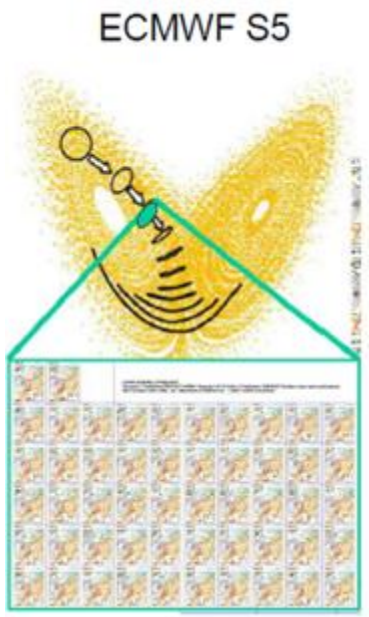
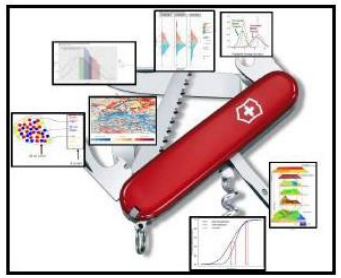
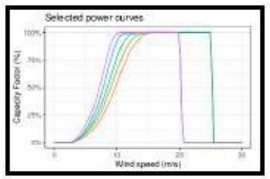
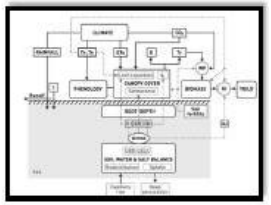
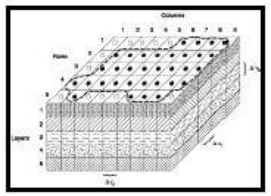
Prediccion estacional

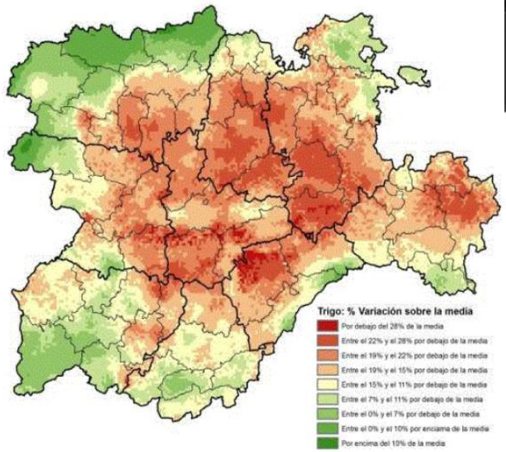


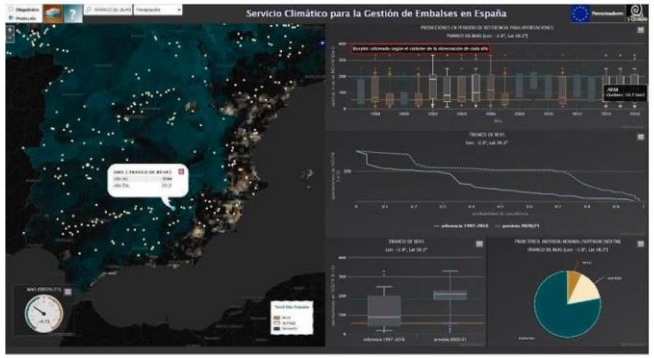


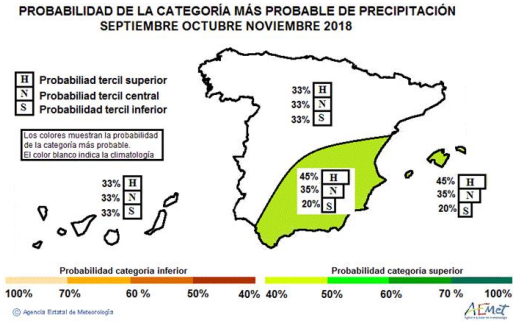












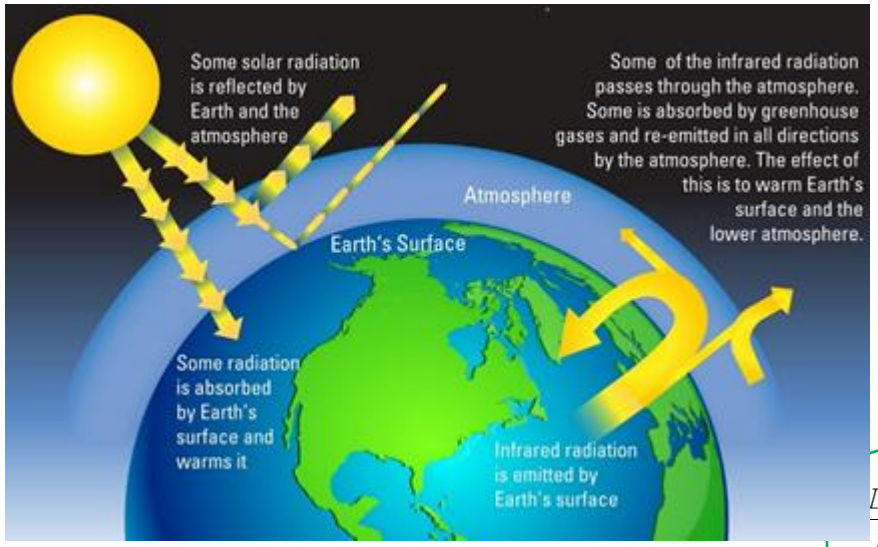
Esteban Rodríguez Guisado
erodriguezg@aemet.es

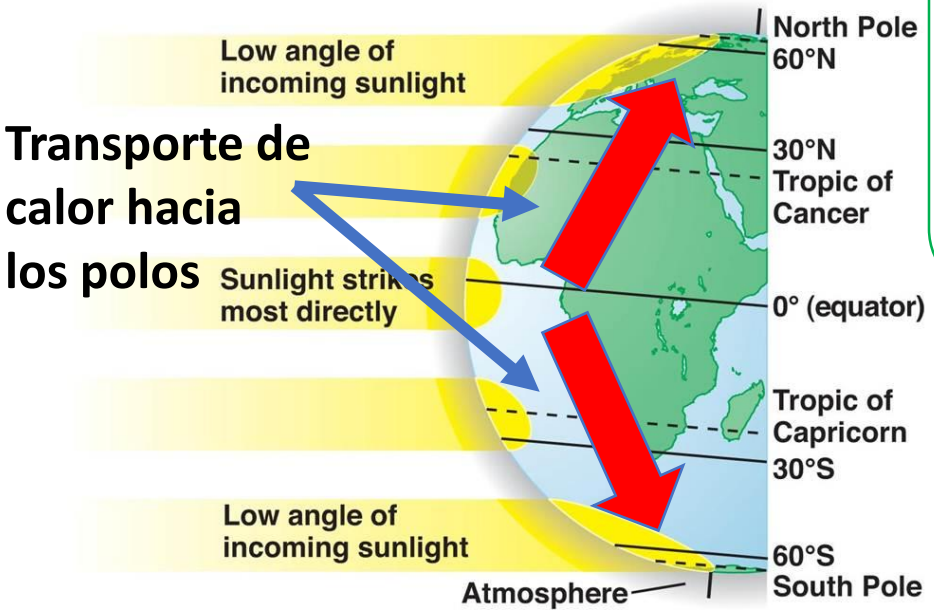
Sistema Climático

Equilibrio radiativo: radiación entrante vs saliente

Sin atmósfera -> 255K

Con atmósfera -> 288K





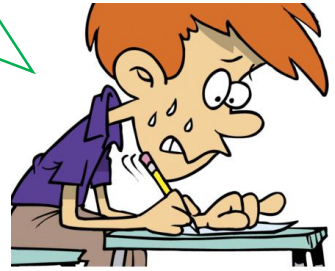
Transporte de calor hacia los polos

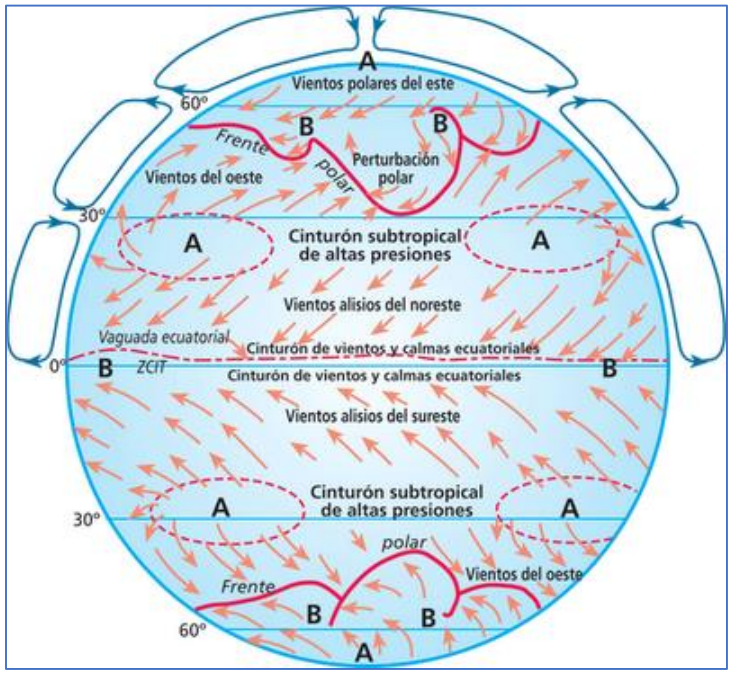
$$\frac{D\mathbf{V}}{Dt} + f\mathbf{k} \otimes \mathbf{V} = -\nabla\Phi$$

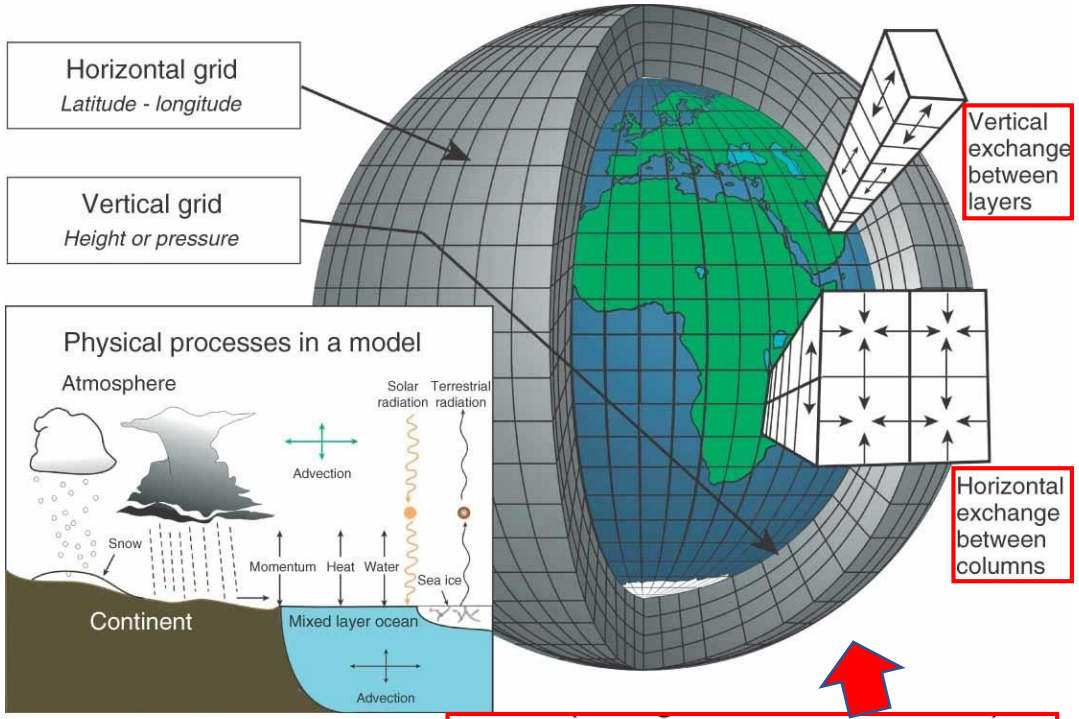
$$(\frac{\partial u}{\partial x} + \frac{\partial v}{\partial y})_p + \frac{\partial \omega}{\partial p} = \nabla \bullet \mathbf{V} + \frac{\partial \omega}{\partial p} = 0$$

$$\frac{\partial T}{\partial t} + u\frac{\partial T}{\partial x} + v\frac{\partial T}{\partial y} - S_p\omega = \frac{\partial T}{\partial t} + \mathbf{V} \bullet \nabla T - S_p\omega = \frac{J}{c_p}$$

$$\frac{\partial \Phi}{\partial p} = -\alpha = -\frac{RT}{p} \quad ; \quad S_p \equiv -T\frac{\partial \ln\theta}{\partial p}$$







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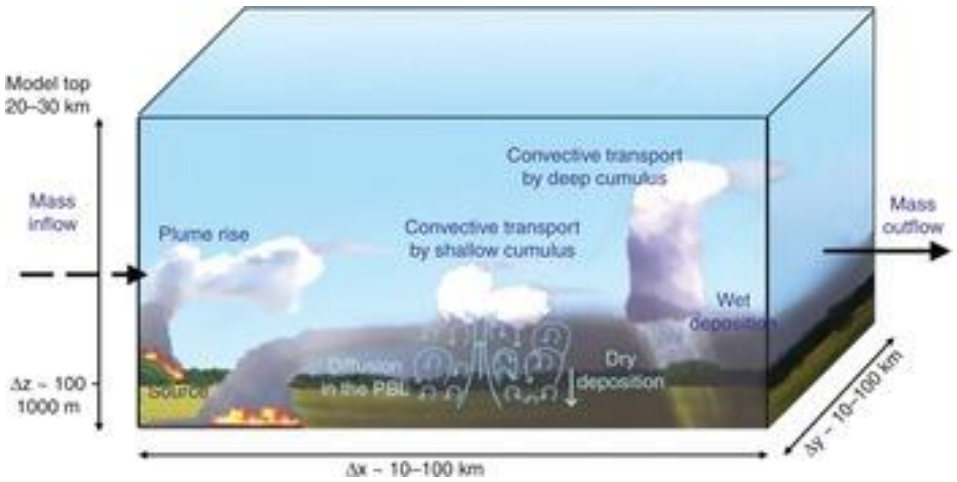
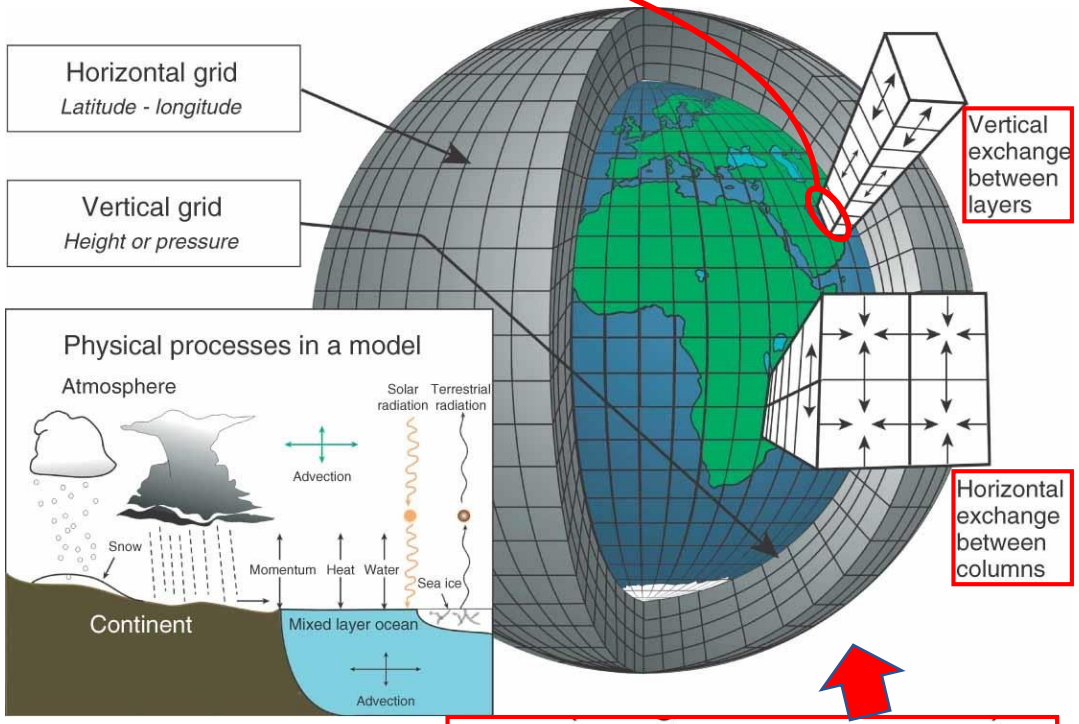
$$\frac{\partial \Phi}{\partial p} = -\alpha = -\frac{RT}{p} \quad ; \quad S_p \equiv -T\frac{\partial \ln\theta}{\partial p}$$

Dificultades: rejilla discreta





$$\frac{D\mathbf{V}}{Dt} + f\mathbf{k} \otimes \mathbf{V} = -\nabla\Phi$$

$$\left(\frac{\partial u}{\partial x} + \frac{\partial v}{\partial y}\right)_p + \frac{\partial \omega}{\partial p} = \nabla \bullet \mathbf{V} + \frac{\partial \omega}{\partial p} = 0$$

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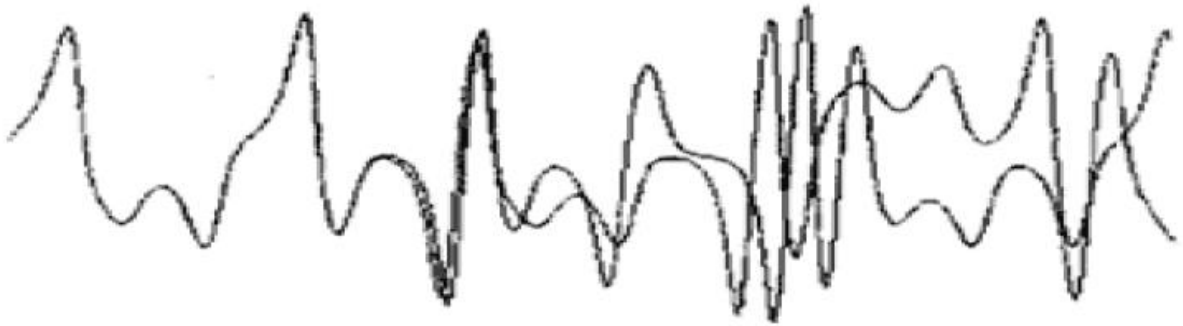
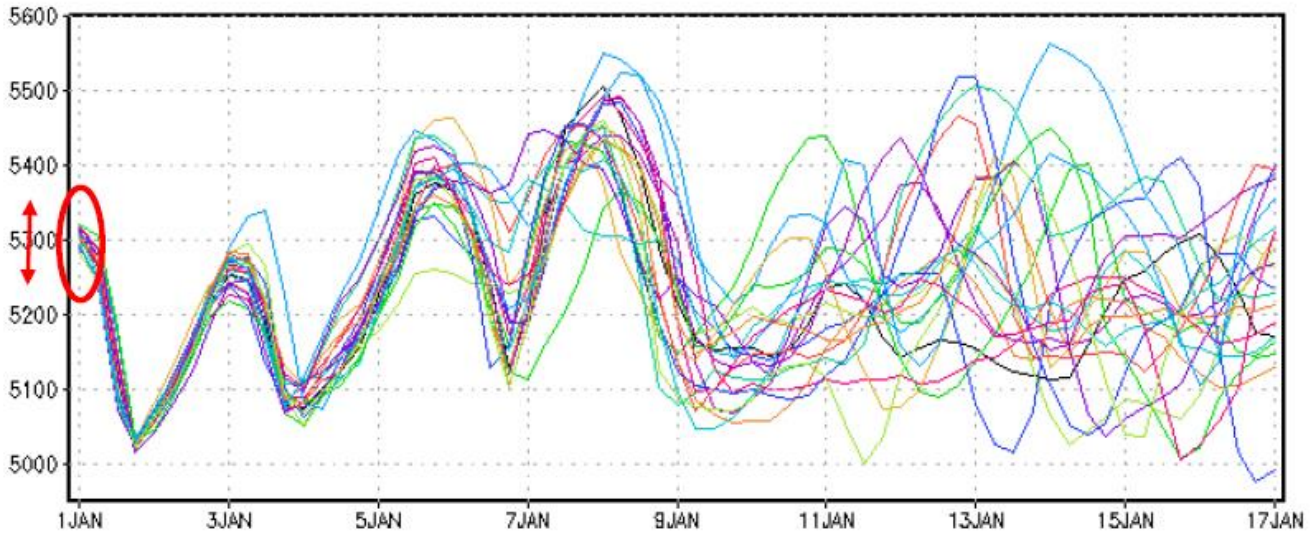
$$\frac{\partial \Phi}{\partial p} = -\alpha = -\frac{RT}{p} \quad ; \quad S_p \equiv -T\frac{\partial \ln\theta}{\partial p}$$

Representación de procesos subgrid mediante aproximaciones basadas en relaciones físicas y observación.
Se comienzan a integrar técnicas de ML.

Limitaciones: la naturaleza caótica de la atmósfera:



Lorenz's experiment: the difference between the starting values of these curves is only .000127



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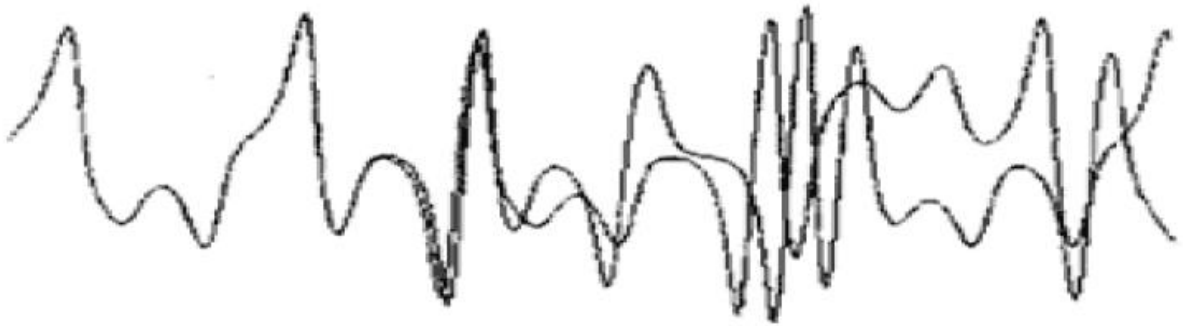

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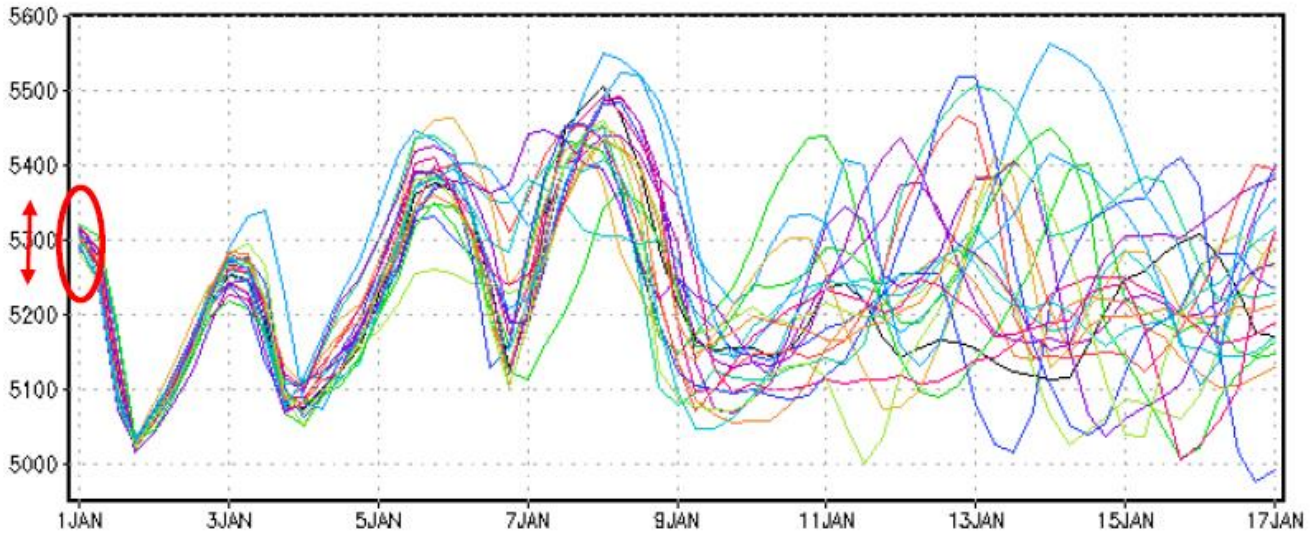

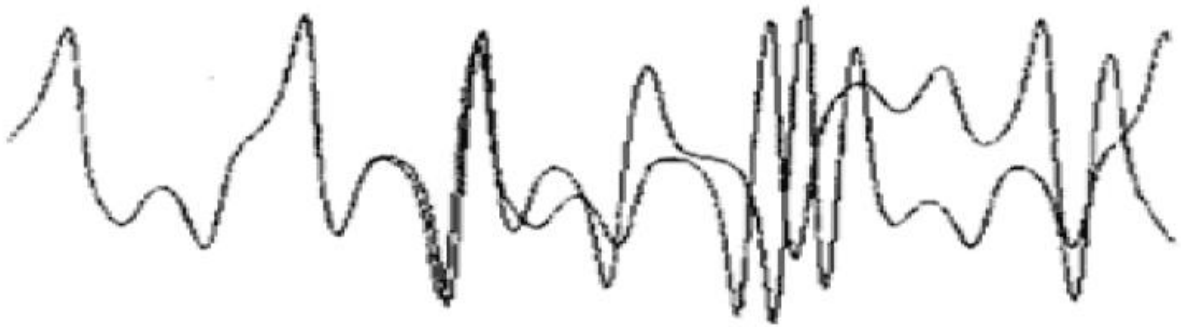

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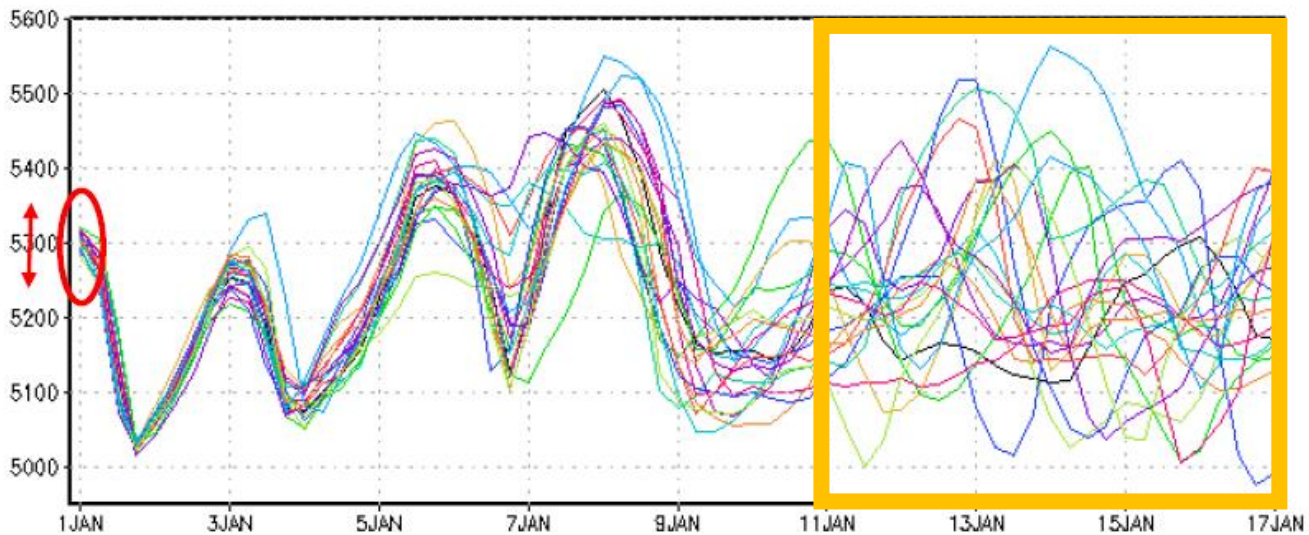
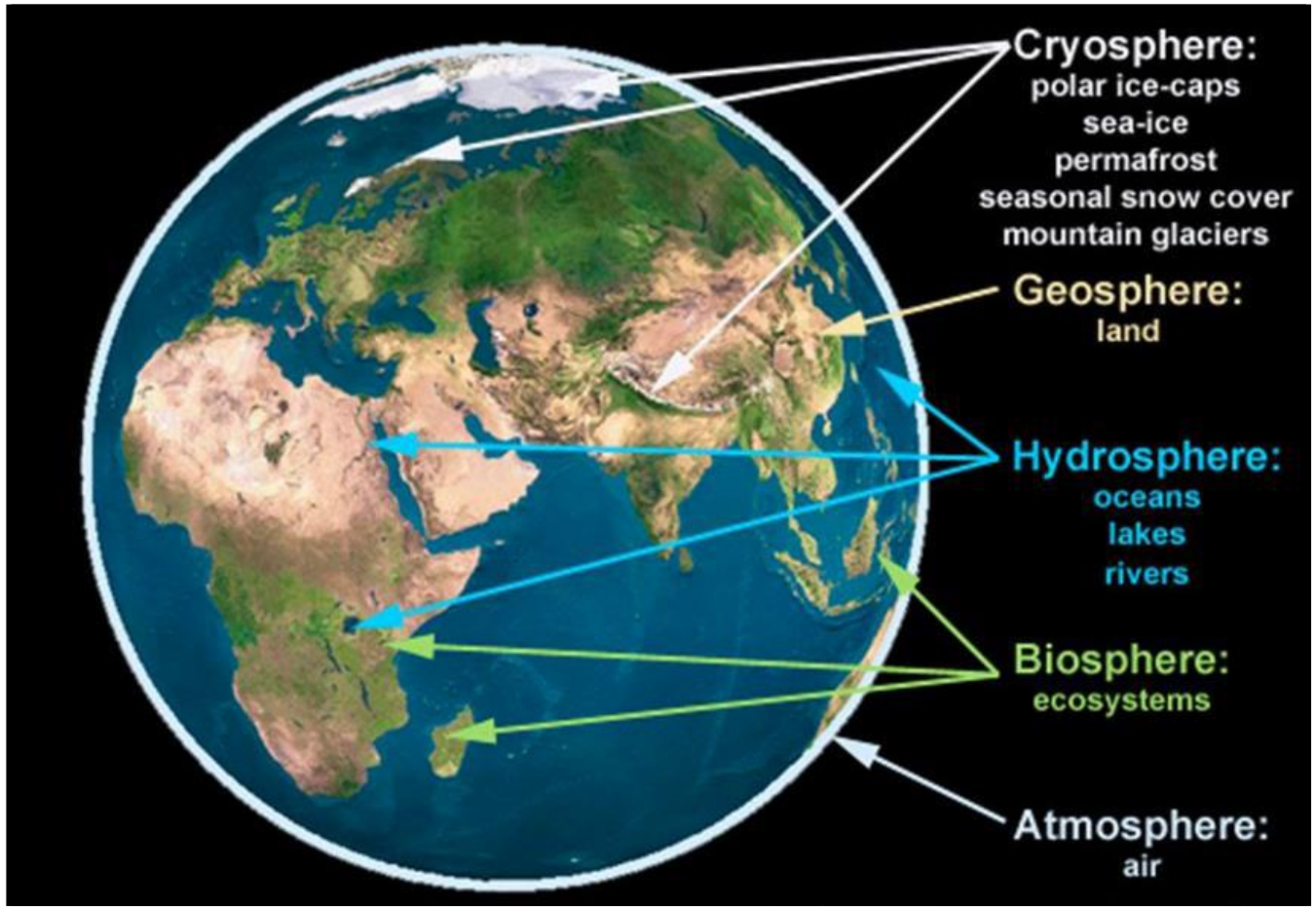
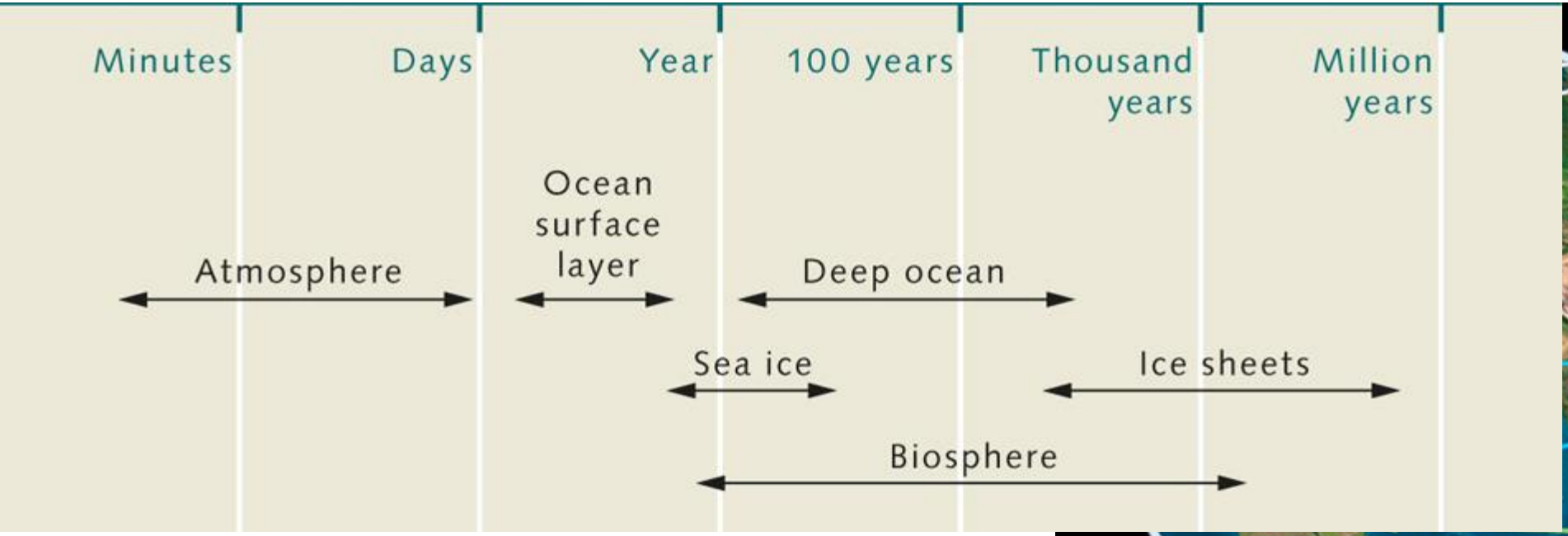
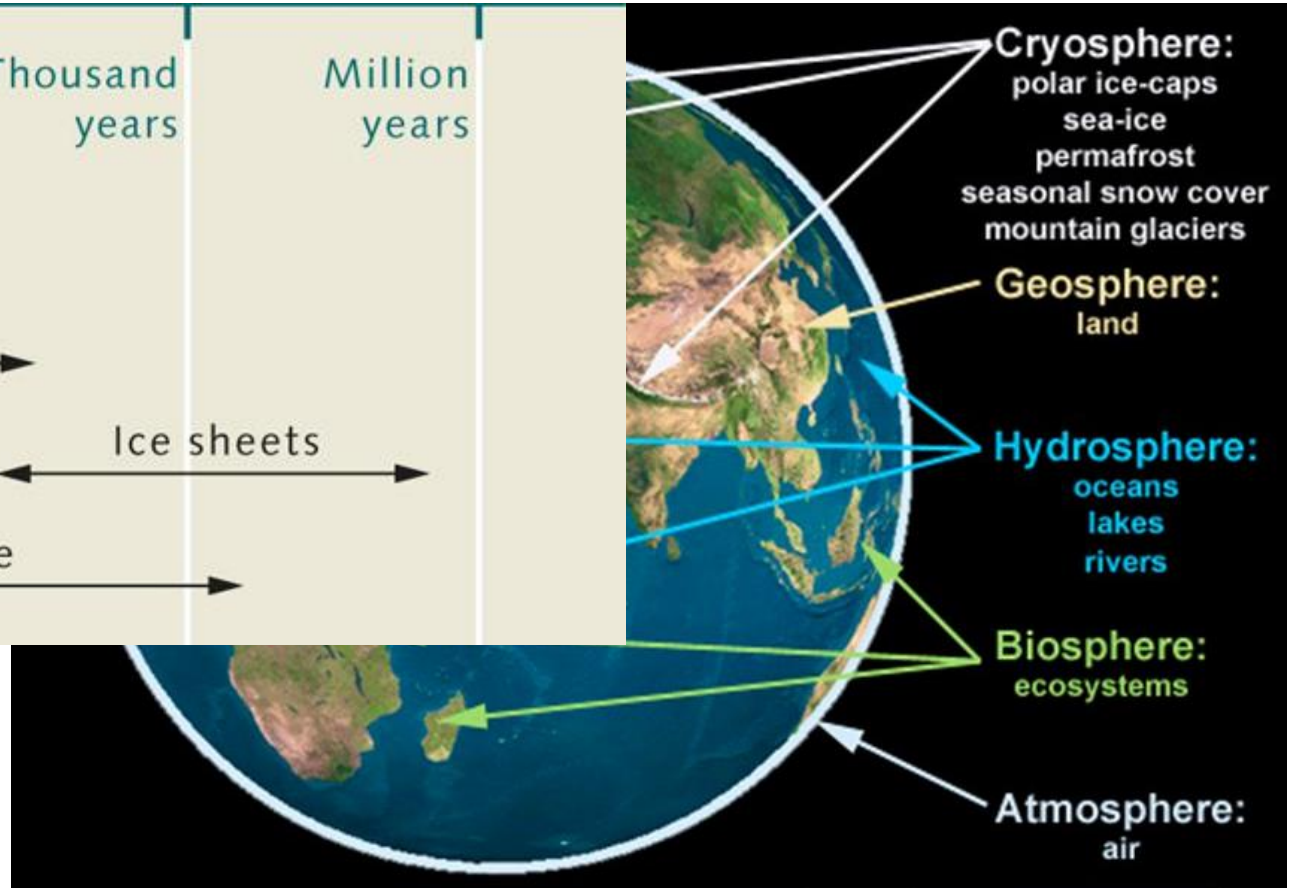


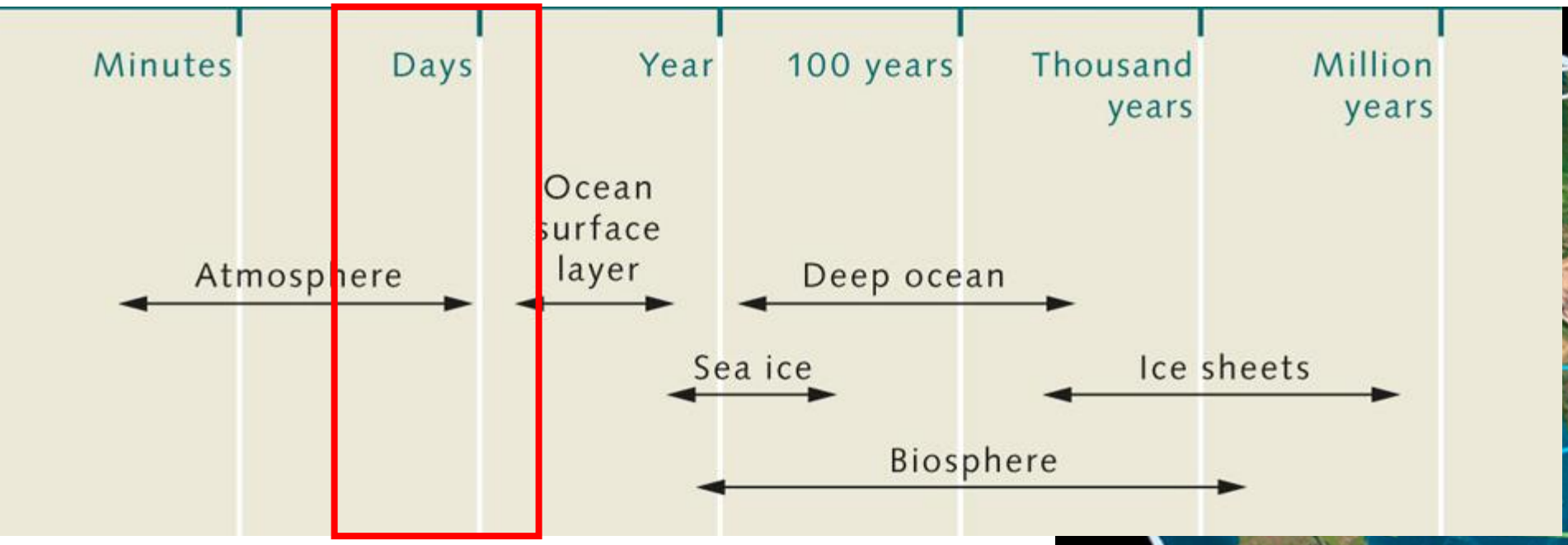
A partir de un umbral de unos 10 días, no se puede predecir con precisión el estado de la atmósfera

La atmósfera evoluciona condicionada por el estado del resto de componentes del sistema climático (e interaccionando todos entre sí), cada uno con procesos que evolucionan en diferentes escalas temporales




Minutes
Days
Year
100 years
Thousand years
Million years
Atmosphere
Ocean surface layer
Deep ocean
Sea ice
Ice sheets
Biosphere


Cryosphere:
polar ice-caps
sea-ice
permafrost
seasonal snow cover
mountain glaciers
Geosphere:
land
Hydrosphere:
oceans
lakes
rivers
Biosphere:
ecosystems
Atmosphere:
air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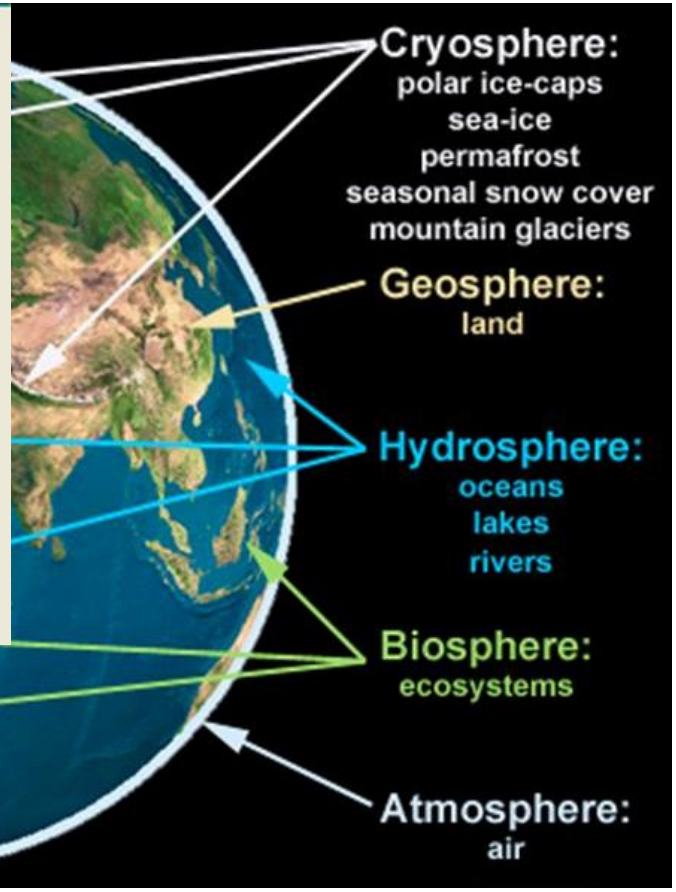
Cryosphere:
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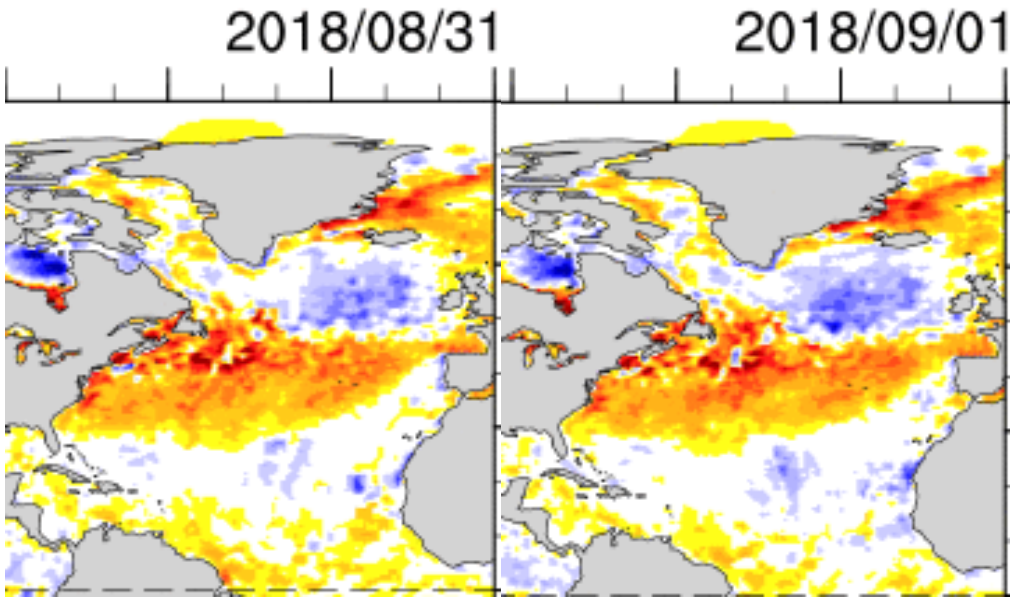
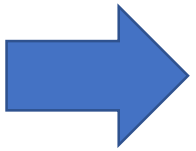
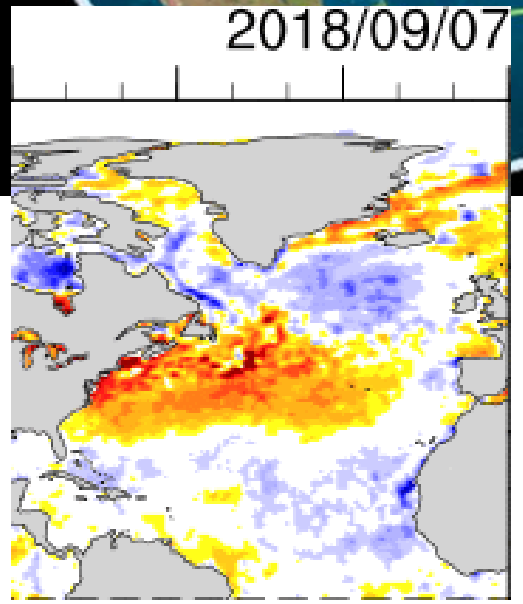
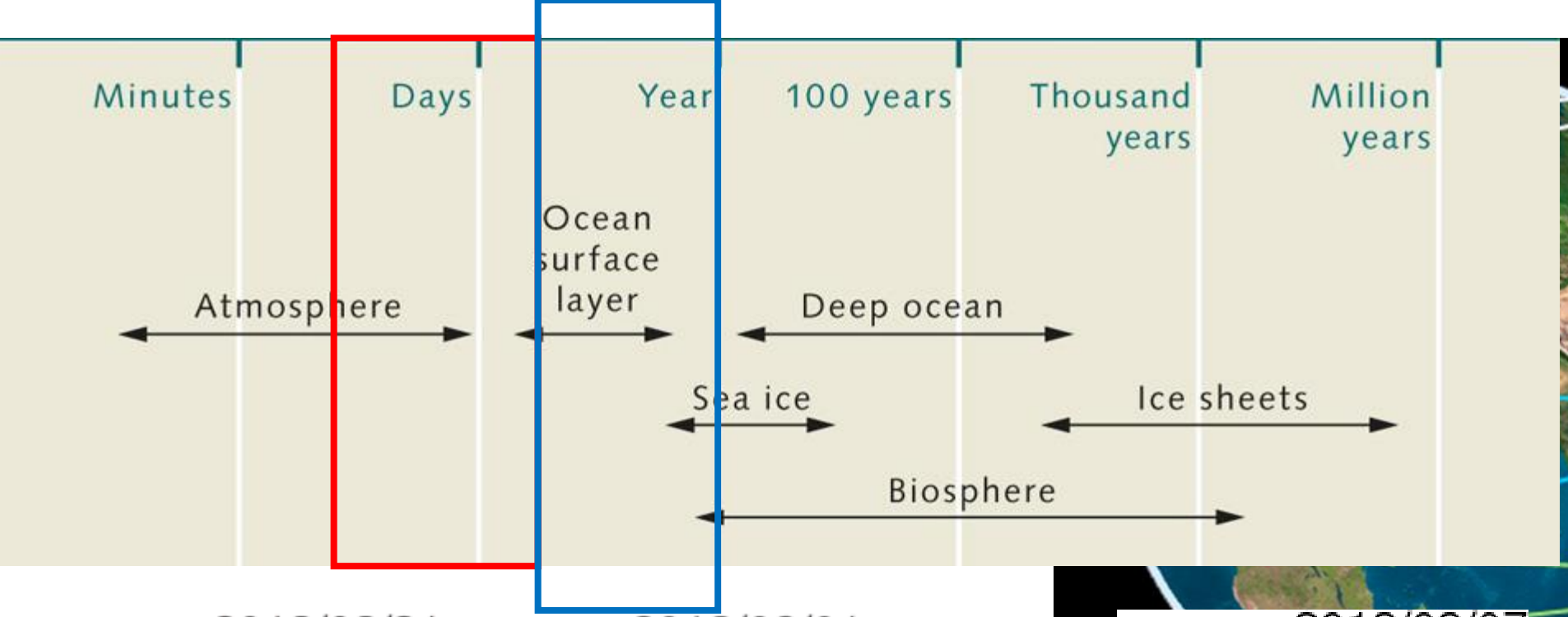

2018/08/31
2018/09/01




2018/09/07


Minutes
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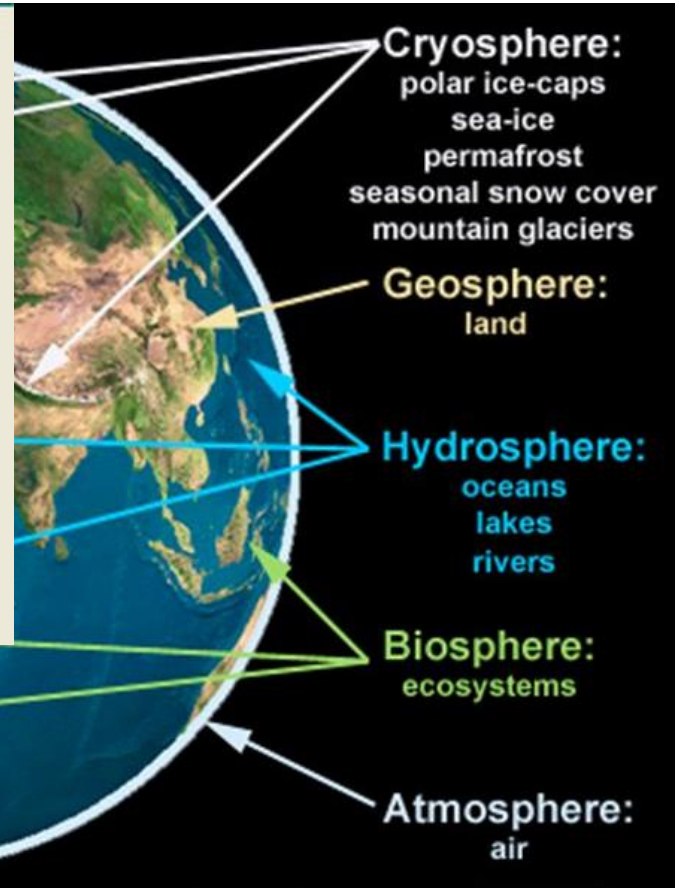
Cryosphere:
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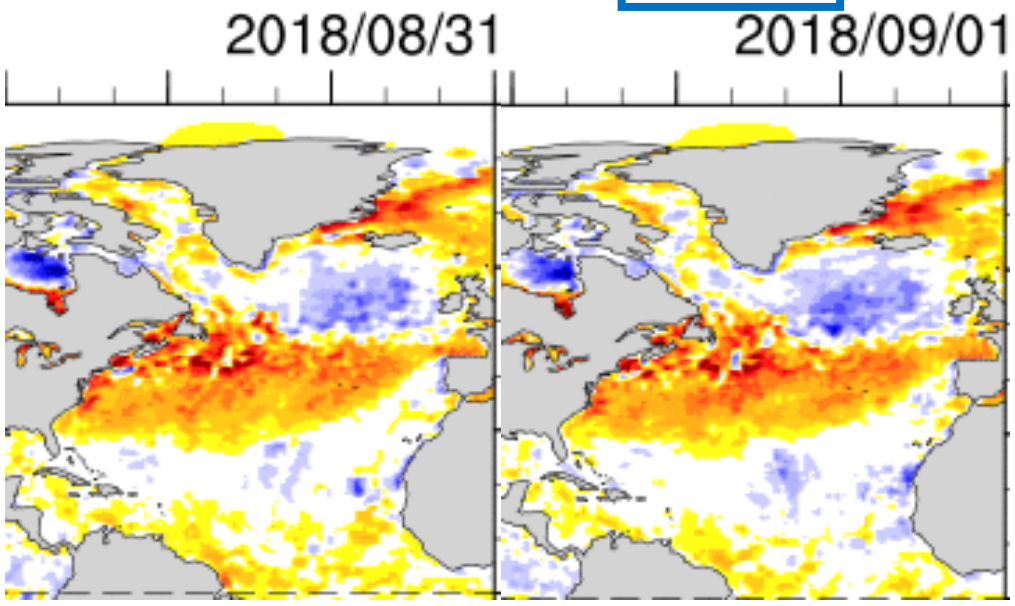
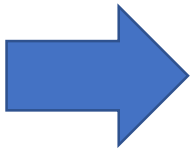
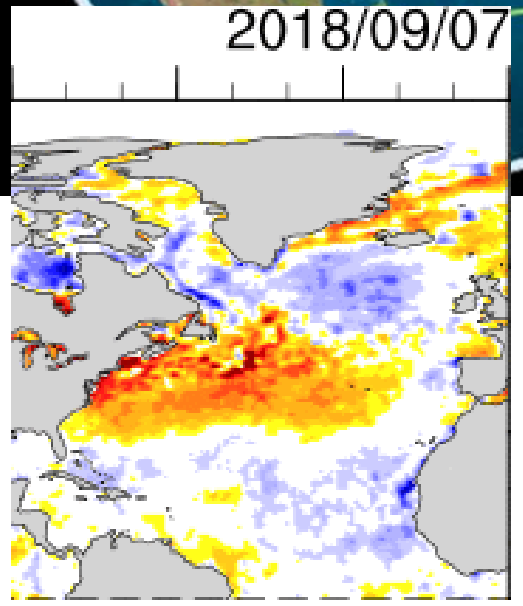

