Deterministic (HRES) and ensemble (ENS) verification scores

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ECMWF

European Centre for Medium Range Weather Forecasts

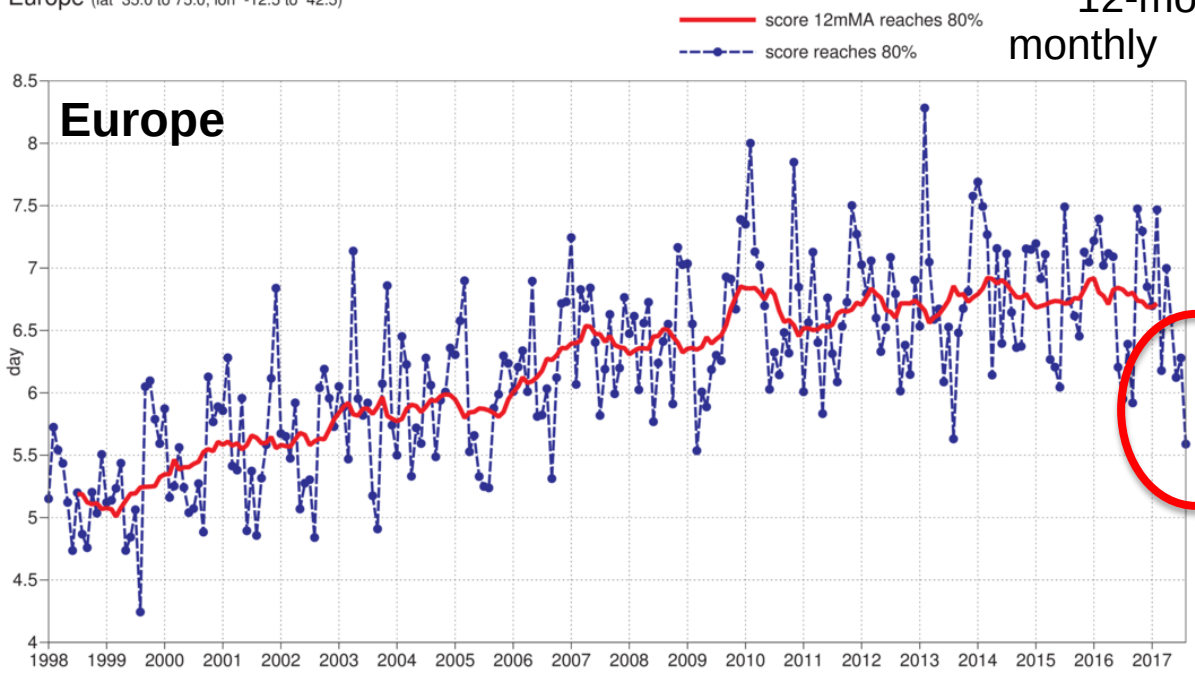
Outline

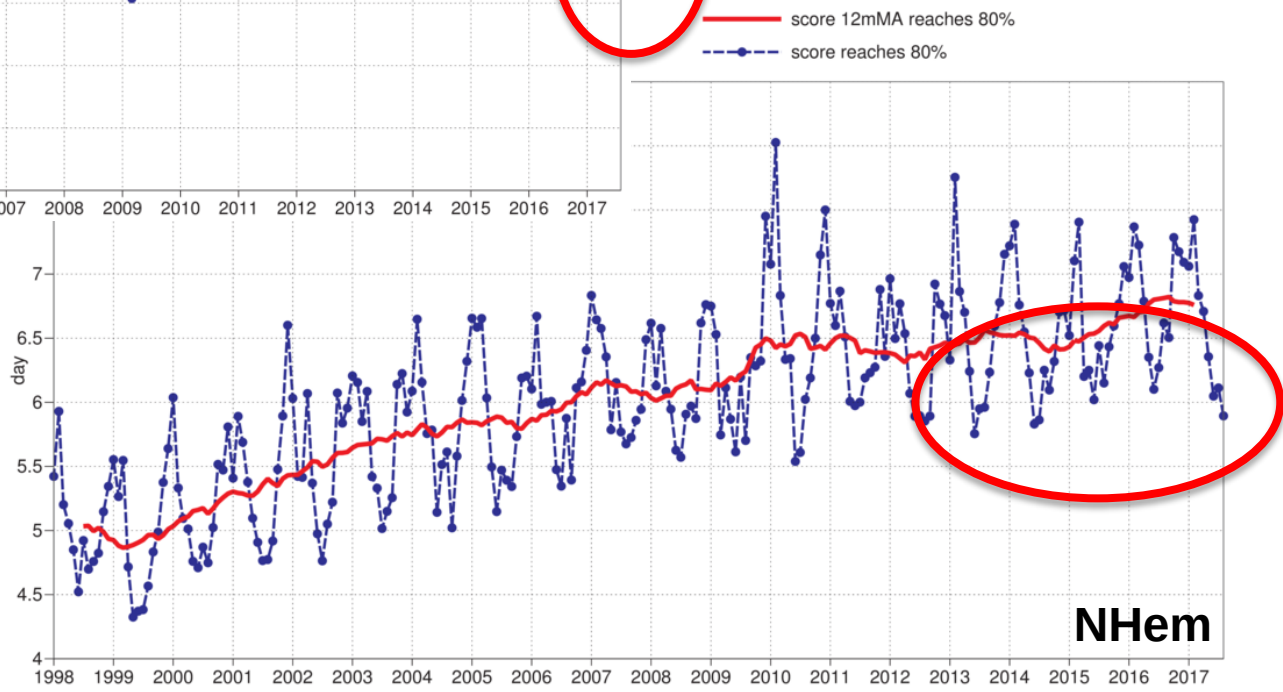
- Global HRES(deterministic) and ENS (ensemble) scores evolution between 1998 – 2017
- YOPP 2017 – Arctic and Antarctic
- SEEPS precipitation score decomposition
- Reminder on ECMWF WMO Lead Centre activities for Deterministic Forecast NWP Verification (WMO-LCDNV: http://apps.ecmwf.int/wmolcdnv/)

HRES - Headline score Z500 Europe, time series of acc=0.8

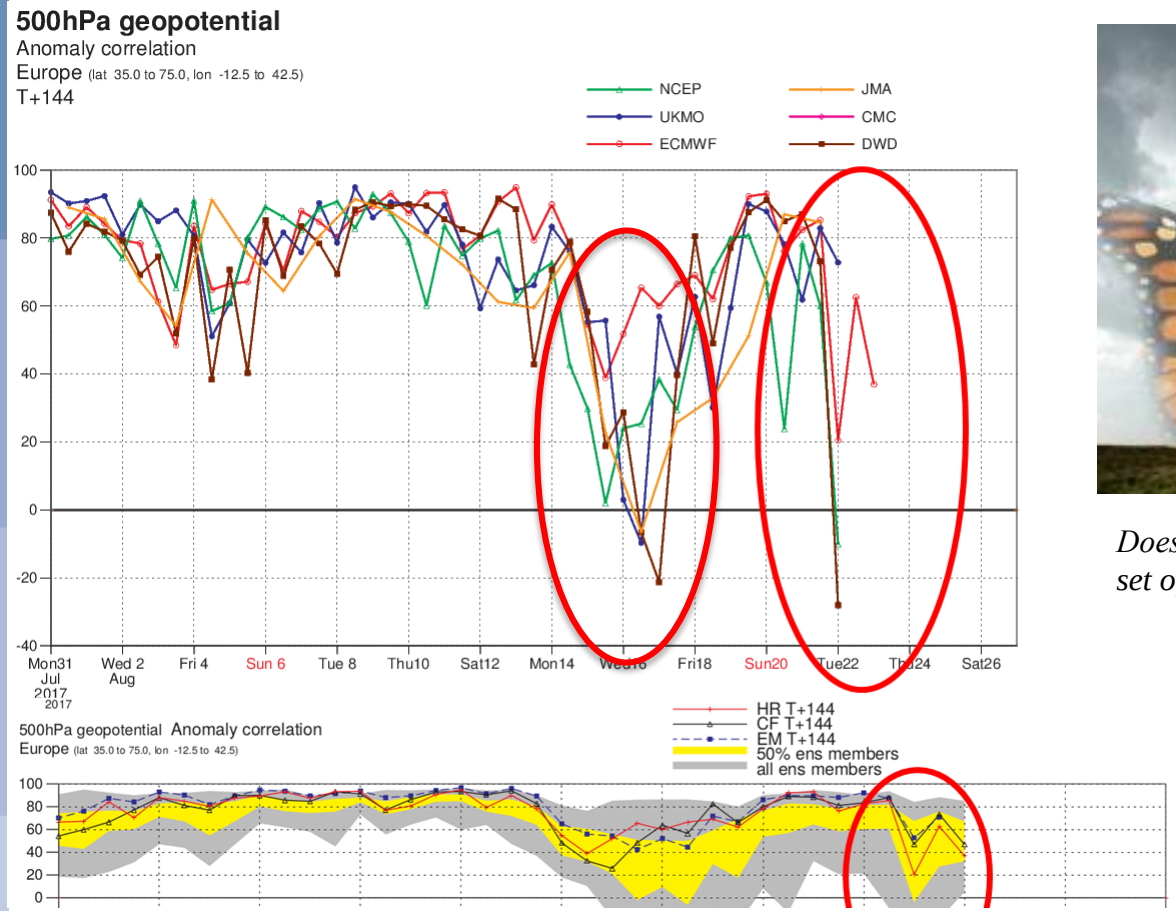
500hPa geopotential
Lead time of Anomaly correlation reaching 80%
Europe (lat 35.0 to 75.0, lon -12.5 to 42.5)

12-month running mean
monthly





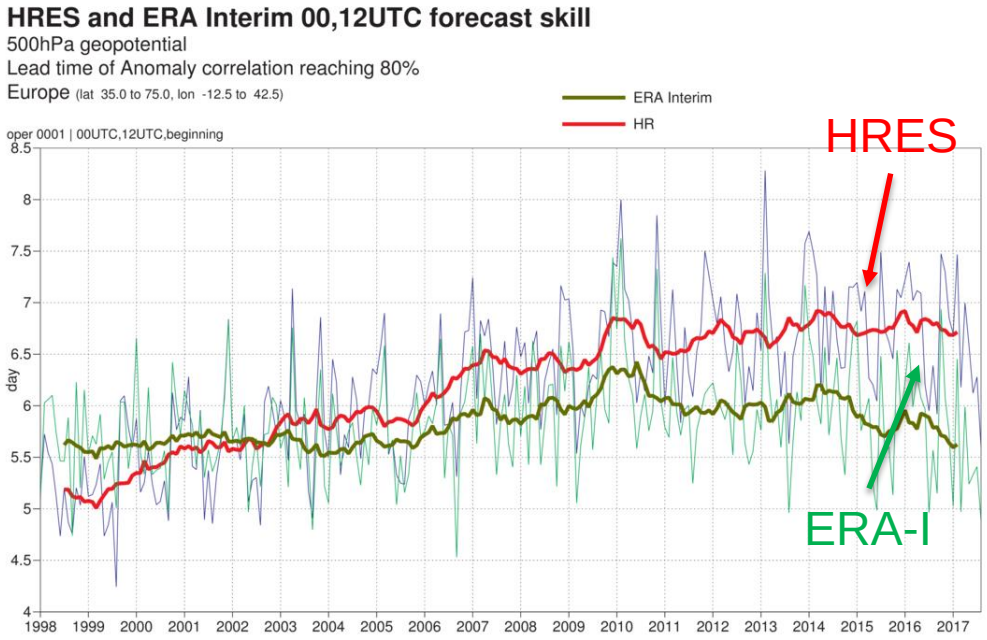
Forecast busts over Europe – related to hurricane activity ?

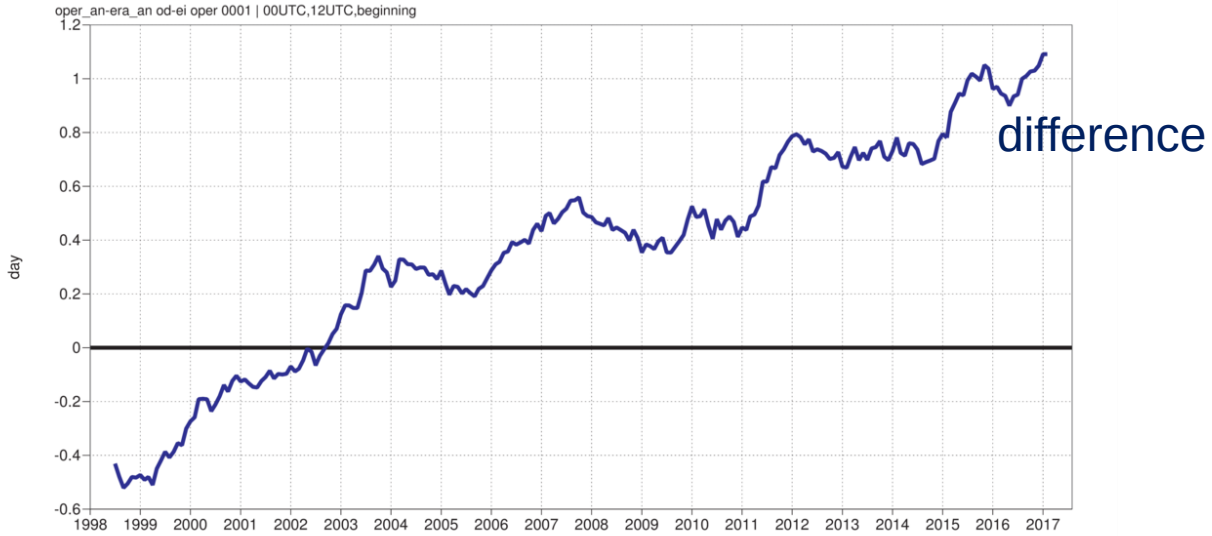


Does the Flap of a Butterfly's Wings in Brazil set off a Tornado in Texas? (Ed Lorenz, 1972)

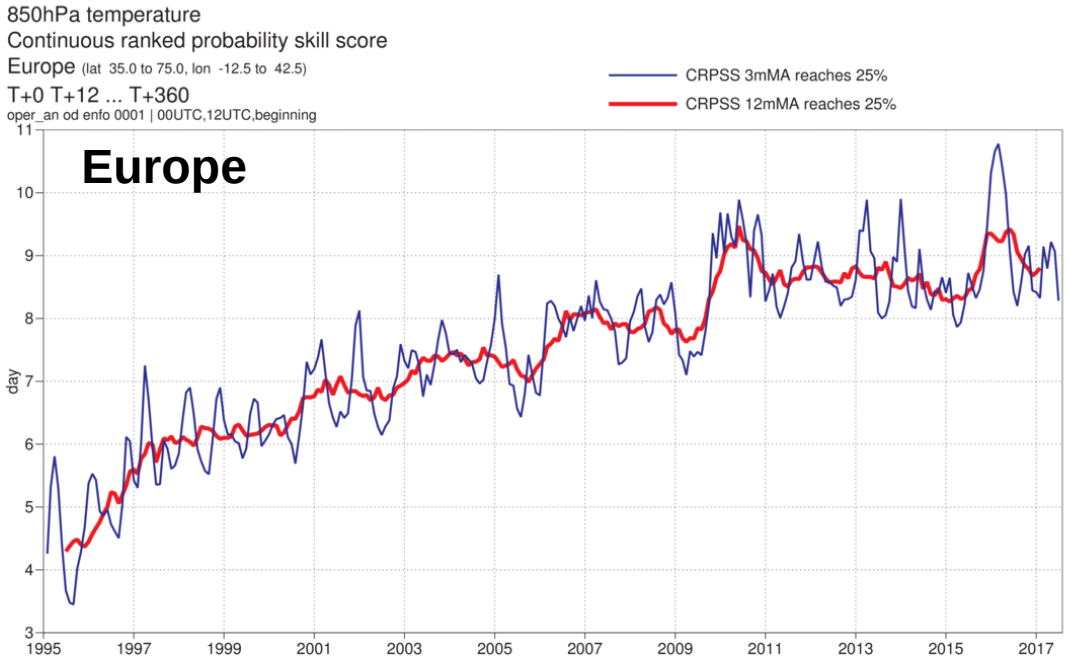
Perhaps, but a hurricane in Texas may set off an uncertain weather forecast for Europe 6 days later …

