



Seminário Seminar

**ALTERAÇÕES CLIMÁTICAS
NA PRODUÇÃO DE VINHO
VISÃO GLOBAL E AVALIAÇÃO DA
SITUAÇÃO NA REGIÃO DO DOURO**

**CLIMATE CHANGE
ON WINE PRODUCTION
GLOBAL OVERVIEW AND REGIONAL
ASSESSMENT IN THE DOURO VALLEY**

12|04'LISBOA | 13|04'PORTO 2012
FUNDAÇÃO LUSO-AMERICANA ALFÂNDEGA DO PORTO



Downscaling climate fields to high resolution

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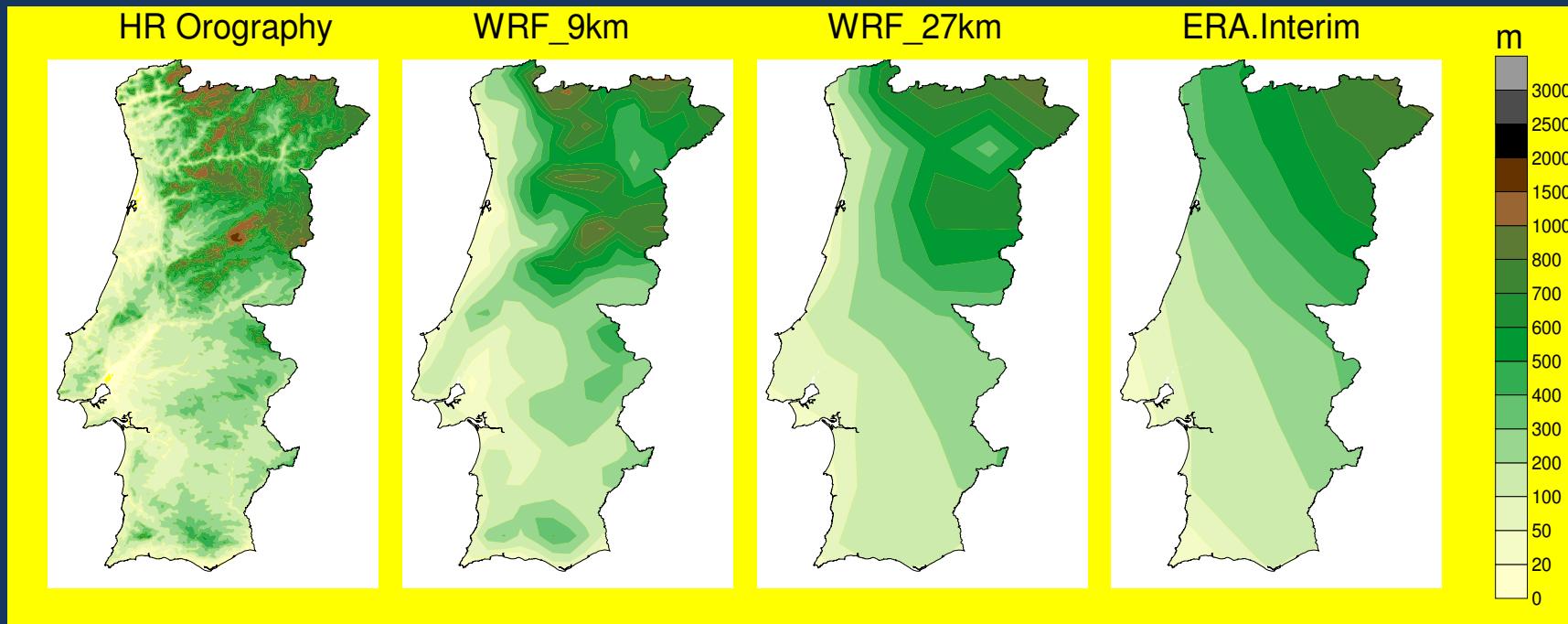
Summary

1. Observations and models
2. Global models: the EC-Earth community model
3. Results from ENSEMBLES in Portugal
4. Downscaling global reanalysis fields with WRF
5. Conclusions



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Topography at different scales



Details are important. Changes in climate affect not just spatial details but the mean values (non-linearity).
What is better: a (displaced) point observation or a simulated distributed field?



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In any case, future climate can only be simulated, not observed.

Simulated fields need to follow a **cascade** of scales:

Global model (low resolution) → ... → Regional high resolution

The same methodology may be applied to past climate.



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EC-Earth

A Seamless Earth-System Prediction Approach in Action

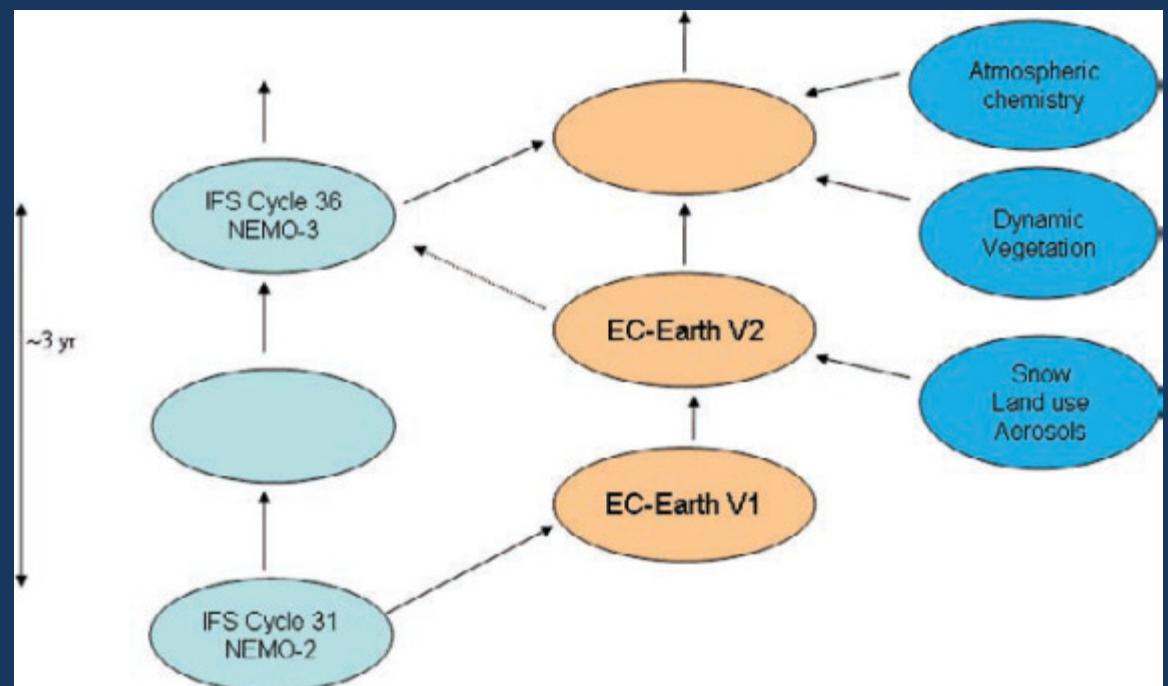
BY WILCO HAZELEGER, CAMIEL SEVERIJNS, TIDO SEMMLER, SIMONA ȘTEFĂNESCU, SHUTING YANG, XUELI WANG, KLAUS WYSER, EMANUEL DUTRA, JOSÉ M. BALDASANO, RICHARD BINTANJA, PHILIPPE BOUGEAULT, RODRIGO CABALLERO, ANNICA M. L. EKMAN, JENS H. CHRISTENSEN, BART VAN DEN HURK, PEDRO JIMENEZ, COLIN JONES, PER KÄLLBERG, TORBEN KOENIGK, RAY MCGRATH, PEDRO MIRANDA, TWAN VAN NOIJE, TIM PALMER, JOSÉ A. PARODI, TORBEN SCHMITH, FRANK SELTEN, TRUDE STORELVMO, ANDREAS STERL, HONORÉ TAPAMO, MARTIN VANCOPPENOLLE, PEDRO VITERBO, AND ULRIKA WILLÉN

