



Spring regional SSTs as precursor of European summer heat waves

Goratz Beobide-Arsuaga^{1,2}, André Düsterhus³, Wolfgang A. Müller⁴, Elizabeth A. Barnes⁵, Johanna Baehr¹
goratz.beobide.arsuaga@uni-hamburg.de

1 Institute of Oceanography, Center for Earth System Research and Sustainability (CEN), Universität Hamburg, Hamburg, Germany

2 International Max Planck Research School on Earth System Modelling, Hamburg, Germany

3 Maynooth University, ICARUS, Department of Geography, Maynooth, Ireland

4 Max Planck Institute for Meteorology, The Ocean in the Earth System, Hamburg, Germany

5 Department of Atmospheric Science, Colorado State University, Fort Collins, CO, USA



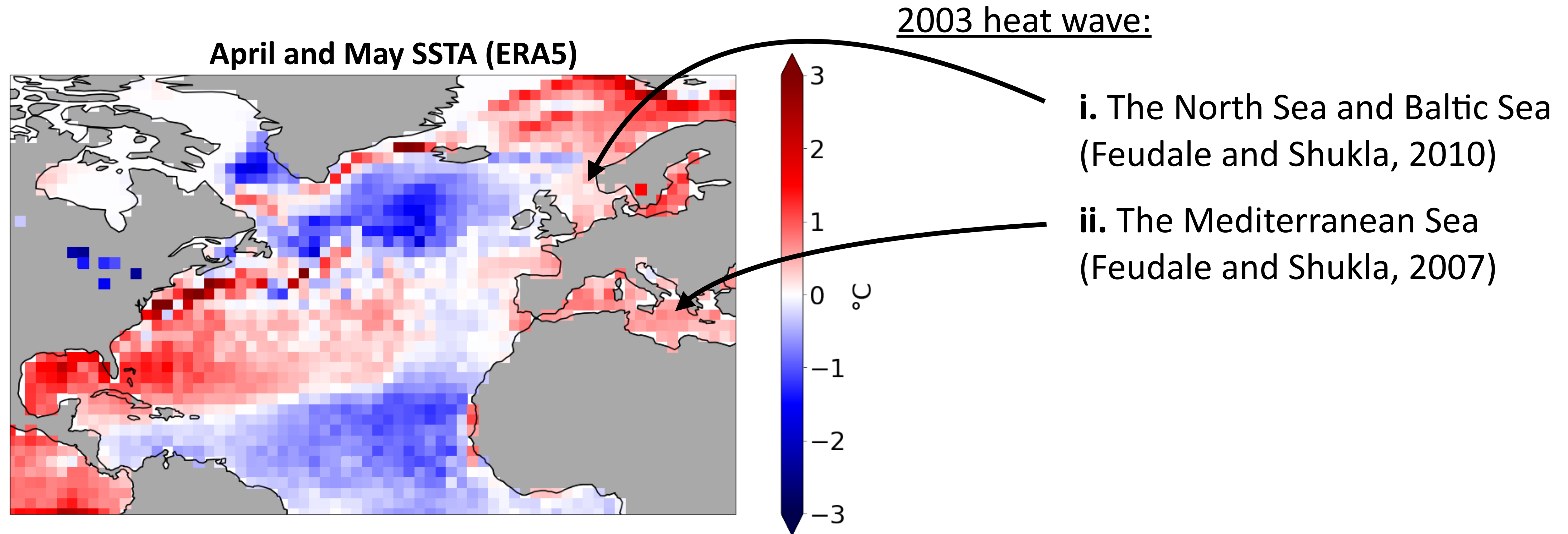
International Max Planck Research School
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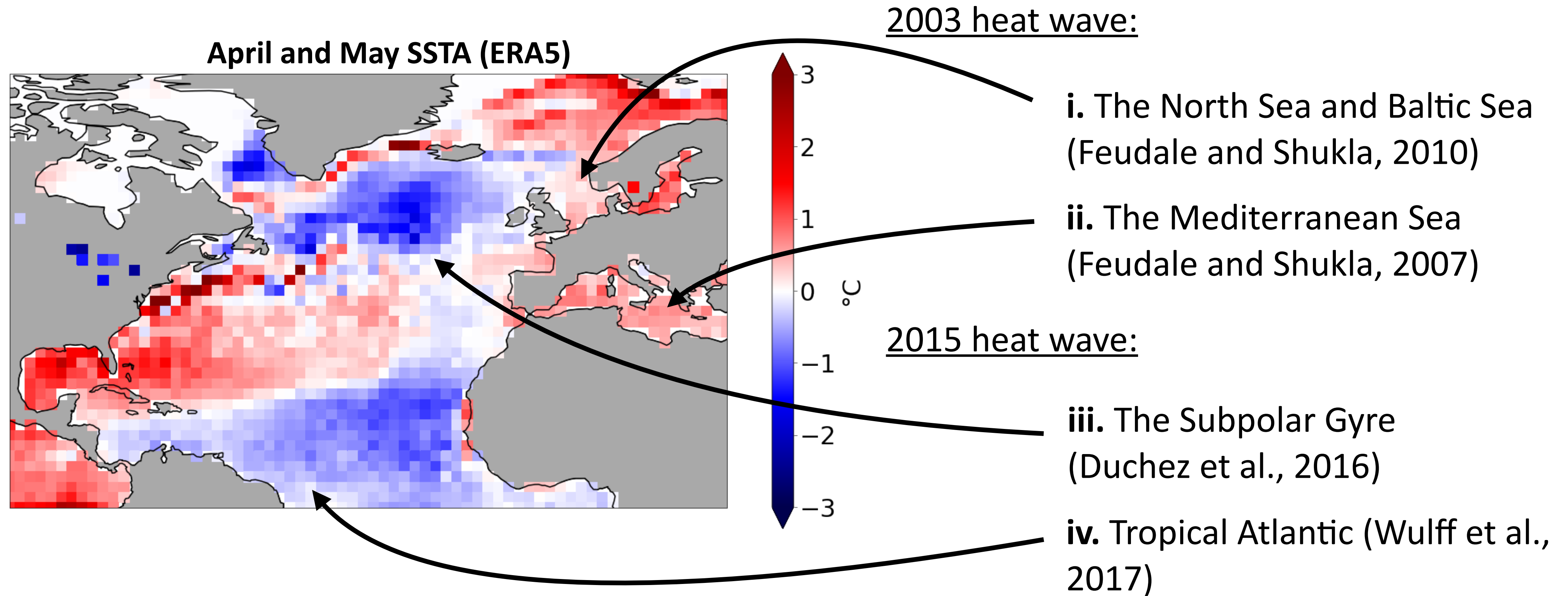
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DER FORSCHUNG | DER LEHRE | DER BILDUNG

Different SSTAs related to different European summer heat waves (EuSHW) ...



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Which region is the most robust precursor of EuSHW?

MPI Grand-Ensemble

- 100 historical runs (1850-2005)
- Select 5000 heat wave years and 5000 non-heat wave years

+

Explainable AI

- NNs to relate April and May (AM) SSTA to heat wave years
- LRP to identify robust precursors (Toms et al. 2020)

