



# Comparing AI and NWP operational forecasts for the energy sector for winter 2025/26

*Using ECMWF Forecasts 2026*

Isla Finney

June 4<sup>th</sup> 2026

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## Intro (for online slides)

- Sentiment that operational forecasters are biased against AI?
- Some operational forecasters (Lake Street incl) want forecasts with physical integrity / balanced energy / which could actually happen
- Enables use of physical knowledge and (vast) experience to “bias adjust” forecasts
- Meteorology is a living science, and embracing change is the only way to keep evolving / stay top of our game
- Hesitancy to move to unproven technology healthy
  - Providing willingness to test new technology exists



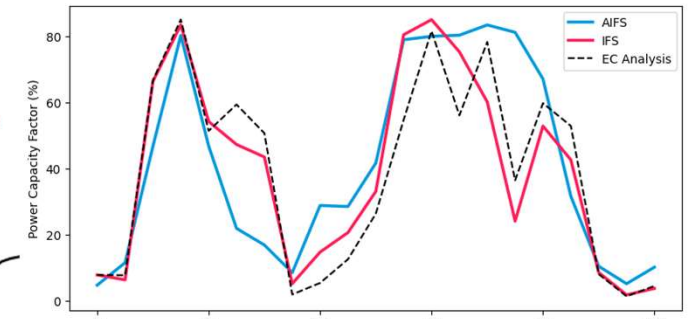
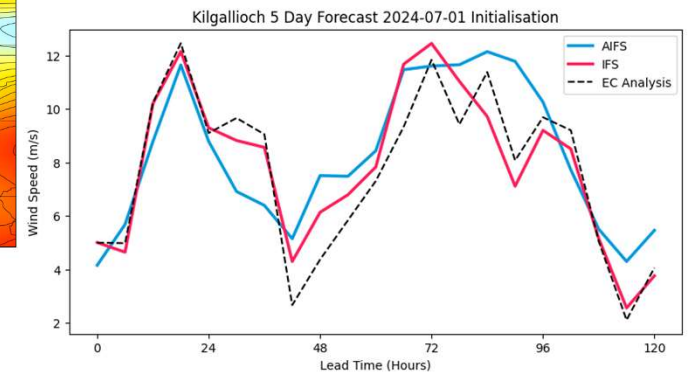
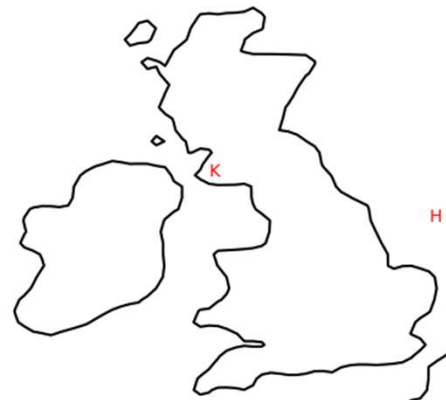
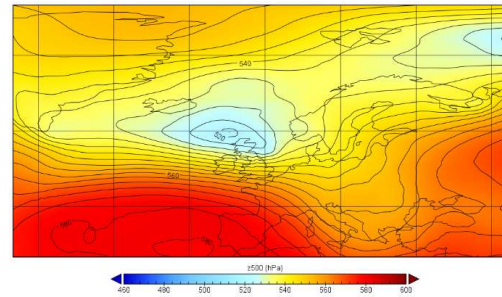
# Embracing AI

Leveraging state-of-the-art AI models to forecast wind power generation using deep learning

Hardy & Finney 2025

<https://doi.org/10.1002/met.70038>

Lake Street created AI 100m wind fields BEFORE they were in ECMWF AI model  
Possible BECAUSE the AI model was producing physically integral output.  
From v1 and 100m wind suffered from known issue of smoothing.



EC analysis, IFS and AIFS contains modified data from the European Centre for Medium-Range Weather Forecasts (ECMWF). Source [www.ecmwf.int](http://www.ecmwf.int).

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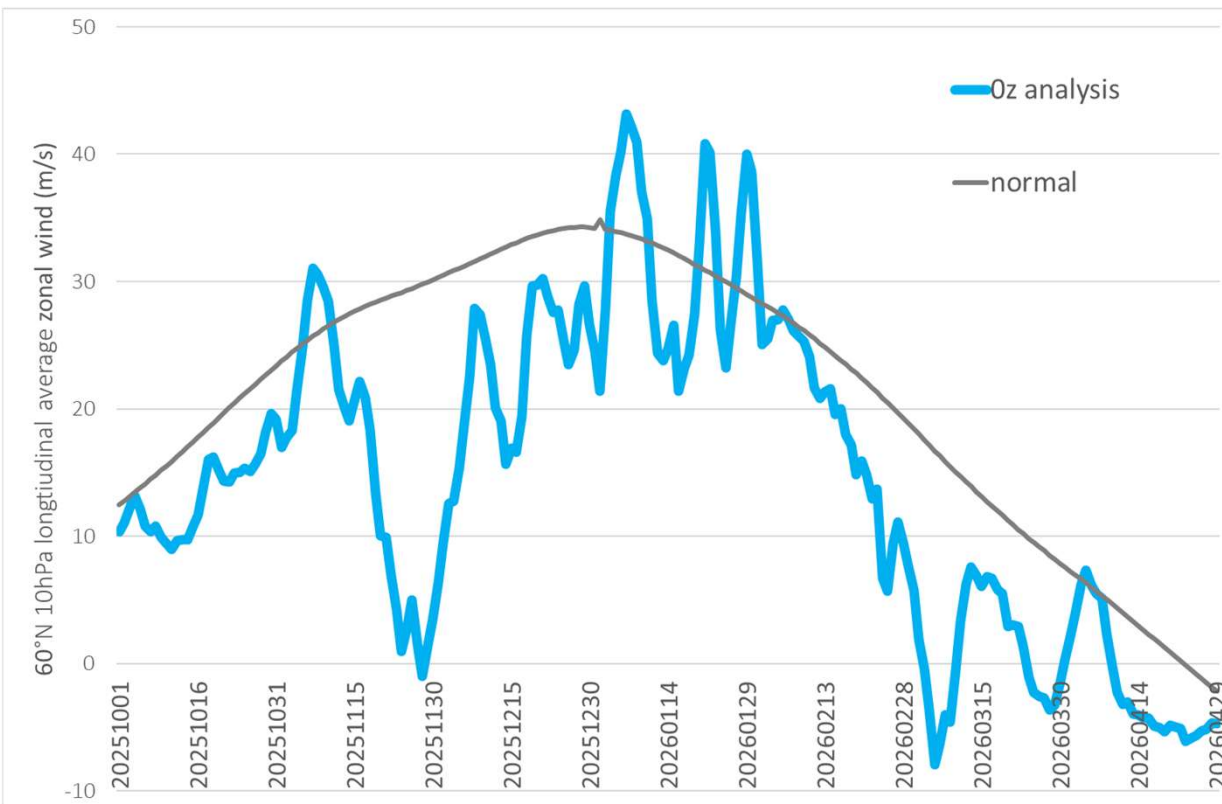
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## Winter 2025/2026: u10 @ 60°N