2018/08/31
2018/09/01




2018/09/07

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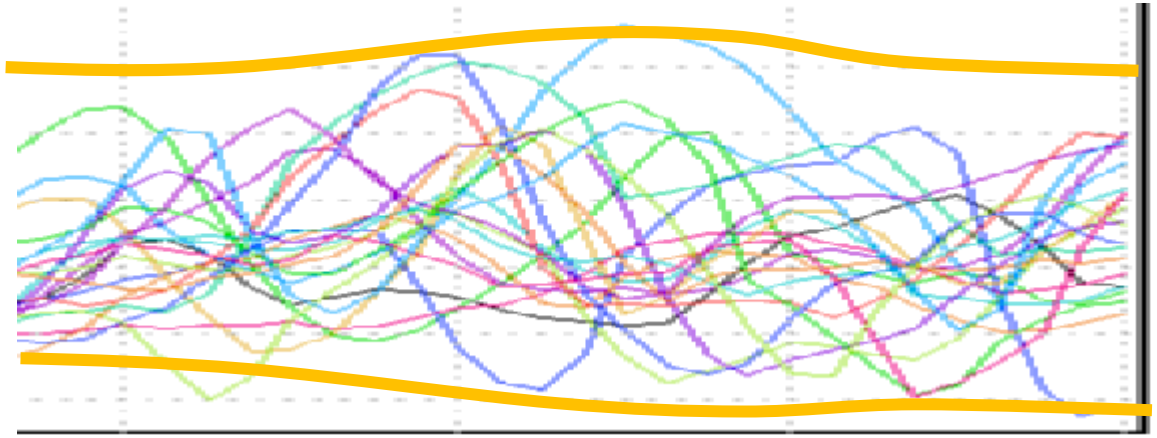
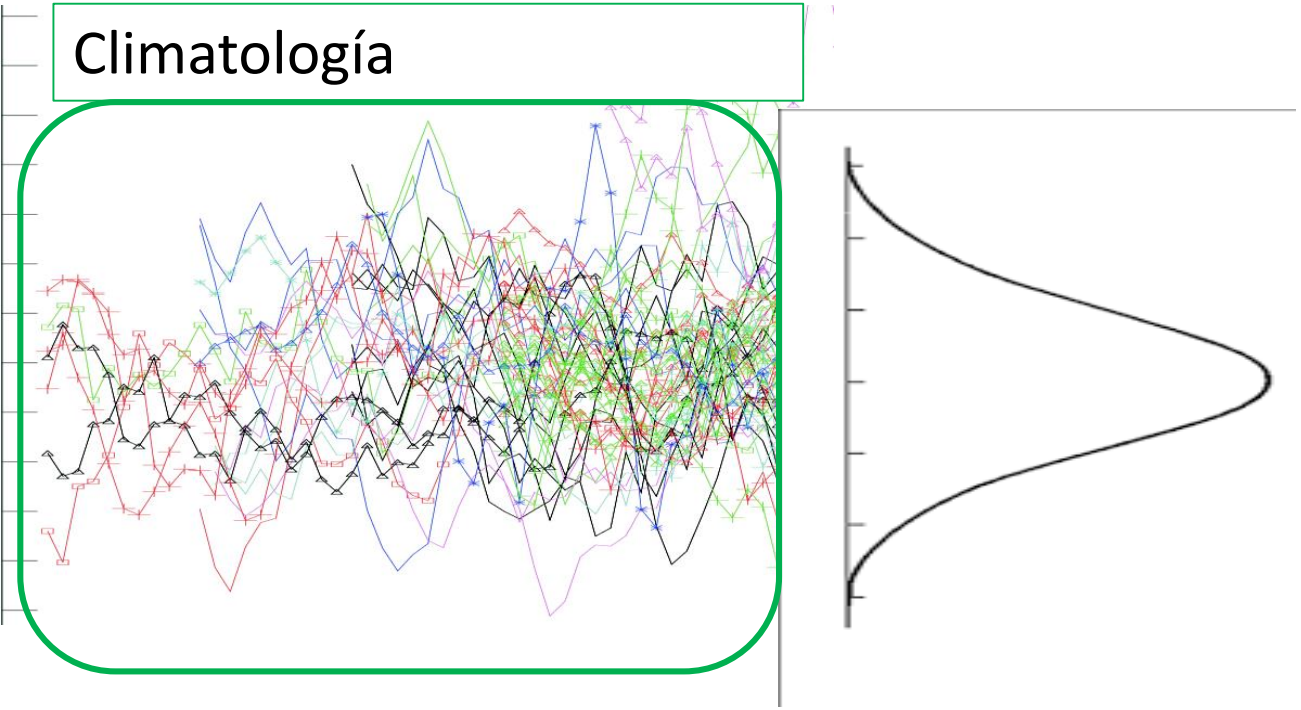
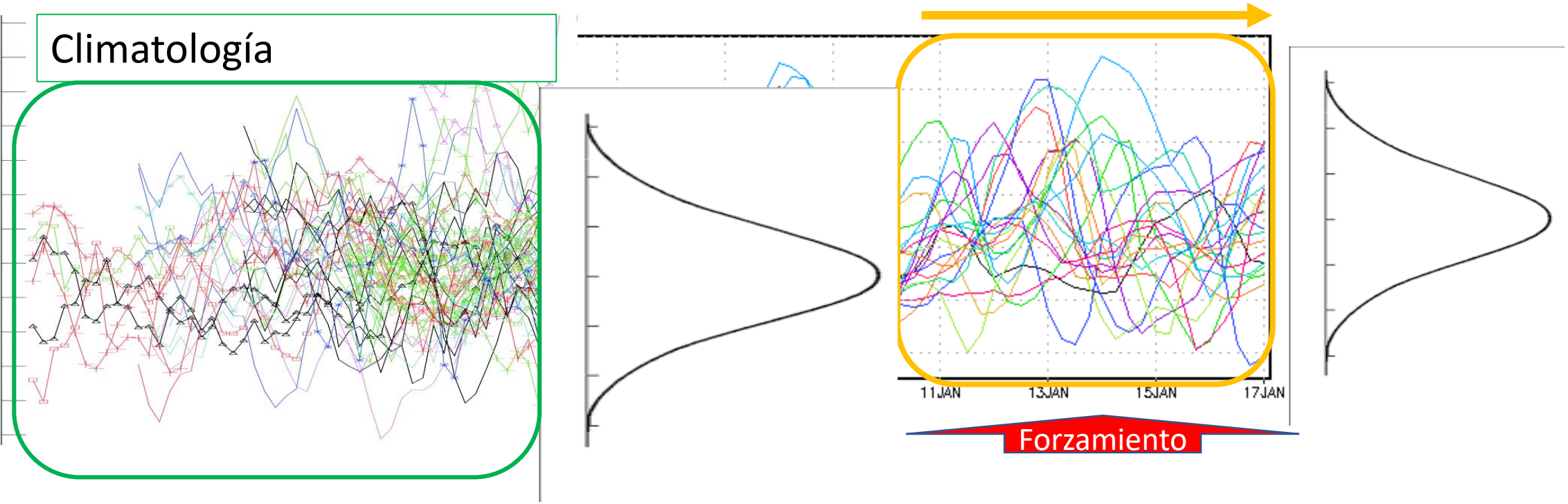


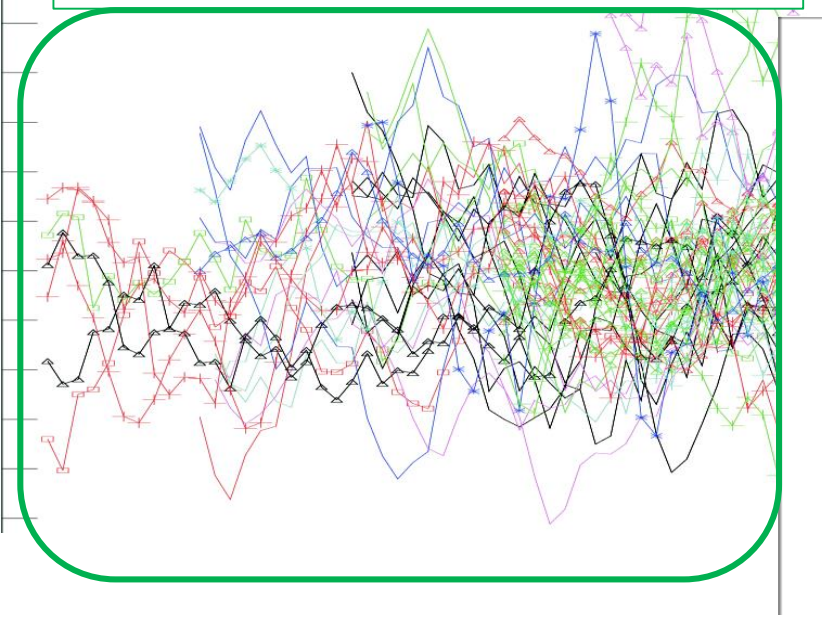
Climatología

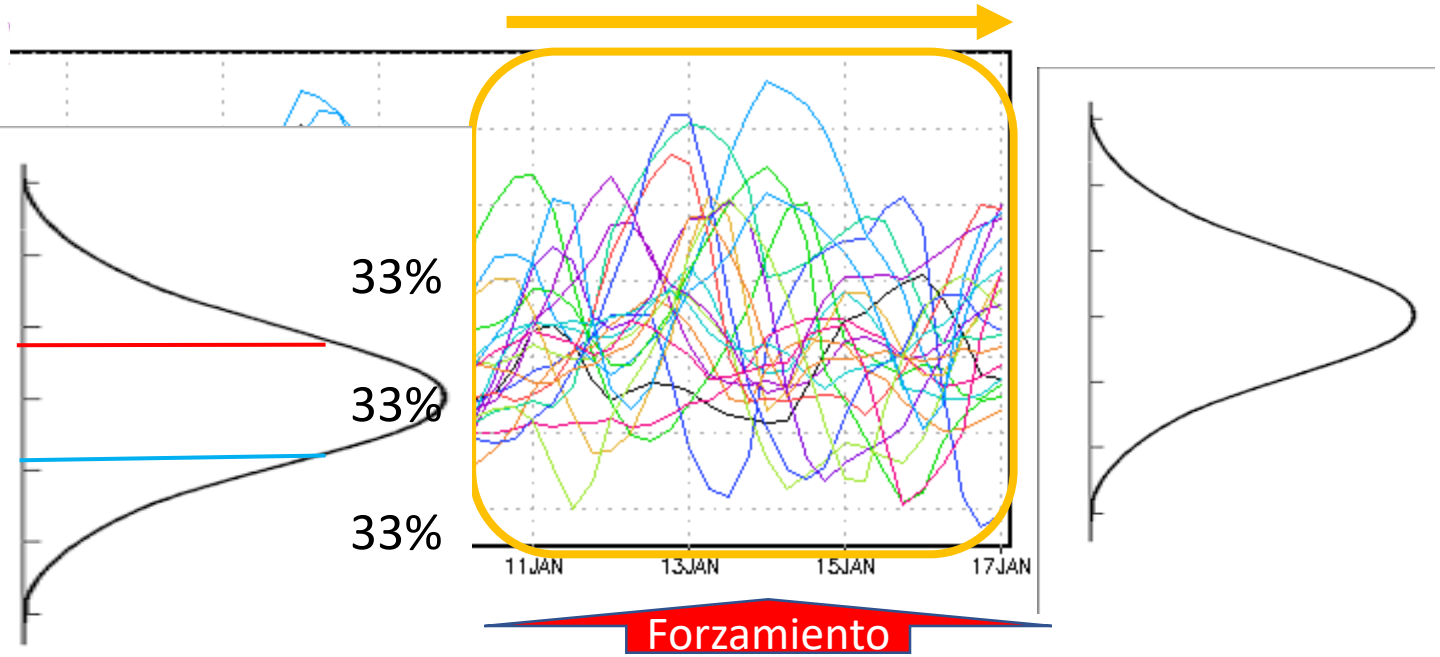


Climatología

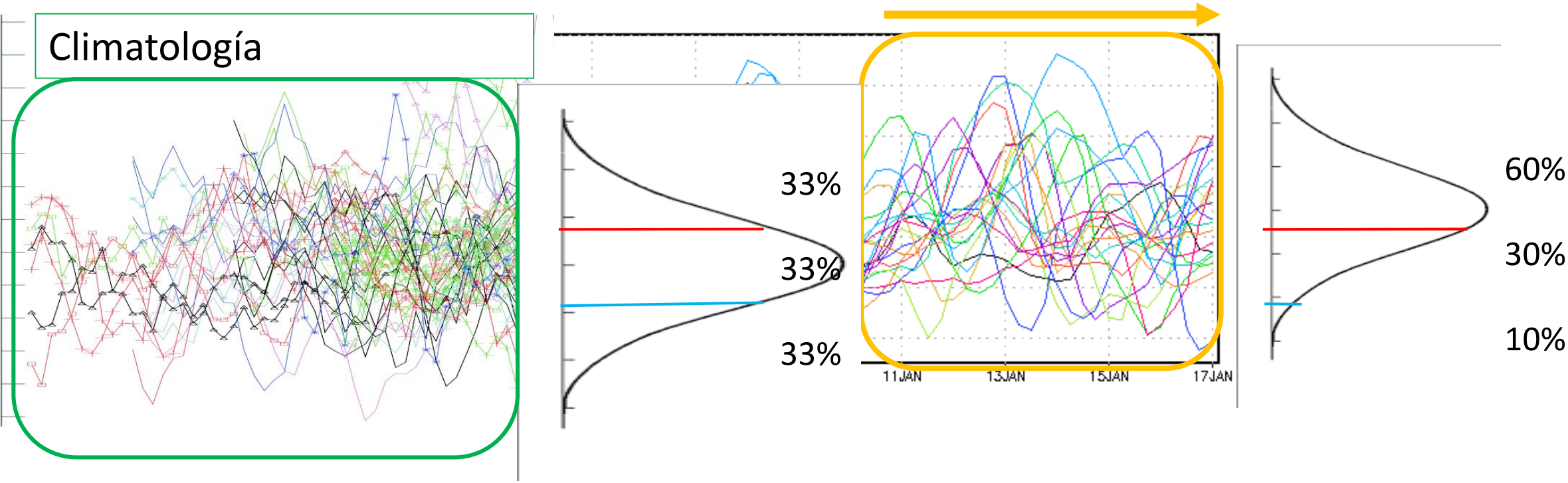


Climatología





Climatología



Predicción de naturaleza probabilista. Normalmente se da en forma de probabilidades para los terciles.

ECMWF EPS-Monthly Forecasting System

Soil Temp. Lev. 1/SST anomaly

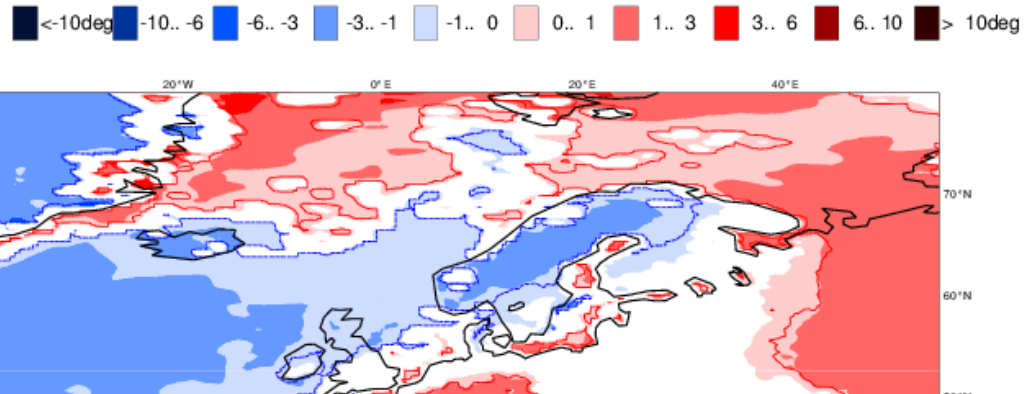
Forecast start reference is 17-09-2018

ensemble size = 51 ,climate size = 660

24-09-2018/TO/3(

Shaded areas significan

Contou



ECMWF Seasonal Forecast

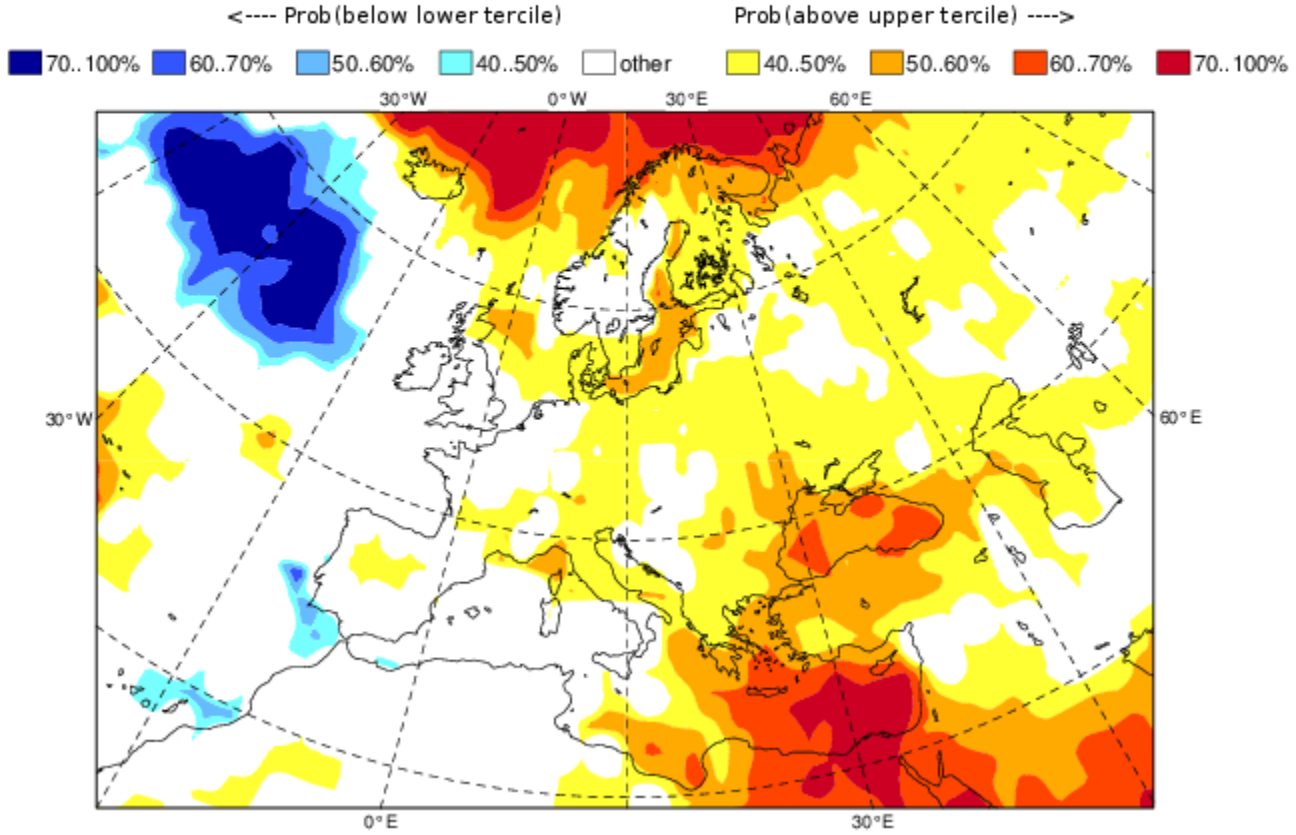
Prob(most likely category of 2m temperature)

Forecast start is 01/09/18, climate period is 1993-2016

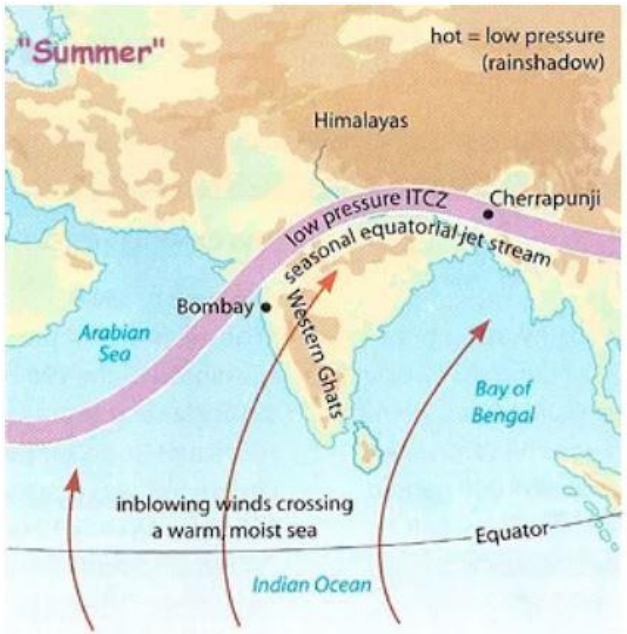
Ensemble size = 51, climate size = 600

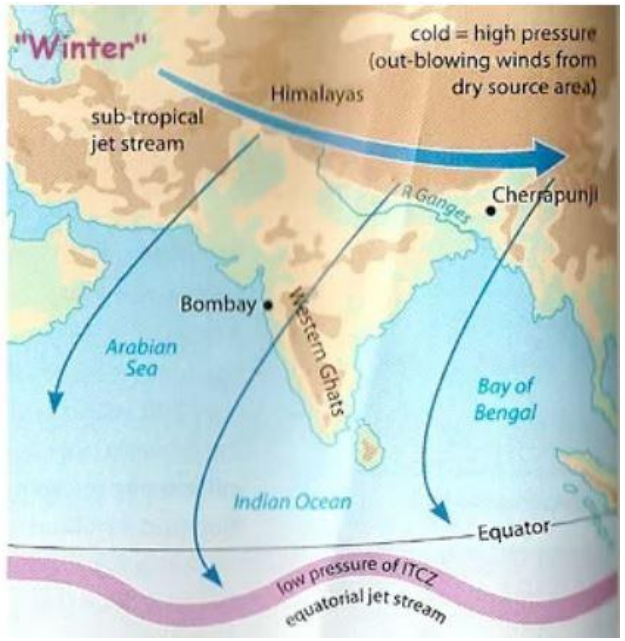
System 5

OND 2018



Los primeros intentos de predicción estacional se hicieron en la India, tratando de predecir la intensidad del monzón.





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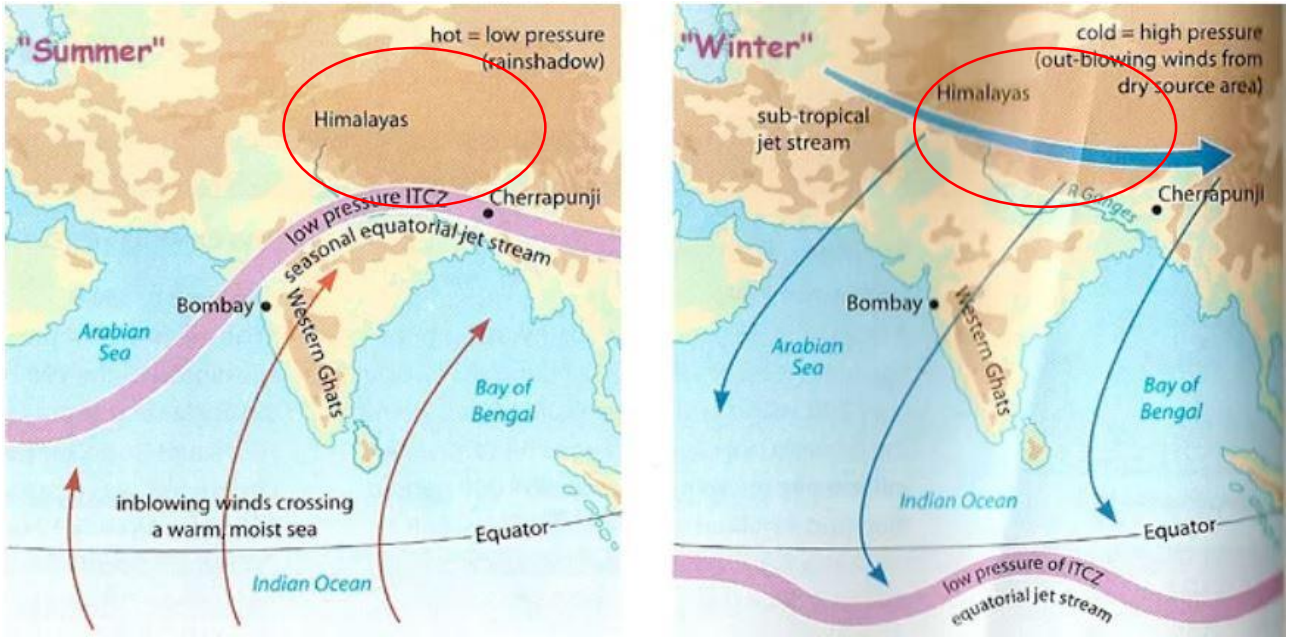

Se trató de elaborar una predicción basada en la variabilidad en el espesor de nieve del Himalaya.

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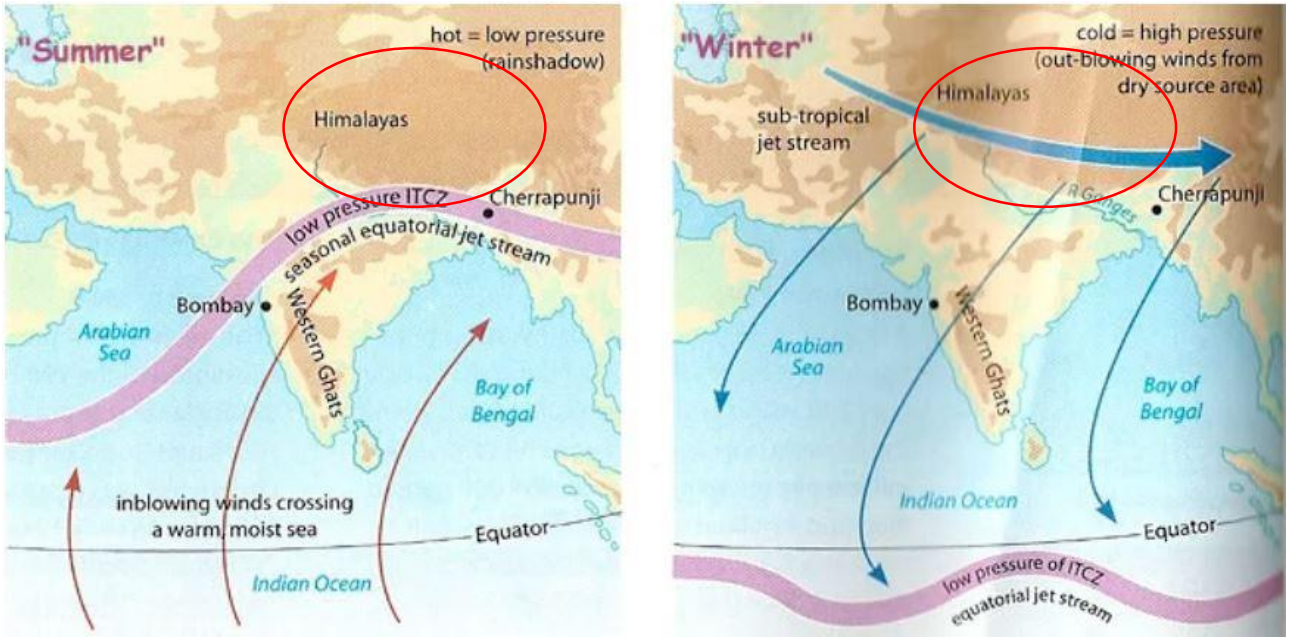
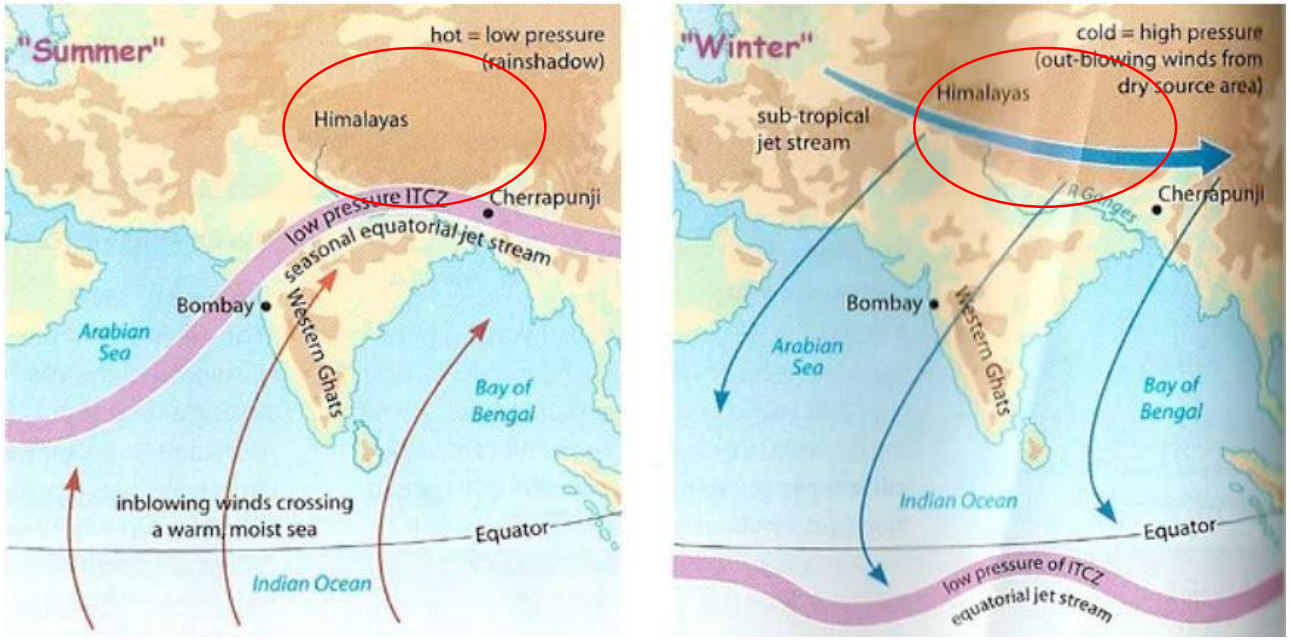


Se trató de elaborar una predicción basada en la variabilidad en el espesor de nieve del Himalaya.

Se exploraron técnicas de análogos y se trataron de desarrollar metodologías objetivas, buscando relación con la variabilidad de otros parámetros meteorológicos (T,P, p…)

Los primeros intentos de predicción estacional se hicieron en la India, tratando de predecir la intensidad del monzón.



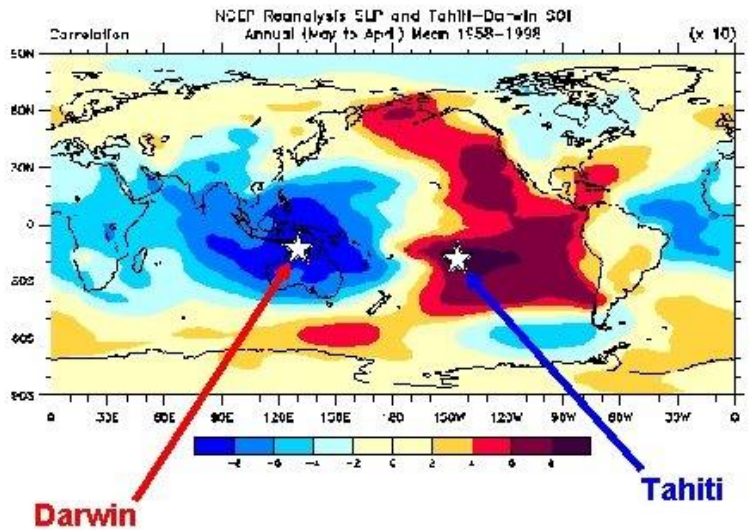
Se trató de elaborar una predicción basada en la variabilidad en el espesor de nieve del Himalaya.

Se exploraron técnicas de análogos y se trataron de desarrollar metodologías objetivas, buscando relación con la variabilidad de otros parámetros meteorológicos (T,P, p…)
Ello llevó a Sir Gilber T. Walker a descubrir tres patrones de fluctuación a gran escala de presión: Oscilación del Atlántico Norte (NAO), Oscilación del Pacífico Norte (NPO) y la oscilación del sur (SO)

Posteriormente, se relacionó la oscilación del sur con anomalías en la temperatura superficial del mar. Estudios sucesivos han llevado a identificar dicho fenómeno como ENSO, uno de los fenómenos de acoplamiento Océano Atmósfera más relevantes.

The Southern Oscillation

Sir Gilbert Walker
(1868-1958)



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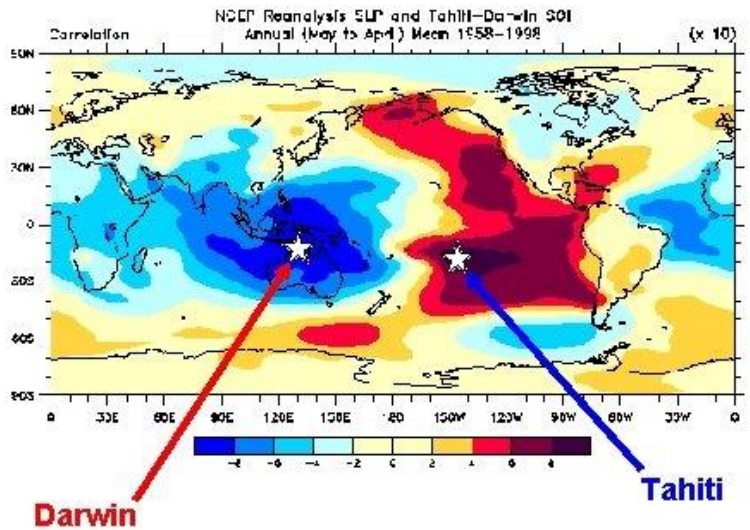
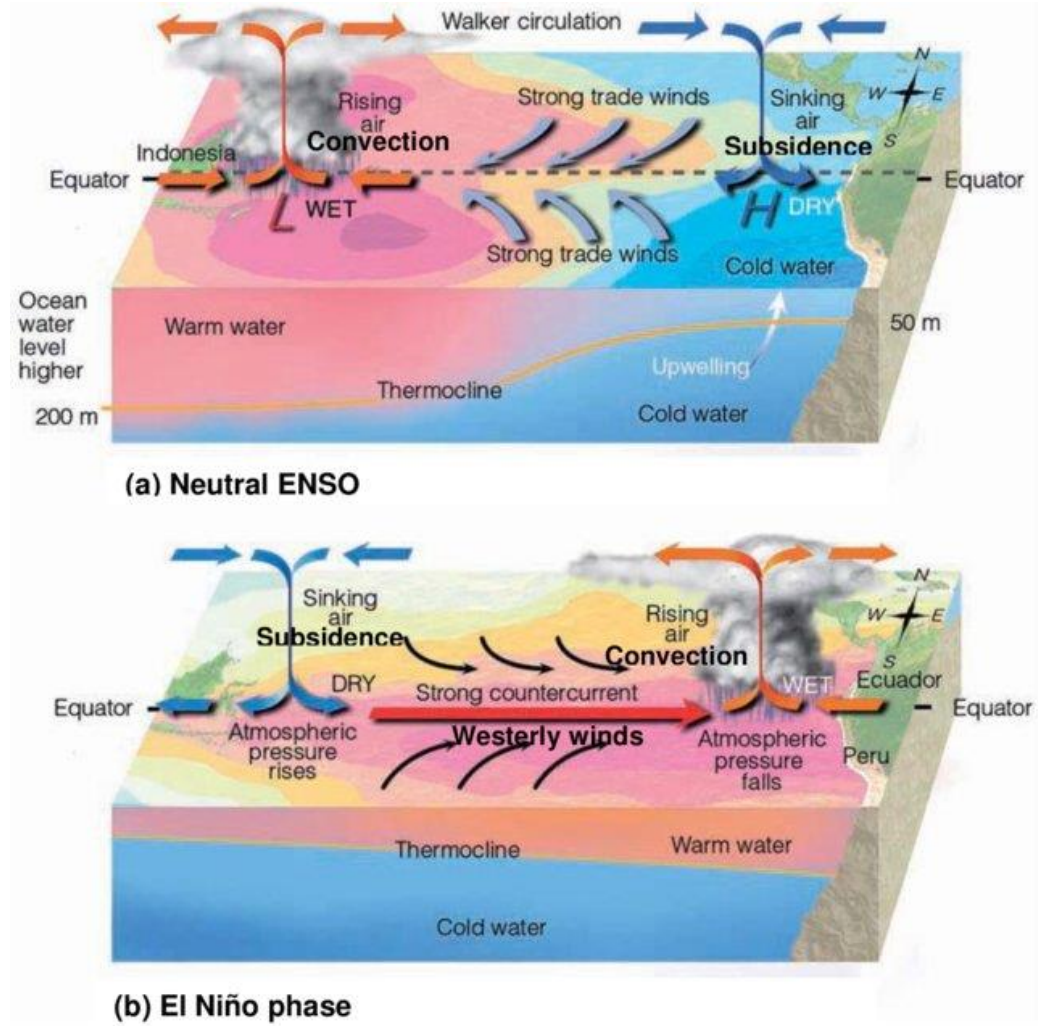
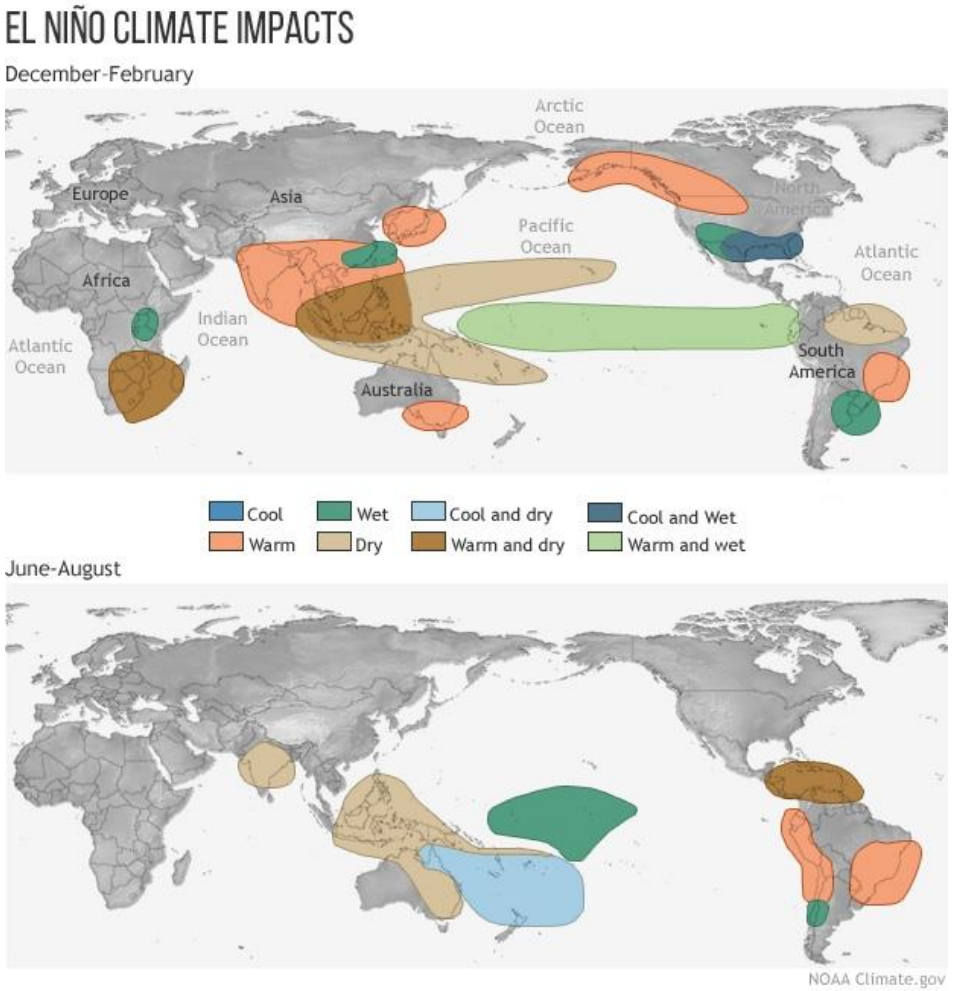


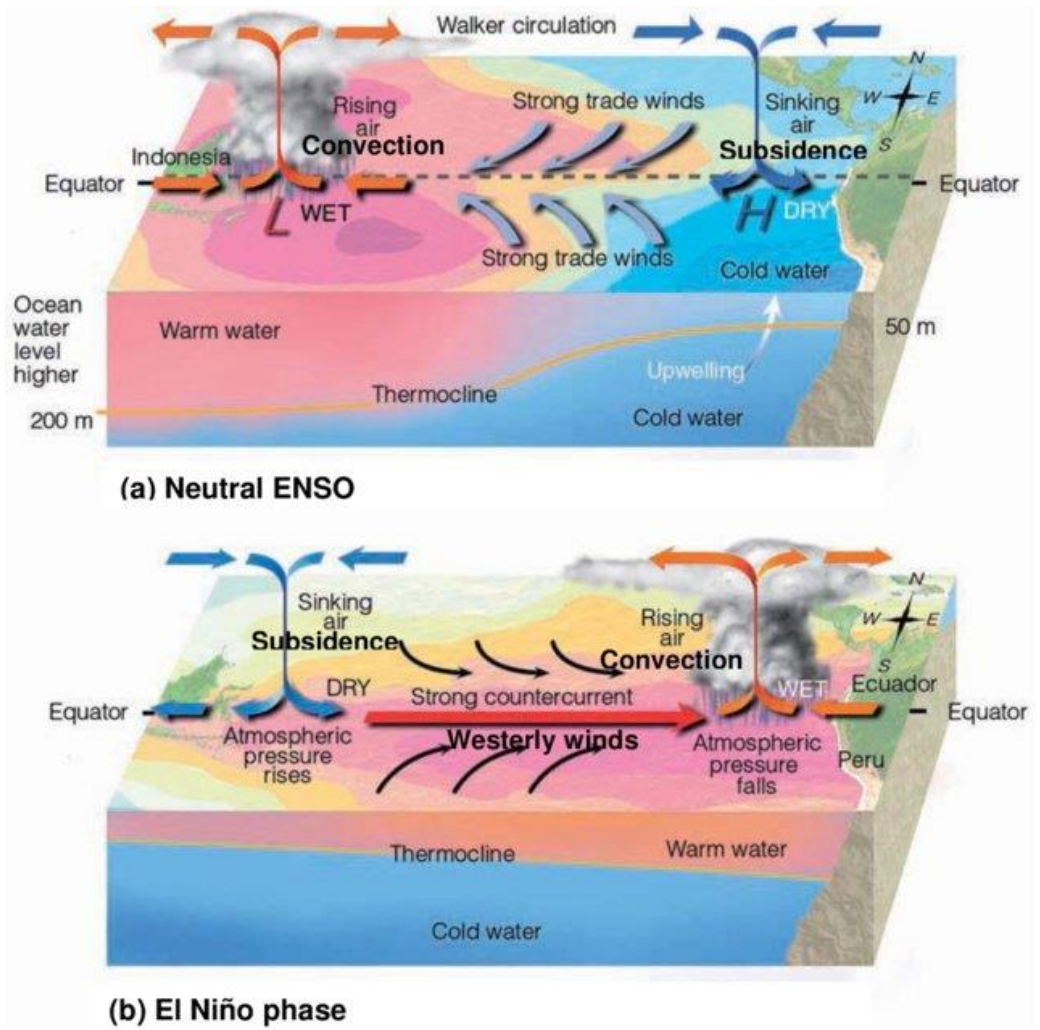
Mechanisms of Past Climate Change
(16:375:553)

Spring 2013

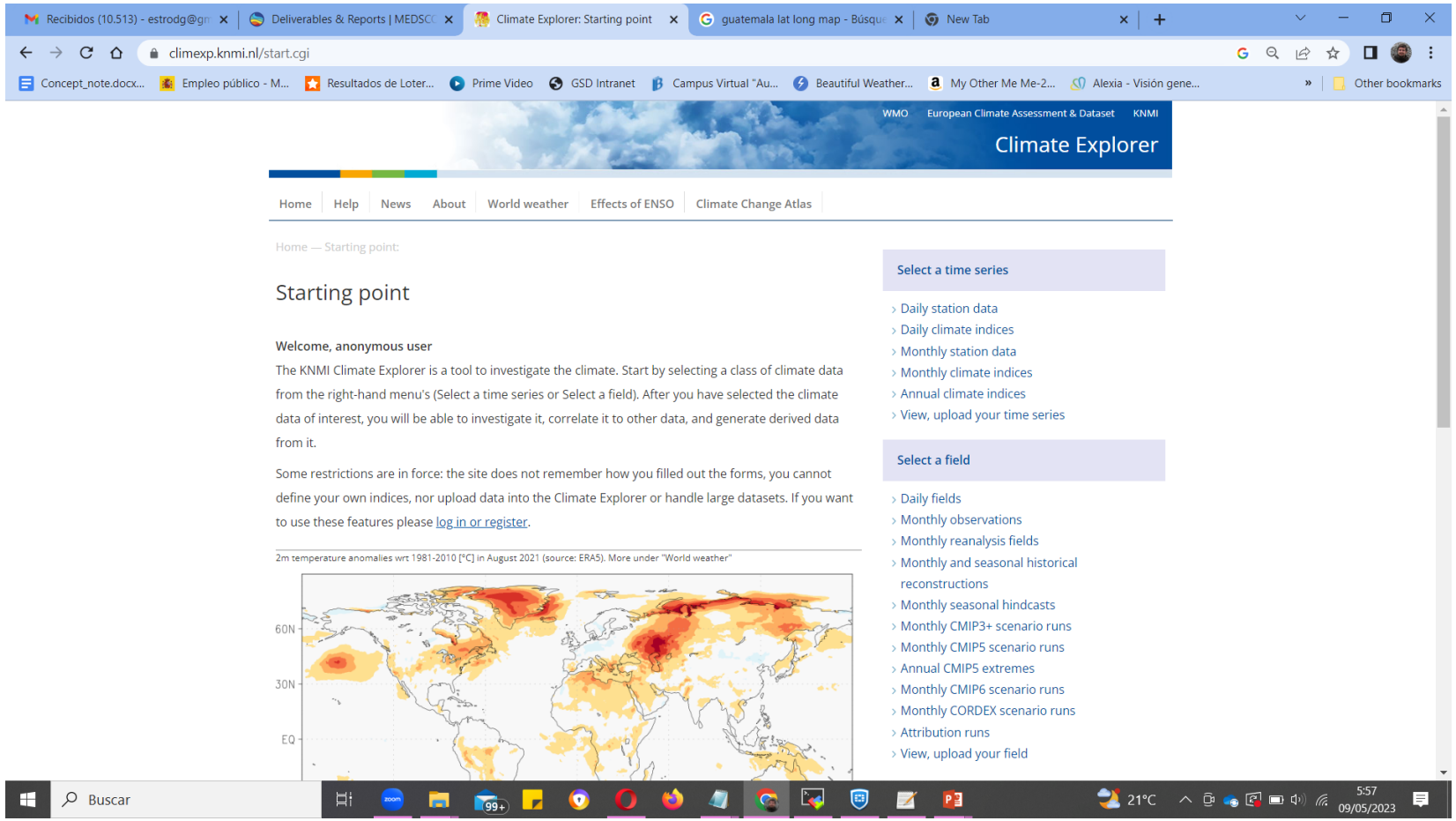


El estado del sistema climático condiciona las anomalías que podemos esperar en el estado la atmósfera.
Desarrollo de modelos empíricos objetivos



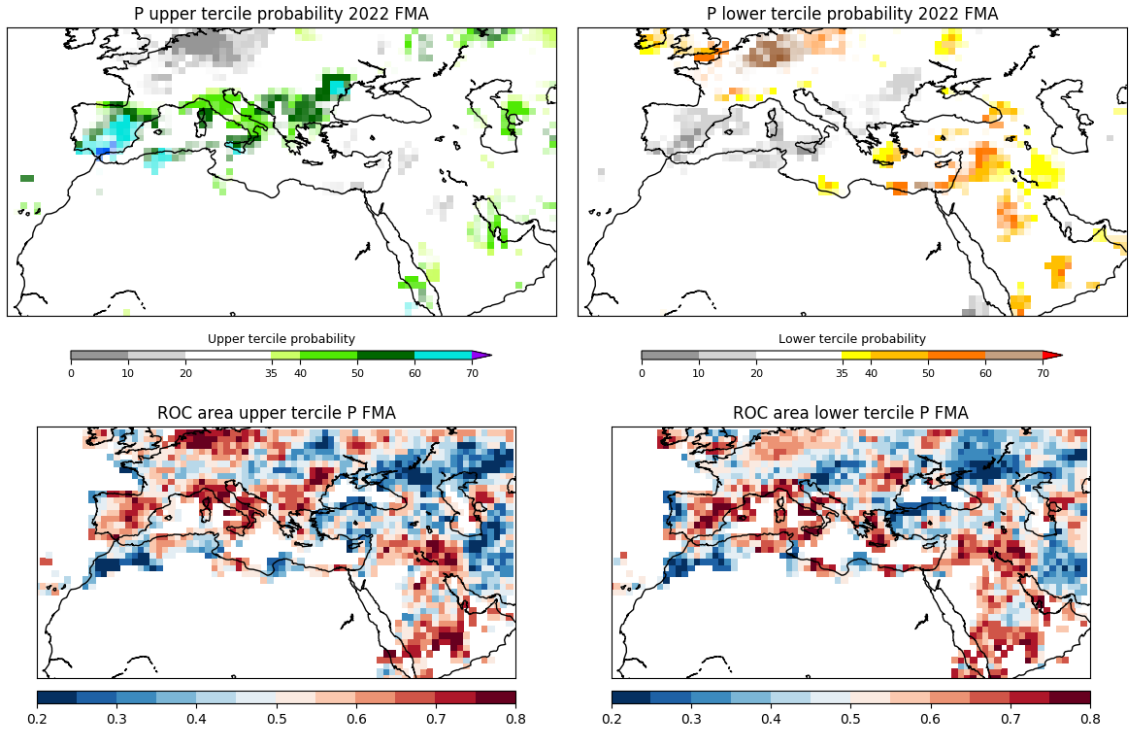


Exploración de posibles predictores mediante climate explorer: https://climexp.knmi.nl/



El estado del sistema climático condiciona las anomalías que podemos esperar en el estado la atmósfera.
Desarrollo de modelos empíricos objetivos

