

High resolution WRF climatic simulations in the Iberian Peninsula: Model validation

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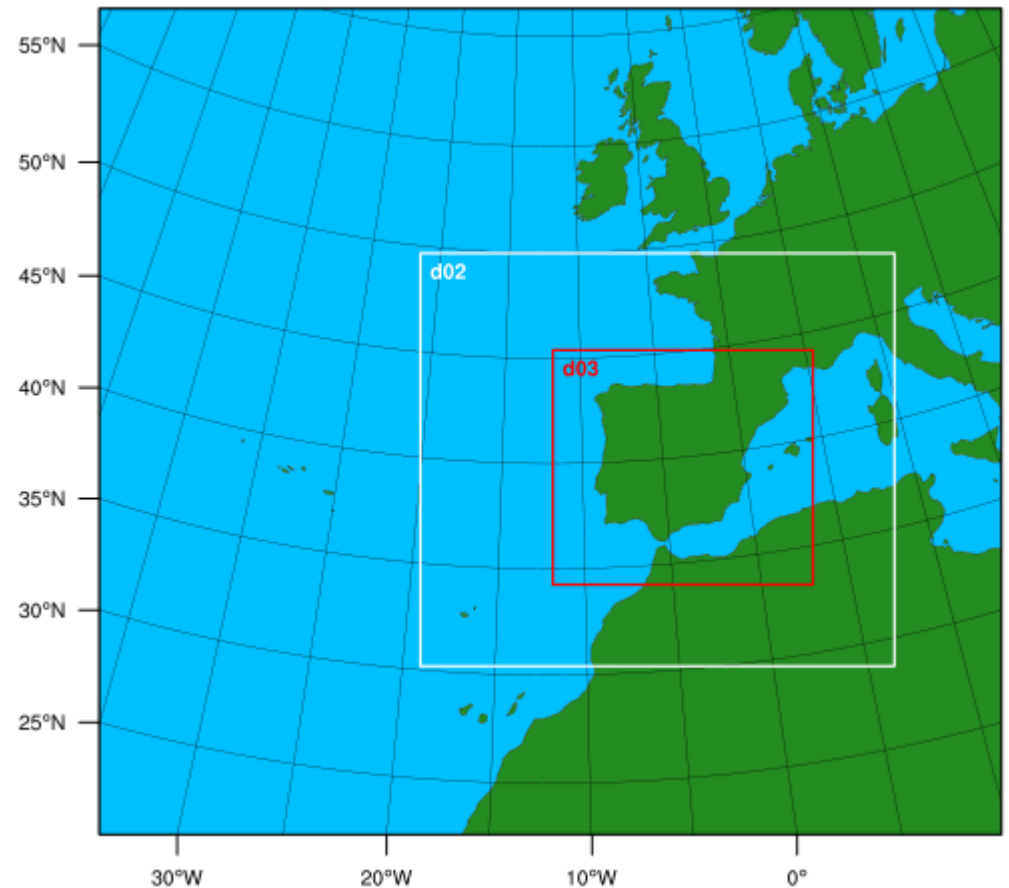
WRF Climatic Simulations Downscaling with 3 nested domains

Resolutions:

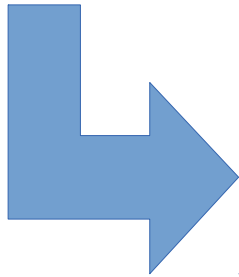
81 km

27 km

9 km – Iberian Peninsula



WRF Climatic Simulations



- SST update (long term simulations)
- Spectral nudging (long term simulations)
- Variable concentration of greenhouse gases
- Climatic parent forcing
- Diagnostics...

