ÇEV903
KÜRESEL İKLİM DEĞİŞİKLİĞİ

Doç. Dr. Özgür ZEYDAN

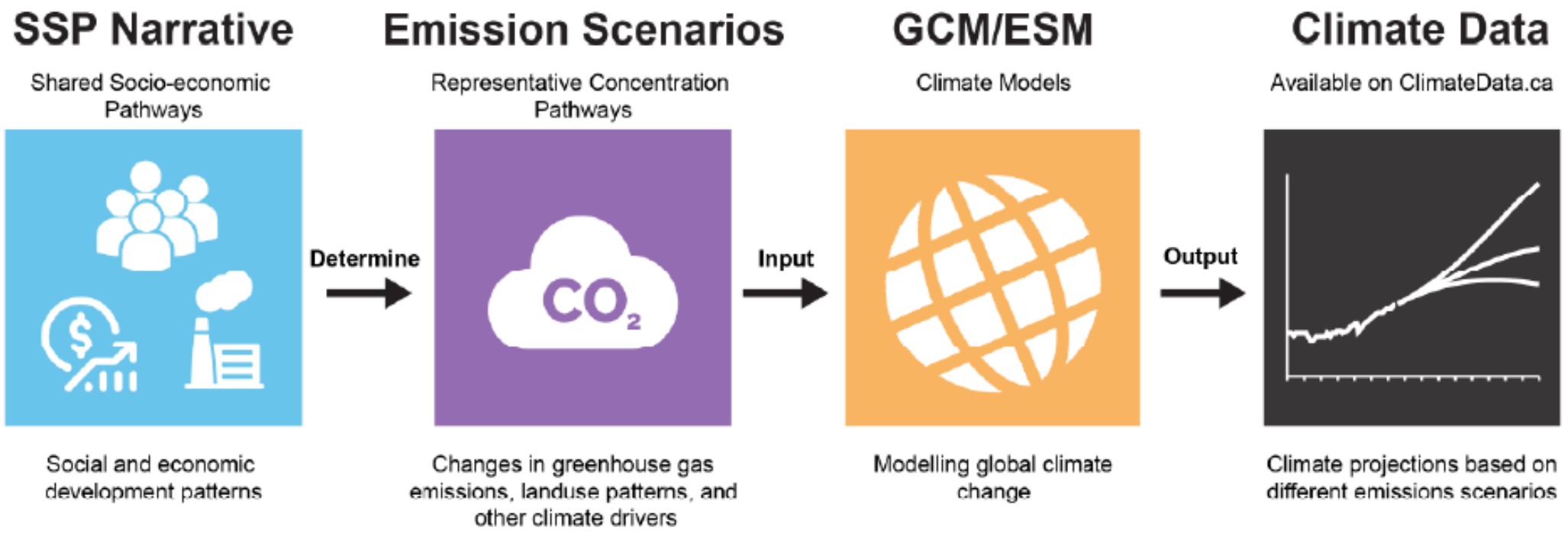
https://ozgurzeydan.com.tr/

İklim Geleceğimiz

- Senaryolar
- İklim Modelleri
- Projeksiyonlar

IPCC 6. İlerleme Raporu Senaryoları

- IPCC 6. İlerleme Raporu iklim geleceğimizi 5 farklı senaryo ile açıklıyor.
- Emisyonlar, sosyo-ekonomik varsayımlara, iklim değişikliğini azaltma düzeylerine ve aerosoller ve metan olmayan ozon öncüleri için hava kirliliği kontrollerine bağlı olarak senaryolar arasında değişiklik göstermektedir.

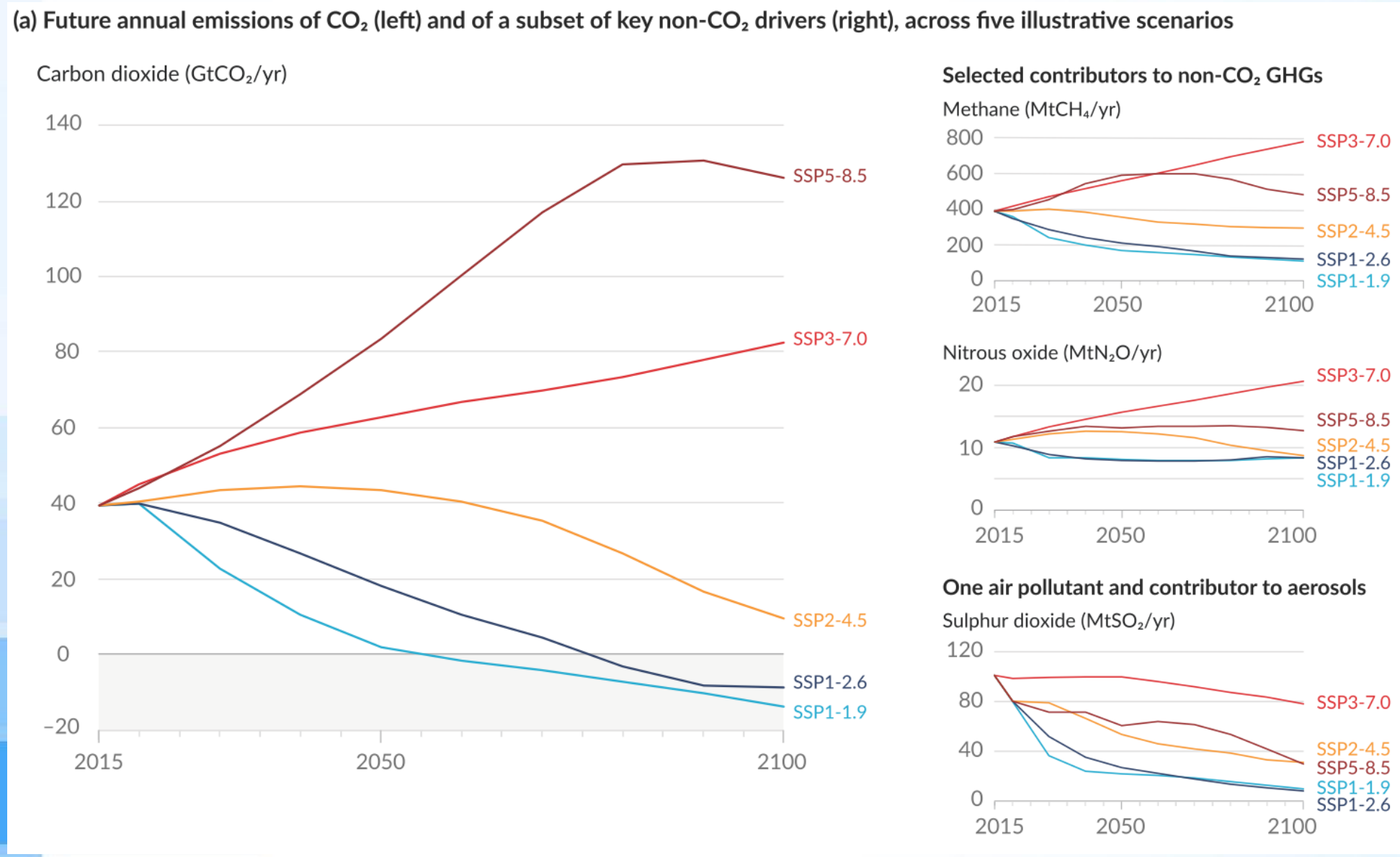


https://climatedata.ca/resource/understanding-shared-socio-economic-pathways-ssps/

IPCC 6. İlerleme Raporu Senaryoları

- Senaryo - radyasyon akısındaki artış (W/m^2)
- SSP1 - 1.9 → negatif sera gazı emisyonu (SGE)
- SSP1 - 2.6 → negatif SGE
- SSP2 - 4.5 → orta düzeyde SGE (2050 sonrası azalan)
- SSP3 - 7.0 → yüksek SGE
- SSP5 - 8.5 → çok yüksek SGE
- SSP: Shared Socio-economic Pathways (Paylaşılan Sosyo-Ekonomik Yollar)