-Predictores basados en:
-temperatura superficial y contenido de calor del mar
-anomalías de presión y geopotencial
-extensión de la cubierta de nieve y el hielo
-humedad del suelo



Sistema basado en partial least squares regression (psql)

Scheme of the model

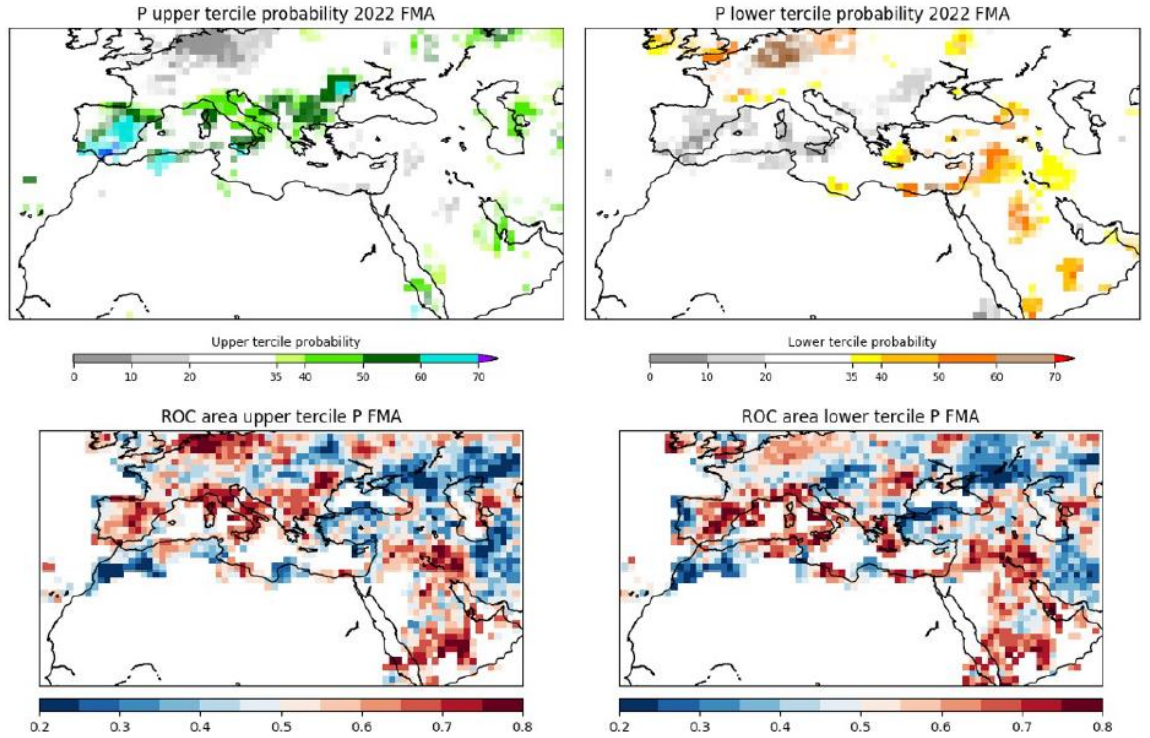
(details in https://www.medscope-project.eu/wp-content/uploads/2021/06/D2.3_Empirical_Forecasting_System.pdf)

Predictors:

Global climate índices

(teleconnetion, SST, snow and ice) and predictors specific from MEDSCOPE

Filtering by correlation, then psql



Forecast can be calculated for different predictands, lead and aggregation times

https://www.medscope-project.eu/wp-content/uploads/2021/06/D2.3_Empirical_Forecasting_System.pdf

MEDSCOPE

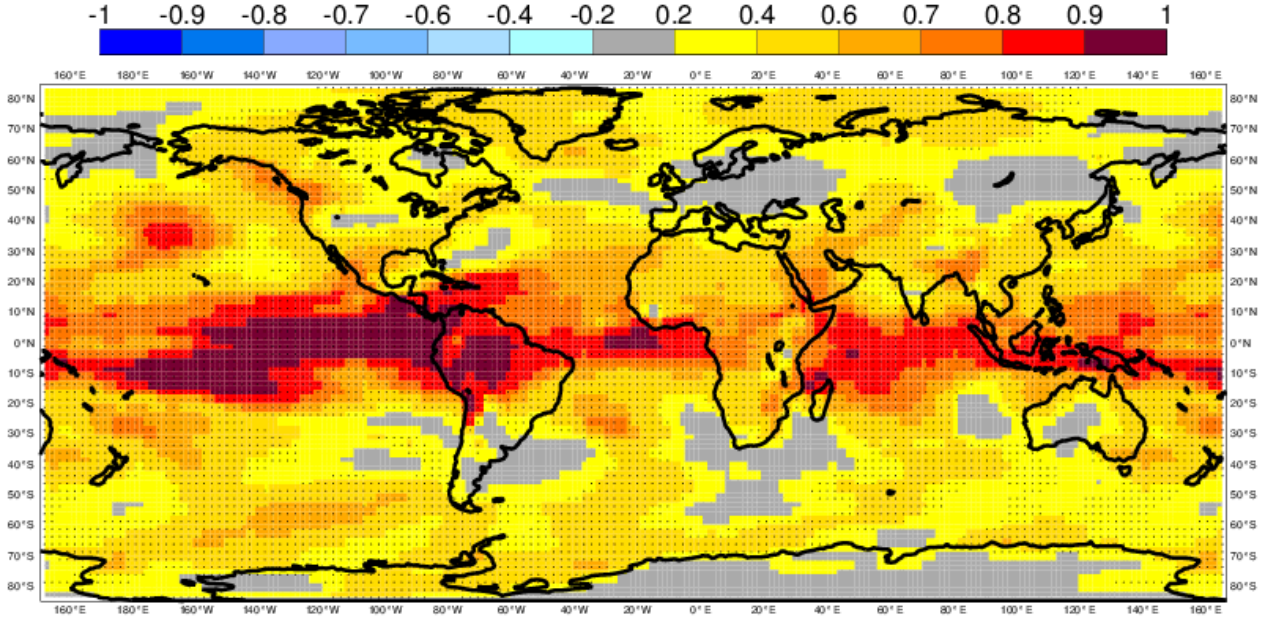
ERA4CS European Research Area for Climate Services

GOBIERNO DE ESPAÑA
VICEPRESIDENCIA TERCERA DEL GOBIERNO
MINISTERIO PARA LA TRANSICIÓN ECOLÓGICA Y EL RETO DEMOGRÁFICO

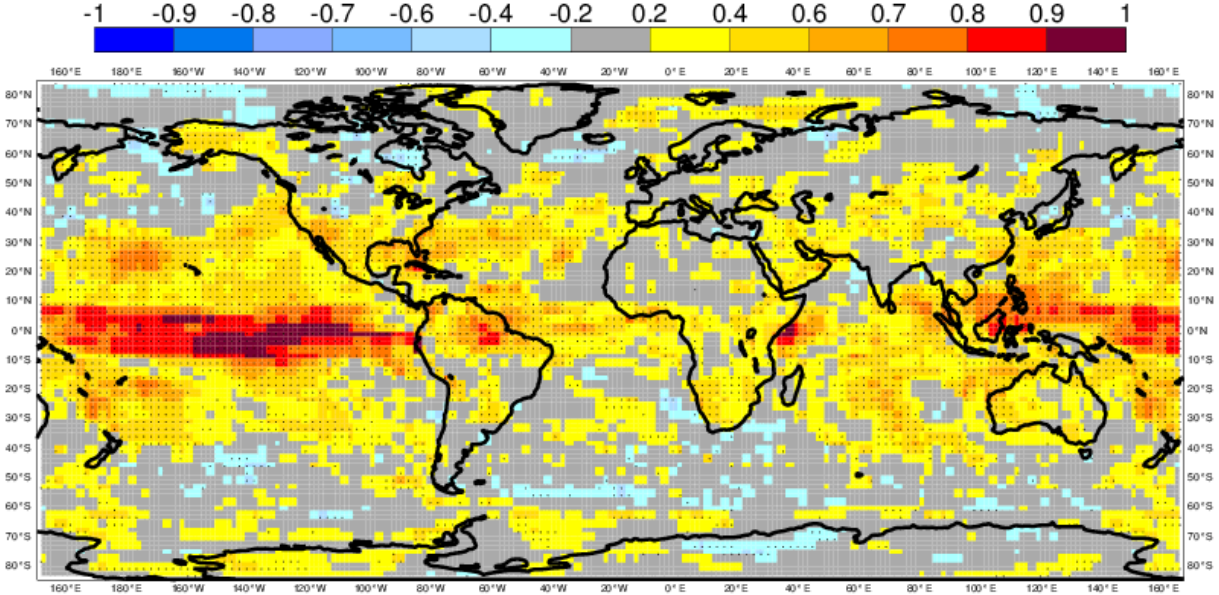
AEMet Agencia Estatal de Meteorología

Funcionan bien los modelos de predicción climática?

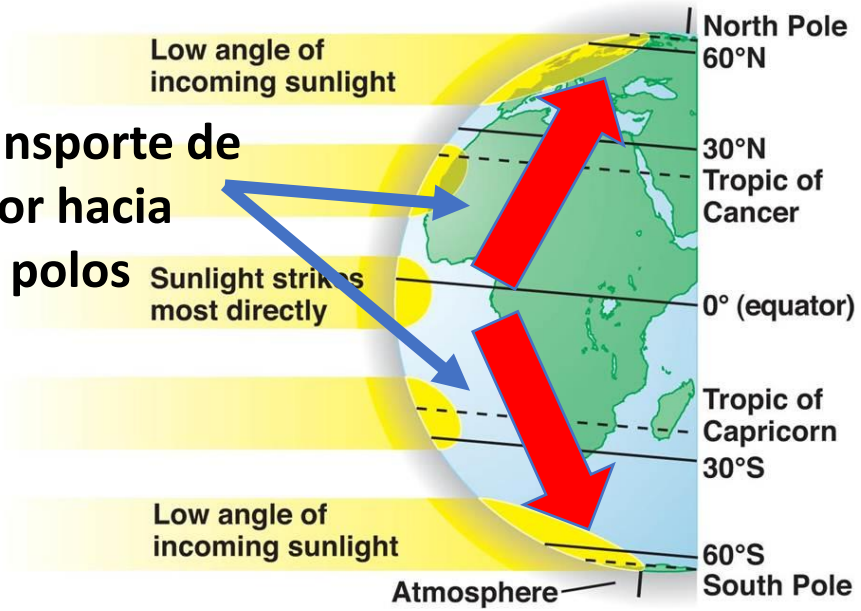
Anomaly Correlation Coefficient for 0001 with 25 ensemble members
850 hPa temperature
Hindcast period 1981-2016 with start in December average over months 2 to 4
Black dots for values significantly different from zero with 95% confidence (1000 samples)

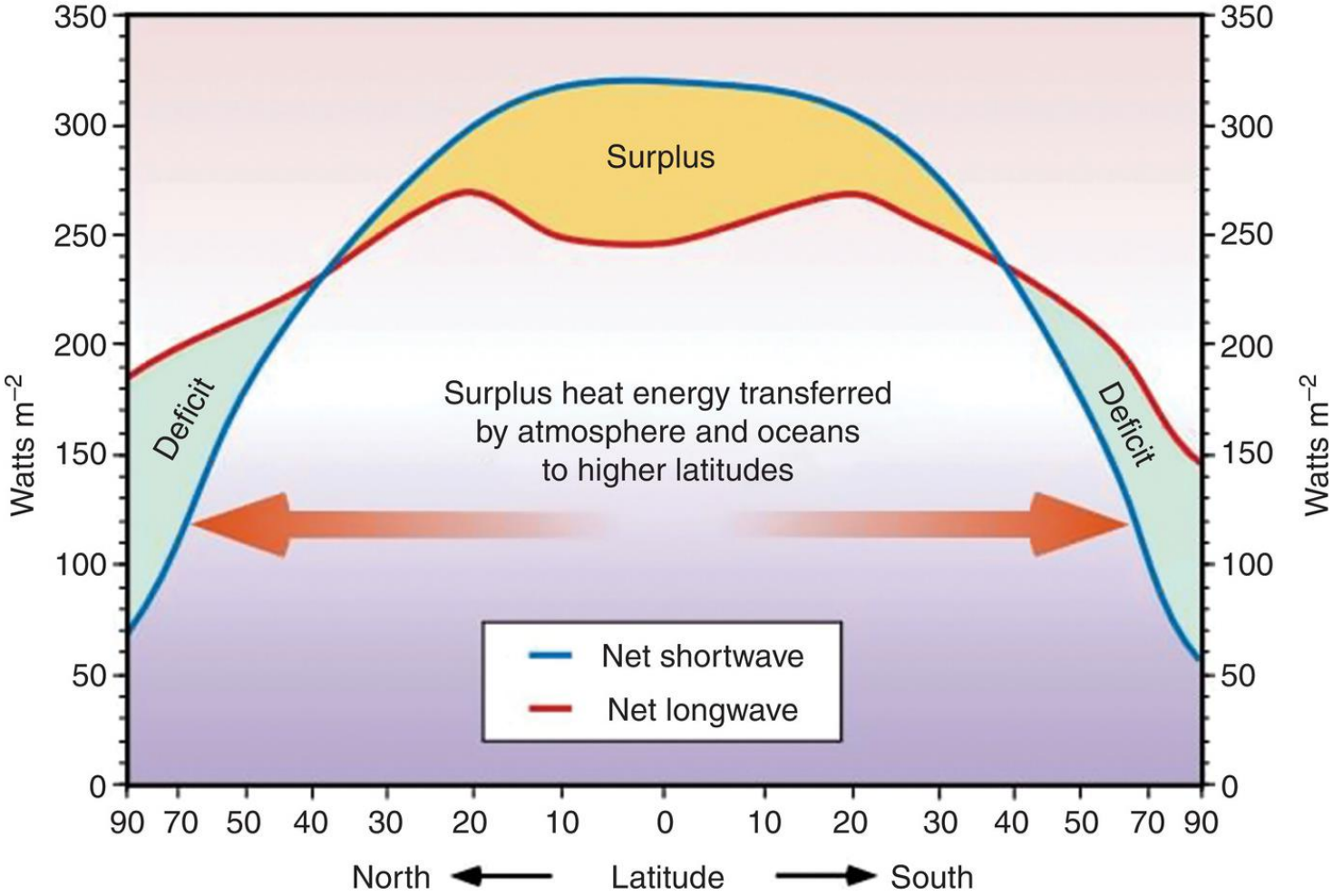


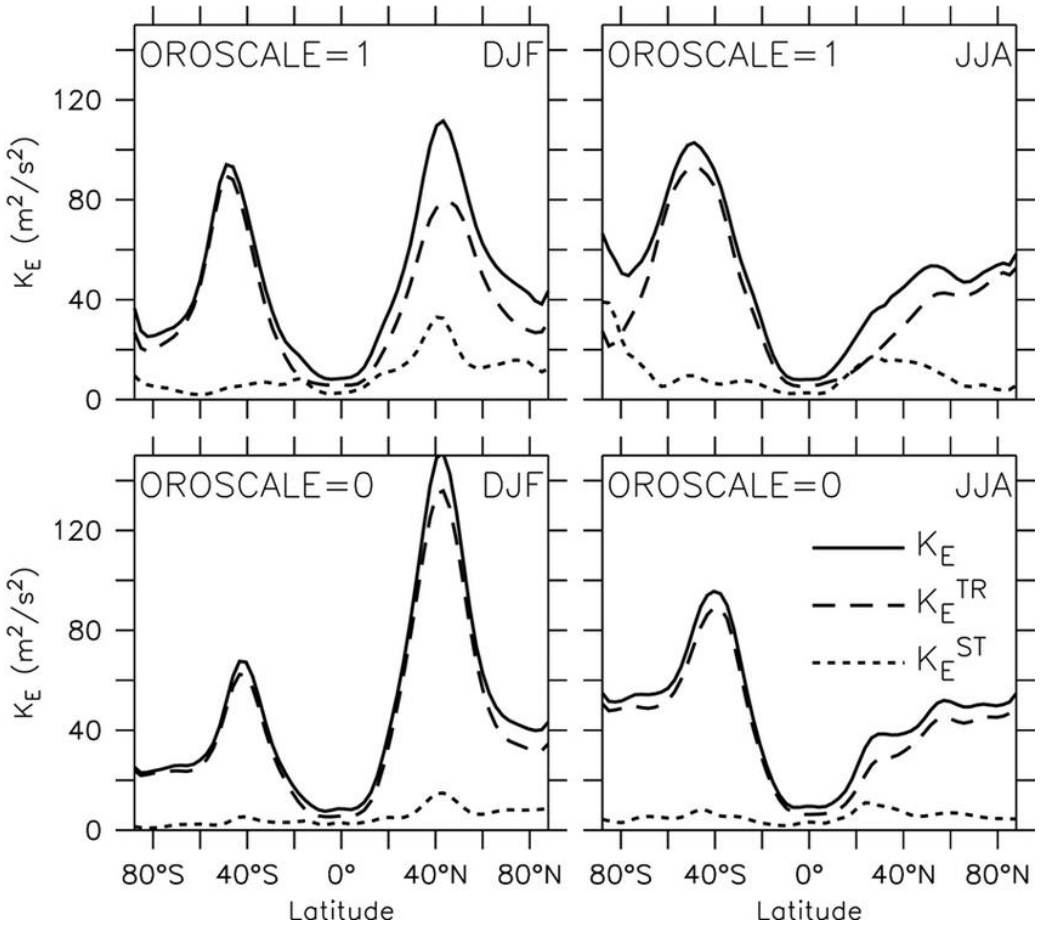
Anomaly Correlation Coefficient for 0001 with 25 ensemble members
Precipitation
Hindcast period 1981-2014 with start in December average over months 2 to 4
Black dots for values significantly different from zero with 95% confidence (1000 samples)

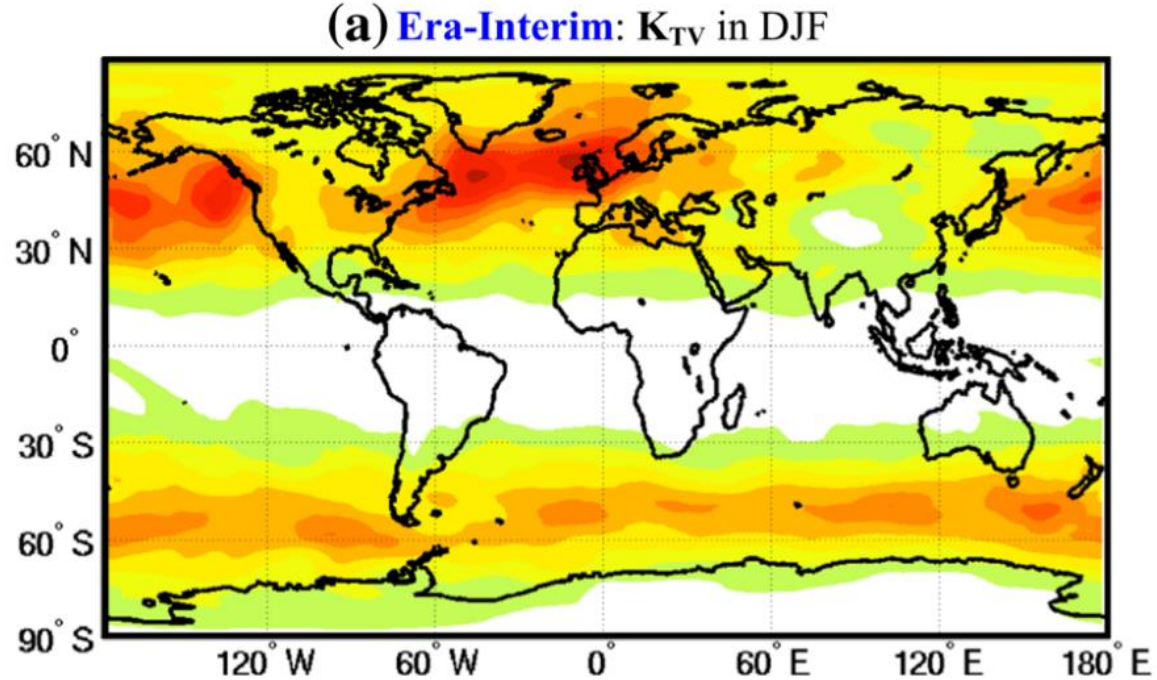


Transporte de calor hacia los polos






OROSCALE=1
DJF
OROSCALE=1
JJA
OROSCALE=0
DJF
OROSCALE=0
JJA
K_E (m^2/s^2)
120
80
40
0
K_E
K_E^{TR}
K_E^{ST}
80°S
40°S
0°
40°N
80°N
Latitude


(a) Era-Interim: K_{TV} in DJF
60° N
30° N
0°
30° S
60° S
90° S
120° W
60° W
0°
60° E
120° E
180° E

Anomaly Correlation Coefficient for 0001 with 25 ensemble members
850 hPa temperature
Hindcast period 1981-2016 with start in December average over months 2 to 4
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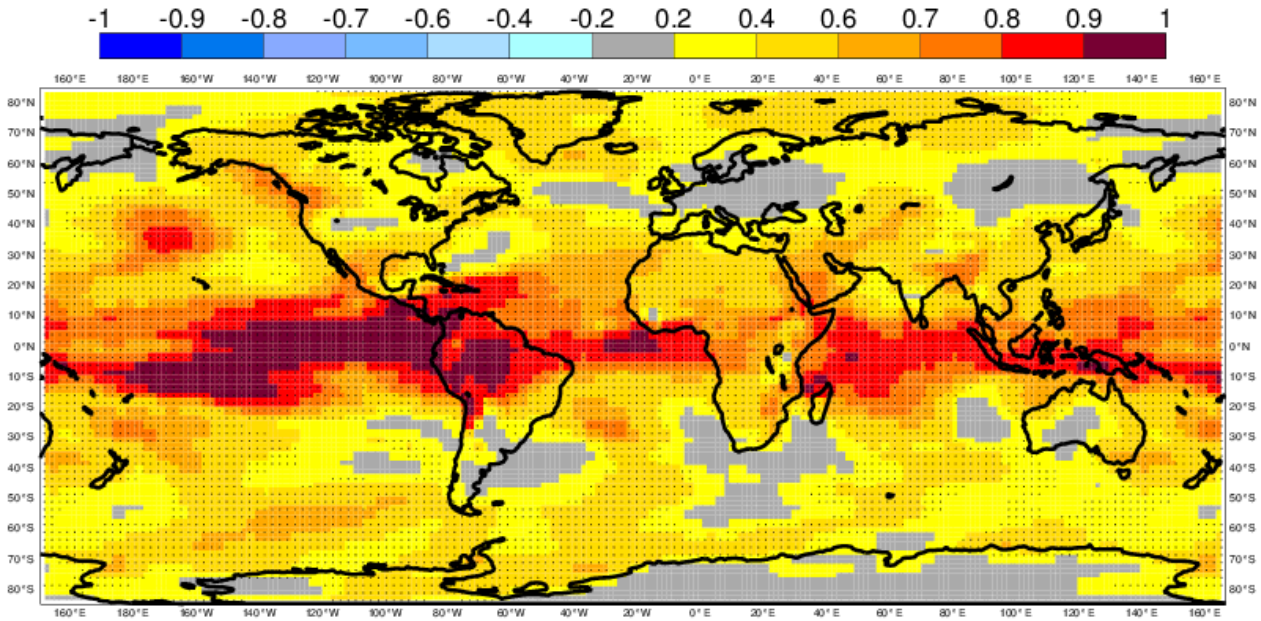
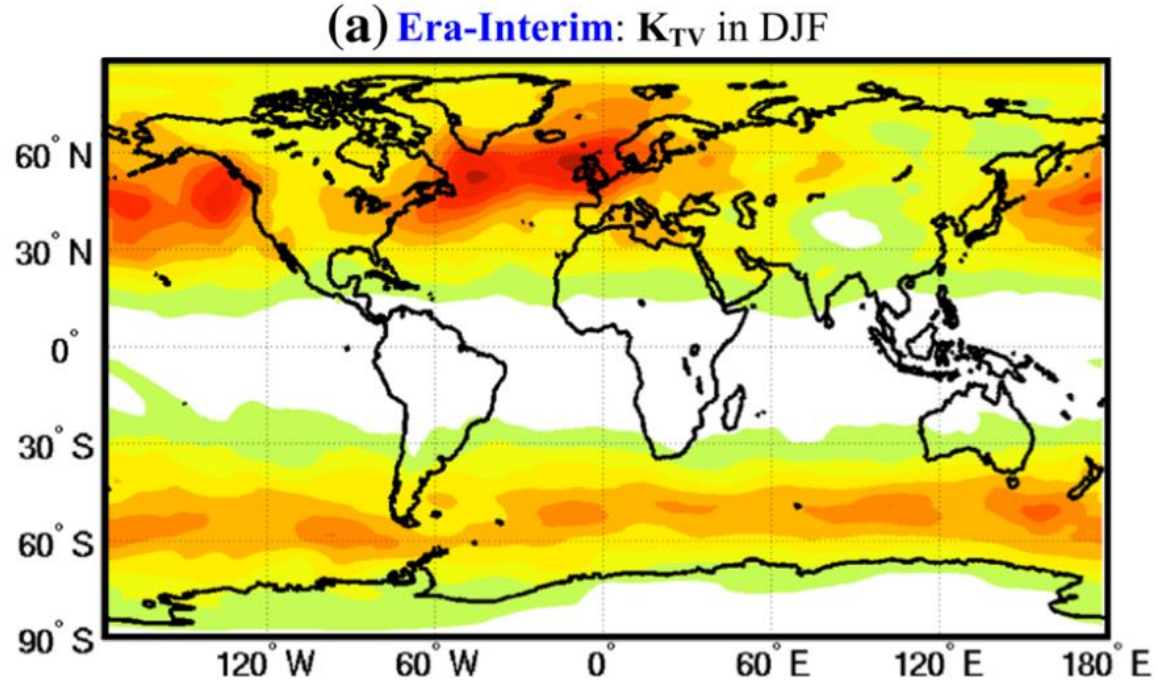
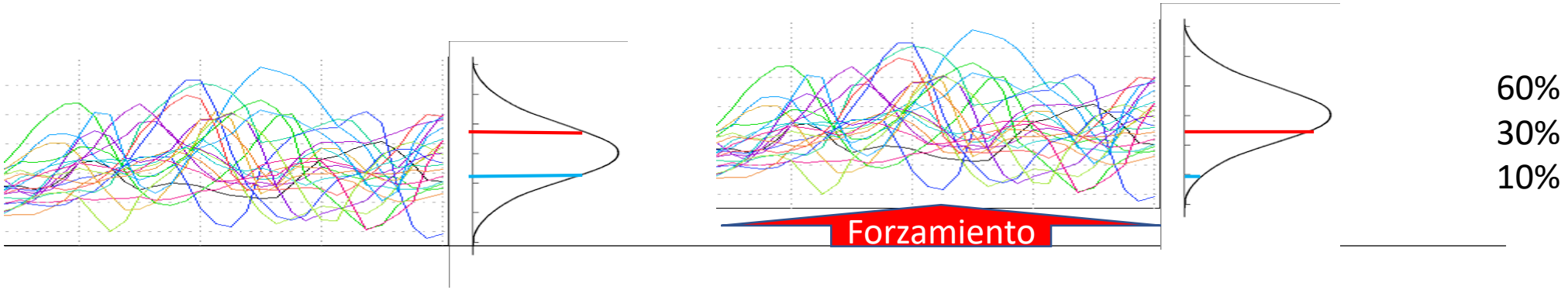




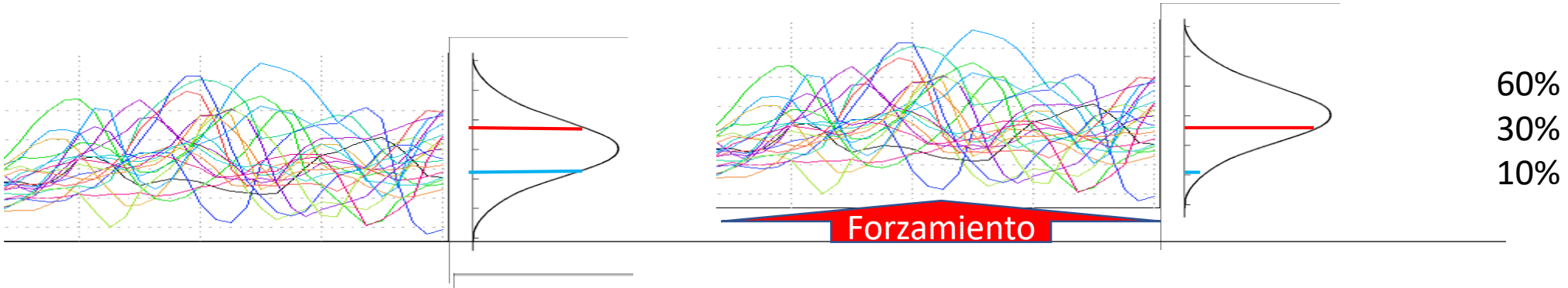
Trópico

Trópico



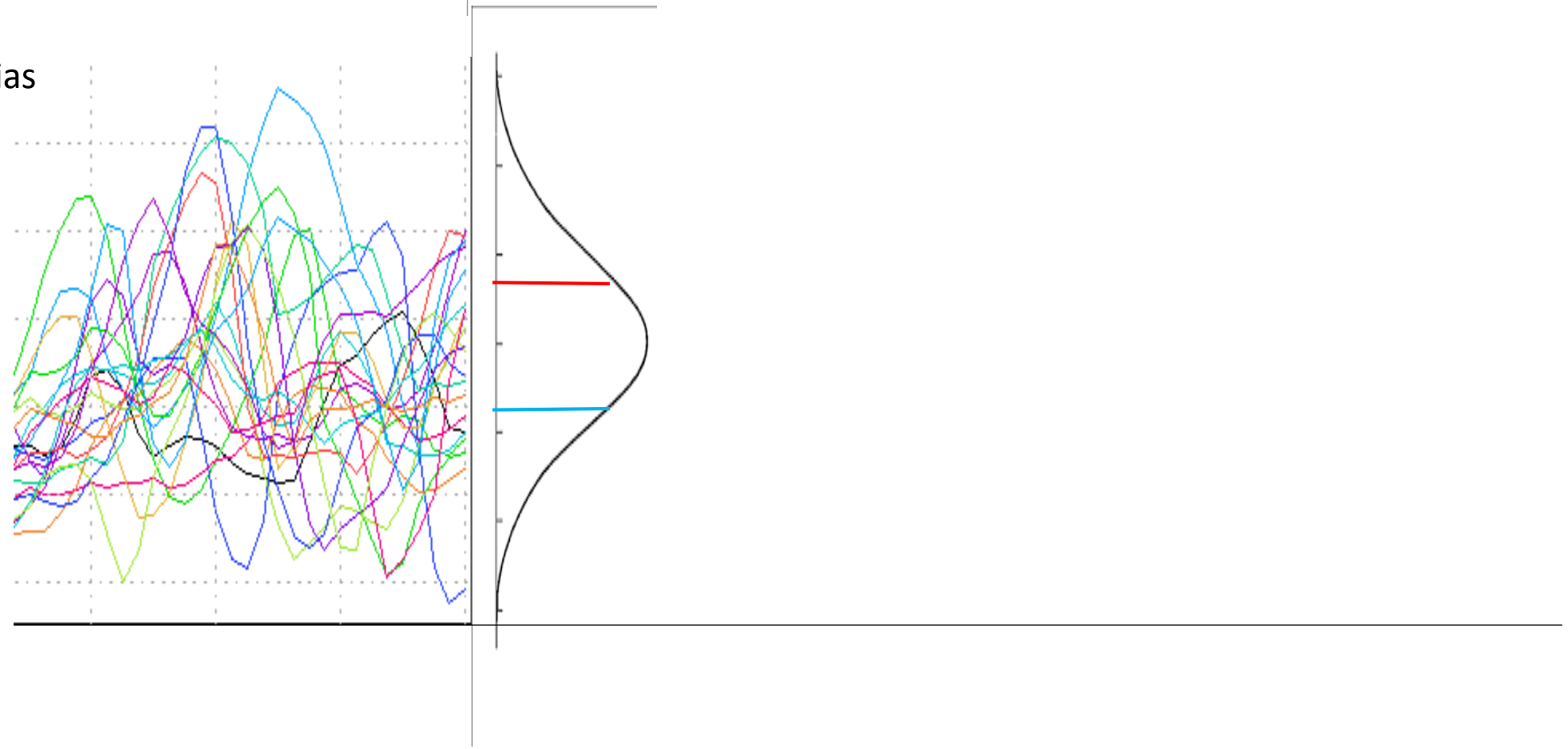
60%
30%
10%

Trópico

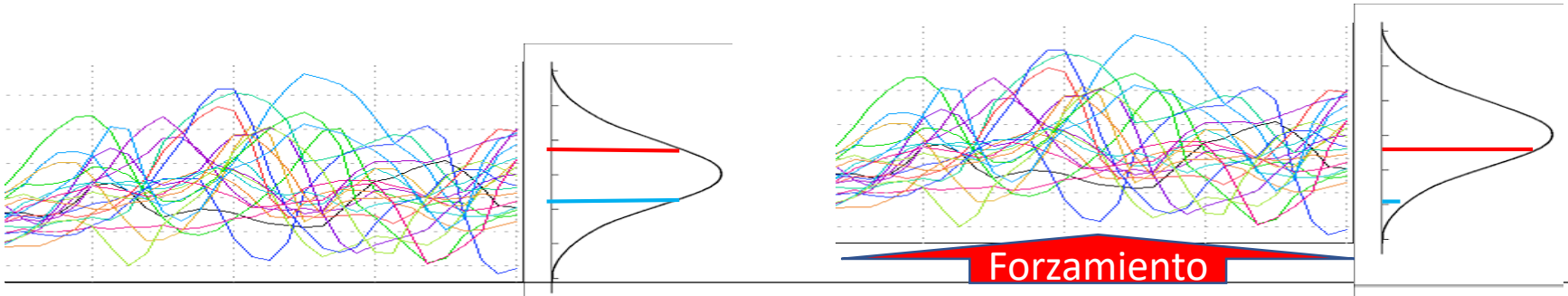


60%
30%
10%

Lat. medias

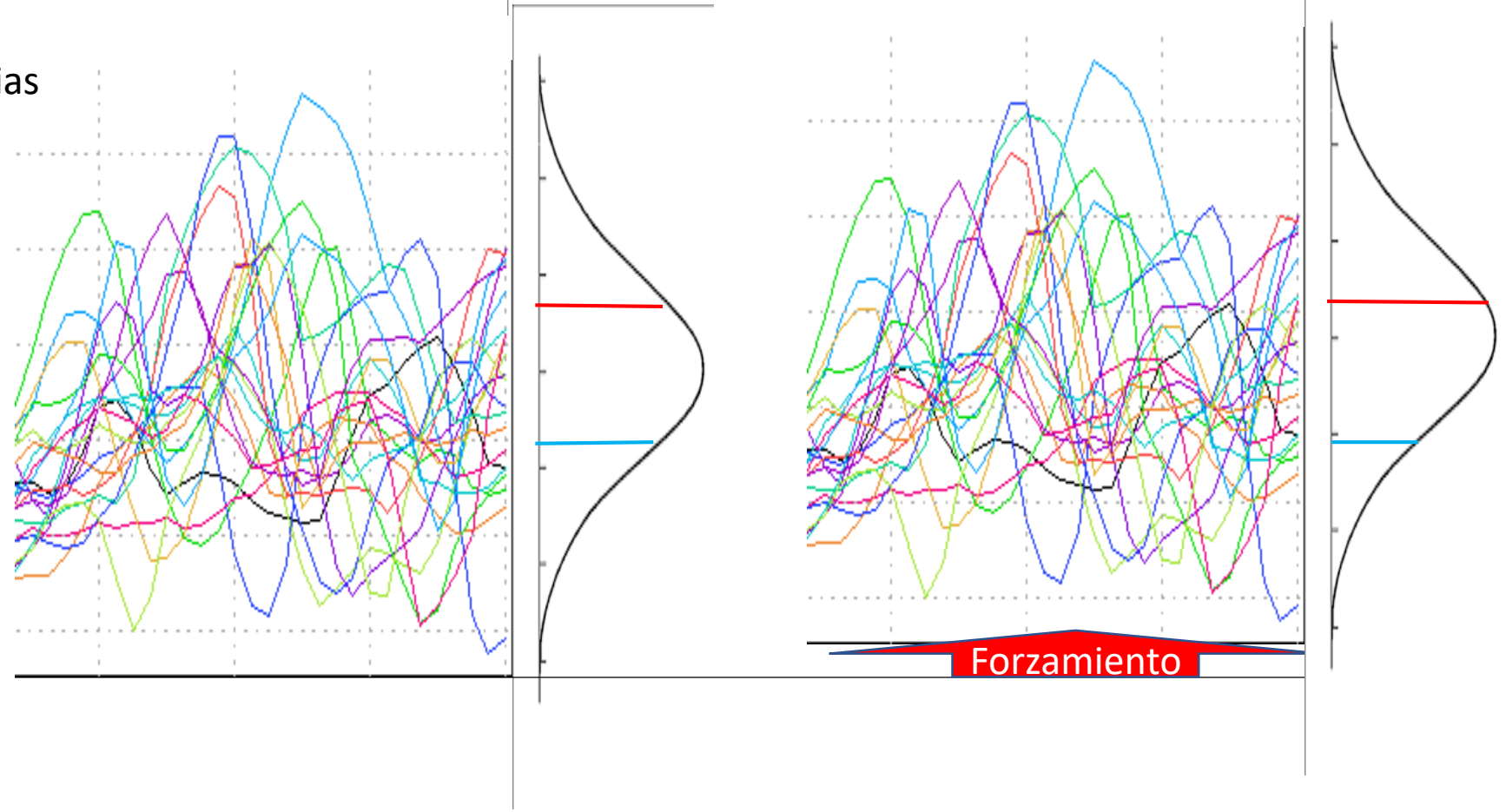


Trópico



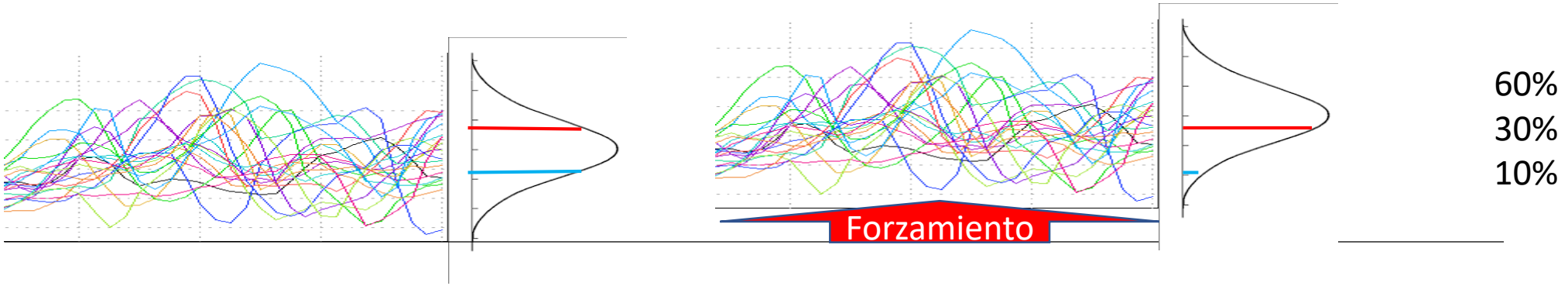
60%
30%
10%

Lat. medias

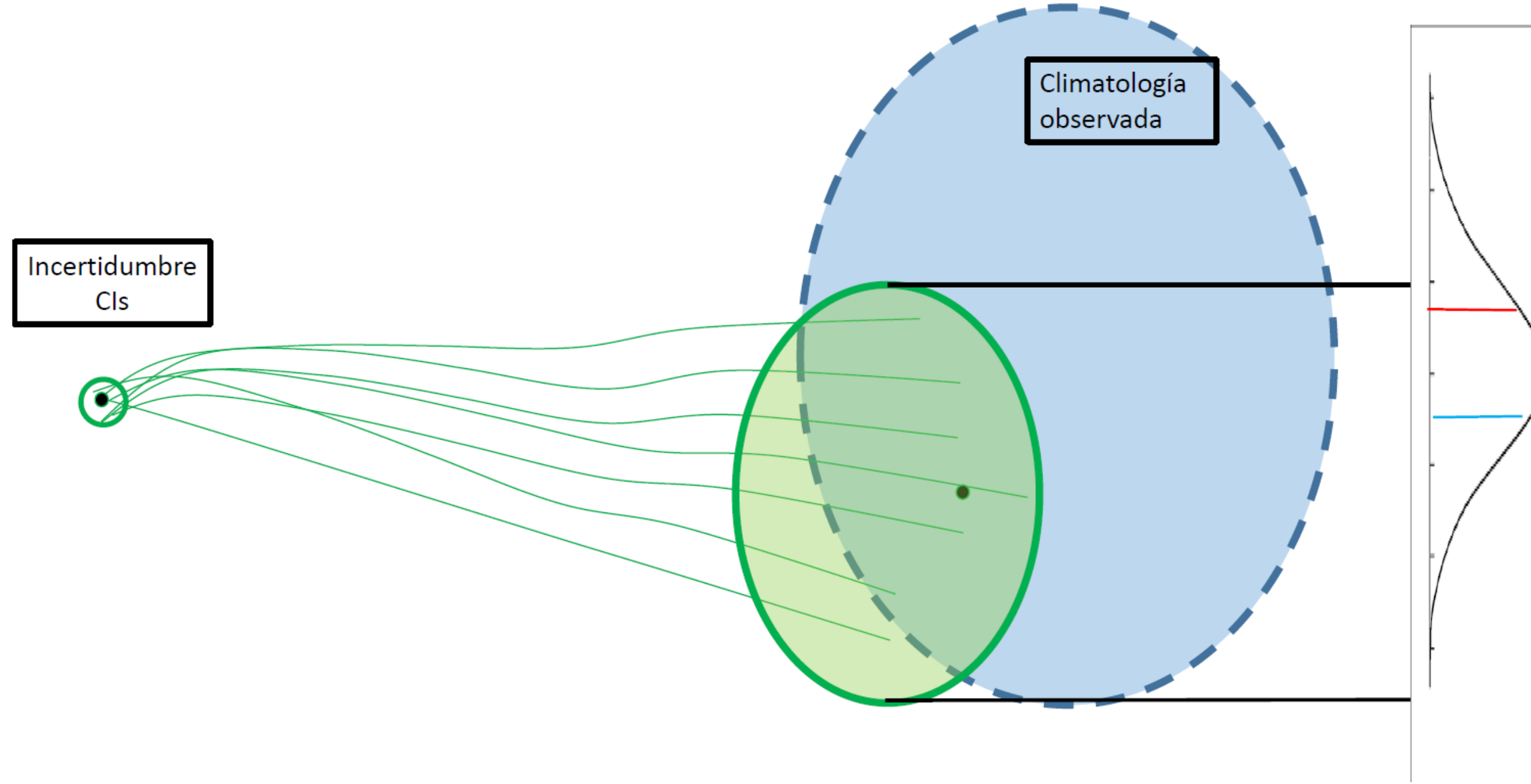


40%
35%
25%

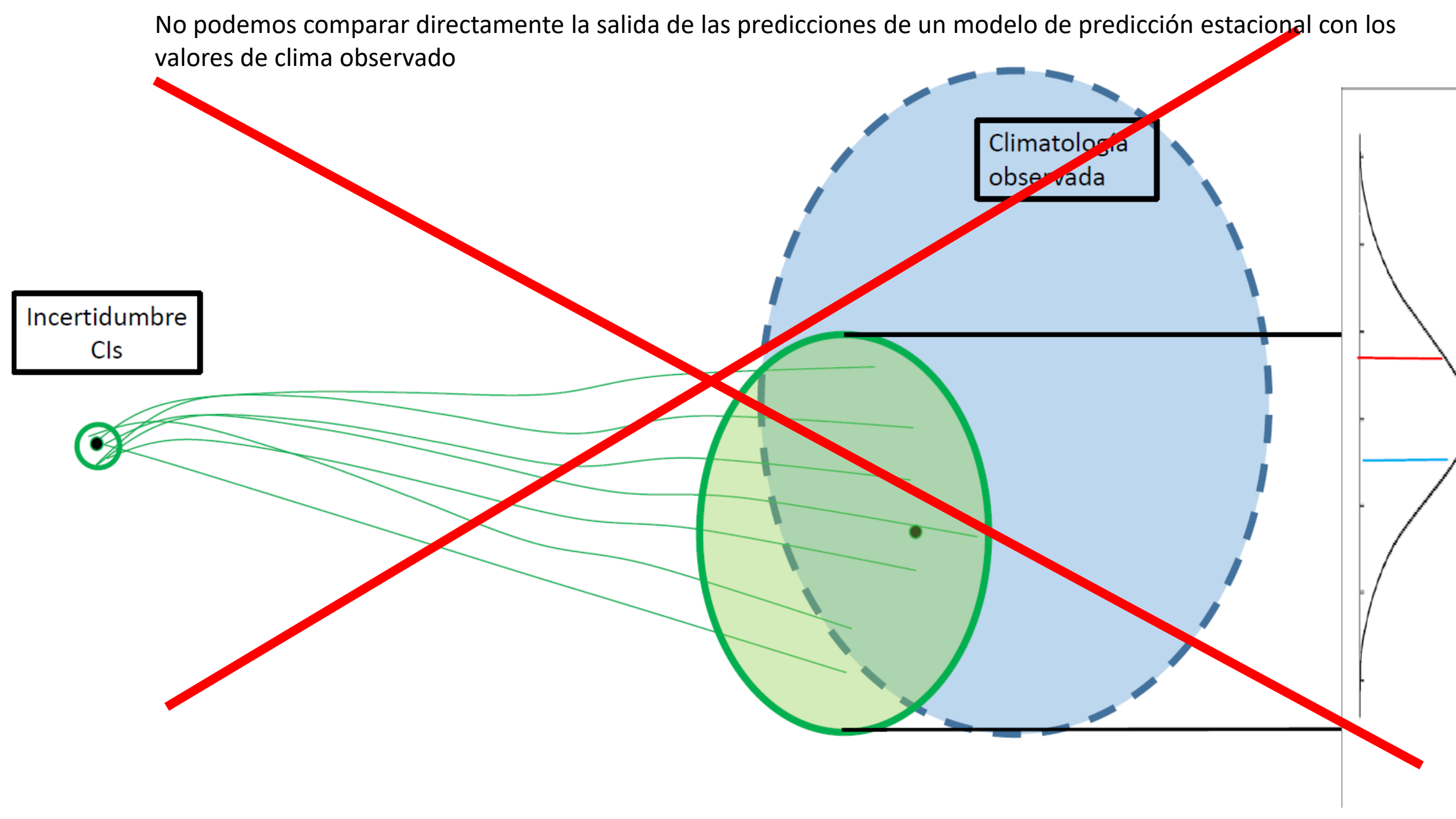
Trópico



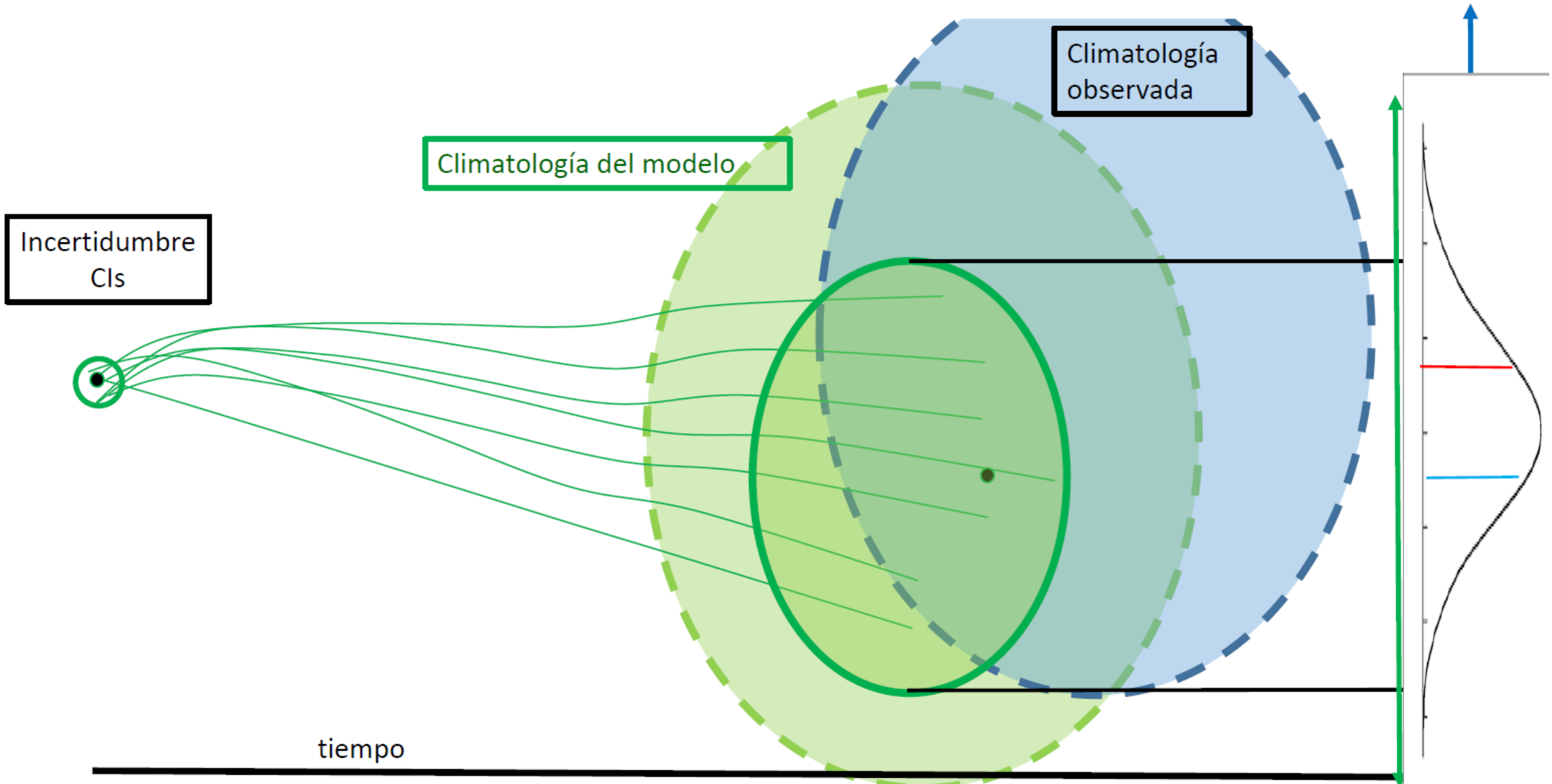
Pero cuando hablamos de comparar las ejecuciones del modelo, hay que tener en cuenta que los modelos climáticos tienen sesgos significativos


Climatología
observada
Incertidumbre
CIs

No podemos comparar directamente la salida de las predicciones de un modelo de predicción estacional con los valores de clima observado



