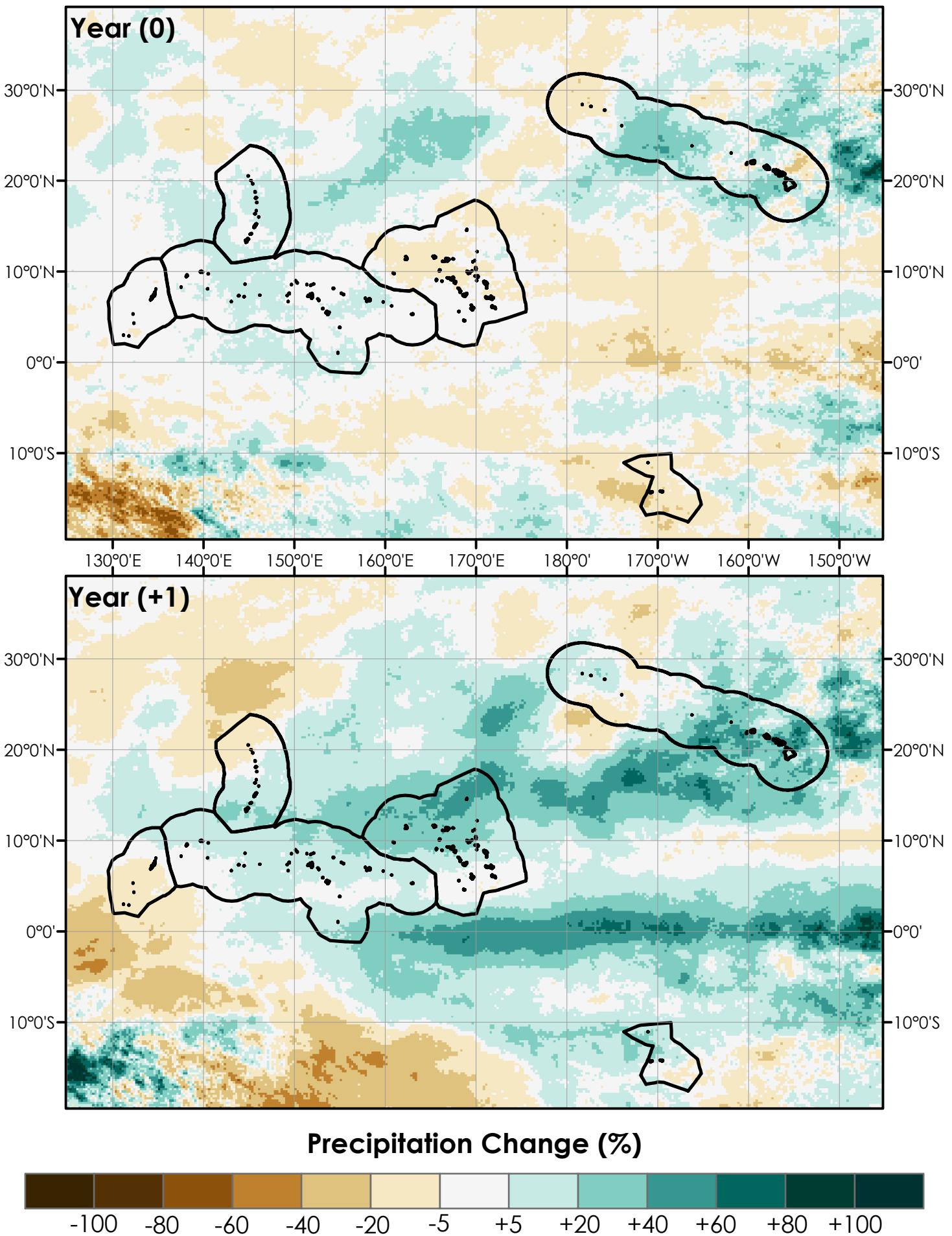




Neutral for MJJ

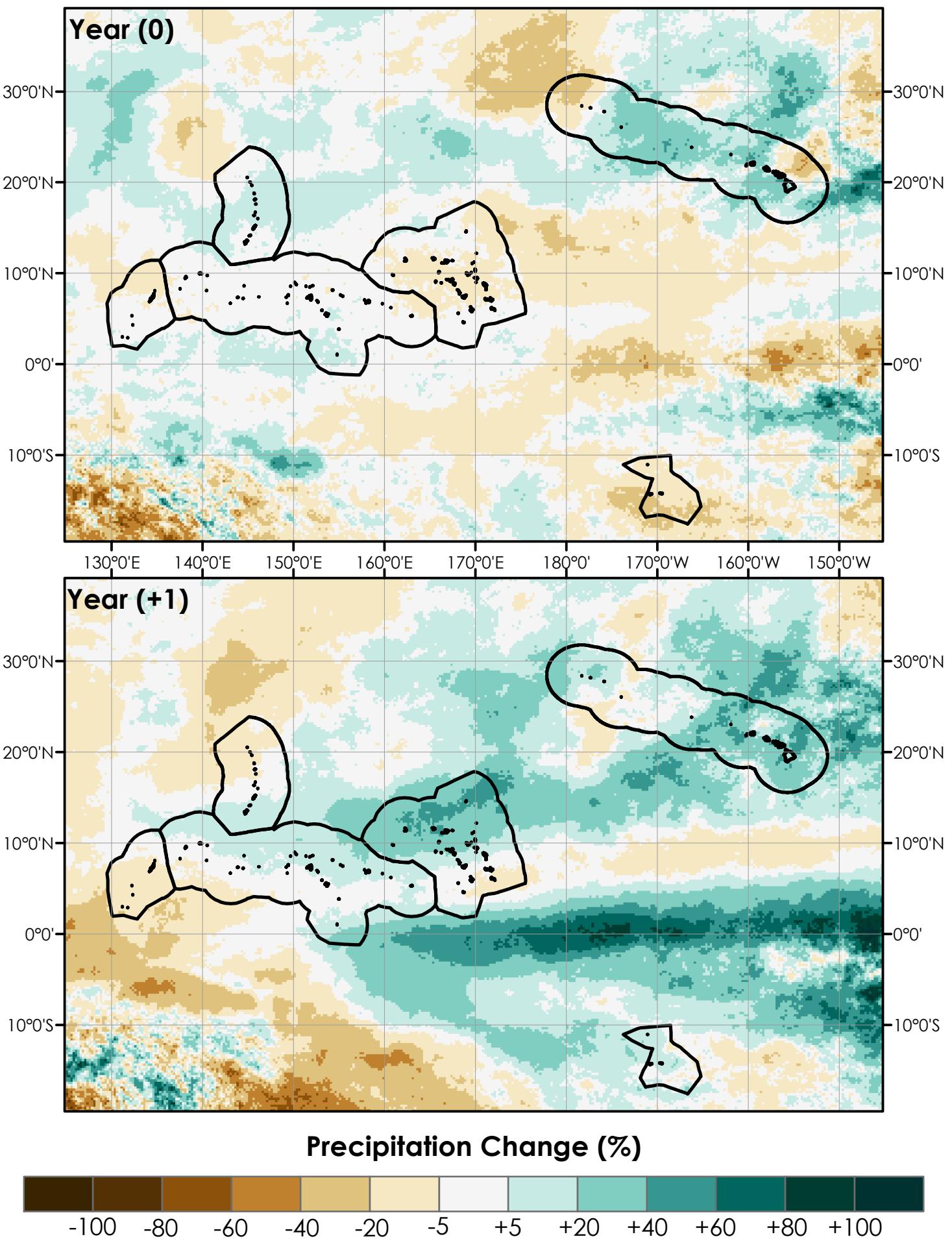
58





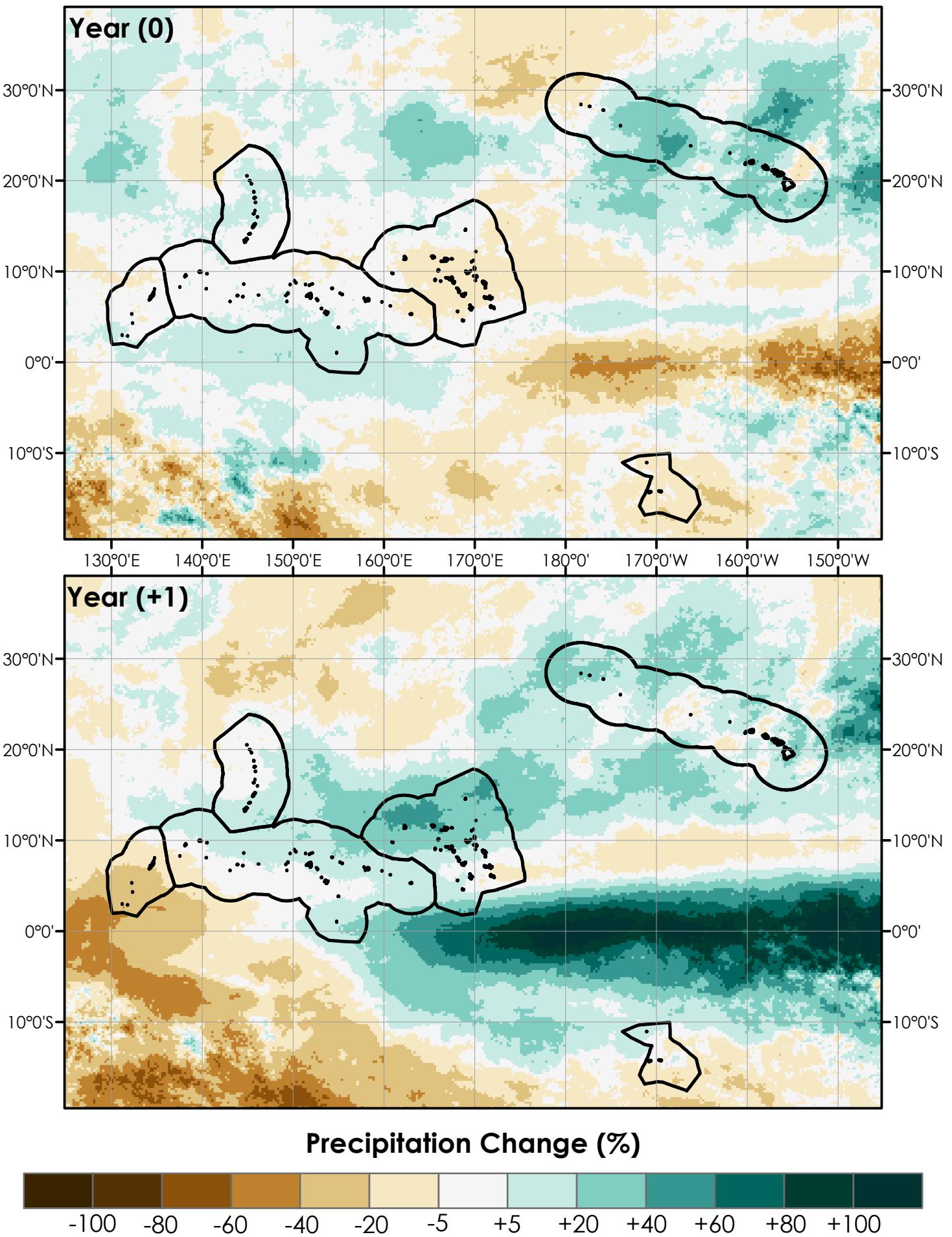
Neutral for JAS

60



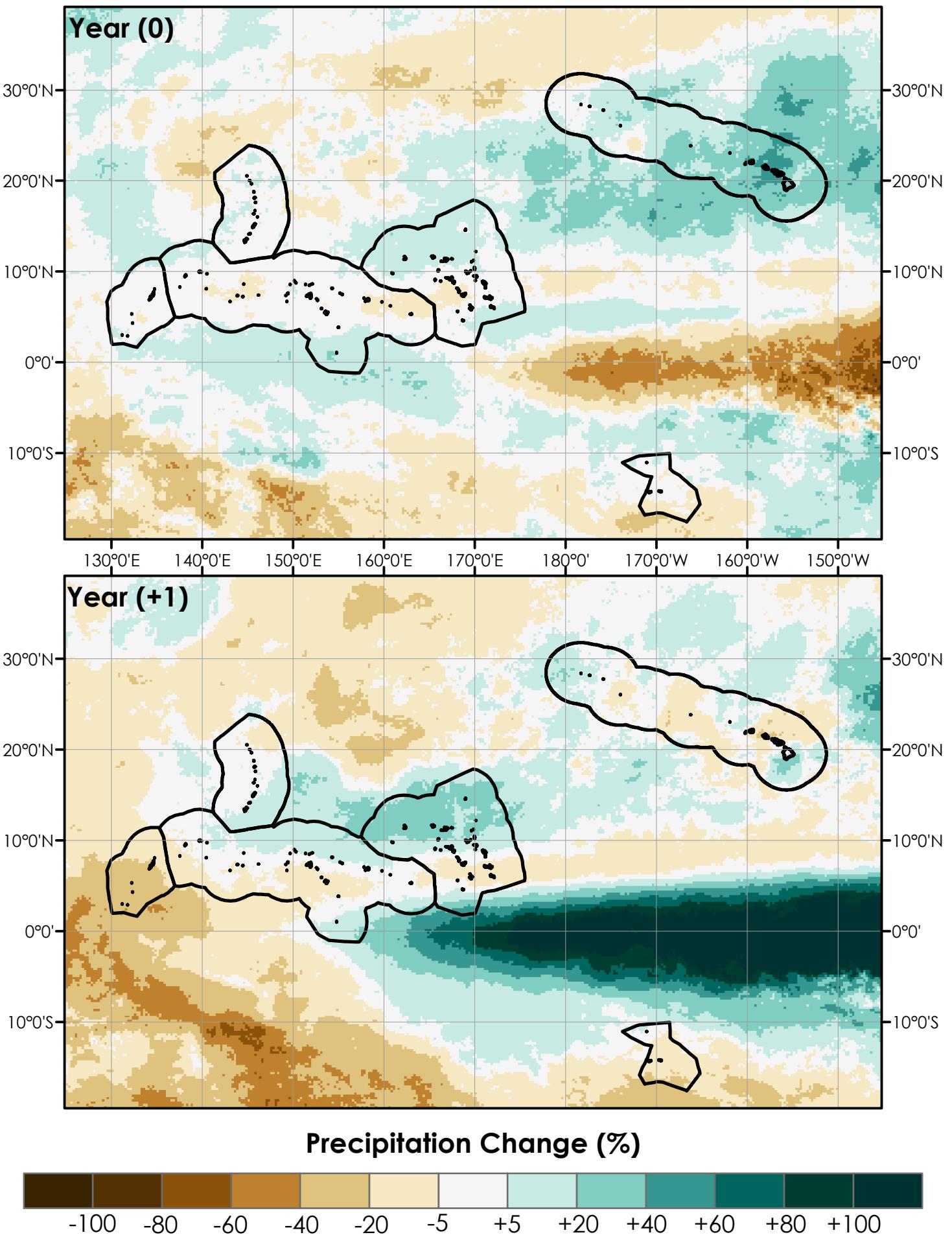
Neutral for ASO

61



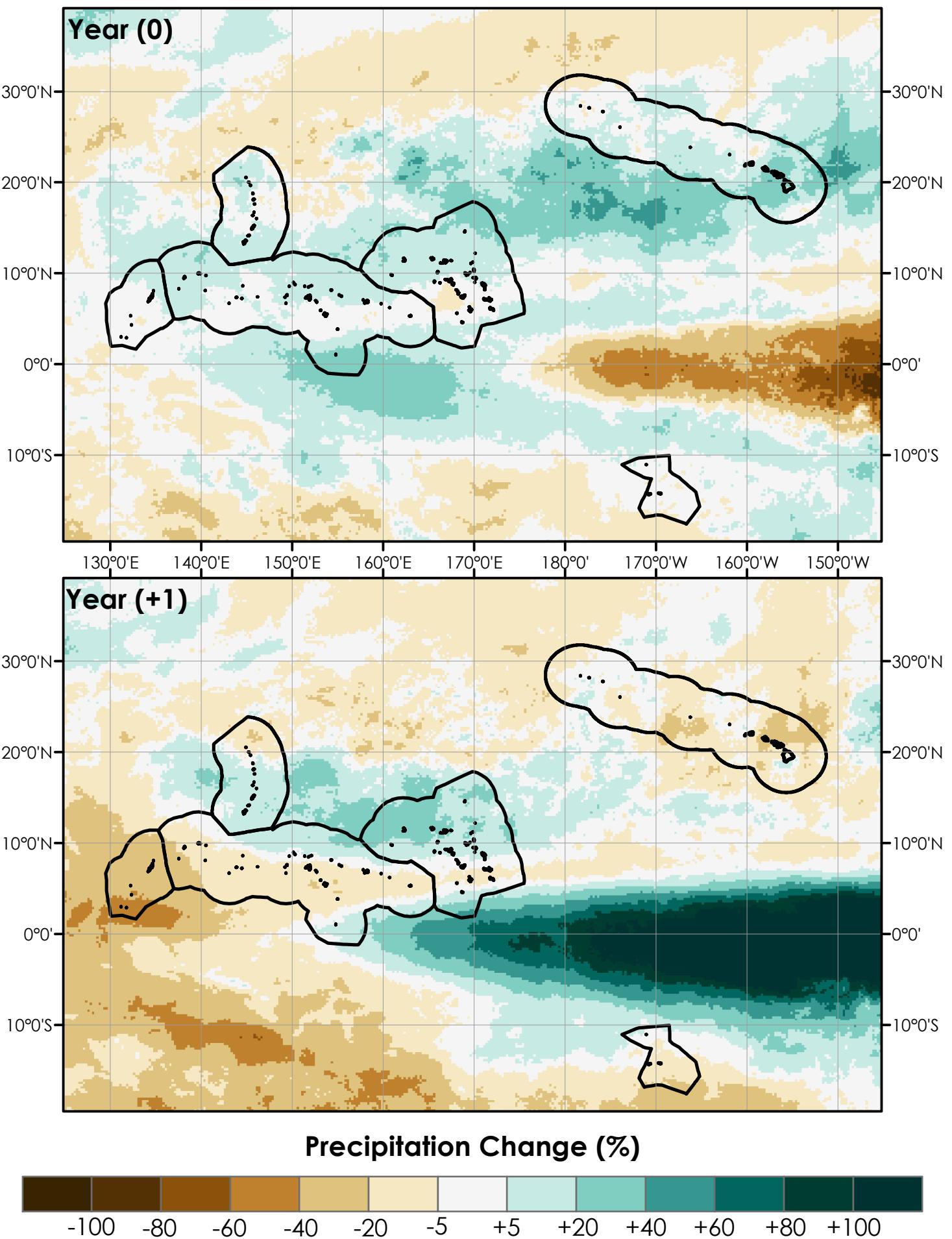
Neutral for SON

62



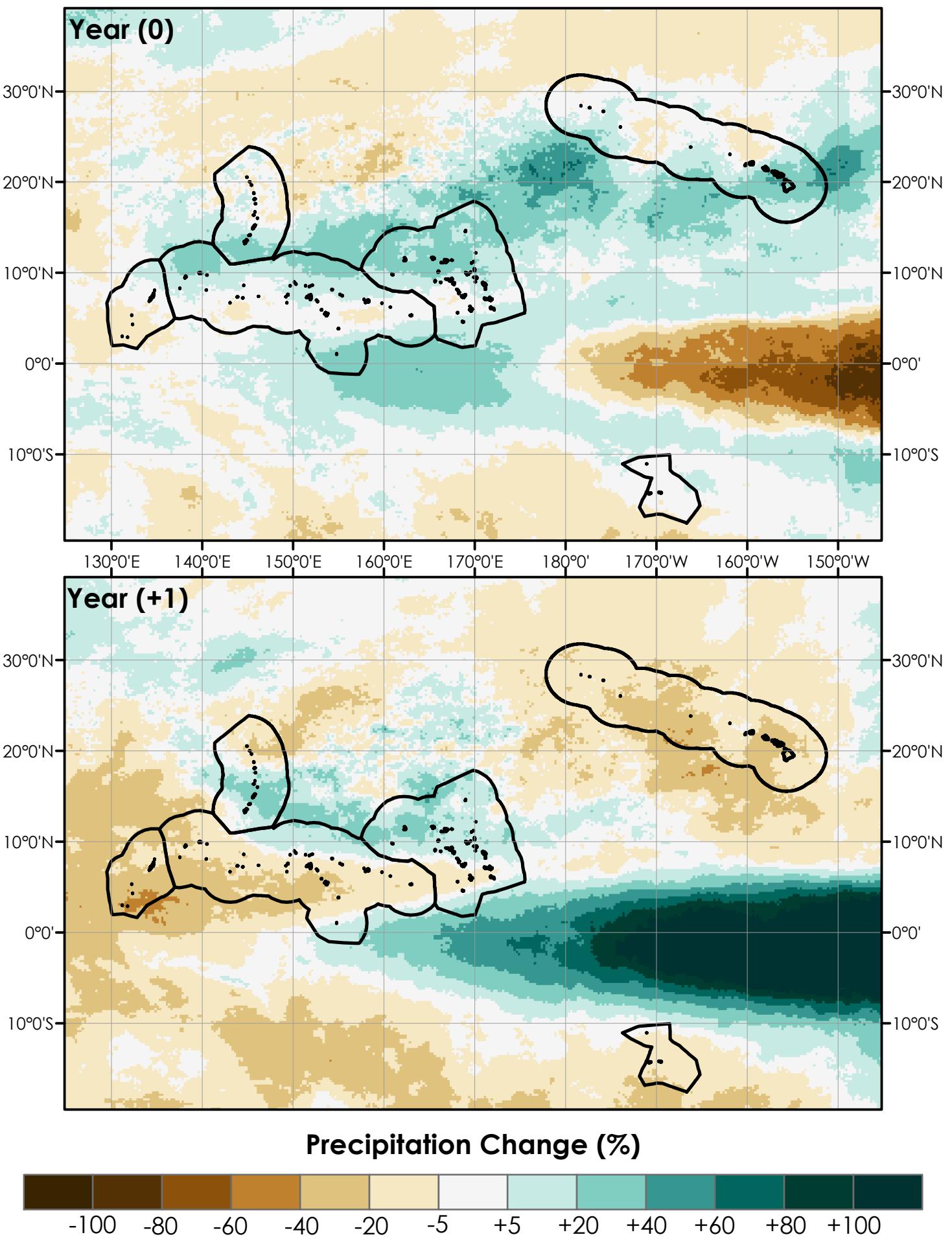
Neutral for OND

63



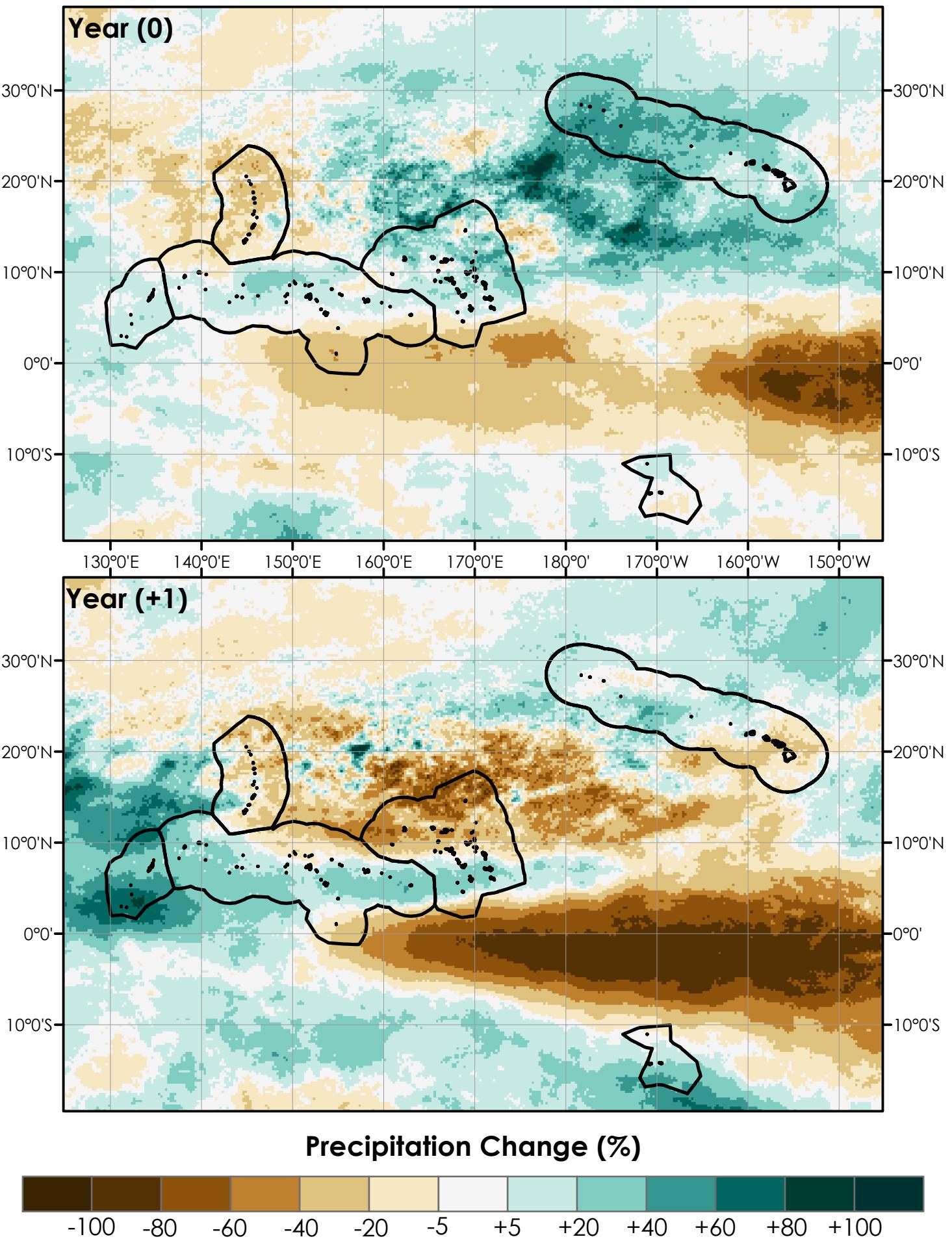
Neutral for NDJ

64



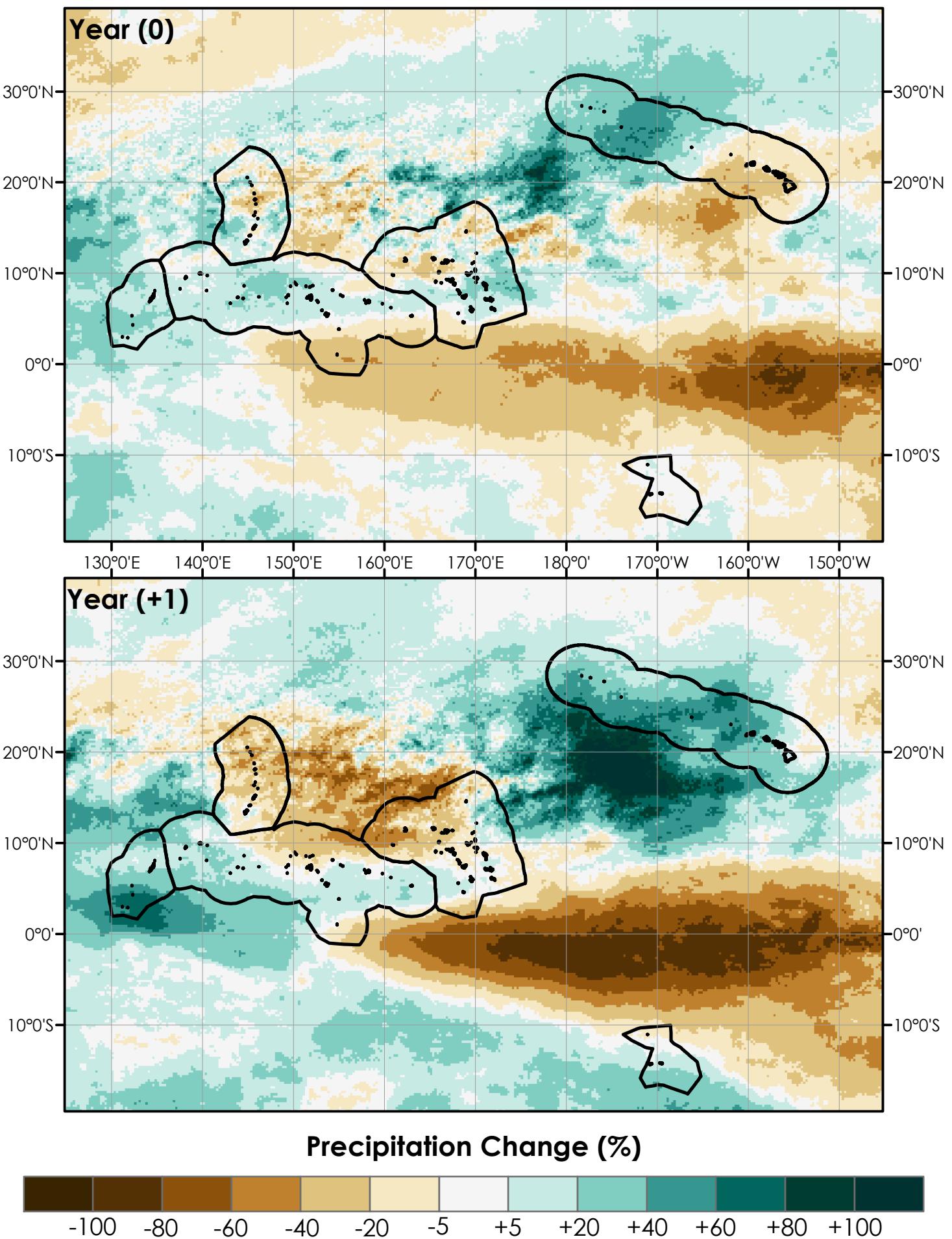
Weak La Niña for DJF

65



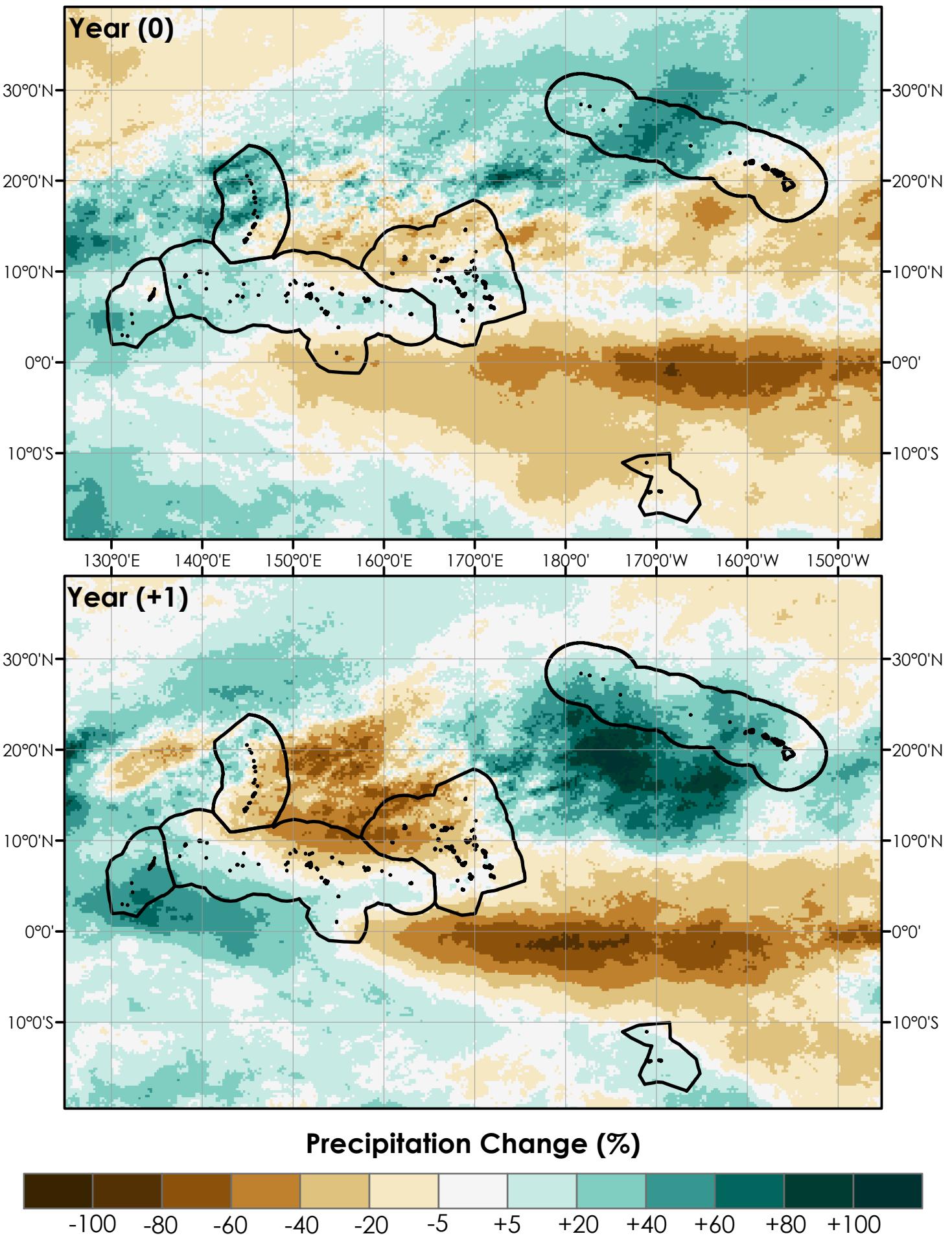
Weak La Niña for JFM

66



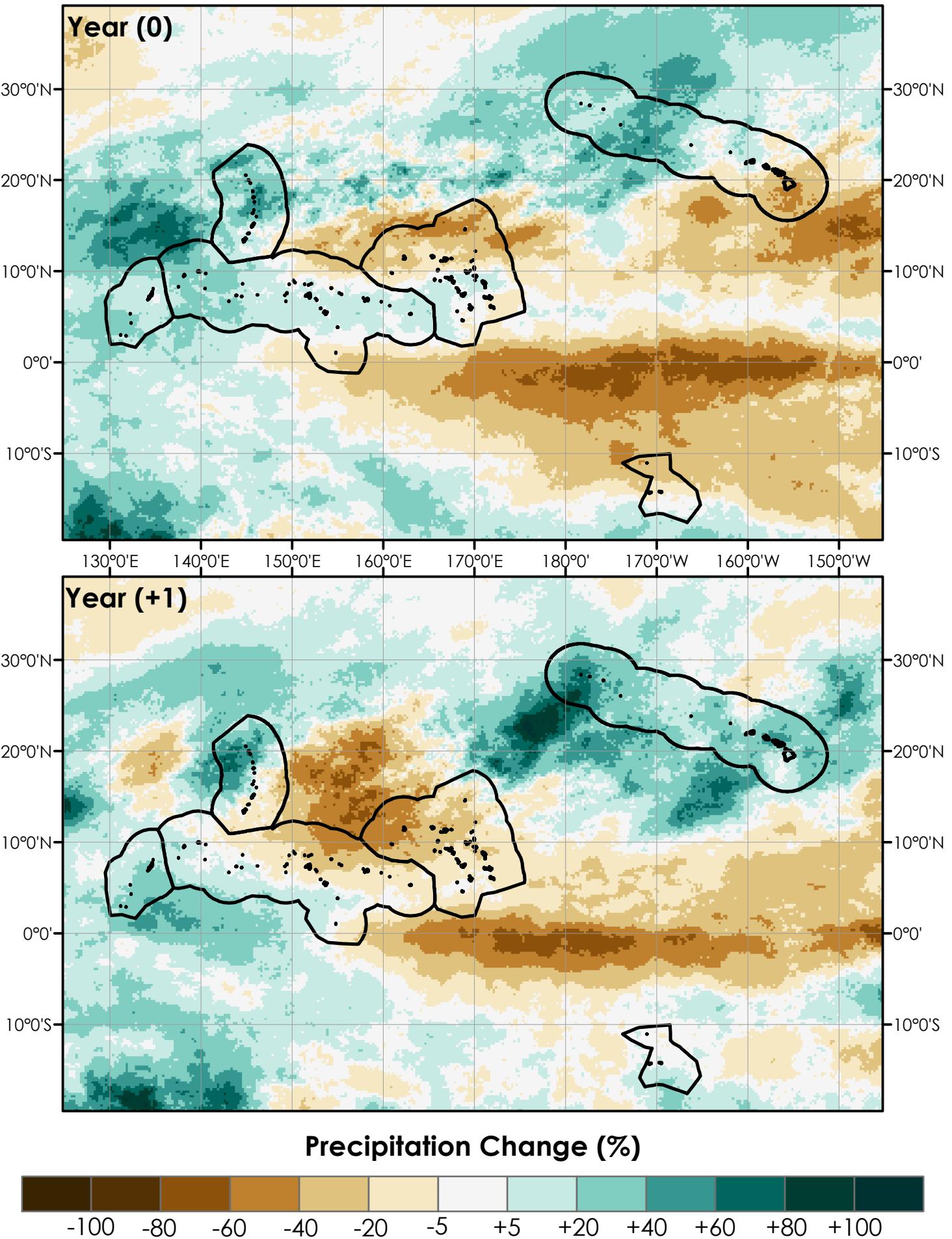
Weak La Niña for FMA

67



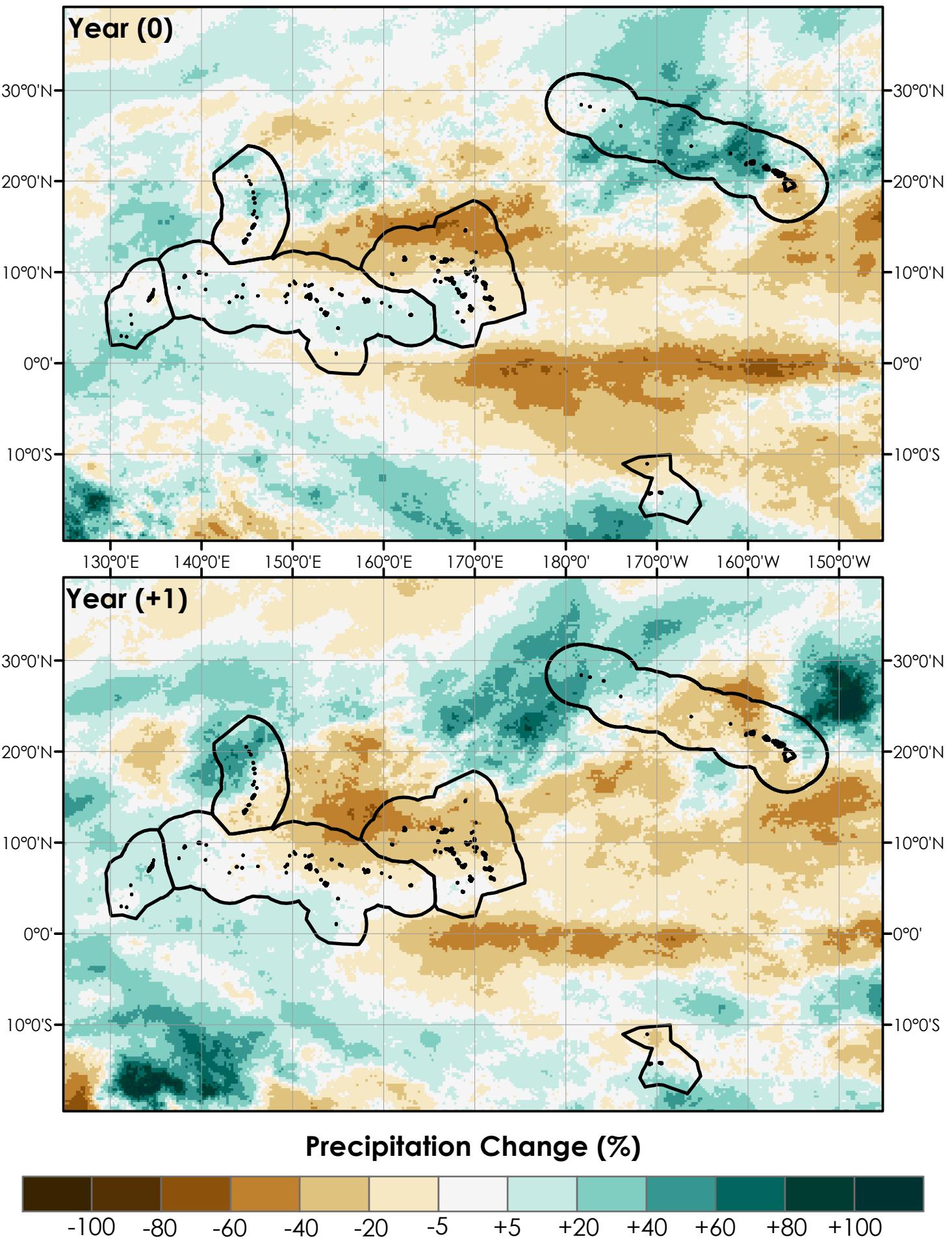
Weak La Niña for MAM

68



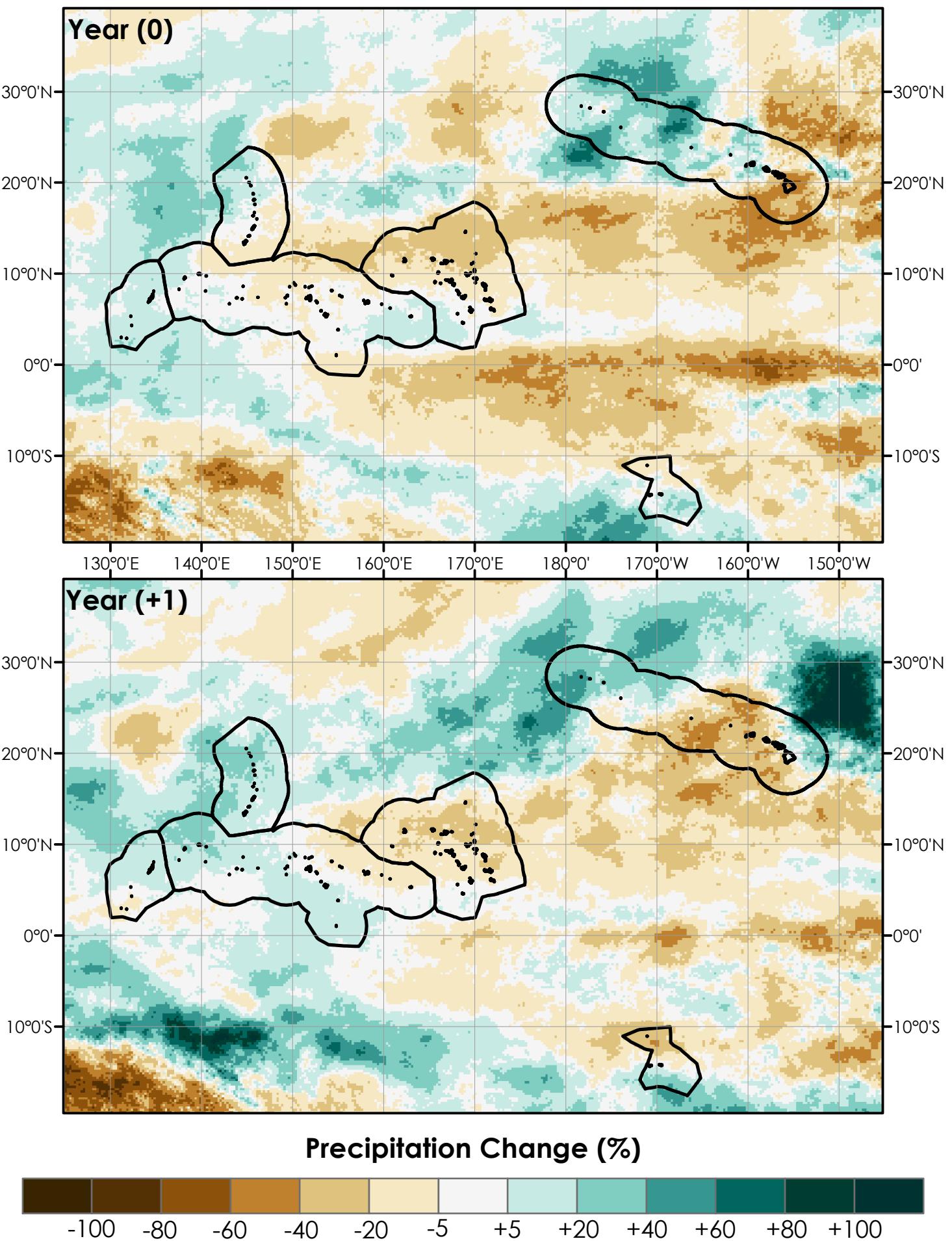
Weak La Niña for AMJ

69



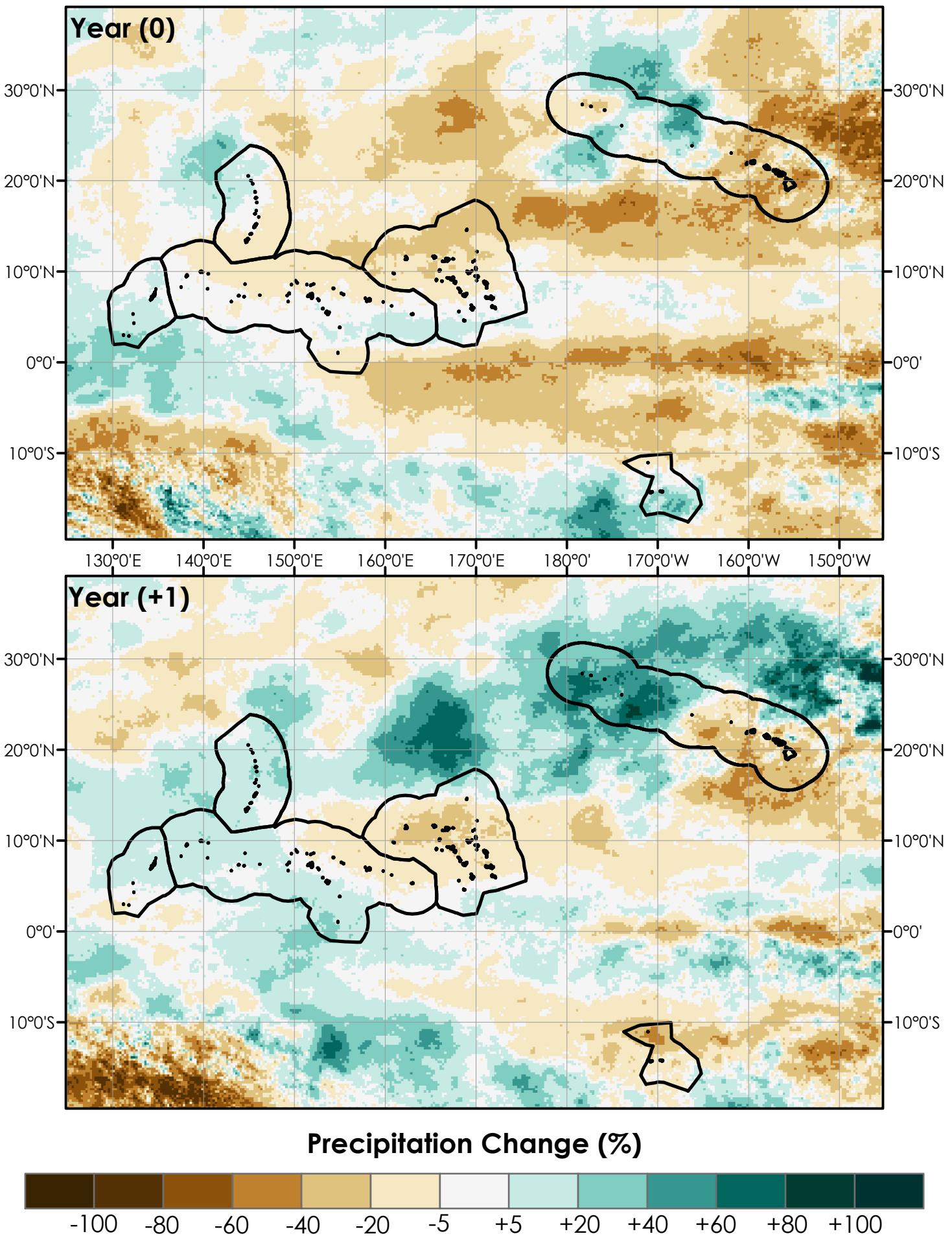
Weak La Niña for MJJ

70



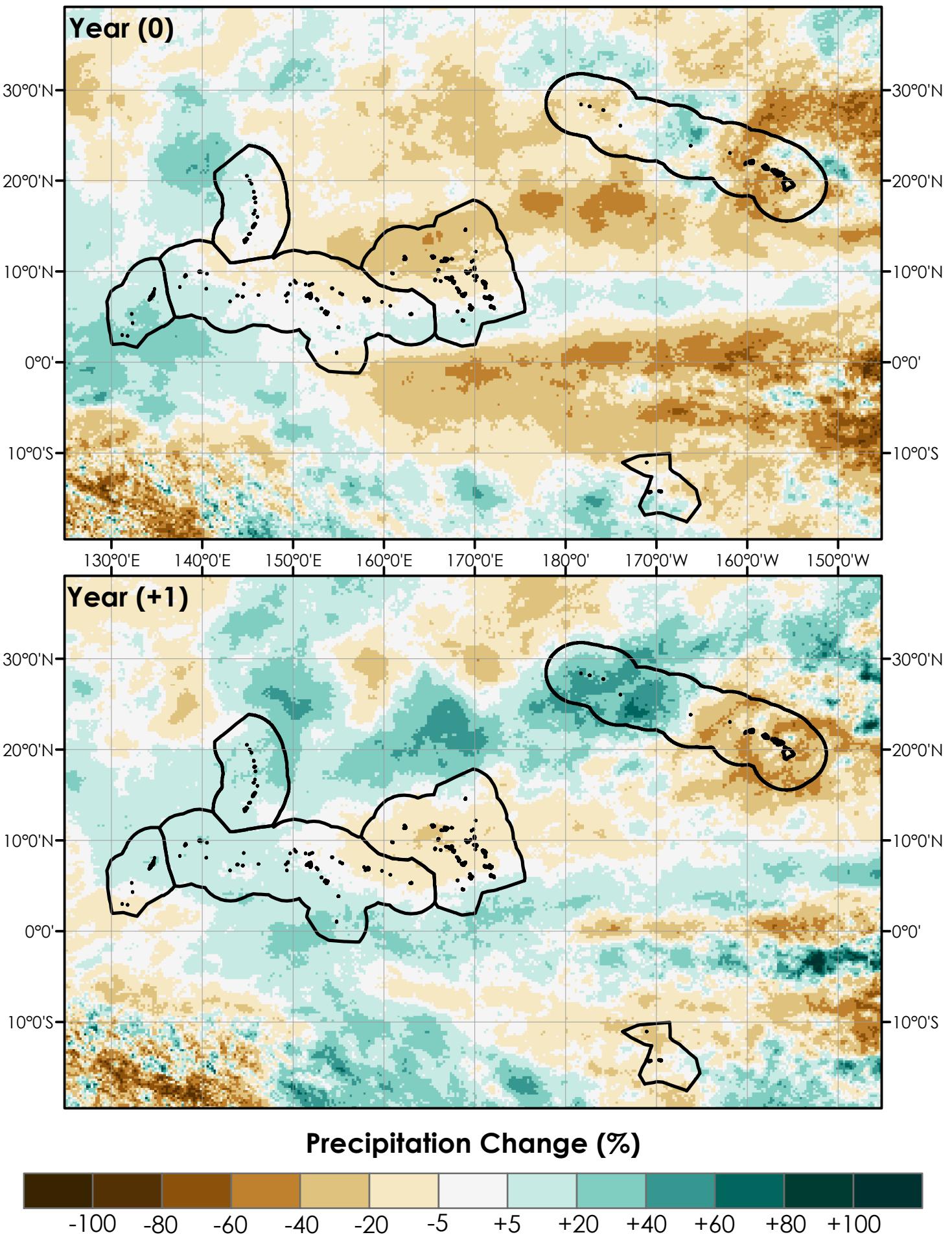
Weak La Niña for JJA

71



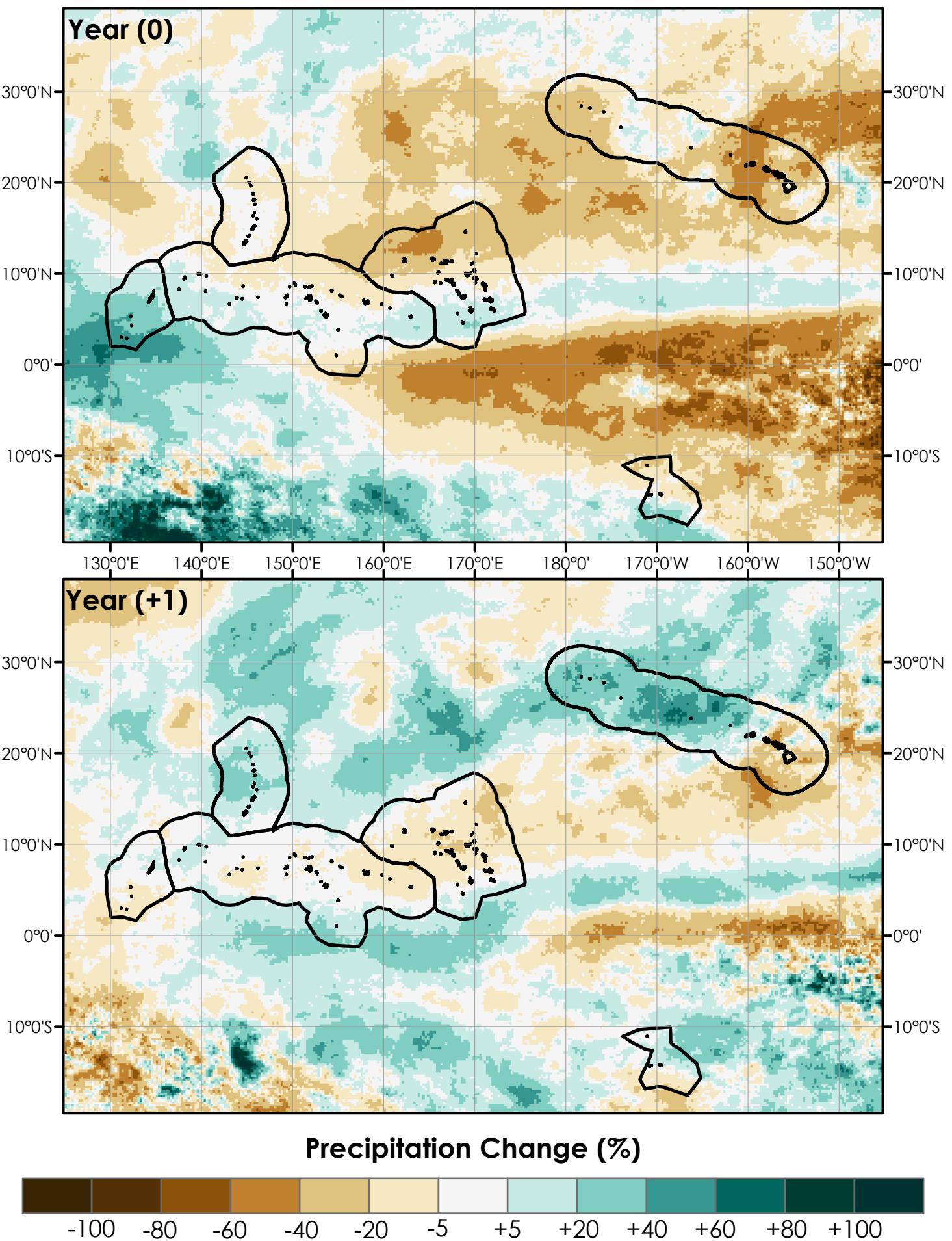
Weak La Niña for JAS

72



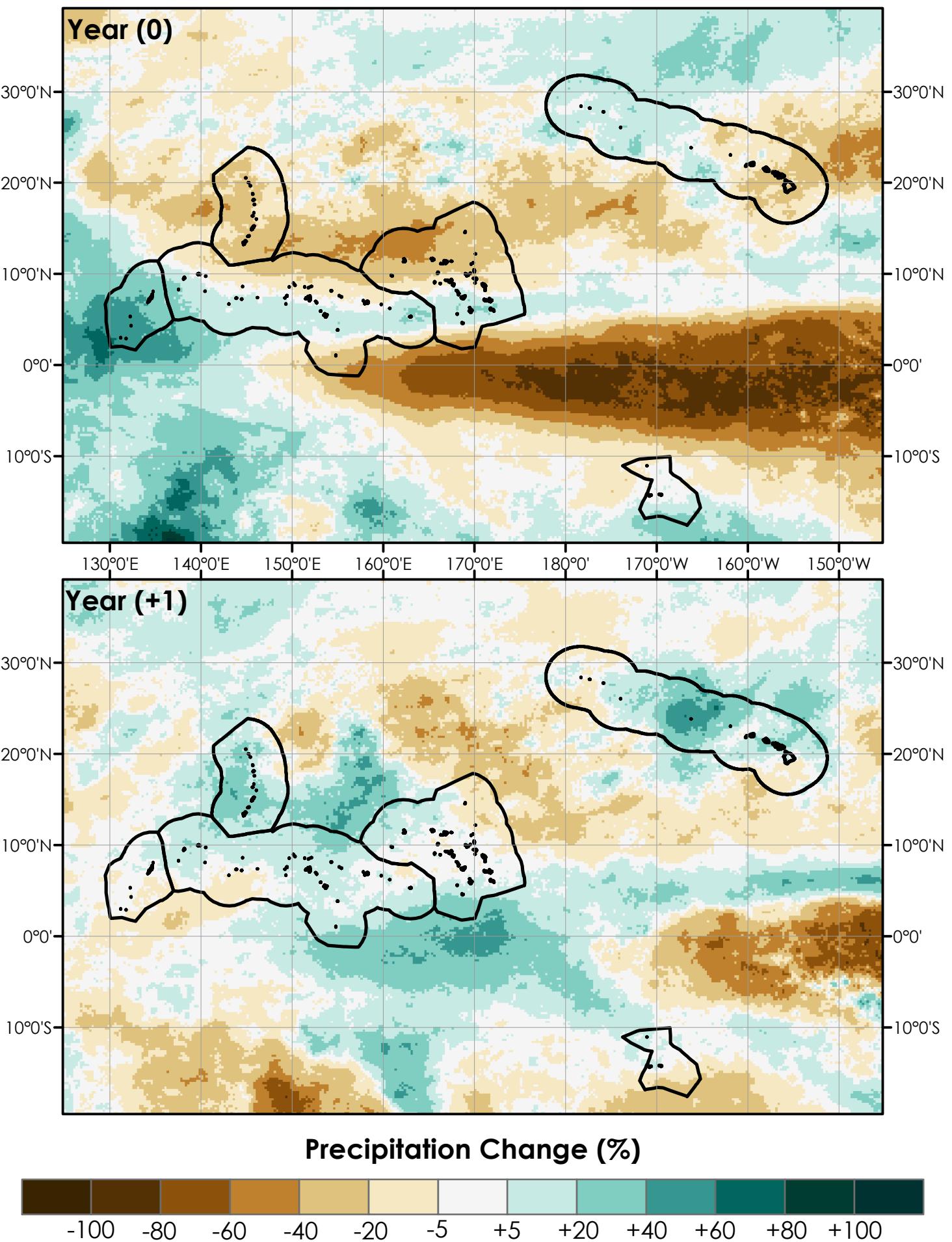
Weak La Niña for ASO

73



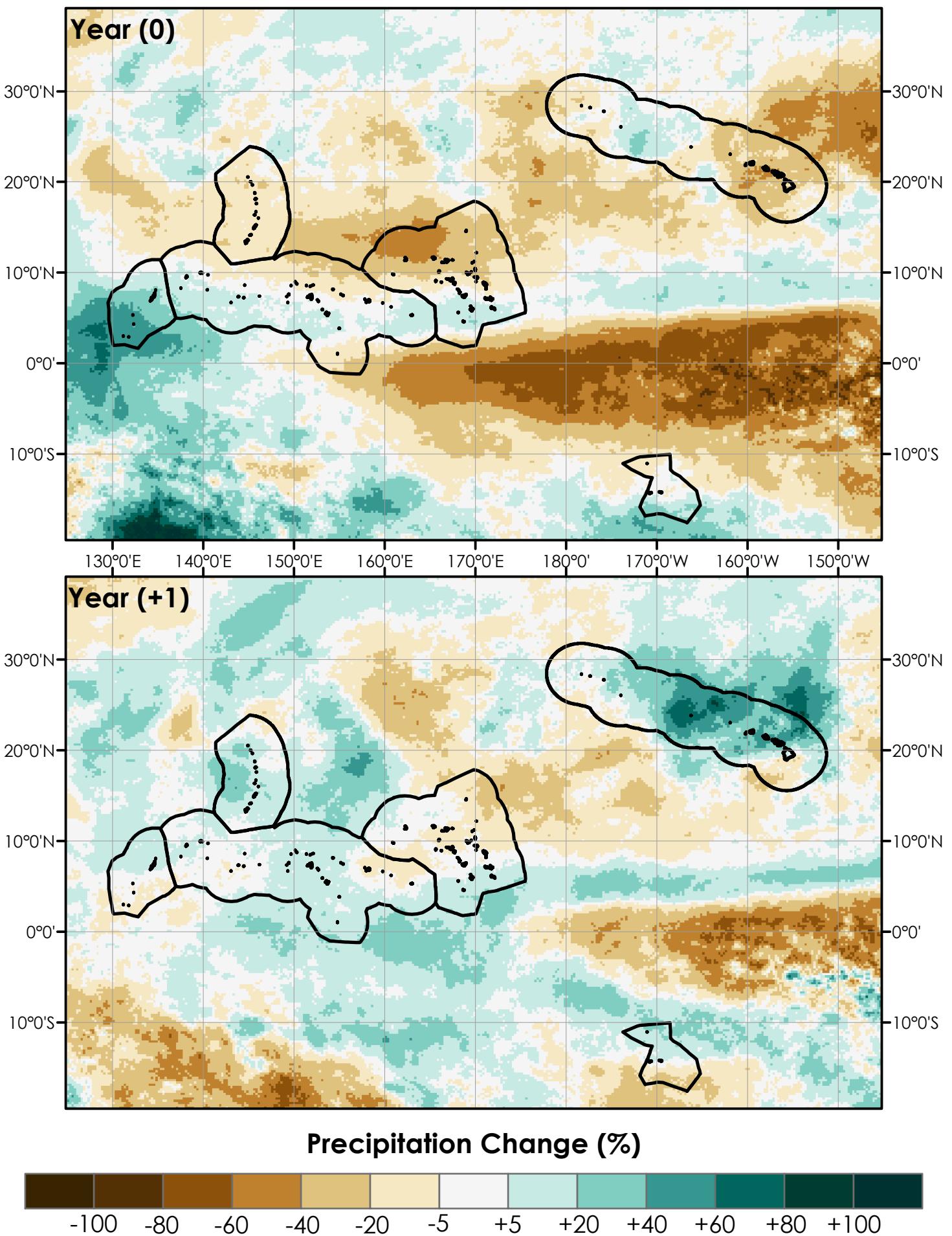
Weak La Niña for OND

74



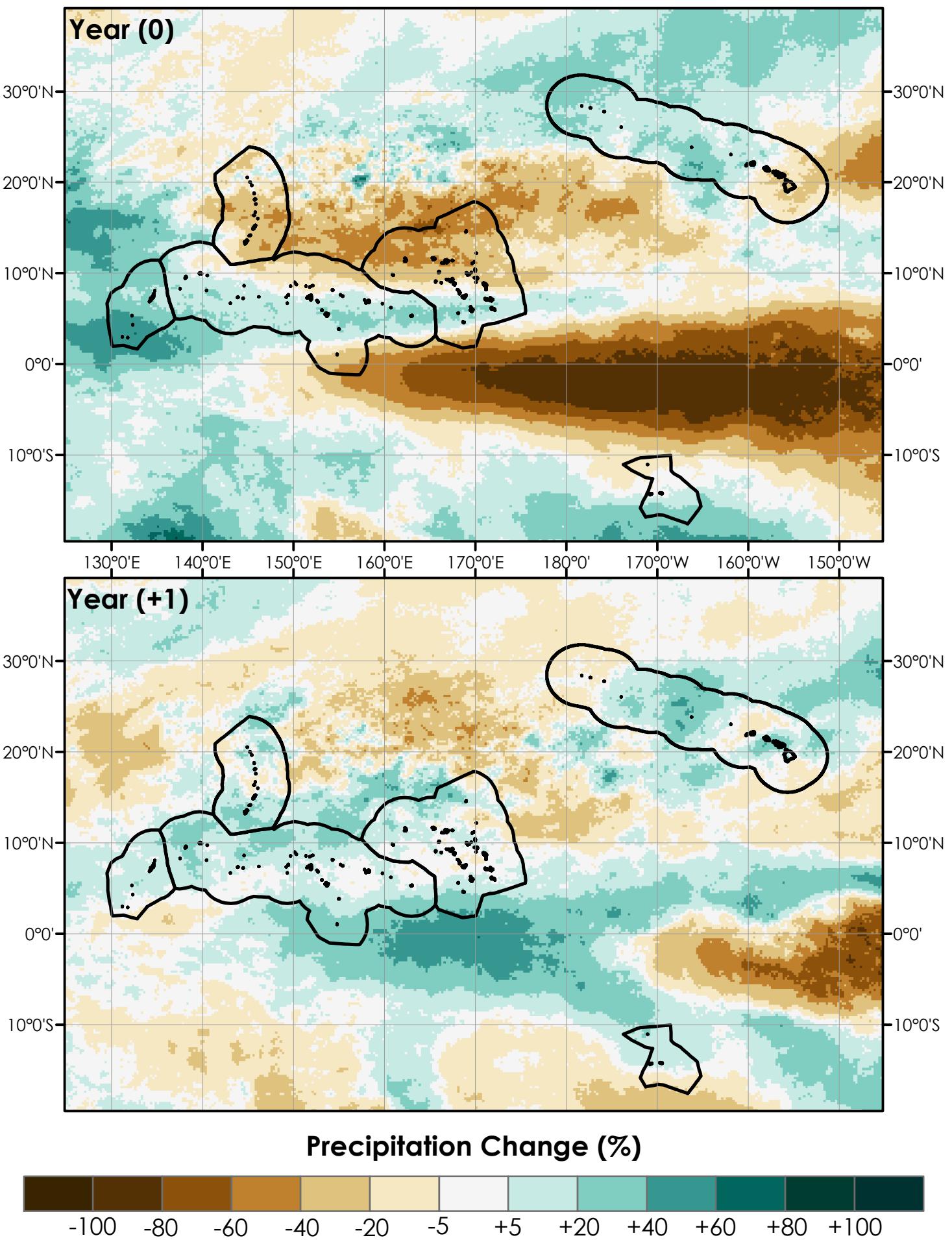
Weak La Niña for SON

75



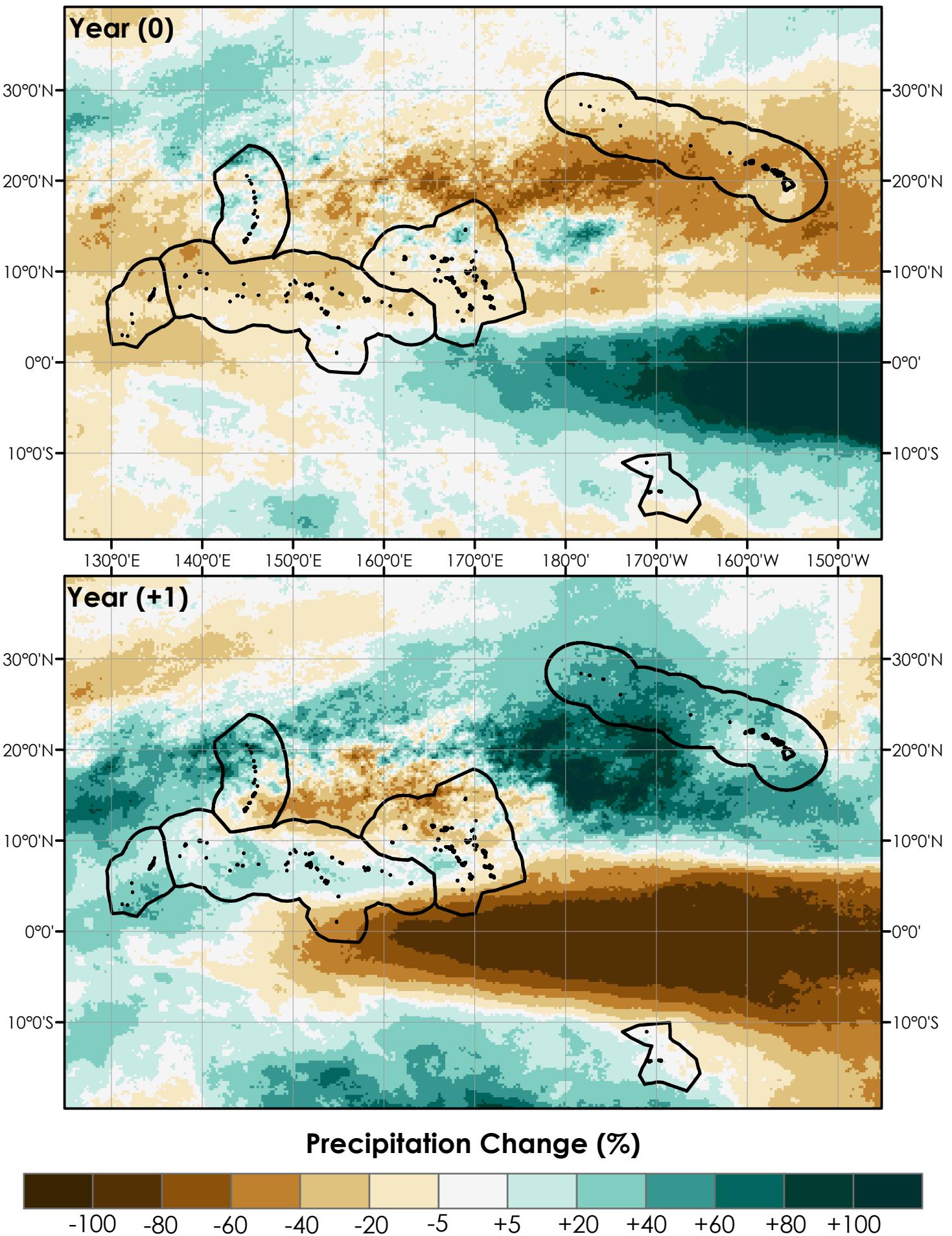
Weak La Niña for NDJ

76



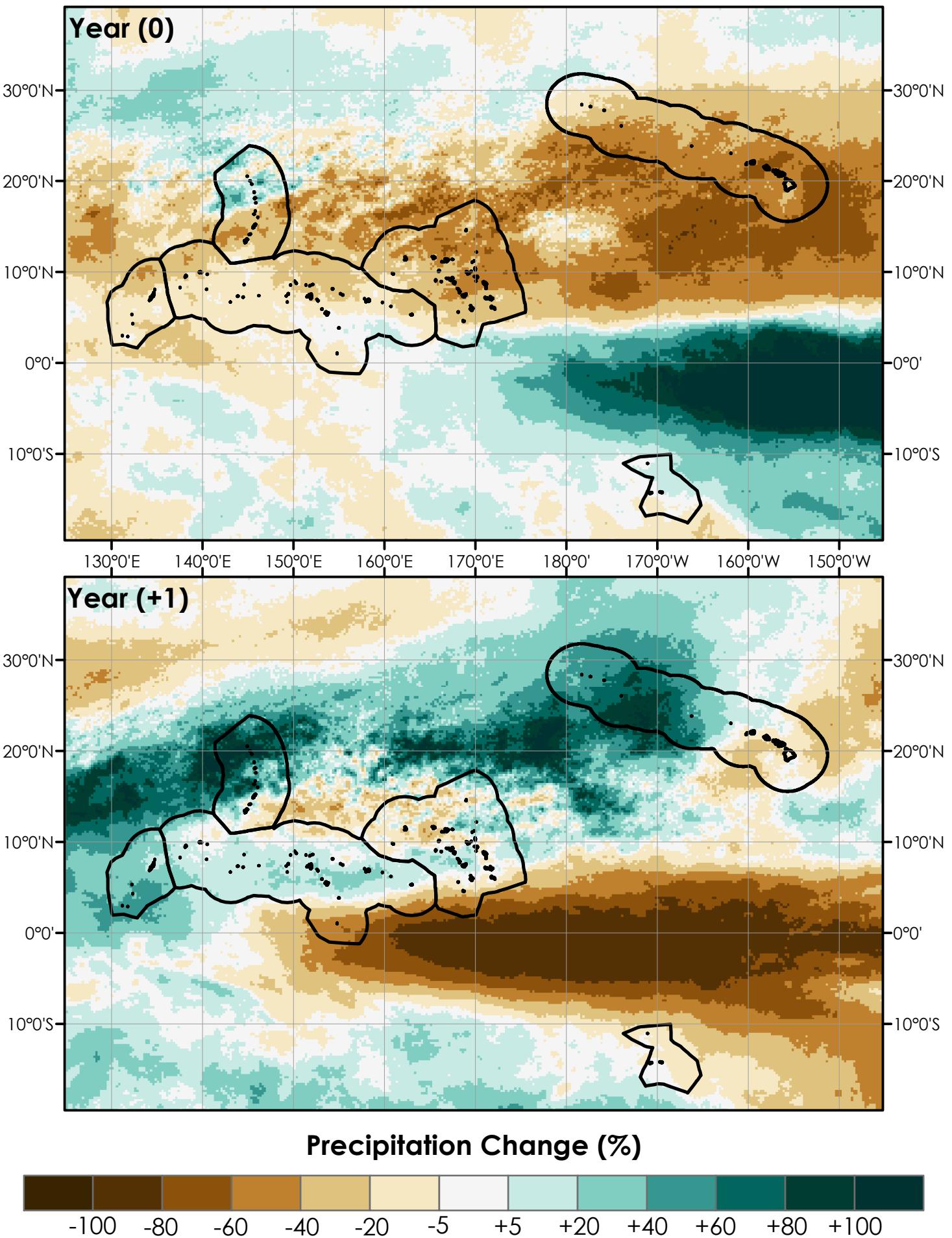
Moderate-Strong La Niña for DJF

77



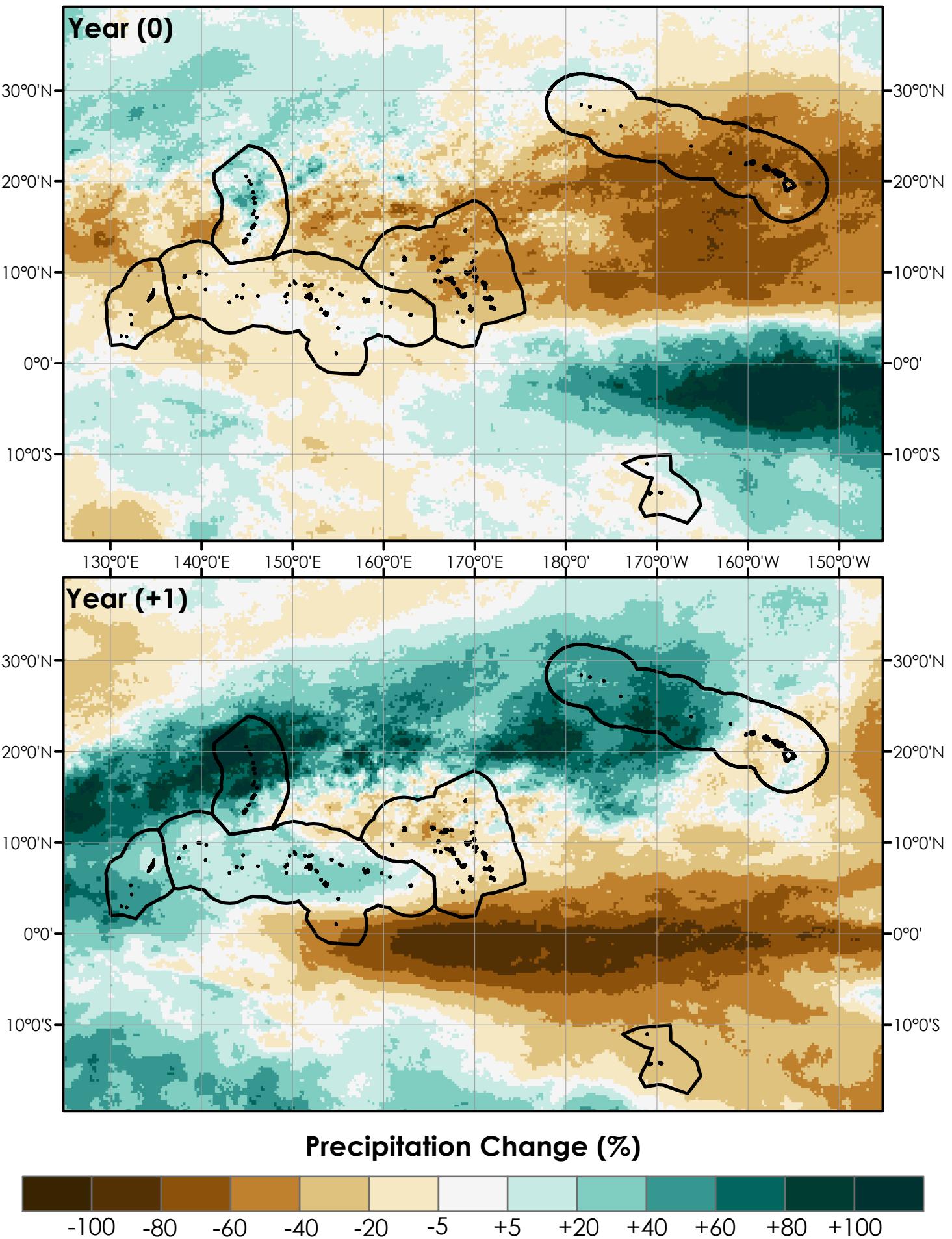
Moderate-Strong La Niña for JFM

78



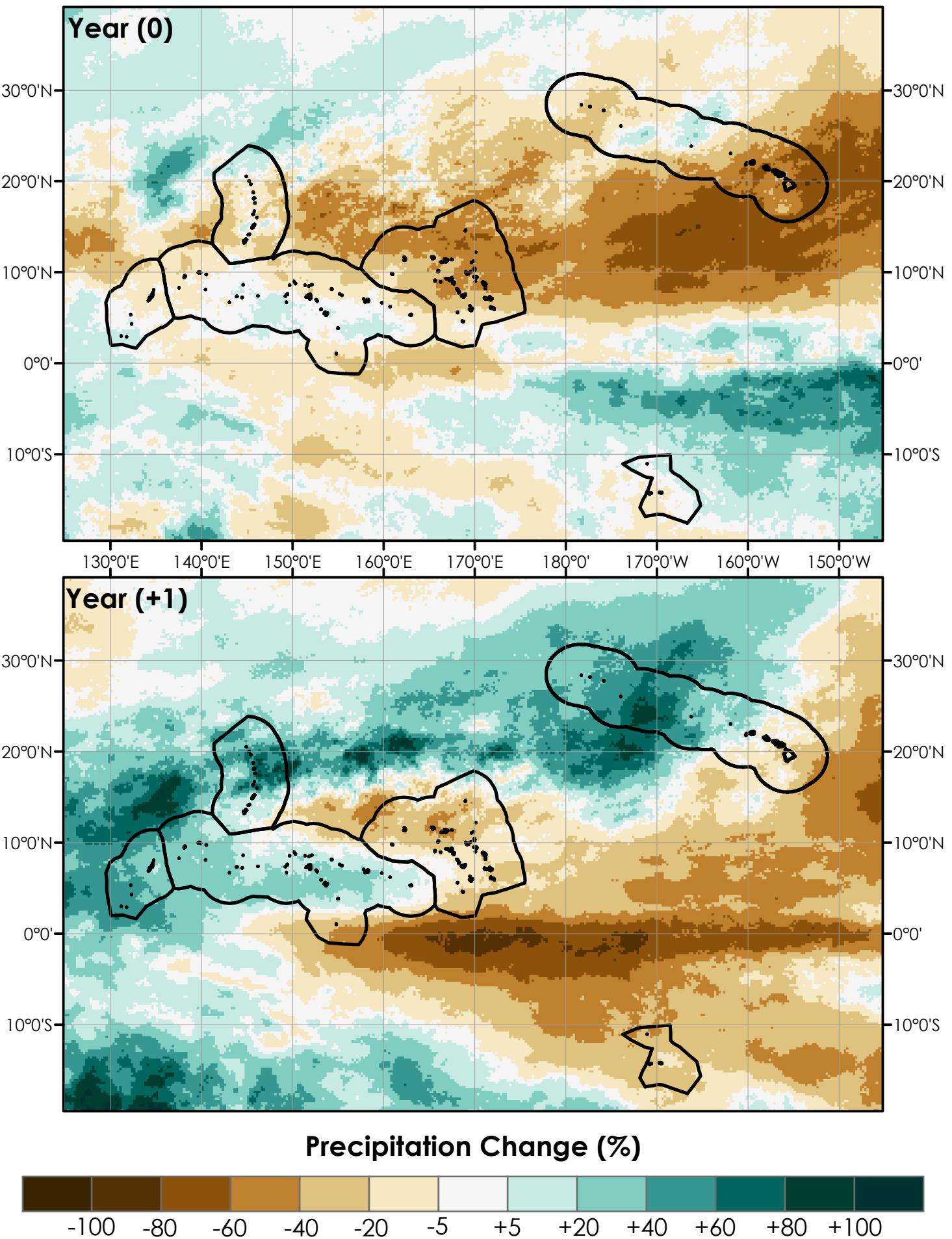
Moderate-Strong La Niña for FMA

79



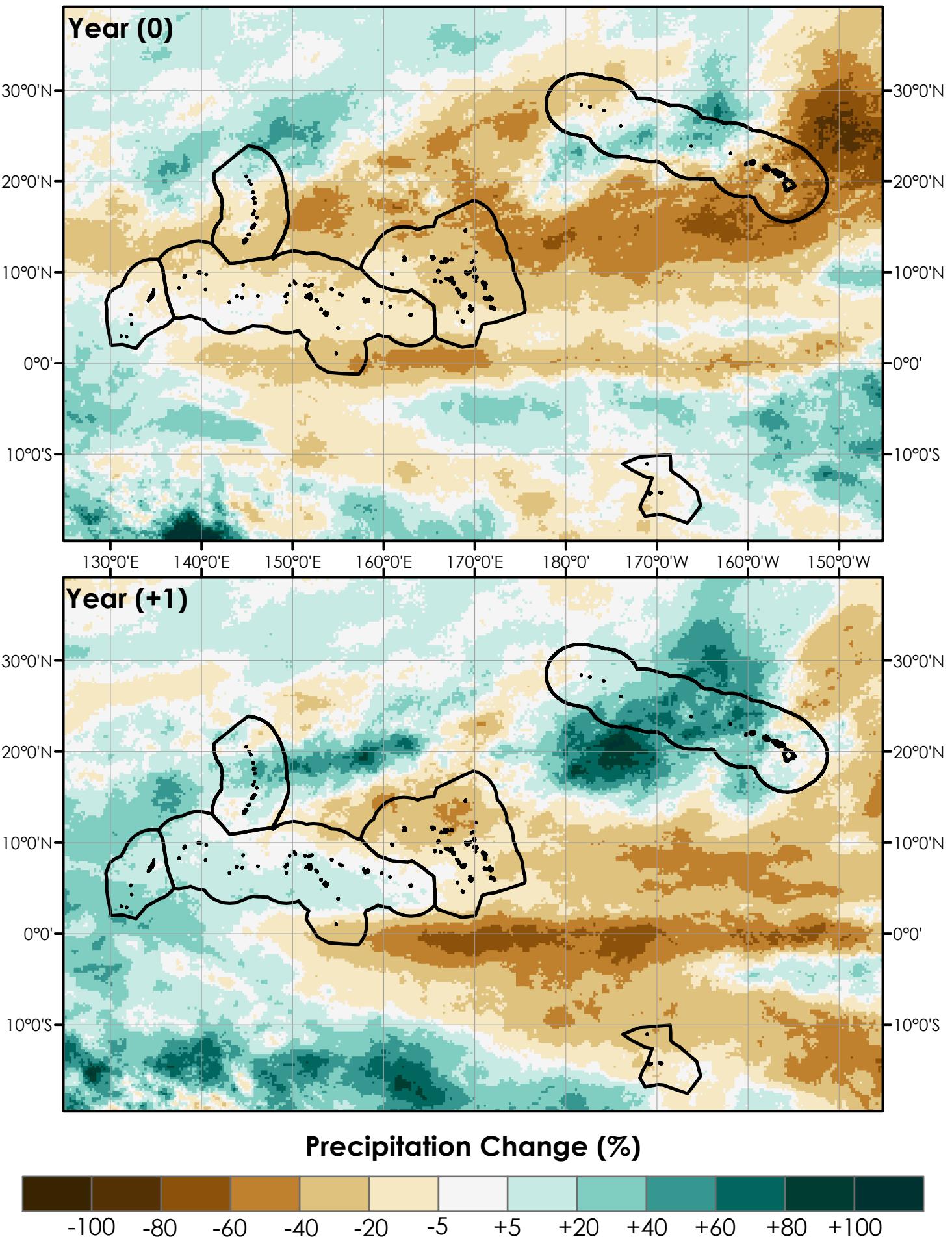
Moderate-Strong La Niña for MAM

80



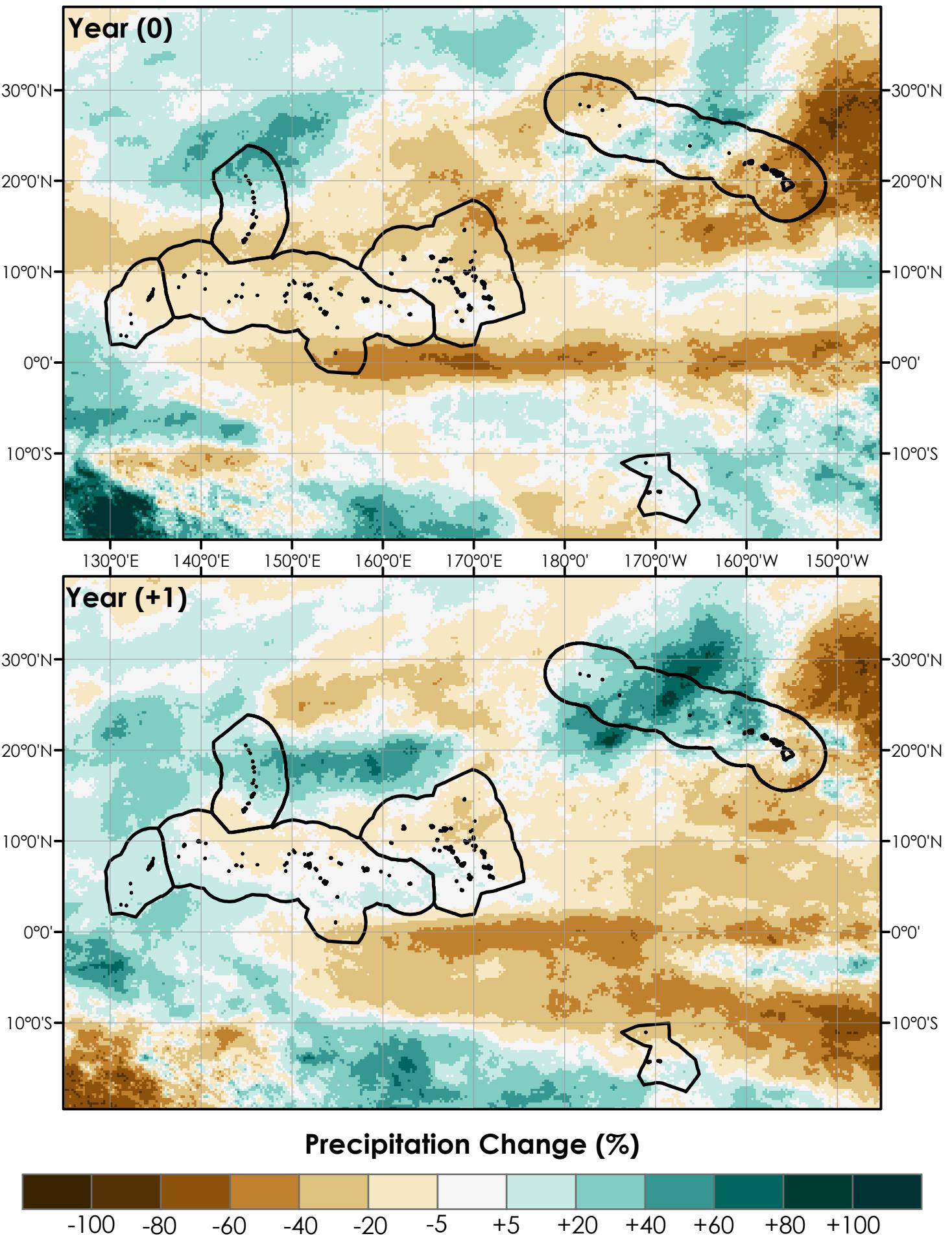
Moderate-Strong La Niña for AMJ

81



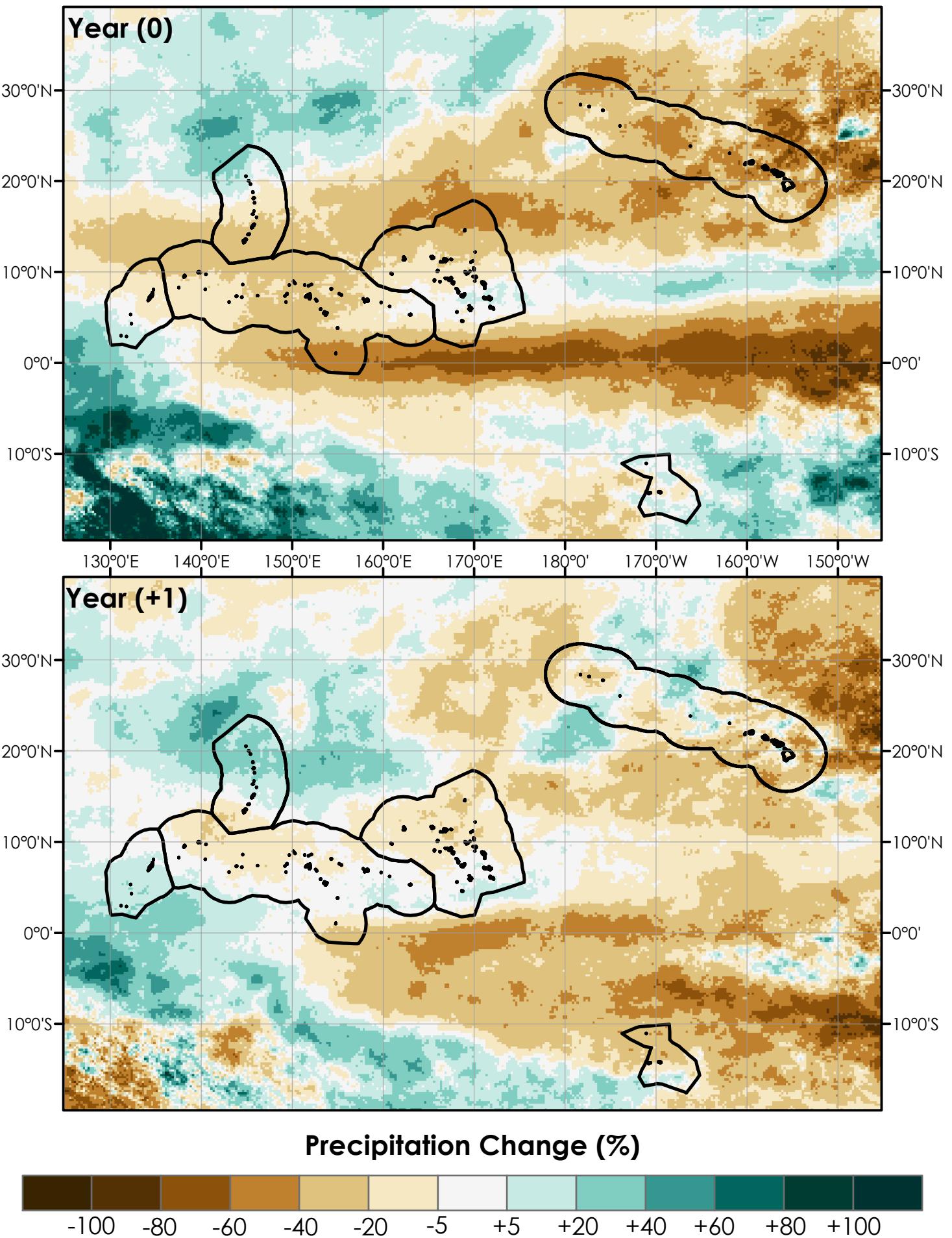
Moderate-Strong La Niña for MJJ

82



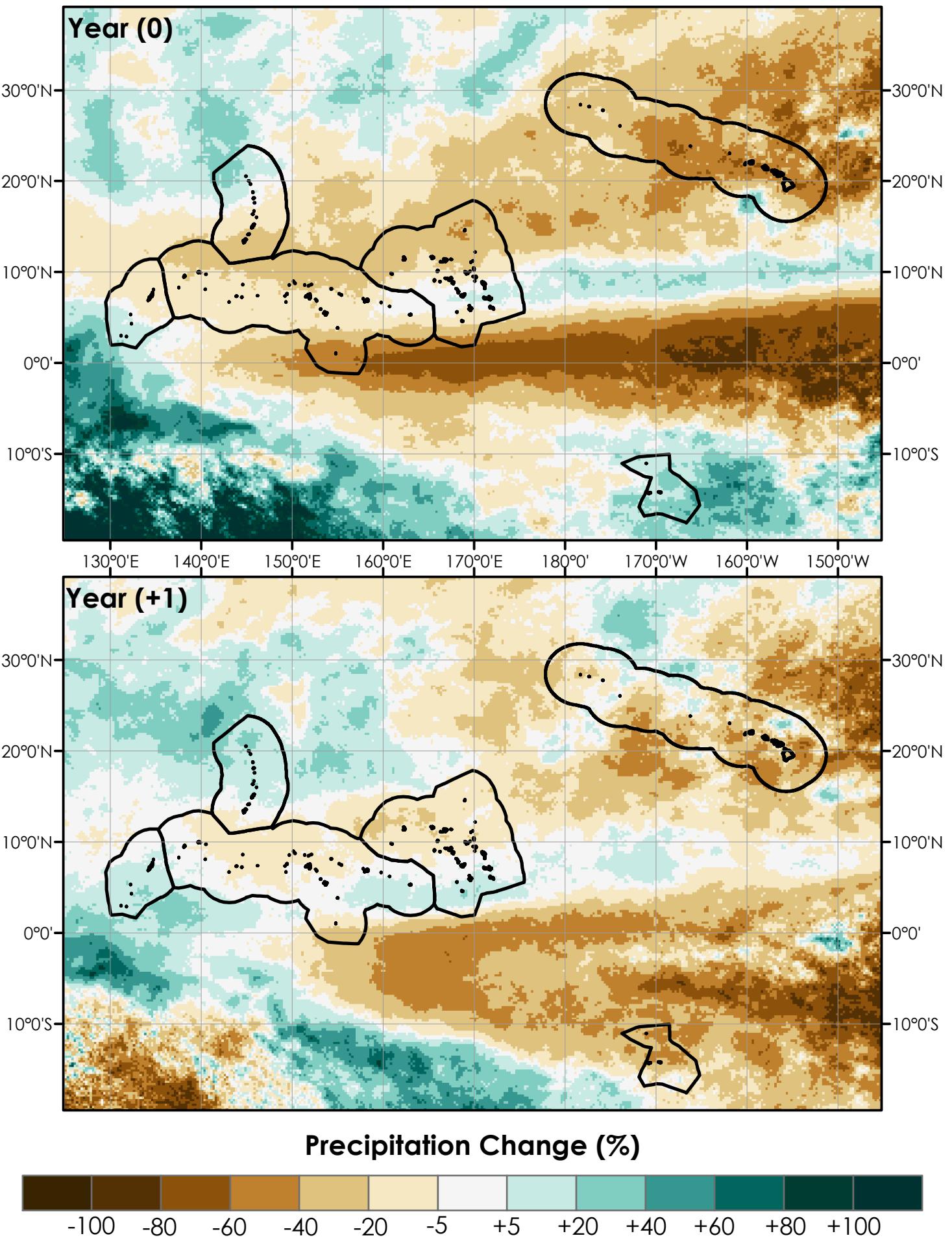
Moderate-Strong La Niña for JJA

83



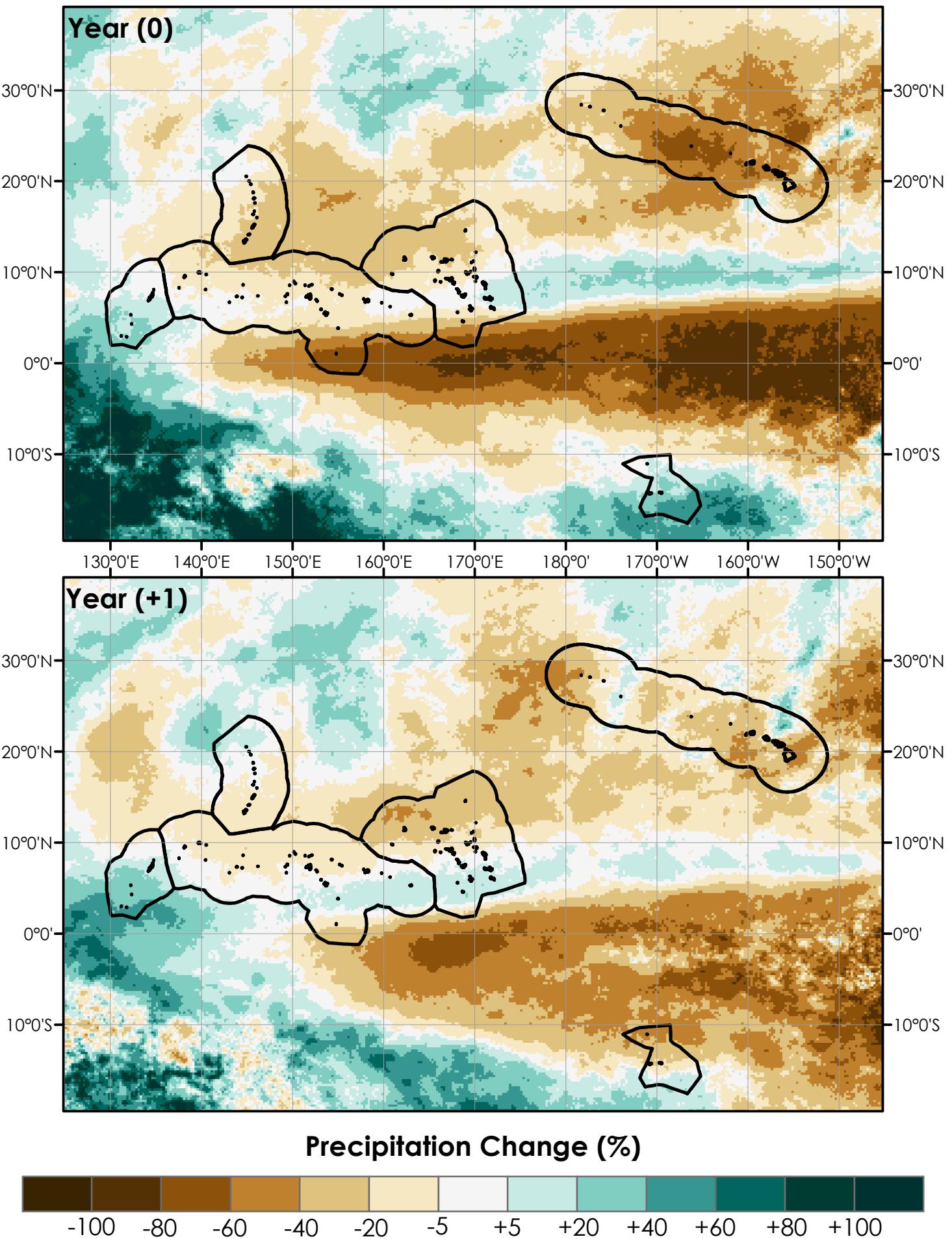
Moderate-Strong La Niña for JAS

84



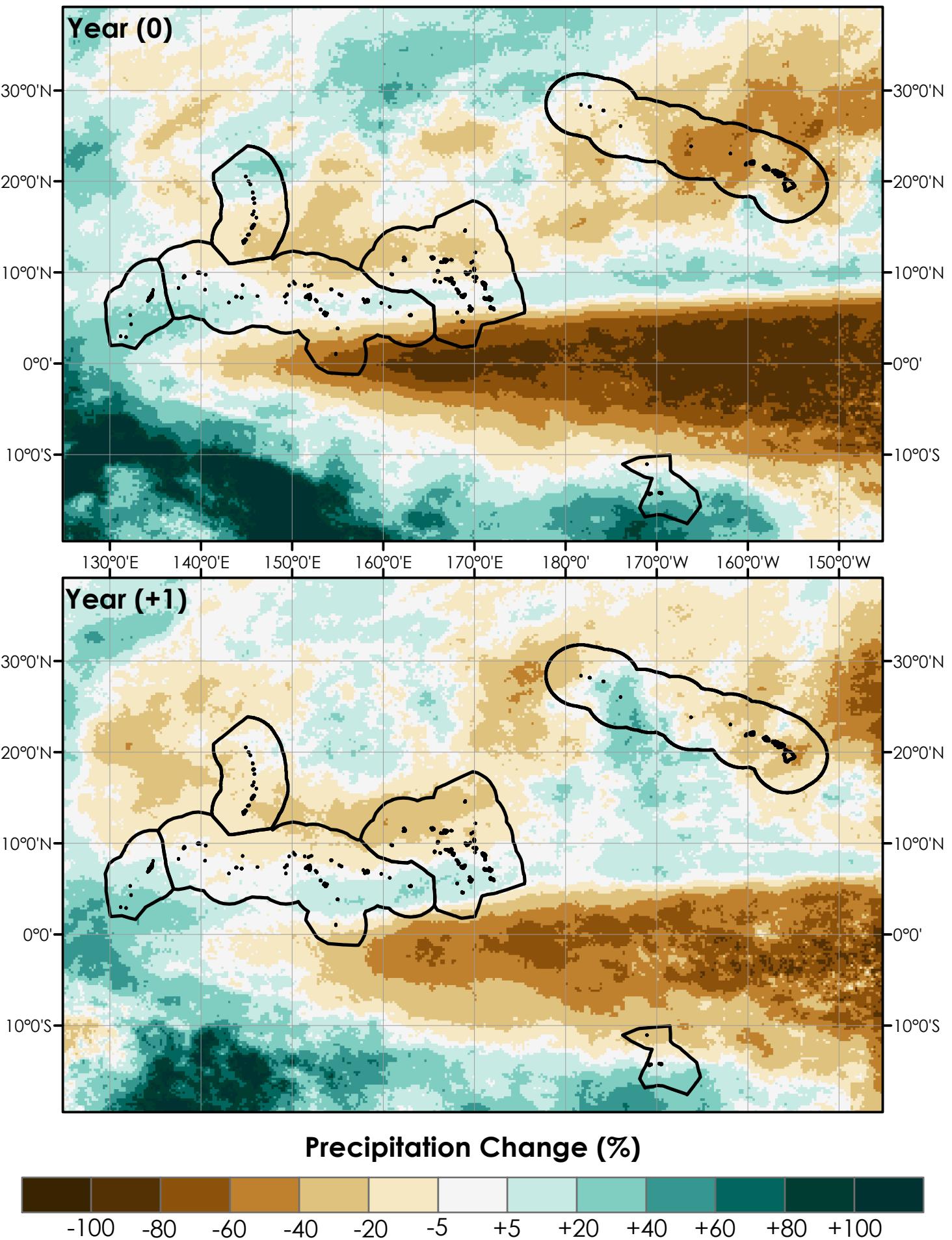
Moderate-Strong La Niña for ASO

85



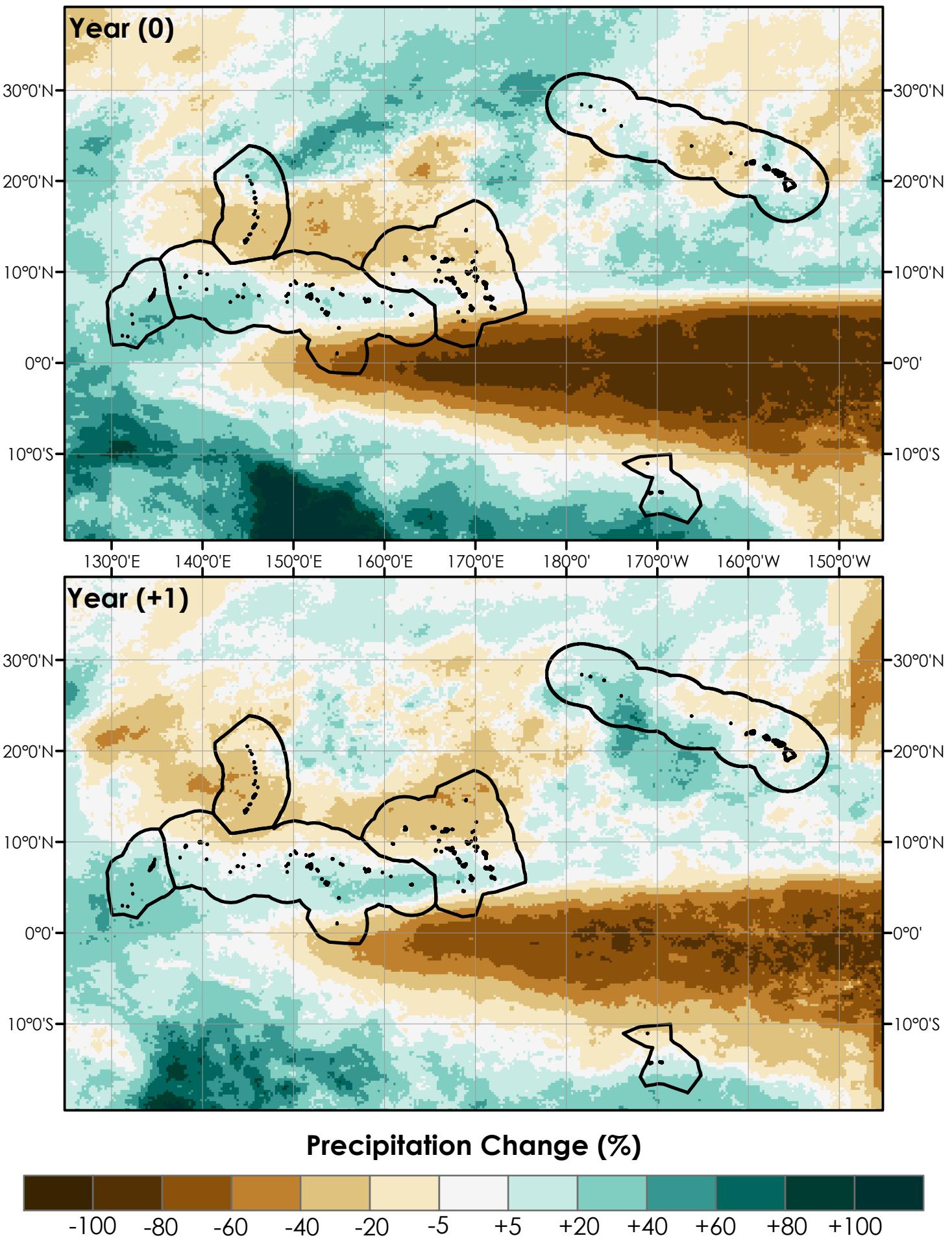
Moderate-Strong La Niña for SON

86



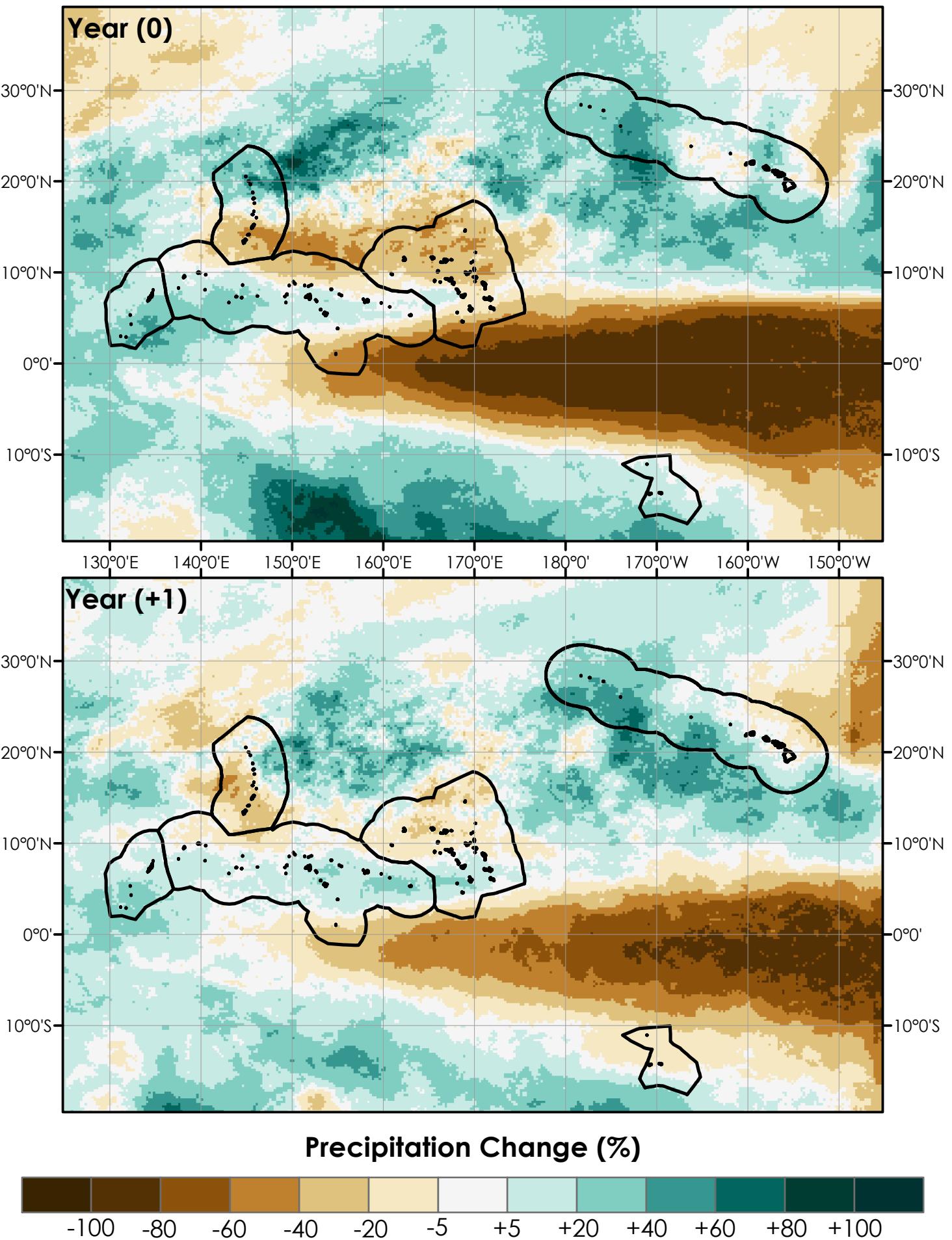
Moderate-Strong La Niña for OND

87



Moderate-Strong La Niña for NDJ

88

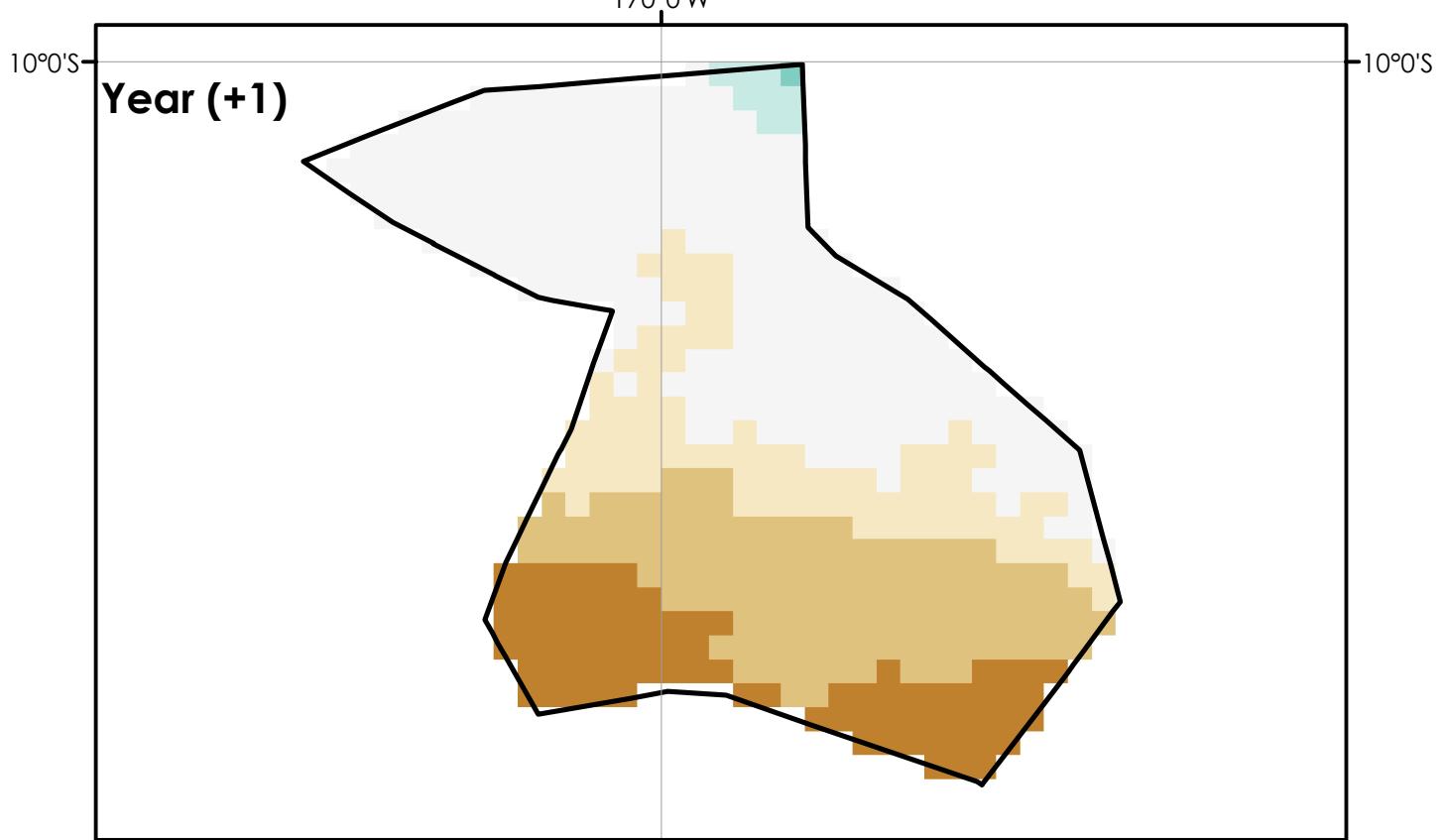
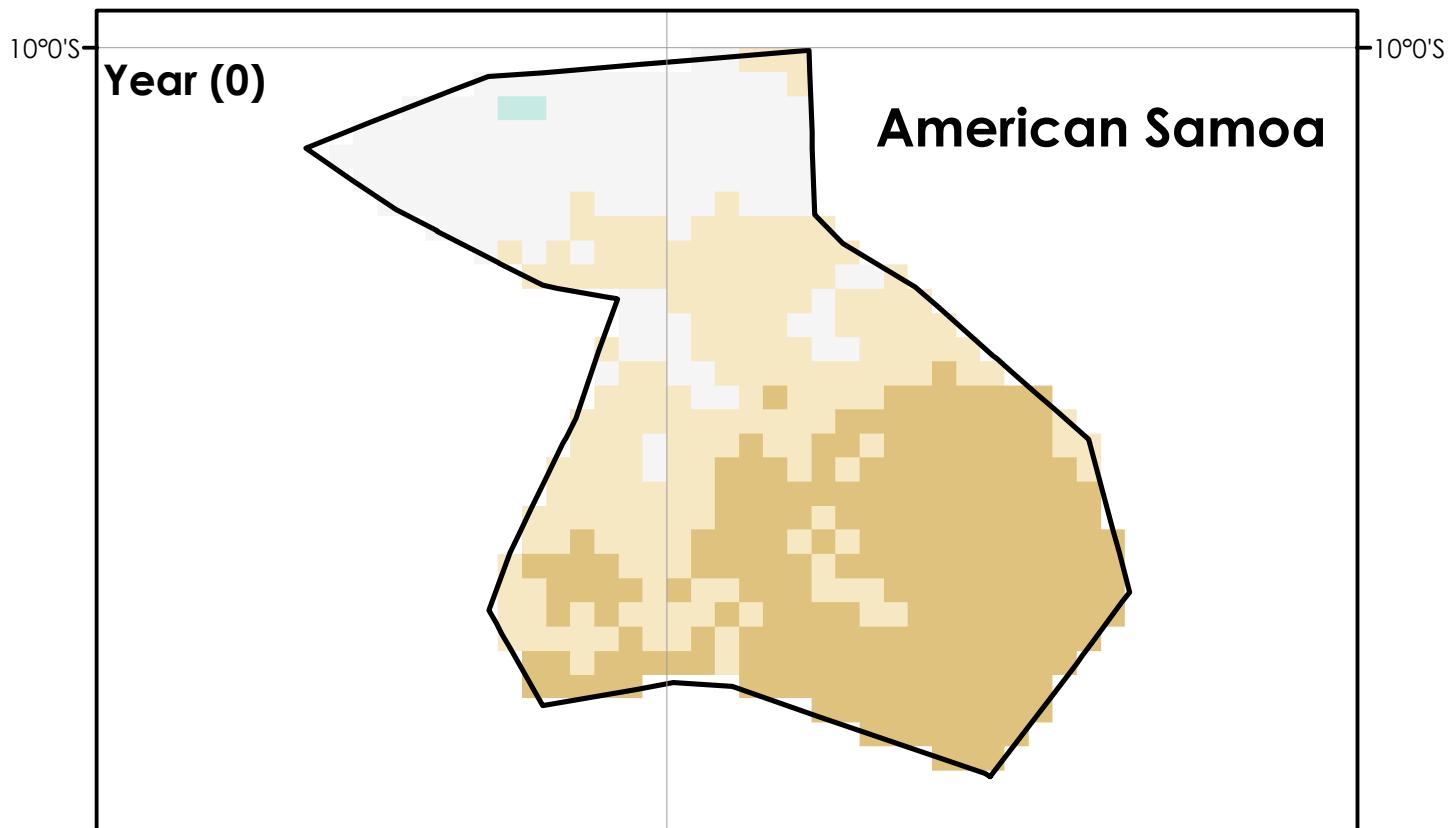


The following two-panel maps show each three month seasonal average precipitation change for each of the five ENSO phases (moderate-strong La Niña and El Niño, weak La Niña and El Niño, and neutral) for the Exclusive Economic Zone (EEZ) of American Samoa. Within each two-panel map, the top map shows the average precipitation change for the three month season preceding (Year (0)) the onset of the specific ENSO phase, which is listed in the title, and the bottom map shows the average precipitation change following (Year (+1)) the onset of the specific ENSO phase.

These maps show the areas within the EEZ that are abnormally wet (turquoise/green) or dry (tan/brown) for the three month season during a specific ENSO phase. Additionally, these maps show how the precipitation varies from a pre ENSO to a post ENSO phase. This is important when determining how the different ENSO phases influence precipitation patterns.

All of the maps show precipitation at a 0.25° resolution from the NOAA PERSIANN-CDR. The “normal” is the 30-year average precipitation from January 1985 through December 2014.

Moderate - Strong El Niño for DJF

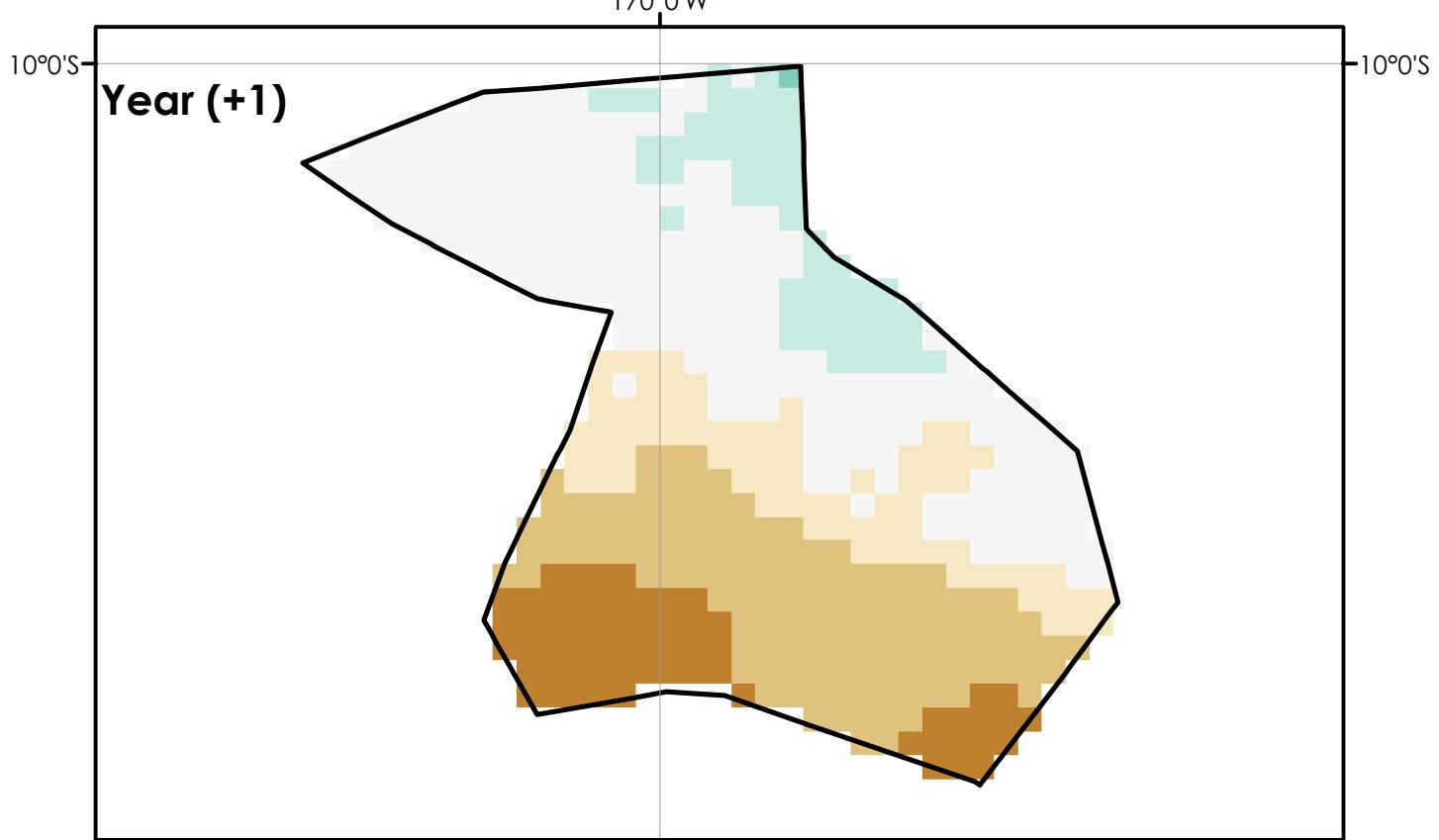
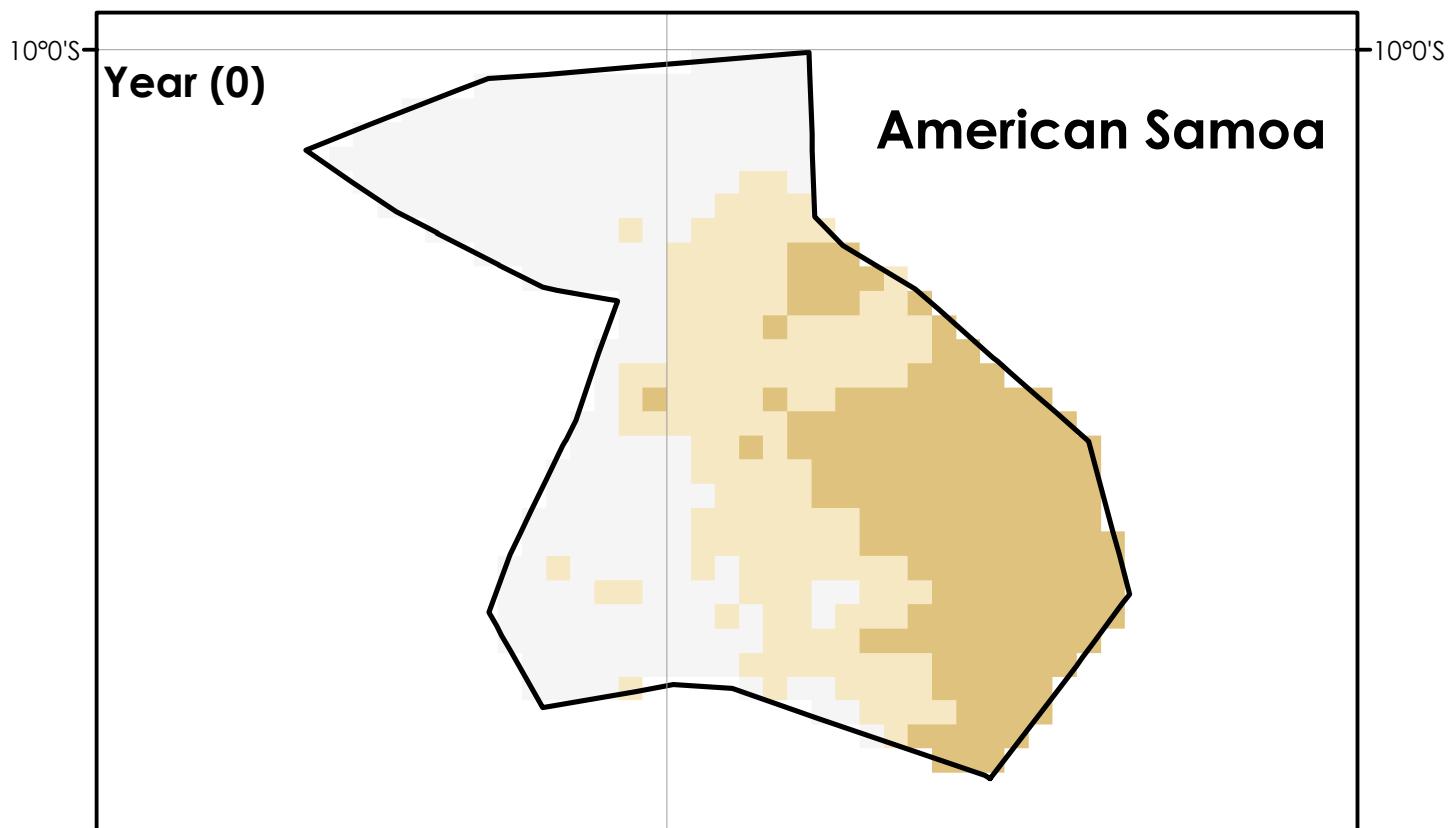


Precipitation Change (%)

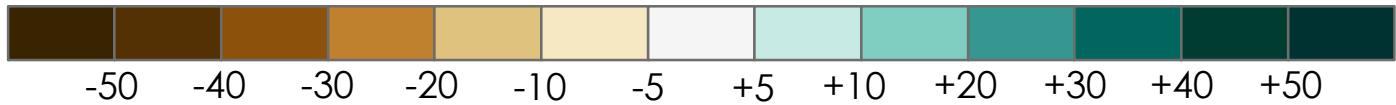


Moderate - Strong El Niño for JFM

91

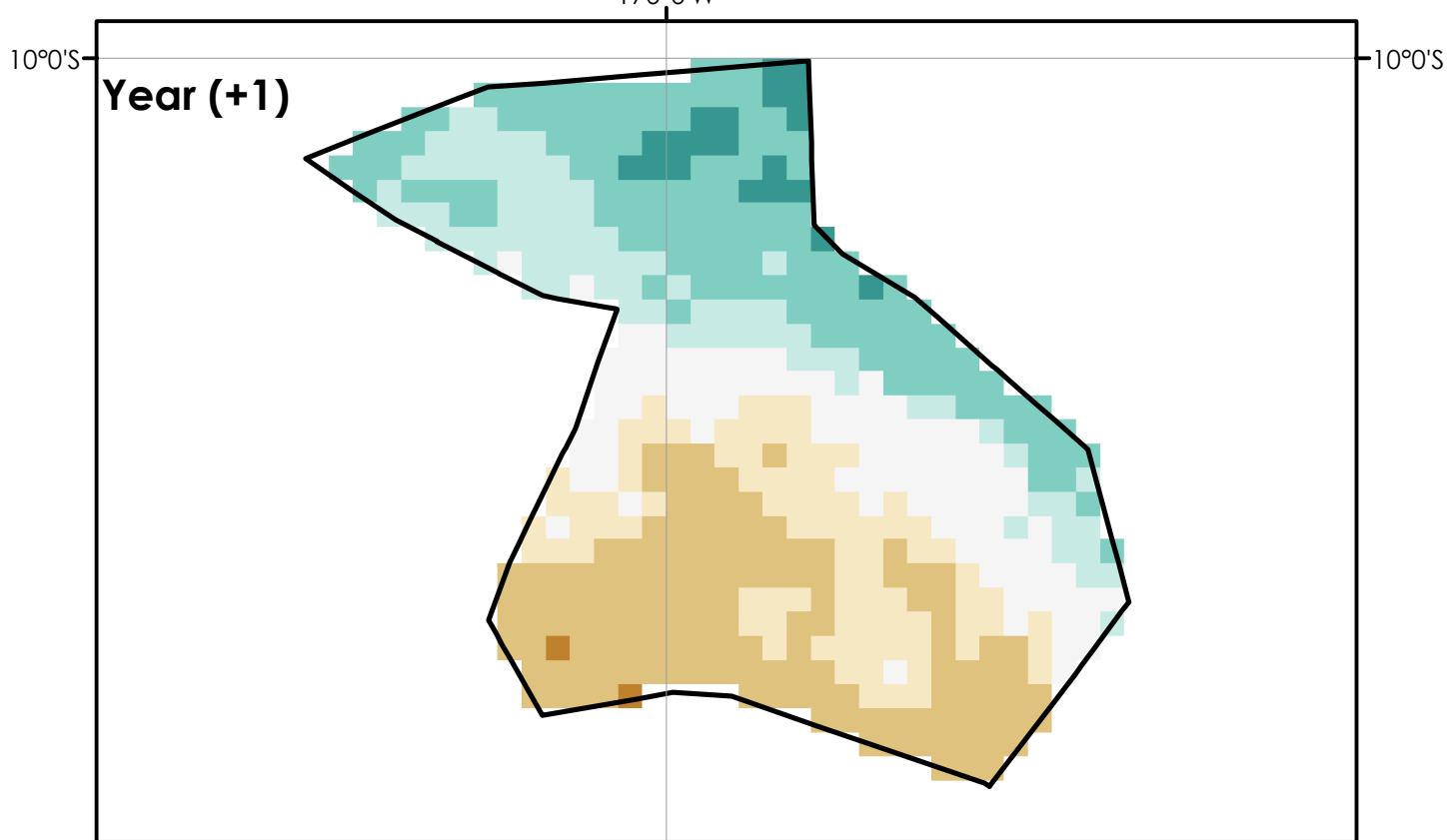
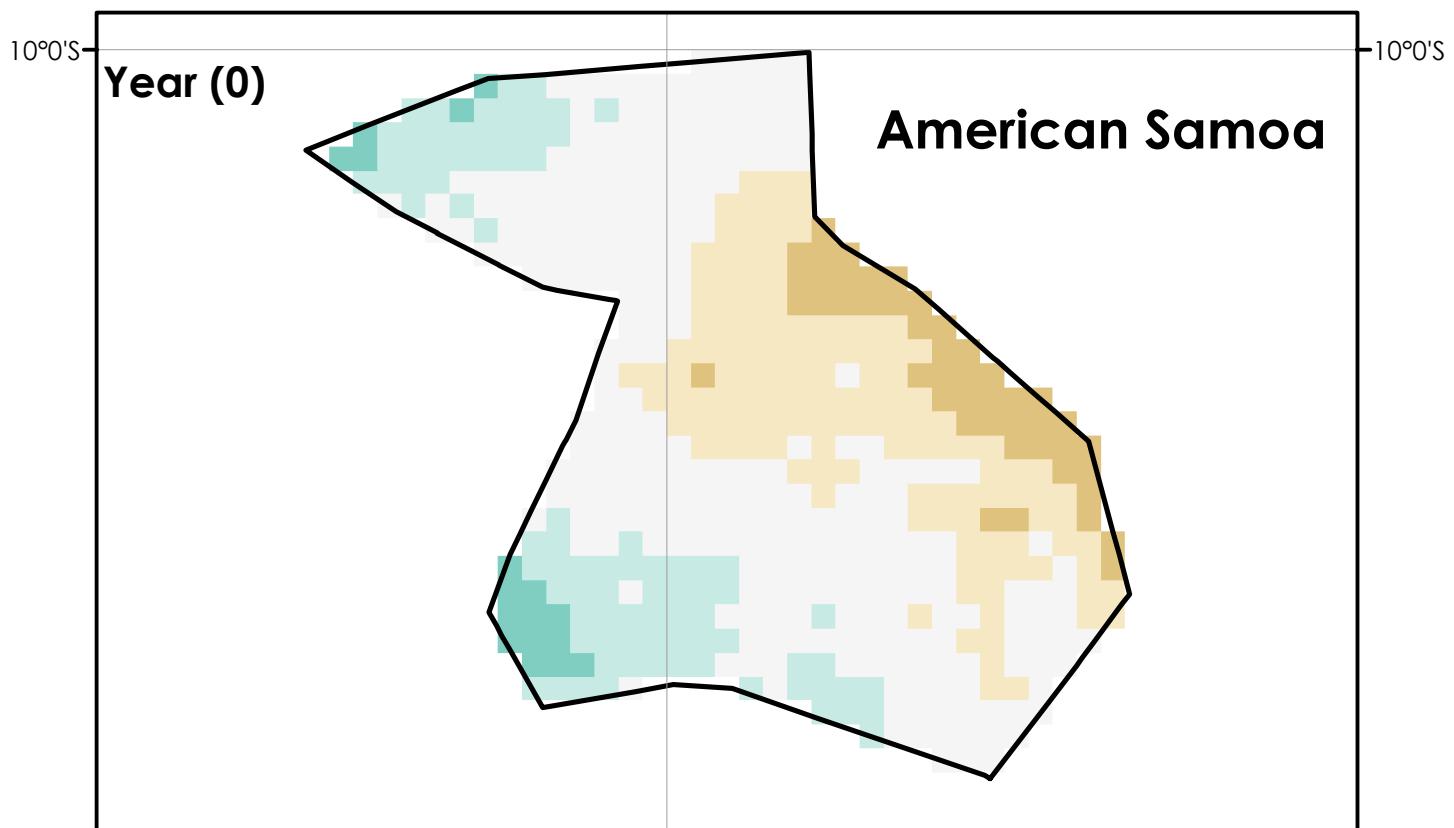


Precipitation Change (%)



Moderate - Strong El Niño for FMA

92

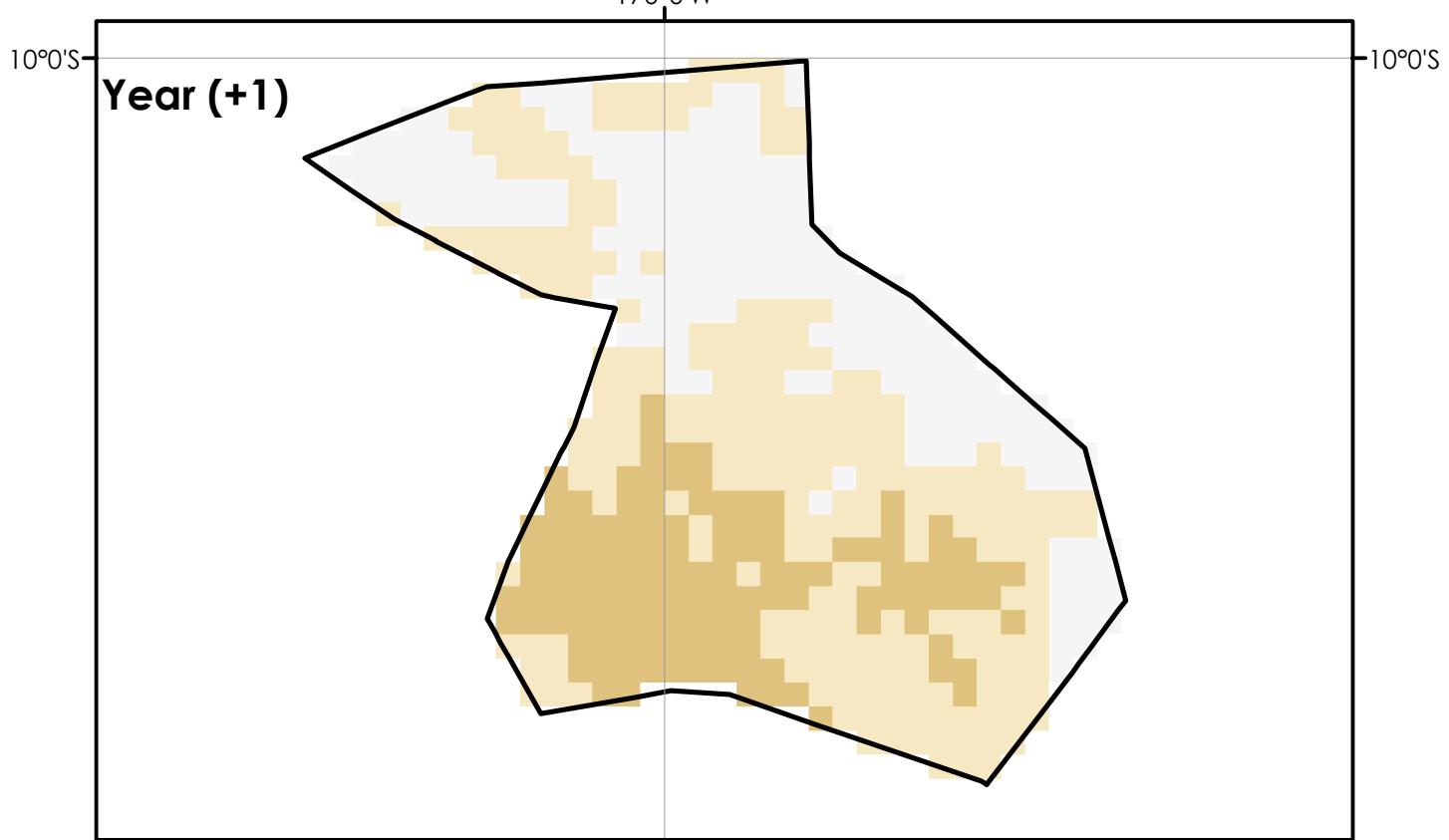
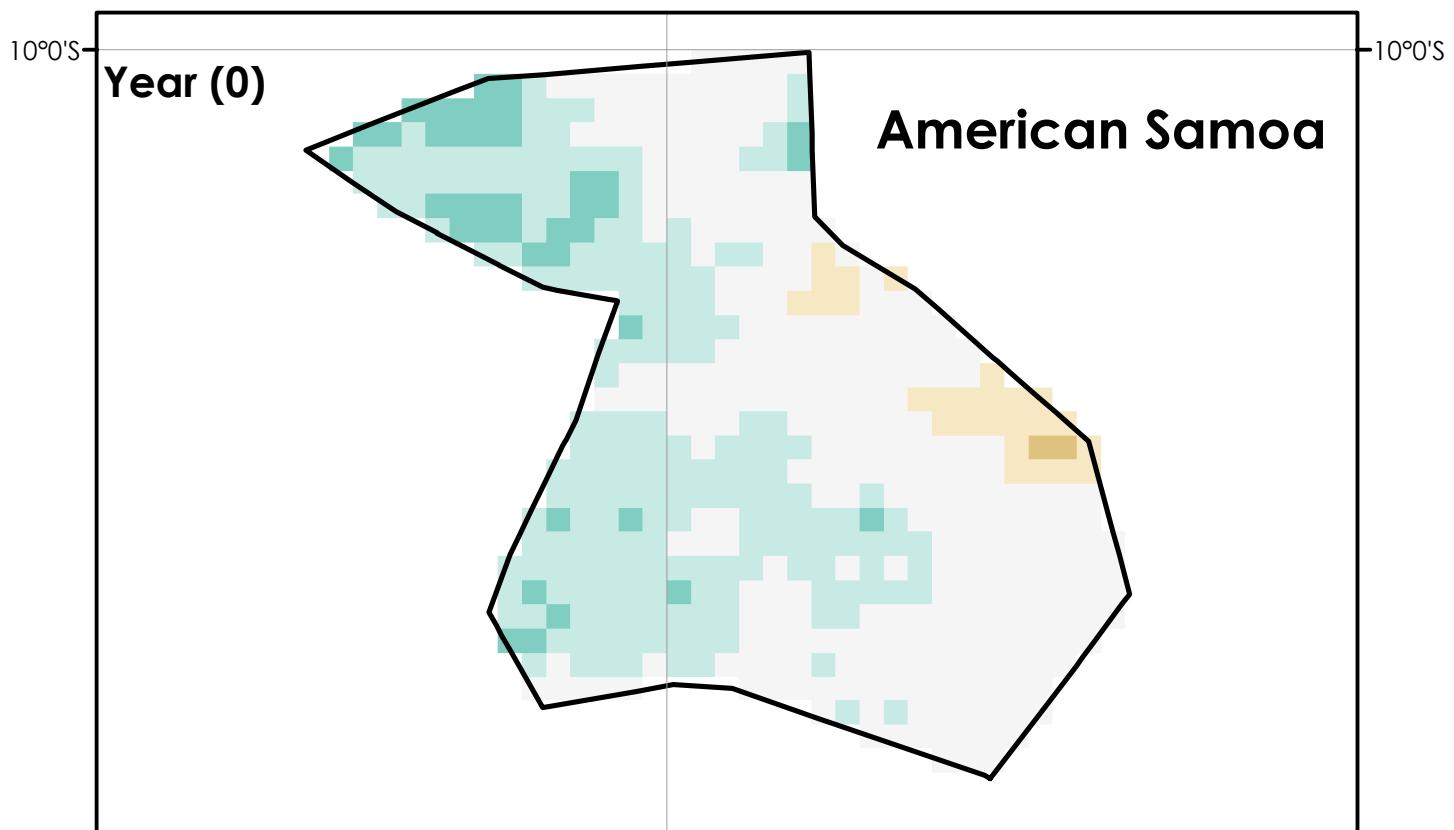


Precipitation Change (%)

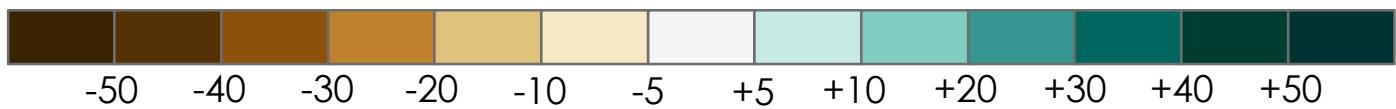


Moderate - Strong El Niño for MAM

93

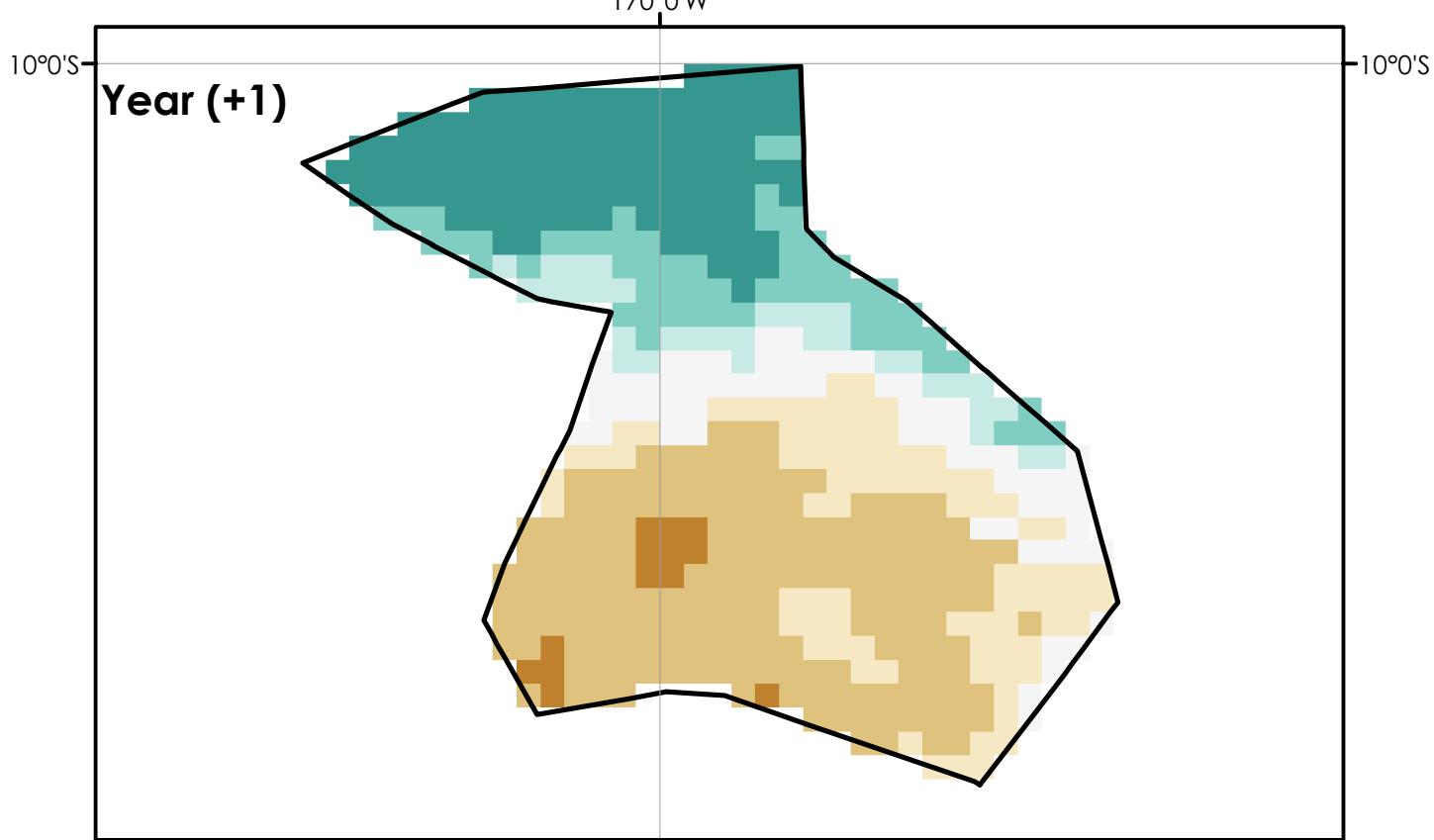
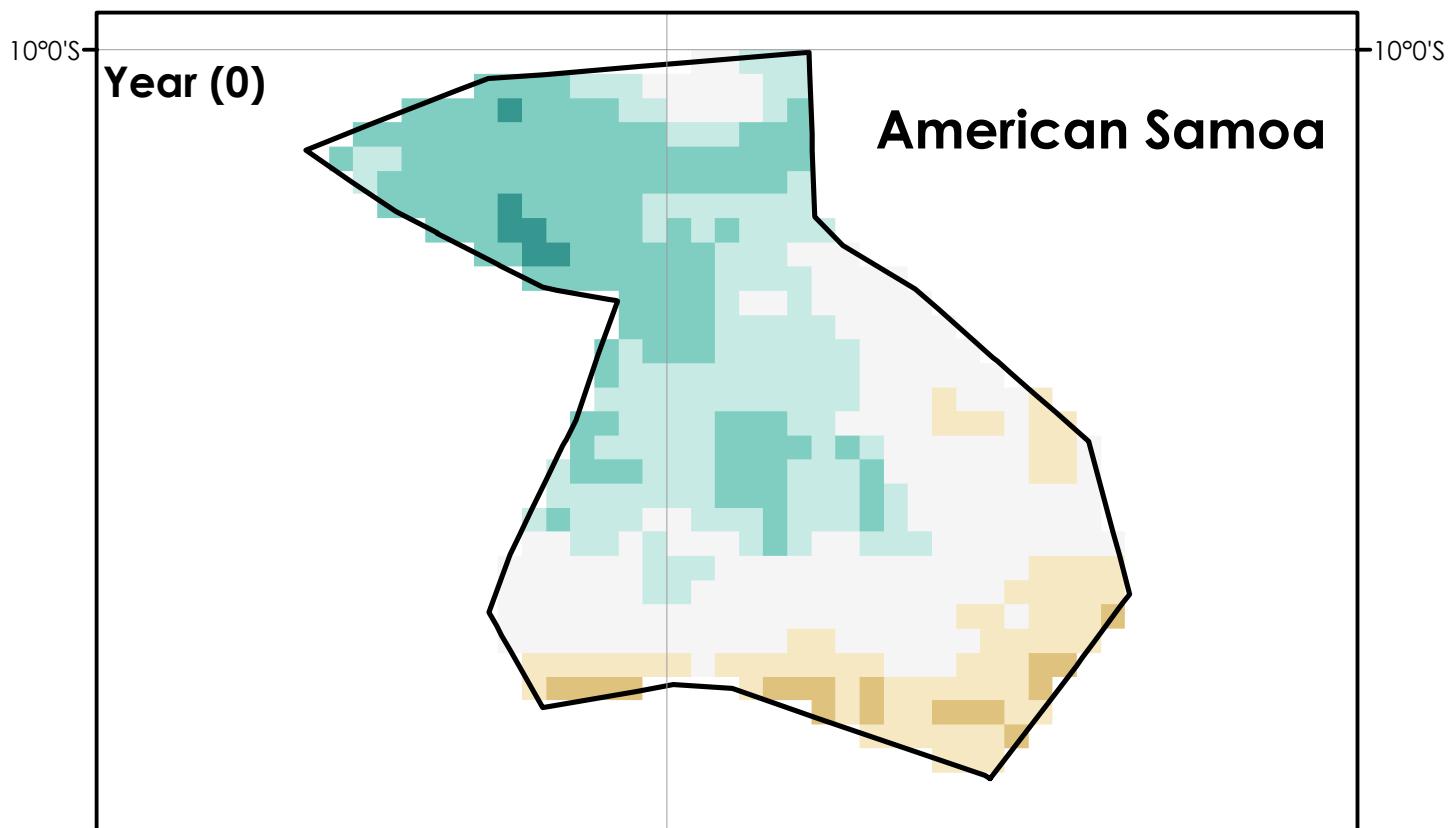


Precipitation Change (%)



Moderate - Strong El Niño for AMJ

94

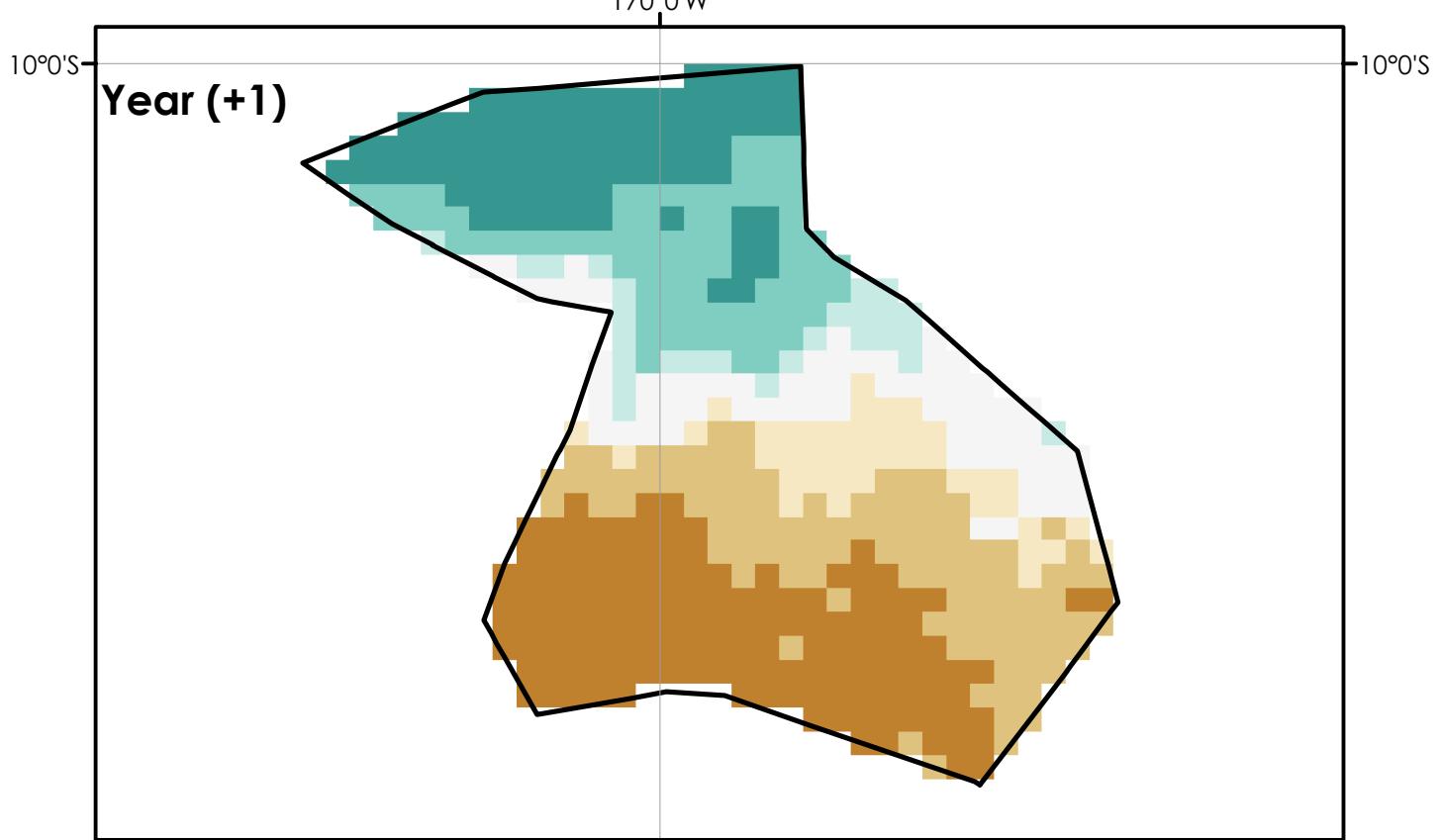
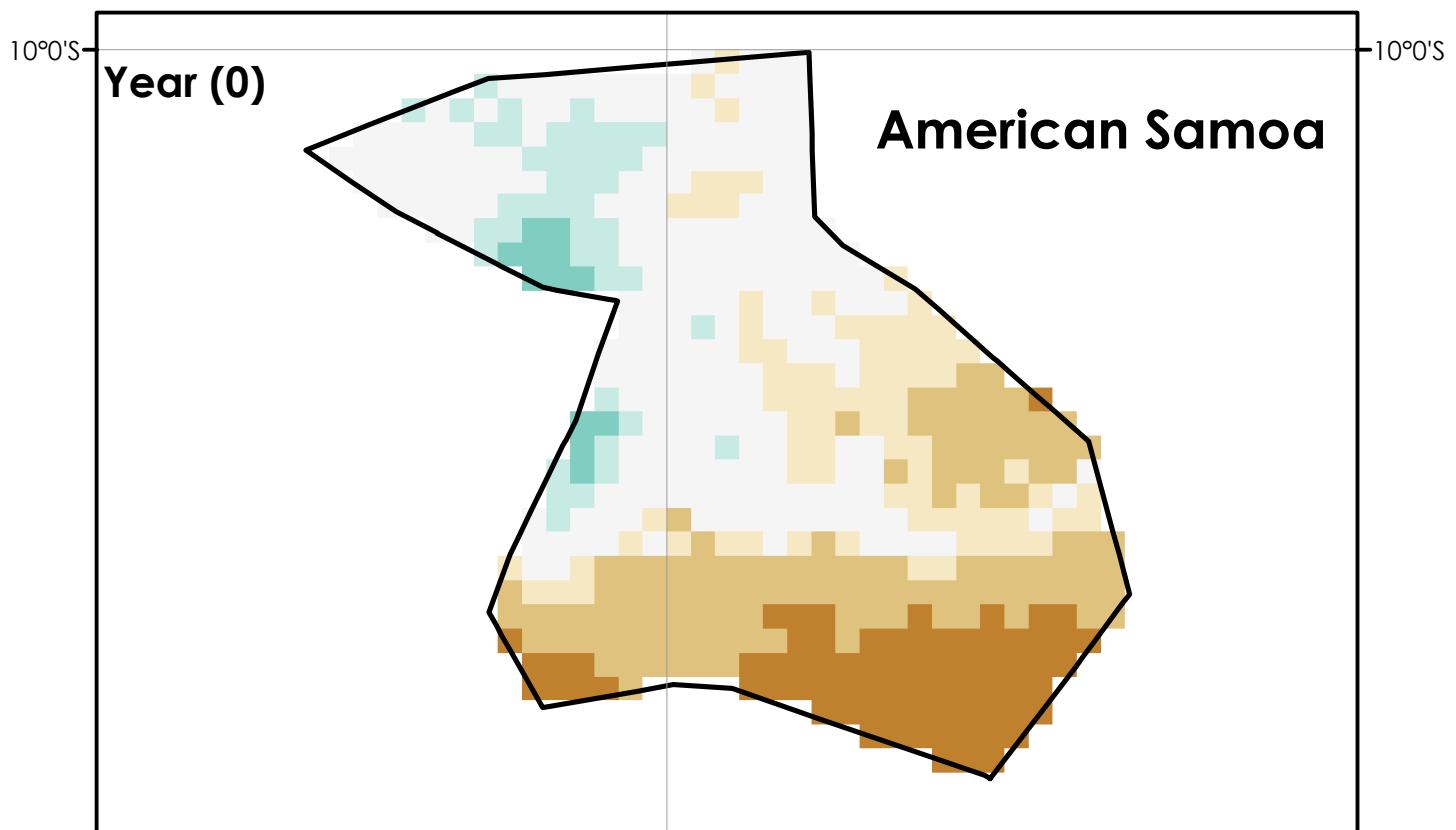


Precipitation Change (%)

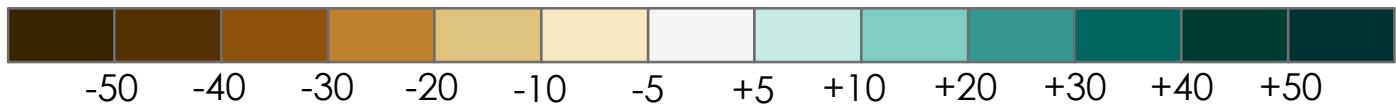


Moderate - Strong El Niño for MJJ

95

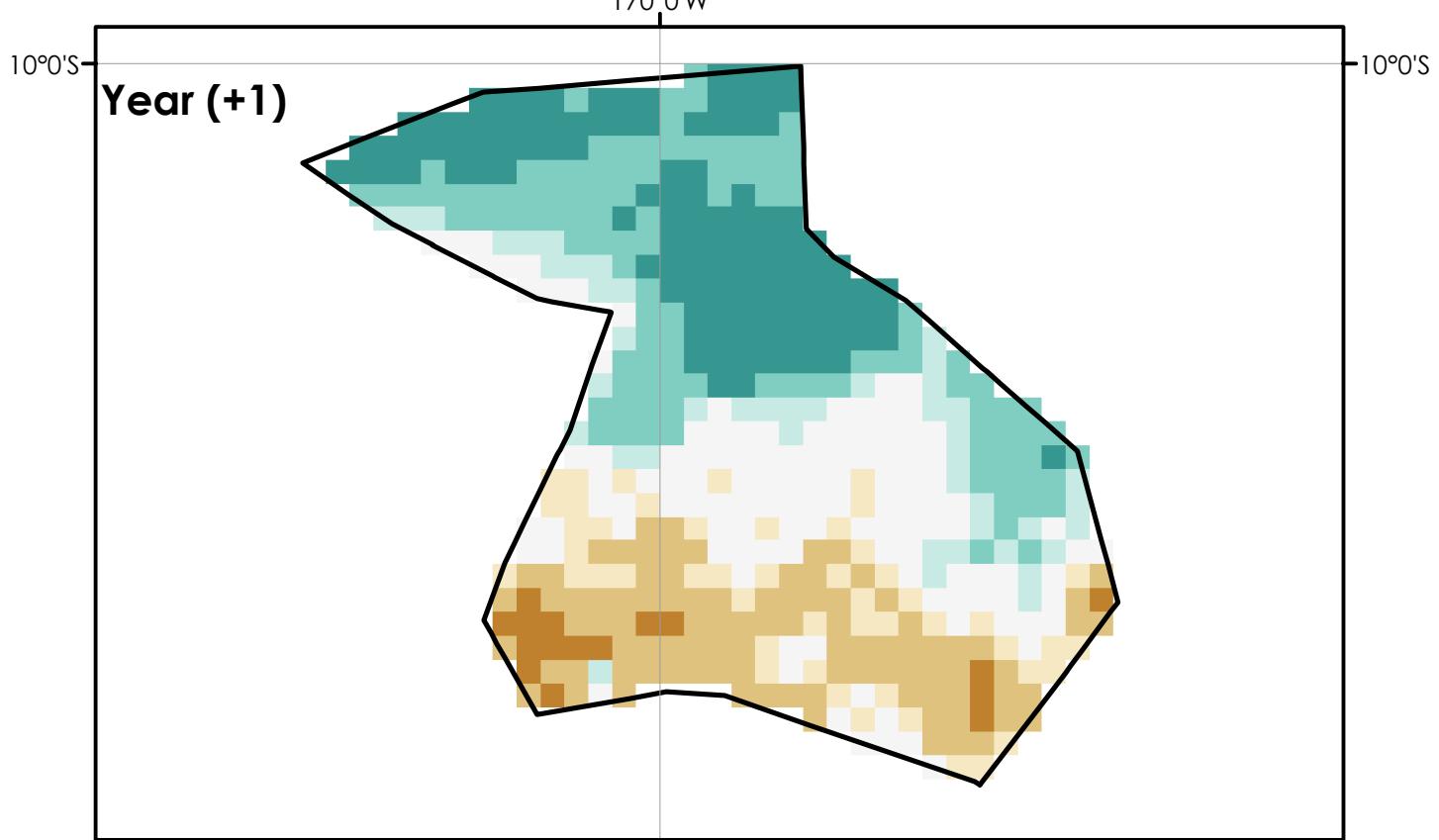
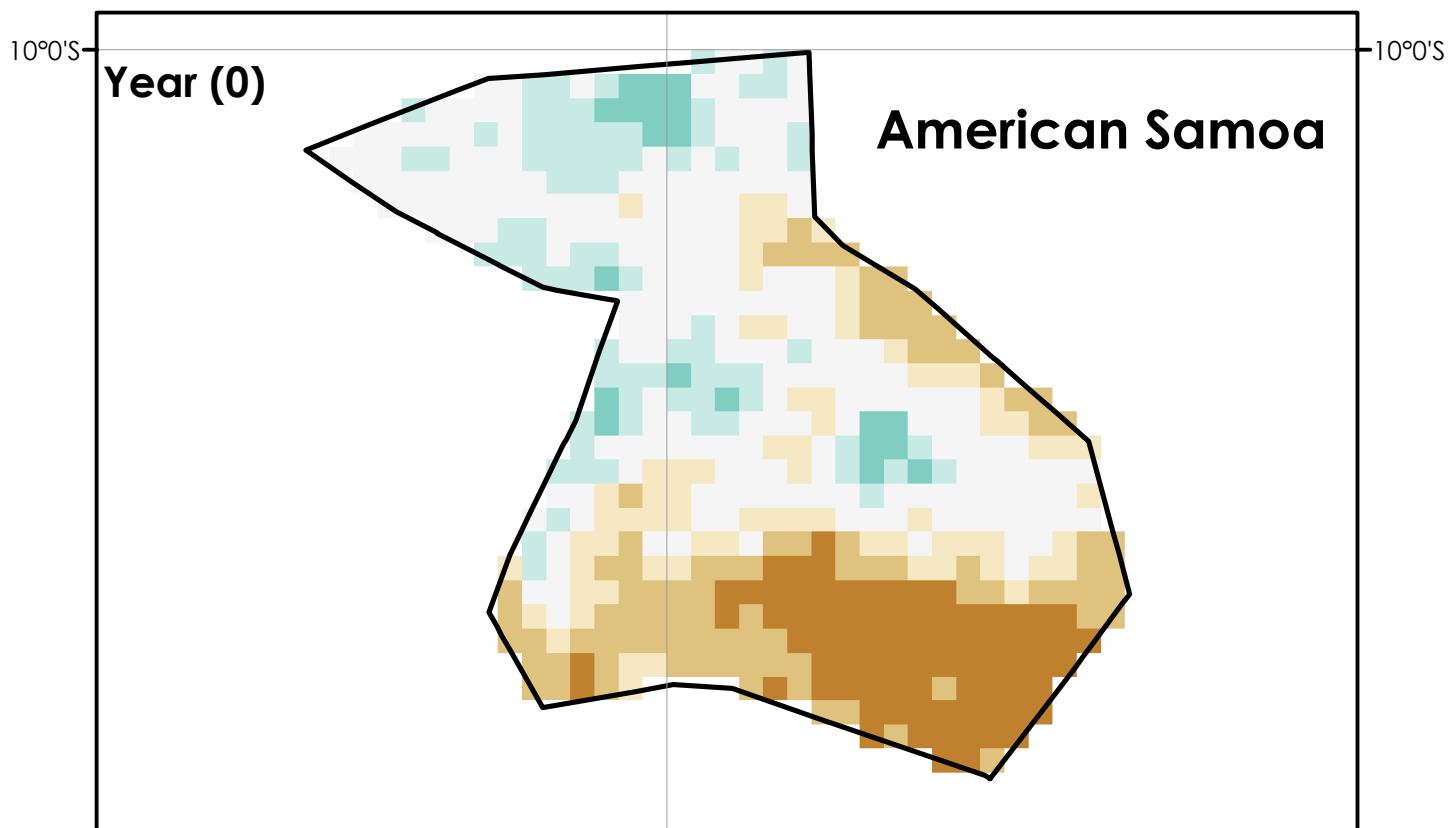


Precipitation Change (%)

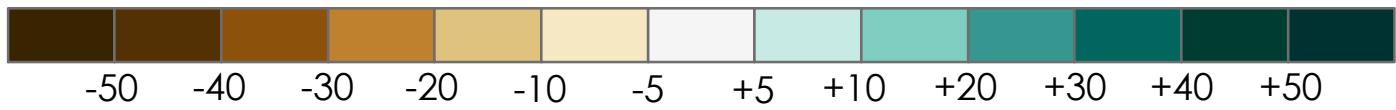


Moderate - Strong El Niño for JJA

96

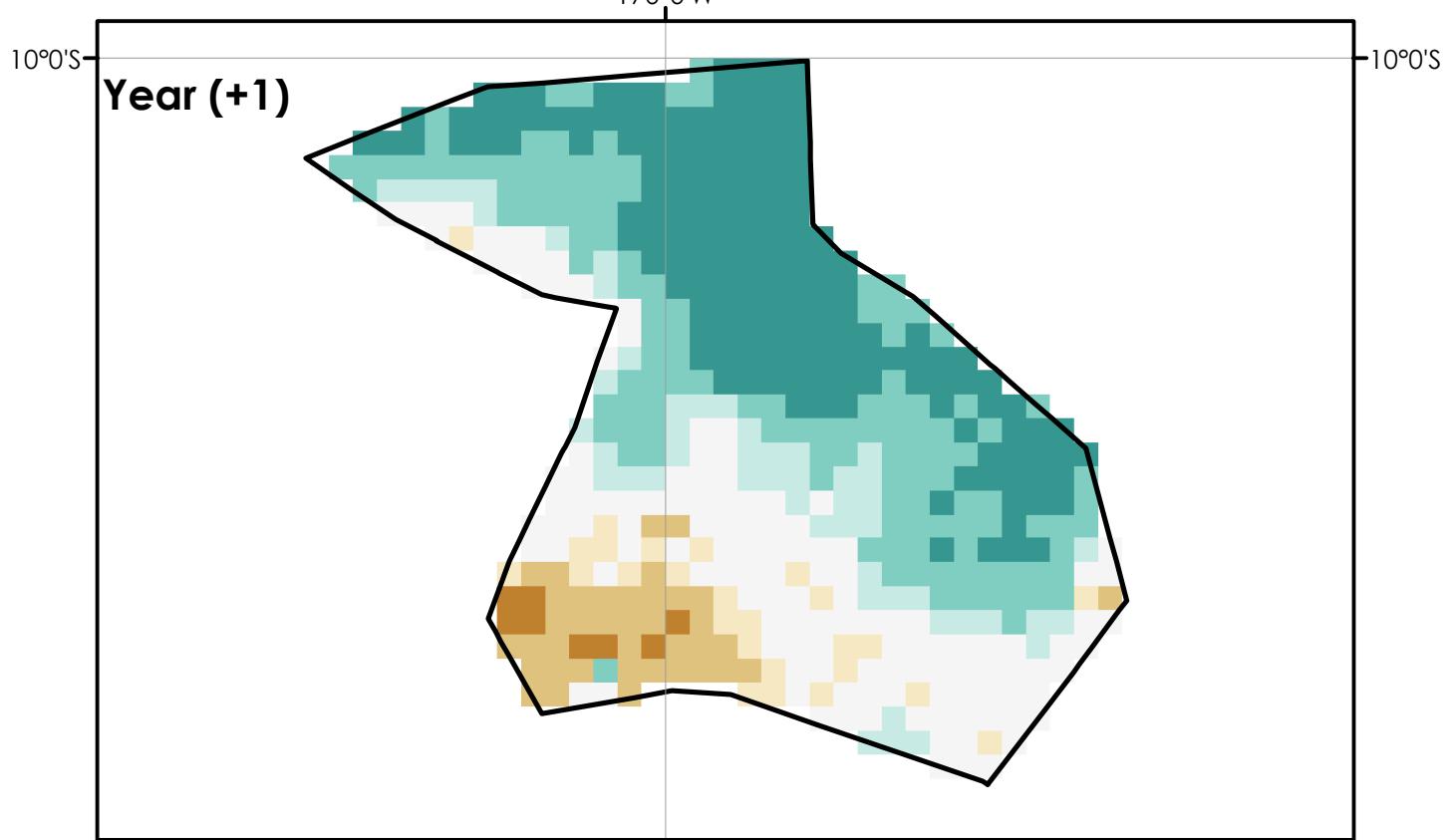
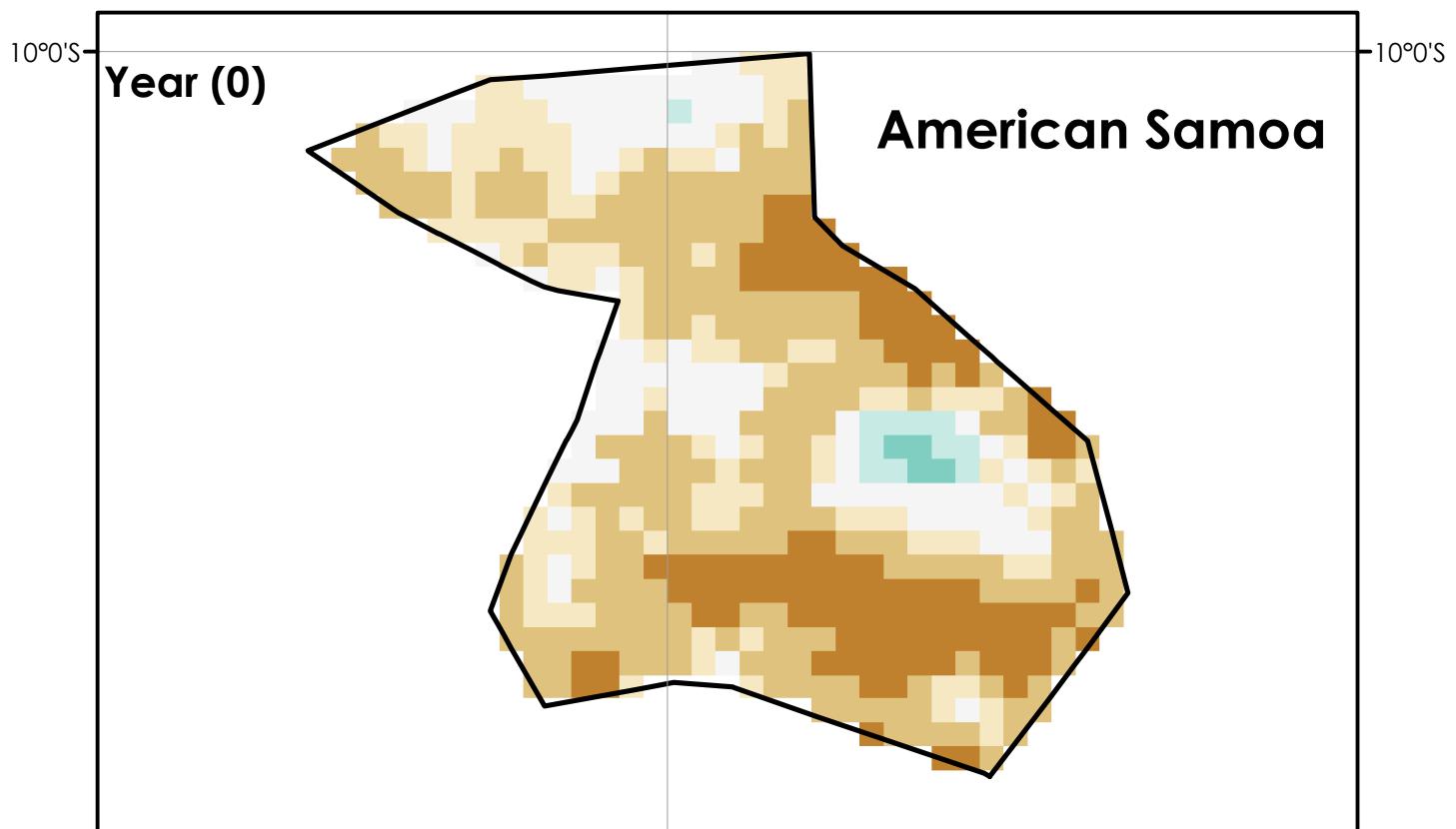


Precipitation Change (%)



Moderate - Strong El Niño for JAS

97

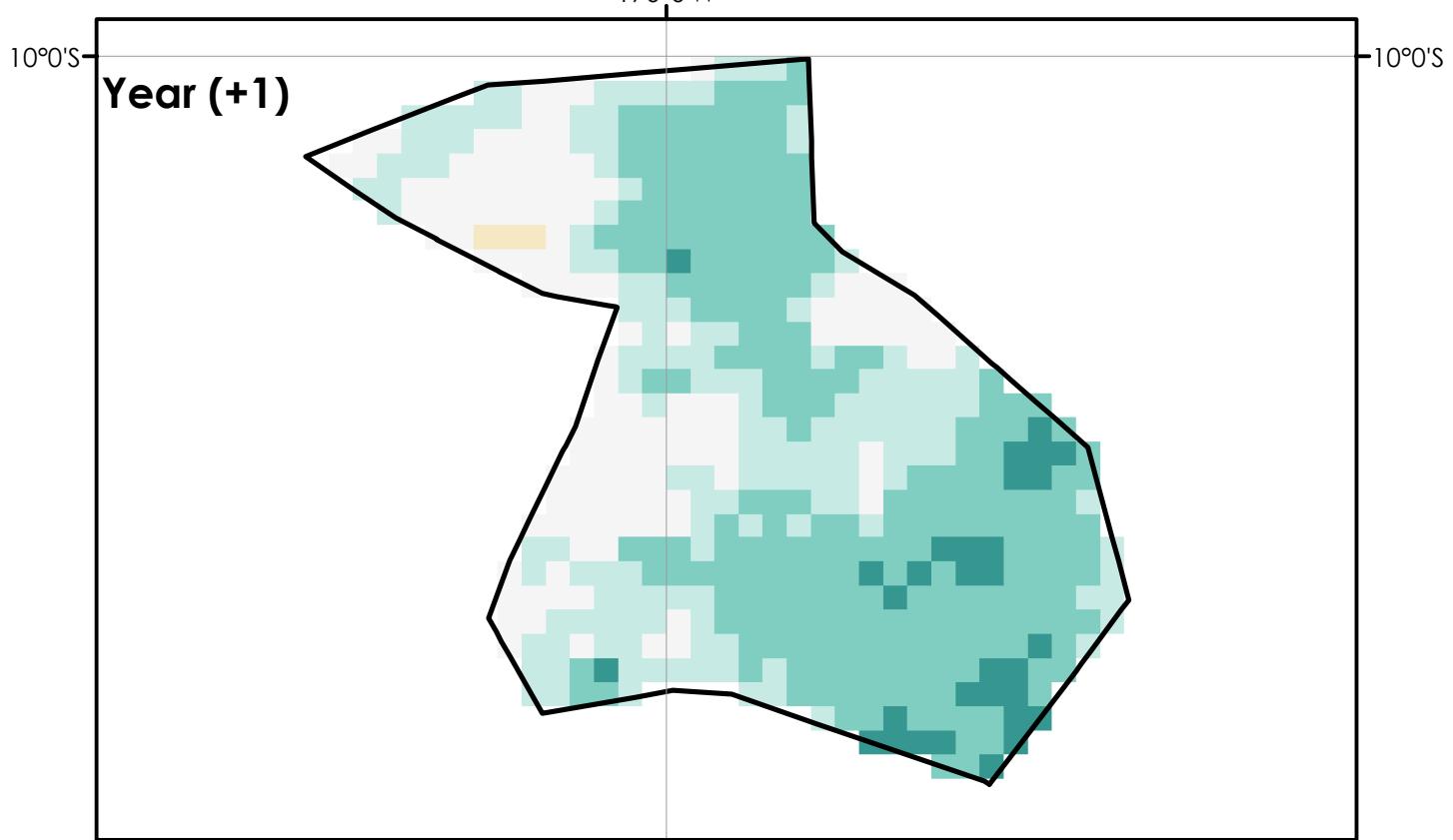
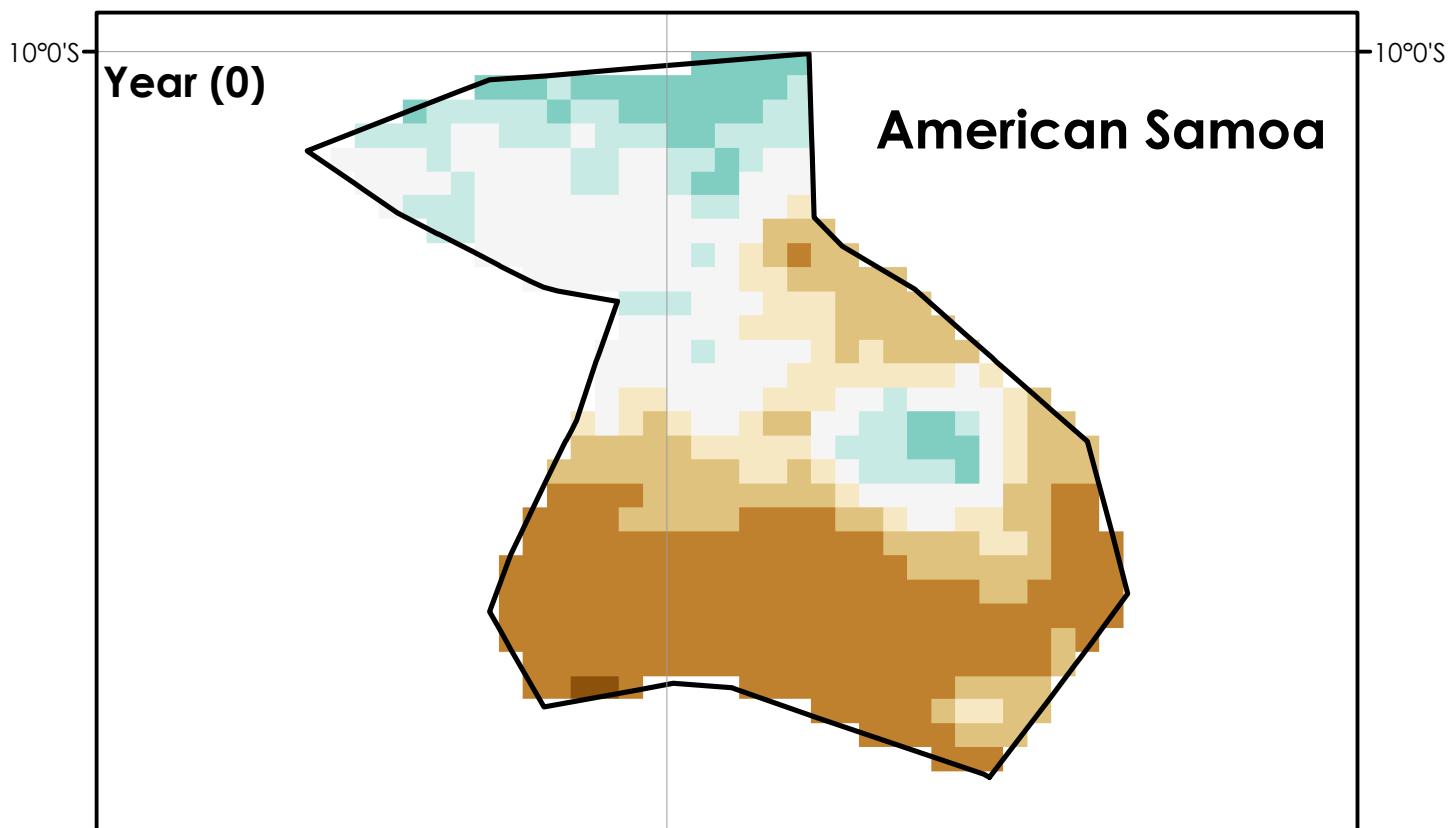


Precipitation Change (%)

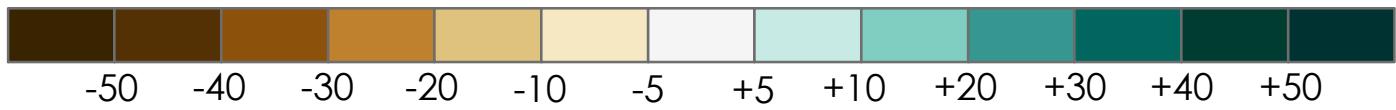


Moderate - Strong El Niño for ASO

98

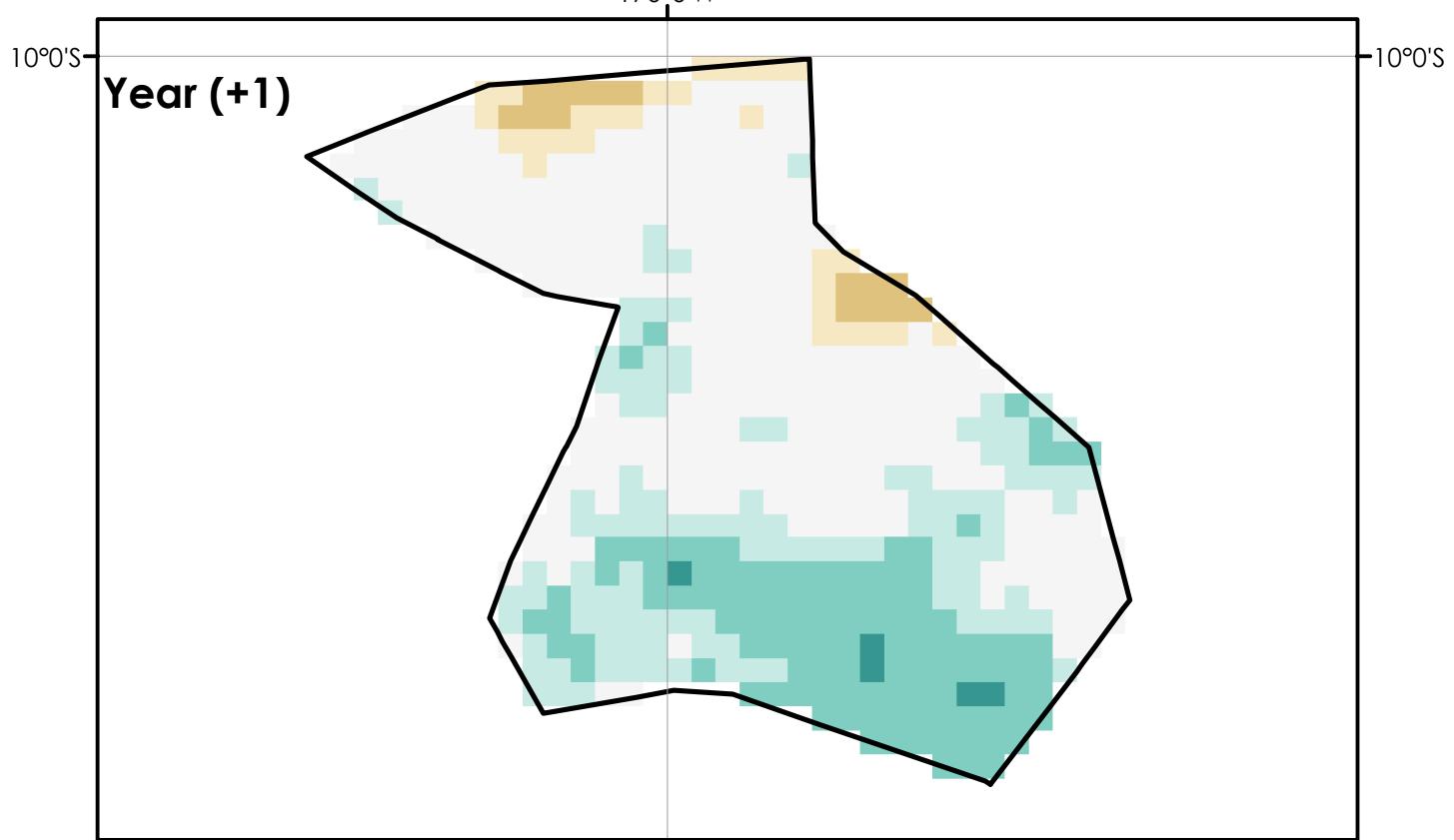
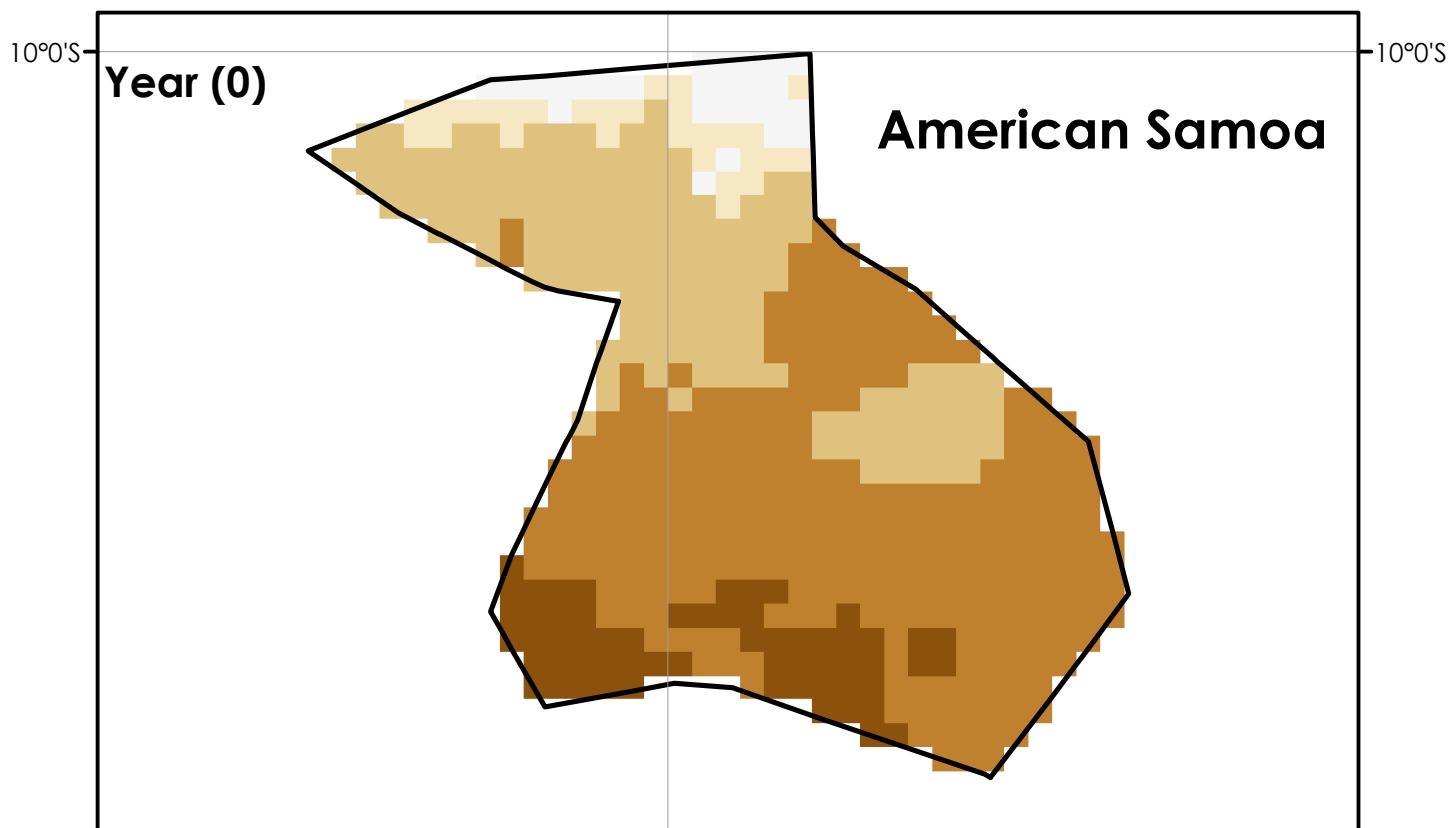


Precipitation Change (%)



Moderate - Strong El Niño for SON

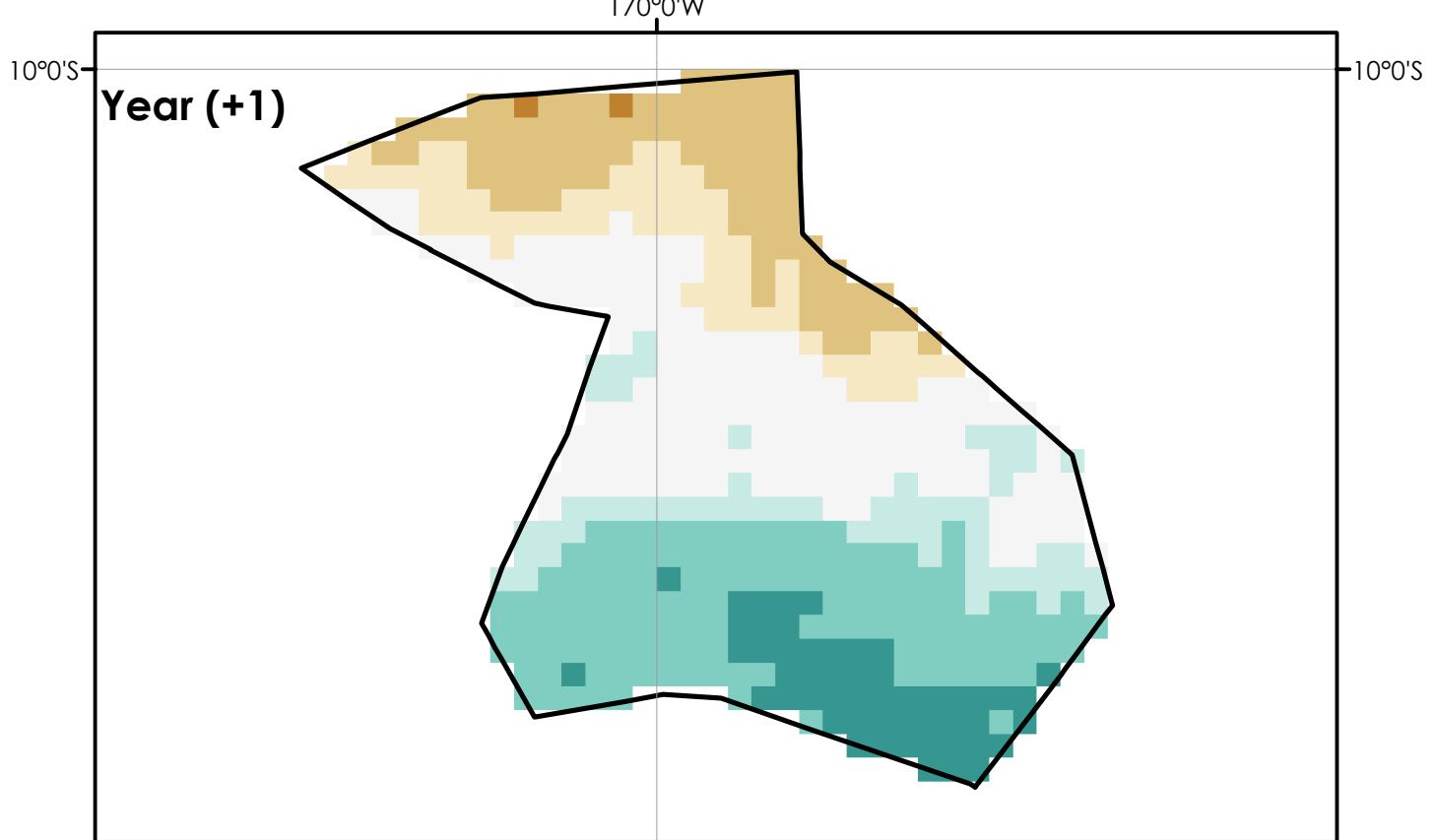
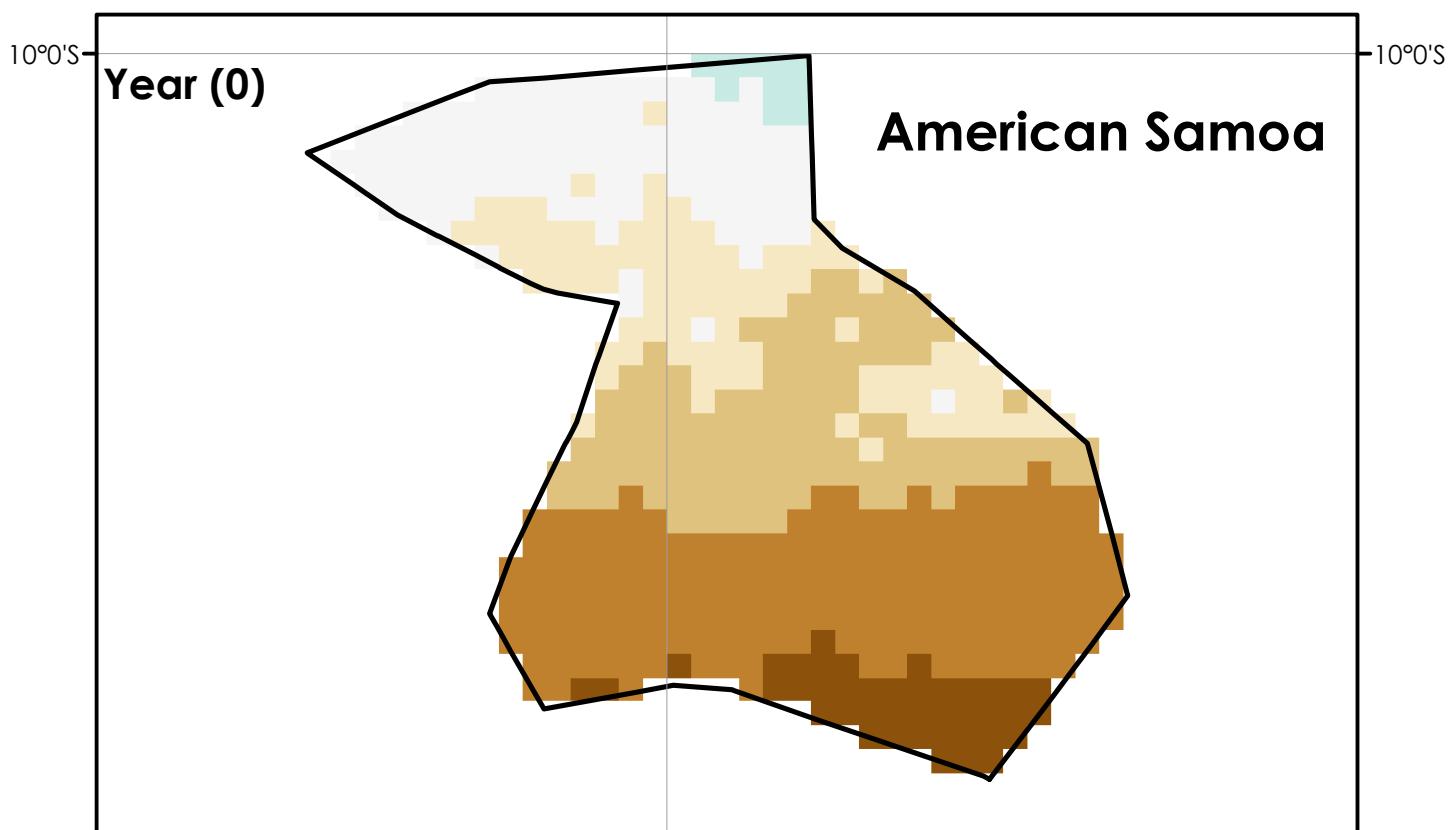
99



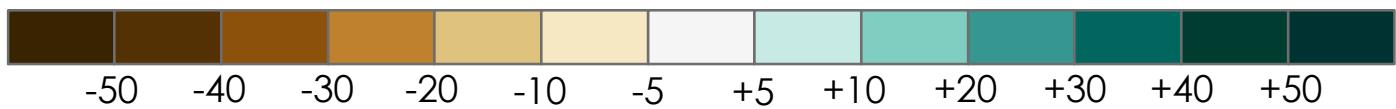
Precipitation Change (%)



Moderate - Strong El Niño for OND

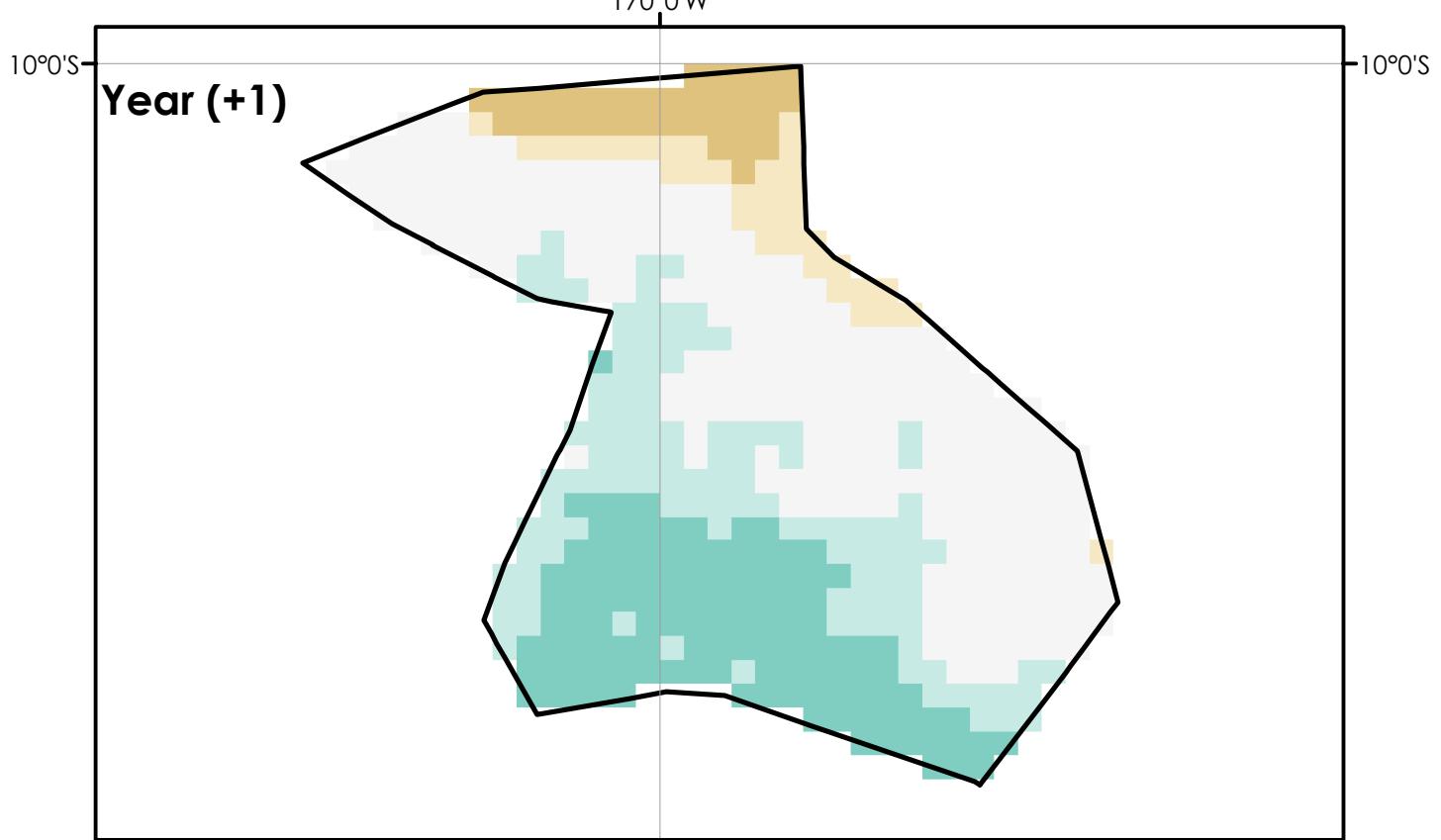
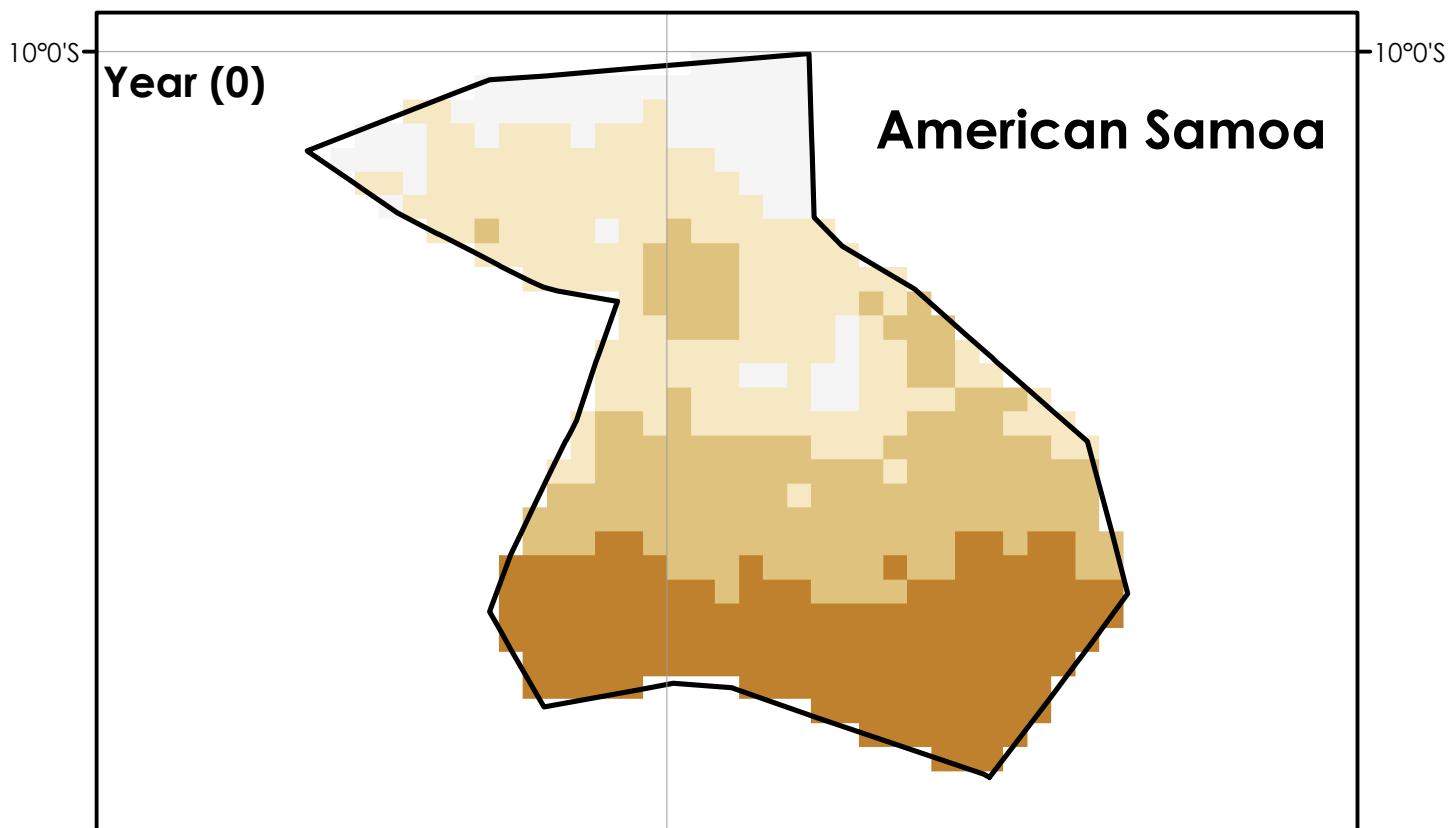


Precipitation Change (%)



Moderate - Strong El Niño for NDJ

101

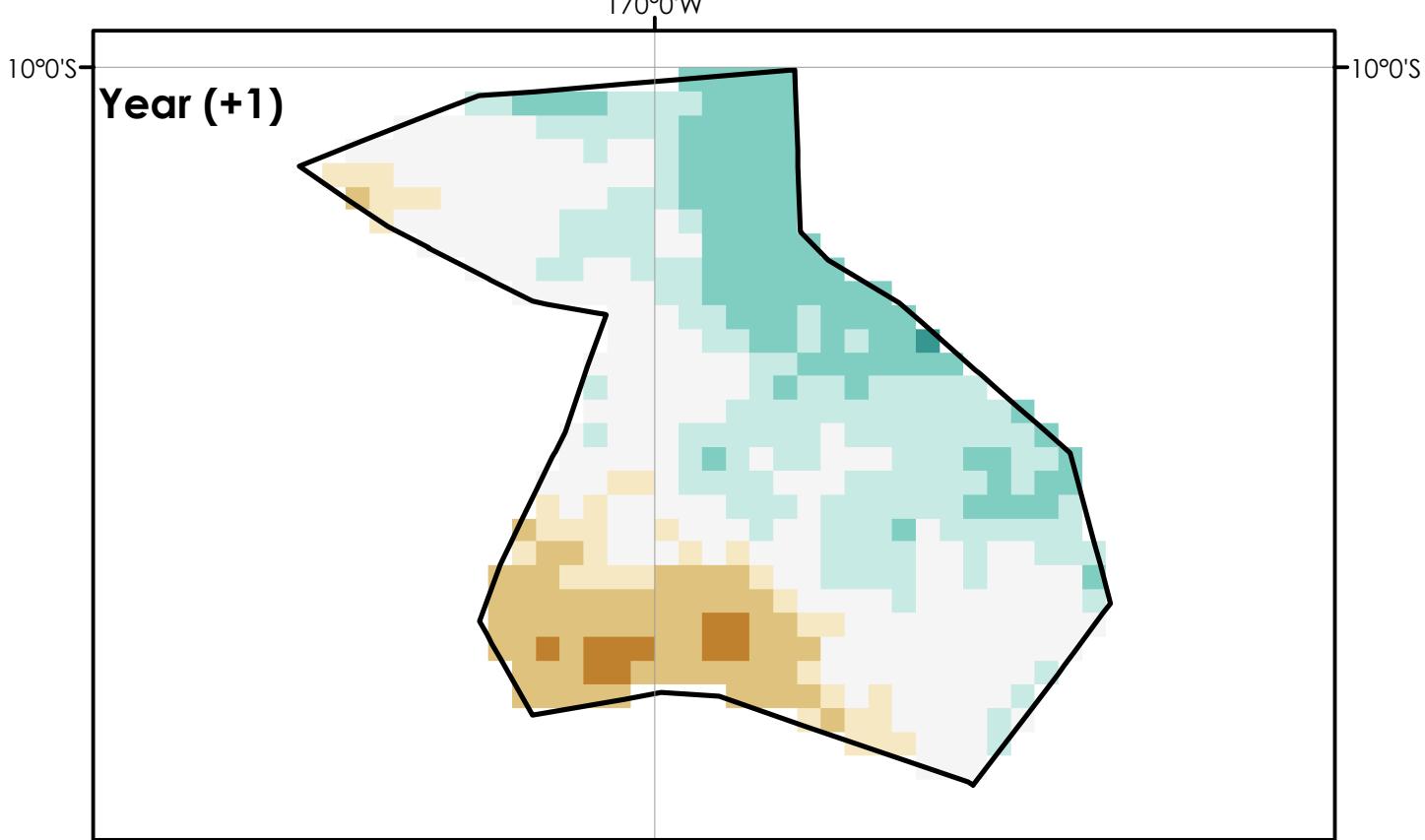
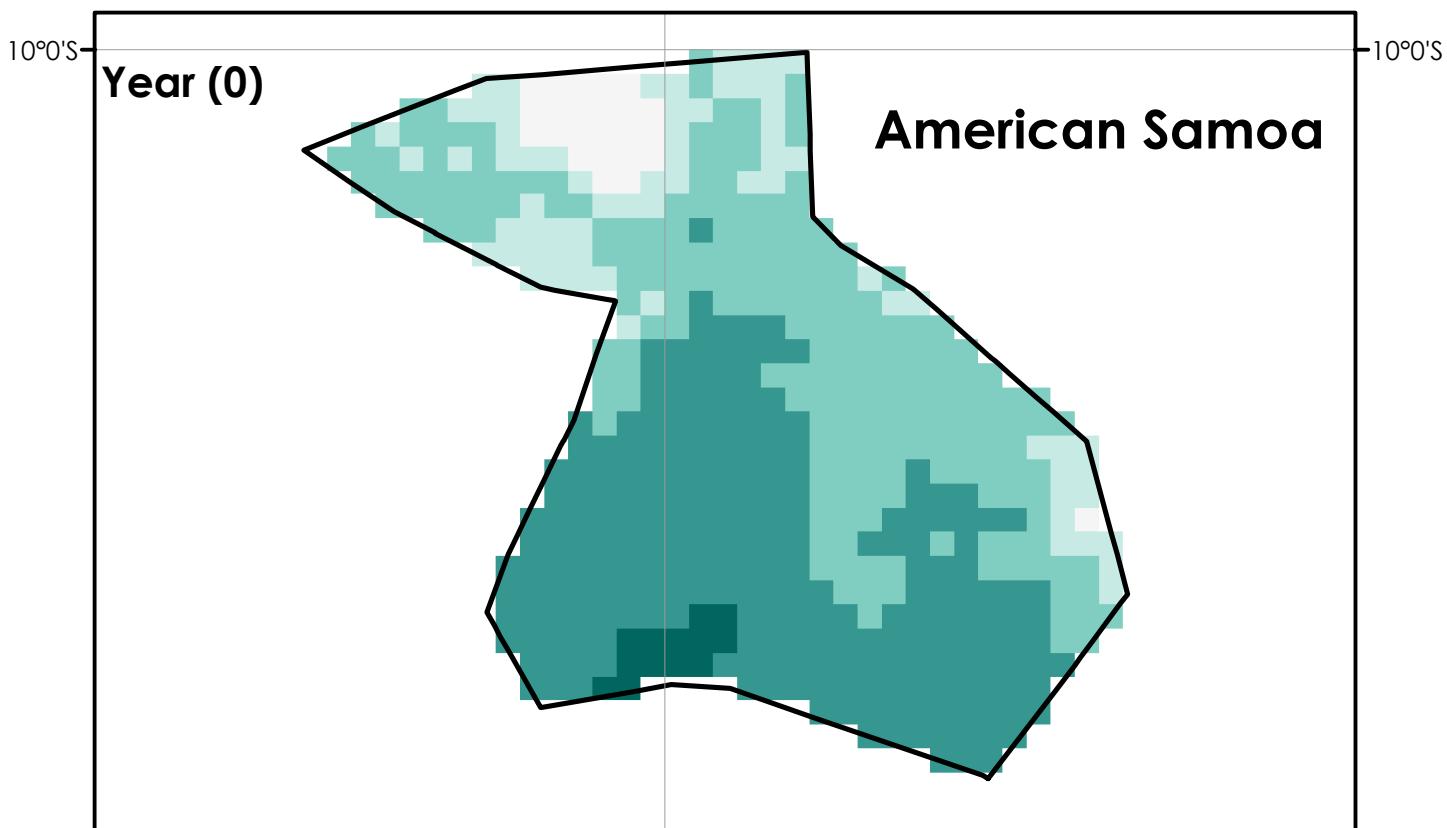


Precipitation Change (%)

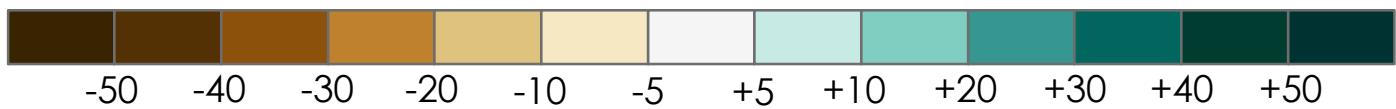


Weak El Niño for DJF

102

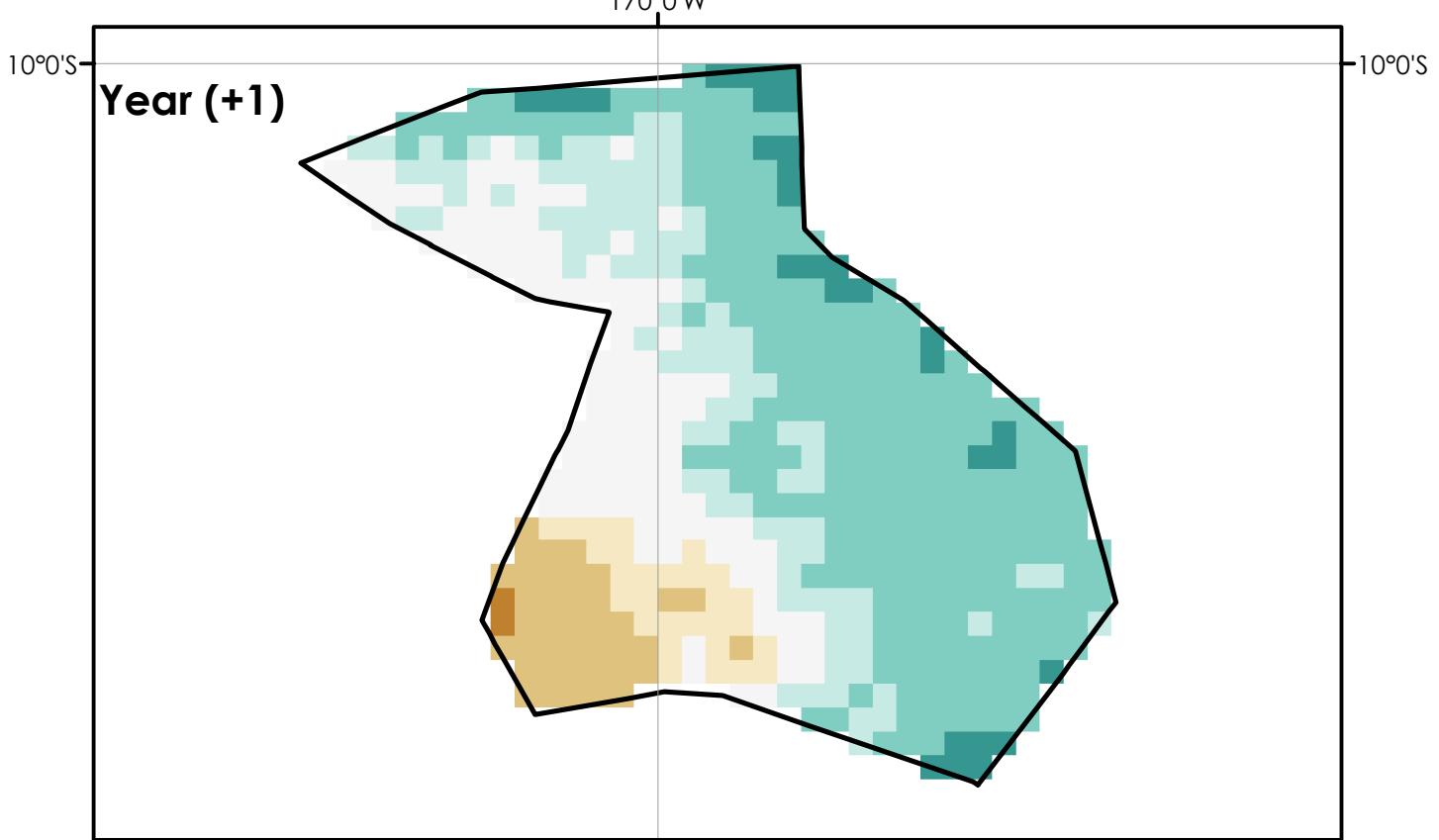
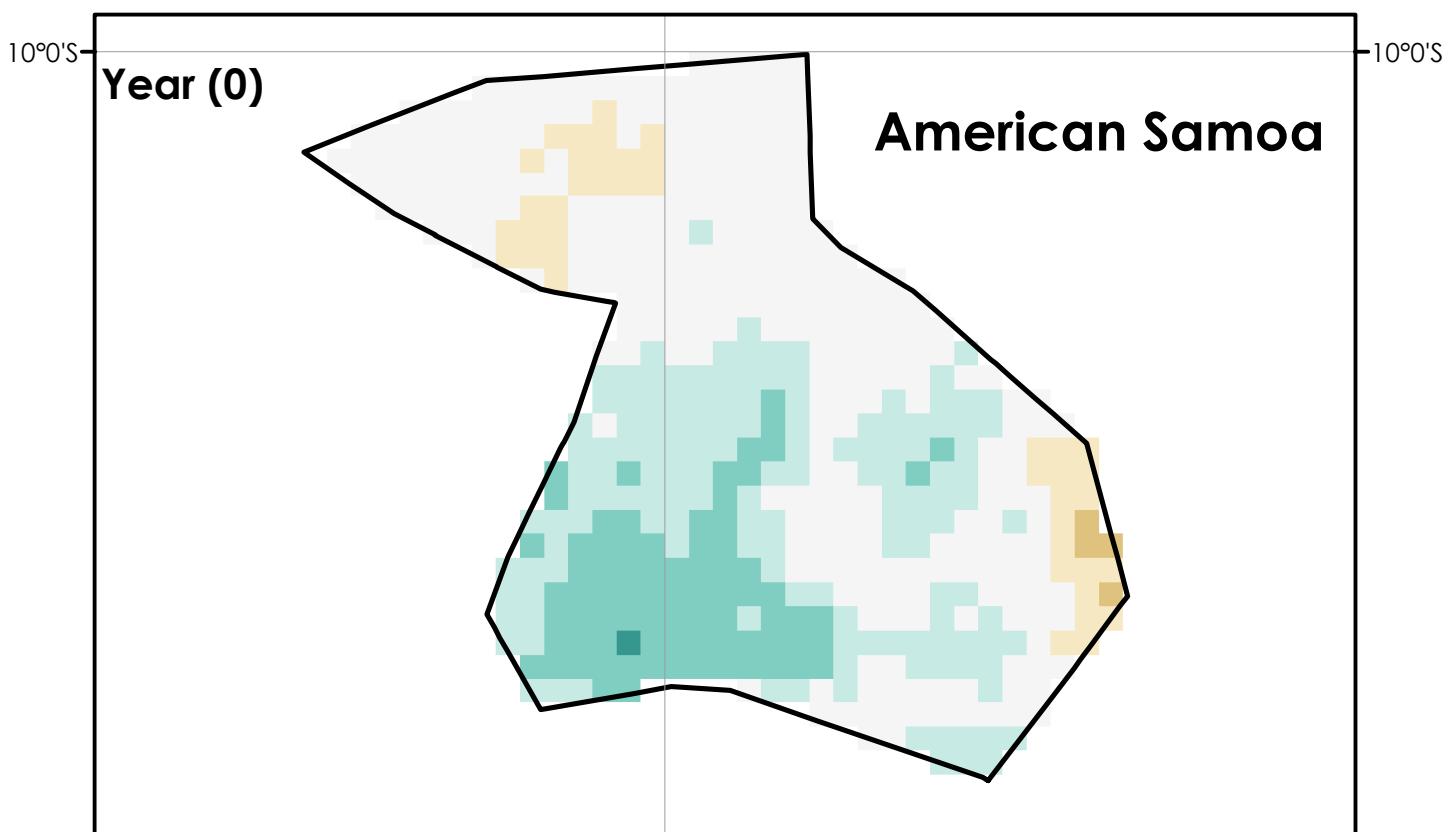


Precipitation Change (%)

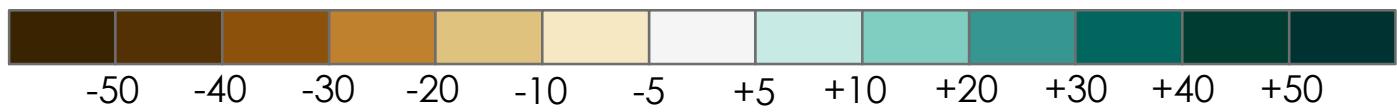


Weak El Niño for JFM

103

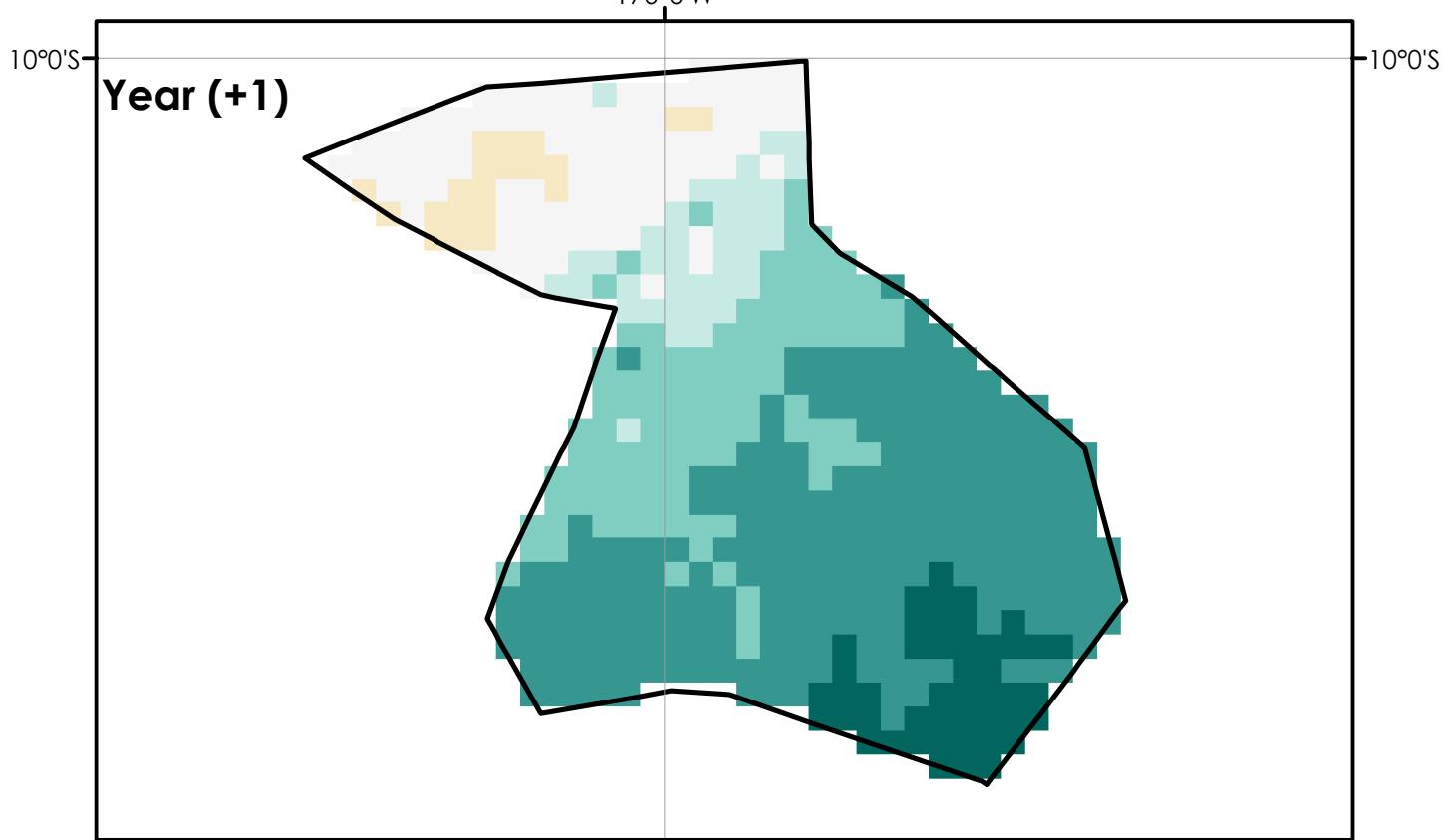
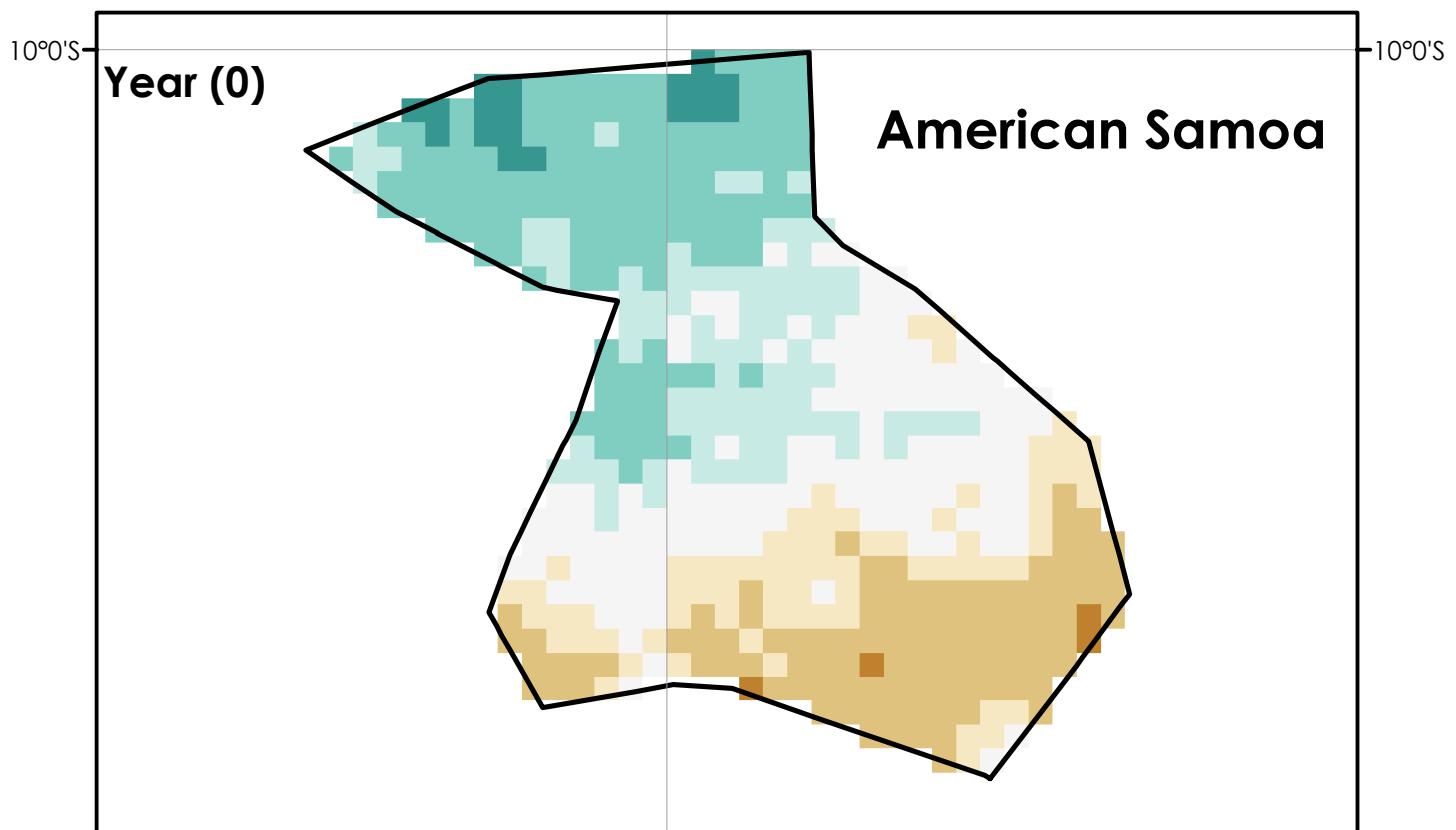


Precipitation Change (%)



Weak El Niño for FMA

104

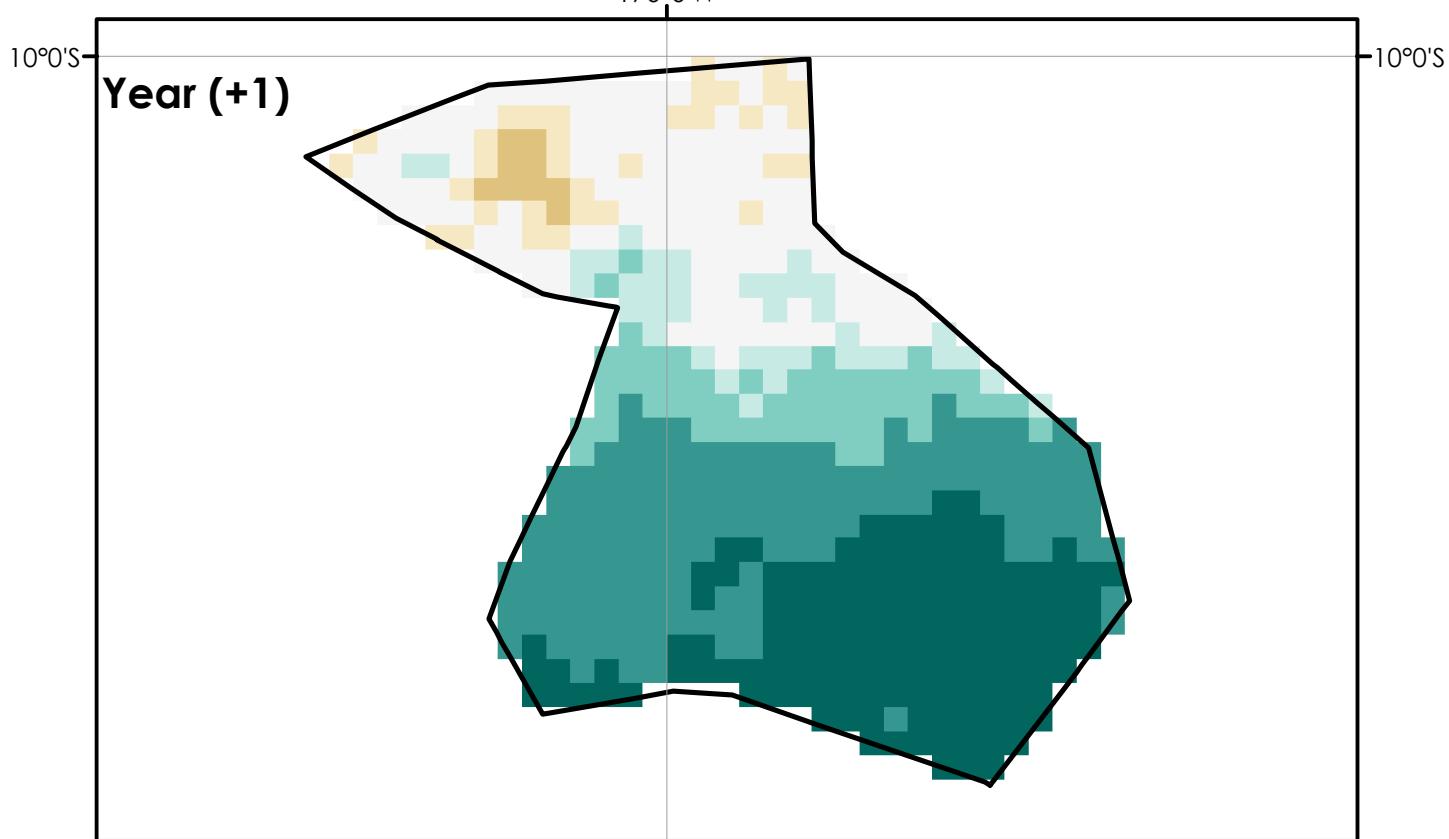
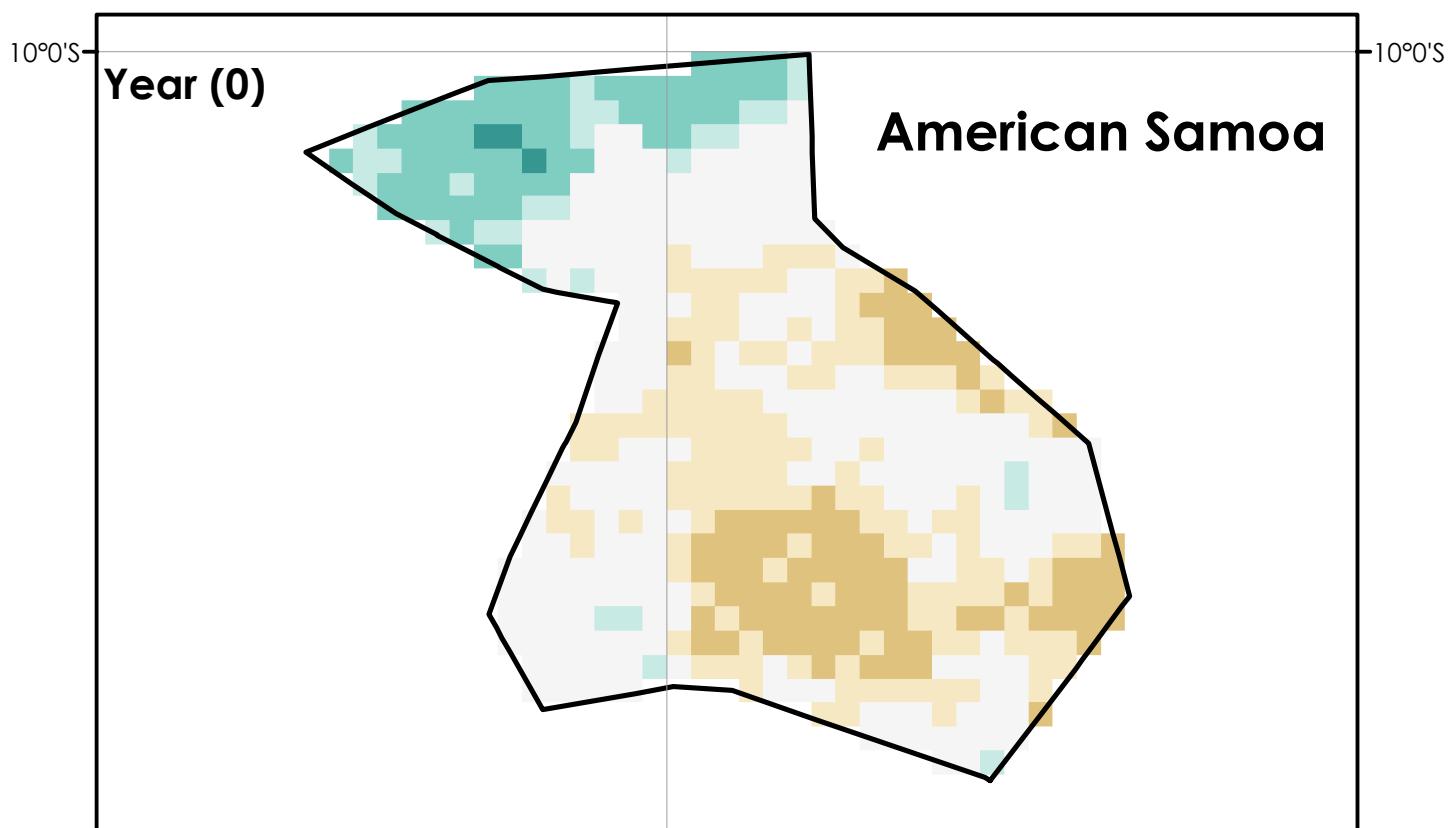


Precipitation Change (%)



Weak El Niño for MAM

105

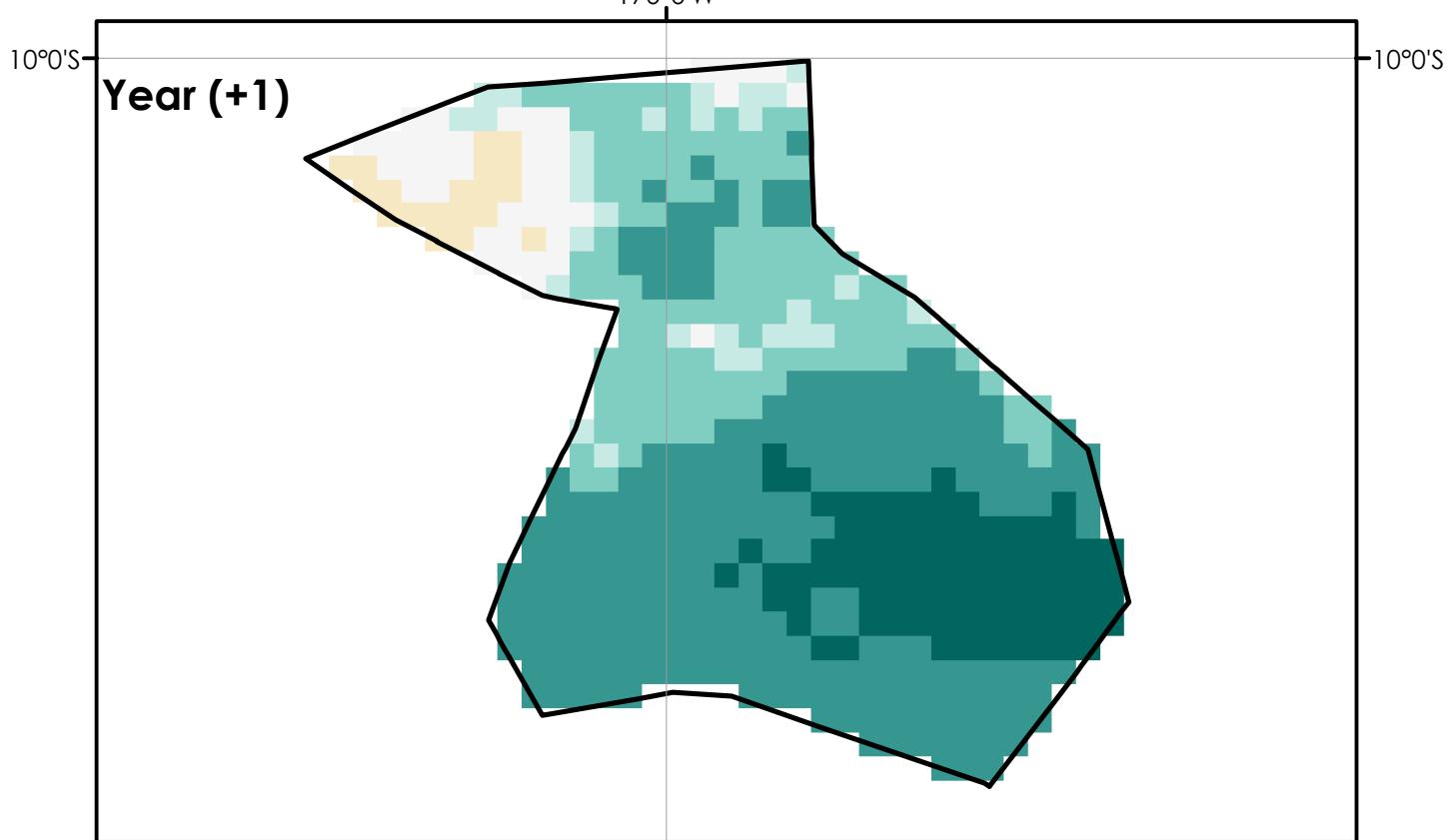
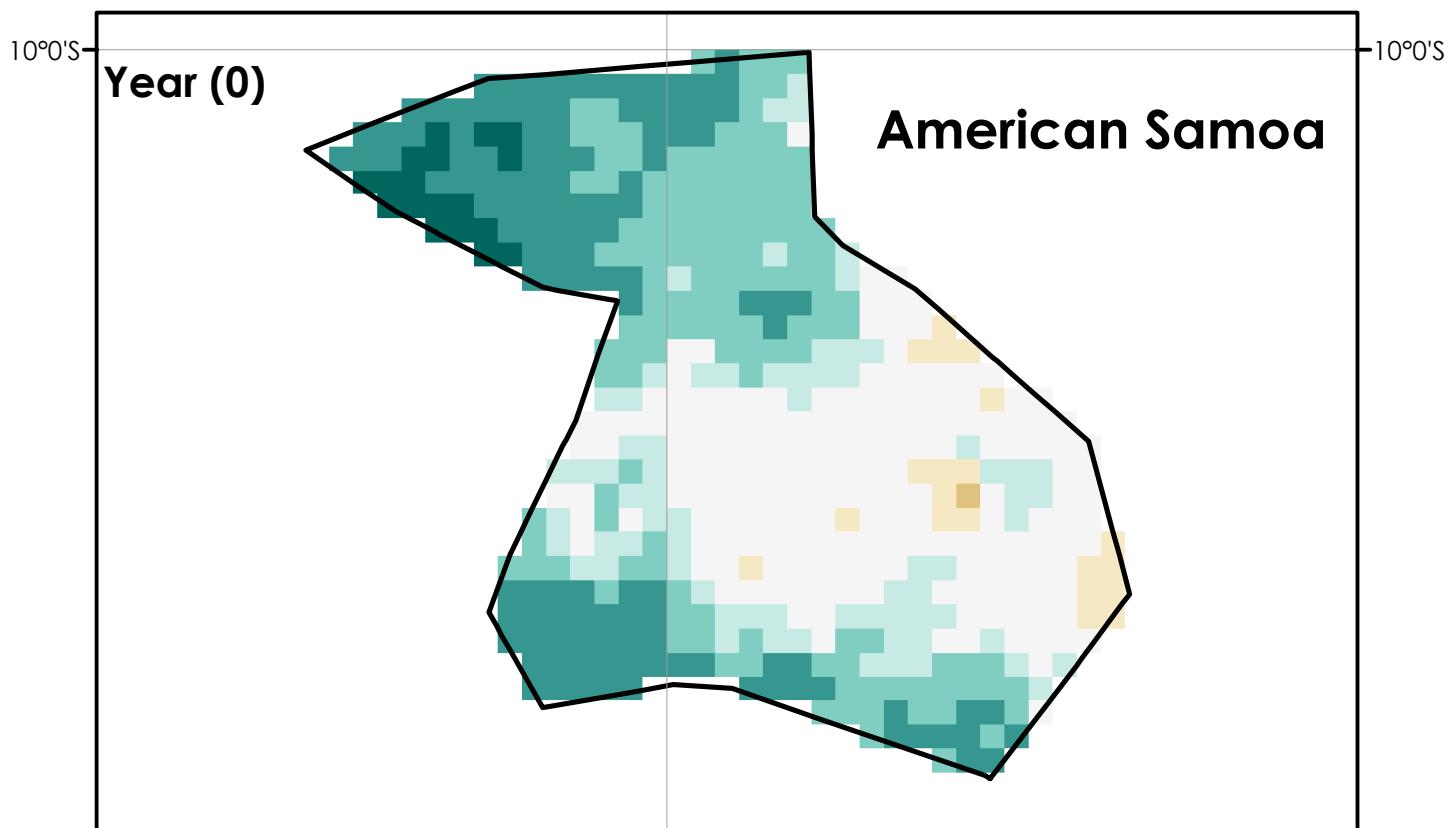


Precipitation Change (%)



Weak El Niño for AMJ

106

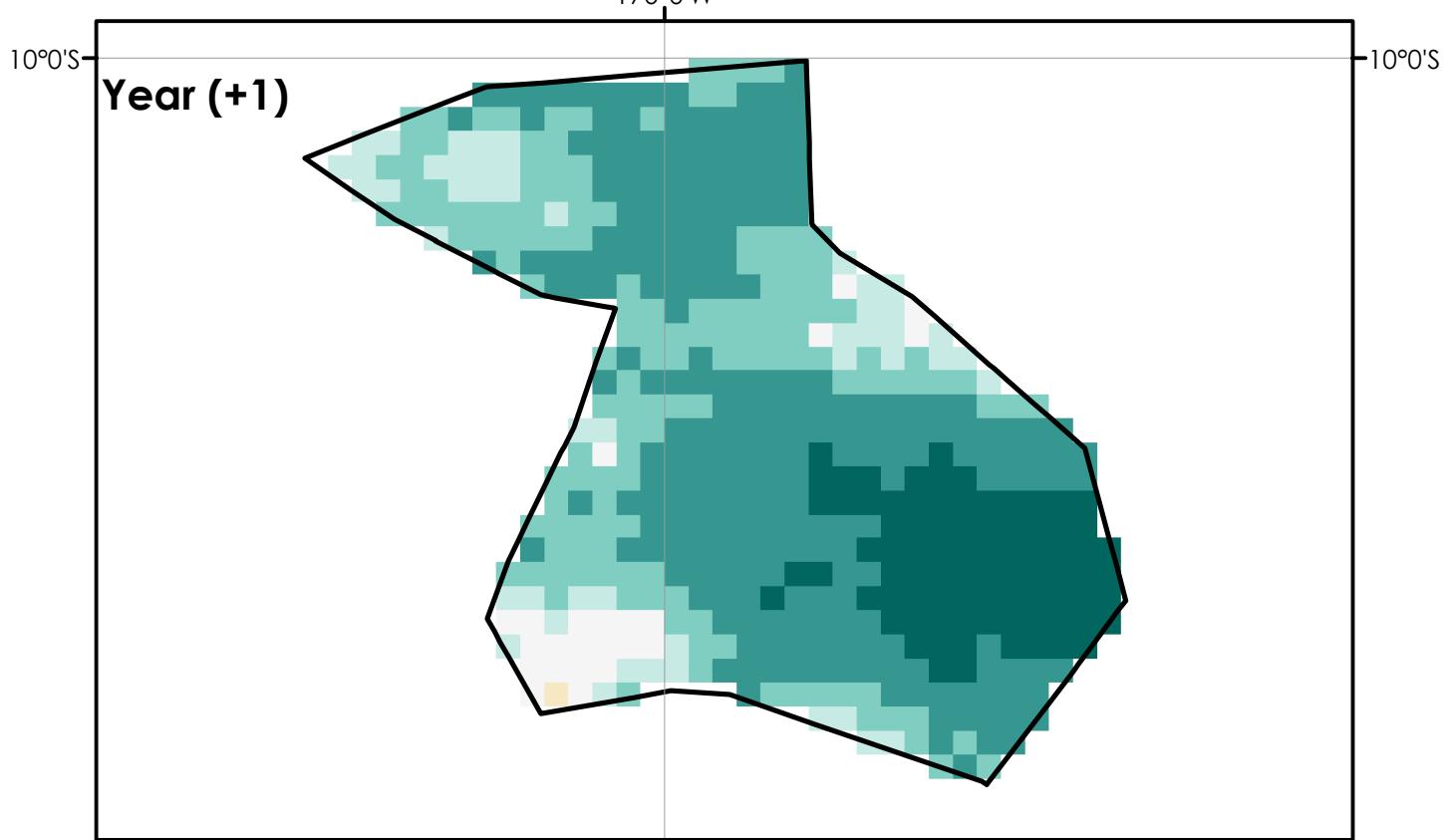
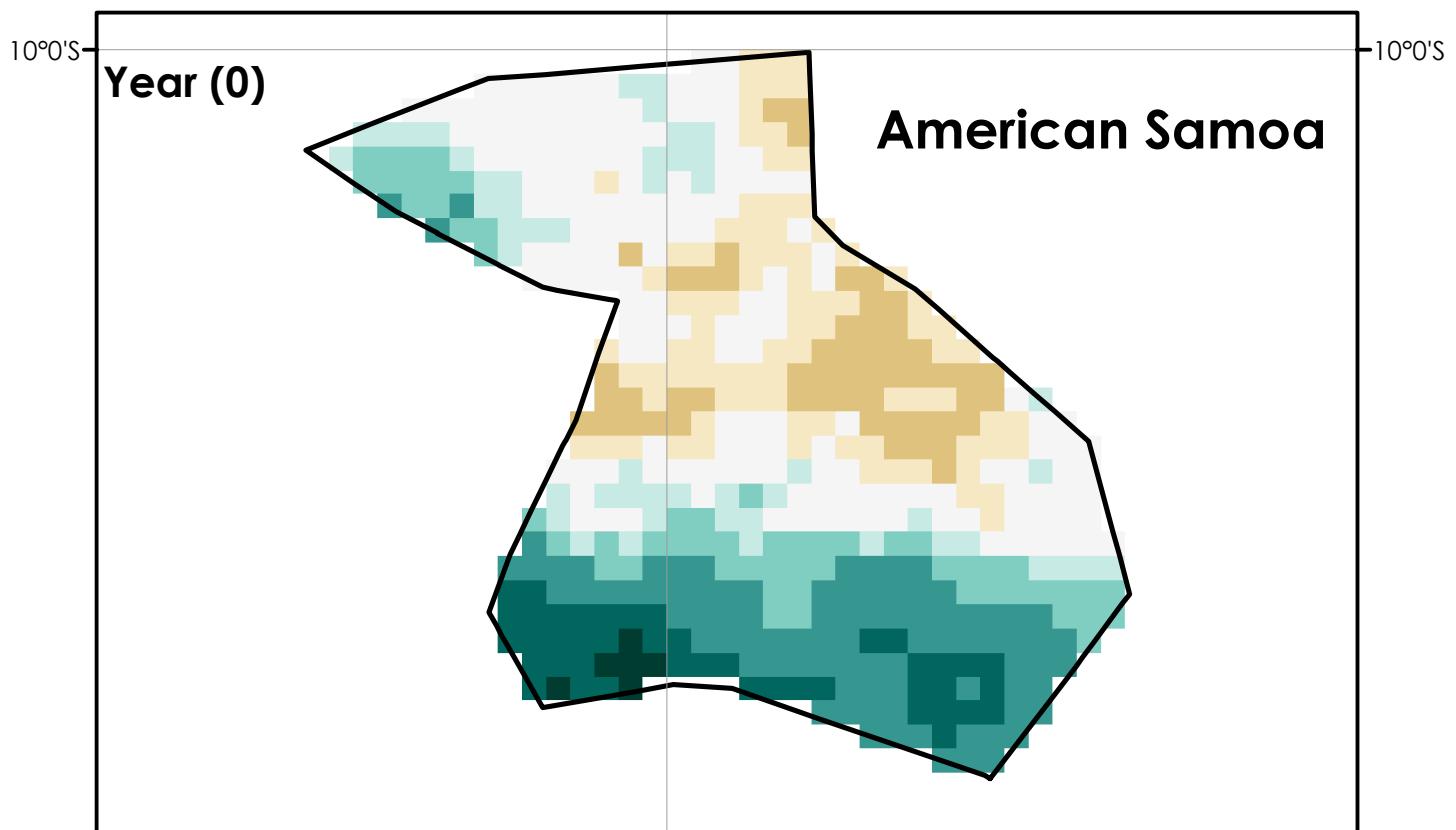


Precipitation Change (%)

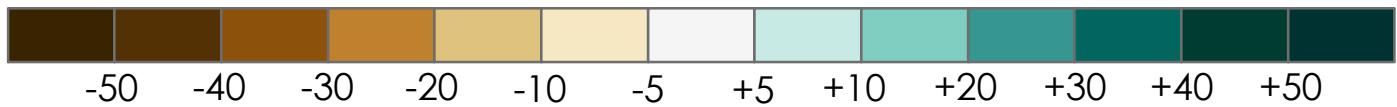


Weak El Niño for MJJ

107

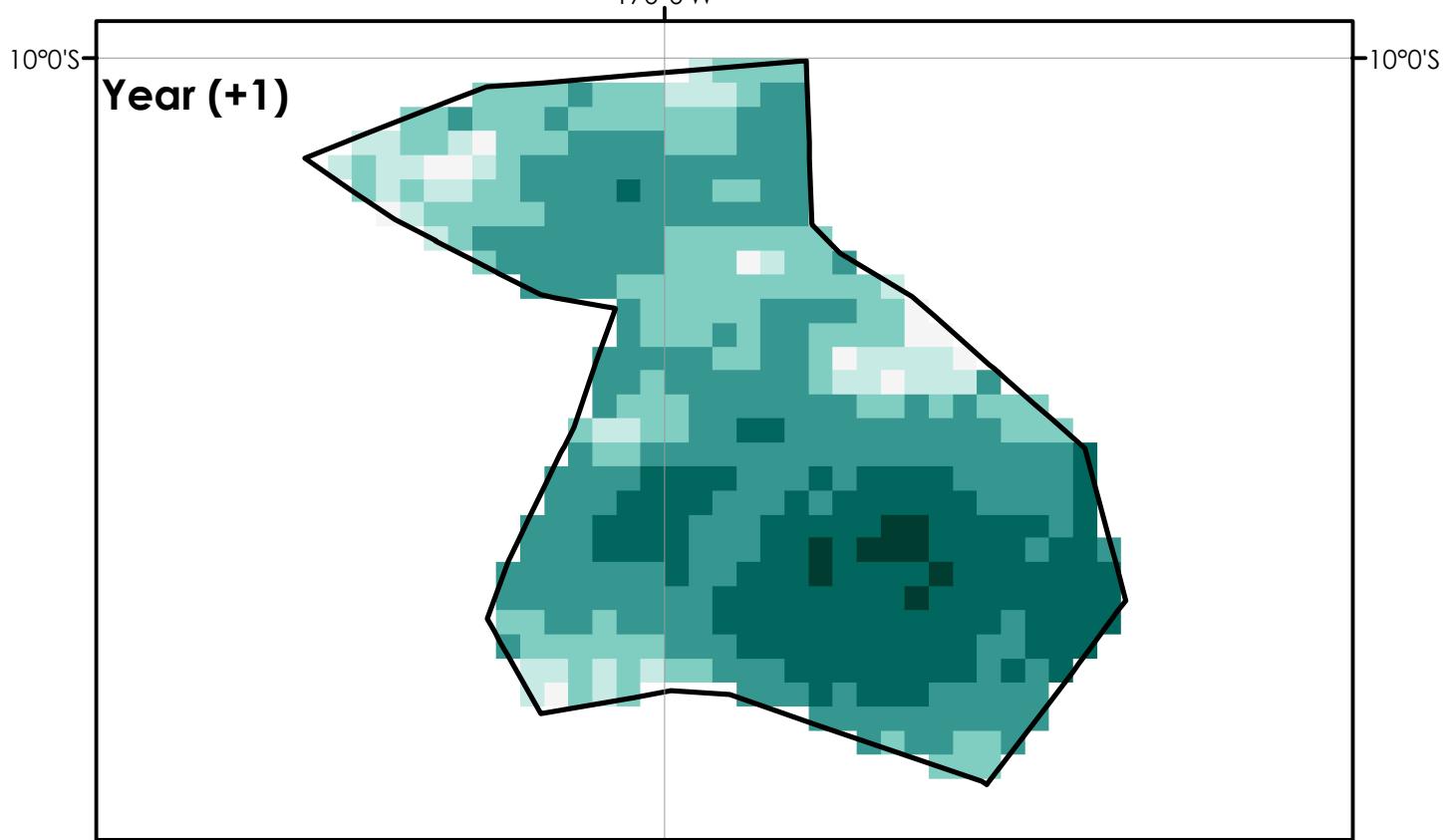
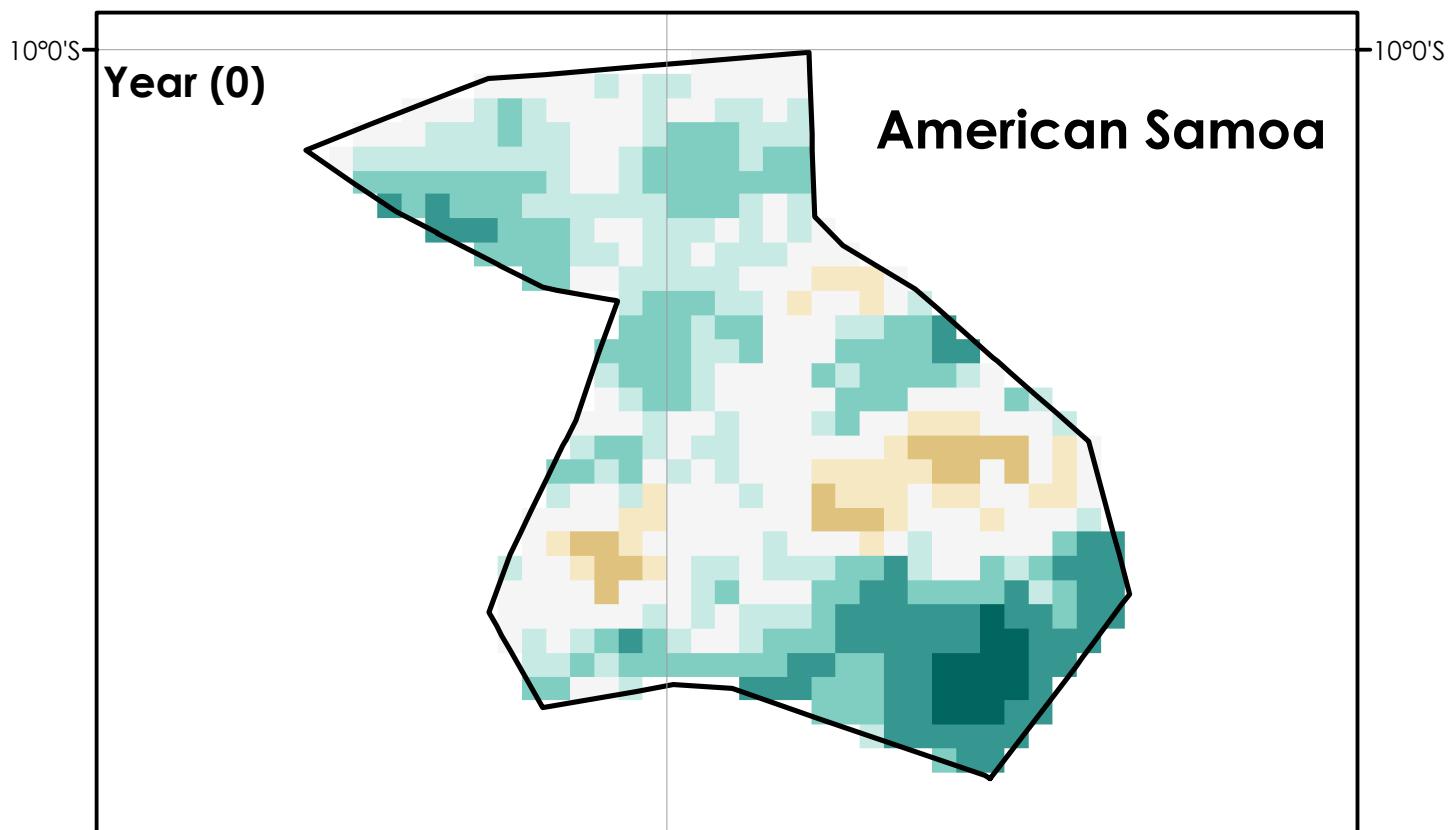


Precipitation Change (%)

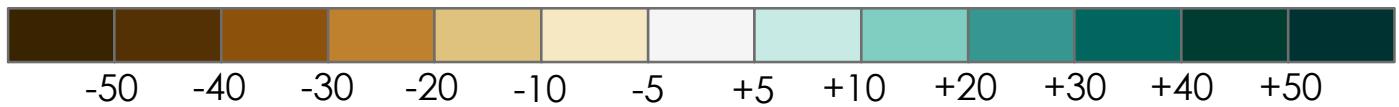


Weak El Niño for JJA

108

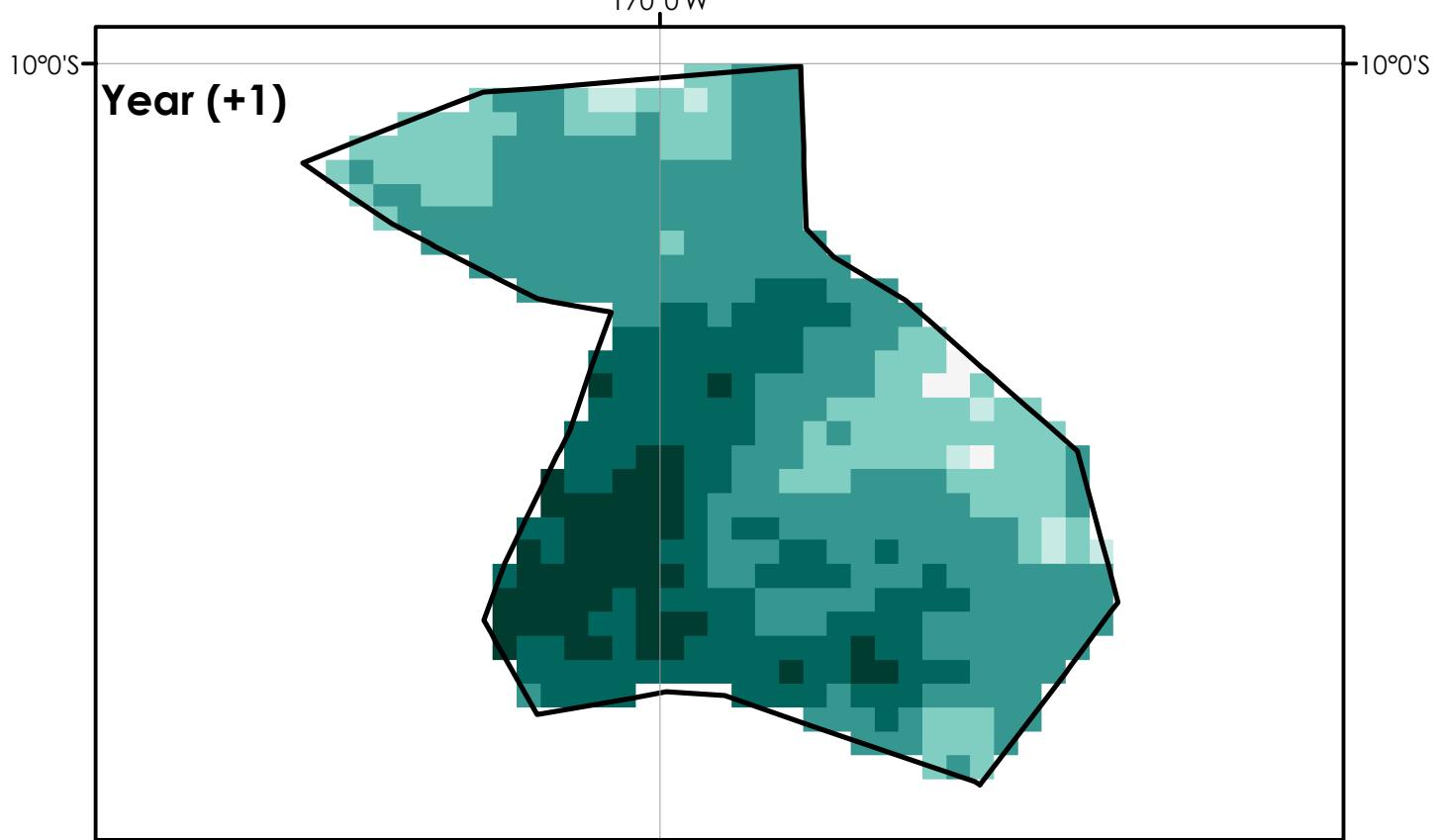
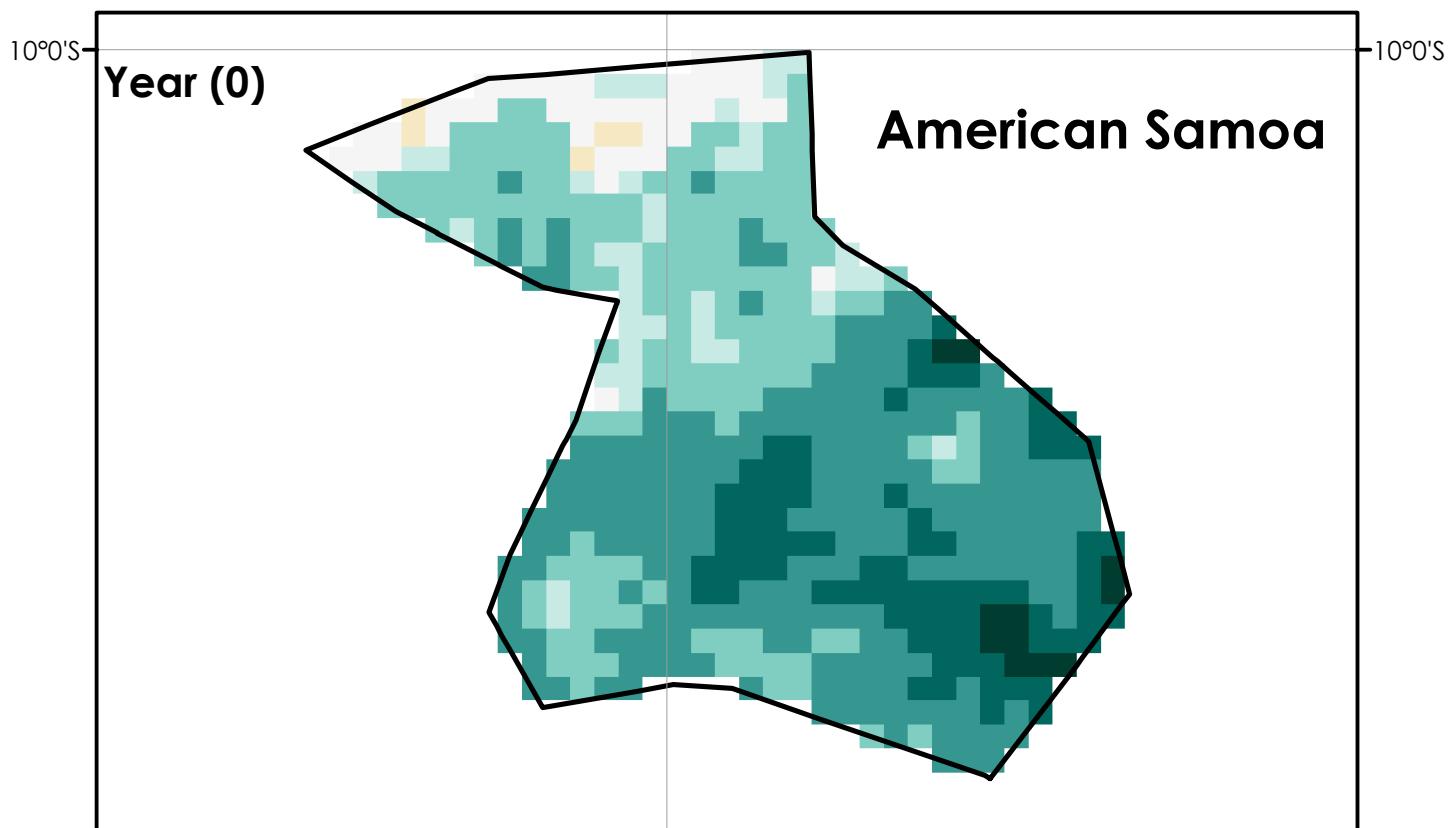


Precipitation Change (%)

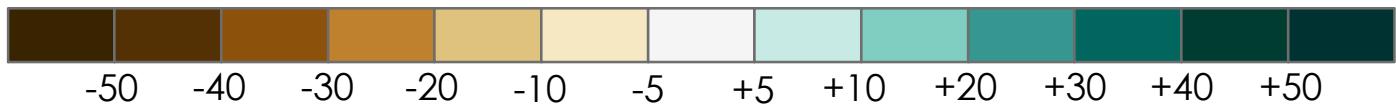


Weak El Niño for JAS

109

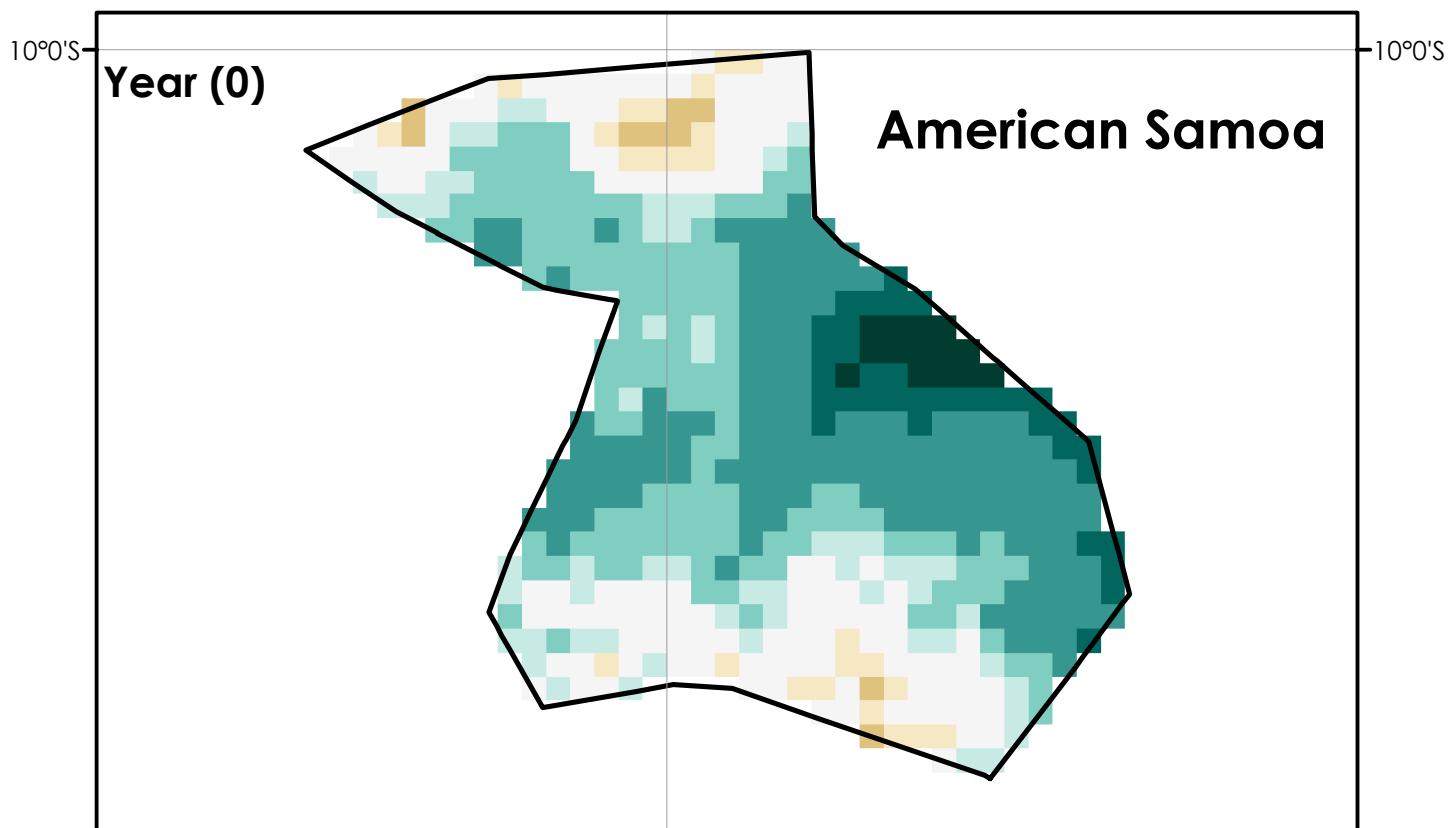


Precipitation Change (%)