- Early SSW in Nov
- Strat PV displaced / stretched / split much of winter

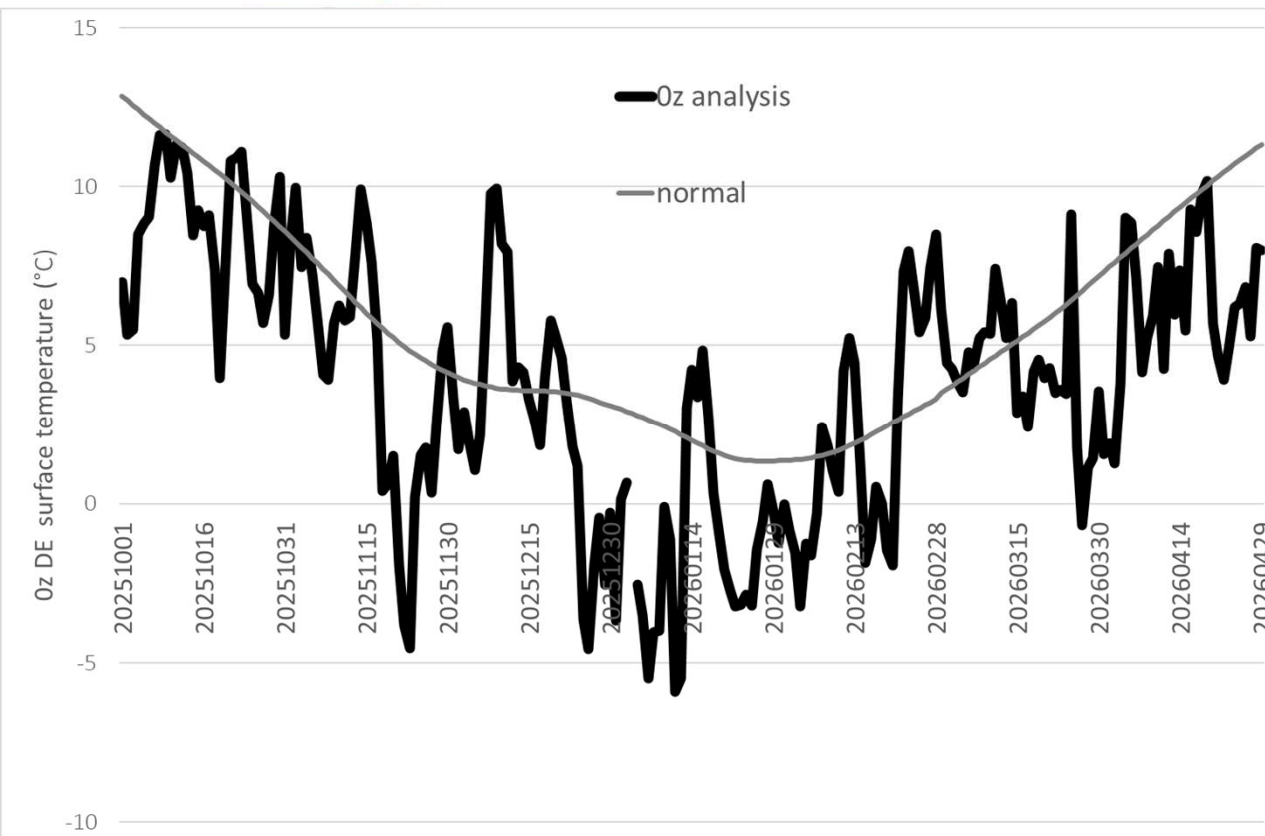
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## Winter 2025/2026: DE T2m



- Early SSW in Nov
- Strat PV displaced / stretched / split much of winter
- Brief cold late Nov
- Longer cold late Dec/early Jan
- Cool late Mar/Apr
- Operationally, changes not all well captured

