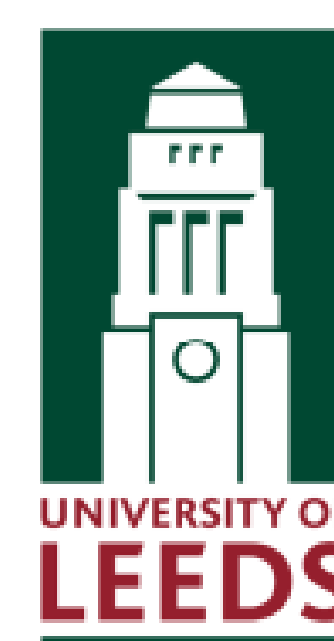


HOW CAPABLE ARE STATE-OF-THE-ART CLIMATE MODELS IN REPRESENTING SEVERE EXTRA-TROPICAL WINDSTORMS?



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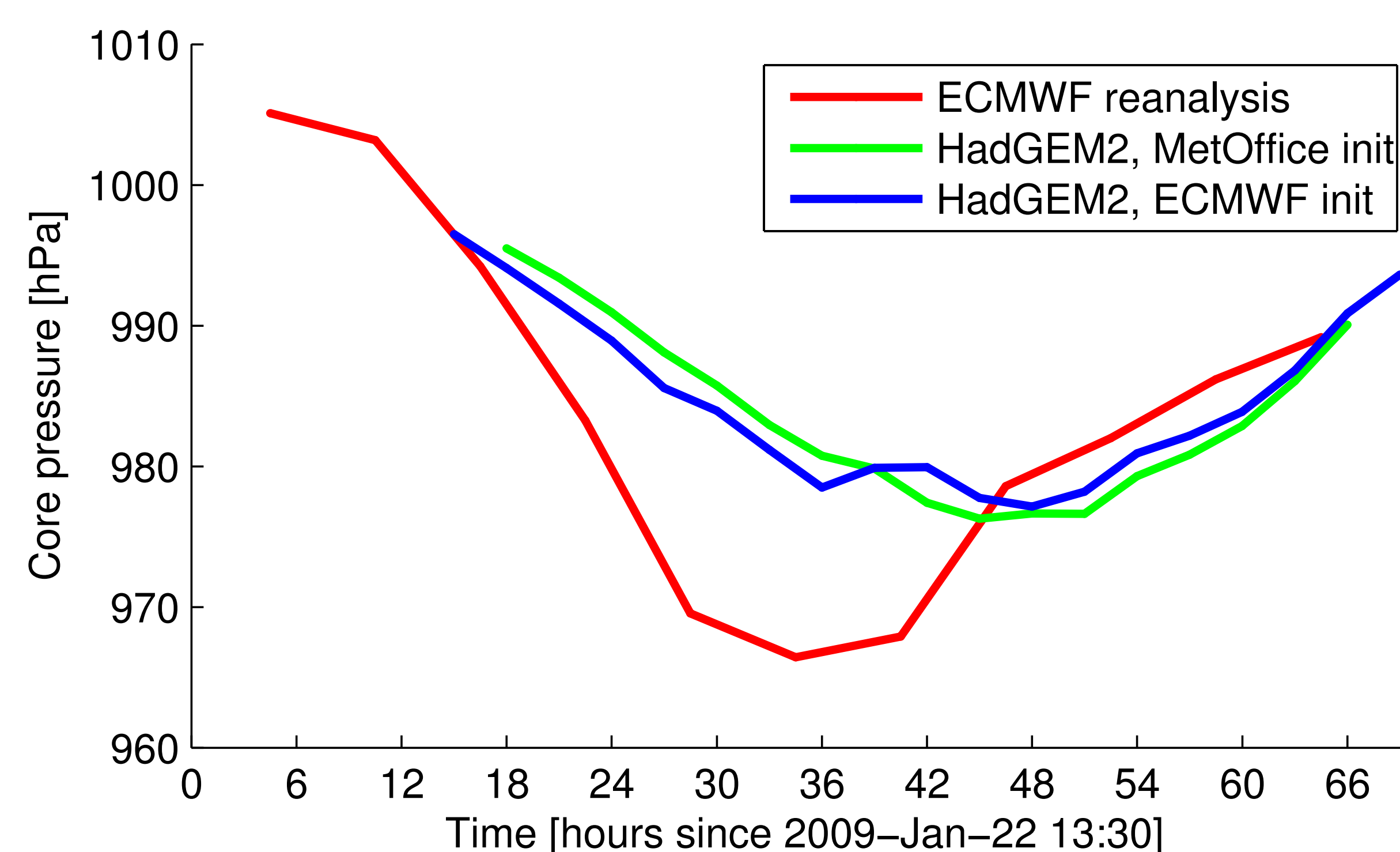
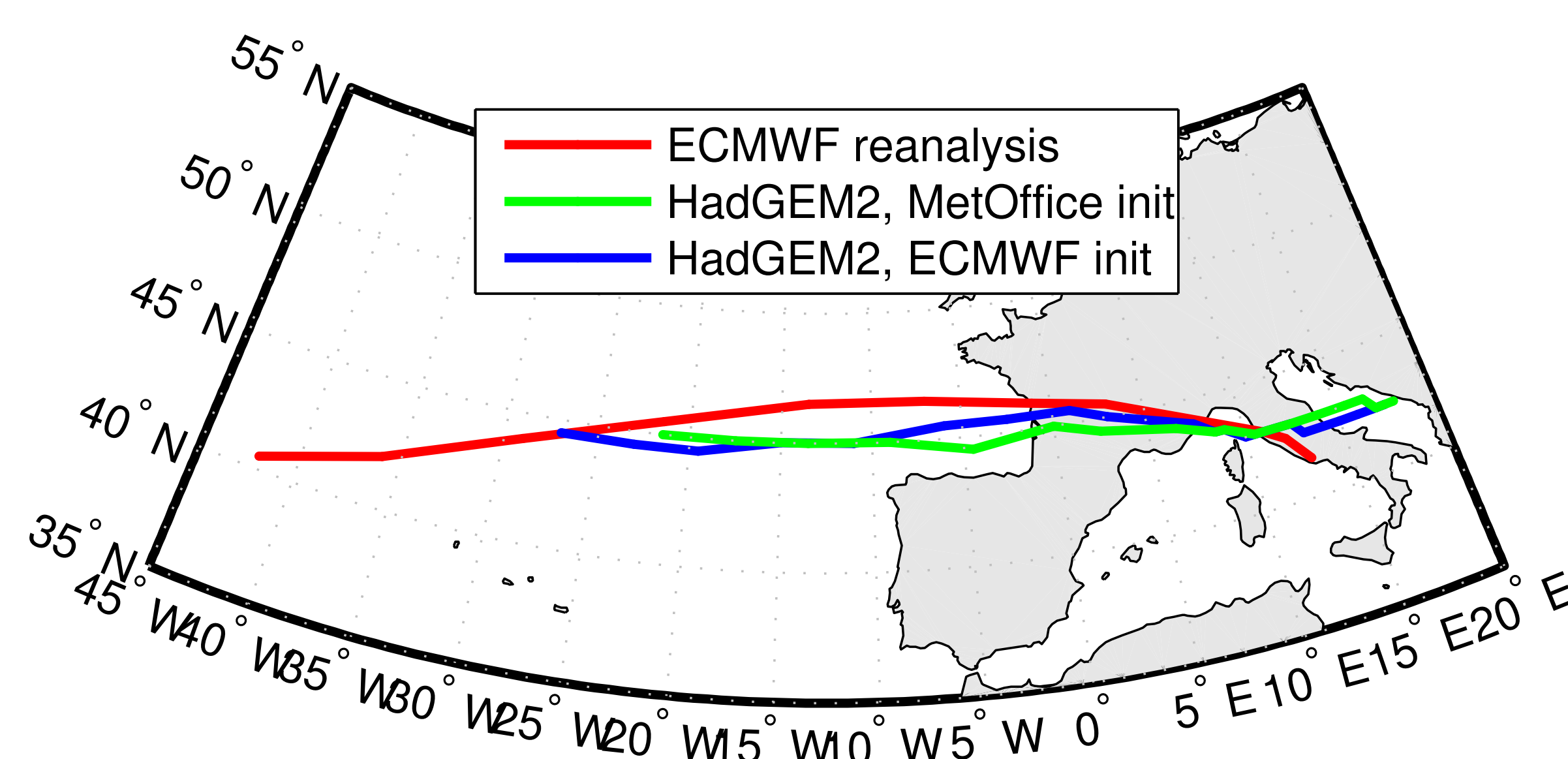
BACKGROUND & MOTIVATION