LOS MODELOS CLIMÁTICOS TIENEN SESGO:
SU CLIMATOLOGÍA NO COINCIDE PERFECTAMENTE CON LA OBSERVADA



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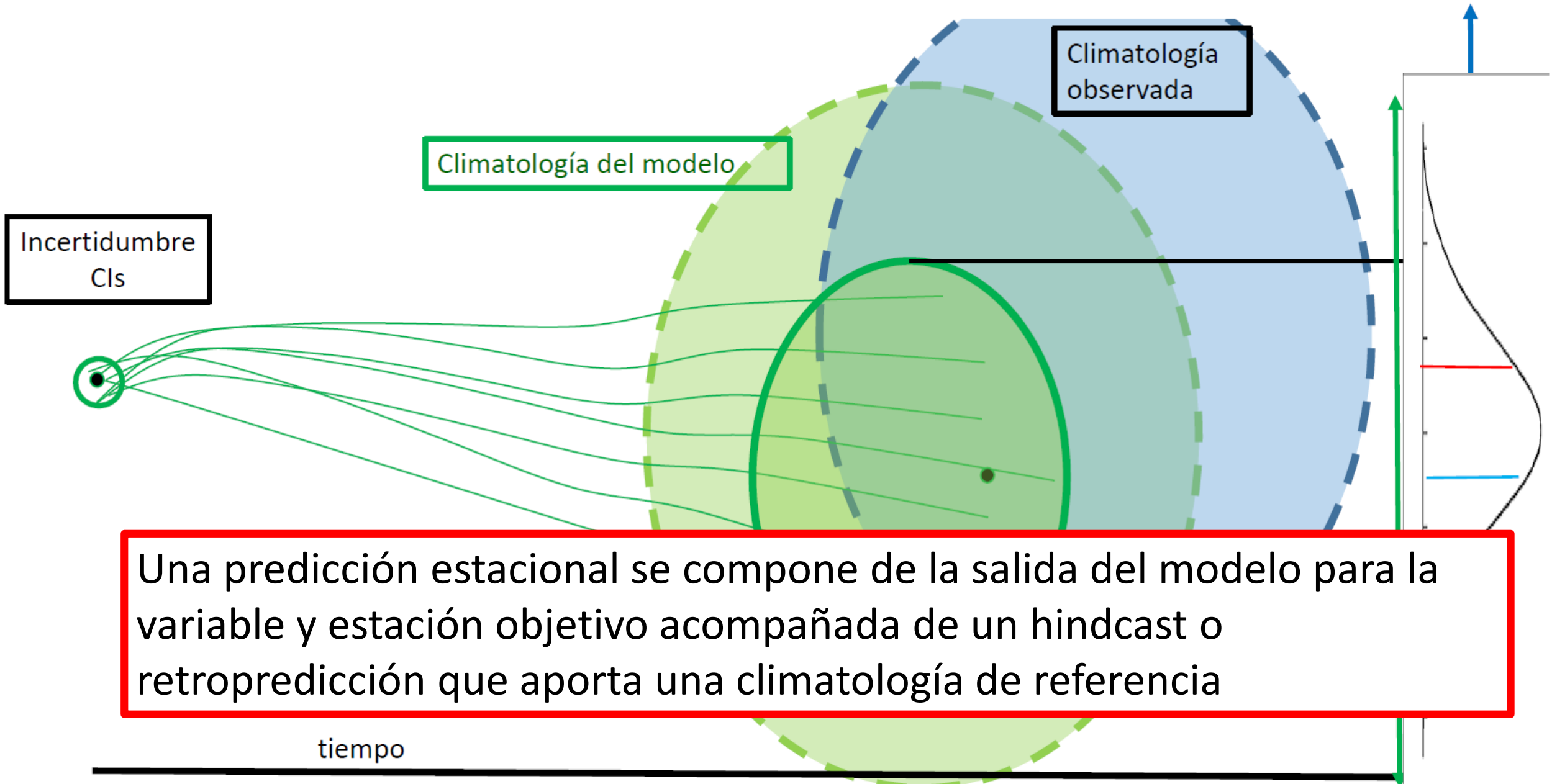


Una predicción estacional se compone de la salida del modelo para la variable y estación objetivo acompañada de un hindcast o retropredicción que aporta una climatología de referencia

ECMWF EPS-Monthly Forecasting System

Soil Temp. Lev. 1/SST anomaly

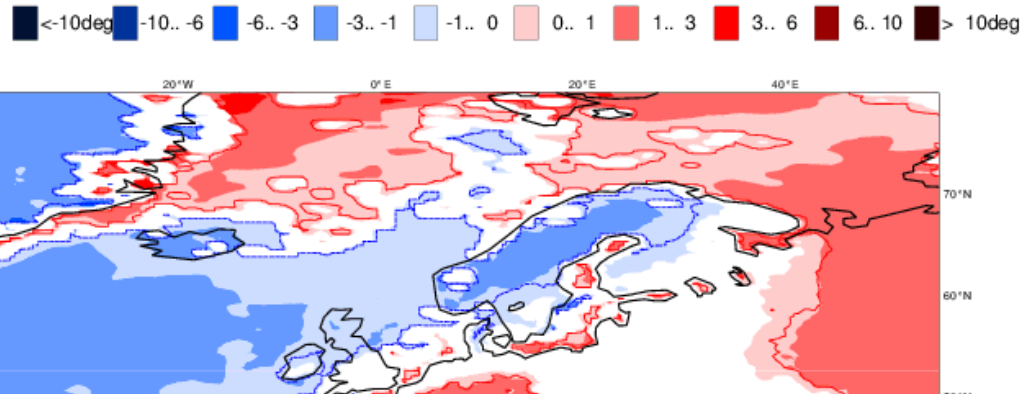
Forecast start reference is 17-09-2018

ensemble size = 51 ,climate size = 660

24-09-2018/TO/3(

Shaded areas significan

Contou



ECMWF Seasonal Forecast

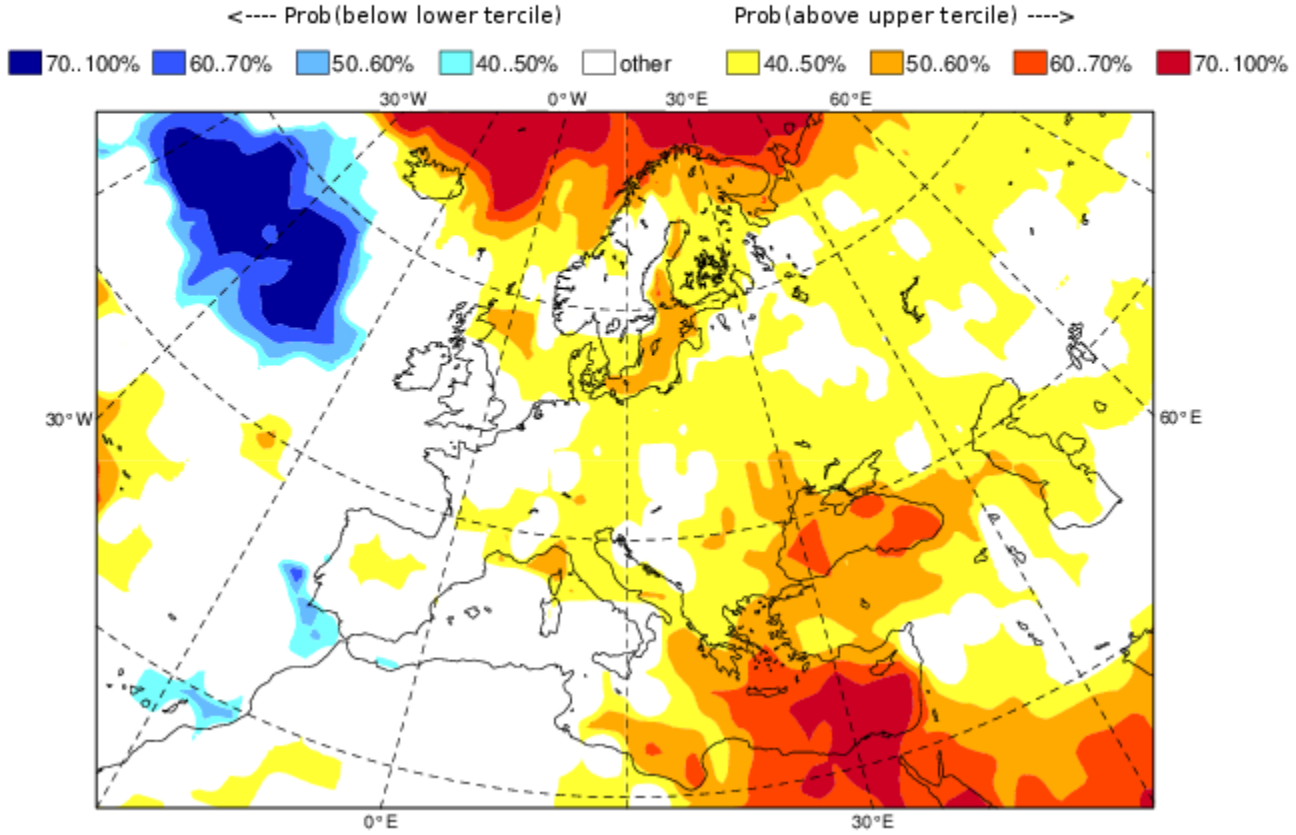
Prob(most likely category of 2m temperature)

Forecast start is 01/09/18, climate period is 1993-2016

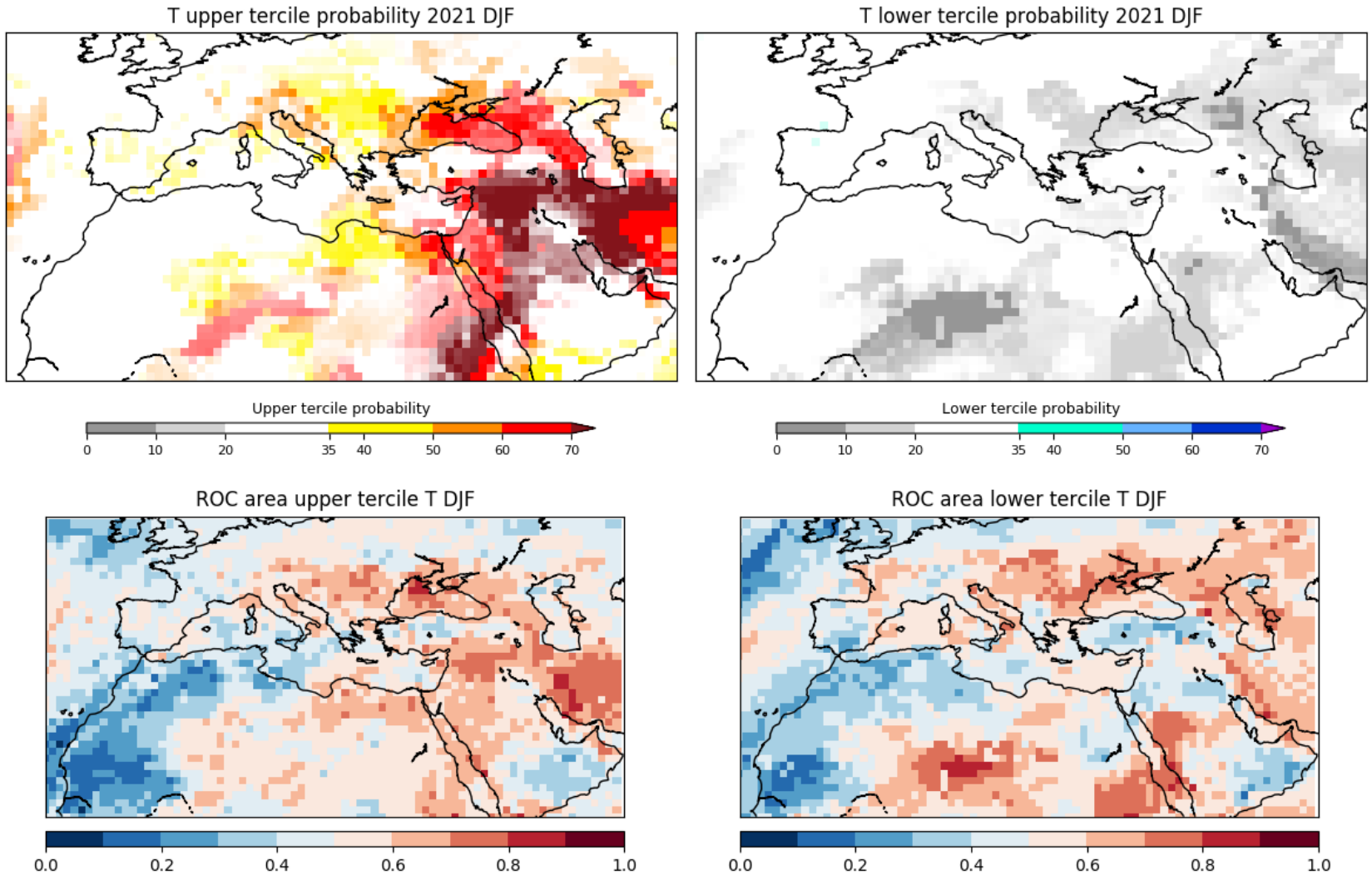
Ensemble size = 51, climate size = 600

System 5

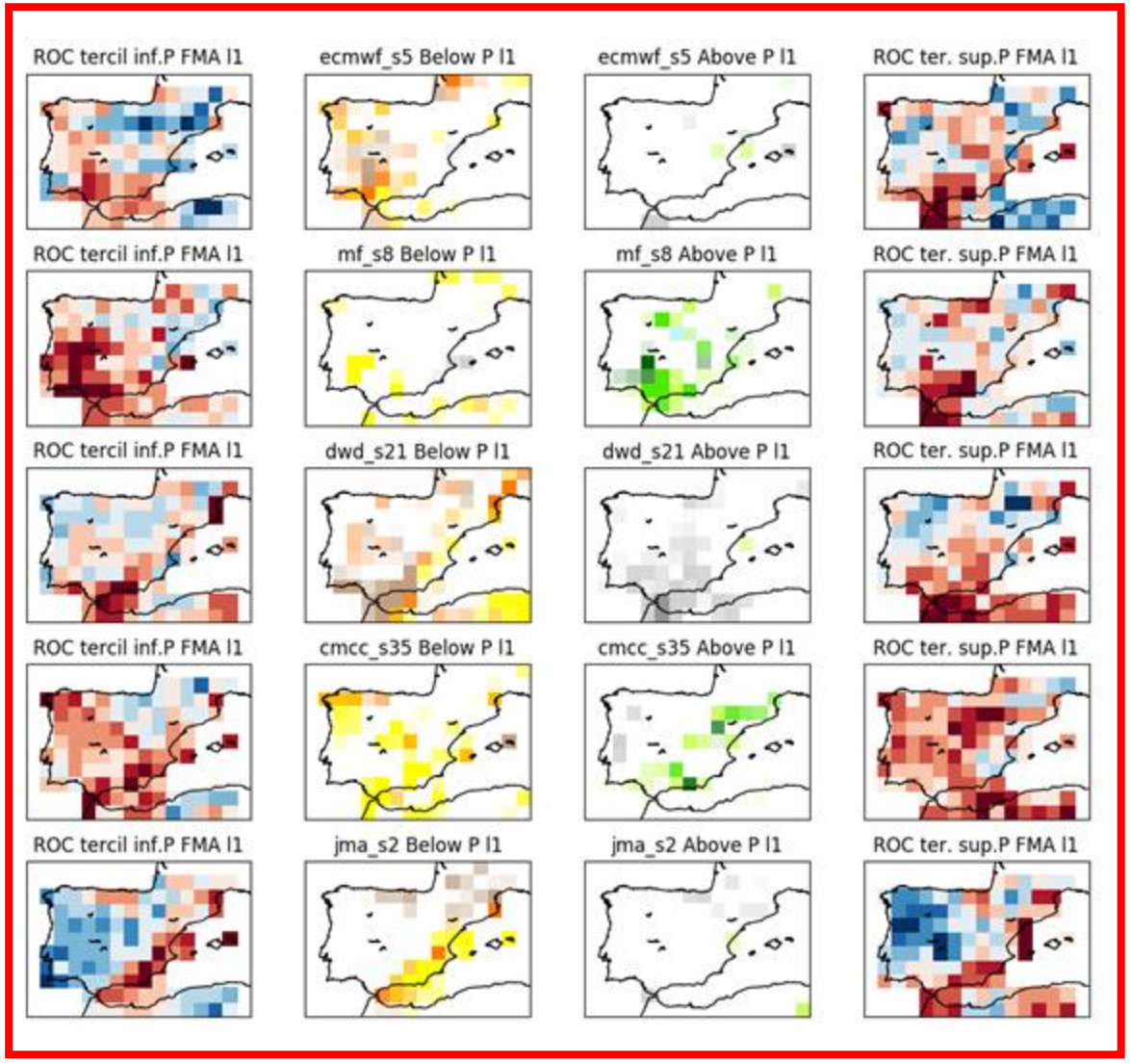
OND 2018



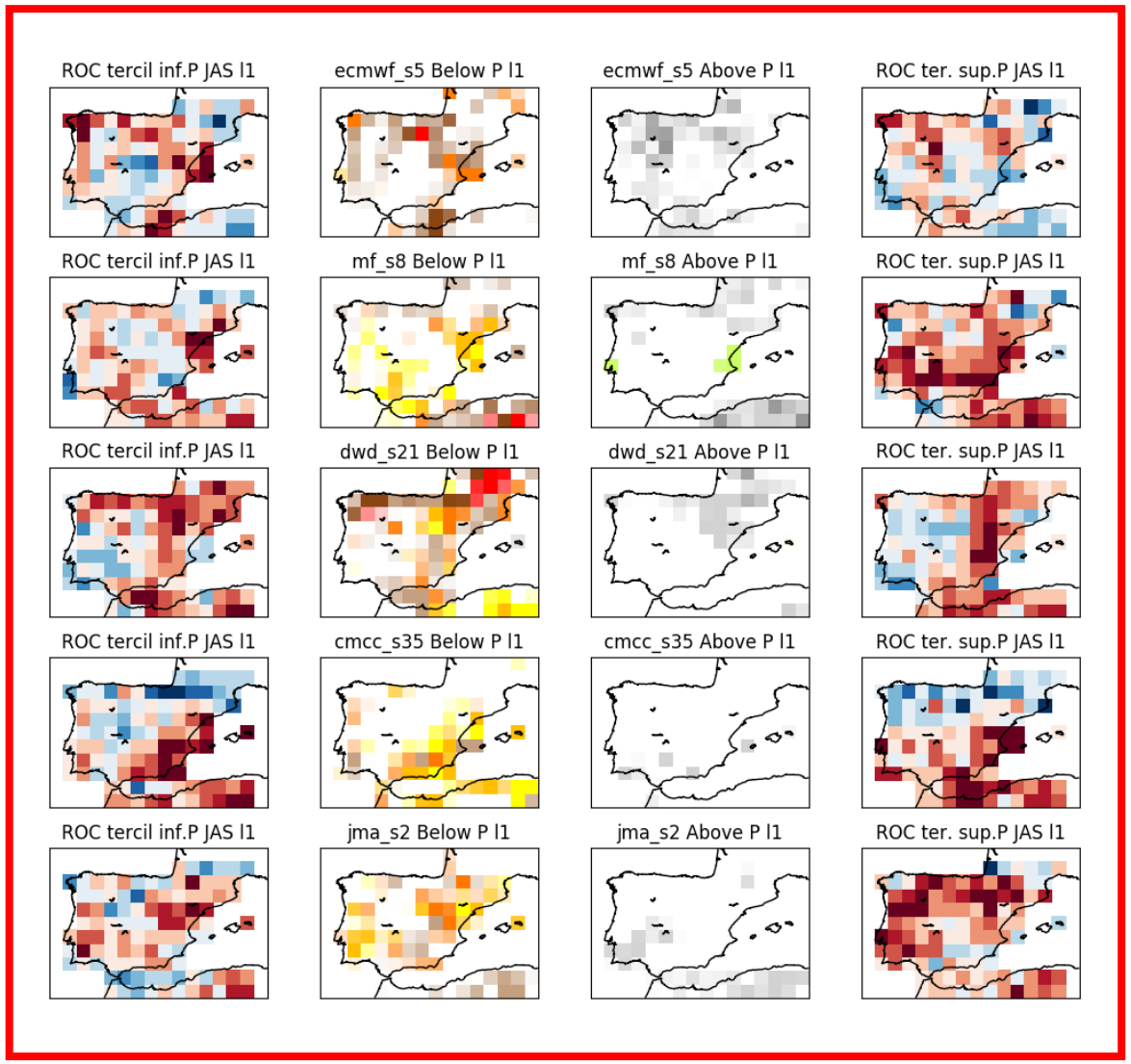
El hindcast no sólo es necesario como referencia, sino que se utiliza para evaluar el funcionamiento del modelo, y elaborar mapas de “skill”, que ayudan a interpretar la información. La WMO recomienda proporcionar dicha información junto con la de pronóstico.



La habilidad o skill de los modelos cambia según la región, estación, modelo y estado del sistema climático.

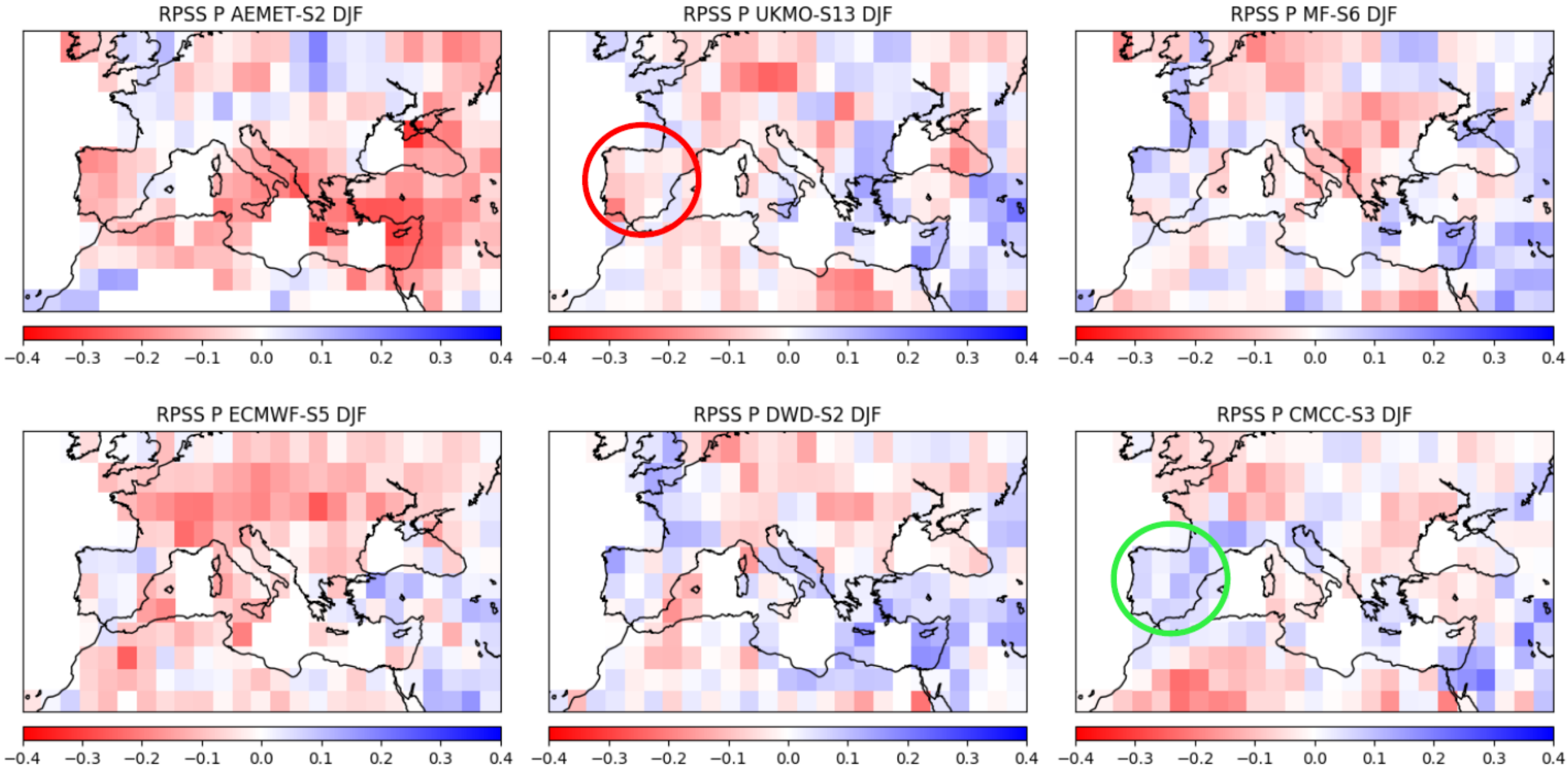


Predicción y skill Febrero-Abril



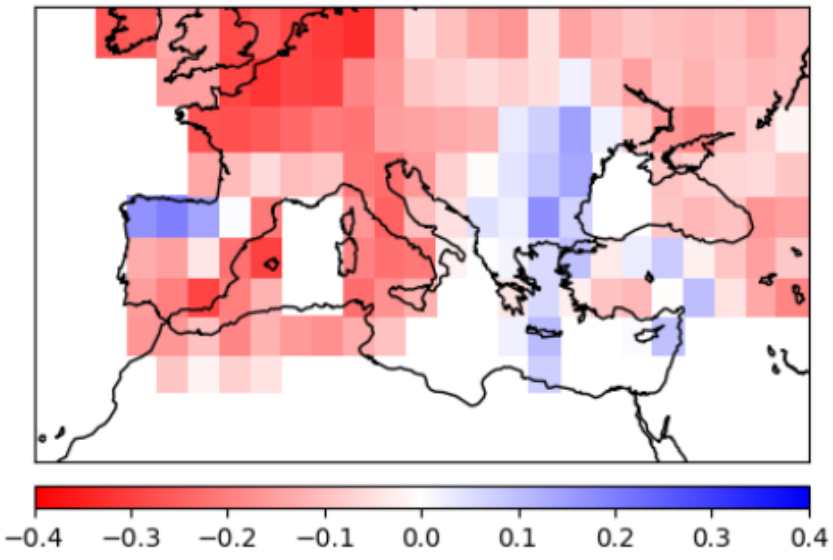
Predicción y skill Julio-Septiembre

Verificación precipitación invierno (JFM). Azul= áreas con skill

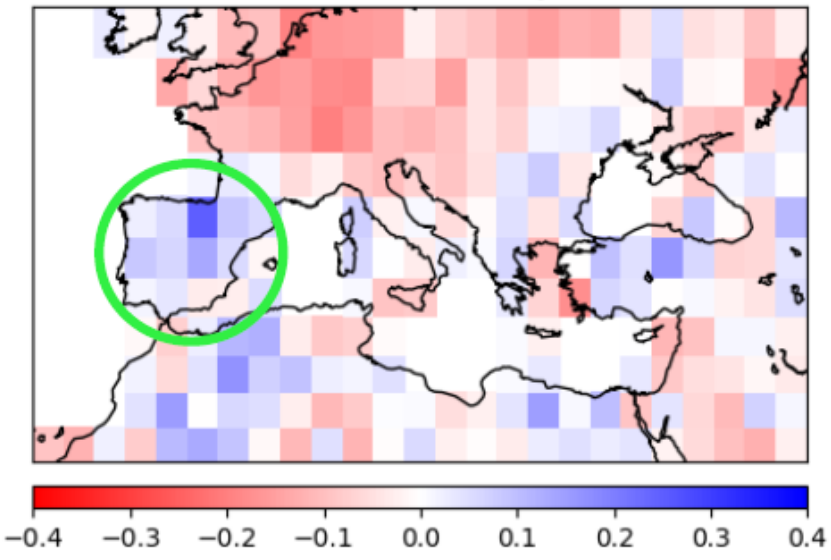


Verificación precipitación verano (JAS). Azul= áreas con skill

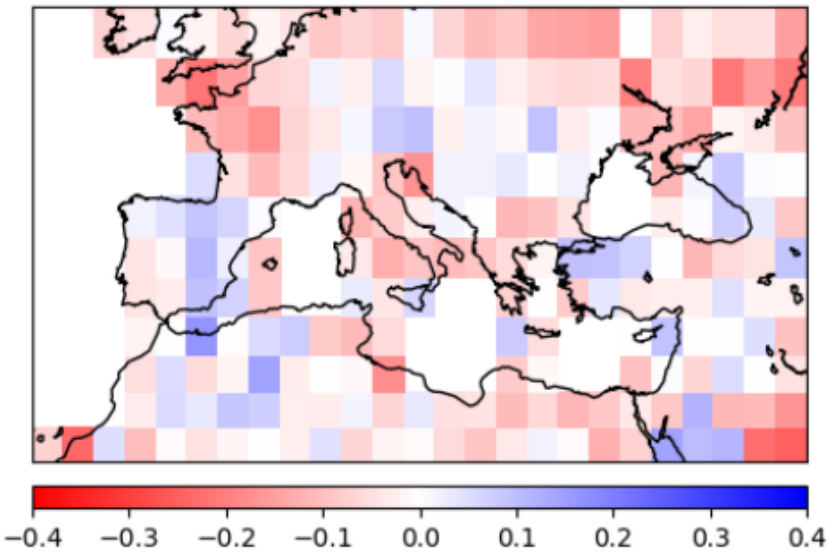
RPSS P AEMET-S2 JAS



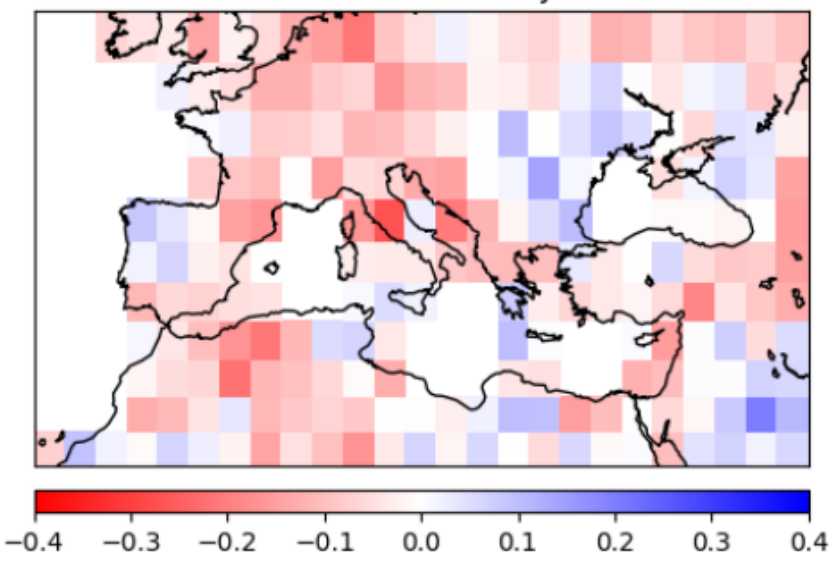
RPSS P UKMO-S13 JAS



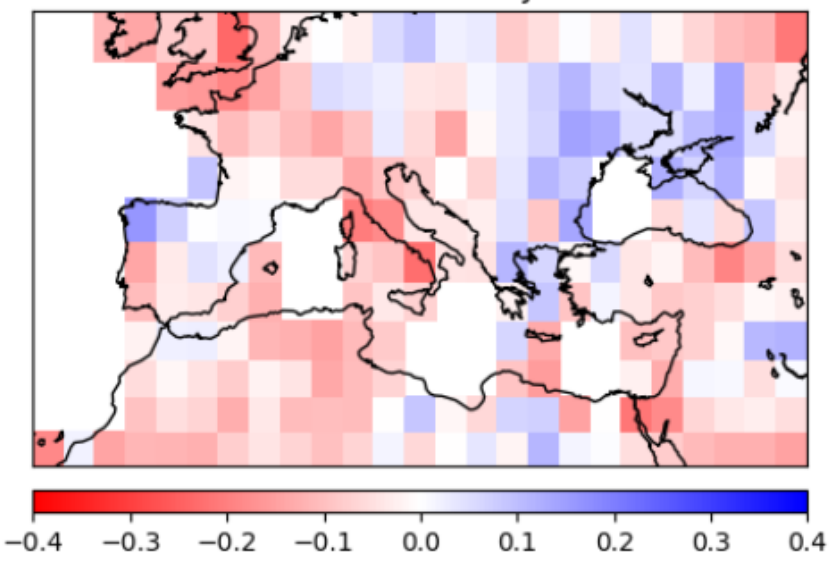
RPSS P MF-S6 JAS



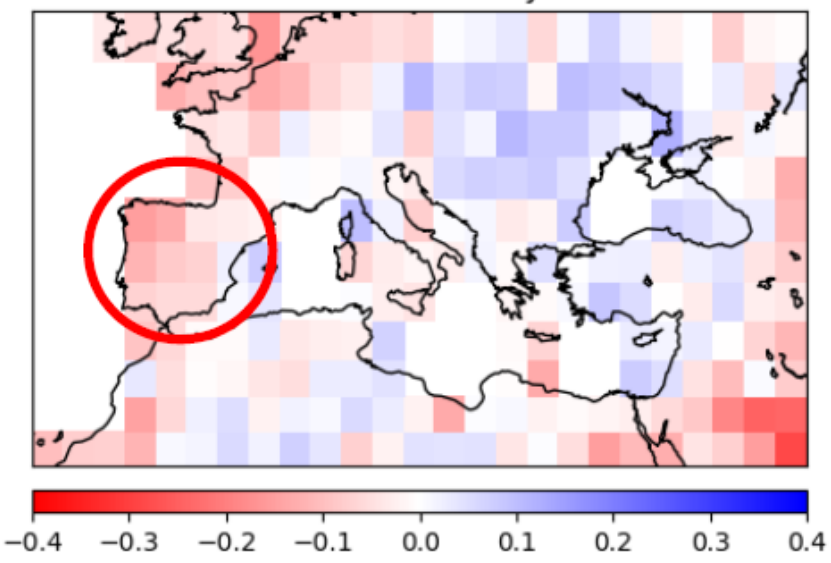
RPSS P ECMWF-S5 JAS

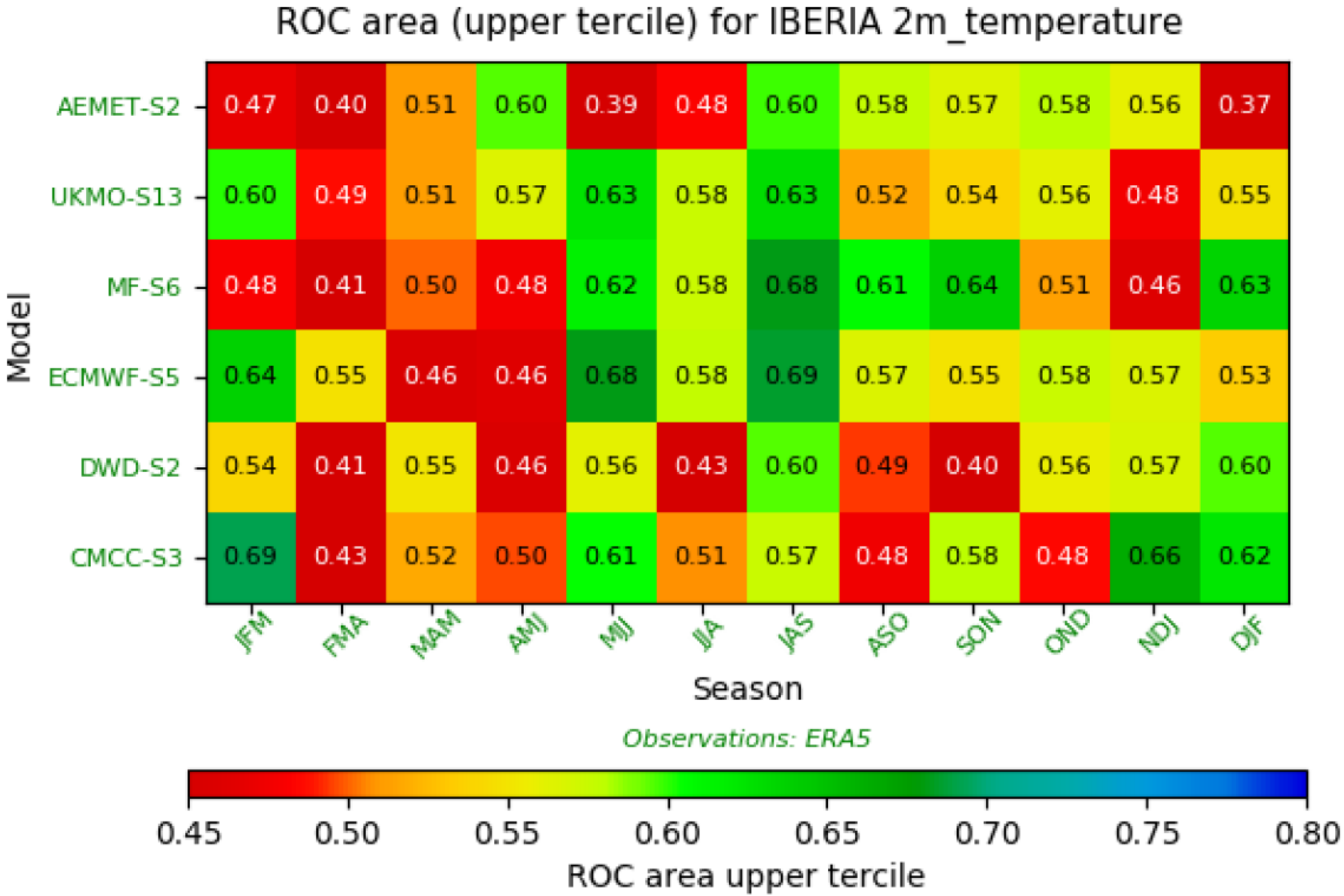


RPSS P DWD-S2 JAS



RPSS P CMCC-S3 JAS



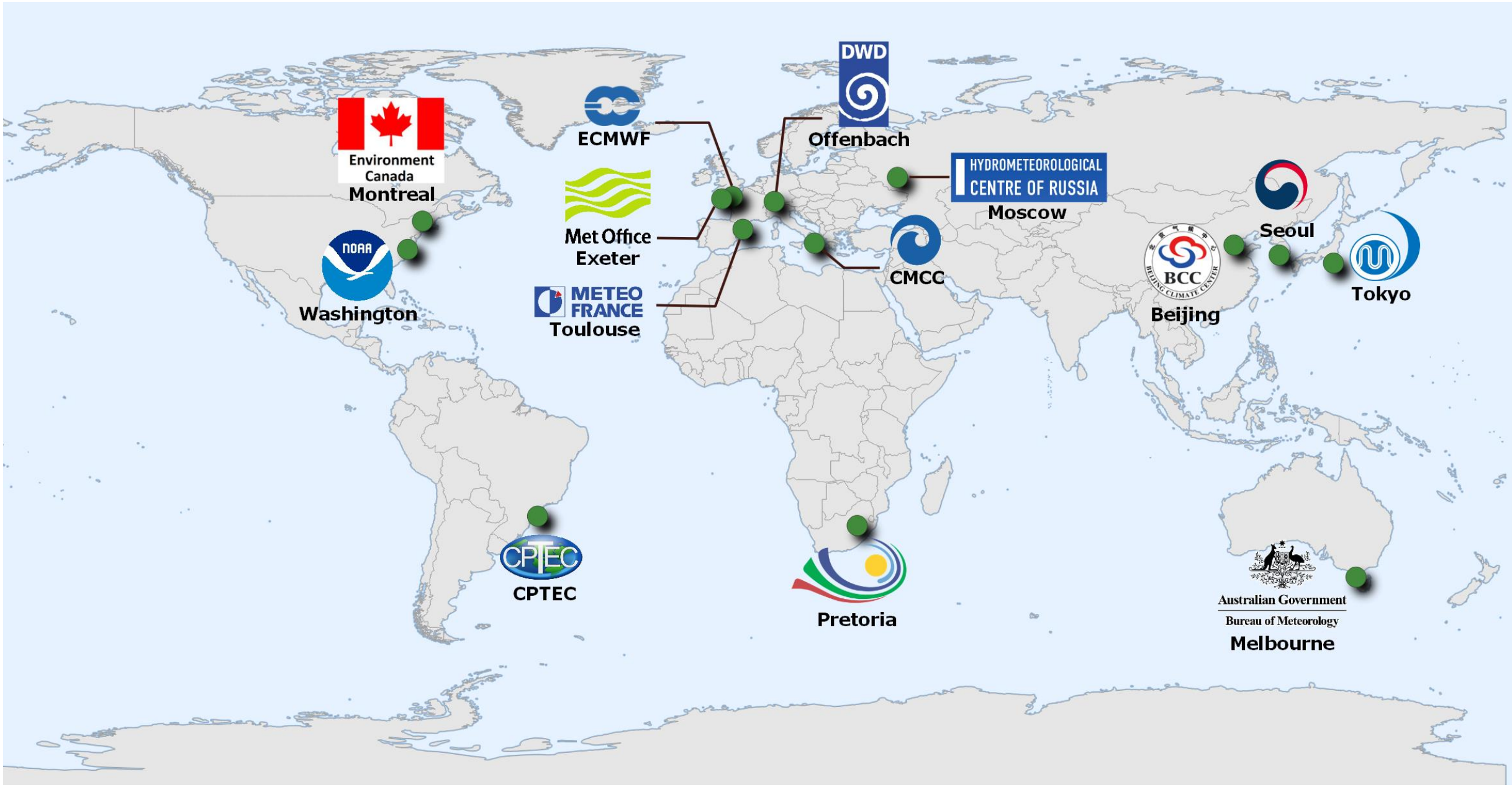

ROC area (upper tercile) for IBERIA 2m_temperature
AEMET-S2 0.47 0.40 0.51 0.60 0.39 0.48 0.60 0.58 0.57 0.58 0.56 0.37
UKMO-S13 0.60 0.49 0.51 0.57 0.63 0.58 0.63 0.52 0.54 0.56 0.48 0.55
MF-S6 0.48 0.41 0.50 0.48 0.62 0.58 0.68 0.61 0.64 0.51 0.46 0.63
ECMWF-S5 0.64 0.55 0.46 0.46 0.68 0.58 0.69 0.57 0.55 0.58 0.57 0.53
DWD-S2 0.54 0.41 0.55 0.46 0.56 0.43 0.60 0.49 0.40 0.56 0.57 0.60
CMCC-S3 0.69 0.43 0.52 0.50 0.61 0.51 0.57 0.48 0.58 0.48 0.66 0.62
Model
JFM FMA MAM AMJ MJJ JJA JAS ASO SON OND NDJ DJF
Season
Observations: ERA5
0.45 0.50 0.55 0.60 0.65 0.70 0.75 0.80
ROC area upper tercile

¿Cómo abordar el problema?

¿Cómo abordar el problema?

Centros Productores Globales para Predicción a Largo Plazo (GPC-LRF):
Generación de ensembles de predicción mensuales, hasta 6meses - 1 año

Predicción estacional: centros productores



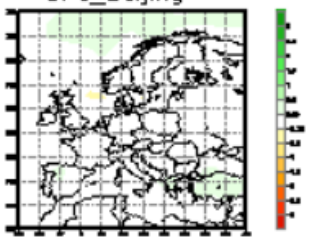
https://wmolc.org/

lat=30 75
lon=345 400

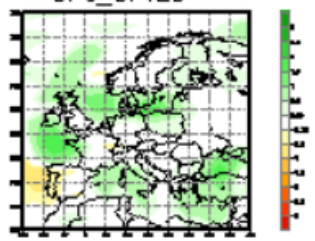
Precipitation : SON2018

(issued on Aug2018) [Unit: mm/day]

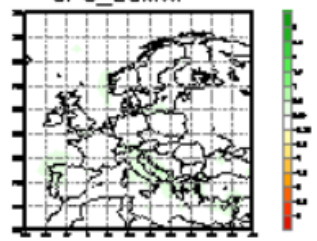
GPC_Beijing



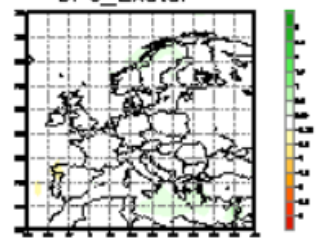
GPC_CPTEC



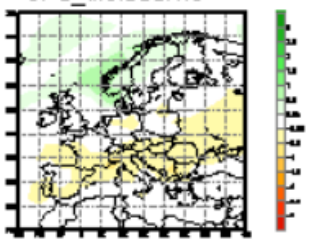
GPC_ECMWF



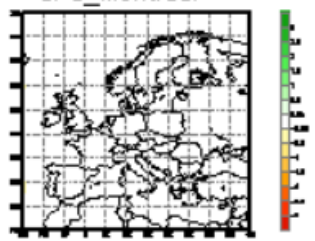
GPC_Exeter



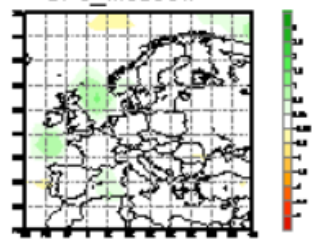
GPC_Melbourne



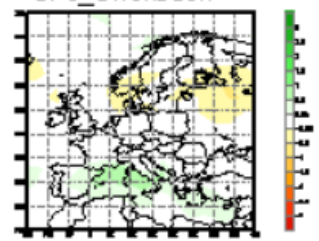
GPC_Montreal



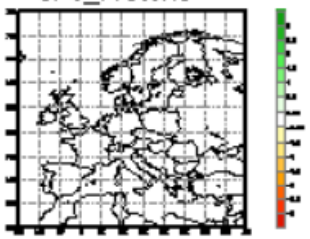
GPC_Moscow



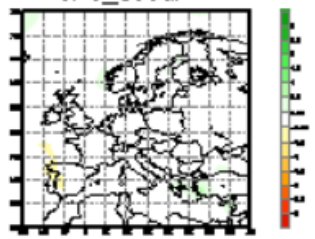
GPC_Offenbach



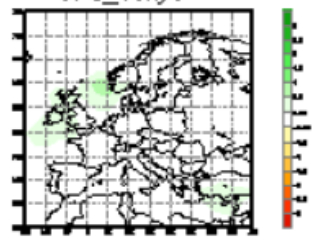
GPC_Pretoria



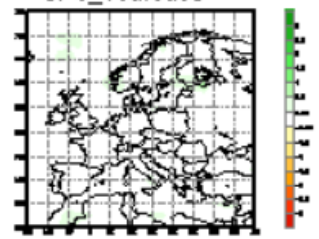
GPC_Seoul



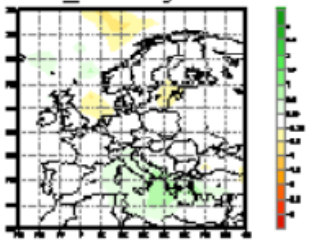
GPC_Tokyo



GPC_Toulouse



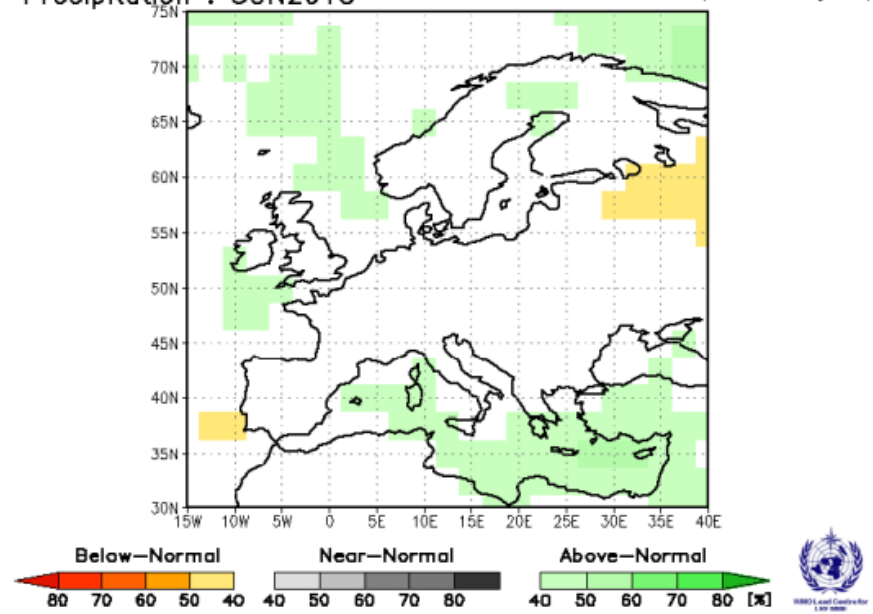
GPC_Washington



Probabilistic Multi-Model Ensemble Forecast

/GPC_seoul/GPC_washington/GPC_tokyo/GPC_exeter/GPC_moscow/GPC_beijing
/GPC_melbourne/GPC_cptec/GPC_pretoria/GPC_montreal/GPC_ecmwf/GPC_offenbach

Precipitation : SON2018 (issued on Aug2018)



C3S 8 modelos

Climate Change

C3S seasonal predictions– graphical products

Publication schedule:

- monthly updates
- on the 13th of each month

Parameters

- [ ] MSLP (8)
- [ ] SST (16)
- [ ] T2m (8)
- [ ] T850 (8)
- [ ] geopotential height 500hPa (8)
- [ ] precipitation (8)
- [ ] zonal wind 10hPa (6)

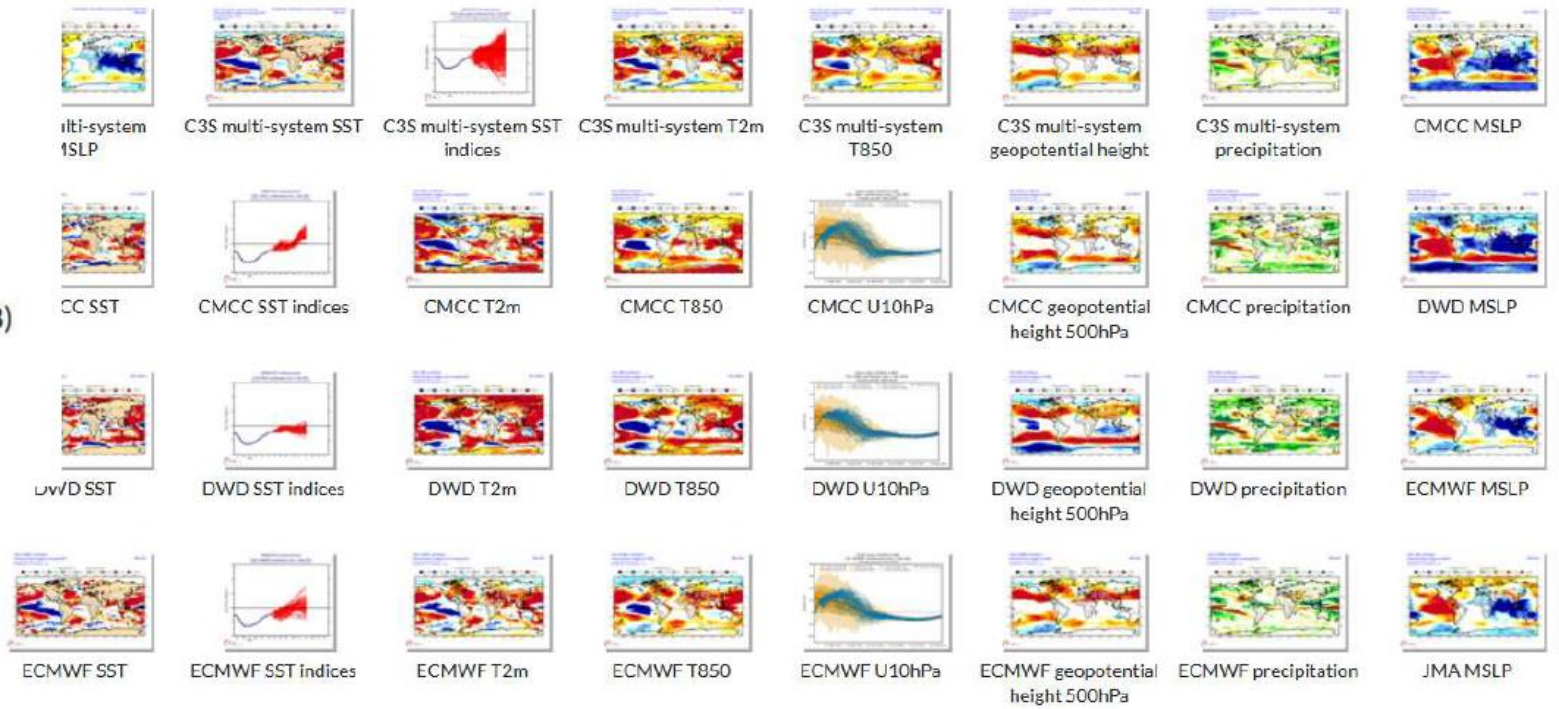
Plot type

- [ ] Maps (48)
- [ ] Time series (14)

Centres

ng items

applied



PROGRAMME OF THE EUROPEAN UNION

Europe's eyes on Earth

IMPLEMENTED BY ECMWF

http://climate.copernicus.eu/charts/c3s_seasonal/

C3S:
-Actualmente 8 modelos
-Repredicciones para el período 1993-2016
-Ejecución mensual
-Alcance de 6 meses
-Datos diarios y agregaciones 3 meses disponibles en el CDS

http://climate.copernicus.eu/charts/c3s_seasonal/

https://cds.climate.copernicus.eu/#!/home

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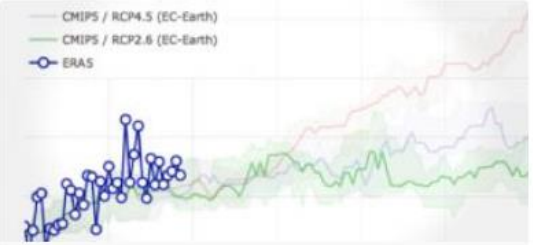
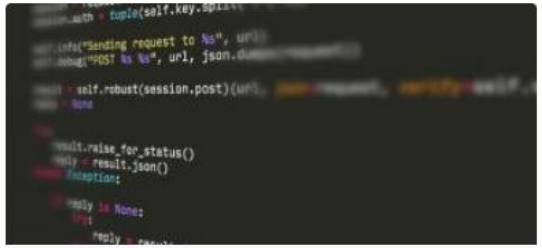
Enter search term(s) | All | Search



Climate Data Store **Toolbox**



Climate Data Store **API**

Access the **ECMWF Support Portal**

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Surname

Country

- Select a value -

Sector

- Select a value -

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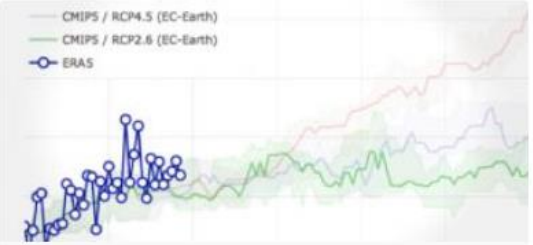
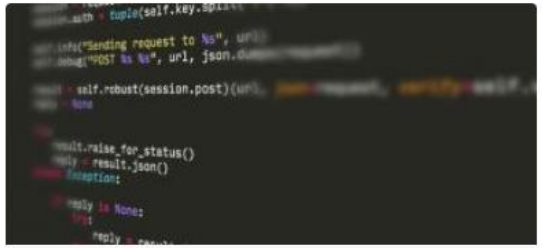
Enter search term(s) | All | Search



Climate Data Store **Toolbox**



Climate Data Store **API**

Access the **ECMWF Support Portal**

Search results

Search dataset

Sort by

Relevancy

Title

Product type

- Climate indices (3)
- Climate projections (35)
- In-situ observations (13)
- Reanalysis (40)
- Satellite observations (37)
- Seasonal forecasts (11)

Variable domain

Spatial coverage

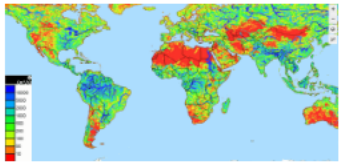
Temporal coverage

Sector

Provider

All | Applications | Datasets | Providers

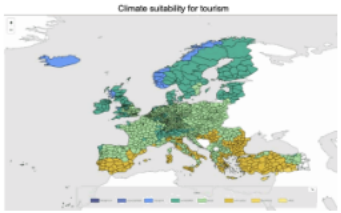
Essential climate variables for water sector applications derived from climate projections



Dataset | Climate projections | Global | Atmosphere (surface)

This dataset contains 4 Essential Climate Variables (ECV) for the 18 bias adjusted Global Climate Models (GCM) from CMIP5: daily precipitation rate, and daily mean, maximum and minimum temperatures. The data are bias adjusted using the Distribution Based Scaling (DBS) method versus the global reference dataset HydroGFD2.0, both bias adjustment method and global reference dataset developed by the...