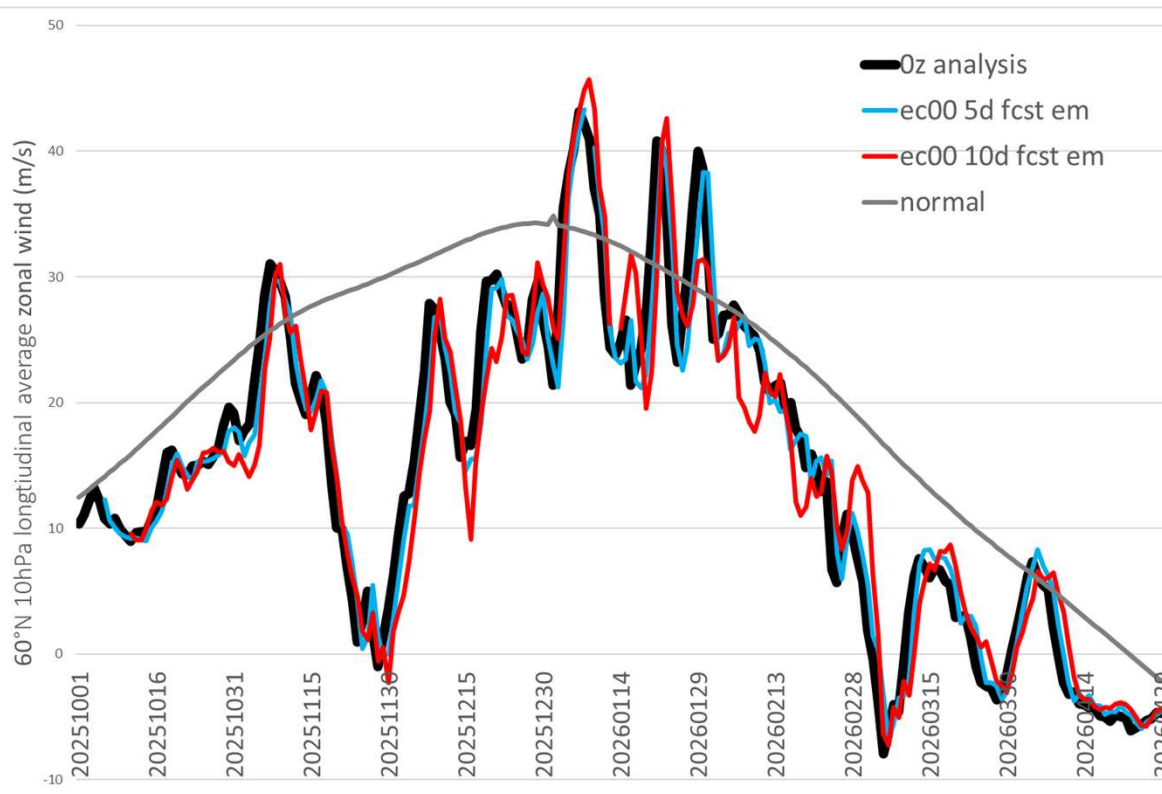
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# Forecasting 10hPa zonal wind @ 60°N



- NWP ens mean
  - 5d forecast good
  - 10d suffers some lag but reasonable
  - analysis lies within spread

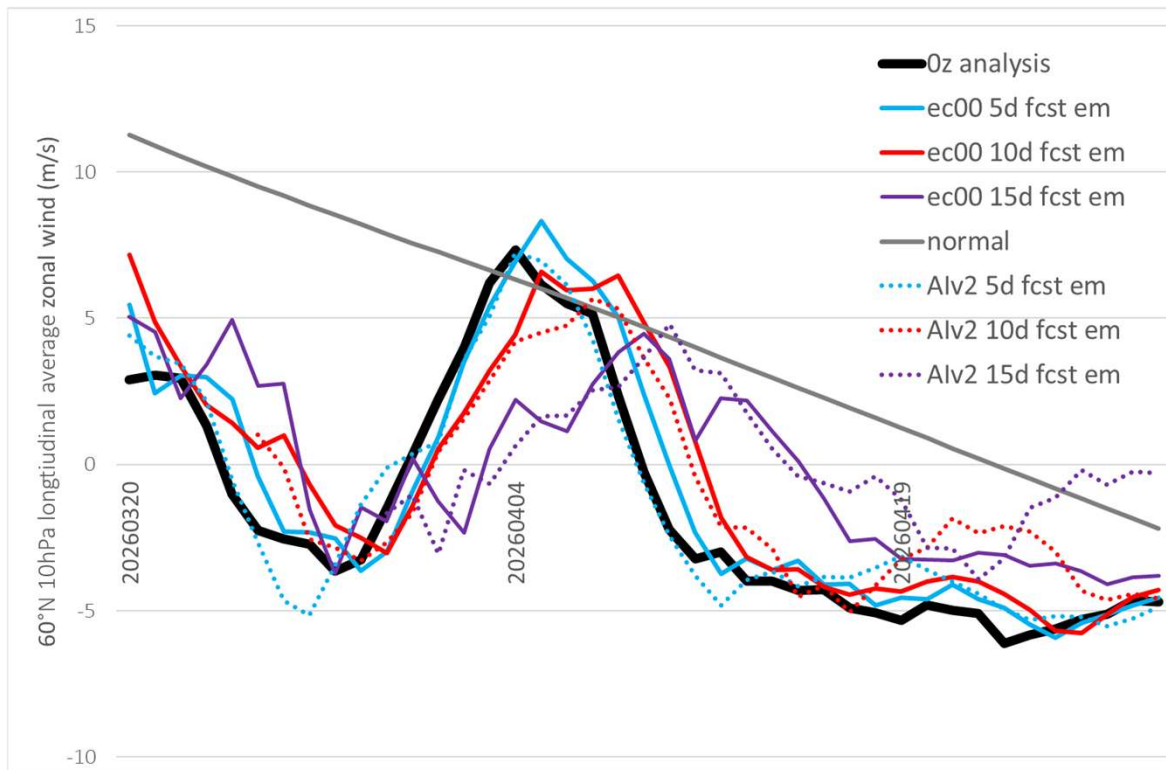
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# Forecasting 10hPa zonal wind @ 60°N