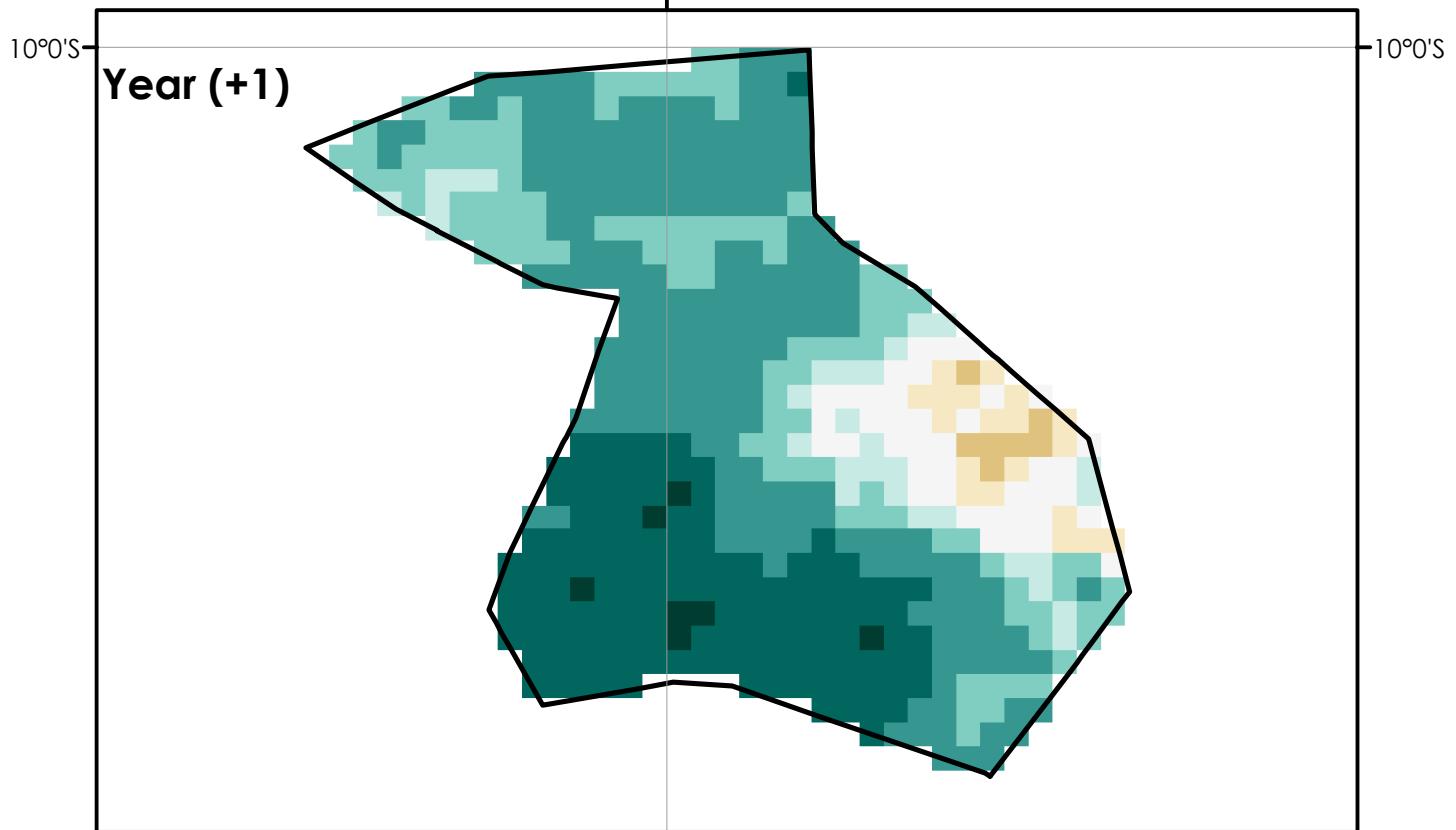


Weak El Niño for ASO

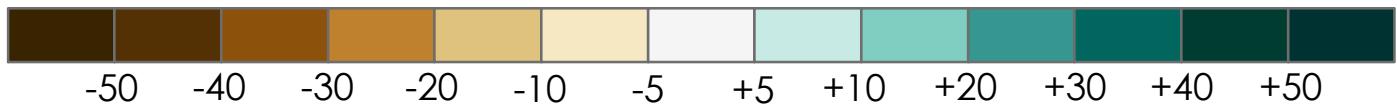
110



170°0'W

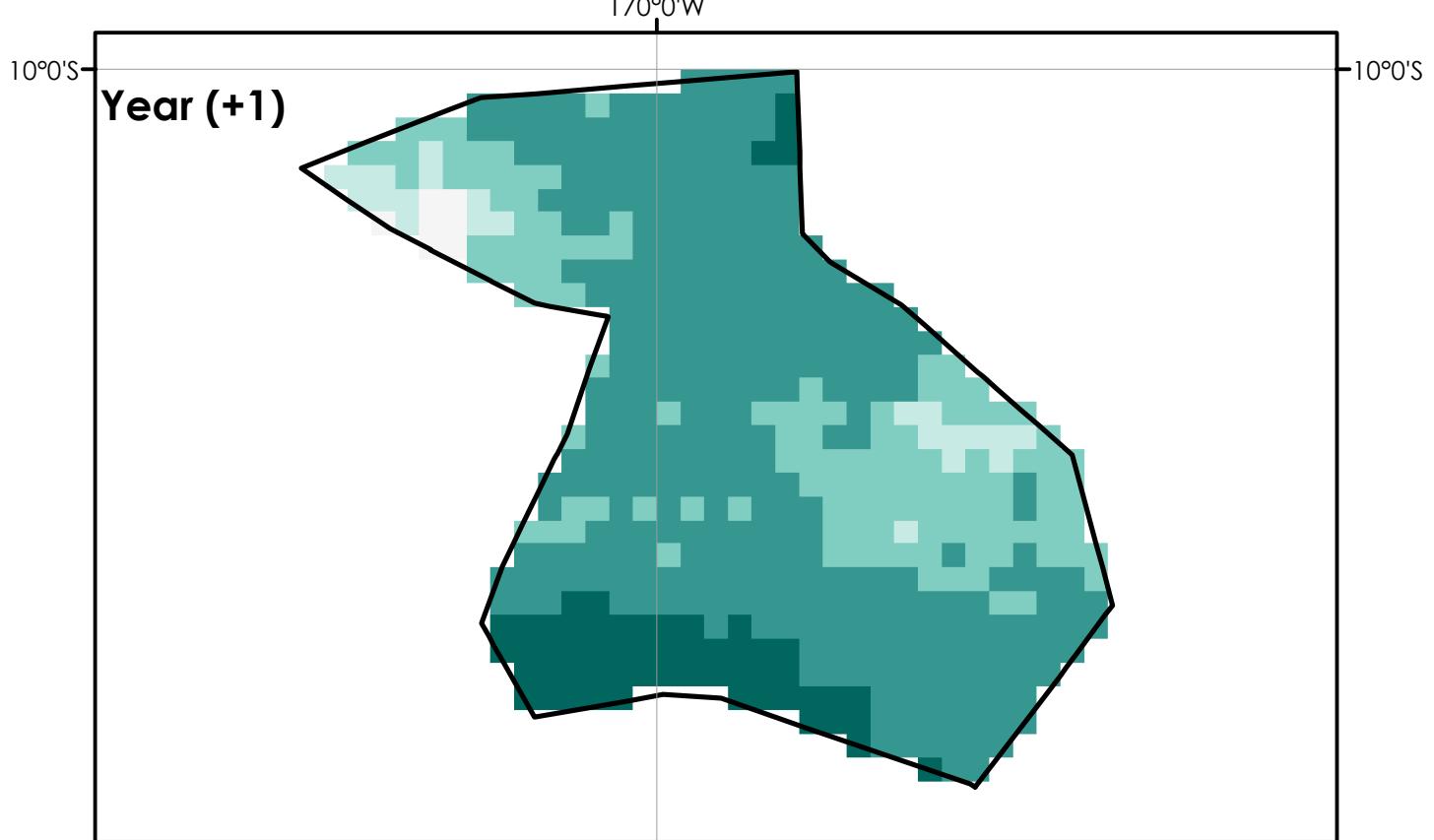
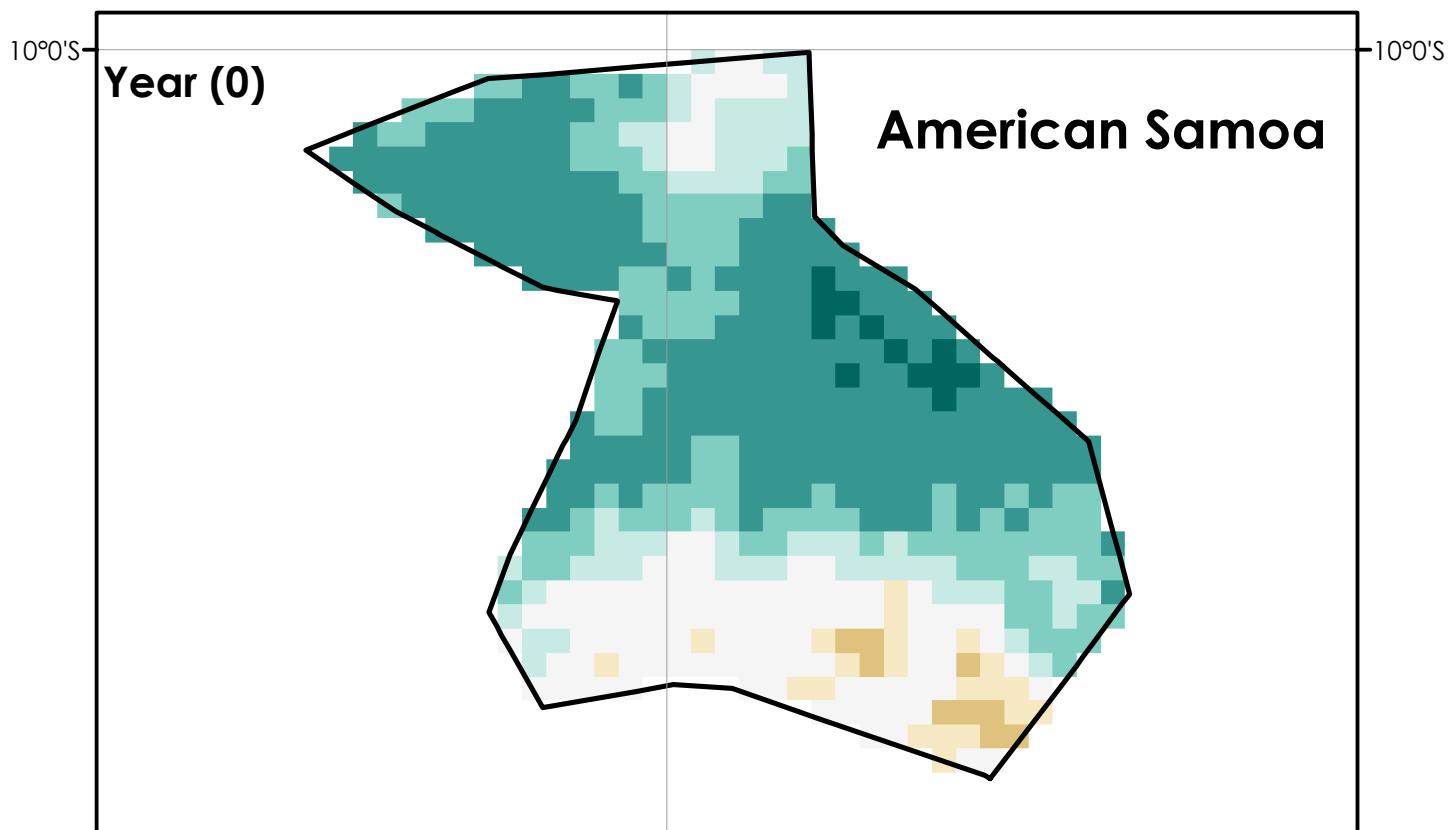


Precipitation Change (%)

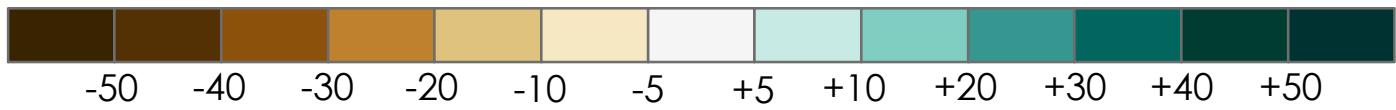


Weak El Niño for SON

111

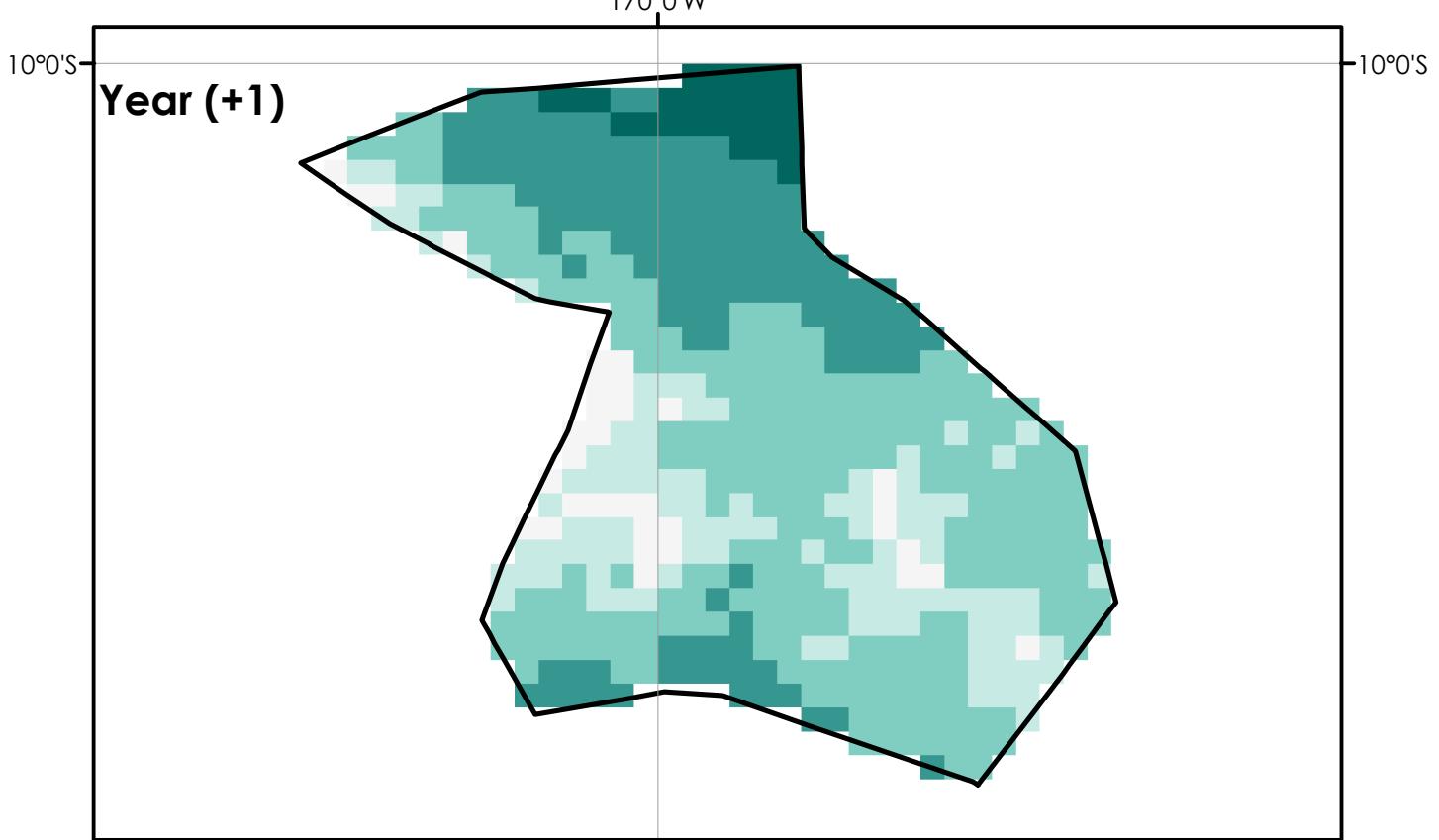
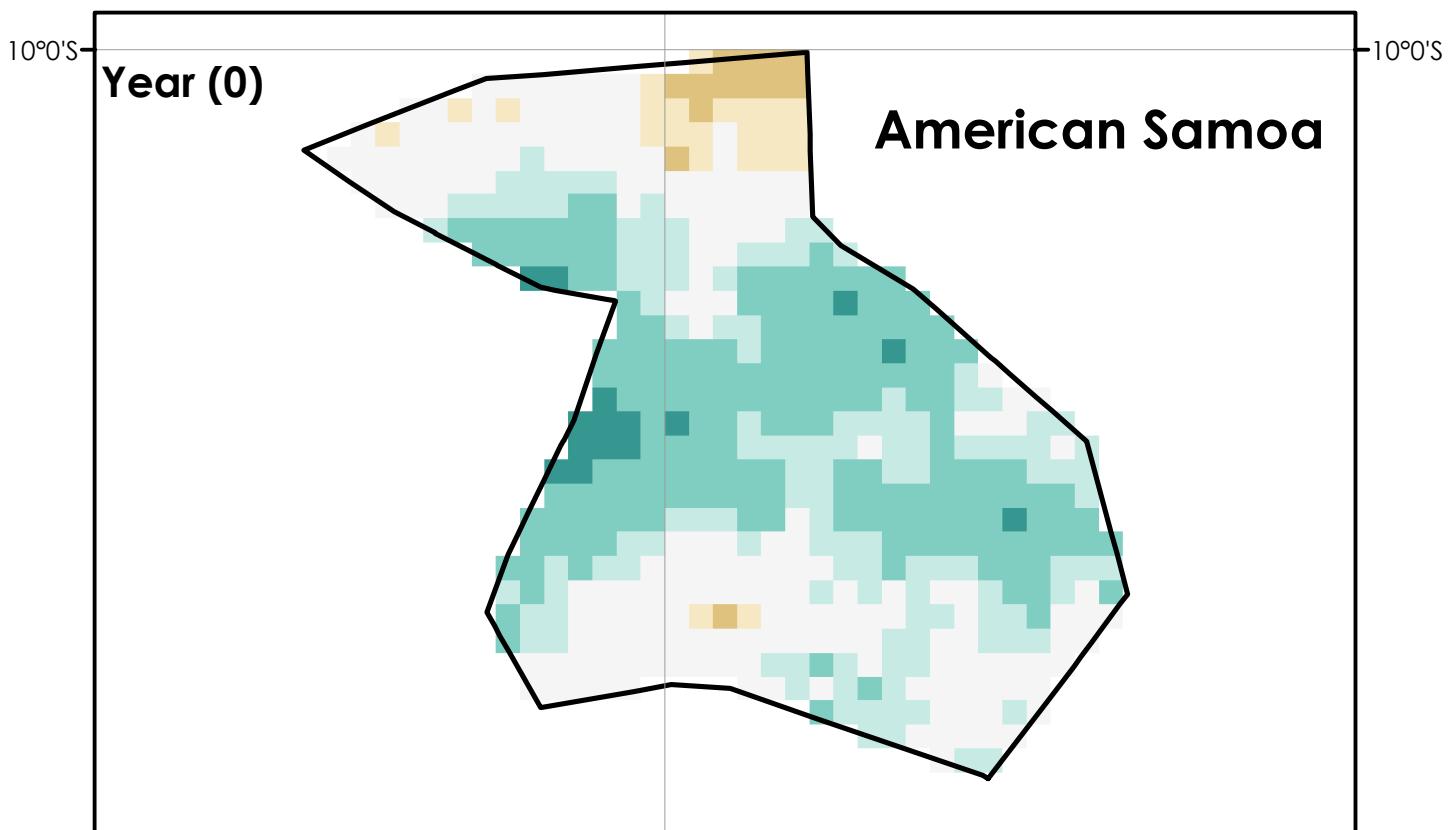


Precipitation Change (%)



Weak El Niño for OND

112

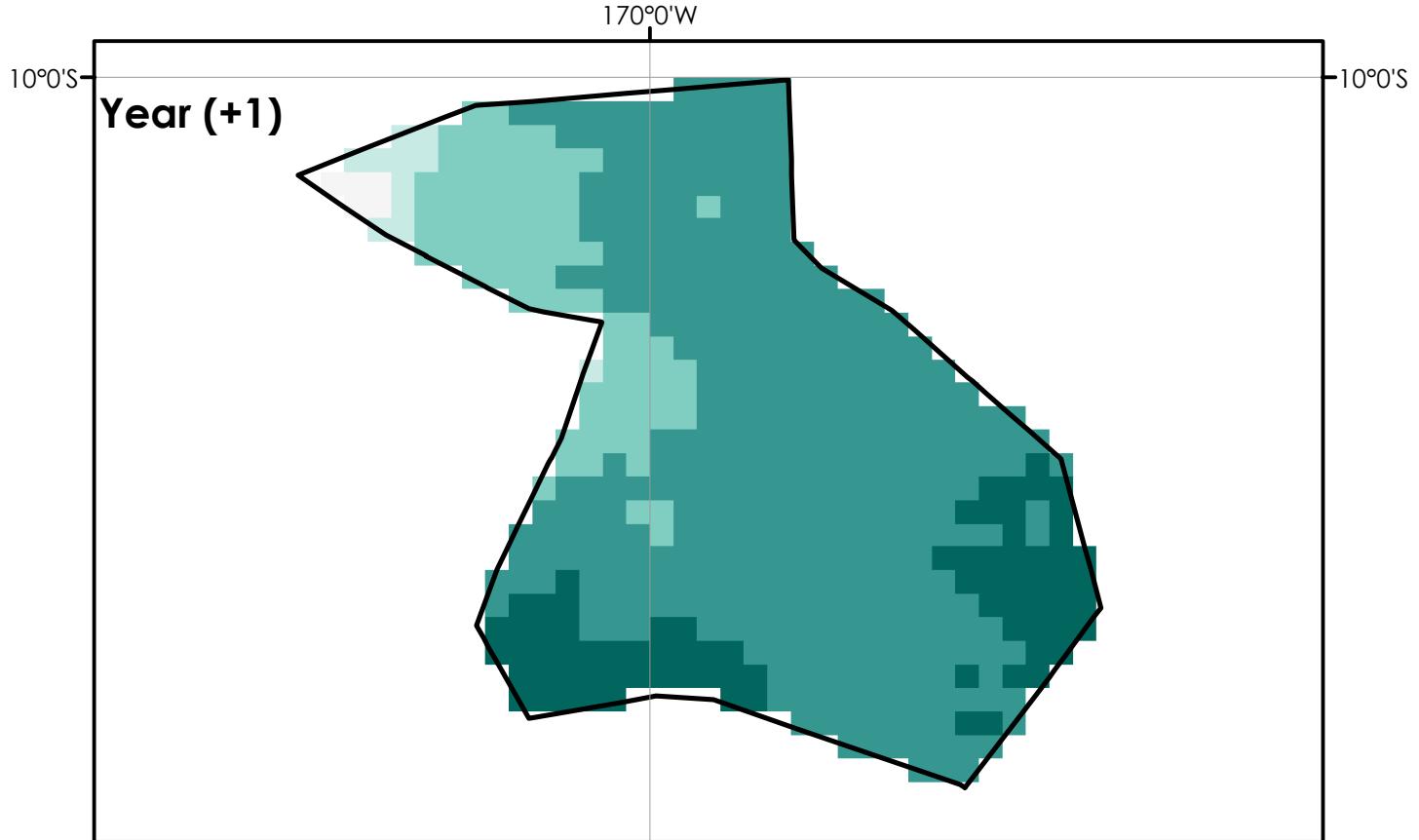
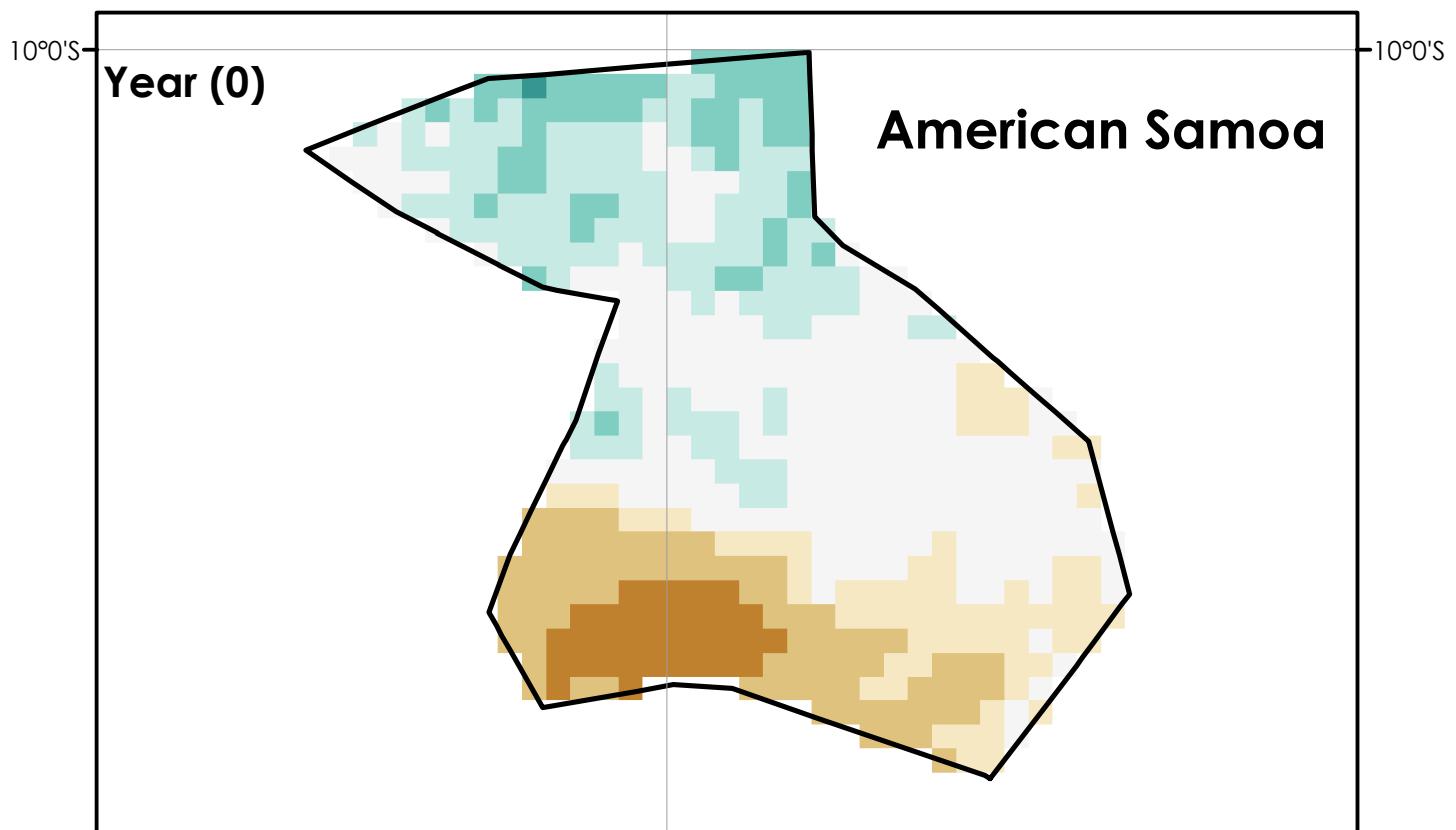


Precipitation Change (%)

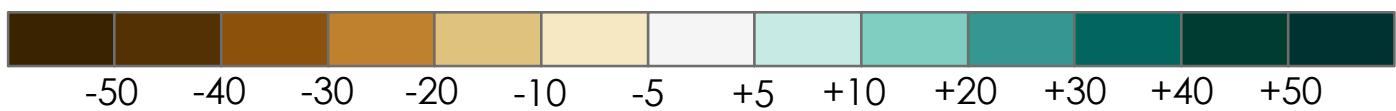


Weak El Niño for NDJ

113

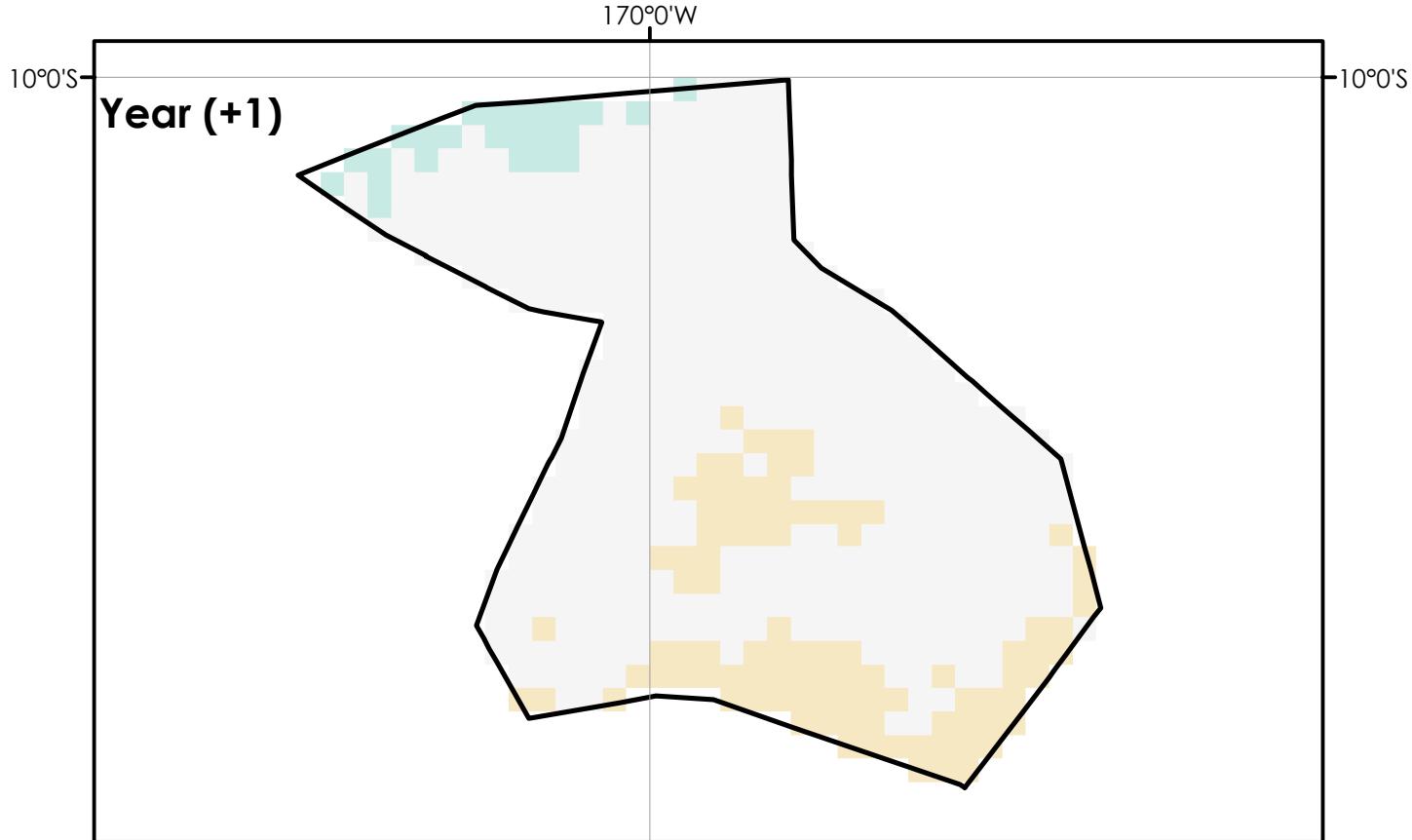
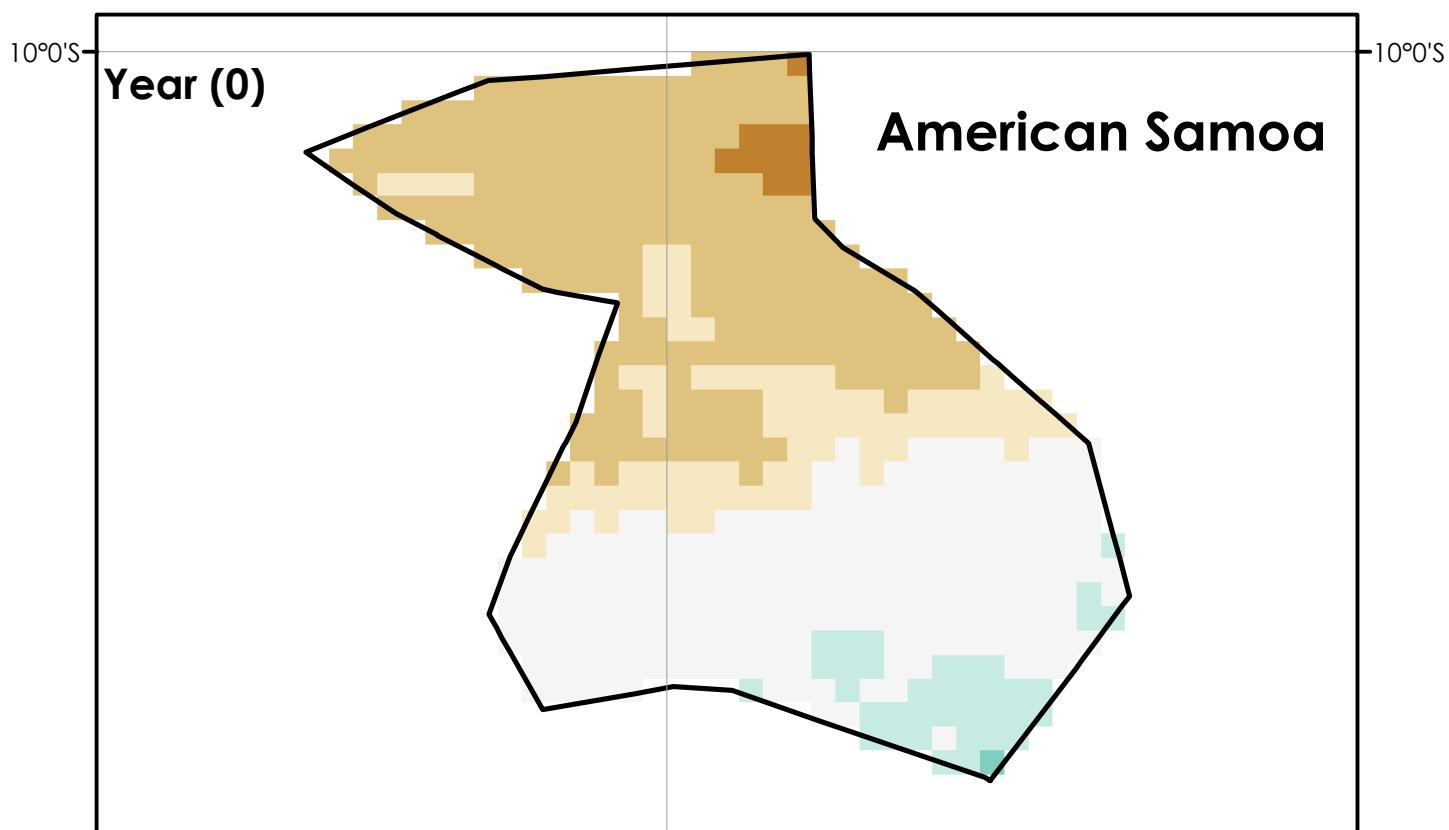


Precipitation Change (%)

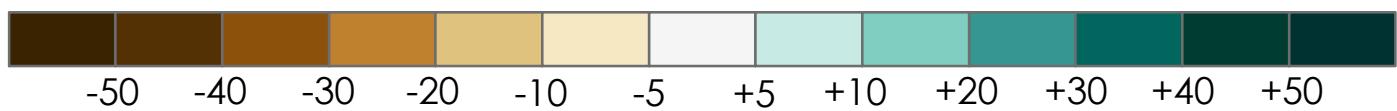


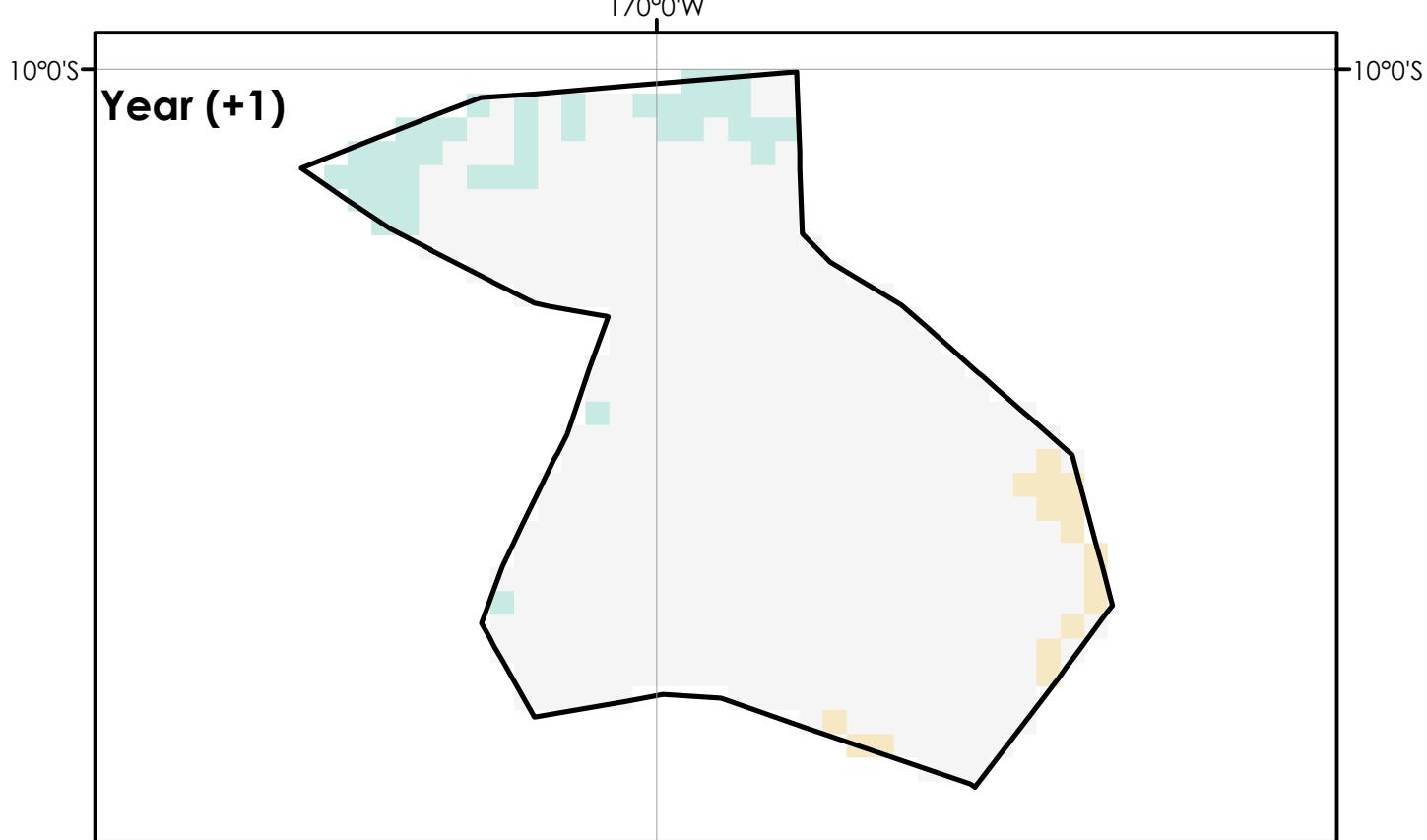
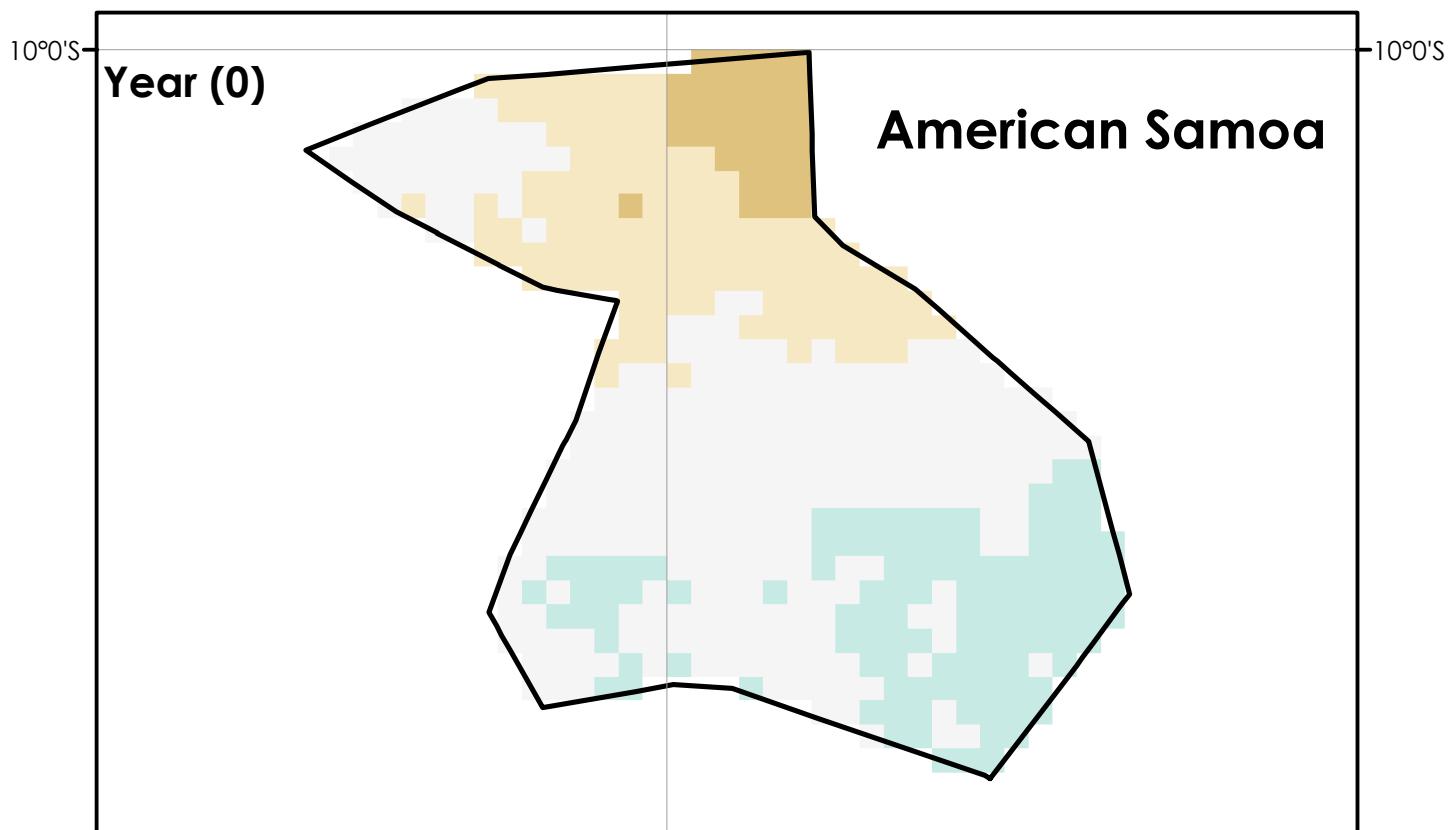
Neutral for DJF

114

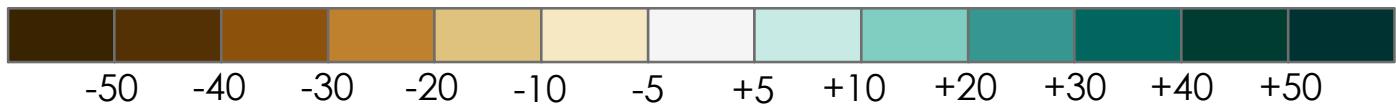


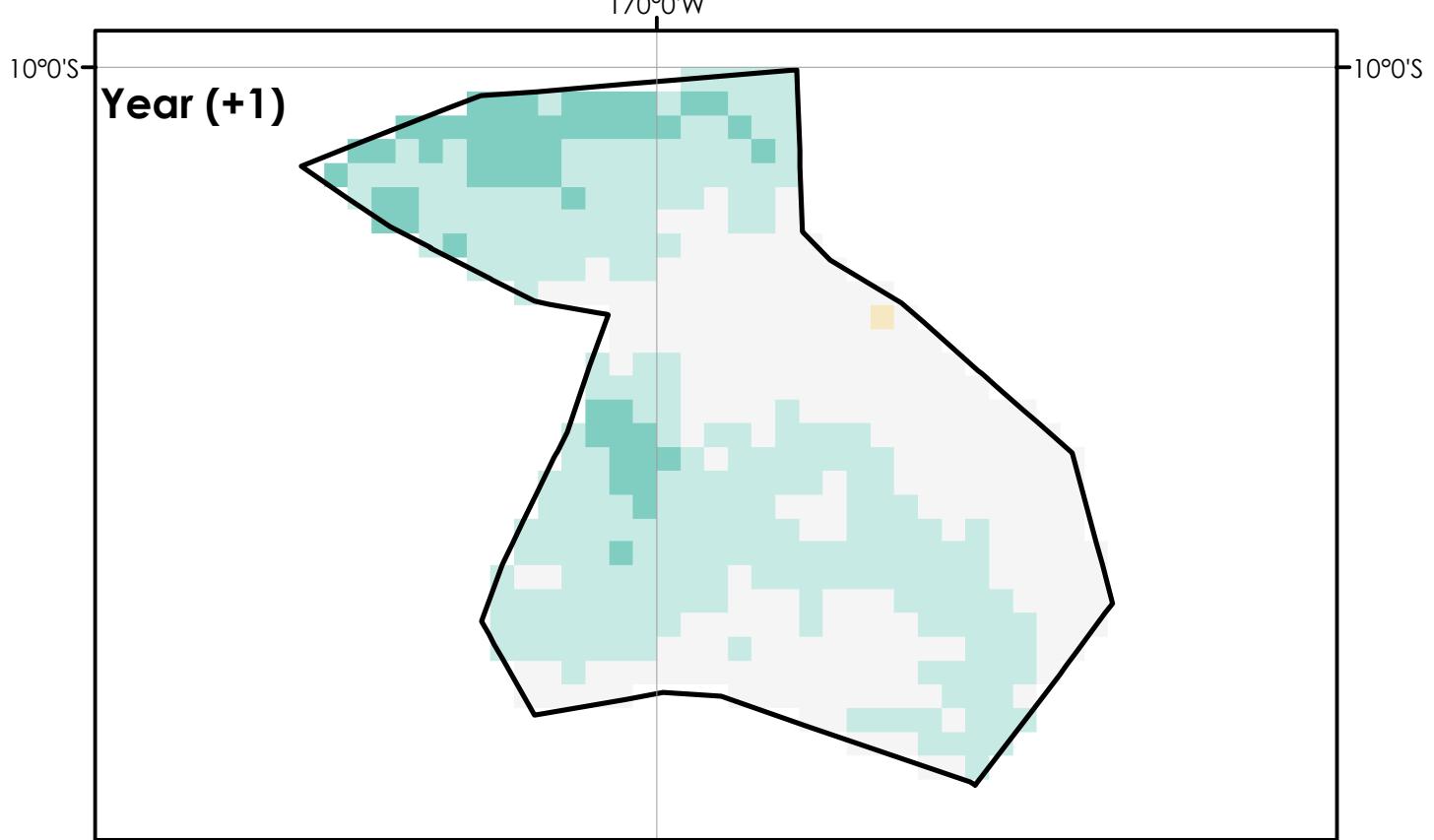
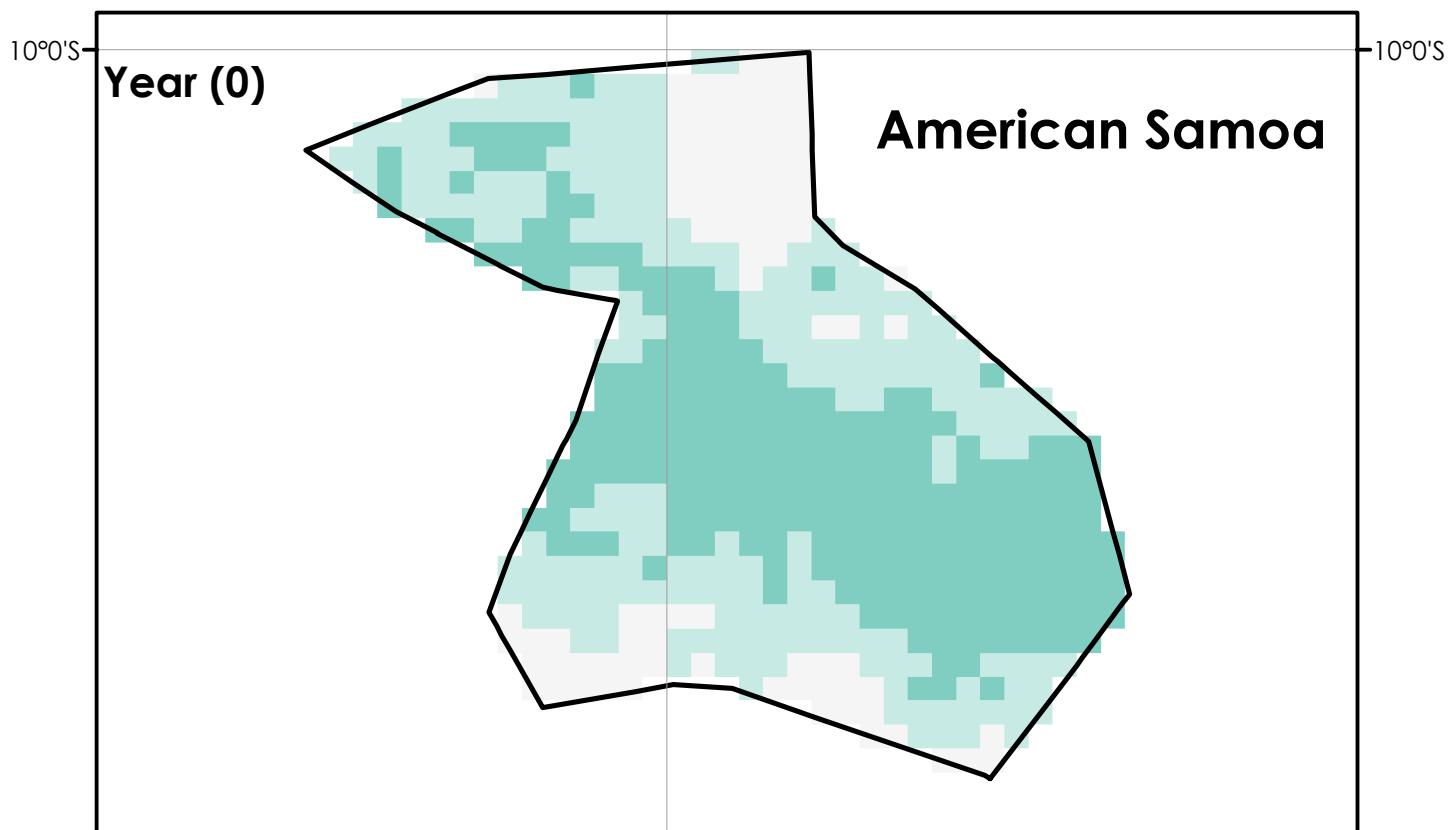
Precipitation Change (%)





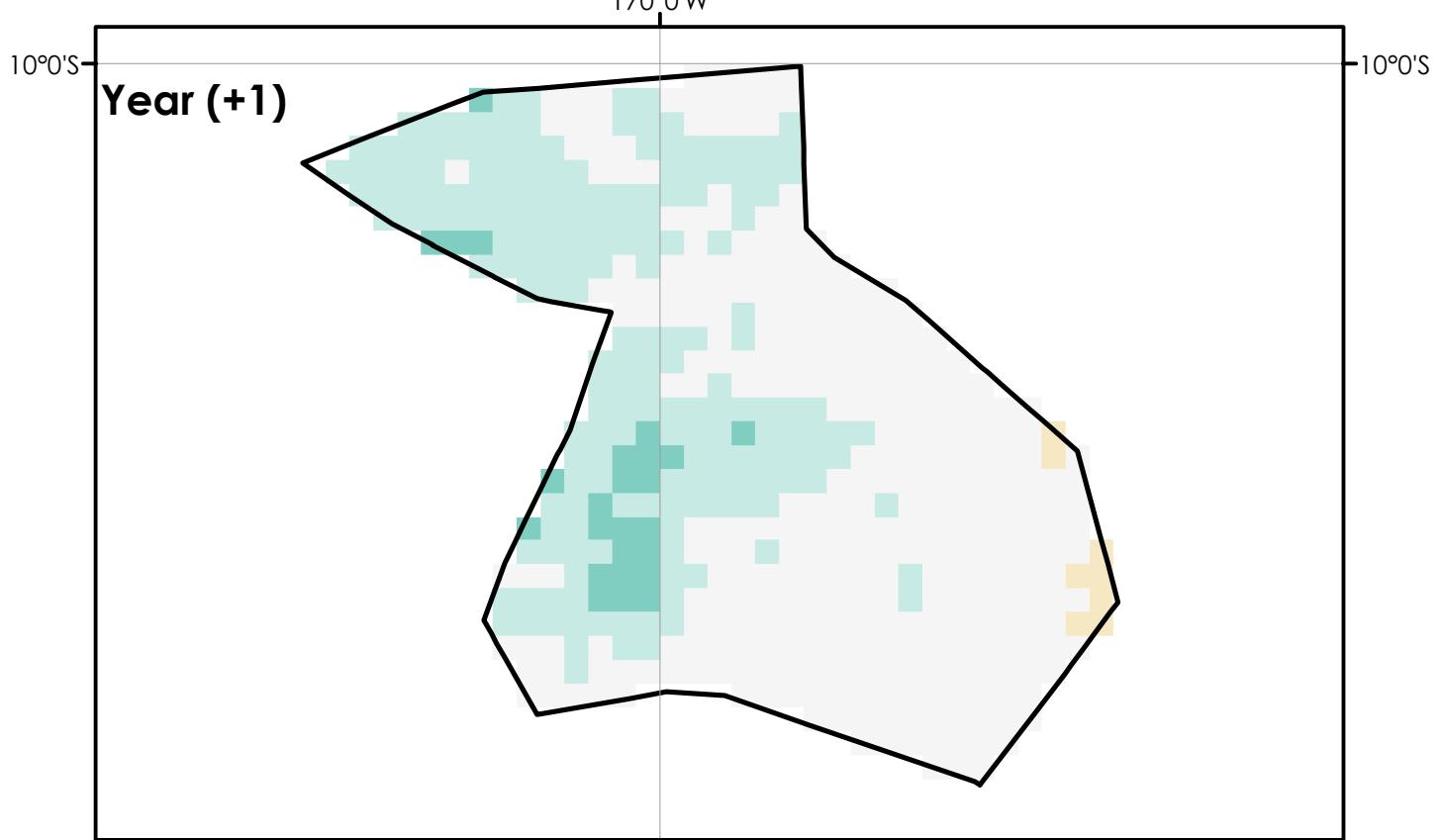
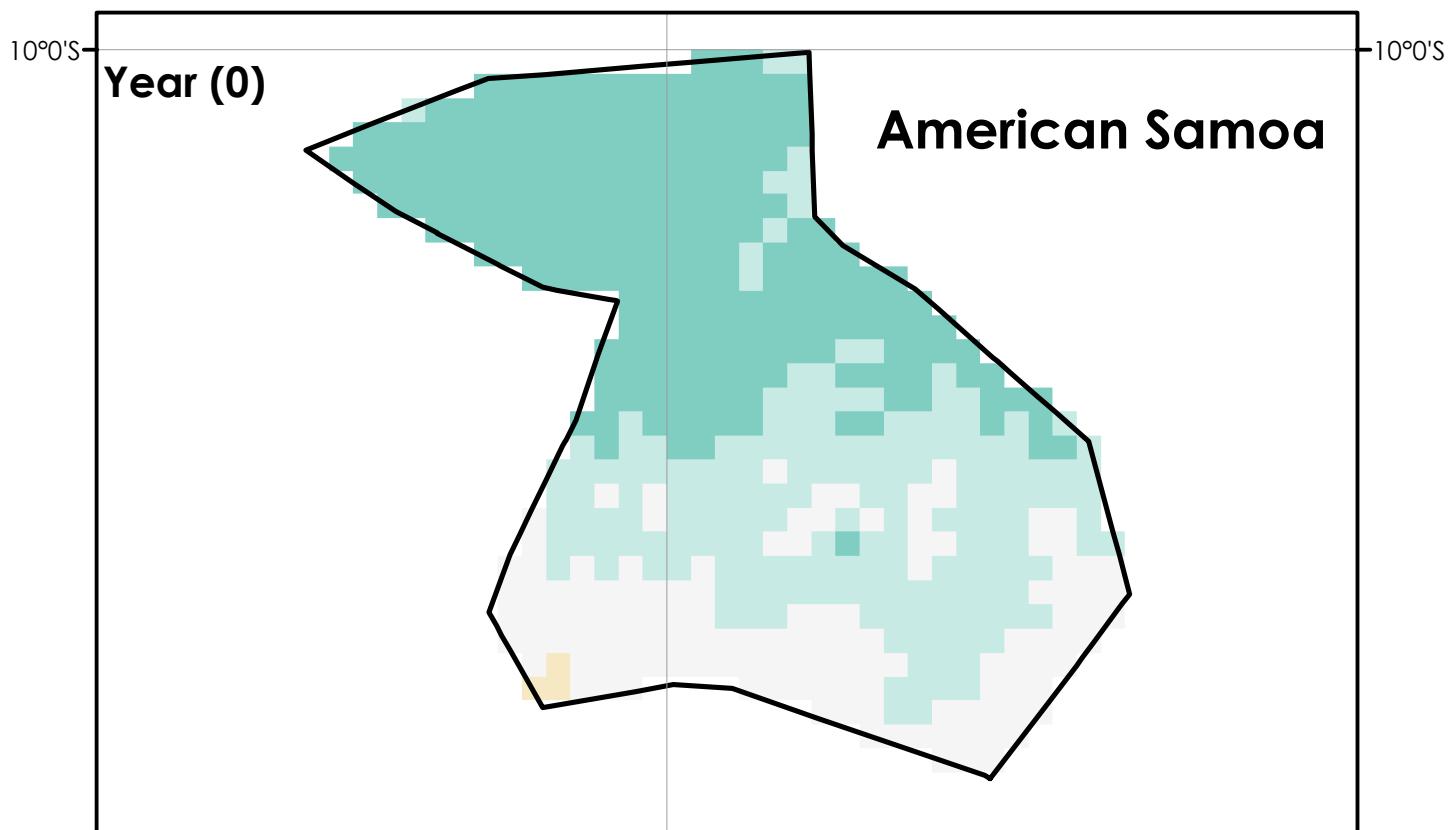
Precipitation Change (%)



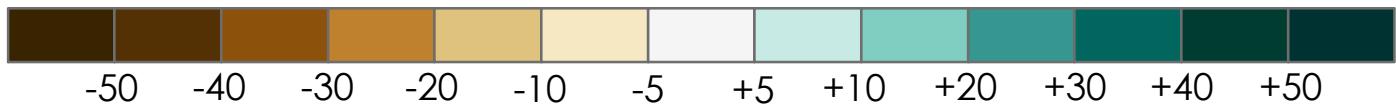


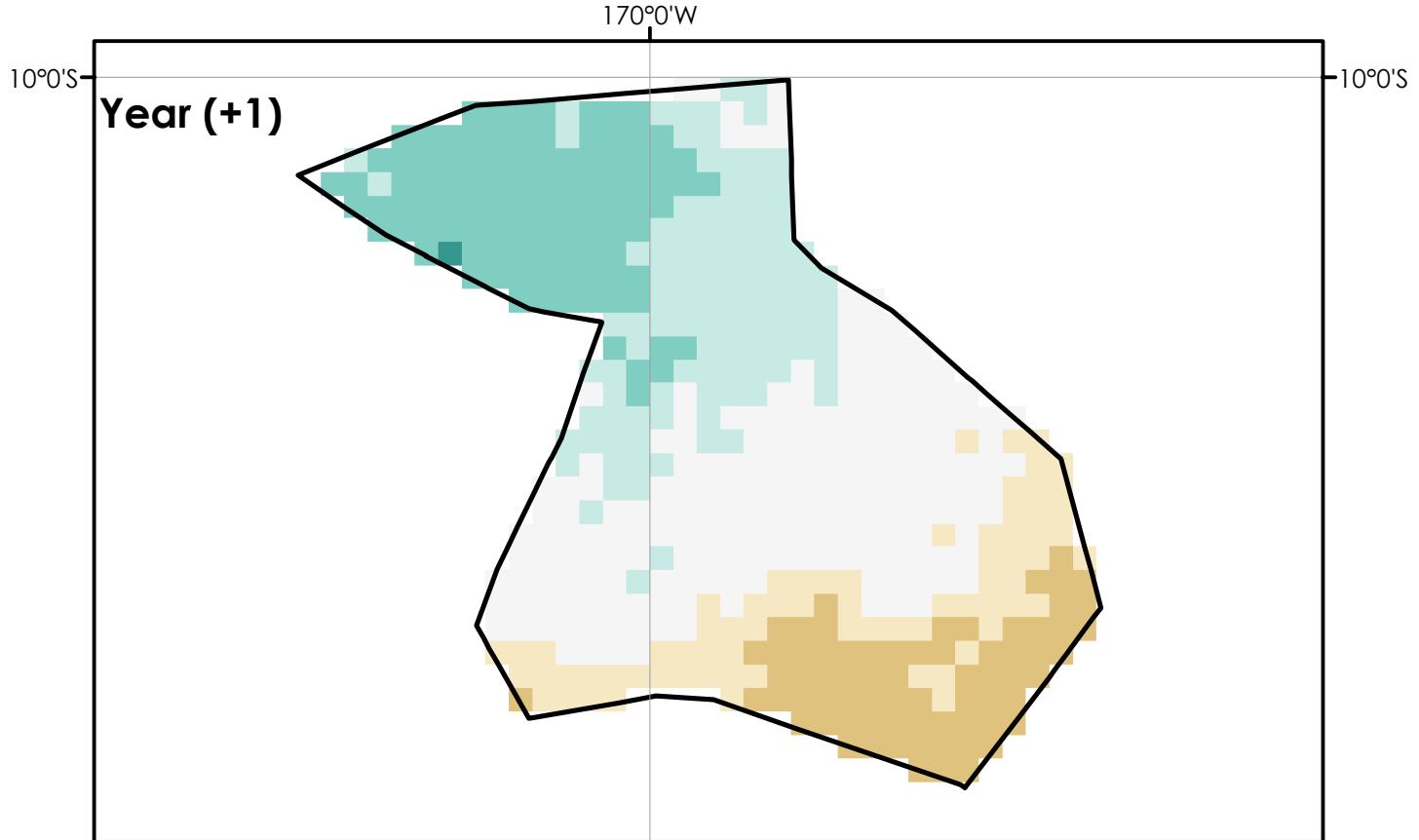
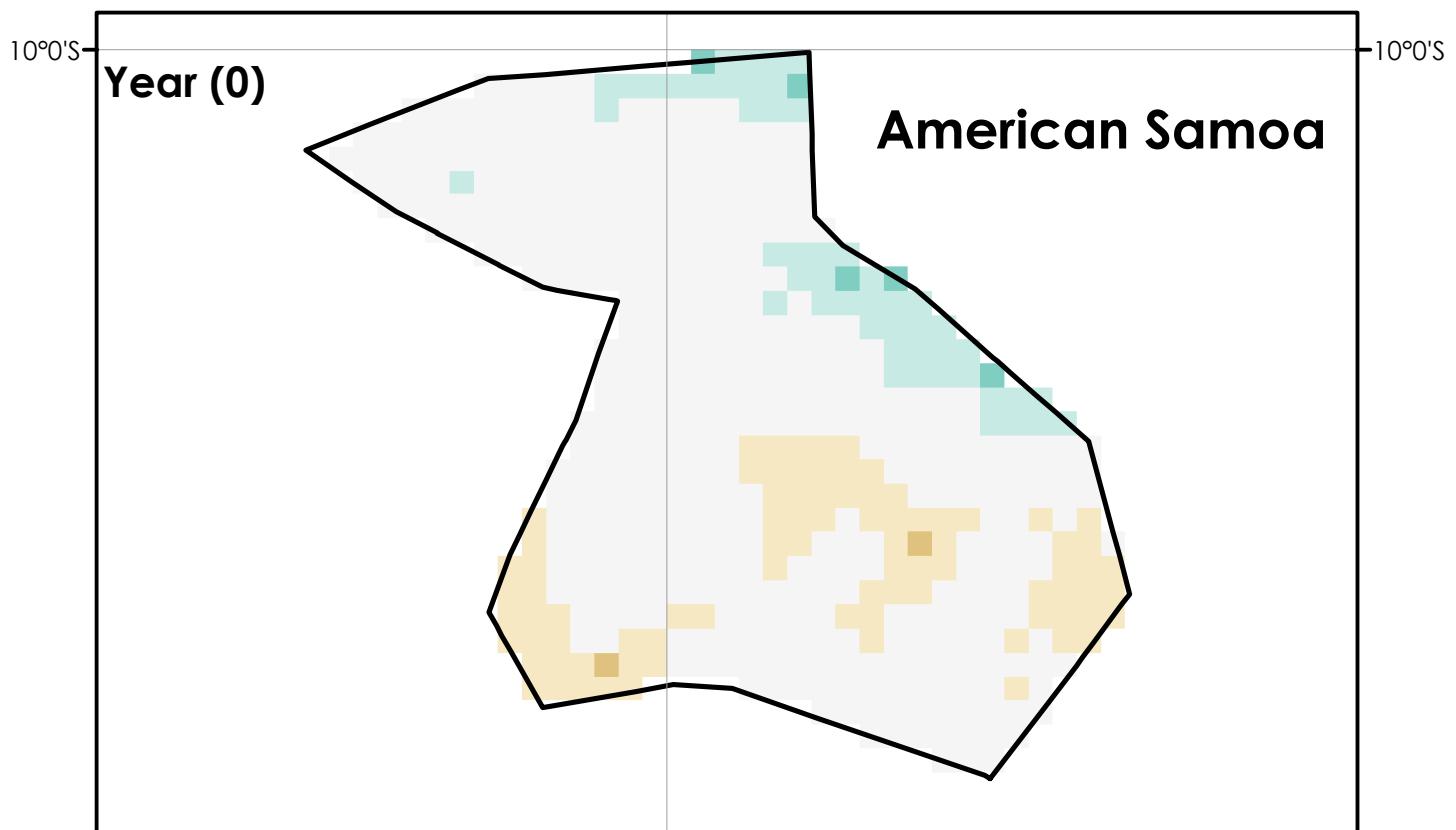
Precipitation Change (%)





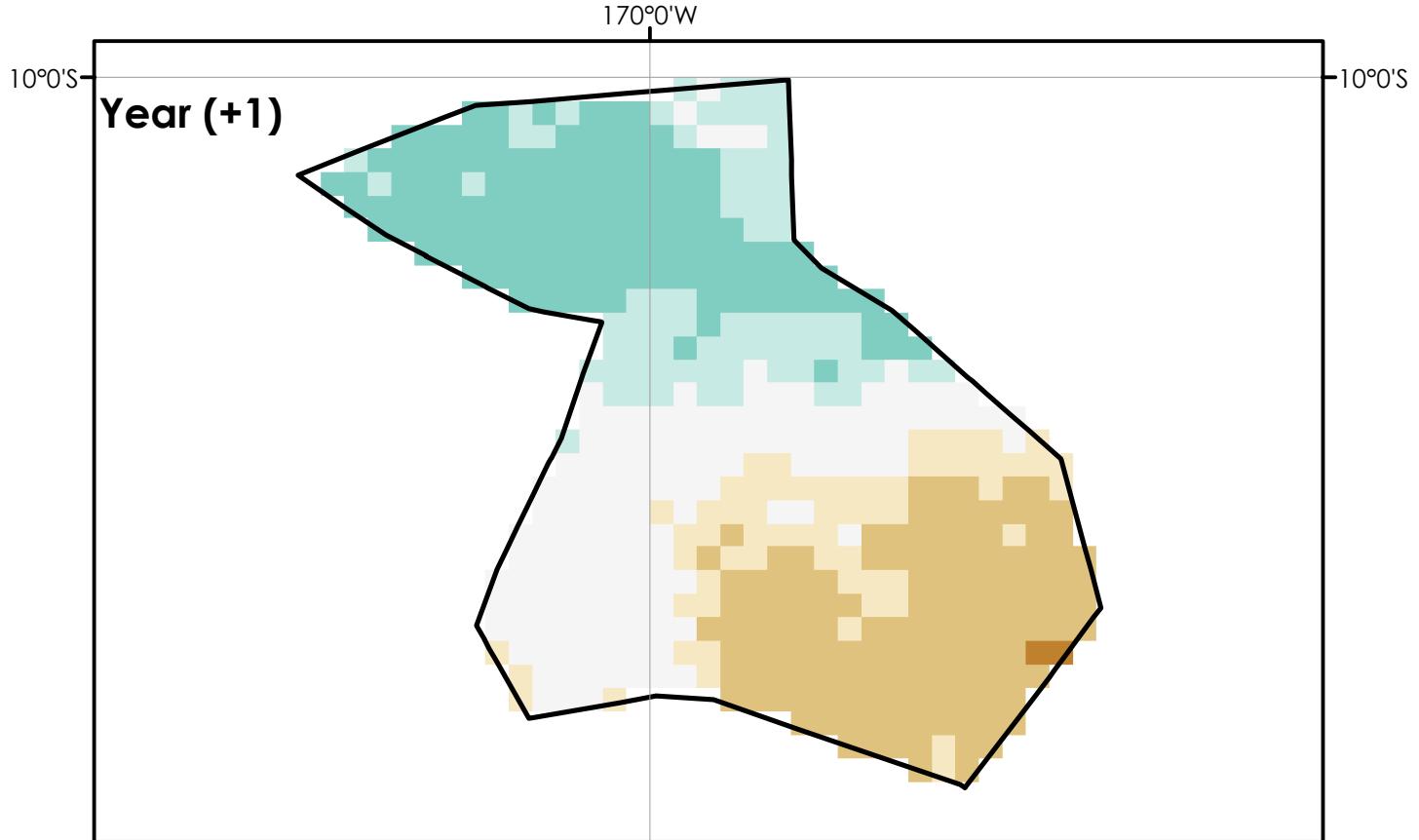
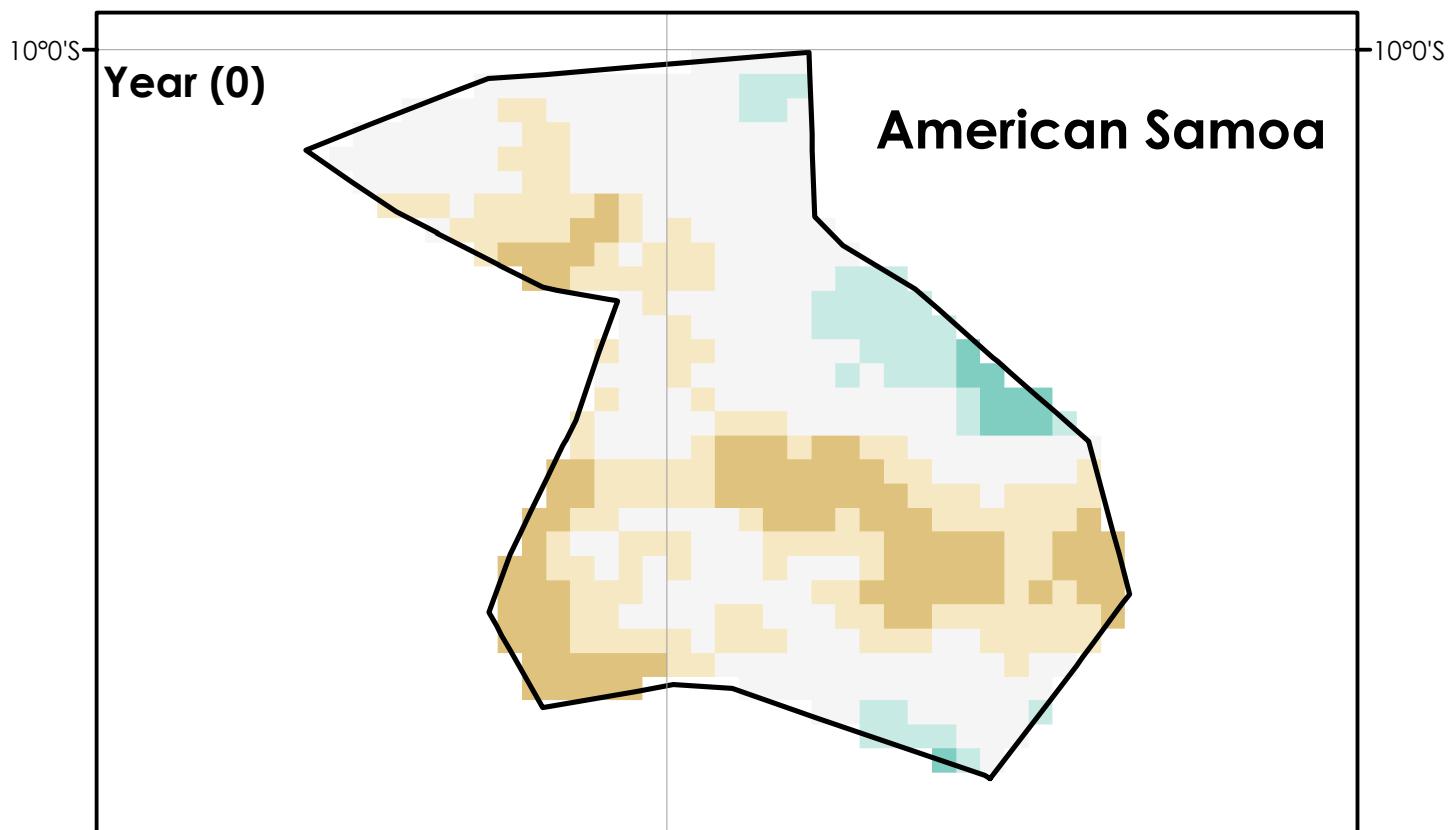
Precipitation Change (%)





Precipitation Change (%)

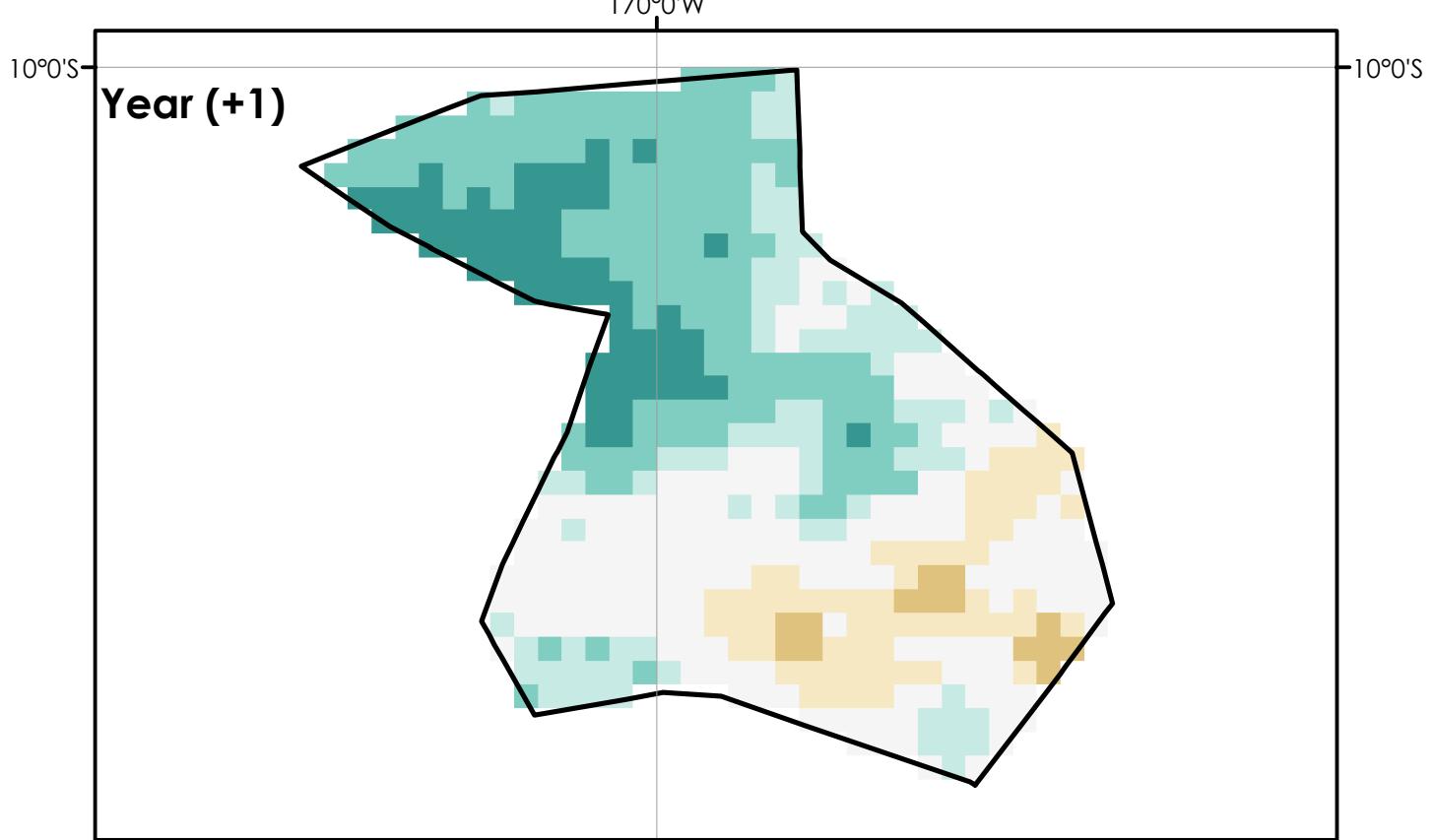
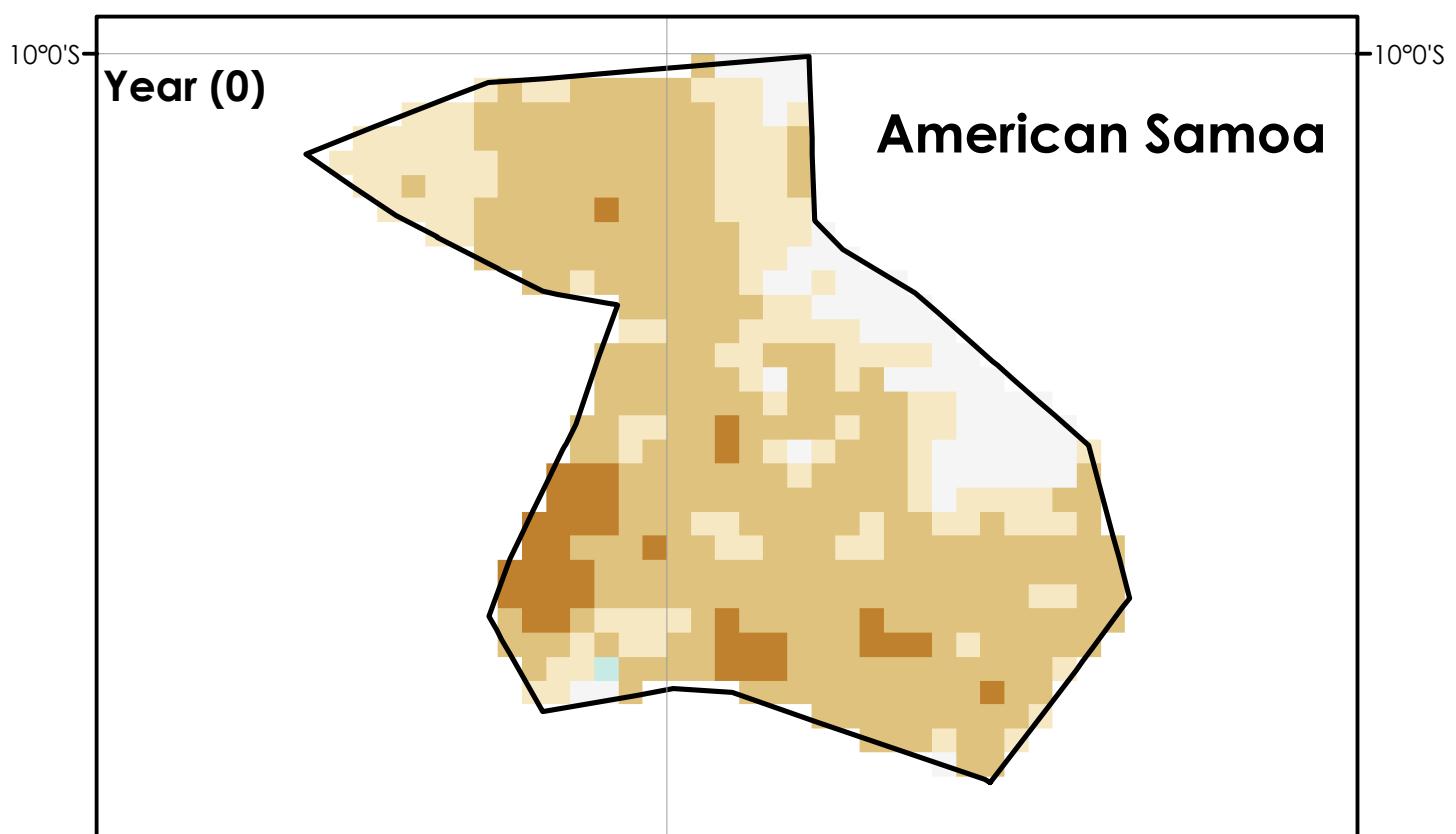




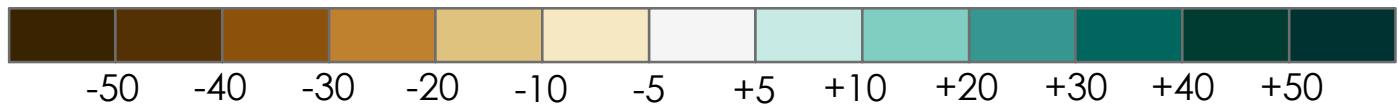
Precipitation Change (%)

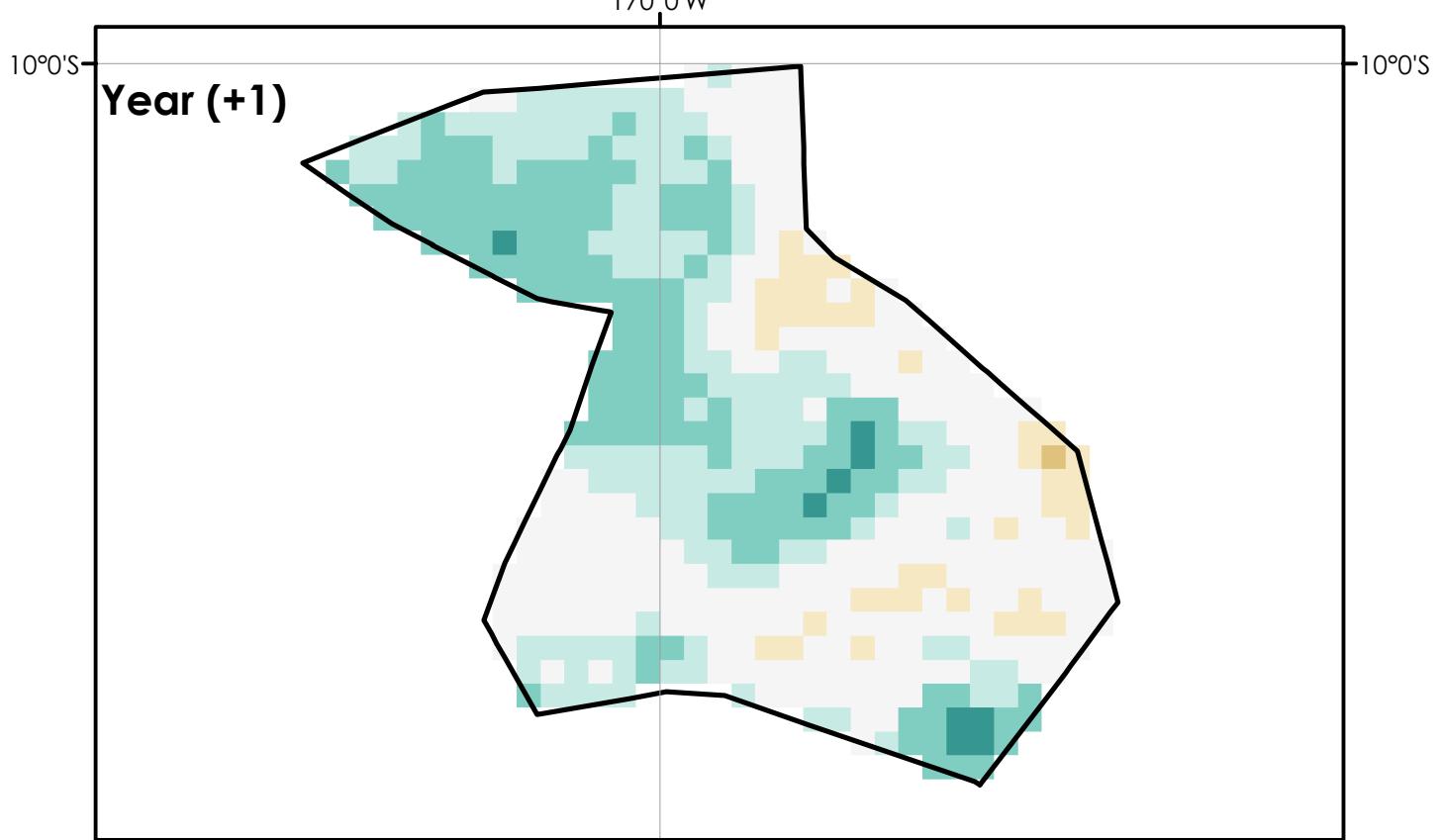
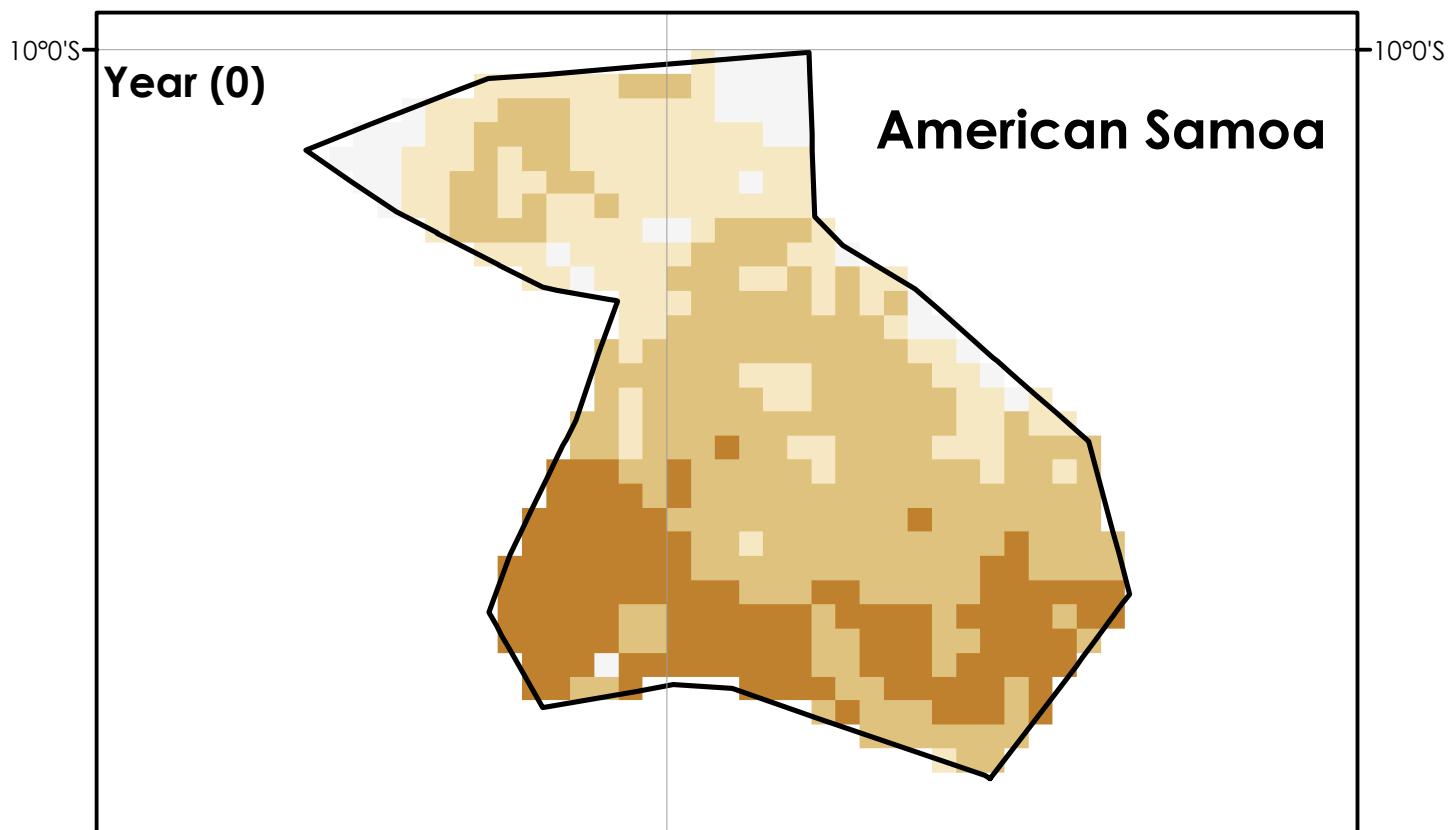


Neutral for JJA

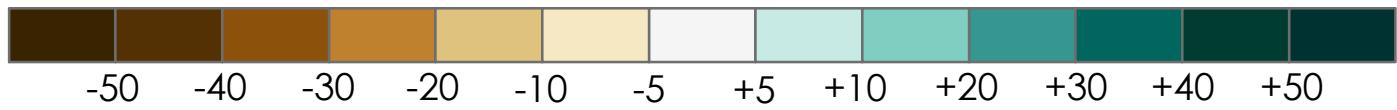


Precipitation Change (%)



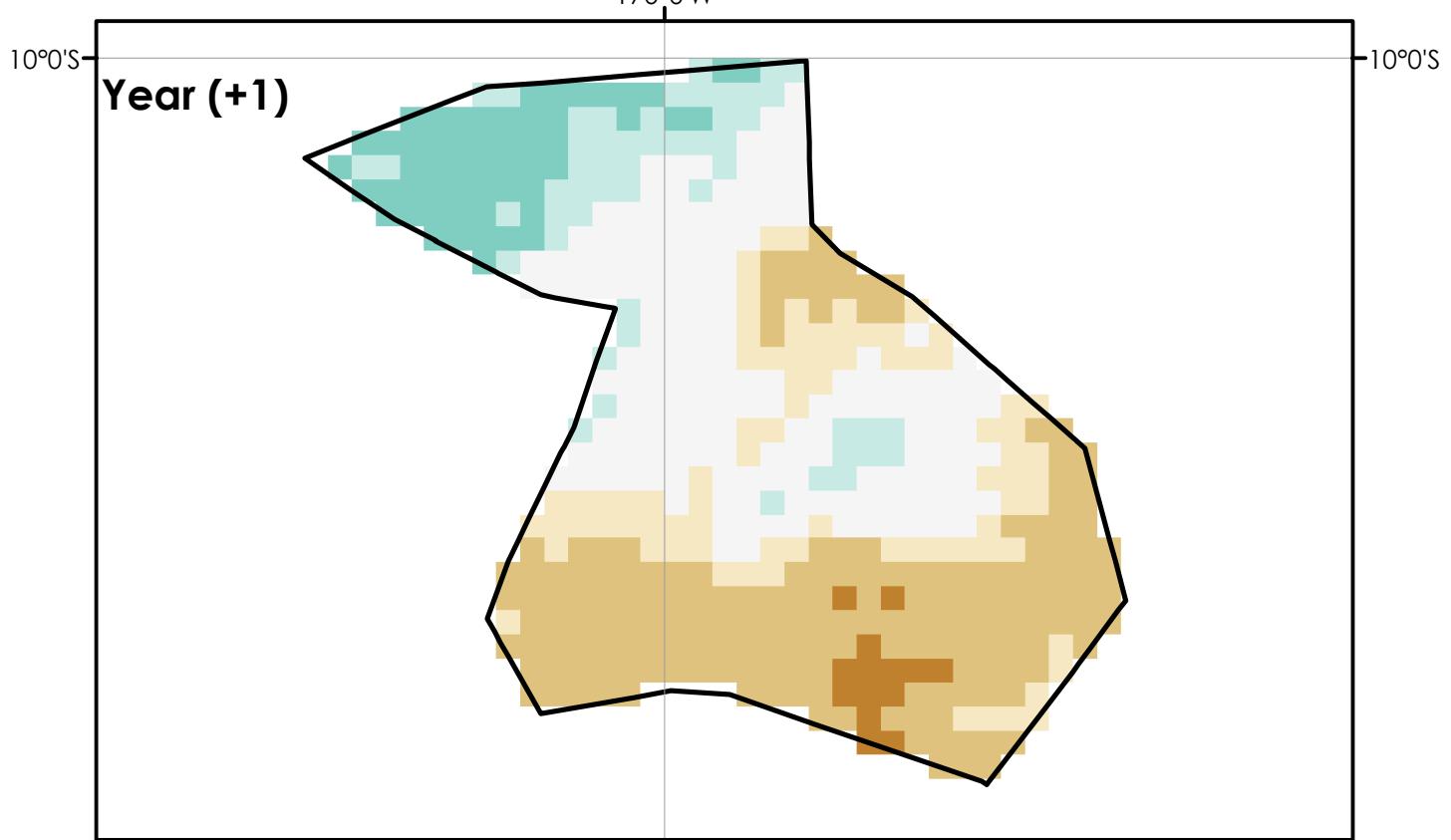
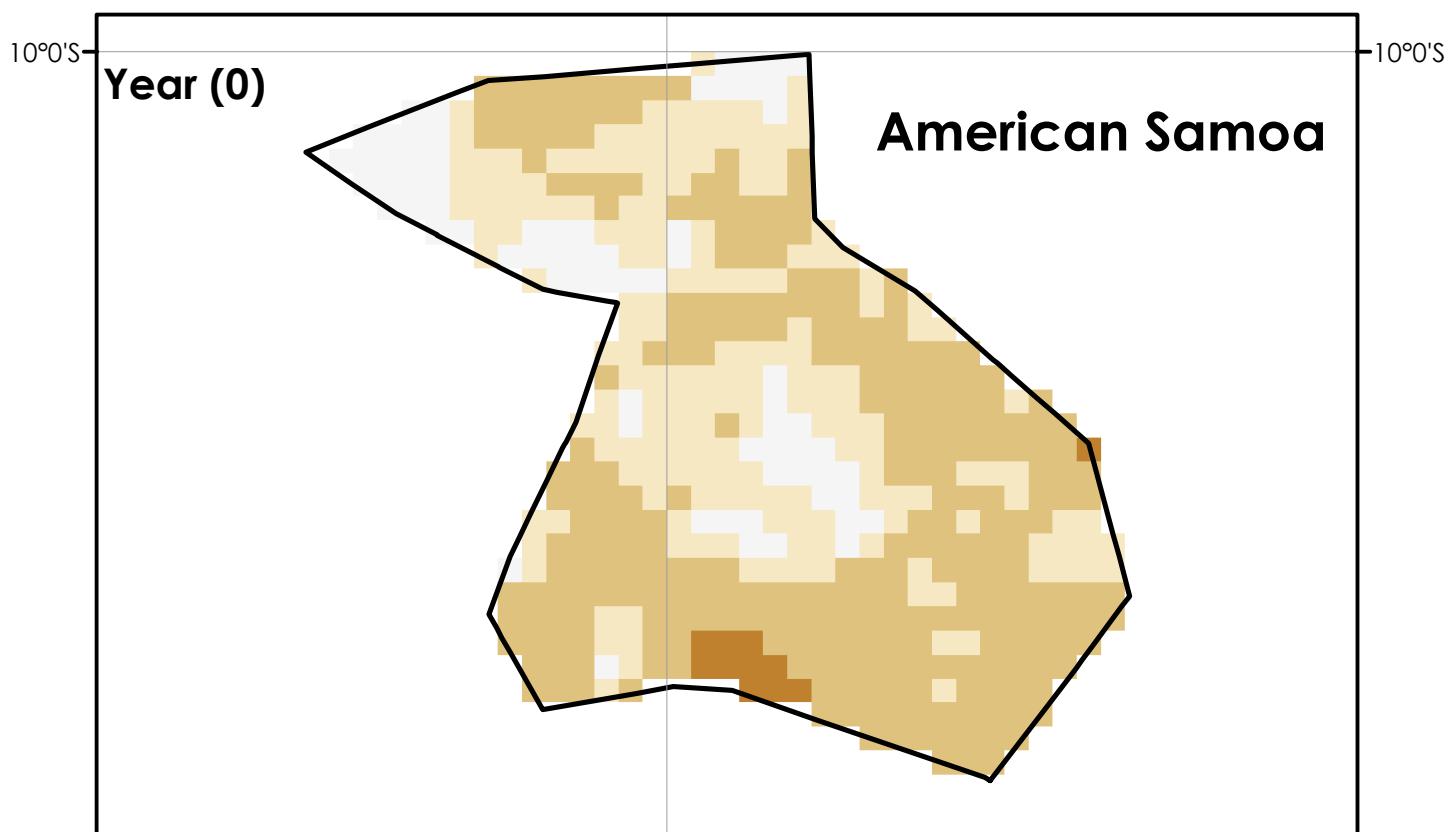


Precipitation Change (%)



Neutral for ASO

122

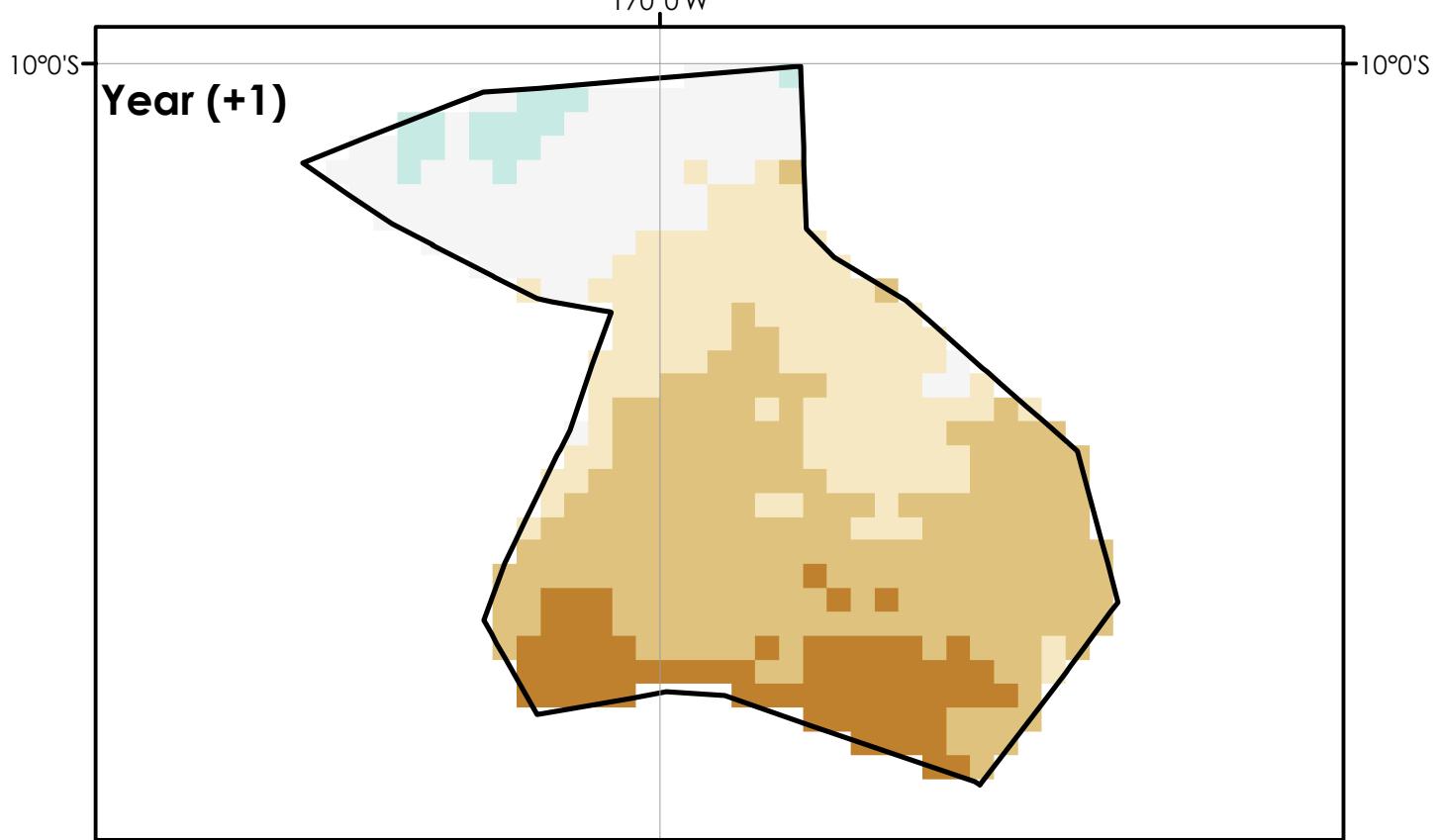
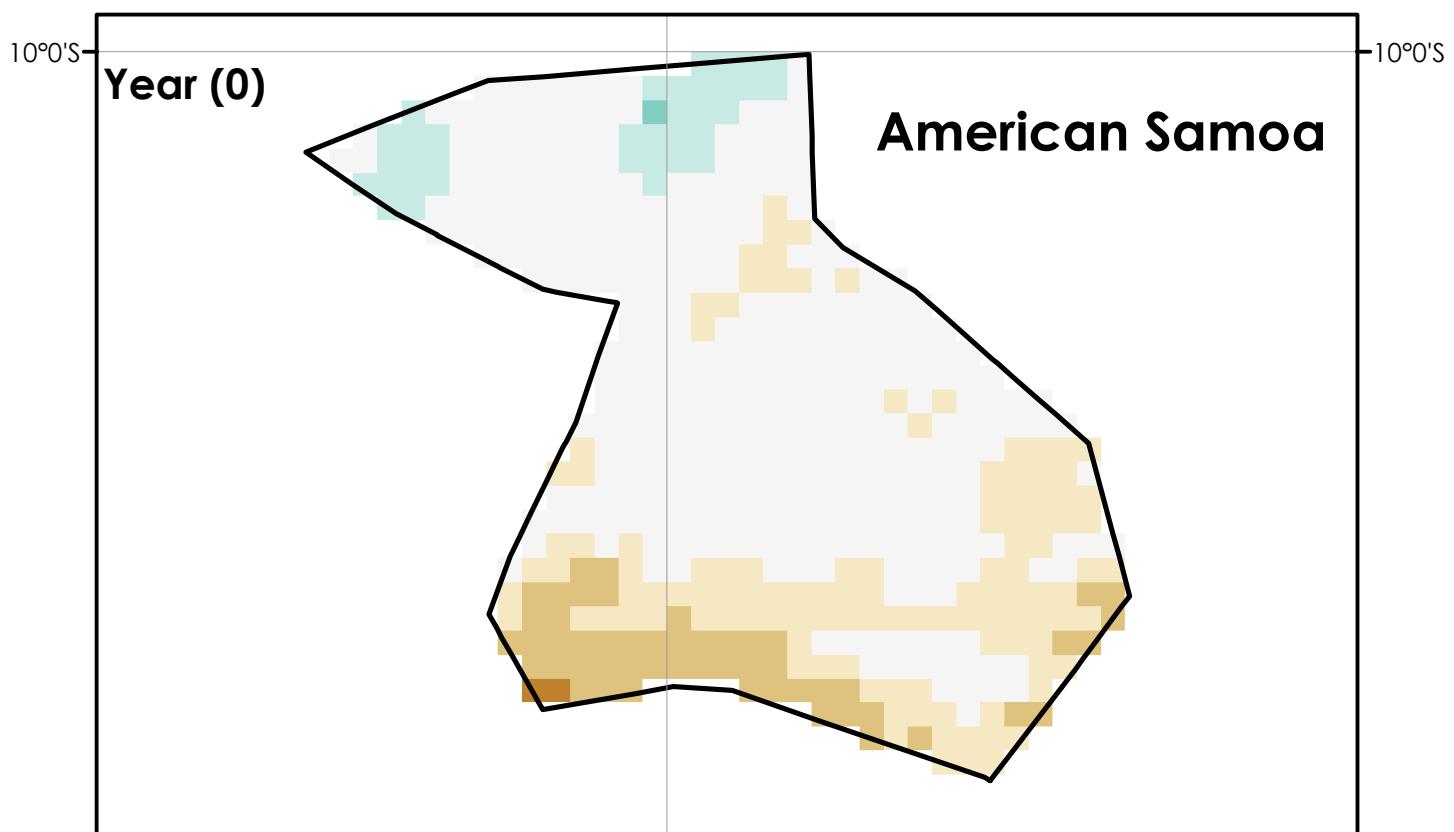


Precipitation Change (%)

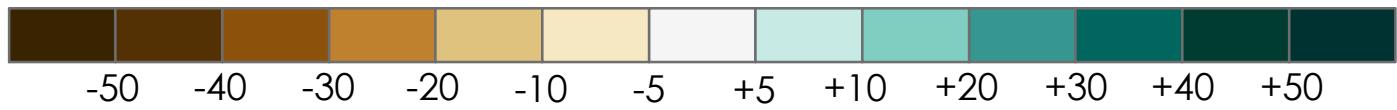


Neutral for SON

123

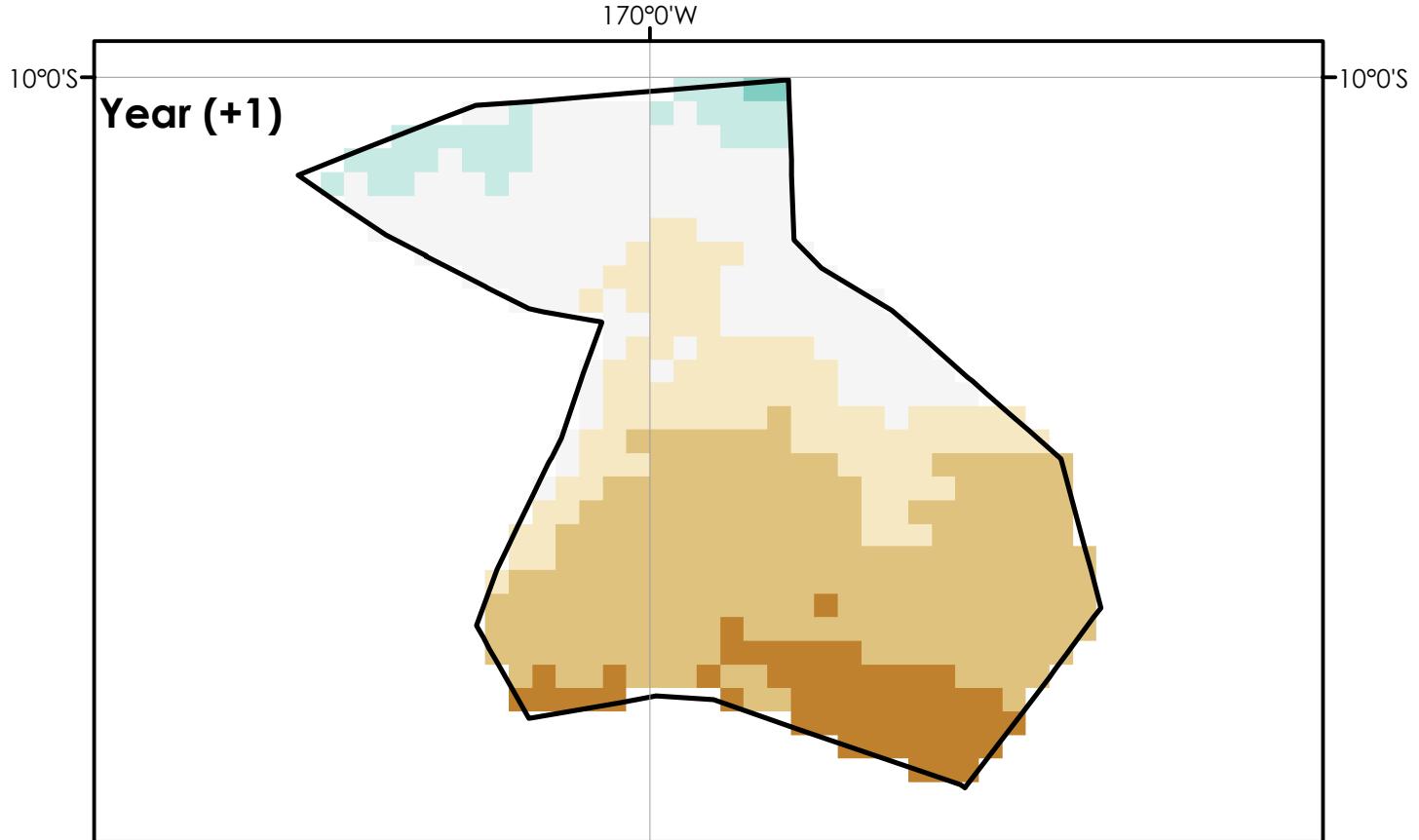
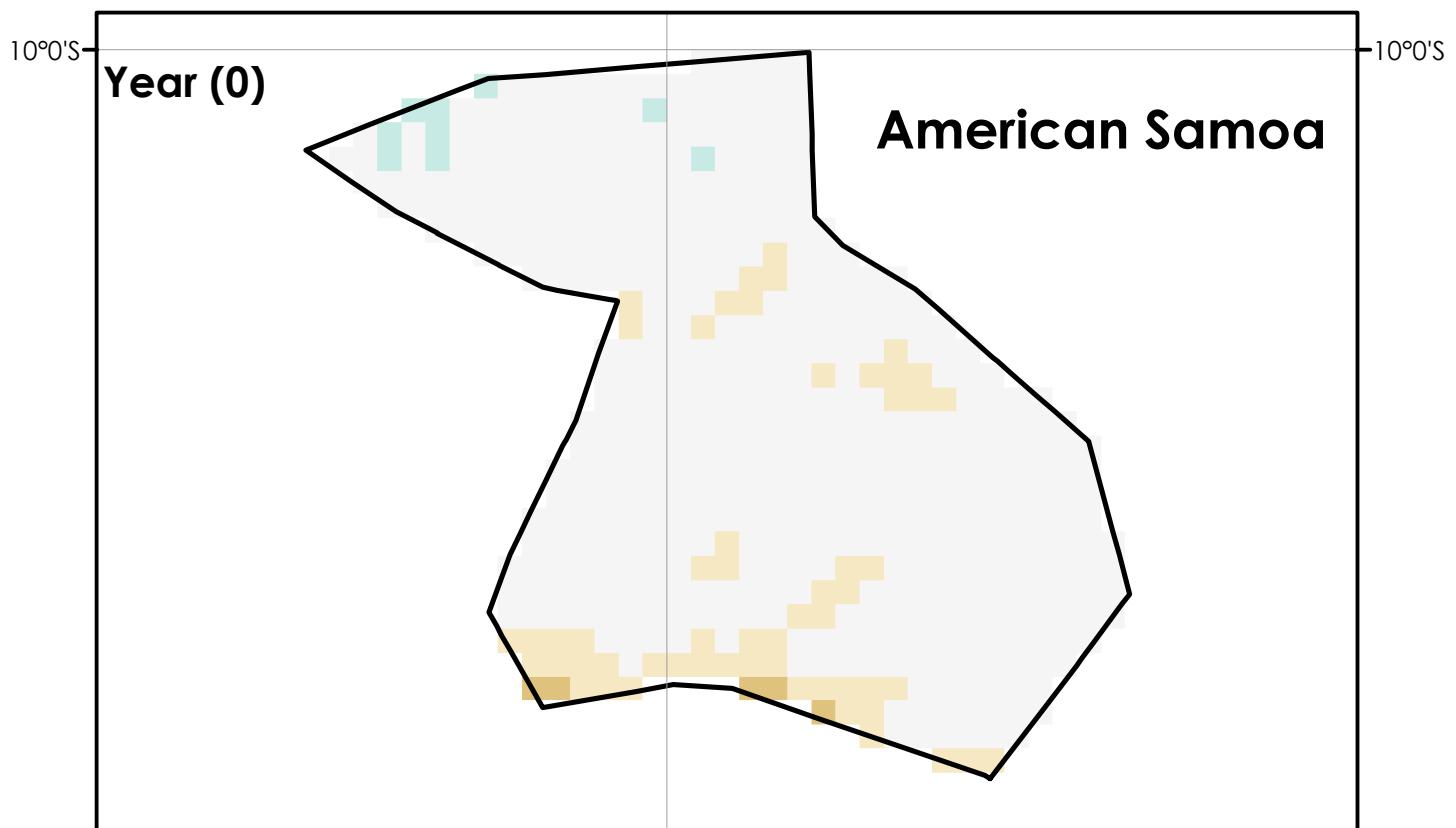


Precipitation Change (%)

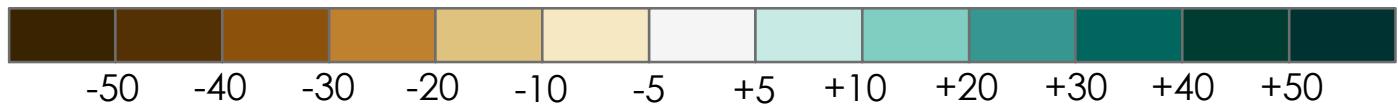


Neutral for OND

124

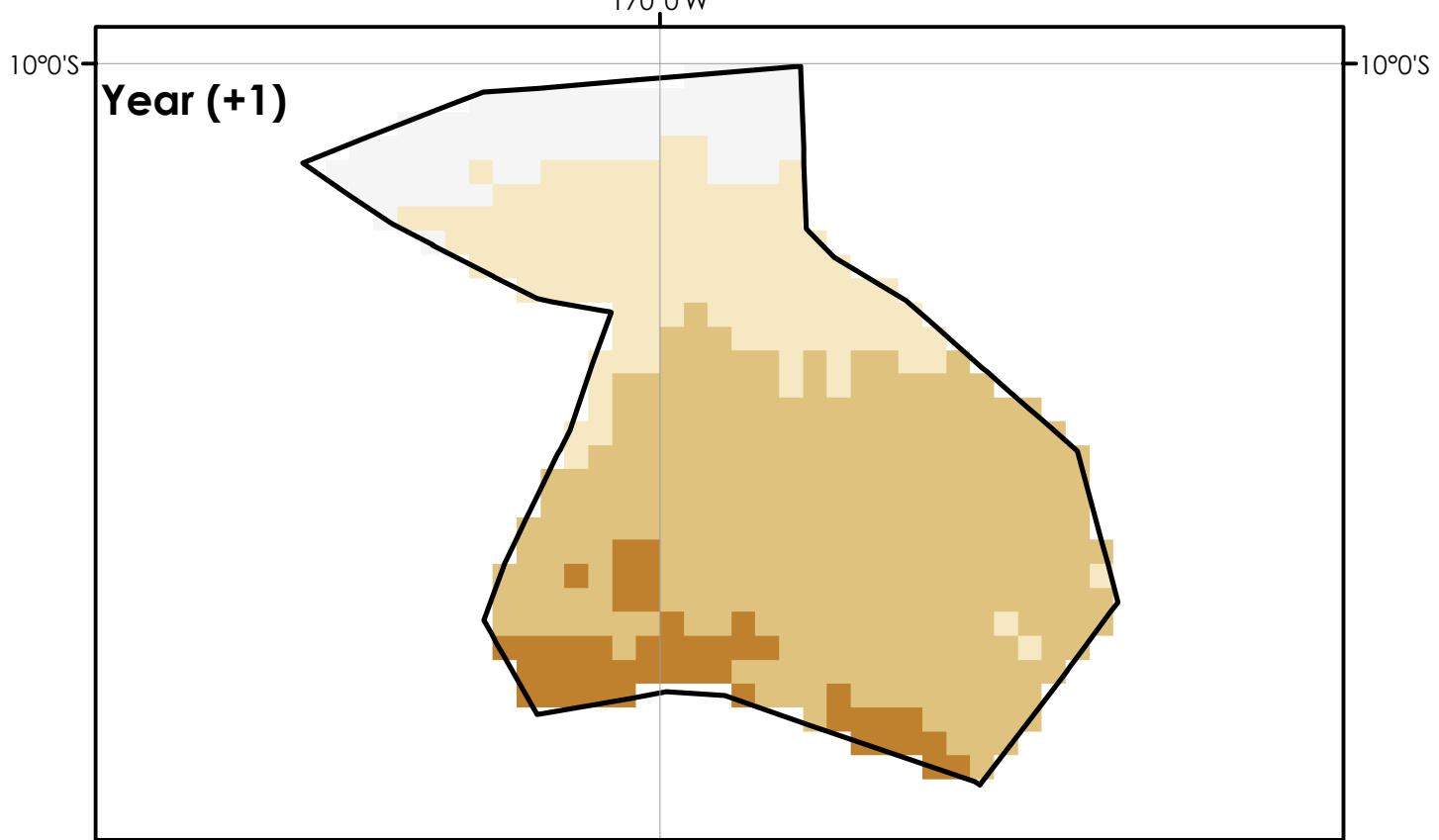
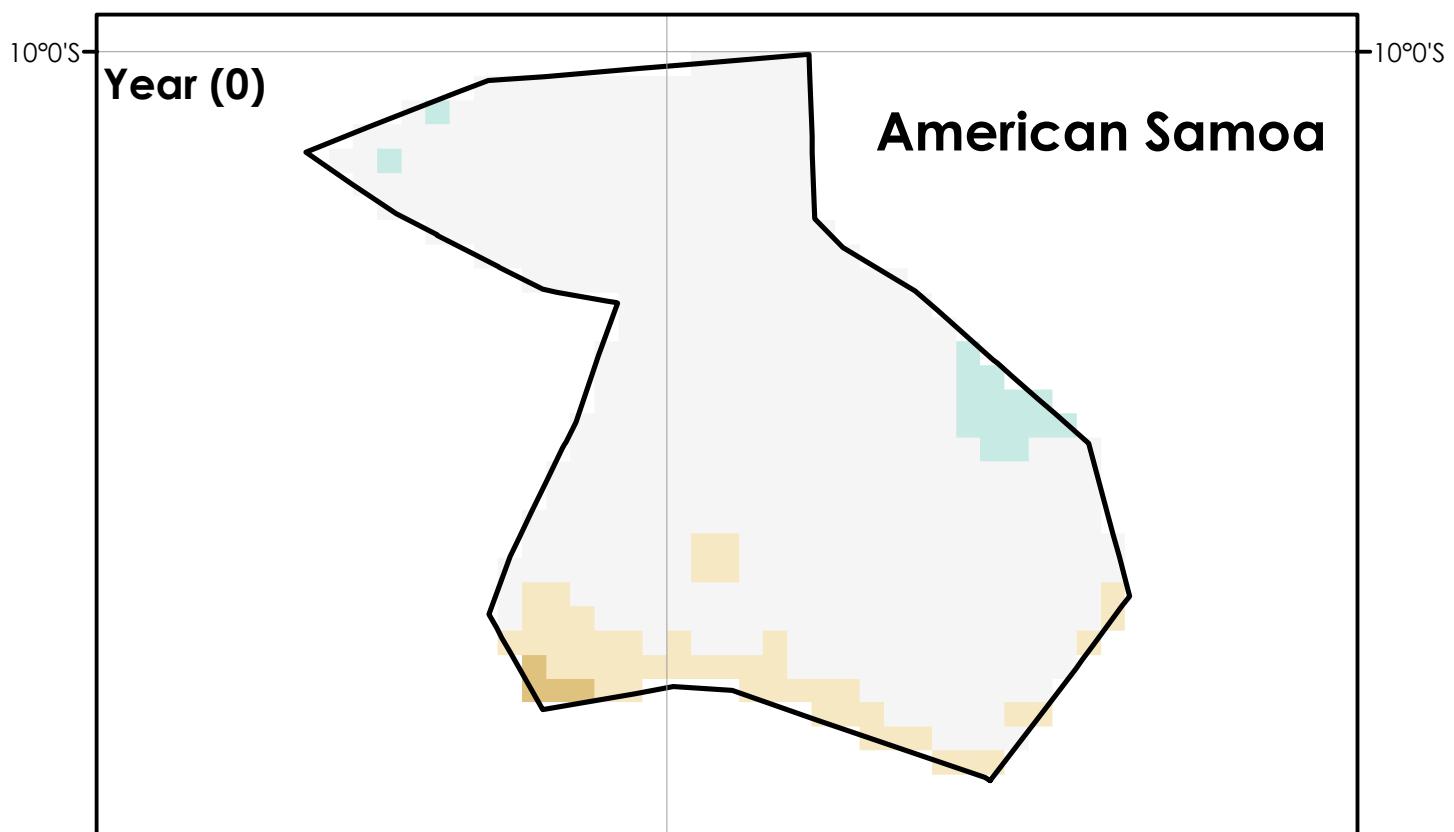


Precipitation Change (%)

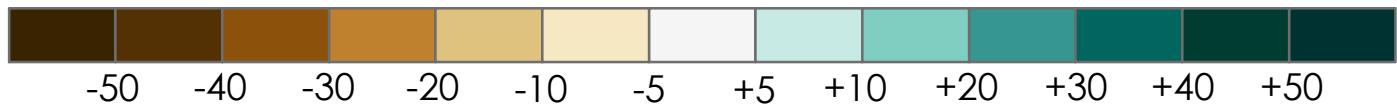


Neutral for NDJ

125

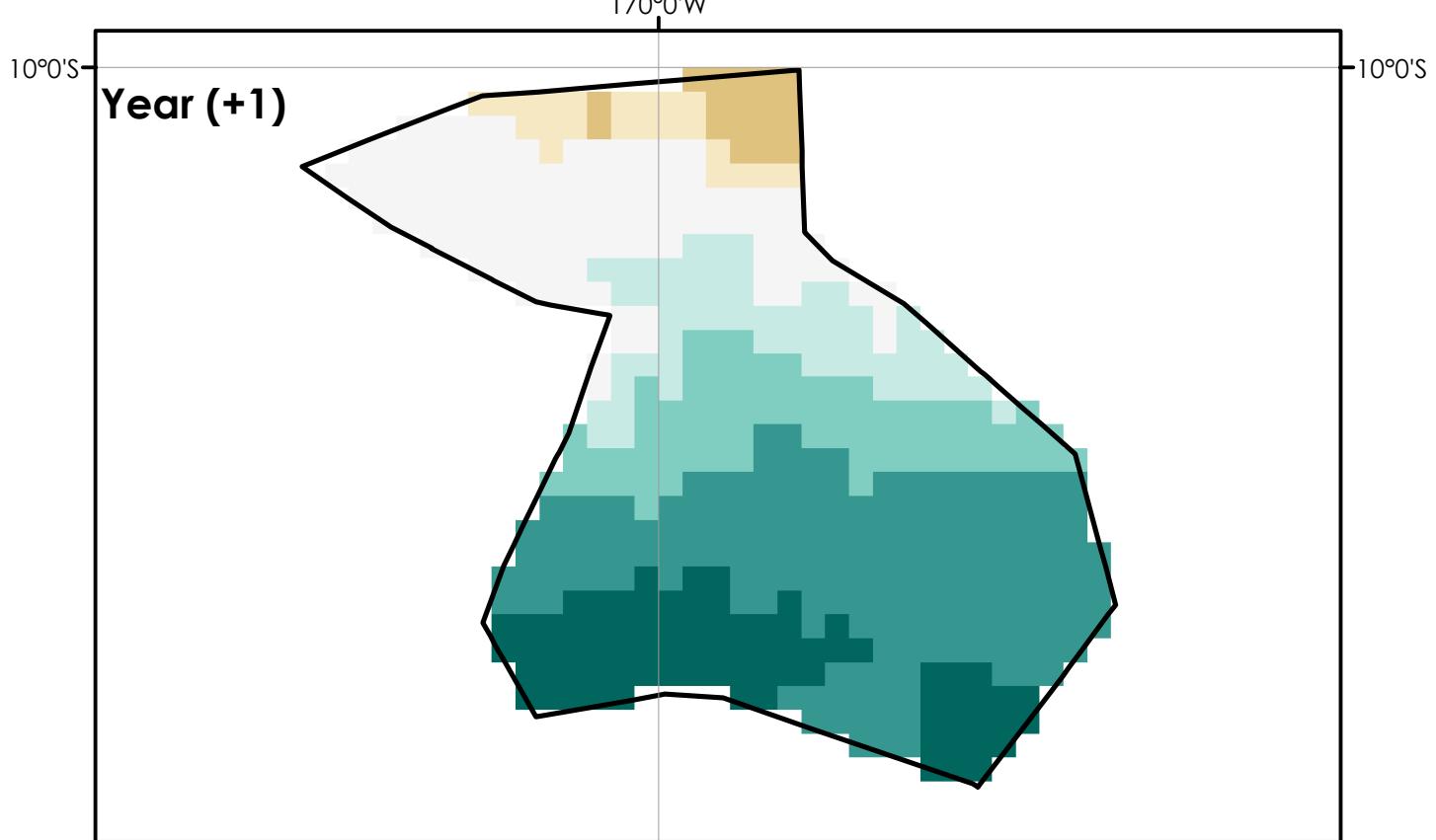
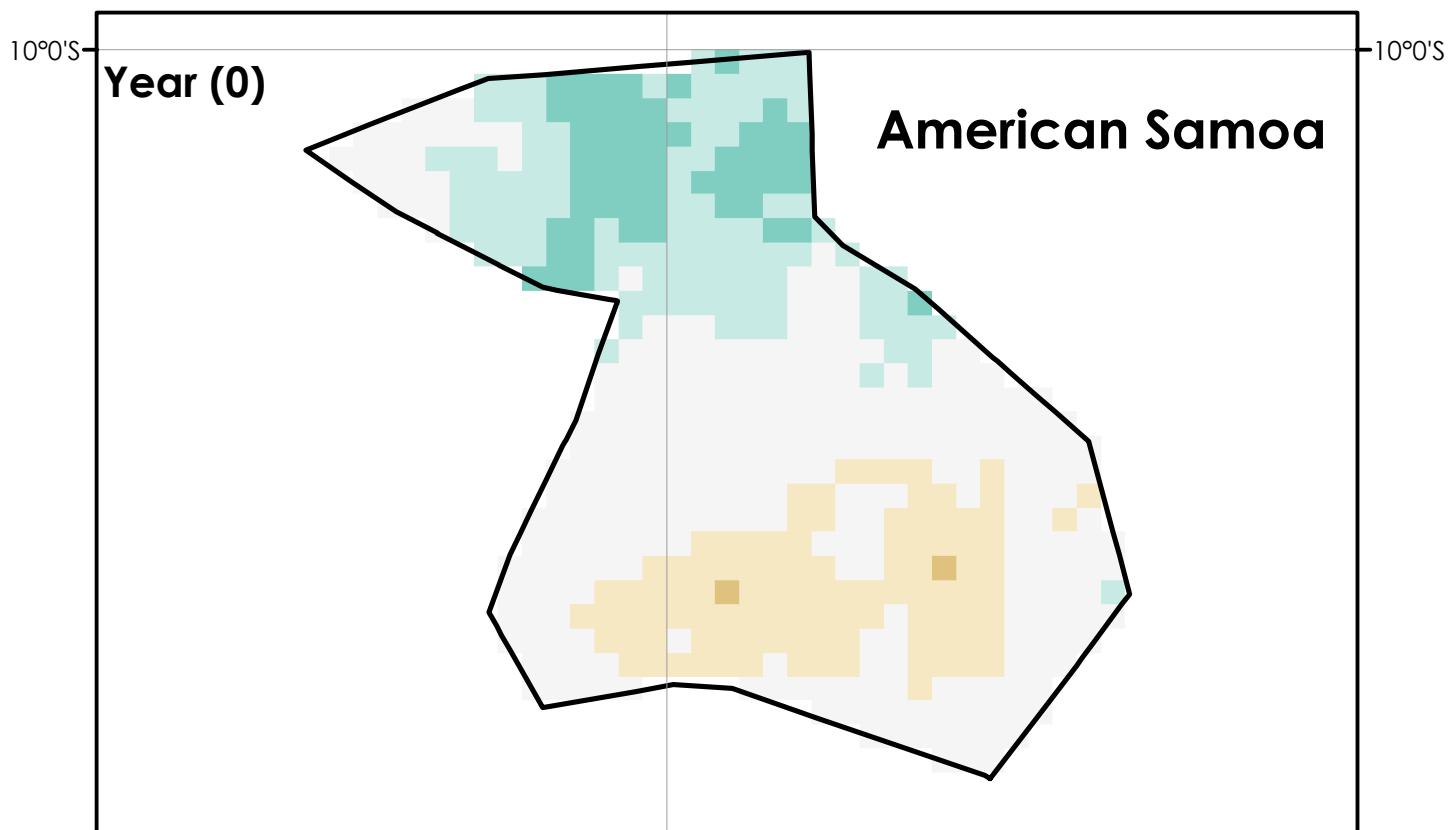


Precipitation Change (%)

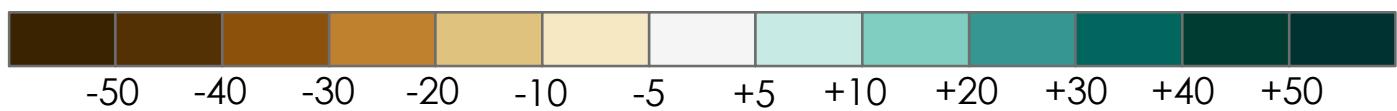


Weak La Niña for DJF

126

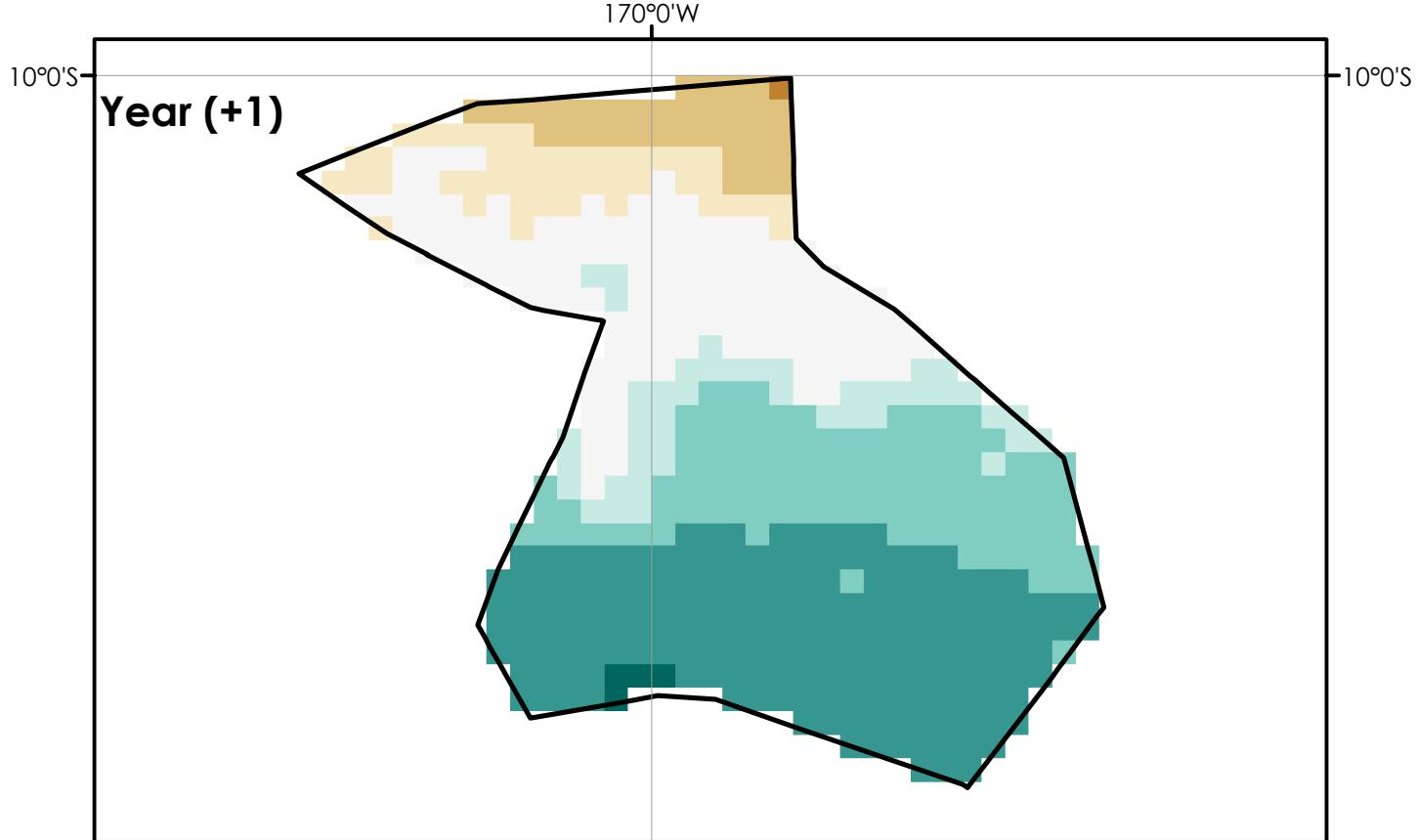
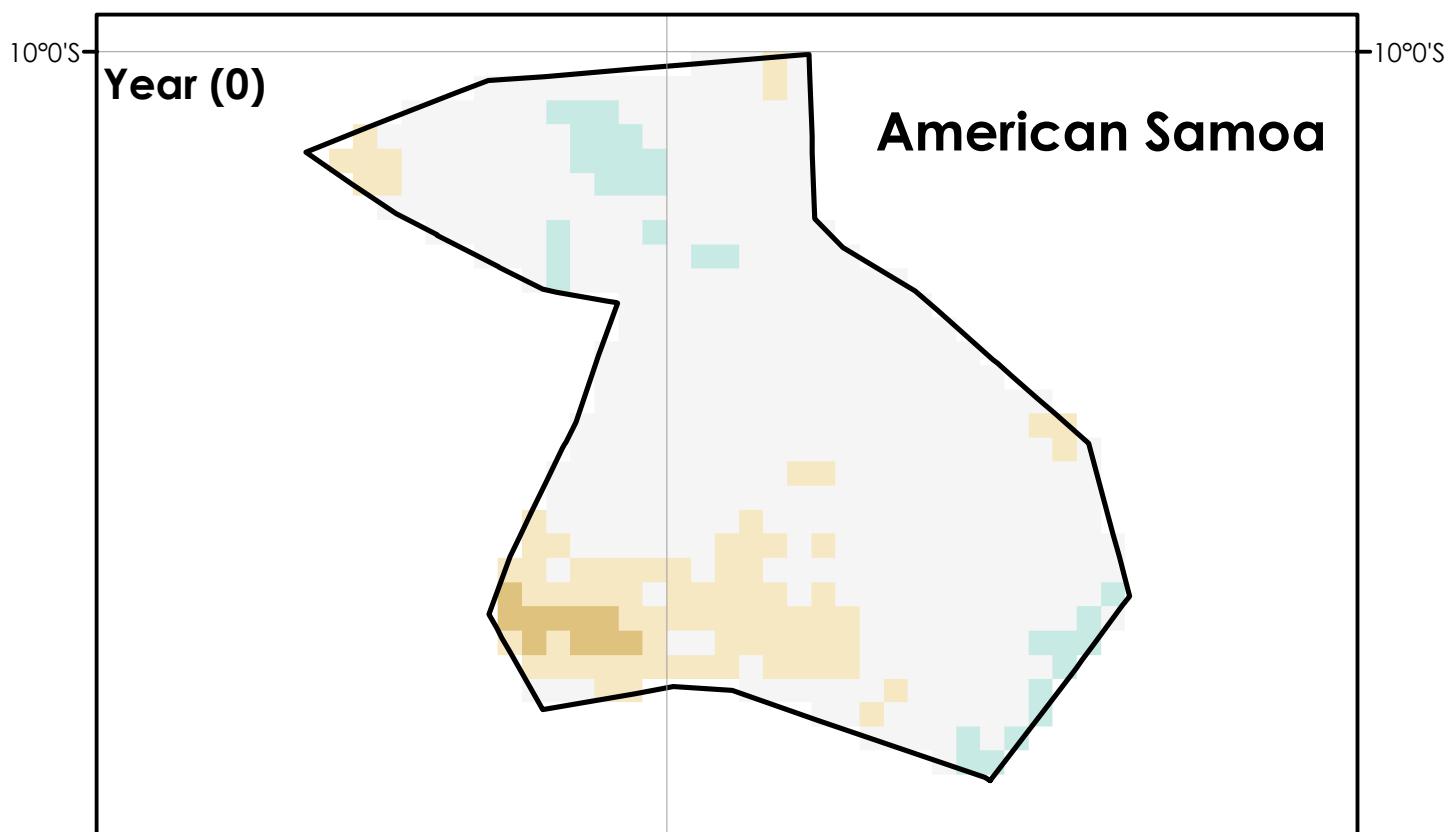


Precipitation Change (%)

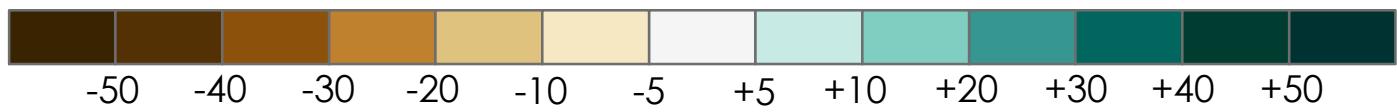


Weak La Niña for JFM

127

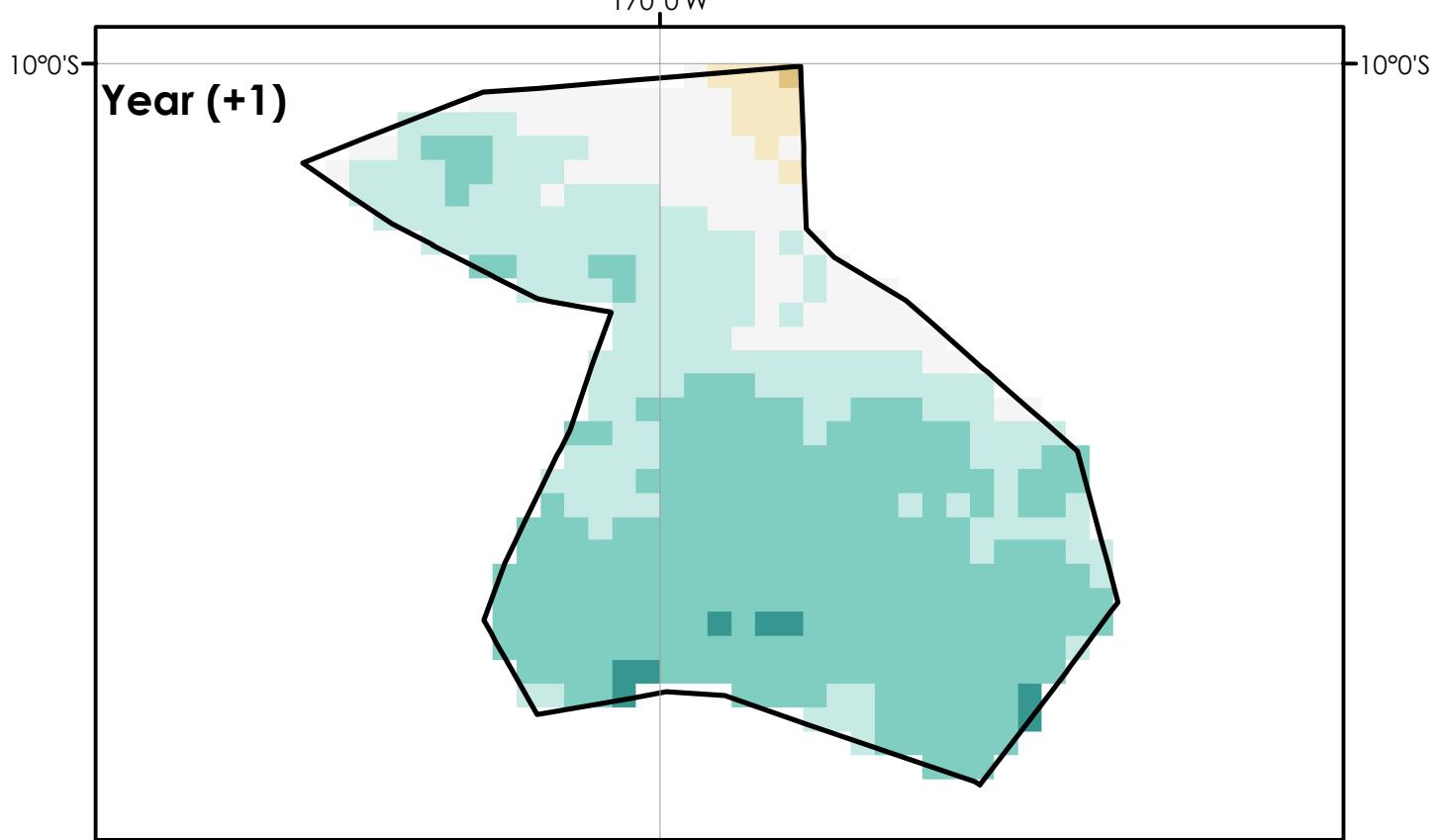
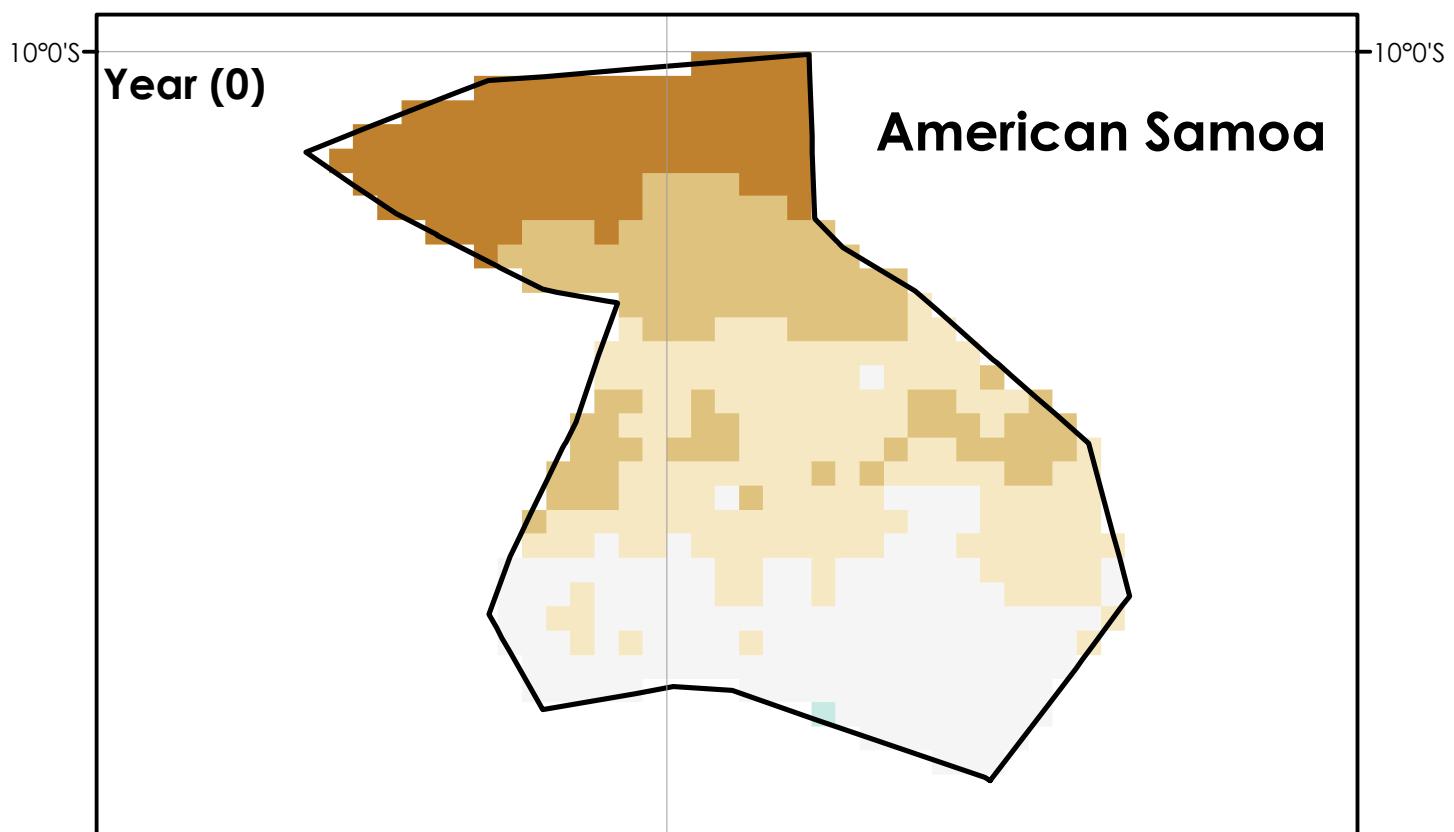


Precipitation Change (%)

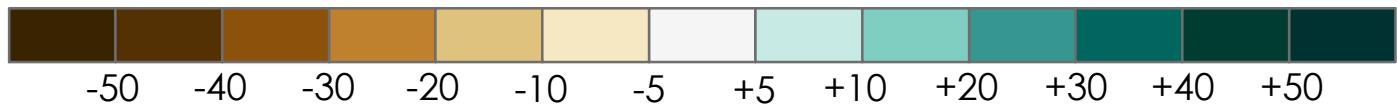


Weak La Niña for FMA

128

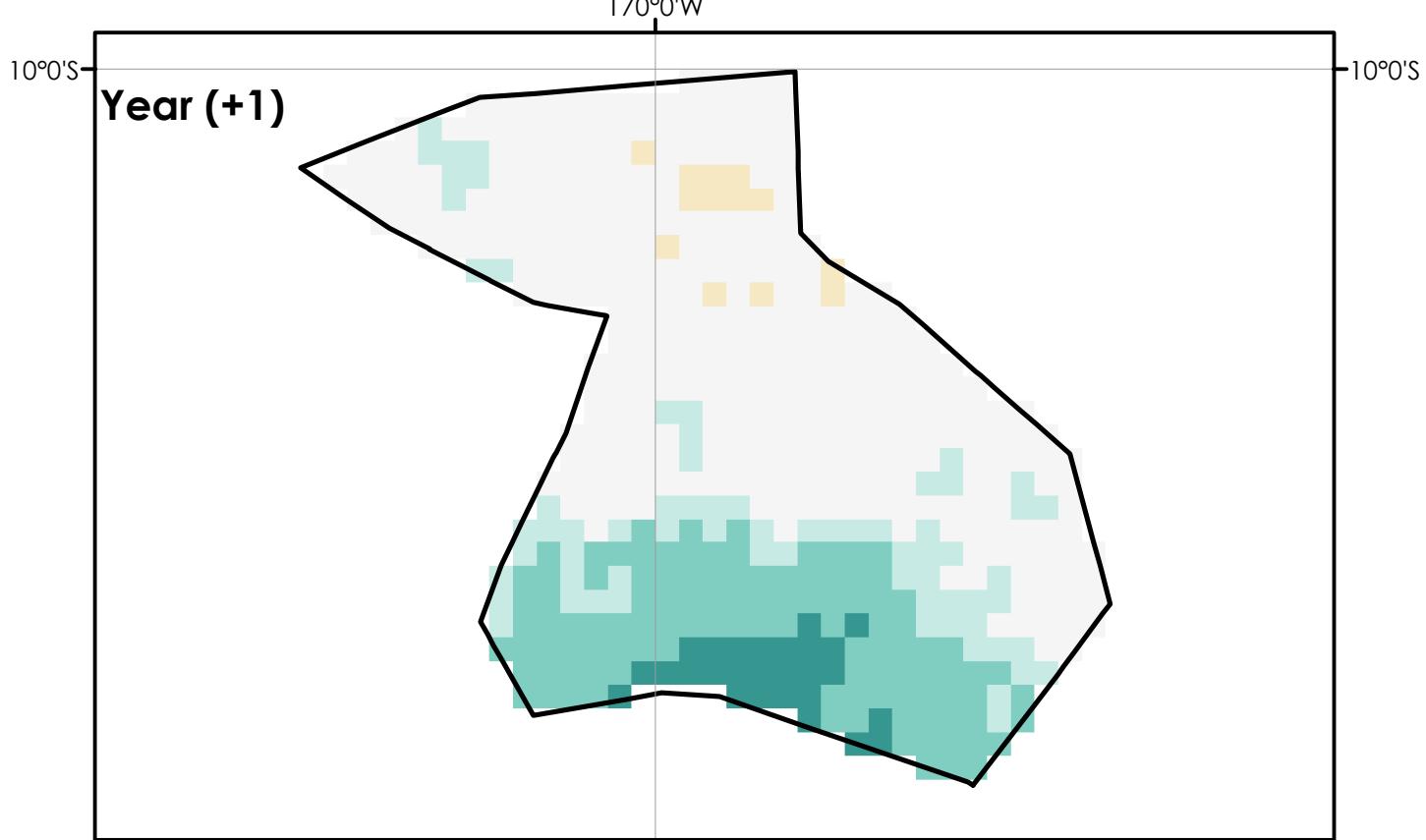
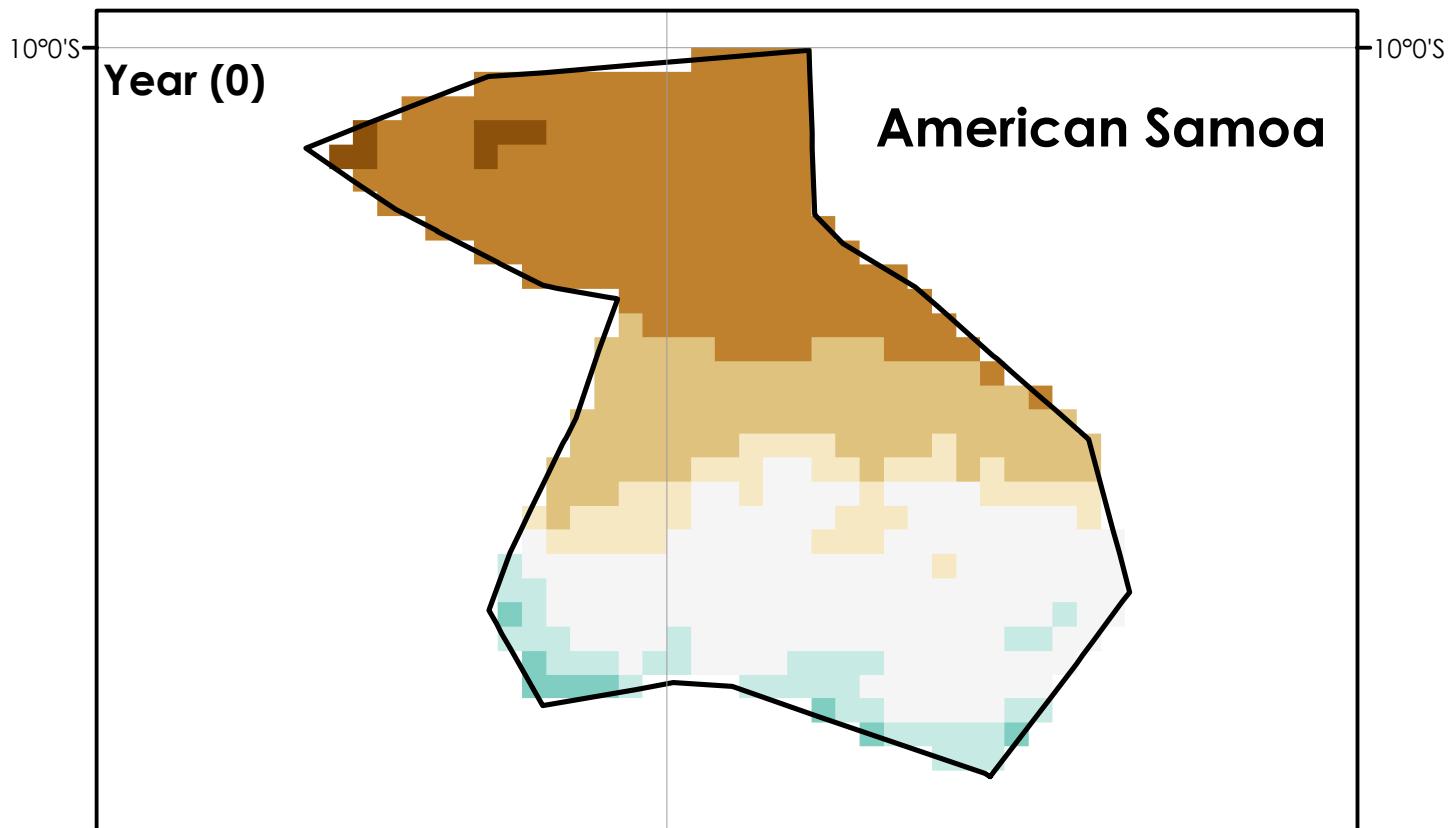


Precipitation Change (%)

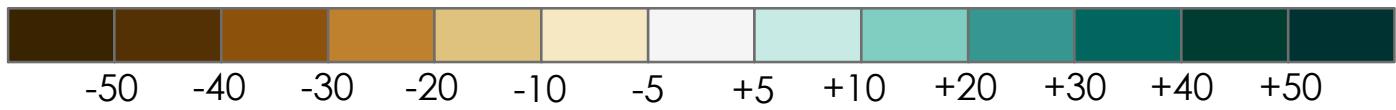


Weak La Niña for MAM

129

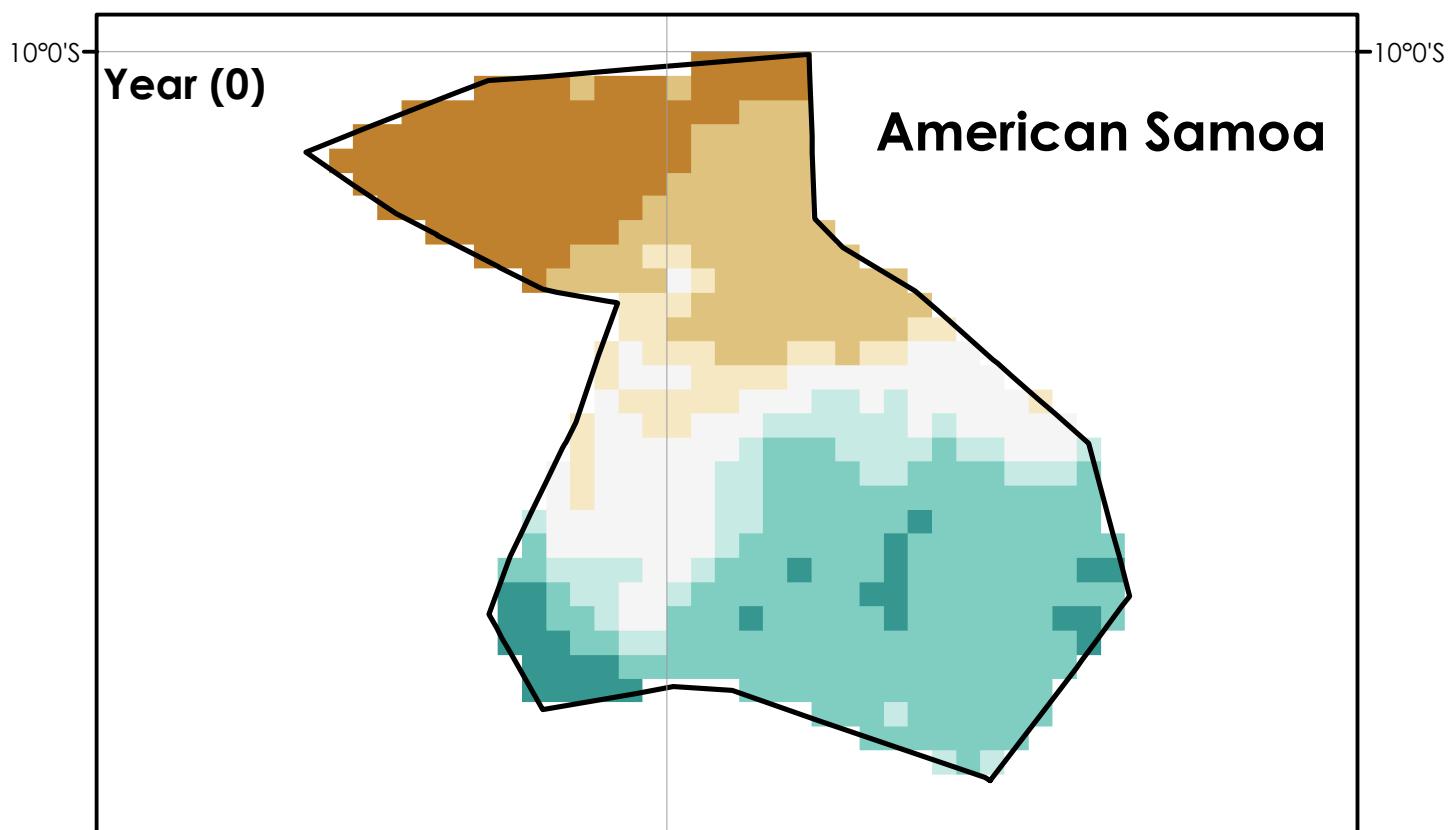


Precipitation Change (%)

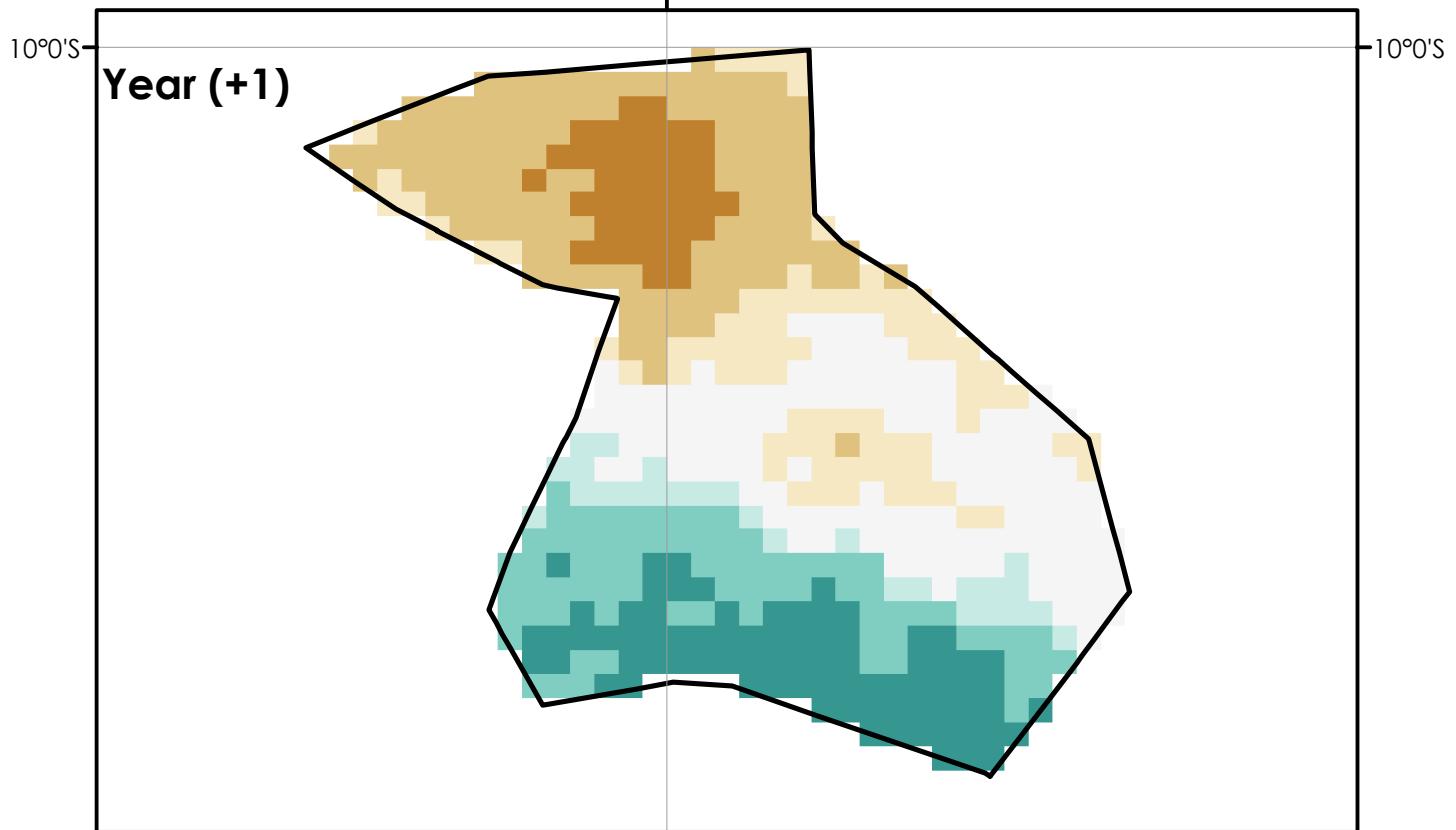


Weak La Niña for AMJ

130



170°0'W

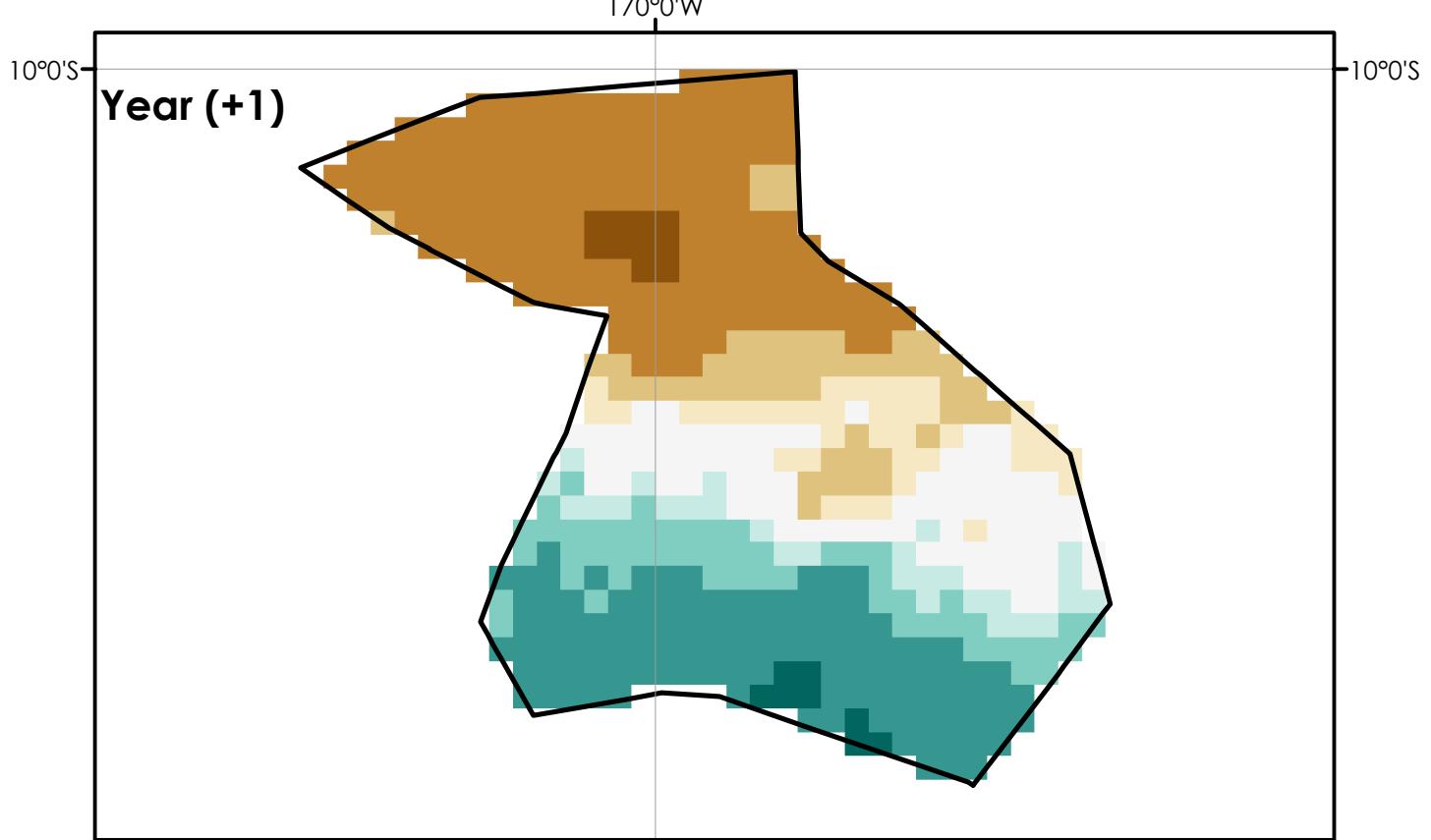
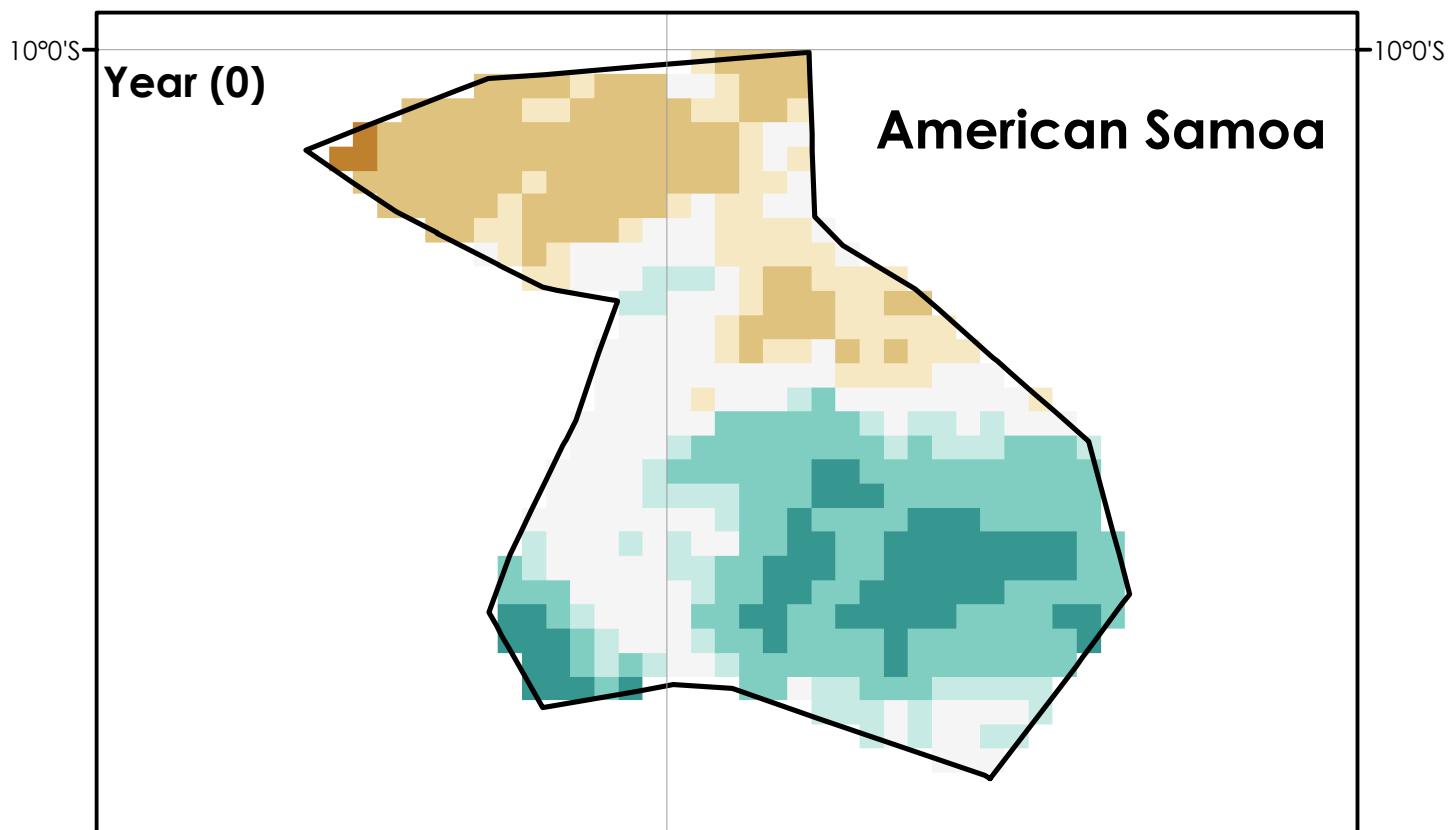


Precipitation Change (%)



Weak La Niña for MJJ

131

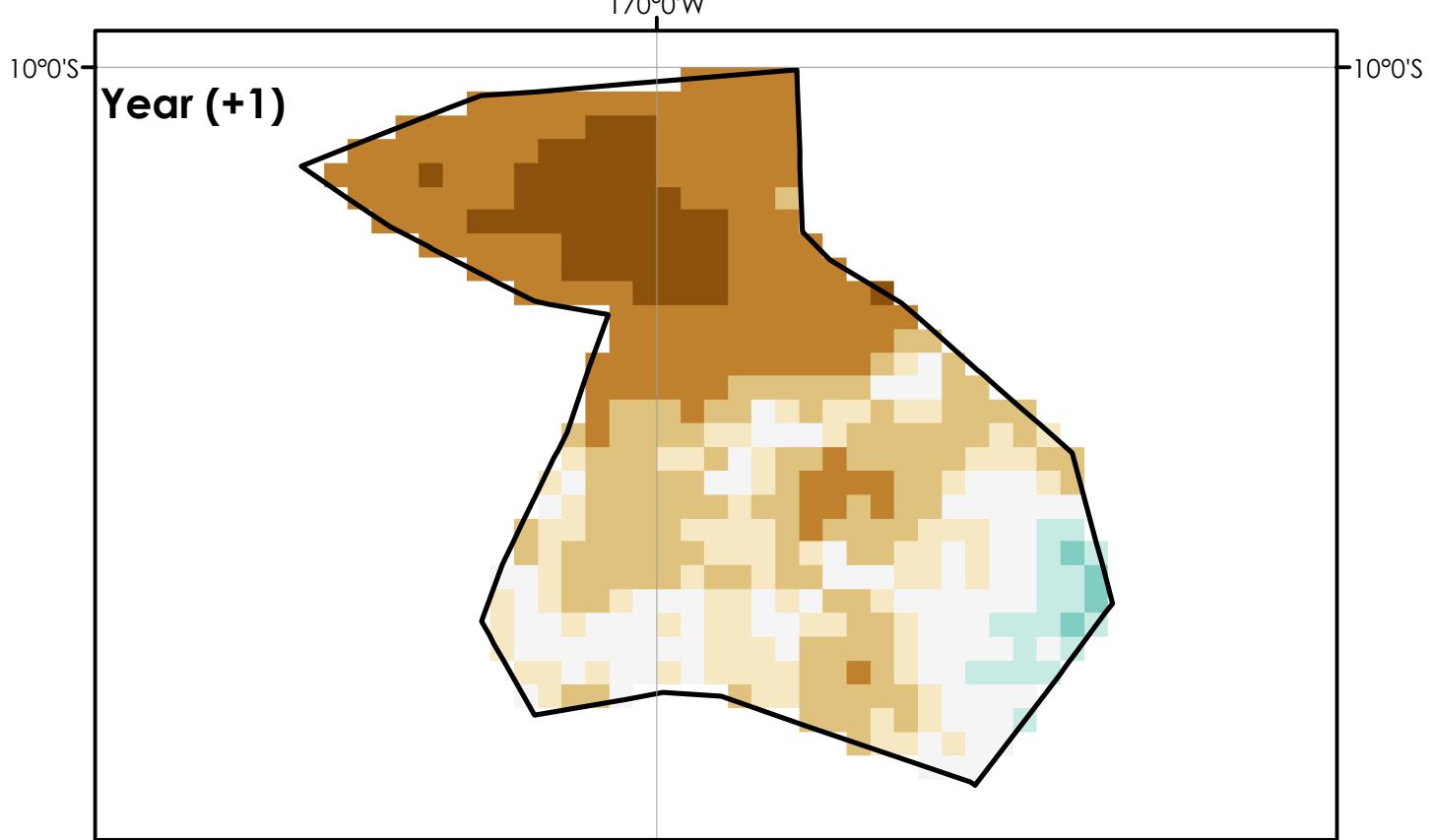
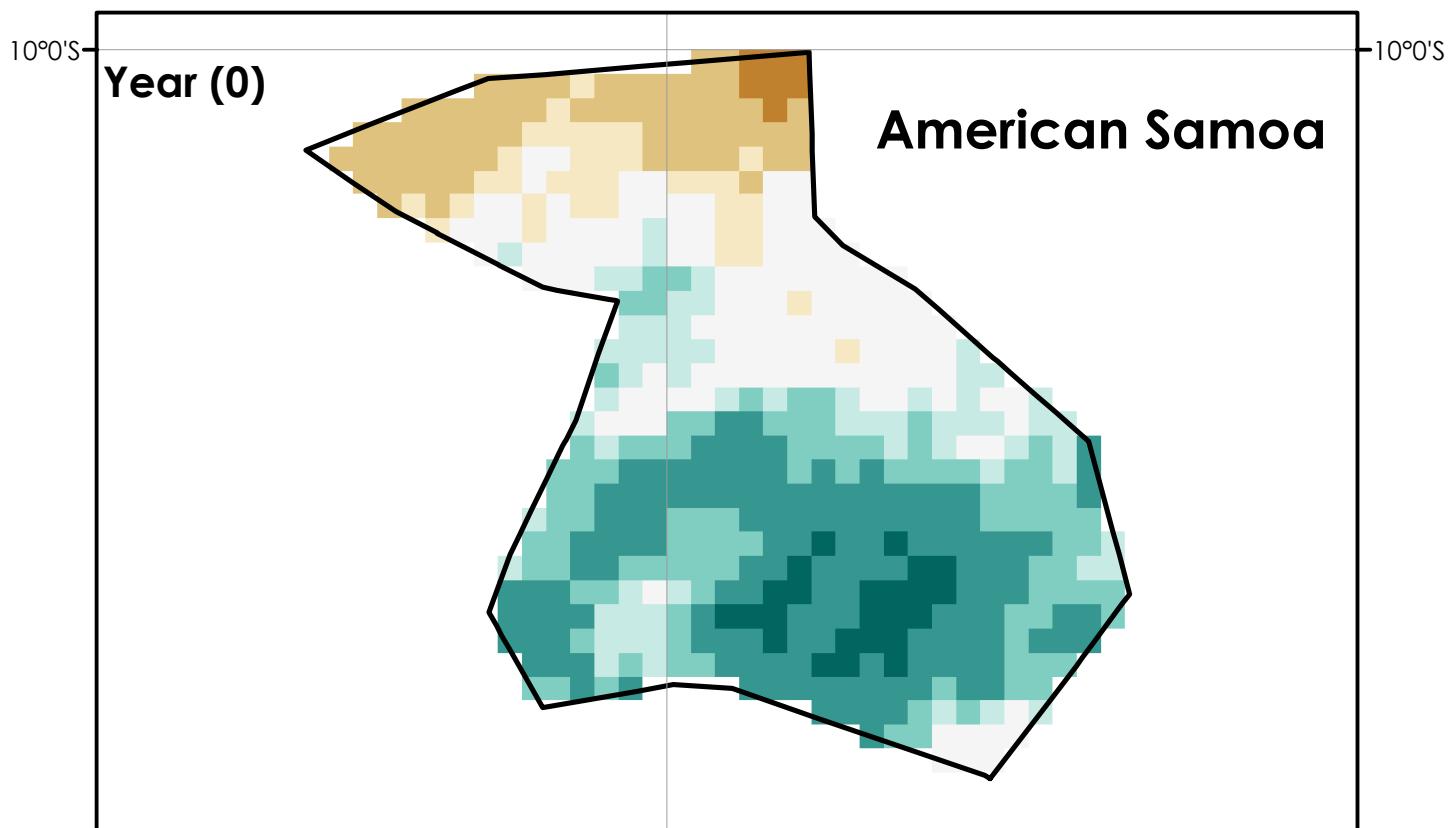


Precipitation Change (%)

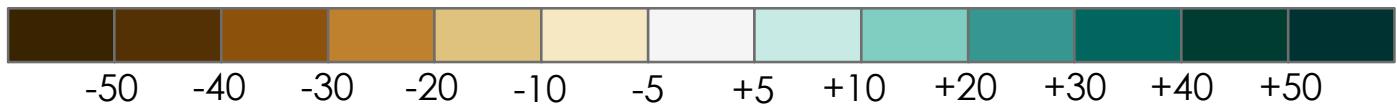


Weak La Niña for JJA

132

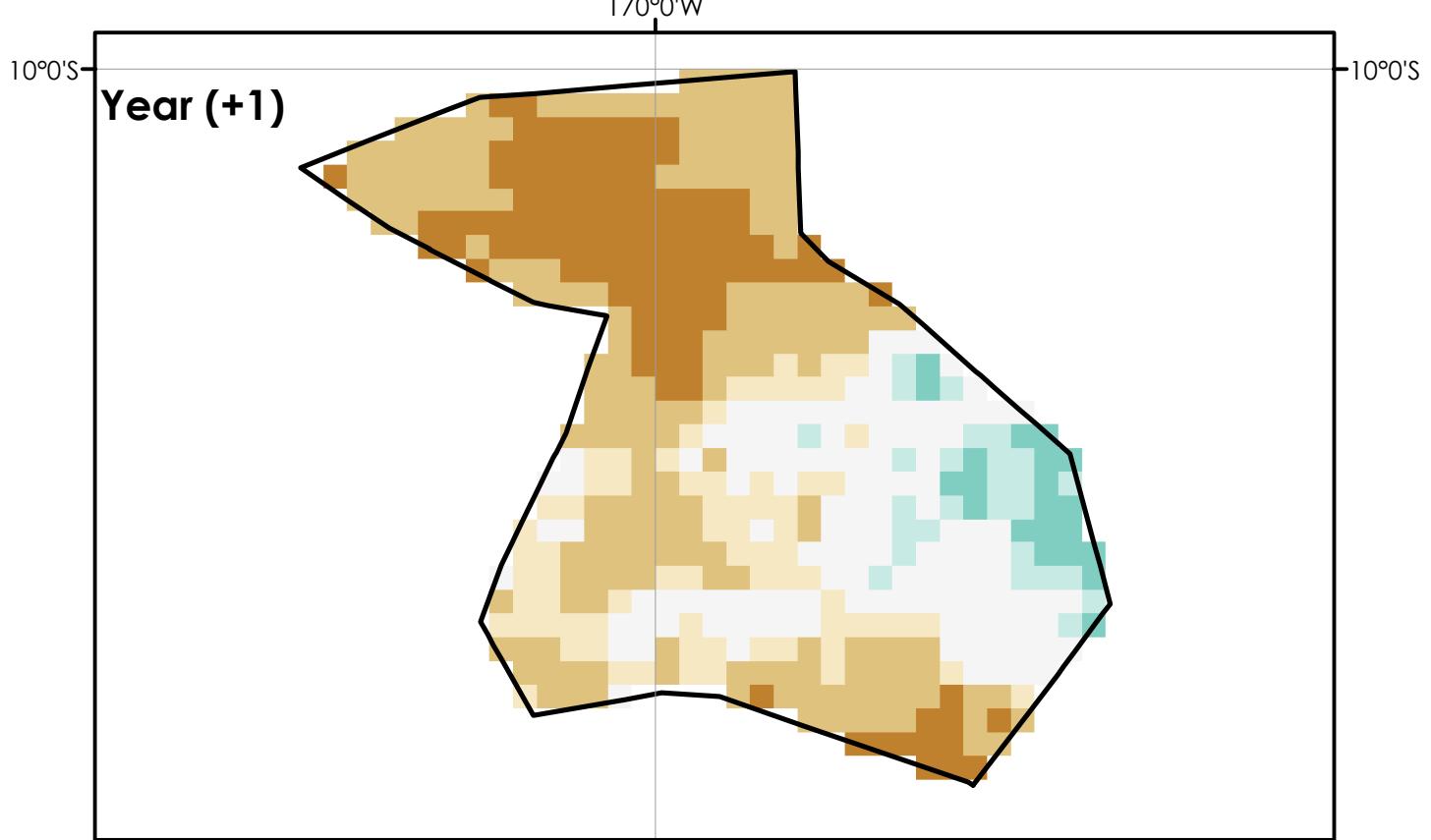
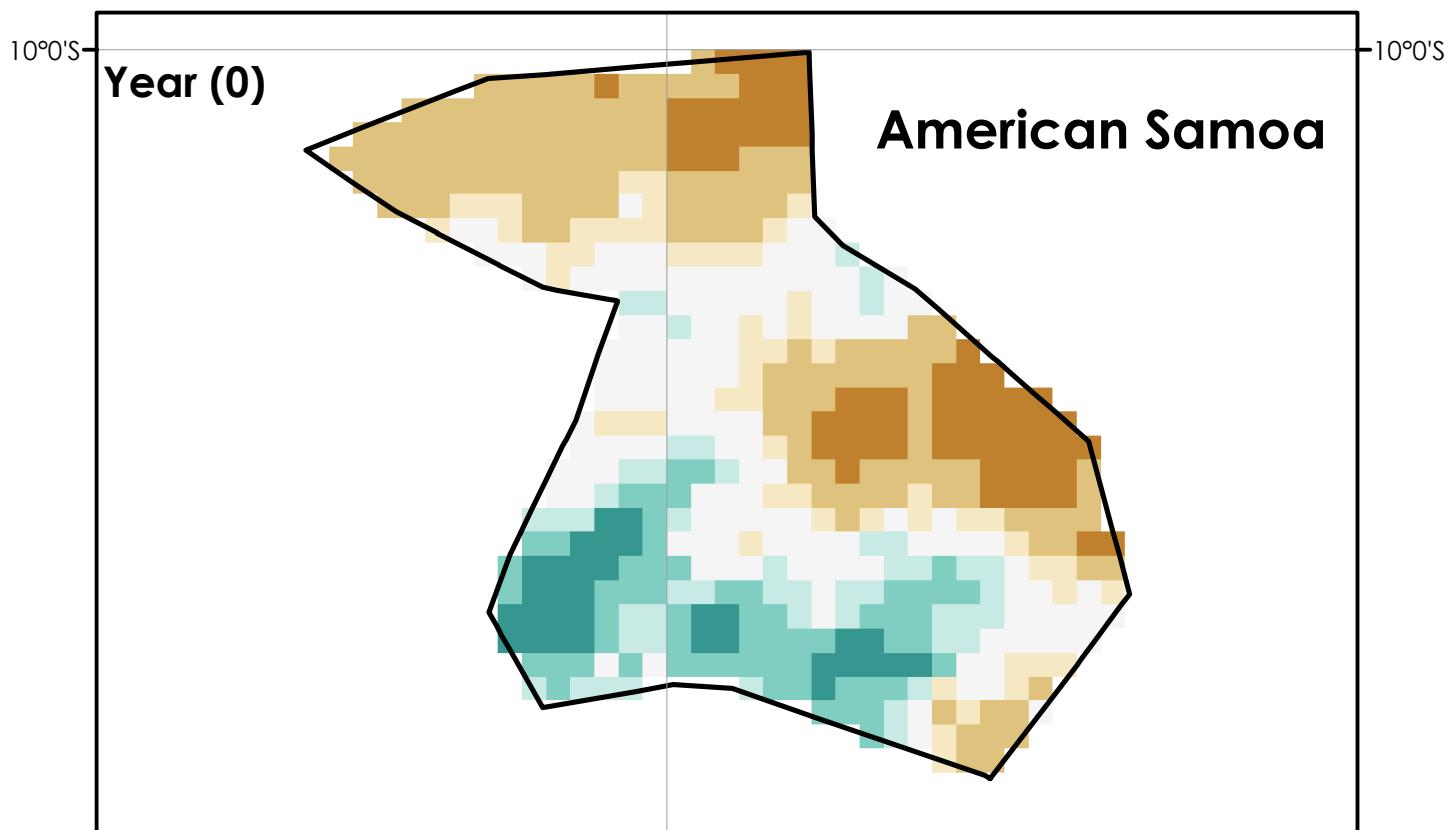


Precipitation Change (%)



Weak La Niña for JAS

133

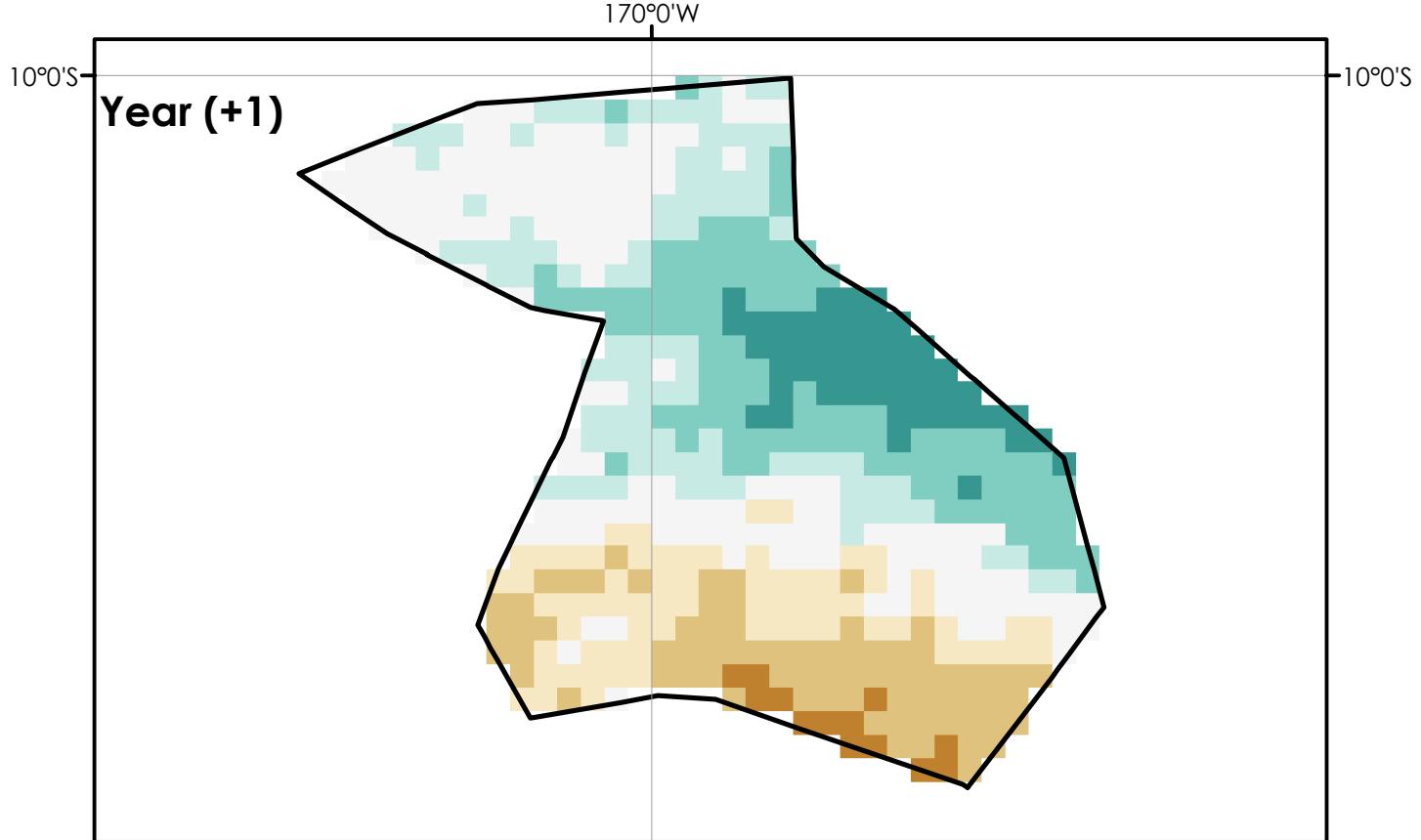
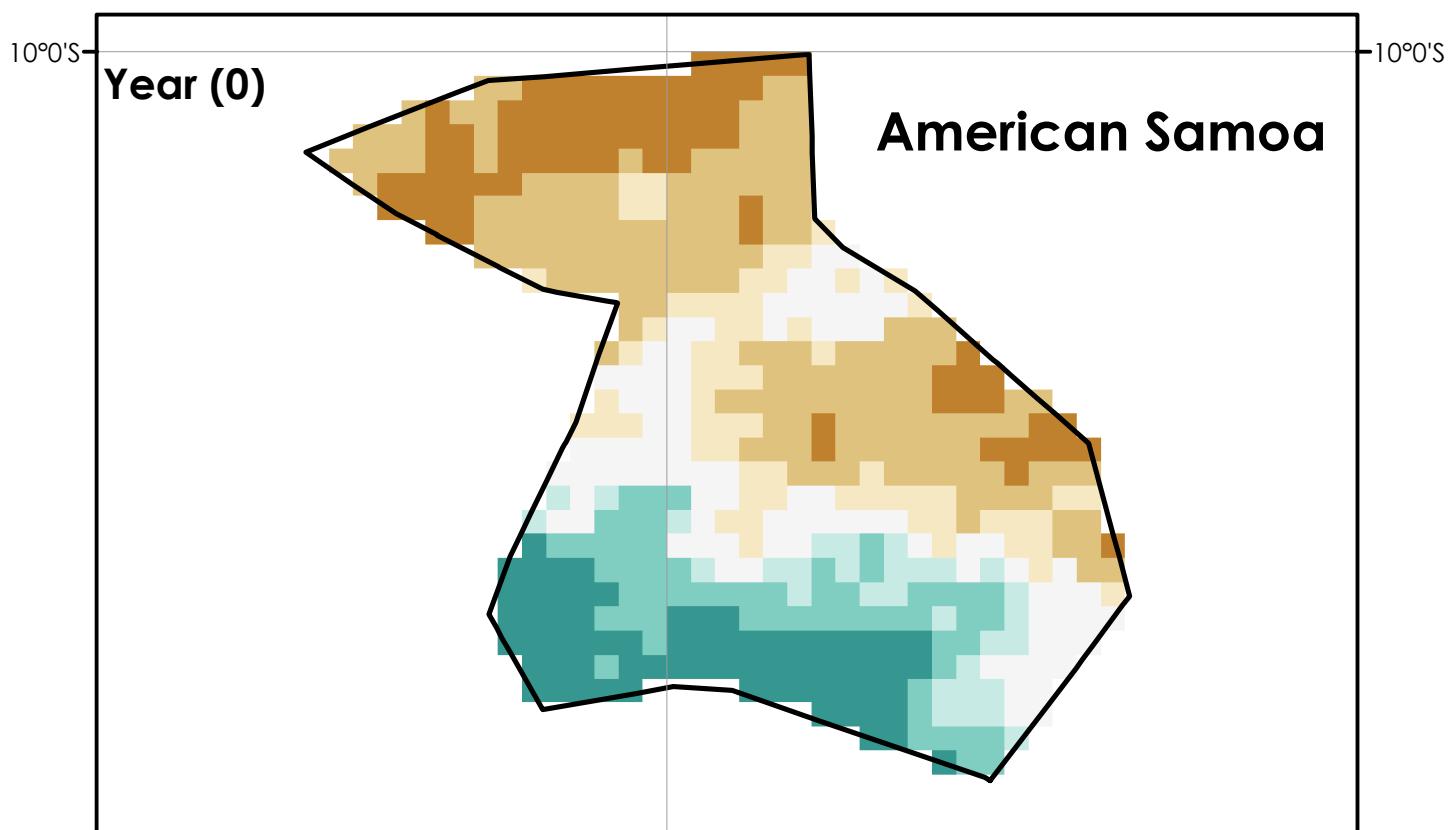


Precipitation Change (%)

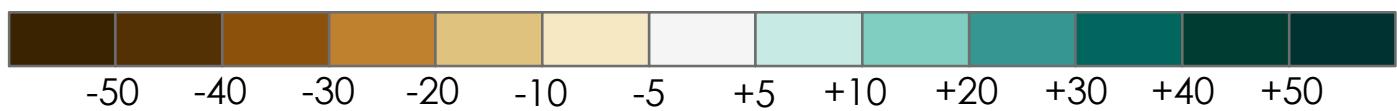


Weak La Niña for ASO

134

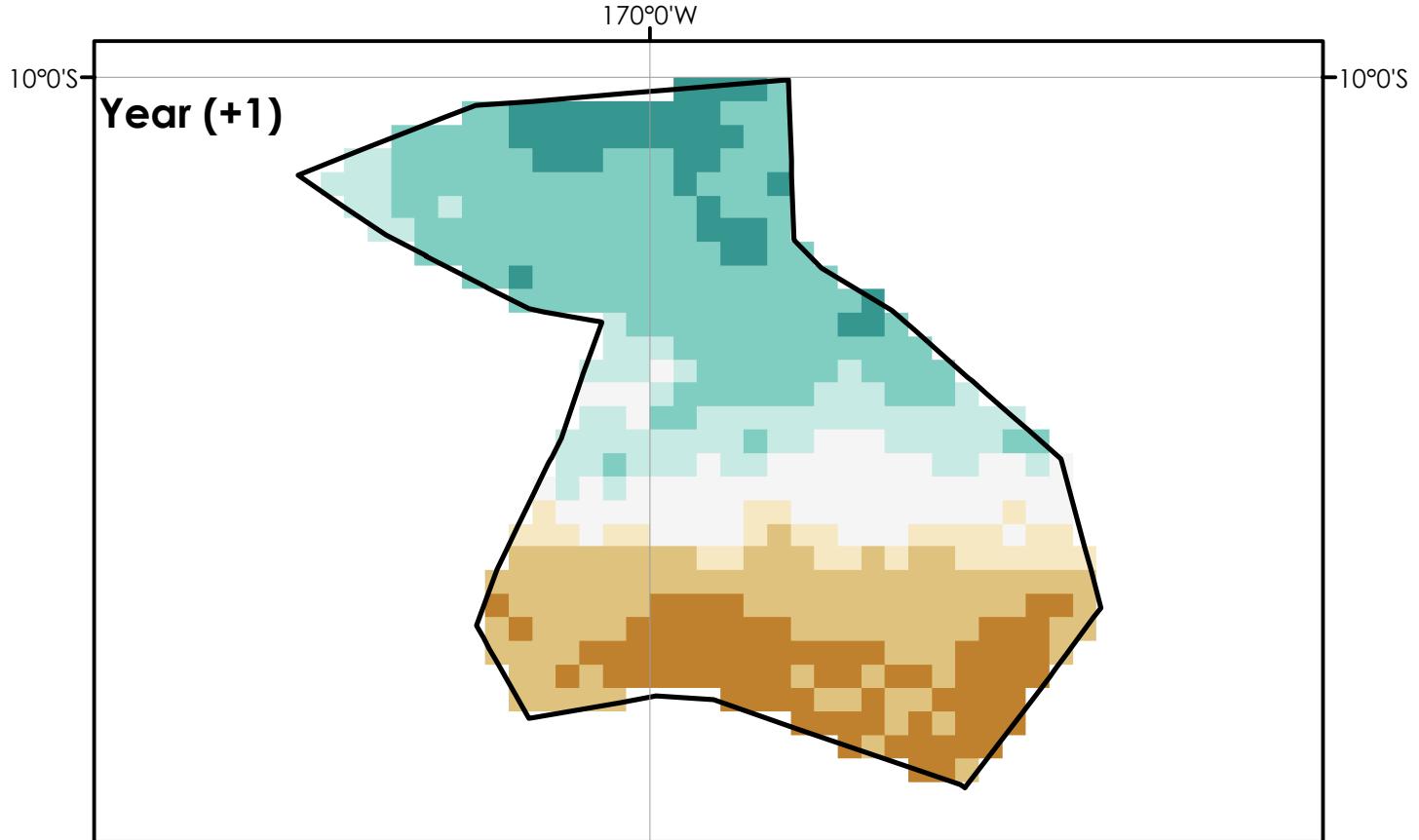
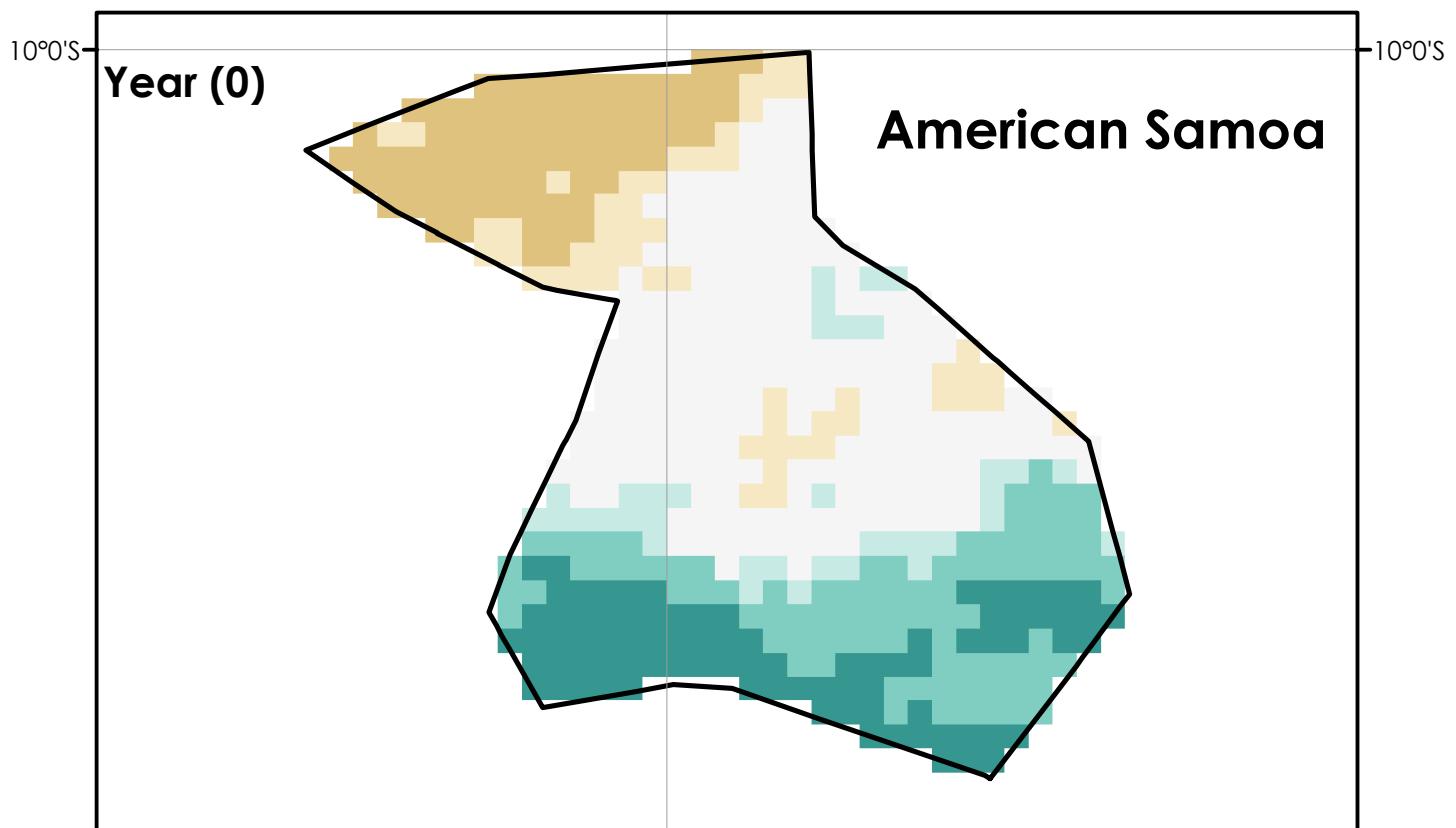


Precipitation Change (%)

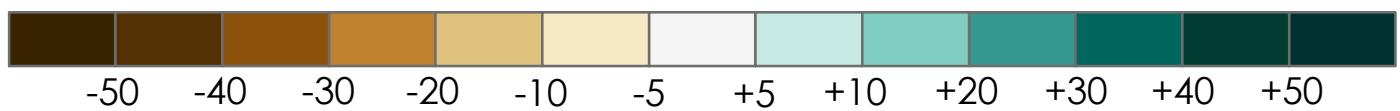


Weak La Niña for SON

135

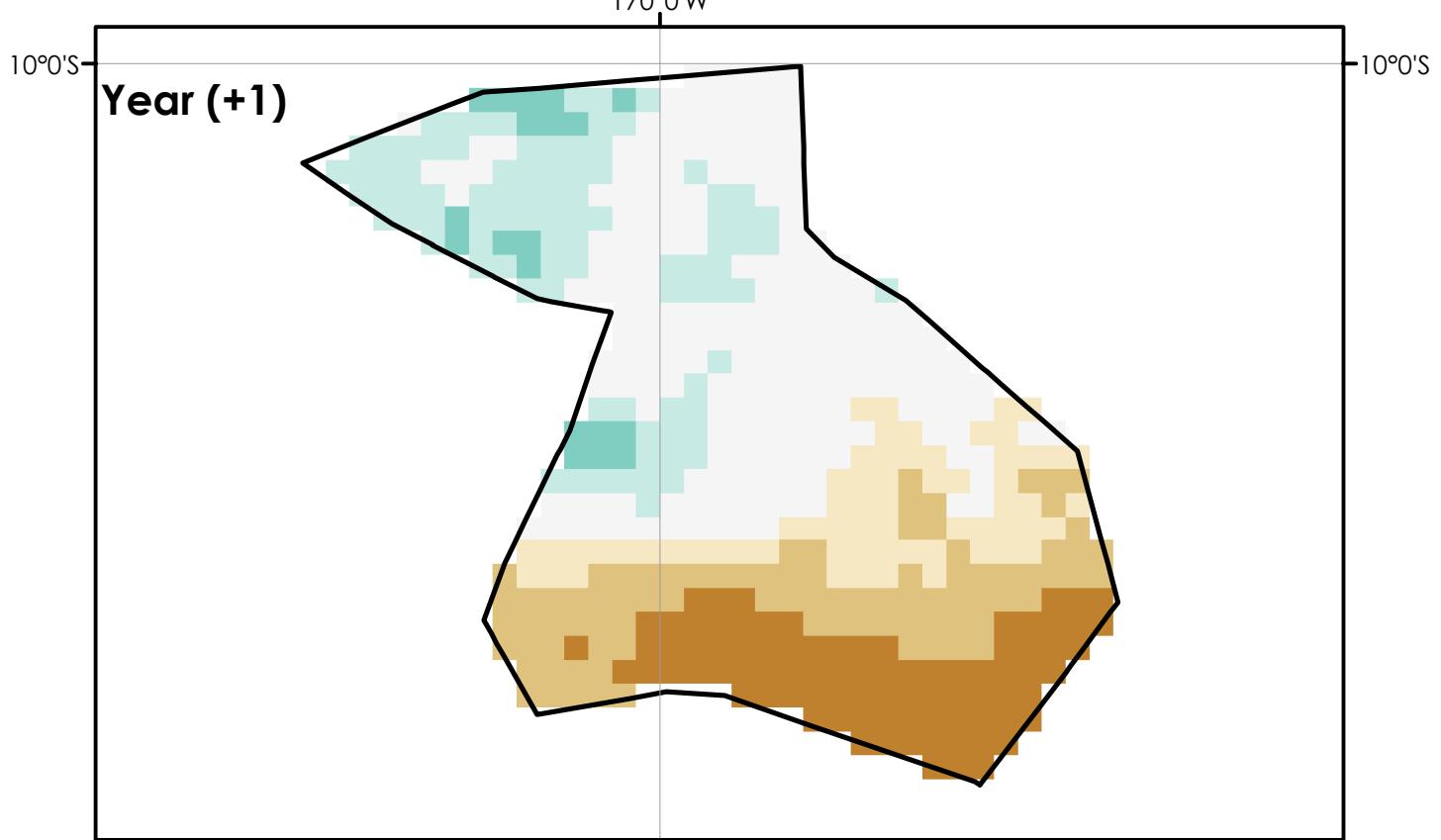
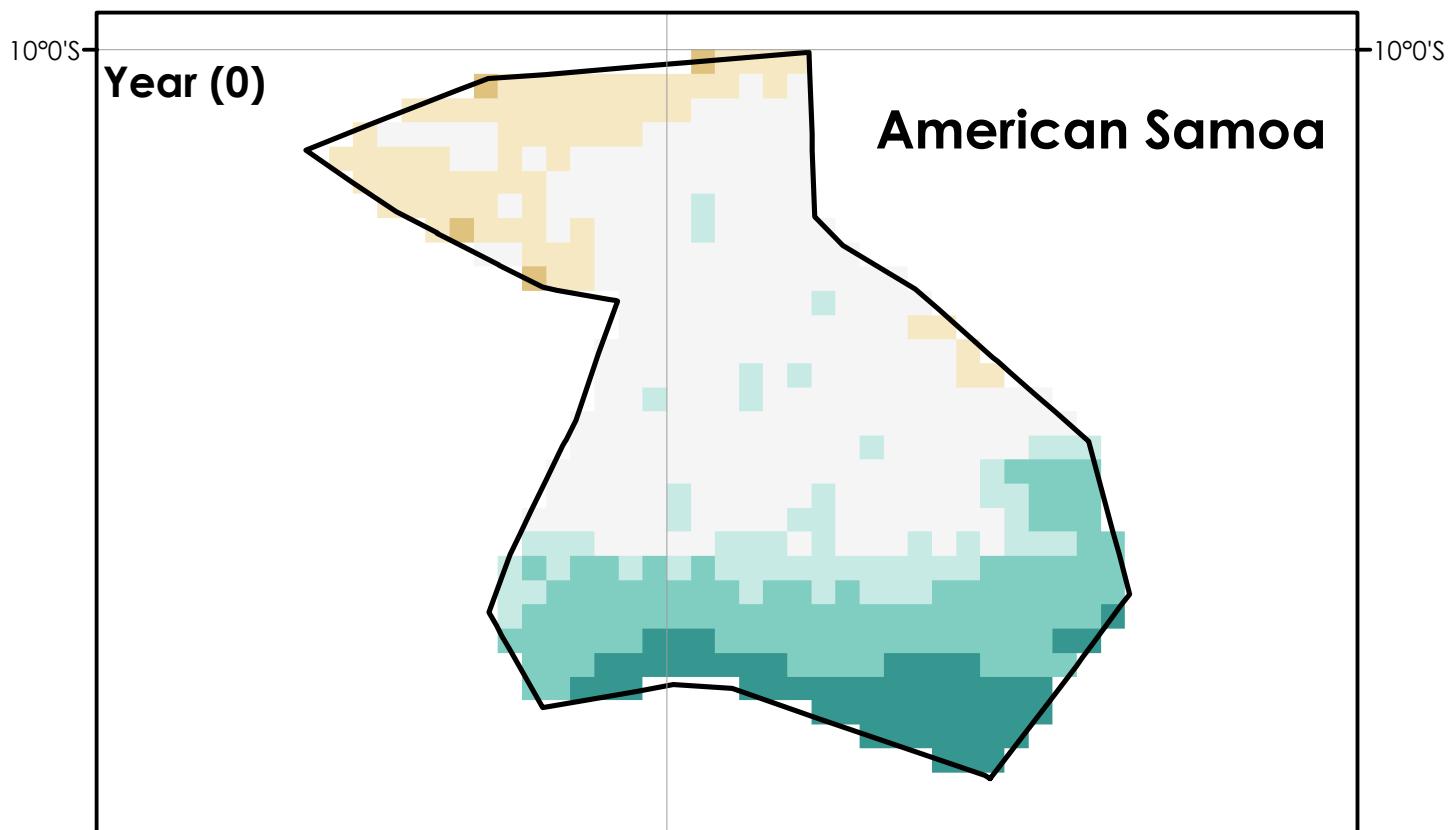


Precipitation Change (%)



Weak La Niña for OND

136

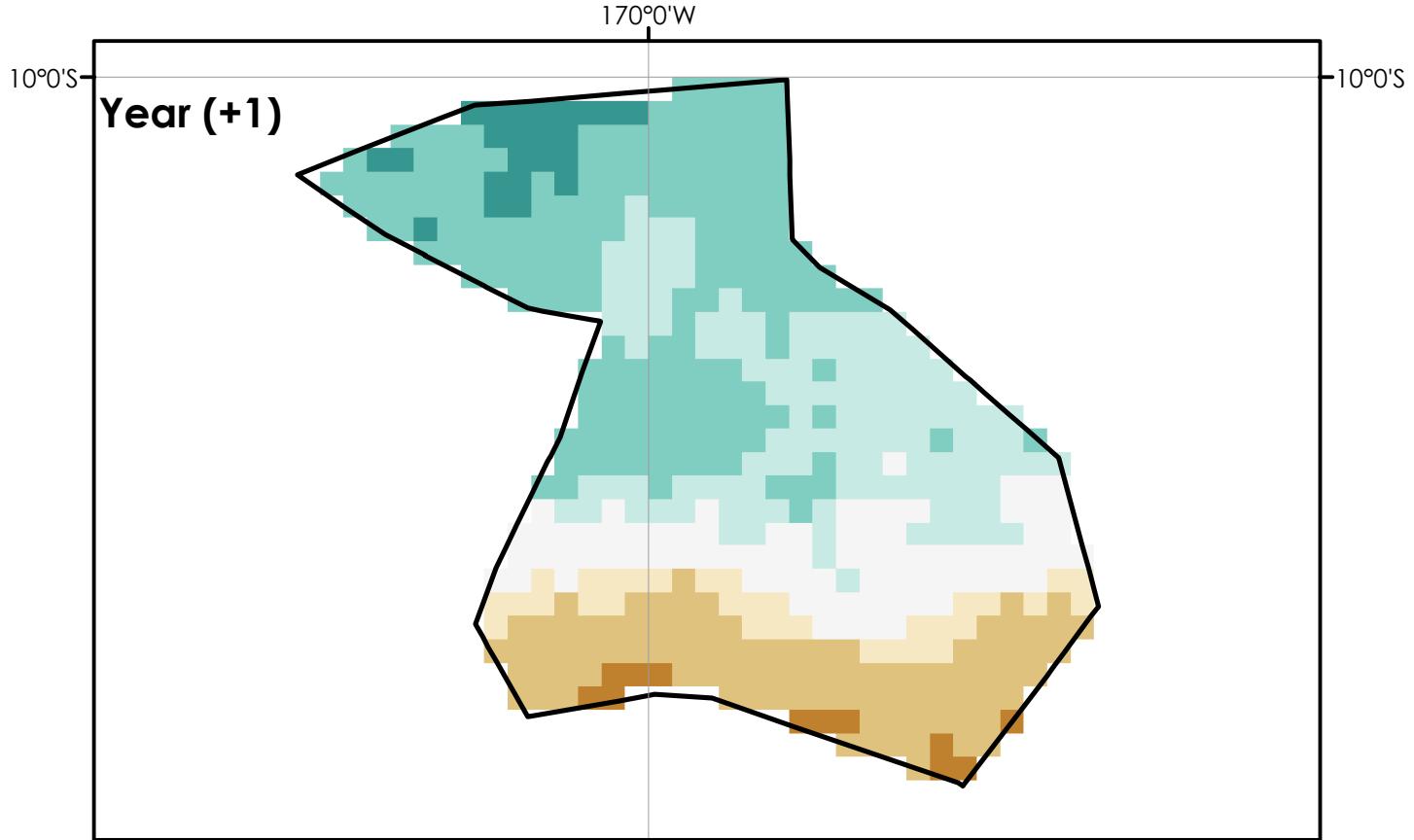
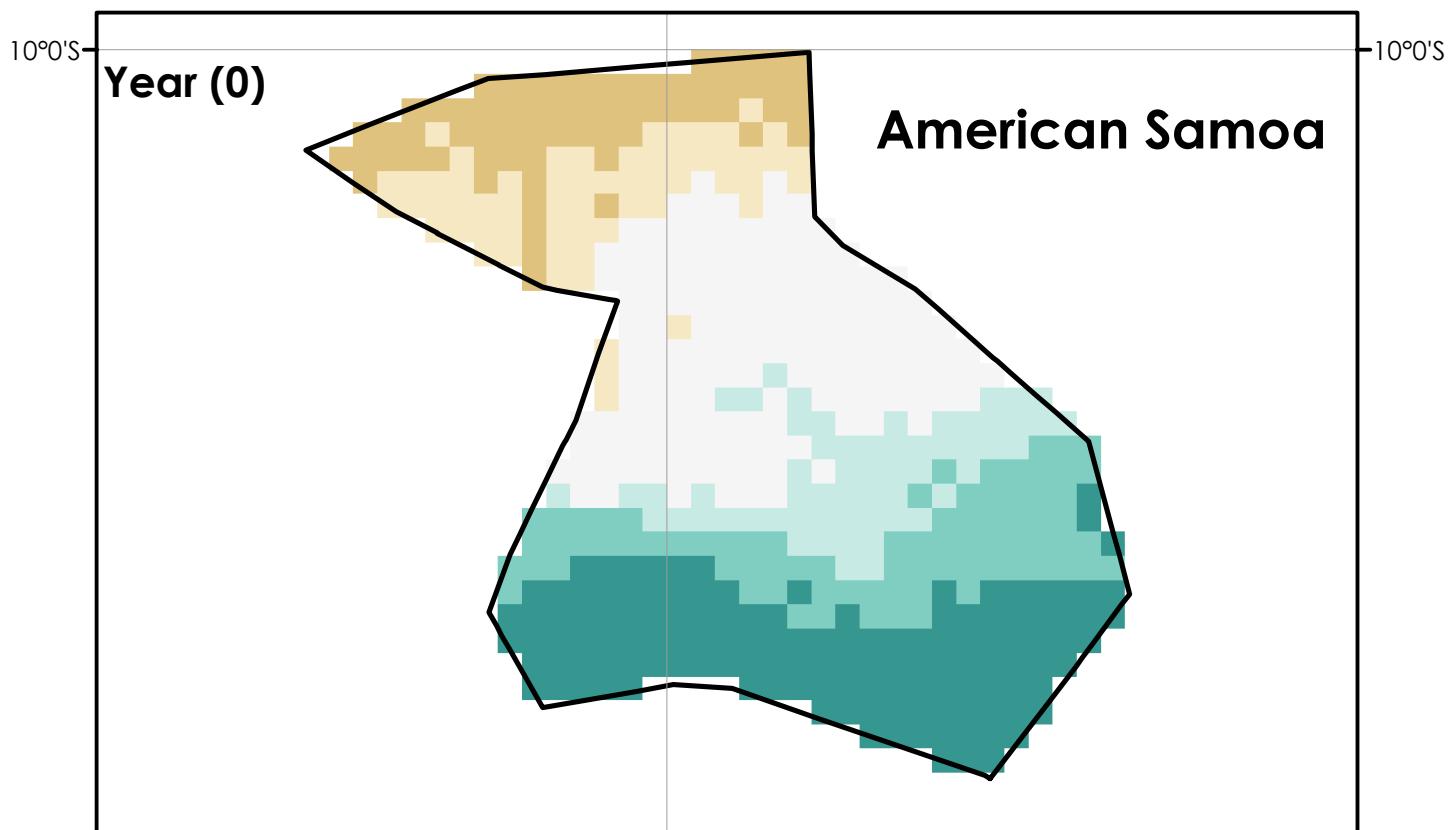


Precipitation Change (%)

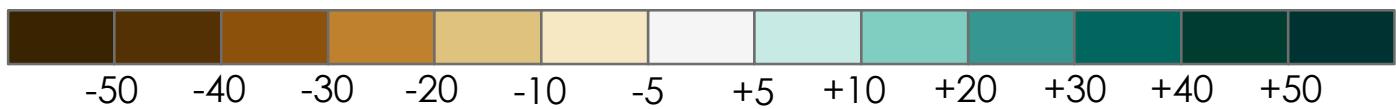


Weak La Niña for NDJ

137

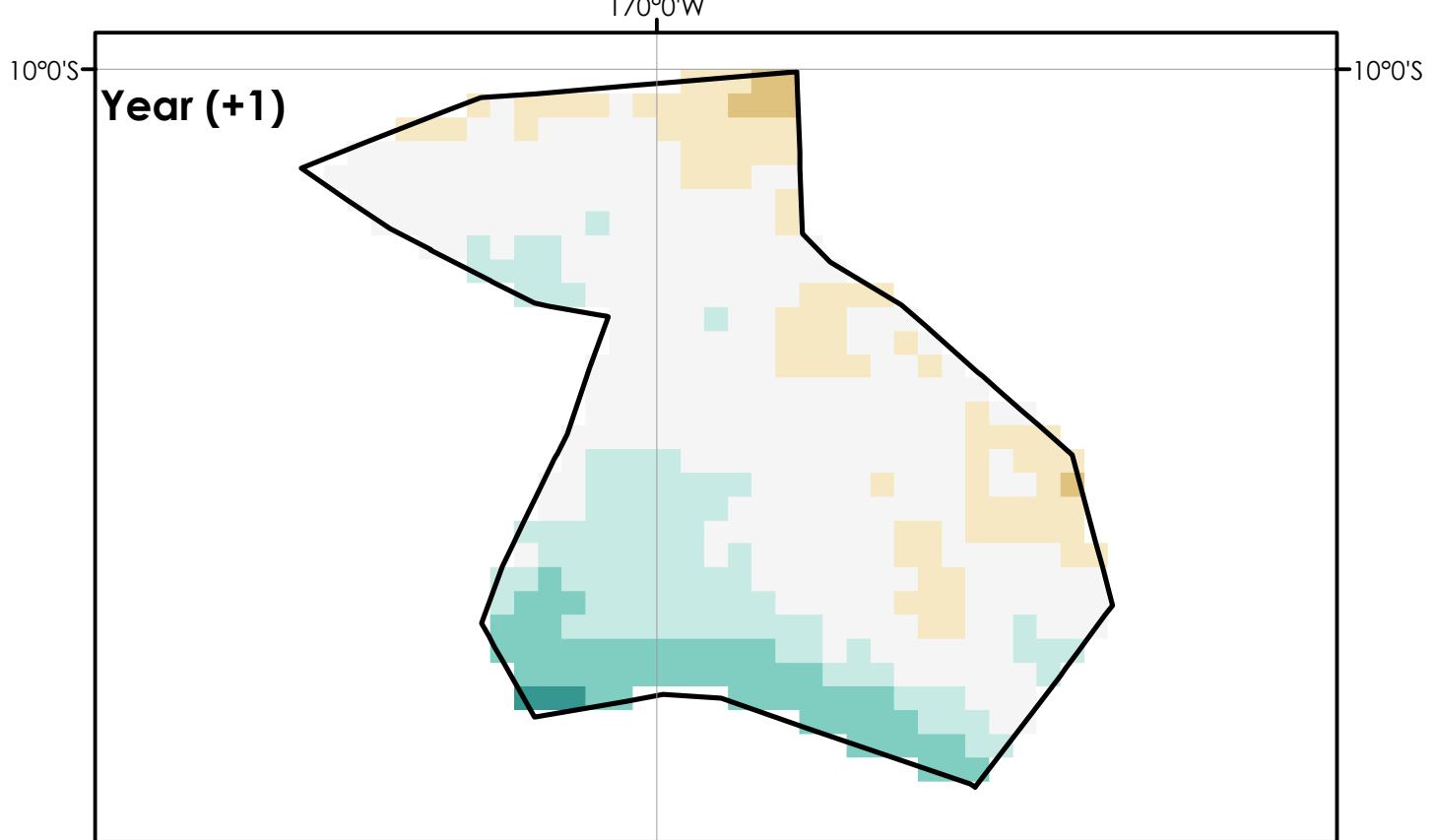
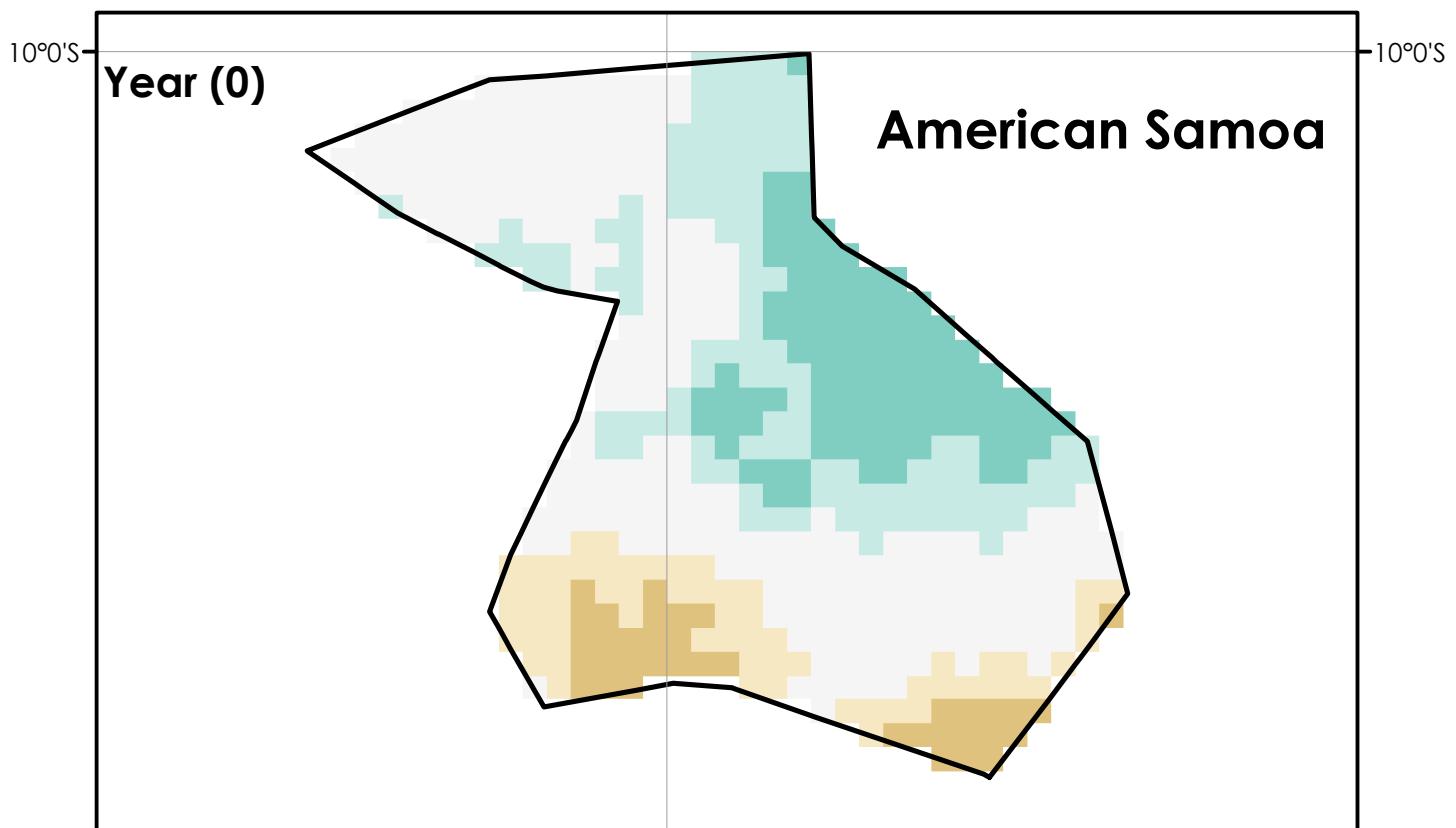


Precipitation Change (%)



Moderate - Strong La Niña for DJF

138

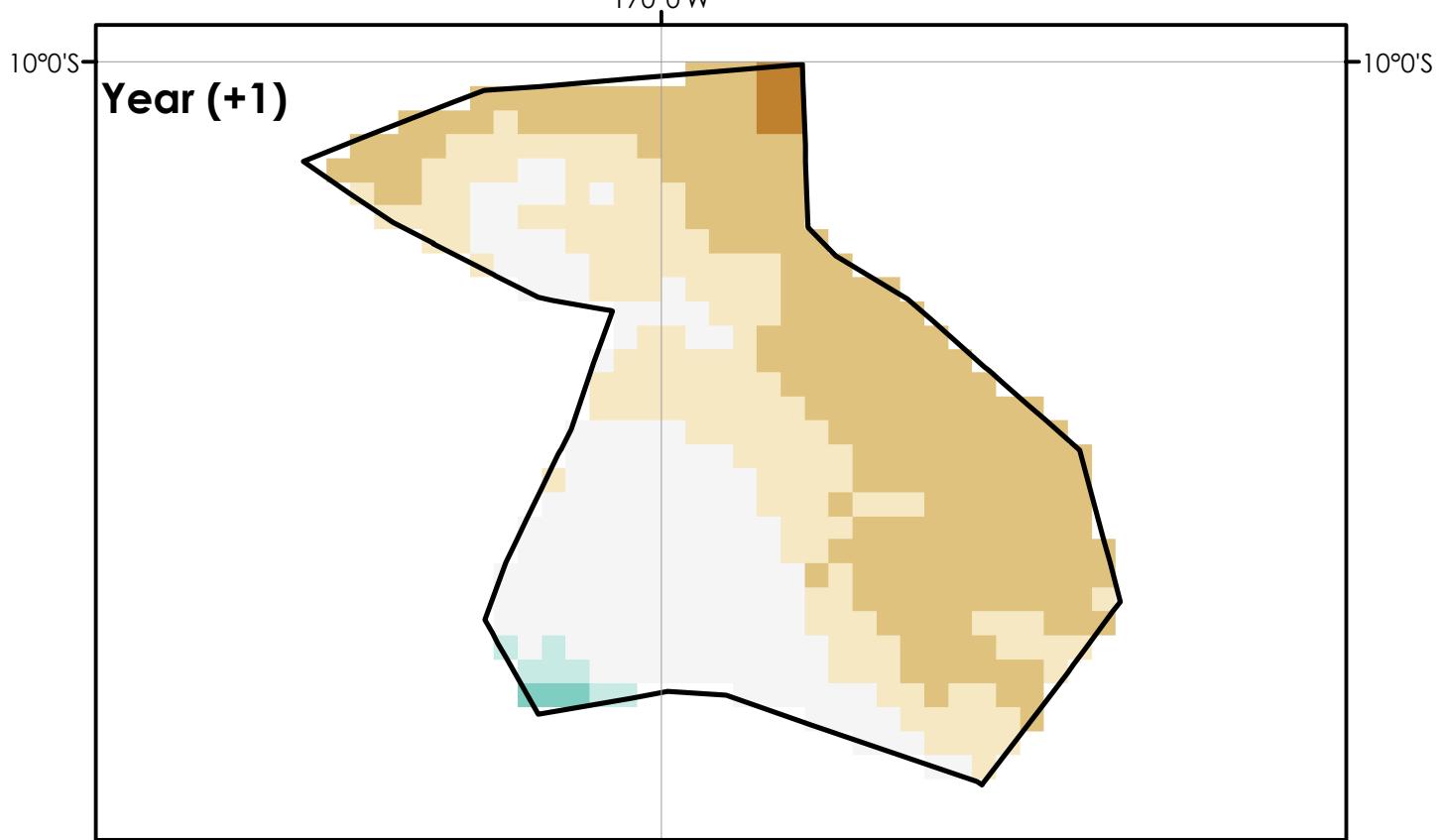
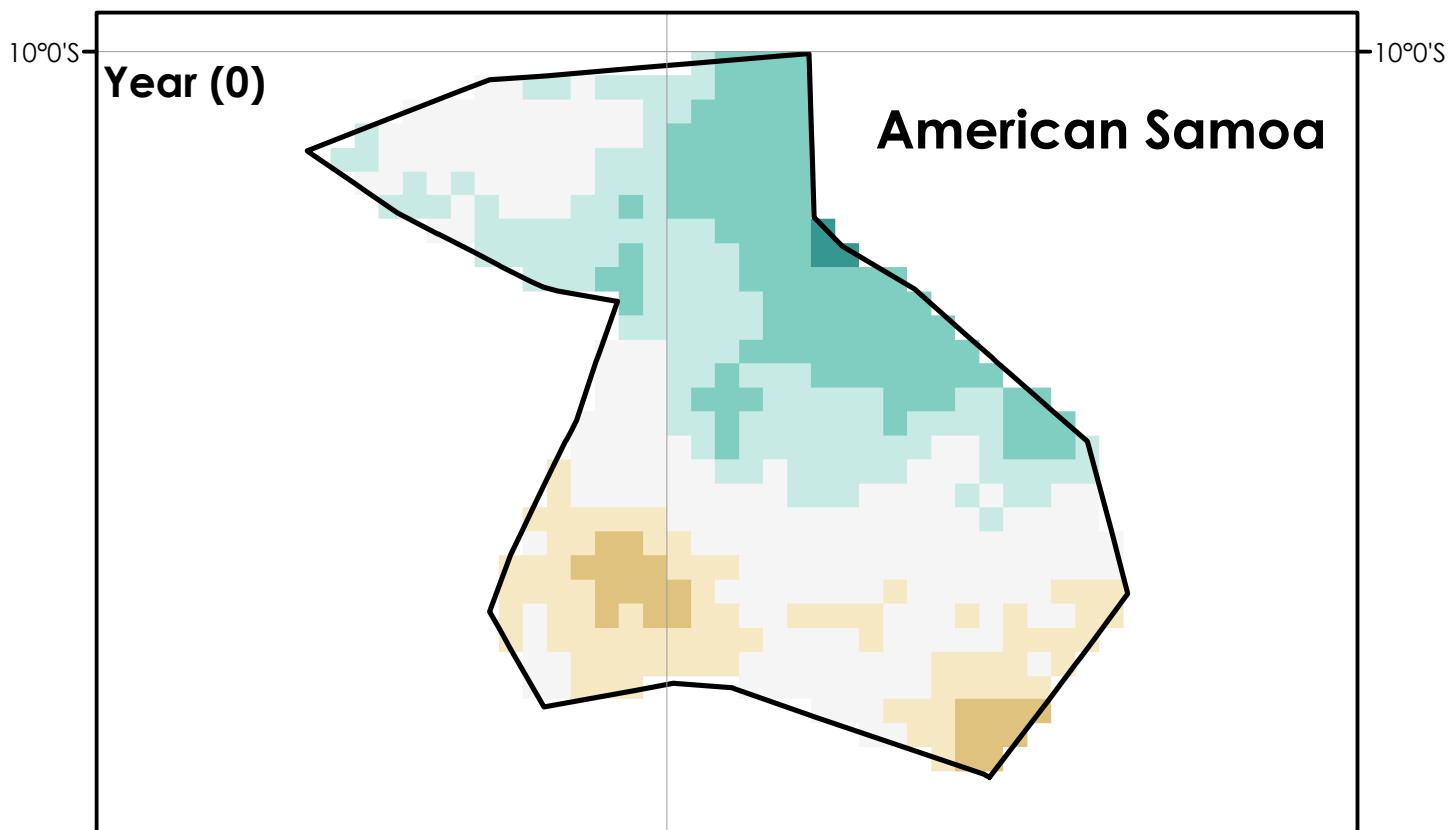


Precipitation Change (%)

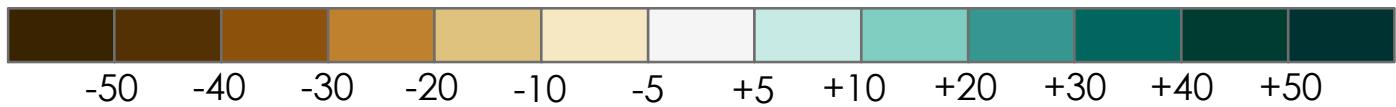


Moderate - Strong La Niña for JFM

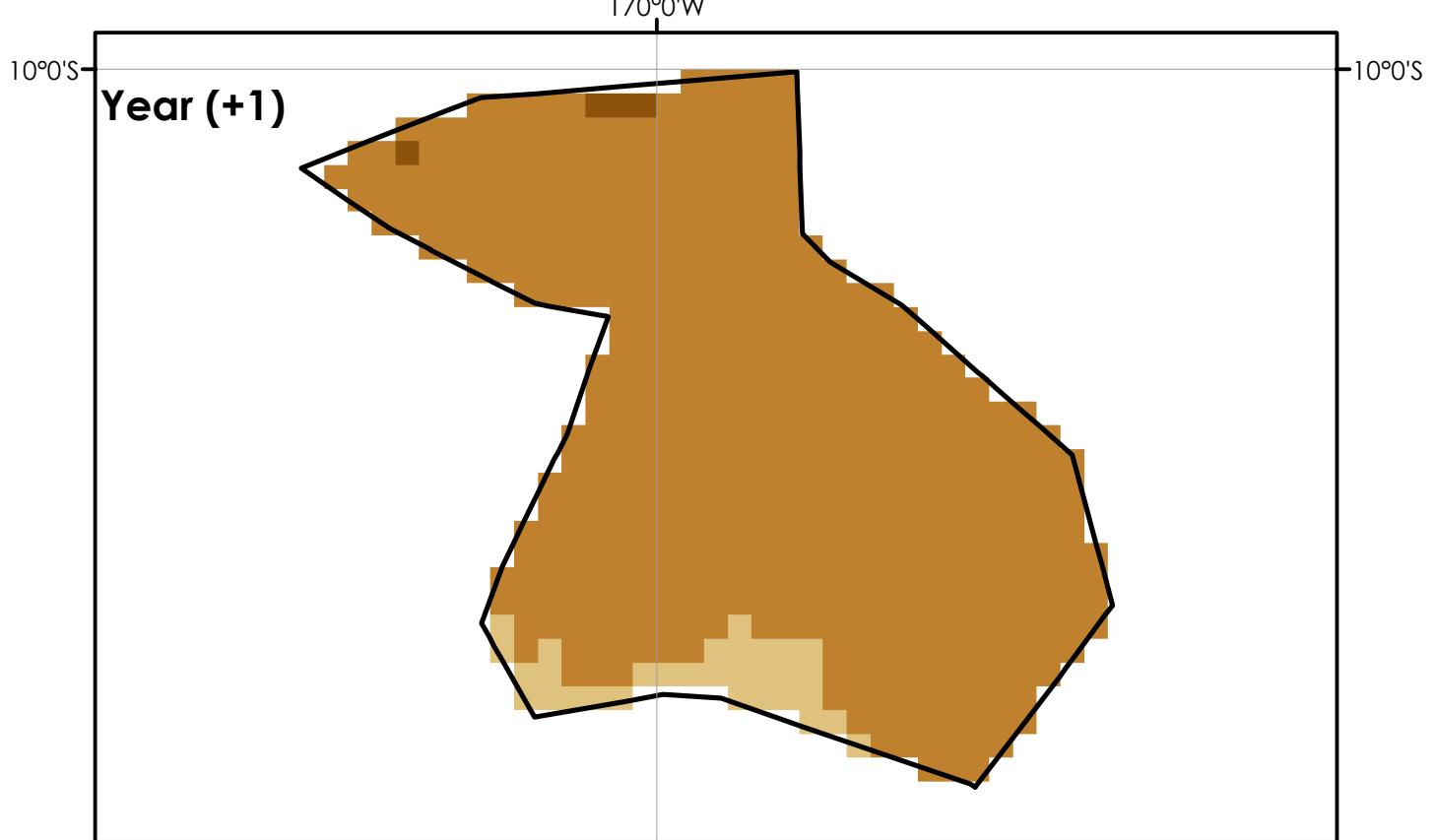
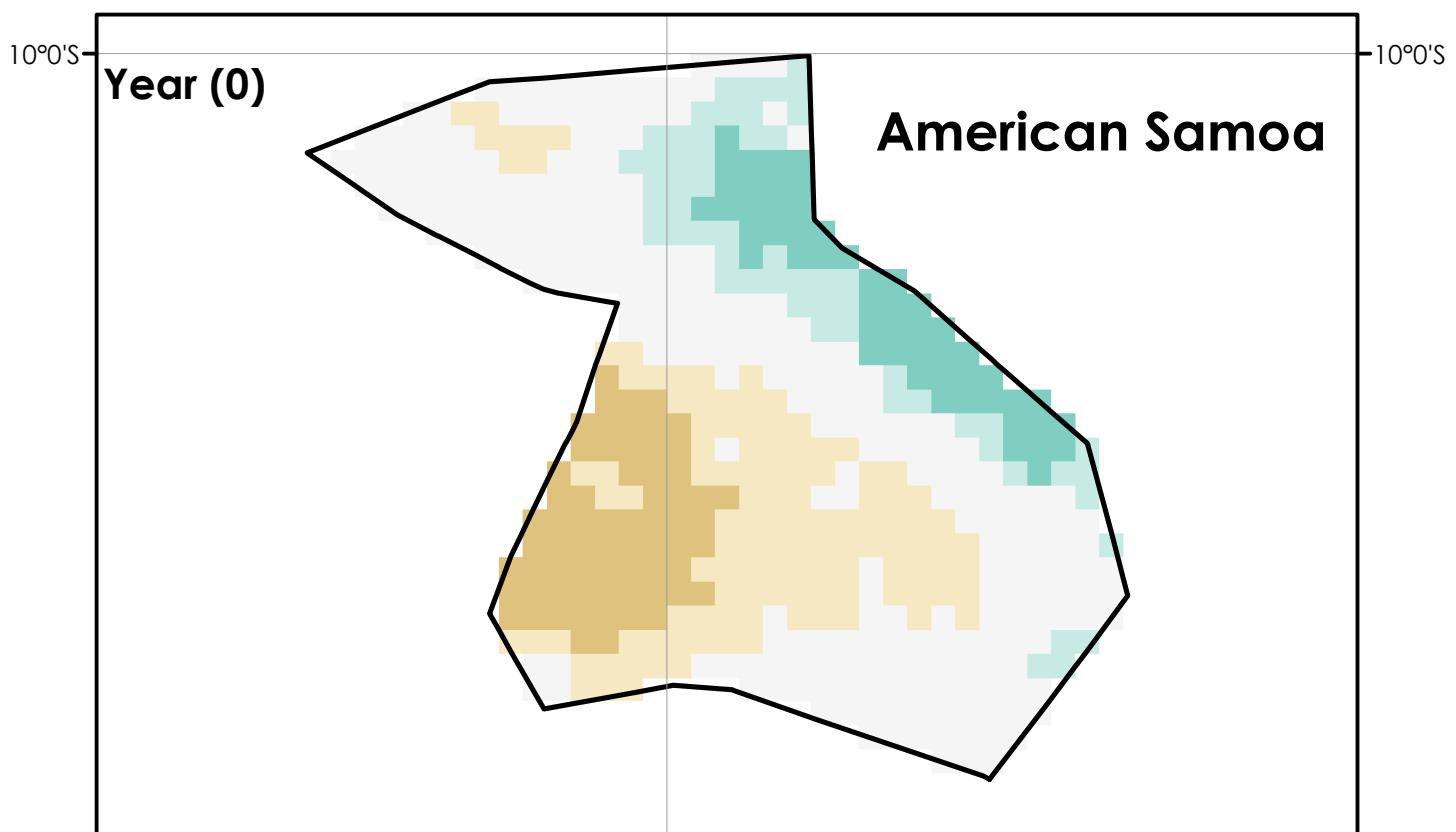
139



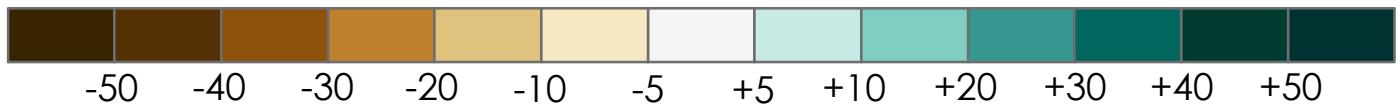
Precipitation Change (%)



Moderate - Strong La Niña for FMA

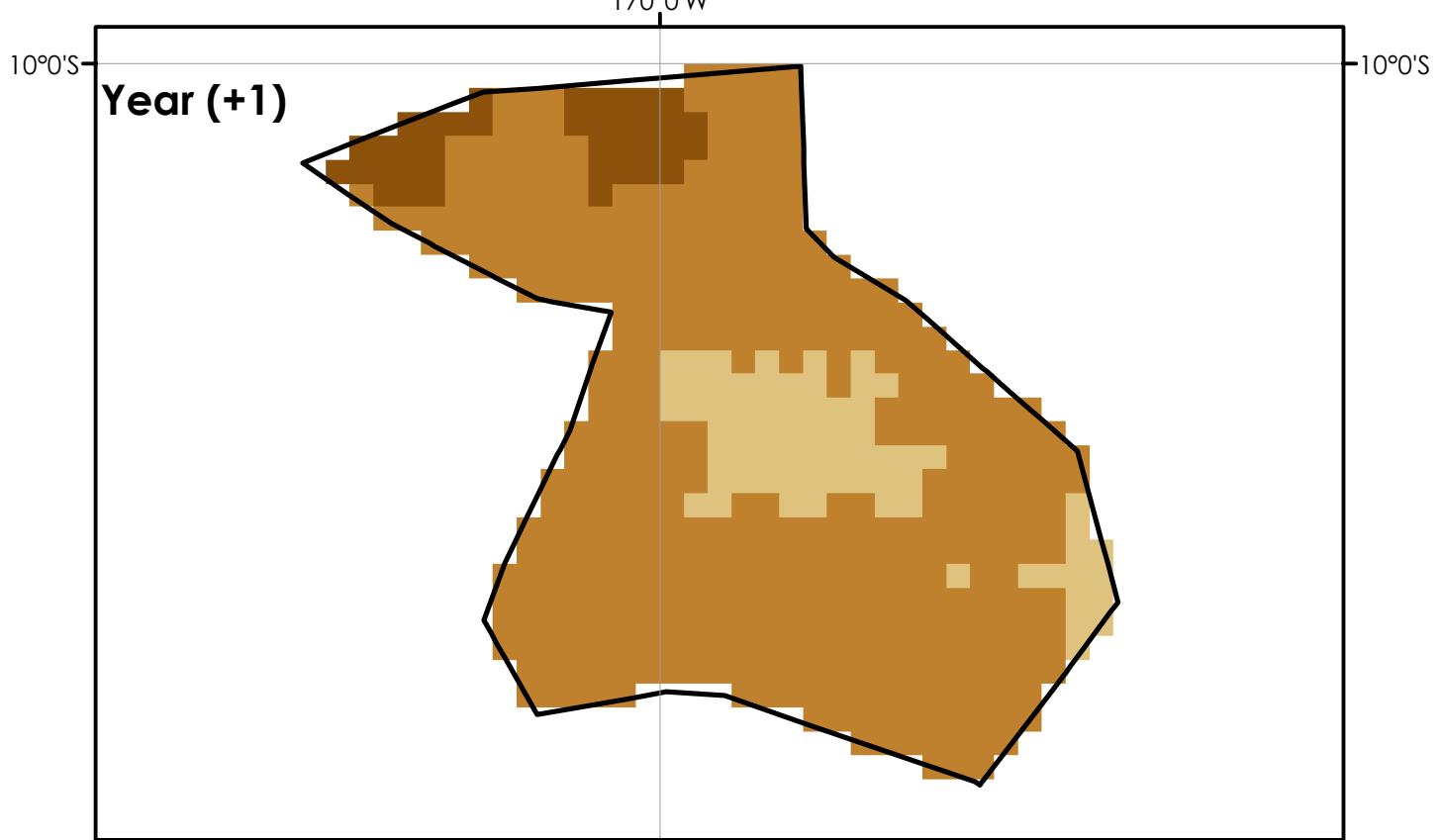
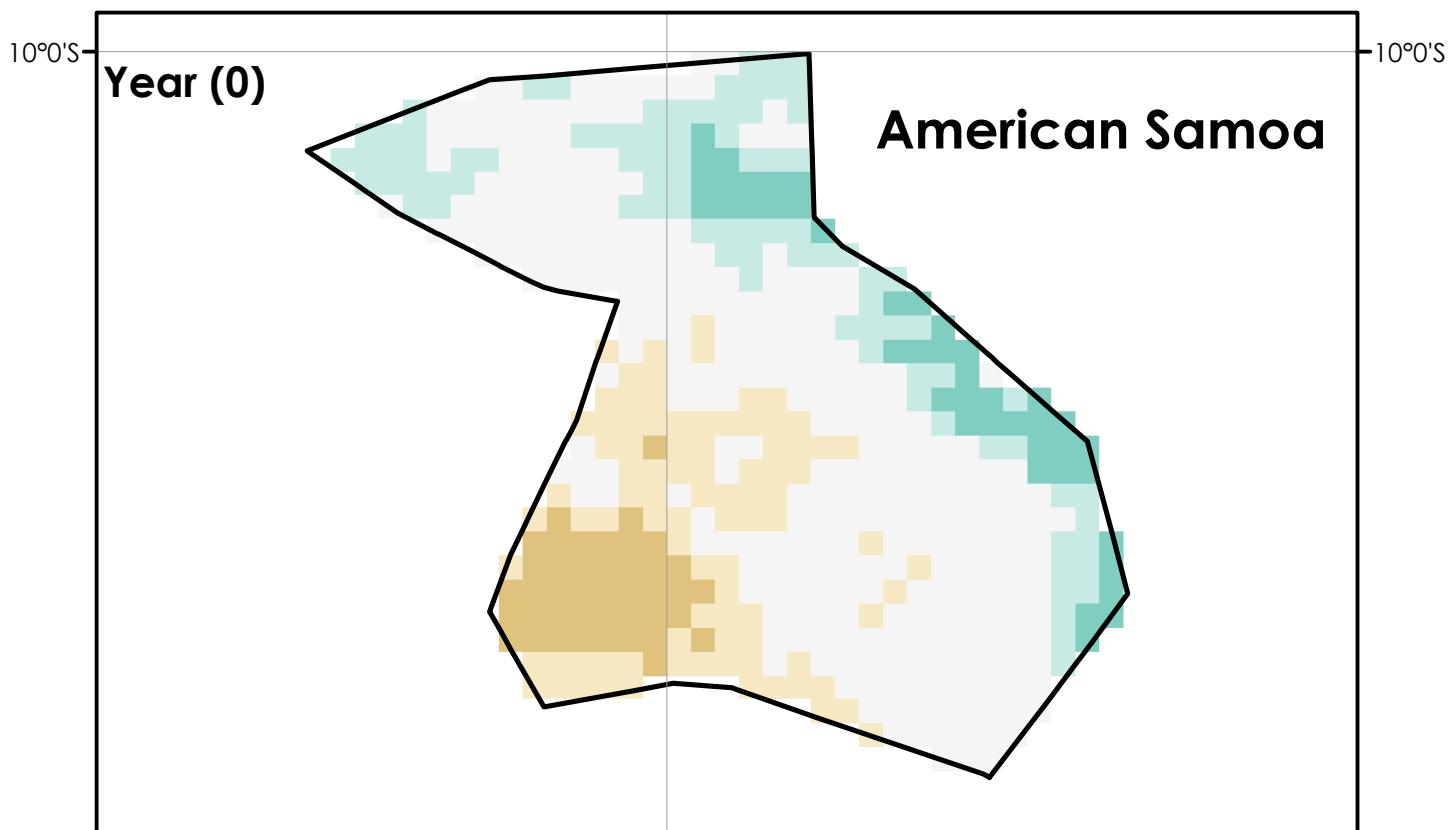


Precipitation Change (%)



Moderate - Strong La Niña for MAM

141

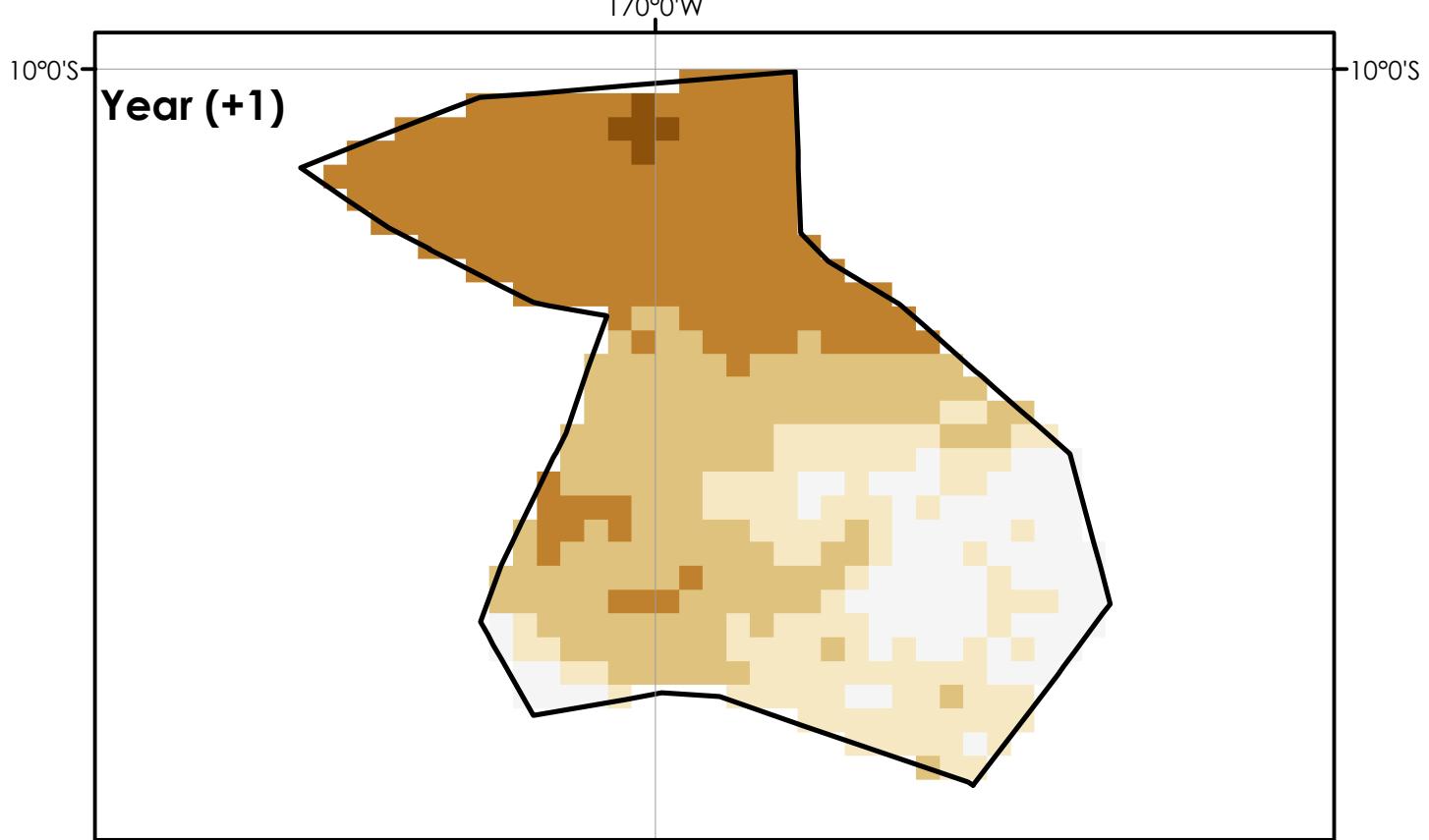
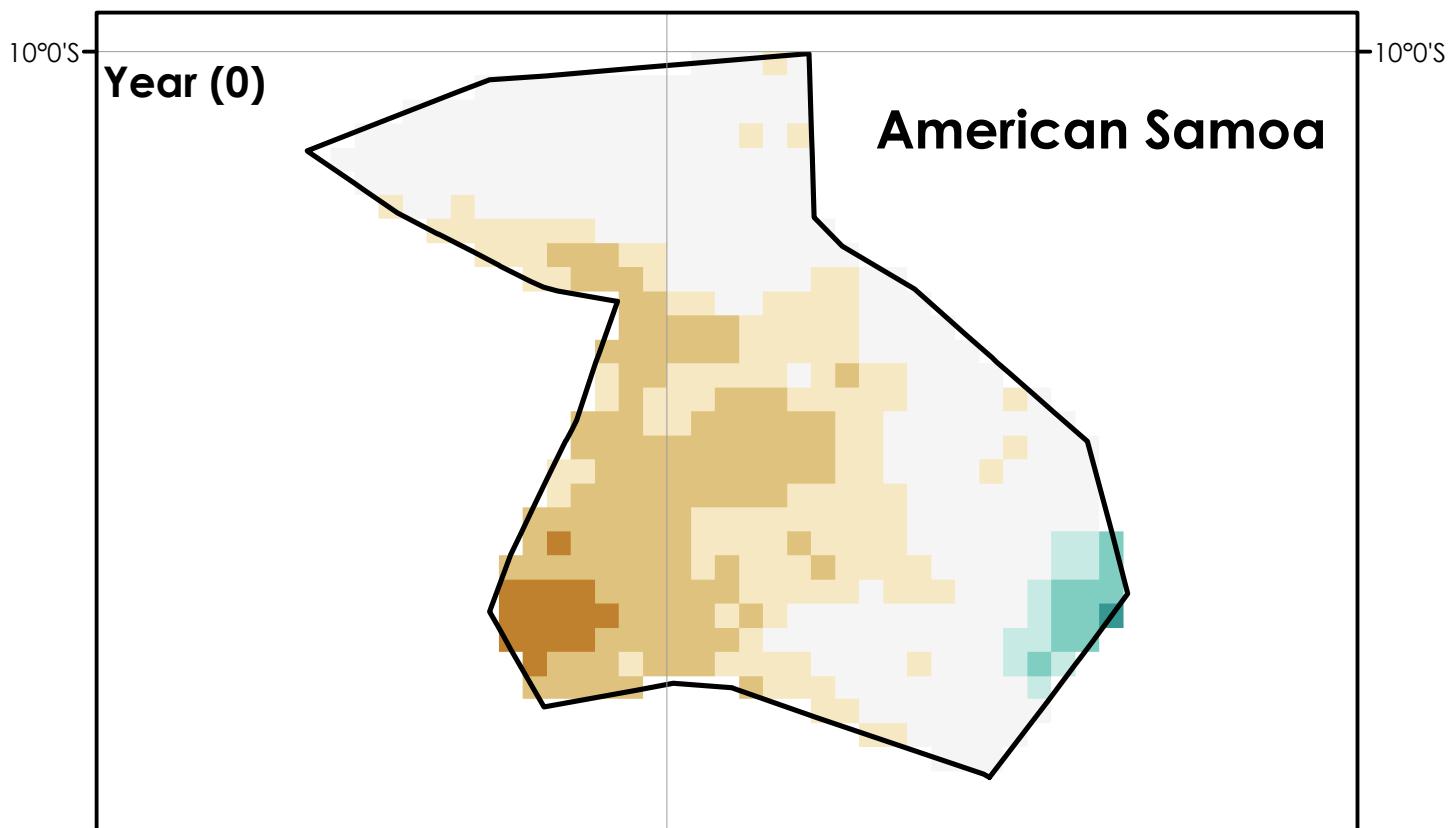


Precipitation Change (%)



Moderate - Strong La Niña for AMJ

142

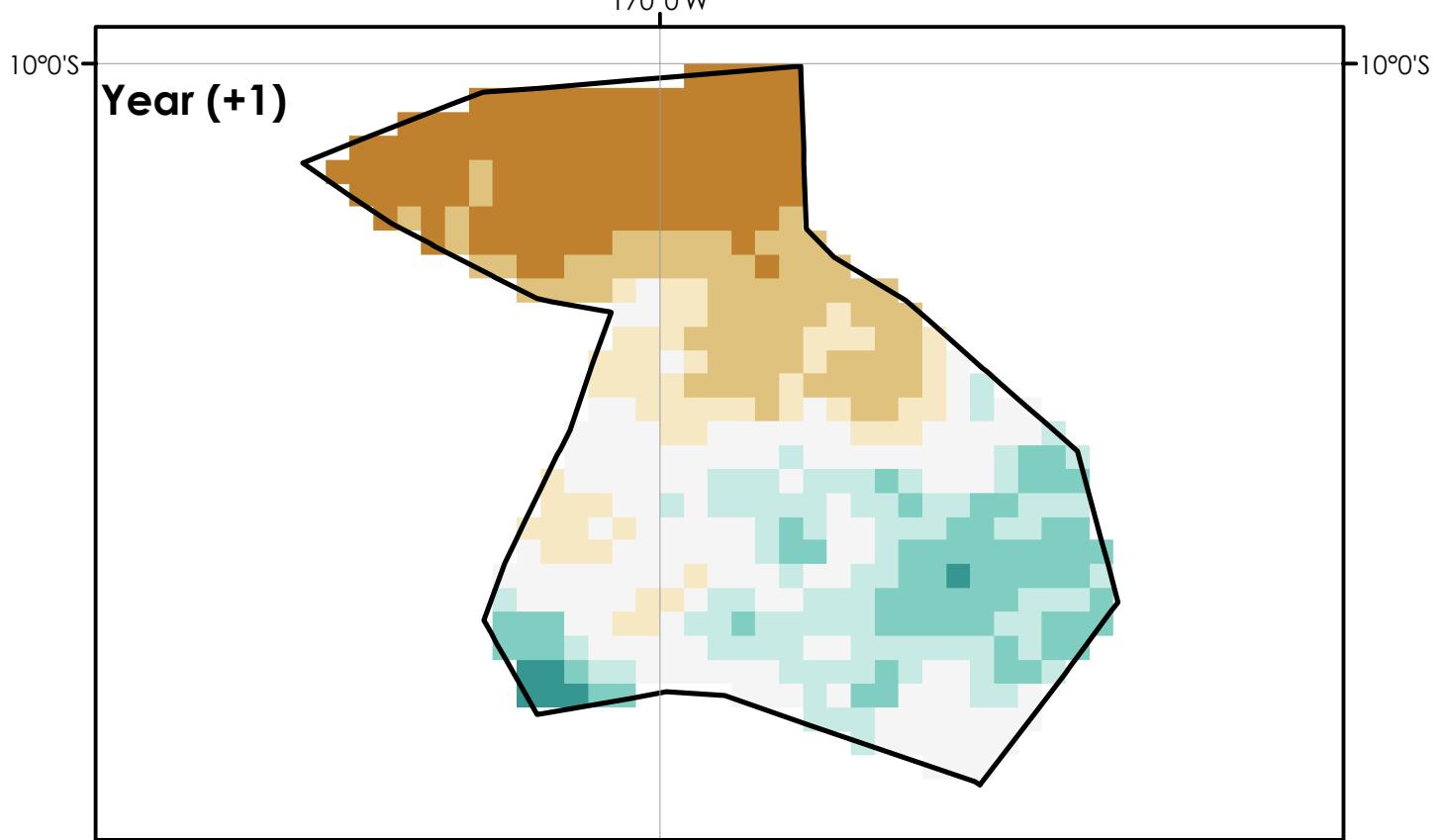
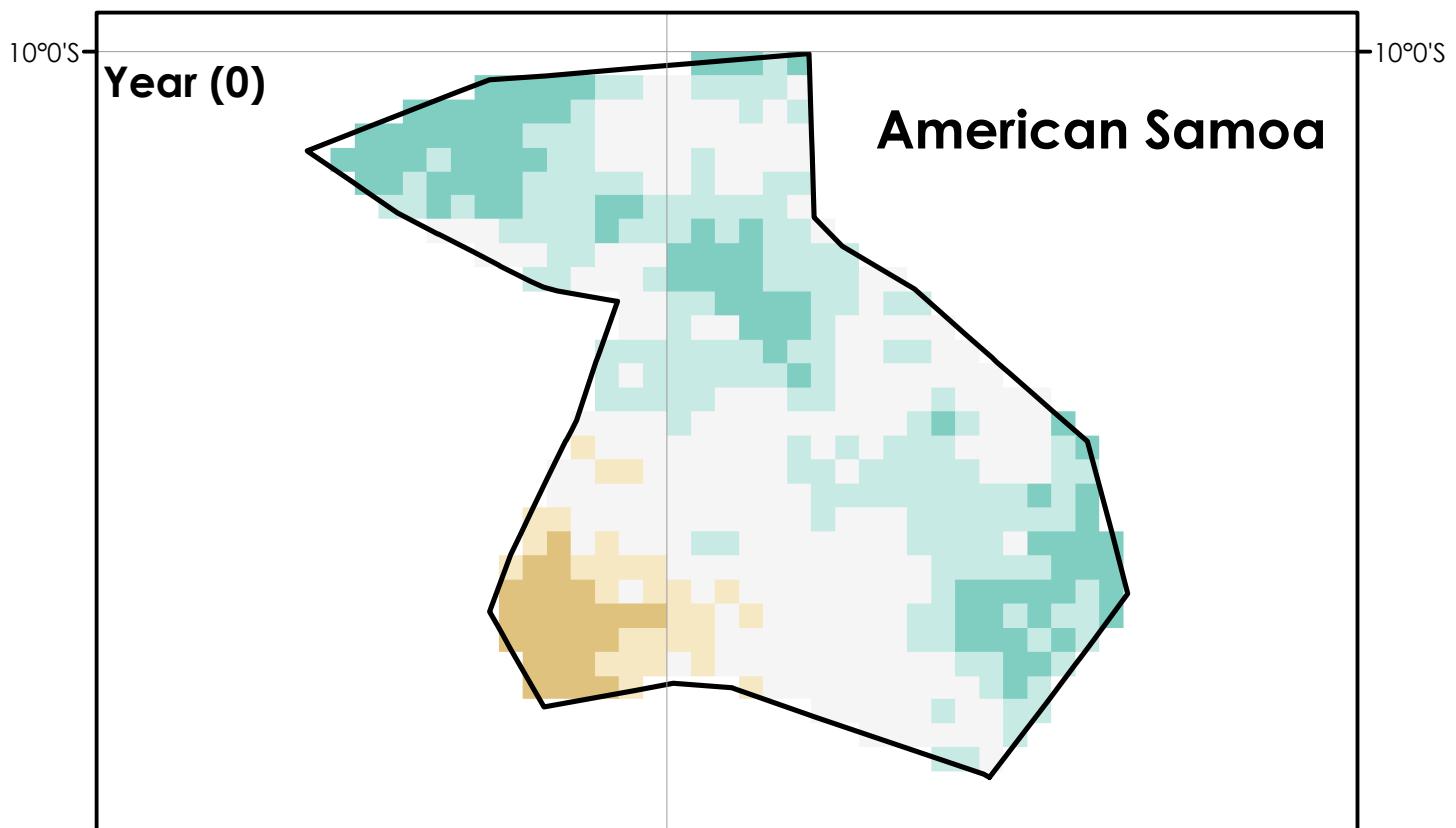


Precipitation Change (%)



Moderate - Strong La Niña for MJJ

143

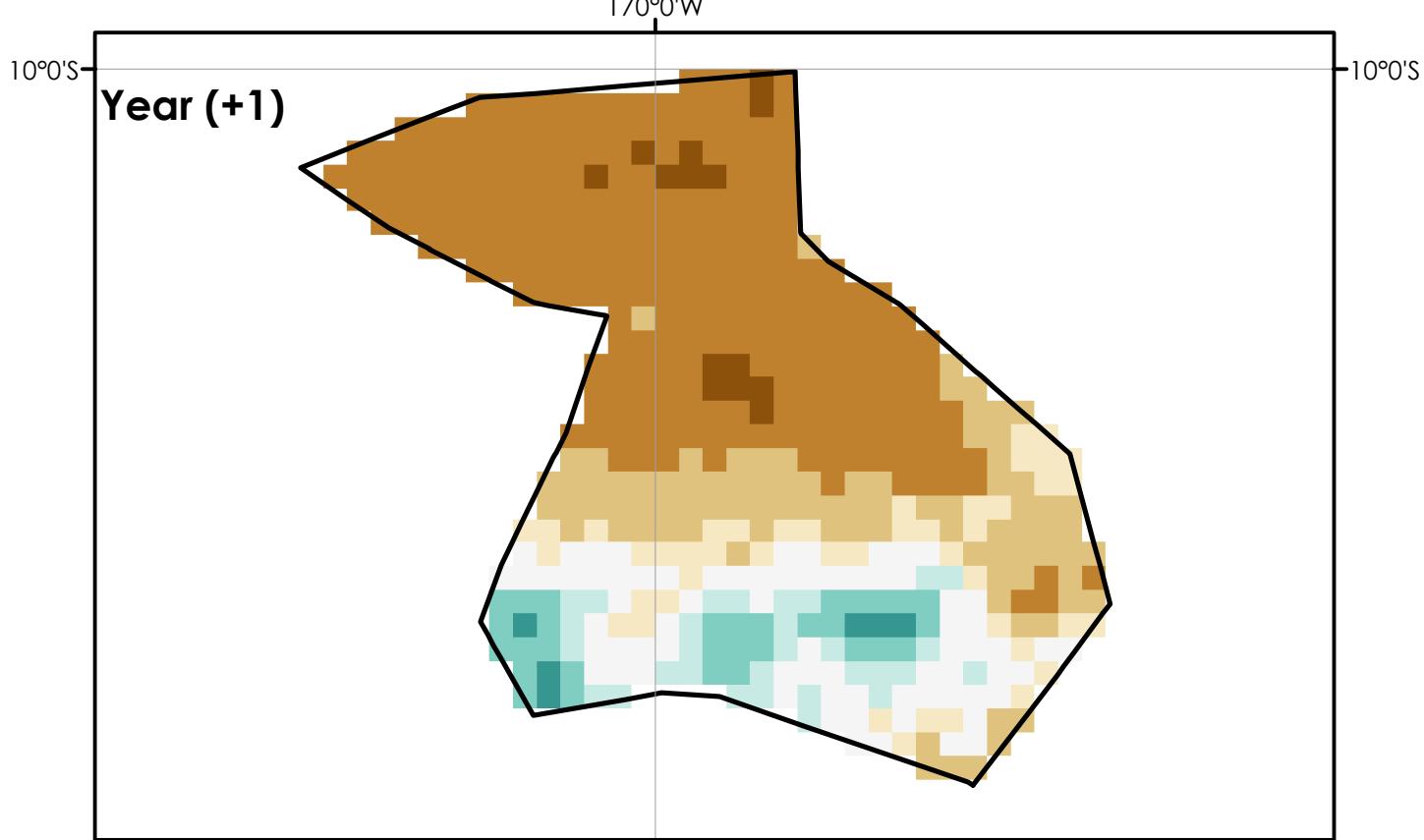
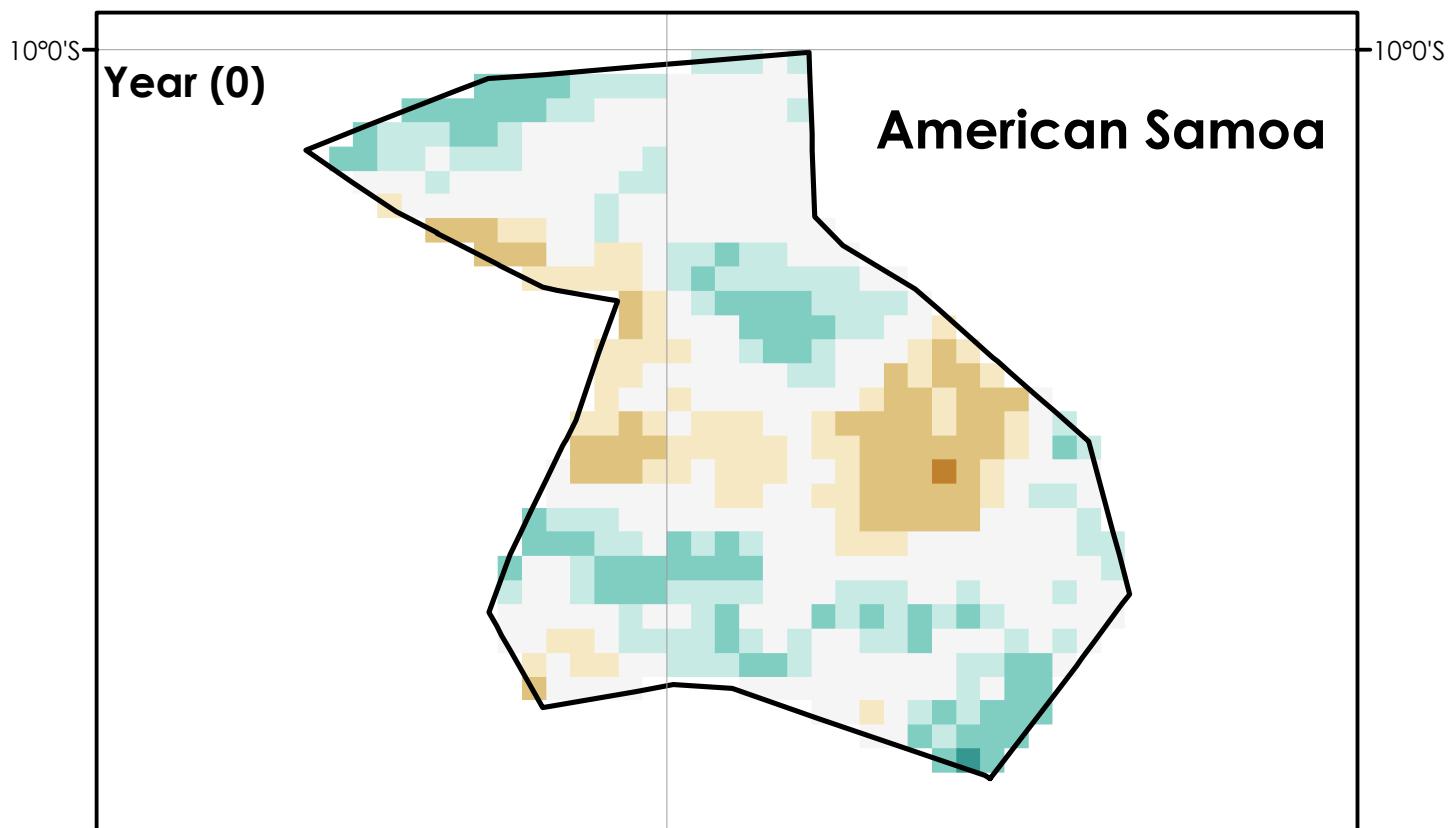


