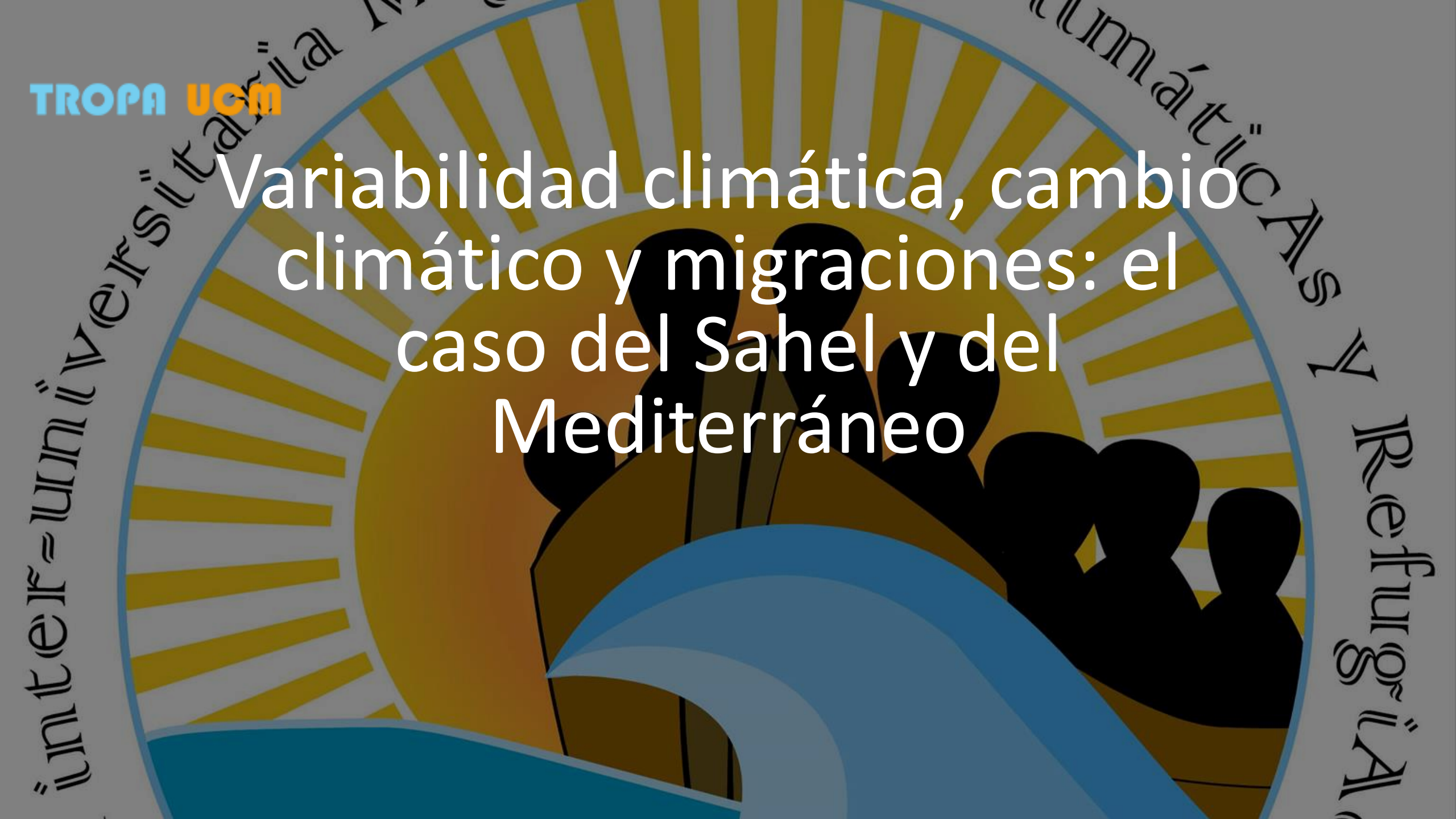
TROPA UCM

Variabilidad climática, cambio climático y migraciones: el caso del Sahel y del Mediterráneo



TROPA UCM http://tropa.fis.ucm.es/

TROPA: TROPical vAriability and teleconnexions

Weather vs Climate

FOTO DE ÁRBOL EN FRENTE DE NUEVOS MINISTERIOS (15/03/2018)

CIERRE DEL PARQUE DE NUEVOS MINISTERIOS POR DERRUMBAMIENTO DE ÁRBOLES

Imagen propia

CIERRE POR CONDICIONES ~~CLIMATOLÓGICAS~~

↓

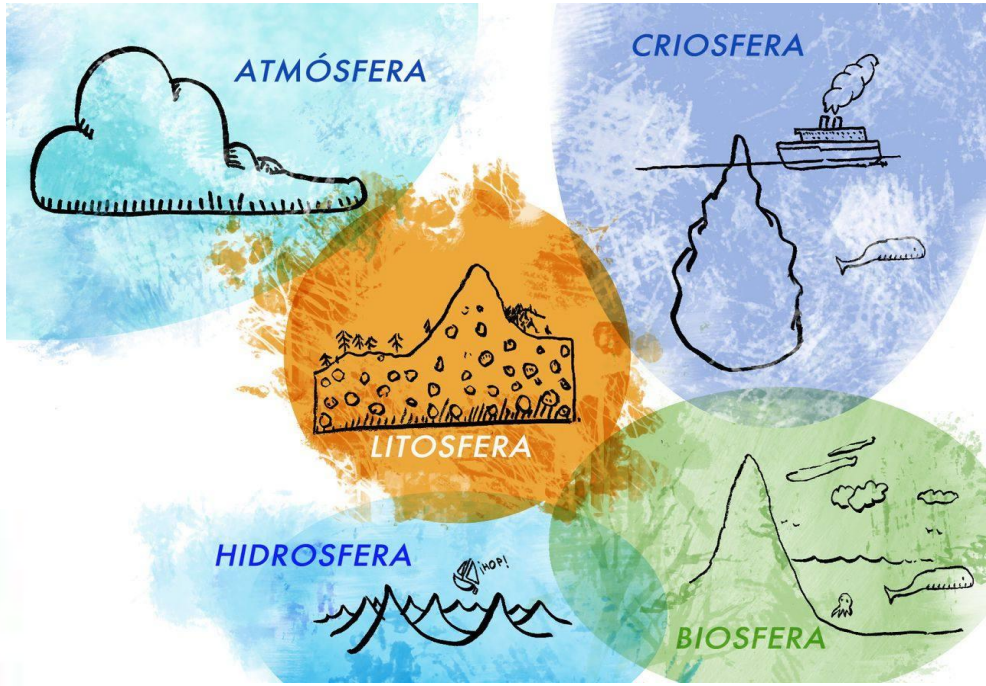
METEOROLÓGICAS

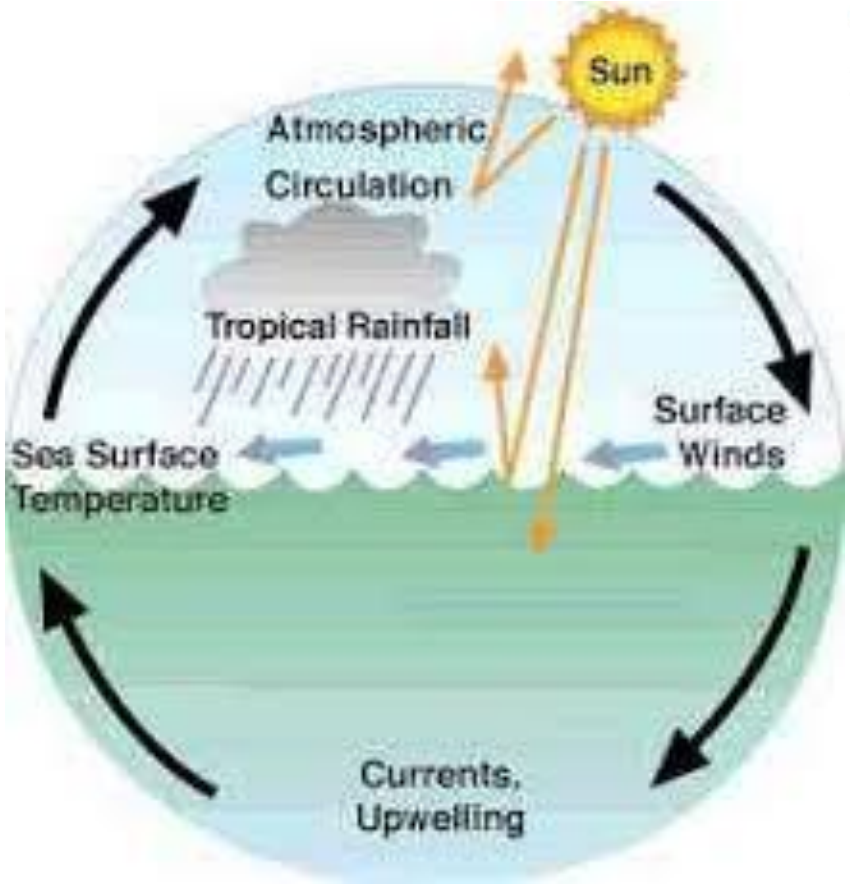
Climate System

- Physical integrated system (thermo-hydro-dynamic) formed by different components and their interactions

