Assessing the Suitability of A Posteriori Random Forests for Downscaling Climate Change Projections

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M. N. Legasa, R. Manzanas

Santander Meteorology Group
Universidad de Cantabria
Spain

mikel.legasa@unican.es

VALUE Experiment 2a (Precipitation Downscaling)

Perfect Prognosis

Training

ERA-Interim Reanalysis
1979-2008

Downscaling

EC-EARTH r12i1p1

Historical	Δ	Future (RCP8.5)
1986-2005		2040-2100

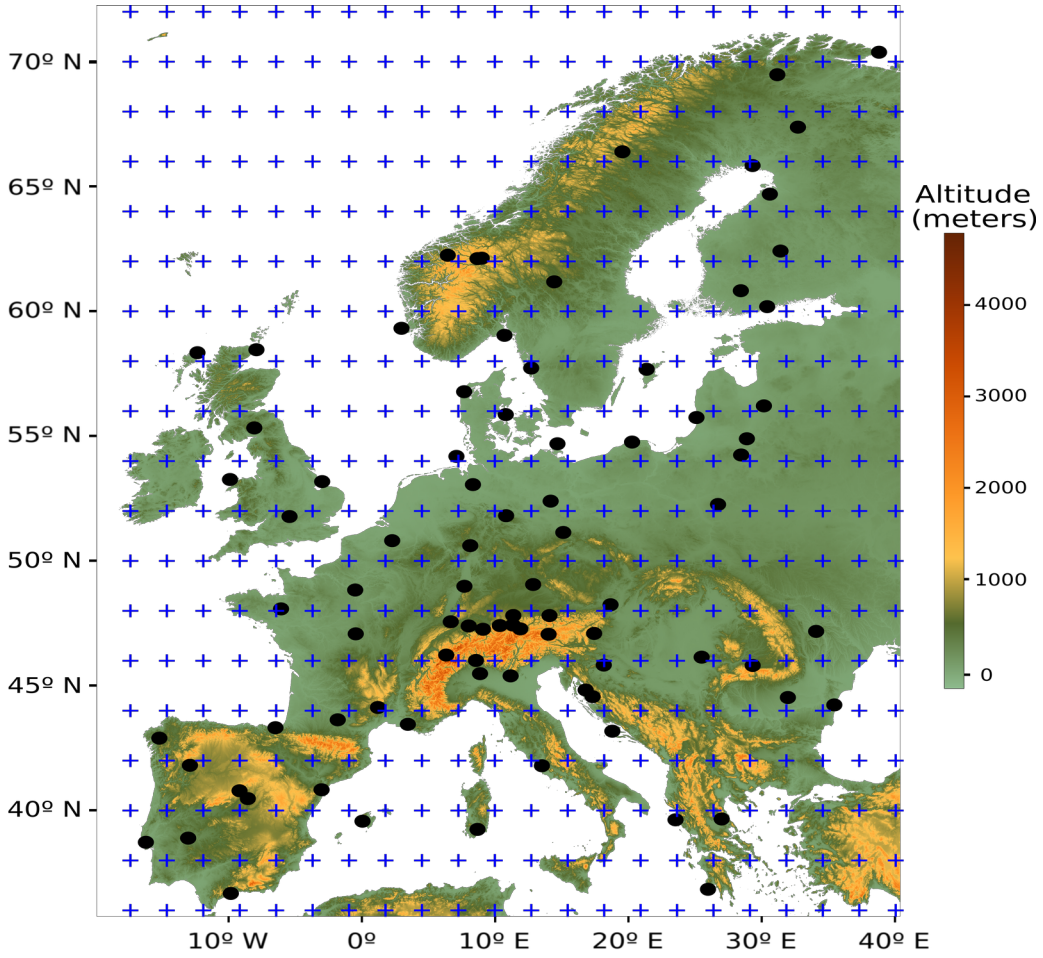
Predictors
@500, 700, 850 & 1000 hPa

- Geopotential
- Sp. Humidity
