



Creating skilful near-term climate predictions right now

Leonard F. Borchert
Matthew B. Menary
Juliette Mignot



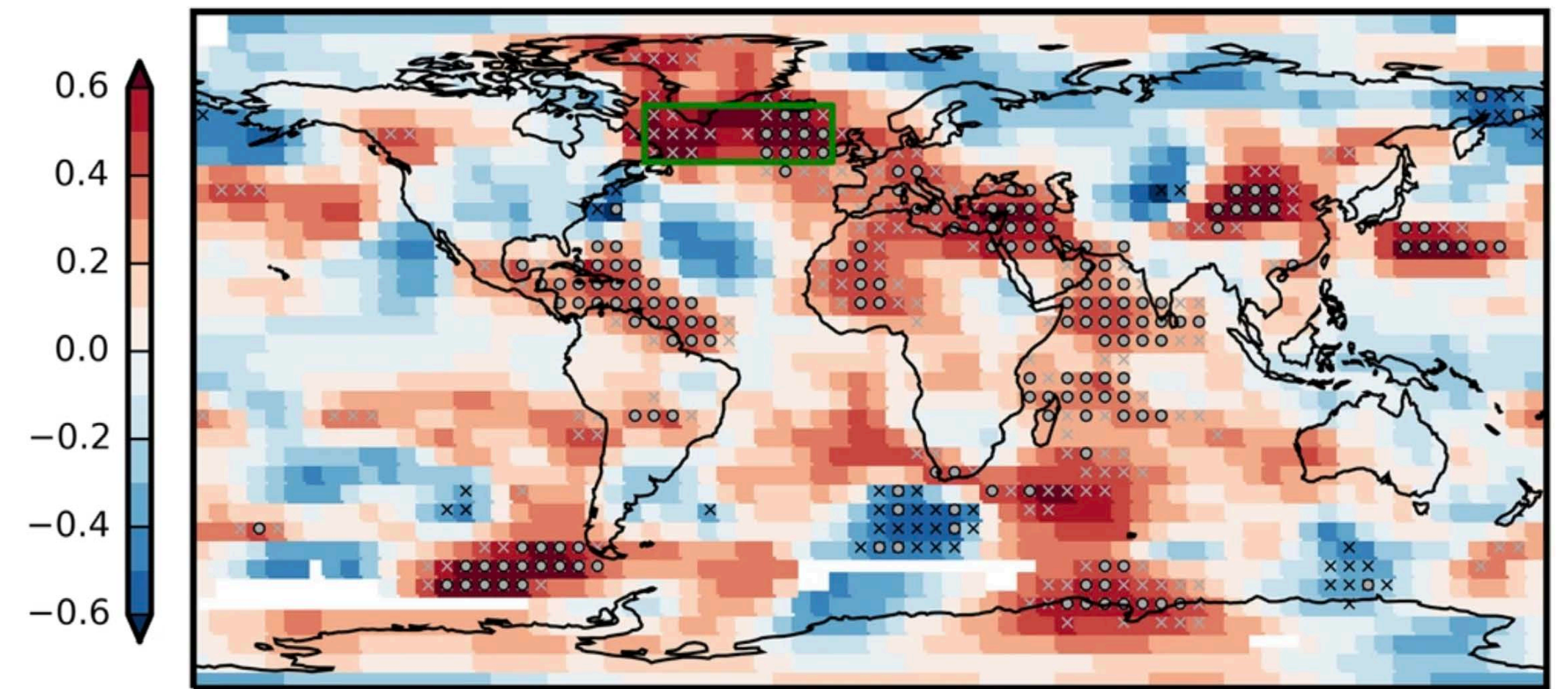
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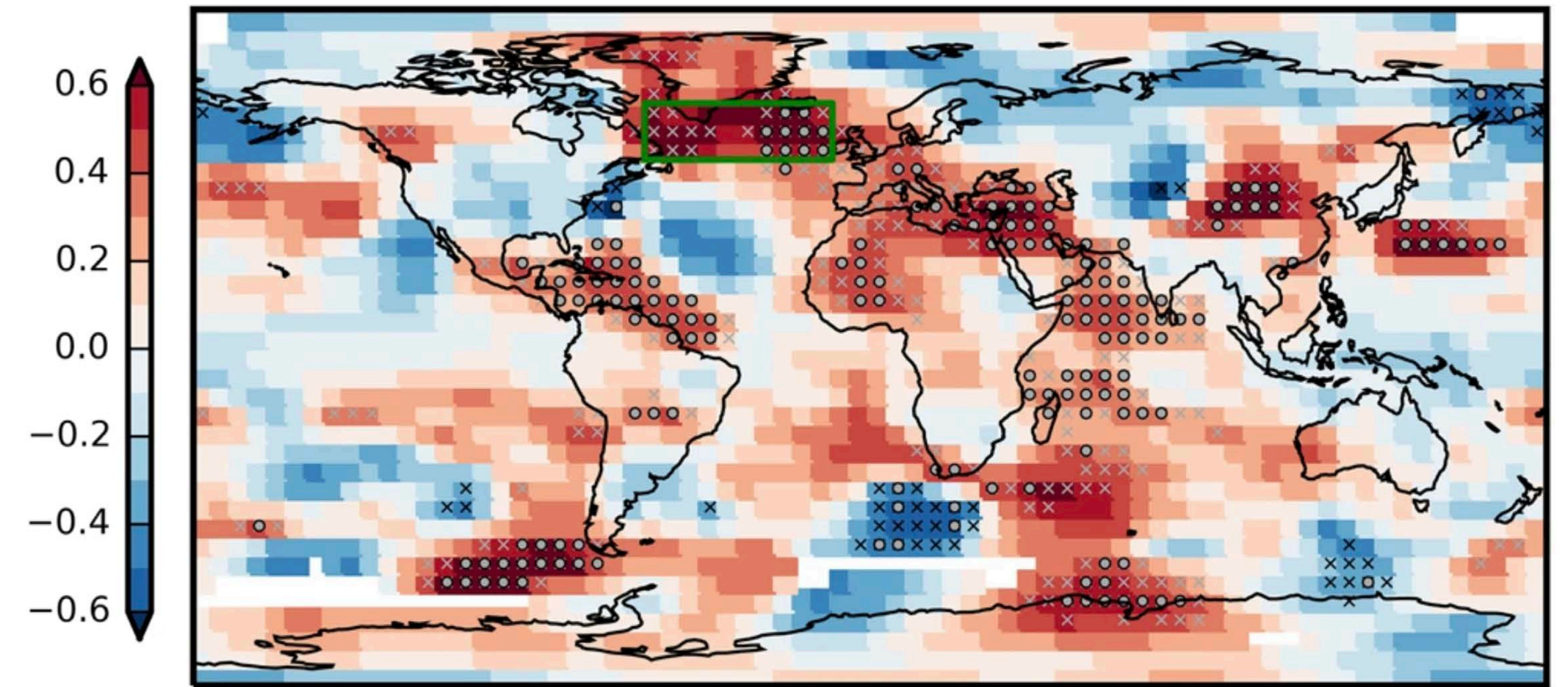
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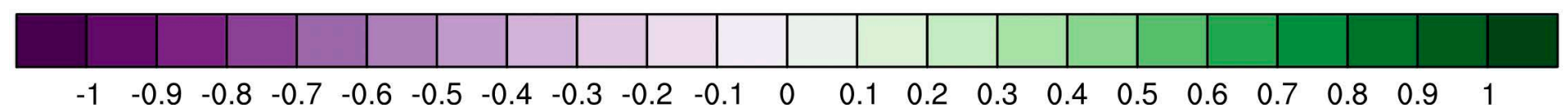
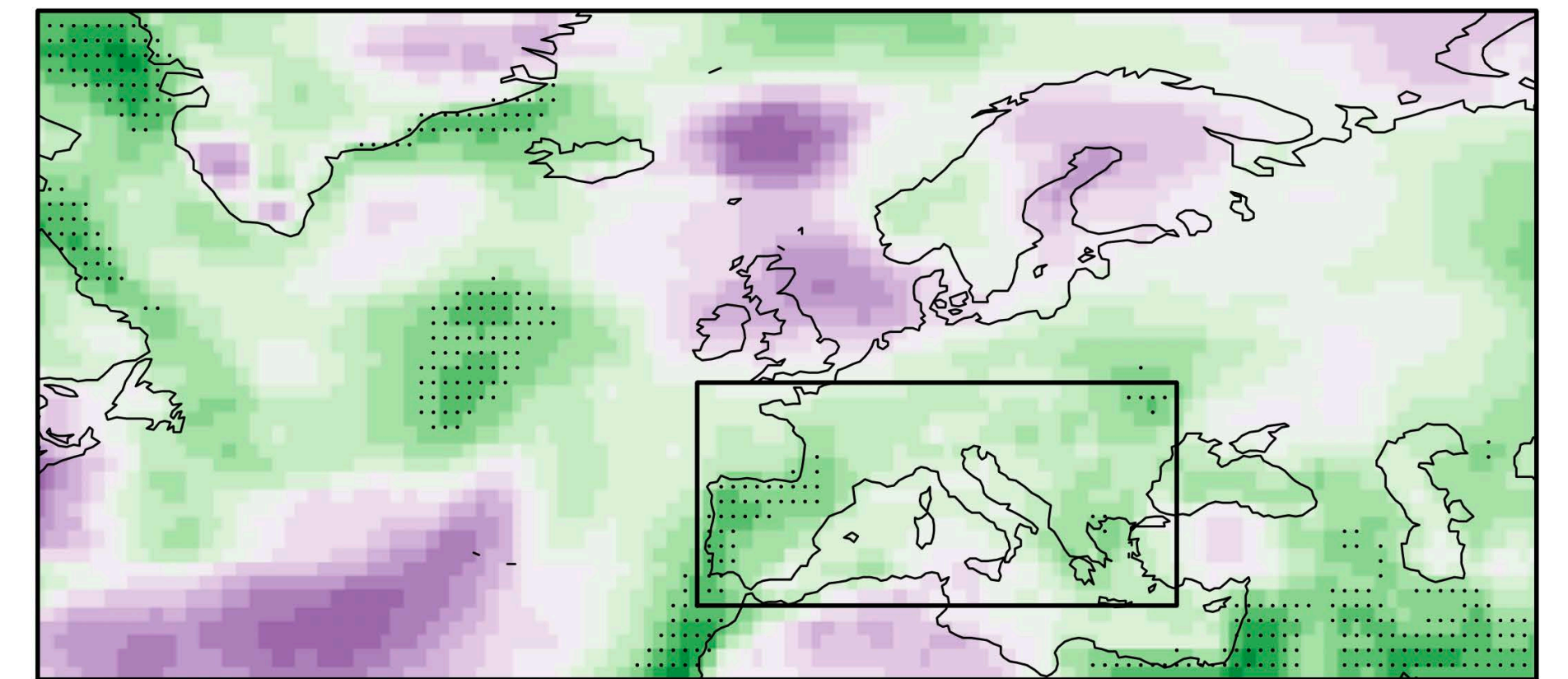
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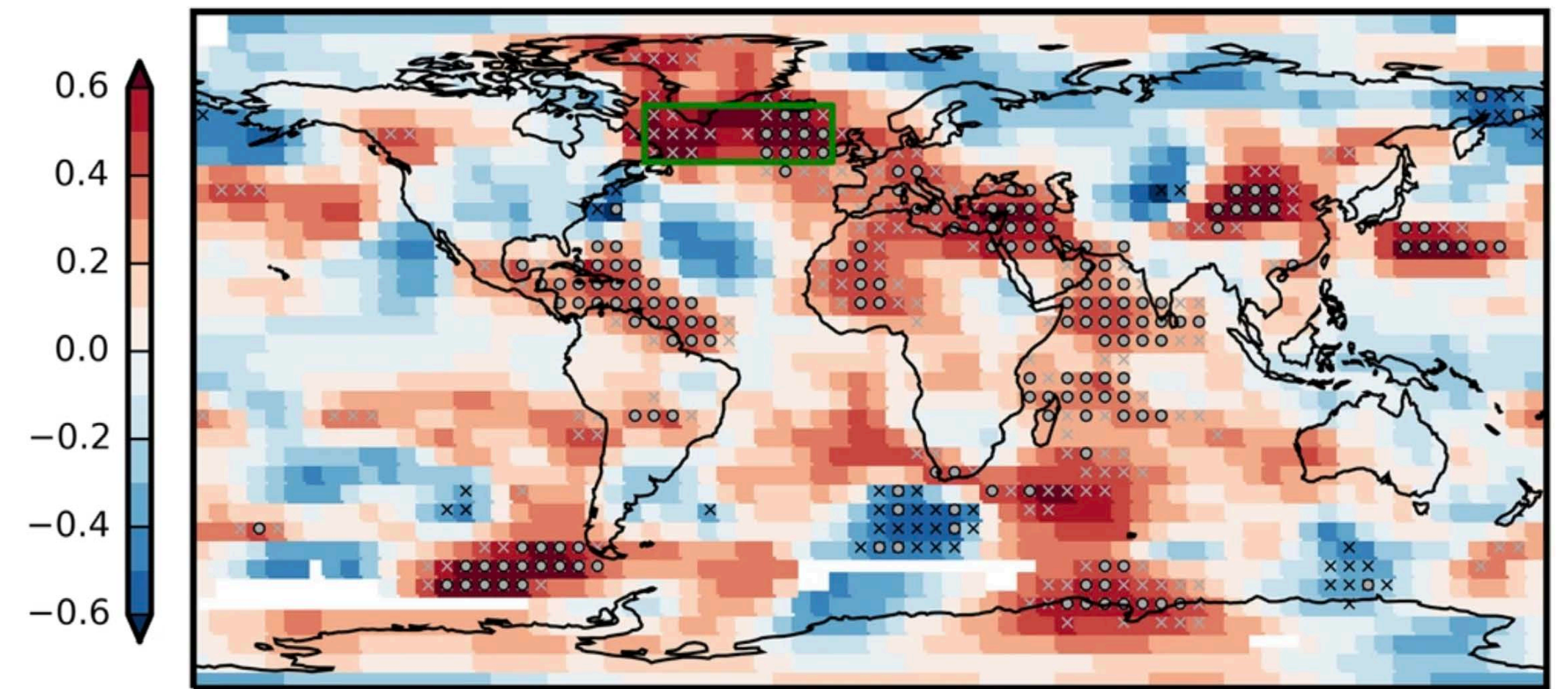
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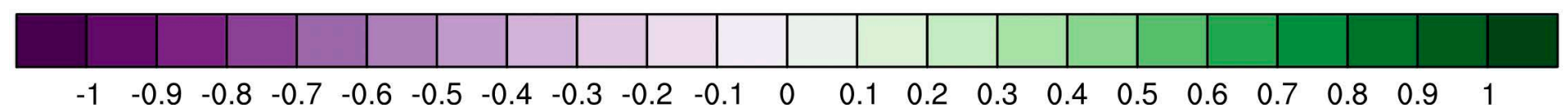
