ECMWF forecast performance

UEF 2023

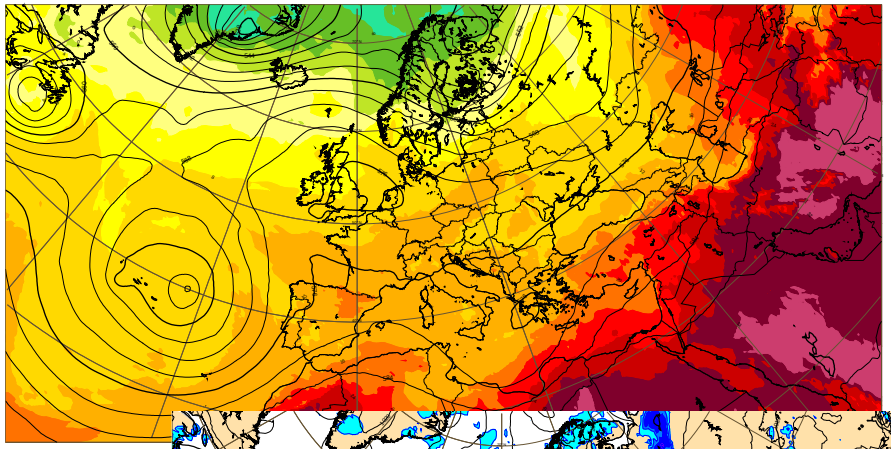
Thomas Haiden

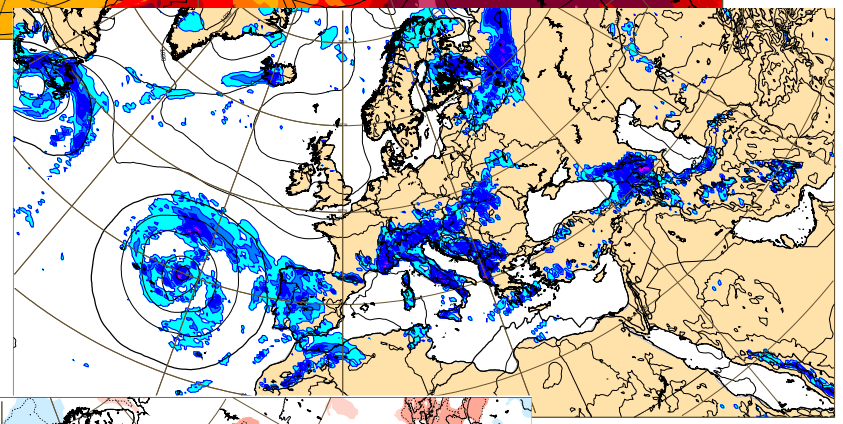
Thanks to: Martin Janousek, Zied Ben Bouallegue, Laura Ferranti, Frederic Vitart, Fernando Prates

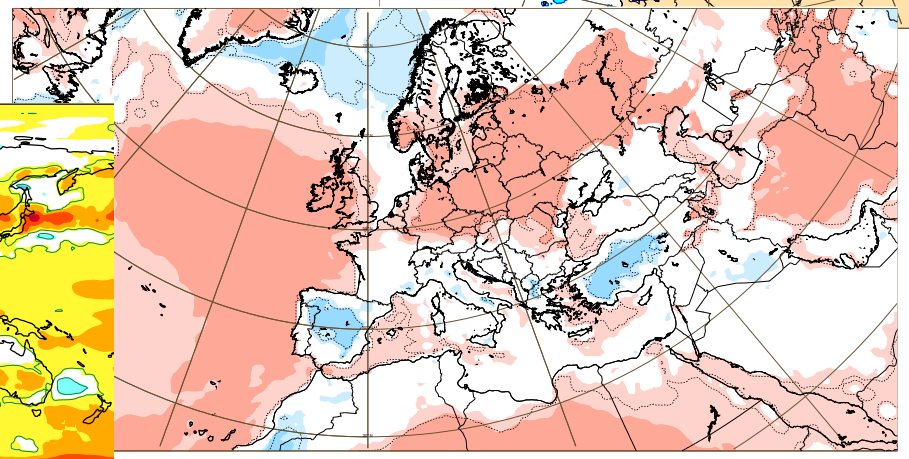
ECMWF

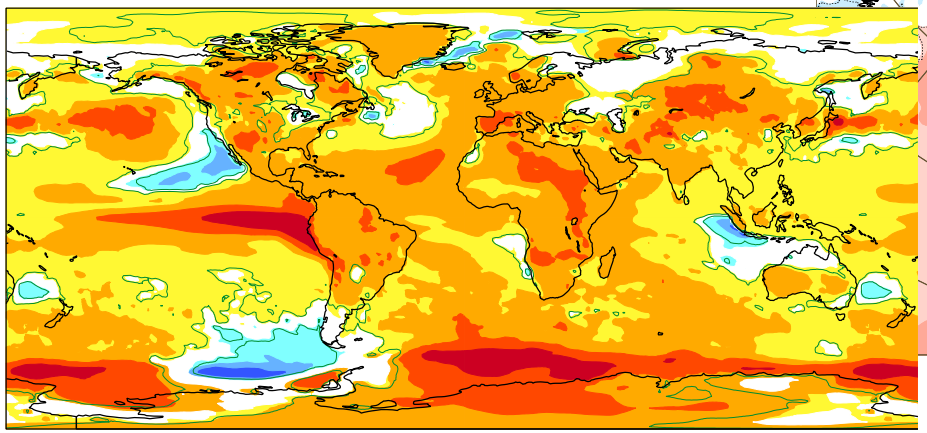
Overview

- Upper-air forecast skill
- Weather parameters
- Extended-range forecast skill
- Seasonal forecast

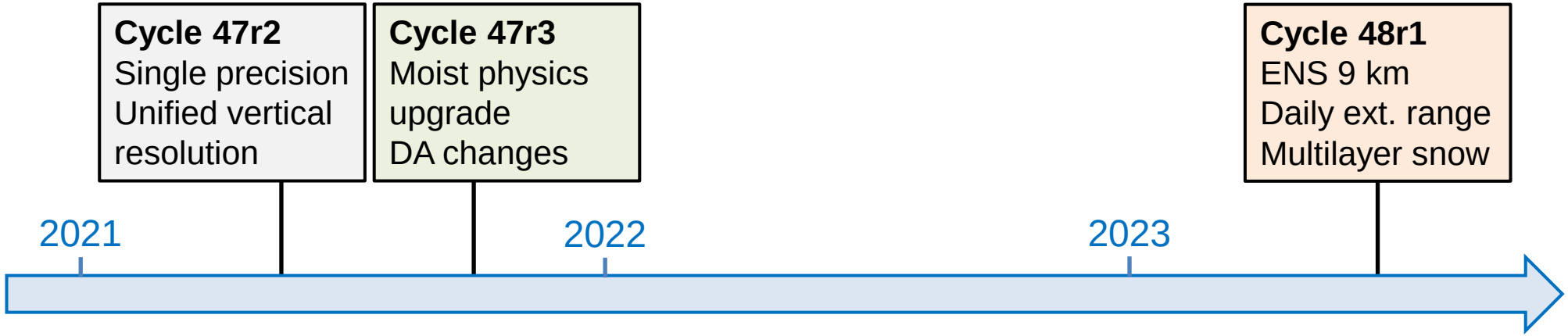




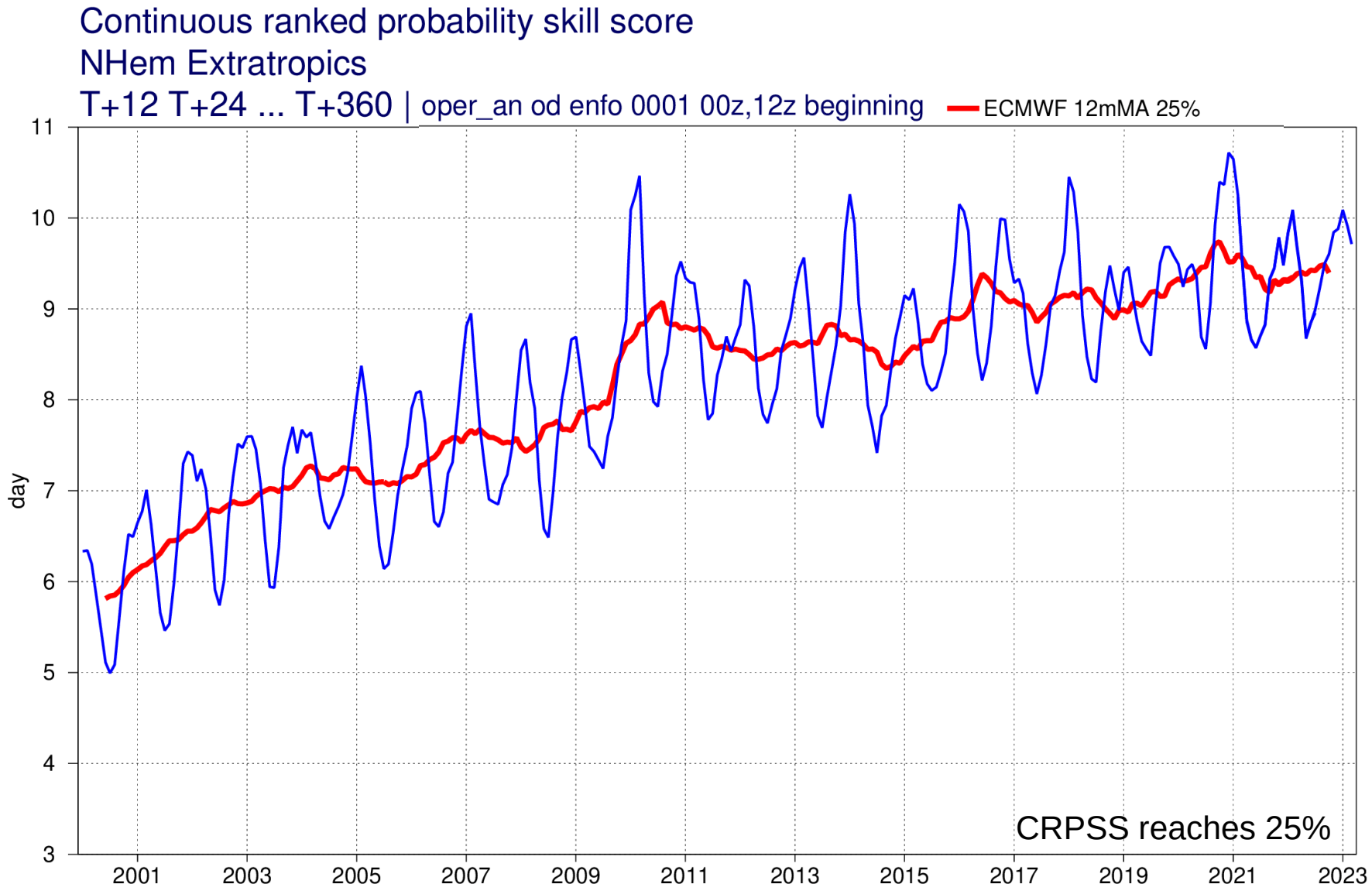




Model upgrades - timeline



ENS upper-air headline score: T850 CRPSS



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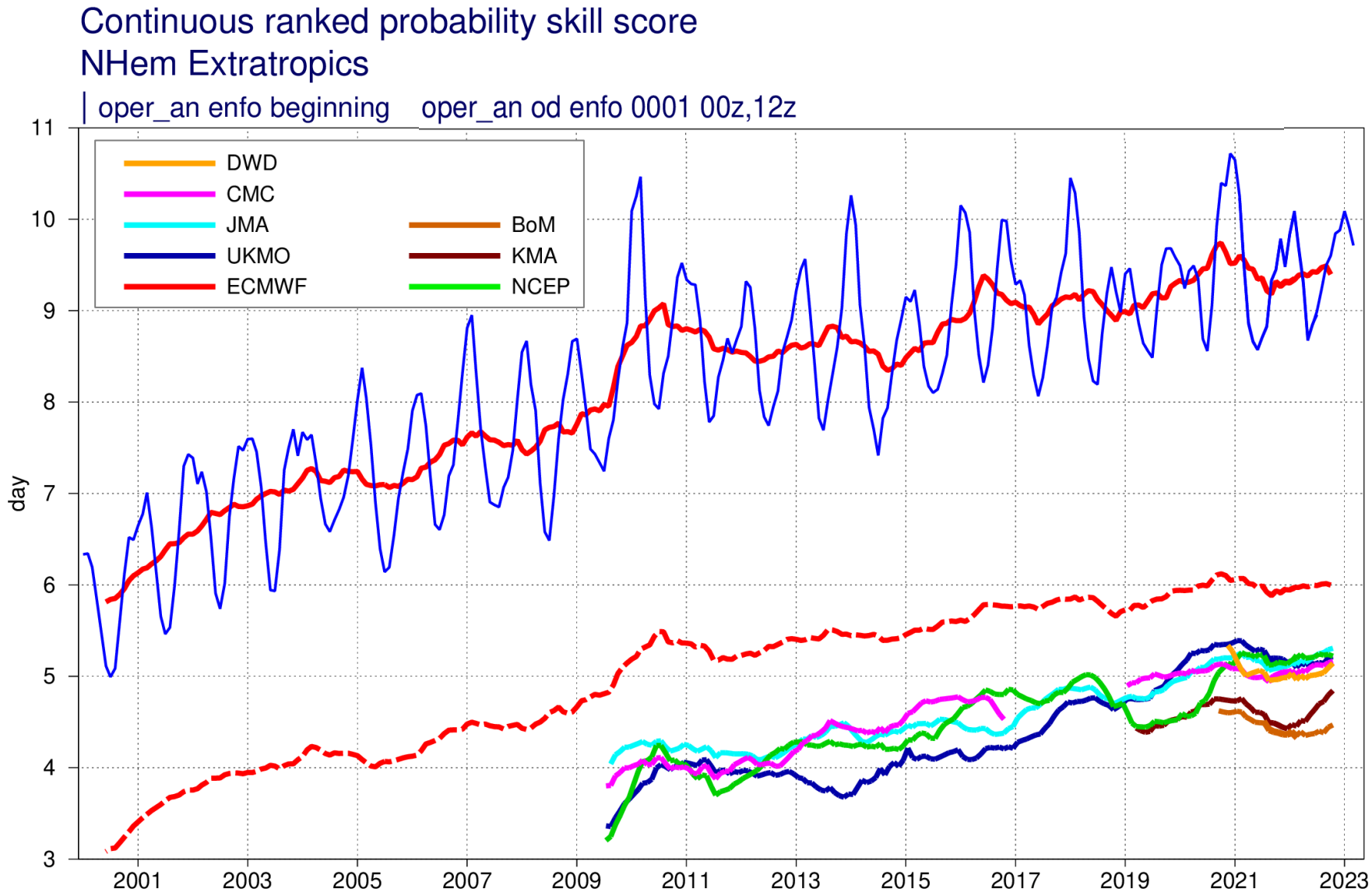
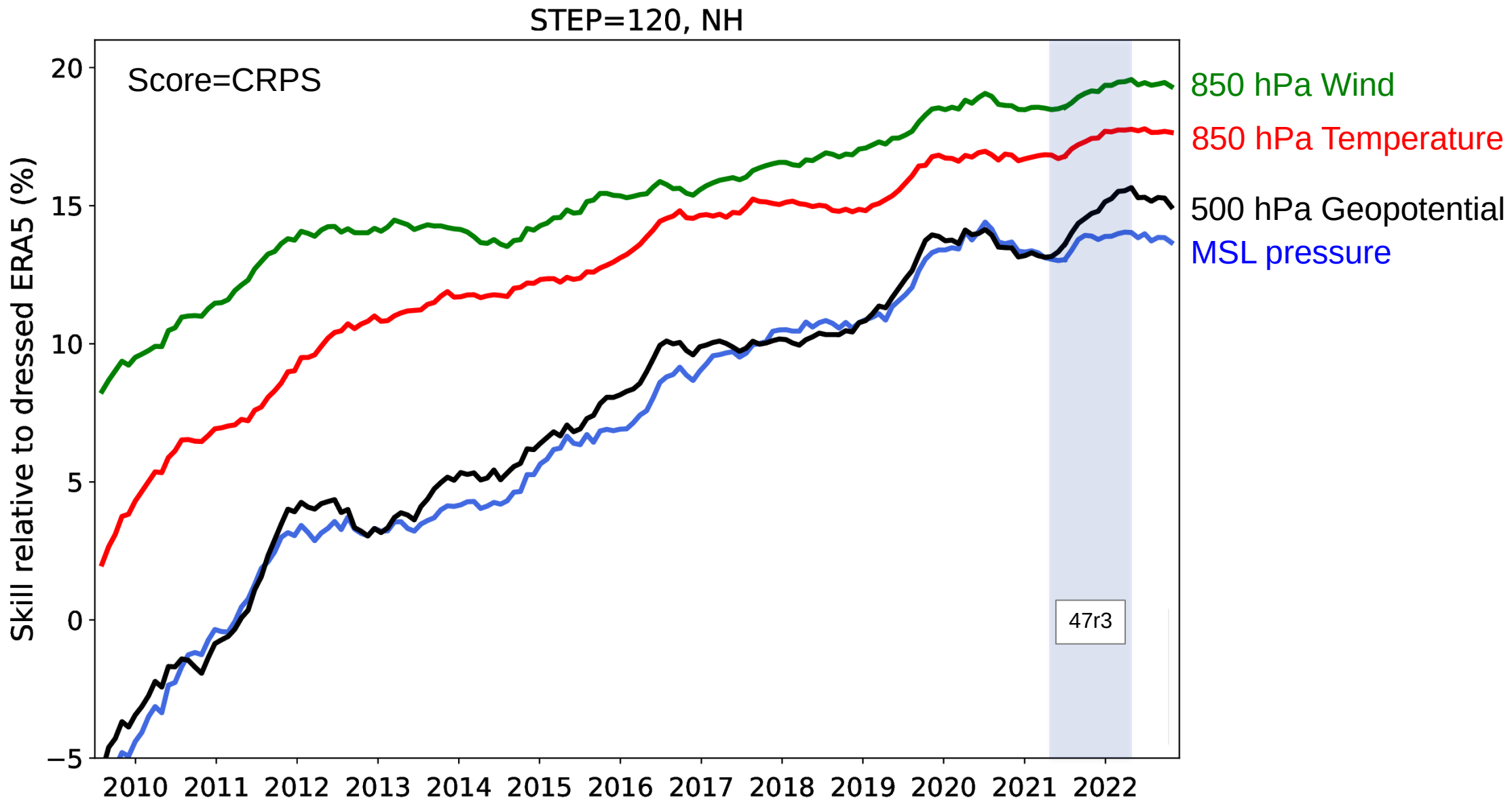