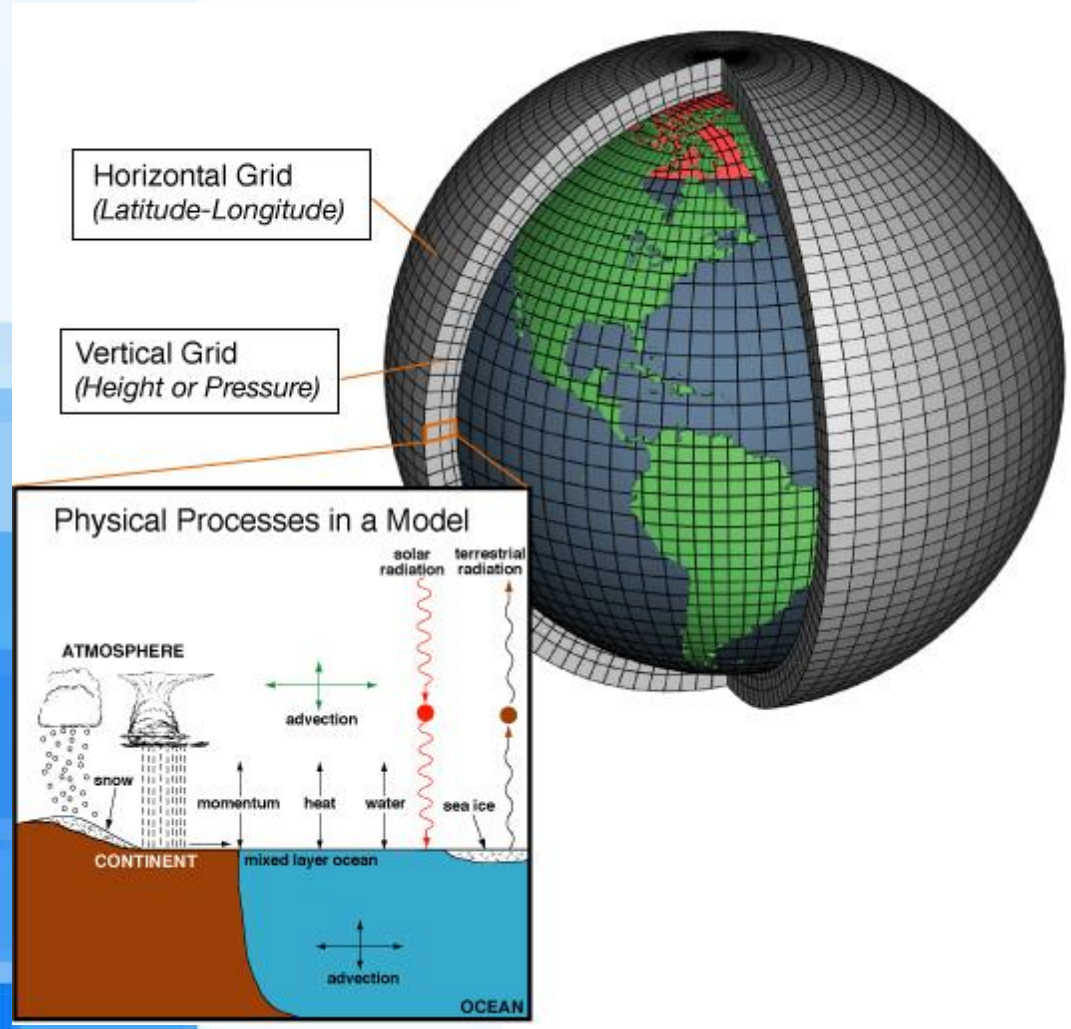
Gelecekteki Emisyonlar



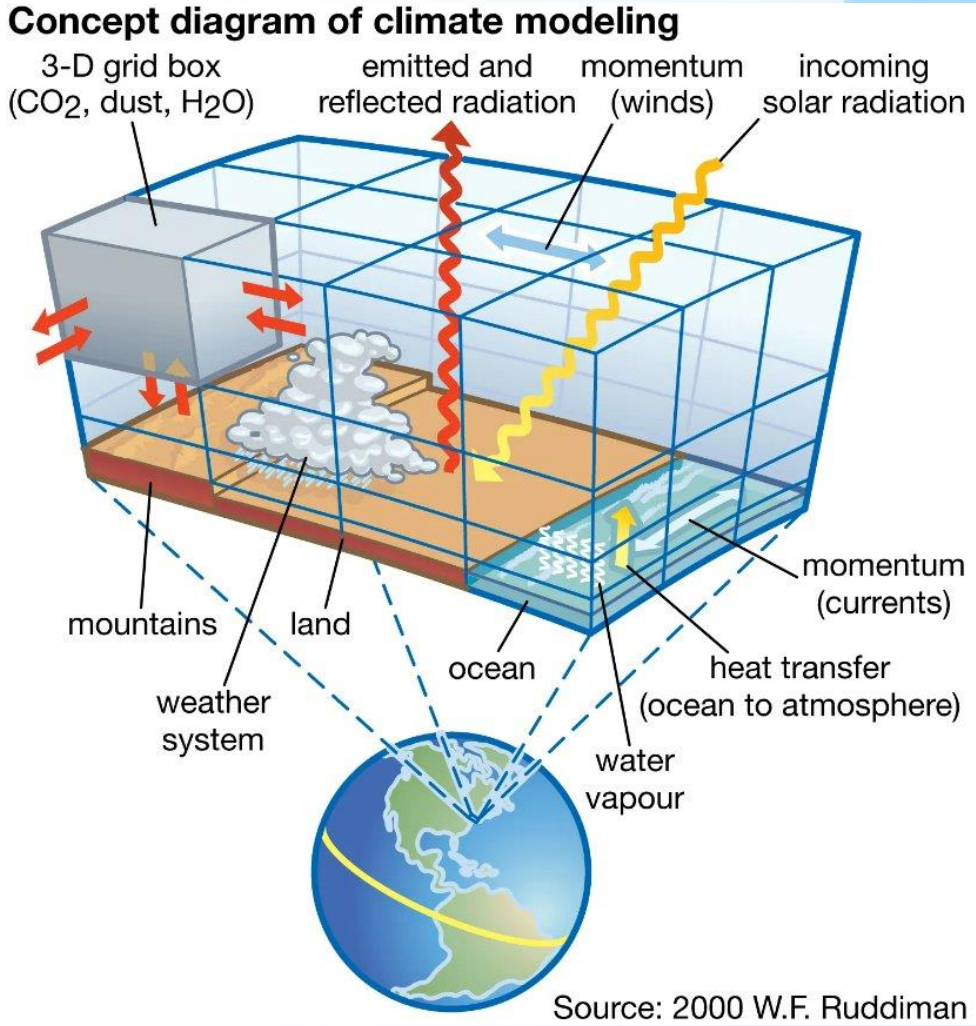
İklim Modelleri

- İklim modelleri dünyayı belirli coğrafi konumları ve yükseklikleri temsil eden üç boyutlu bir hücre ızgarasına böler.
- Bileşenlerin her biri (atmosfer, kara yüzeyi, okyanus ve deniz buzu), sıcaklık gibi bir dizi iklim değişkeni için küresel ızgarada hesaplanan denklemlere sahiptir.
- Zaman içinde nasıl değiştiklerini hesaplayan model bileşenlerine ek olarak, farklı parçalar ısı, su ve momentum akışını da değiştirir.
- Birbirleriyle birleşik bir sistem olarak etkileşime girerler.

İklim Modelleri



https://www.climate.gov/media/10042

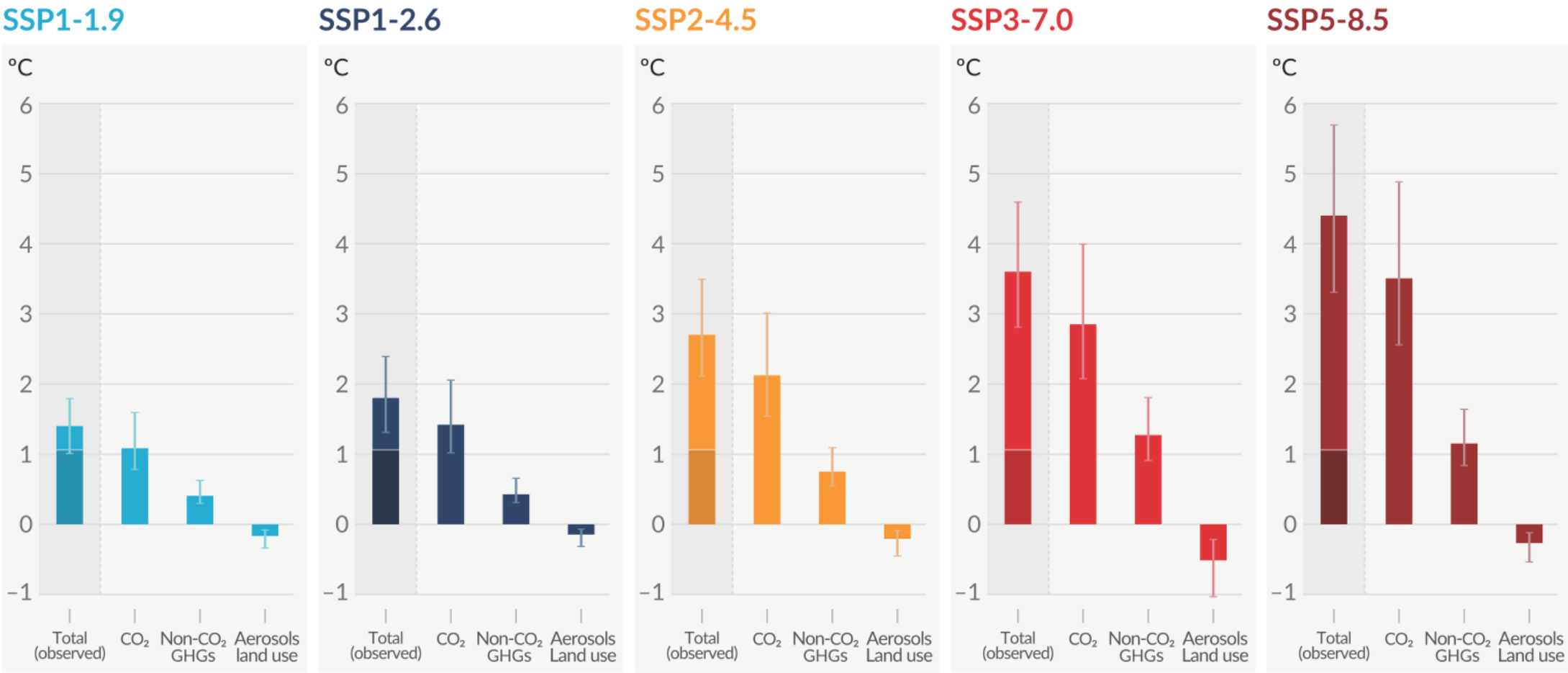


https://www.britannica.com/science/global-warming/Theoretical-climate-models

Sera Gazlarının Isınmaya Katkıları

(b) Contribution to global surface temperature increase from different emissions, with a dominant role of CO_2 emissions

Change in global surface temperature in 2081–2100 relative to 1850–1900 (°C)



Total warming (observed warming to date in darker shade), warming from CO_2, warming from non-CO_2 GHGs and cooling from changes in aerosols and land use

