COASTAL EL NIÑO INDEX IMPACT ON AIR TEMPERATURE AND PRECIPITATION ANOMALIES AND FUTURE PROJECTIONS

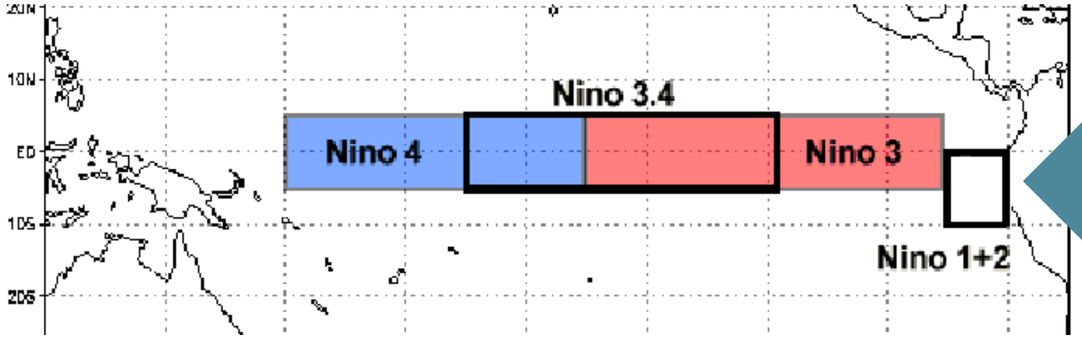
KENTROSAURUS_FOXTROT "TENUTO"