- Air Temperature
- Eastward Wind
- Northward Wind

Predictand

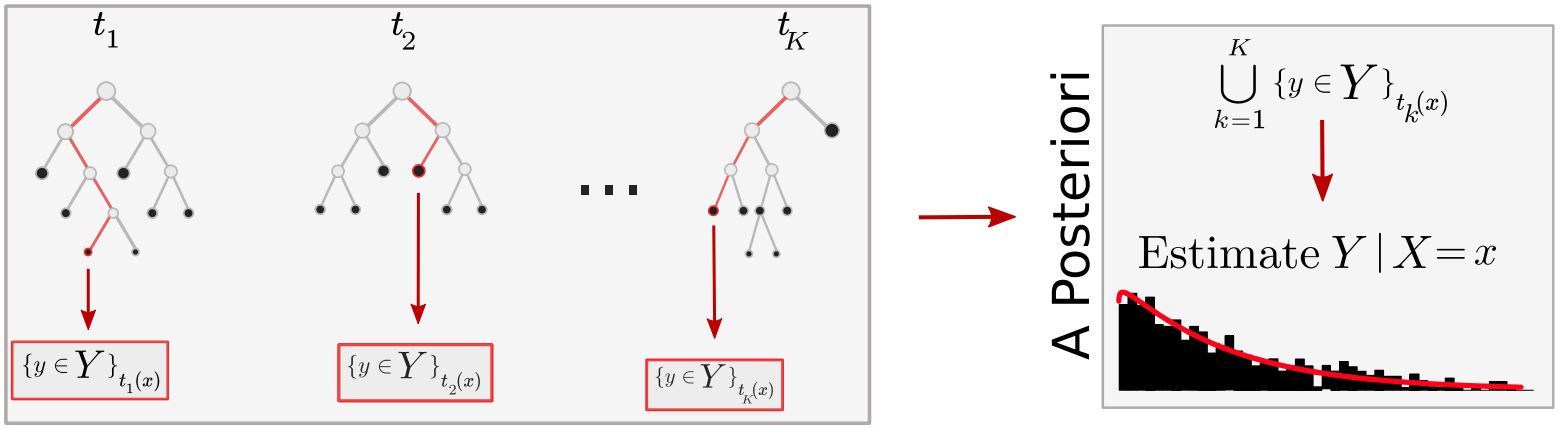
Precipitation at 86 locations in Europe

European Climate Assessment & Data (ECA&D)



Downscaling Approach

Prediction for $X = x$



Water Resources Research

Research Article | Open Access

A Posteriori Random Forests for Stochastic Downscaling of Precipitation by Predicting Probability Distributions

M. N. Legasa, R. Manzanas, A. Calviño, J. M. Gutiérrez

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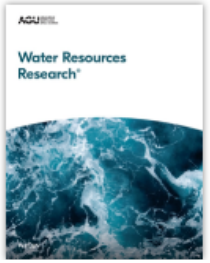