- It is a closed system (no exchange of matter) that can exchange energy with the outside. The subsystems are open and are connected through flows of heat, momentum and matter.

- Each component of the system responds to a perturbation with different time scales.





Fuente AEMET

Variability

Climate Variability: fluctuations of the variables that define the climate of a region: temperature, wind intensity, precipitation.... and which in the tropics state of the atmosphere is closely related to the ocean.

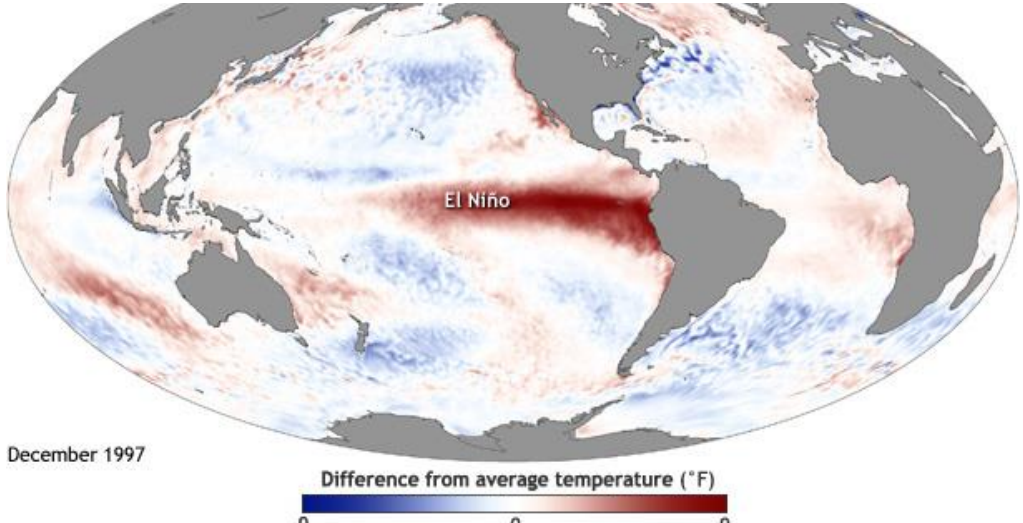
Internal Climate Variability vs Forced Climate Variability

1 External Forcings: external factors that affect the climate system but are not influenced by climate variables:

- i. Astronomical factors (solar radiation, orbital parameters);
- ii. Terrestrial factors (atmospheric composition (except H20), tectonic movements, etc); → **forced variability.**

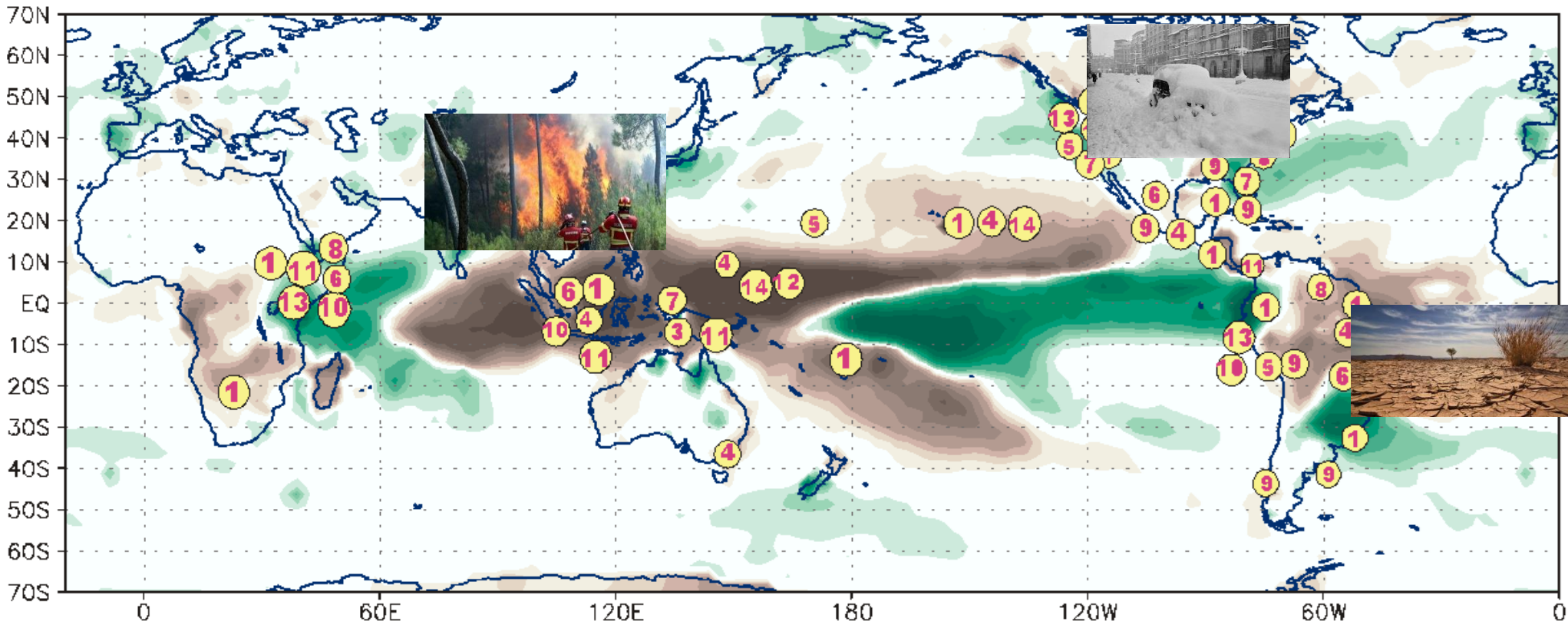
2 Internal forcings: originate in the climate system itself, giving rise to interactions and feedbacks independent of external forcings (ENSO, small-scale disturbances, etc.) → **internal variability**.

SST signals are slower and are able to teleconnect with remote regions, which gives it predictive value.