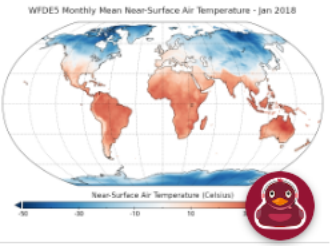
Climate suitability indicators for tourism from 1970 to 2100 over Europe derived from climate projections



Dataset | Tourism | Europe | Land (biosphere) | Climate projections

This dataset provides a set of climate suitability indicators for tourism in Europe under future climate scenarios. These indicators have been tailored for two different kinds of tourism activities; urban and beach tourism. The climatic suitability indicators consist of two indices; the Holiday Climate Index (HCI) rates the climate resources based on activities associated with urban tourism, whil...

Near surface meteorological variables from 1979 to 2019 derived from bias-corrected reanalysis



Dataset | Global | Atmosphere (surface)

This dataset provides bias-corrected reconstruction of near-surface meteorological variables derived from the fifth generation of the European Centre for Medium-Range Weather Forecasts (ECMWF) atmospheric reanalyses (ERA5). It is intended to be used as a meteorological forcing dataset for land surface and hydrological models. The dataset has been obtained using the same methodology used to deriv...

...ations of meteorological variables from the Integrated Global Radiosounding Archive and the

Search results

ERA5

Sort by

Relevancy

Title

Product type

- Climate indices (3)
- Climate projections (10)
- In-situ observations (2)
- Reanalysis (30)

Variable domain

- Atmosphere (surface) (10)
- Atmosphere (upper air) (10)
- Land (biosphere) (6)
- Land (hydrology) (7)
- Ocean (physics) (3)

Spatial coverage

- Europe (9)
- Global (17)

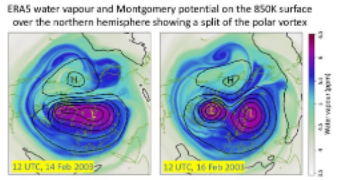
Temporal coverage

- Future (3)

All | Applications | Datasets | Providers

Showing 1-20 of 30 results for **ERA5** x **Reanalysis** x

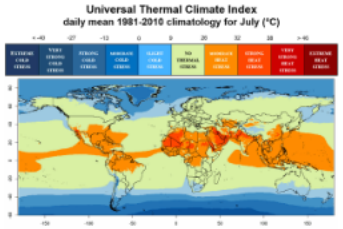
Complete ERA5 global atmospheric reanalysis



Dataset | Atmosphere (surface) | Atmosphere (upper air) | Global | Reanalysis

ERA5 is the fifth generation ECMWF atmospheric reanalysis of the global climate covering the period from January 1940 to present1. It is produced by the Copernicus Climate Change Service (C3S) at ECMWF and provides hourly estimates of a large number of atmospheric, land and oceanic climate variables. The data cover the Earth on a 31km grid and resolve the atmosphere using 137 levels from the surfa...

Thermal comfort indices derived from ERA5 reanalysis

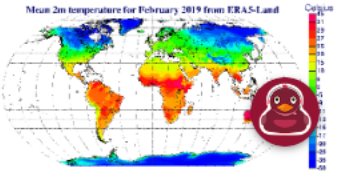


Dataset | Reanalysis | Global

This dataset provides a complete historical reconstruction for a set of indices representing human thermal stress and discomfort in outdoor conditions. This dataset, also known as ERA5-HEAT (Human thErmAl comforT) represents the current state-of-the-art for bioclimatology data record production. The dataset is organised around two main variables: the mean radiant temperature (MRT) the universal t...

Updated 2023-09-06

ERA5-Land hourly data from 1950 to present



Dataset | Reanalysis | Global | Land (hydrology) | Land (biosphere)

ERA5-Land is a reanalysis dataset providing a consistent view of the evolution of land variables over several decades at an enhanced resolution compared to ERA5. ERA5-Land has been produced by replaying the land component of the ECMWF ERA5 climate reanalysis. Reanalysis combines model data with observations from across the world into a globally complete and consistent dataset using the laws of phy...

Updated 2023-09-07

ERA5 monthly averaged data on single levels from 1940 to present

Overview | Download data | Quality assessment | Documentation

Clear all

Product type

At least one selection must be made

- [ ] Monthly averaged reanalysis
- [ ] Monthly averaged ensemble members
- [ ] Monthly averaged reanalysis by hour of day
- [ ] Monthly averaged ensemble members by hour of day

Select all

Variable

At least one selection must be made

Popular

- [ ] 10m u-component of wind
- [ ] 10m v-component of wind
- [ ] 2m dewpoint temperature
- [ ] 2m temperature
- [ ] Mean sea level pressure
- [ ] Mean wave direction
- [ ] Mean wave period
- [ ] Sea surface temperature
- [ ] Significant height of combined wind waves and swell
- [ ] Surface pressure
- [ ] Total precipitation

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Temperature and pressure

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Publication date

2019-04-18

Resource updated

2023-09-06

References

Citation

Acknowledgement

DOI: 10.24381/cds.f17050d7

Related data

ERA5 hourly data on pressure levels from 1940 to pre

ERA5 hourly data on pressure levels from 1950 to 1978

Correo :: Entrada | ECMWF | Charts | ORAS5 global ocean reana | Global Producing Centres | Search results | ERA5 monthly averaged da | Daily statistics calculated f | Resampling and aggregati

cds.climate.copernicus.eu/cdsapp#!/dataset/reanalysis-era5-single-levels-monthly-means?tab=form

Concept_note.docx... | Empleo público - M... | Resultados de Loter... | Prime Video | GSD Intranet | Campus Virtual "Au... | Beautiful Weather... | My Other Me Me-2... | Alexia - Visión gene... | Sky Sport F1 Live St... | Núcleo Rural Tixileir... | Let there be lights!... | Otros marcadores

Select all Clear all

Year

☑ 1940	☑ 1941	☑ 1942	☑ 1943	☑ 1944	☑ 1945
☑ 1946	☑ 1947	☑ 1948	☑ 1949	☑ 1950	☑ 1951
☑ 1952	☑ 1953	☑ 1954	☑ 1955	☑ 1956	☑ 1957
☑ 1958	☑ 1959	☑ 1960	☑ 1961	☑ 1962	☑ 1963
☑ 1964	☑ 1965	☑ 1966	☑ 1967	☑ 1968	☑ 1969
☑ 1970	☑ 1971	☑ 1972	☑ 1973	☑ 1974	☑ 1975
☑ 1976	☑ 1977	☑ 1978	☑ 1979	☑ 1980	☑ 1981
☑ 1982	☑ 1983	☑ 1984	☑ 1985	☑ 1986	☑ 1987
☑ 1988	☑ 1989	☑ 1990	☑ 1991	☑ 1992	☑ 1993
☑ 1994	☑ 1995	☑ 1996	☑ 1997	☑ 1998	☑ 1999
☑ 2000	☑ 2001	☑ 2002	☑ 2003	☑ 2004	☑ 2005
☑ 2006	☑ 2007	☑ 2008	☑ 2009	☑ 2010	☑ 2011
☑ 2012	☑ 2013	☑ 2014	☑ 2015	☑ 2016	☑ 2017
☑ 2018	☑ 2019	☑ 2020	☑ 2021	☑ 2022	☐ 2023

Clear all

Month

☐ January	☐ February	☐ March	☐ April	☐ May	☐ June
☐ July	☐ August	☐ September	☑ October	☑ November	☑ December

Select all Clear all

Time

☑ 00:00	☐ 01:00	☐ 02:00	☐ 03:00	☐ 04:00	☐ 05:00
☐ 06:00	☐ 07:00	☐ 08:00	☐ 09:00	☐ 10:00	☐ 11:00
☐ 12:00	☐ 13:00	☐ 14:00	☐ 15:00	☐ 16:00	☐ 17:00
☐ 18:00	☐ 19:00	☐ 20:00	☐ 21:00	☐ 22:00	☐ 23:00

Select all Clear all

Geographical area

If you use the CDS-API, how satisfied are you with it? (1-very unsatisfied, 5-very satisfied).

★★★★★

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23°C Mayorm. nublado

Búsqueda

9:57 07/09/2023

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cds.climate.copernicus.eu/cdsapp#!/dataset/reanalysis-era5-single-levels-monthly-means?tab=form

Concept_note.docx... | Empleo público - M... | Resultados de Loter... | Prime Video | GSD Intranet | Campus Virtual "Au... | Beautiful Weather... | My Other Me Me-2... | Alexia - Visión gene... | Sky Sport F1 Live St... | Núcleo Rural Tixileir... | Let there be lights!... | Otros marcadores

○ GRIB ◉ NetCDF (experimental)

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Hide API request | Show Toolbox request | Submit

Please go to the documentation page for information as to how to use the CDS API.

```
import cdsapi

c = cdsapi.Client()

c.retrieve(
    'reanalysis-era5-single-levels-monthly-means',
    {
        'format': 'netcdf',
        'product_type': 'monthly_averaged_reanalysis',
        'variable': [
            '2m_temperature', 'mean_sea_level_pressure',
        ],
        'year': [
            '1940', '1941', '1942',
            '1943', '1944', '1945',
            '1946', '1947', '1948',
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            '1964', '1965', '1966',
            '1967', '1968', '1969',
            '1970', '1971', '1972',
            '1973', '1974', '1975',
            '1976', '1977', '1978',
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            '1982', '1983', '1984',
            '1985', '1986', '1987',
            '1988', '1989', '1990',
            '1991', '1992', '1993',
            '1994', '1995', '1996',
```

Abajo se crea un trozo de código que, al pegarlo y ejecutarlo en entorno Python, realiza una petición de datos igual a la que hemos generado mediante el menú web. Esto permite automatizar la descarga.

23°C Mayorm. nublado | Búsqueda | 9:57 07/09/2023

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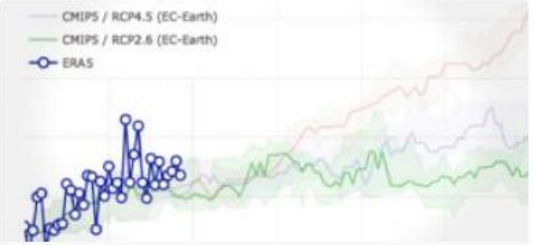
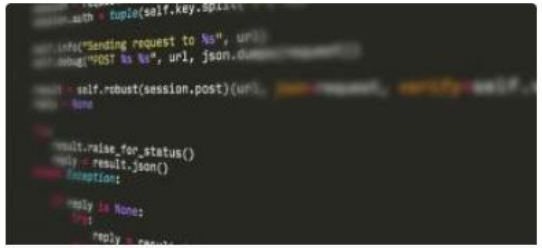


Climate Data Store **Toolbox**



Climate Data Store **API**

Access the **ECMWF Support Portal**

How to use the CDS API

The **Climate Data Store (CDS) Application Program Interface (API)** is a service providing programmatic access to CDS data. In this page you will find explanations and examples showing how to use the CDS API.

For troubleshooting, check Common Error Messages for CDS Requests

For Windows users, please read How to install and use CDS API on Windows

For macOS users, please read How to install and use CDS API on macOS

For linux users, please proceed as follows:

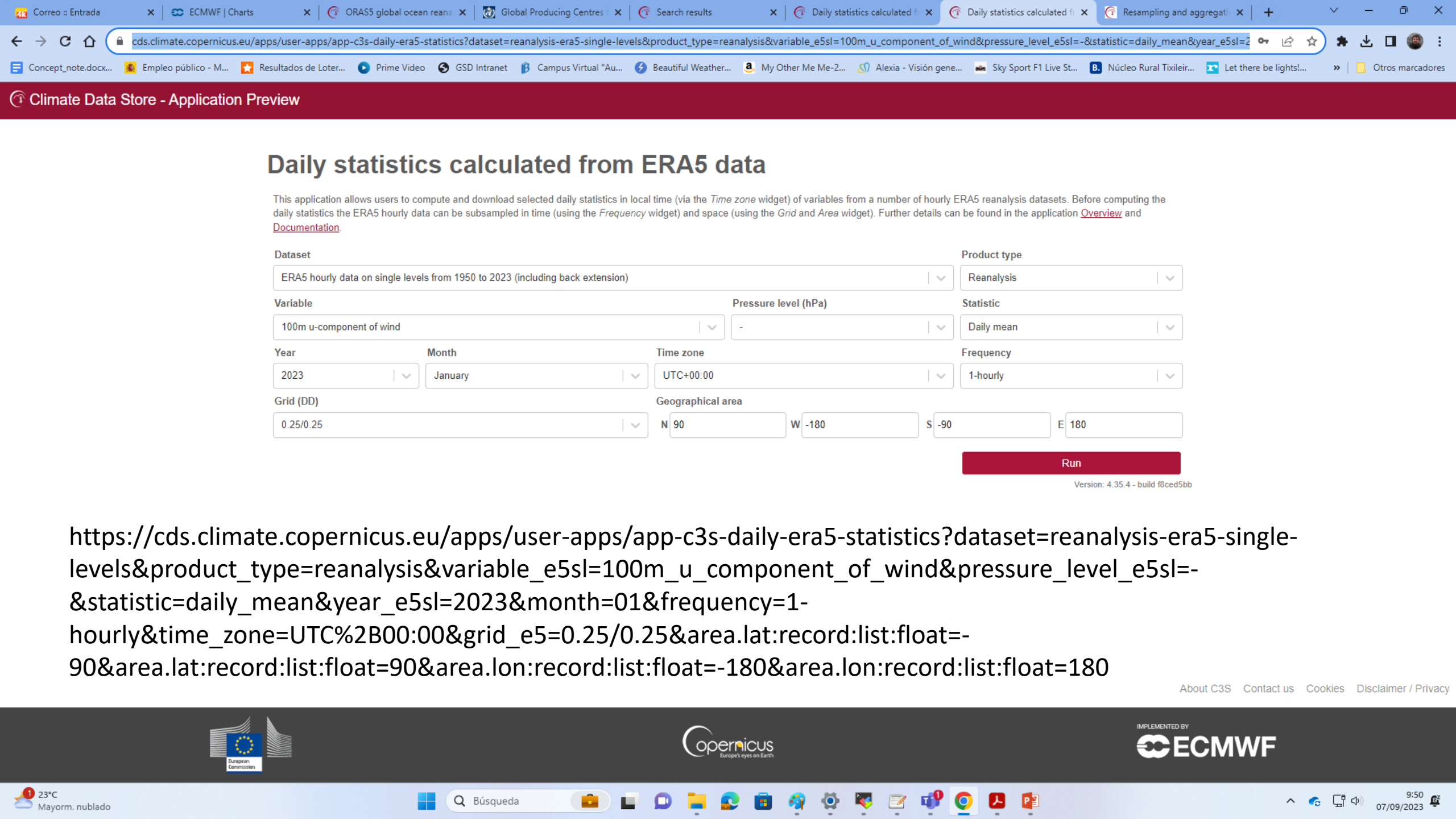
1. Install the CDS API key
2. Install the CDS API client
3. Use the CDS API client for data access

Install the CDS API key

1. If you don't have an account, please self register at the CDS registration page and go to the steps below.
2. If you are not logged, please login and go to the step below.
3. Copy the code displayed beside, in the file **$HOME/.cdsapirc** *(in your Unix/Linux environment).*

```
url: https://cds.climate.copernicus.eu/api/v2
key: 24620:2c21d682-ae46-4170-a6e0-156e973bb3c1
```

Install the CDS API client


Correo :: Entrada
ECMWF | Charts
ORAS5 global ocean reana
Global Producing Centres
Search results
Daily statistics calculated fr
Daily statistics calculated fr
Resampling and aggregati
cds.climate.copernicus.eu/apps/user-apps/app-c3s-daily-era5-statistics?dataset=reanalysis-era5-single-levels&product_type=reanalysis&variable_e5sl=100m_u_component_of_wind&pressure_level_e5sl=-&statistic=daily_mean&year_e5sl=2
Concept_note.docx...
Empleo público - M...
Resultados de Loter...
Prime Video
GSD Intranet
Campus Virtual "Au...
Beautiful Weather...
My Other Me Me-2...
Alexia - Visión gene...
Sky Sport F1 Live St...
Núcleo Rural Tixileir...
Let there be lights!...
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Climate Data Store - Application Preview
Daily statistics calculated from ERA5 data
This application allows users to compute and download selected daily statistics in local time (via the Time zone widget) of variables from a number of hourly ERA5 reanalysis datasets. Before computing the daily statistics the ERA5 hourly data can be subsampled in time (using the Frequency widget) and space (using the Grid and Area widget). Further details can be found in the application Overview and Documentation.
Dataset
ERA5 hourly data on single levels from 1950 to 2023 (including back extension)
Product type
Reanalysis
Variable
100m u-component of wind
Pressure level (hPa)
-
Statistic
Daily mean
Year
2023
Month
January
Time zone
UTC+00:00
Frequency
1-hourly
Grid (DD)
0.25/0.25
Geographical area
N 90
W -180
S -90
E 180
Run
Version: 4.35.4 - build f8ced5bb
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Product type

- Climate indices (3)
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- Satellite observations (37)
- Seasonal forecasts (11)

Variable domain

- Atmosphere (surface) (6)
- Atmosphere (upper air) (6)
- Land (hydrology) (4)
- Ocean (physics) (1)

Spatial coverage

- Europe (3)
- Global (8)

Temporal coverage

- Future (7)
- Past (9)
- Present (9)

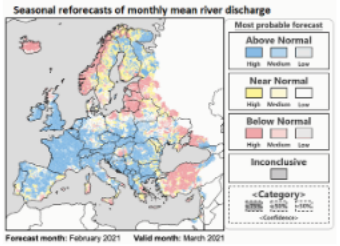
All | Applications | Datasets | Providers

Showing 1-11 of 11 results for **Seasonal forecasts** ×

Multi-model seasonal reforecasts of river discharge for Europe

Dataset | Europe | Seasonal forecasts | Land (hydrology) | Water management

This dataset provides hydrological seasonal reforecasts of monthly mean river discharge across Europe for the period 1993 to 2016. The first is an E-HYPE multi-model system comprising eight model realisations using a catchment-based resolution. The second comprises the E-HYPEgrid, VIC-WUR and LISFLOOD-EFAS hydrological models at a 5km gridded resolution. The initialisation of the hydrological seas...

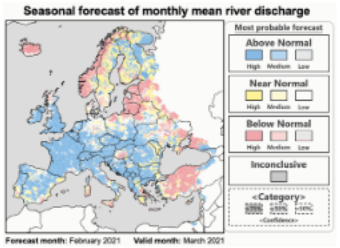


Multi-model seasonal forecasts of river discharge for Europe from January 2021 to present

Dataset | Europe | Seasonal forecasts | Land (hydrology) | Water management

This dataset provides hydrological seasonal forecasts of monthly mean river discharge across Europe. Two hydrological model ensembles are provided. The first is an E-HYPE multi-model system comprising eight model realisations using a catchment-based resolution. The second comprises the E-HYPEgrid, VIC-WUR and EFAS (LISFLOOD) hydrological models at a 5km gridded resolution. The initialisation of th...

Updated 2023-08-13

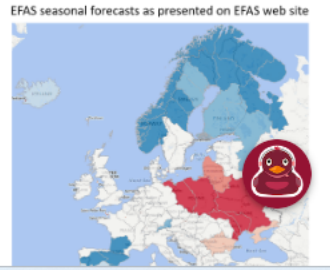


Seasonal forecasts of river discharge and related data by the European Flood Awareness System

Dataset | Seasonal forecasts | Europe | Land (hydrology)

This dataset provides gridded modelled daily hydrological time series forced with seasonal meteorological forecasts. The dataset is a consistent representation of the most important hydrological variables across the European Flood Awareness (EFAS) domain. The temporal resolution is daily forecasts initialised once a month consisting of: River discharge Soil moisture for three soil layers Snow wat...

Updated 2023-07-10



Seasonal forecast monthly statistics on single levels

Overview | Download data | Quality assessment | Documentation

Clear all

Originating centre

At least one selection must be made

- ECMWF
- UK Met Office
- Météo France
- DWD
- CMCC
- NCEP
- JMA
- ECCC

System

At least one selection must be made

- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 12
- 13
- 14
- 15
- 21
- 35
- 51
- 600
- 601
- 602

Variable

- 10m u-component of wind
- 10m v-component of wind
- 10m wind gust since previous post-processing
- 10m wind speed
- 2m dewpoint temperature
- 2m temperature
- East-west surface stress rate of accumulation
- Evaporation
- Maximum 2m temperature in the last 24 hours
- Mean sea level pressure
- Mean sub-surface runoff rate
- Mean surface runoff rate

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Publication date

2018-06-14

Resource updated

2023-09-05

References

Citation

Acknowledgement

DOI: 10.24381/cds.68dd14c3

Related data

Seasonal forecast anomalies on pressure levels

Seasonal forecast anomalies on single levels

Seasonal forecast daily and subdaily data on single levels

Product type

- Ensemble
- Individual members

- [x] Monthly mean
- [ ] Monthly minimum
- [ ] Monthly maximum
- [ ] Monthly standard deviation

Select all Clear all

Select all Clear all

Year

[ ] 1981	[ ] 1982	[ ] 1983	[ ] 1984	[ ] 1985	[ ] 1986
[ ] 1987	[ ] 1988	[ ] 1989	[ ] 1990	[ ] 1991	[ ] 1992
[x] 1993	[ ] 1994	[ ] 1995	[ ] 1996	[ ] 1997	[ ] 1998
[ ] 1999	[ ] 2000	[ ] 2001	[ ] 2002	[ ] 2003	[ ] 2004
[ ] 2005	[ ] 2006	[ ] 2007	[ ] 2008	[ ] 2009	[ ] 2010
[ ] 2011	[ ] 2012	[ ] 2013	[ ] 2014	[ ] 2015	[ ] 2016
[ ] 2017	[ ] 2018	[ ] 2019	[ ] 2020	[ ] 2021	[ ] 2022
[ ] 2023					

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Month

[ ] January	[ ] February	[ ] March	[ ] April	[ ] May	[ ] June
[ ] July	[ ] August	[ ] September	[ ] October	[x] November	[ ] December

Select all Clear all

Leadtime month

[x] 1	[x] 2	[x] 3	[ ] 4
[ ] 5	[ ] 6		

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Format

GRIB

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Hide API request | Show Toolbox request | Submit Form

Please go to the documentation page for information as to how to use the CDS API.

```
import cdsapi

c = cdsapi.Client()

c.retrieve(
    'seasonal-monthly-single-levels',
    {
        'originating_centre': 'ecmwf',
        'system': '5',
        'variable': 'total_precipitation',
        'product_type': 'monthly_mean',
        'year': '1993',
        'month': '11',
        'leadtime_month': [
            '1', '2', '3',
        ],
        'format': 'netcdf',
    },
    'download.nc')
```

https://cds.climate.copernicus.eu/#!/home

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Home Search Datasets Applications Toolbox Support Live

Welcome to the Climate Data Store

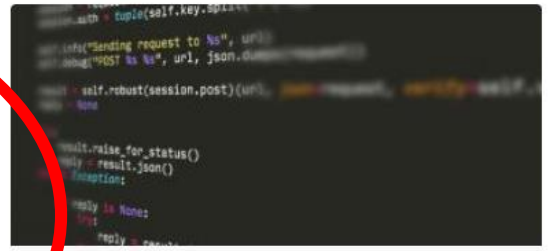
Dive into this wealth of information about the Earth's past, present and future climate.

It is freely available and functions as a one-stop shop to explore climate data. Register for free to obtain access to the CDS and its Toolbox.

We are constantly improving the services and adding new datasets. For latest announcements, watch the posts on the C3S forum.

Enter search term(s) | All | Search

Climate Data Store **Toolbox**

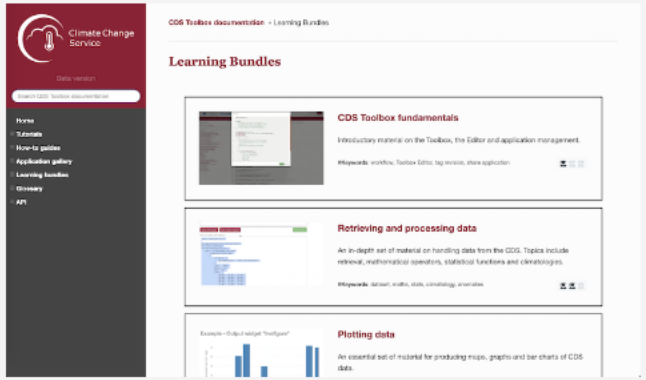


Climate Data Store **API**

Access the **ECMWF Support Portal**

Welcome to the Toolbox

Toolbox Documentation



Access the full set of documentation material, including tutorials, how-to guides and a glossary.

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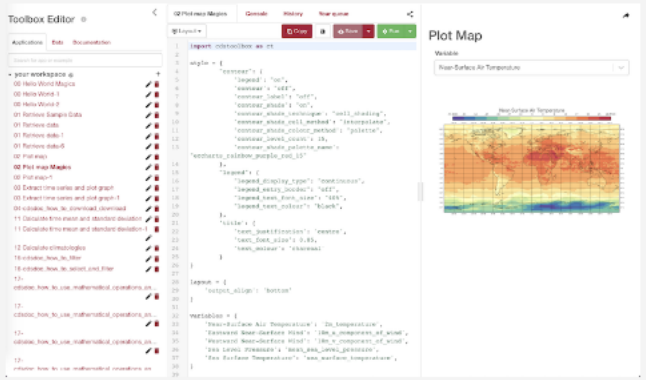

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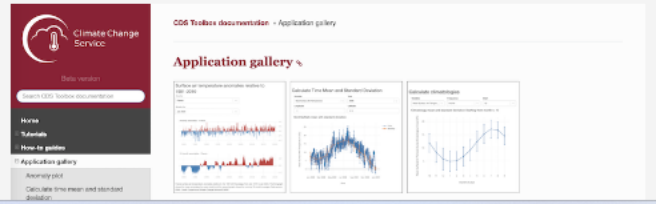

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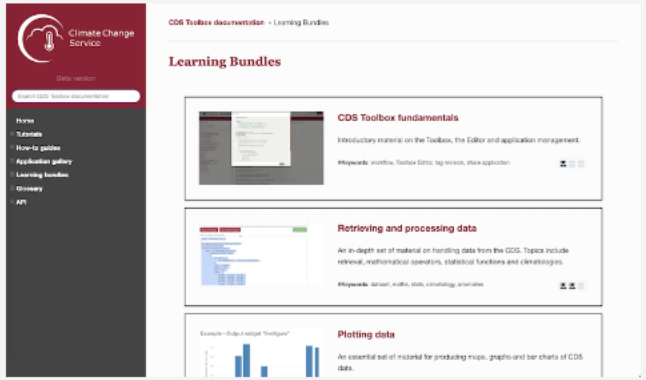

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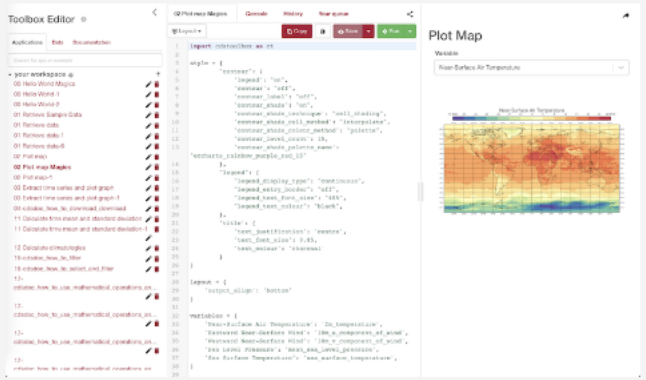

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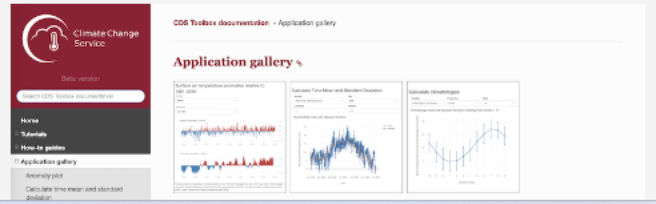

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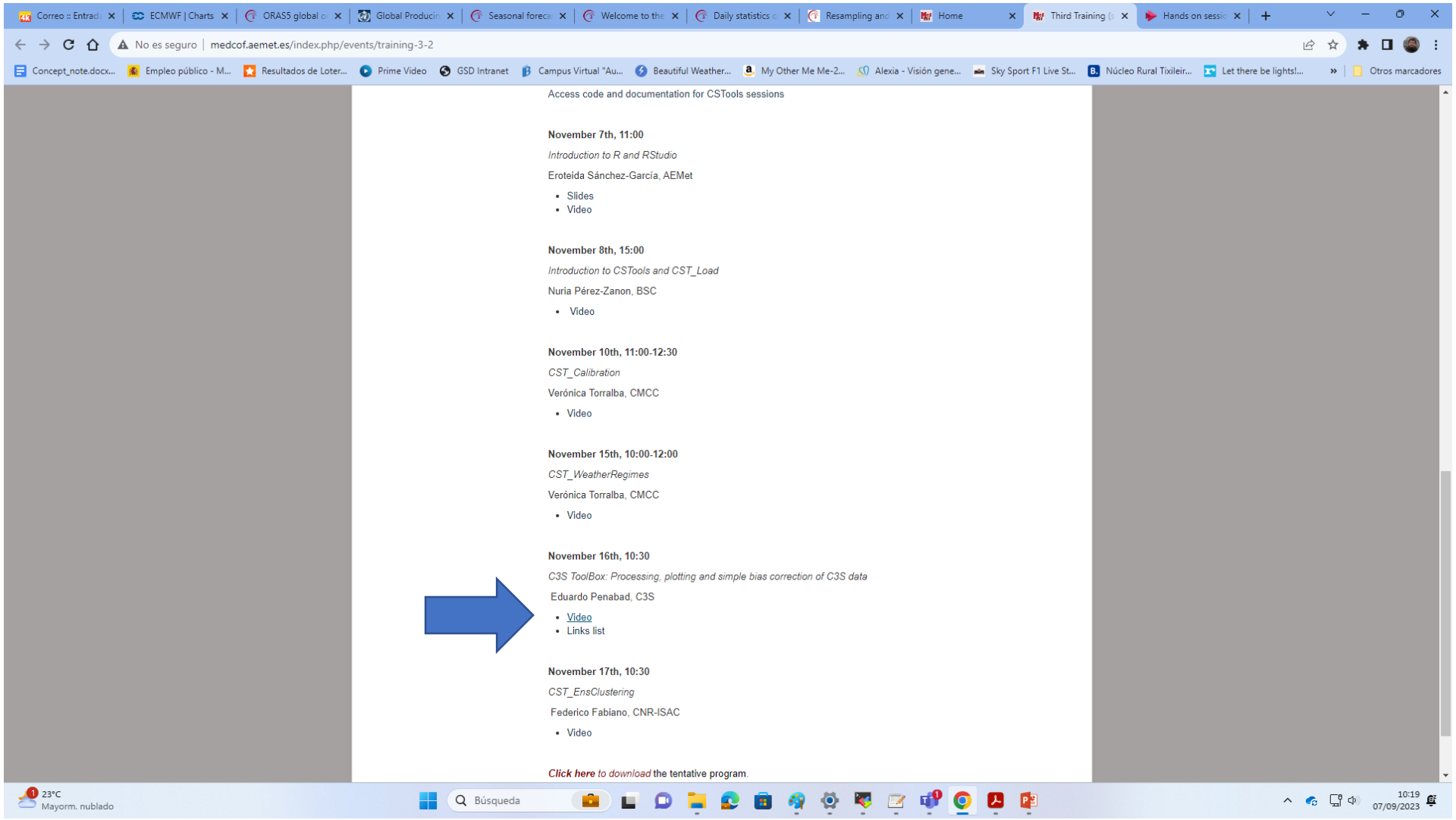


¿Cómo abordar el problema?

Centros Productores Globales para Predicción a Largo Plazo (GPC-LRF):
Generación de ensembles de predicción mensuales, hasta 6meses - 1 año

Centros Regionales de Clima(RCC):
Interpretación de salidas de modelos, postprocesos, elaboración de boletines y predicciones.

Legend

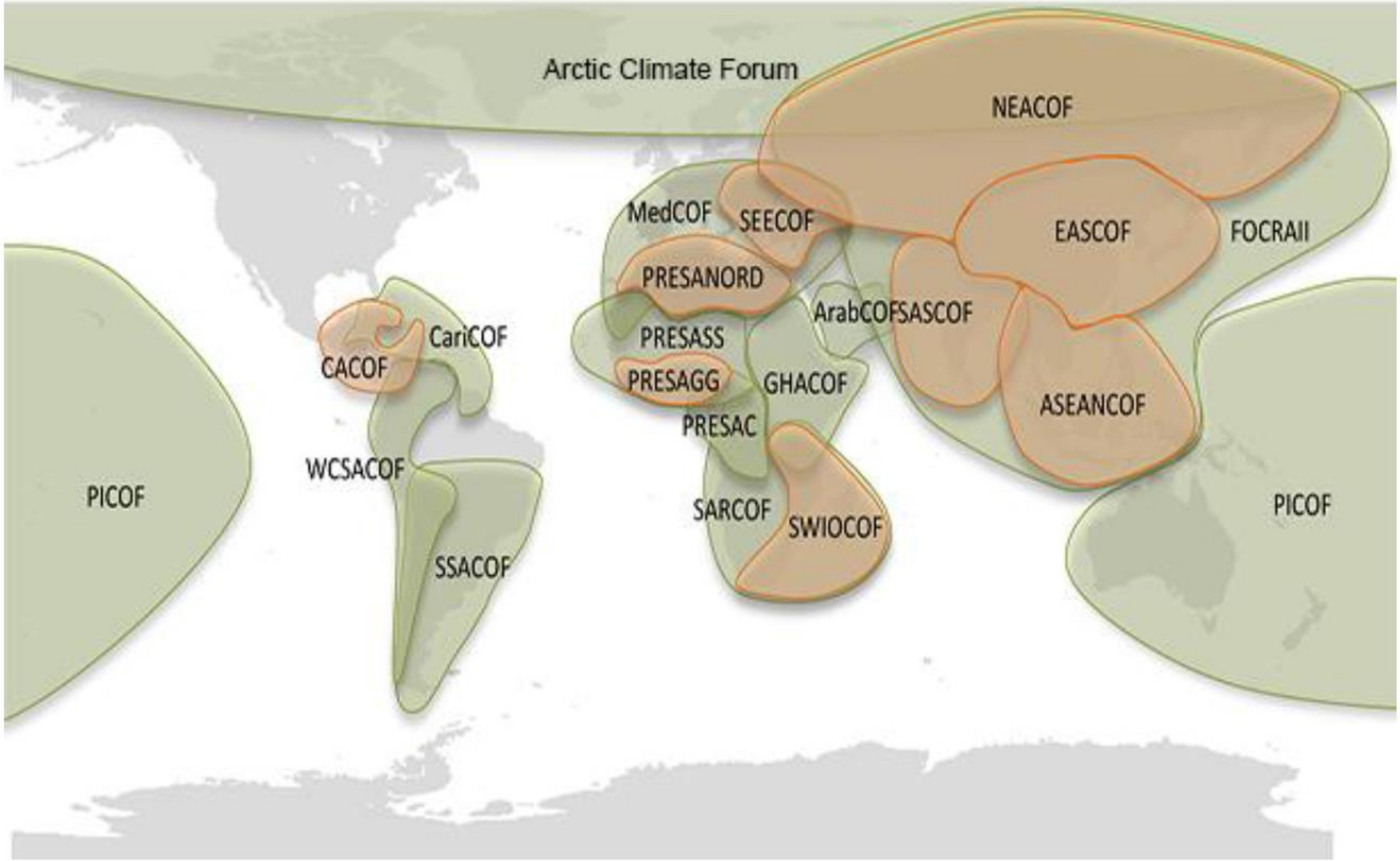
designated RCC
designated RCC-Network
RCC in demonstration phase
RCC-Network in demonstation phase
RCC proposed
RCC-Network proposed

¿Cómo abordar el problema?

Global Producing Centers – Long Range Forecast(GPC-LRF):
Generación de ensembles de predicción mensuales, hasta 6meses - 1 año

Regional Climate Centers (RCCs):
Interpretación de salidas de modelos, postprocesos, elaboración de boletines y predicciones.

Regional Climate Outlook Forums (RCOFs):
Elaboración de predicciones y productos relevantes para usuarios por consenso entre expertos de países de zonas climáticas homogéneas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MedCOF
SEECOF
EASCOF
FOCRAII
PRESANORD
ArabCOF
SASCOF
CariCOF
PRESASS
CACOF
PRESAGG
GHACOF
ASEANCOF
PRESAC
WCSACOF
PICOF
SARCOF
SWIOCOF
PICOF
SSACOF

AEMet

WMO Northern Africa RCC Network

WMO RA VI RCC Network

WMO OMM

MedCOF Mediterranean Climate Outlook Forum

Harmonization of climate predictions

Capacity building

Interaction with users

Supported by WMO infrastructure (GPCs, RCCs, LC LRFMME, ...), C3S, etc.

Co-operation between WMO RA I and RAVI

Typical MedCOF session
- PreCOF (CB)
- Verification
- Monitoring
- Consensus forecast
- Interaction with users

Help to bridge gap btw CSs research and users

ERA4CS MEDSCOPE: scientific arm of MedCOF

Typical MedCOF session

- PreCOF (CB)
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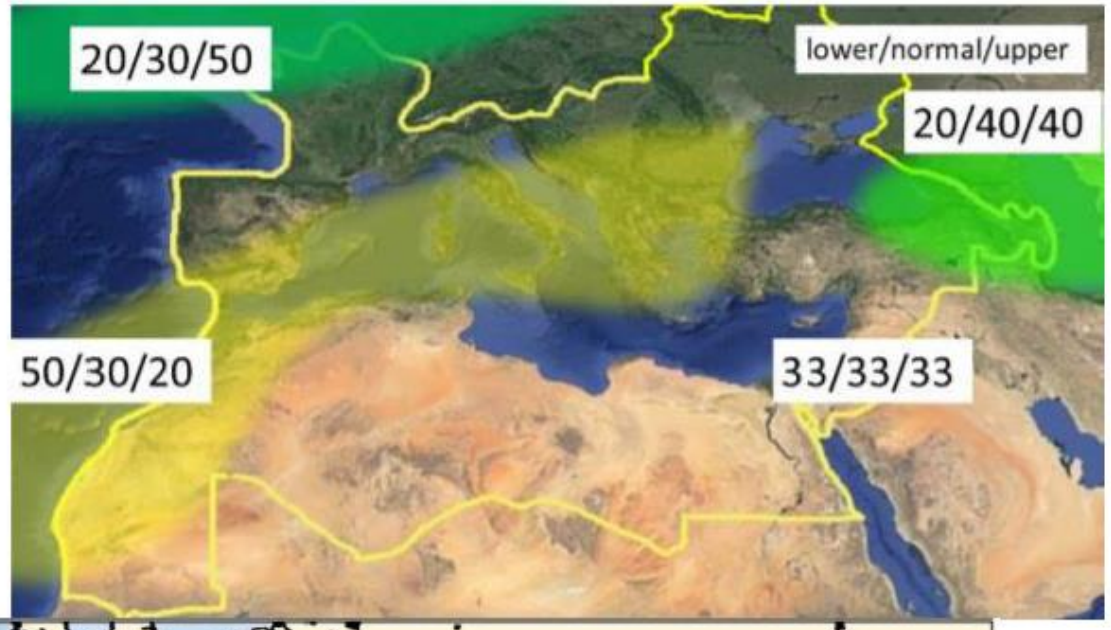
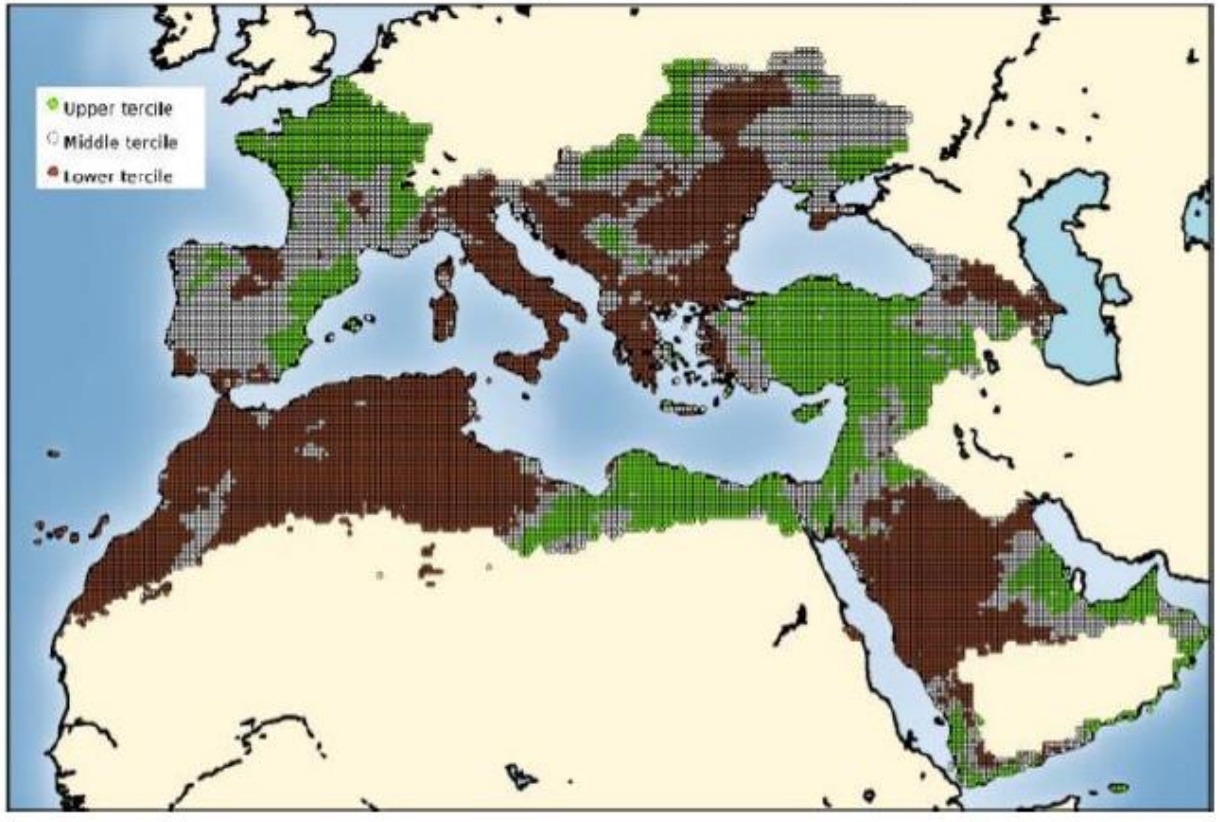
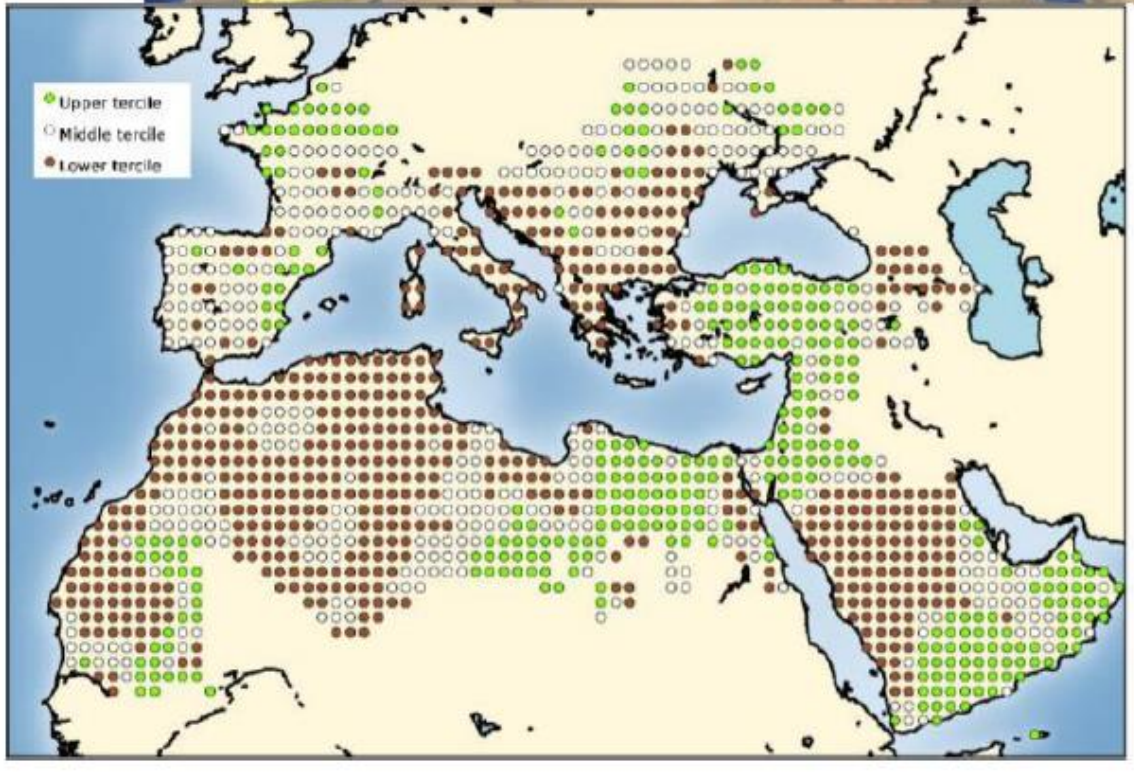


PRECIPITATION DJF 2019-2020 (ERA-Interim data)
(reference period 1981-2010)



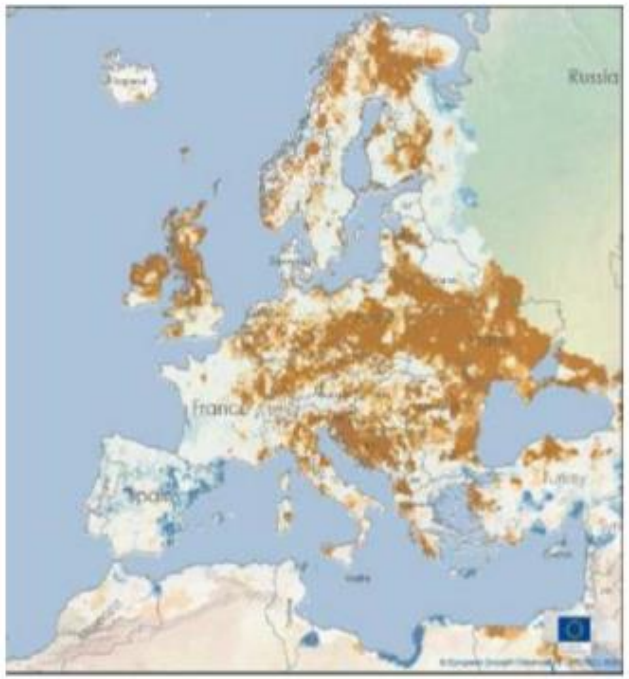


Typical MedCOF session

- PreCOF (CB)
- Verification
- **Monitoring**
- Consensus forecast
- Interaction with users

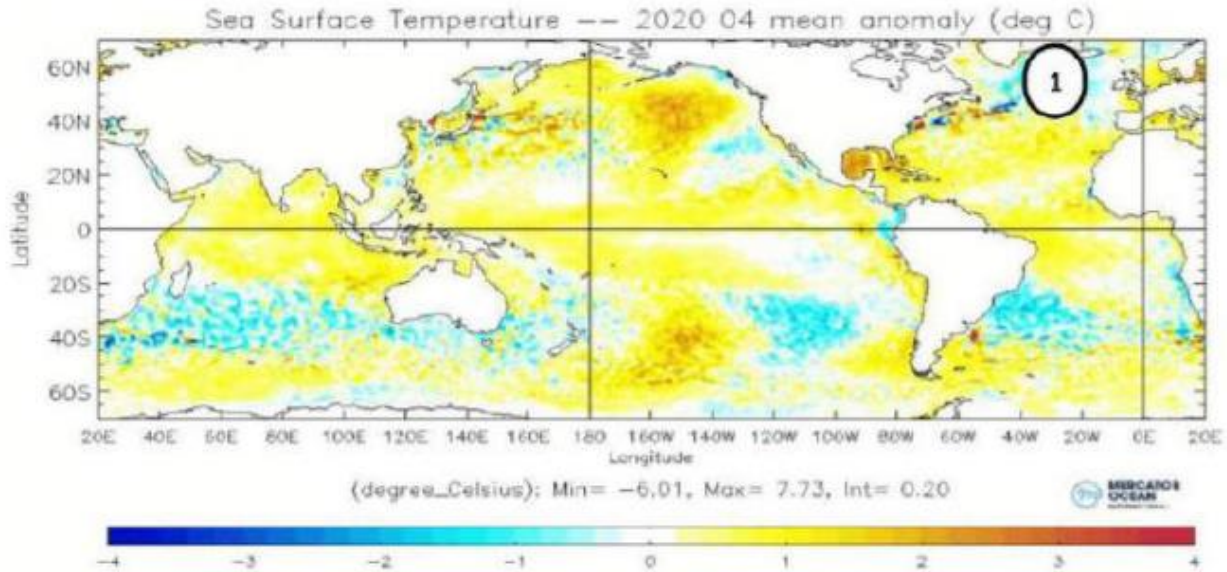
5. Soil moisture

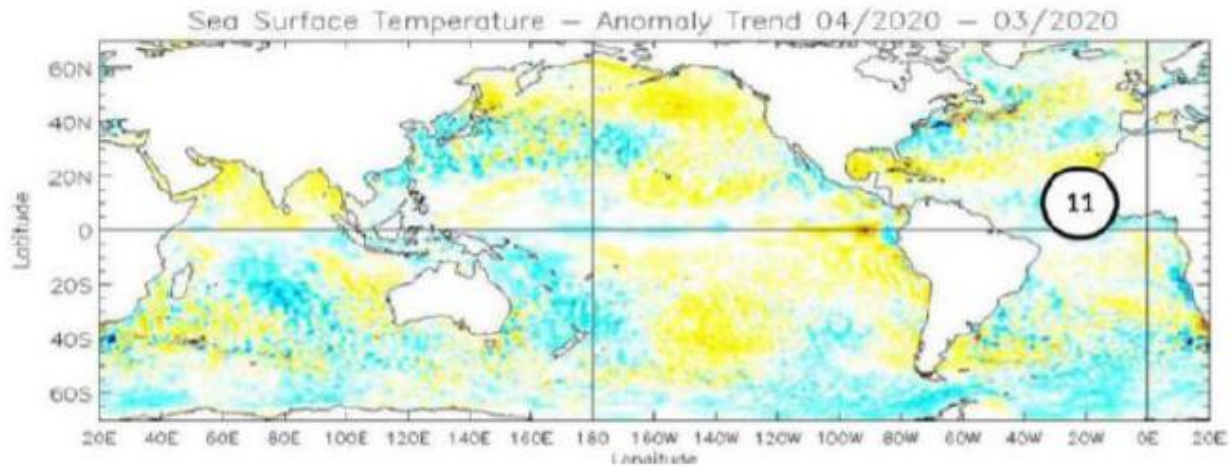
In those parts of the domain, where precipitation was very low, the upper layers of soil dried out considerably during April 2020. In early May 2020, soil moisture was below normal particularly in parts of Italy, the northern Balkans and parts of Eastern Europe (Fig. 5). A dry soil has less potential evaporation, which causes a lower latent heat flux into the atmosphere, and therefore less cooling of the soil and near surface air by evaporation. This means that low soil moisture can amplify positive surface air temperature anomalies, even in the following summer, causing increased risk of heatwaves.