Gelecekteki Isınma Tahminleri

1850 – 1900 dönemine kıyasla

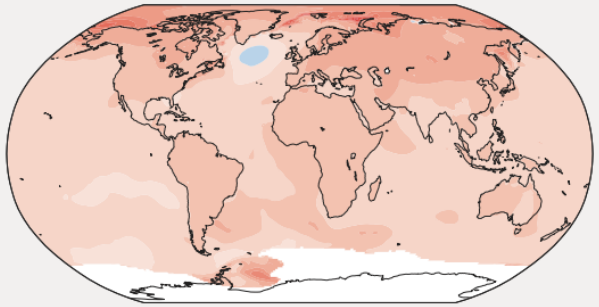
	Near term, 2021–2040		Mid-term, 2041–2060		Long term, 2081–2100	
Scenario	Best estimate (°C)	*Very likely* range (°C)	Best estimate (°C)	*Very likely* range (°C)	Best estimate (°C)	*Very likely* range (°C)
SSP1-1.9	1.5	1.2 to 1.7	1.6	1.2 to 2.0	1.4	1.0 to 1.8
SSP1-2.6	1.5	1.2 to 1.8	1.7	1.3 to 2.2	1.8	1.3 to 2.4
SSP2-4.5	1.5	1.2 to 1.8	2.0	1.6 to 2.5	2.7	2.1 to 3.5
SSP3-7.0	1.5	1.2 to 1.8	2.1	1.7 to 2.6	3.6	2.8 to 4.6
SSP5-8.5	1.6	1.3 to 1.9	2.4	1.9 to 3.0	4.4	3.3 to 5.7

Sıcaklık Projeksiyonları

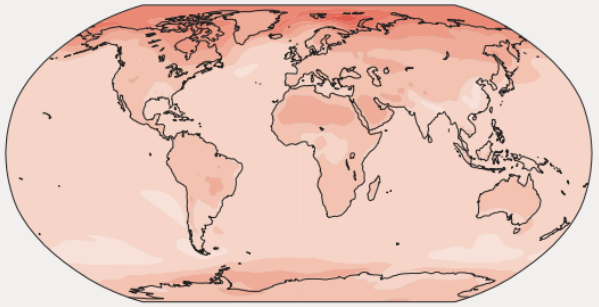
(a) Annual mean temperature change (°C) at 1°C global warming

Warming at 1°C affects all continents and is generally larger over land than over the oceans in both observations and models. Across most regions, observed and simulated patterns are consistent.

Observed change per **1°C** global warming



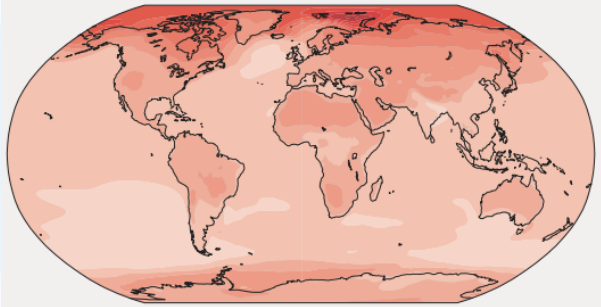
Simulated change at **1°C** global warming



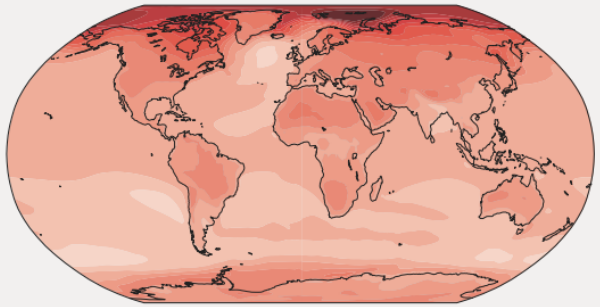
(b) Annual mean temperature change (°C) relative to 1850–1900

Across warming levels, land areas warm more than ocean areas, and the Arctic and Antarctica warm more than the tropics.

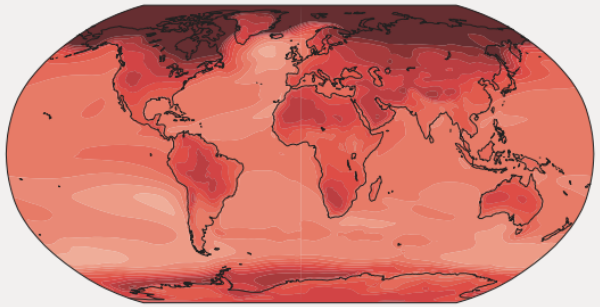
Simulated change at **1.5°C** global warming