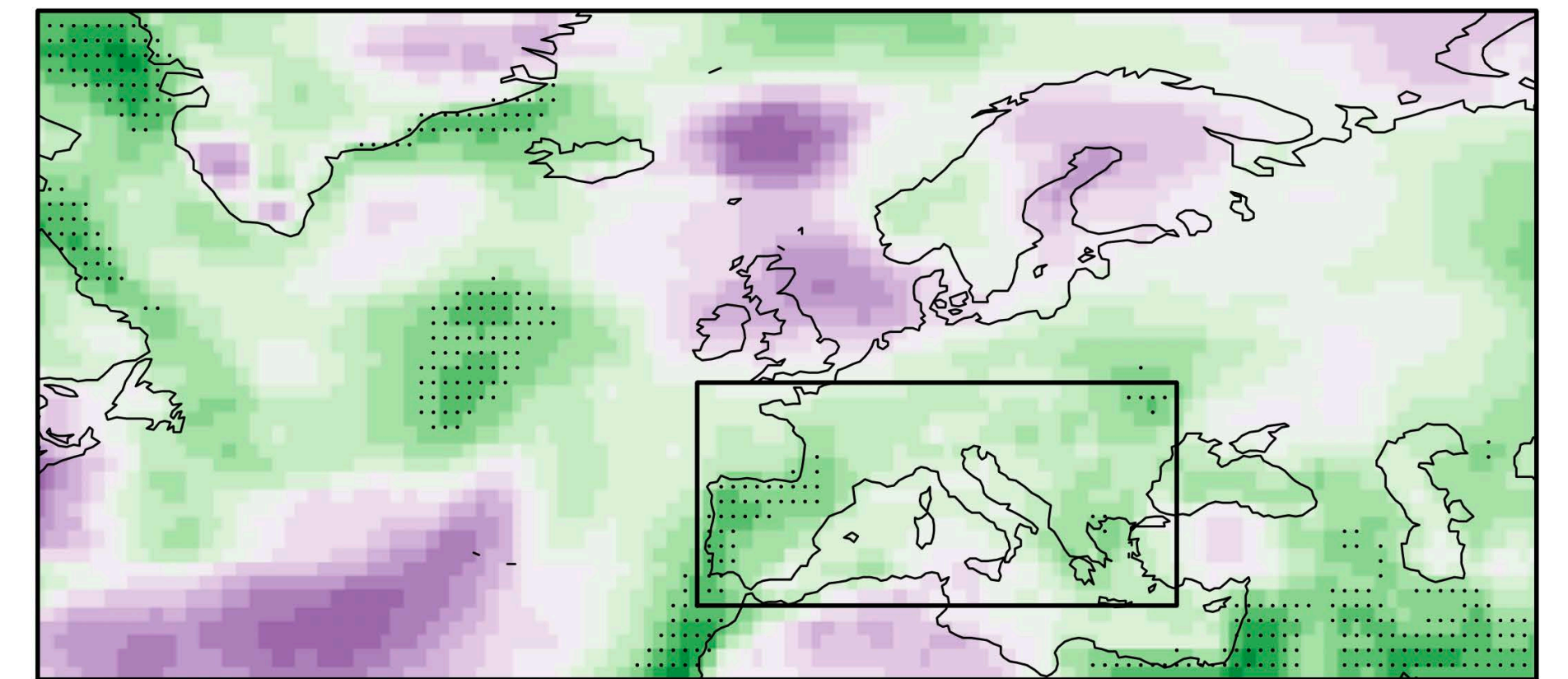
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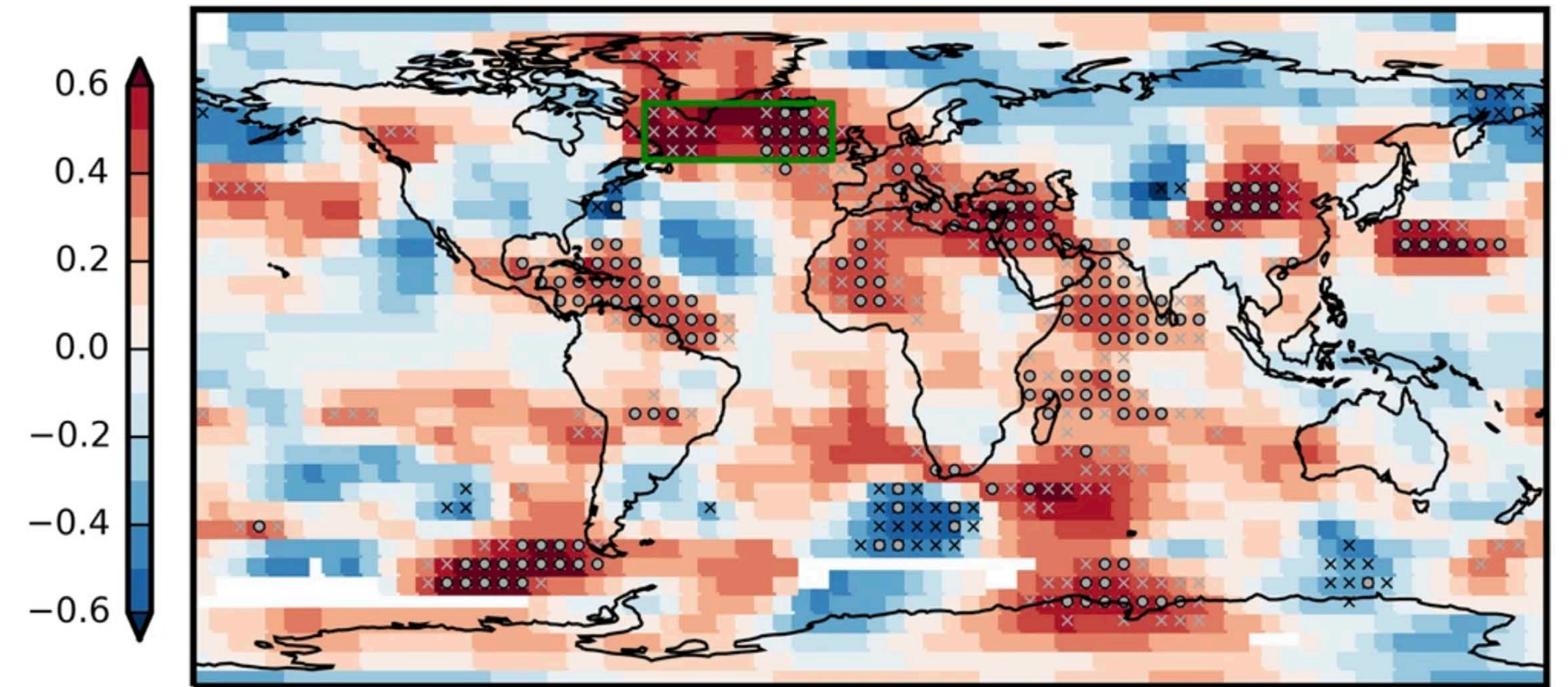
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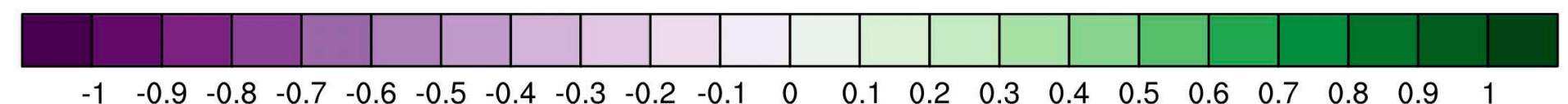
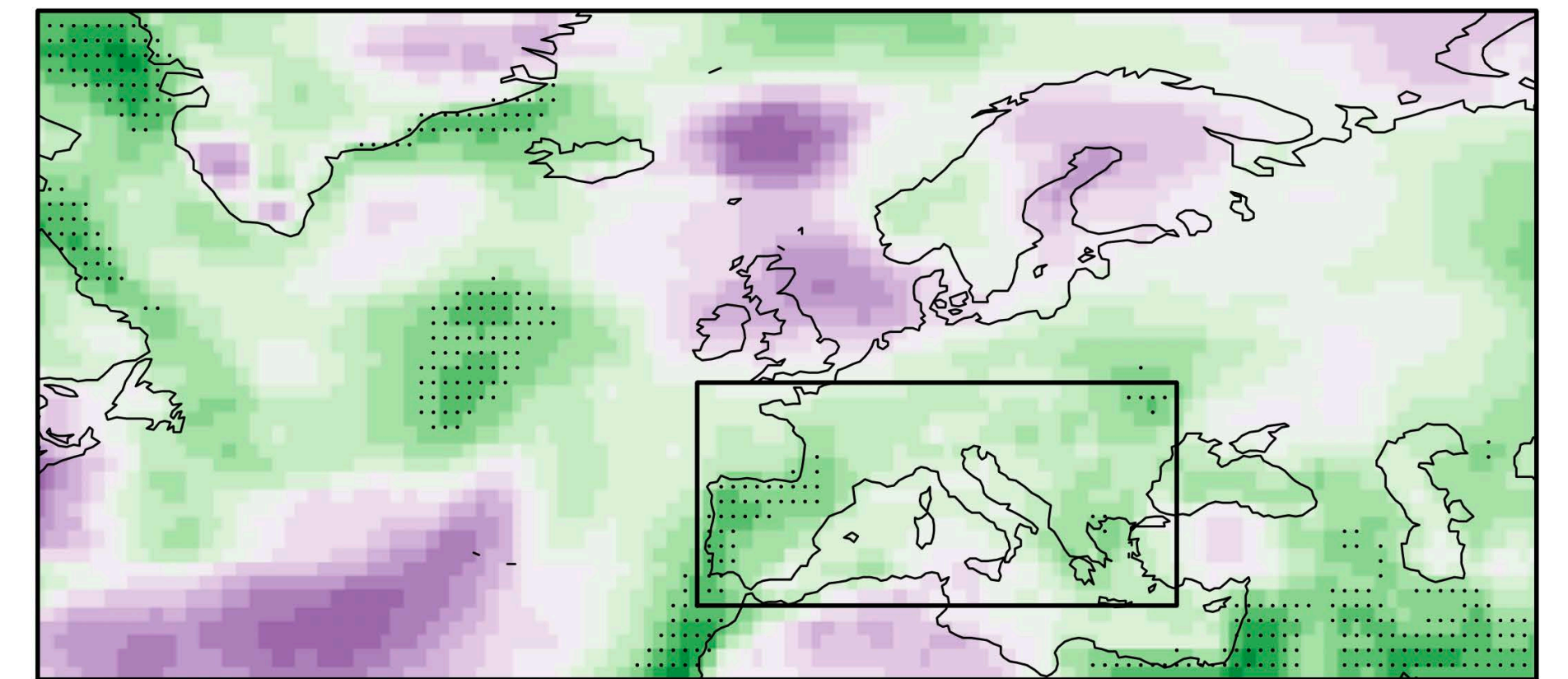
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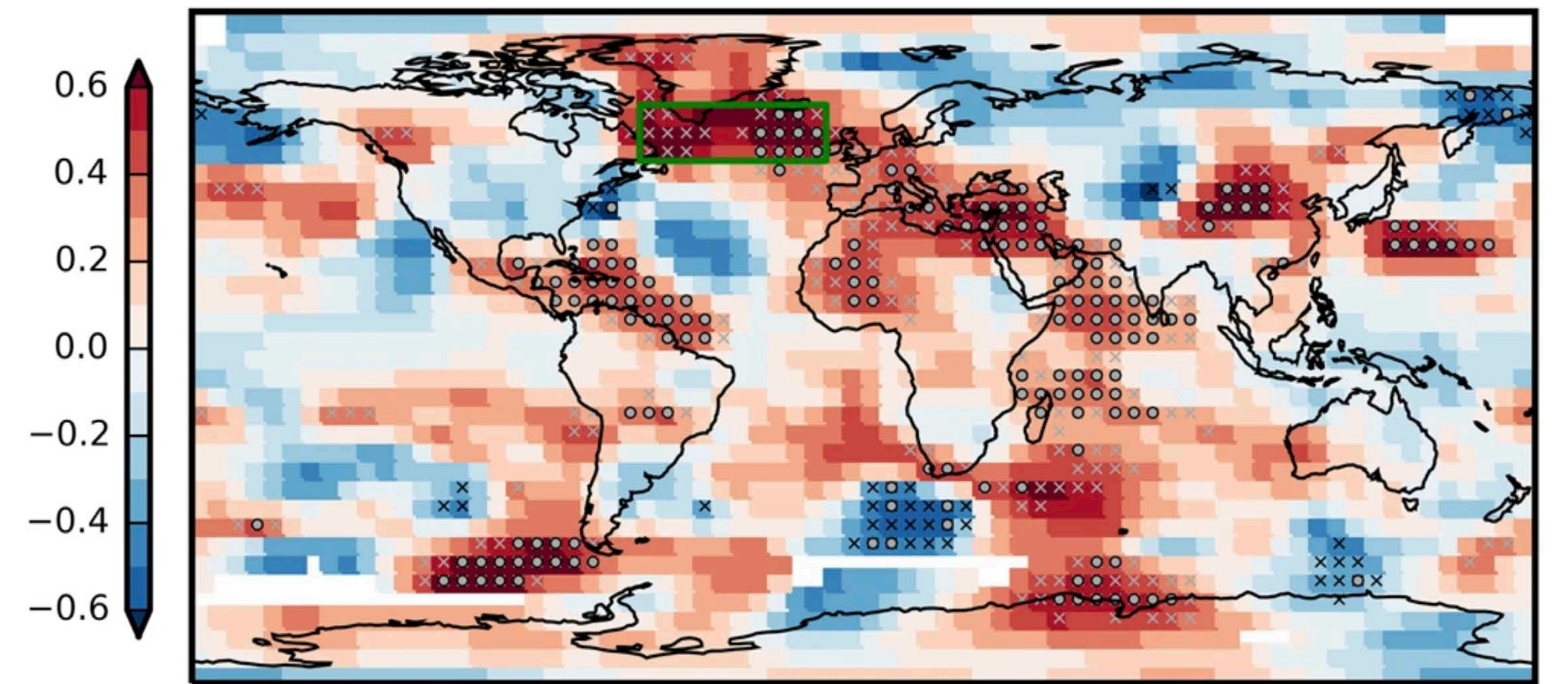
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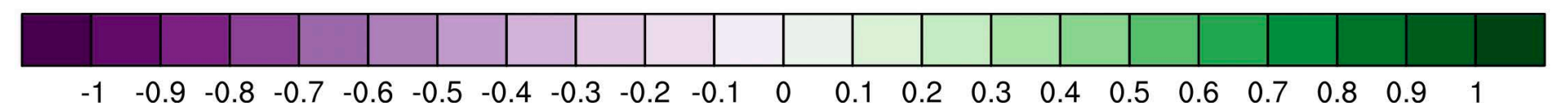
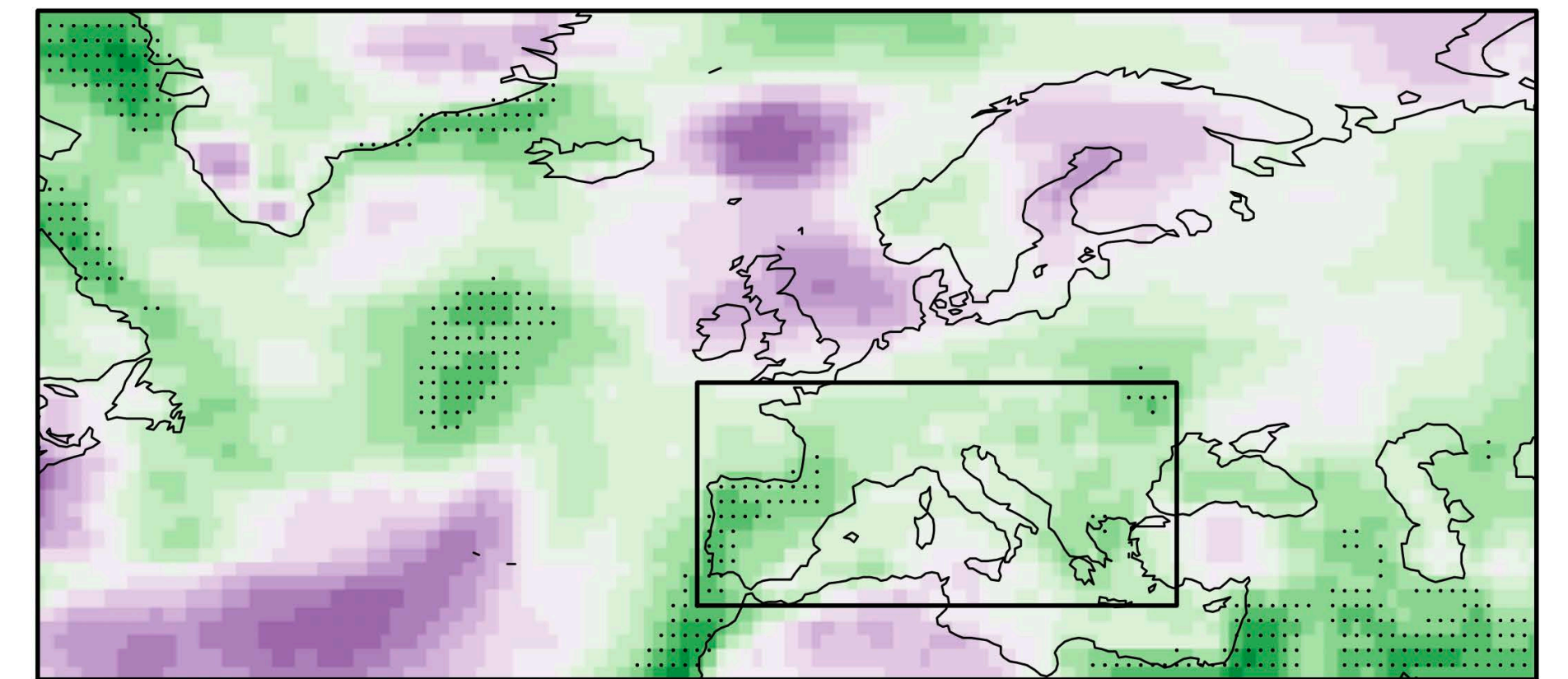
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- Here: proof of concept for decadal prediction



