

ECMWF product development

David Richardson

Head of Evaluation Section, Forecast Department, ECMWF

David.richardson@ecmwf.int



Outline

Review the efforts made by ECMWF to address feedback and requests from users of ECMWF forecasts

- New forecast output fields:
 - lightning
 - Integrated water vapour transport
 - Max CAPE/CAPES
- Additions to ecCharts – vertical profiles, extended-range forecasts
- Updated www
- New edition of User Guide to ECMWF Forecast Products

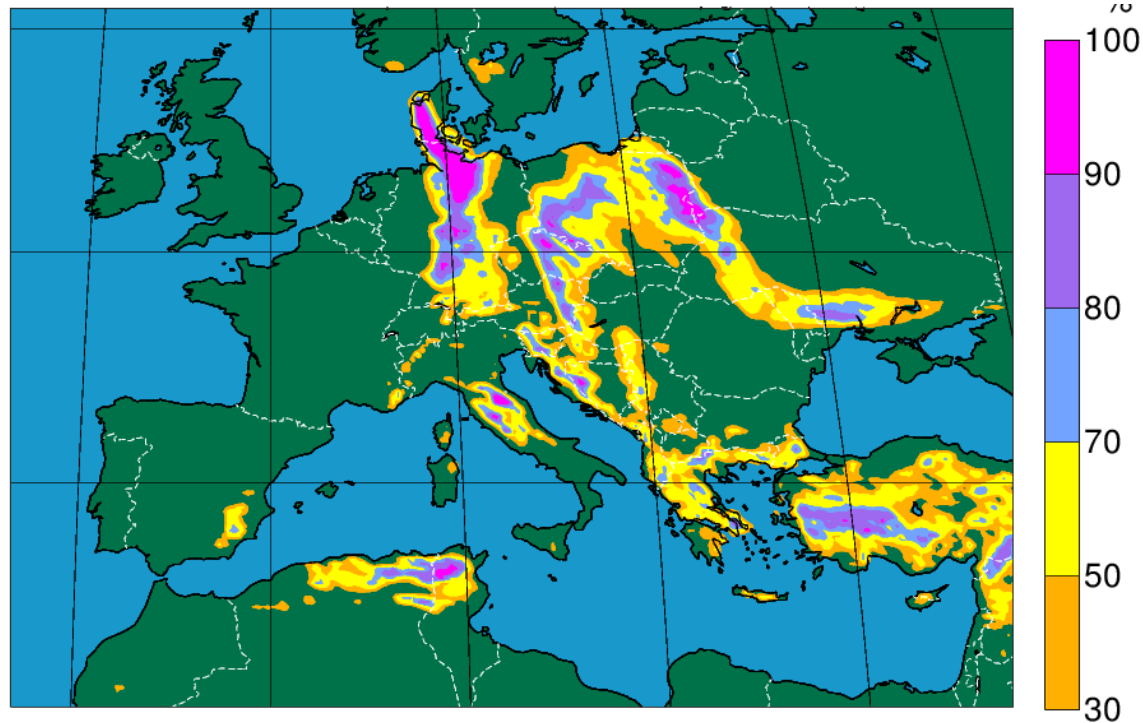
New lightning parameters (June 2018)

- Four lightning density parameters introduced with IFS cycle 45r1:
 - Instantaneous total lightning flash density (litoti)
 - Averaged total lightning flash density in the last hour (litota1)
 - Averaged total lightning flash density in the last 3 hours (litota3)
 - Averaged total lightning flash density in the last 6 hours (litota6)
- “Total” - cloud-to-ground and intra-cloud flashes
- Parametrization in IFS convective hydrometeor amounts, CAPE and convective cloud base height
- Instantaneous - flash density during one model time step of the model (so prone to larger errors)

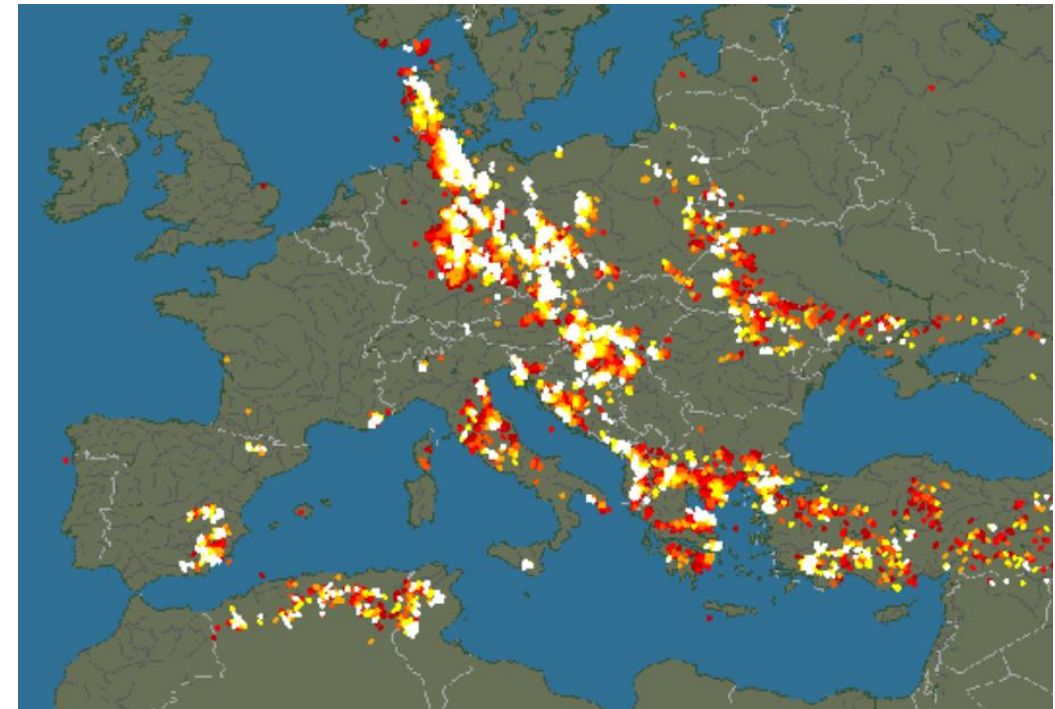


New lightning parameters (June 2018)