Climatematch Academy

- Selyn Acuña
- Daphne Arenas

INTRODUCTION

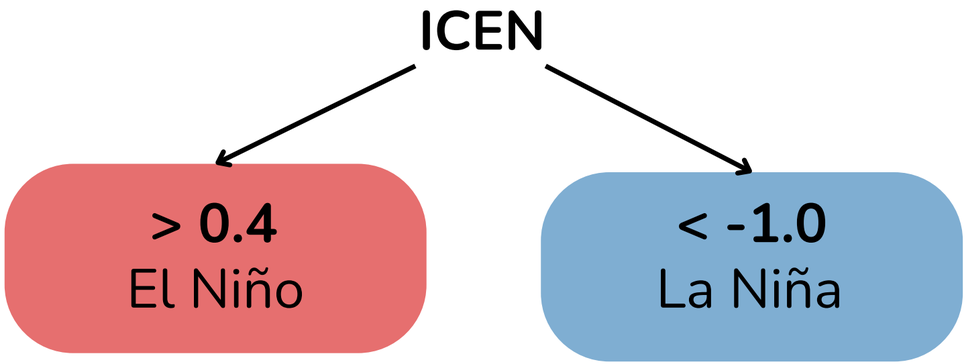
Region 1+2

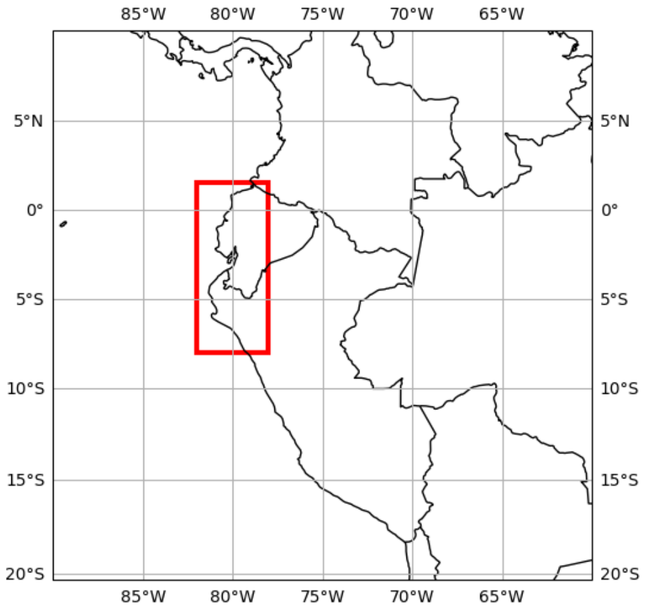


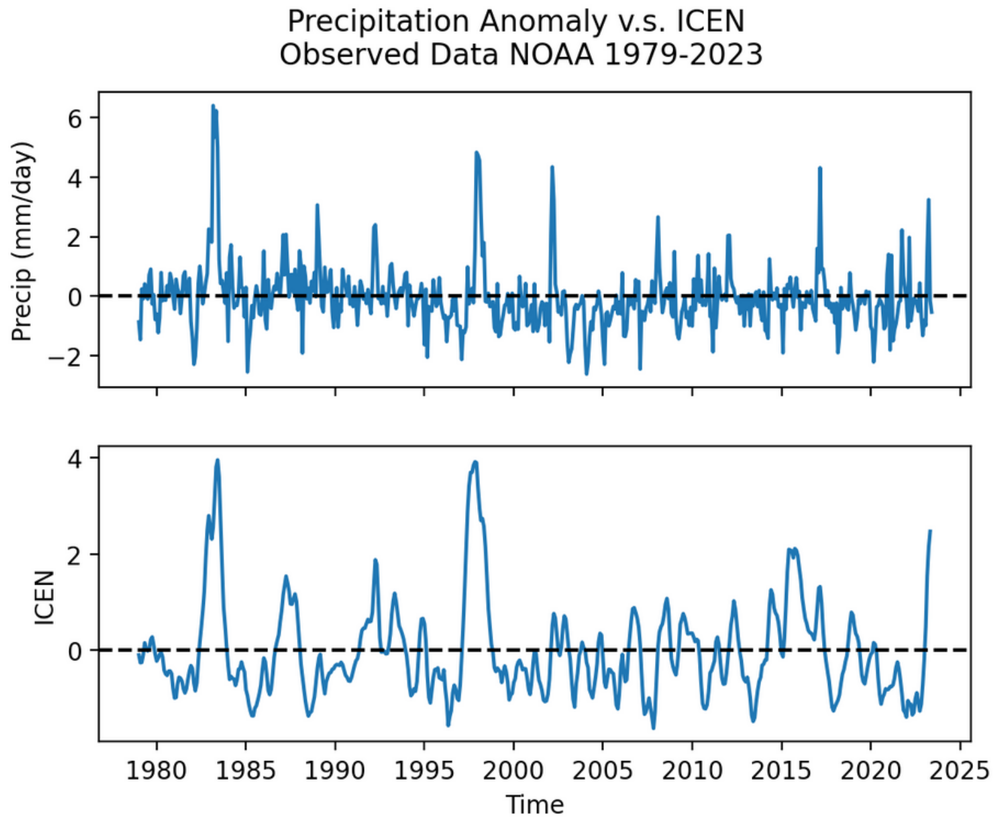
Affects coastal areas of Peru and Ecuador

How is the relationship between Coastal El Niño Index (ICEN) with precipitation and air temperature anomalies in the northern coast of Peru and coastal areas of Ecuador during 1979-2023 and what are the future projections?