WRF model forcing (parent models)

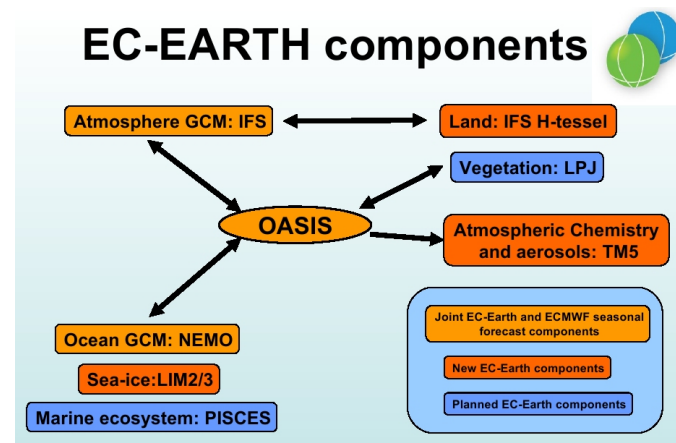
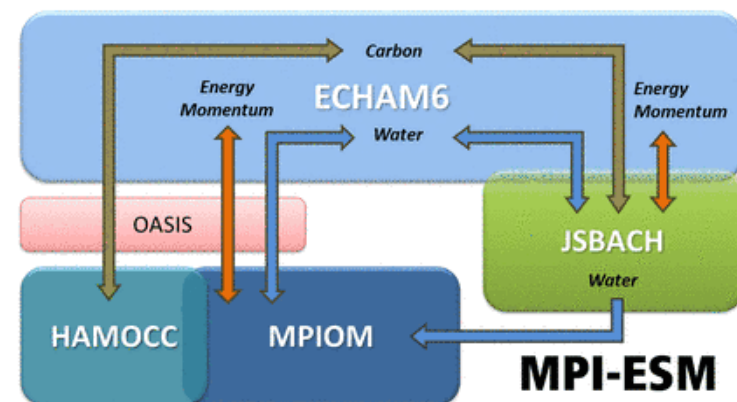
Climate runs:

Earth System models: coupled atmosphere, ocean and land surface

- **MPI-ESM**, Max Planck Institute for Meteorology Earth system model
- **EC-EARTH**, national weather services and universities from currently 11 countries in Europe

Hindcast run:

- **ERA-INTERIM**



WRF model setup

2-way nesting

ASpectral
nudging

Microphysics	WRF Single-Moment 6-class scheme. A scheme with ice, snow and graupel processes suitable for high-resolution simulations
PBL	Yonsei University scheme
Surface layer	Revised MM5 surface layer scheme
Land surface	Noah Land Surface Model. Unified NCEP/NCAR/AFWA scheme with soil temperature and moisture in four layers, fractional snow cover and frozen soil physics
Cumulus	Grell-Freitas, Grell et al. (2013)
Longwave	Rapid Radiative Transfer Model
Shortwave	Dudhia scheme, Simple downward integration

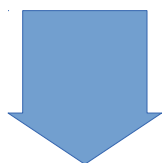
Representative Concentration Pathways (IPCC, Assess. Rep. 5)

Simulation periods:

1985+ **1986-2005** Historical

2035+ **2036-2055** Medium term future

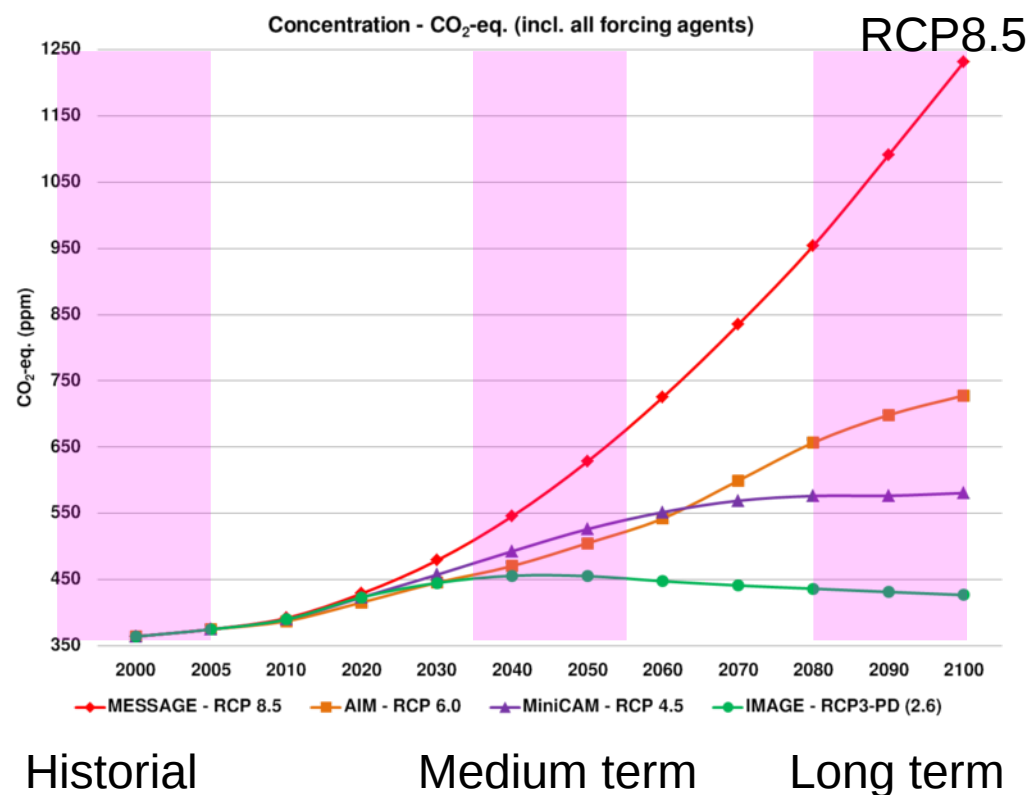
2080+ **2081-2100** Long term future



RCP8.5

SPINUP

Extremes/soil moisture



Parent
Model

1986-2005 Historical

MPI

T63 – 1.9° dt=6h

ERA

0.75 dt=6h

2036-2055 Medium term future

MPI

EC-EARTH

test

T159 125 km, dt=6h

2081-2100 Long term future

MPI

Land Cover:

CORINE 2006 – 44 classes

Used in **all simulations!**

100 m resolution

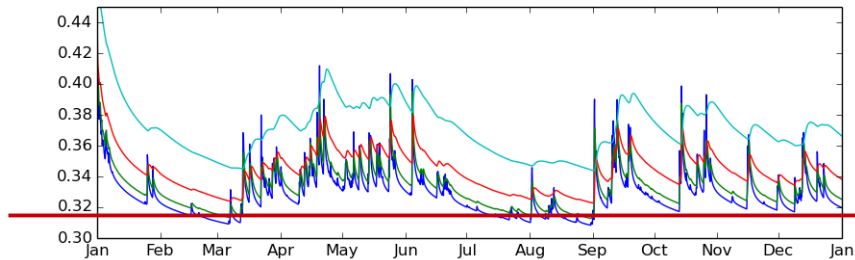
44 classes converted to
24 USGS classes (1993) (Pineda
et al 2004)

USGS 1km (not updated for
Europe)



