



ECMWF product development

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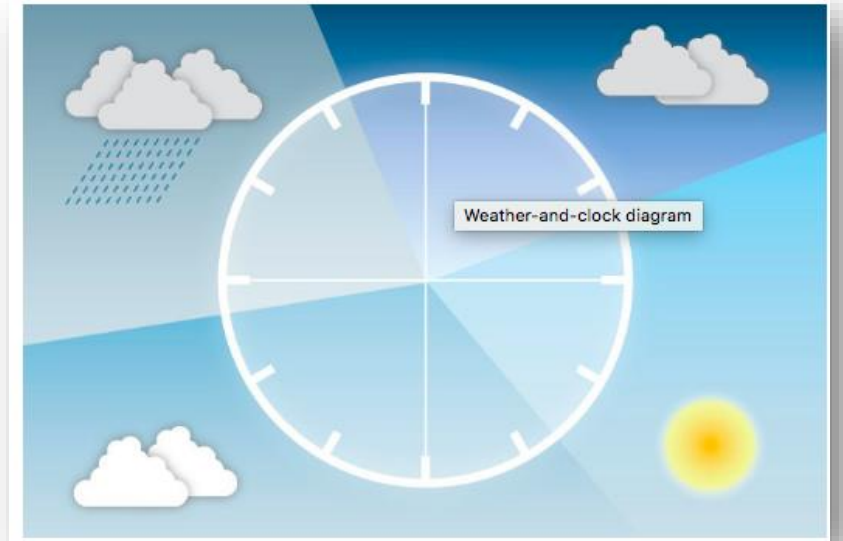
Input from many ECMWF colleagues



High-frequency products

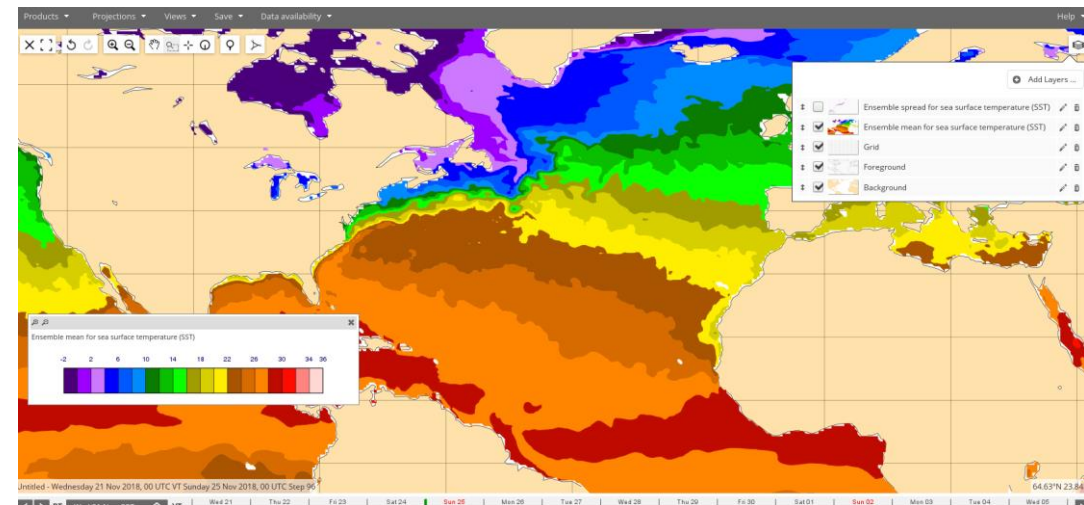
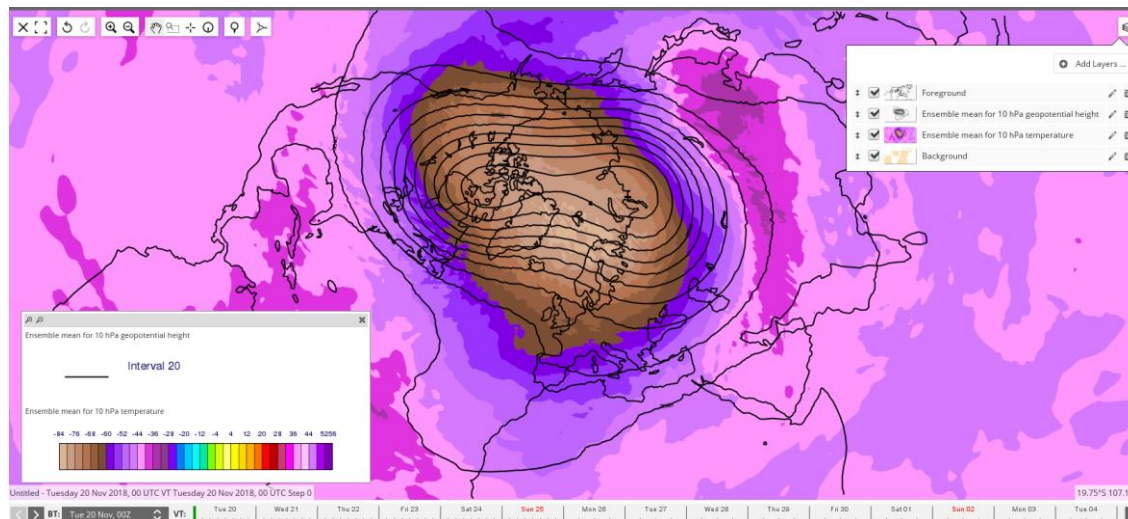
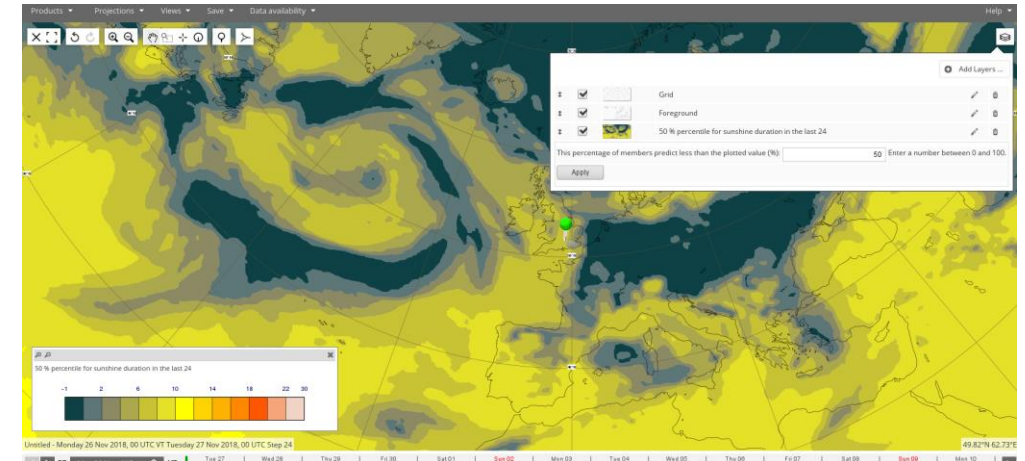
Since 1 October 2018:

- Hourly data and 06/18 UTC forecast runs are now available to all users holding a real-time licence, upon request
- **HRES & HRES-WAM** : hourly data from 0 to 90 hours for the 00/06/12/18 UTC forecast runs
- **ENS & ENS-WAM**: hourly data from 0 to 90 hours and 3-hourly data from 93 to 144 hours for the 00/06/12/18 UTC forecast runs
- Data from Boundary Conditions Optional Programme



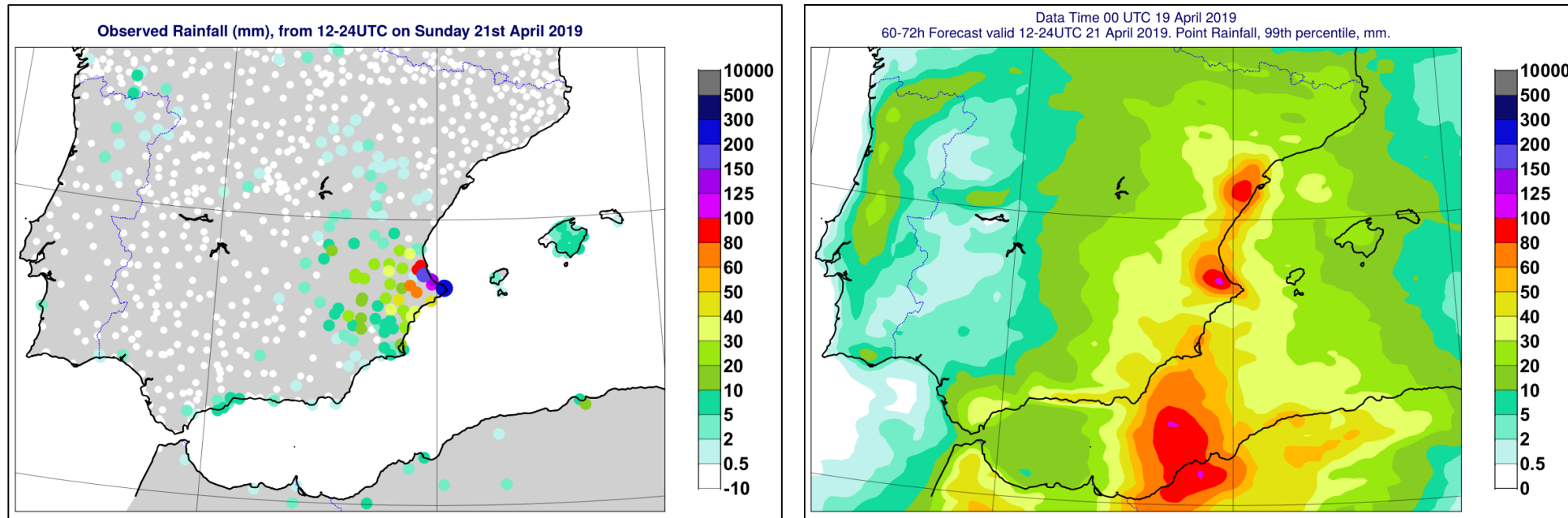
New ecCharts products

- ecCharts products are updated on a regular basis (typically June/November)
- Main changes Nov 2018
 - CAPE shear ensemble probability (user controlled)
 - Sunshine duration over the last 24 hours
 - SST ensemble mean and spread
 - Sea ice cover ensemble mean and spread
 - 10 hPa geopotential and temperature