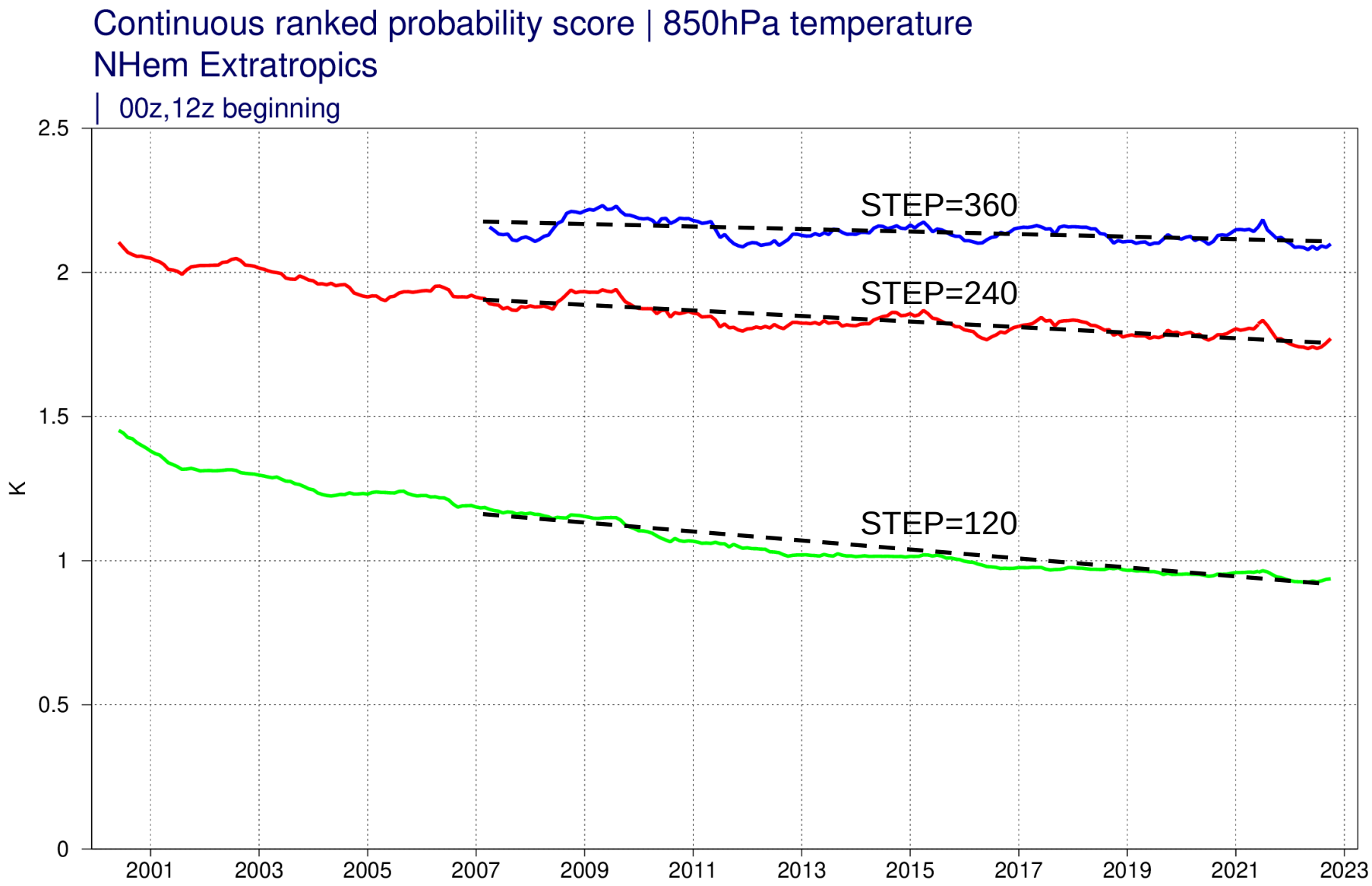
CRPSS reaches 25%

CRPSS reaches 50%

ENS skill relative to dressed ERA5 – Day 5



T850 CRPS at forecast days 5, 10, 15



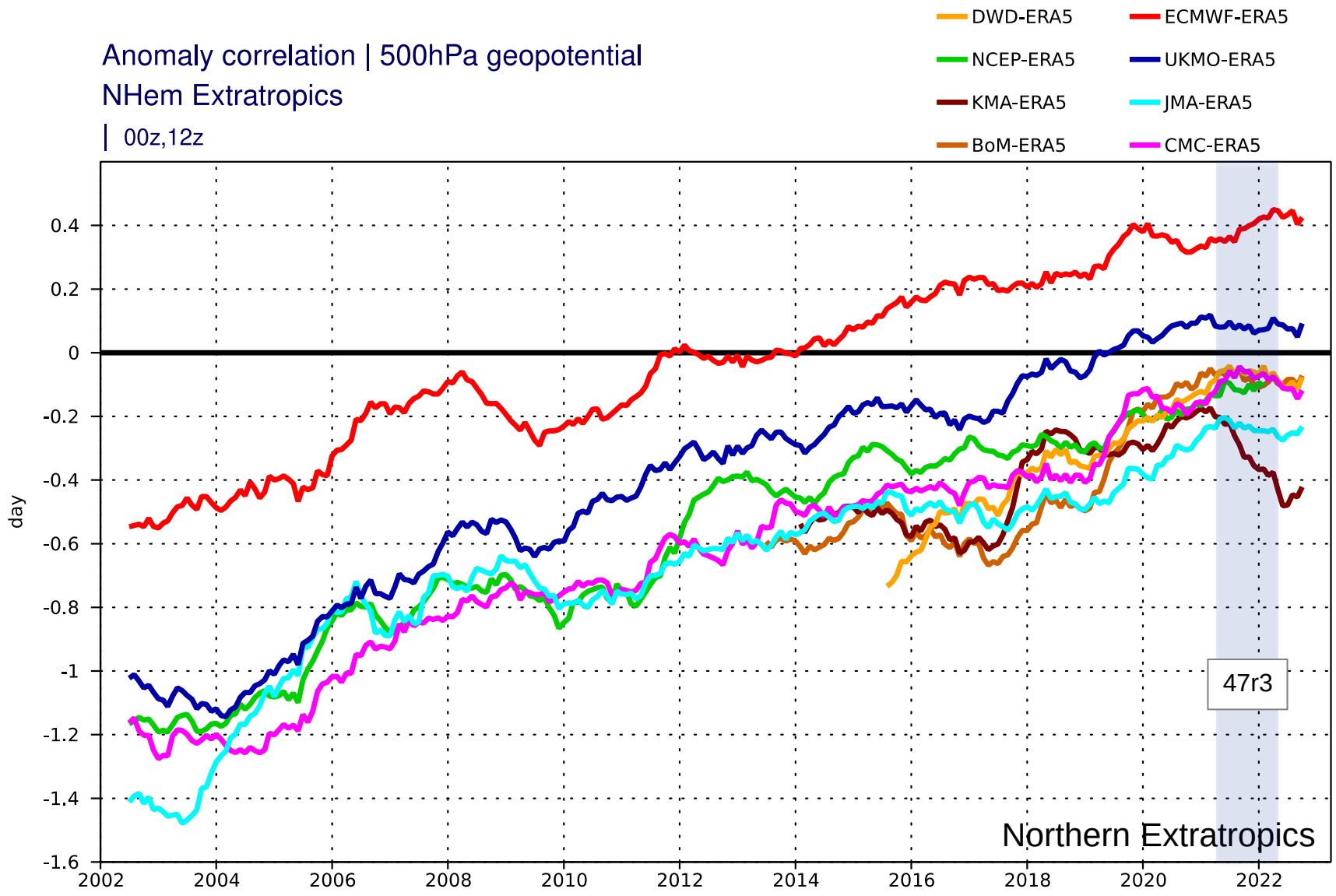
Error reduction over 15 years

- 4%

- 8%

- 25%

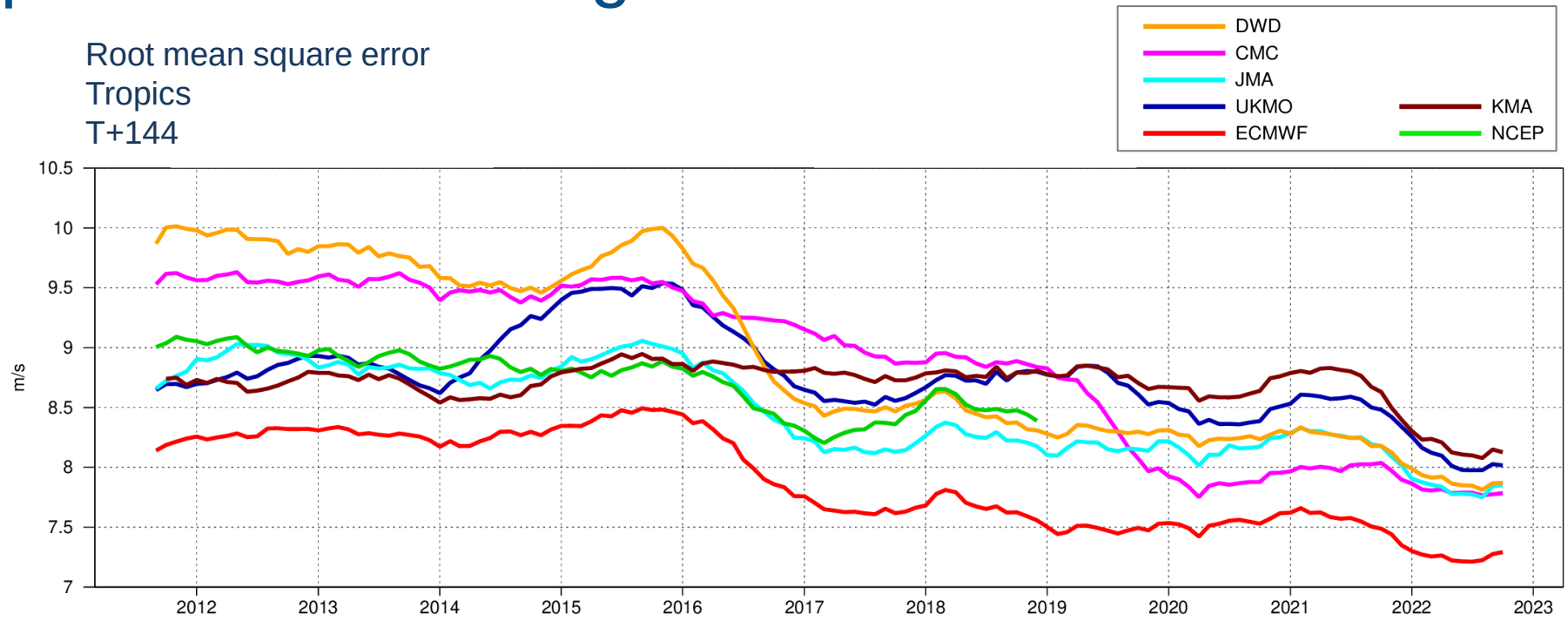
Anomaly correlation of 500 hPa geopotential reaching 85%



Relative to ERA5

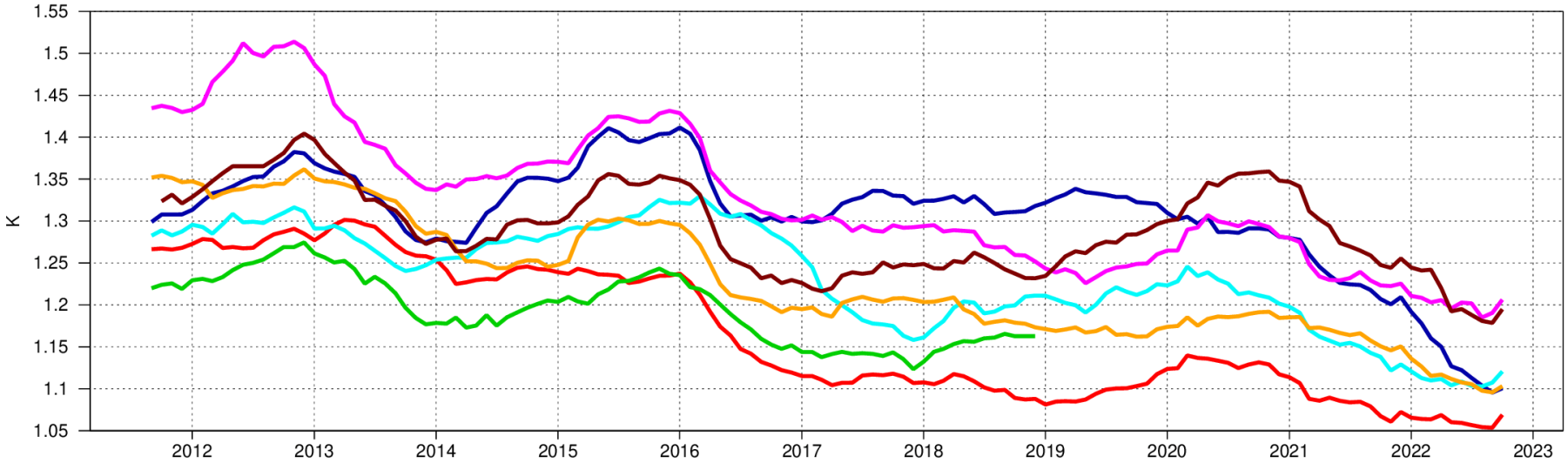
Tropics: verification against radiosondes