Ensemble forecast from 45r1 esuite
Prob(flash density) > 0.1 fl/100km²/h
10 May 2018 00 UTC, range: 12-15 hours

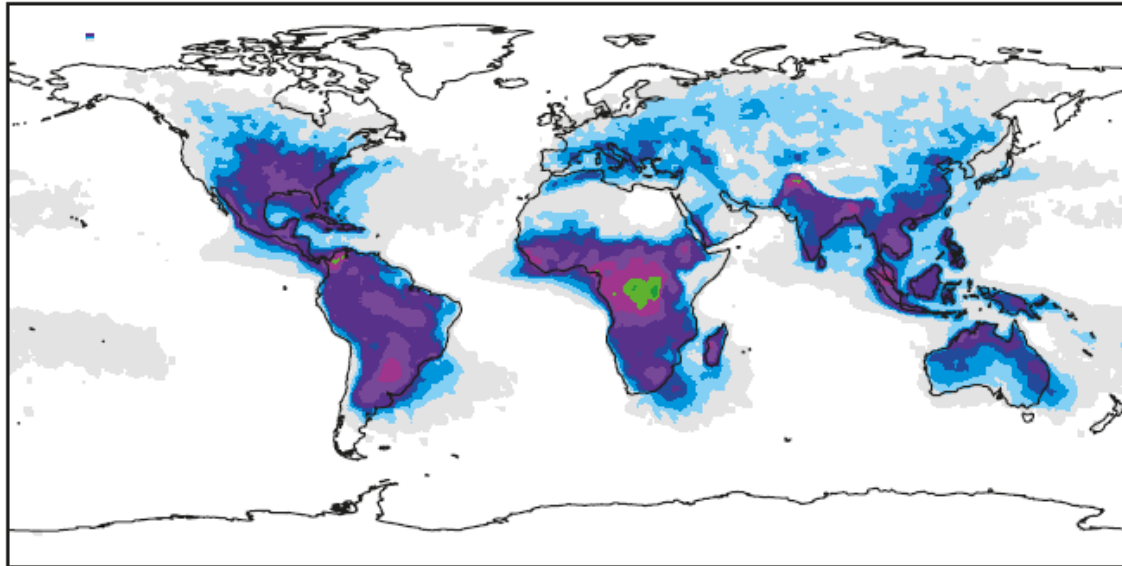


Observed lightning strikes (Blitzortung.org)
10 May 2018 12 to 15 UTC



New lightning parameters (June 2018)