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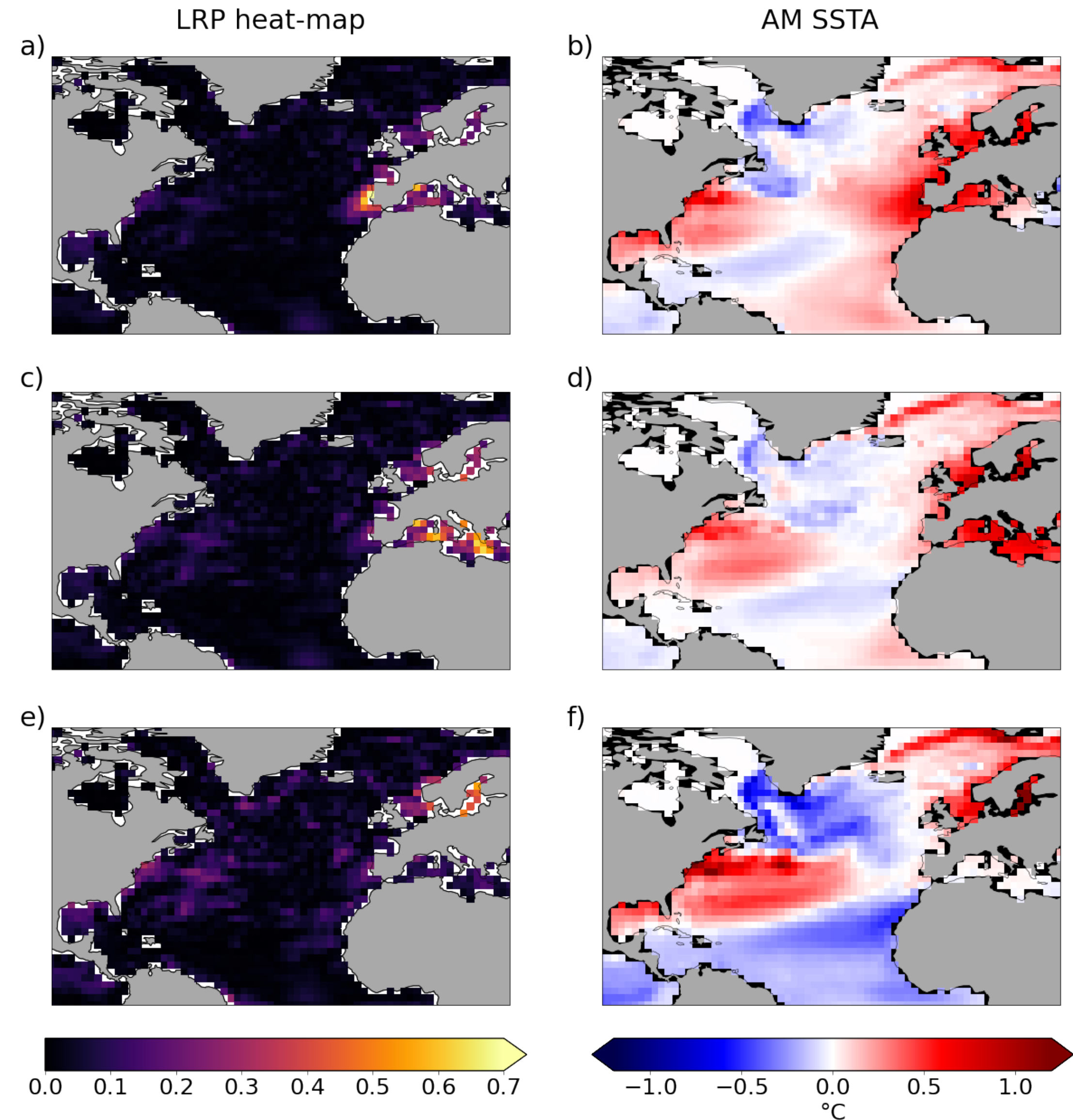
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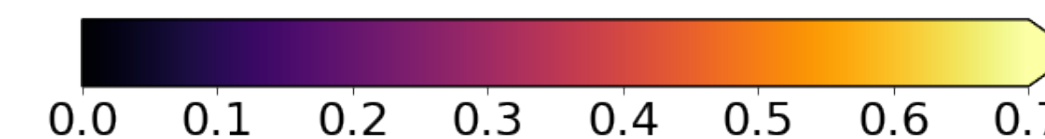
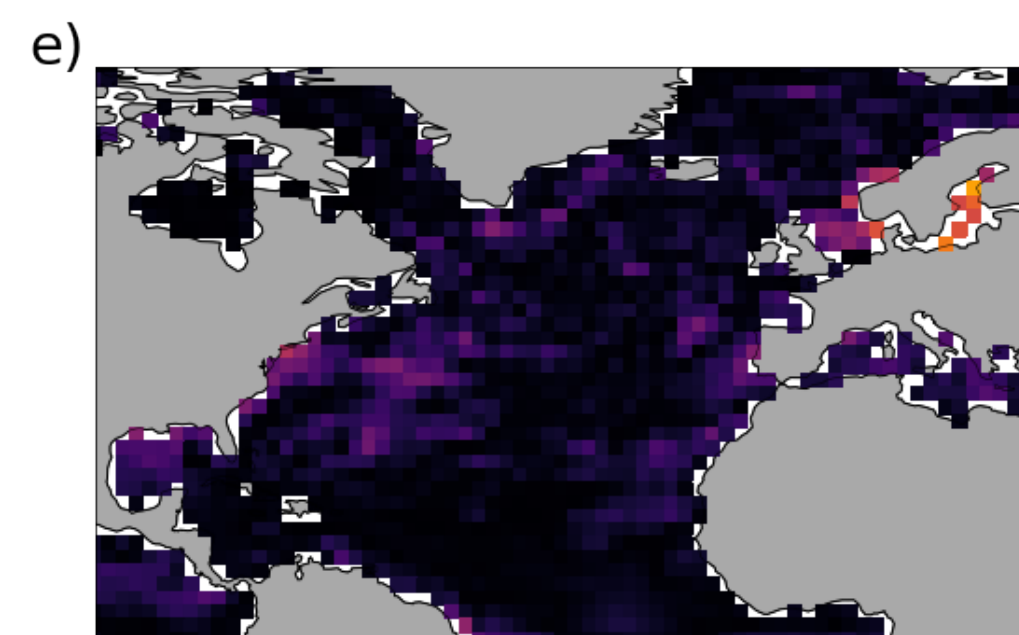
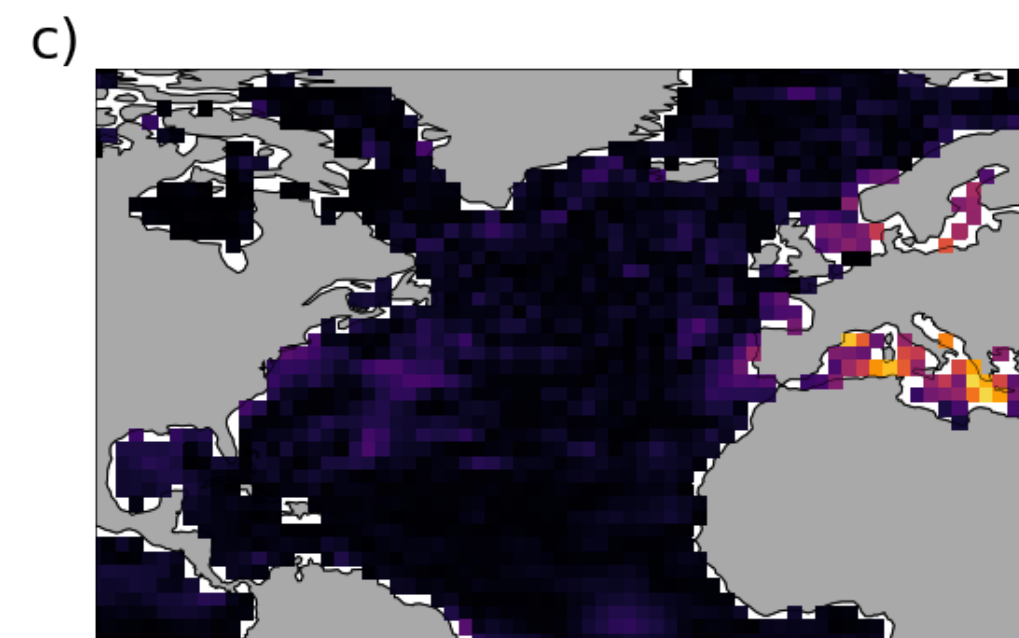
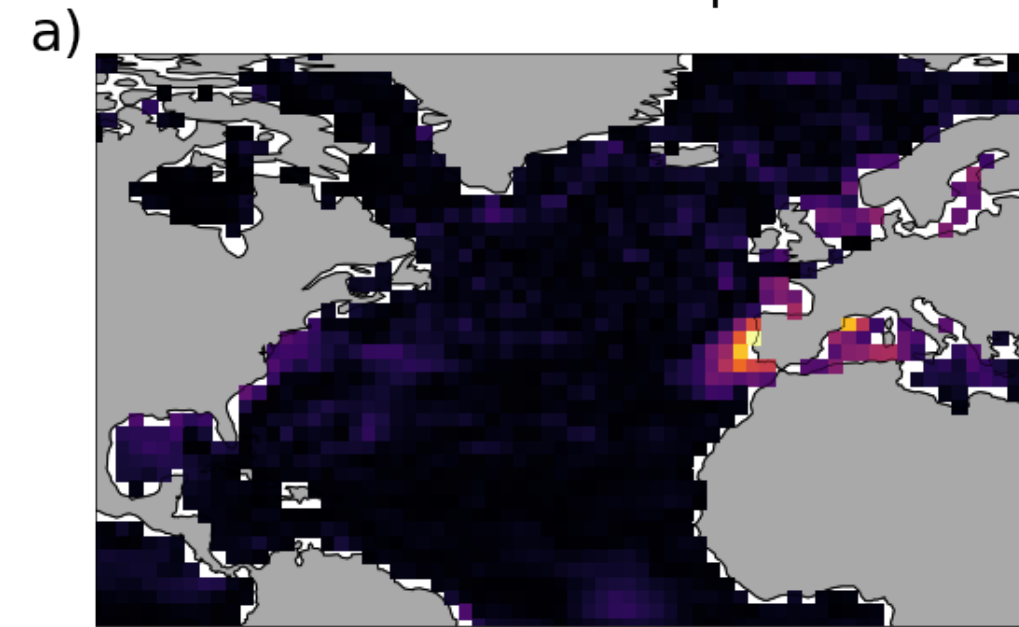
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West of Iberian Peninsula