HRES verification against ERA-I Z500 time series of acc=0.8

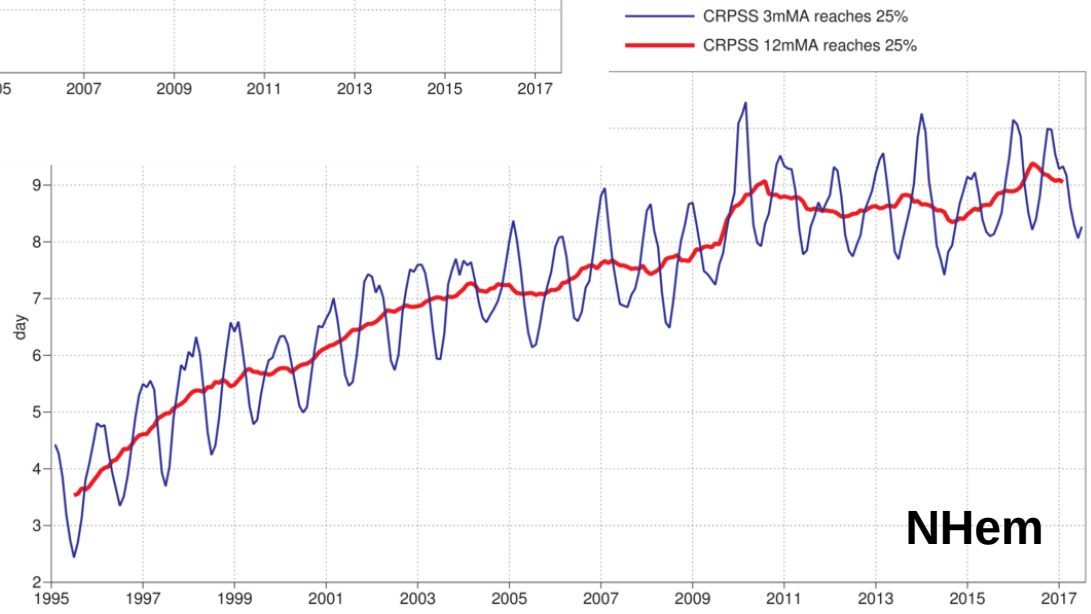




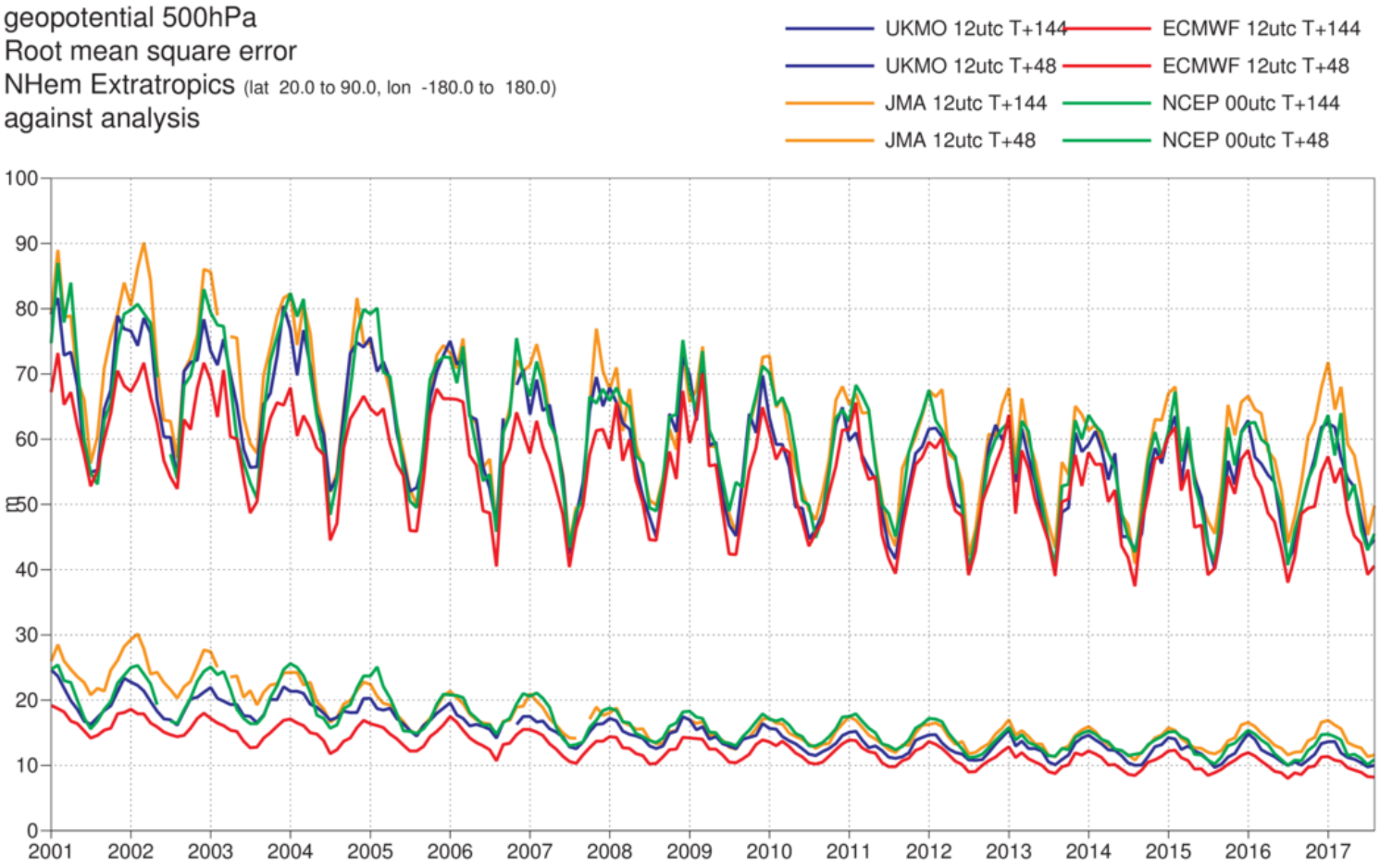
ENS - Headline probabilistic score, CRPSS, T850 Europe