Point rainfall in ecCharts

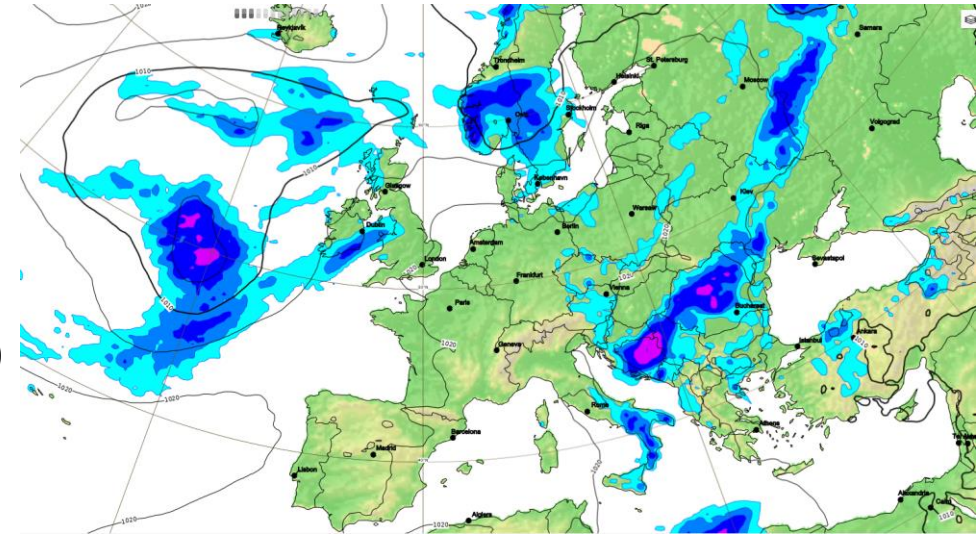
- Raw model output does not represent localised extreme rainfall totals, due to resolution limitations. Often such events can deliver flash floods.
- post-processed “Point Rainfall” addresses this shortfall, delivering a probabilistic rainfall forecast designed to match rain gauge measurements
- Experimental “Point Rainfall” products now in ecCharts



Wednesday 14:00-15:15 (Speakers' Corner) - Fatima Pillosu: ecPoint rainfall products

ecCharts-2: smoother and faster

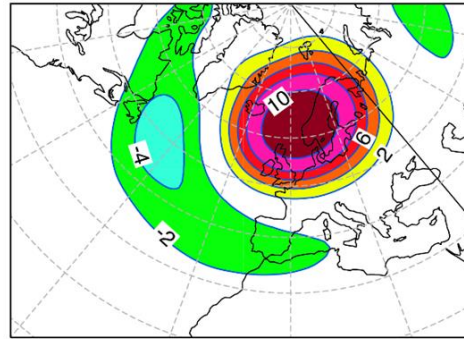
- Improved speed and usability:
 - Zoom and pan
 - Re-ordering of layers (and turning on and off)
 - Geographical layers (background, foreground, rivers, borders)
 - Change of forecast time/step
- Each layer is loaded independently
- Undo/redo operations are removed as currently zoom and pan operations are much faster
- "Add product to Dashboard" is disabled for the time being and will be enabled once Dashboard code is also updated
- Existing products/projections will be available in ecCharts-2 (may appear slightly different)
- Any product/projection created in ecCharts-2 will ONLY be available in ecCharts-2



Wednesday 14:00-15:15 (Speakers' Corner) - Cihan Sahin: ecCharts - faster and more responsive

Test products for early warnings of cold spells

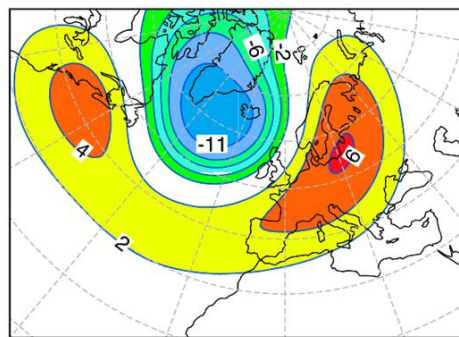
- <https://confluence.ecmwf.int/display/FCST/Test+products>



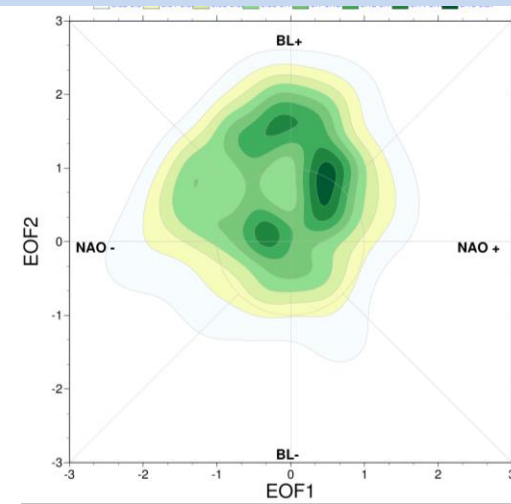
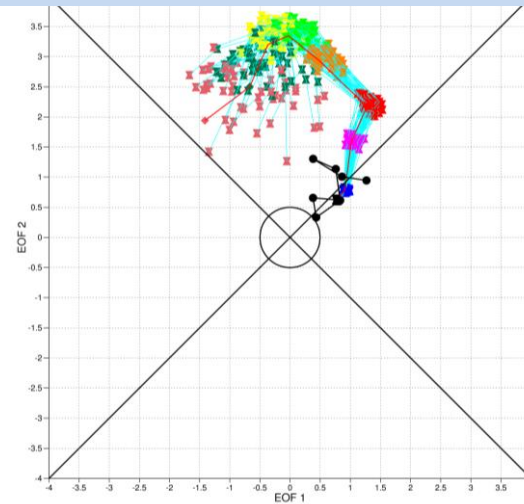
EOF2/BLO



Tuesday 16:45-17:15. Extended-range product and diagnostic developments (Linus Magnusson)

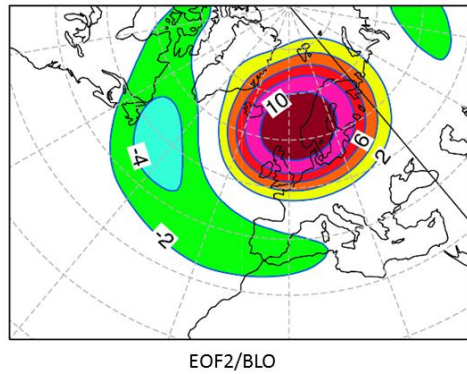


EOF1/NAO



Forecast jumpiness

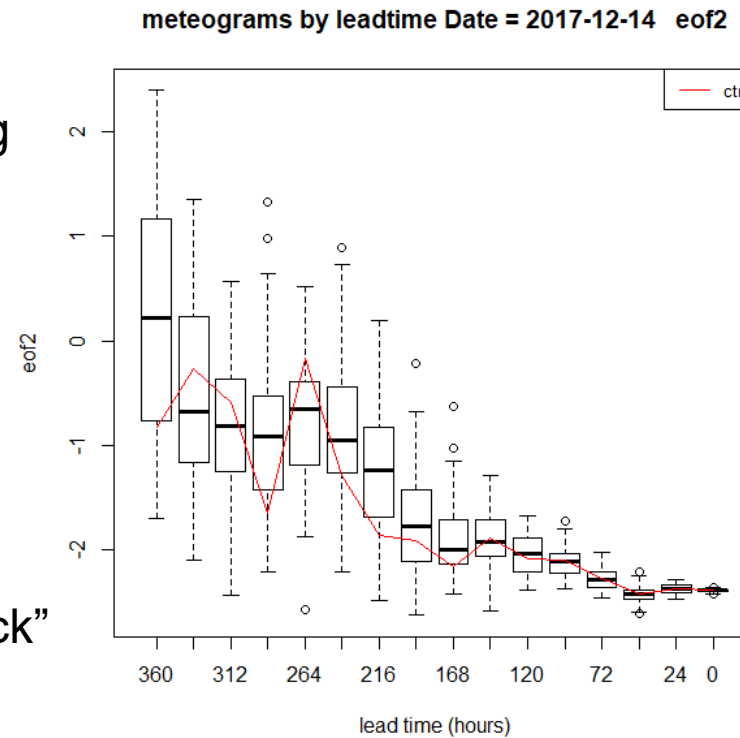
- Blocking from 15 days (360 hours) ahead