Impacts of ENSO

Impacts from 1997/98 El Niño



1. Crop/Stock Damage
2. Energy Savings
3. Famine
4. Fires
5. Fisheries Disruption
6. Health Risks
7. Human Fatalities
8. Pests Increased
9. Property Damage
10. Tourism Decreased
11. Transportation Problems
12. Social Disruptions
13. Wildlife Fatalities
14. Water Rationing

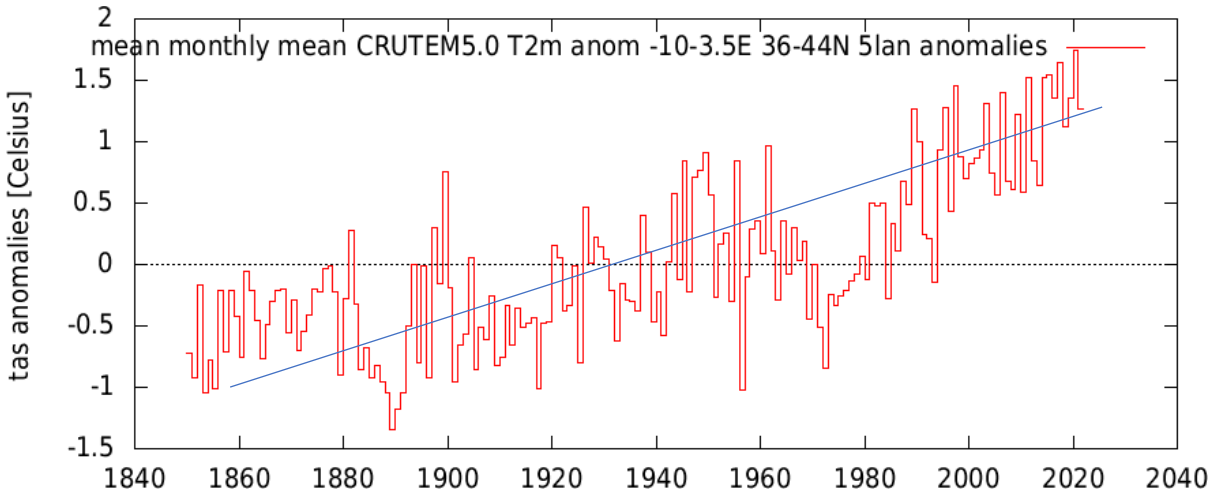
Fuente: NOAA

Variability

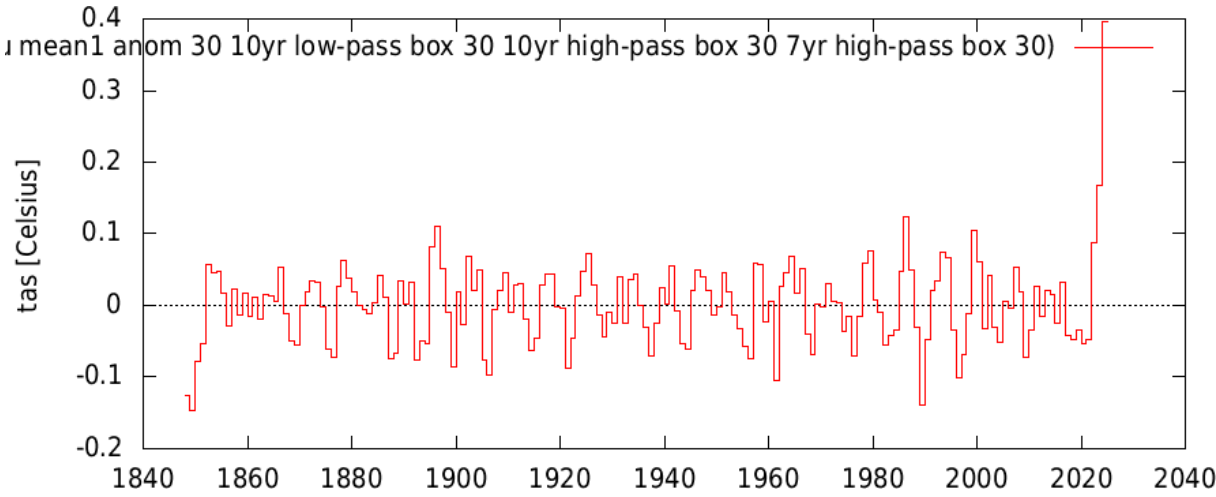
Total Climate Variability = natural forced variability
+ antropogenic forced variability (climate change)
+ internal variability

we also have to consider that internal variability might change under CC

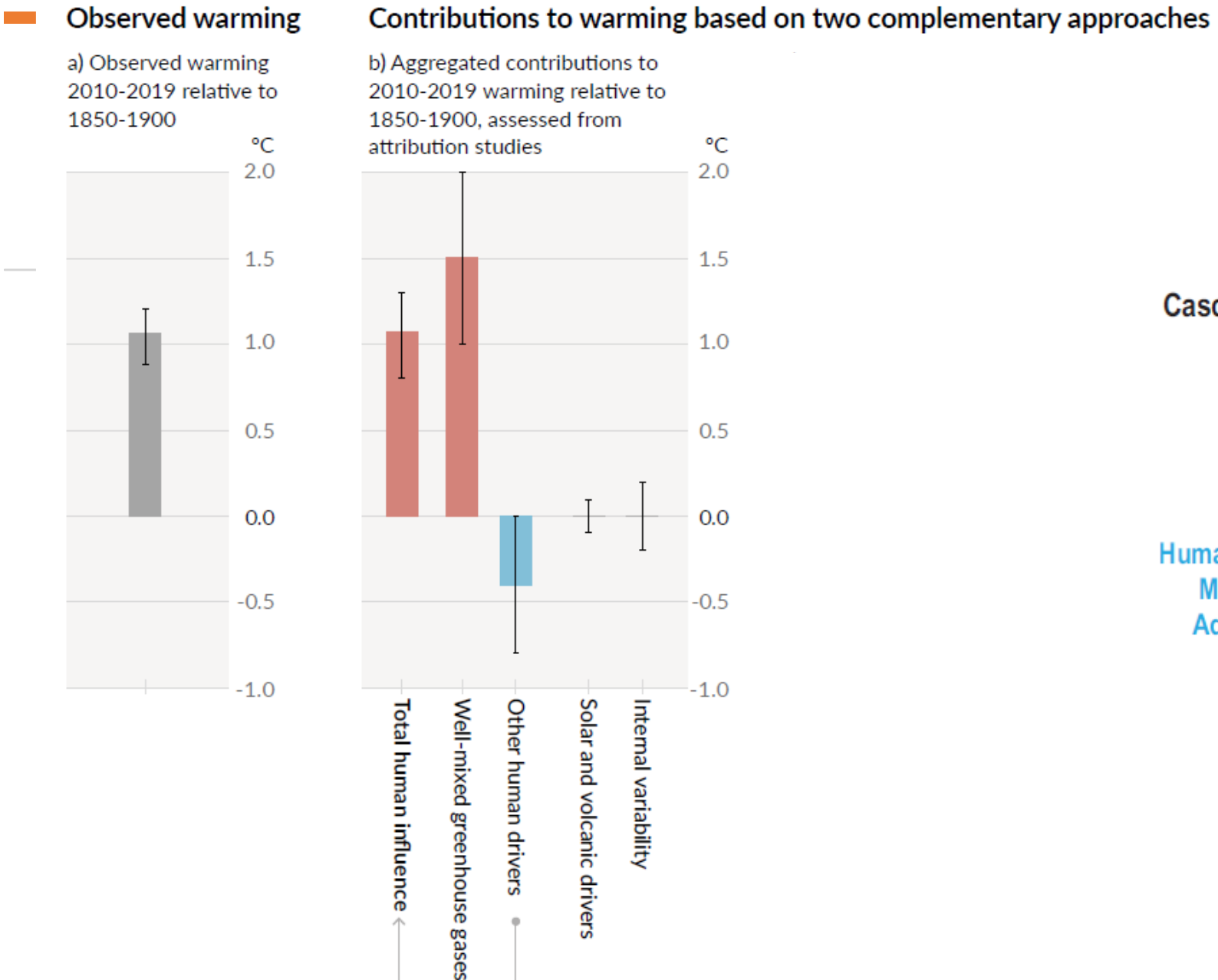
Air temperature over Iberian Peninsula annual anoma