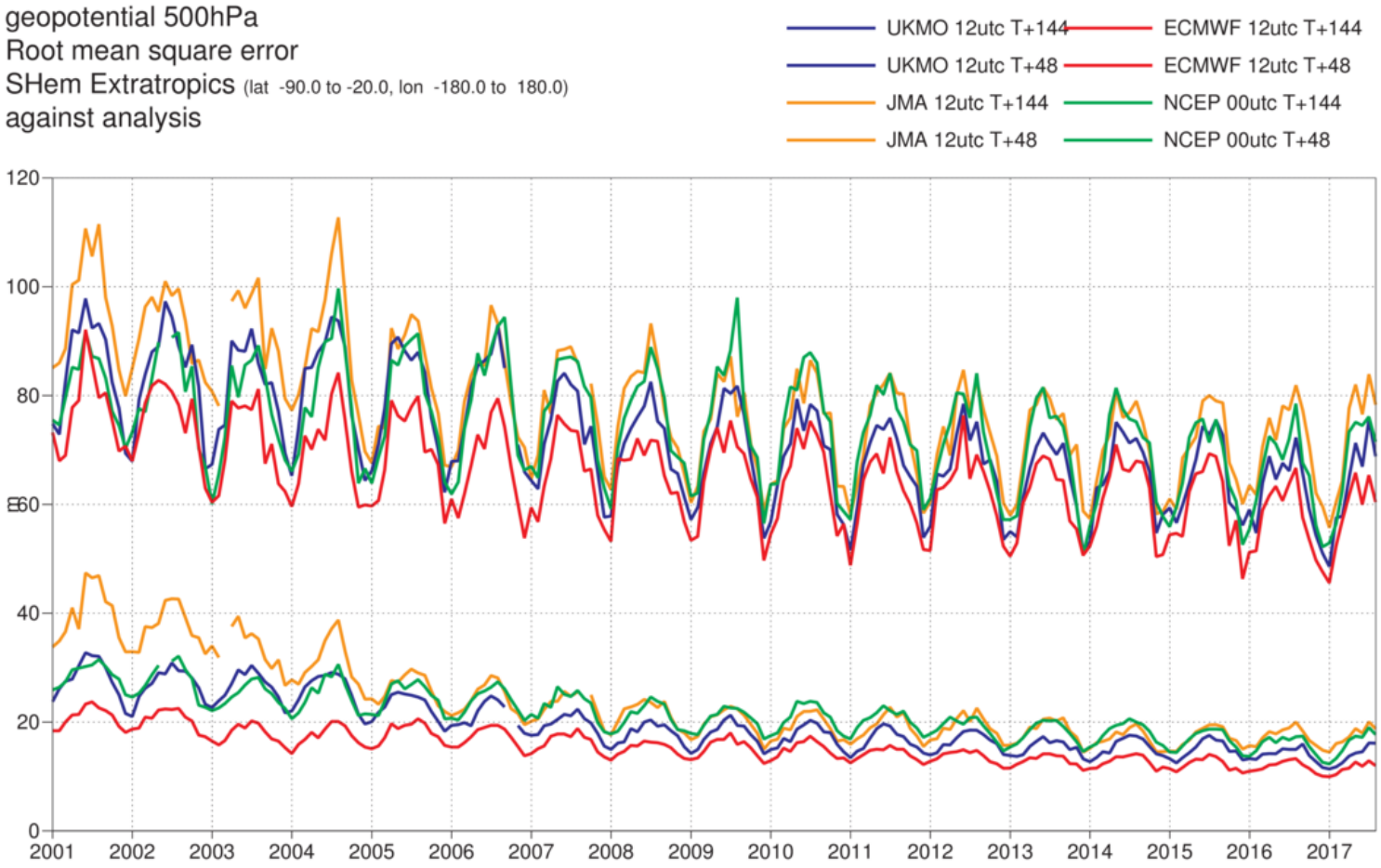
Day at which skill score reaches 25%



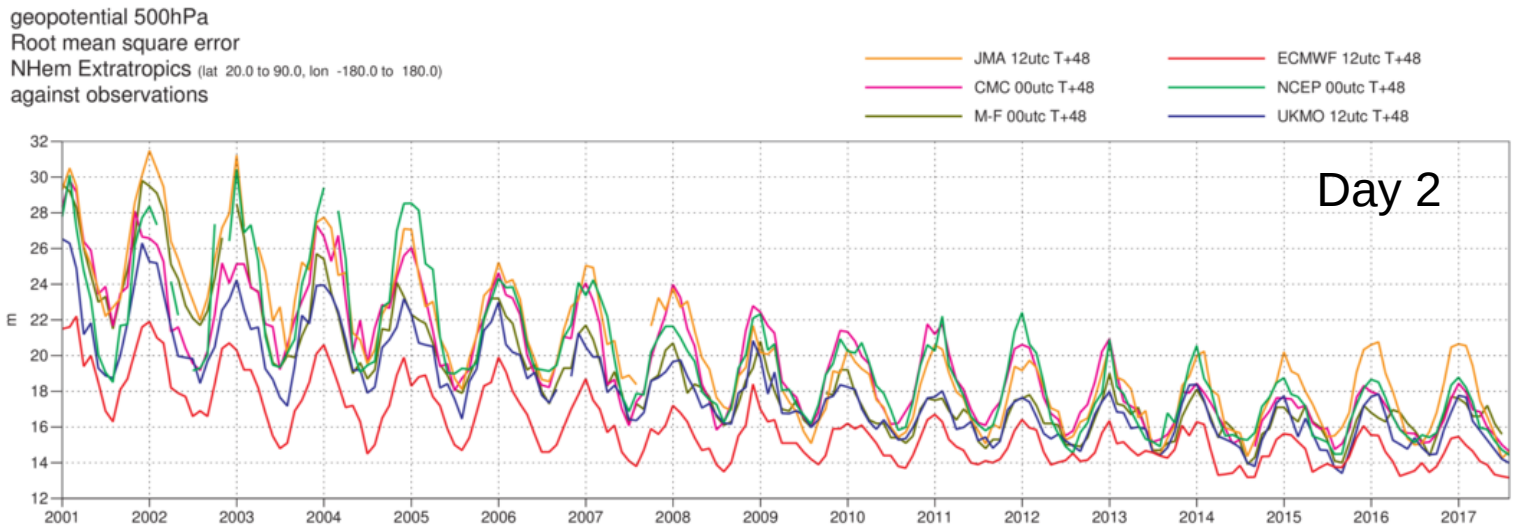
HRES - WMO scores Z500 NHem

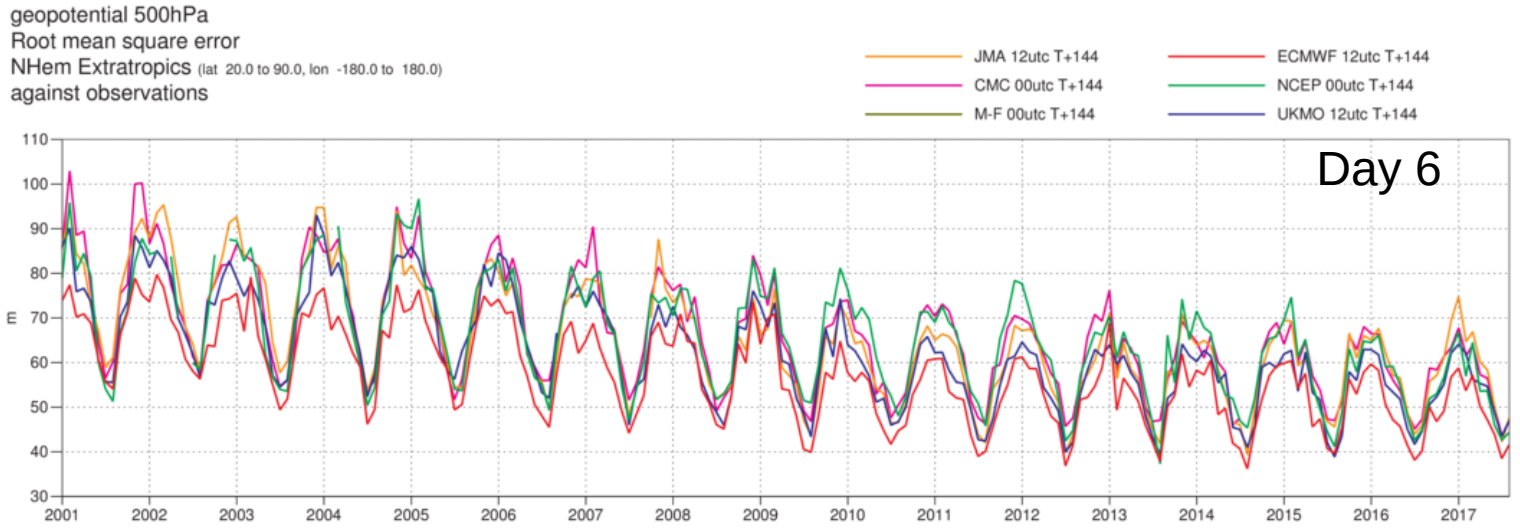


HRES - WMO scores Z500 SHem



HRES - verification against observations, Z500, NHem





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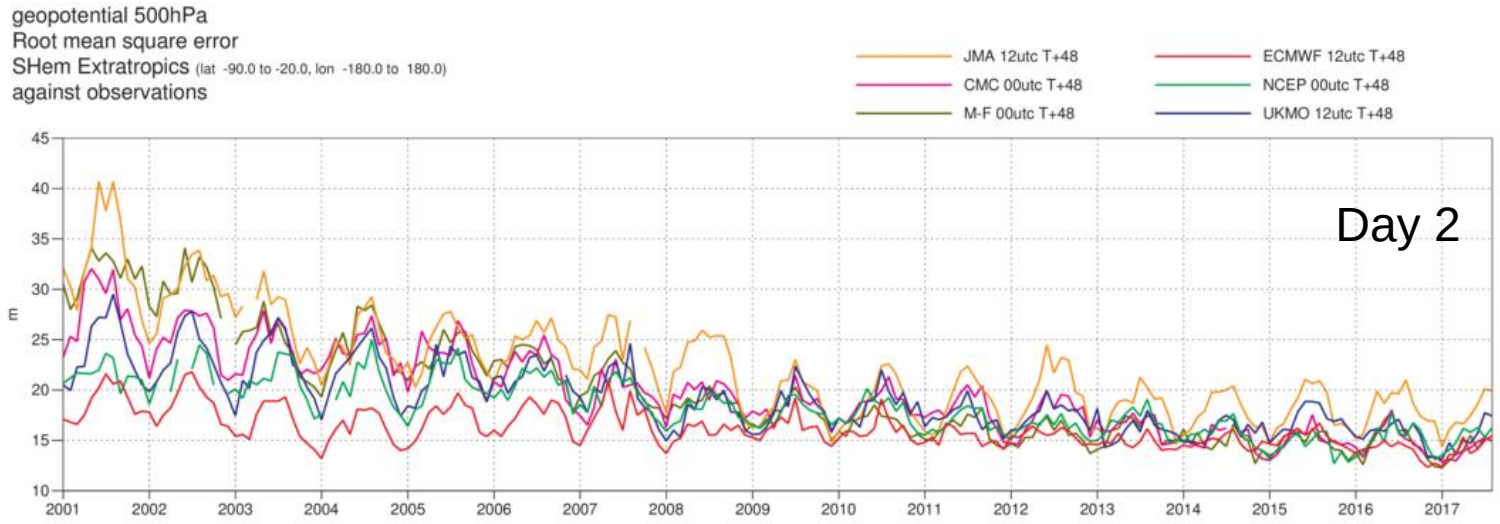
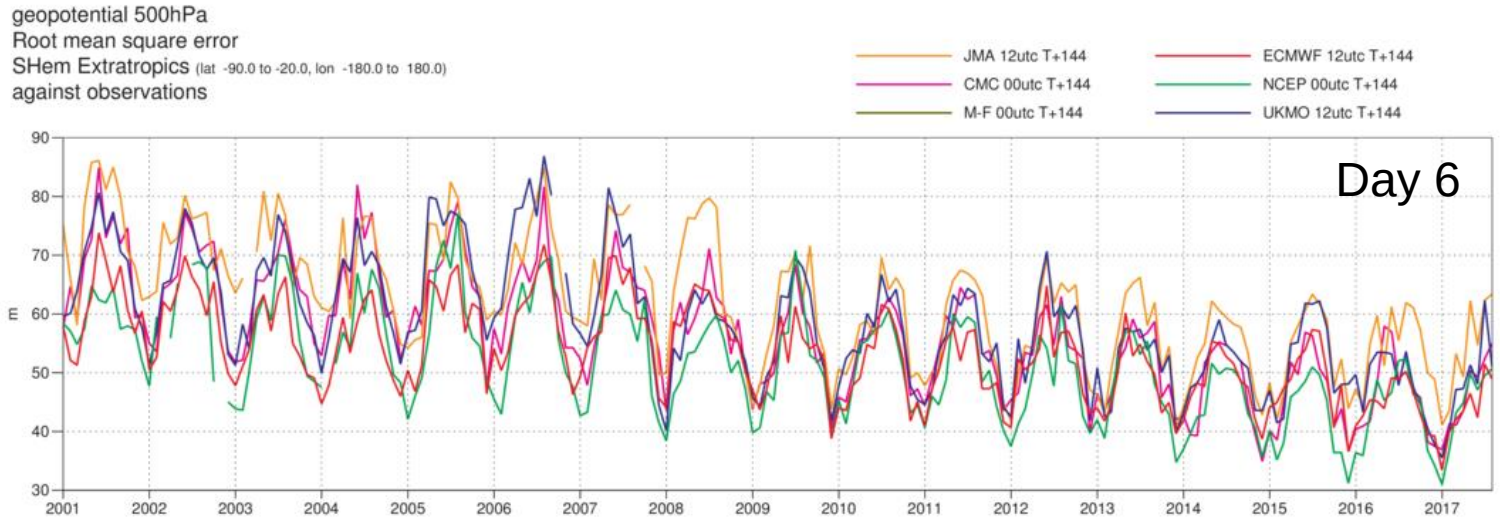
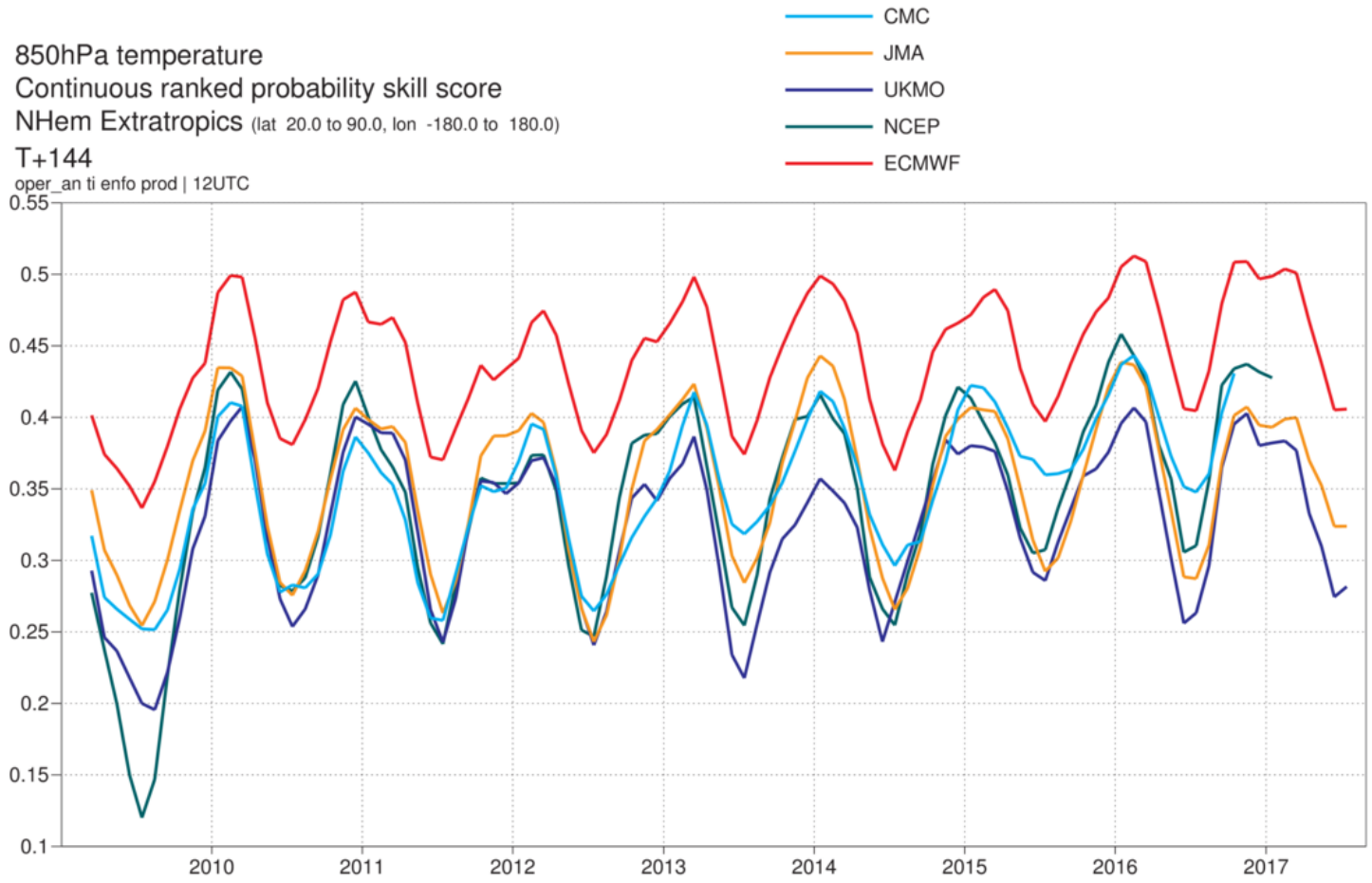
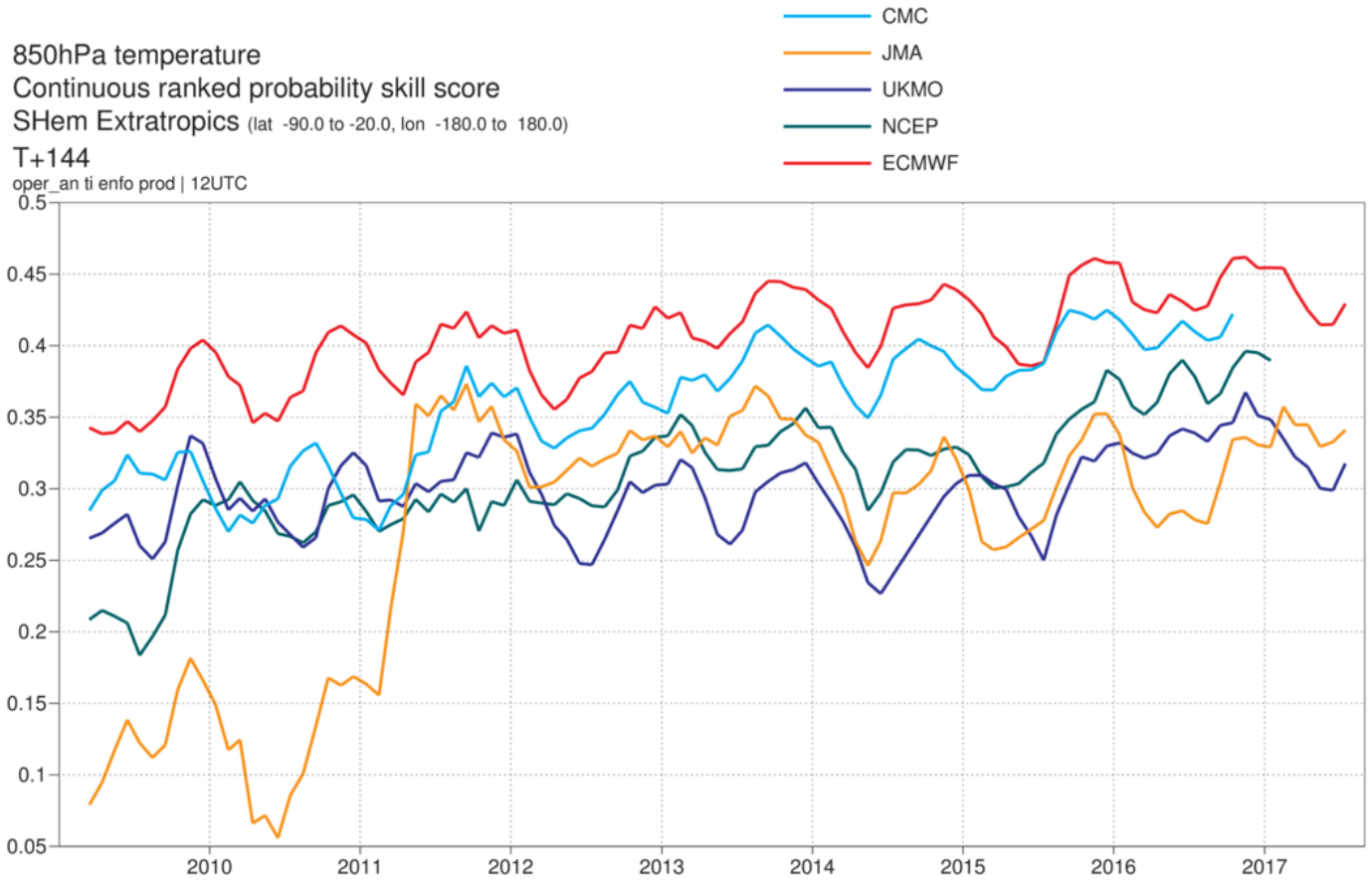