Blocking

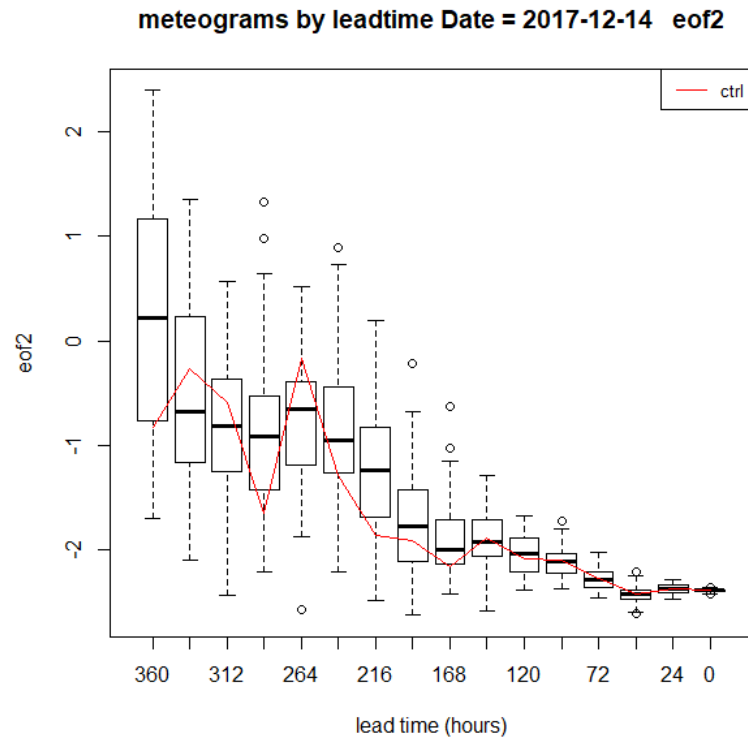


“anti-block”



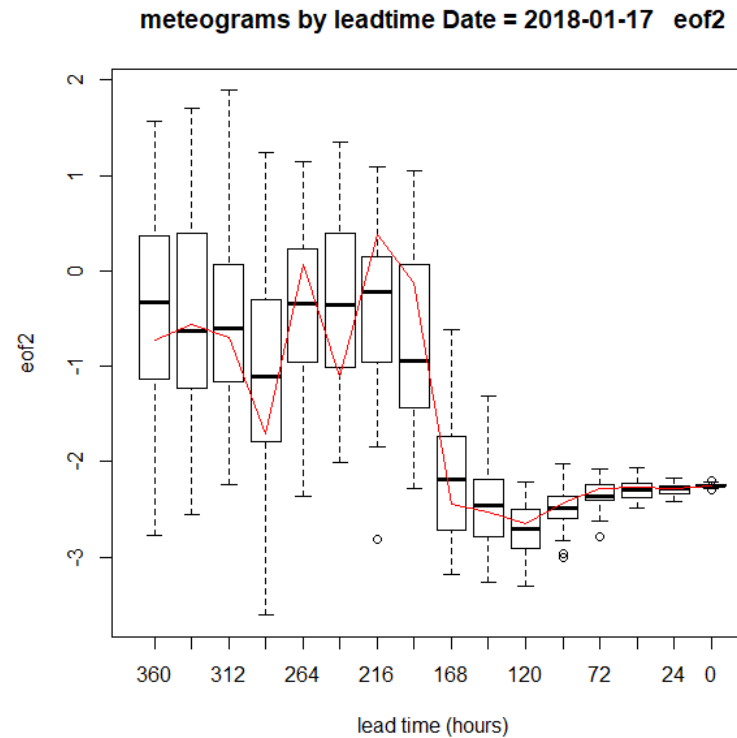
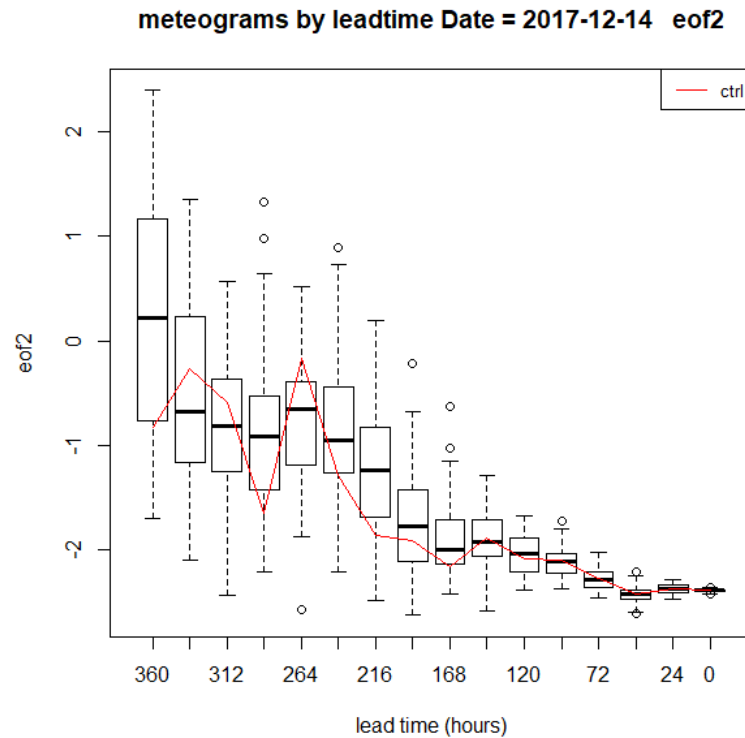
Examples of forecast jumpiness

- Blocking from 15 days (360 hours) ahead



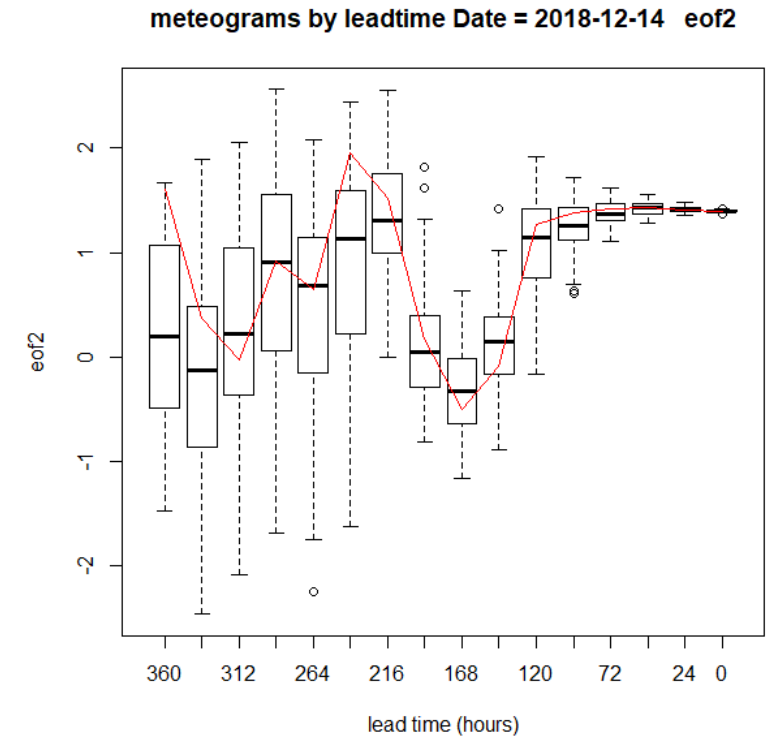
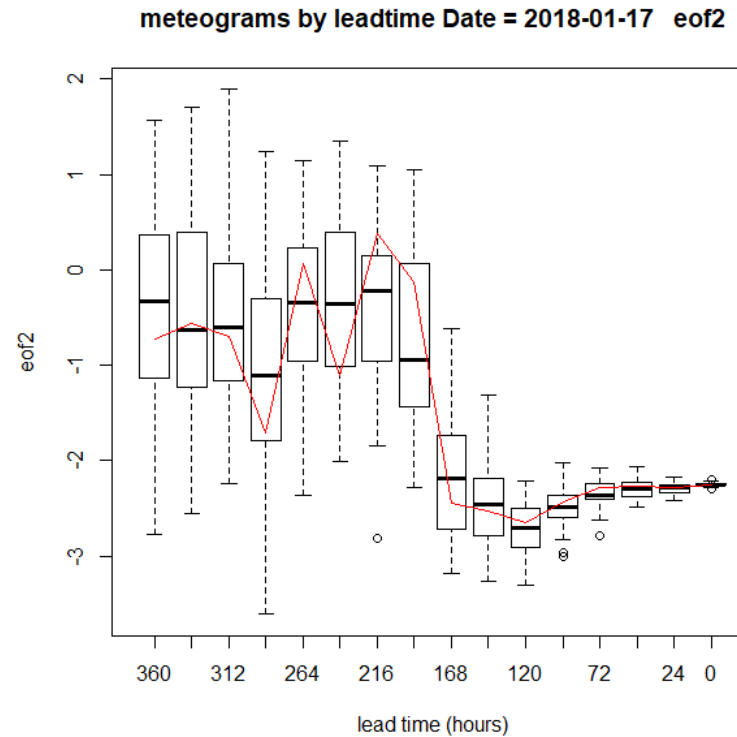
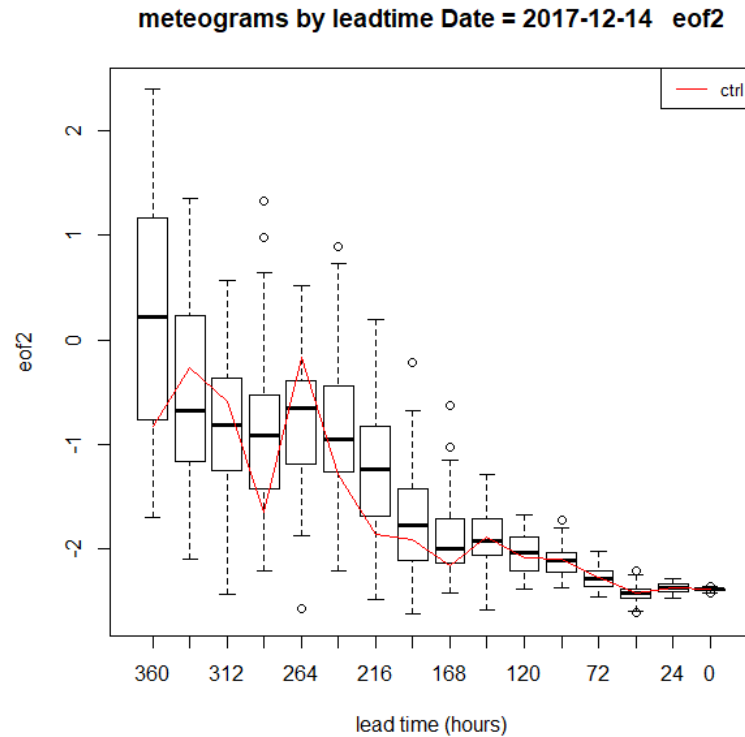
Examples of forecast jumpiness