Precipitation Change (%)



Moderate - Strong La Niña for JJA

144

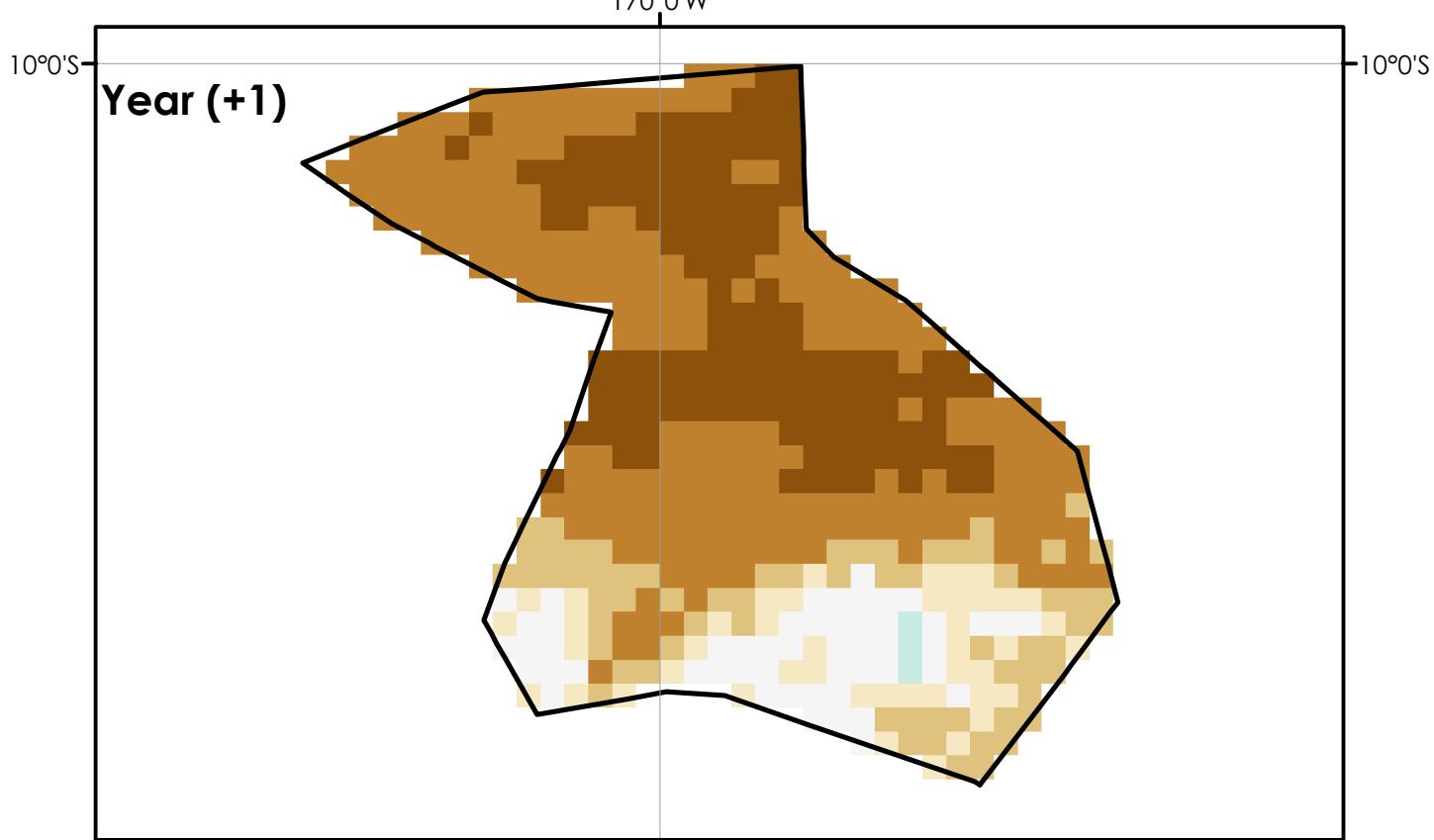
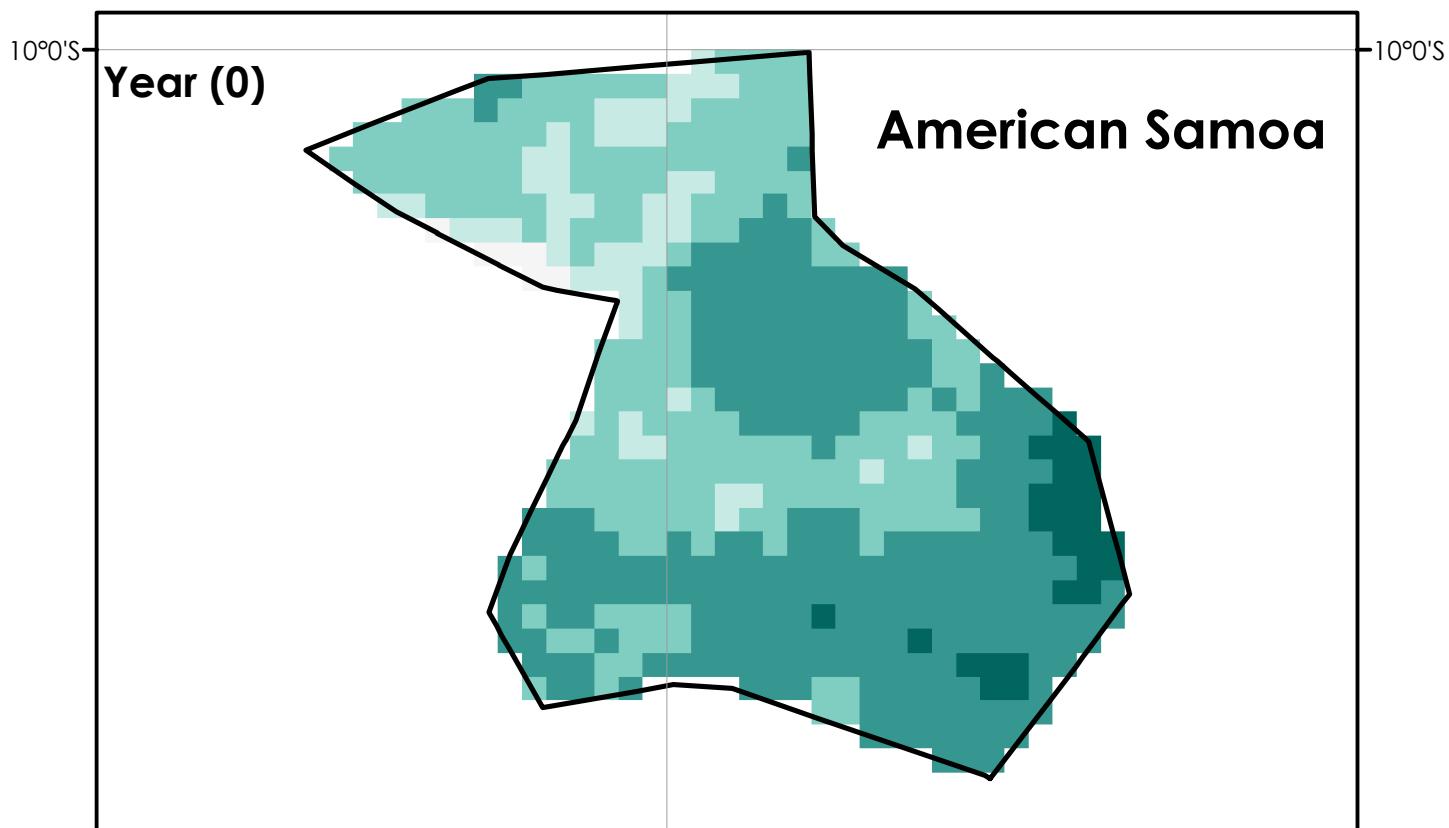


Precipitation Change (%)



Moderate - Strong La Niña for JAS

145

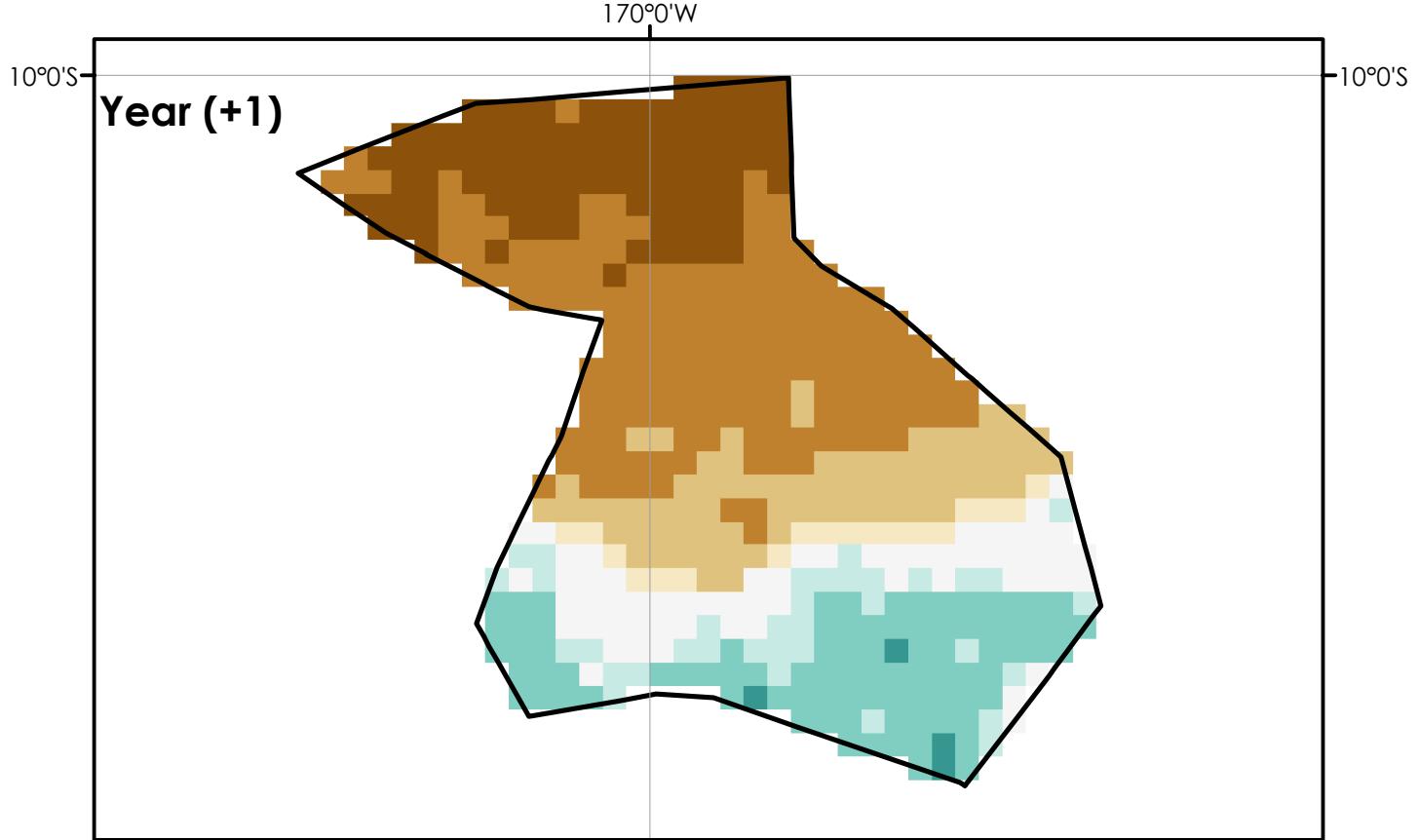
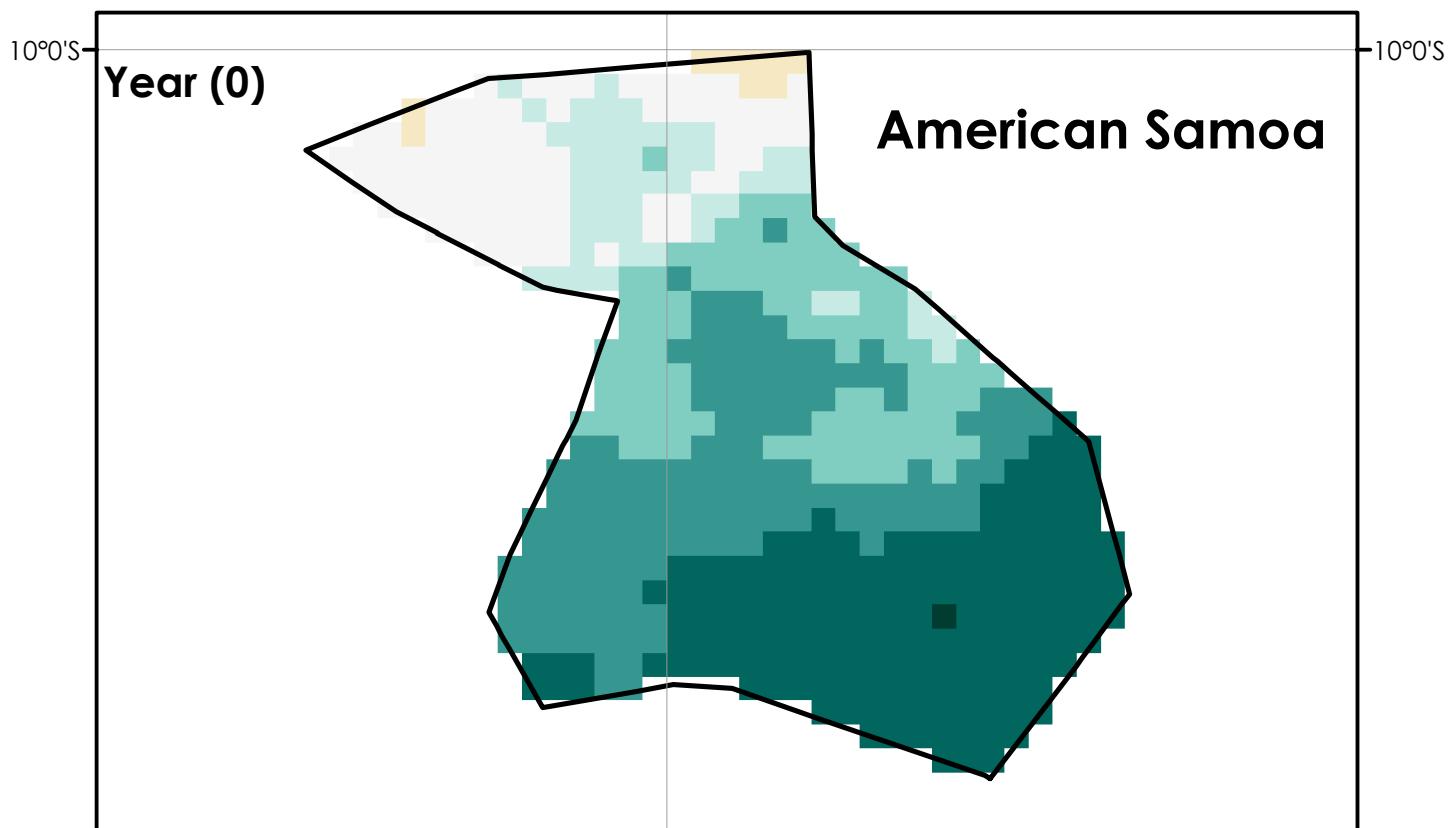


Precipitation Change (%)



Moderate - Strong La Niña for ASO

146

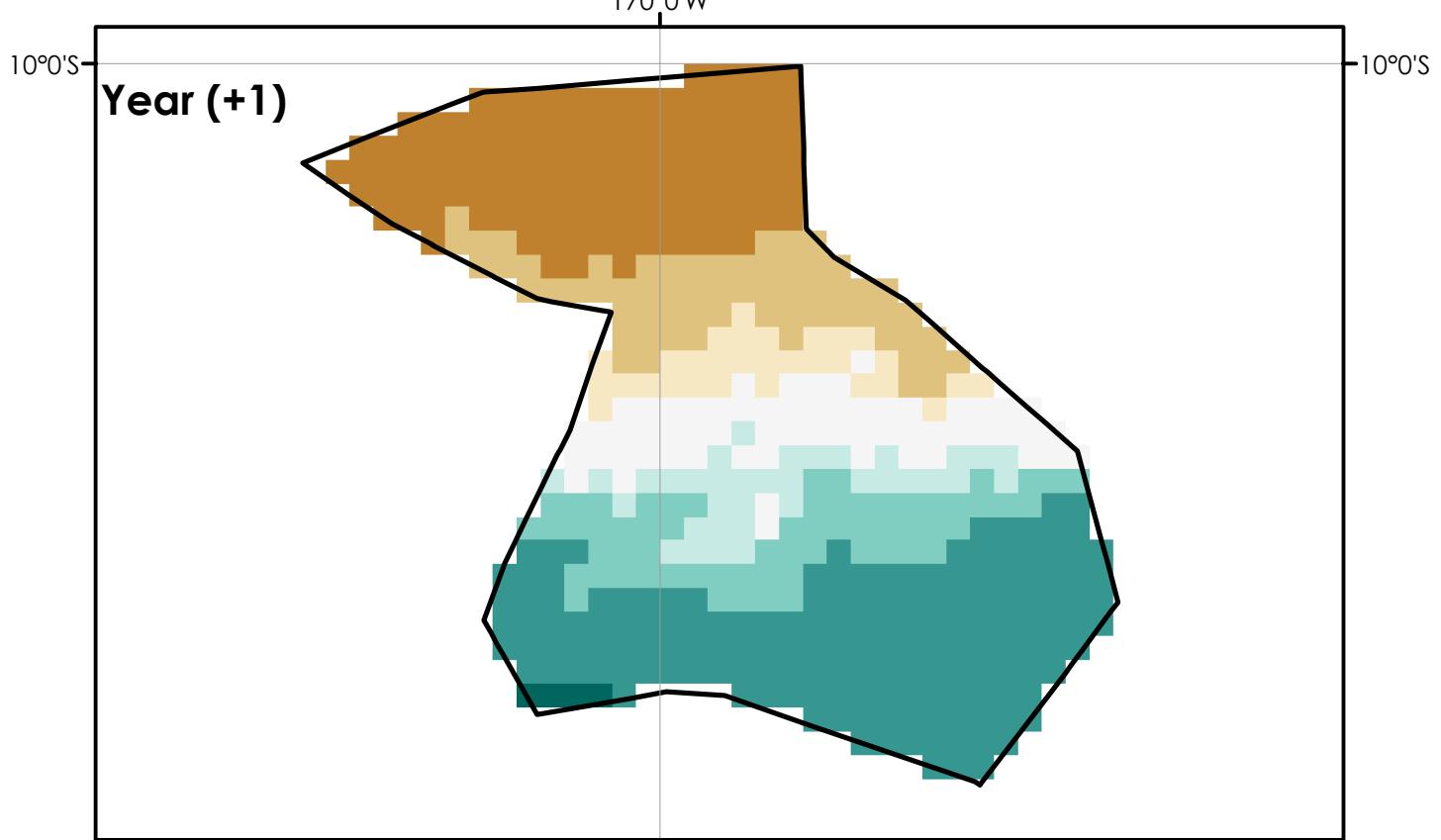
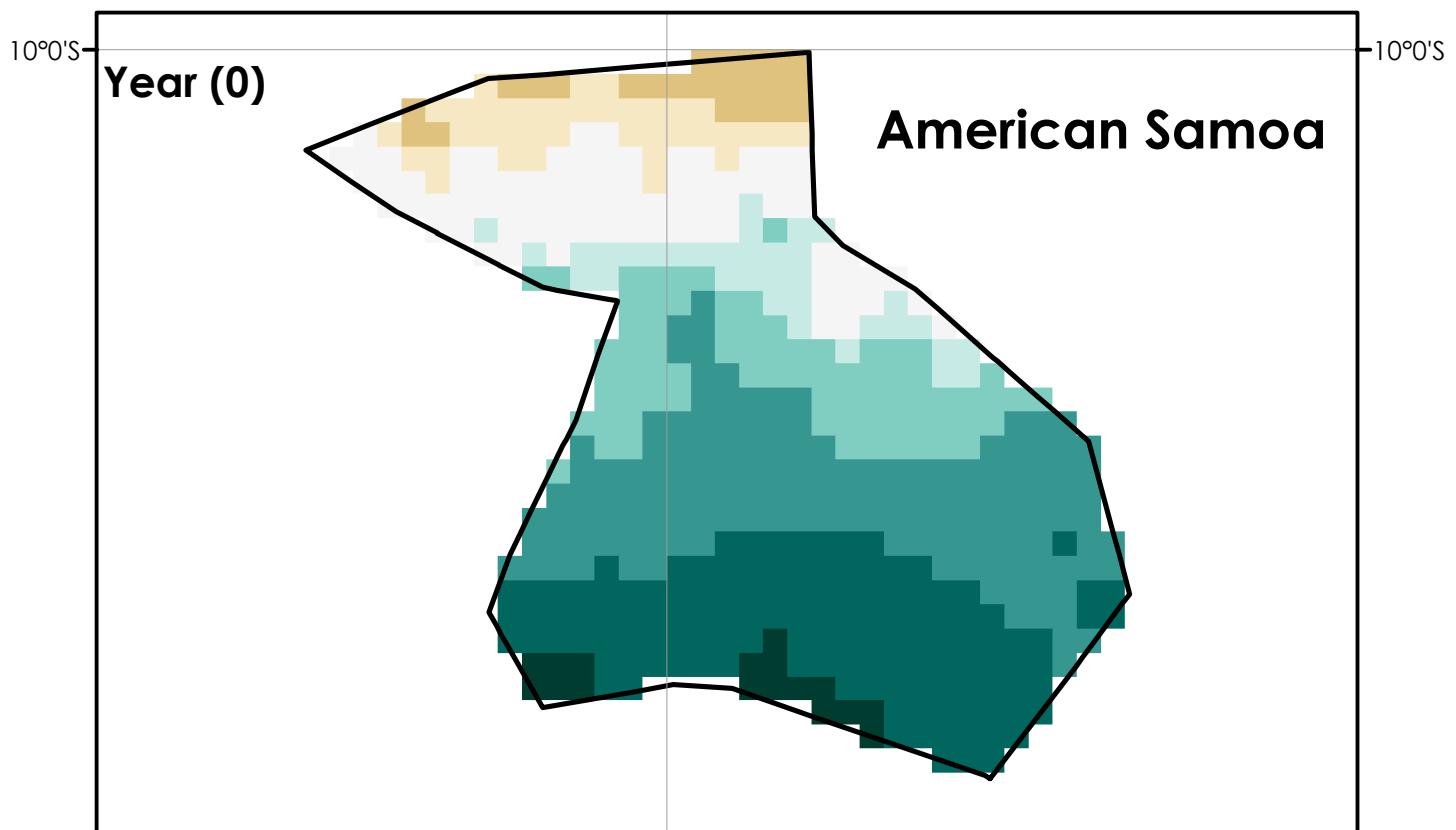


Precipitation Change (%)



Moderate - Strong La Niña for SON

147

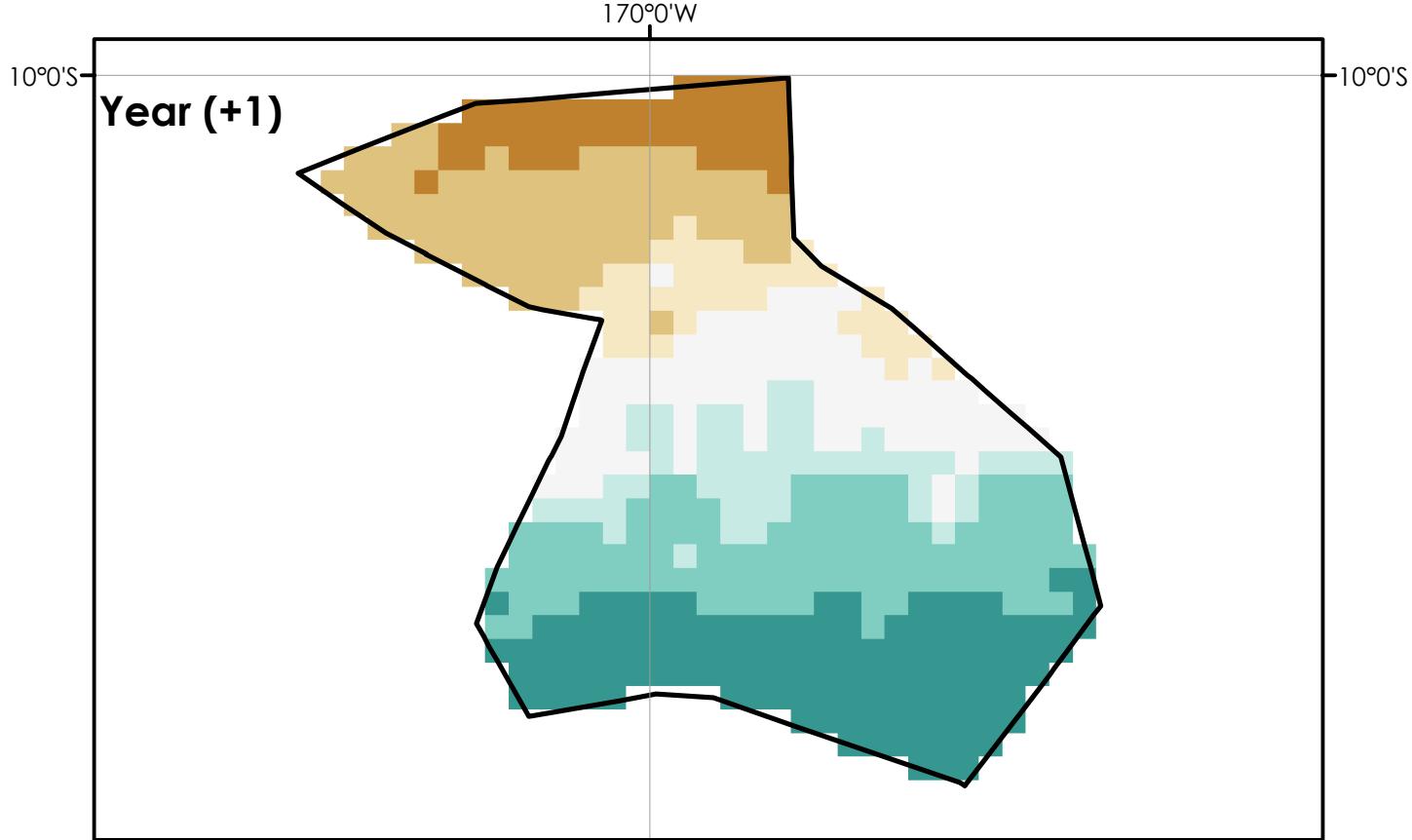
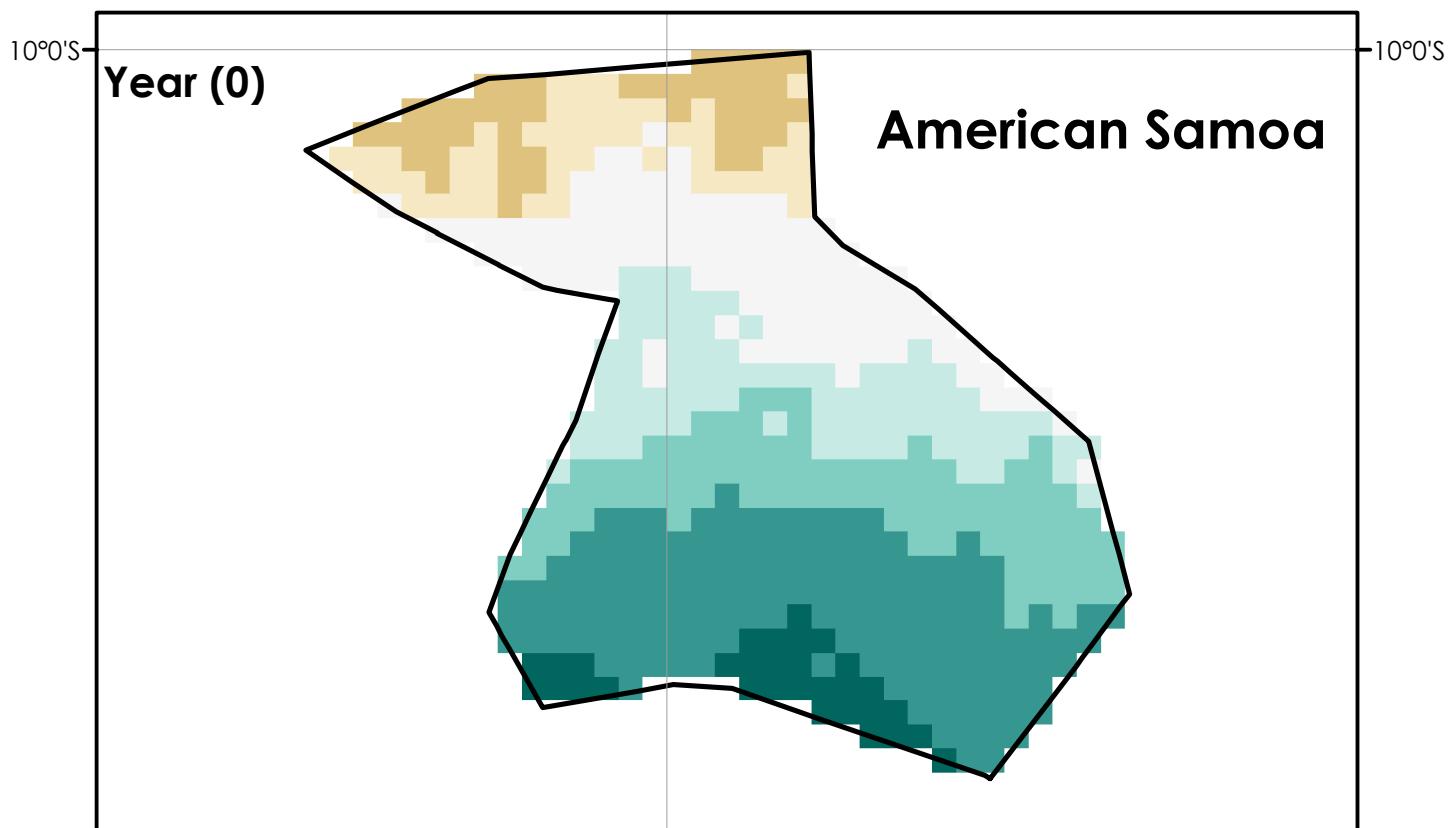


Precipitation Change (%)



Moderate - Strong La Niña for OND

148

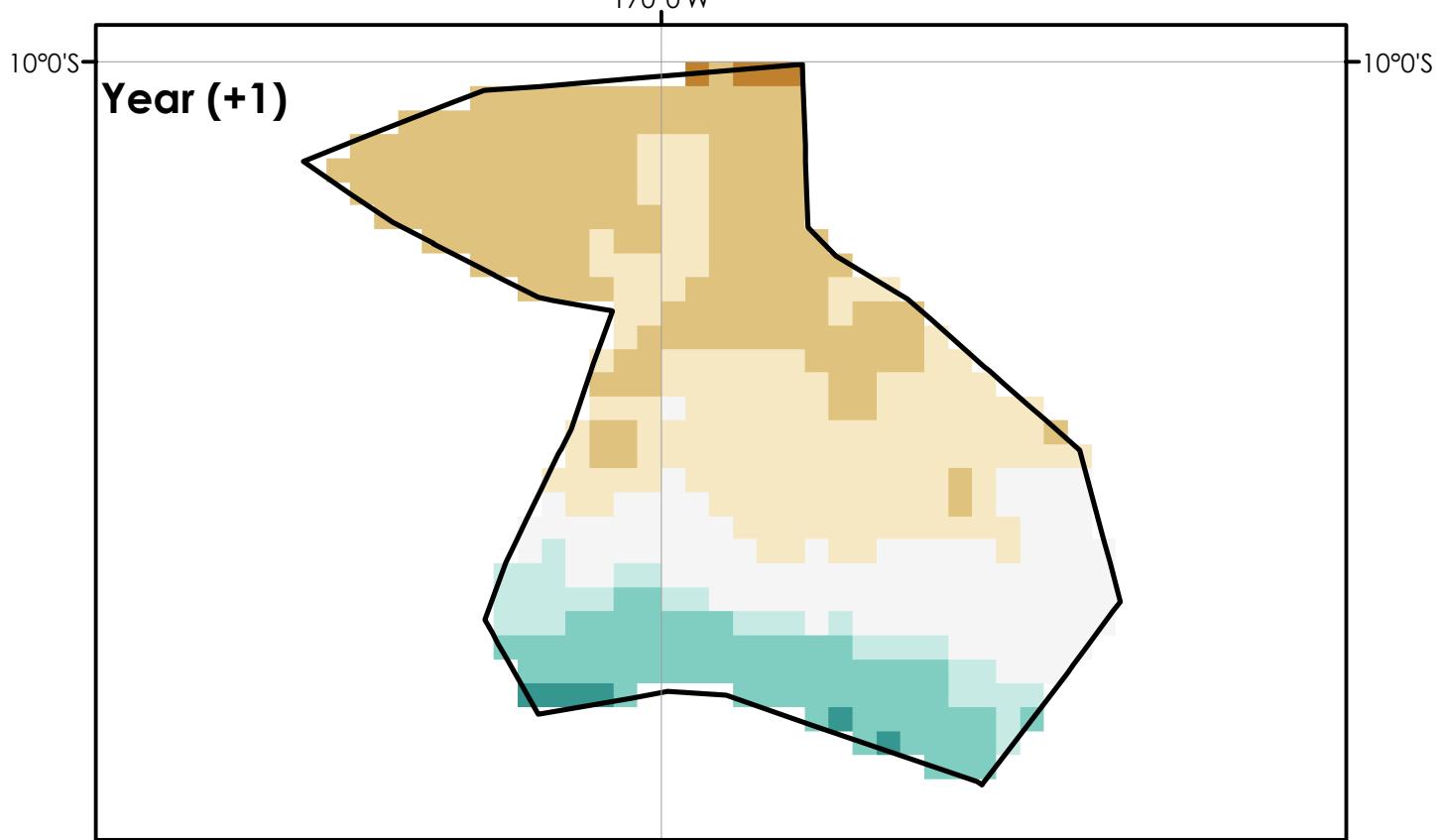
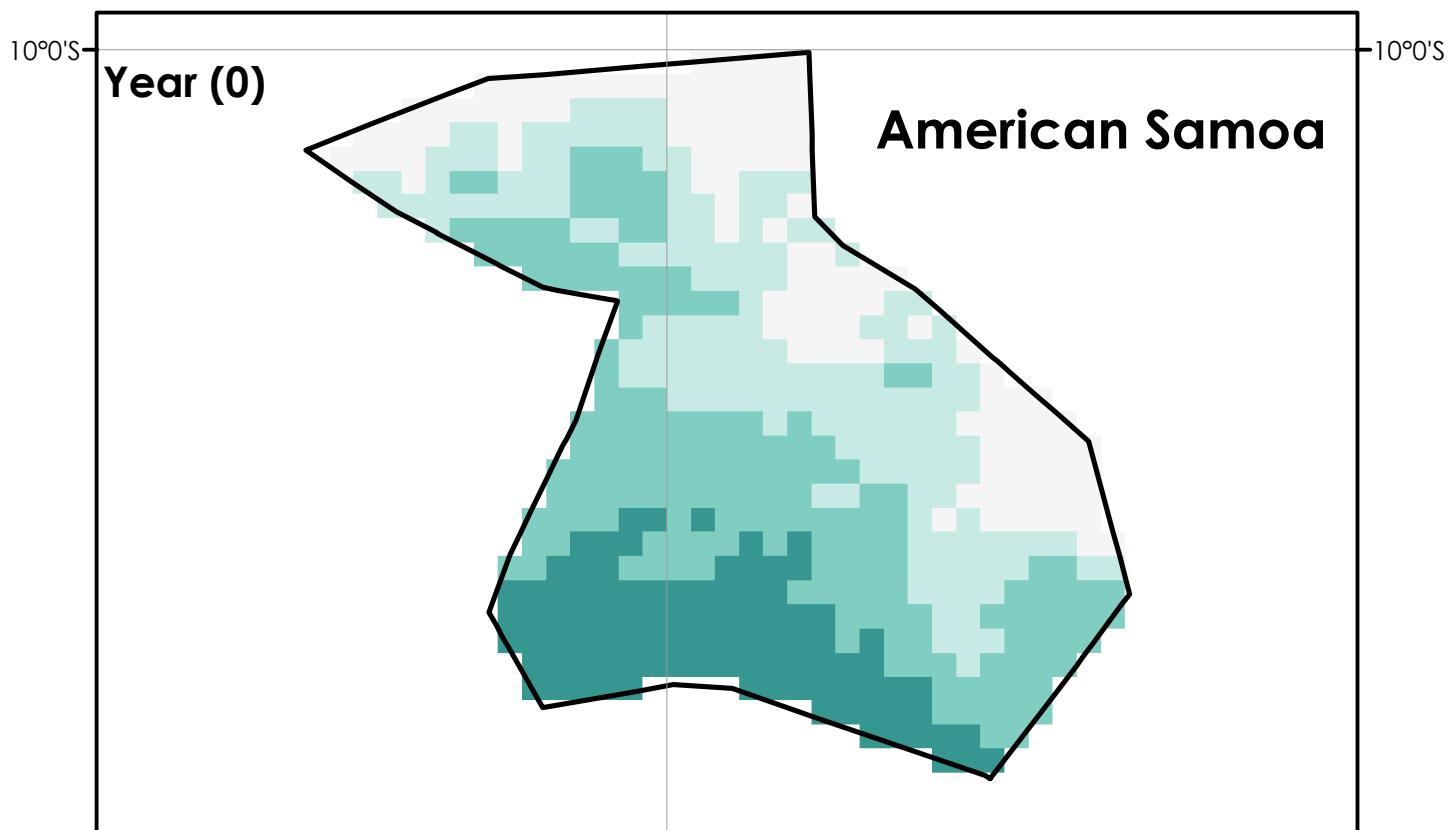


Precipitation Change (%)

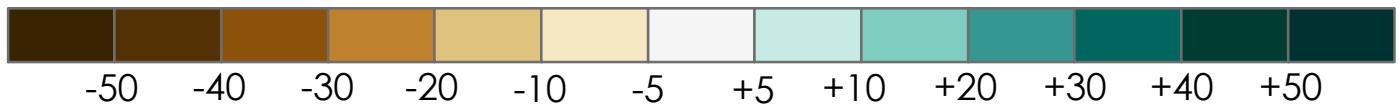


Moderate - Strong La Niña for NDJ

149



Precipitation Change (%)



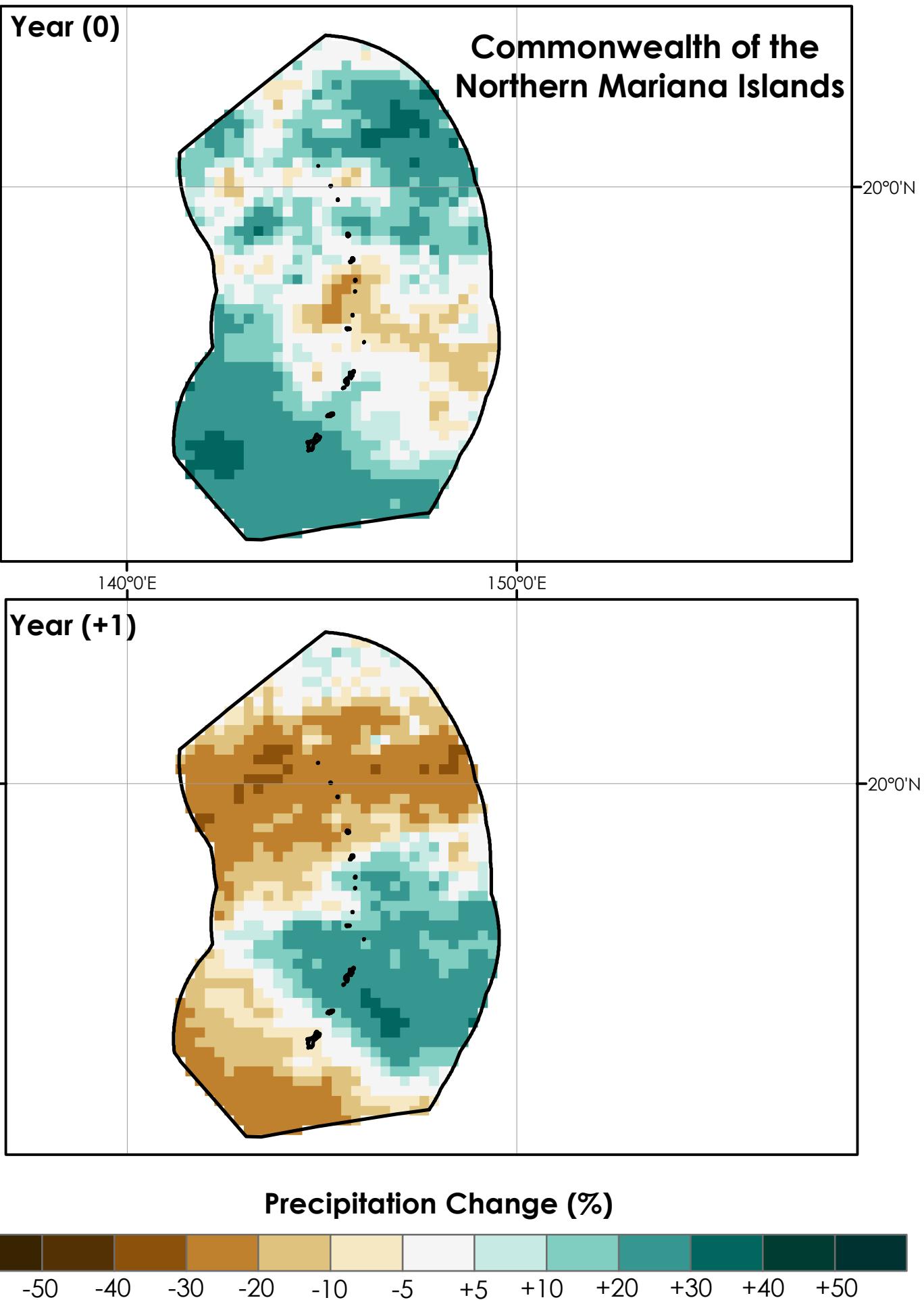
The following two-panel maps show each three month seasonal average precipitation change for each of the five ENSO phases (moderate-strong La Niña and El Niño, weak La Niña and El Niño, and neutral) for the Northern Mariana Islands Exclusive Economic Zone. Within each two-panel map, the top map shows the average precipitation change for the three month season preceding (Year (0)) the onset of the specific ENSO phase, which is listed in the title, and the bottom map shows the average precipitation change following (Year (+1)) the onset of the specific ENSO phase.

These maps show the areas within the EEZ that are abnormally wet (turquoise/green) or dry (tan/brown) for the three month season during a specific ENSO phase. Additionally, these maps show how the precipitation varies from a pre ENSO to a post ENSO phase. This is important when determining how the different ENSO phases influence precipitation patterns.

All of the maps show precipitation at a 0.25° resolution from the NOAA PERSIANN-CDR. The “normal” is the 30-year average precipitation from January 1985 through December 2014.

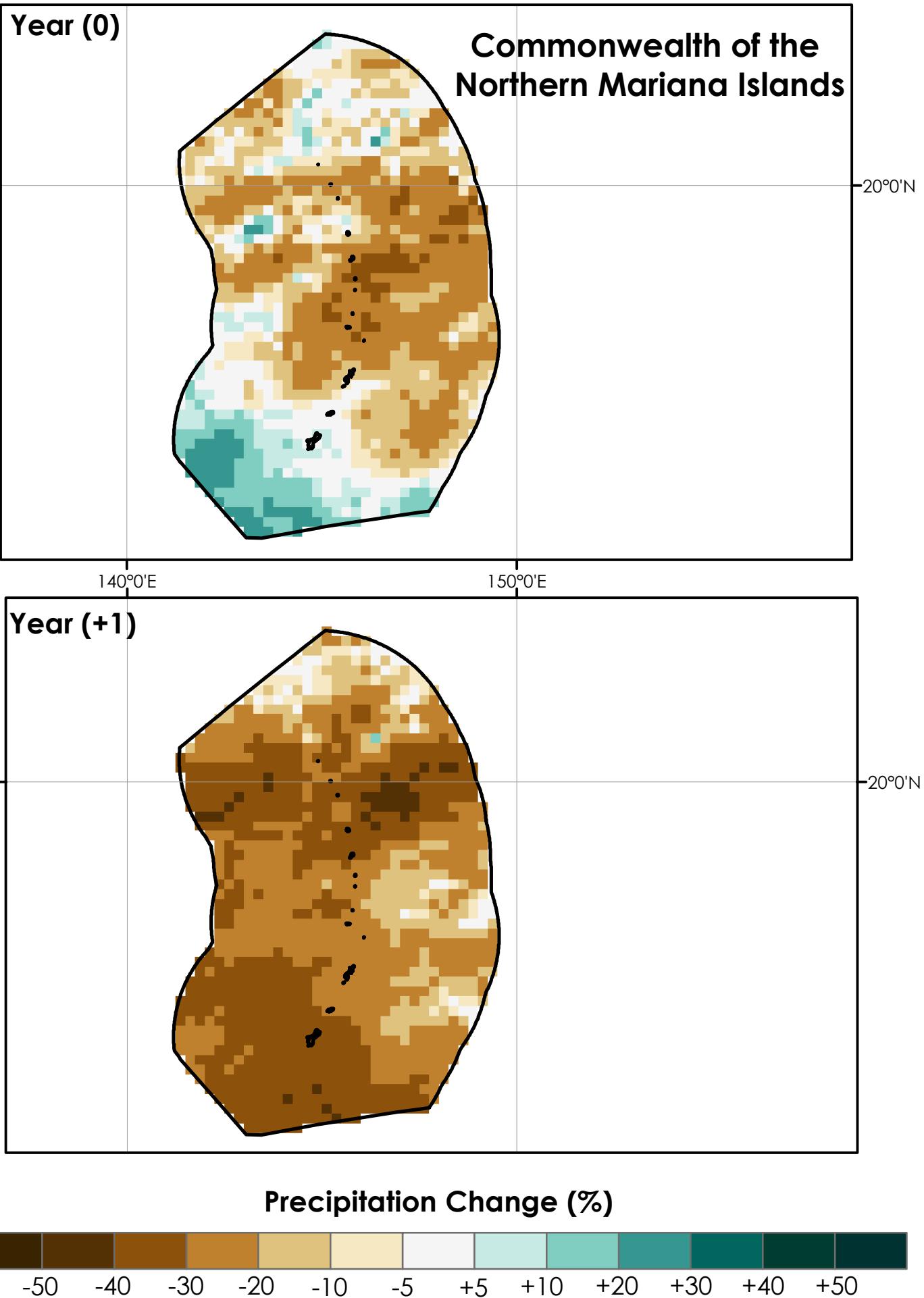
Moderate - Strong El Niño for DJF

151



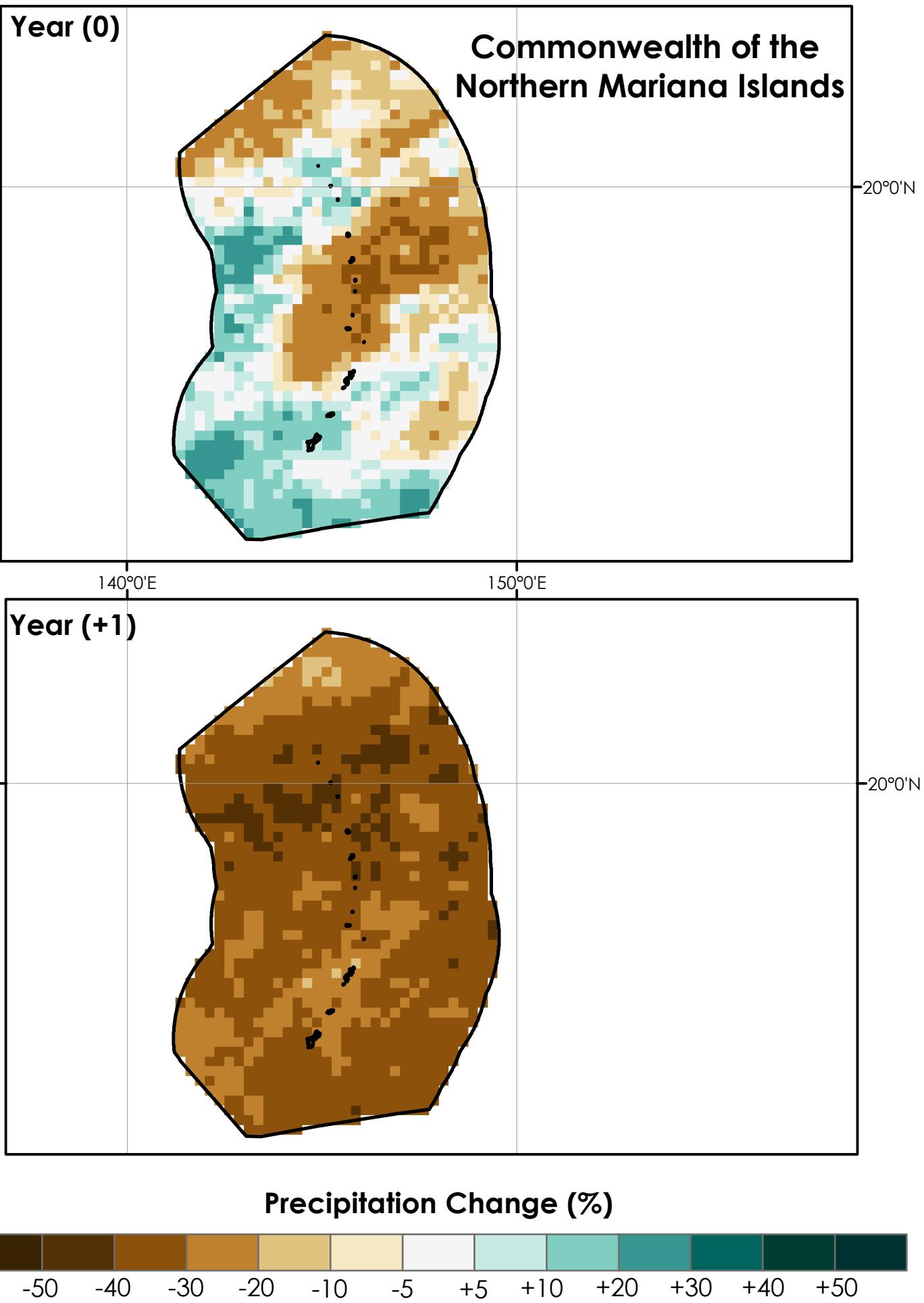
Moderate - Strong El Niño for JFM

152



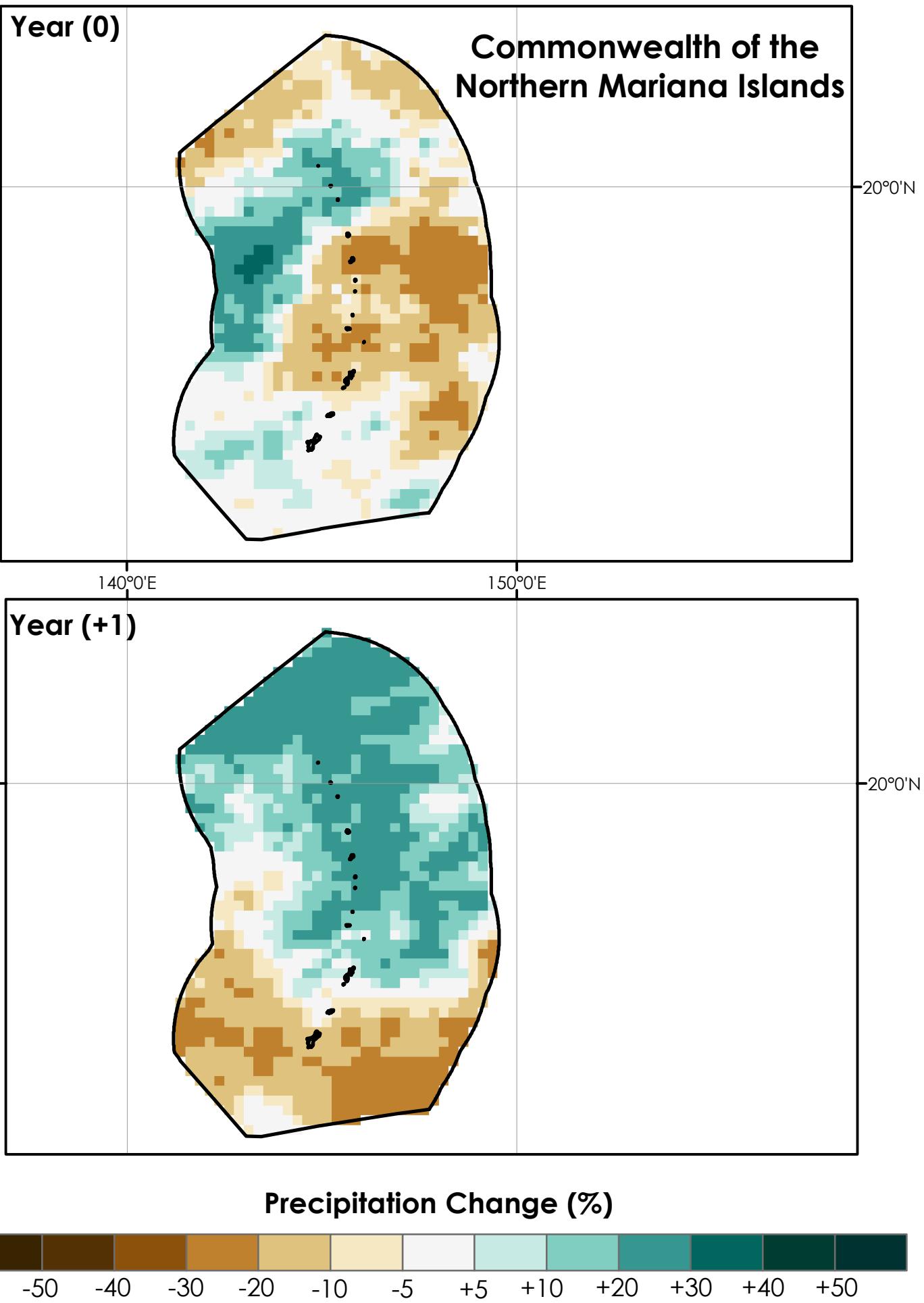
Moderate - Strong El Niño for FMA

153



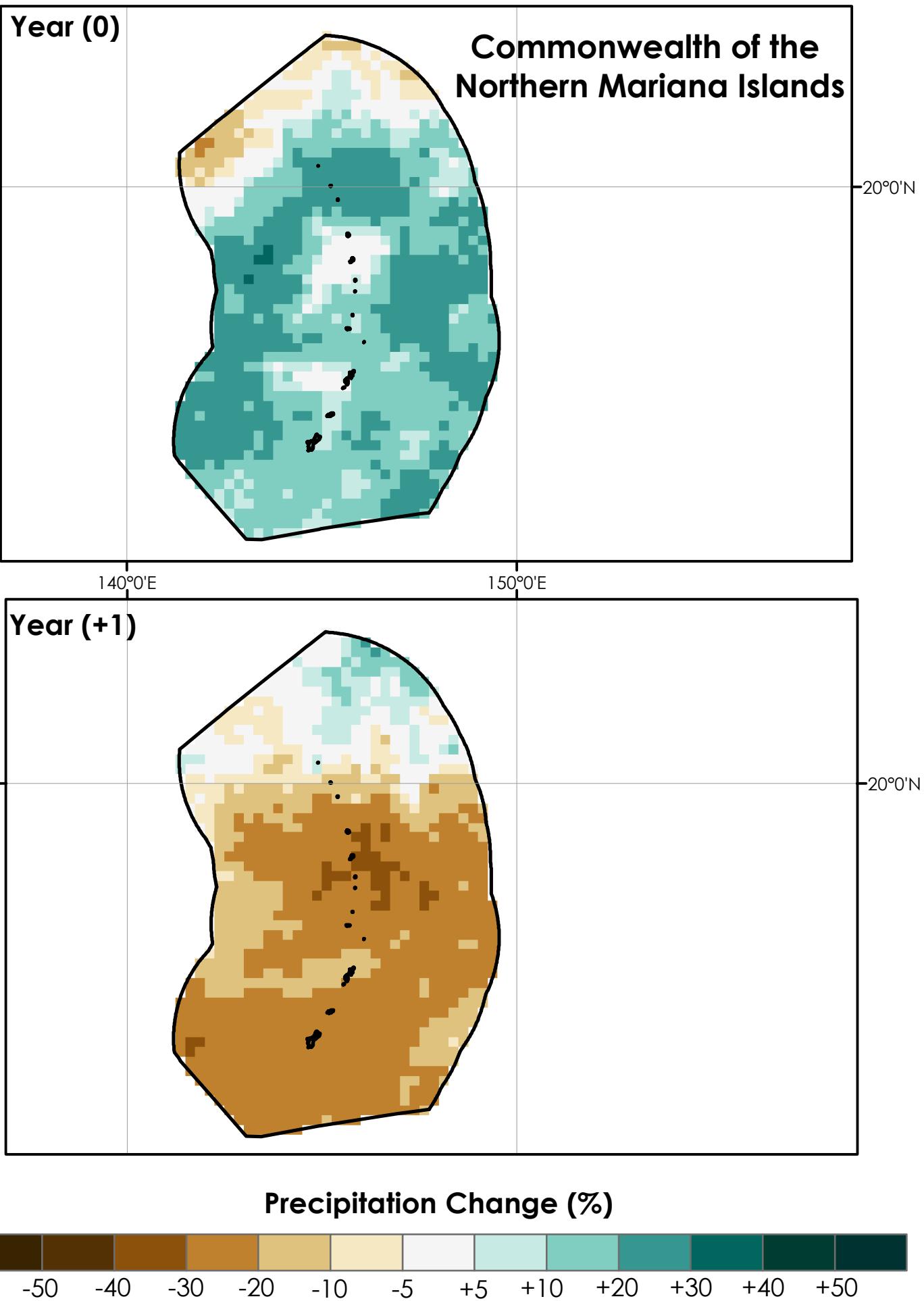
Moderate - Strong El Niño for MAM

154



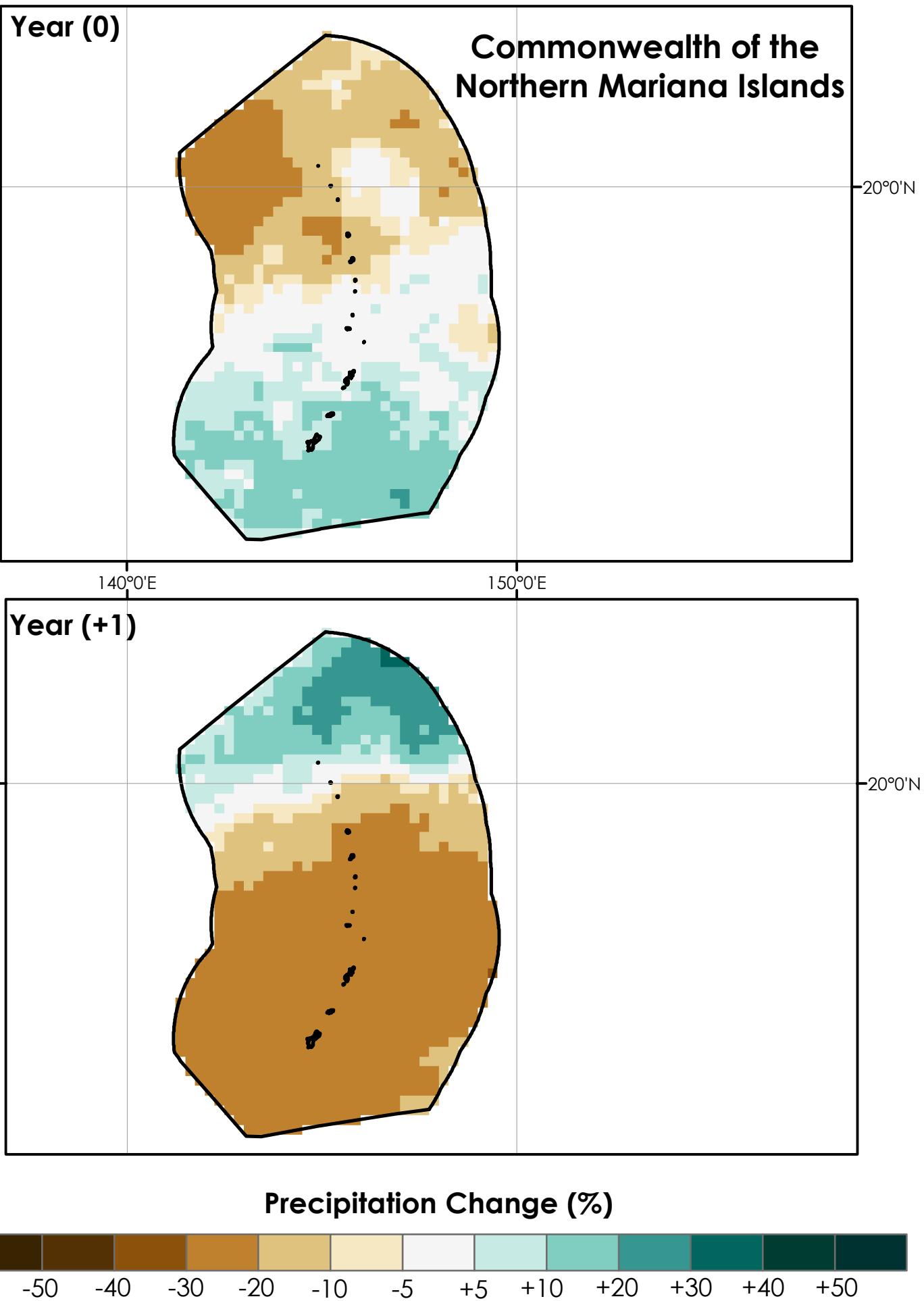
Moderate - Strong El Niño for AMJ

155



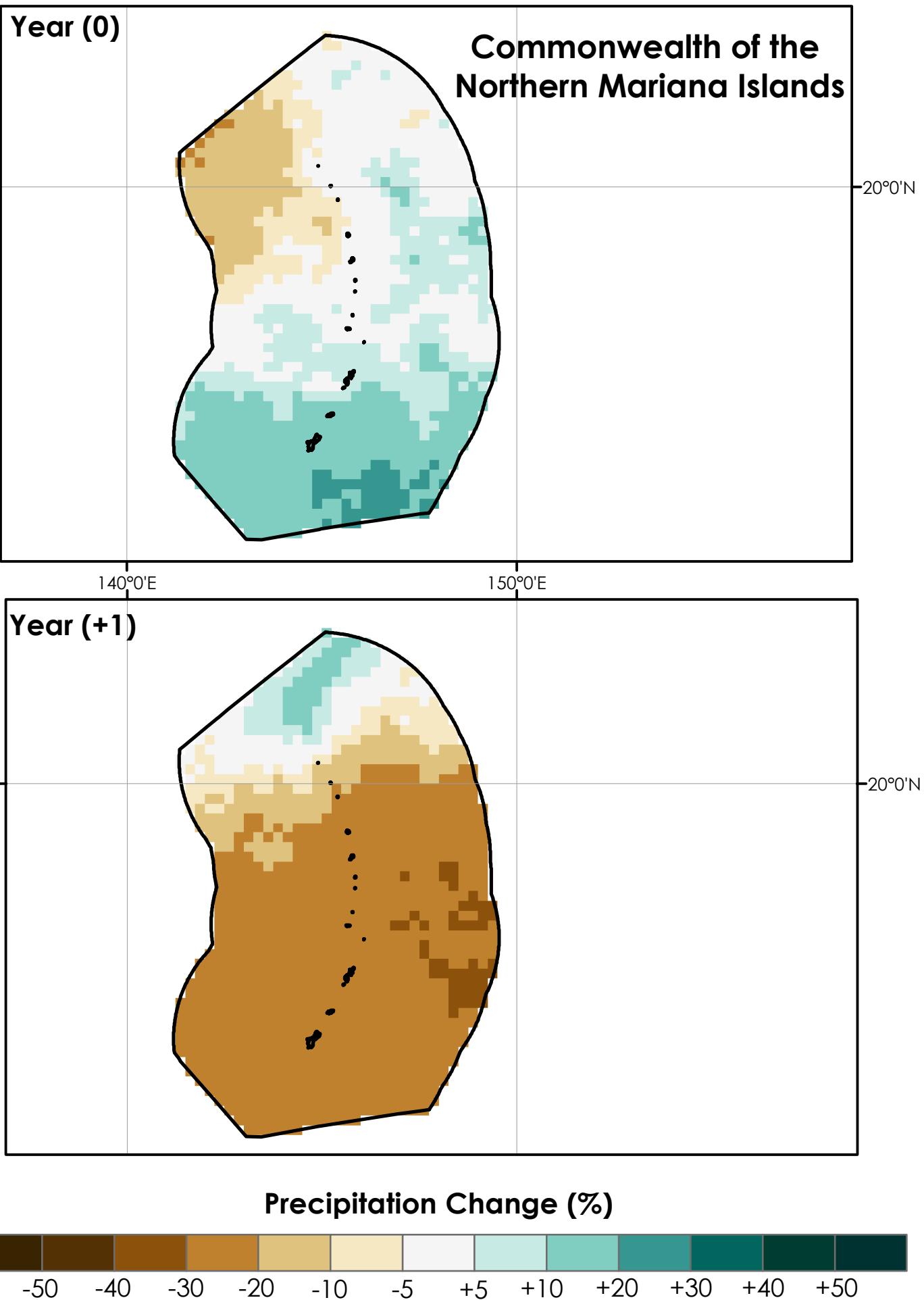
Moderate - Strong El Niño for MJJ

156



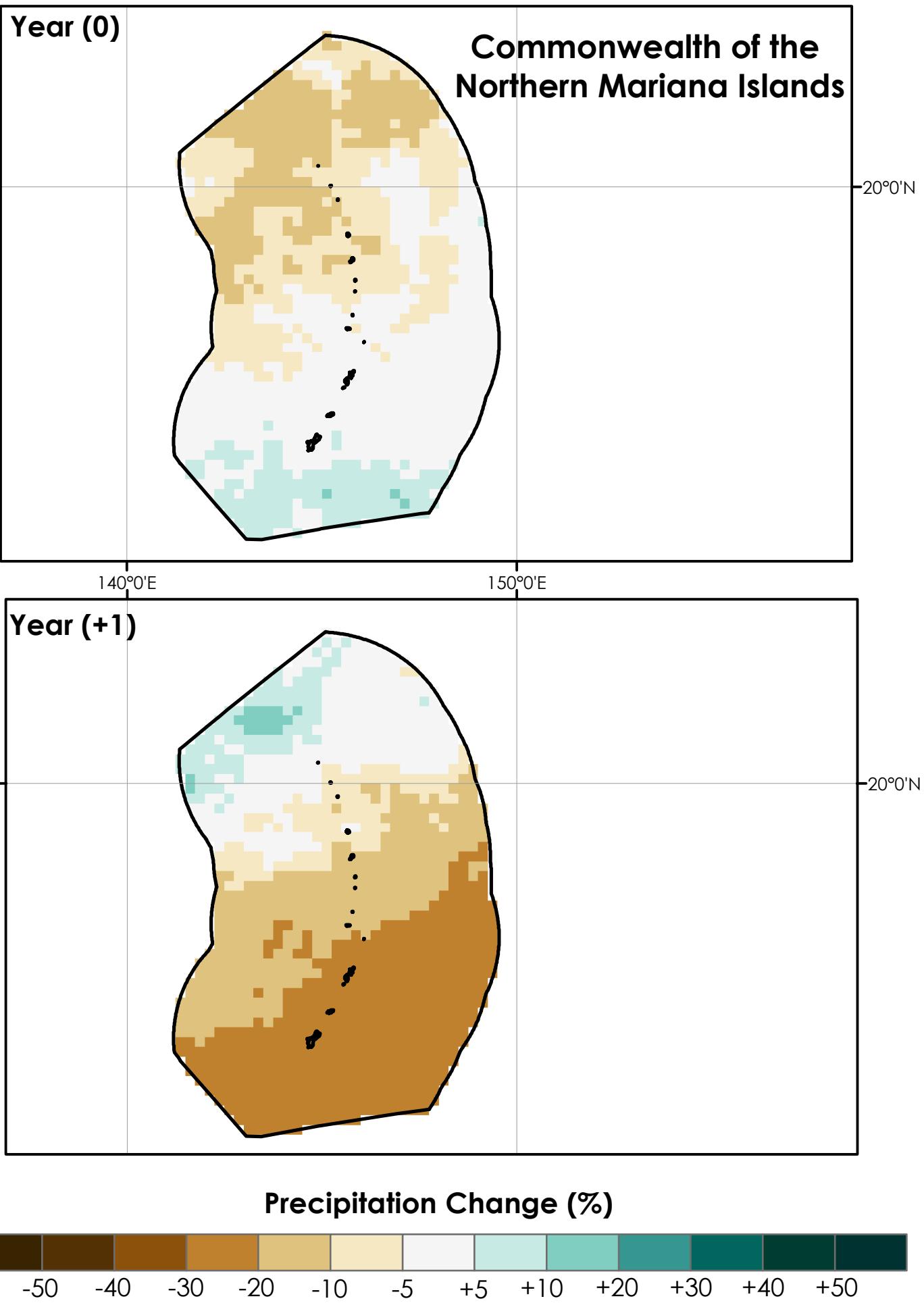
Moderate - Strong El Niño for JJA

157



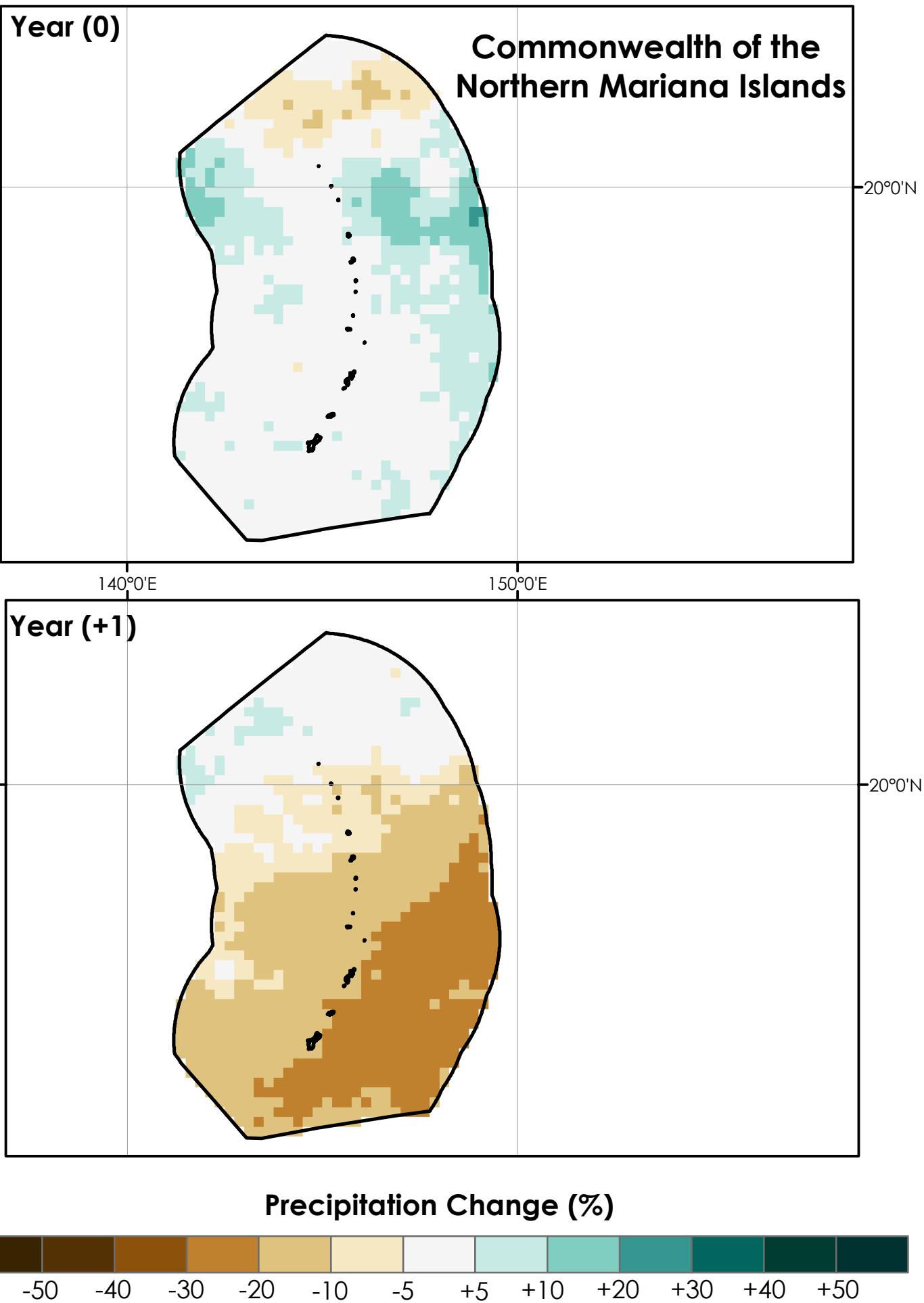
Moderate - Strong El Niño for JAS

158



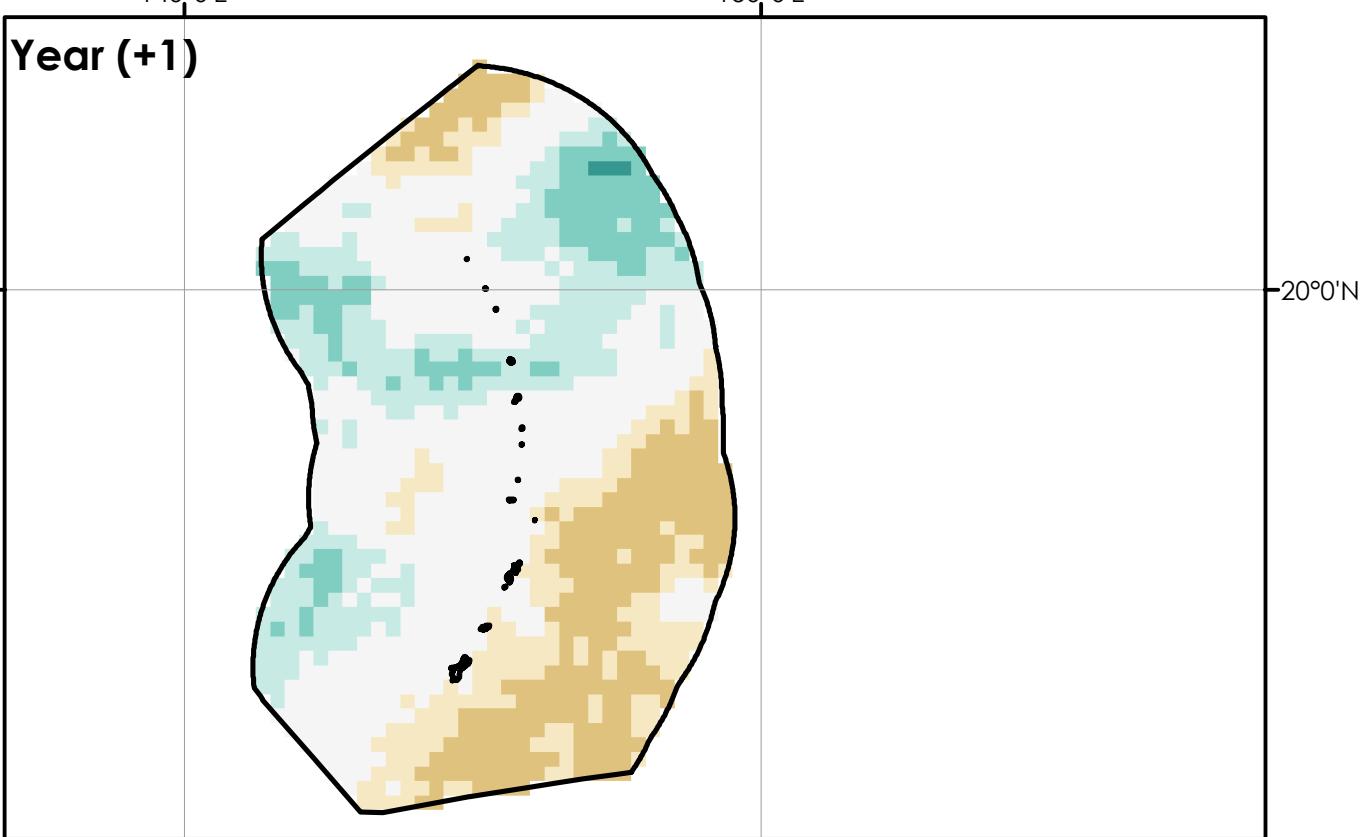
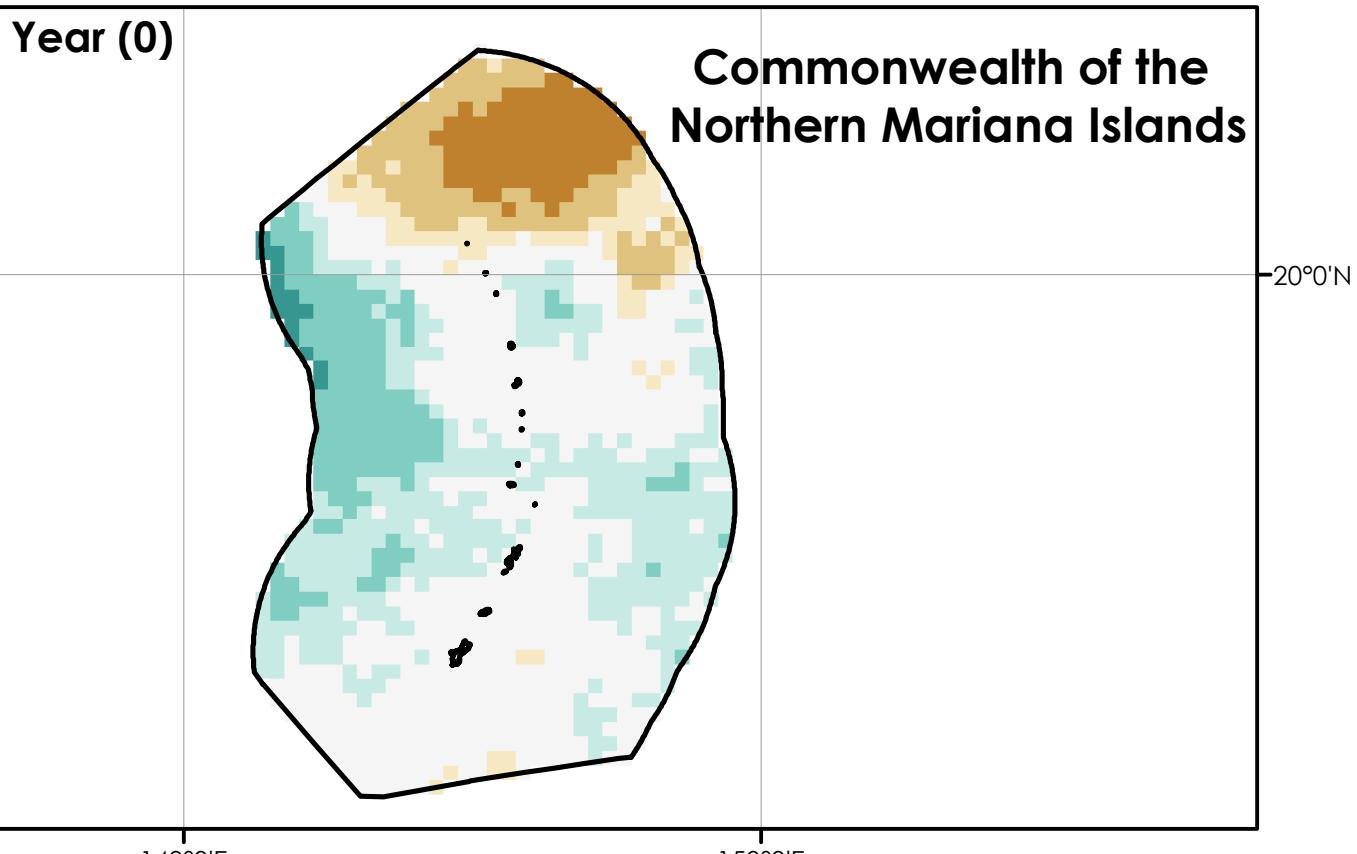
Moderate - Strong El Niño for ASO

159

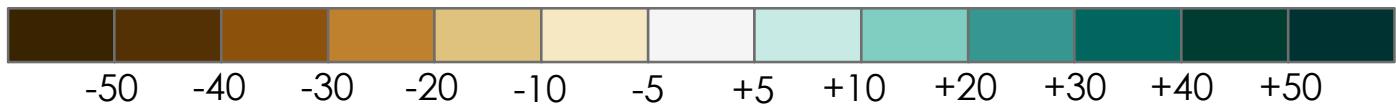


Moderate - Strong El Niño for SON

160

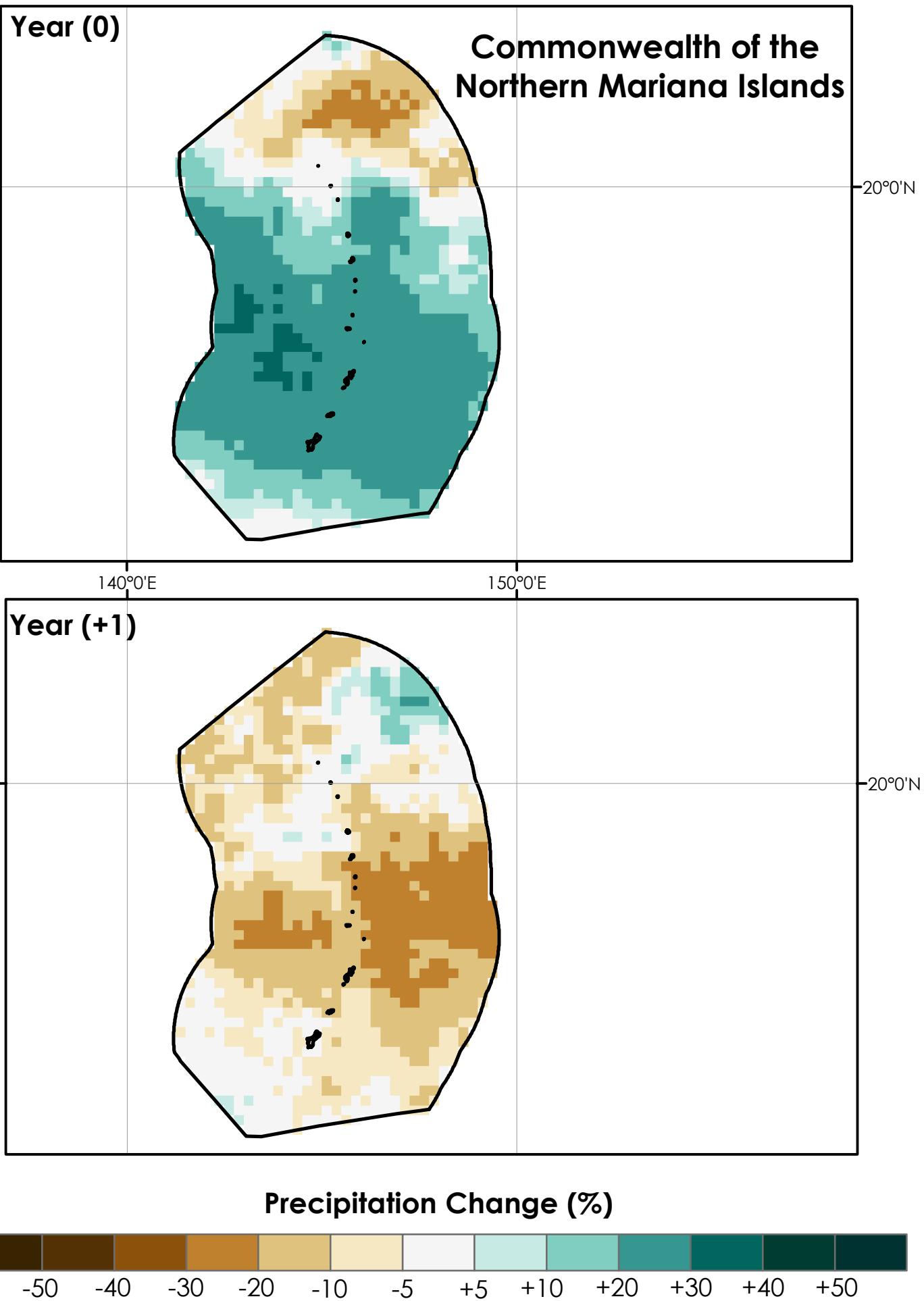


Precipitation Change (%)



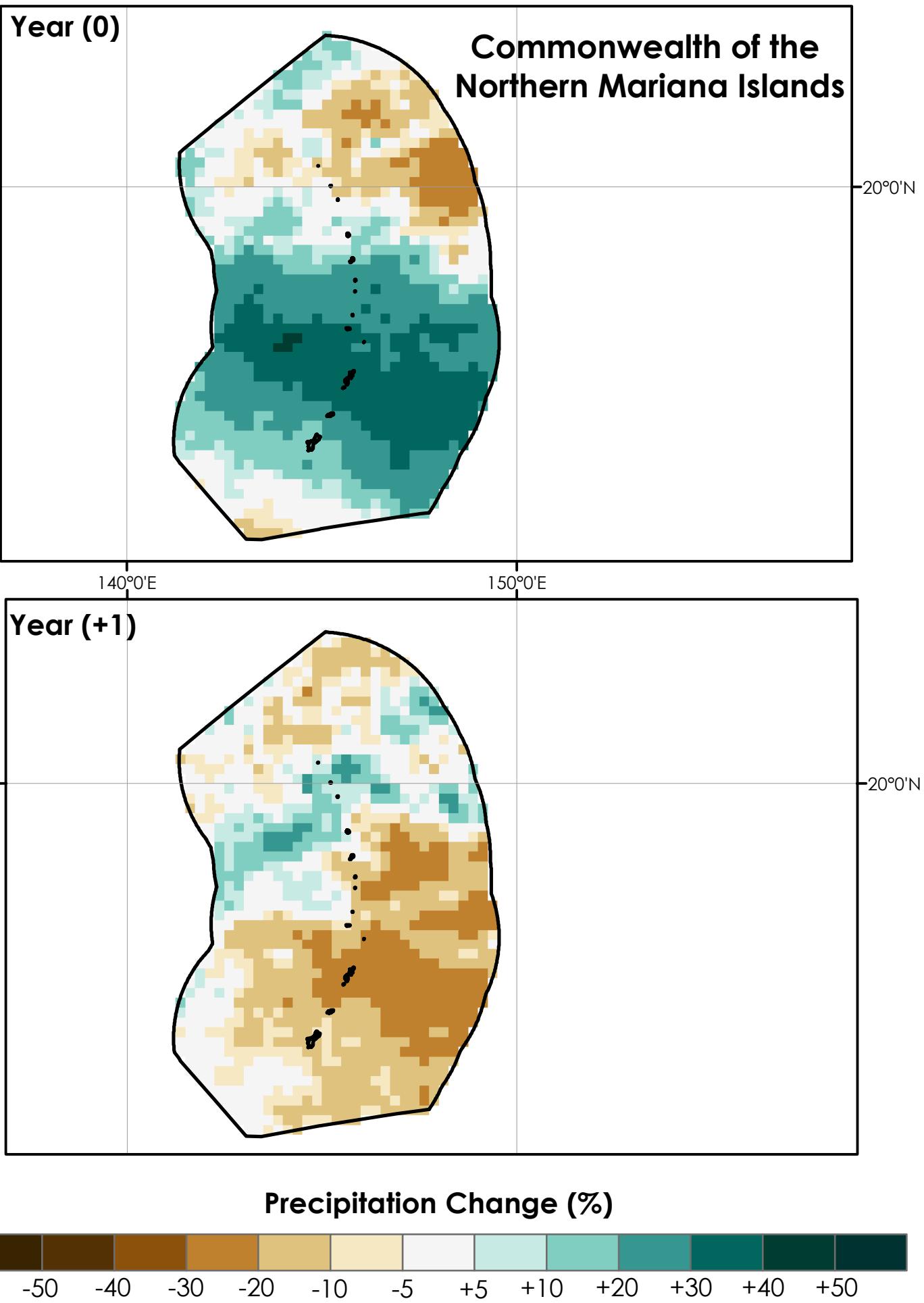
Moderate - Strong El Niño for OND

161



Moderate - Strong El Niño for NDJ

162



Weak El Niño for DJF

163

Year (0)

Commonwealth of the
Northern Mariana Islands

20°0'N

20°0'N

140°0'E

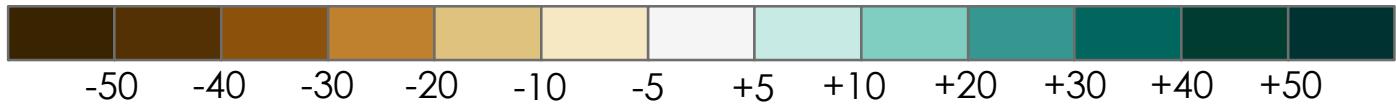
150°0'E

Year (+1)

20°0'N

20°0'N

Precipitation Change (%)



Weak El Niño for JFM

164

Year (0)

Commonwealth of the
Northern Mariana Islands

20°0'N

20°0'N

140°0'E

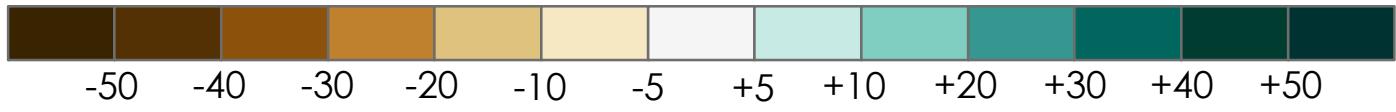
150°0'E

Year (+1)

20°0'N

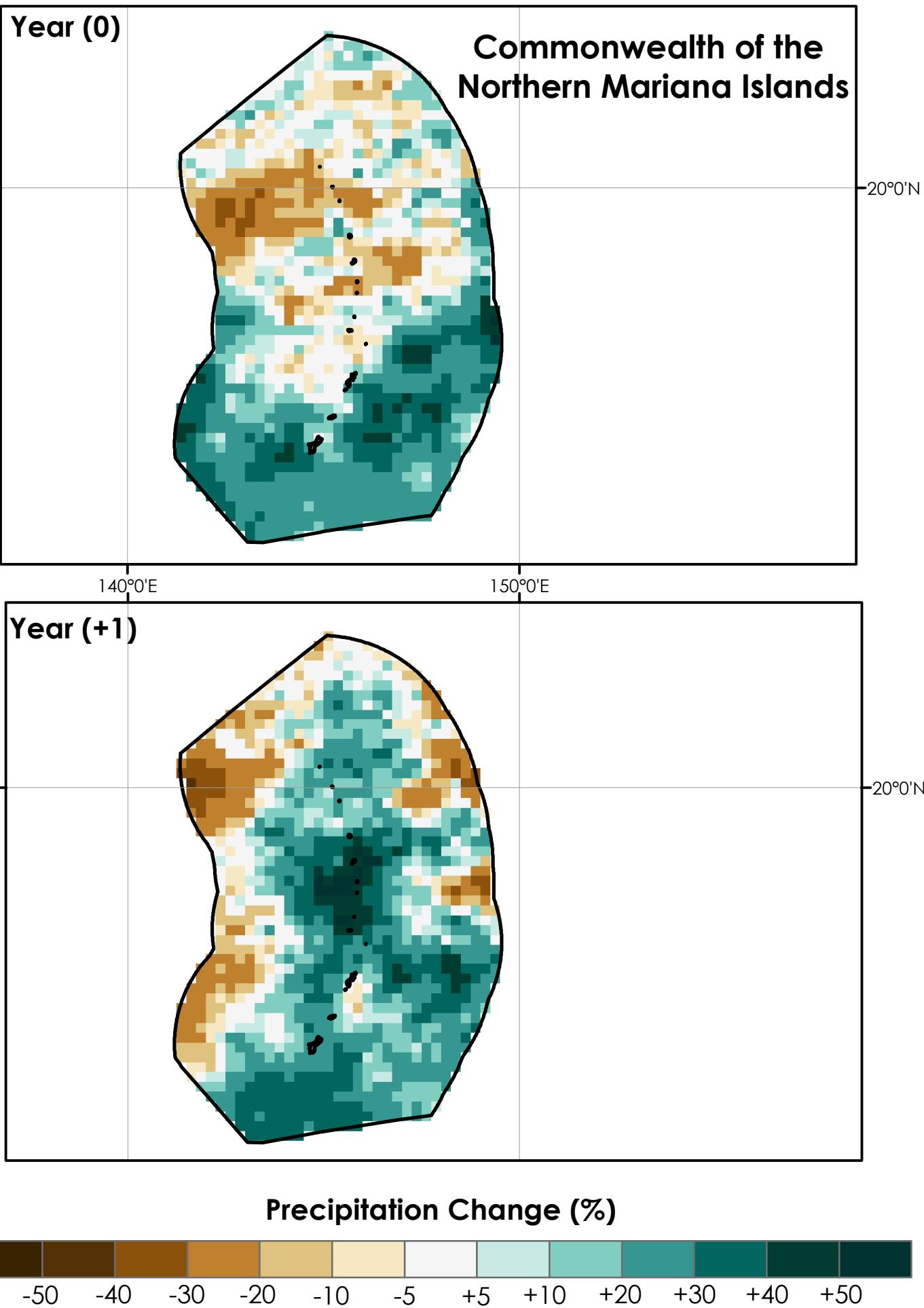
20°0'N

Precipitation Change (%)



Weak El Niño for FMA

165



Weak El Niño for MAM

166

Year (0)

Commonwealth of the
Northern Mariana Islands

20°0'N

20°0'N

140°0'E

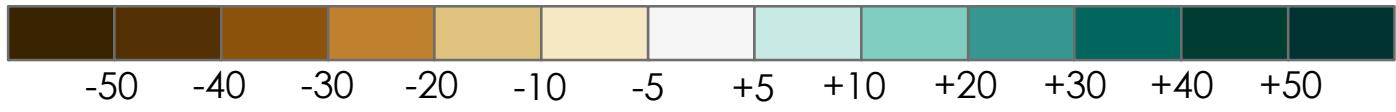
150°0'E

Year (+1)

20°0'N

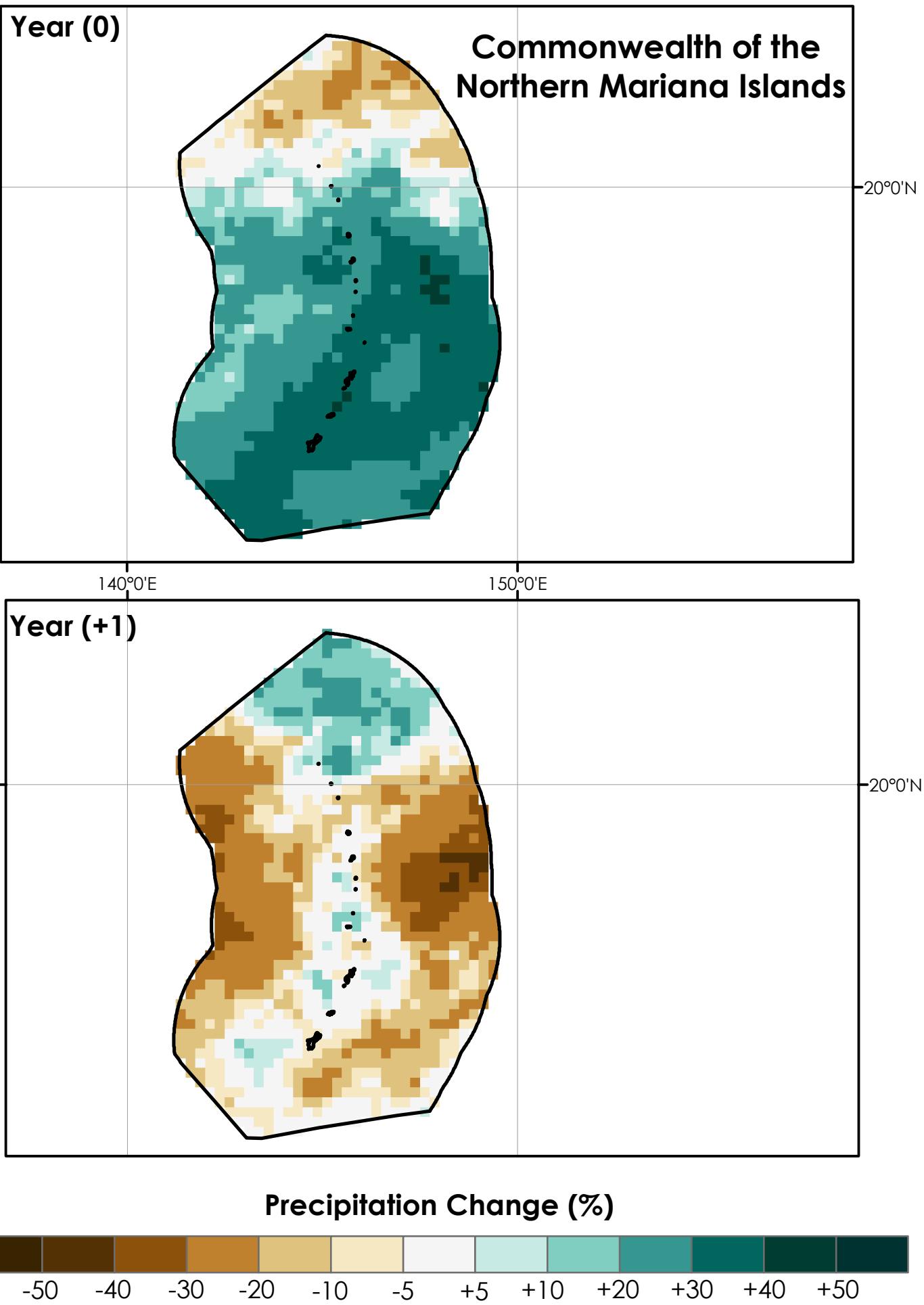
20°0'N

Precipitation Change (%)



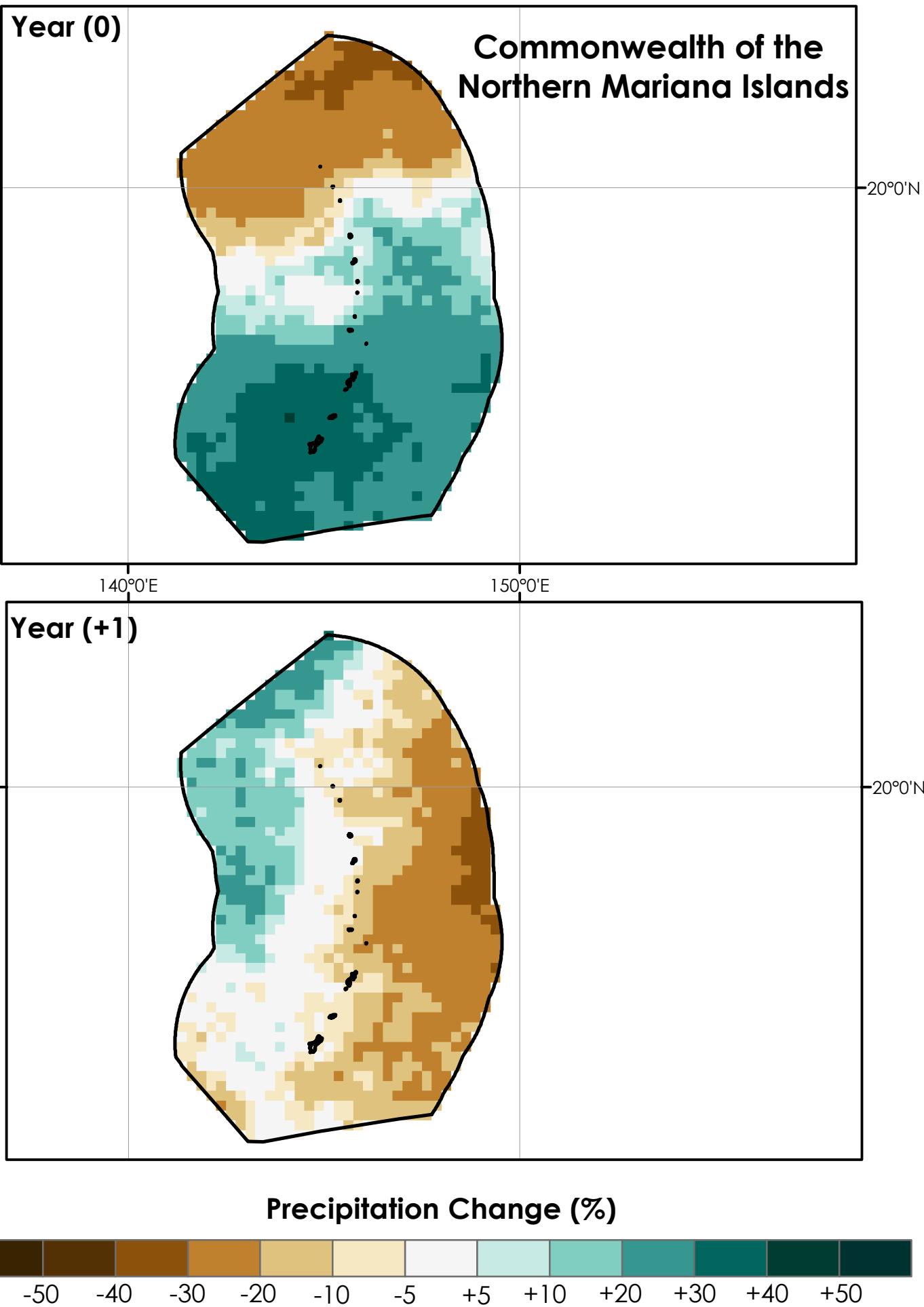
Weak El Niño for AMJ

167



Weak El Niño for MJJ

168



Weak El Niño for JJA

169

Year (0)

Commonwealth of the
Northern Mariana Islands

20°0'N

20°0'N

140°0'E

150°0'E

Year (+1)

20°0'N

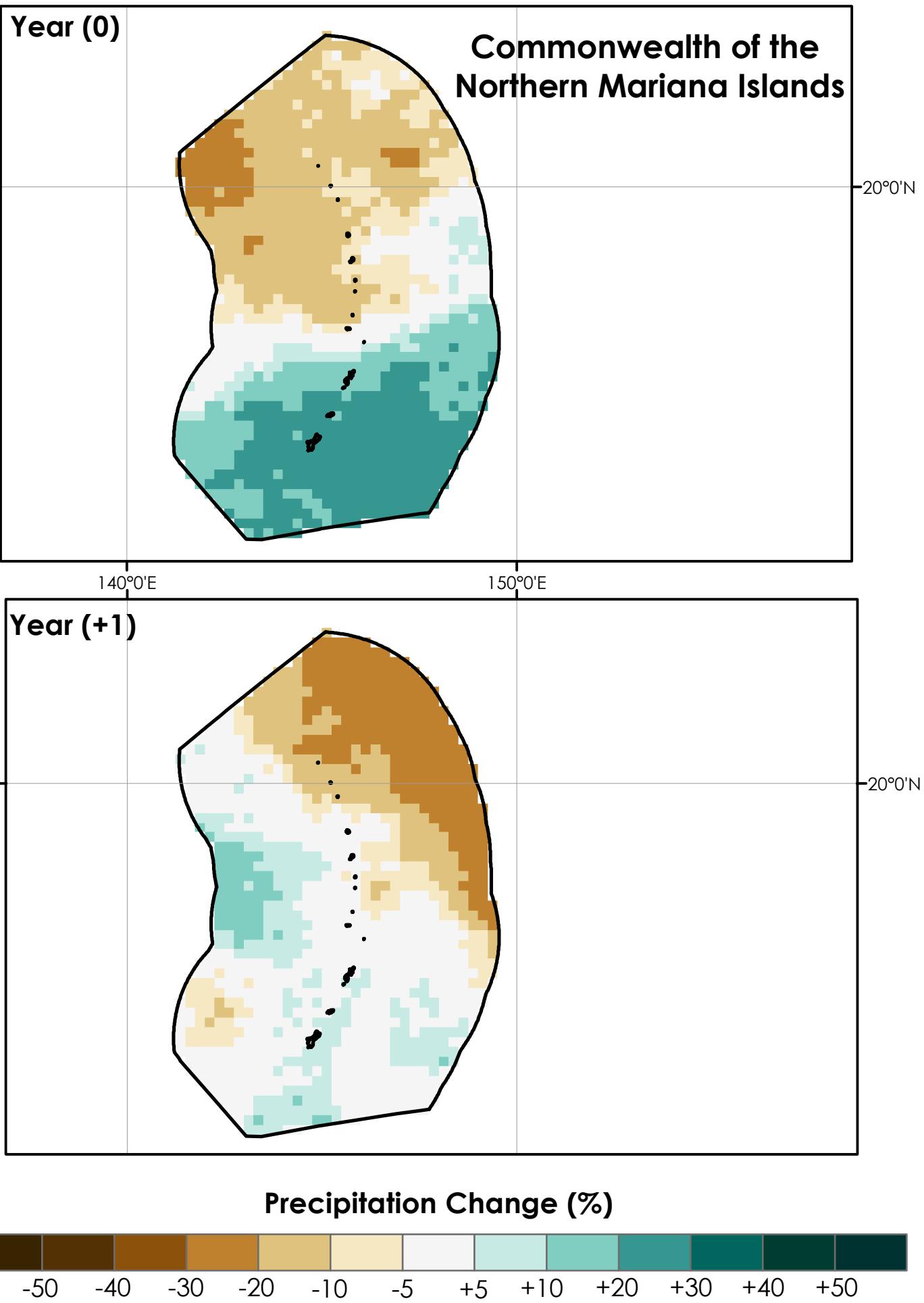
20°0'N

Precipitation Change (%)



Weak El Niño for JAS

170



Weak El Niño for ASO

171

Year (0)

Commonwealth of the
Northern Mariana Islands

20°0'N

20°0'N

140°0'E

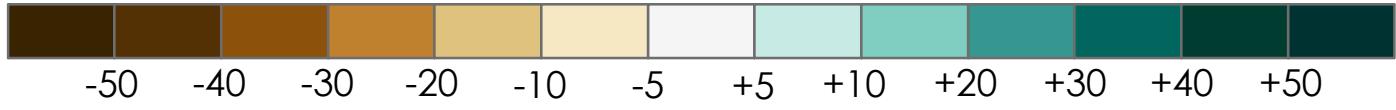
150°0'E

Year (+1)

20°0'N

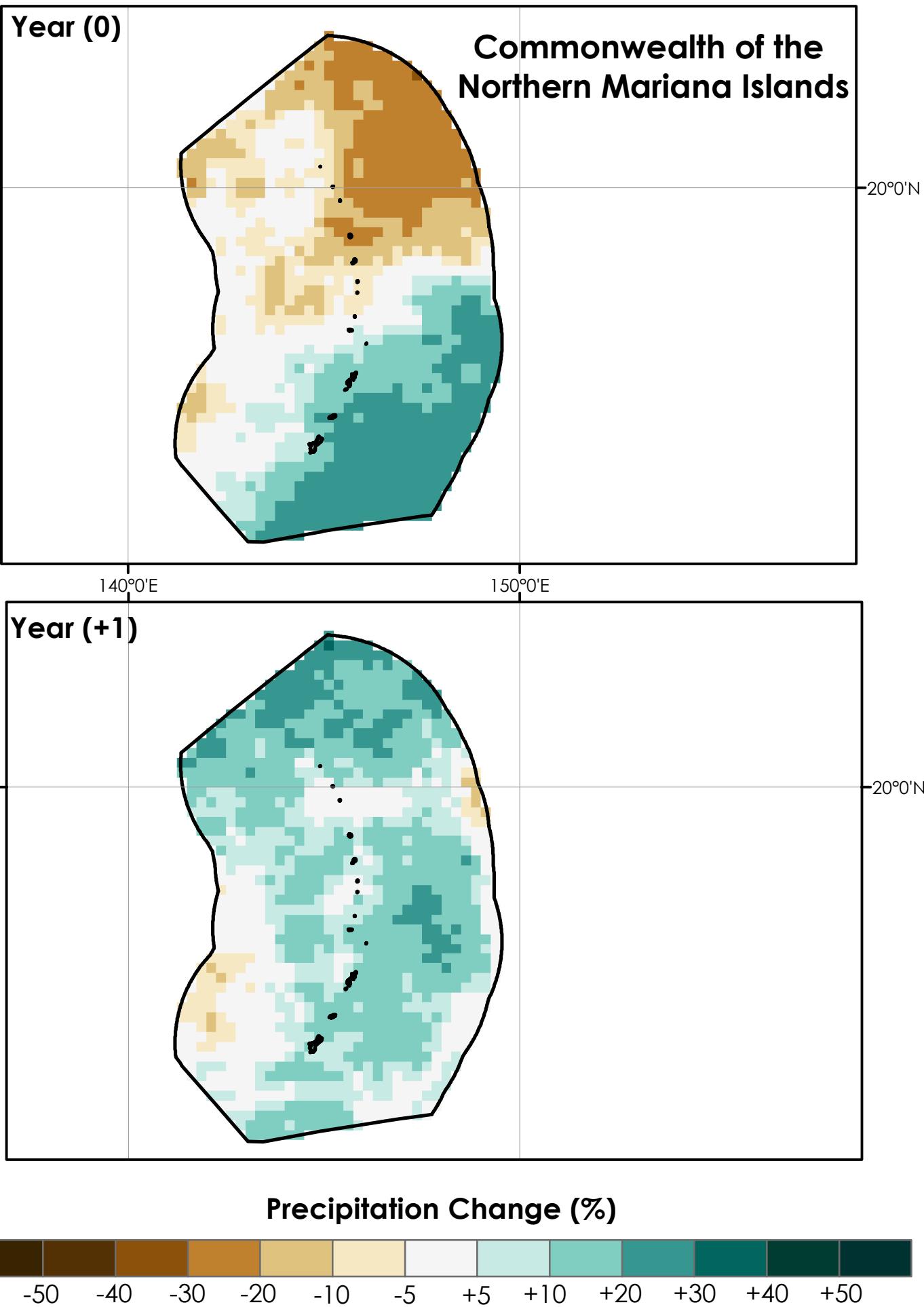
20°0'N

Precipitation Change (%)



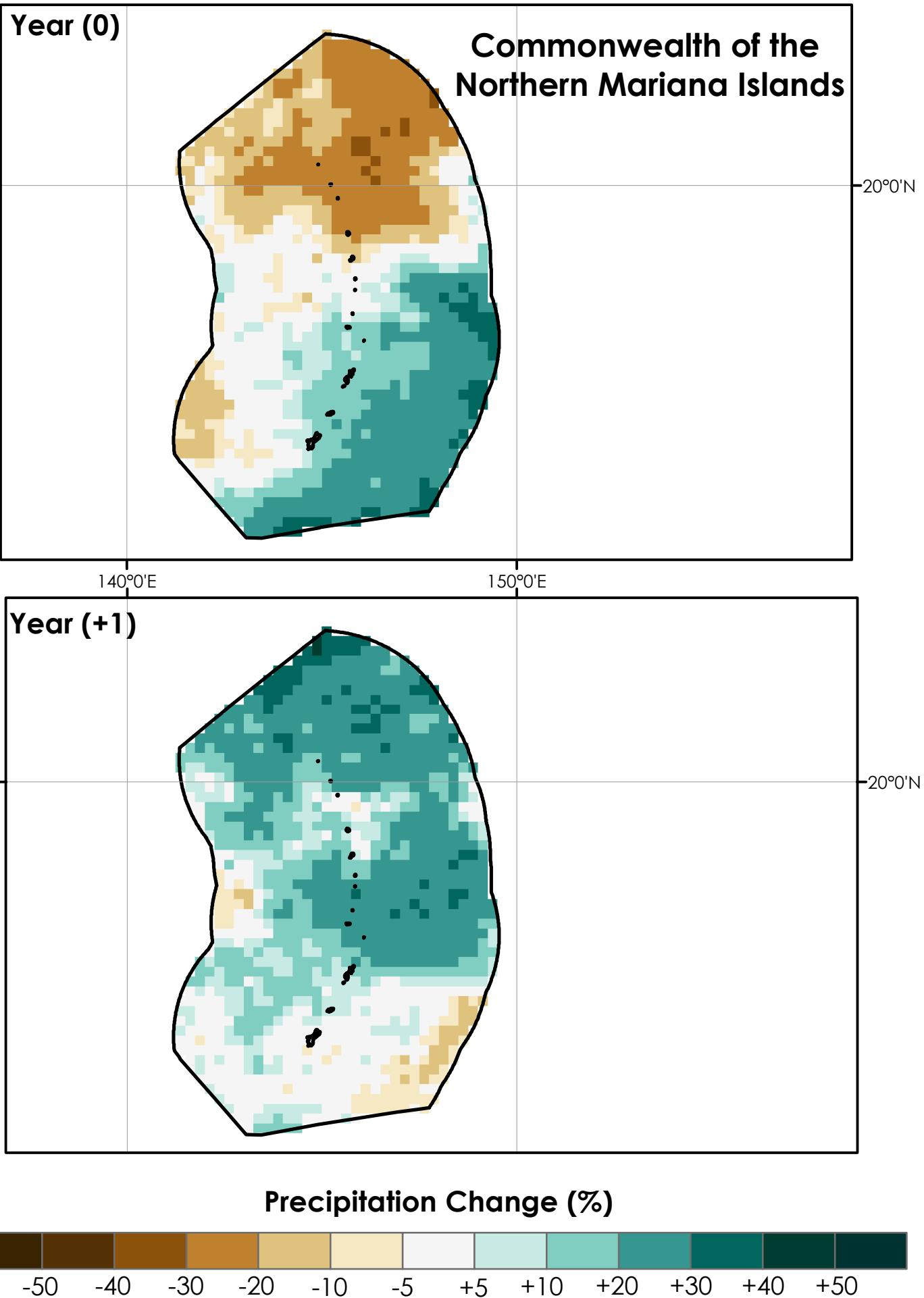
Weak El Niño for SON

172



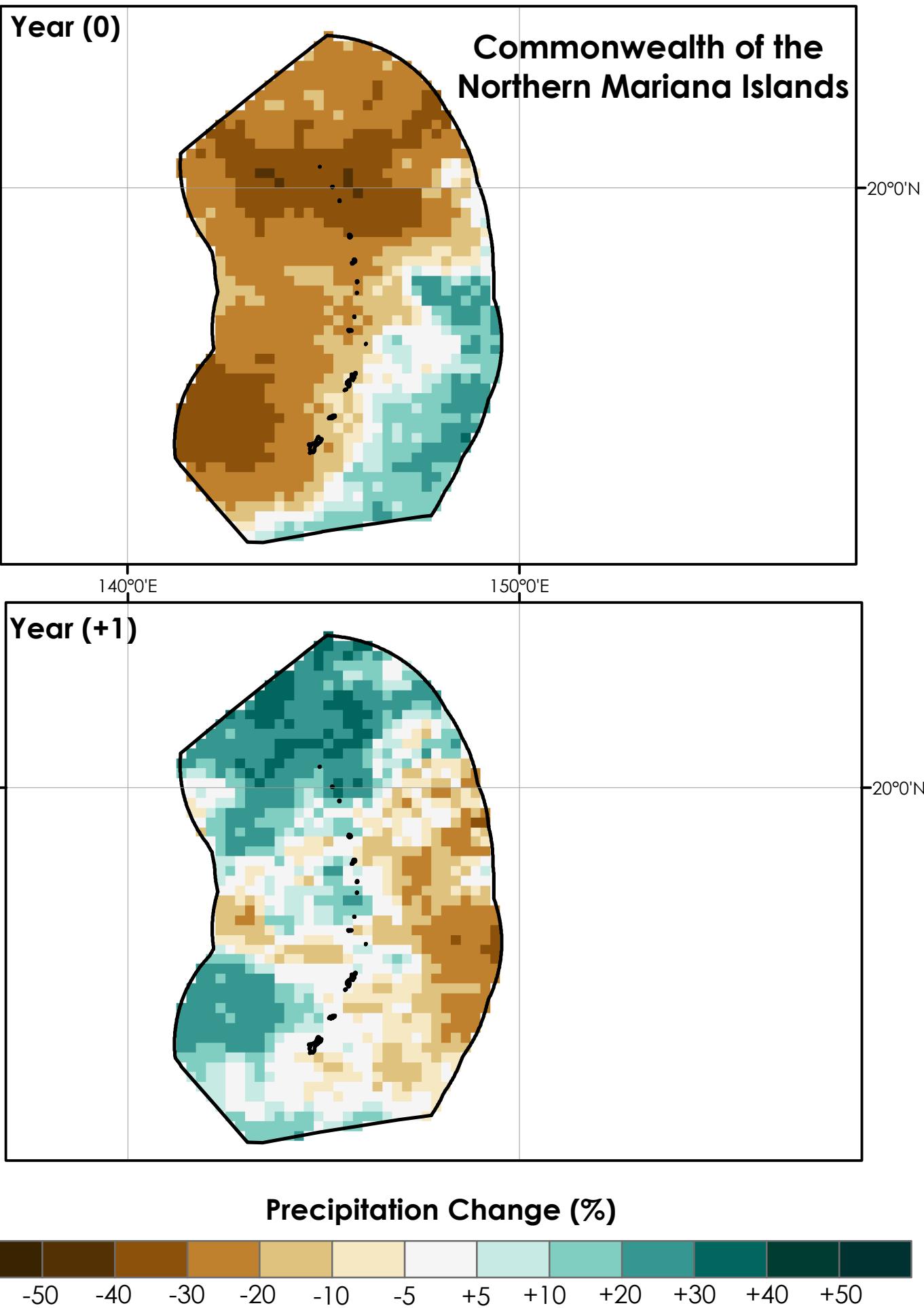
Weak El Niño for OND

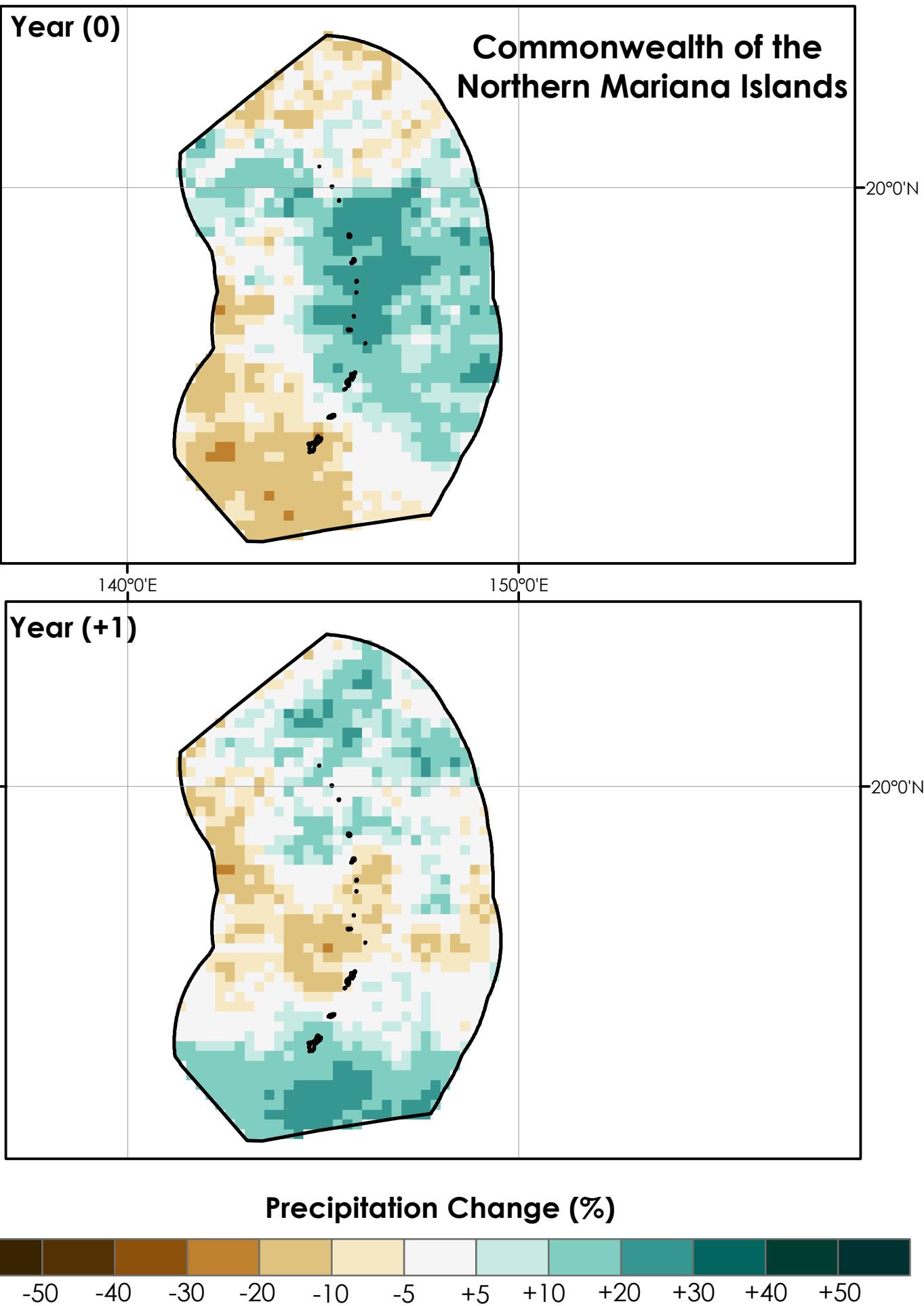
173

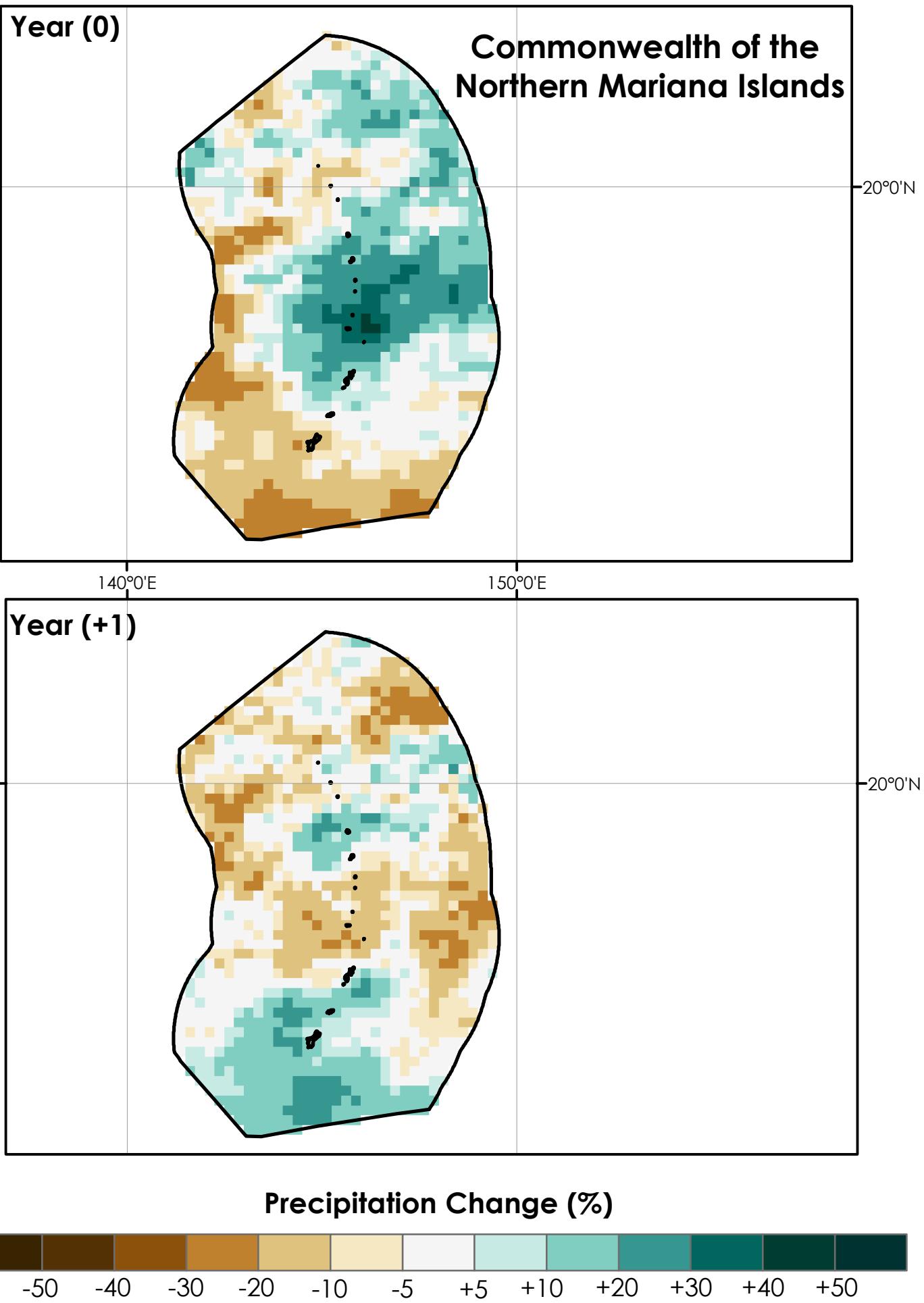


Weak El Niño for NDJ

174

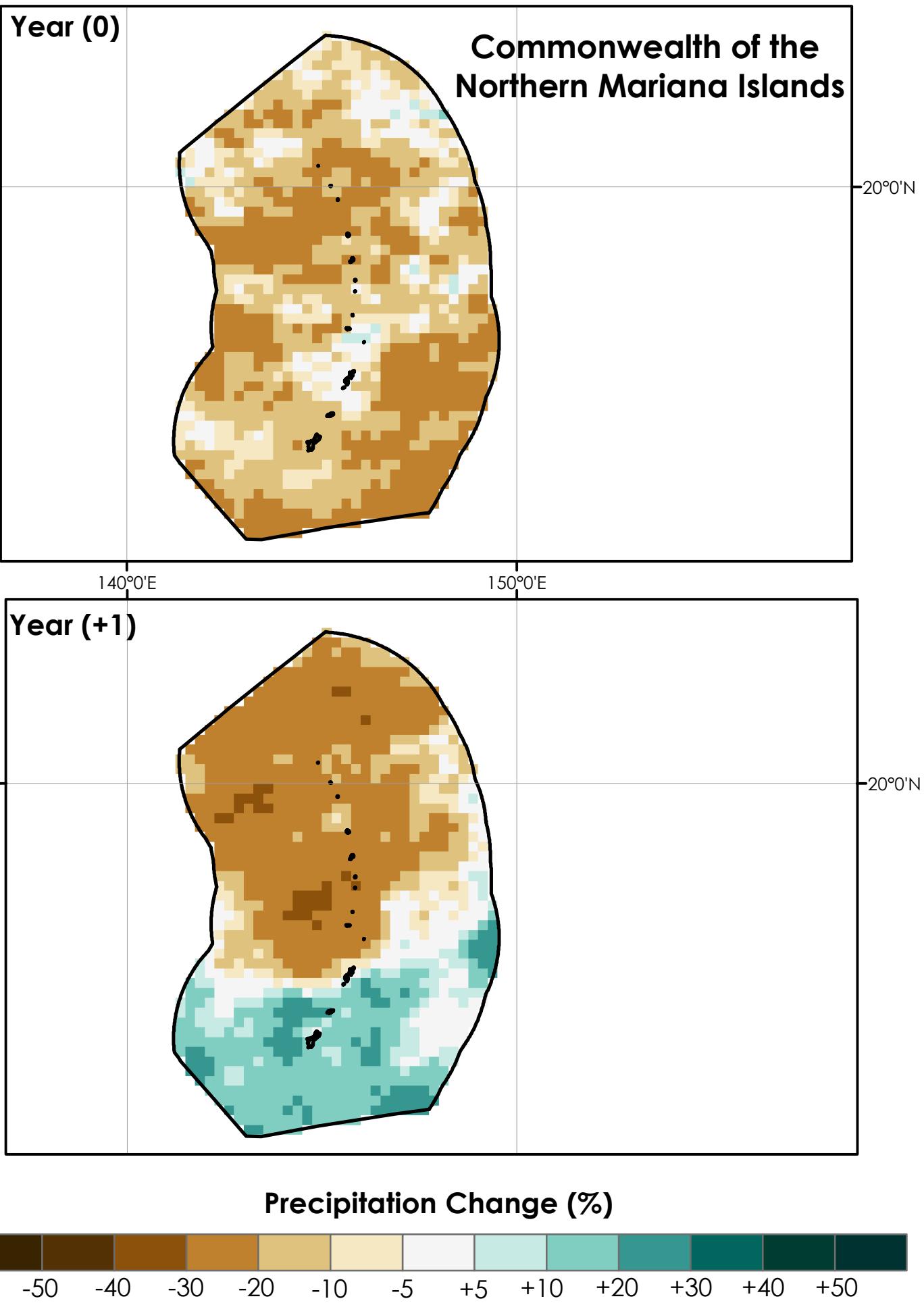


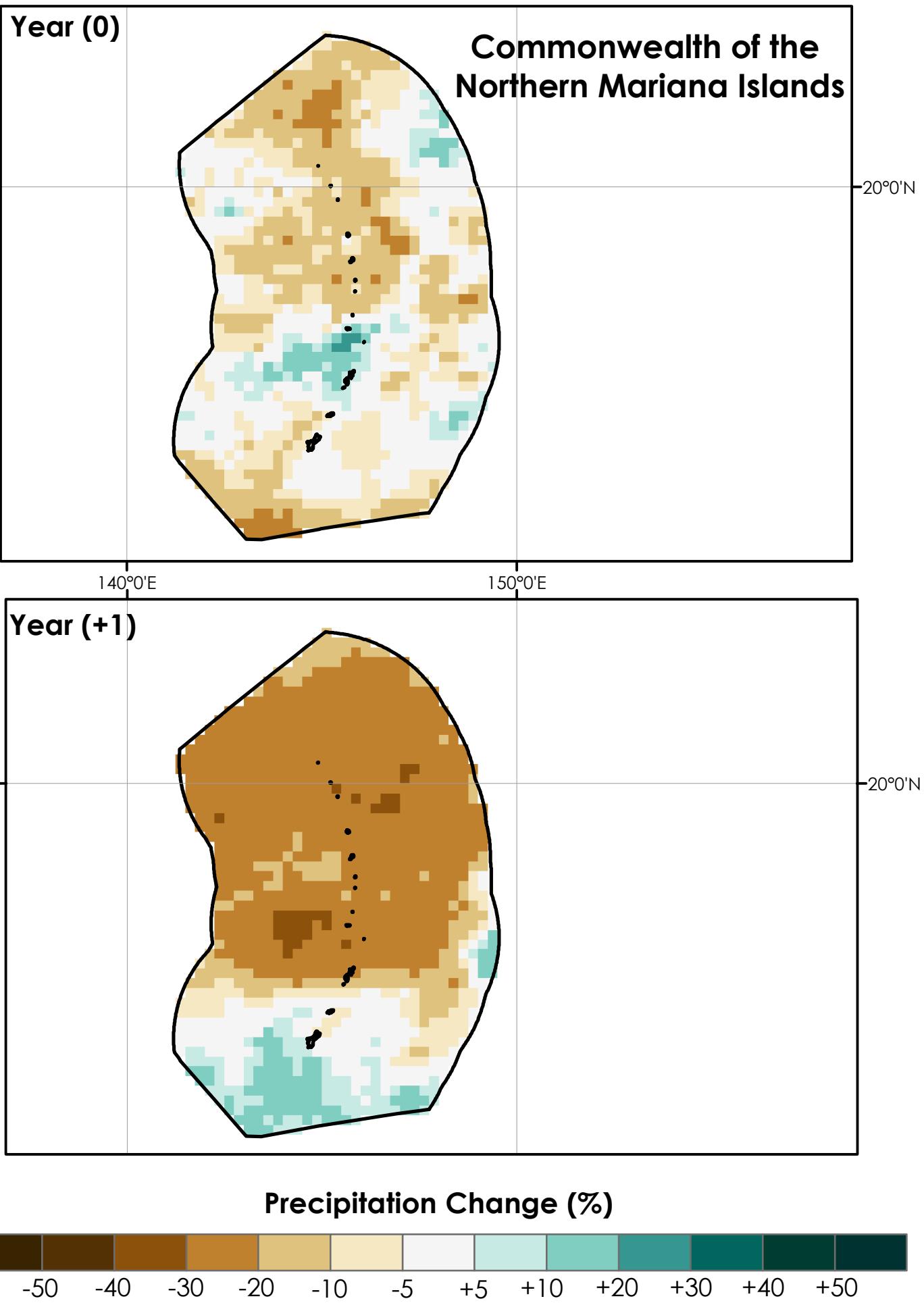


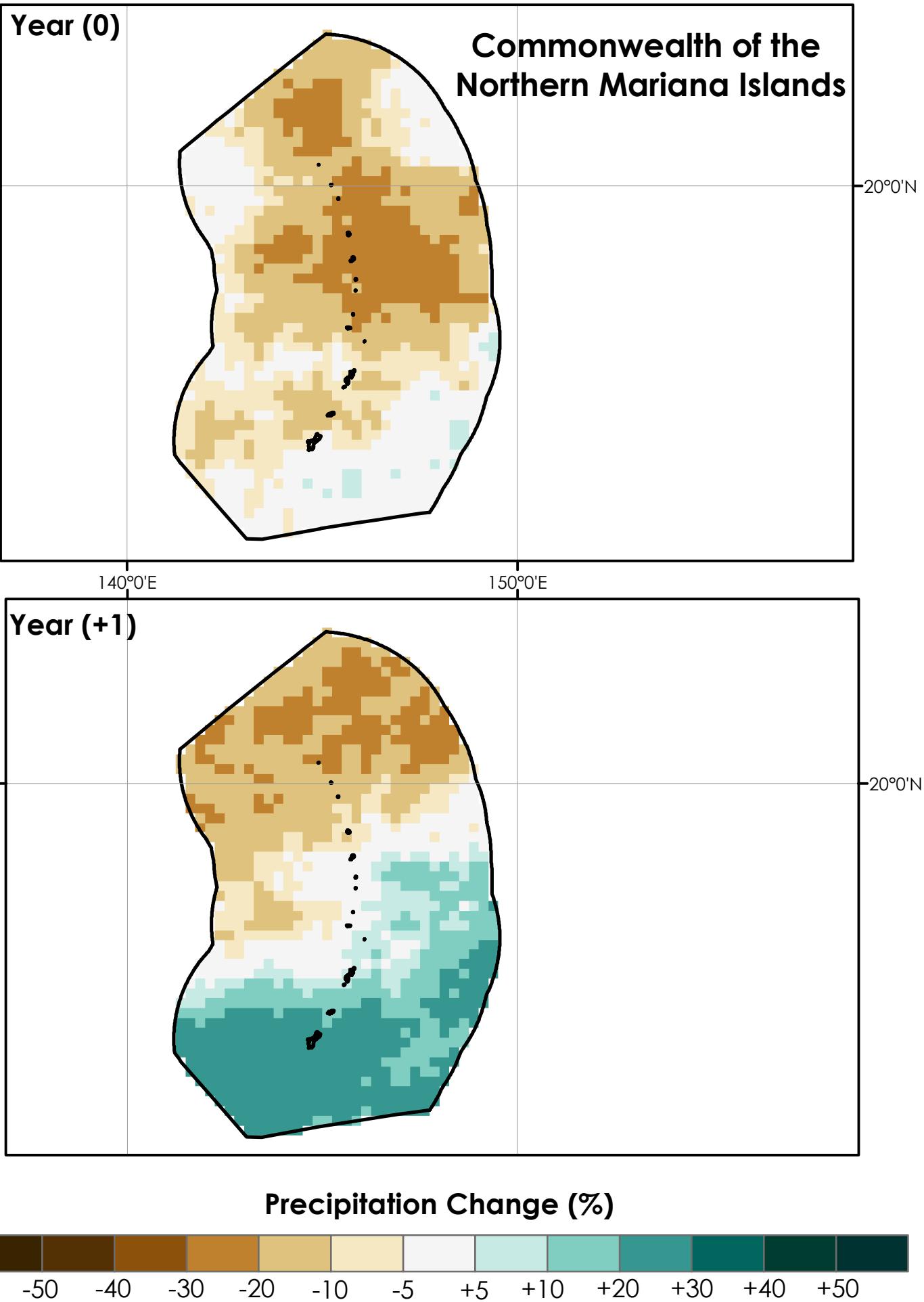


Neutral for FMA

177







Neutral for MJJ

180

Year (0)

Commonwealth of the
Northern Mariana Islands

20°0'N

20°0'N

140°0'E

150°0'E

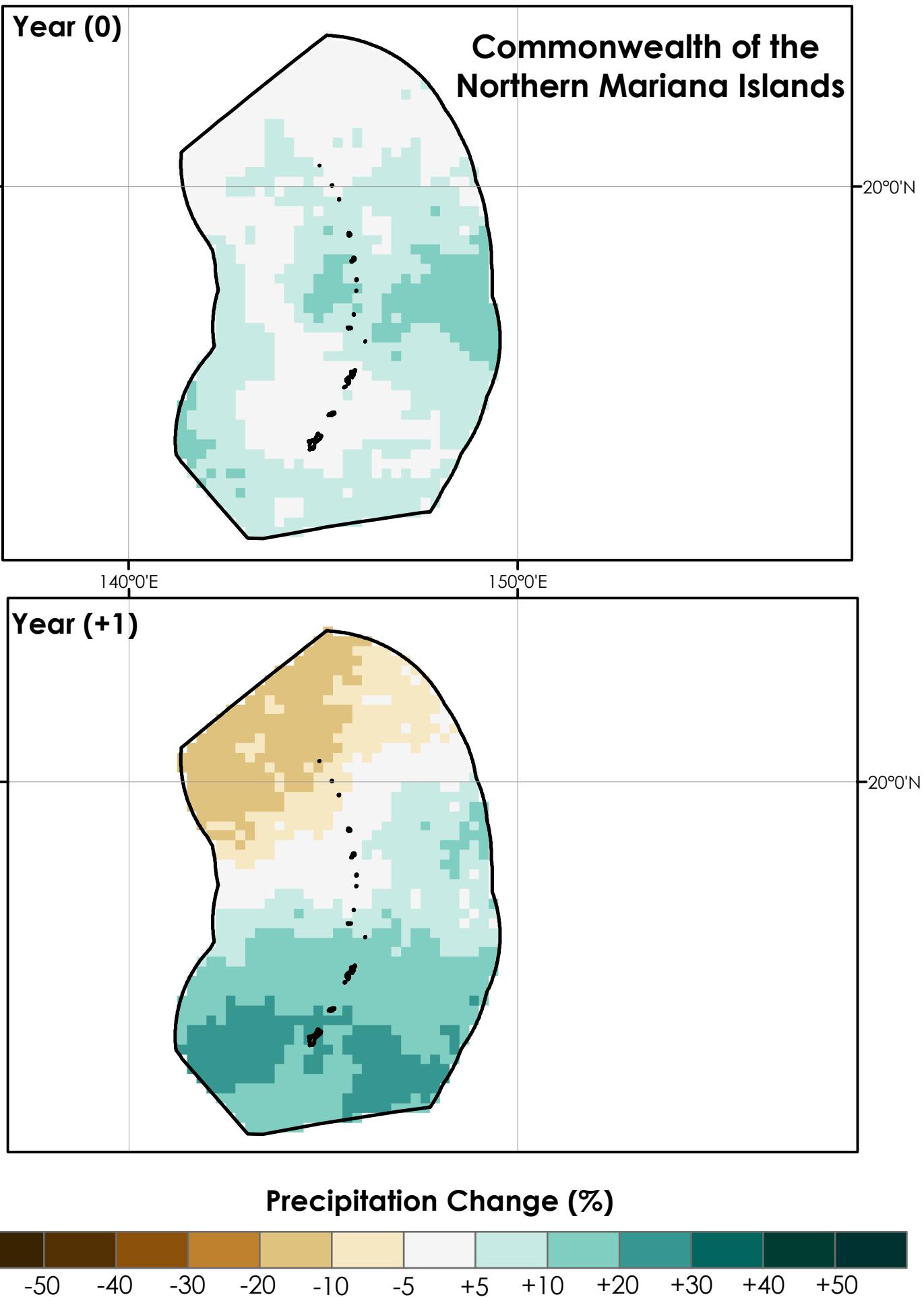
Year (+1)

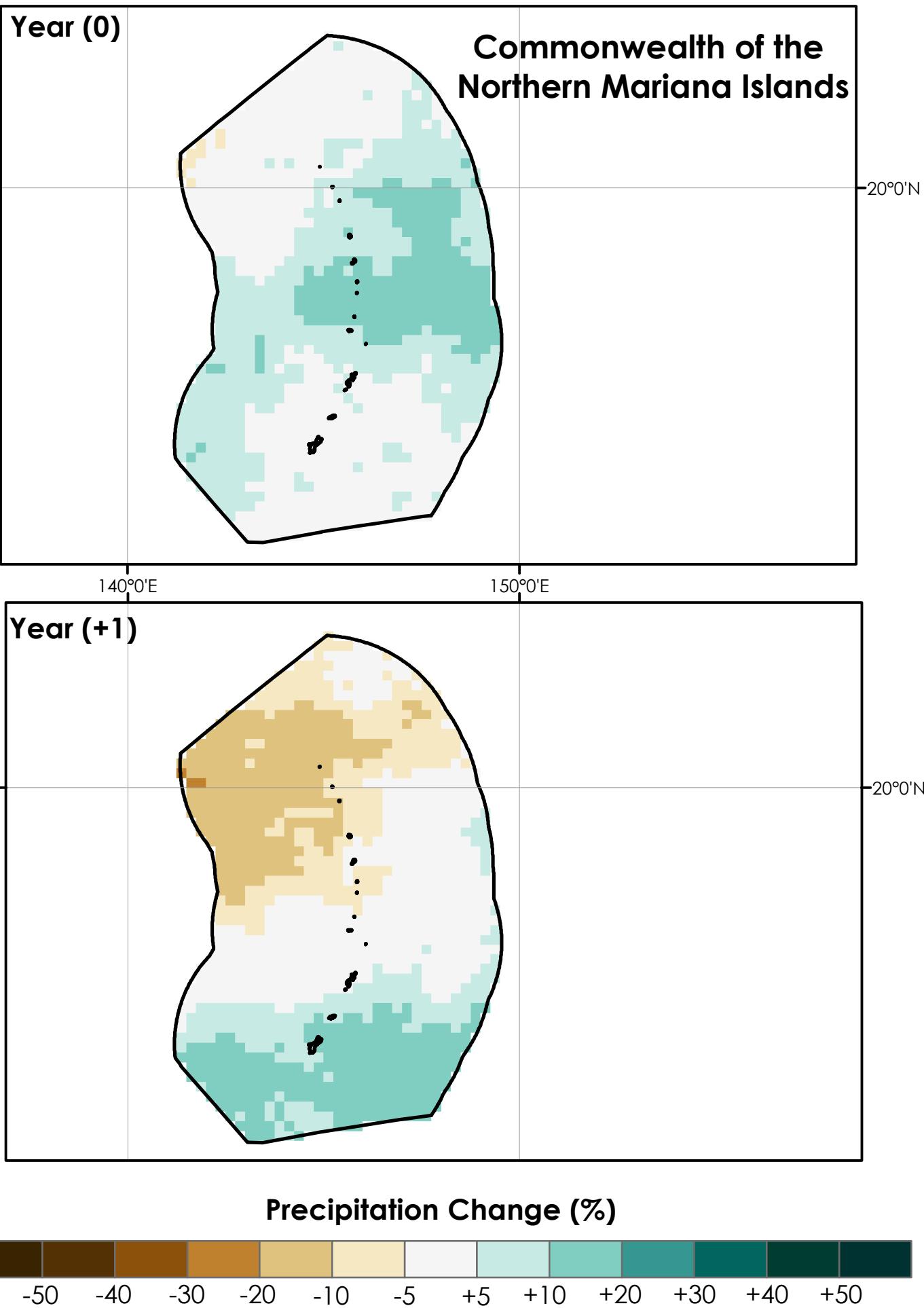
20°0'N

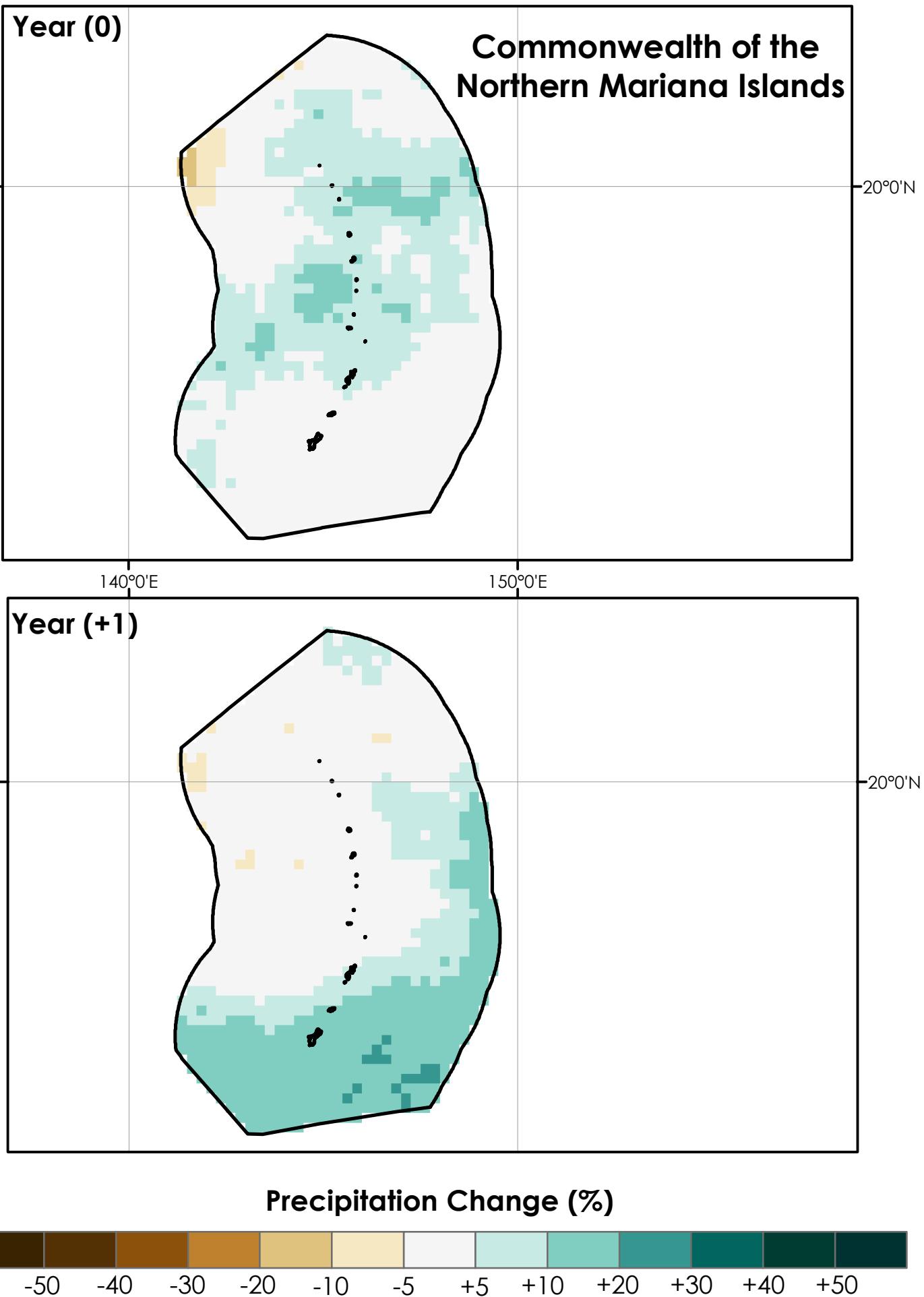
20°0'N

Precipitation Change (%)



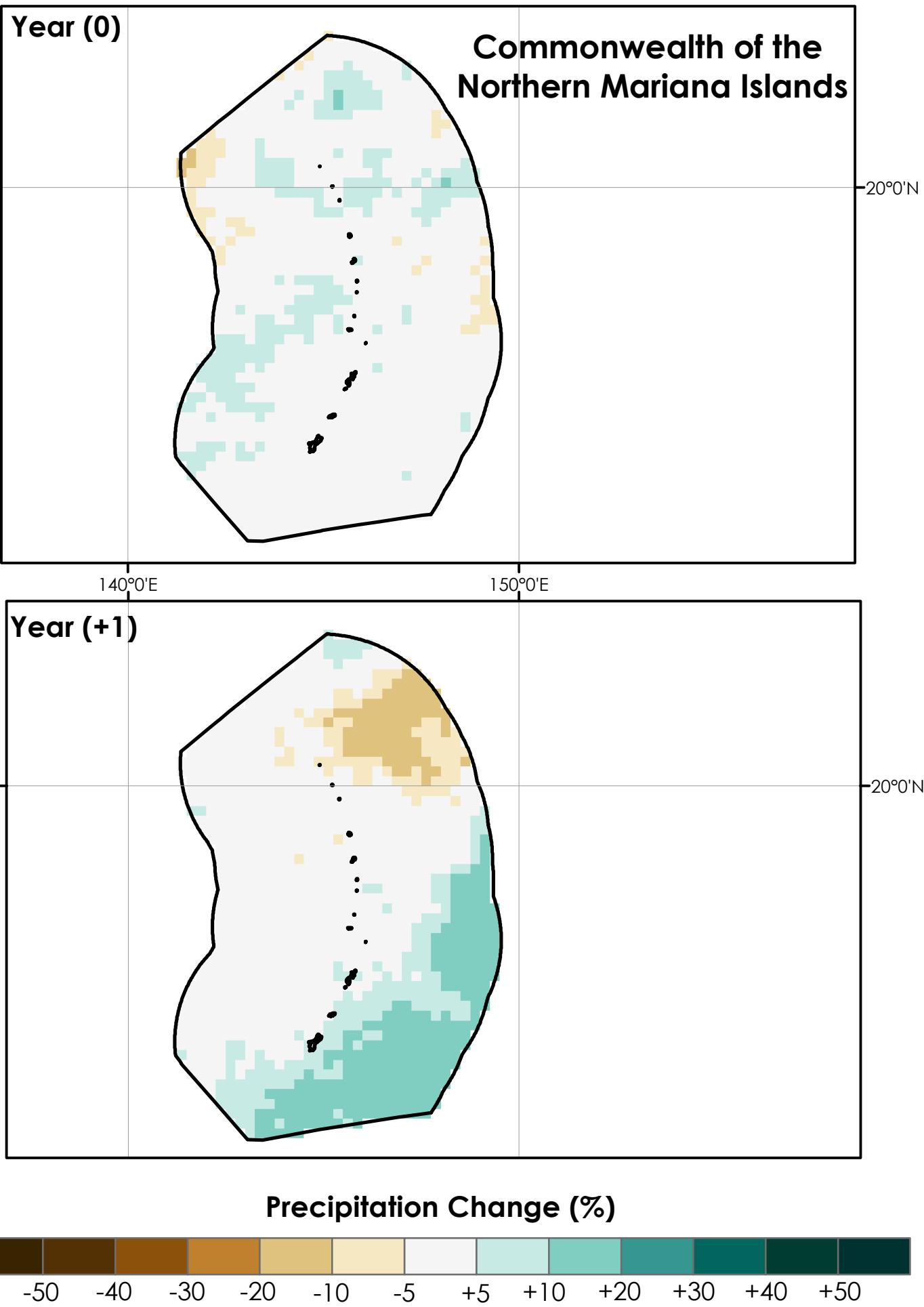


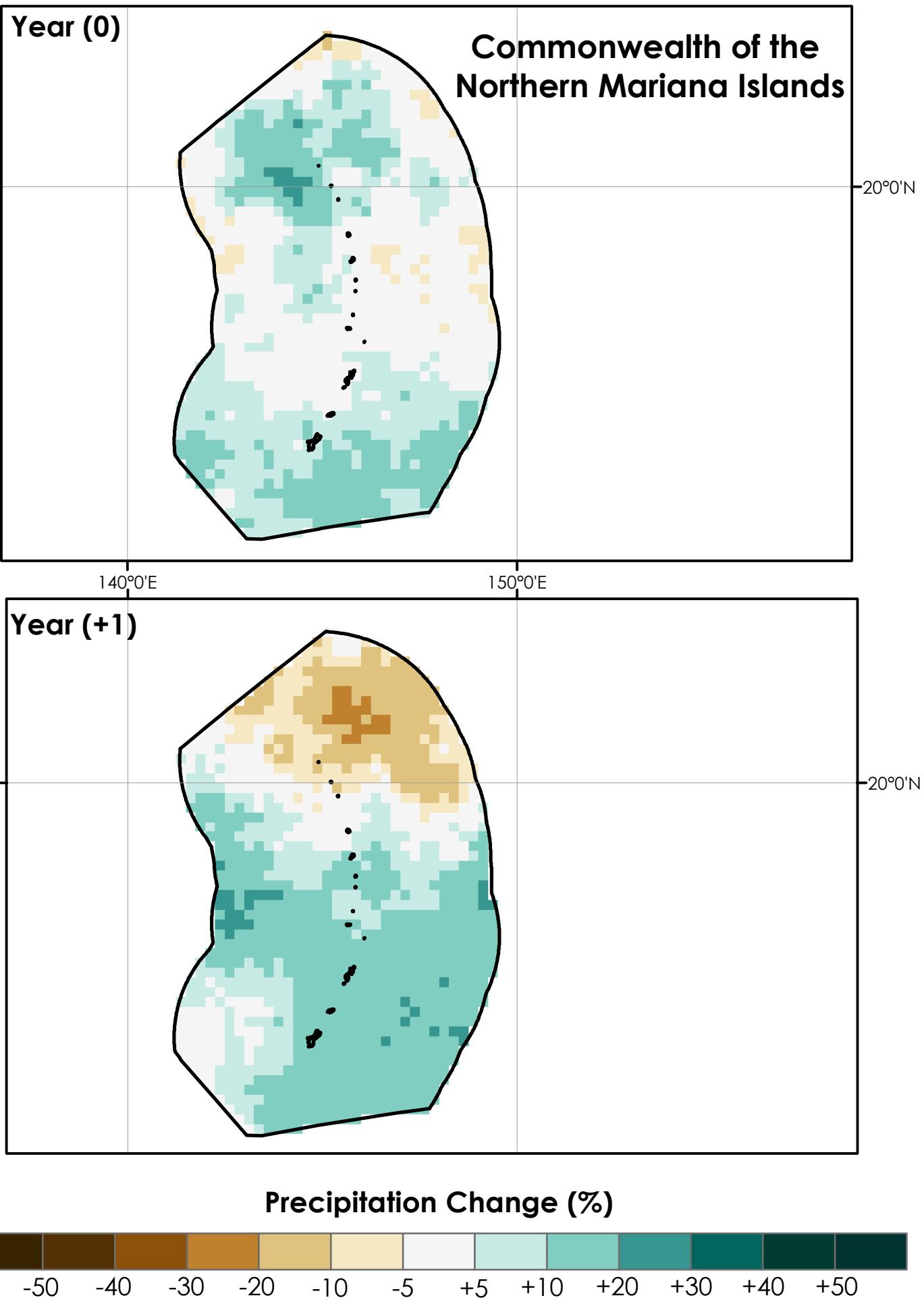


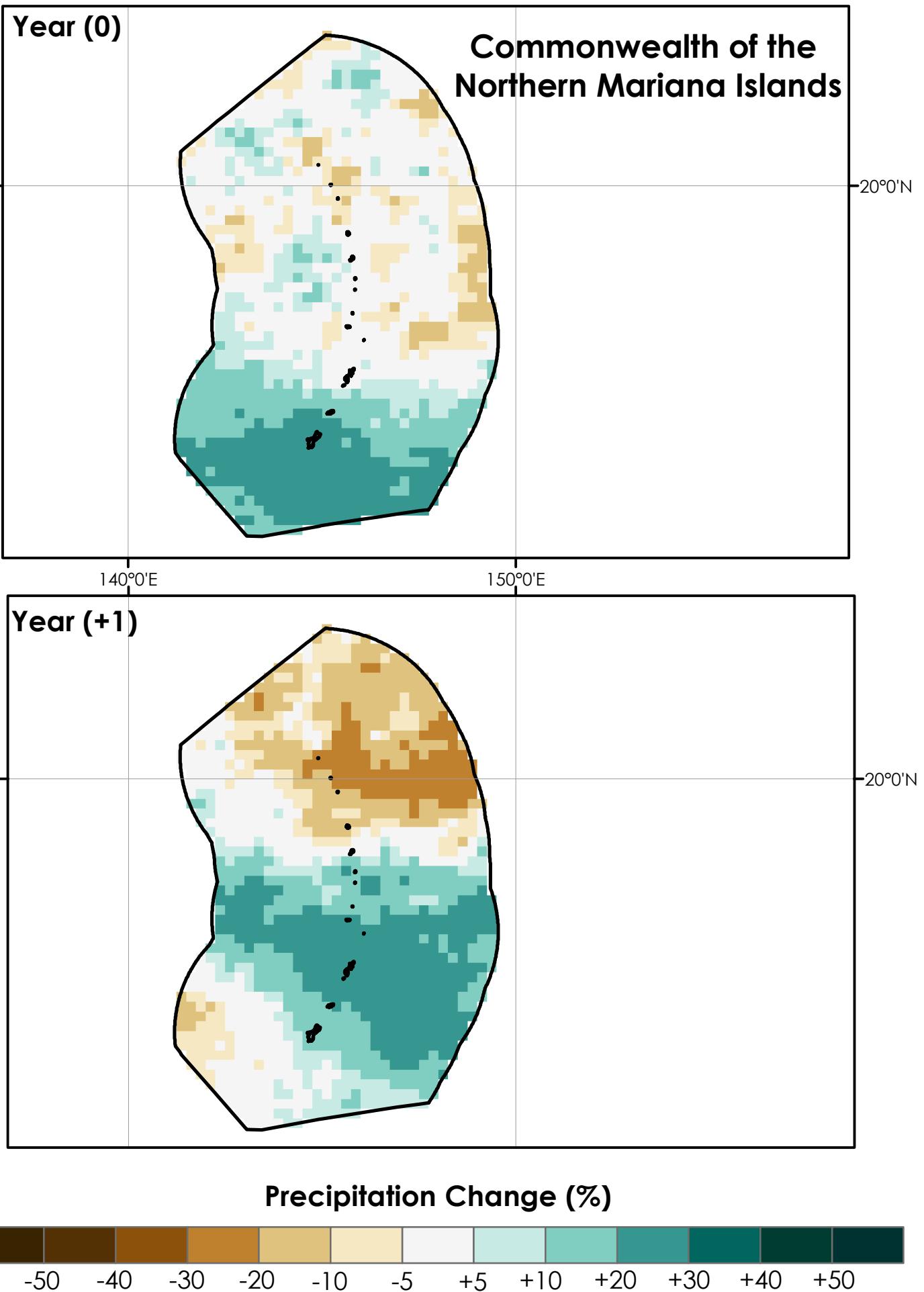


Neutral for SON

184







Weak La Niña for DJF

187

Year (0)

Commonwealth of the
Northern Mariana Islands

20°0'N

20°0'N

140°0'E

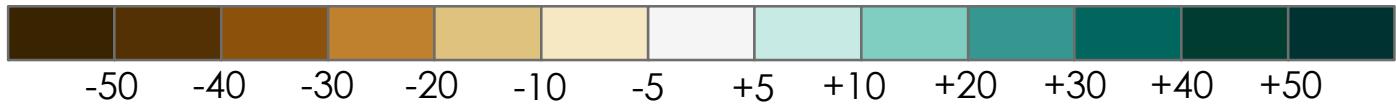
150°0'E

Year (+1)

20°0'N

20°0'N

Precipitation Change (%)



Weak La Niña for JFM

188

Year (0)

Commonwealth of the
Northern Mariana Islands

20°0'N

20°0'N

140°0'E

150°0'E

Year (+1)

20°0'N

20°0'N

Precipitation Change (%)



Weak La Niña for FMA

189

Year (0)

Commonwealth of the
Northern Mariana Islands

20°0'N

20°0'N

140°0'E

150°0'E

Year (+1)

20°0'N

20°0'N

Precipitation Change (%)



Weak La Niña for MAM

190

Year (0)

Commonwealth of the
Northern Mariana Islands

20°0'N

20°0'N

140°0'E

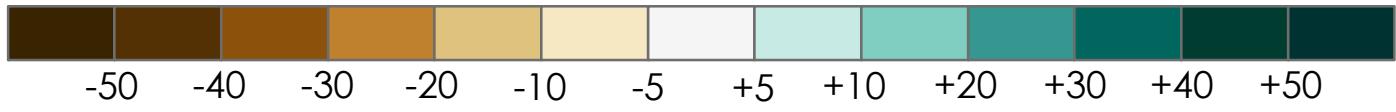
150°0'E

Year (+1)

20°0'N

20°0'N

Precipitation Change (%)



Weak La Niña for AMJ

191

Year (0)

Commonwealth of the
Northern Mariana Islands

20°0'N

20°0'N

140°0'E

150°0'E

Year (+1)

20°0'N

20°0'N

Precipitation Change (%)



Weak La Niña for MJJ

192

Year (0)

Commonwealth of the
Northern Mariana Islands

20°0'N

20°0'N

140°0'E

150°0'E

Year (+1)

20°0'N

20°0'N

Precipitation Change (%)



Weak La Niña for JJA

193

Year (0)

Commonwealth of the
Northern Mariana Islands

20°0'N

20°0'N

140°0'E

150°0'E

Year (+1)

20°0'N

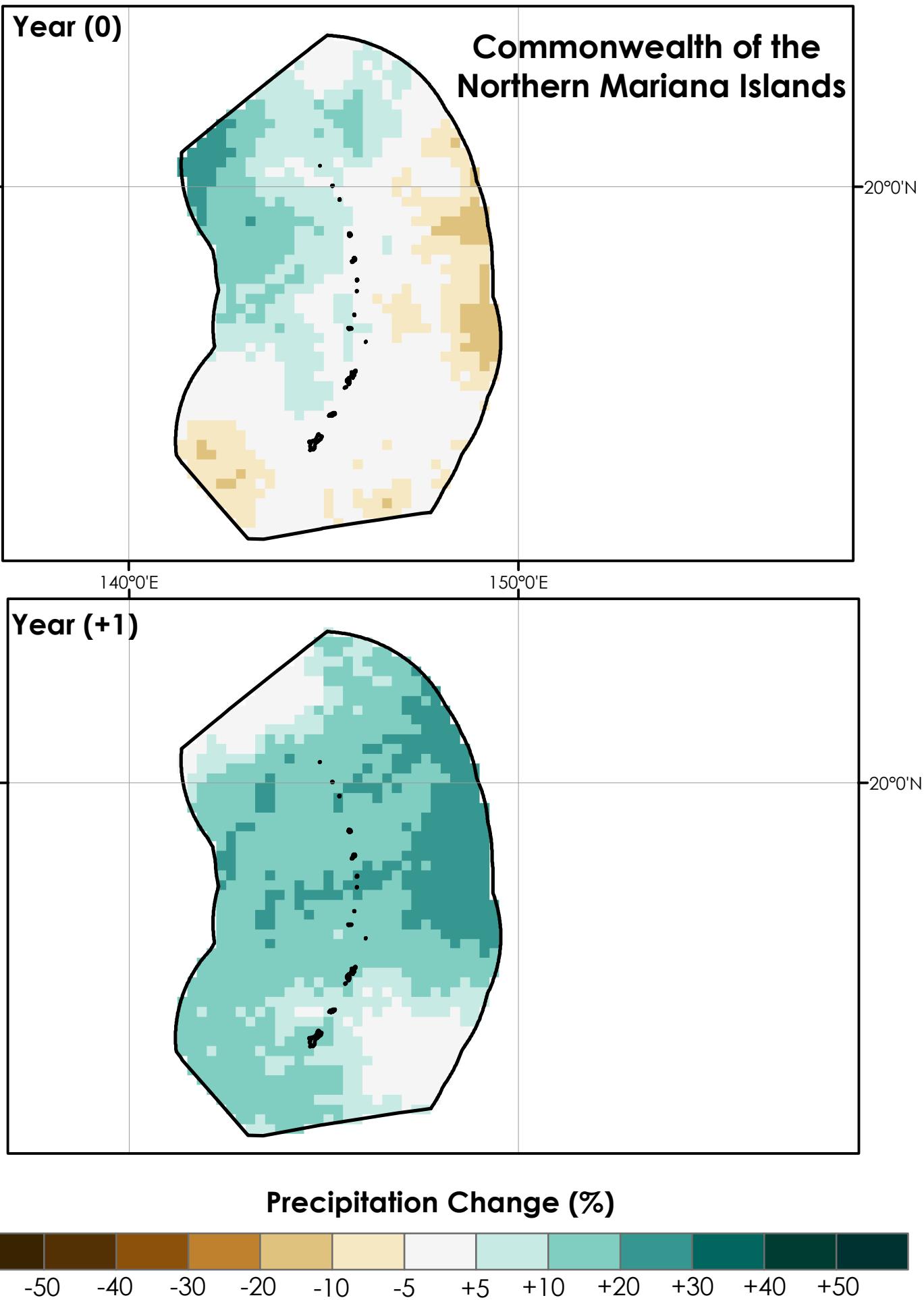
20°0'N

Precipitation Change (%)



Weak La Niña for JAS

194



Weak La Niña for ASO

195

Year (0)

Commonwealth of the
Northern Mariana Islands

20°0'N

20°0'N

140°0'E

150°0'E

Year (+1)

20°0'N

20°0'N

Precipitation Change (%)



Weak La Niña for SON

196

Year (0)

Commonwealth of the
Northern Mariana Islands

20°0'N

20°0'N

140°0'E

150°0'E

Year (+1)

20°0'N

20°0'N

Precipitation Change (%)



Weak La Niña for OND

197

Year (0)

Commonwealth of the
Northern Mariana Islands

20°0'N

20°0'N

140°0'E

150°0'E

Year (+1)

20°0'N

20°0'N

Precipitation Change (%)



Weak La Niña for NDJ

198

Year (0)

Commonwealth of the
Northern Mariana Islands

20°0'N

20°0'N

140°0'E

150°0'E

Year (+1)

20°0'N

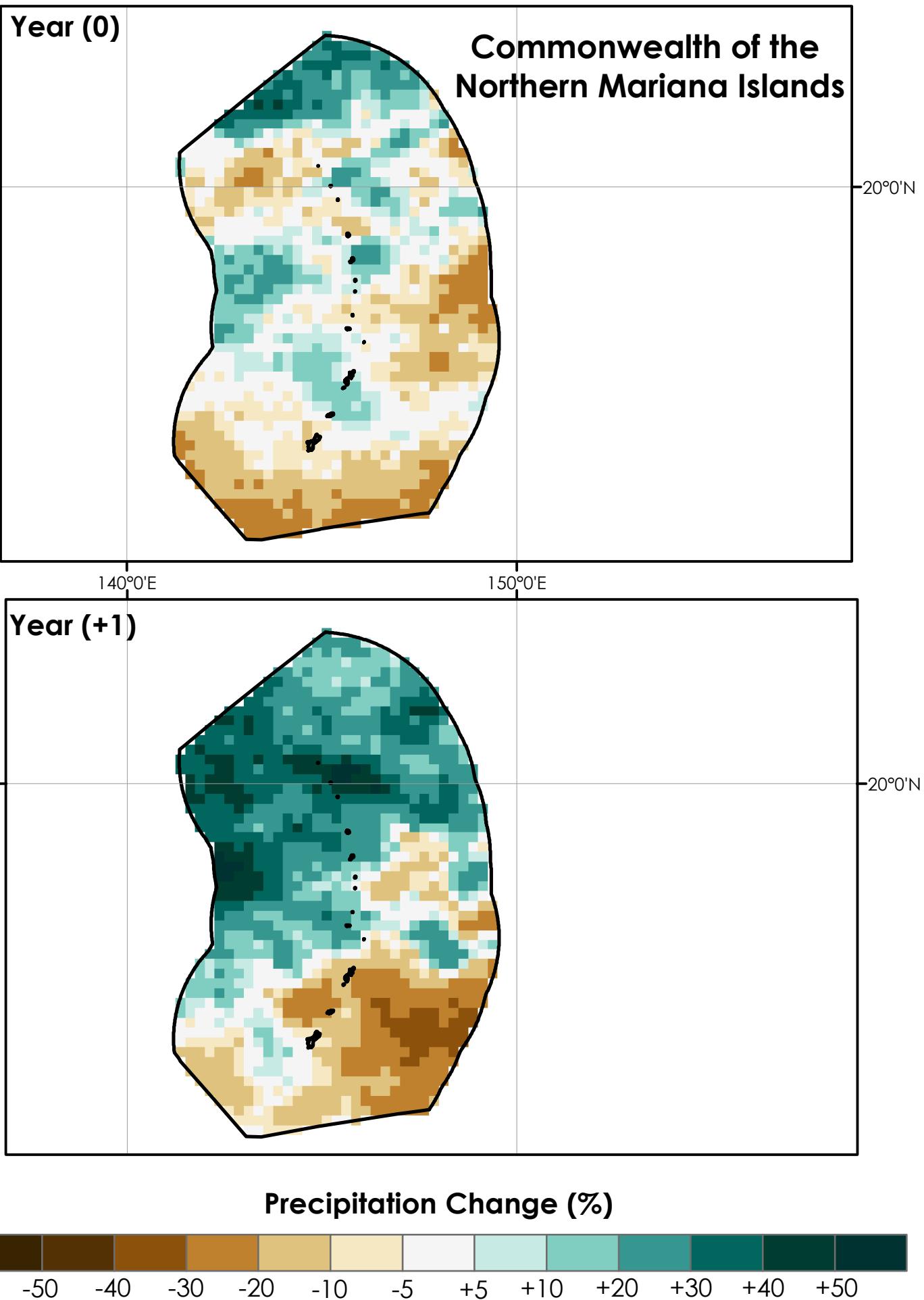
20°0'N

Precipitation Change (%)



Moderate - Strong La Niña for DJF

199



Moderate - Strong La Niña for JFM

200

Year (0)

Commonwealth of the
Northern Mariana Islands

20°0'N

20°0'N

140°0'E

150°0'E

Year (+1)

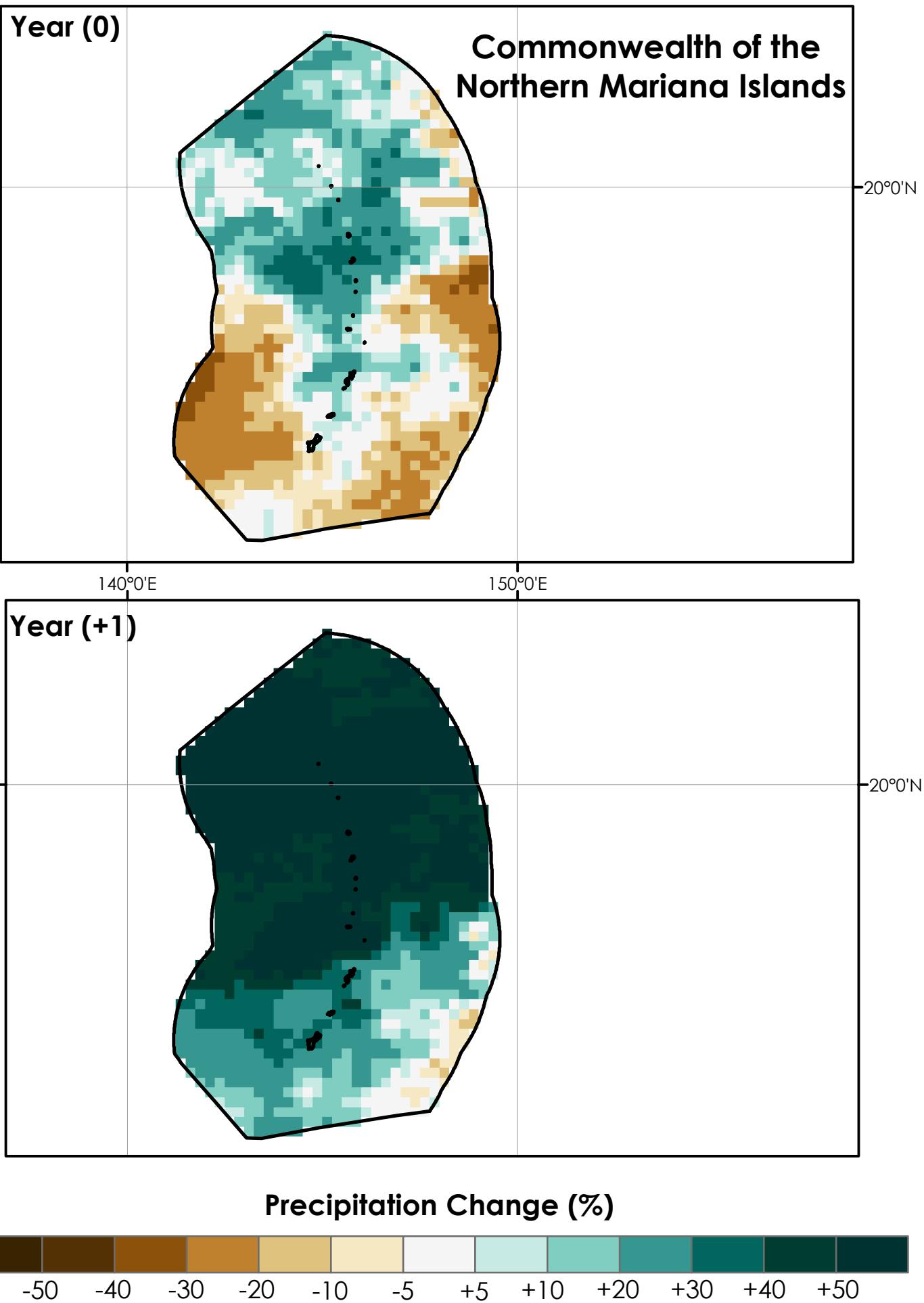
20°0'N

20°0'N



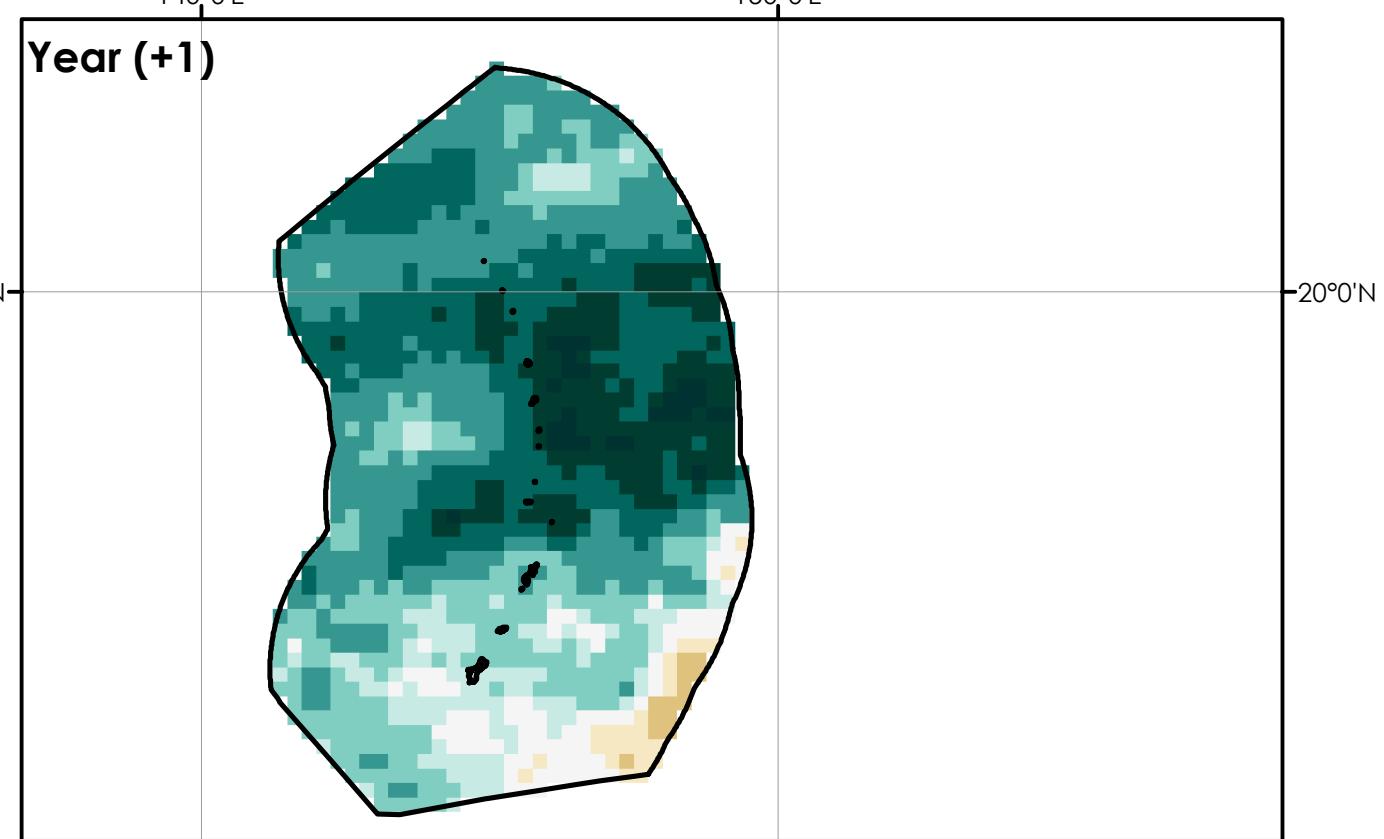
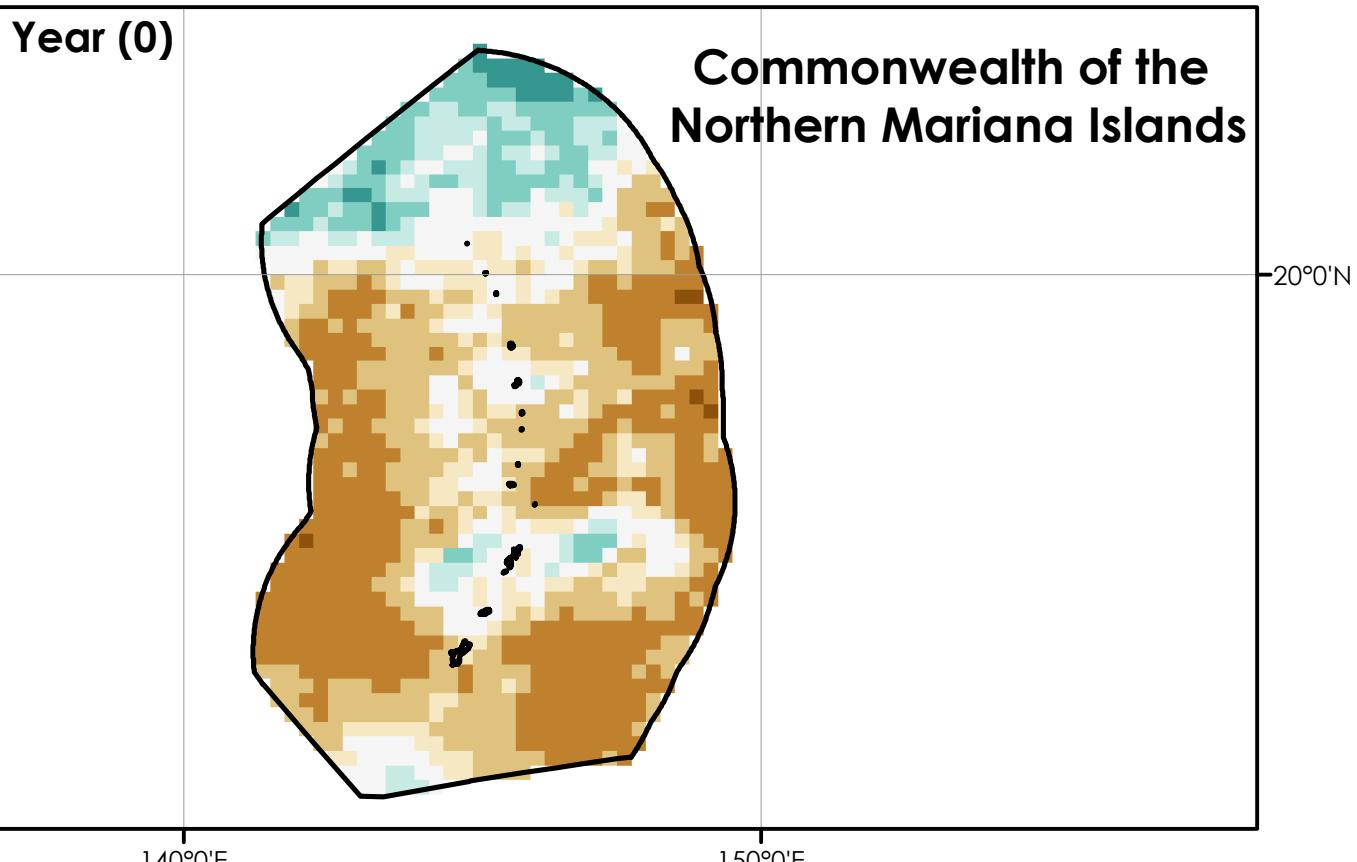
Moderate - Strong La Niña for FMA

201

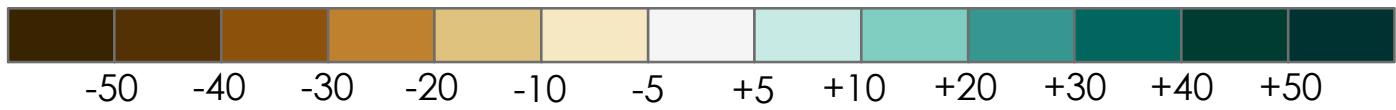


Moderate - Strong La Niña for MAM

202

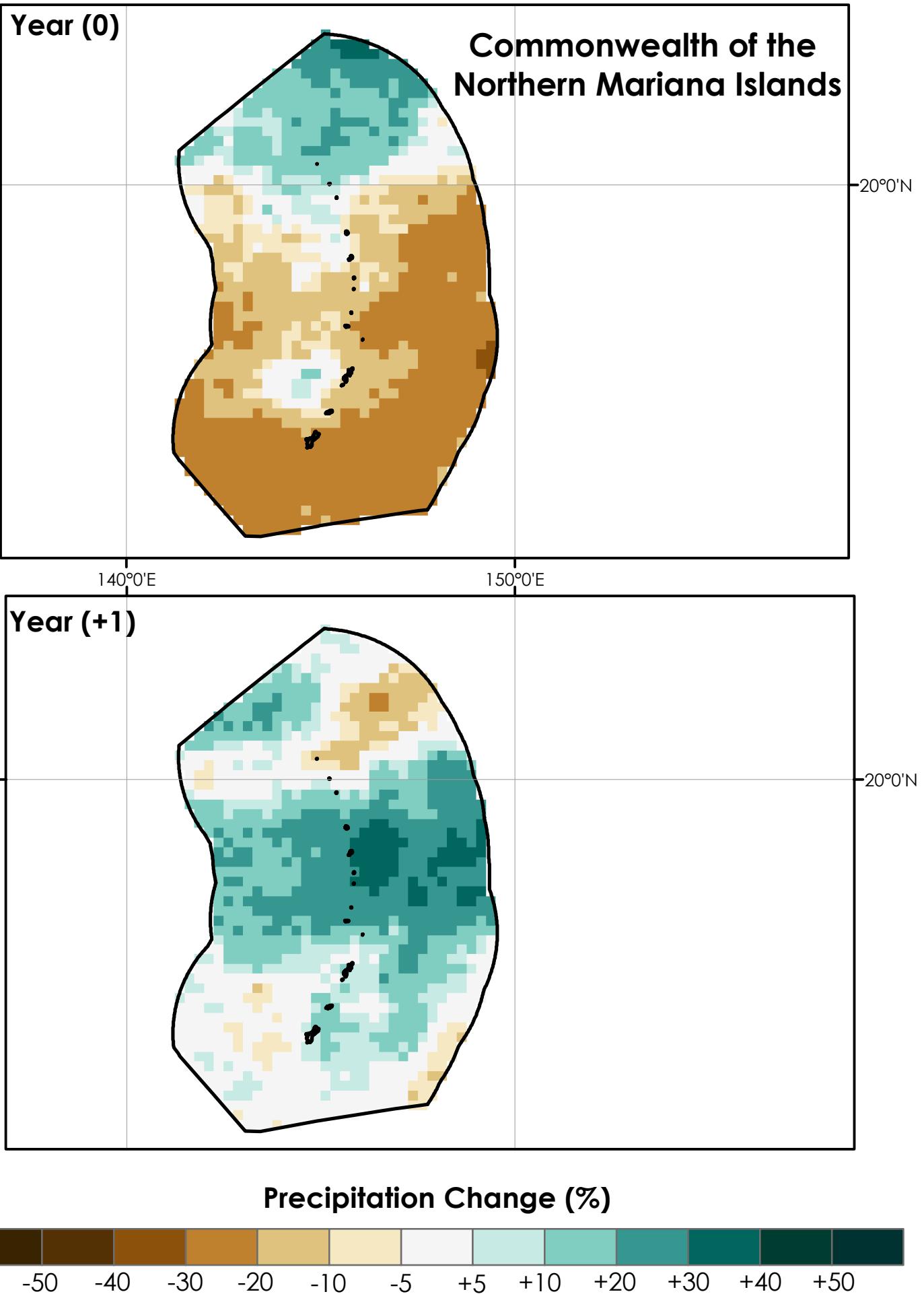


Precipitation Change (%)



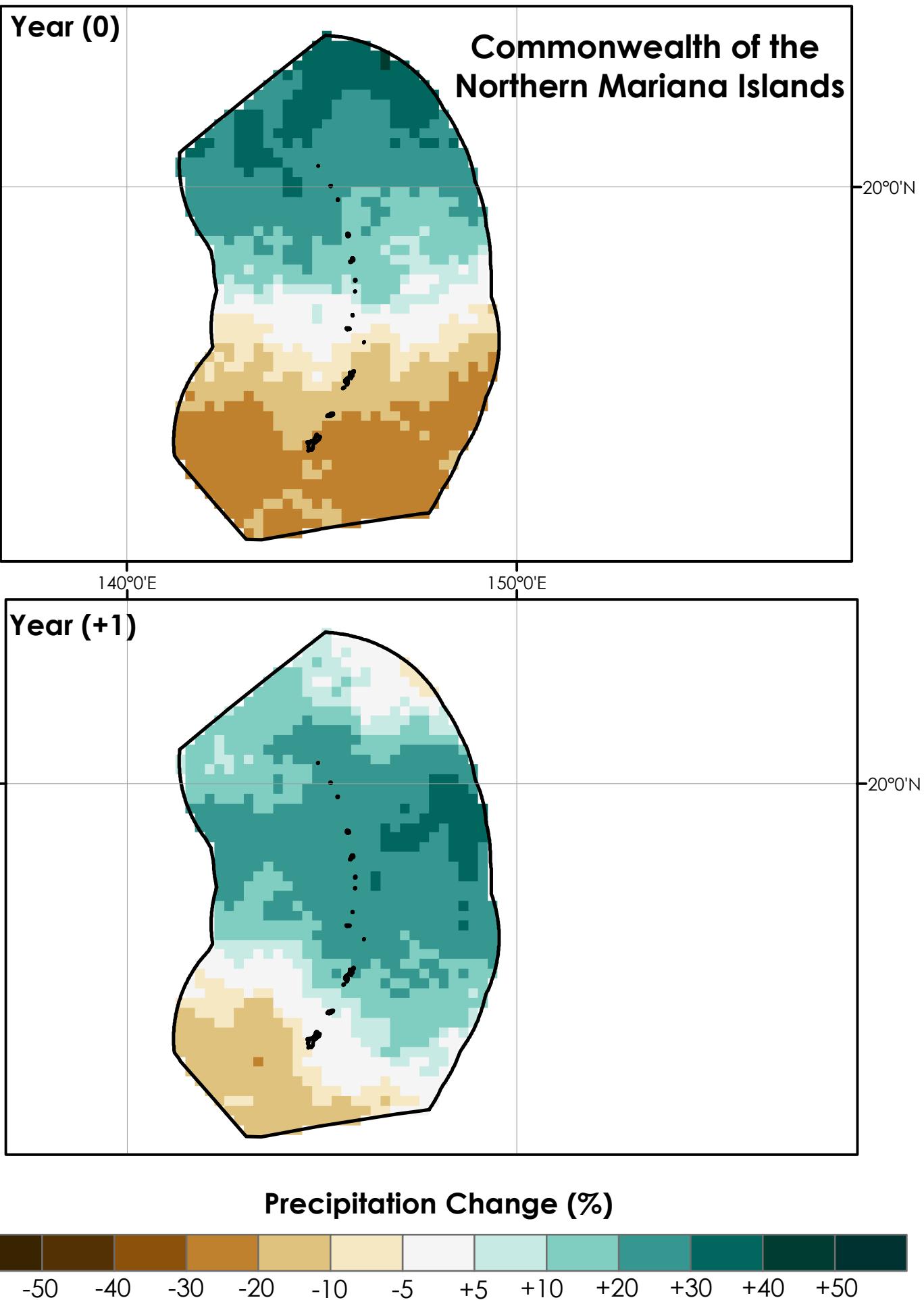
Moderate - Strong La Niña for AMJ

203



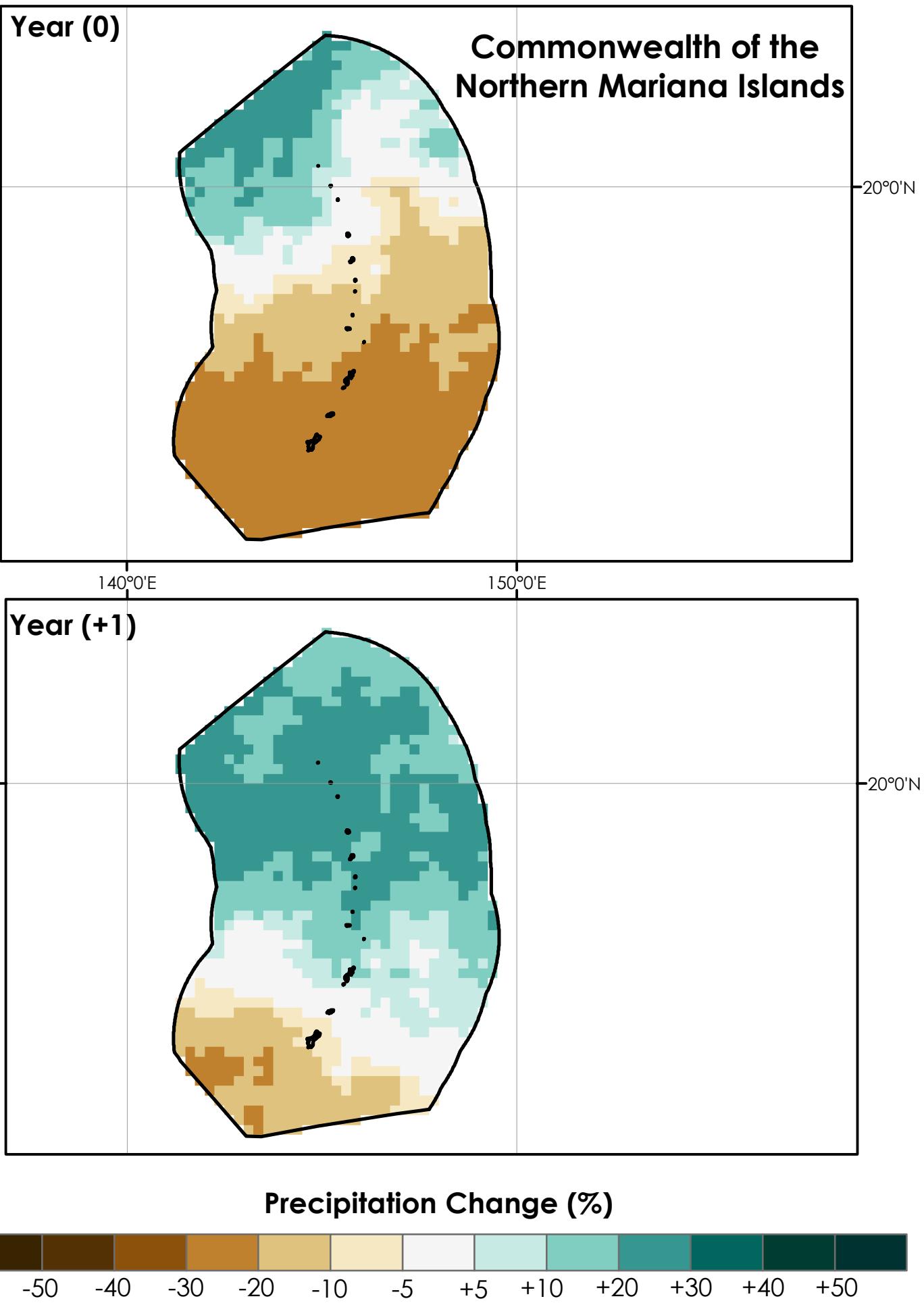
Moderate - Strong La Niña for MJJ

204



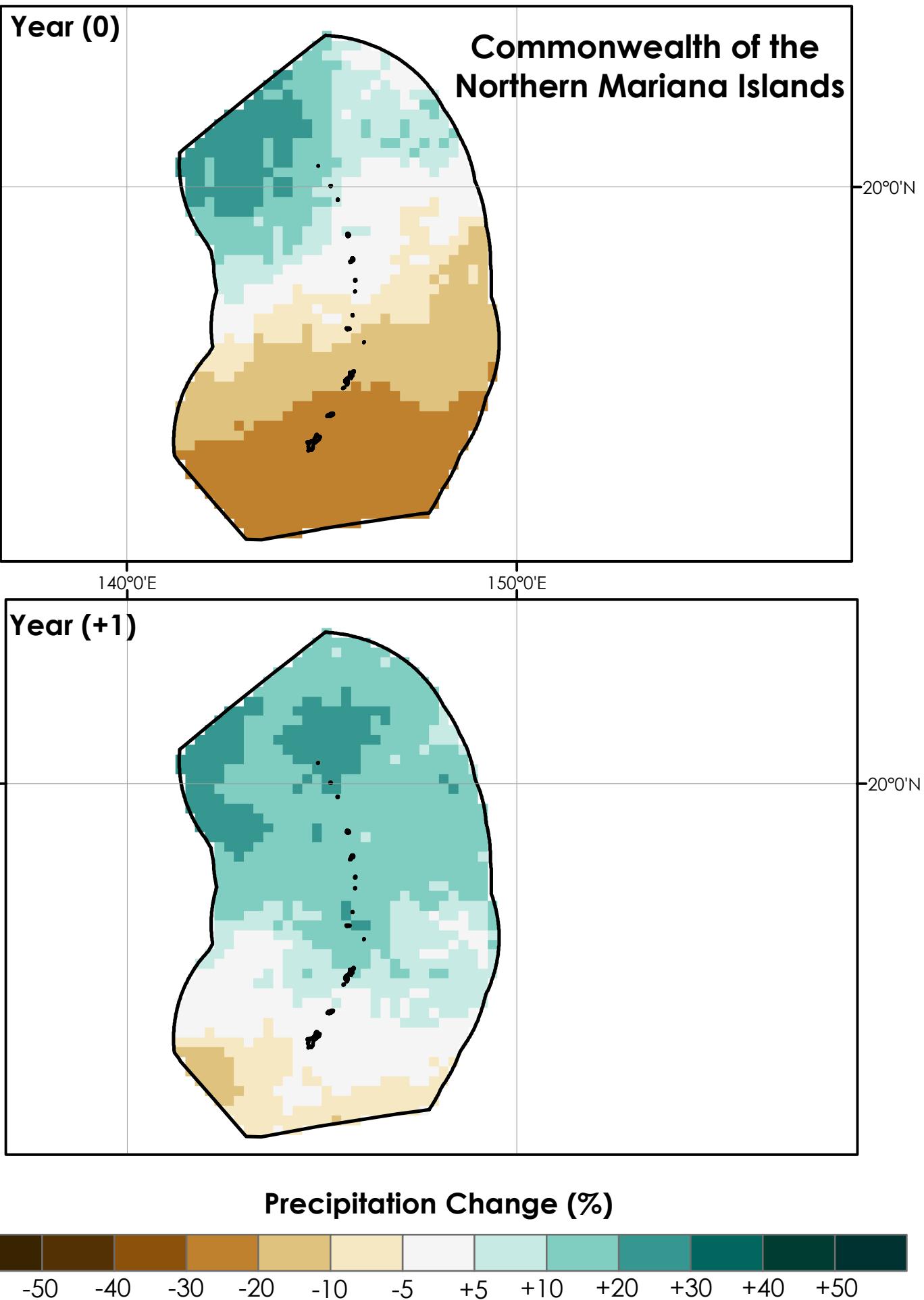
Moderate - Strong La Niña for JJA

205



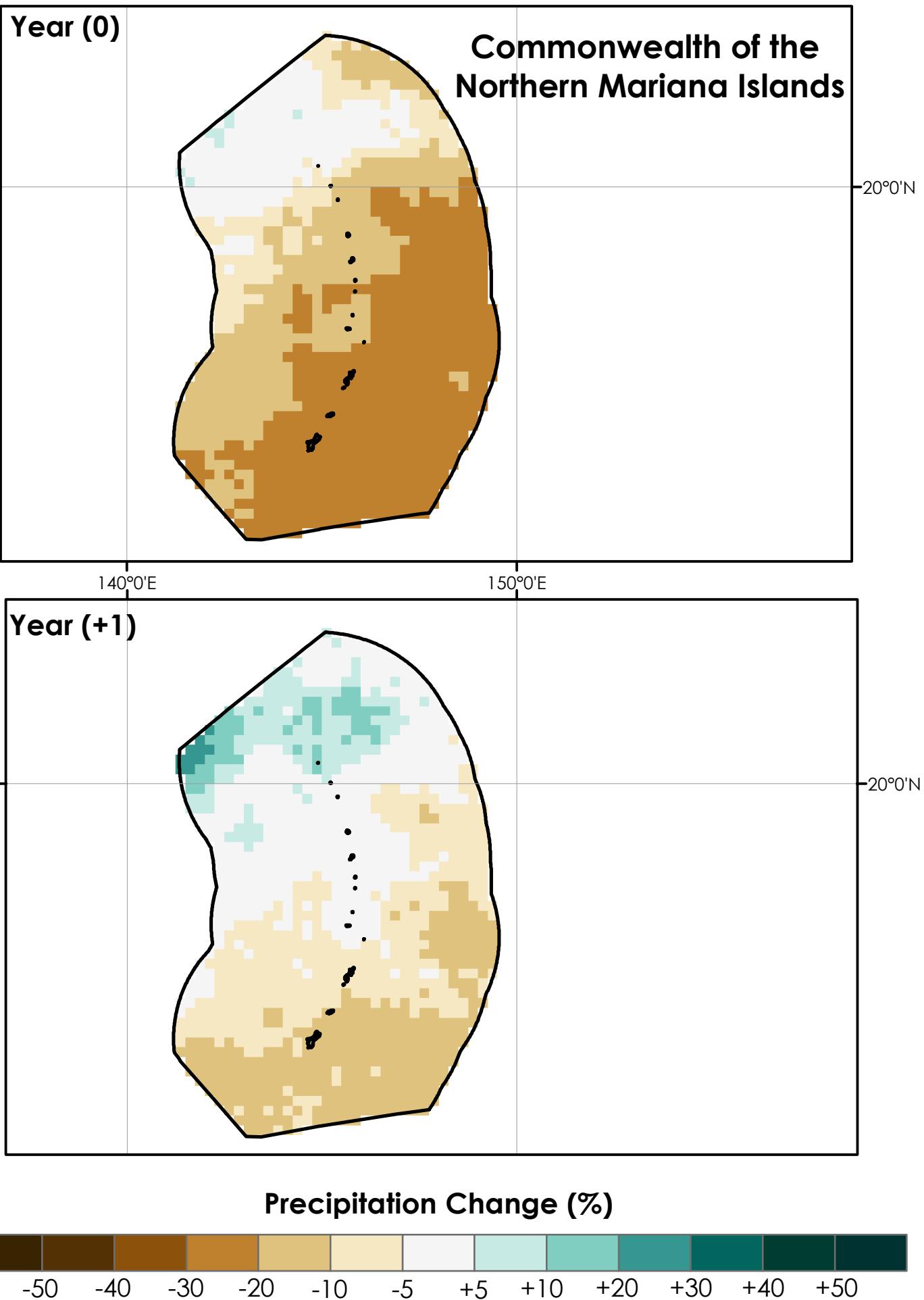
Moderate - Strong La Niña for JAS

206



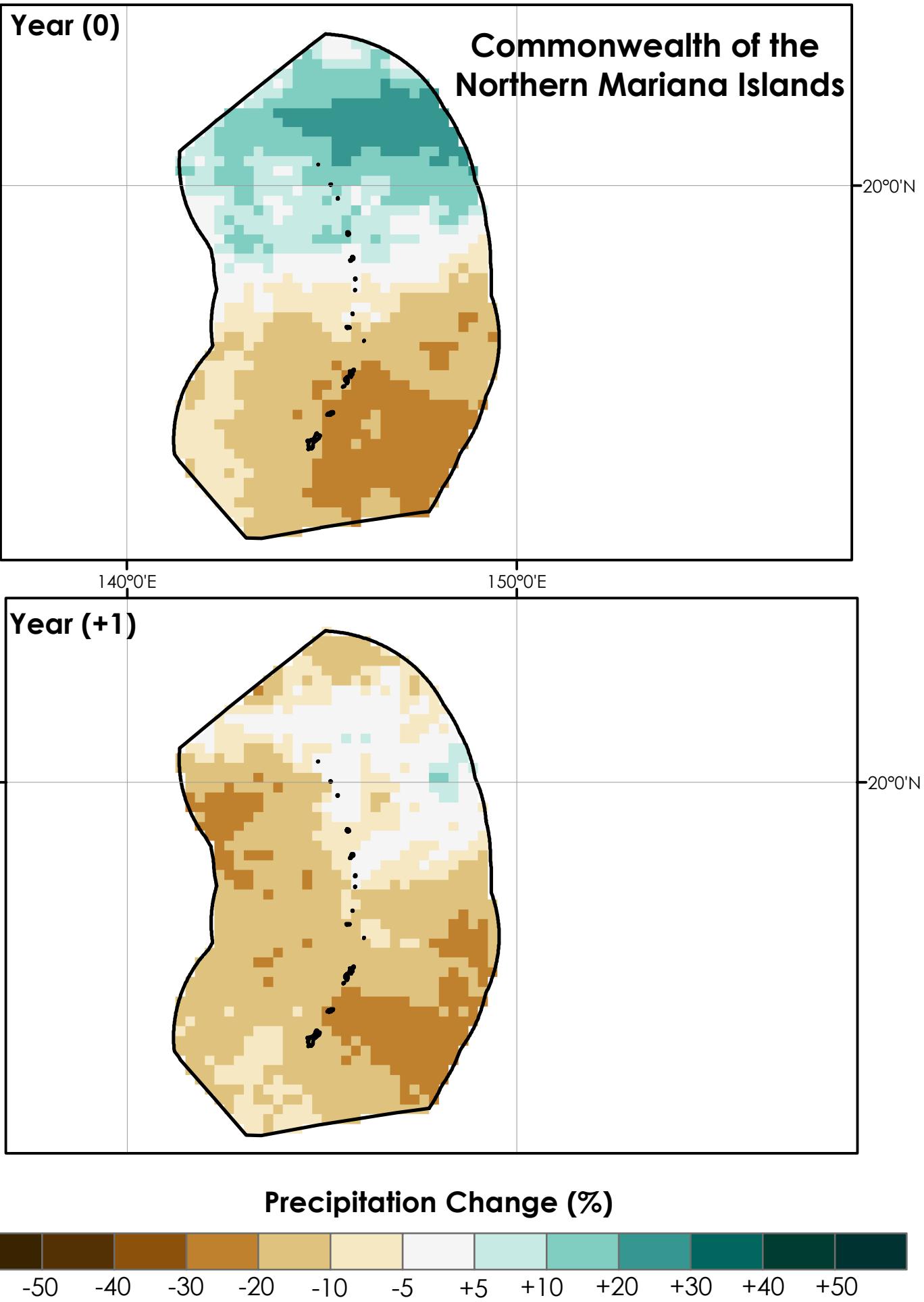
Moderate - Strong La Niña for ASO

207



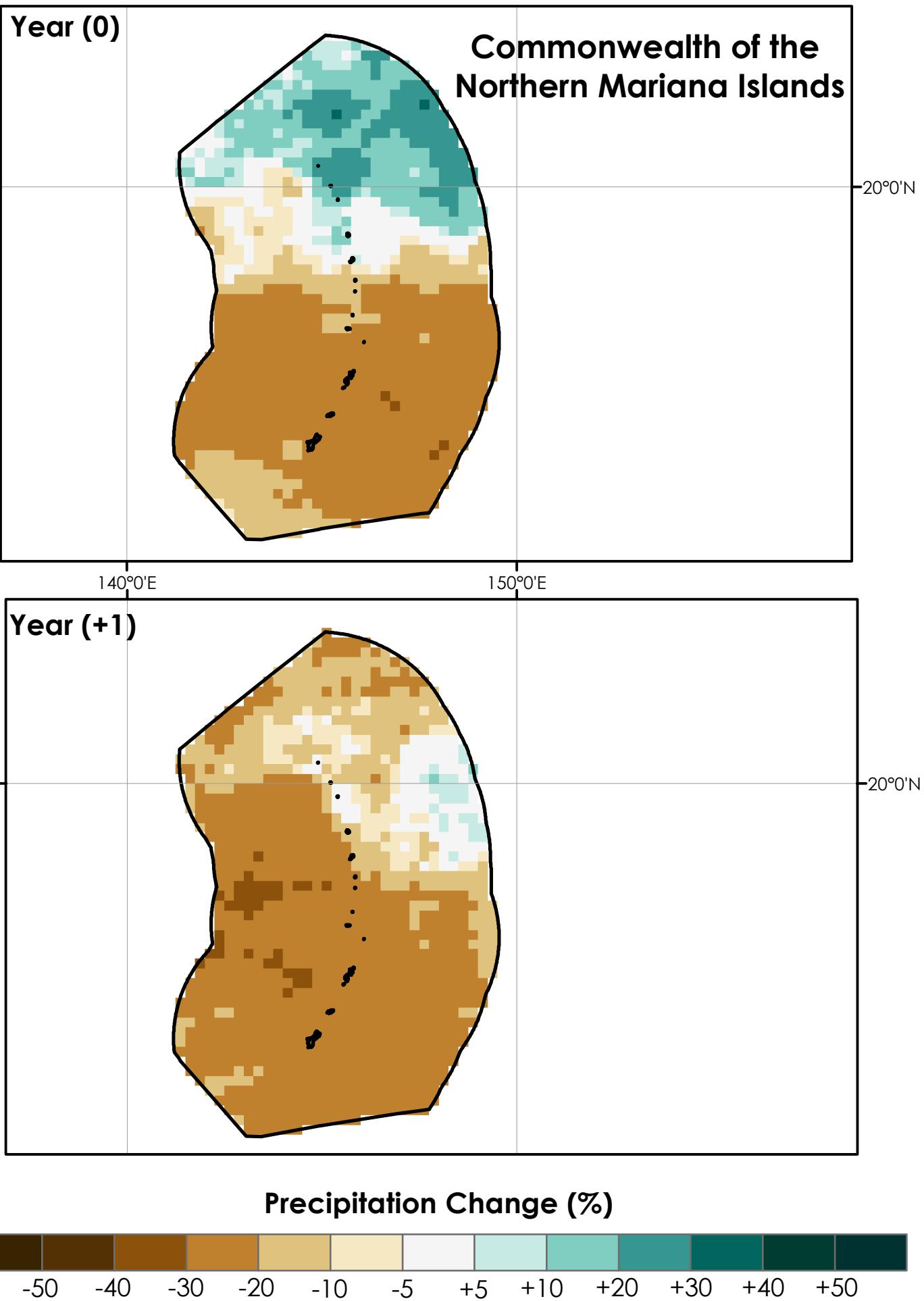
Moderate - Strong La Niña for SON

208



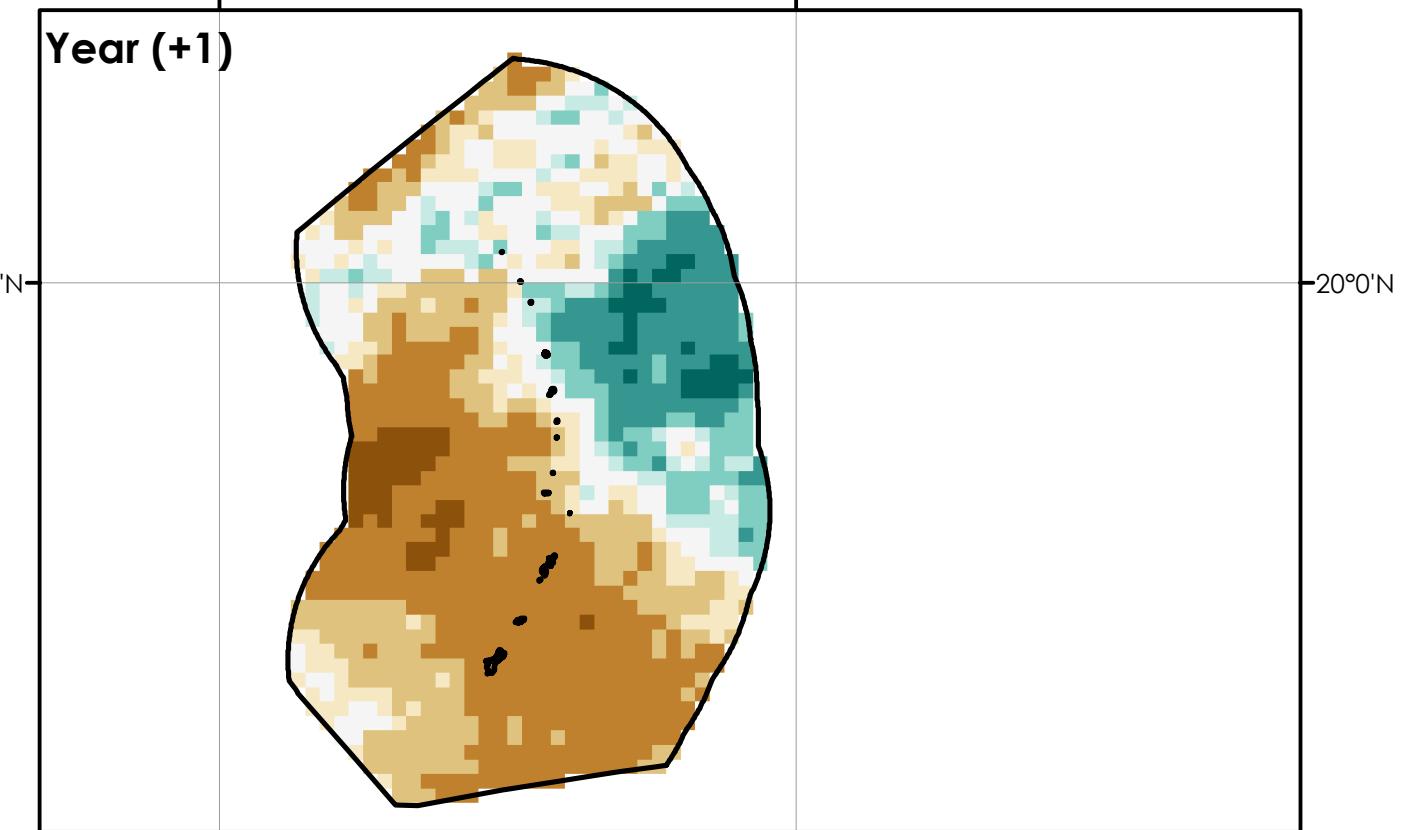
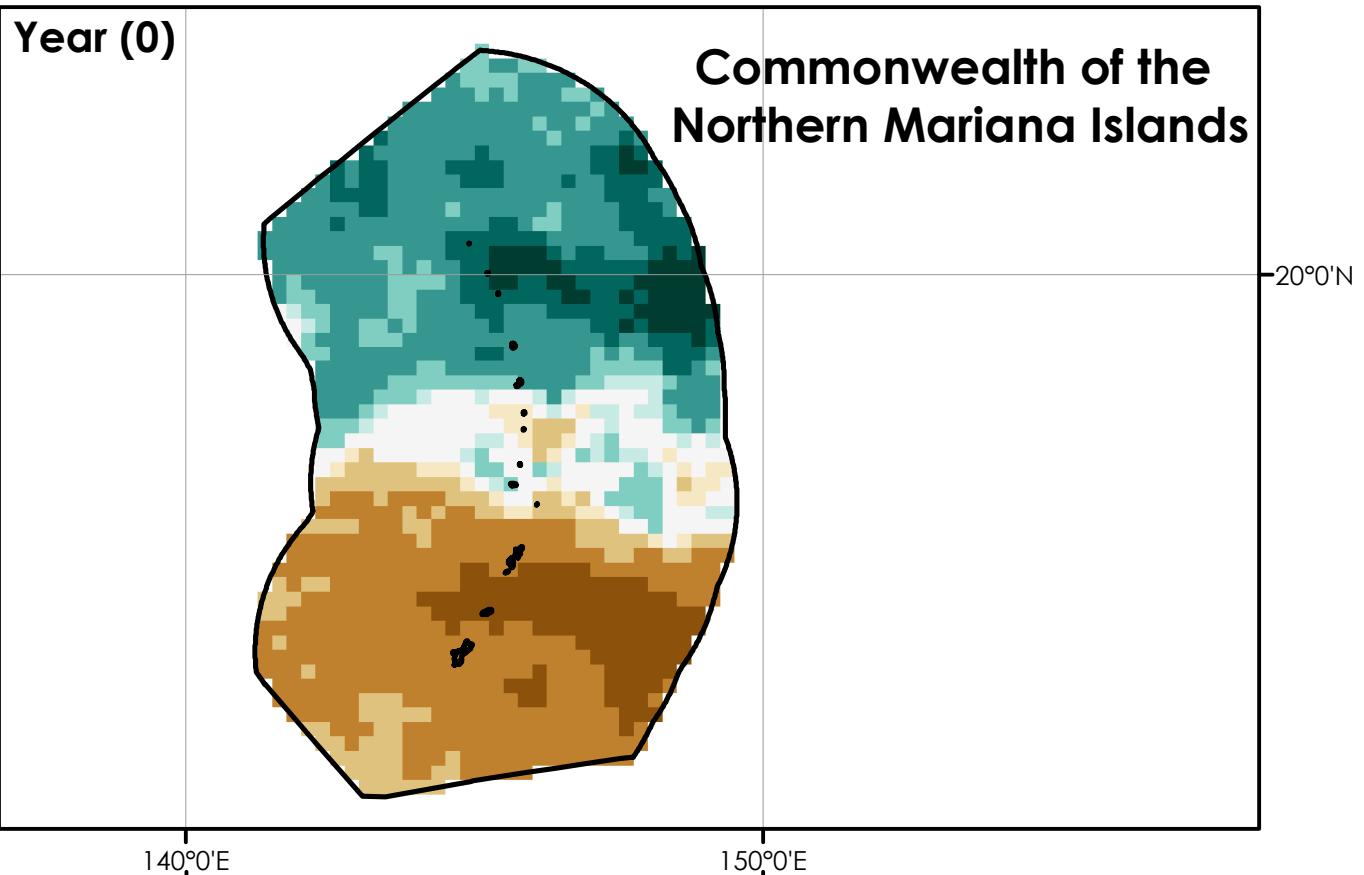
Moderate - Strong La Niña for OND

209



Moderate - Strong La Niña for NDJ

210



Precipitation Change (%)



The following two-panel maps show each three month seasonal average precipitation change for each of the five ENSO phases (moderate-strong La Niña and El Niño, weak La Niña and El Niño, and neutral) for the Federated States of Micronesia Exclusive Economic Zone. Within each two-panel map, the top map shows the average precipitation change for the three month season preceding (Year (0)) the onset of the specific ENSO phase, which is listed in the title, and the bottom map shows the average precipitation change following (Year (+1)) the onset of the specific ENSO phase.

These maps show the areas within the EEZ that are abnormally wet (turquoise/green) or dry (tan/brown) for the three month season during a specific ENSO phase. Additionally, these maps show how the precipitation varies from a pre ENSO to a post ENSO phase. This is important when determining how the different ENSO phases influence precipitation patterns.

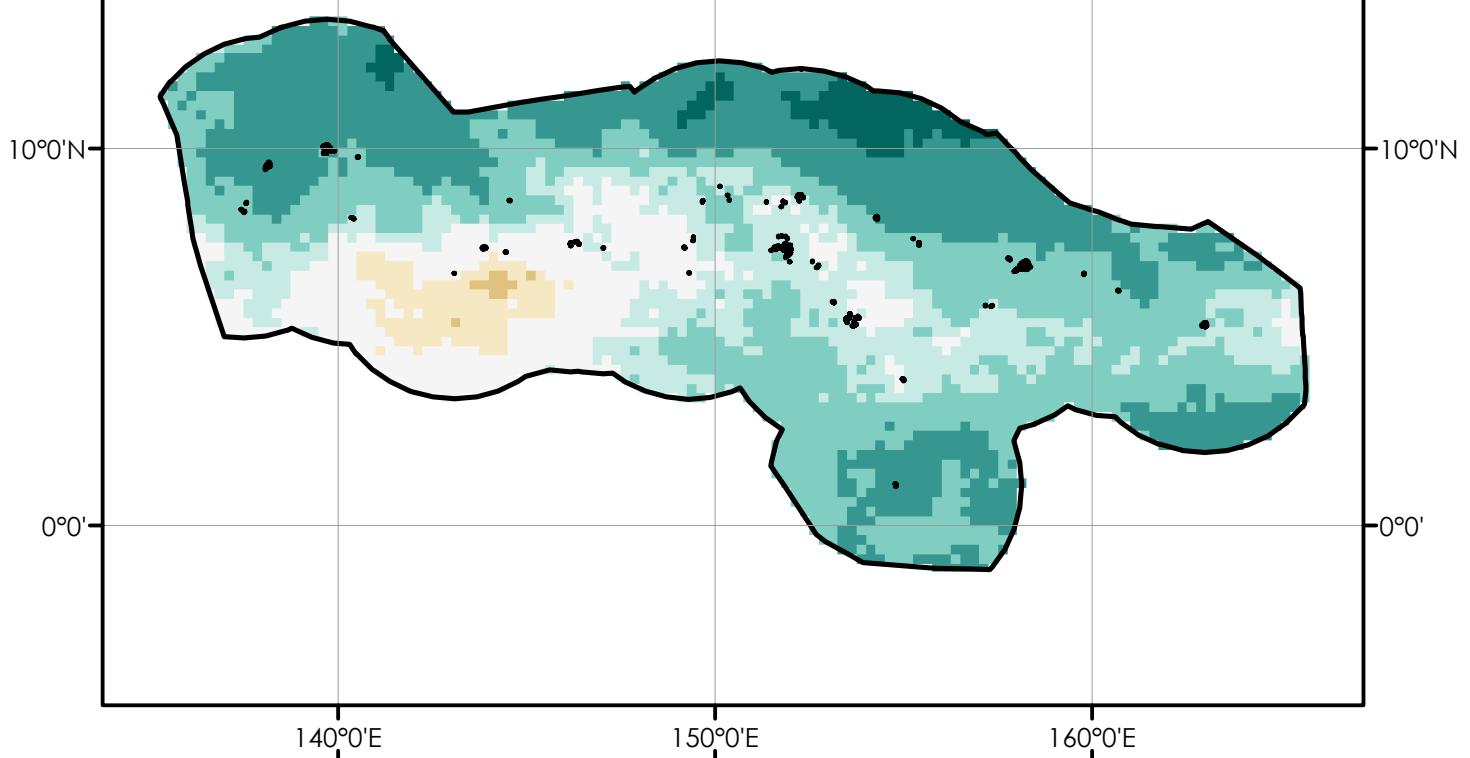
All of the maps show precipitation at a 0.25° resolution from the NOAA PERSIANN-CDR. The “normal” is the 30-year average precipitation from January 1985 through December 2014.

Moderate - Strong El Niño for DJF

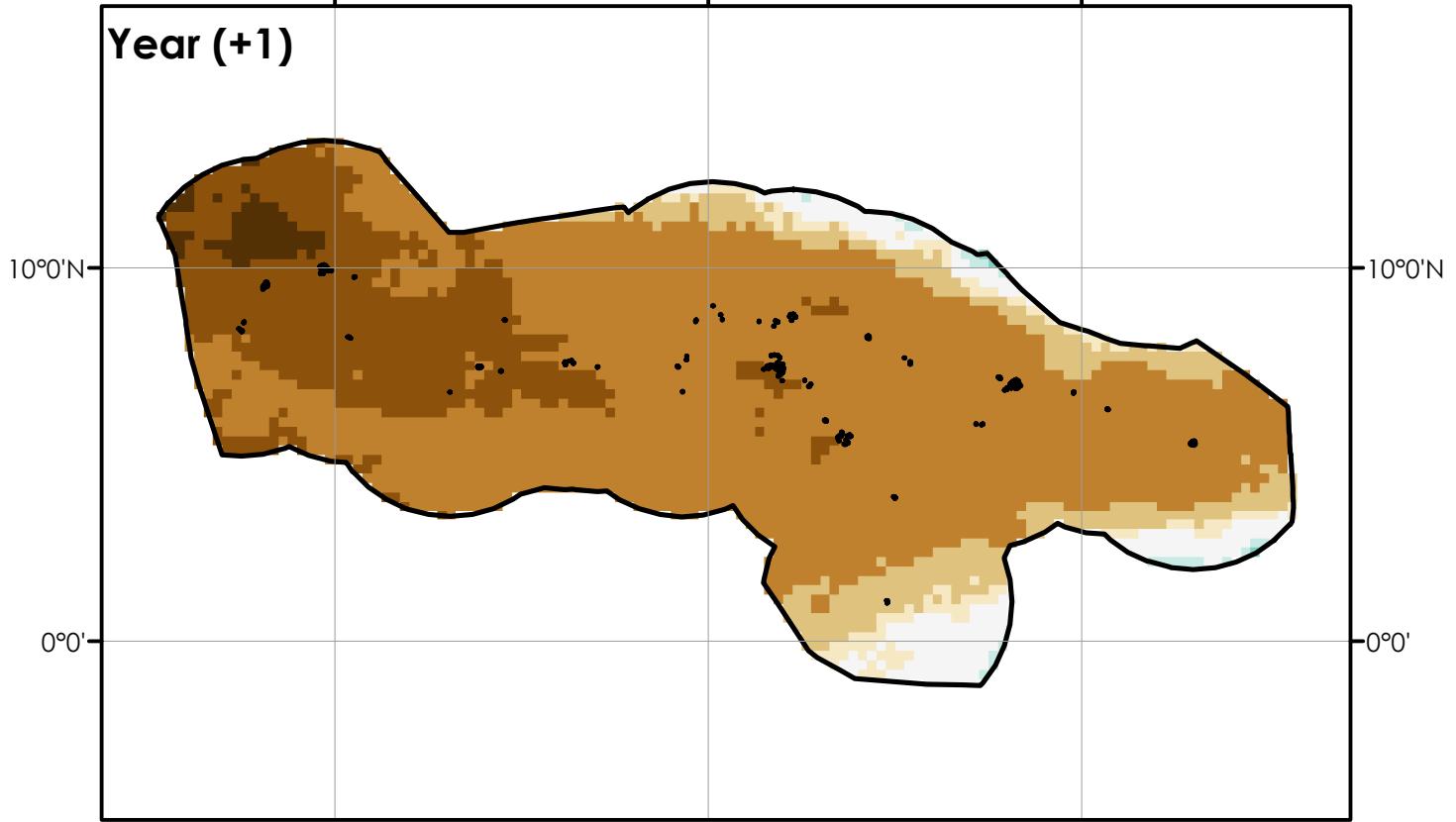
212

Year (0)

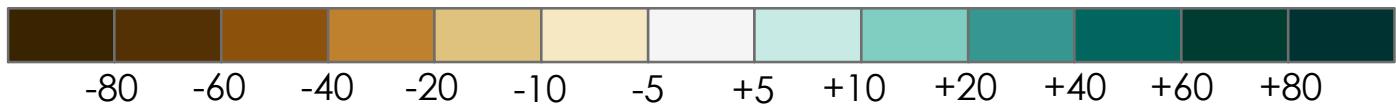
Federated States of Micronesia



Year (+1)

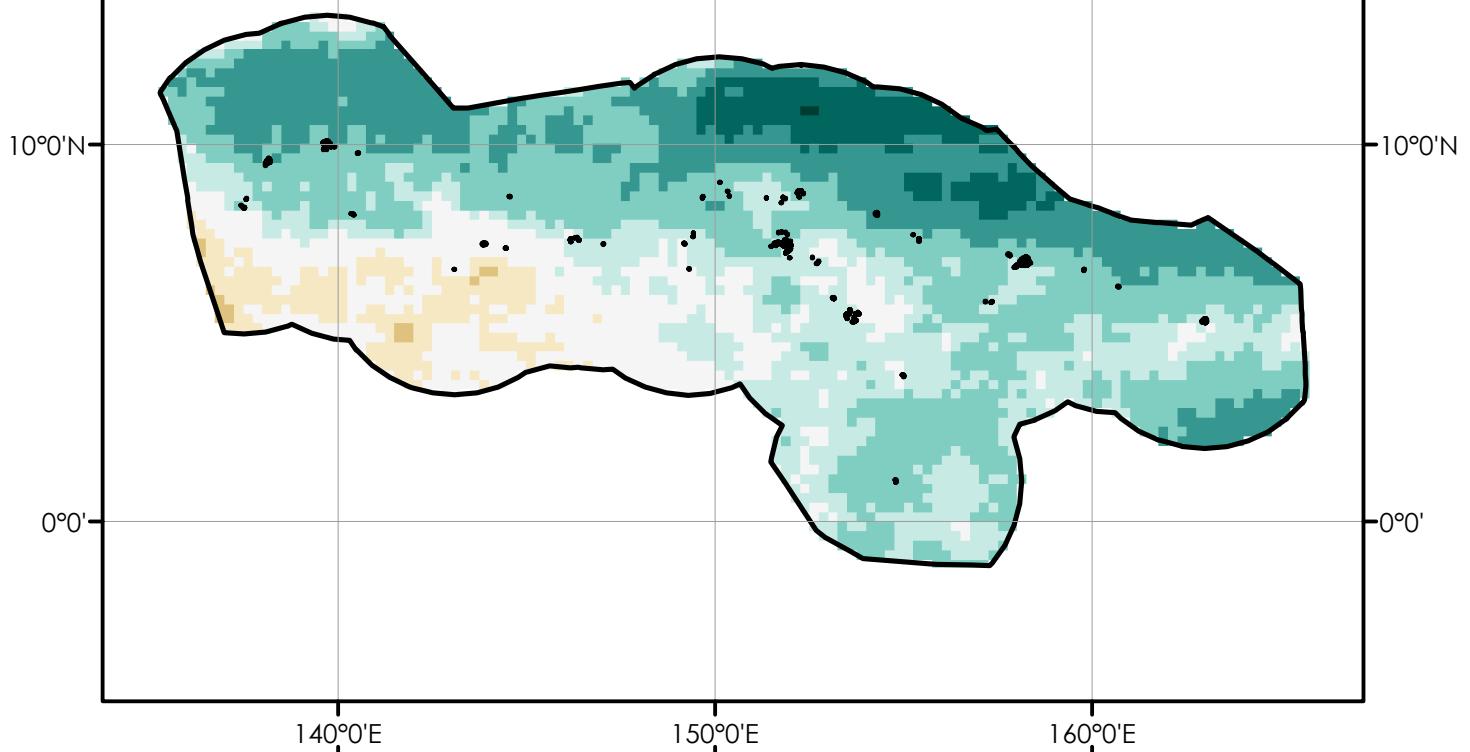


Precipitation Change (%)

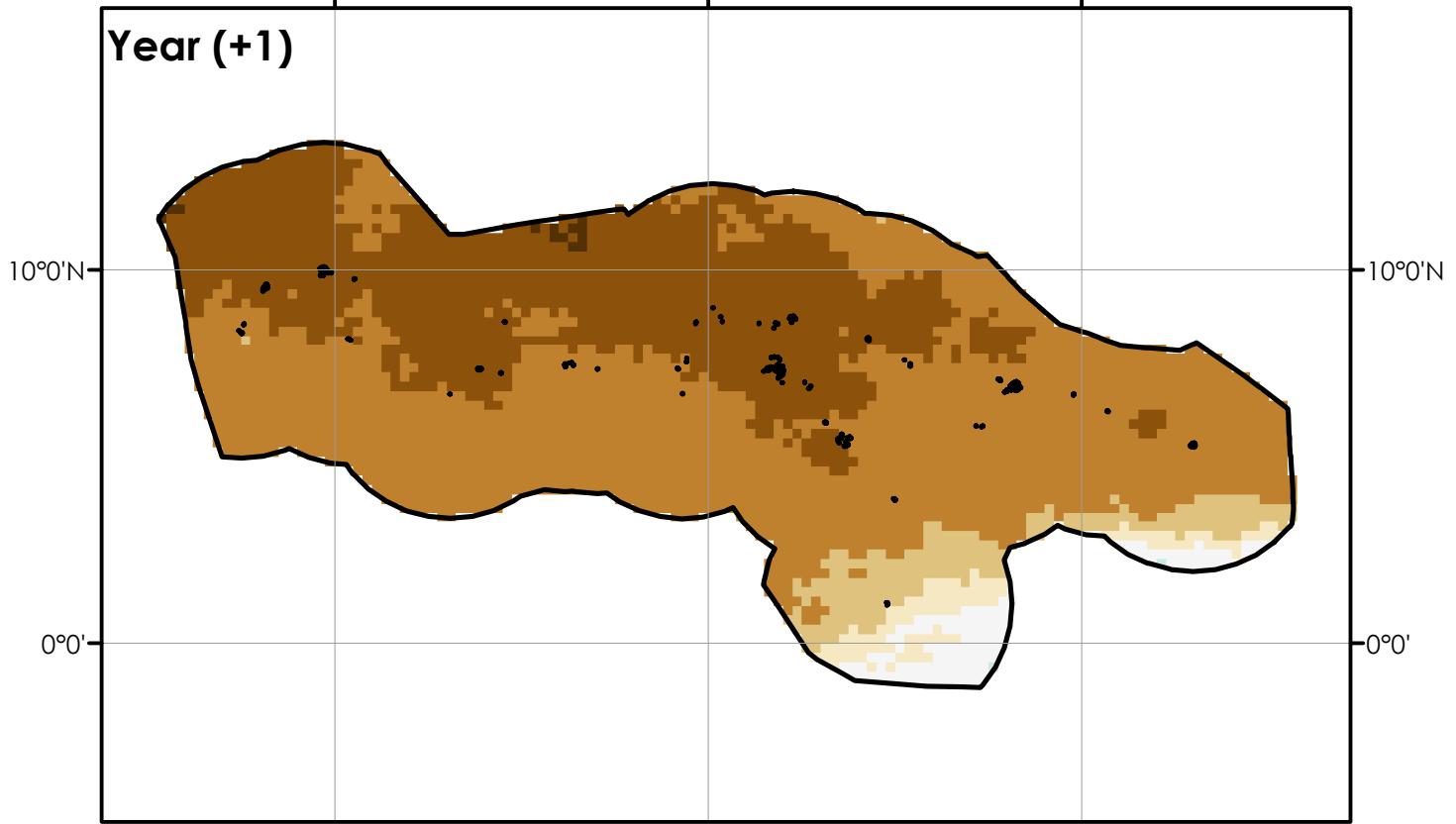


Year (0)

Federated States of Micronesia



Year (+1)



Precipitation Change (%)

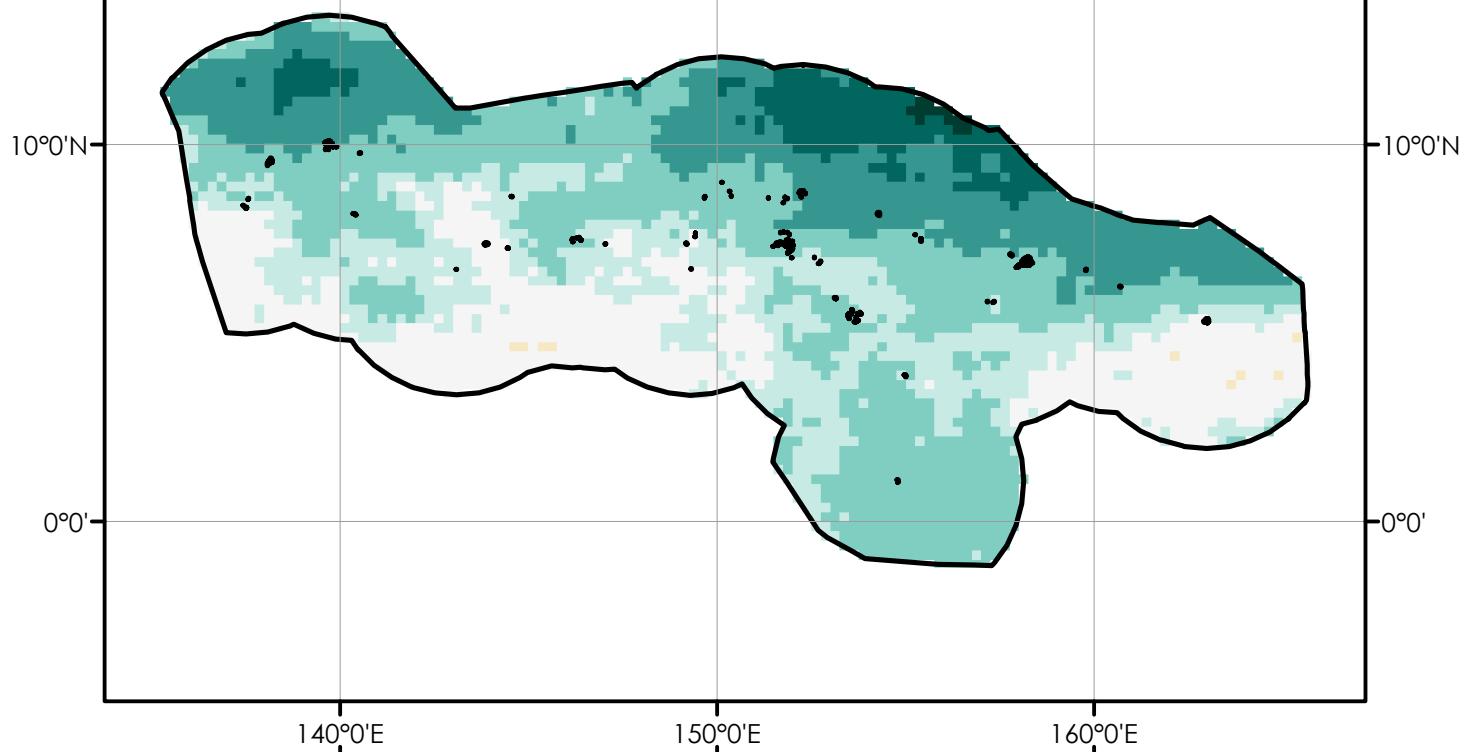


Moderate - Strong El Niño for FMA

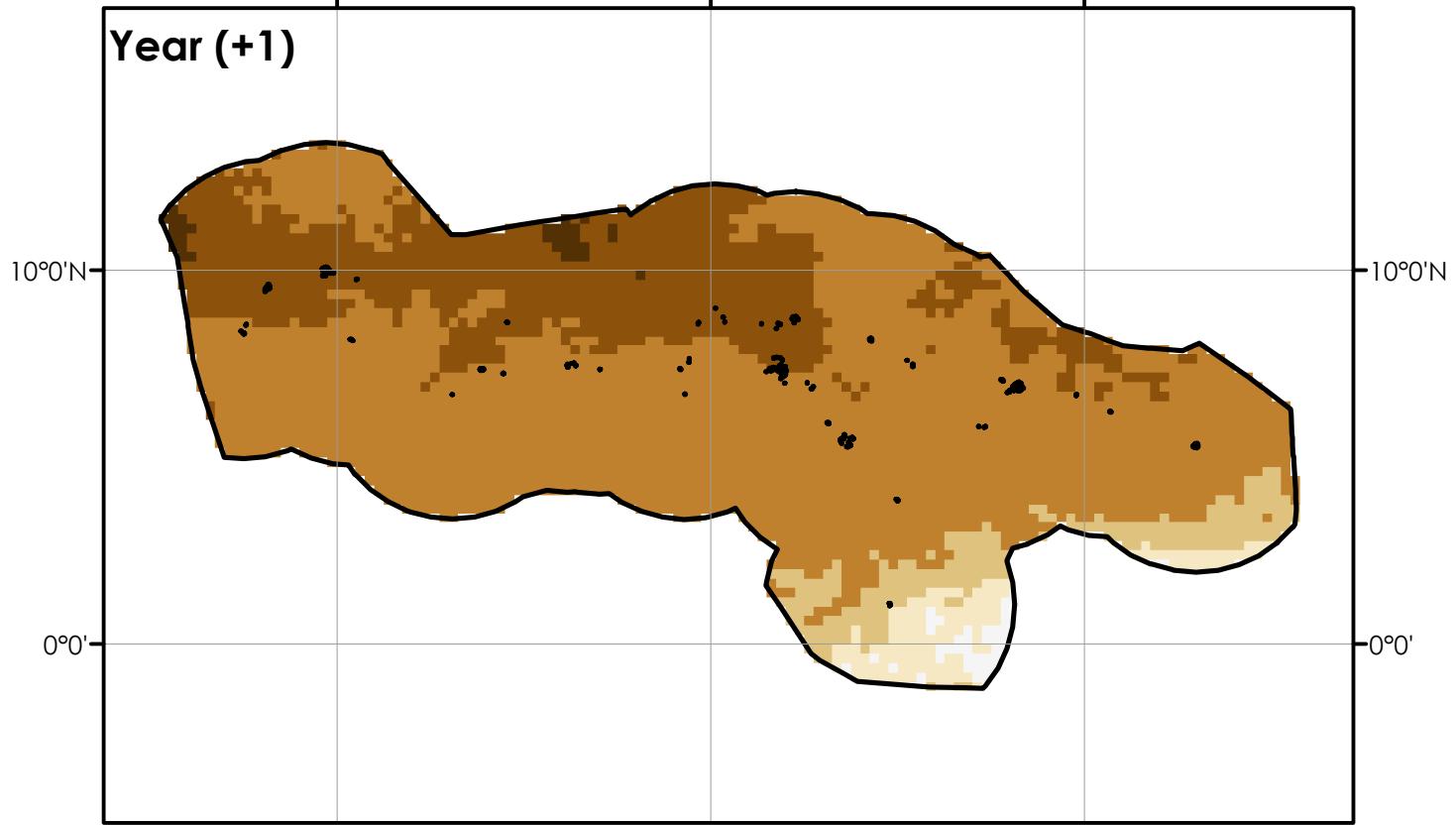
214

Year (0)

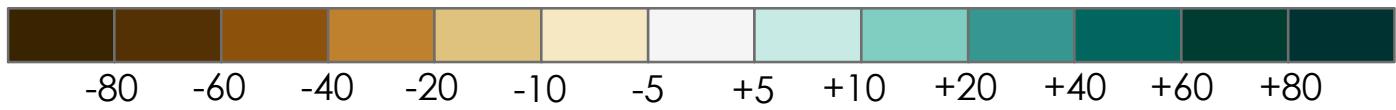
Federated States of Micronesia



Year (+1)

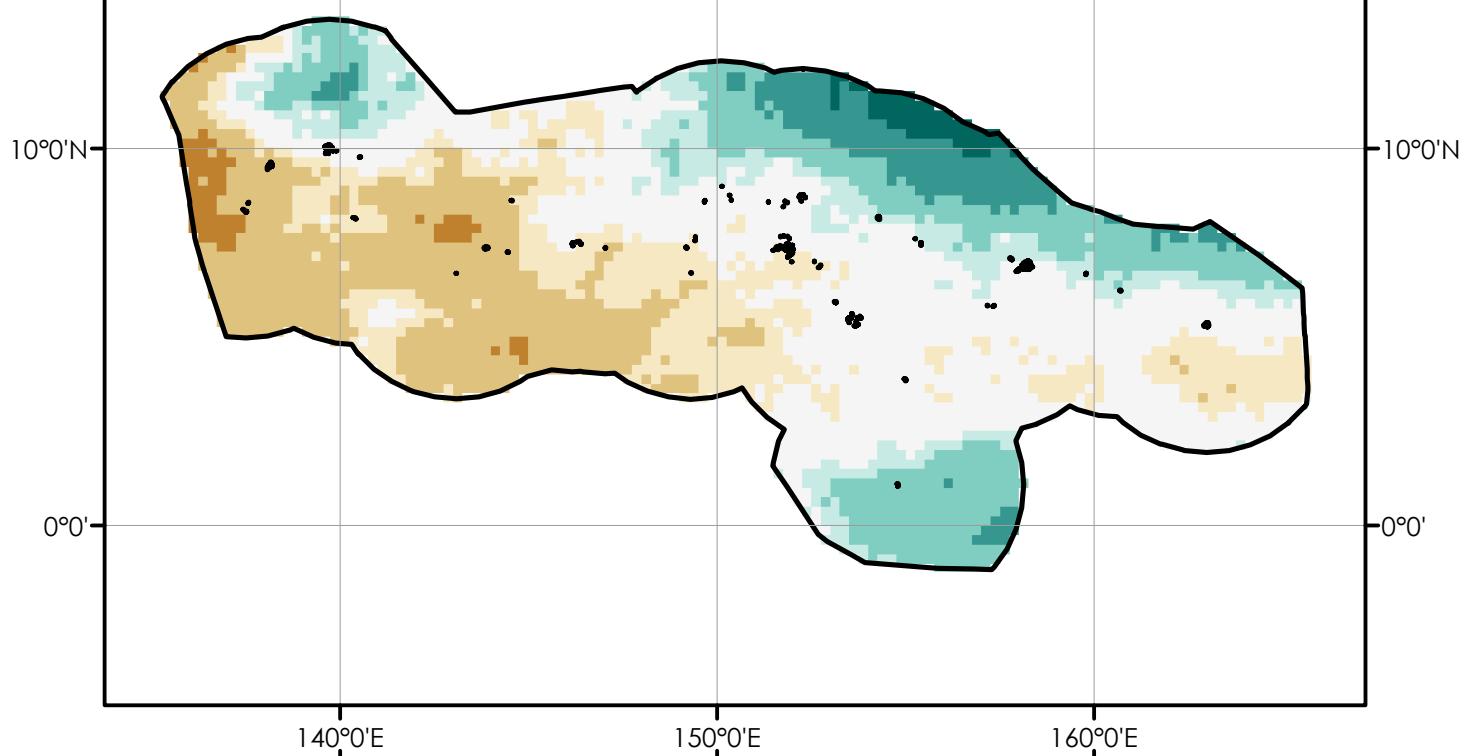


Precipitation Change (%)

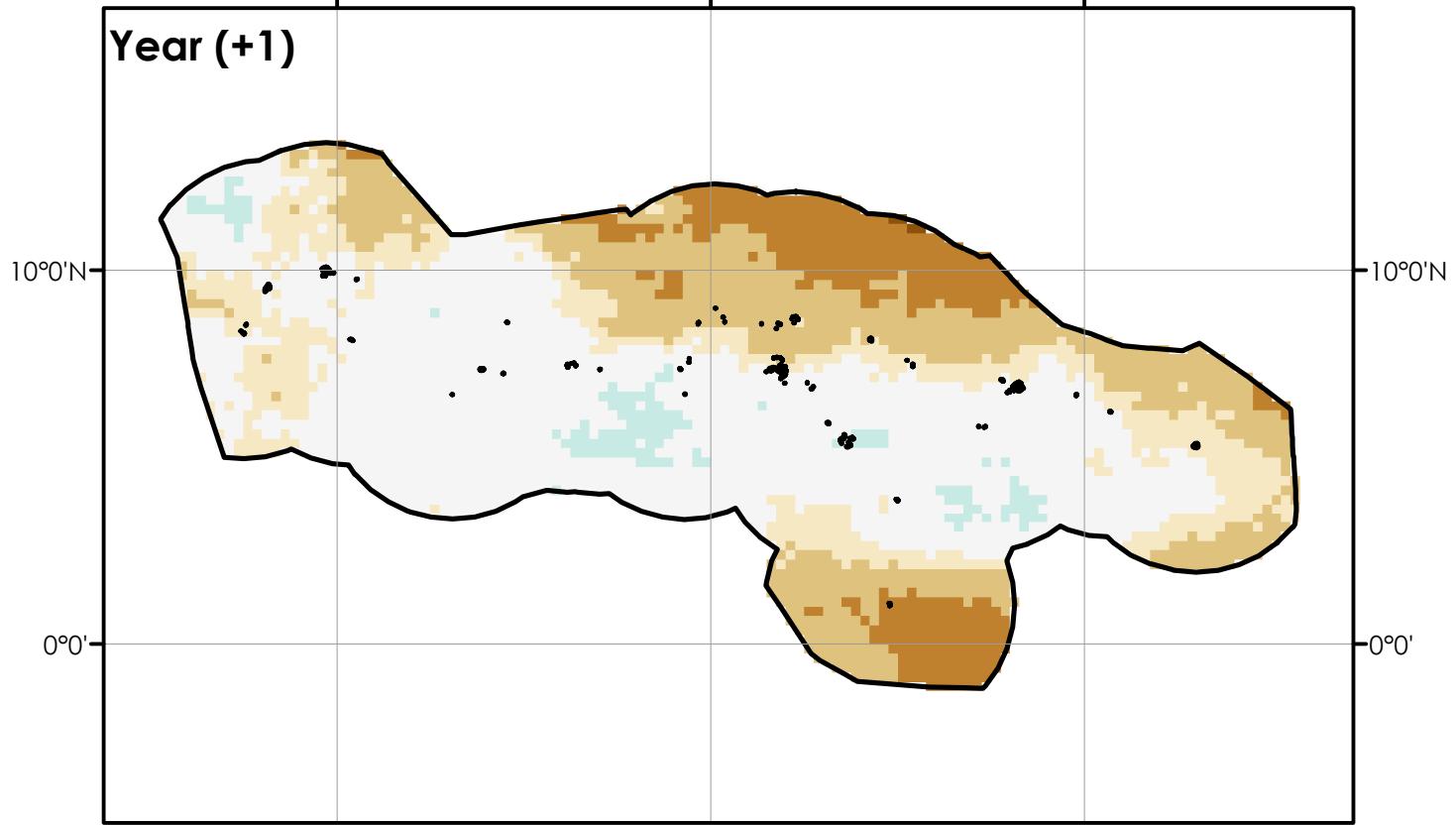


Year (0)

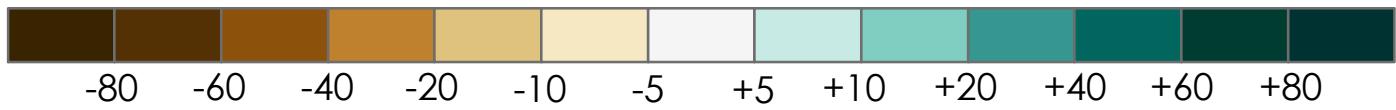
Federated States of Micronesia

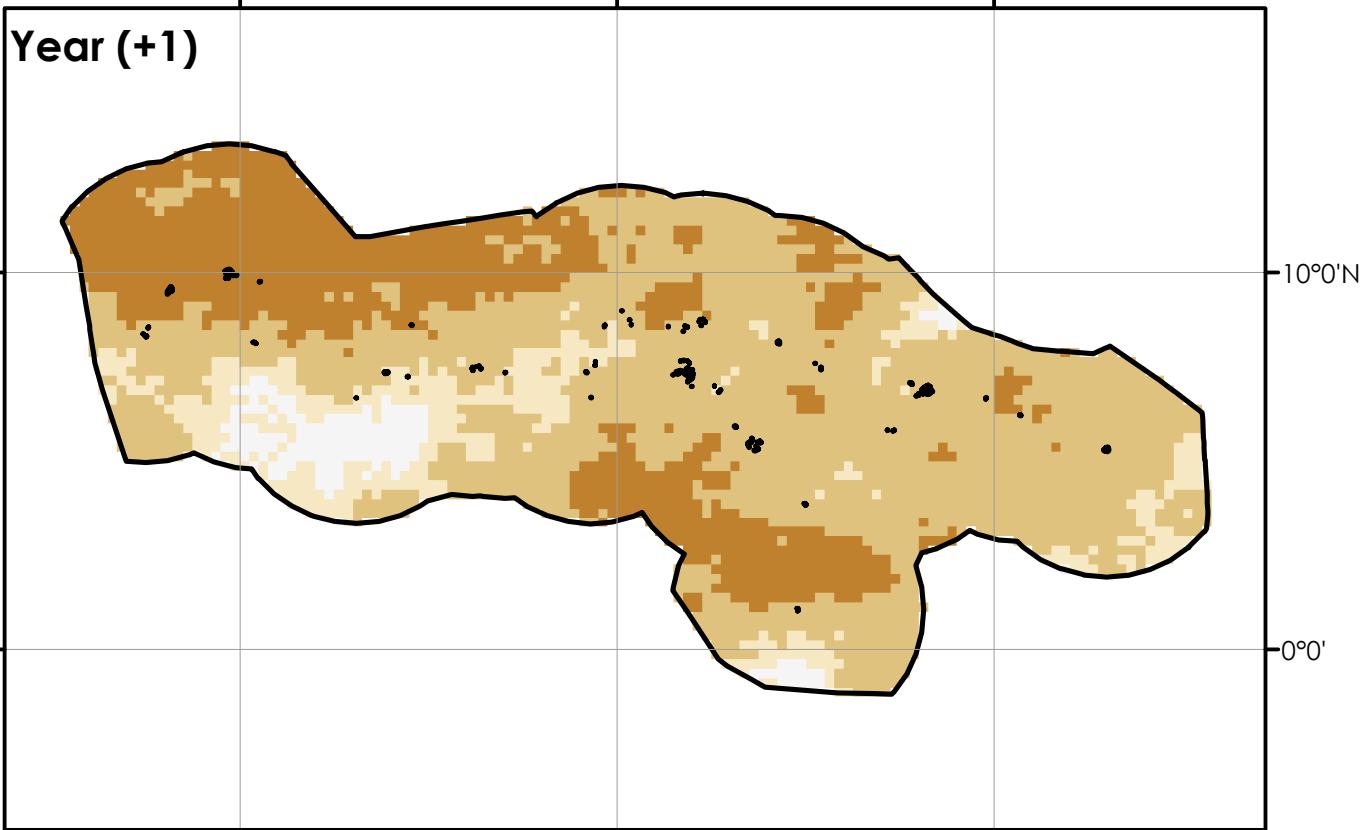
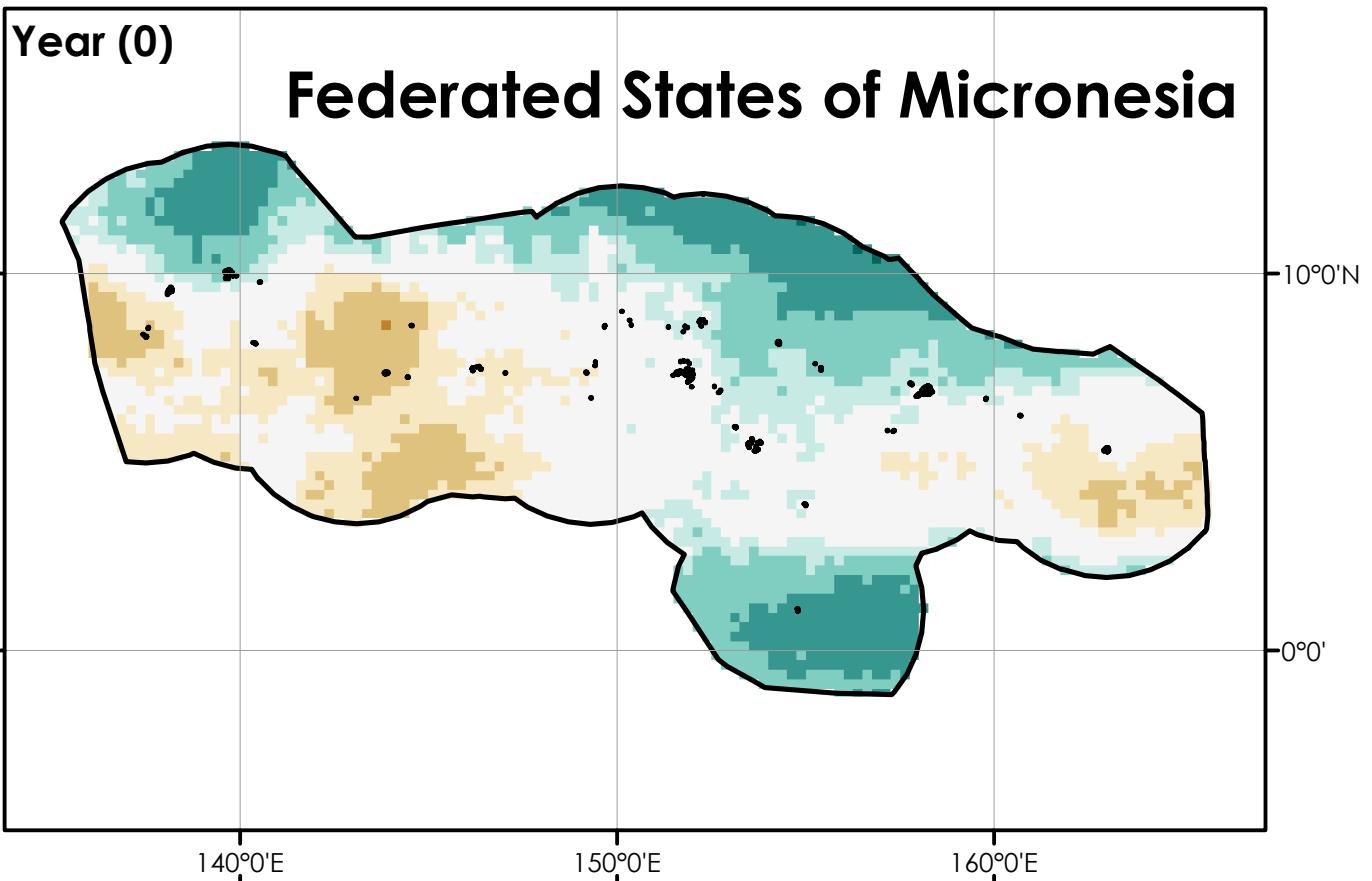


Year (+1)



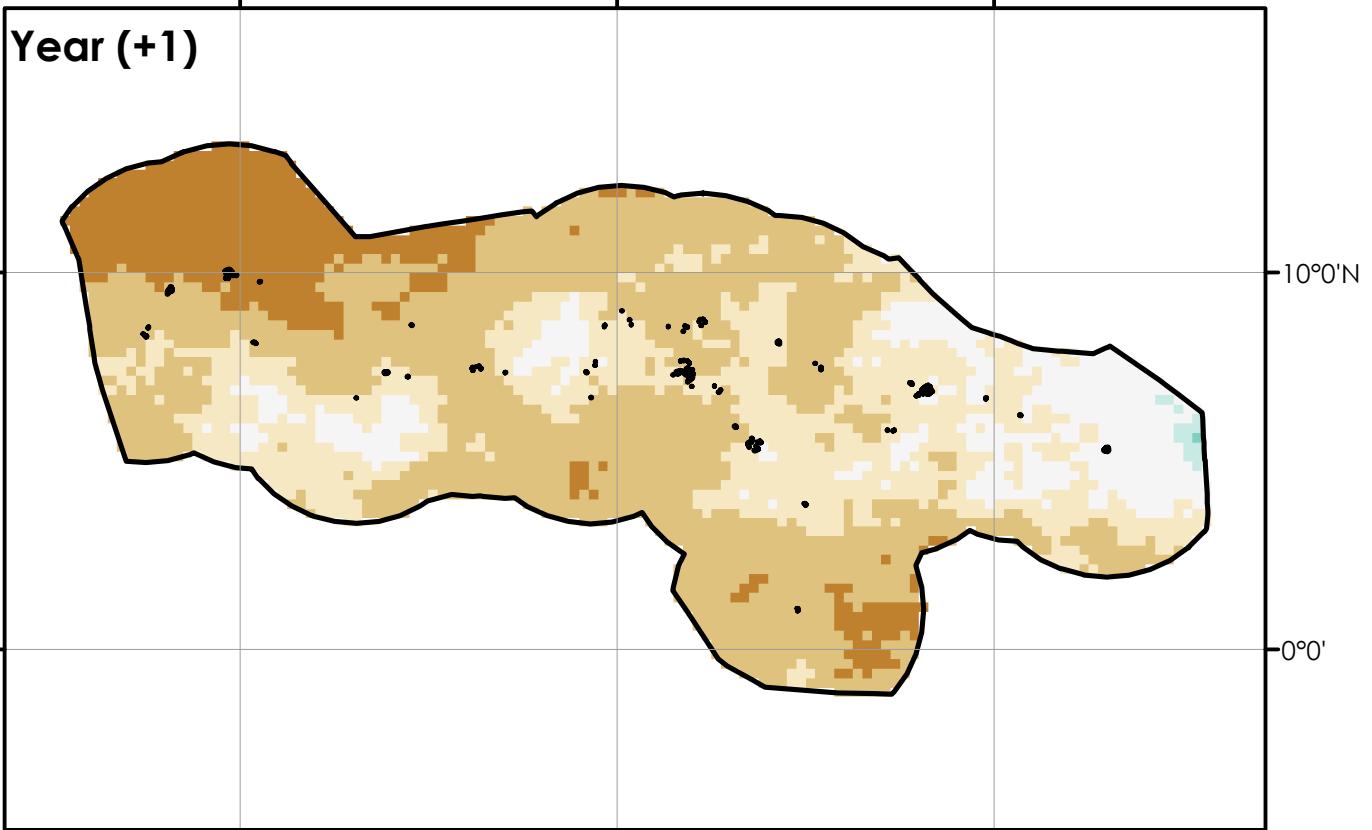
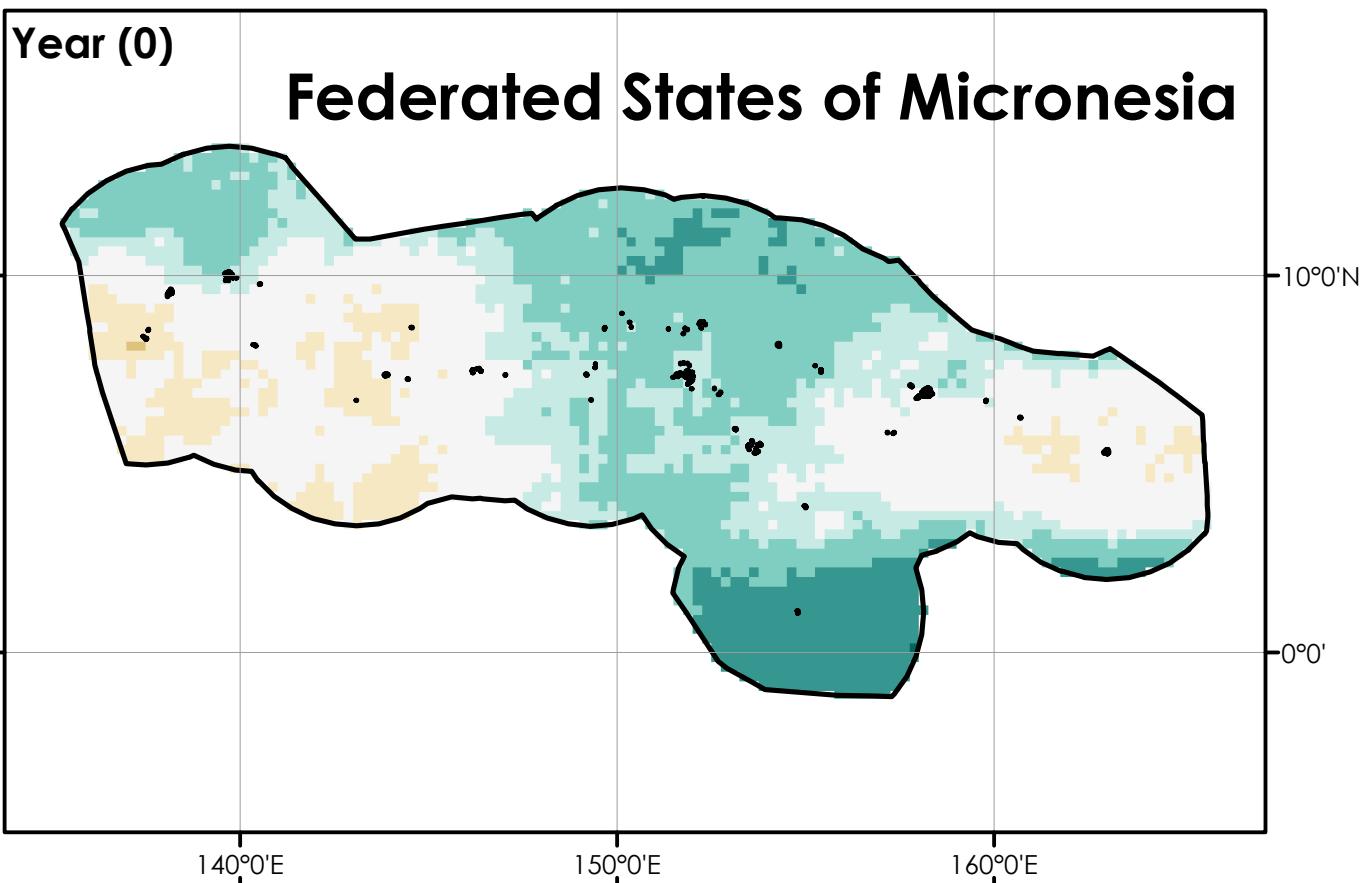
Precipitation Change (%)





Precipitation Change (%)



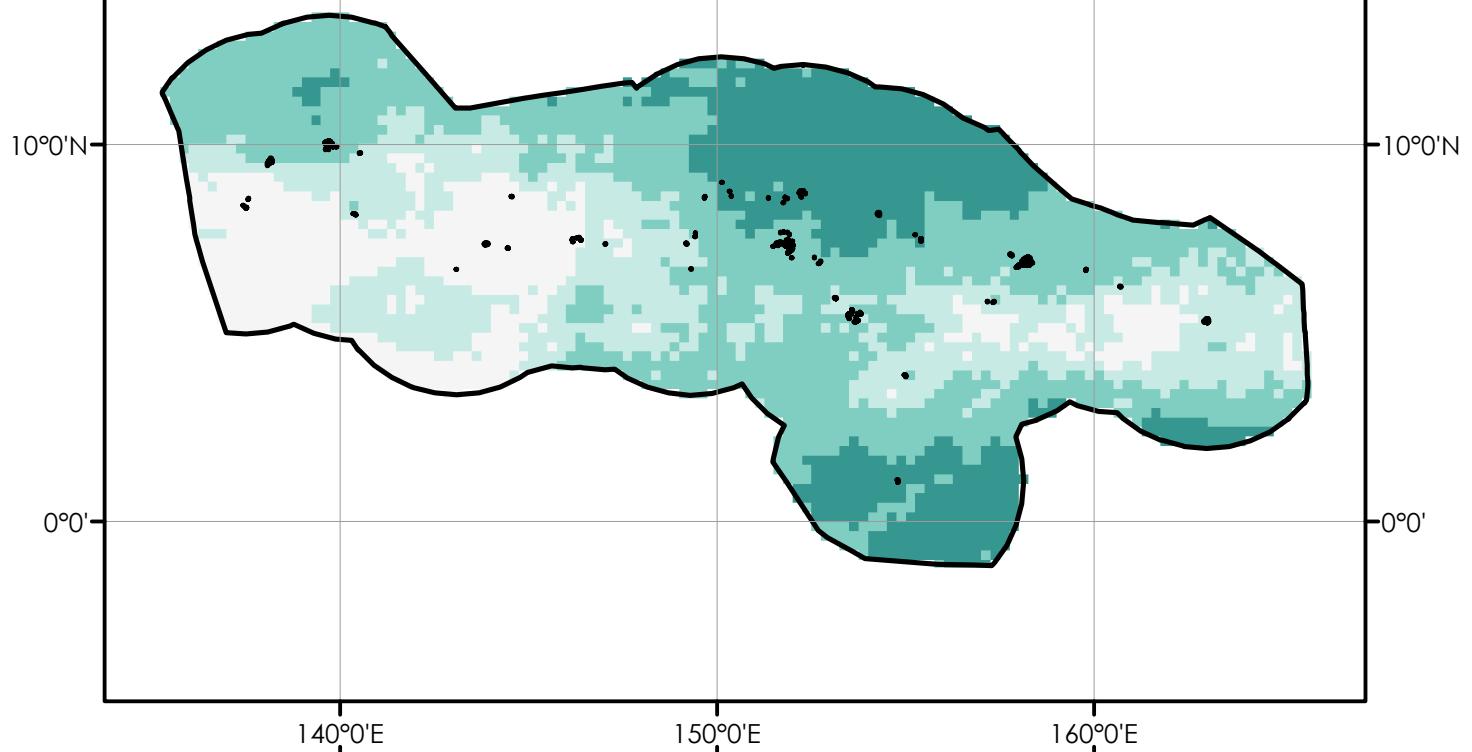


Precipitation Change (%)

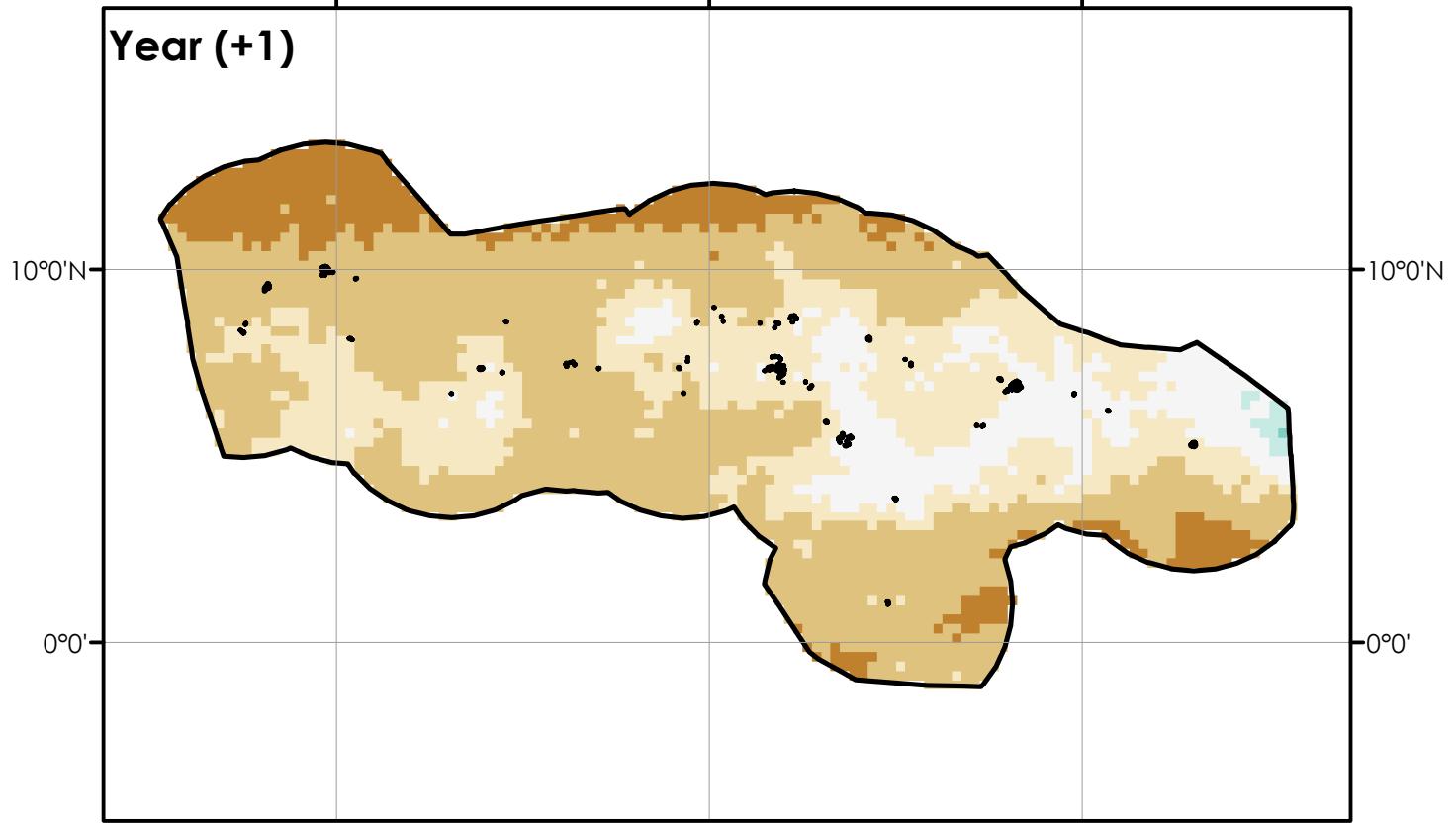


Year (0)