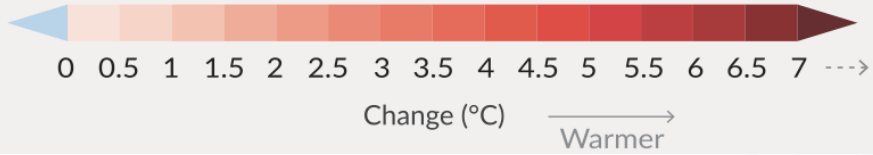


Simulated change at **2°C** global warming

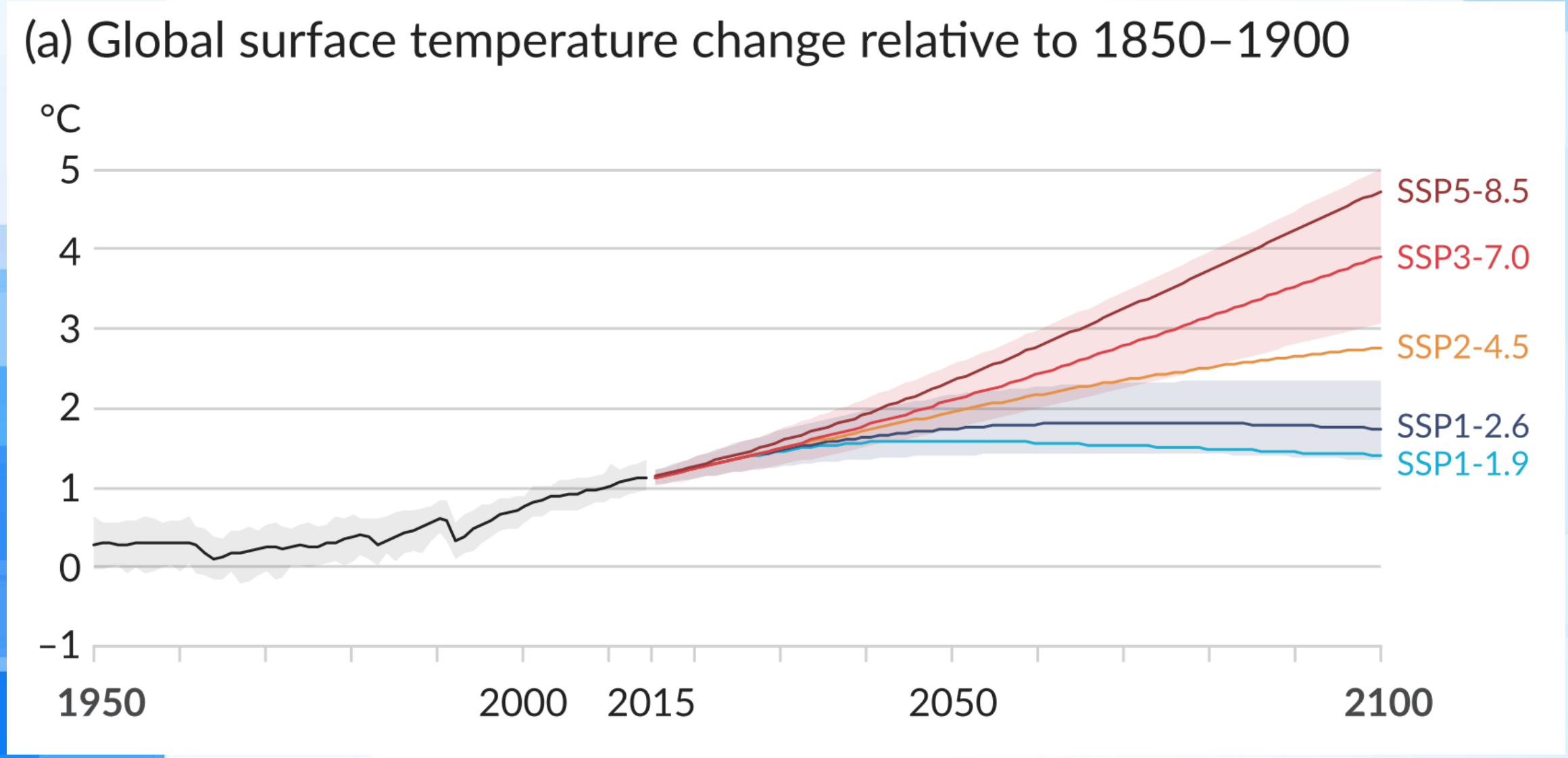


Simulated change at **4°C** global warming

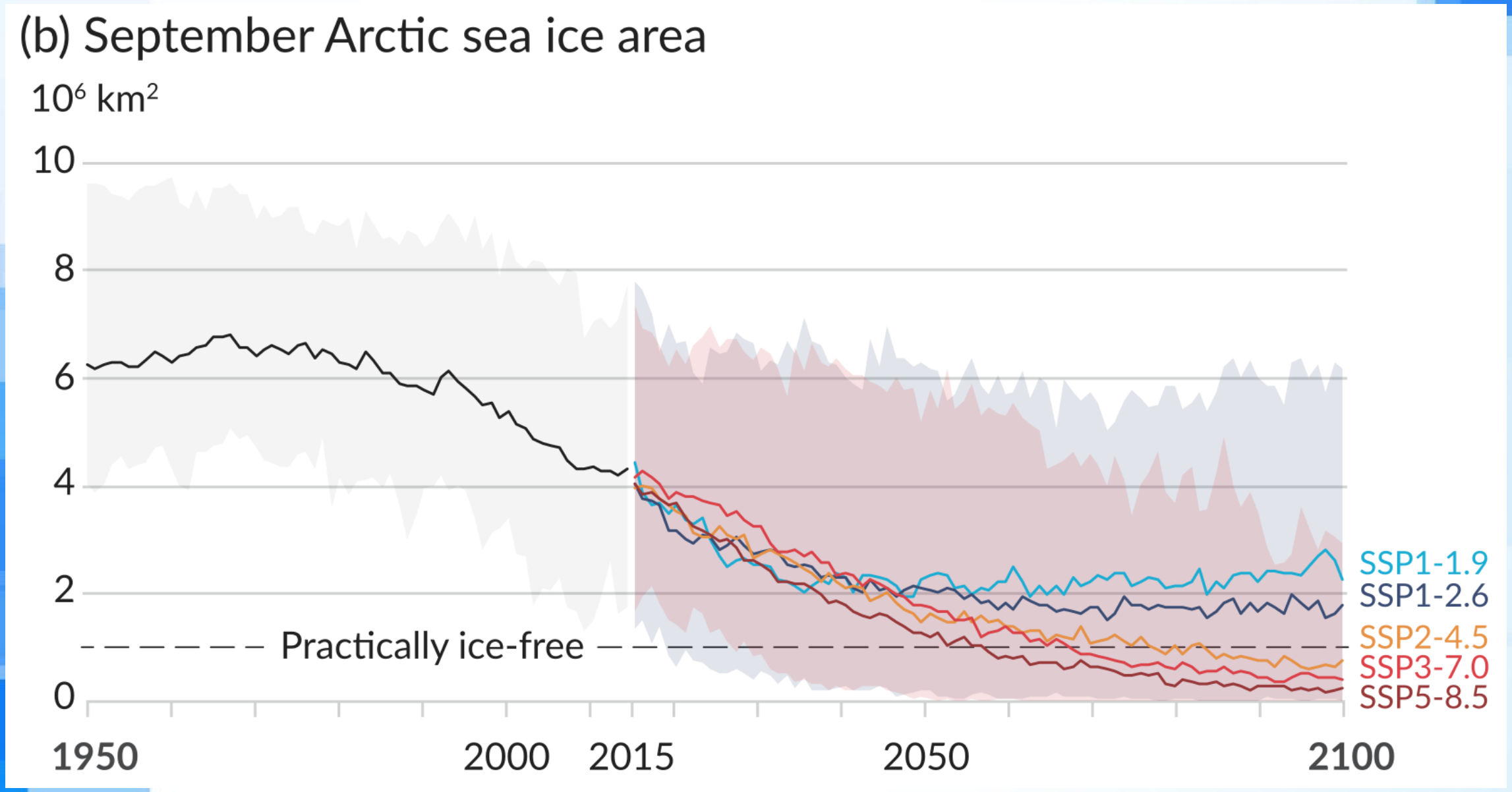




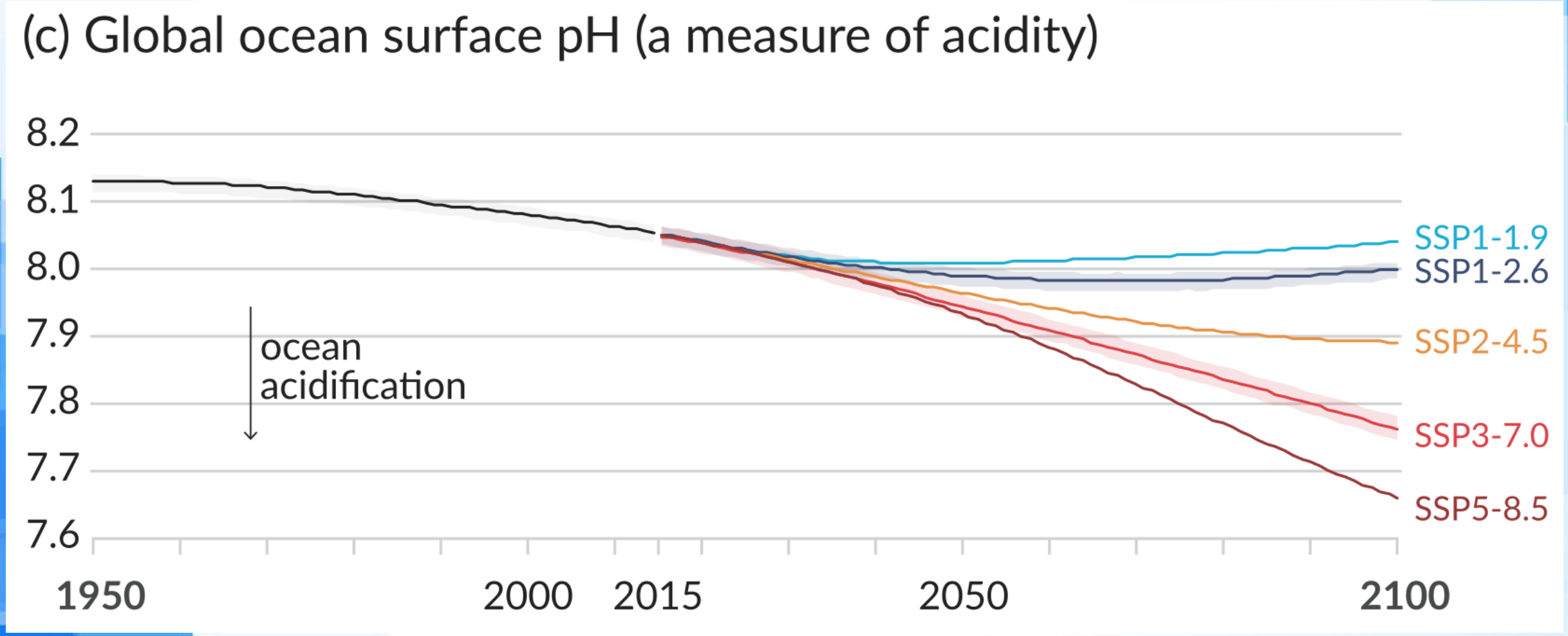
Sıcaklık Projeksiyonları (yıllara göre)



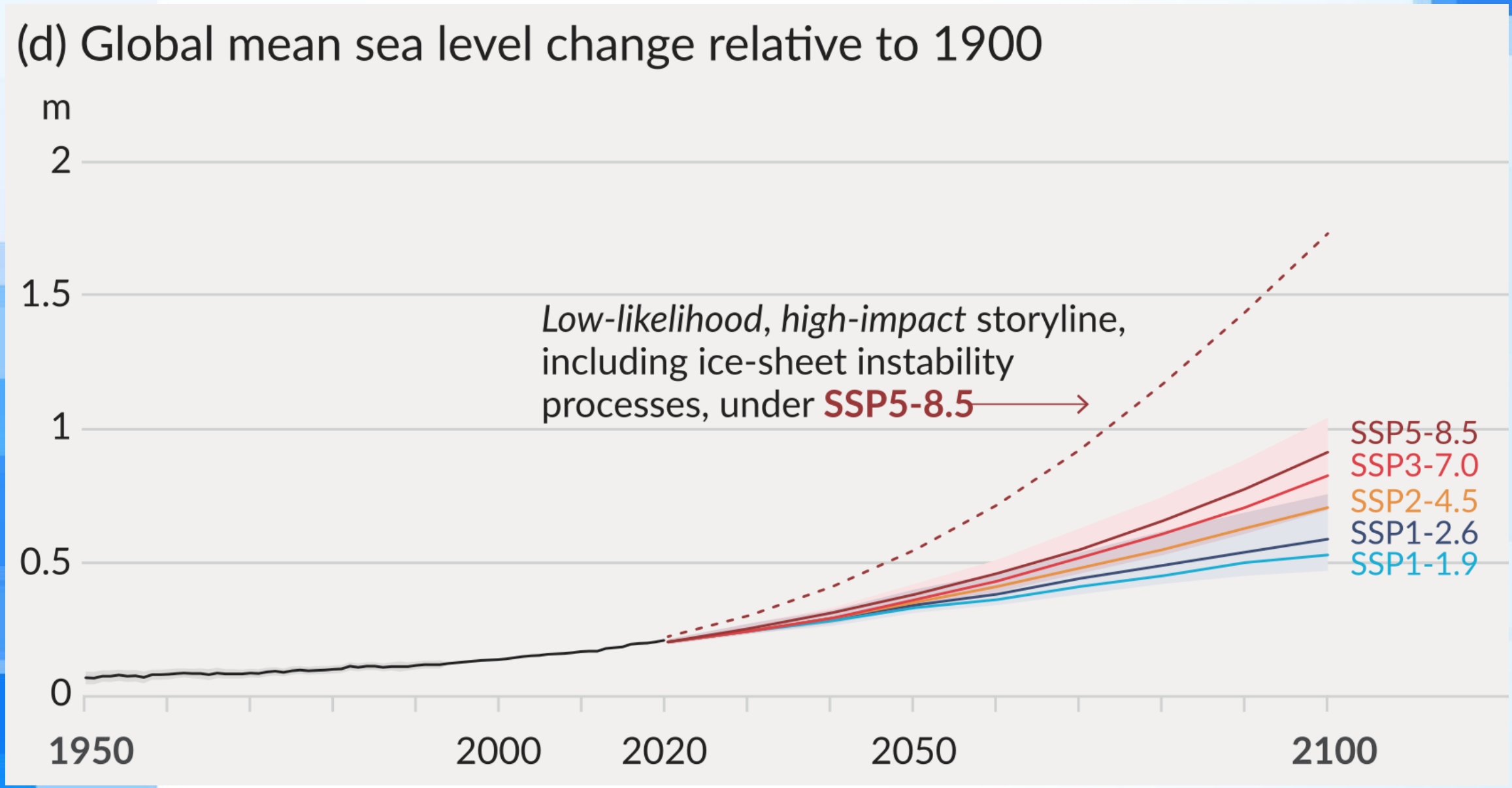
Arktik Buzul Erimesi (Eylül ayı – yıllara göre)