ICEN IMPACT ON PRECIPITATION AND TEMPERATURE ANOMALIES





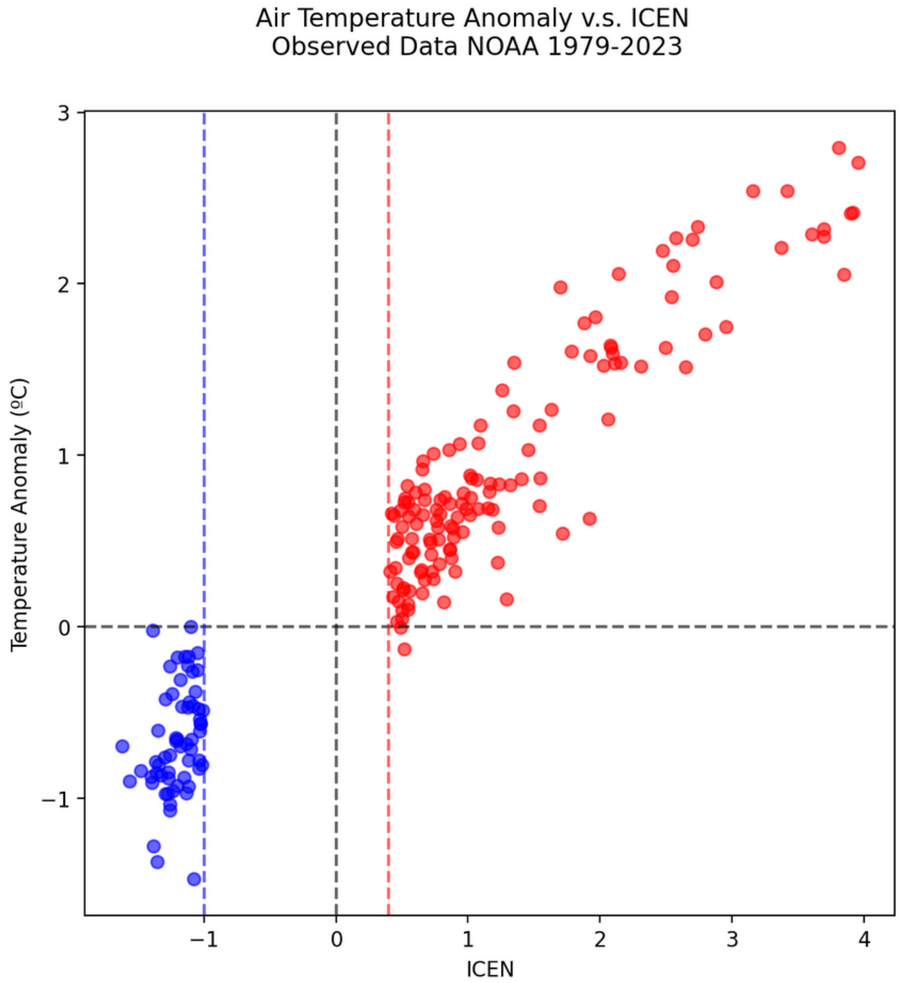


Index: Coastal El Niño Index (ICEN) -region 1+2

Dataset: NOAA Dataset (Observed data)