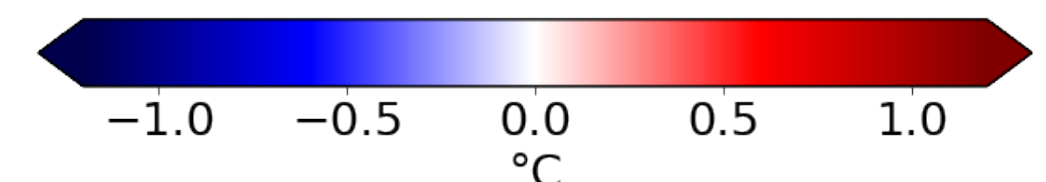
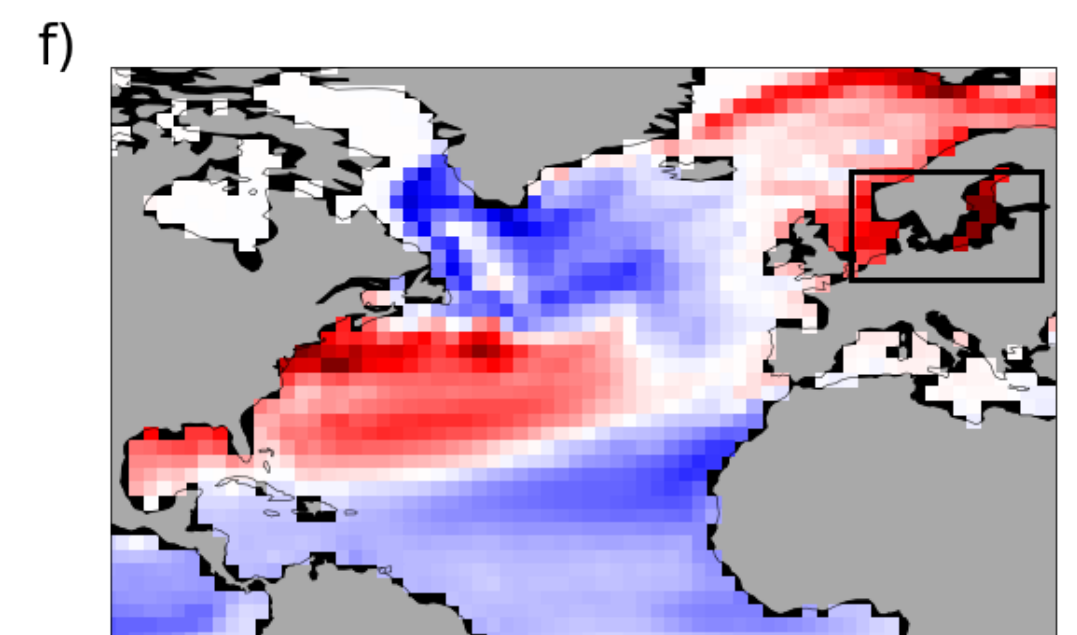
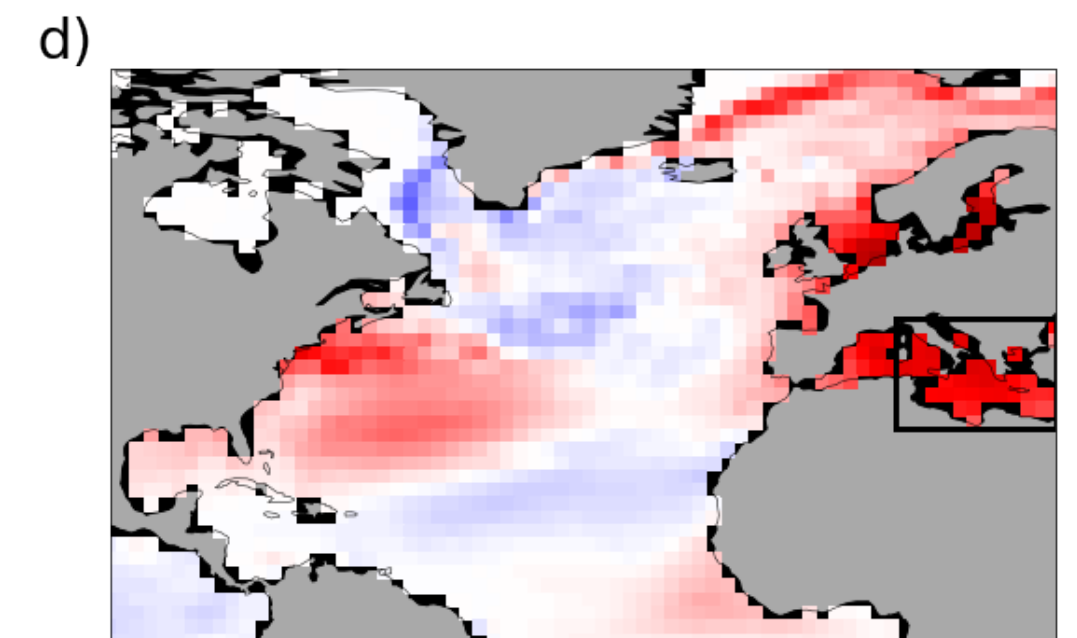
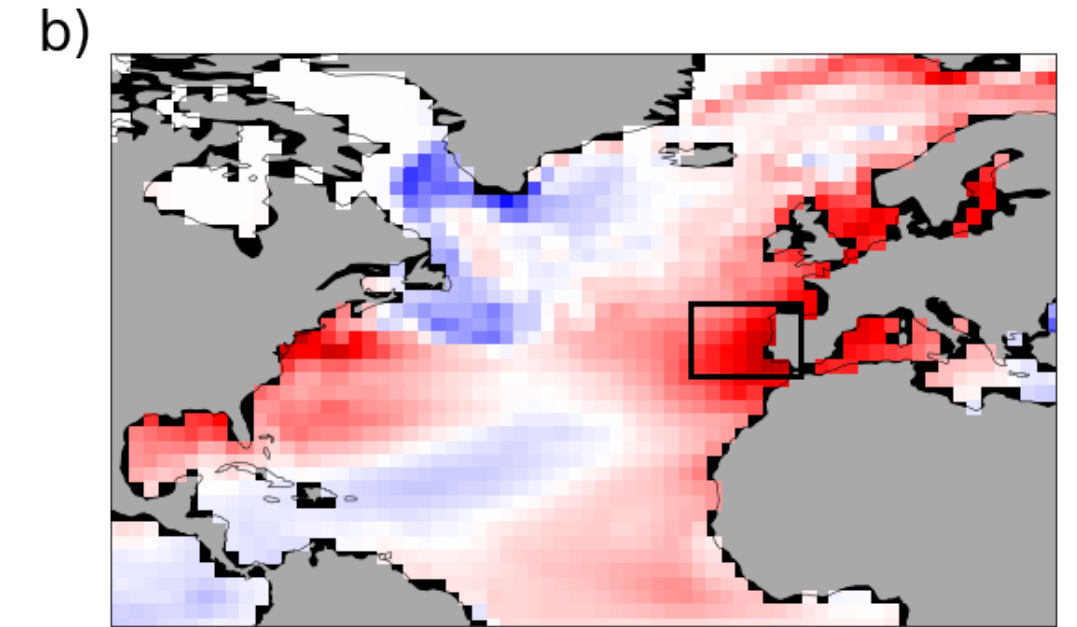
Mediterranean Sea