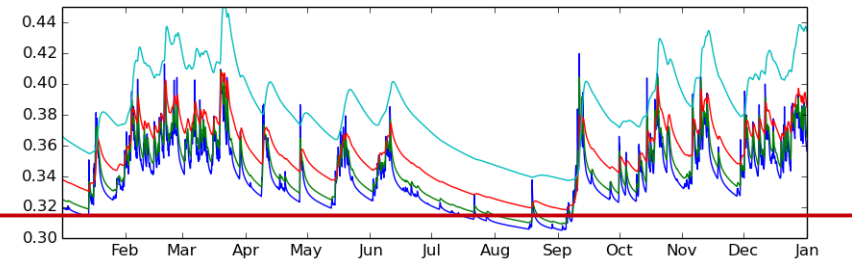
Model spinup and soil moisture

1985

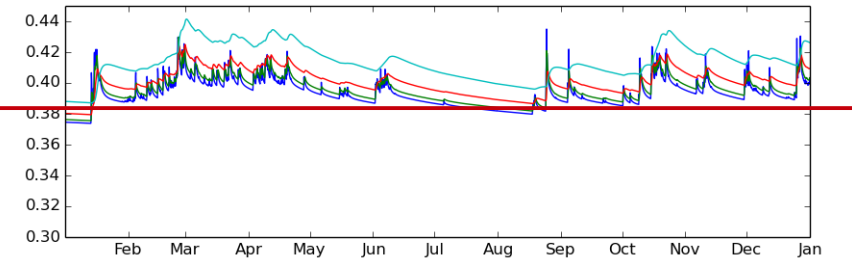
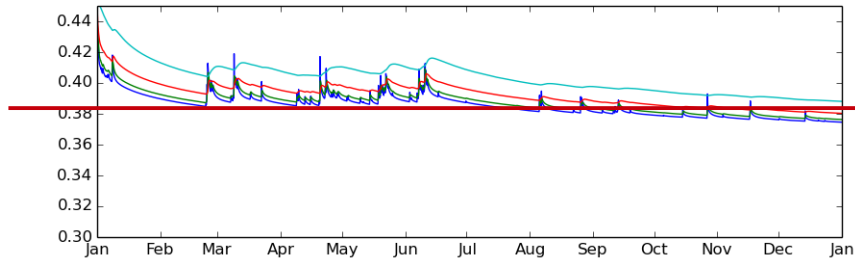


Porto

1986

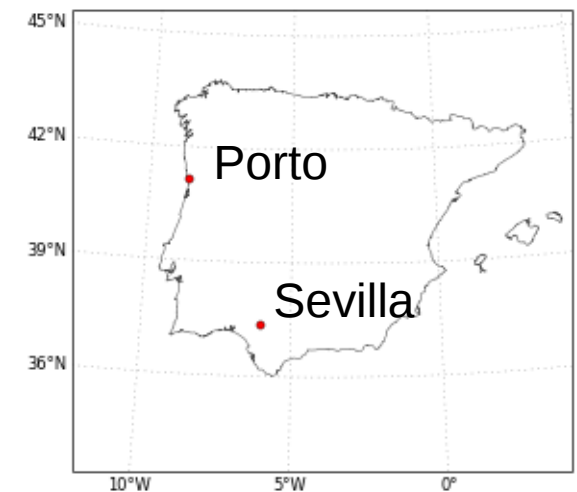


Sevilla



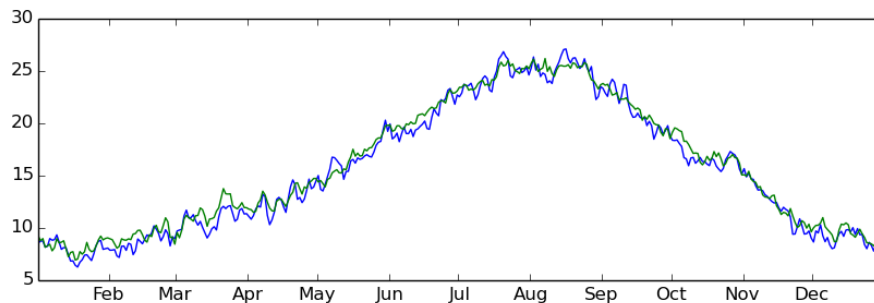
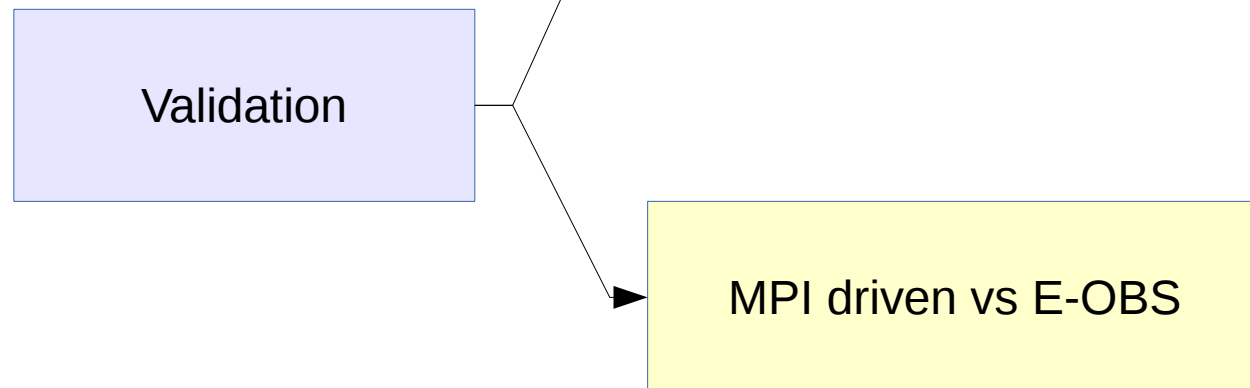
Spinup year