Over the Mediterranean and Black Sea:

- The western Mediterranean had above-normal temperatures in April, while the eastern Mediterranean temperatures were around normal. The Black Sea was warmer than normal.



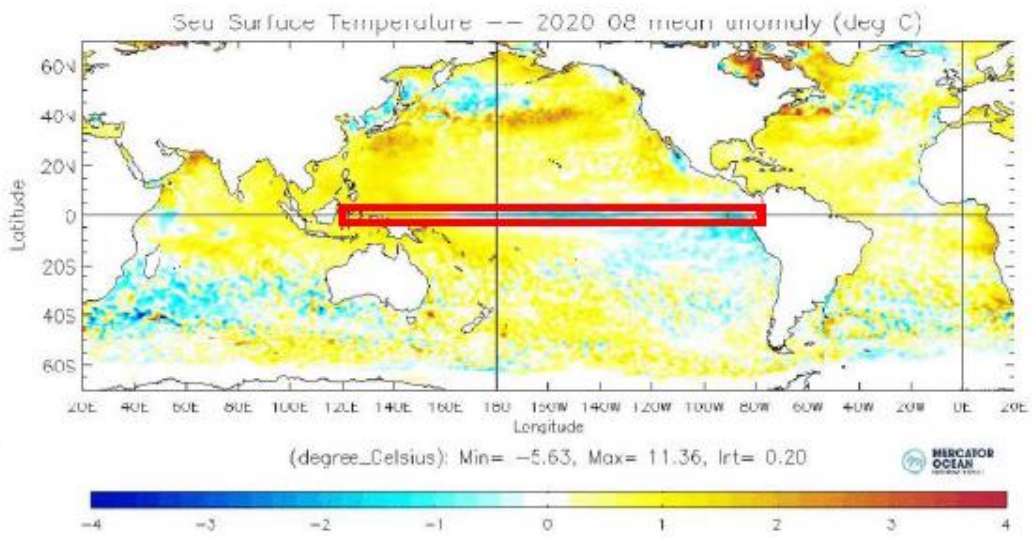


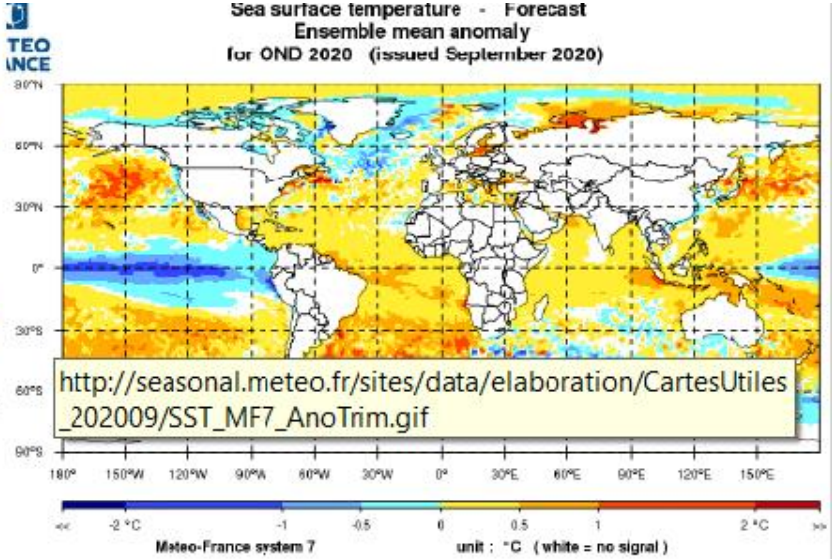
Typical MedCOF session

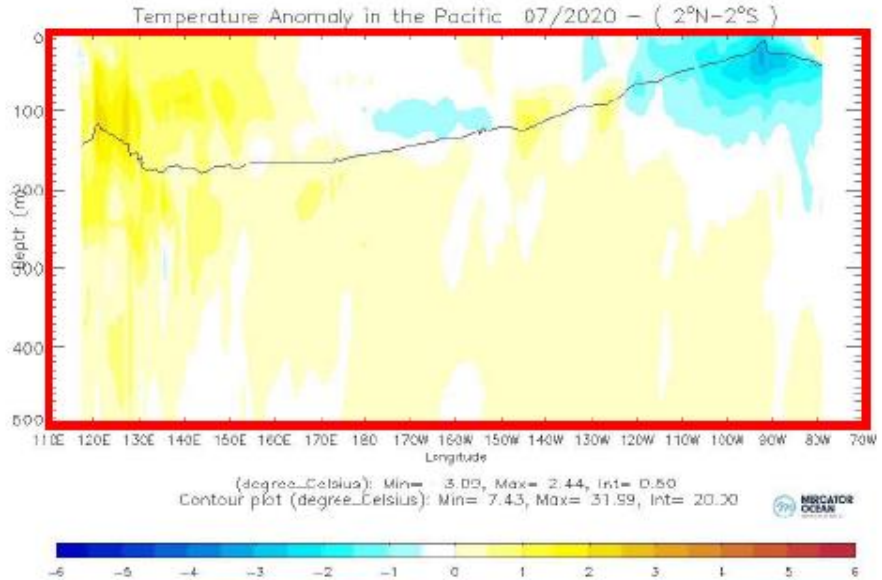
- PreCOF (CB)
- Verification
- Monitoring
- Consensus forecast
- Interaction with users

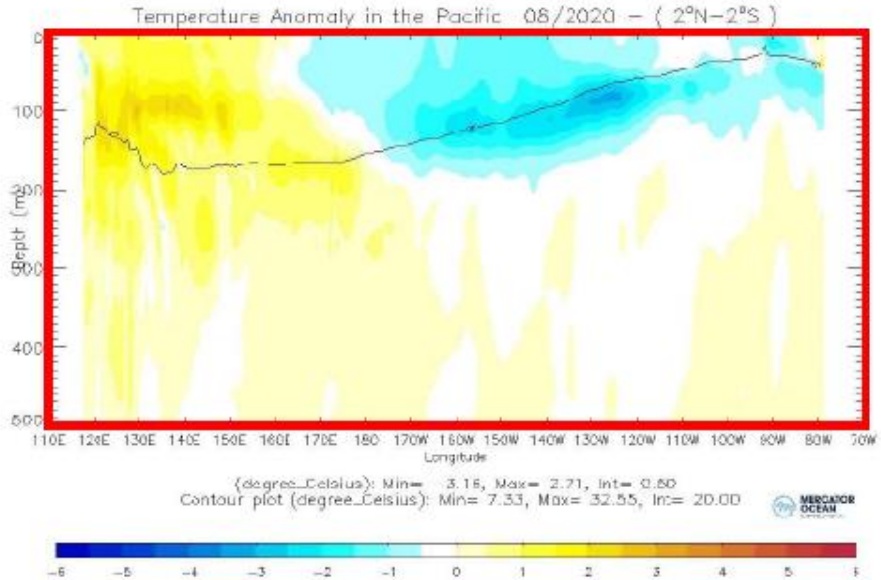
Análisis de estado de clima, drivers y modos de variabilidad relevantes

Análisis capa superficial Pacífico Ecuatorial









Typical MedCOF session

- PreCOF (CB)
- Verification
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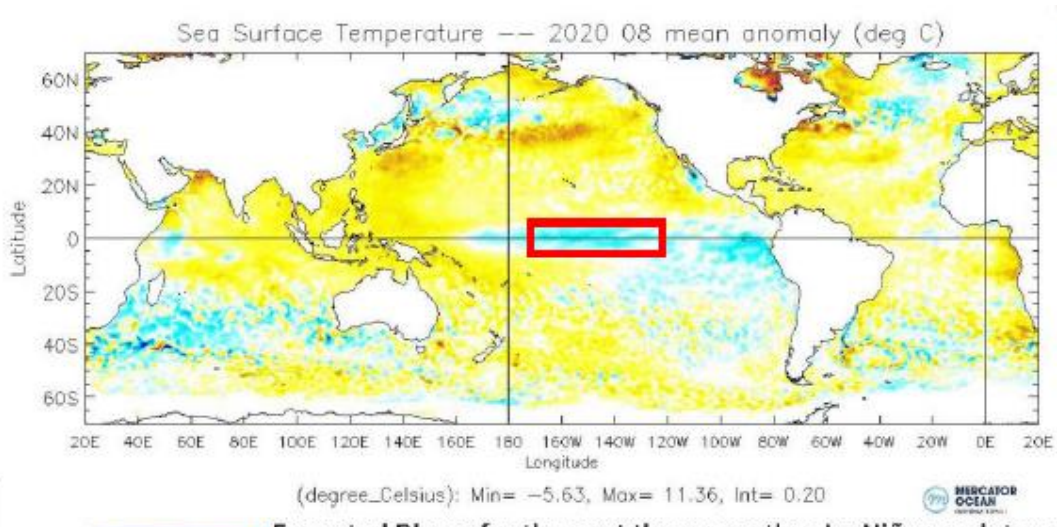
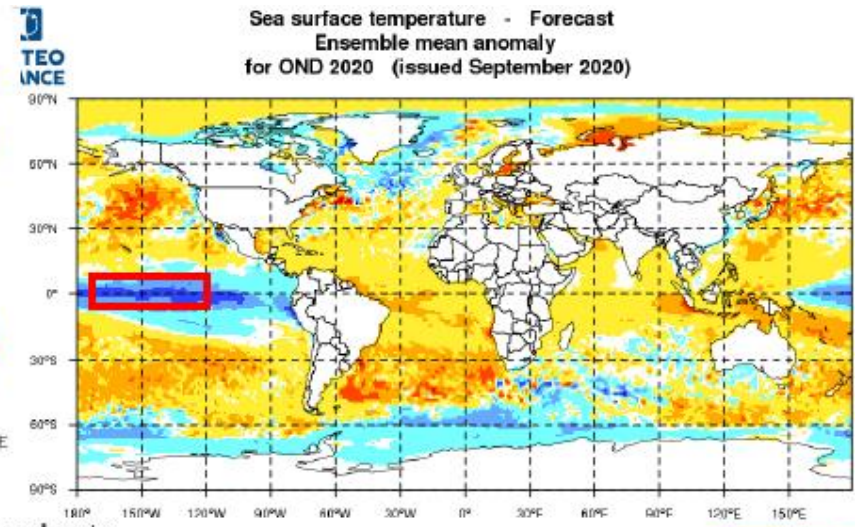
- Interaction with users

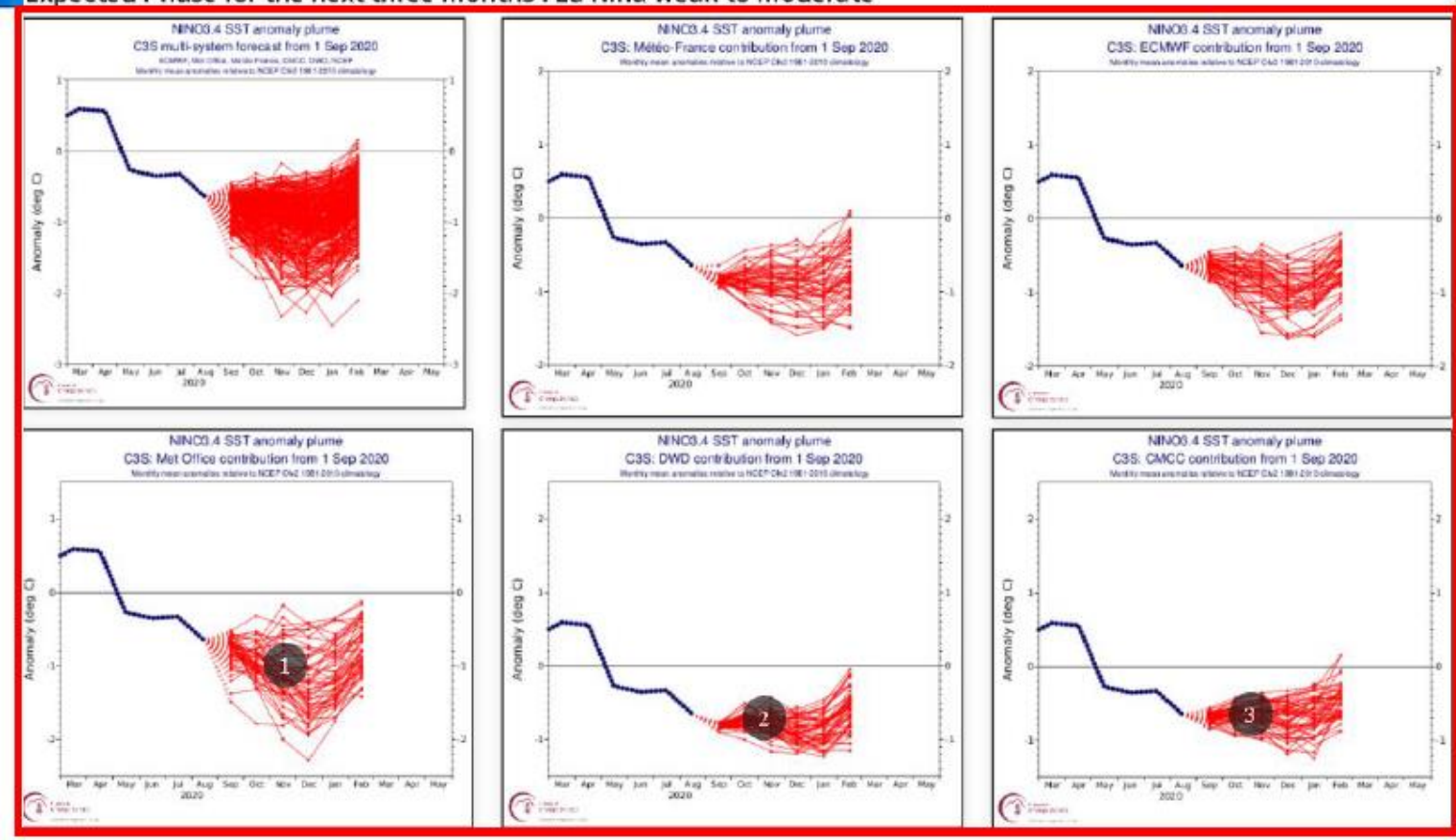
Análisis de estado de clima, drivers y modos de variabilidad relevantes

Análisis estado y pronóstico ENSO





Expected Phase for the next three months : La Niña weak to moderate



Typical MedCOF session

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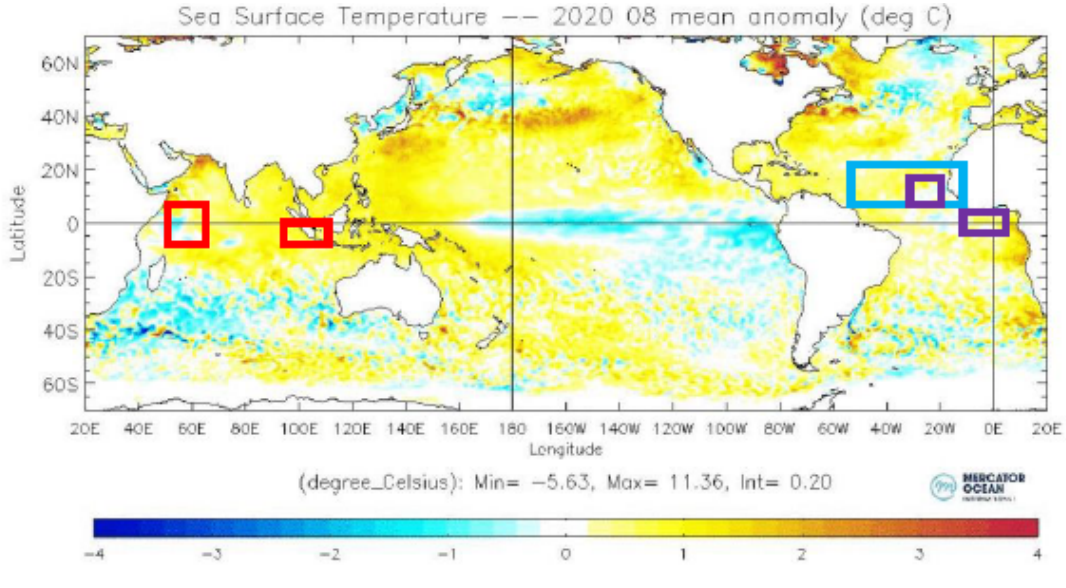
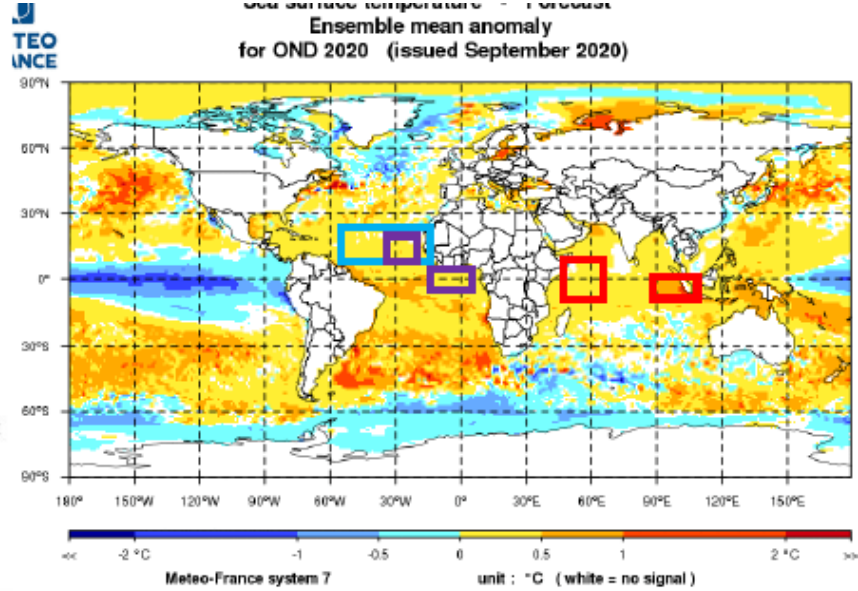
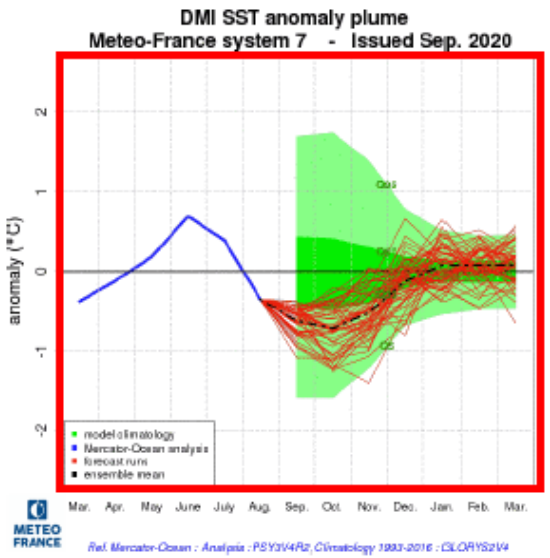
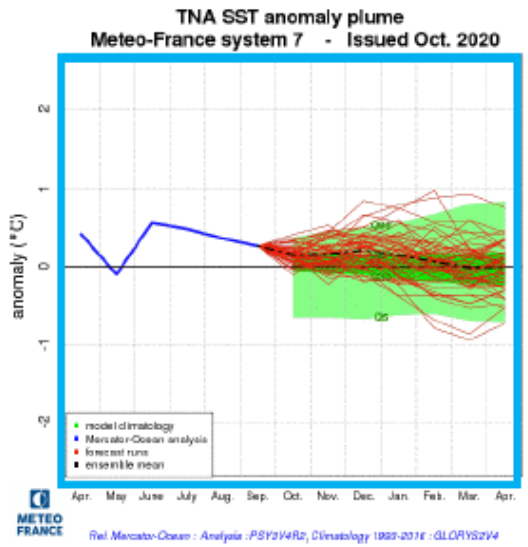
Análisis de estado de clima, drivers y modos de variabilidad relevantes

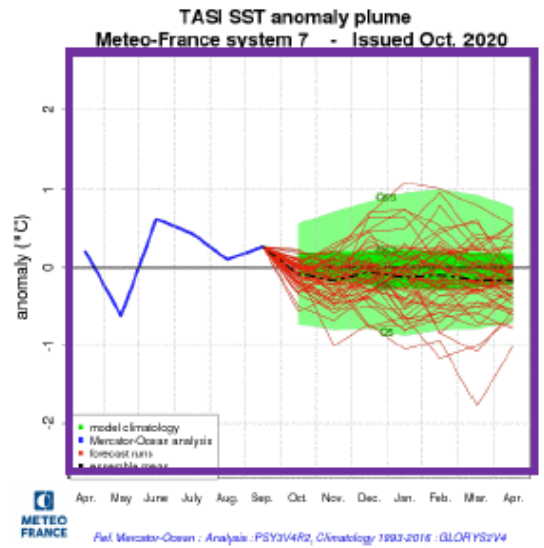
Análisis estado y pronóstico otros drivers relevantes en el Atlántico y el Índico











Typical MedCOF session

- PreCOF (CB)
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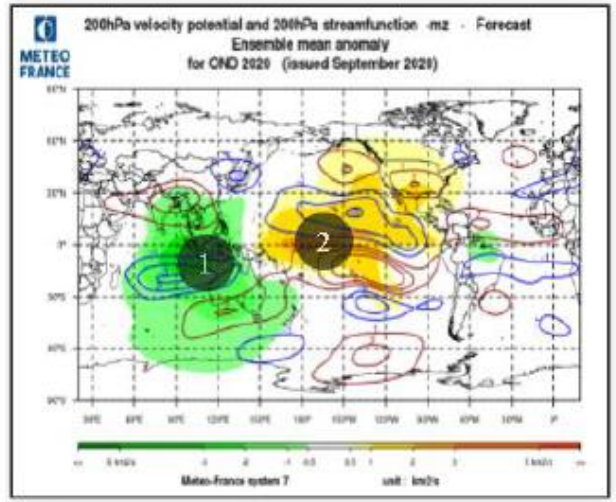
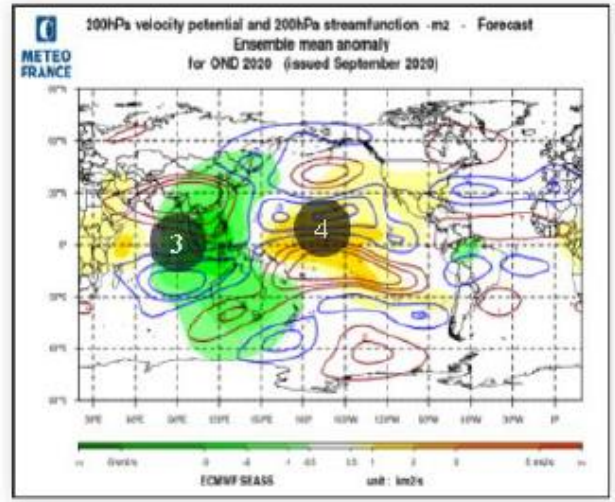
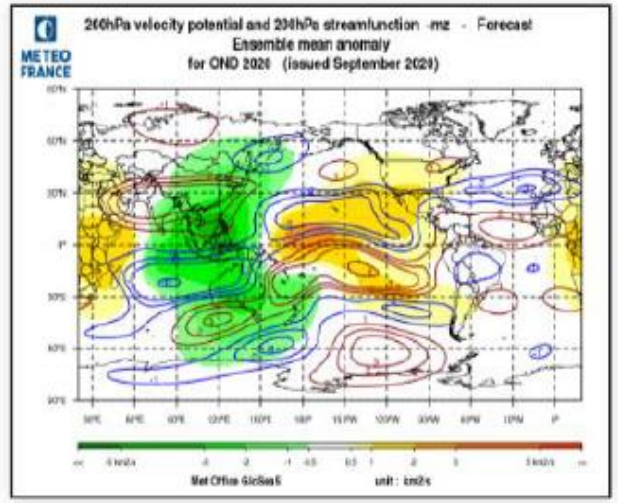
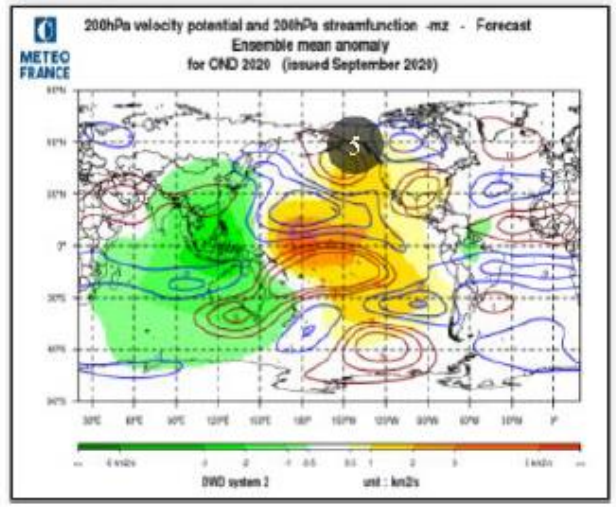
Análisis de estado de clima, drivers y modos de variabilidad relevantes

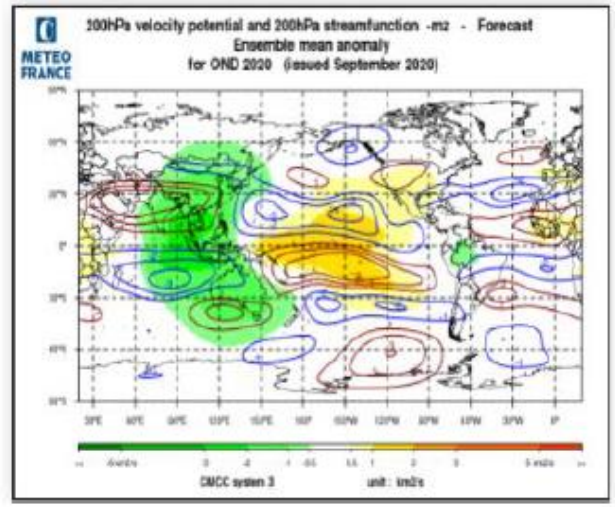
Análisis respuesta atmósférica a anomalías SST y teleconexiones

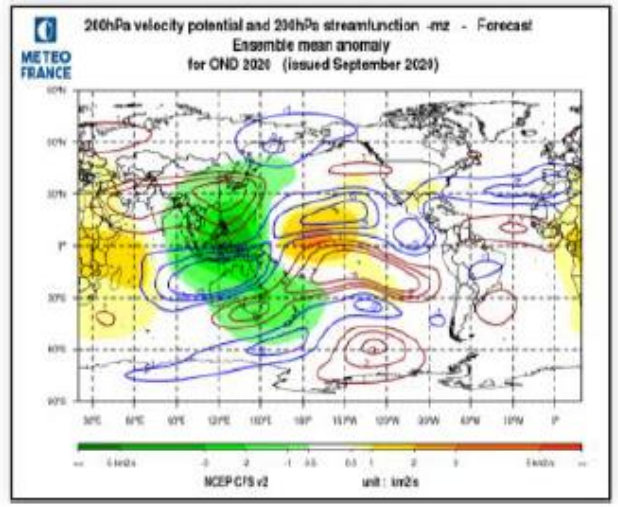












Typical MedCOF session

- PreCOF (CB)
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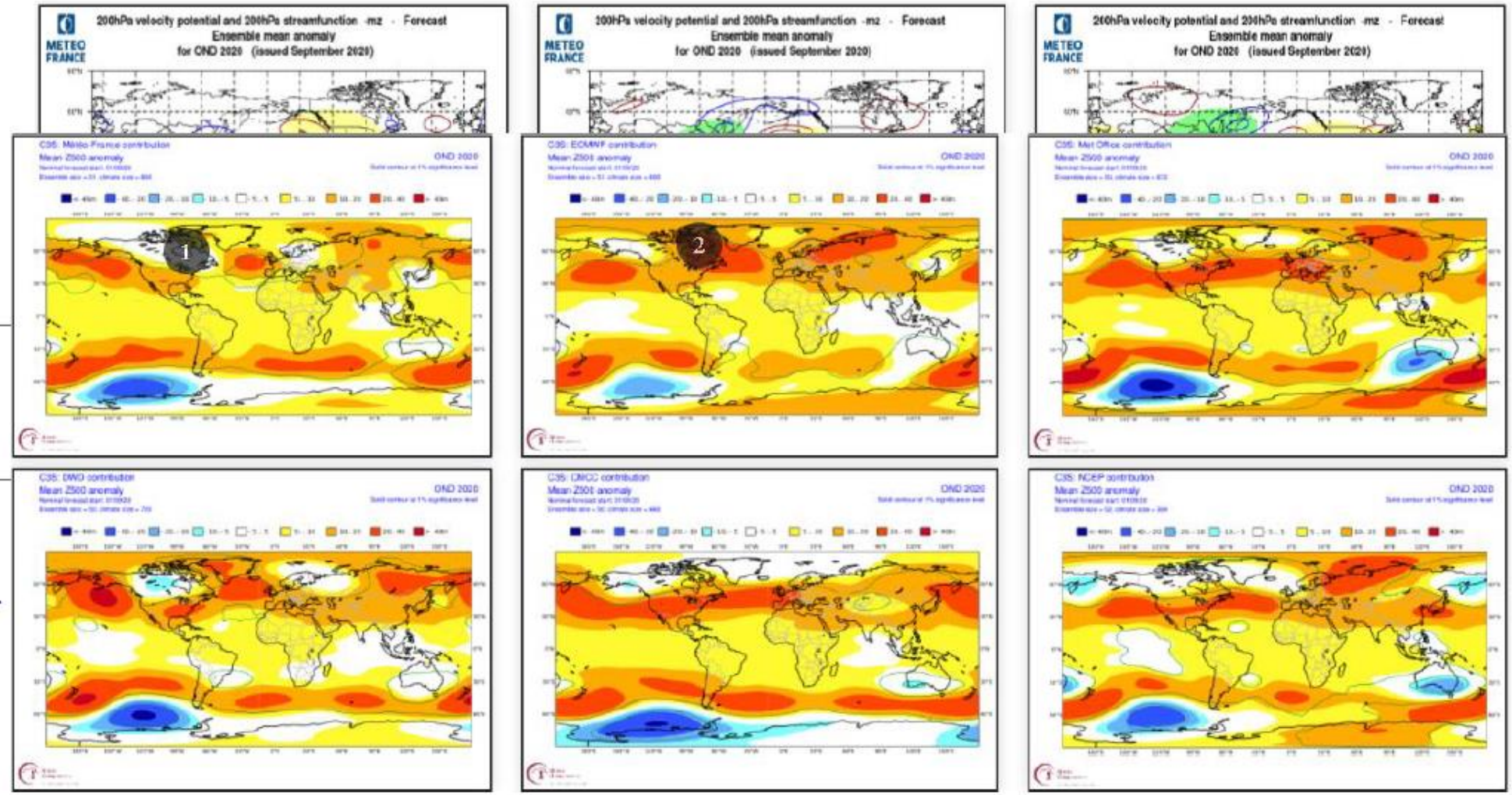
Análisis de estado de clima, drivers y modos de variabilidad relevantes

Análisis respuesta atmósférica a anomalías SST y teleconexiones

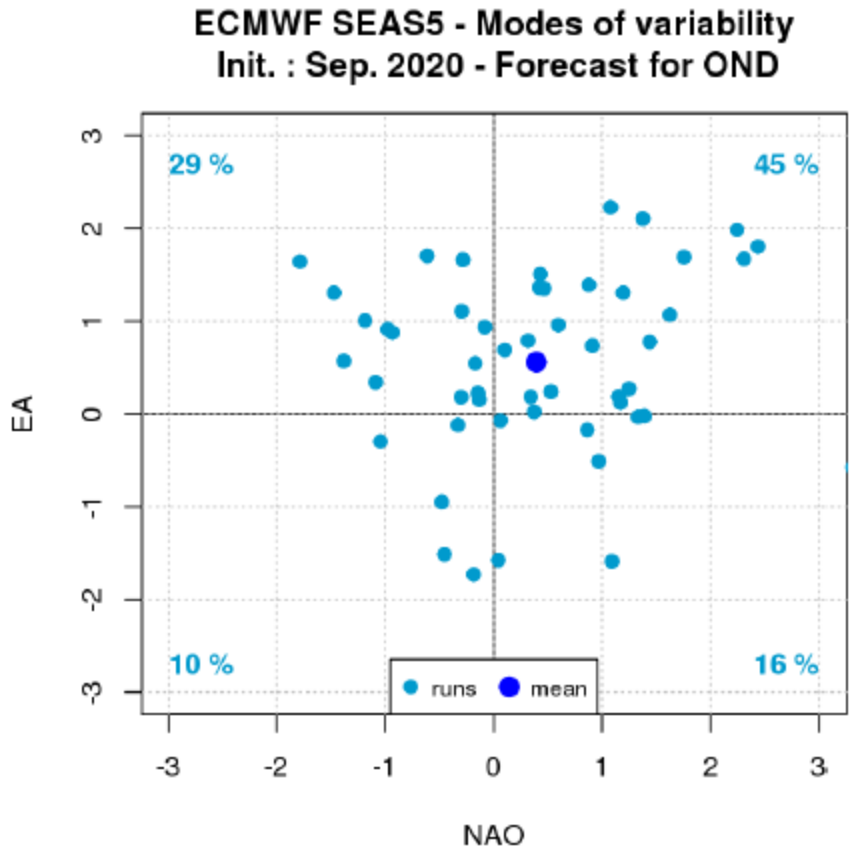


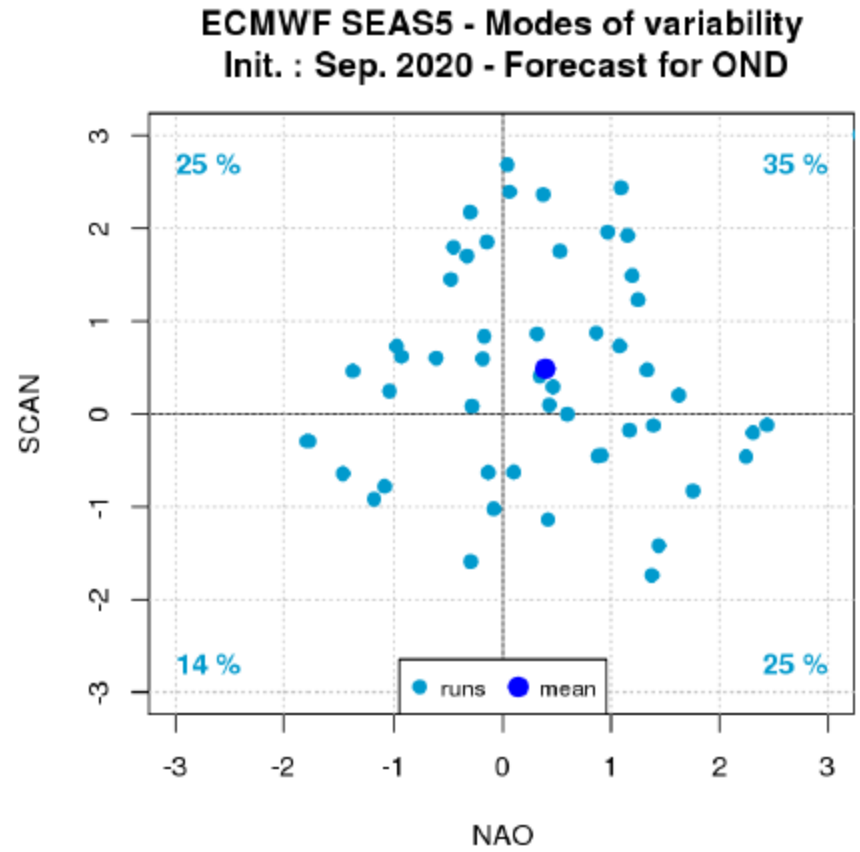
Typical MedCOF session

- PreCOF (CB)
- Verification
- Monitoring
- Consensus forecast
- Interaction with users

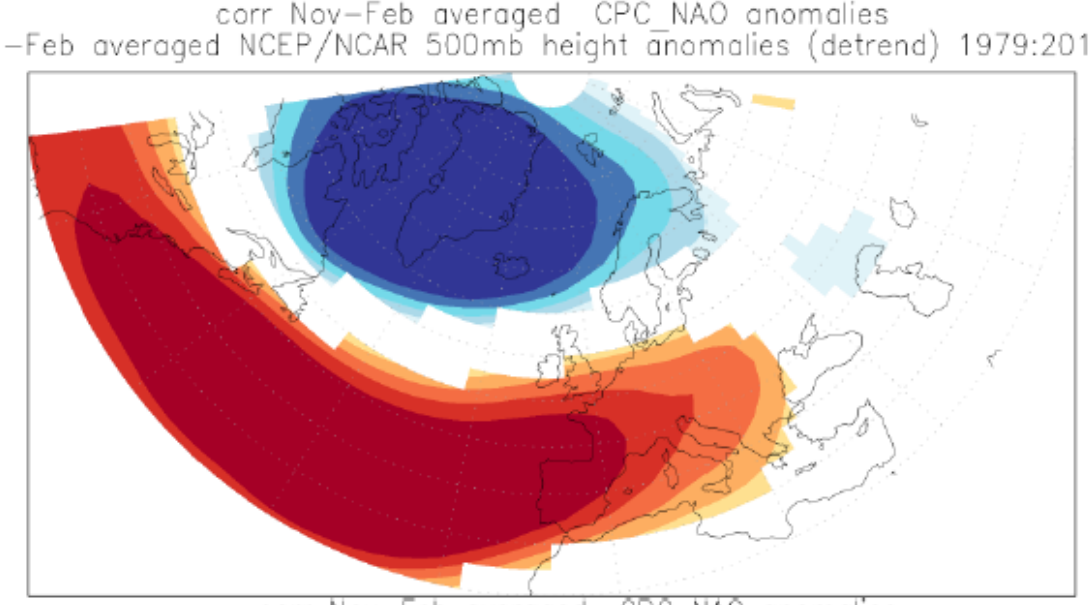
Análisis de estado de clima, drivers y modos de variabilidad relevantes

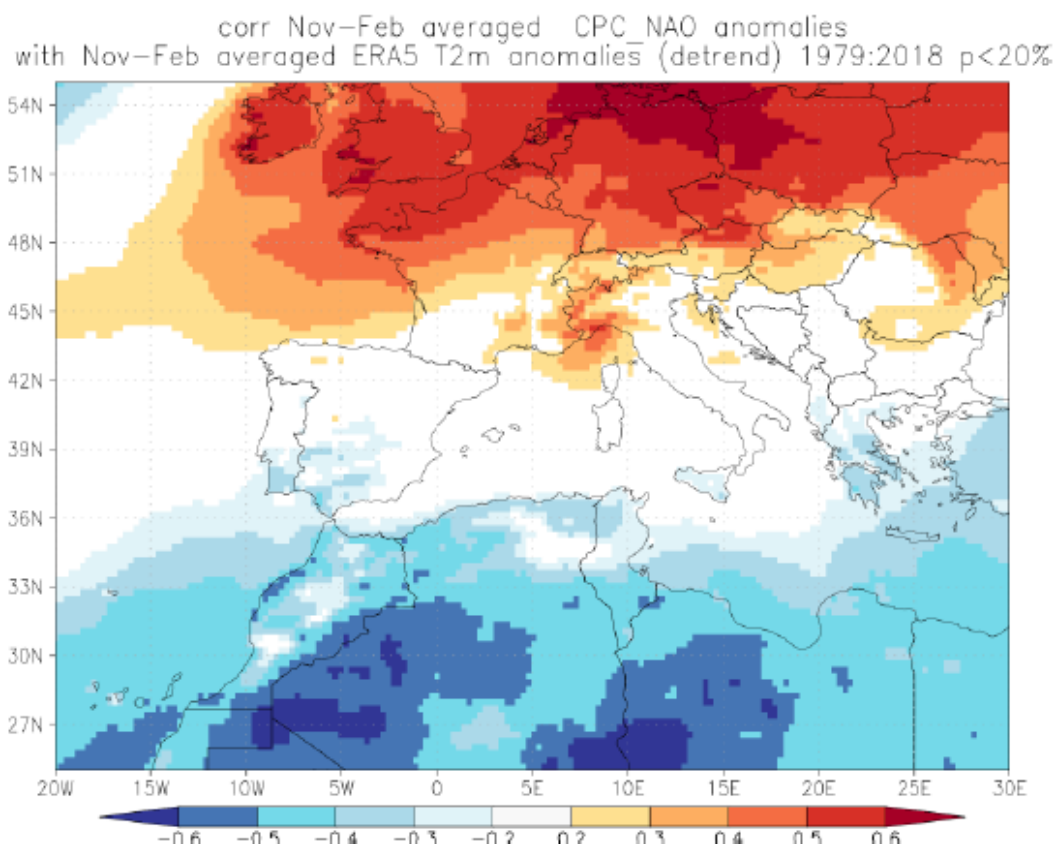
Análisis respuesta atmósférica. Modos de variabilidad.

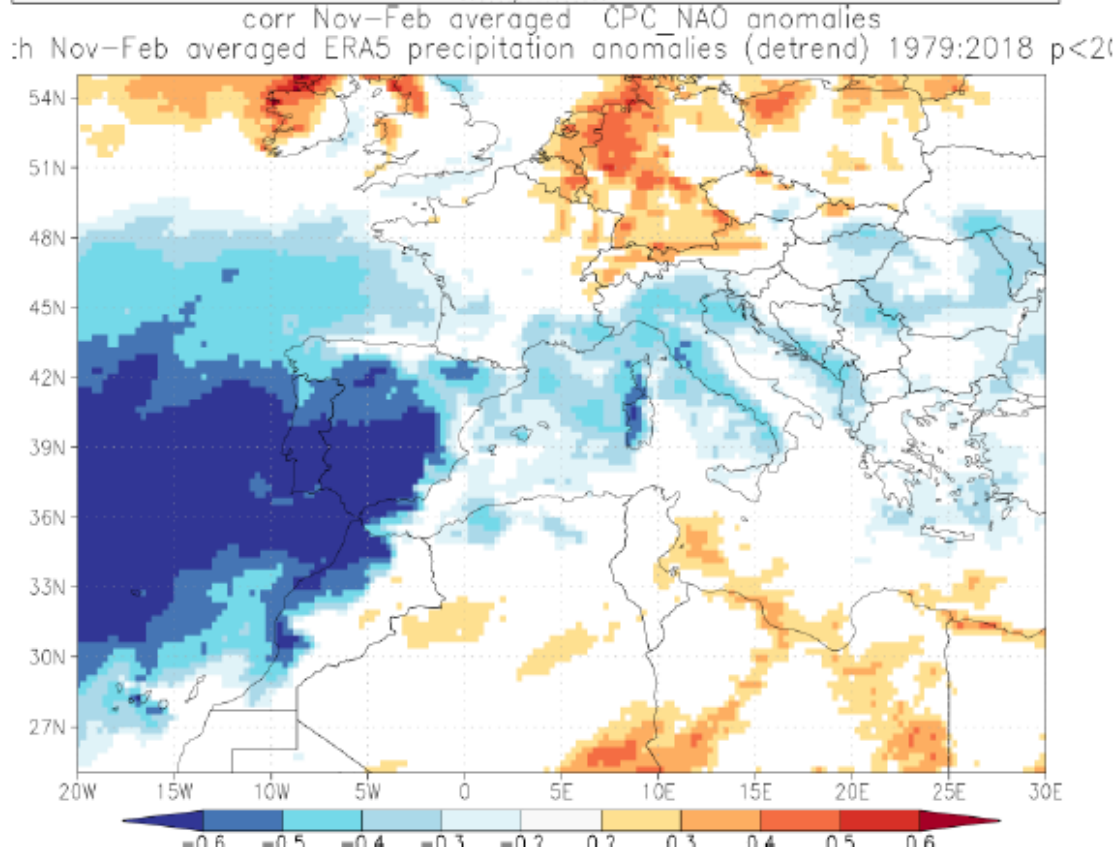




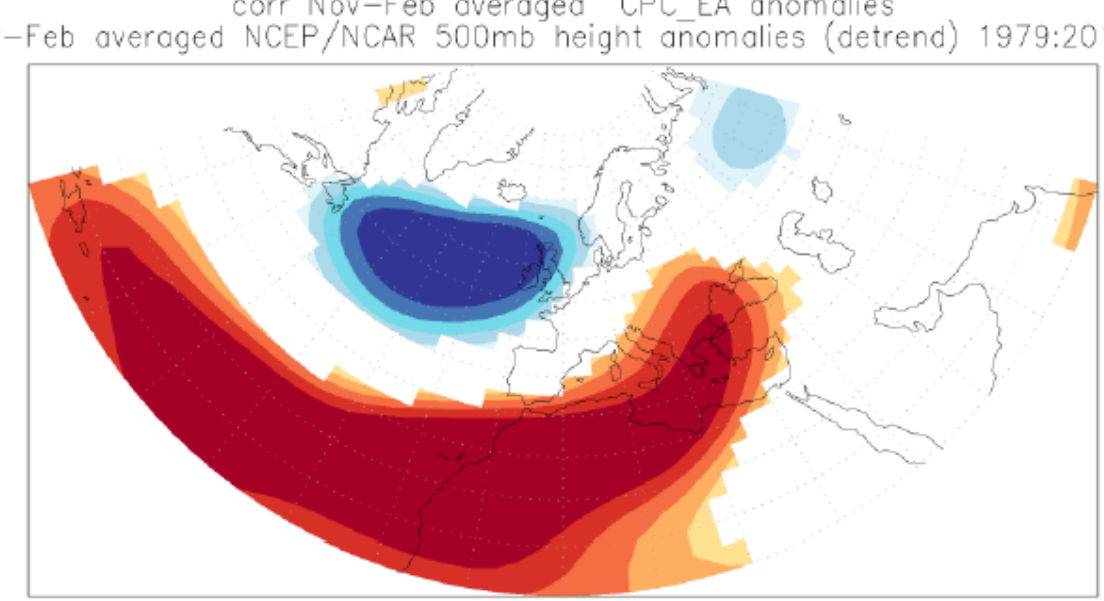
North Atlantic Oscillation

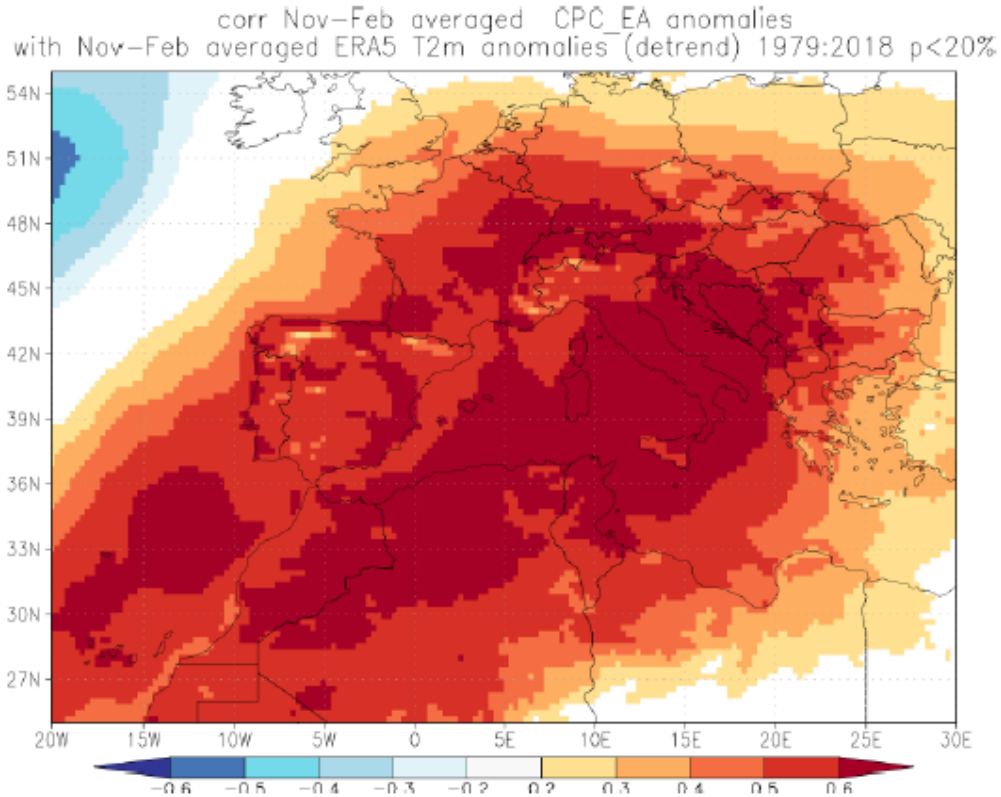


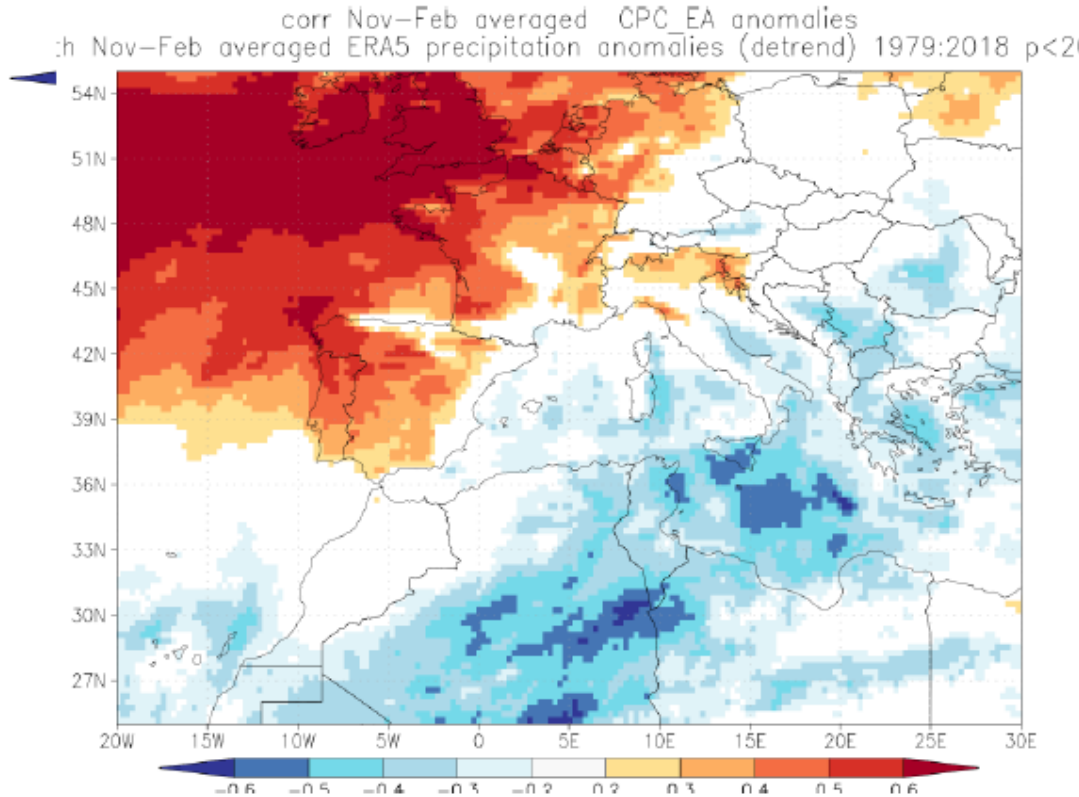




East Atlantic





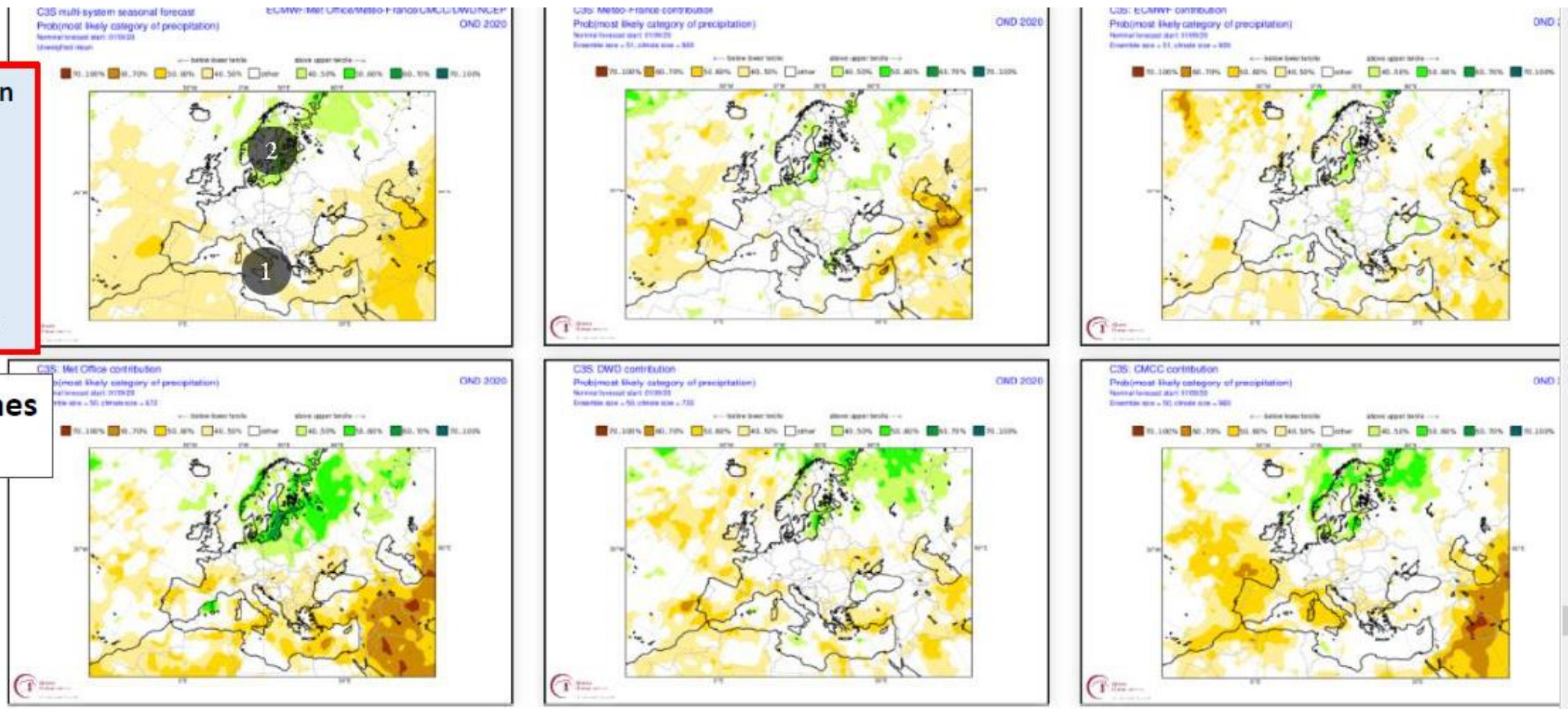


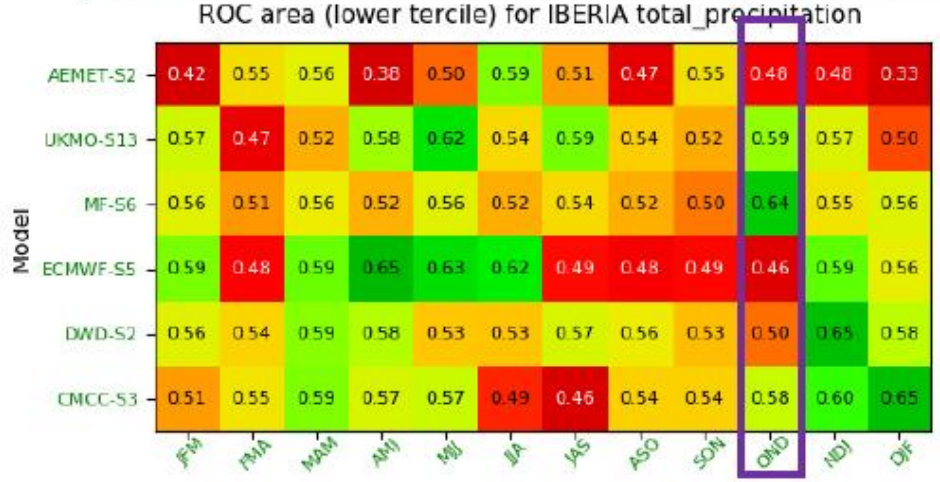
Typical MedCOF session

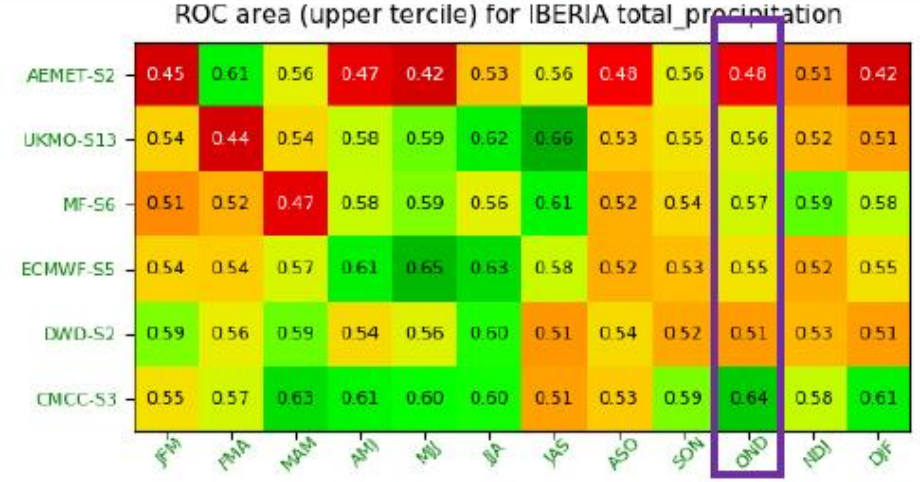
- PreCOF (CB)
- Verification
- Monitoring
- Consensus forecast
- Interaction with users