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Constructing a dynamical-statistical model

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- Underlying idea (e.g. Simpson et al., 2019):
 1. Derive link between predictable & unpredictable quantity
 2. Predict predictable quantity
 3. Derive prediction of unpredictable quantity (rescaling)

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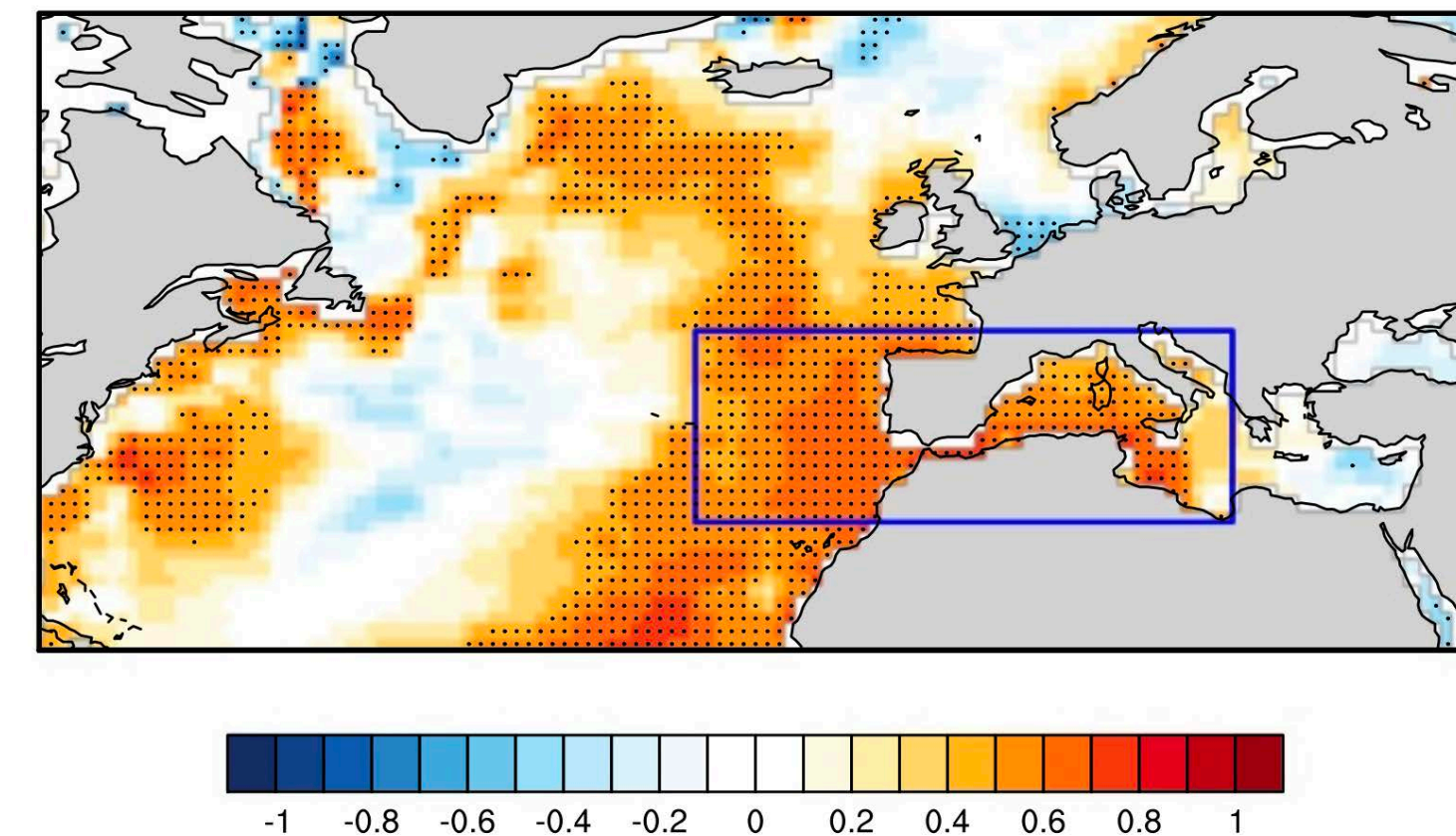
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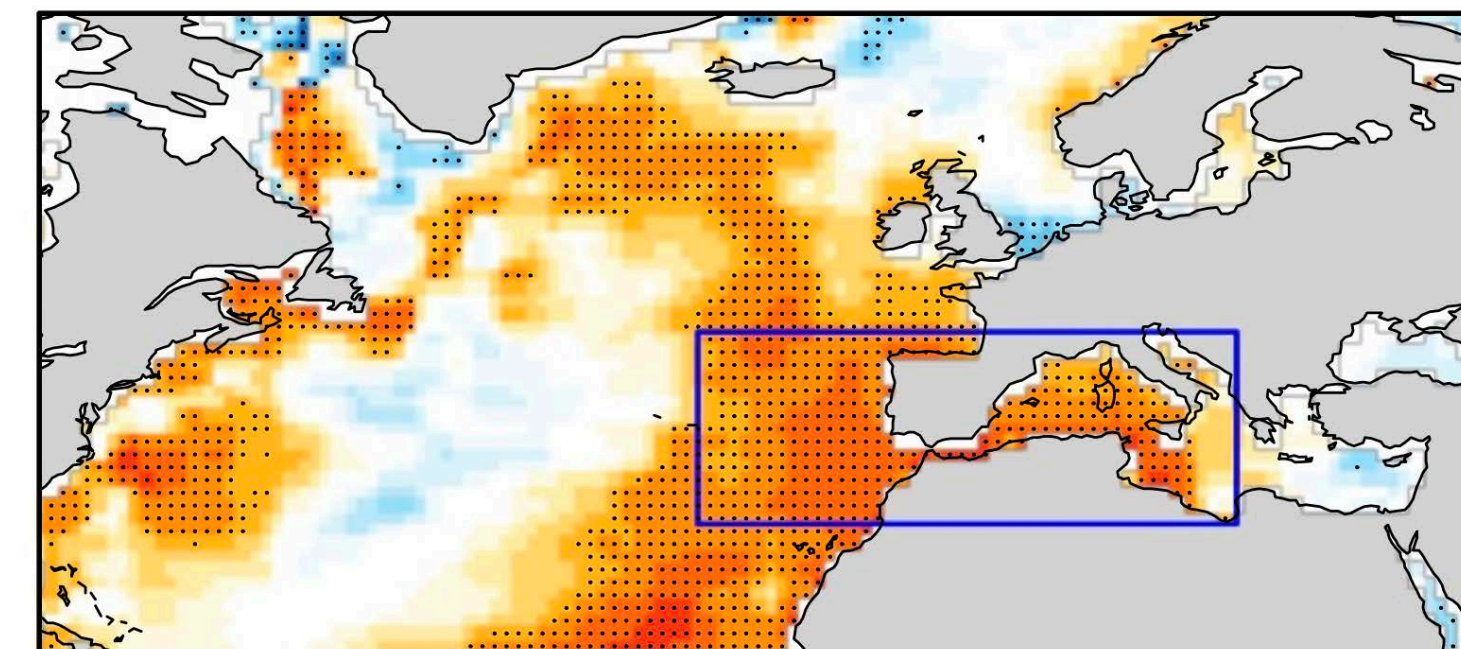
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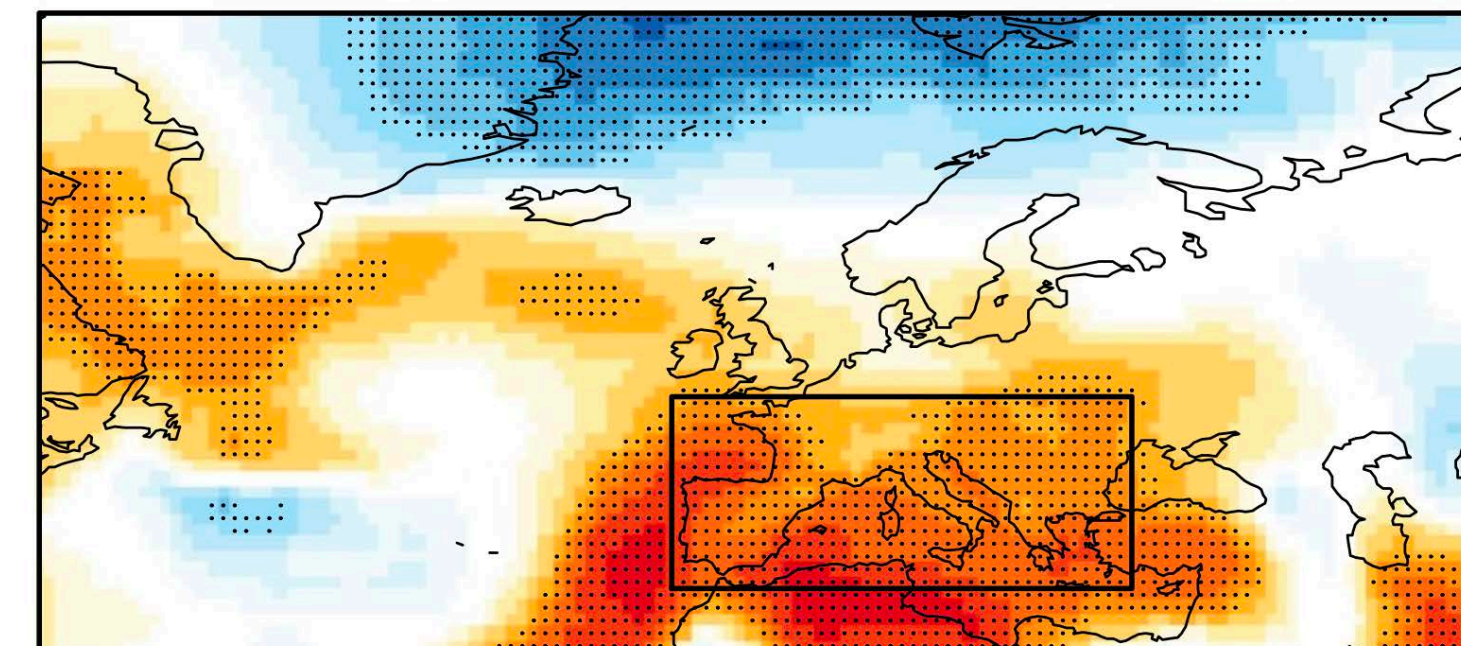
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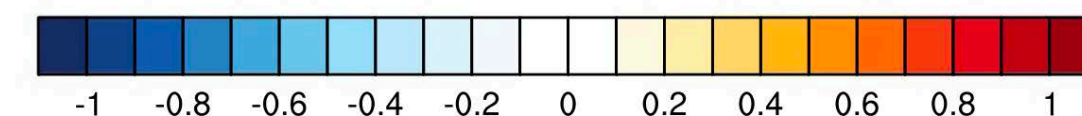
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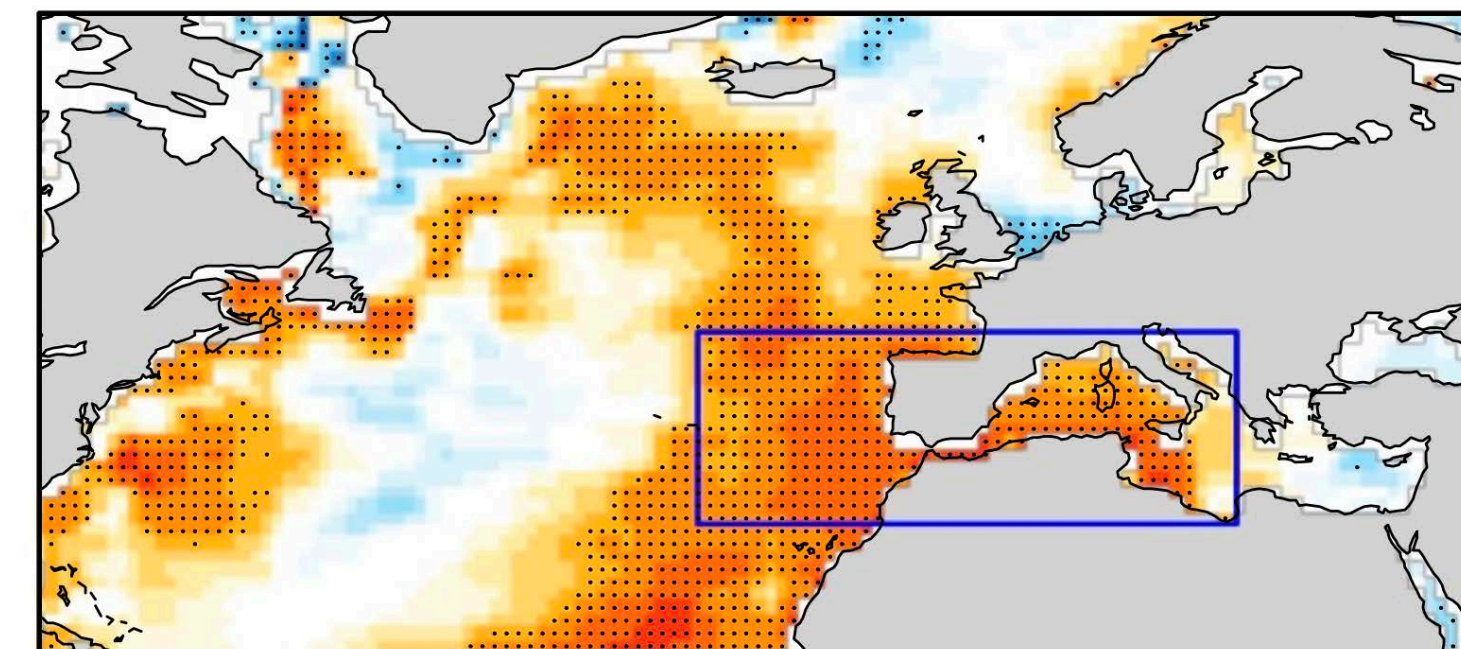