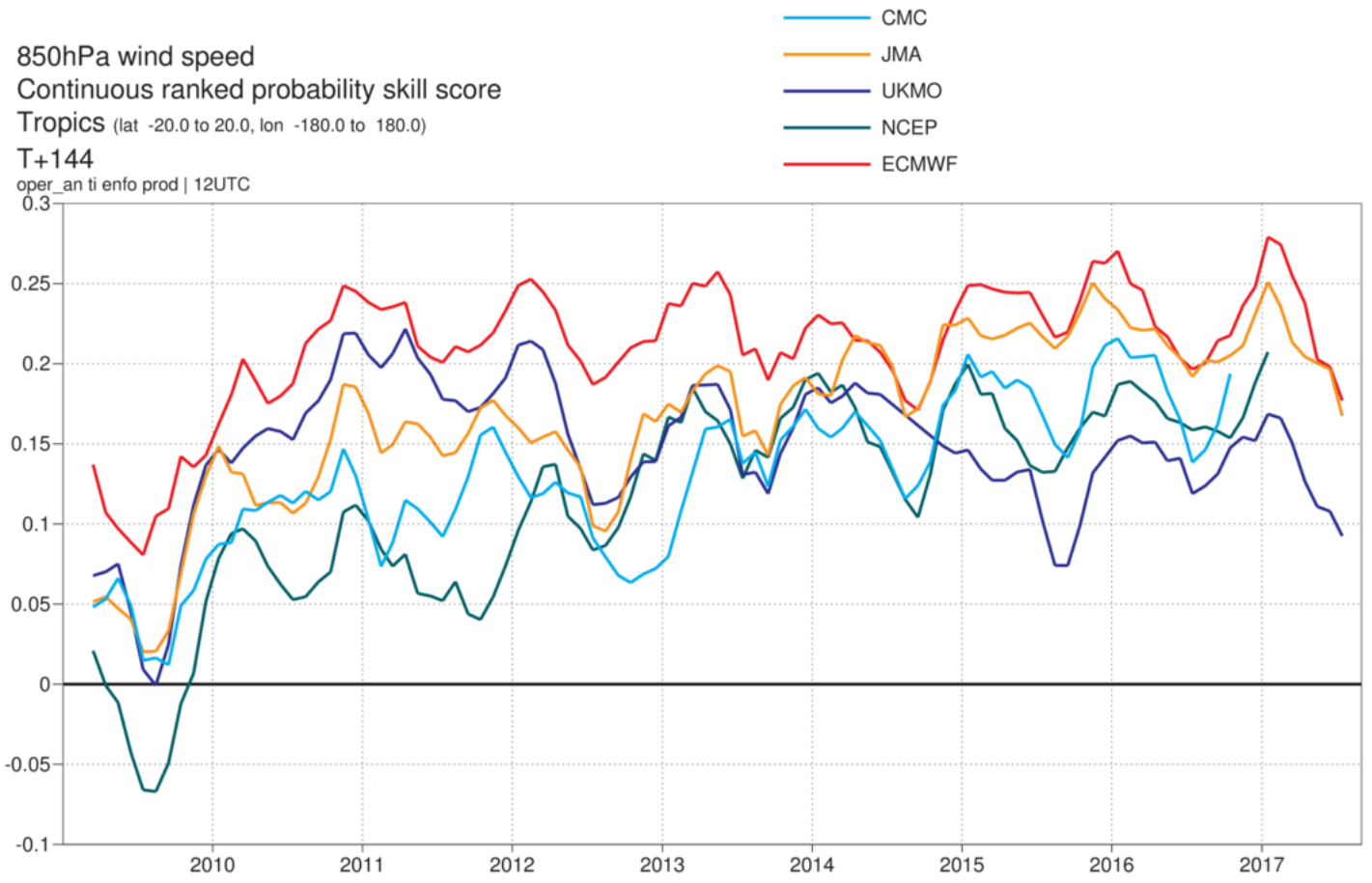
ENS - CRPSS, T850, NHem, day 6



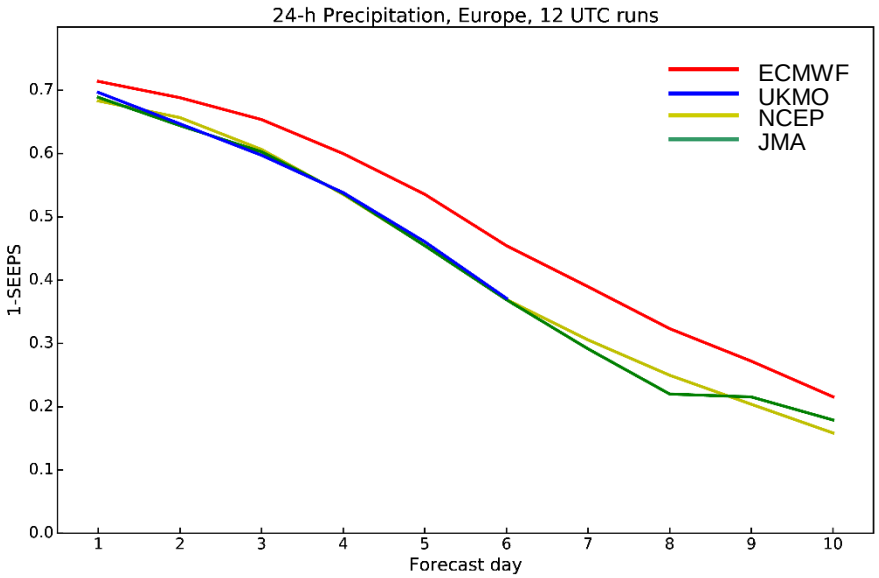
ENS - CRPSS, T850, SHem, day 6



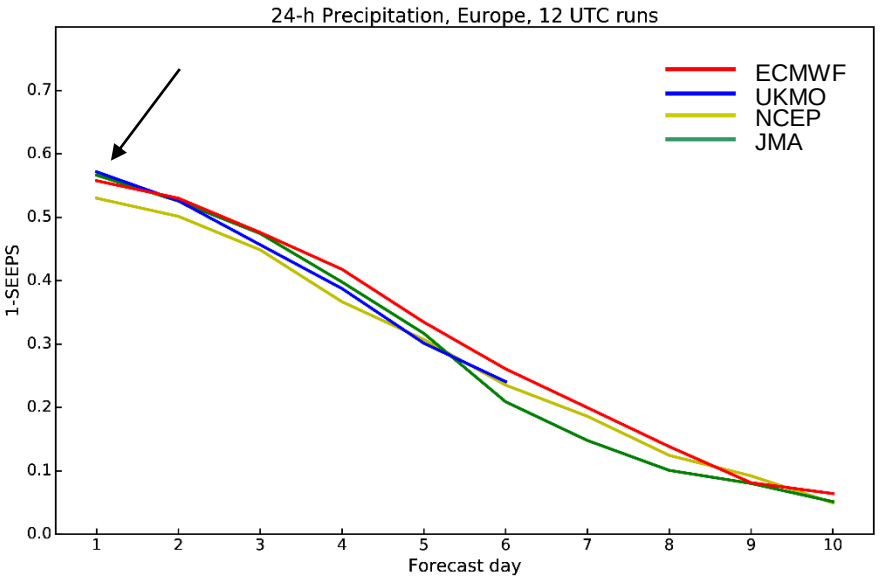
ENS - CRPSS, T850, Tropics, day 6



Precipitation: low skill compared to others at day 1 in summer



DJF 2016-17



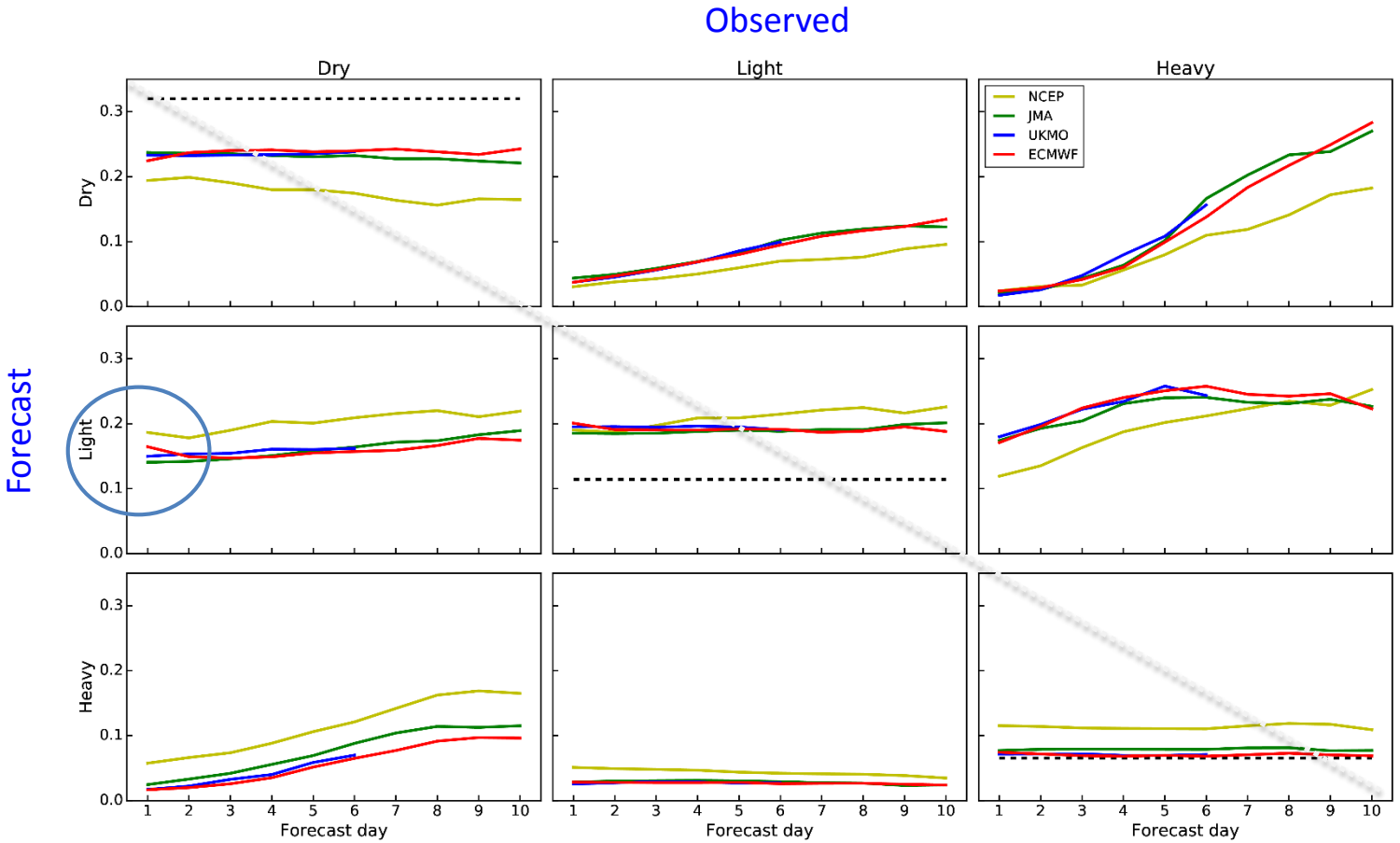
JJA 2017

Europe

ECMWF

Europe

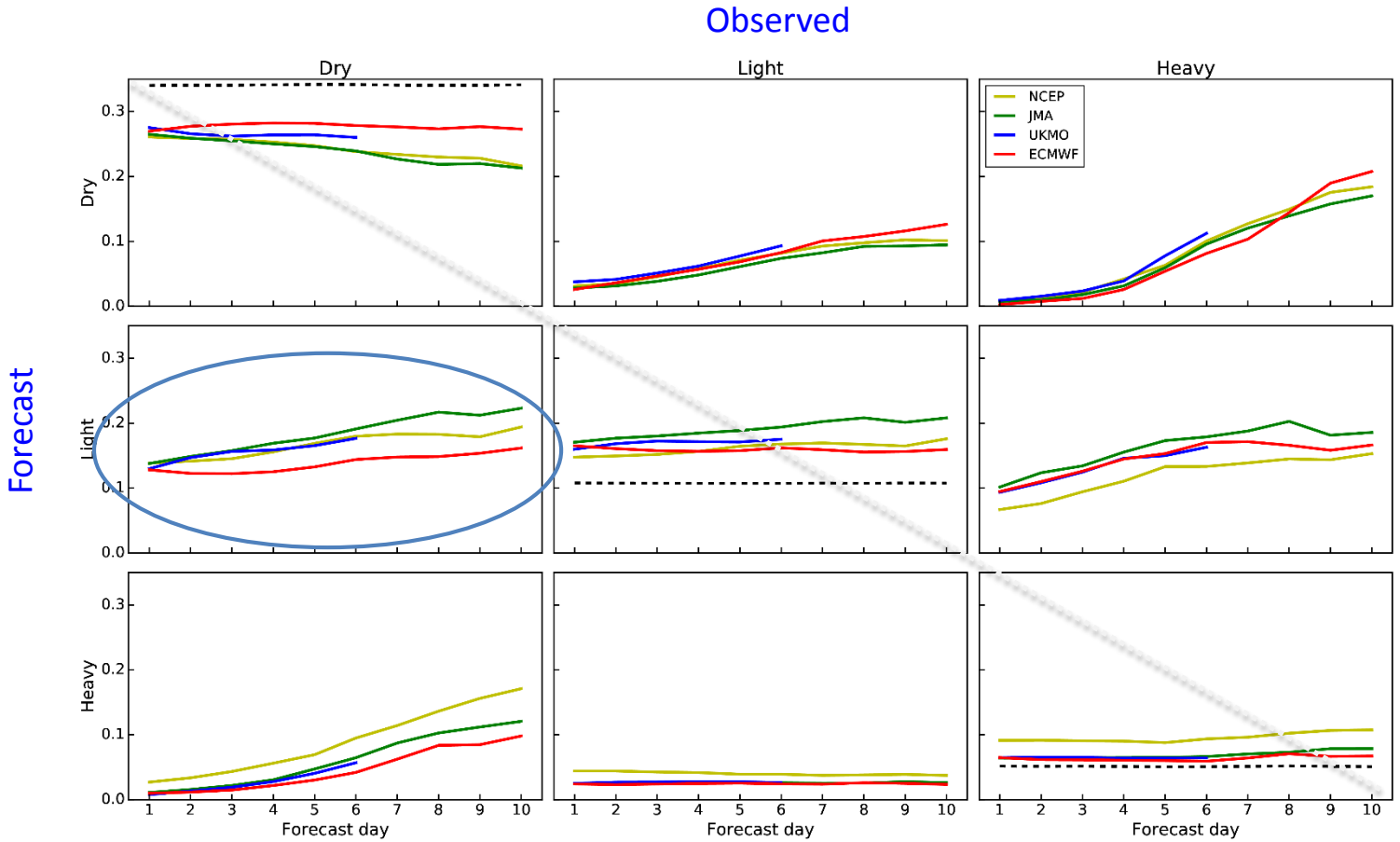
SEEPS decomposition - summer



ECMWF

Europe

SEEPS decomposition - winter



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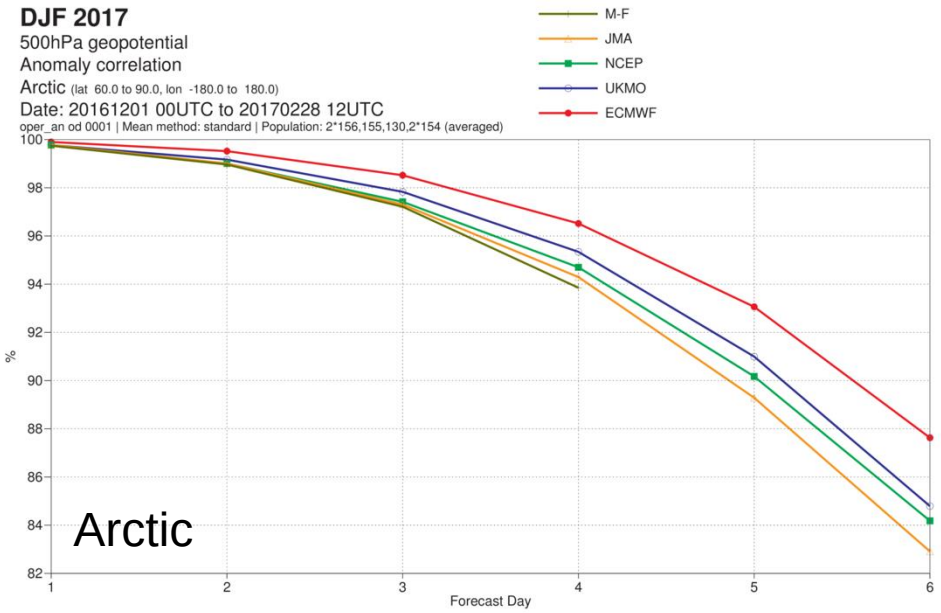