Climatology: 1981-2010

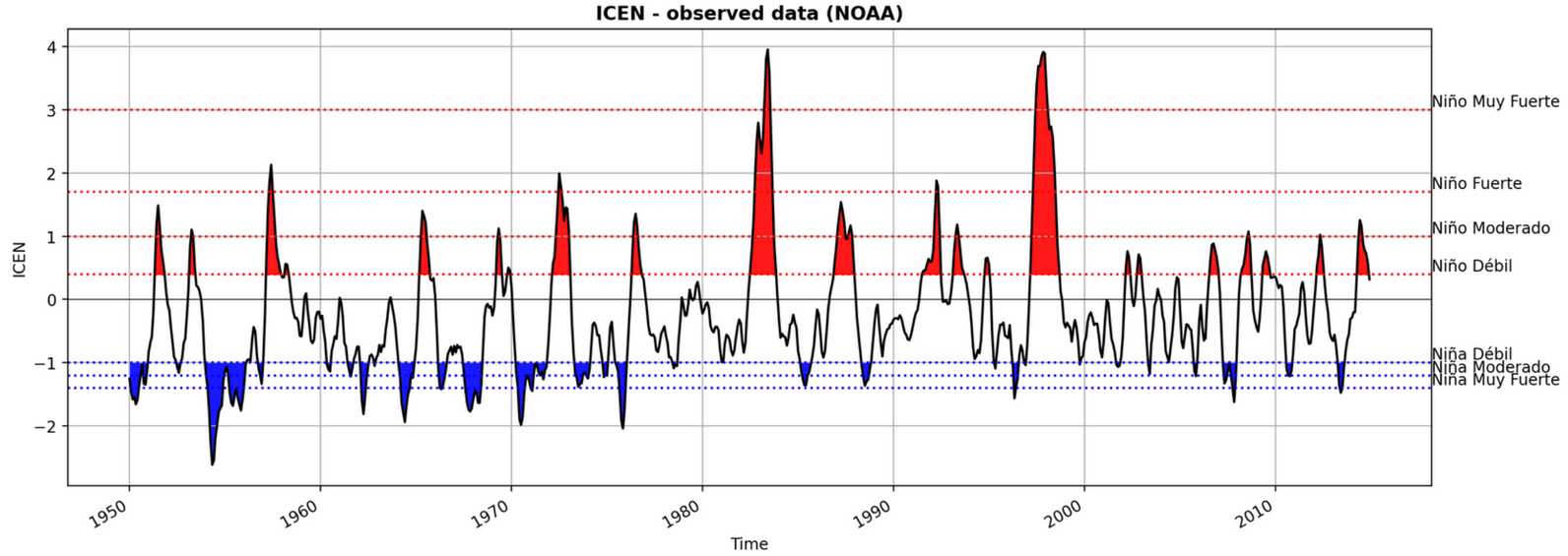
ICEN IMPACT ON PRECIPITATION AND TEMPERATURE ANOMALIES

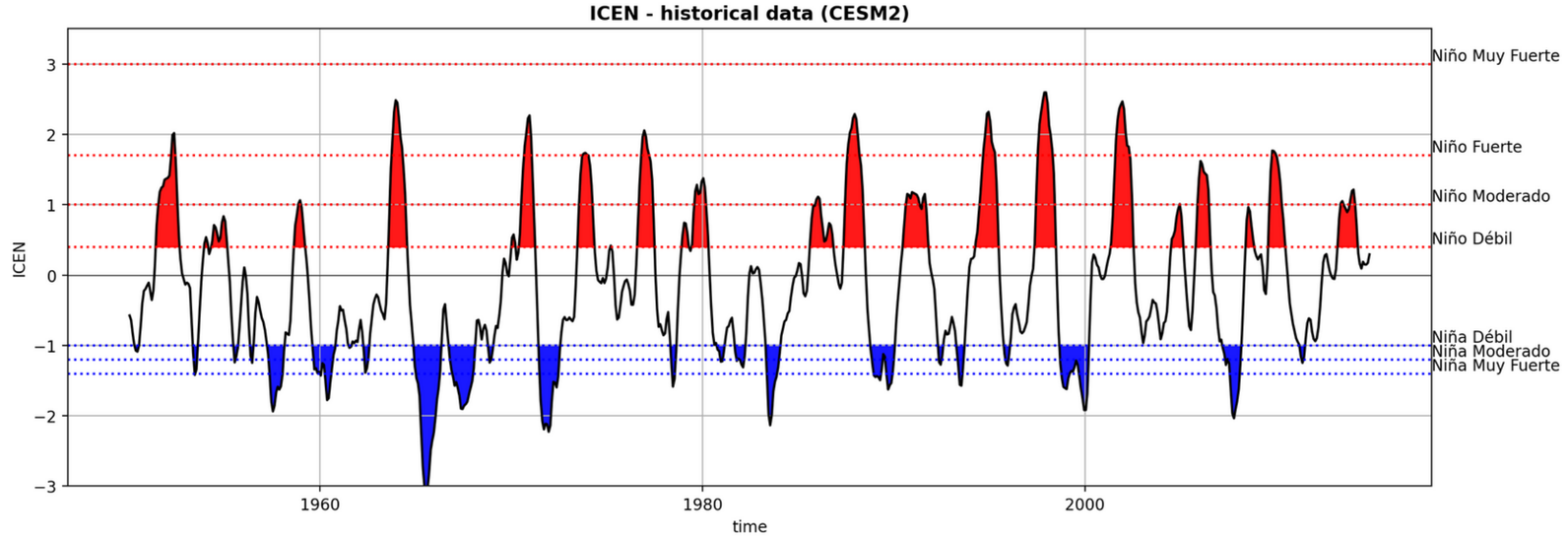


Spearman Correlation	Precipitation Anomalies	Air Temperature Anomalies
Niño (ICEN >0.4)	**0.452**	**0.816**
Niña (ICEN <-1)	**-0.216**	**0.394**

- Spearman's rank correlation coefficient
- Positive and significant correlation. between Coastal El Niño Events and the air temperature anomalies.

ICEN VALIDATION USING CMIP6 MODELS





Models' validation

Qualitative analysis (Visual)