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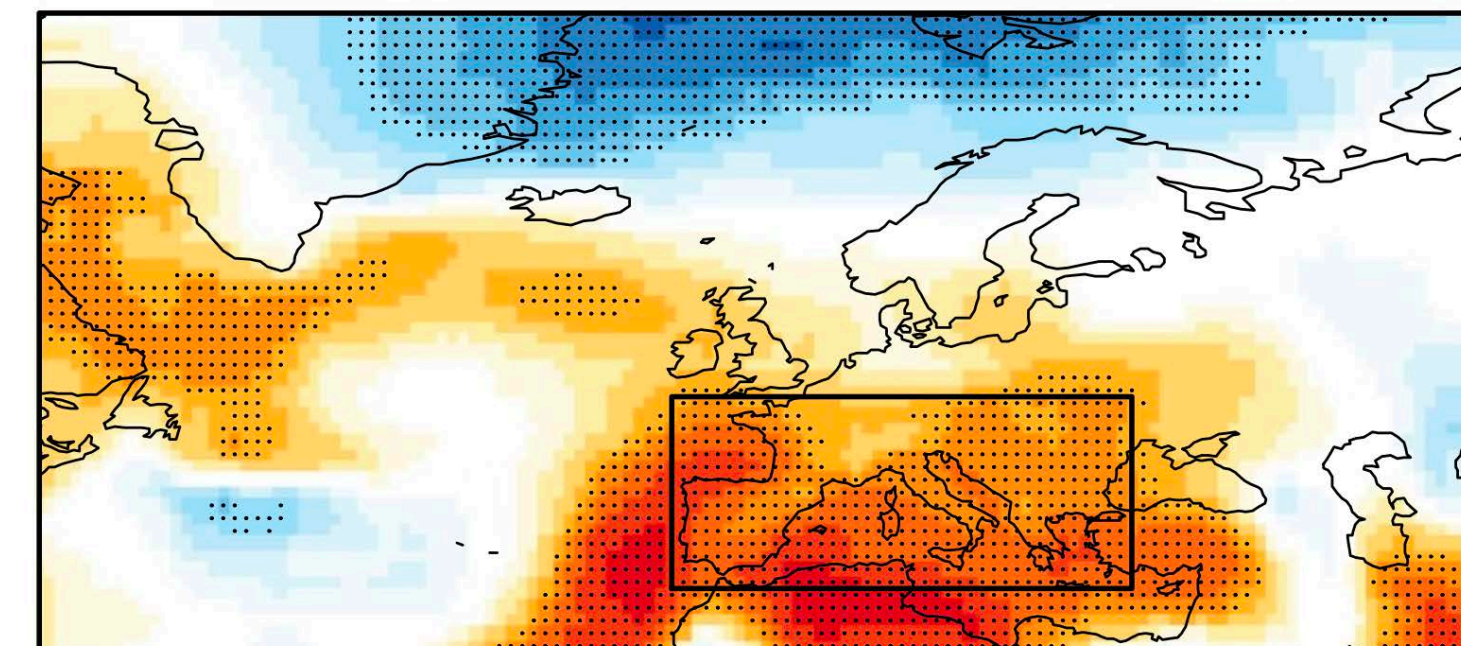


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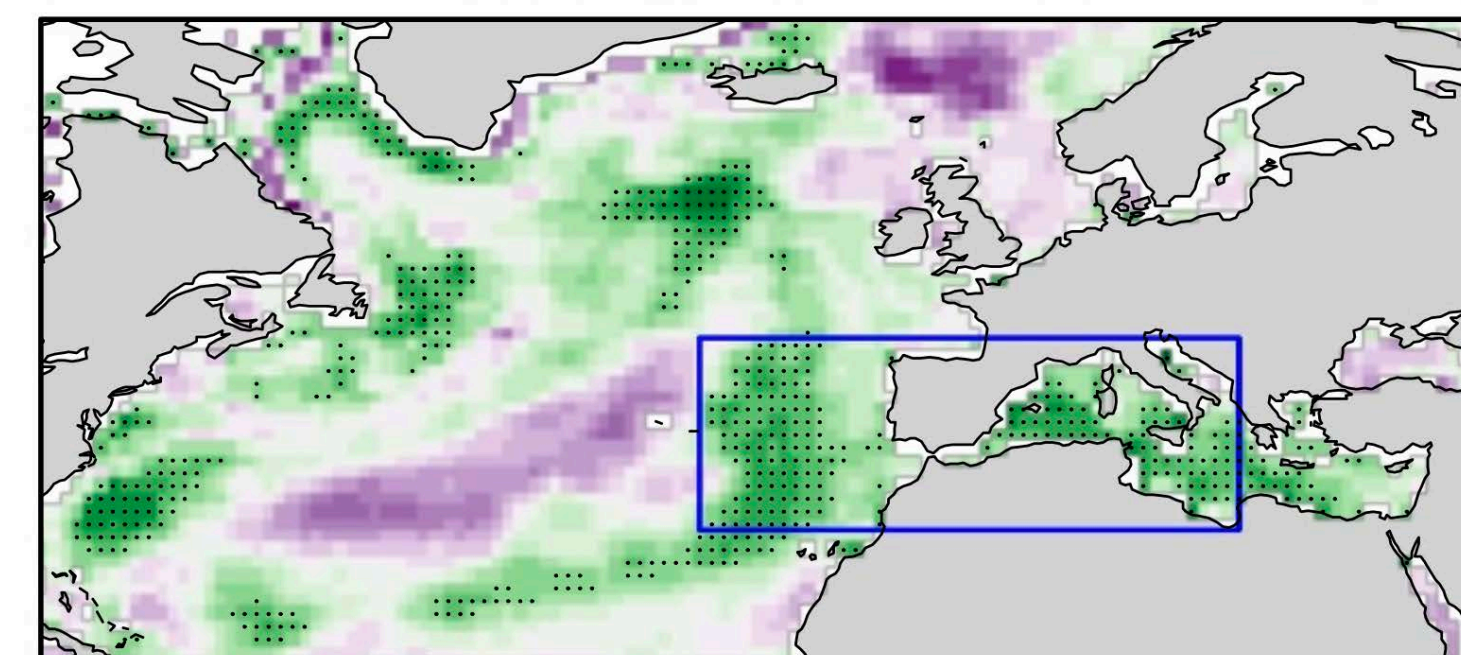
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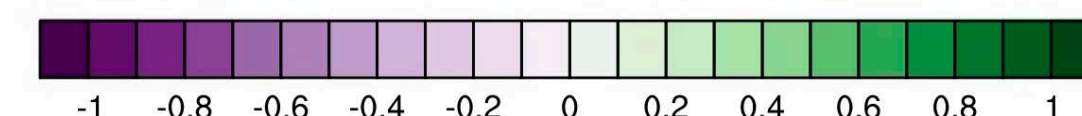
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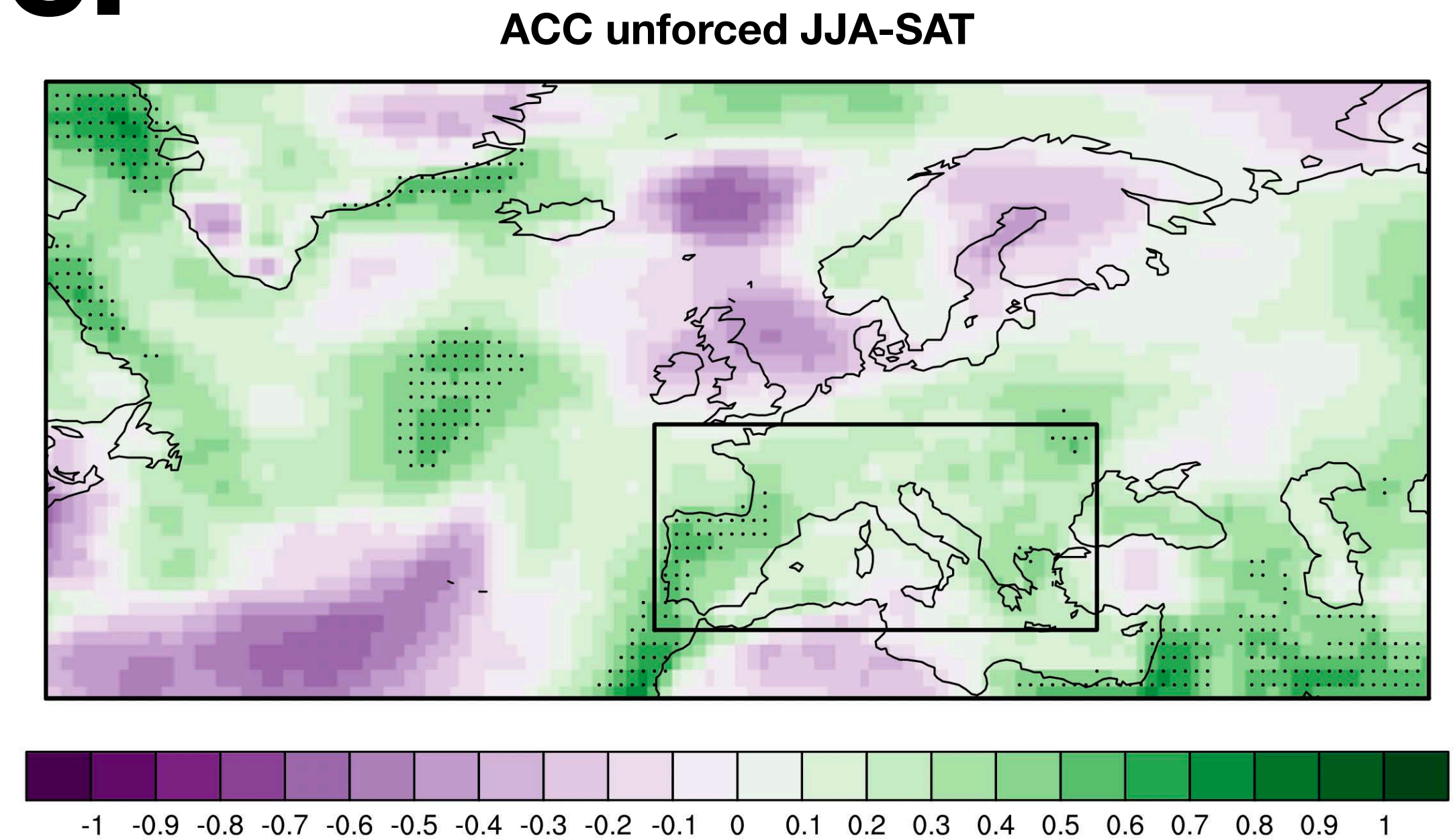
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Testing the dyn-stat model