- Weather patterns in the midlatitudes are predominantly shaped by cyclonic systems.
- Severe extra-tropical cyclones are among the most damaging natural phenomena affecting Europe.
- Evolution of storm frequency, intensity and track location is uncertain in a changing climate [1].
- Lack of agreement between models, between ensemble members of the same model and between modelled and observed climatologies of intense cyclones.
- IPCC AR4 report concluded that improvements are needed on forecasting regional impacts.

METHODOLOGY

- Focus on case specific studies rather than on statistical features (climatology) of extra-tropical storms.
- Short, few days hindcasts of historic, damaging windstorms using several state-of-the-art climate models (HadGEM, ECHAM, CESM) in “NWP mode” (technically challenging).
- Model runs similar to Transpose-AMIP experiments [2]: initialization of atmosphere from reanalysis data (e.g., ECMWF), prescribed SST, other fields (land, aerosols, etc.) from model climatology or nudging.
- Automated storm position tracking in minimum of sea level pressure (SLP) using custom written software.

HINDCAST OF WINDSTORM KLAUS



Tracks (left) and core pressure (right) of the winter storm Klaus (Jan. 2009) from HadGEM2 model initialized from ECMWF reanalysis (blue) and MetOffice analysis (green) compared to ECMWF reanalysis data (red). Climate model shows considerable bias with respect to the reanalysis data.

CONCLUSIONS & FUTURE WORK

- Seamless approach (i.e., using a climate model in NWP mode) may help to identify systematic problems of climate models in representing fast processes in the atmosphere [3].
- Assess model performance for different horizontal and vertical resolutions, different lead times and parametrizations.
- Identify main, systematic sources of bias and use this knowledge to calibrate output of climate models.

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