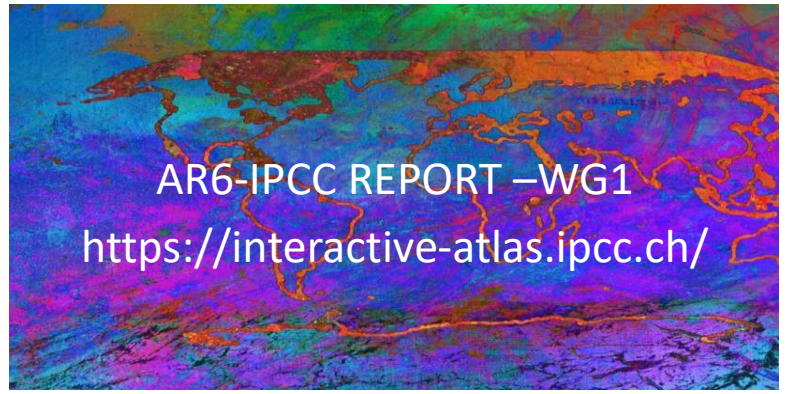


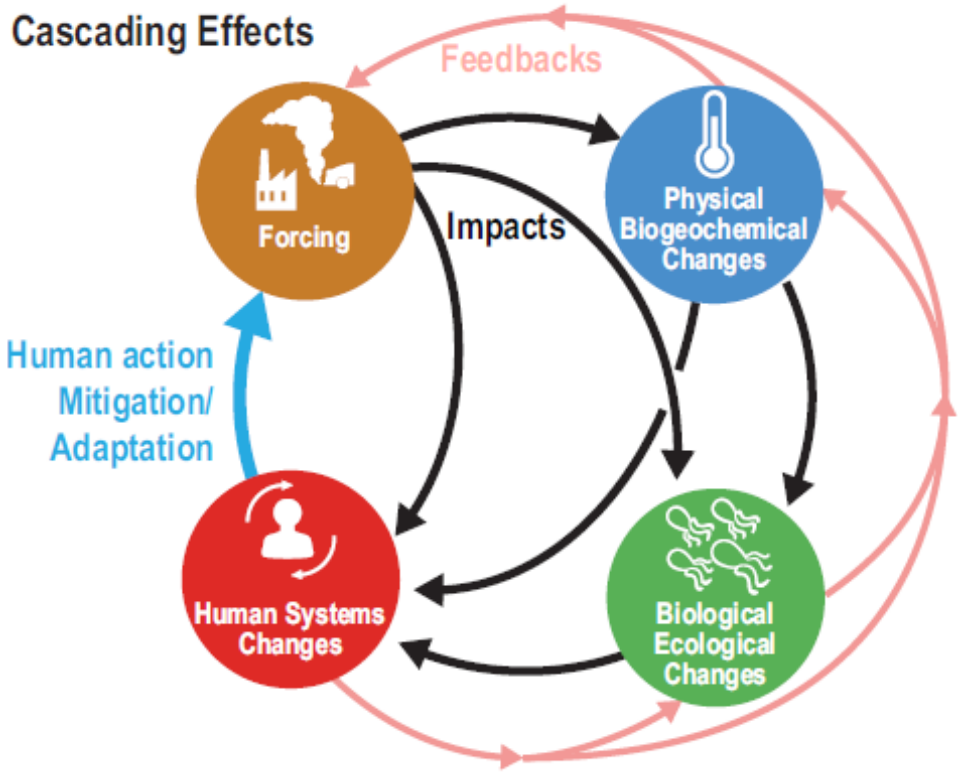
After filtering > 7 years



Global warming





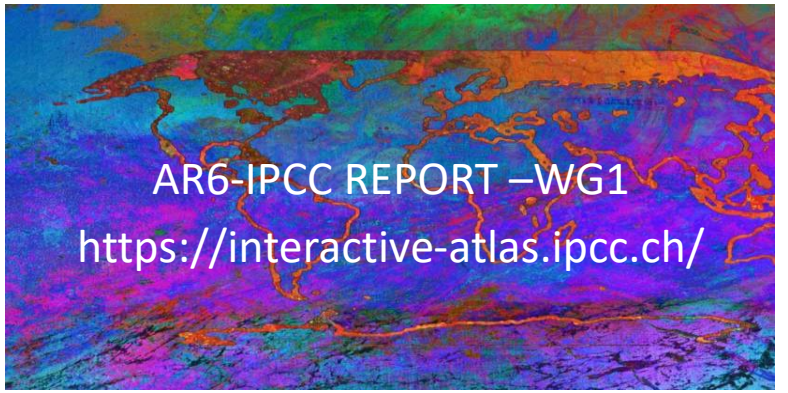


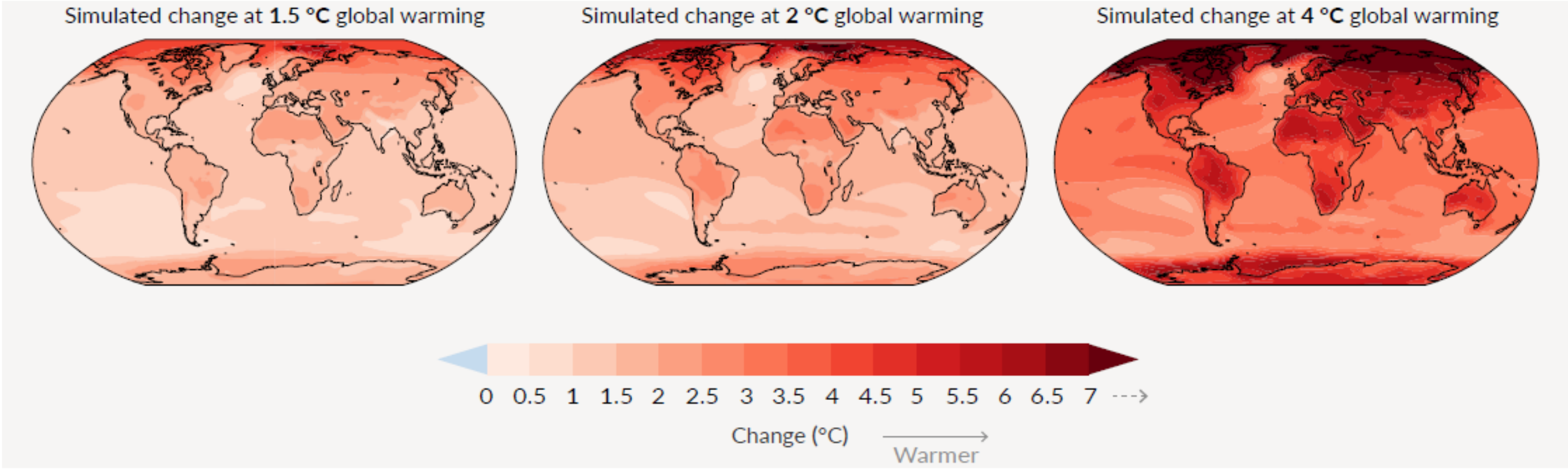
Hidrologycal cycle will be intensified

Rise temp ➔ atmosphere retains more vapour ➔ more evaporation

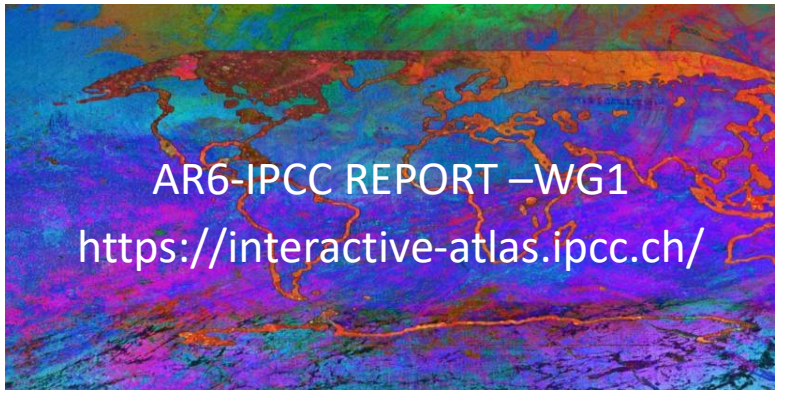
➔ More intense precipitation

➔ More droughts

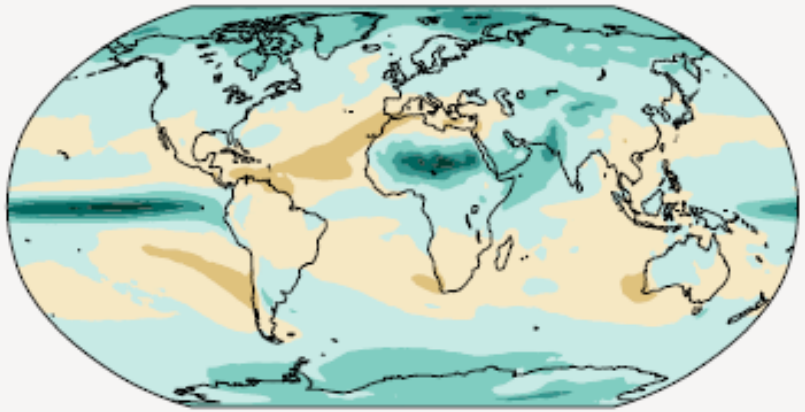




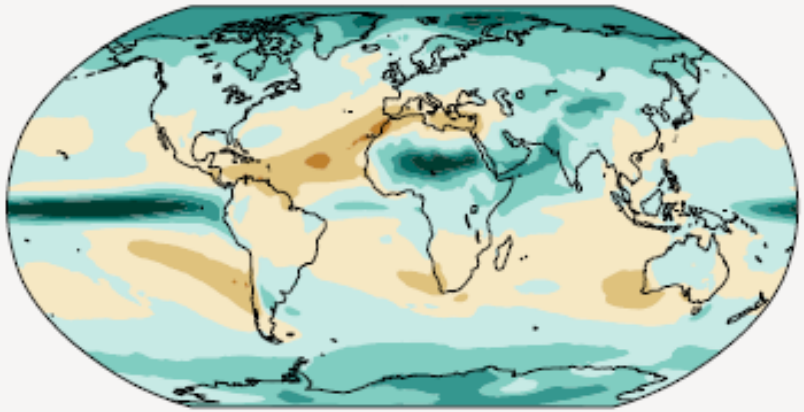
Precipitation changes



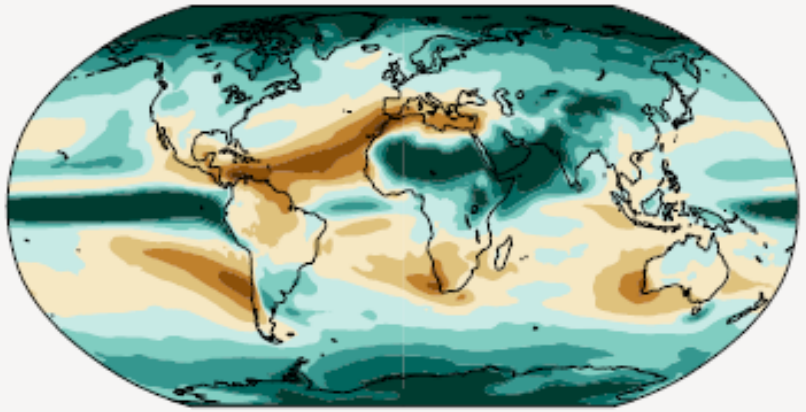