Okyanus Asitleşmesi (yıllara göre)



Deniz Seviyesi Yükselmesi (yıllara göre)

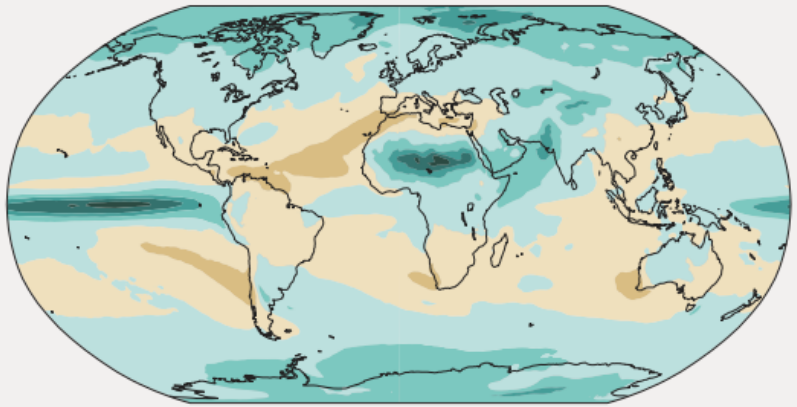


Yağış Projeksiyonları

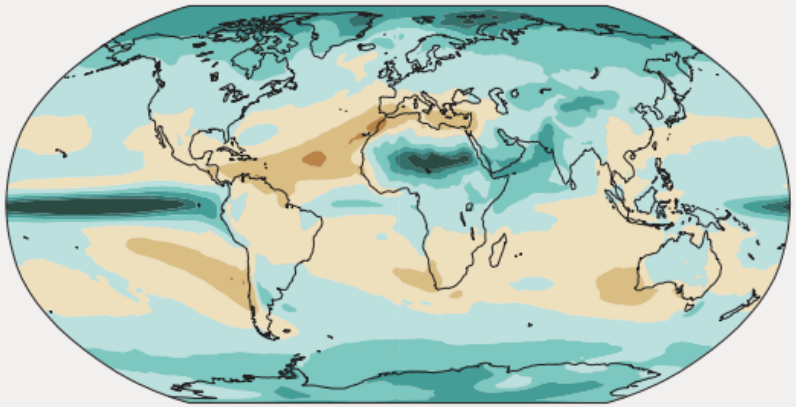
(c) Annual mean precipitation change (%) relative to 1850–1900

Precipitation is projected to increase over high latitudes, the equatorial Pacific and parts of the monsoon regions, but decrease over parts of the subtropics and in limited areas of the tropics.

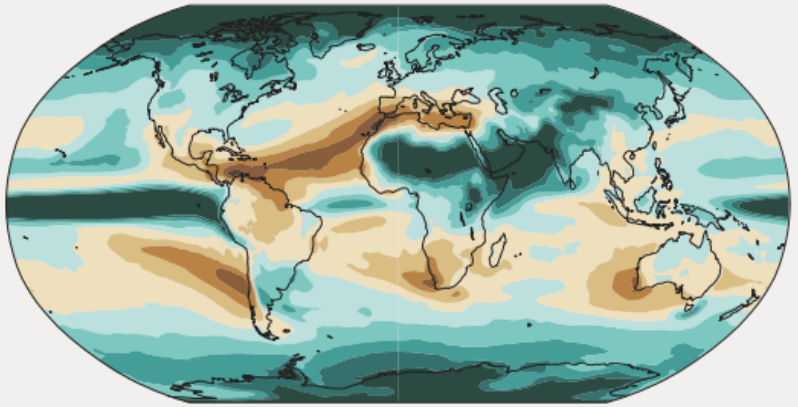
Simulated change at **1.5°C** global warming



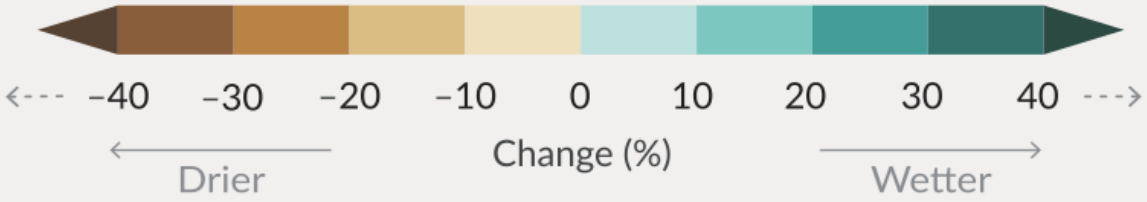
Simulated change at **2°C** global warming



Simulated change at **4°C** global warming



Relatively small absolute changes may appear as large % changes in regions with dry baseline conditions.

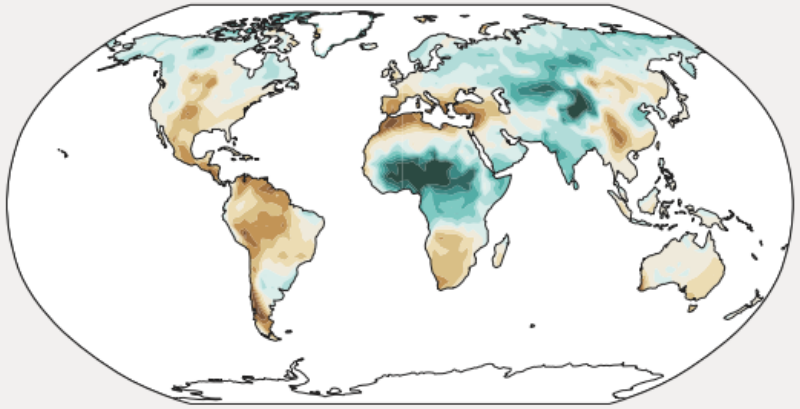


Toprak Nemi Projeksiyonları

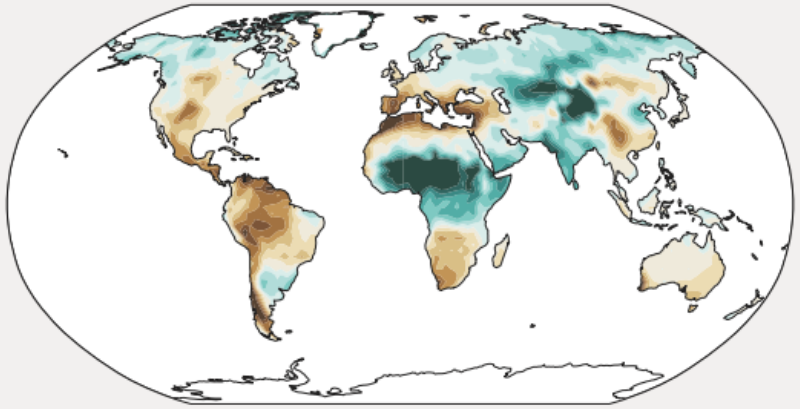
(d) Annual mean total column soil moisture change (standard deviation)

Across warming levels, changes in soil moisture largely follow changes in precipitation but also show some differences due to the influence of evapotranspiration.

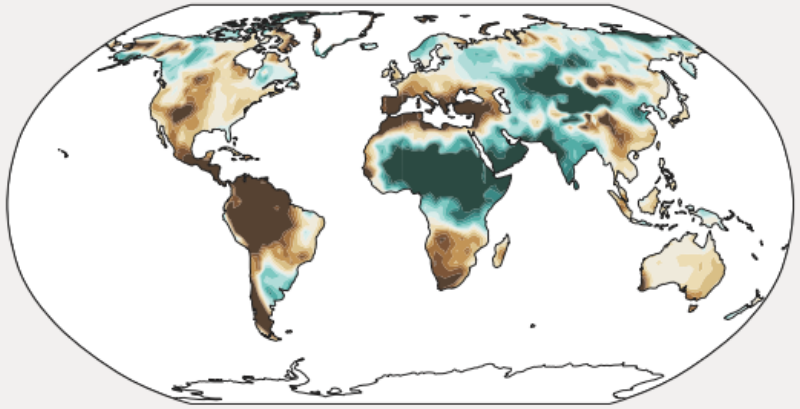
Simulated change at **1.5°C** global warming



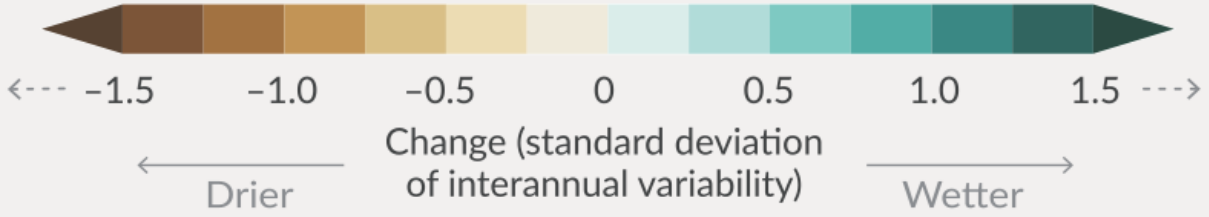
Simulated change at **2°C** global warming