a Climatology



b IFS model runs

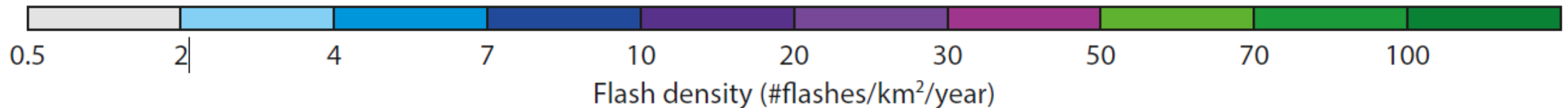
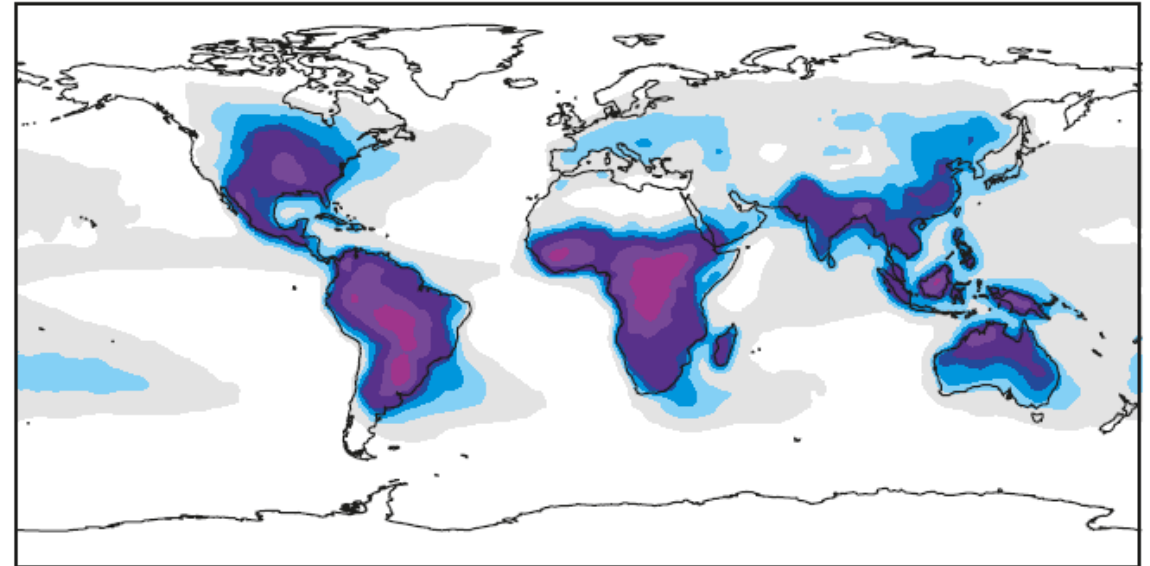
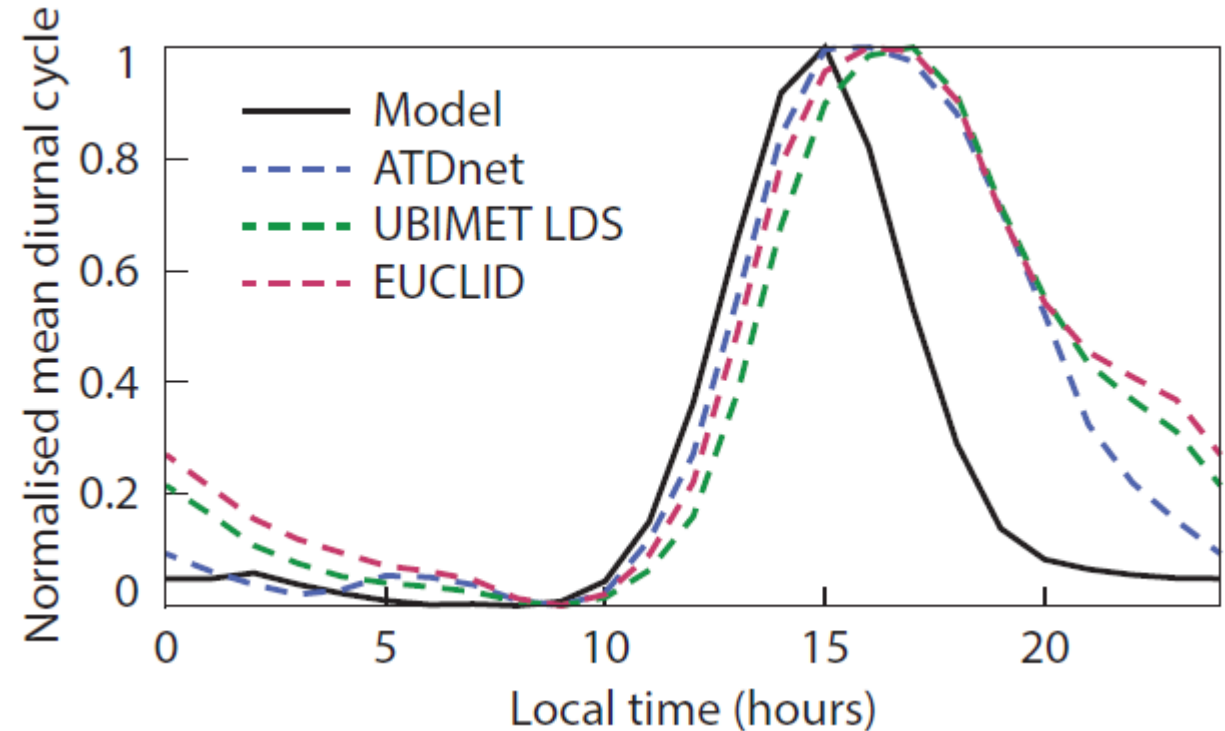


Figure 3 Annual mean lightning flash densities from (a) the LIS/OTD satellite climatology and (b) ten one-year-long IFS model runs, both at 80 km resolution. Note that panel (a) shows the same field as Figure 2, but at a coarser resolution.

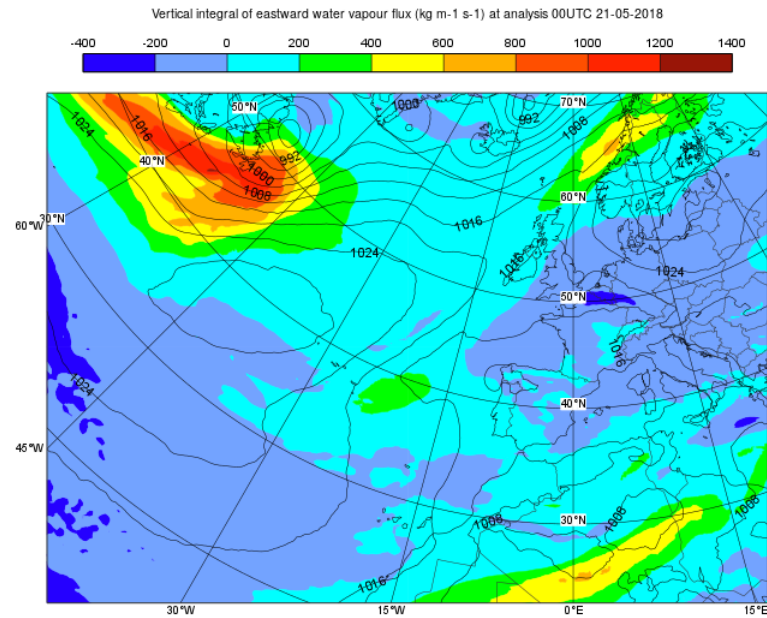
New lightning parameters (June 2018)

Mean diurnal cycle of lightning activity (normalised between 0 and 1) from IFS short-range forecasts at 18 km resolution and from three European ground-based networks of lightning sensors (ATDnet, EUCLID and UBIMET LDS) over the summer of 2015.