- NWP ens mean
  - 5d forecast good
  - 10d suffers some lag but reasonable
  - analysis lies within spread
- Alv1: no 10hPa level
- Alv2 ens mean
  - Pre RCP data. Treat w caution!
  - Only from Mar 15<sup>th</sup>
  - Thanks to ECMWF support for filling MARS gaps in Alv2 data ☺

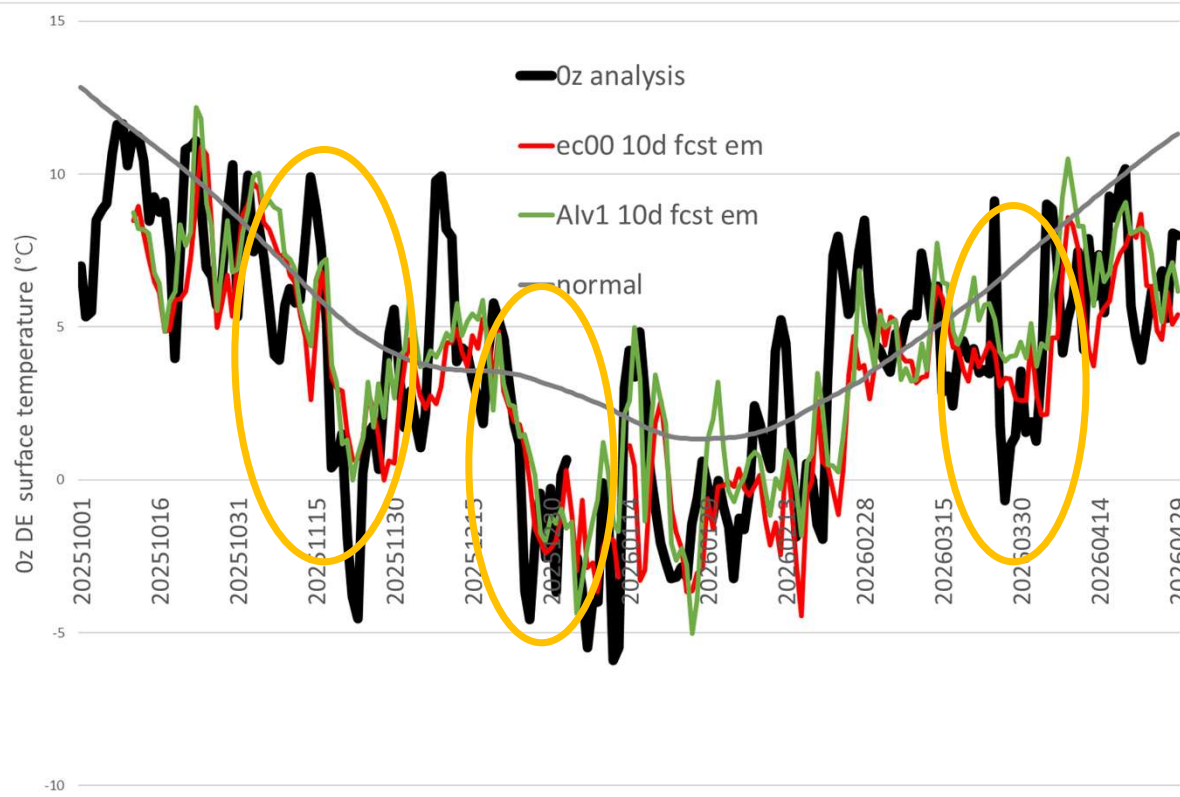
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# Forecasting DE T2m