North Sea and Baltic Sea

LRP heat-map

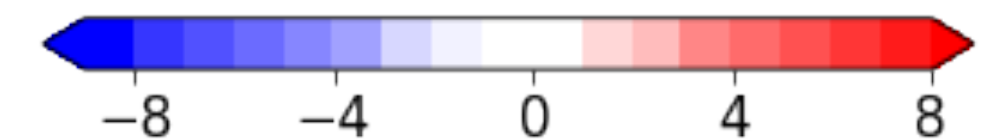
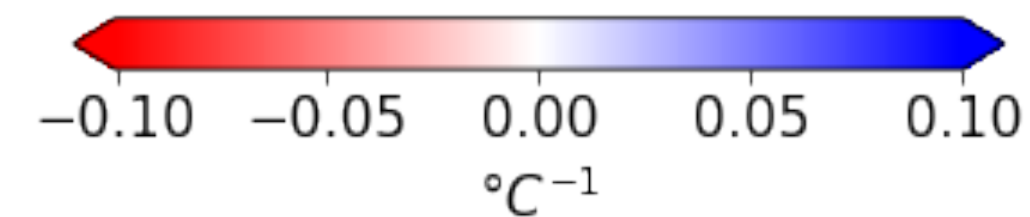
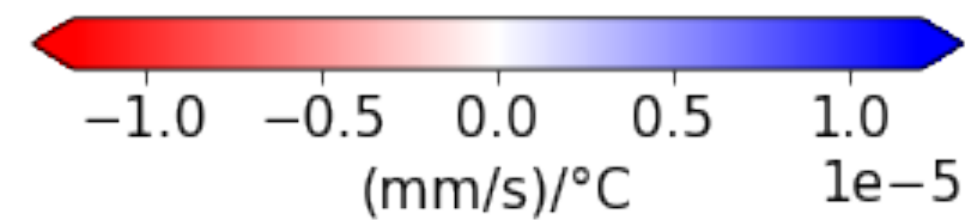
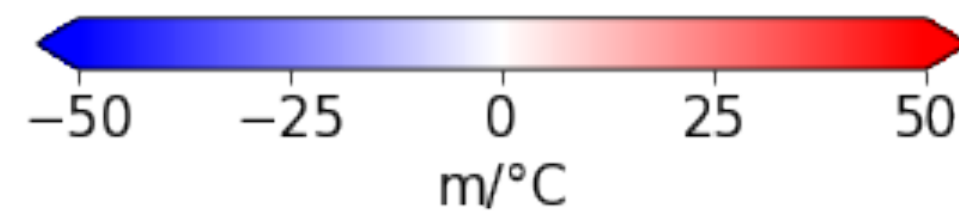
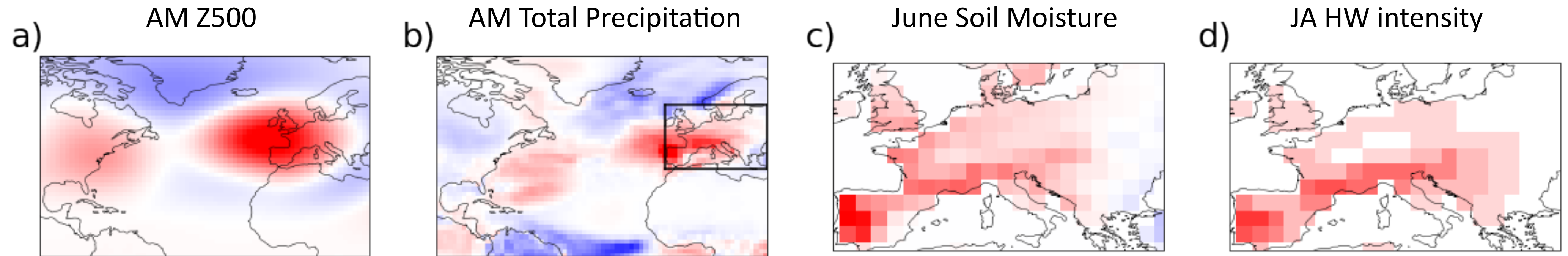


AM SSTA



How can regional spring SSTAs relate to EuSHW?

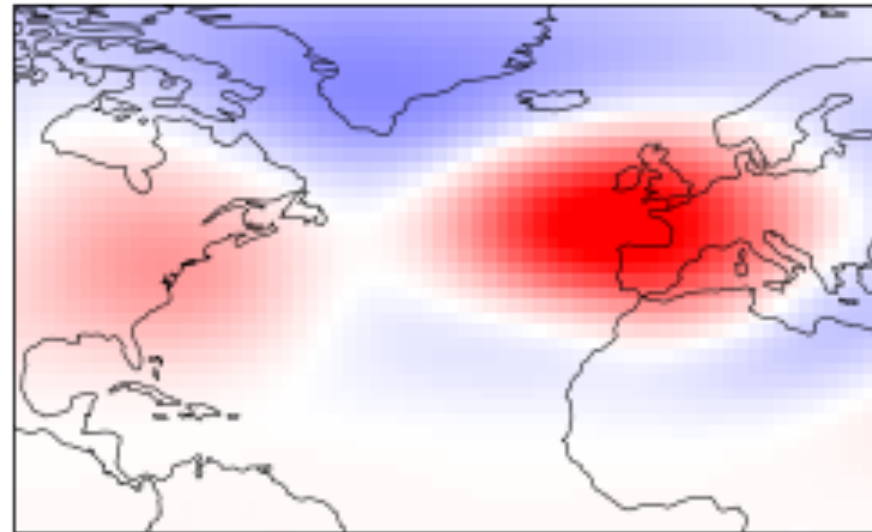
West of Iberian
Peninsula



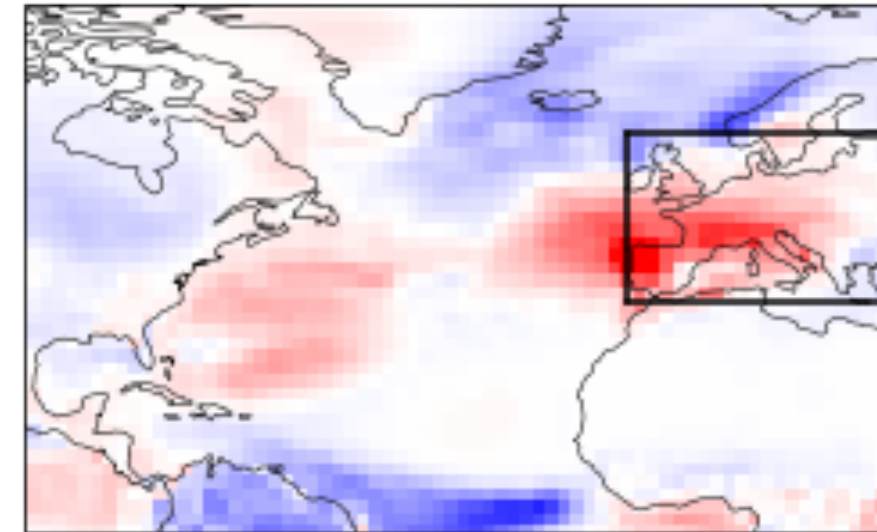
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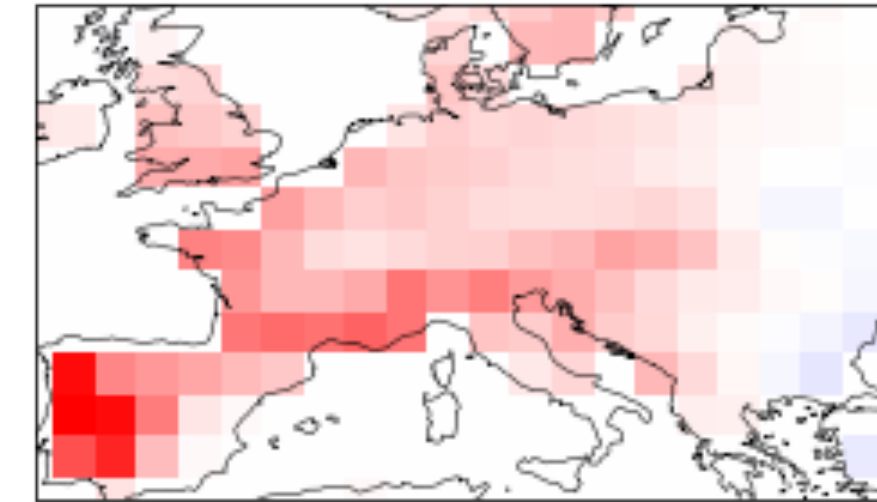
a) AM Z500