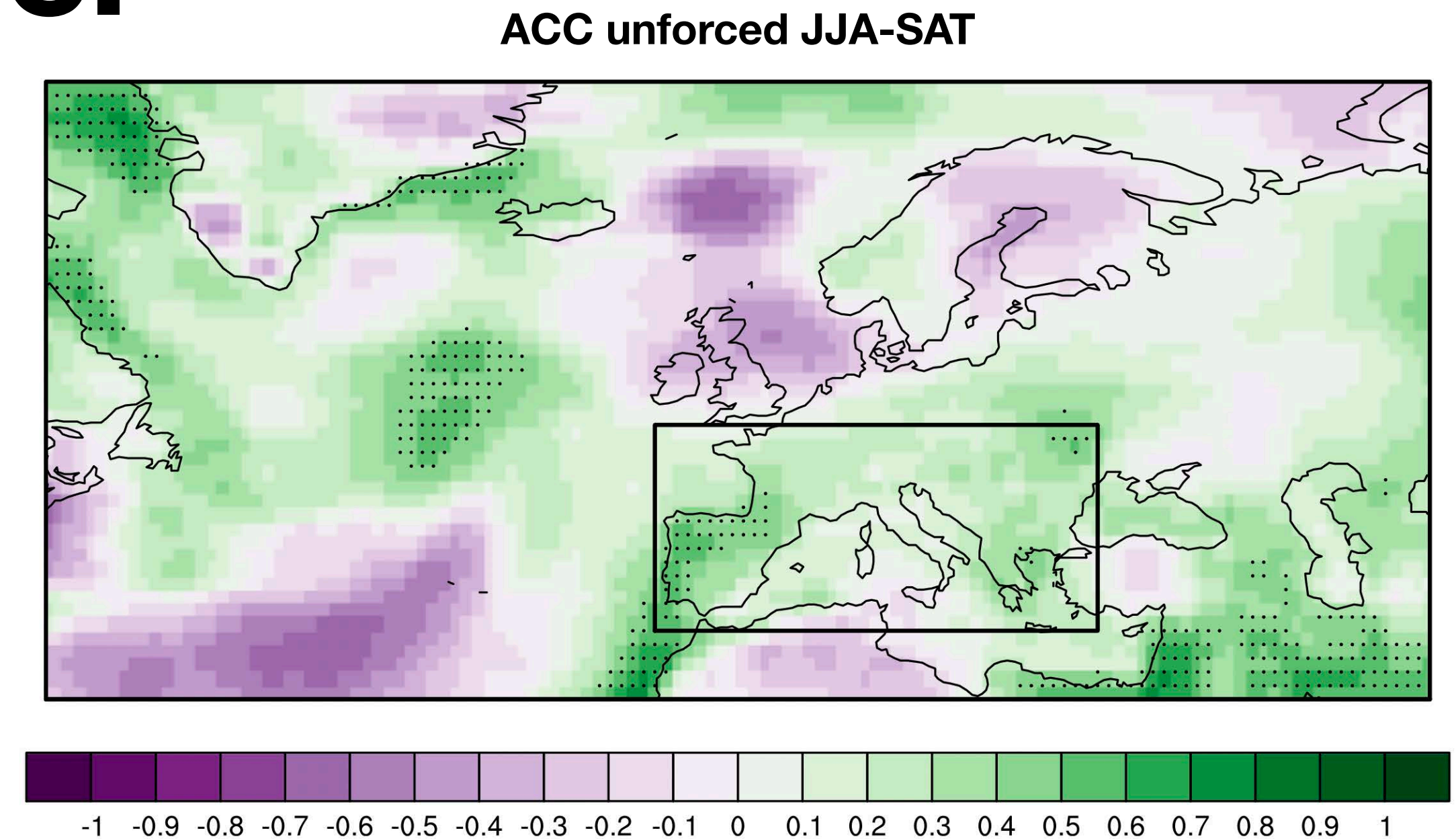
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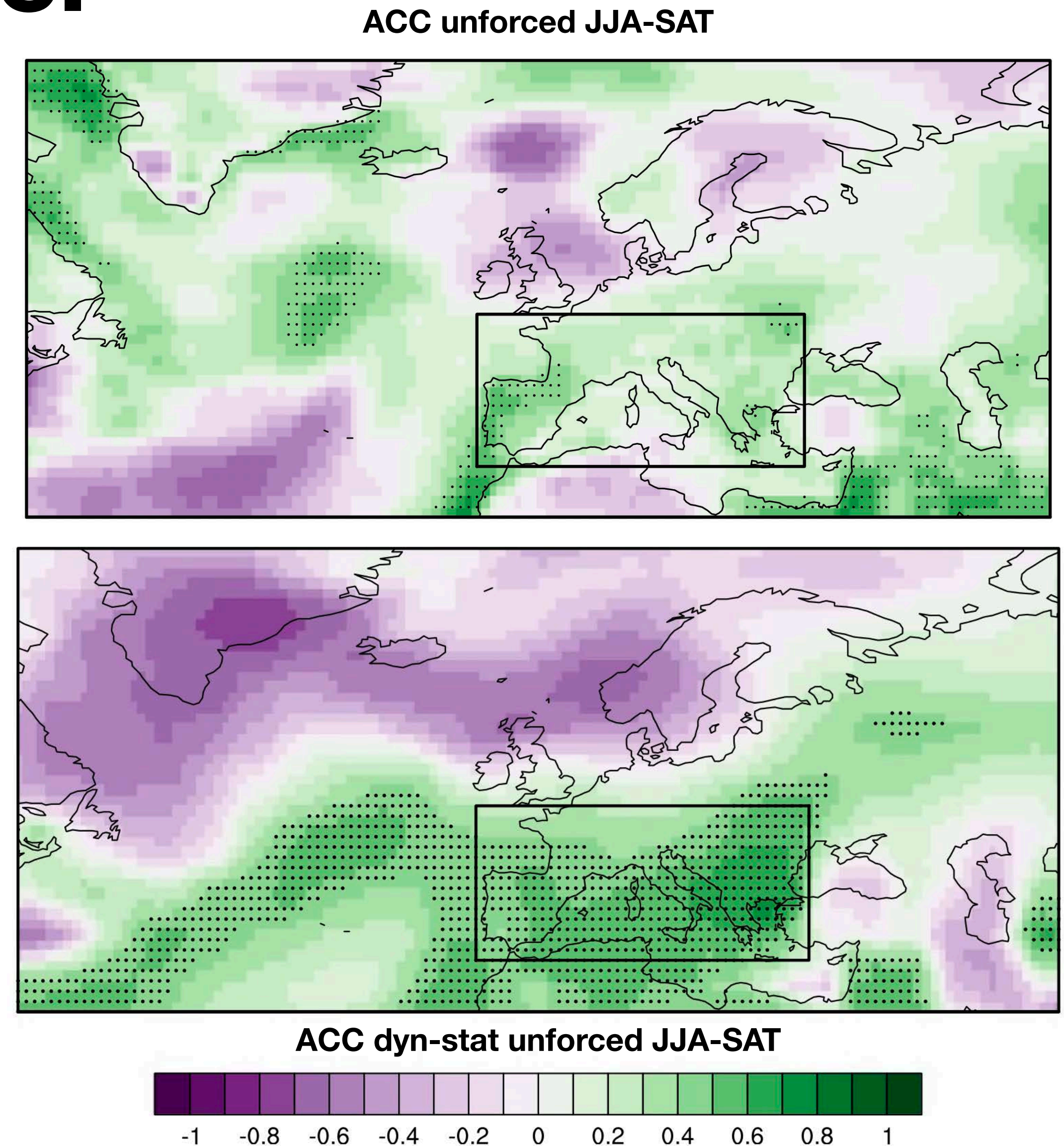
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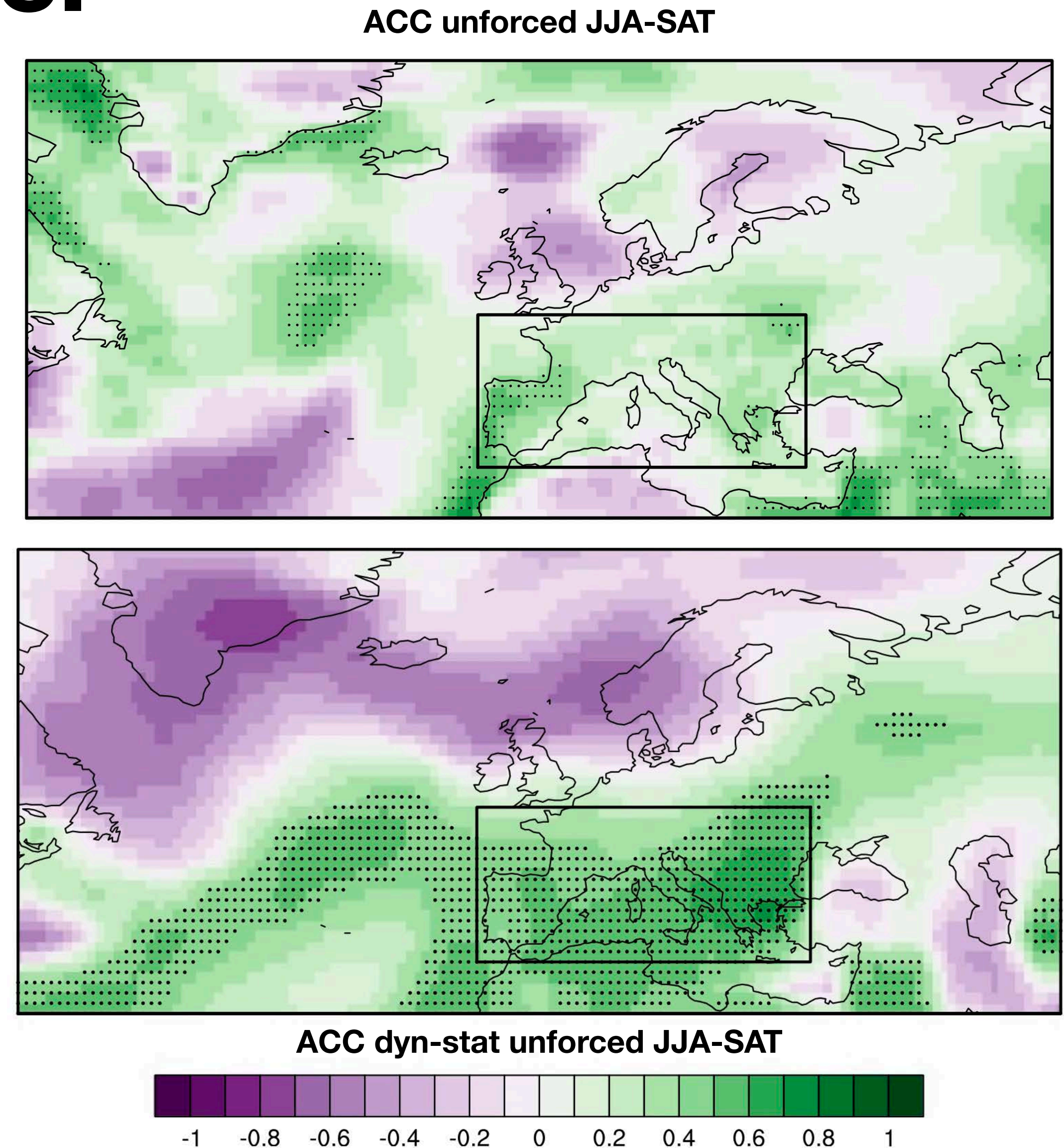
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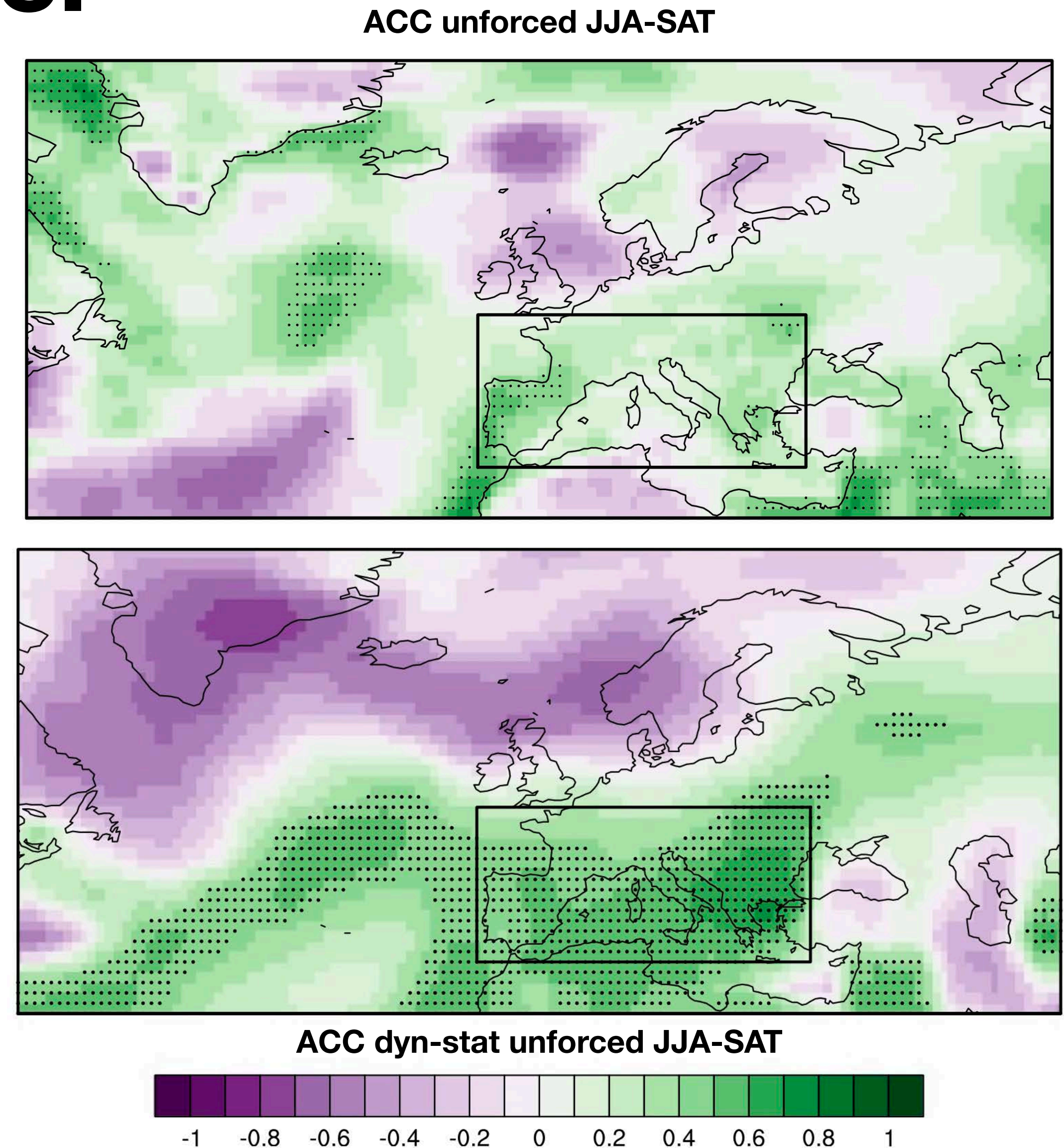
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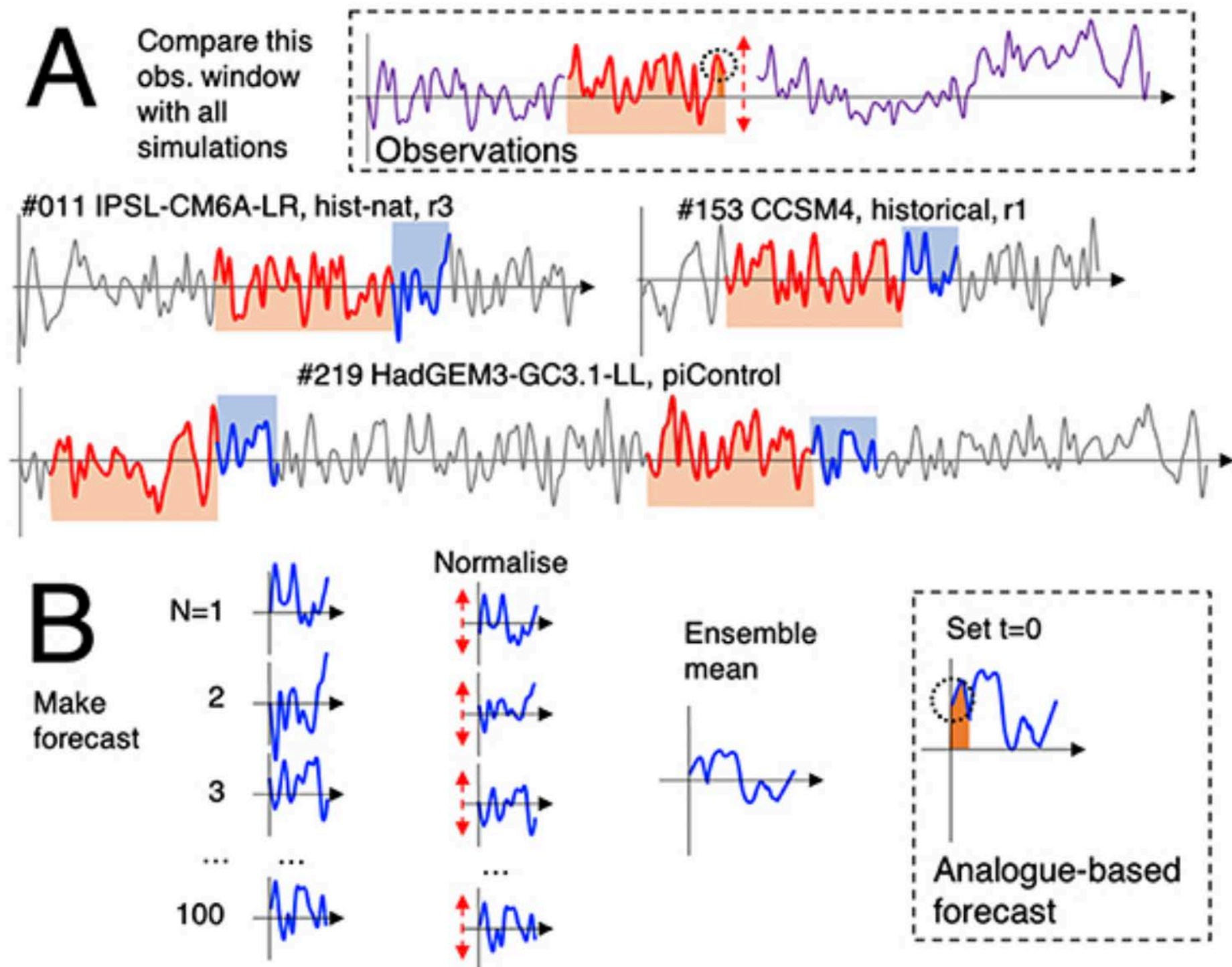
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- Partly significant increase