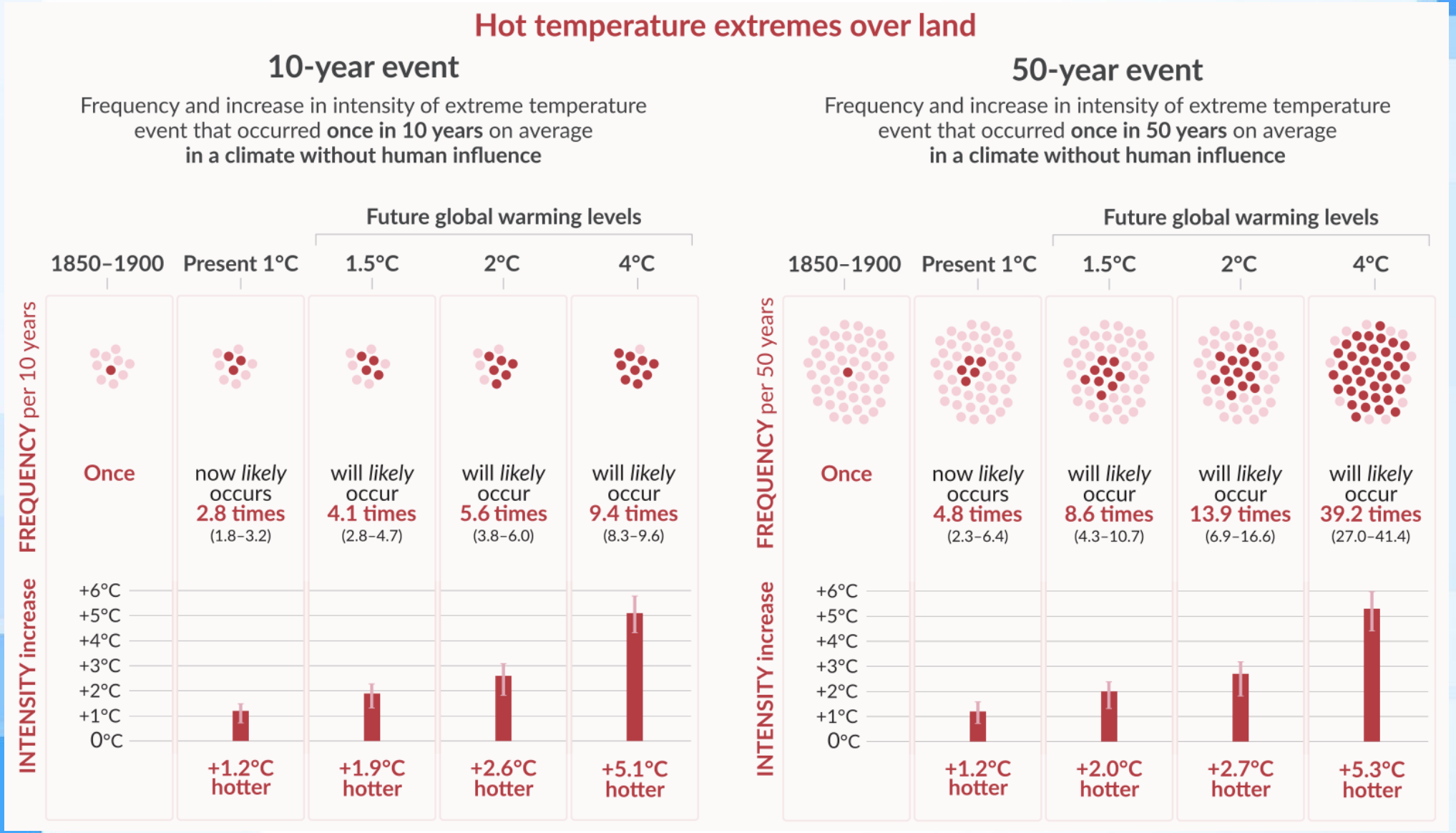
Simulated change at **4°C** global warming



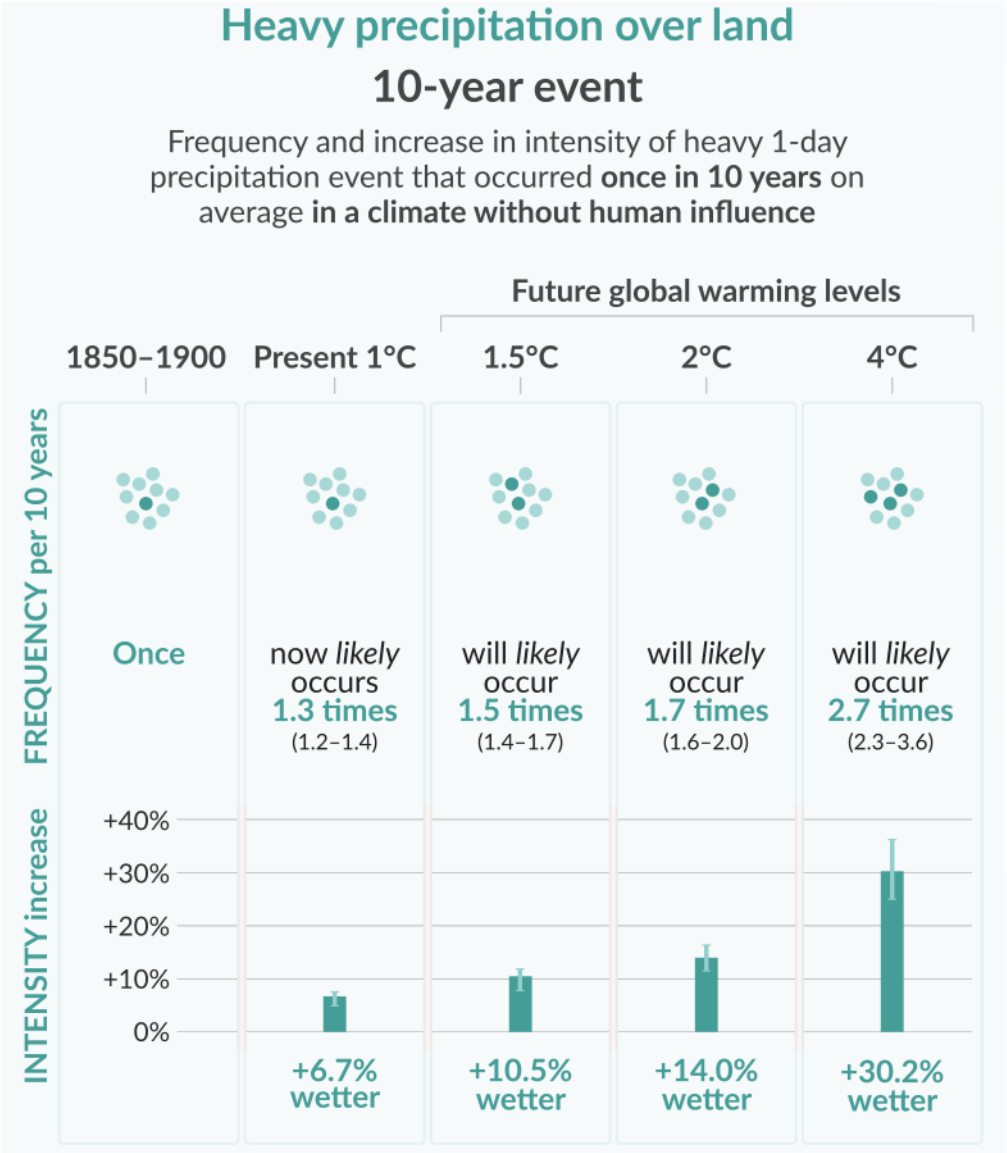
Relatively small absolute changes may appear large when expressed in units of standard deviation in dry regions with little interannual variability in baseline conditions.



