AIFS and beyond

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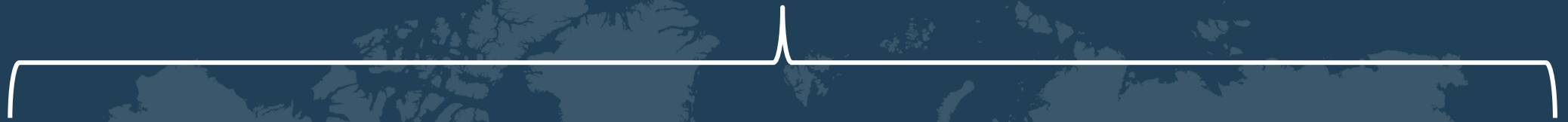
Project overview: different paths **towards a ML ensemble prediction at ECMWF**



The hybrid model

Enhanced and accelerated implementation of ECMWF ML Roadmap

Delivering results

Development of a ML ensemble forecast

Data-driven model initialised with NWP analysis hence requiring conventional data assimilation.

Embracing novelty

Observations-driven ML system

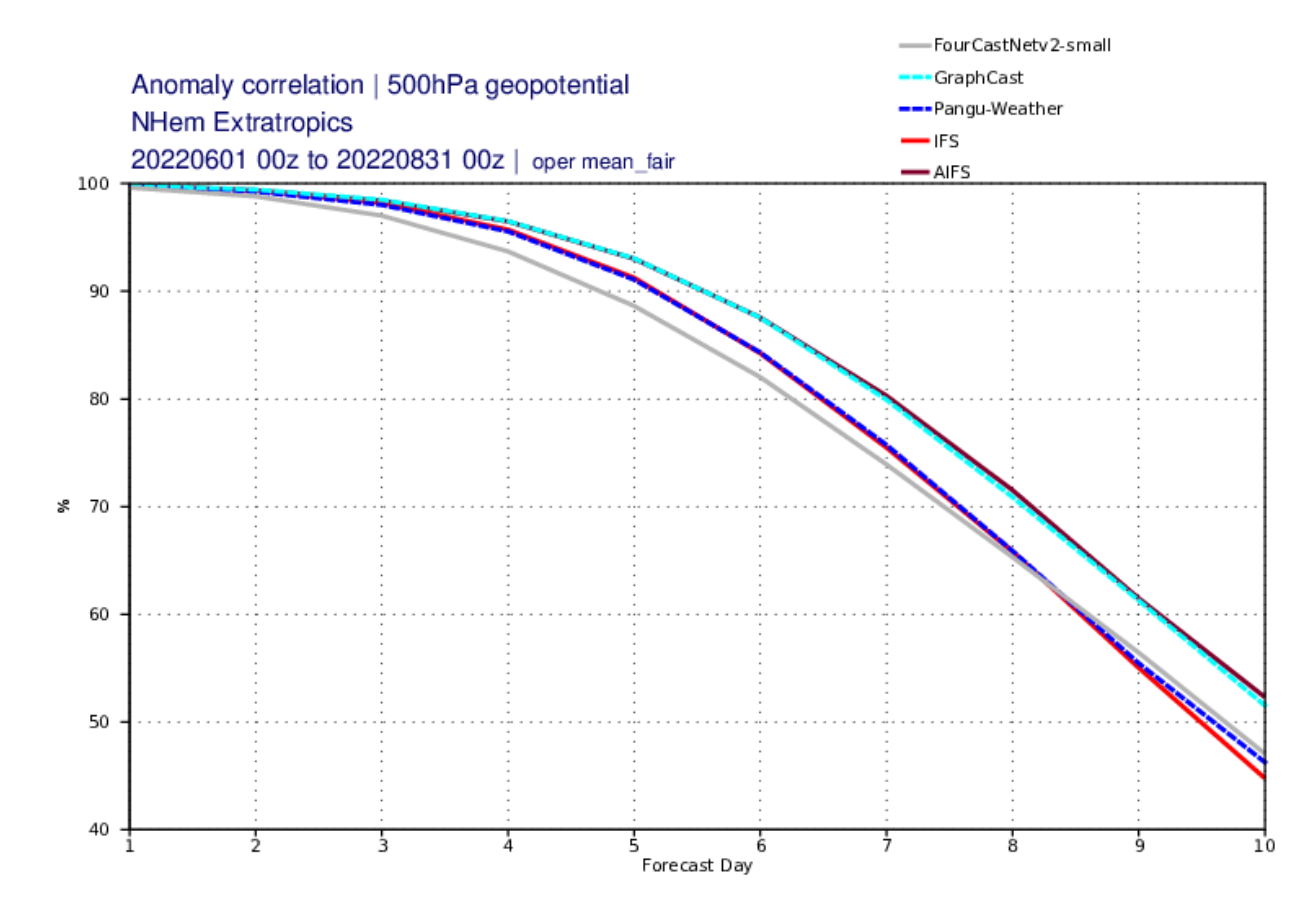
A whole system reinventing the path from observations to predictions.