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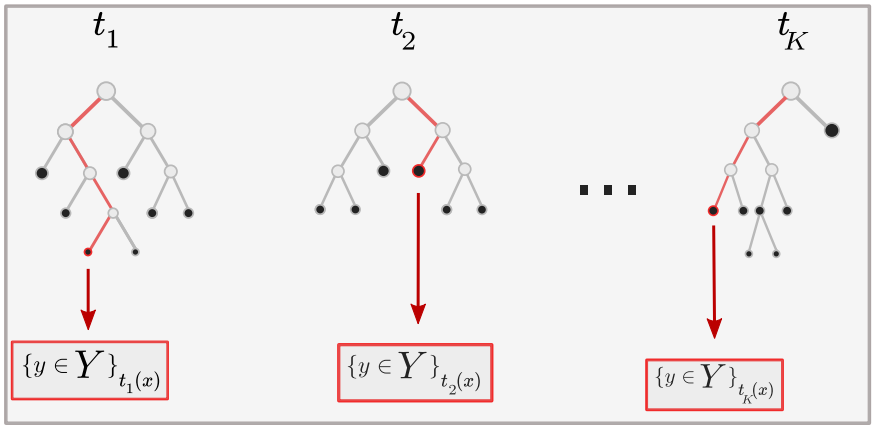
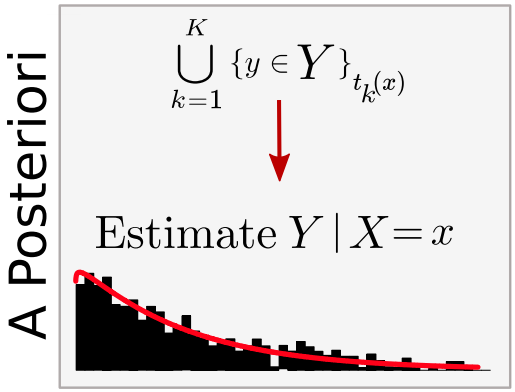
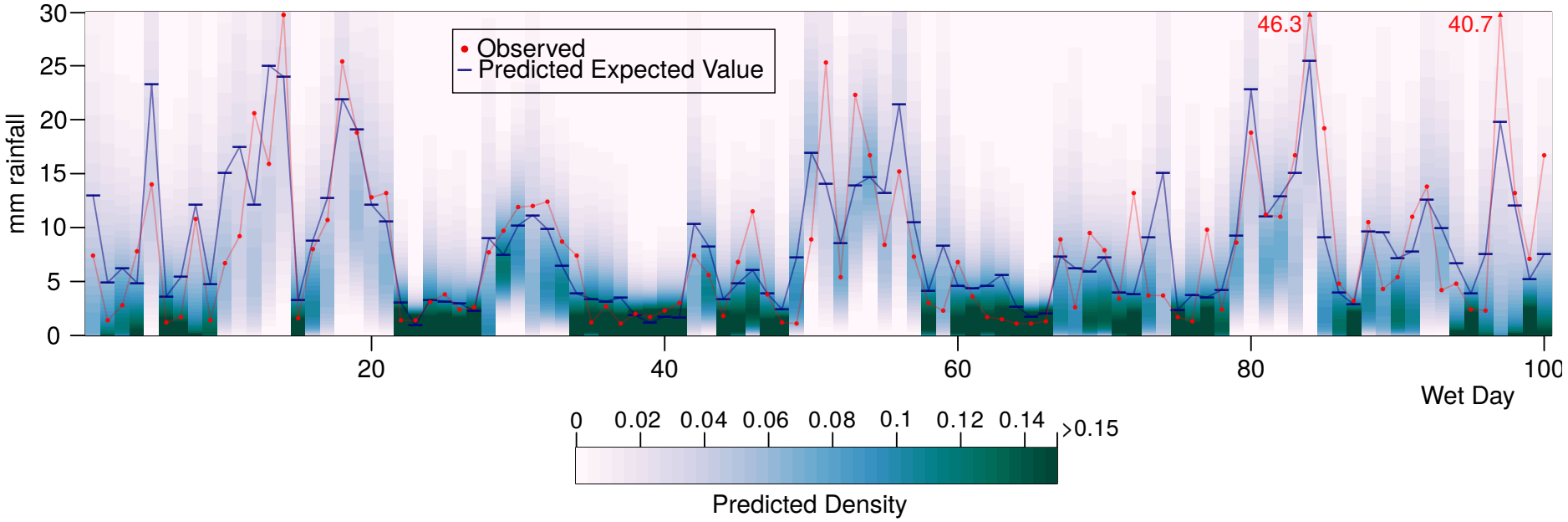
Downscaling Approach