Soil depths:
3; 19; 78; 268; 698 cm



Climate Model Validation

Surface Air temperature



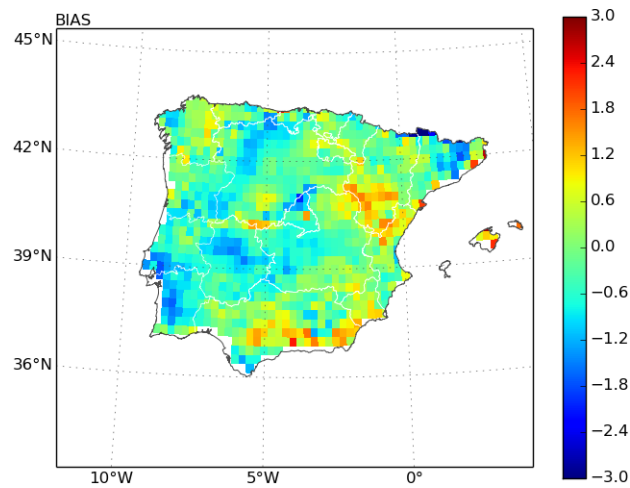
366 days average of mean max min

E-OBS: high-resolution
(0.25°) gridded data set of
daily climate over Europe

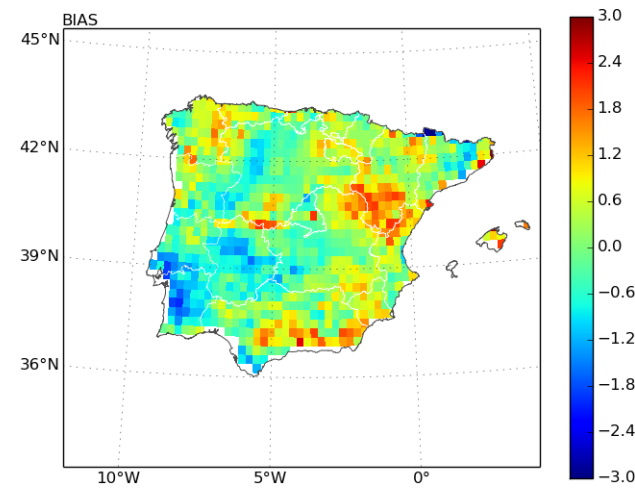
Climate Model Validation - Surface Air temperature - MAX