Federated States of Micronesia

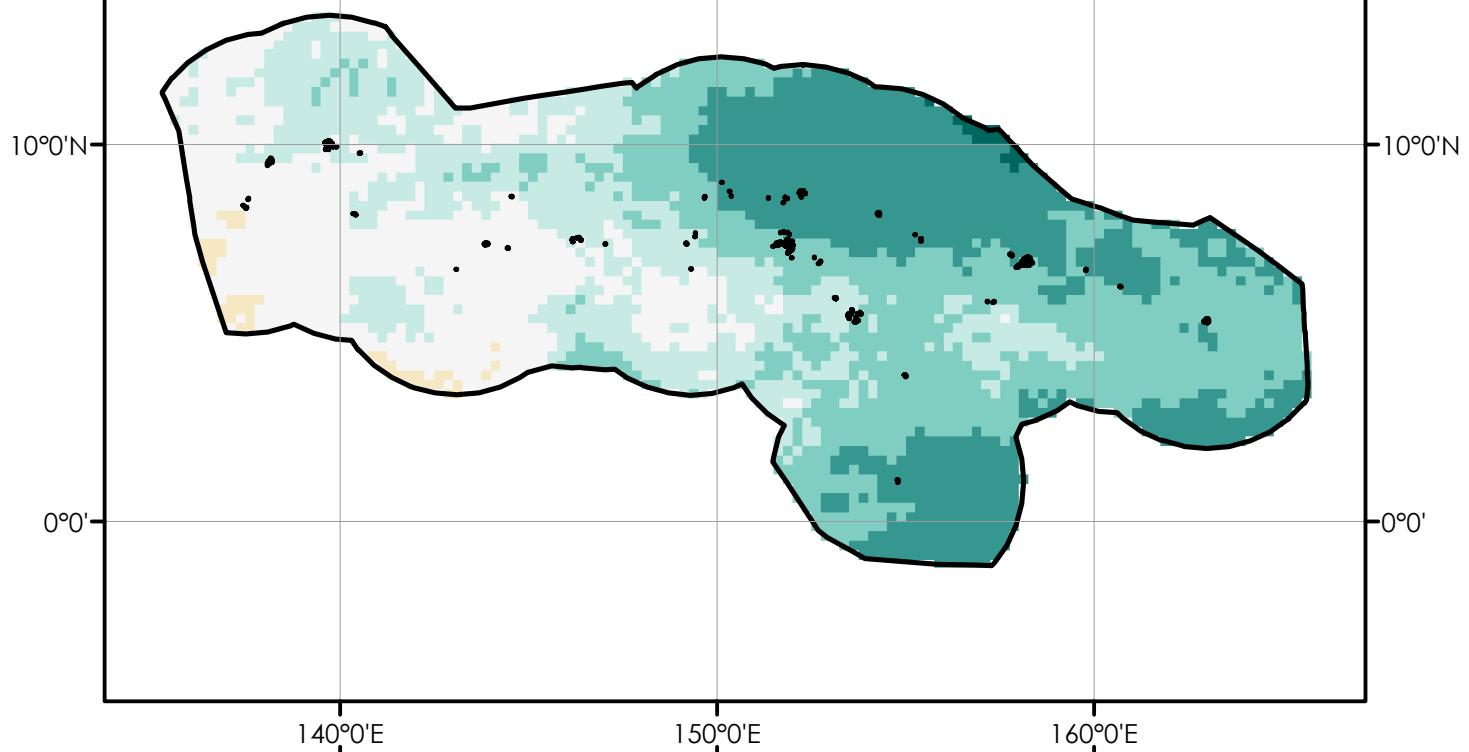
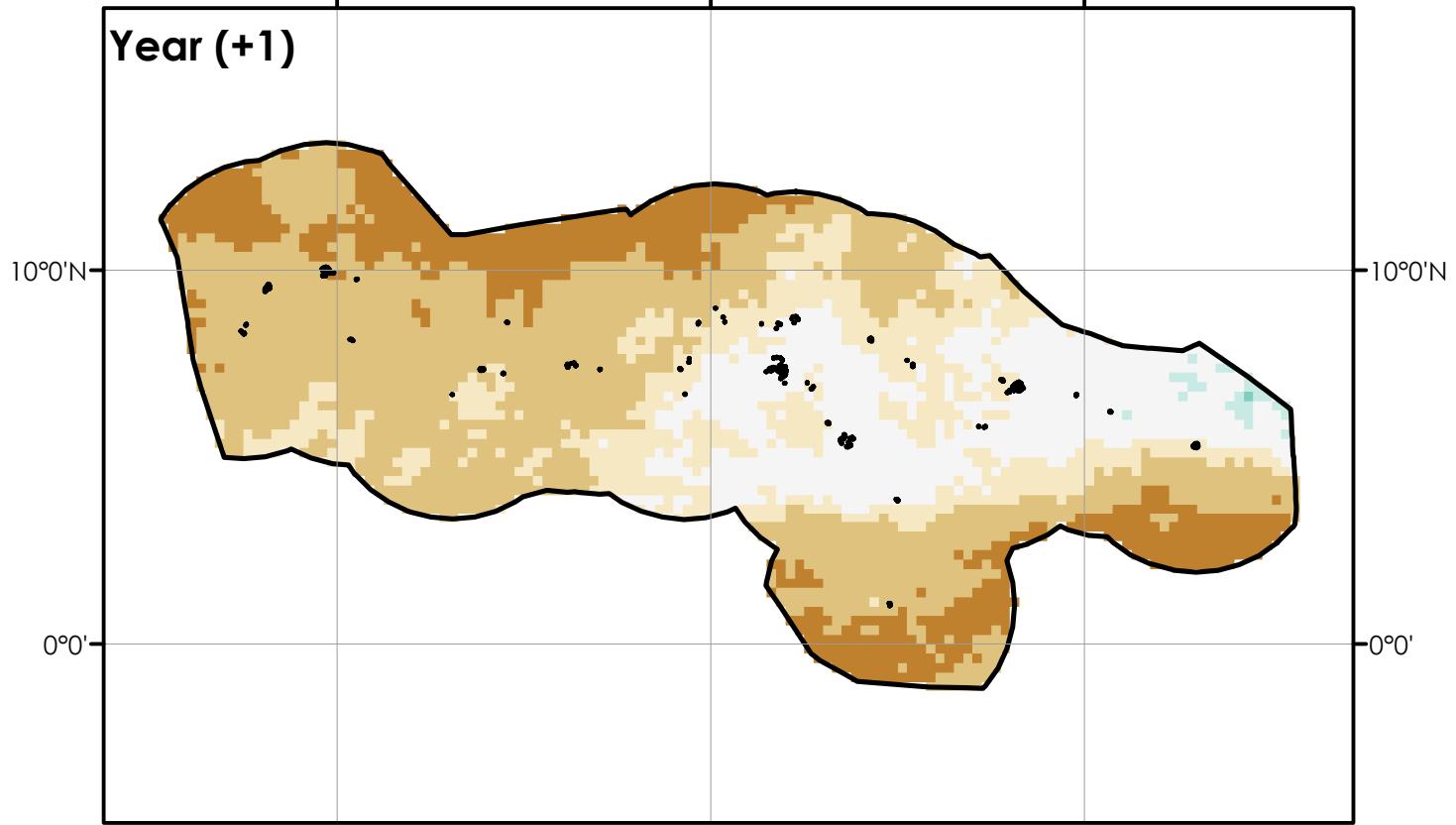


Year (+1)



Precipitation Change (%)



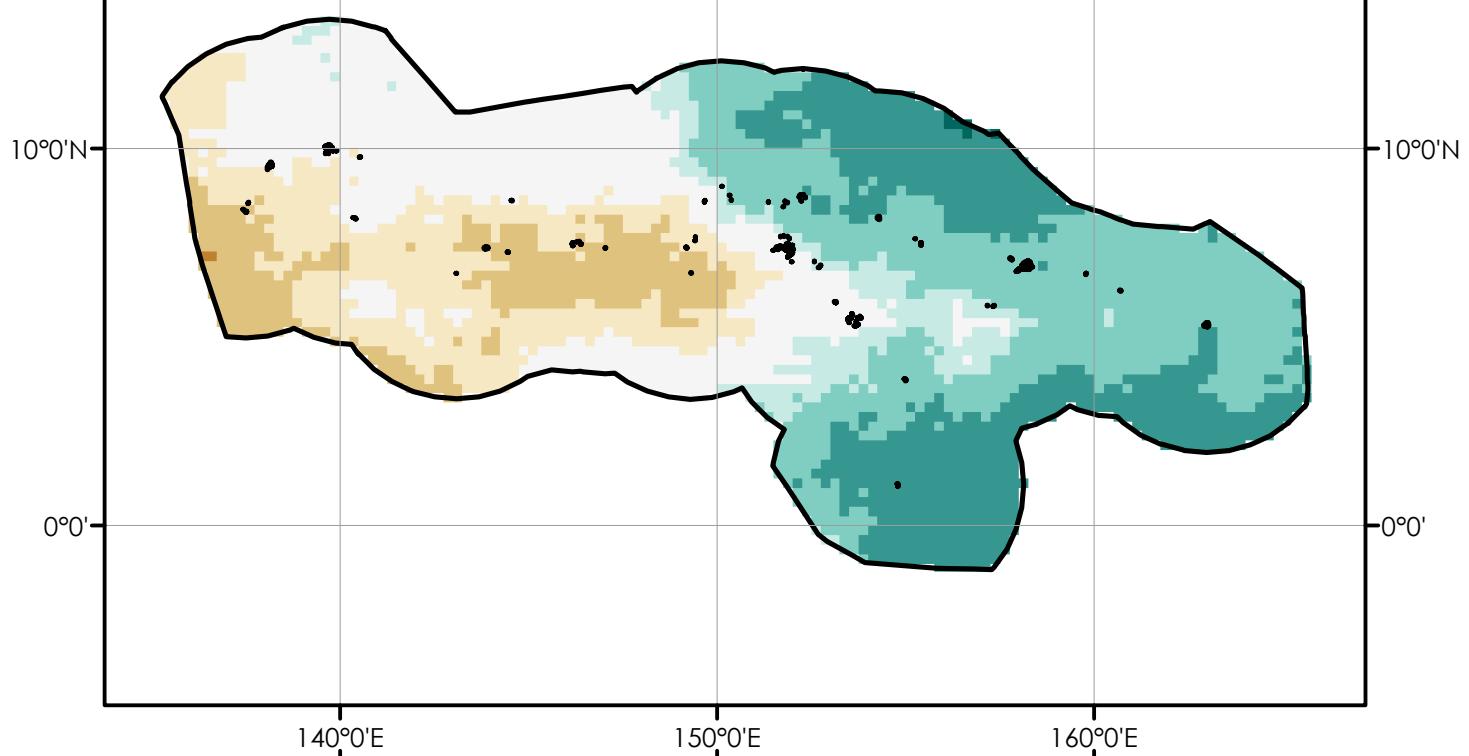
Year (0)**Federated States of Micronesia****Year (+1)****Precipitation Change (%)**

Moderate - Strong El Niño for ASO

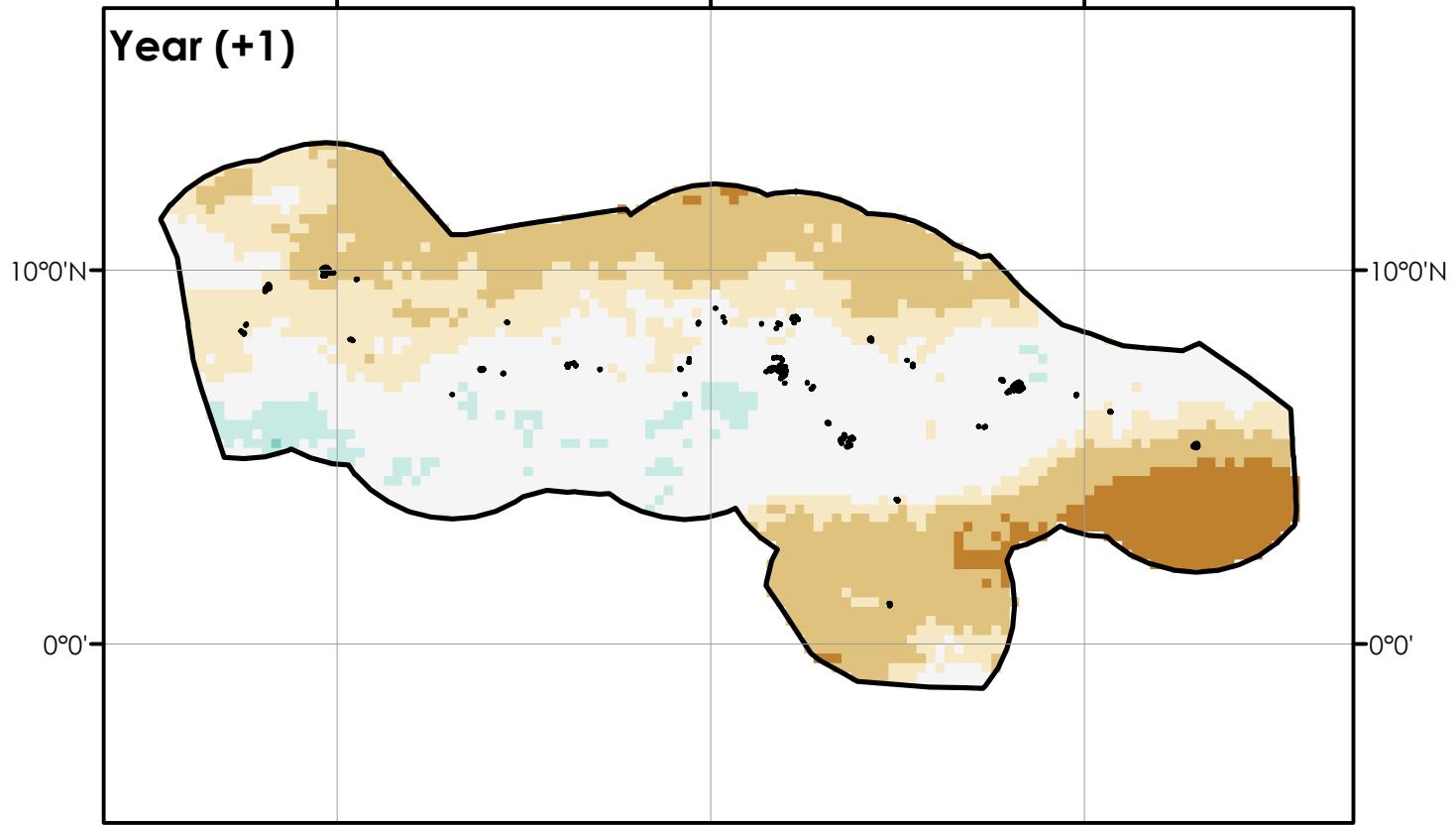
220

Year (0)

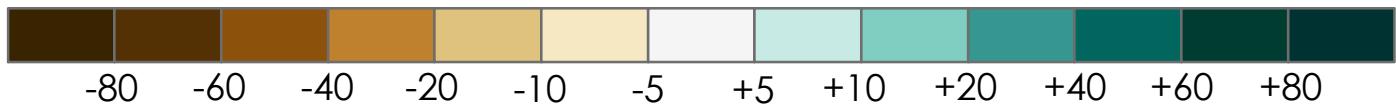
Federated States of Micronesia

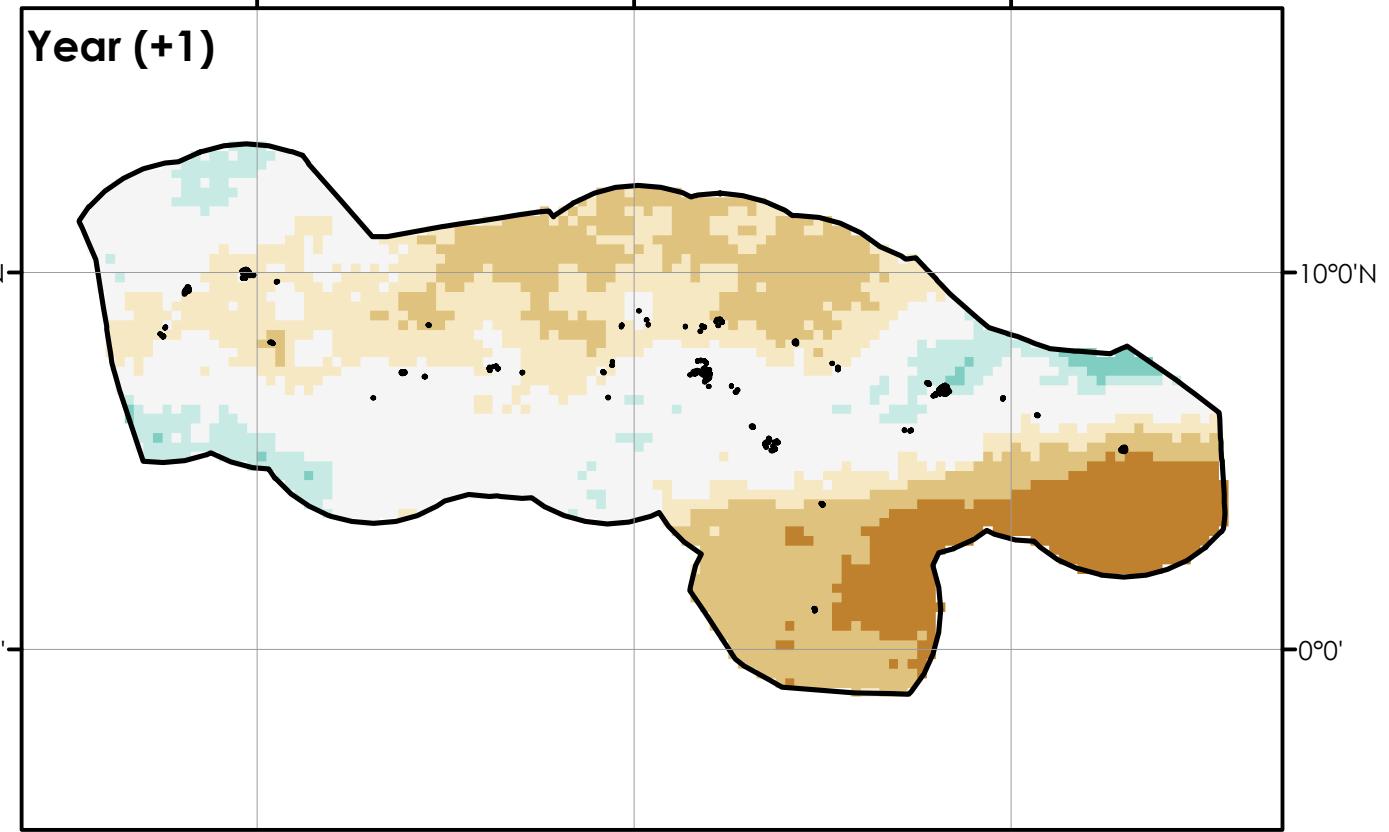
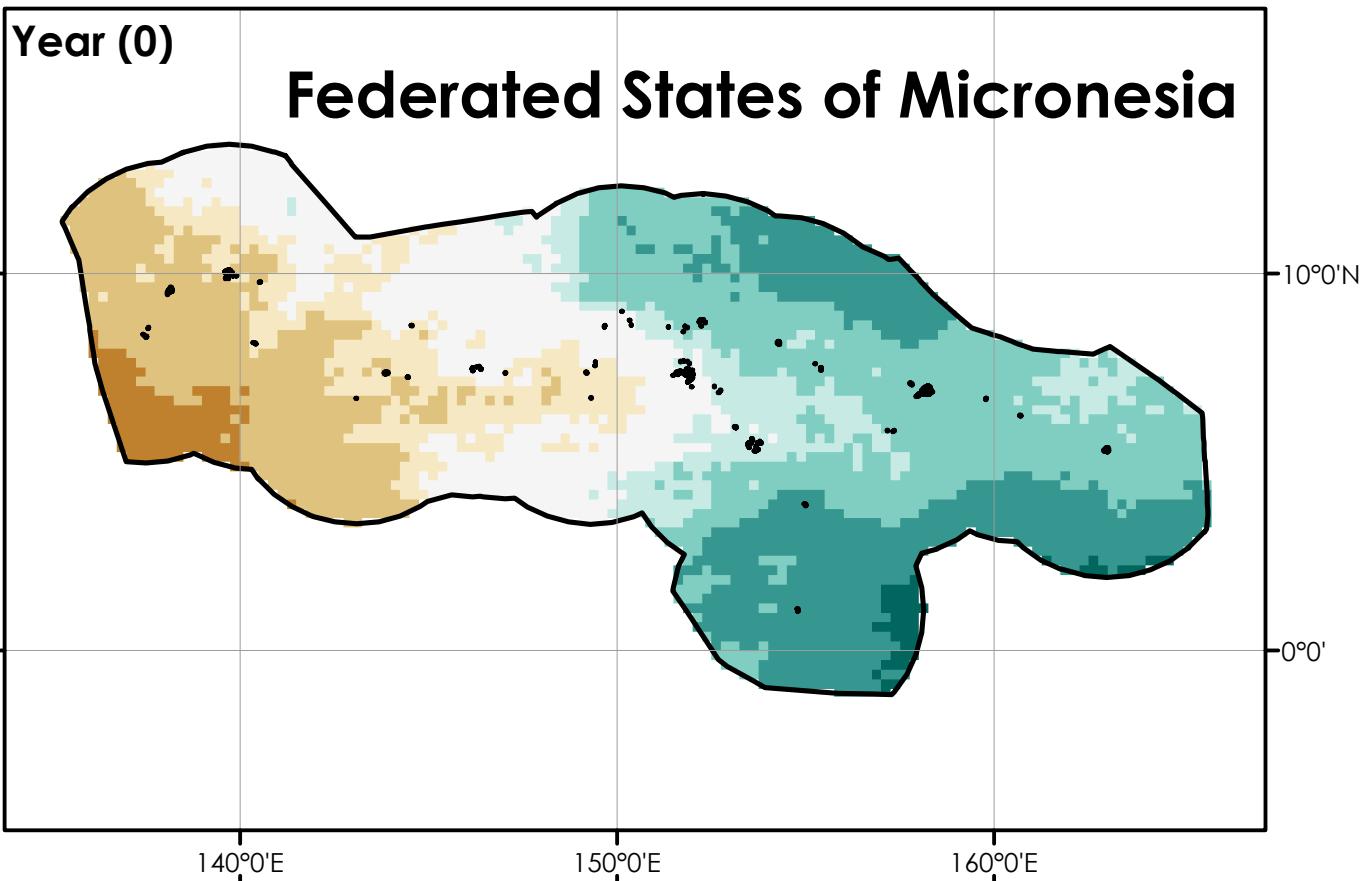


Year (+1)

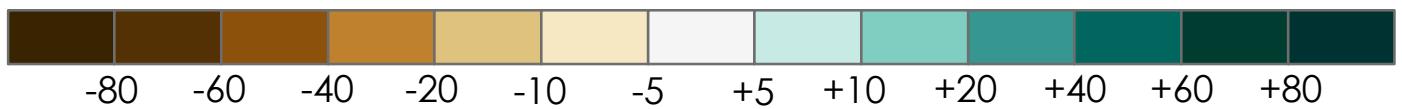


Precipitation Change (%)



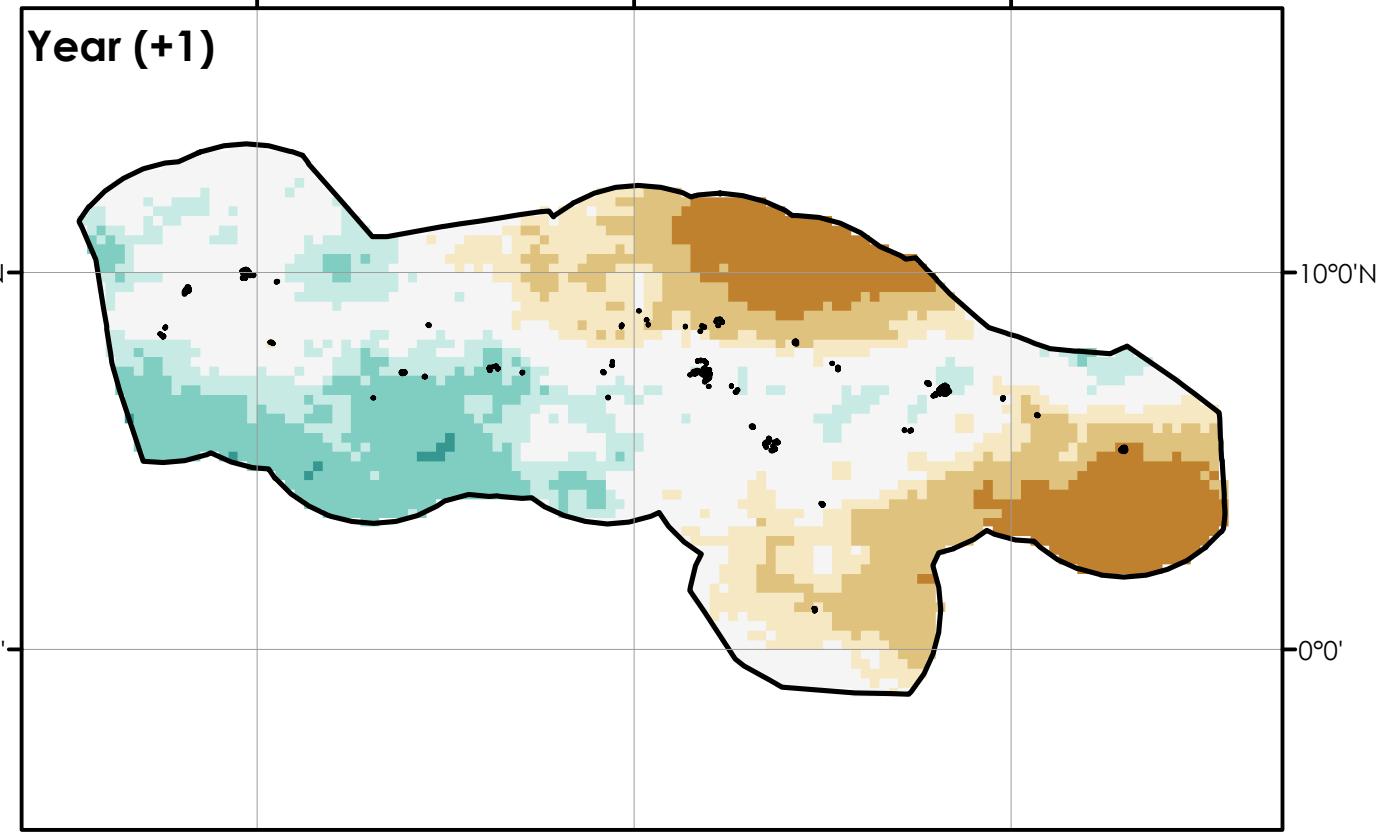
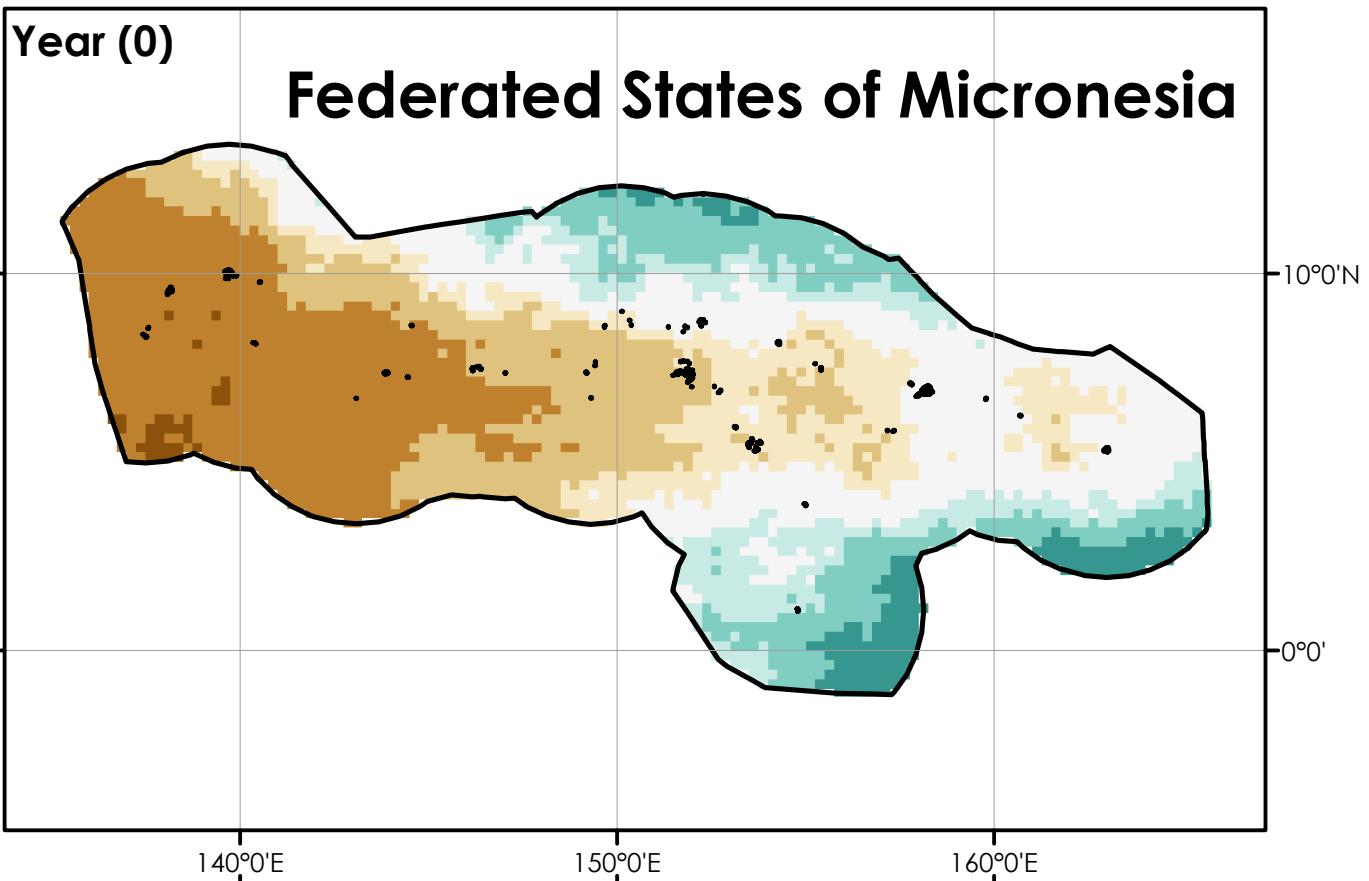


Precipitation Change (%)

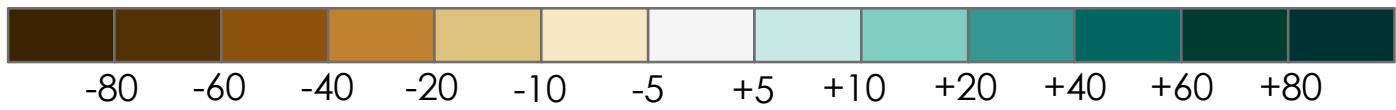


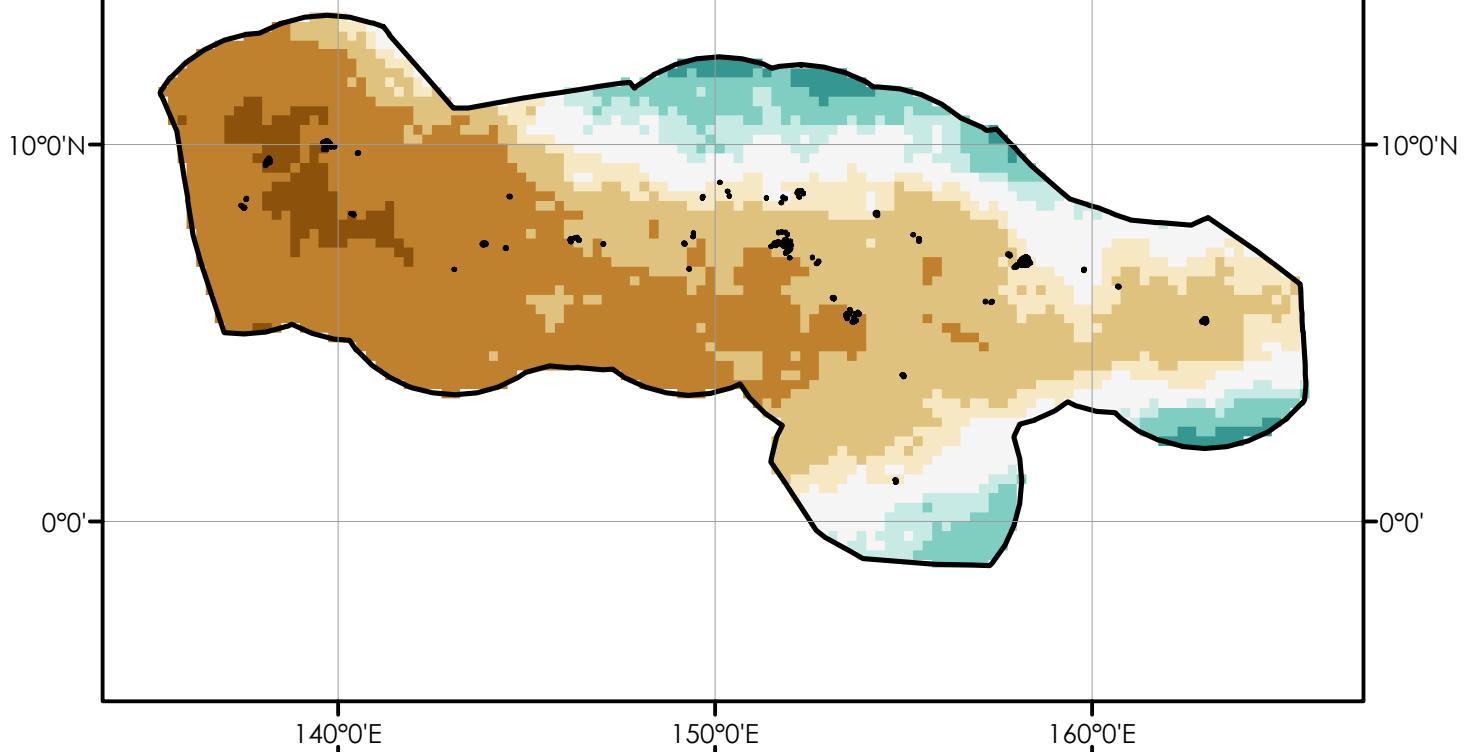
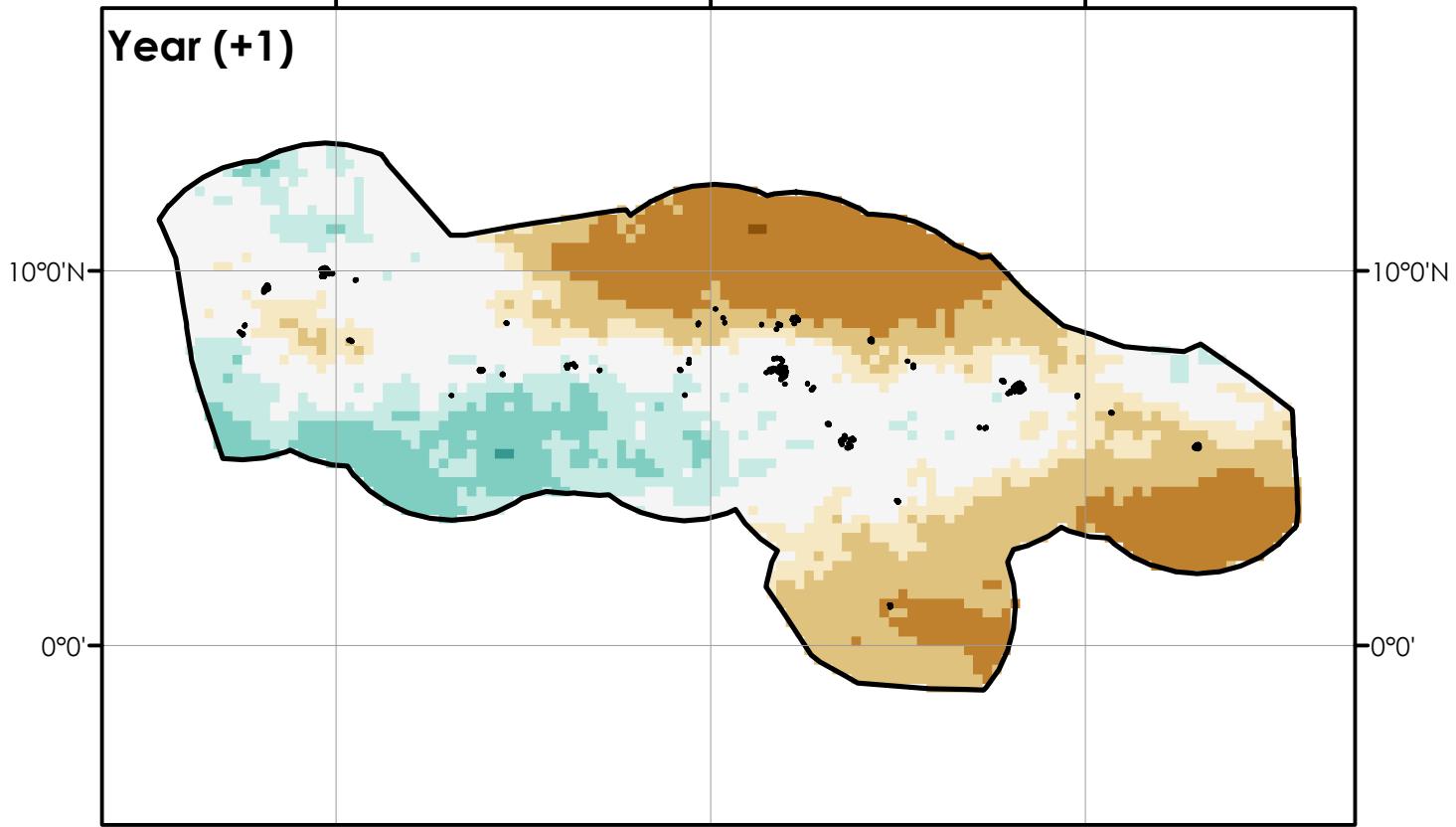
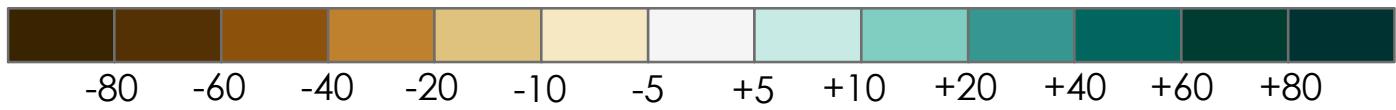
Moderate - Strong El Niño for OND

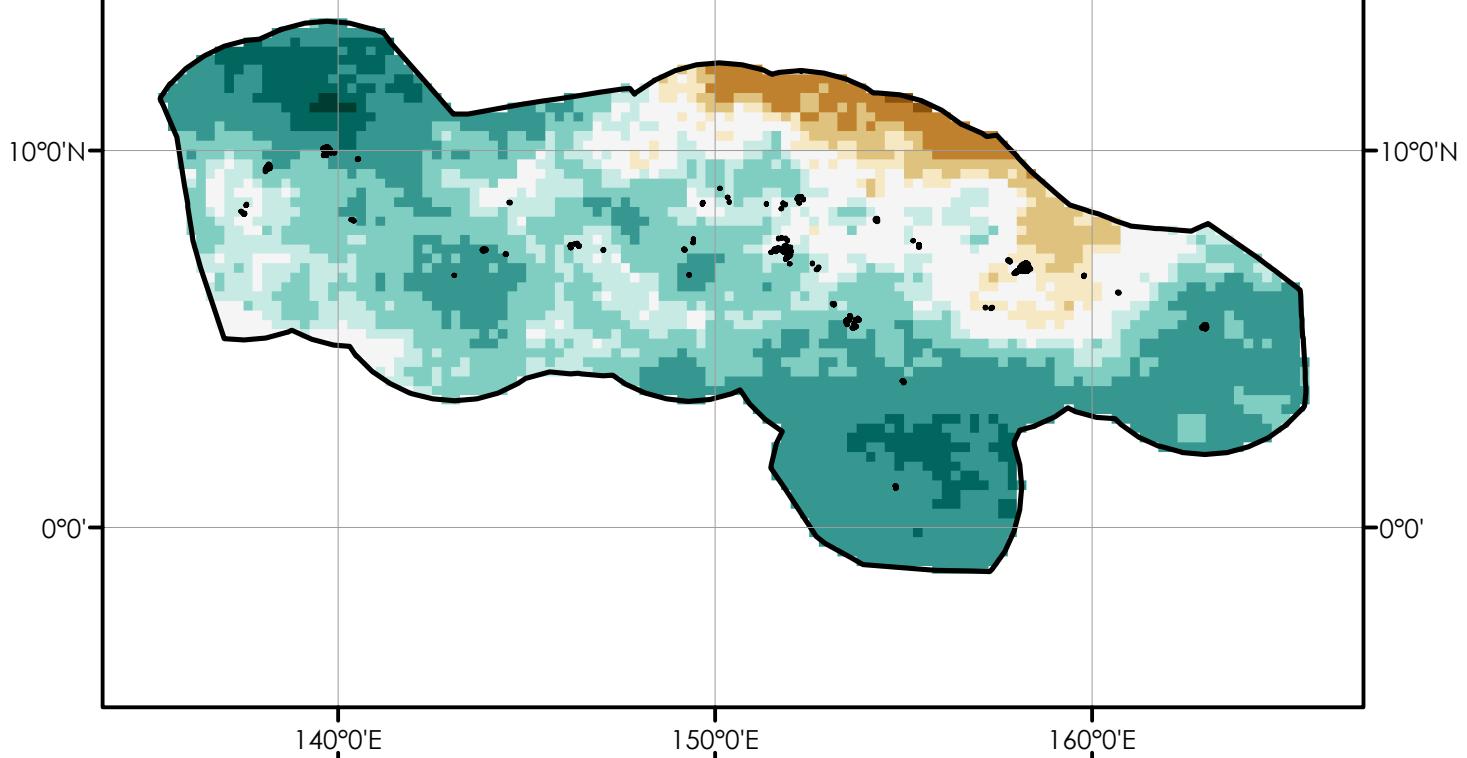
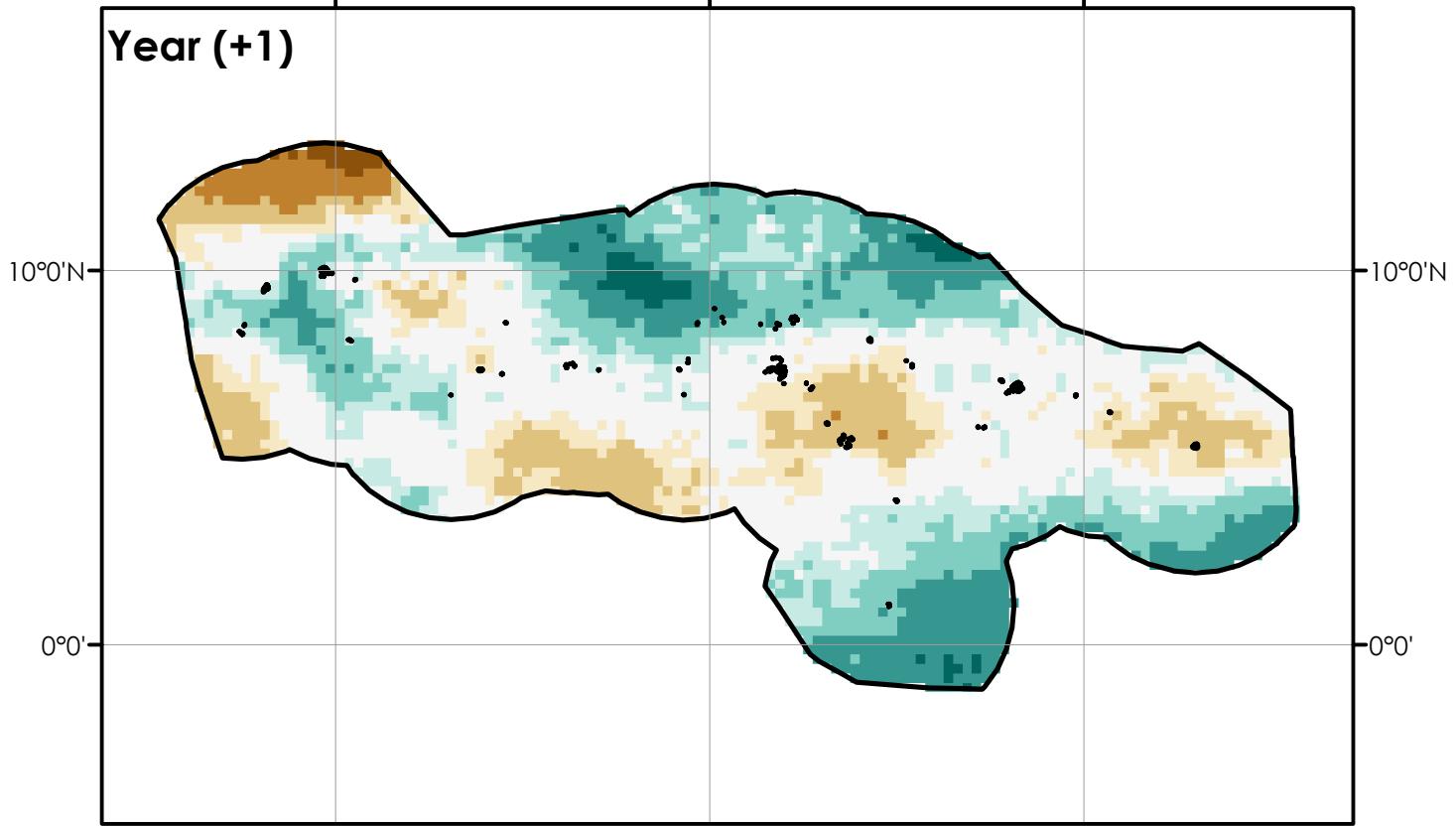
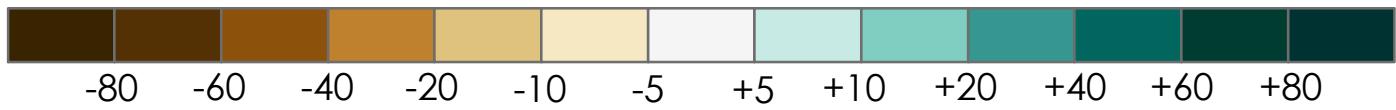
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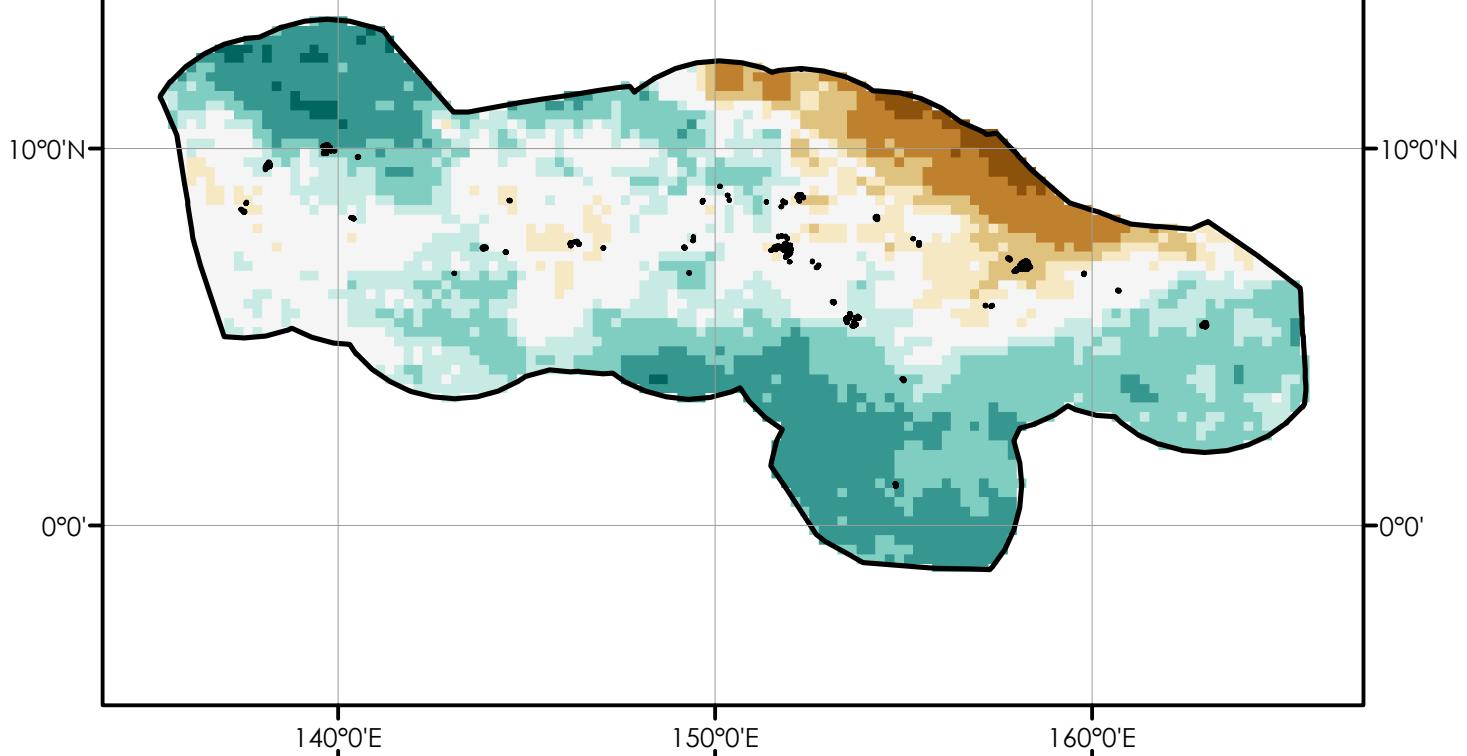
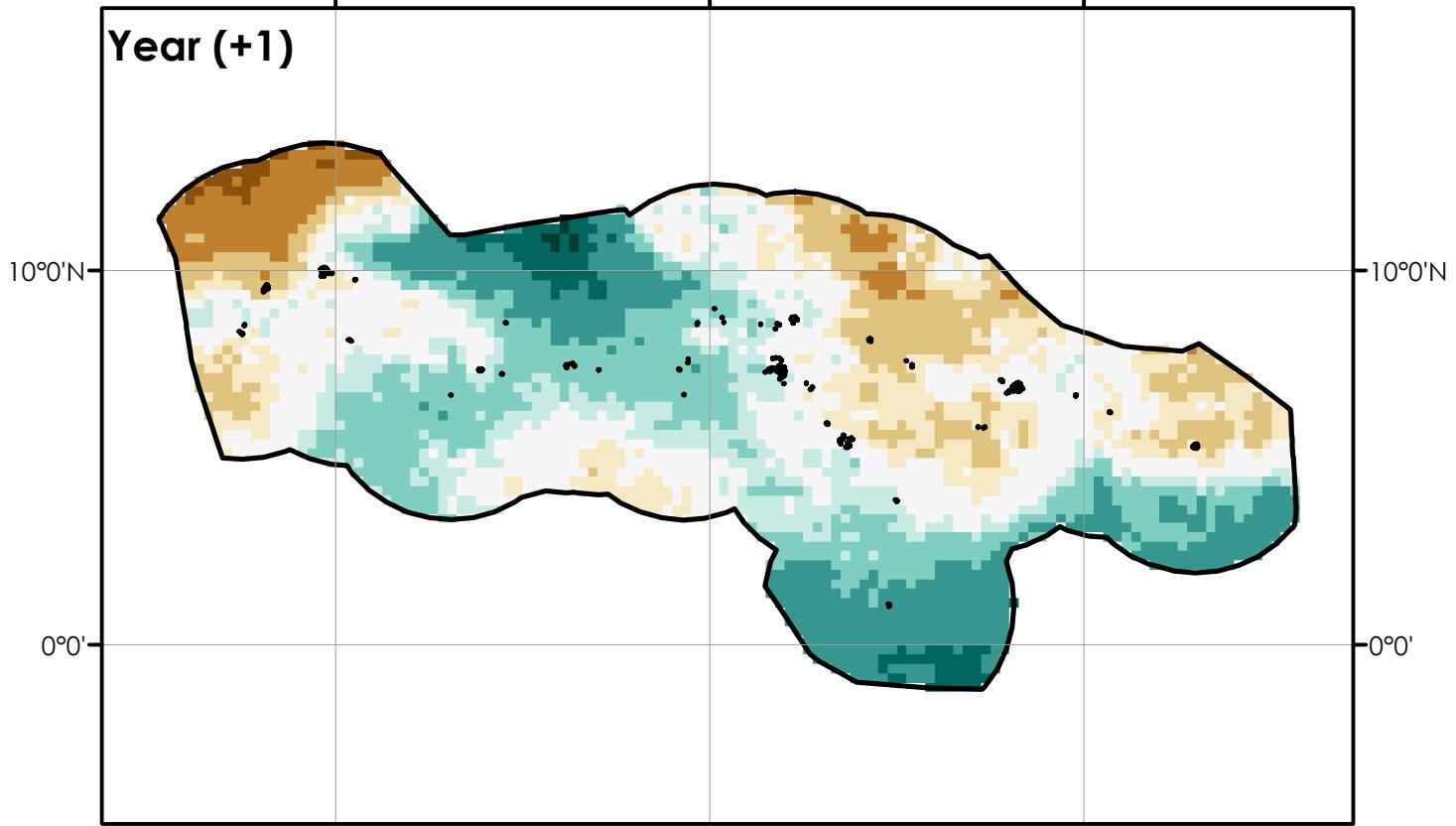
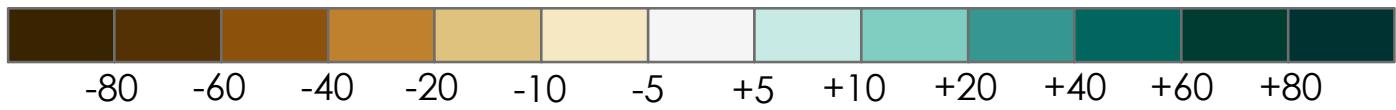


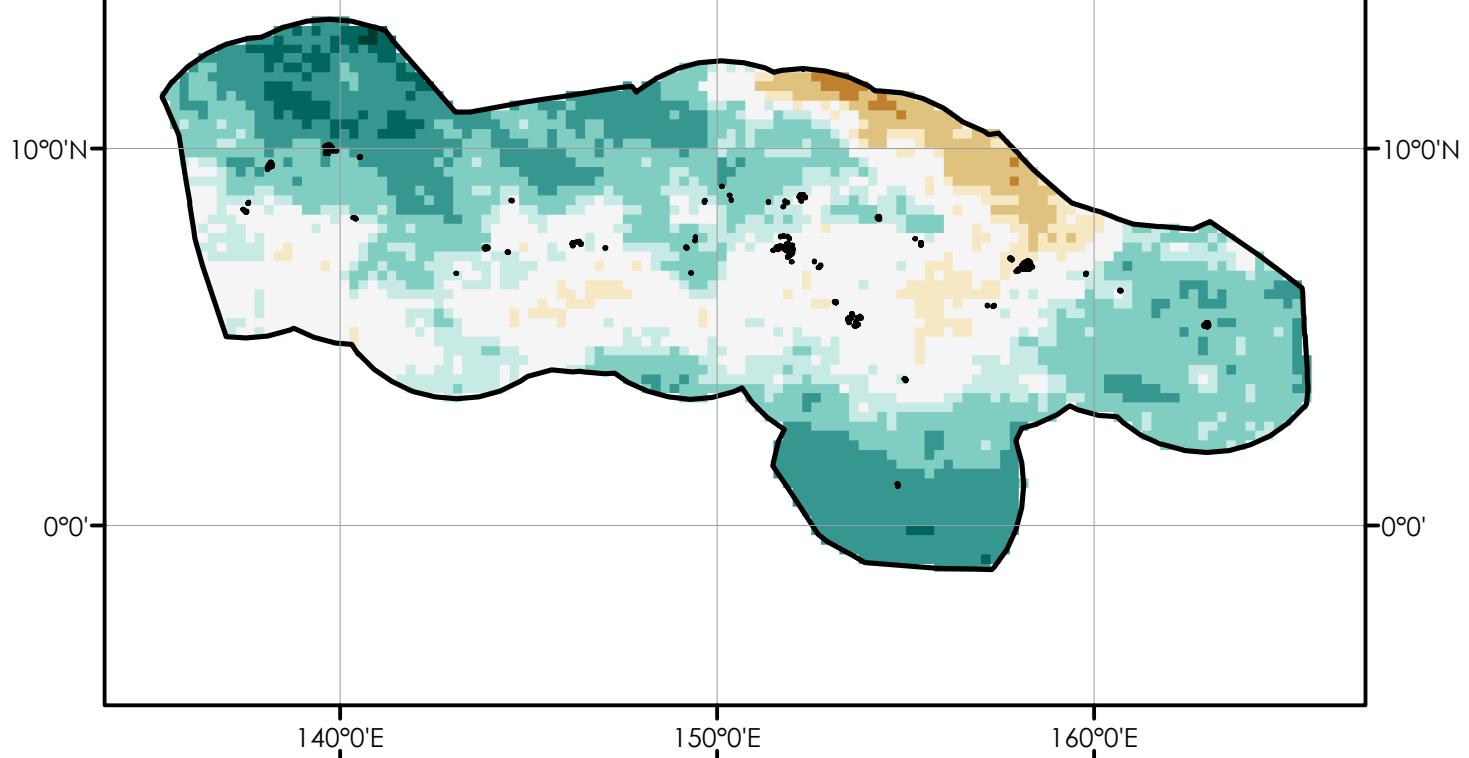
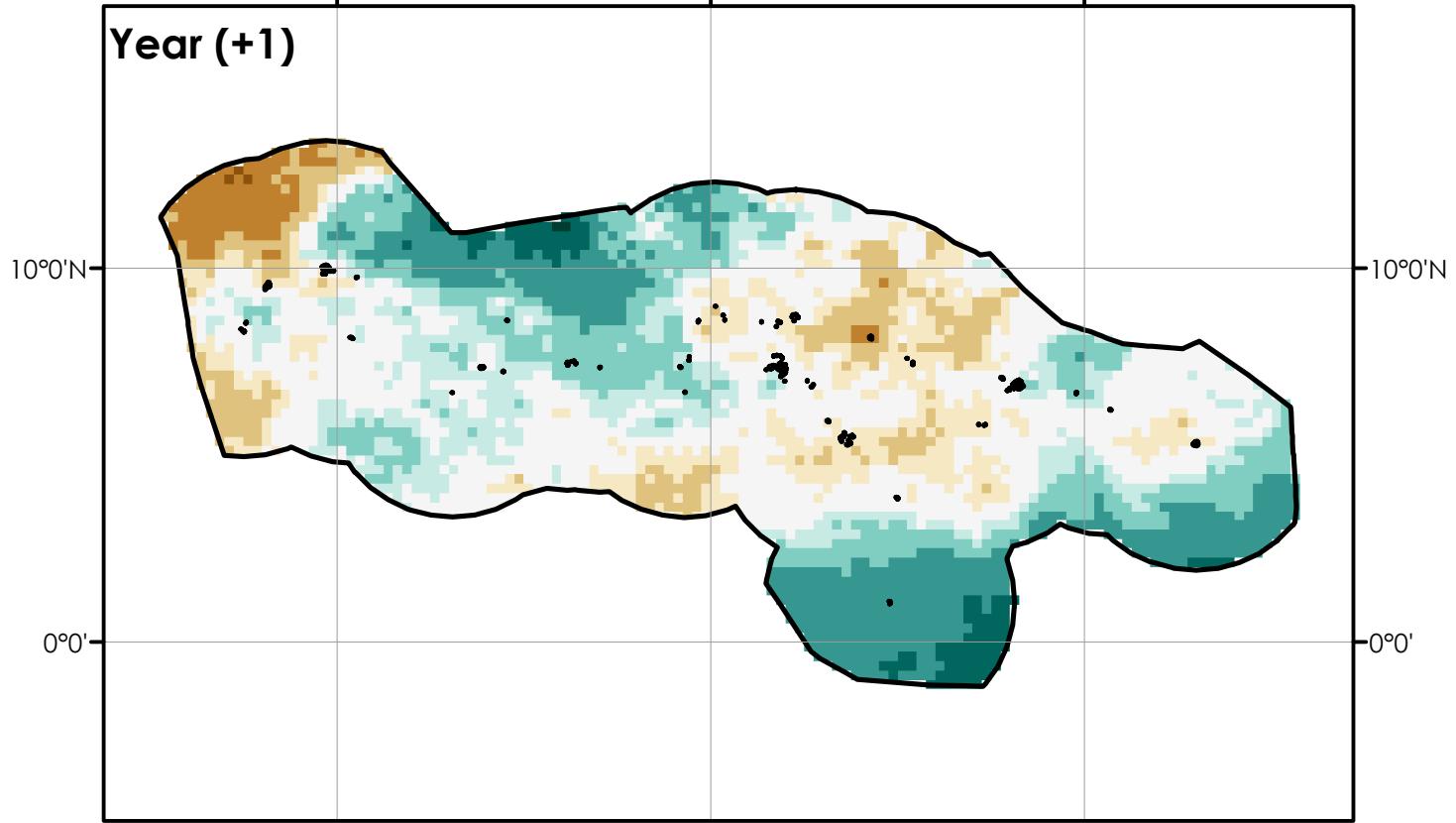
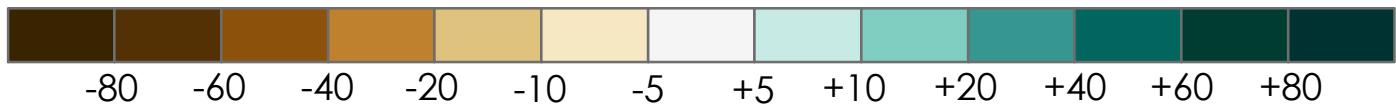
Precipitation Change (%)

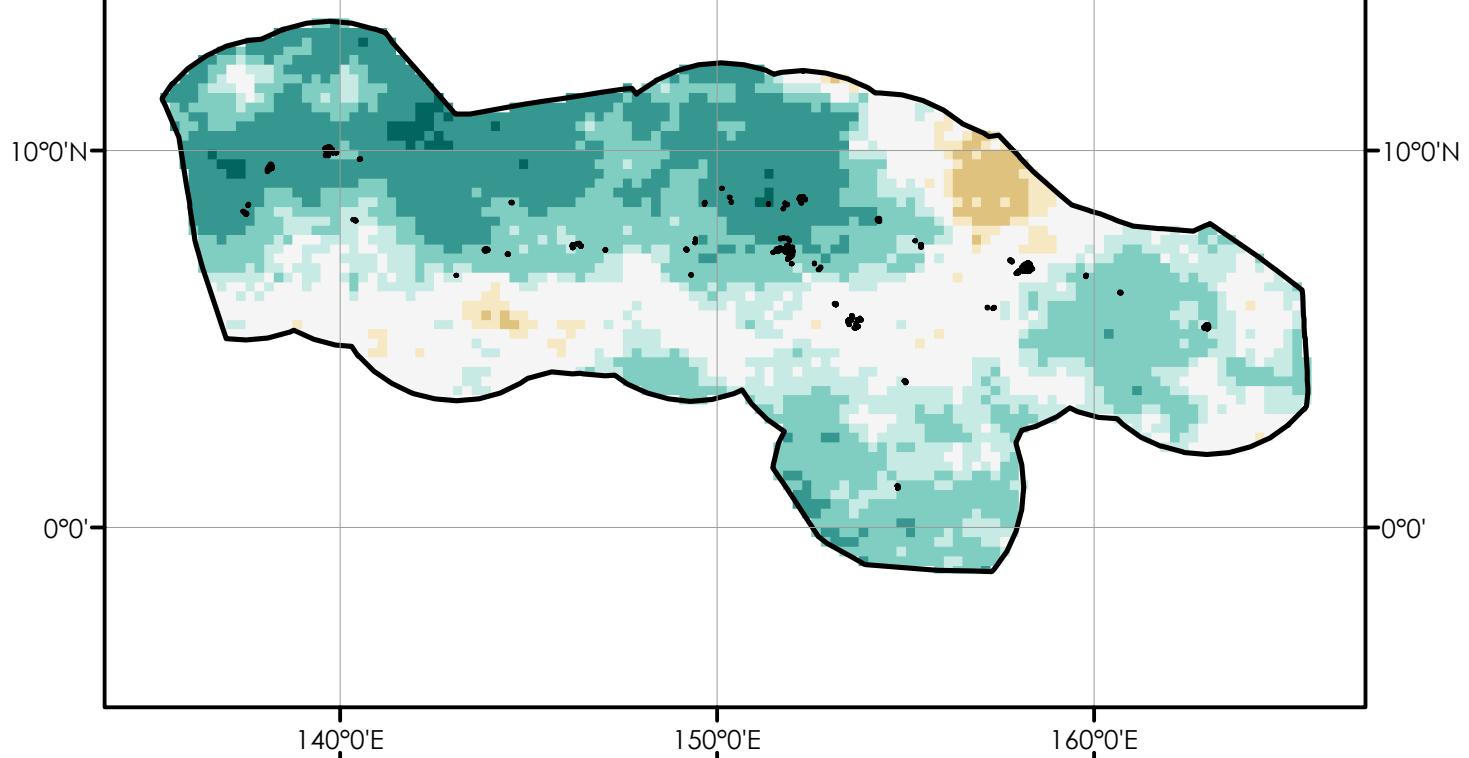
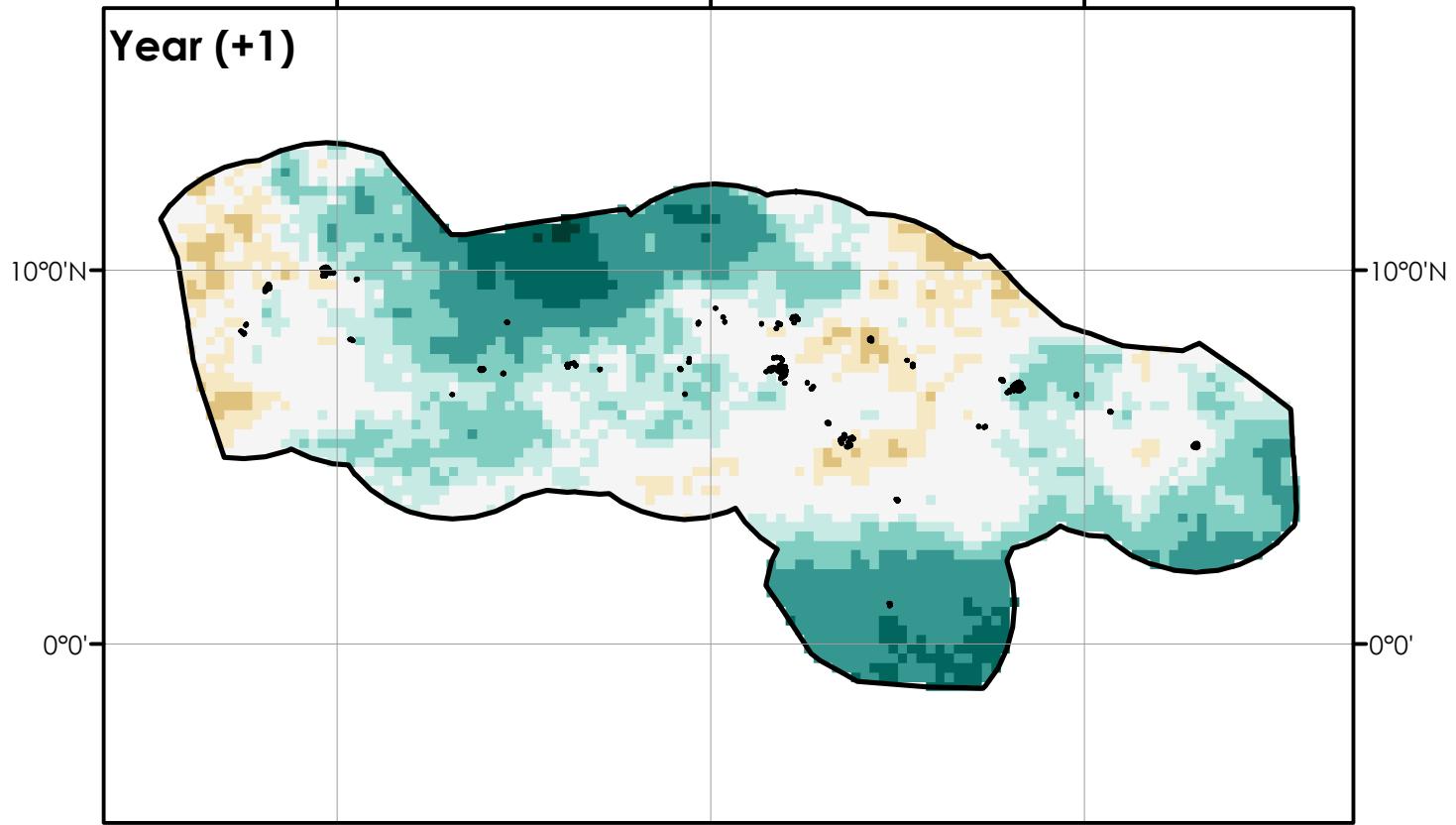
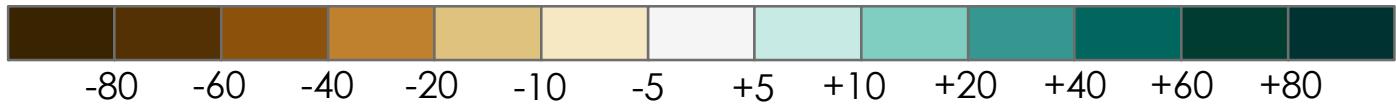


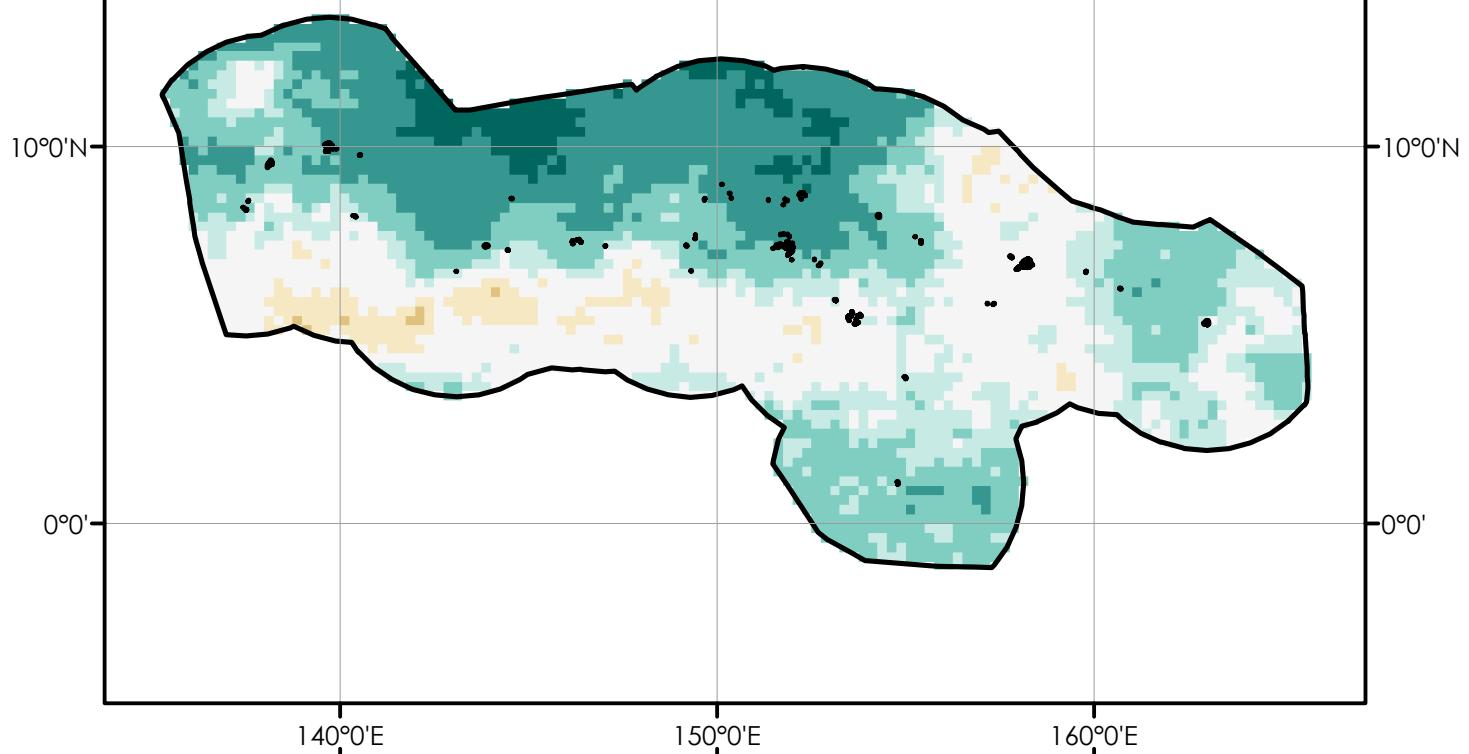
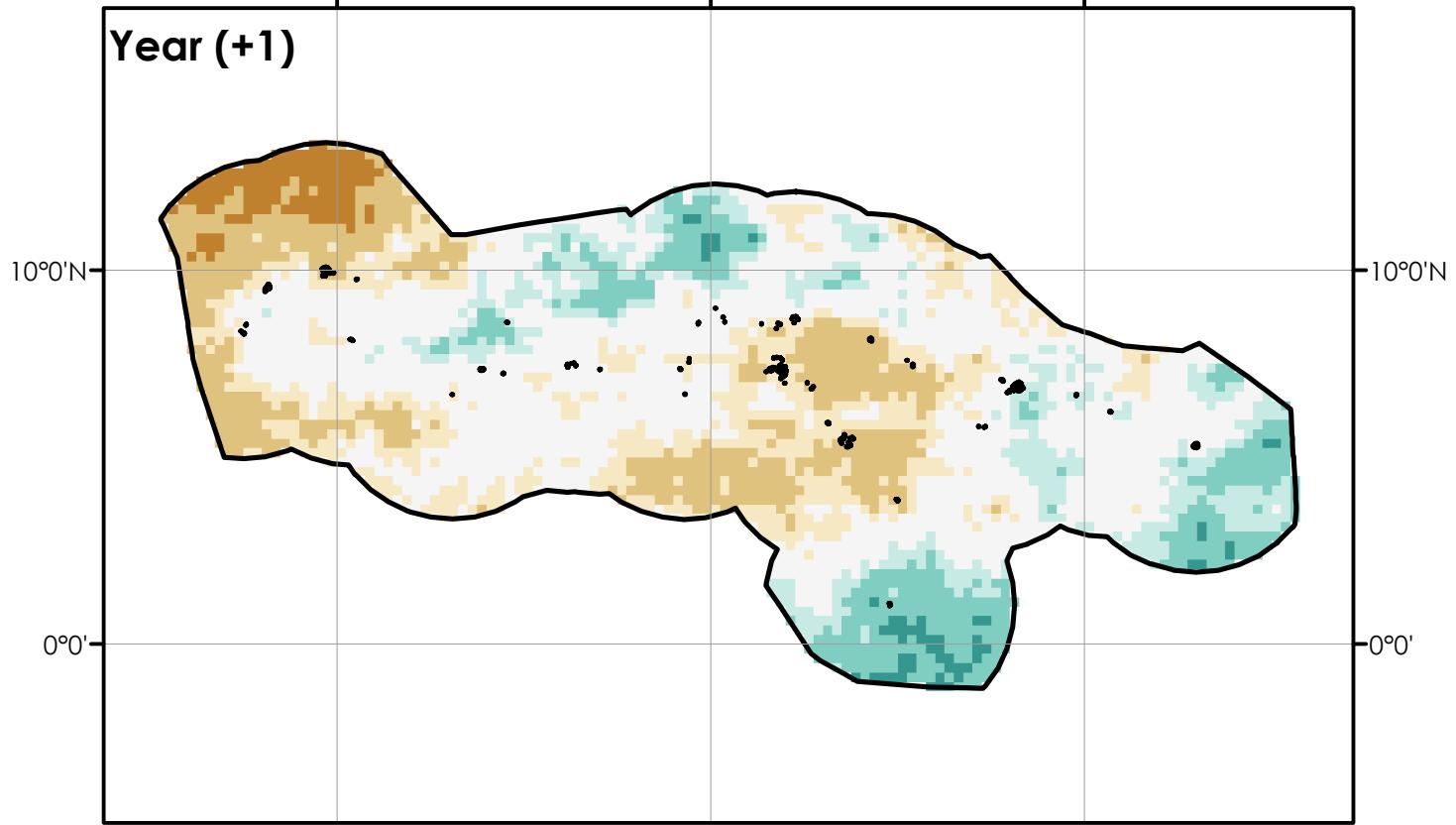
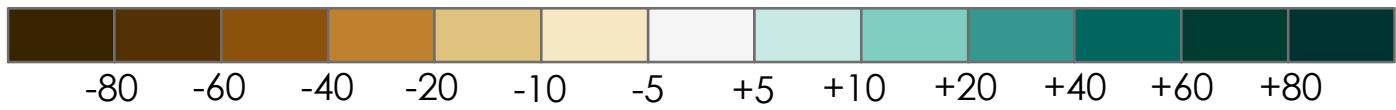
Year (0)**Federated States of Micronesia****Year (+1)****Precipitation Change (%)**

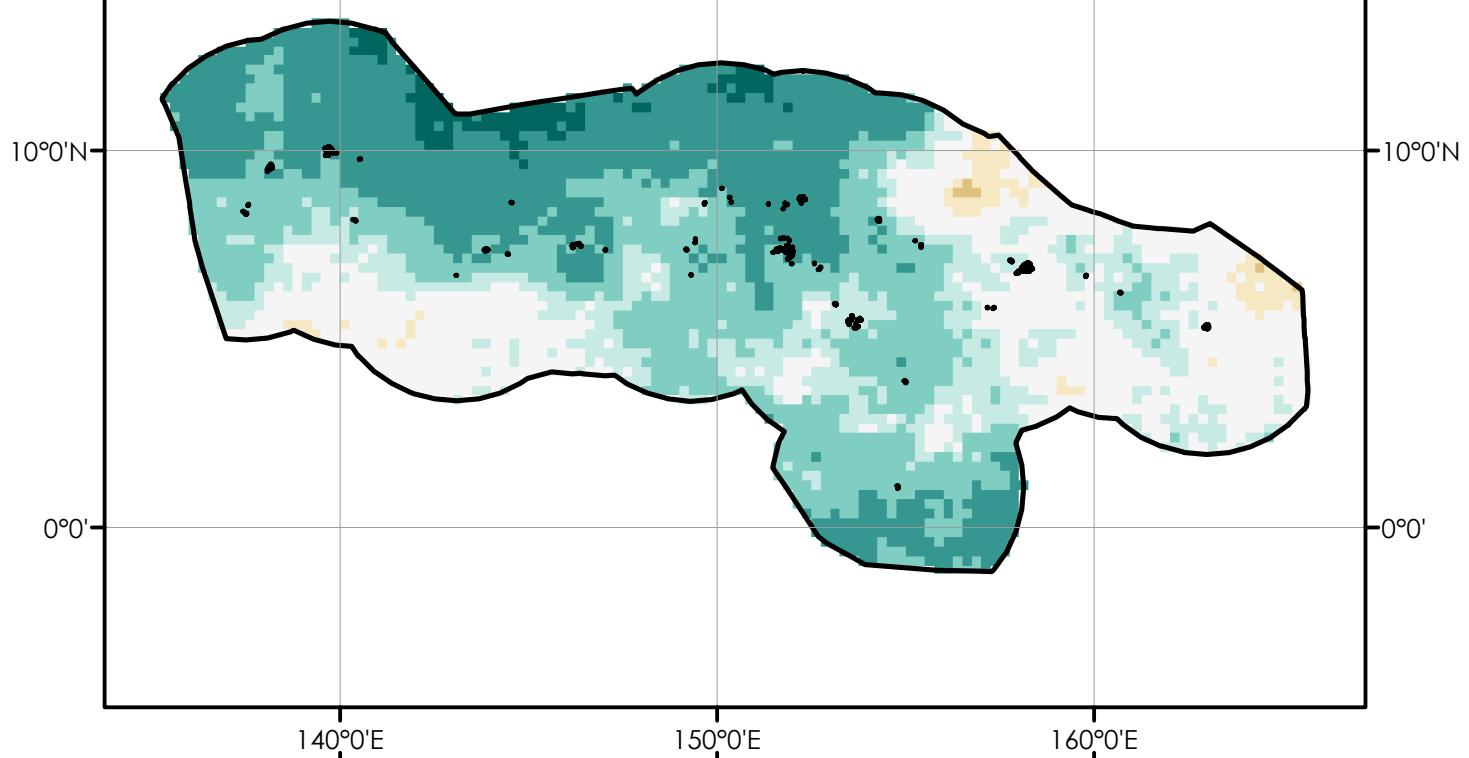
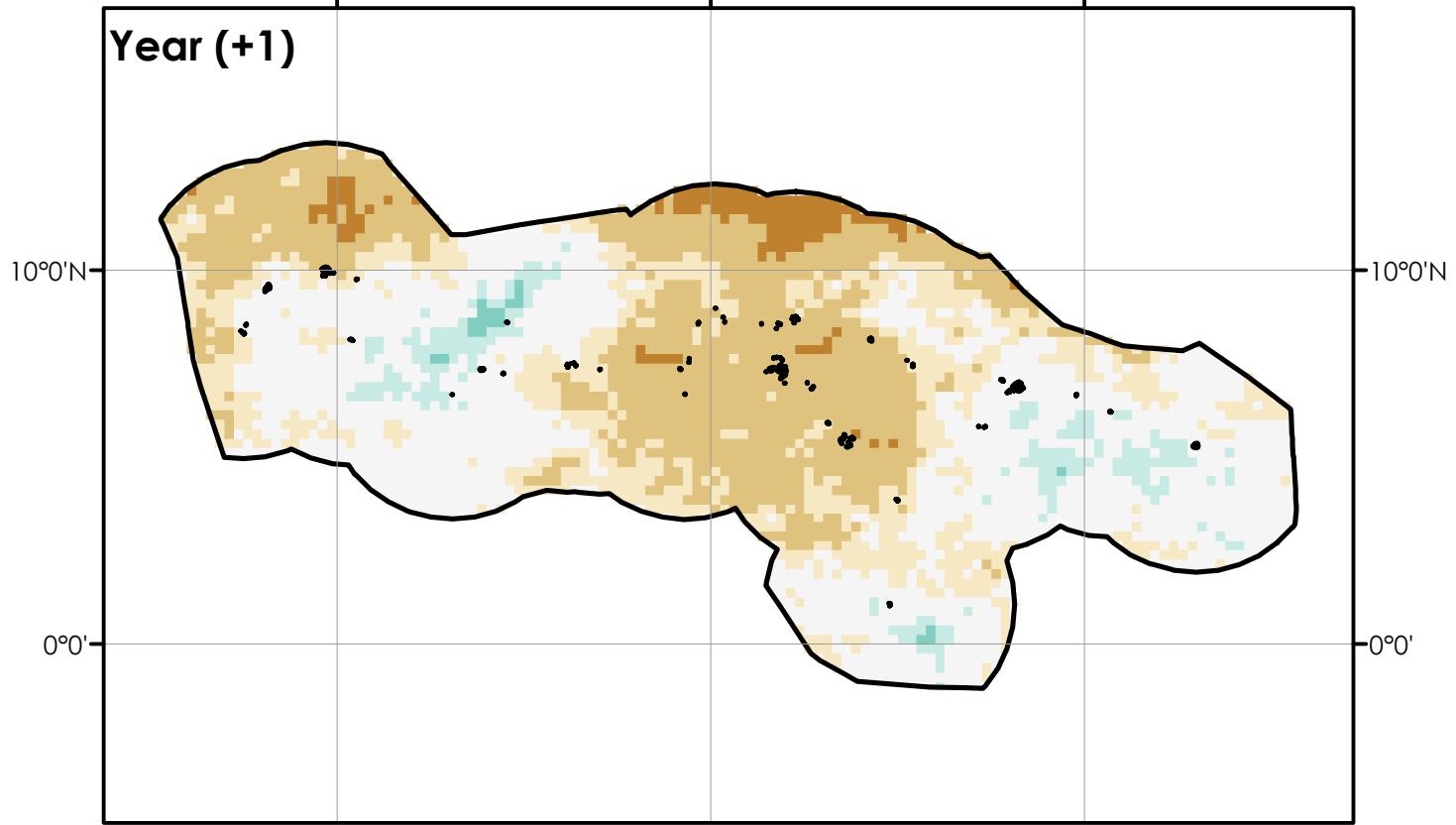
Year (0)**Federated States of Micronesia****Year (+1)****Precipitation Change (%)**

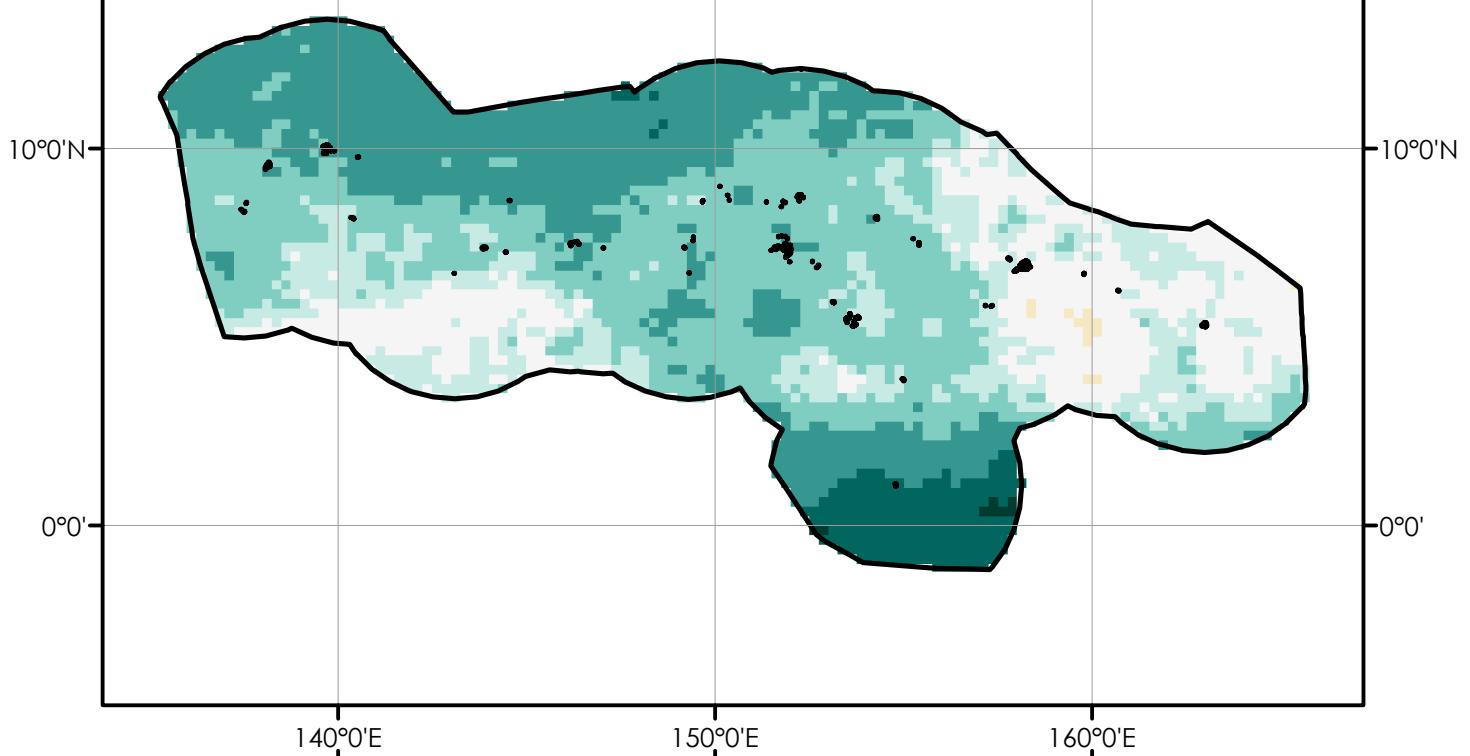
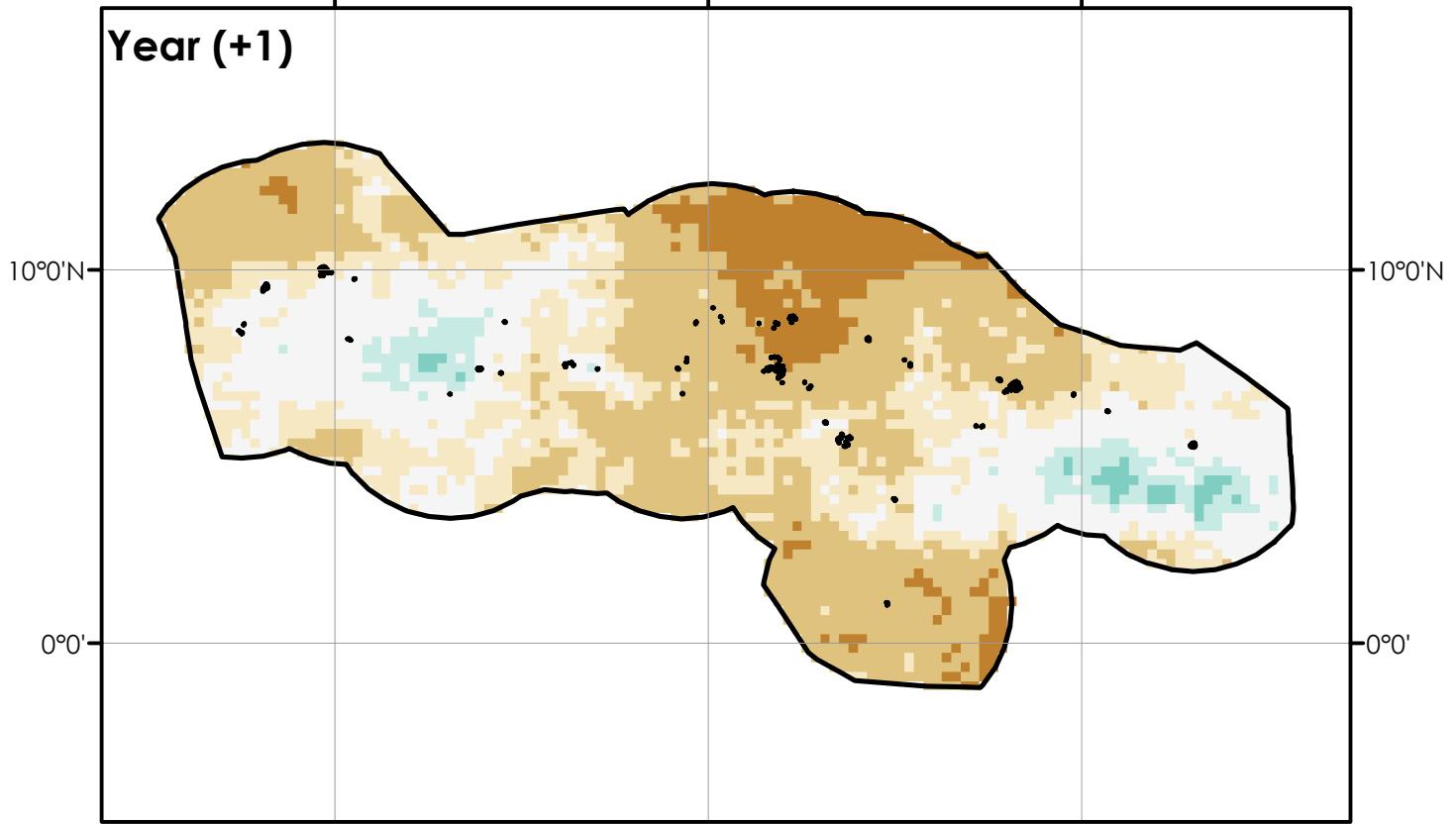
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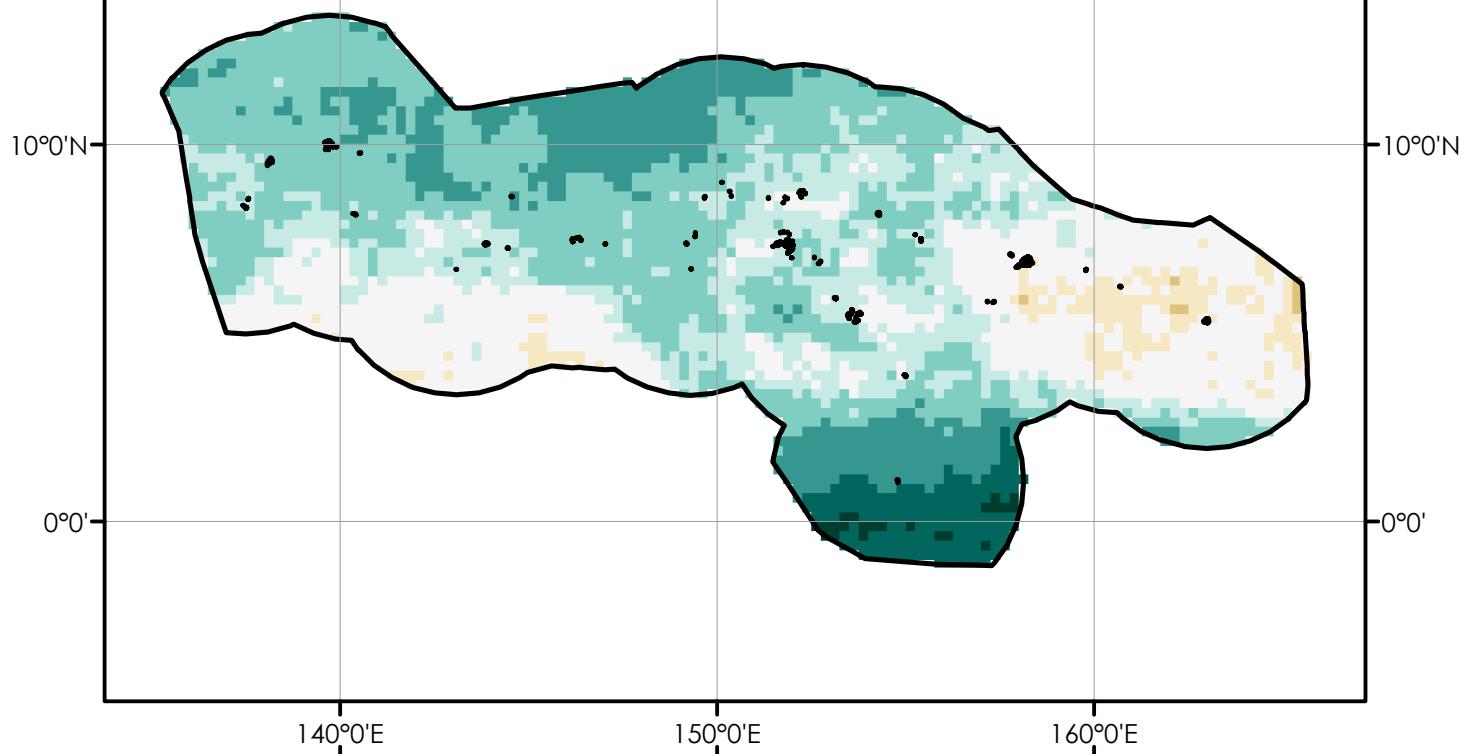
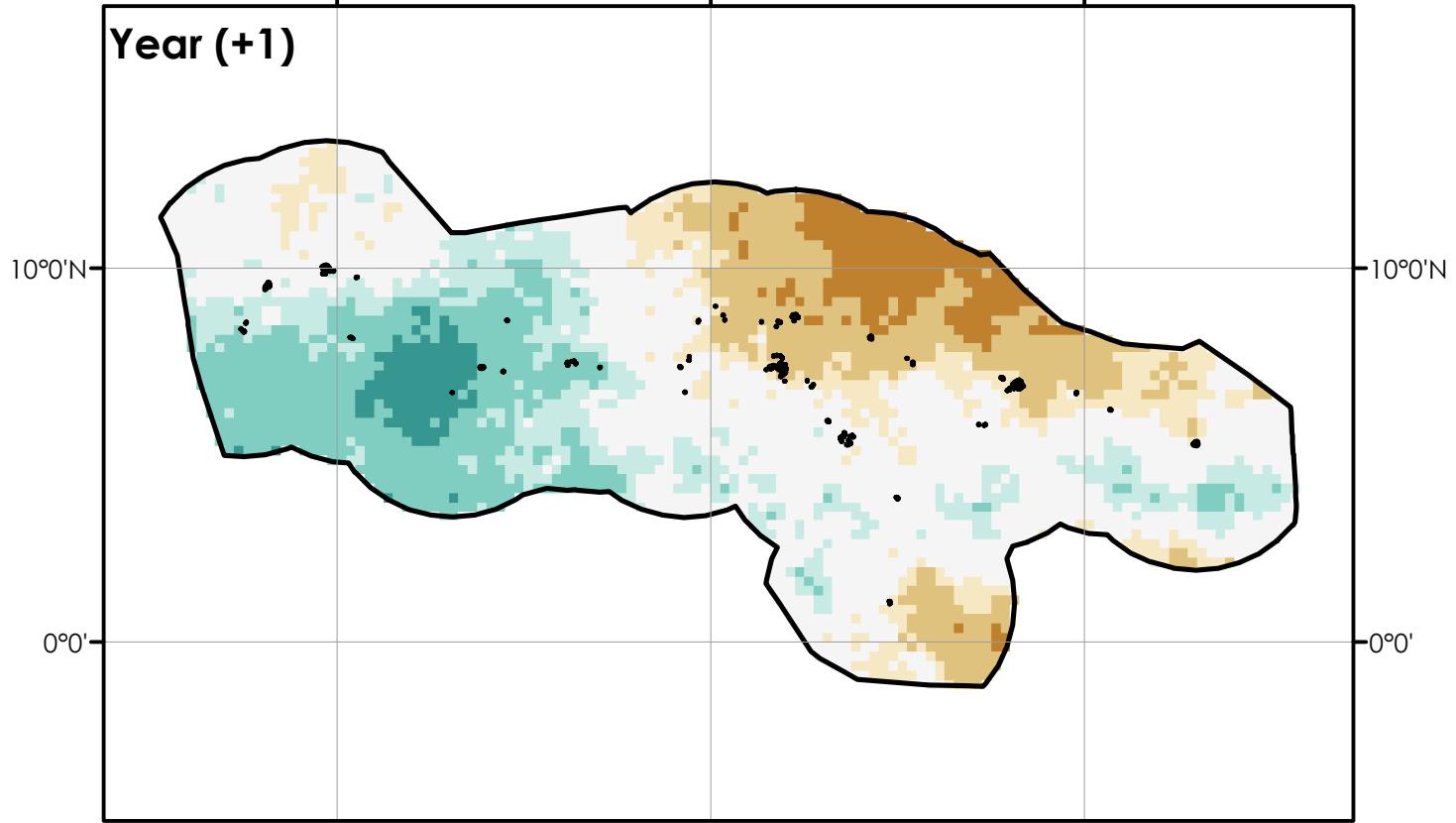
Year (0)**Federated States of Micronesia****Year (+1)****Precipitation Change (%)**

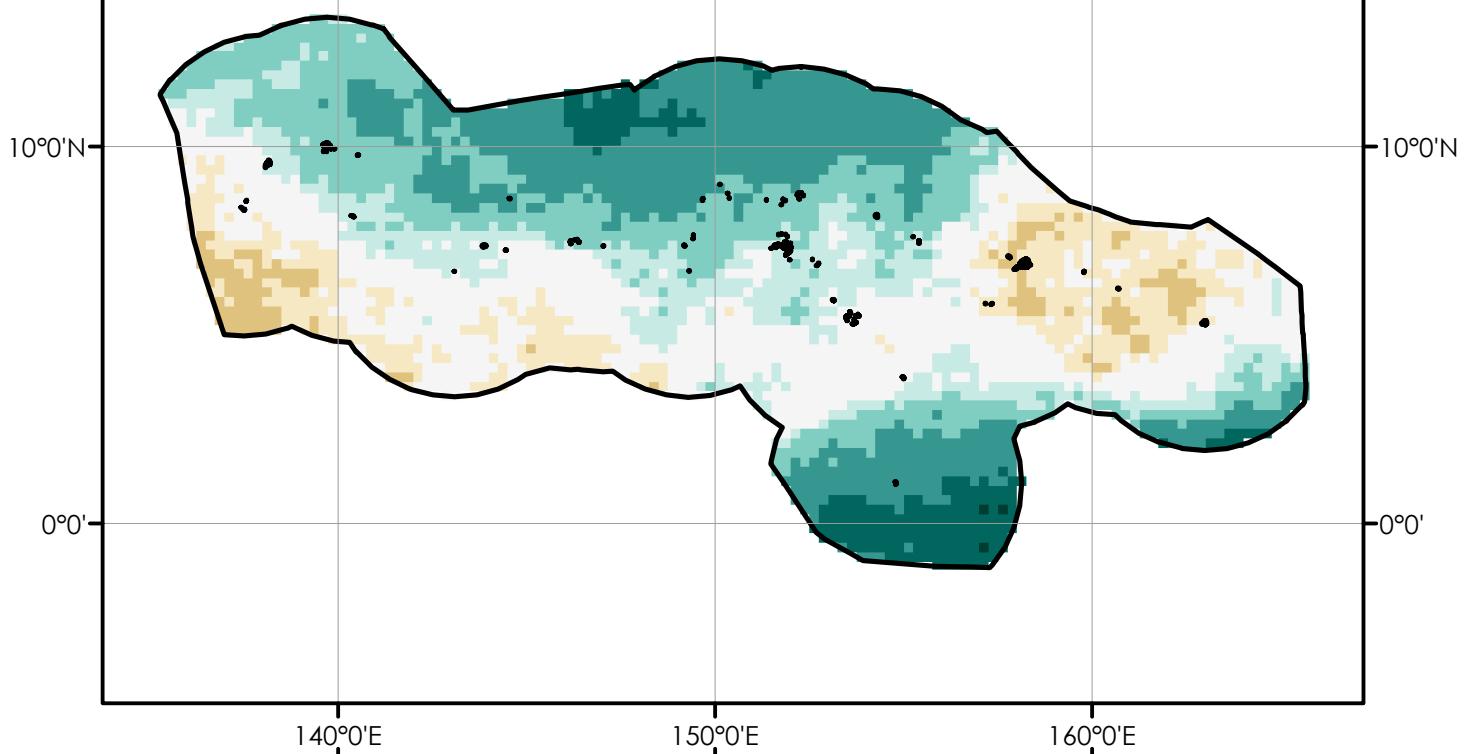
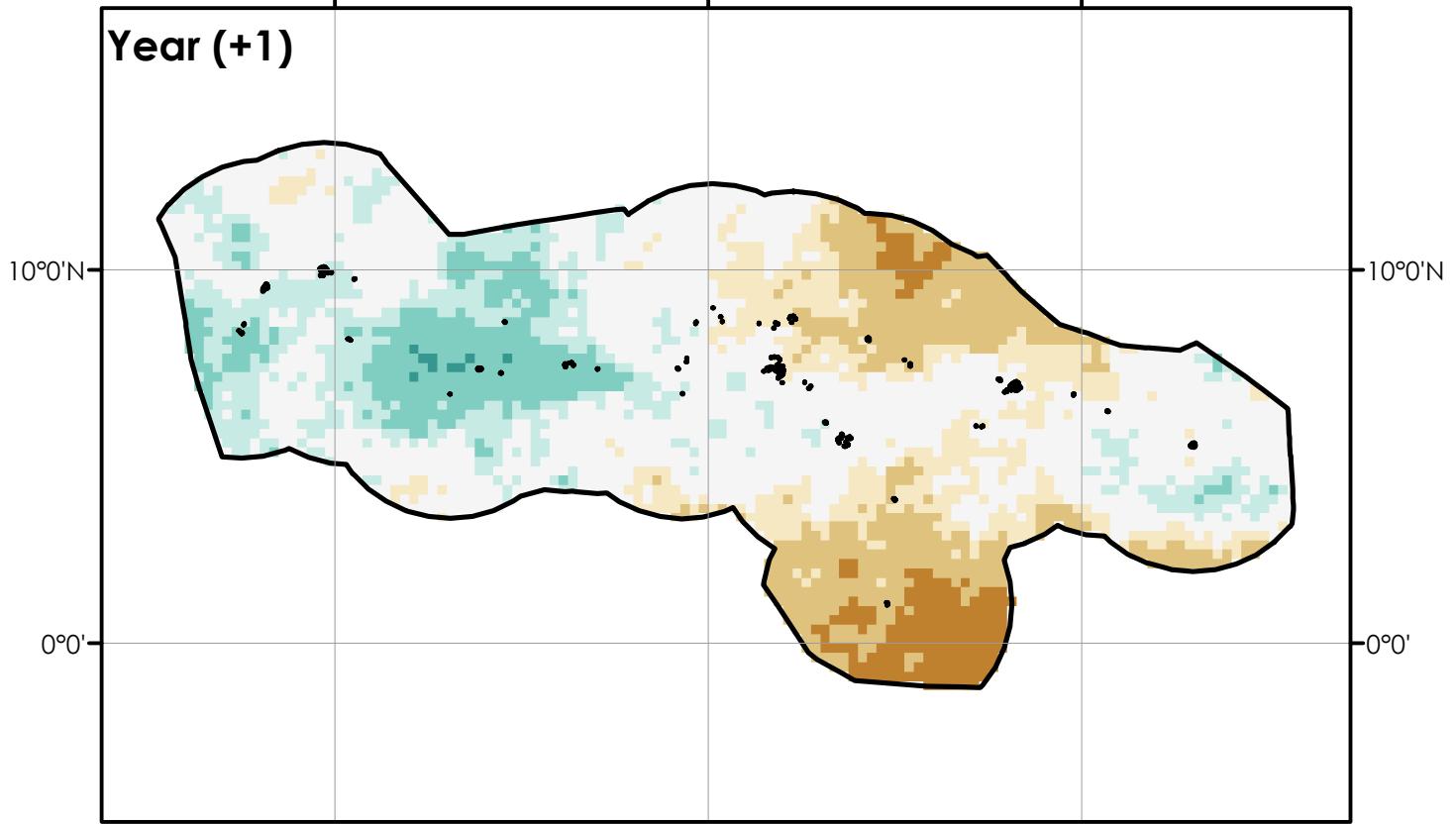
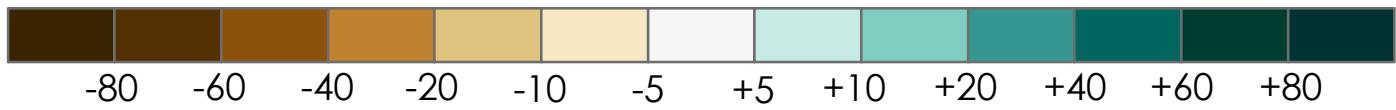
Year (0)**Federated States of Micronesia****Year (+1)****Precipitation Change (%)**

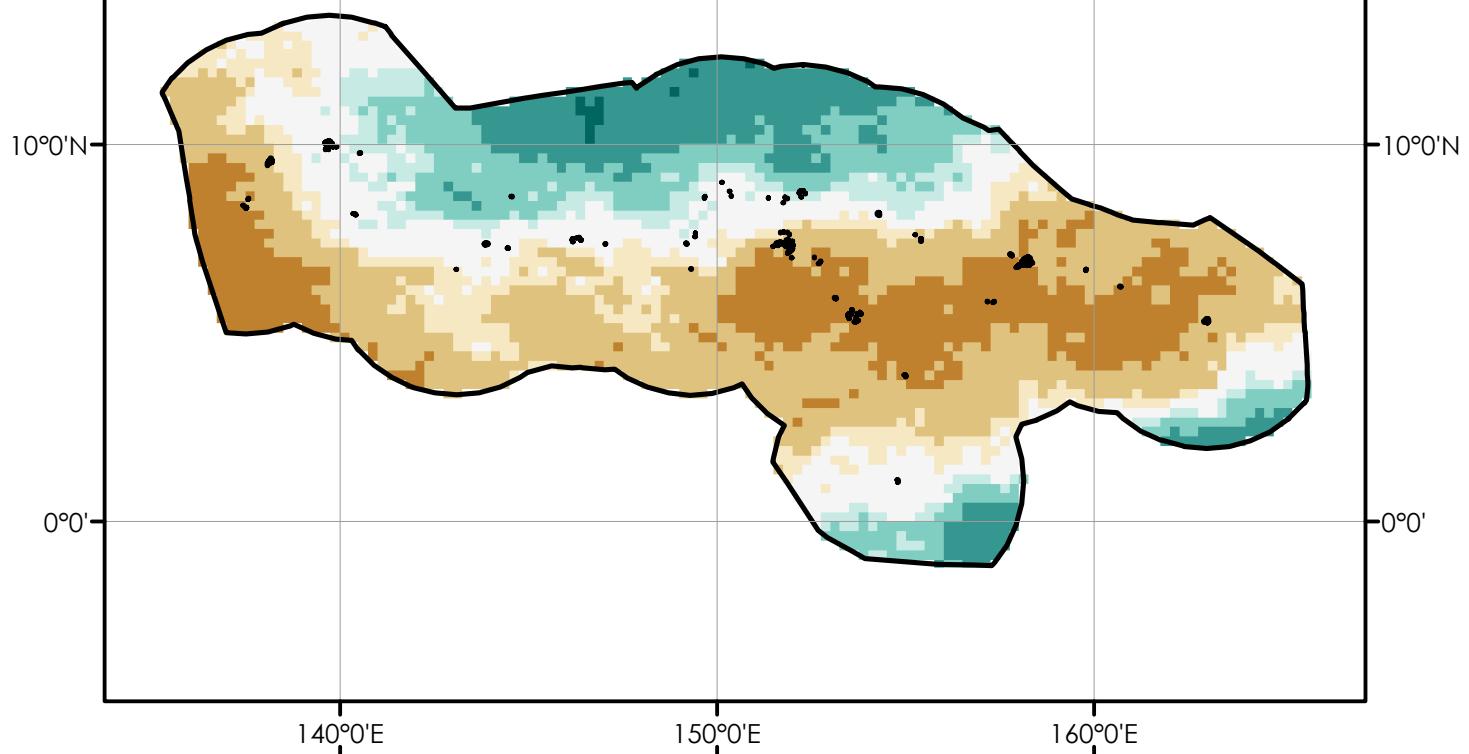
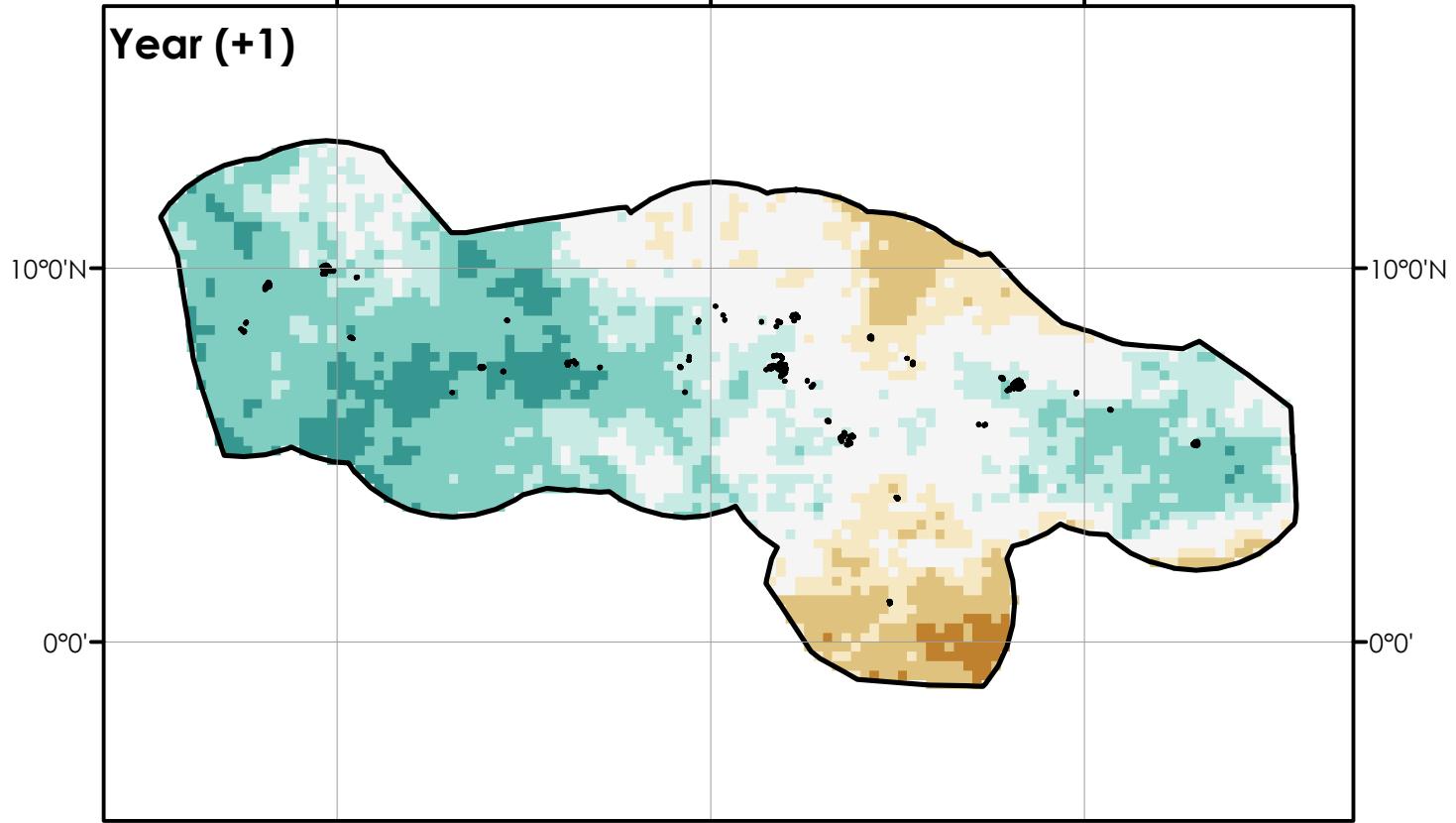
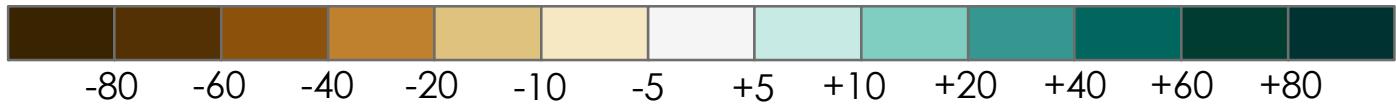
Year (0)**Federated States of Micronesia****Year (+1)****Precipitation Change (%)**

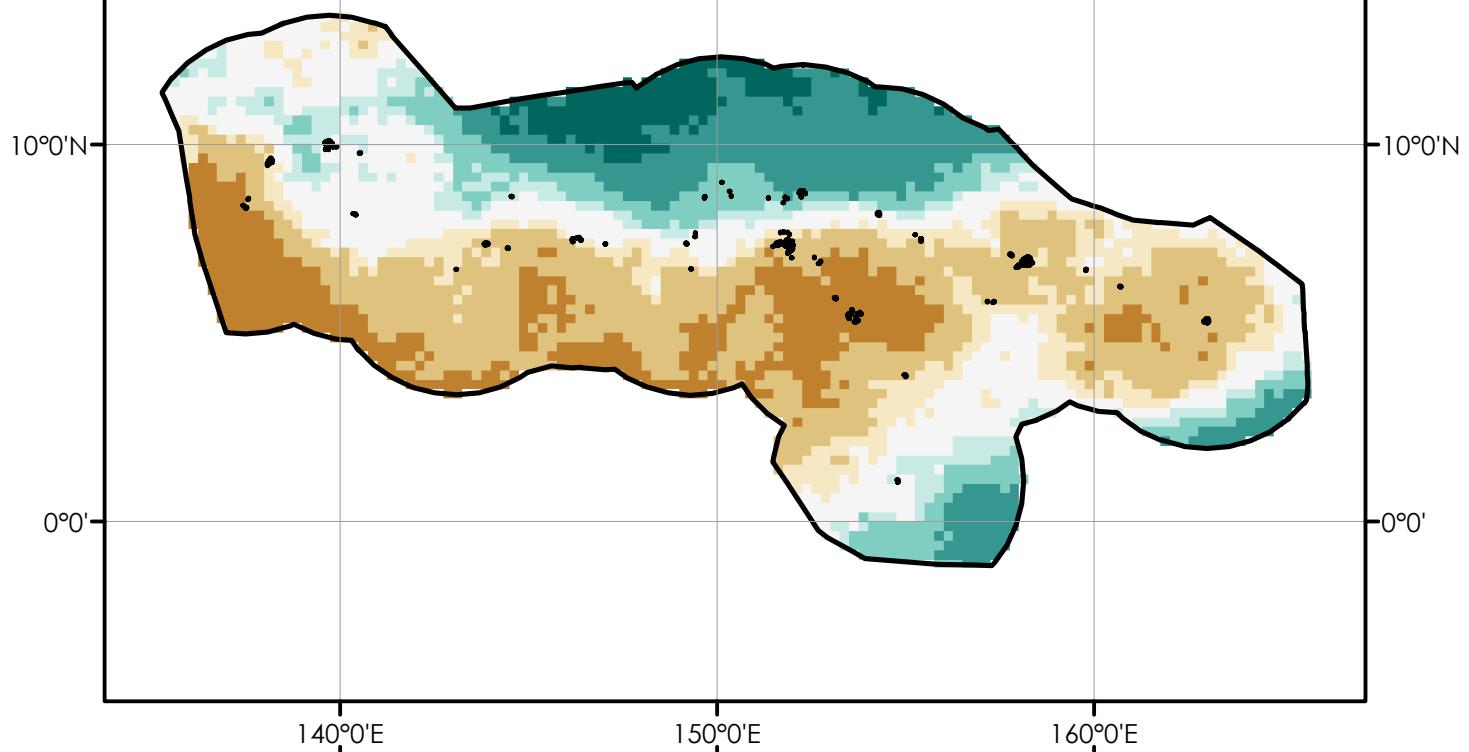
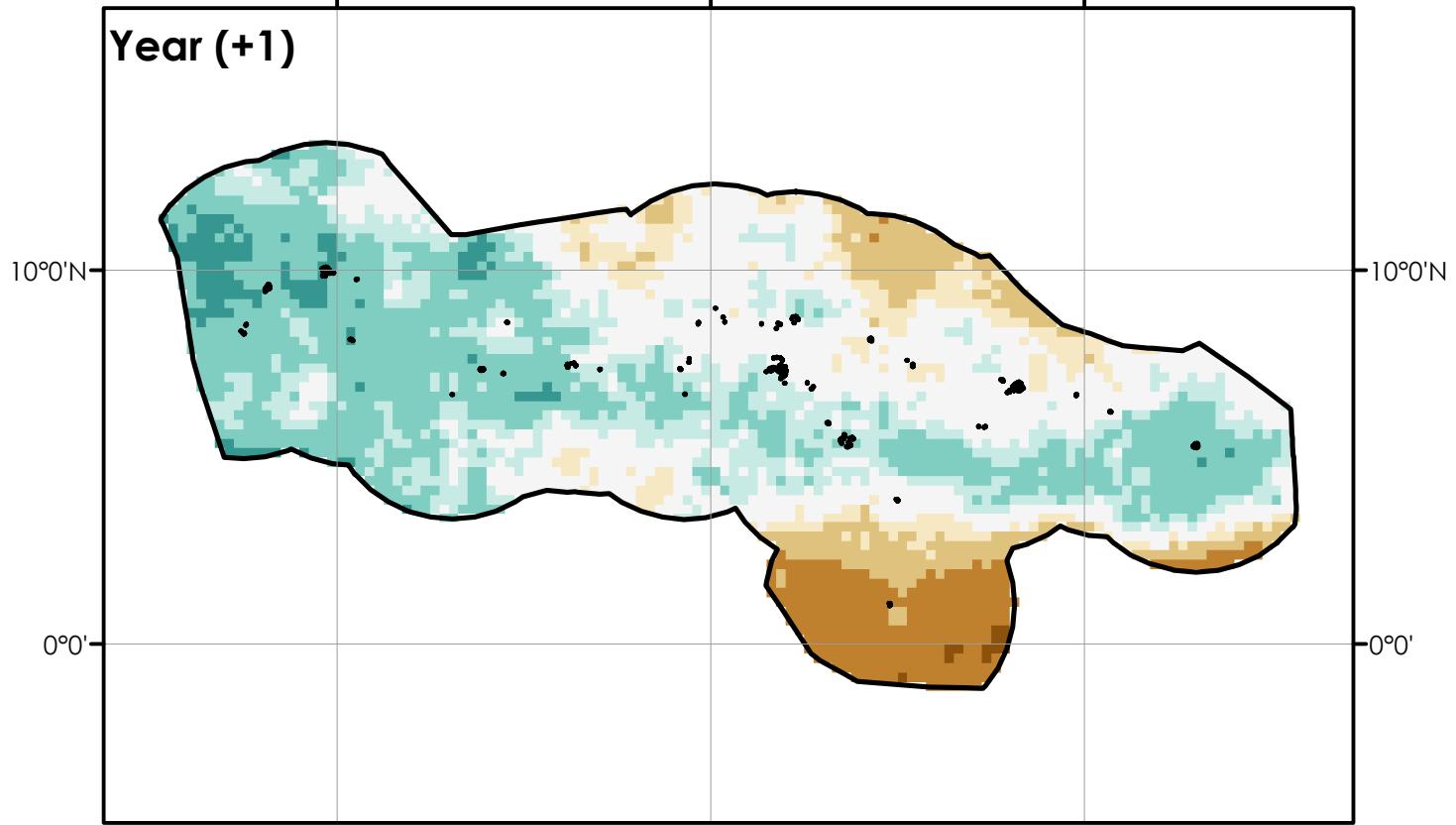
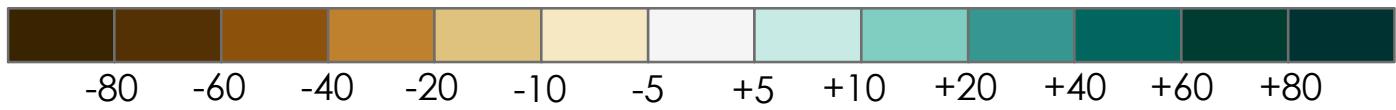
Year (0)**Federated States of Micronesia****Year (+1)****Precipitation Change (%)**

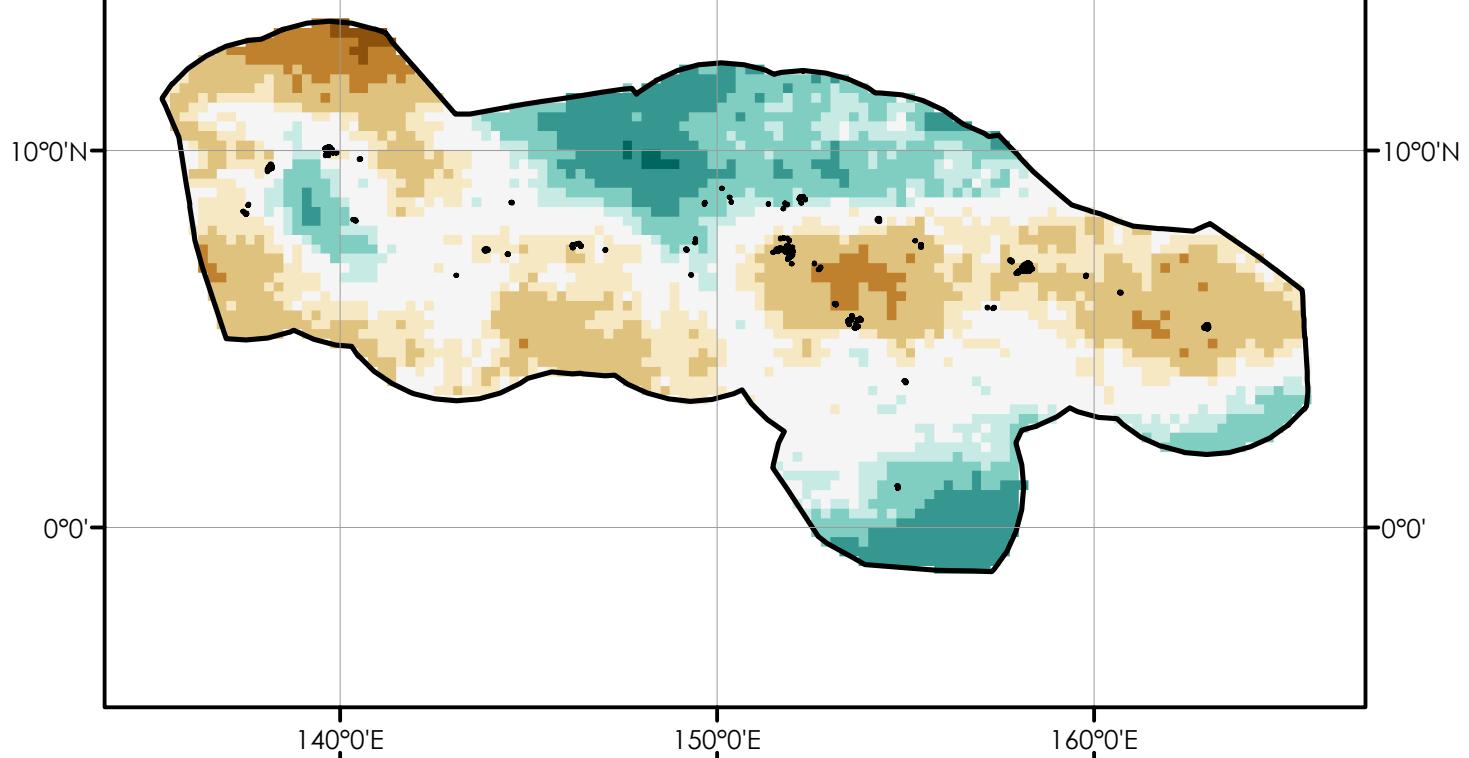
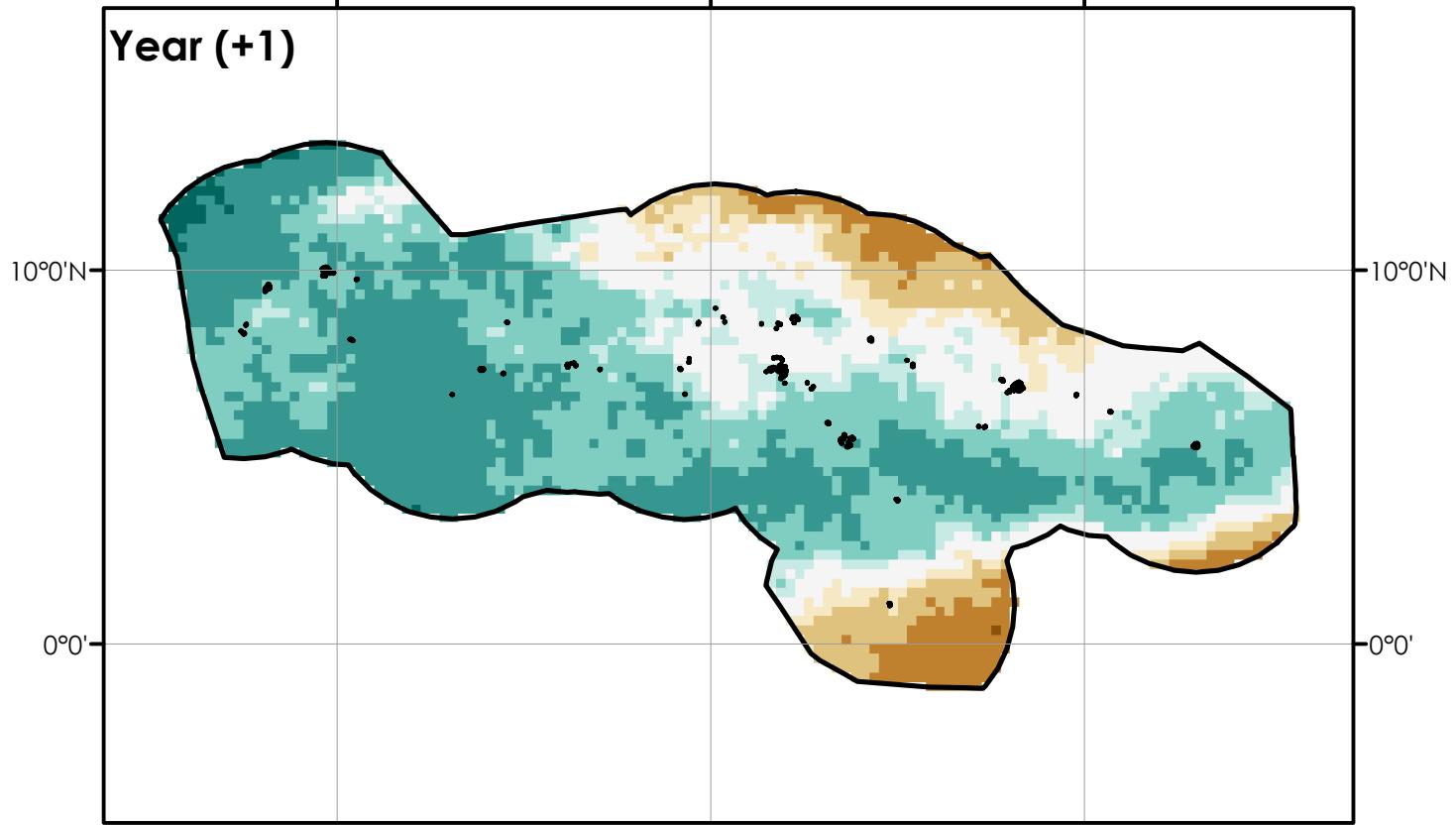
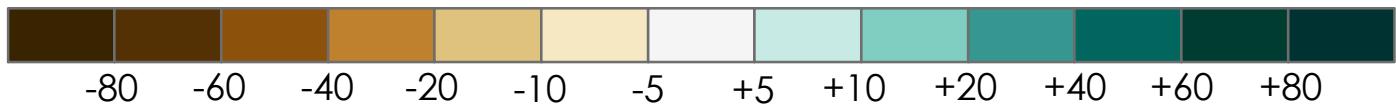
Year (0)**Federated States of Micronesia****Year (+1)****Precipitation Change (%)**

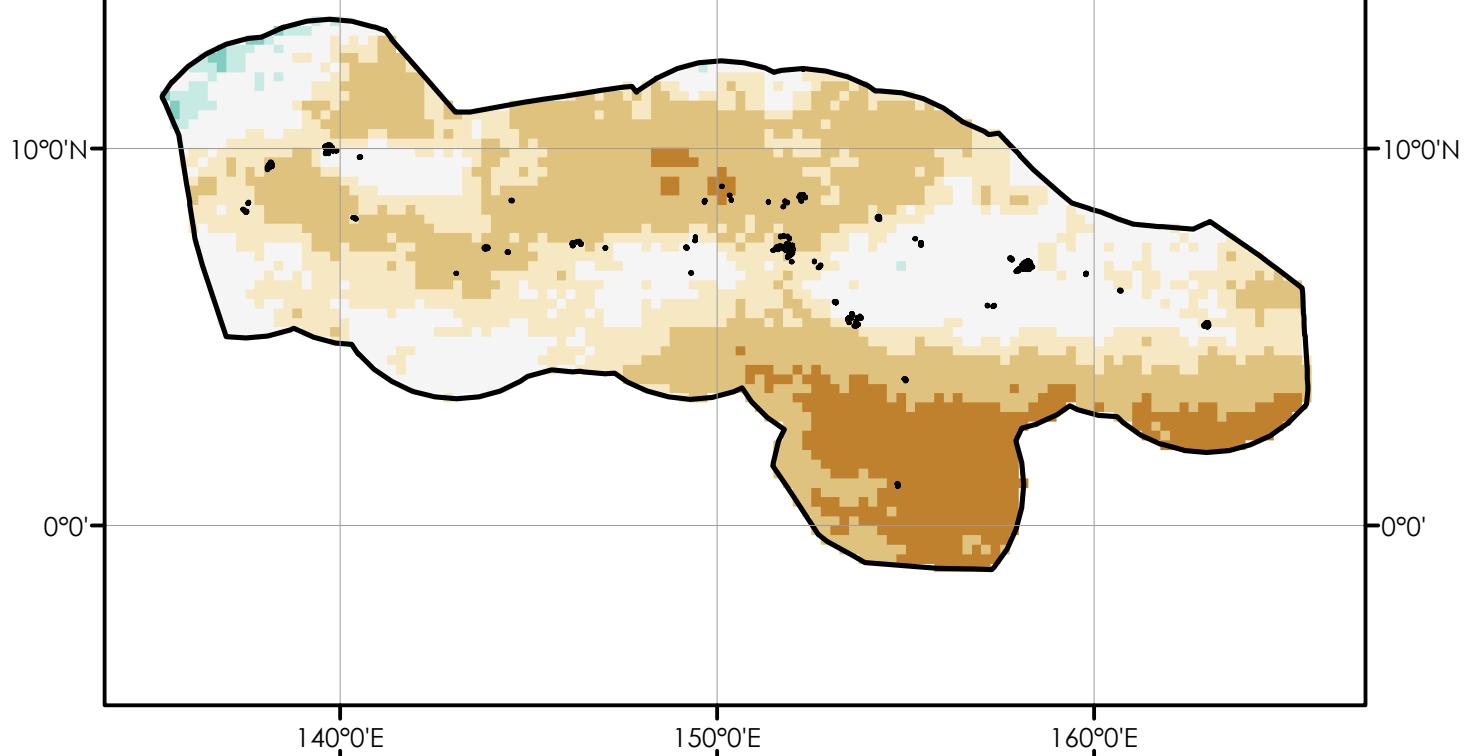
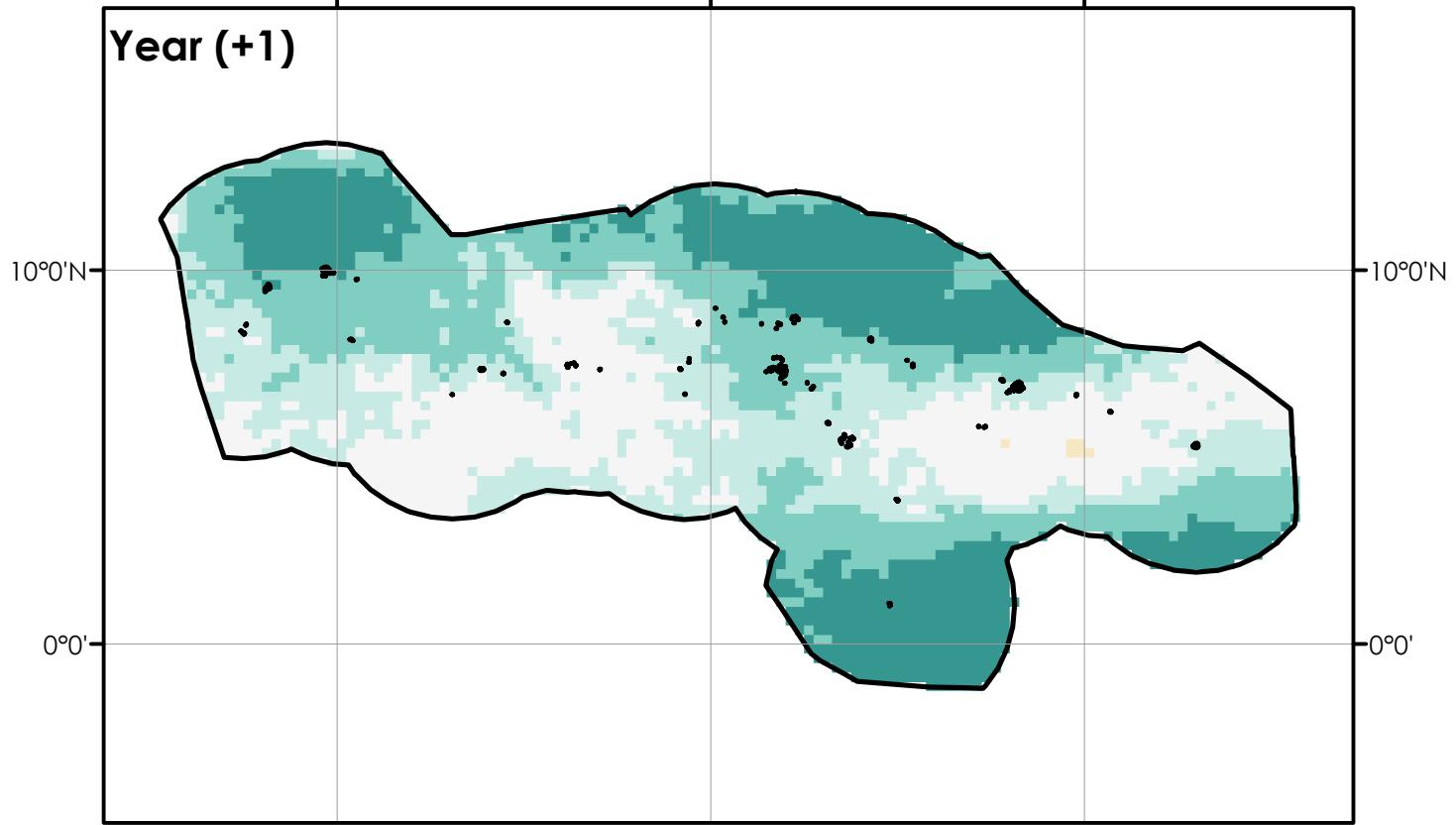
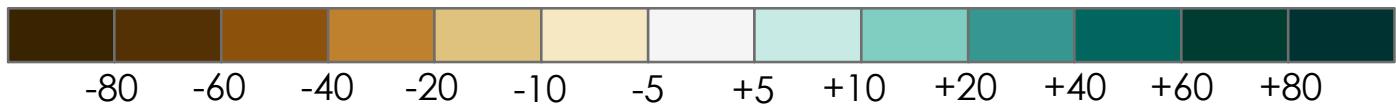
Year (0)**Federated States of Micronesia****Year (+1)****Precipitation Change (%)**

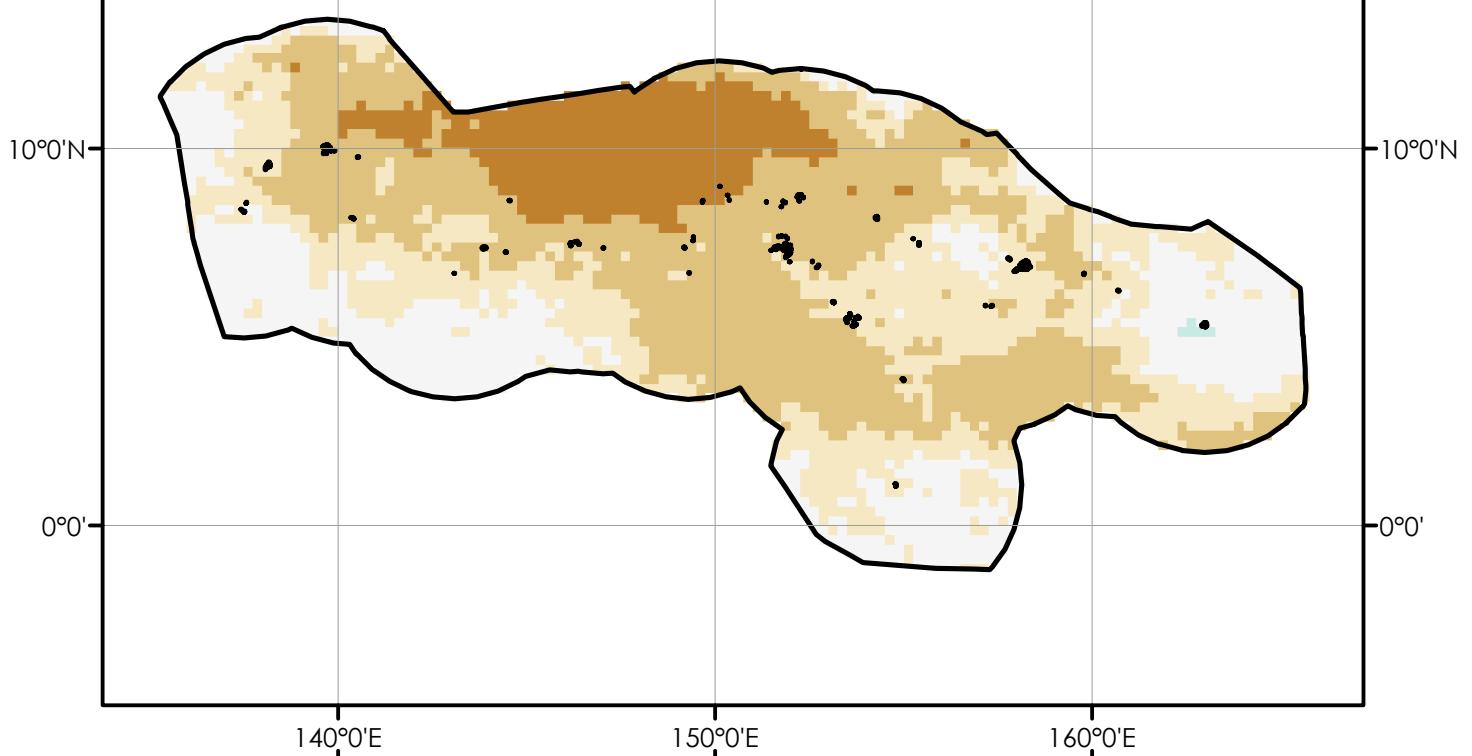
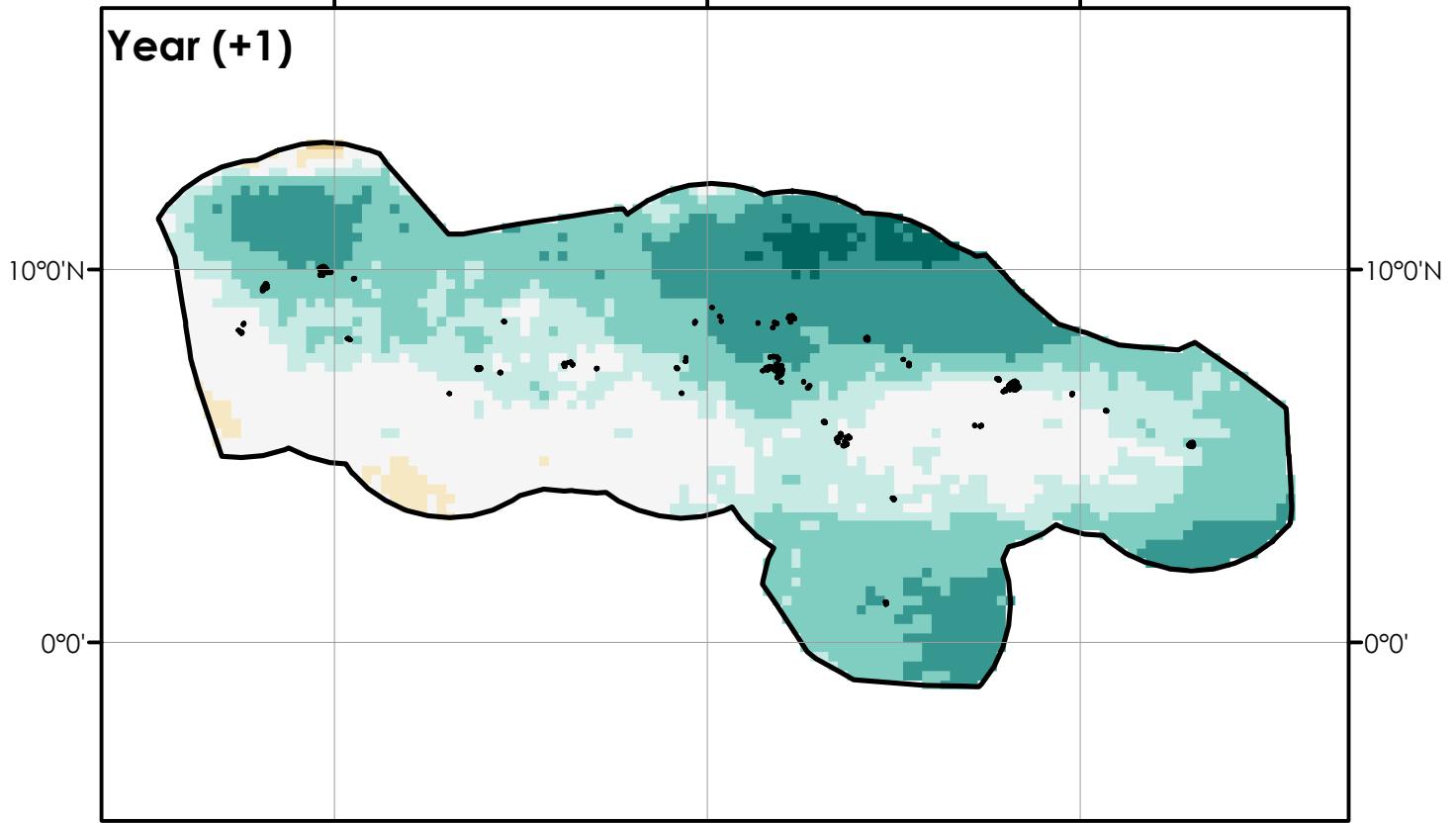
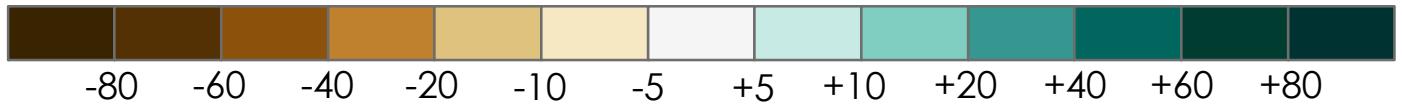
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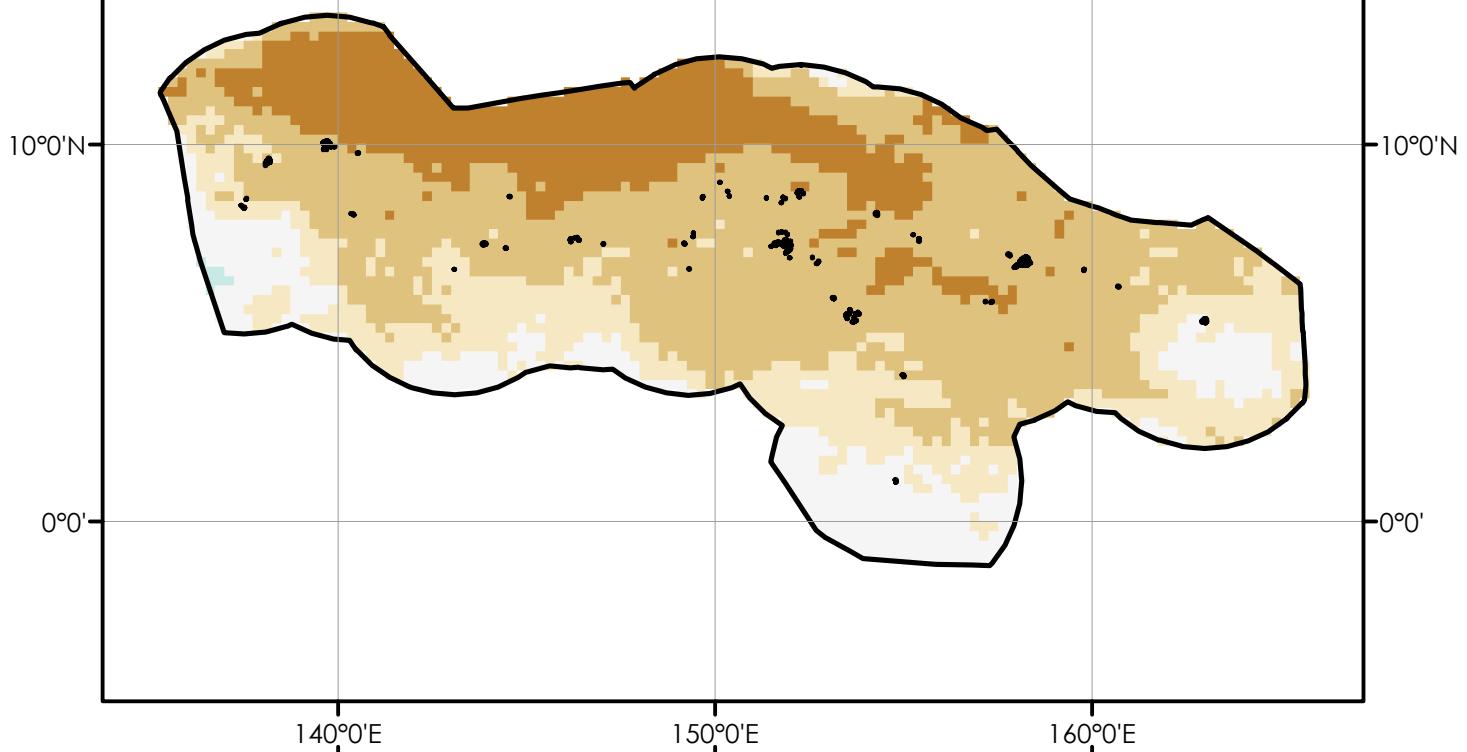
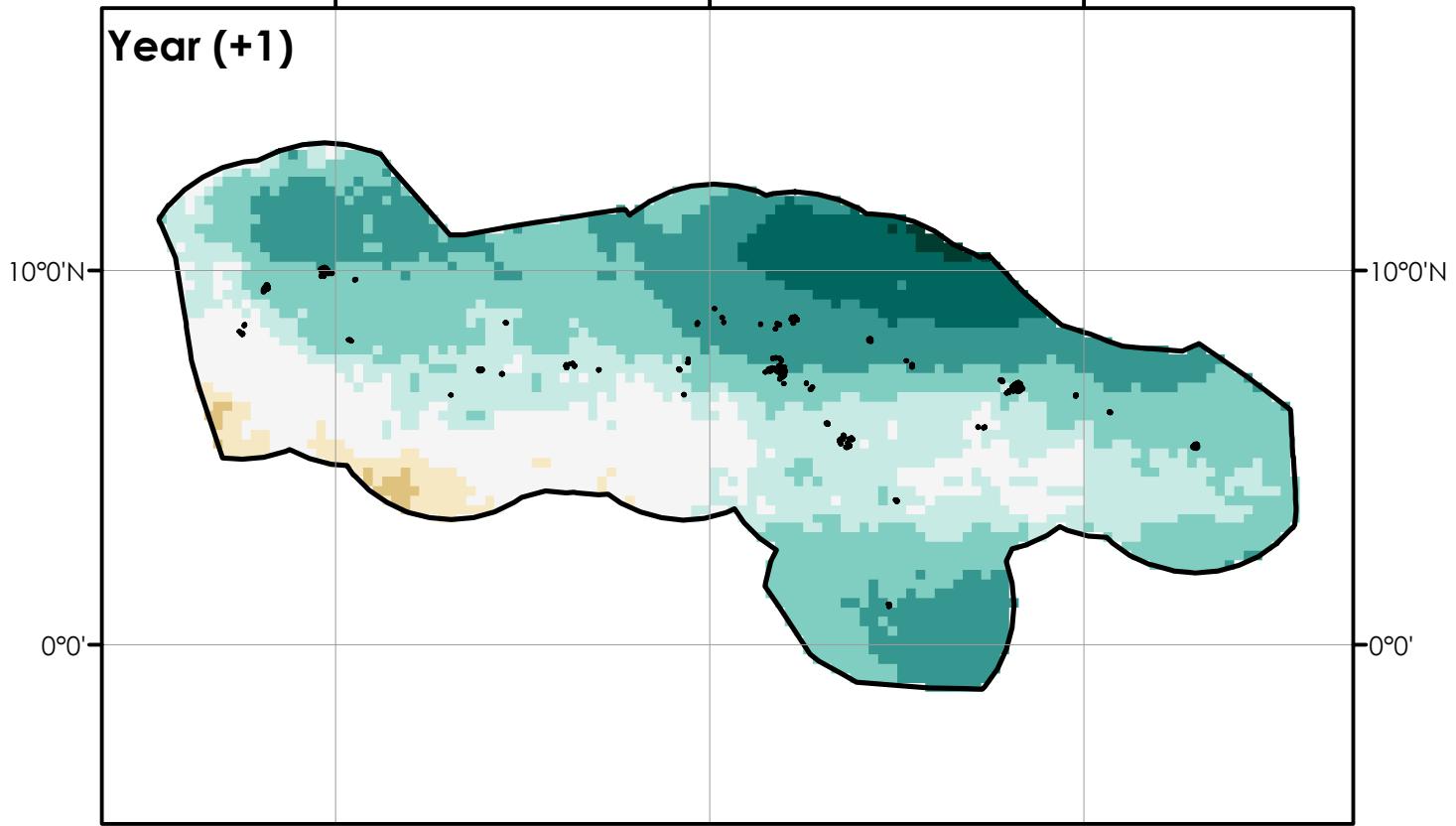
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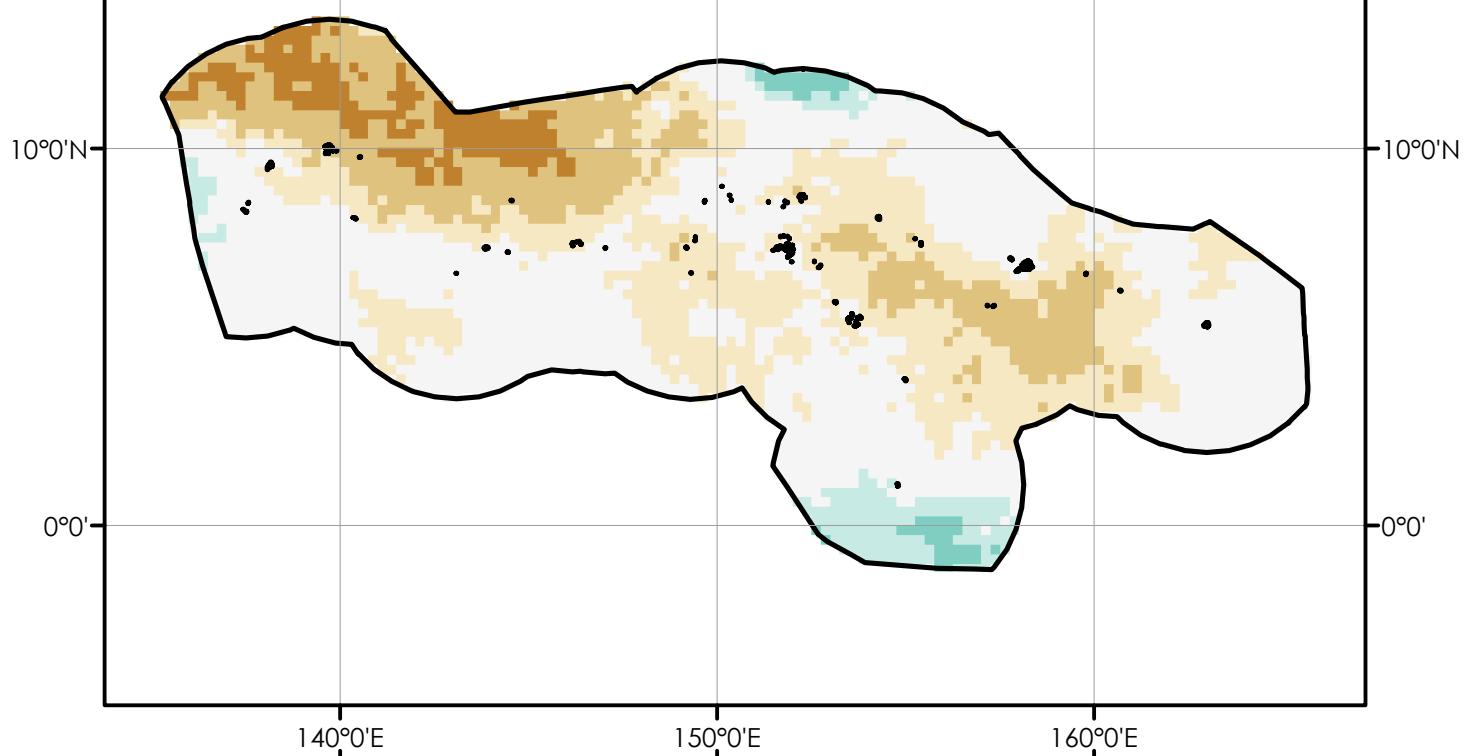
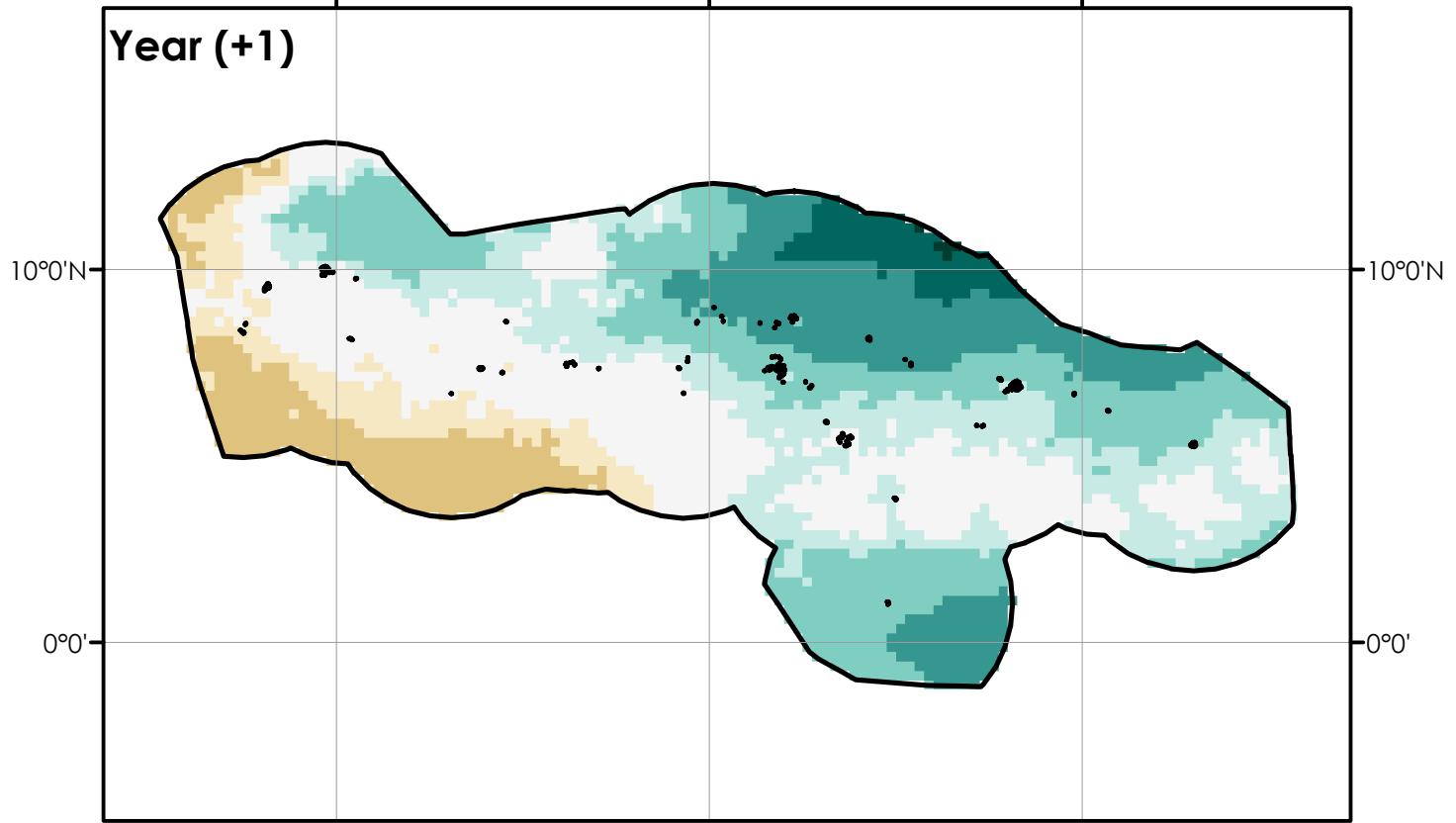
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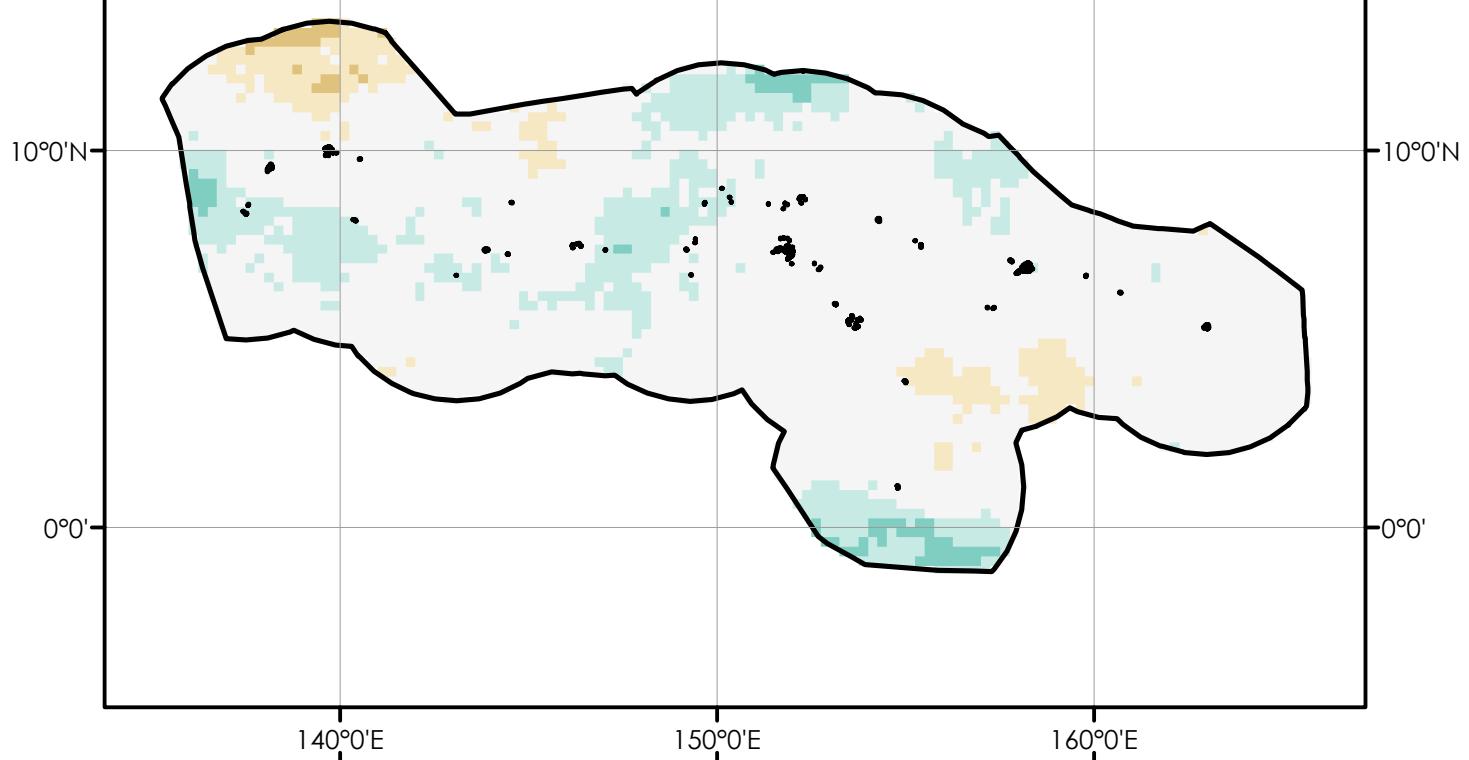
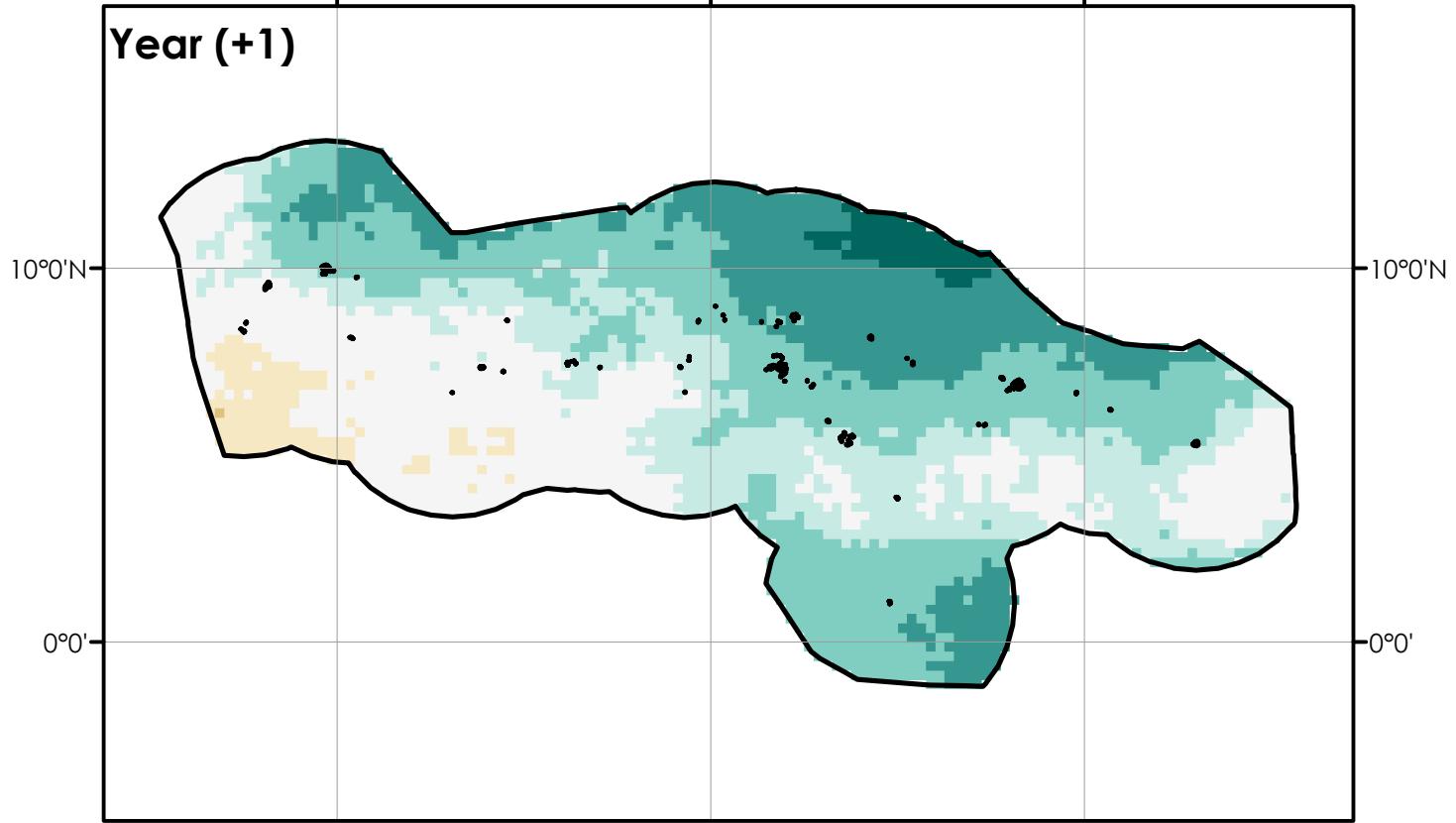
Year (0)**Federated States of Micronesia****Year (+1)****Precipitation Change (%)**

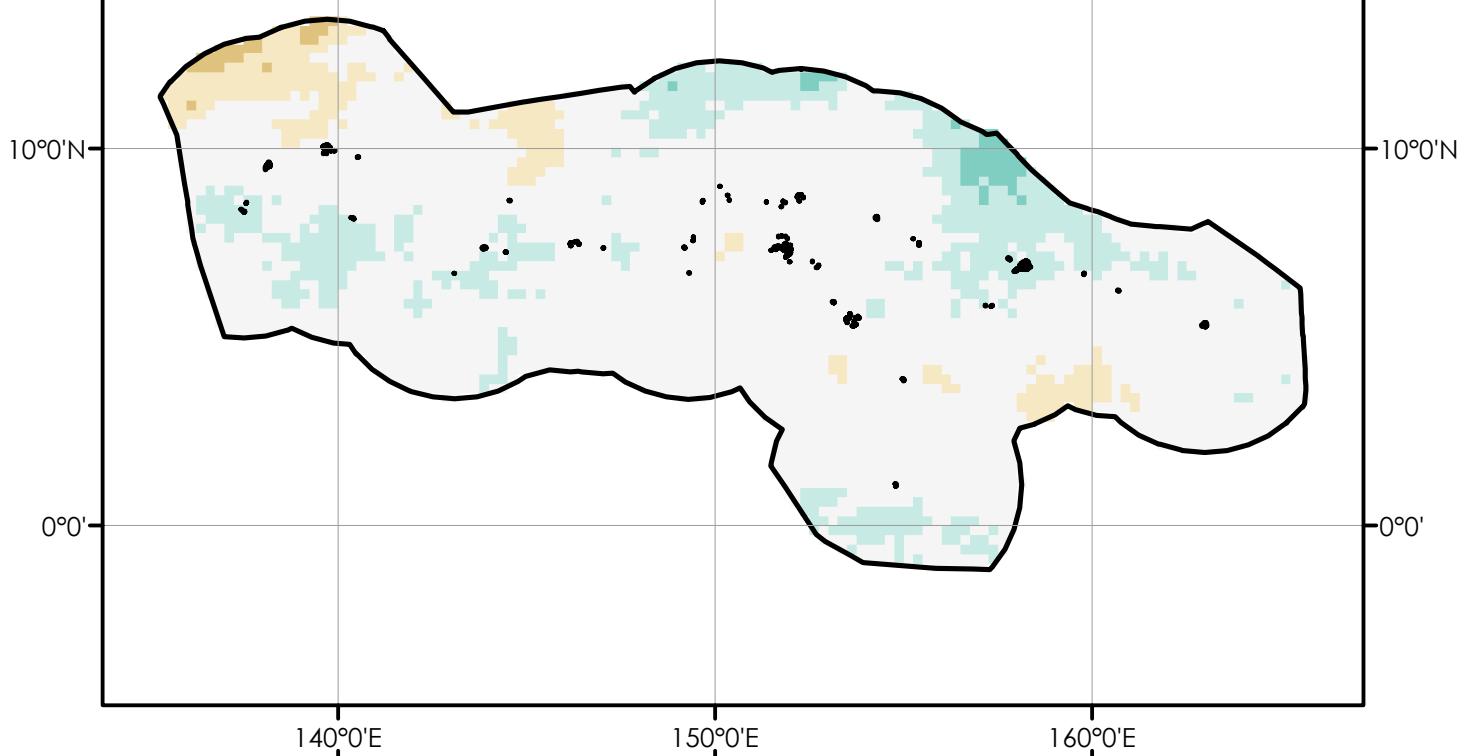
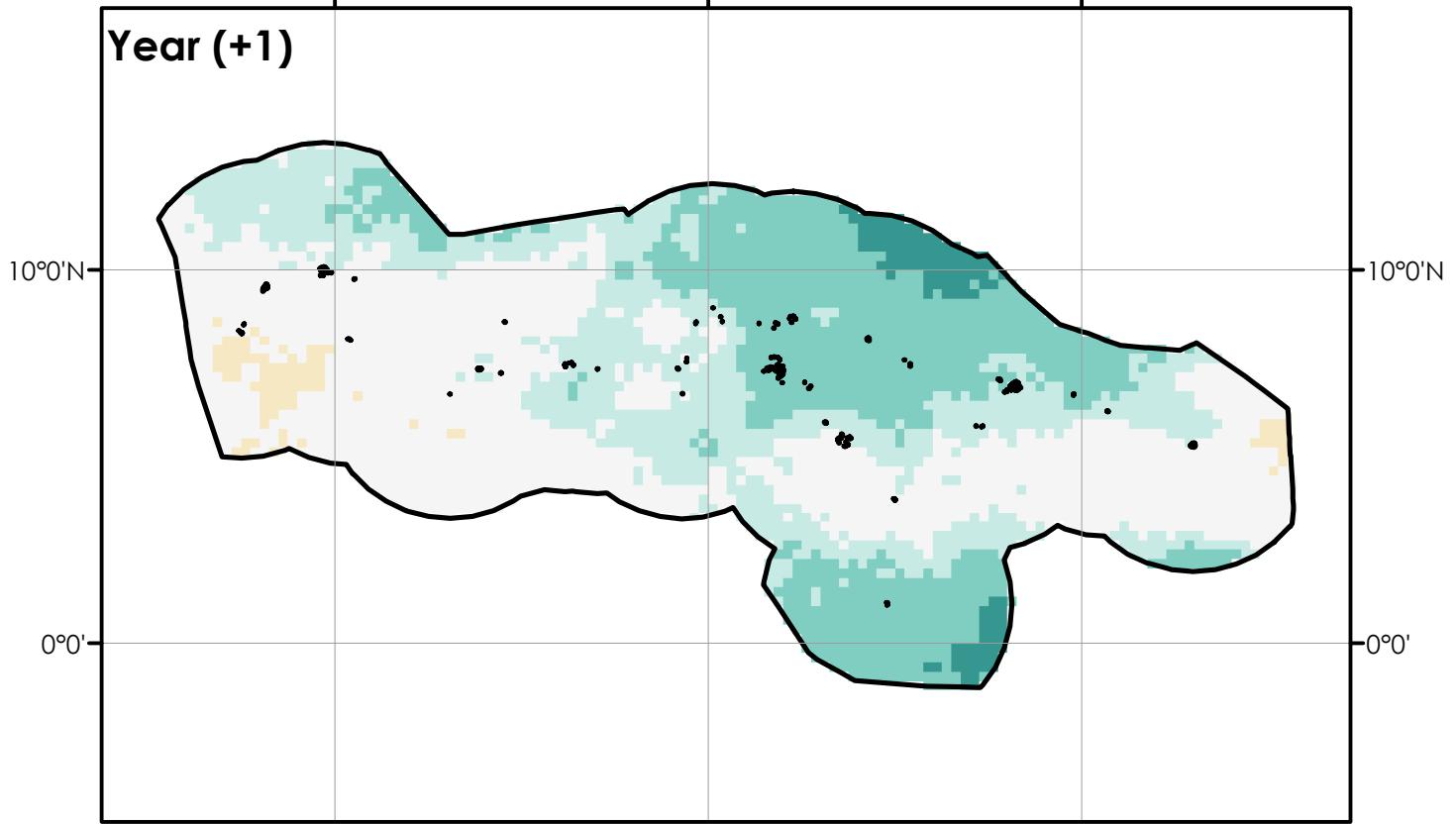
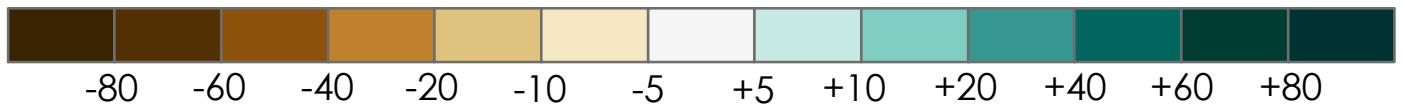
Year (0)**Federated States of Micronesia****Year (+1)****Precipitation Change (%)**

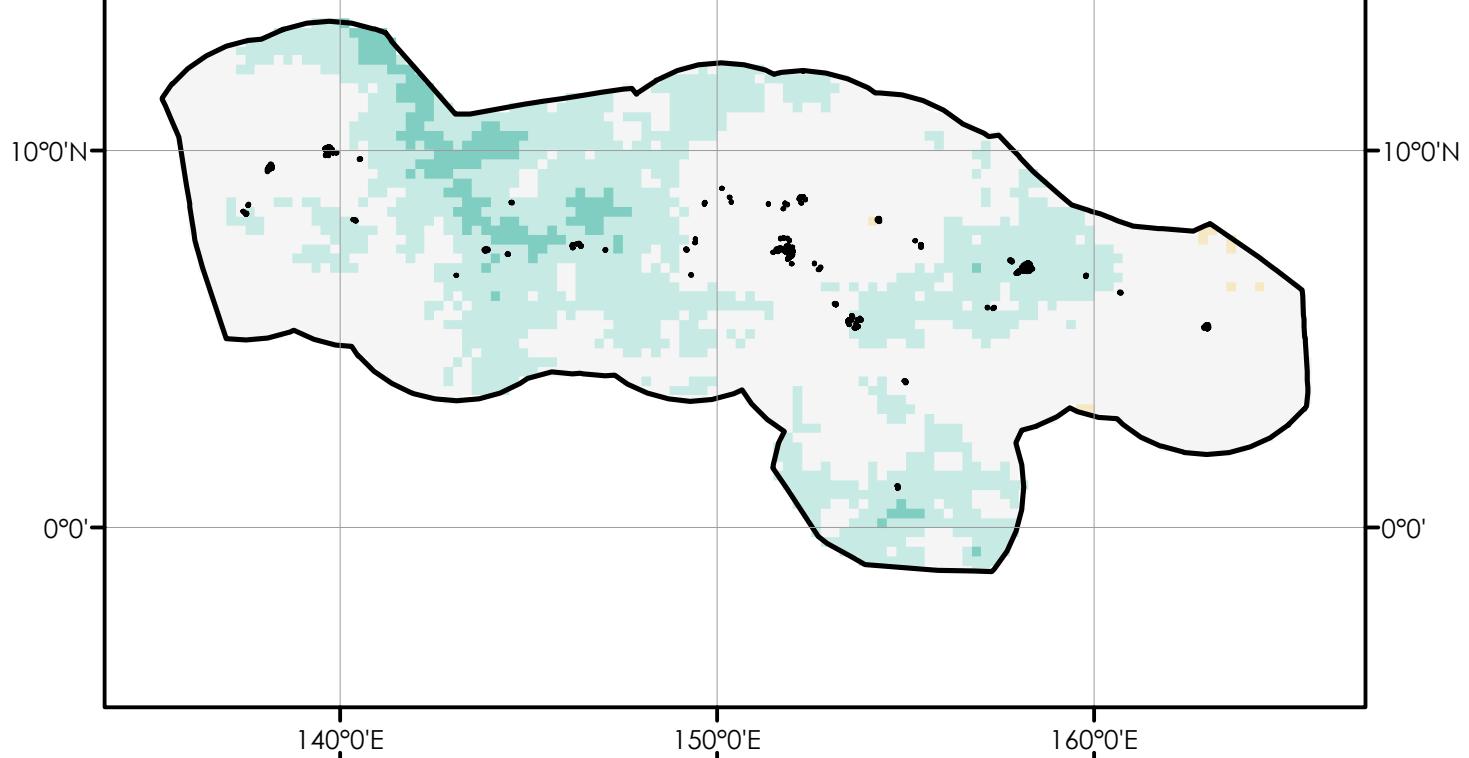
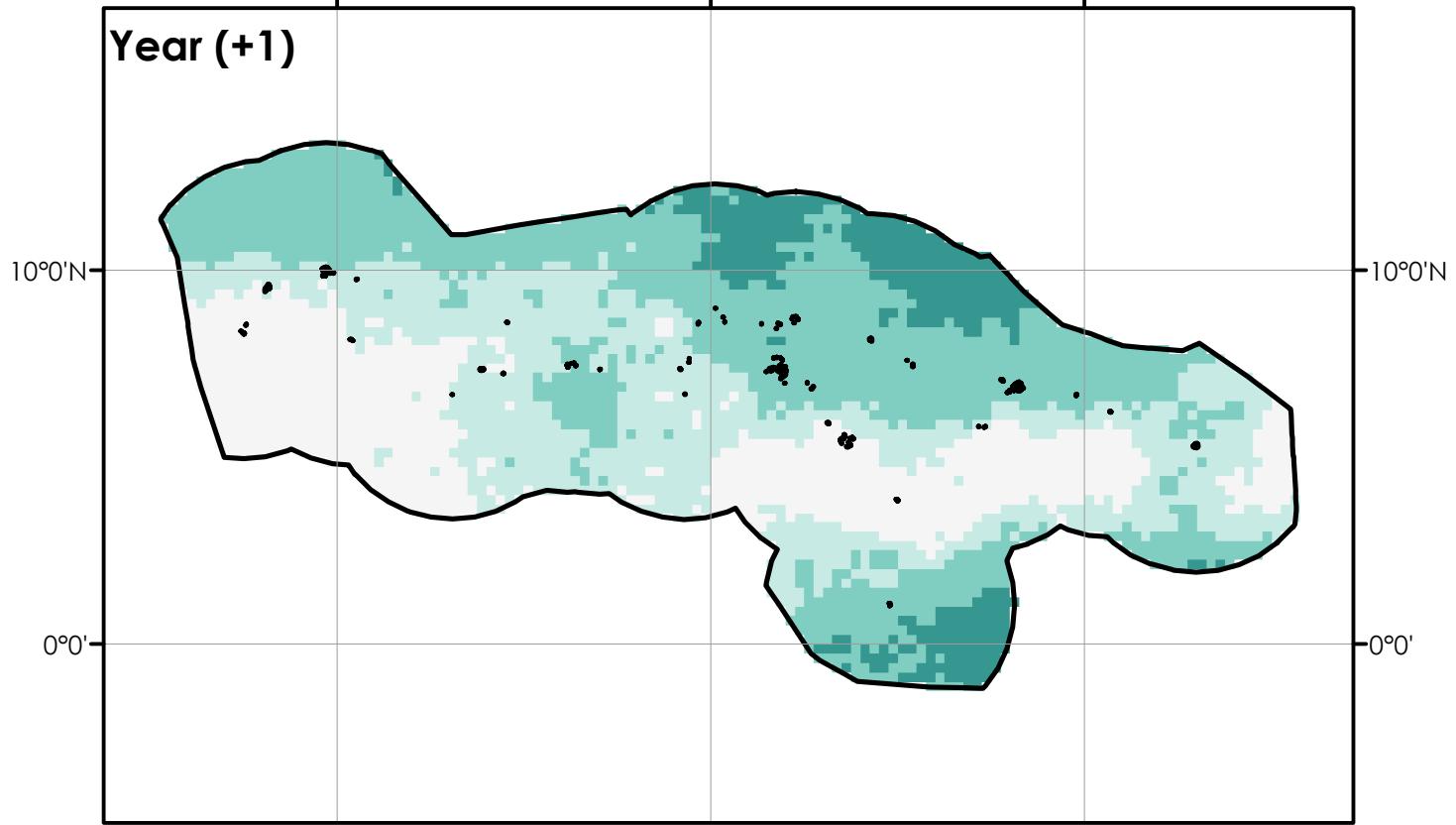
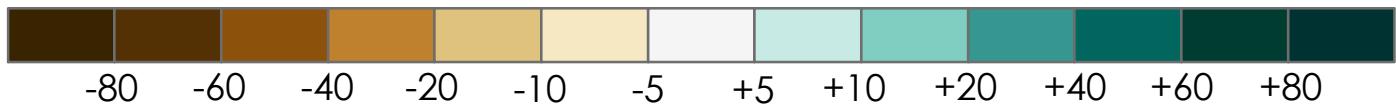
Year (0)**Federated States of Micronesia****Year (+1)****Precipitation Change (%)**

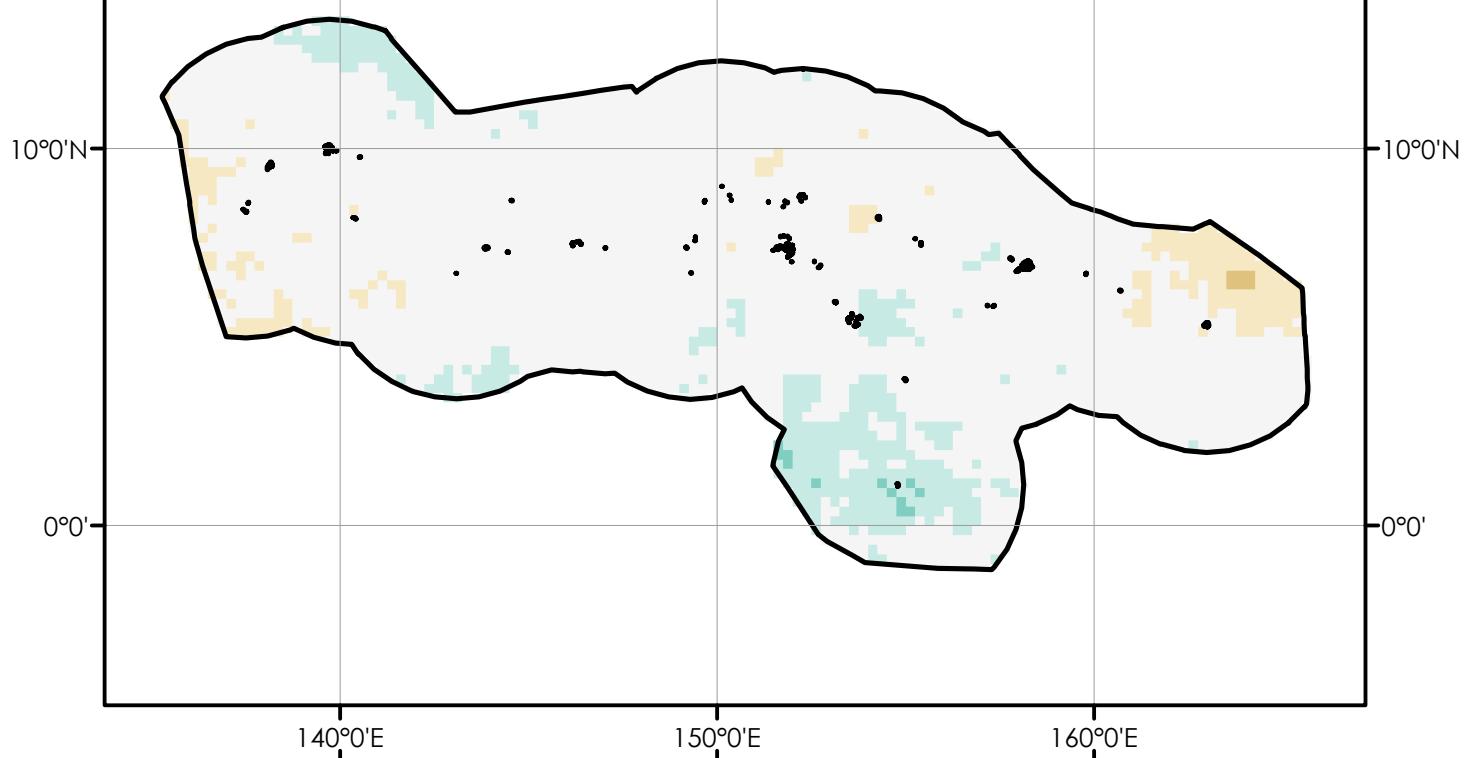
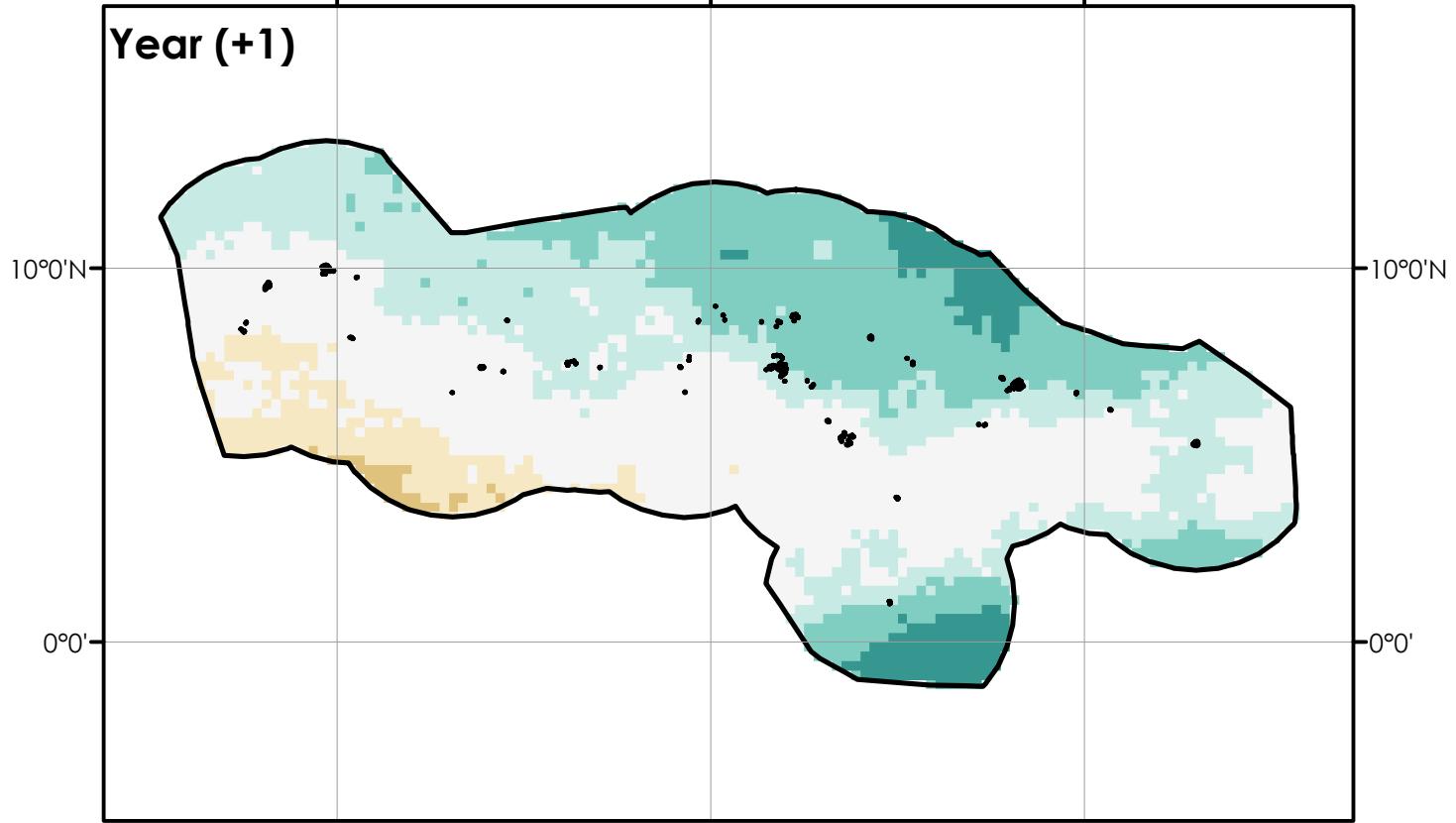
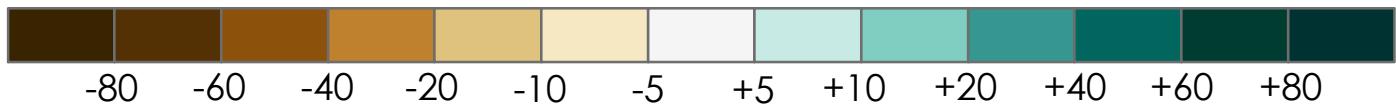
Year (0)**Federated States of Micronesia****Year (+1)****Precipitation Change (%)**

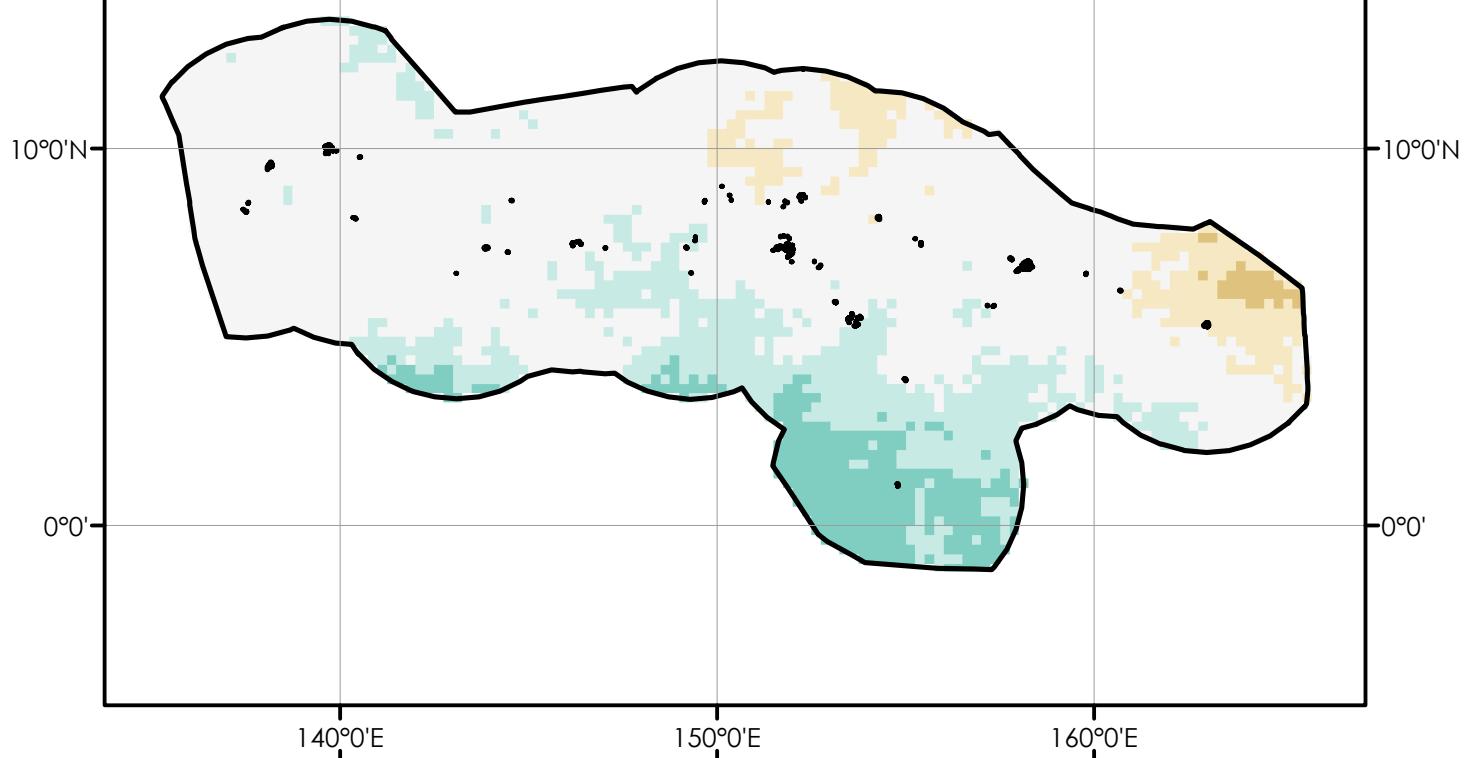
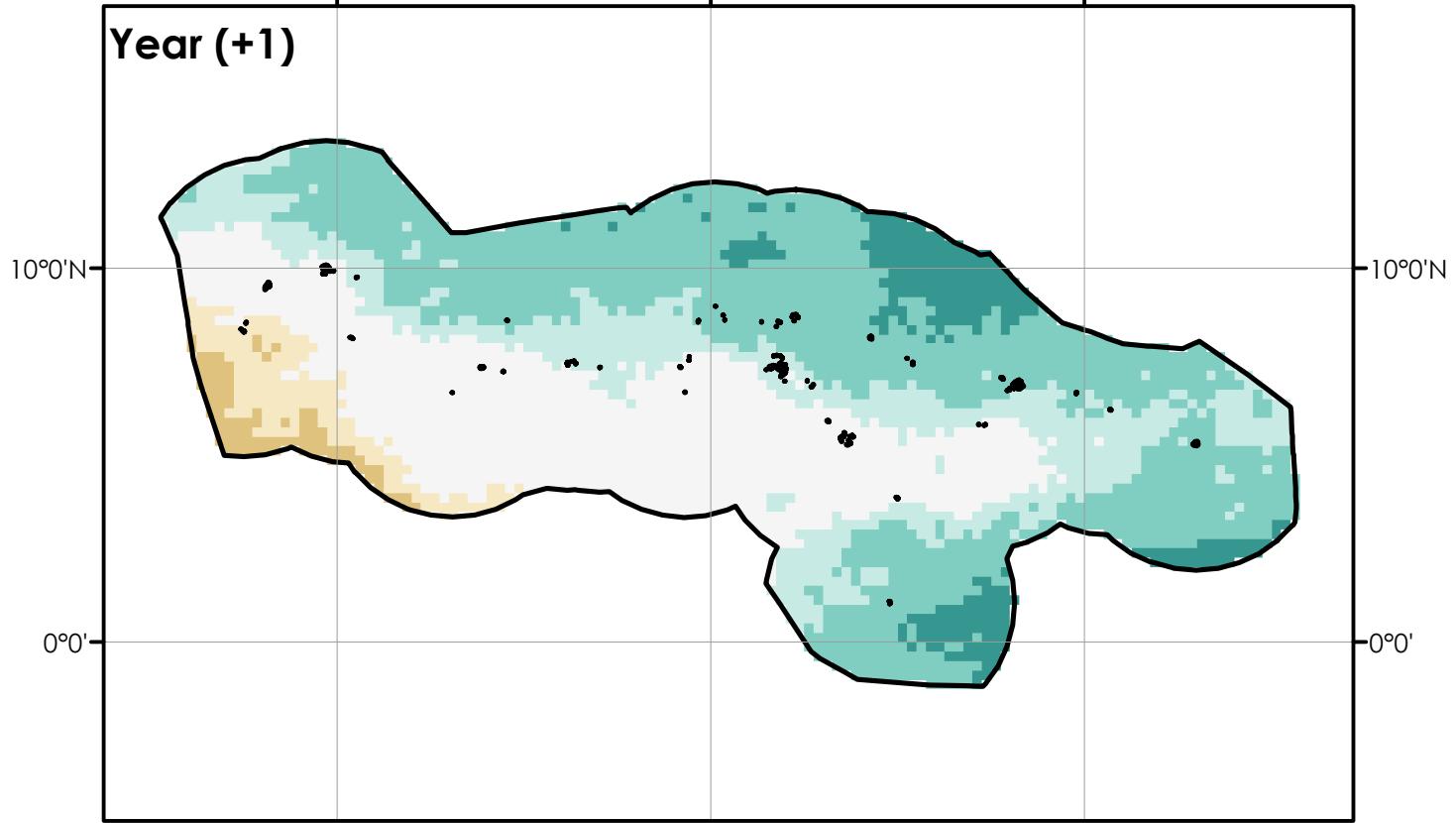
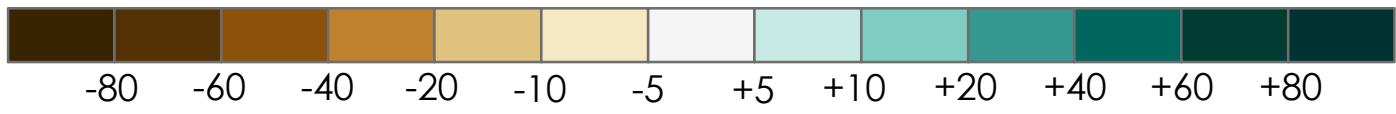
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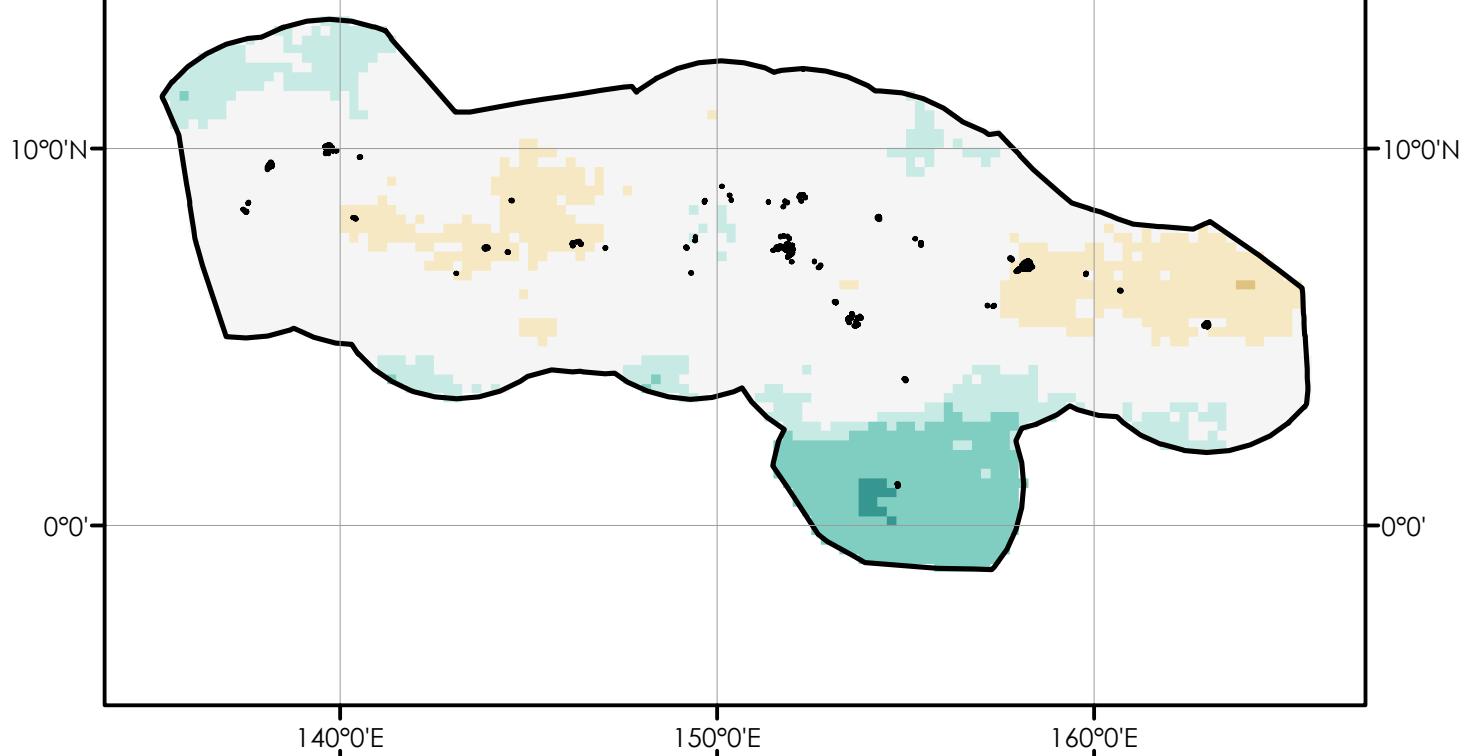
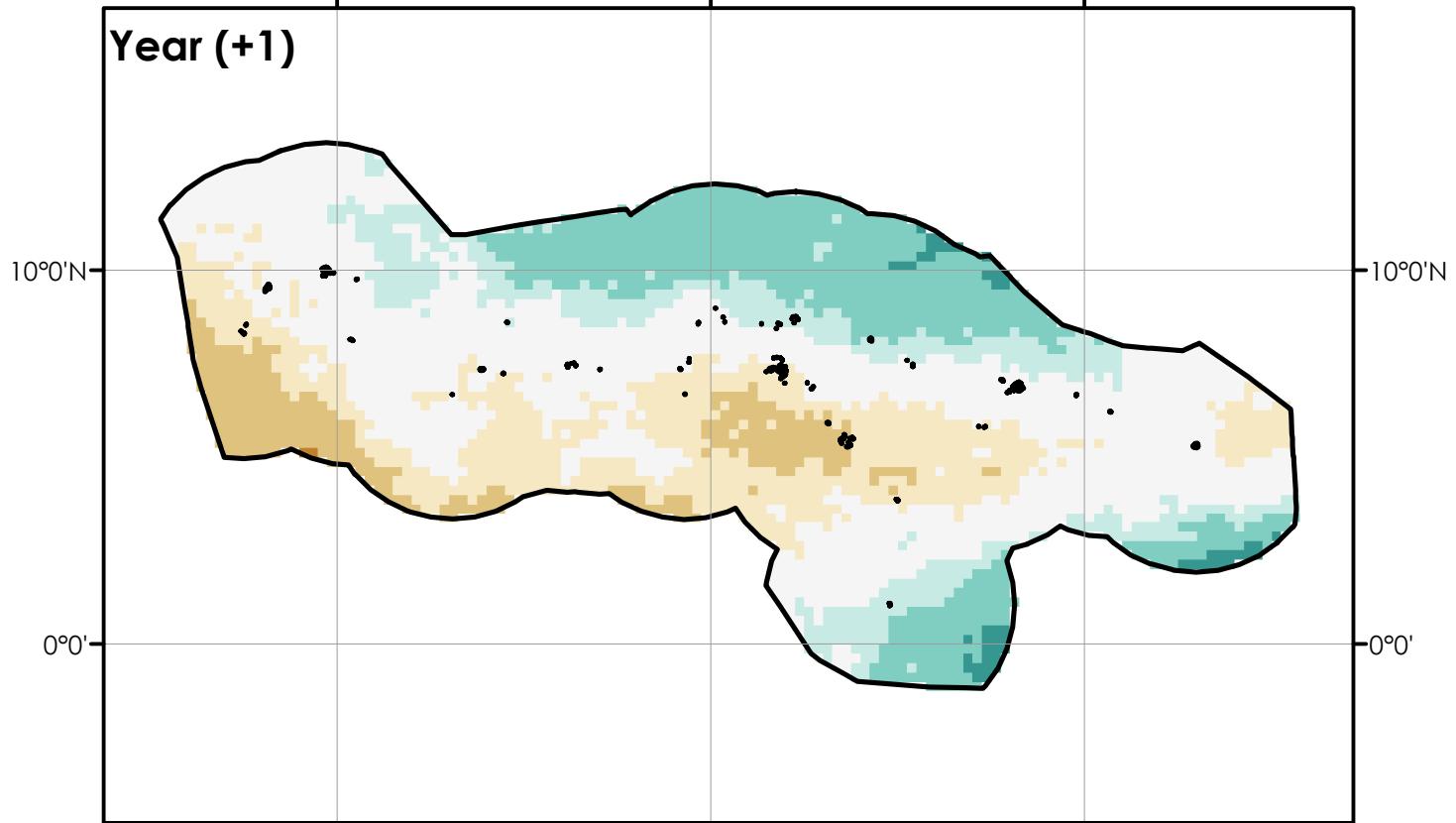
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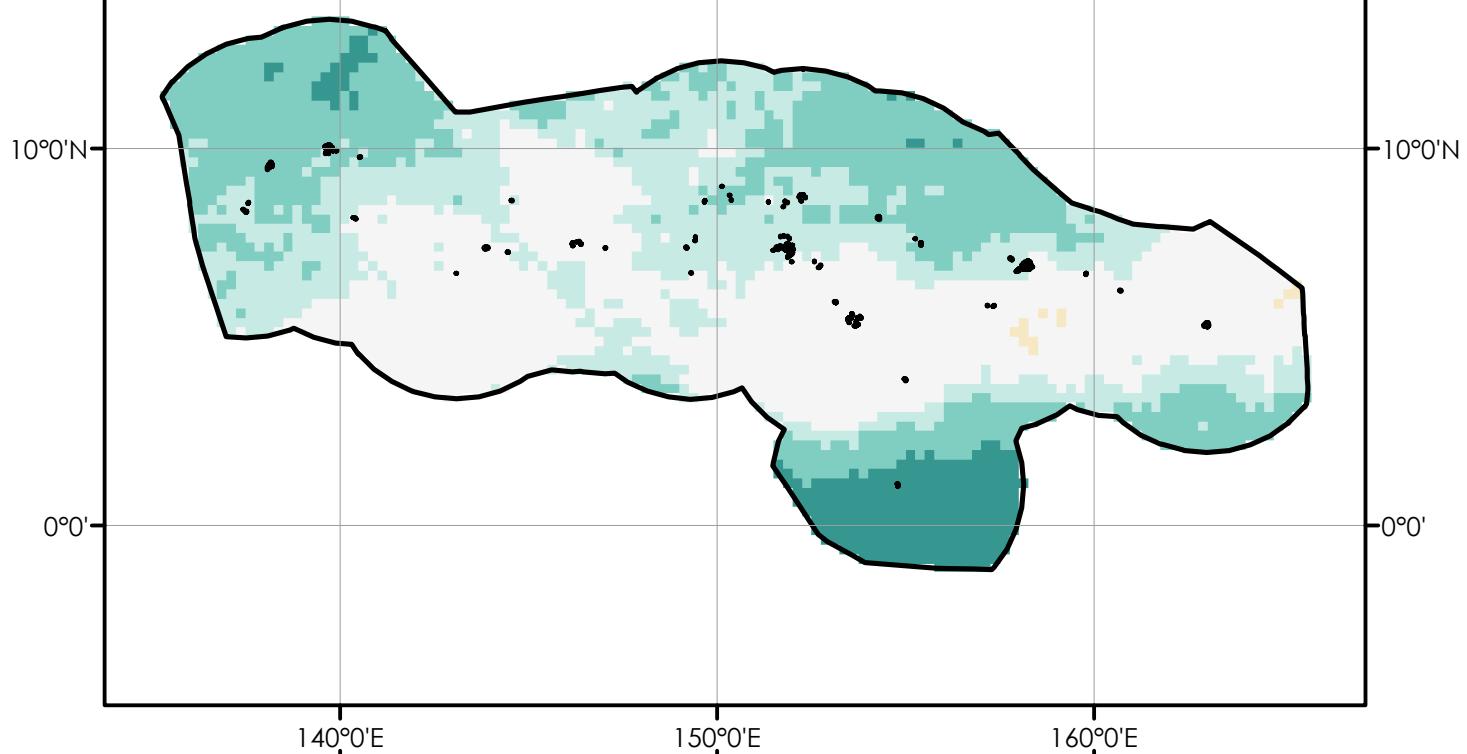
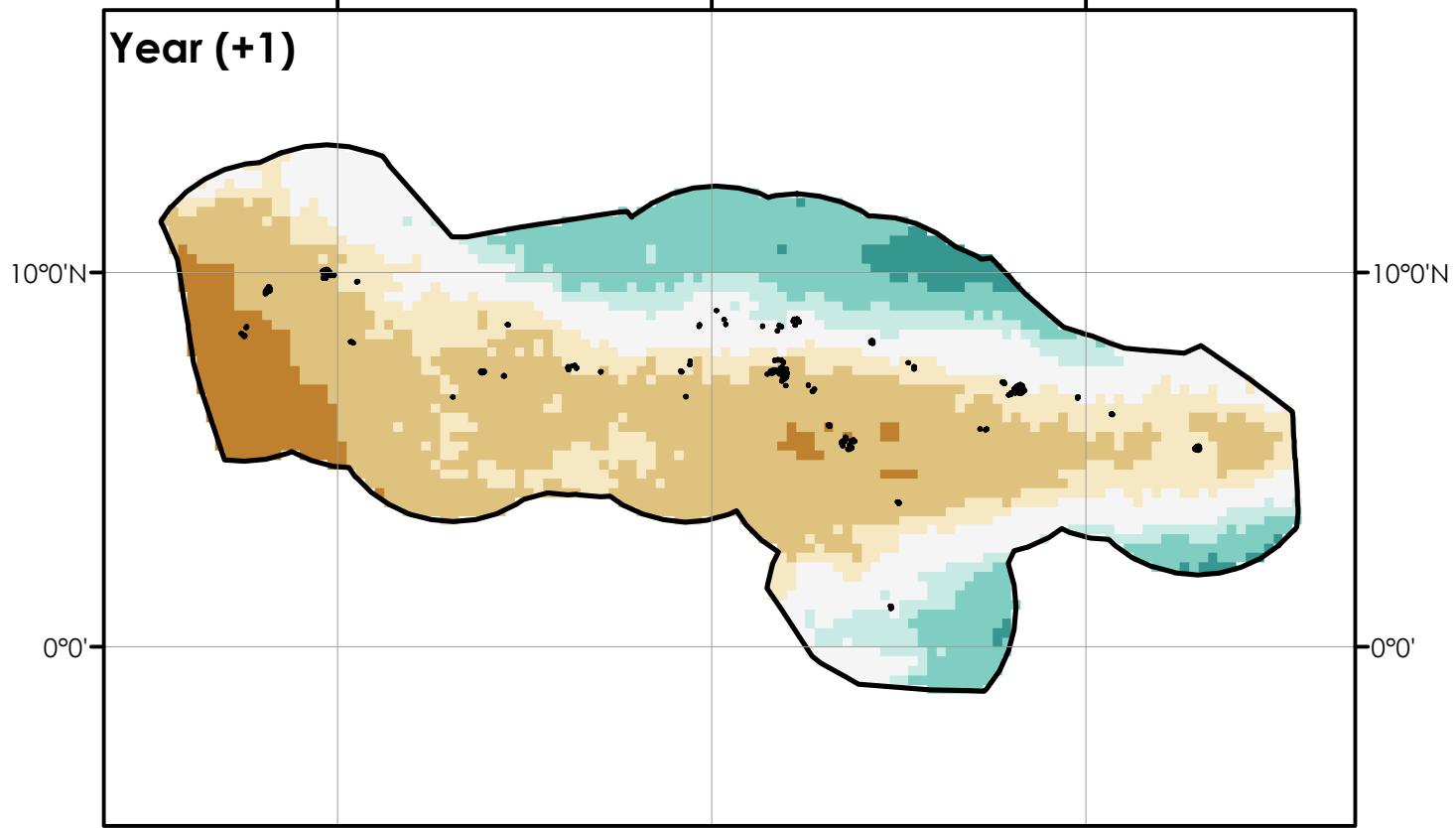
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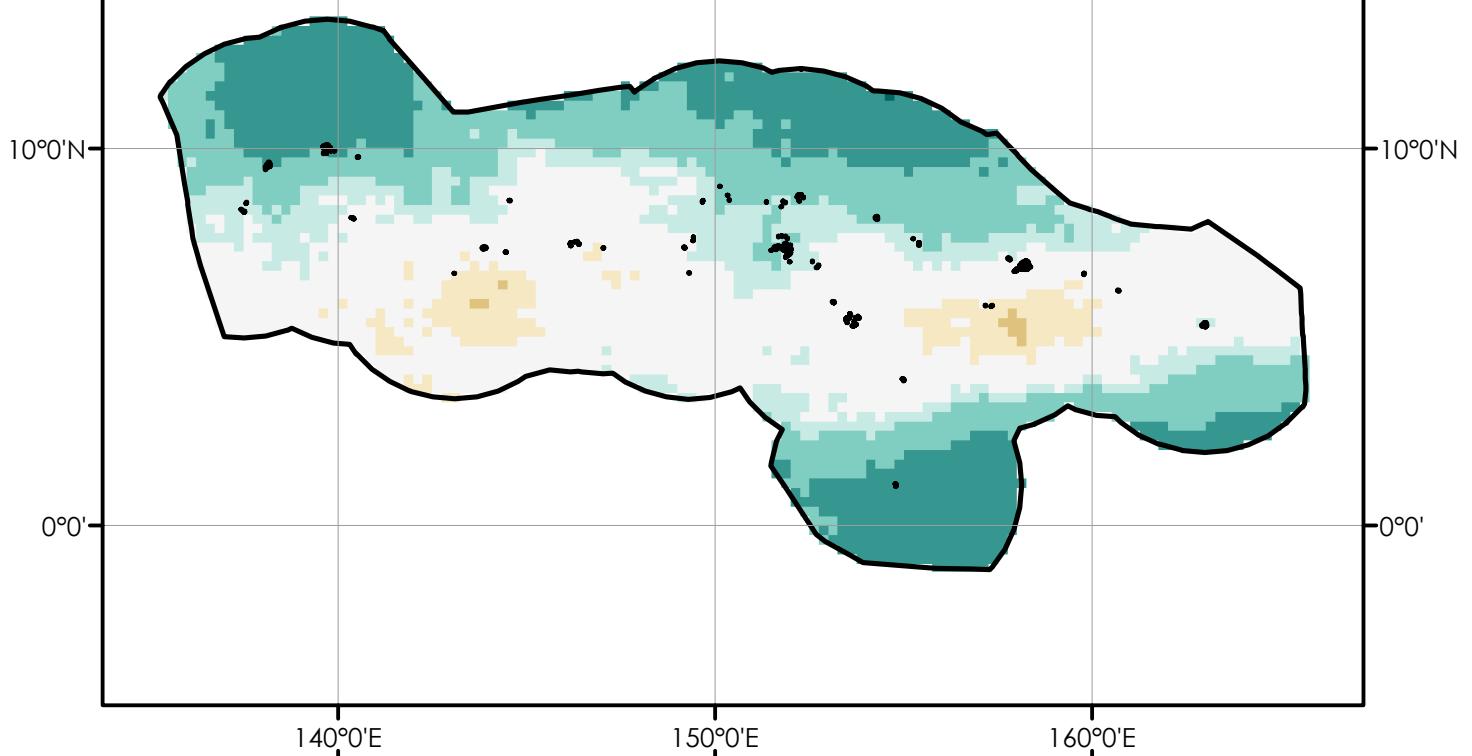
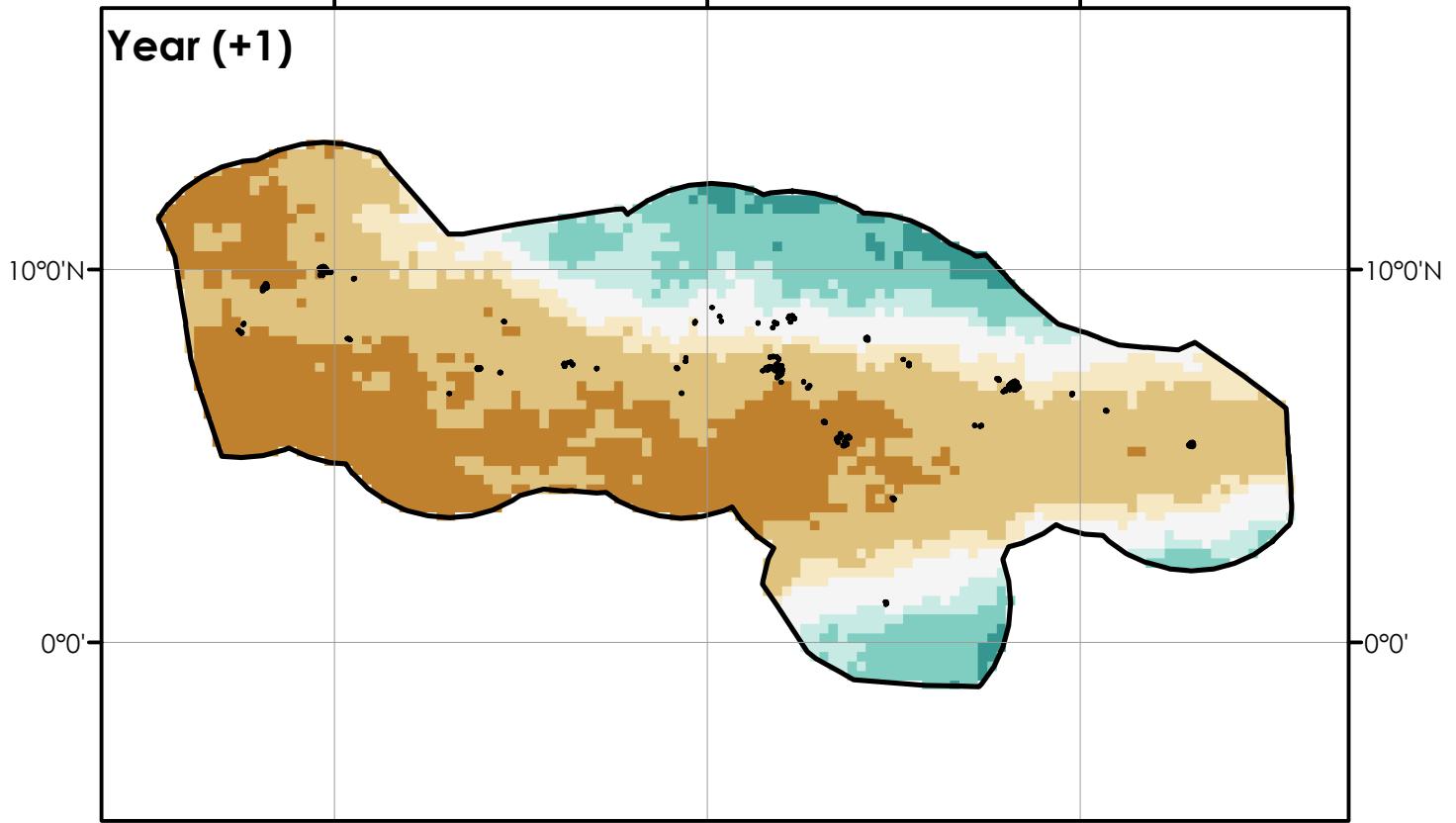
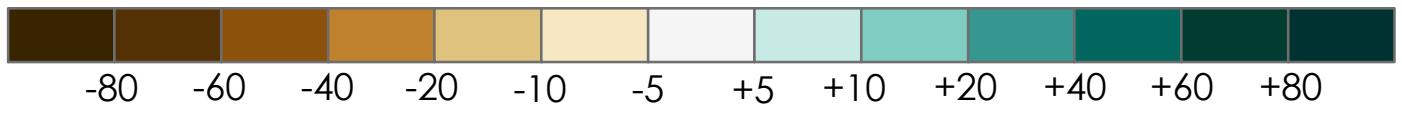
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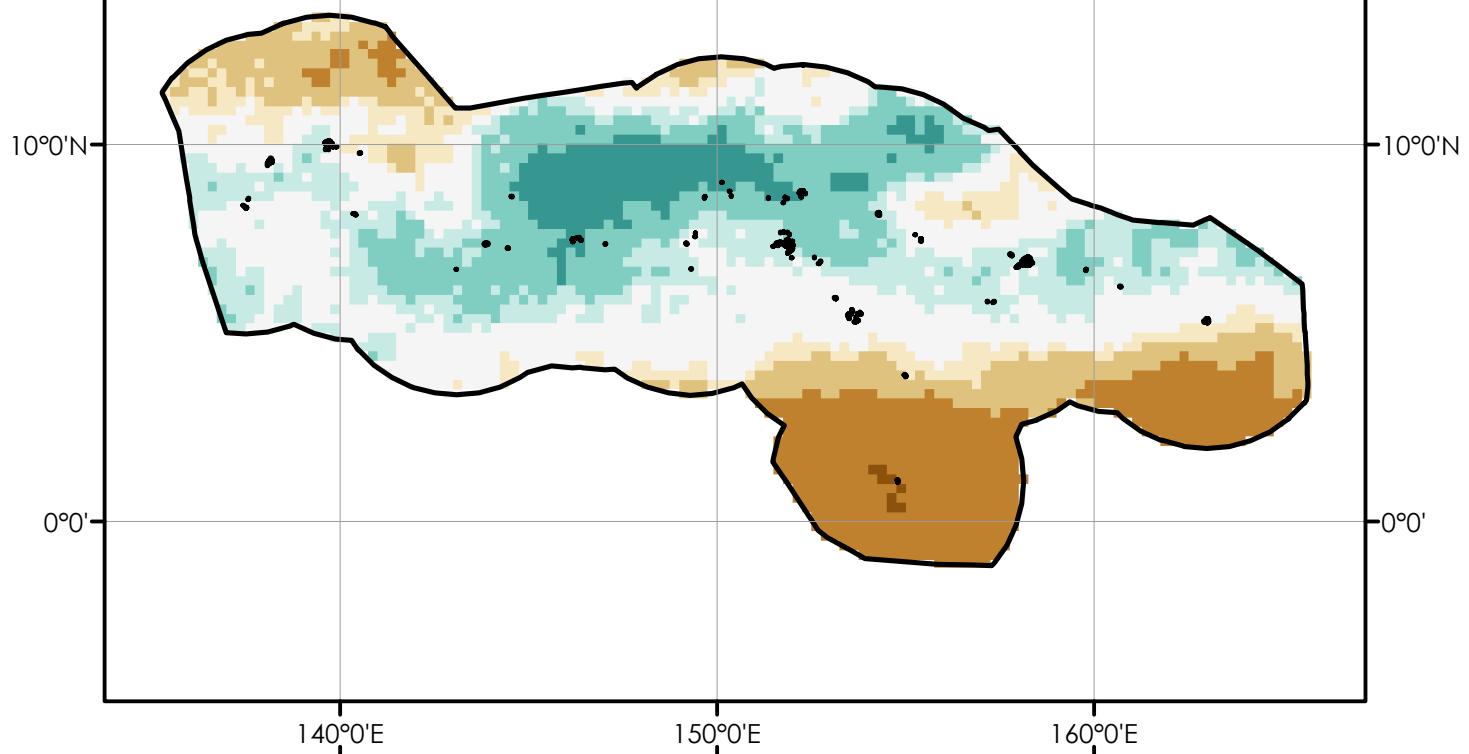
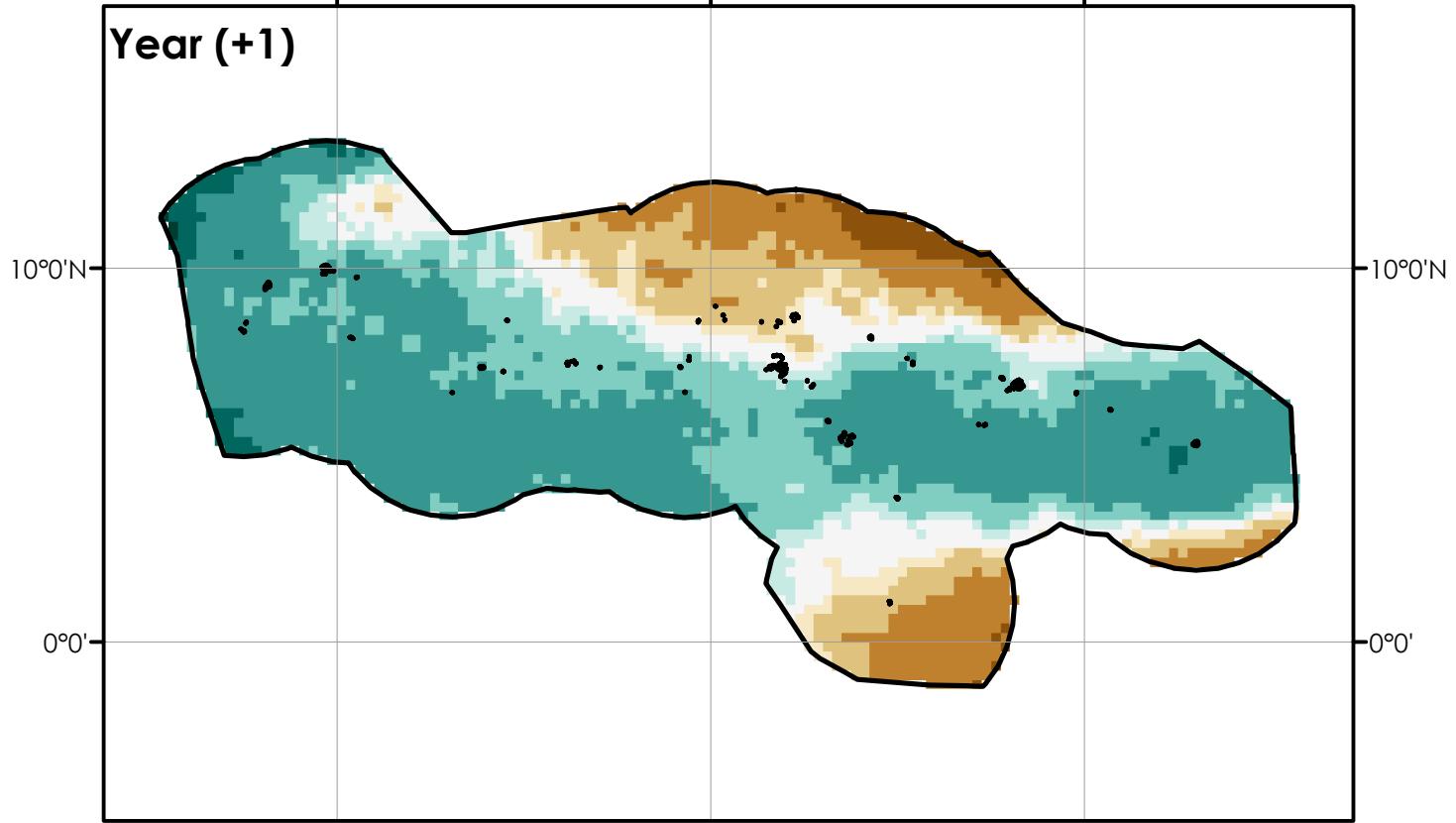
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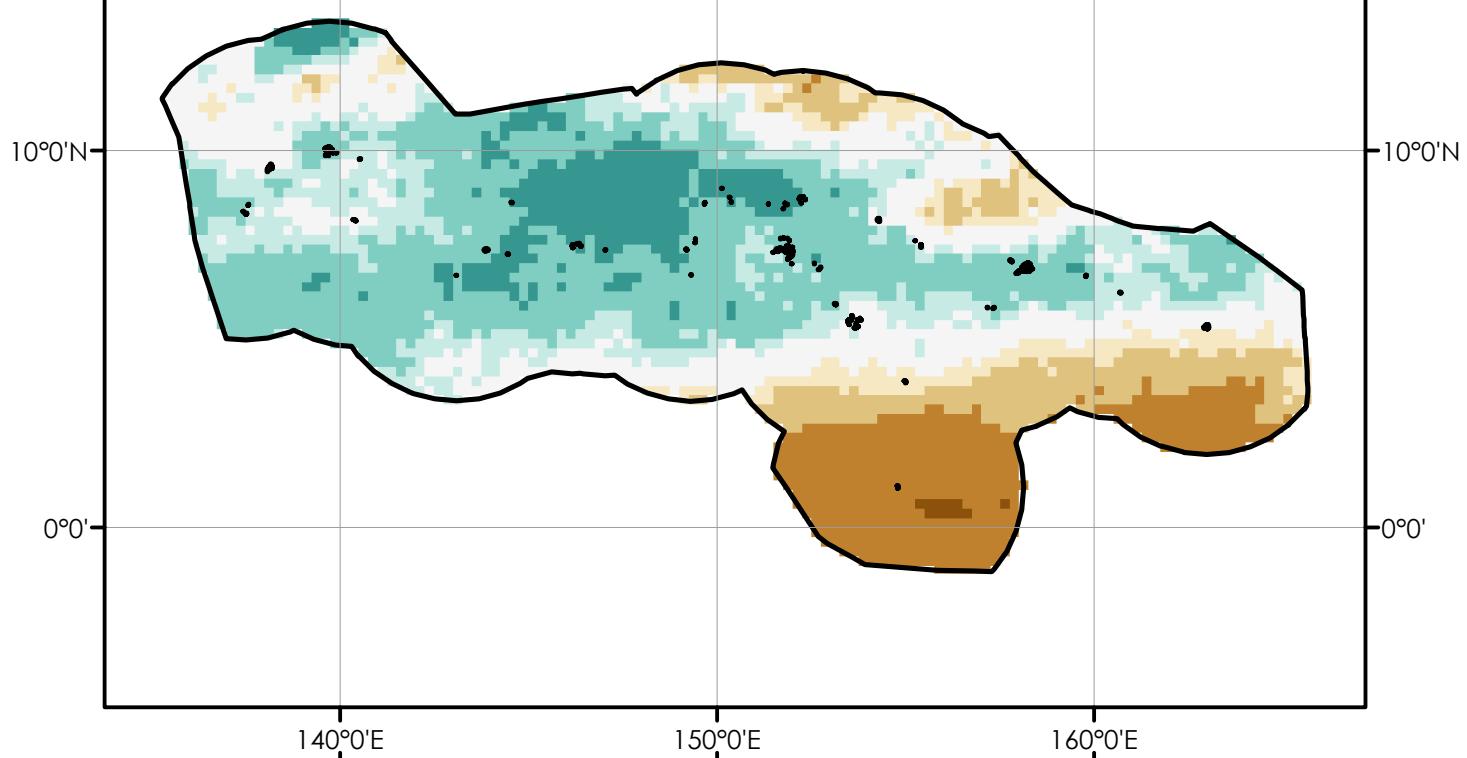
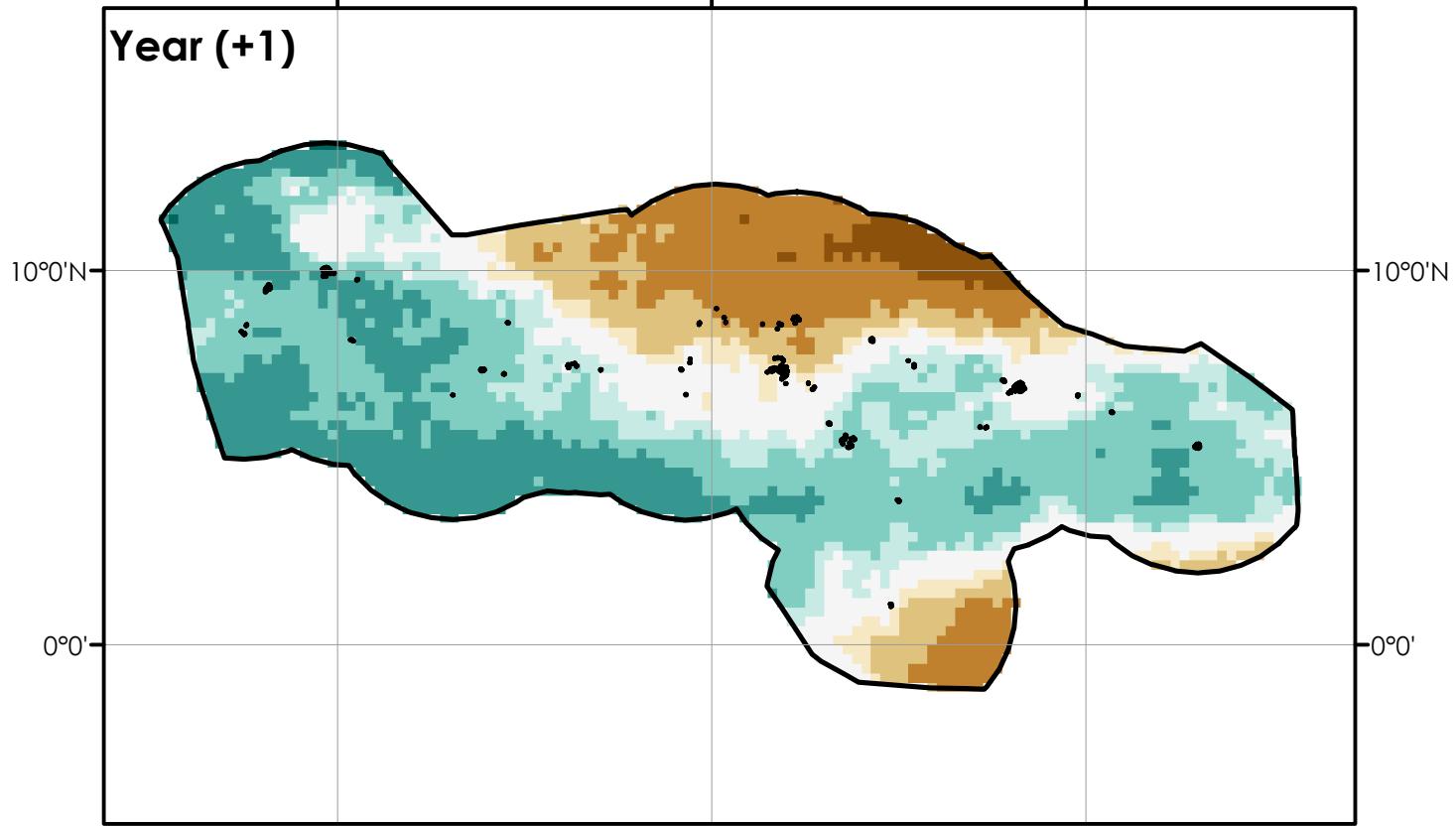
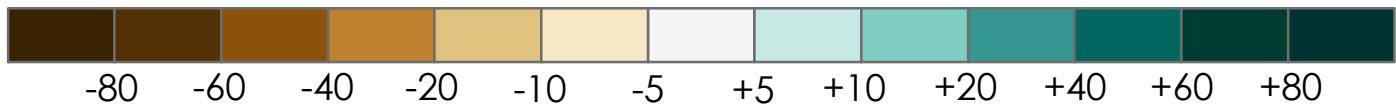
Year (0)**Federated States of Micronesia****Year (+1)****Precipitation Change (%)**

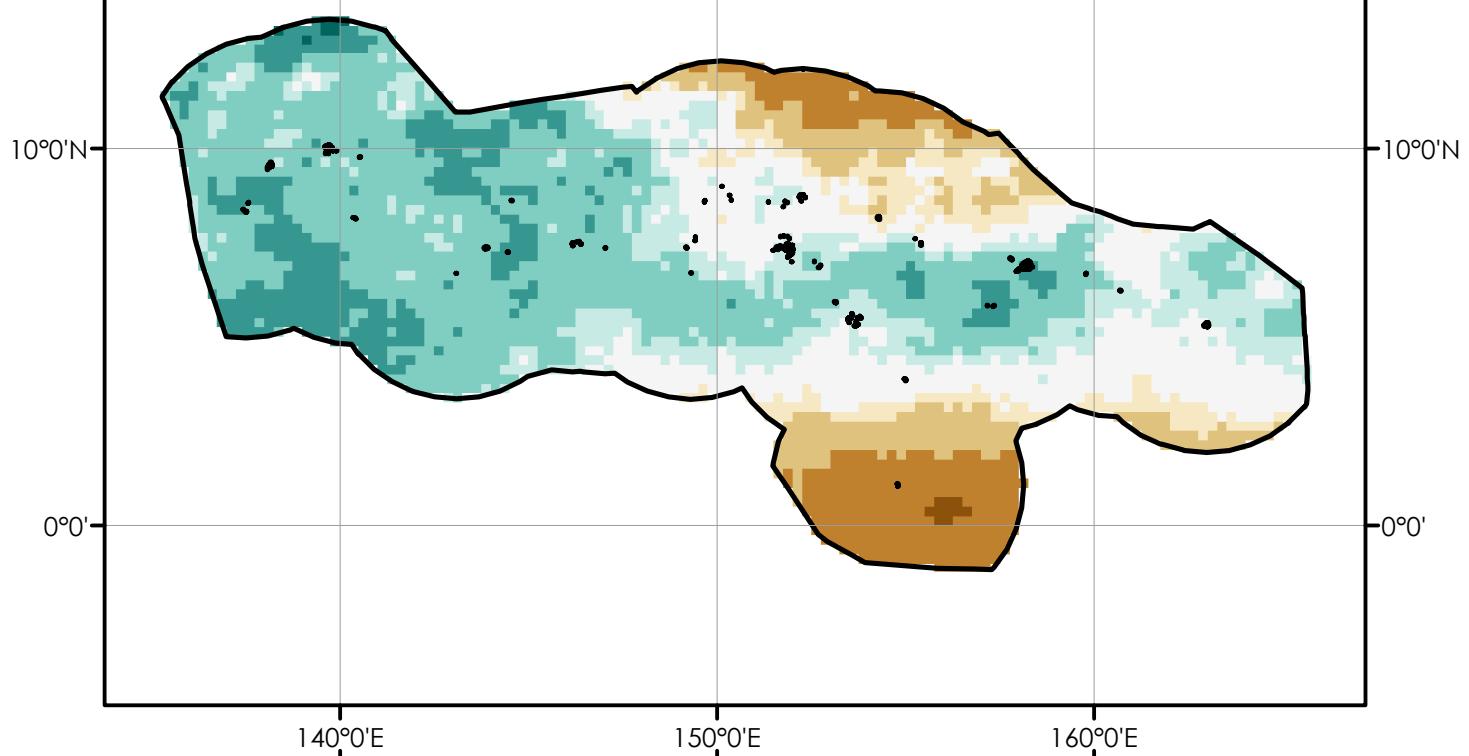
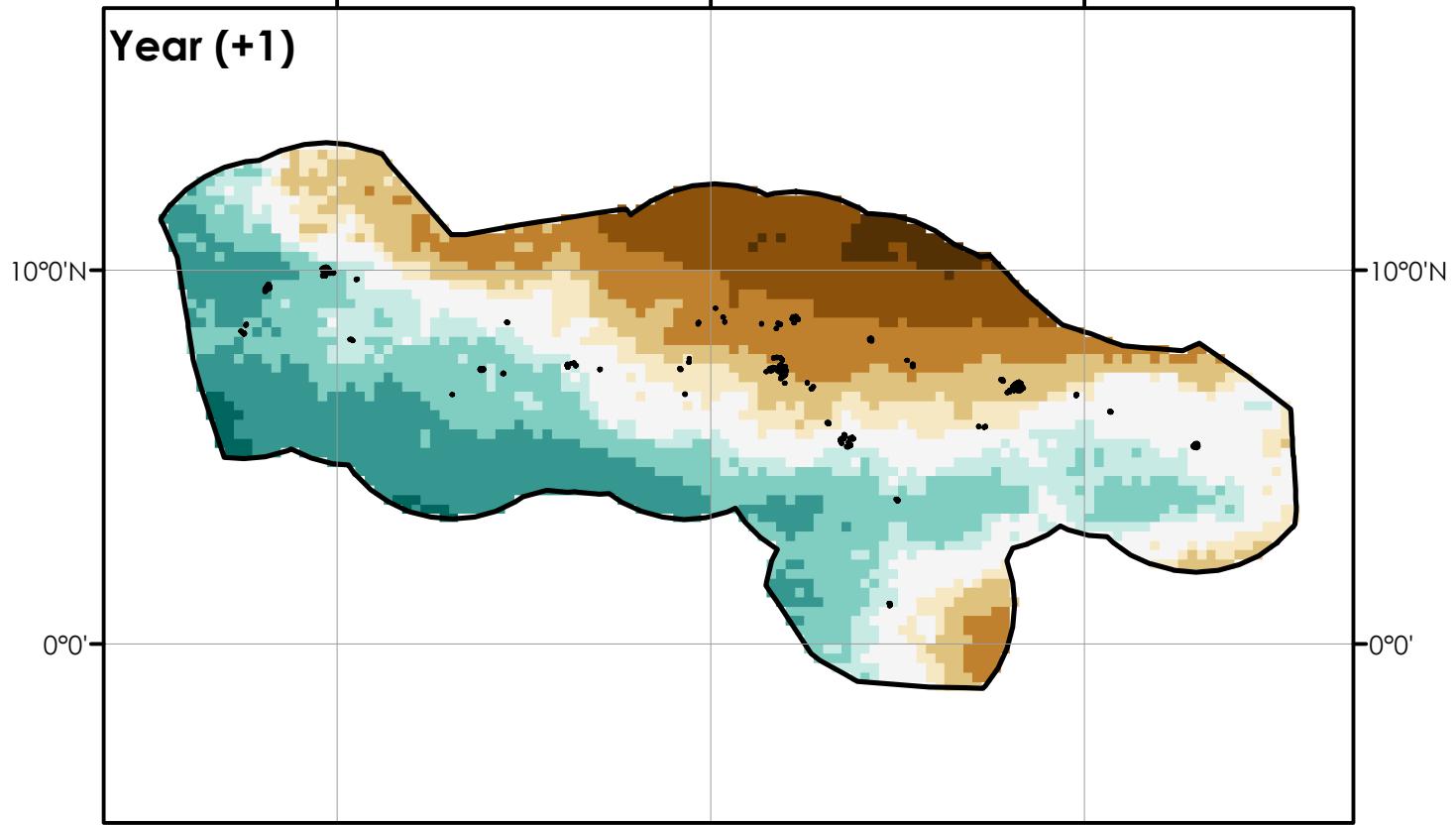
Year (0)**Federated States of Micronesia****Year (+1)****Precipitation Change (%)**

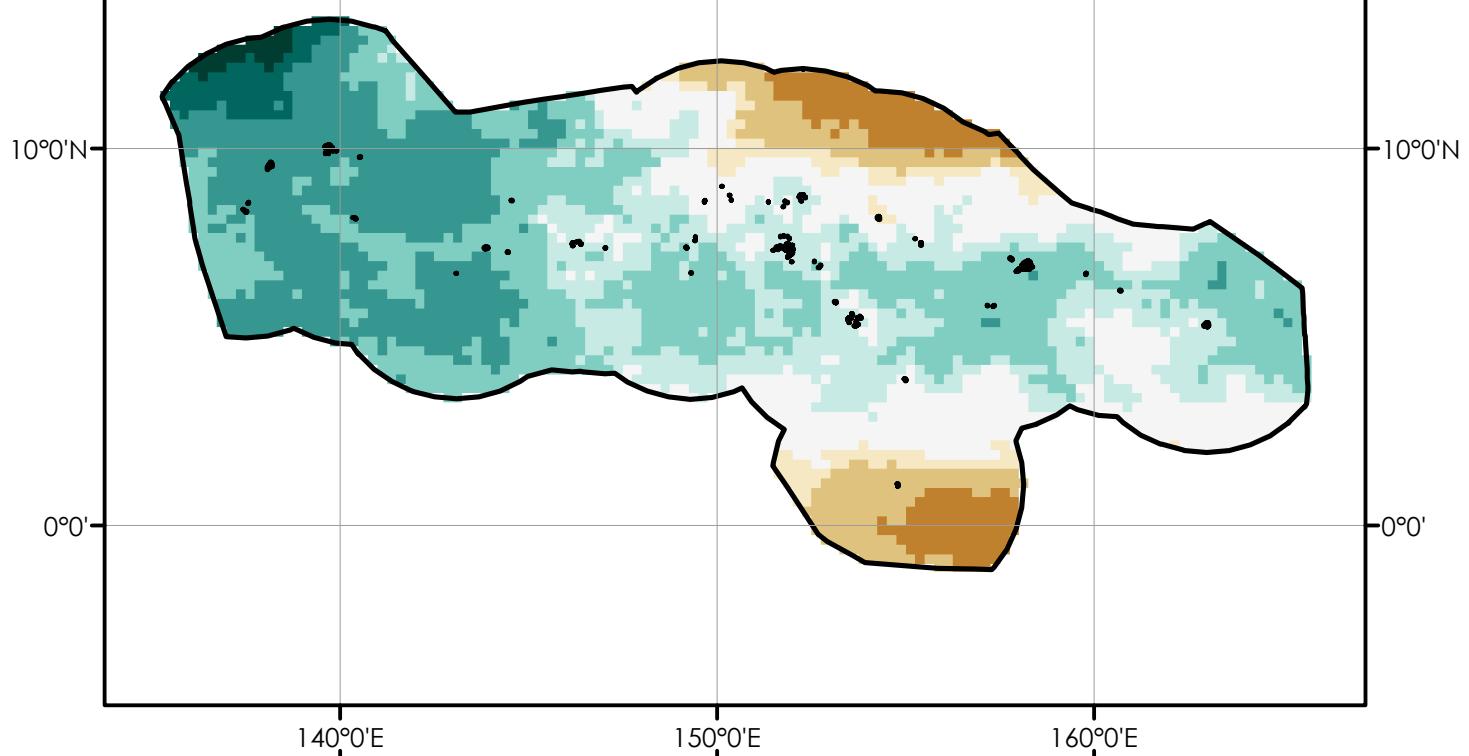
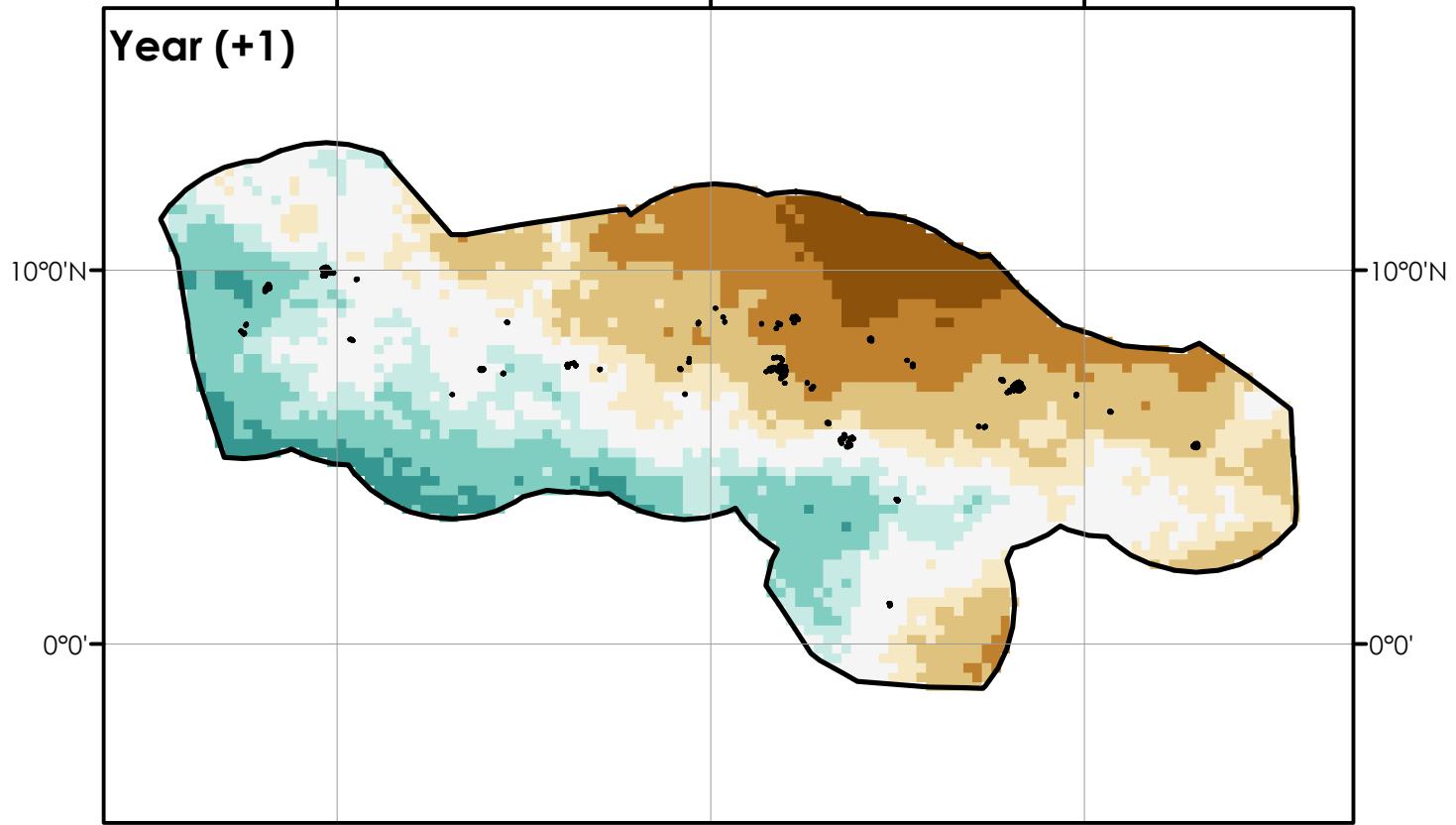
Year (0)**Federated States of Micronesia****Year (+1)****Precipitation Change (%)**

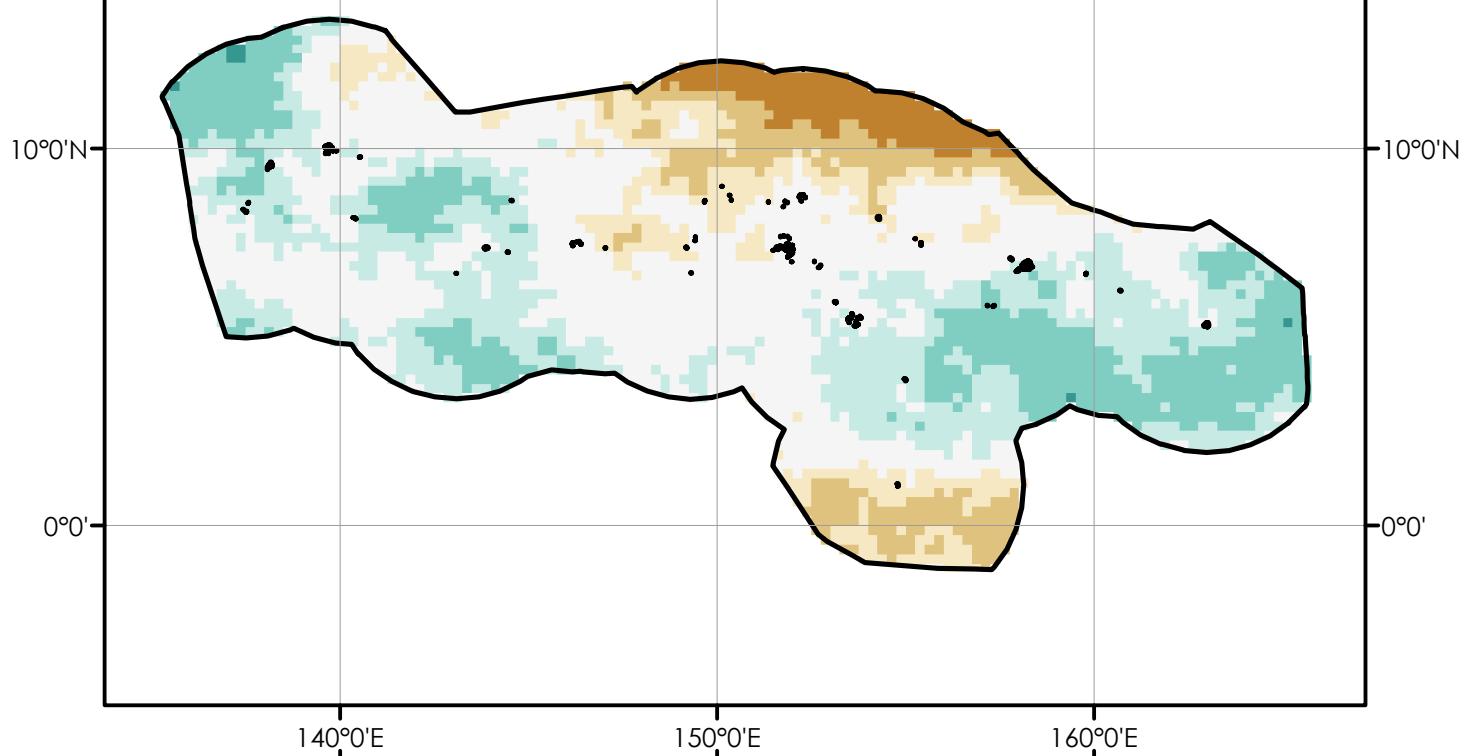
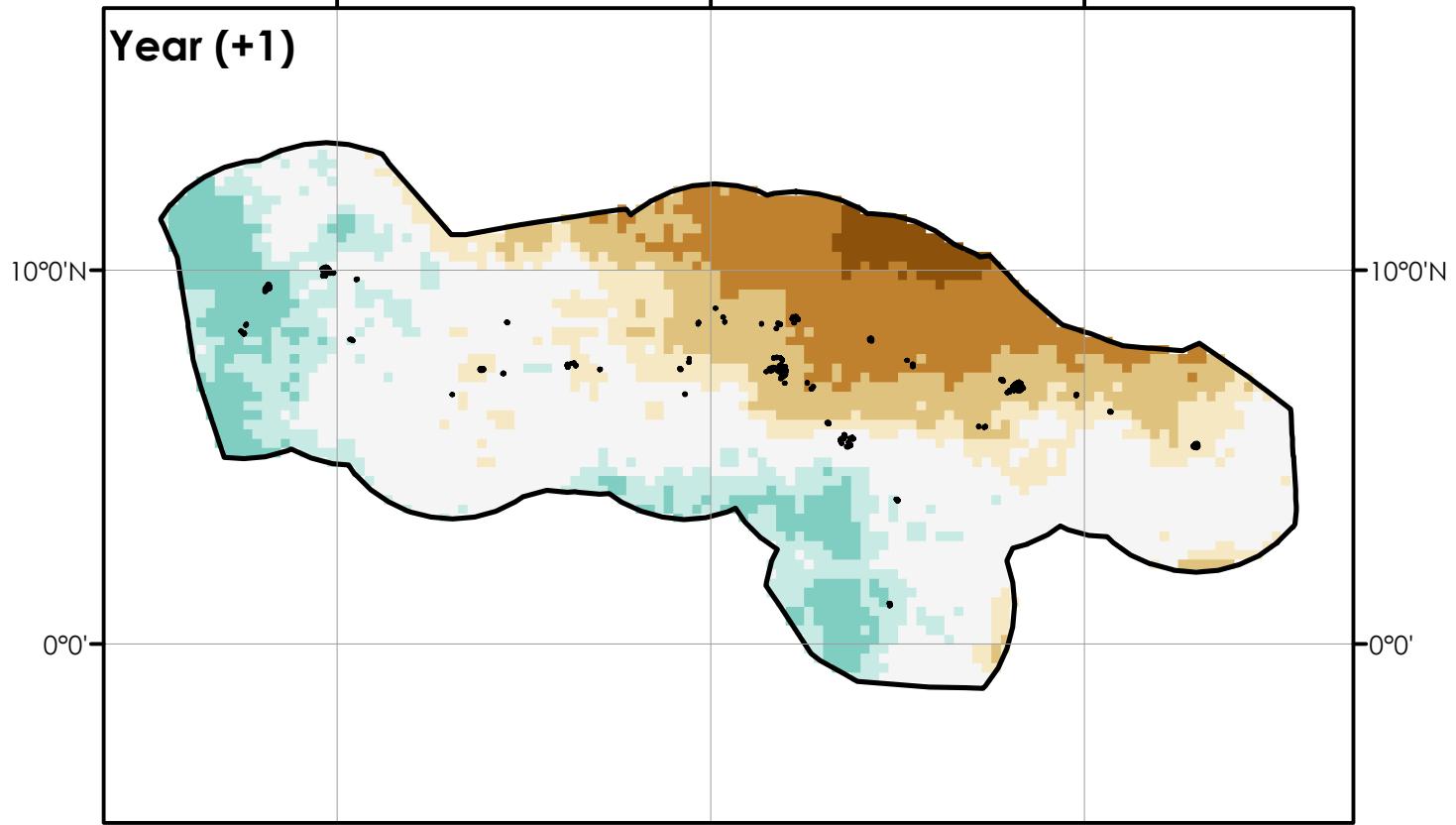
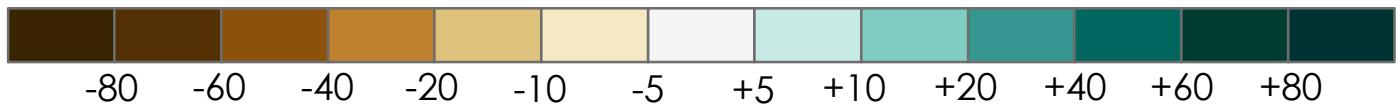
Year (0)**Federated States of Micronesia****Year (+1)****Precipitation Change (%)**

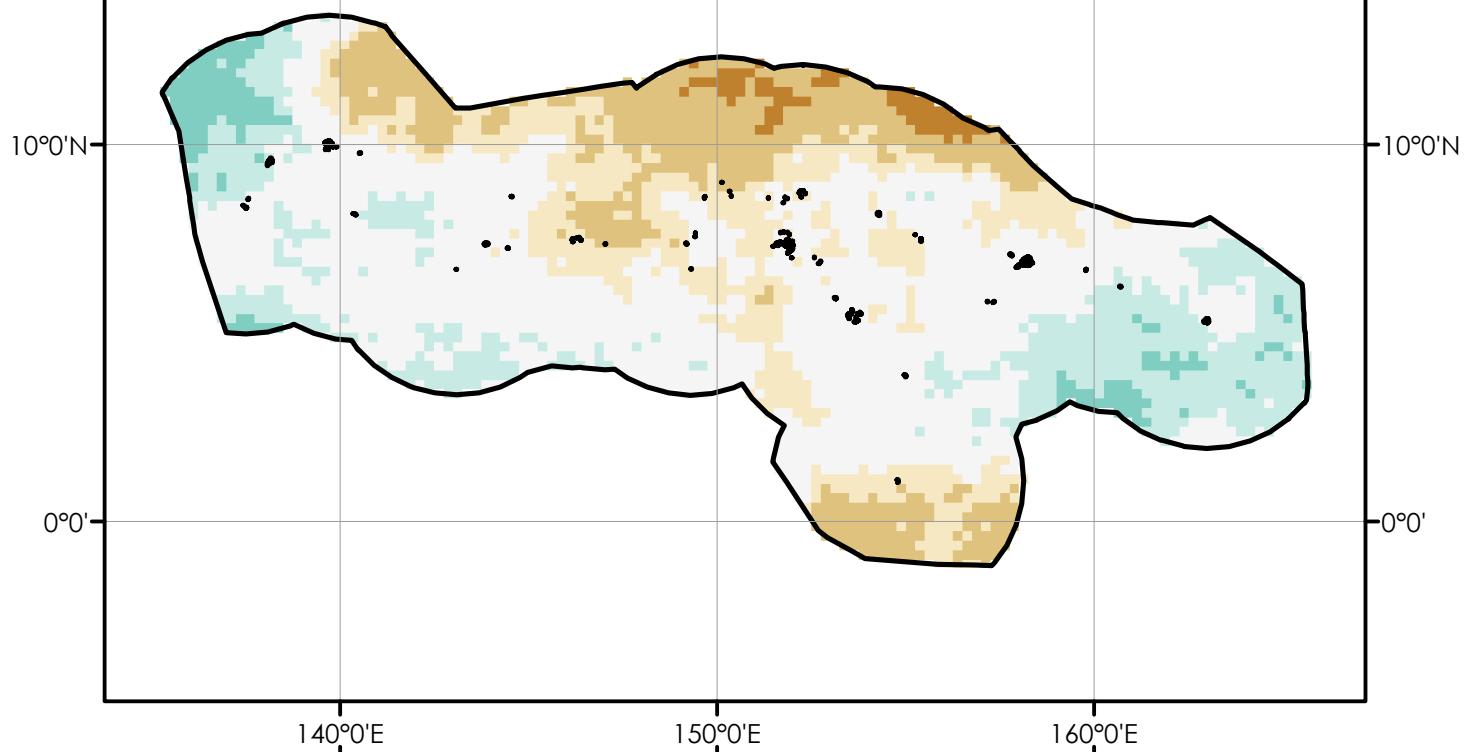
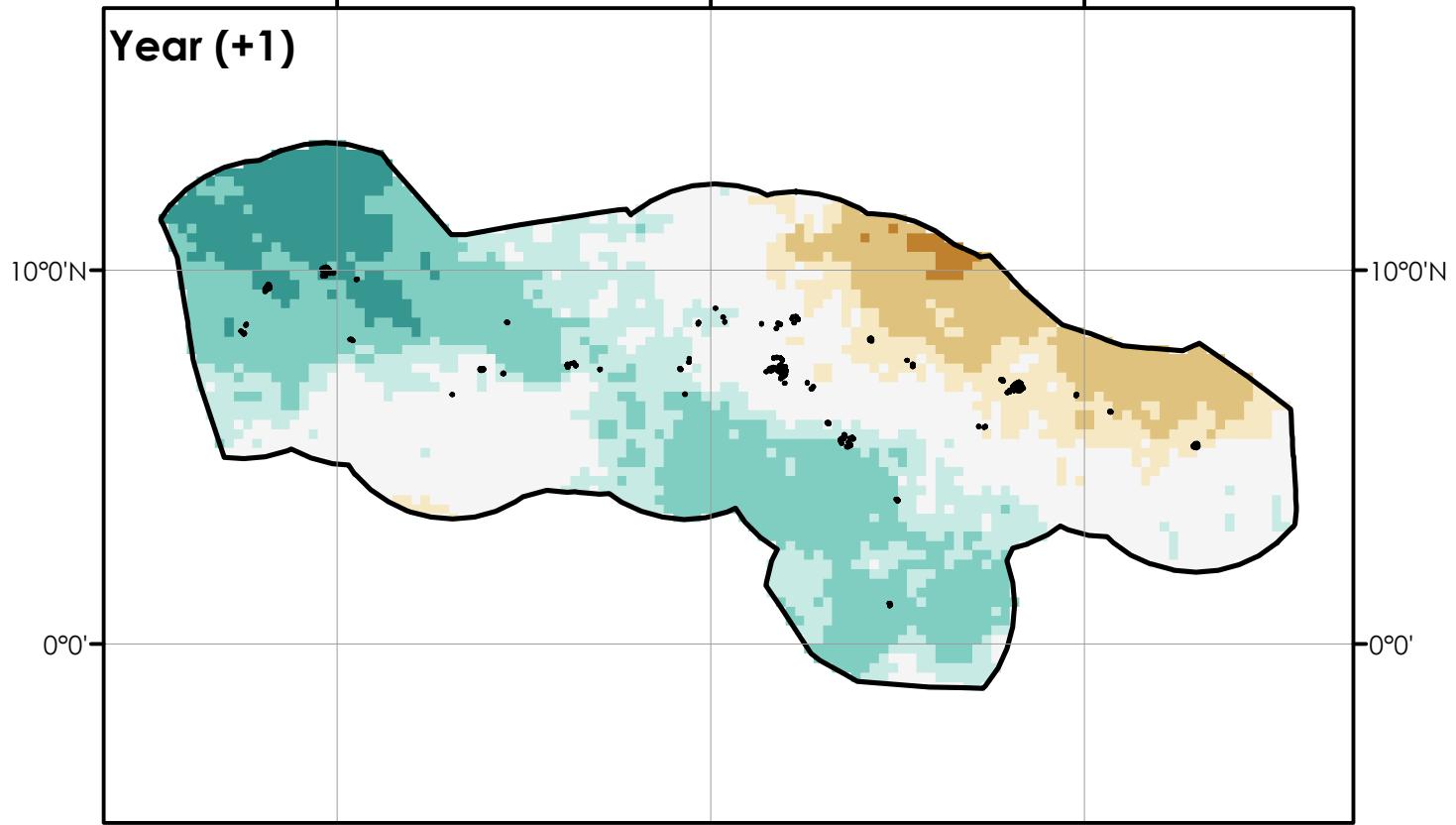
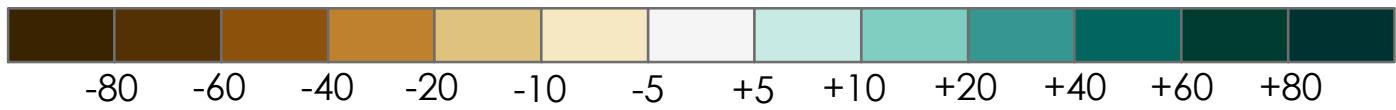
Year (0)**Federated States of Micronesia****Year (+1)****Precipitation Change (%)**

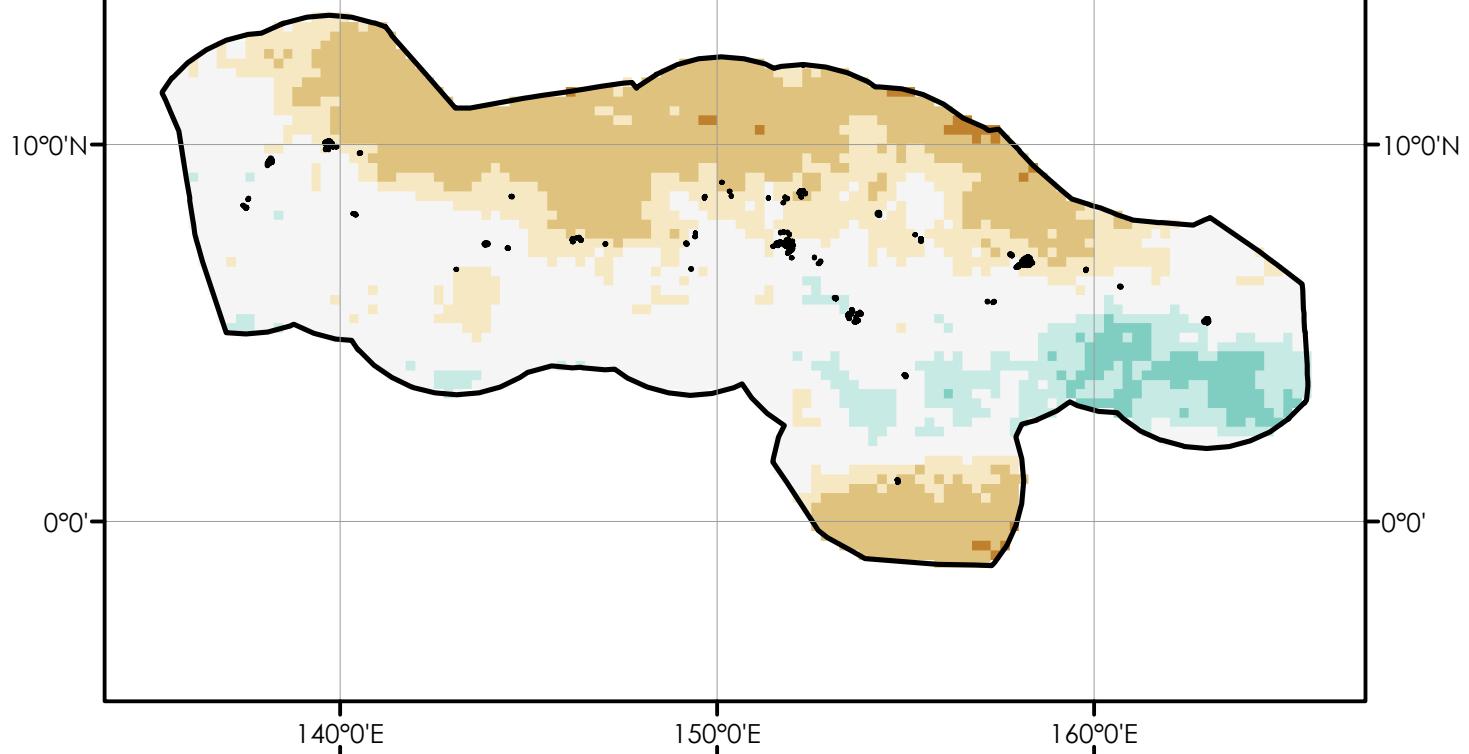
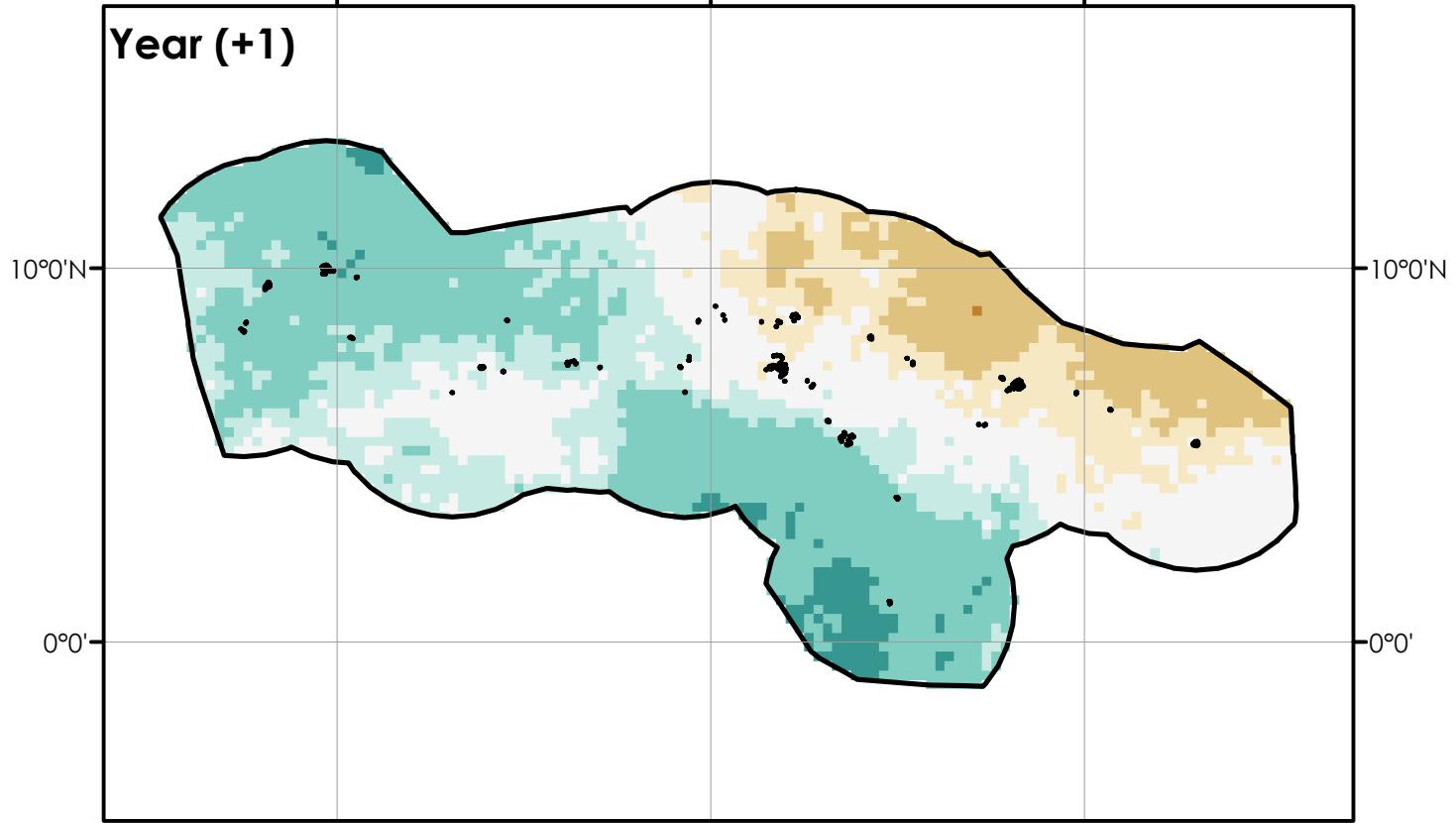
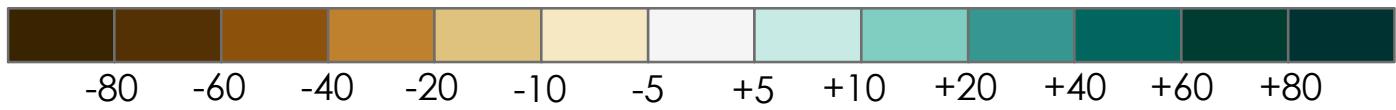
Year (0)**Federated States of Micronesia****Year (+1)****Precipitation Change (%)**