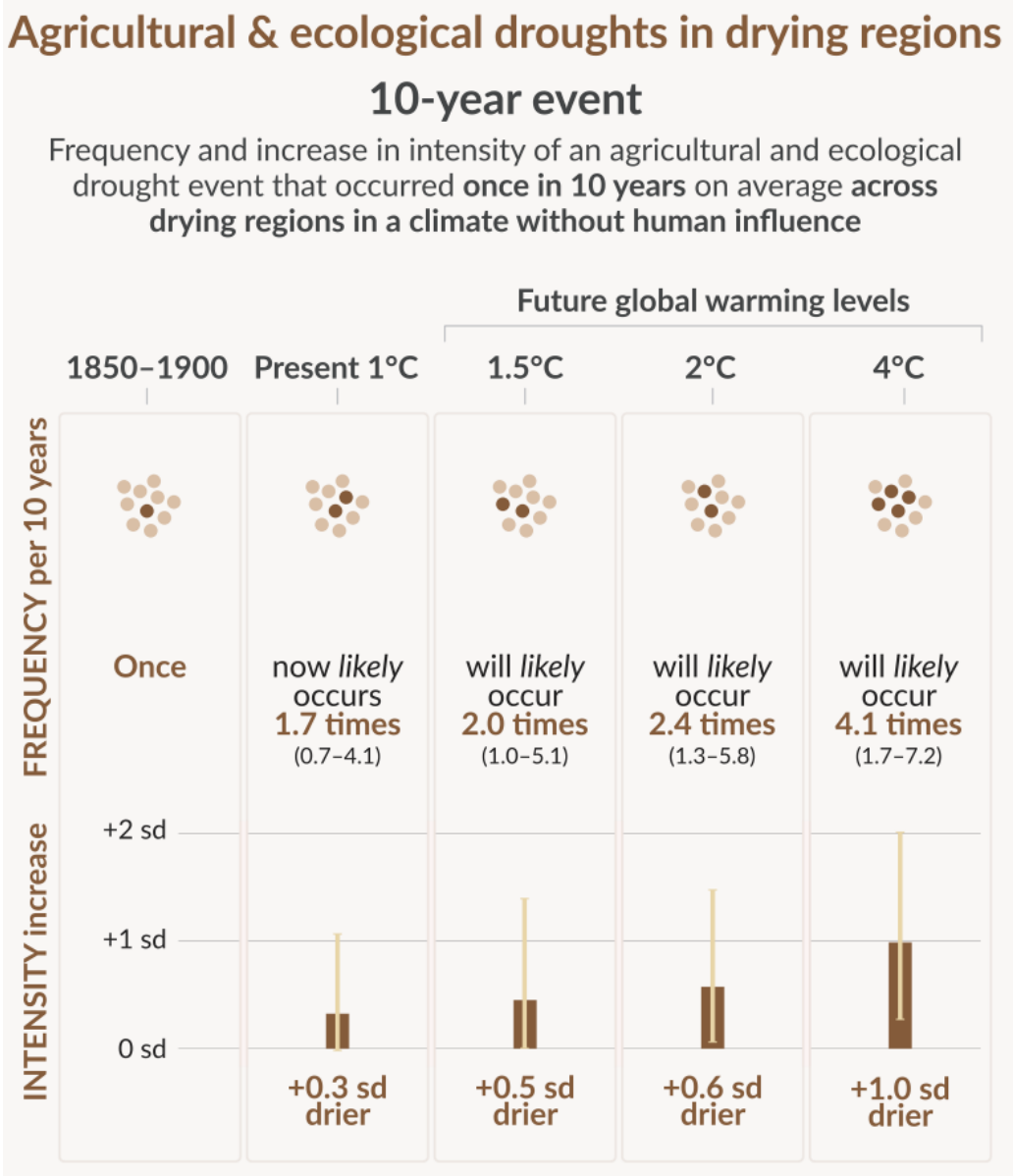
Aşırı Sıcaklık Olayları



Aşırı Yağış Olayları



Tarımsal ve Ekolojik Kuraklık



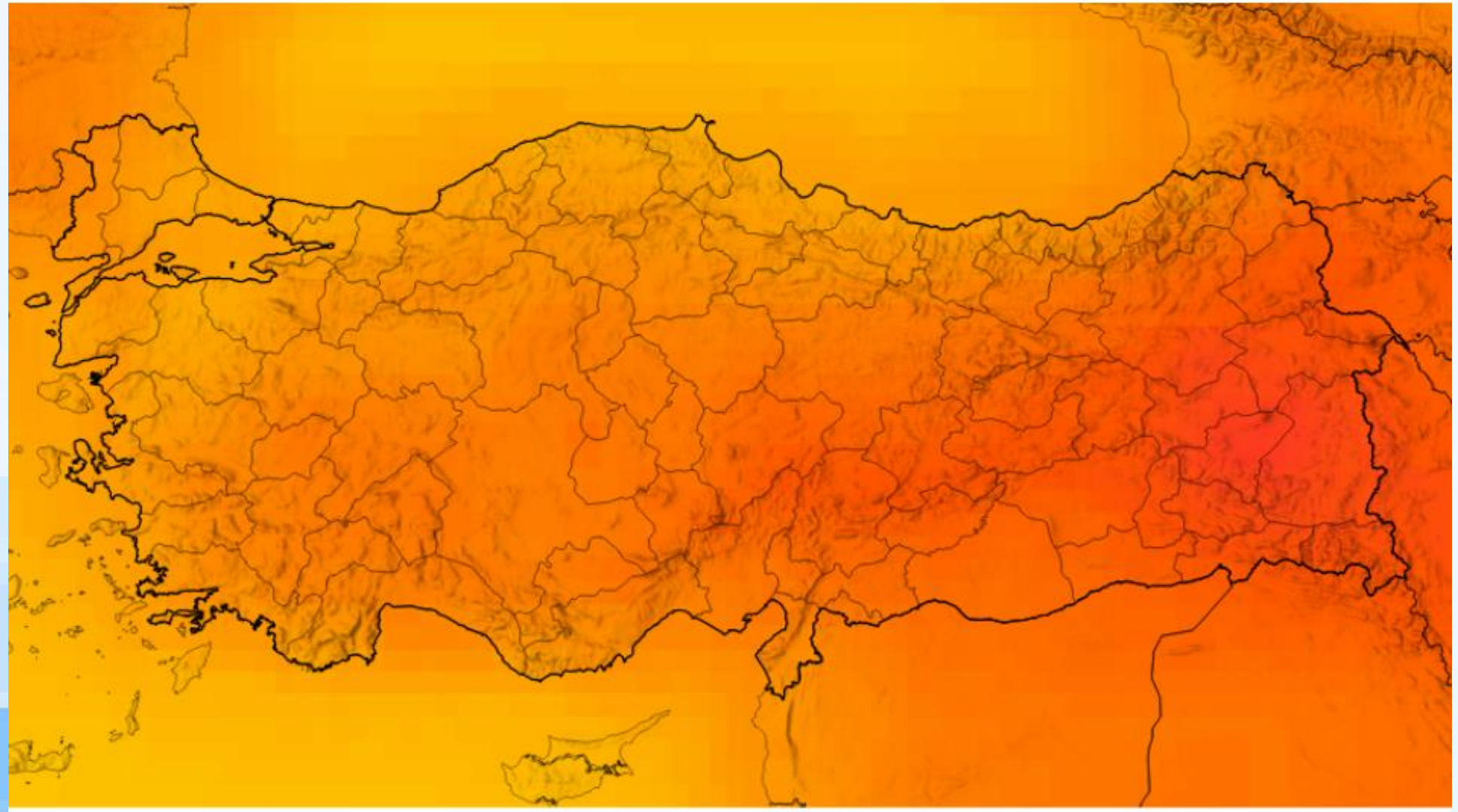
Türkiye için İklim Projeksiyonları

- İklim projeksiyon verileri, Dünya İklim Araştırma Programı tarafından denetlenen Eşleştirilmiş Model Karşılaştırma Projeleri'nin (CMIP'ler) küresel iklim modeli derlemelerinden modellenmiş verilerdir. Sunulan veriler, CMIP'lerin Altıncı Aşaması'ndan türetilen CMIP6'dır.
- CMIP'ler, IPCC Değerlendirme Raporları'nın veri temelini oluşturur. CMIP6, IPCC'nin Altıncı Değerlendirme Raporunu destekler.
- Veriler 0,25º x 0,25º (25 km x 25 km) çözünürlükte sunulmaktadır.
- https://climateknowledgeportal.worldbank.org/country/turkiye/climate-data-projections

Projected Anomaly of Average Mean Surface Air Temperature

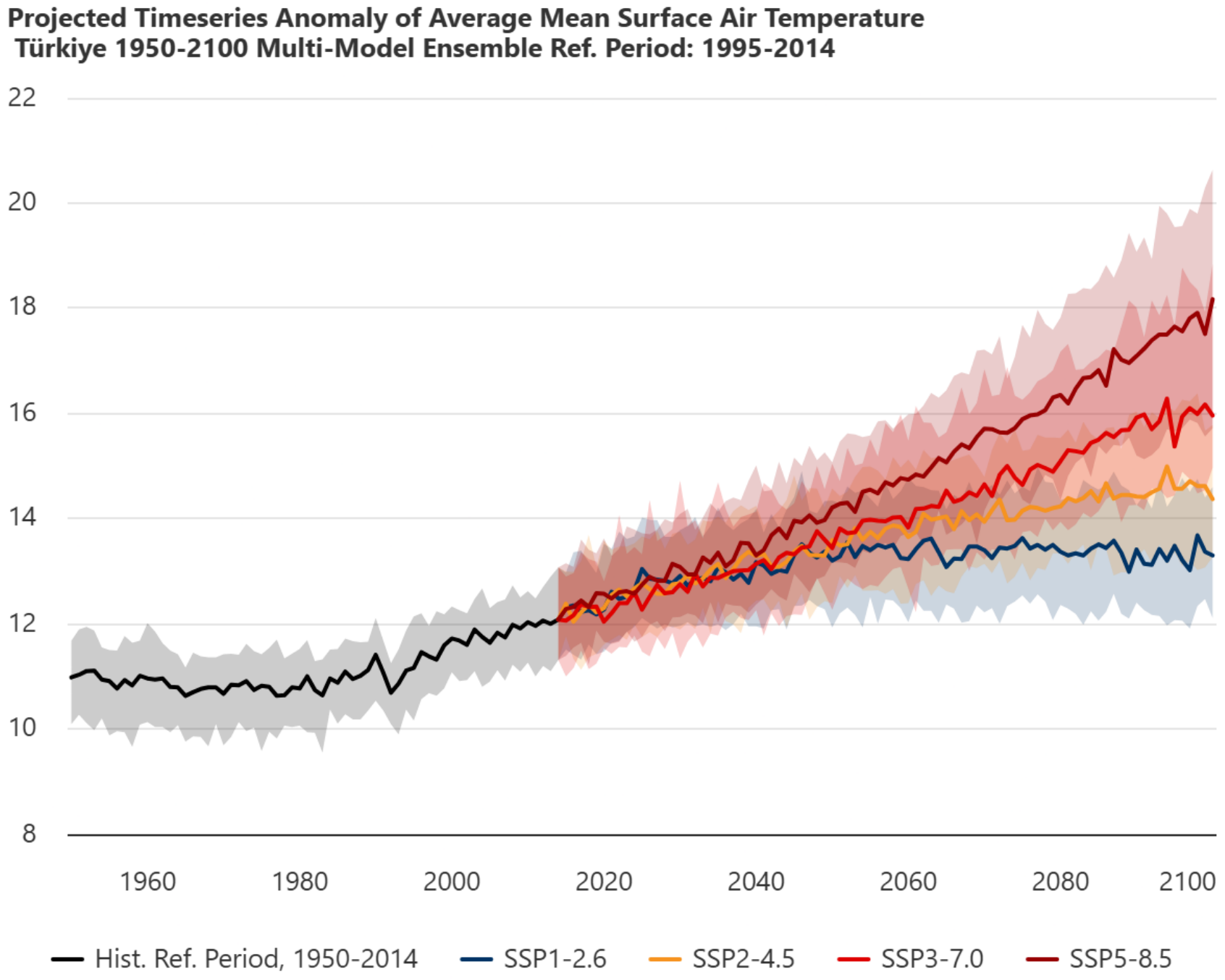
EXPAND MAP

Türkiye • 2080-2099 • Annual • SSP5-8.5 • Multi-Model Ensemble • Ref. Period: 1995-2014