ACCESS-CM2

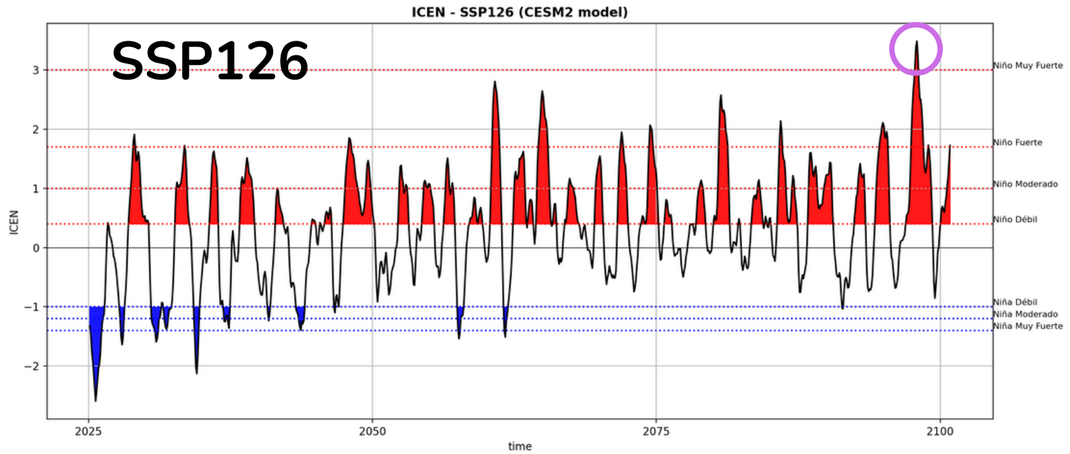
GFDL-ESM4

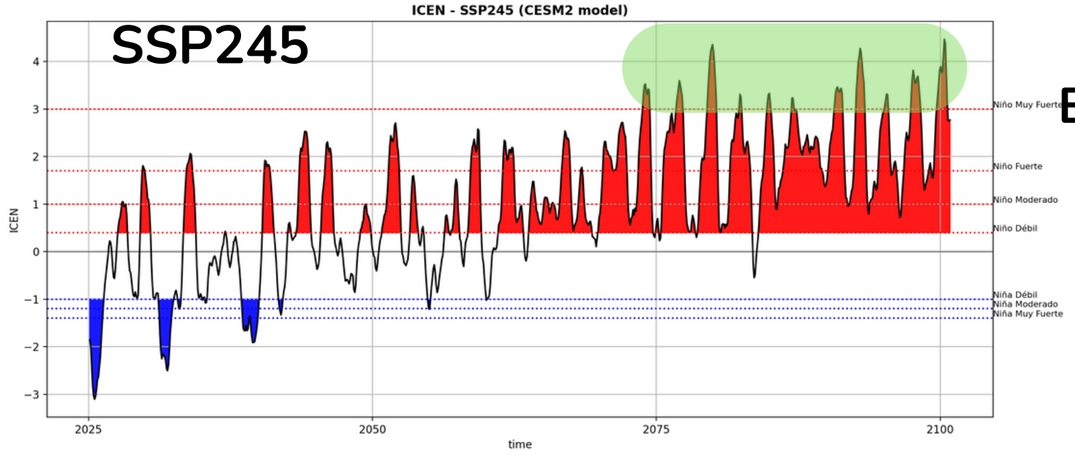
MPI-ESM1-2-LR

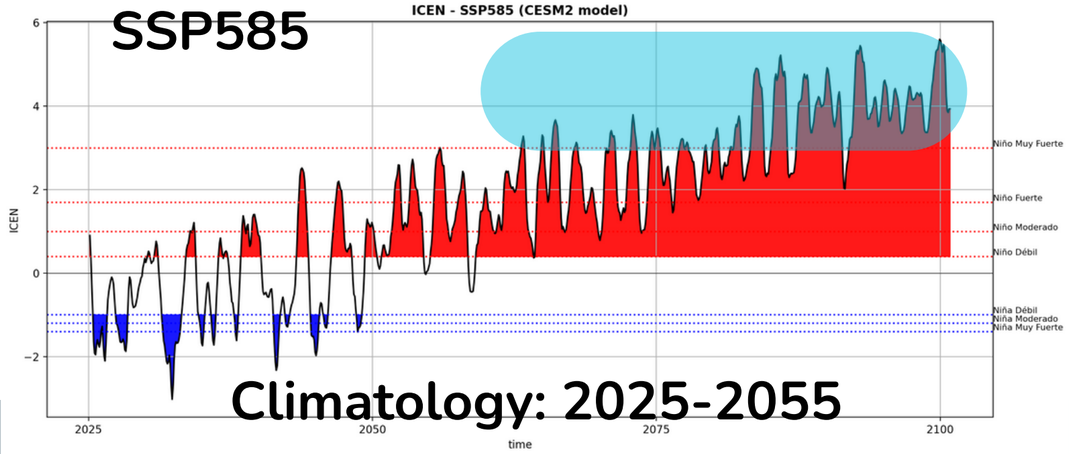
CESM2

However...

It is not very accurate though, it doesn't record some extreme Coastal El Niño events (ICEN>3)







Climatology: 2025-2055

ICEN PROJECTIONS USING CESM2 MODEL

SSP126 projections

Only 1 extreme event (ICEN>3)