- Blocking from 15 days (360 hours) ahead



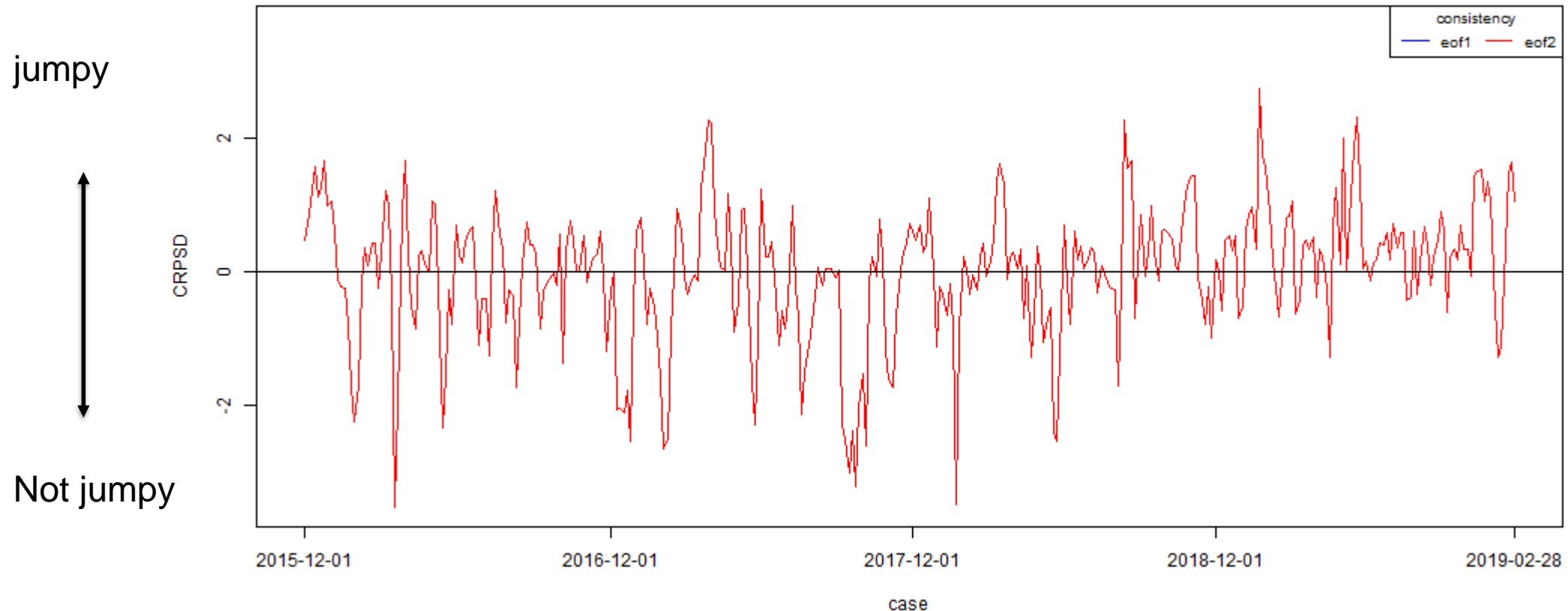
Examples of forecast jumpiness

- Blocking from 15 days (360 hours) ahead



Jumpiness December–February 2015/16 – 2018/19

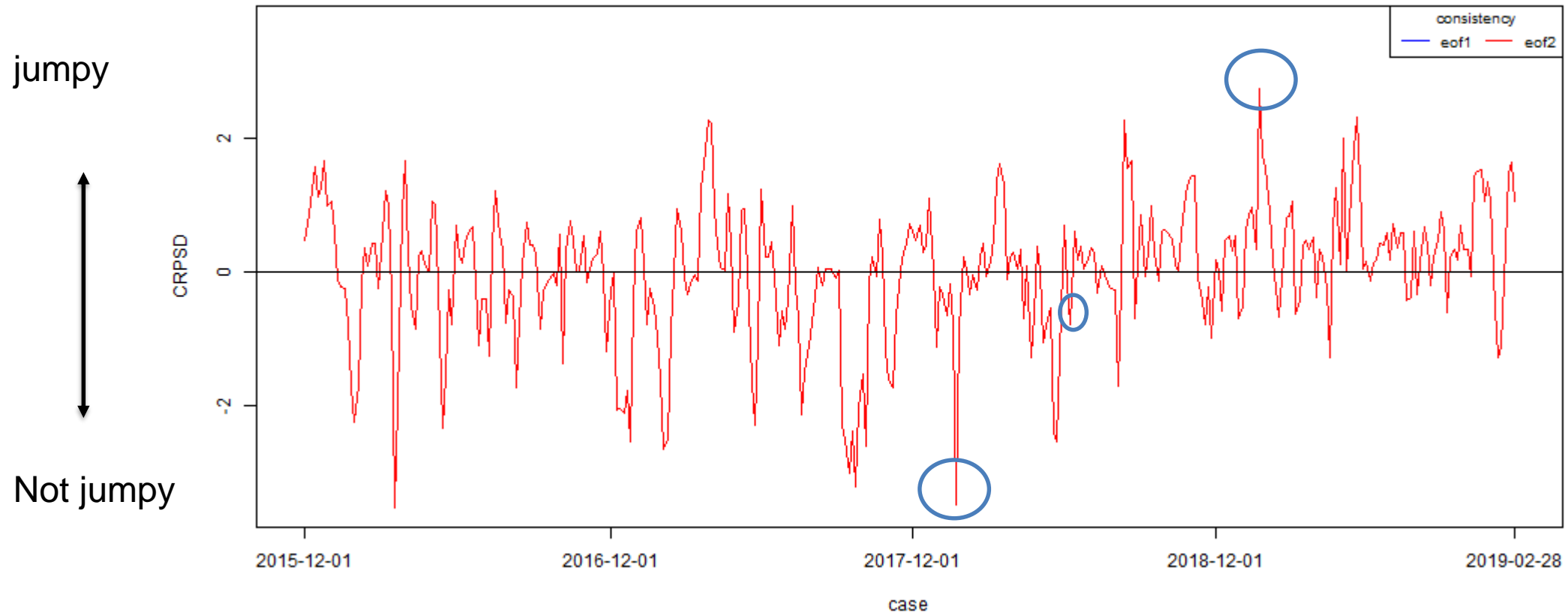
Forecast consistency CRPSD for large-scale regimes
DJF 2015/16 - 2018/19 (361 cases)