Análisis de predicciones de modelos

Predicción temperatura y precipitación







Typical MedCOF session

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- Consensus forecast
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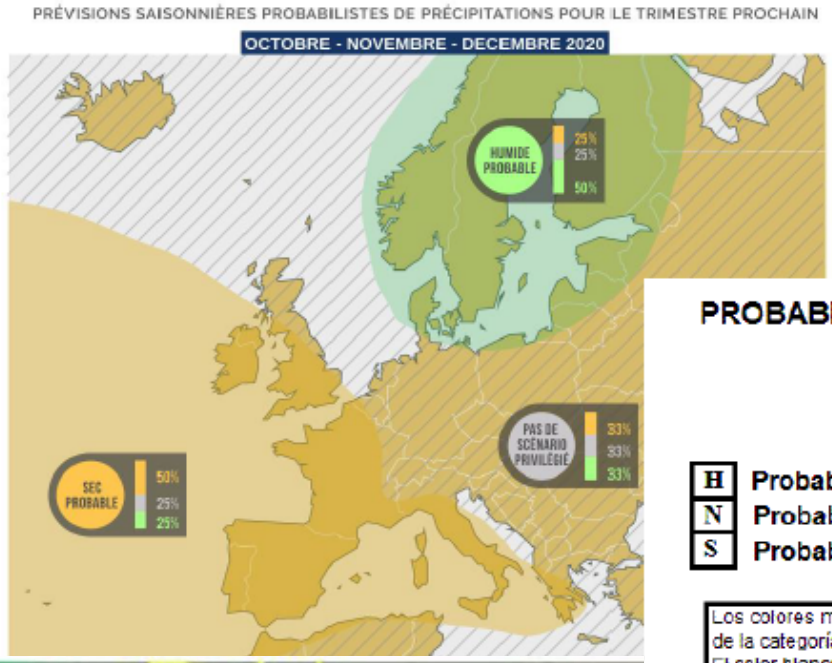
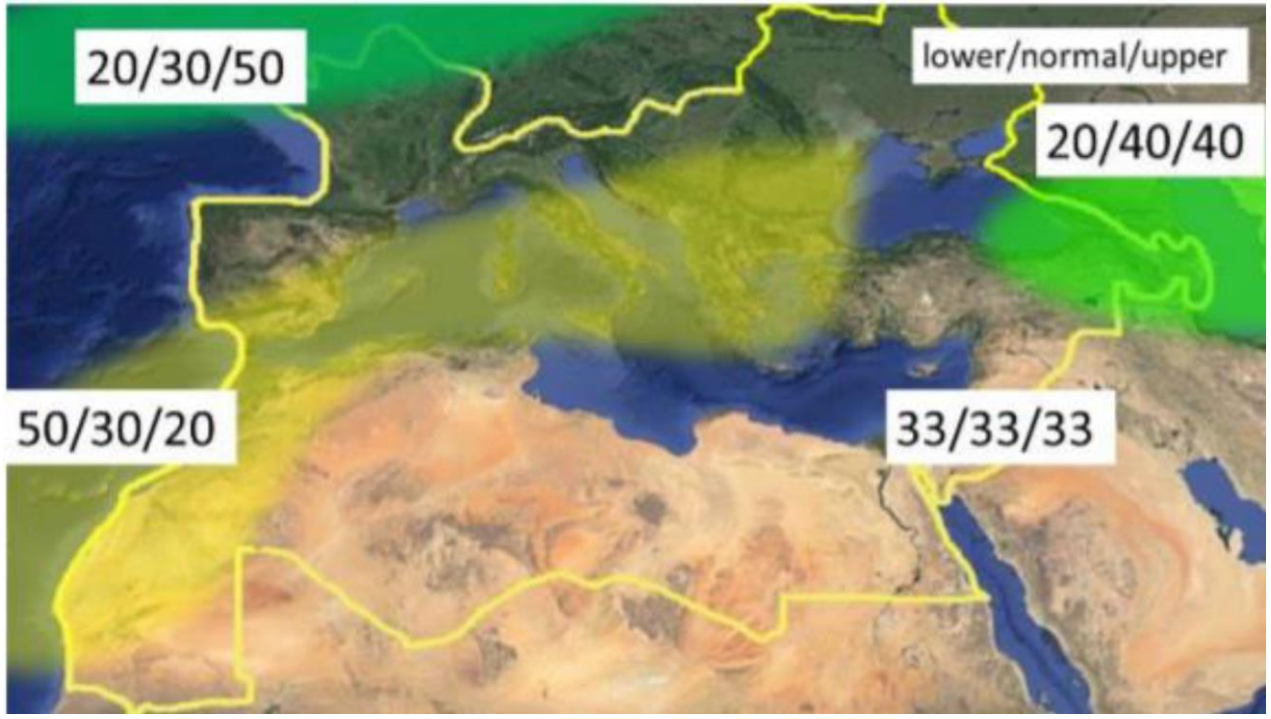
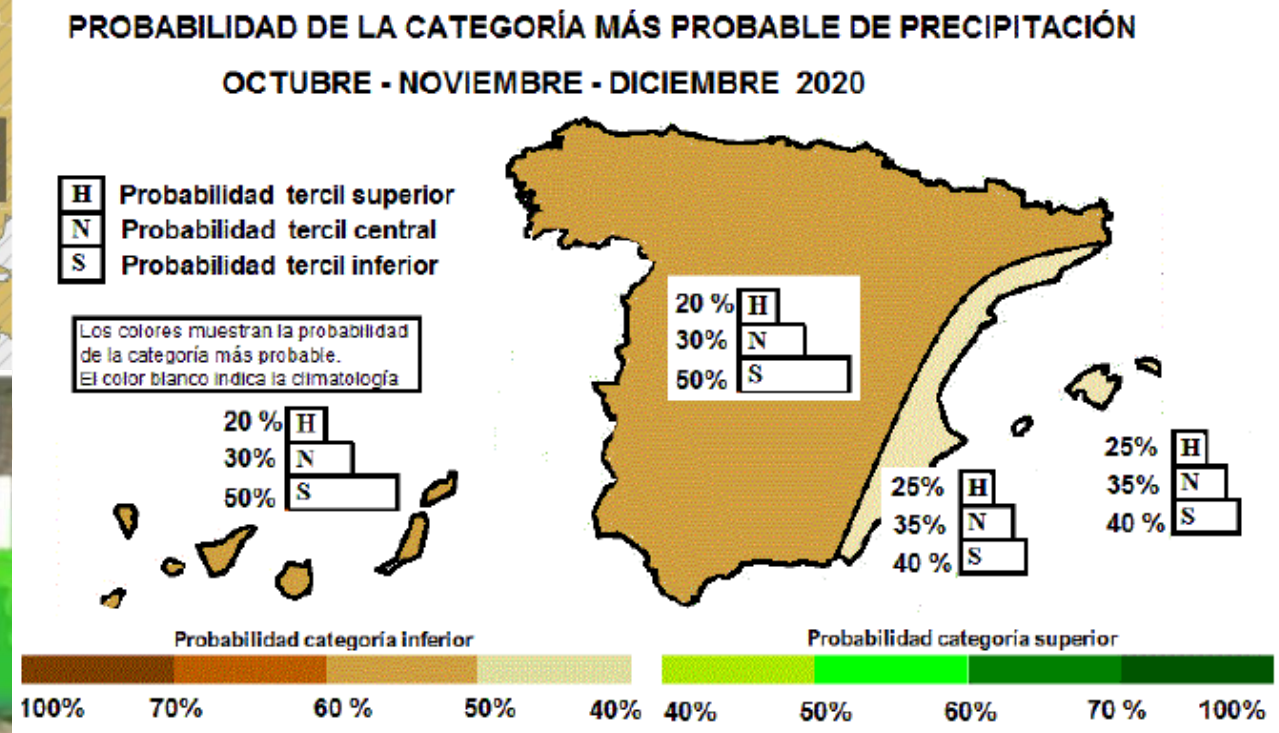
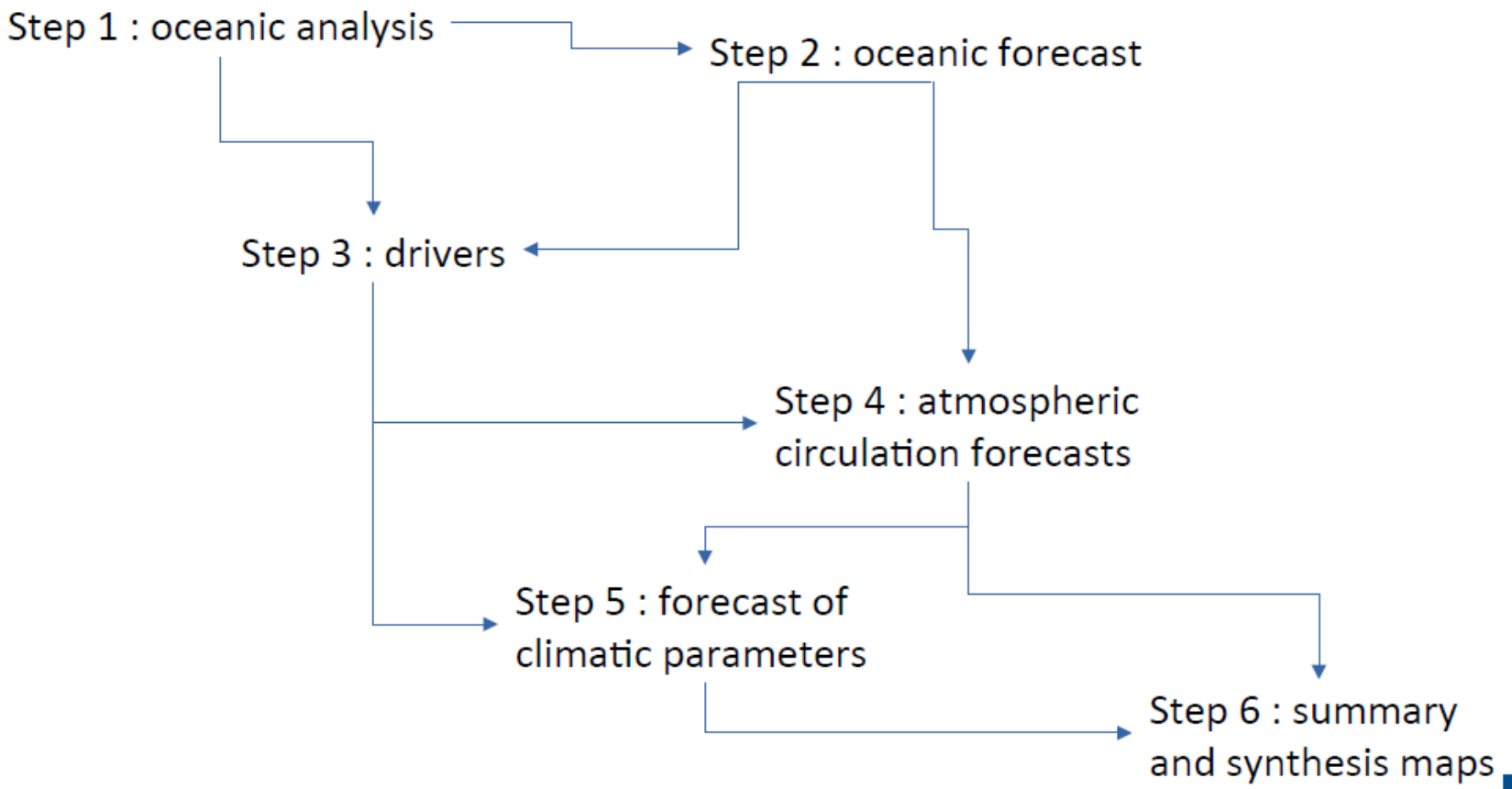
Predicción por consenso





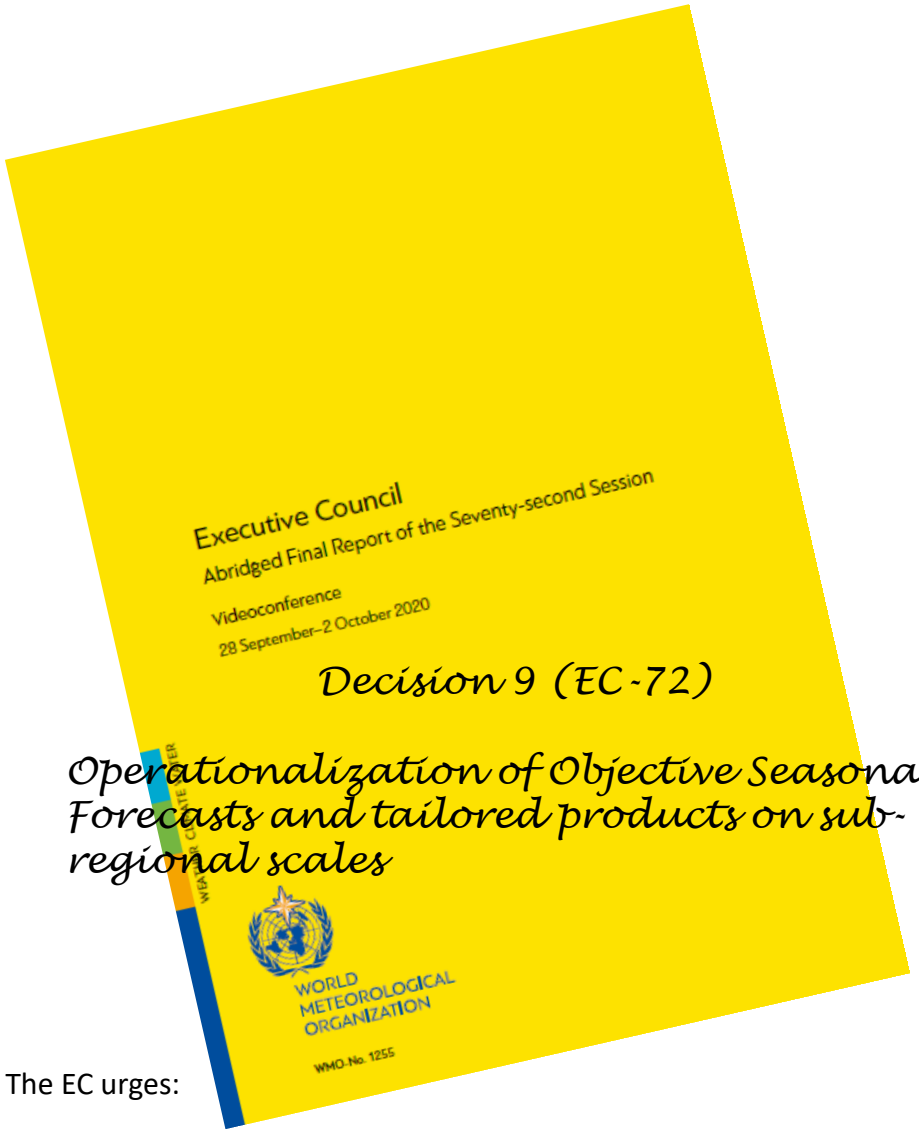


Current MedCOF procedure



Drawbacks of current practices in many RCOFs

- a subjective, consensus-based forecast process that is **neither traceable nor reproducible**;
- forecasts are packaged in a **fixed, one size-fits-all tercile probability format** that seldom addresses the requirements of specific applications;
- forecasts are generally **unavailable in digitized form**, and therefore, if needed, cannot be used in terms of quantitative inputs feeding into application models or decision support tools;
- forecasts are **not amenable to standardized verification** and skill assessments, thereby making forecast quality ambiguous, and also making future improvements difficult;
- forecast preparation requires a **high degree of manual activity**, which limits the frequency of forecast updates and the diversity of products.



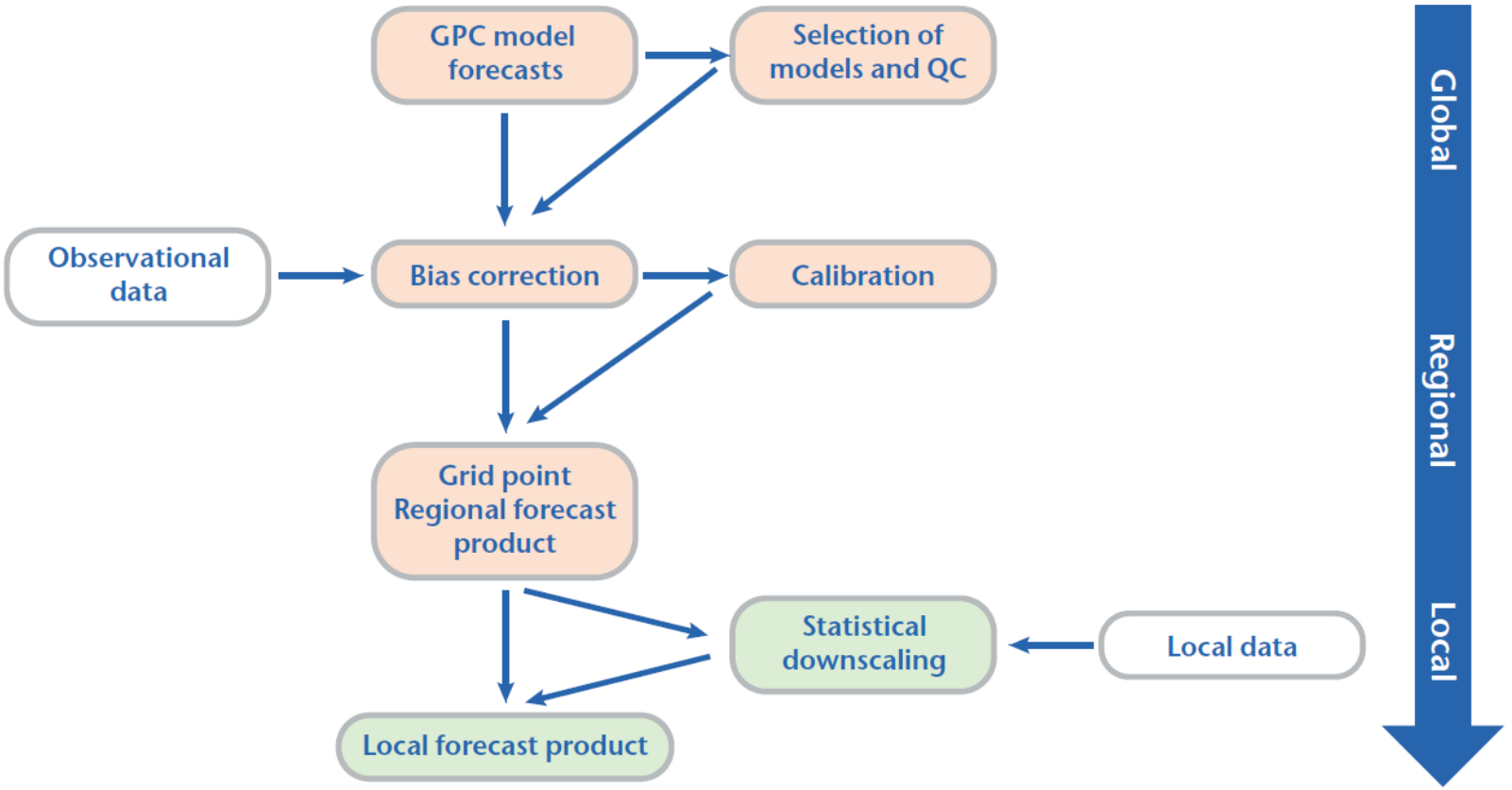
Decision 9 (EC-72)

Operationalization of Objective Seasonal Forecasts and tailored products on sub-regional scales

The EC urges:

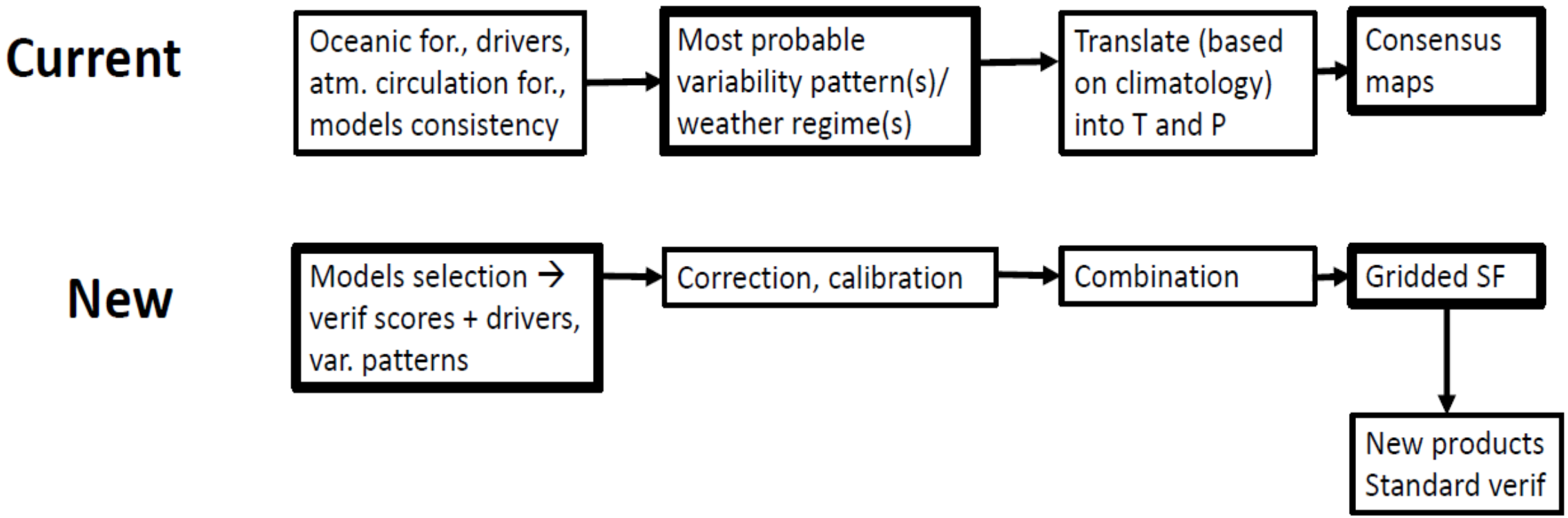
(a) RCCs, RCC networks and other relevant organizations cooperating on RCFs worldwide to actively contribute to the implementation of the proposal in the respective regions;
(b) WMO GPCs for LRF and the LC for MME LRF to facilitate access to required data sets and ensure timely and regular provision of objective sub-seasonal and seasonal forecast products, in suitable formats to RCCs, RCFs, and NMHSs

Recommended procedure for developing SFs at the regional and national levels (WMO 2020)



An outline of the recommended procedure for developing seasonal forecasts at the regional and national levels starting from the forecasts from GPCs-LRF (WMO 2020)

Current versus new approaches to SF



ERA4CS MEDSCOPE: designed as the scientific arm of MedCOF

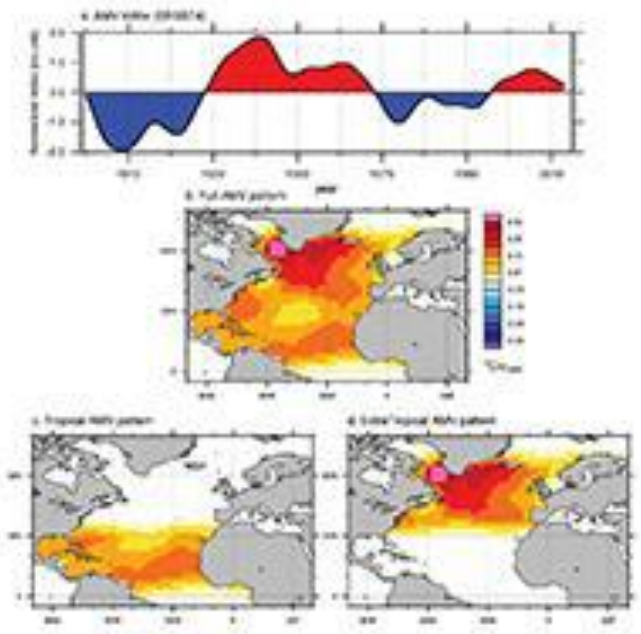
Research community and seasonal forecast producers (e.g. Copernicus)

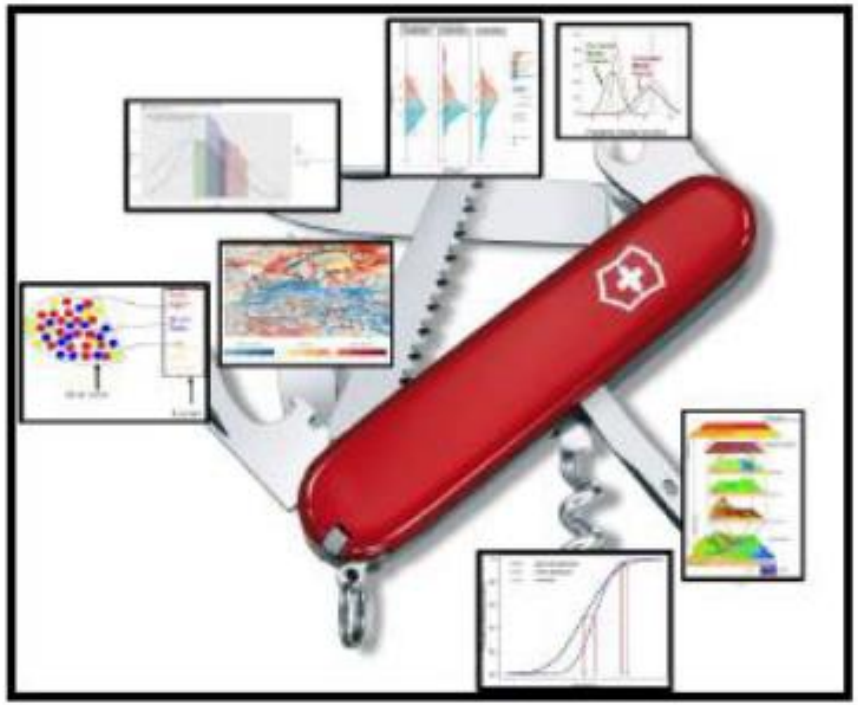
MEDSCOPE

(Thanks to S. Gualdi, CMCC)

ERA4CS MEDSCOPE Project:

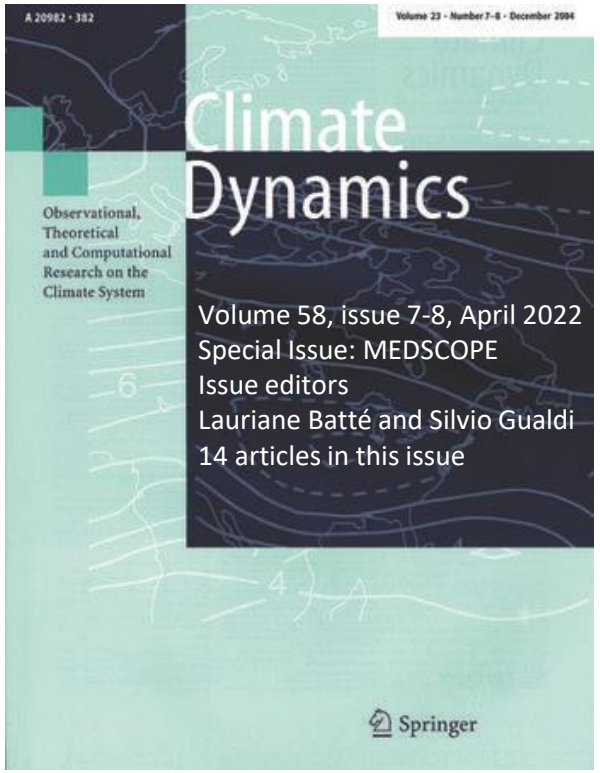
main objectives



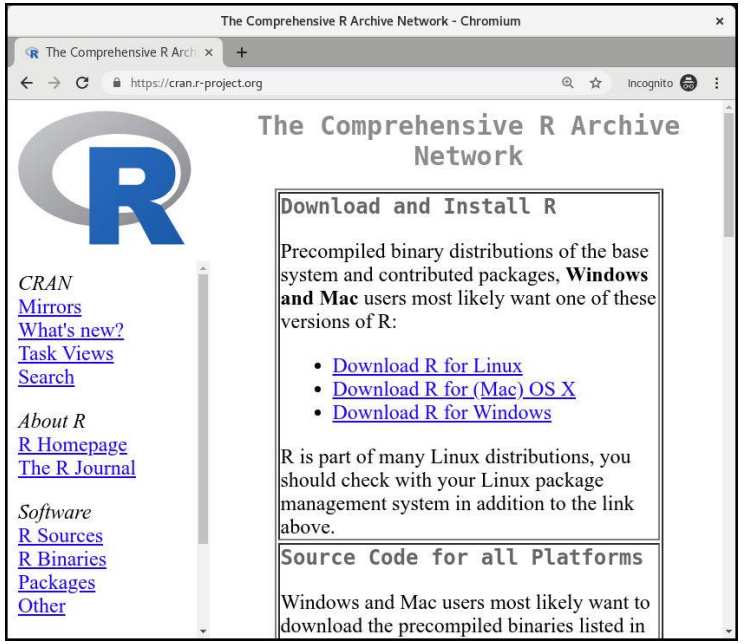


ERA4CS MEDSCOPE Project:

output



MEDSCOPE Special Issue: advancing the understanding of variability and predictability over the Mediterranean region at seasonal to decadal time scales



Climate Services Toolbox (CSTools) primarily designed to merge all the required steps on seasonal forecast post-processing

Climate Services developed and evaluated for 3 sectors: renewable energy, water and agroforestry

The CSTools Toolbox

Retrieval and transformation	CST_Load, CST_Anomaly, CST_SaveExp, CST_MergeDims, CST_SplitDims, as.s2dv_cube, s2dv_cube
Classification	CST_MultiEOFS, CST_WeatherRegimes, CST_RegimesAssign, CST_CategoricalEnsCombination
Downscaling	CST_Analogs, CST_RainFarm, CST_RFTemp, CST_AdamontAnalogs, CST_AnalogsPredictors
Correction	CST_BEI_Weighting, CST_BiasCorrection, CST_Calibration, CST_QuantileMapping, CST_DynBiasCorrection
Assessment	CST_MultiMetric, CST_MultivarRMSE
Visualization	PlotCombinedMap, PlotForecastPDF, PlotMostLikelyQuantileMap, PlotPDFsOLE, PlotTriangles4Categories

Table 1.-. Summary of the functions and methods by category. Prefix CST refers to functions working on a specific object class called s2dv_cube (from Perez-Zanón et al. 2021a).

- The package contains process-based state-of-the-art methods for loading and transformation requirements, forecast calibration, bias correction, statistical and stochastic downscaling, optimal forecast combination and multivariate verification, as well as basic and advanced tools to obtain tailored products.
- All functions are documented in a standard reference manual on the CRAN website (https://CRAN.R-project.org/package=CSTools).
- The documentation also includes vignettes describing some of the methodologies included in CSTools, as well as information on how to use the package to conduct specific analysis.
- Thanks to the toolbox design in individual functions, users can develop their own post-processing chain.

En este training existen sesiones prácticas (en inglés) sobre CSTools, explicando cómo instalarlo, cómo cargar datos, y cómo ejecutar varias de las funciones:

http://medcof.aemet.es/index.php/events/training-3-2

Los desarrolladores han preparado un set de scrips para descargar datos de estacional del cds creando ficheros y estructura de carpetas con el formato que CSTools necesita para ingestarlos:

https://earth.bsc.es/gitlab/es/cds-seasonal-downloader

Pero el verdadero valor de la predicción estacional está en las aplicaciones sectoriales

Sectores como el energético, agrícola, hidrológico…trabajan en escalas de tiempo donde las informaciones respecto a probabilidades de determinados eventos pueden influenciar el proceso de toma de decisiones

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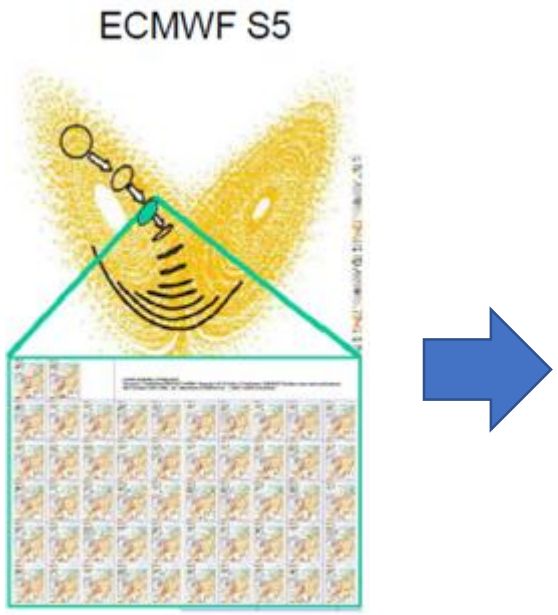

Partimos de modelos de predicción estacional

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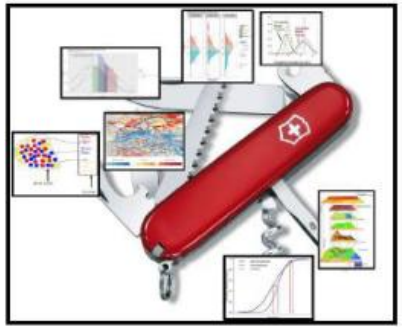
Partimos de modelos de predicción estacional

Postproceso de las variables de interés (calibración, corrección, donwscaling…)



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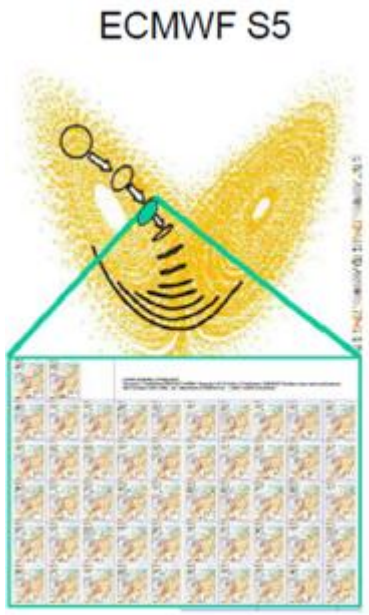

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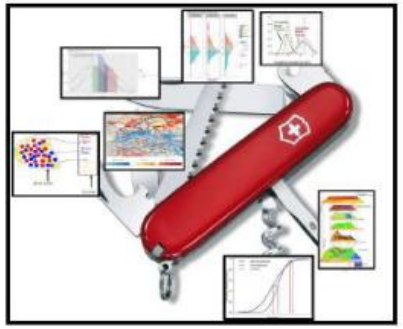

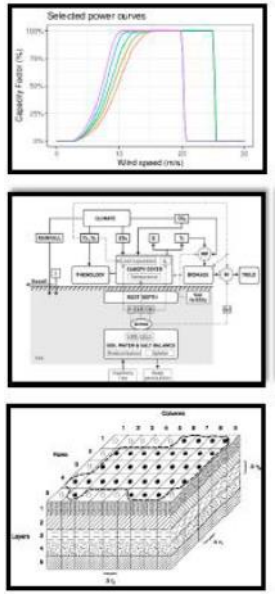

La información postprocesada de cada ejecución el modelo se introduce en un modelo de aplicación

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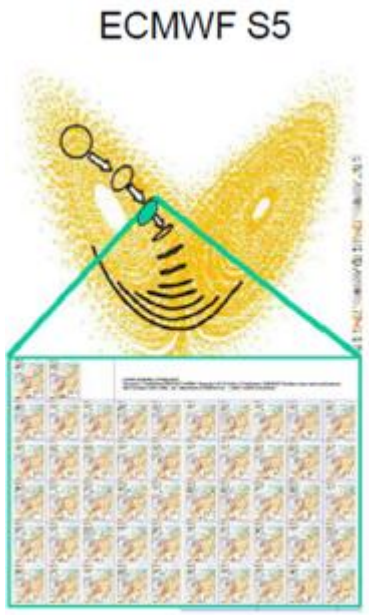
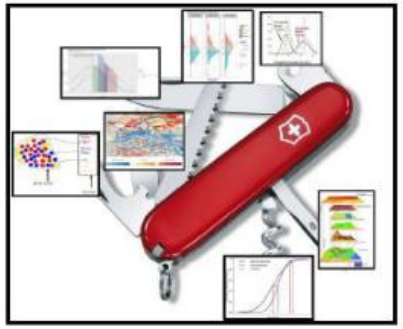
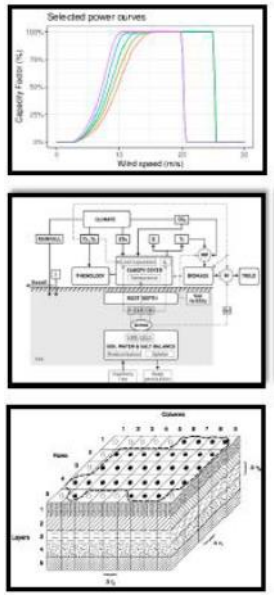


Partimos de modelos de predicción estacional

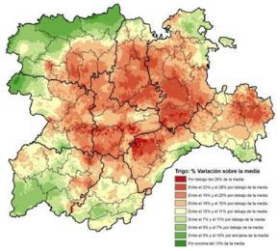
Postproceso de las variables de interés (calibración, corrección, donwscaling…)

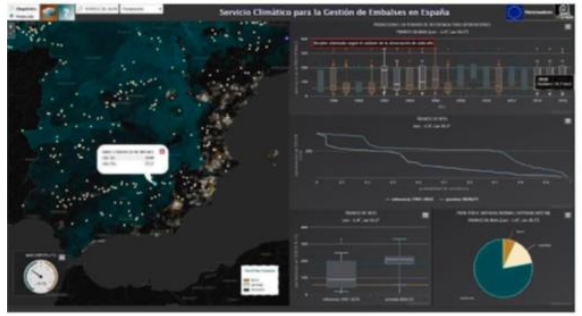




La información postprocesada de cada ejecución el modelo se introduce en un modelo de aplicación

La salida del modelo de aplicación permite construir pronósticos probabilistas sobre variables sectoriales: rendimiento de un cultivo, aportaciones a un embalse…





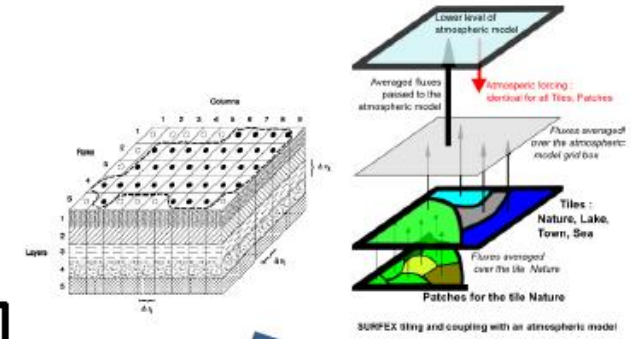
VIEWER

EVALUATION AT BELESAR RESERVOIR

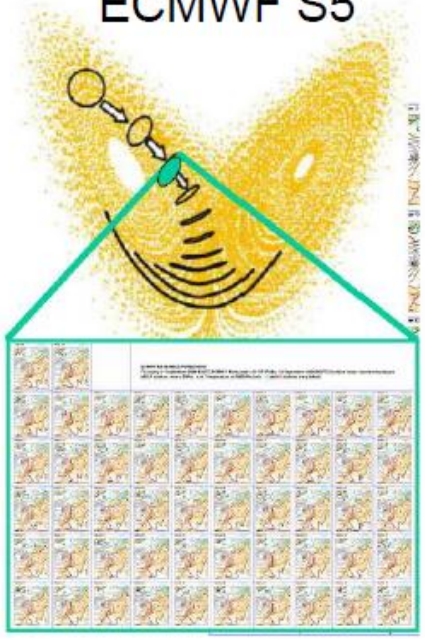
BEST NAO weighting and combination

SIMPA

SURFEX



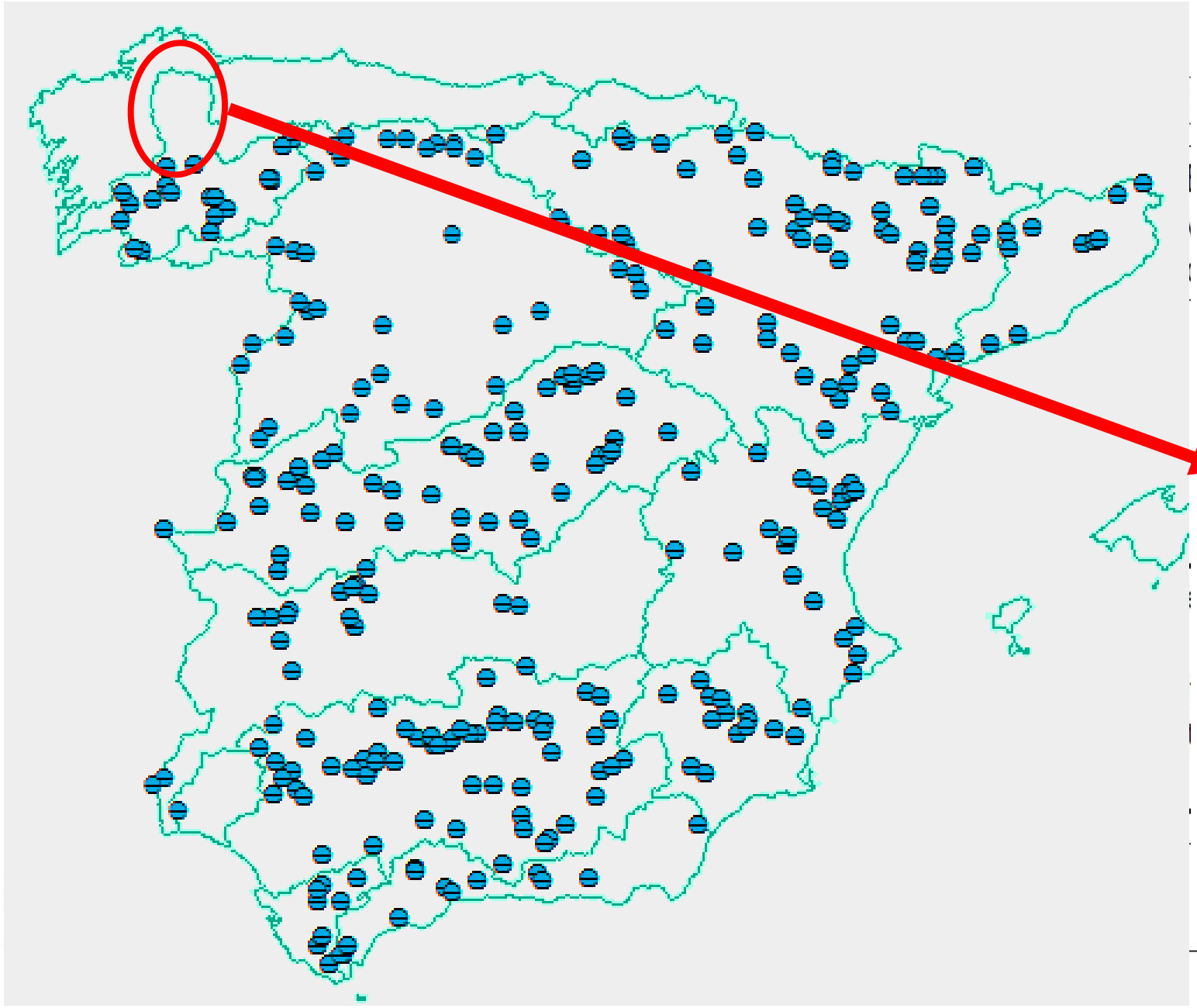
ECMWF S5

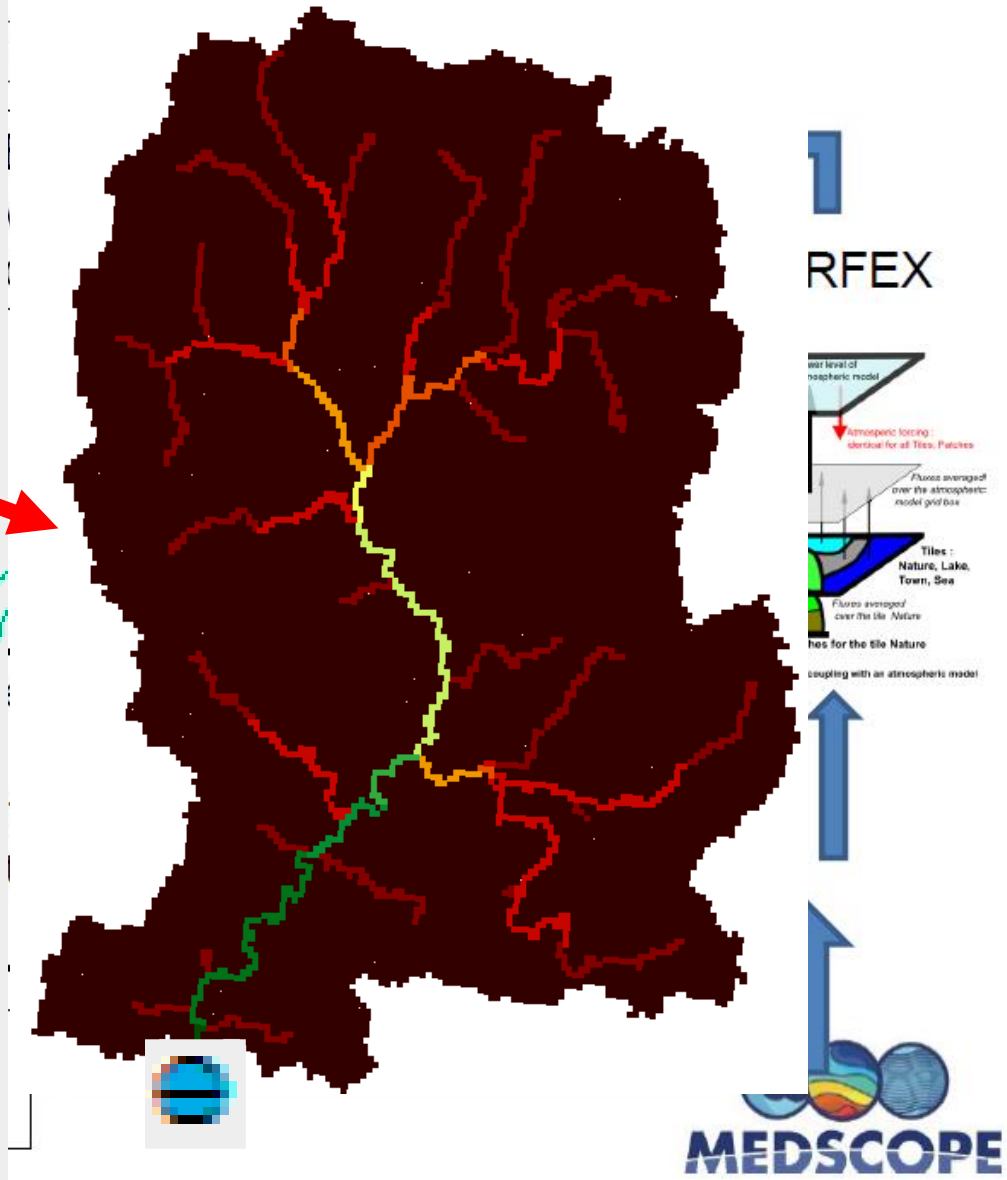


- **Domain of application**: All water reservoirs in Spain
- **Potential user(s):** dam managers
- **Decision making process**: Partition of water resources among main users: agriculture, energy, public supply