Analogues: Mimic initialisation by sampling CMIP archive?

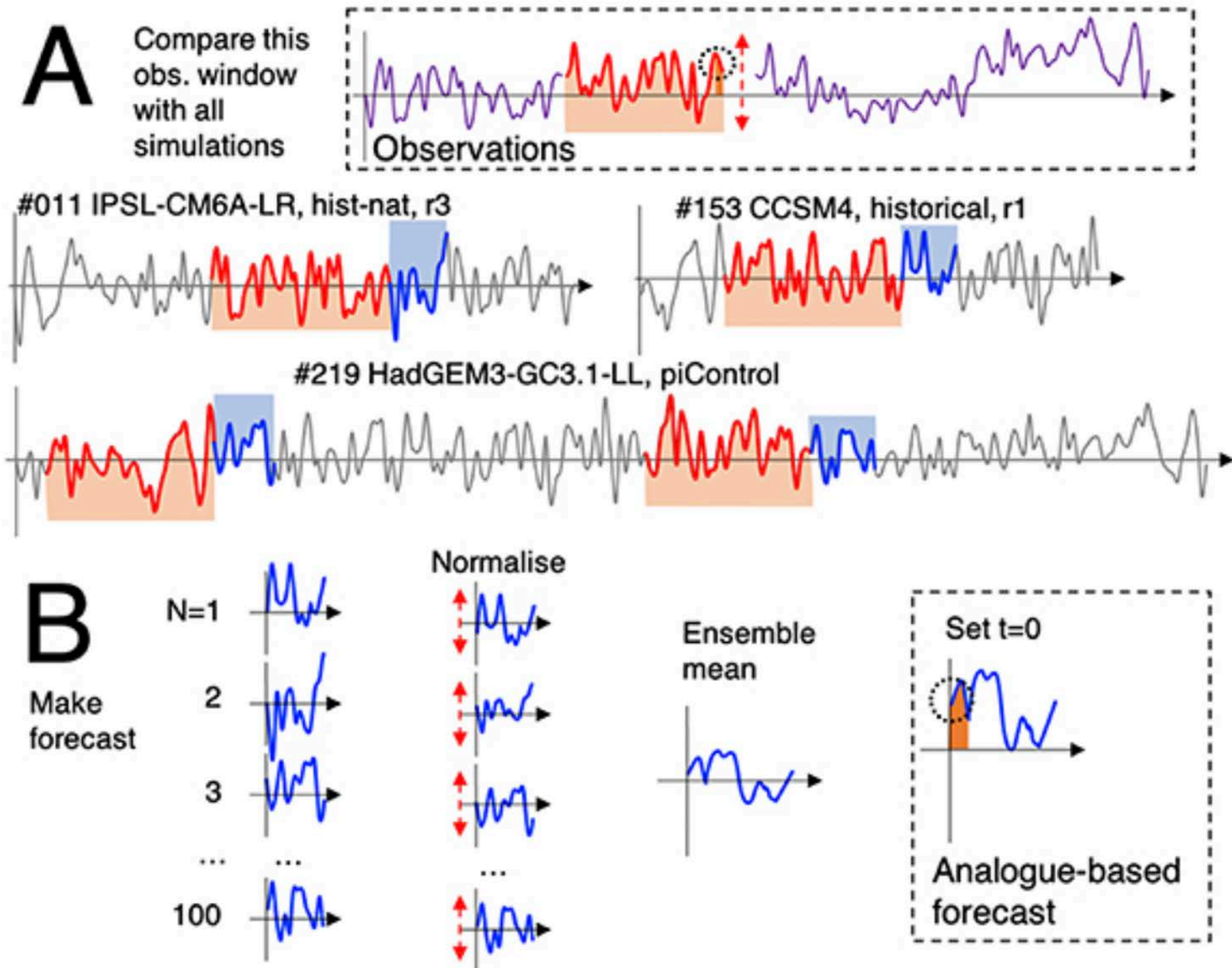
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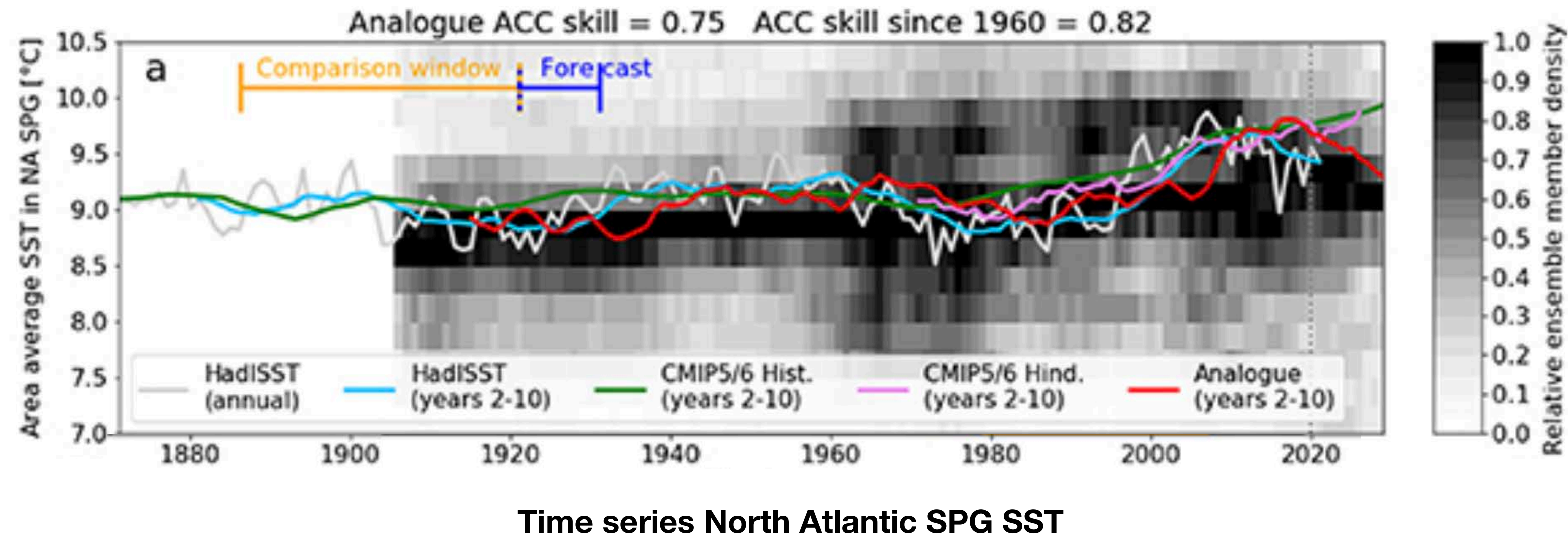
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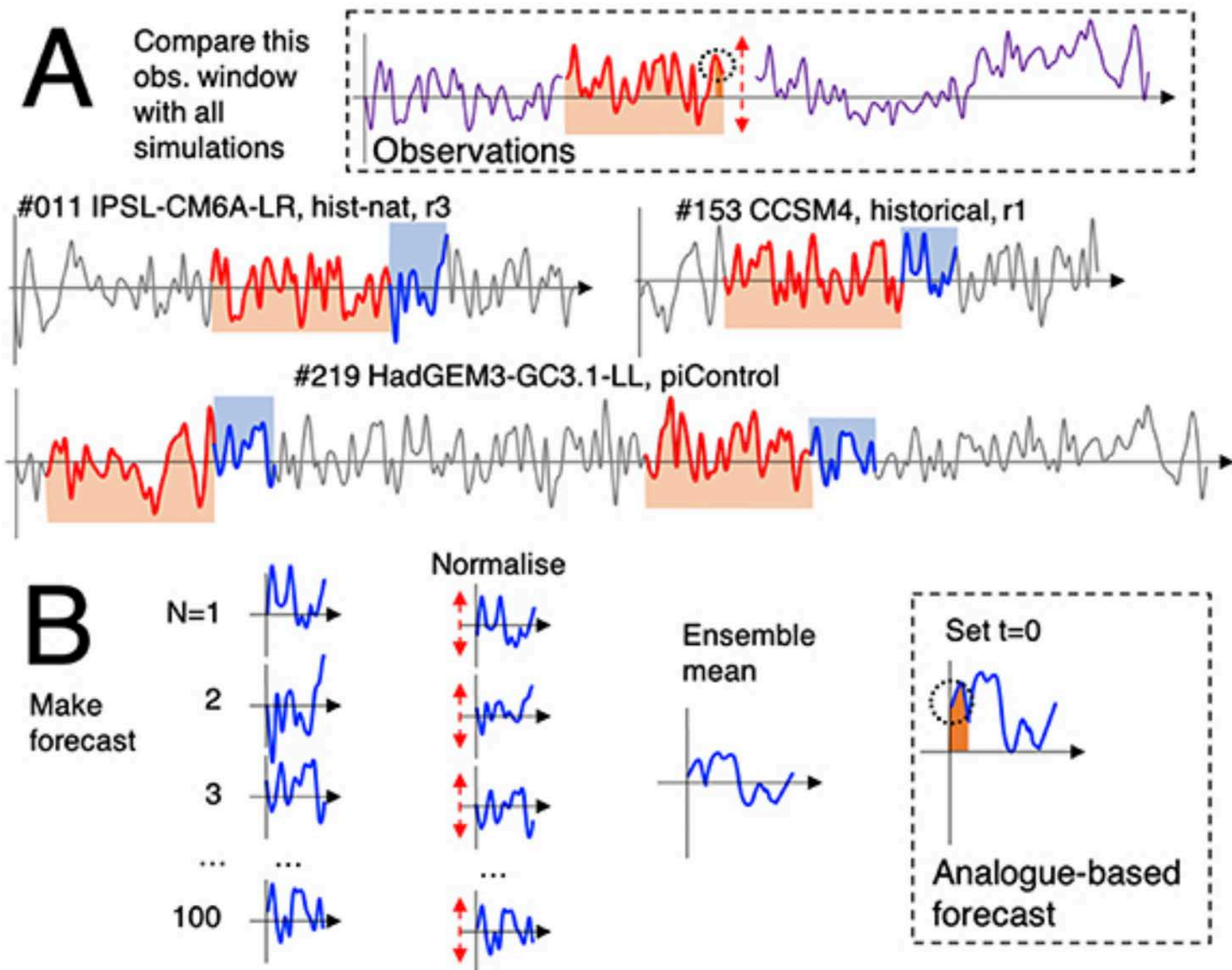