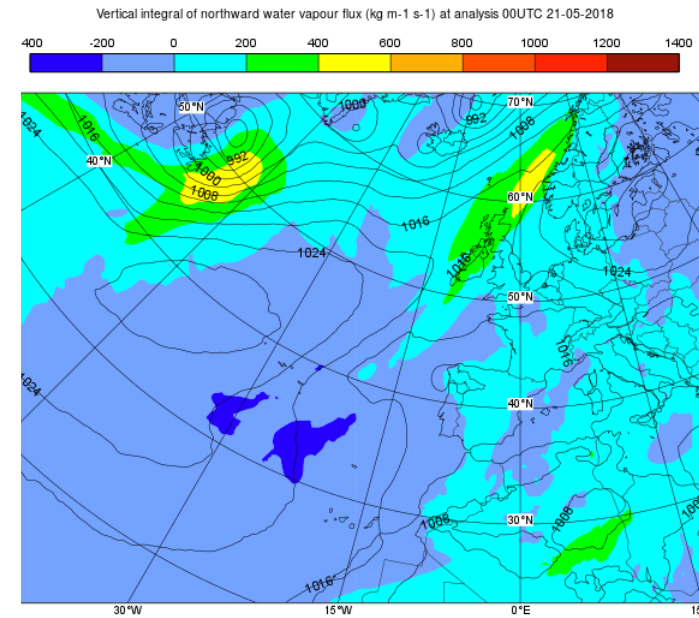


Vertical integral of eastward and northward water vapour flux (June 2018)