SSP245 projections

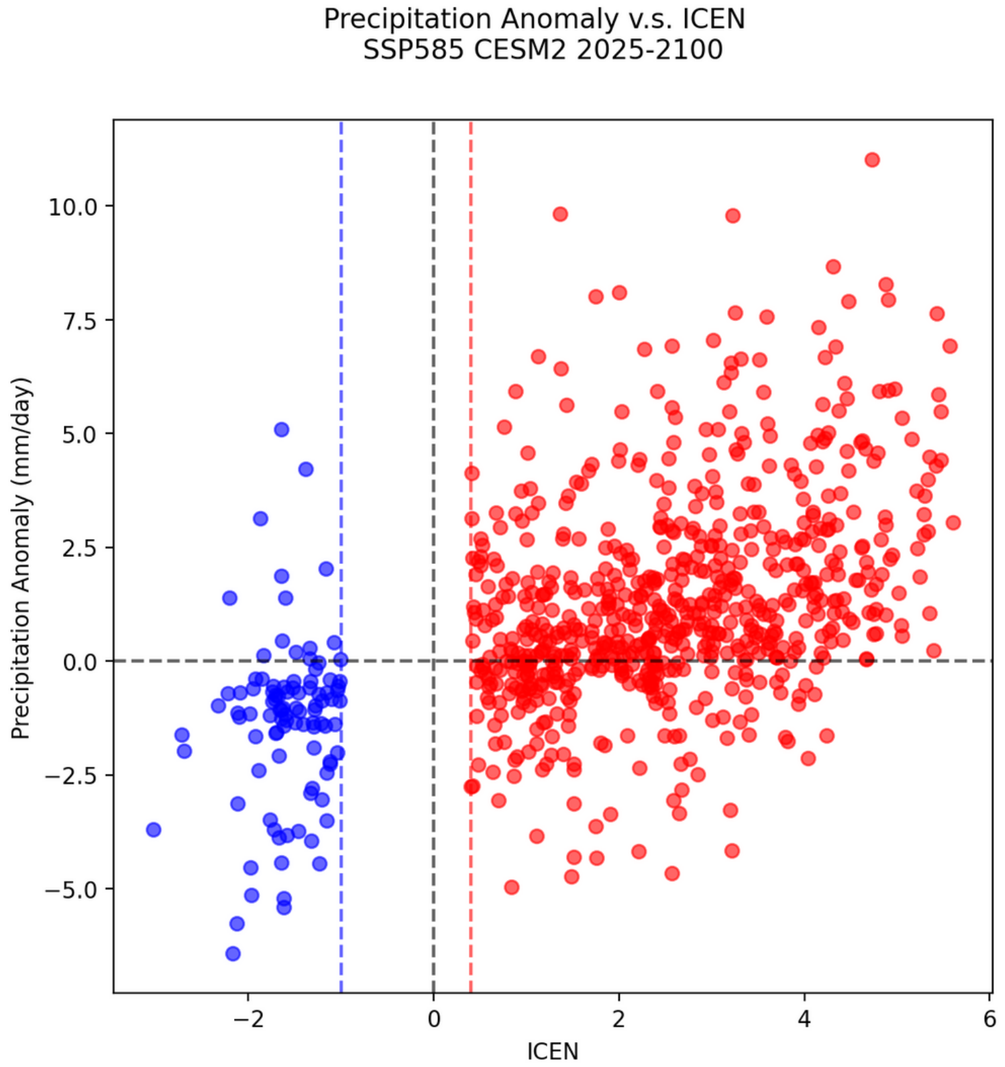
Extreme events are more frequent, especially a little before 2075 (~2075-2100)

SSP585 projections

Extreme events are more frequent, especially since nearly 2062 (~2062-2100)

Under all scenarios, **Coastal El Niño** will be more frequent and intense, especially in **SSP585**, but ... it could also be because all scenarios considered more warming.

ICEN PROJECTIONS: WILL CORRELATIONS CHANGE?