Simulated change at **1.5 °C** global warming



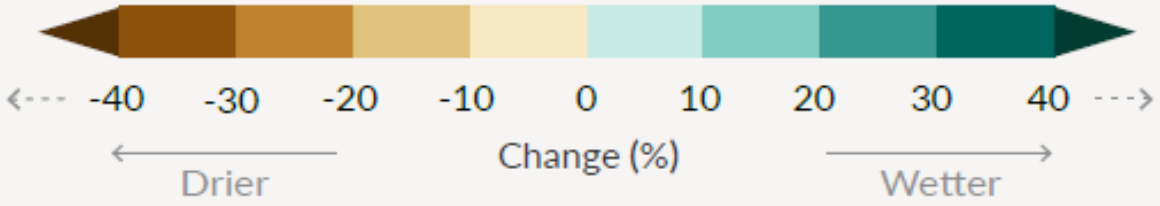
Simulated change at **2 °C** global warming



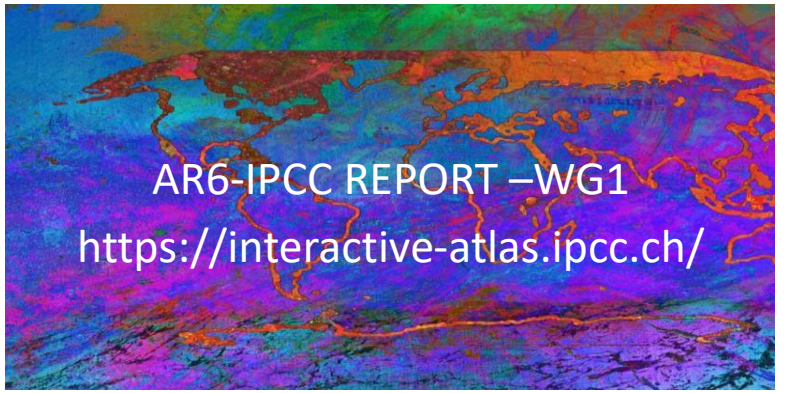
Simulated change at **4 °C** global warming



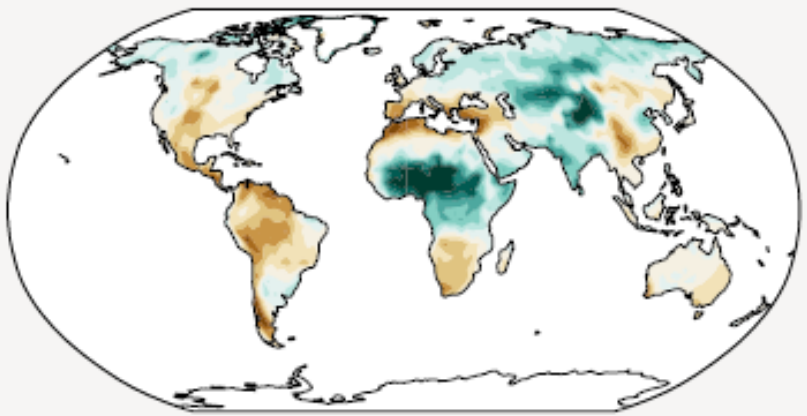
Relatively small absolute changes may appear as large % changes in regions with dry baseline conditions



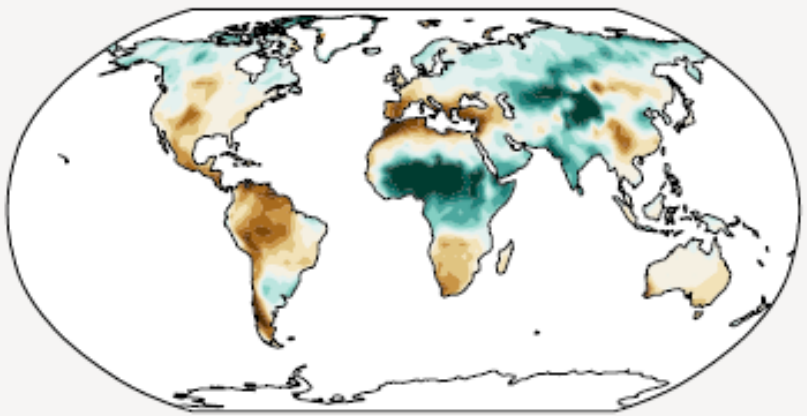
Surface humidity changes



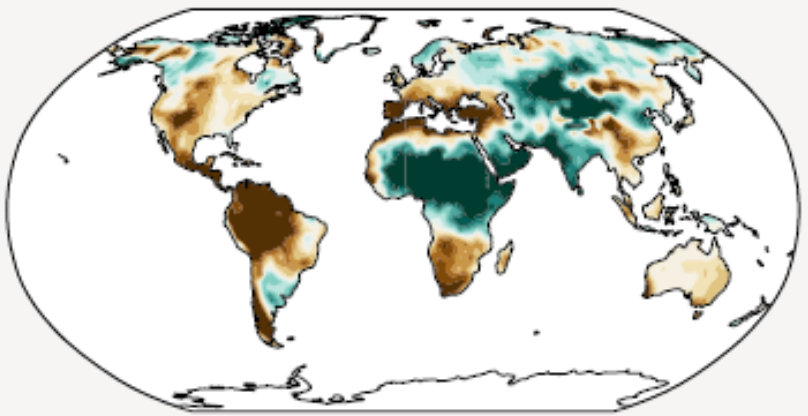
Simulated change at **1.5 °C** global warming