ECMWF IFS model+
NEMO ocean

“synchronized” with
ECMWF seasonal

New components
Various computers,
inc. Linux

10 EU countries
~20 Institutions





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EC-Earth for IPCC AR5, CMIP5

>20 member ensemble of coupled runs:

- Historical 1850-2005
- RCP 4.5 2005-2100
- RCP 8.5 2005-2100

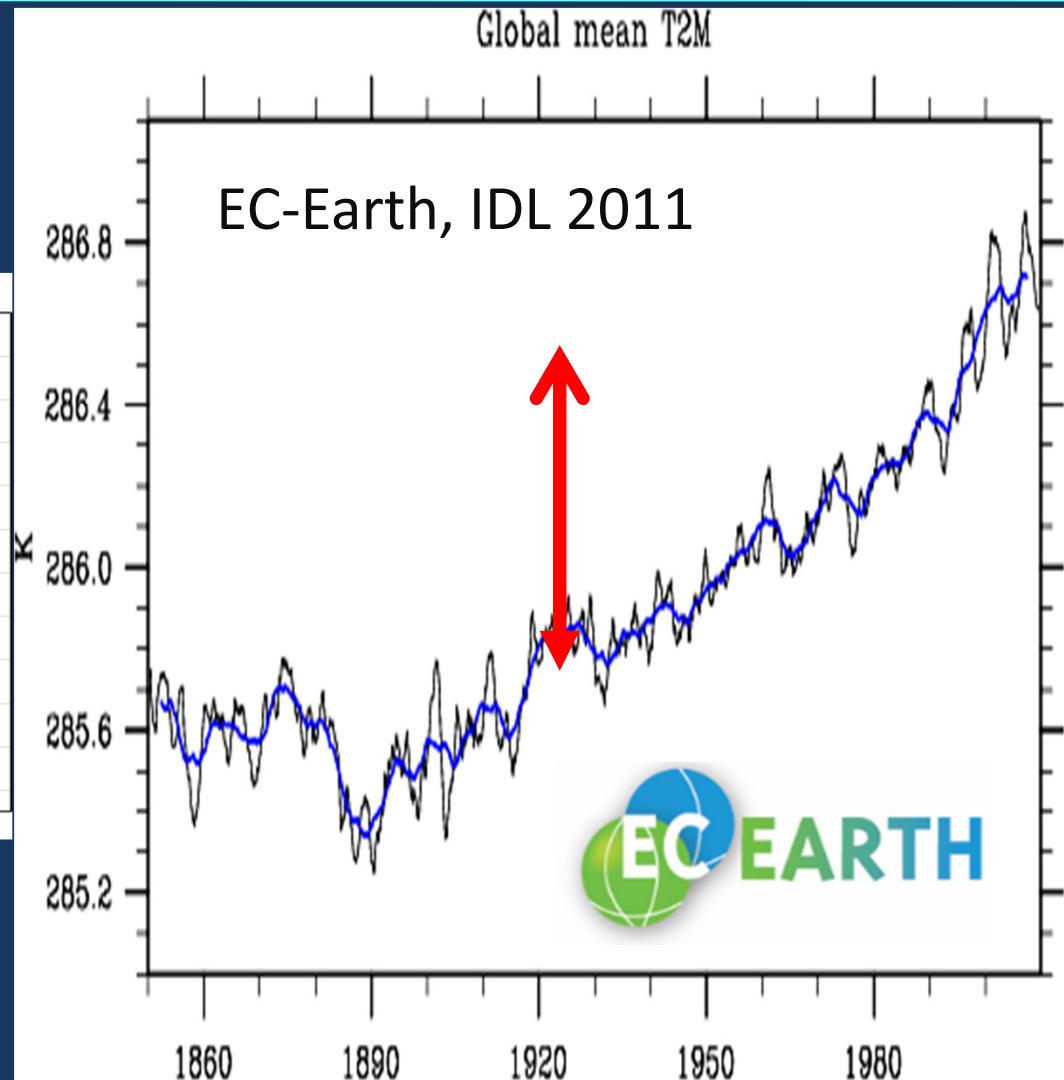
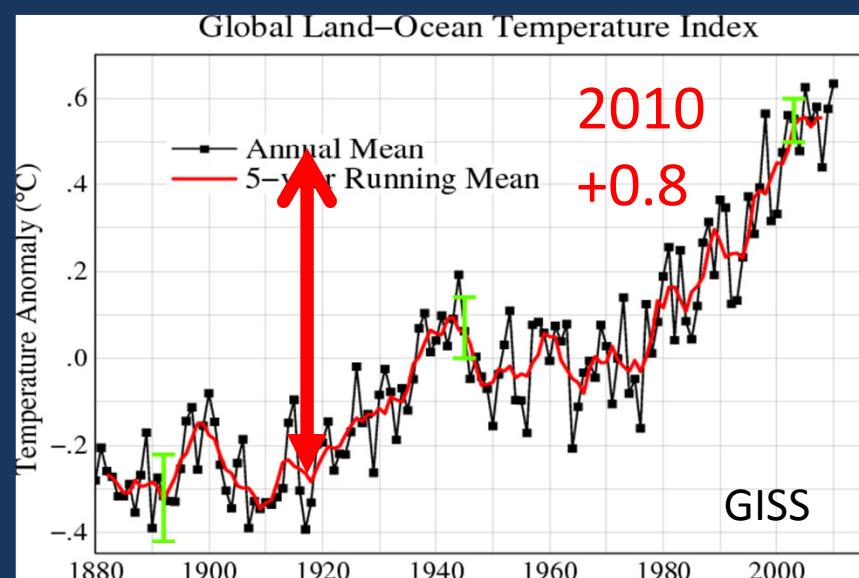
Various other ensembles: decadal forecasts, AMIP, etc.

Regional downscaling in different areas (here shown for Iberia), with different RCMs



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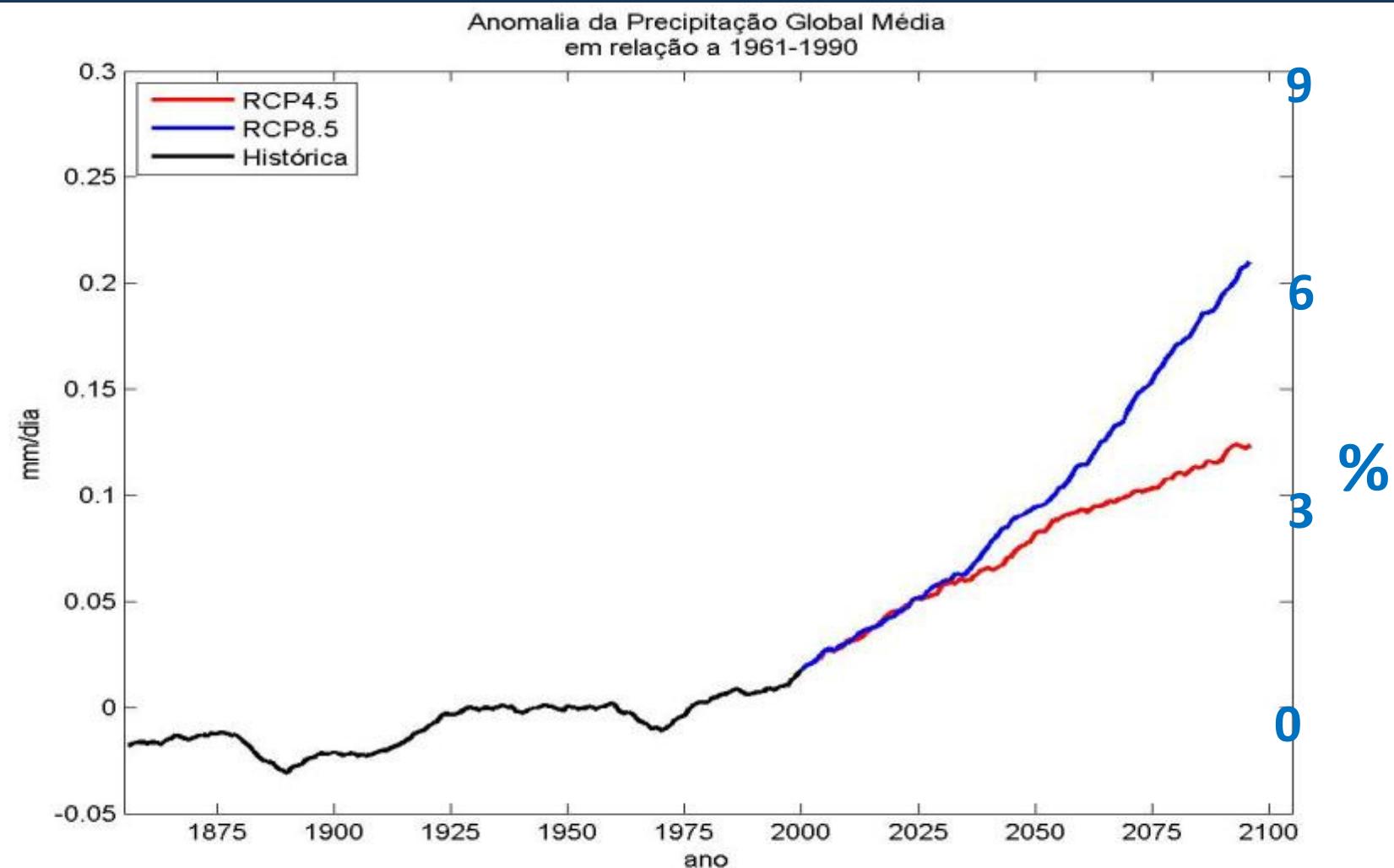
EC-Earth Historical run