Prediction for $X = x$



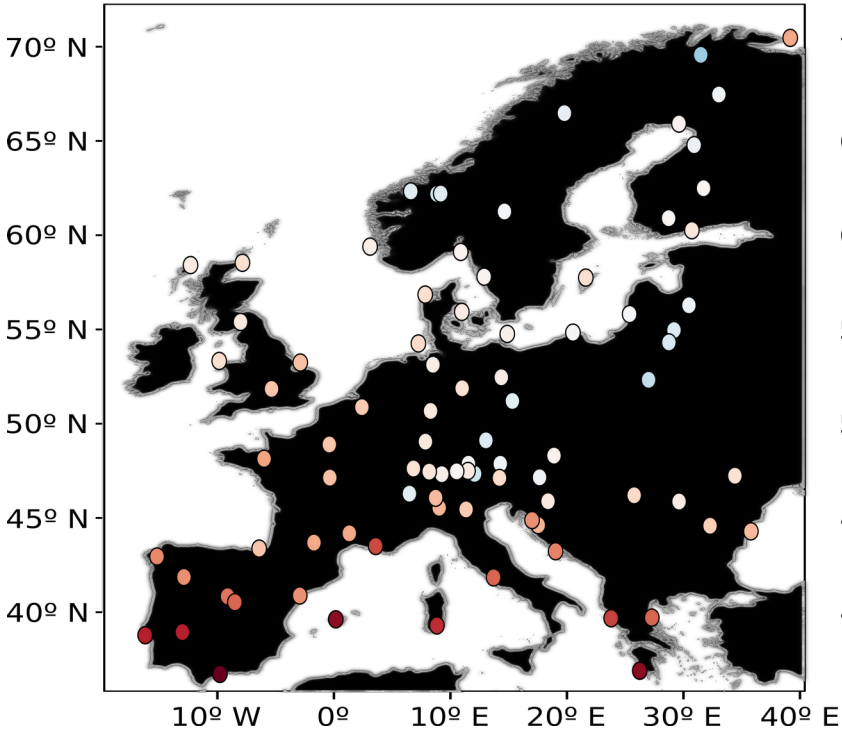




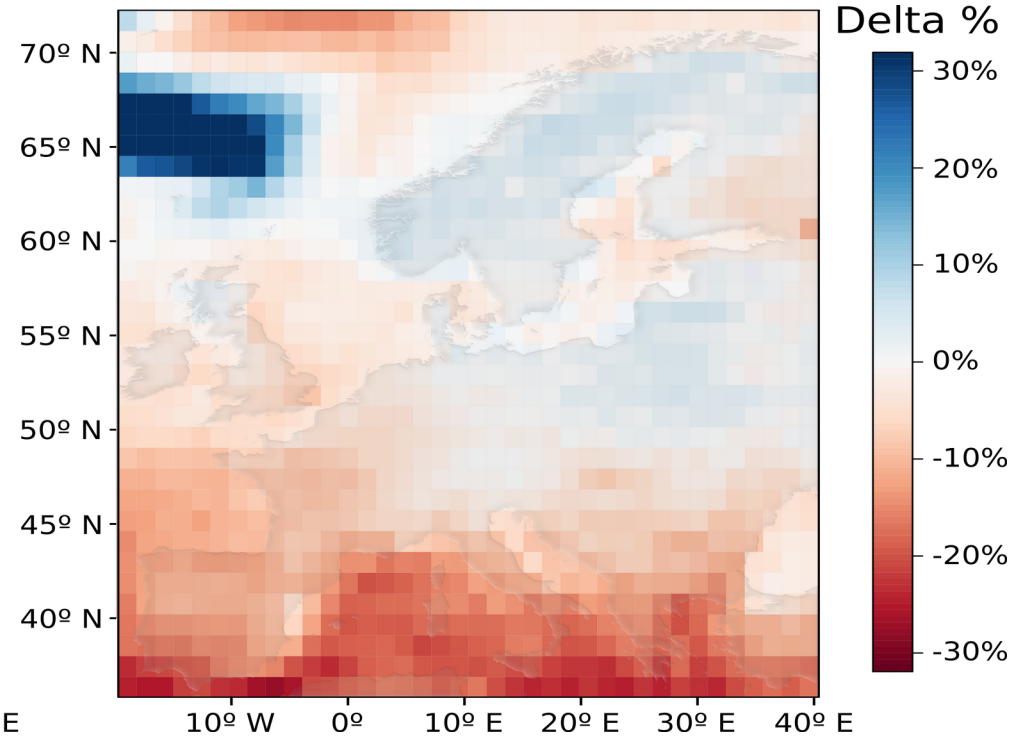
Climate Change Deltas for RCP8.5

R01: Proportion of Wet Days

A Posteriori Random Forests



EC-Earth r12i1p1 (RCP 8.5)