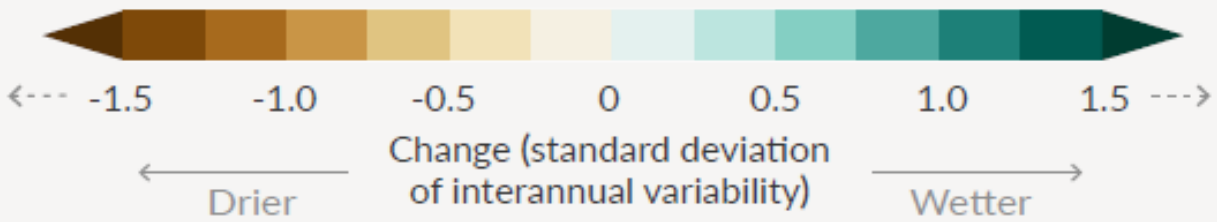
Simulated change at **2 °C** global warming



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

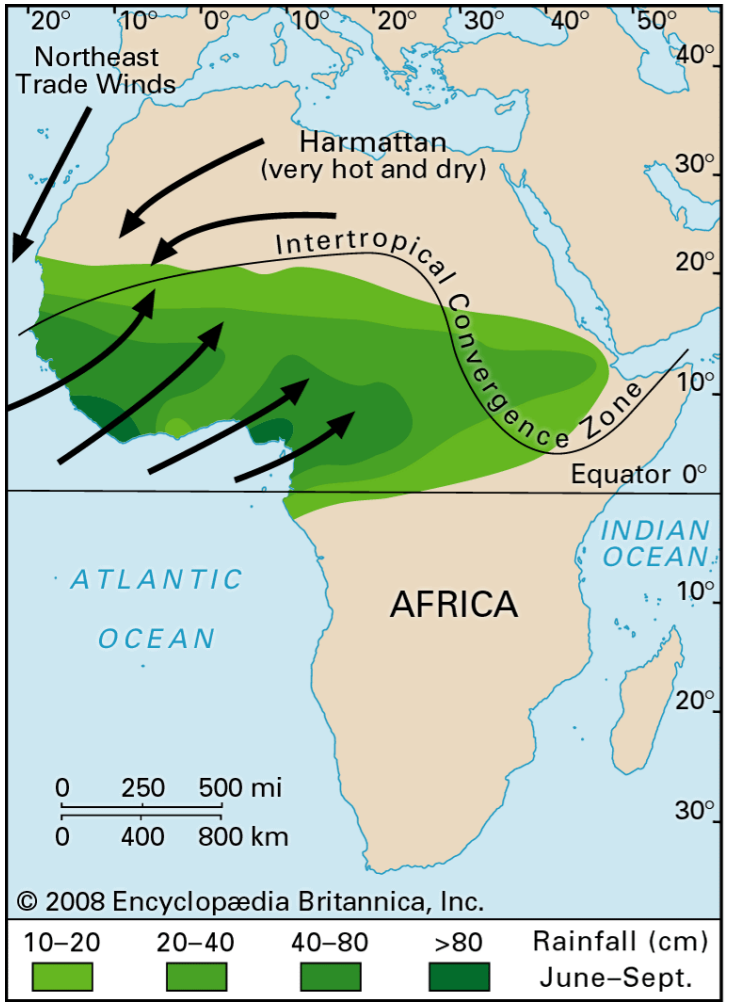


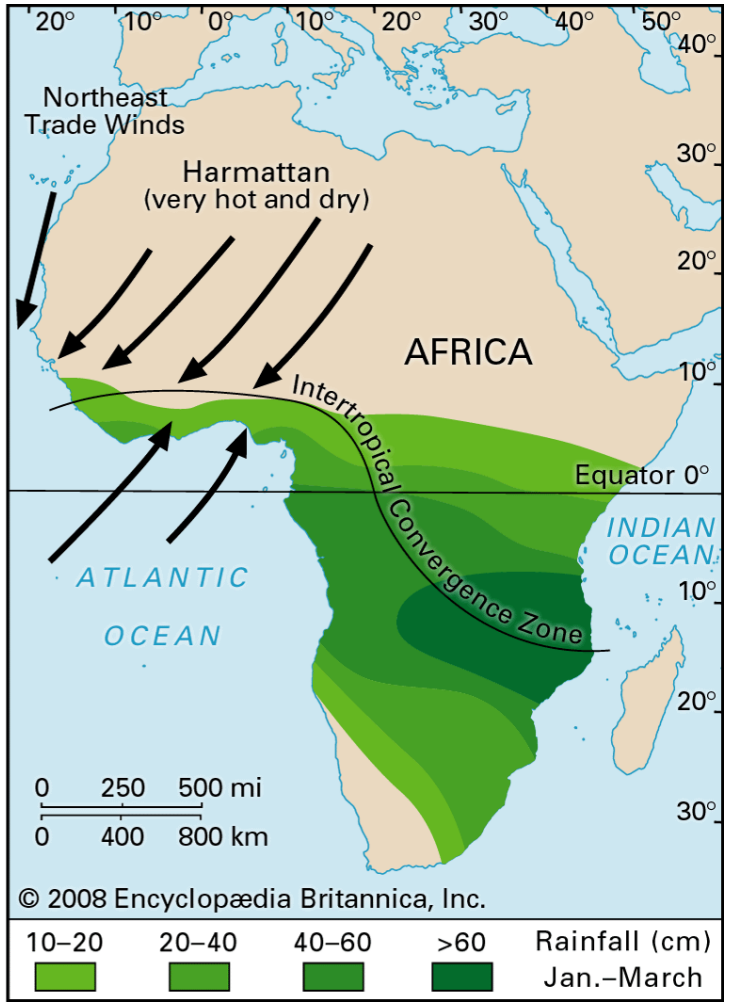
Relatively small absolute changes may appear large when expressed in units of standard deviation in dry regions with little interannual variability in baseline conditions



Precipitation variability over the Sahel region

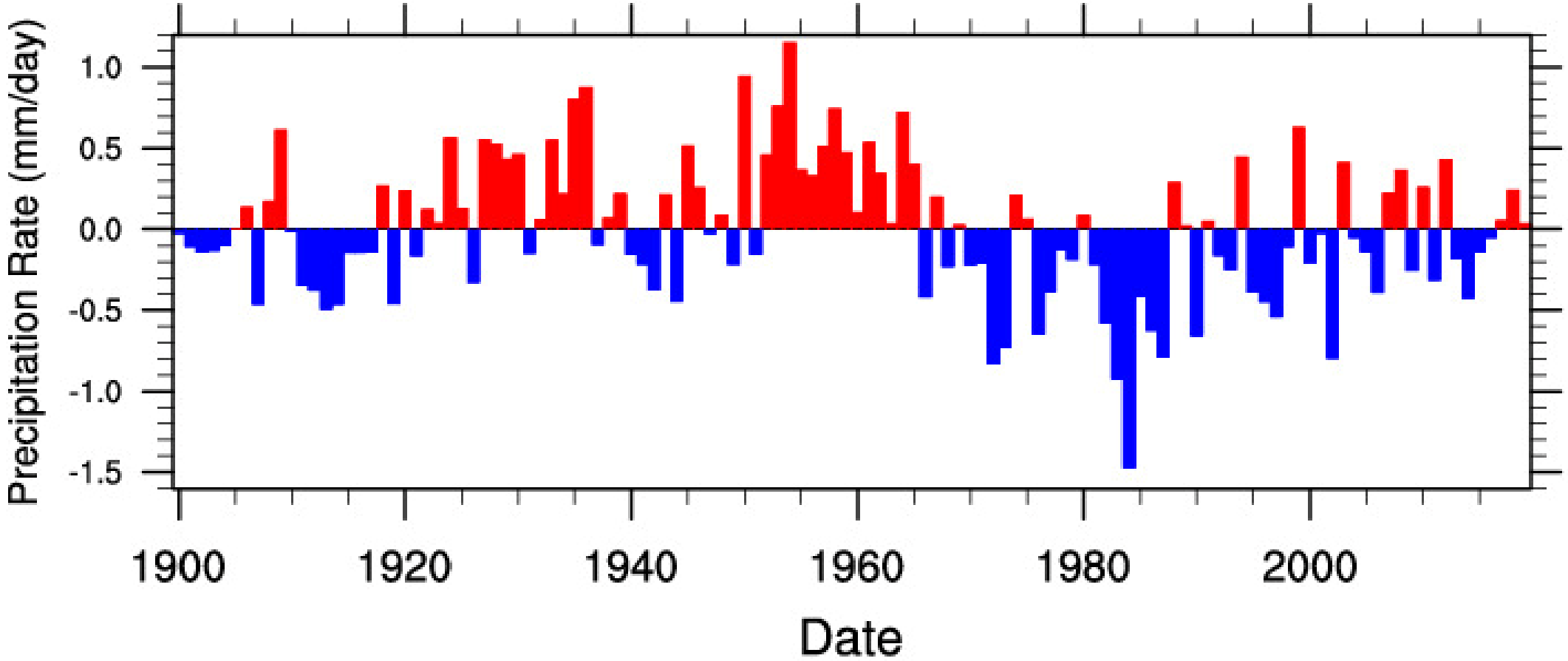
TROPA: Study of climate variability over the Atlantic from intraseasonal to multidecadal timescales. We mainly study internal climate variability from the past century