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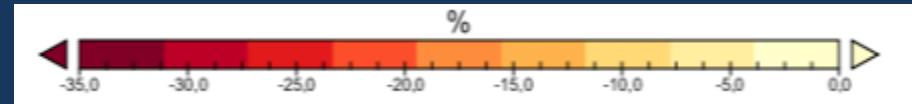
EC-Earth Global Δ Precipitation





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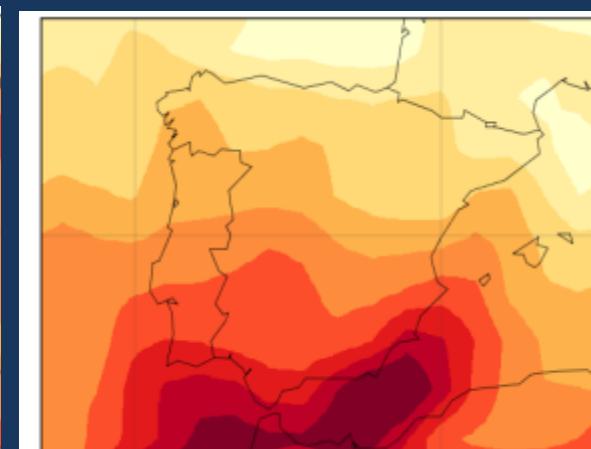
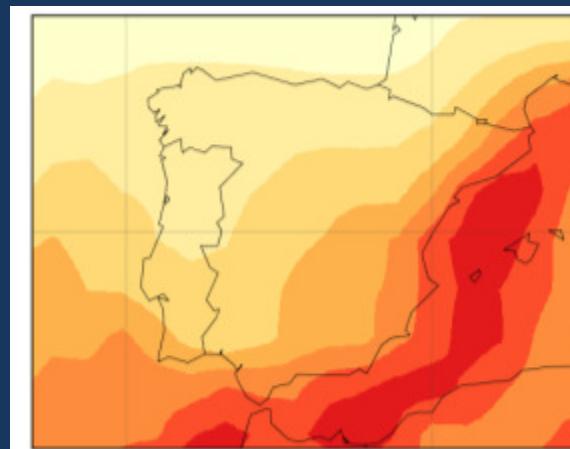
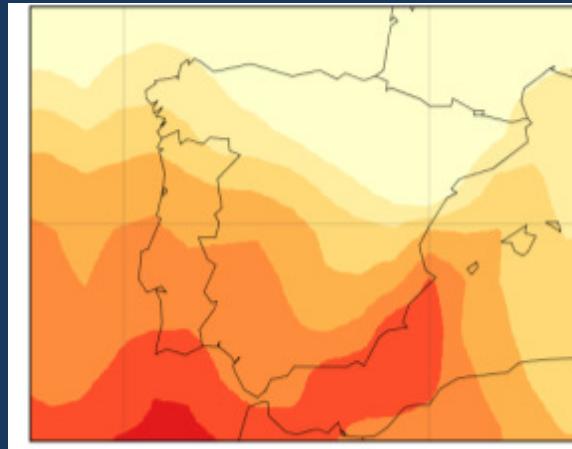
Iberia in EC-Earth scenarios



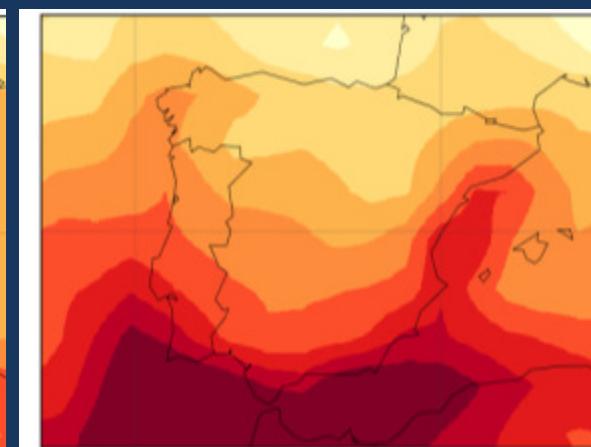
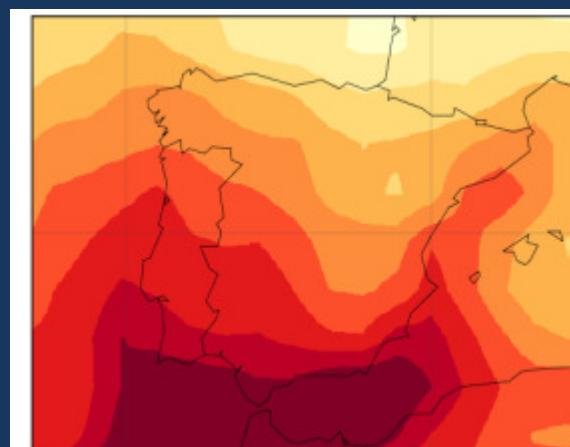
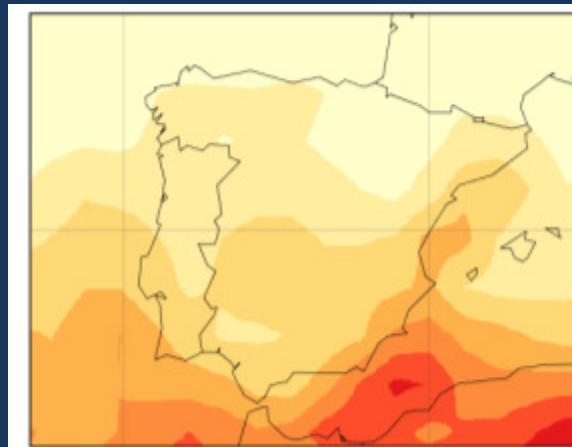
2011-2040