Root mean square error
Tropics
T+144



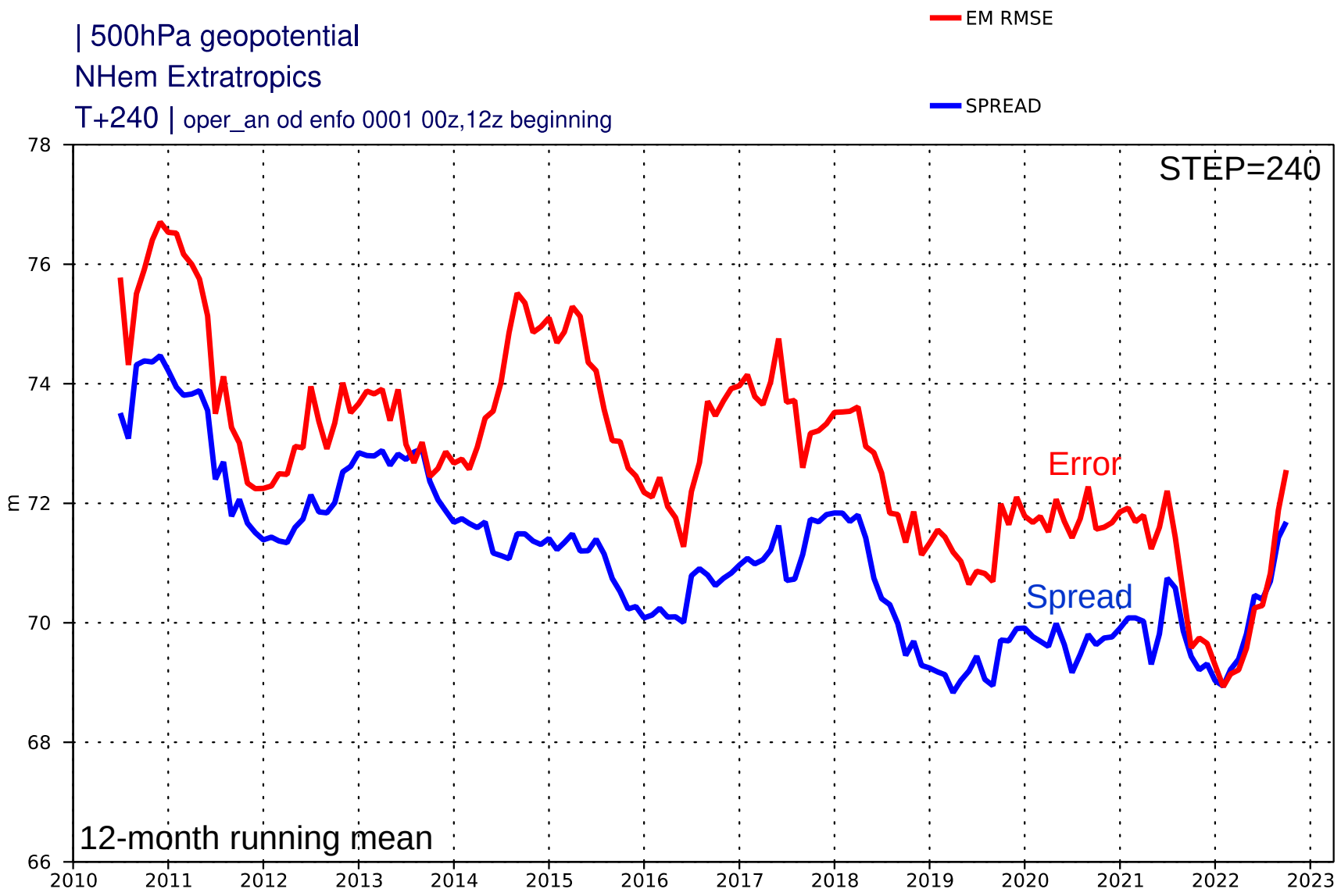
250 hPa wind

Day 6

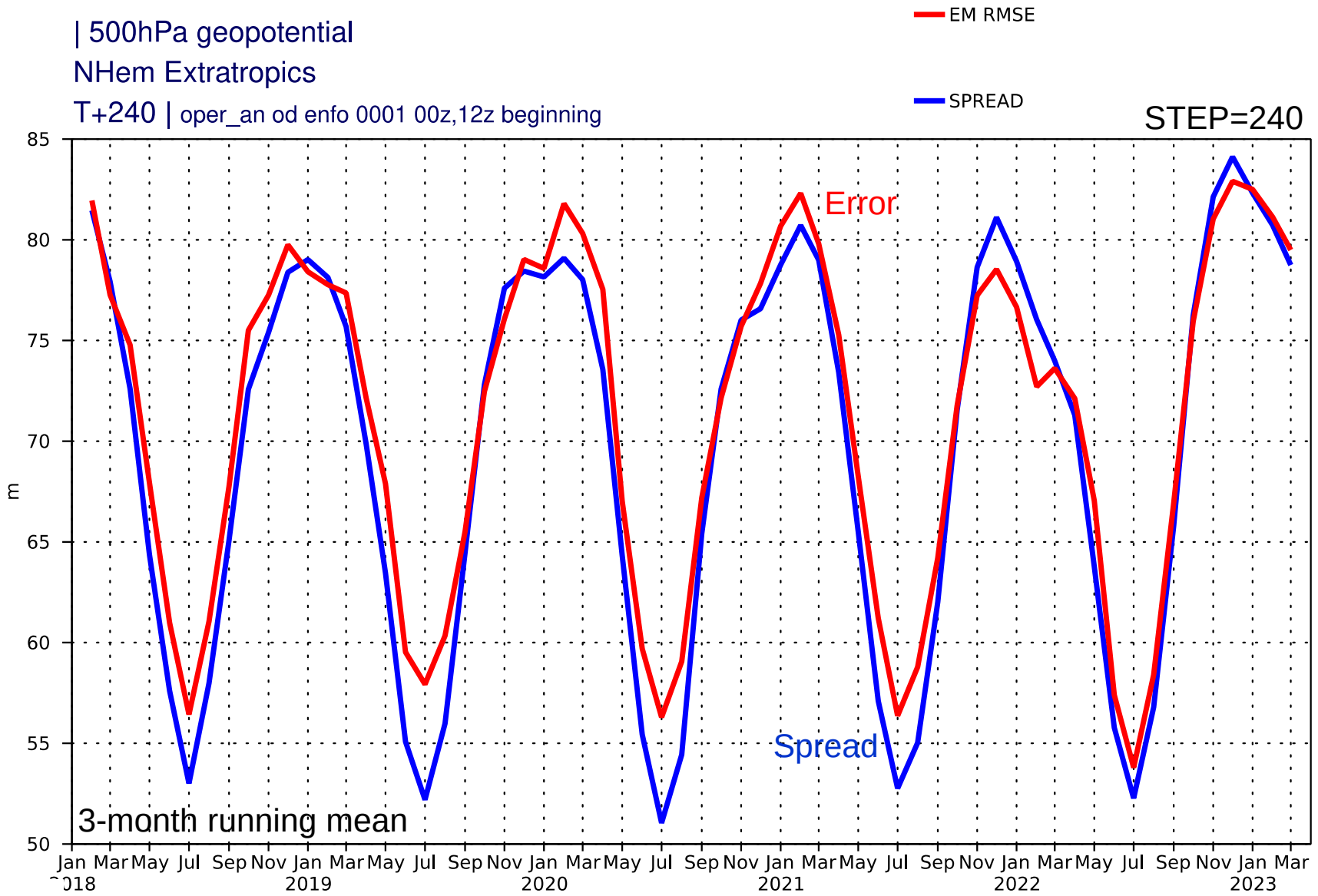


850 hPa temperature

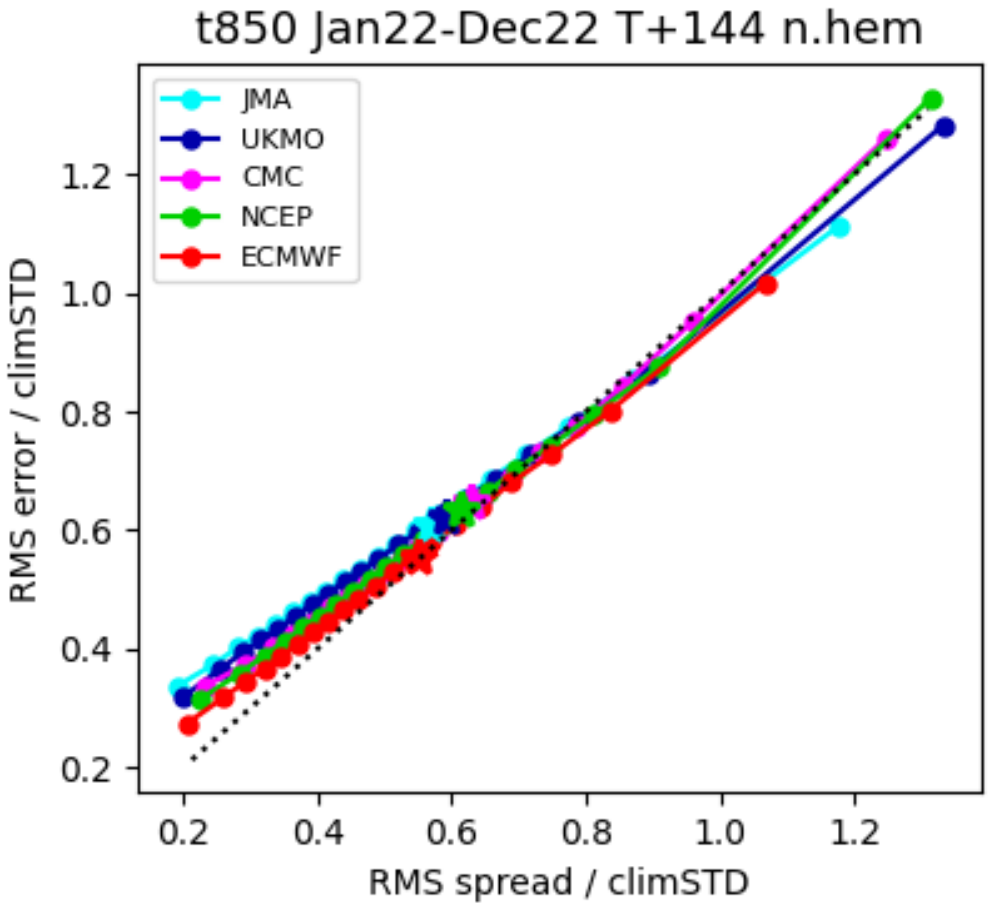
ENS: Z500 spread and error at Day 10



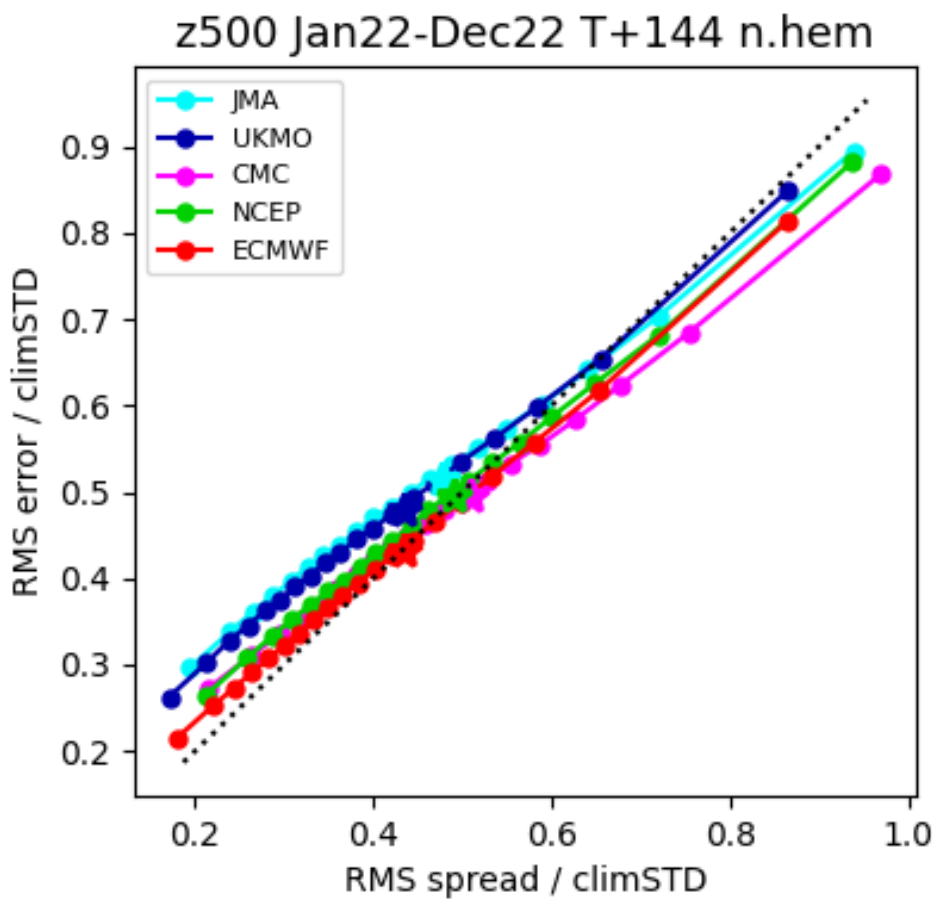
ENS: Z500 spread and error at Day 10



ENS: Spread reliability (Day 6)