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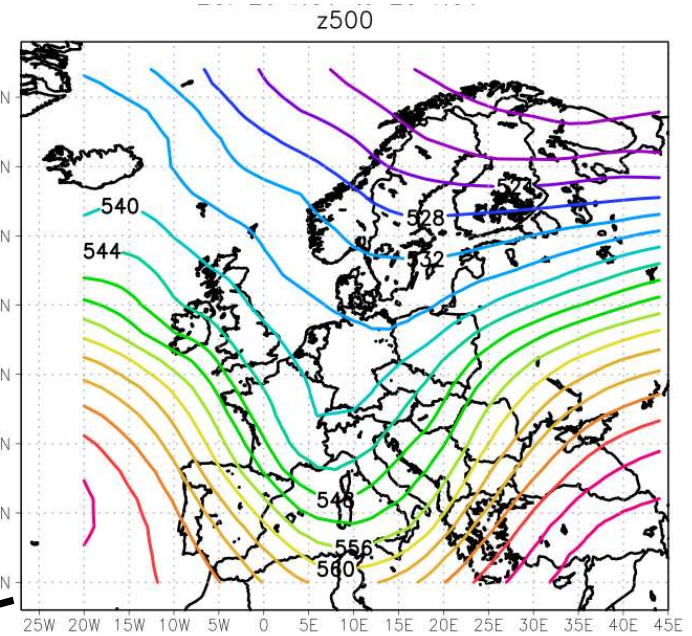
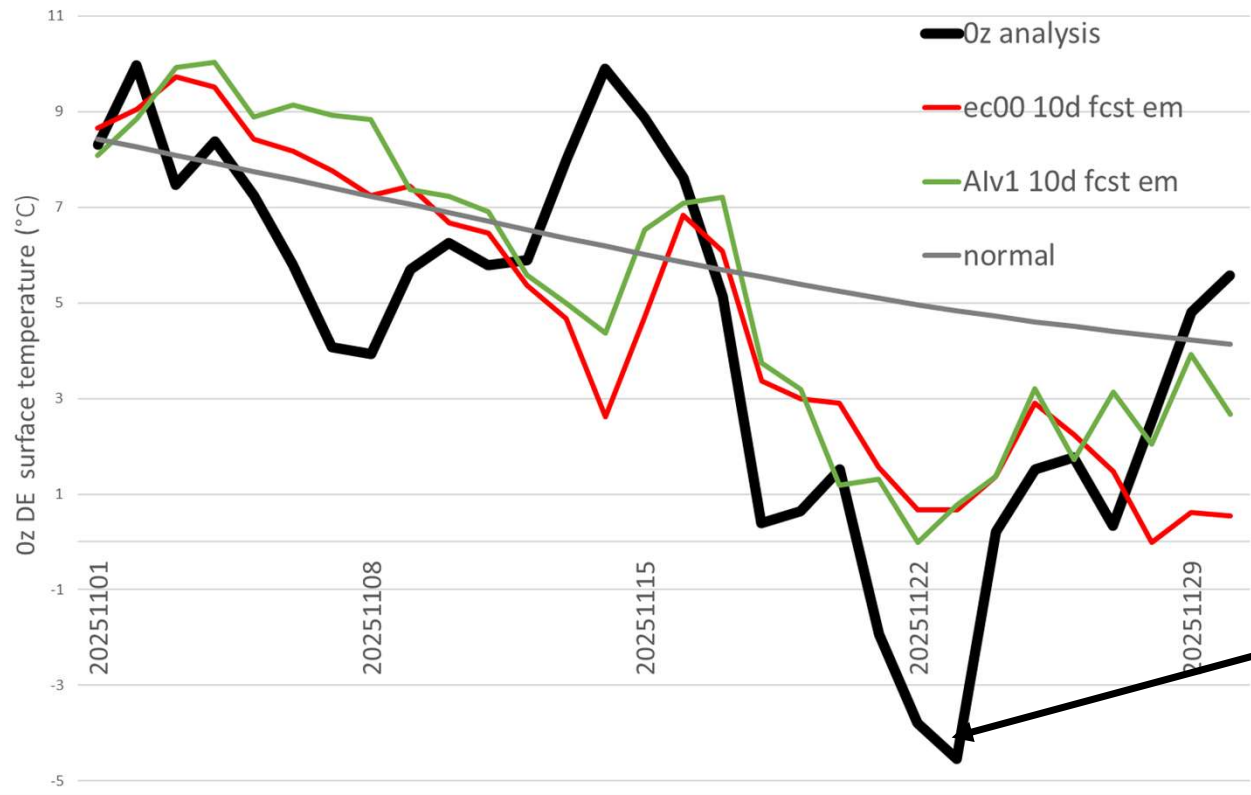
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- AI & NWP ens mean
  - 5d forecast mainly good
  - 10d mis-times changes lagged under-estimates shift
  - analysis lies within spread almost always (AI & NWP)

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# Late Nov



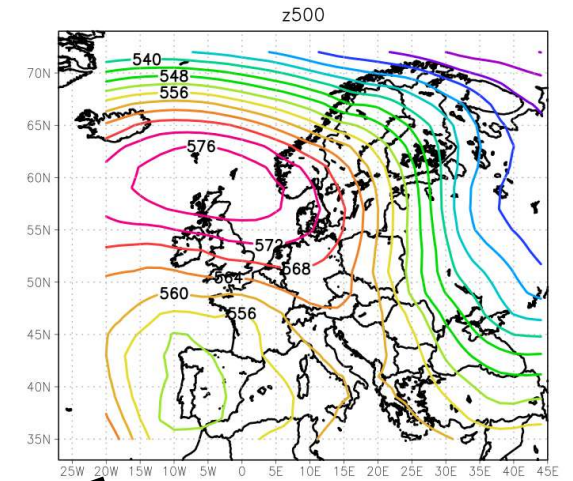
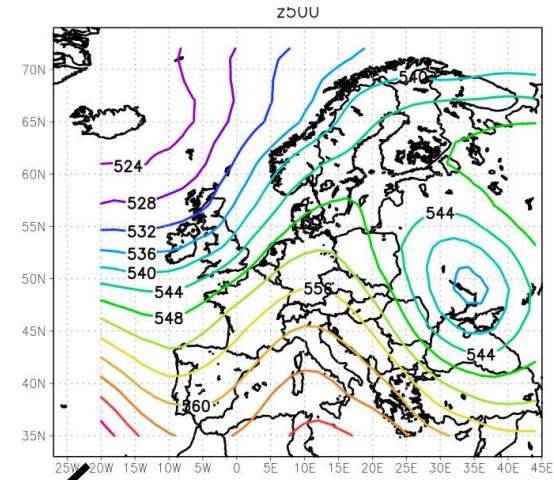
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# Late Dec