2041-2070

2071-2100



RCP4.5



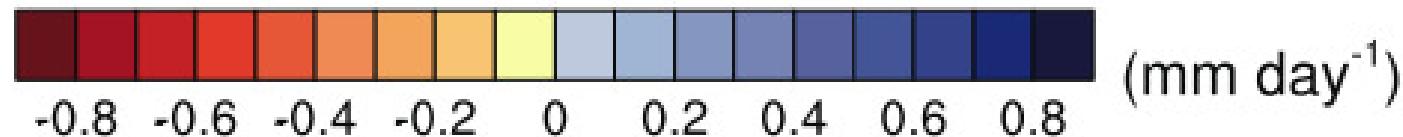
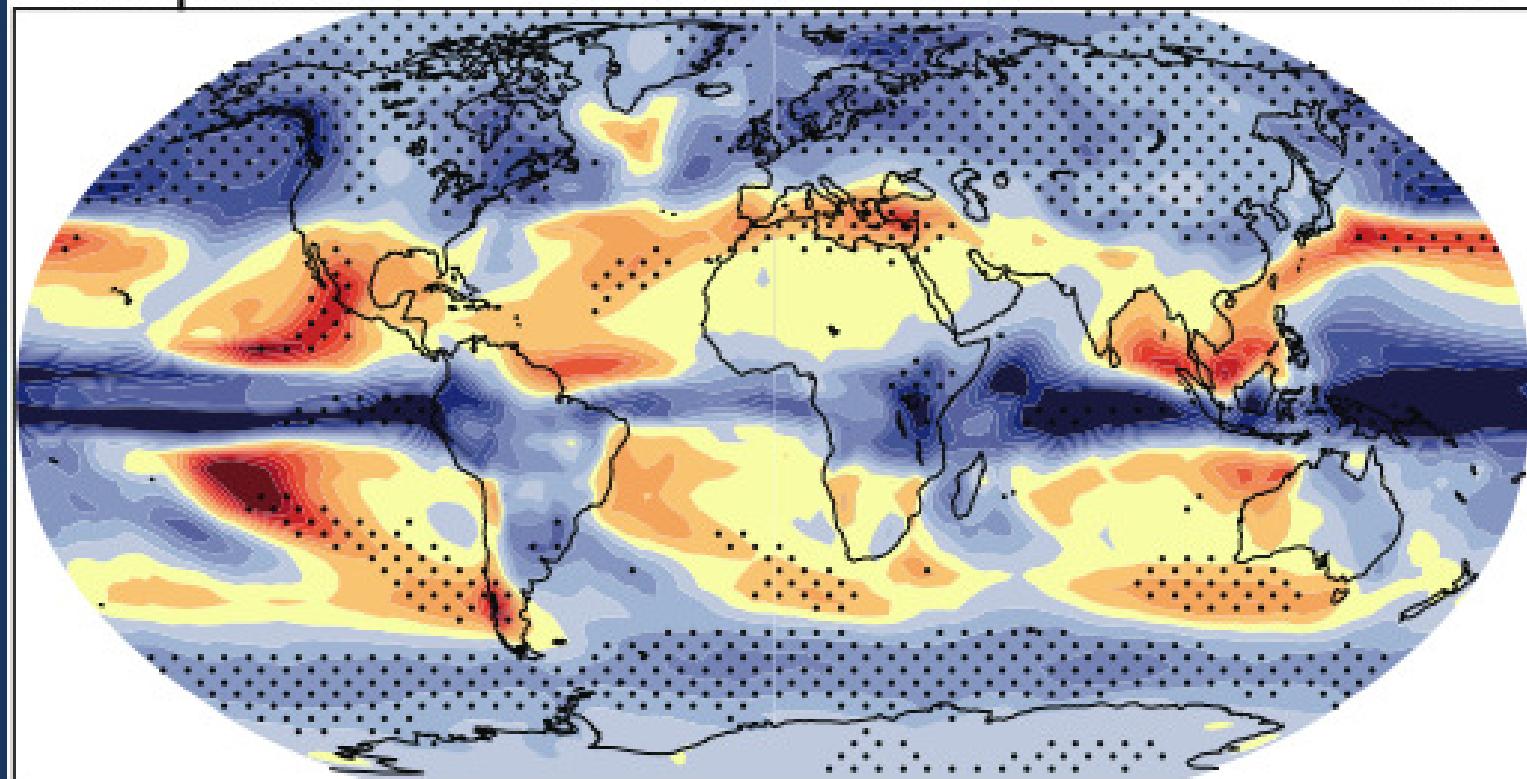
RCP8.5



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Multimodel anomaly IPCC 2007

Precipitation A1B: 2080-2099 DJF



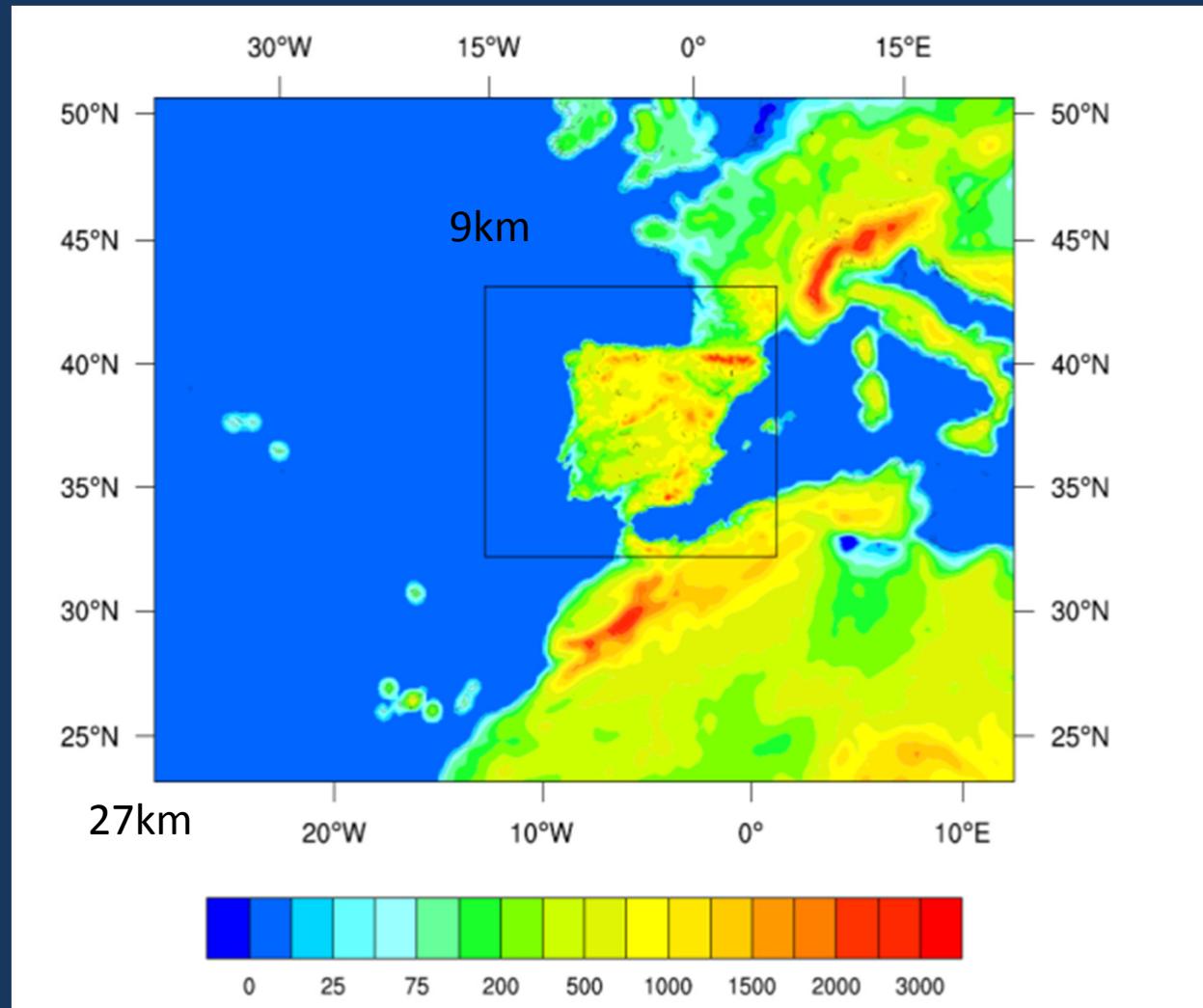


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WRF regional climate setup

Control run:
ERA-Interim
1989-2008
(27km, 9km)

Scenarios...

