

# The added value of high-resolution in the atmosphere and ocean

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### Objectives:

- Provide a systematic assessment of the benefits of increased atmospheric and oceanic resolutions for processes affecting European climate
- Evaluate the robustness of the response across the PRIMAVERA model ensemble and implications for future projections.

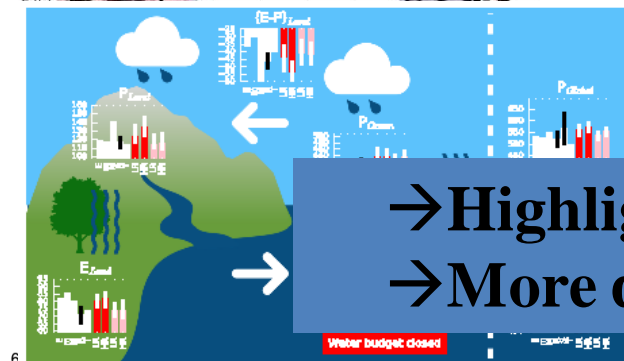
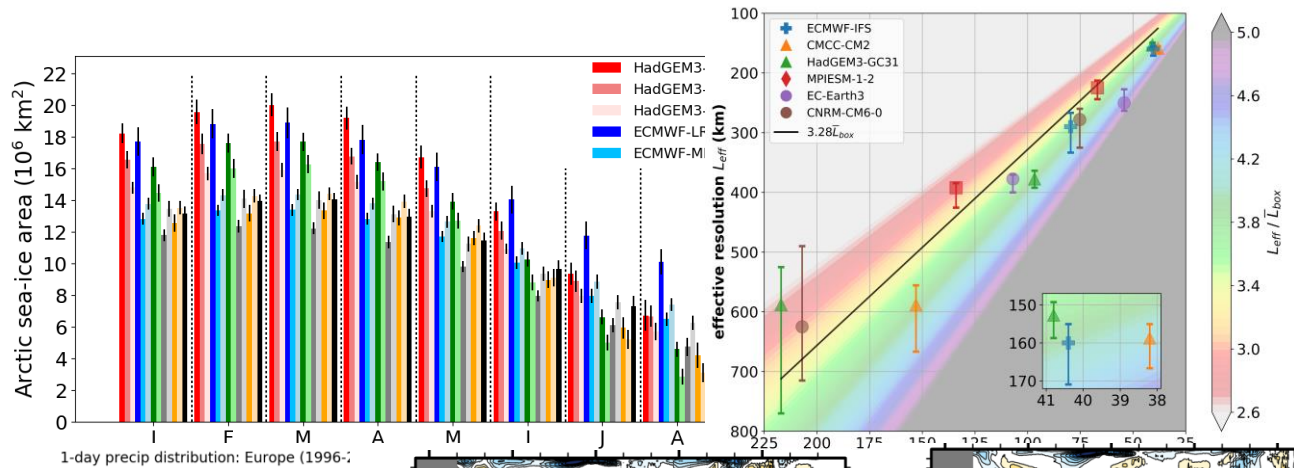
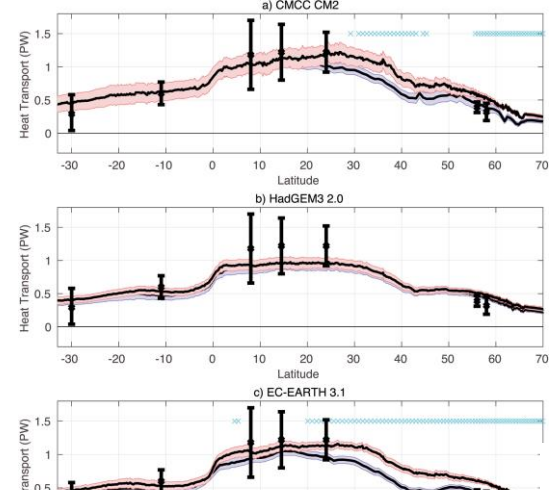
### Tasks:

T2.1 [M1-M48] North Atlantic climate system processes

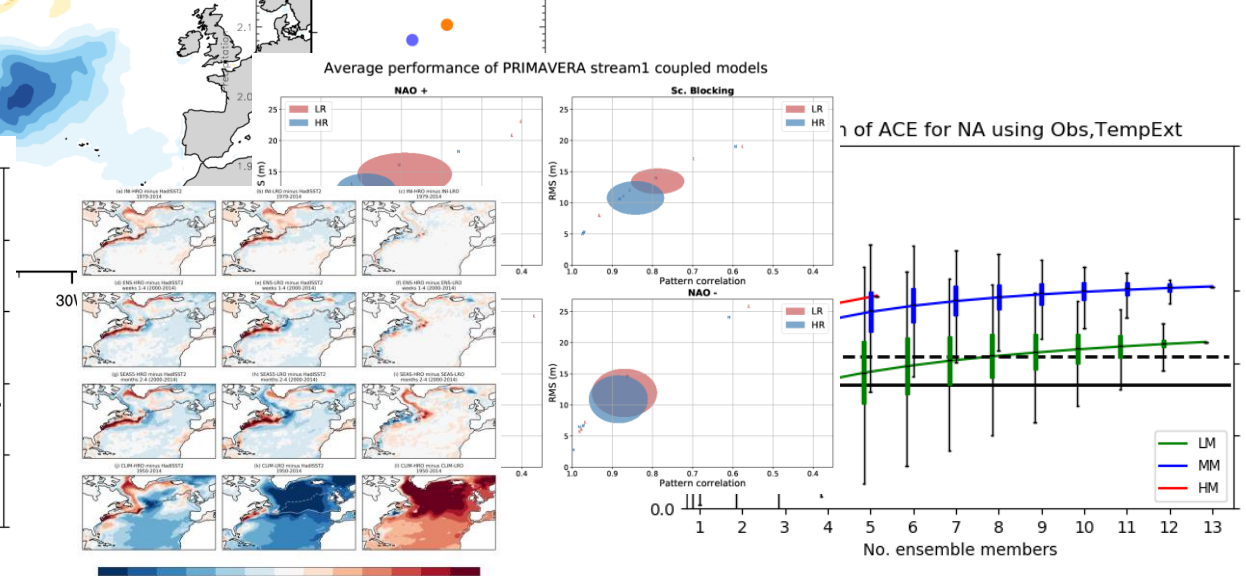
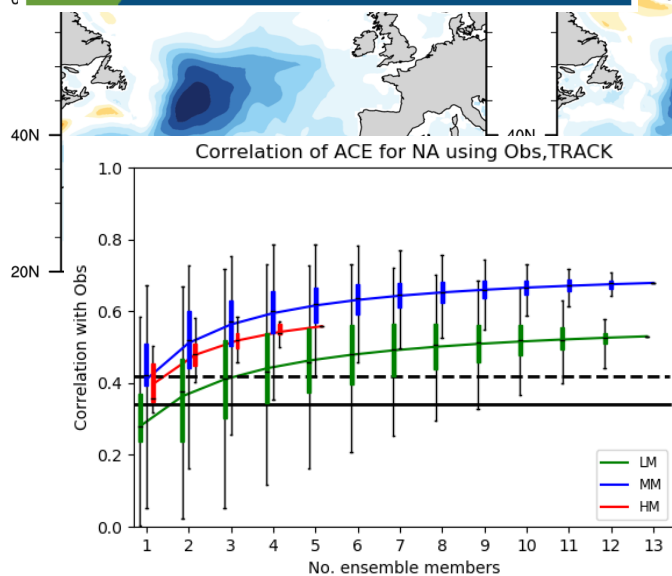
T2.2 [M1-M48] Arctic processes

T2.3 [M13-M48] Tropical cyclones and their transition to the extra-tropics

T2.4 [M24-M48] Processes impacted by large-scale drivers and implications for climate projections



→ Highlights are presented in two WP2-posters  
 → More detailed results in CMIP6 posters



## D2.1 Assessment of benefits of increased resolution across pre-PRIMAVERA simulations

- **increasing the resolution improves specific processes**
  - **important to isolate the effect of the ocean resolution from the atmosphere resolution.**
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- Atlantic Ocean heat transport
  - Arctic Sea ice extent
  - Position of the Atlantic storm track and number of storms
  - Moisture transport to land
  - Extreme Precipitation

**D2.2 Quantification of benefits of increased atmosphere resolution only versus increased resolution in the coupled system, and robustness across Stream 1 simulations**

- Long-term biases in atmospheric variables are weakly affected by increase in atmospheric resolution but more by increase in ocean resolution
- The spatial pattern of large scale-modes of variability change significantly with resolution, but improvements are not consistent across models.

**Increase of atmosphere:**

- Blocking
- extreme events and intense storms
- tropical storms

**Increase of ocean resolution:**

- heat in the North Atlantic, Arctic sea ice and regional biases
- air-sea coupling over the Gulf Stream

**D2.3 Relative merits of increased resolution in WP2 and model developments in WP3**

**Strong regional and process dependence of the relative benefits of resolution and improved physics.**

- Biases in the upper North Atlantic (SST and stratification) benefit more from a resolution increase, than from the use of more sophisticated vertical mixing schemes.
- Melt ponds and increased resolution lead to a similar improvement of Arctic sea ice concentrations and local biases.
- A refined representation of the snowfall ratio improves high latitude precipitation more than resolution increase.

- **D2.4 Assessment of impact of large-scale drivers on processes that benefit from increased resolution, M36**
  - close cooperation with WP5
  
- **D2.5 Conclusions on minimum requirements in terms for a reliable representation of climate, M47**
  - close cooperation with WP4

- Continued analysis of Stream 1 future and Stream 2 simulations
  - **Cooperation across all WPs to establish physical storylines on the impact of increased resolution all the way to the users.**
- Results are presented in the "end-to-end-sessions"

- Scientific publications : 30 published/ accepted, 13 submitted
- Presentations at conferences: around 50
- Fact sheets for WP10/11
- Interaction with the international community through various projects and organizations