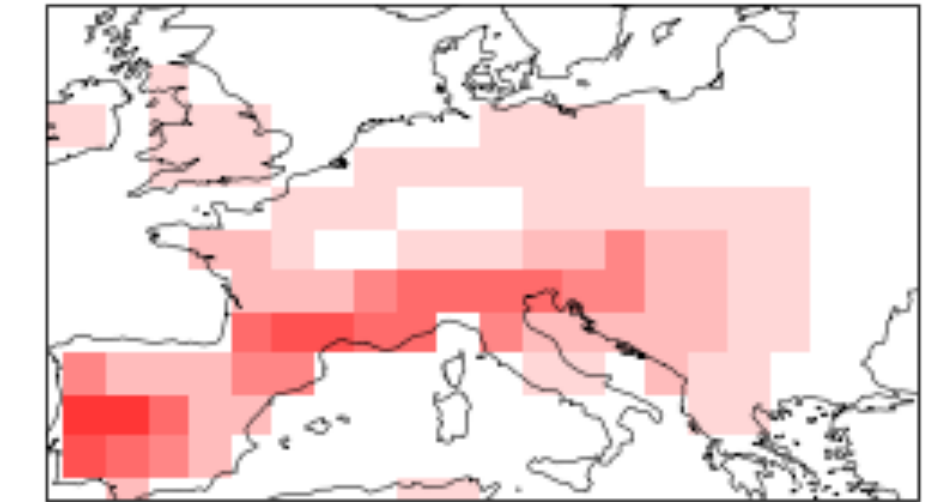
b) AM Total Precipitation



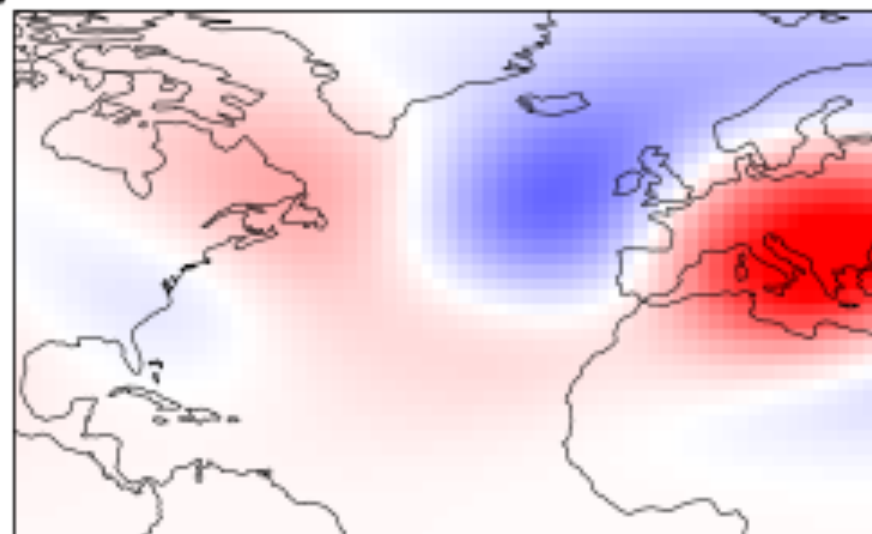
c) June Soil Moisture



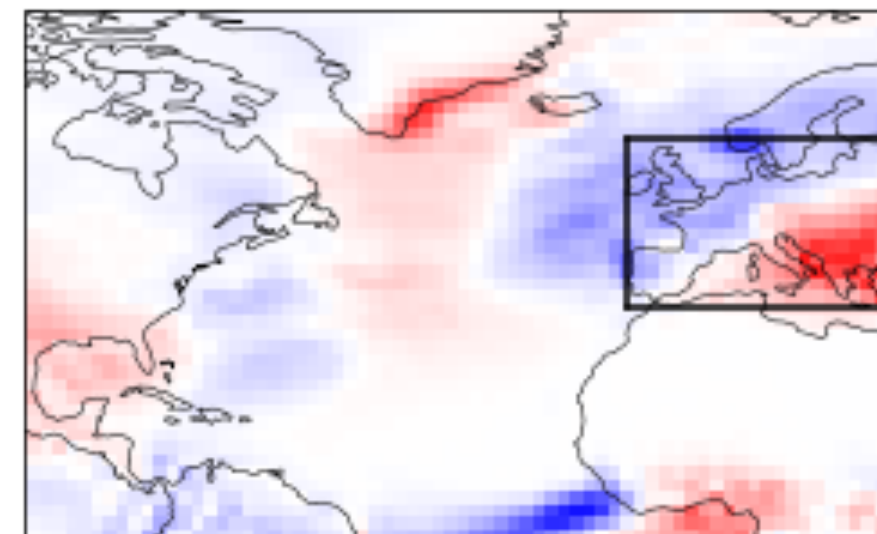
d) JA HW intensity



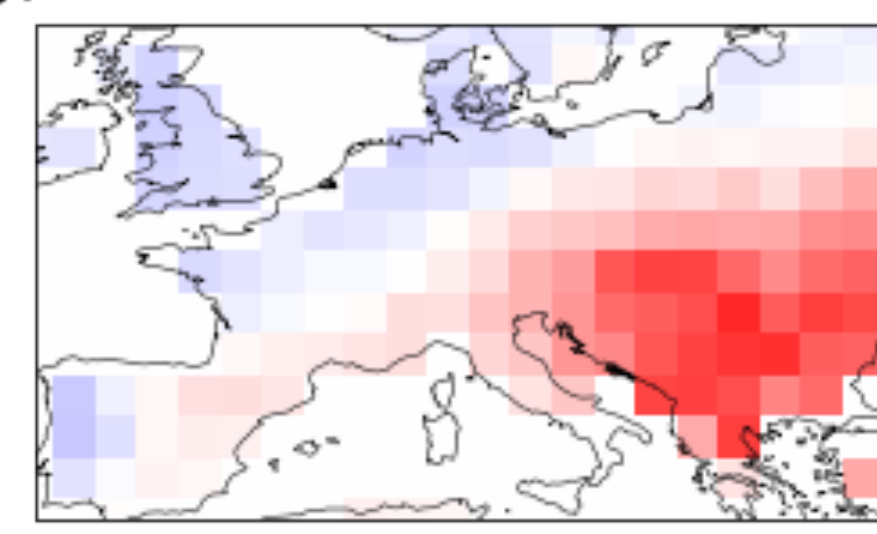
e)



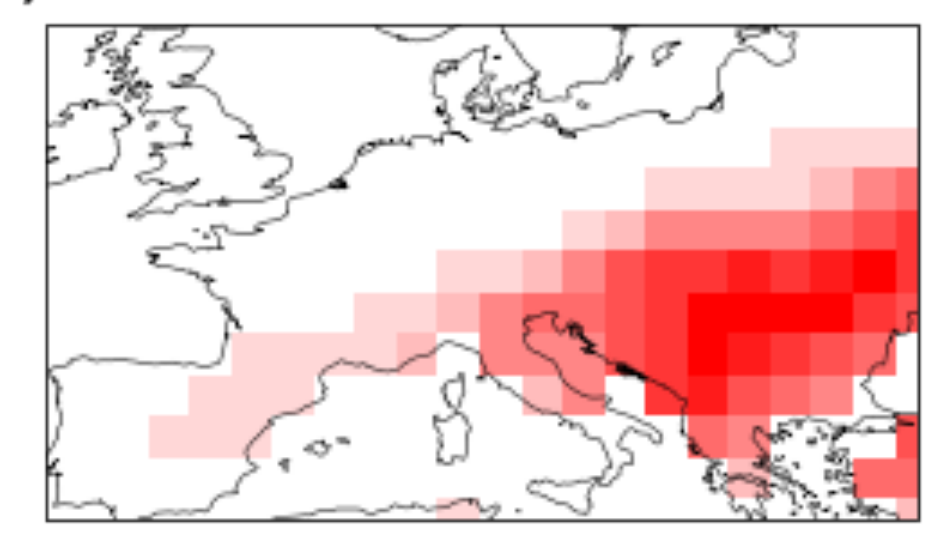
f)