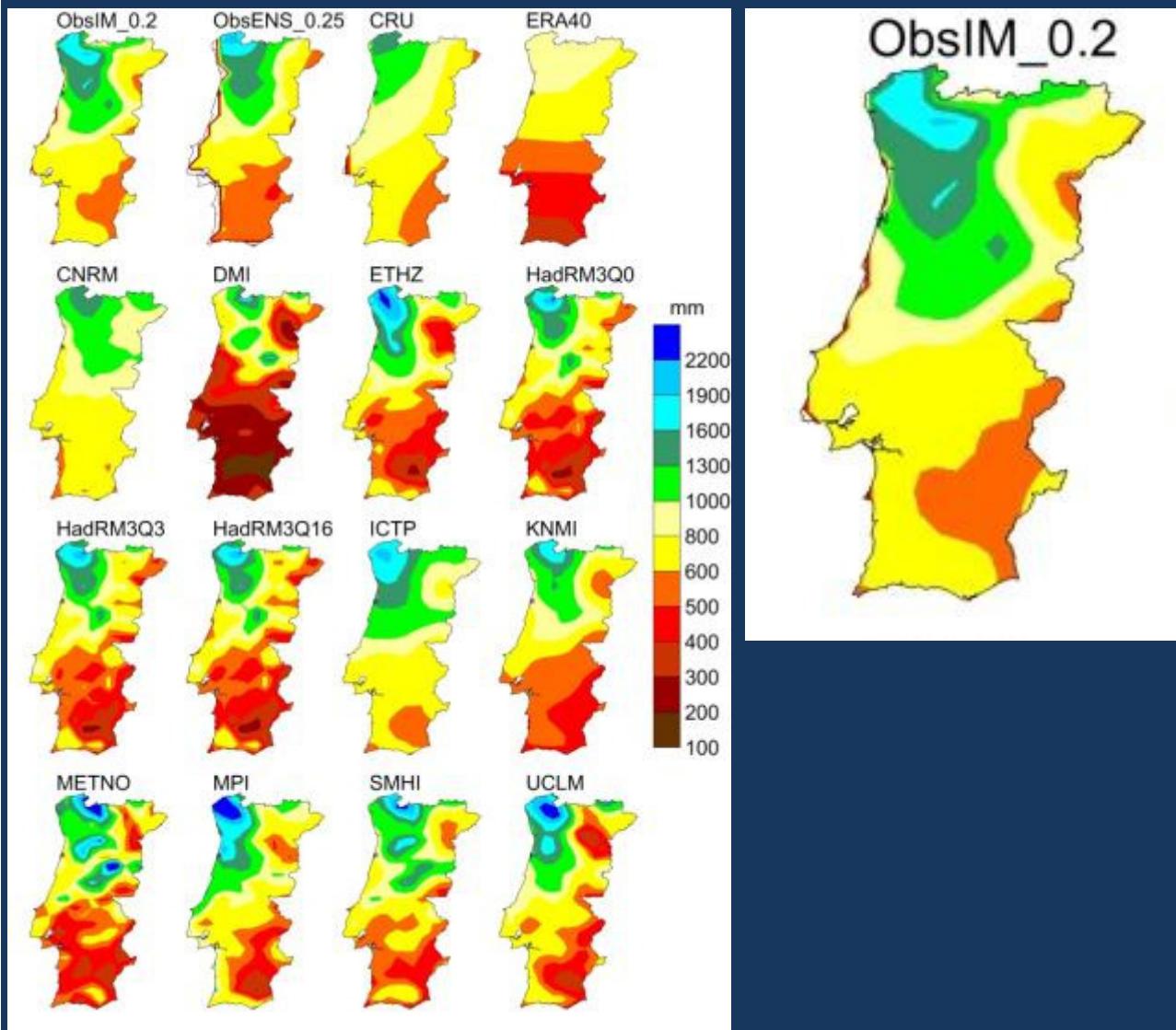




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ENSEMBLES 1961-2000 (ERA-40)

Precipitation

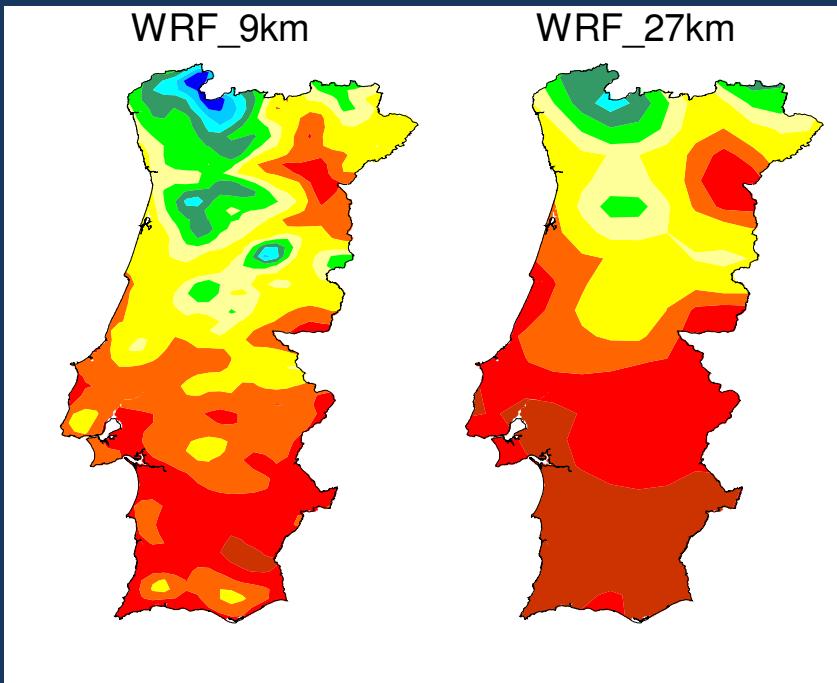




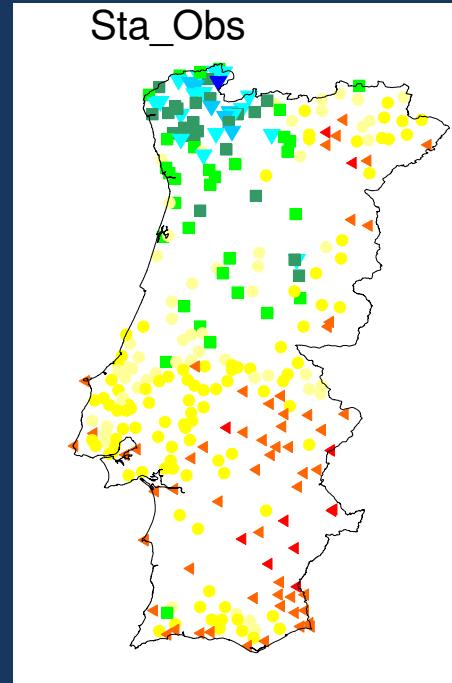
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Annual precip: models, stations, grid

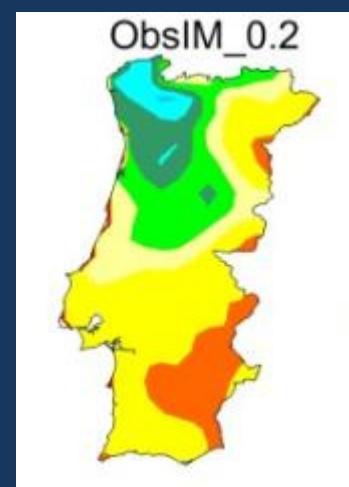
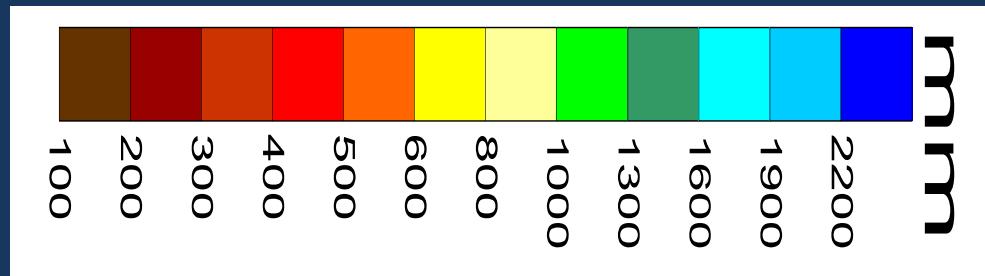
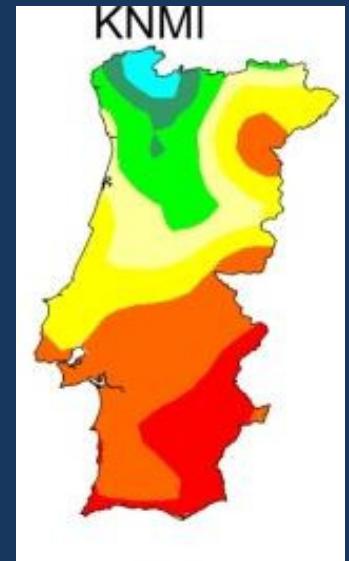
ERA-Interim 1989-2008