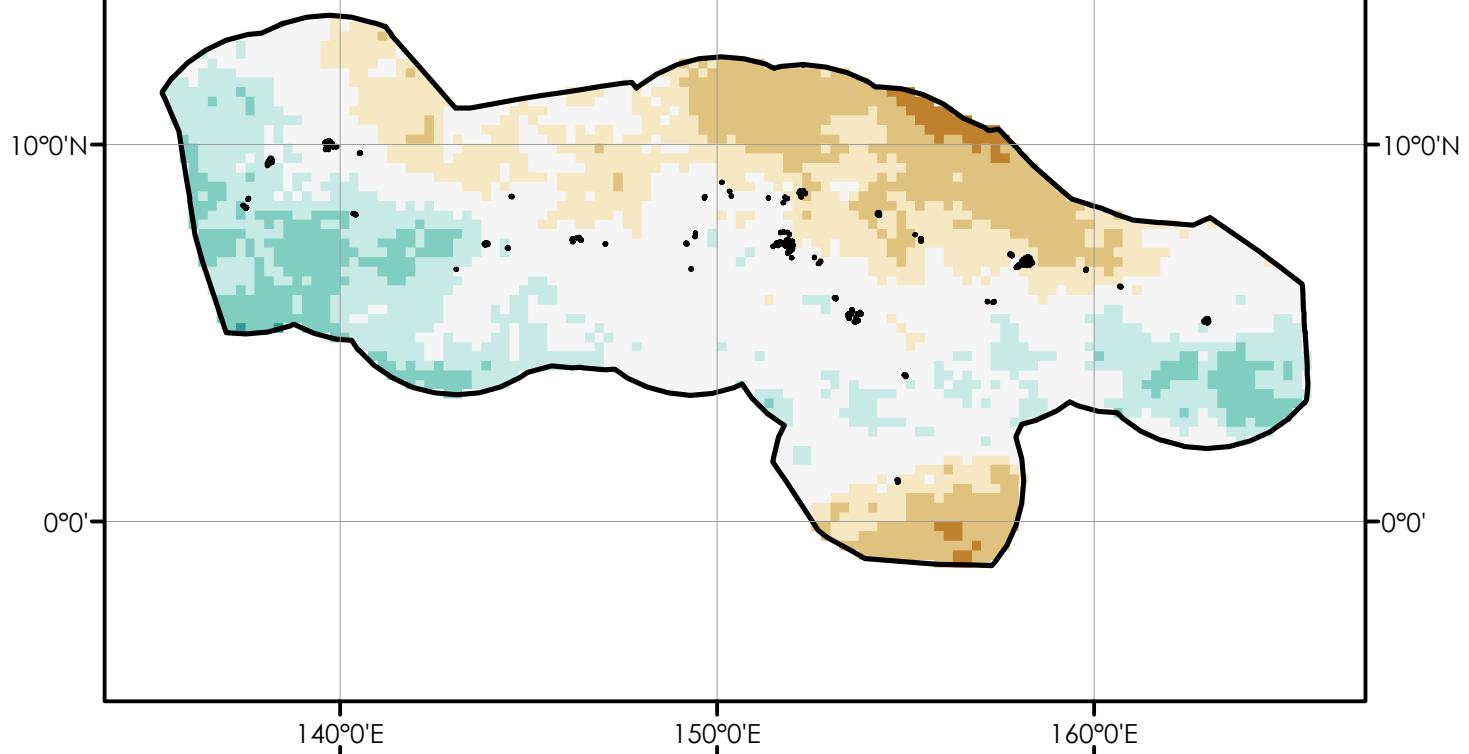
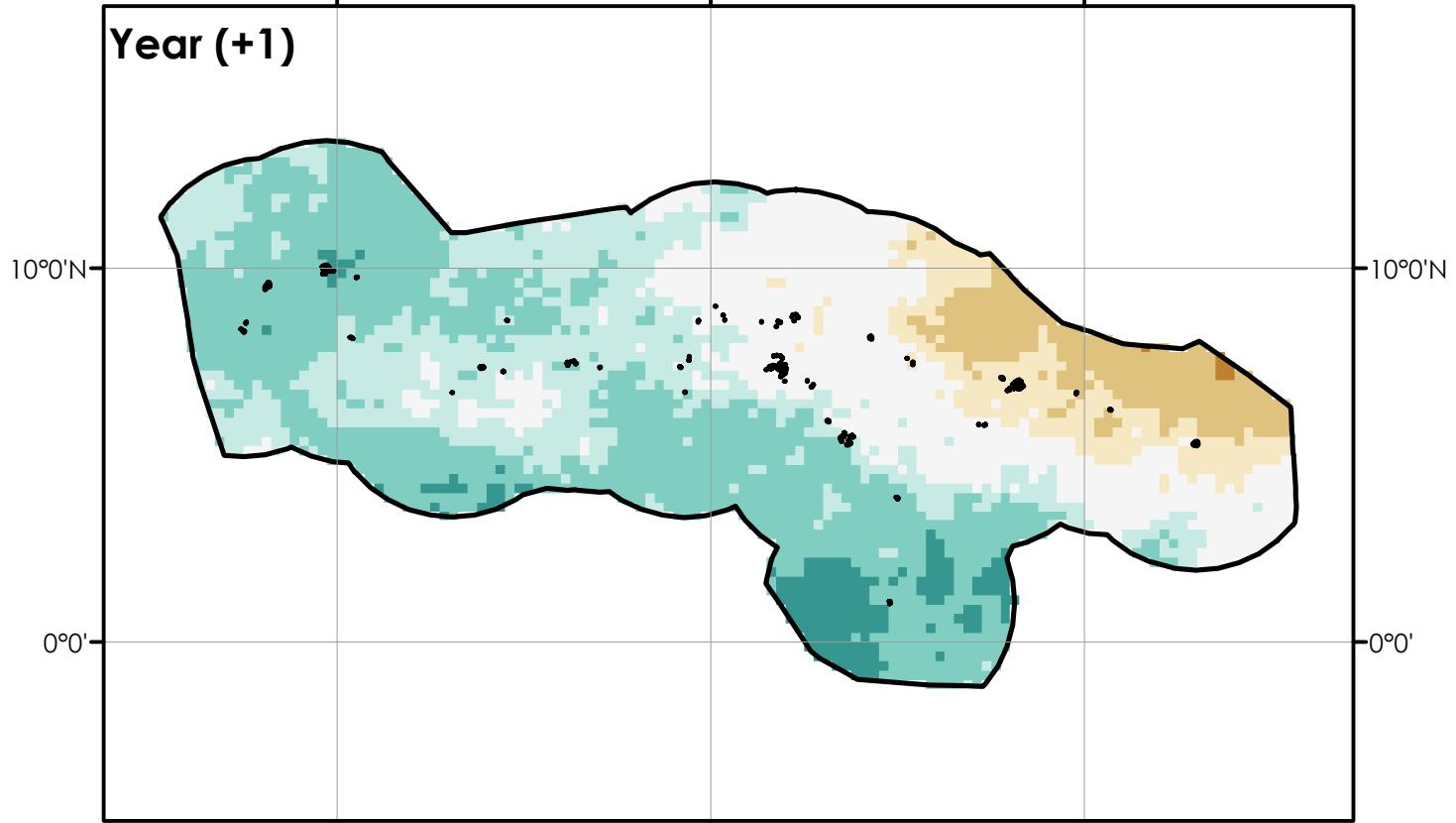
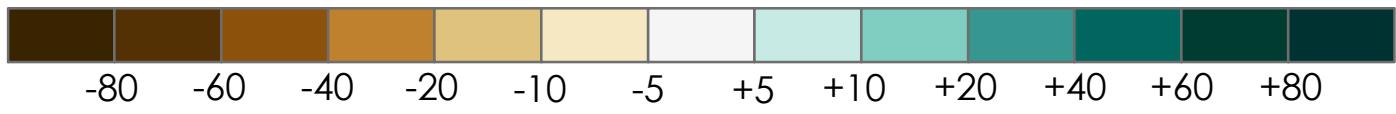
Year (0)**Federated States of Micronesia****Year (+1)****Precipitation Change (%)**

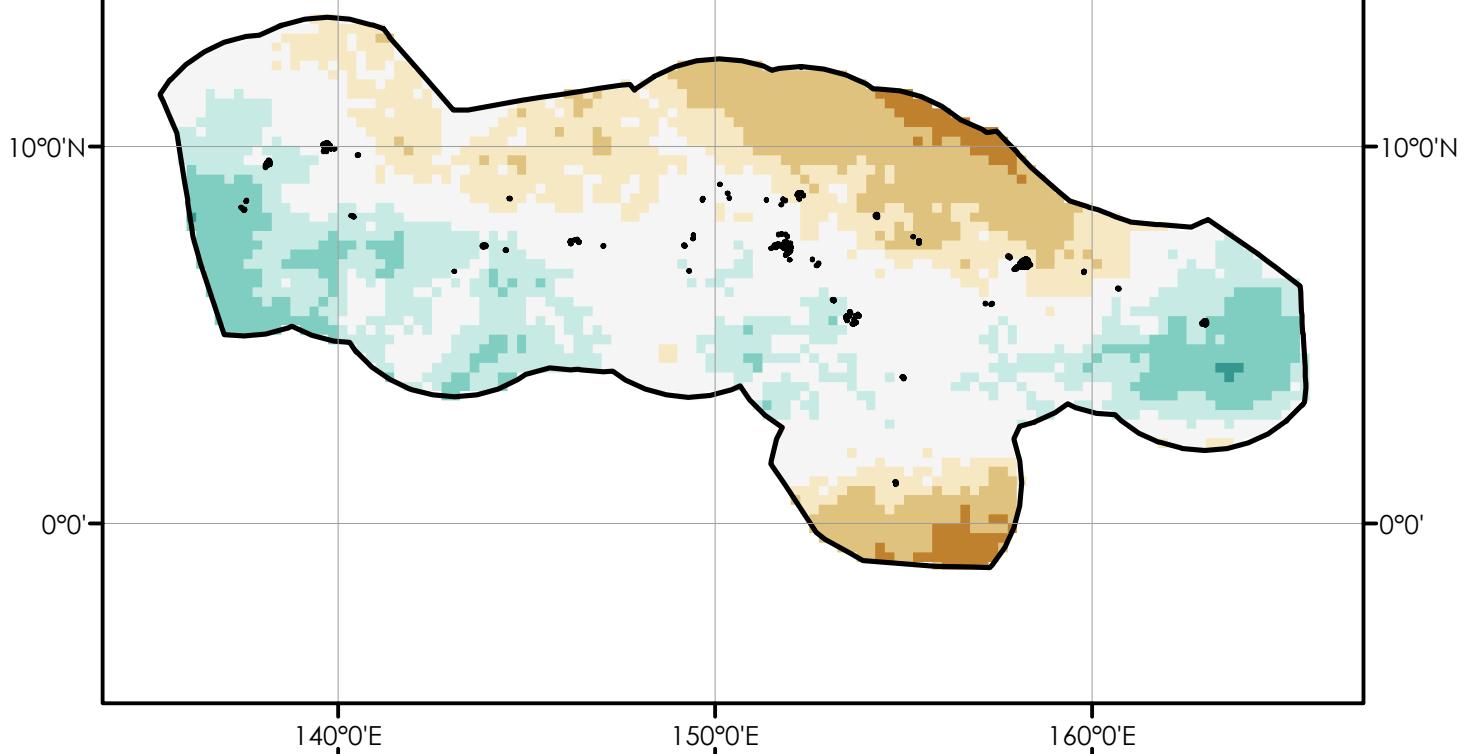
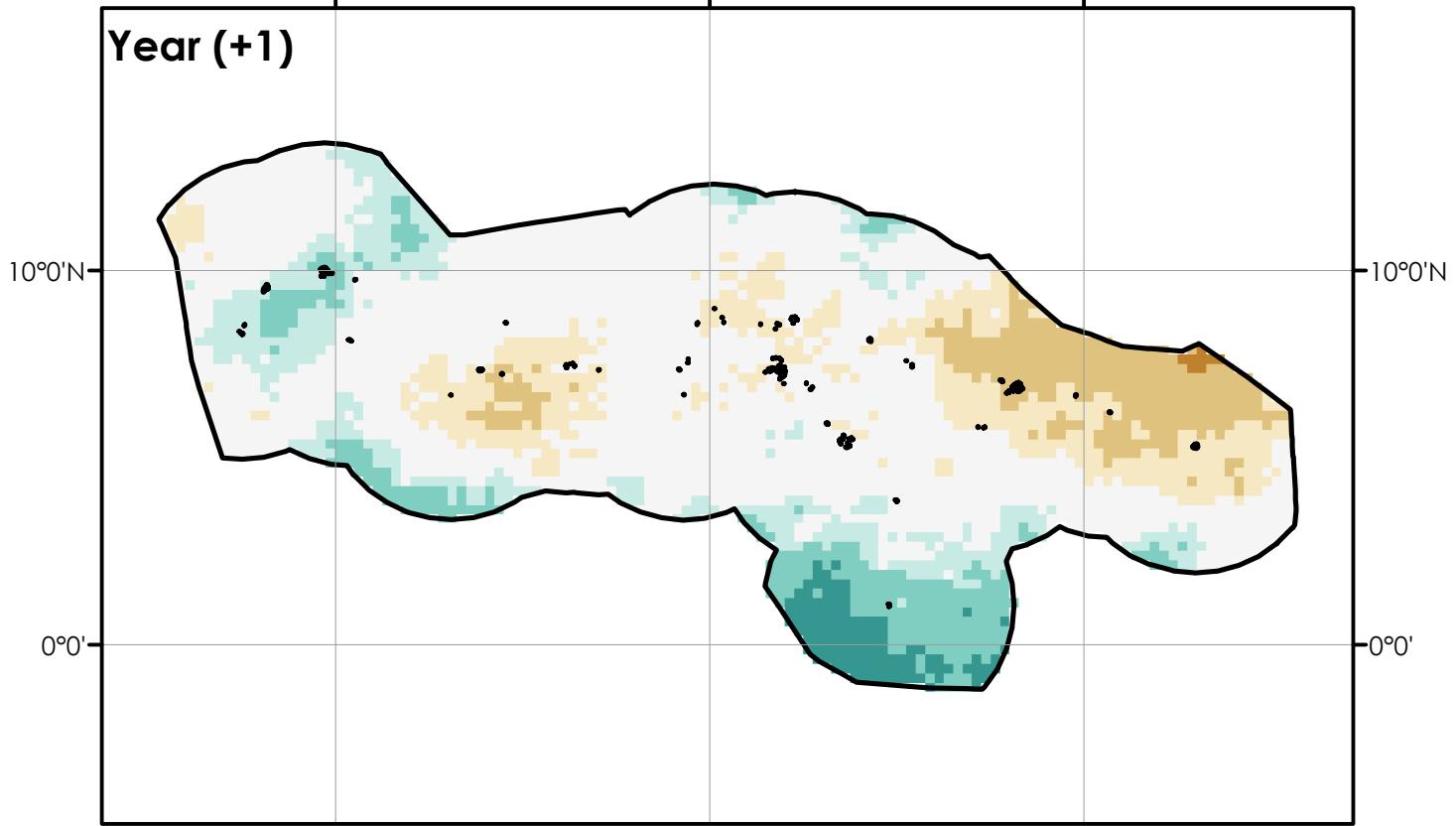
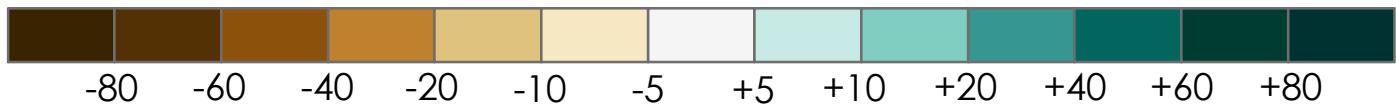
Year (0)**Federated States of Micronesia****Year (+1)****Precipitation Change (%)**

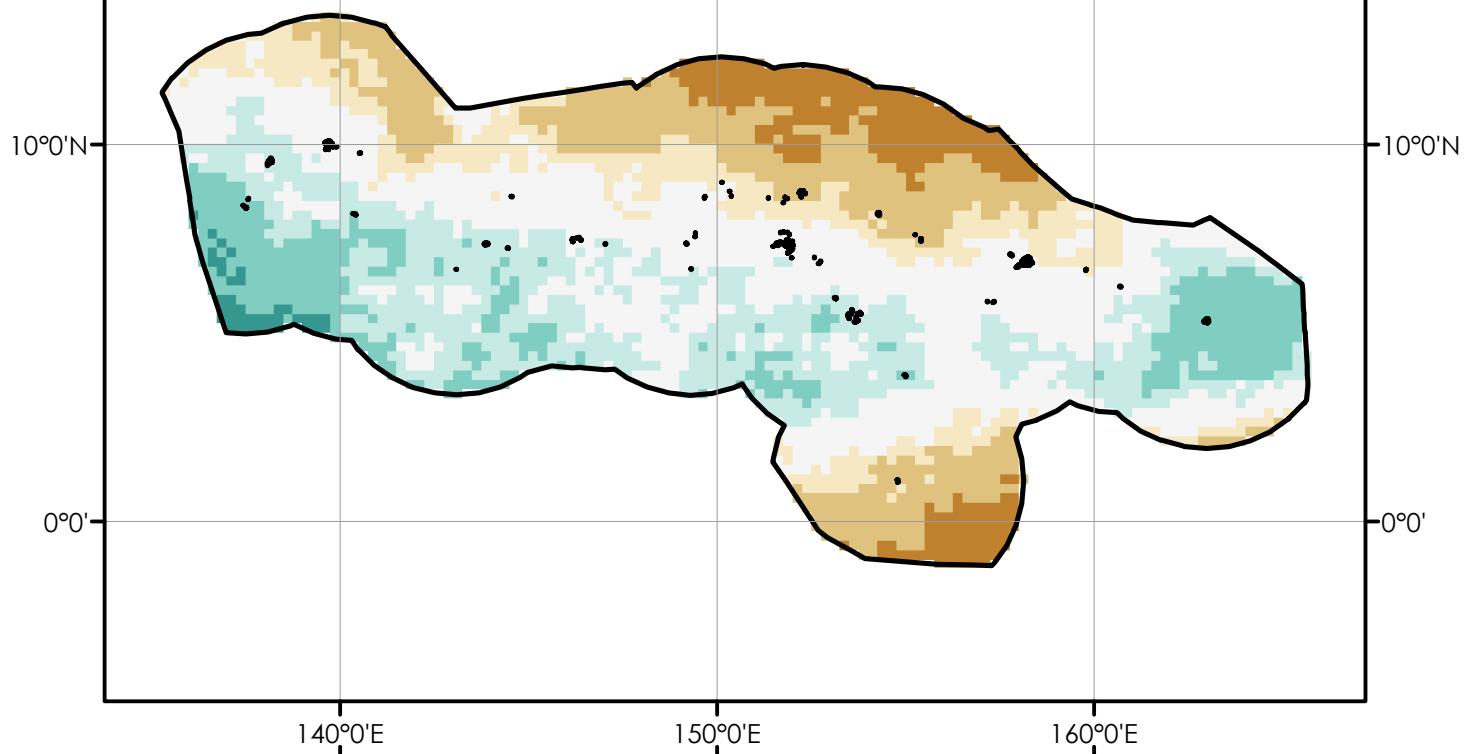
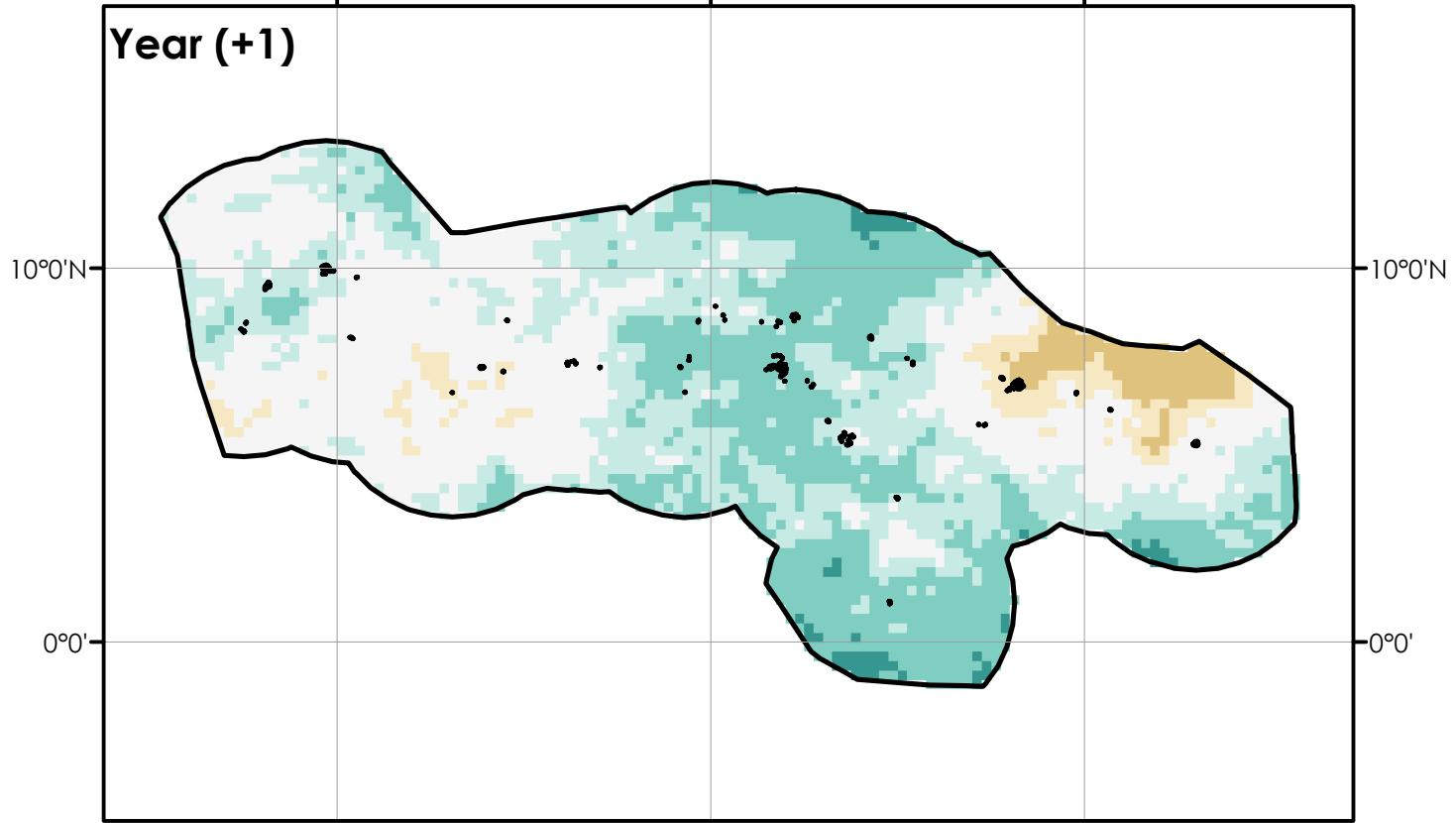
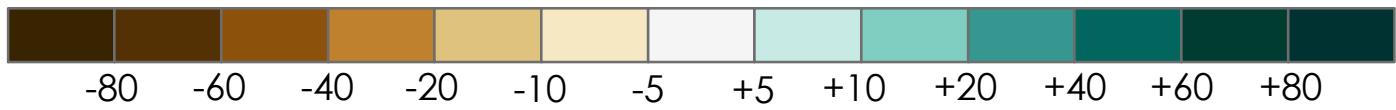
Year (0)**Federated States of Micronesia****Year (+1)****Precipitation Change (%)**

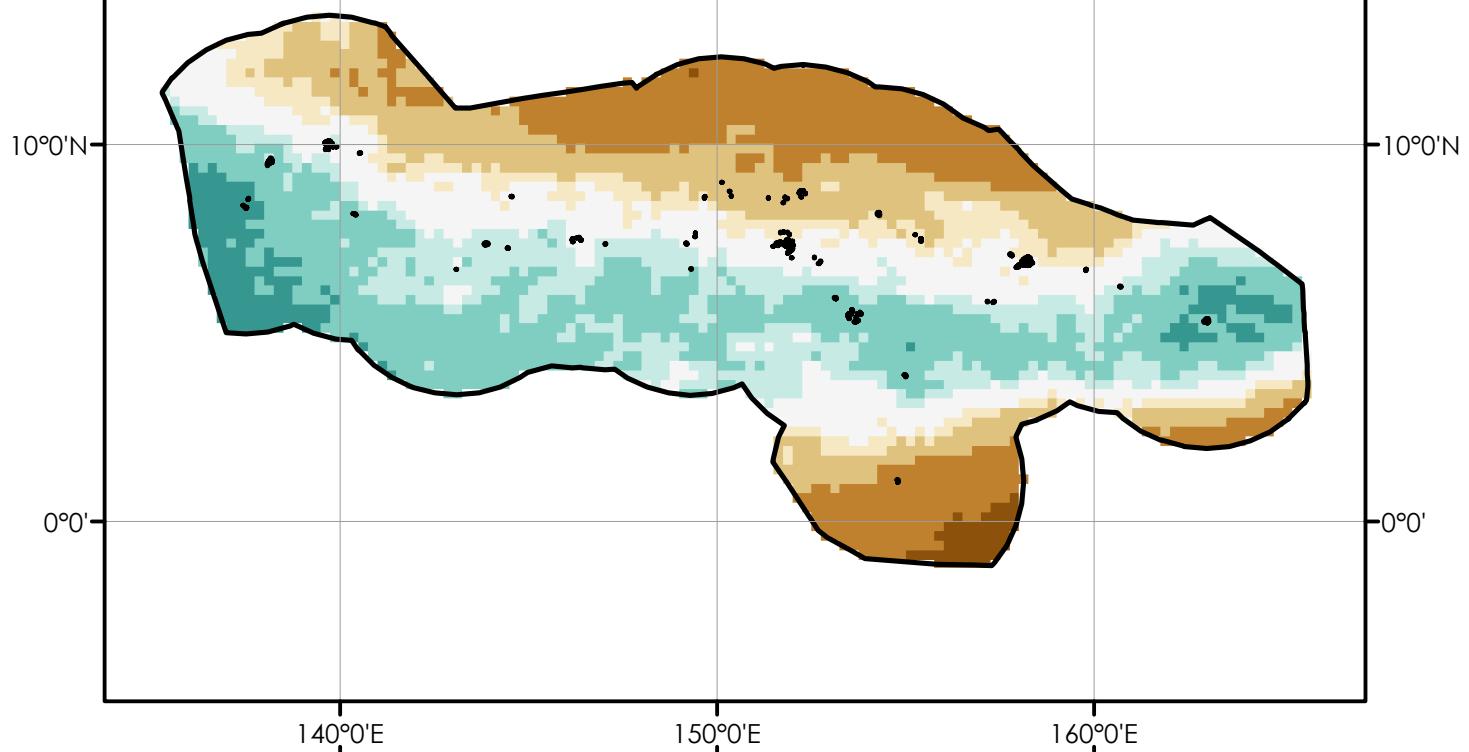
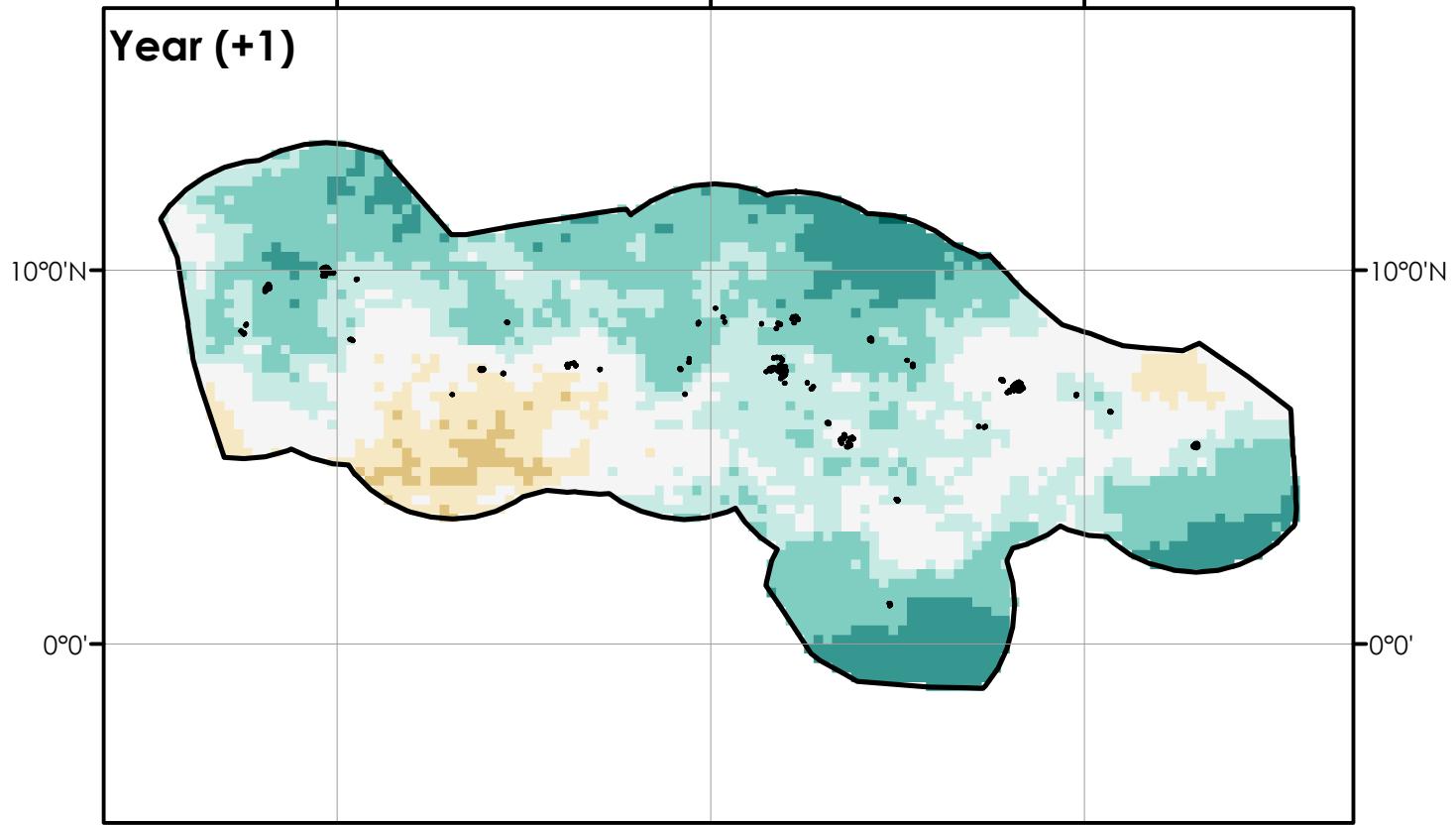
Year (0)**Federated States of Micronesia****Year (+1)****Precipitation Change (%)**

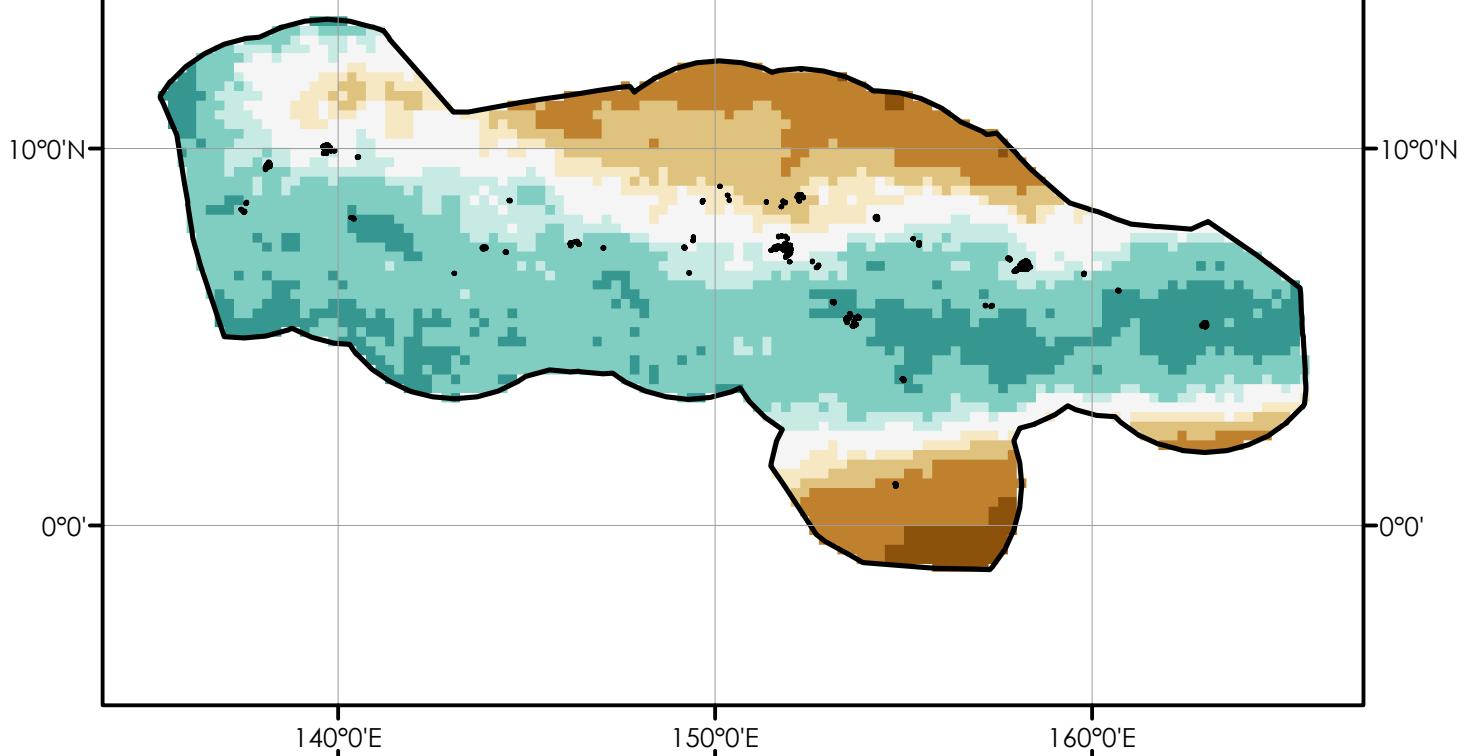
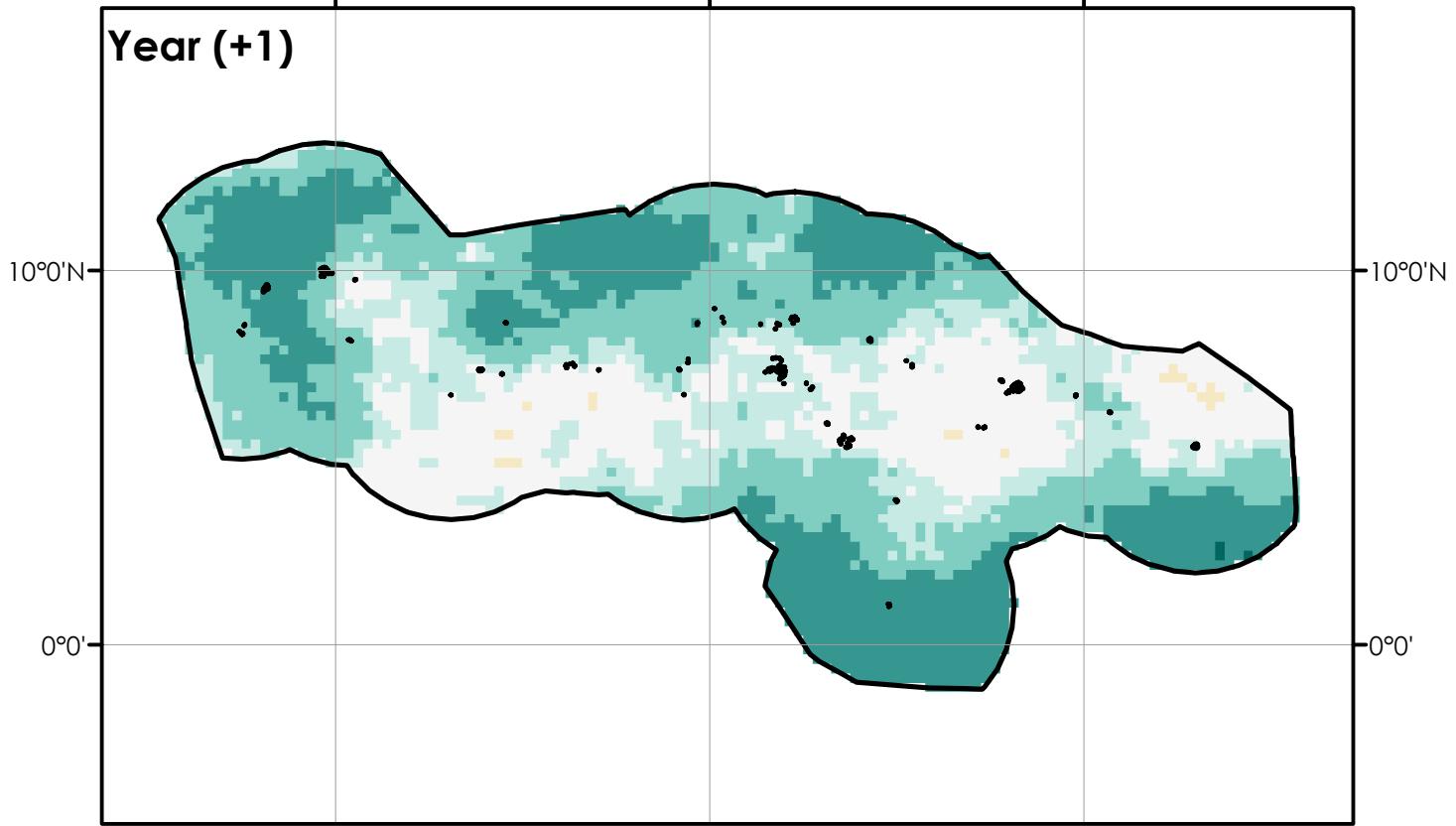
Year (0)**Federated States of Micronesia****Year (+1)****Precipitation Change (%)**

Year (0)**Federated States of Micronesia****Year (+1)****Precipitation Change (%)**

Year (0)**Federated States of Micronesia****Year (+1)****Precipitation Change (%)**

Year (0)**Federated States of Micronesia****Year (+1)****Precipitation Change (%)**

Year (0)**Federated States of Micronesia****Year (+1)****Precipitation Change (%)**

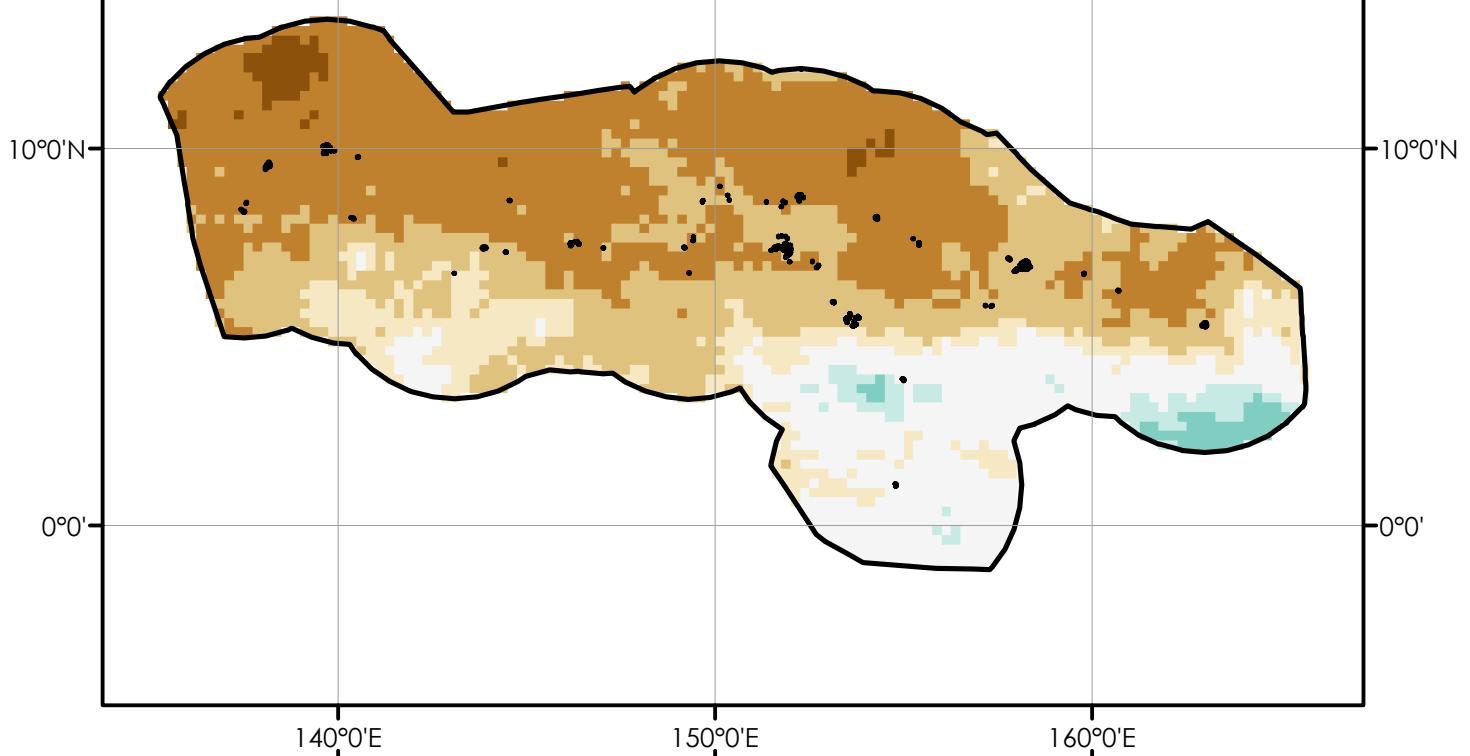
Year (0)**Federated States of Micronesia****Year (+1)****Precipitation Change (%)**

Moderate - Strong La Niña for DJF

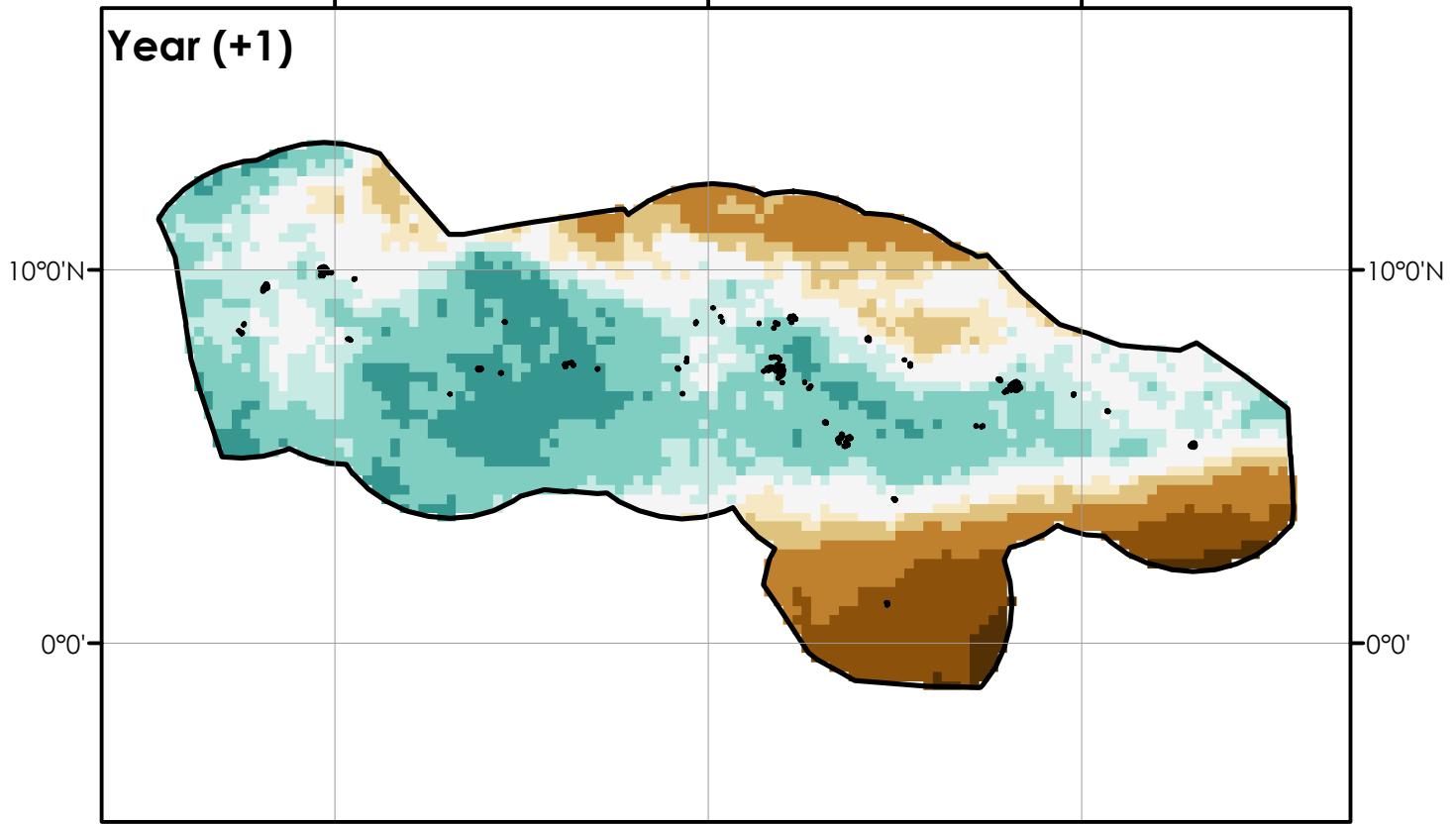
260

Year (0)

Federated States of Micronesia

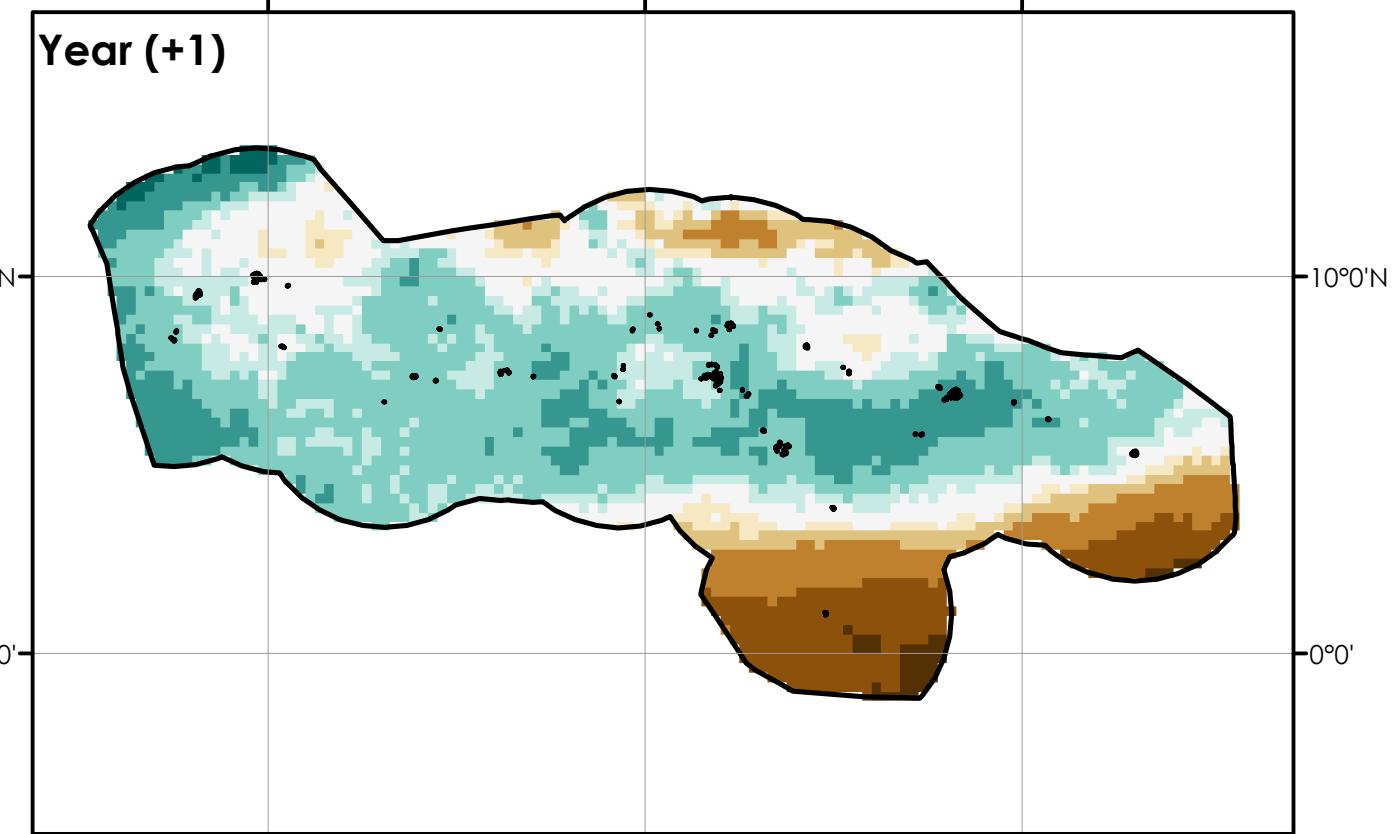
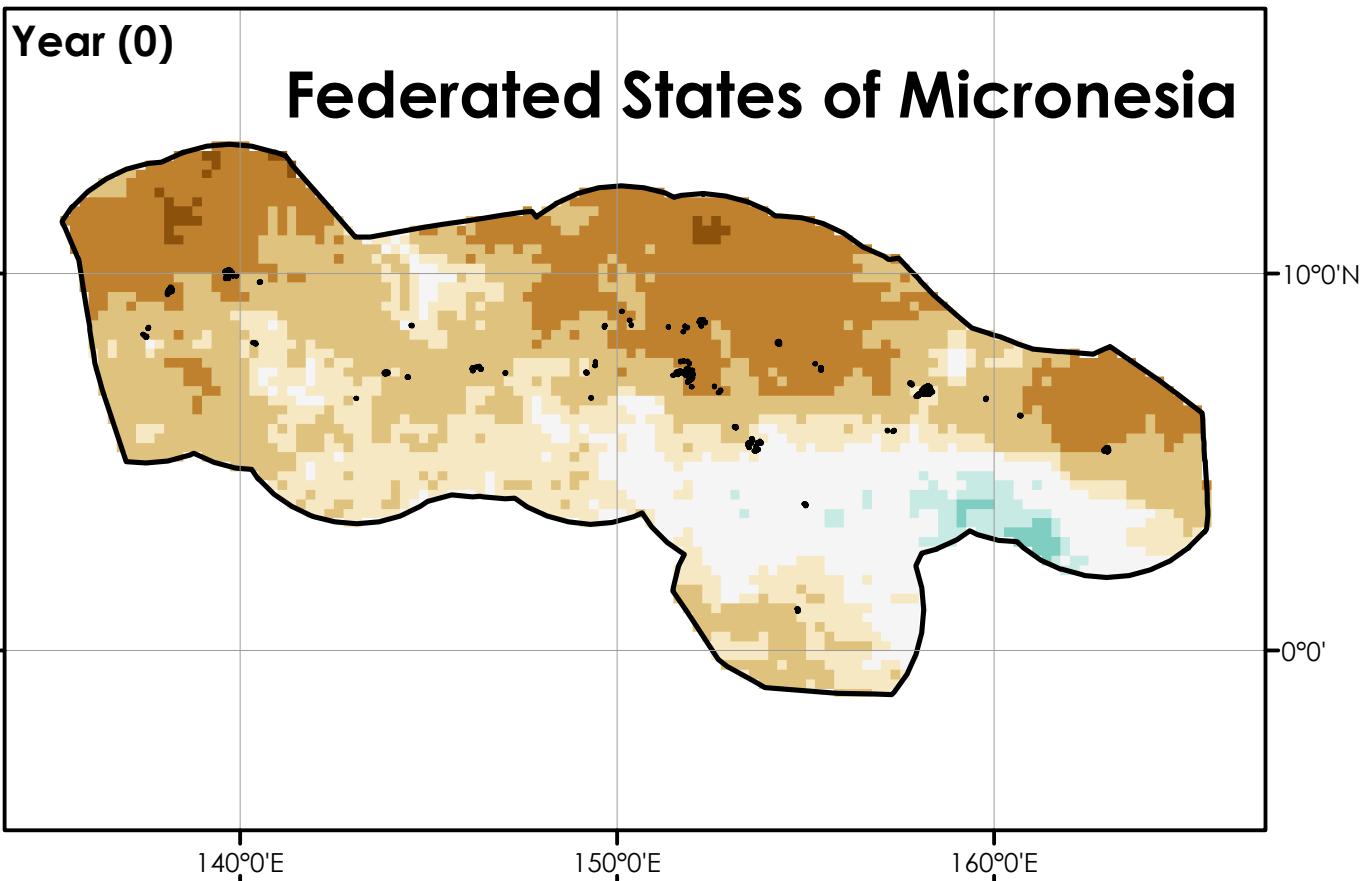


Year (+1)

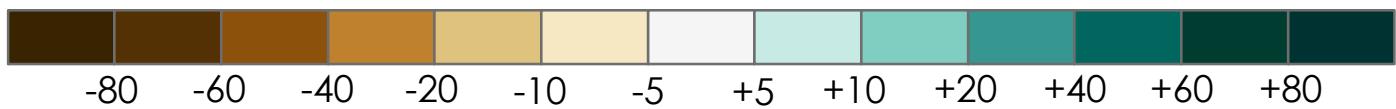


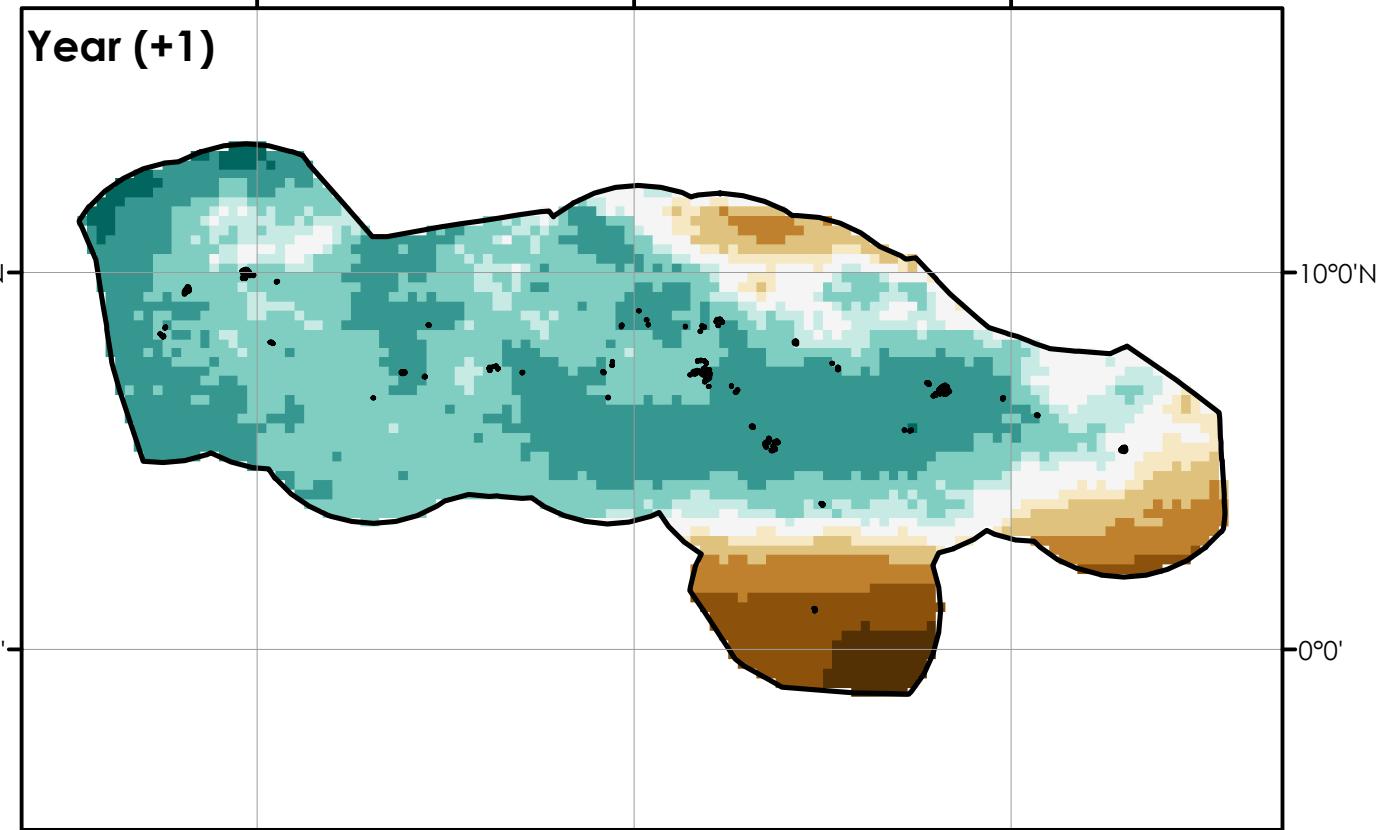
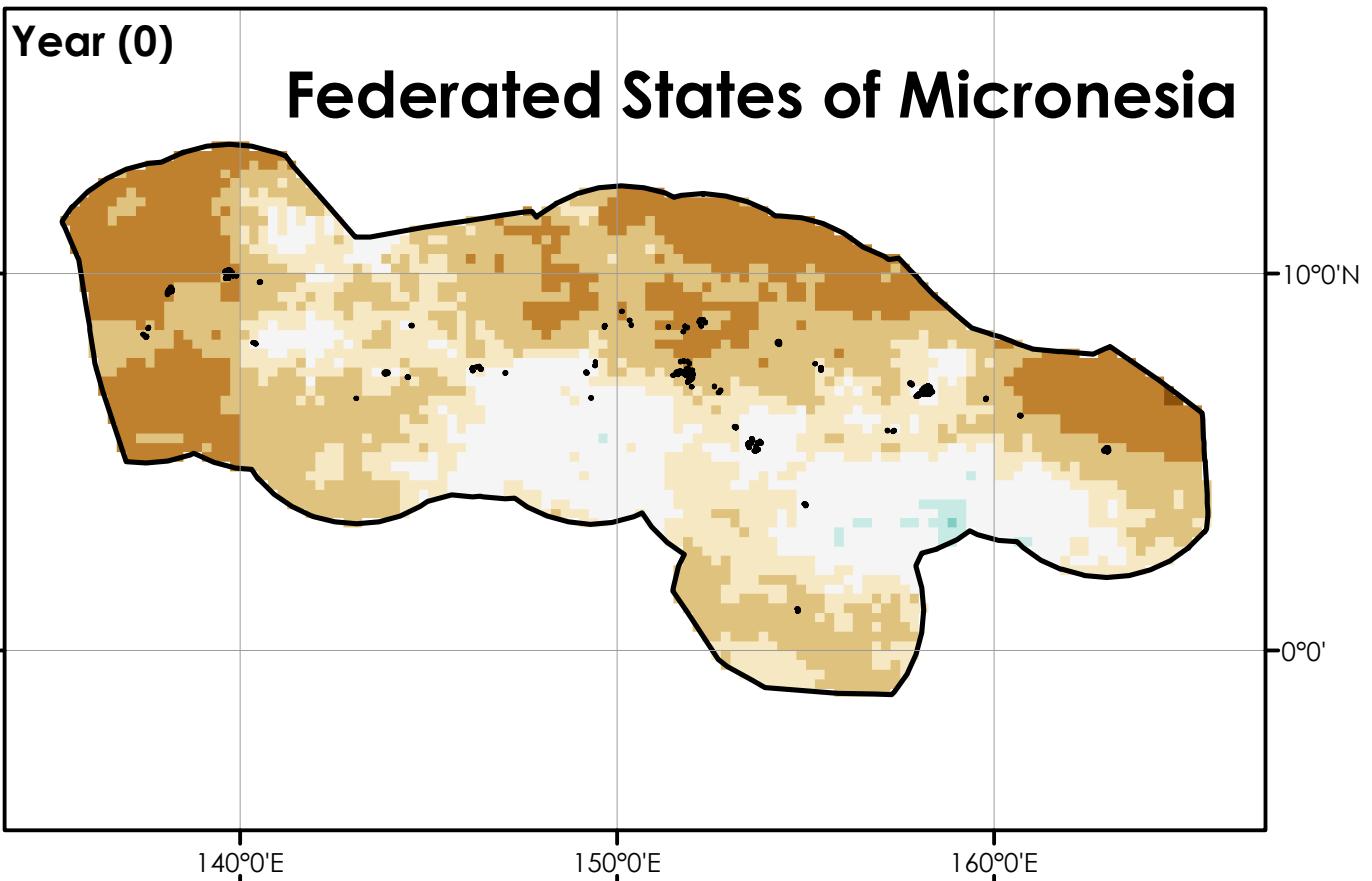
Precipitation Change (%)





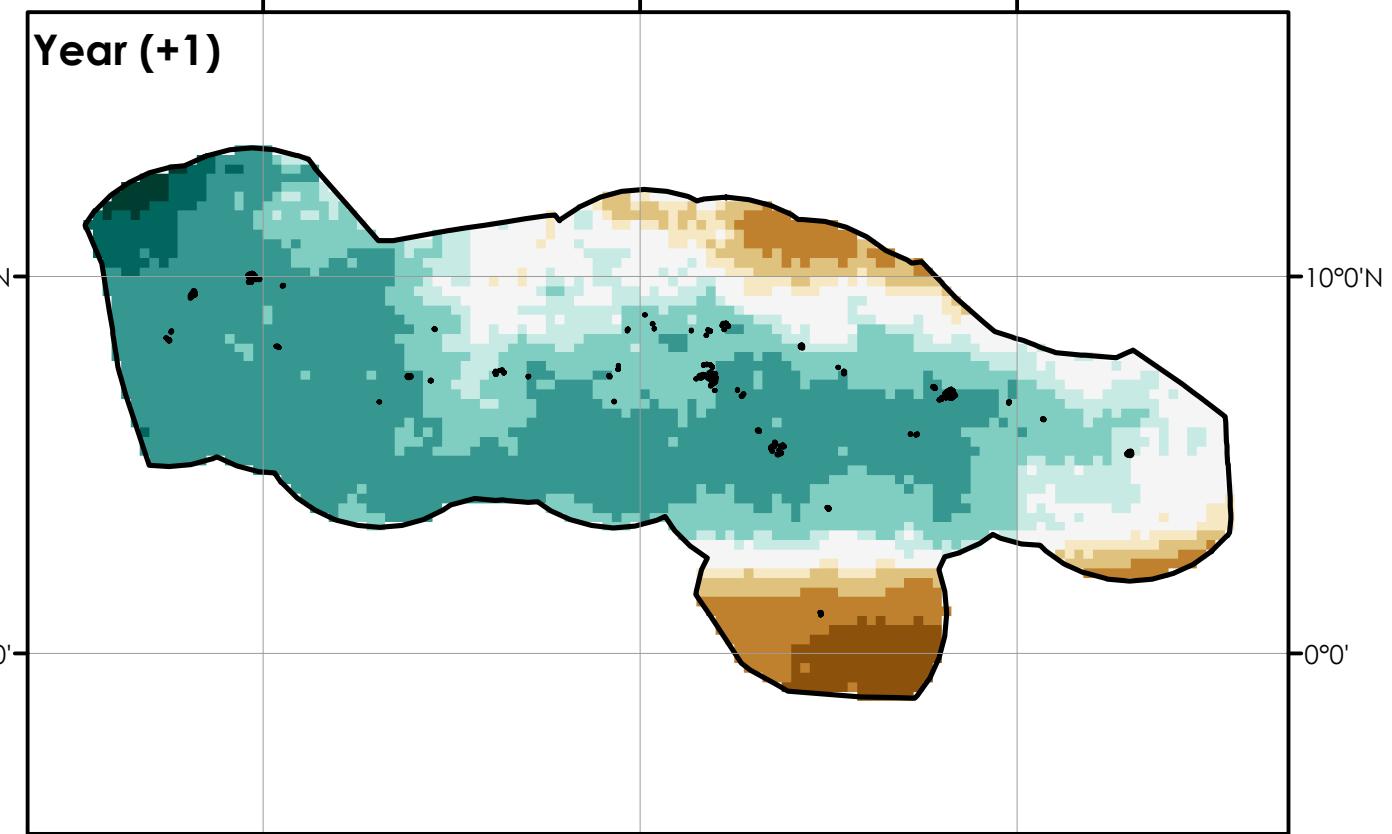
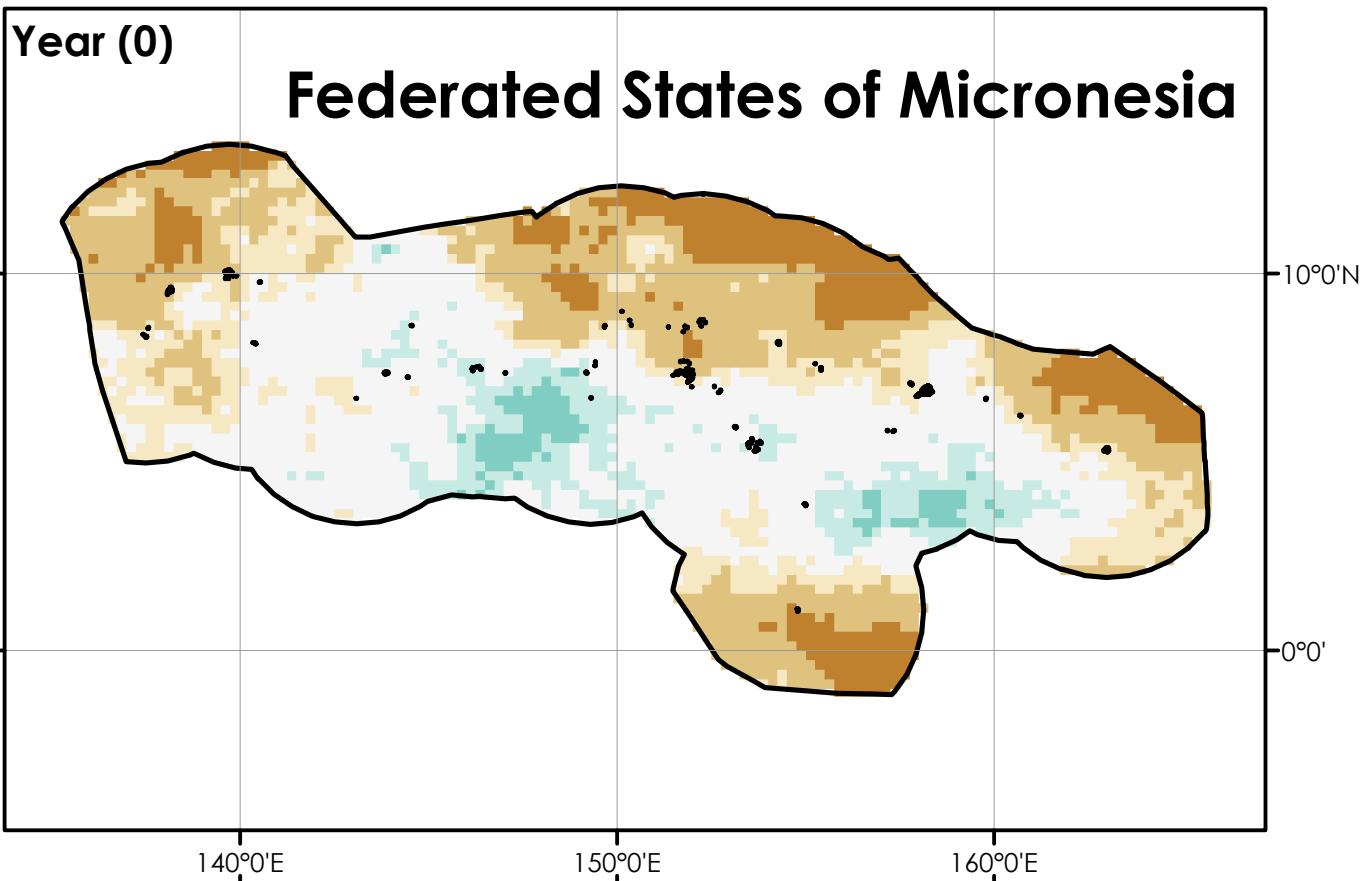
Precipitation Change (%)





Precipitation Change (%)

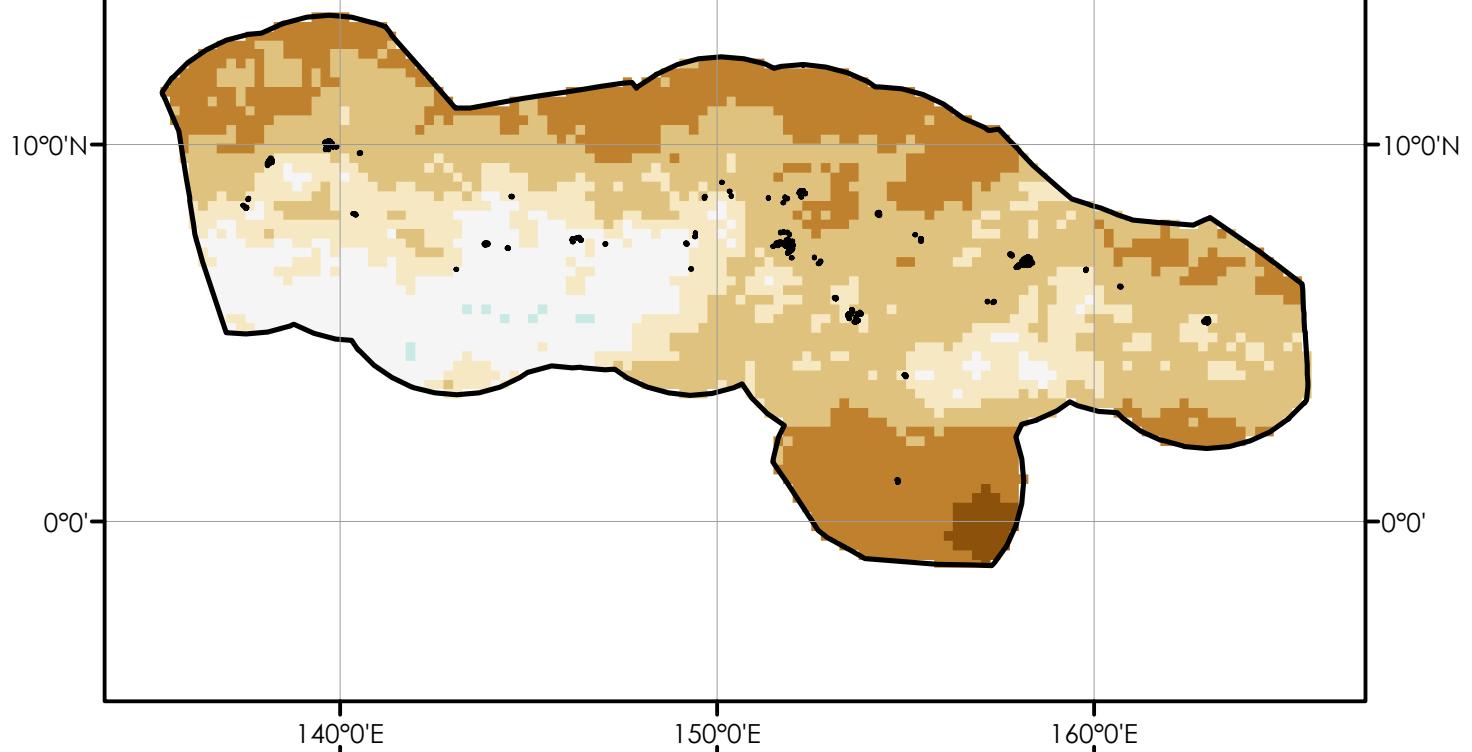




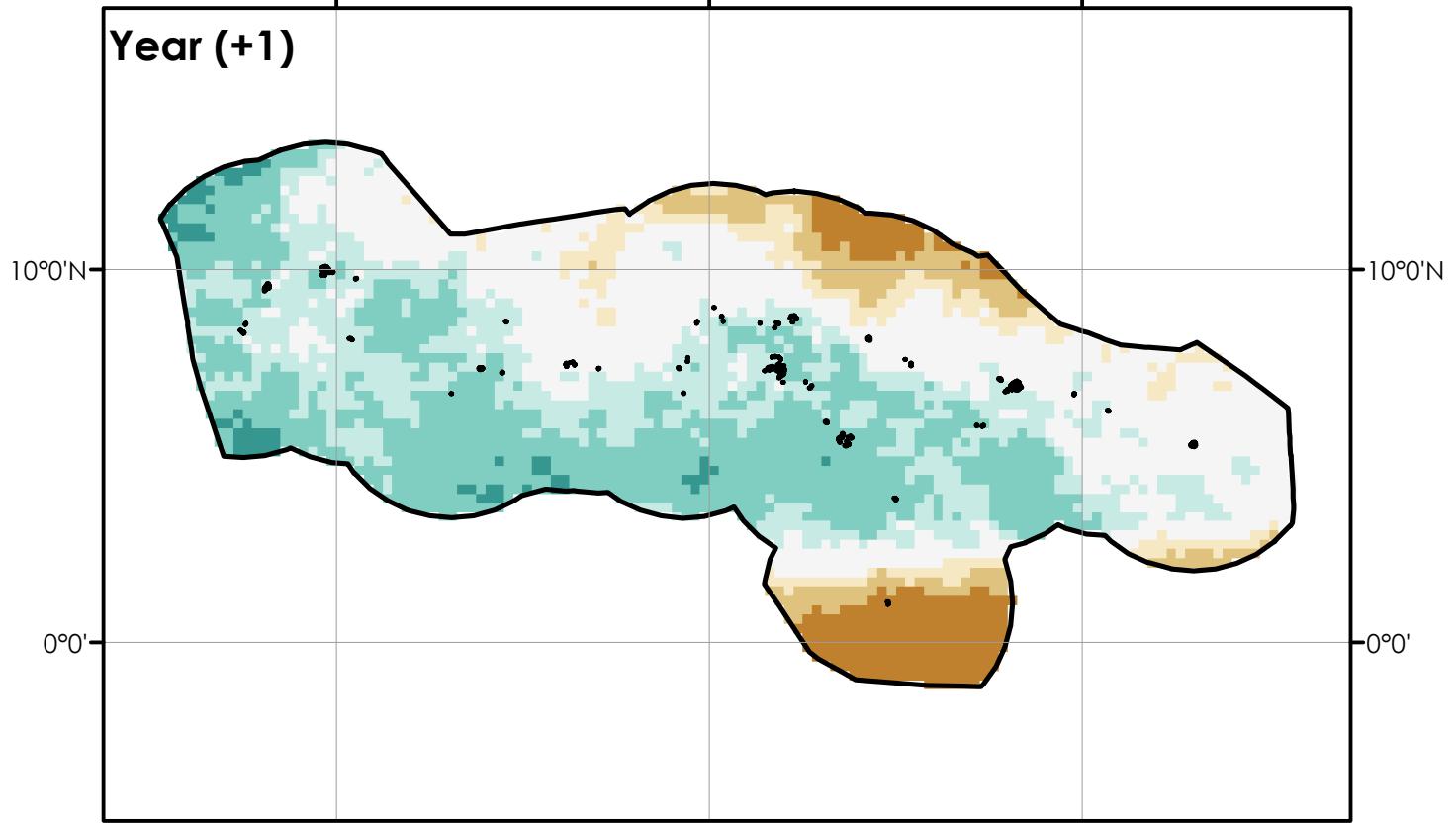
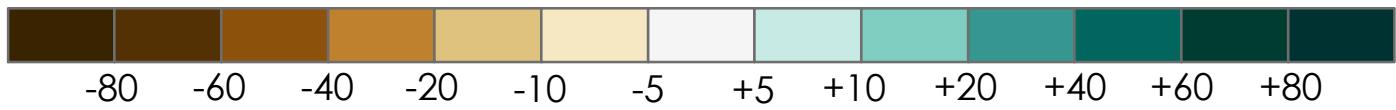
Precipitation Change (%)

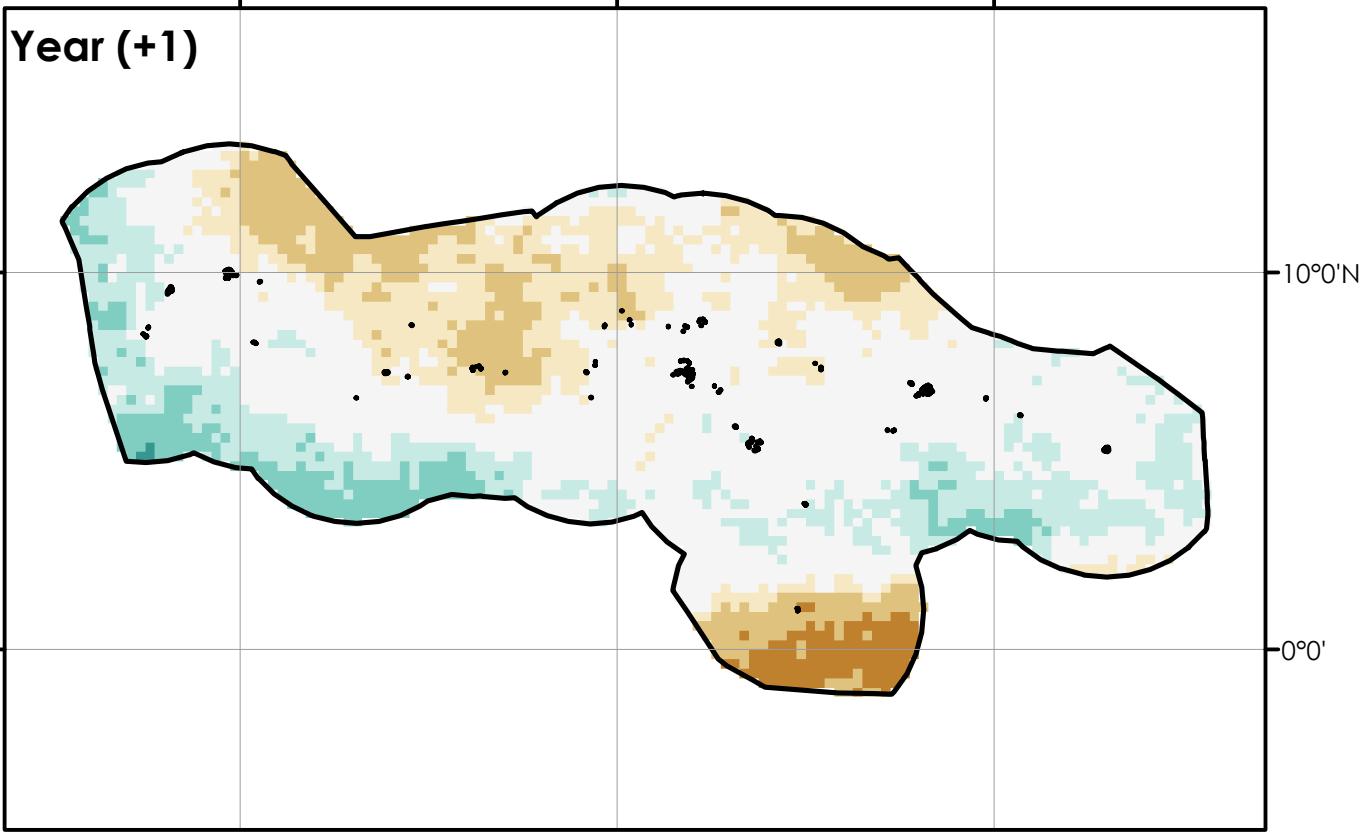
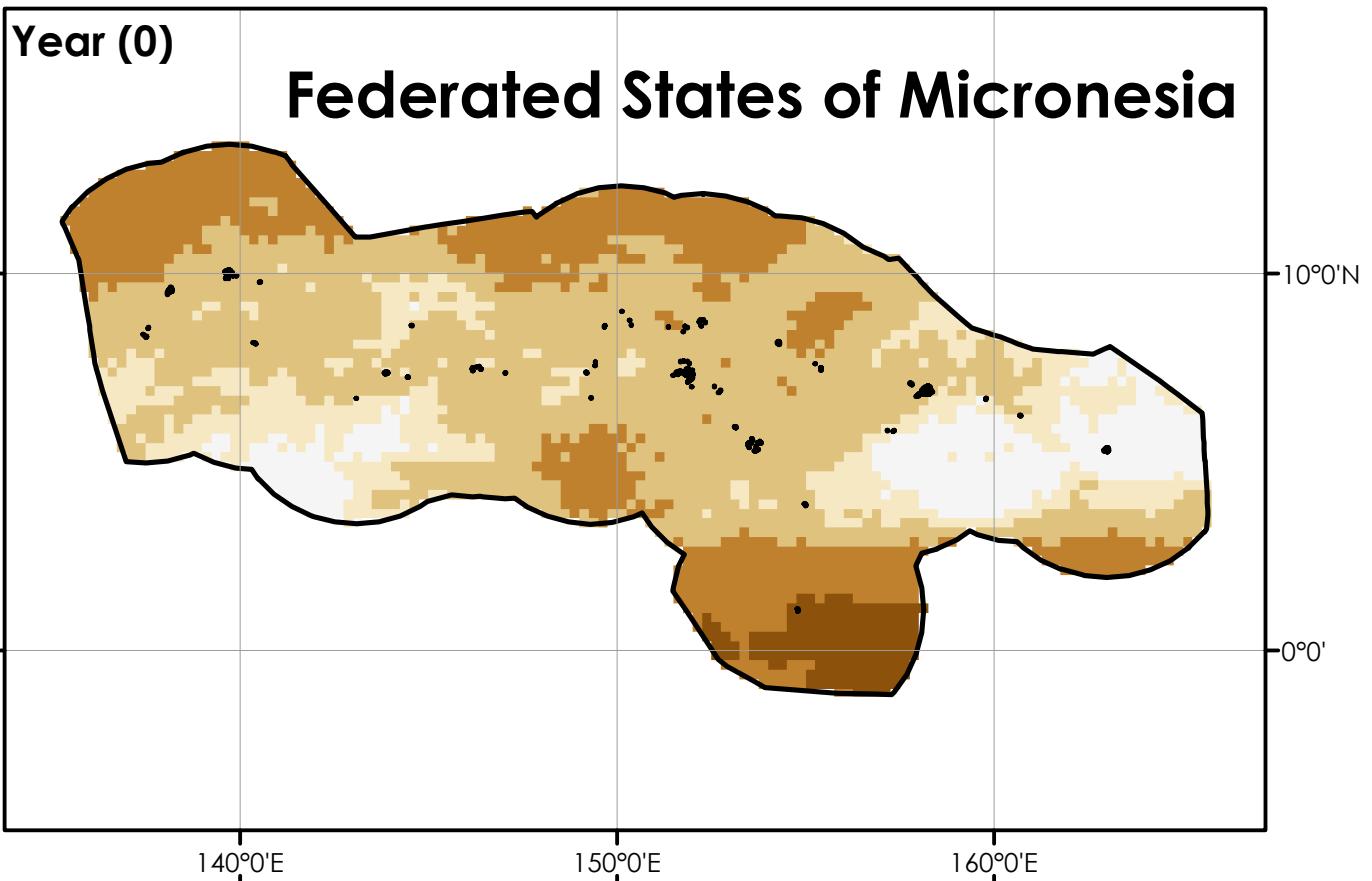


Year (0)

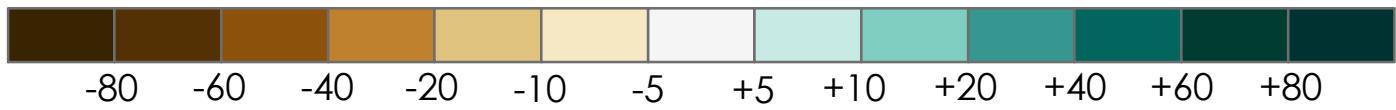
Federated States of Micronesia

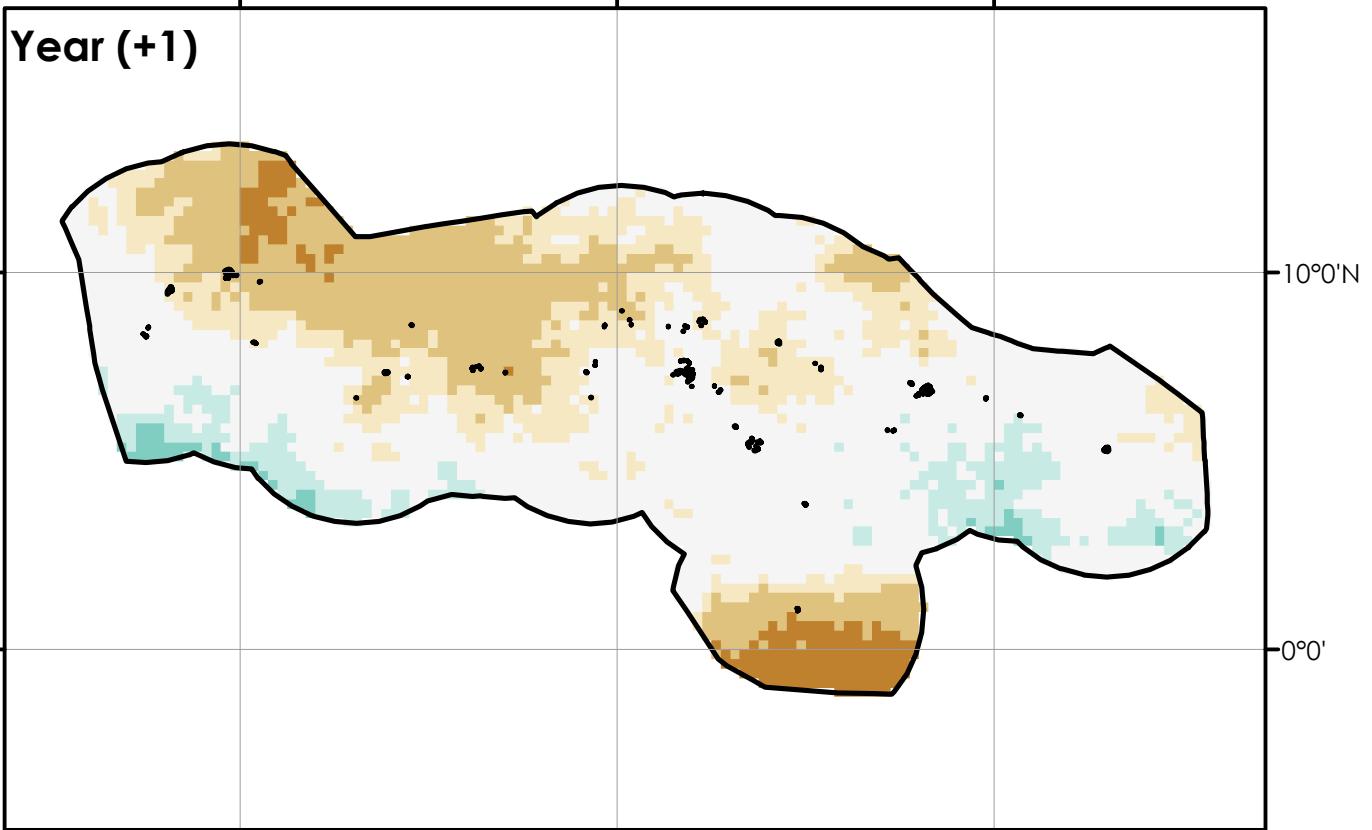
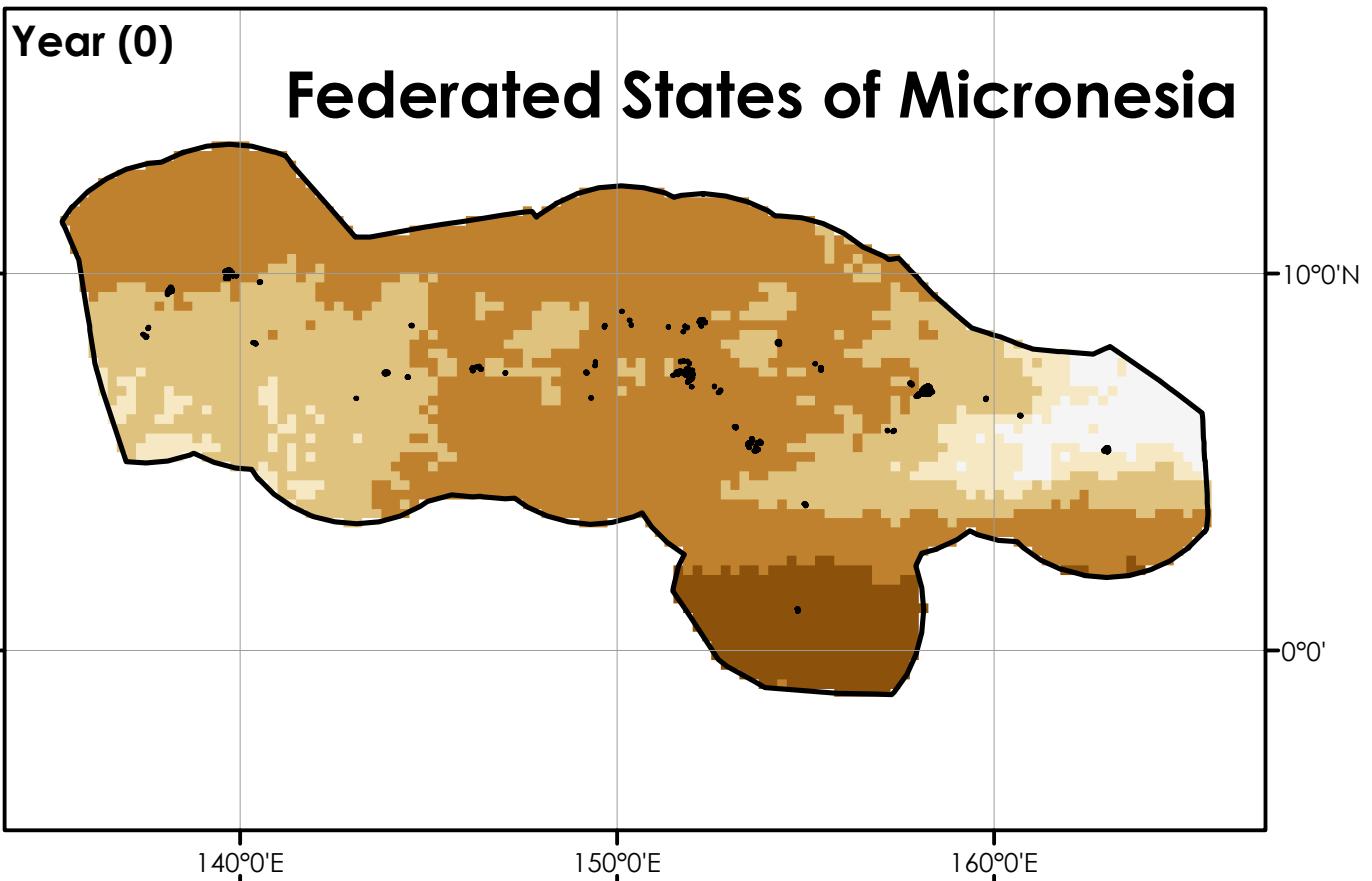
Year (+1)

**Precipitation Change (%)**

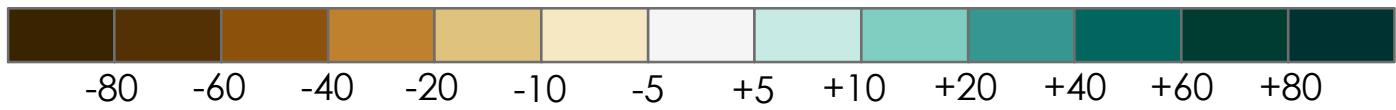


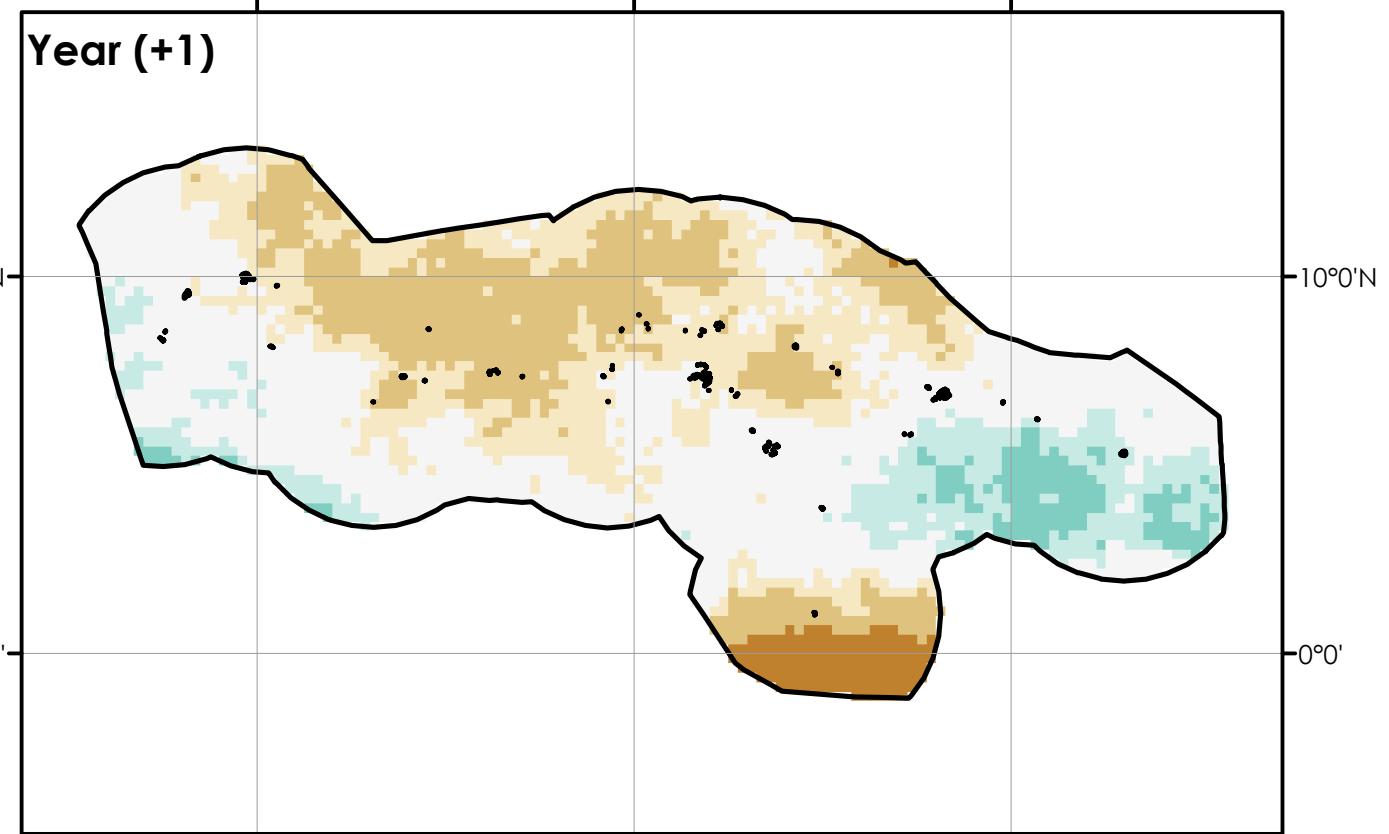
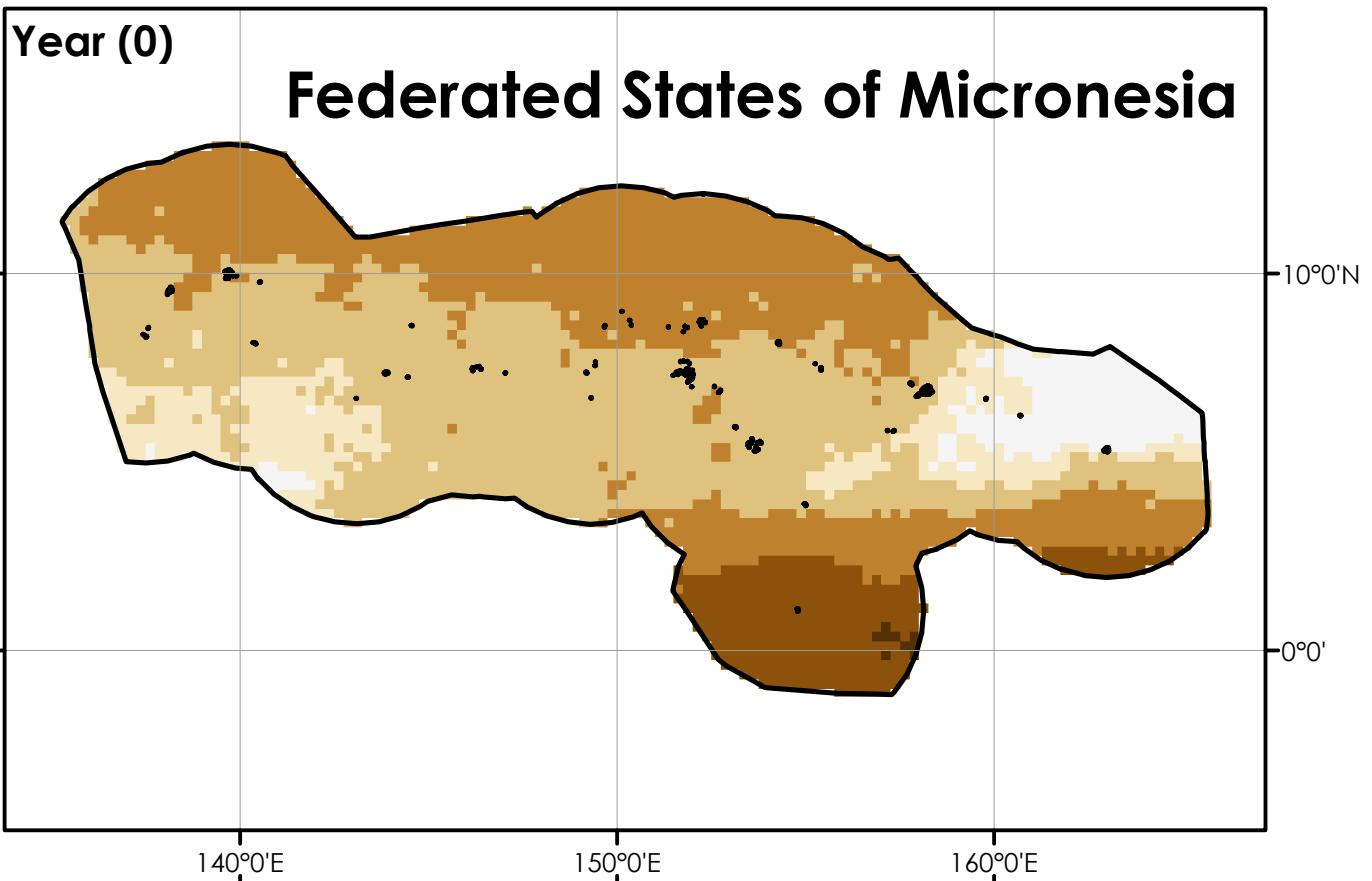
Precipitation Change (%)





Precipitation Change (%)



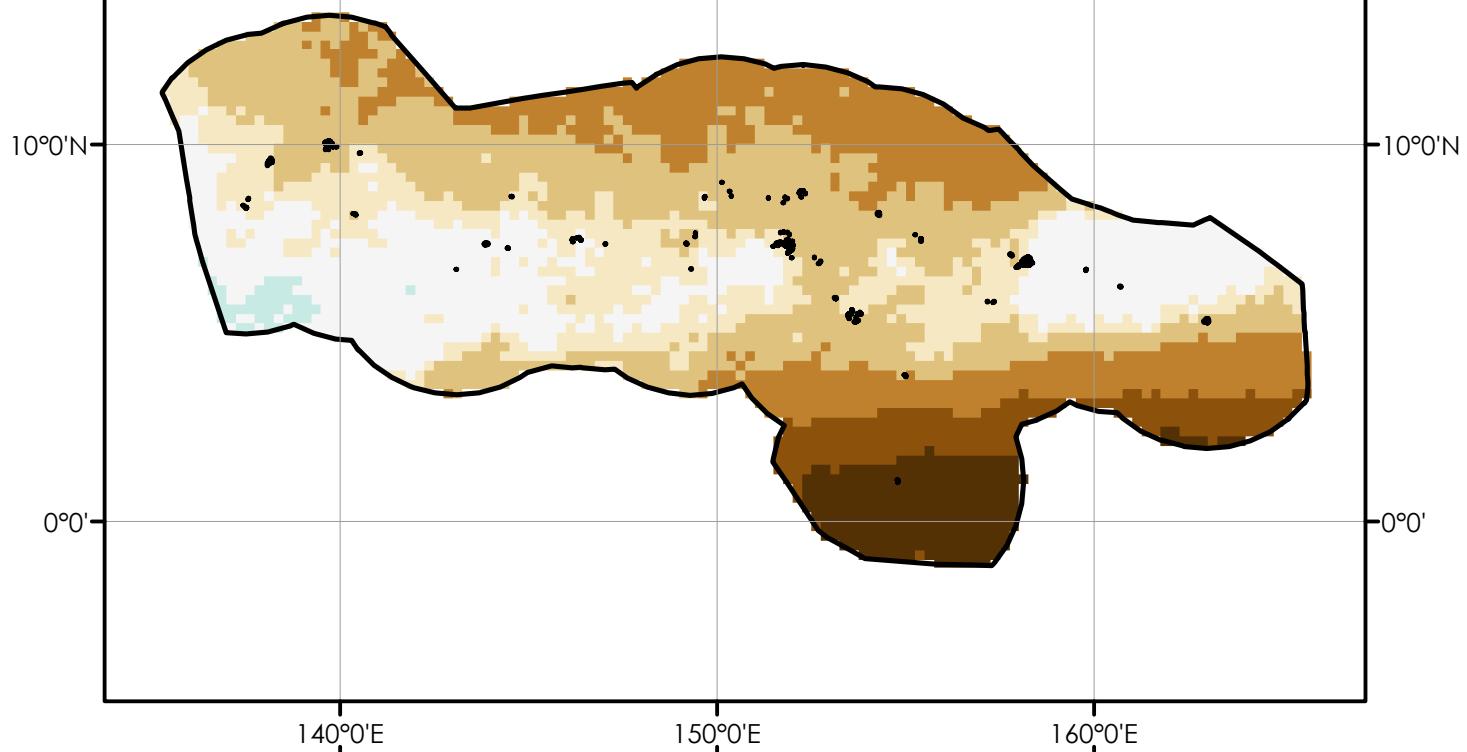


Precipitation Change (%)

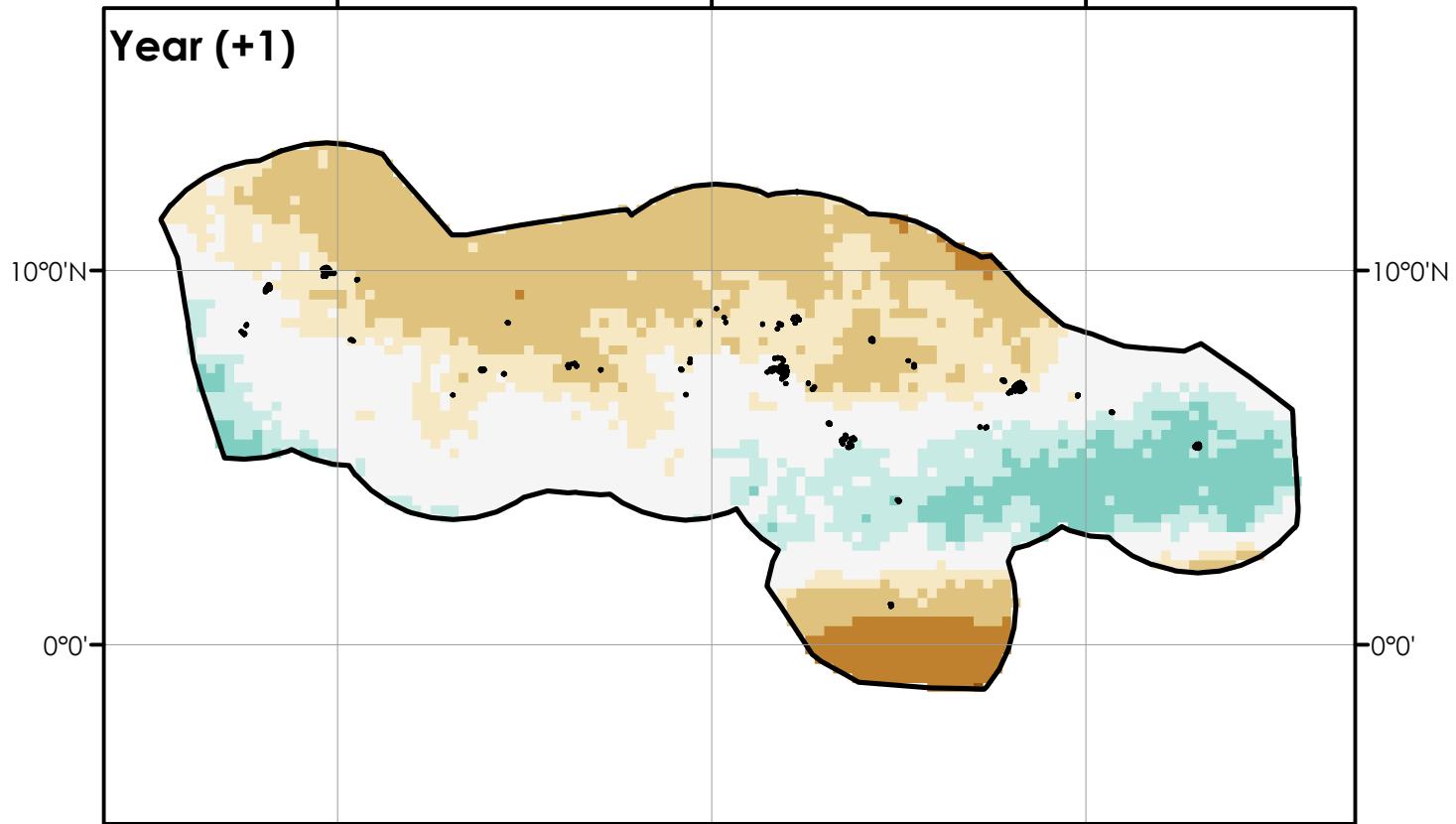


Year (0)

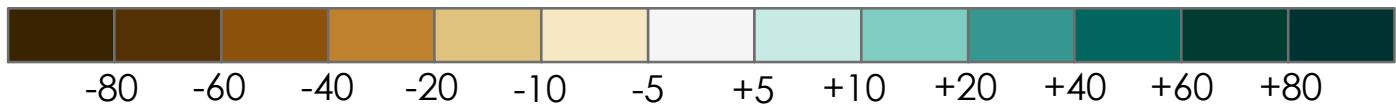
Federated States of Micronesia



Year (+1)

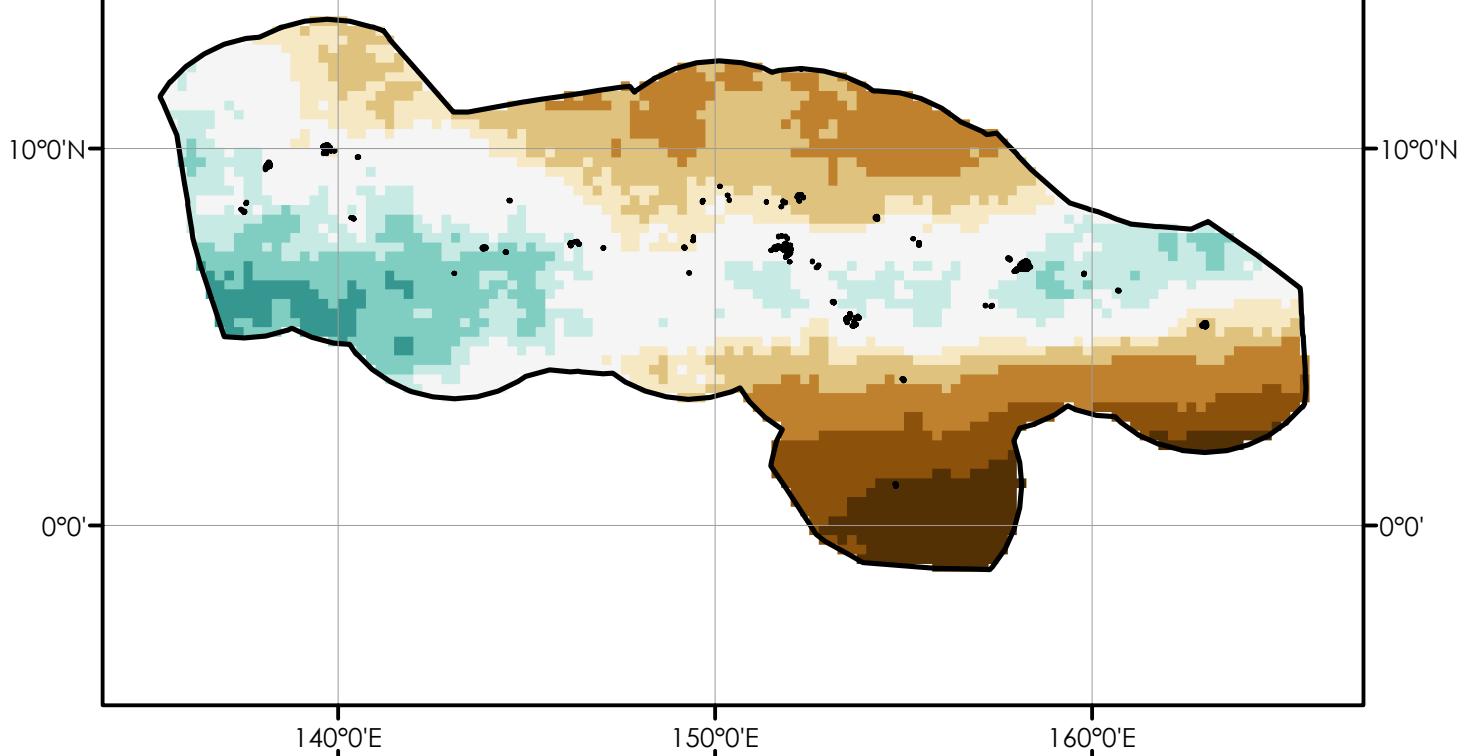


Precipitation Change (%)

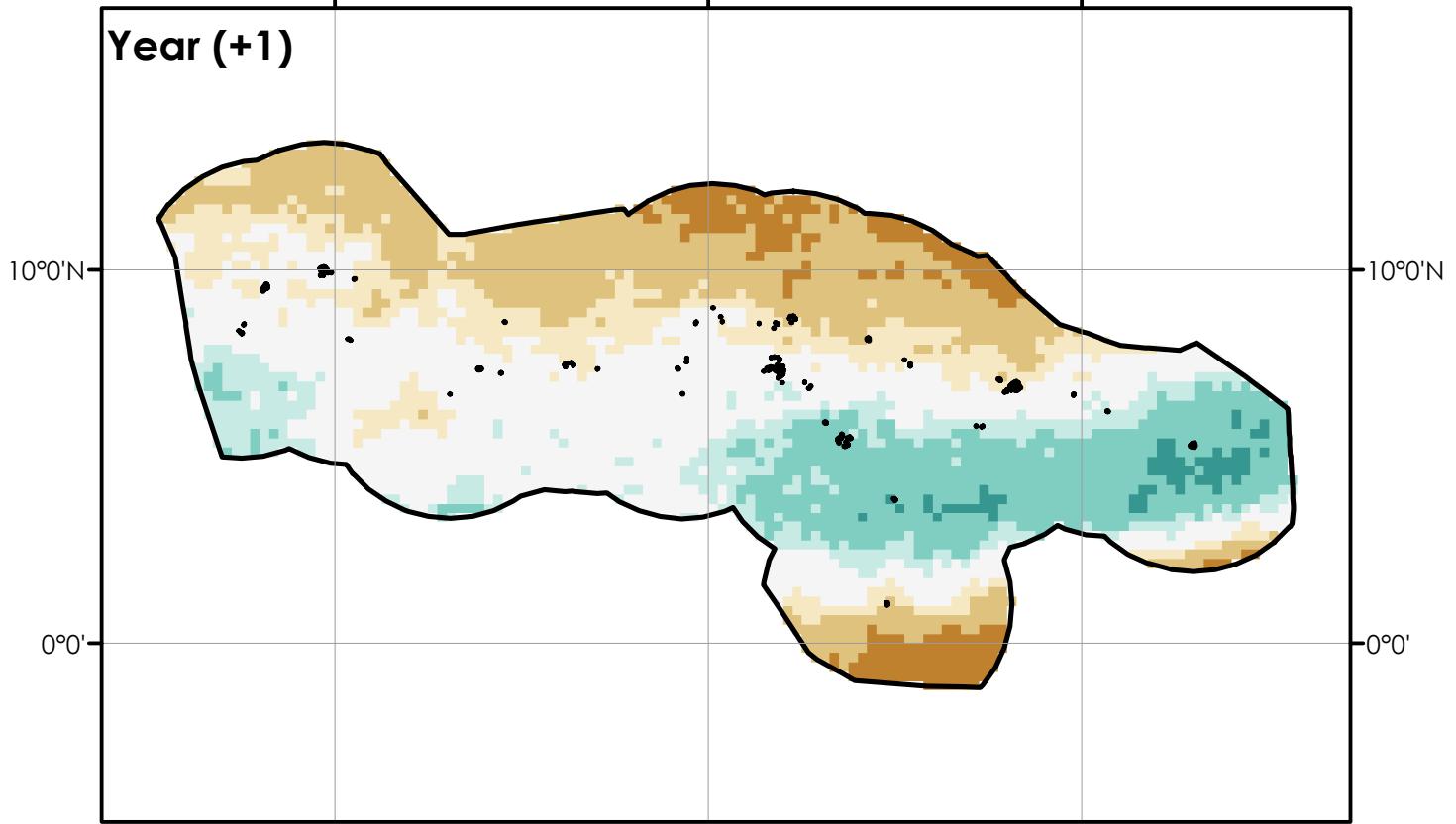


Year (0)

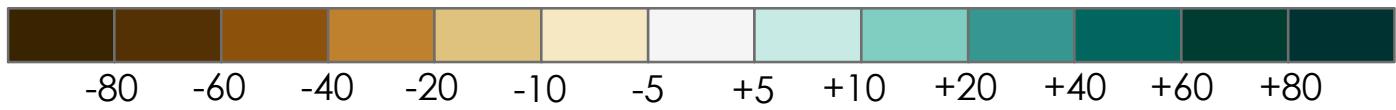
Federated States of Micronesia

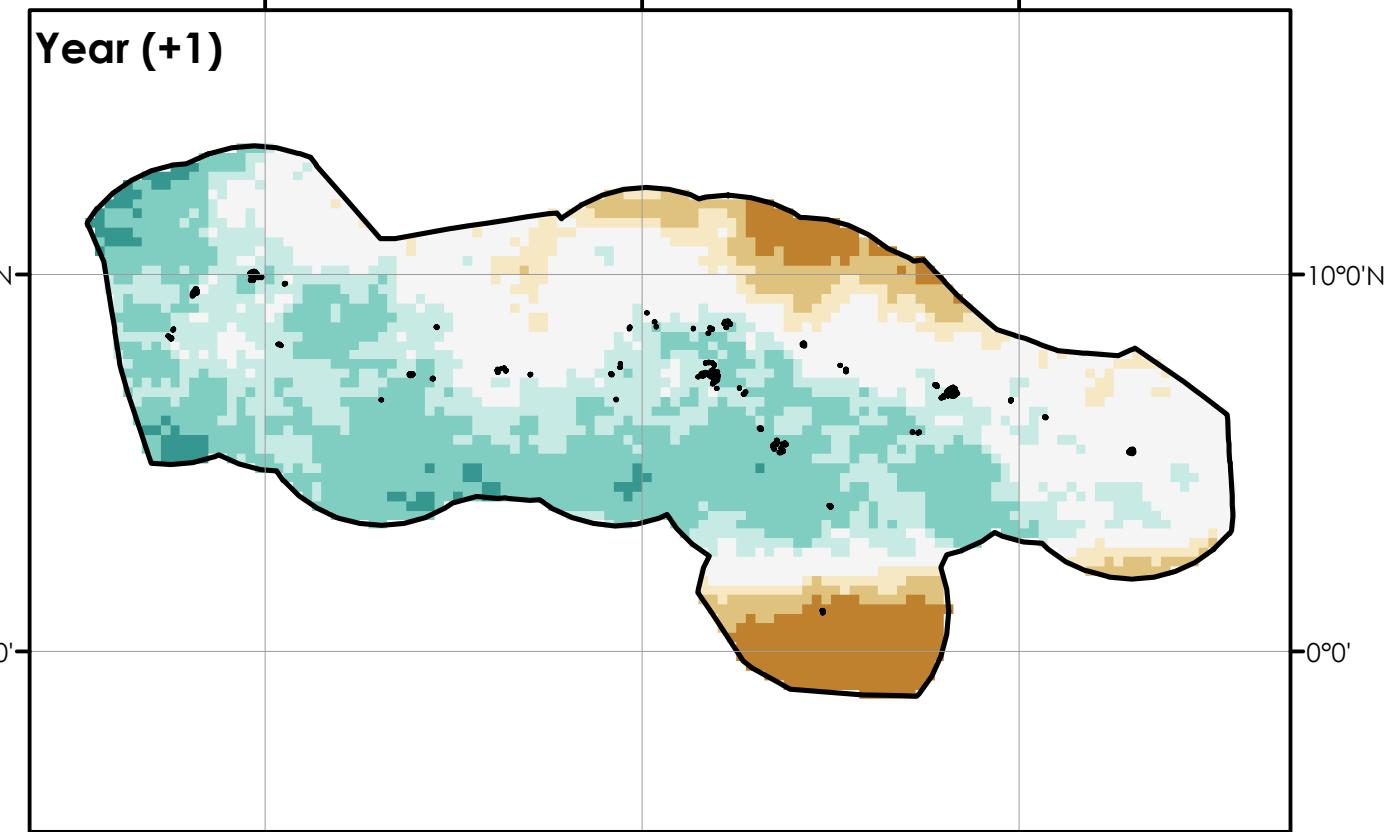
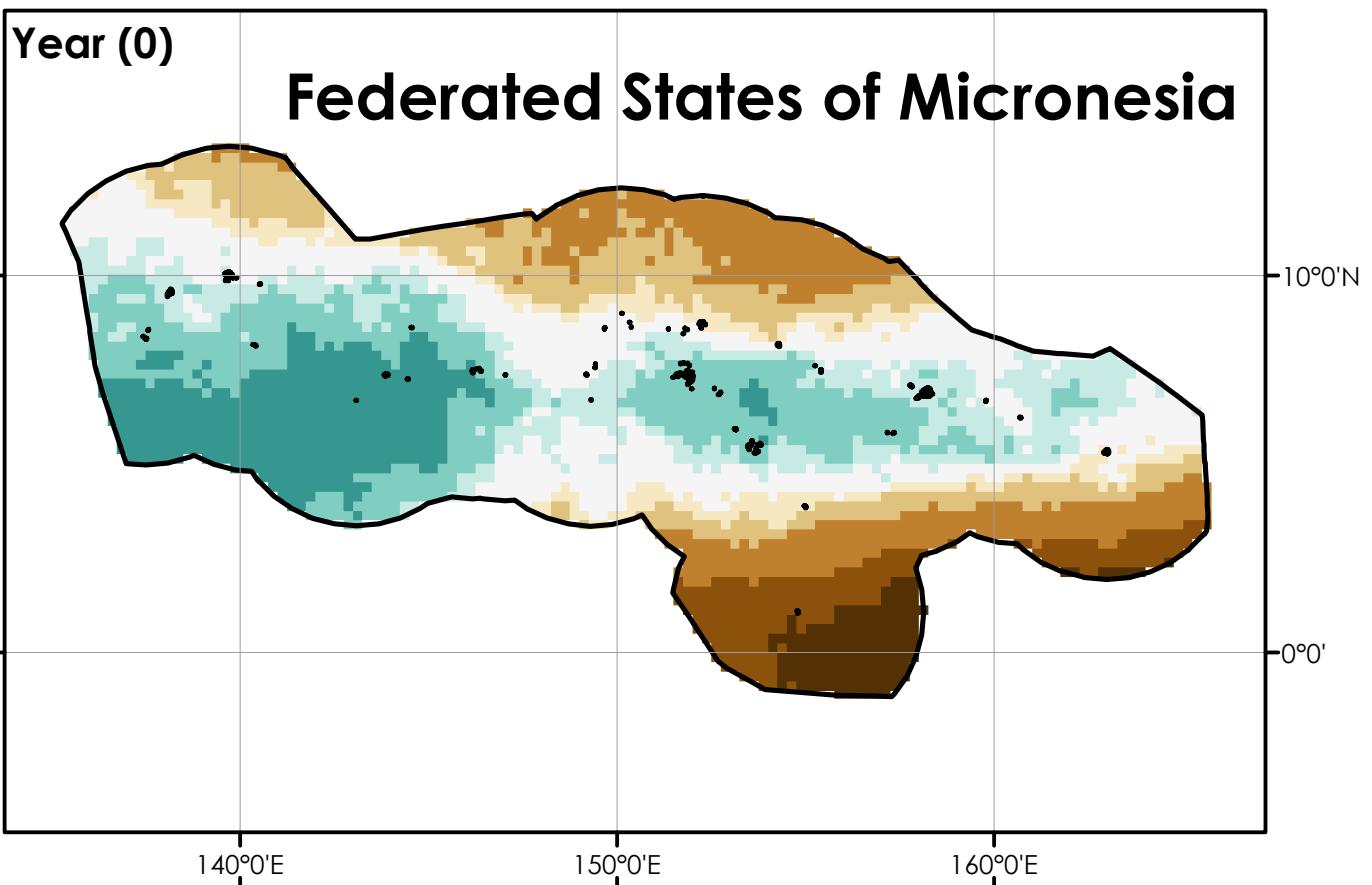


Year (+1)



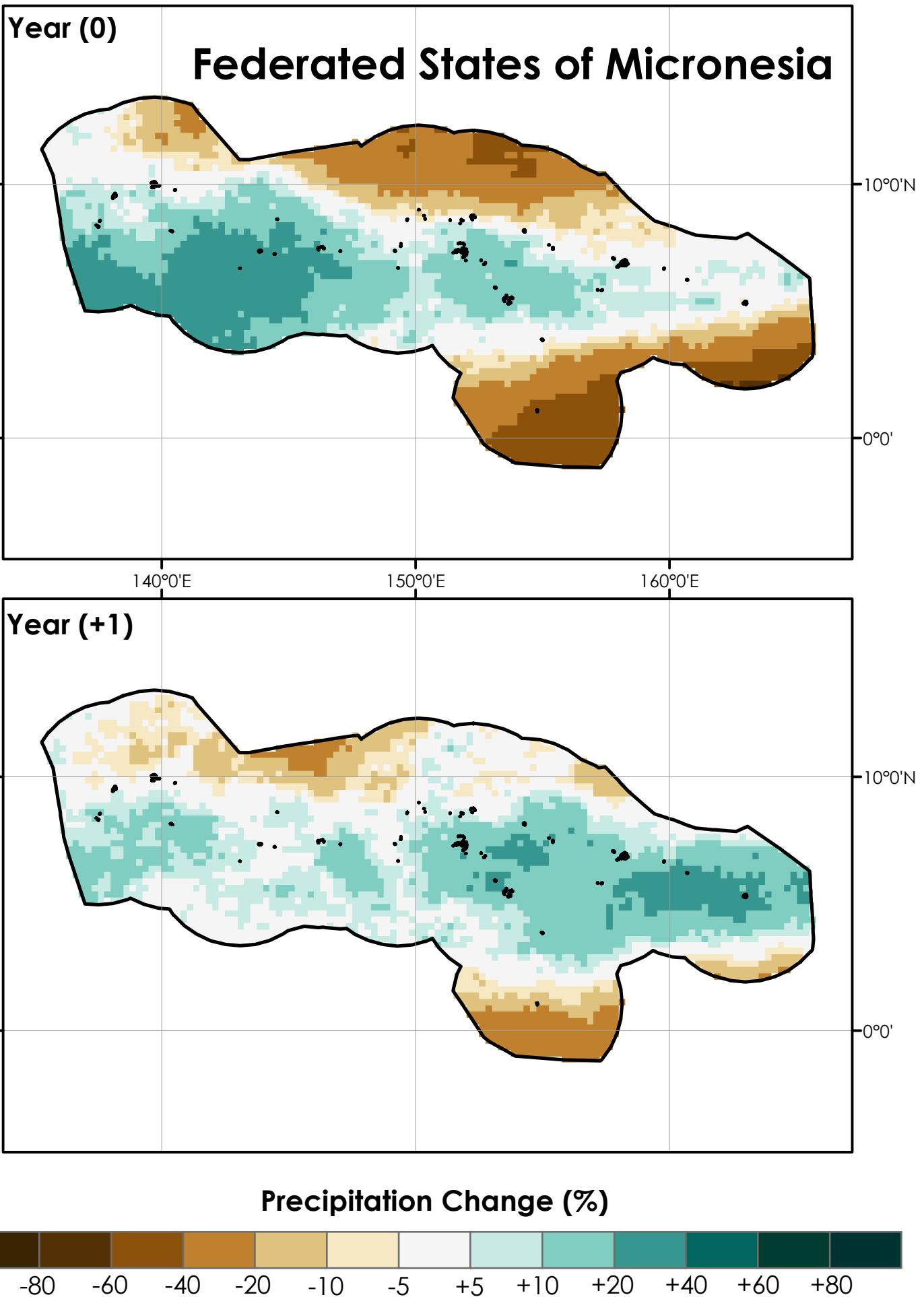
Precipitation Change (%)





Precipitation Change (%)

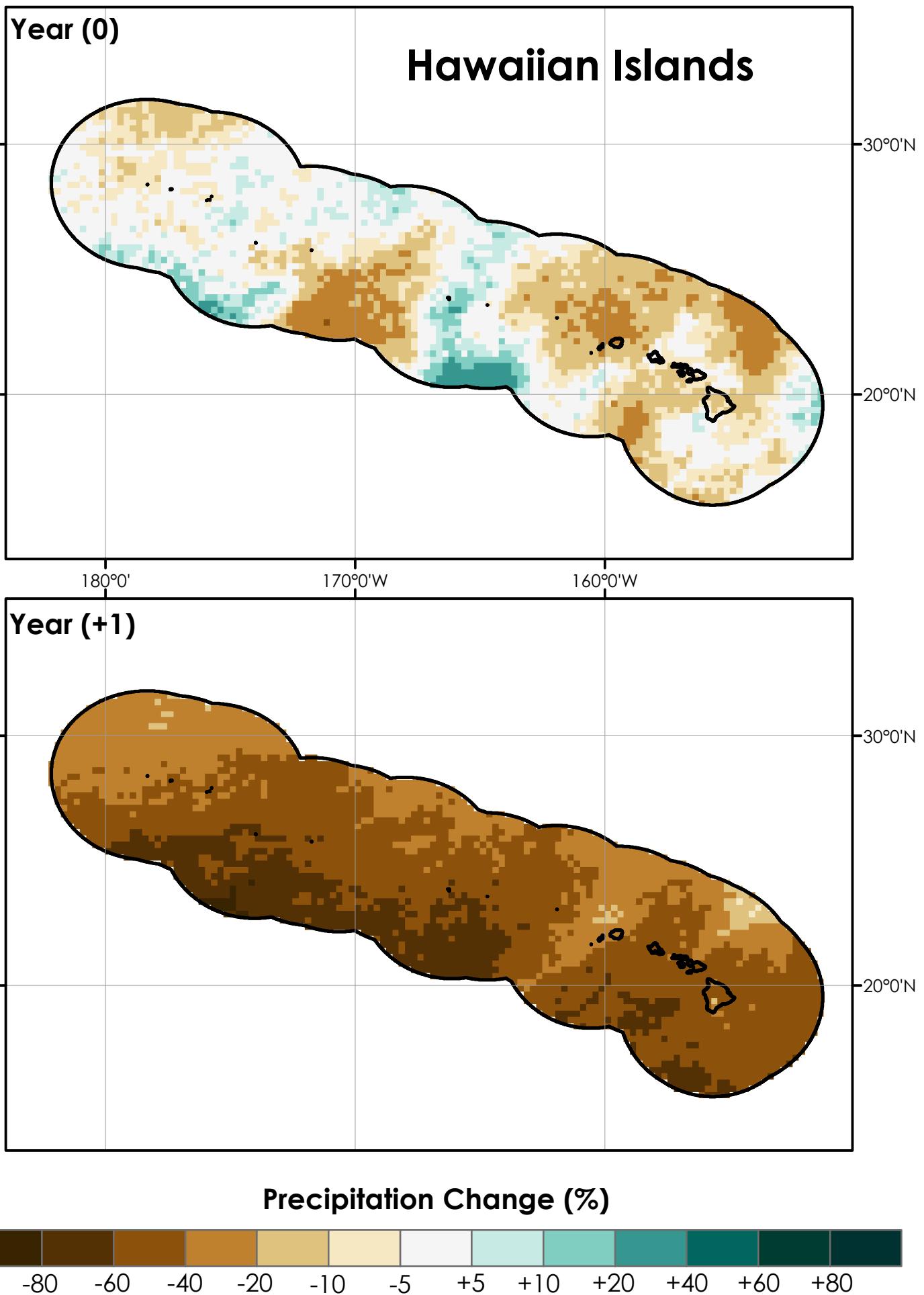


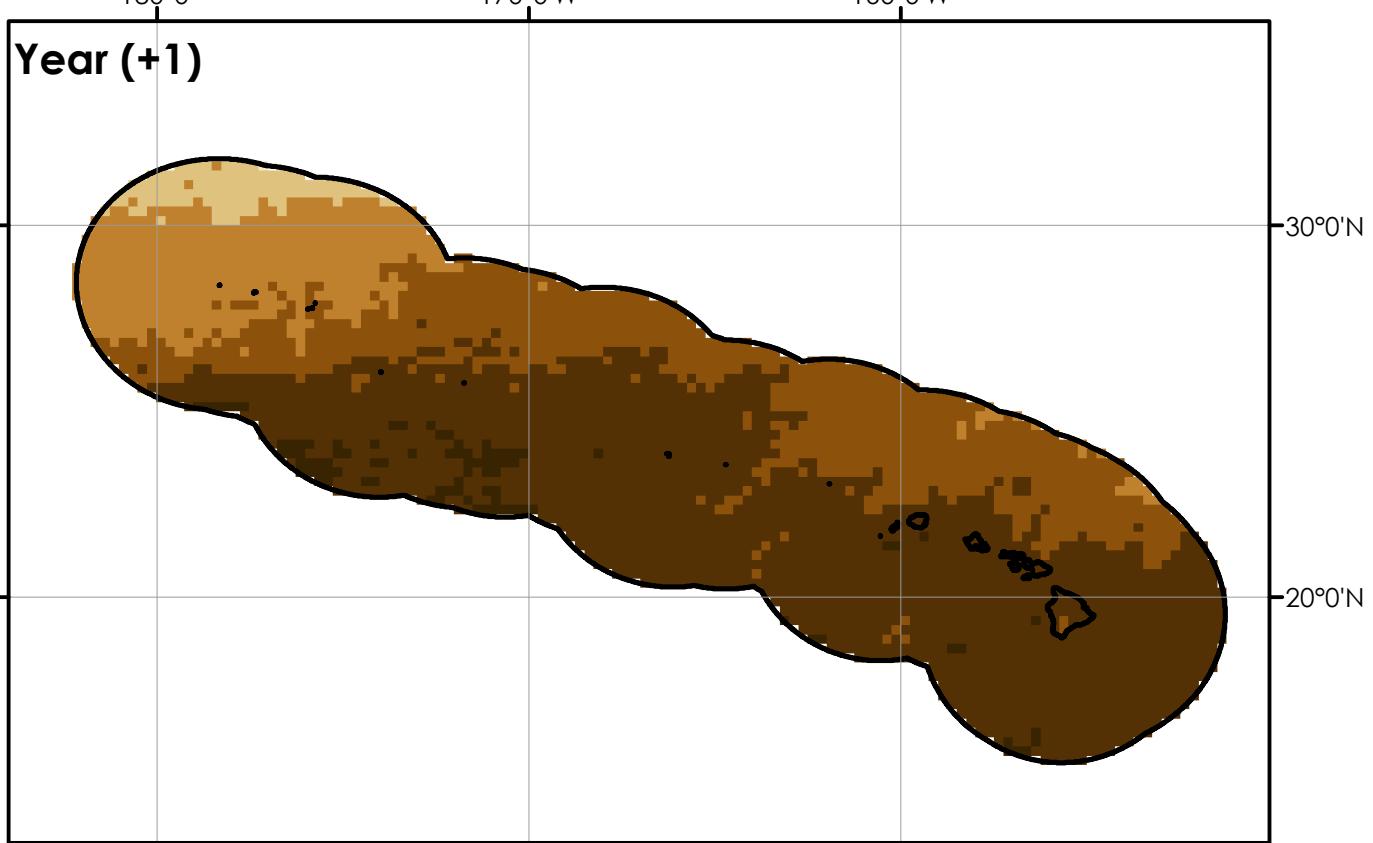
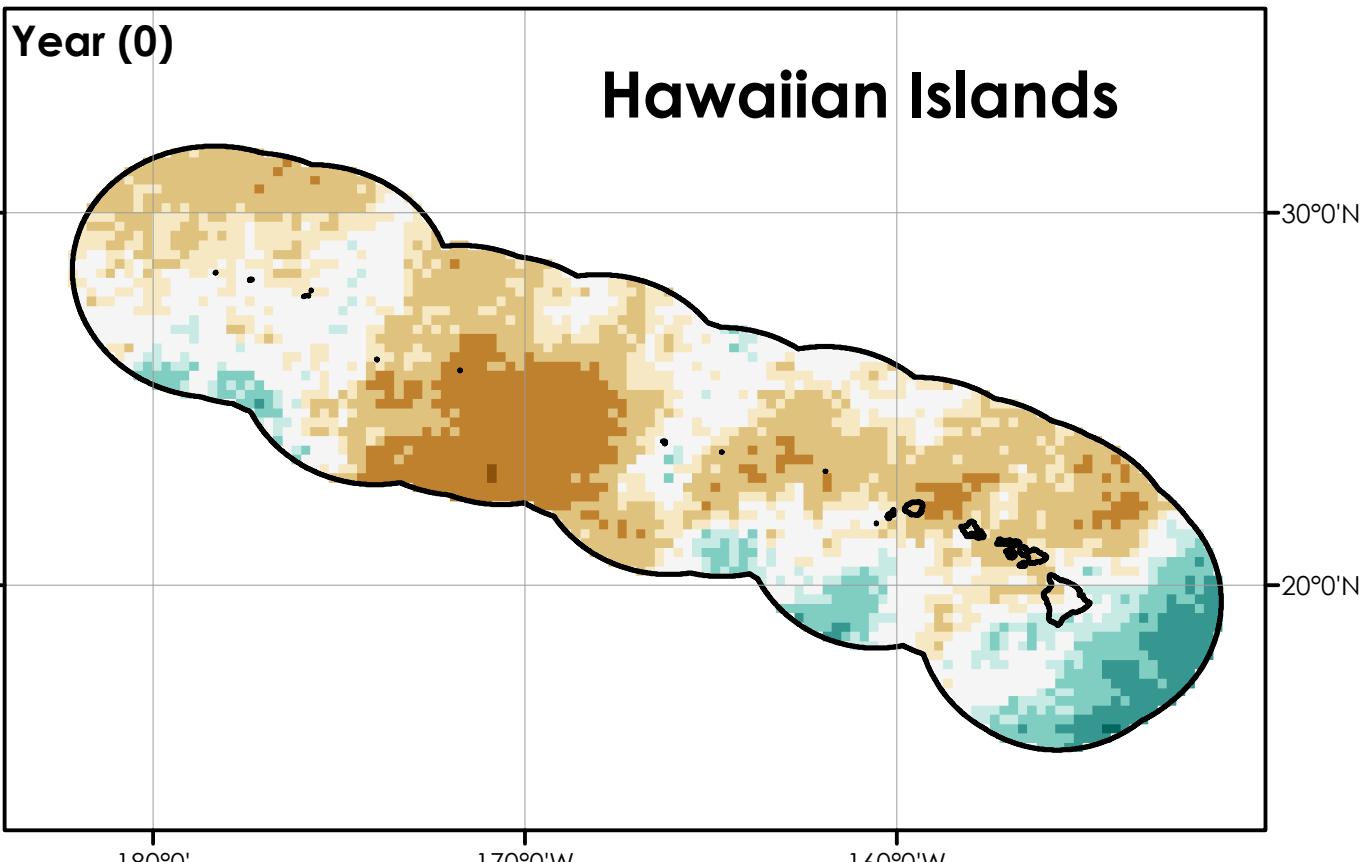


The following two-panel maps show each three month seasonal average precipitation change for each of the five ENSO phases (moderate-strong La Niña and El Niño, weak La Niña and El Niño, and neutral) for the Hawaiian Islands Exclusive Economic Zone. Within each two-panel map, the top map shows the average precipitation change for the three month season preceding (Year (0)) the onset of the specific ENSO phase, which is listed in the title, and the bottom map shows the average precipitation change following (Year (+1)) the onset of the specific ENSO phase.

These maps show the areas within the EEZ that are abnormally wet (turquoise/green) or dry (tan/brown) for the three month season during a specific ENSO phase. Additionally, these maps show how the precipitation varies from a pre ENSO to a post ENSO phase. This is important when determining how the different ENSO phases influence precipitation patterns.

All of the maps show precipitation at a 0.25° resolution from the NOAA PERSIANN-CDR. The “normal” is the 30-year average precipitation from January 1985 through December 2014.



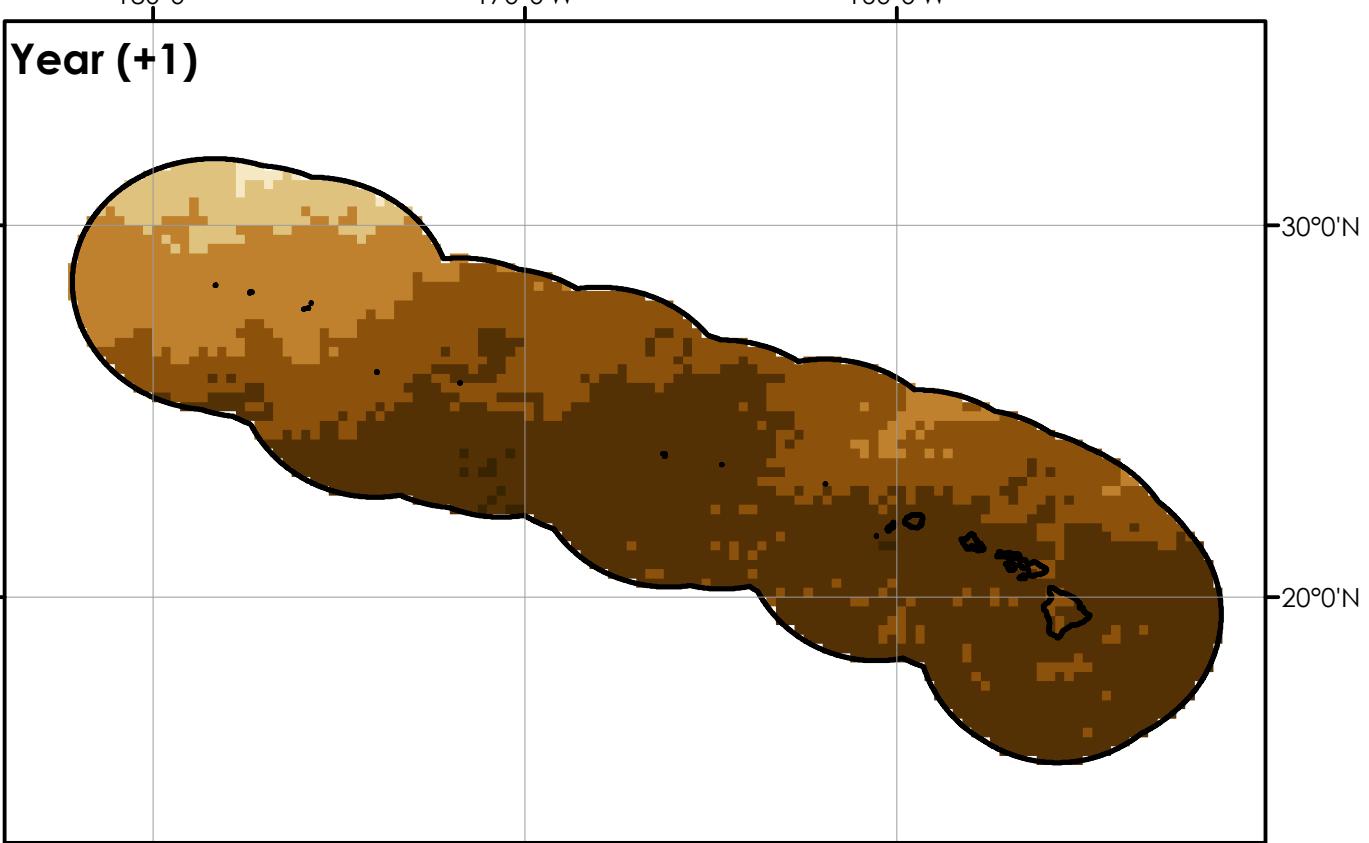
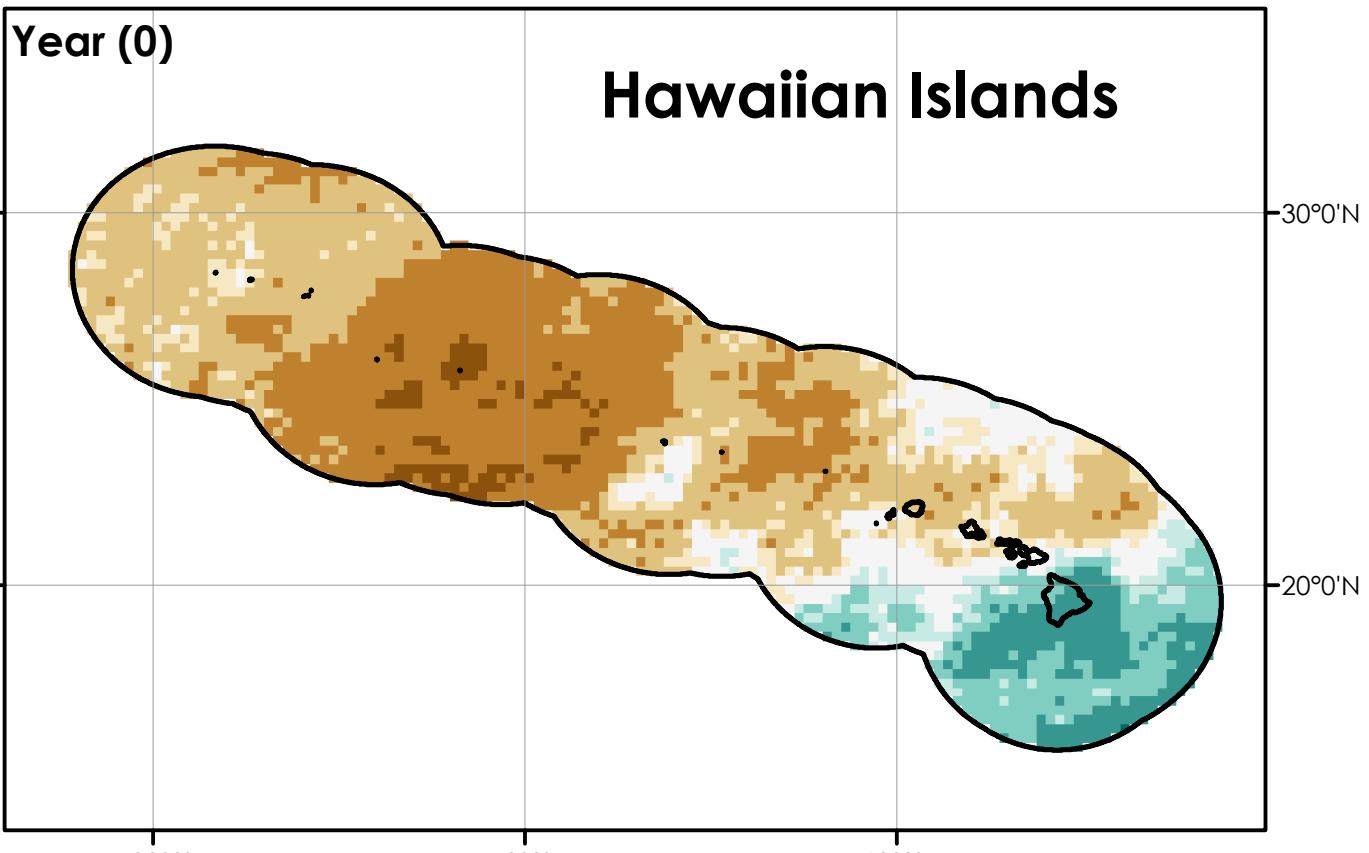


Precipitation Change (%)

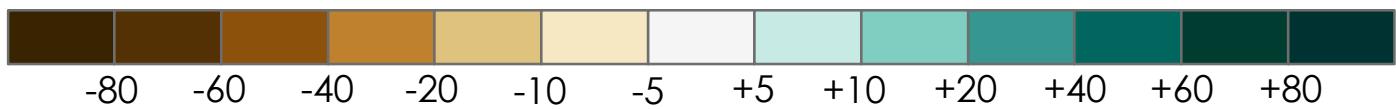


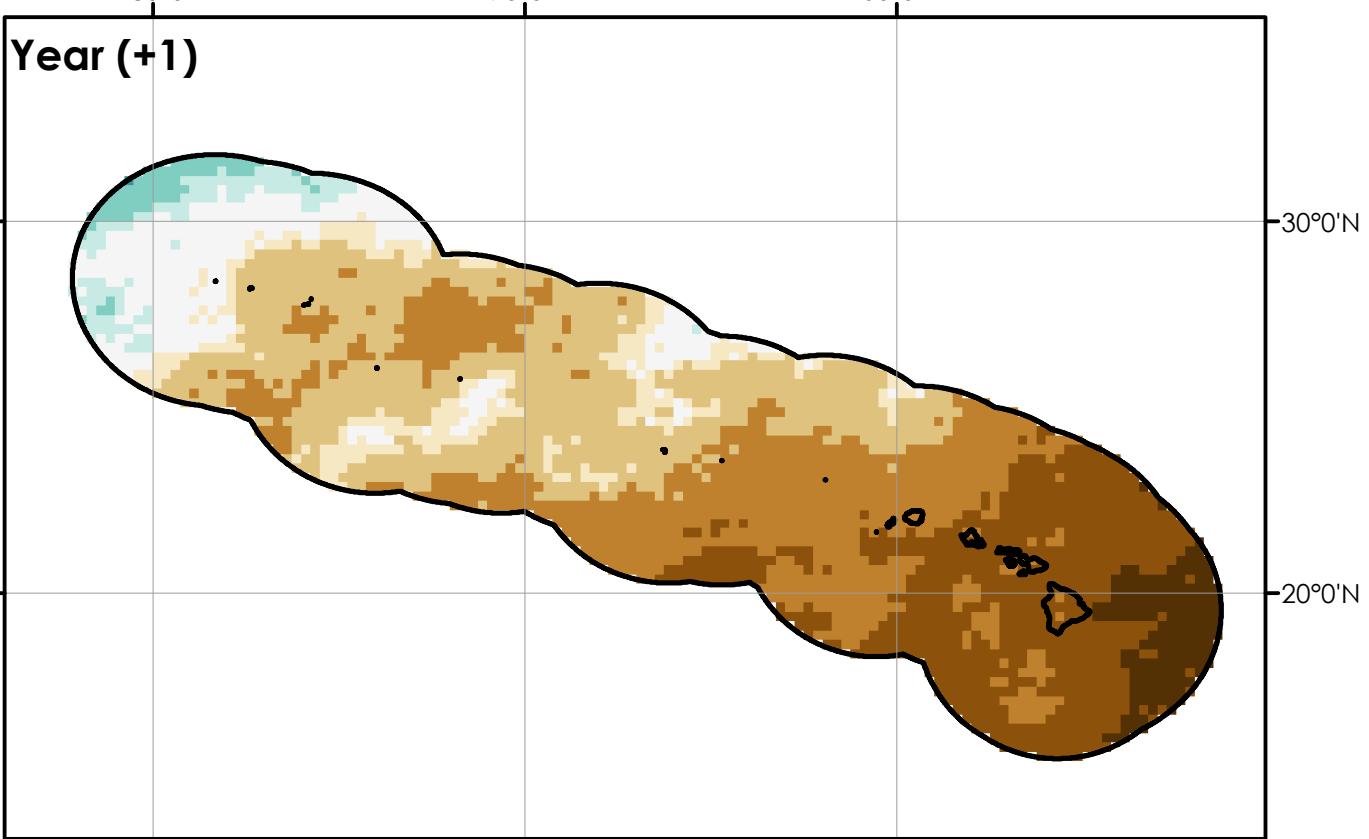
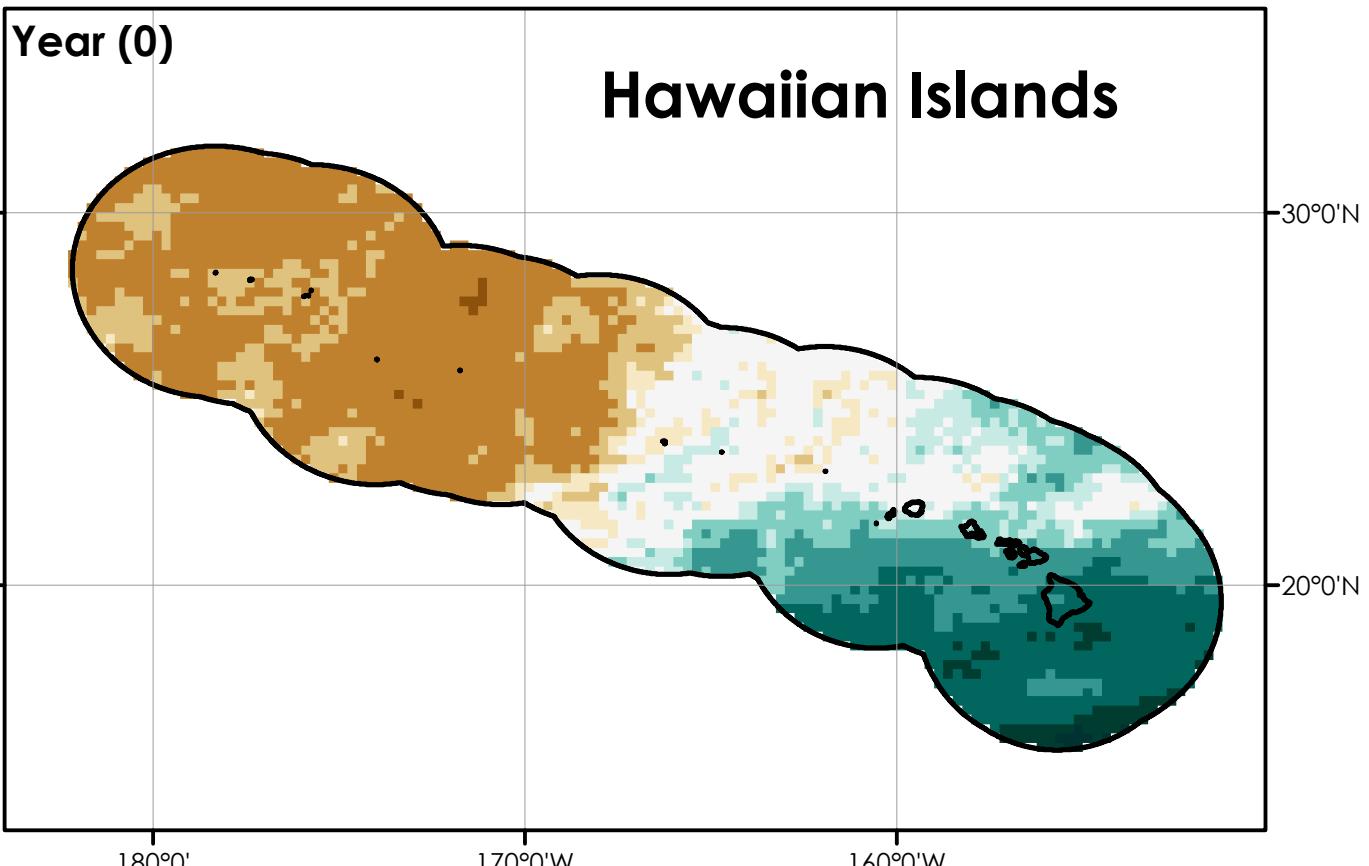
Moderate - Strong El Niño for FMA

275



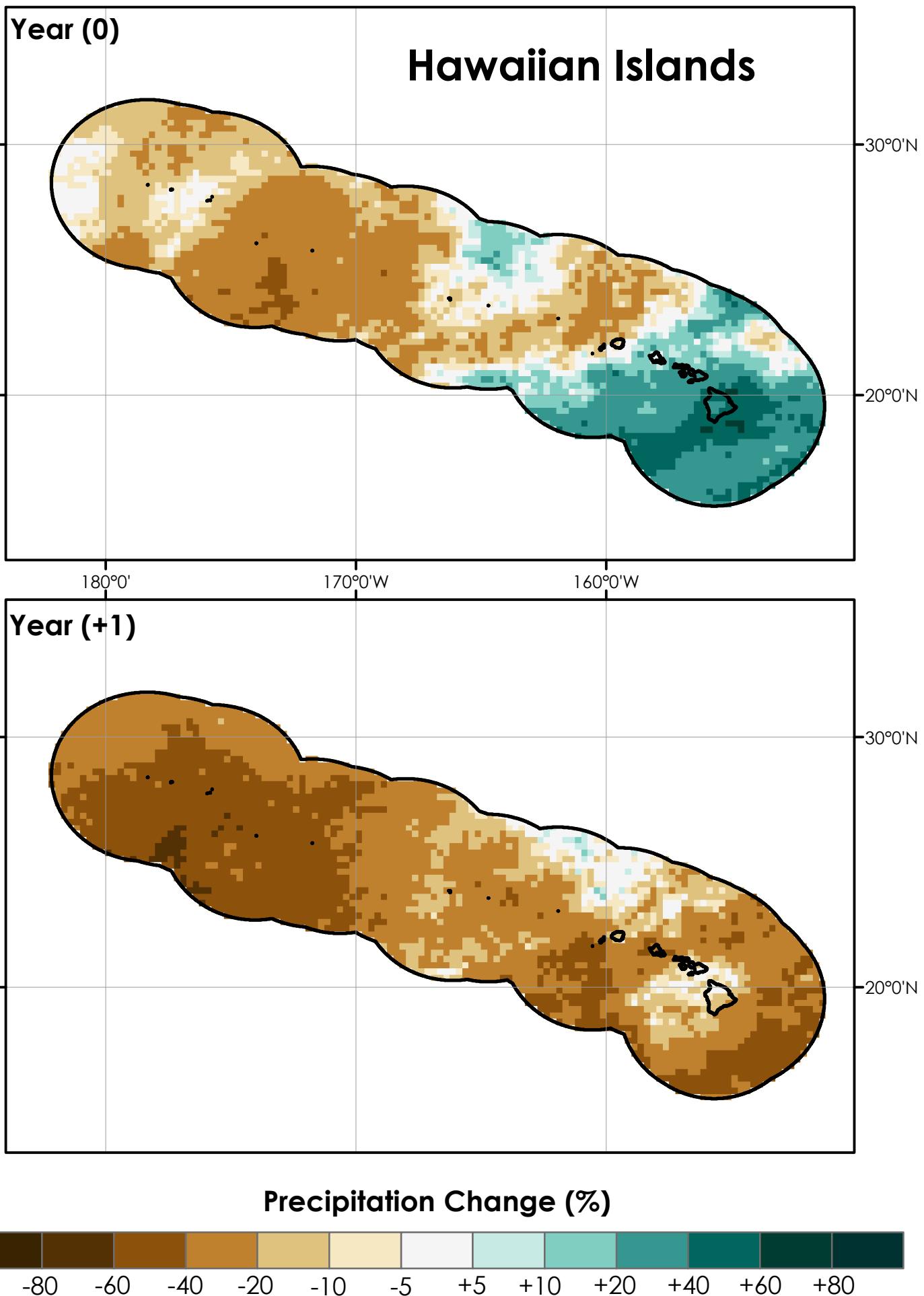
Precipitation Change (%)

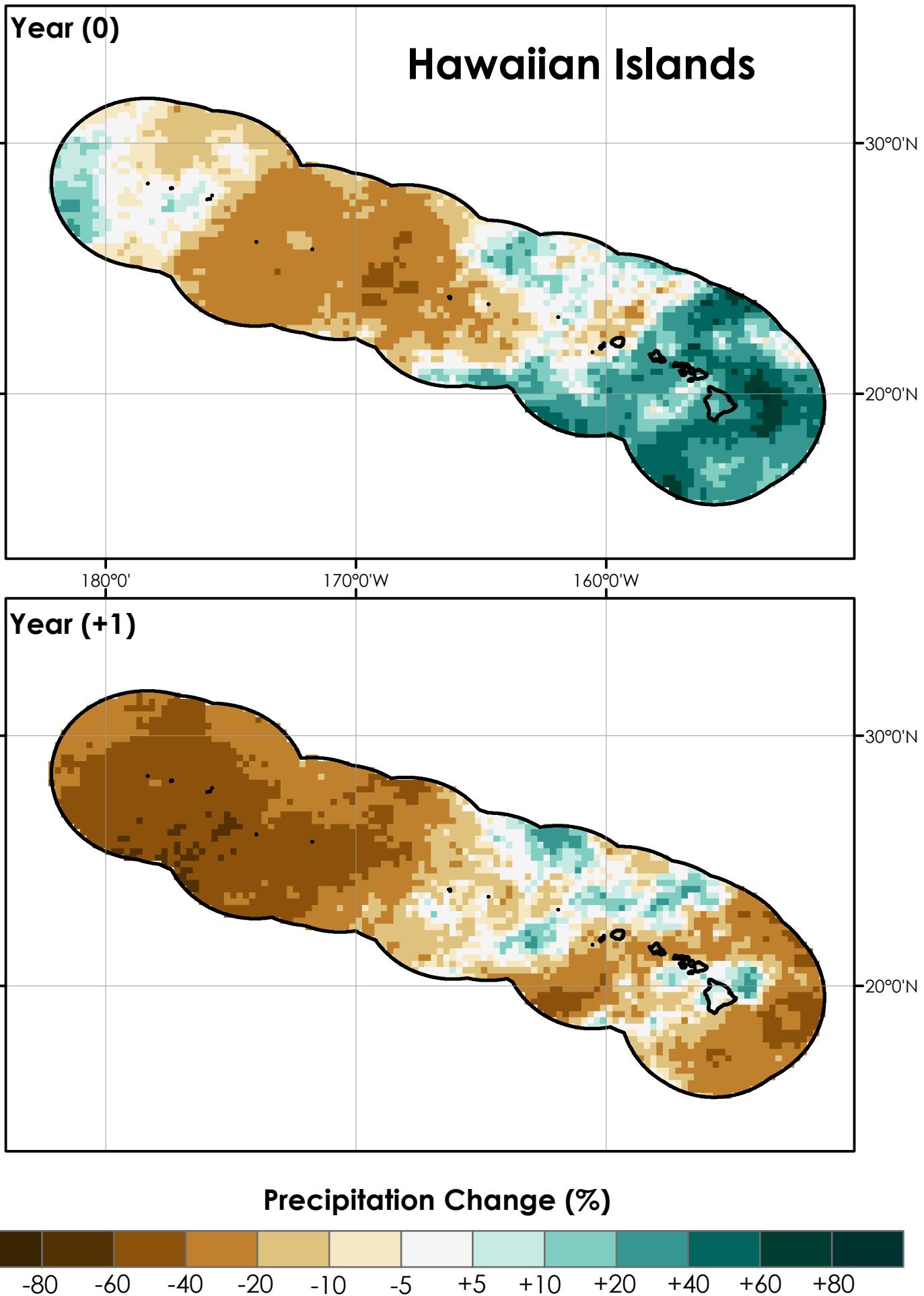


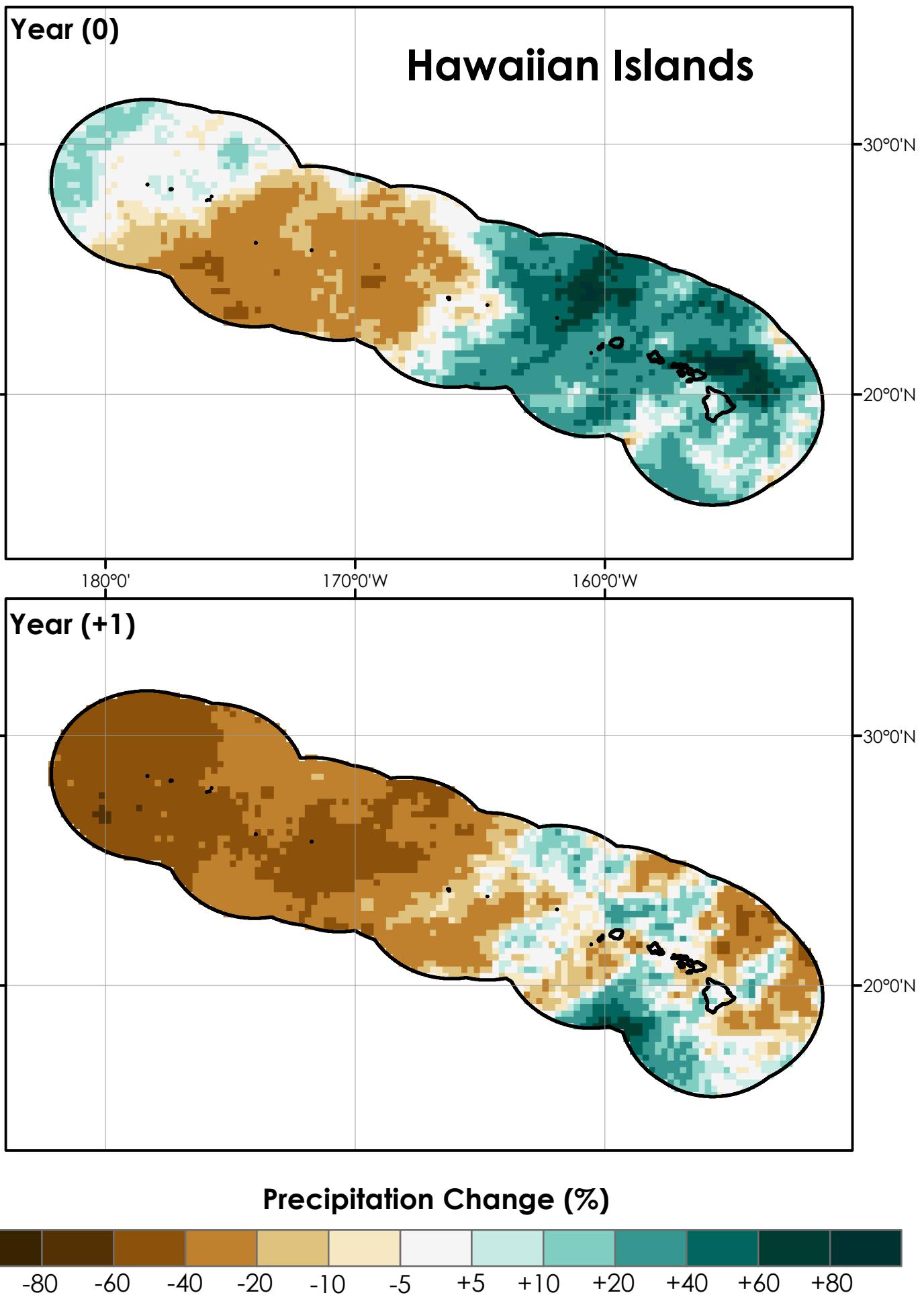


Precipitation Change (%)







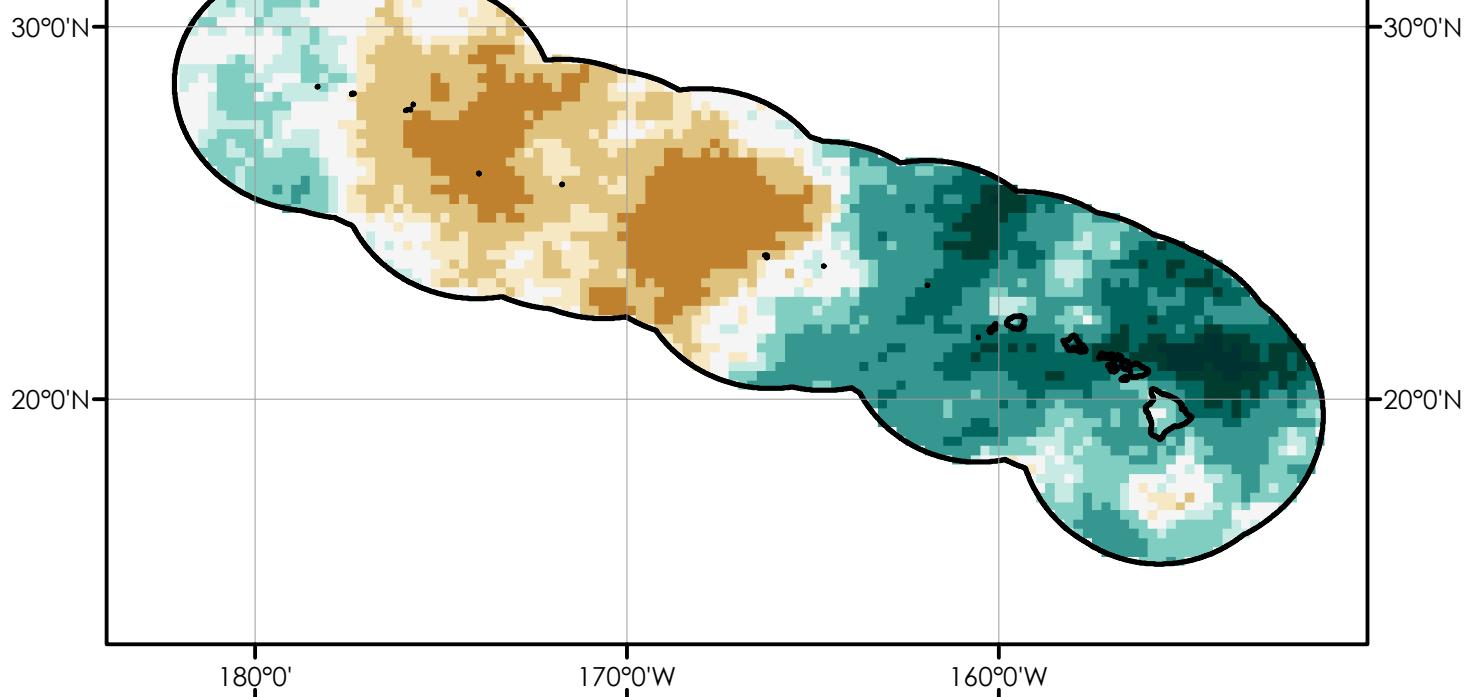


Moderate - Strong El Niño for JAS

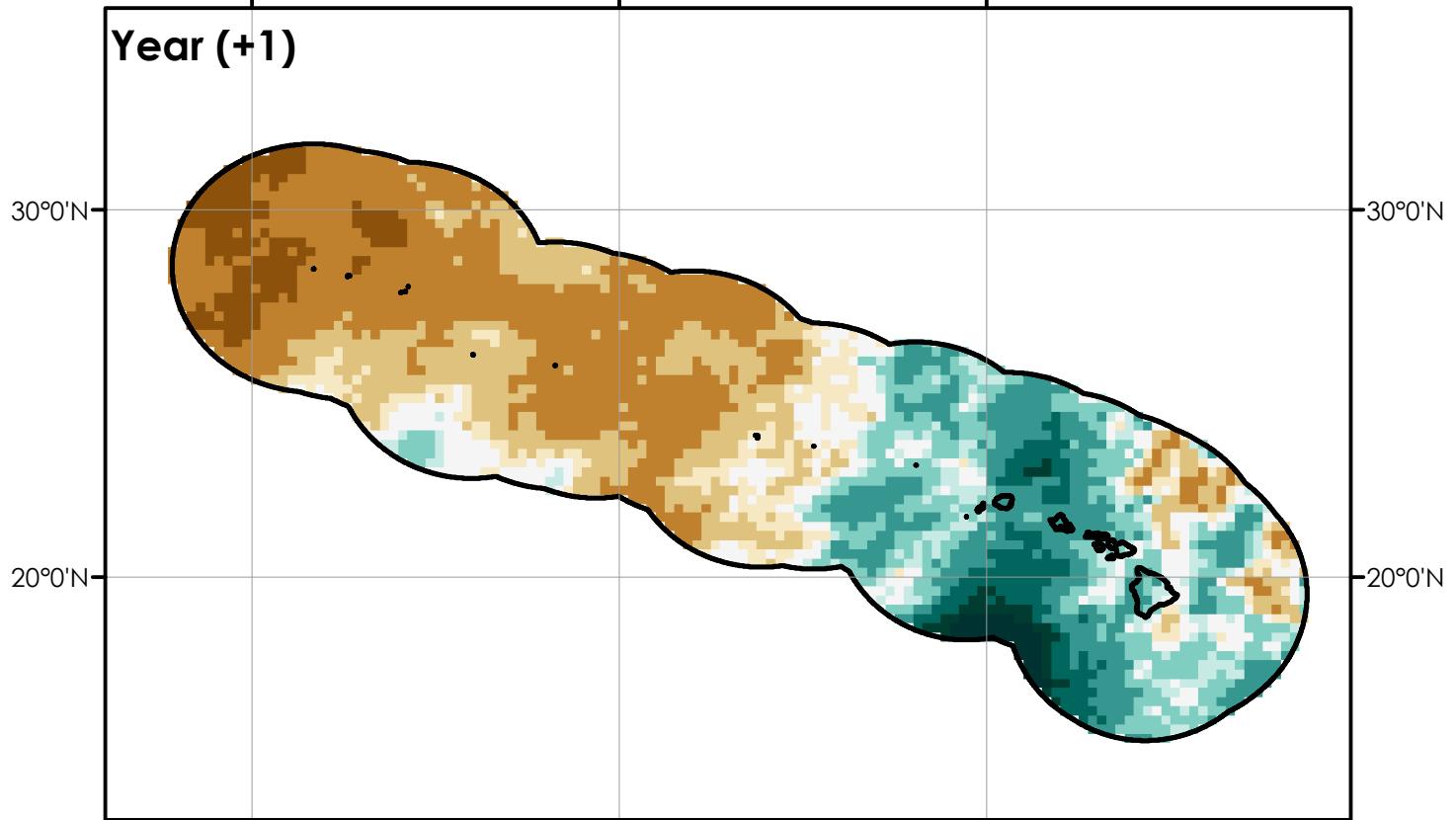
280

Year (0)

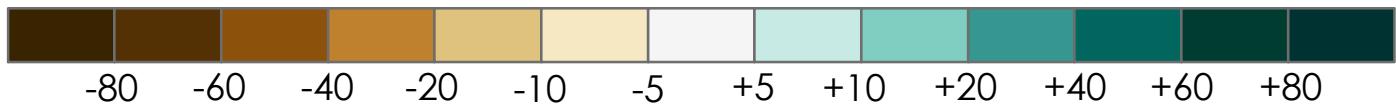
Hawaiian Islands

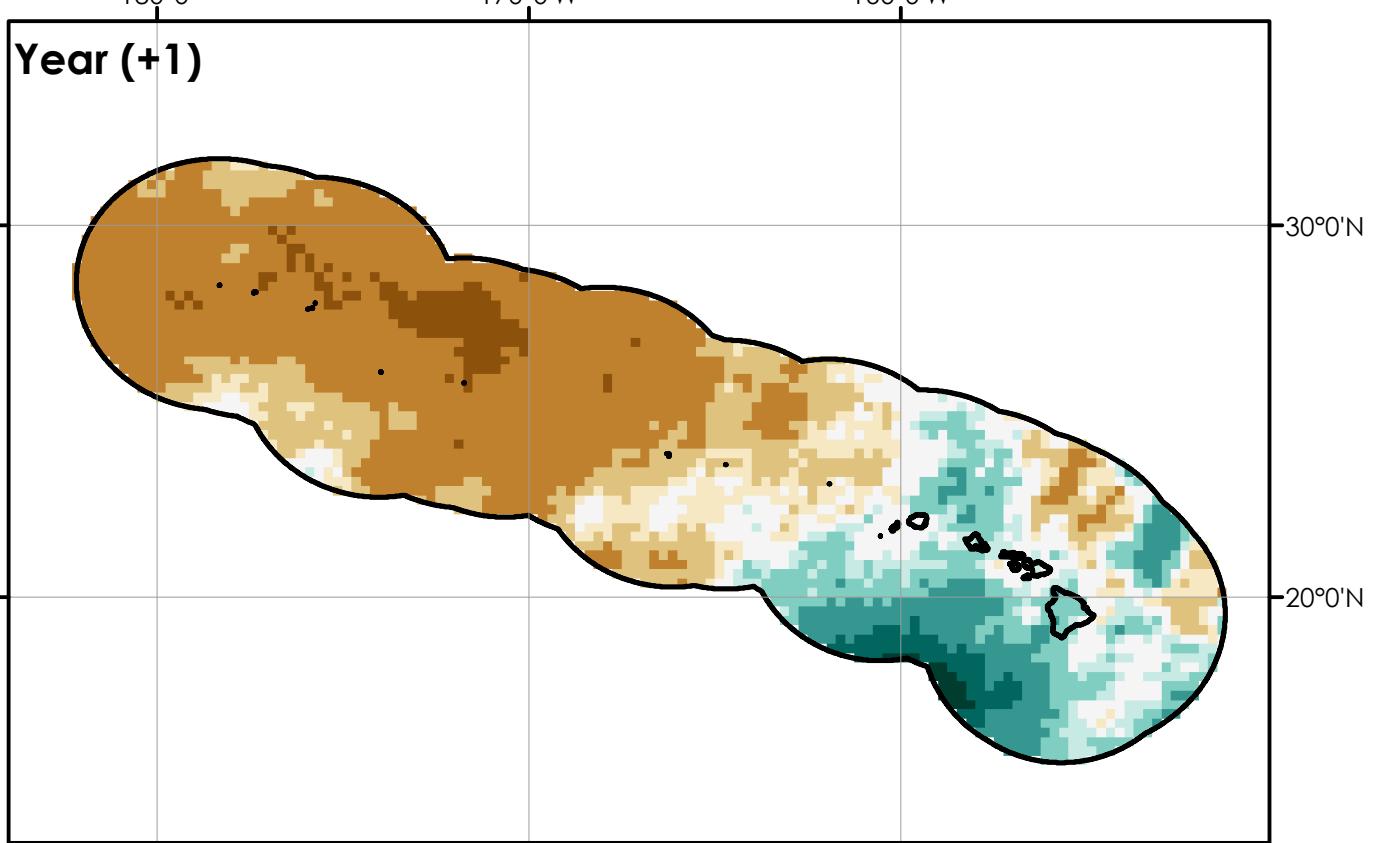
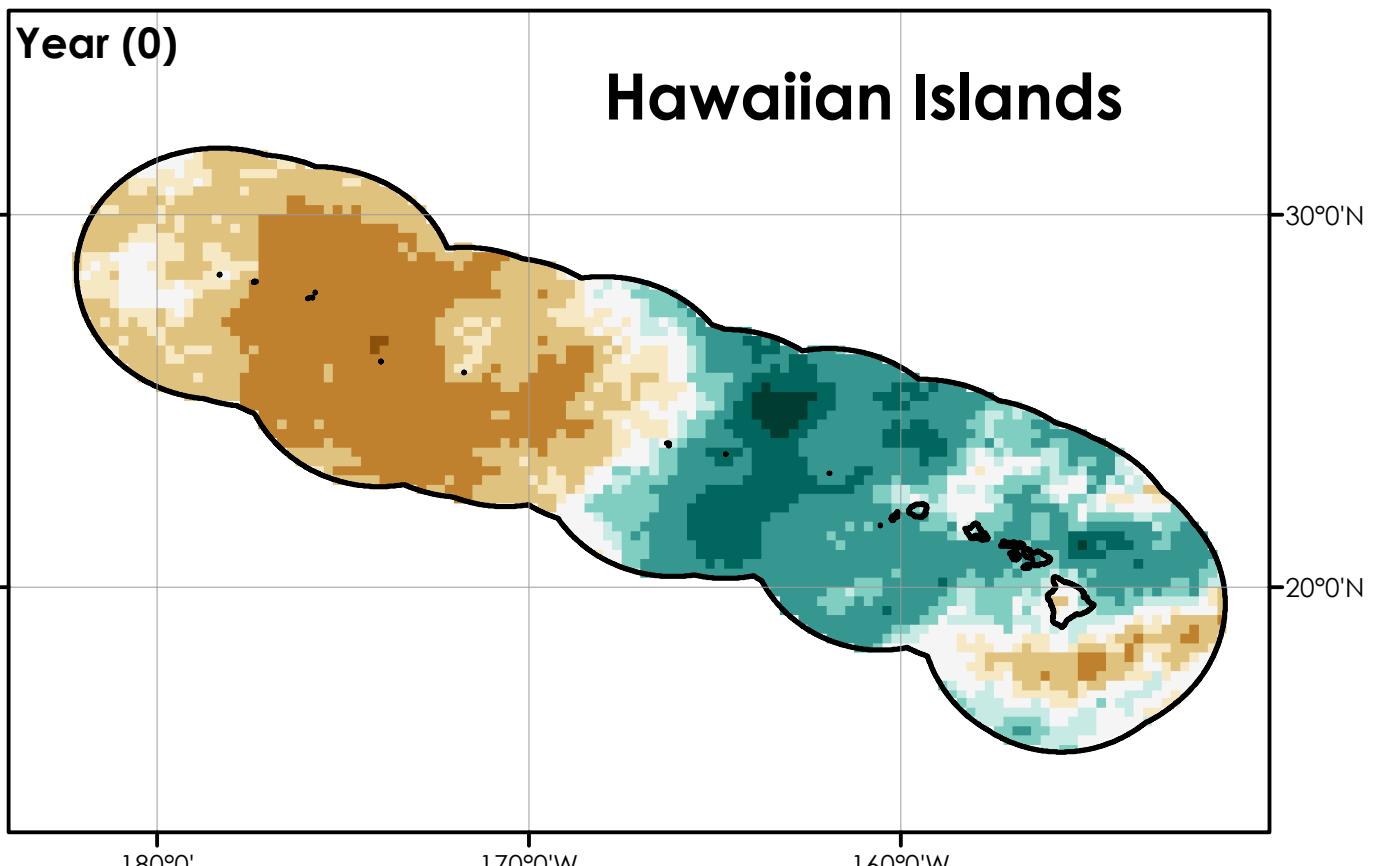


Year (+1)

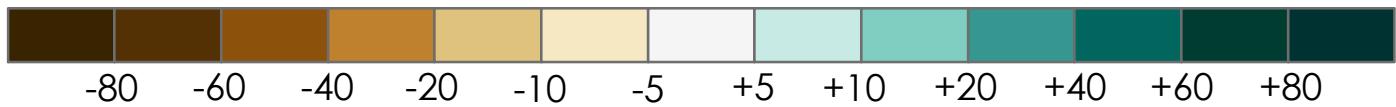


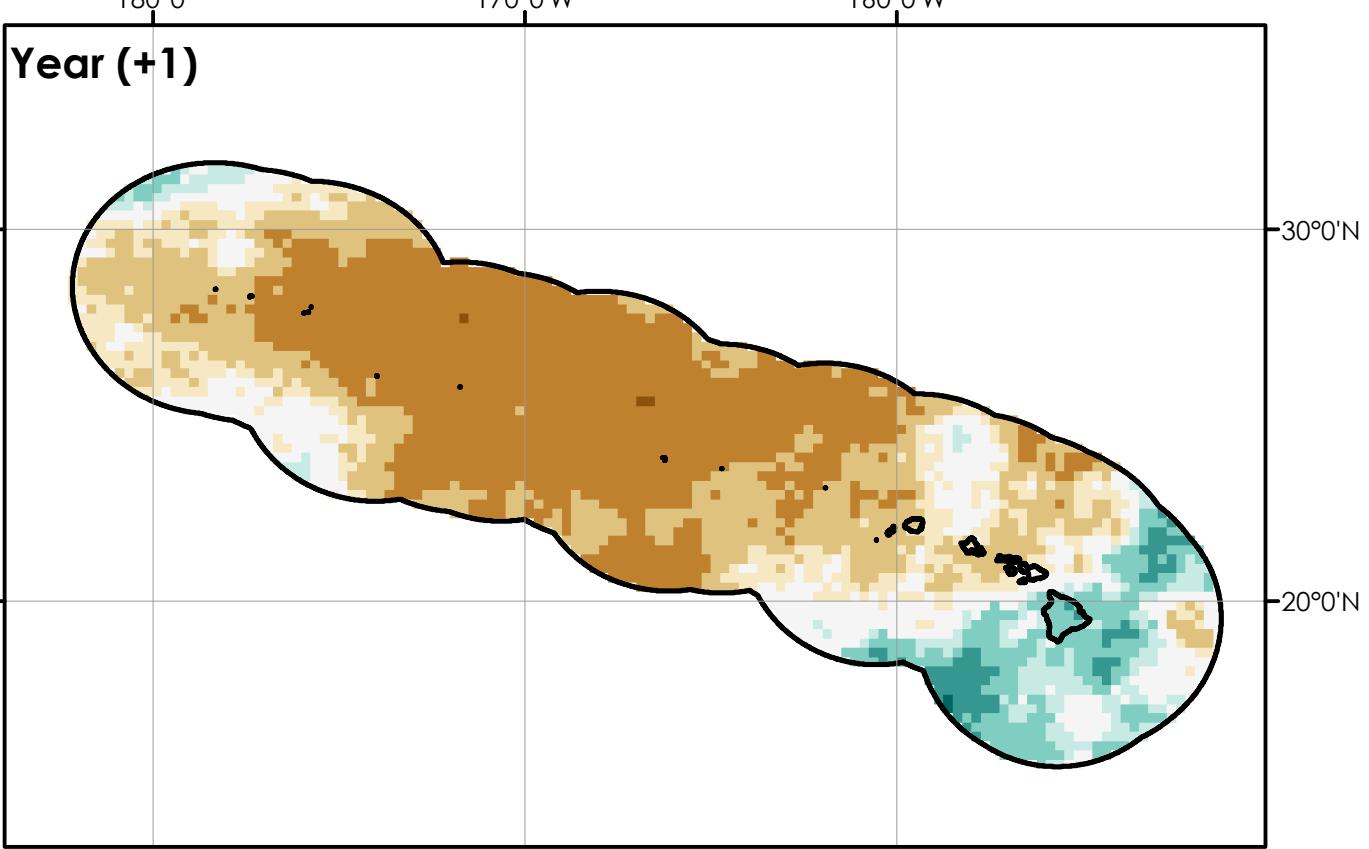
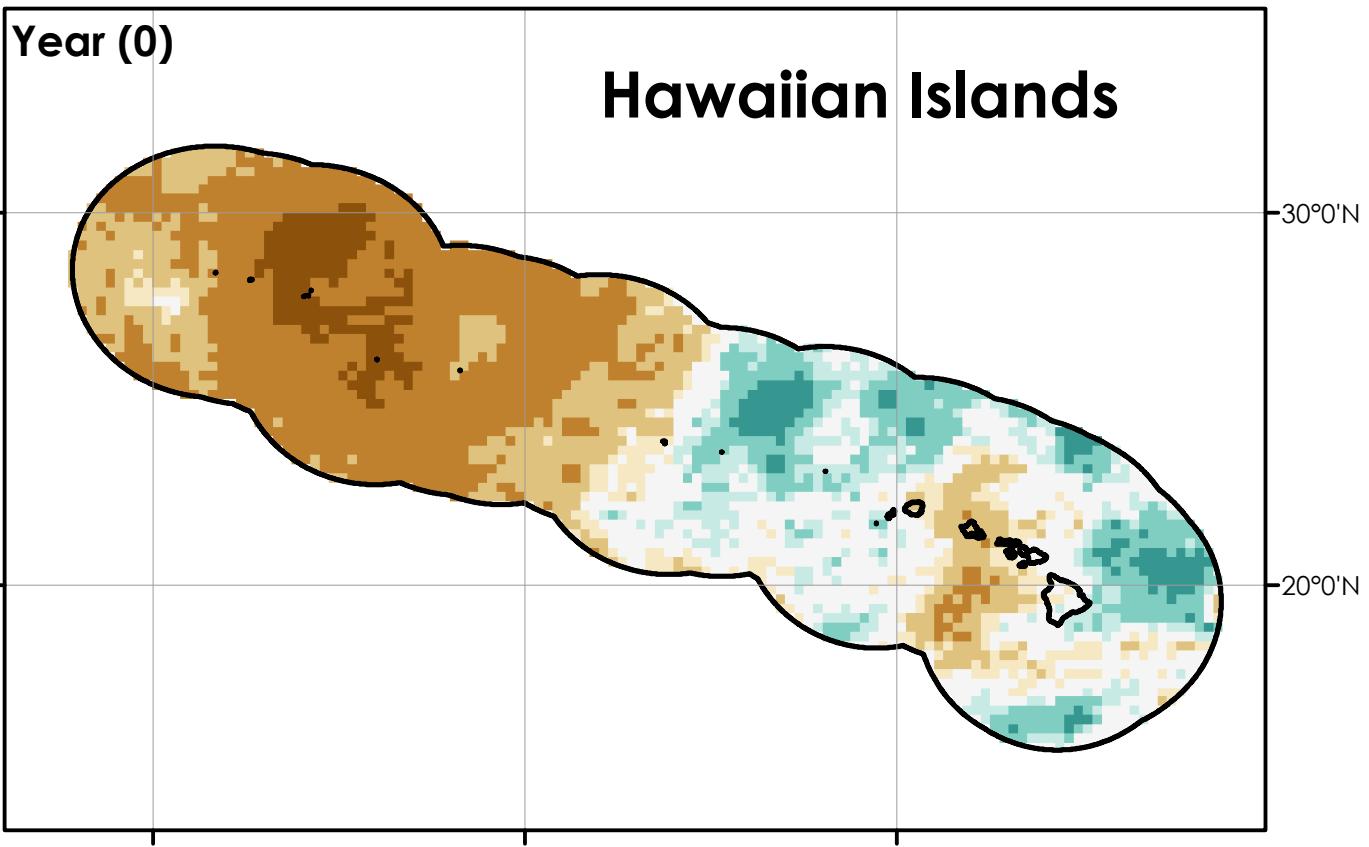
Precipitation Change (%)





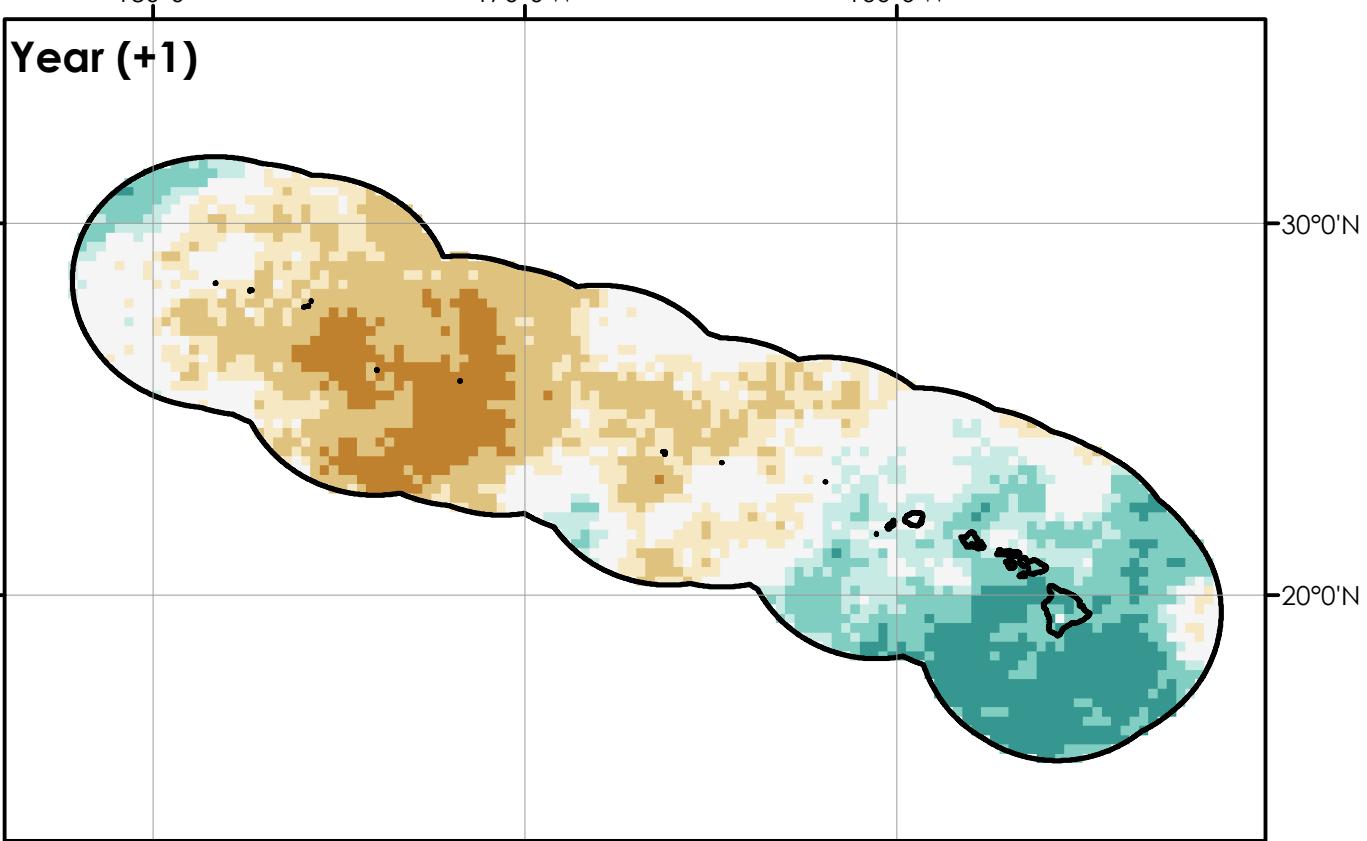
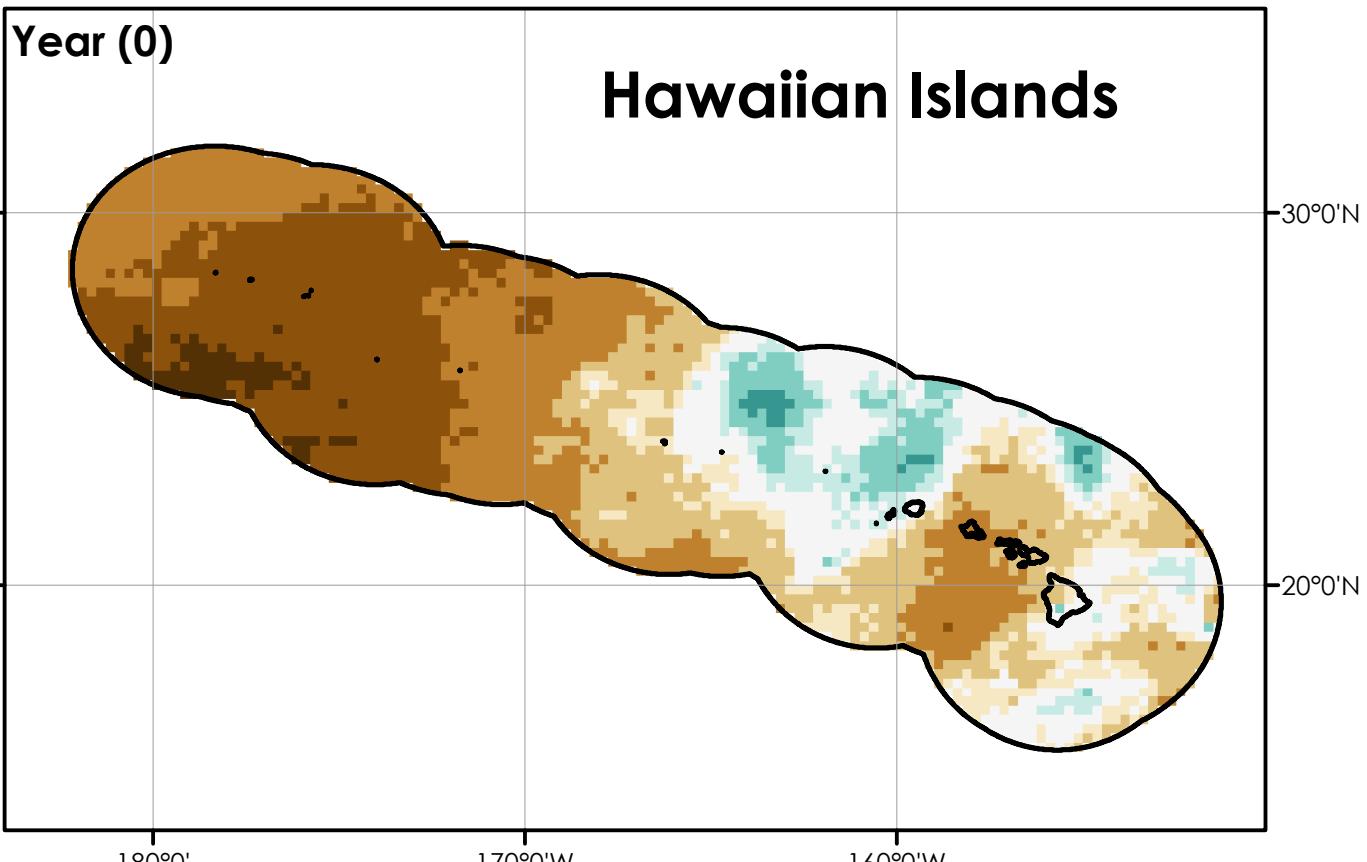
Precipitation Change (%)



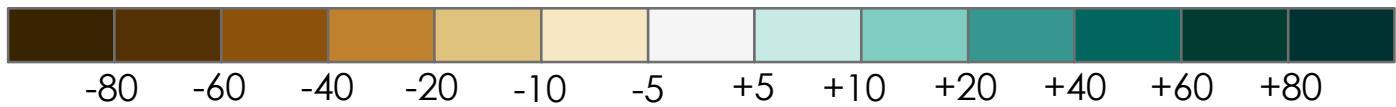


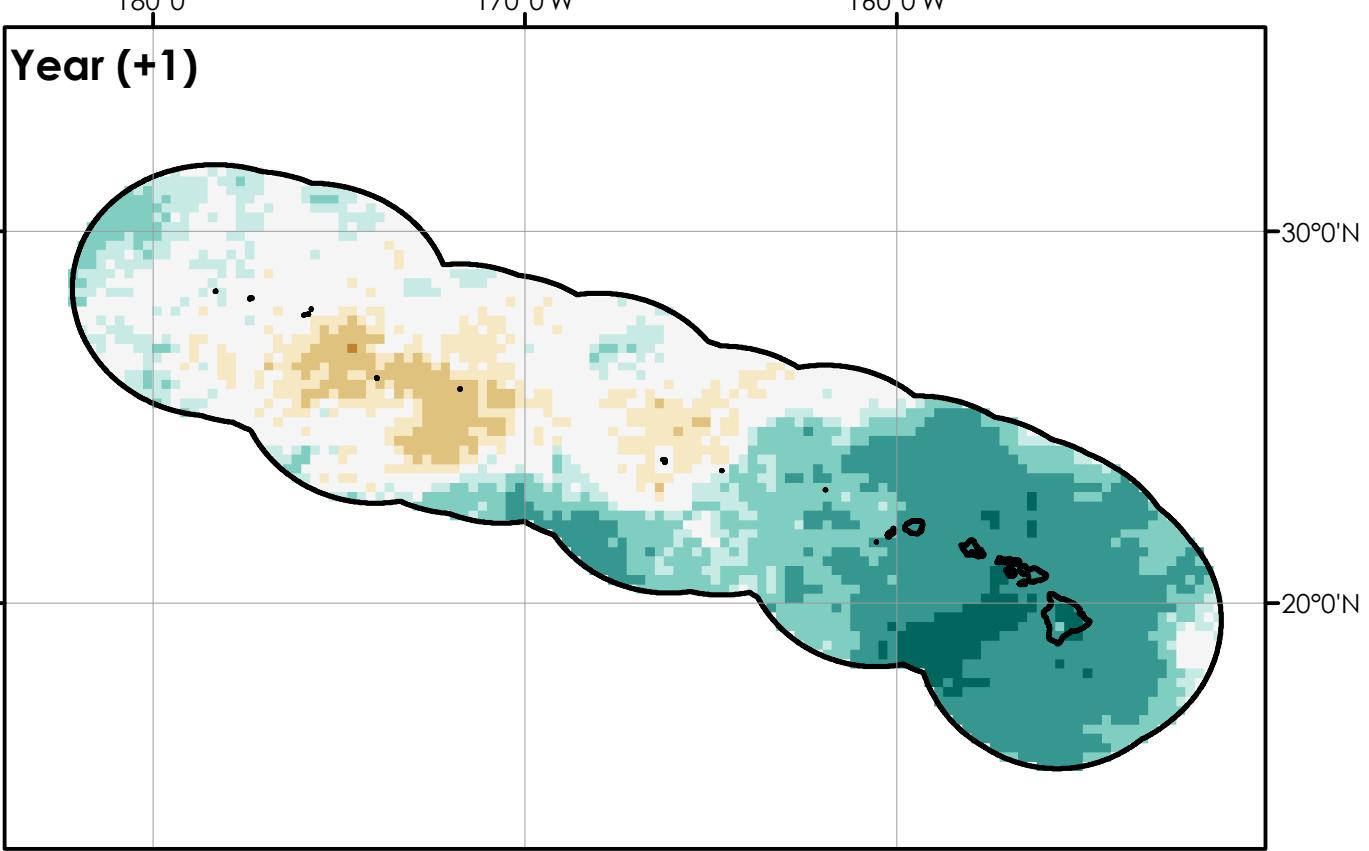
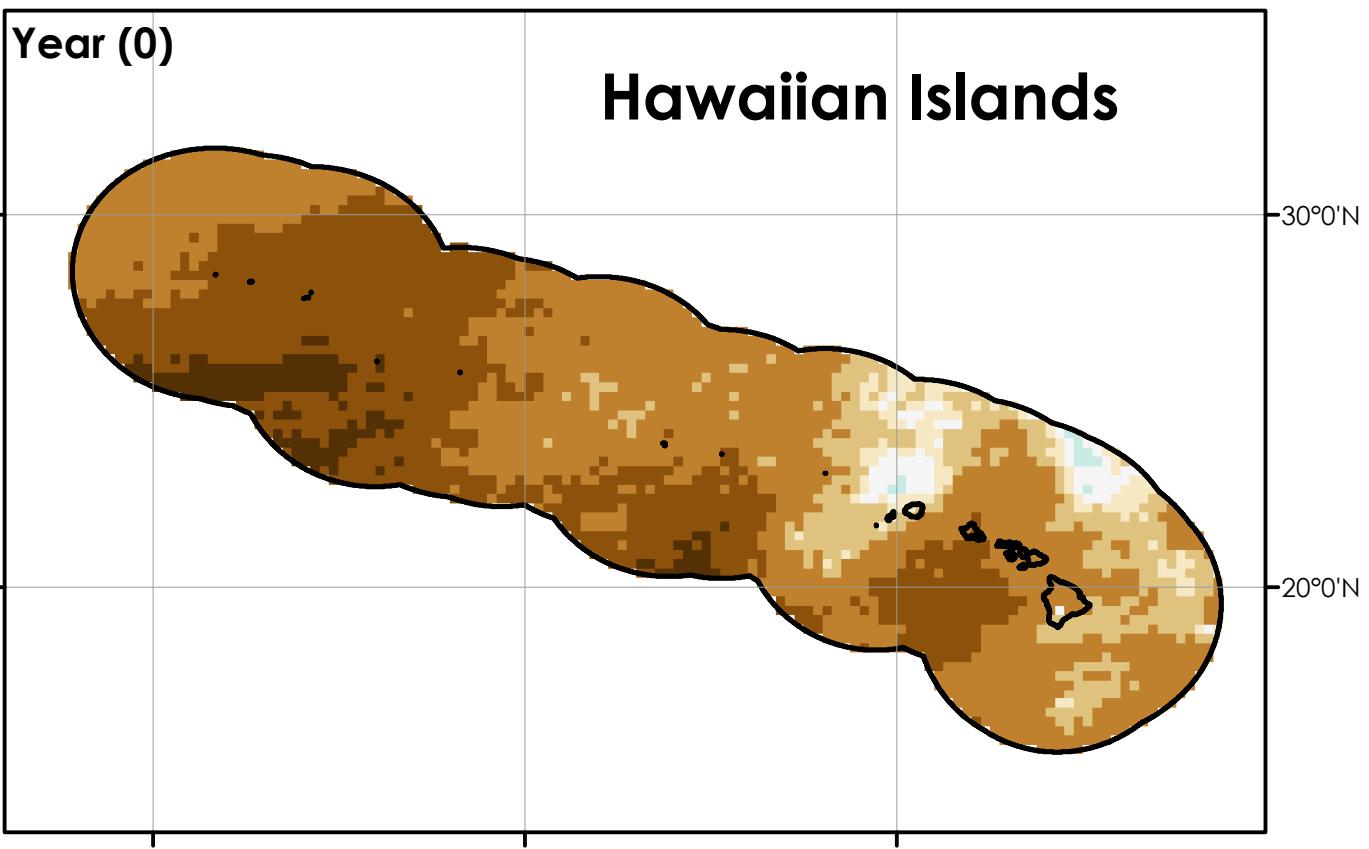
Precipitation Change (%)



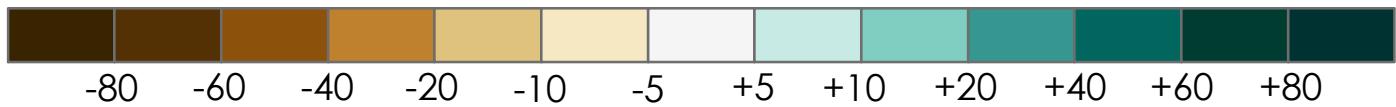


Precipitation Change (%)





Precipitation Change (%)

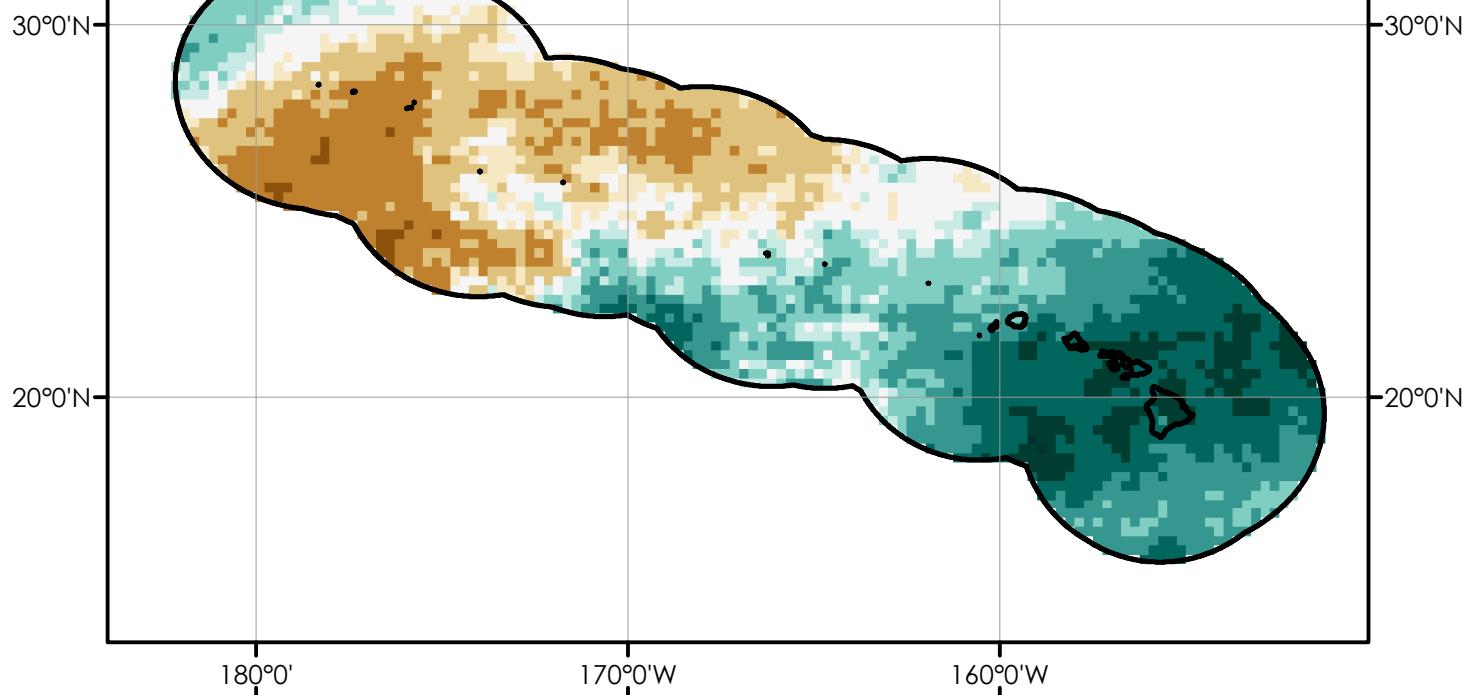


Weak El Niño for DJF

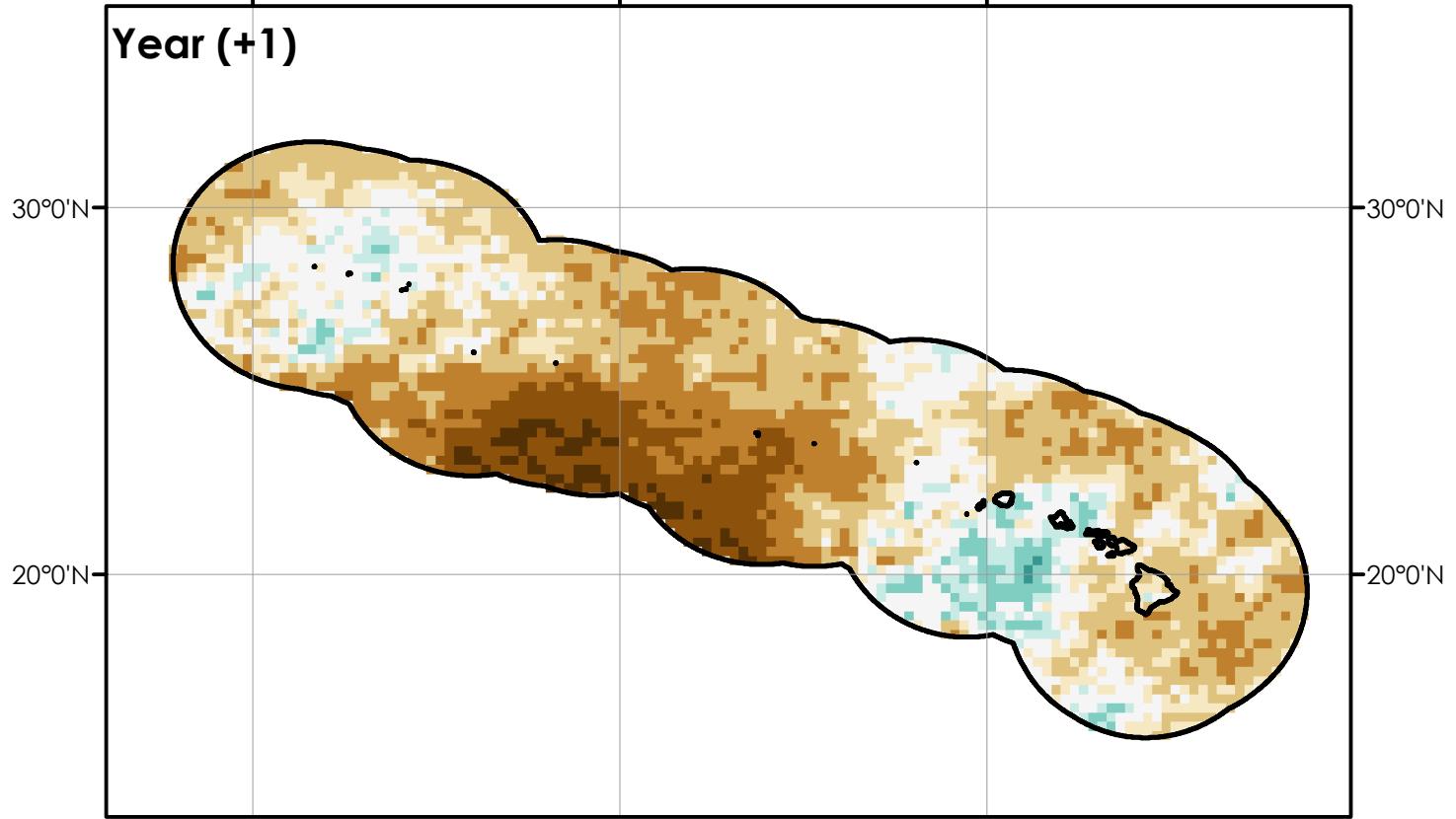
285

Year (0)

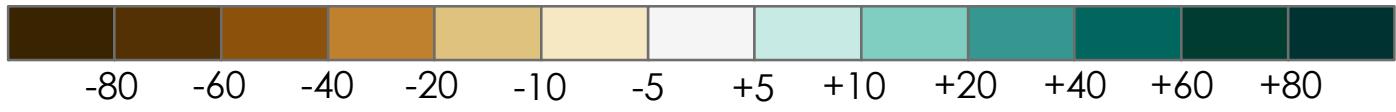
Hawaiian Islands

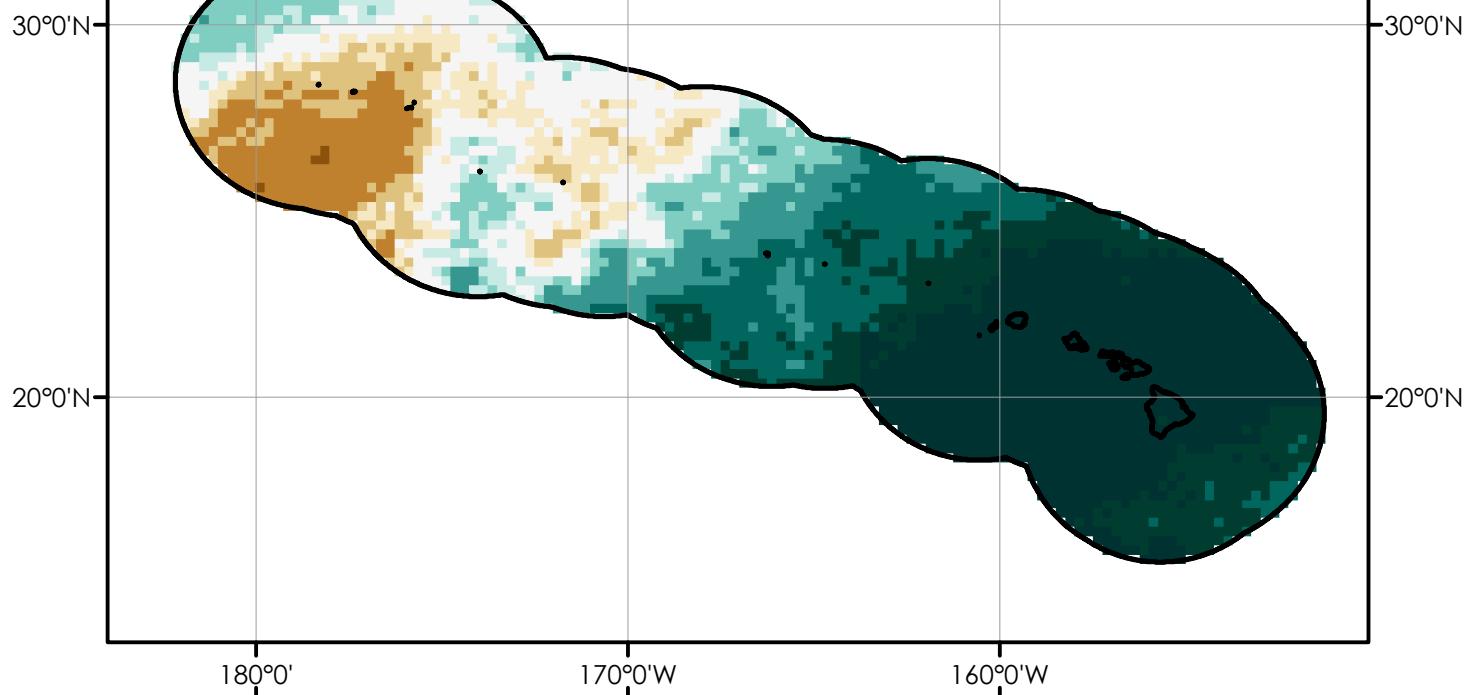
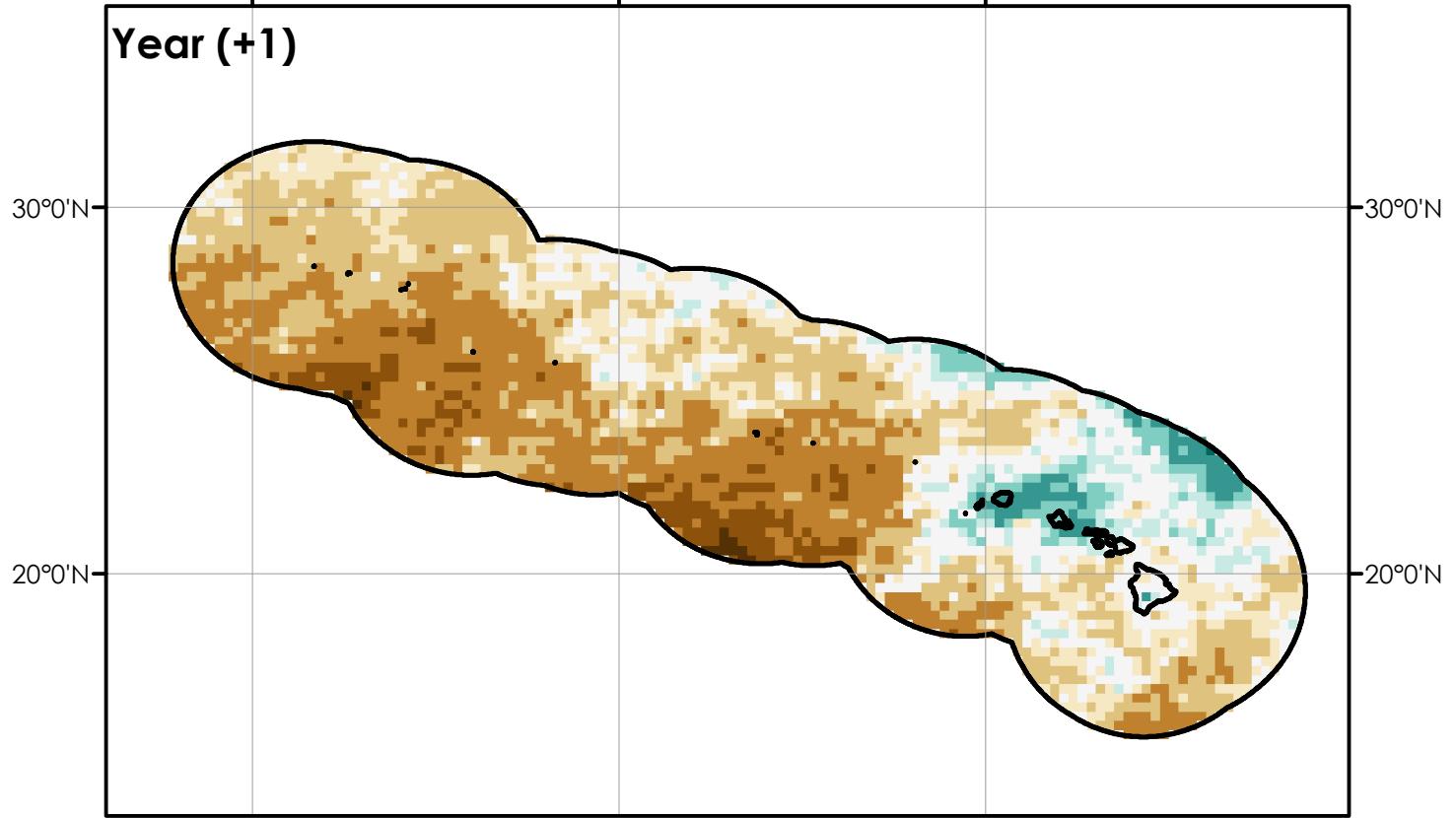
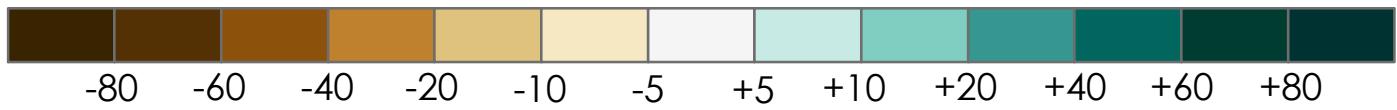


Year (+1)



Precipitation Change (%)



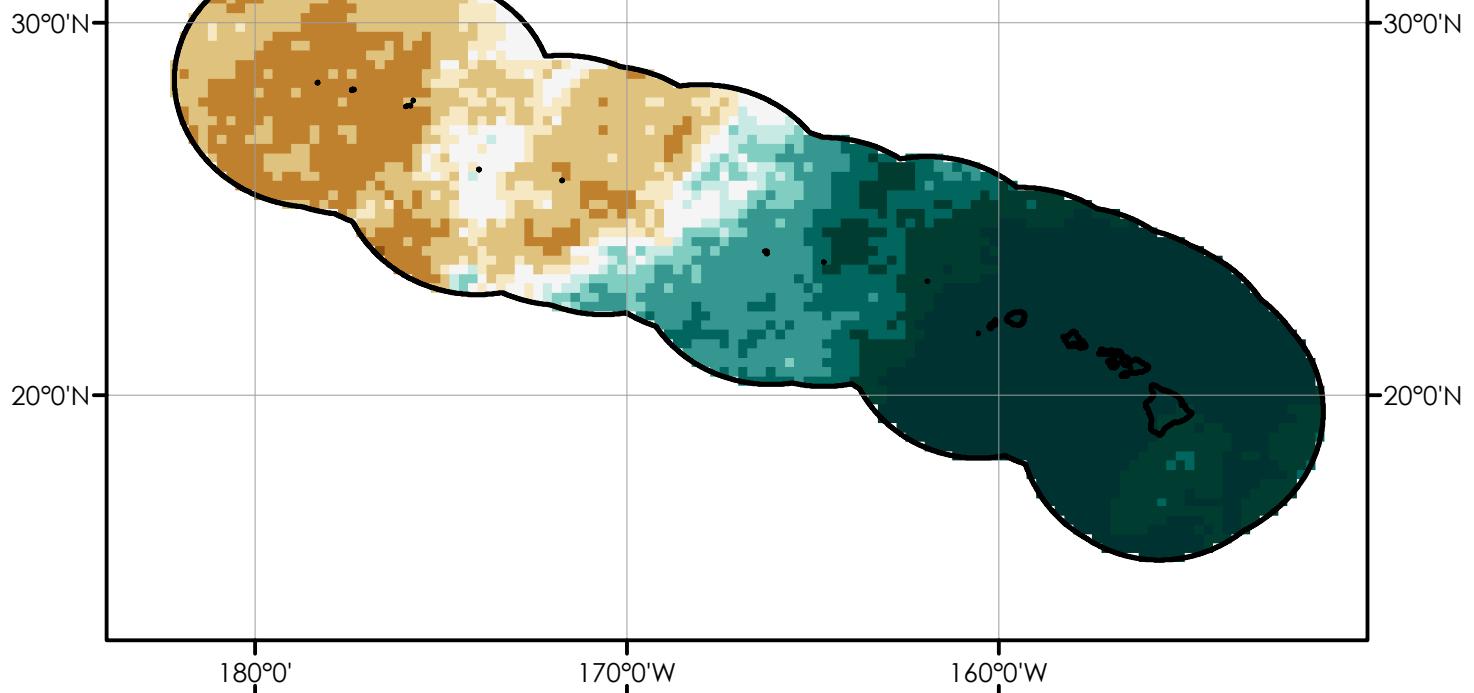
Year (0)**Hawaiian Islands****Year (+1)****Precipitation Change (%)**

Weak El Niño for FMA

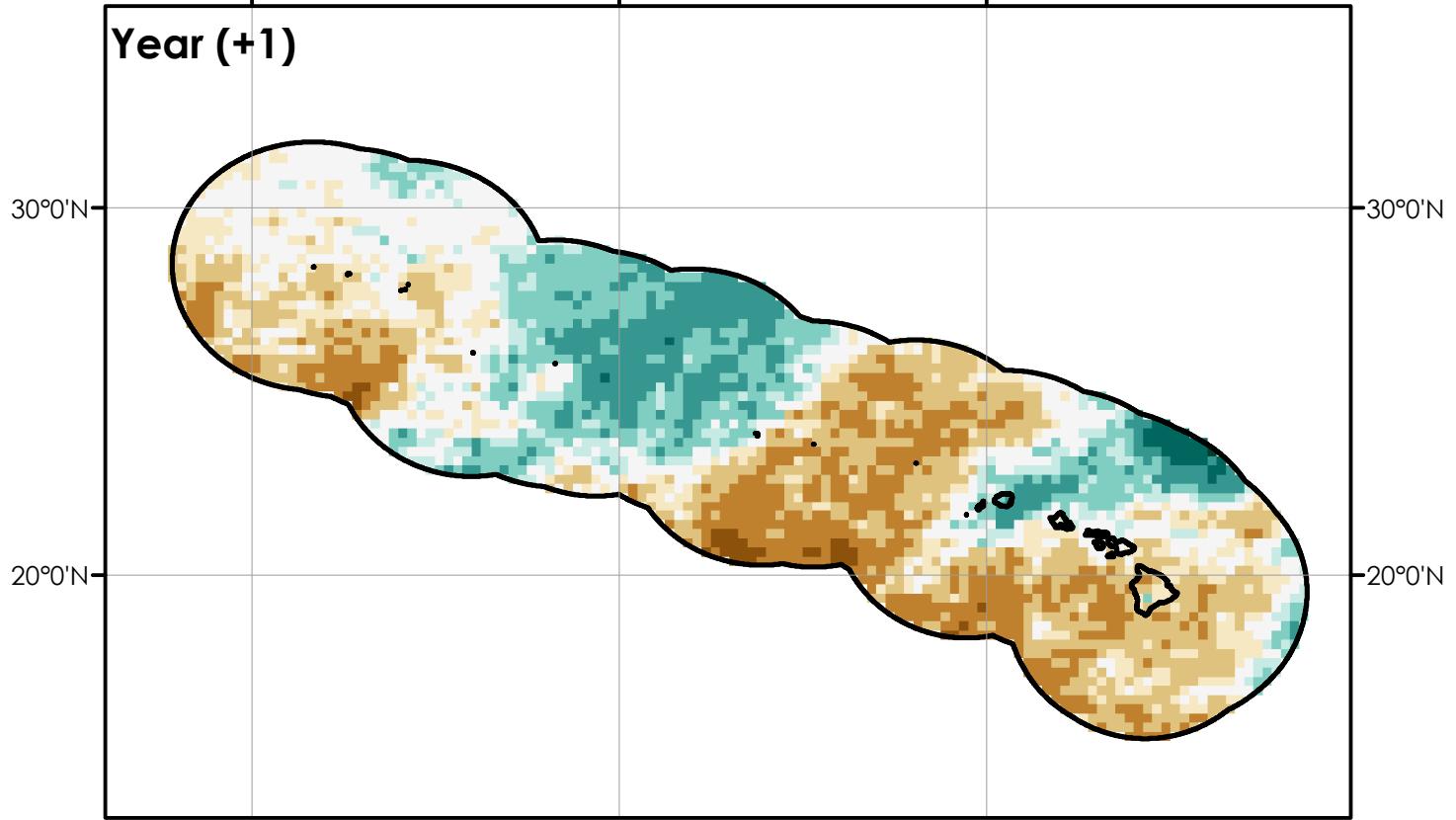
287

Year (0)

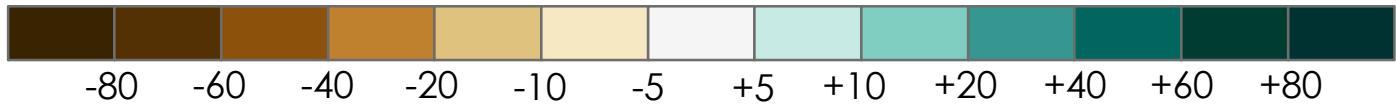
Hawaiian Islands

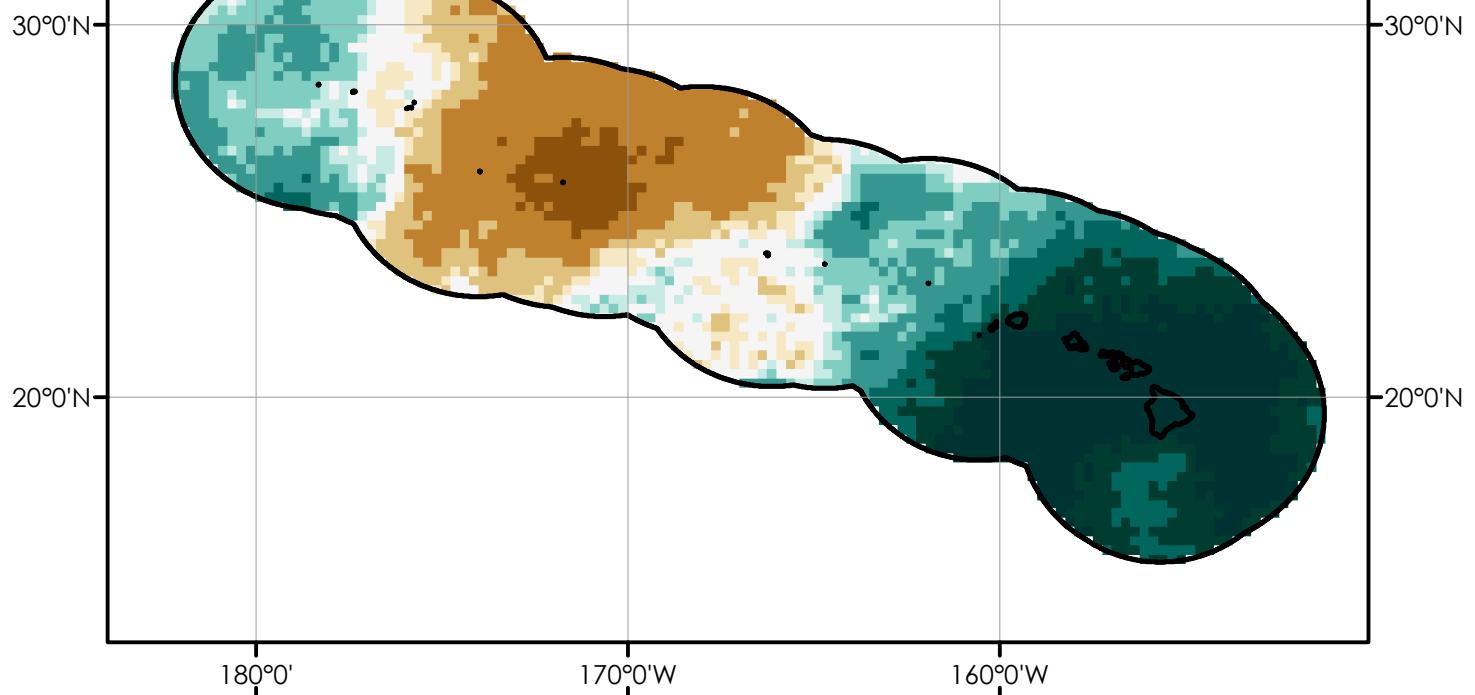
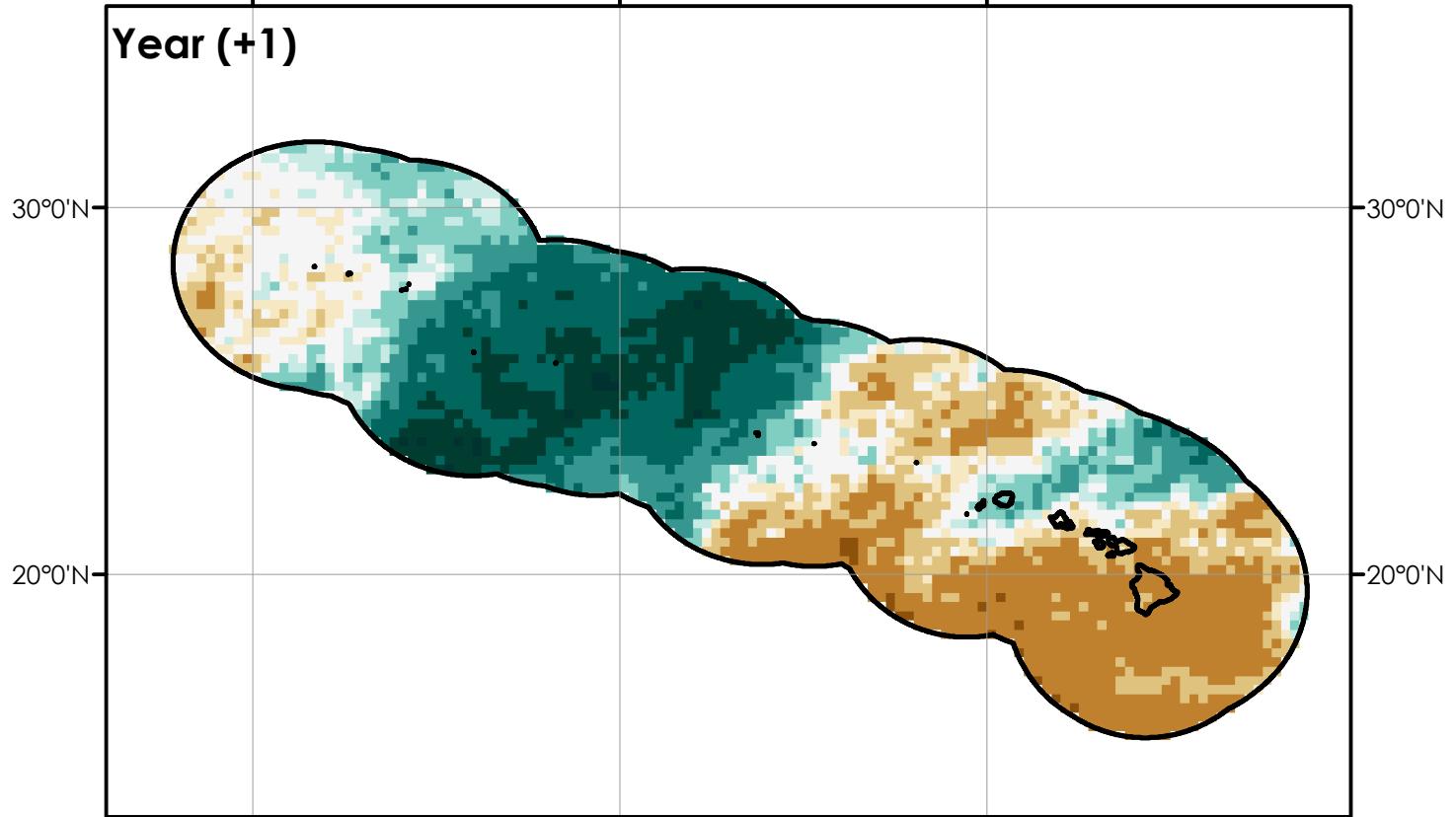
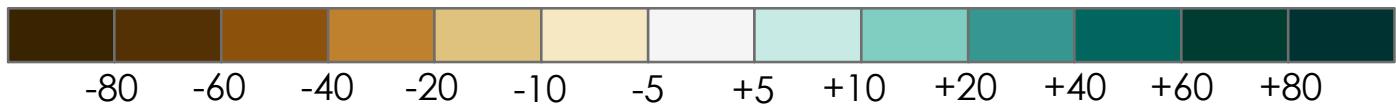


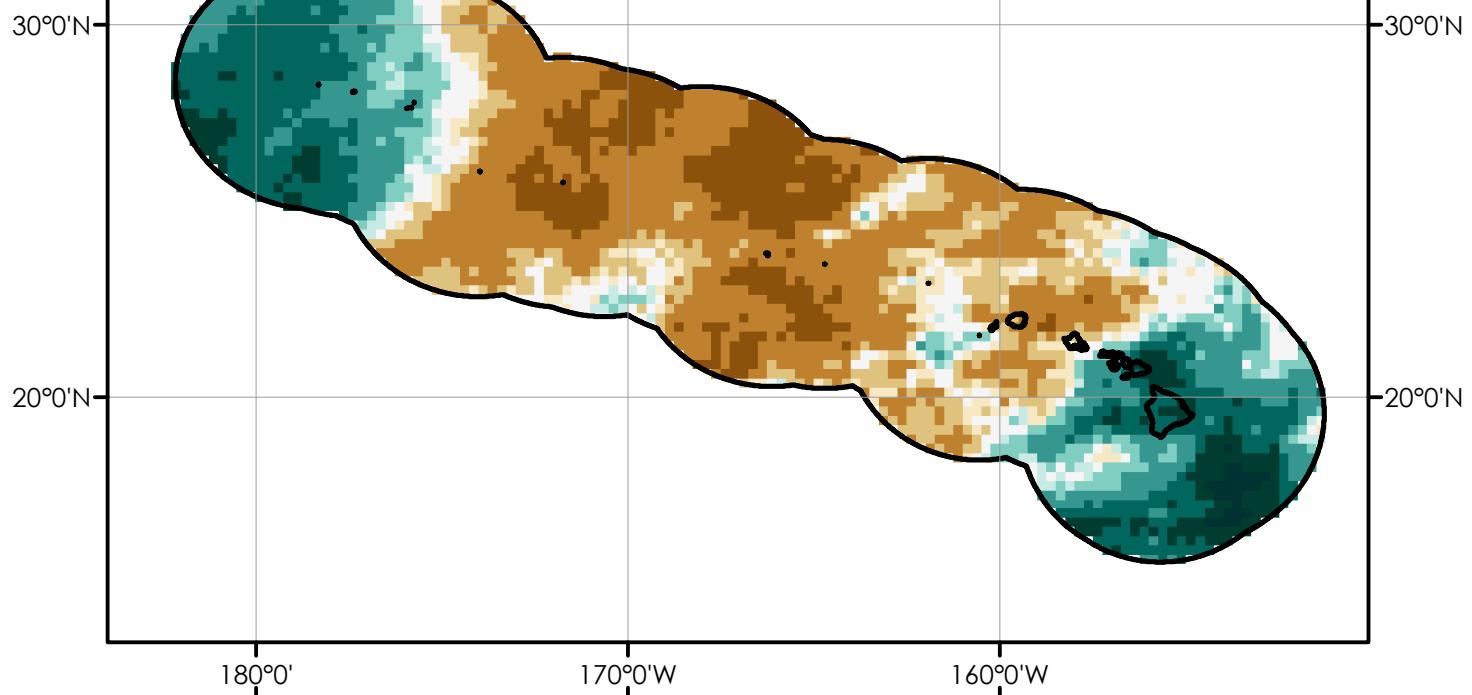
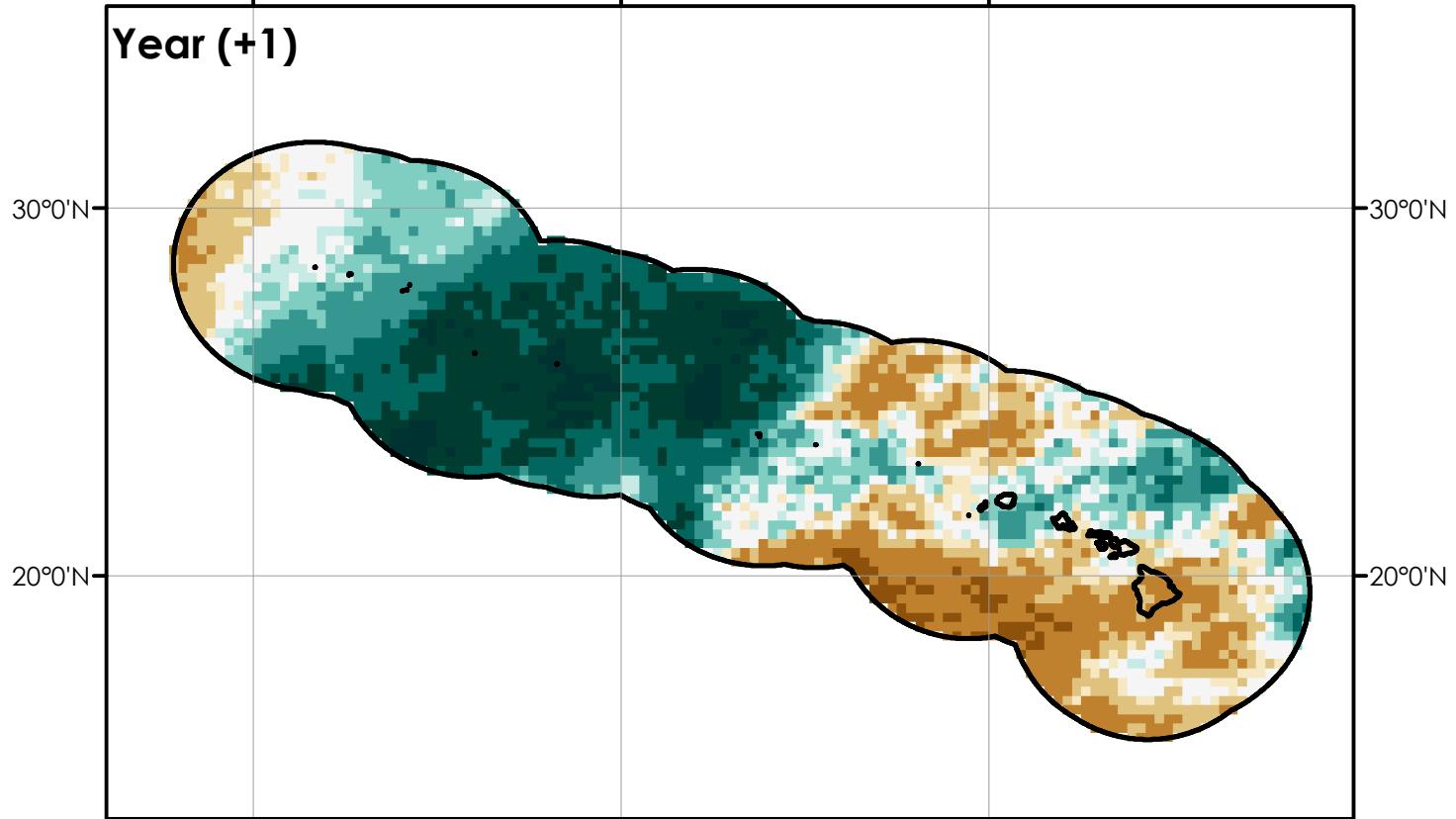
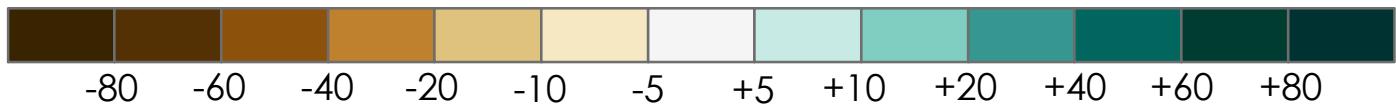
Year (+1)



Precipitation Change (%)



Year (0)**Hawaiian Islands****Year (+1)****Precipitation Change (%)**

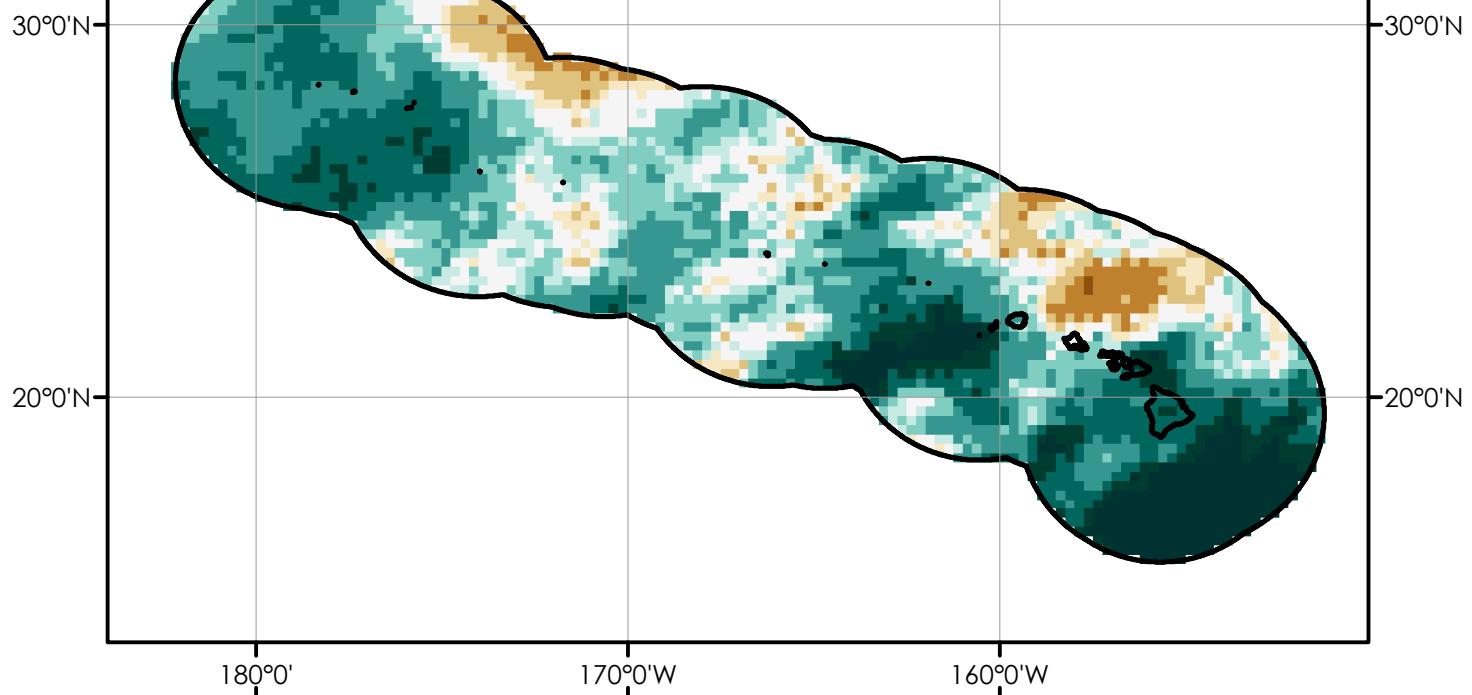
Year (0)**Hawaiian Islands****Year (+1)****Precipitation Change (%)**

Weak El Niño for MJJ

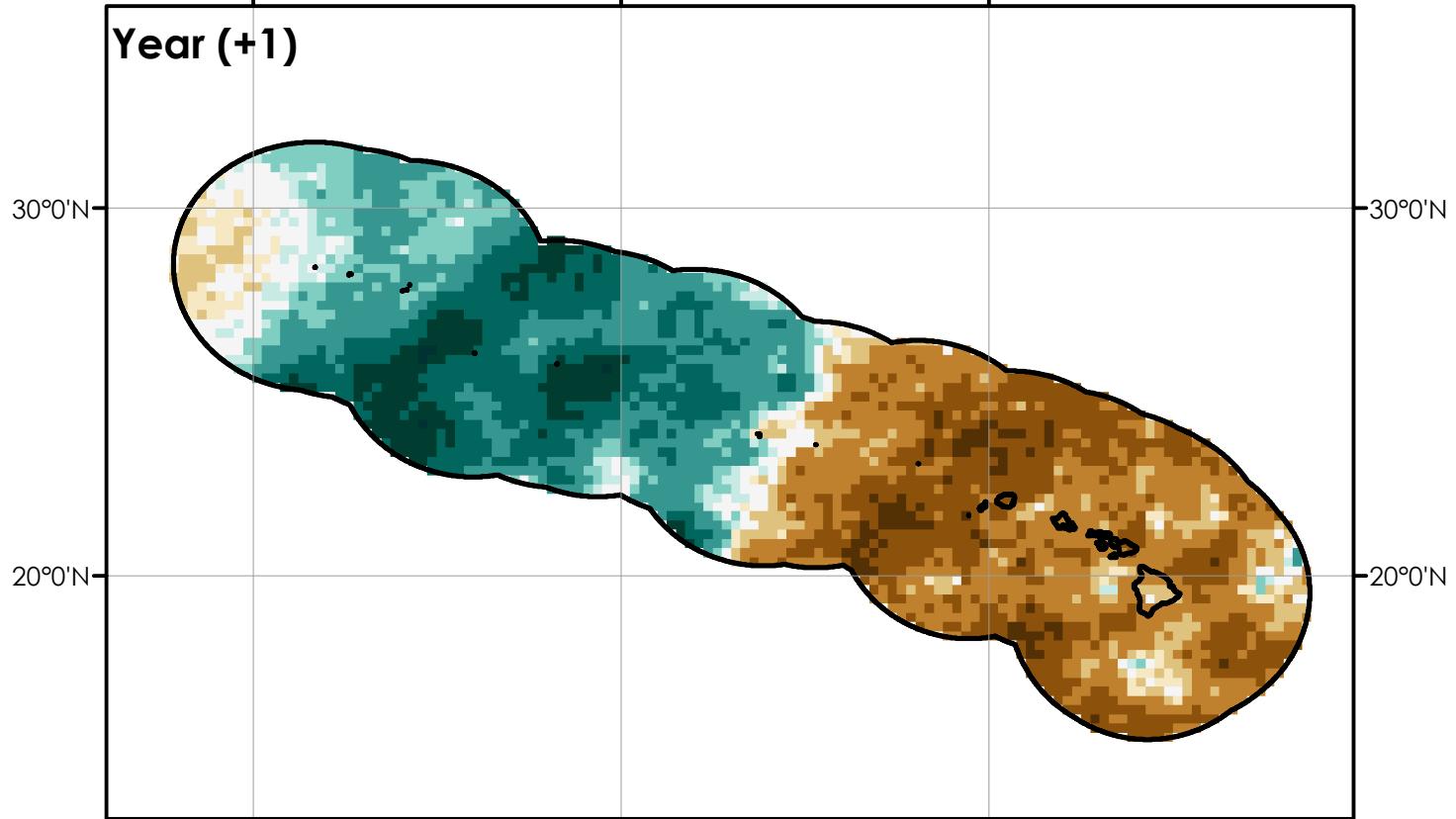
290

Year (0)

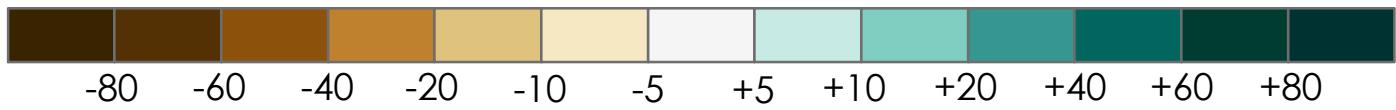
Hawaiian Islands

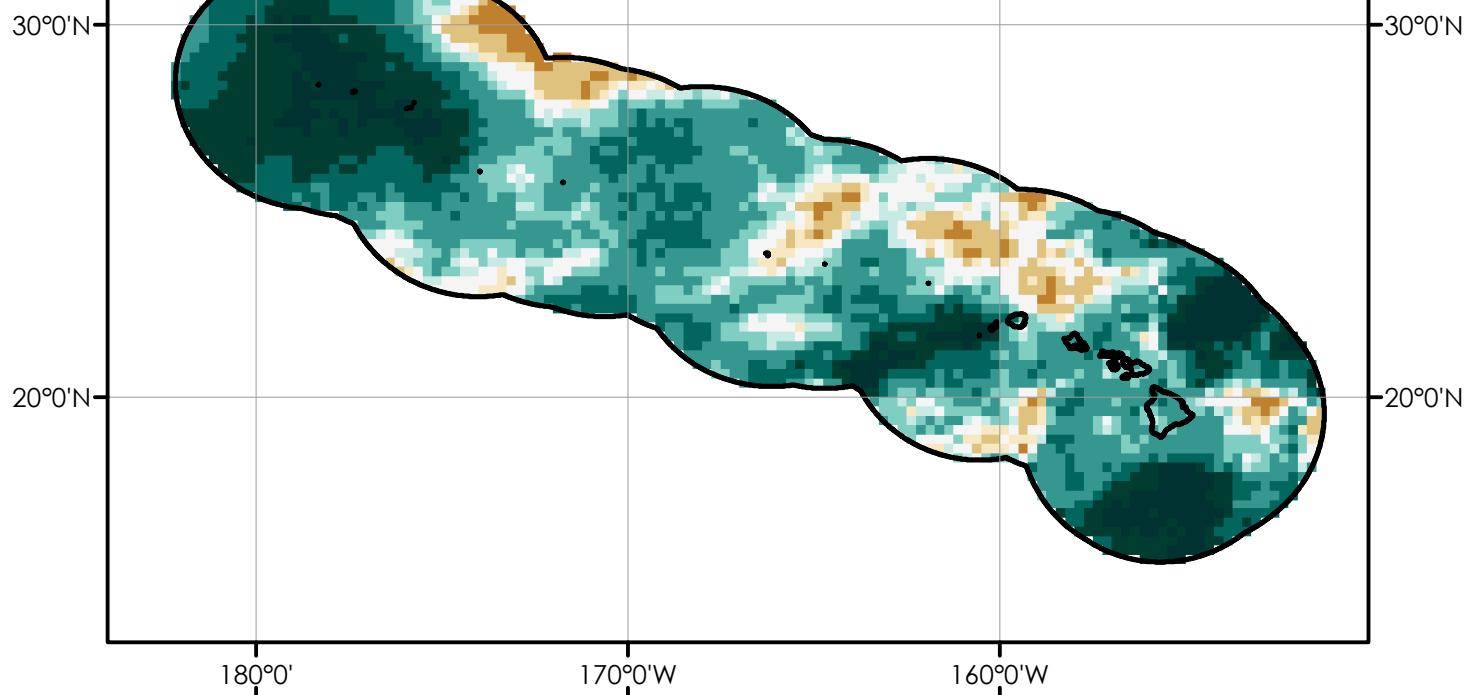
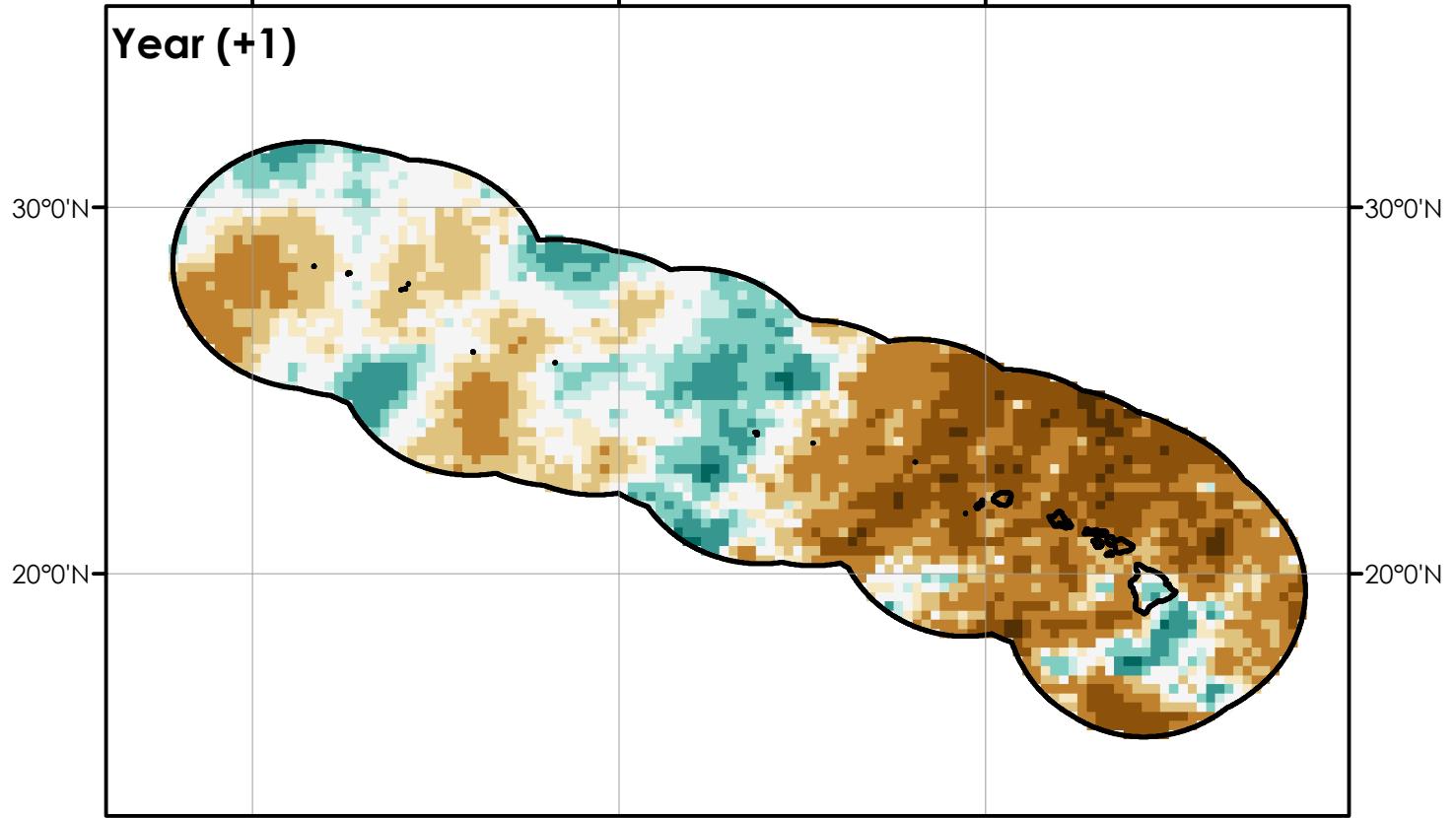
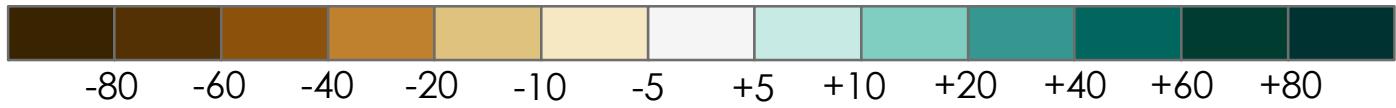


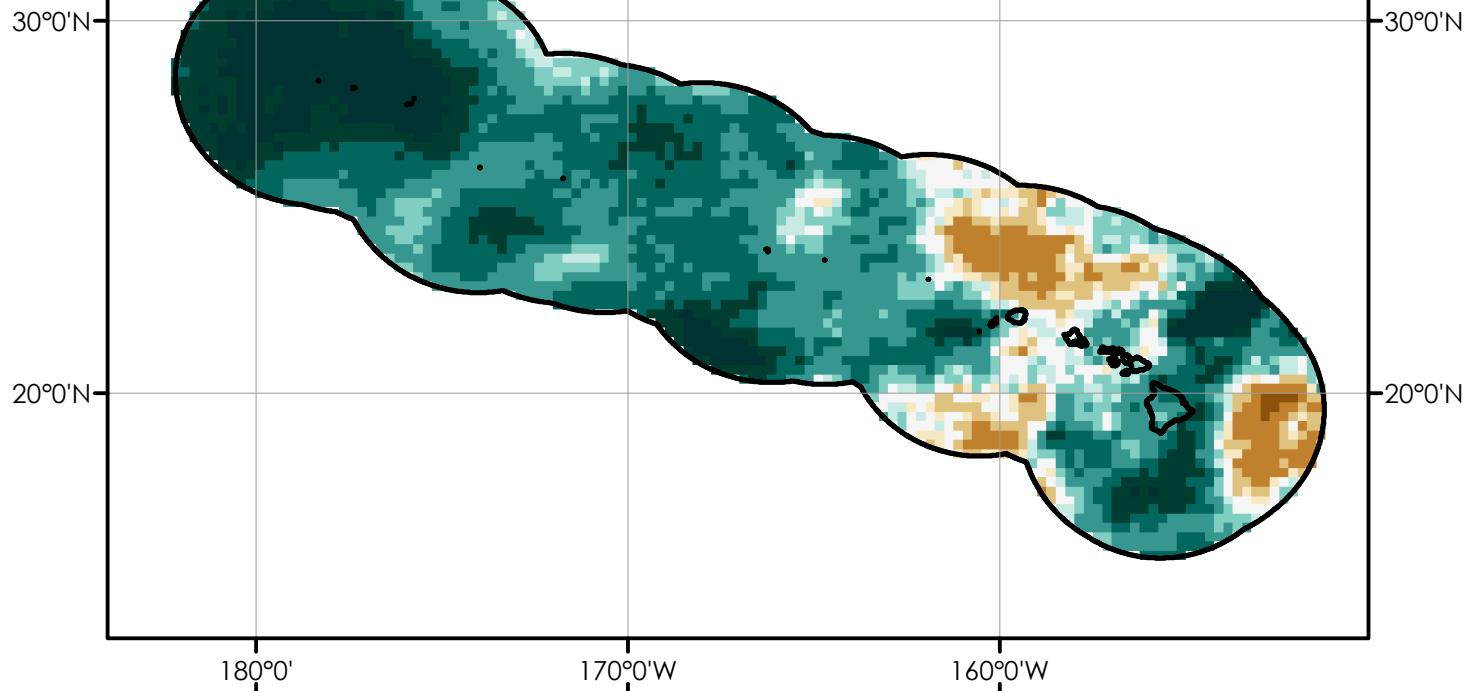
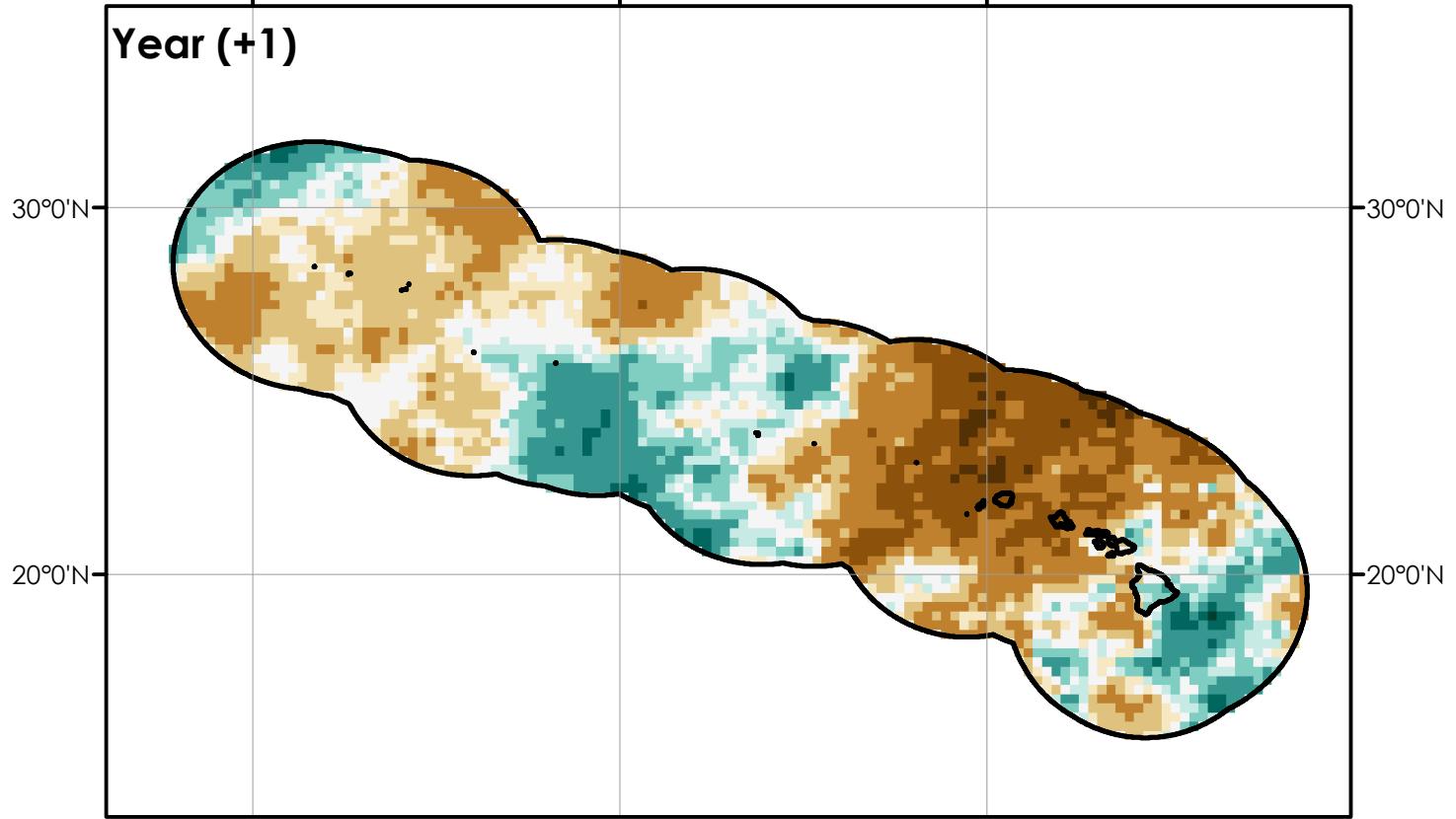
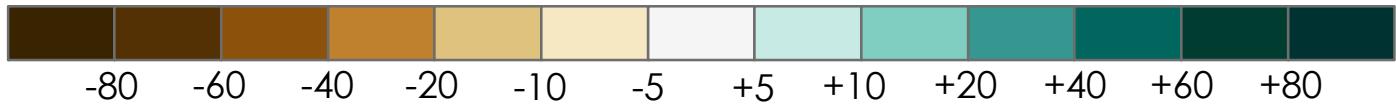
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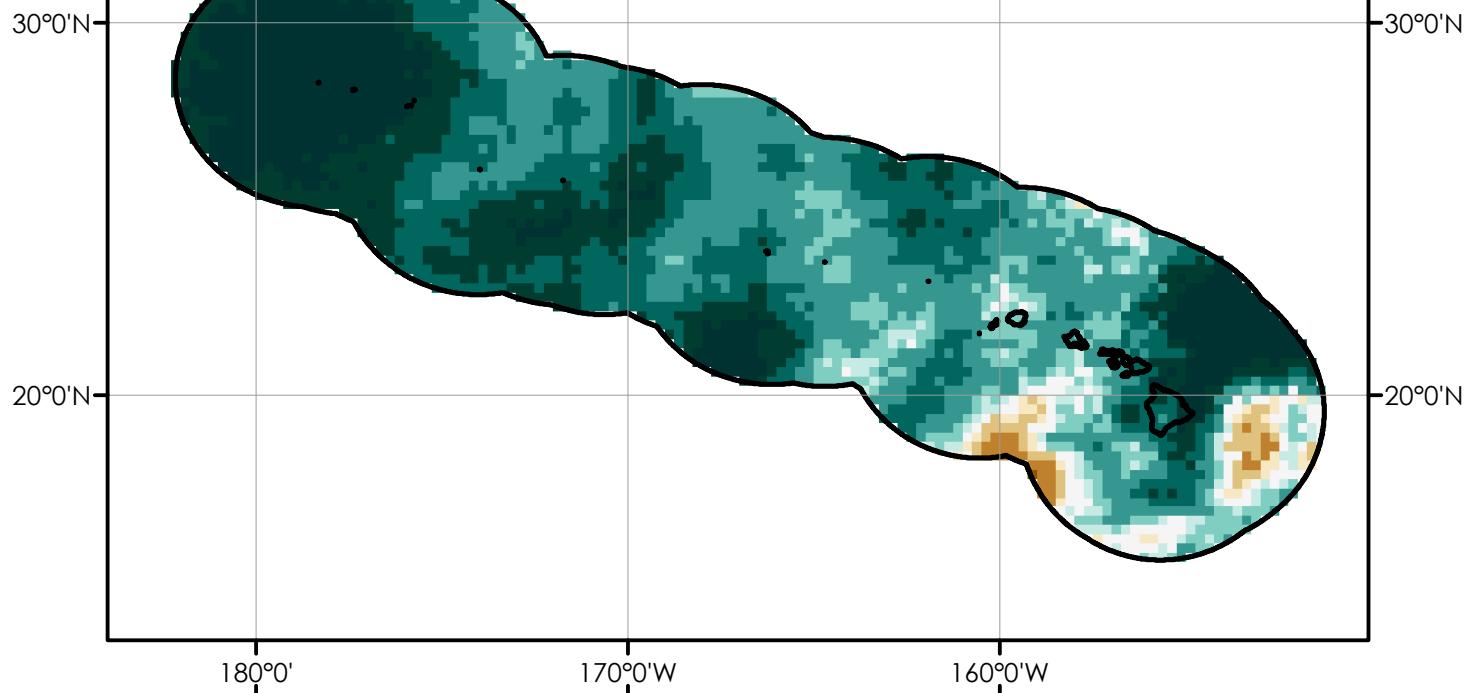
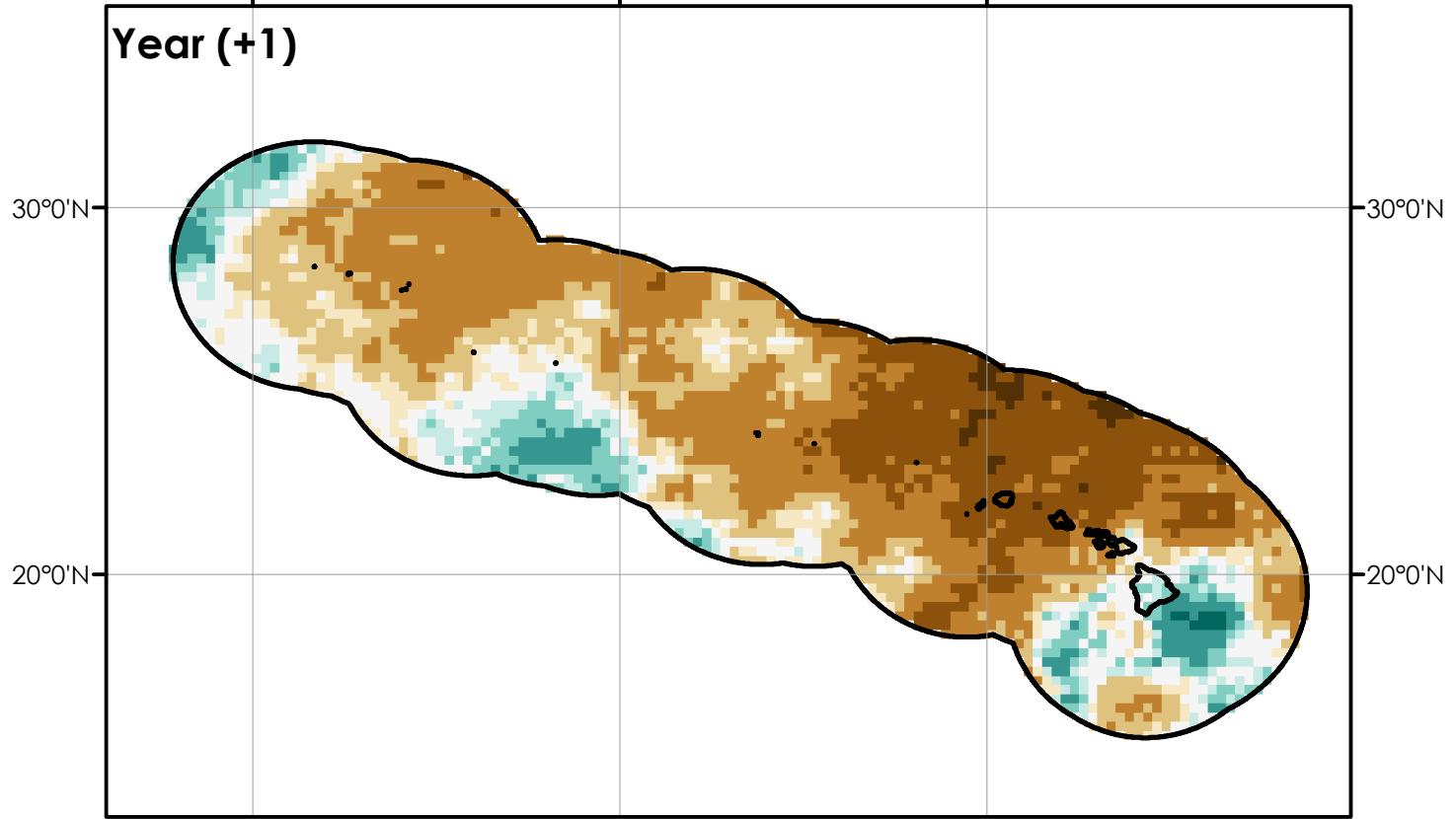
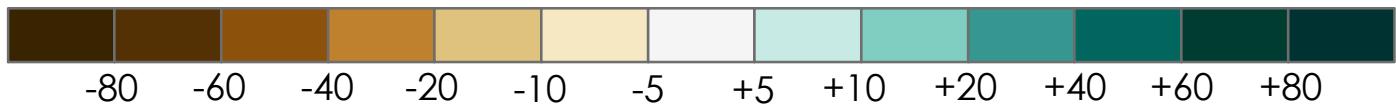