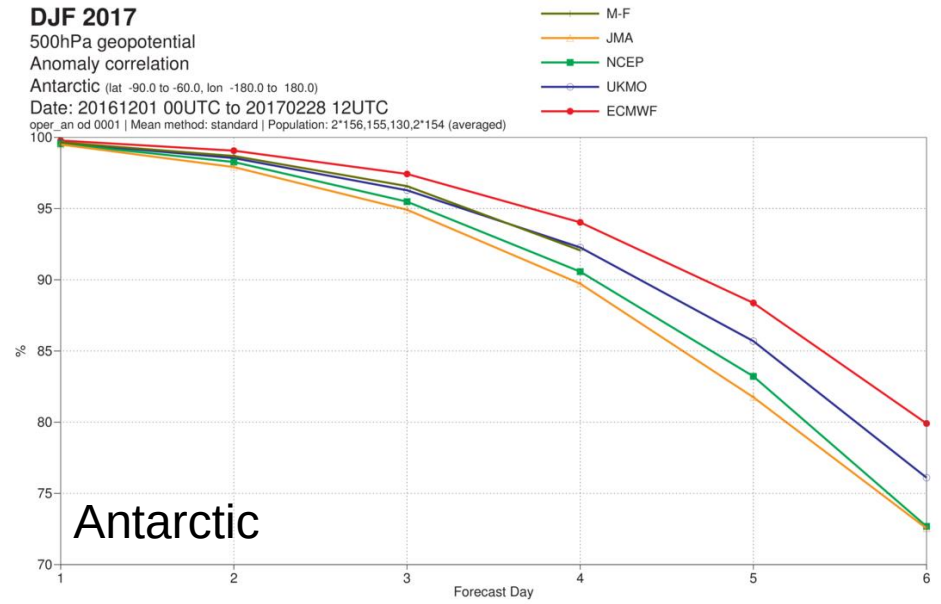
Year Of Polar Prediction

DJF 2017





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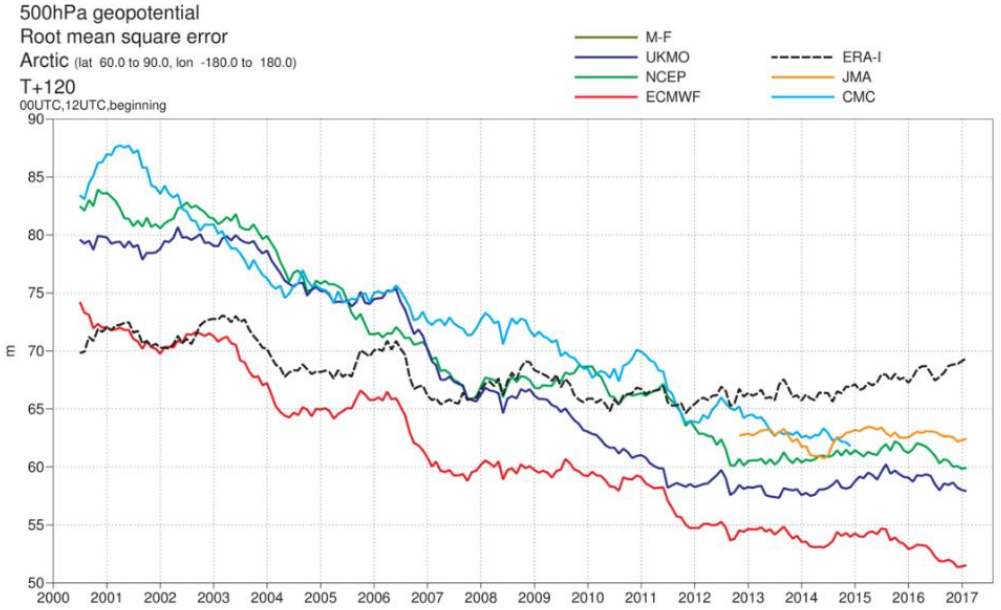
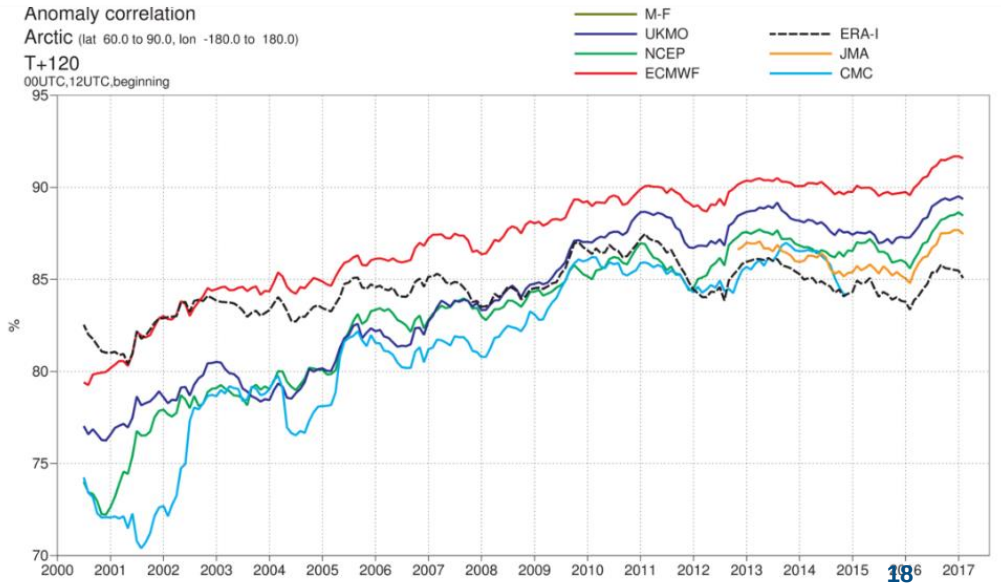
Year Of Polar Prediction
Arctic scores

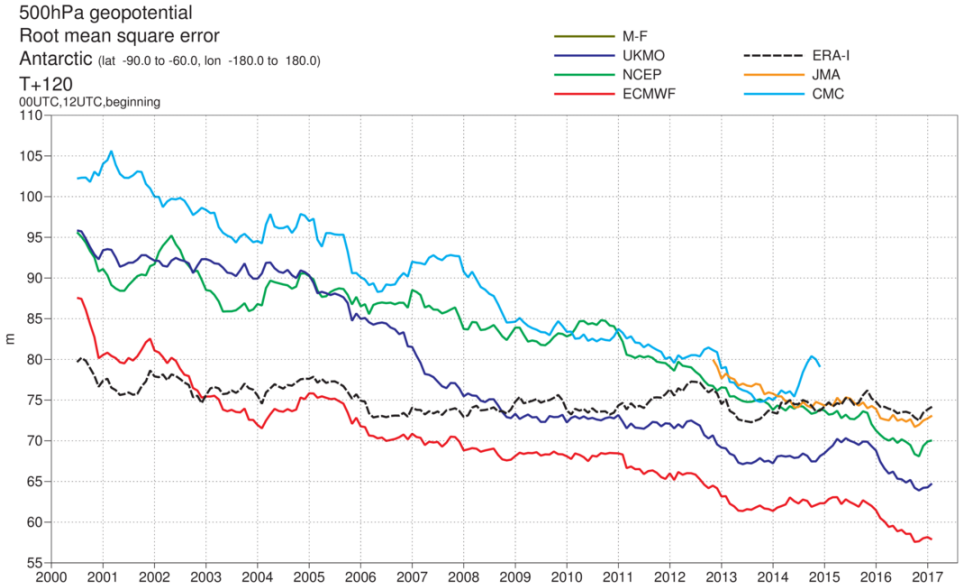
Day 5

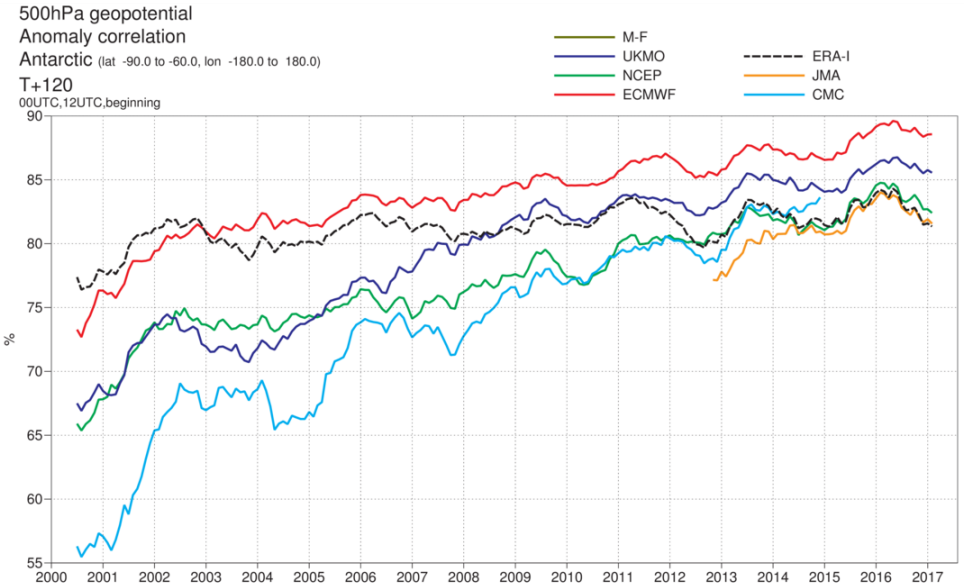




Year Of Polar Prediction
Antarctic scores

Day 5





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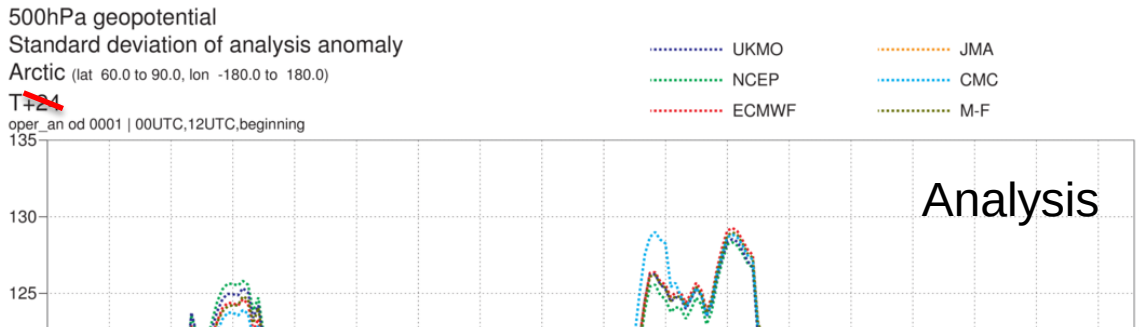
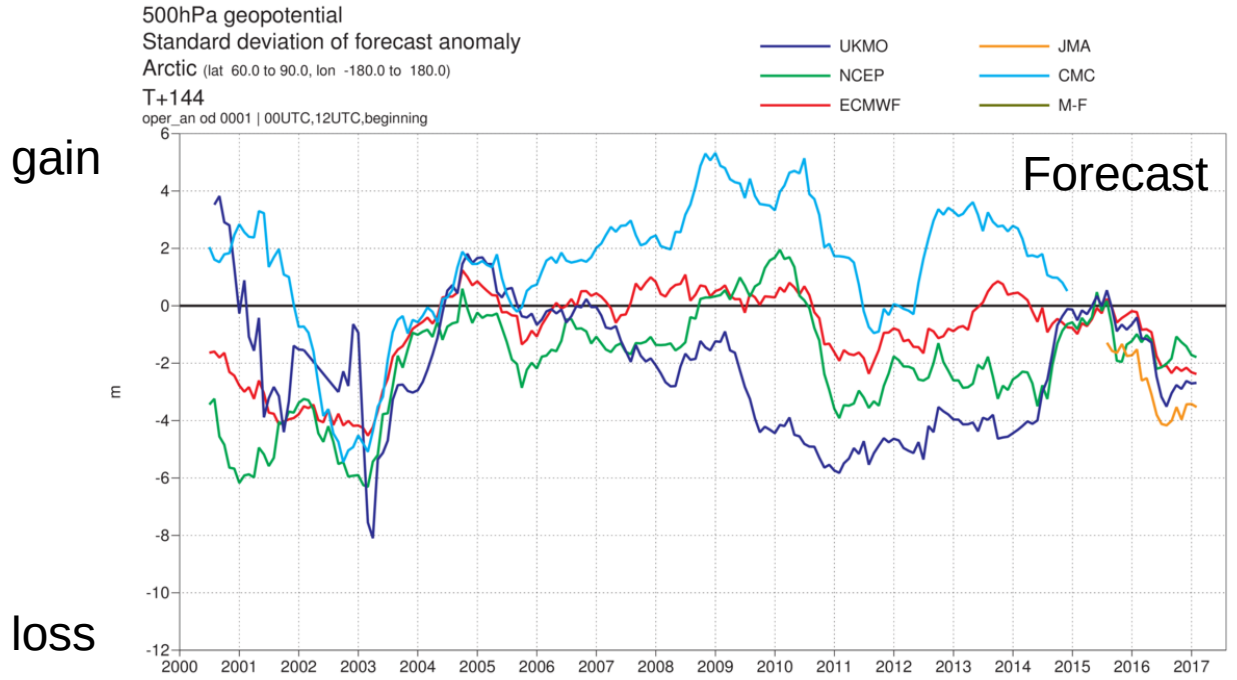
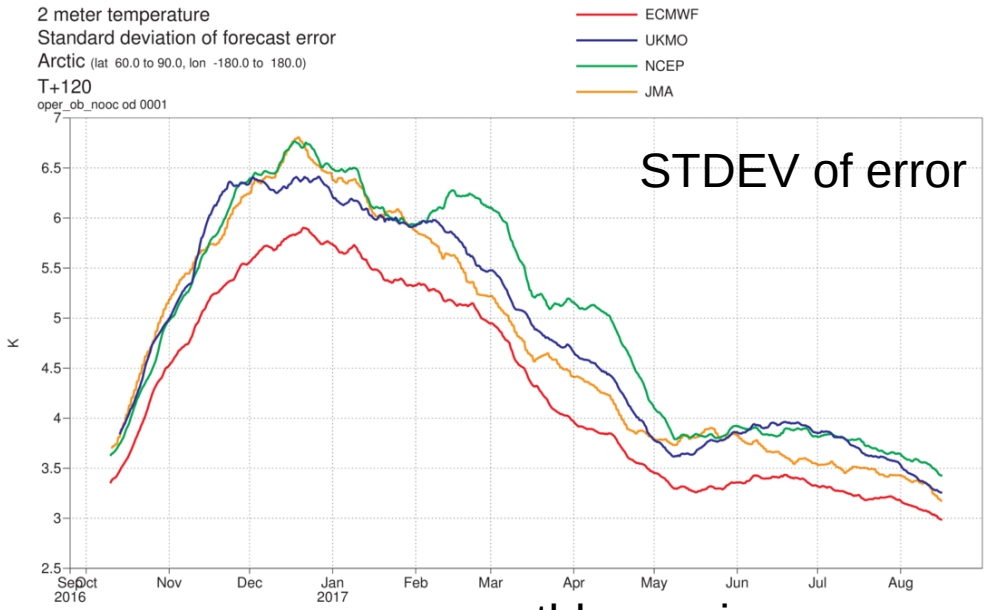
Arctic, analysis and model activity