Inconsistency over all forecast lead times (1-15 days): “CRPS” difference between ENS

Jumpiness December–February 2015/16 – 2018/19

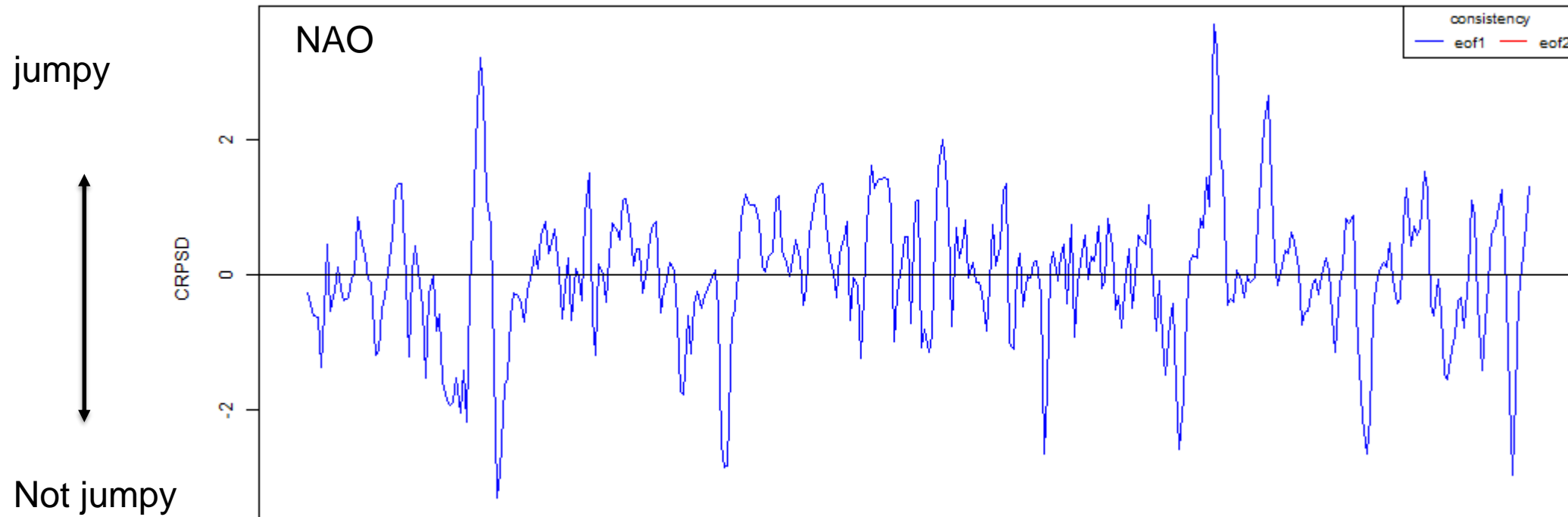
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Forecast consistency CRPSD for large-scale regimes
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**Tuesday 16:45-17:15. Extended-range product and diagnostic developments
(Linus Magnusson)**

**Wednesday 15:45-16:15. Challenges and Limits in Ensemble Weather Prediction
(Mark Rodwell)**

New cycle 46r1 (11 June)

New parameters and outputs

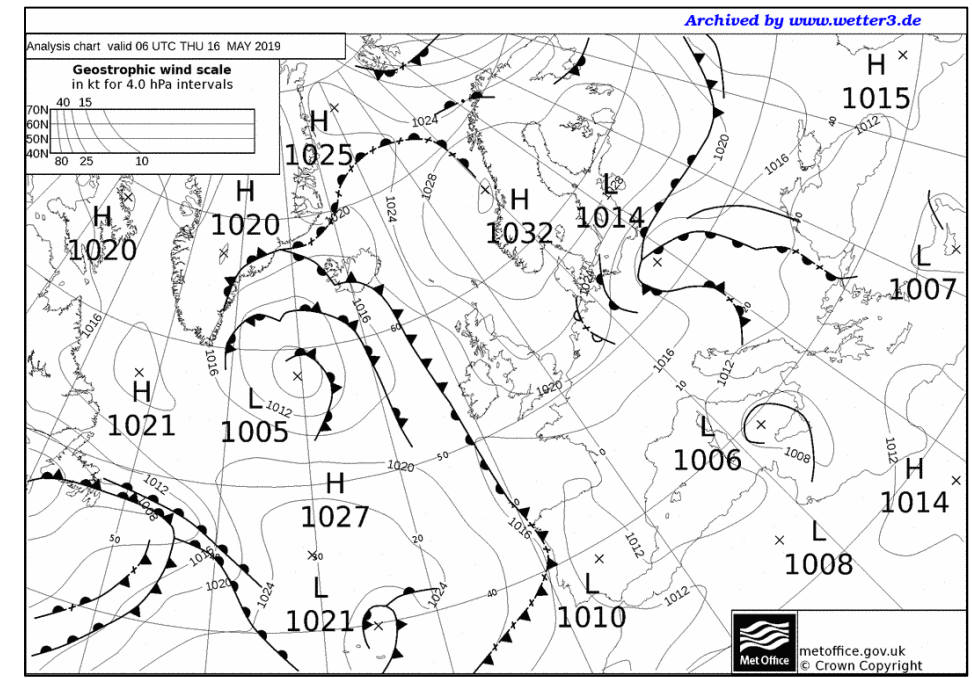
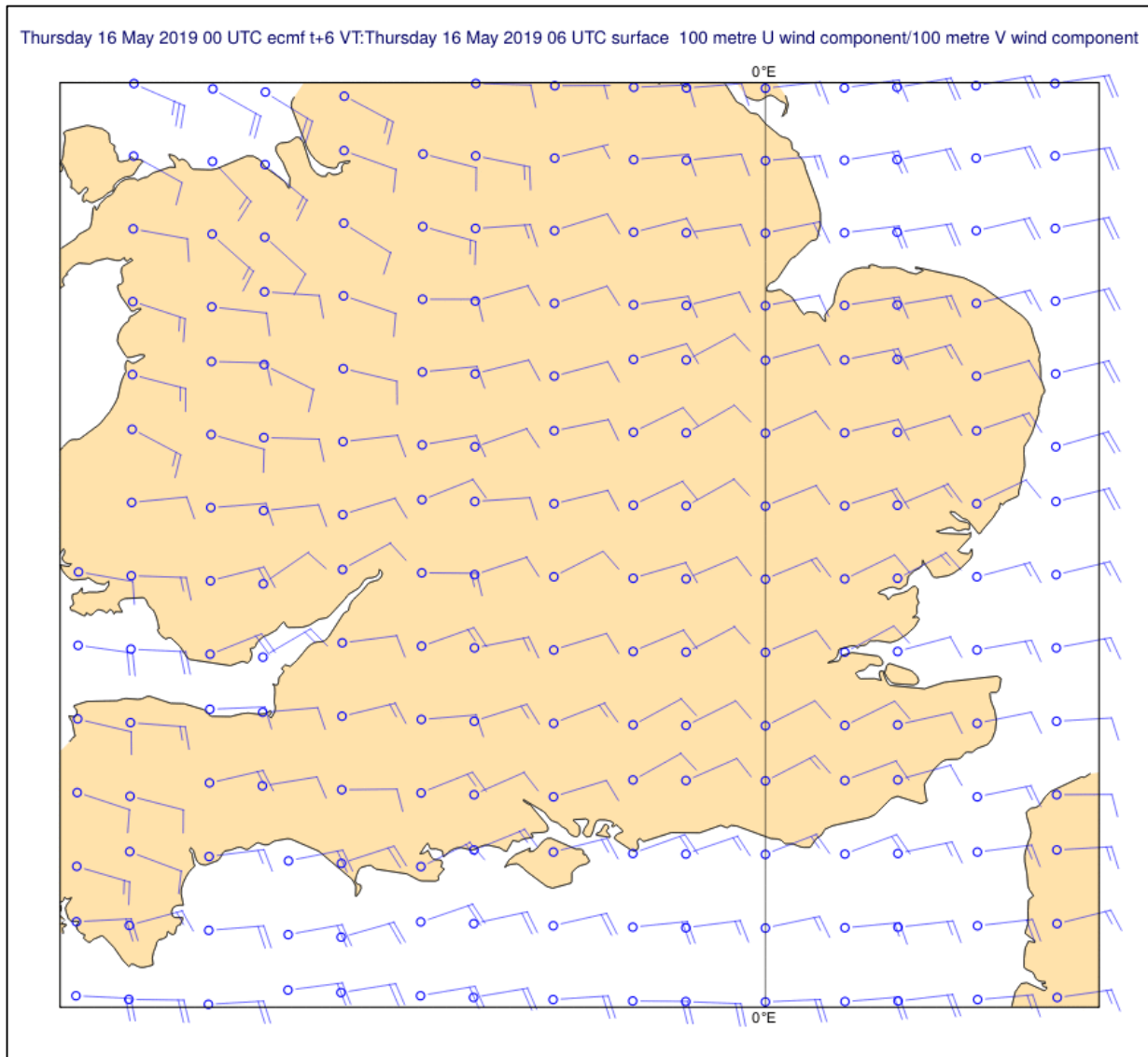
<https://confluence.ecmwf.int/display/FCST/Implementation+of+IFS+cycle+46R1>