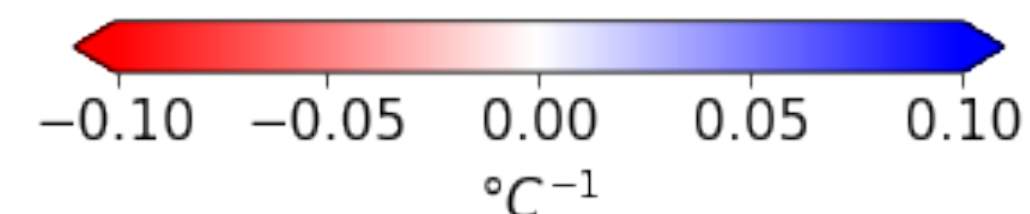
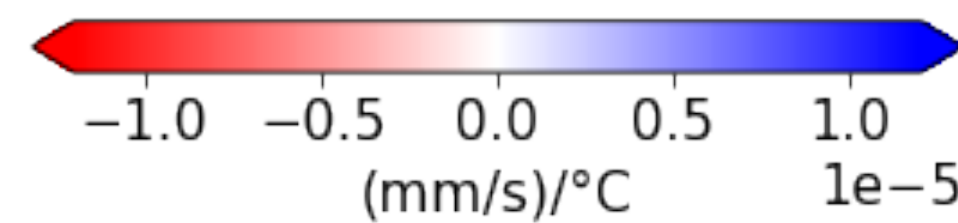
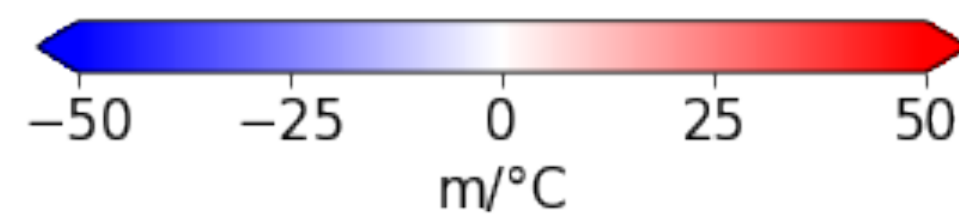
g)



h)



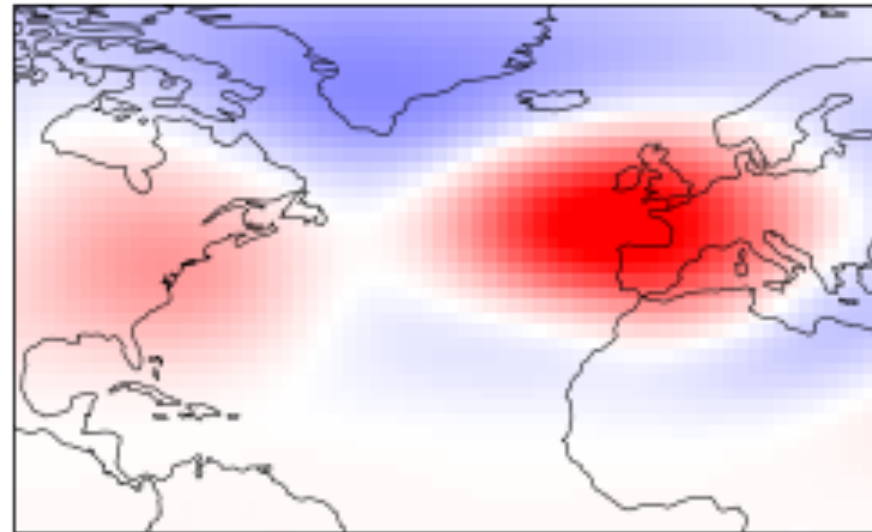
Mediterranean Sea



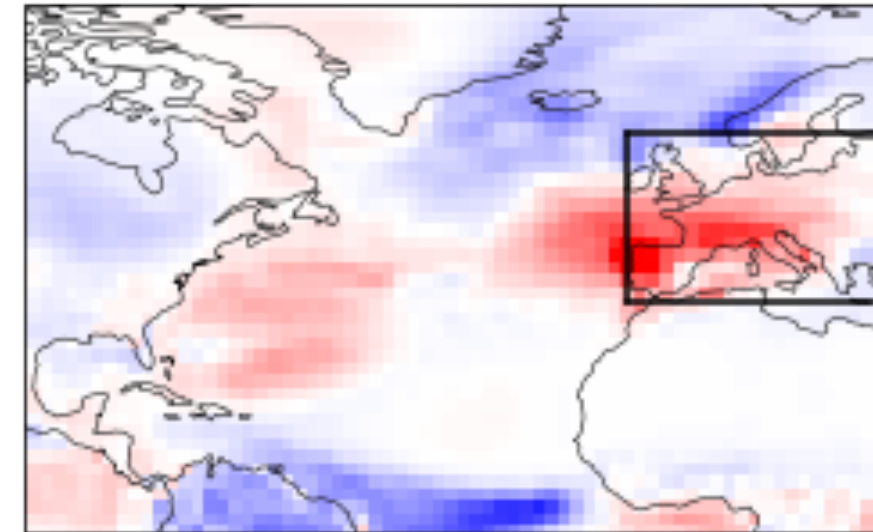
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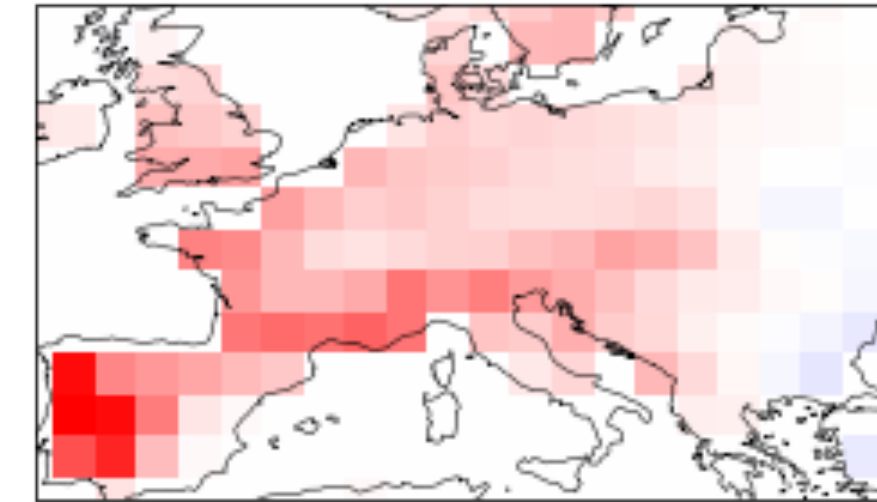
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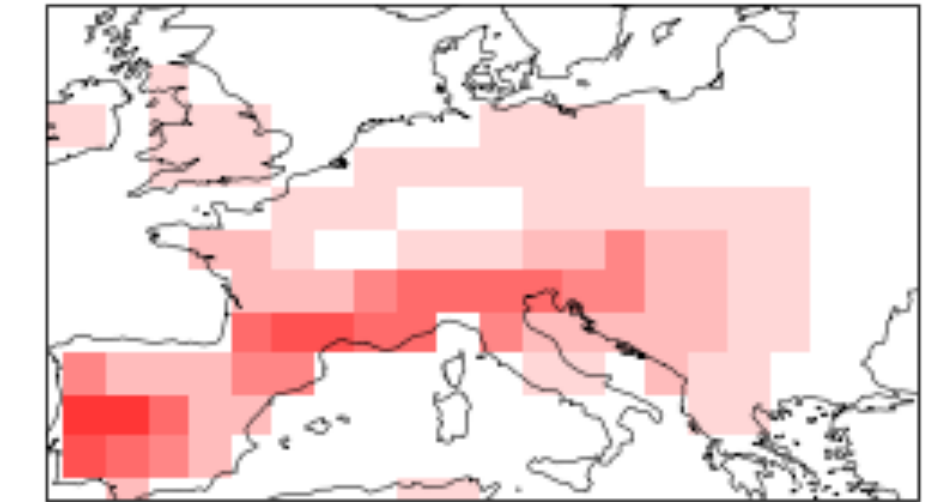
b) AM Total Precipitation