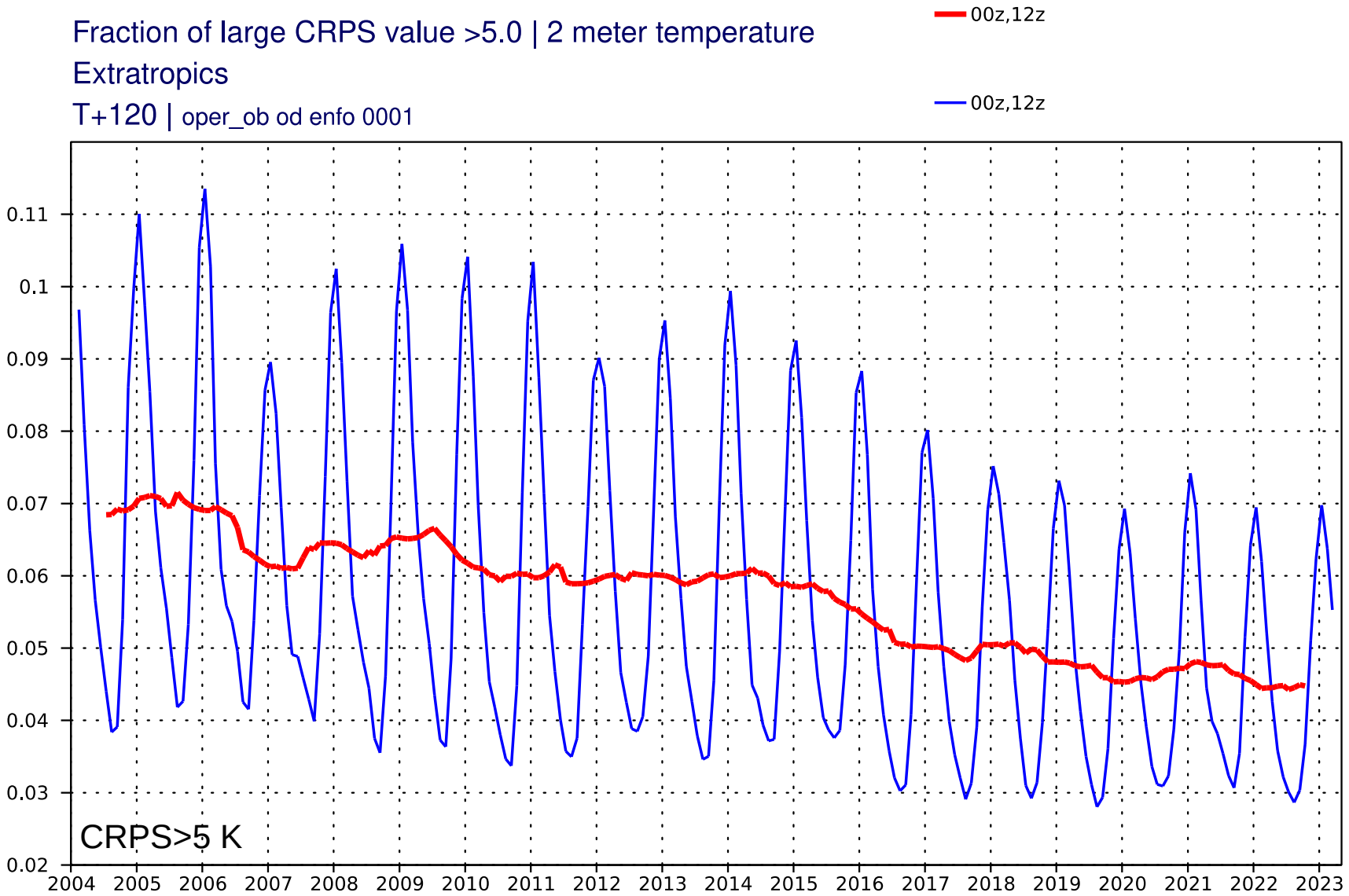


850 hPa Temperature



500 hPa Geopotential

Fraction of large ENS T2m errors



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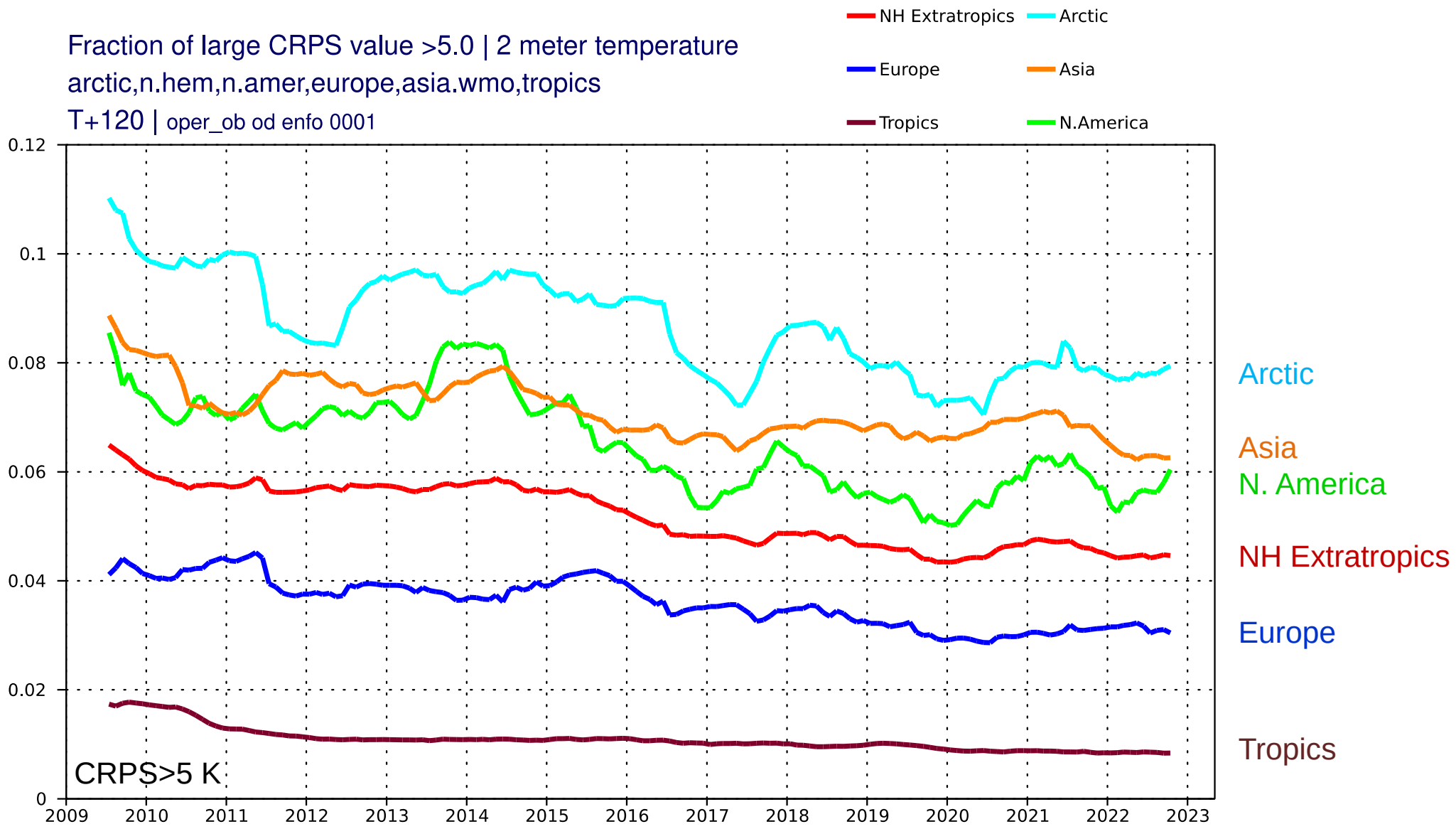
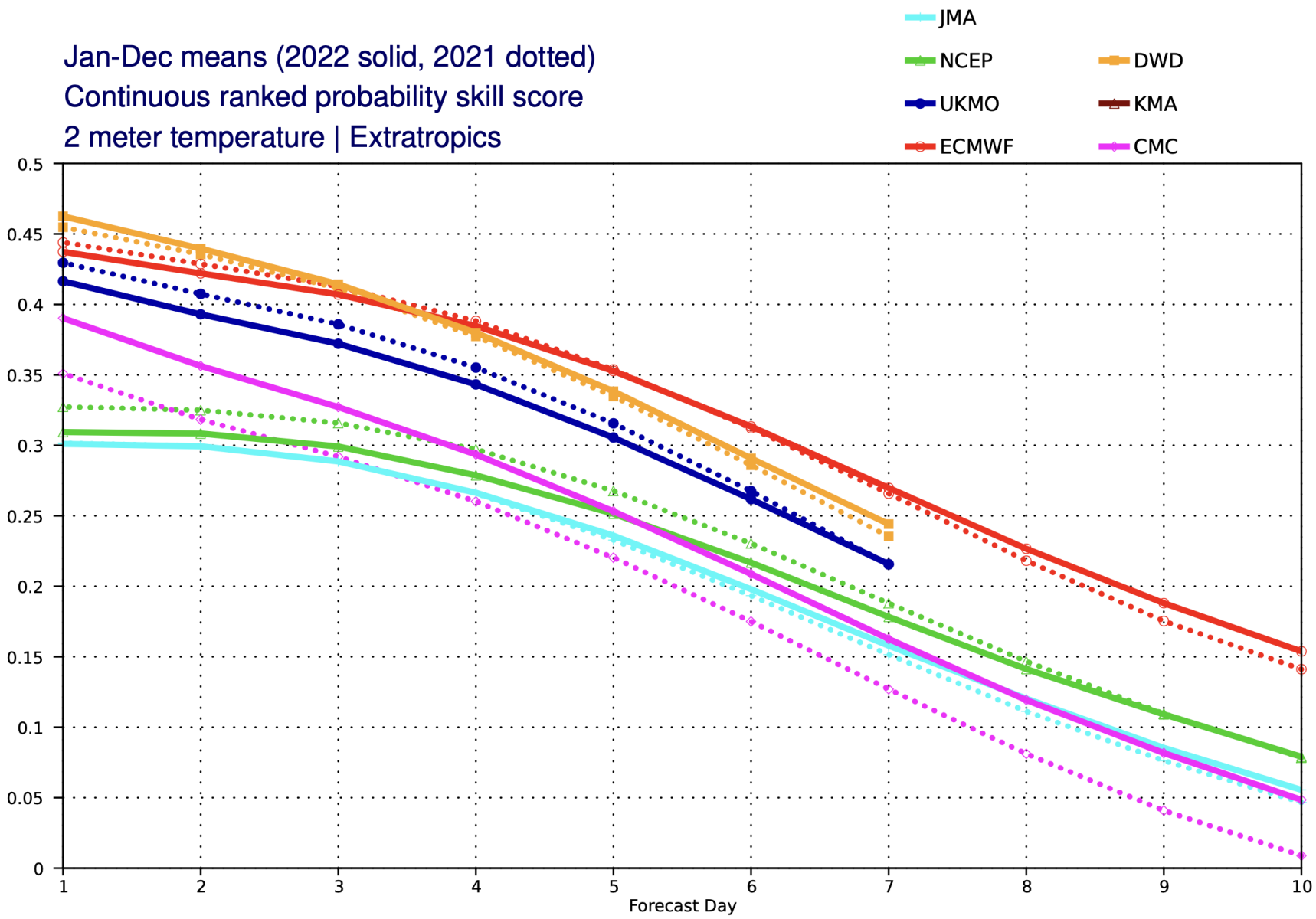
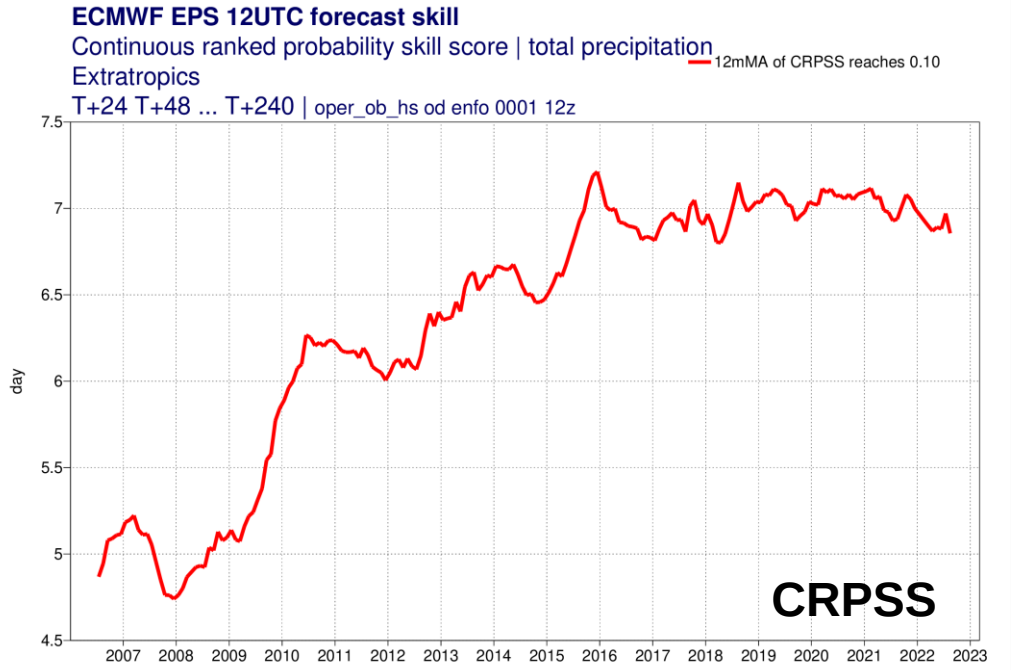
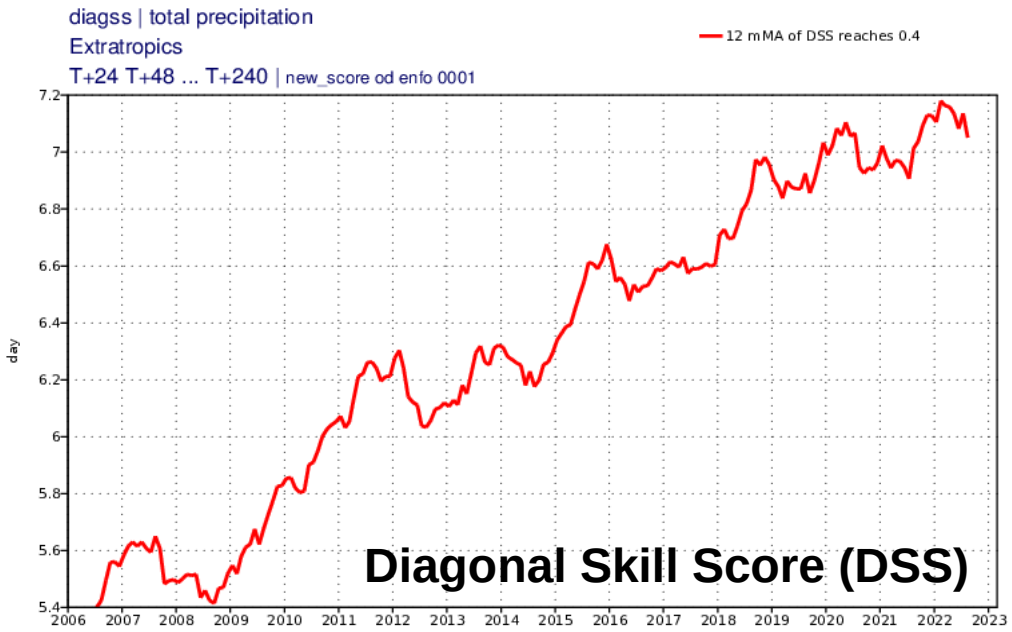