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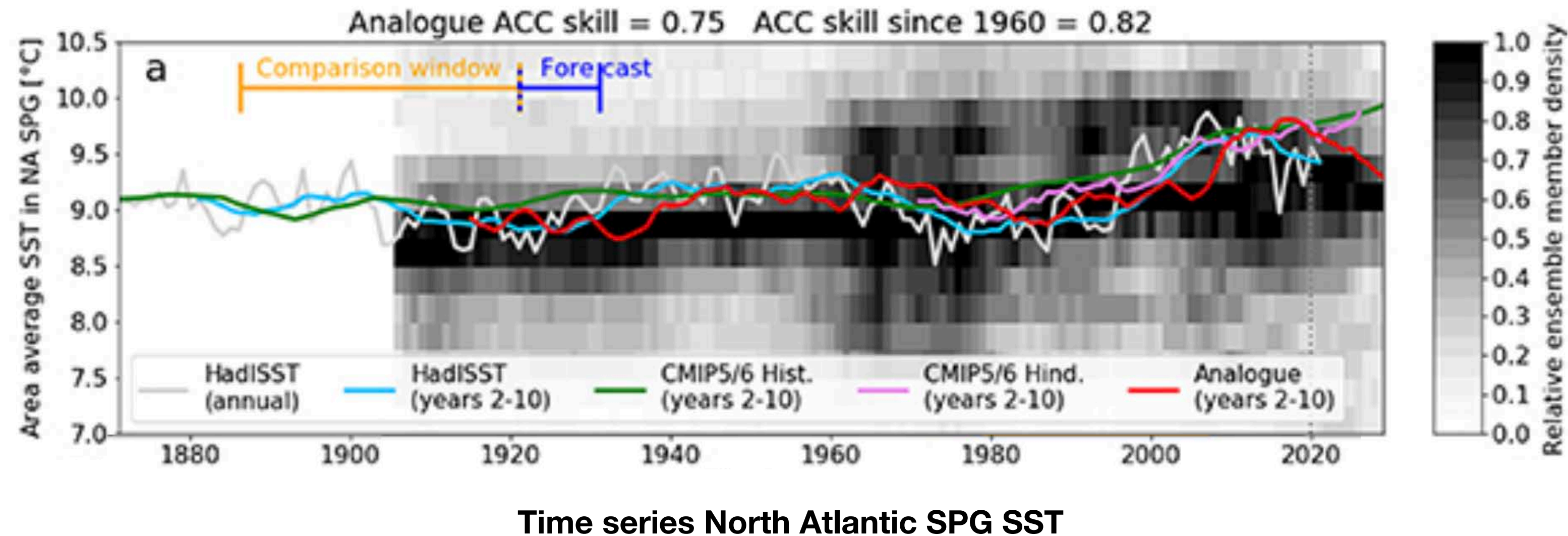


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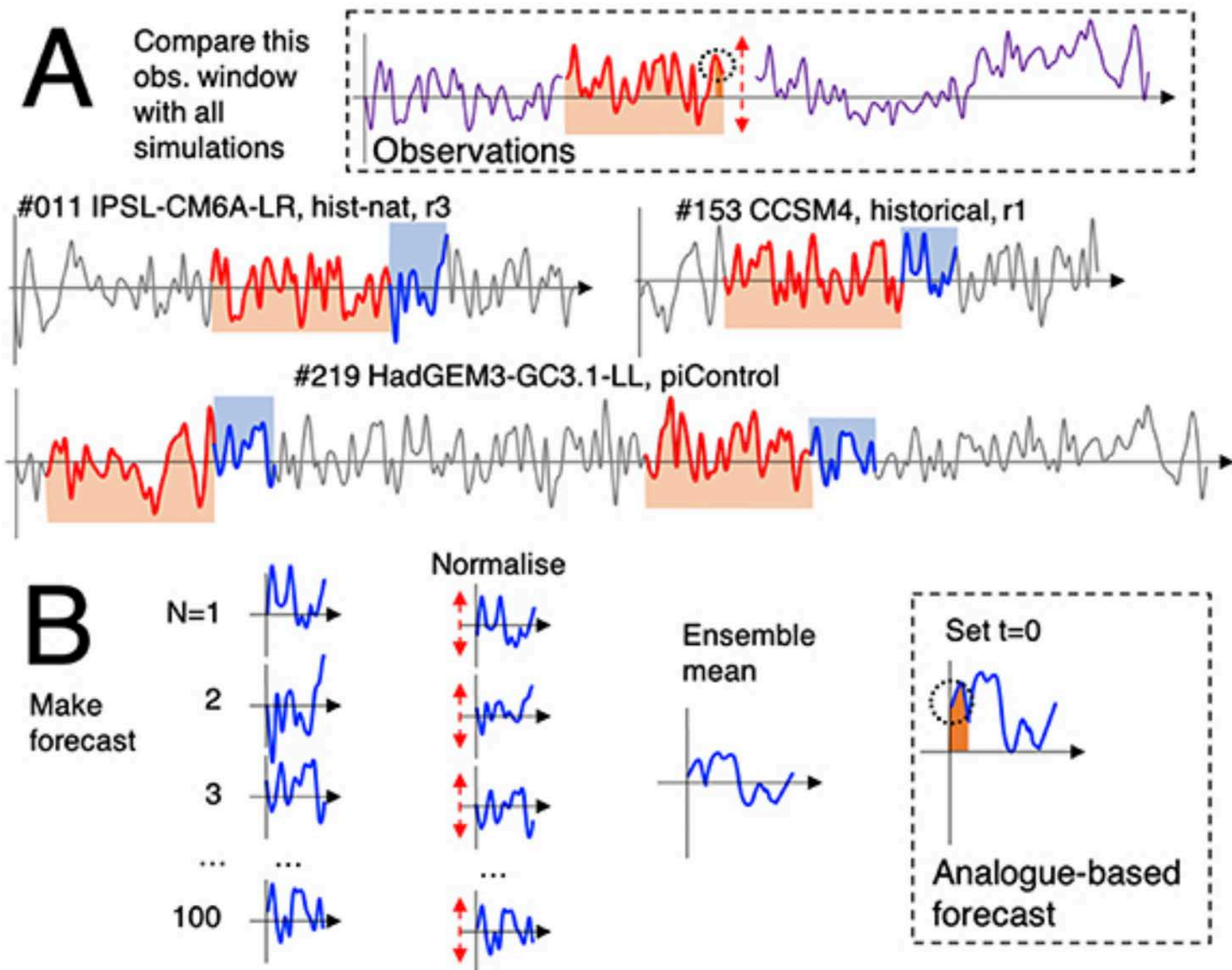
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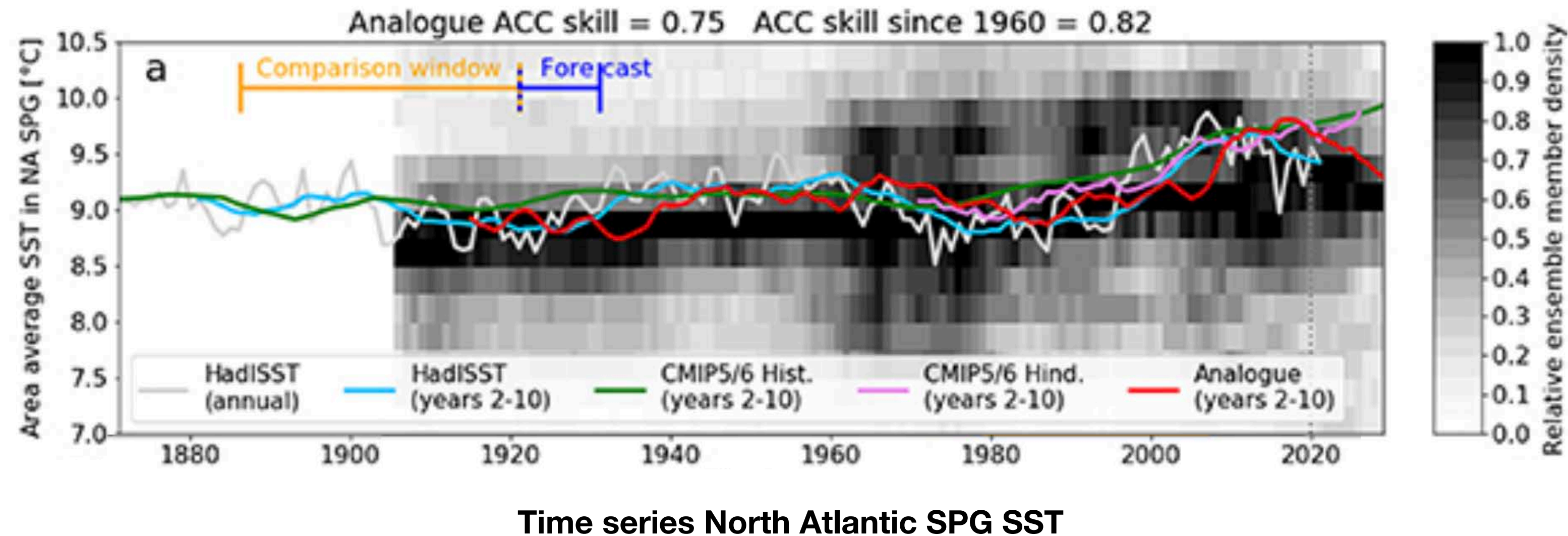
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- Future work: Improve selection method; Extend to European climate

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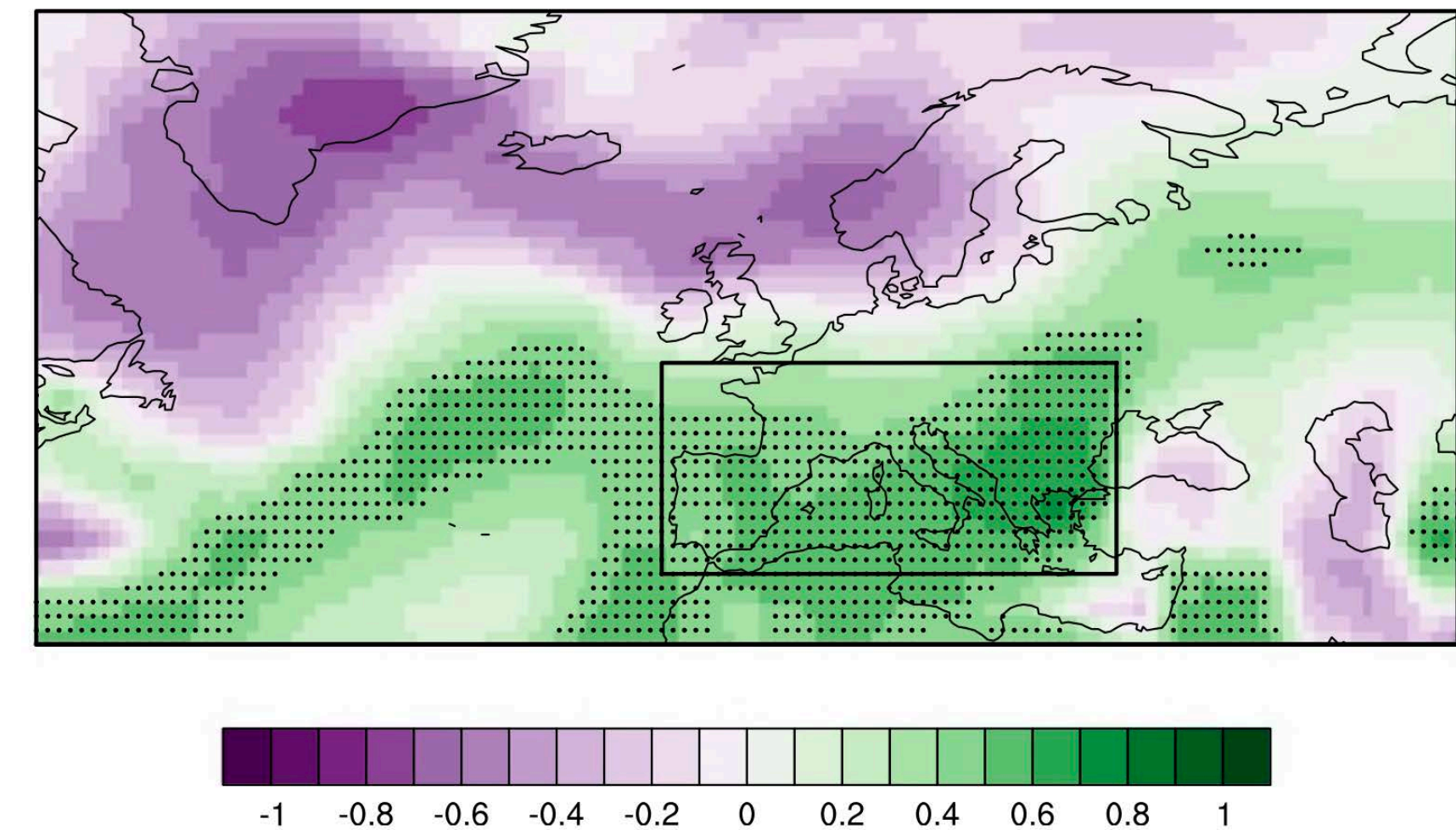
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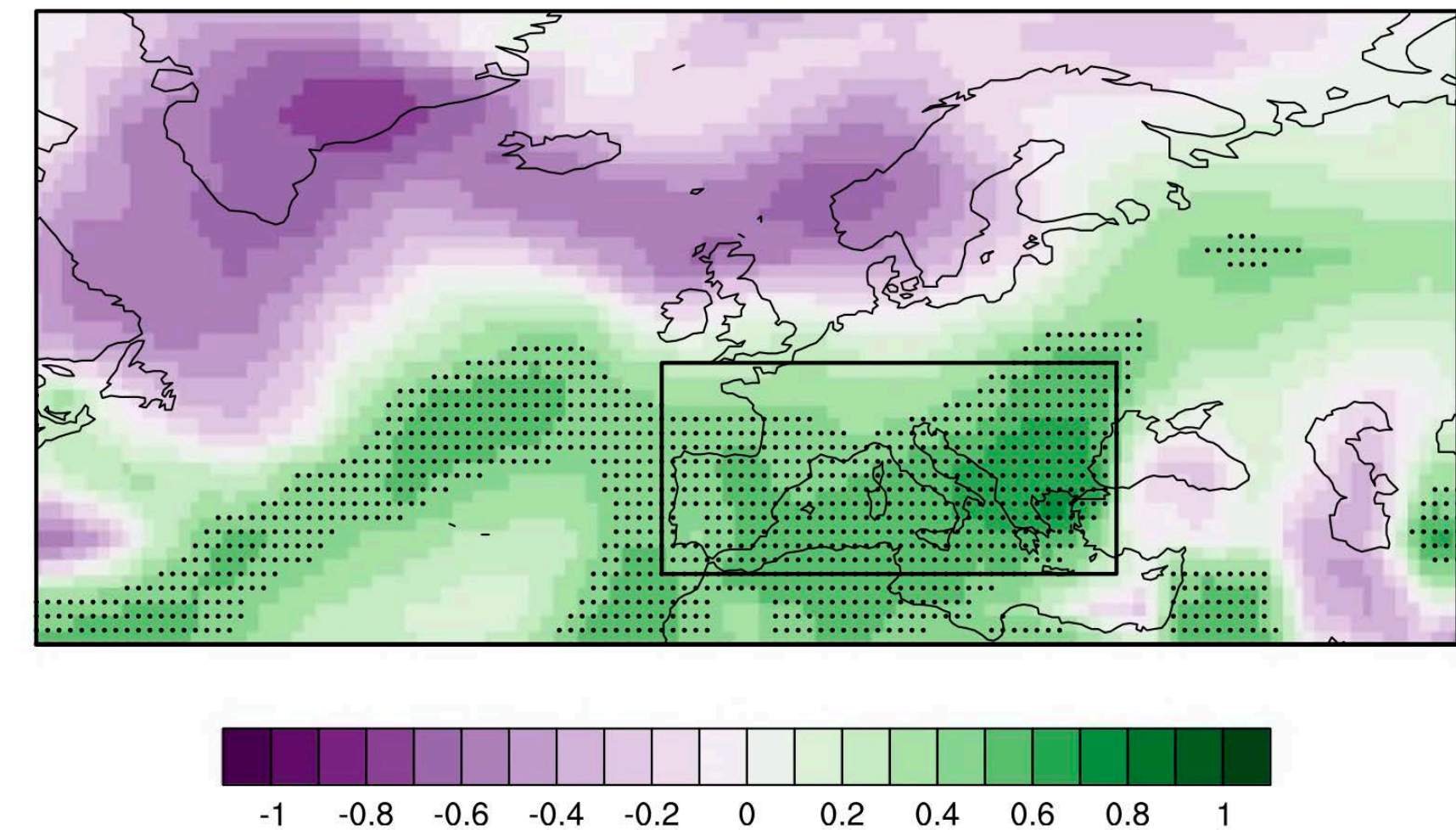
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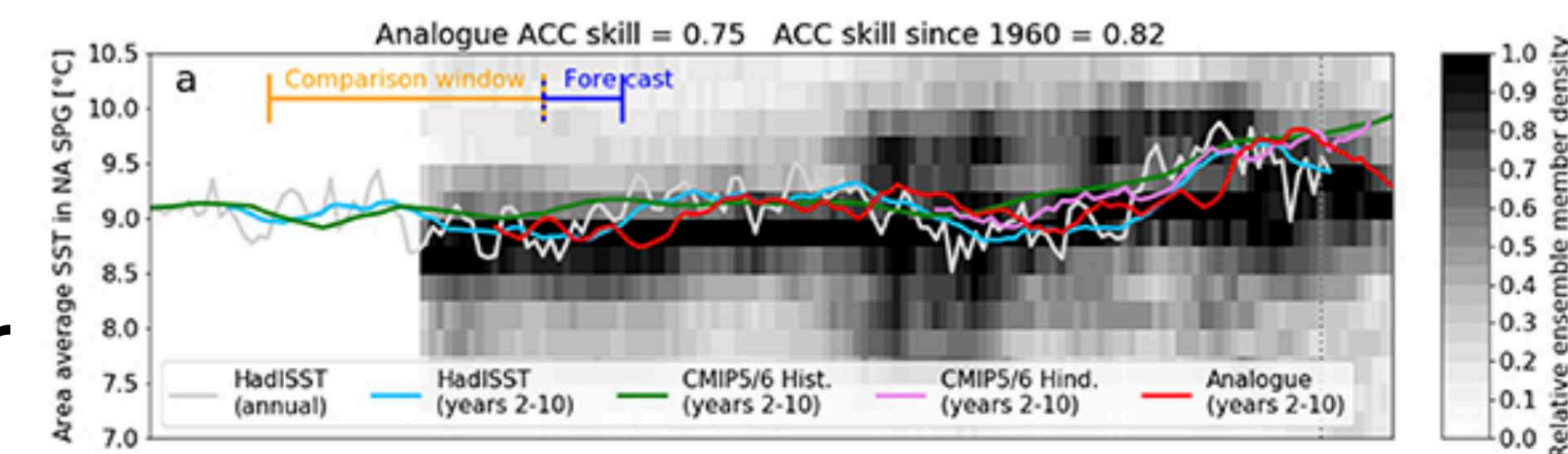