bias

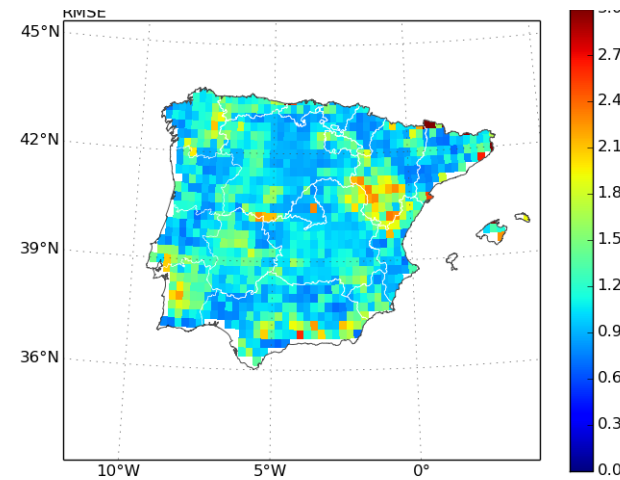
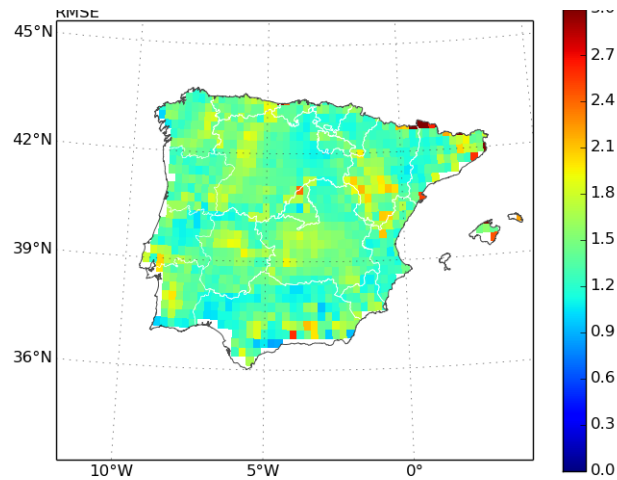
WRF-MPI