Stations SNIRH



ERA-40 1961-2000





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Temperature

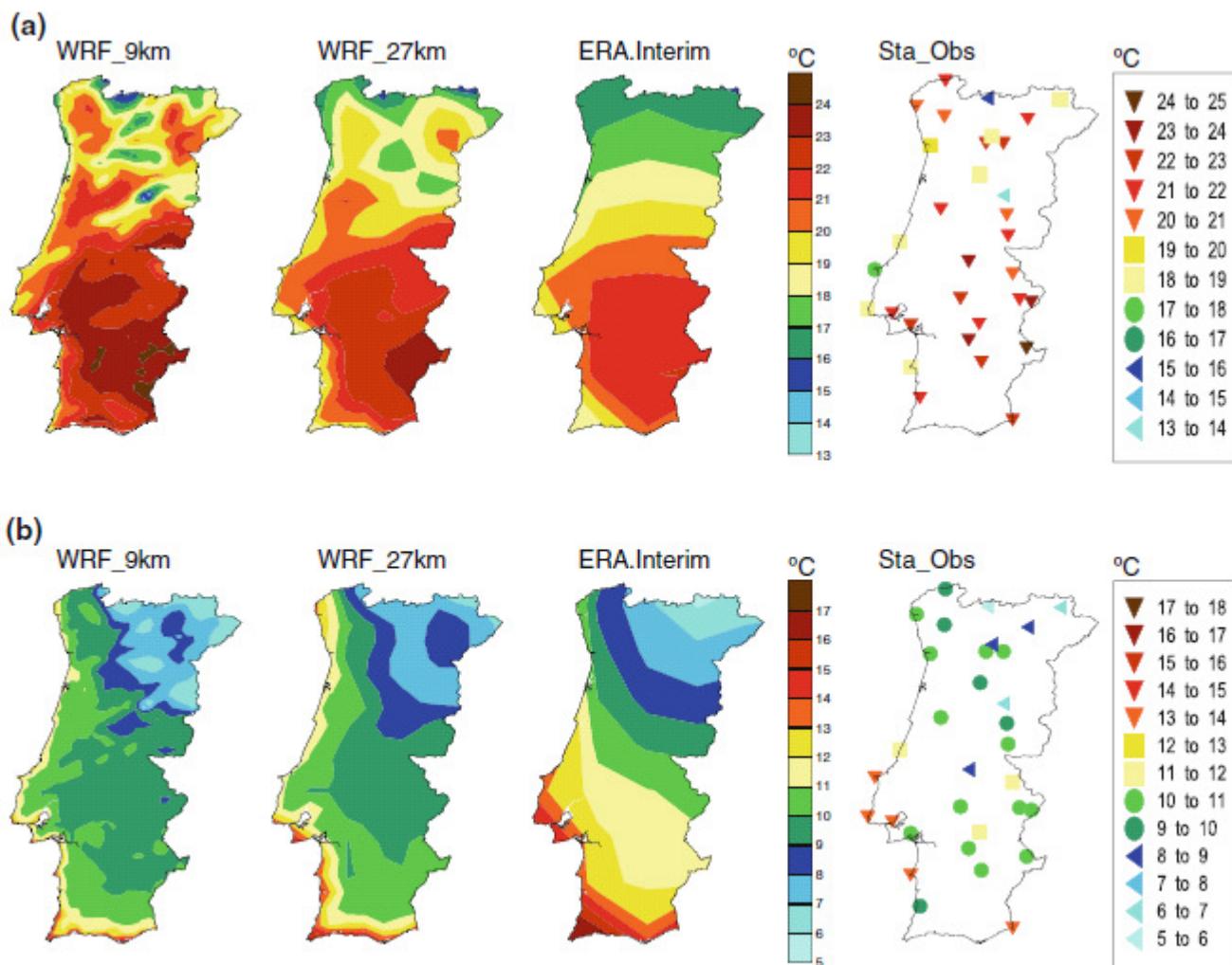


Fig. 2 The 20-years mean daily a maximum and b minimum near surface temperatures, from WRF9km, WRF27km, ERA-Interim and weather station observations



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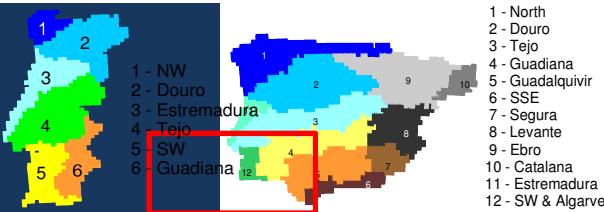
WRF (1989-2008) vs ENSEMBLES (1961-2000)
Ibérica

Grid point statistics (against 0.2 deg gridded data)

Model		Correlation	N Bias (%)	MAPE	N σ
ENSEMBLES	5day	[0.44, 0.7]	[2.9, 28.5]	[0.73, 1.16]	[0.83, 1.12]
	Month	[0.54, 0.82]	[2.9, 26.0]	[0.45, 0.78]	[0.84, 1.17]
ETHZ	5day	0.70	4.1	0.75	<u>0.97</u>
	Month	0.80	4.1	0.47	0.94
KNMI	5day	0.70	2.9	0.73	0.84
	Month	0.82	2.9	0.45	0.86
WRF 27km	5day	0.70	-4.7	0.72	0.94
	Month	0.74	-4.7	0.52	0.89
WRF 9km	5day	<u>0.80</u>	<u>1.4</u>	<u>0.59</u>	<u>0.96</u>
	Month	<u>0.84</u>	<u>1.4</u>	<u>0.40</u>	<u>0.97</u>