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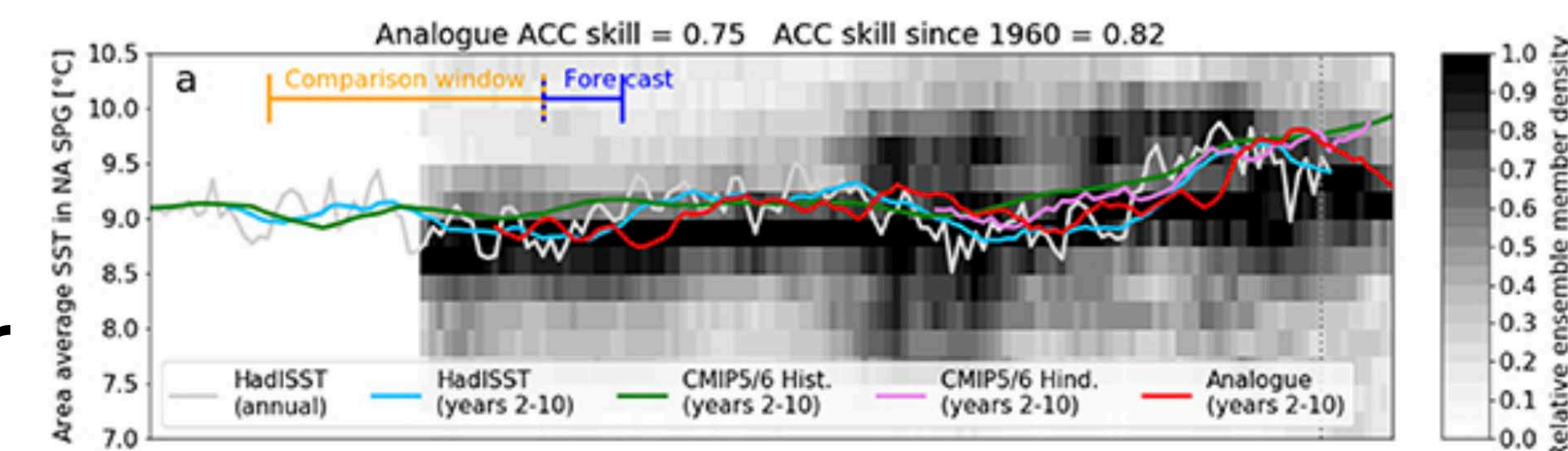
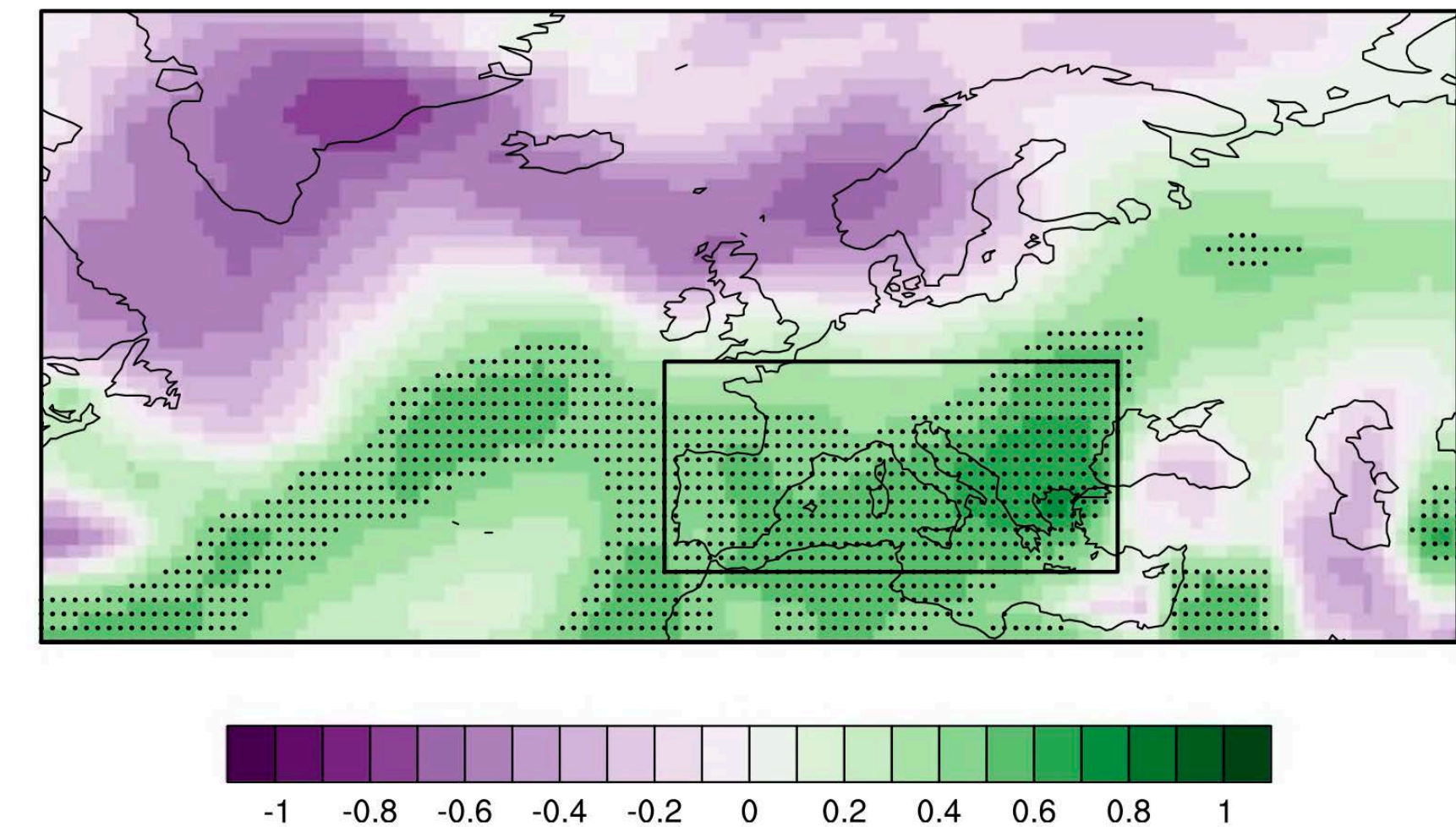
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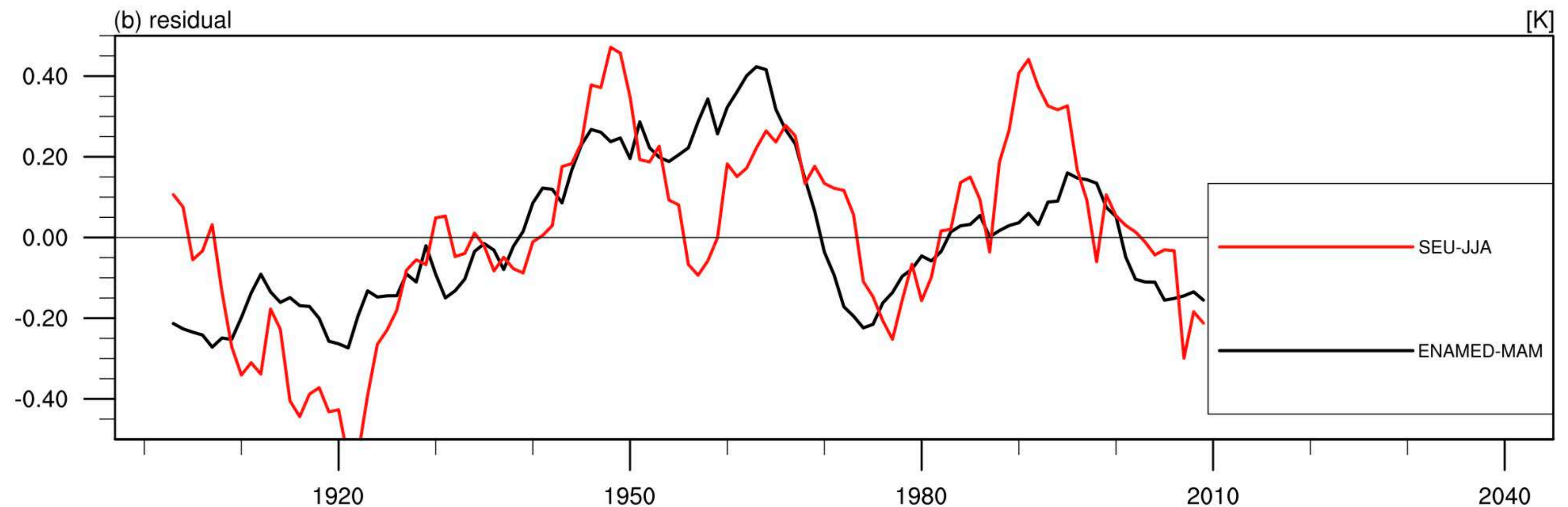
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- Simpson et al. (2019) Decadal predictability of late winter precipitation in western Europe through an ocean-jet stream connection, *Nature Geoscience*, 12, 613-619
- Smith et al. (2019) Robust skill of decadal climate predictions. *npj Clim Atmos Sci* **2**, 13. <https://doi.org/10.1038/s41612-019-0071-y>

Methods: dynamical-statistical model

- The link between spring SST and summer European surface temperature (EUST) is determined via correlation analysis (1900-1969)
- Spring SST predictions with the CMIP6 multi-model ensemble (LY2-9) are then rescaled to observed summer EUST variance in 1900-1969
- The skill of this prediction is evaluated against observed EUST during 1970-2014

Observed time series:
JJA-EUST (10W-30E, 35-50N) in red
MAM-SST (25W-15E, 35-45N) in black



Methods: analogue prediction

- Analogue methods search existing model simulations for climate states similar to observed at start of a prediction and then use the following years to predict
- Here:
 - RMSE of all possible 35-year mean North Atlantic SST in HadISST with all possible 35-year mean North Atlantic SST in CMIP5 and 6 models
 - Select lowest 100 RMSEs: store the following 10 years in the simulations
 - Normalise and then average those 100 selected analogues in ensemble space
 - Average lead times 2-10 for prediction