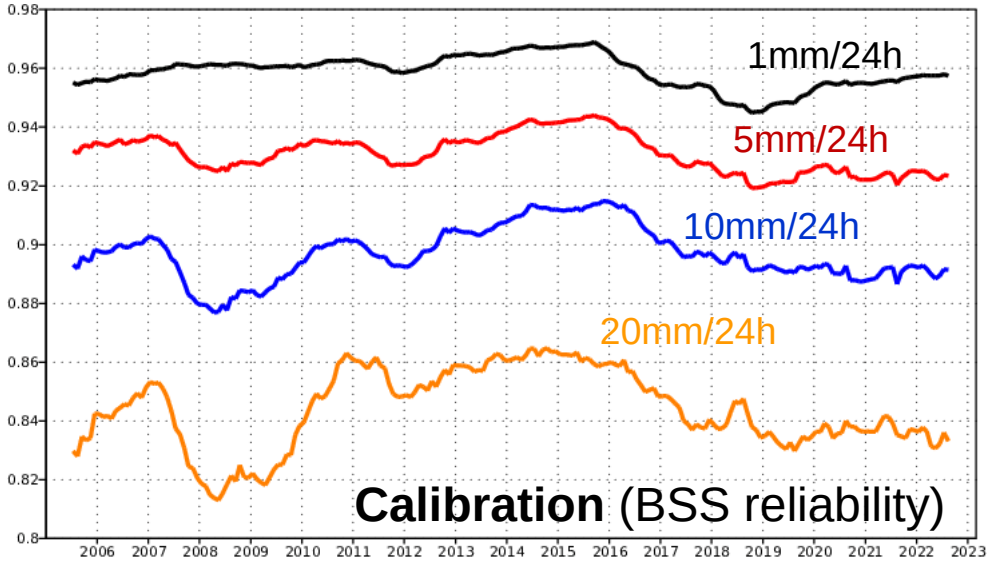
ENS 2m Temperature (TIGGE against SYNOP)

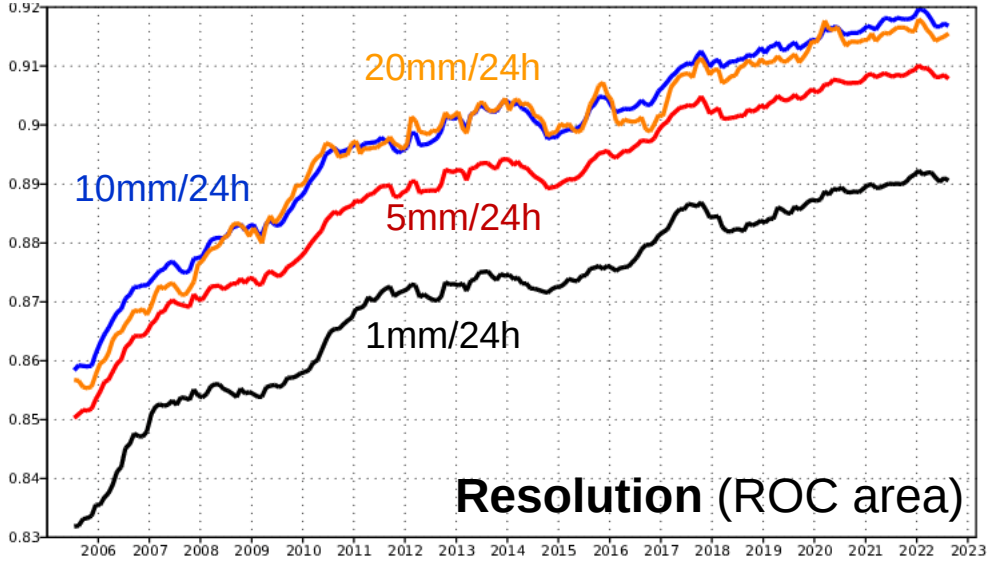


ENS precipitation scores

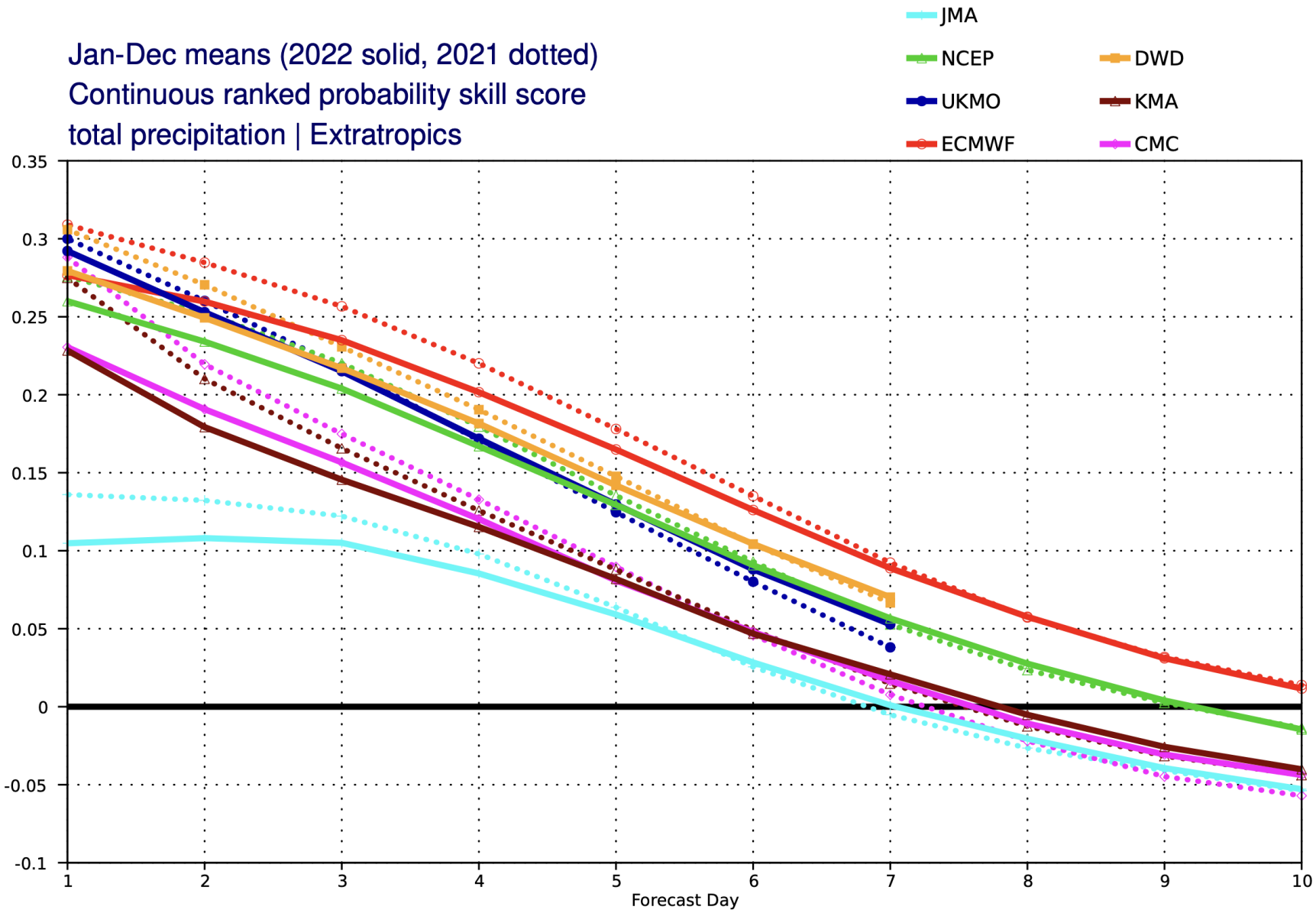




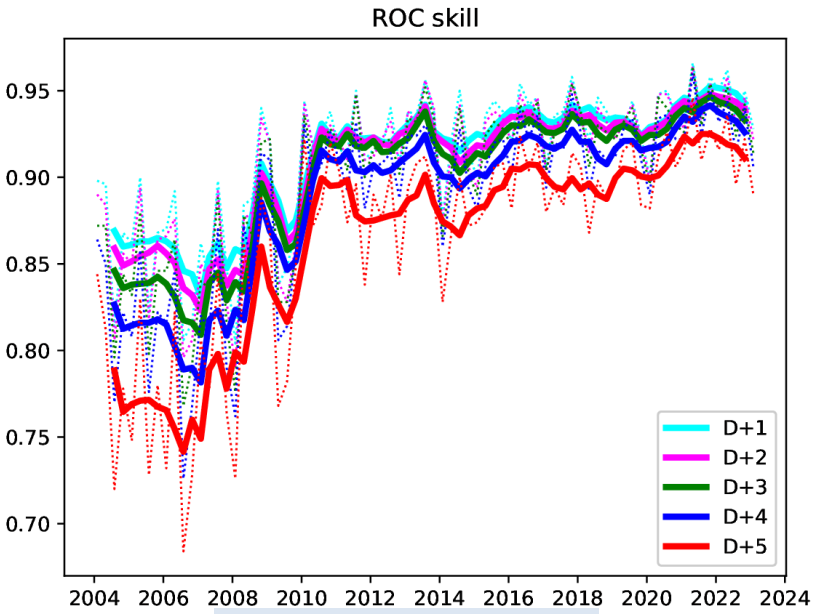


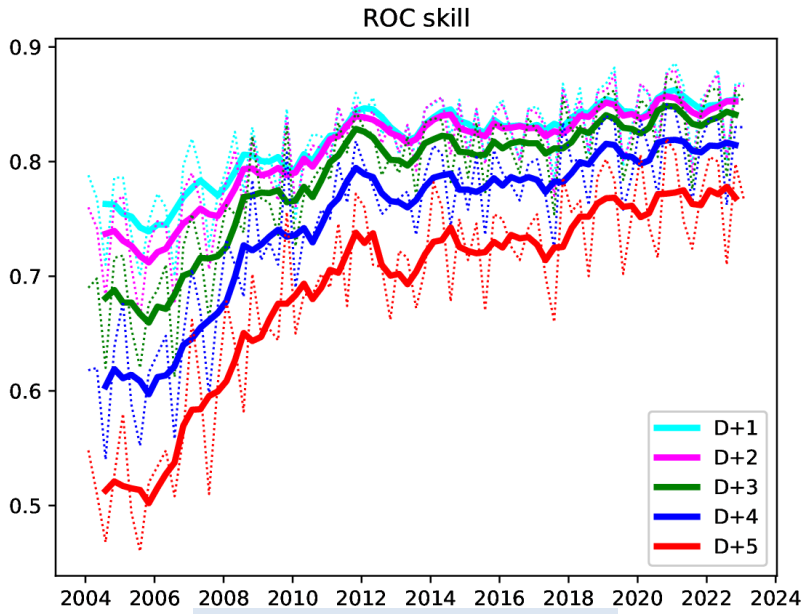


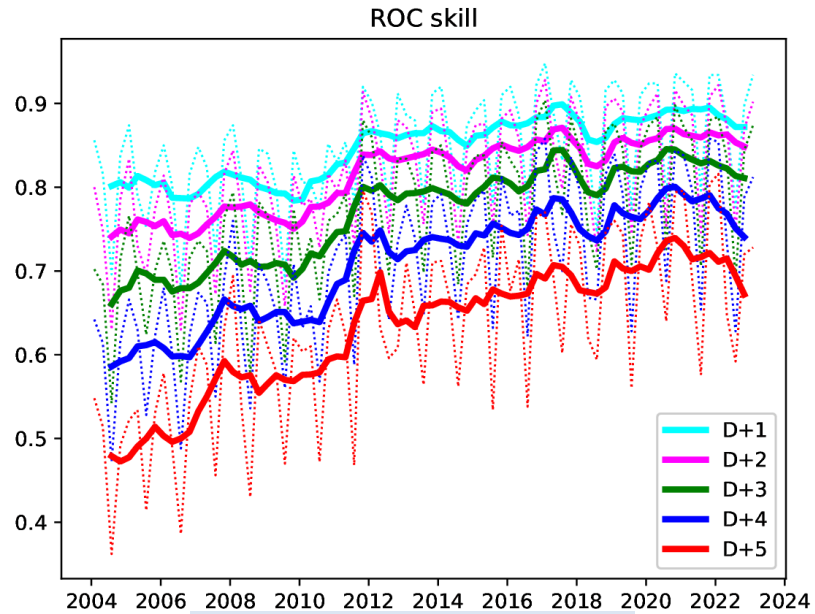
ENS 24-h Precipitation (TIGGE against SYNOP)



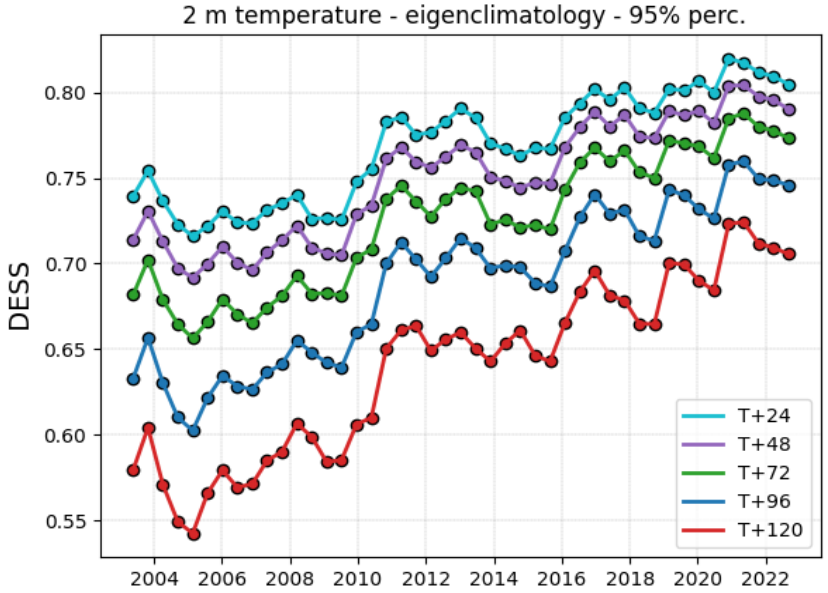
Verification of extremes: EFI ROC and Diagonal Score