Difference of stdev of forecast and analysis anomalies

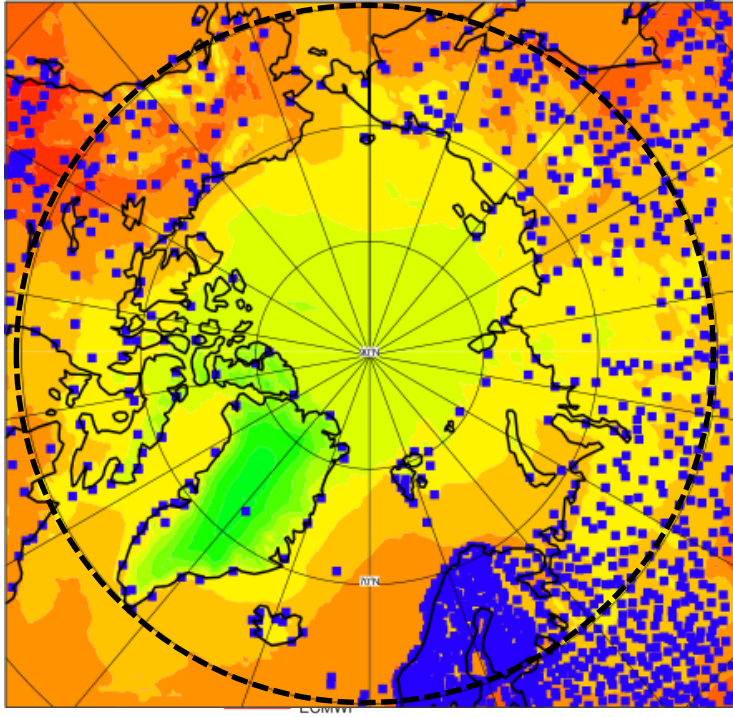




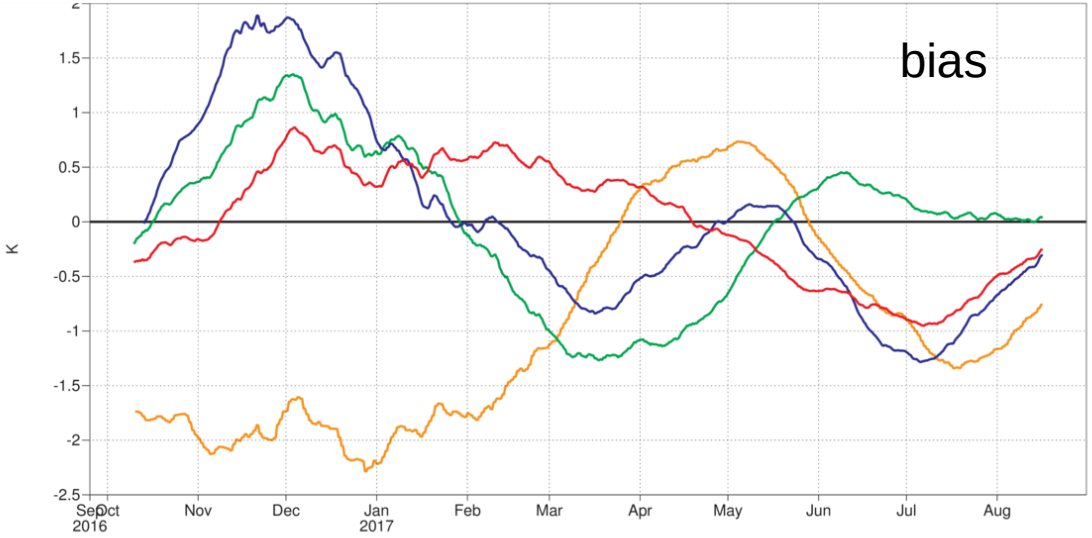
2m temperature, against SYNOP Arctic



STDEV of error

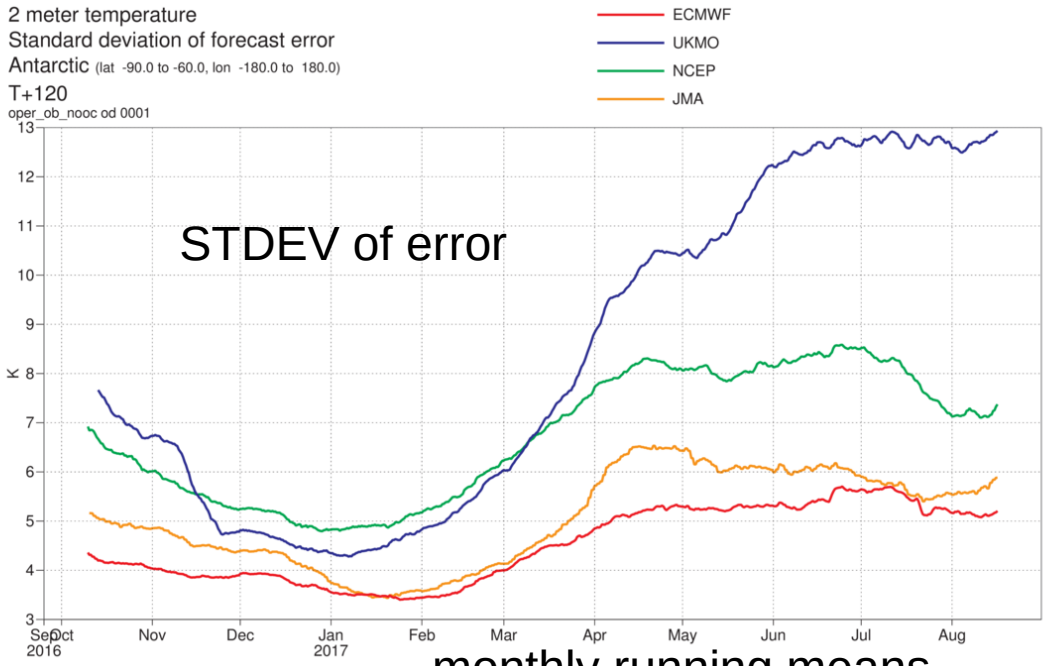


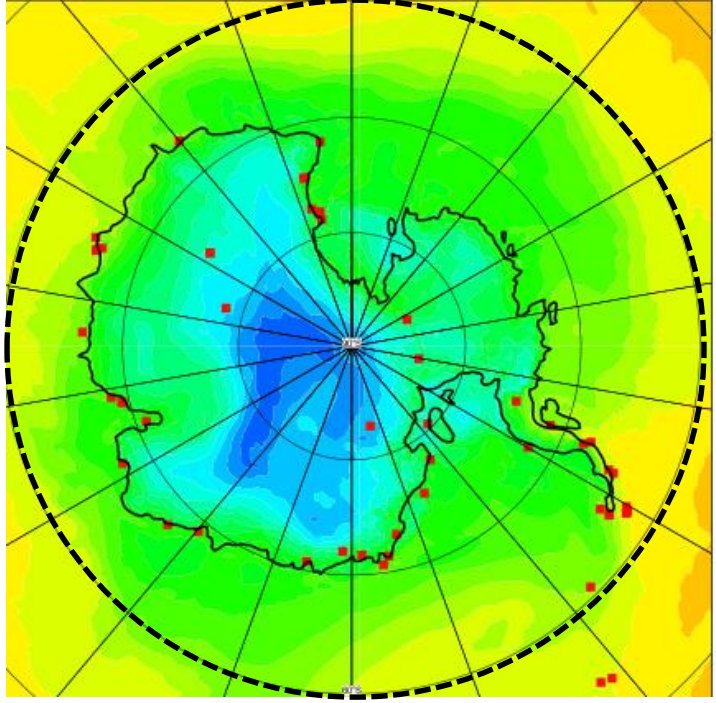
monthly running means



ECMWF EUROPEAN CENTRE FOR

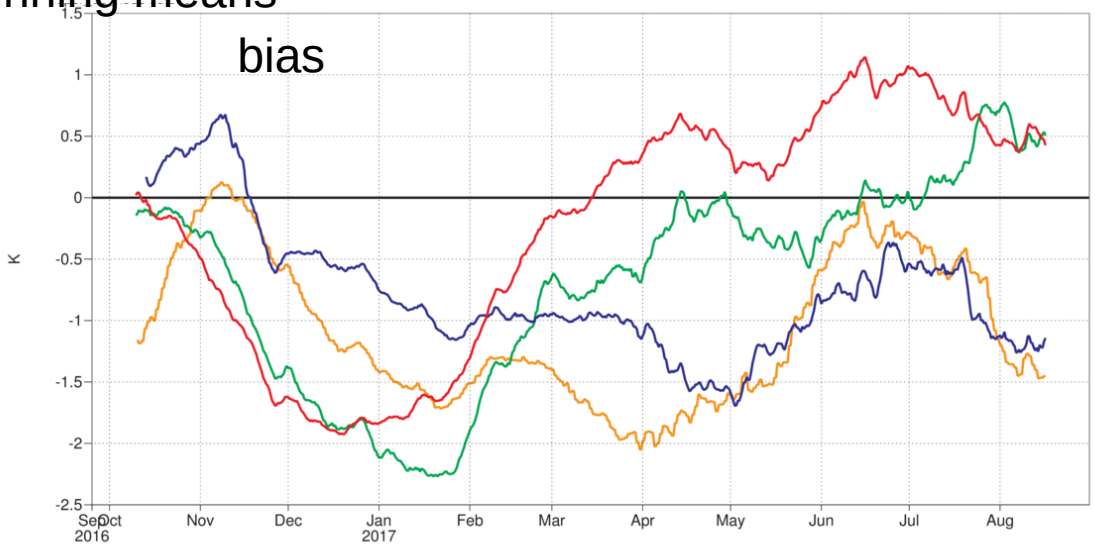
2m temperature, against SYNOP Antarctic





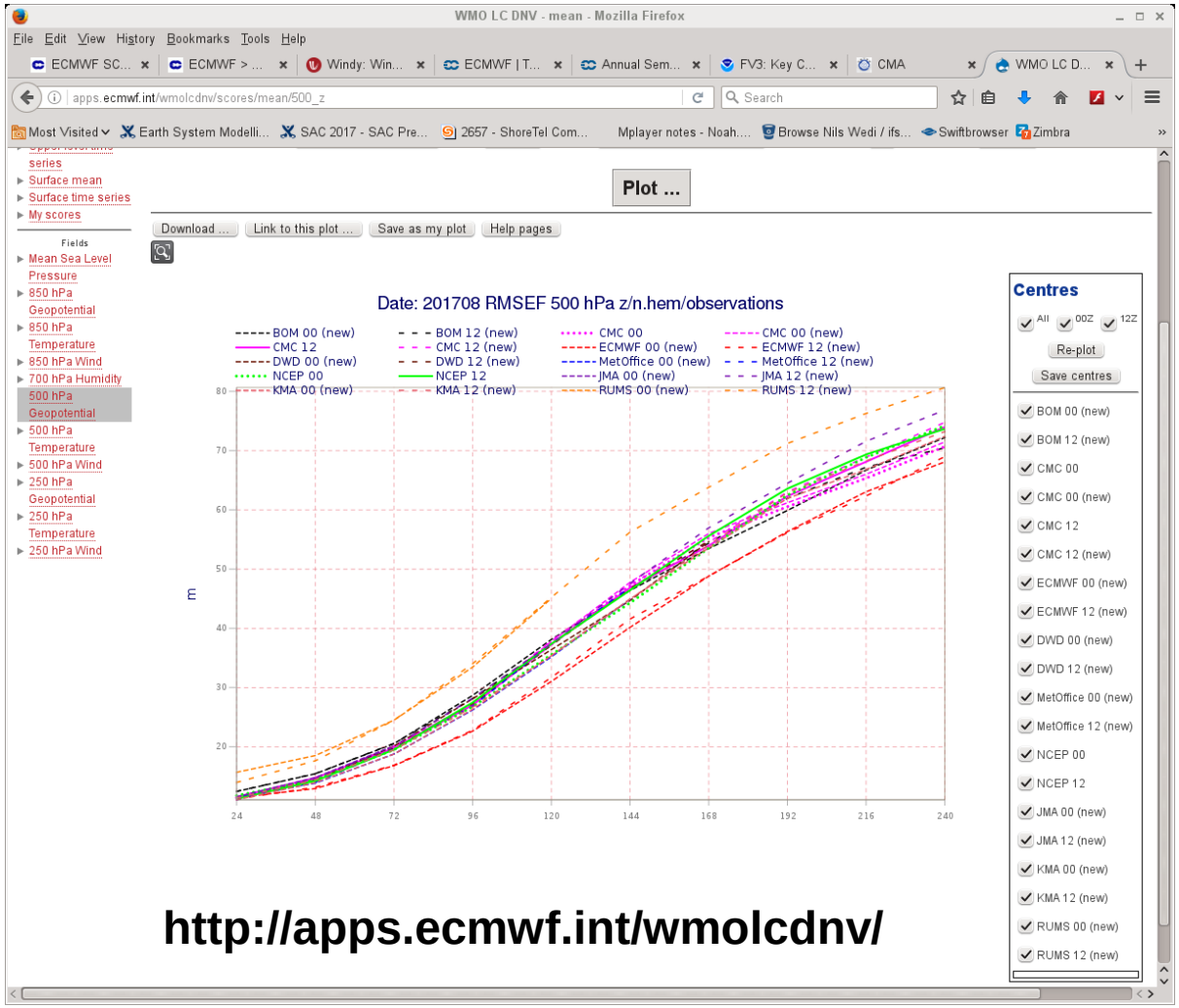
ECMWF
UKMO
NCEP
JMA

monthly running means



WMO Lead Centre for Deterministic Forecast NWP Verification (WMO-LCDNV)

- Collecting upper-air verification reports from global centres continues, most of centres has migrated to new definition of scores and the exchange format