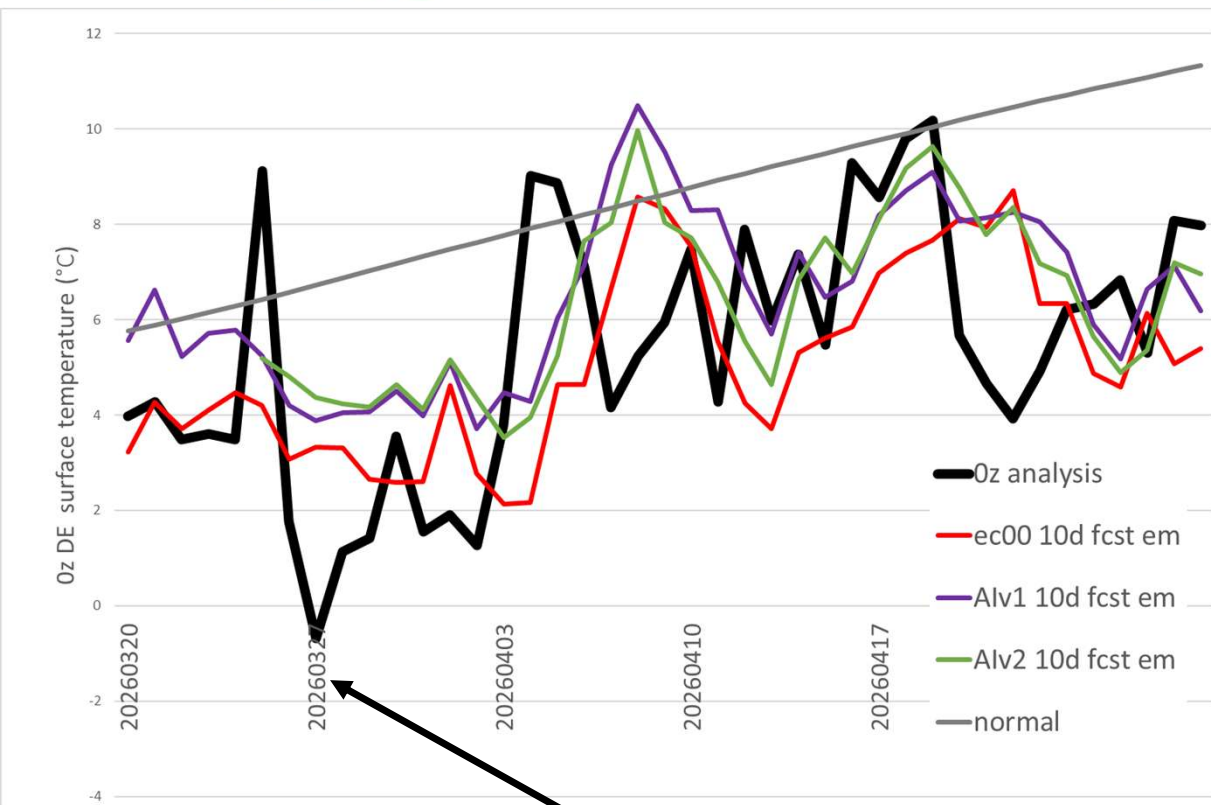
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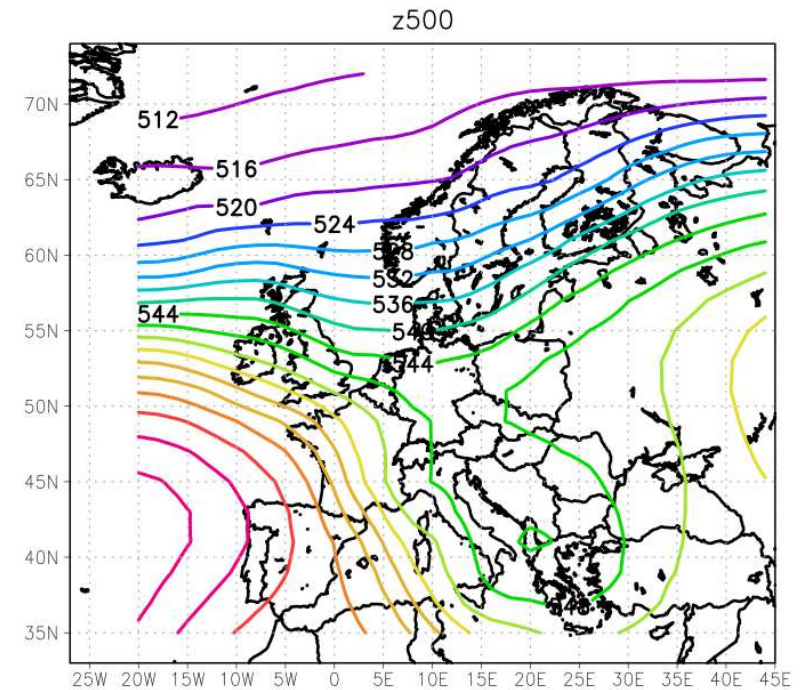
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# Late Mar