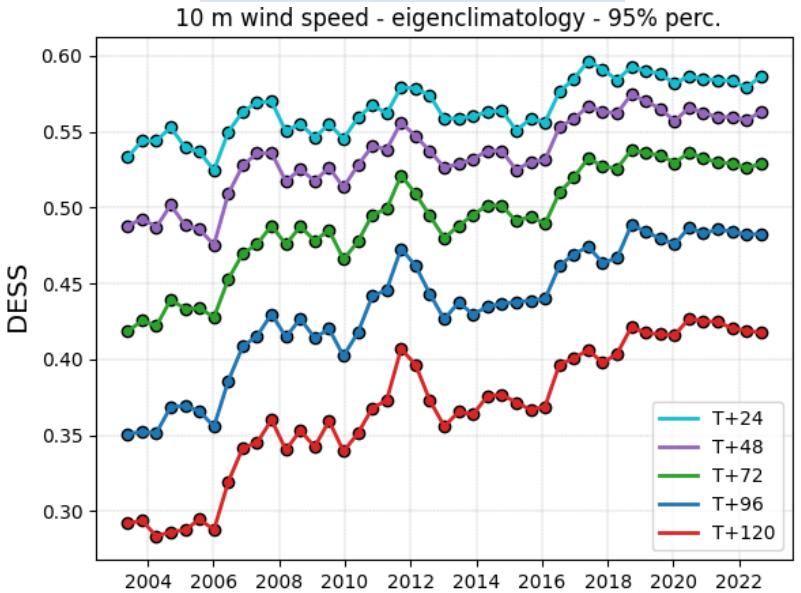




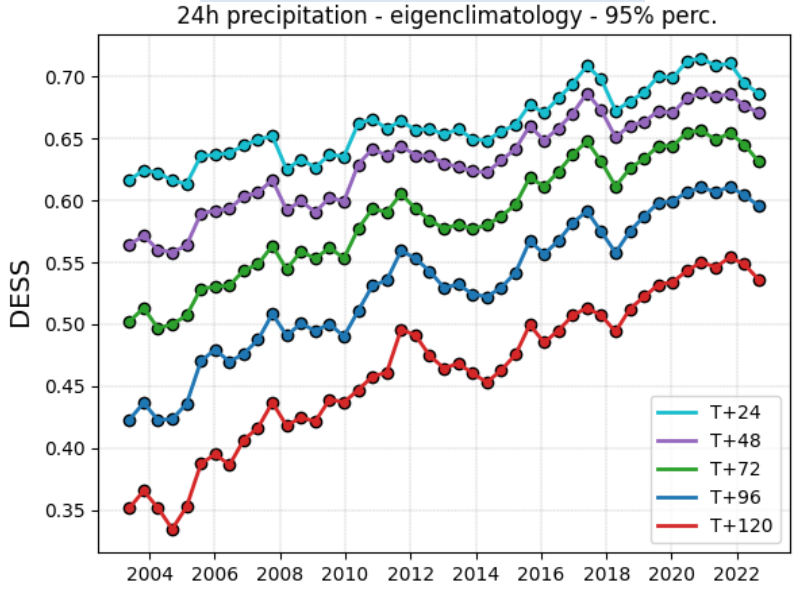
2m temperature



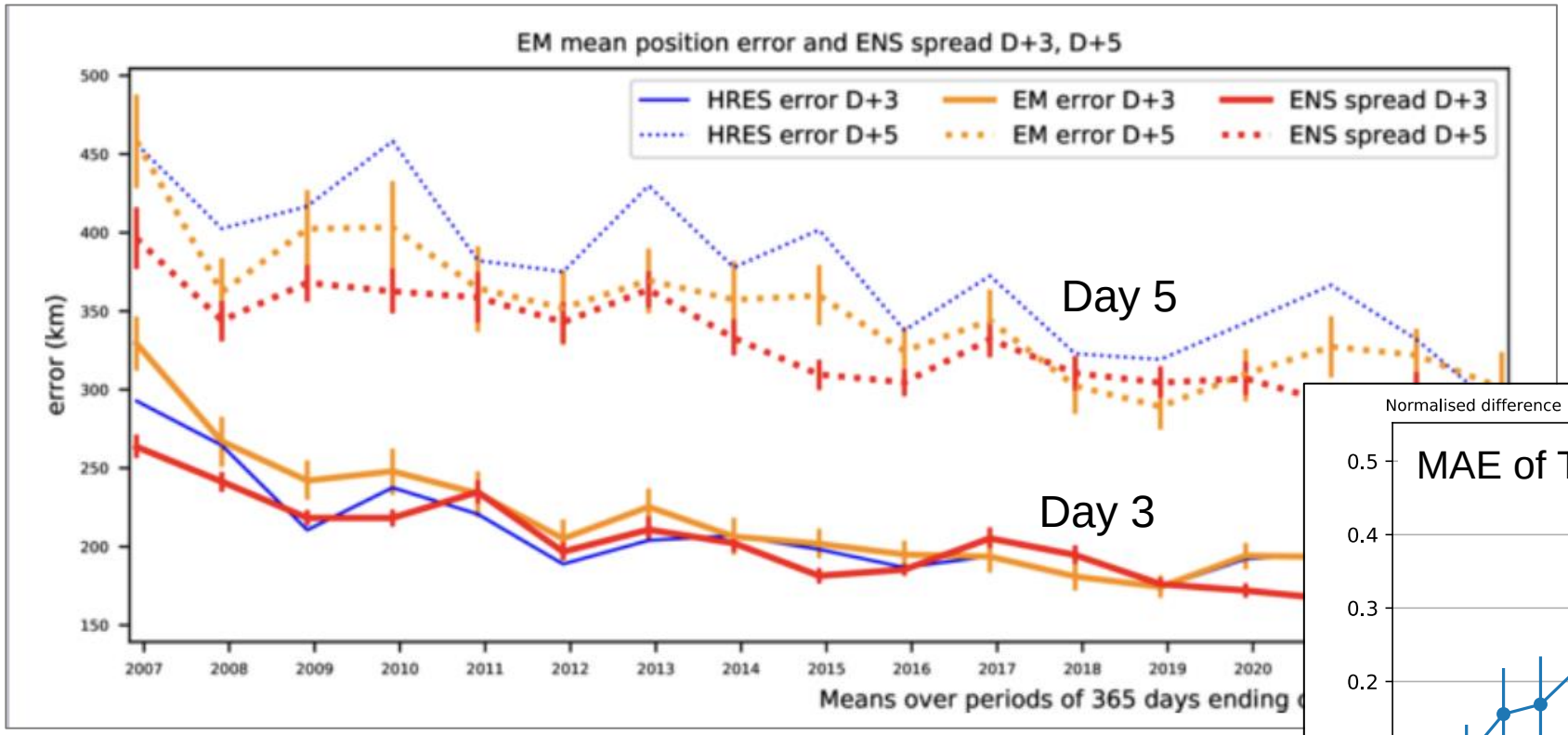
10m wind speed

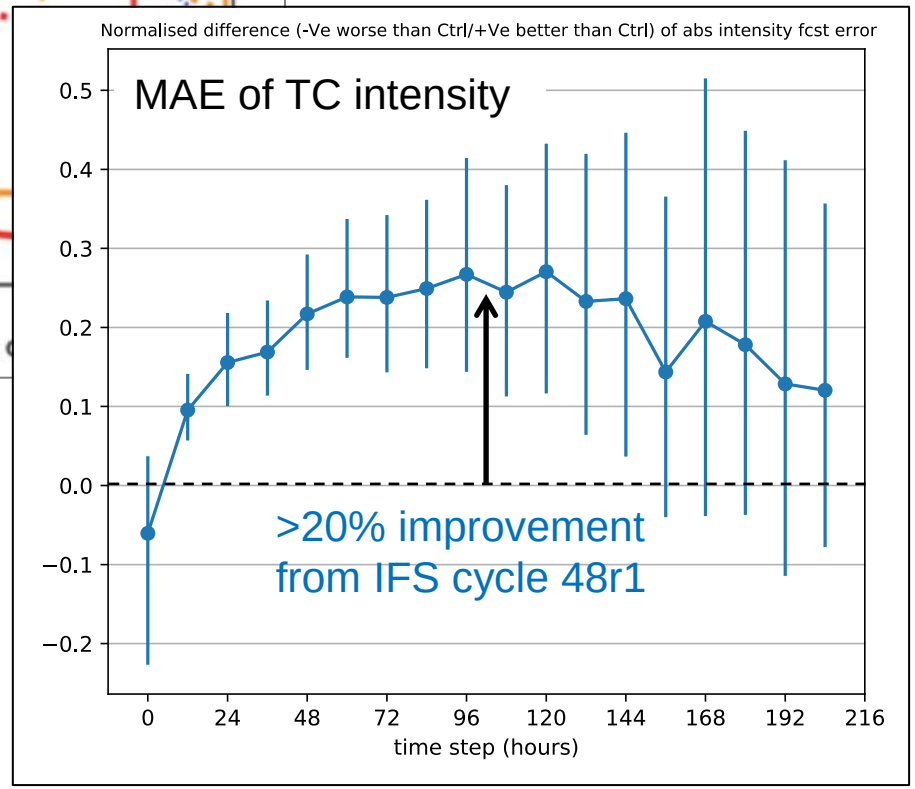


24h precipitation



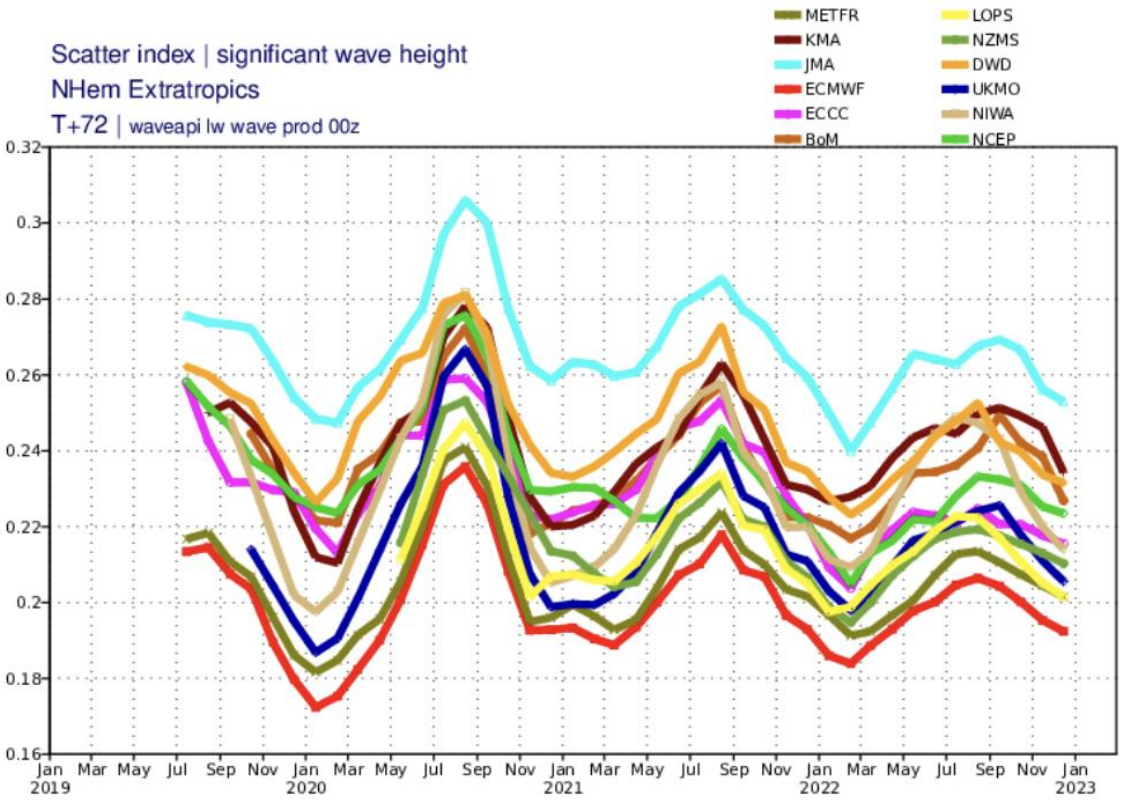
Tropical cyclones: verification against IBTrACS



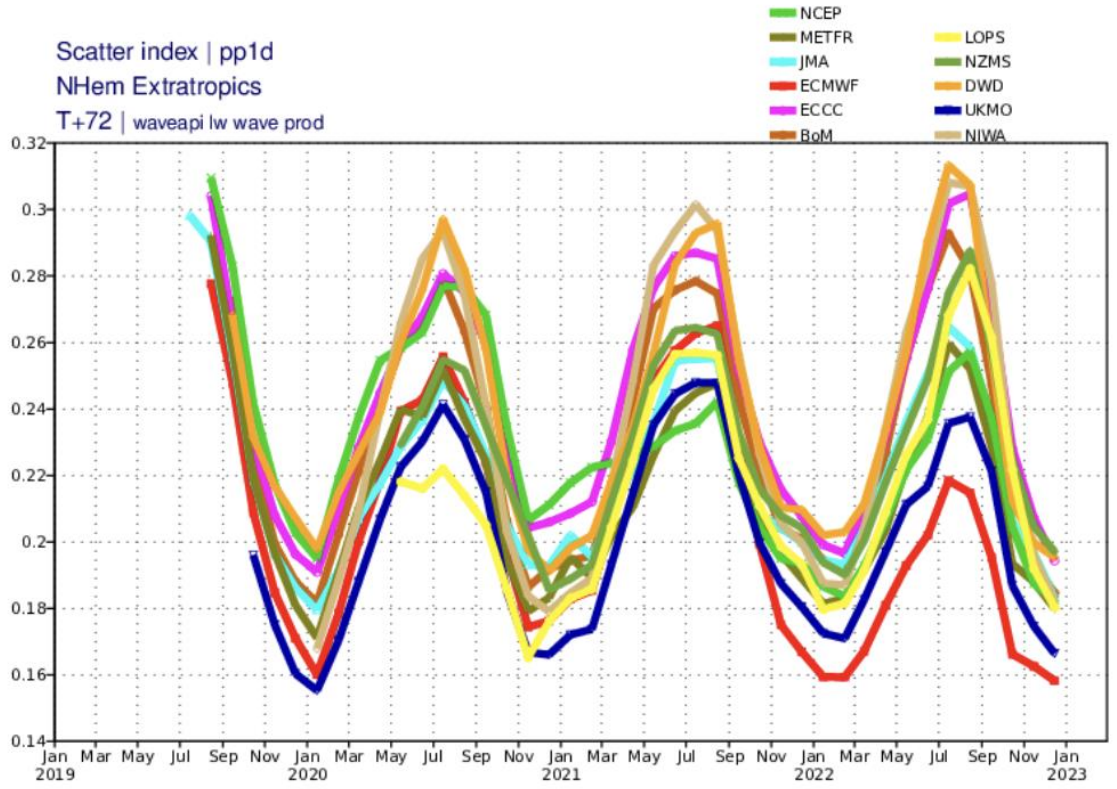


- Smallest TC position errors in the HRES so far
- ENS spread slightly too low (by about 10%)