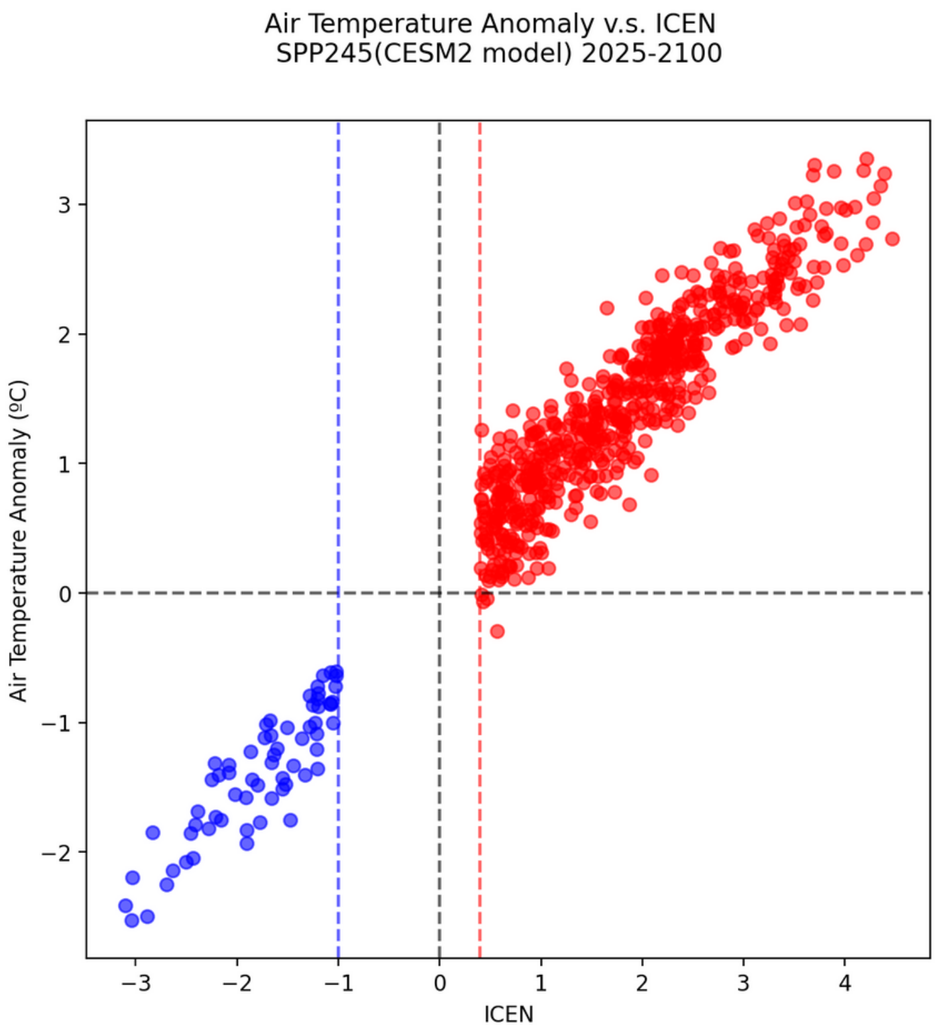


Climatology: 2025-2055

Niño	Observed (1979-2023)	Historical data (1970-2014)	SSP126	SSP245	SSP585
Precipation anomalies	**0.452**	**0.490**	**0.388**	**0.493**	**0.393**
Air Temperature anomalies	**0.816**	**0.851**	**0.832**	**0.926**	**0.954**

- Low association between Coastal El Niño (ICEN>0.4) with precipitation anomalies
- High Spearman correlation coefficient between Coastal El Niño with air temperature anomalies

ICEN PROJECTIONS: WILL CORRELATIONS CHANGE?



Climatology: 2025-2055

Niña	Observed (1979-2023)	Historical data (1970-2014)	SSP126	SSP245	SSP585
Precipation anomalies	**-0.216**	**0.100**	**0.176**	**0.078**	**0.142**
Air Temperature anomalies	**0.394**	**0.590**	**0.549**	**0.875**	**0.822**

- Very Low association between Coastal La Niña with precipitation anomalies

- High Spearman correlation coefficient between Coastal La Niña with air temperature anomalies

CONCLUSIONS

- Coastal El Niño impacts on air temperature anomalies (Spearman correlation coefficient >0.8) using observed and CESM2 data.
- More Coastal El Niño events are expected under all scenarios using the CESM2 model.
- Coastal El Niño intensity is expected to increase in all scenarios, especially in SSP585.

SUGGESTIONS

It’s recommended to ...

- **Model validation**: use about 10 models and do a statistical analysis (ex. correlation) and a spatial distribution analysis when comparing to the observed data
- **Projections**: Apply the detrending method to see the "real" variability of the ICEN.

OPEN SCIENCE

Code:

https://drive.google.com/drive/folders/1B4oIoJFhiPyl6isY_otewjEhtrWOYKBK?usp=drive_link

Figures:

https://drive.google.com/drive/folders/1eBjzTeawi4u610BjGxQxqqdJzi5RT9C8?usp=sharing

THANK YOU!