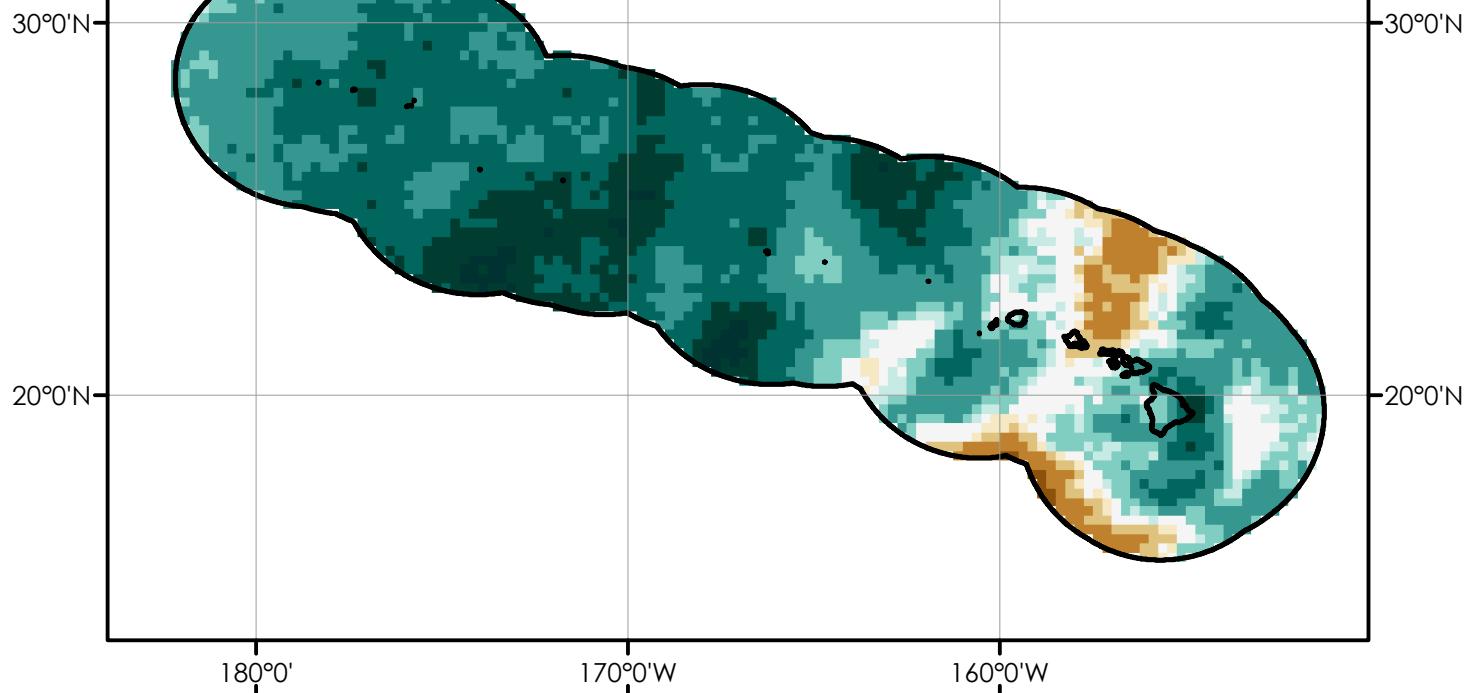
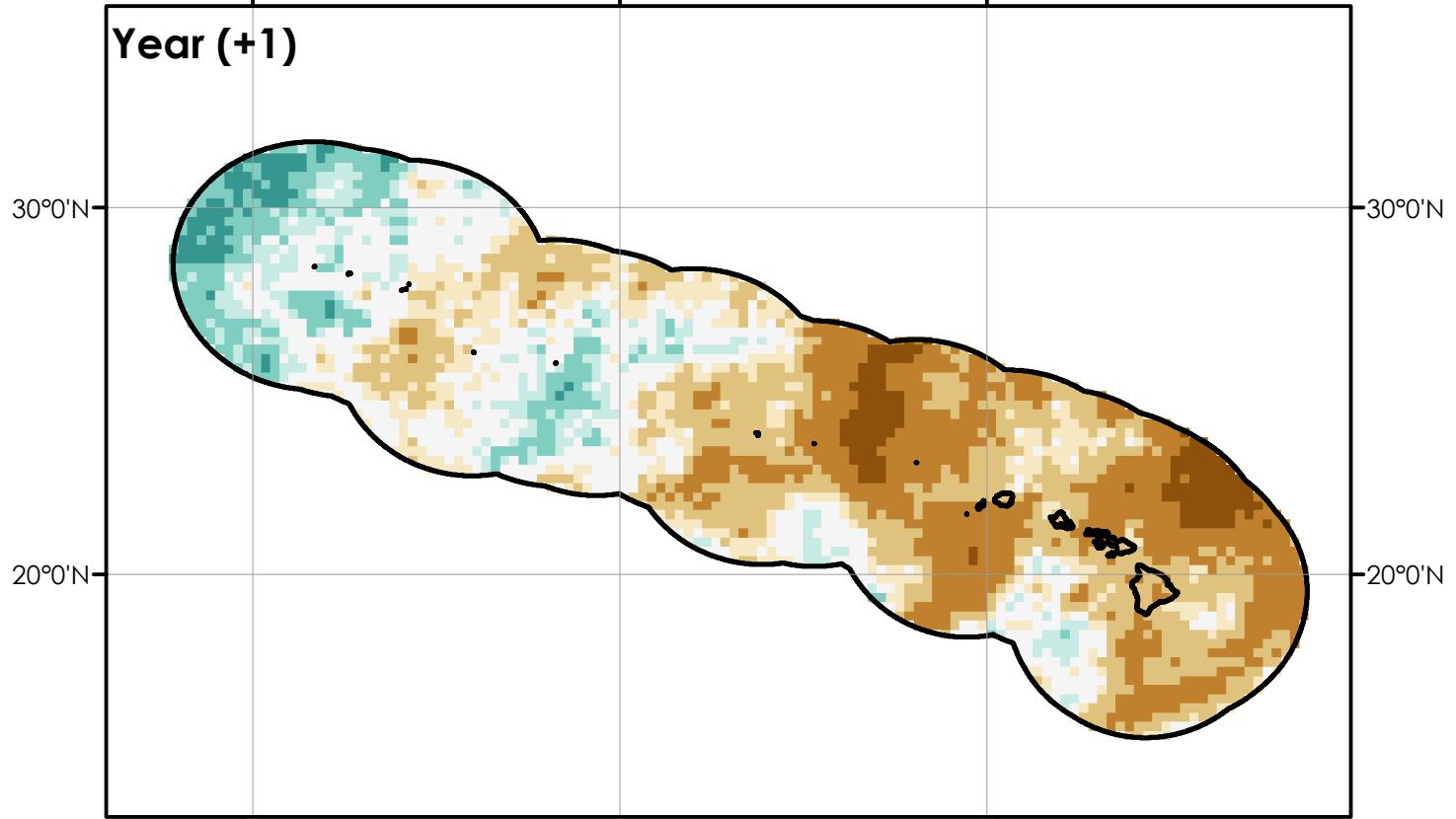
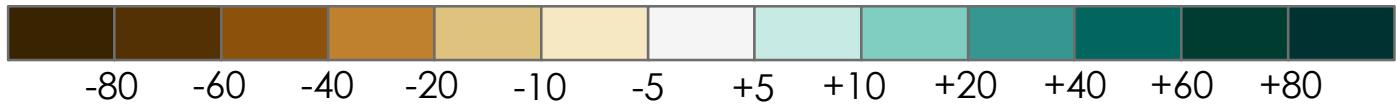
Precipitation Change (%)

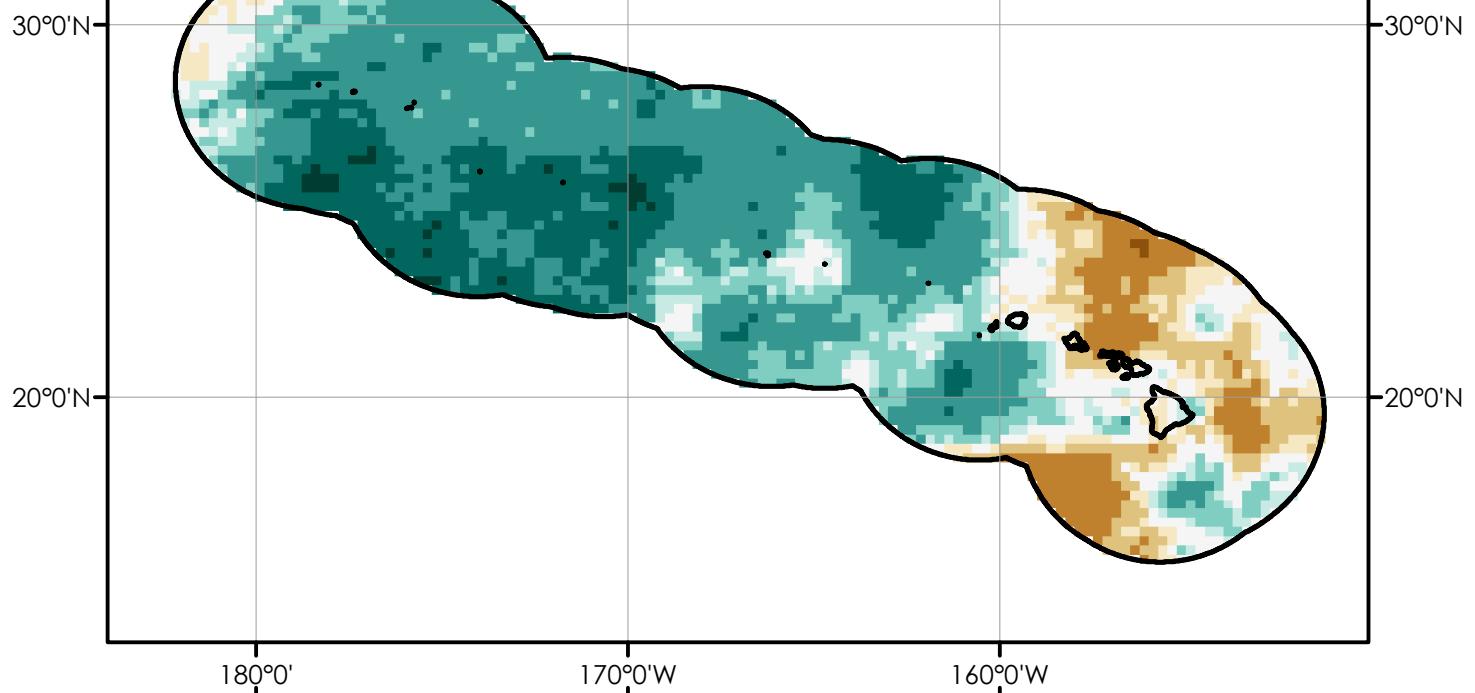
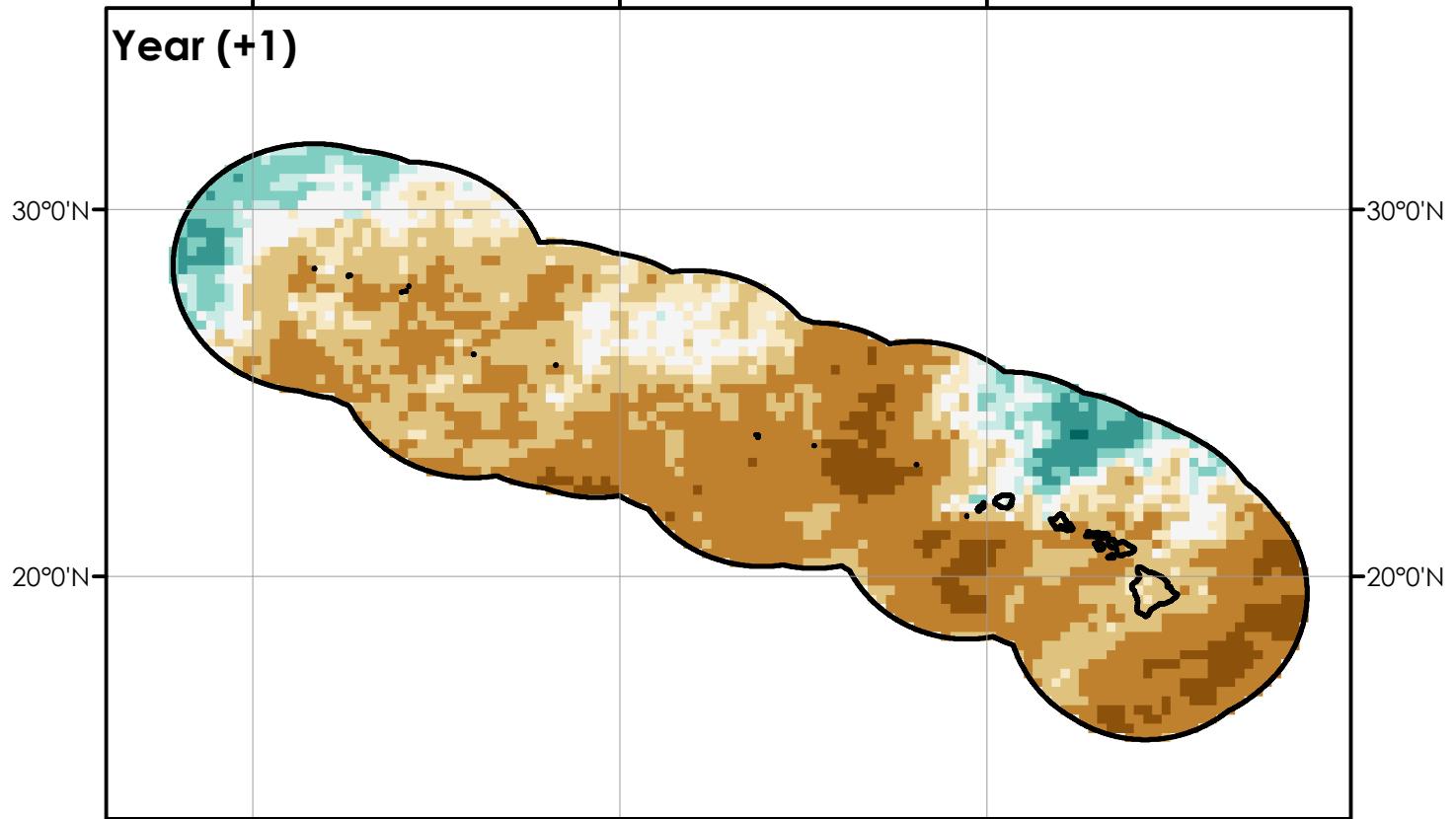
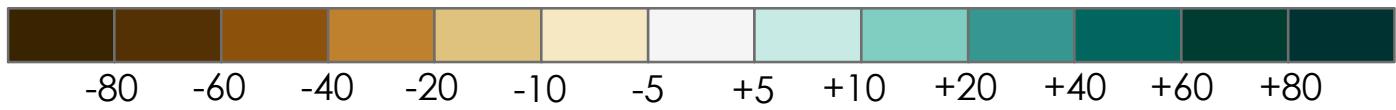


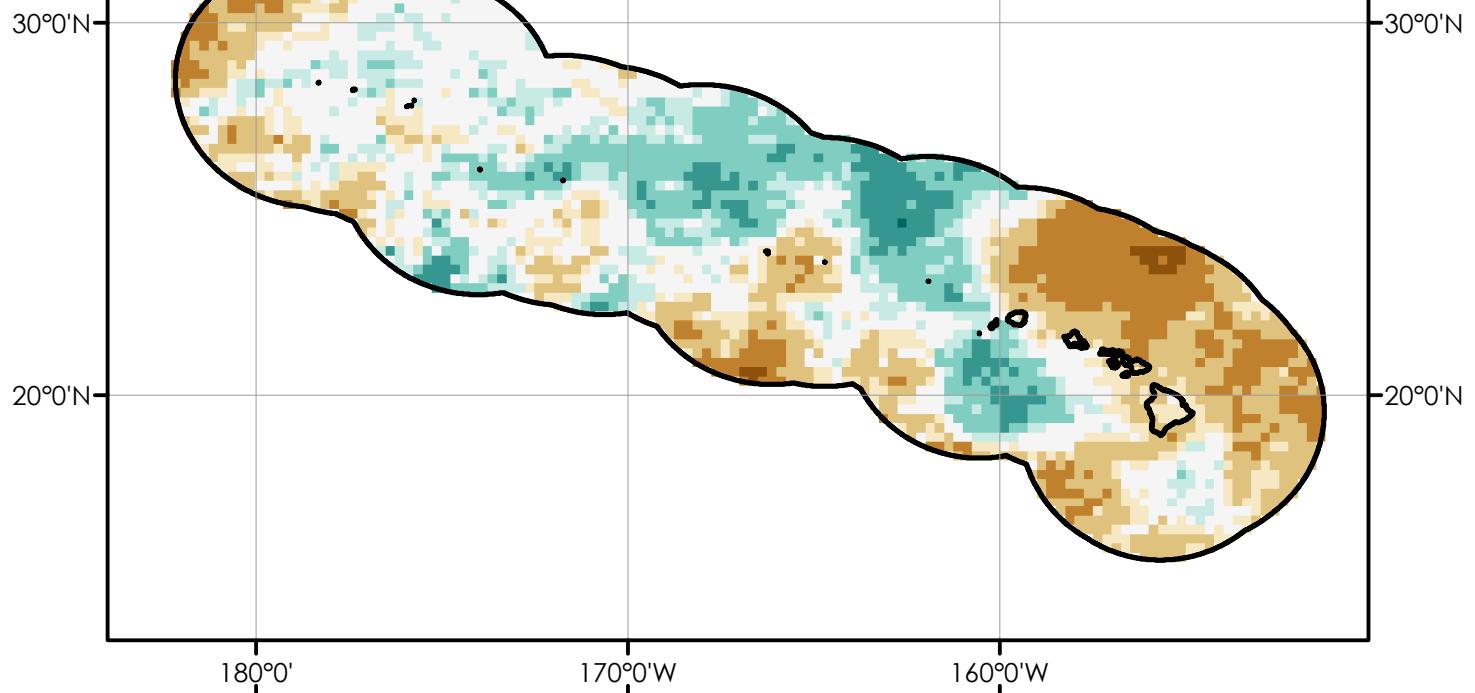
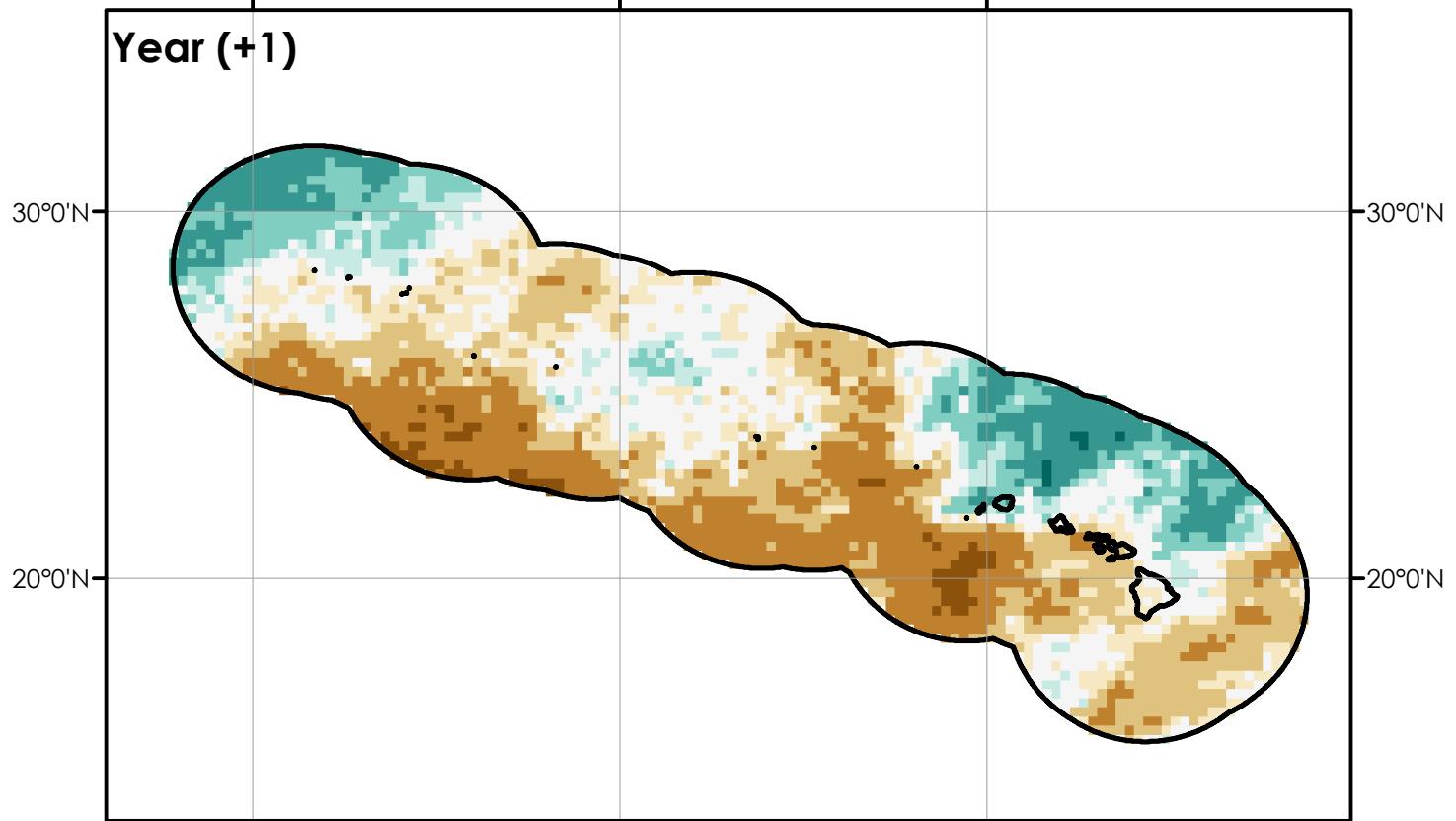
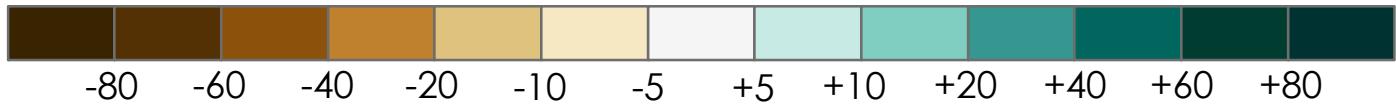
Year (0)**Hawaiian Islands****Year (+1)****Precipitation Change (%)**

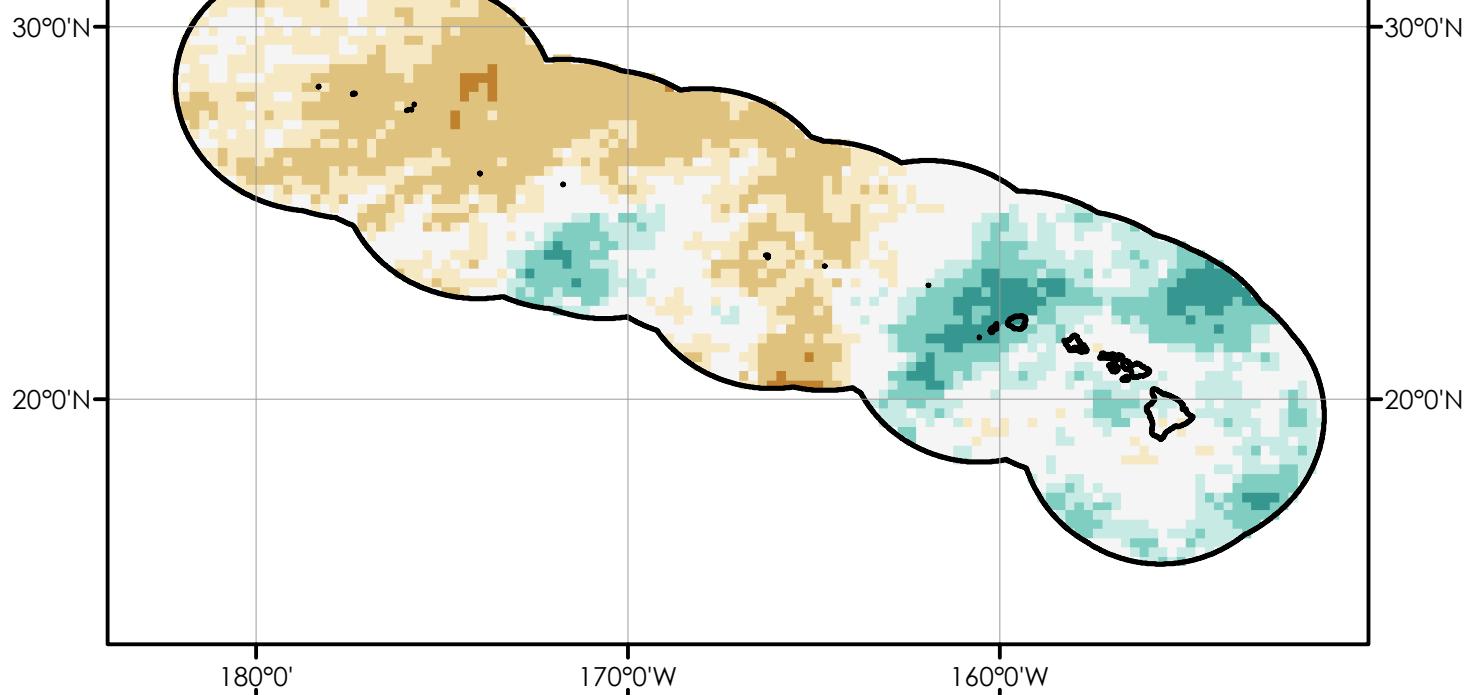
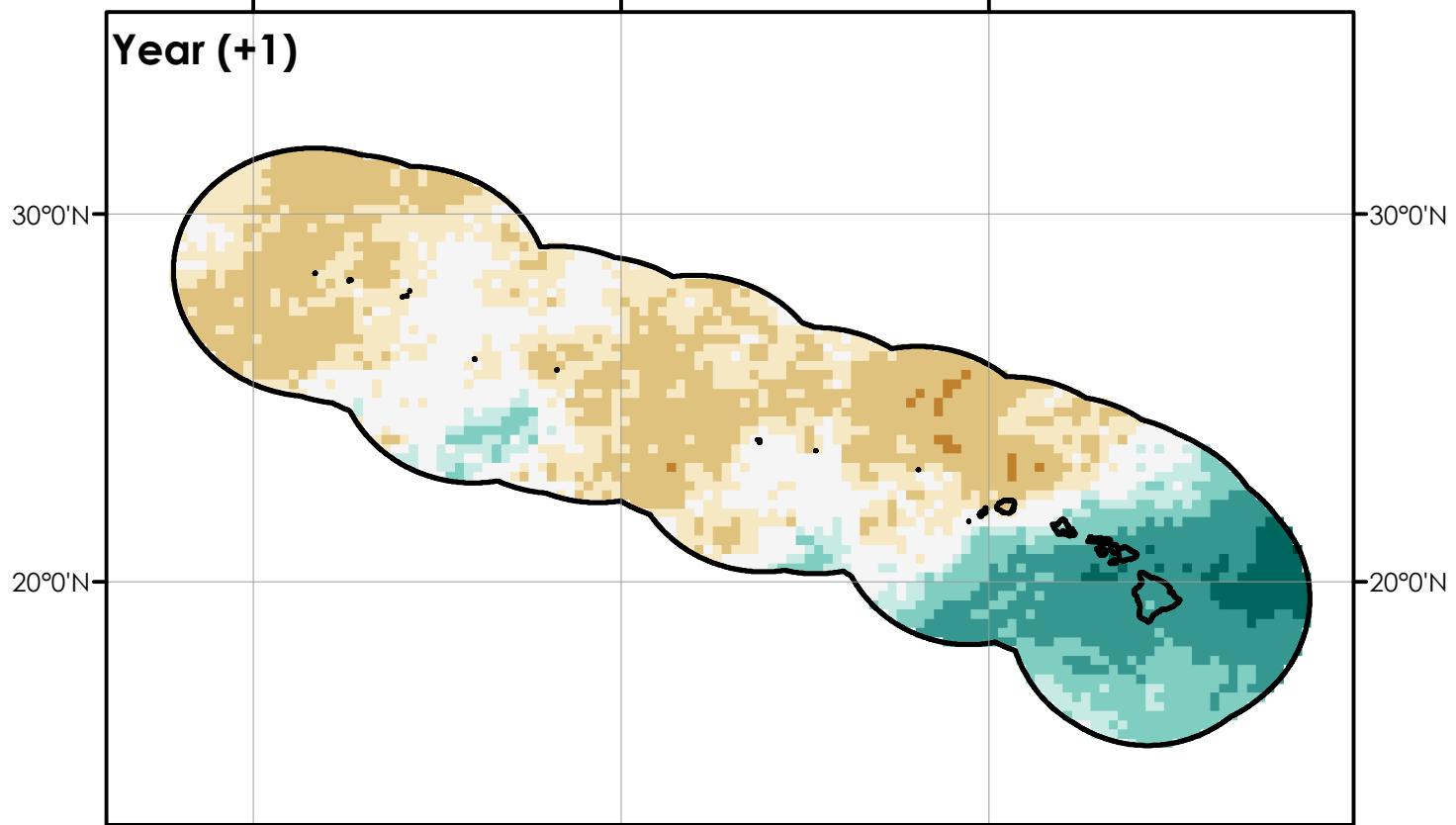
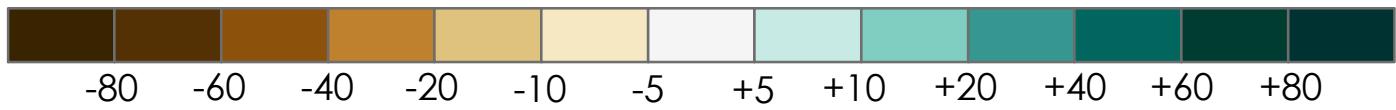
Year (0)**Hawaiian Islands****Year (+1)****Precipitation Change (%)**

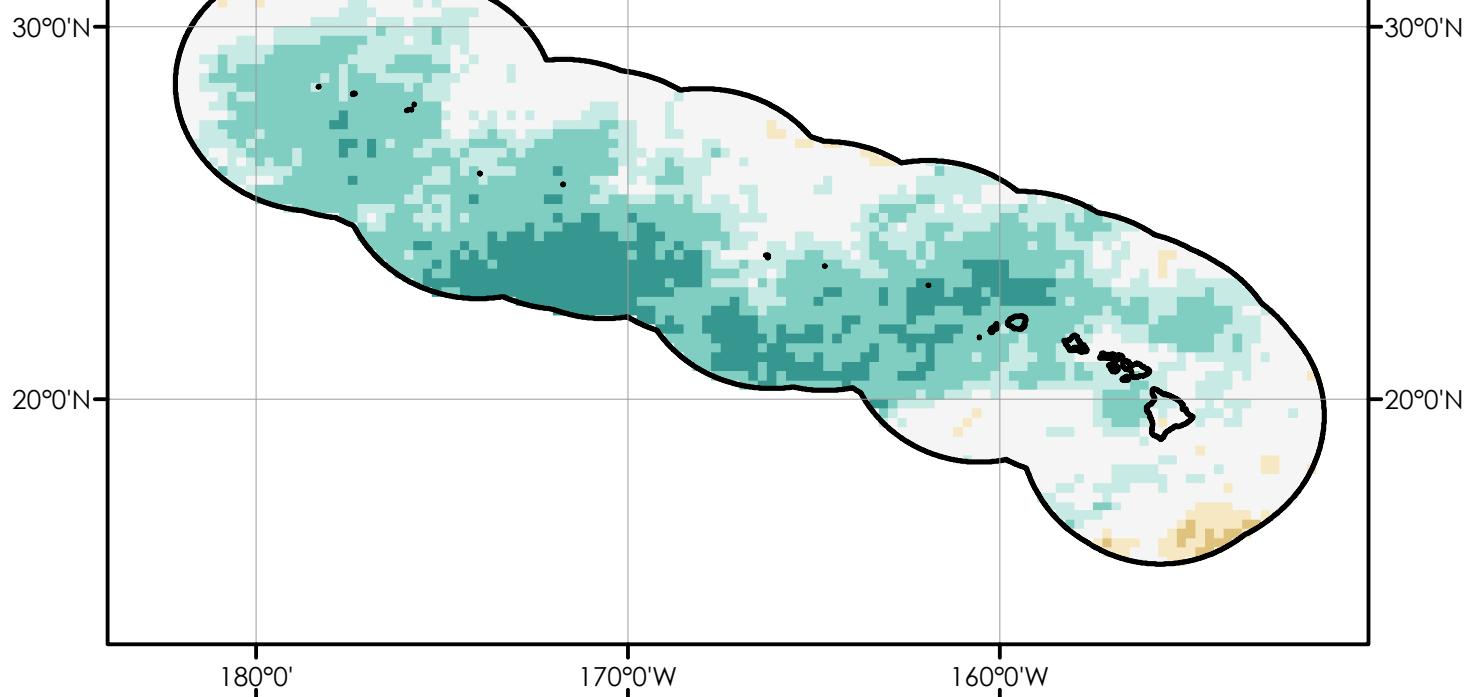
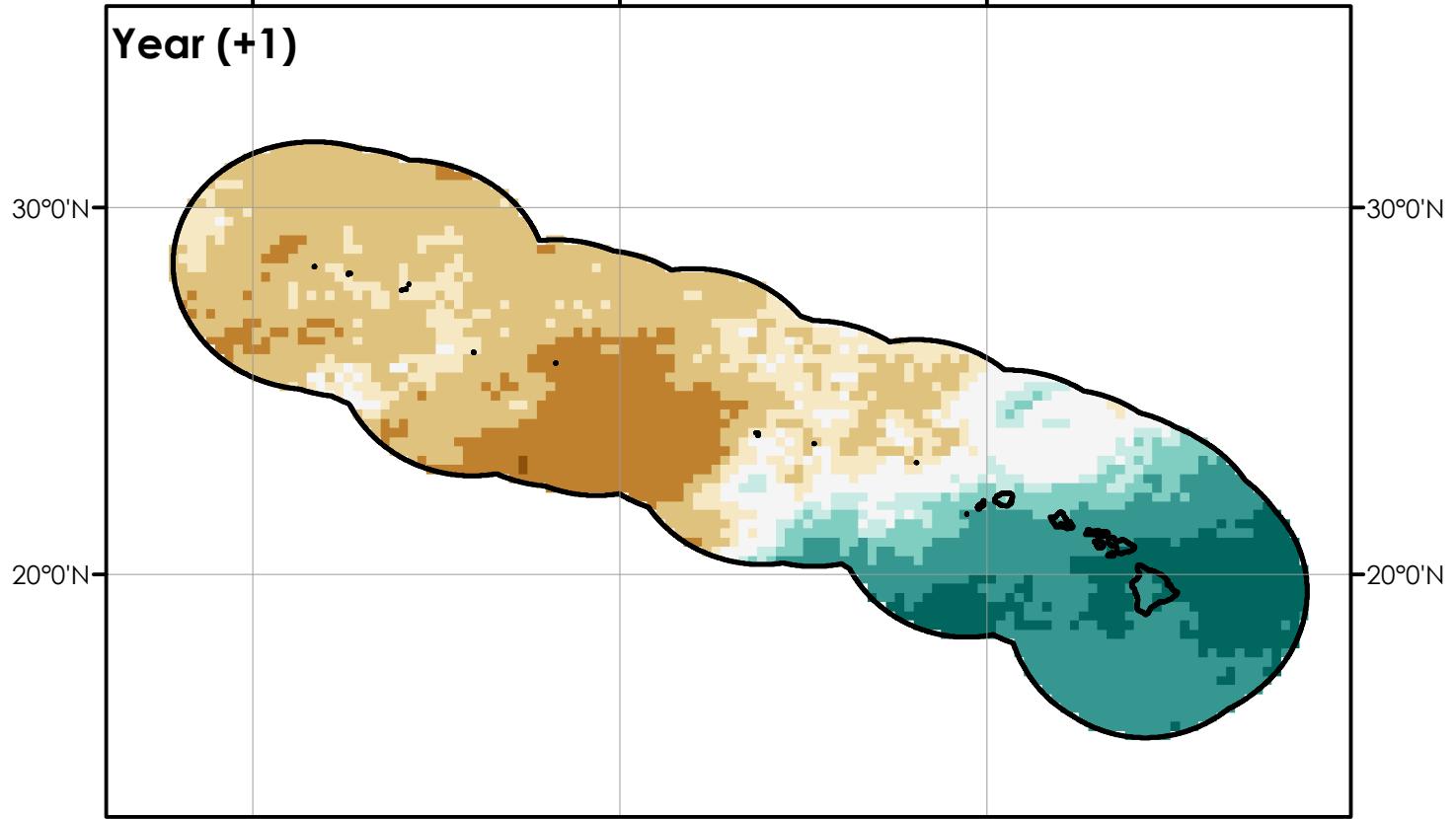
Year (0)**Hawaiian Islands****Year (+1)****Precipitation Change (%)**

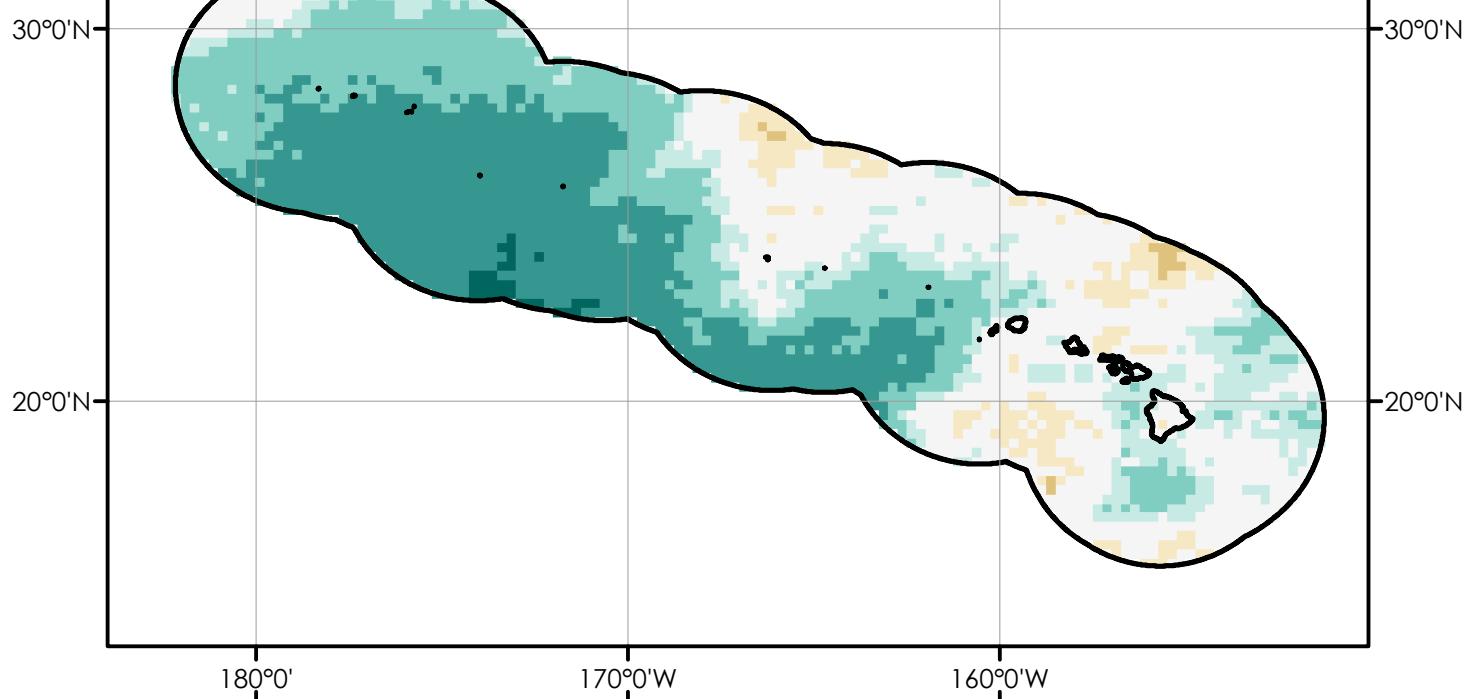
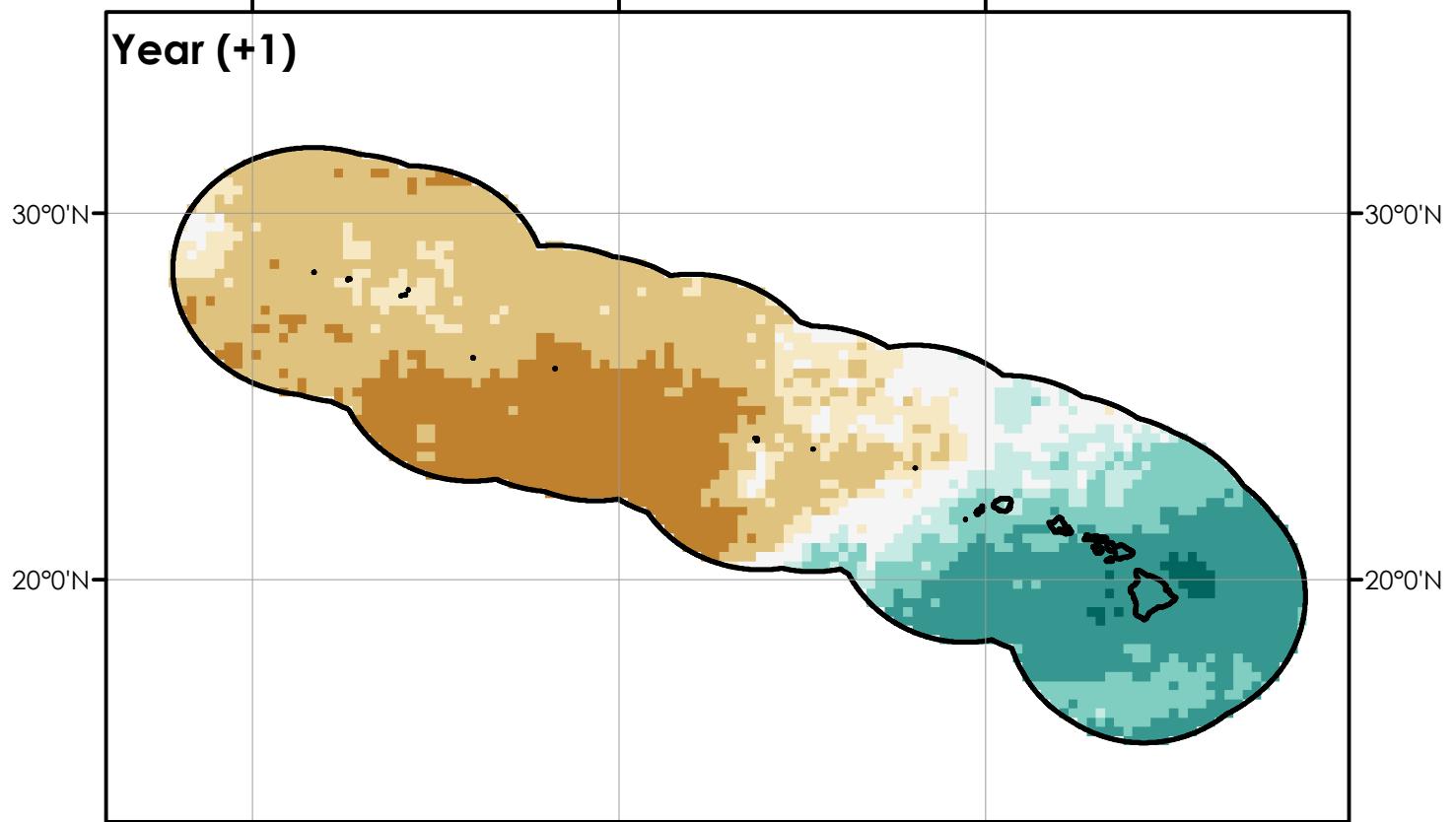
Year (0)**Hawaiian Islands****Year (+1)****Precipitation Change (%)**

Year (0)**Hawaiian Islands****Year (+1)****Precipitation Change (%)**

Year (0)**Hawaiian Islands****Year (+1)****Precipitation Change (%)**

Year (0)**Hawaiian Islands****Year (+1)****Precipitation Change (%)**

Year (0)**Hawaiian Islands****Year (+1)****Precipitation Change (%)**

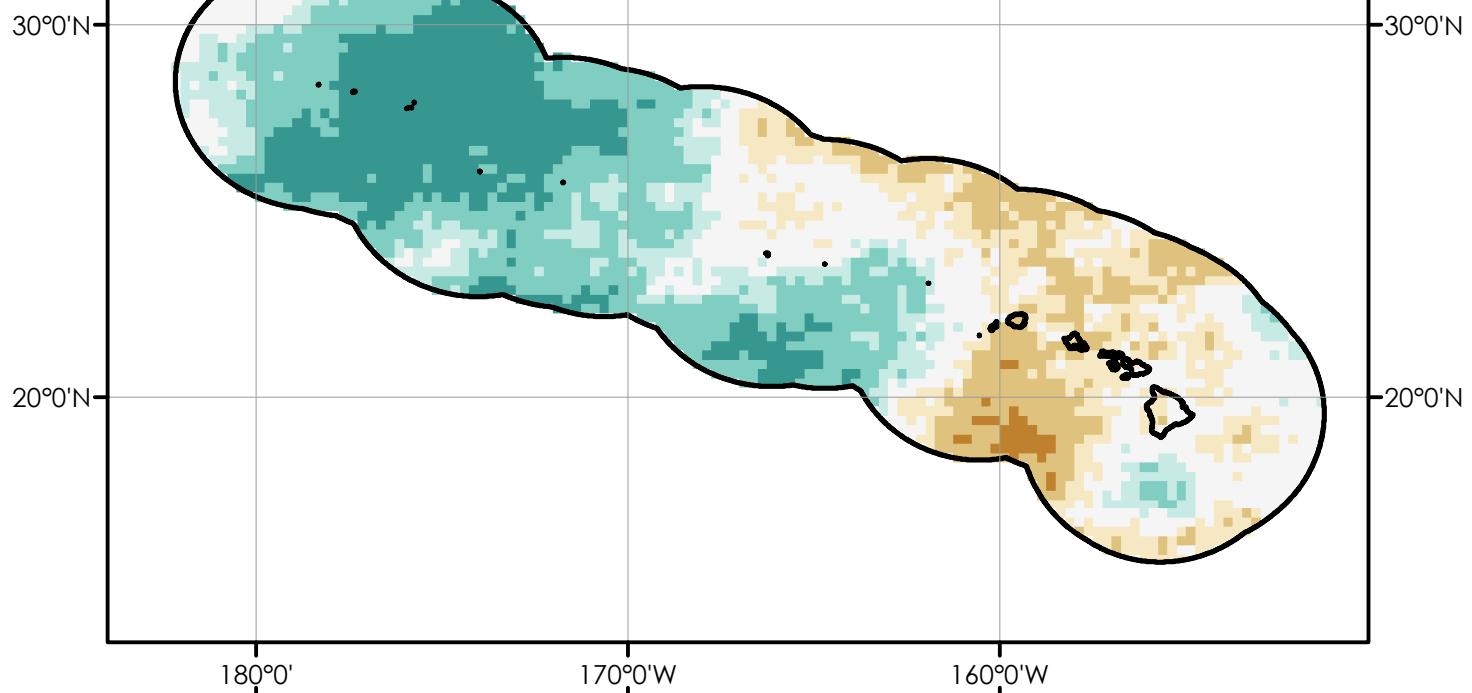
Year (0)**Hawaiian Islands****Year (+1)****Precipitation Change (%)**

Neutral for MAM

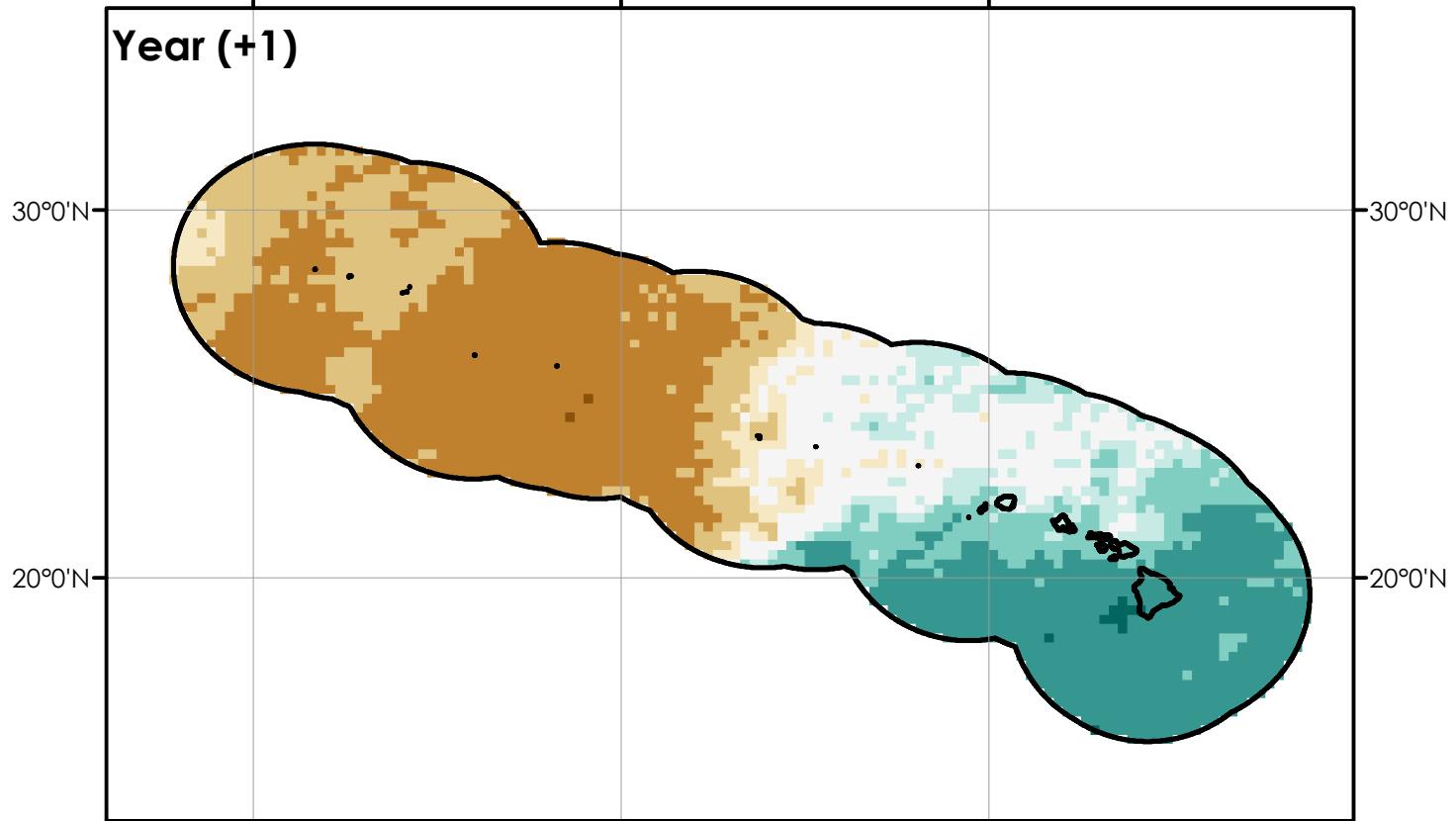
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Year (0)

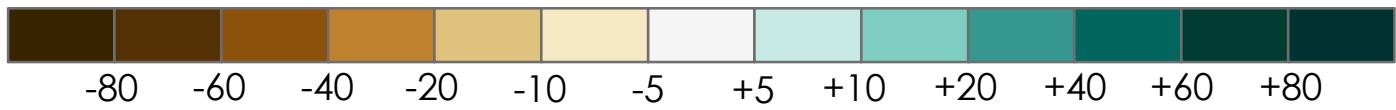
Hawaiian Islands

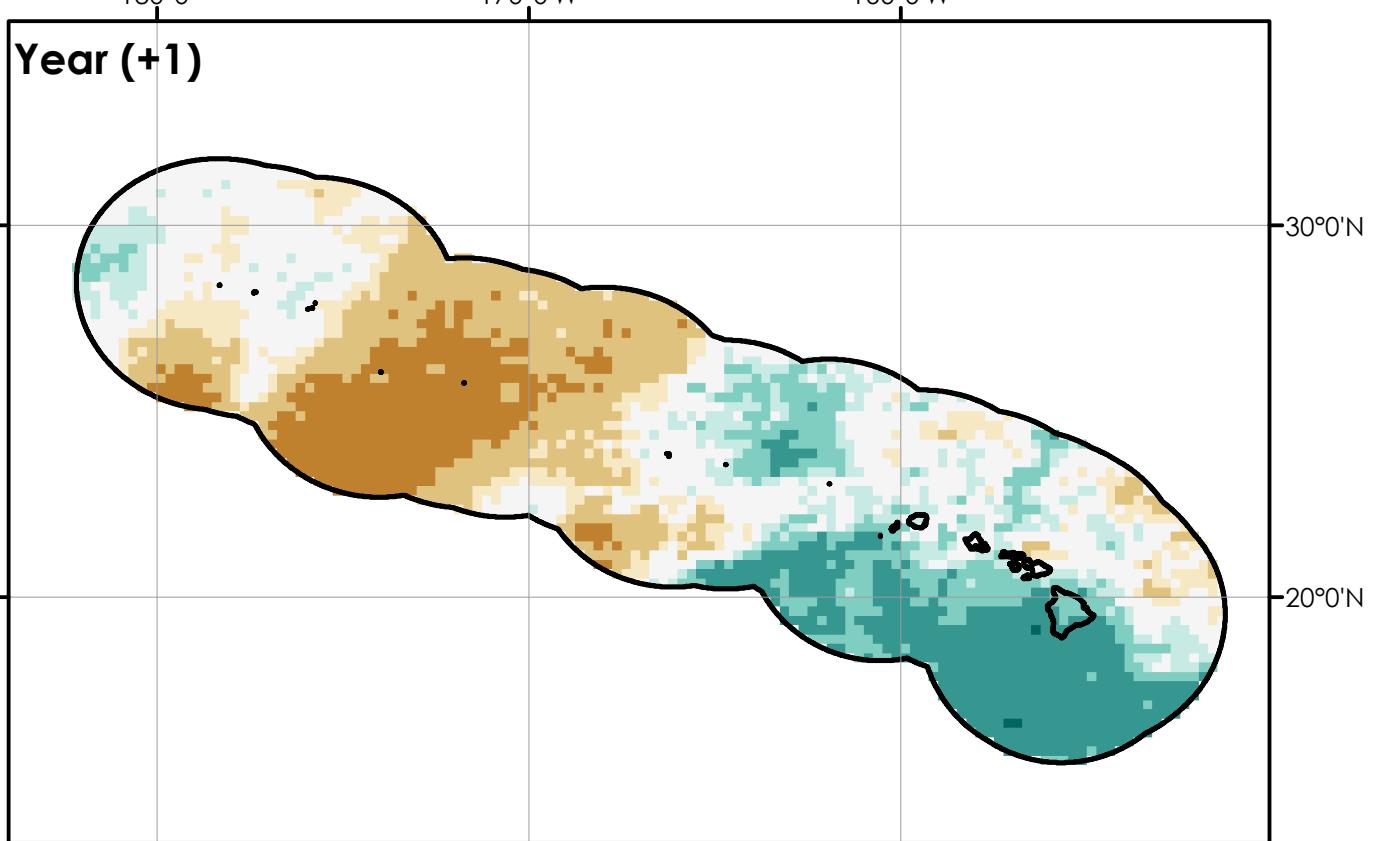
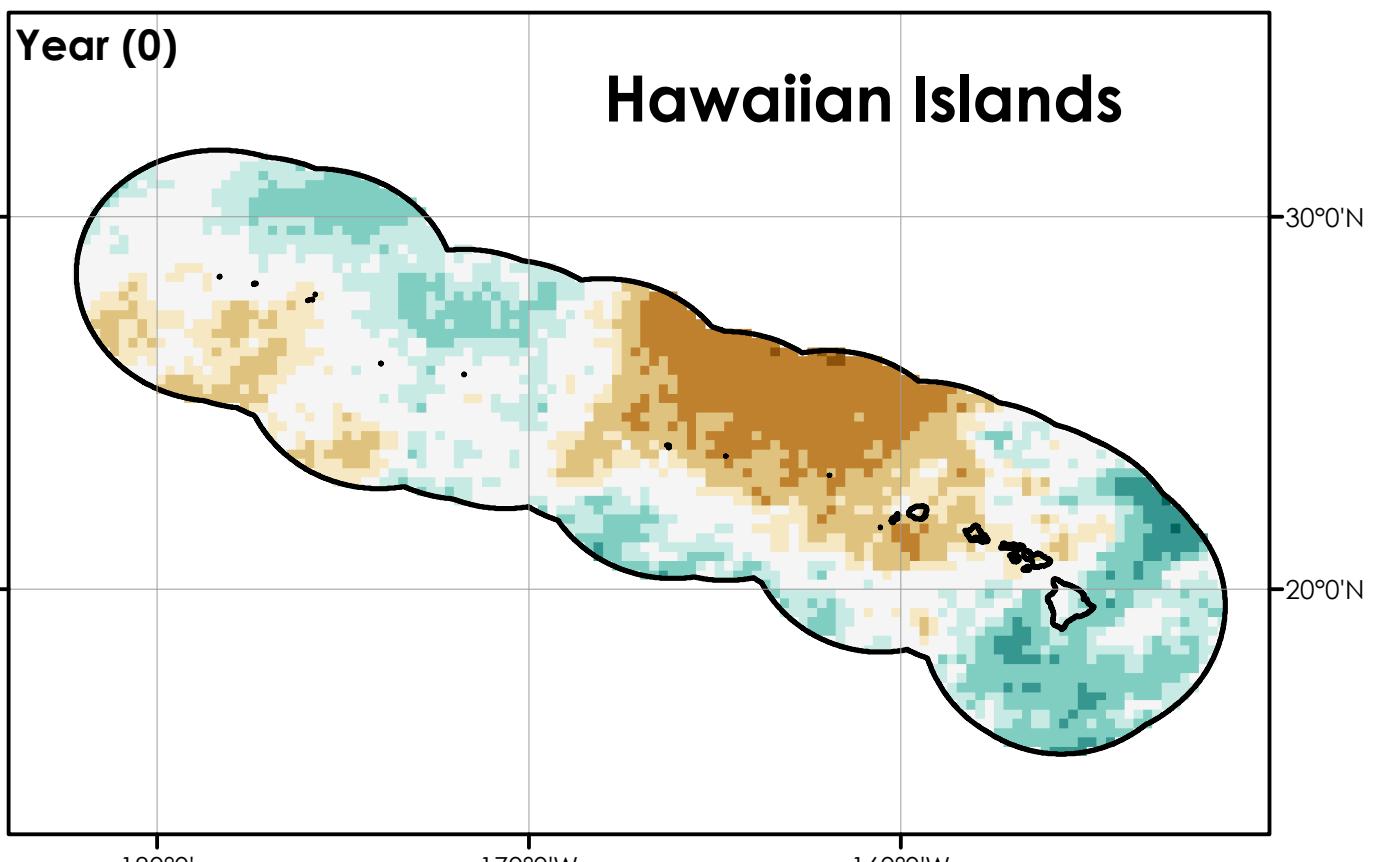


Year (+1)



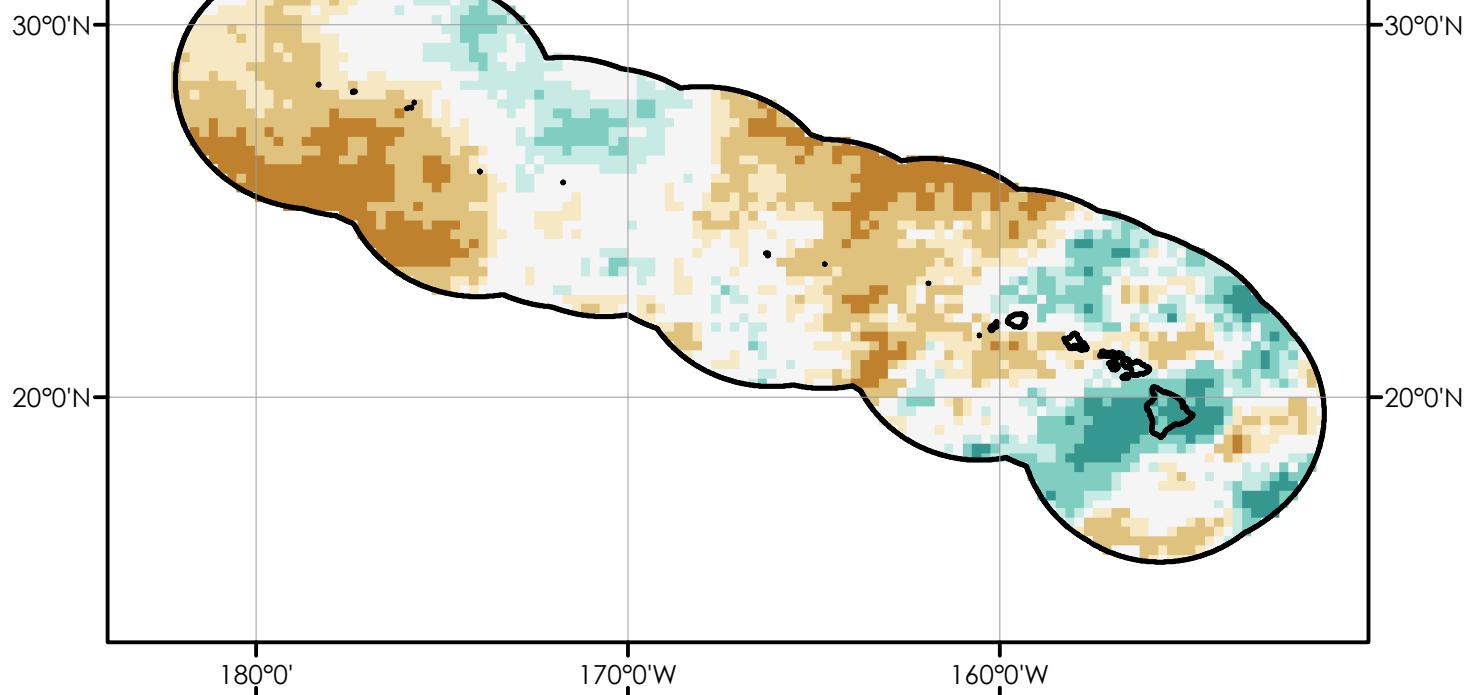
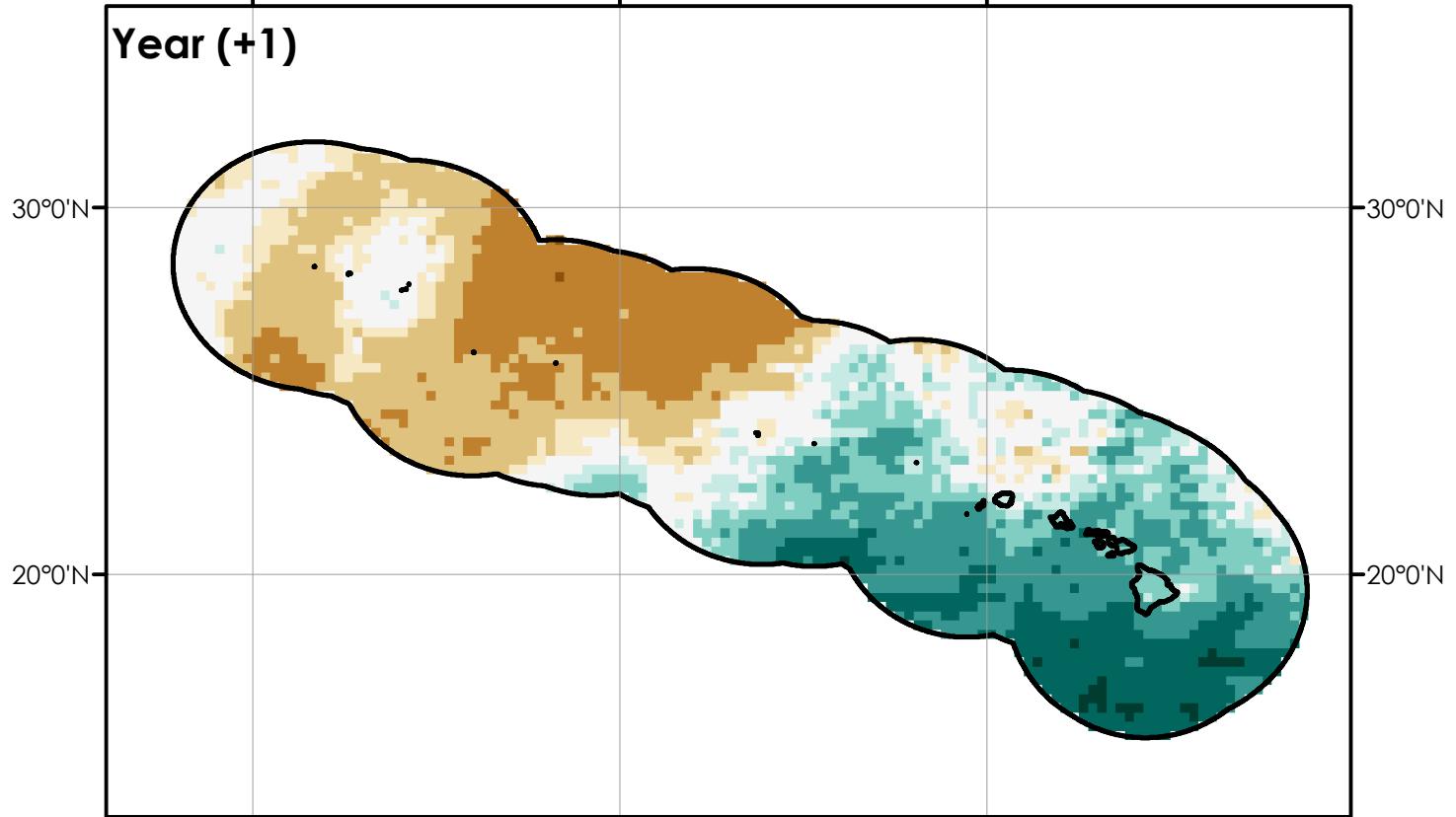
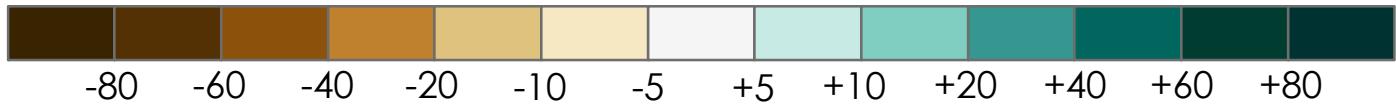
Precipitation Change (%)

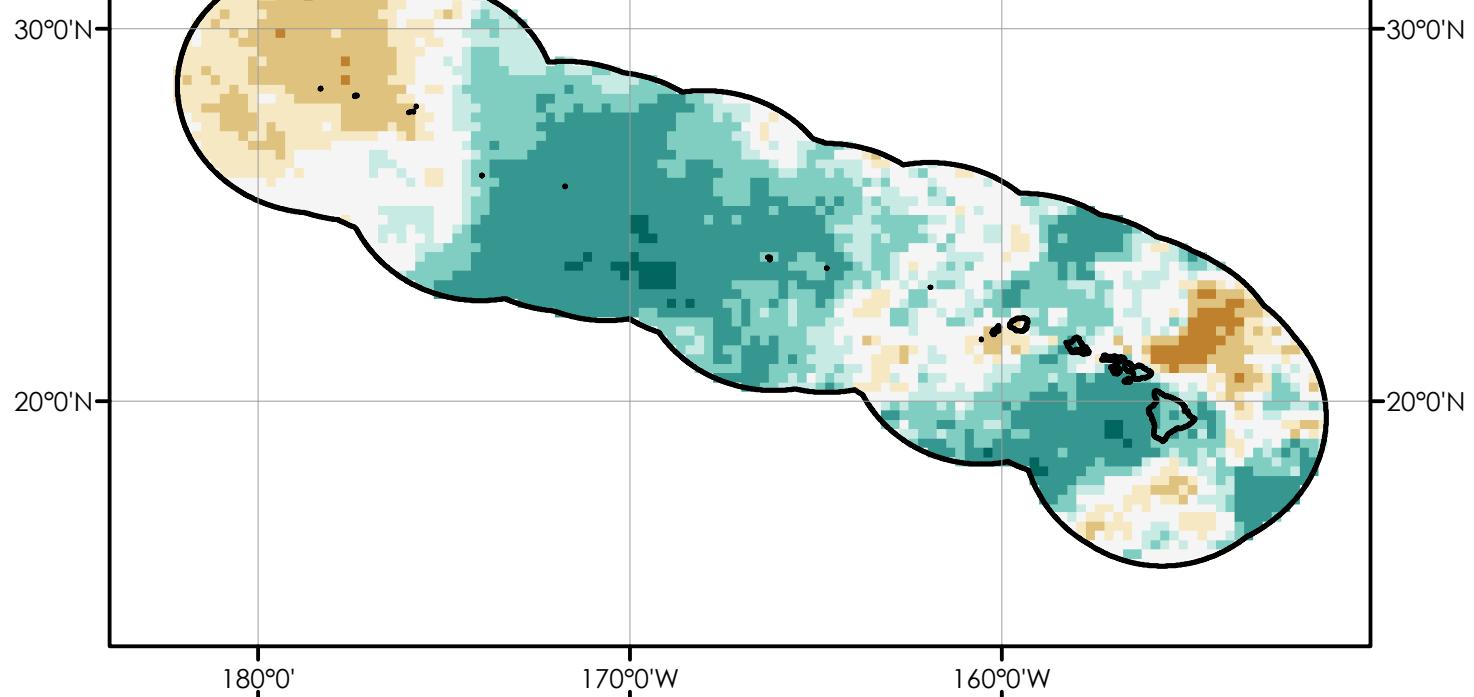
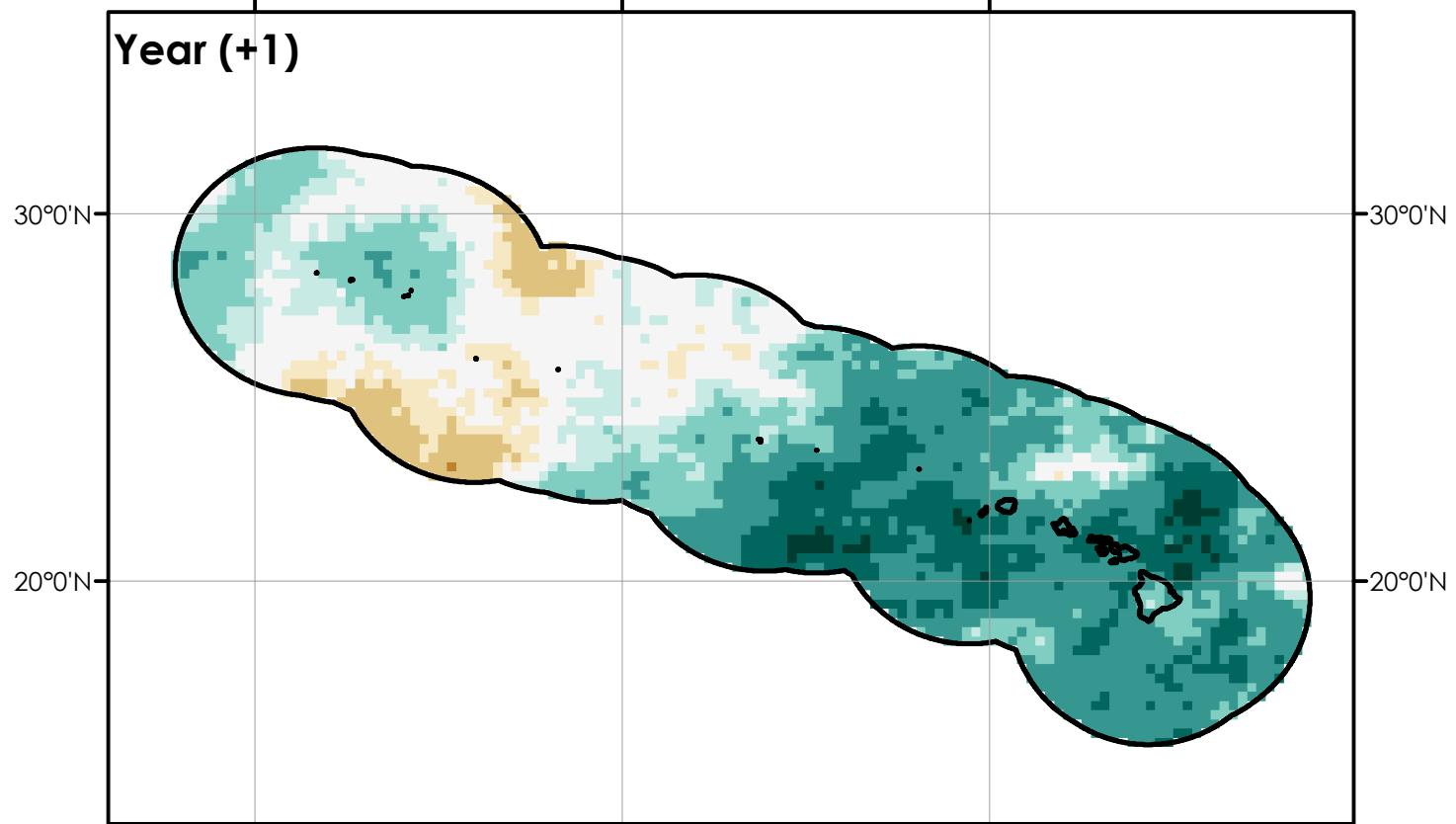
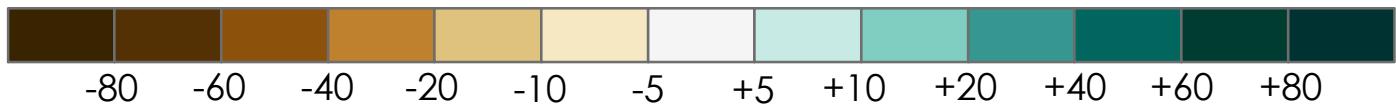


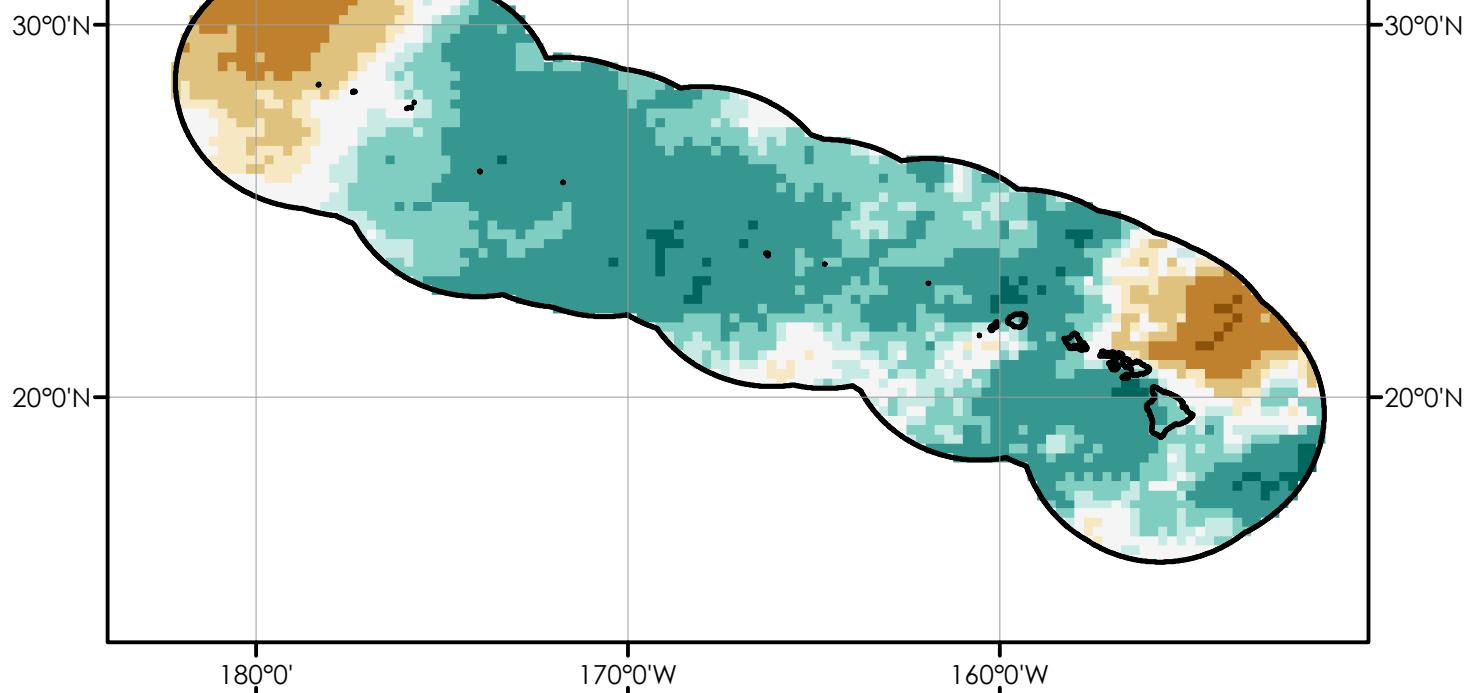
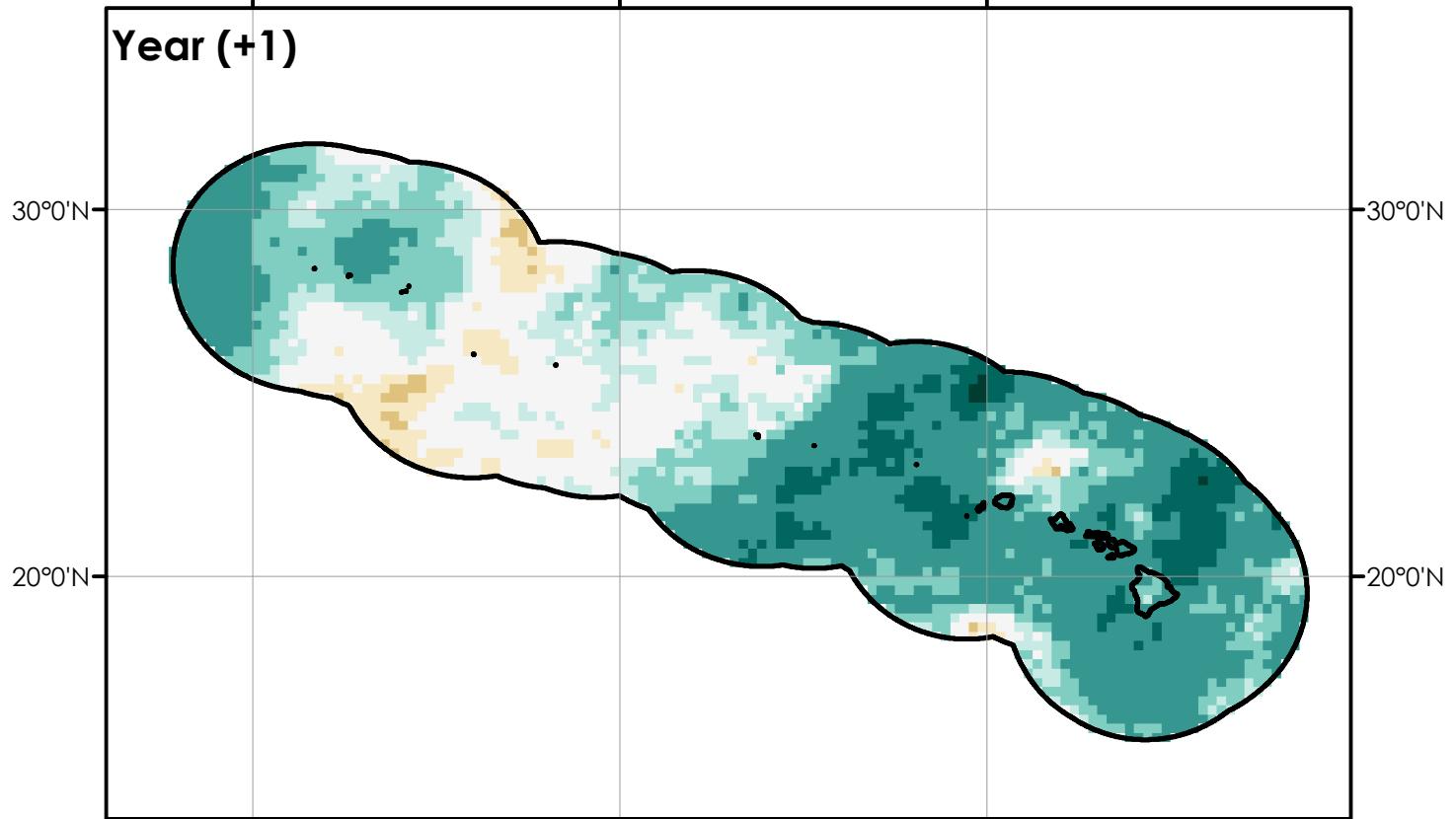
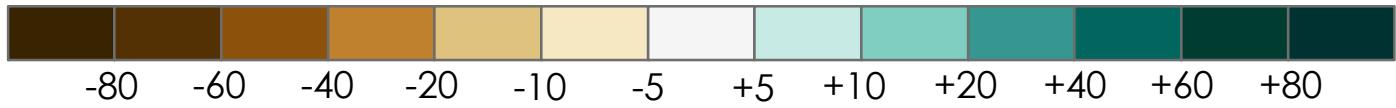


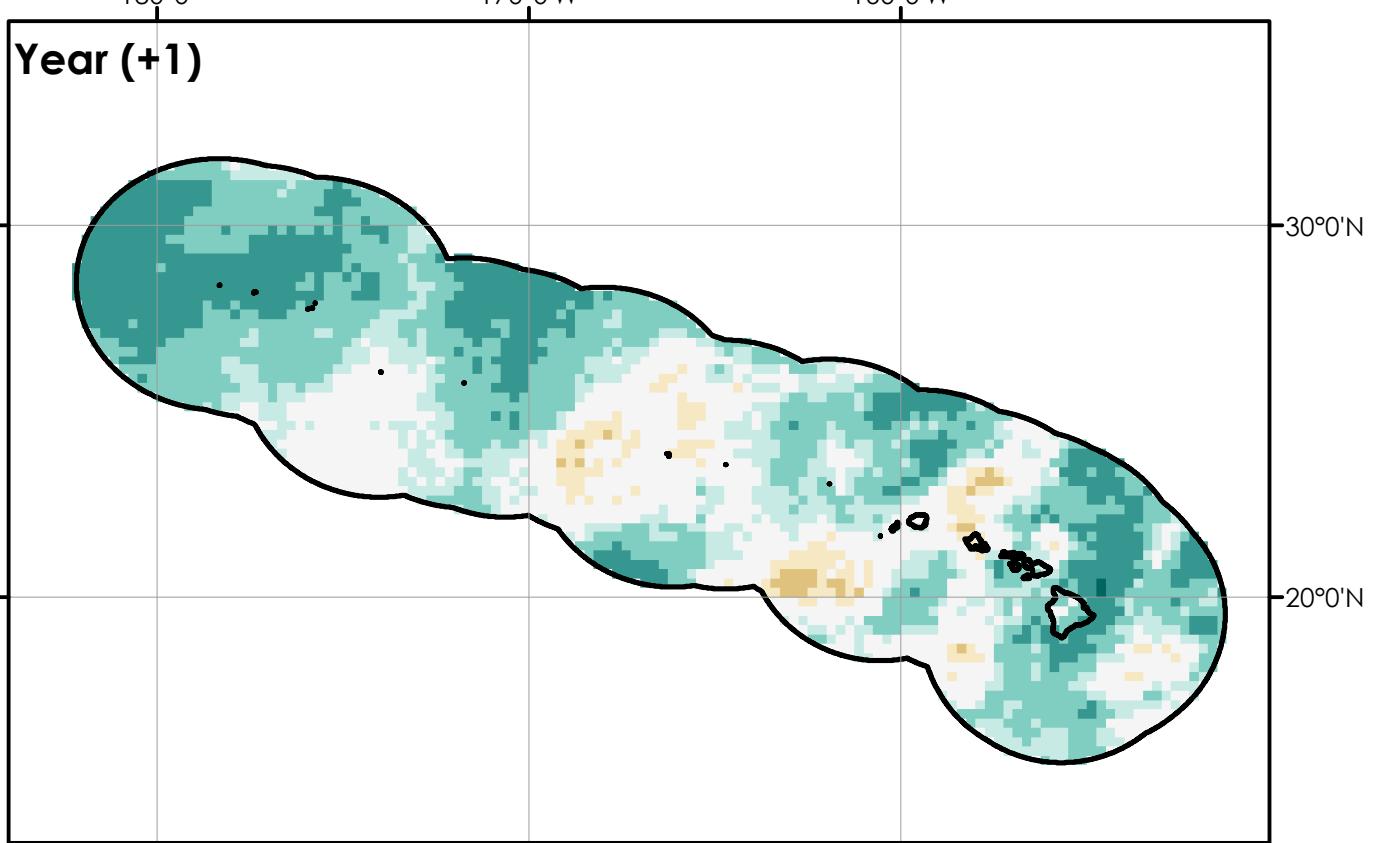
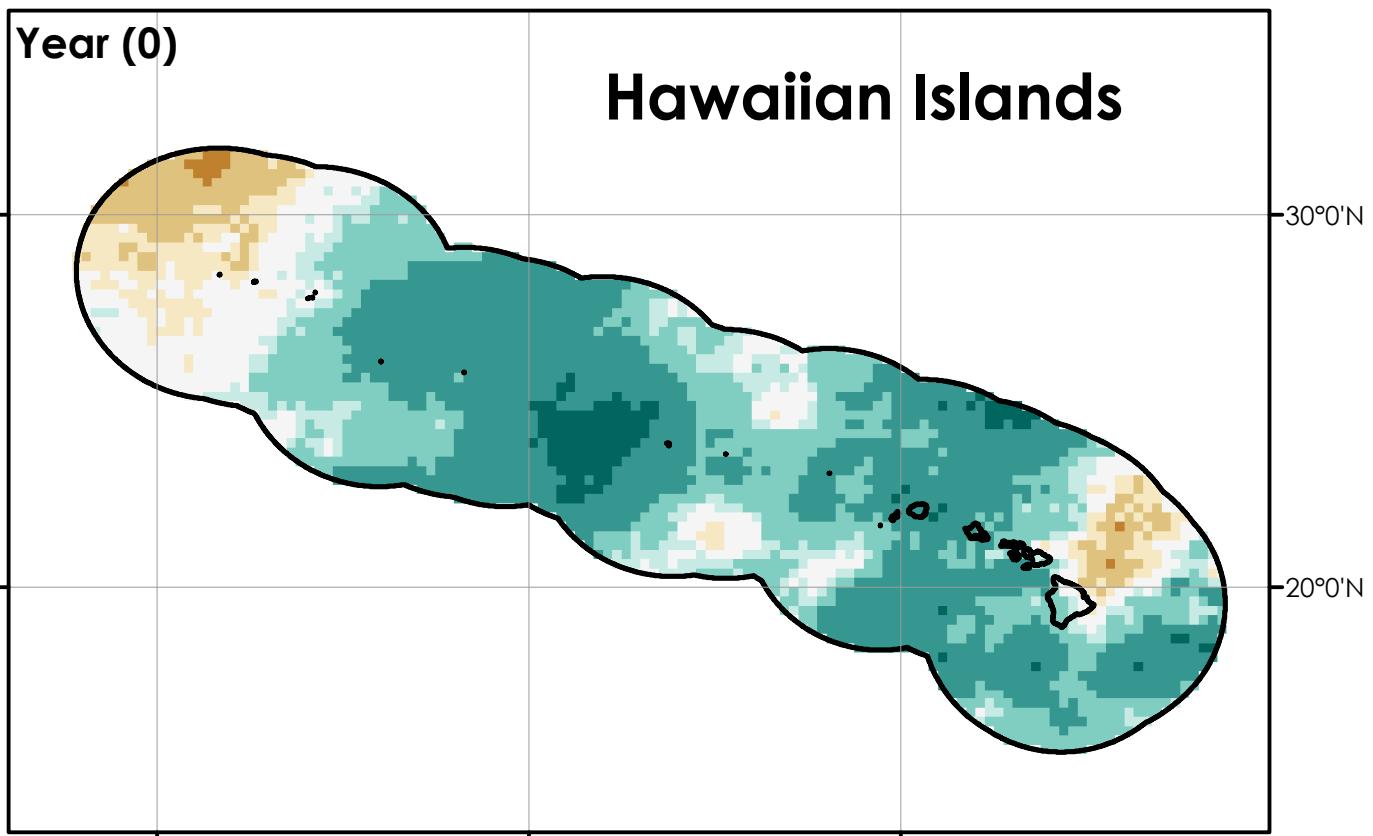
Precipitation Change (%)



Year (0)**Hawaiian Islands****Year (+1)****Precipitation Change (%)**

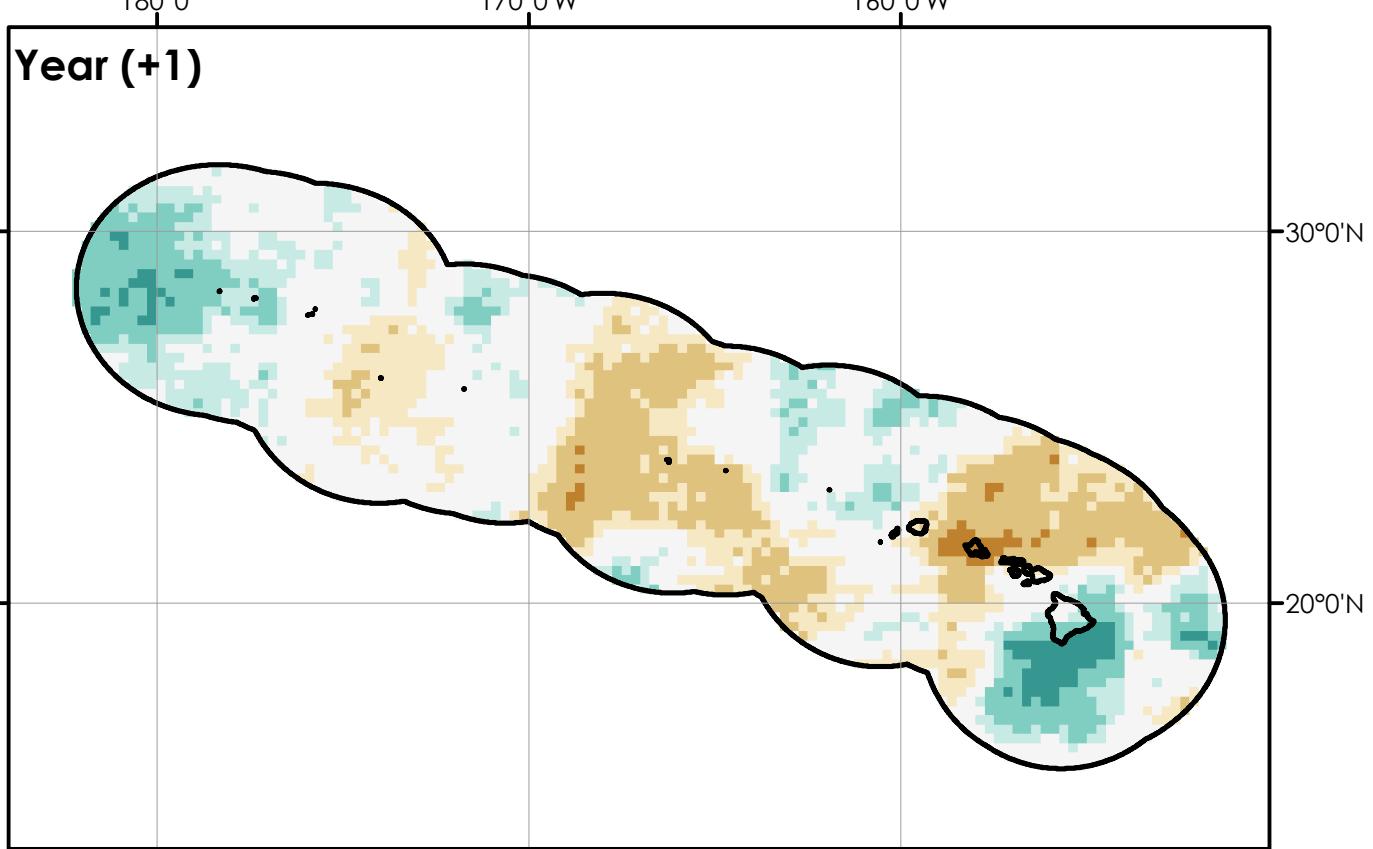
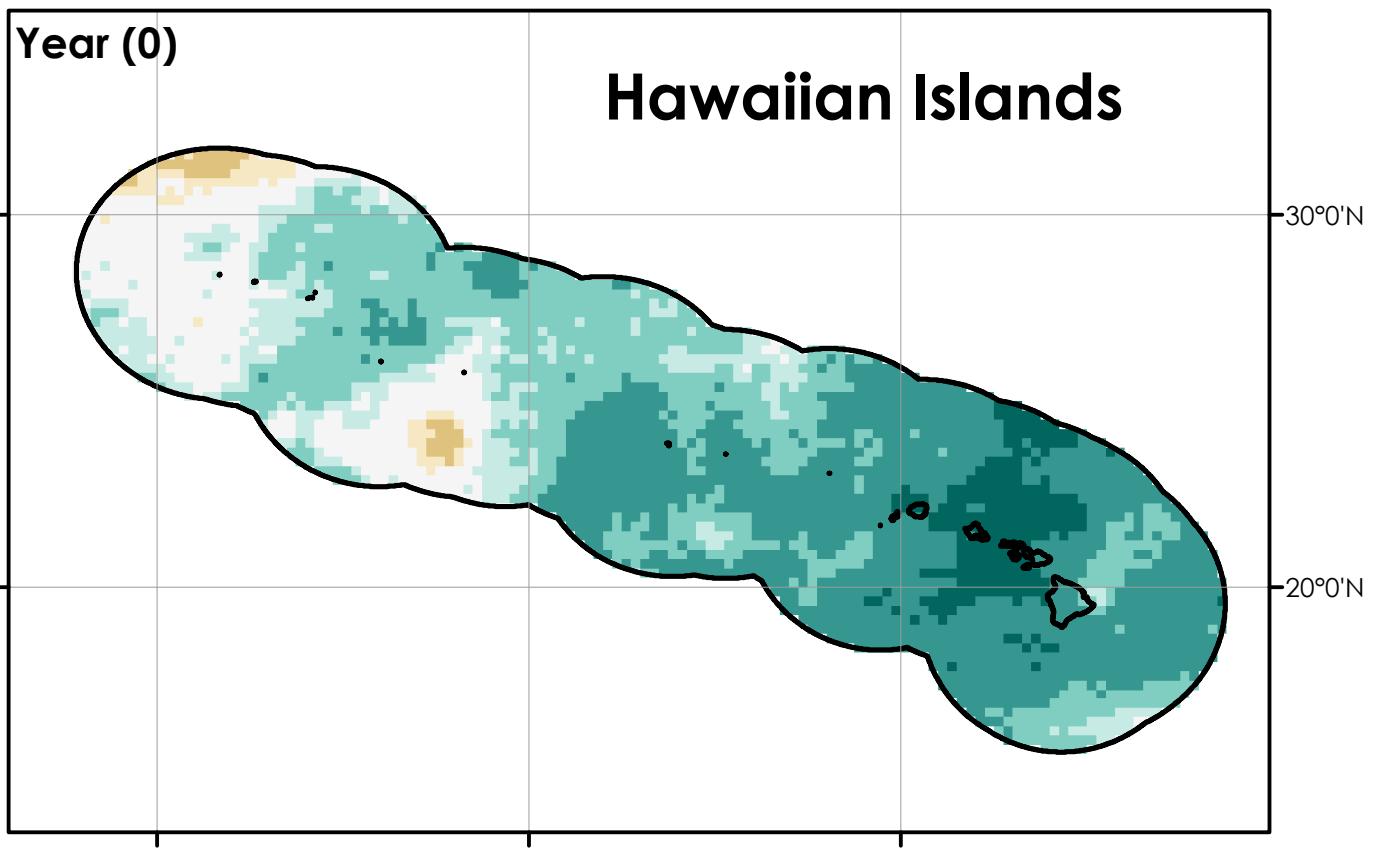
Year (0)**Hawaiian Islands****Year (+1)****Precipitation Change (%)**

Year (0)**Hawaiian Islands****Year (+1)****Precipitation Change (%)**



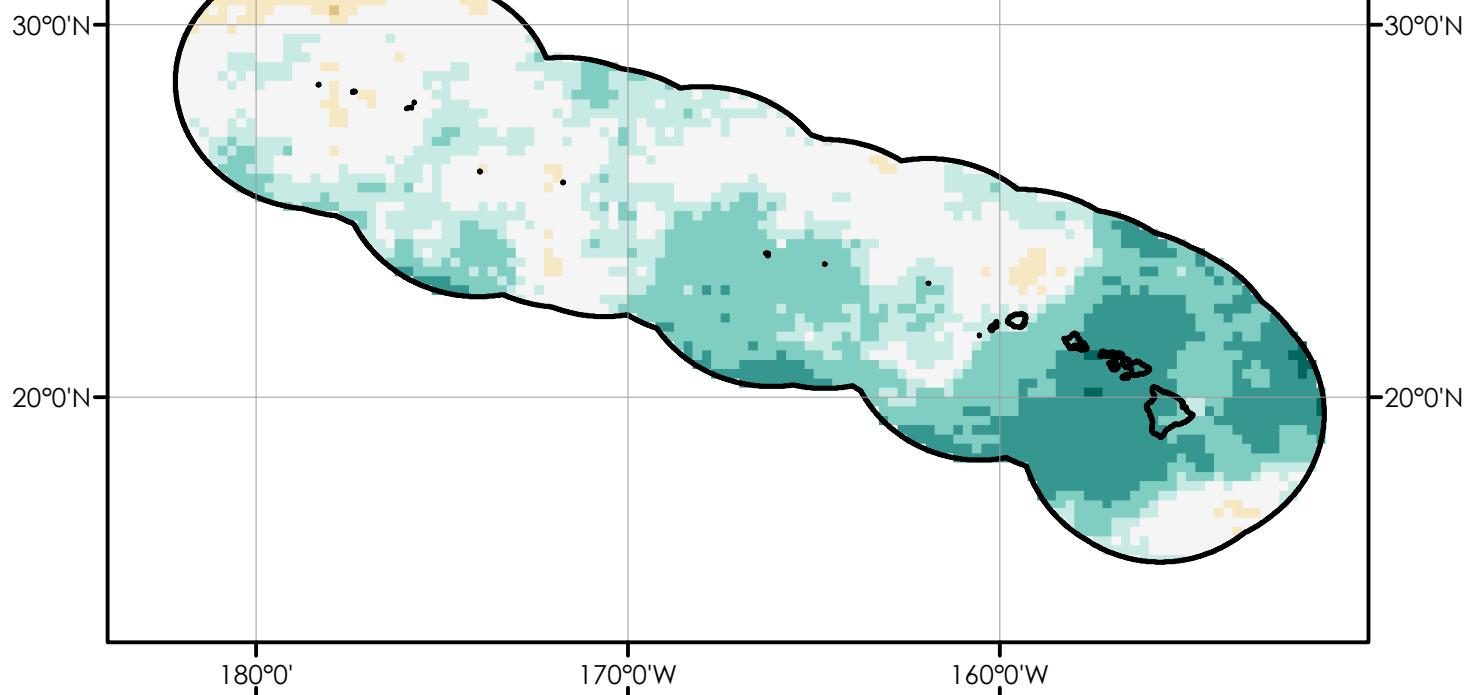
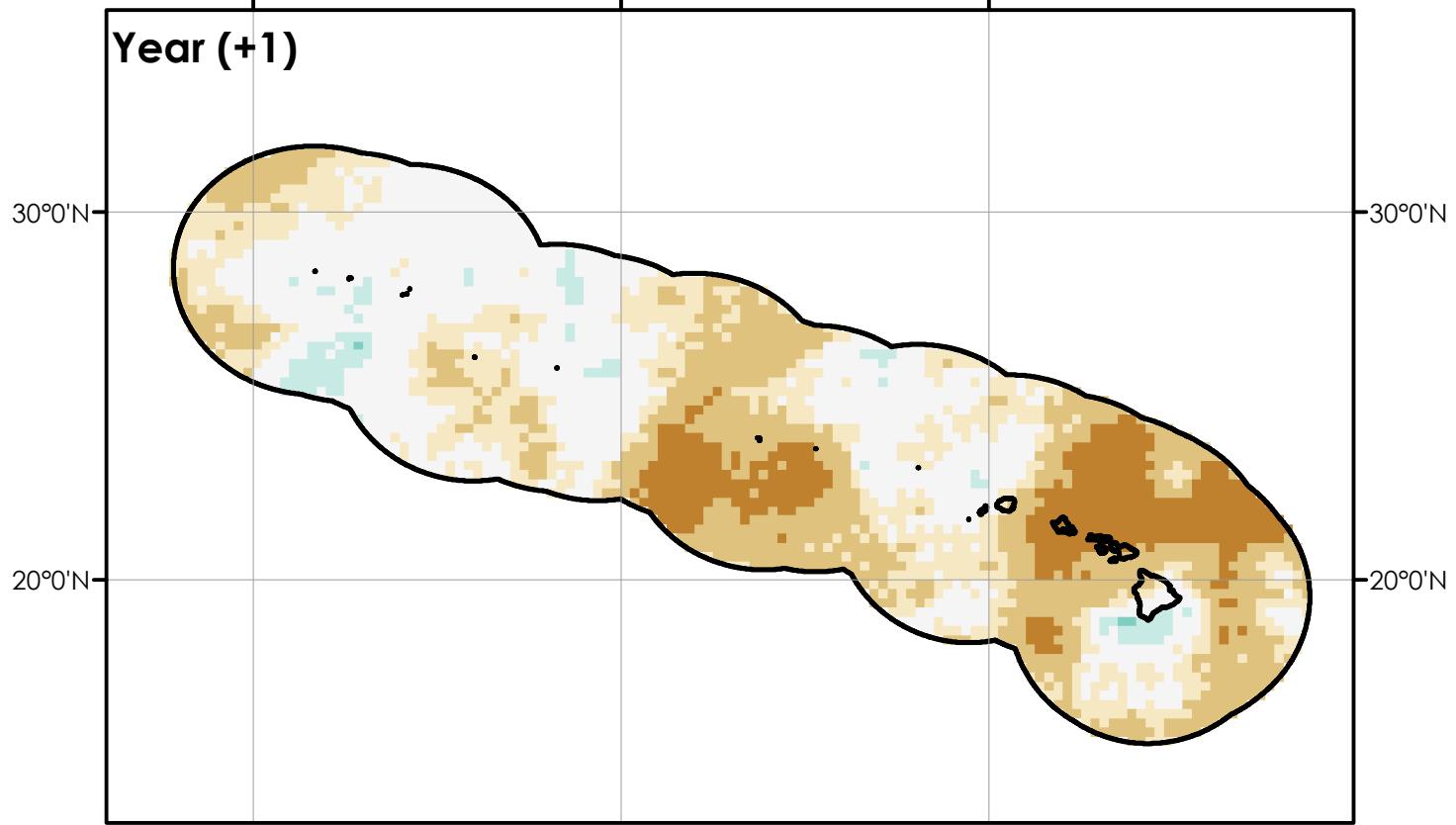
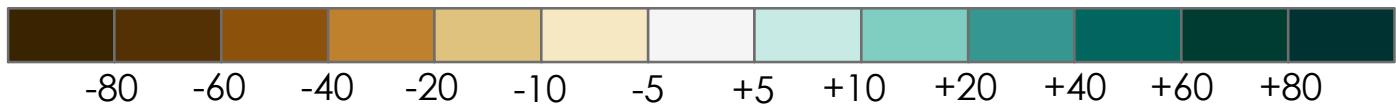
Precipitation Change (%)

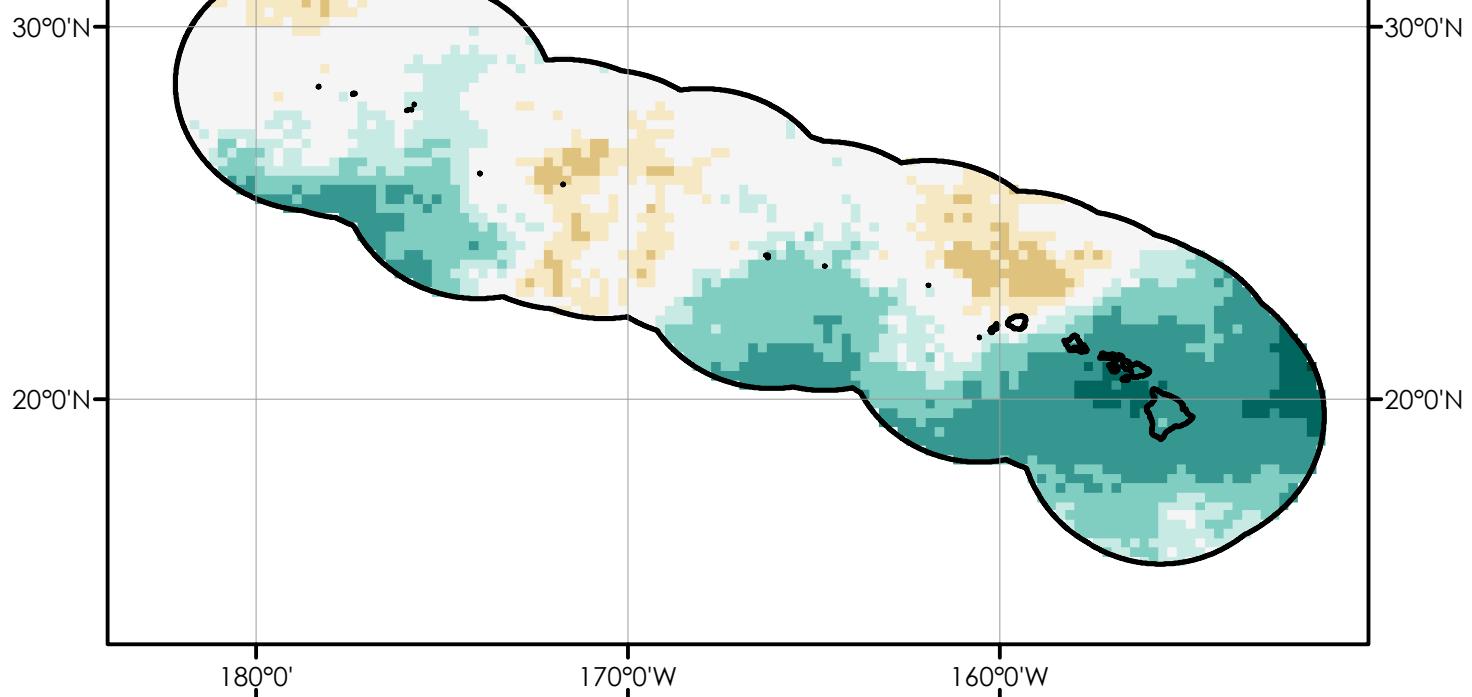
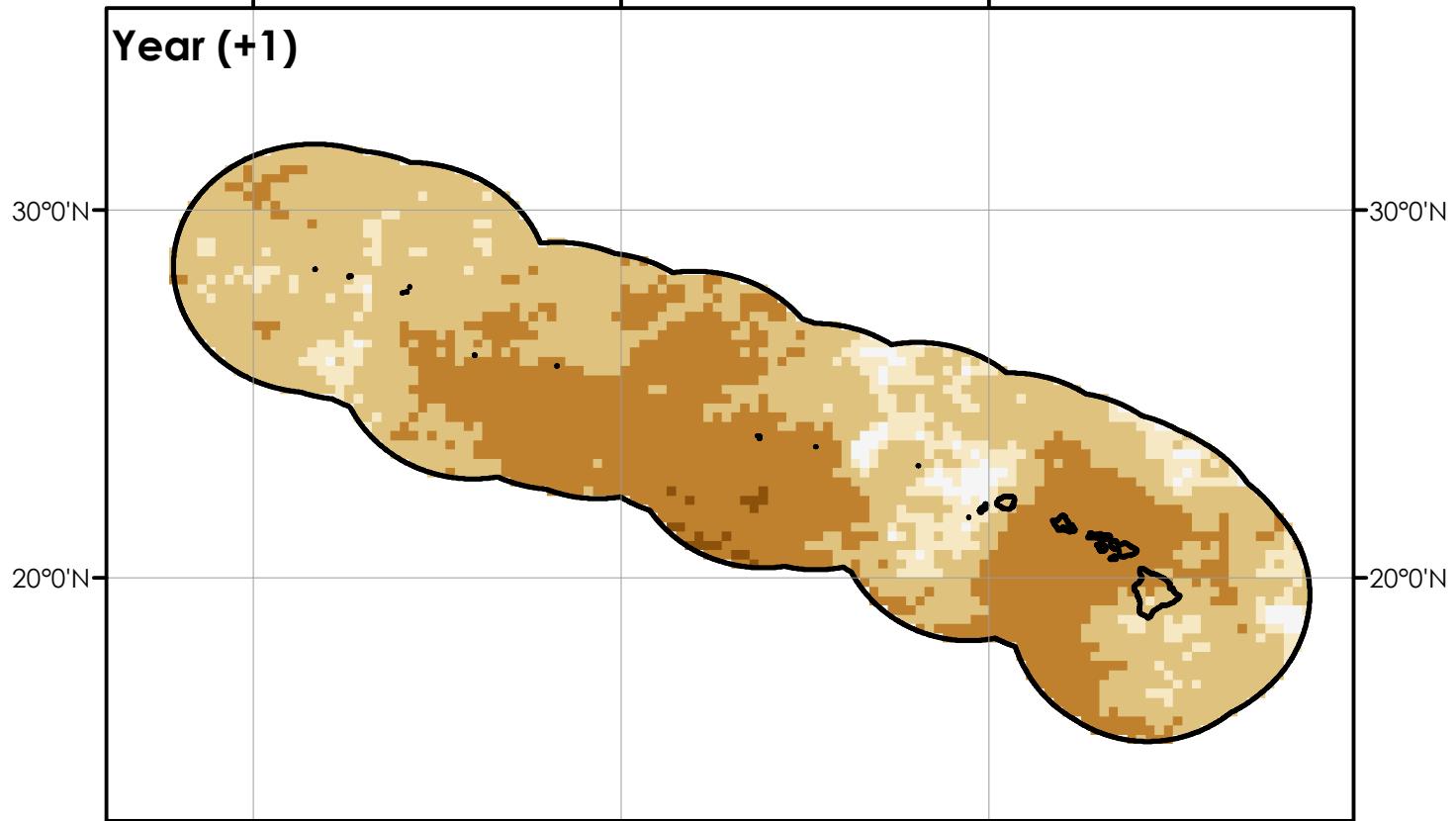
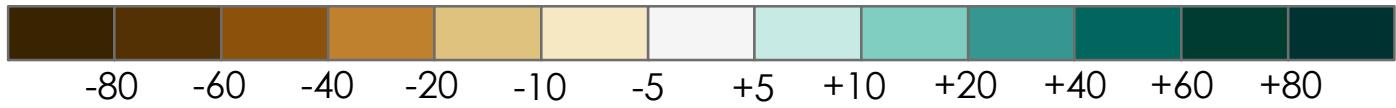


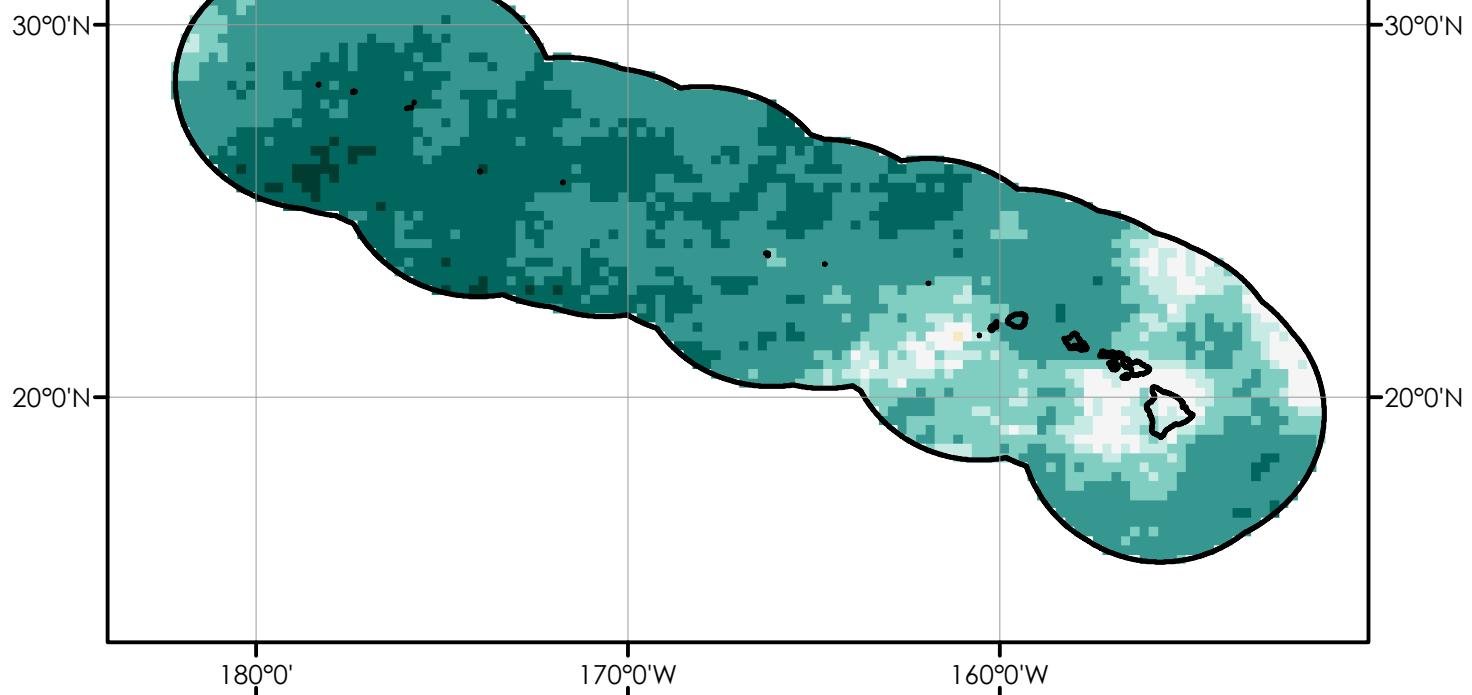
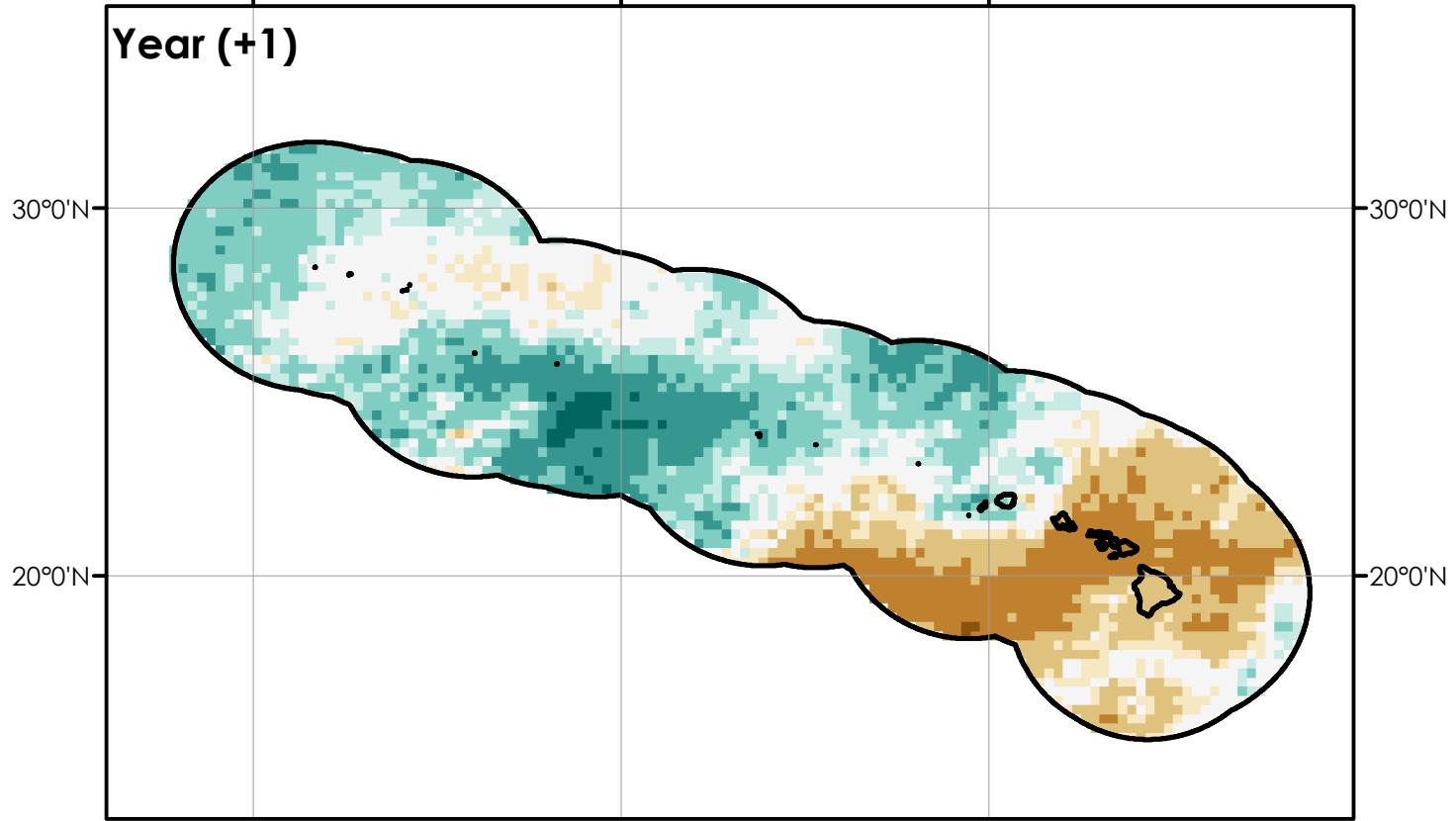
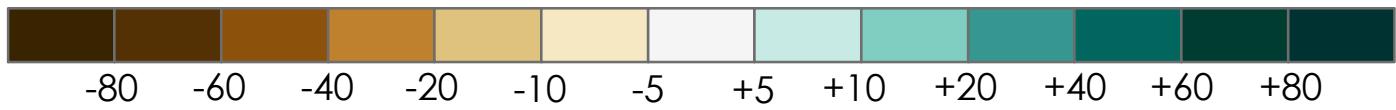


Precipitation Change (%)



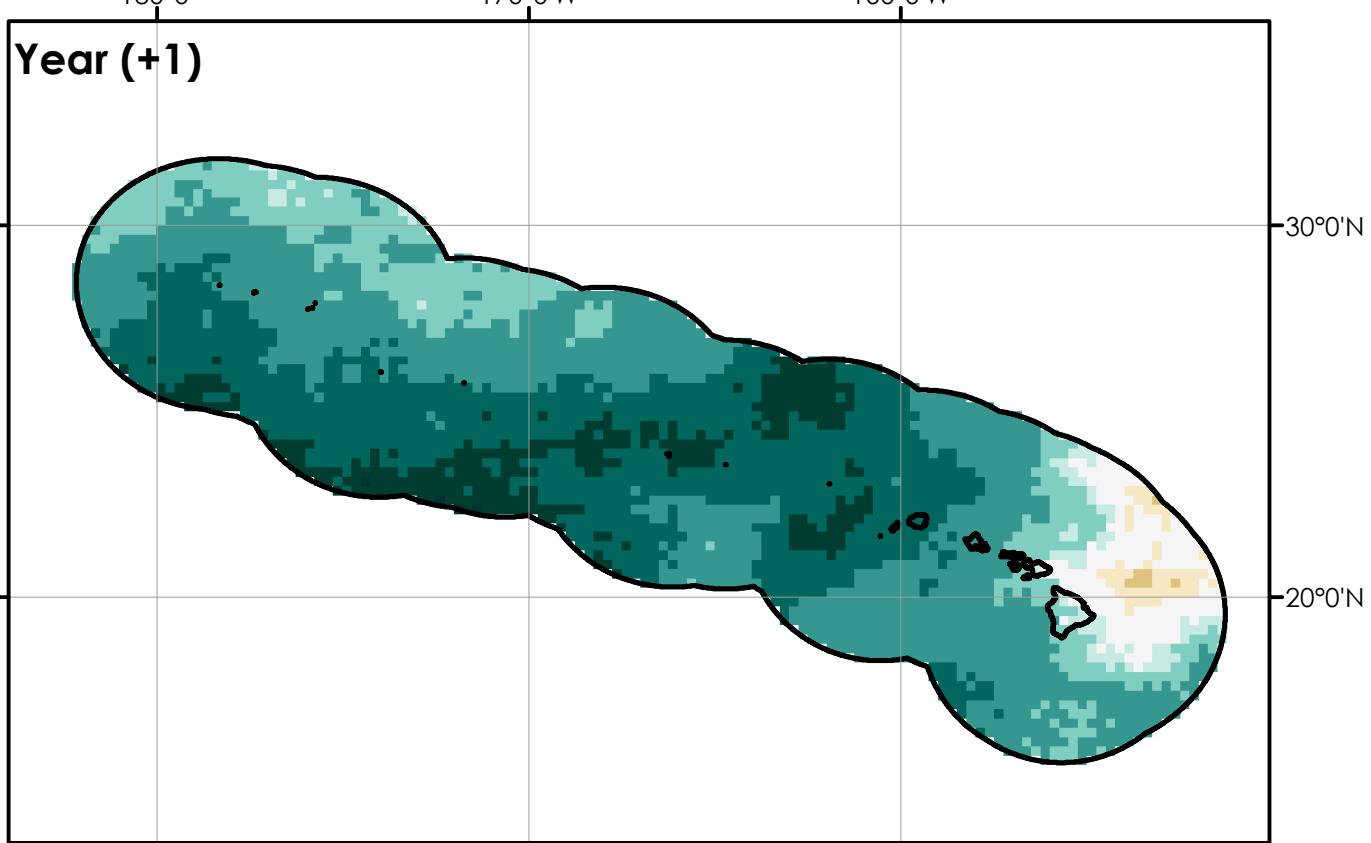
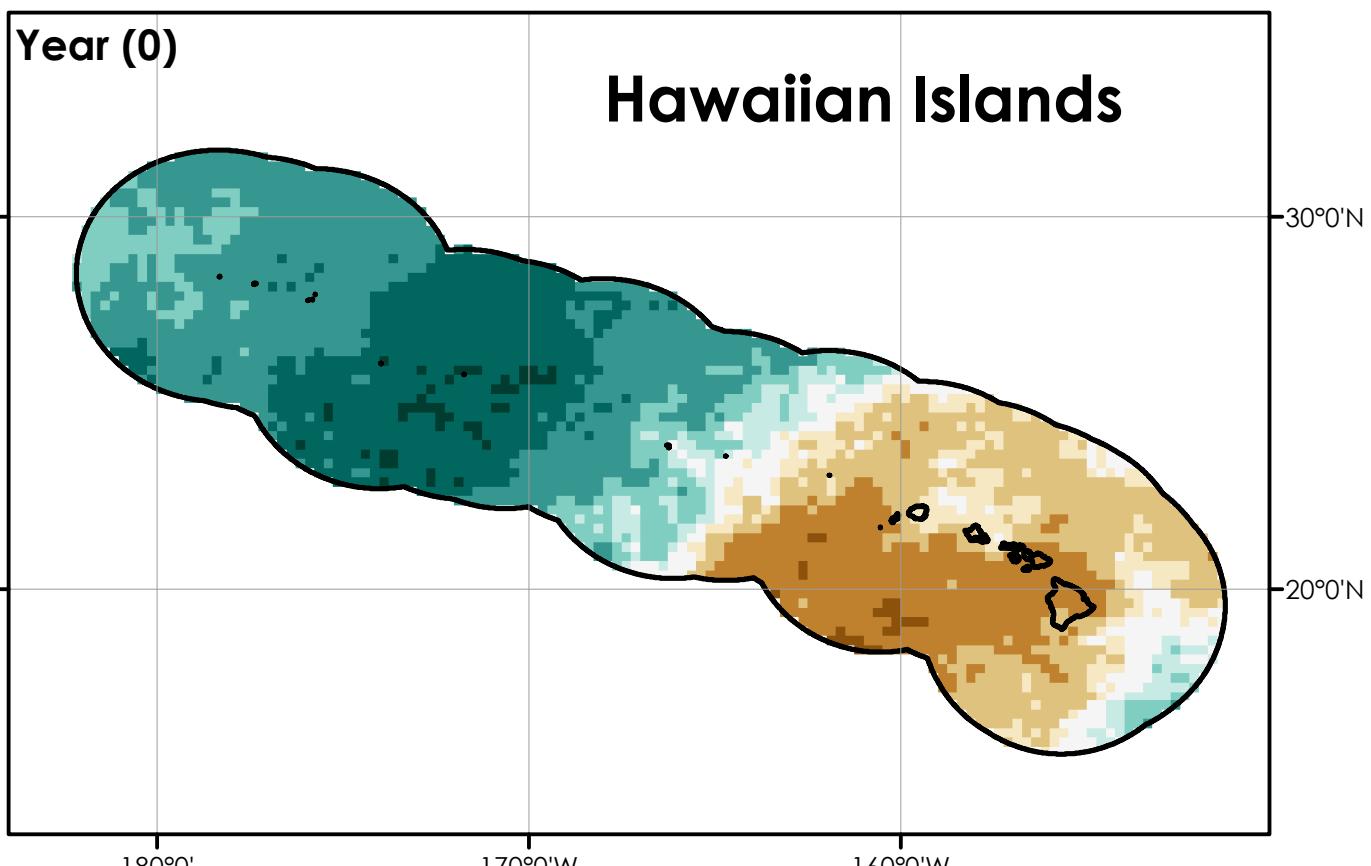
Year (0)**Hawaiian Islands****Year (+1)****Precipitation Change (%)**

Year (0)**Hawaiian Islands****Year (+1)****Precipitation Change (%)**

Year (0)**Hawaiian Islands****Year (+1)****Precipitation Change (%)**

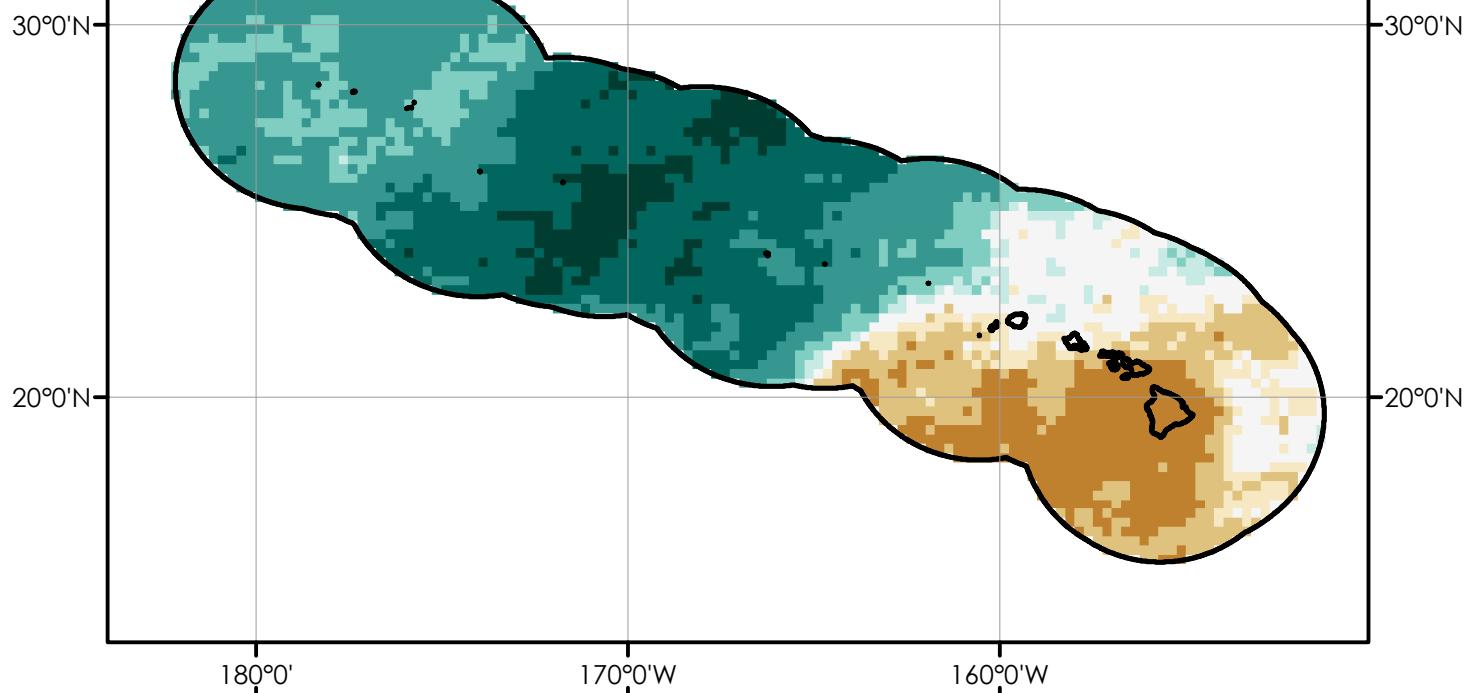
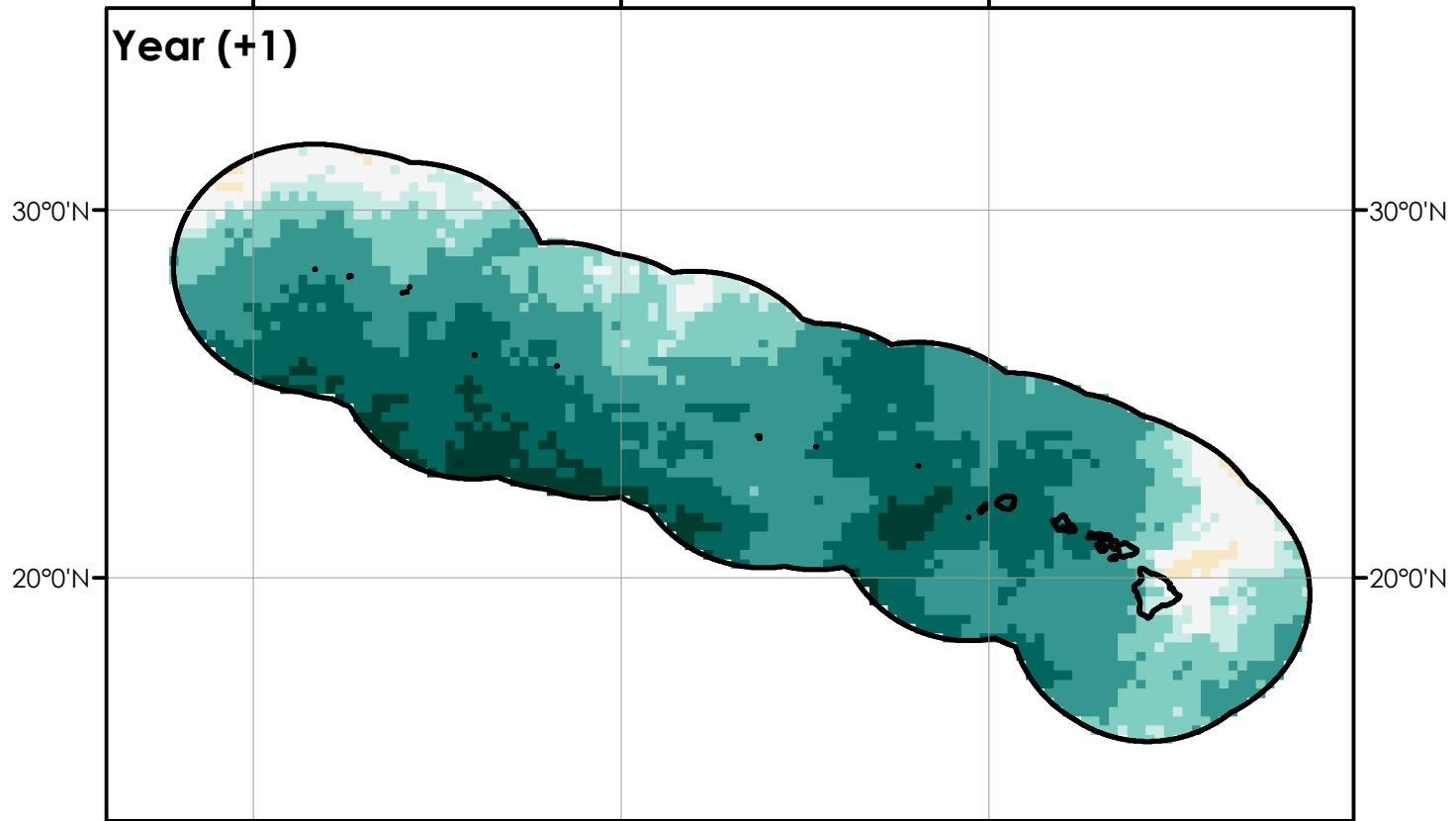
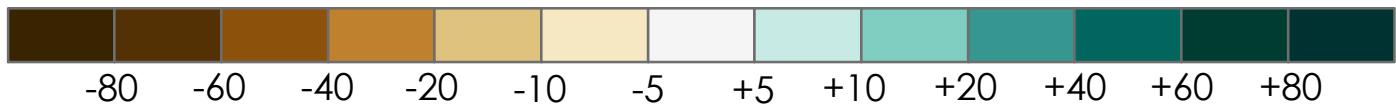
Weak La Niña for JFM

310



Precipitation Change (%)



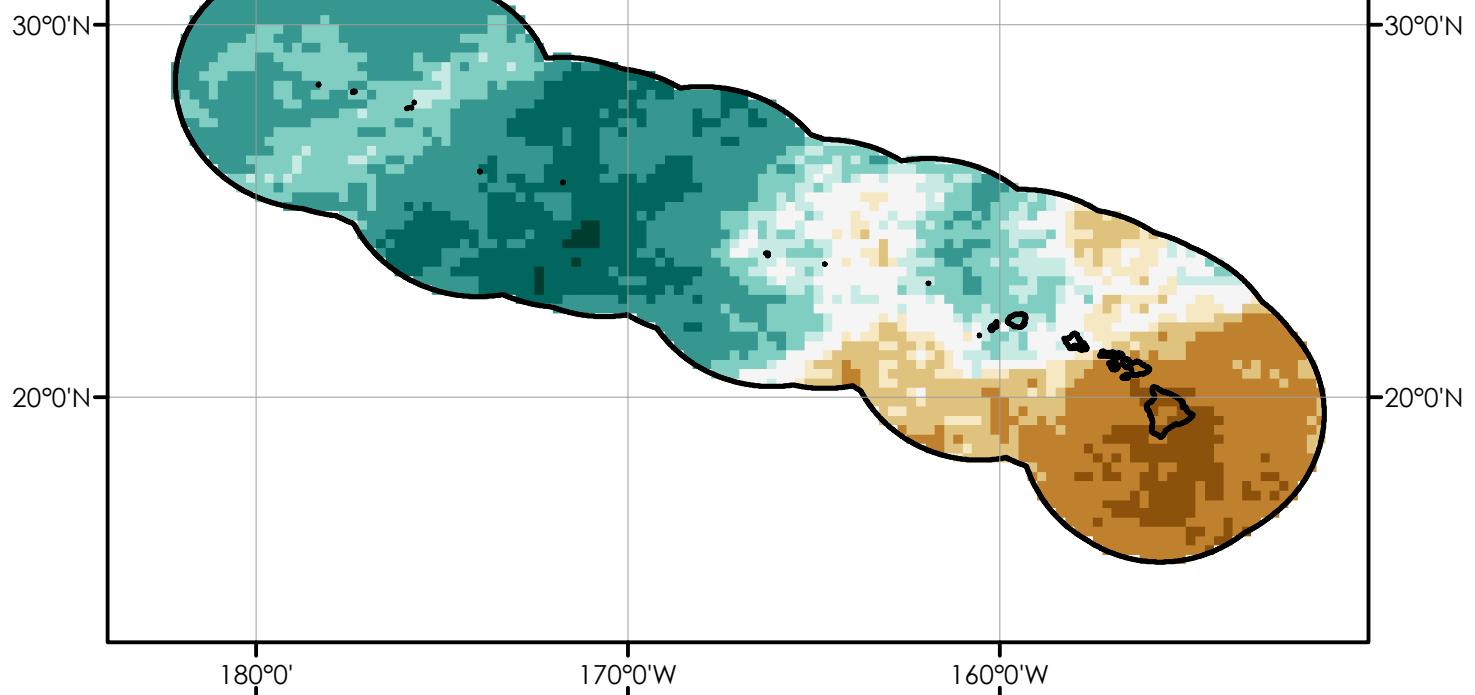
Year (0)**Hawaiian Islands****Year (+1)****Precipitation Change (%)**

Weak La Niña for MAM

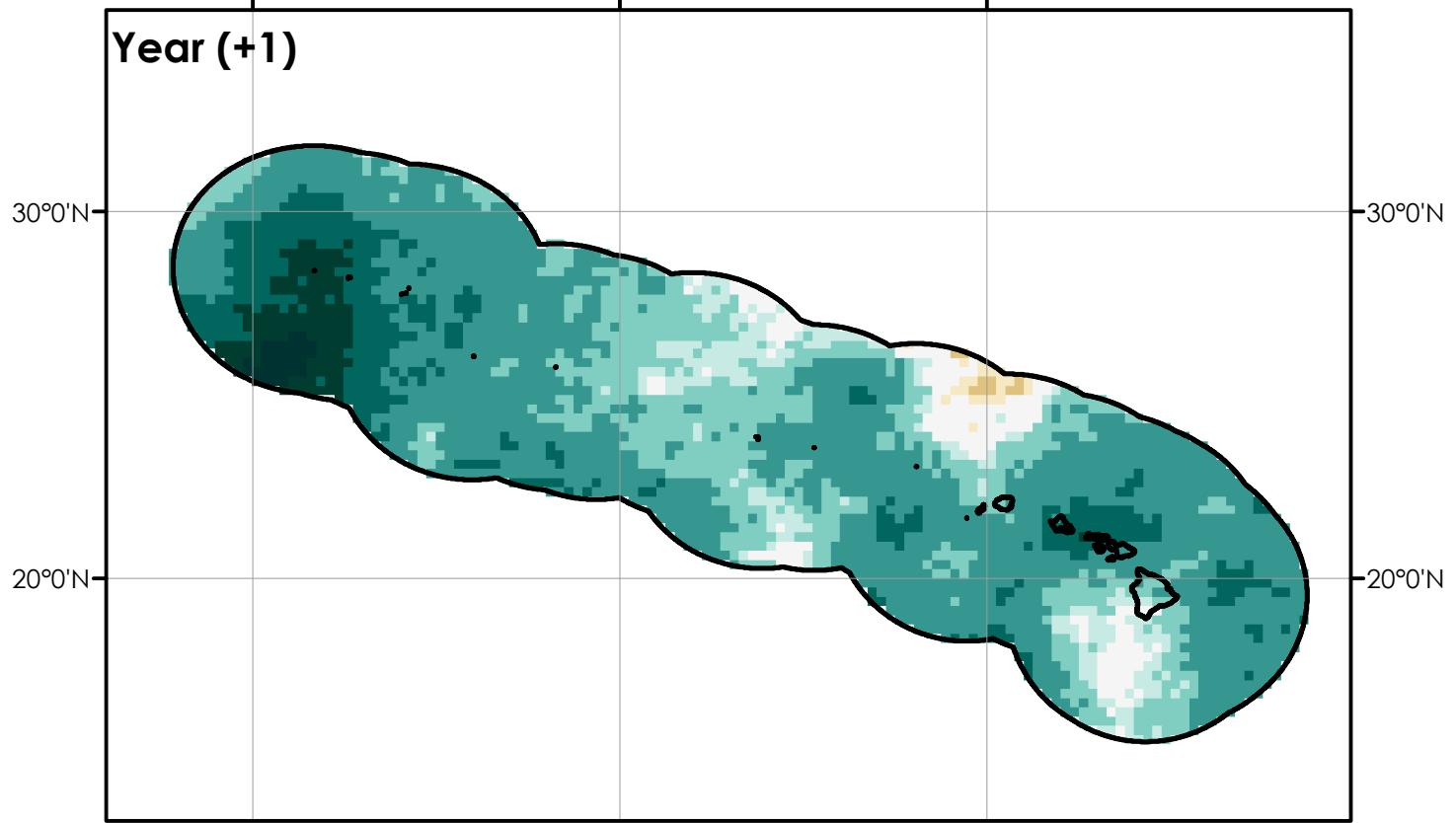
312

Year (0)

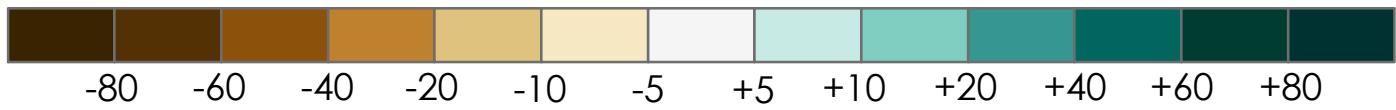
Hawaiian Islands

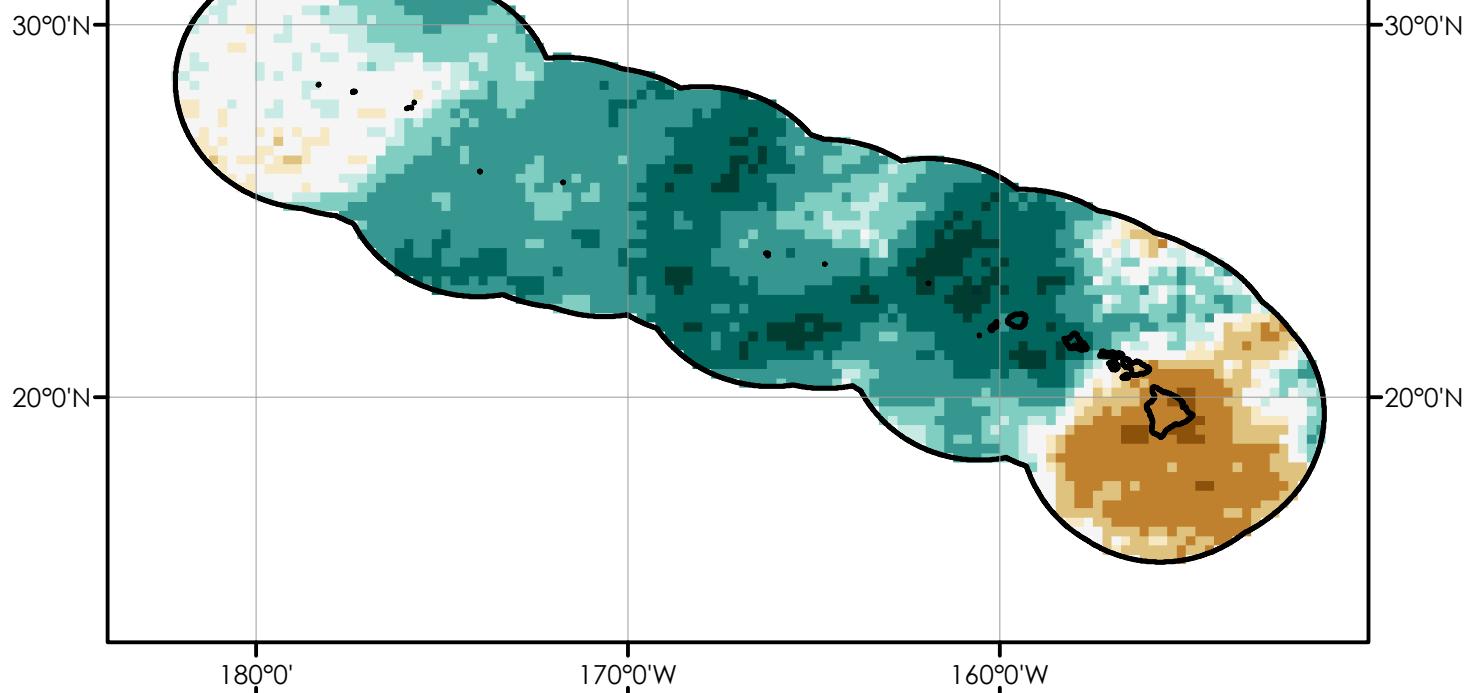
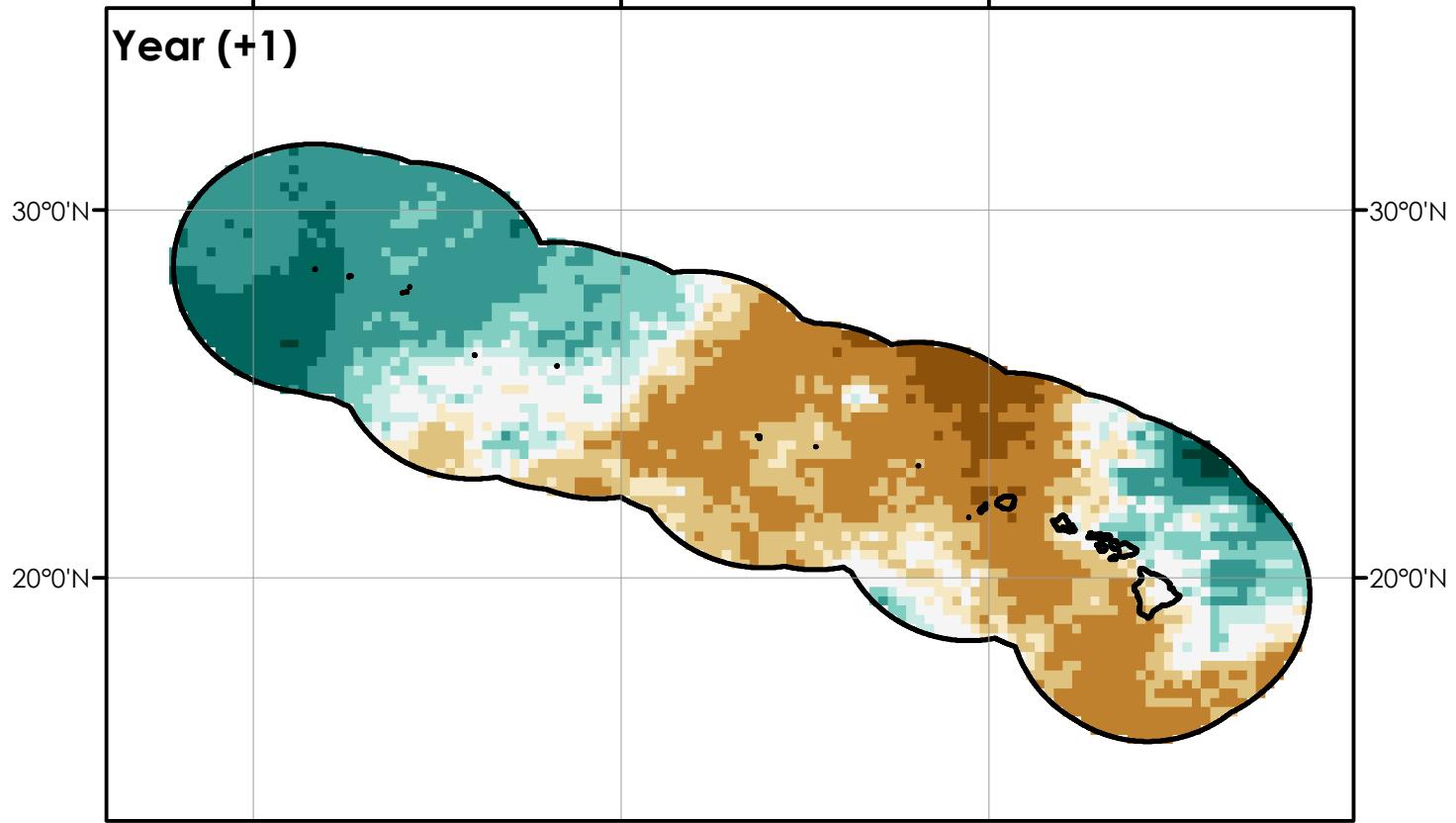
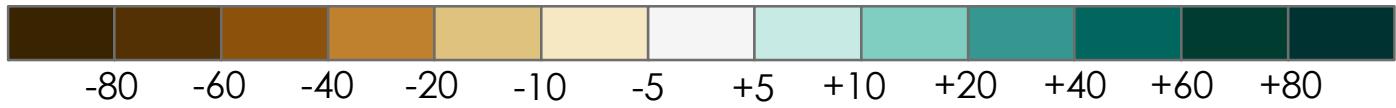


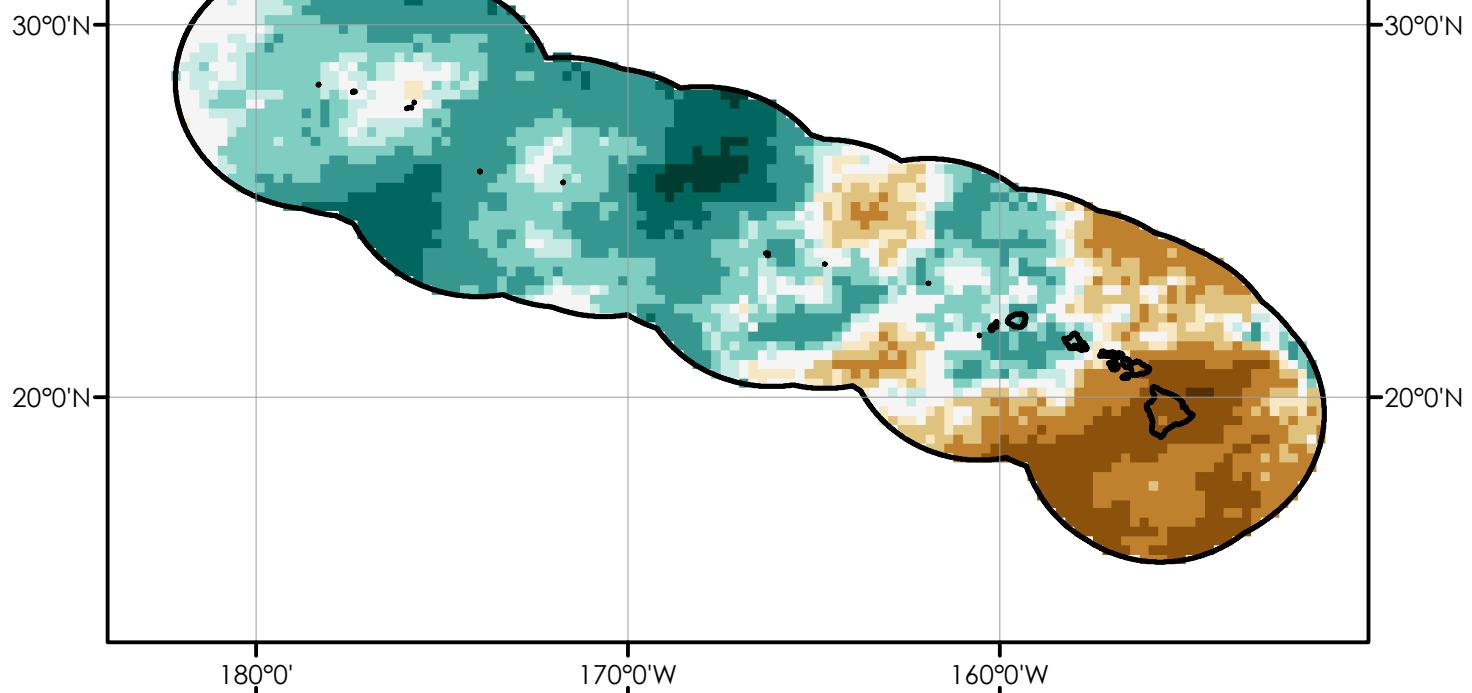
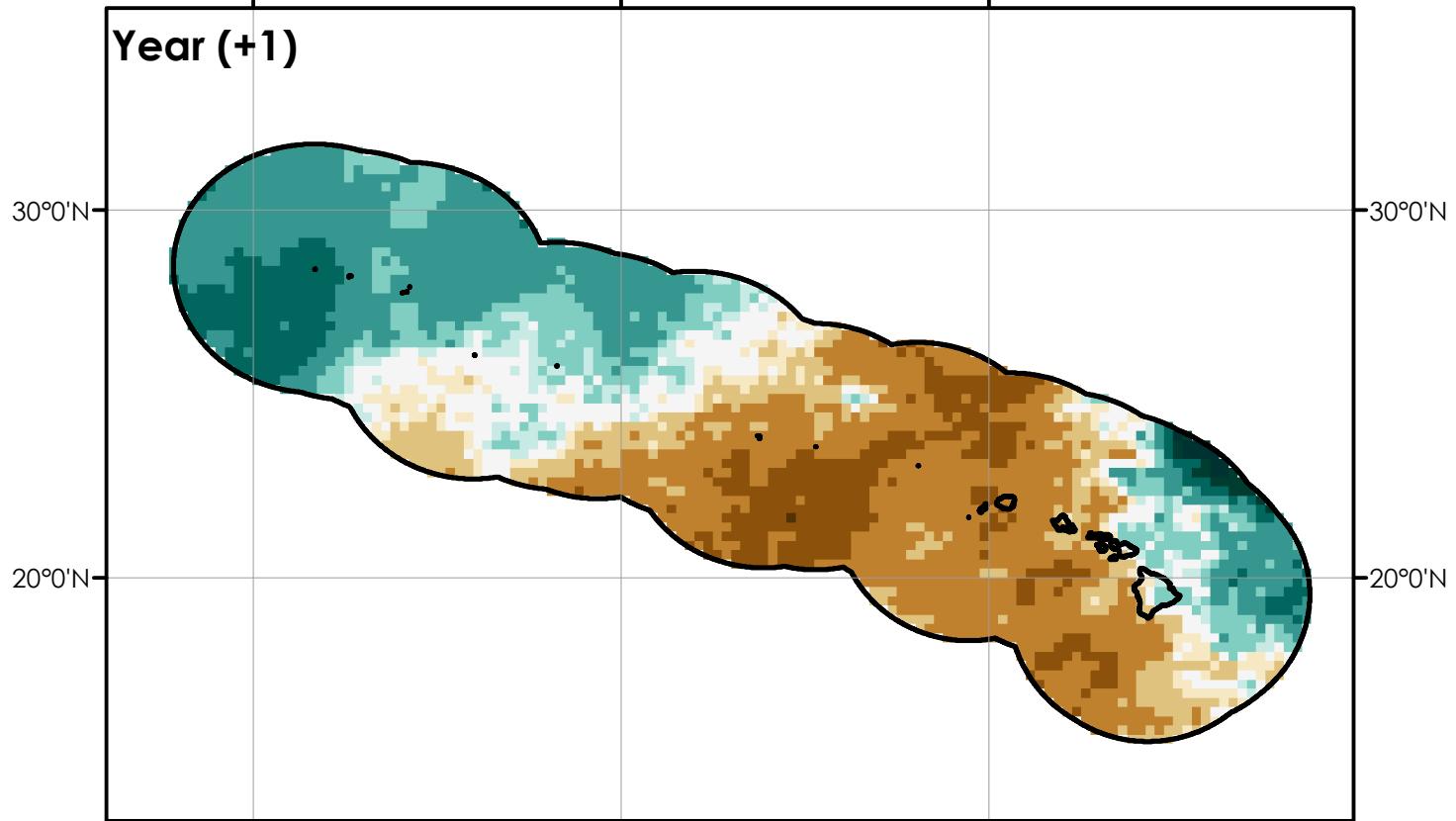
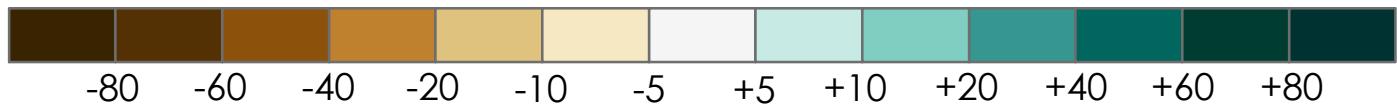
Year (+1)

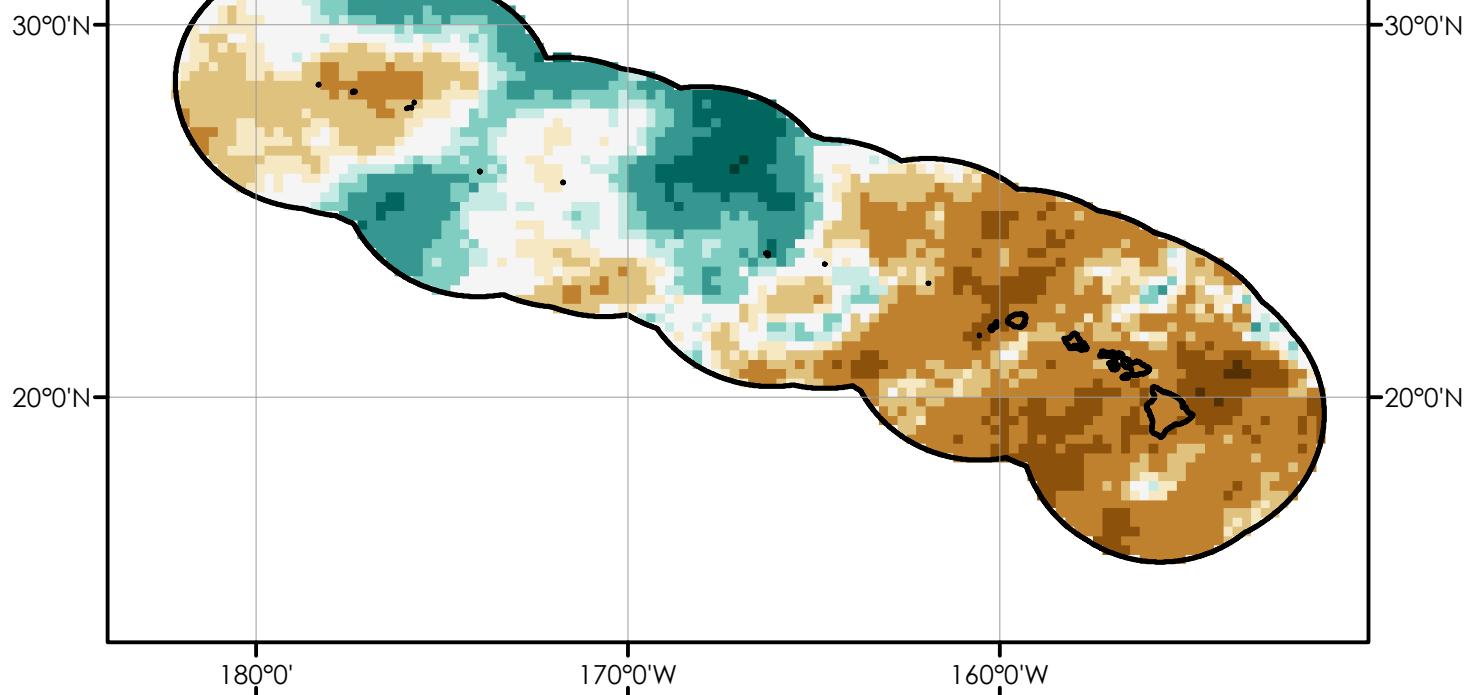
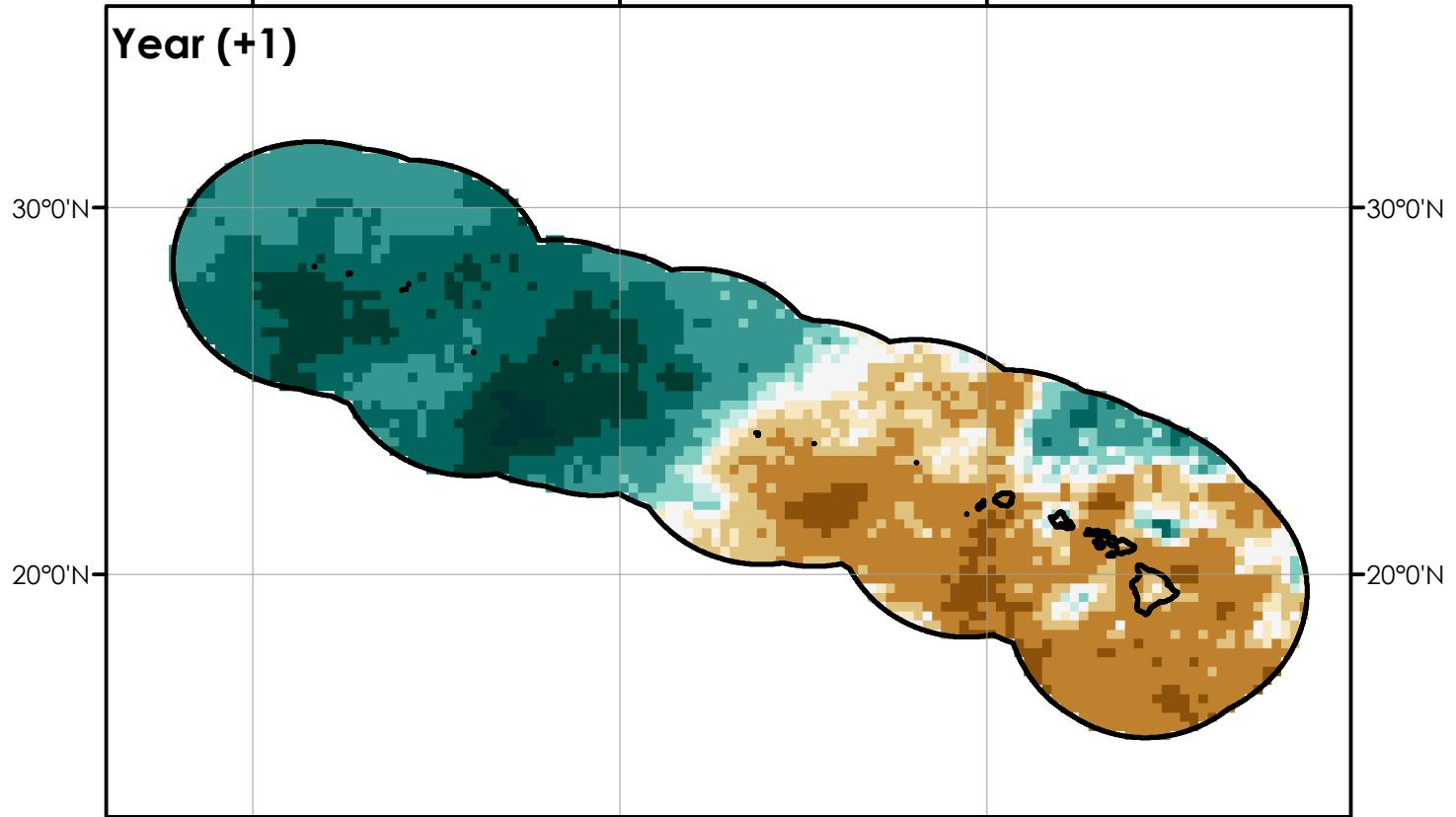
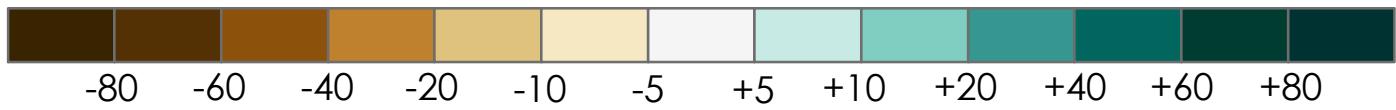


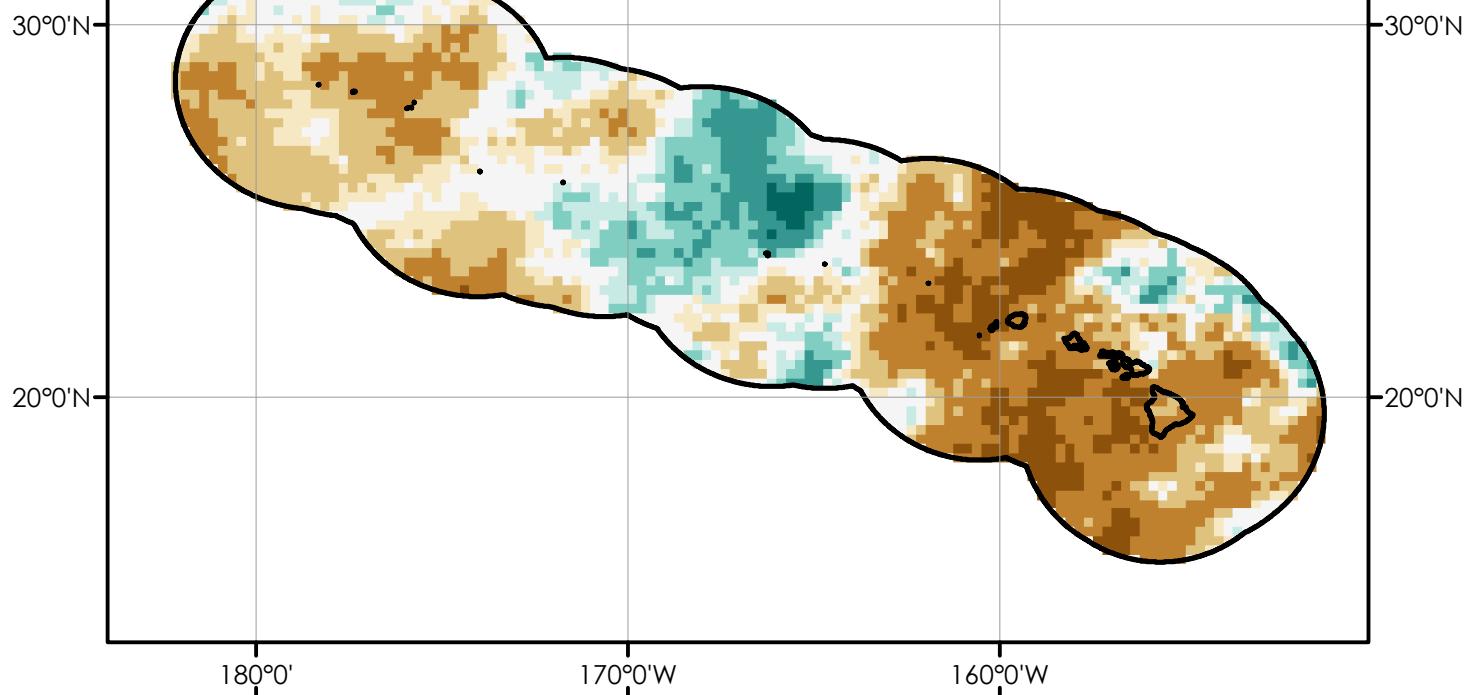
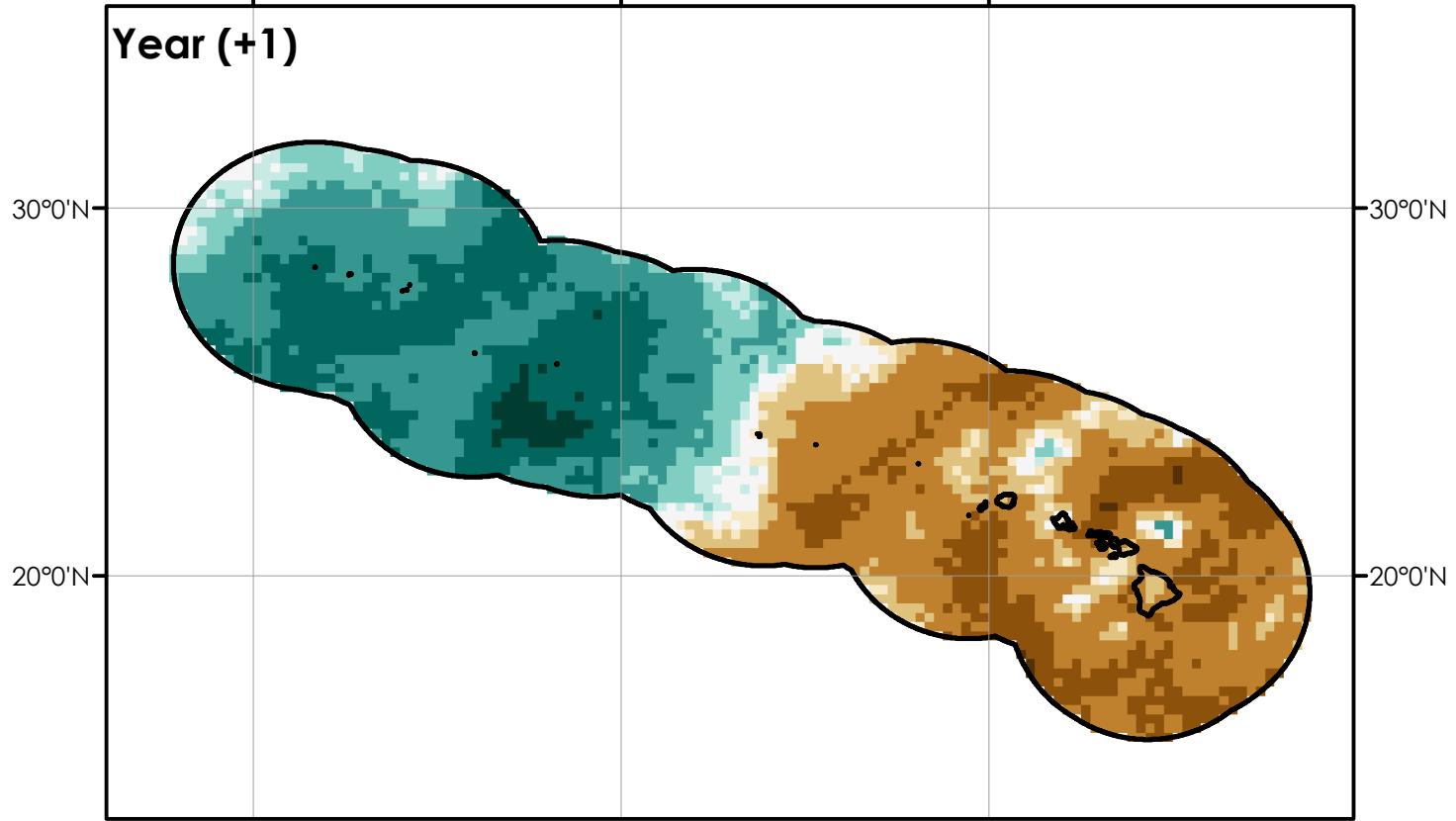
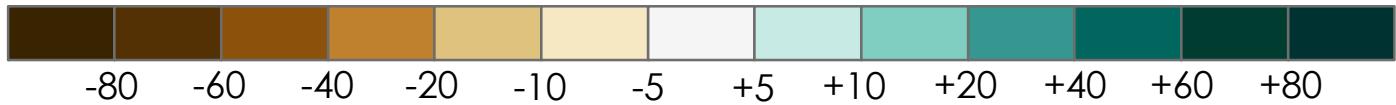
Precipitation Change (%)

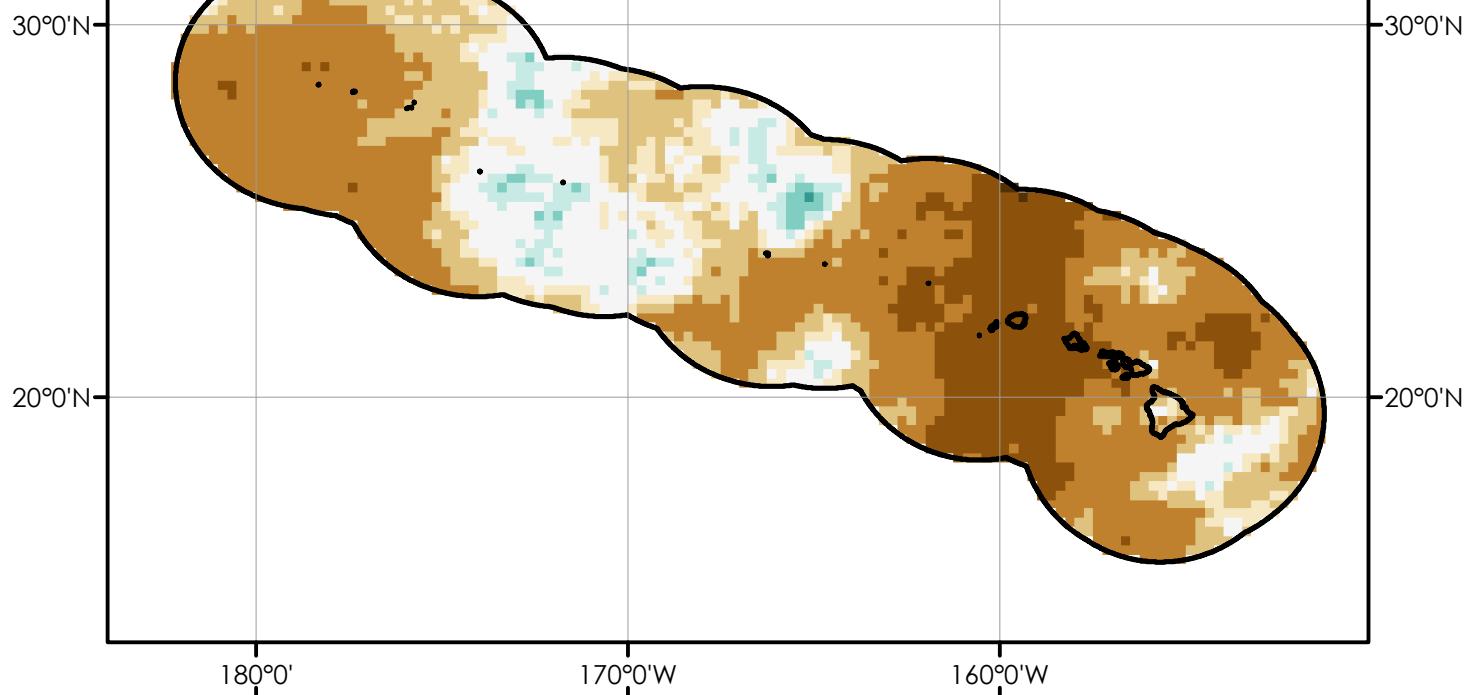
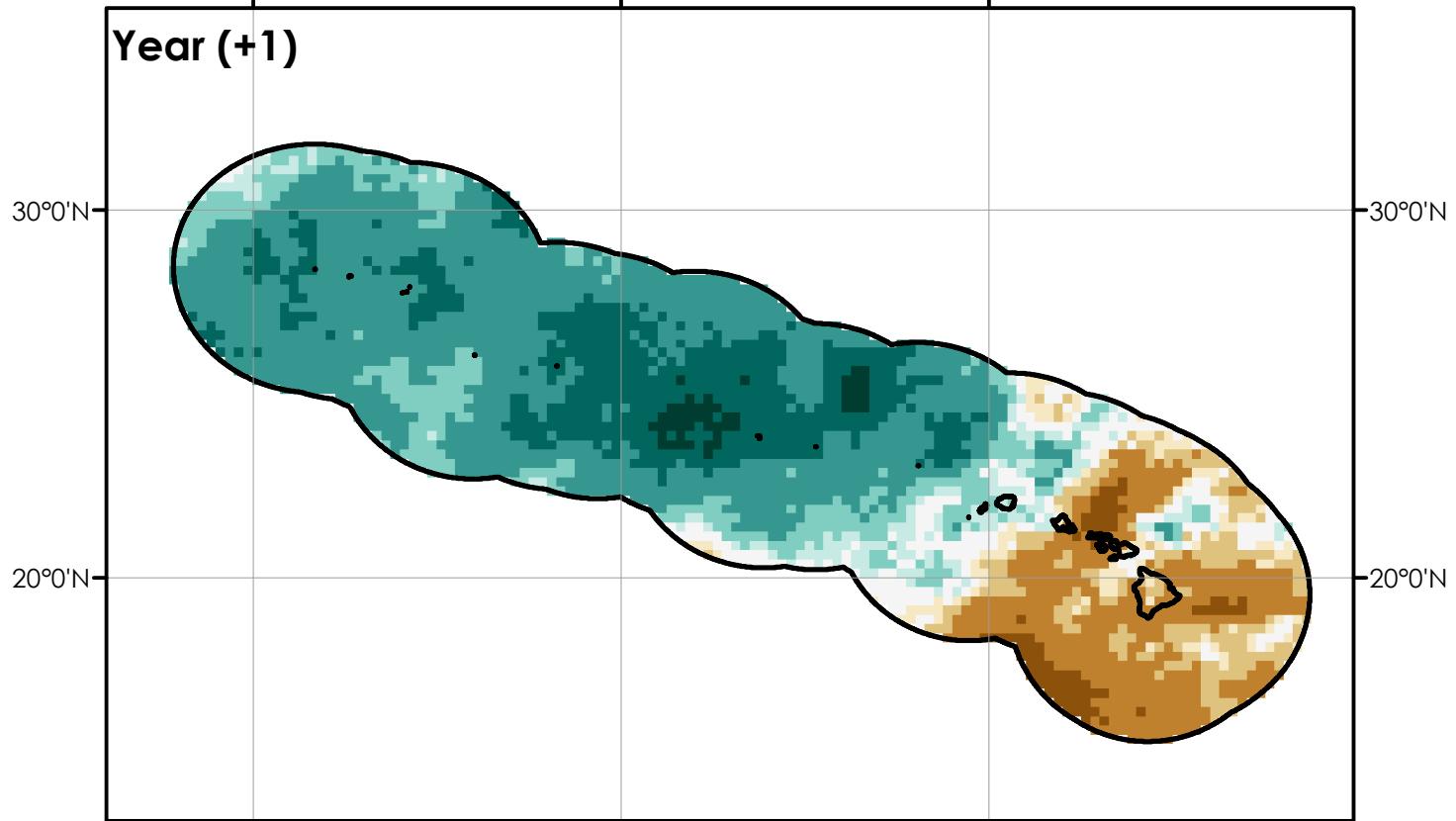
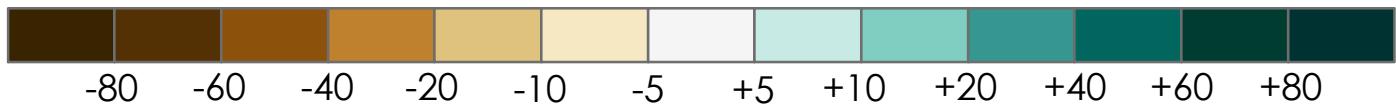


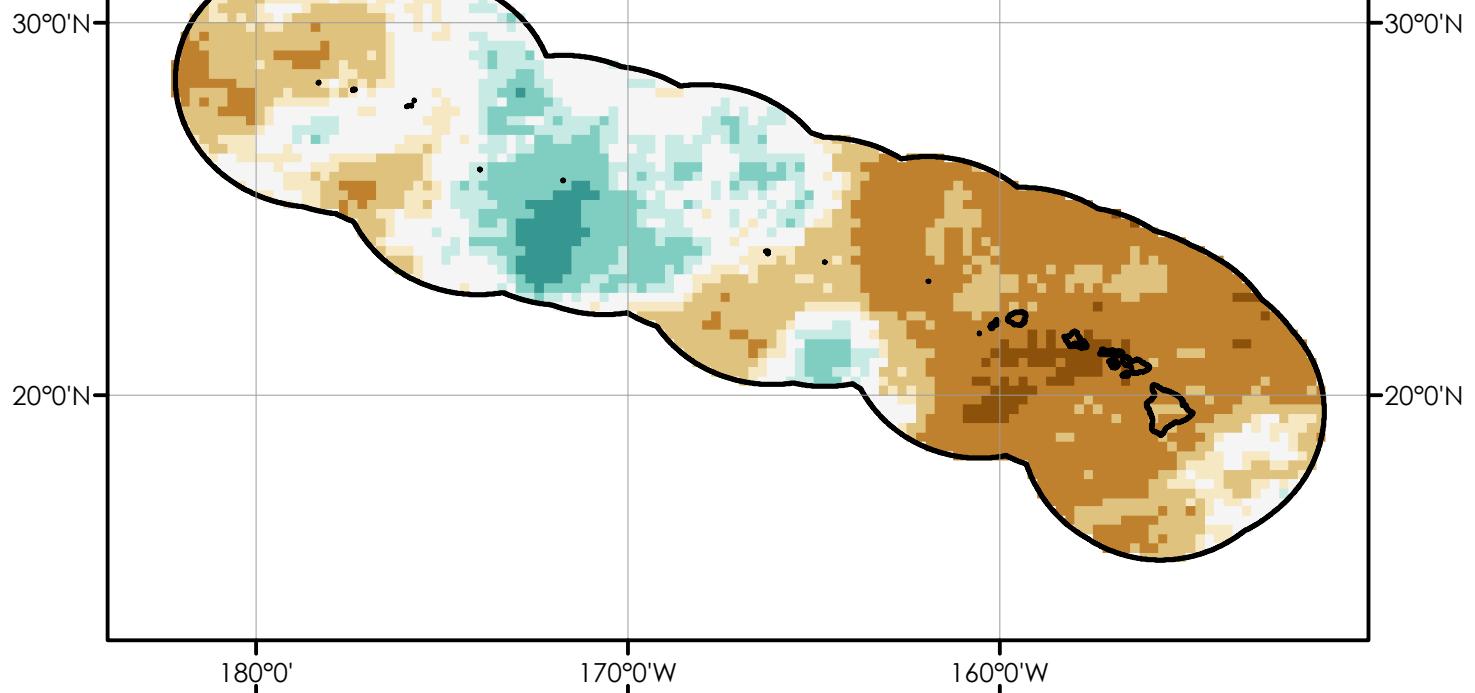
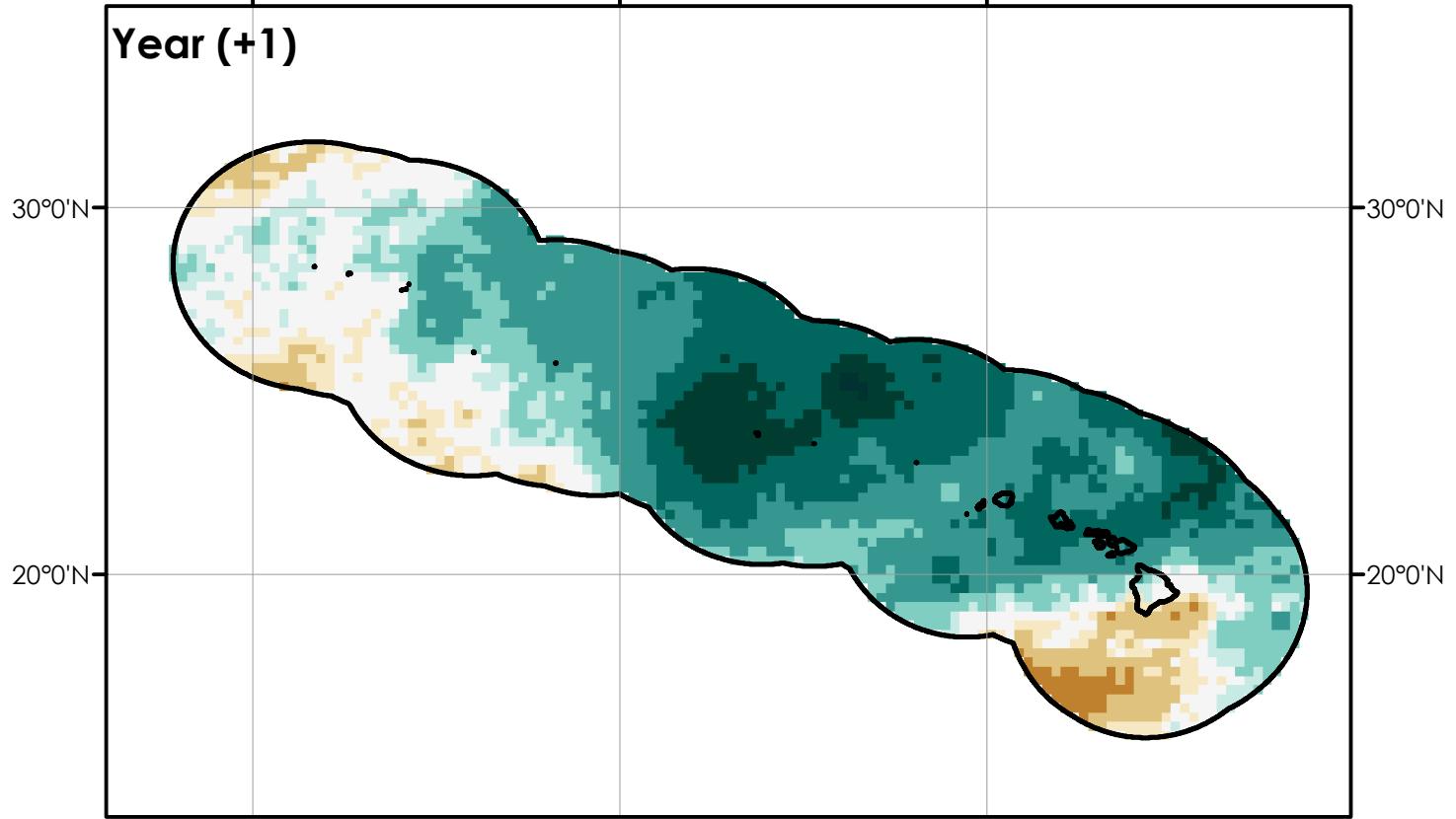
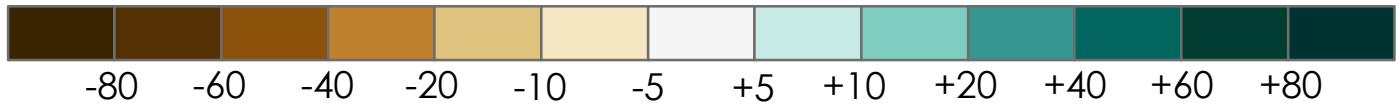
Year (0)**Hawaiian Islands****Year (+1)****Precipitation Change (%)**

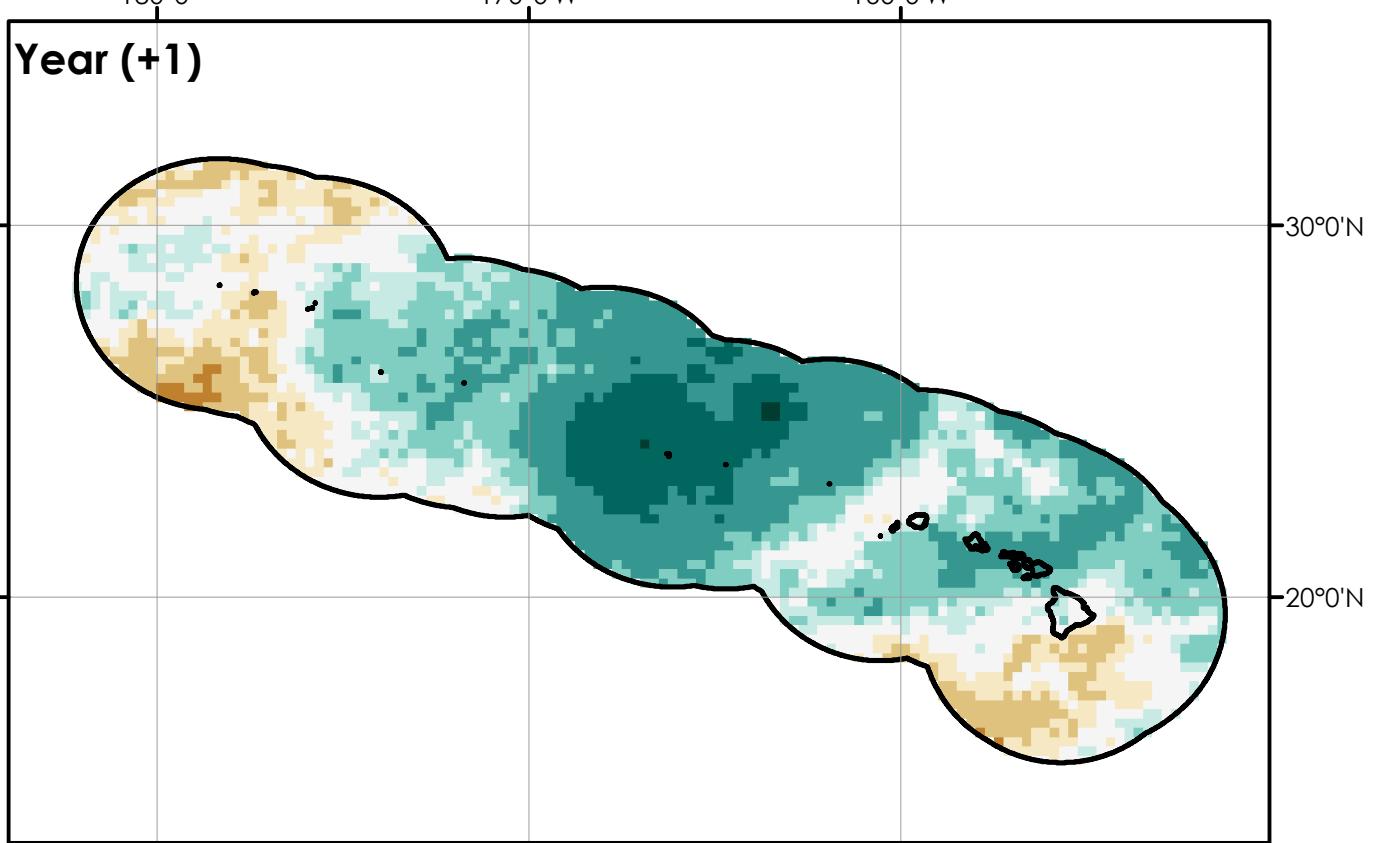
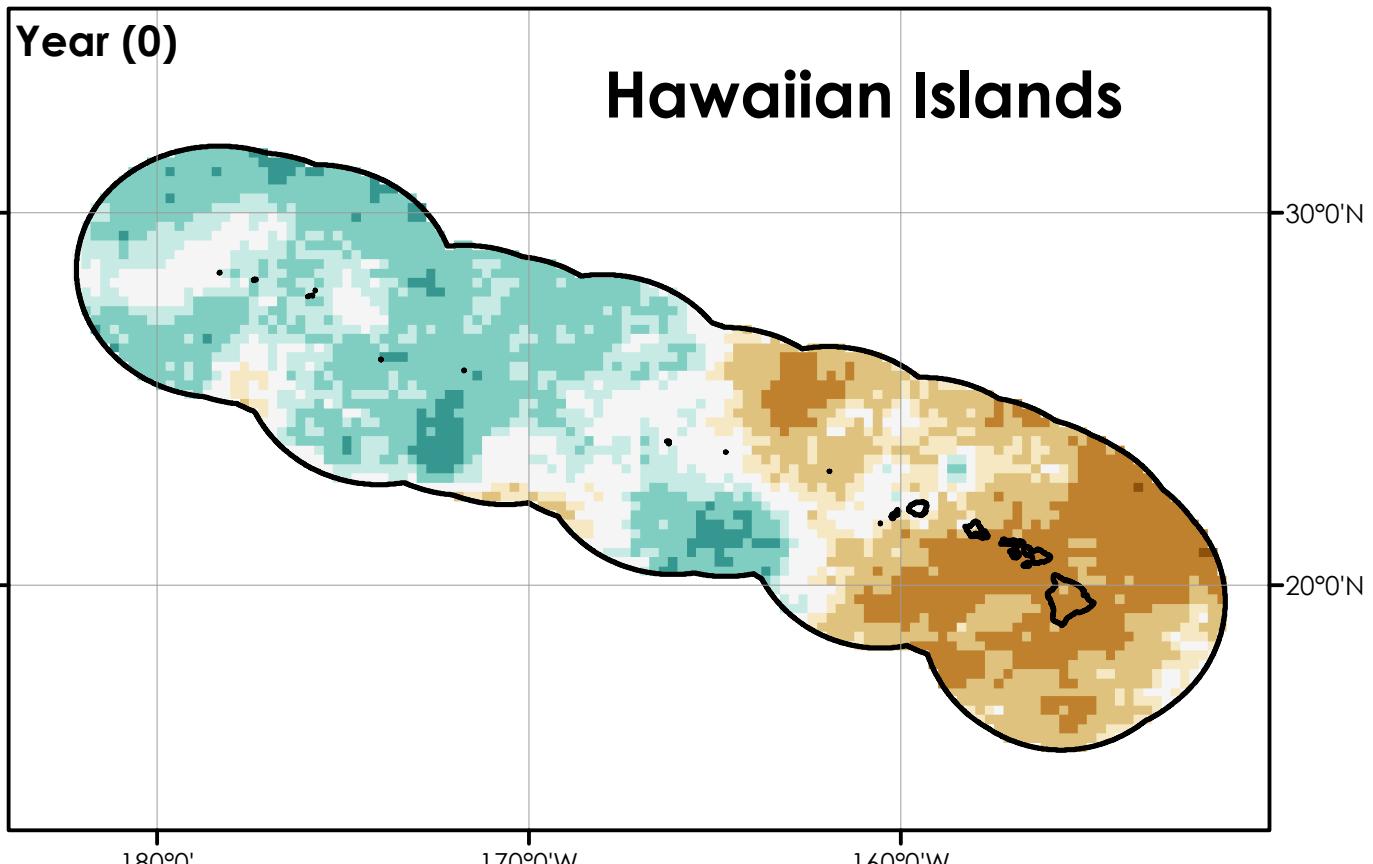
Year (0)**Hawaiian Islands****Year (+1)****Precipitation Change (%)**

Year (0)**Hawaiian Islands****Year (+1)****Precipitation Change (%)**

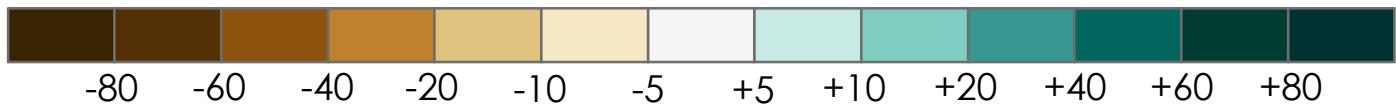
Year (0)**Hawaiian Islands****Year (+1)****Precipitation Change (%)**

Year (0)**Hawaiian Islands****Year (+1)****Precipitation Change (%)**

Year (0)**Hawaiian Islands****Year (+1)****Precipitation Change (%)**



Precipitation Change (%)

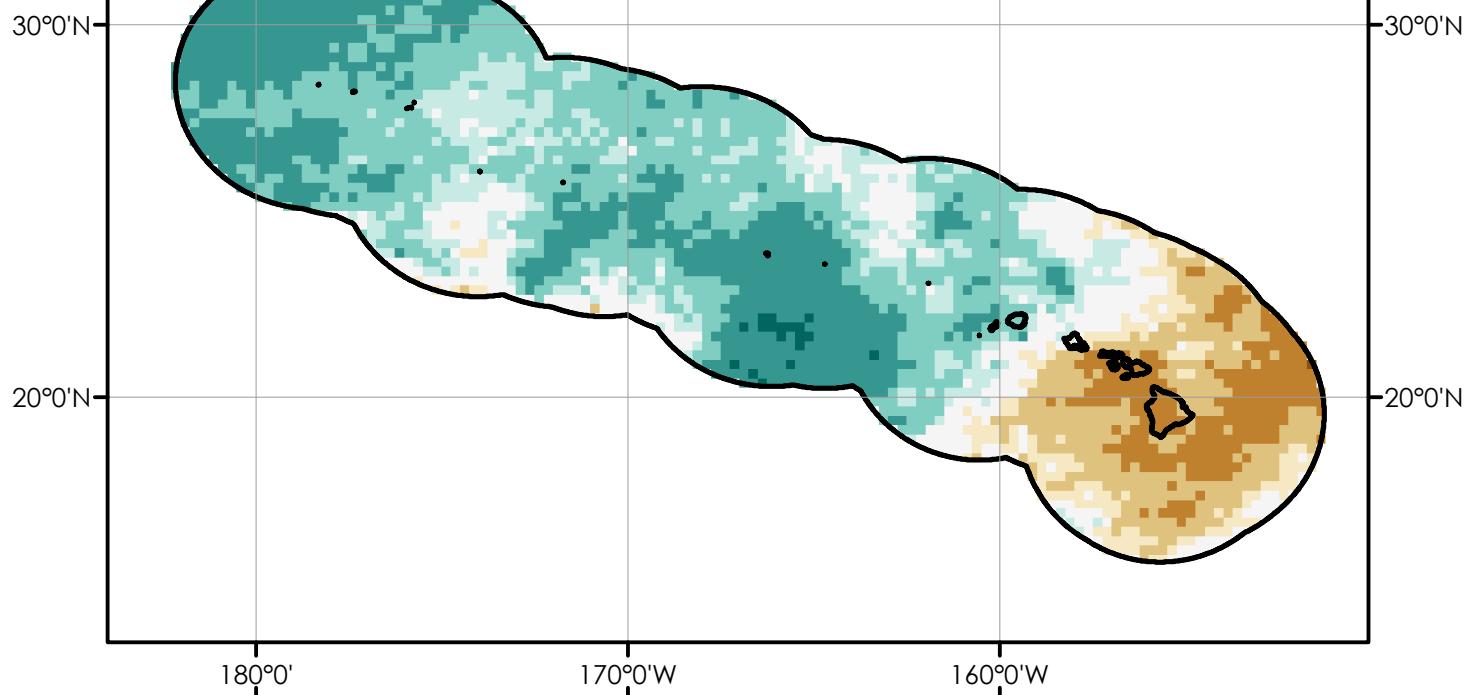


Weak La Niña for NDJ

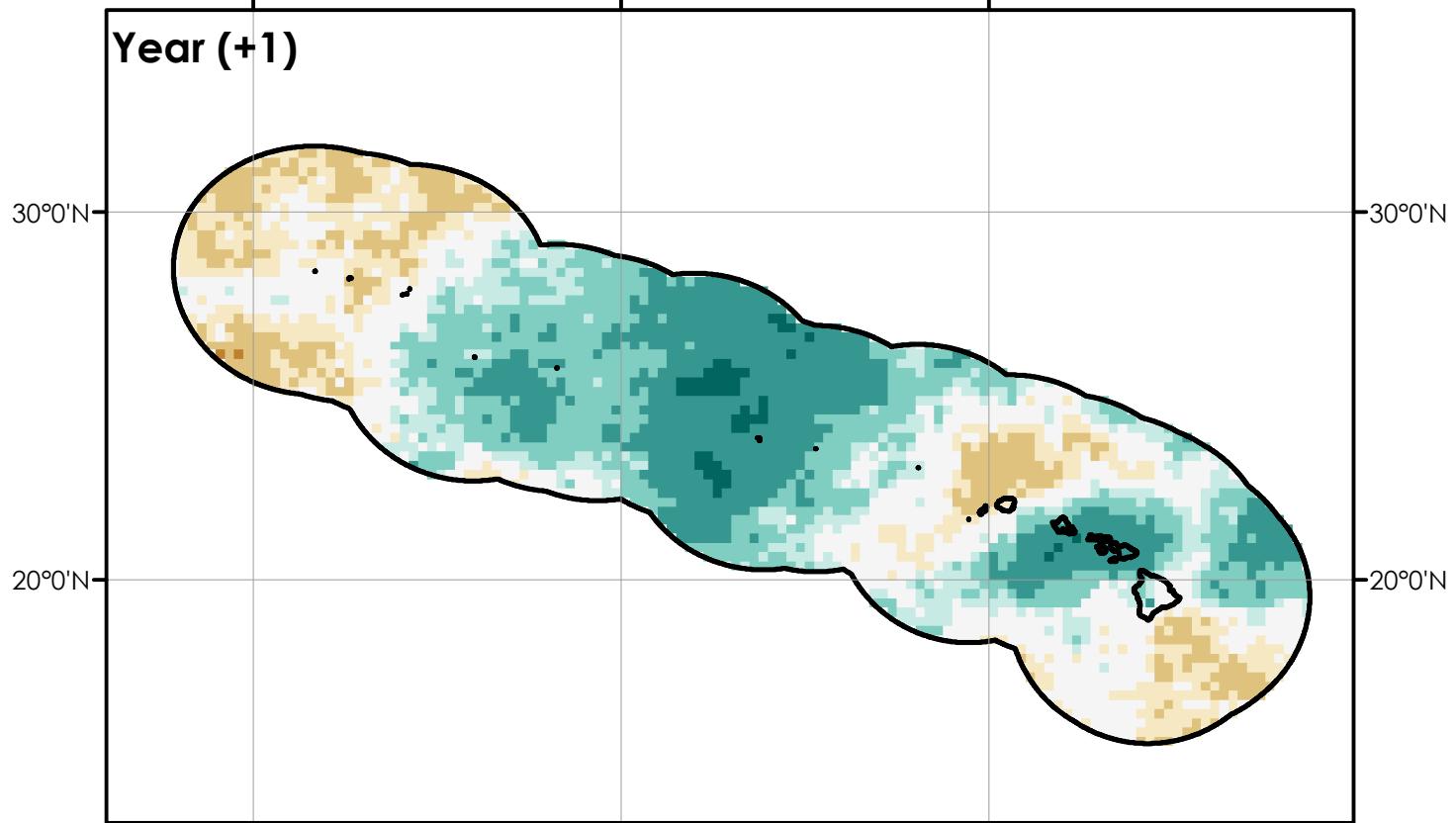
320

Year (0)

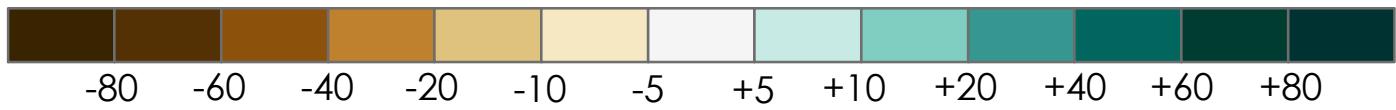
Hawaiian Islands

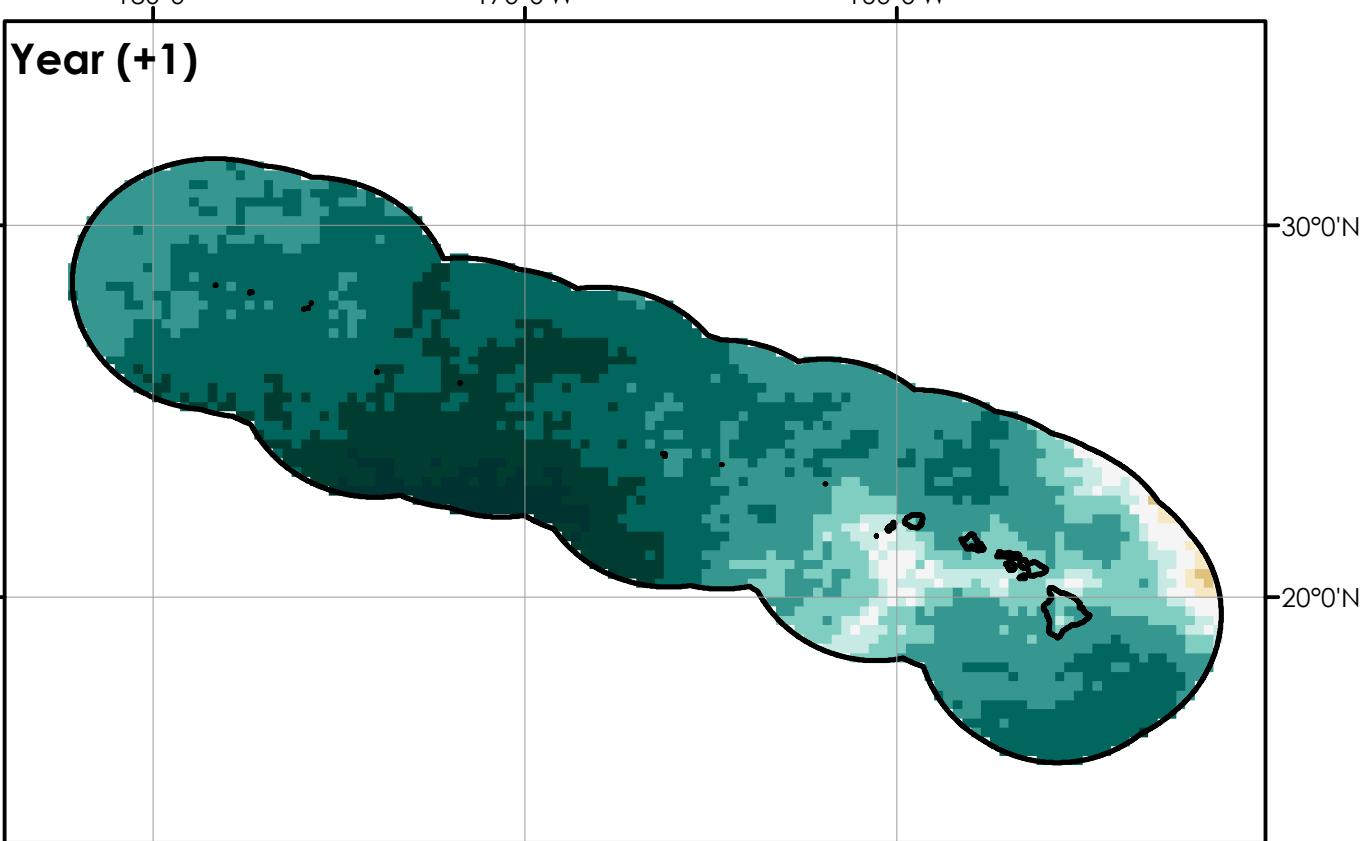
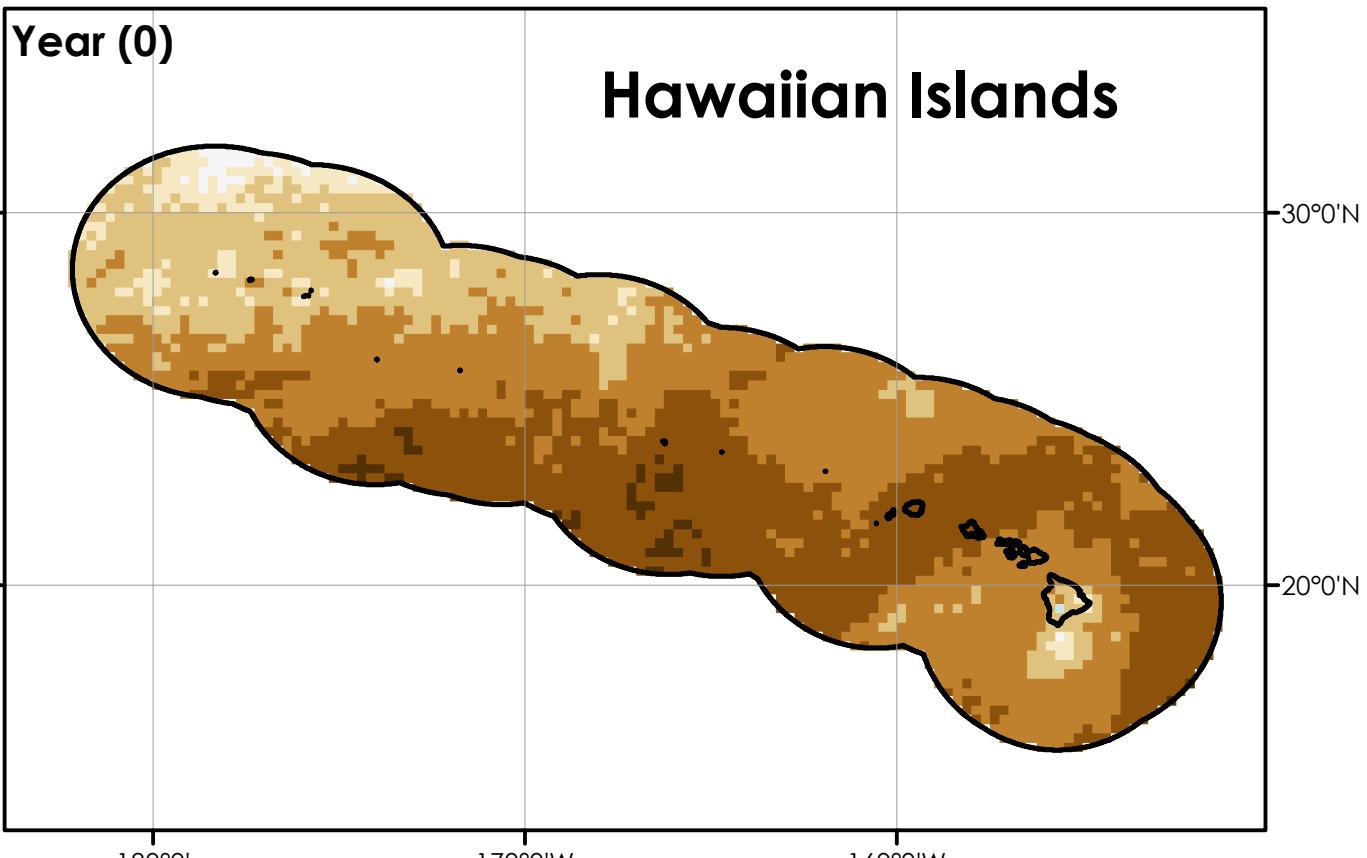


Year (+1)



Precipitation Change (%)





Precipitation Change (%)

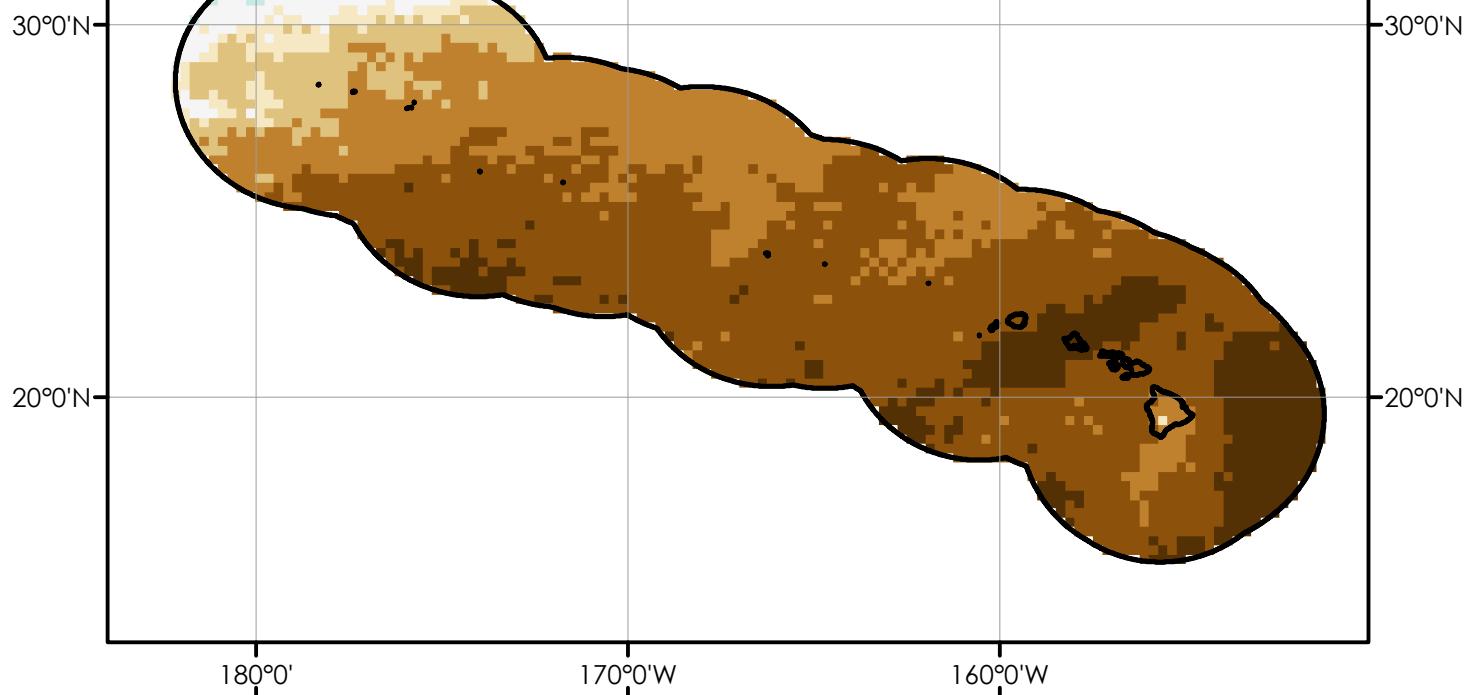


Moderate - Strong La Niña for JFM

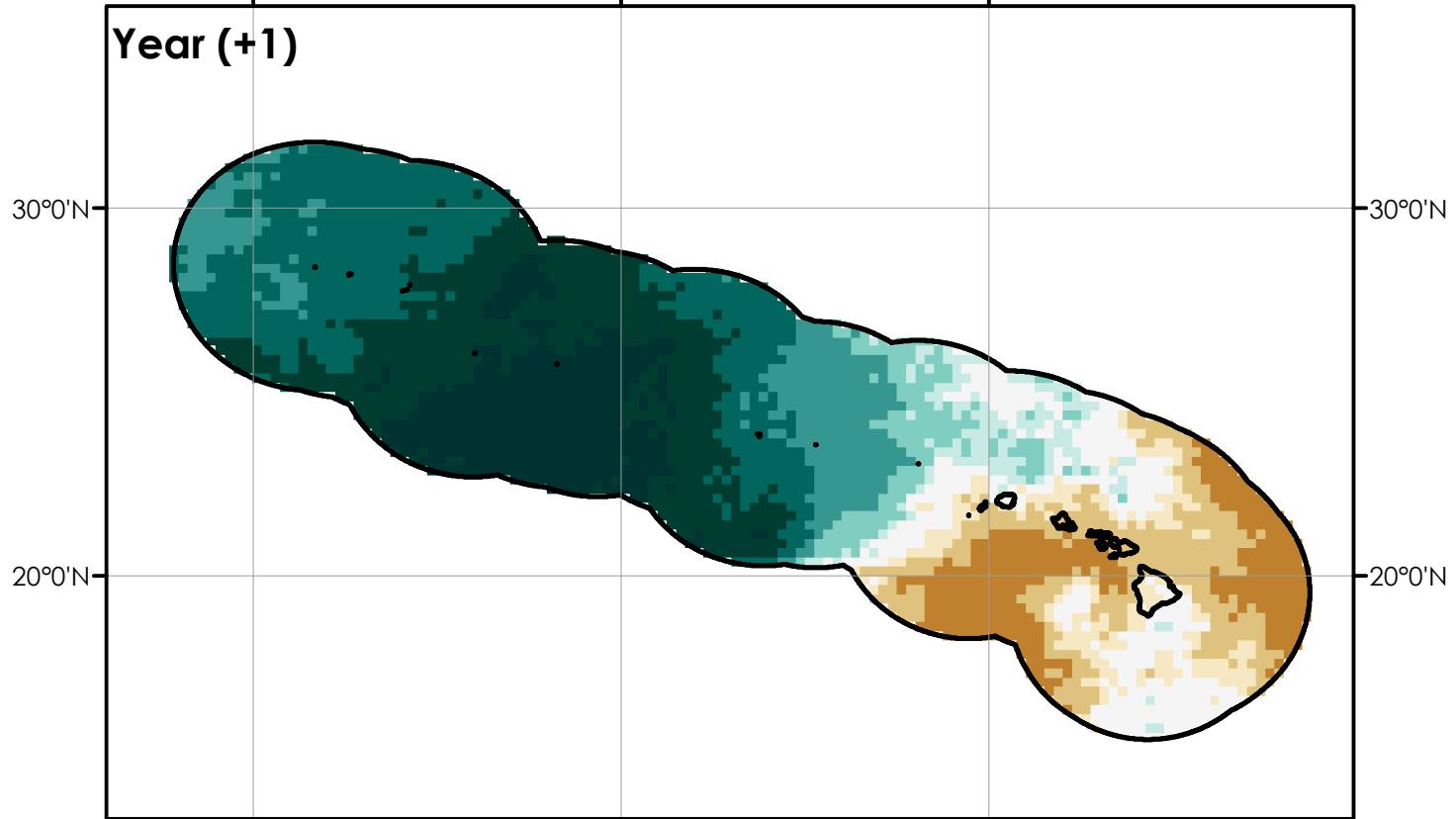
322

Year (0)

Hawaiian Islands

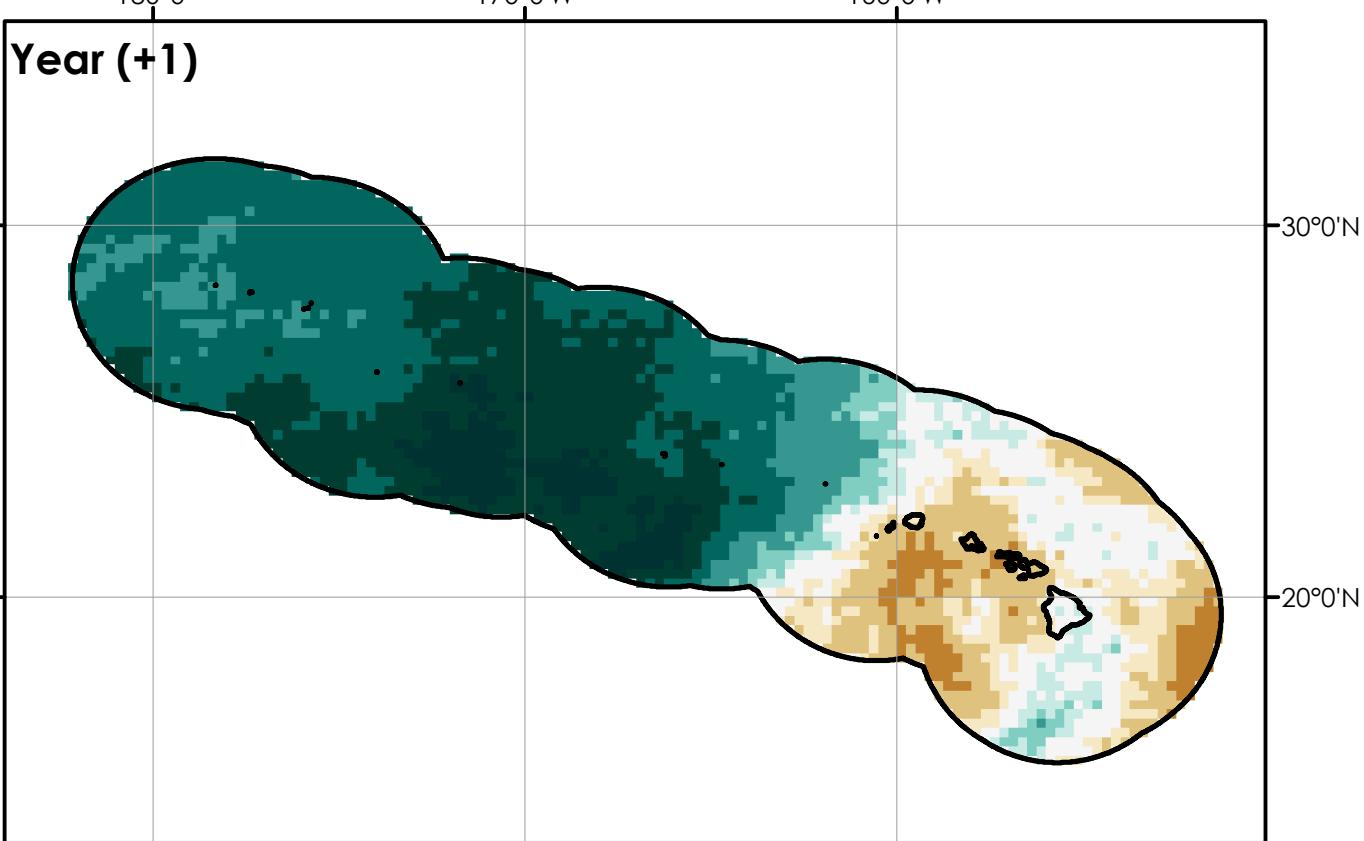
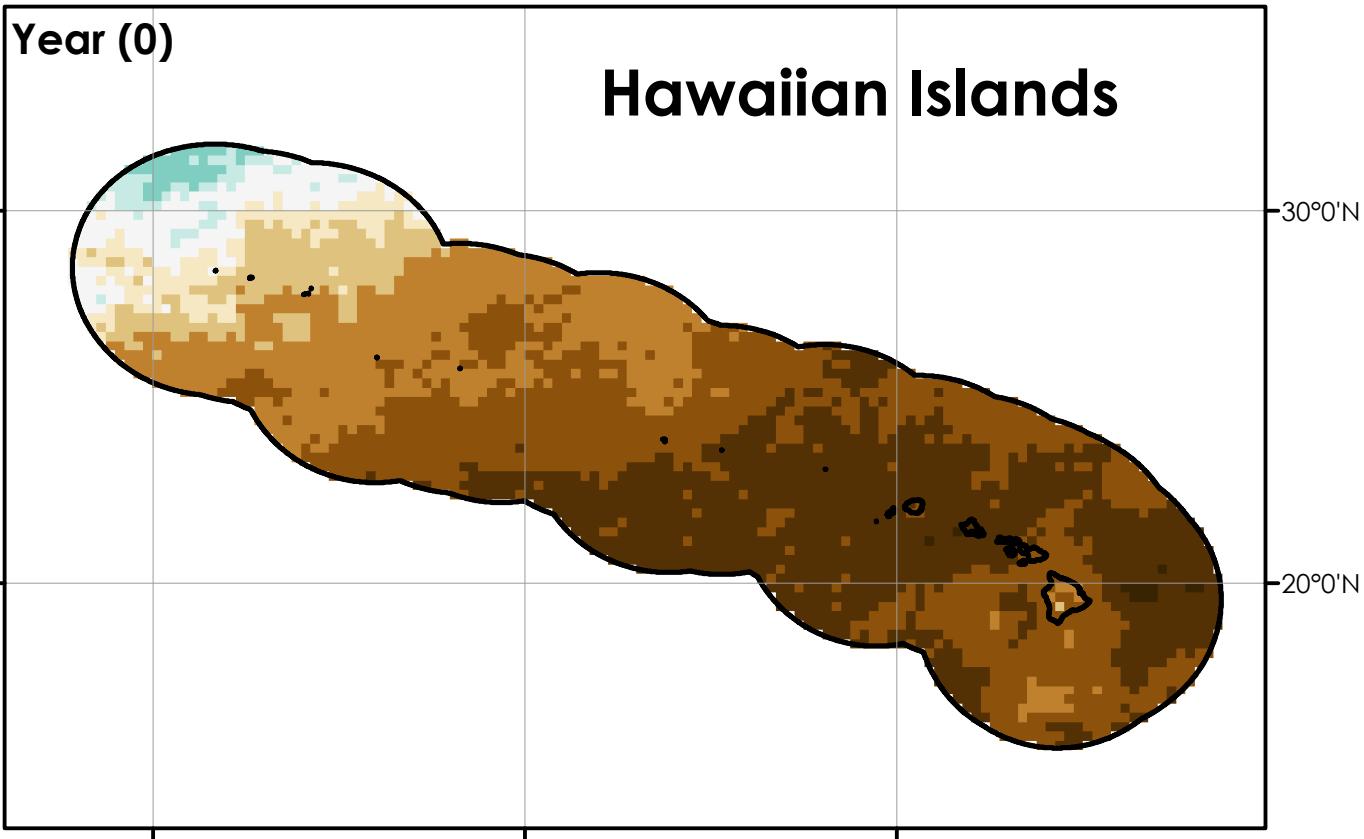


Year (+1)

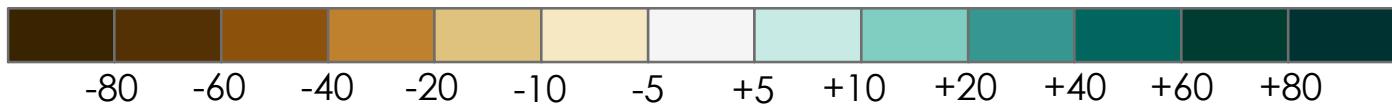


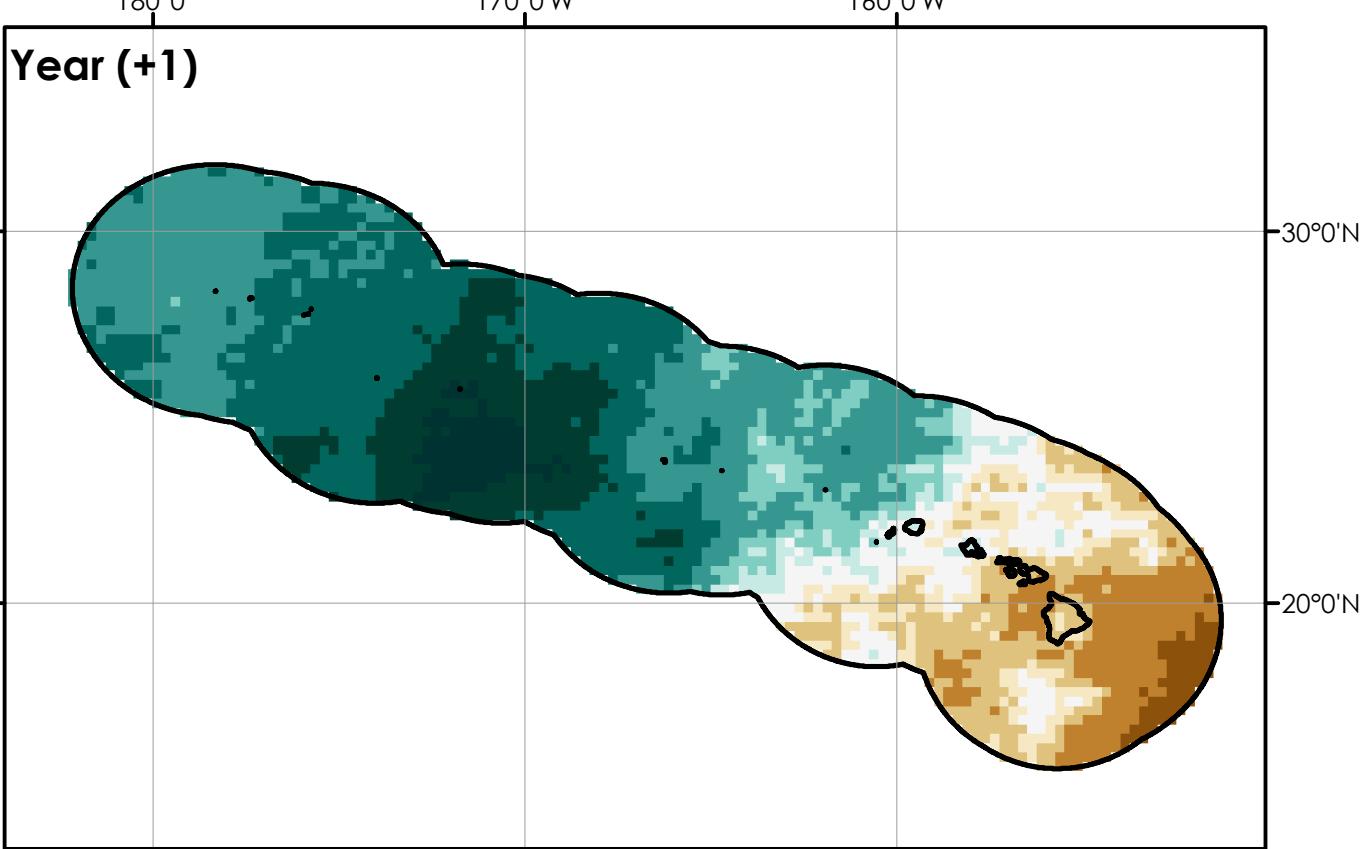
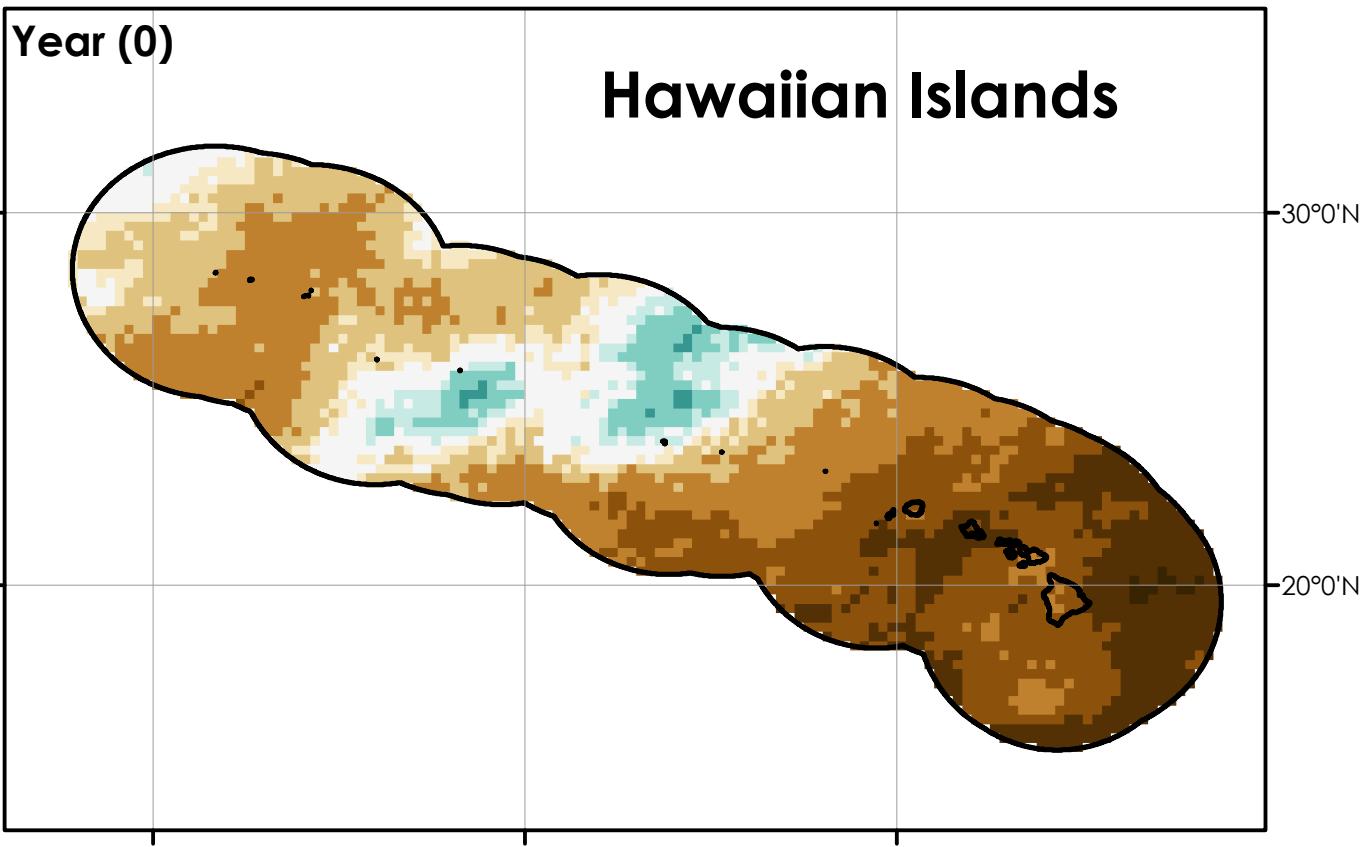
Precipitation Change (%)



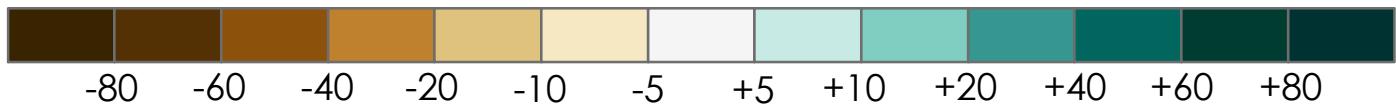


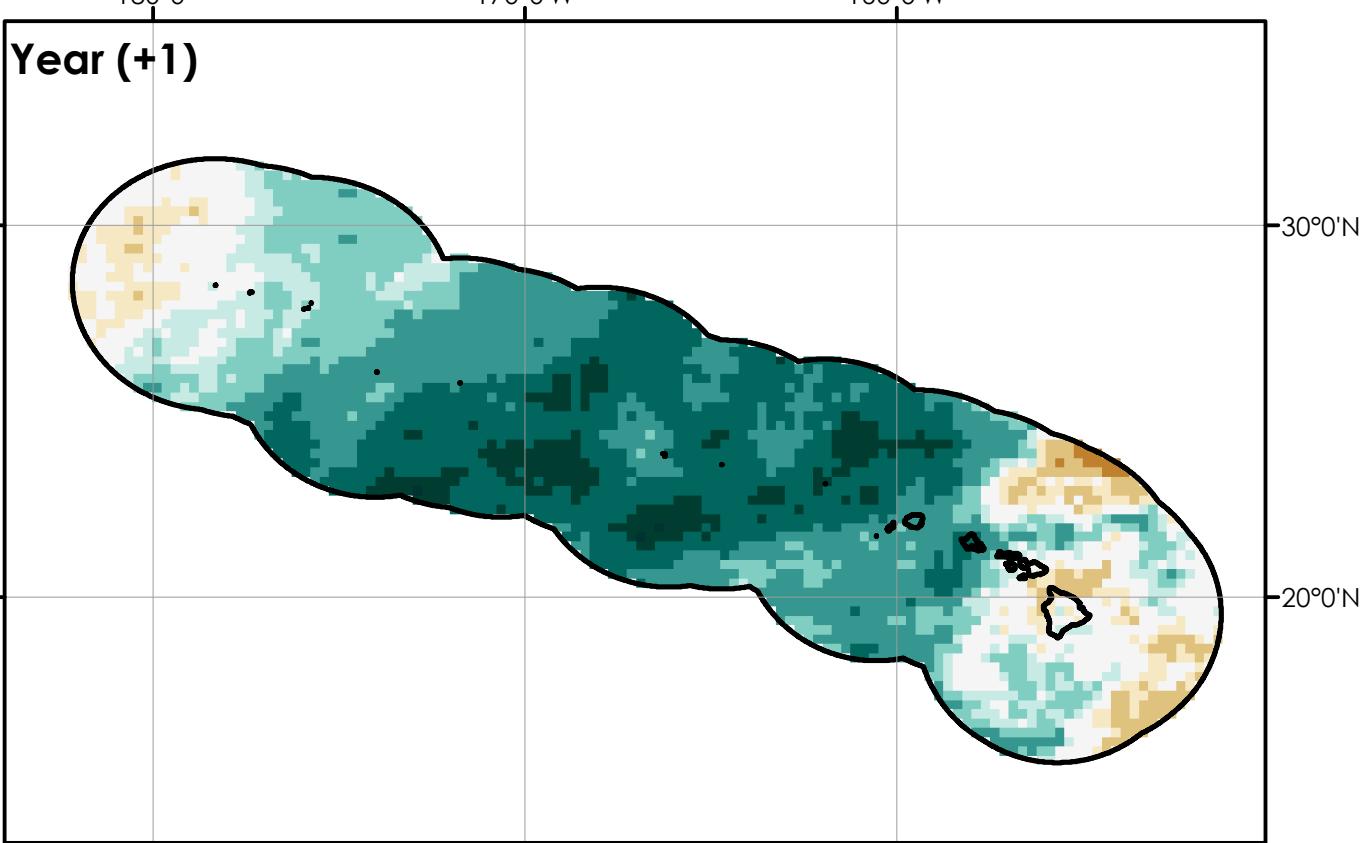
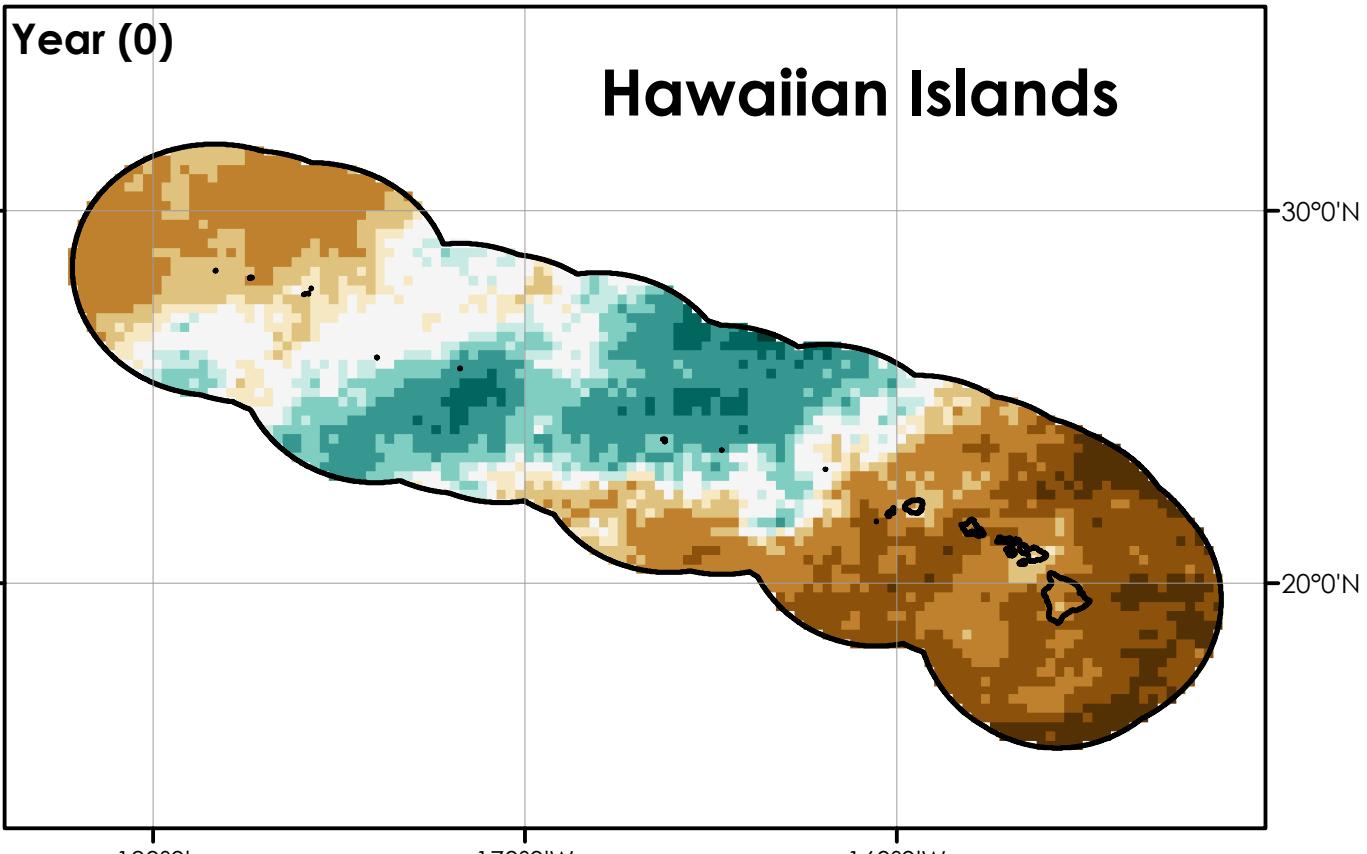
Precipitation Change (%)





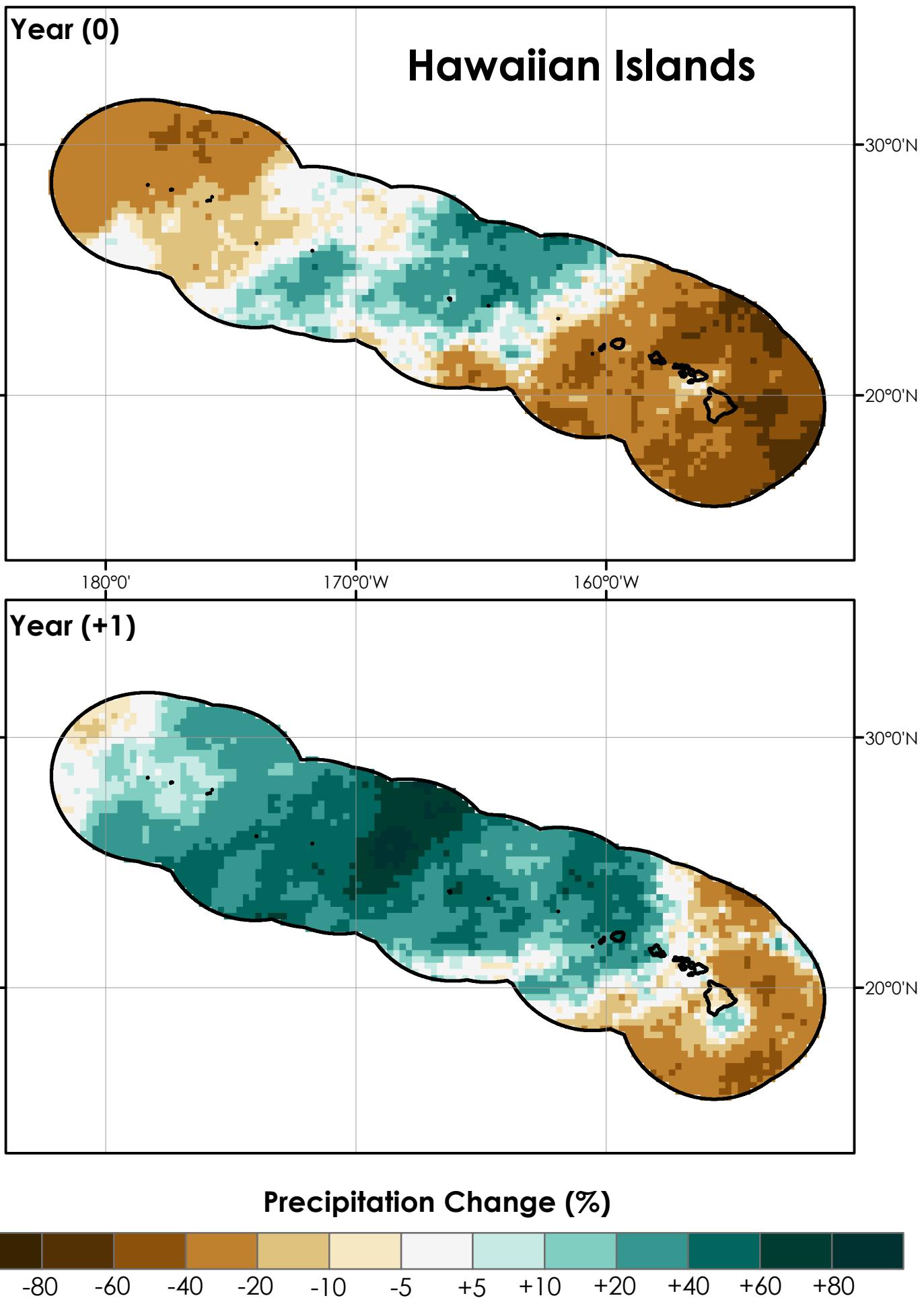
Precipitation Change (%)

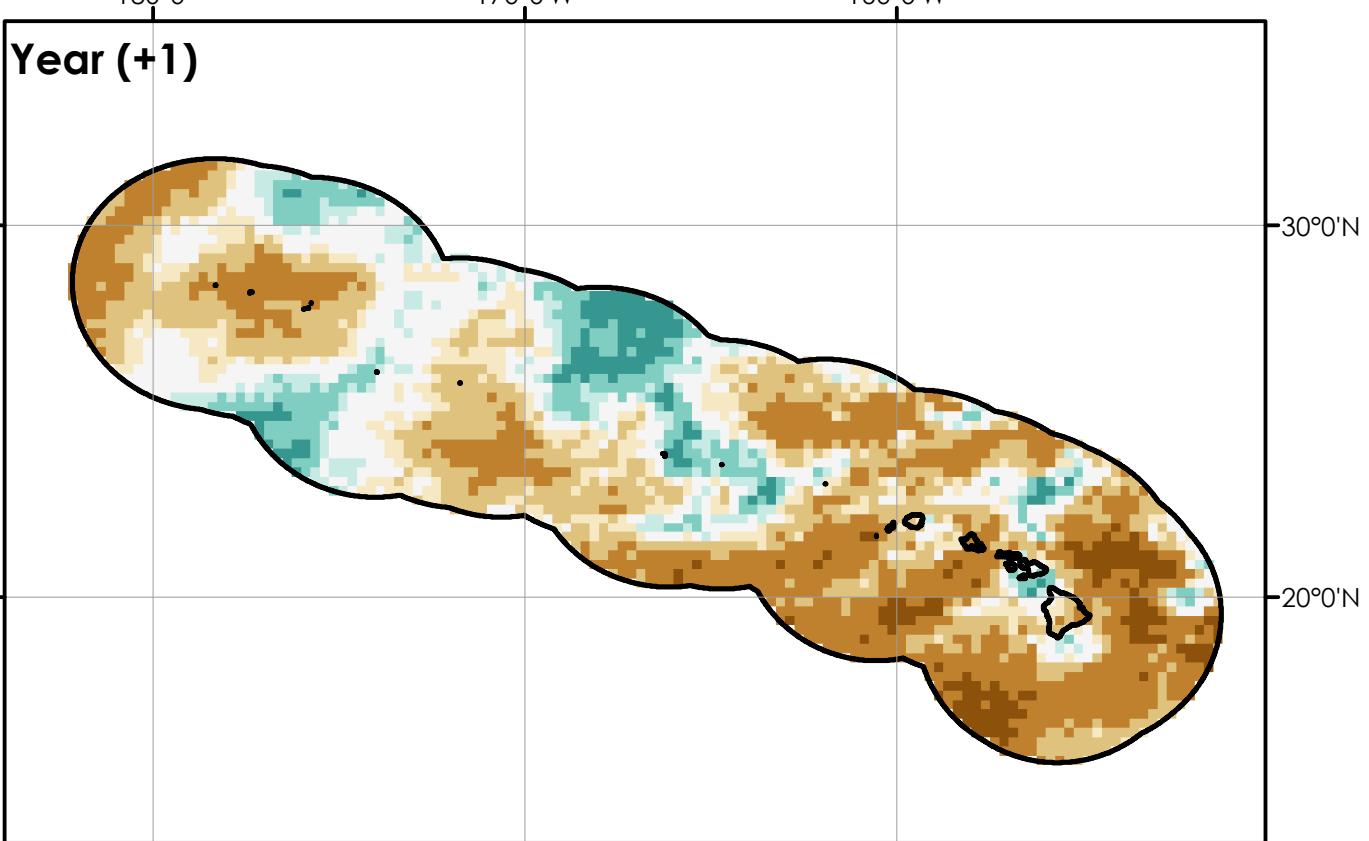
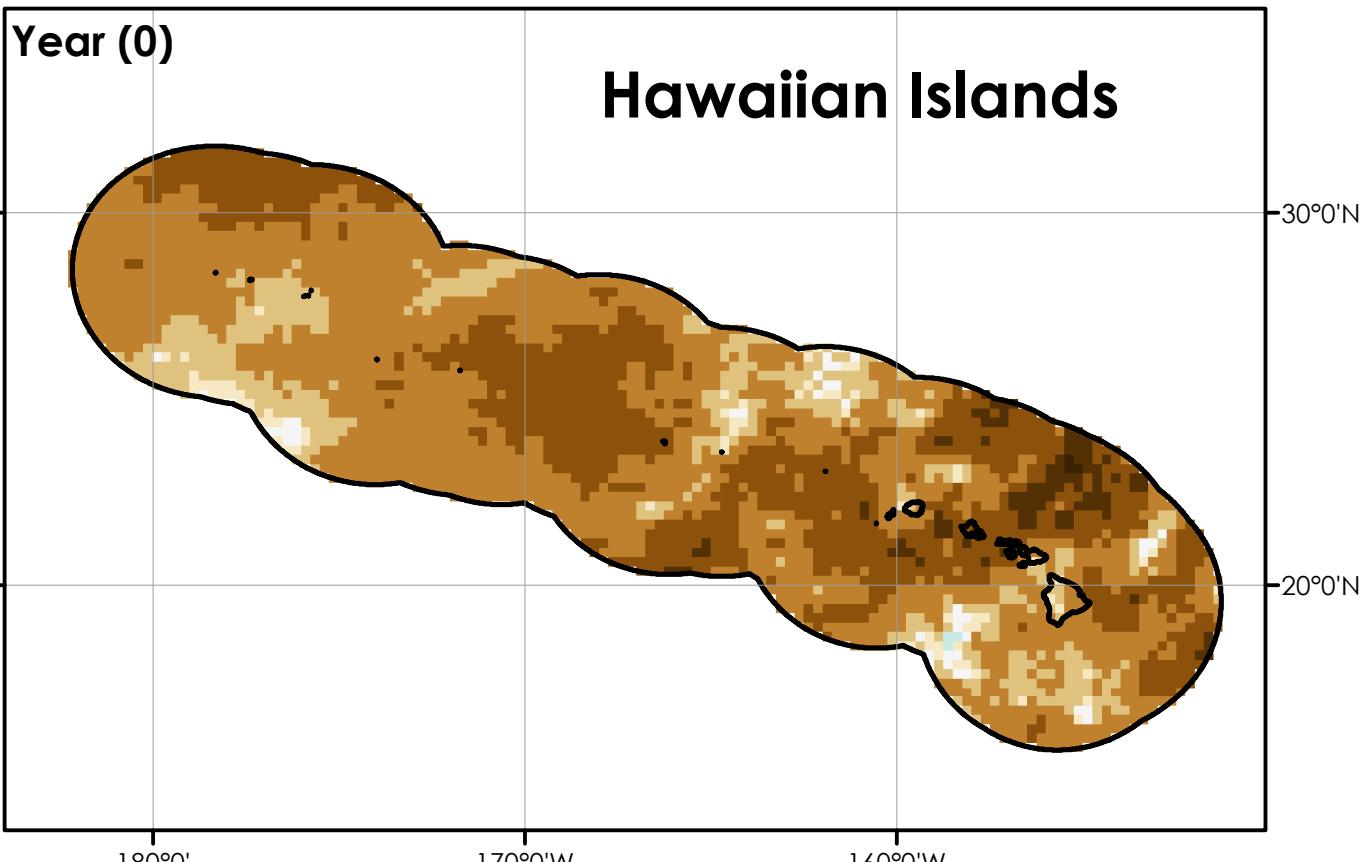




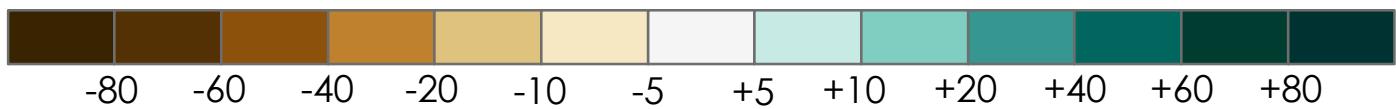
Precipitation Change (%)

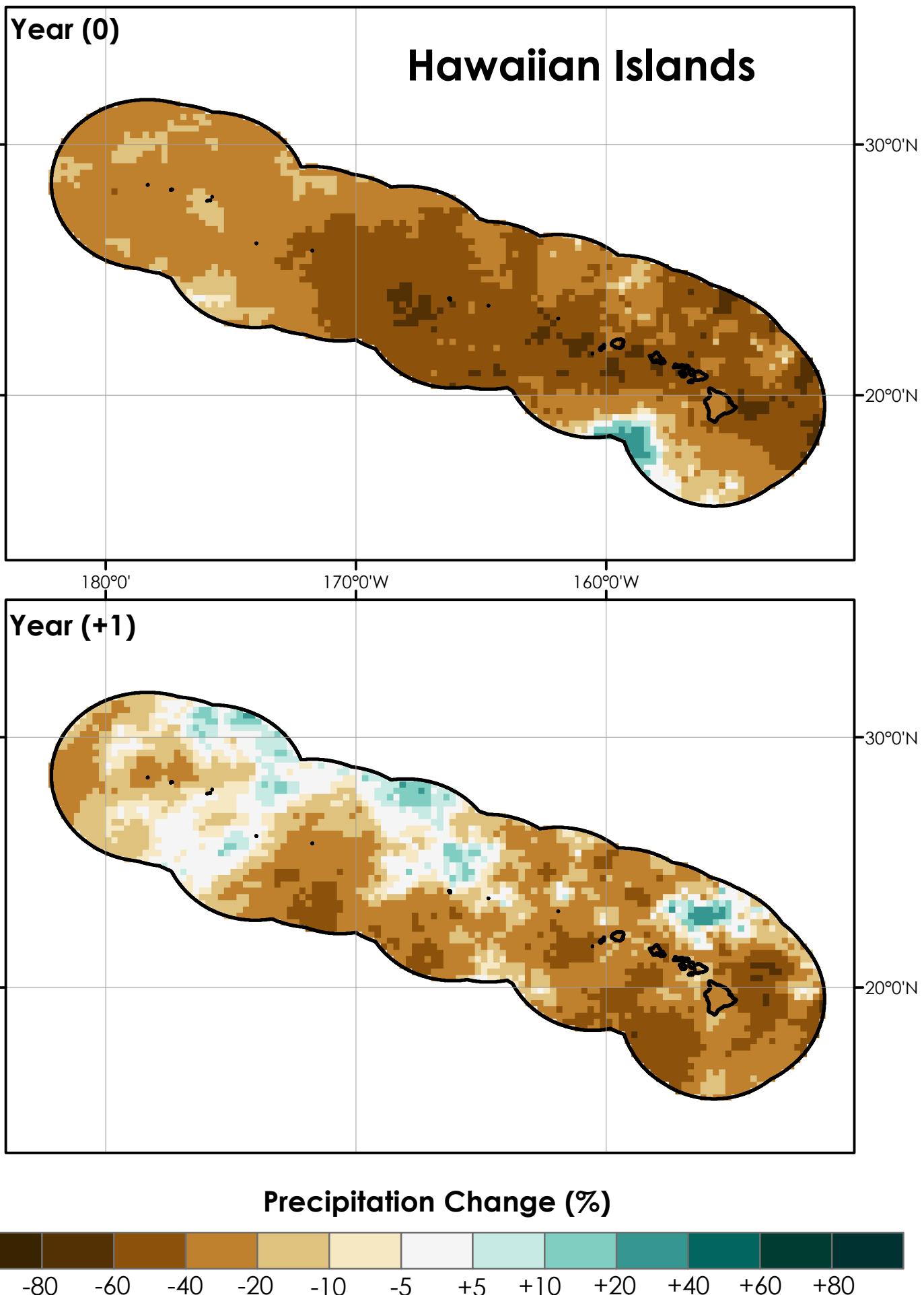


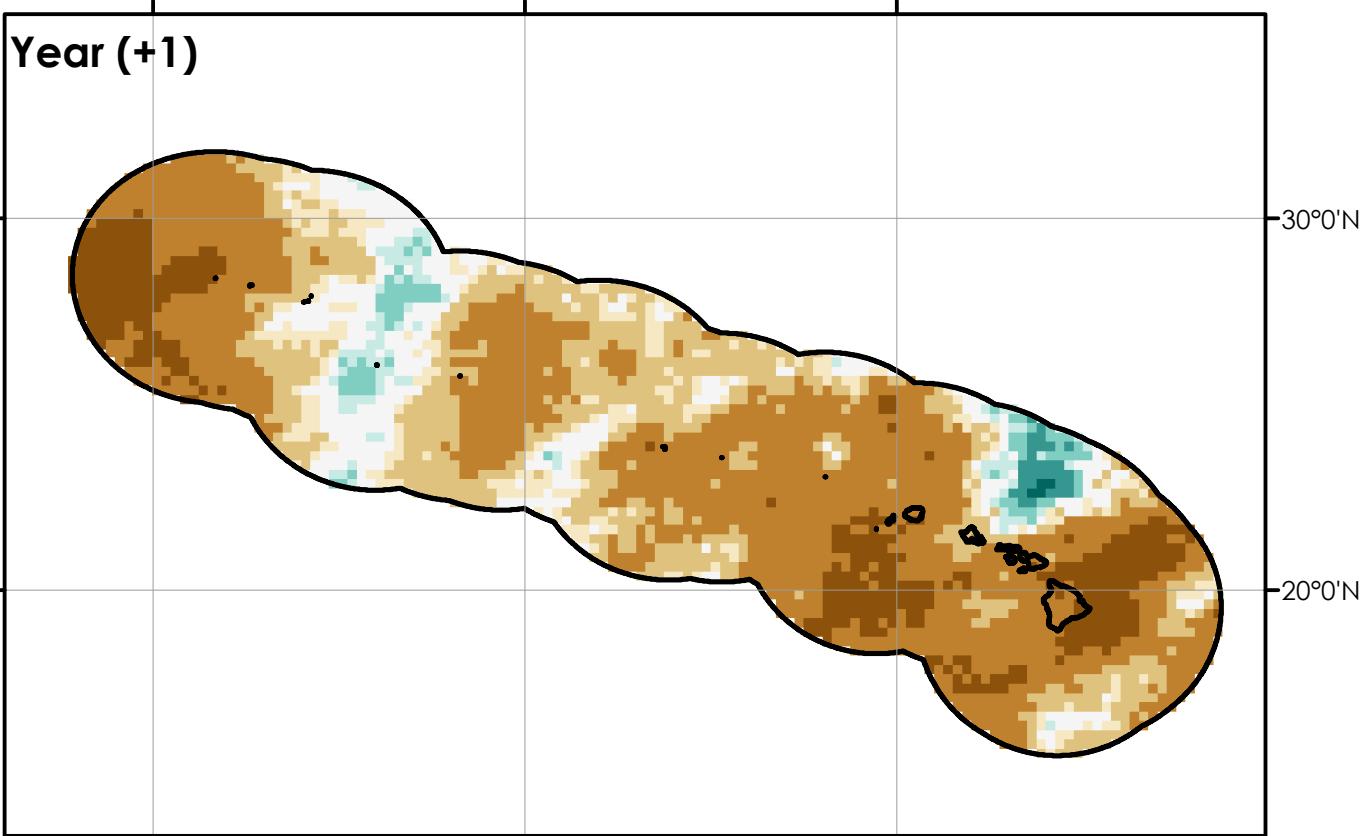
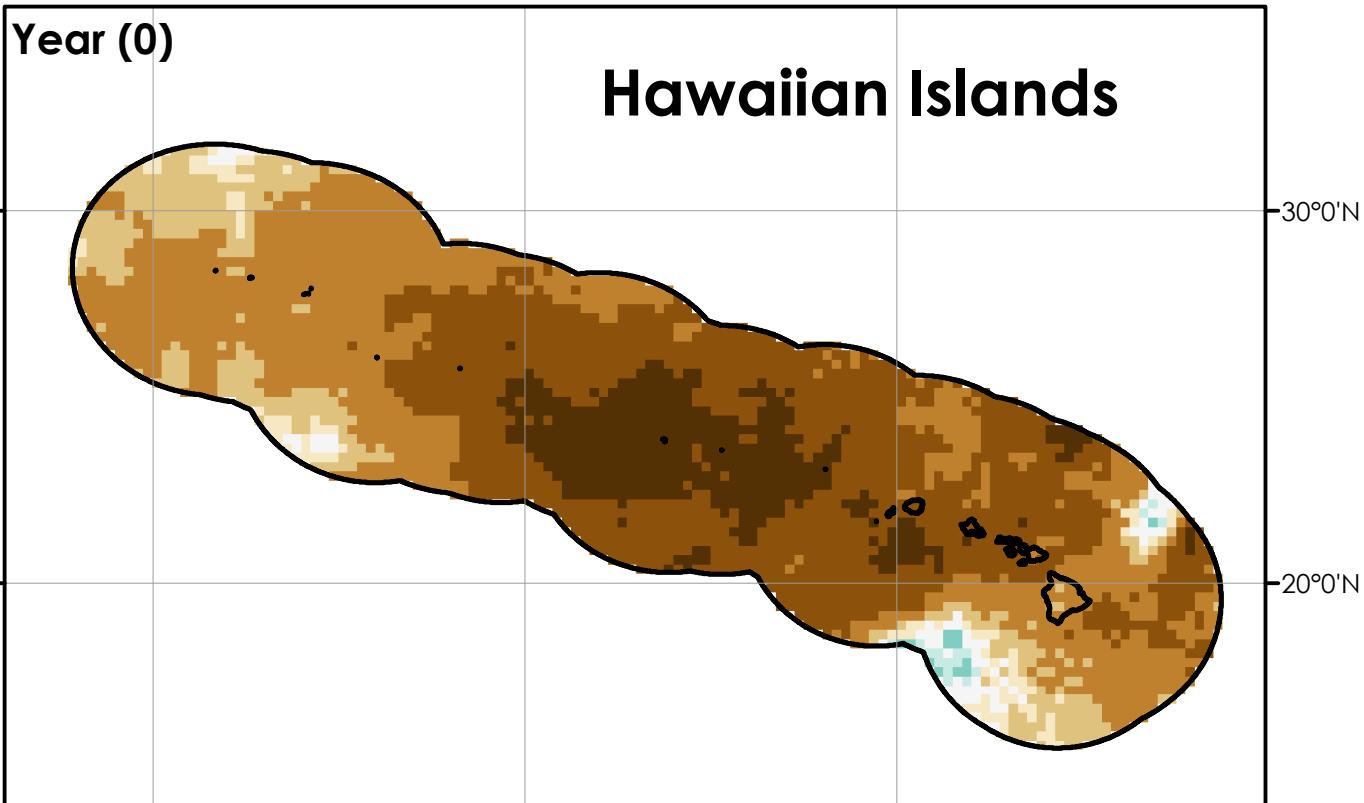




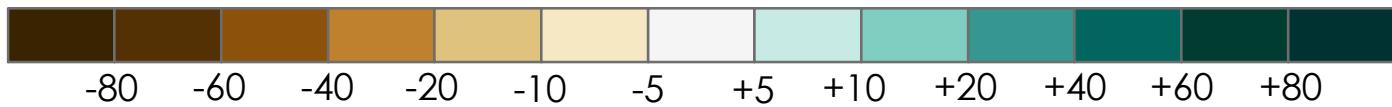
Precipitation Change (%)







Precipitation Change (%)

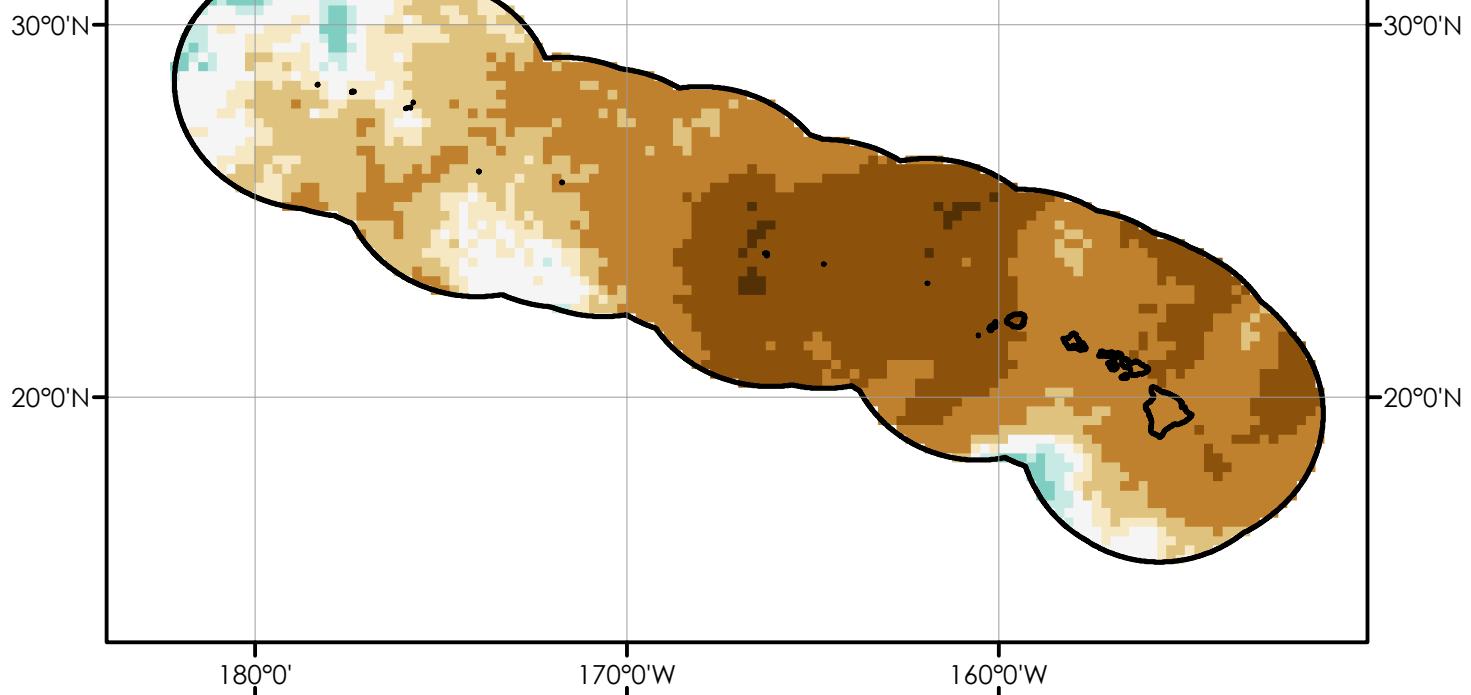


Moderate - Strong La Niña for SON

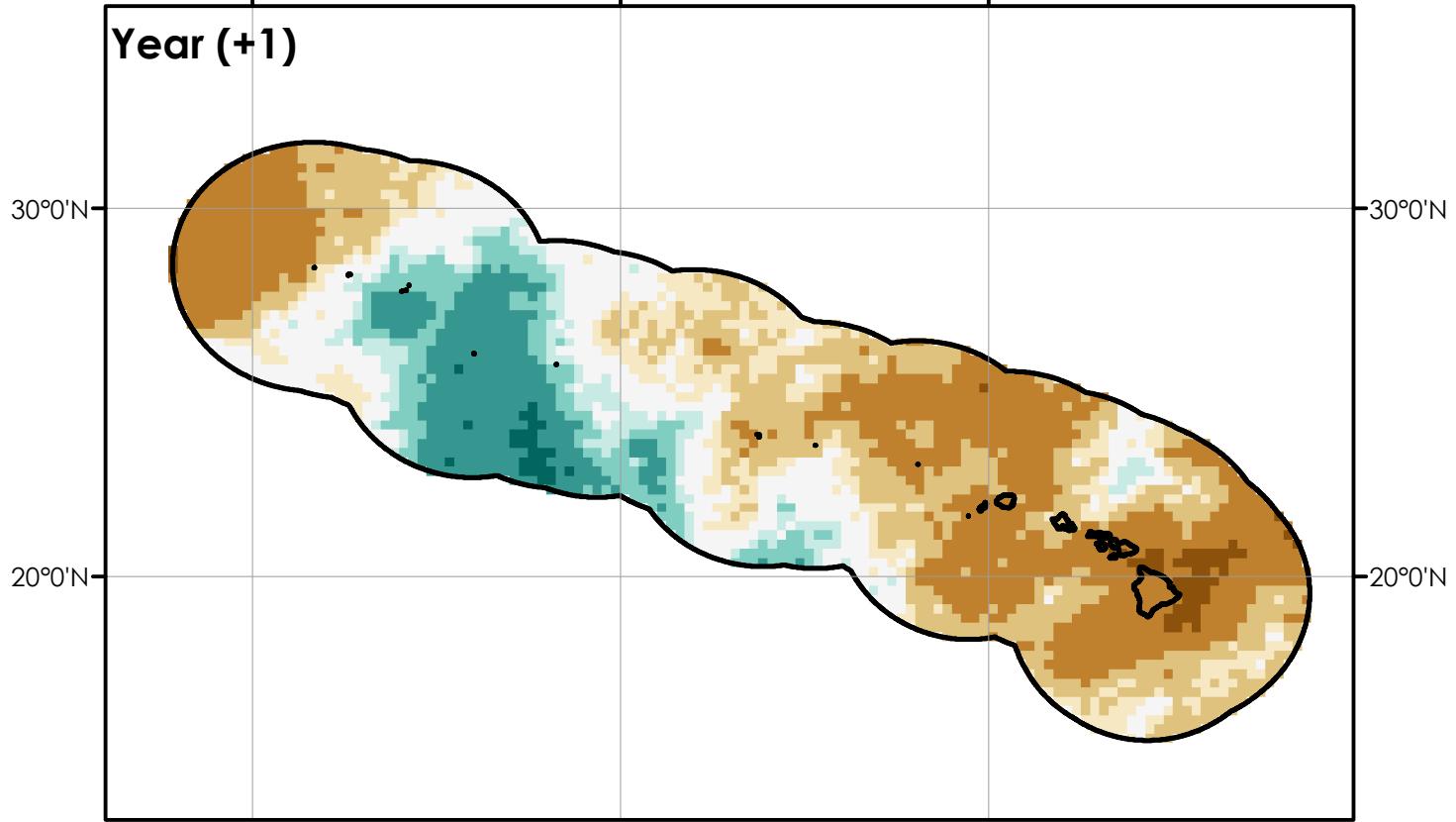
330

Year (0)

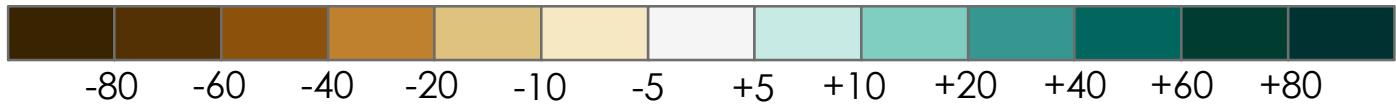
Hawaiian Islands

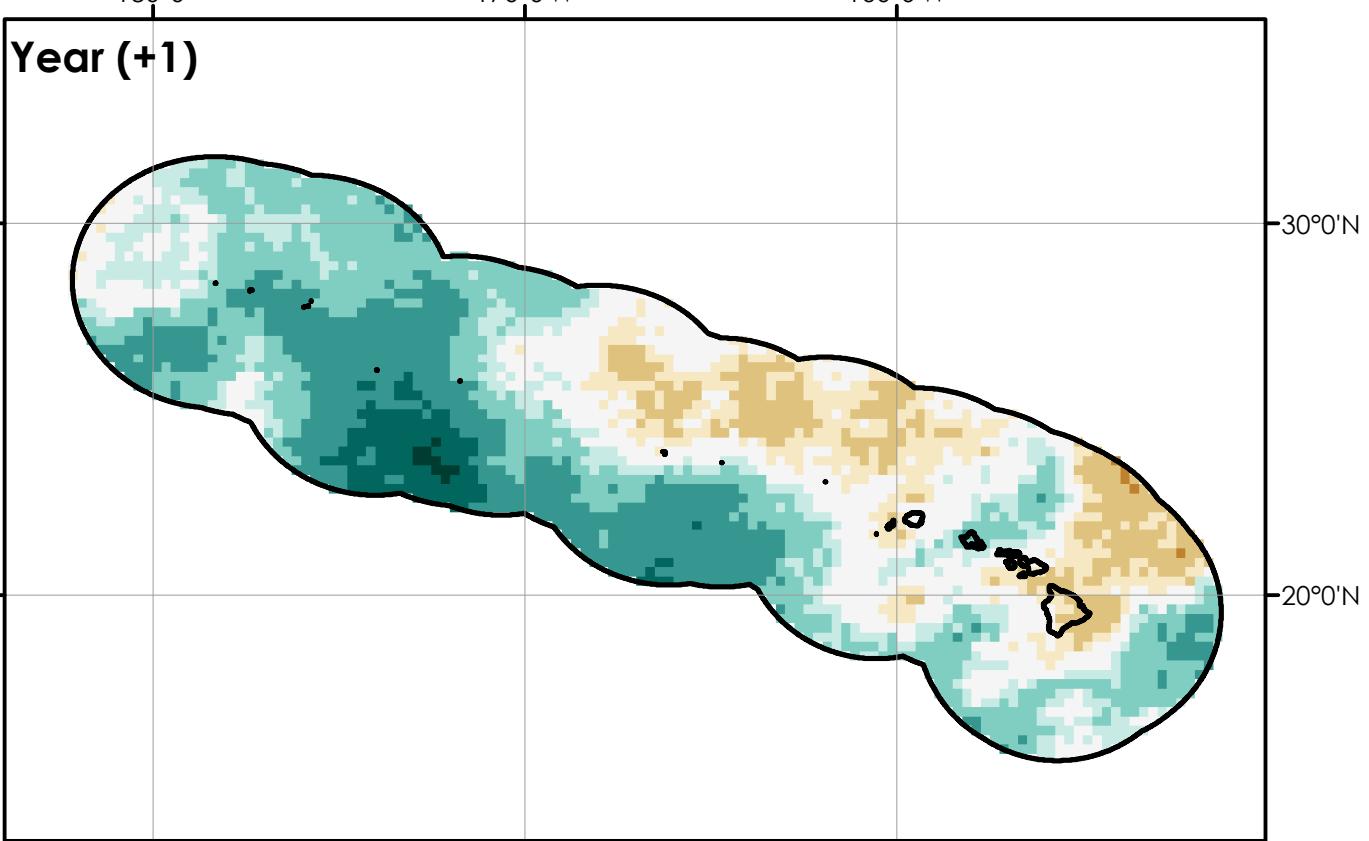
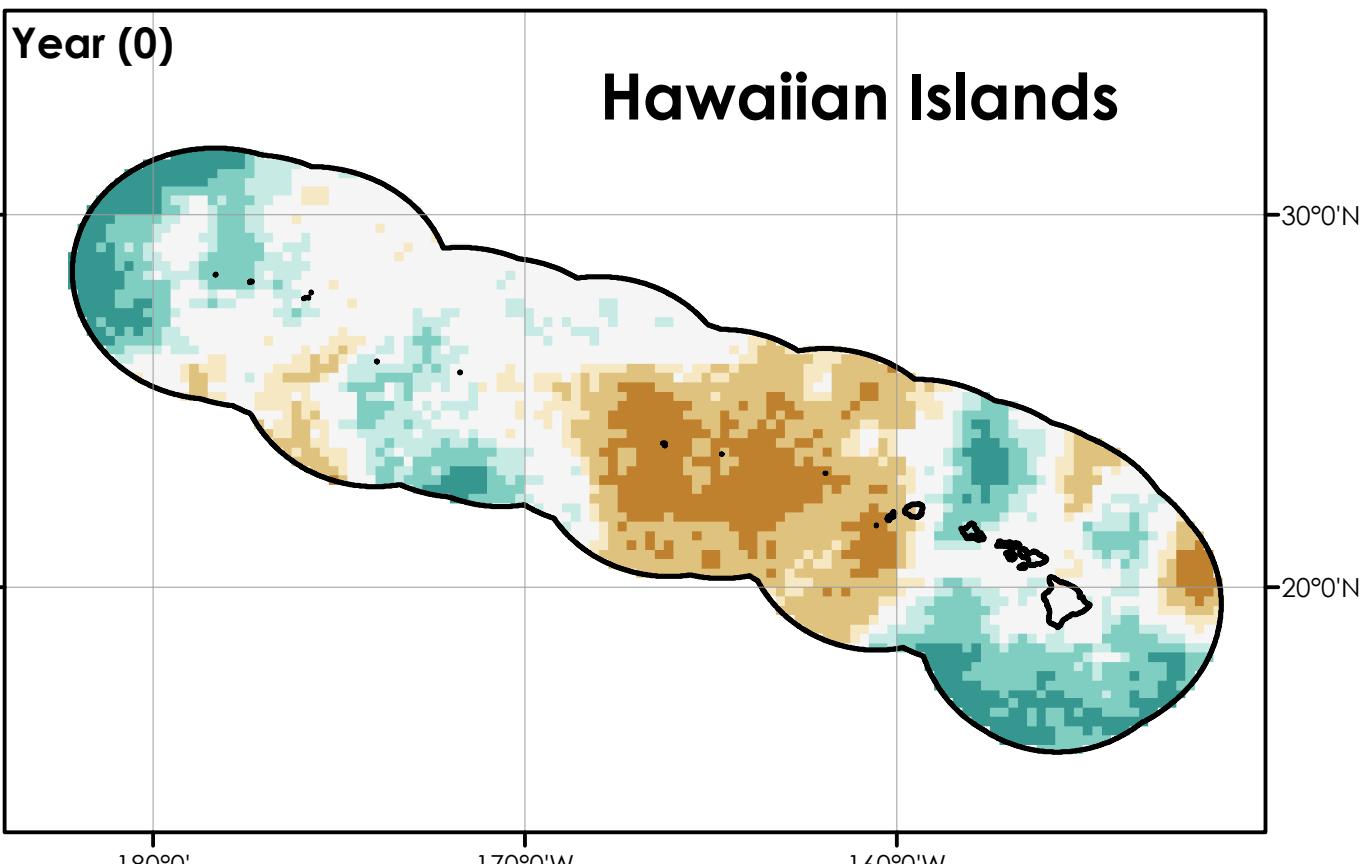


Year (+1)

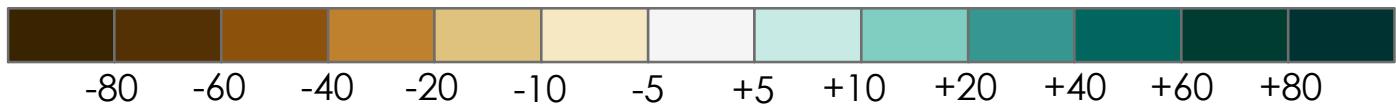


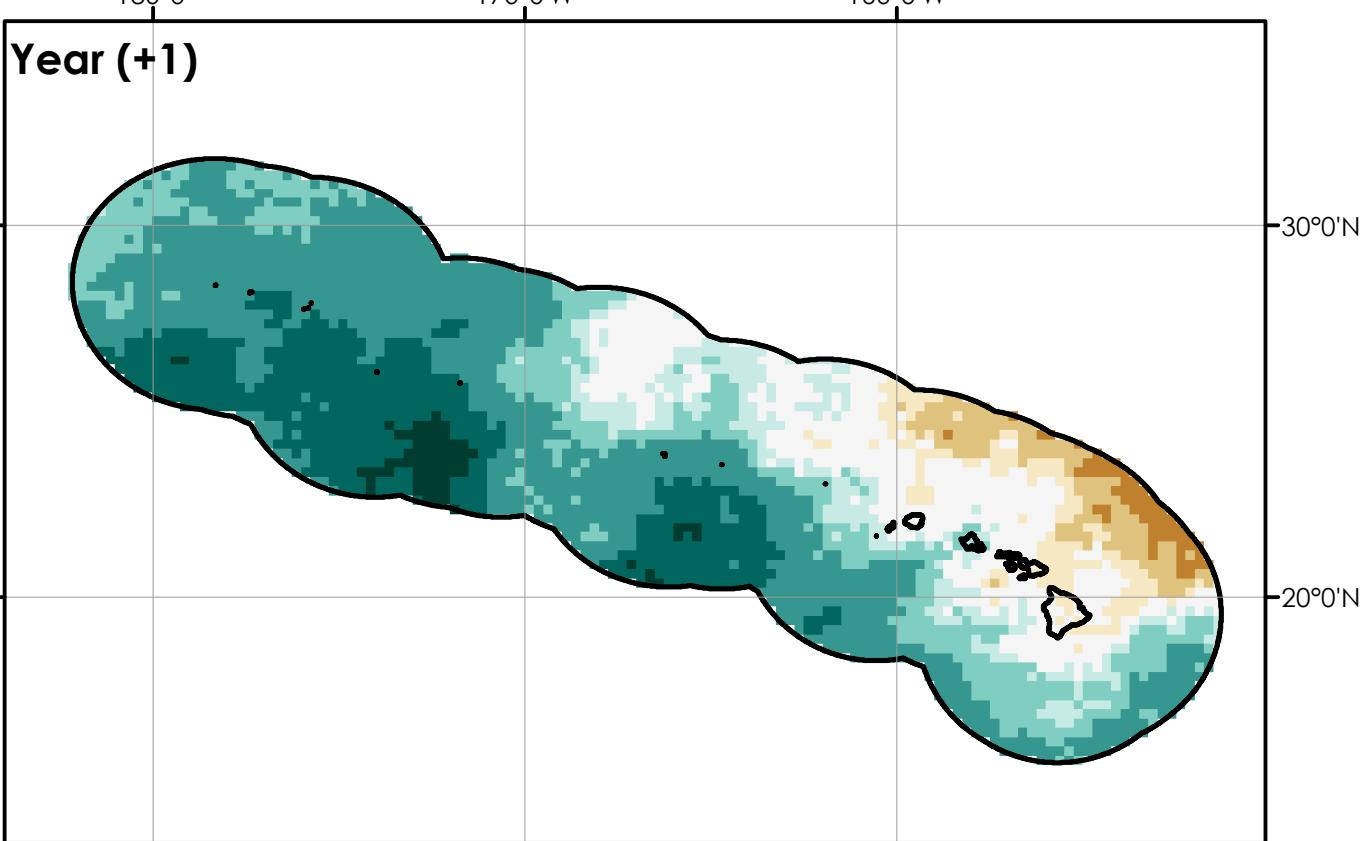
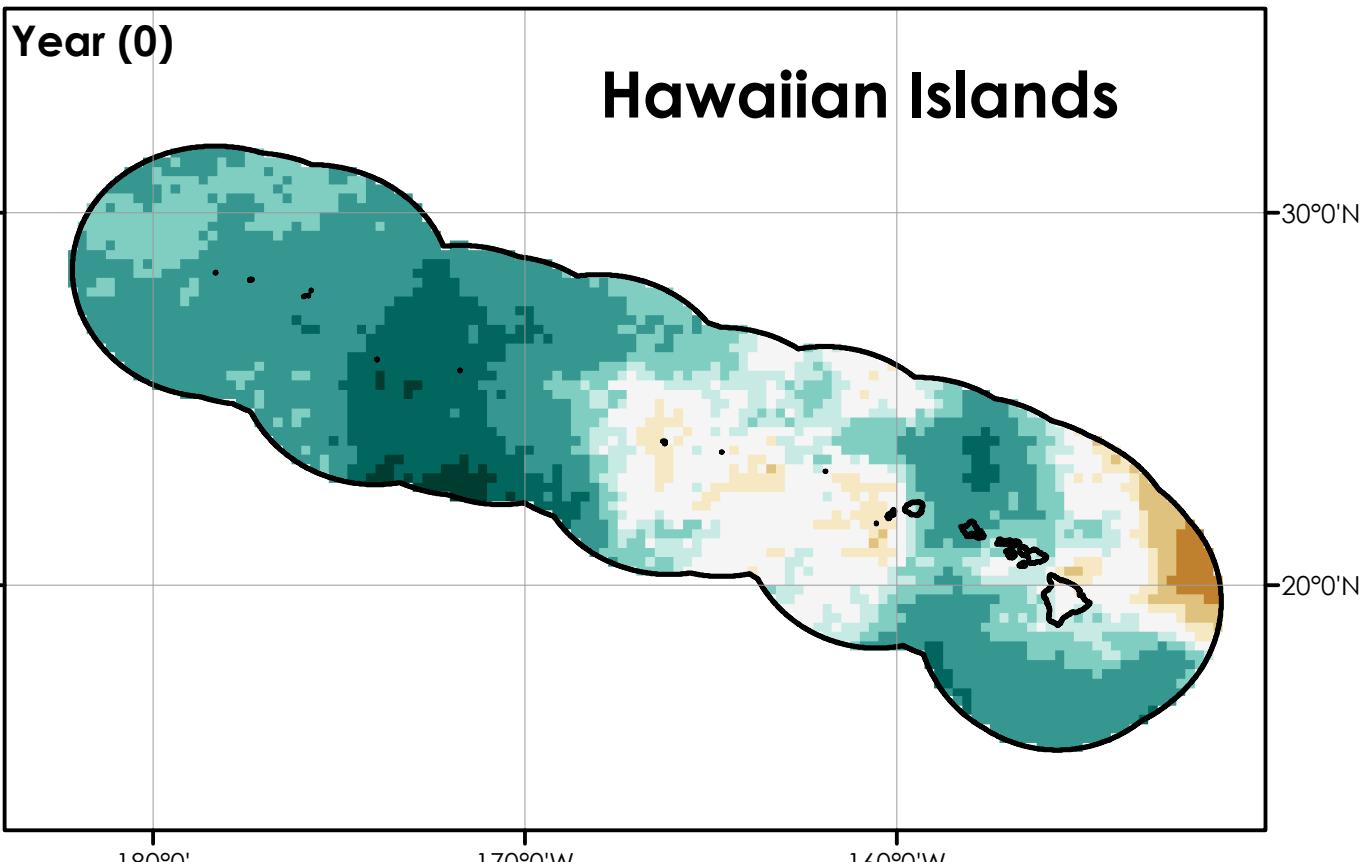
Precipitation Change (%)



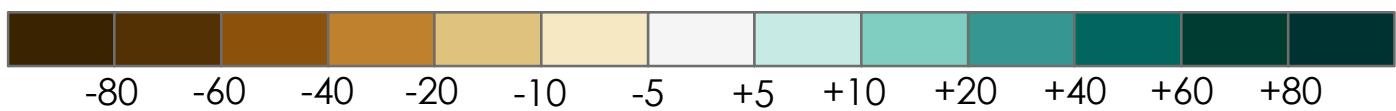


Precipitation Change (%)





Precipitation Change (%)



The following two-panel maps show each three month seasonal average precipitation change for each of the five ENSO phases (moderate-strong La Niña and El Niño, weak La Niña and El Niño, and neutral) for the Republic of the Marshall Islands Exclusive Economic Zone. Within each two-panel map, the top map shows the average precipitation change for the three month season preceding (Year (0)) the onset of the specific ENSO phase, which is listed in the title, and the bottom map shows the average precipitation change following (Year (+1)) the onset of the specific ENSO phase.