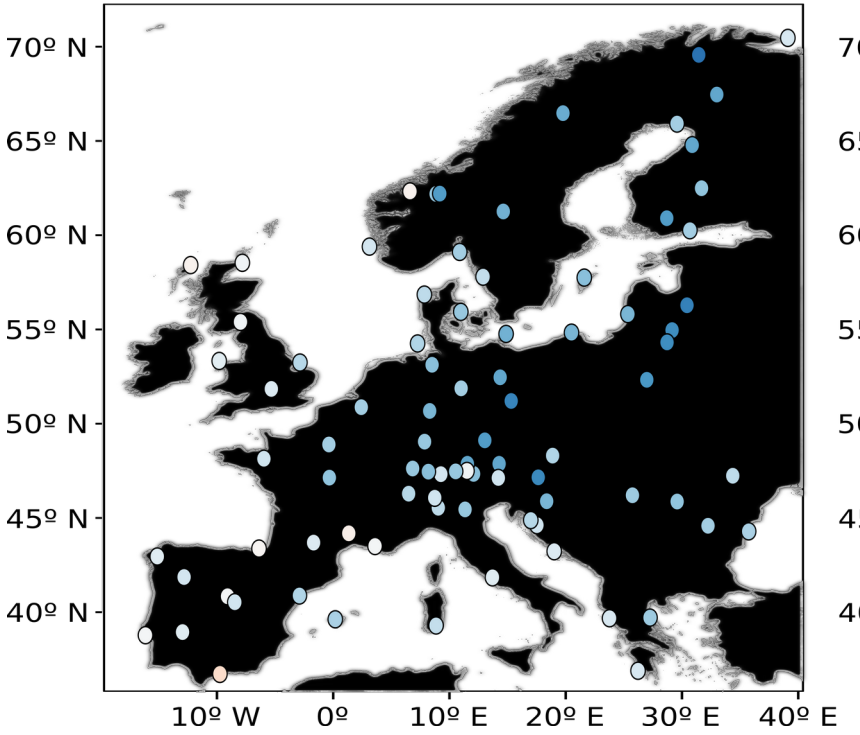


$$\text{Delta \%} = \frac{\text{RCP8.5 - Historical}}{\text{Historical}} \cdot 100$$

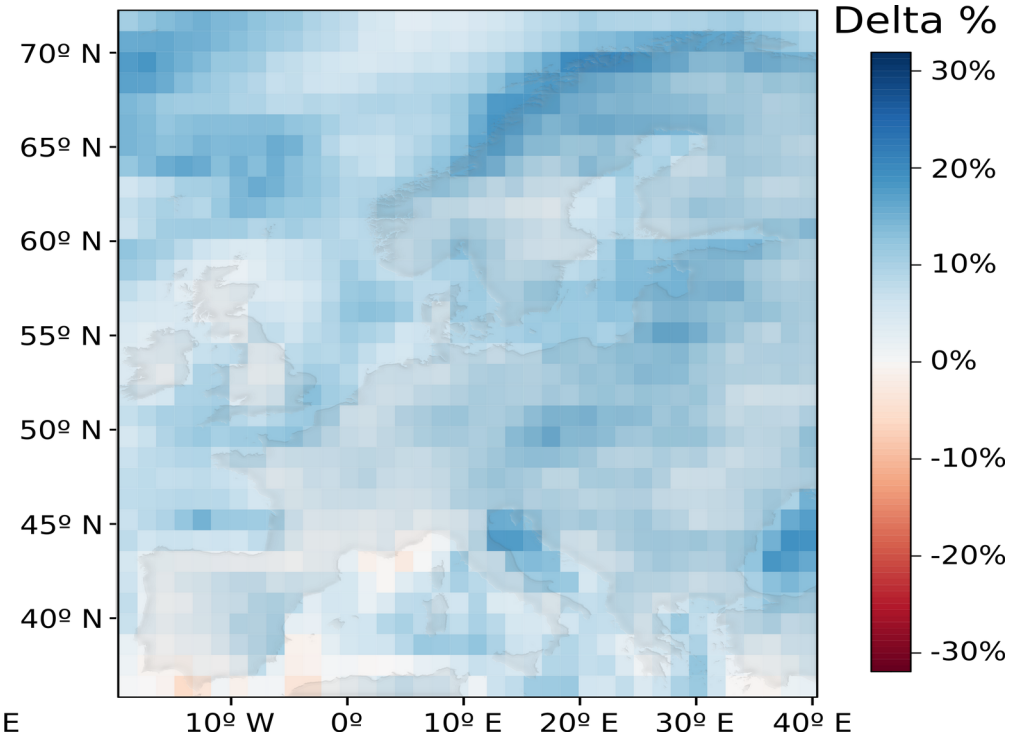
Climate Change Deltas for RCP8.5

SDII: Mean Precipitation on Wet Days

A Posteriori Random Forests



EC-Earth r12i1p1 (RCP 8.5)