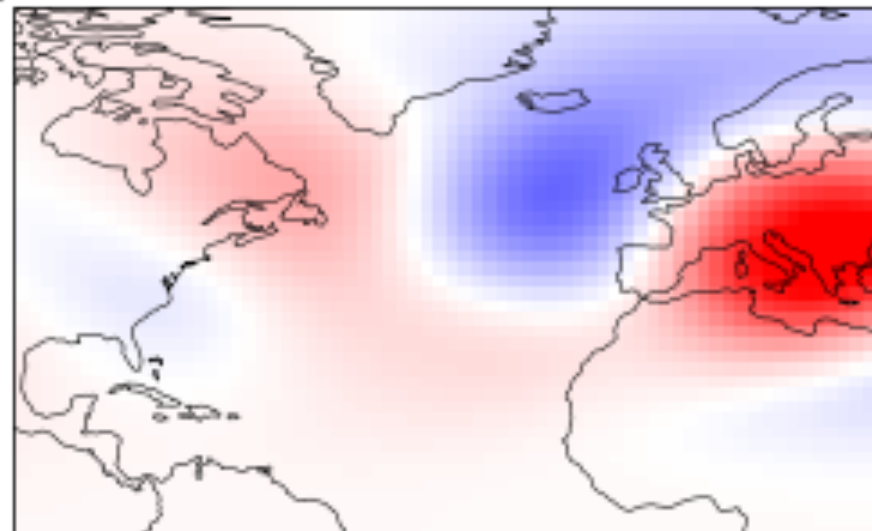
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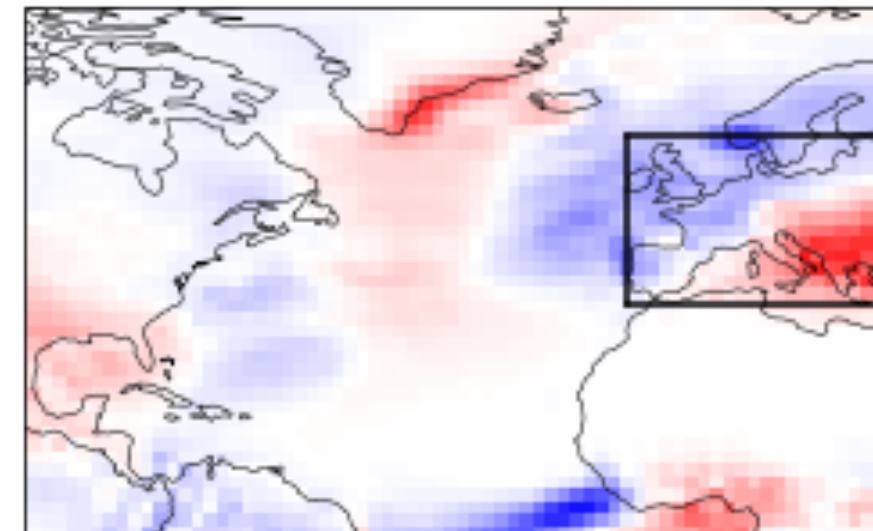
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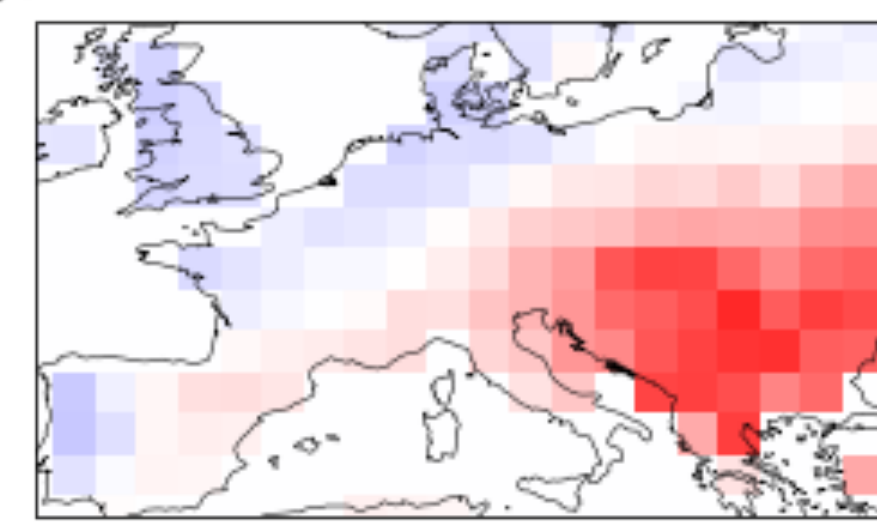
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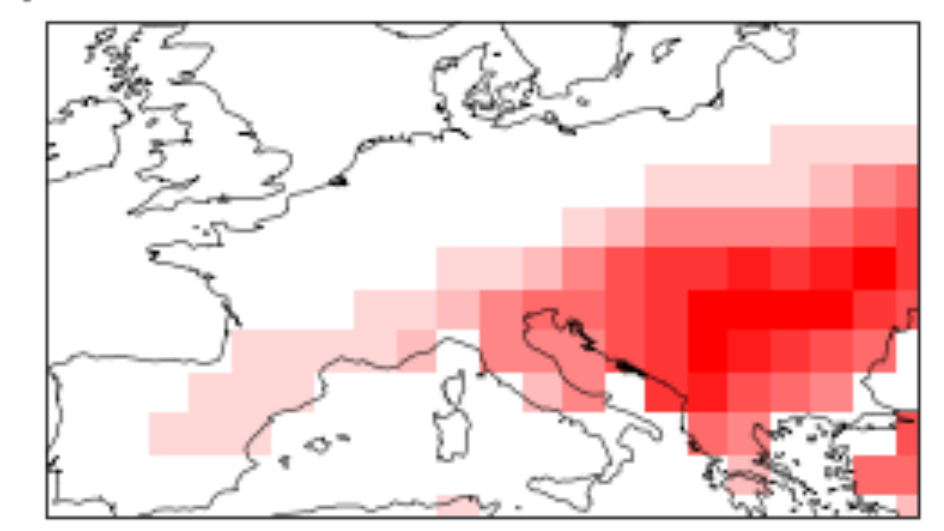
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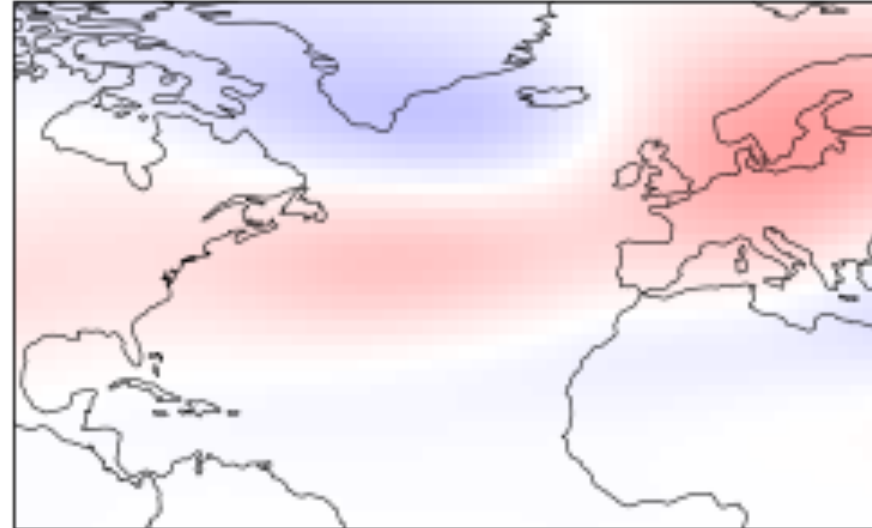
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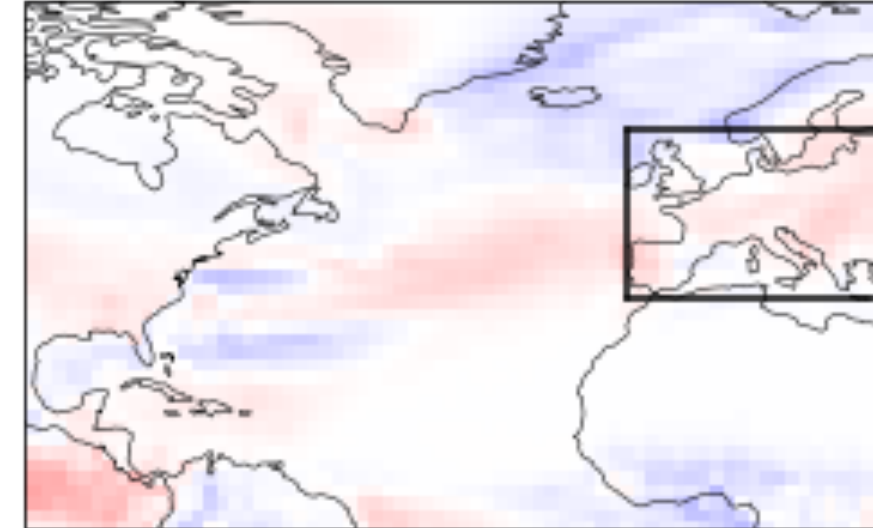
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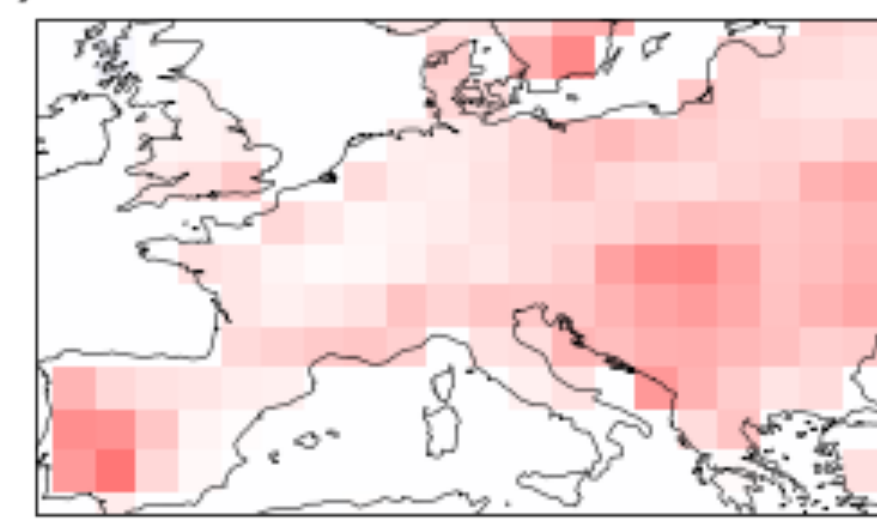
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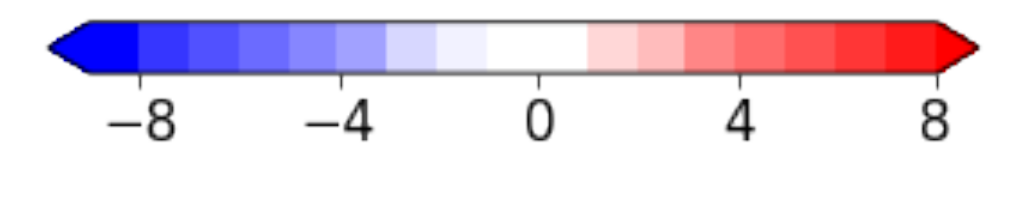