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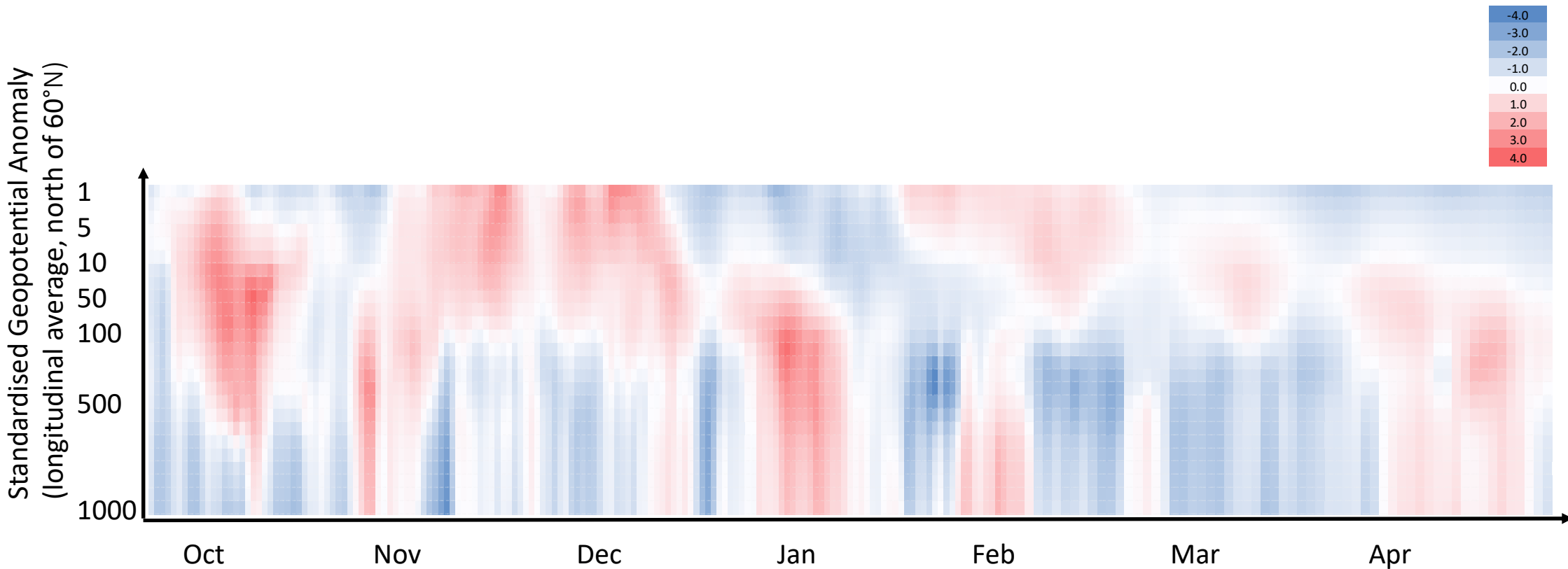


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# 'Drip map', 00z analysis



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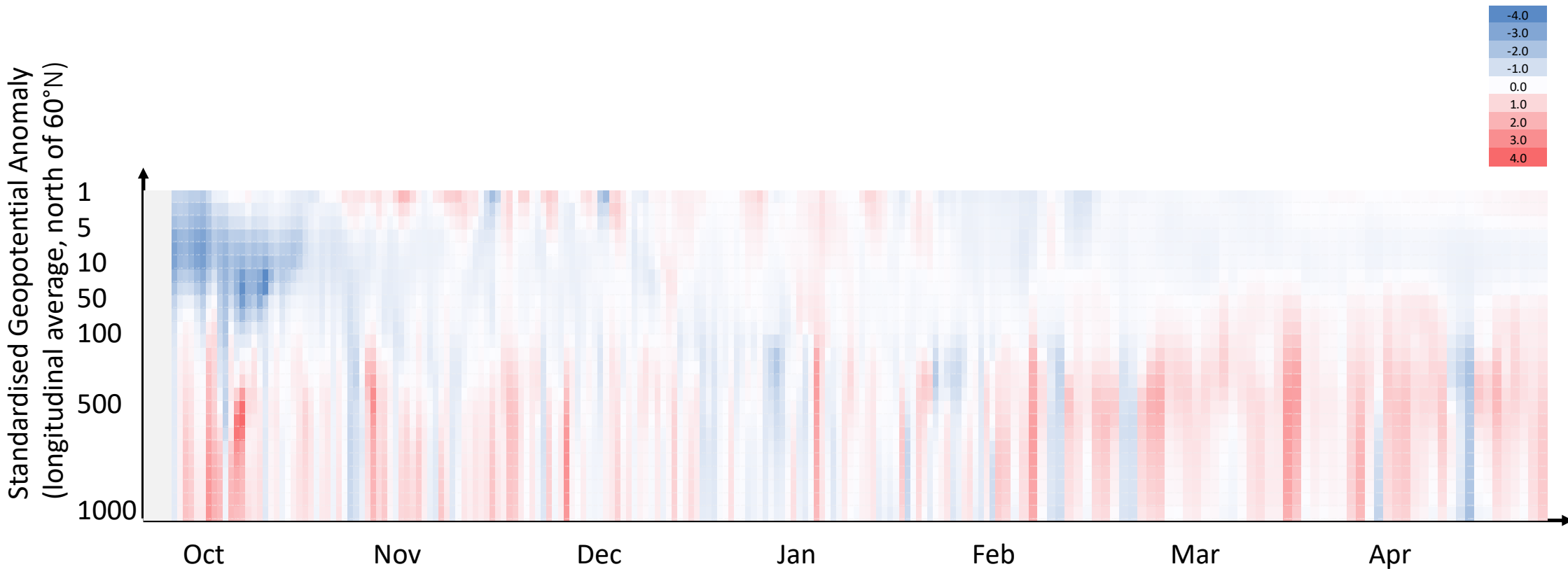


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# 'Drip map', NWP 5d fcst error