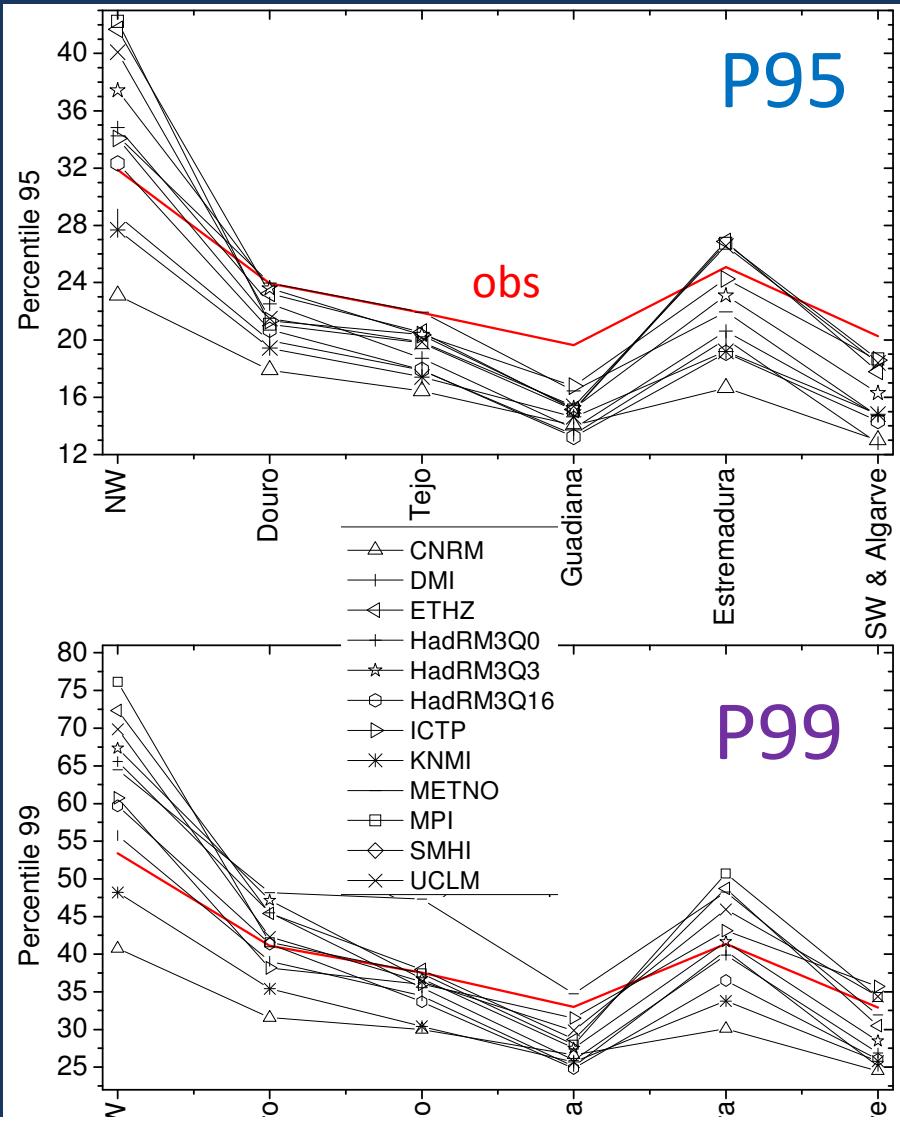


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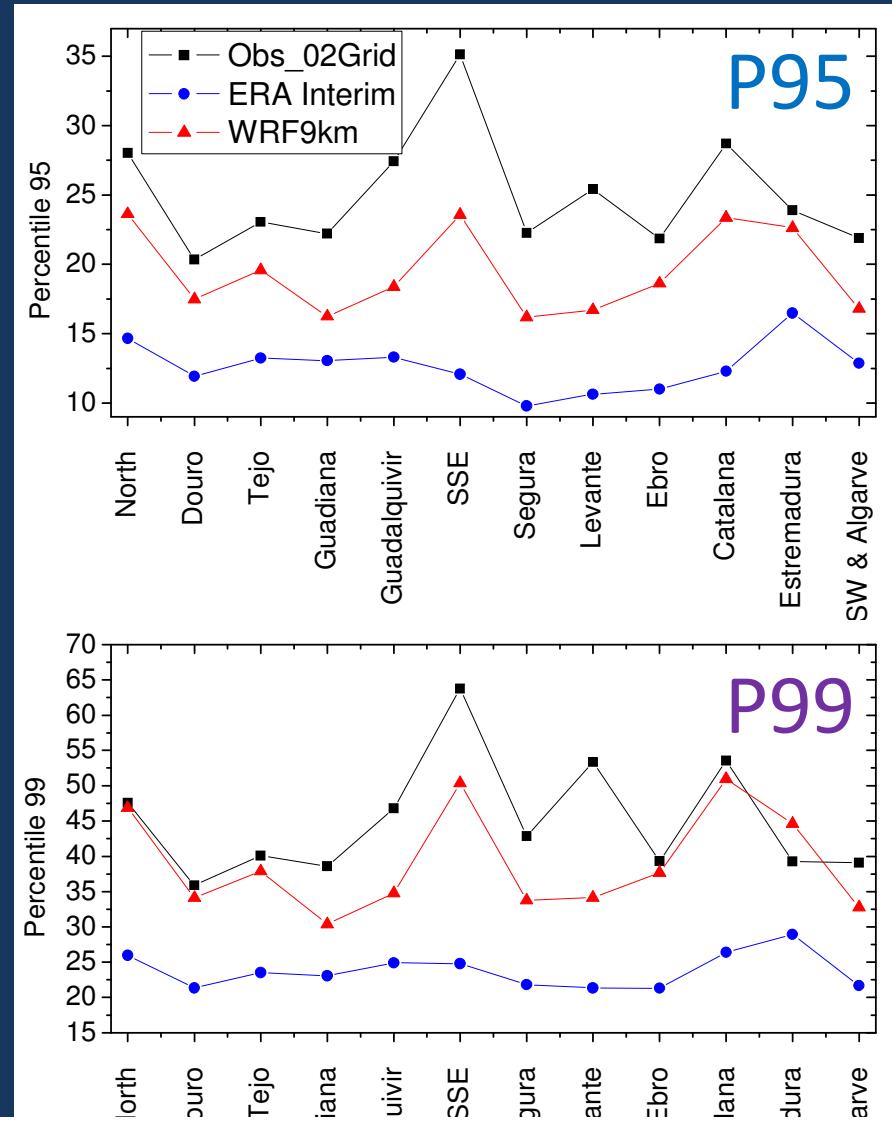


Extreme precipitation

PT 1961-2000 ENSEMBLES



IB 1989-2008

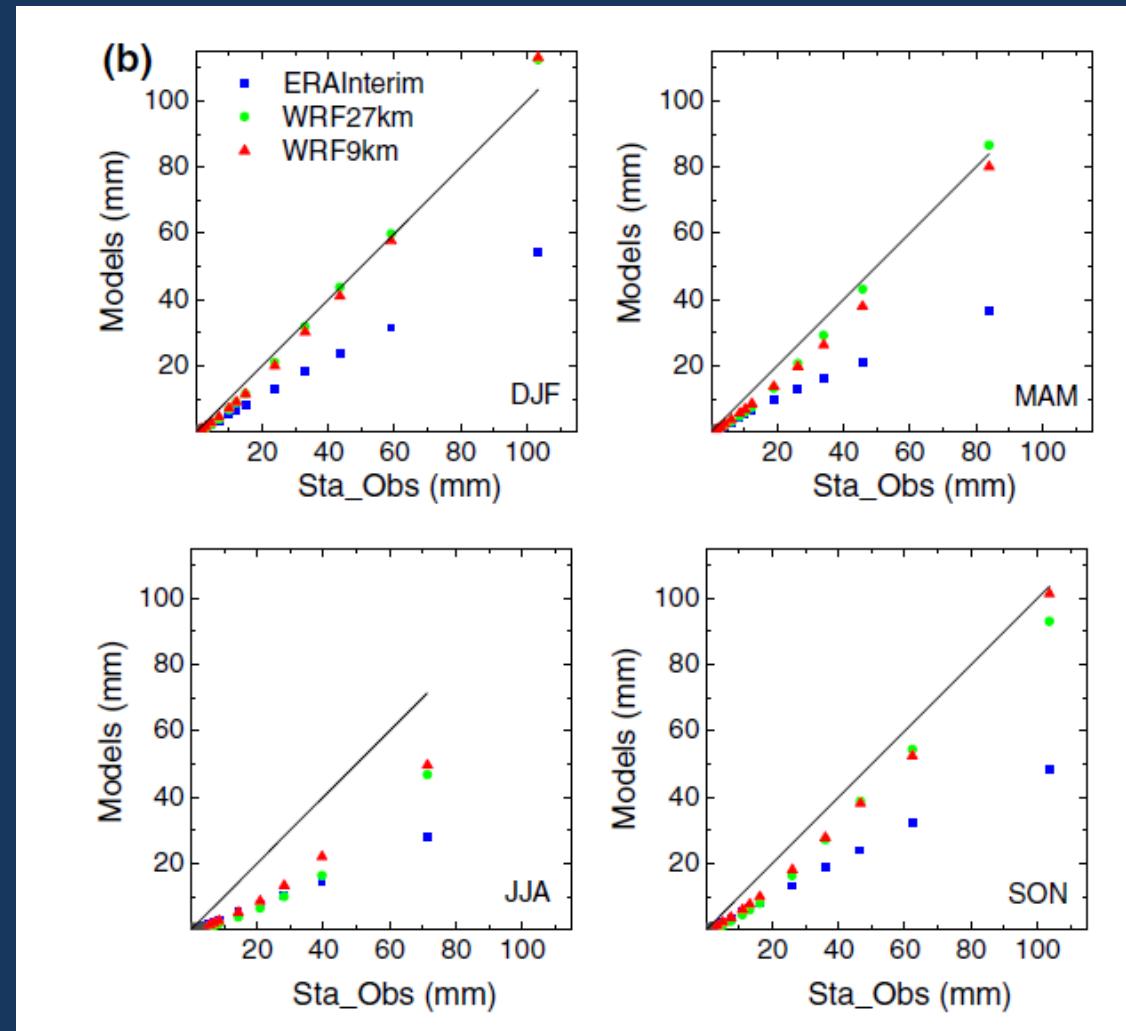




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Extreme daily precipitation (Portugal, stations)