New model output parameters

Extended output have been added in cycle 46r1, including a subset of ocean fields on the atmospheric grid.

paramId	shortName	name	Description	units	GRIB edition	Components	Test data available	Dissemination	ecCharts	Added to the Catalogue
Near-surface wind output										
228239	200u	200 metre U wind component	eastward component of the 200m wind.	m s^{-1}	1	HRES / ENS	✓	TBC	TBC	TBC
228240	200v	200 metre V wind component	northward component of the 200m wind.	m s^{-1}	1	HRES / ENS	✓	TBC	TBC	TBC
Wave model parameters										
140098	weta	Wave induced mean sea level correction	Wave induced mean sea level correction	m	1	HRES-WAM / HRES-SAW / ENS-WAM	✓	TBC	TBC	TBC
140099	wraf	Ratio of wave angular and frequency width	Ratio of wave angular and frequency width	dimensionless	1	HRES-WAM / HRES-SAW / ENS-WAM	✓	TBC	TBC	TBC
140100	wslc	Number of events in freak waves statistics	Number of events in freak waves statistics	dimensionless	1	HRES-WAM / HRES-SAW / ENS-WAM	✓	TBC	TBC	TBC
140101	utaua	U-component of atmospheric surface	U-component of atmospheric surface momentum flux	N m^{-2}	1	HRES-WAM / HRES-SAW /	✓	TBC	TBC	TBC

200m winds versus 100m winds - example



Anticyclonic Easterly flow across the south of the UK

Time = 06UTC, HRES run

Sig differences between **100m winds** and new **200m winds**

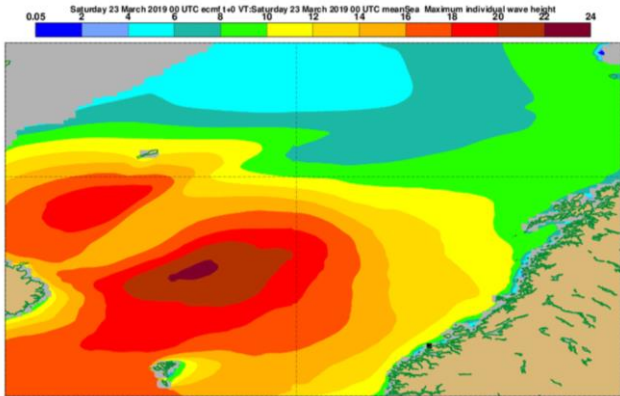
Differences in speed and direction depend on synoptic situation and time of day. At night differences tend to be larger.

We had some interest also in 50m winds, but tests showed that little could be added to the information provided by 10m and 100m winds that users already had.

Ocean wave parameters



shortName	Description
weta	Wave induced mean sea level correction
wraf	Ratio of wave angular and frequency width
wnslc	Number of events in freak waves statistics
utaua	U-component of atmospheric surface momentum flux
vtaua	V-component of atmospheric surface momentum flux
utauo	U-component of surface momentum flux into ocean
vtauo	V-component of surface momentum flux into ocean
wphio	Wave turbulent energy flux into ocean

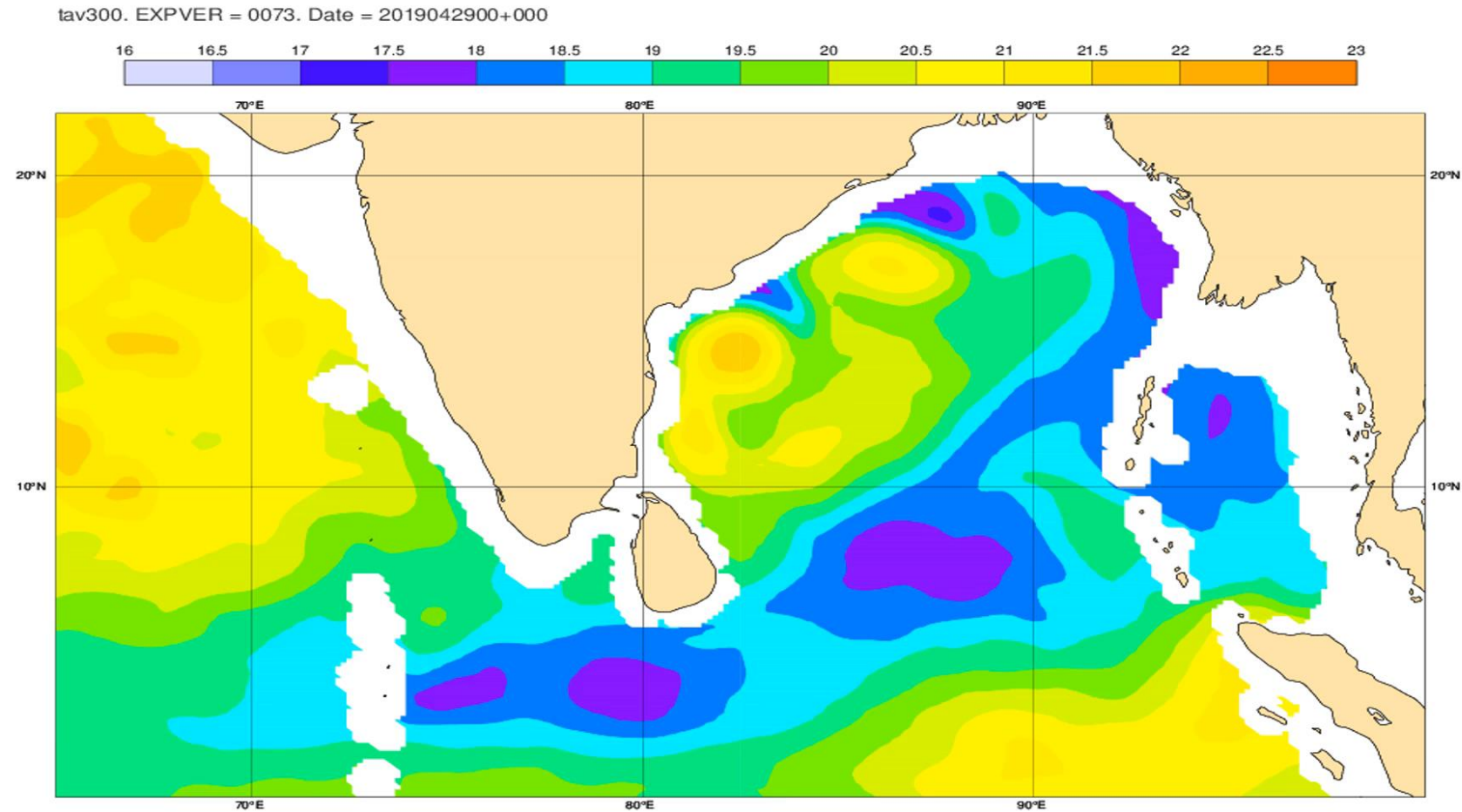


Ocean model outputs

shortName	Description
sithick	Sea-ice thickness
mld	Mixed layer depth
zos	Sea surface height
t20d	Depth of 20C isotherm
so	Sea water practical salinity
tav300	Average potential temperature in the upper 300m
sav300	Average salinity in the upper 300m

- All parameters are in GRIB edition 1
- Parameters available for HRES and ENS
- These fields are interpolated from the NEMO resolution (0.25 degree)

Animation of average 300m ocean temp from 46r1 during TC Fani



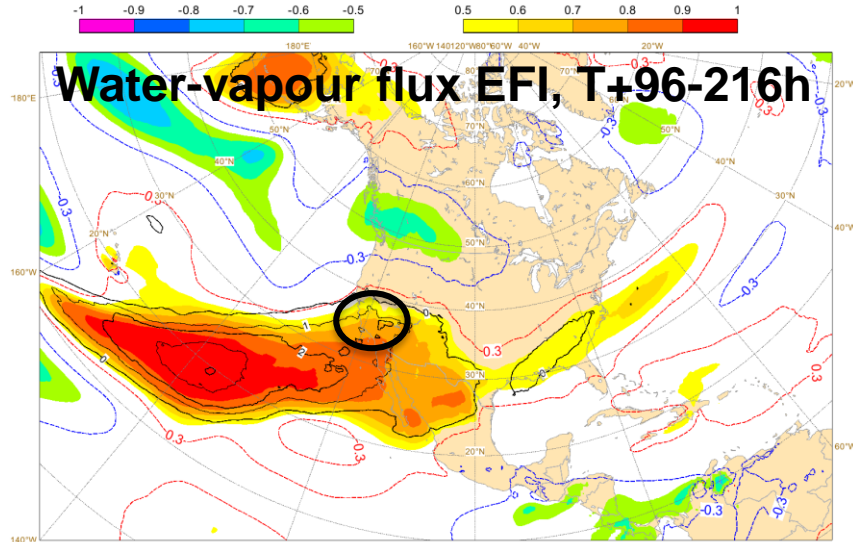
Parameters on Potential Vorticity levels (1.5 and 2 PVU)

shortName	Description
z	Geopotential
o3	Ozone mass mixing ratio
pt	Potential Temperature
pres	Pressure
q	Specific humidity
u	U component of wind
v	V component of wind