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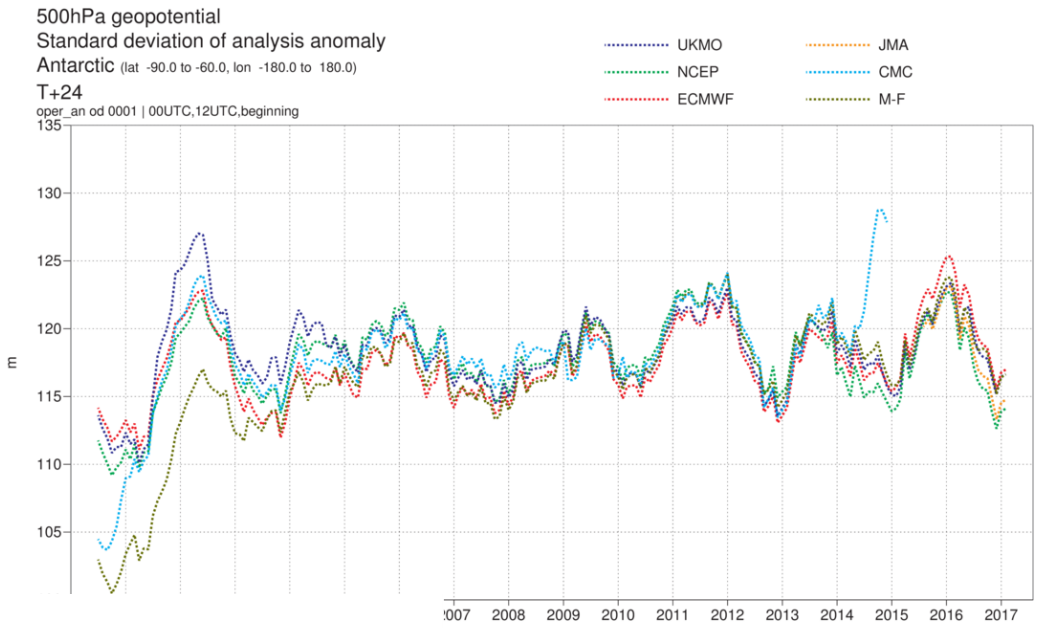
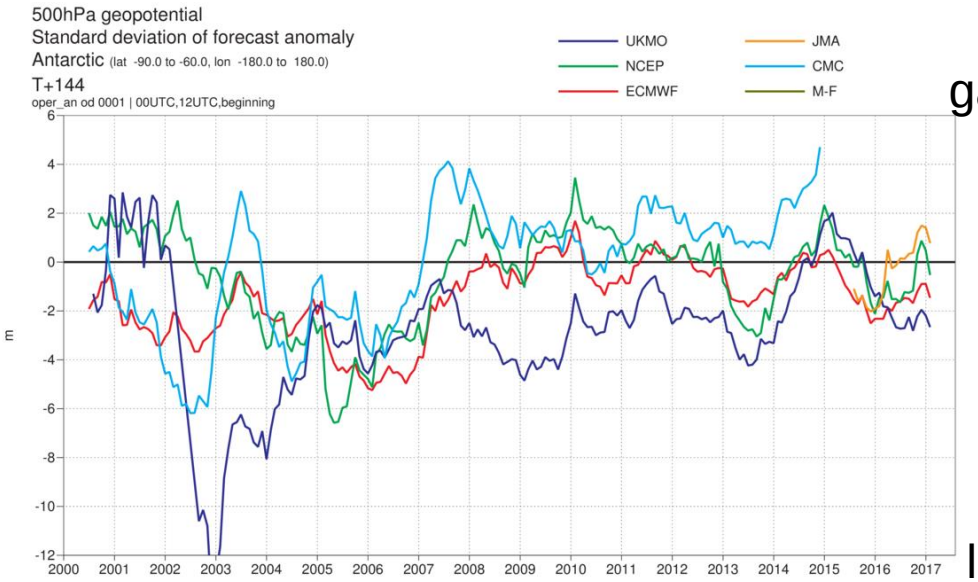
Conclusions

- Era-Interim near-realtime performance worsening, verification against ERA5 in progress
- ECMWF best ever summer score in 2016 followed by less predictable 2017 summer …
- Summer 2017 Europe + NH less predictable ? Forecast busts over Europe, connections to hurricane activity, warm SSTs, convective events in the US …
- CRPSS notable gains for JMA in the tropics, less so in the extratropics, ECMWF gains in 2016/17 (resolution ?)
- NCEP SHem day 6 rms errors against observations compare better in 2016/17 to ECMWF, suggesting resolution increase at ECMWF helped to better fit observation locations ?
- Summer precipitation problems (drizzle)

Antarctic, analysis and model activity



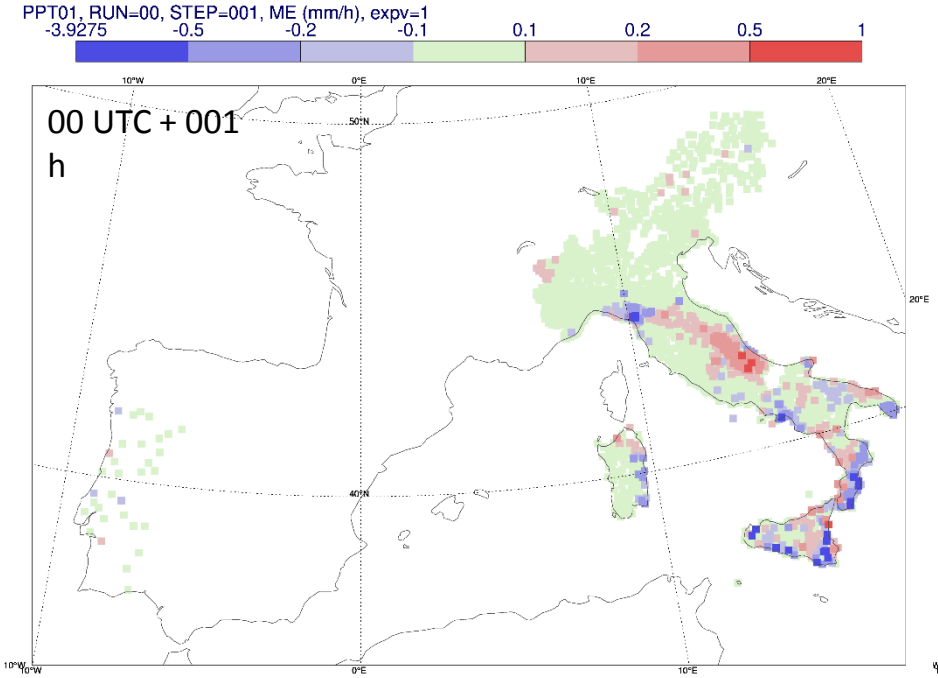


gain

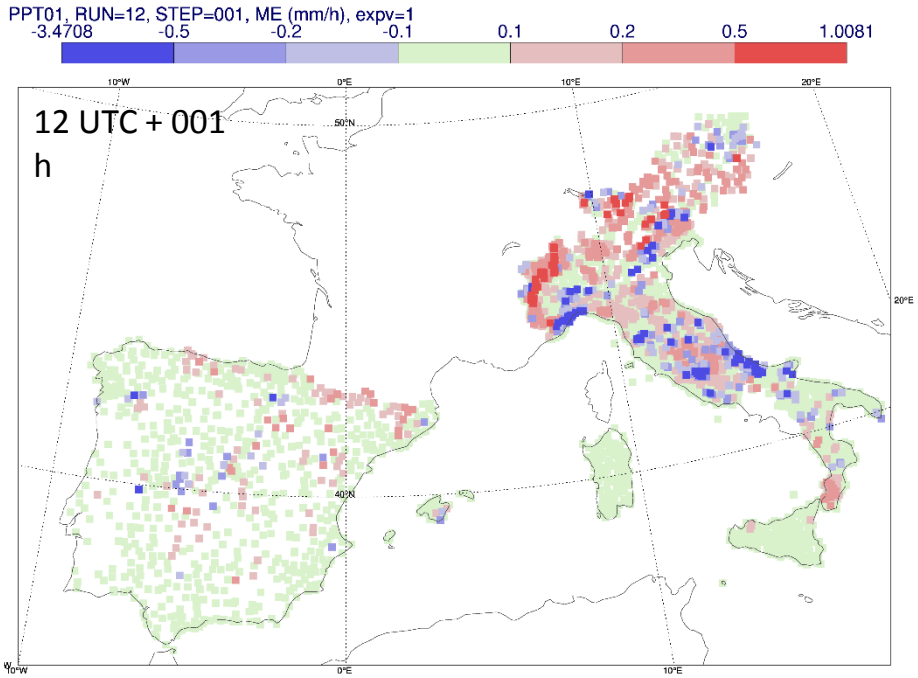
loss

Difference of stdev of forecast and analysis anomalies

Mean precipitation error at +001 h



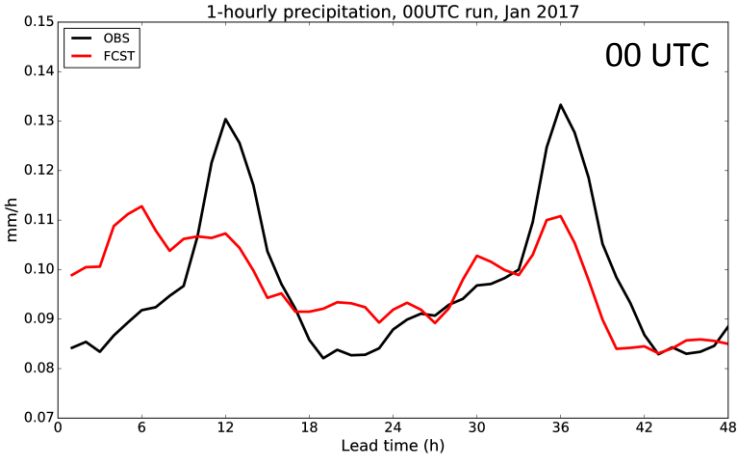
January 2017

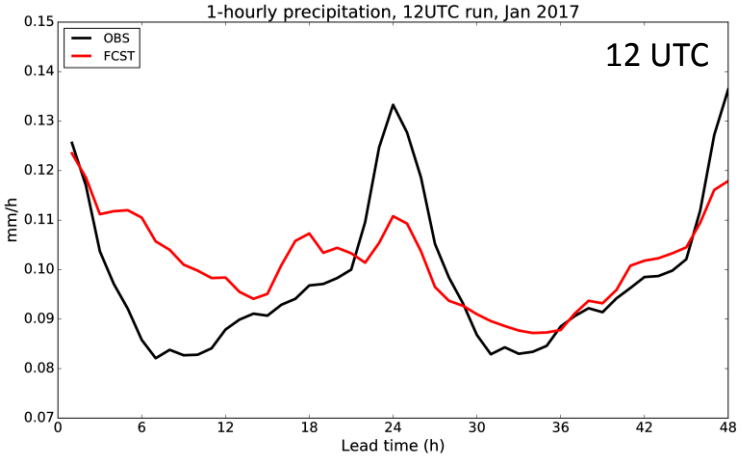


July 2017

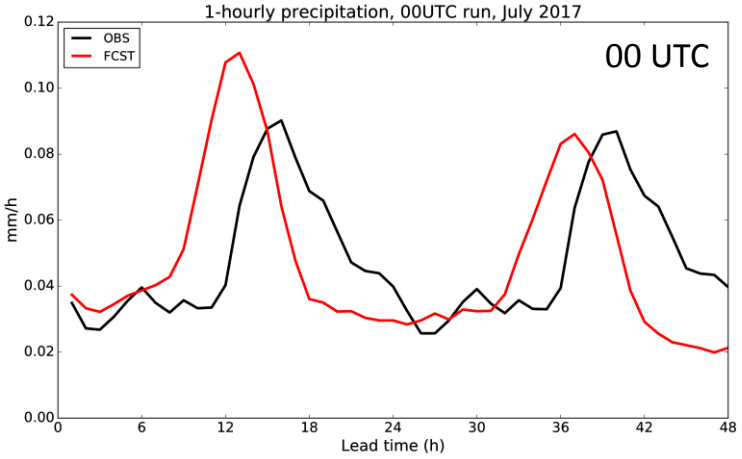
ECMWF

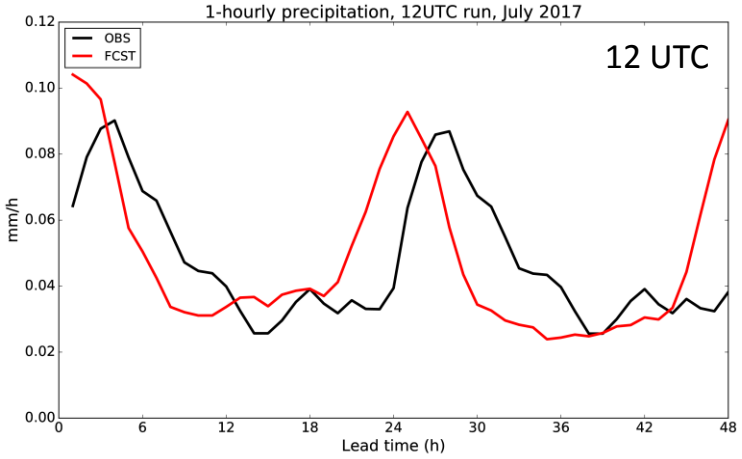
Observed and forecast 1-hourly precipitation





January 2017

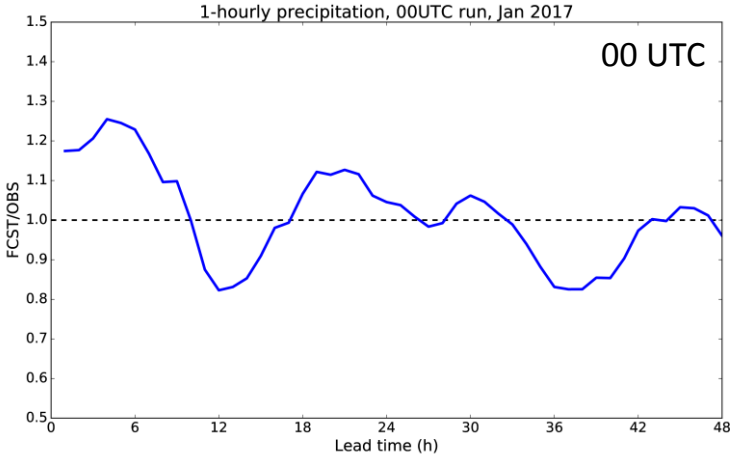


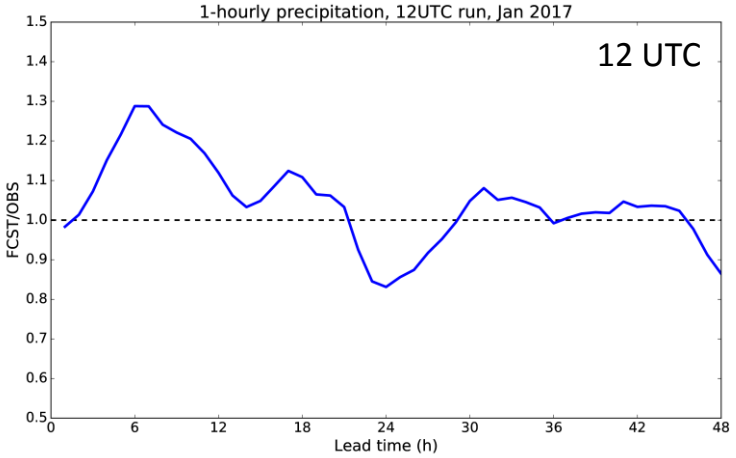


July 2017

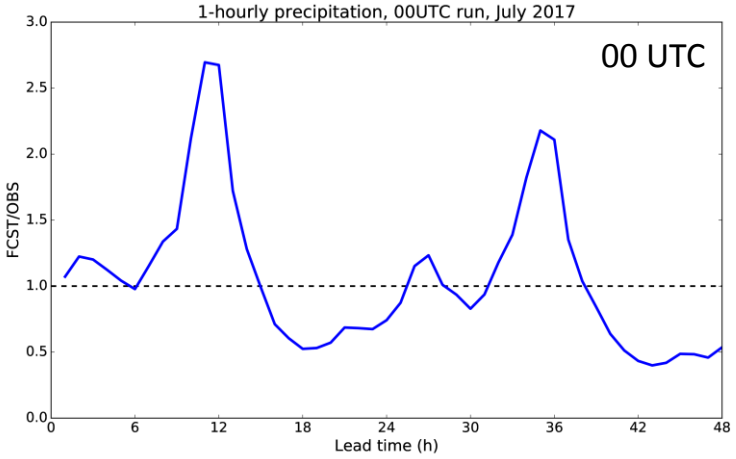
ECMWF

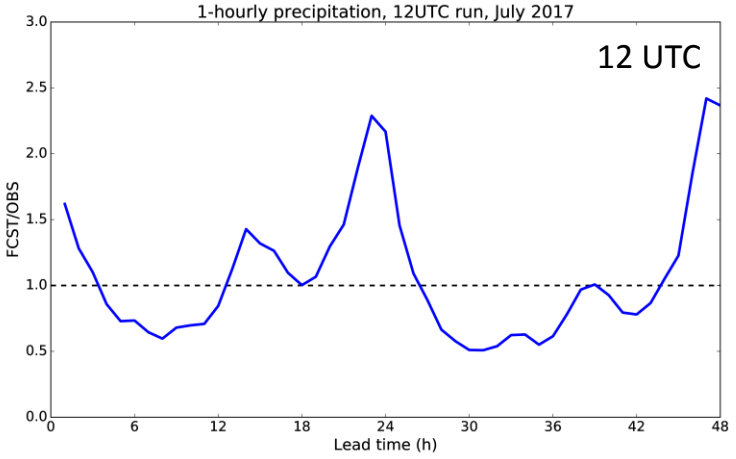
Ratio of forecast to observed 1-hourly precipitation