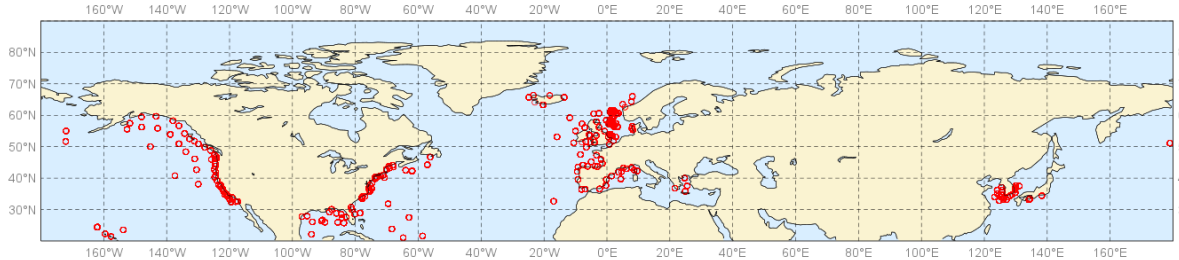
Ocean wave forecast – N. Extratropics

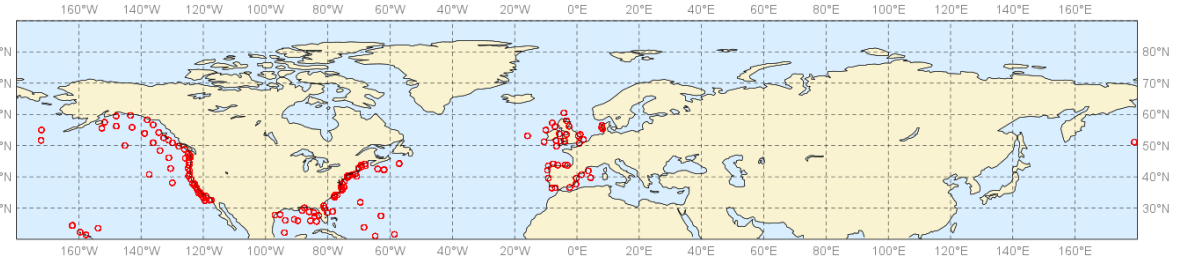


Significant wave height

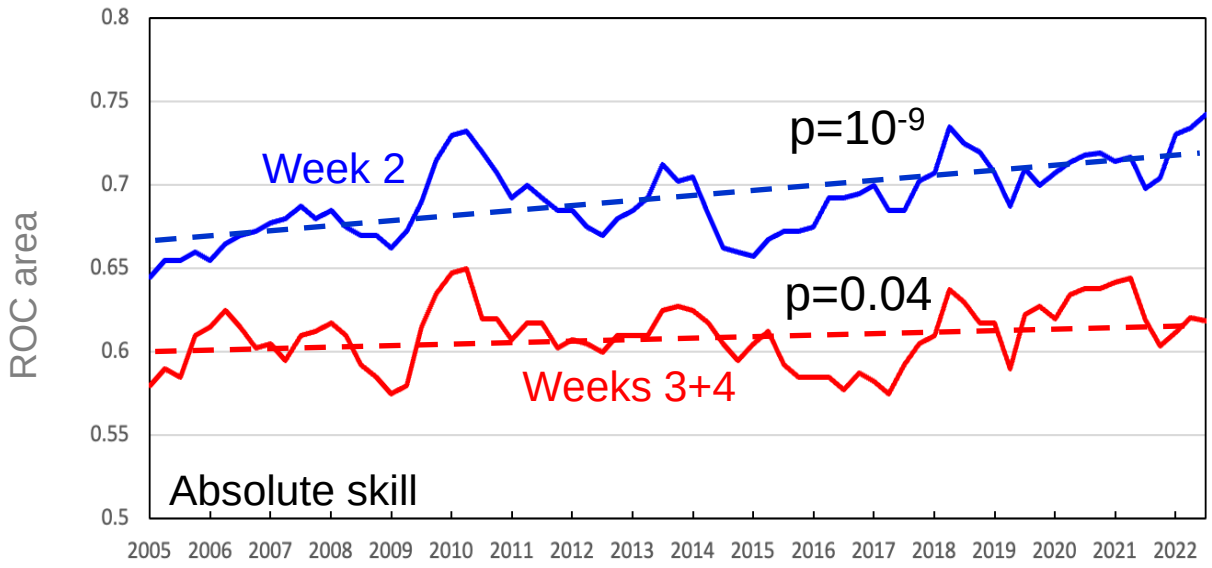


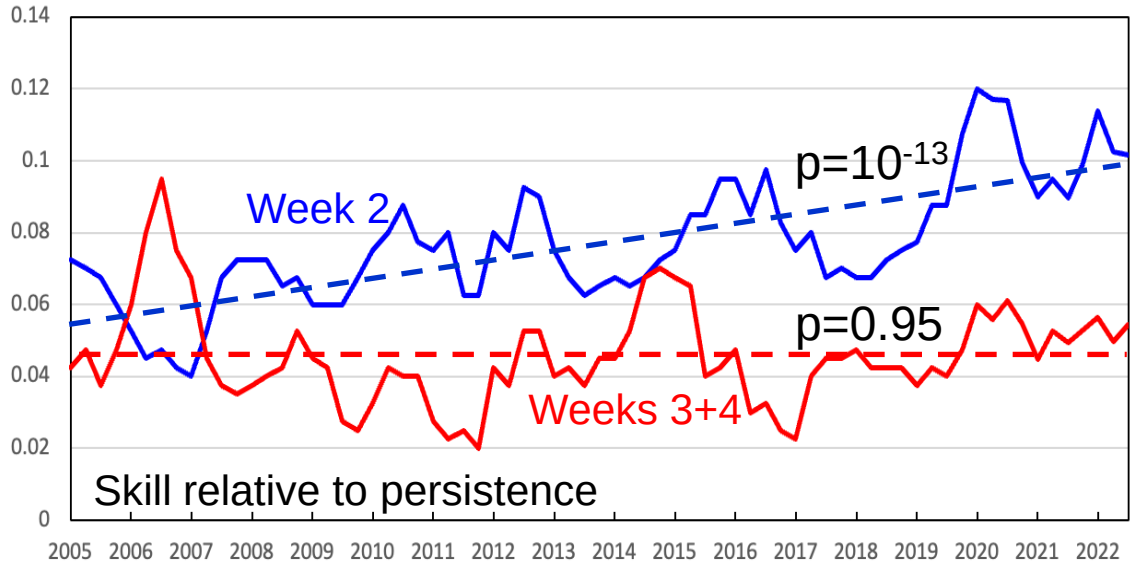
Peak period





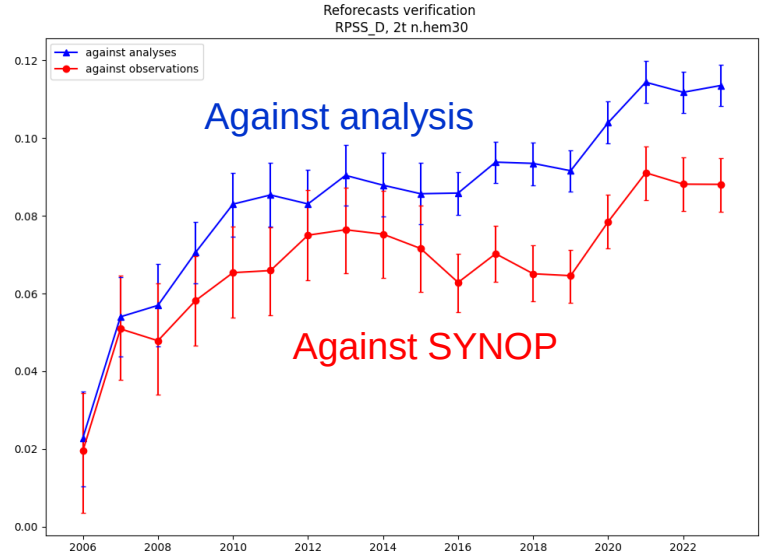
Extended range: T2m ROC area (upper tercile)





Verification of real-time forecasts:

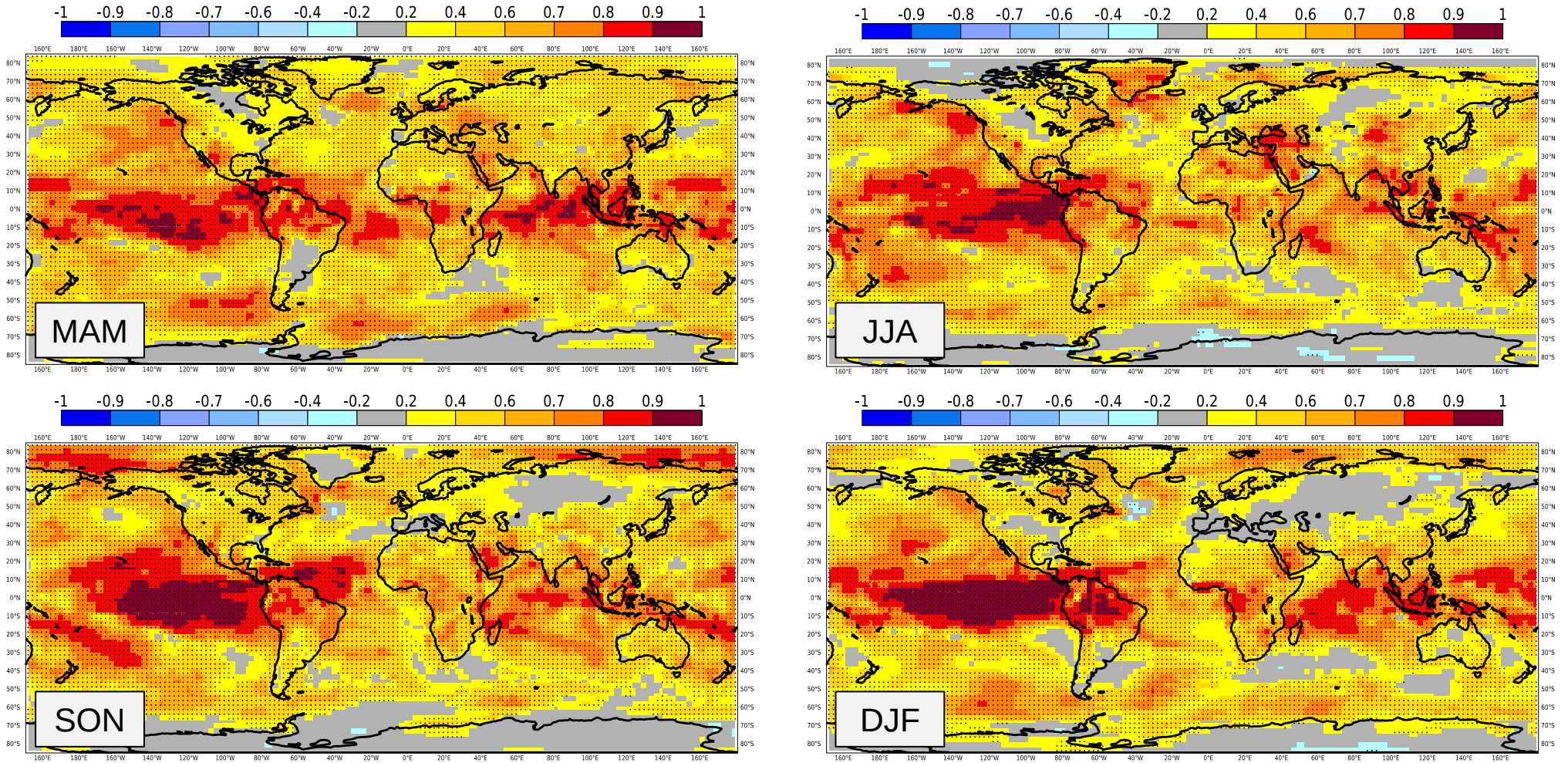
- Improving skill at week 2
- Skill in weeks 3+4 shows no significant trend



Verification of re-forecasts:

- Improving skill at week 3

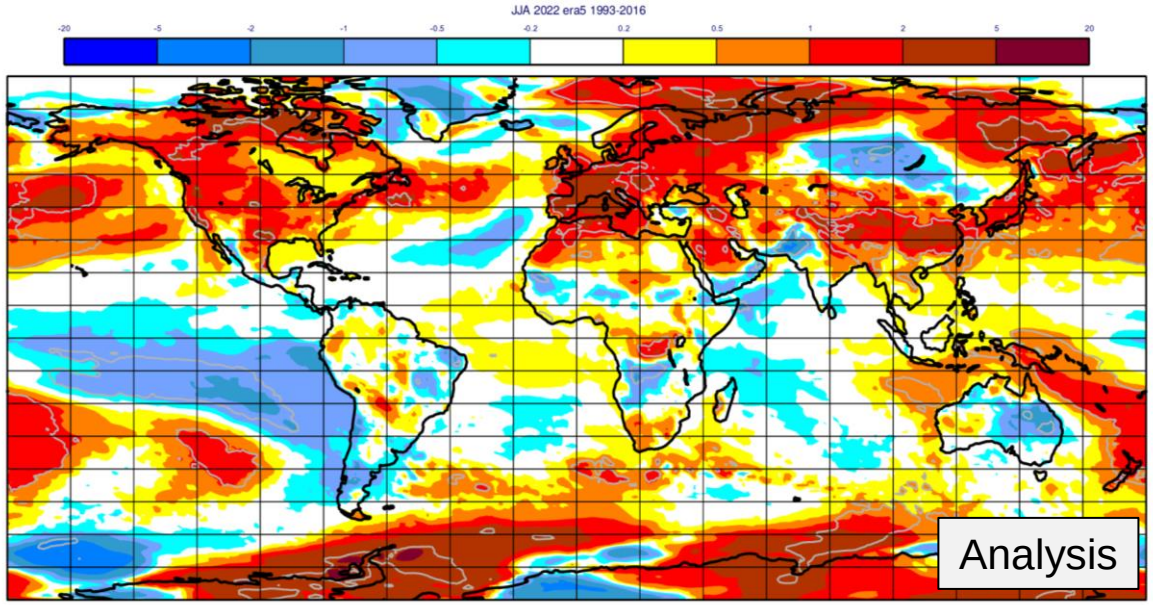
ECMWF 2m temperature long-range forecast skill (SEAS5)

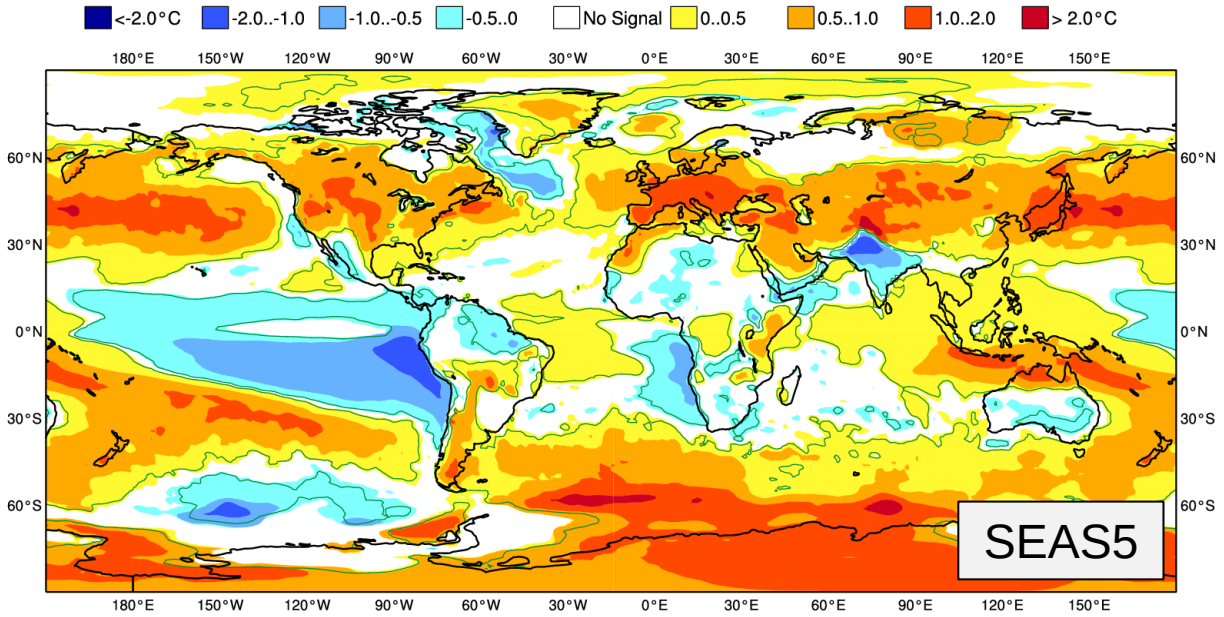


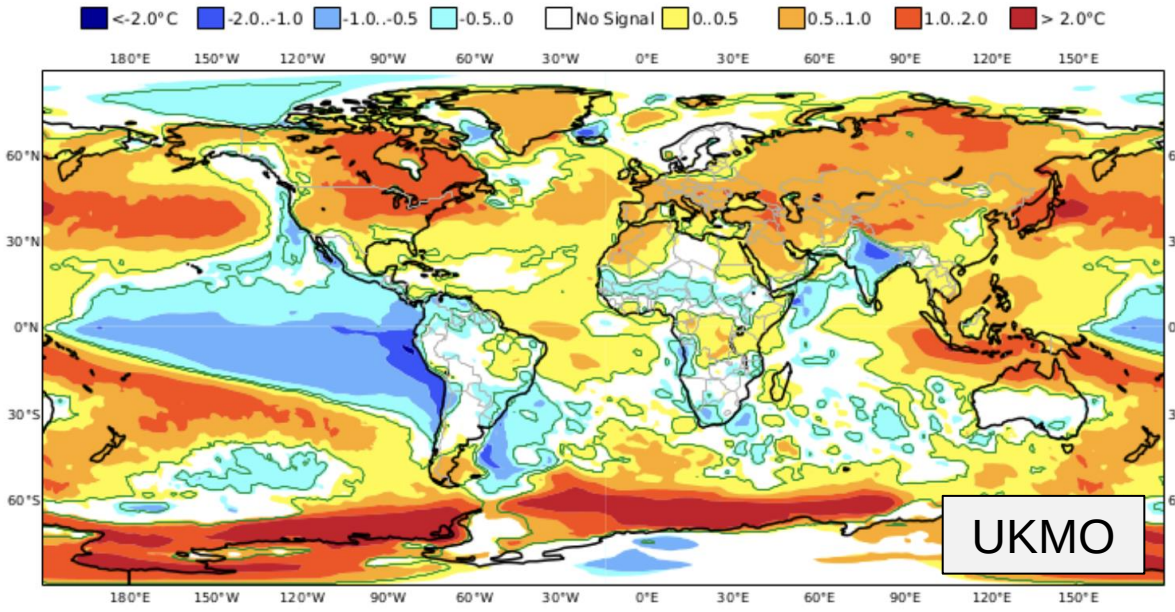
- Score: anomaly correlation of the ensemble mean
- Period: 1981-2016 hindcasts (25 members)
- Lead time: months 2-4