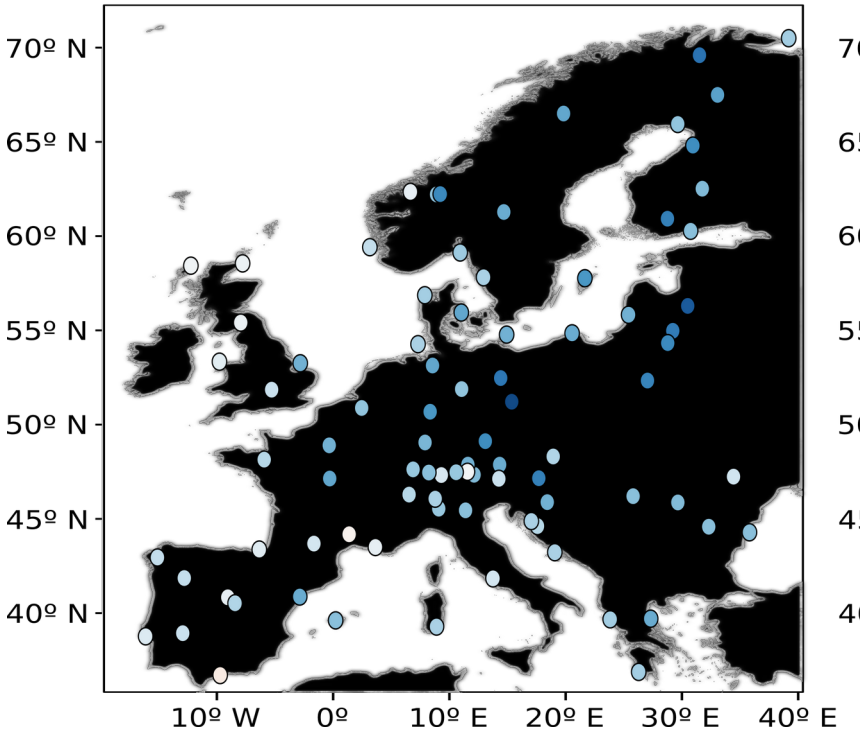


$$\text{Delta \%} = \frac{\text{RCP8.5 - Historical}}{\text{Historical}} \cdot 100$$

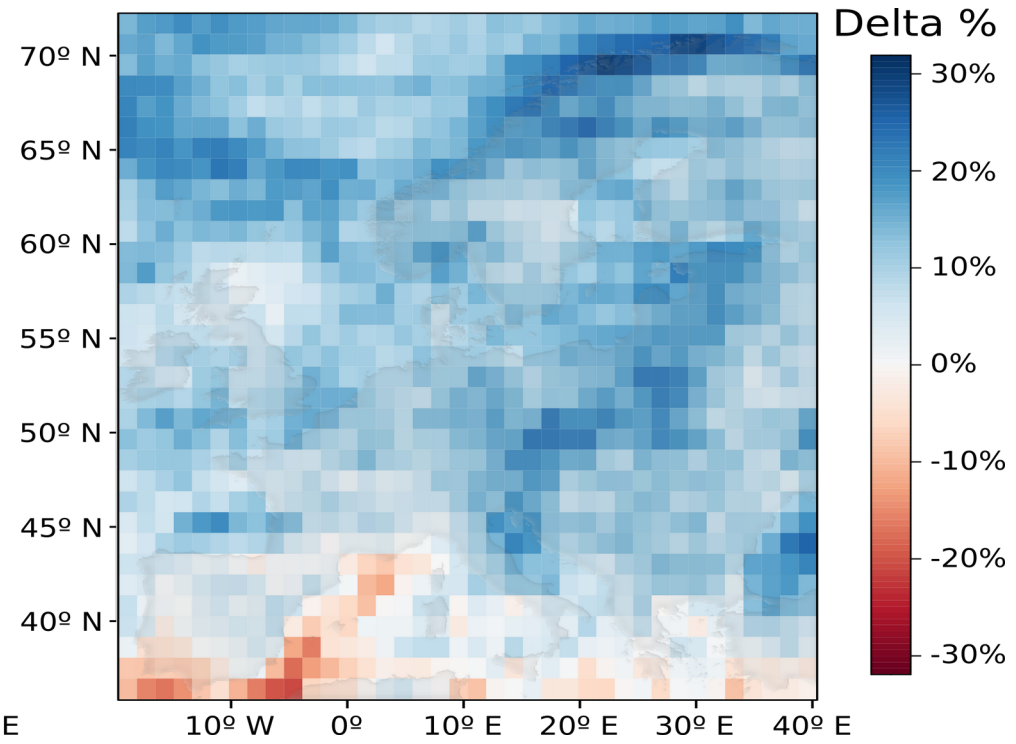
Climate Change Deltas for RCP8.5

P98: 98th Percentile of Precipitation Amount

A Posteriori Random Forests



EC-Earth r12i1p1 (RCP 8.5)



$$\text{Delta \%} = \frac{\text{RCP8.5 - Historical}}{\text{Historical}} \cdot 100$$

Conclusions

Preliminary results show consistent climate change deltas downscaled by a posteriori random forests

Future Lines of Work

1) Extend the analysis to other regions and variables (e.g. temperature and winds)

2) Extend the approach to spatial downscaling and gridded data

3) Intercompare with other state-of-the-art downscaling approaches

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