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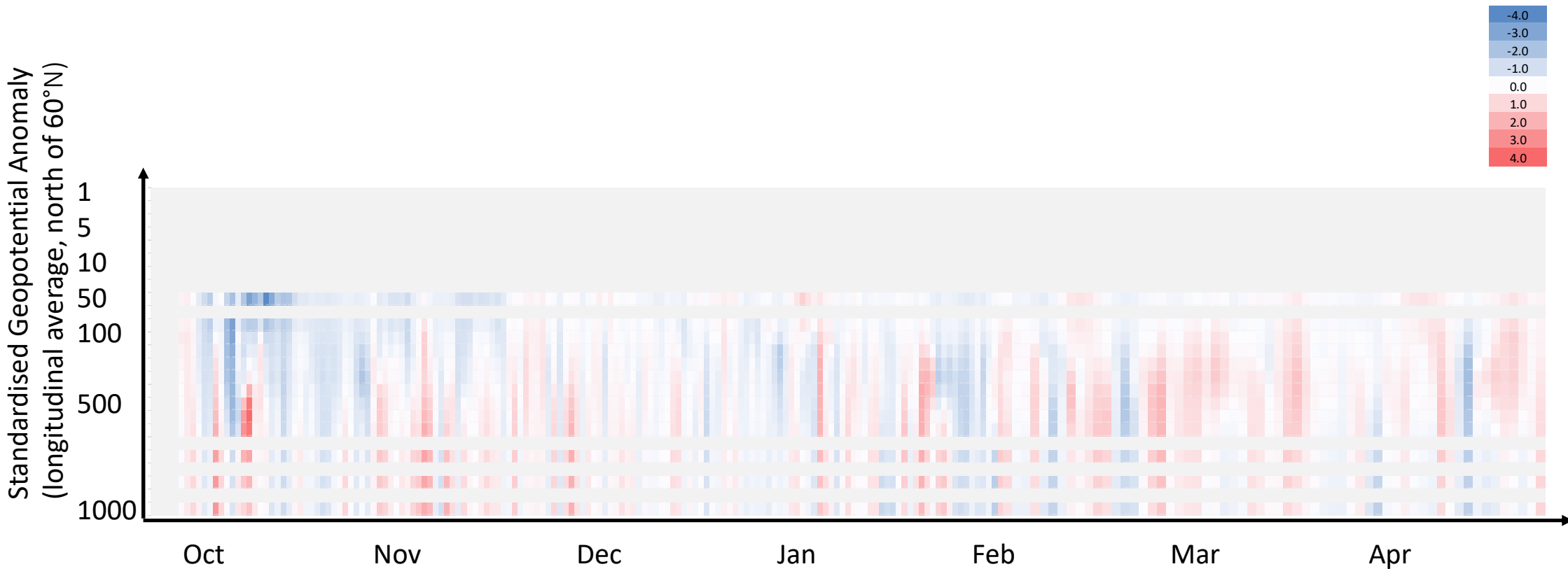


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# 'Drip map', Alv1 5d fcst error



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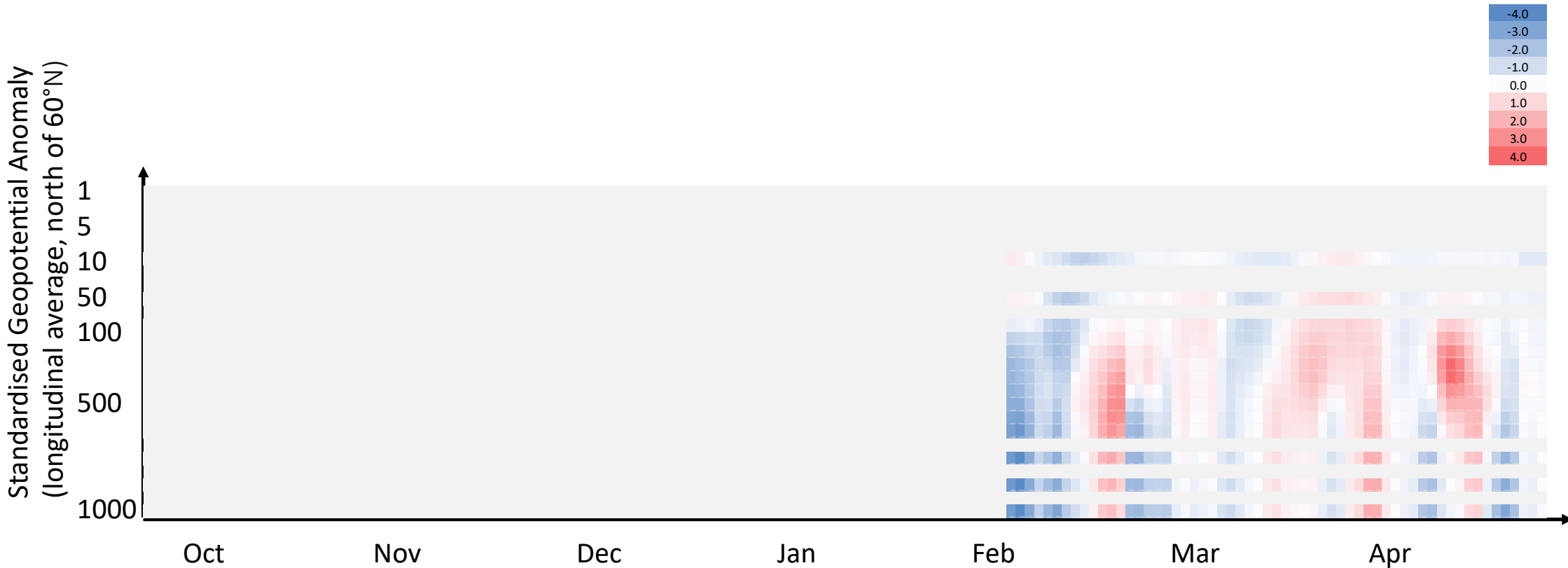
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# 'Drip map', Alv2 5d fcst error

**Pre RCP data. Treat w caution!**



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## Hopes for AI (v3?)

- AI DOP
  - has unique initialisation and explores different state space
  - => less correlation to NWP fcst shifts, spread is not “parallel” to NWP
- Structure enables flow dependent ensembles
  - New ensemble members formed mid-forecast to explore uncertainty “hot-spots”
- Imagination is required for the next significant step.

These are a couple of our ideas. What are yours?



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