WP2
The added value of high-resolution in the atmosphere and ocean
(T. Koenigk, L. P. Caron)

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.

• Atlantic Ocean heat transport
• Arctic Sea ice extent
• Position of the Atlantic storm track and number of storms
• Moisture transport to land
• Extreme Precipitation
WP2-Deliverables - completed

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.
WP2 – Upcoming Deliverables

- 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
WP2 – Future work

• 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”
WP2-Outreach

- 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