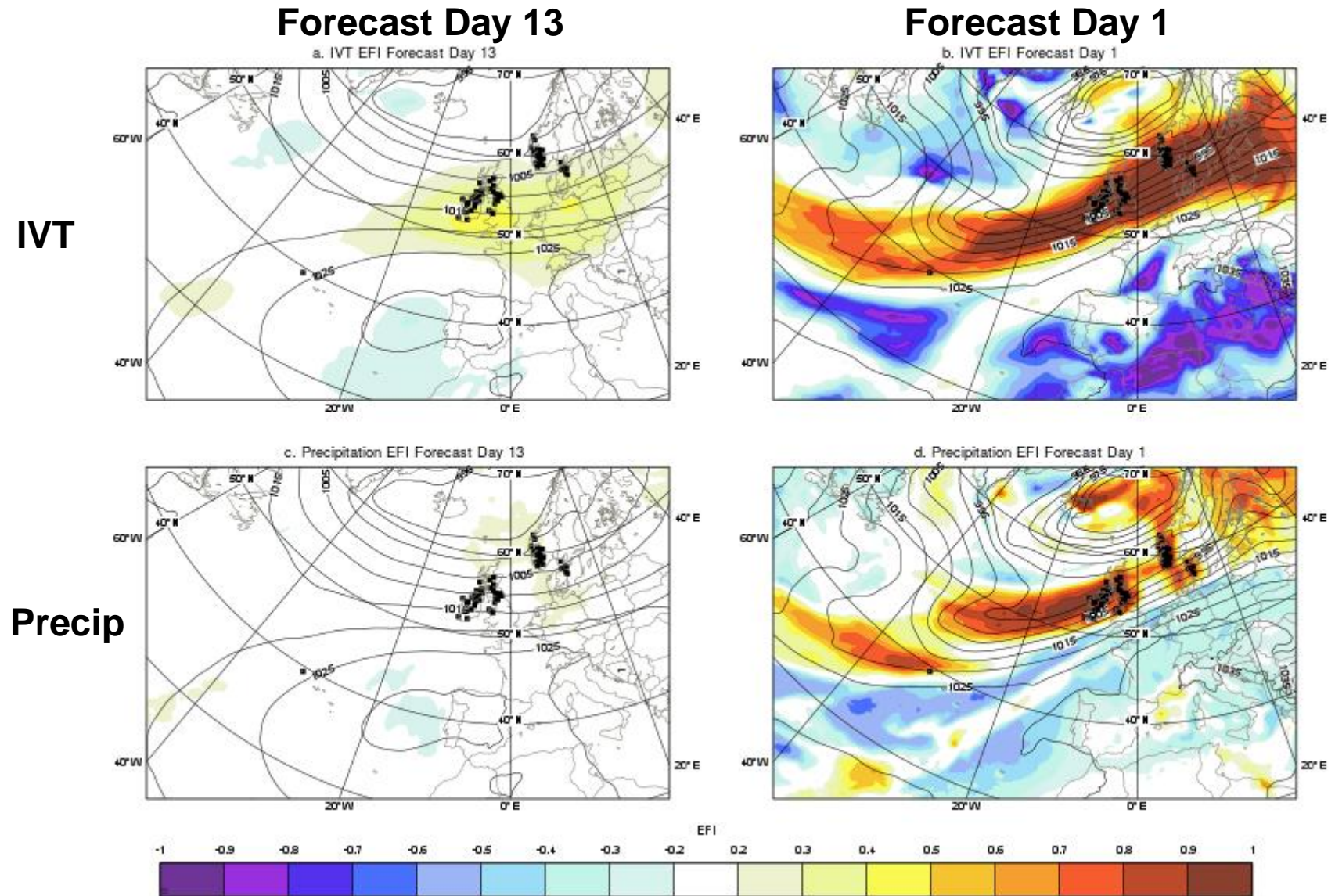
Eastward Flux



Northward Flux

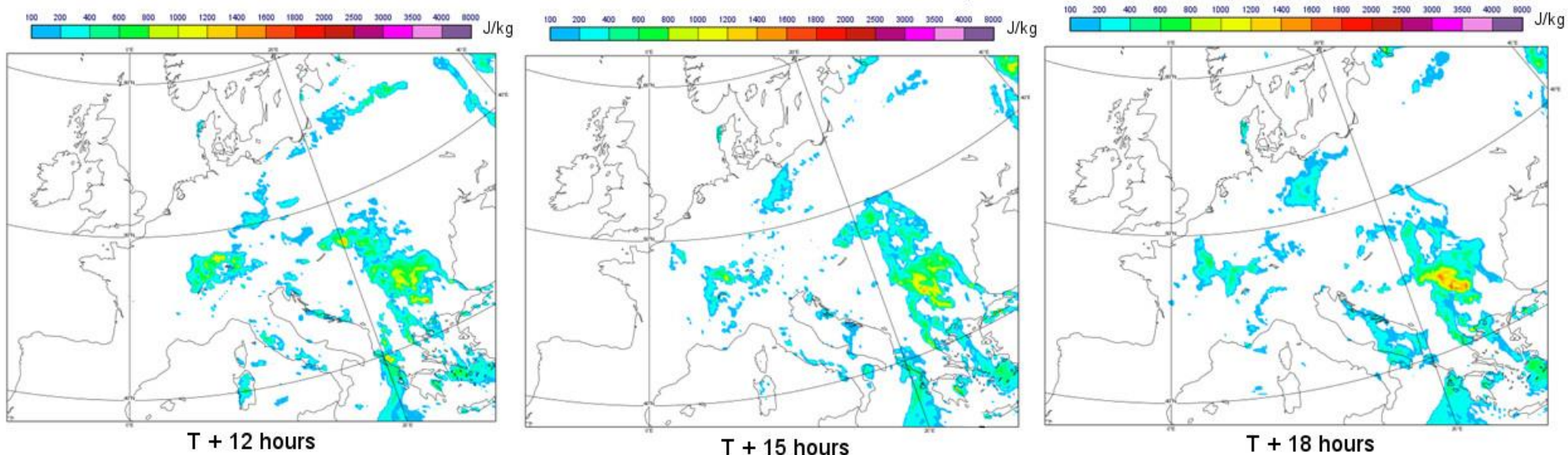


Vertical integral of eastward and northward water vapour flux

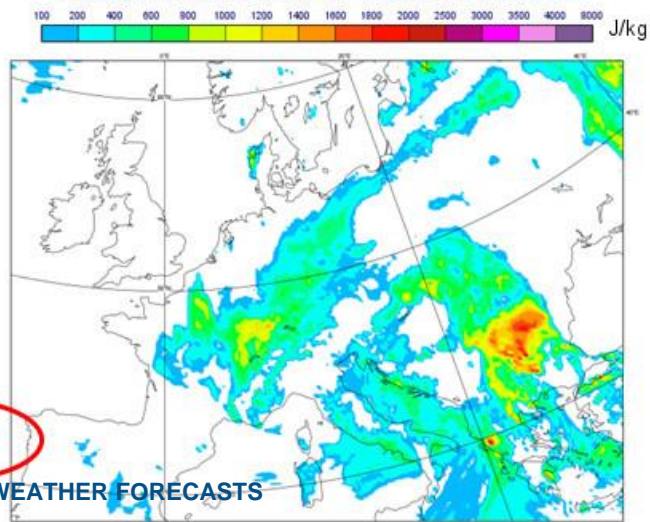


Max CAPE, CAPES in last 6 hours (June 2018)

Instantaneous CAPE. Base time 16 May 2018 00 UTC

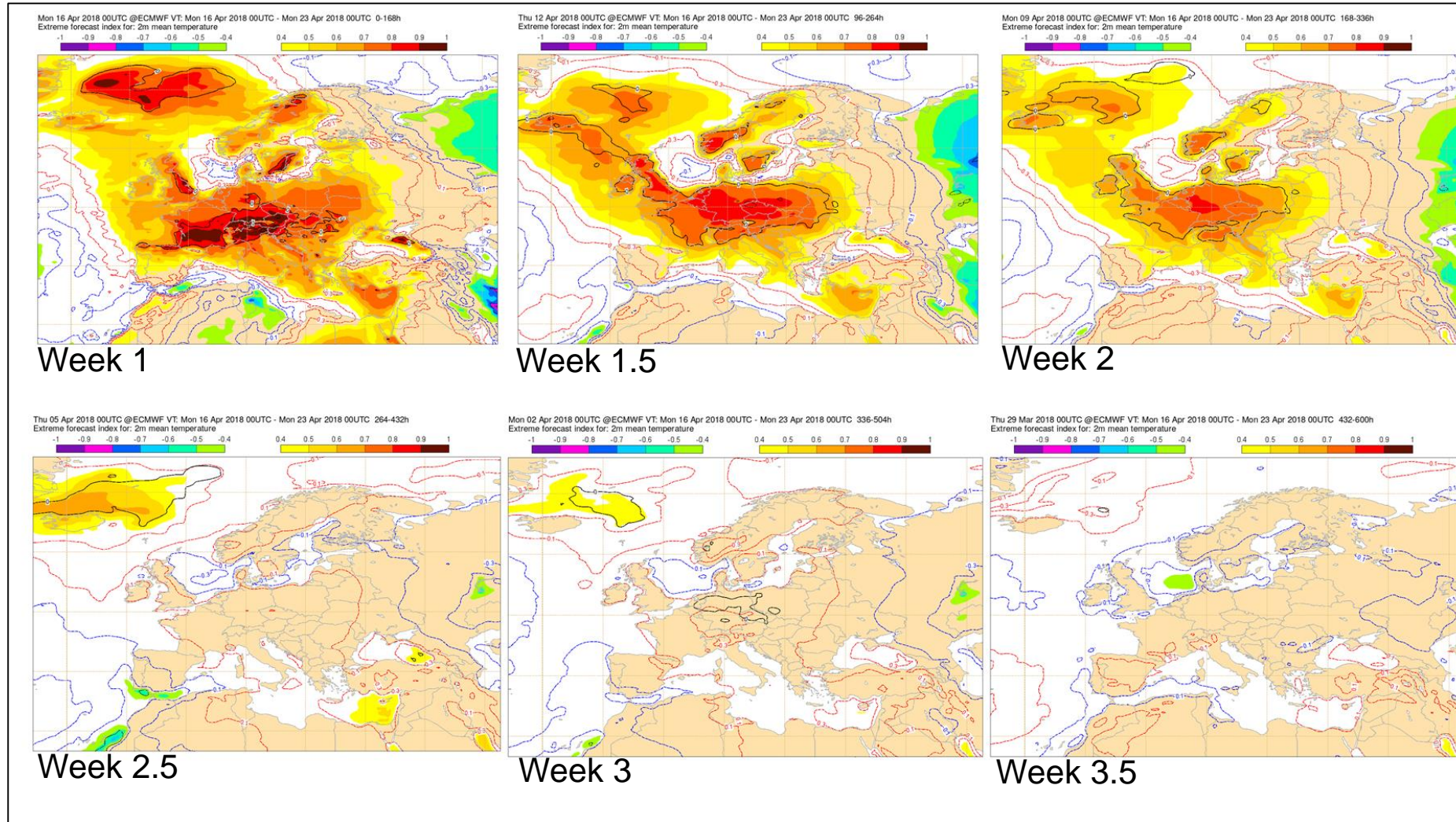


Maximum CAPE over 6 hours



NEW!