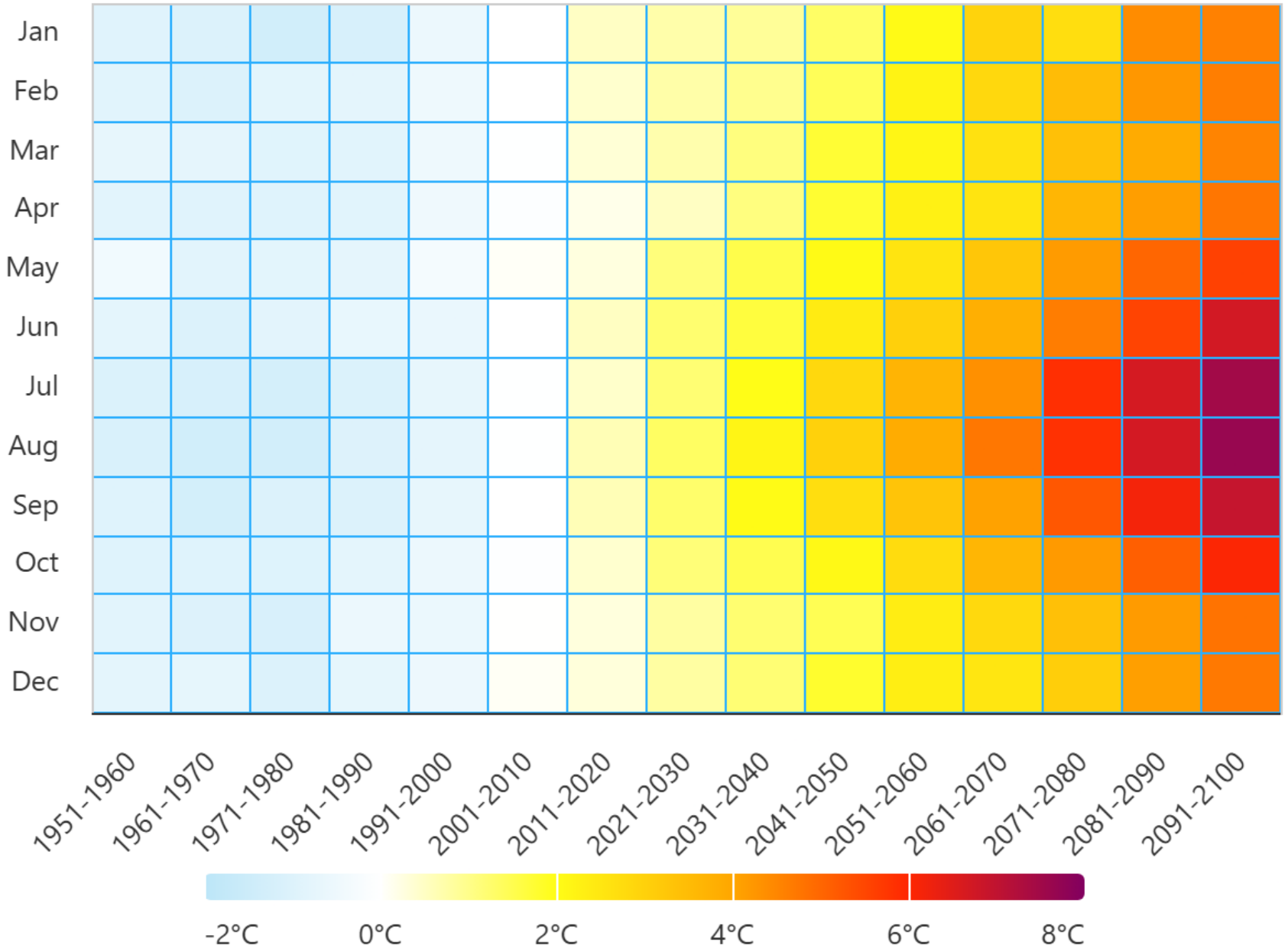


TEMPERATURE(°C)

0 2 4 6 9 11 13 15


Projected Timeseries Anomaly of Average Mean Surface Air Temperature
Türkiye 1950-2100 Multi-Model Ensemble Ref. Period: 1995-2014
22
20
18
16
14
12
10
8
1960
1980
2000
2020
2040
2060
2080
2100
Hist. Ref. Period, 1950-2014
SSP1-2.6
SSP2-4.5
SSP3-7.0
SSP5-8.5

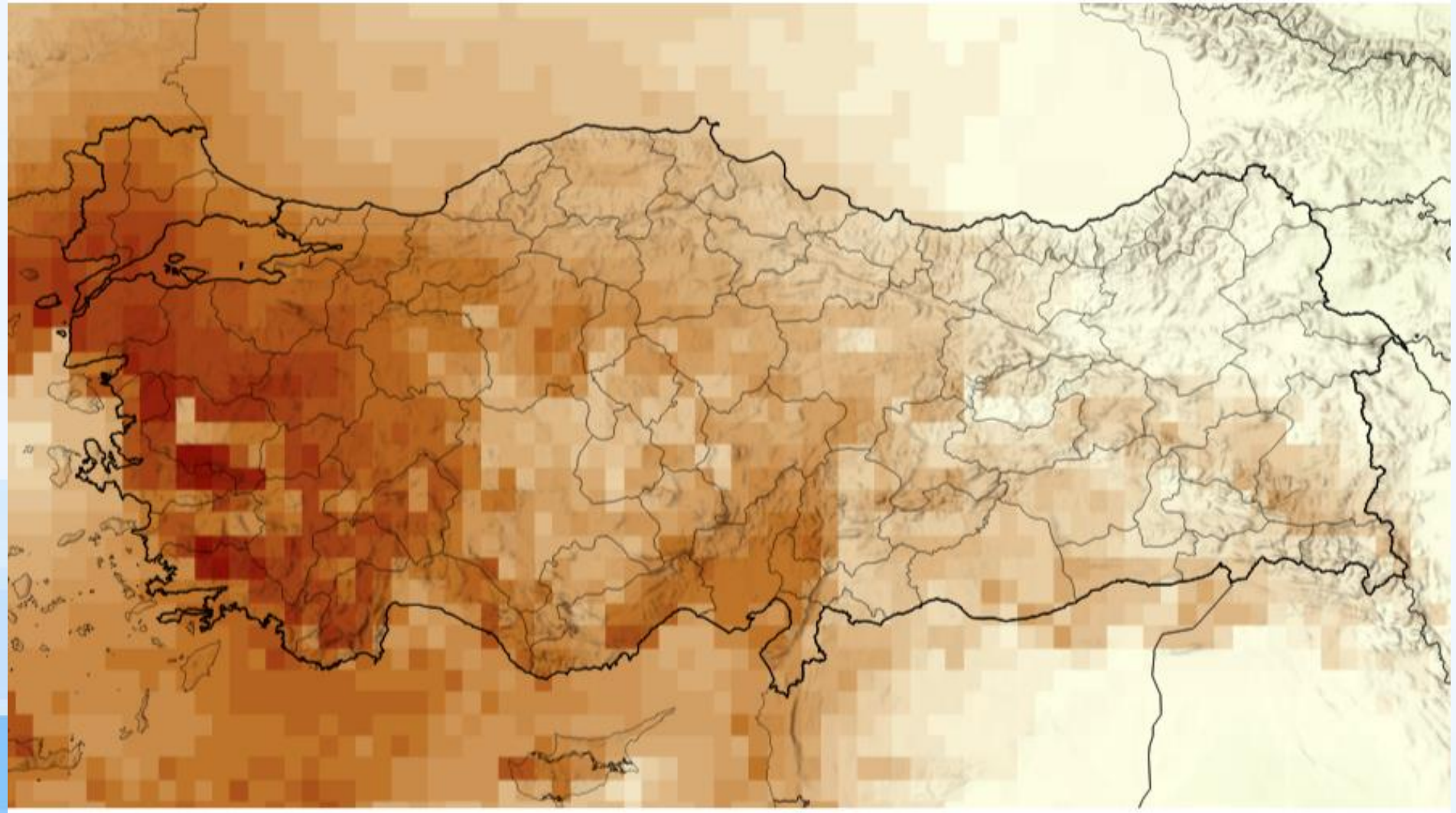
Projected Heat Plot Average Mean Surface Air Temperature Türkiye (Ref. Period: 1995-2014) SSP5-8.5 Multi-Model Ensemble



Projected Anomaly of Precipitation Percent Change

EXPAND MAP

Türkiye • 2080-2099 • Annual • SSP5-8.5 • Multi-Model Ensemble • Ref. Period: 1995-2014



PERCENT(%)

-40 -6 28 62 96 130 164 198 232 266 300

Kaynaklar

- https://www.ipcc.ch/report/ar6/wg1/downloads/report/IPCC_AR6_WGI_SPM.pdf
- https://www.gfdl.noaa.gov/climate-modeling/#:~:text=Climate%20models%20divide%20the%20globe,climate%20variables%20such%20as%20temperature.
- https://www.mgm.gov.tr/iklim/iklim-degisikligi.aspx
- https://climateknowledgeportal.worldbank.org/country/turkiye/climate-data-projections