Downscaling based on ANALOGS

MEDSCOPE




1
RFEX
Tiles :
Nature, Lake,
Town, Sea
MEDSCOPE

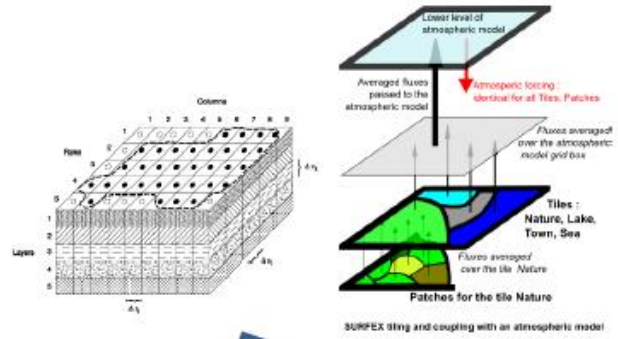
VIEWER

EVALUATION AT BELESAR RESERVOIR

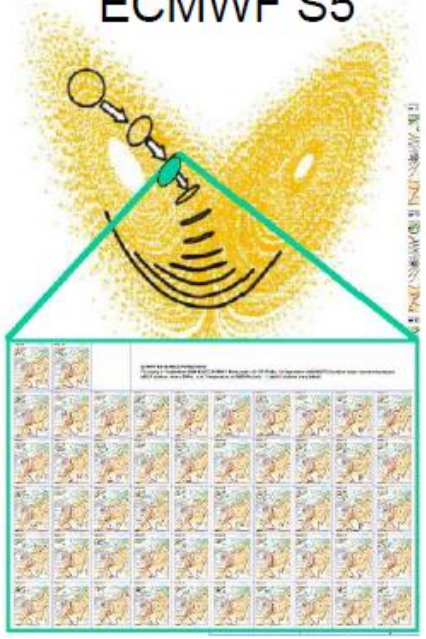
BEST NAO weighting and combination

SIMPA

SURFEX



ECMWF S5



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MEDSCOPE

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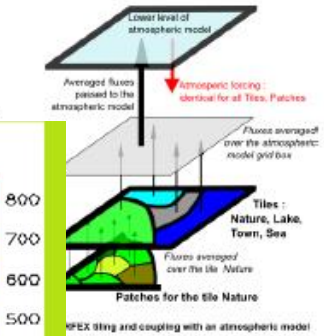

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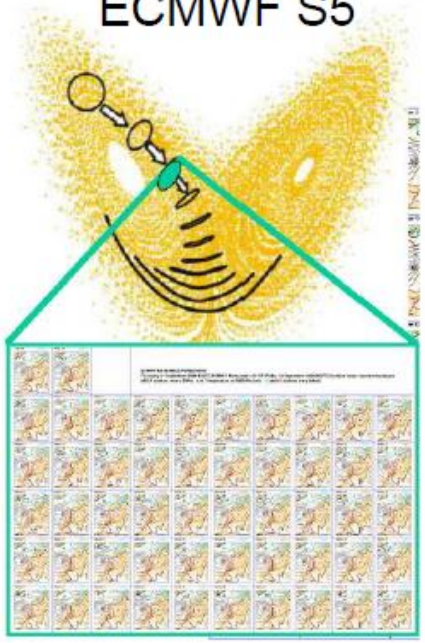

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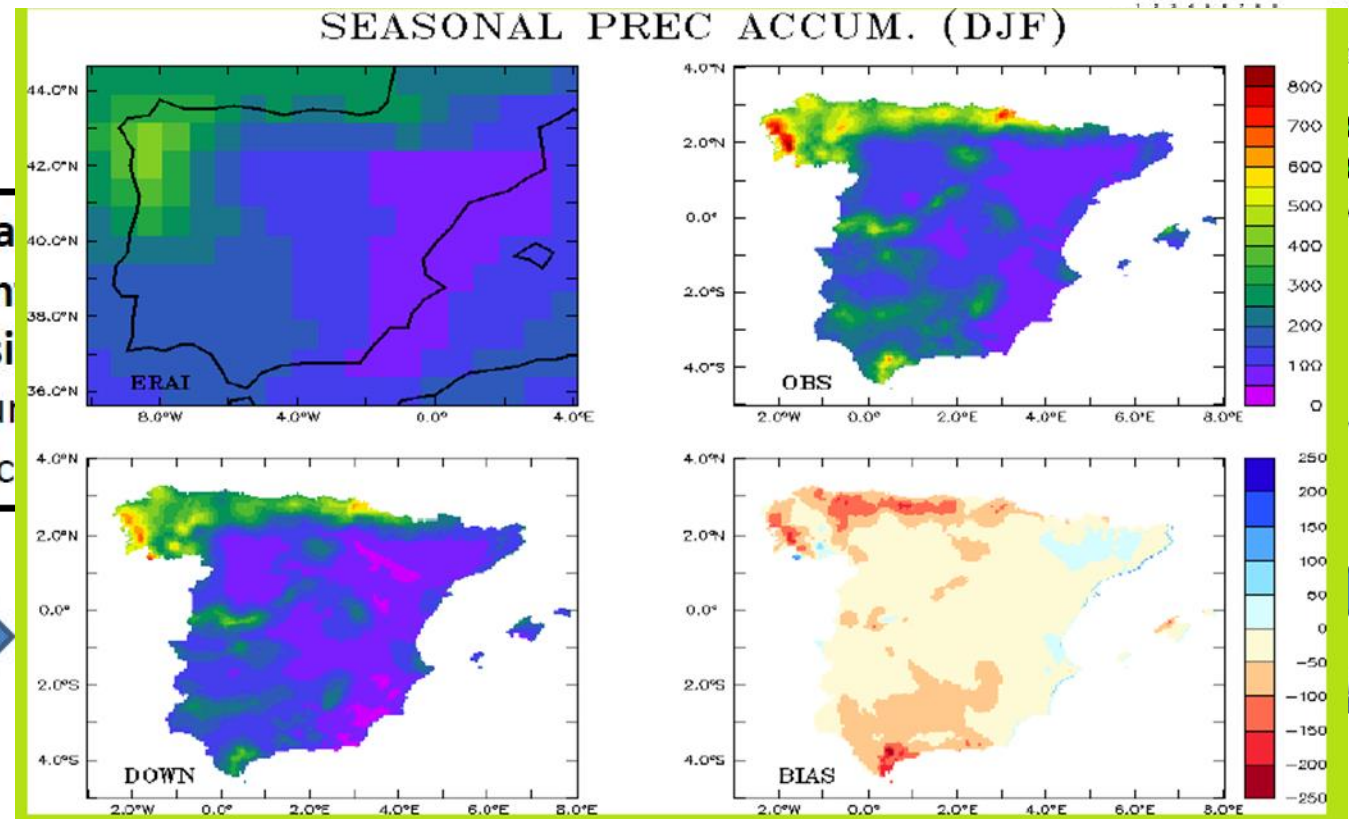


EDSCOPE

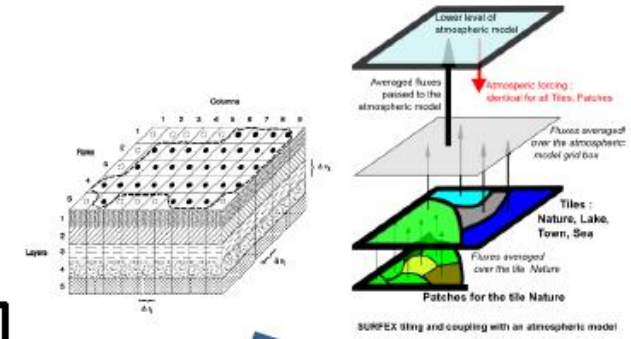
VIEWER

EVALUATION AT BELESAR RESERVOIR

BEST NAO weighting and combination

SIMPA

SURFEX



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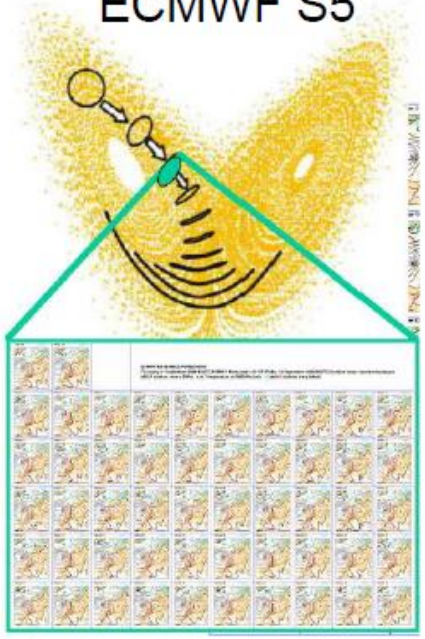

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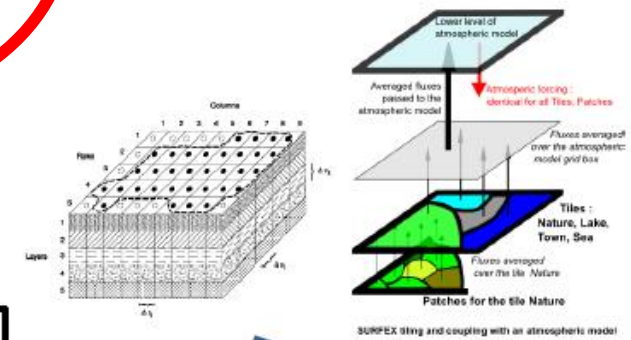
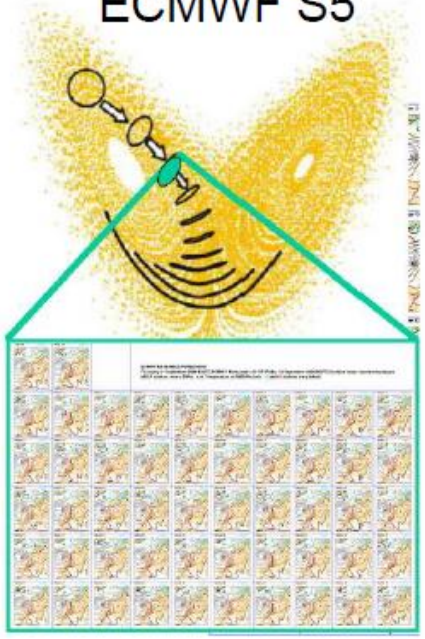
SIMPA

SURFEX



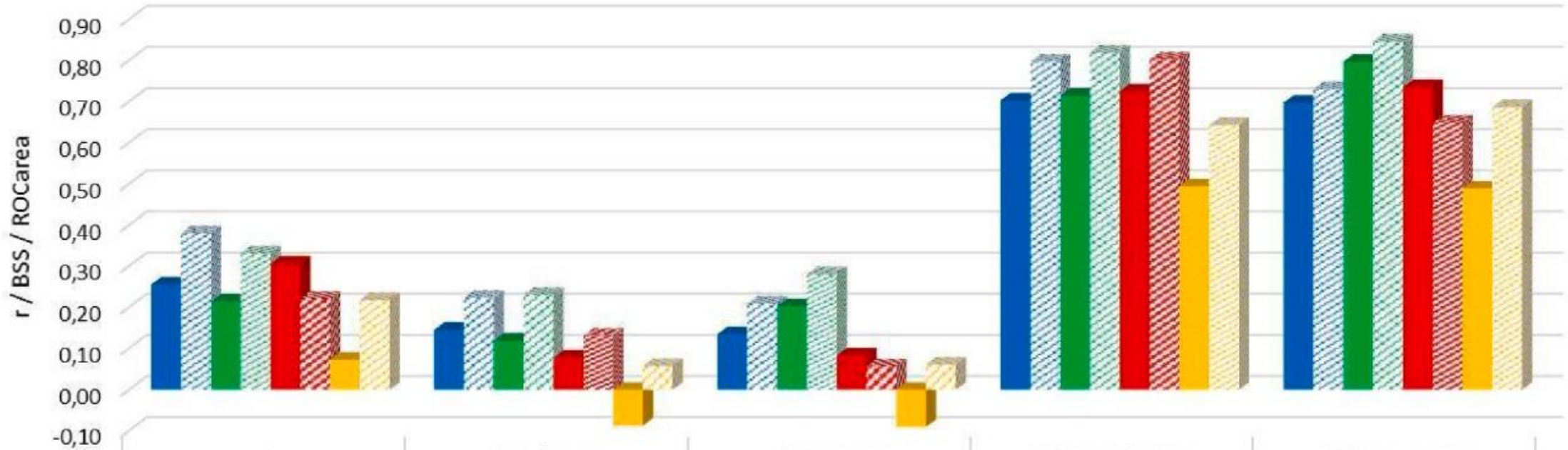
ECMWF S5



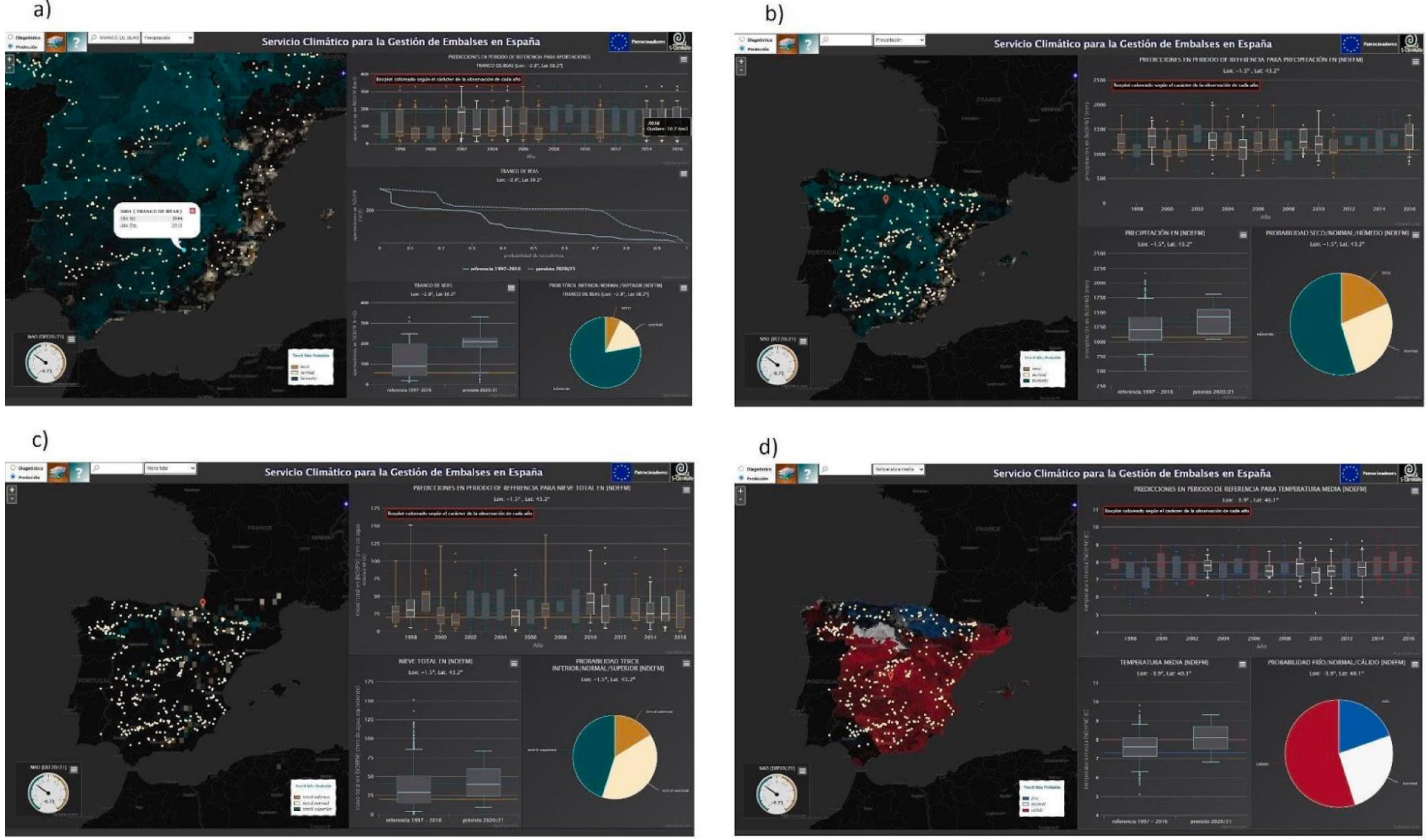
- **Domain of application**: All water reservoirs in Spain
- **Potential user(s):** dam managers
- **Decision making process**: Partition of water resources among main users: agriculture, energy, public supply

Downscaling based on ANALOGS

MEDSCOPE

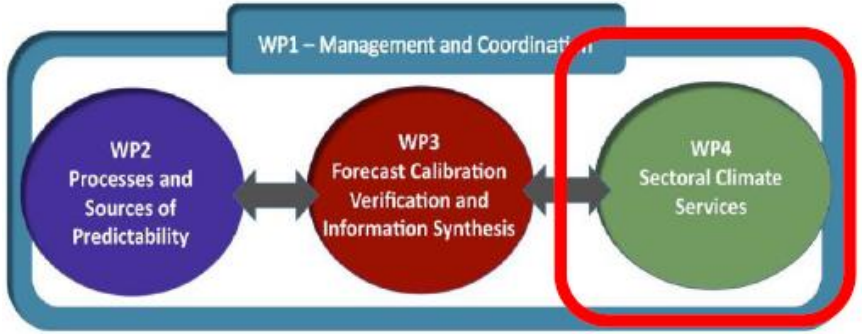


	r	BSS_lower	BSS_upper	ROCarea_lower	ROCarea_upper
SIMPA-EQ	0,26	0,15	0,13	0,70	0,70
SIMPA-W	0,38	0,22	0,21	0,80	0,73
SURFEX-EQ	0,21	0,12	0,20	0,71	0,80
SURFEX-W	0,33	0,23	0,28	0,82	0,85
SClimWaRe	0,31	0,08	0,08	0,73	0,74
SClimWaRe-H	0,22	0,13	0,06	0,80	0,65
SEAS5-EQ	0,07	-0,09	-0,09	0,49	0,49
SEAS5-W	0,22	0,06	0,06	0,64	0,69



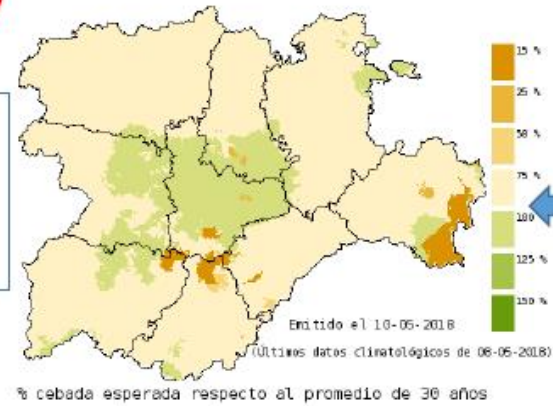
Overview of the forecasting displaying panels showing seasonal forecasts for November to March of accumulated water inflow (a), accumulated precipitation (b), accumulated snowfall (c) and mean temperature (d).

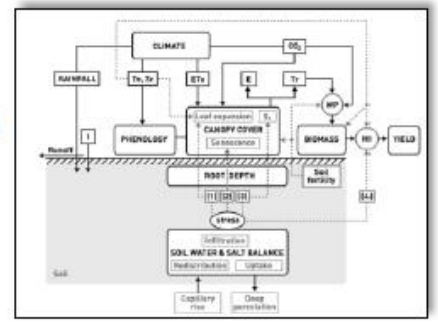
Co-design, co-develop, co-evaluacion



Predicciones estacionales para estimar la producción de cereals en Castilla y León

Predicción probabilista de rendimiento del cultivo de trigo on a 5km grid over Castilla y Leon (Spain)



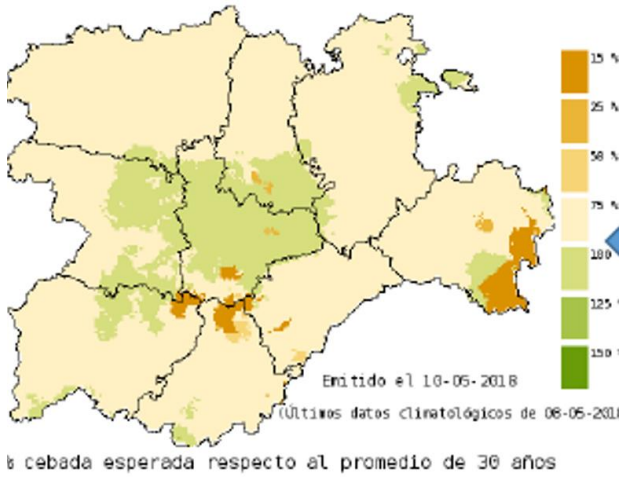


AQUACROP

- **Dominio de aplicación**: producción de trigo en Cy L
- **Usuarios potenciales:** agricultores en CyL
- **Proceso de toma de decisiones**: impacto sobre la producción de cereals/toma de decisions sobre el cultivo, selección de variedades…

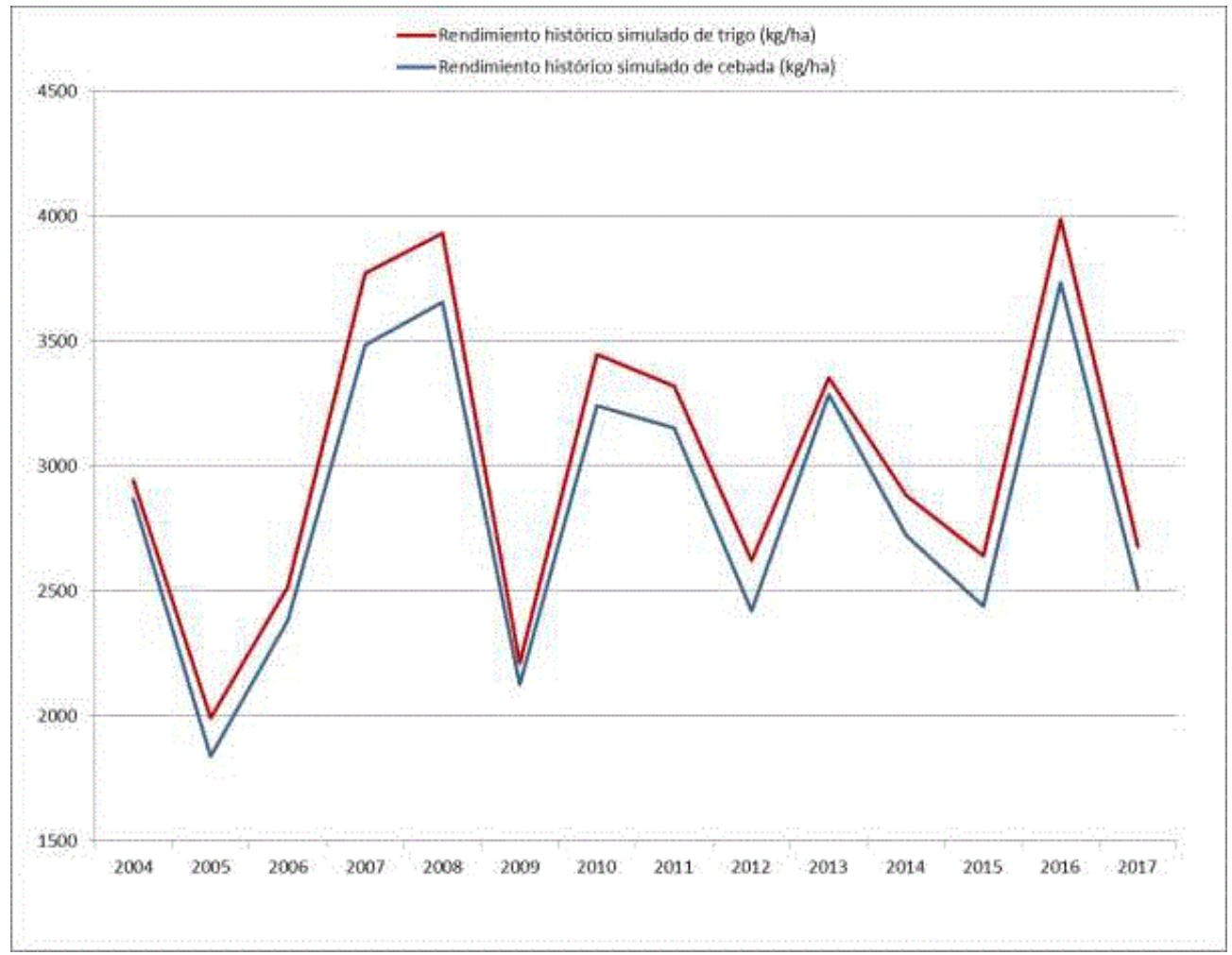
Downscaling based on ANALOGS

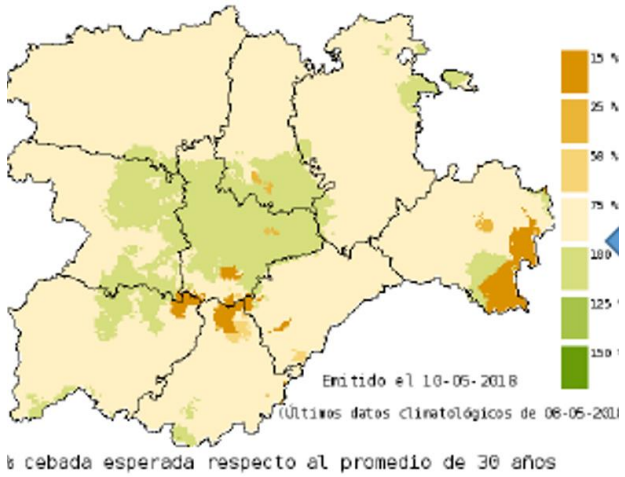
MEDSCOPE



Evaluación de resultados:

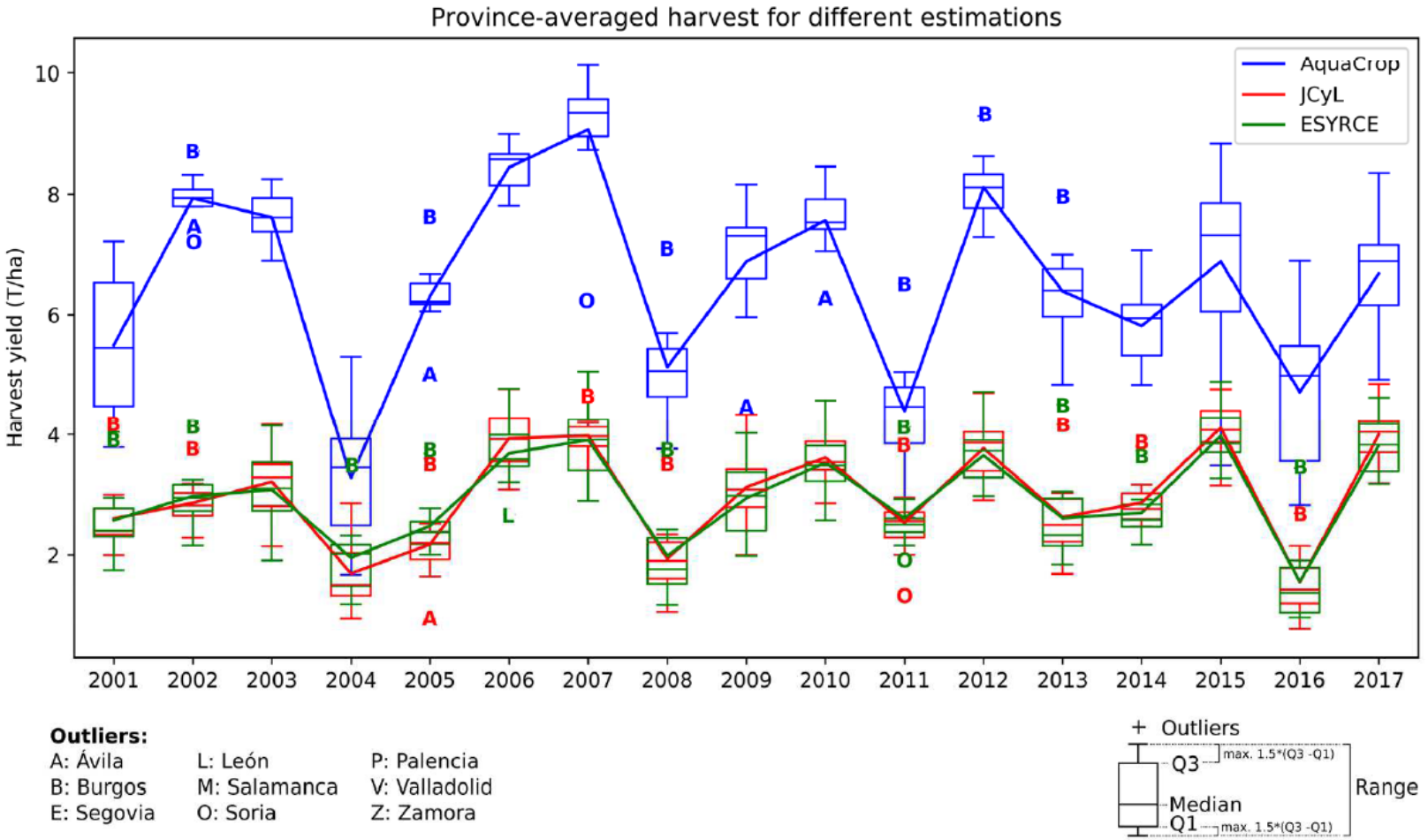
Uso de observaciones sintéticas: se acoplan aquacrop con las observaciones, dando unos resultados sintéticos de ”producción observada de trigo”

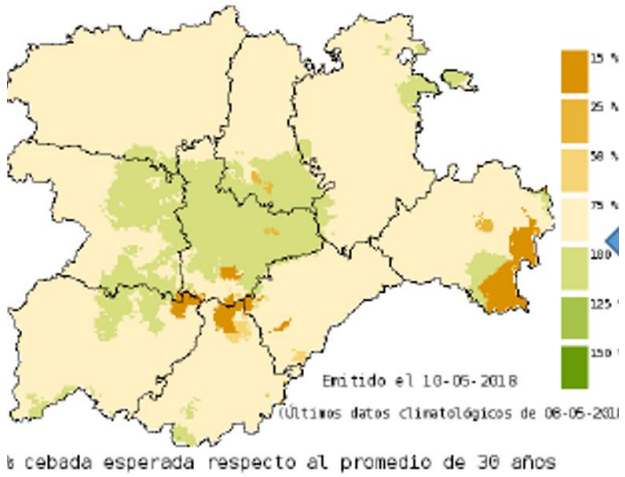




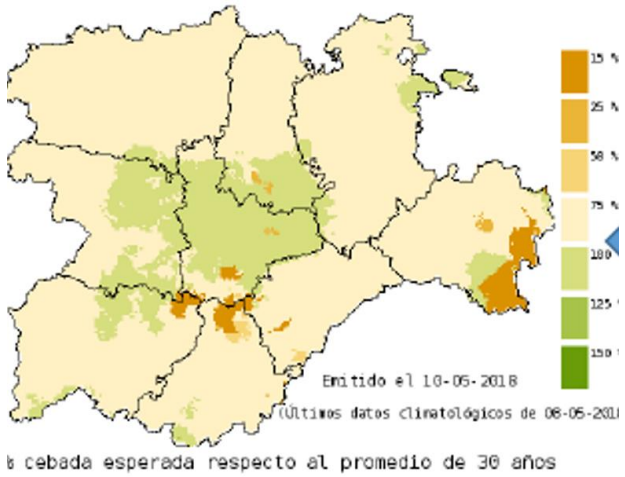
Evaluación de resultados:

Uso de observaciones sintéticas: se acoplan aquacrop con las observaciones, dando unos resultados sintéticos de ”producción observada de trigo”



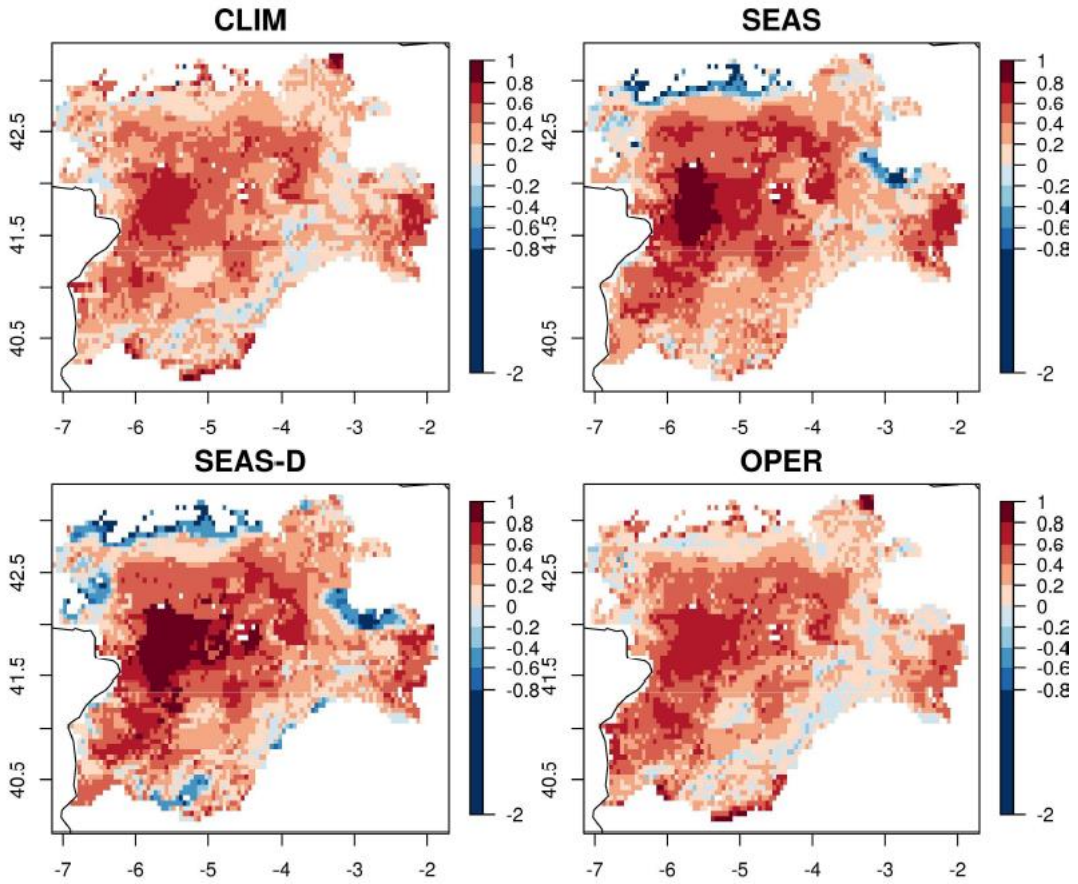


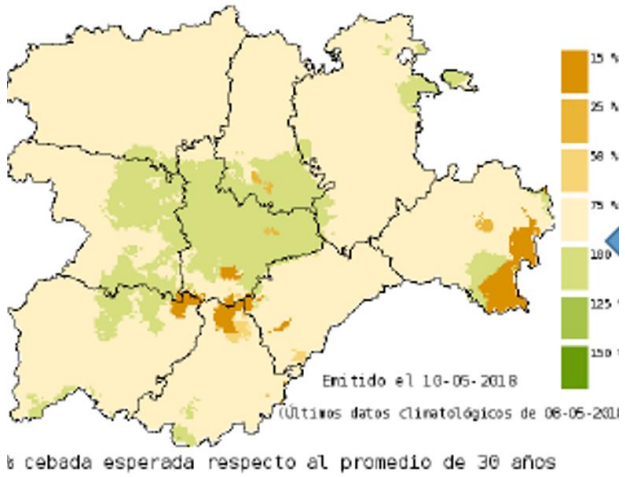
Evaluación de resultados:
Se compara, desde el 1 de abril:
CLIM: ensemble basado en climatología pasada
SEAS: ensemble basado en el modelo de estacional de ECMWF
SEAS-D: ensemble basado en el modelo de estacional de ECMWF
OPER: predicción operativa los primeros 10 días, después climatología pasada



Tercil inferior (producción por debajo de lo normal)

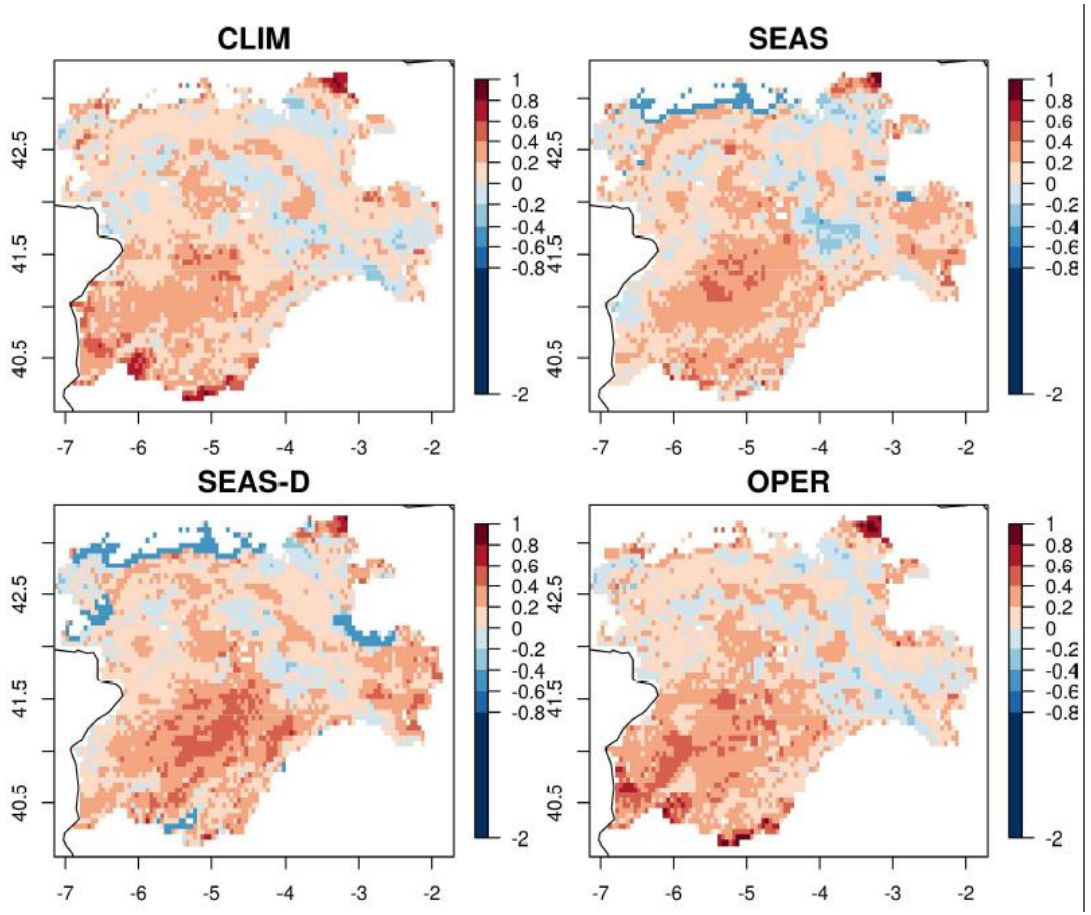
Evaluación de resultados:
Se compara, desde el 1 de abril:
CLIM: ensemble basado en climatología pasada
SEAS: ensemble basado en el modelo de estacional de ECMWF
SEAS-D: ensemble basado en el modelo de estacional de ECMWF
OPER: predicción operativa los primeros 10 días, después climatología pasada





Tercil superior (producción por encima de lo normal)

Evaluación de resultados:
Se compara, desde el 1 de abril:
CLIM: ensemble basado en climatología pasada
SEAS: ensemble basado en el modelo de estacional de ECMWF
SEAS-D: ensemble basado en el modelo de estacional de ECMWF
OPER: predicción operativa los primeros 10 días, después climatología pasada



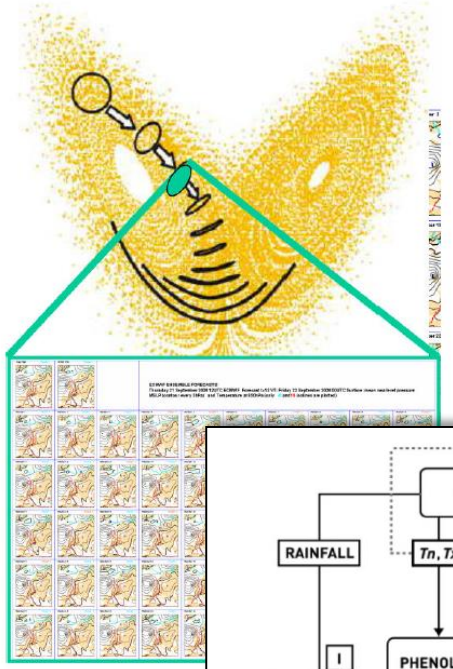
Identify project goals

- Castilla y León region is the **main national producer of winter cereals in Spain**. Most of this production is obtained in rainfed farms (not irrigated) and is therefore very much affected by precipitation variability.
- So far, a **harvest prediction tool** making use of past observations, climatological data and short/medium range forecasts has been developed by the Agricultural Technology Institute of Castilla y León (ITACyL) and AEMET to estimate crop yield at **seasonal time scale**. This system is delivering yield predictions since the 2015 campaign.

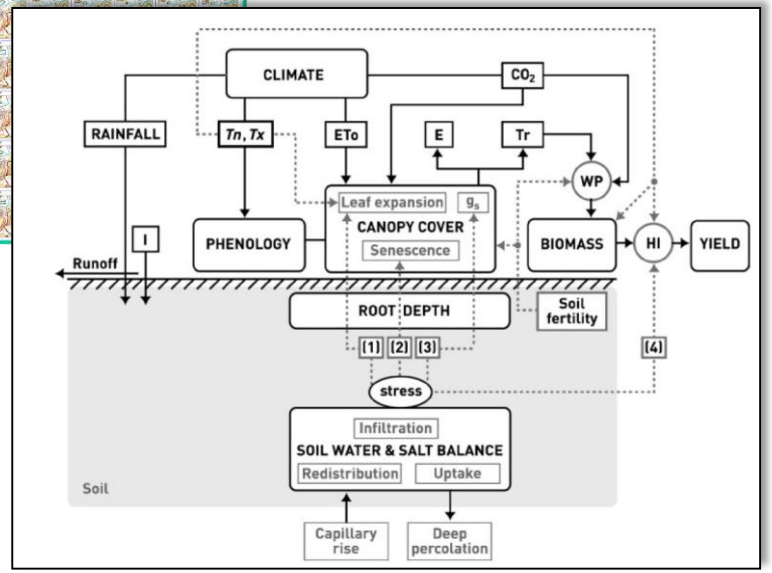
Identify and invite stakeholders

- It is important to involve a **diverse selection of stakeholders** that represent the variety of interests shared by this group as a whole. In this context, the dialogue cannot benefit all the different groups if it is not planned accordingly. **An inclusive and flexible strategy,** which empowers weaker groups, should be implemented that allows a balanced representation of all stakeholders. Furthermore, the process of facilitation should ensure that the users have different roles, different interests and different power levels.

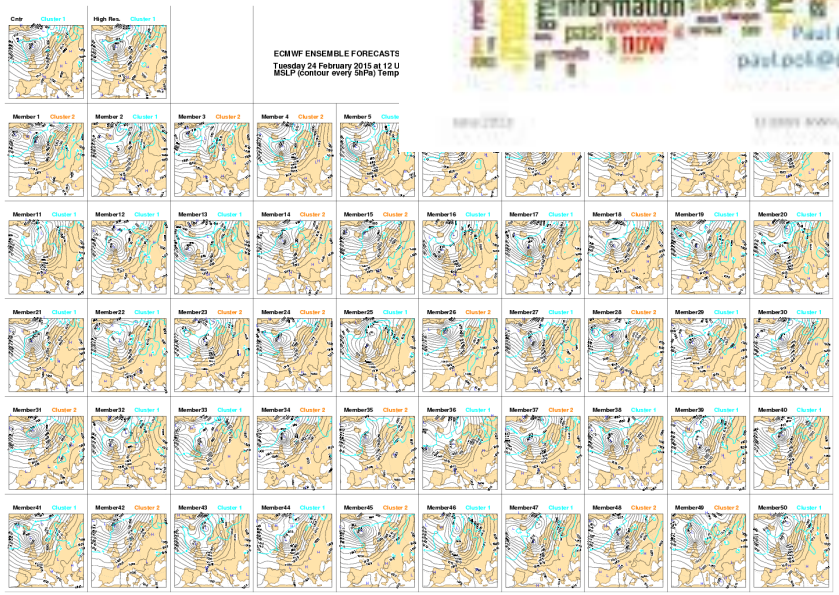
Choose modelling tools

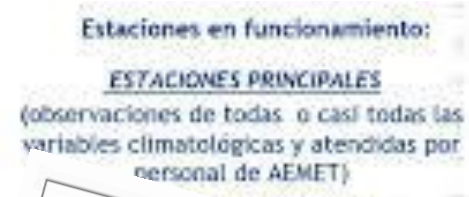


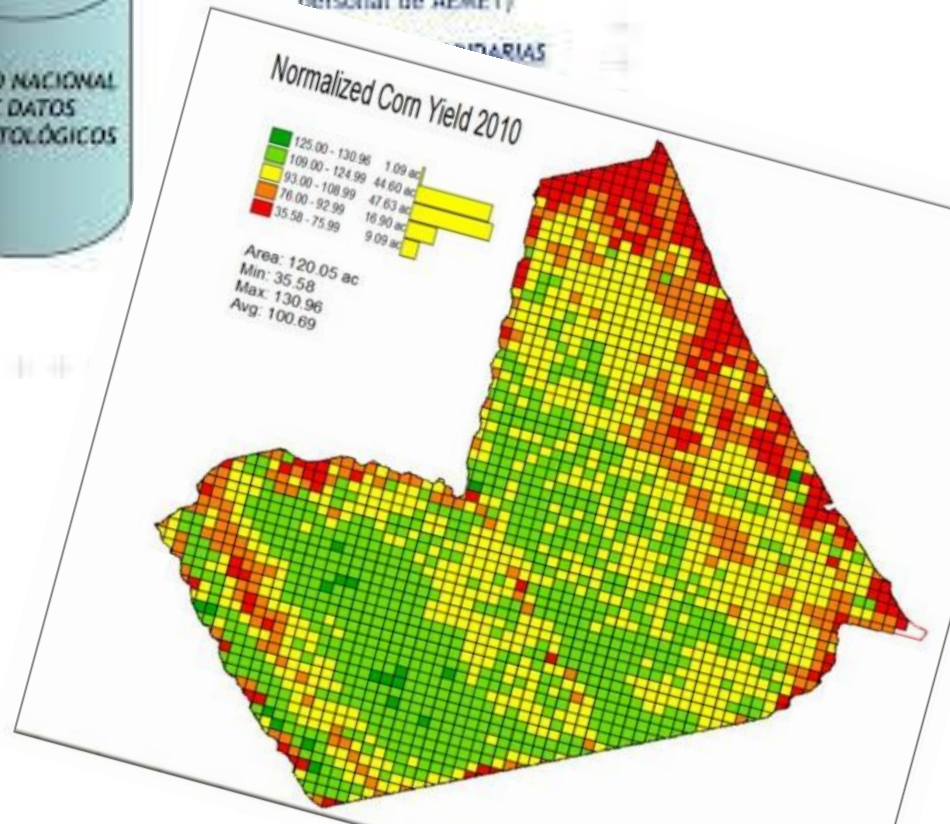
Downscaling based on ANALOGS



Collect and process data

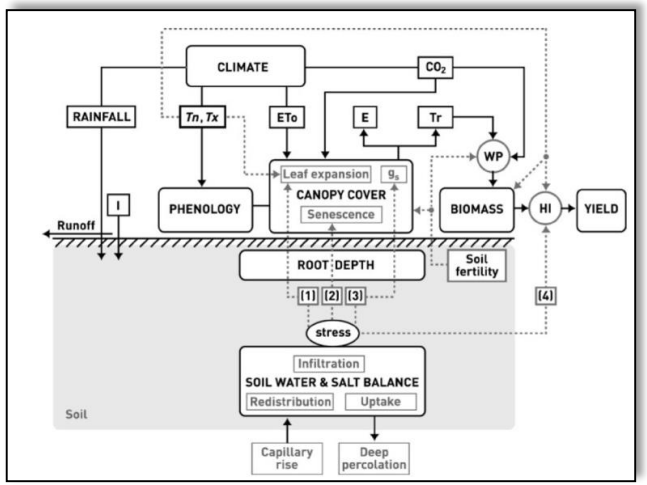


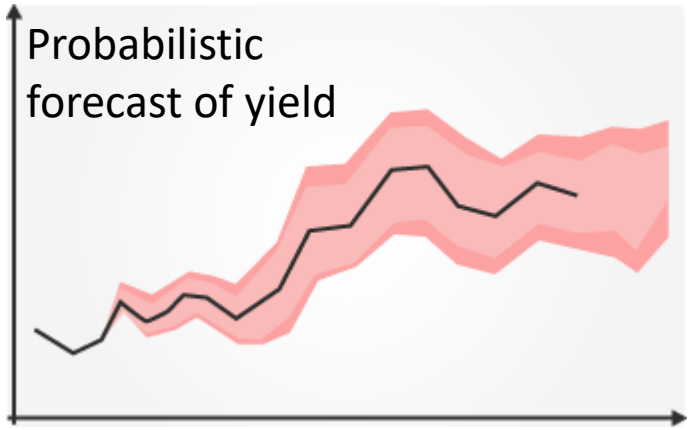


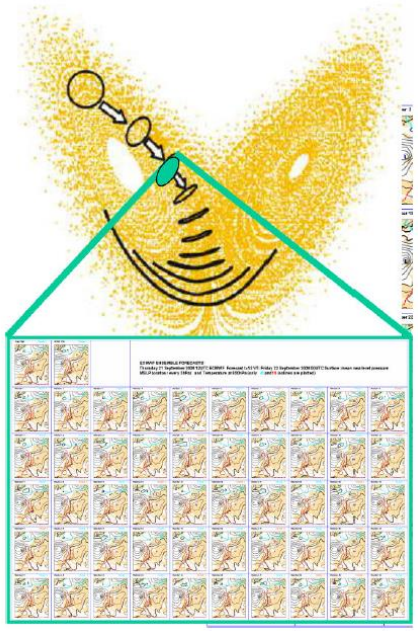


Discuss system, build conceptual model

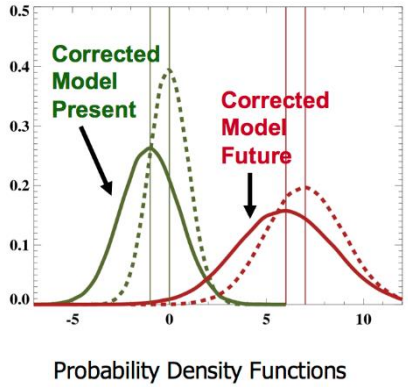
Crop model







Downscaling based on ANALOGS



BEST NAO weighting and combination

Strategy for verification

- Use retrospective forecast (hindcast) during a sufficiently long period (20-30 years)
- Run the whole suite previously defined in hindcast mode generating probabilistic forecasts in terms of users variables (e.g., crop yield, Tons/Ha)
- Define and use some reference to compare the new developed climate service
- Compute some probabilistic or deterministic skill scores (e.g., ROA área, anomaly correlation, etc.

(see e.g., http://www.aemet.es/es/conocermas/recursos_en_linea/publicaciones_y_estudios/publicaciones/detalles/NT_21_AEMET)

Present results to other stakeholders and decisión makers