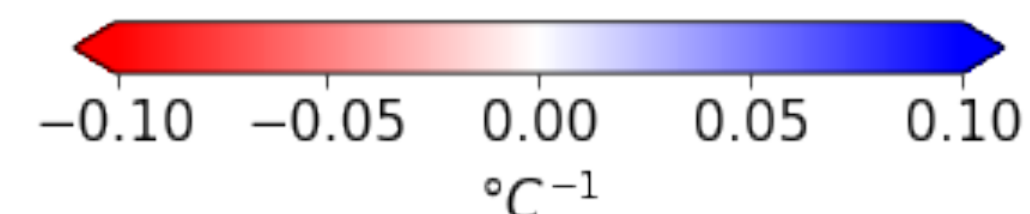
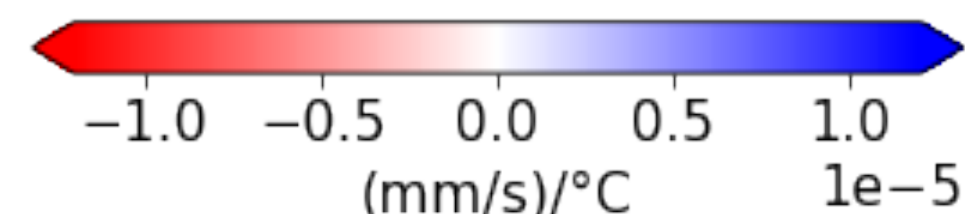
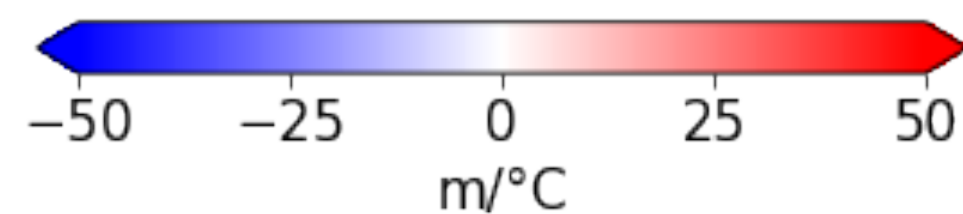
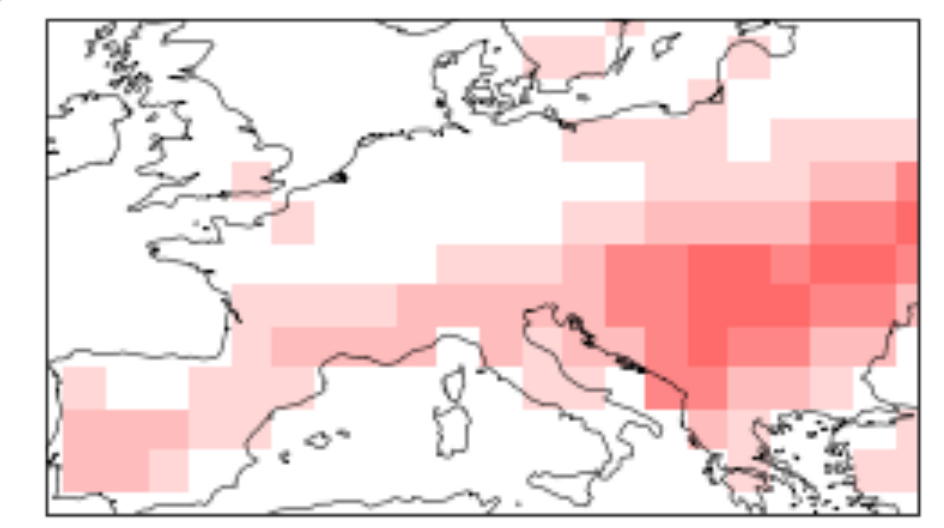
j)



k)




l)



North Sea and Baltic Sea

Conclusion

1. The **tripolar North Atlantic** is a precursor of EuSHW.
2. The **regional seas** are precursor of different EuSHW:
 - West of Iberian Peninsula → Western EuSHW
 - The Mediterranean Sea
 - The North Sea and the Baltic Sea

→ Southeastern EuSHW
3. Each spring regional SSTAs can be related to **distinct patterns** of June soil moisture anomalies, which resemble the location of EuSHW.

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