January 2017

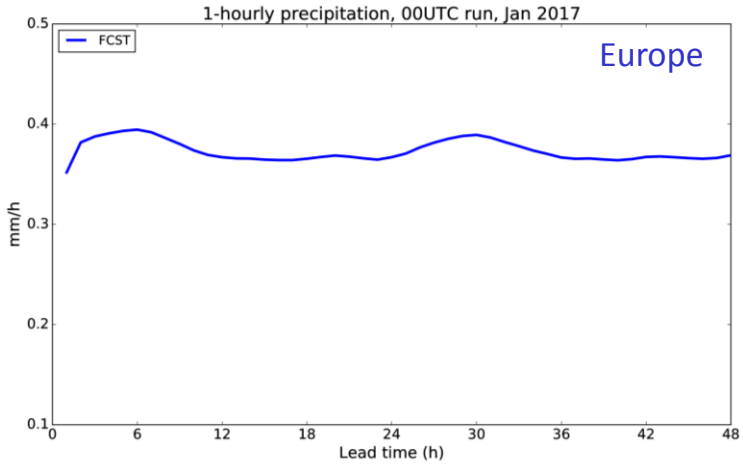


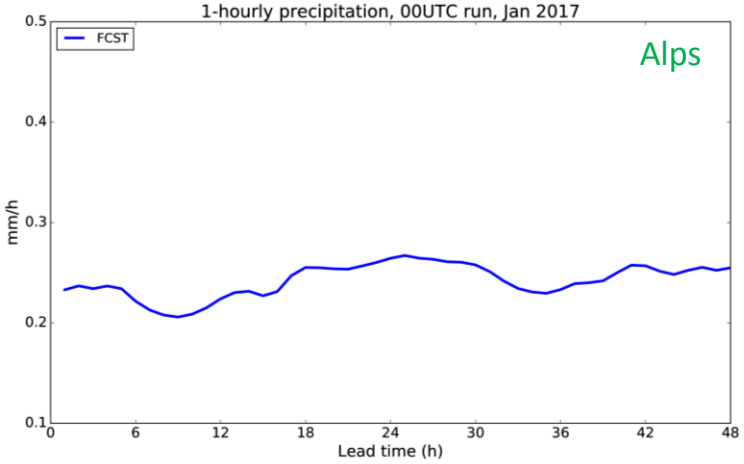


July 2017

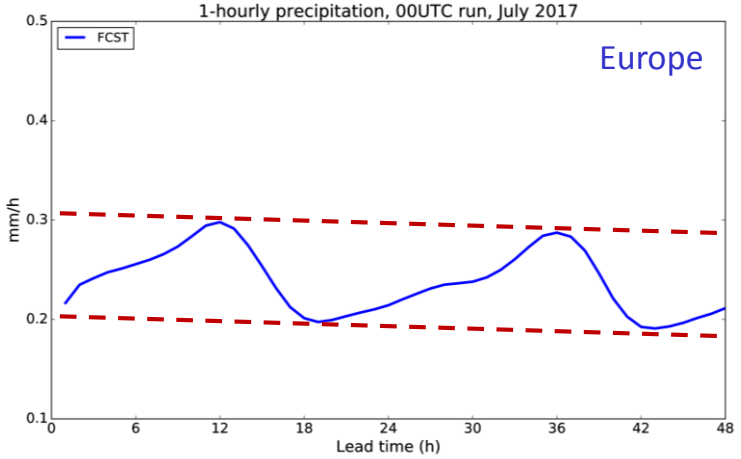
ECMWF

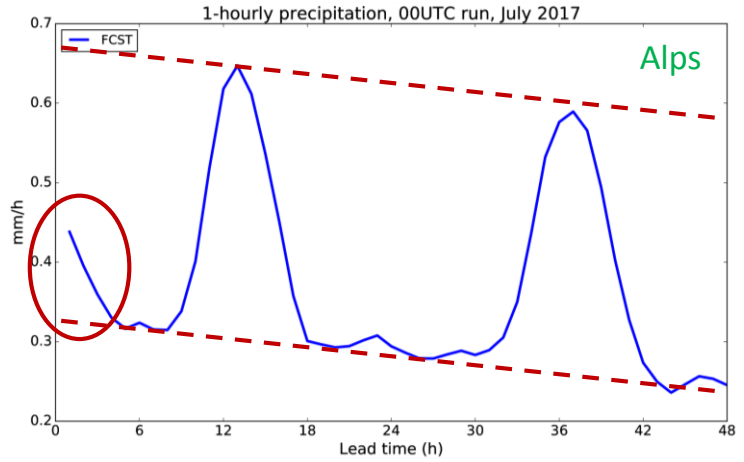
Precipitation spin-down





January 2017

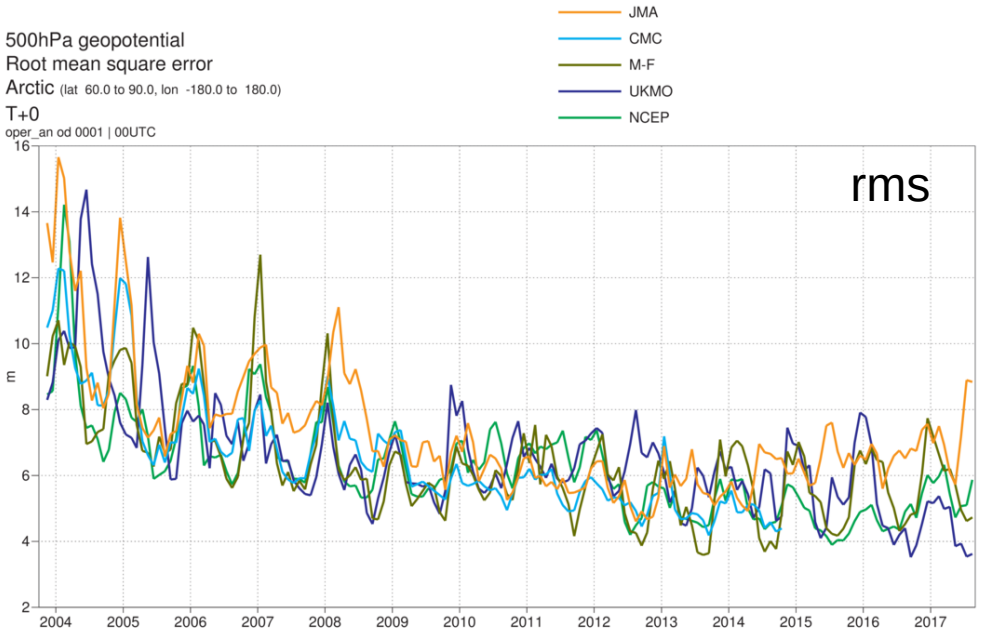


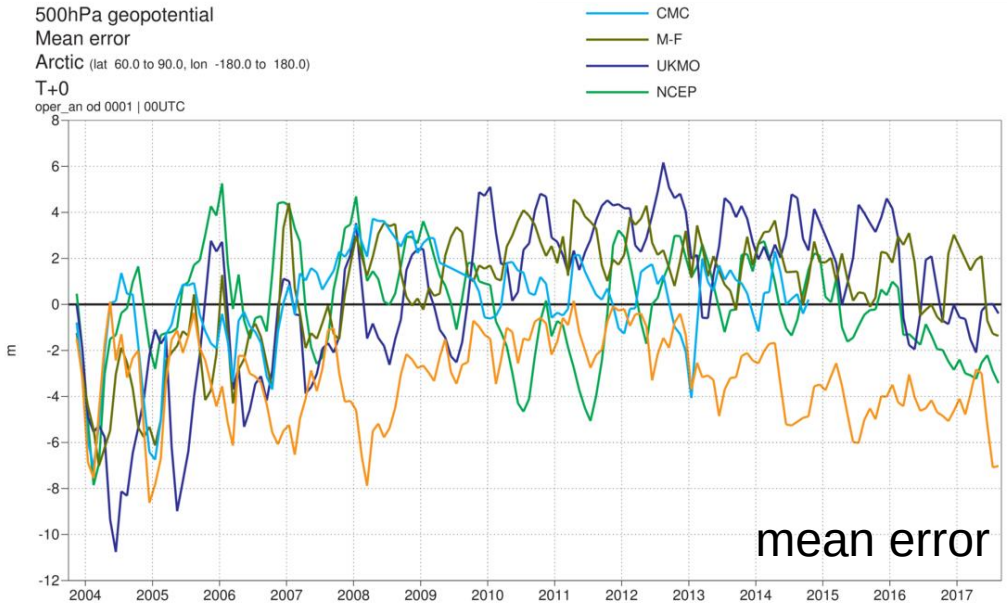


July 2017

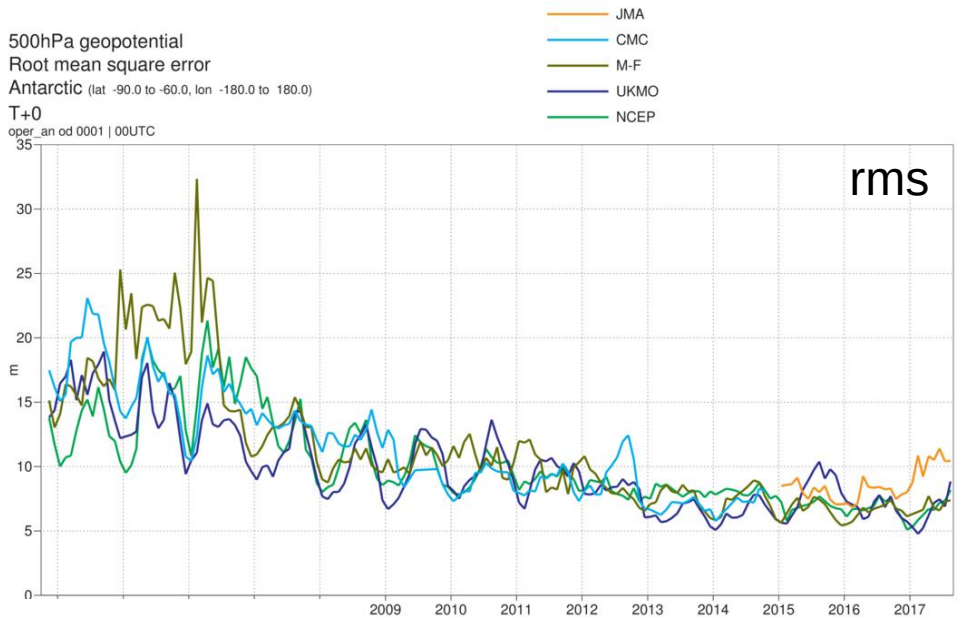
ECMWF

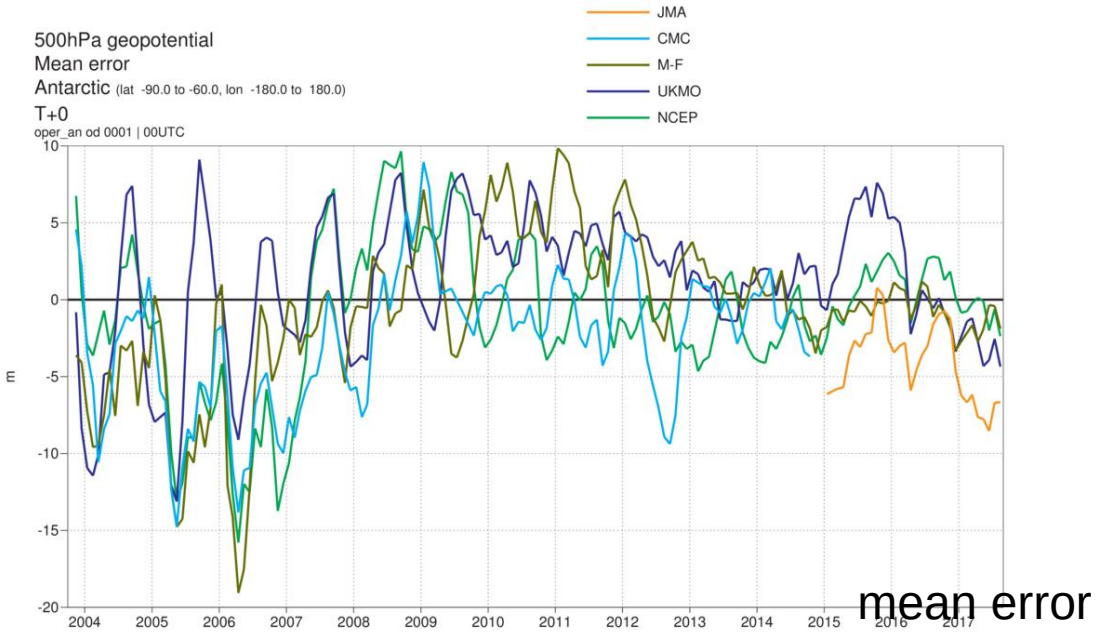
Arctic, Z500 analysis difference relative to ECMWF analysis





Antarctic, Z500 analysis difference relative to ECMWF analysis





mean error