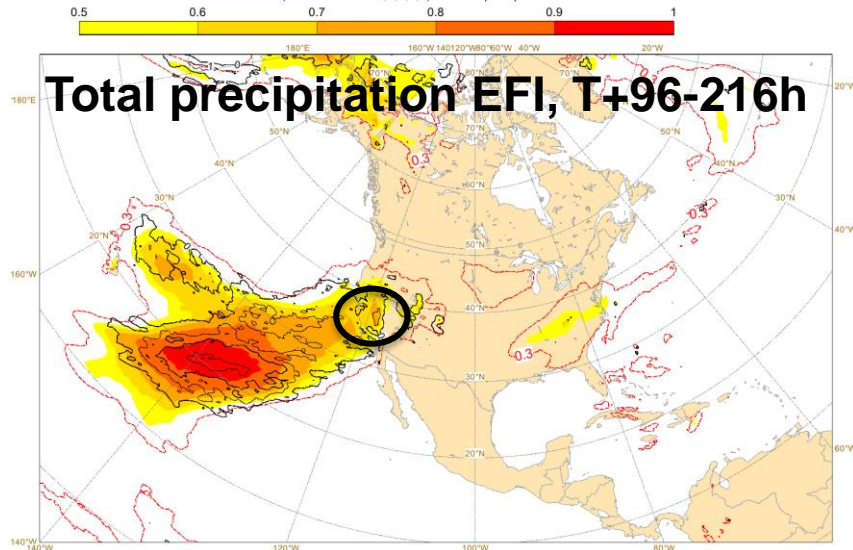
- All parameters are in GRIB edition 1
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Water vapour flux EFI/SOT

Thu 07 Feb 2019 00UTC @ECMWF expver = 1 VT: Mon 11 Feb 2019 00UTC - Sat 16 Feb 2019 00UTC 96-216h
Extreme forecast index and Shift of Tails (black contours 0,1,2,5,8) for: water vapour flux

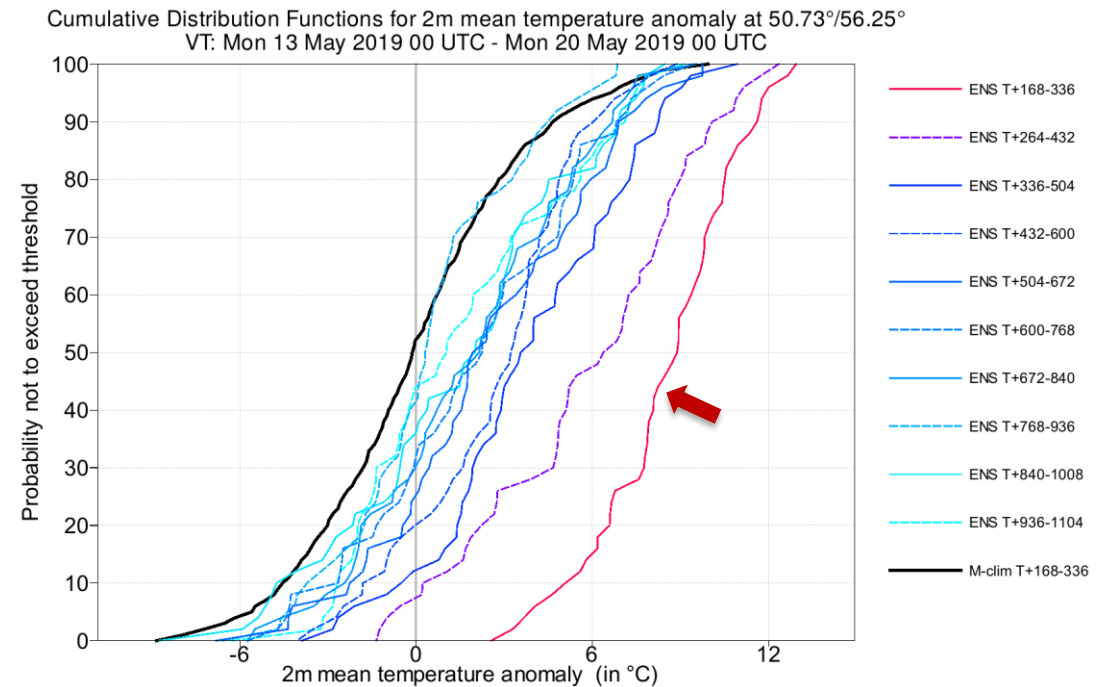
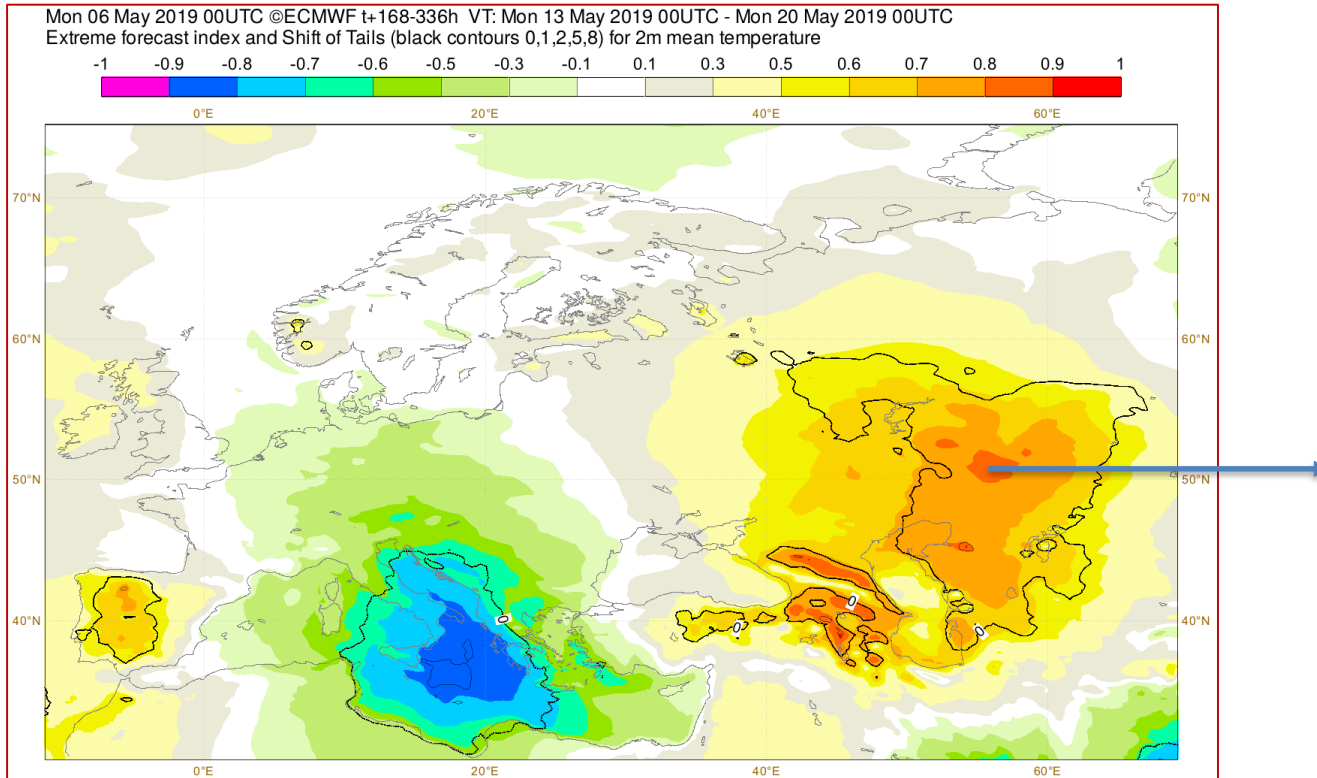


Thu 07 Feb 2019 00UTC @ECMWF expver = 1 VT: Mon 11 Feb 2019 00UTC - Sat 16 Feb 2019 00UTC 96-216h
Extreme forecast index and Shift of Tails (black contours 0,1,2,5,8) for: total precipitation



- Water Vapor flux (WVF) is the magnitude of the combined vertical integrals of the eastward and northward WVF components.
- The WVF EFI complements the precipitation EFI by highlighting the large-scale water vapour transport in the atmosphere.
- Available for the same forecast steps as total precipitation EFI/SOT – daily up to D+7, 3-day averages up to D+10 and 5-day averages up to D+15.
- The example shows a case of heavy precipitation that hit California in February 2019 caused by a powerful atmospheric river bringing air abundant in moisture from the Pacific towards North America. The atmospheric river can be noticed pretty well 5 days in advance in the water vapour EFI. Total precipitation EFI also provides a hint of possible large accumulations of rain.