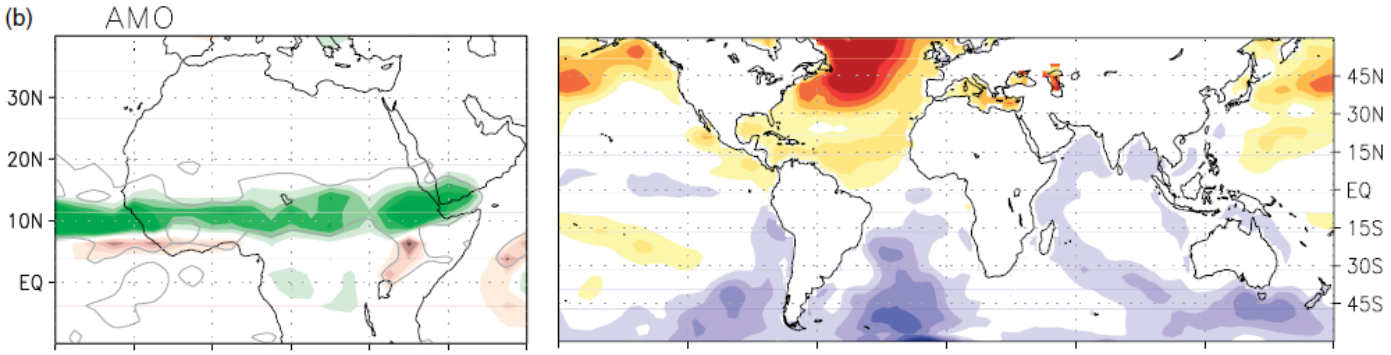
Precipitation variability over the Sahel region

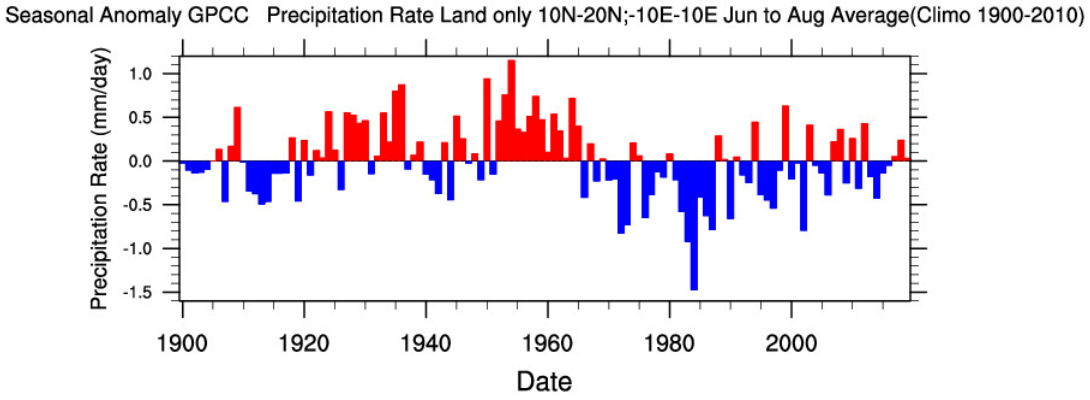
Seasonal Anomaly GPCC Precipitation Rate Land only 10N-20N;-10E-10E Jun to Aug Average(Climo 19



Precipitation variability over the Sahel region

For each time-scale of variability we can find “Modes of variability of precipitation-SST”





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Atmos. Sci. Let. **12**: 67–74 (2011)
Published online in Wiley Online Library
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Interannual and decadal SST-forced responses of the West African monsoon

Belén Rodríguez-Fonseca[1]*, Serge Janicot[2], Elsa Mohino[2,3], Teresa Losada[1], Juergen Bader[4], Cyril Caminade[5], Fabrice Chauvin[6], Bernard Fontaine[7], Javier García-Serrano[1], Sebastien Gervois[2], Mathieu Joly[6], Irene Polo[1], Paolo Ruti[8], Pascal Roucou[7] and Aurore Voldoire[6]