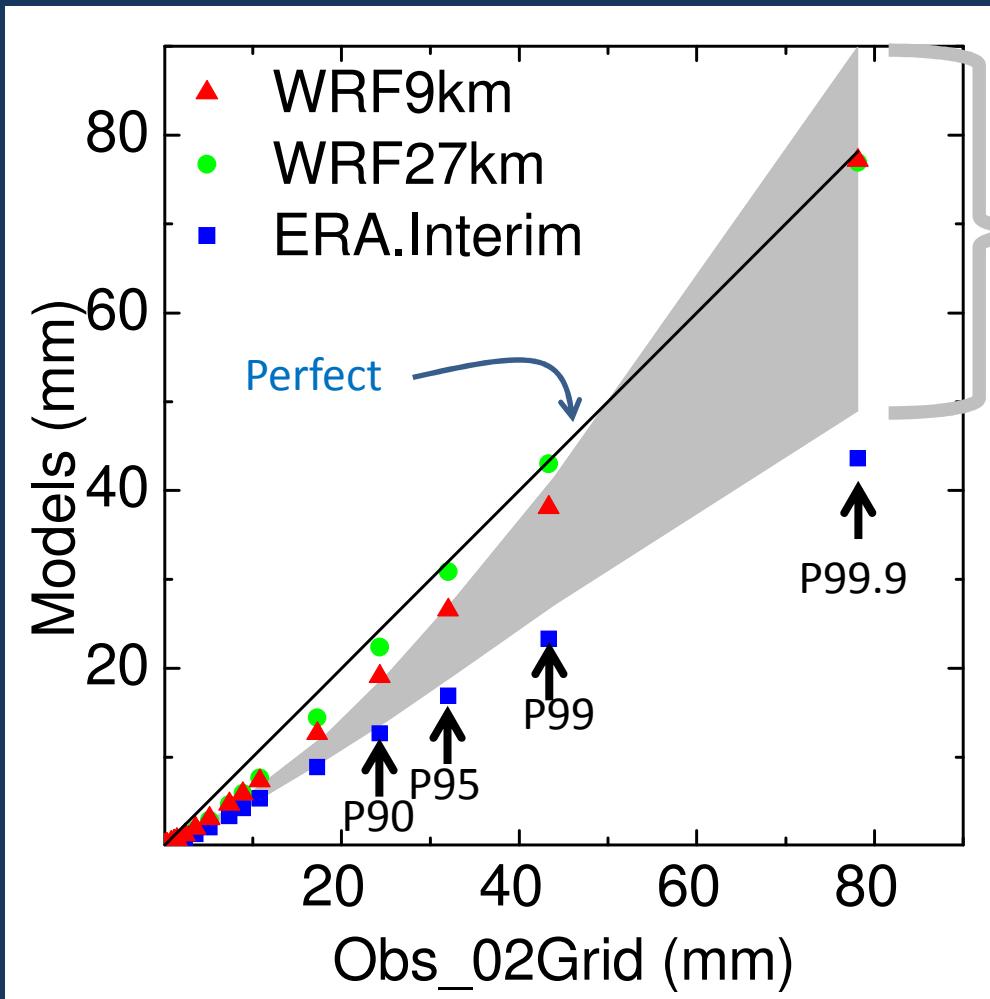
P99.9
P99
P95
P90
...





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Extreme precipitation (Iberia, grid)



ENSEMBLES

Grid point
statistics

Gridded
observations
at 0.2 deg



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Conclusion

EC-Earth and WRF share important features:

- ✓ Open codes, community models
- ✓ Well tested in weather prediction
- ✓ Good computing performance

EC-Earth is still evolving but promises to become a competitive Earth-system model
and constitutes an excellent platform for new parametrizations (e.g. snow)

First WRF results from climate runs at 9km

- ✓ Are (at least) comparable with leading RCMs
- ✓ Do a very good job in extreme weather statistics



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Thank you

References

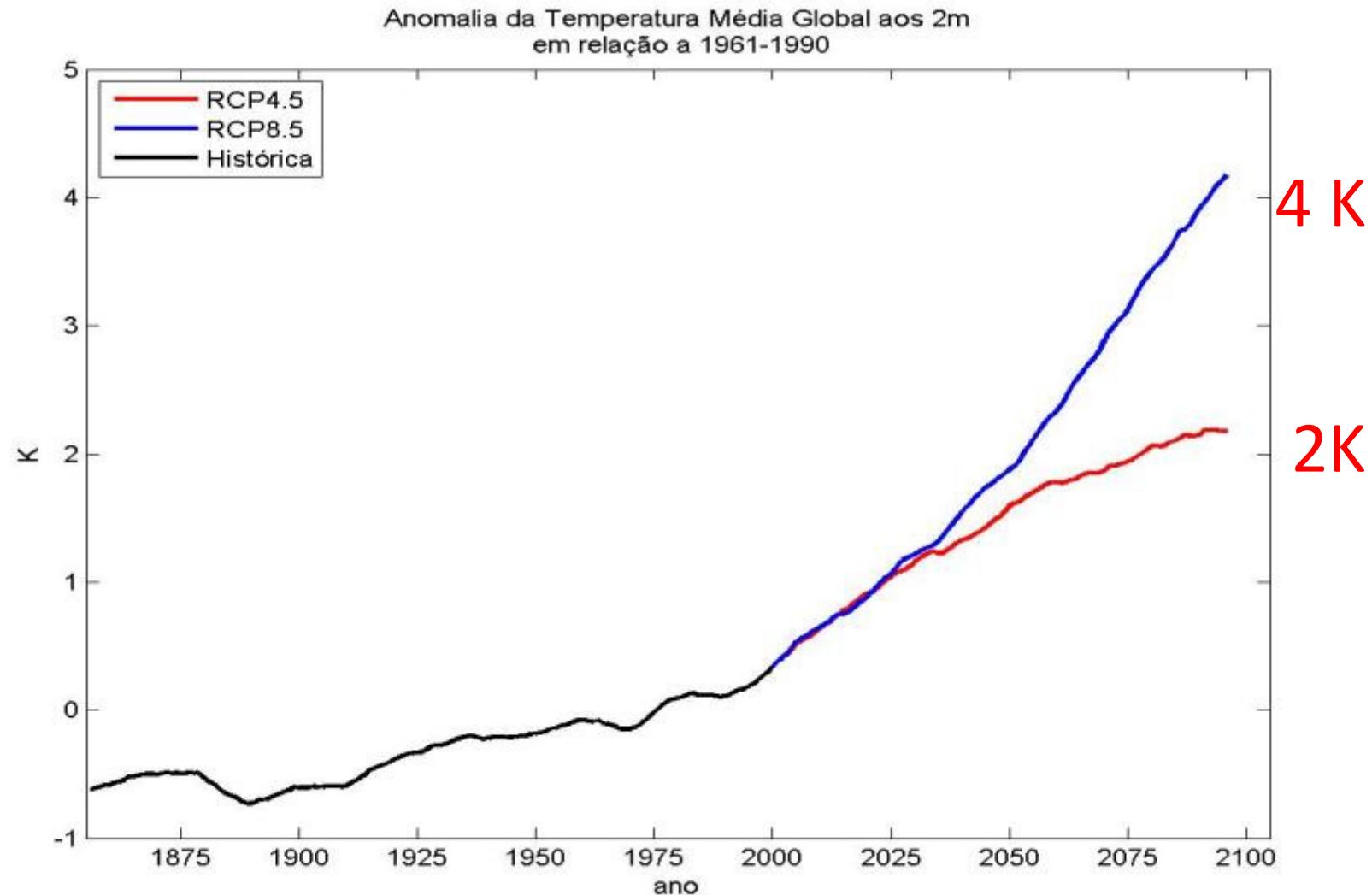
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www.idl.ul.pt/pmiranda.htm



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EC-Earth Global scenarios ΔT_{2m}





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