These maps show the areas within the EEZ that are abnormally wet (turquoise/green) or dry (tan/brown) for the three month season during a specific ENSO phase. Additionally, these maps show how the precipitation varies from a pre ENSO to a post ENSO phase. This is important when determining how the different ENSO phases influence precipitation patterns.

All of the maps show precipitation at a 0.25° resolution from the NOAA PERSIANN-CDR. The “normal” is the 30-year average precipitation from January 1985 through December 2014.

Moderate - Strong El Niño for DJF

334

Year (0)

Republic of the
Marshall Islands

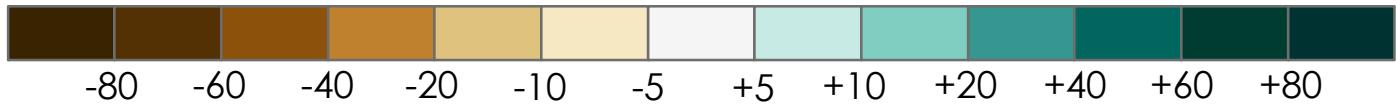
10°0'N 10°0'N

160°0'E 170°0'E 180°0'

Year (+1)

10°0'N 10°0'N

Precipitation Change (%)



Moderate - Strong El Niño for JFM

335

Year (0)

Republic of the
Marshall Islands

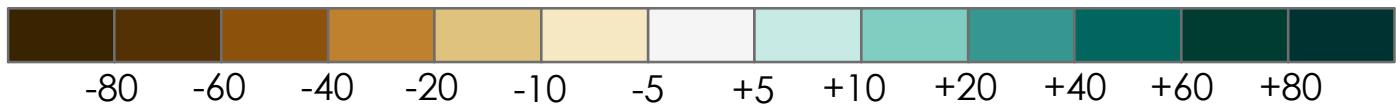
10°0'N 10°0'N

160°0'E 170°0'E 180°0'

Year (+1)

10°0'N 10°0'N

Precipitation Change (%)



Moderate - Strong El Niño for FMA

336

Year (0)

Republic of the
Marshall Islands

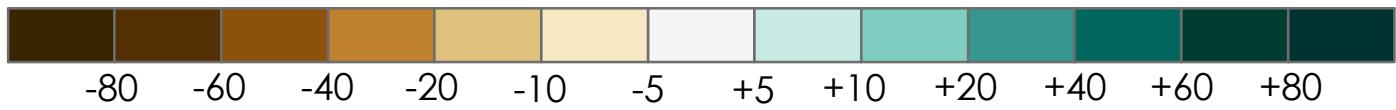
10°0'N 10°0'N

160°0'E 170°0'E 180°0'

Year (+1)

10°0'N 10°0'N

Precipitation Change (%)



Moderate - Strong El Niño for MAM

337

Year (0)

Republic of the
Marshall Islands

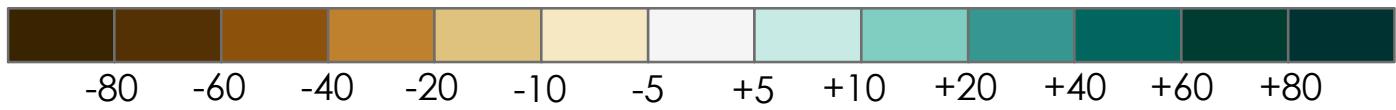
10°0'N 10°0'N

160°0'E 170°0'E 180°0'

Year (+1)

10°0'N 10°0'N

Precipitation Change (%)



Moderate - Strong El Niño for AMJ

338

Year (0)

Republic of the
Marshall Islands

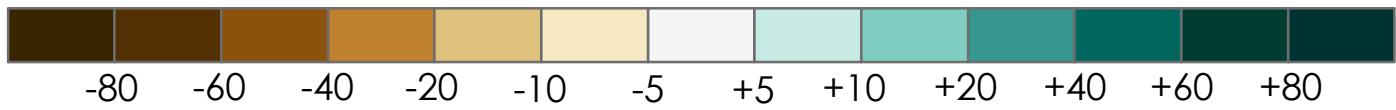
10°0'N 10°0'N

160°0'E 170°0'E 180°0'

Year (+1)

10°0'N 10°0'N

Precipitation Change (%)



Moderate - Strong El Niño for MJJ

339

Year (0)

Republic of the
Marshall Islands

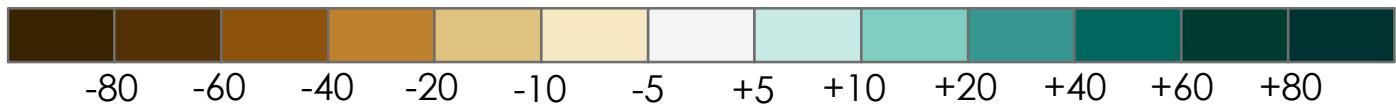
10°0'N 10°0'N

160°0'E 170°0'E 180°0'

Year (+1)

10°0'N 10°0'N

Precipitation Change (%)



Moderate - Strong El Niño for JJA

340

Year (0)

Republic of the
Marshall Islands

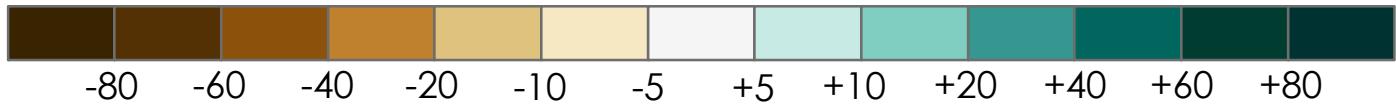
10°0'N 10°0'N

160°0'E 170°0'E 180°0'

Year (+1)

10°0'N 10°0'N

Precipitation Change (%)



Moderate - Strong El Niño for JAS

341

Year (0)

Republic of the
Marshall Islands

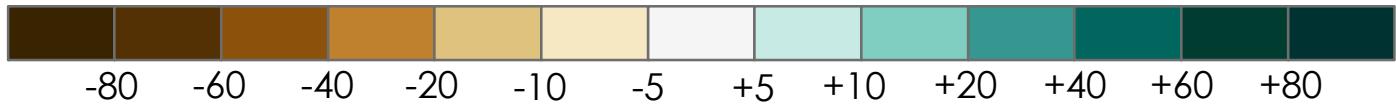
10°0'N 10°0'N

160°0'E 170°0'E 180°0'

Year (+1)

10°0'N 10°0'N

Precipitation Change (%)



Moderate - Strong El Niño for ASO

342

Year (0)

Republic of the
Marshall Islands

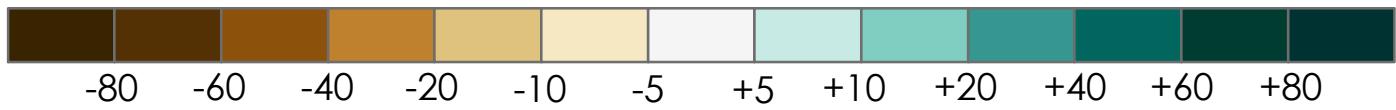
10°0'N 10°0'N

160°0'E 170°0'E 180°0'

Year (+1)

10°0'N 10°0'N

Precipitation Change (%)



Moderate - Strong El Niño for SON

343

Year (0)

Republic of the
Marshall Islands

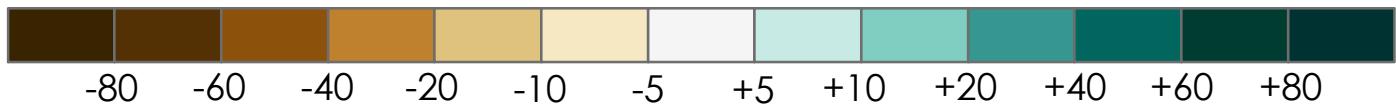
10°0'N 10°0'N

160°0'E 170°0'E 180°0'

Year (+1)

10°0'N 10°0'N

Precipitation Change (%)



Moderate - Strong El Niño for OND

344

Year (0)

Republic of the
Marshall Islands

10°0'N 10°0'N

160°0'E 170°0'E 180°0'

Year (+1)

10°0'N 10°0'N

Precipitation Change (%)



Moderate - Strong El Niño for NDJ

345

Year (0)

Republic of the
Marshall Islands

10°0'N 10°0'N

160°0'E 170°0'E 180°0'

Year (+1)

10°0'N 10°0'N

Precipitation Change (%)



Weak El Niño for DJF

346

Year (0)

Republic of the
Marshall Islands

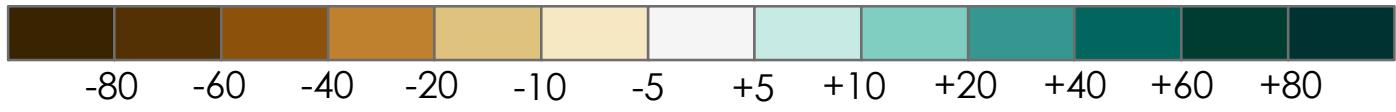
10°0'N 10°0'N

160°0'E 170°0'E 180°0'

Year (+1)

10°0'N 10°0'N

Precipitation Change (%)



Weak El Niño for JFM

347

Year (0)

Republic of the
Marshall Islands

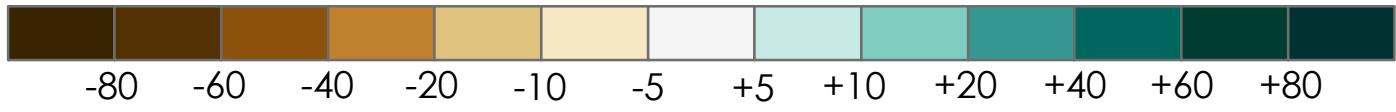
10°0'N 10°0'N

160°0'E 170°0'E 180°0'

Year (+1)

10°0'N 10°0'N

Precipitation Change (%)



Weak El Niño for FMA

348

Year (0)

Republic of the
Marshall Islands

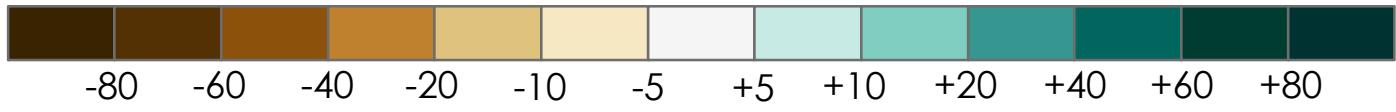
10°0'N 10°0'N

160°0'E 170°0'E 180°0'

Year (+1)

10°0'N 10°0'N

Precipitation Change (%)



Weak El Niño for MAM

349

Year (0)

Republic of the
Marshall Islands

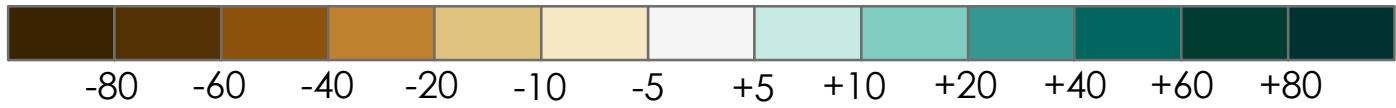
10°0'N 10°0'N

160°0'E 170°0'E 180°0'

Year (+1)

10°0'N 10°0'N

Precipitation Change (%)



Weak El Niño for AMJ

350

Year (0)

Republic of the
Marshall Islands

10°0'N 10°0'N

160°0'E 170°0'E 180°0'

Year (+1)

10°0'N 10°0'N

Precipitation Change (%)



Weak El Niño for MJJ

351

Year (0)

Republic of the
Marshall Islands

10°0'N 10°0'N

160°0'E 170°0'E 180°0'

Year (+1)

10°0'N 10°0'N

Precipitation Change (%)



Weak El Niño for JJA

352

Year (0)

Republic of the
Marshall Islands

10°0'N 10°0'N

160°0'E 170°0'E 180°0'

Year (+1)

10°0'N 10°0'N

Precipitation Change (%)



Weak El Niño for JAS

353

Year (0)

Republic of the
Marshall Islands

10°0'N 10°0'N

160°0'E 170°0'E 180°0'

Year (+1)

10°0'N 10°0'N

Precipitation Change (%)



Weak El Niño for ASO

354

Year (0)

Republic of the
Marshall Islands

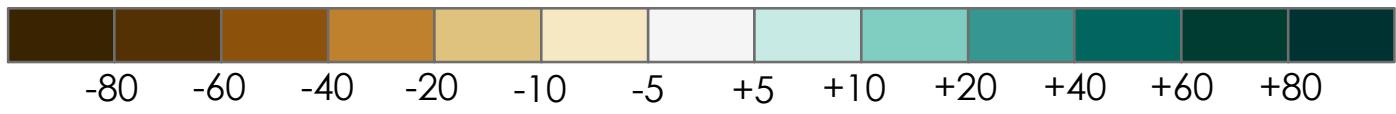
10°0'N 10°0'N

160°0'E 170°0'E 180°0'

Year (+1)

10°0'N 10°0'N

Precipitation Change (%)



Weak El Niño for SON

355

Year (0)

Republic of the
Marshall Islands

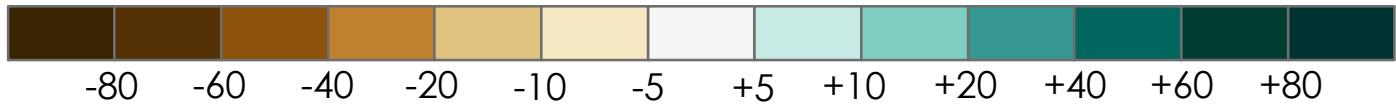
10°0'N 10°0'N

160°0'E 170°0'E 180°0'

Year (+1)

10°0'N 10°0'N

Precipitation Change (%)



Weak El Niño for OND

356

Year (0)

Republic of the
Marshall Islands

10°0'N 10°0'N

160°0'E 170°0'E 180°0'

Year (+1)

10°0'N 10°0'N

Precipitation Change (%)



Year (0)**Republic of the
Marshall Islands**

10°0'N 10°0'N

160°0'E 170°0'E 180°0'

Year (+1)

10°0'N 10°0'N

Precipitation Change (%)

Year (0)

Republic of the
Marshall Islands

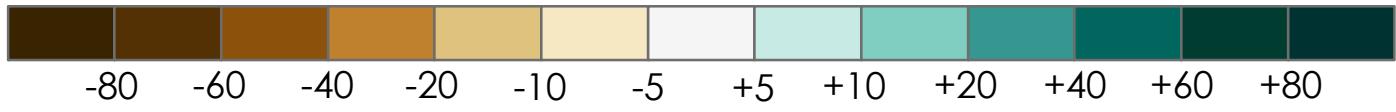
10°0'N 10°0'N

160°0'E 170°0'E 180°0'

Year (+1)

10°0'N 10°0'N

Precipitation Change (%)



Year (0)**Republic of the
Marshall Islands**

10°0'N 10°0'N

160°0'E 170°0'E 180°0'

Year (+1)

10°0'N 10°0'N

Precipitation Change (%)

Year (0)

Republic of the
Marshall Islands

10°0'N 10°0'N

160°0'E 170°0'E 180°0'

Year (+1)

10°0'N 10°0'N

Precipitation Change (%)



Year (0)

Republic of the
Marshall Islands

10°0'N 10°0'N

160°0'E 170°0'E 180°0'

Year (+1)

10°0'N 10°0'N

Precipitation Change (%)



Year (0)**Republic of the
Marshall Islands**

10°0'N 10°0'N

160°0'E 170°0'E 180°0'

Year (+1)

10°0'N 10°0'N

Precipitation Change (%)

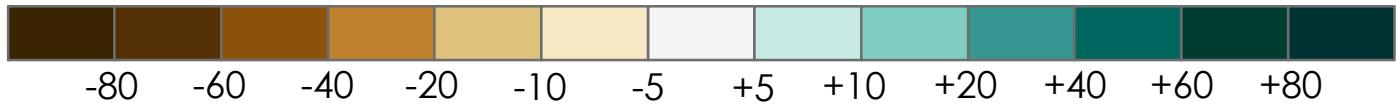
Year (0)**Republic of the
Marshall Islands**

10°0'N 10°0'N

160°0'E 170°0'E 180°0'

Year (+1)

10°0'N 10°0'N

Precipitation Change (%)

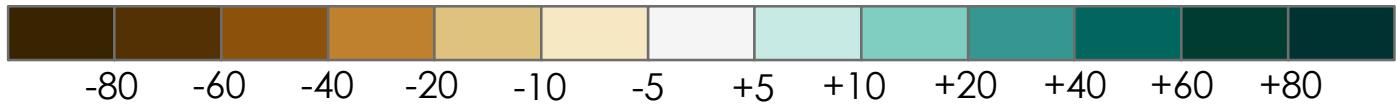
Year (0)**Republic of the
Marshall Islands**

10°0'N 10°0'N

160°0'E 170°0'E 180°0'

Year (+1)

10°0'N 10°0'N

Precipitation Change (%)

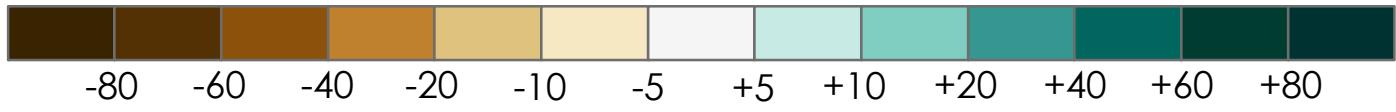
Year (0)**Republic of the
Marshall Islands**

10°0'N 10°0'N

160°0'E 170°0'E 180°0'

Year (+1)

10°0'N 10°0'N

Precipitation Change (%)

Year (0)

Republic of the
Marshall Islands

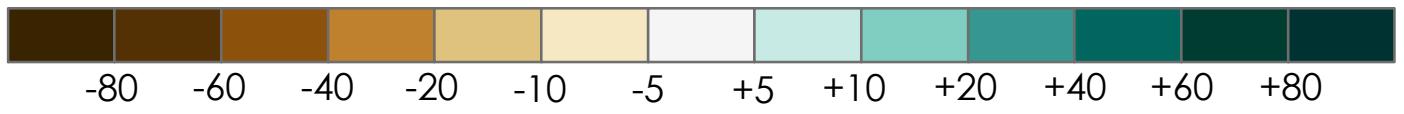
10°0'N 10°0'N

160°0'E 170°0'E 180°0'

Year (+1)

10°0'N 10°0'N

Precipitation Change (%)



Year (0)

Republic of the
Marshall Islands

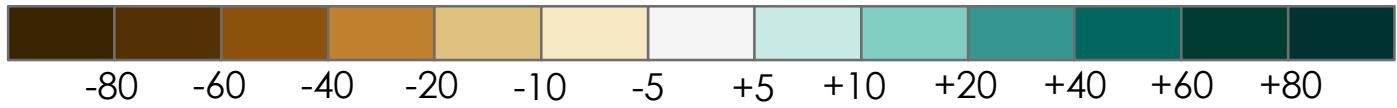
10°0'N 10°0'N

160°0'E 170°0'E 180°0'

Year (+1)

10°0'N 10°0'N

Precipitation Change (%)



Year (0)**Republic of the
Marshall Islands**

10°0'N 10°0'N

160°0'E 170°0'E 180°0'

Year (+1)

10°0'N 10°0'N

Precipitation Change (%)

Year (0)**Republic of the
Marshall Islands**

10°0'N 10°0'N

160°0'E 170°0'E 180°0'

Year (+1)

10°0'N 10°0'N

Precipitation Change (%)

Weak La Niña for DJF

370

Year (0)

Republic of the
Marshall Islands

10°0'N 10°0'N

160°0'E 170°0'E 180°0'

Year (+1)

10°0'N 10°0'N

Precipitation Change (%)



Weak La Niña for JFM

371

Year (0)

Republic of the
Marshall Islands

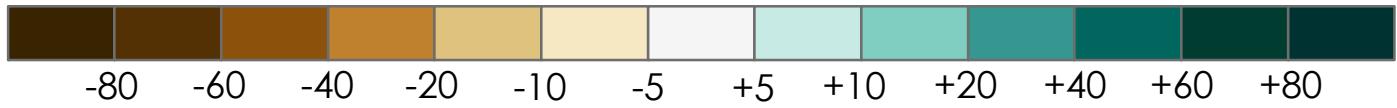
10°0'N 10°0'N

160°0'E 170°0'E 180°0'

Year (+1)

10°0'N 10°0'N

Precipitation Change (%)



Weak La Niña for FMA

372

Year (0)

Republic of the
Marshall Islands

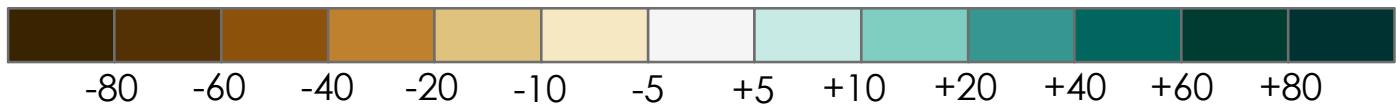
10°0'N 10°0'N

160°0'E 170°0'E 180°0'

Year (+1)

10°0'N 10°0'N

Precipitation Change (%)



Weak La Niña for MAM

373

Year (0)

Republic of the
Marshall Islands

10°0'N 10°0'N

160°0'E 170°0'E 180°0'

Year (+1)

10°0'N 10°0'N

Precipitation Change (%)



Weak La Niña for AMJ

374

Year (0)

Republic of the
Marshall Islands

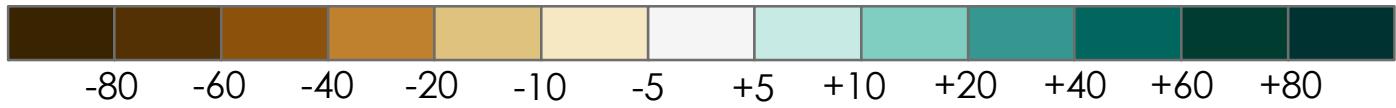
10°0'N 10°0'N

160°0'E 170°0'E 180°0'

Year (+1)

10°0'N 10°0'N

Precipitation Change (%)



Weak La Niña for MJJ

375

Year (0)

Republic of the
Marshall Islands

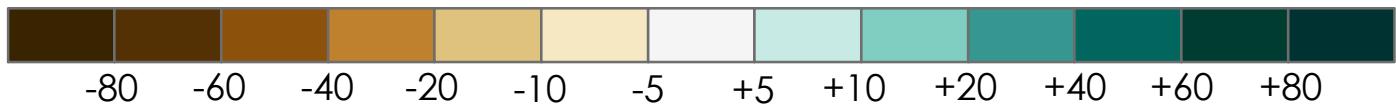
10°0'N 10°0'N

160°0'E 170°0'E 180°0'

Year (+1)

10°0'N 10°0'N

Precipitation Change (%)



Weak La Niña for JJA

376

Year (0)

Republic of the
Marshall Islands

10°0'N 10°0'N

160°0'E 170°0'E 180°0'

Year (+1)

10°0'N 10°0'N

Precipitation Change (%)



Weak La Niña for JAS

377

Year (0)

Republic of the
Marshall Islands

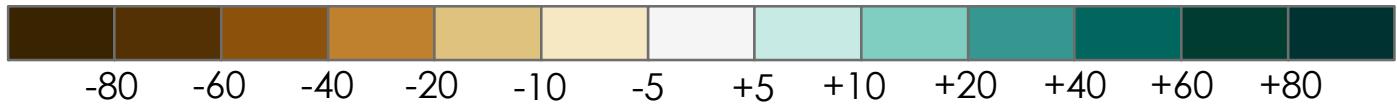
10°0'N 10°0'N

160°0'E 170°0'E 180°0'

Year (+1)

10°0'N 10°0'N

Precipitation Change (%)



Weak La Niña for ASO

378

Year (0)

Republic of the
Marshall Islands

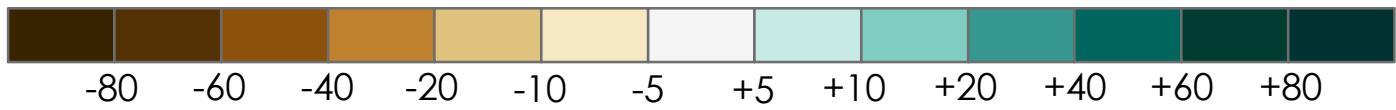
10°0'N 10°0'N

160°0'E 170°0'E 180°0'

Year (+1)

10°0'N 10°0'N

Precipitation Change (%)



Weak La Niña for SON

379

Year (0)

Republic of the
Marshall Islands

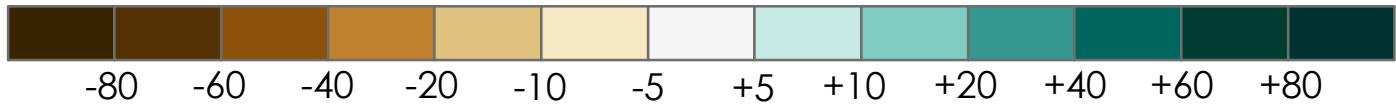
10°0'N 10°0'N

160°0'E 170°0'E 180°0'

Year (+1)

10°0'N 10°0'N

Precipitation Change (%)



Weak La Niña for OND

380

Year (0)

Republic of the
Marshall Islands

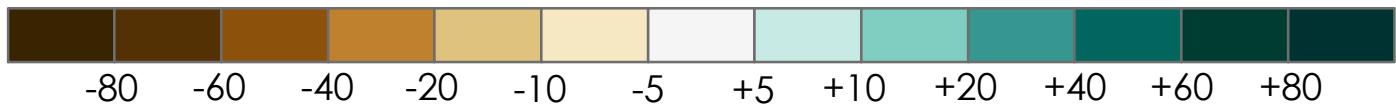
10°0'N 10°0'N

160°0'E 170°0'E 180°0'

Year (+1)

10°0'N 10°0'N

Precipitation Change (%)



Weak La Niña for NDJ

381

Year (0)

Republic of the
Marshall Islands

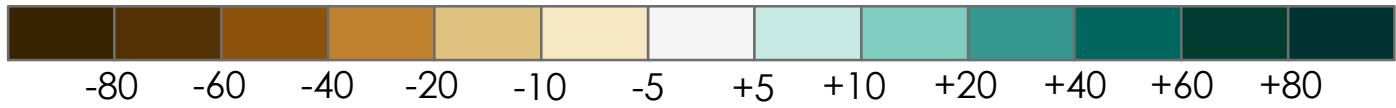
10°0'N 10°0'N

160°0'E 170°0'E 180°0'

Year (+1)

10°0'N 10°0'N

Precipitation Change (%)



Moderate - Strong La Niña for DJF

382

Year (0)

Republic of the
Marshall Islands

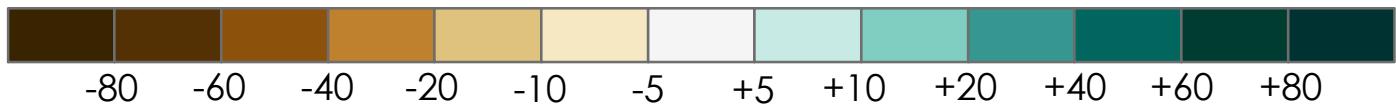
10°0'N 10°0'N

160°0'E 170°0'E 180°0'

Year (+1)

10°0'N 10°0'N

Precipitation Change (%)



Moderate - Strong La Niña for JFM

383

Year (0)

Republic of the
Marshall Islands

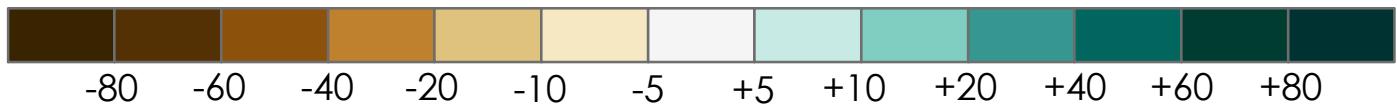
10°0'N 10°0'N

160°0'E 170°0'E 180°0'

Year (+1)

10°0'N 10°0'N

Precipitation Change (%)



Moderate - Strong La Niña for FMA

384

Year (0)

Republic of the
Marshall Islands

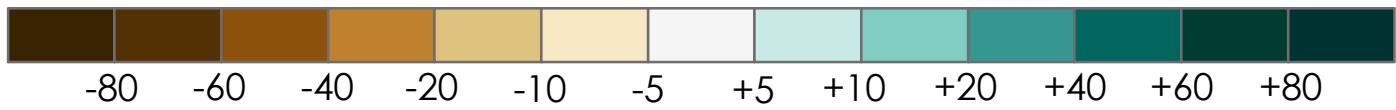
10°0'N 10°0'N

160°0'E 170°0'E 180°0'

Year (+1)

10°0'N 10°0'N

Precipitation Change (%)



Moderate - Strong La Niña for MAM

385

Year (0)

Republic of the
Marshall Islands

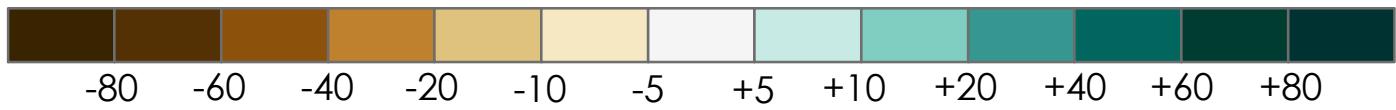
10°0'N 10°0'N

160°0'E 170°0'E 180°0'

Year (+1)

10°0'N 10°0'N

Precipitation Change (%)



Moderate - Strong La Niña for AMJ

386

Year (0)

Republic of the
Marshall Islands

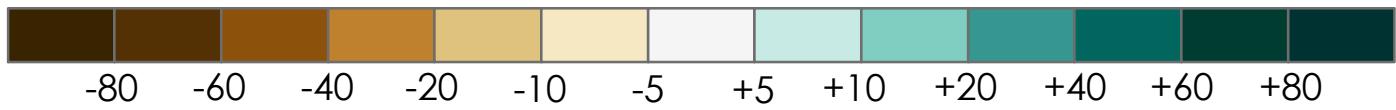
10°0'N 10°0'N

160°0'E 170°0'E 180°0'

Year (+1)

10°0'N 10°0'N

Precipitation Change (%)



Moderate - Strong La Niña for MJJ

387

Year (0)

Republic of the
Marshall Islands

10°0'N 10°0'N

160°0'E 170°0'E 180°0'

Year (+1)

10°0'N 10°0'N

Precipitation Change (%)



Moderate - Strong La Niña for JJA

388

Year (0)

Republic of the
Marshall Islands

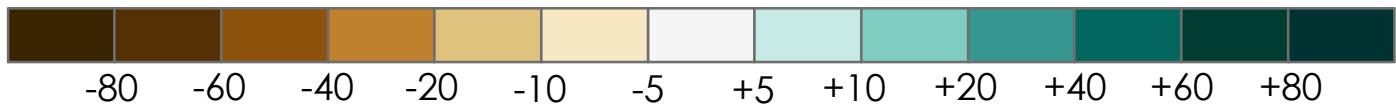
10°0'N 10°0'N

160°0'E 170°0'E 180°0'

Year (+1)

10°0'N 10°0'N

Precipitation Change (%)



Moderate - Strong La Niña for JAS

389

Year (0)

Republic of the
Marshall Islands

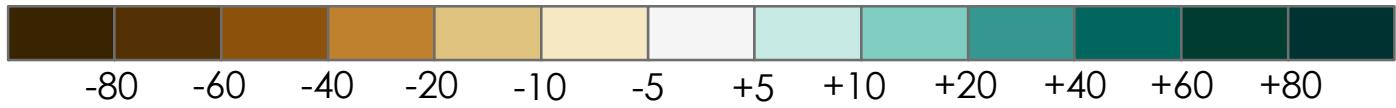
10°0'N 10°0'N

160°0'E 170°0'E 180°0'

Year (+1)

10°0'N 10°0'N

Precipitation Change (%)



Moderate - Strong La Niña for ASO

390

Year (0)

Republic of the
Marshall Islands

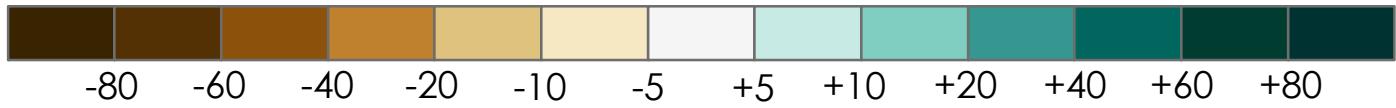
10°0'N 10°0'N

160°0'E 170°0'E 180°0'

Year (+1)

10°0'N 10°0'N

Precipitation Change (%)



Moderate - Strong La Niña for SON

391

Year (0)

Republic of the
Marshall Islands

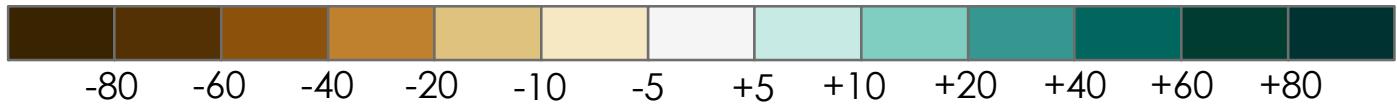
10°0'N 10°0'N

160°0'E 170°0'E 180°0'

Year (+1)

10°0'N 10°0'N

Precipitation Change (%)



Moderate - Strong La Niña for OND

392

Year (0)

Republic of the
Marshall Islands

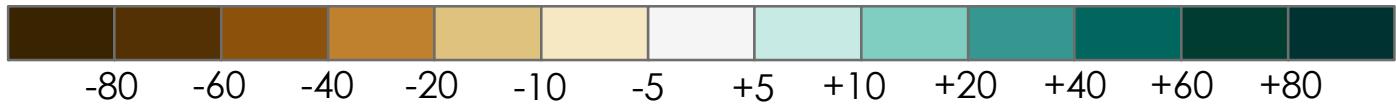
10°0'N 10°0'N

160°0'E 170°0'E 180°0'

Year (+1)

10°0'N 10°0'N

Precipitation Change (%)



Year (0)

Republic of the
Marshall Islands

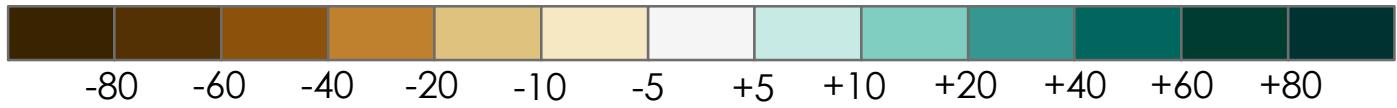
10°0'N 10°0'N

160°0'E 170°0'E 180°0'

Year (+1)

10°0'N 10°0'N

Precipitation Change (%)



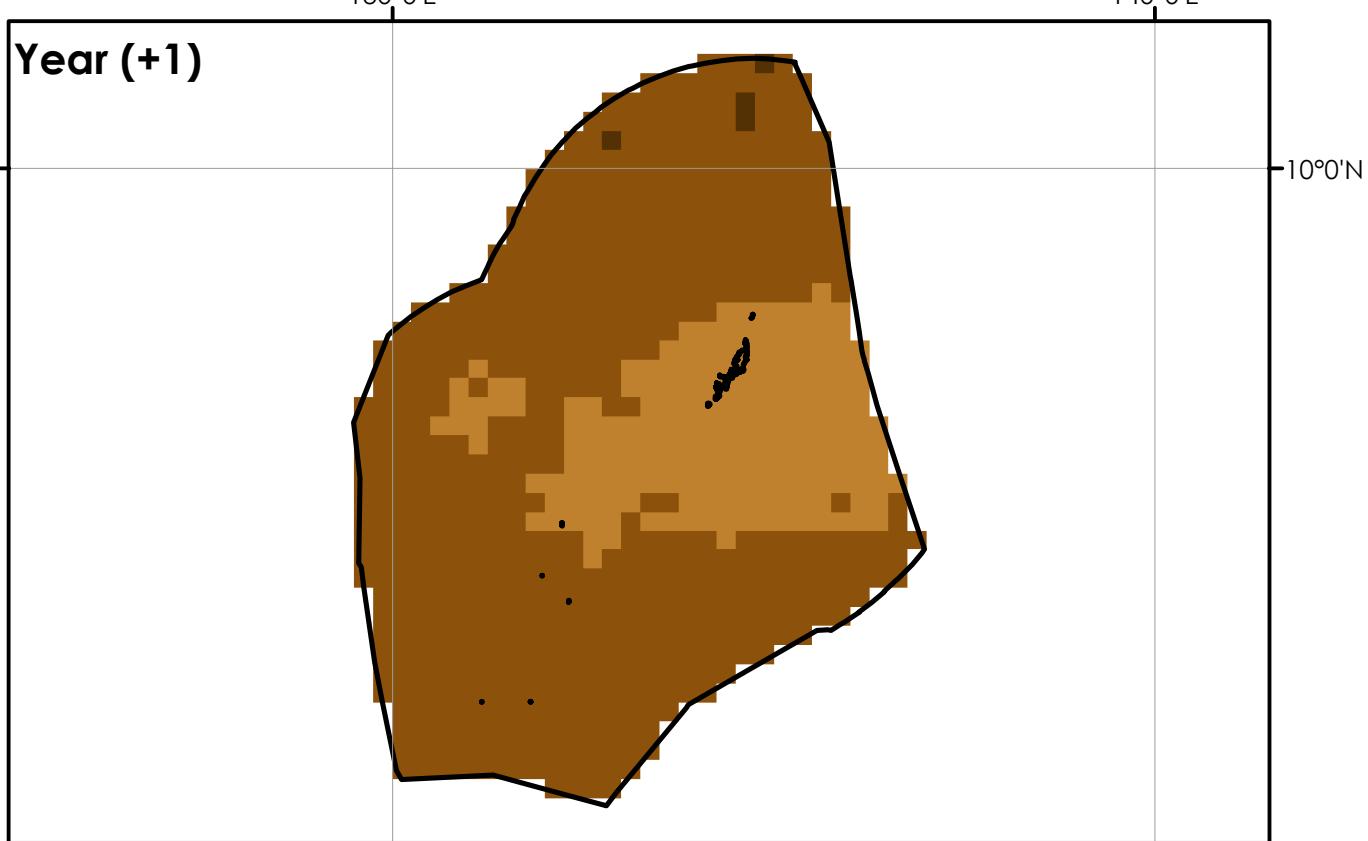
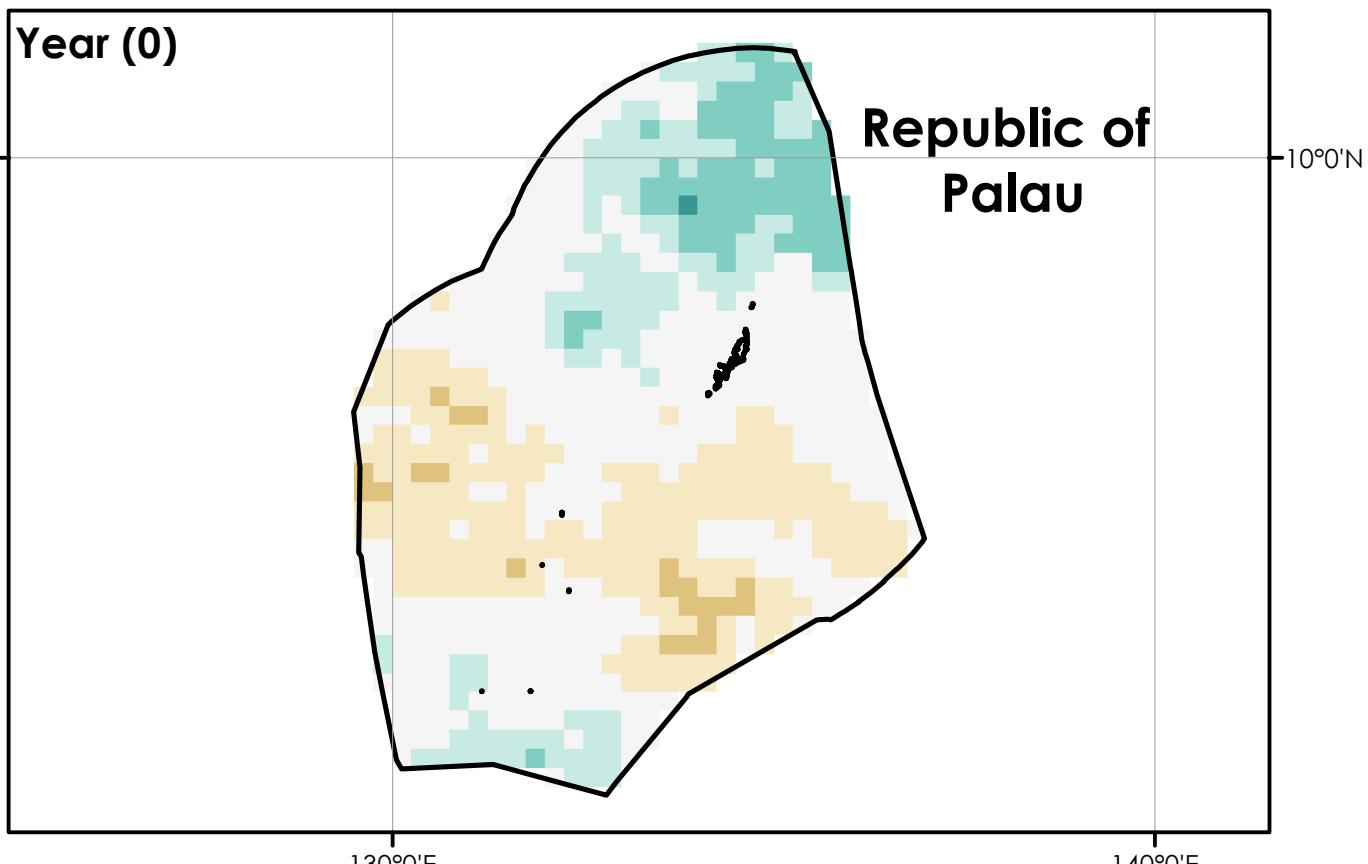
The following two-panel maps show each three month seasonal average precipitation change for each of the five ENSO phases (moderate-strong La Niña and El Niño, weak La Niña and El Niño, and neutral) for the Republic of Palau Exclusive Economic Zone. Within each two-panel map, the top map shows the average precipitation change for the three month season preceding (Year (0)) the onset of the specific ENSO phase, which is listed in the title, and the bottom map shows the average precipitation change following (Year (+1)) the onset of the specific ENSO phase.

These maps show the areas within the EEZ that are abnormally wet (turquoise/green) or dry (tan/brown) for the three month season during a specific ENSO phase. Additionally, these maps show how the precipitation varies from a pre ENSO to a post ENSO phase. This is important when determining how the different ENSO phases influence precipitation patterns.

All of the maps show precipitation at a 0.25° resolution from the NOAA PERSIANN-CDR. The “normal” is the 30-year average precipitation from January 1985 through December 2014.

Moderate - Strong El Niño for DJF

395

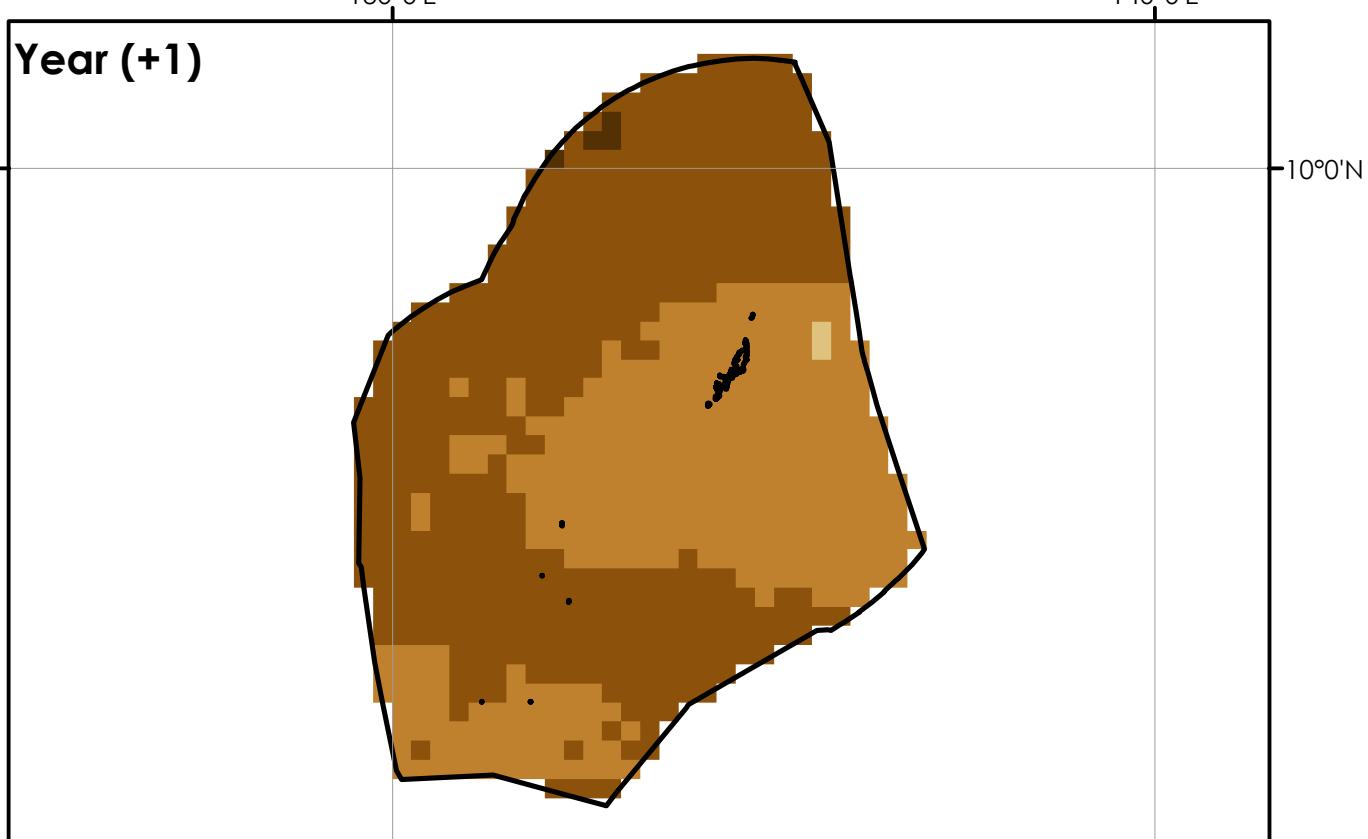
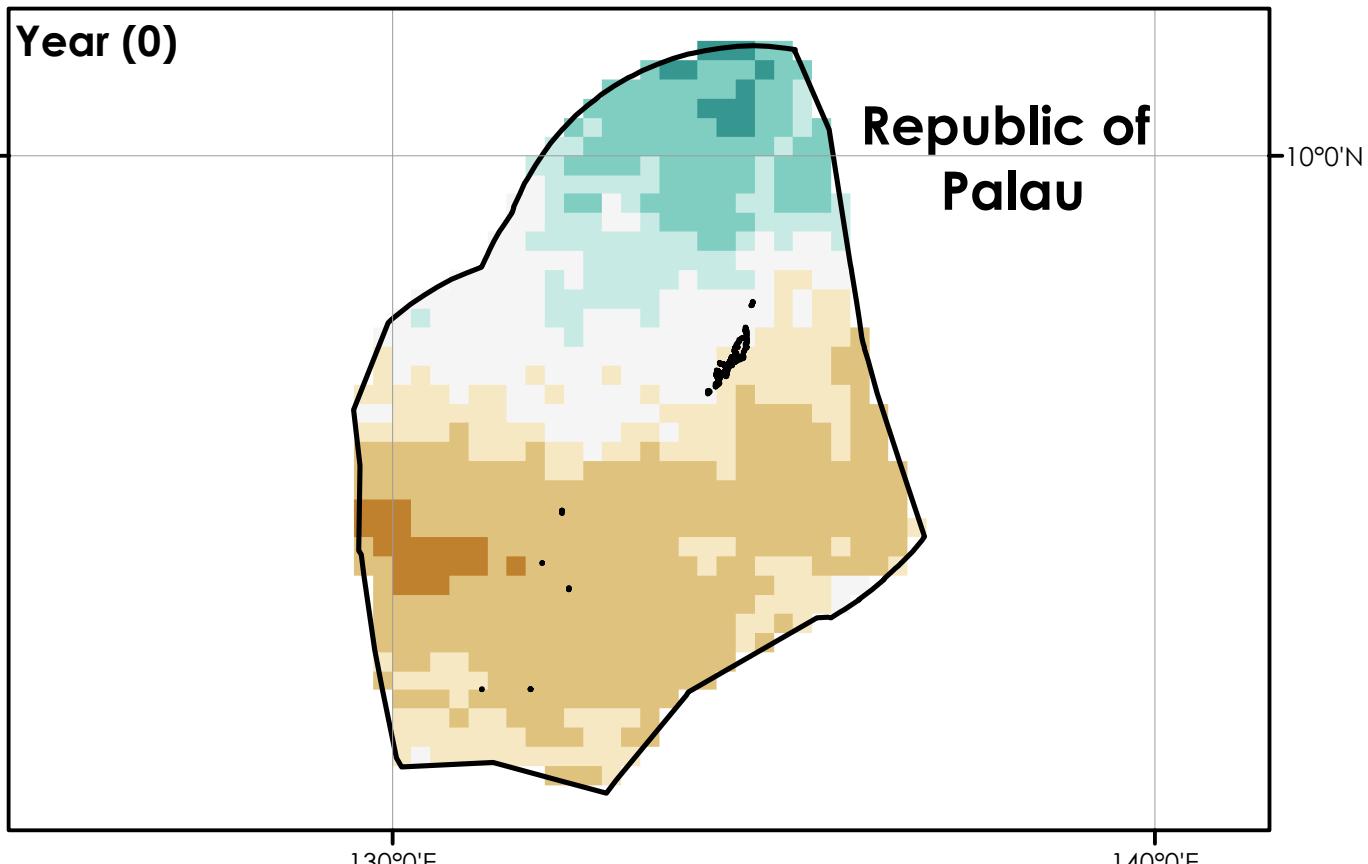


Precipitation Change (%)



Moderate - Strong El Niño for JFM

396

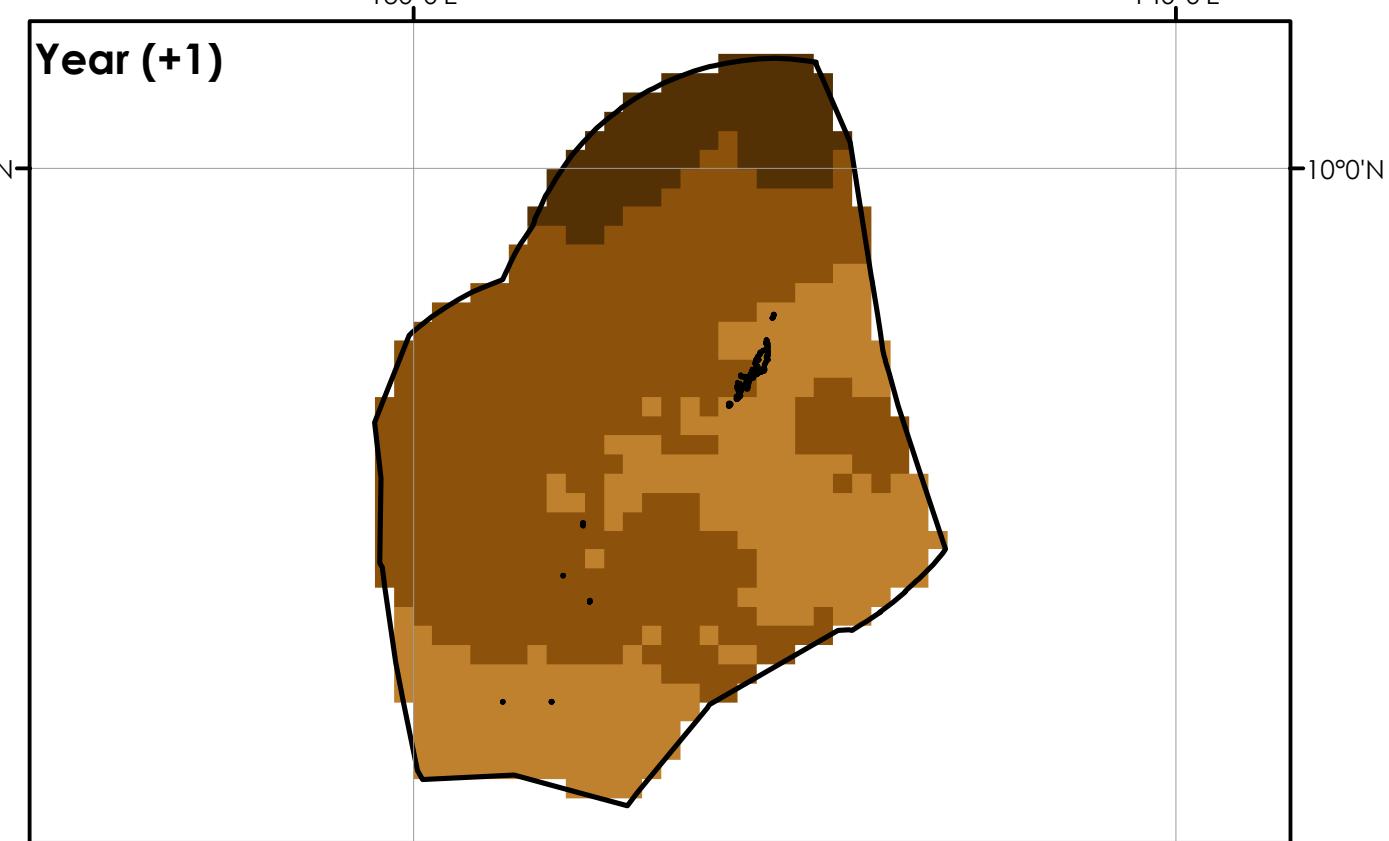
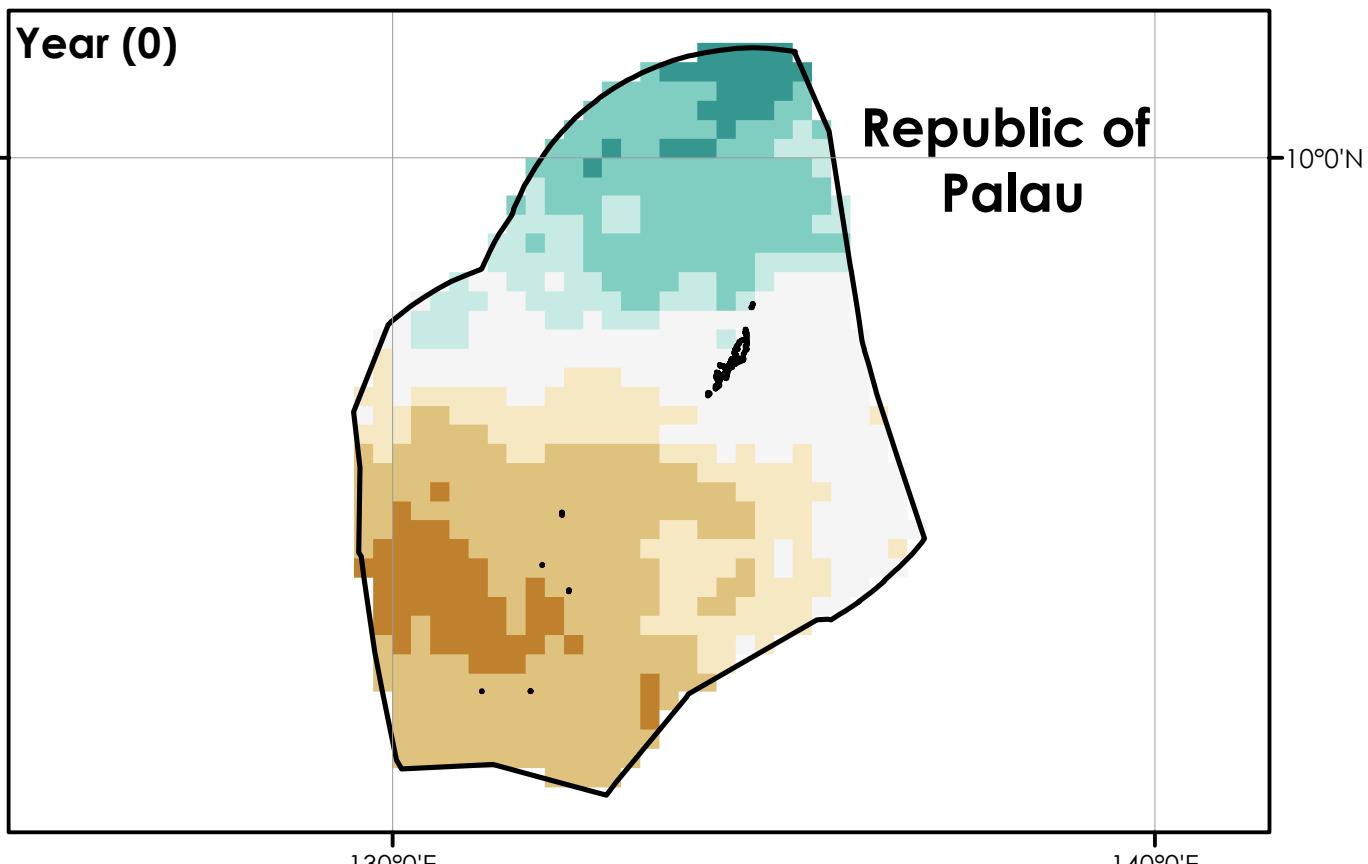


Precipitation Change (%)

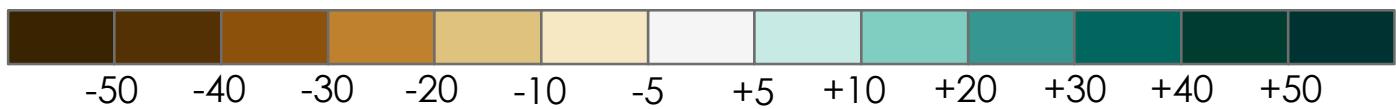


Moderate - Strong El Niño for FMA

397

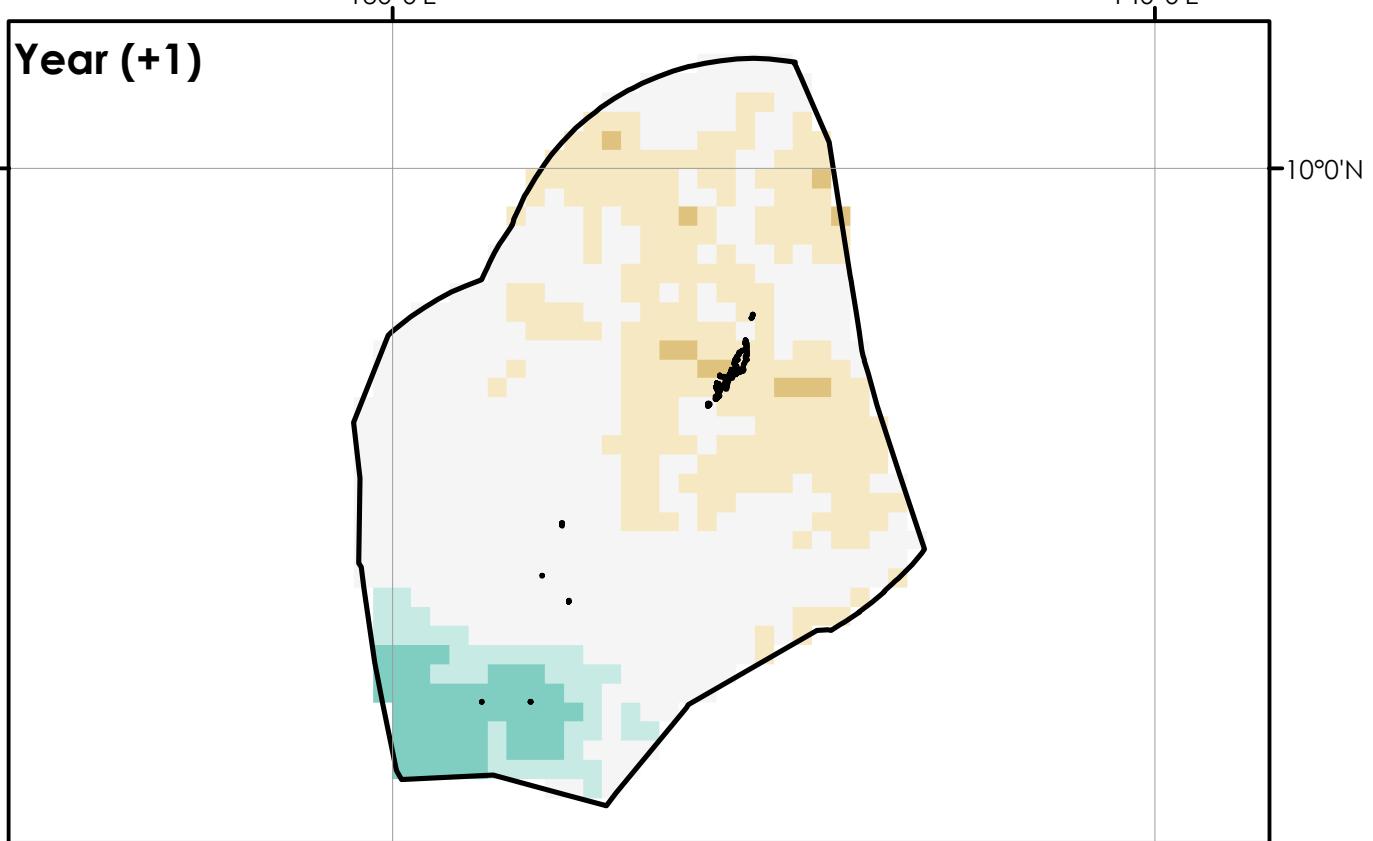
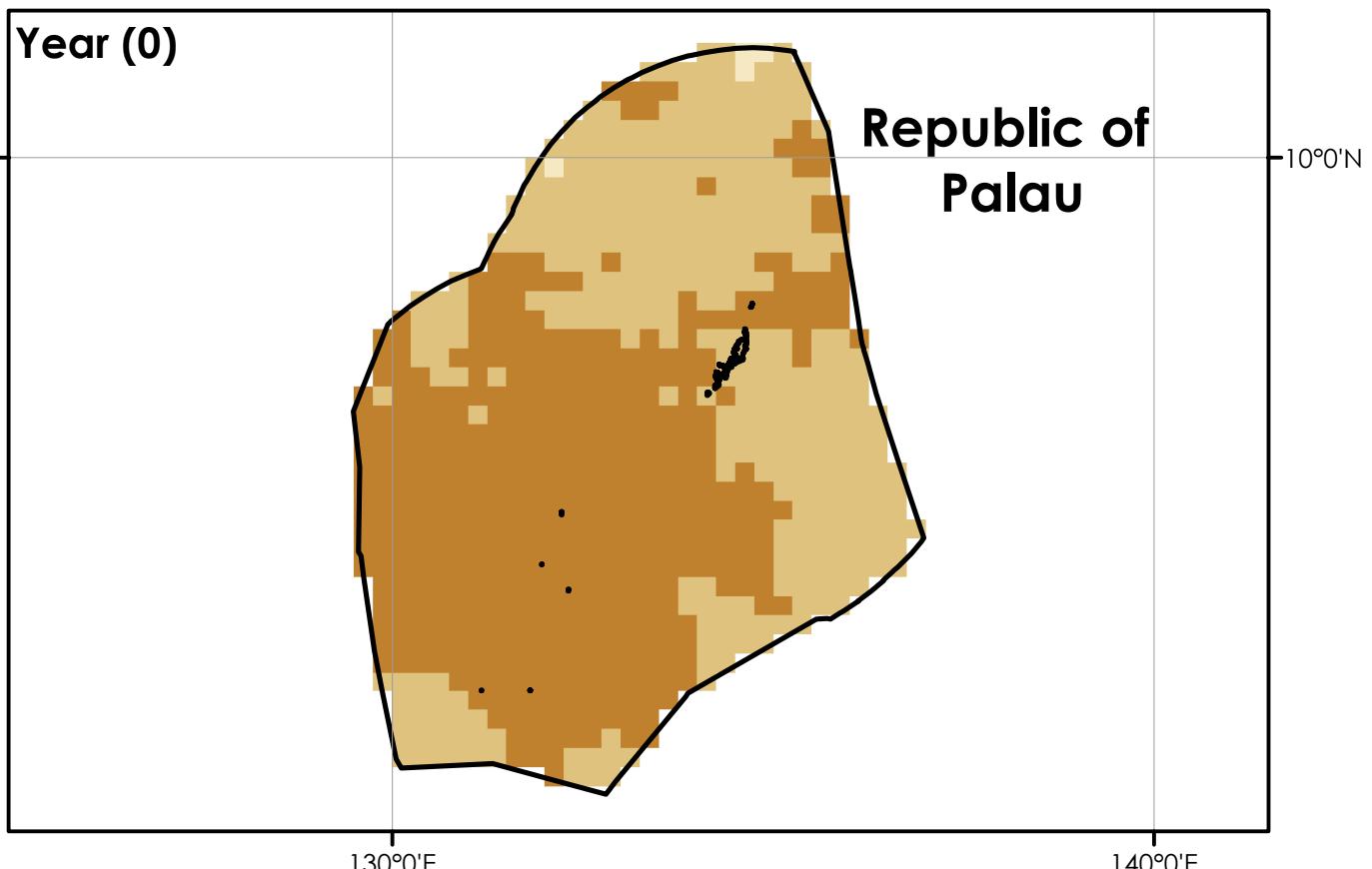


Precipitation Change (%)

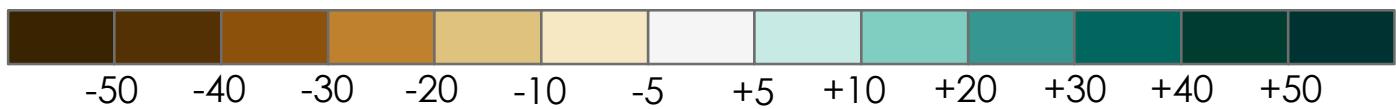


Moderate - Strong El Niño for MAM

398

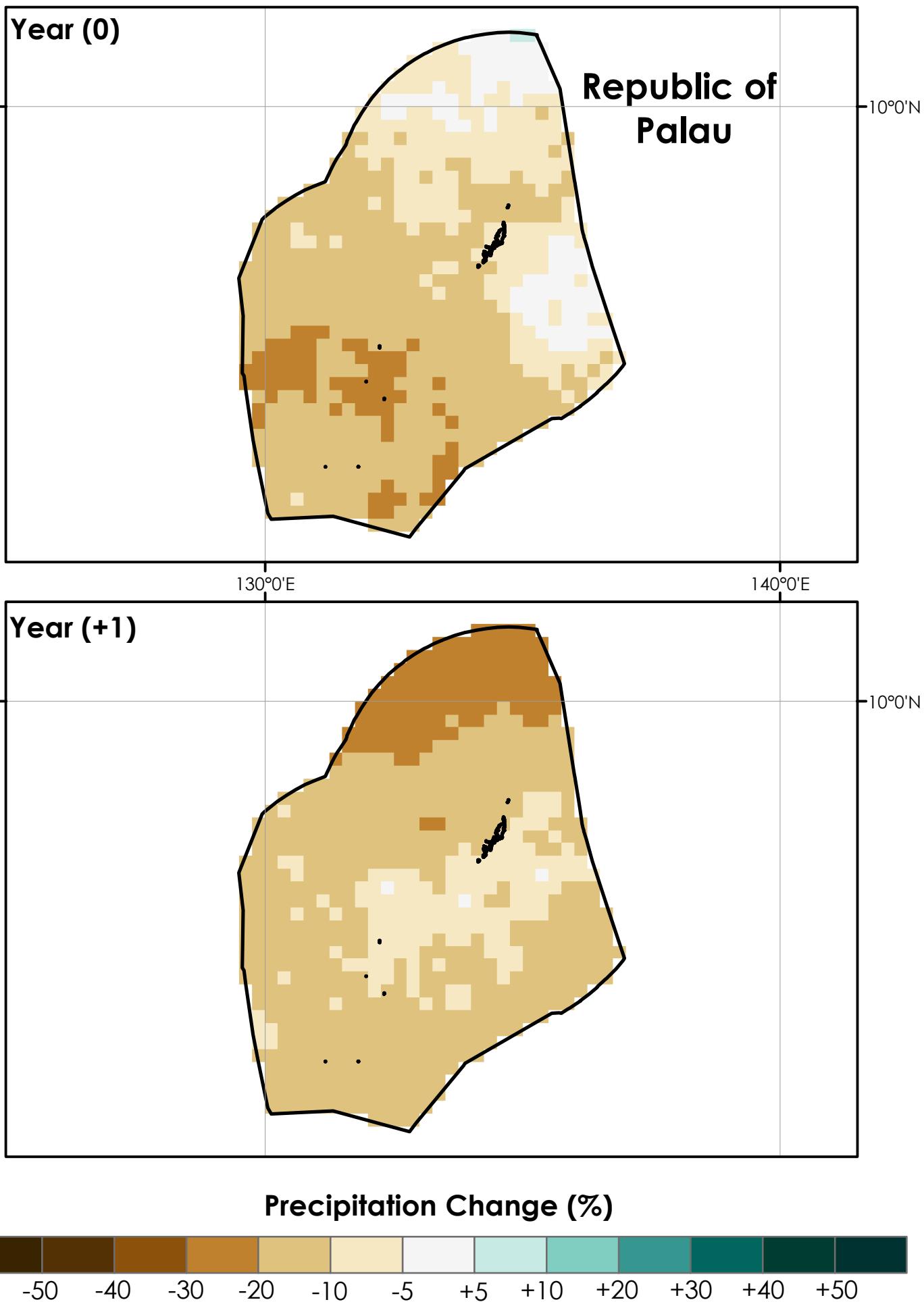


Precipitation Change (%)



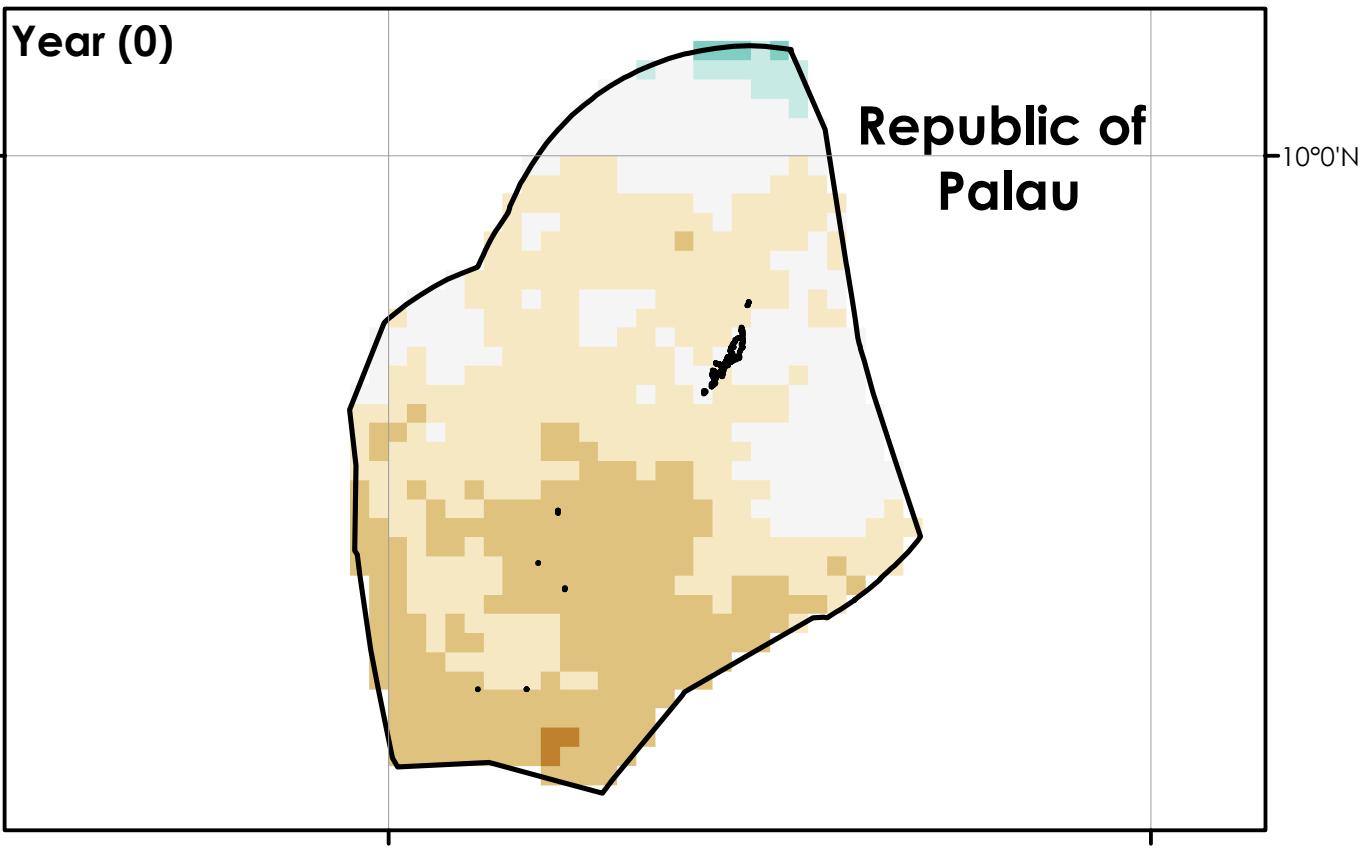
Moderate - Strong El Niño for AMJ

399



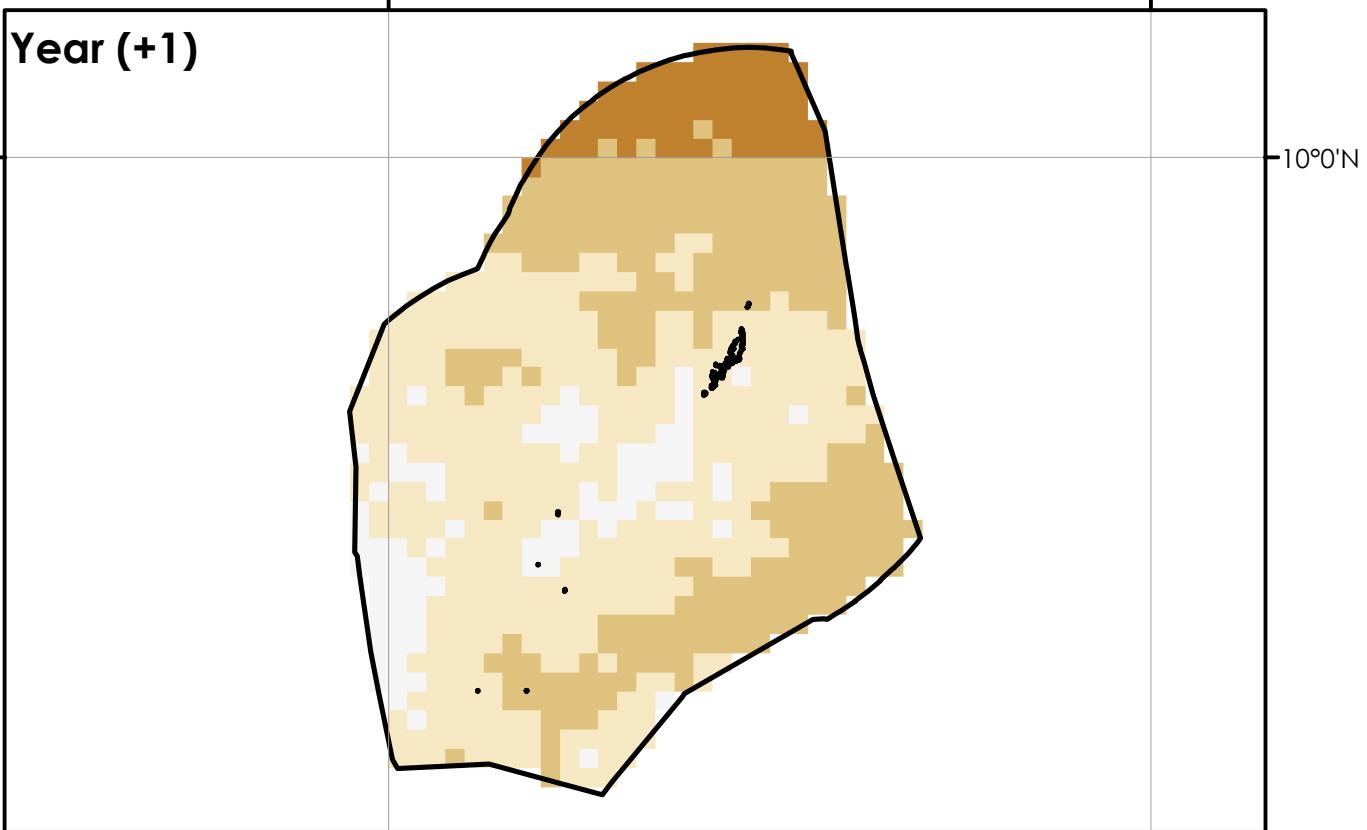
Moderate - Strong El Niño for MJJ

400



130°0'E

140°0'E



Precipitation Change (%)

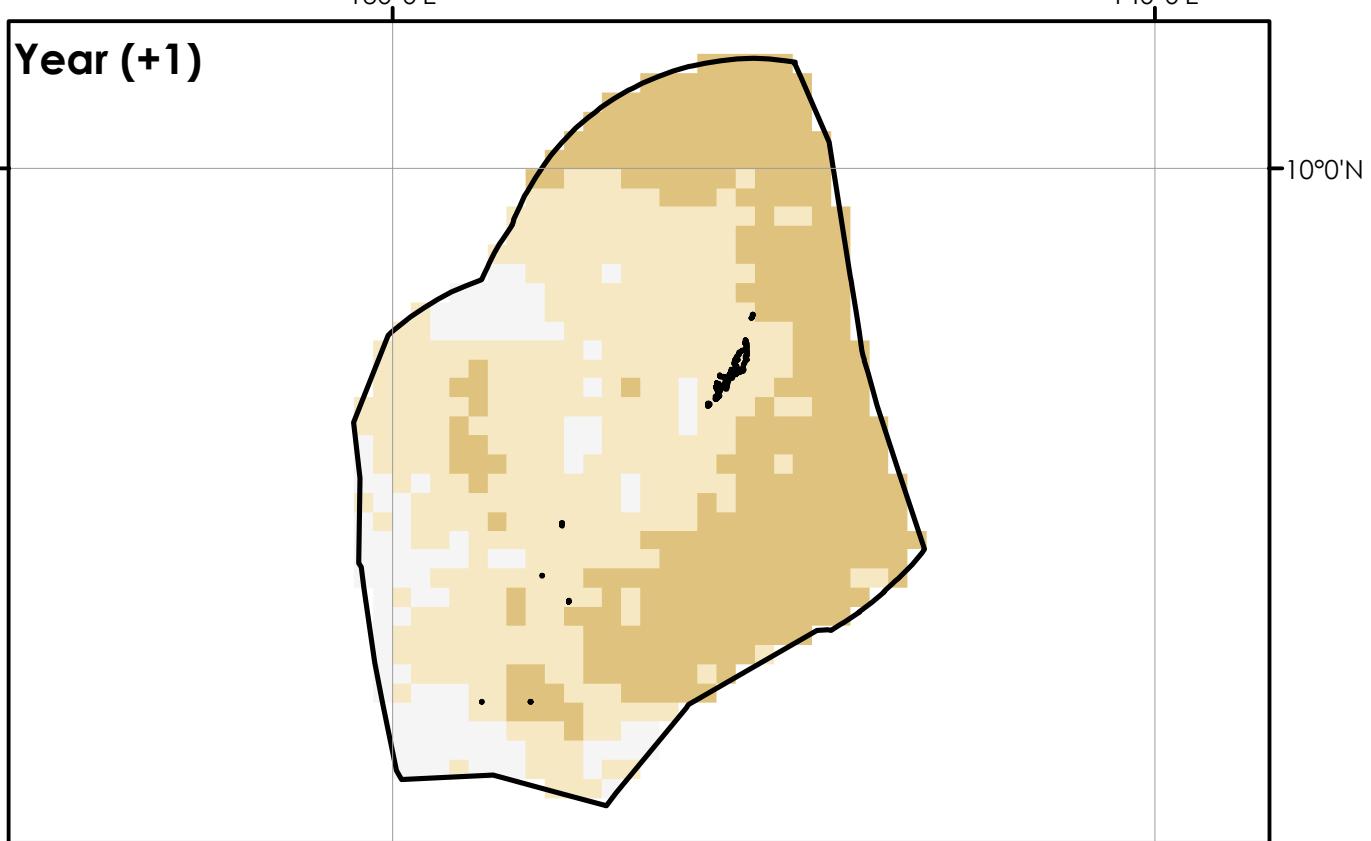
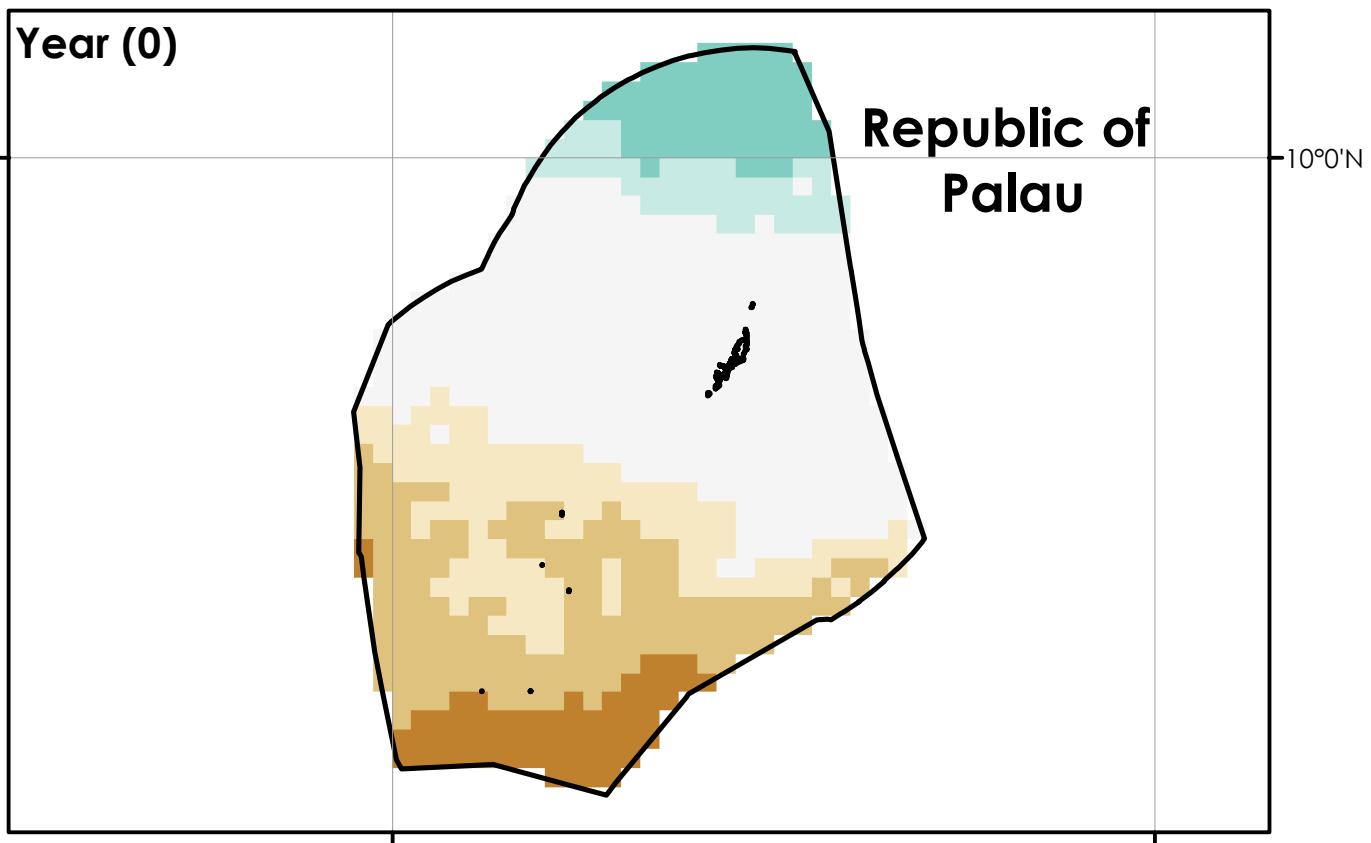


-50 -40 -30 -20 -10 -5 +5 +10 +20 +30 +40 +50

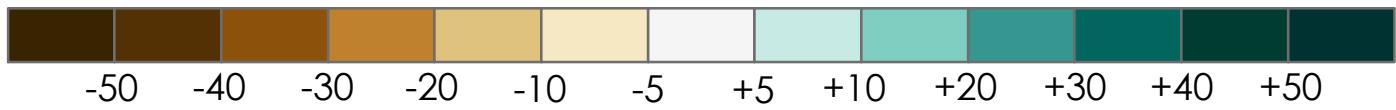
10°0'N

Moderate - Strong El Niño for JJA

401

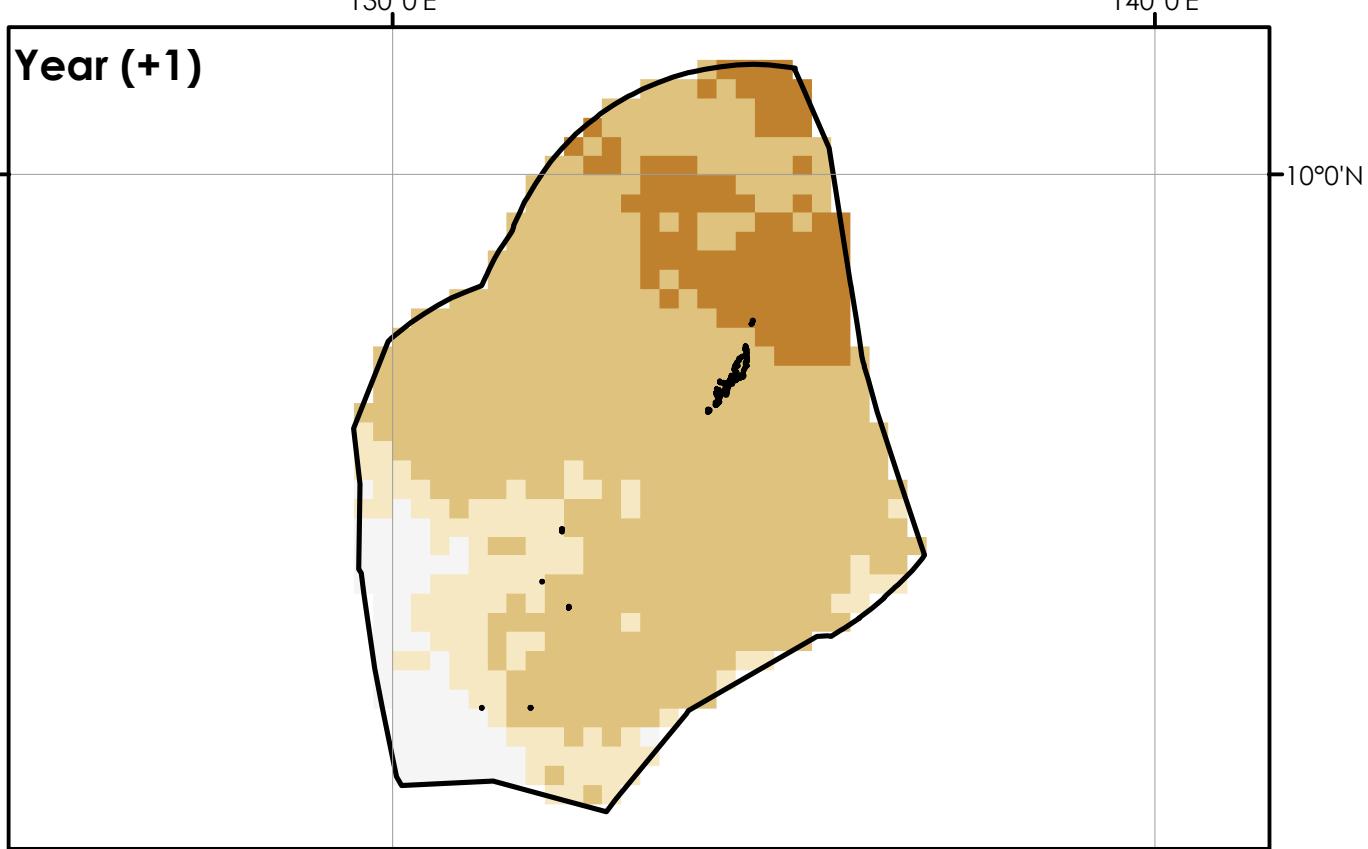
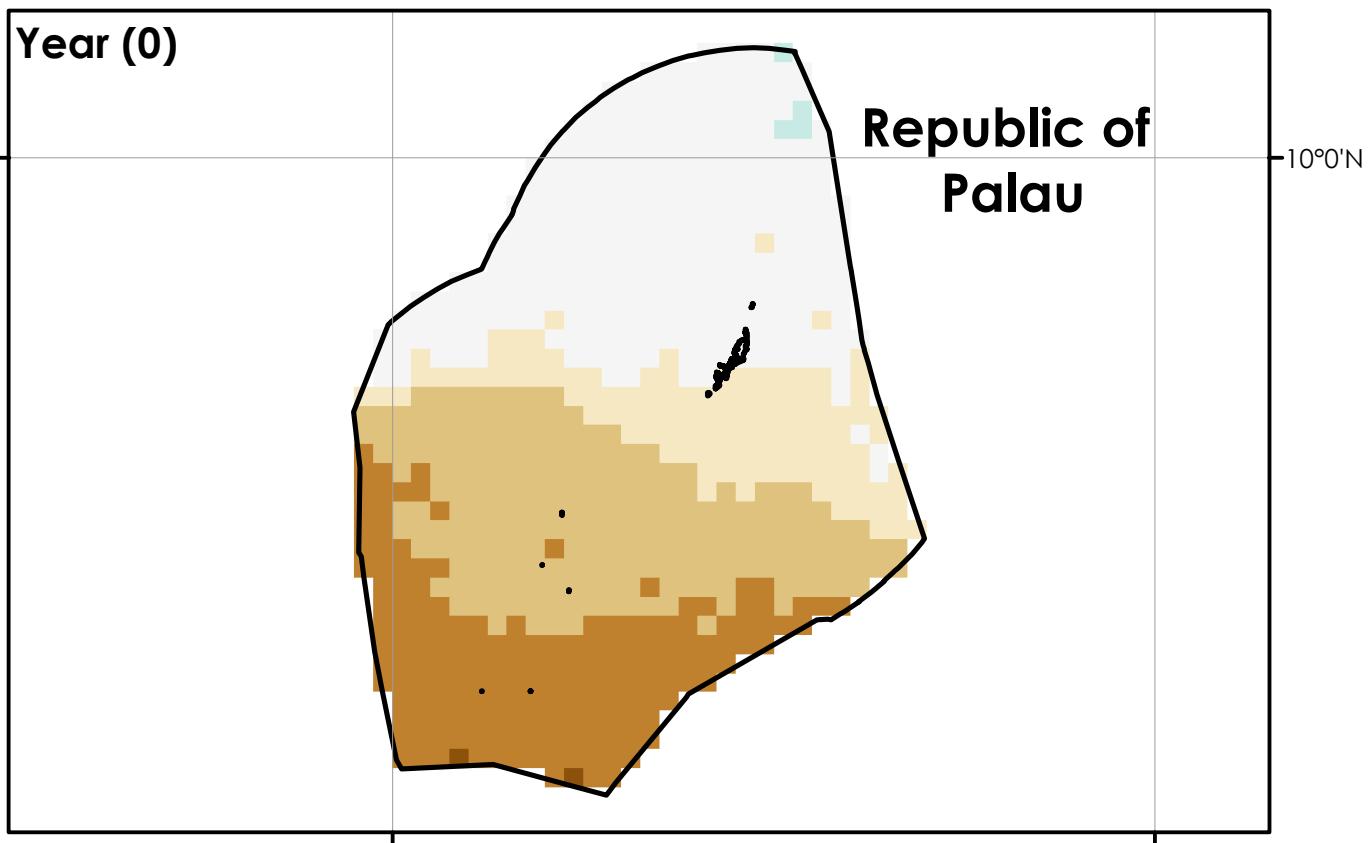


Precipitation Change (%)



Moderate - Strong El Niño for JAS

402

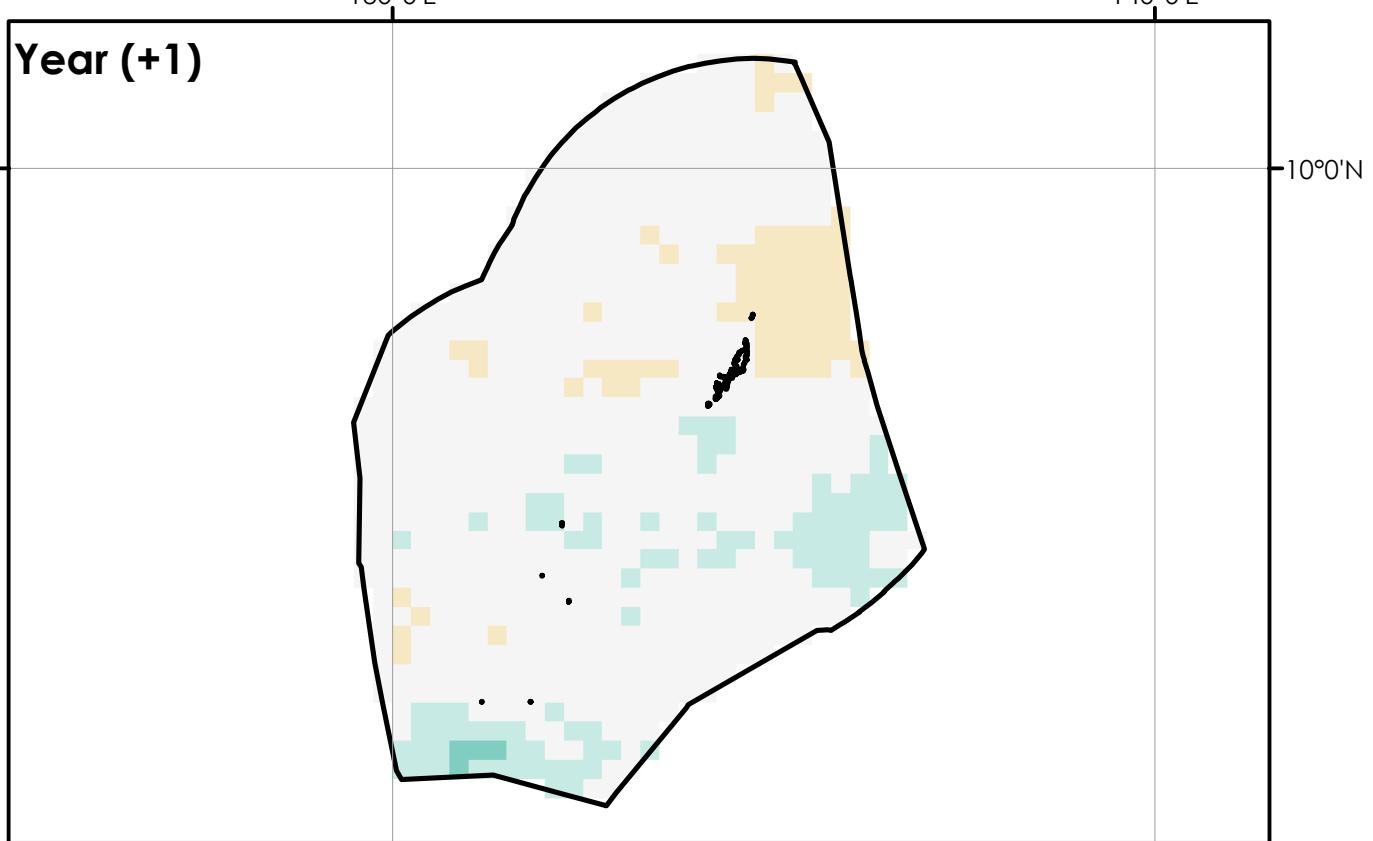
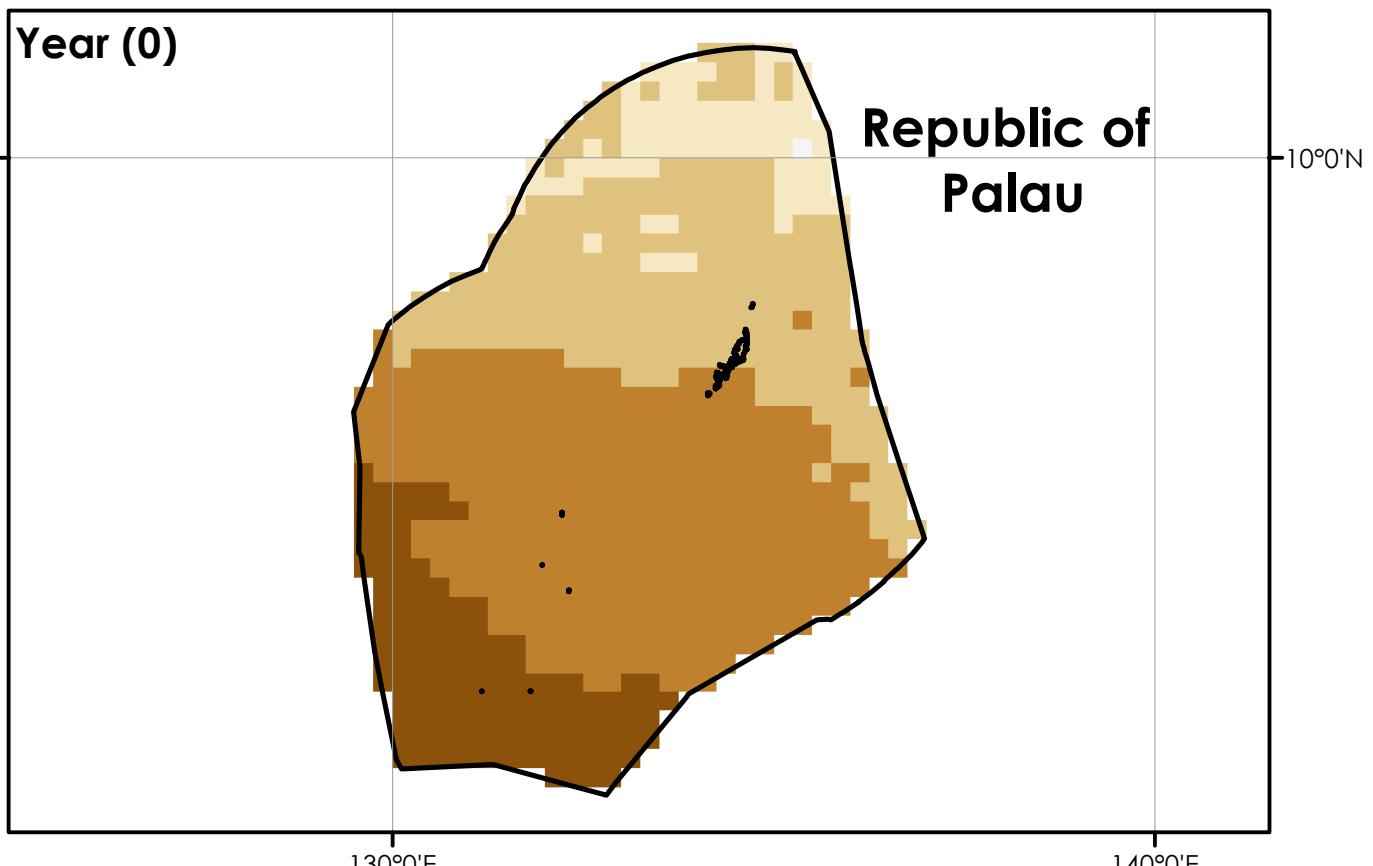


Precipitation Change (%)



Moderate - Strong El Niño for ASO

403

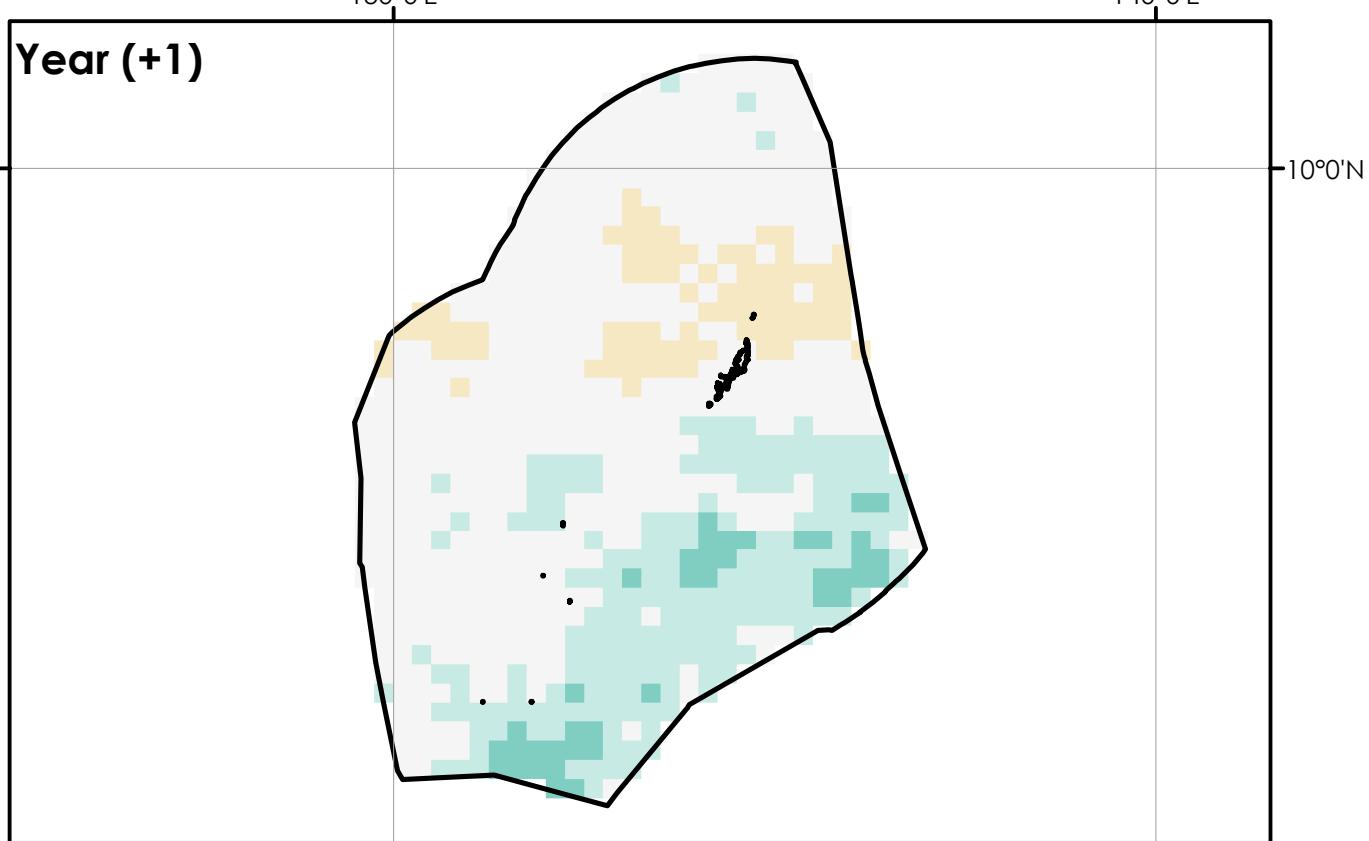
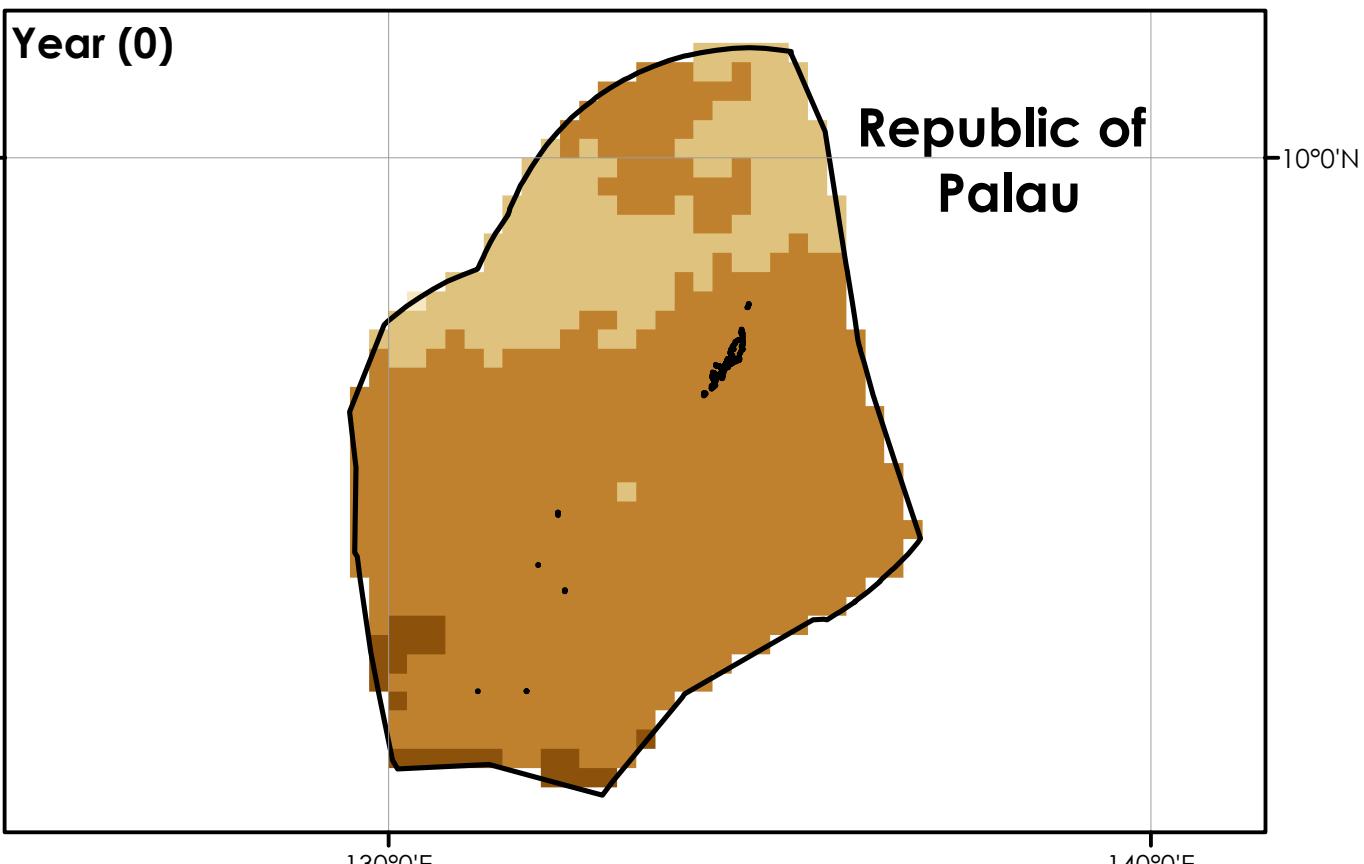


Precipitation Change (%)



Moderate - Strong El Niño for SON

404

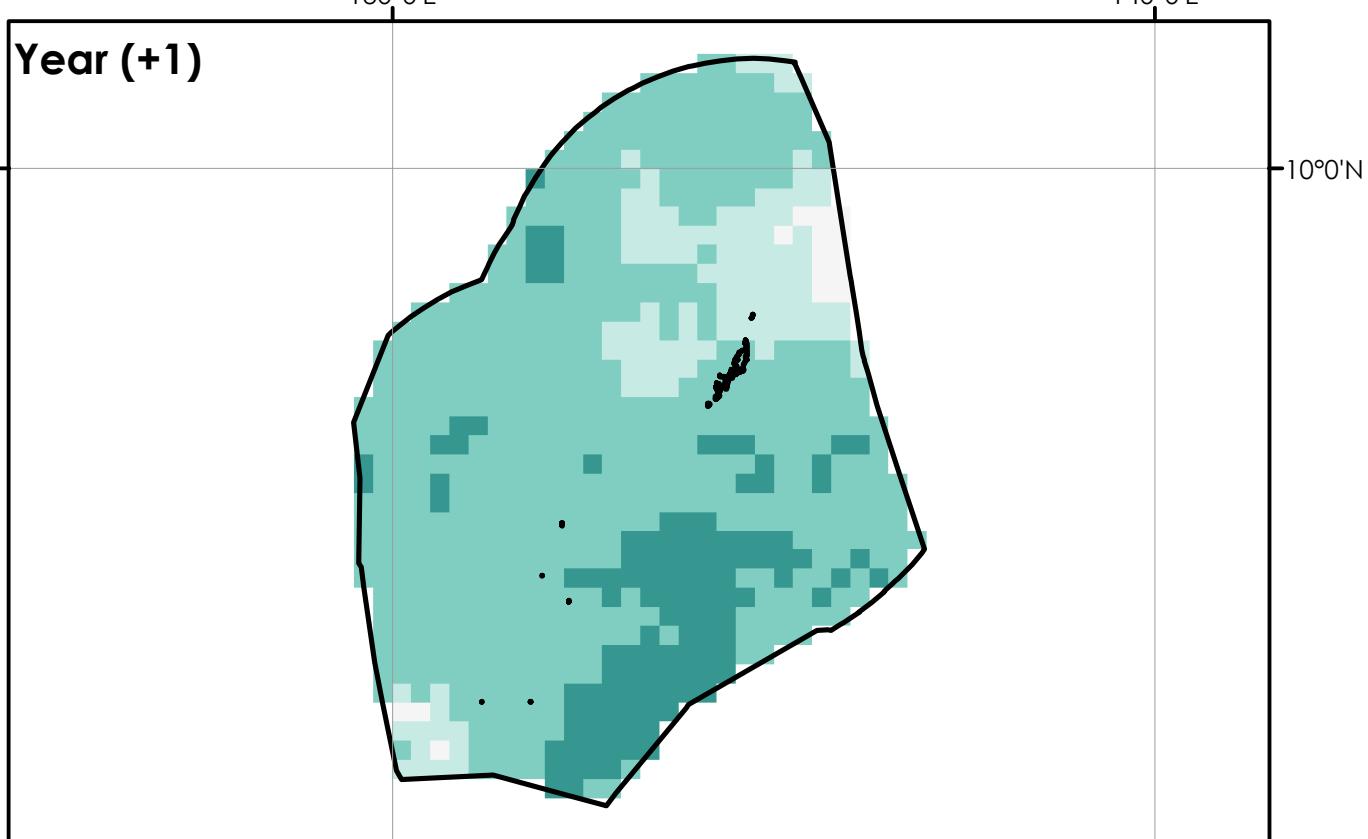
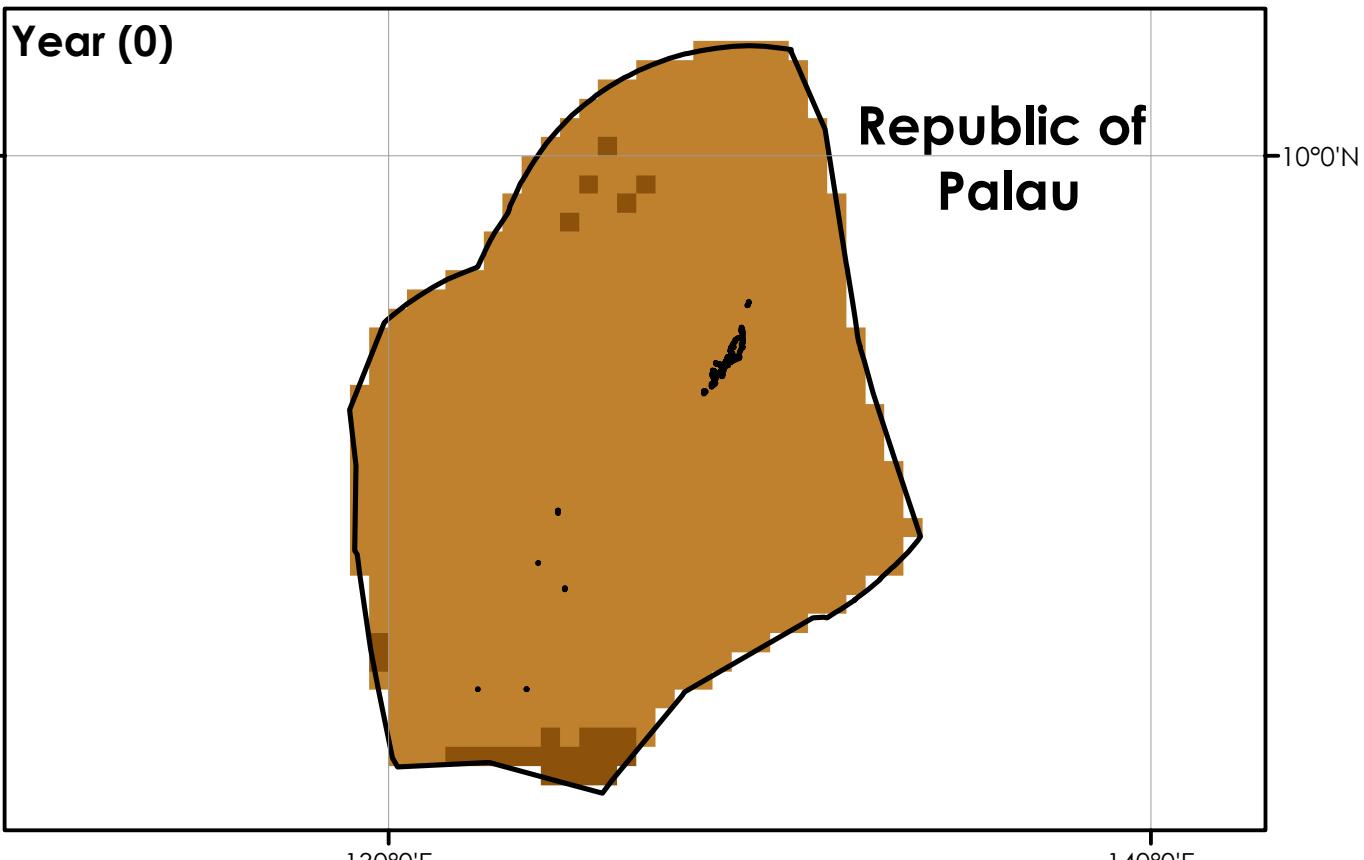


Precipitation Change (%)



Moderate - Strong El Niño for OND

405

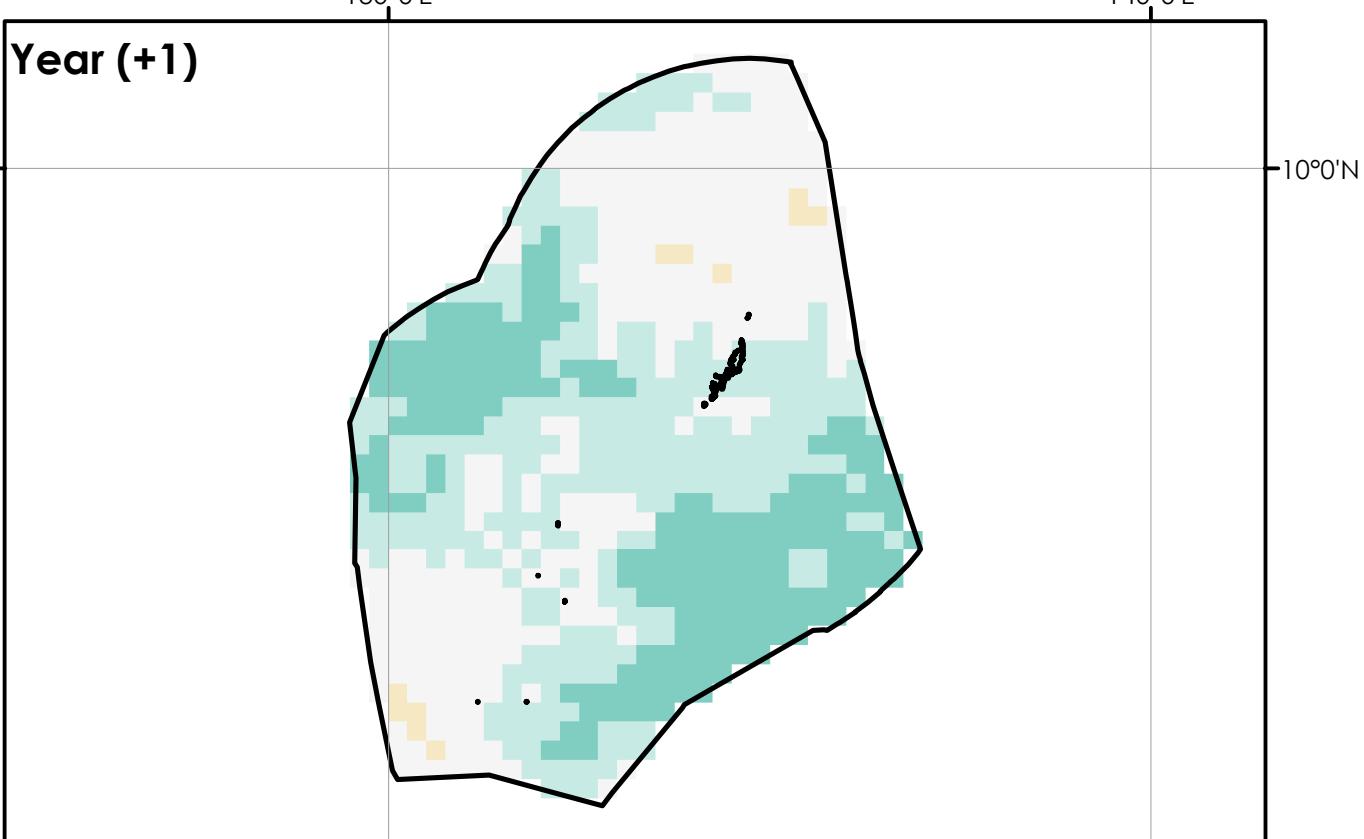
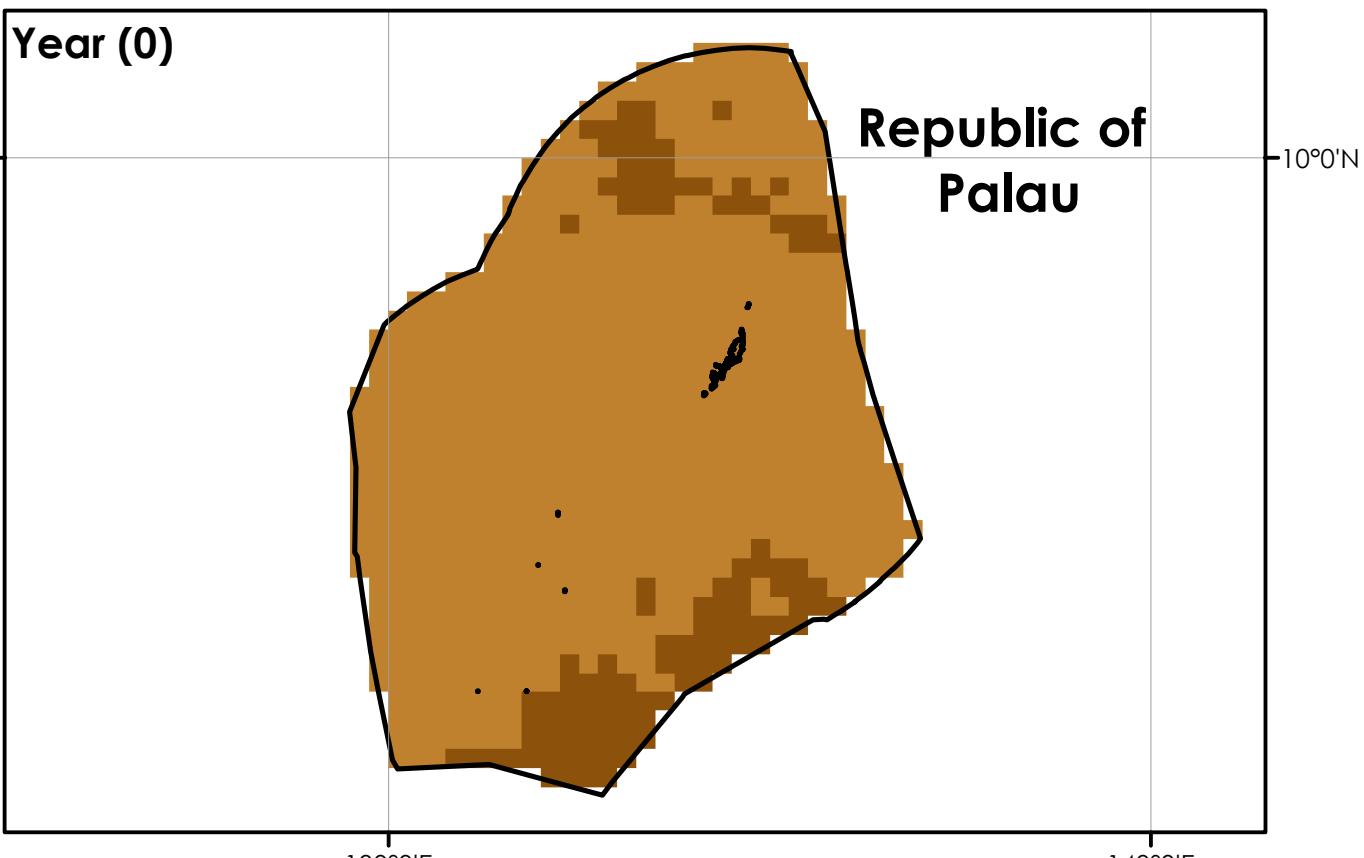


Precipitation Change (%)

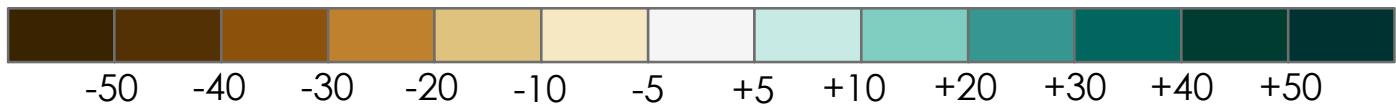


Moderate - Strong El Niño for NDJ

406

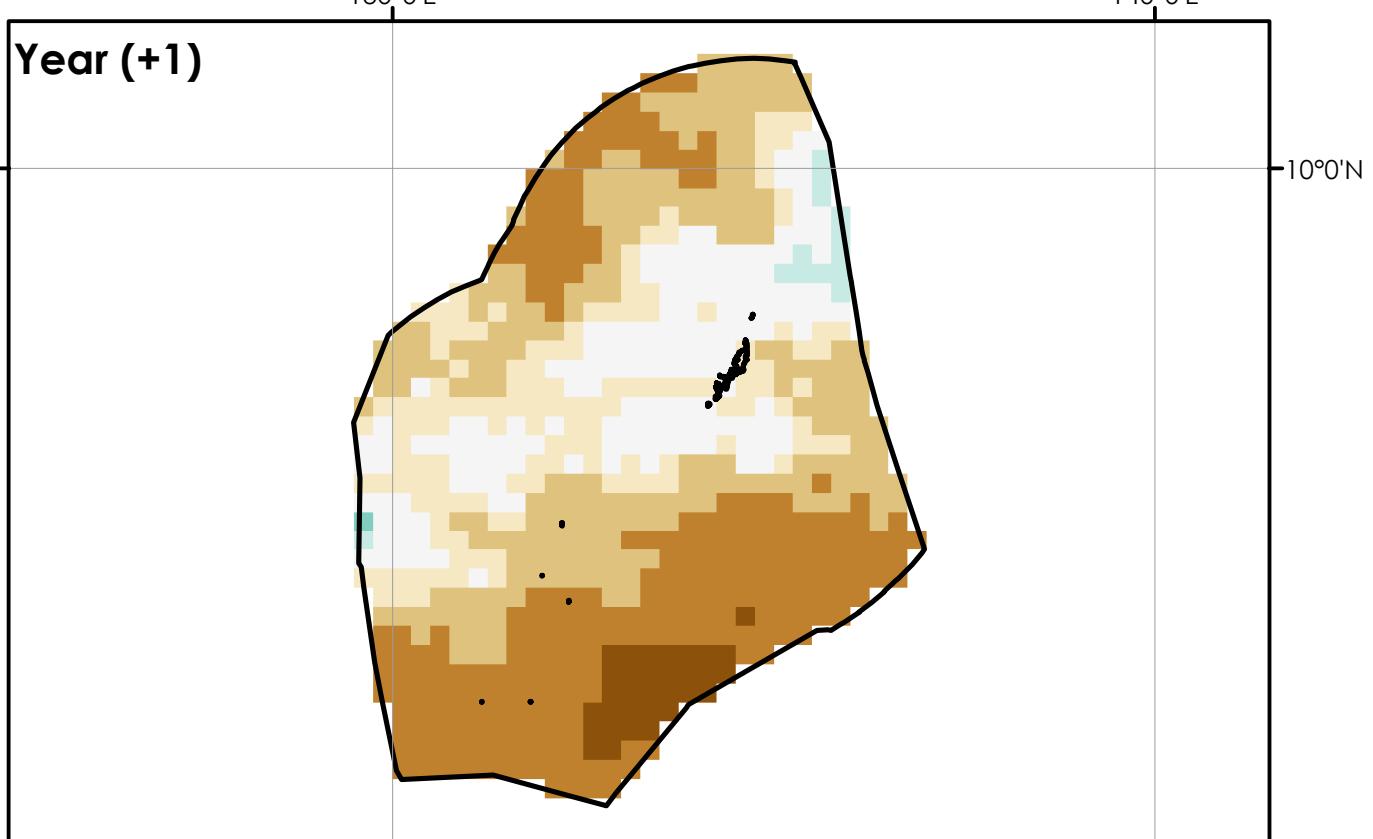
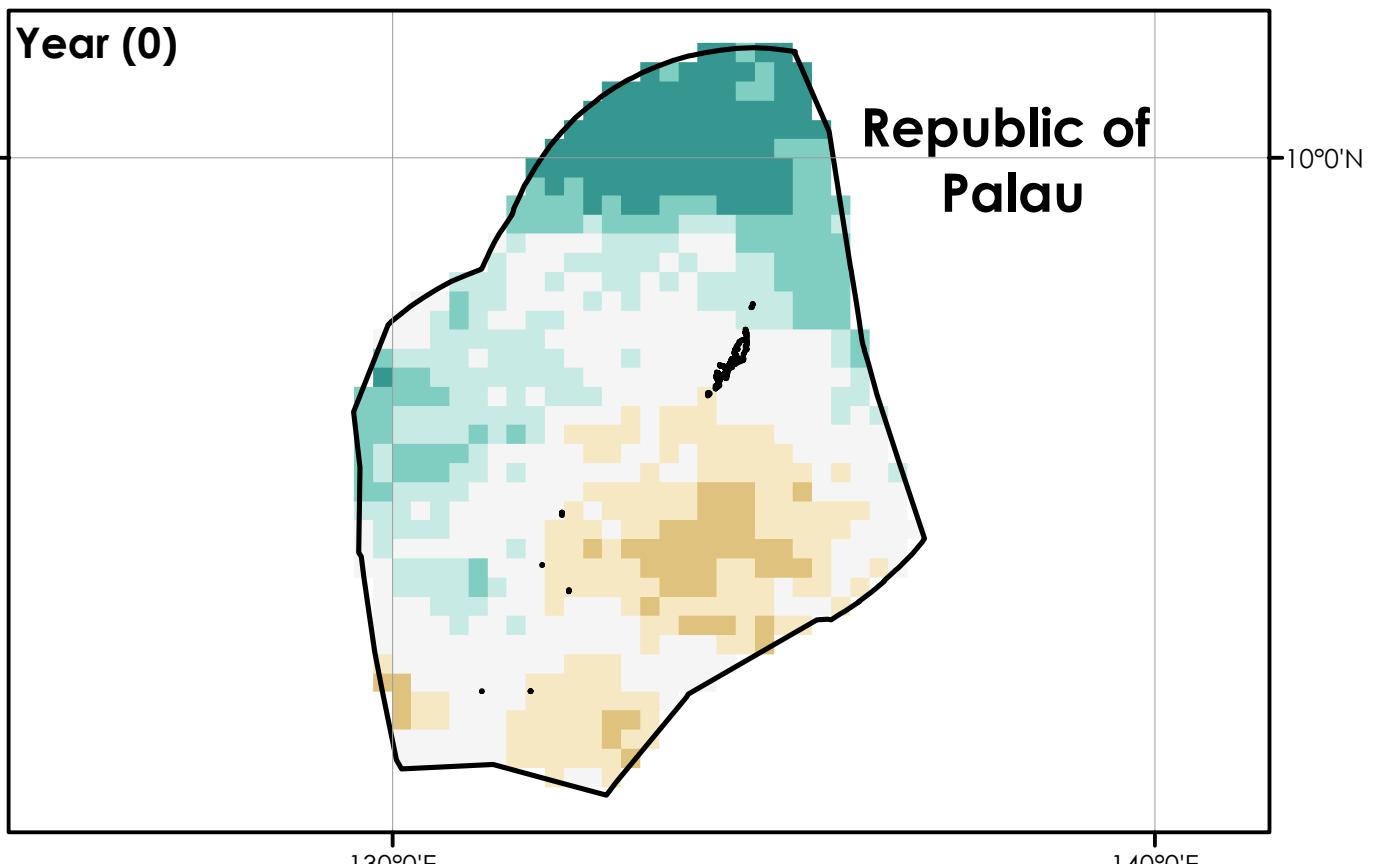


Precipitation Change (%)

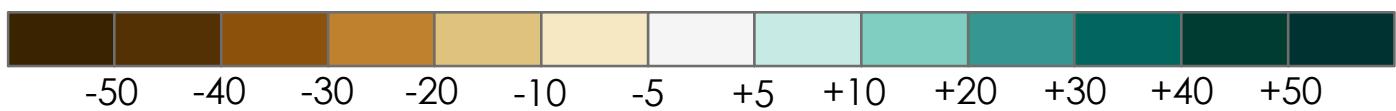


Weak El Niño for DJF

407

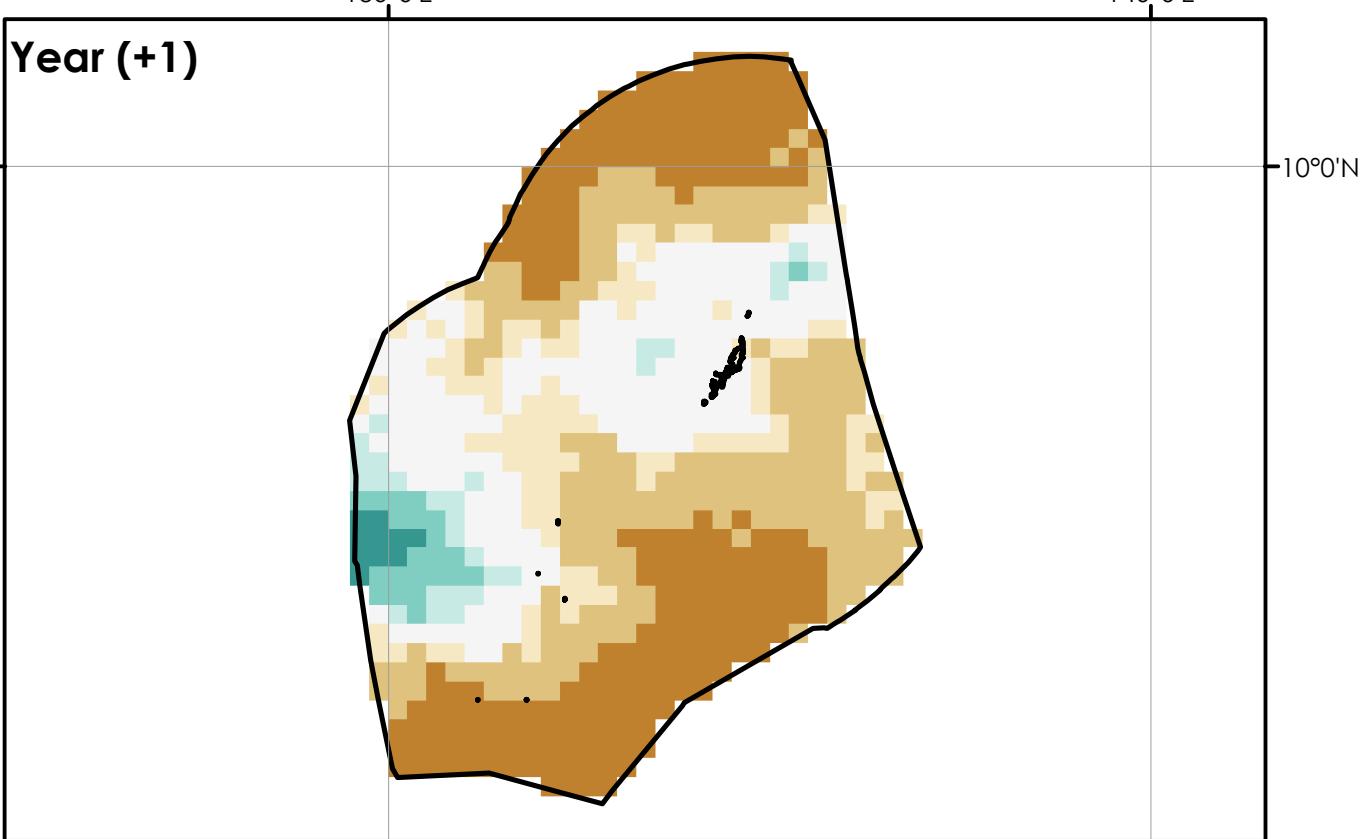
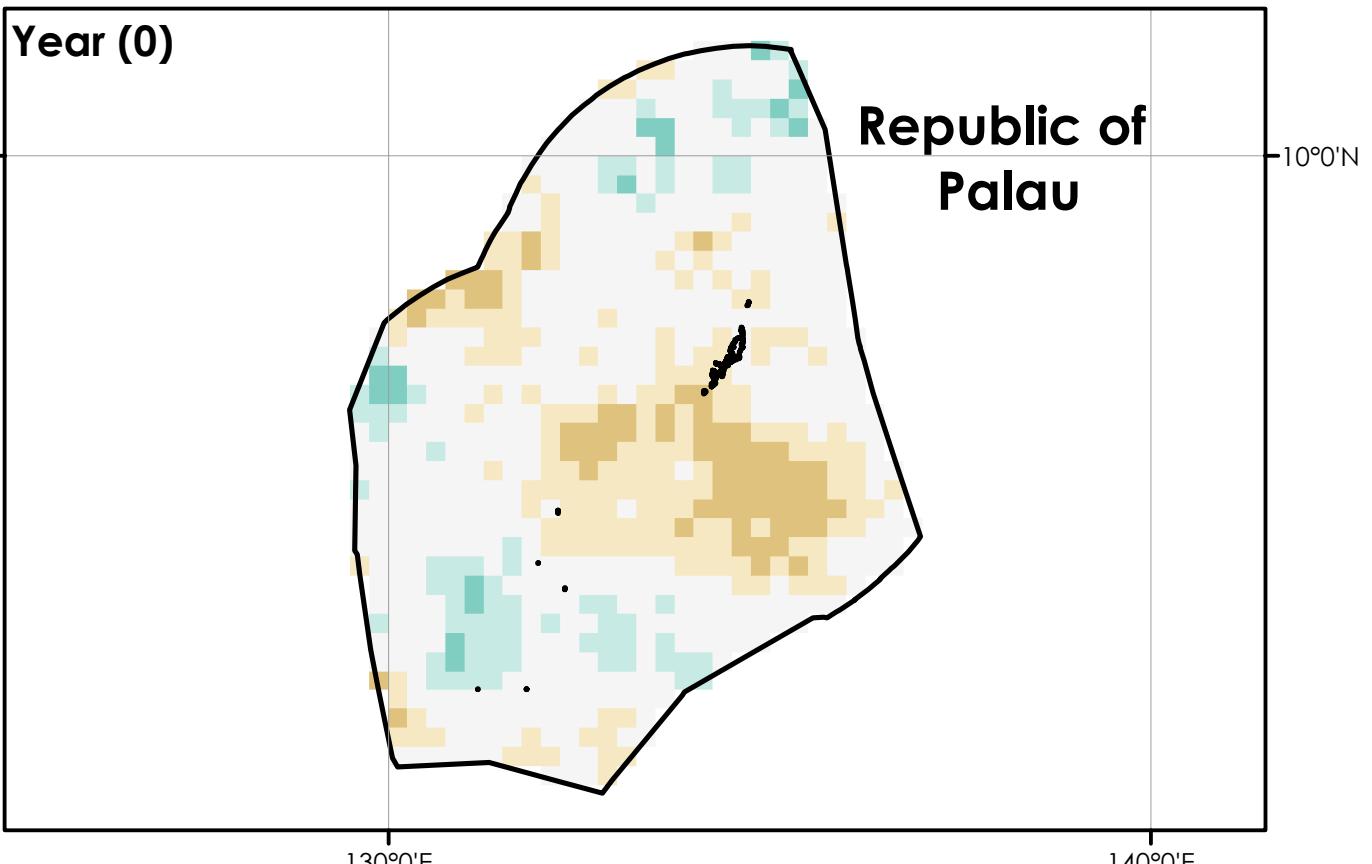


Precipitation Change (%)



Weak El Niño for JFM

408

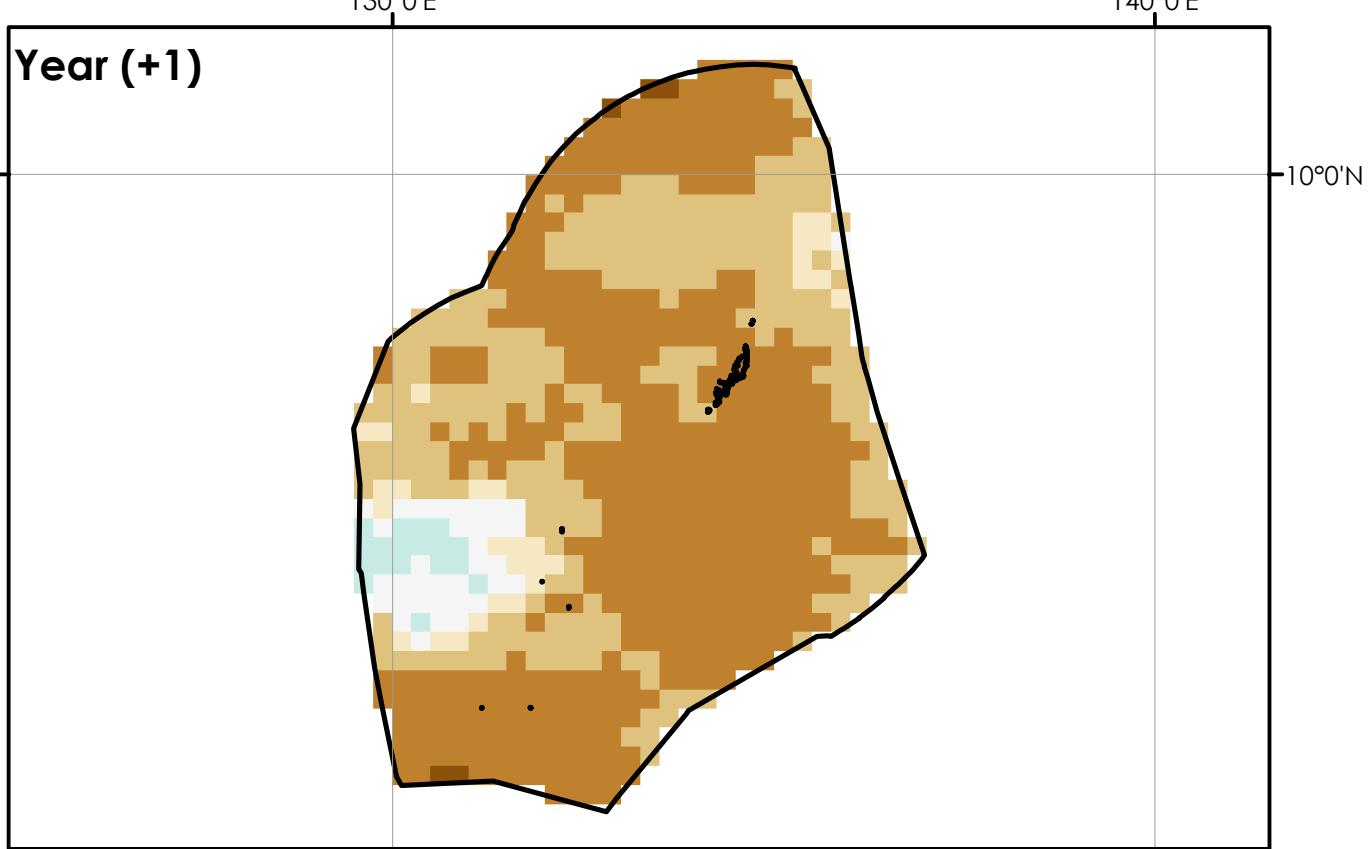
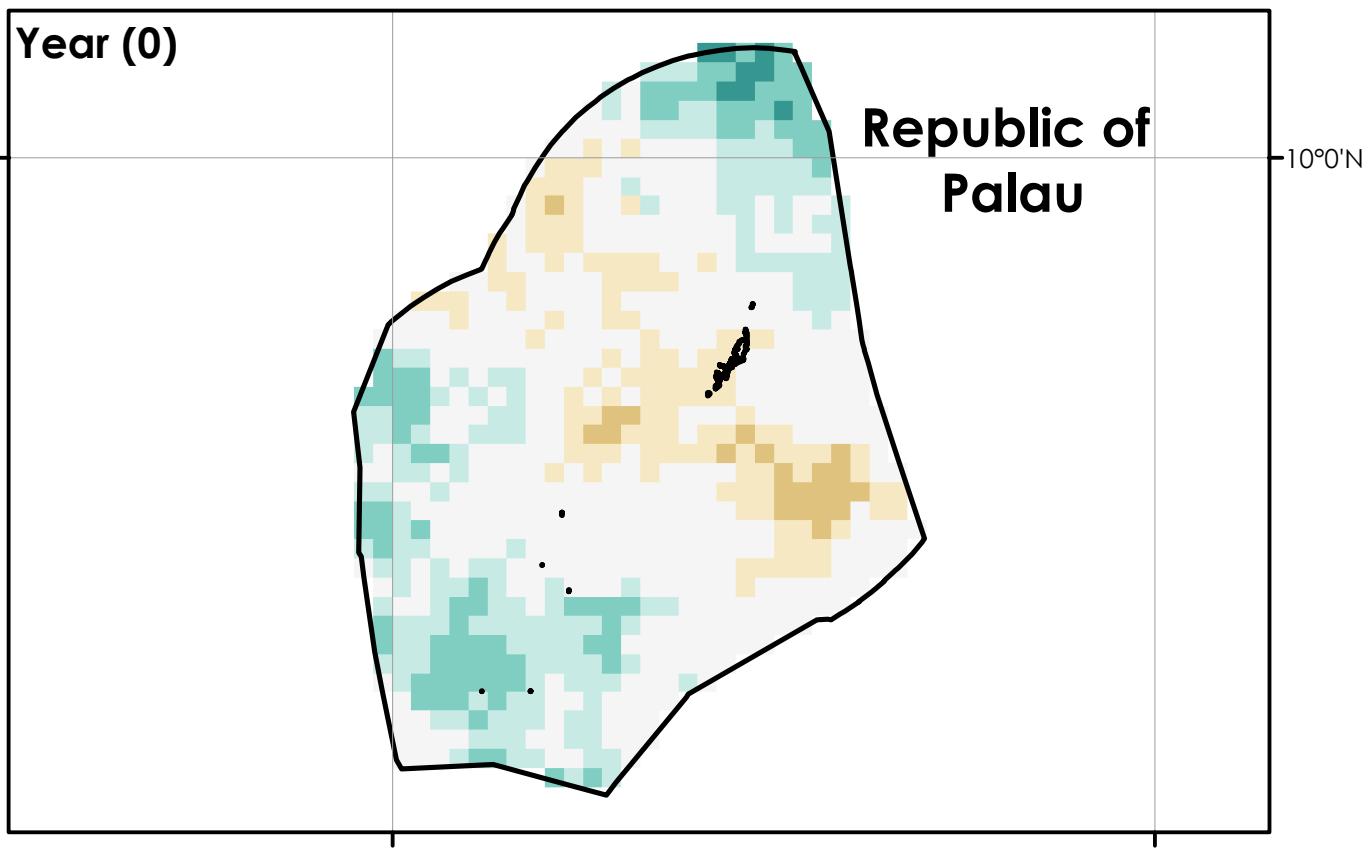


Precipitation Change (%)

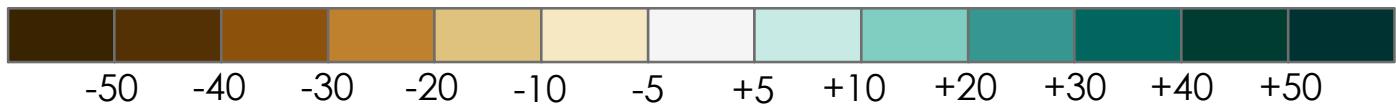


Weak El Niño for FMA

409

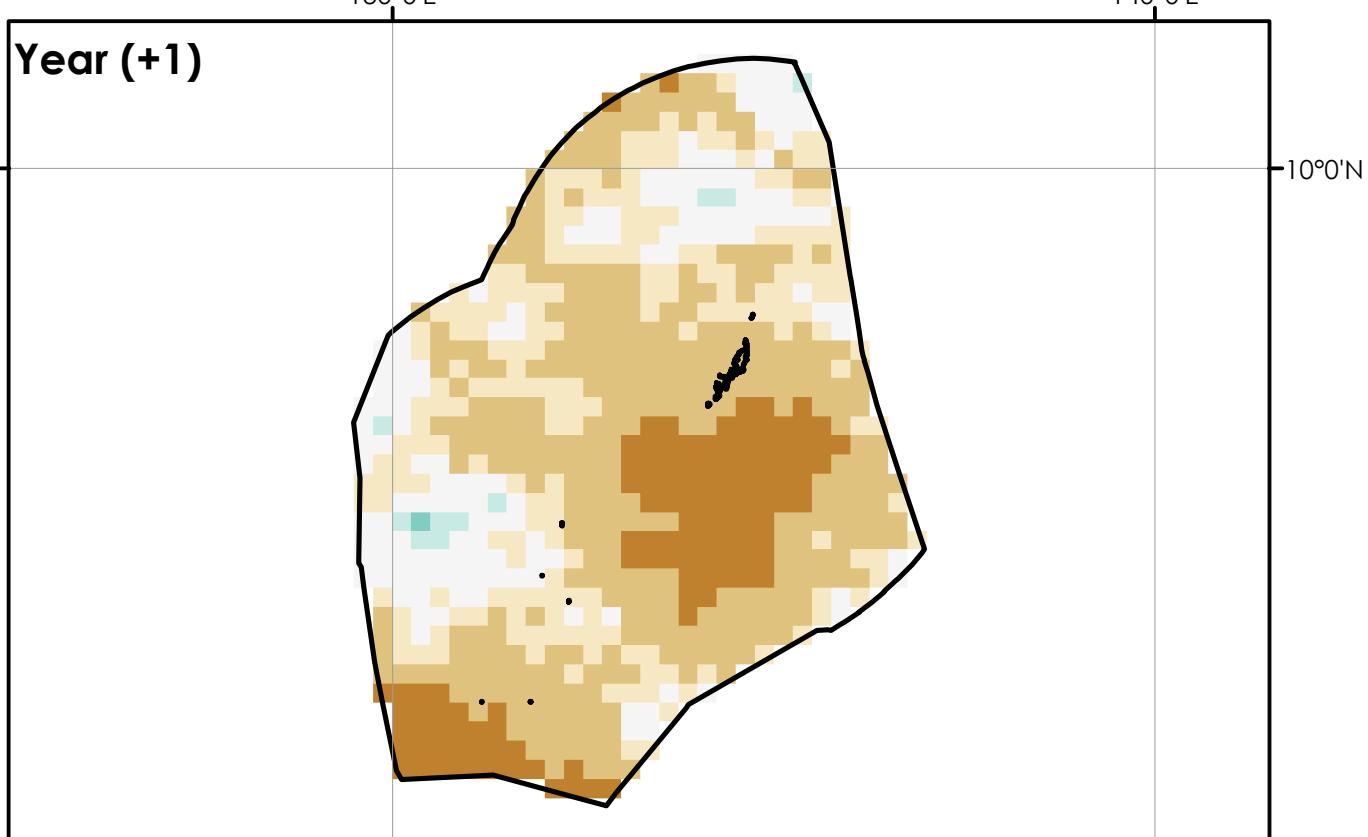
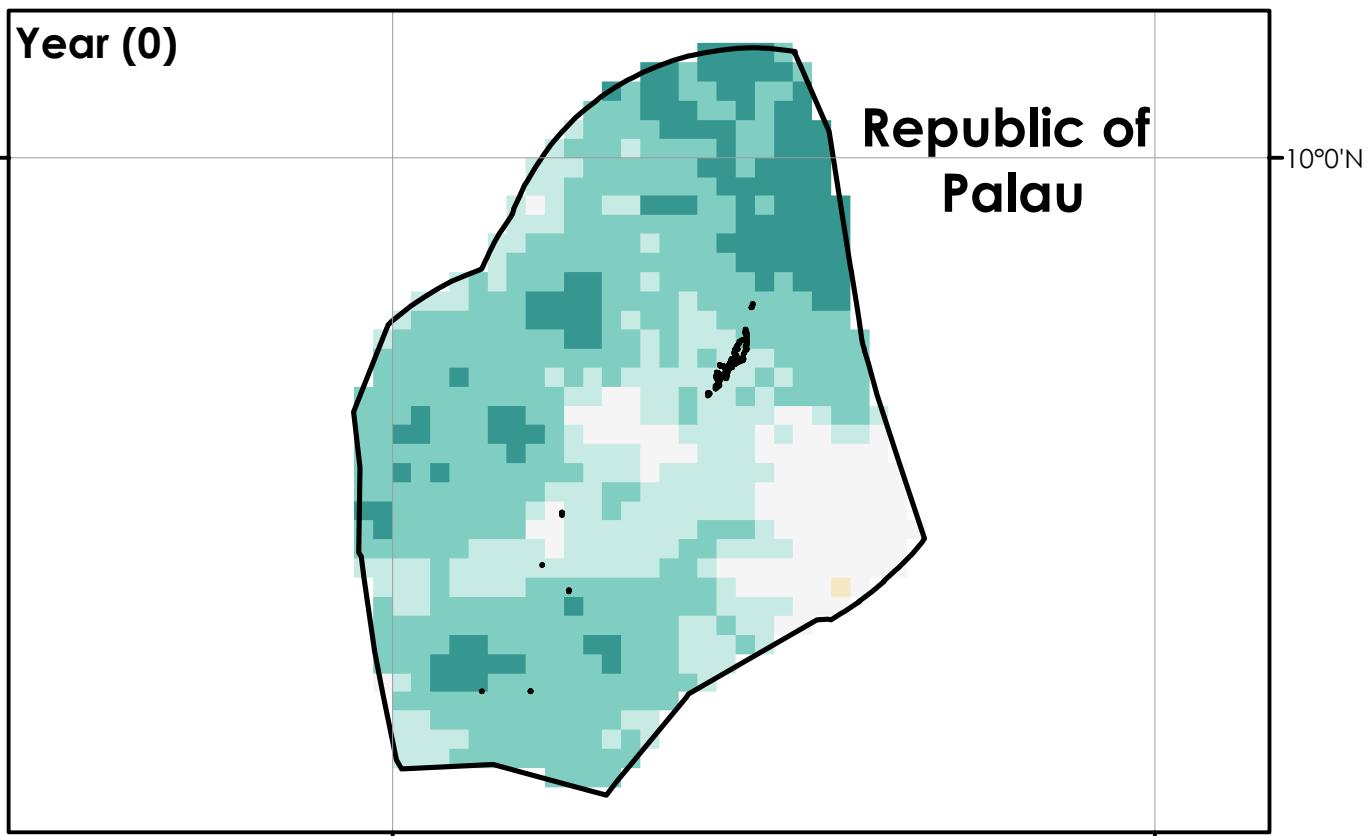


Precipitation Change (%)

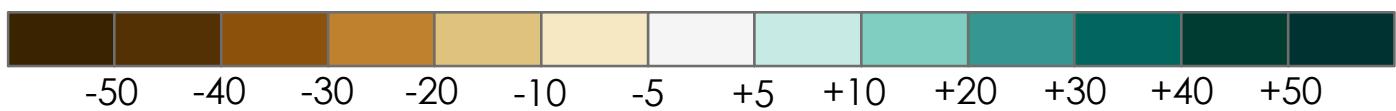


Weak El Niño for MAM

410

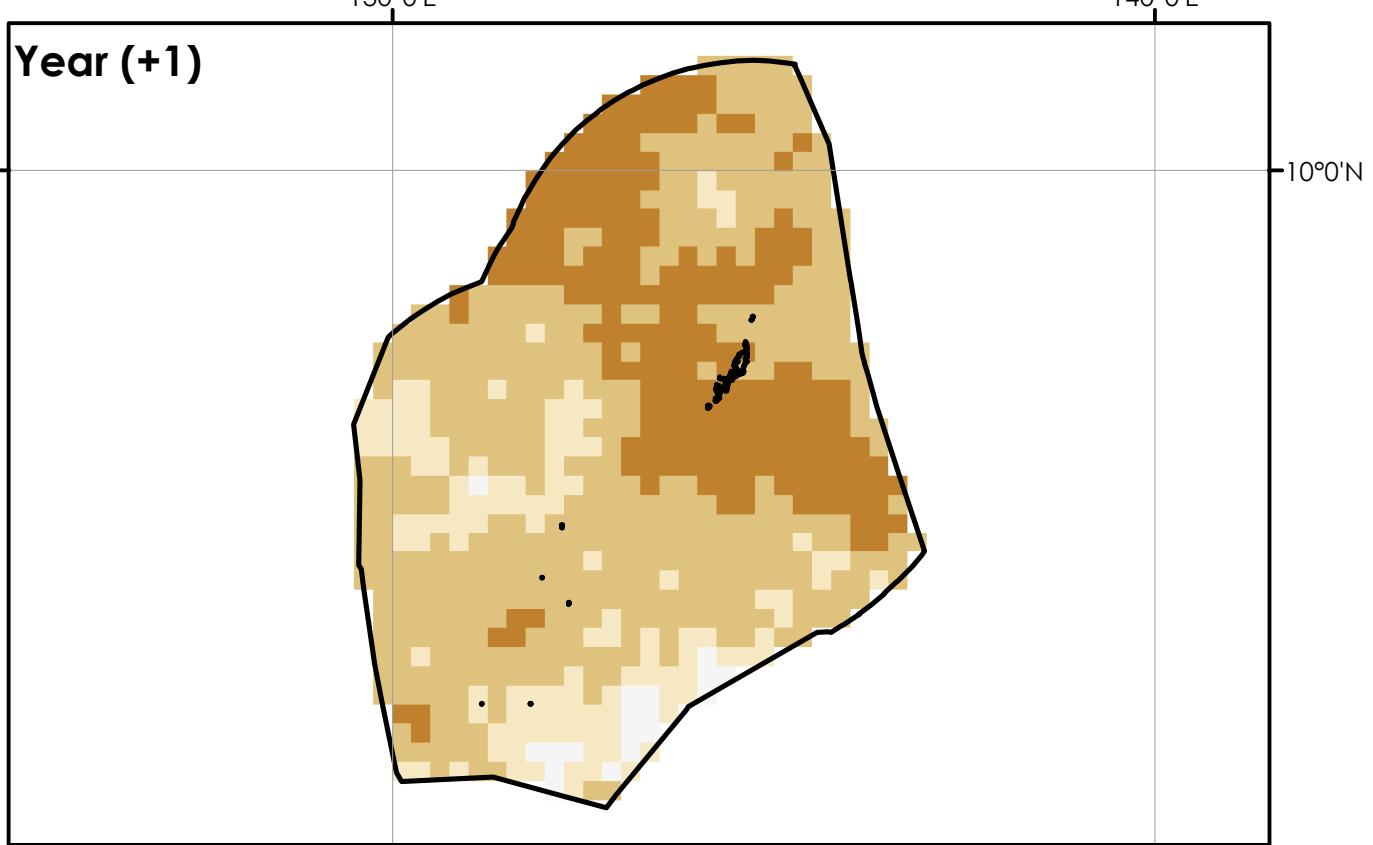
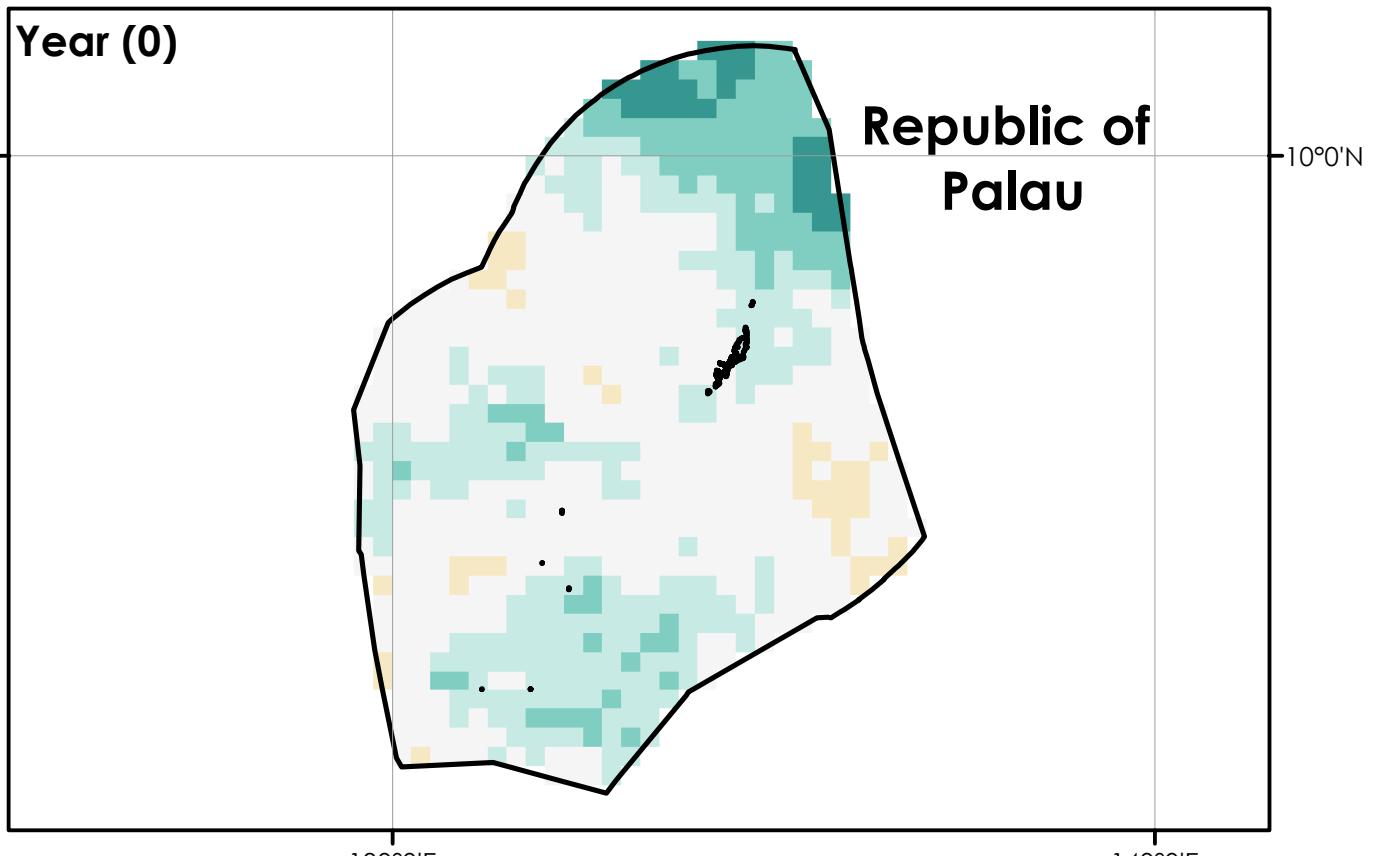


Precipitation Change (%)



Weak El Niño for AMJ

411

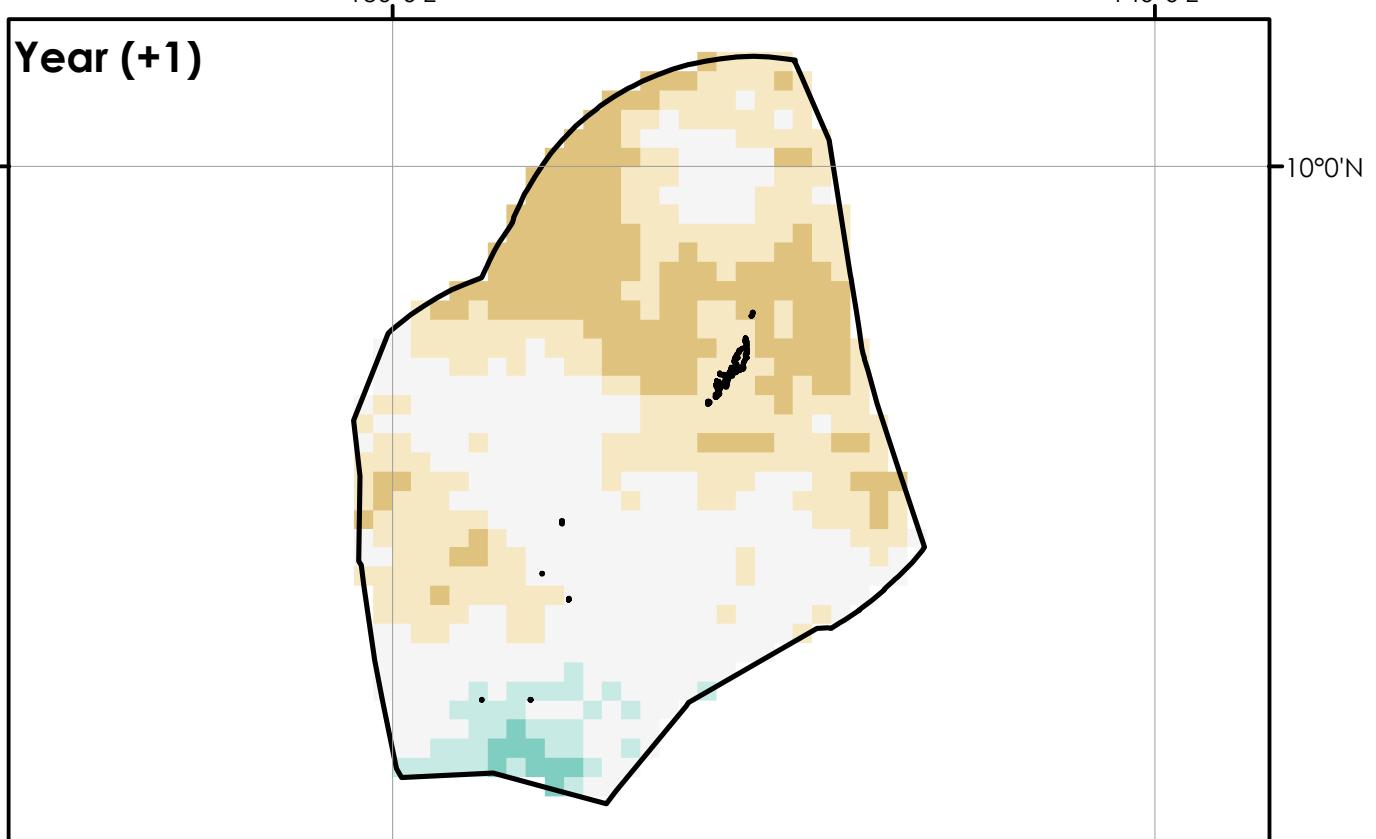
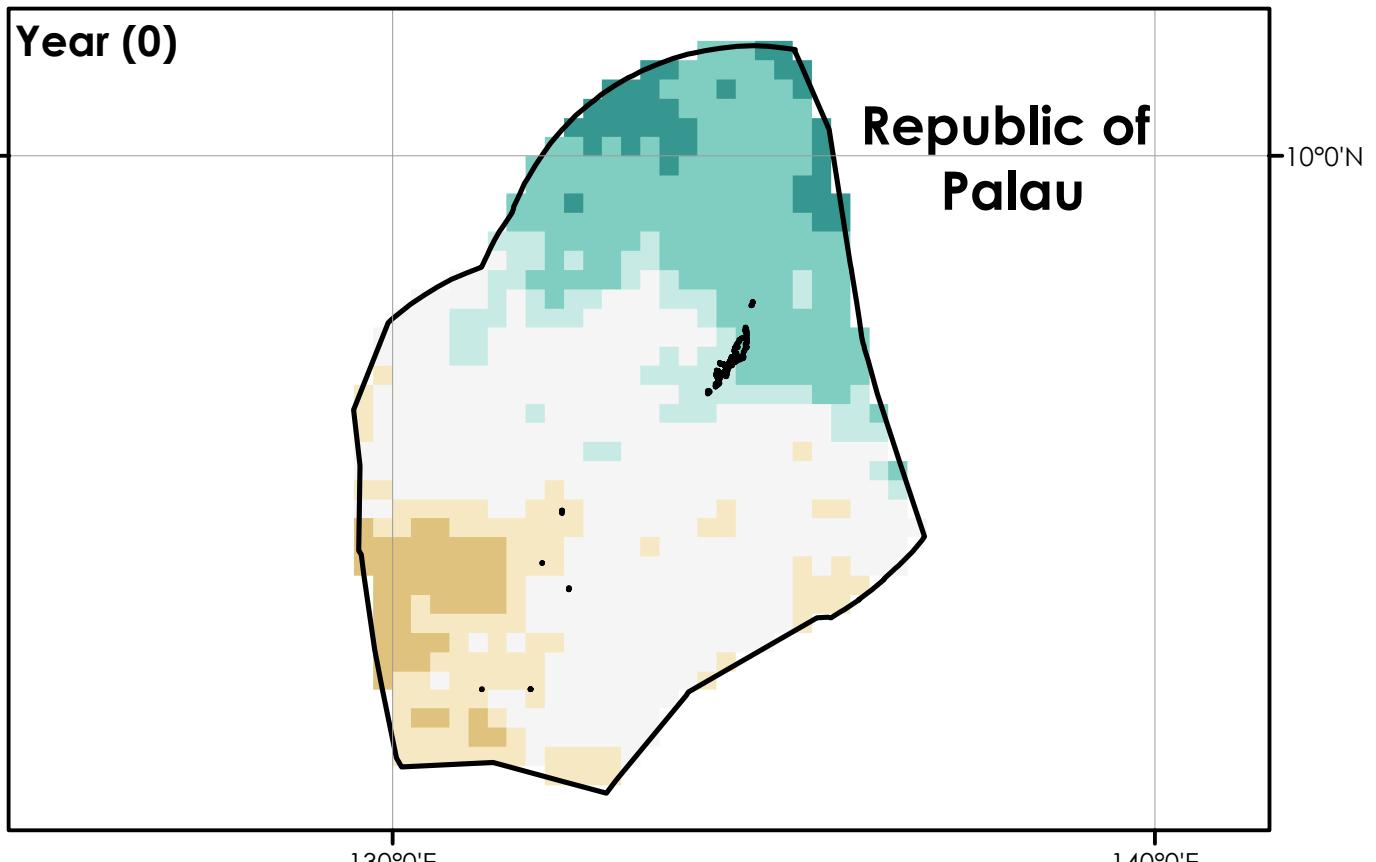


Precipitation Change (%)

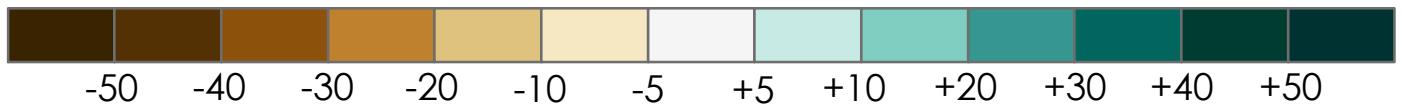


Weak El Niño for MJJ

412

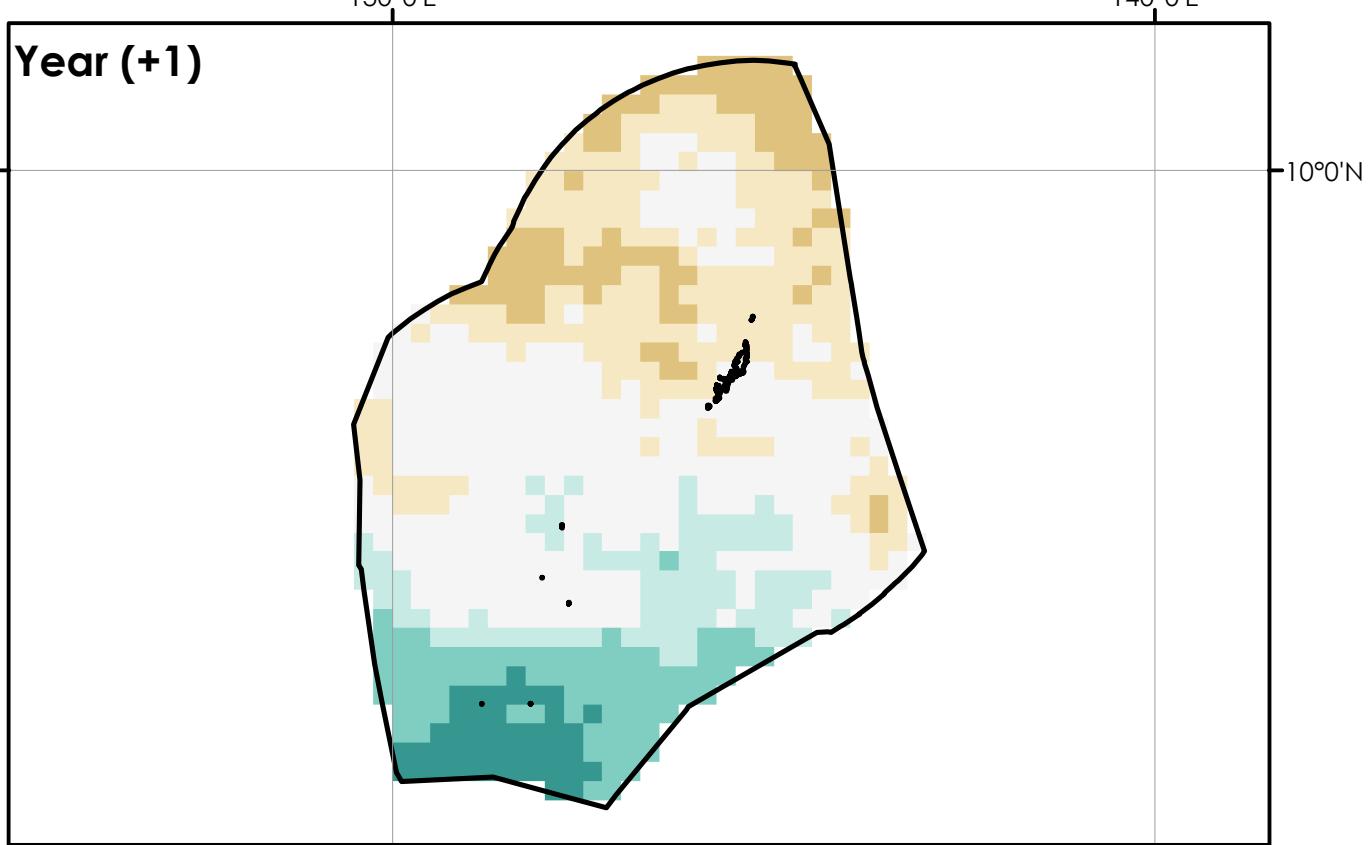
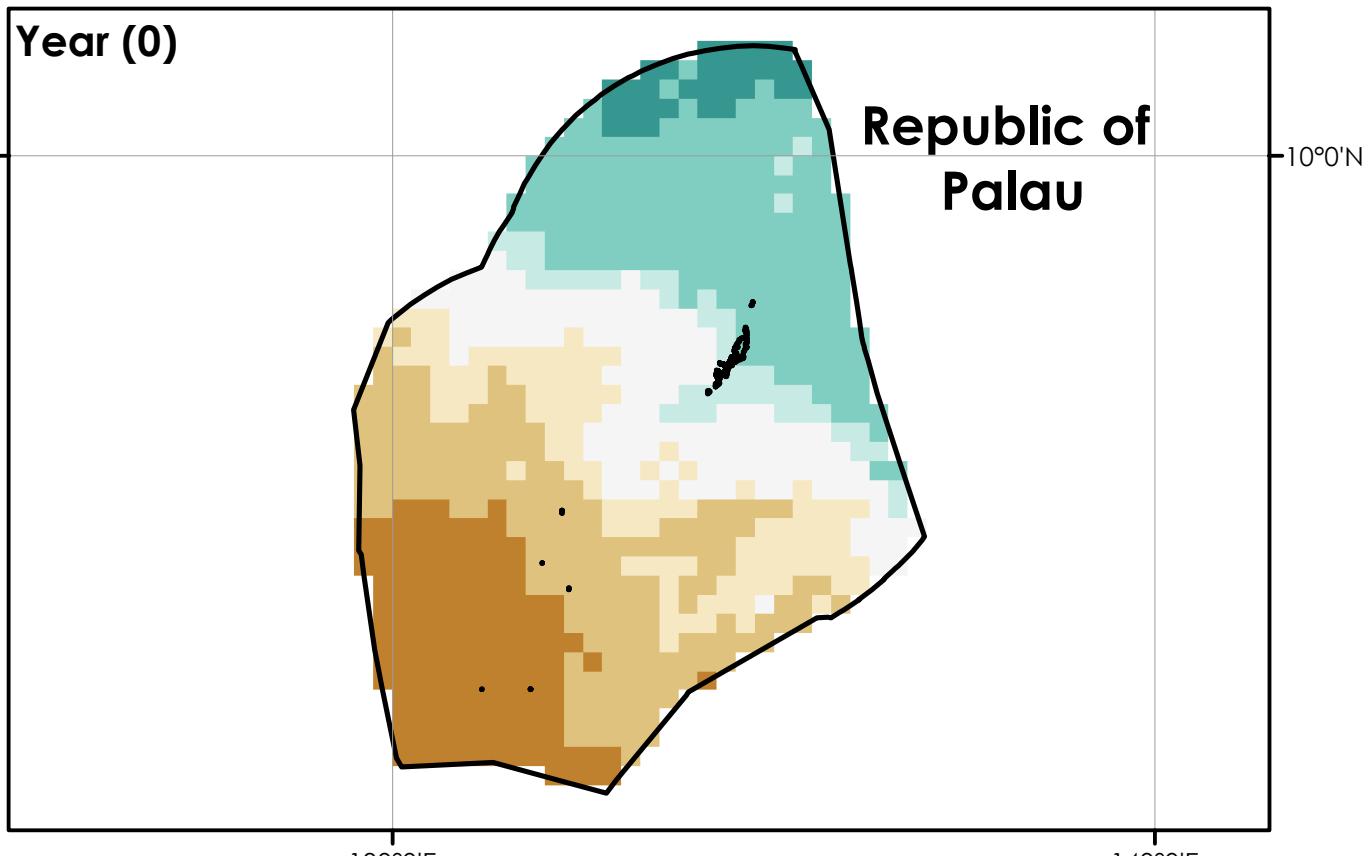


Precipitation Change (%)

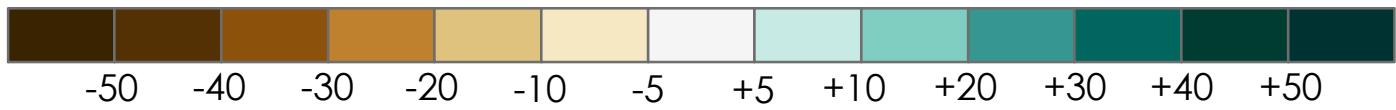


Weak El Niño for JJA

413

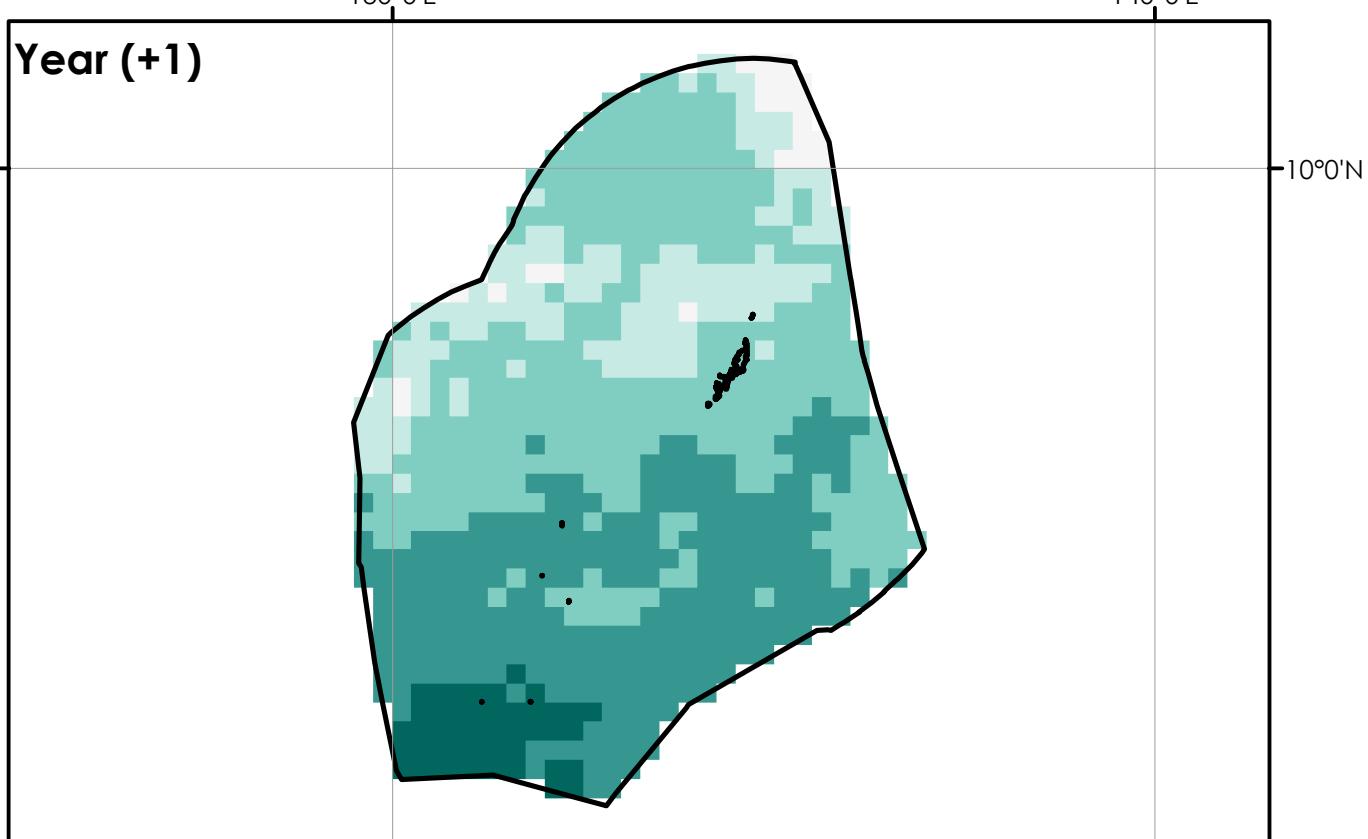
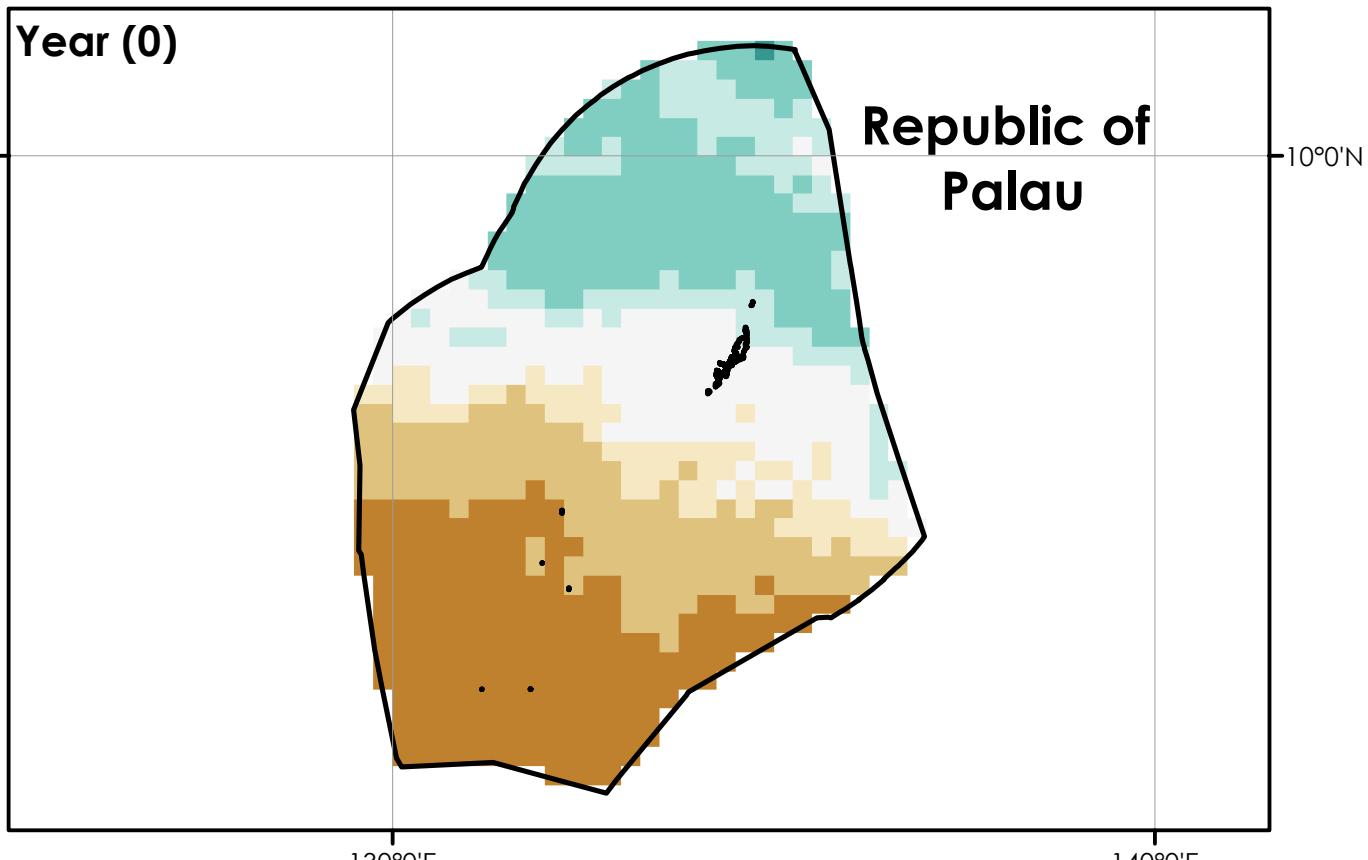


Precipitation Change (%)



Weak El Niño for JAS

414

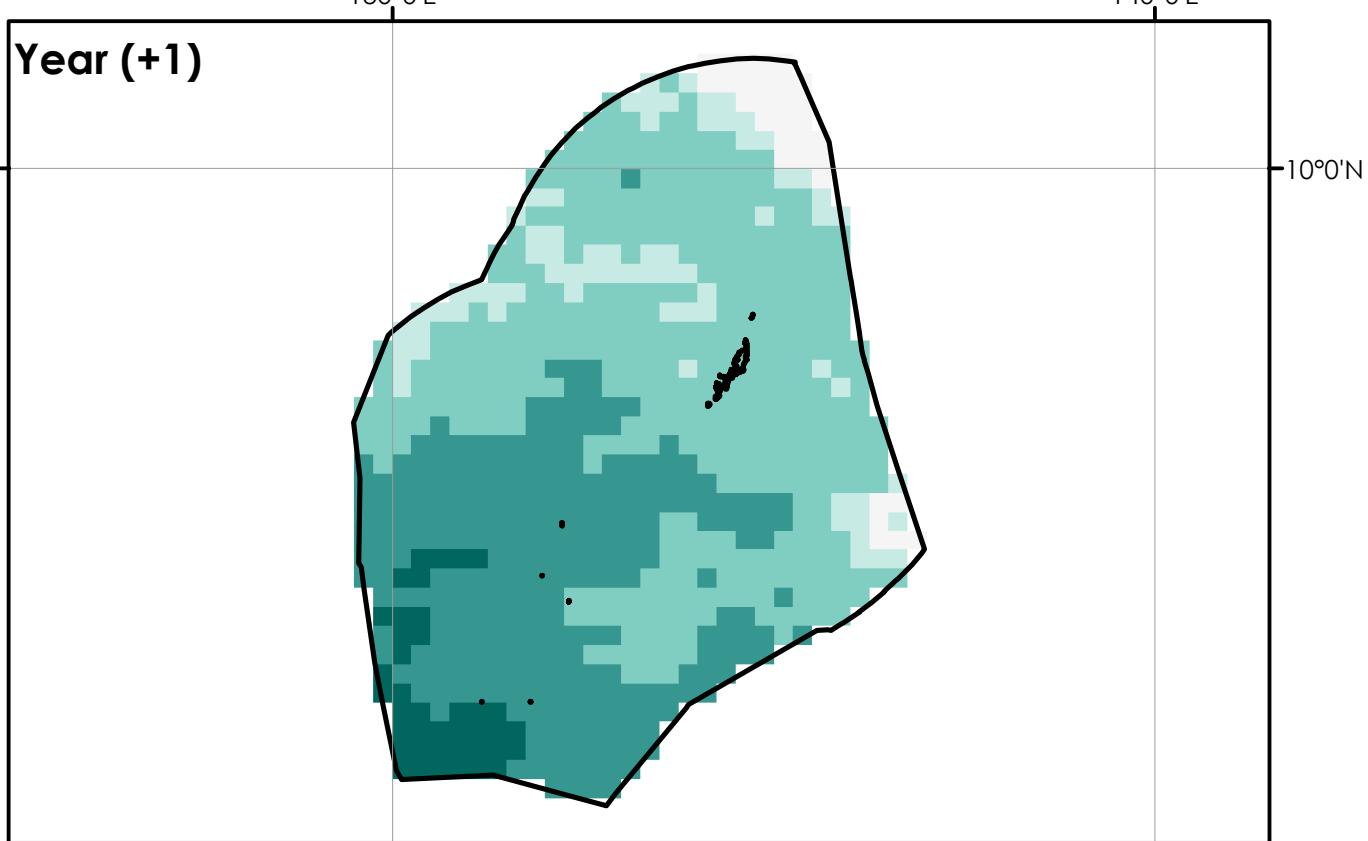
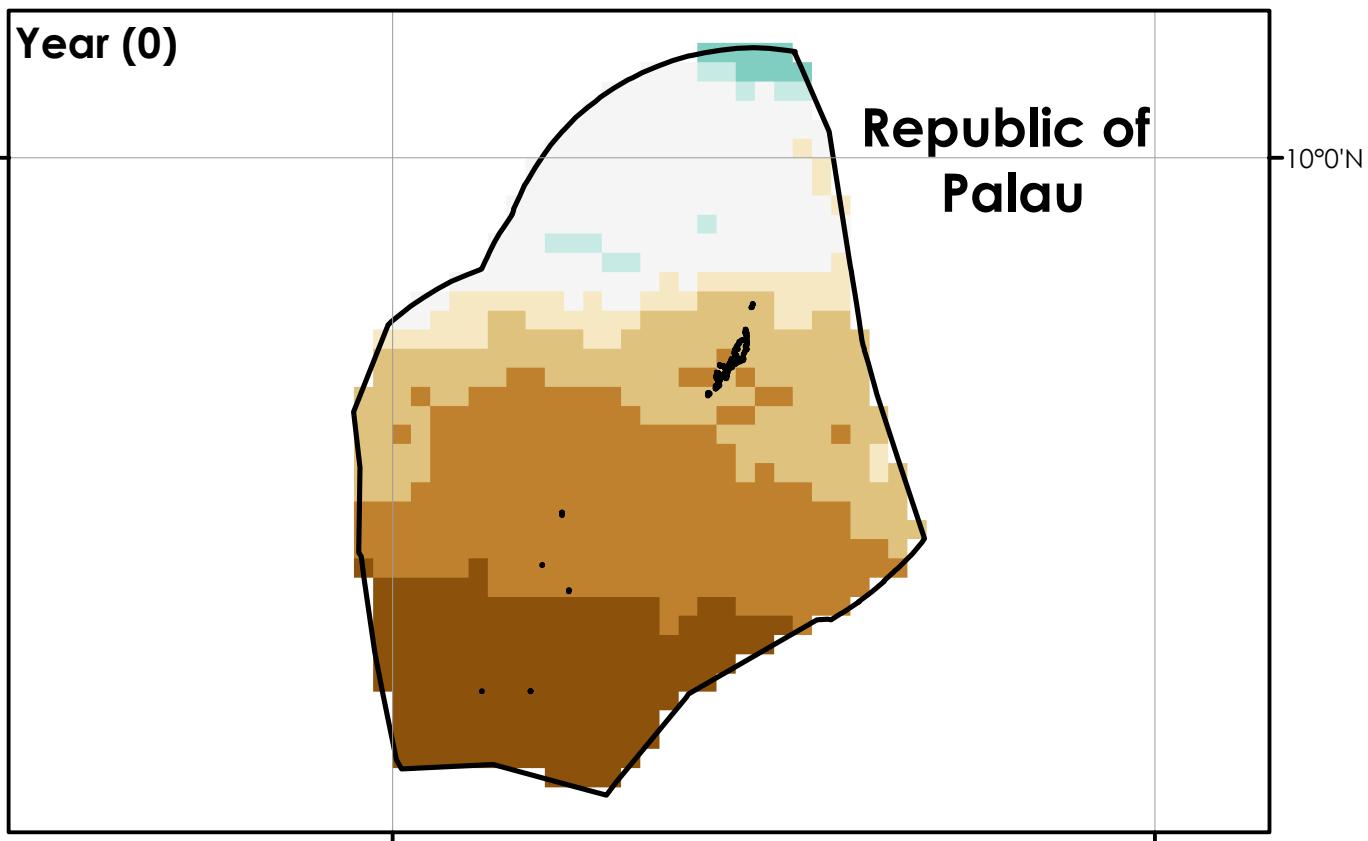


Precipitation Change (%)



Weak El Niño for ASO

415

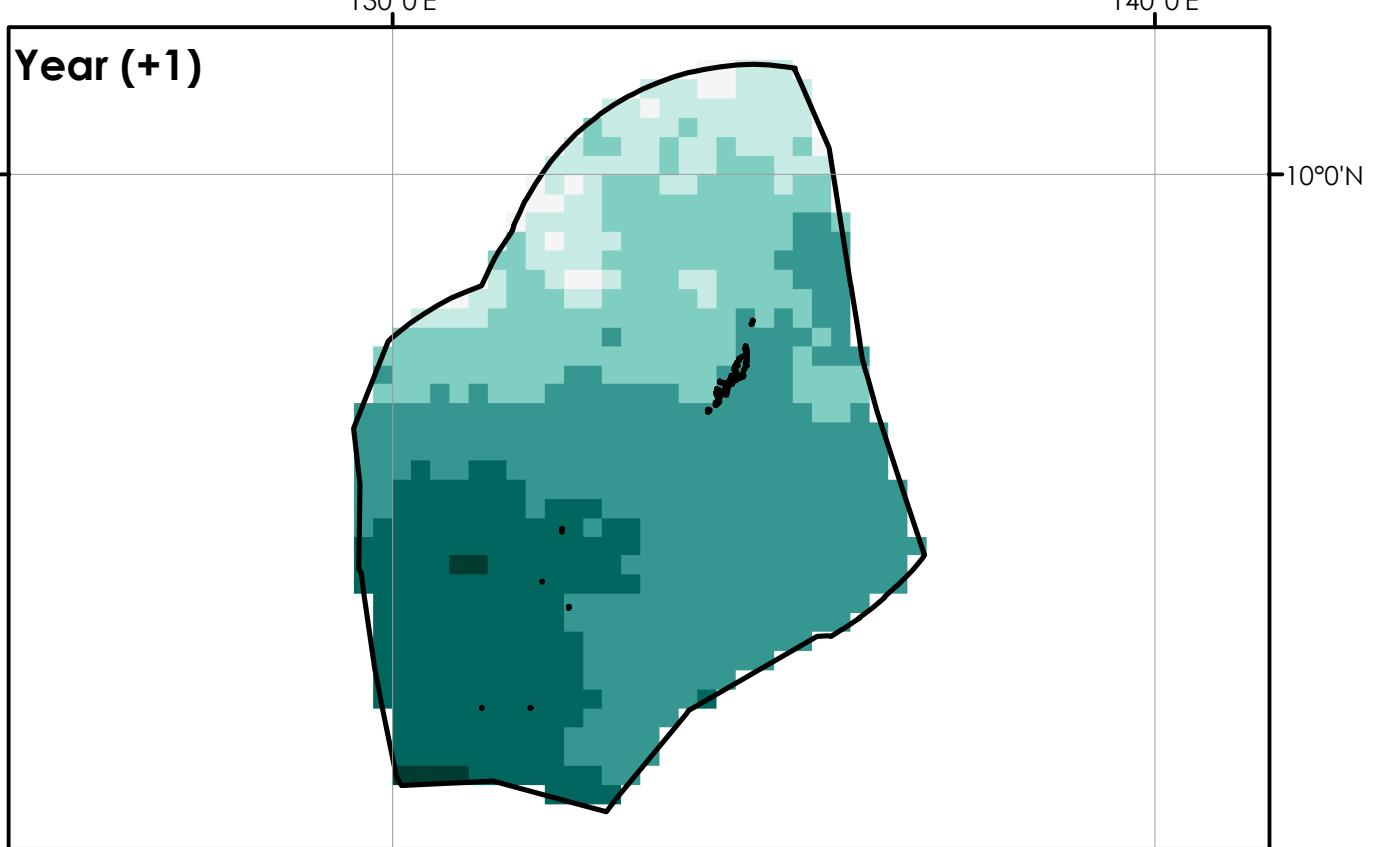
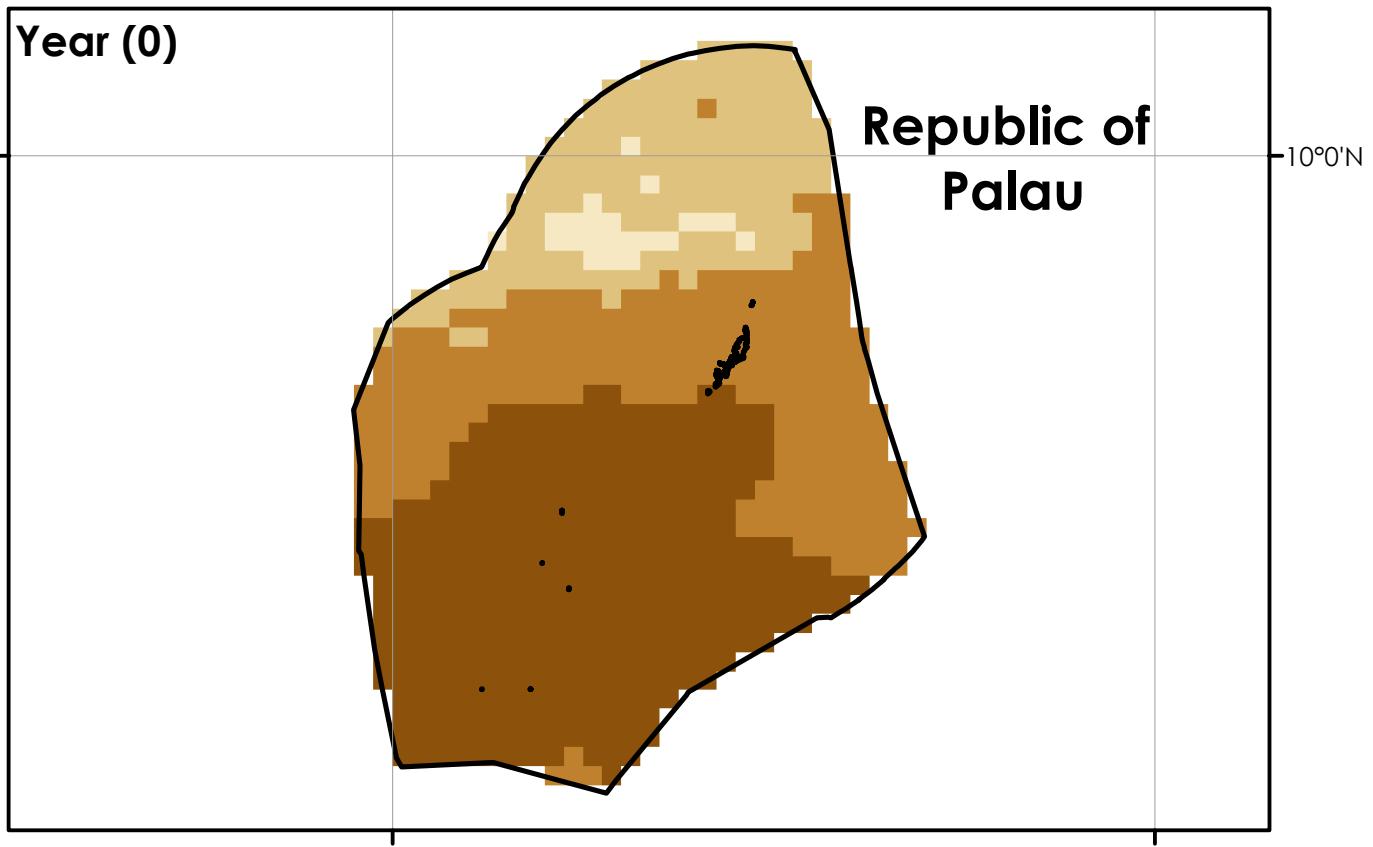


Precipitation Change (%)

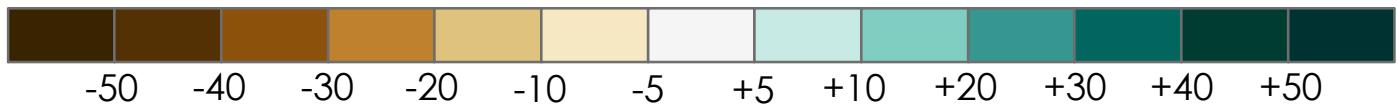


Weak El Niño for SON

416

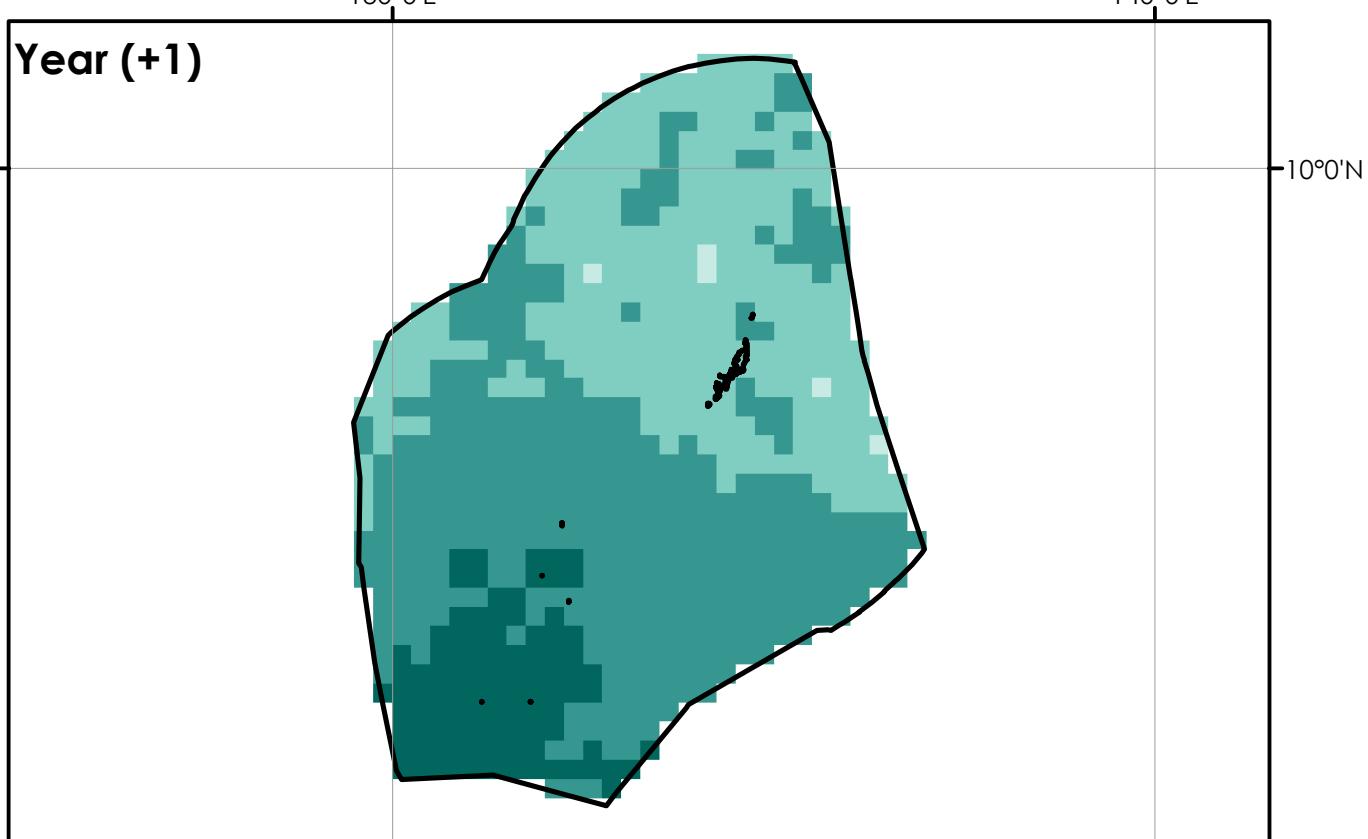
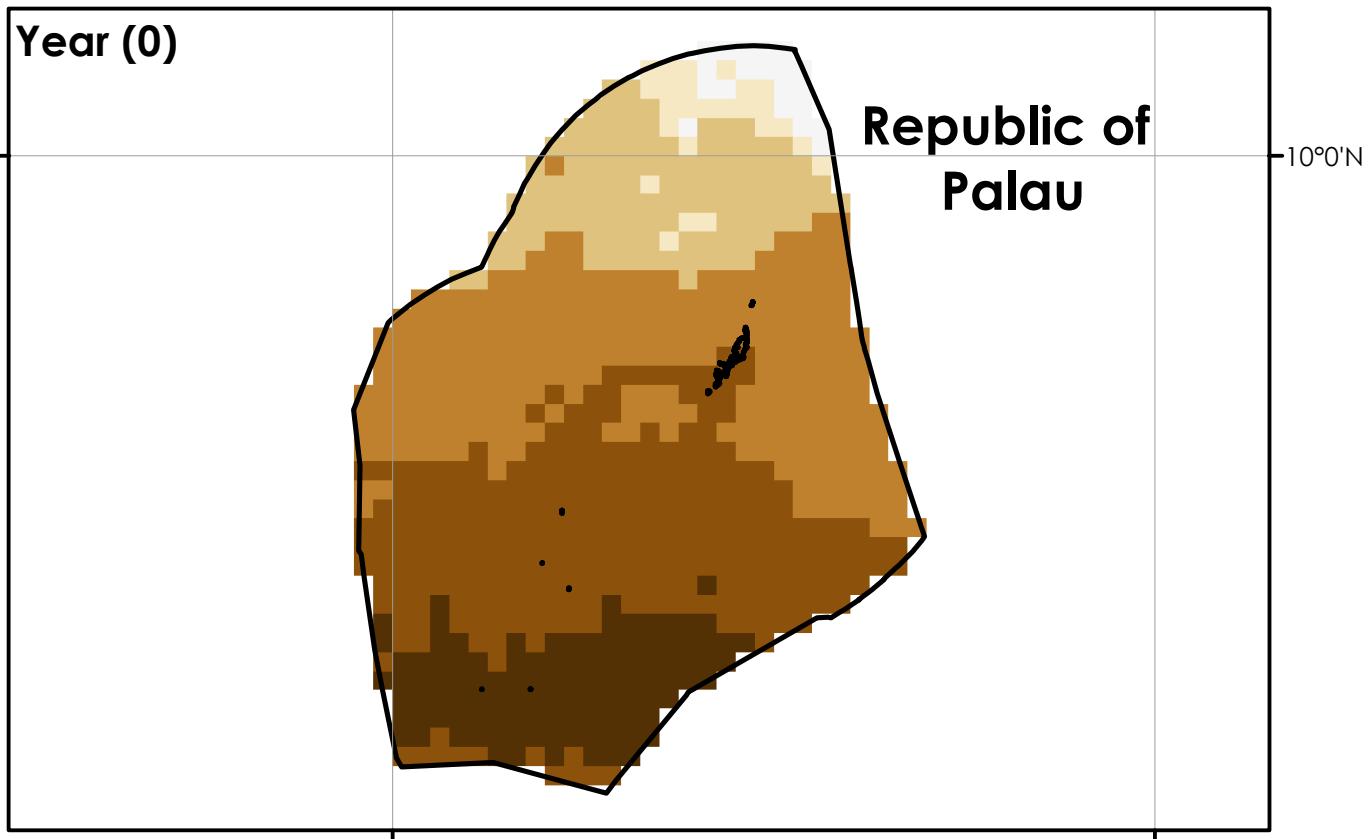


Precipitation Change (%)

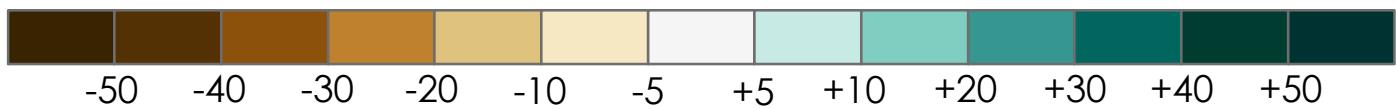


Weak El Niño for OND

417

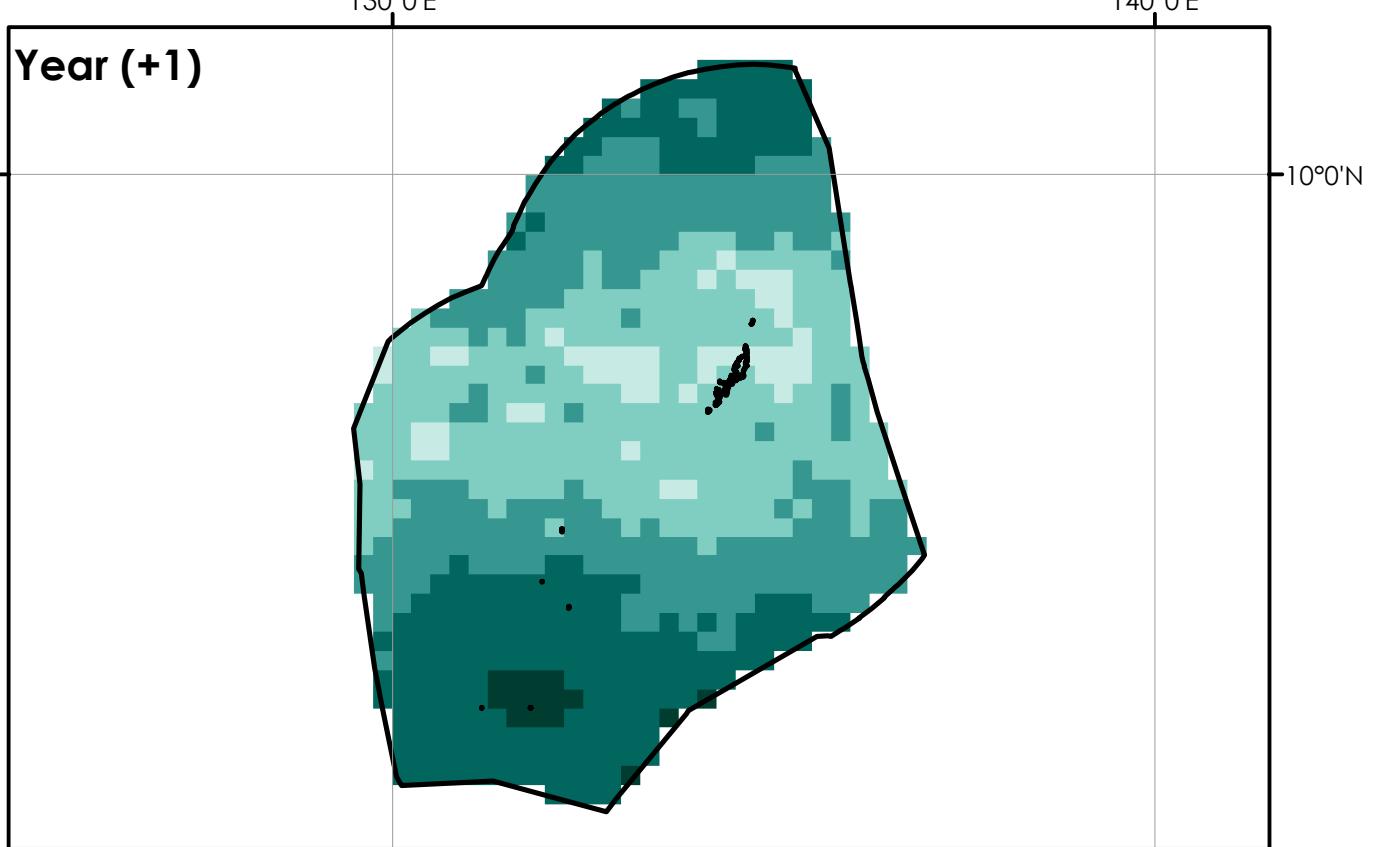
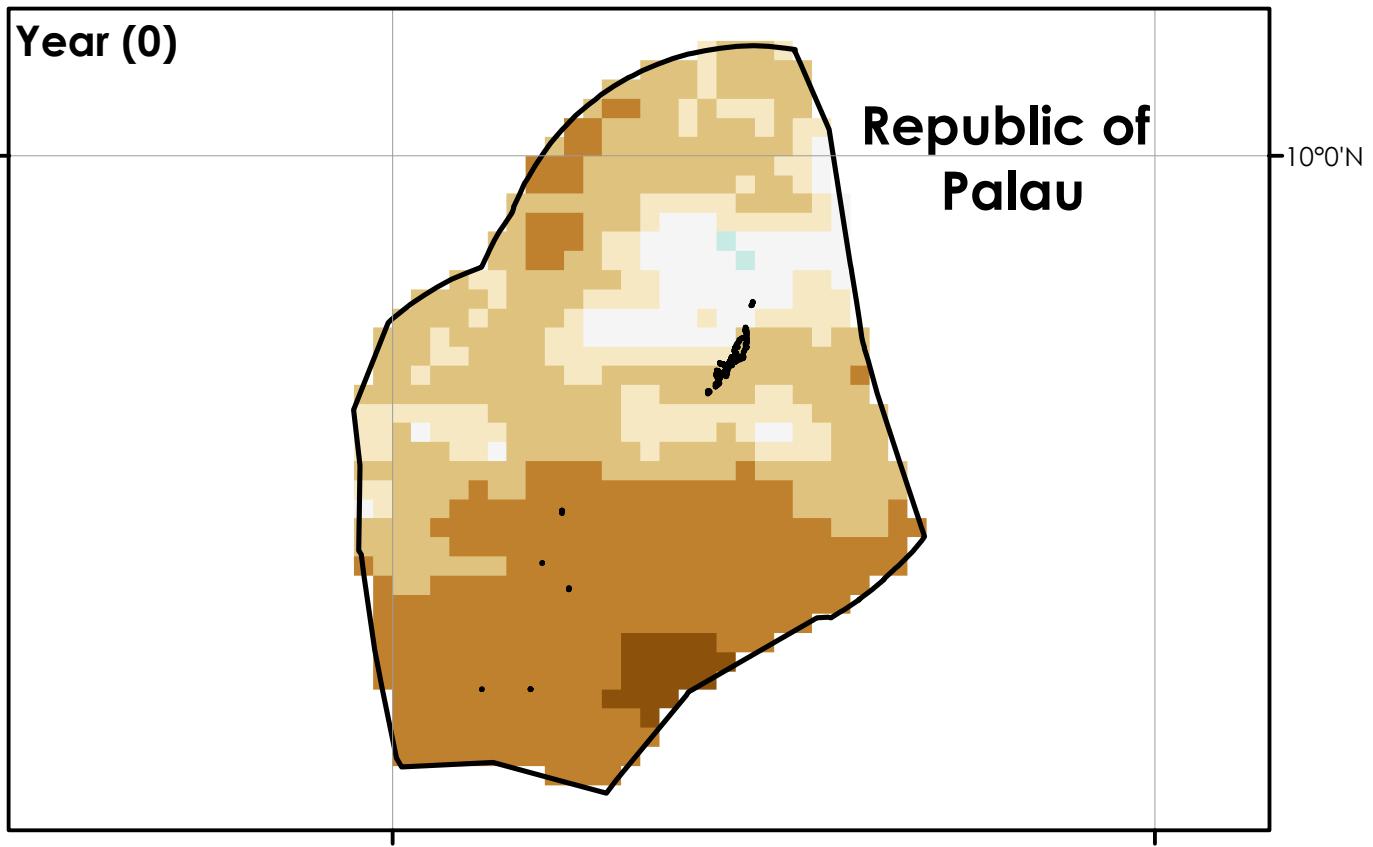


Precipitation Change (%)

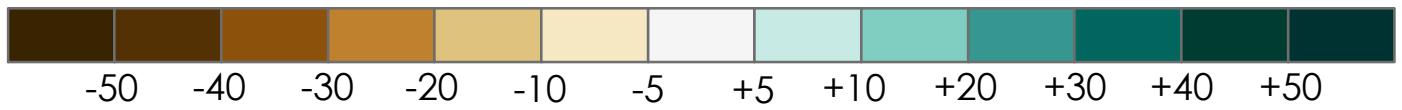


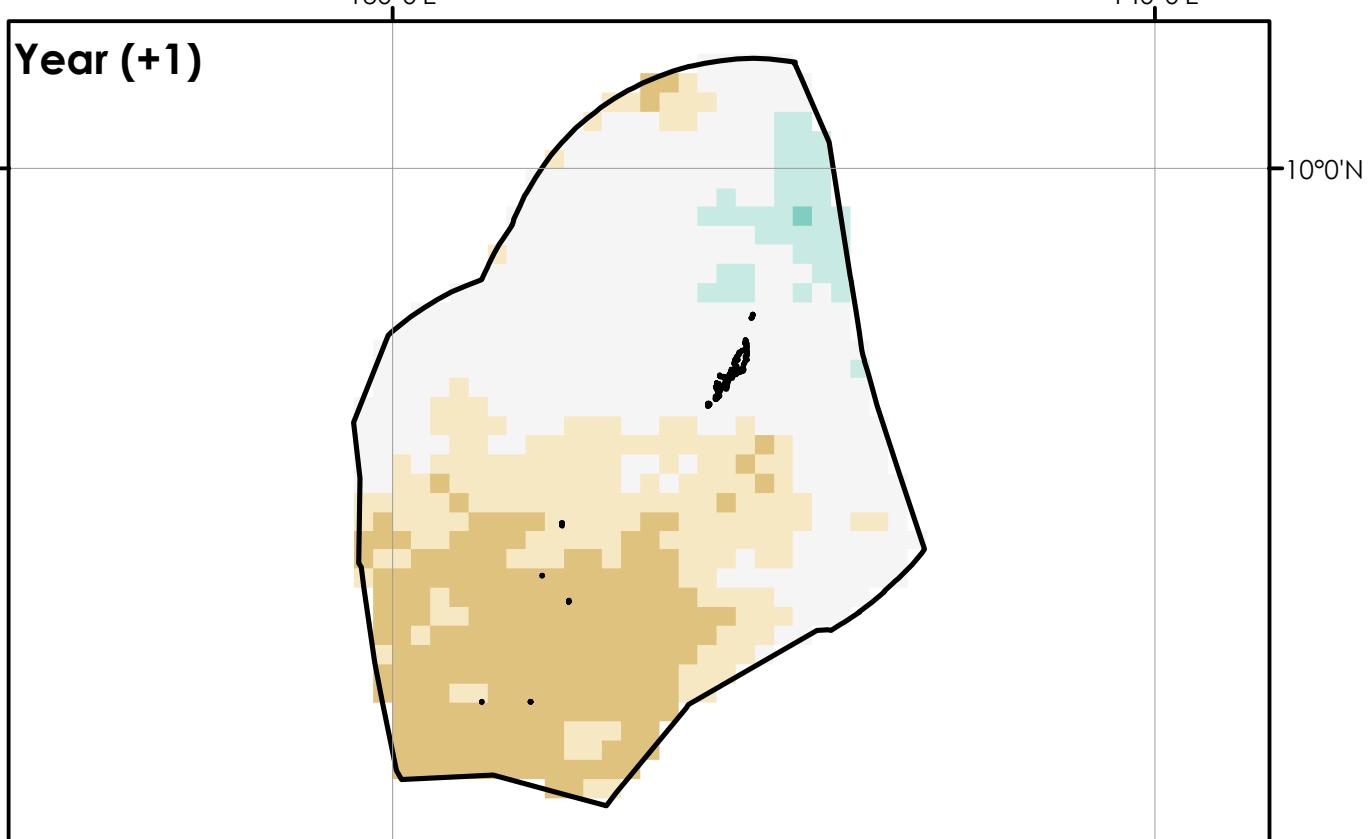
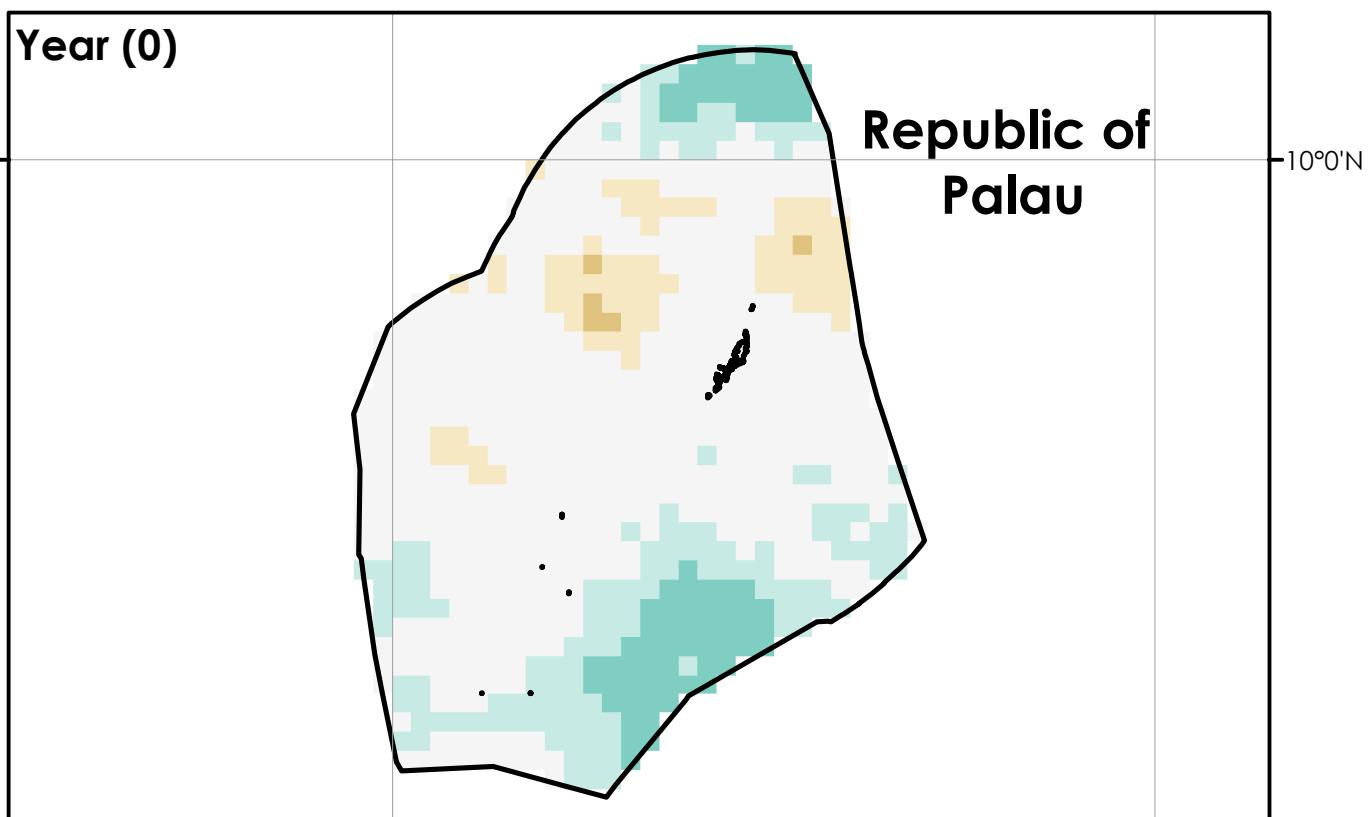
Weak El Niño for NDJ

418



Precipitation Change (%)



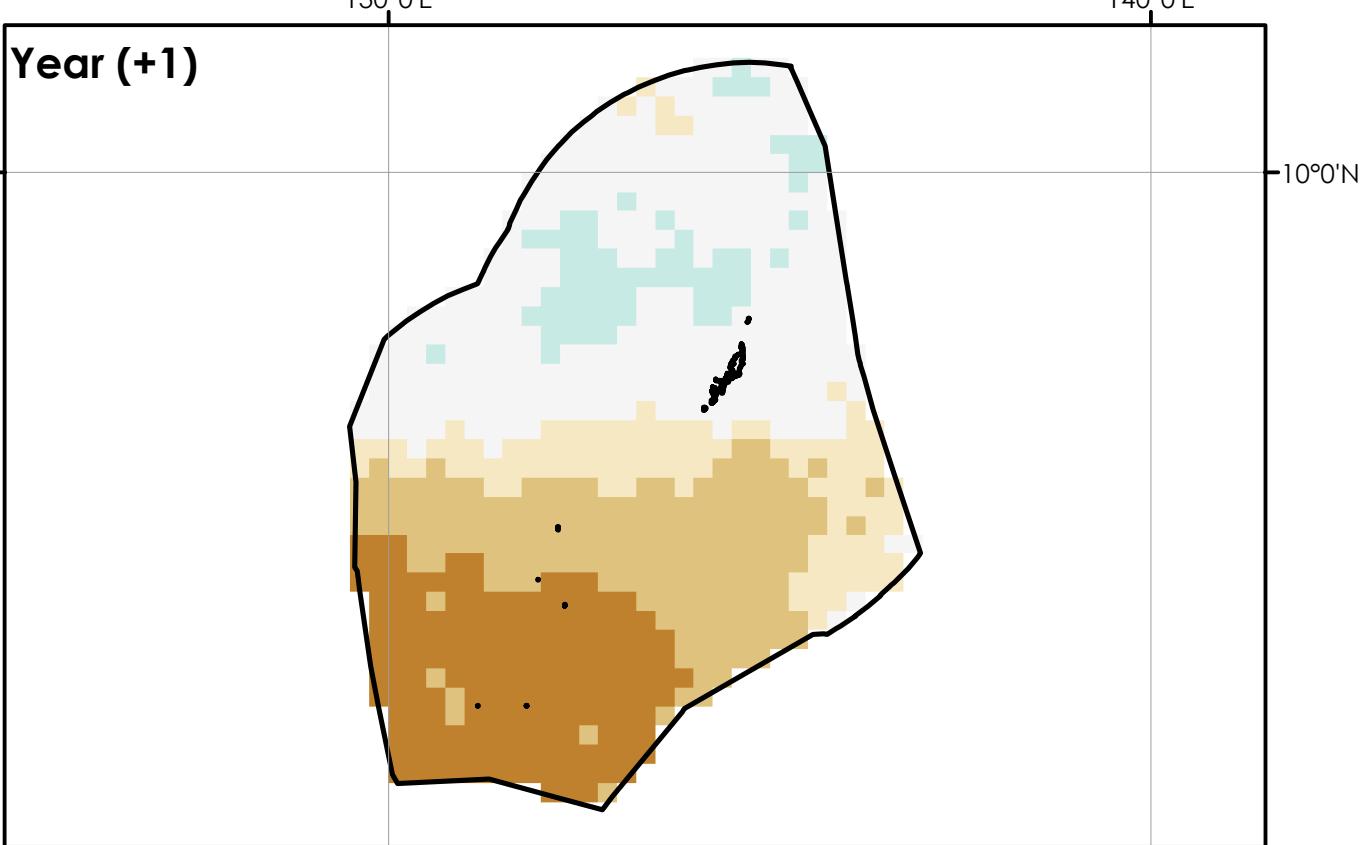
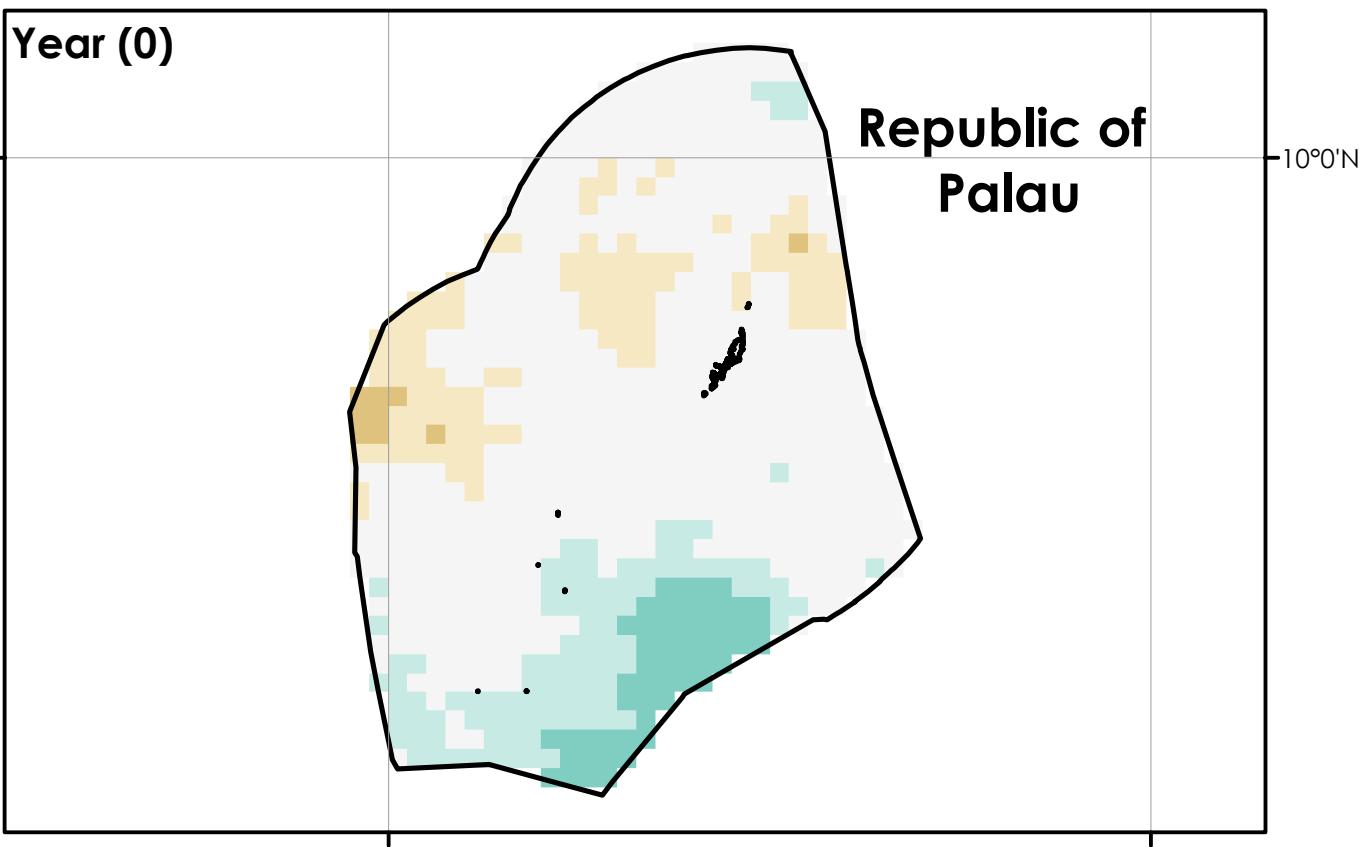


Precipitation Change (%)

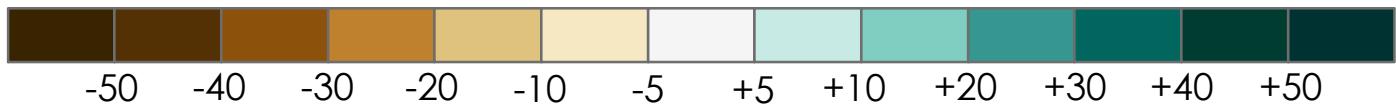


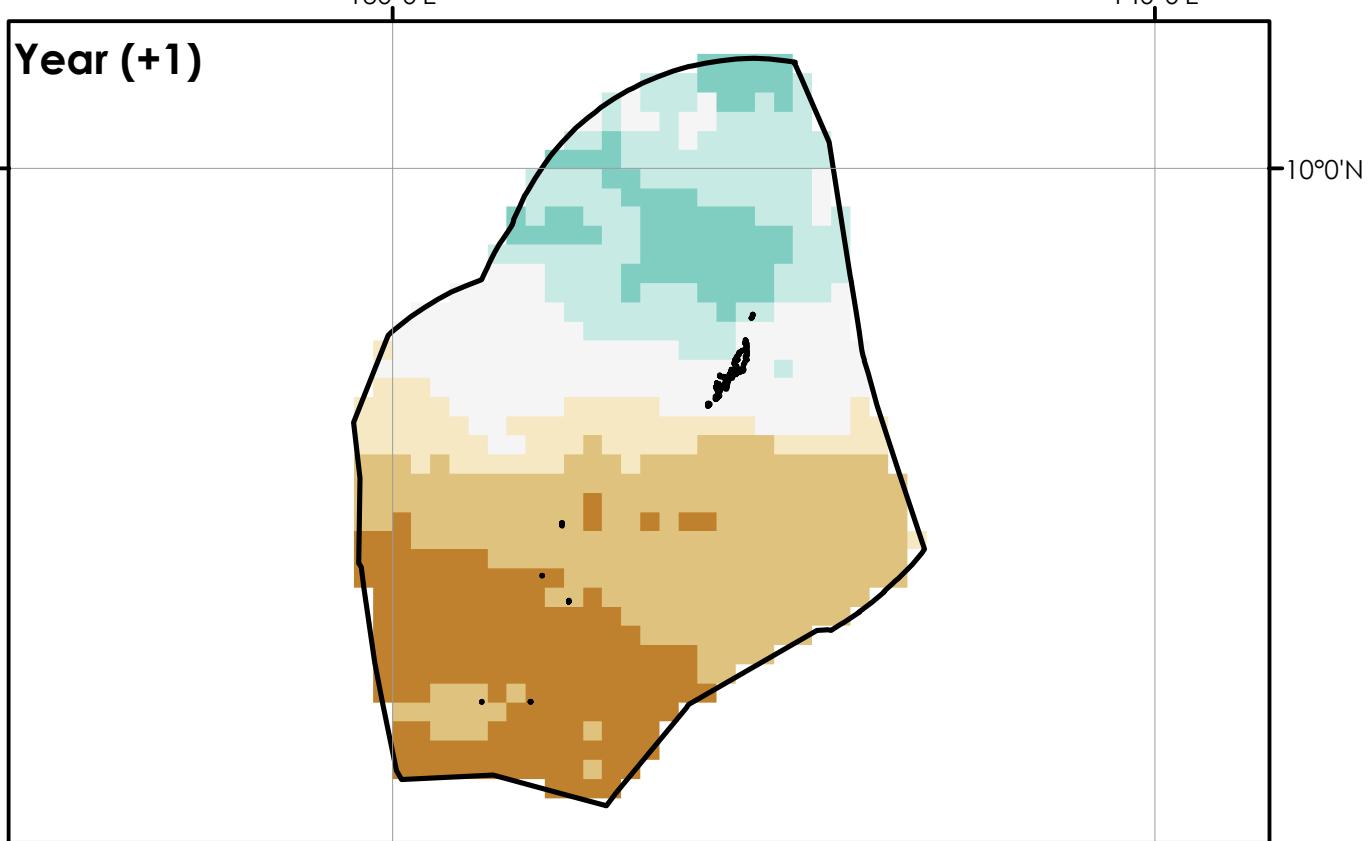
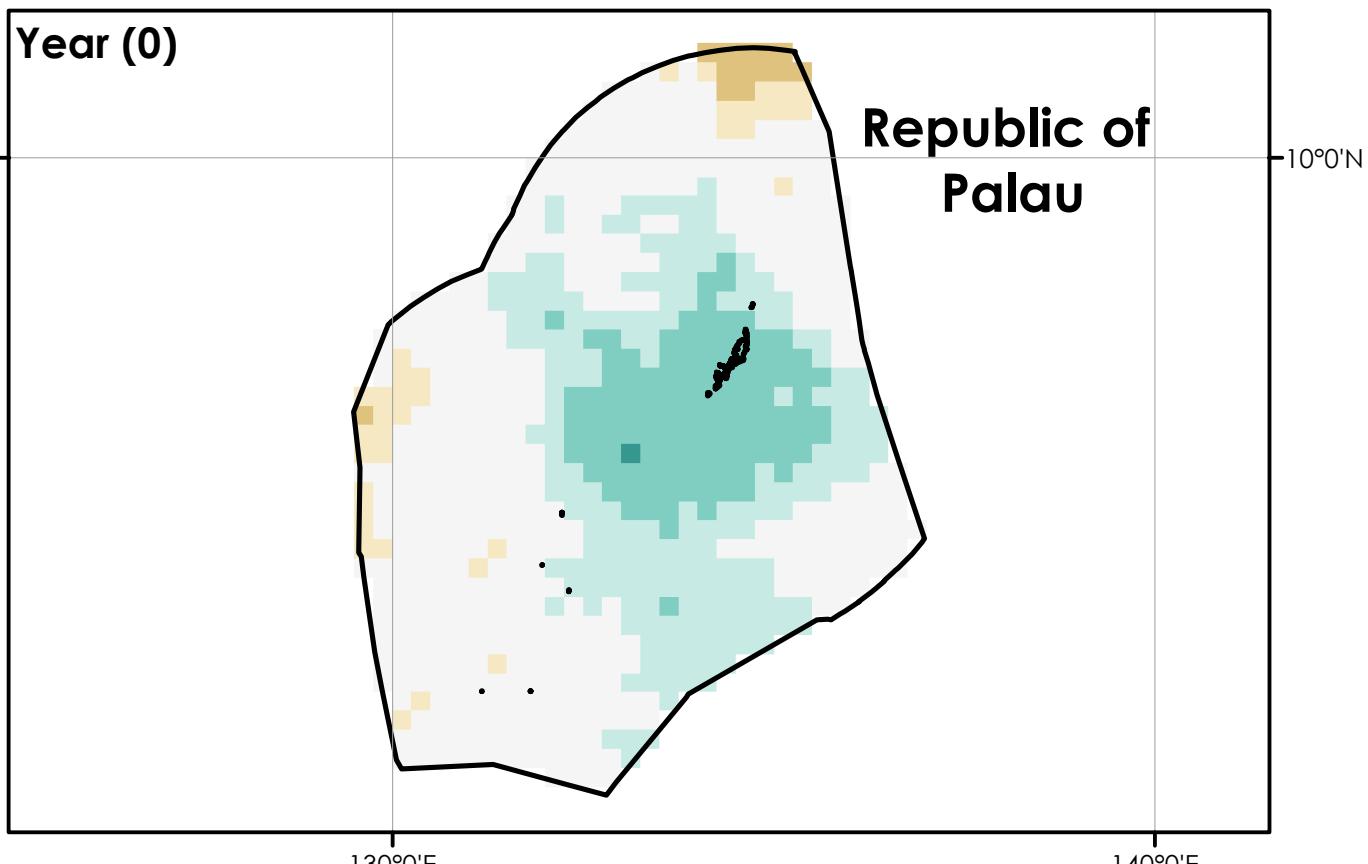
Neutral for JFM

420

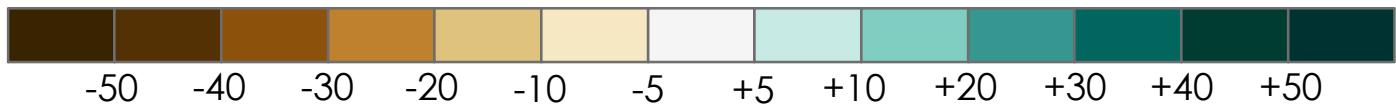


Precipitation Change (%)



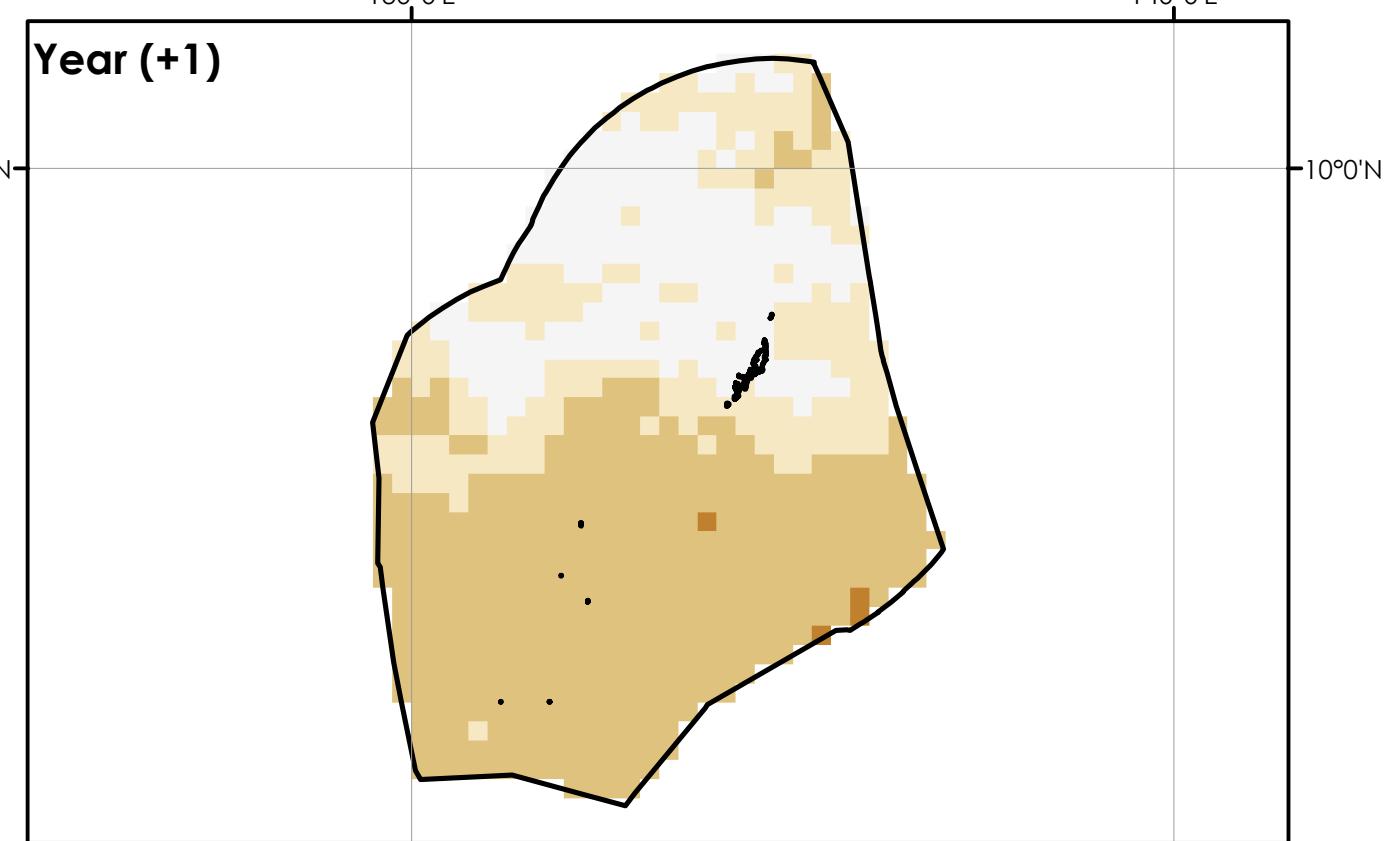
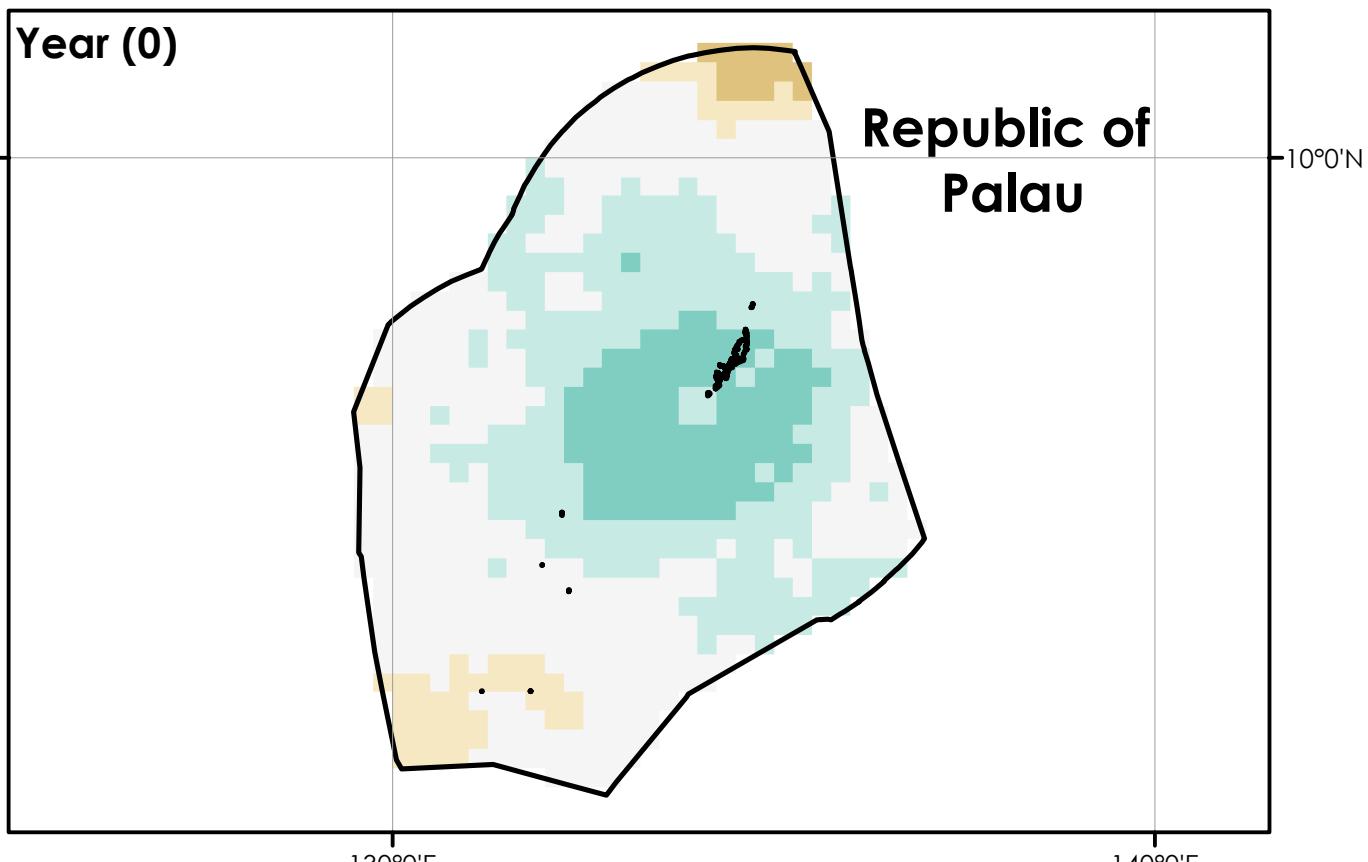


Precipitation Change (%)



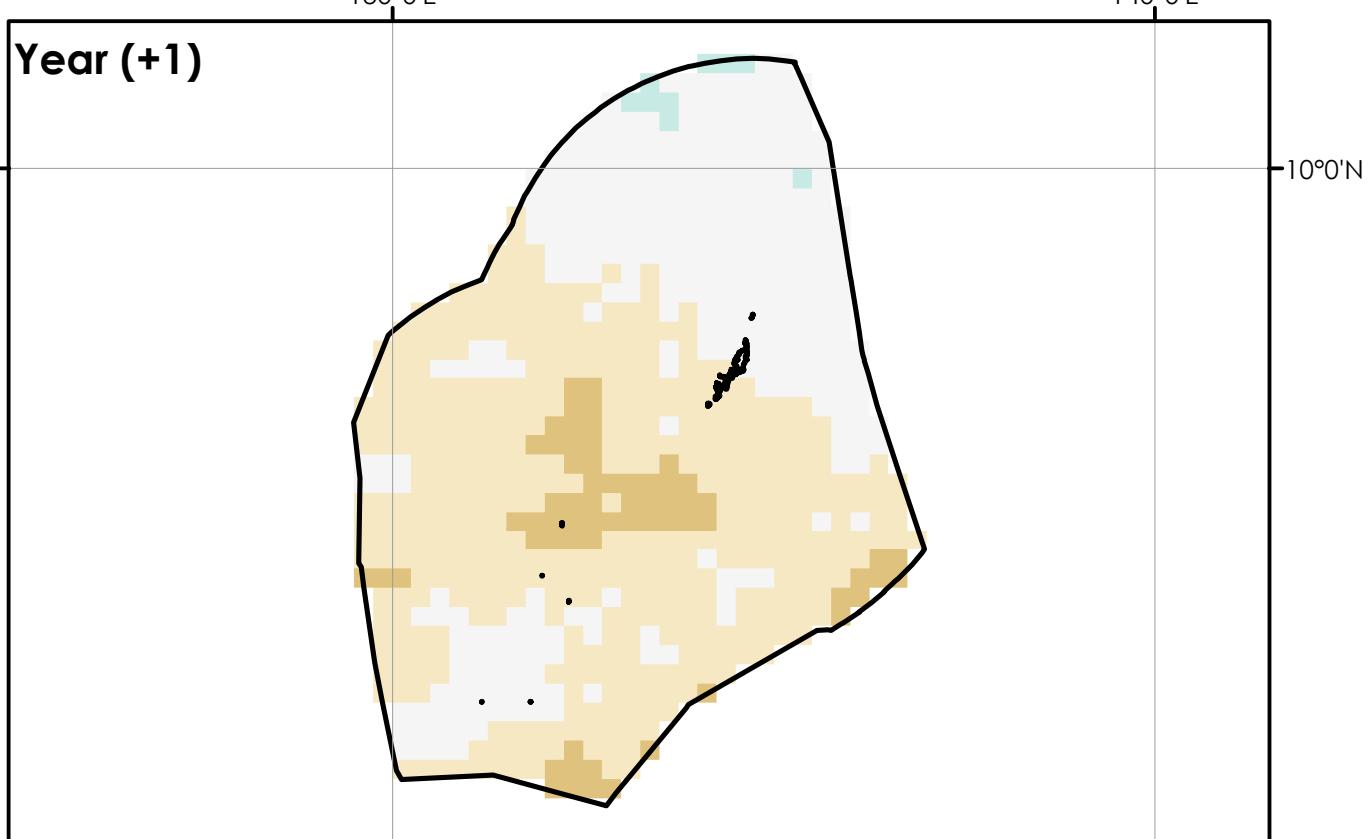
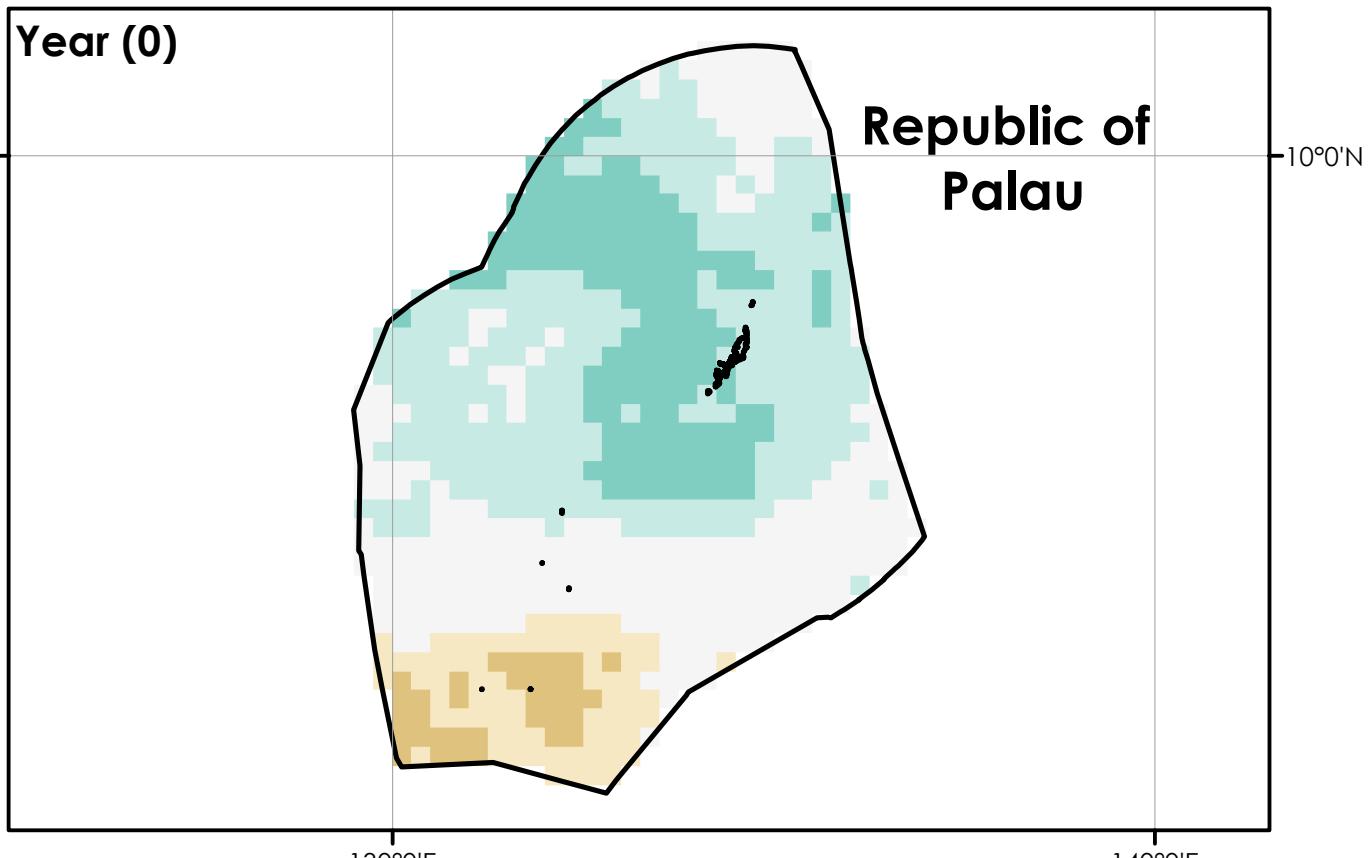
Neutral for MAM

422



Precipitation Change (%)