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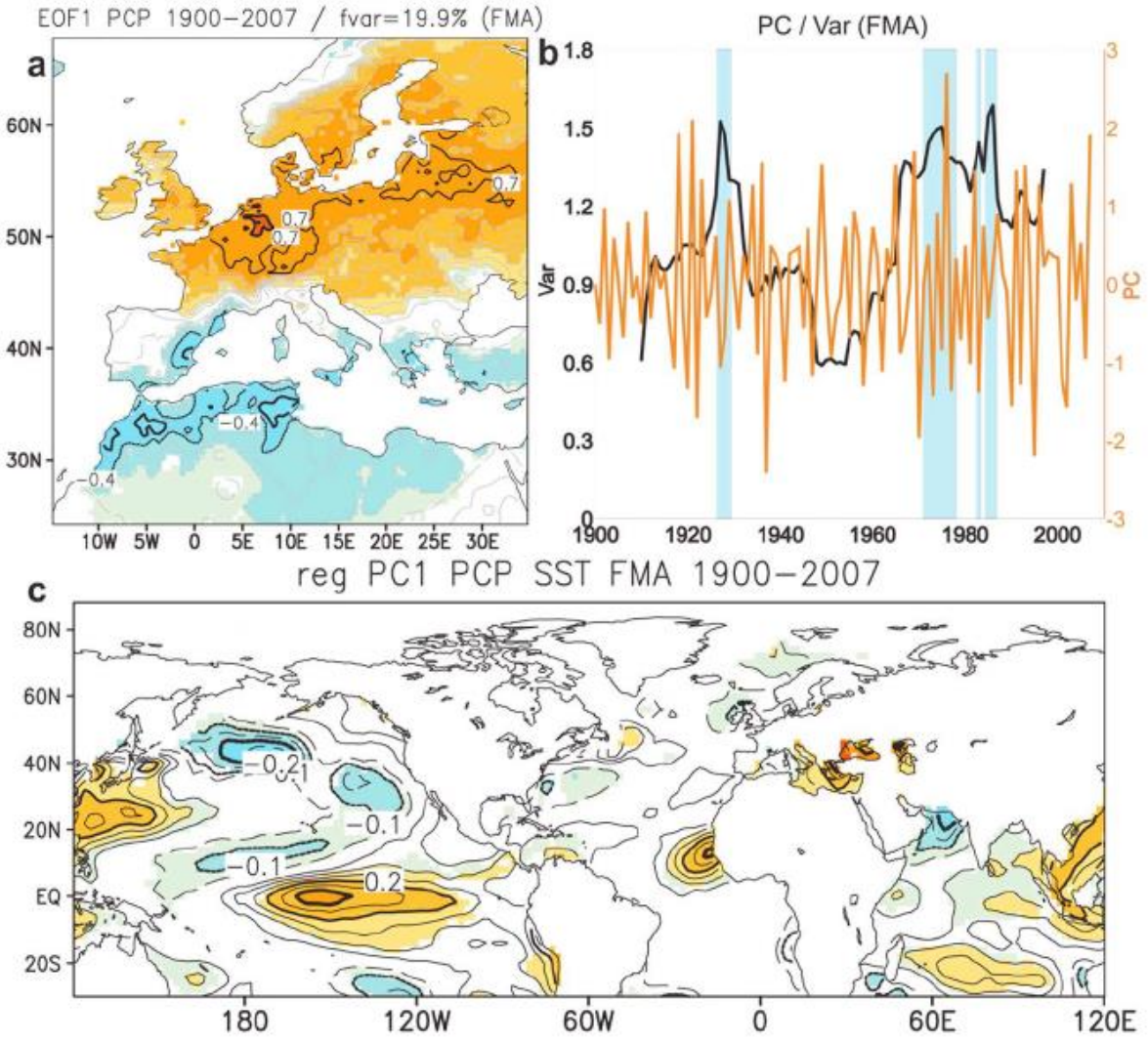
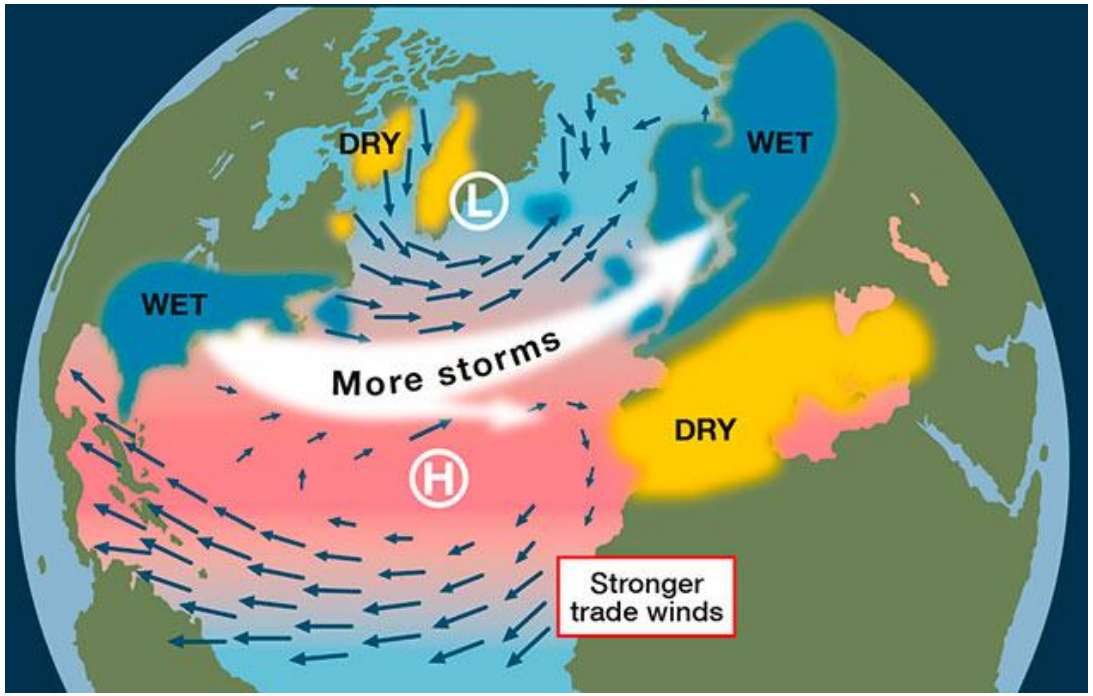
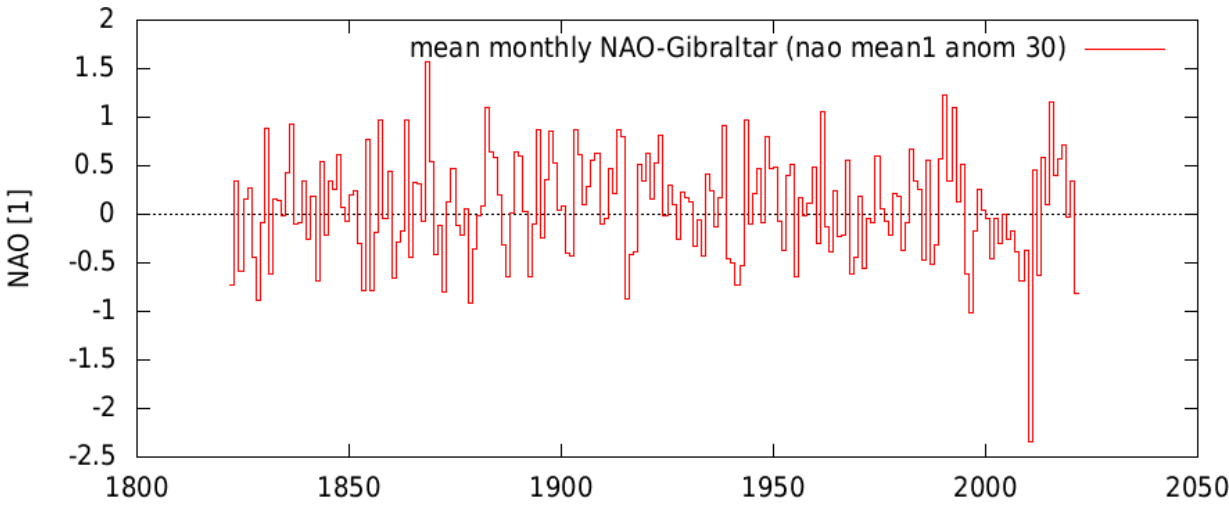
[2] *LOCEAN/IPSL, CNRS, Universite Pierre et Marie Curie, Paris, France*
[3] *Universidad de Sevilla, Spain*
[4] *Bjerknes Centre for Climate Research, Bergen, Norway*
[5] *CERFAX, Tolouse-Cedex, France*
[6] *GAME/CNRM, Meteo-France/CNRS, Tolouse, France*
[7] *Centre de Recherches de Climatologie, Université de Bourgogne, Dijon, France*
[8] *ENEA, Rome, Italy*

Precipitation variability over the Mediterranean region







Climate impacts on human activities

Agricultural and Forest Meteorology
Volumes 198–199, November–December 2014, Pages 42-52

Review

Crop yield as a bioclimatic index of El Niño impact in Europe: Crop forecast implications

Mirian Capa-Morocho [a, b], Belén Rodríguez-Fonseca [a, c, d], Margarita Ruiz-Ramos [a, b]

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https://doi.org/10.1016/j.agrformet.2014.07.012

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Climate impacts on human activities

ELSEVIER

Progress in Oceanography
Volume 186, July 2020, 102341

El Niño as a predictor of round sardinella distribution along the northwest African coast

Jorge López-Parages [a, b, f], Pierre-Amaël Auger [c, d], Belén Rodríguez-Fonseca [a, i], Noel Keenlyside [e], Carlo Gaetan [b], Angelo Rubino [b], Maeregu Woldeyes Arisido [b, j], Timothée Brochier [g, h]

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La variabilidad climática y el cambio global tiene impactos en las actividades humanas:

- Cambios en la diversidad y en la abundancia de especies (cambios en la pesca)
- Cambios en los patrones de lluvia que cambian el pastoreo y zona/tipo de cultivos
- Aumento de fenómenos extremos (olas calor, inundaciones..) producen daños en cultivos/infraestructuras

<u>Caso del Senegal (Sahel):</u>
Décadas de mayor/menor precipitación y años extremos de sequía (ej 2002)
Cambios en la pesca artesanal Senegal (causa sistema económico o/y cambios en pesca)
Eventos extremos de Nivel del mar (ej: 2016 en San Luis)

<u>Caso de PI-Canarias (Mediterráneo):</u>
Futuro desertificación
Cambios en nivel del mar
Cambios en la pesca

Red inter-universitaria **M**igr**A**cione**S** **C**limátic**A**s y **R**efugi**A**d@**S** (**MASCARAS**)

En MASCARAS nos gustaría reflexionar sobre las migraciones climáticas de manera inter-disciplinar:

Variabilidad climática: UCM-TROPA +
Economía: UCM
Antropología social: U La Laguna
Psicología social: U Málaga
Demografía: U Salamanca
Salud Pública: OSMAN
Educación Eco-social: FUHEM

Jornadas 24-26 Noviembre 2021 UCM

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¿qué está ocurriendo? Es el clima un estresor y se suma a otros problemas estructurales (violencia, inestabilidad, precariedad…) que hacen que las personas migren?

Repensar lo que se entiende con mitigación/adaptación al CC – transición justa

Impactos de la variabilidad climática con perspectiva de género

Caso de estudio: Región del Sahel y Península Ibérica-Canarias