WRF-ERA

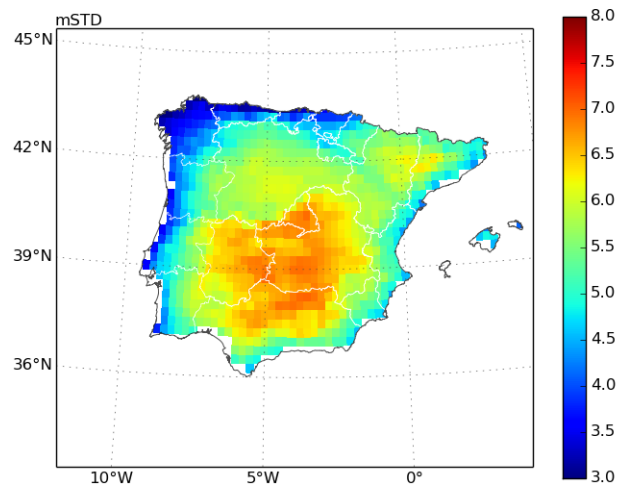


rmse

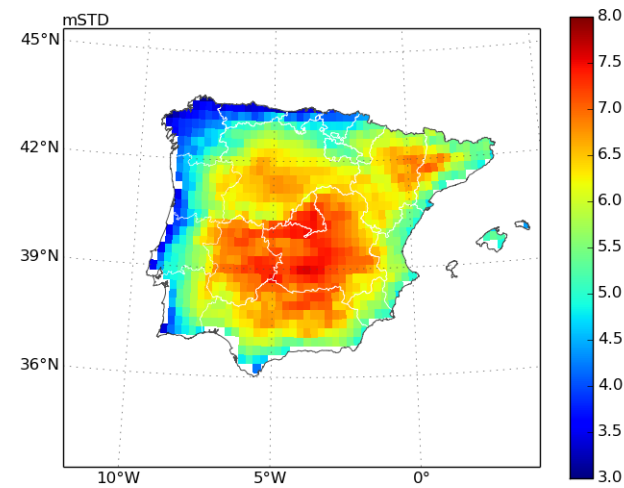


Climate Model Validation - Surface Air temperature - MAX

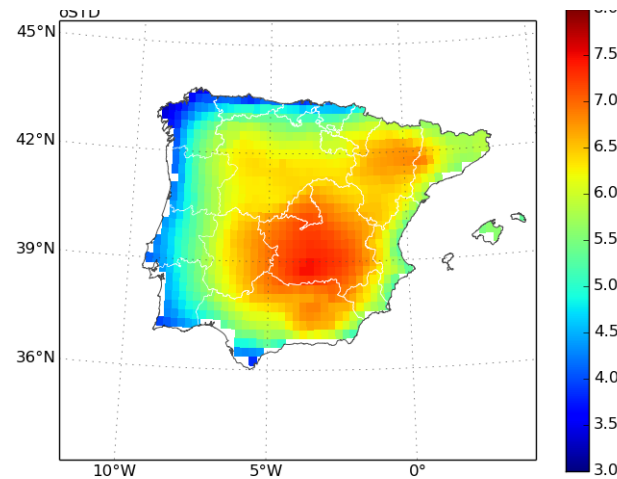
std WRF-MPI



std WRF-ERA

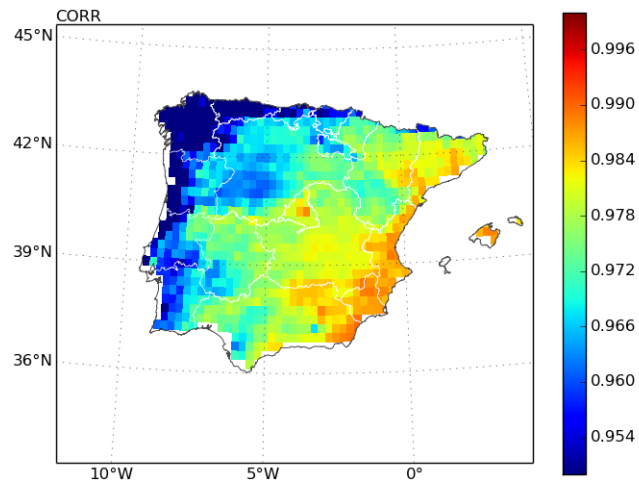


std E-OBS

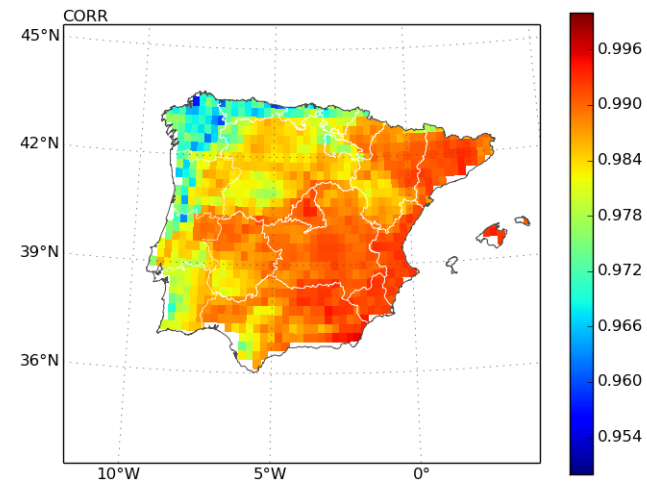


Climate Model Validation - Surface Air temperature – corr coef

WRF-MPI



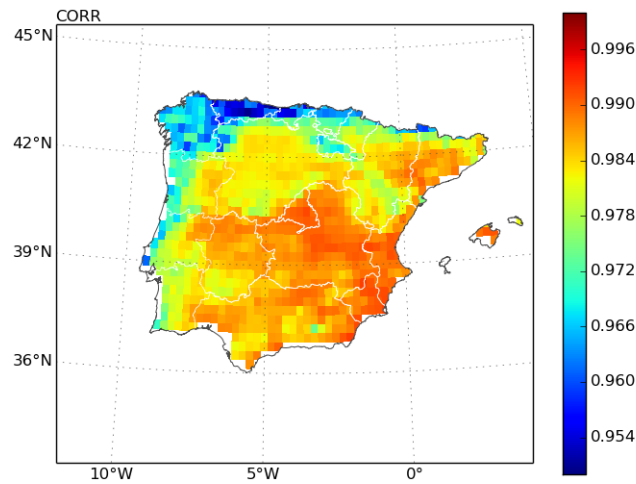
WRF-ERA