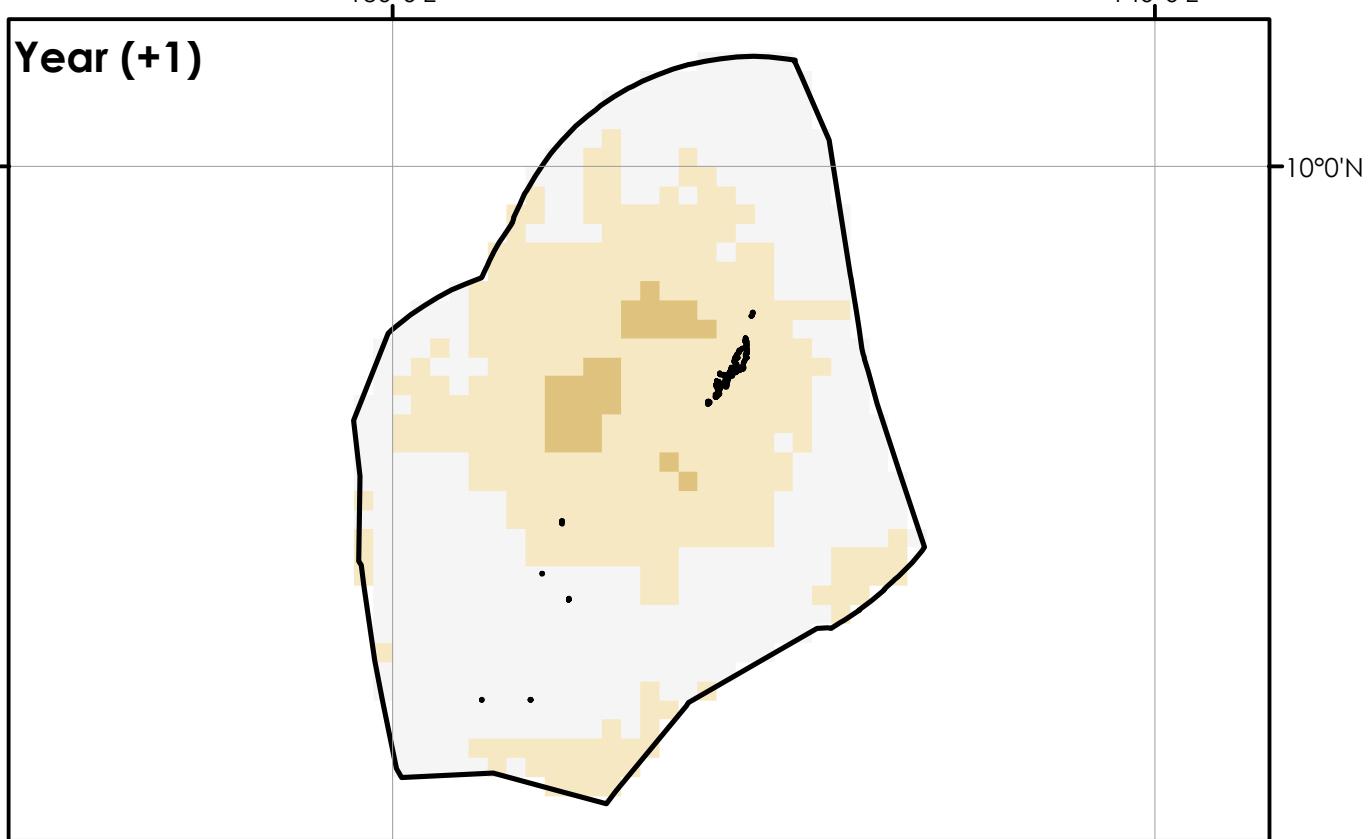
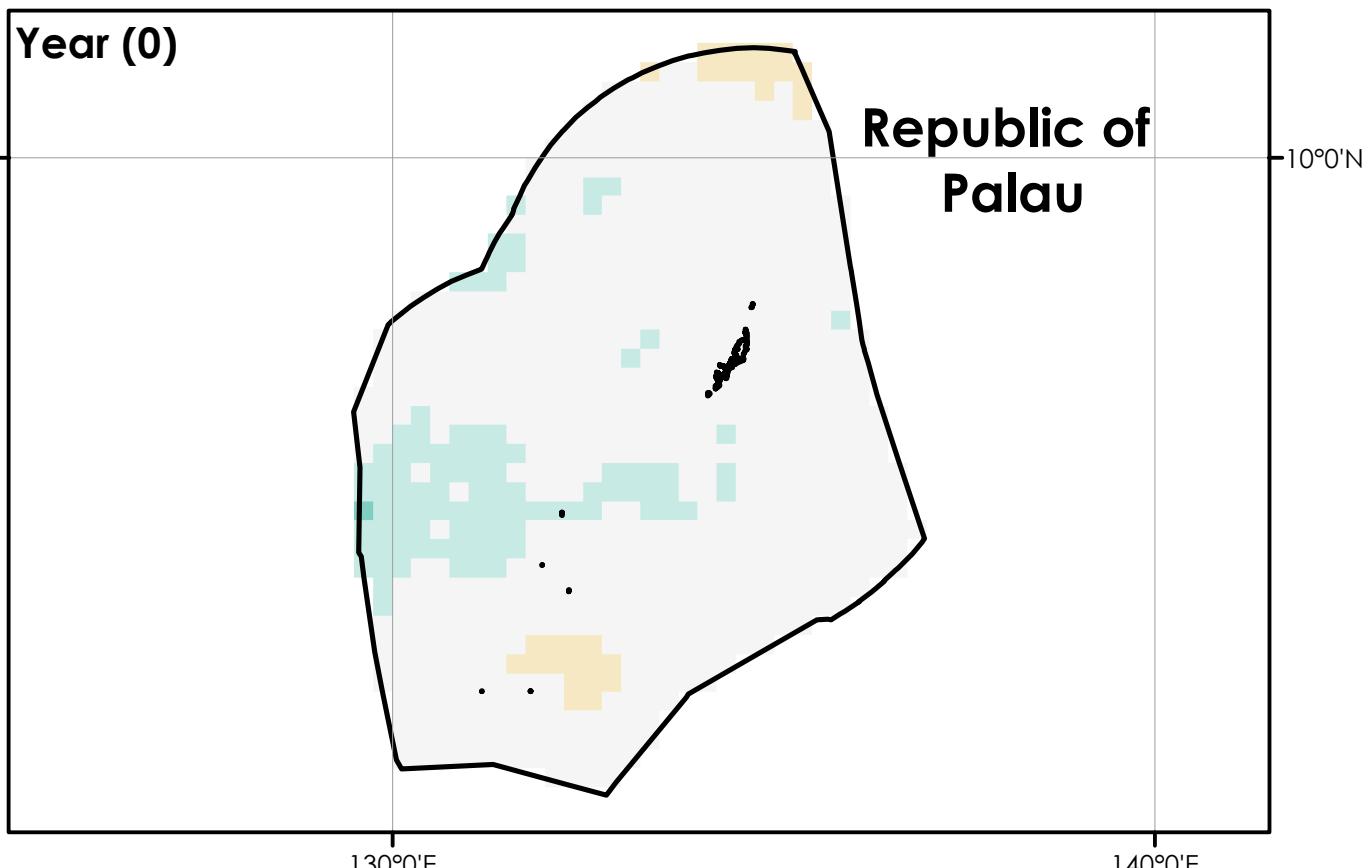


Precipitation Change (%)

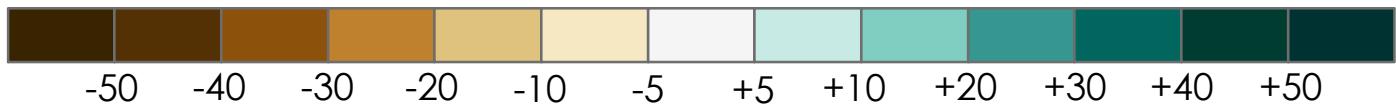


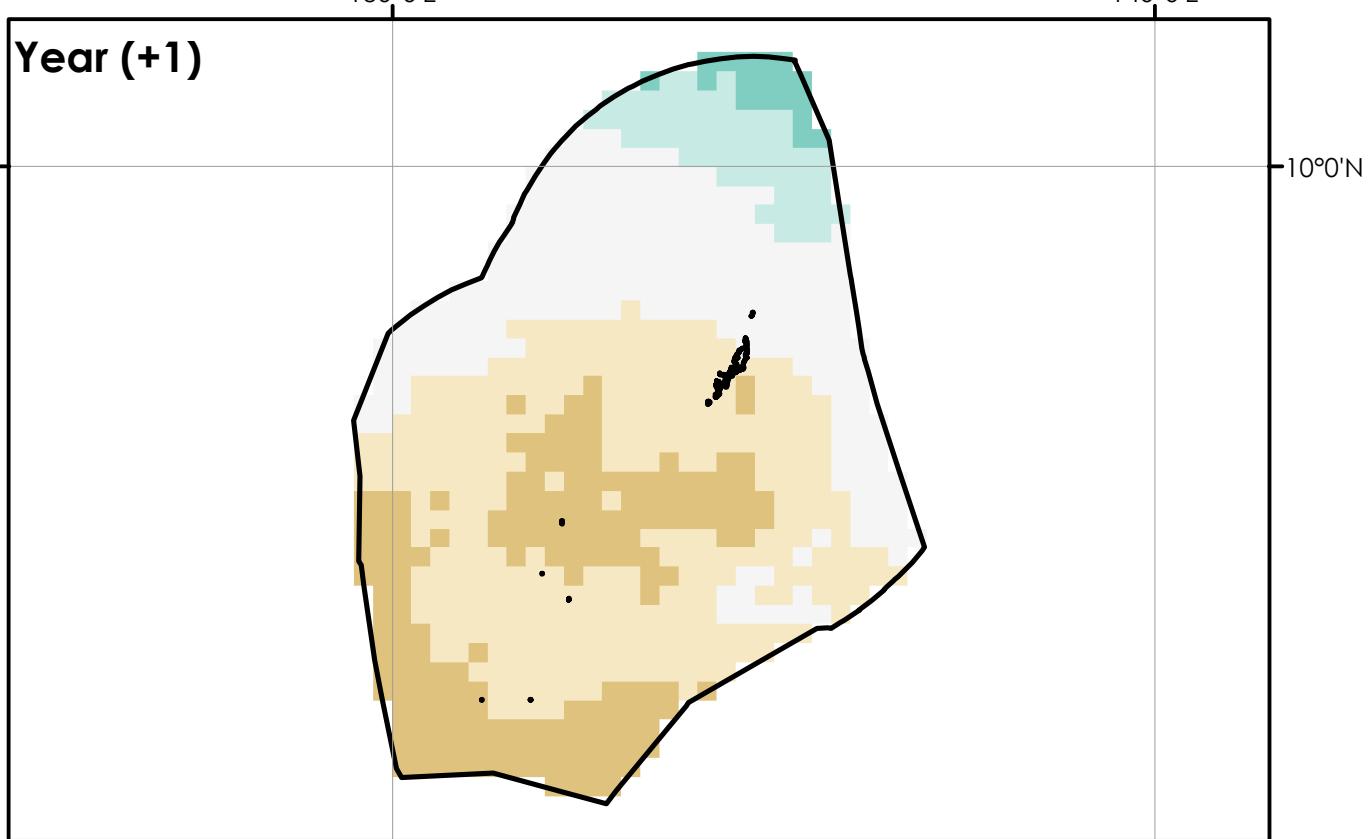
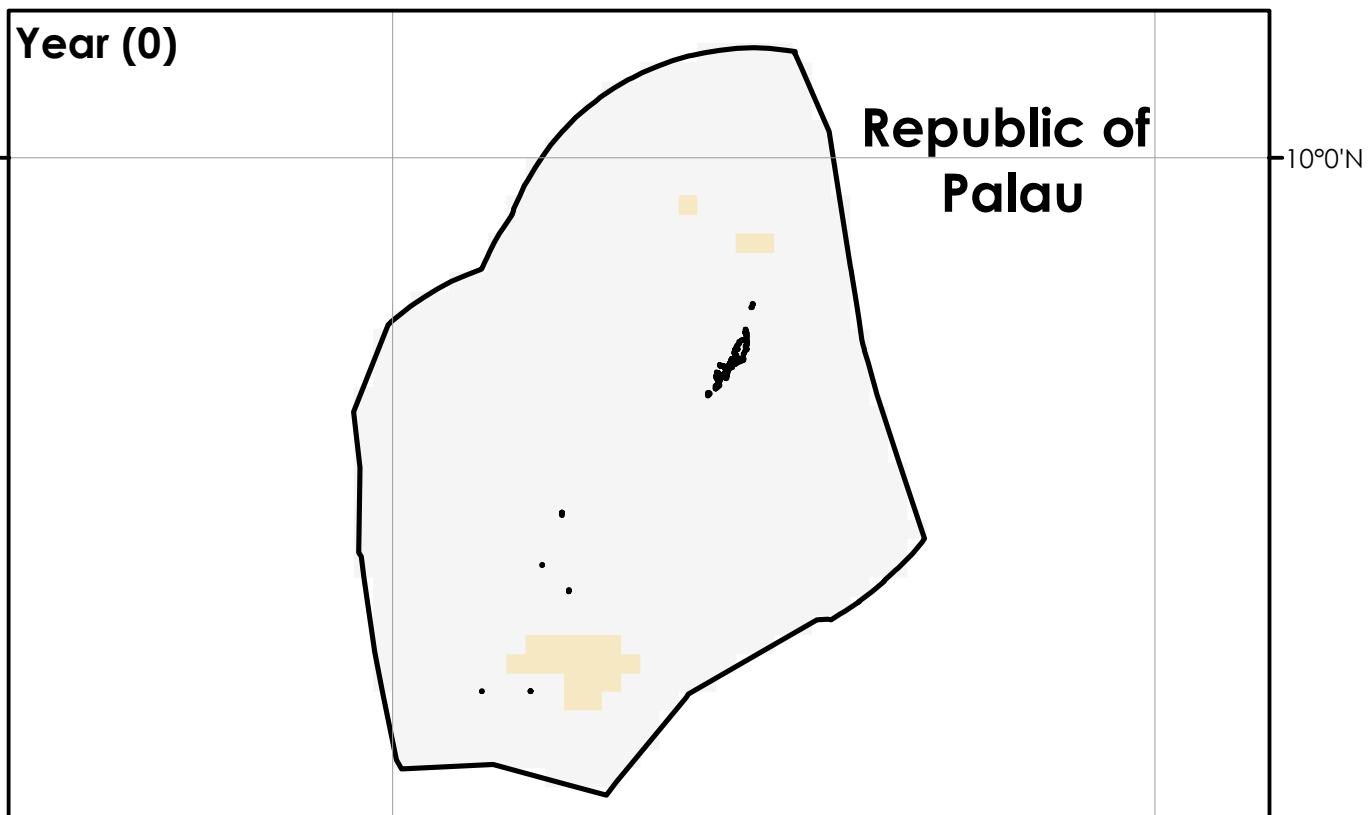
Neutral for MJJ

424



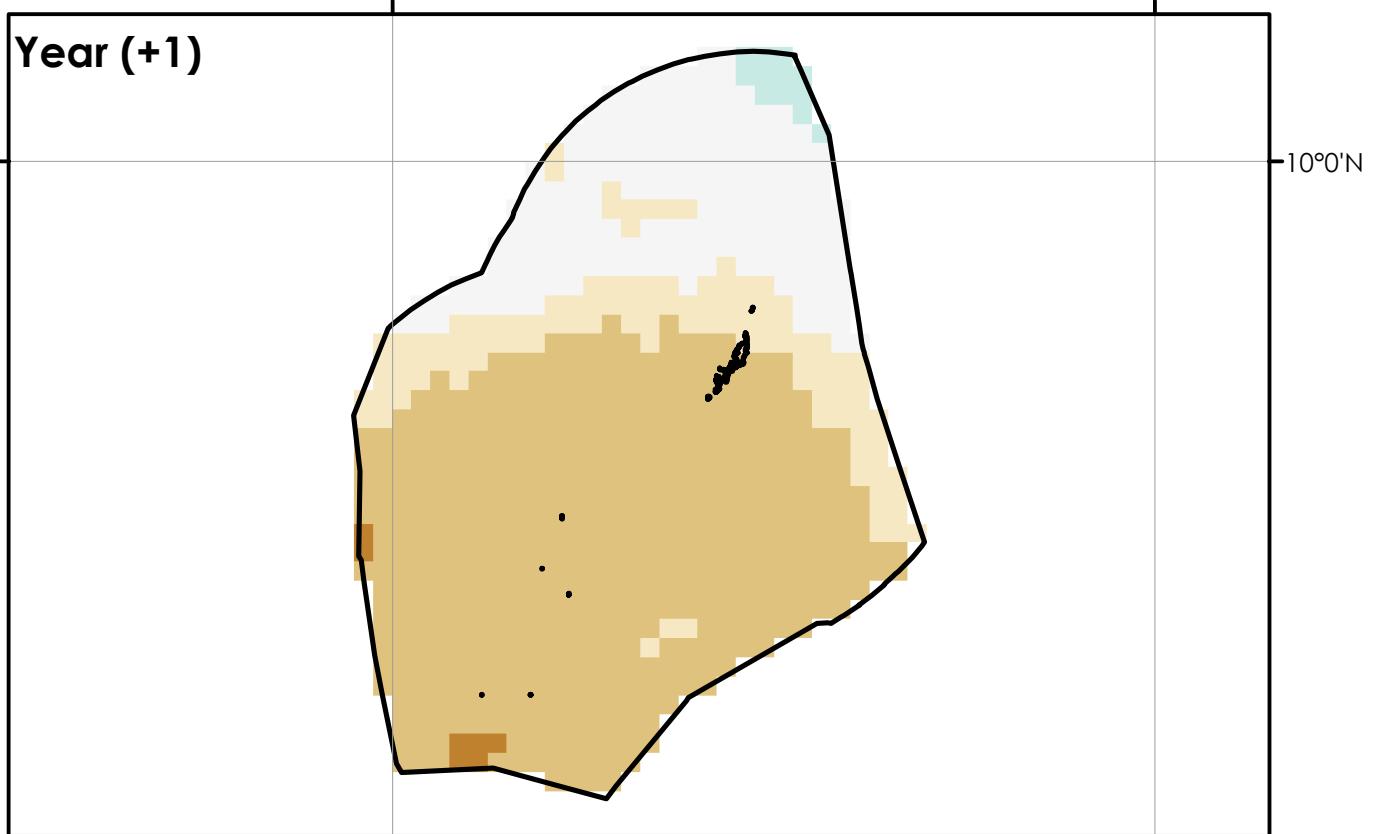
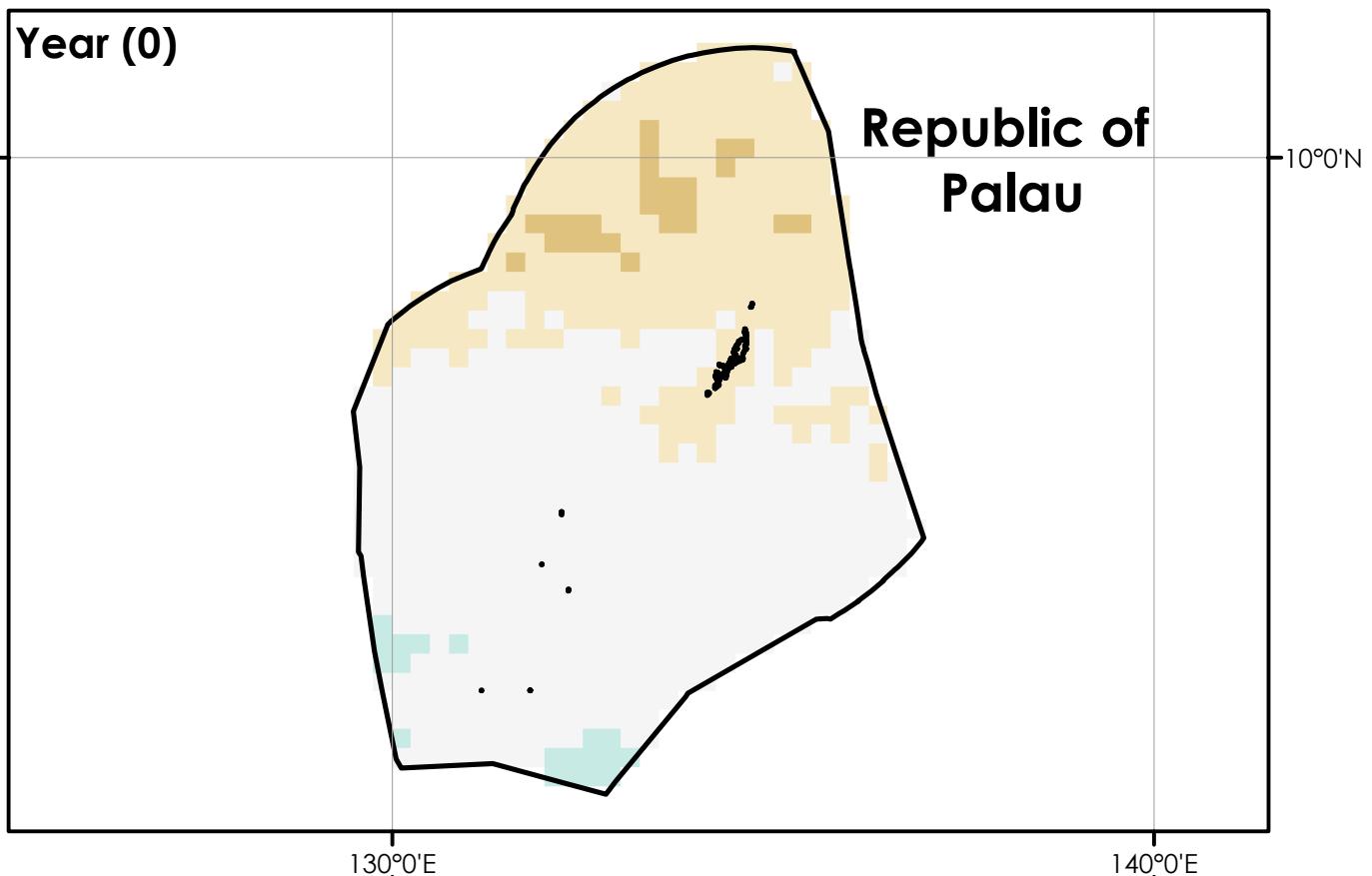
Precipitation Change (%)





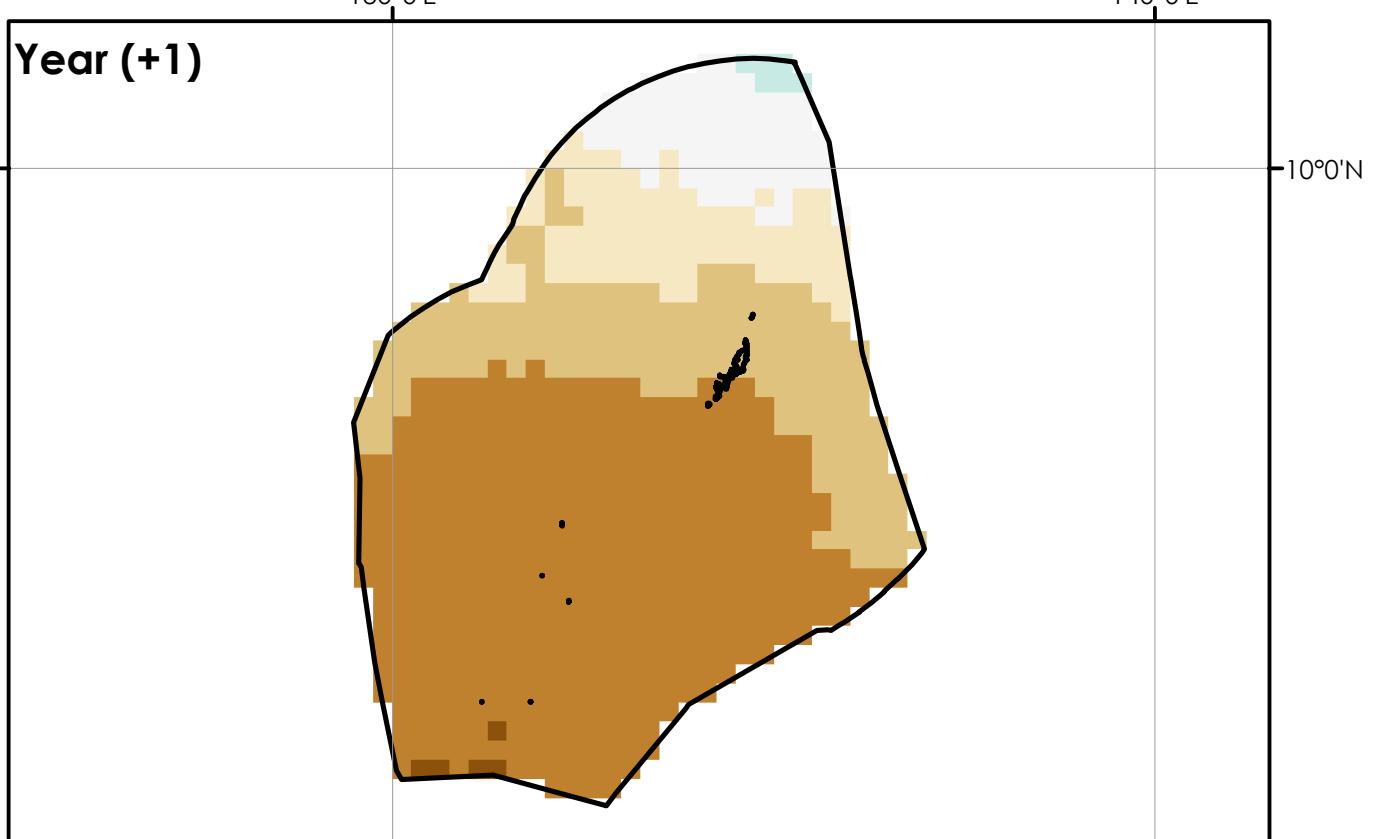
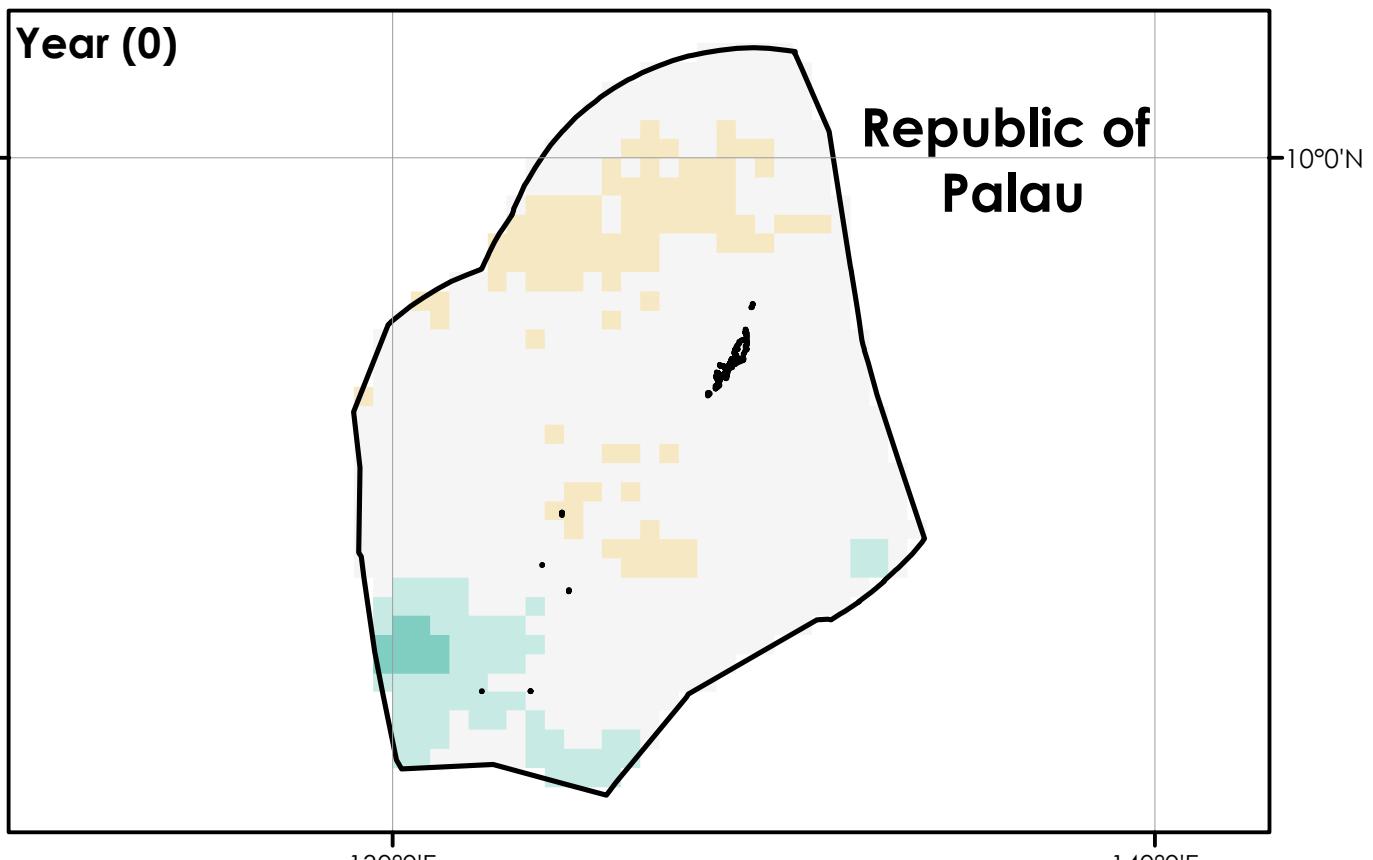
Precipitation Change (%)





Precipitation Change (%)



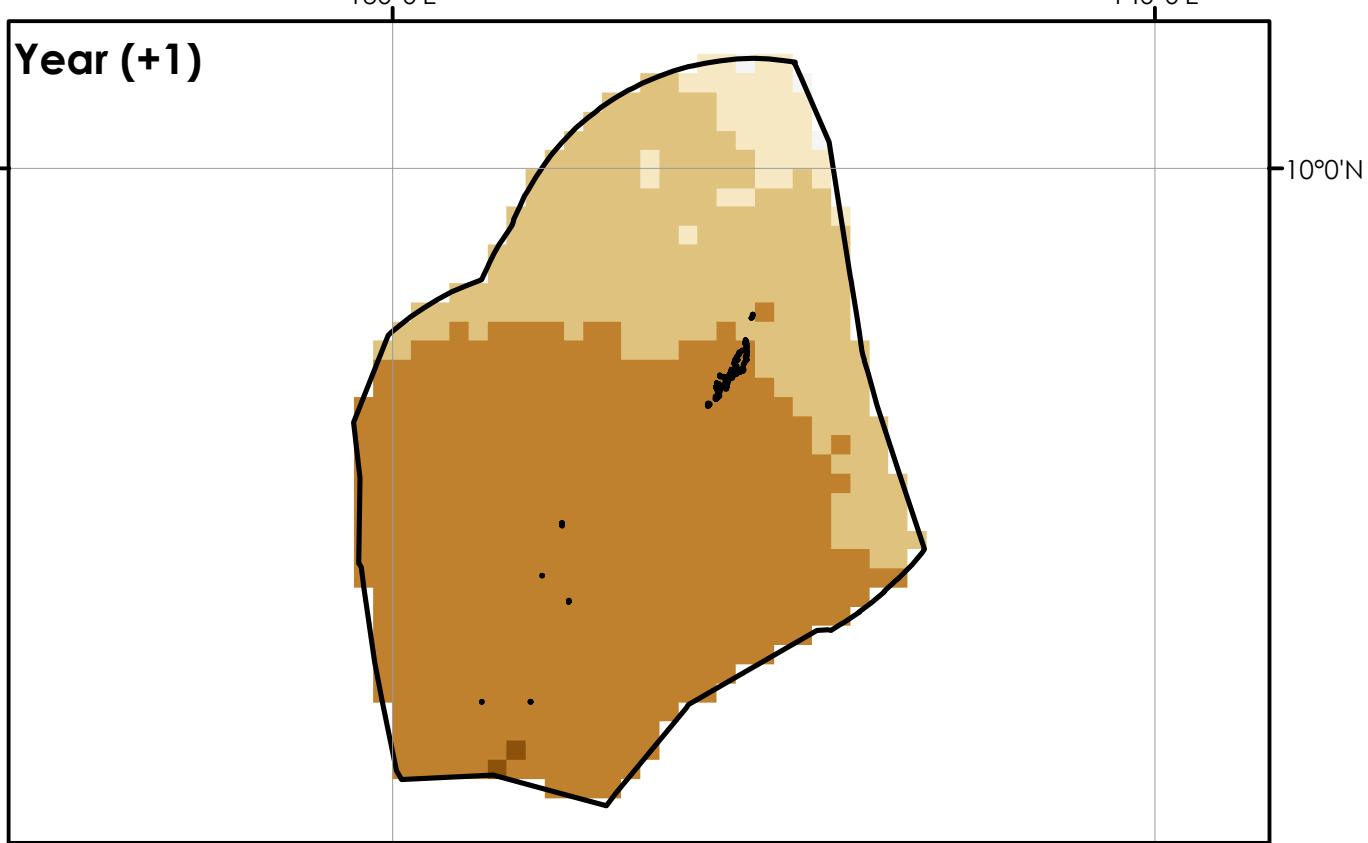
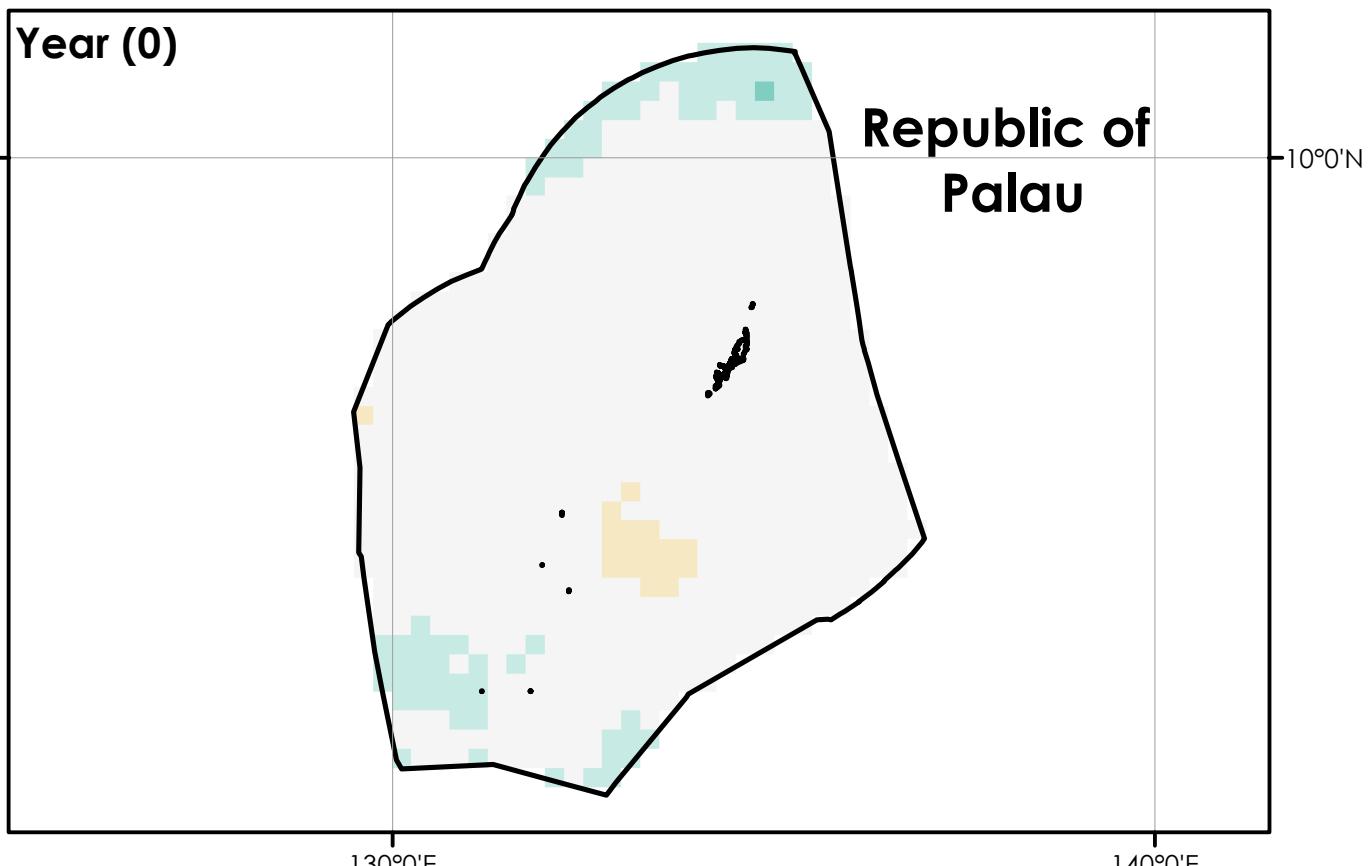


Precipitation Change (%)

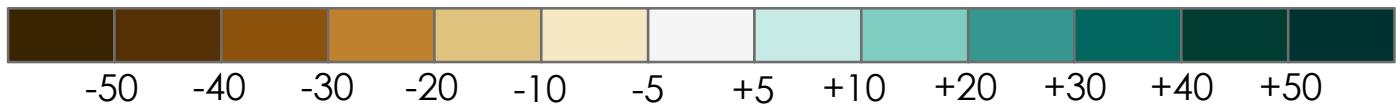


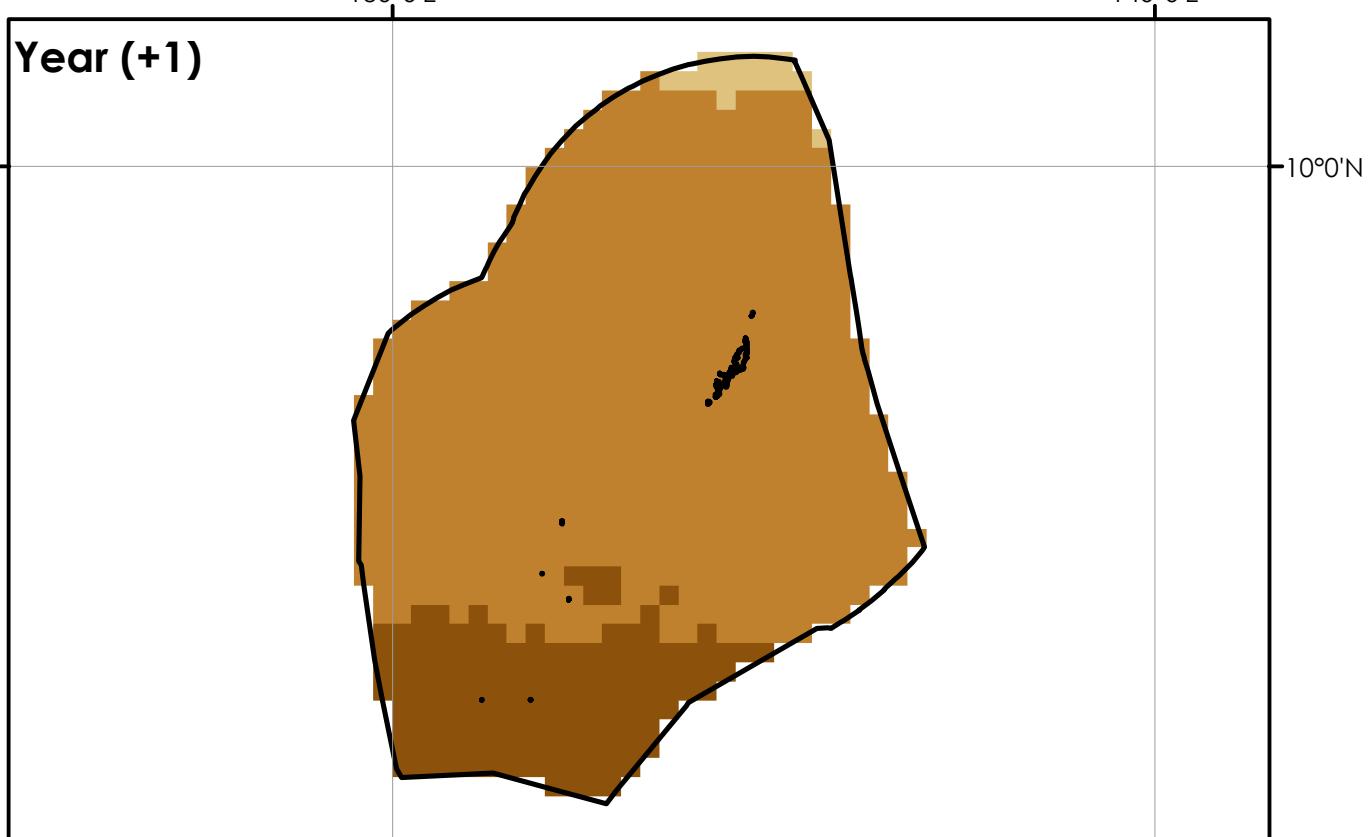
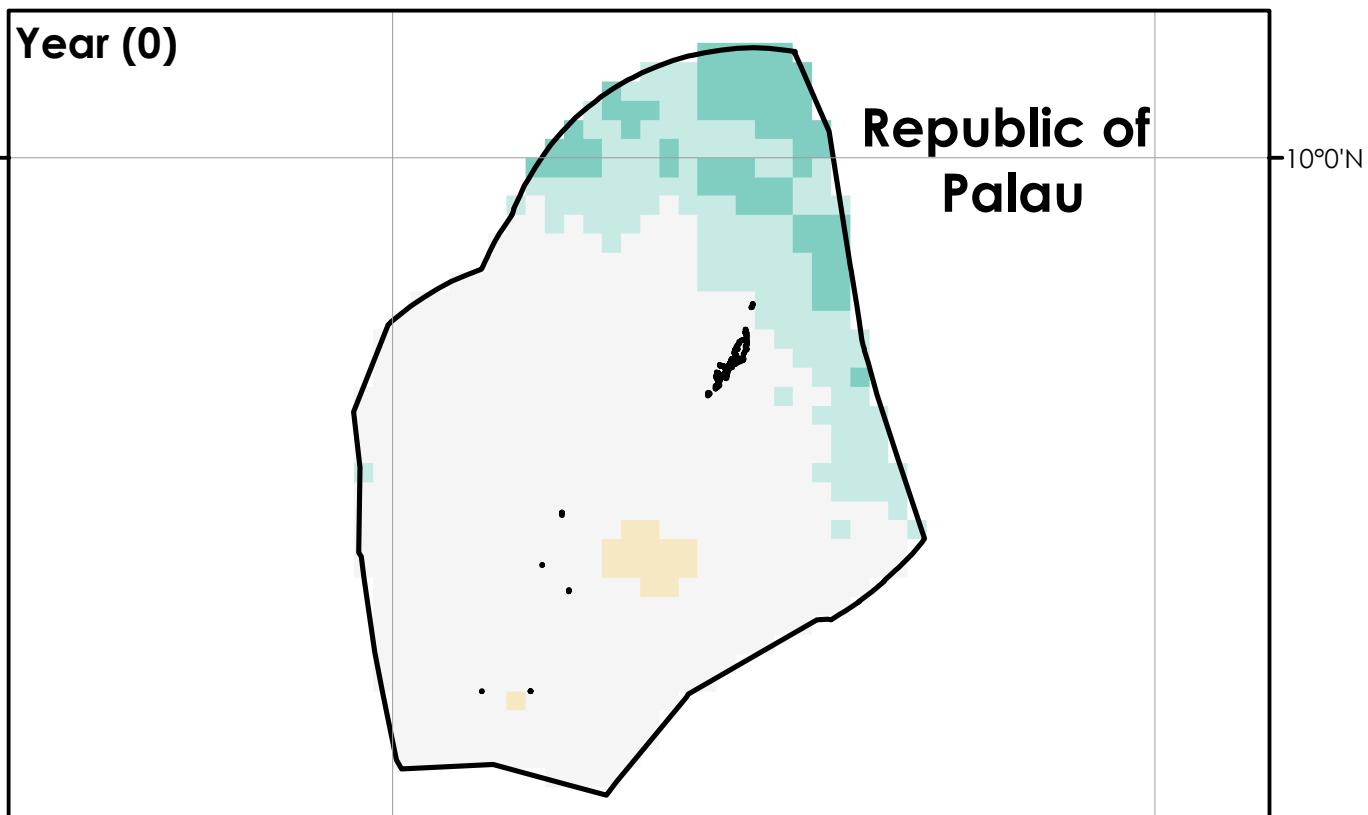
Neutral for SON

428



Precipitation Change (%)



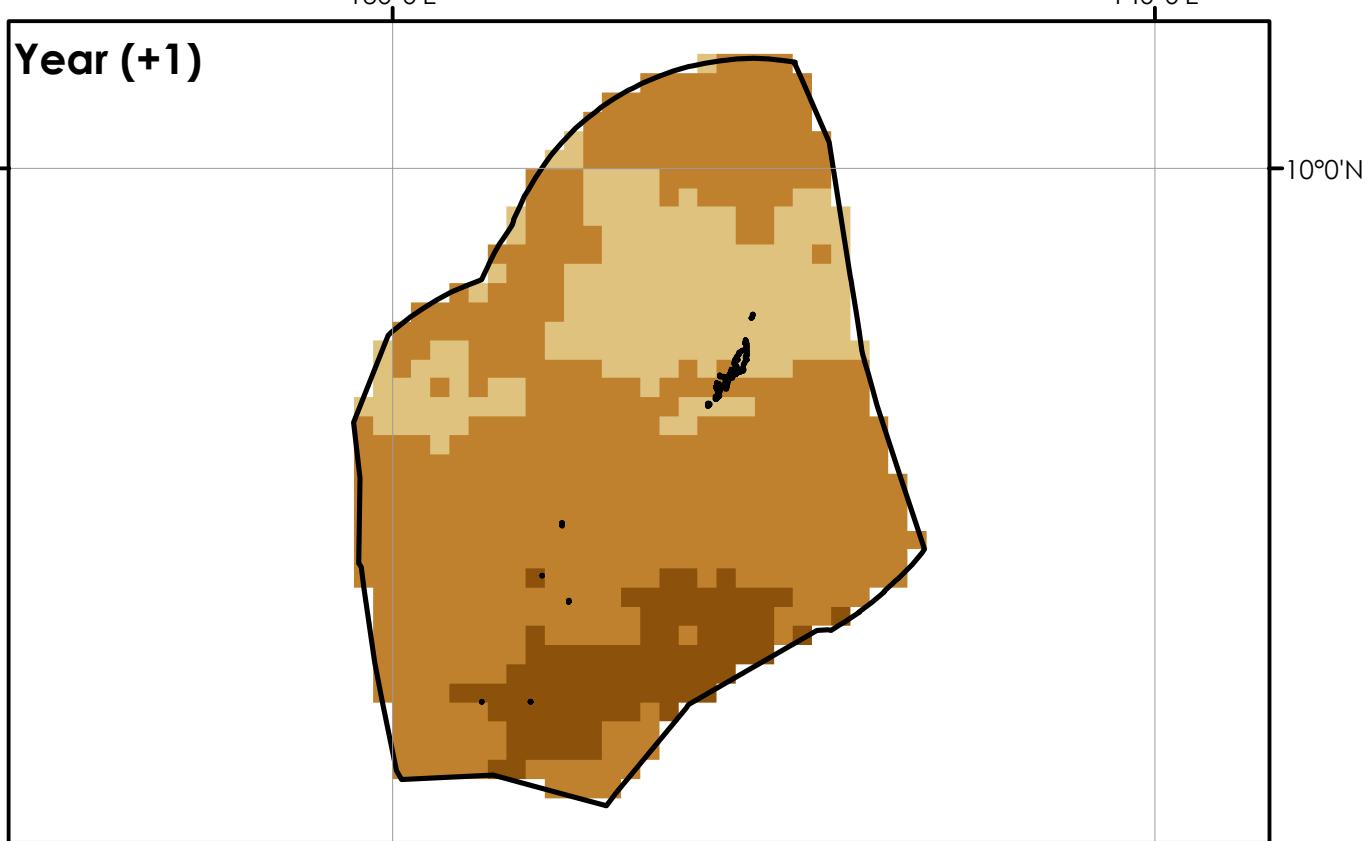
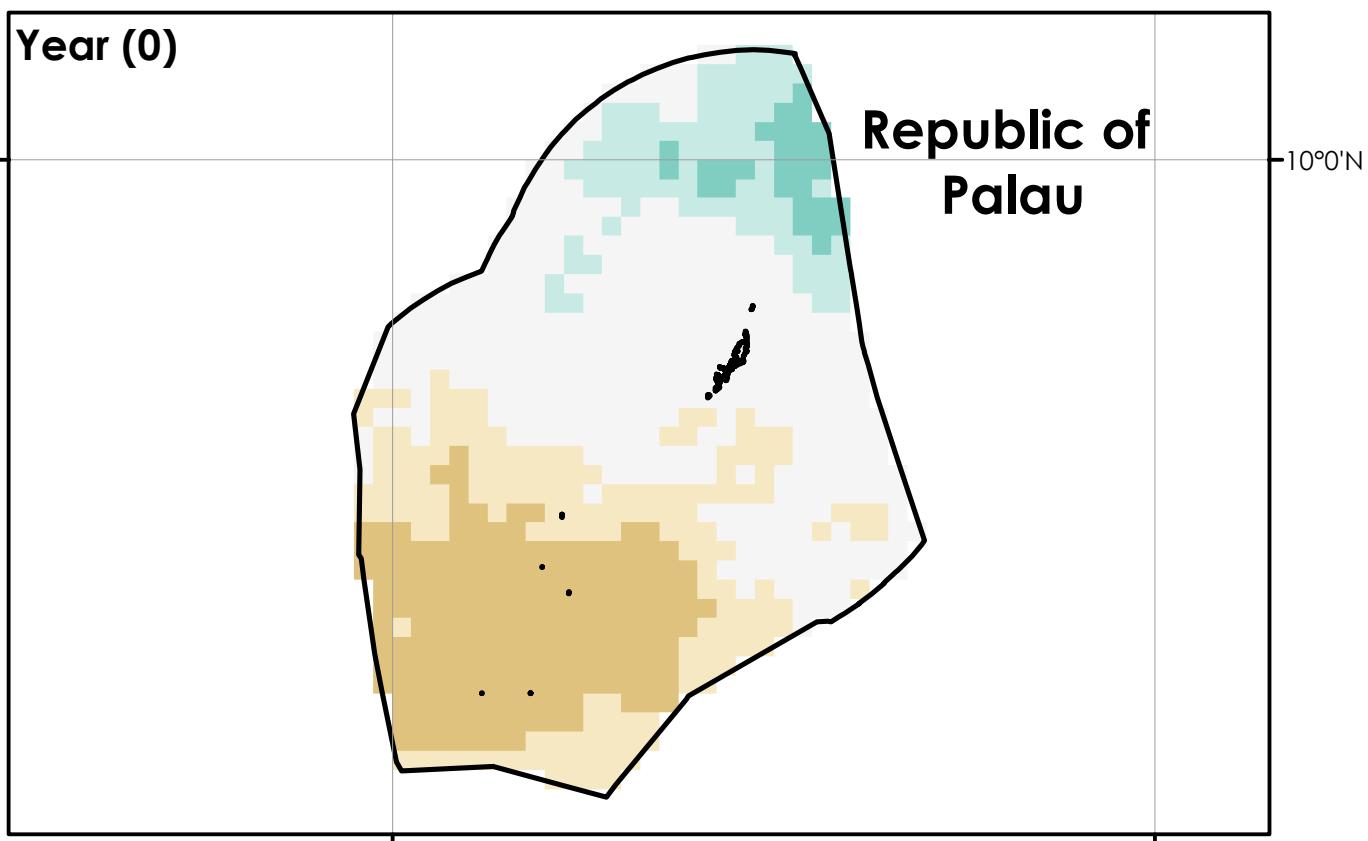


Precipitation Change (%)

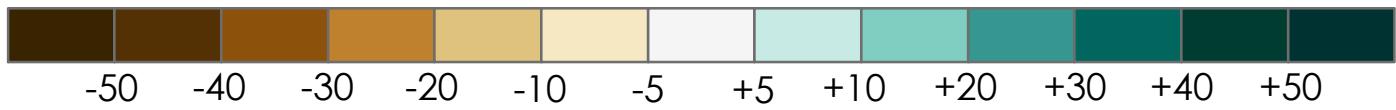


Neutral for NDJ

430

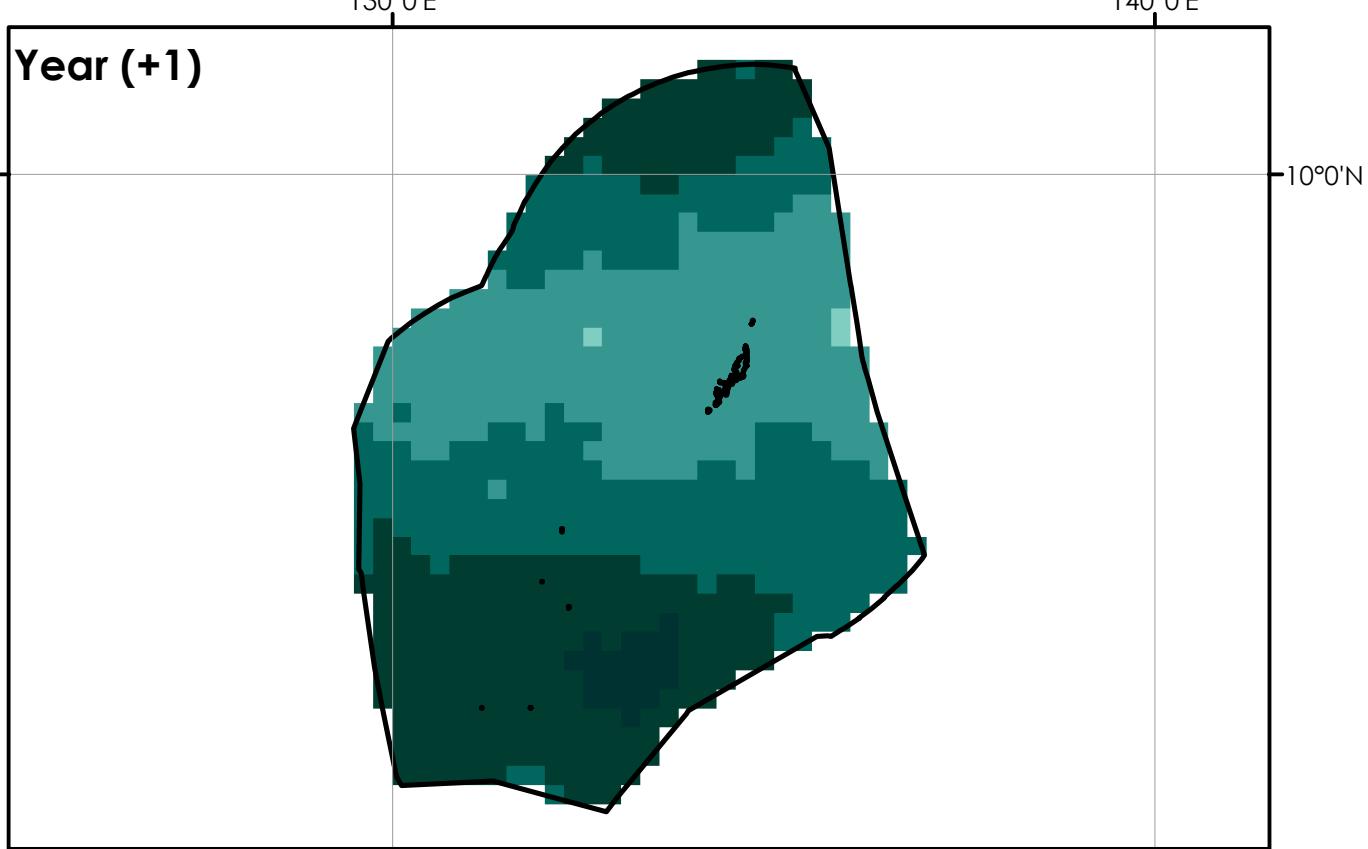
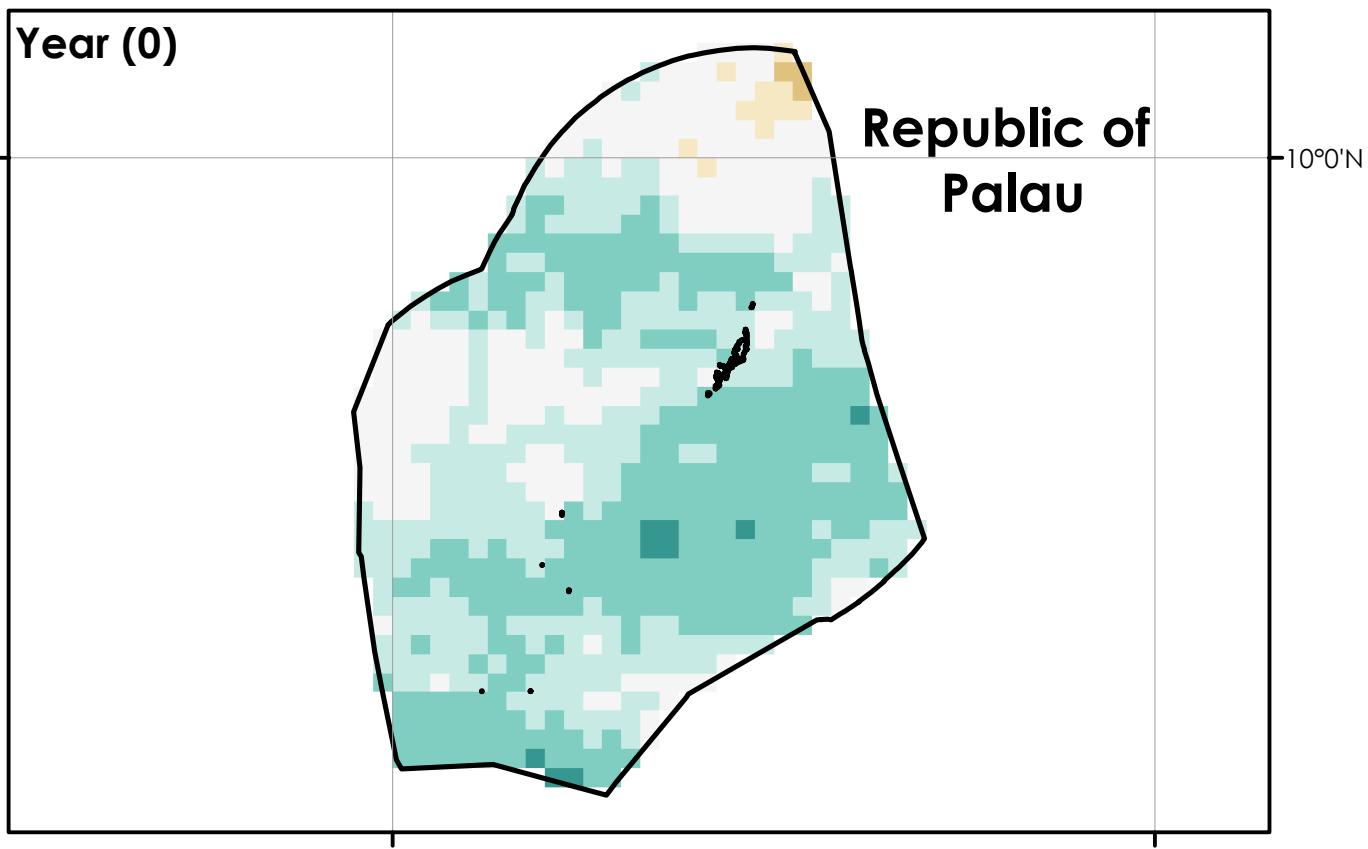


Precipitation Change (%)



Weak La Niña for DJF

431

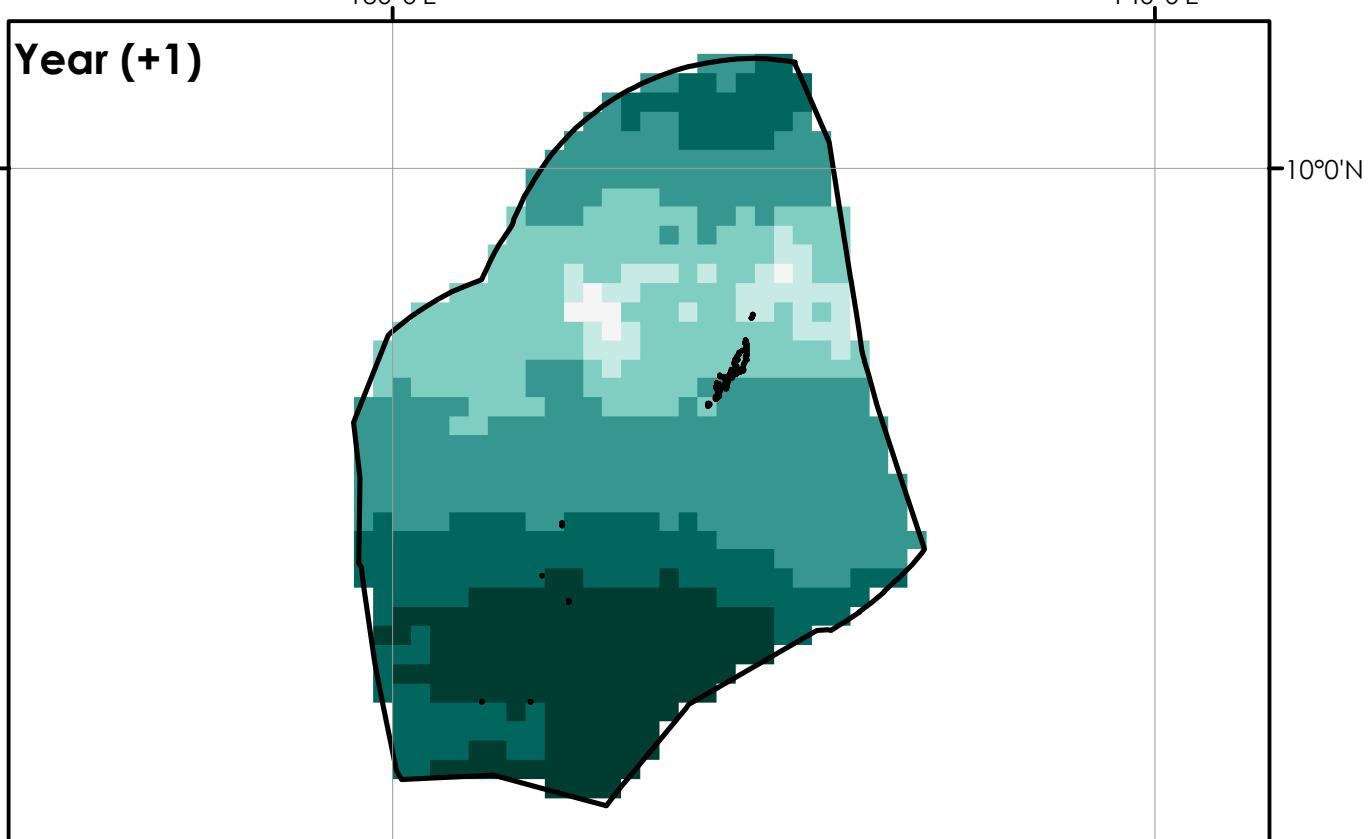
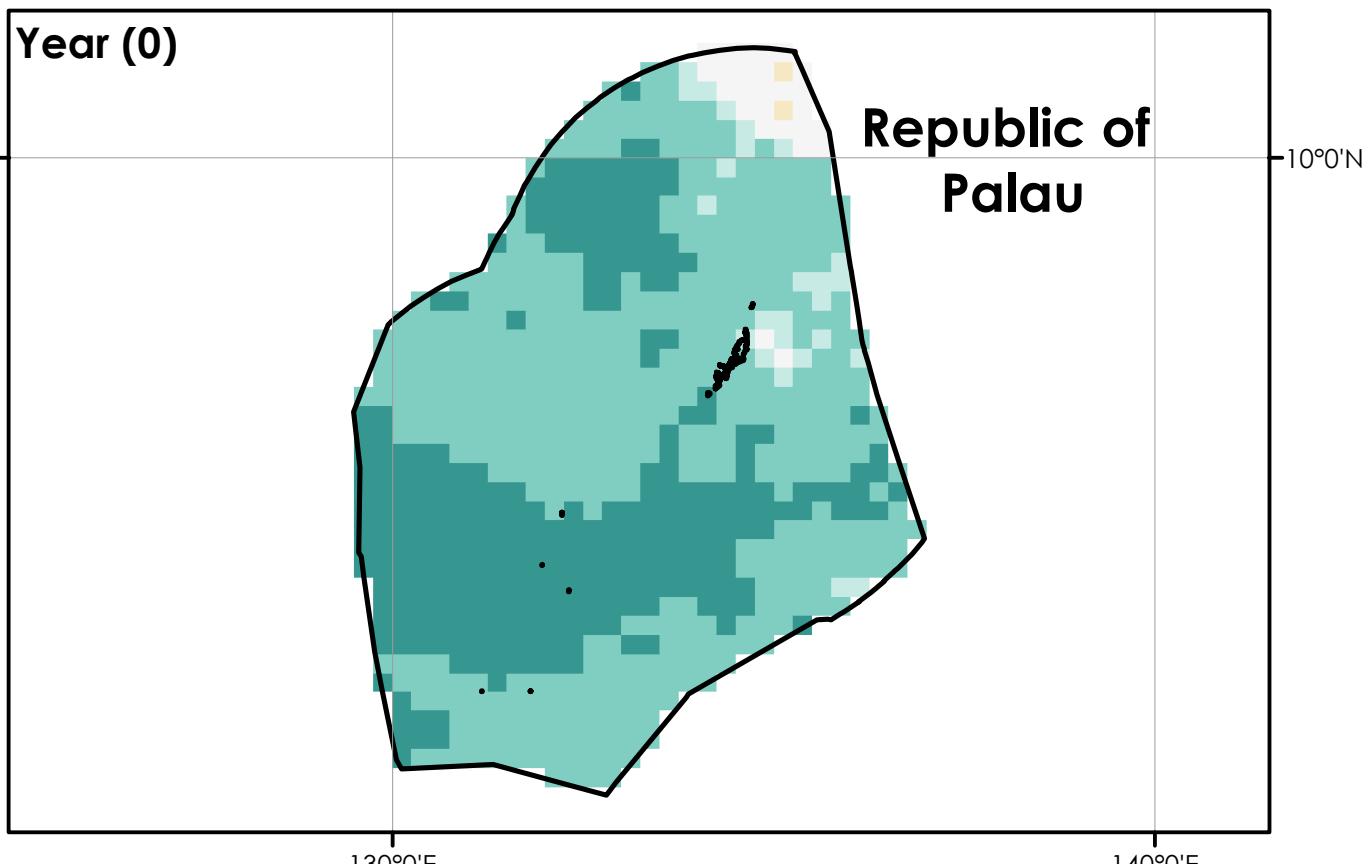


Precipitation Change (%)

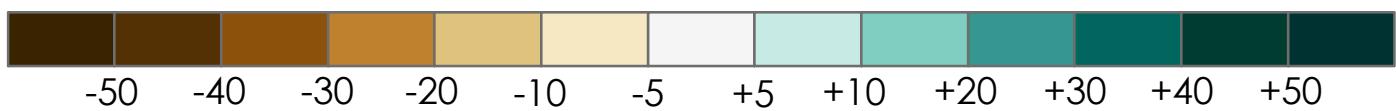


Weak La Niña for JFM

432

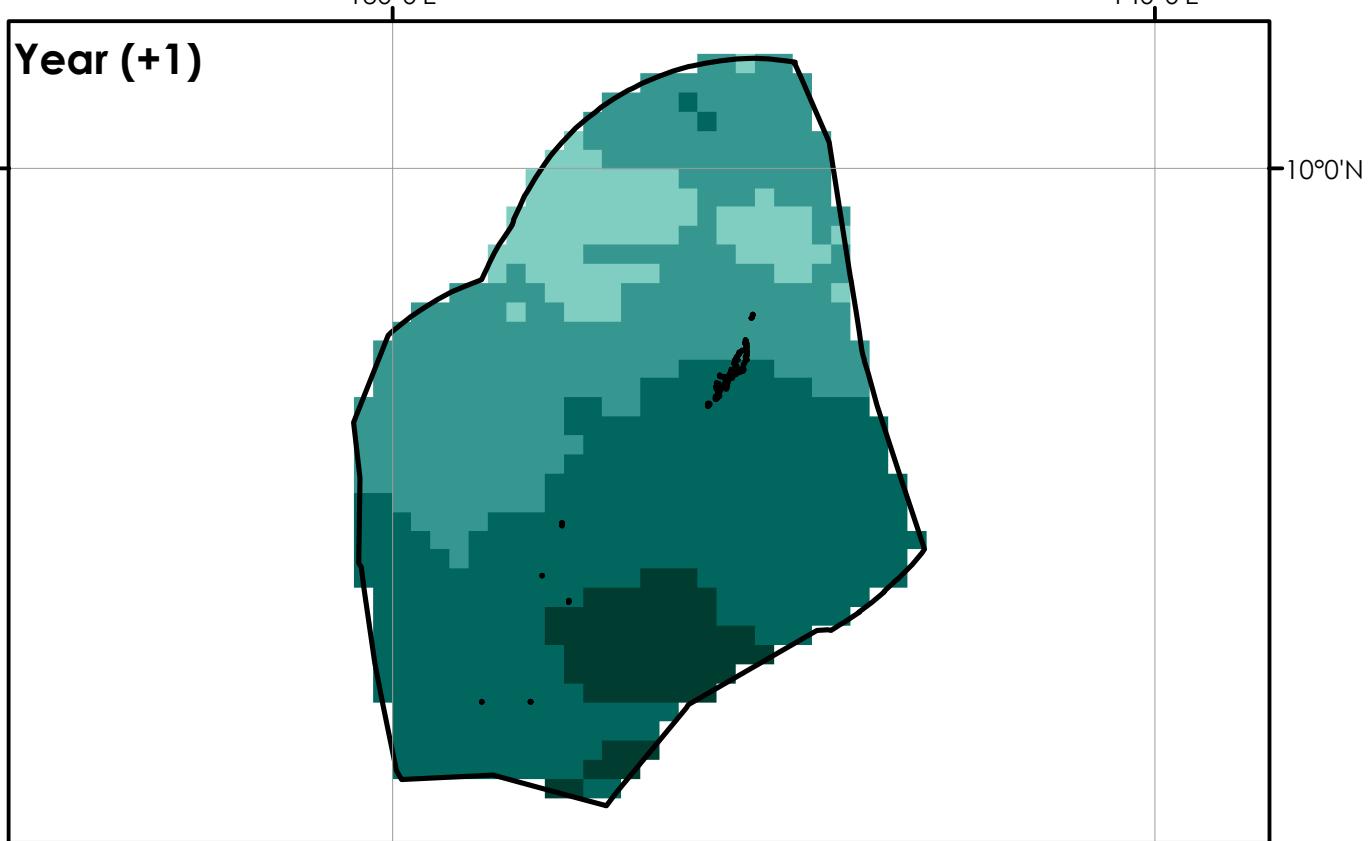
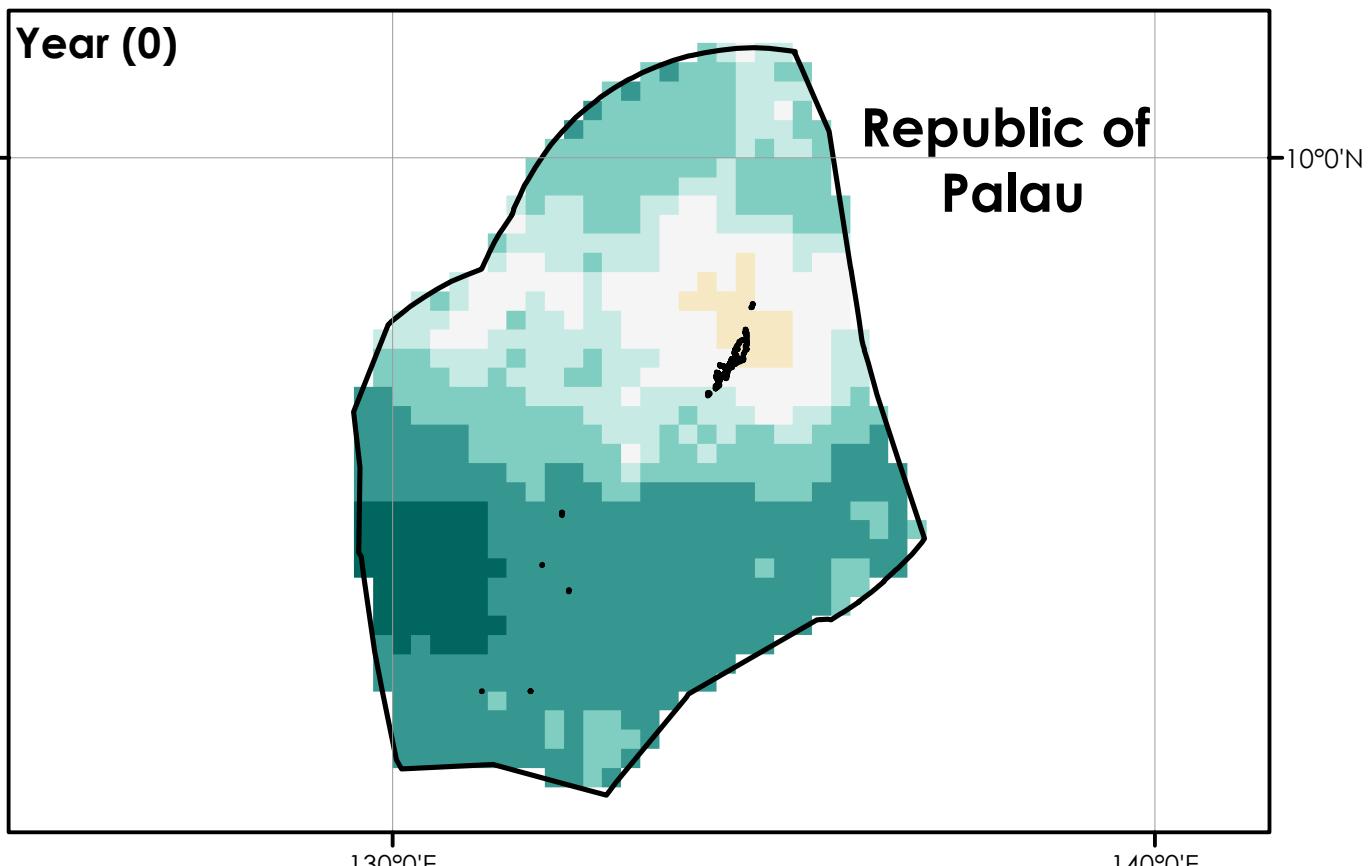


Precipitation Change (%)

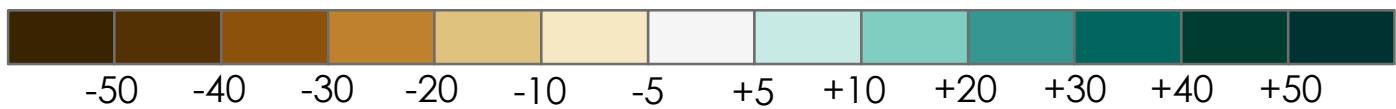


Weak La Niña for FMA

433

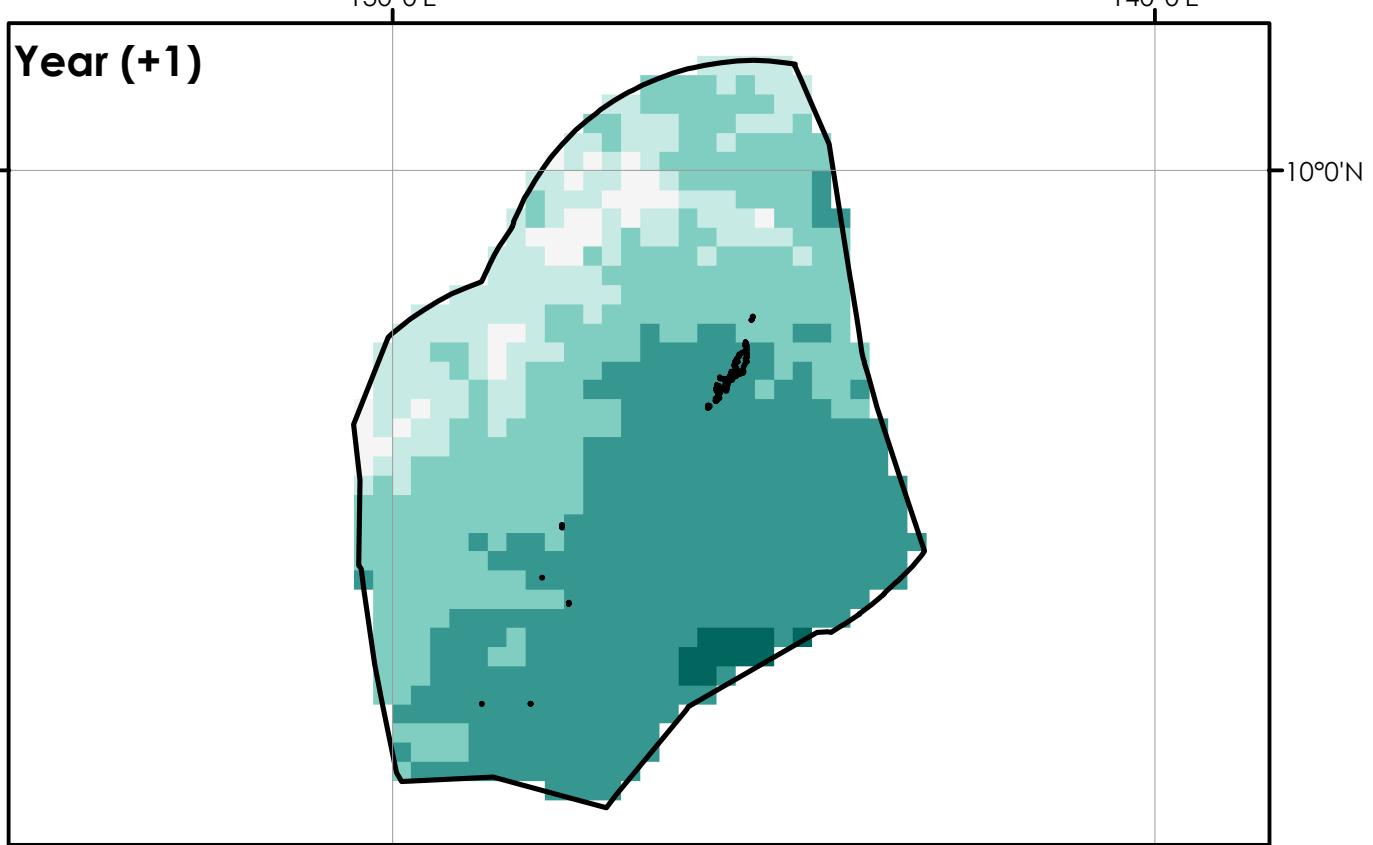
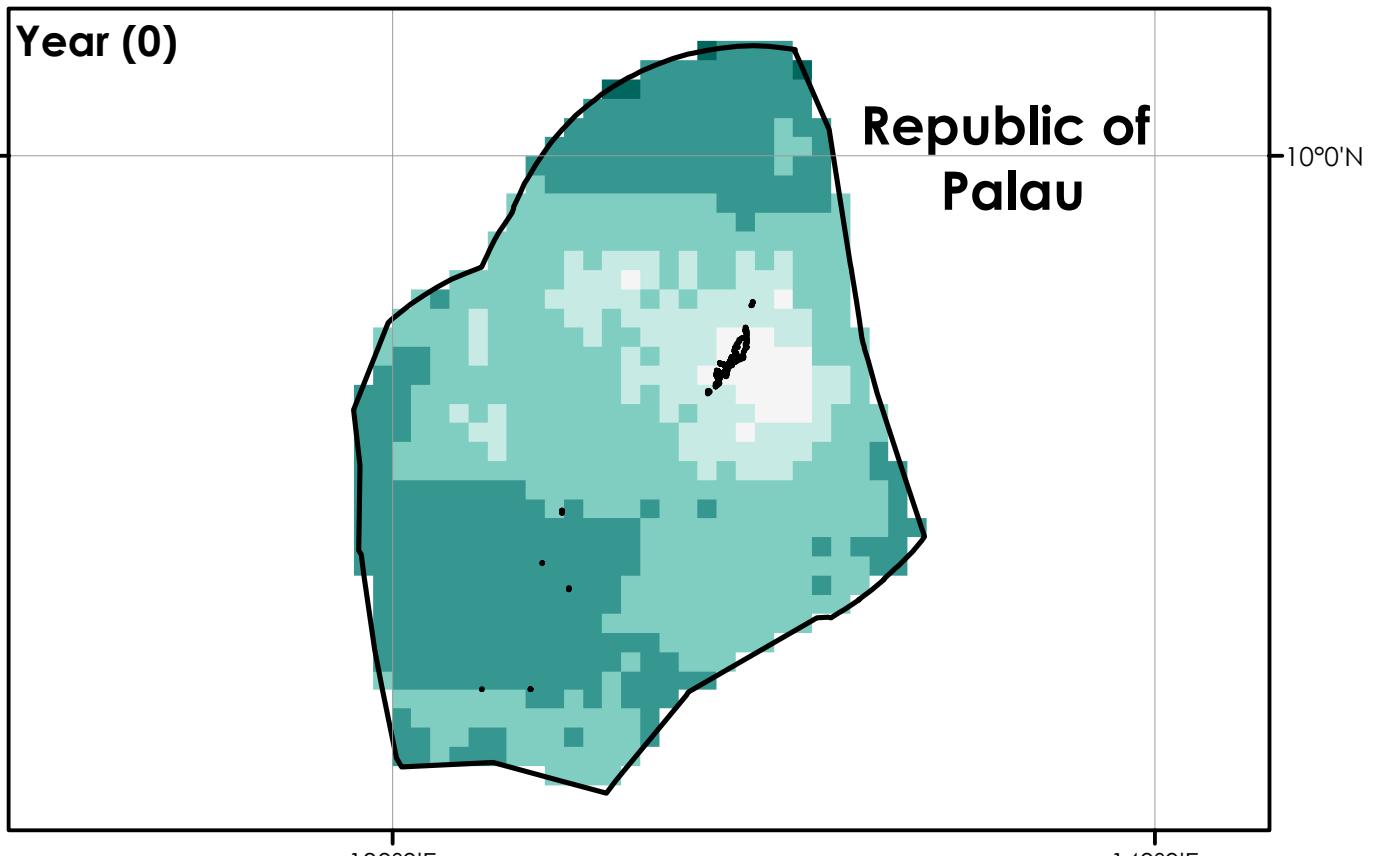


Precipitation Change (%)

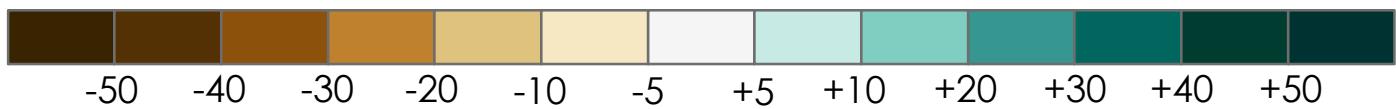


Weak La Niña for MAM

434

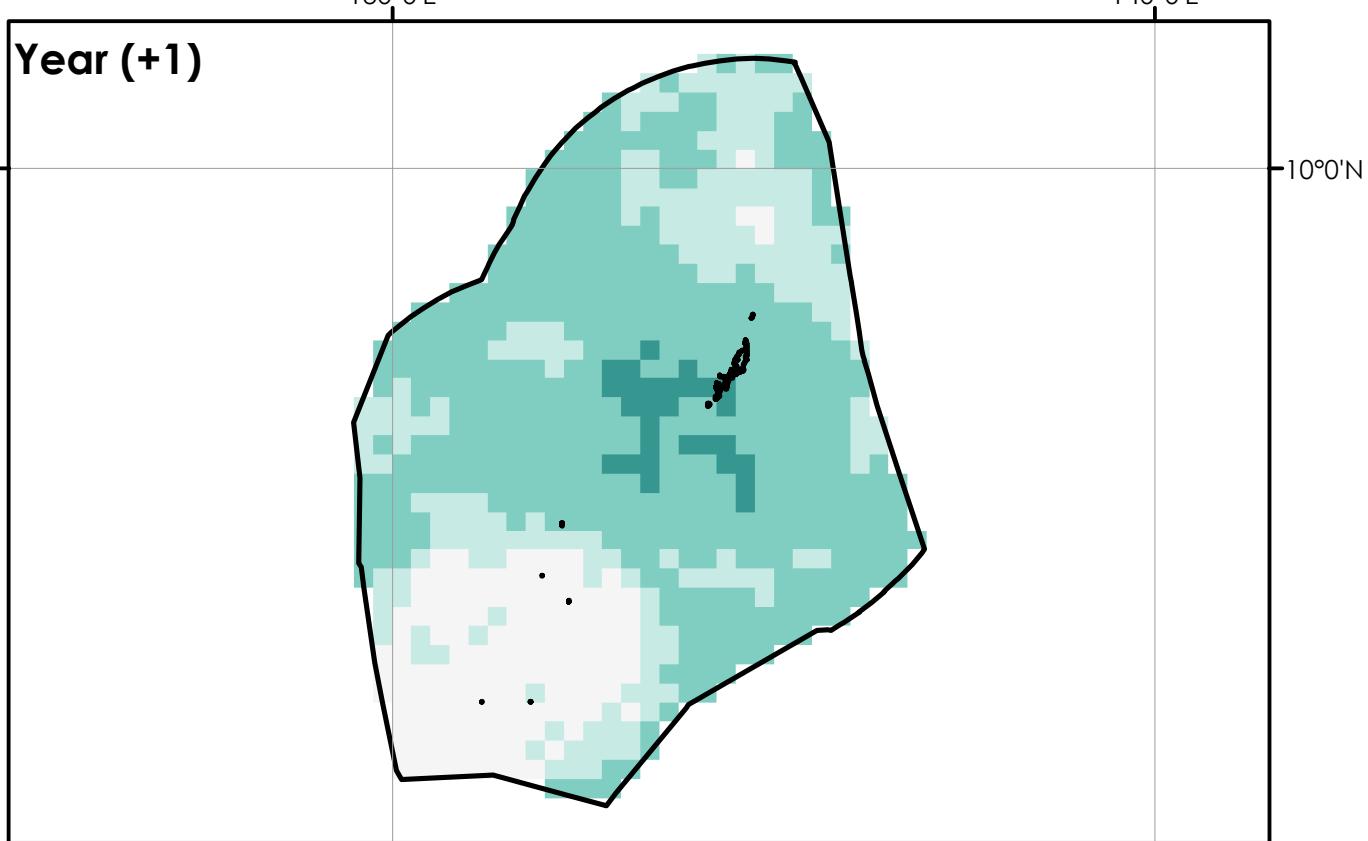
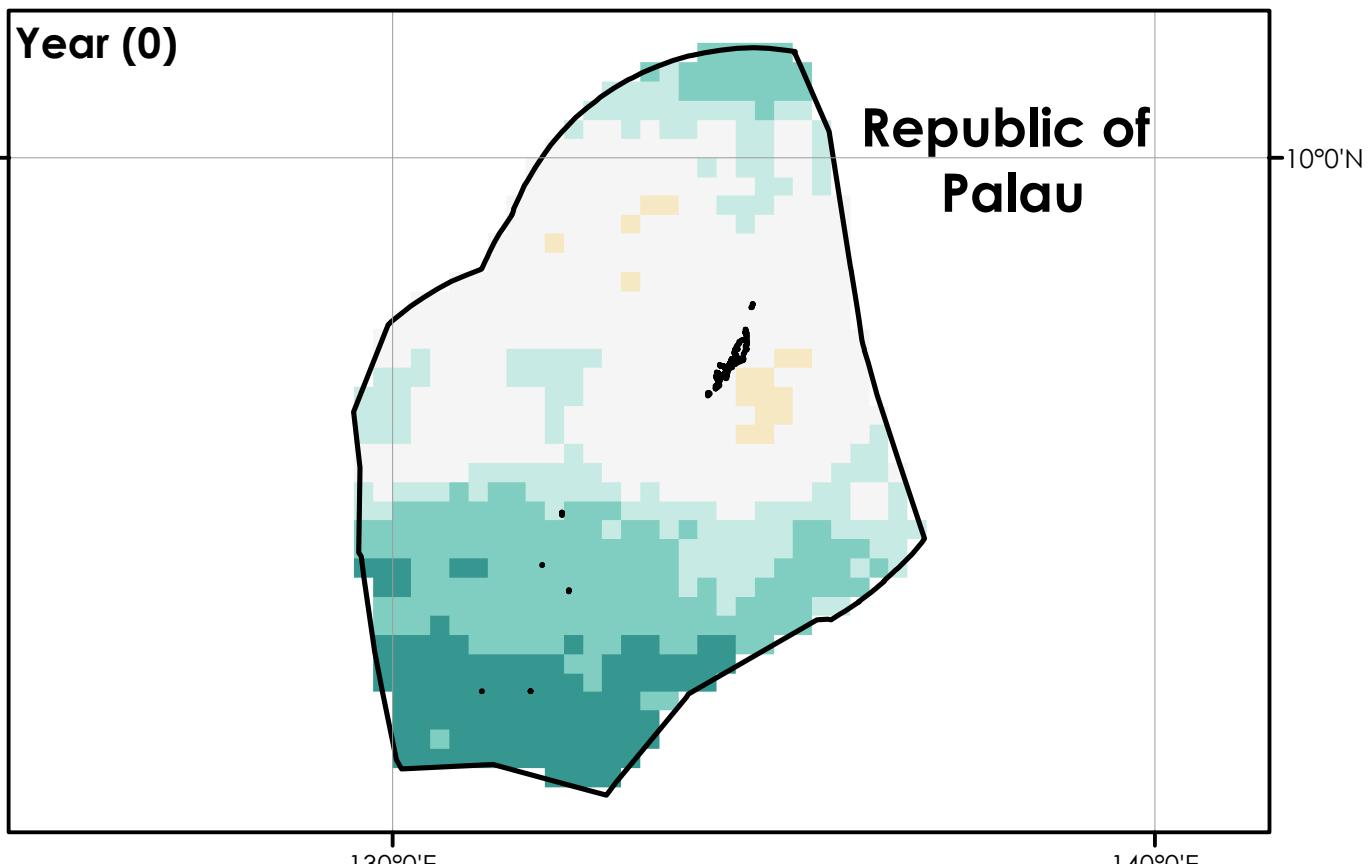


Precipitation Change (%)

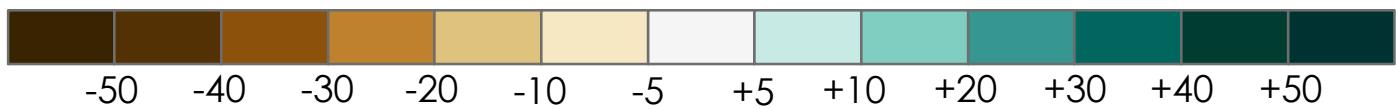


Weak La Niña for AMJ

435

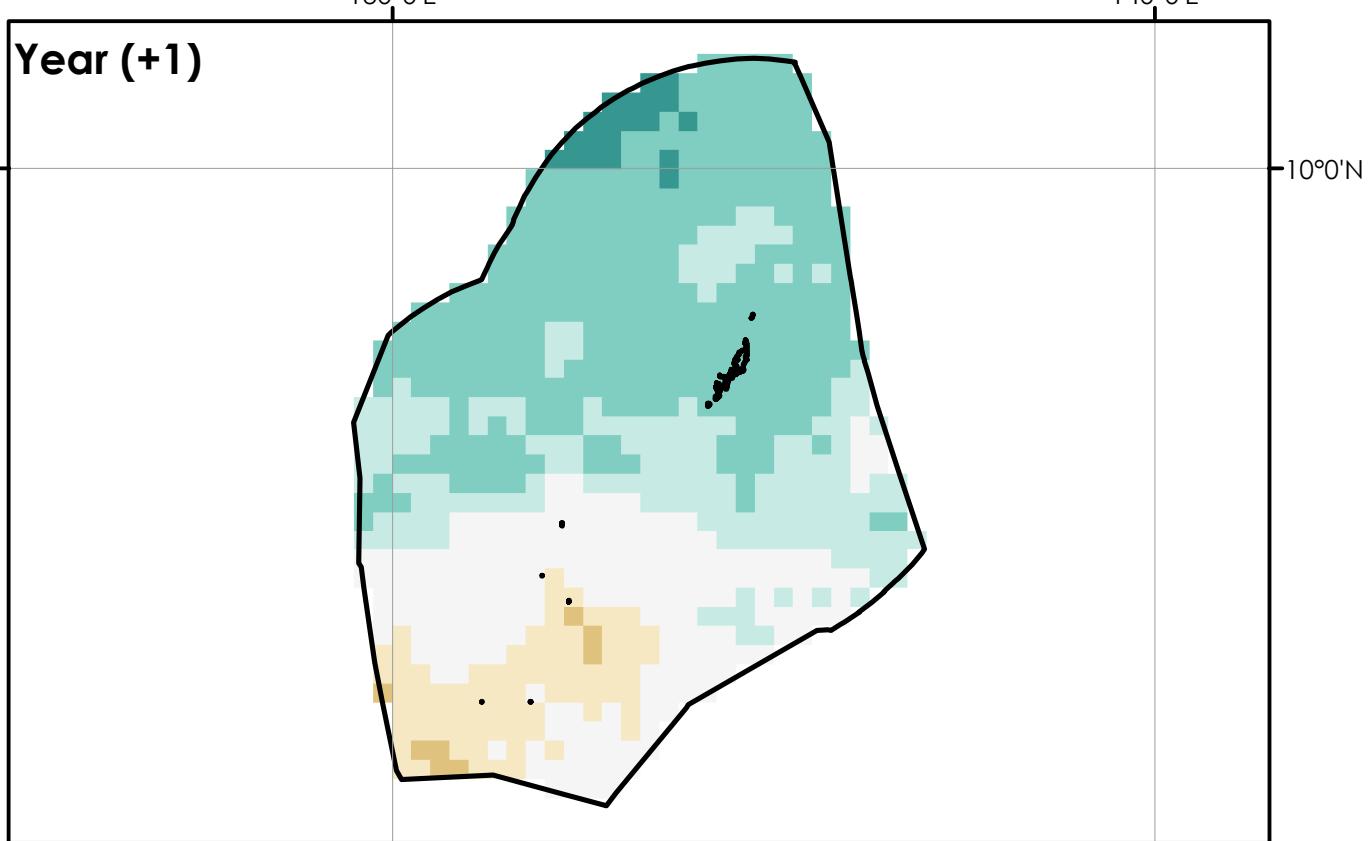
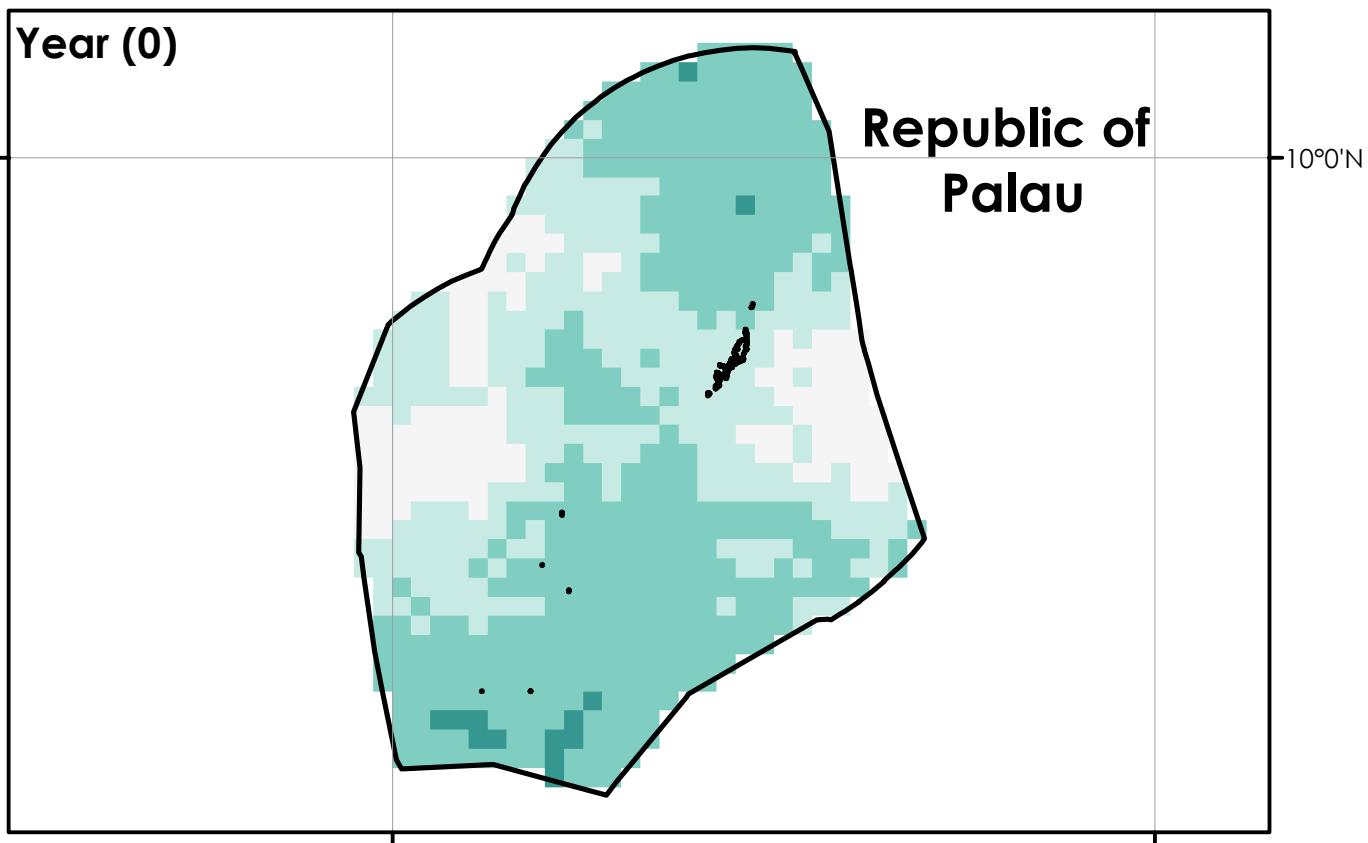


Precipitation Change (%)



Weak La Niña for MJJ

436

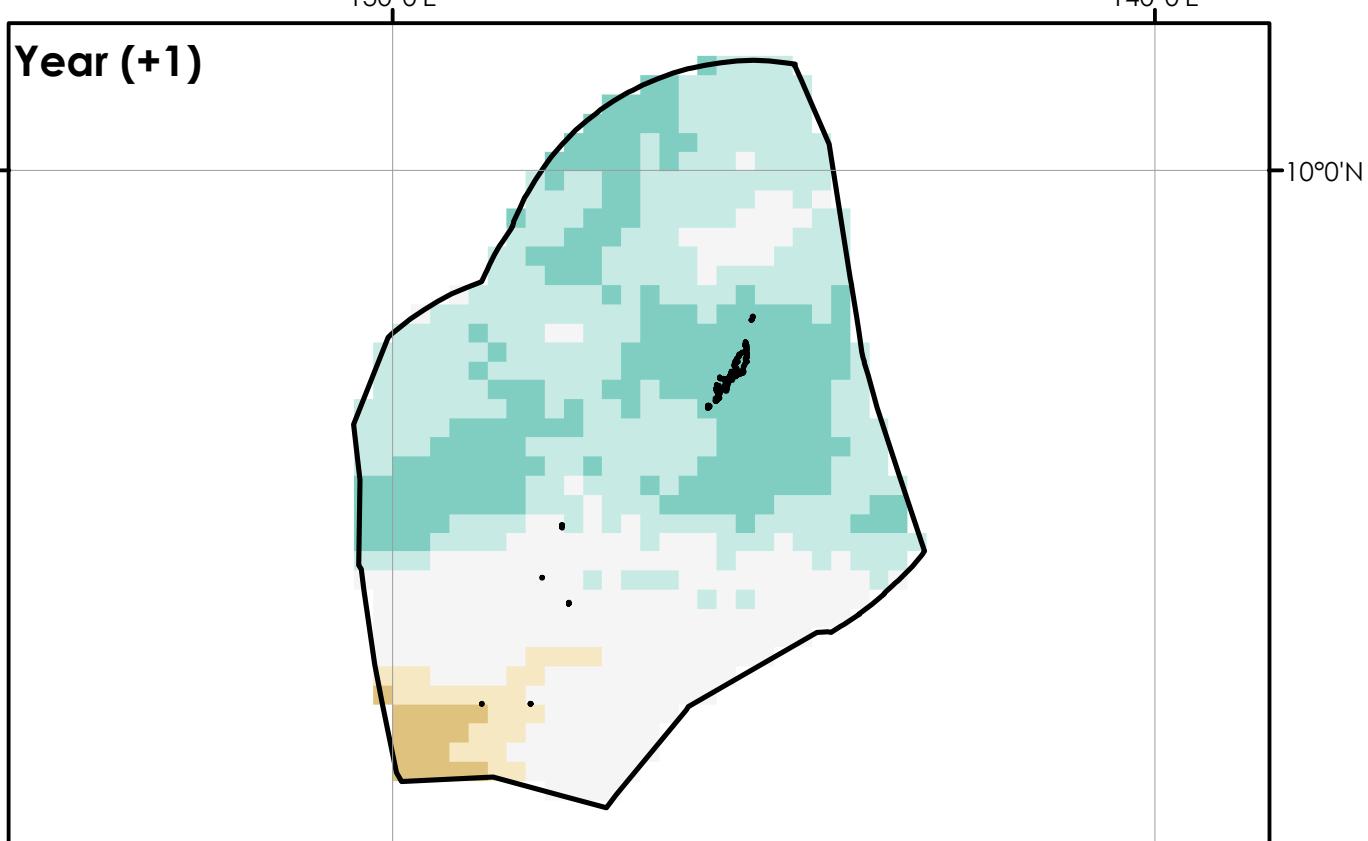
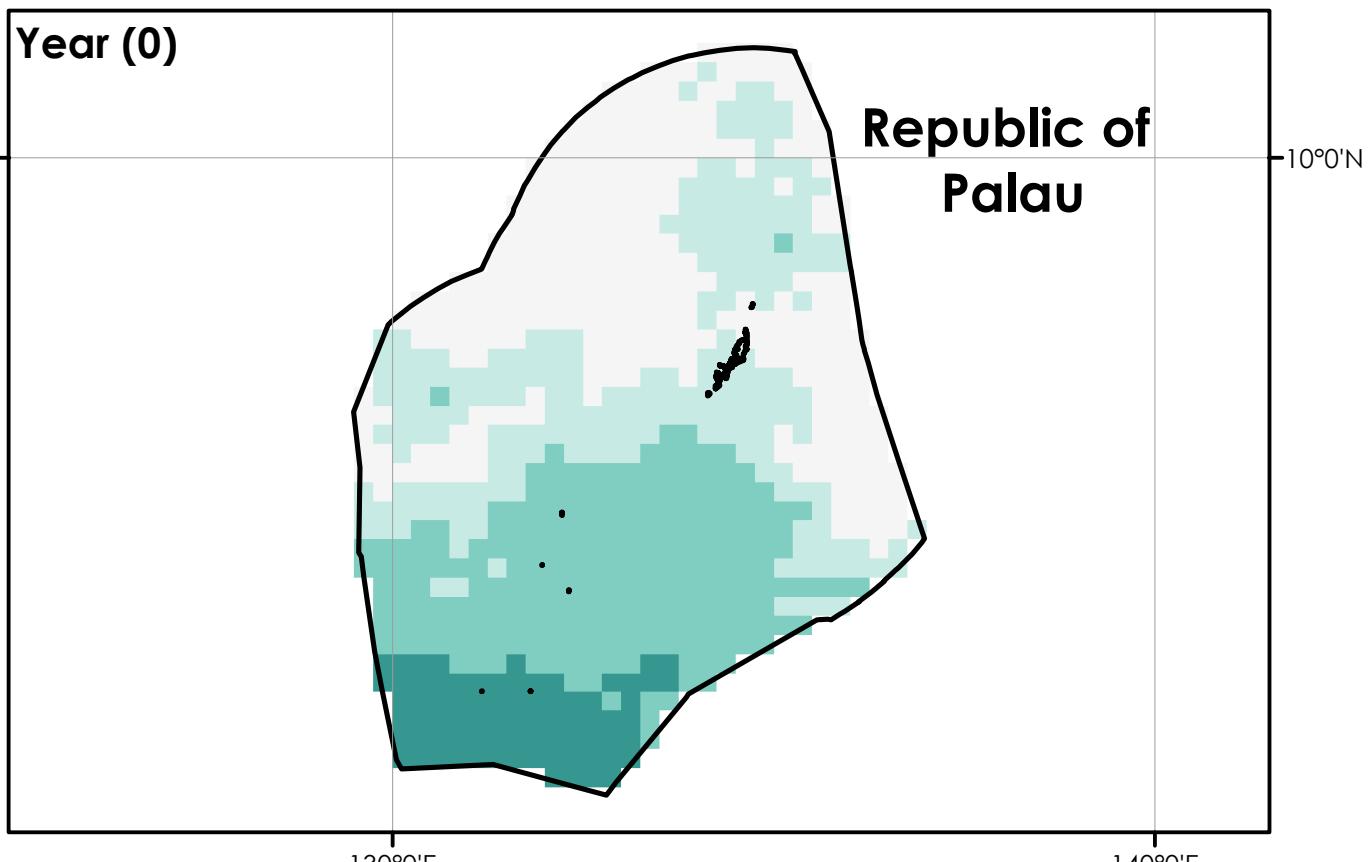


Precipitation Change (%)

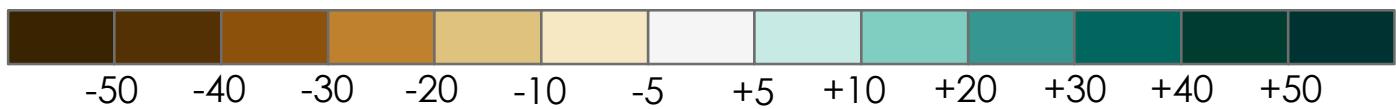


Weak La Niña for JJA

437

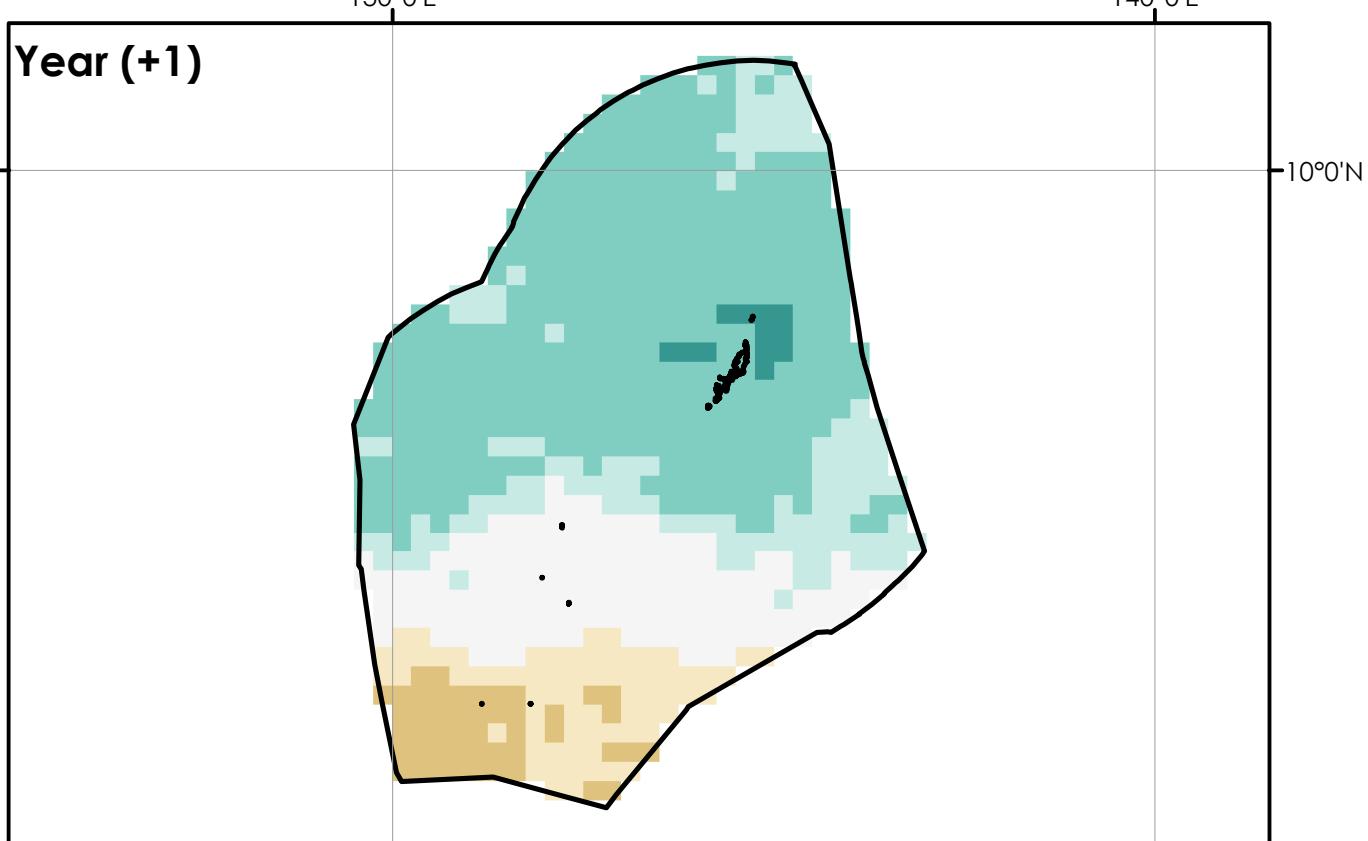
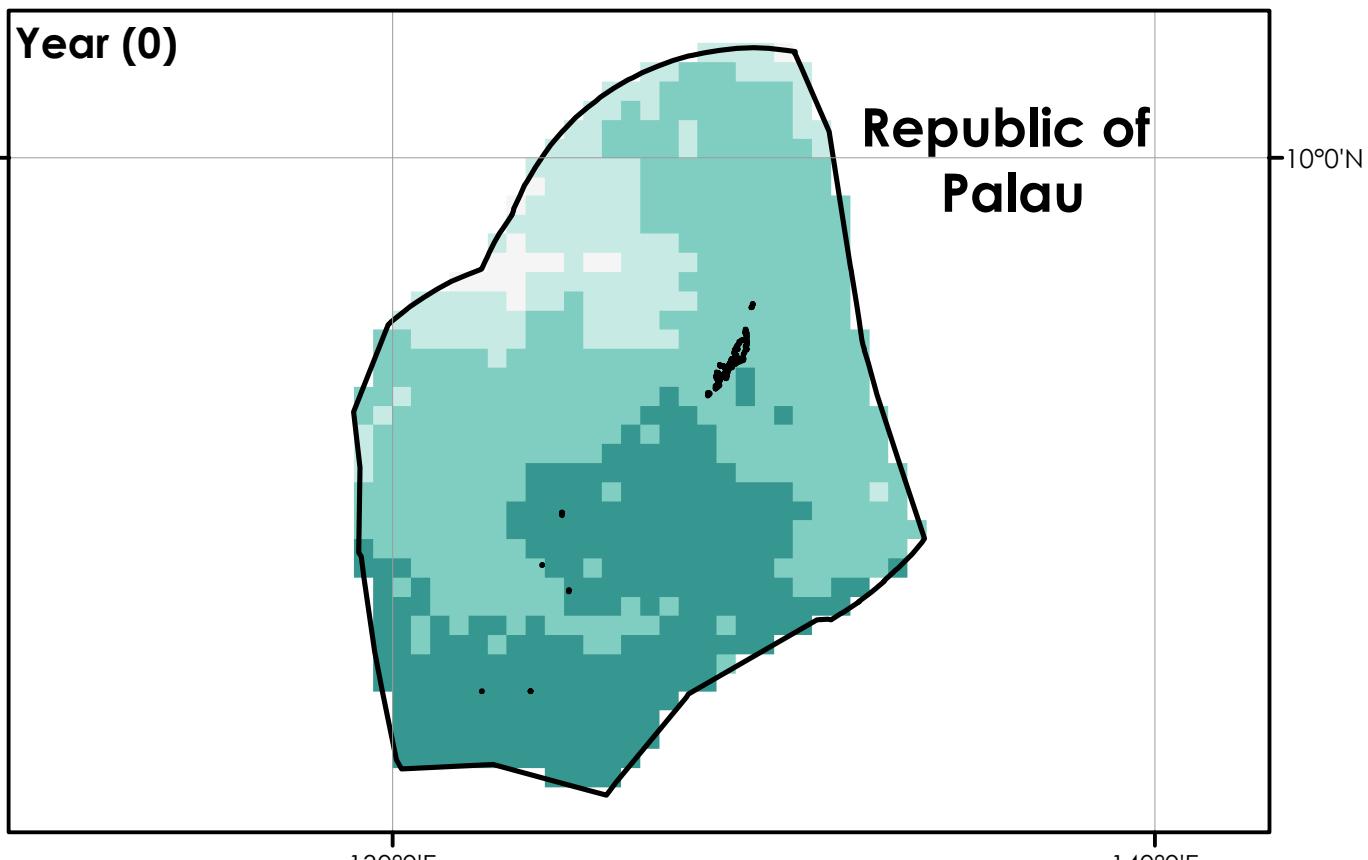


Precipitation Change (%)



Weak La Niña for JAS

438

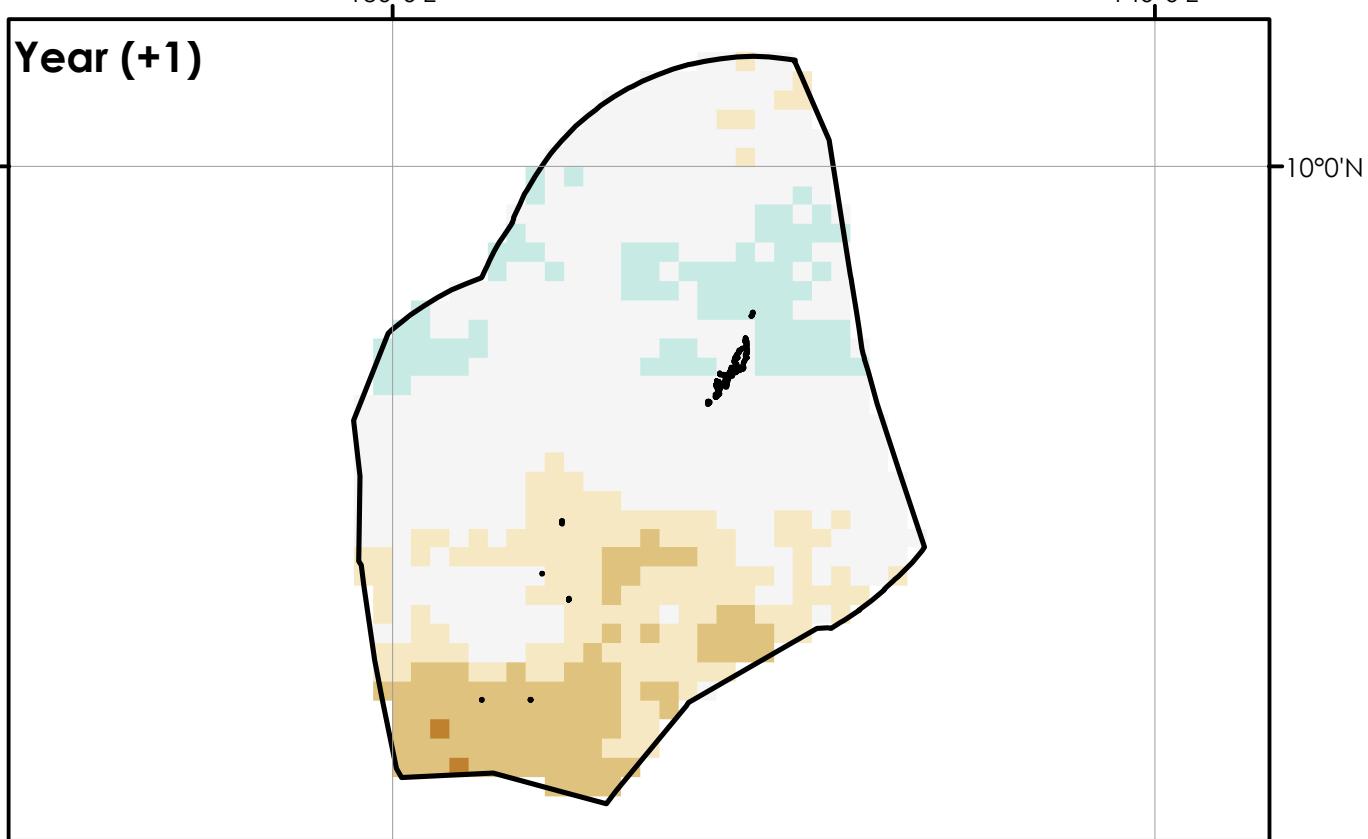
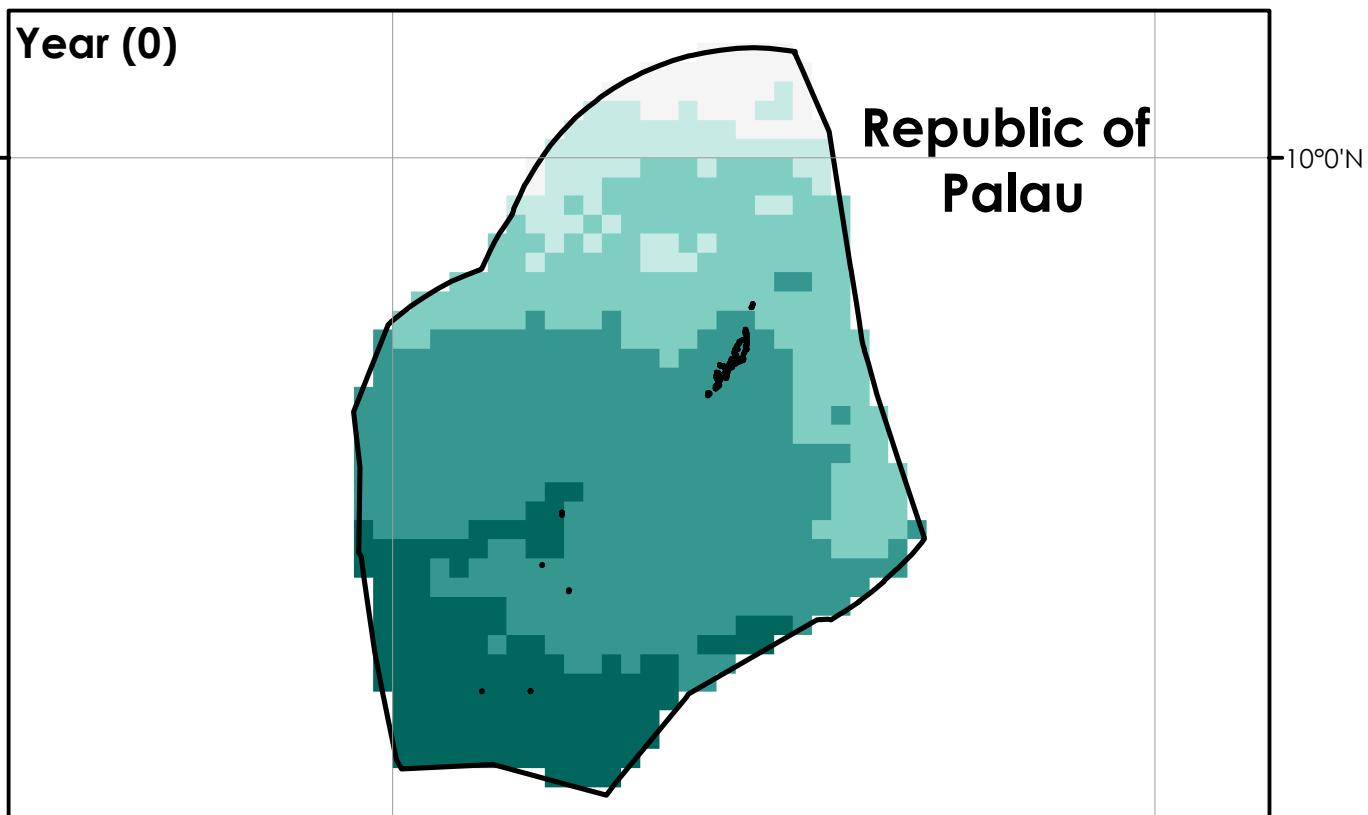


Precipitation Change (%)

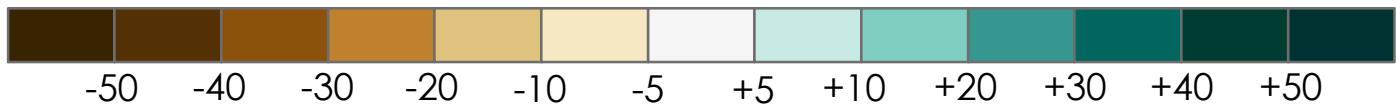


Weak La Niña for ASO

439

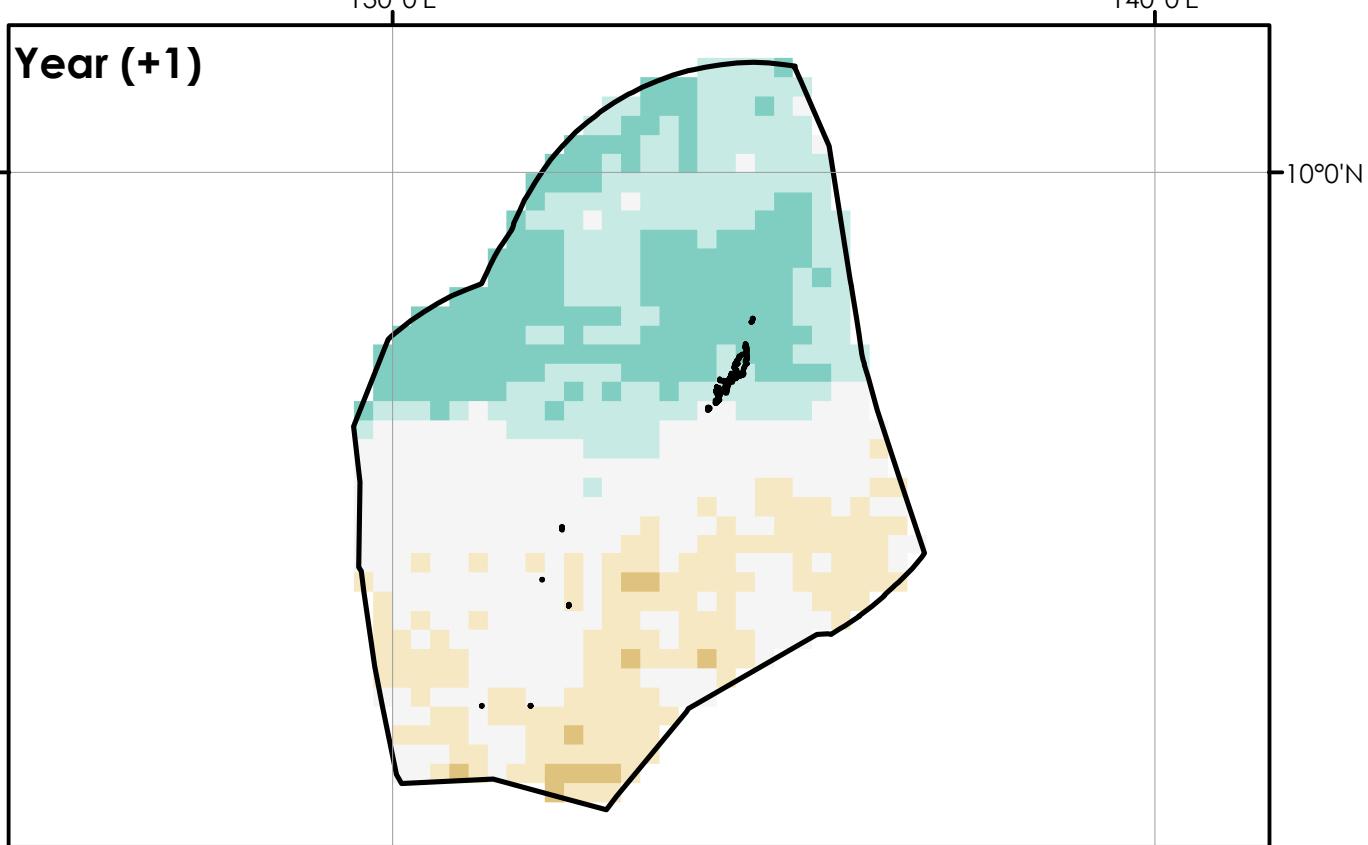
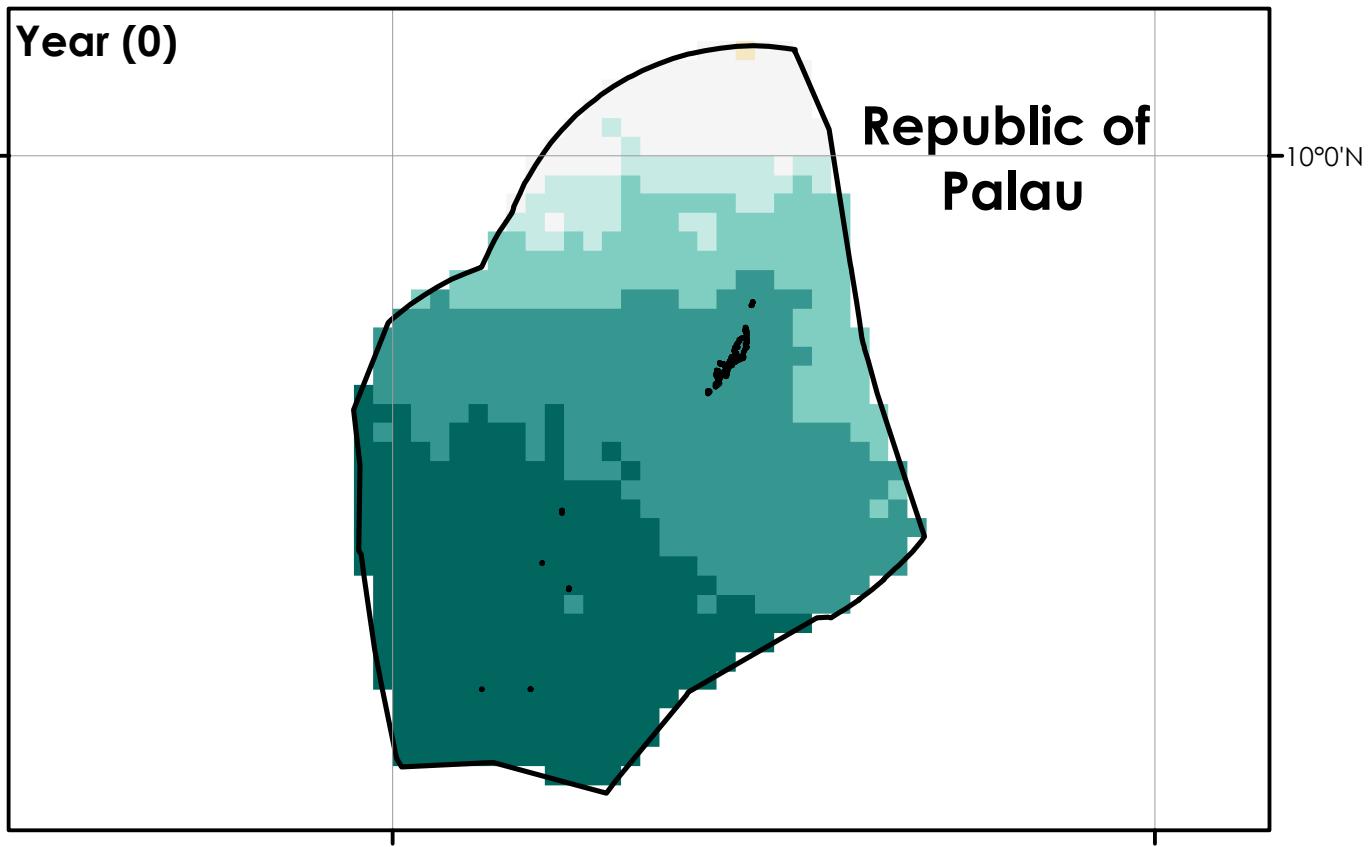


Precipitation Change (%)

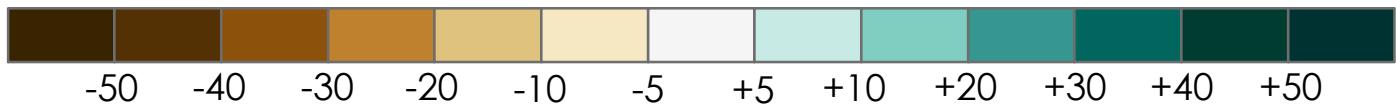


Weak La Niña for SON

440

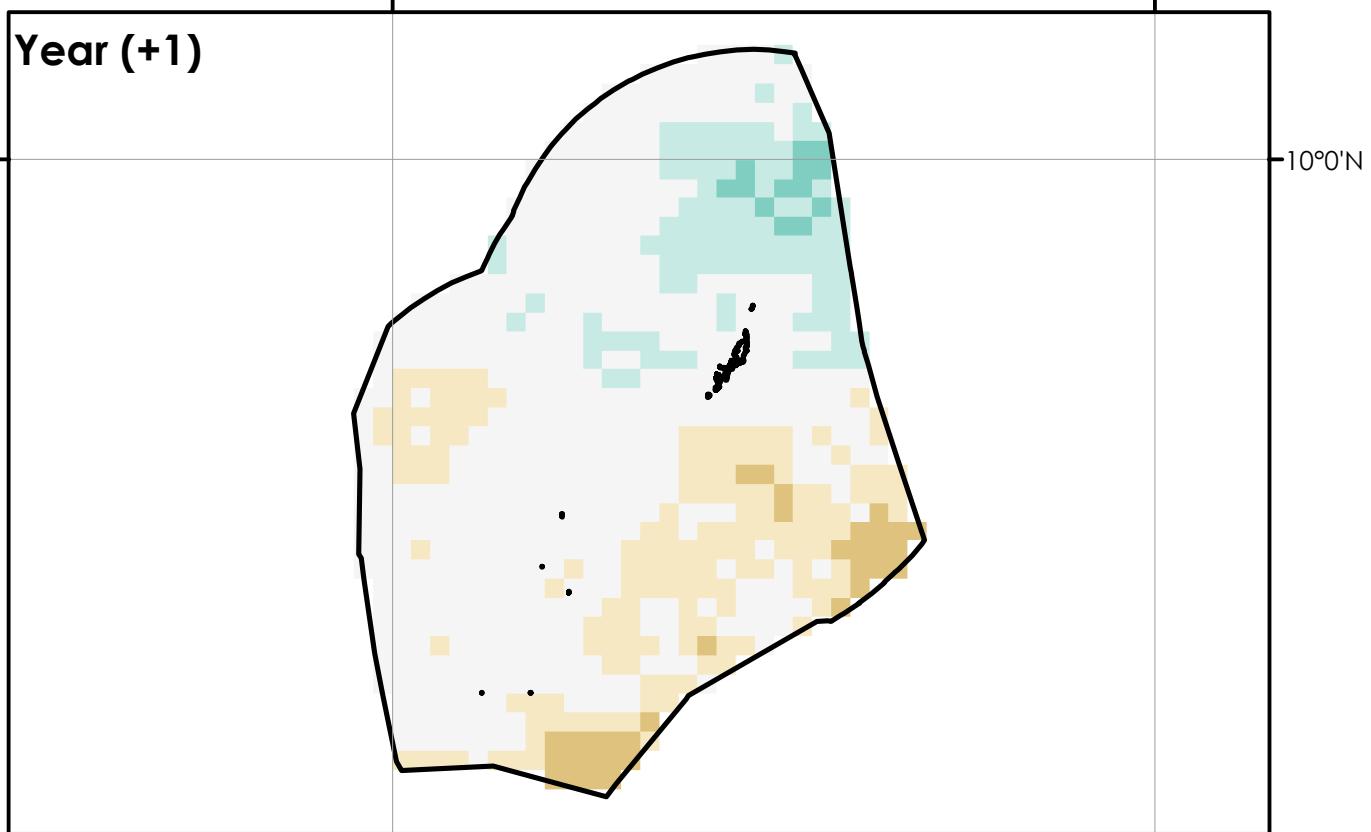
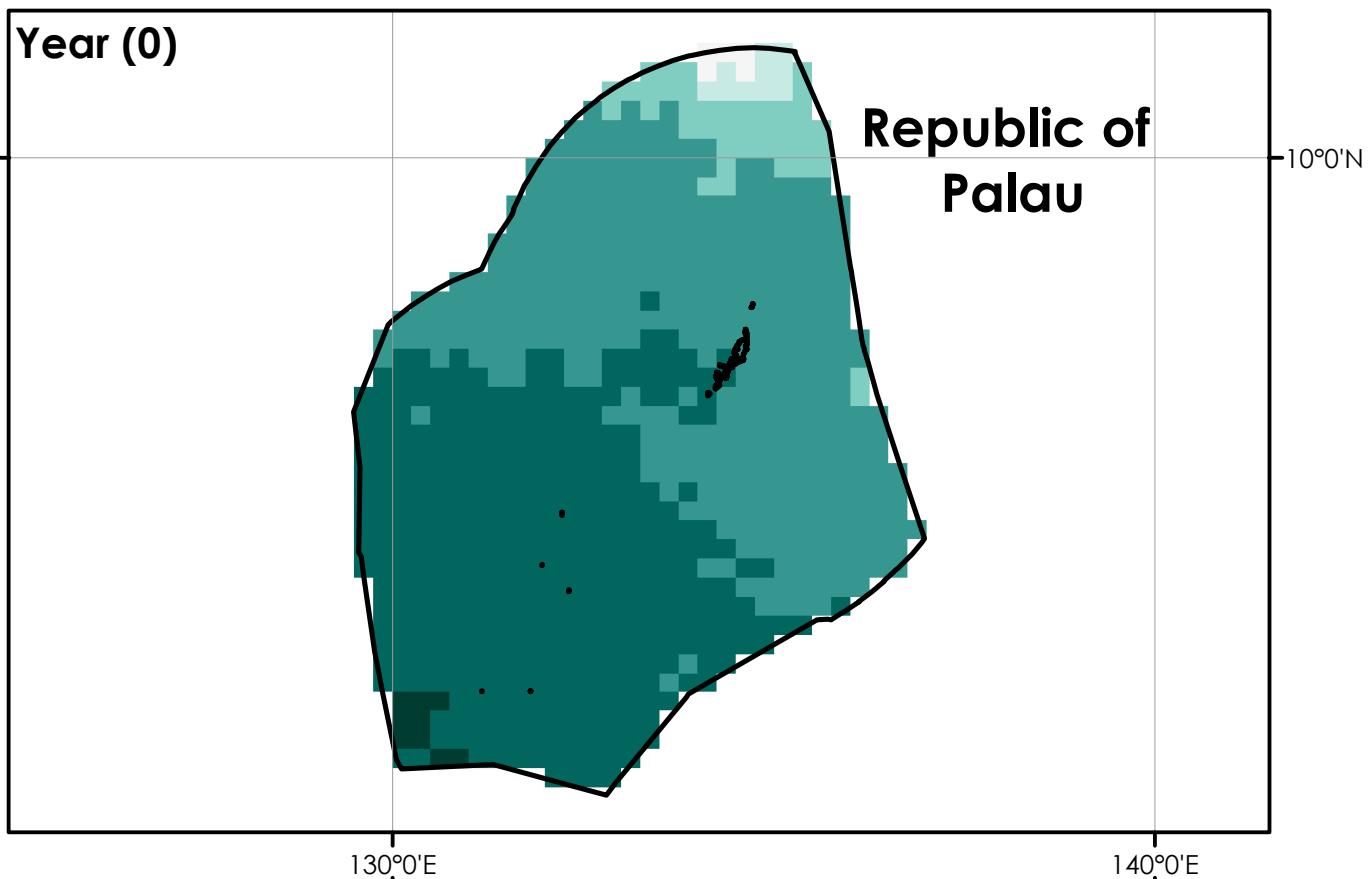


Precipitation Change (%)



Weak La Niña for OND

441

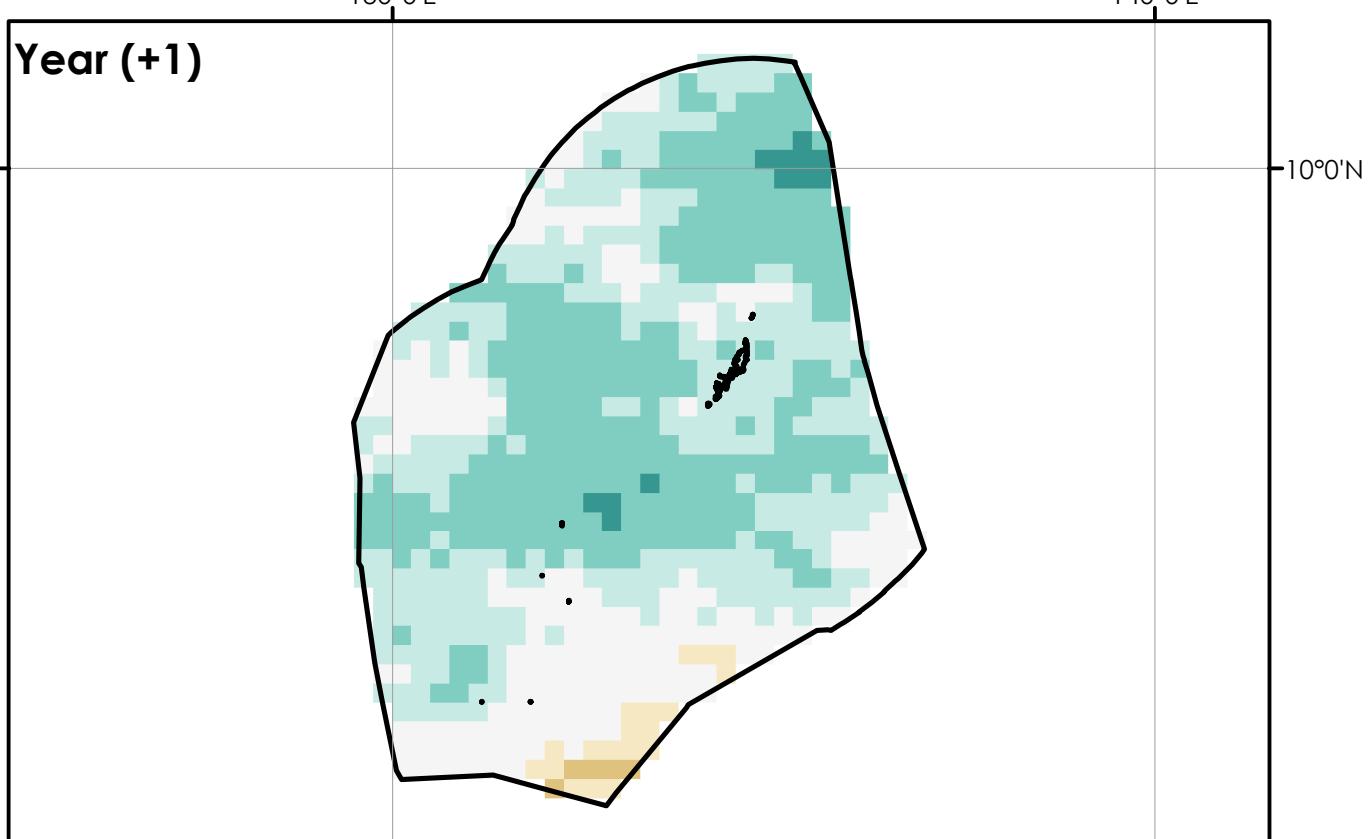
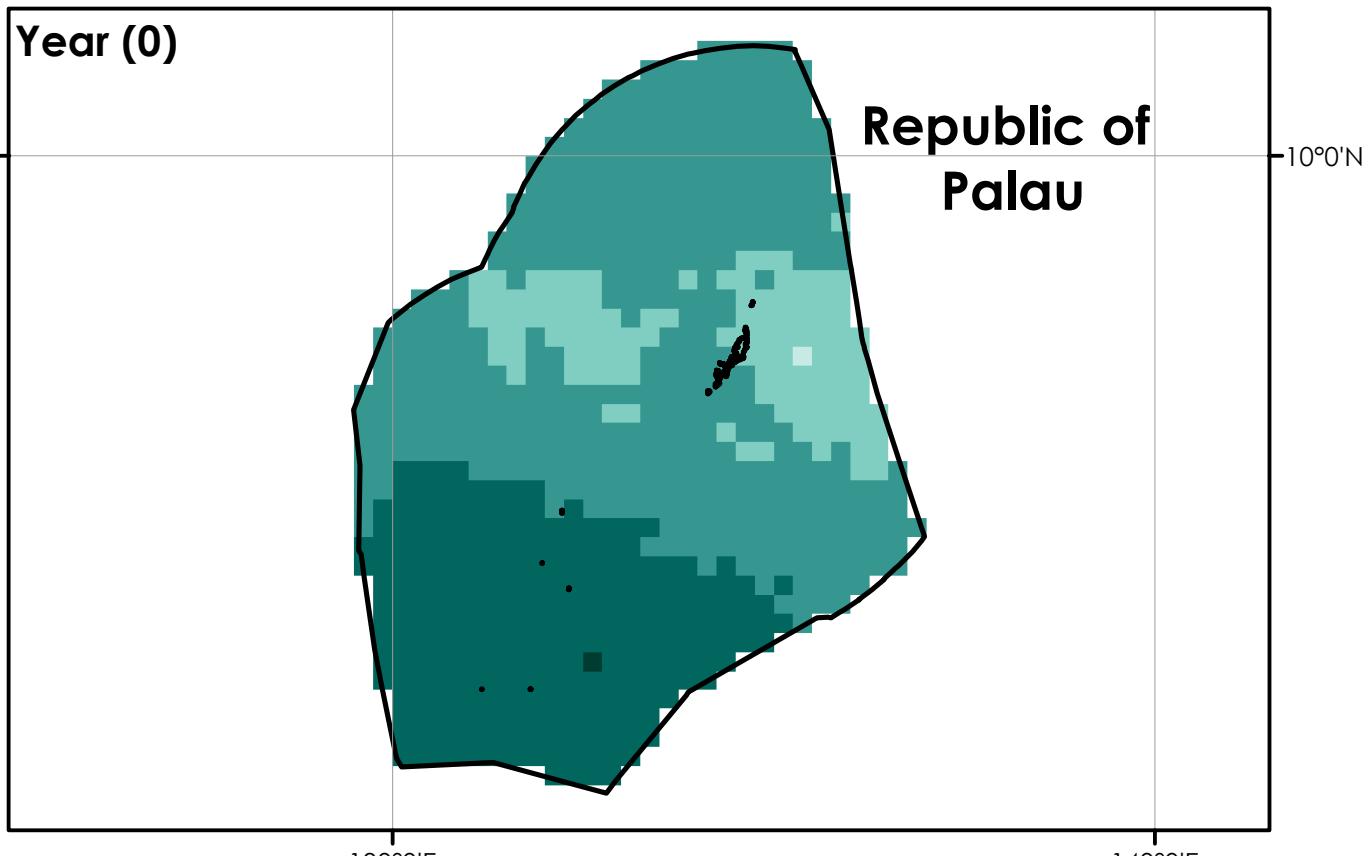


Precipitation Change (%)



Weak La Niña for NDJ

442

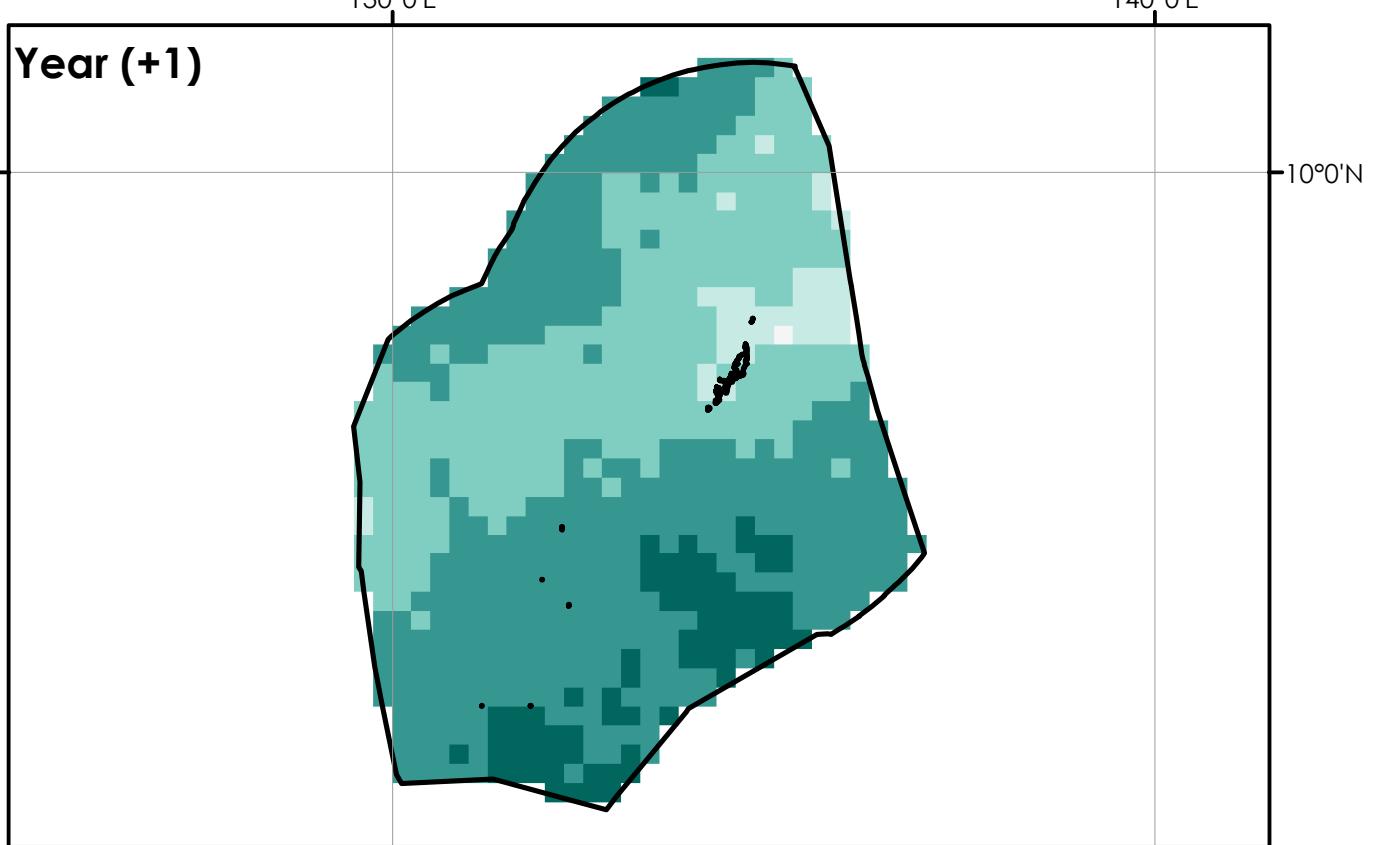
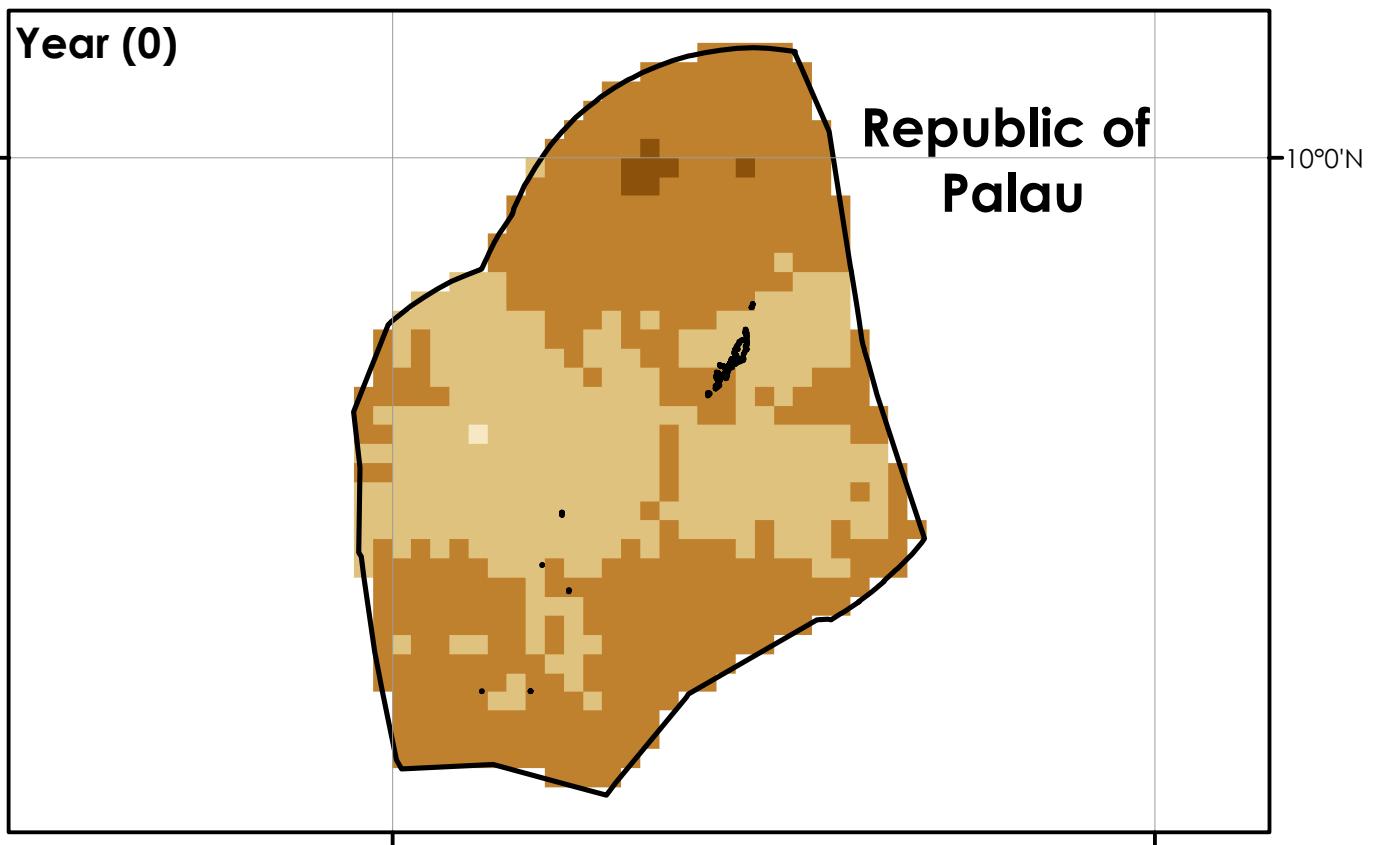


Precipitation Change (%)



Moderate - Strong La Niña for DJF

443

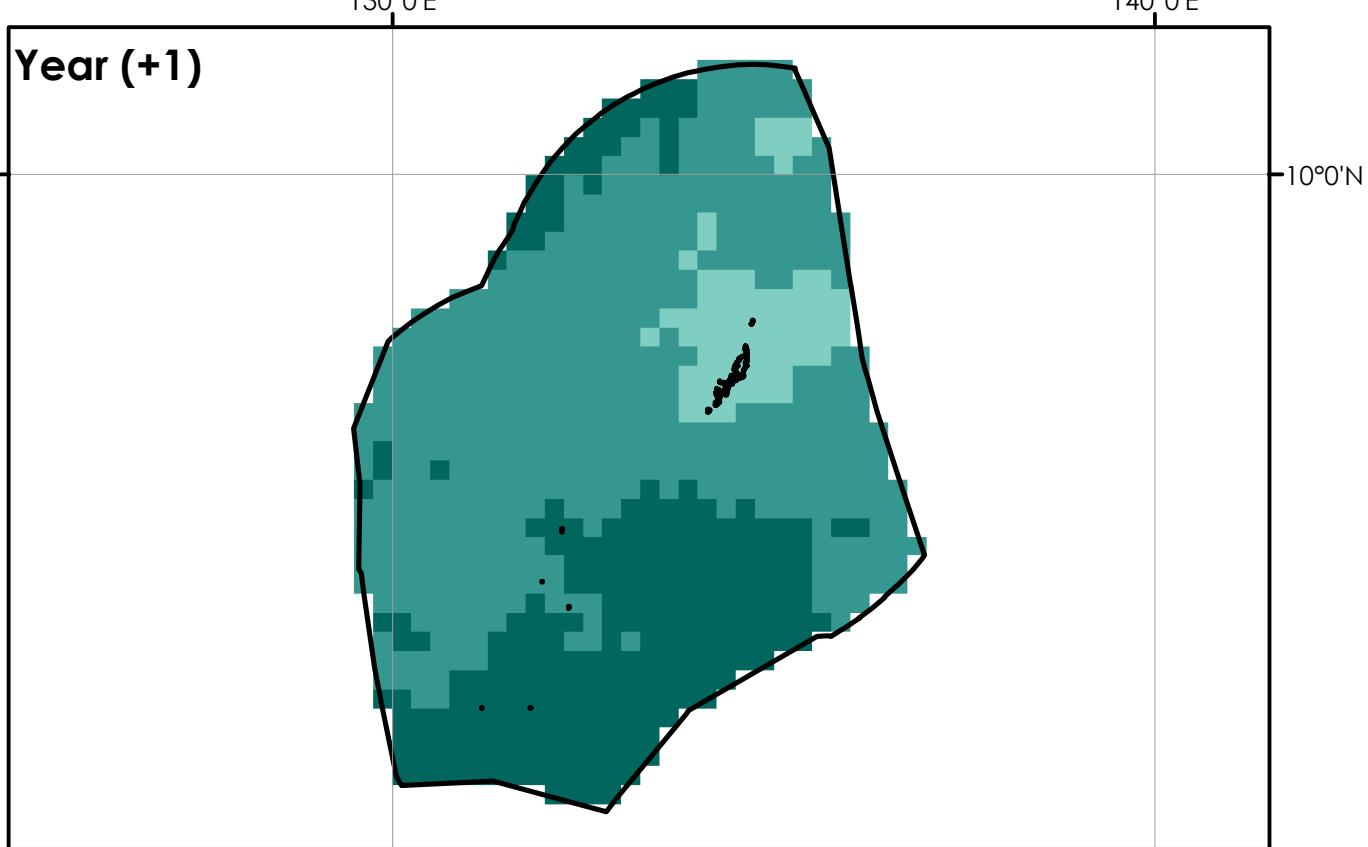
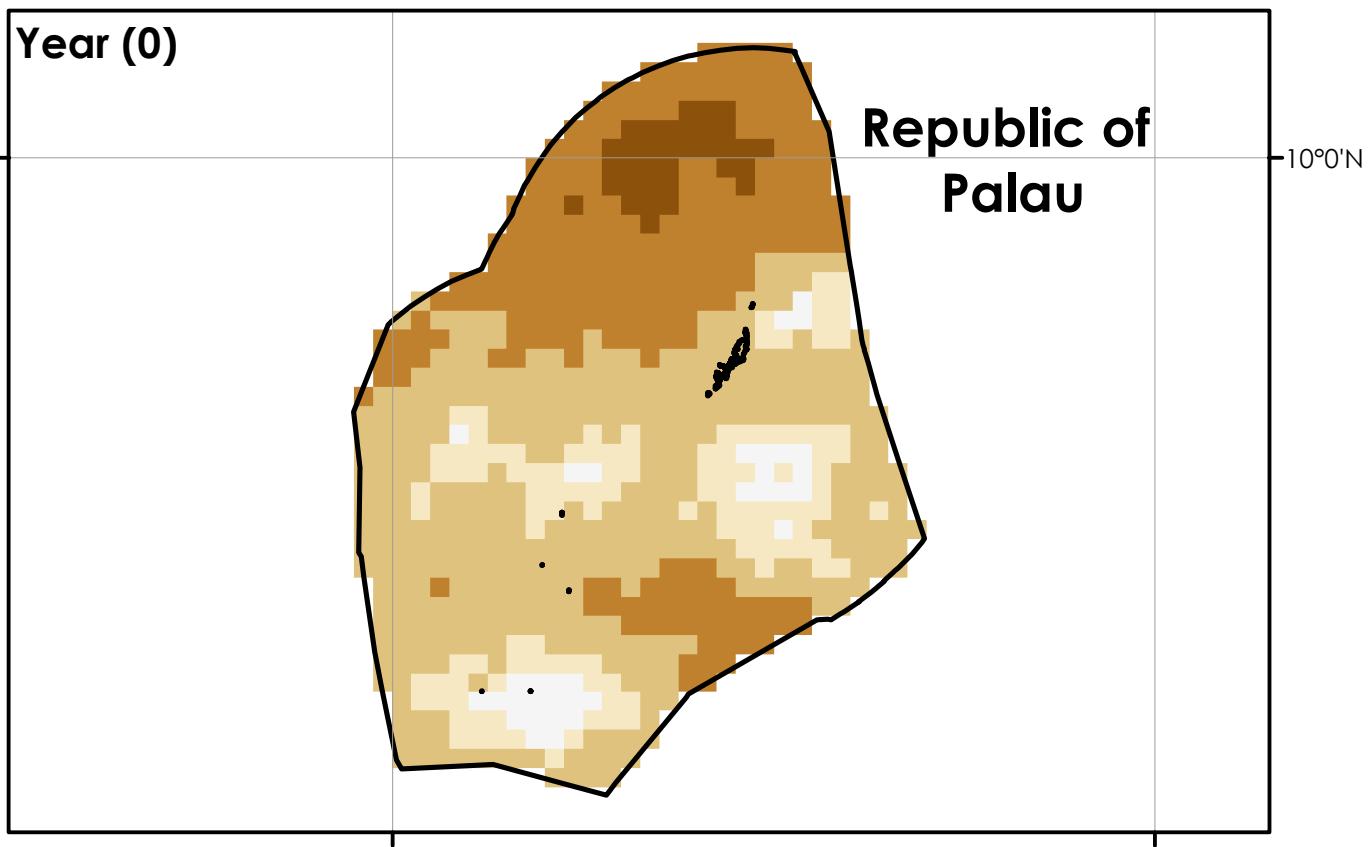


Precipitation Change (%)

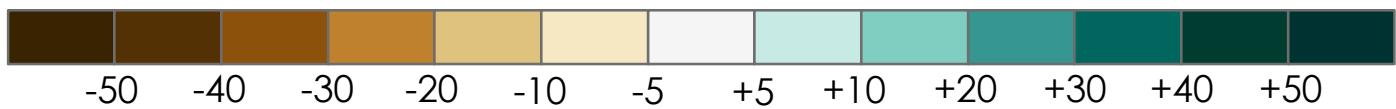


Moderate - Strong La Niña for JFM

444

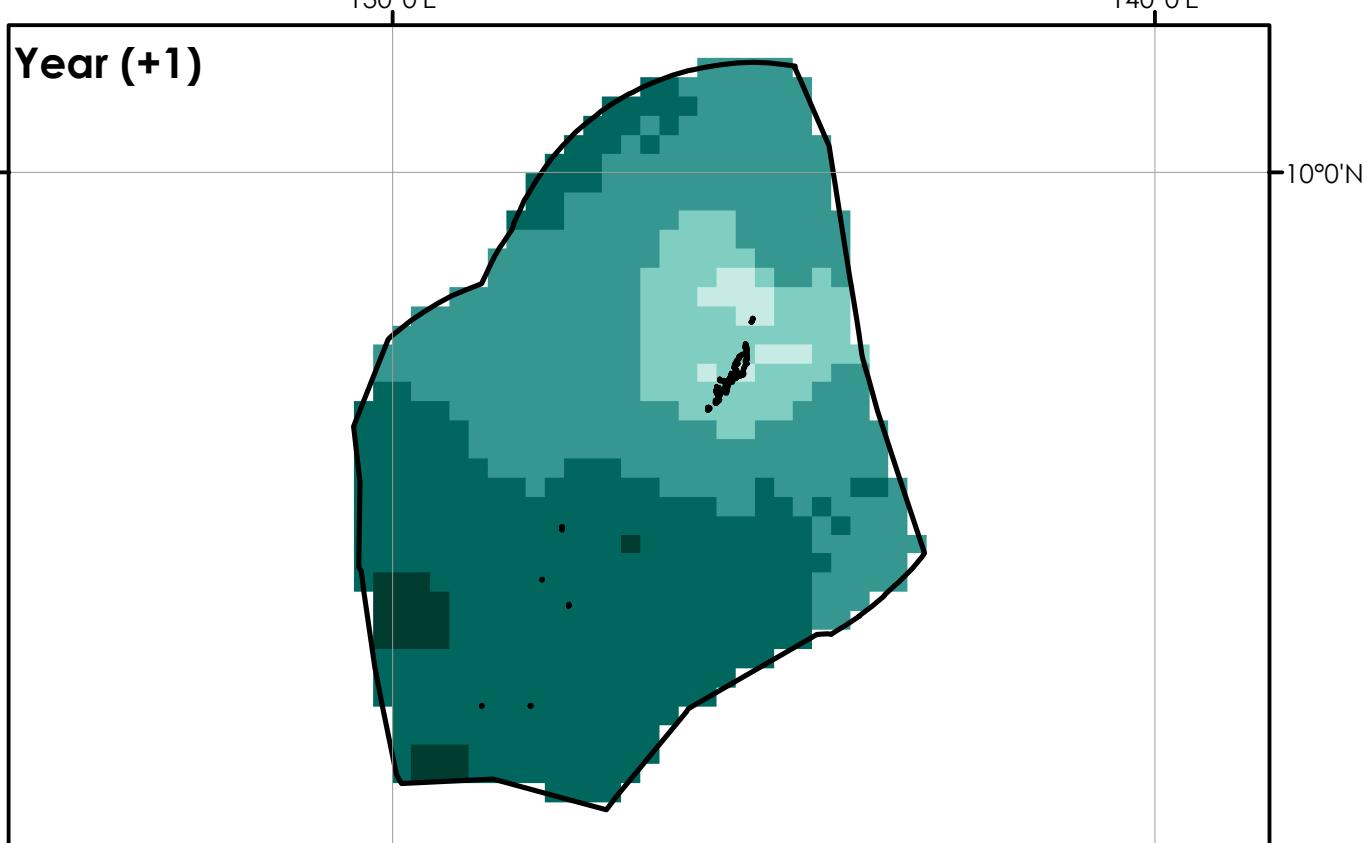
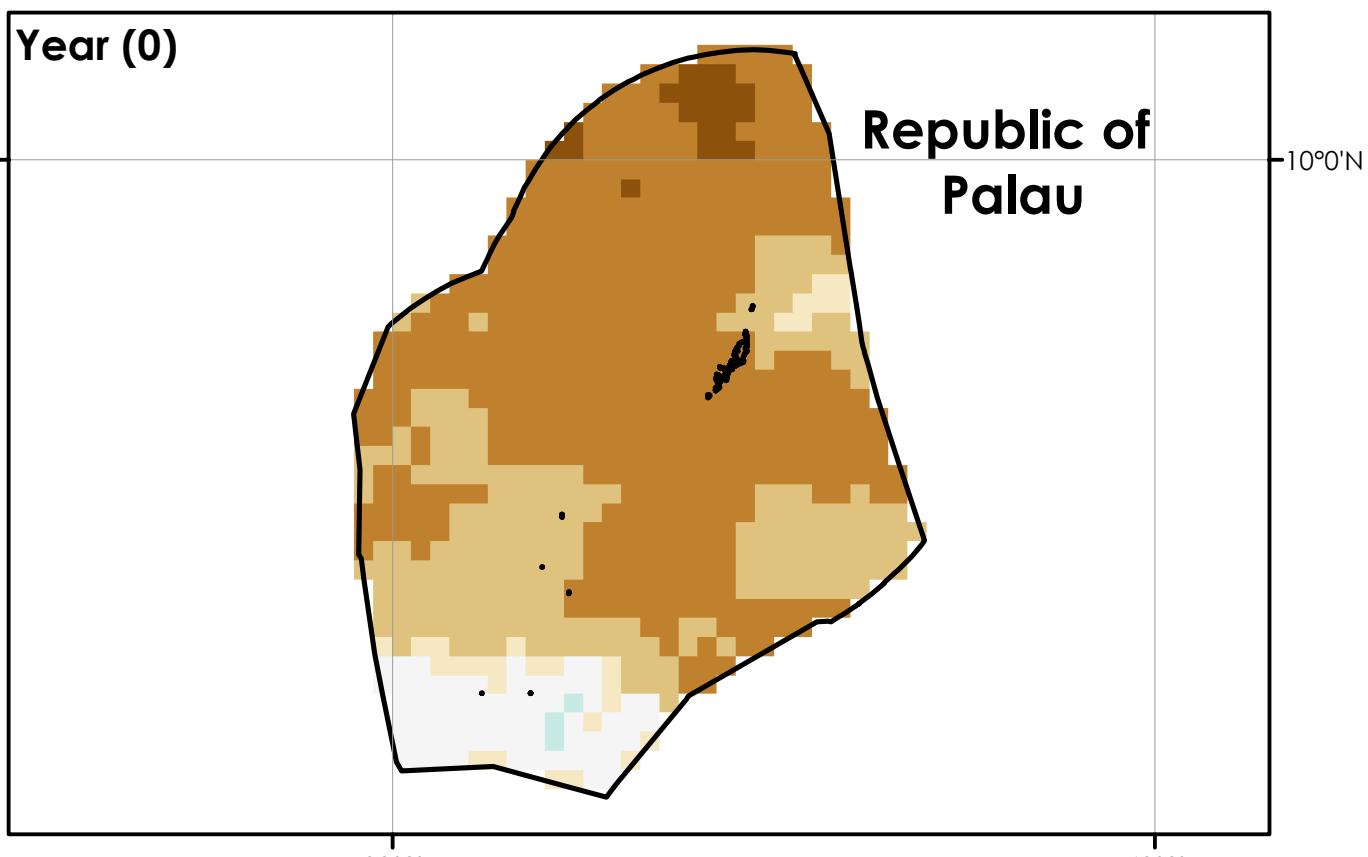


Precipitation Change (%)

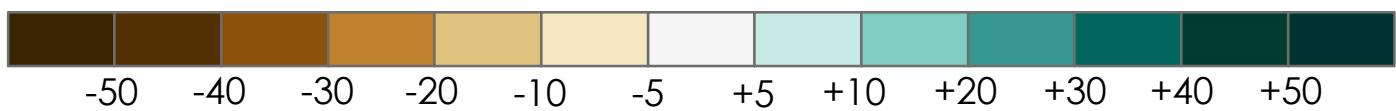


Moderate - Strong La Niña for FMA

445

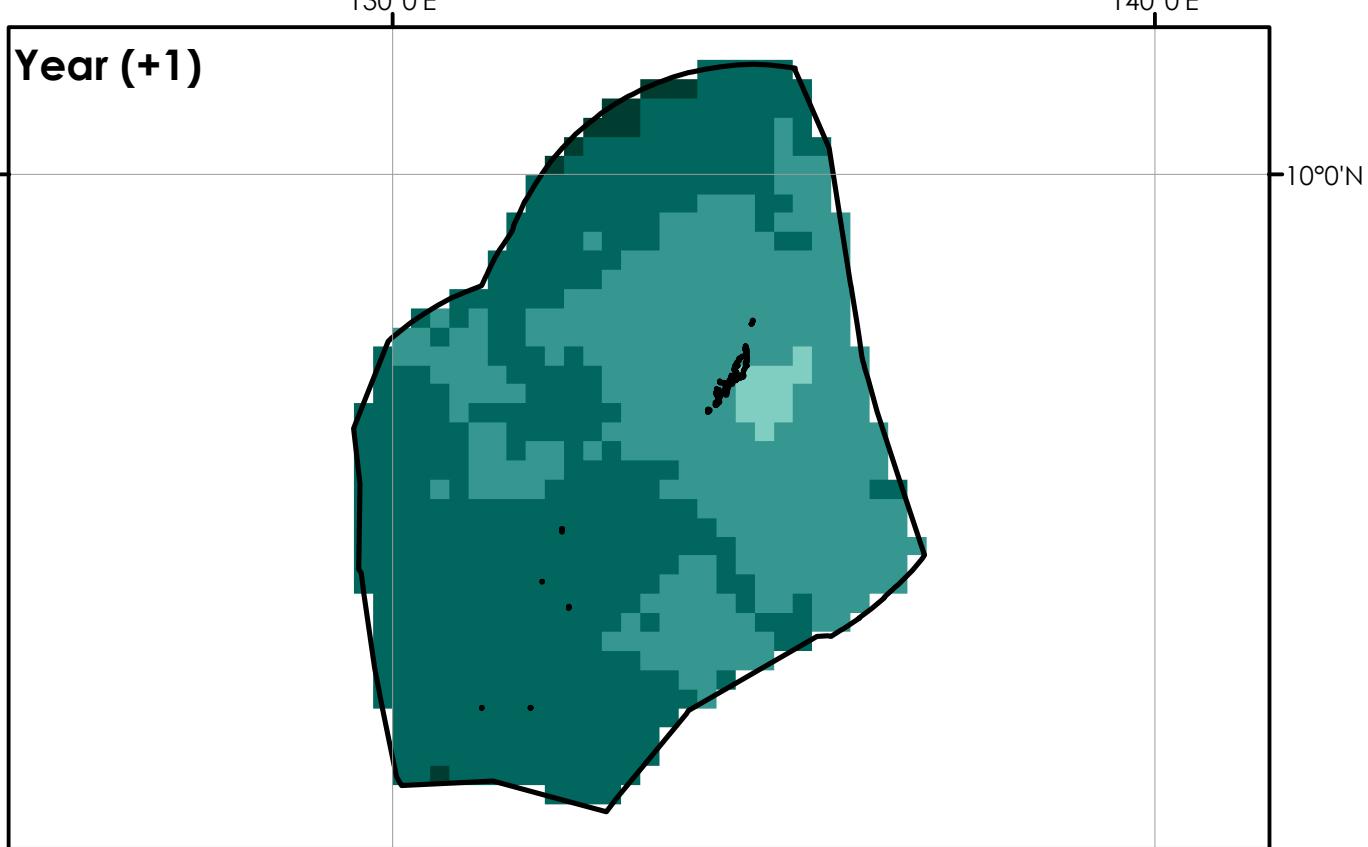
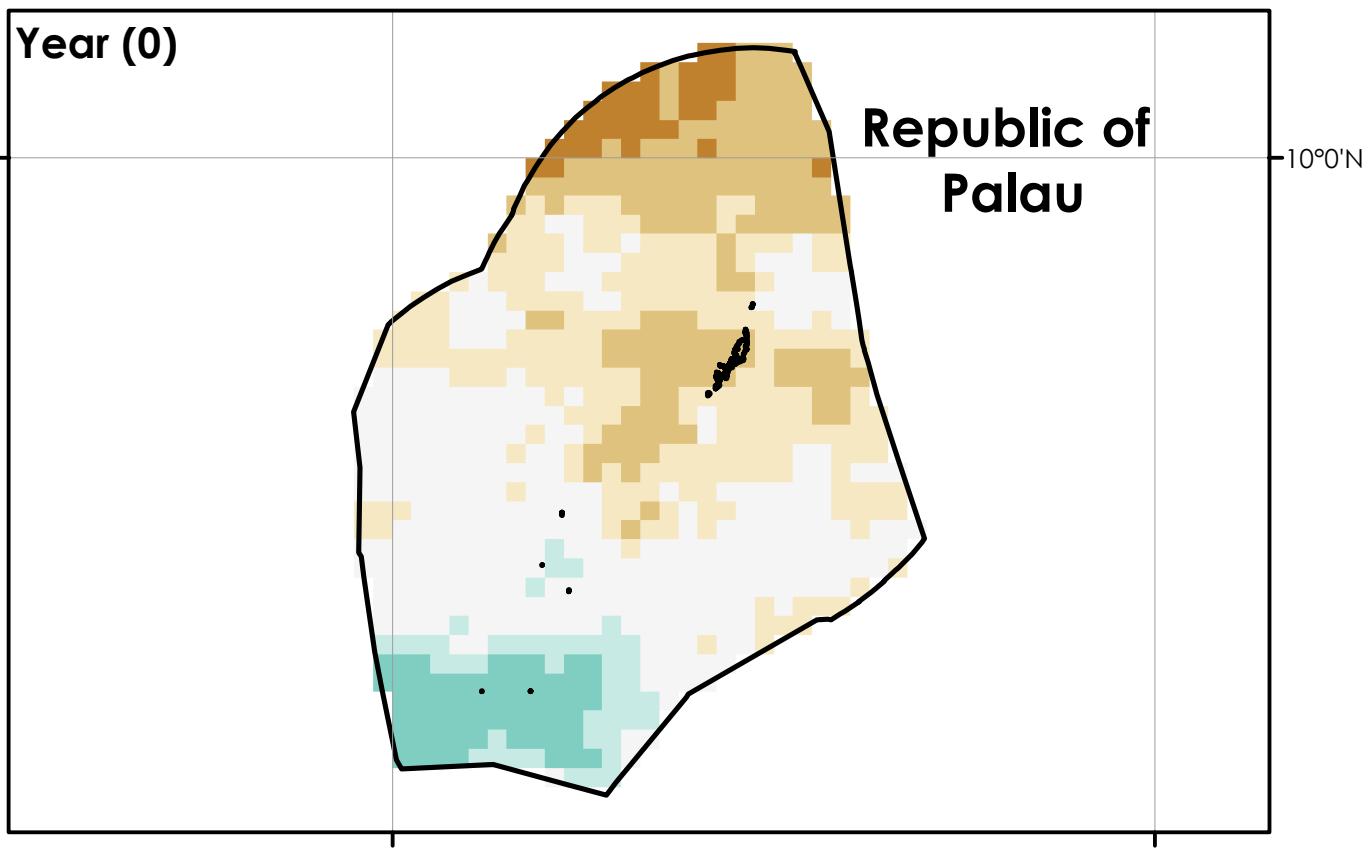


Precipitation Change (%)



Moderate - Strong La Niña for MAM

446

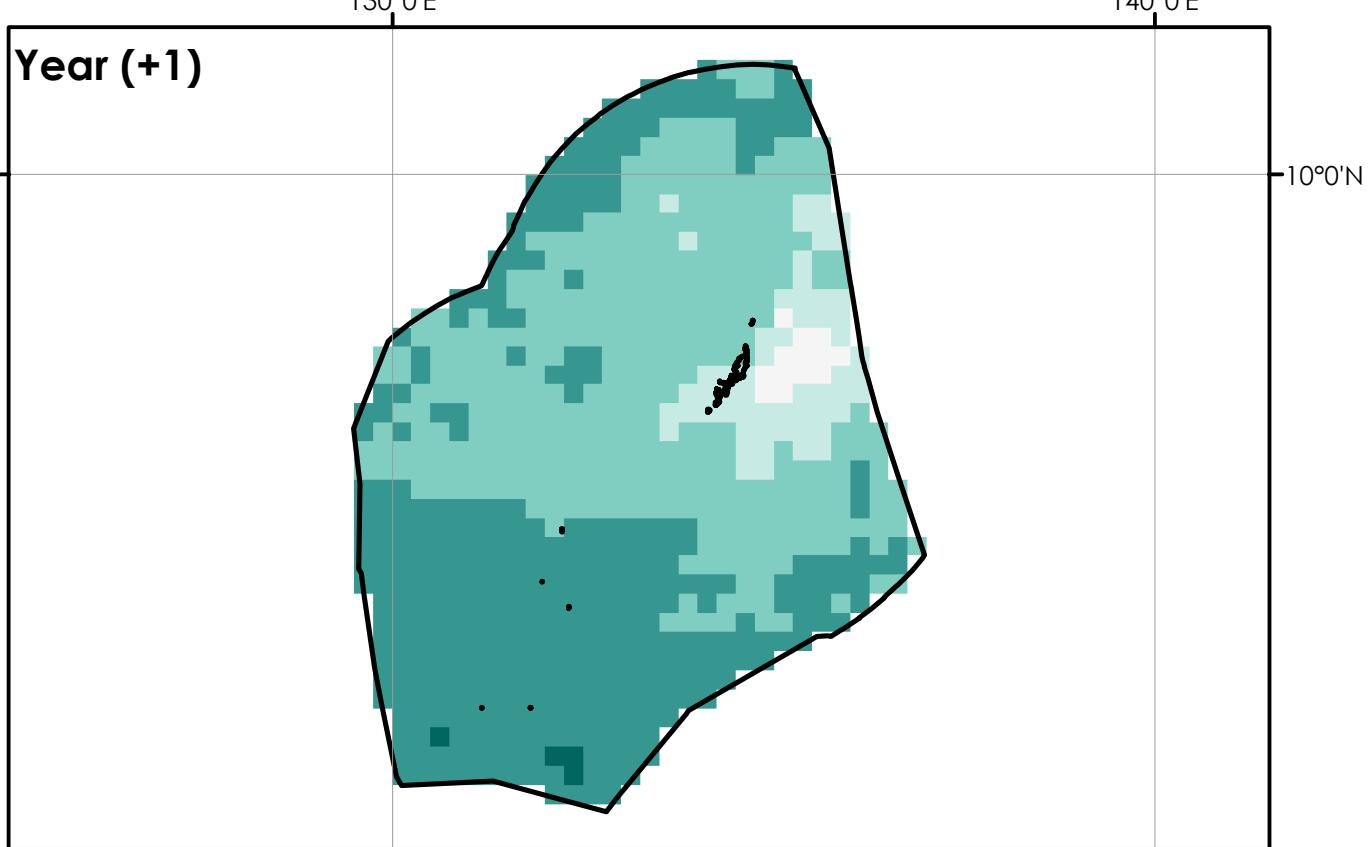
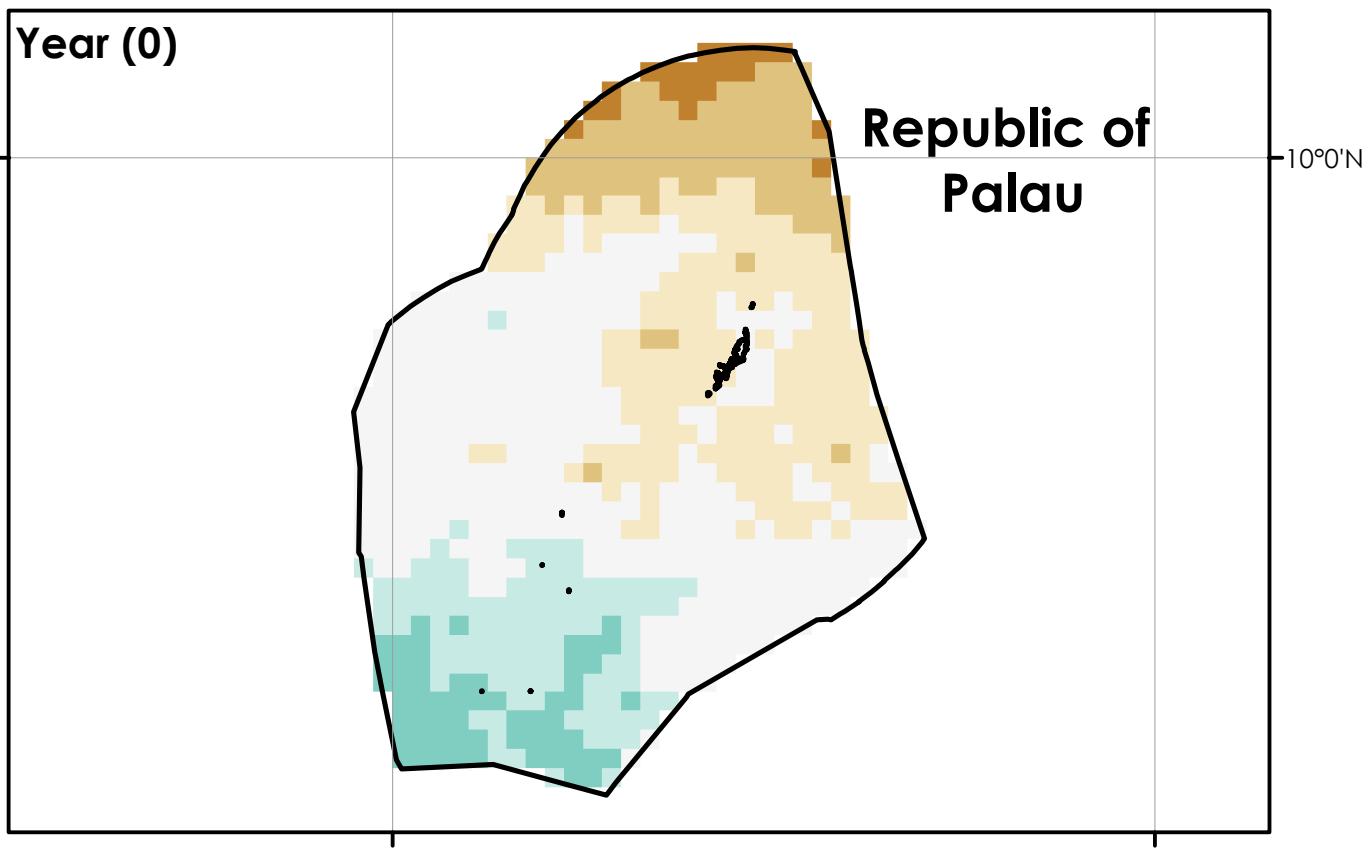


Precipitation Change (%)

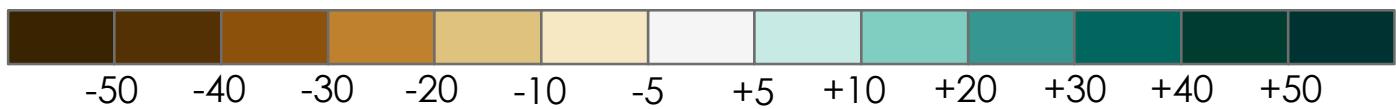


Moderate - Strong La Niña for AMJ

447

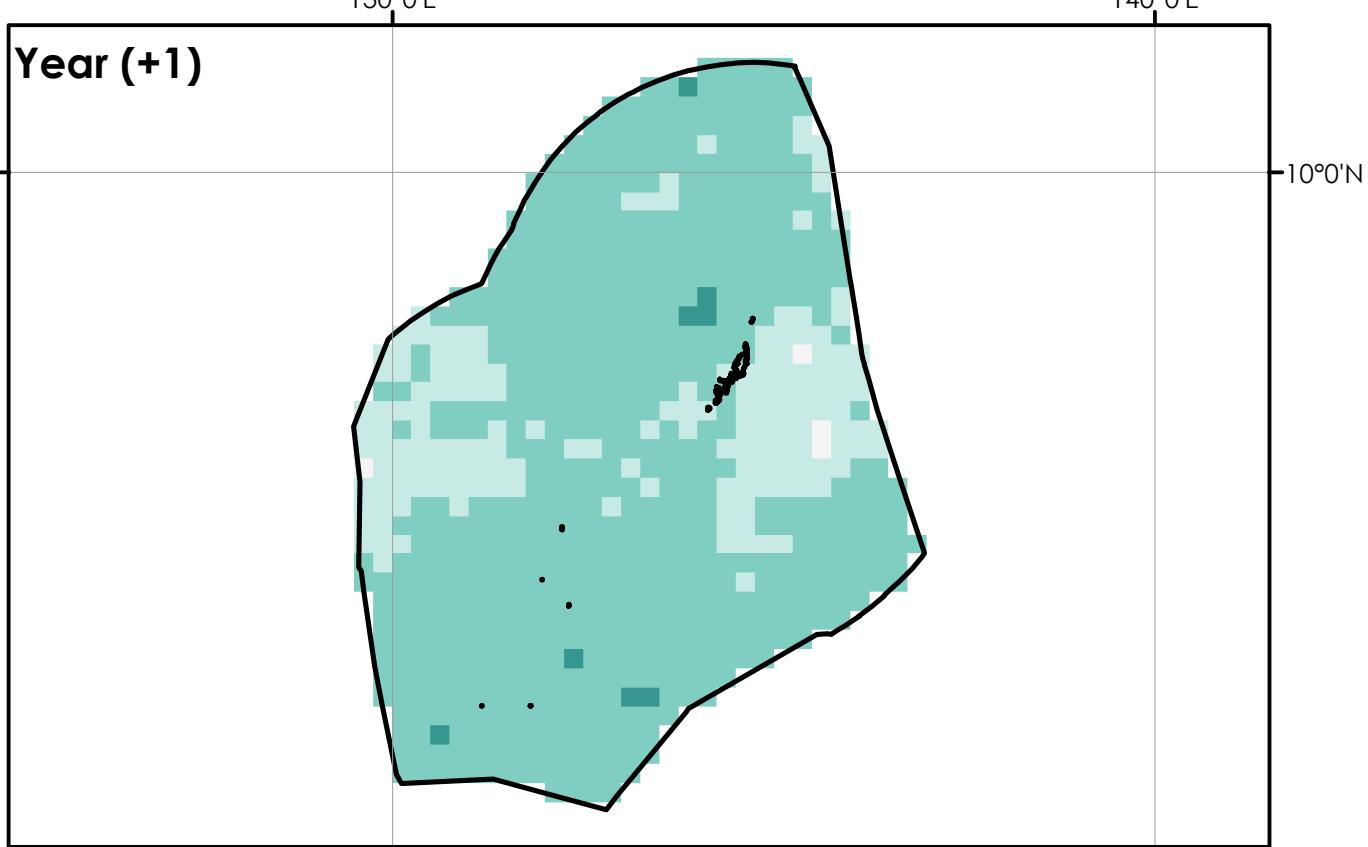
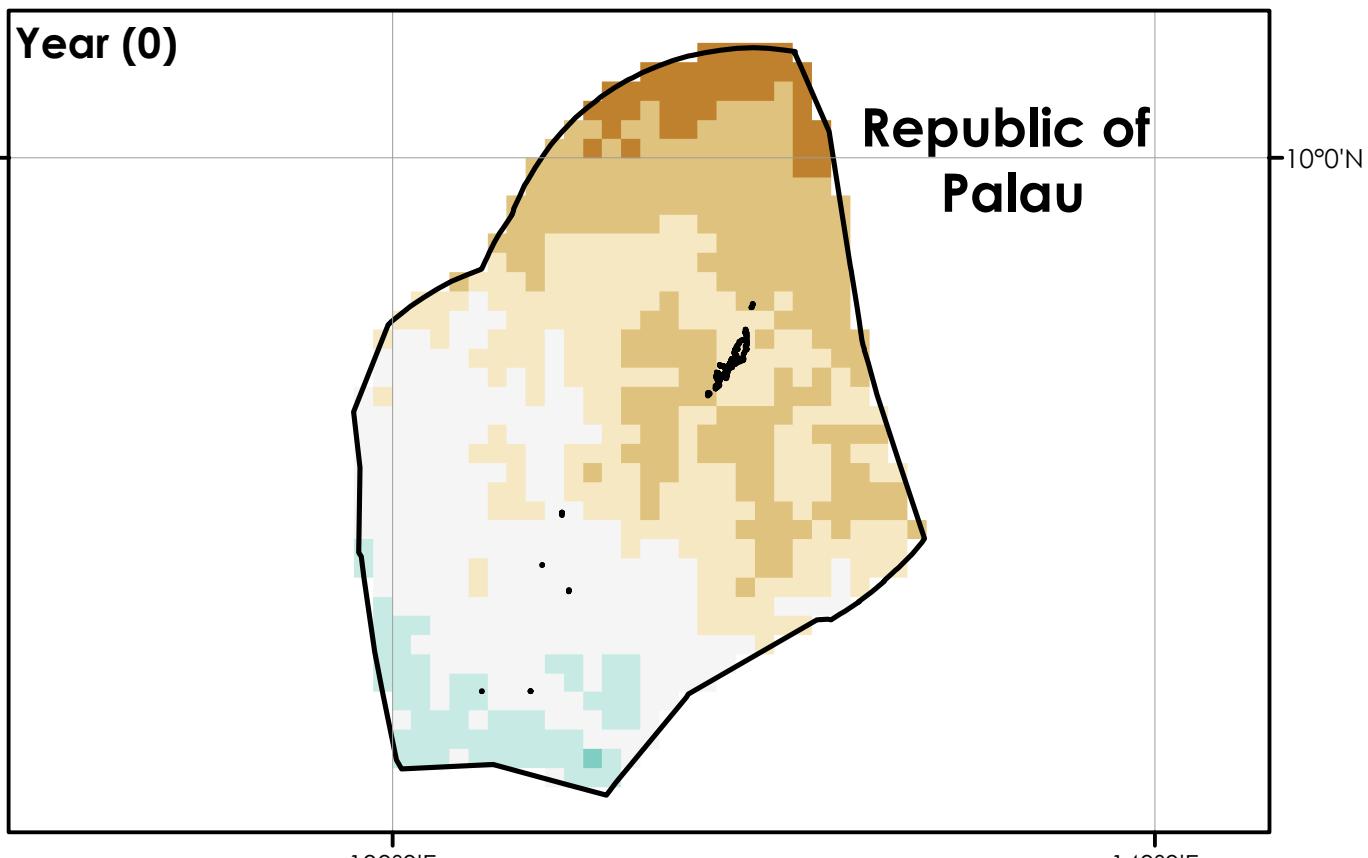


Precipitation Change (%)



Moderate - Strong La Niña for MJJ

448

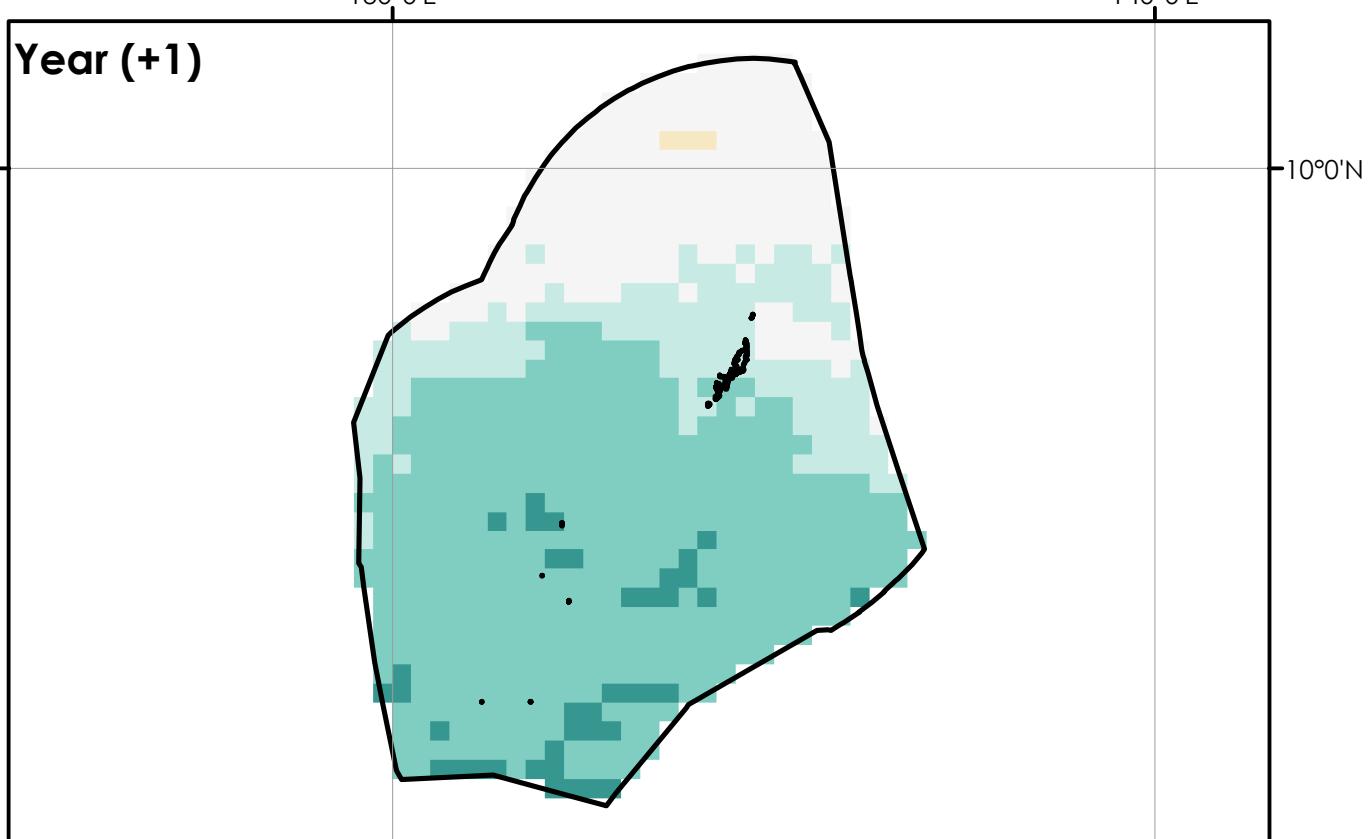
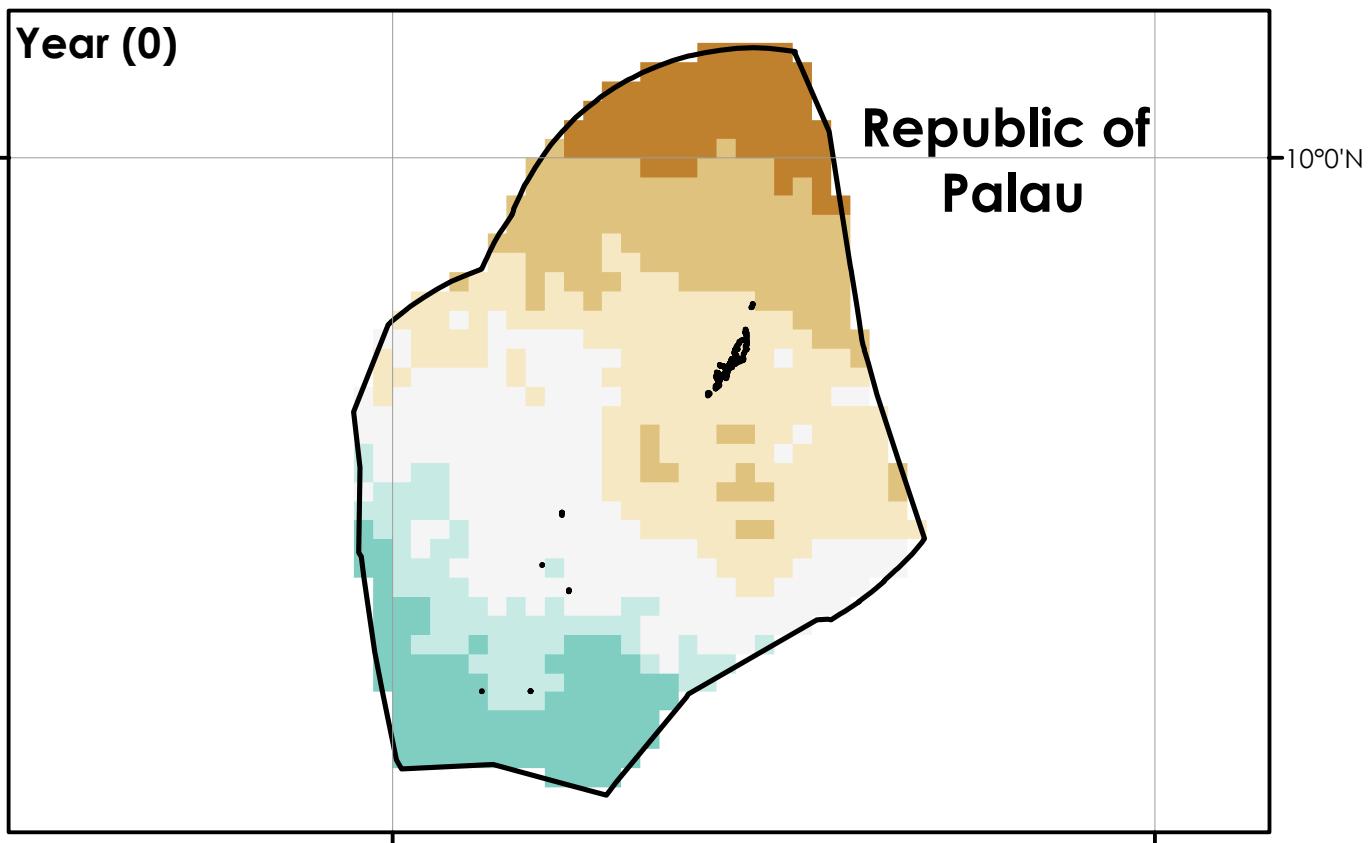


Precipitation Change (%)

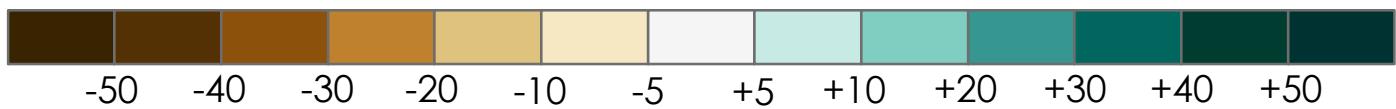


Moderate - Strong La Niña for JJA

449

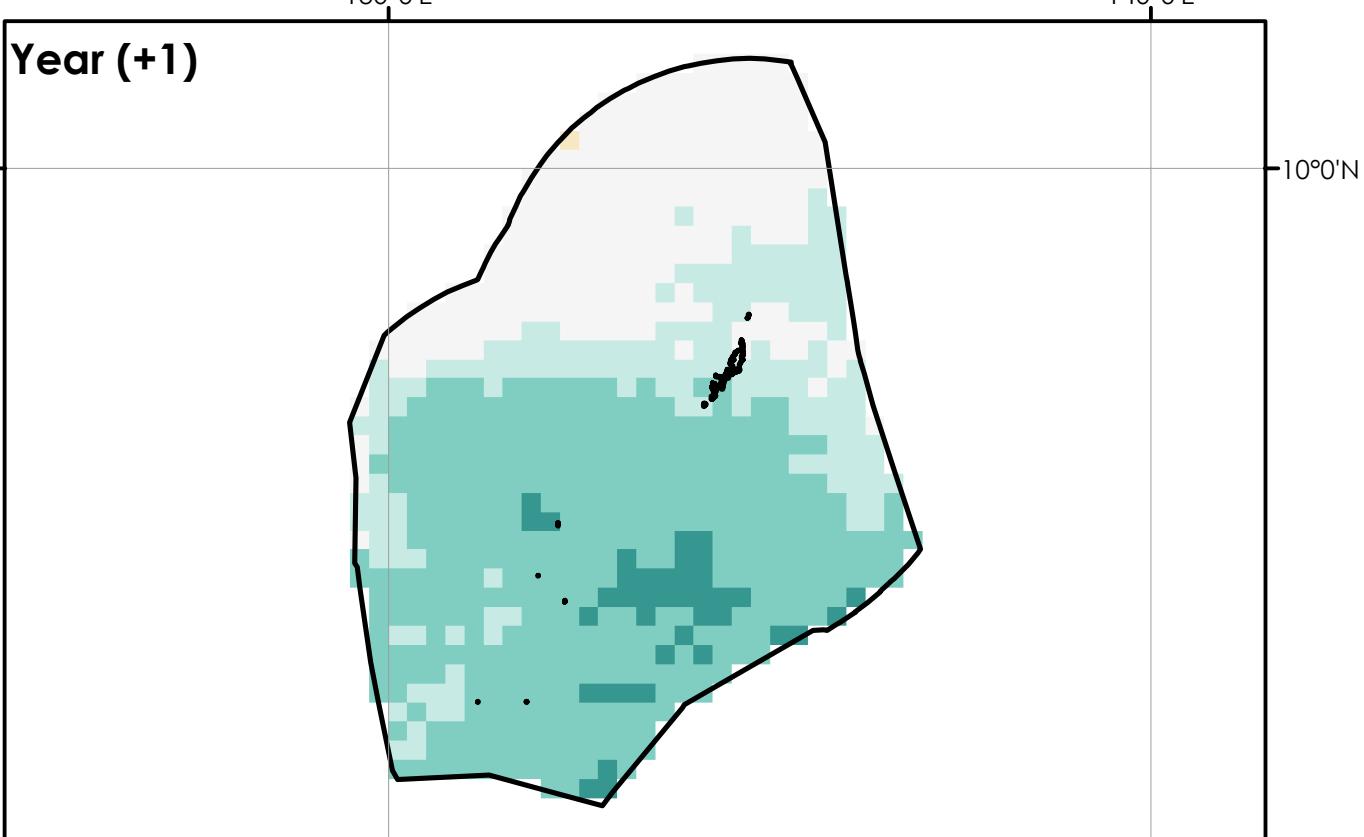
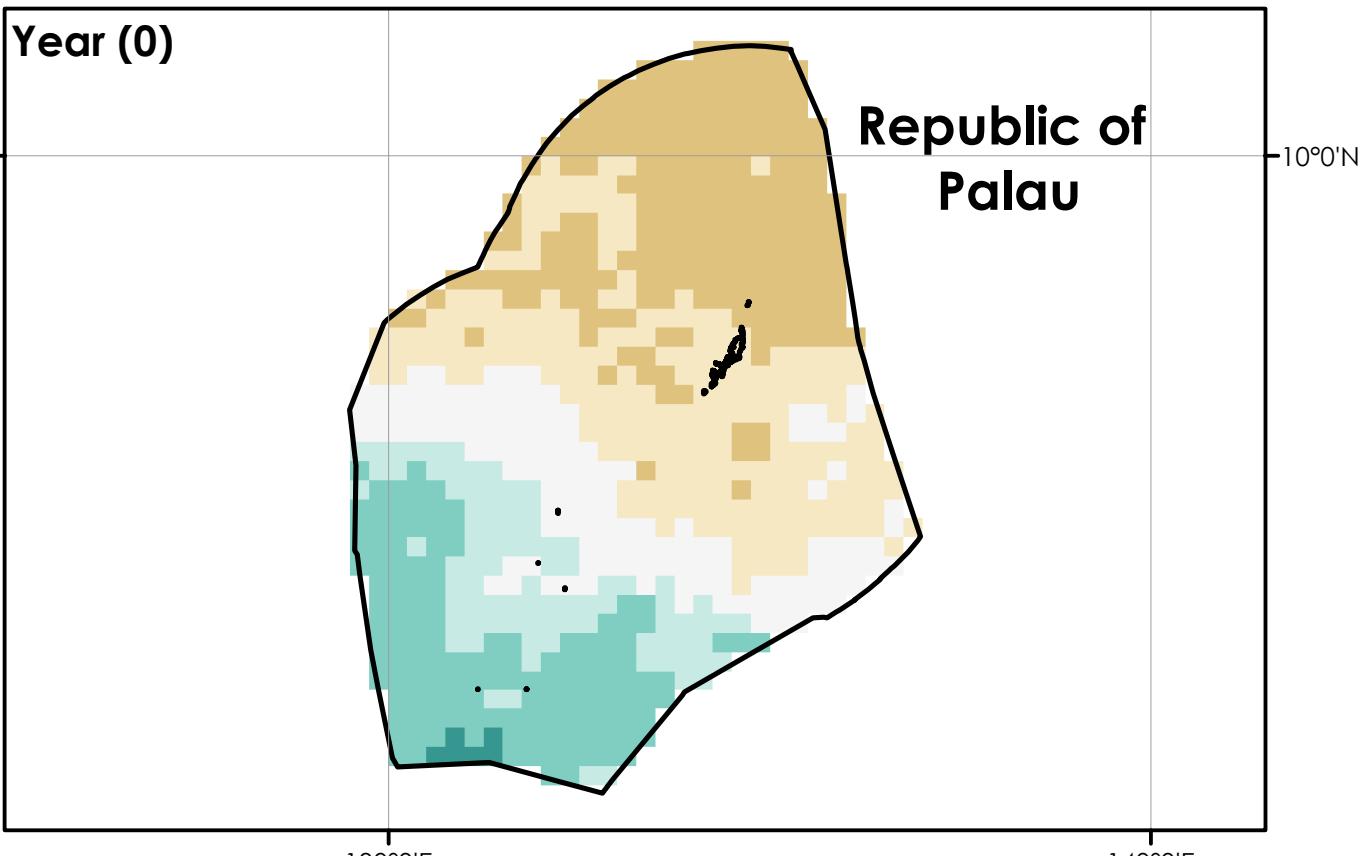


Precipitation Change (%)

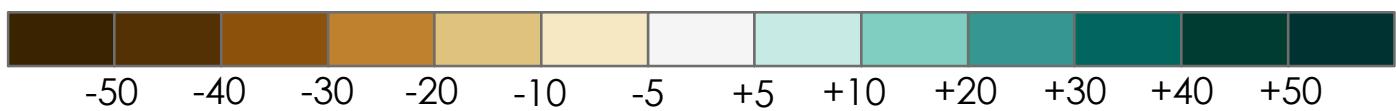


Moderate - Strong La Niña for JAS

450

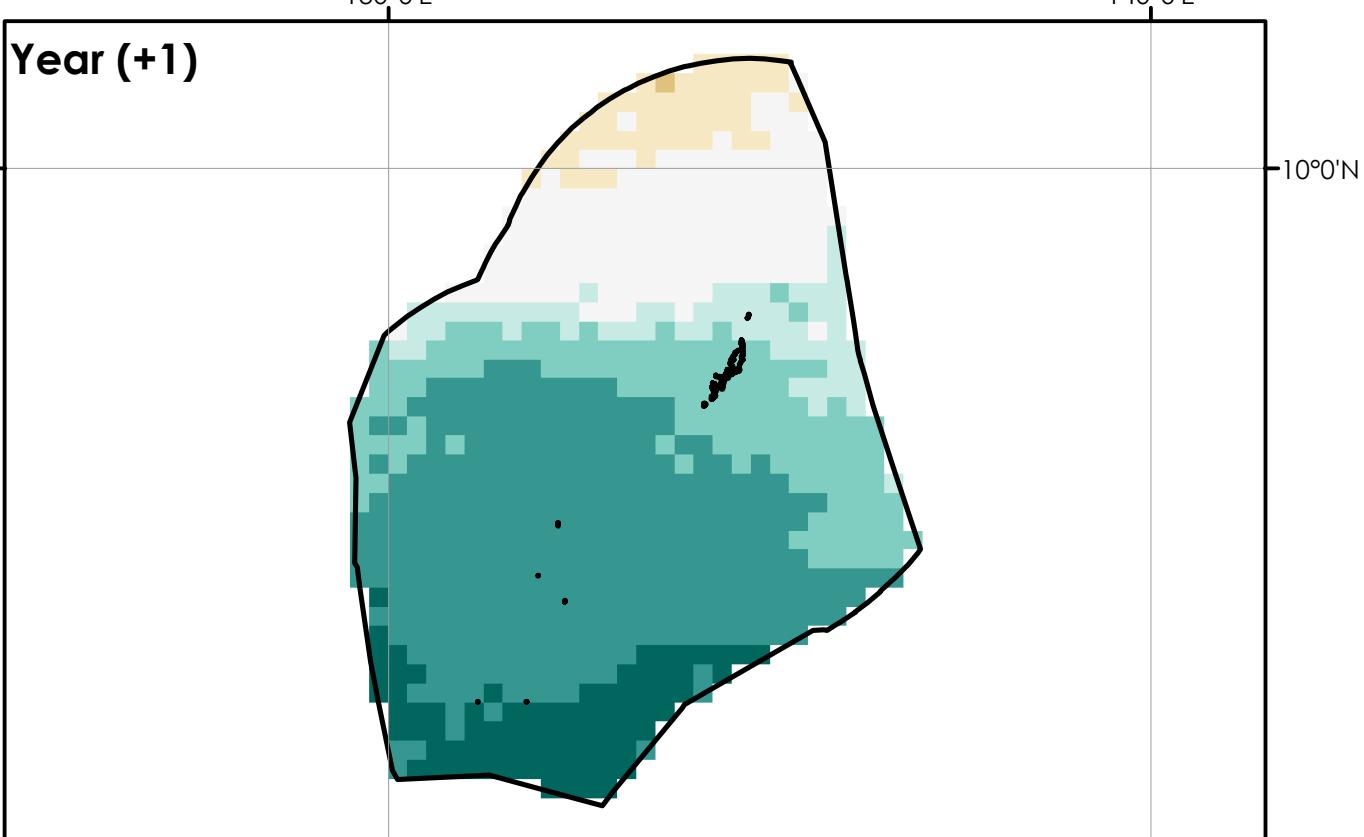
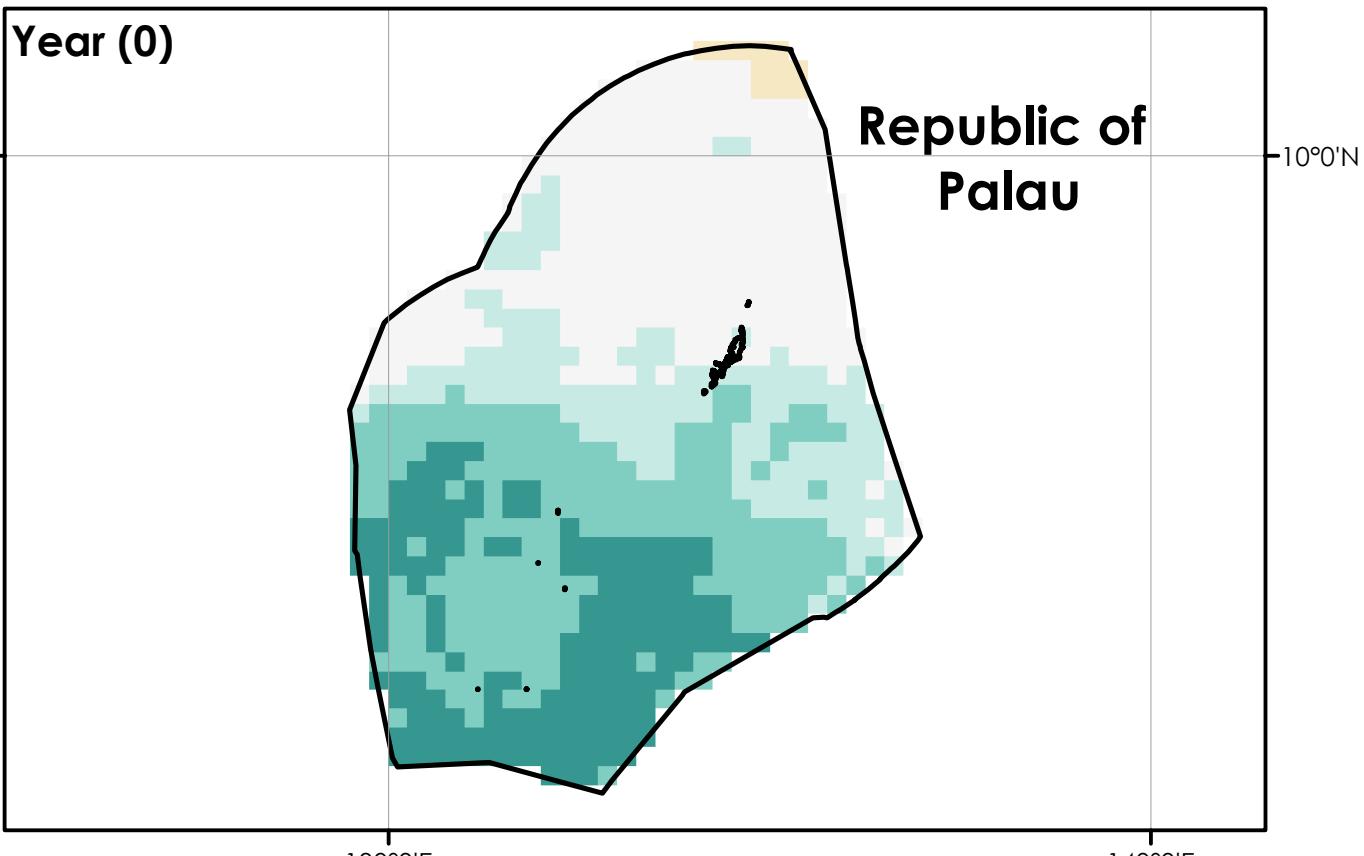


Precipitation Change (%)

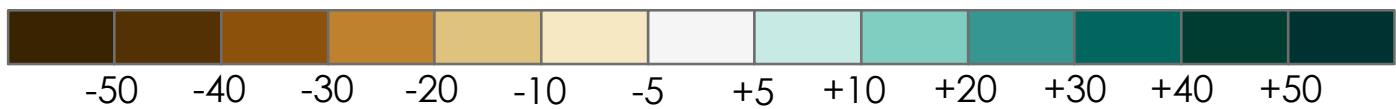


Moderate - Strong La Niña for ASO

451

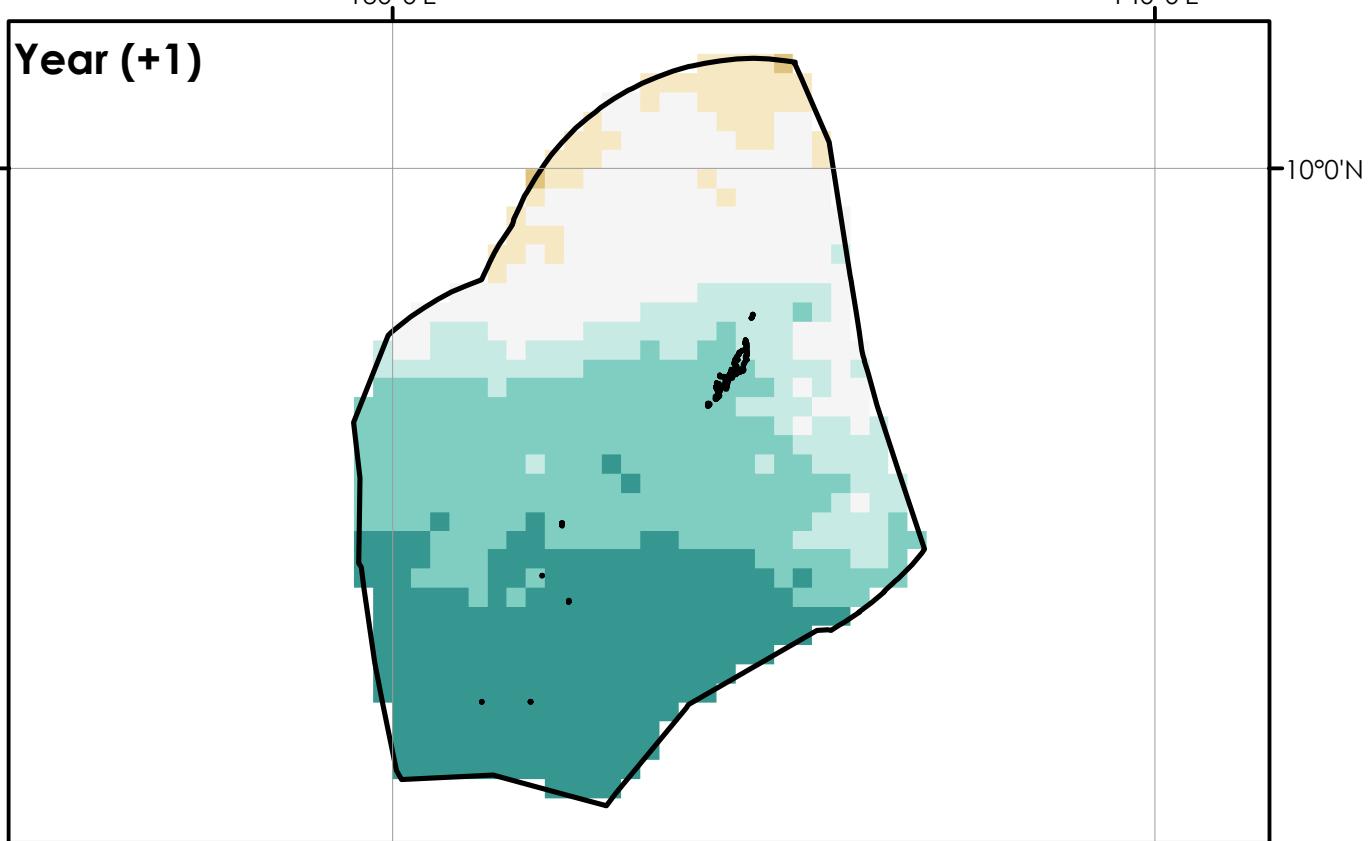
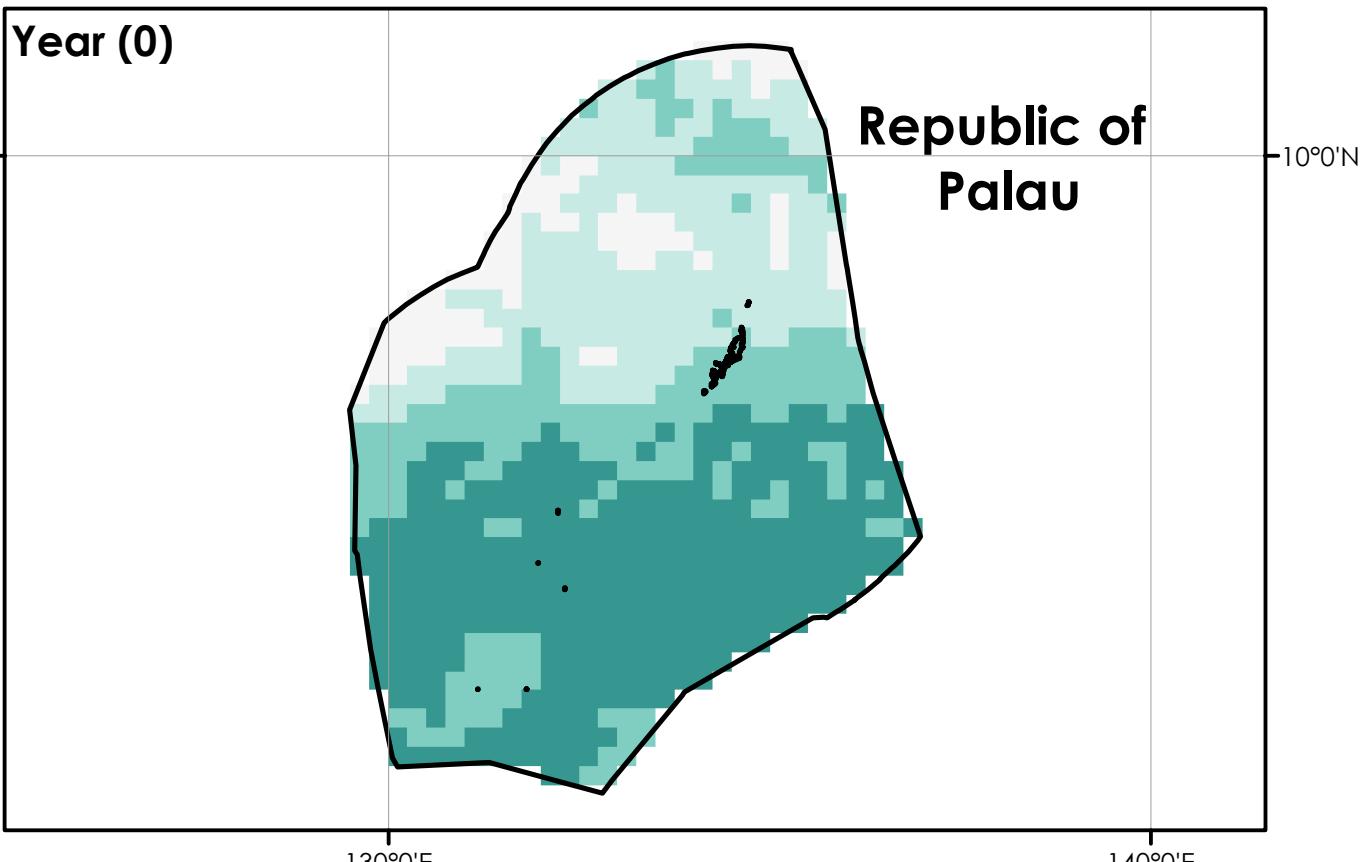


Precipitation Change (%)

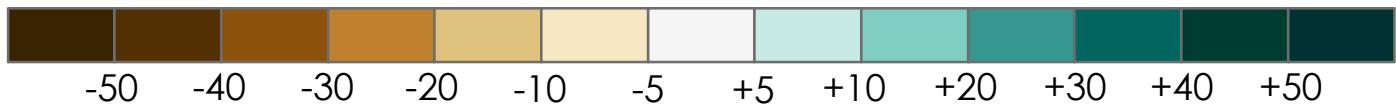


Moderate - Strong La Niña for SON

452

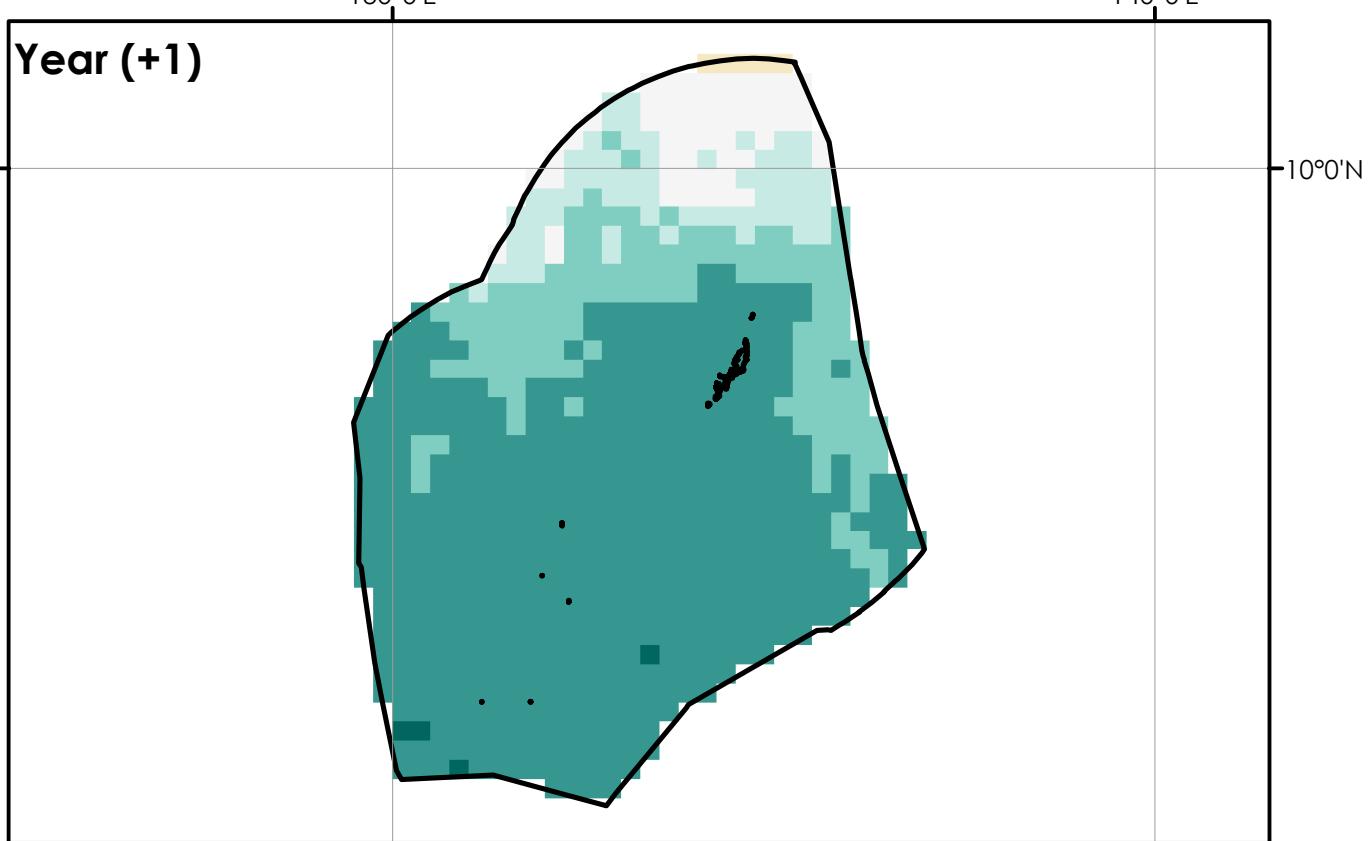
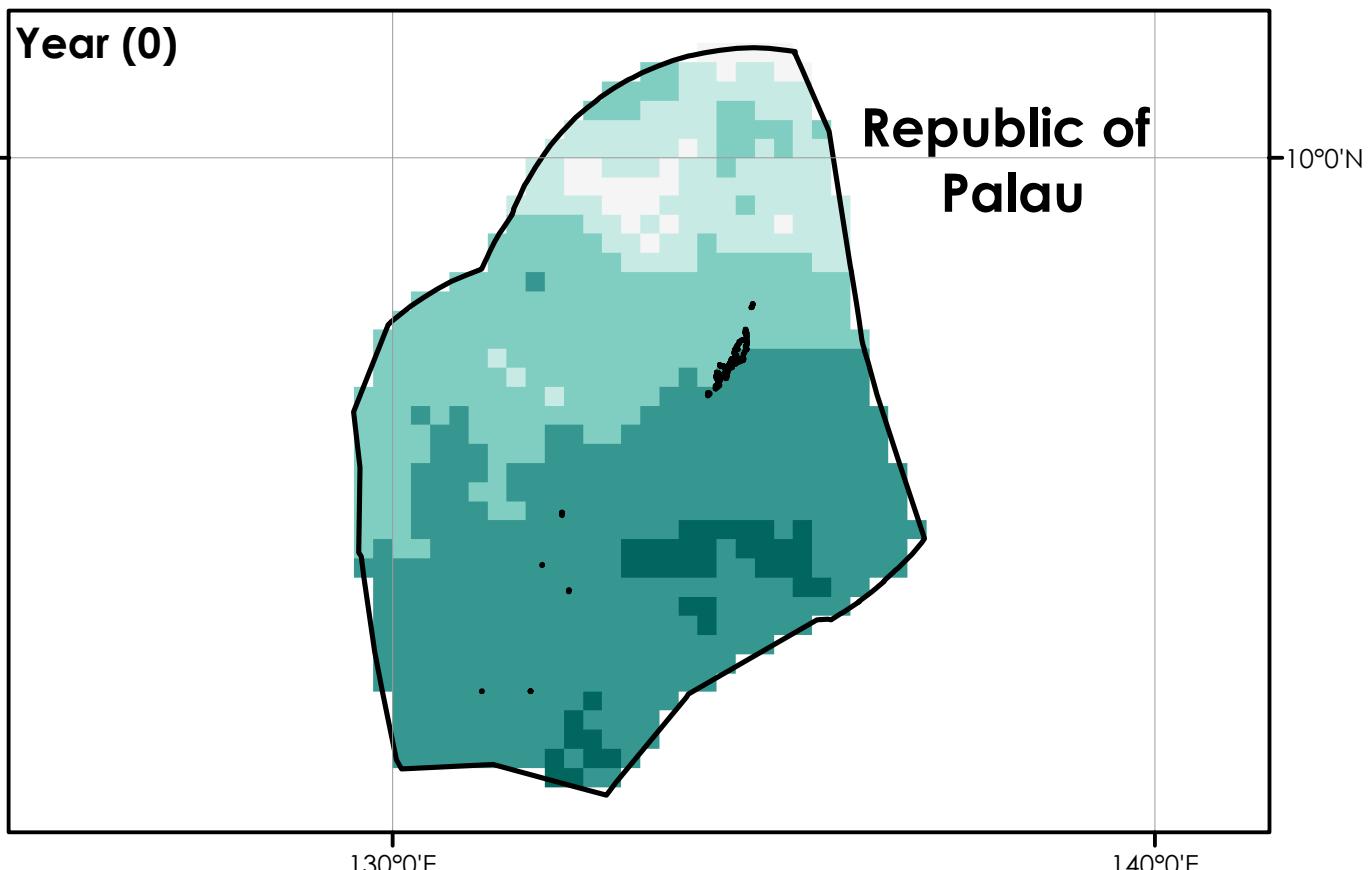


Precipitation Change (%)

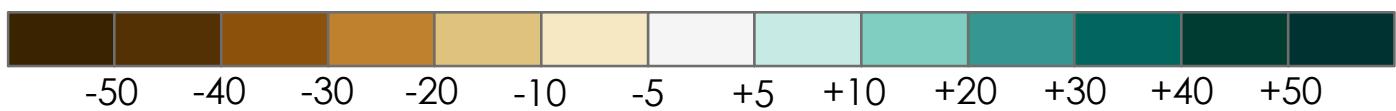


Moderate - Strong La Niña for OND

453

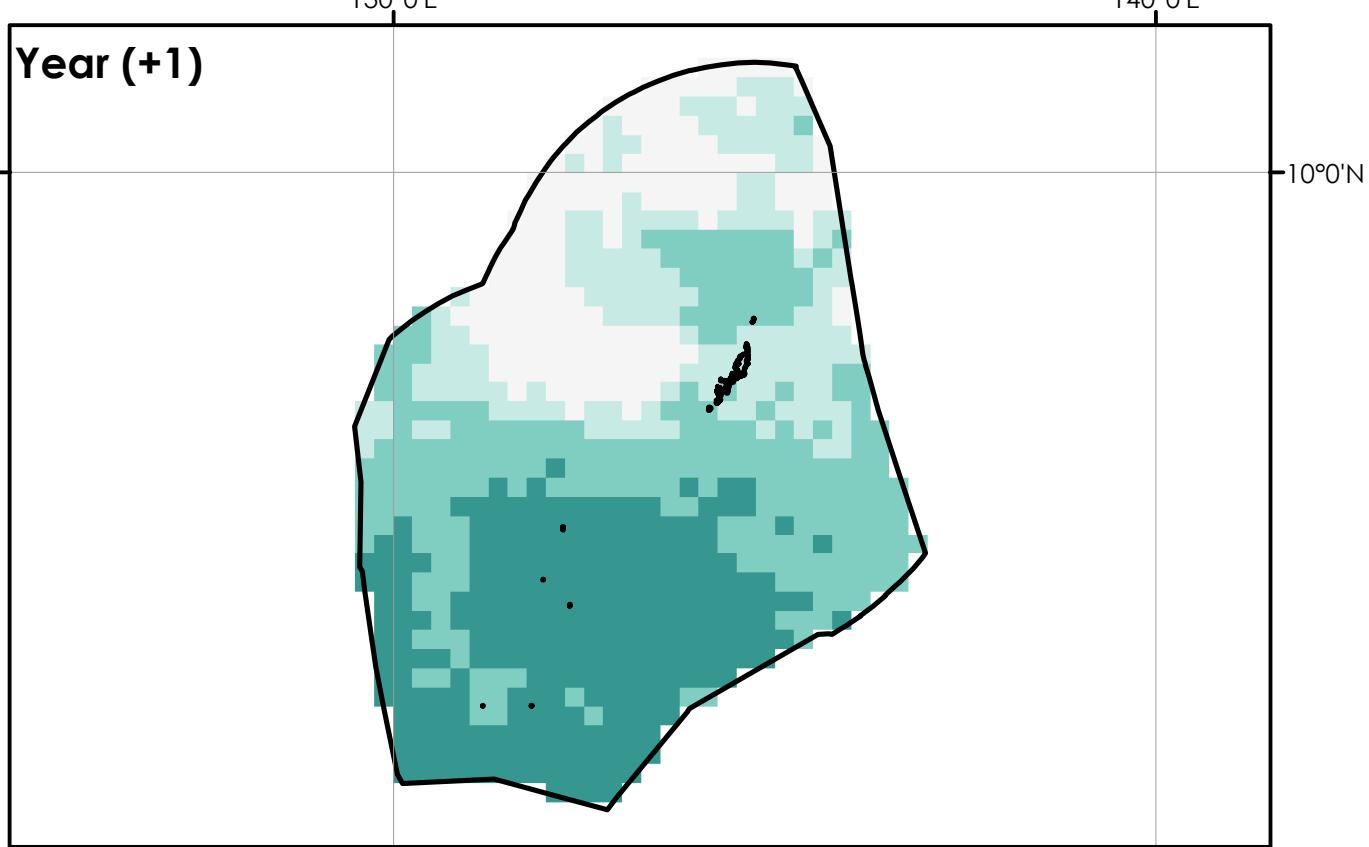
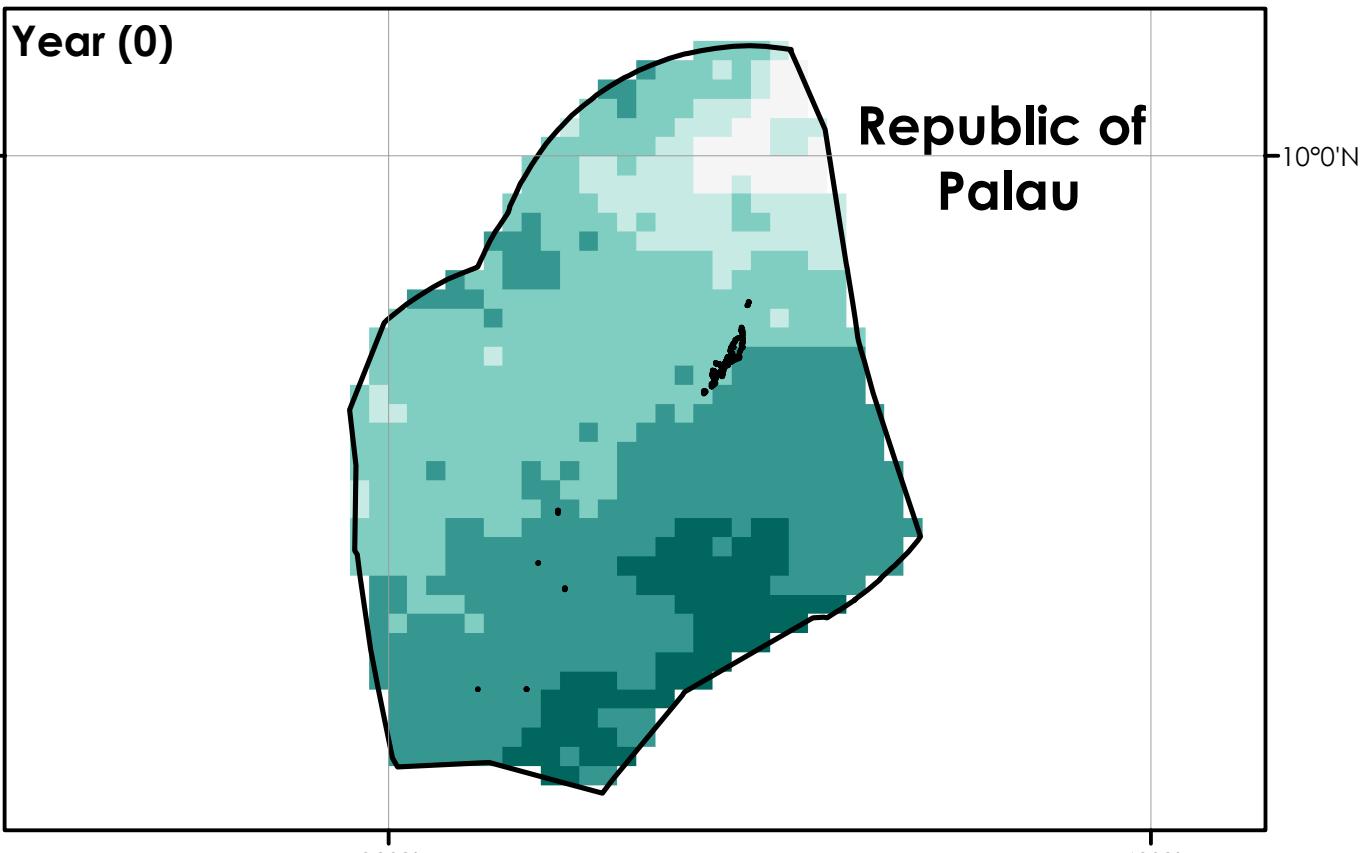


Precipitation Change (%)



Moderate - Strong La Niña for NDJ

454



Precipitation Change (%)



The following tables show the average percent change of precipitation from the PERSIANN-CDR for each *in situ* Level 1 GHCN station location. The results show the percent change for each three month season preceding (year 0) and following (year +1) each of the five phases of the ENSO (moderate-strong La Niña and El Niño, weak La Niña and El Niño, and neutral). Each table is labelled with the station name in the upper left corner of the table. For a list of the years used for each ENSO phase for this analysis, refer to Table 2.

PAGO		30 Year		MODERATE-STRONG		WEAK		NEUTRAL
Season	Year	mm	in	La Niña	El Niño	La Niña	El Niño	
DJF	0	728	29	5%	-8%	3%	28%	-8%
JFM	0	700	28	3%	-5%	1%	8%	-1%
FMA	0	571	22	-6%	1%	-12%	8%	8%
MAM	0	509	20	-3%	8%	-11%	-1%	4%
AMJ	0	395	16	-13%	11%	-2%	7%	-2%
MJJ	0	316	12	-5%	10%	2%	1%	-4%
JJA	0	225	9	-10%	7%	11%	10%	-8%
JAS	0	267	11	8%	-8%	20%	29%	-14%
ASO	0	334	13	22%	-14%	1%	29%	-9%
SON	0	484	19	22%	-26%	5%	23%	-3%
OND	0	601	24	10%	-15%	3%	17%	-3%
NDJ	0	724	29	17%	-11%	3%	0%	-1%
DJF	+1	728	29	6%	-8%	3%	-1%	0%
JFM	+1	700	28	-1%	-9%	4%	4%	2%
FMA	+1	571	22	-30%	-3%	8%	19%	6%
MAM	+1	509	20	-28%	-4%	2%	30%	6%
AMJ	+1	395	16	-18%	-12%	10%	17%	5%
MJJ	+1	316	12	-2%	-16%	5%	14%	4%
JJA	+1	225	9	-17%	-3%	-13%	24%	11%
JAS	+1	267	11	-22%	2%	-15%	53%	1%
ASO	+1	334	13	-20%	2%	2%	43%	-5%
SON	+1	484	19	6%	3%	1%	22%	-12%
OND	+1	601	24	4%	4%	2%	7%	-8%
NDJ	+1	724	29	-8%	10%	7%	25%	-14%

GUAM		30 Year		MODERATE-STRONG		WEAK		NEUTRAL
Season	Year	mm	in	La Niña	El Niño	La Niña	El Niño	
DJF	0	212	8	-8%	34%	-11%	4%	-21%
JFM	0	168	7	-5%	0%	3%	9%	-16%
FMA	0	133	5	6%	9%	6%	15%	-14%
MAM	0	152	6	-7%	-2%	16%	2%	-3%
AMJ	0	211	8	-25%	10%	0%	50%	-6%
MJJ	0	362	14	-20%	6%	-5%	56%	-13%
JJA	0	580	23	-31%	16%	-10%	51%	-5%
JAS	0	744	29	-26%	3%	0%	29%	-1%
ASO	0	765	30	-25%	3%	0%	28%	1%
SON	0	630	25	-17%	0%	-10%	14%	6%
OND	0	457	18	-23%	26%	-28%	11%	8%
NDJ	0	312	12	-31%	21%	-27%	-16%	28%
DJF	+1	212	8	-7%	-5%	-17%	-14%	21%
JFM	+1	168	7	0%	-42%	-9%	25%	19%
FMA	+1	133	5	41%	-36%	-29%	37%	7%
MAM	+1	152	6	8%	-27%	-5%	54%	-1%
AMJ	+1	211	8	7%	-28%	-7%	-9%	20%
MJJ	+1	362	14	-3%	-34%	17%	-6%	14%
JJA	+1	580	23	-9%	-36%	14%	-4%	19%
JAS	+1	744	29	-4%	-28%	7%	6%	13%
ASO	+1	765	30	-11%	-20%	0%	12%	14%
SON	+1	630	25	-16%	-4%	-3%	9%	9%
OND	+1	457	18	-31%	-5%	13%	-2%	11%
NDJ	+1	312	12	-27%	-12%	19%	0%	9%

CHUUK		30 Year		MODERATE-STRONG		WEAK		NEUTRAL
Season	Year	mm	in	La Niña	El Niño	La Niña	El Niño	
DJF	0	586	23	-19%	9%	10%	7%	-7%
JFM	0	572	23	-22%	9%	13%	-7%	-6%
FMA	0	623	25	-17%	14%	7%	-2%	-11%
MAM	0	710	28	-13%	-4%	9%	14%	-3%
AMJ	0	768	30	-17%	4%	1%	19%	-2%
MJJ	0	785	31	-14%	10%	-2%	19%	-5%
JJA	0	831	33	-22%	17%	-1%	14%	-3%
JAS	0	838	33	-17%	18%	-1%	5%	-4%
ASO	0	809	32	-8%	5%	0%	5%	1%
SON	0	737	29	1%	4%	-2%	-16%	4%
OND	0	693	27	15%	-12%	-6%	-15%	9%
NDJ	0	640	25	14%	-16%	1%	-14%	11%
DJF	+1	586	23	14%	-38%	0%	-2%	17%
JFM	+1	572	23	14%	-51%	0%	7%	22%
FMA	+1	623	25	19%	-44%	-17%	7%	25%
MAM	+1	710	28	21%	-28%	-14%	4%	14%
AMJ	+1	768	30	10%	-18%	-14%	-7%	16%
MJJ	+1	785	31	2%	-12%	-5%	-13%	13%
JJA	+1	831	33	-1%	-8%	-7%	-17%	15%
JAS	+1	838	33	-5%	-3%	-2%	-8%	8%
ASO	+1	809	32	-6%	5%	-5%	-3%	4%
SON	+1	737	29	-5%	2%	8%	7%	-6%
OND	+1	693	27	10%	4%	7%	4%	-13%
NDJ	+1	640	25	16%	1%	11%	8%	-17%

POHNPEI		30 Year		MODERATE-STRONG		WEAK		NEUTRAL
Season	Year	mm	in	La Niña	El Niño	La Niña	El Niño	
DJF	0	633	25	-14%	16%	7%	-4%	-4%
JFM	0	591	23	-8%	12%	16%	-14%	-9%
FMA	0	636	25	-4%	16%	21%	-7%	-16%
MAM	0	753	30	-6%	1%	19%	-3%	-7%
AMJ	0	786	31	-14%	4%	8%	1%	1%
MJJ	0	780	31	-12%	2%	-1%	5%	3%
JJA	0	749	29	-20%	13%	-6%	4%	5%
JAS	0	768	30	-16%	19%	-5%	-4%	0%
ASO	0	768	30	-6%	17%	-4%	-9%	-2%
SON	0	759	30	6%	17%	-3%	-20%	-6%
OND	0	756	30	11%	-3%	-5%	-14%	4%
NDJ	0	706	28	8%	-7%	9%	-12%	3%
DJF	+1	633	25	13%	-28%	4%	-2%	8%
JFM	+1	591	23	29%	-35%	2%	-1%	6%
FMA	+1	636	25	35%	-36%	-14%	7%	10%
MAM	+1	753	30	24%	-21%	-18%	10%	8%
AMJ	+1	786	31	5%	-12%	-12%	3%	11%
MJJ	+1	780	31	1%	-6%	-9%	-4%	9%
JJA	+1	749	29	1%	-5%	-8%	-15%	12%
JAS	+1	768	30	1%	-4%	-10%	-11%	11%
ASO	+1	768	30	-4%	0%	-14%	0%	10%
SON	+1	759	30	-5%	5%	-10%	10%	3%
OND	+1	756	30	8%	5%	-1%	-1%	-6%
NDJ	+1	706	28	16%	4%	3%	-1%	-12%

YAP		30 Year		MODERATE-STRONG		WEAK		NEUTRAL
Season	Year	mm	in	La Niña	El Niño	La Niña	El Niño	
JFM	0	385	15	-18%	54%	27%	45%	11%
FMA	0	371	15	-24%	21%	11%	13%	-2%
MAM	0	418	16	-31%	2%	4%	5%	-21%
AMJ	0	560	22	-33%	-37%	-5%	-4%	-31%
MJJ	0	761	30	-33%	-29%	-21%	-13%	-27%
JJA	0	939	37	-30%	-20%	-15%	-1%	-20%
JAS	0	982	39	-23%	2%	-5%	16%	-5%
ASO	0	888	35	-10%	15%	17%	30%	7%
SON	0	726	29	10%	16%	31%	29%	26%
OND	0	630	25	17%	1%	23%	1%	23%
NDJ	0	526	21	30%	-24%	35%	9%	37%
DJF	+1	465	18	21%	-33%	27%	9%	35%
JFM	+1	385	15	29%	-49%	44%	30%	42%
FMA	+1	371	15	14%	-47%	24%	-8%	20%
MAM	+1	418	16	3%	-56%	4%	-11%	-1%
AMJ	+1	560	22	-2%	-55%	-12%	-26%	-27%
MJJ	+1	761	30	-20%	-43%	-12%	-27%	-28%
JJA	+1	939	37	-19%	-33%	-5%	-20%	-18%
JAS	+1	982	39	-10%	-17%	6%	-6%	0%
ASO	+1	888	35	8%	-8%	24%	17%	13%
SON	+1	726	29	18%	12%	35%	32%	20%
OND	+1	630	25	10%	8%	23%	35%	11%
NDJ	+1	526	21	24%	19%	36%	42%	2%
JFM	0	385	15	-18%	54%	27%	45%	11%

HILO, HI		30 Year		MODERATE-STRONG		WEAK		NEUTRAL
Season	Year	mm	in	La Niña	El Niño	La Niña	El Niño	
DJF	0	254	10	-9%	-8%	3%	64%	-11%
JFM	0	266	10	-33%	-2%	-29%	101%	4%
FMA	0	226	9	-39%	27%	-29%	77%	-3%
MAM	0	197	8	-59%	46%	-42%	106%	-7%
AMJ	0	134	5	-47%	43%	-38%	61%	5%
MJJ	0	135	5	-48%	31%	-48%	53%	18%
JJA	0	130	5	-32%	29%	-35%	22%	8%
JAS	0	155	6	-46%	31%	-21%	28%	6%
ASO	0	155	6	-26%	11%	-17%	60%	-7%
SON	0	197	8	-30%	3%	-18%	43%	11%
OND	0	234	9	2%	-1%	-23%	7%	10%
NDJ	0	264	10	3%	-24%	-16%	-6%	28%
DJF	+1	254	10	26%	-47%	-16%	-9%	28%
JFM	+1	266	10	-5%	-69%	10%	-4%	32%
FMA	+1	226	9	7%	-66%	23%	-8%	25%
MAM	+1	197	8	-15%	-50%	40%	-28%	21%
AMJ	+1	134	5	0%	-20%	18%	-27%	9%
MJJ	+1	135	5	-16%	-2%	13%	-15%	6%
JJA	+1	130	5	-23%	-1%	-25%	13%	23%
JAS	+1	155	6	-36%	8%	-31%	25%	24%
ASO	+1	155	6	-43%	12%	-16%	15%	19%
SON	+1	197	8	-32%	20%	2%	-18%	8%
OND	+1	234	9	-10%	19%	1%	-15%	-2%
NDJ	+1	264	10	0%	43%	-9%	1%	-21%

HONOLULU, HI		30 Year		MODERATE-STRONG		WEAK		NEUTRAL	
Season	Year	mm	in	La Niña	El Niño	La Niña	El Niño		
DJF	0	149	6	-46%	-7%	27%	54%	-5%	
JFM	0	142	6	-66%	-10%	-9%	129%	2%	
FMA	0	112	4	-79%	-7%	-4%	150%	-2%	
MAM	0	84	3	-70%	15%	7%	105%	-6%	
AMJ	0	40	2	-51%	3%	64%	-12%	-2%	
MJJ	0	38	1	-47%	19%	18%	-2%	5%	
JJA	0	41	2	-61%	32%	-29%	51%	7%	
JAS	0	51	2	-61%	50%	-31%	24%	7%	
ASO	0	74	3	-55%	14%	-46%	36%	12%	
SON	0	108	4	-23%	-18%	-42%	-10%	38%	
OND	0	152	6	9%	-32%	-15%	-16%	21%	
NDJ	0	160	6	25%	-43%	-1%	-5%	22%	
DJF	+1	149	6	21%	-53%	10%	1%	15%	
JFM	+1	142	6	-12%	-69%	34%	13%	23%	
FMA	+1	112	4	-12%	-66%	49%	-8%	19%	
MAM	+1	84	3	6%	-63%	52%	-9%	6%	
AMJ	+1	40	2	55%	-46%	8%	-4%	-3%	
MJJ	+1	38	1	27%	-28%	-6%	-35%	17%	
JJA	+1	41	2	-22%	-5%	-17%	-44%	37%	
JAS	+1	51	2	-37%	34%	-24%	-34%	23%	
ASO	+1	74	3	-20%	11%	-1%	-42%	17%	
SON	+1	108	4	-20%	-7%	56%	-12%	-16%	
OND	+1	152	6	15%	10%	26%	-6%	-27%	
NDJ	+1	160	6	13%	36%	17%	2%	-39%	

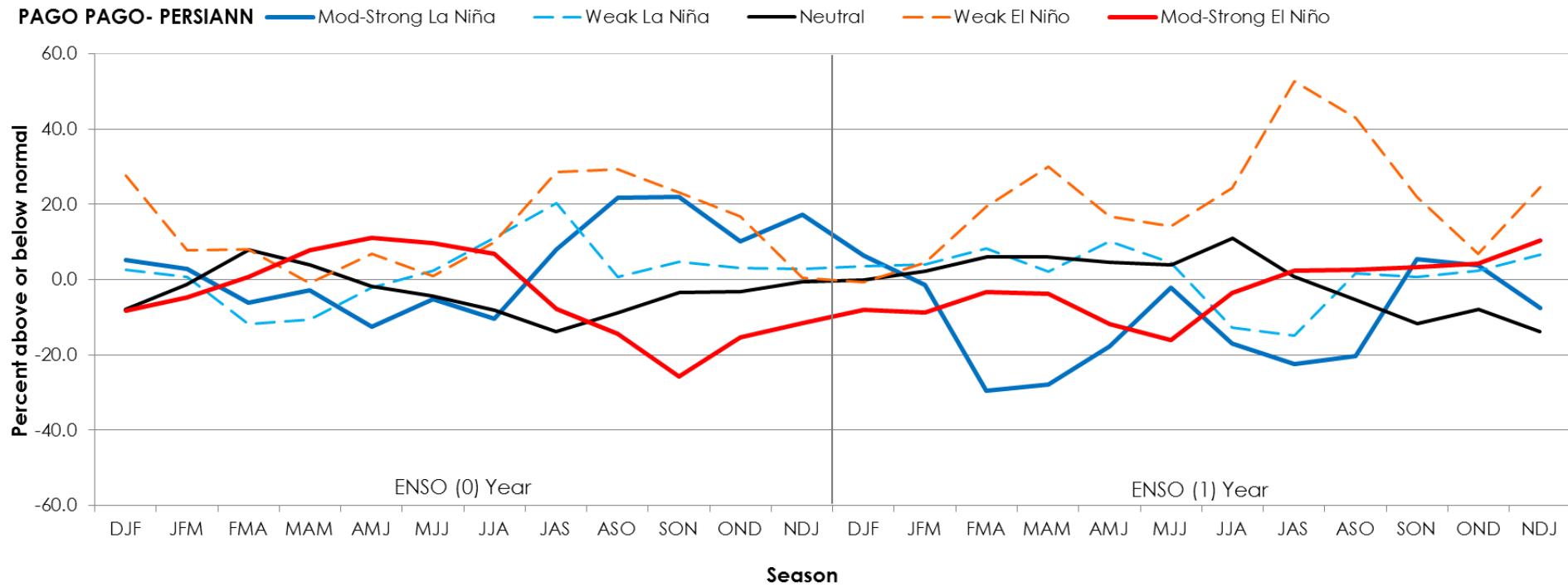
LIHUE		30 Year		MODERATE-STRONG		WEAK		NEUTRAL
Season	Year	mm	in	La Niña	El Niño	La Niña	El Niño	
DJF	0	169	7	-42%	-15%	27%	33%	3%
JFM	0	150	6	-54%	-16%	-9%	109%	7%
FMA	0	125	5	-55%	-12%	0%	113%	-2%
MAM	0	92	4	-39%	9%	9%	66%	-10%
AMJ	0	48	2	-5%	-2%	42%	-32%	-10%
MJJ	0	40	2	-15%	-8%	18%	8%	-8%
JJA	0	43	2	-28%	47%	-33%	4%	-10%
JAS	0	55	2	-49%	45%	-36%	3%	9%
ASO	0	97	4	-59%	25%	-54%	25%	22%
SON	0	136	5	-40%	-5%	-37%	22%	32%
OND	0	187	7	-4%	-8%	-6%	7%	7%
NDJ	0	179	7	18%	-20%	15%	1%	2%
DJF	+1	169	7	22%	-44%	23%	10%	-2%
JFM	+1	150	6	-6%	-73%	37%	34%	14%
FMA	+1	125	5	-15%	-64%	44%	32%	10%
MAM	+1	92	4	-3%	-43%	27%	20%	6%
AMJ	+1	48	2	21%	-5%	-24%	10%	3%
MJJ	+1	40	2	50%	-9%	-27%	-33%	6%
JJA	+1	43	2	-13%	-6%	-39%	-36%	44%
JAS	+1	55	2	-34%	30%	-29%	-42%	29%
ASO	+1	97	4	-46%	0%	33%	-53%	19%
SON	+1	136	5	-33%	-9%	54%	-27%	-2%
OND	+1	187	7	-3%	4%	19%	-11%	-9%
NDJ	+1	179	7	7%	34%	-7%	9%	-22%

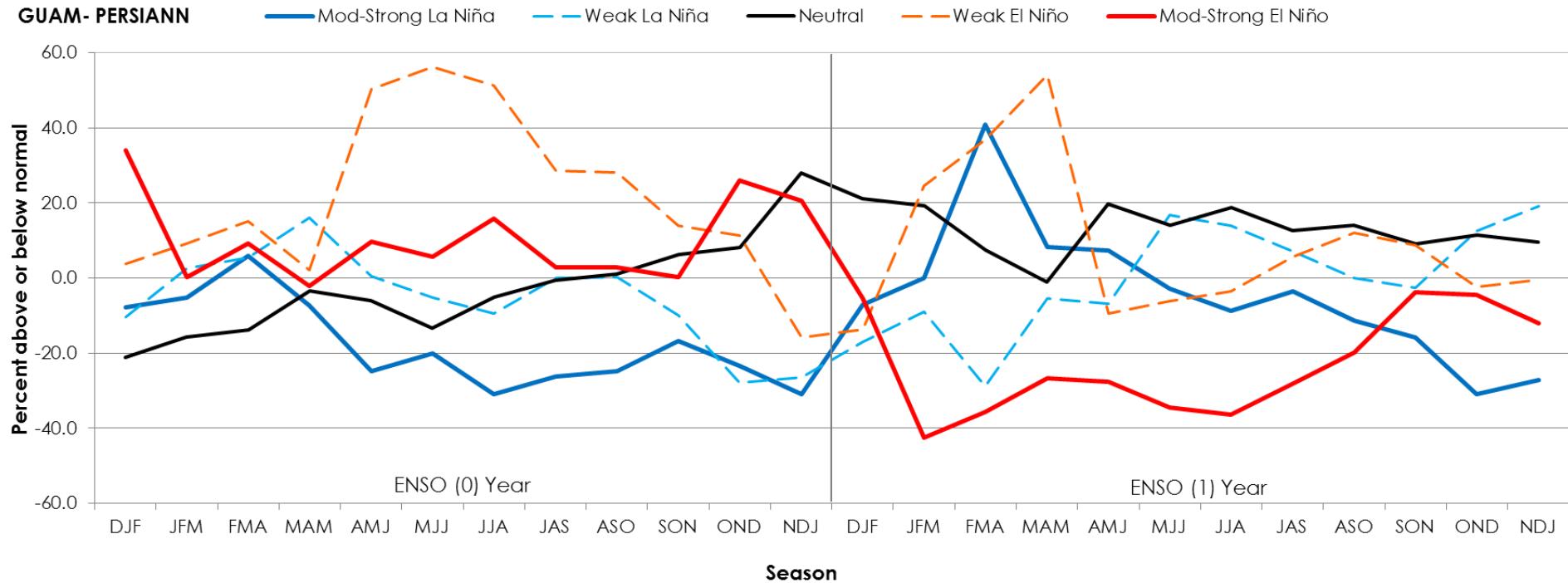
KWAJALEIN		30 Year		MODERATE-STRONG		WEAK		NEUTRAL
Season	Year	mm	in	La Niña	El Niño	La Niña	El Niño	
DJF	0	326	13	-12%	18%	12%	-2%	-15%
JFM	0	271	11	-43%	26%	0%	2%	-8%
FMA	0	312	12	-45%	40%	6%	3%	-19%
MAM	0	395	16	-43%	30%	6%	10%	-6%
AMJ	0	451	18	-32%	15%	9%	10%	-1%
MJJ	0	507	20	-16%	10%	-4%	10%	1%
JJA	0	541	21	-8%	22%	-7%	9%	-8%
JAS	0	594	23	-5%	31%	-13%	3%	-12%
ASO	0	630	25	-4%	24%	1%	9%	-15%
SON	0	656	26	-3%	12%	-4%	8%	-6%
OND	0	606	24	-8%	5%	2%	26%	-6%
NDJ	0	471	19	-13%	10%	-2%	15%	1%
DJF	+1	326	13	-3%	1%	-7%	11%	2%
JFM	+1	271	11	5%	-36%	-3%	-39%	32%
FMA	+1	312	12	-19%	-44%	-21%	16%	43%
MAM	+1	395	16	-18%	-37%	-13%	15%	35%
AMJ	+1	451	18	-14%	-23%	-16%	23%	23%
MJJ	+1	507	20	-3%	-7%	-7%	-10%	13%
JJA	+1	541	21	-6%	-7%	-16%	-5%	18%
JAS	+1	594	23	-5%	-8%	-16%	-4%	18%
ASO	+1	630	25	0%	-6%	-19%	7%	13%
SON	+1	656	26	0%	-3%	-3%	2%	3%
OND	+1	606	24	2%	-4%	2%	-8%	3%
NDJ	+1	471	19	-1%	-9%	7%	-11%	5%

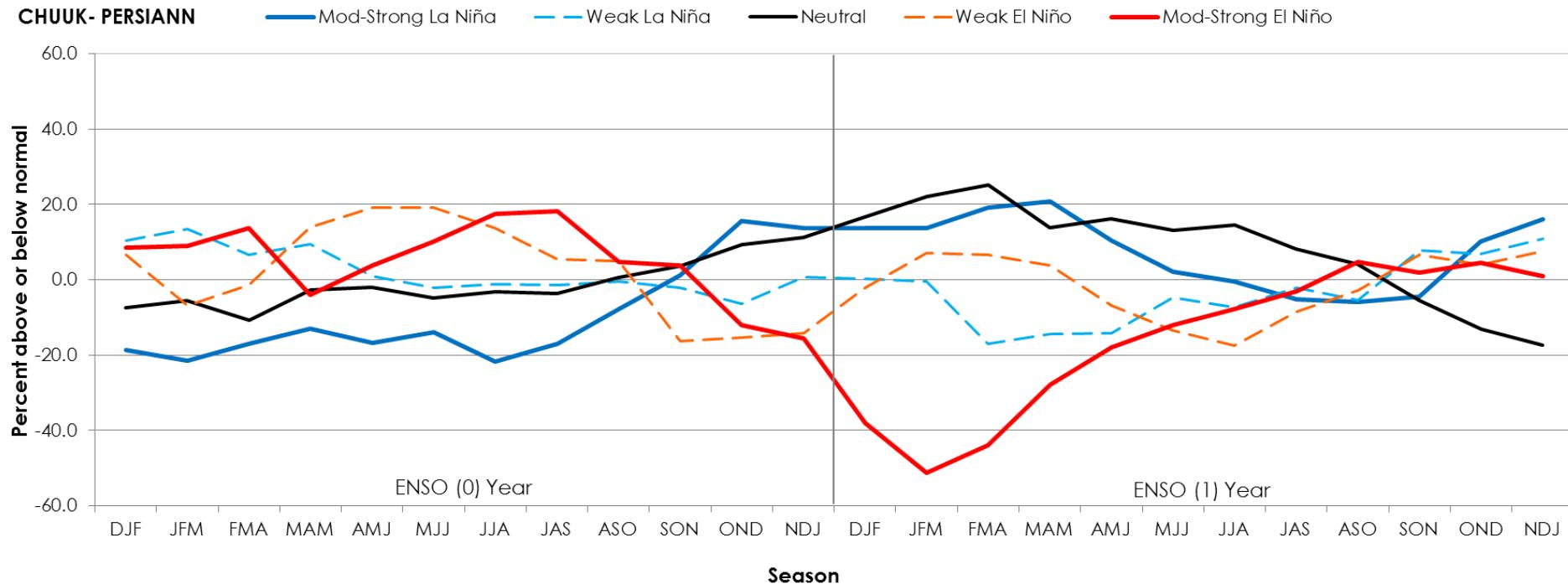
MAJURO		30 Year		MODERATE-STRONG		WEAK		NEUTRAL
Season	Year	mm	in	La Niña	El Niño	La Niña	El Niño	
DJF	0	537	21	-13%	4%	3%	31%	-6%
JFM	0	482	19	-28%	4%	11%	11%	3%
FMA	0	530	21	-34%	13%	0%	13%	2%
MAM	0	609	24	-36%	21%	-5%	14%	3%
AMJ	0	682	27	-26%	13%	-8%	8%	7%
MJJ	0	701	28	-4%	9%	-8%	-1%	0%
JJA	0	719	28	7%	7%	-1%	-8%	-6%
JAS	0	721	28	11%	11%	-3%	-10%	-9%
ASO	0	725	29	9%	8%	4%	-7%	-9%
SON	0	764	30	9%	1%	-3%	-16%	0%
OND	0	750	30	-6%	-4%	9%	-9%	3%
NDJ	0	672	26	-12%	2%	13%	-17%	5%
DJF	+1	537	21	-8%	-6%	15%	-4%	0%
JFM	+1	482	19	2%	-25%	15%	-16%	10%
FMA	+1	530	21	-12%	-41%	8%	11%	22%
MAM	+1	609	24	-17%	-32%	-6%	12%	28%
AMJ	+1	682	27	-17%	-17%	-12%	9%	23%
MJJ	+1	701	28	-3%	8%	-19%	-11%	12%
JJA	+1	719	28	-1%	14%	-17%	-10%	5%
JAS	+1	721	28	2%	10%	-8%	-5%	-1%
ASO	+1	725	29	2%	3%	-9%	6%	1%
SON	+1	764	30	3%	4%	2%	6%	-7%
OND	+1	750	30	6%	0%	-3%	3%	-2%
NDJ	+1	672	26	12%	-8%	1%	14%	-6%

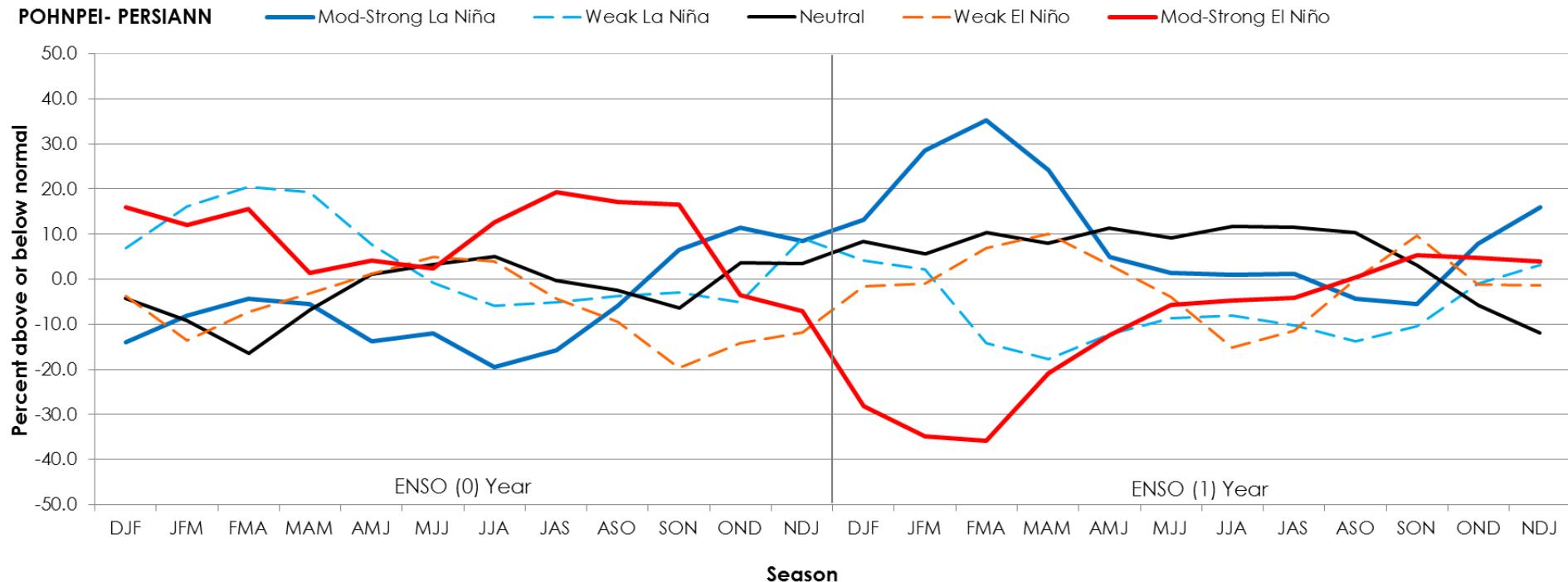
KOROR		30 Year		MODERATE-STRONG		WEAK		NEUTRAL	
Season	Year	mm	in	La Niña	El Niño	La Niña	El Niño		
DJF	0	624	25	-15%	2%	11%	-3%	1%	
JFM	0	572	23	-16%	-7%	17%	-9%	3%	
FMA	0	518	20	-27%	-1%	-1%	-7%	15%	
MAM	0	577	23	-14%	-19%	4%	9%	12%	
AMJ	0	736	29	-6%	-9%	-2%	5%	8%	
MJJ	0	908	36	-9%	-5%	8%	9%	0%	
JJA	0	949	37	-6%	1%	6%	7%	-2%	
JAS	0	893	35	-8%	-5%	16%	0%	-3%	
ASO	0	756	30	4%	-19%	26%	-21%	1%	
SON	0	659	26	11%	-27%	32%	-38%	2%	
OND	0	620	24	19%	-33%	41%	-41%	-1%	
NDJ	0	630	25	20%	-28%	23%	-5%	-2%	
DJF	+1	624	25	13%	-29%	19%	0%	0%	
JFM	+1	572	23	16%	-30%	13%	4%	1%	
FMA	+1	518	20	11%	-40%	35%	-21%	4%	
MAM	+1	577	23	21%	-28%	21%	-14%	-2%	
AMJ	+1	736	29	9%	-12%	21%	-20%	-4%	
MJJ	+1	908	36	10%	-7%	14%	-9%	-7%	
JJA	+1	949	37	9%	-6%	13%	-5%	-7%	
JAS	+1	893	35	7%	-16%	19%	14%	-10%	
ASO	+1	756	30	14%	-4%	9%	19%	-16%	
SON	+1	659	26	13%	-3%	13%	23%	-19%	
OND	+1	620	24	28%	11%	3%	17%	-28%	
NDJ	+1	630	25	9%	8%	10%	13%	-19%	

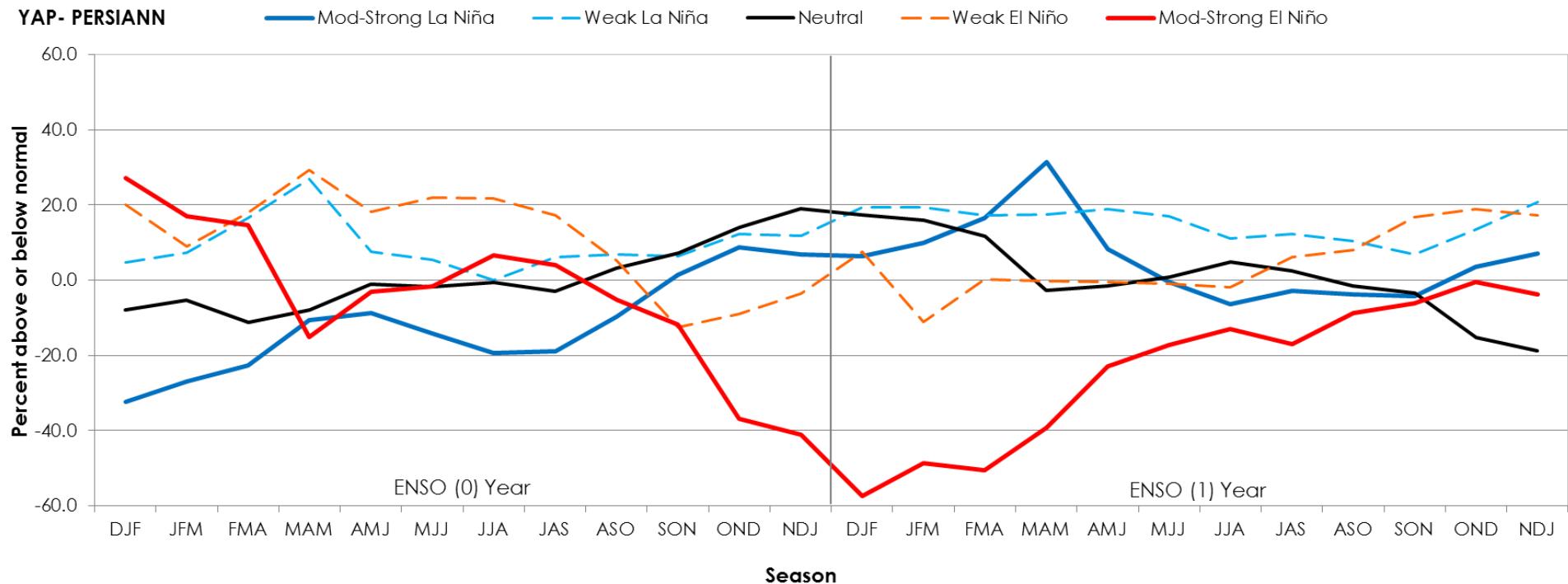
The following time series graphs show the percent change of precipitation from the PERSIANN-CDR for each *in situ* Level 1 GHCN station in the specific EEZ. The results show the percent change for each three month season preceding (ENSO (0) year) and following (ENSO (1) year) each of the five phases of the ENSO (moderate-strong La Niña and El Niño, weak La Niña and El Niño, and neutral). Each figure is labeled with the station name in the upper left corner of the table. Refer to Table 2 for a list of the years used for each ENSO phase.





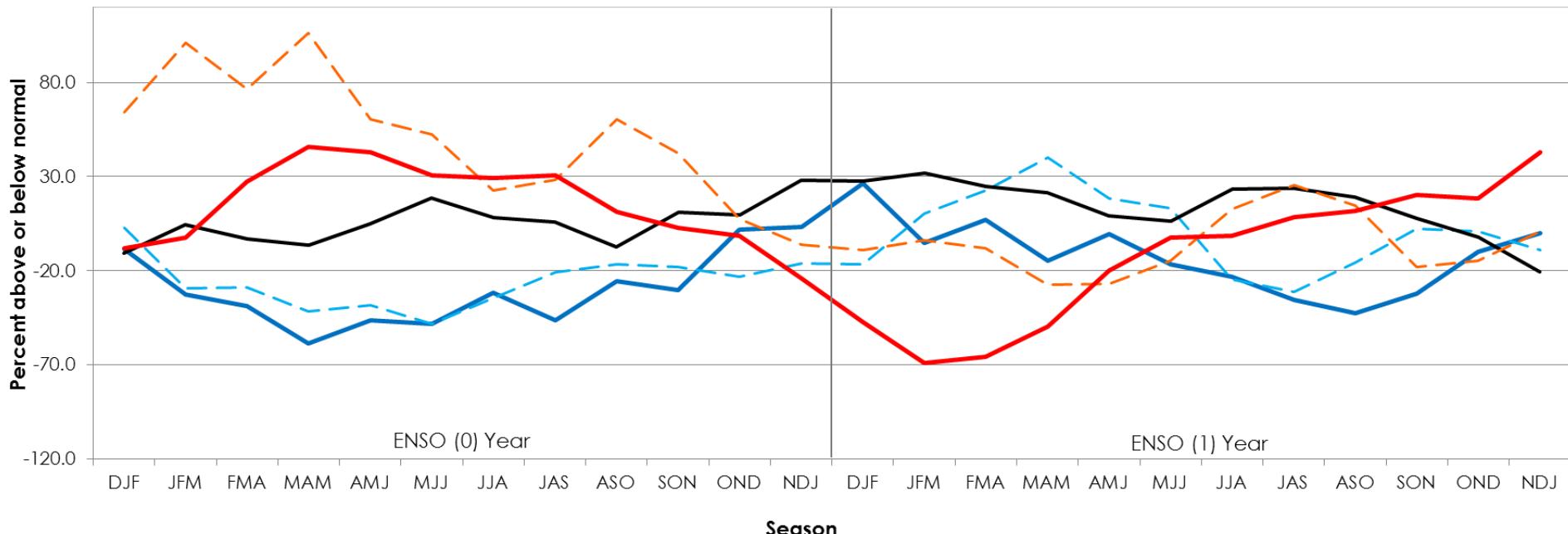






HILO - PERSIANN

Mod-Strong La Niña Weak La Niña Neutral Weak El Niño Mod-Strong El Niño



HONOLULU- PERSIANN Mod-Strong La Niña Weak La Niña Neutral Weak El Niño Mod-Strong El Niño