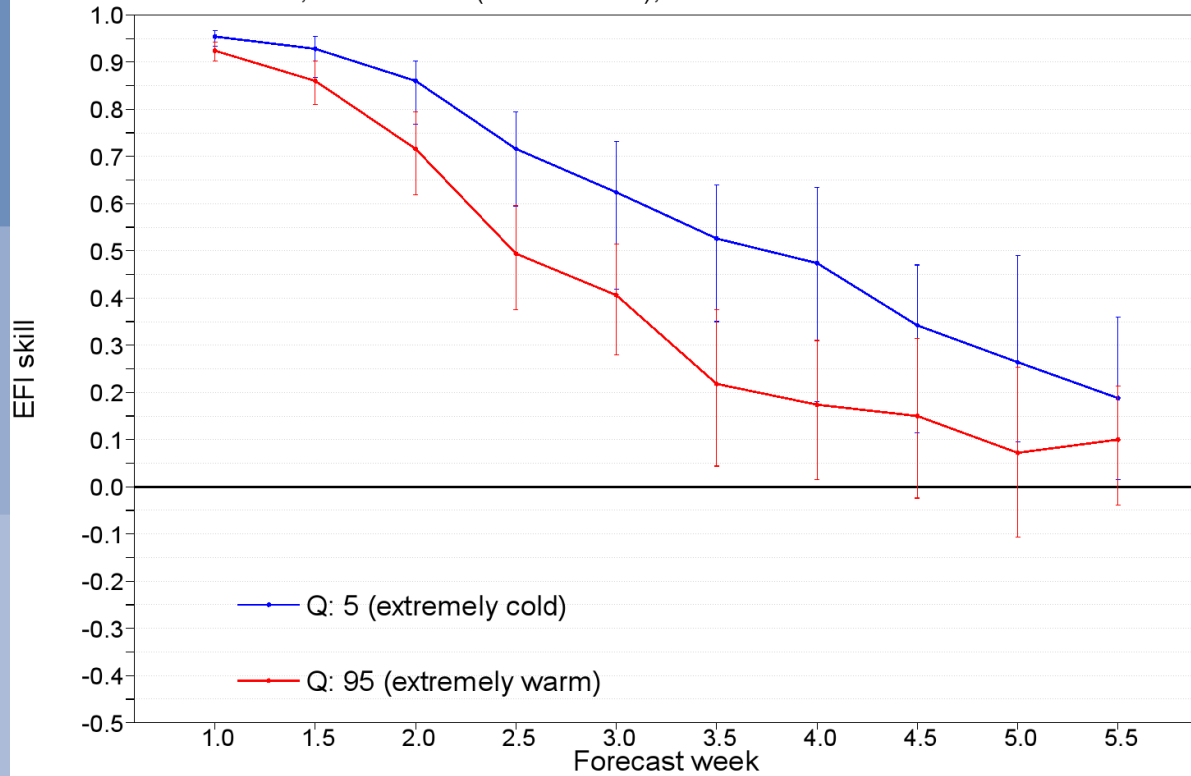
Extended-range EFI/SOT (under test)