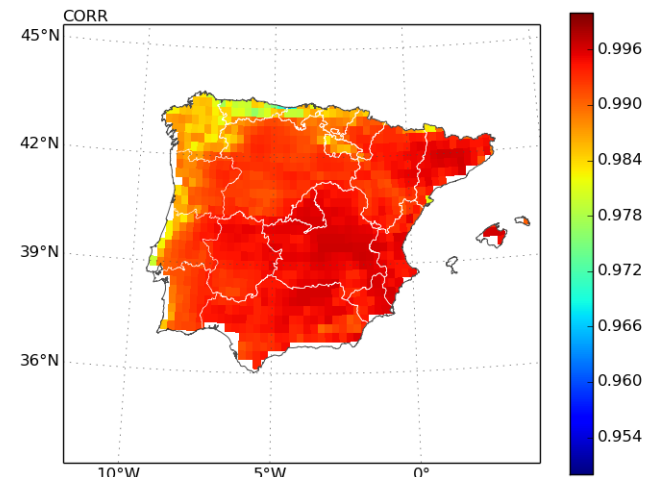
Climate Model Validation - Surface Air temperature – corr coef

MEAN

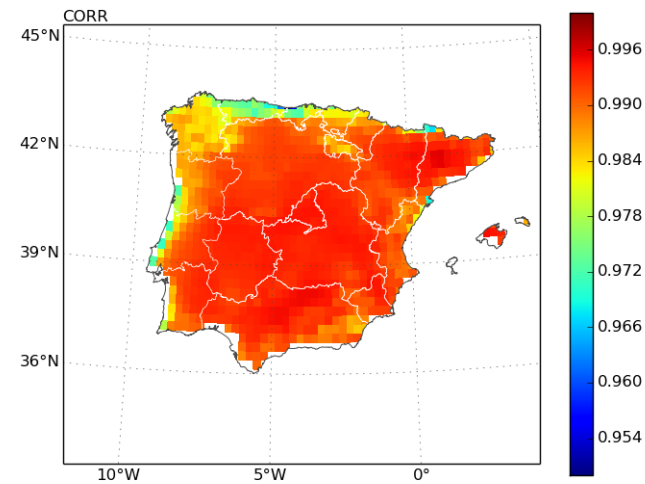
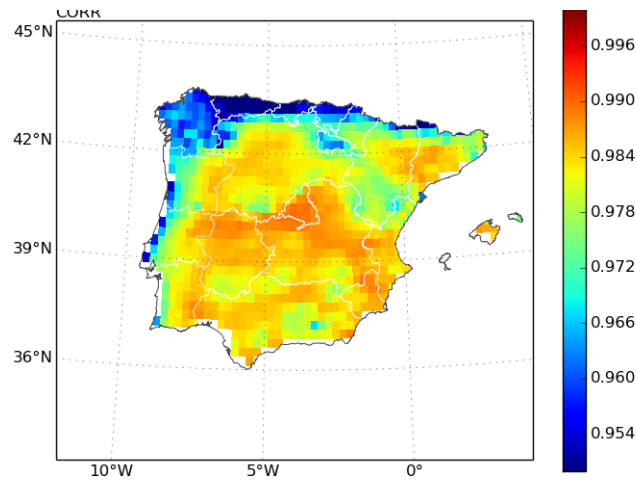
WRF-MPI



WRF-ERA



MIN



About:

Clicurb ... pollution; extremes; heat waves



Applications:

- Agriculture
- Forests/rivers
- Sea surface interaction (heat/fresh water/momentum)
- Wind power

Collaborations?

Thank you

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