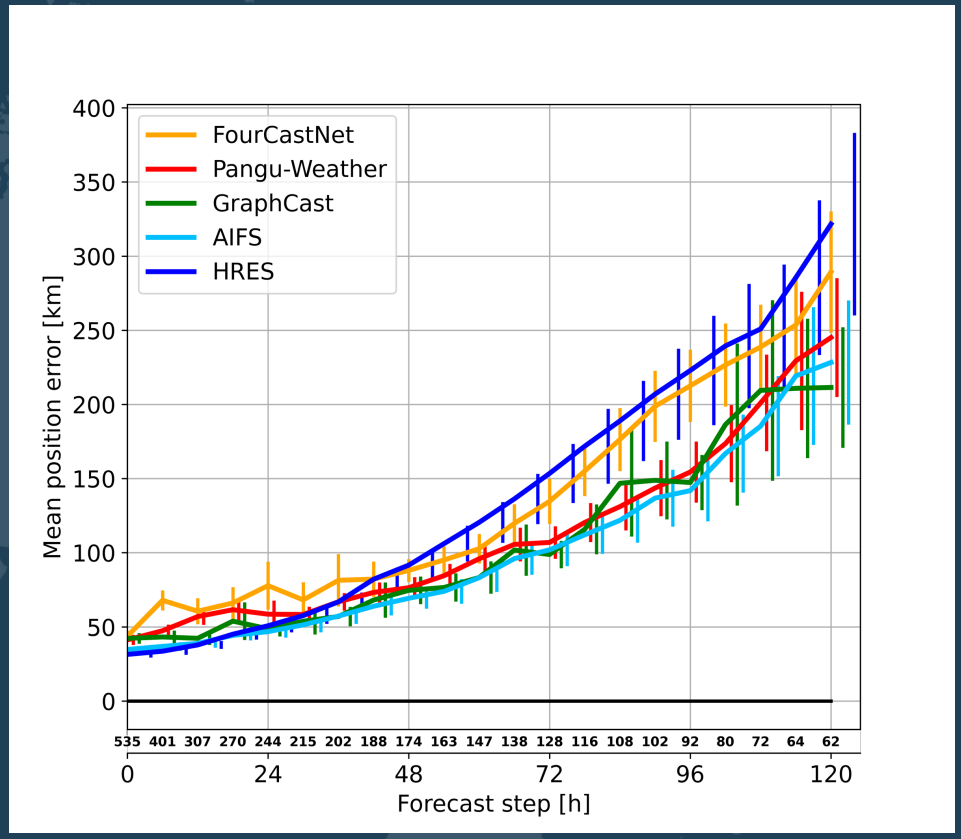
A scientific challenge

The AIFS

- Particularly inspired by Keisler & GraphCast.
  - GNNs naturally encode the sphere and allow use of more optimal grids.
- Currently 1° but rivals atmospheric scores of others.
  - Utilise reduced-Gaussian grids for more efficiency.
  - Significantly cheaper to train, useful for exploring ensemble approaches.
- Already running daily and producing live and open forecasts.
  - As with other ML models, we want as many eyes on forecasts as possible.
- Upgrade imminent to move to 0.25° with further skill improvement.

The AIFS





Caveats: reduced number of TC (resolution induced) and underestimation of intensity.

Next steps for the AIFS

- Ongoing work to explore ensemble approaches, will be the active topic of the year (see GenCast).
- Further improvements to AIFS in skill and parameters offered.
- Expanding representation to include land, ocean, sea-ice in DestinE.
- AIFS open data.
- Open-sourcing of code for inference and training.
- Collaboration with European Met Centres to explore limited area modelling with ML.
- Observation-based forecasting/DA.