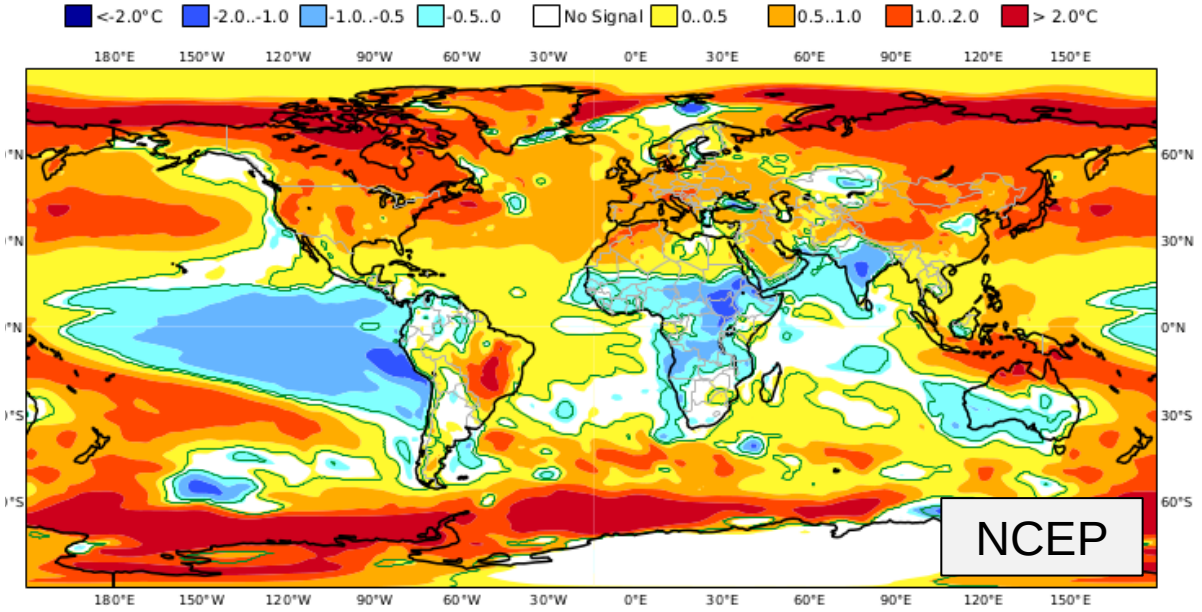
T2m anomalies JJA 2022

relative to 1993-2016

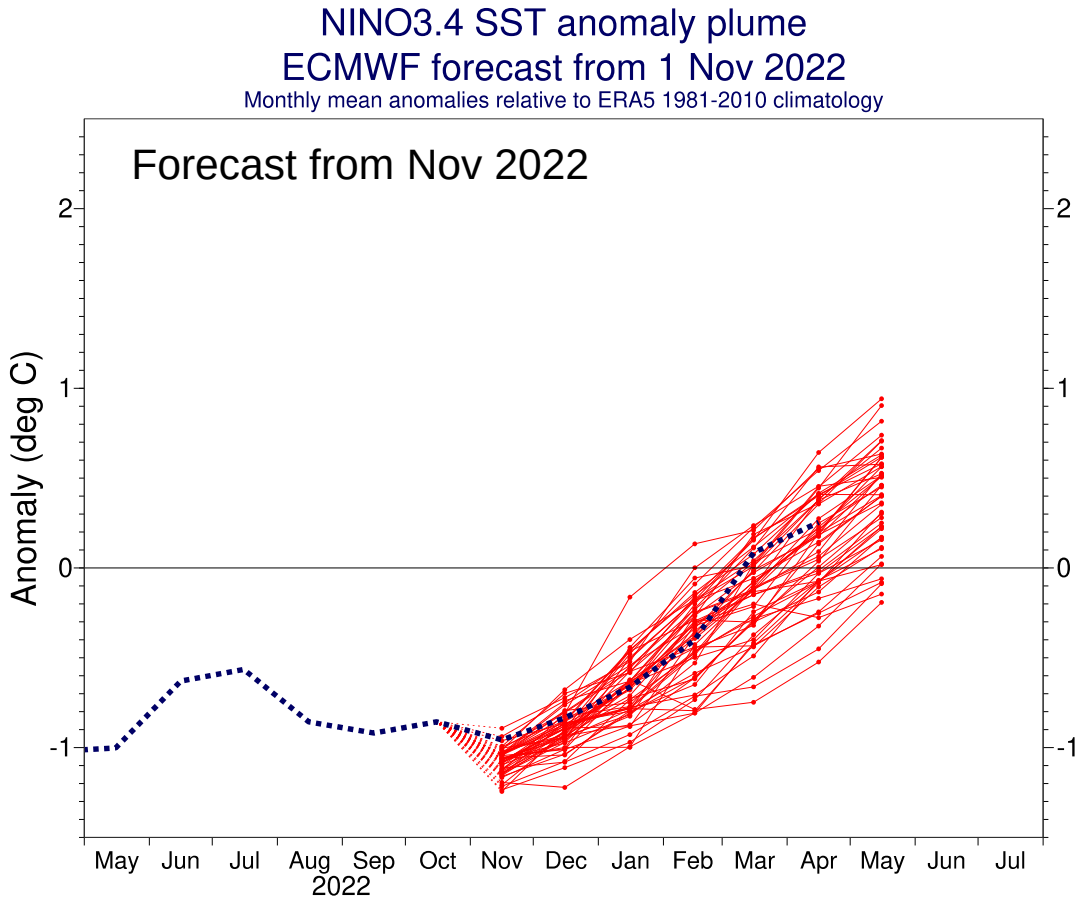


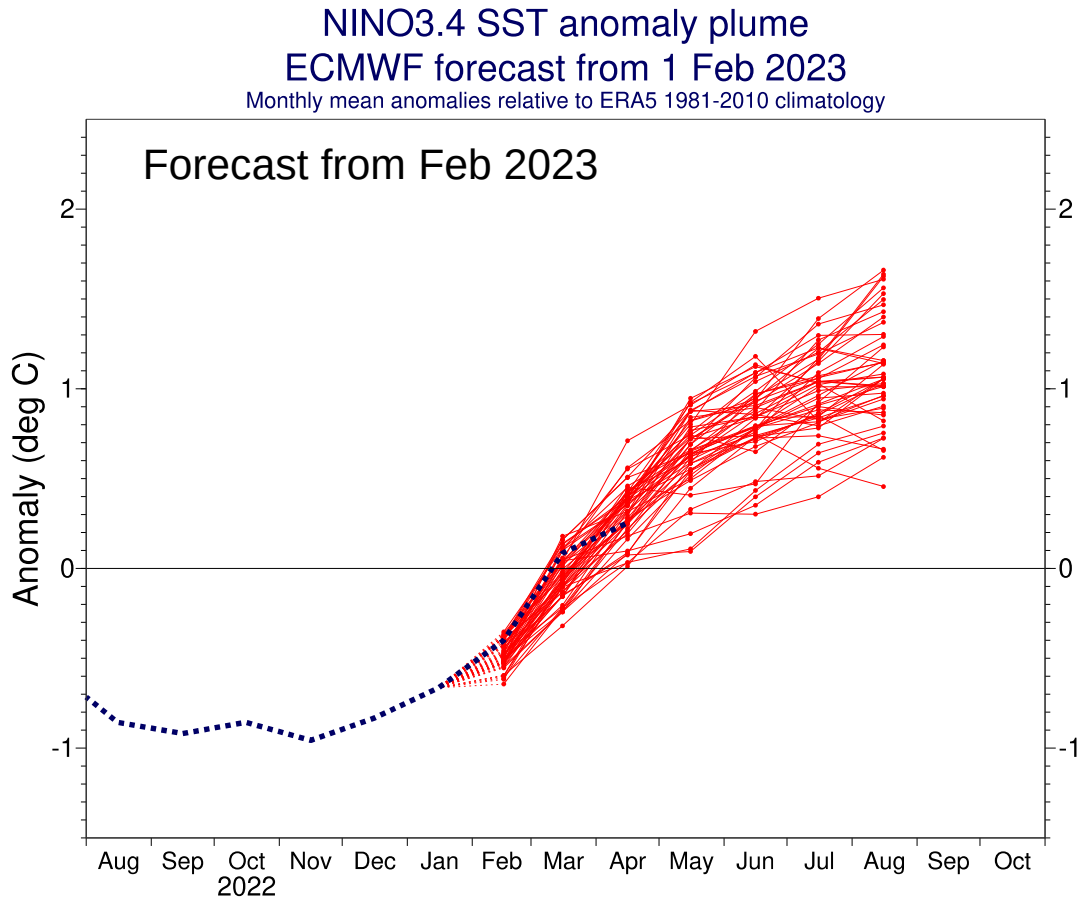






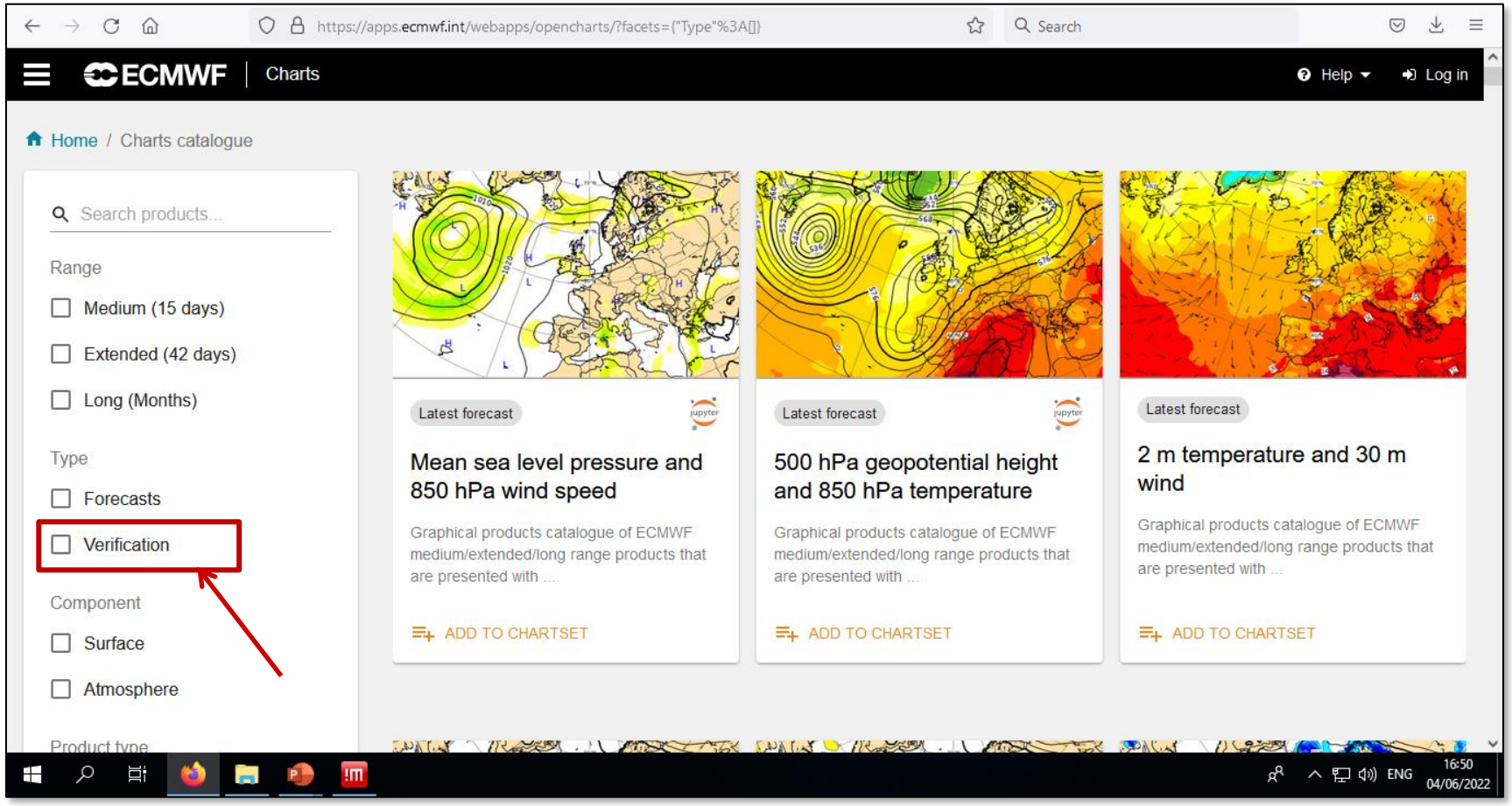
El Nino forecast

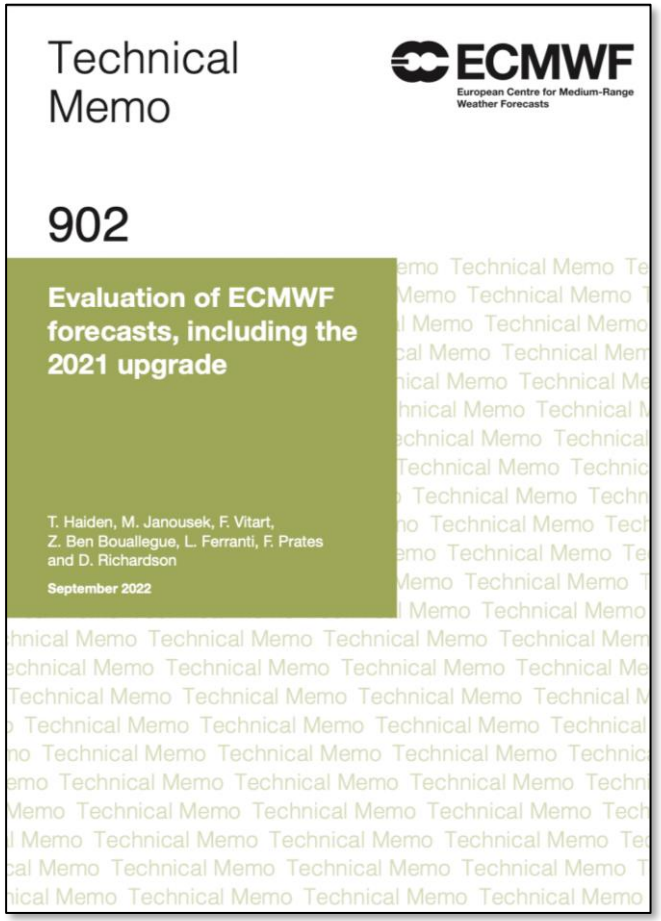




- Transition from La Nina to El Nino well predicted
- Correct timing and good ensemble sharpness
- Earlier in 2022, transition was predicted to happen too soon

More verification results





WMO Lead Centre for Deterministic NWP Verification (LC-DNV)

WMO Lead Centre for Wave Forecast Verification (LC-WFV)