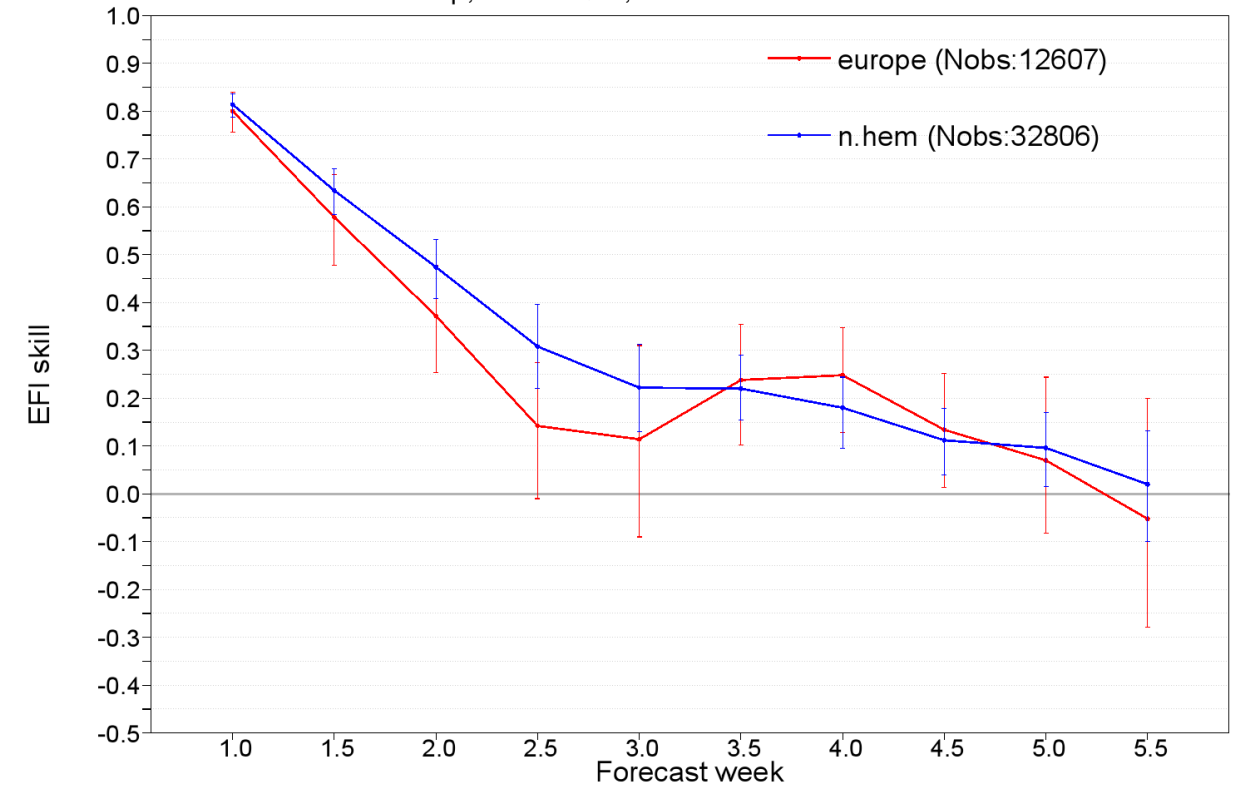
2018 Spring Heatwave

Extended-range EFI

Parameter: 2t; area: n.hem (Nobs: 52396); Season: 01 October 2017 - 04 March 2018

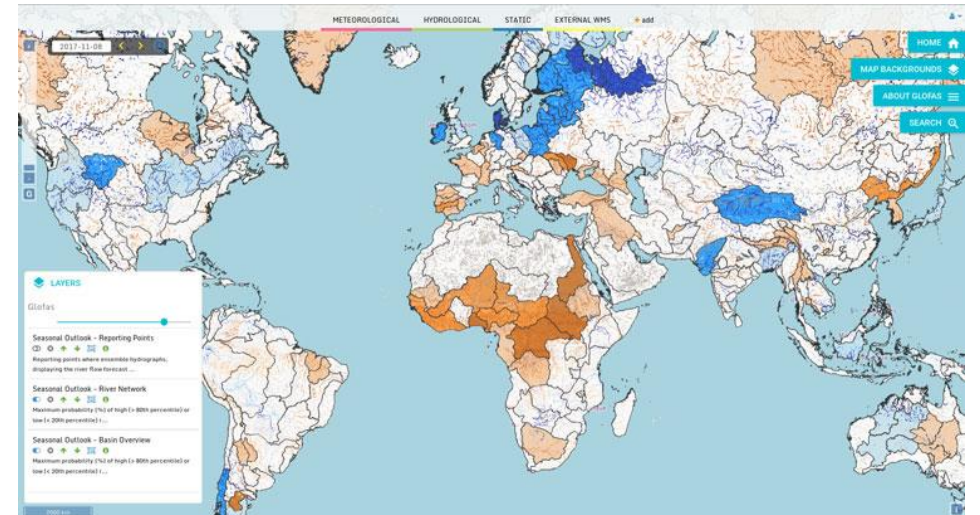
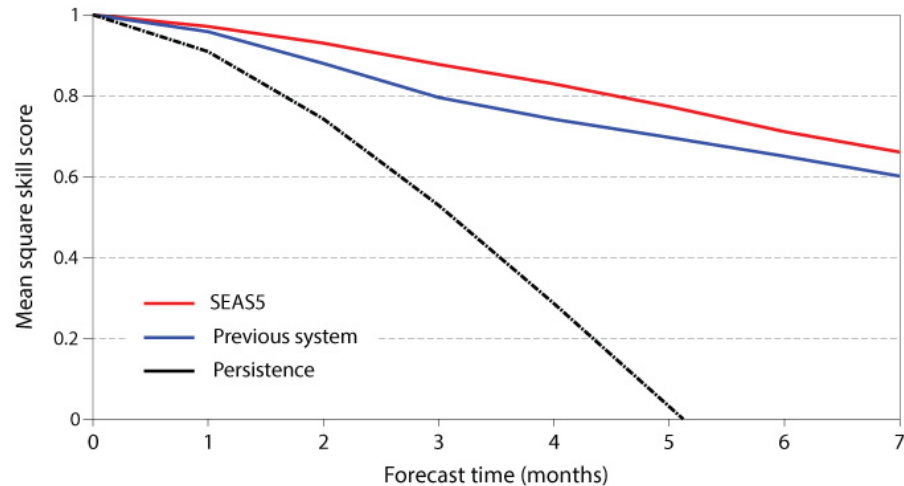


Parameter: tp; Event: Q95; Period: October 2017 - March 2018



New seasonal forecast SEAS5

- SEAS5 (Nov 2017)
 - Sea ice
 - Release date from 8th to 5th,
 - Reforecasts 36 years (was 30), 25 members (was 15)
 - New chart layout
 - Verification grouped in separate families (based on 1981-2016 reforecasts)
 - Added SST anomaly plumes for Nino 1+2 region
 - NB charts (2m temperature etc) are anomalies relative to 1993-2016 (consistent with C3S)



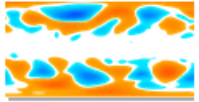
Extended-range in ecCharts

Select from these ECMWF Layers to add to your personal list, or double click to view