Extended-range EFI/SOT and CDFs of anomalies

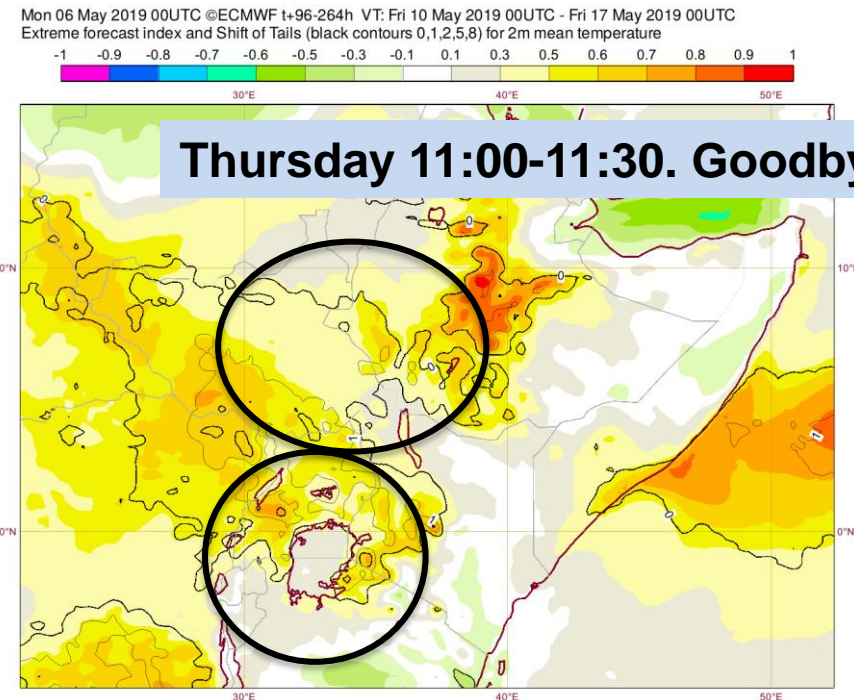


- Parameters: 2m temperature weekly mean and weekly precipitation totals
- M-climate derived from a set of 3 reforecasts centred on the date of the real-time forecast, e.g. a sample size of 660 values
- Forecasts are available for all extended-range forecast steps up to T+936-1104h.
- Cumulative Distribution Functions (CDFs) of anomalies complement the EFI/SOT

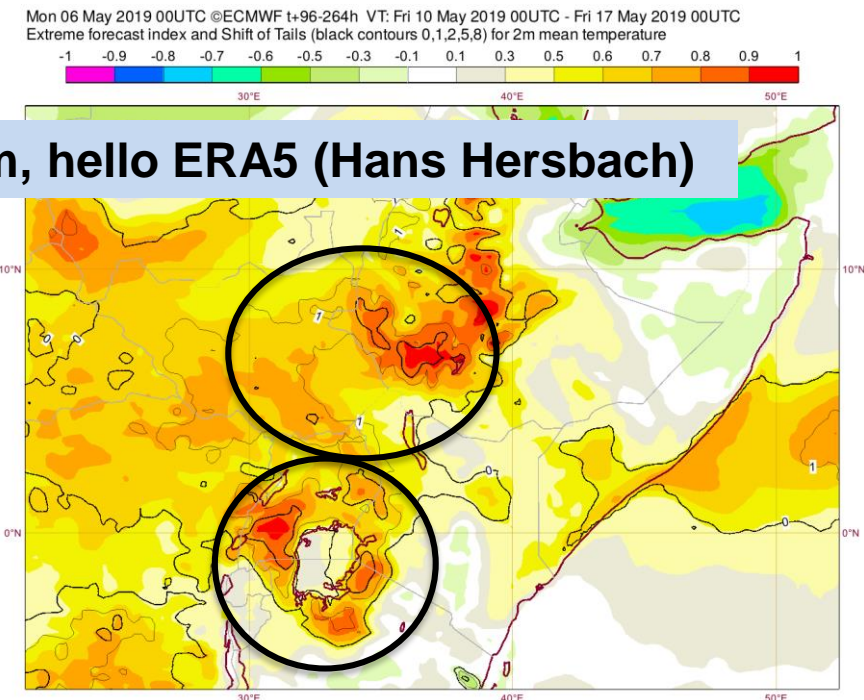
Reforecasts initialised from ERA-5: more consistent climatology

- The new IFS cycle 46r1 will use the ERA5 data to initialize the re-forecasts and also use ERA5 EDA to perturb the re-forecasts initial conditions.
- ERA5 is used for climatology of EFI and SOT

46r1 EFI with ERA-5 climate



46r1 EFI with ERA-Interim climate



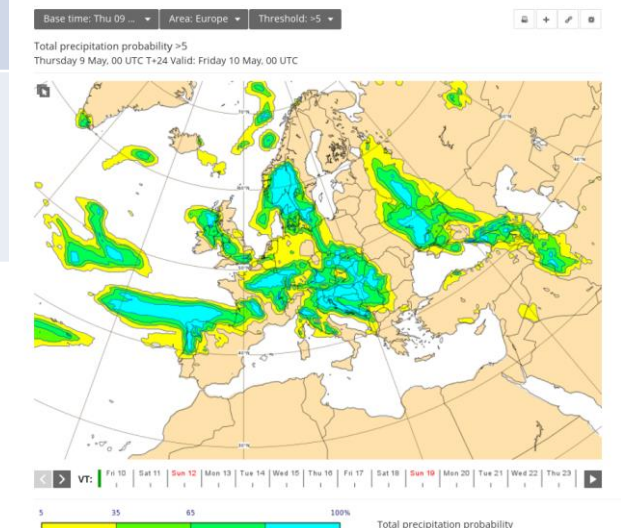
New products for WMO (ECMWF role as World Meteorological Centre)

shortName	Description	threshold
tpg<threshold>	Total precipitation of at least <threshold> mm	25, 50, 100 mm
10fgg10	10 metre wind gust of at least 10 m/s	10 m/s
ptsa_gt_<threshold>stdev	Probability of 850hPa temperature standardized anomaly greater than <threshold> standard deviation	1, 1.5, 2 stdev
ptsa_lt_<threshold>stdev	Probability of 850hPa temperature standardized anomaly less than - <threshold> standard deviation	1, 1.5, 2 stdev

- All parameters are in GRIB edition 2
- Parameters available for ENS




Probabilities: 24hr total precipitation



User guide to ECMWF forecast products

- <https://software.ecmwf.int/wiki/display/FUG/Forecast+User+Guide>



Spaces

Calendars

Create

Forecast User Guide

SPACE SHORTCUTS

Forecast User Home

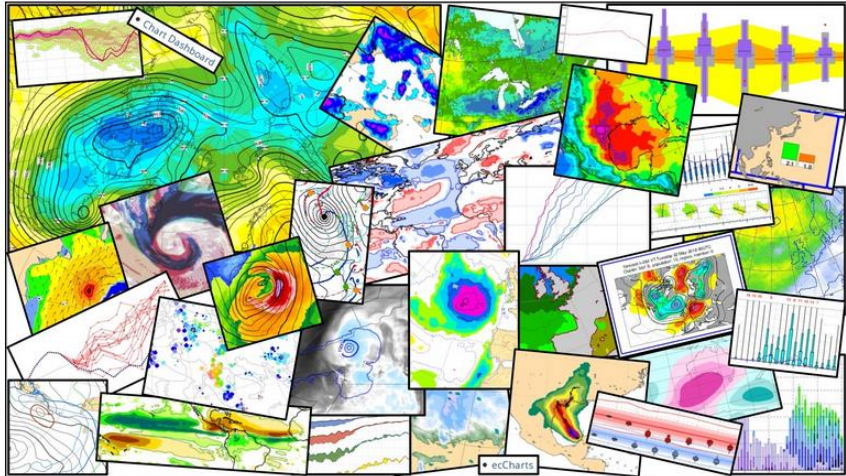
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Forecast User Guide

Search this user guide for ...

"Behind good forecast practices are often hidden good theories; equally, good theories should provide a basis for good forecast practices." Professor Tor Bergeron, personal communication, 1974



The aim of this User Guide is to help meteorologists make the best use of the forecast products from ECMWF - to increase understanding of the ensemble forecast process, to develop new products to reach new sectors of society to satisfy new demands. The User Guide presents the Integrated Forecasting System (IFS) and advises on how best to use the output, not least on how

also available to explain aspects of the ECMWF's more visually. Education is a key component of the work at ECMWF and further educational material is available through the web site (e.g. Webinars (recordings), Slidecasts (slides and audio recordings), Tutorials, Training lectures (presentations in PDF))

Wednesday 14:00-15:15 (Speakers' Corner) - Ivan Tsonevsky: New ECMWF model products explained

Summary

- High frequency products
- ecCharts: new layers, ecCharts-2
- Test products for winter cold spells (medium and extended range)
- Jumpiness
- New forecast output fields (46r1):
 - 200m wind, parameters on PV=1.5, 2
 - Ocean waves
 - Ocean fields
 - Integrated water vapour transport EFI
 - Extended-range EFI
 - Additional event probabilities (WMO products)
- New edition of User Guide

Thanks for all your feedback and requests!