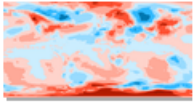
extended

23 matching items

extended



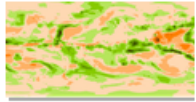
Extended range: 500 hPa



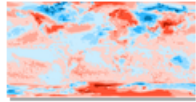
Extended range: 2m temperature weekly



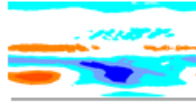
Extended range: MSLP weekly mean



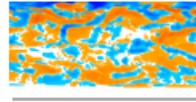
Extended range: precipitation weekly



Extended range: surface temperature



Extended range: 10hPa temperature



Extended range: Sunshine duration



Extended range: 10 metre wind weekly



Extended range: 100 metre wind



Extended range: 850 hPa wind



Extended range: 700 hPa wind



Extended range: 500 hPa wind

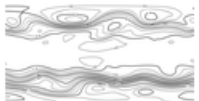


Extended range: 200 hPa wind



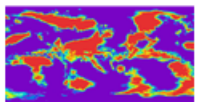
Extended range: 10 hPa wind weekly

Extended range: Weekly mean

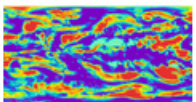


Extended range: 500 hPa

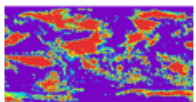
Extended range - Probability distribution



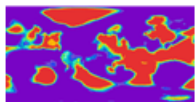
Extended range: 2t probability dist. at



Extended range: precipitation

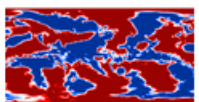


Extended range: surface temperature

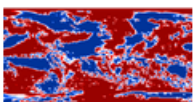


Extended range: MSLP probability

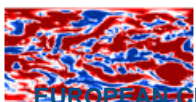
Extended range: Weekly anomaly probability



Extended range: 2m temperature



Extended range: surface temperature

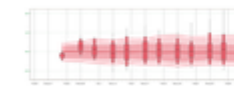


Extended range: Precipitation



Extended range: MSLP probability of

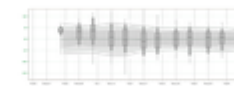
Meteograms - Extended range weekly mean anomaly



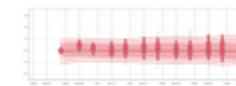
Extended range: 2mt weekly mean



Extended range: precipitation weekly

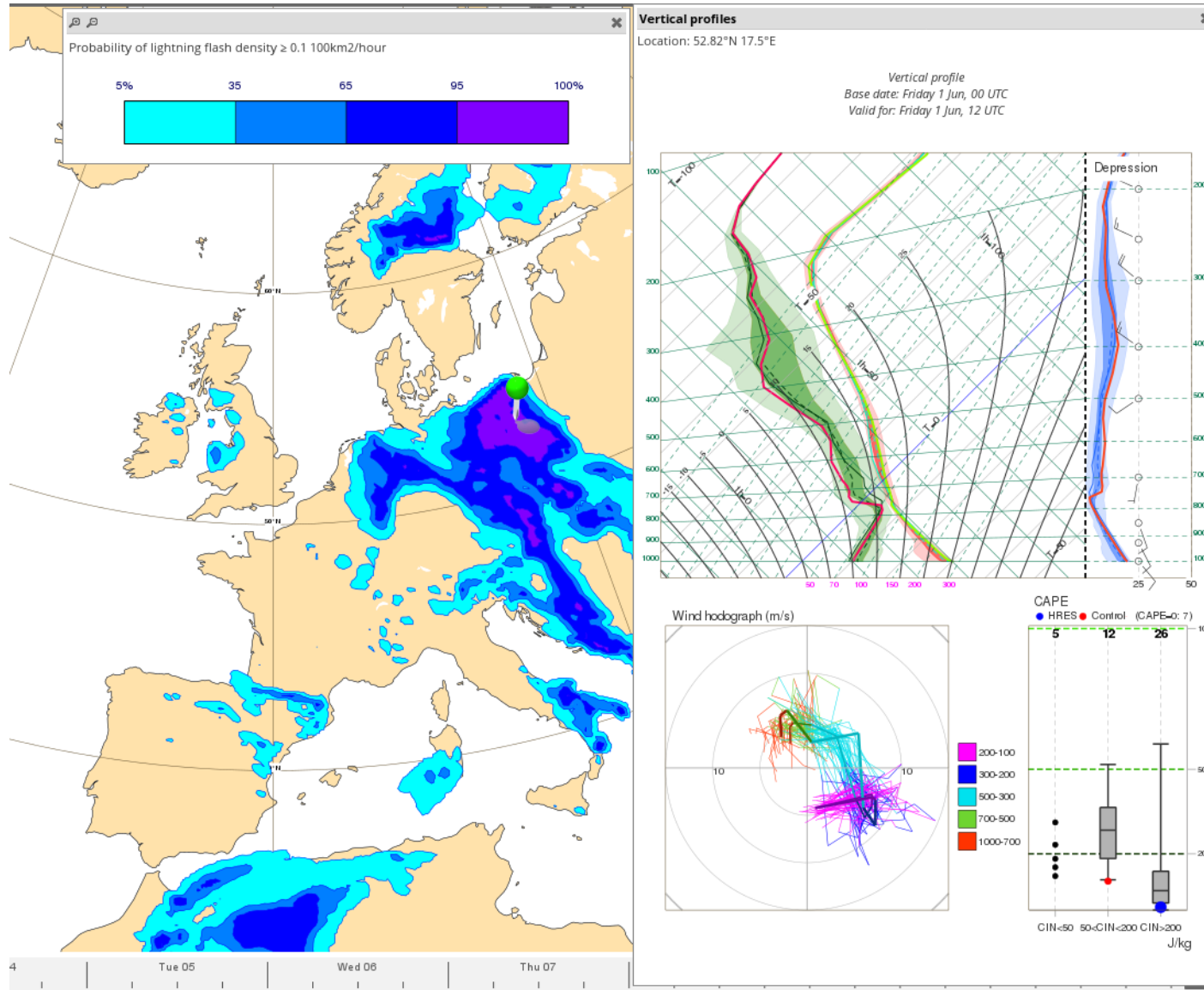


Extended range: MSLP weekly mean



Extended range: Surface temperature

New ecCharts products – vertical profiles



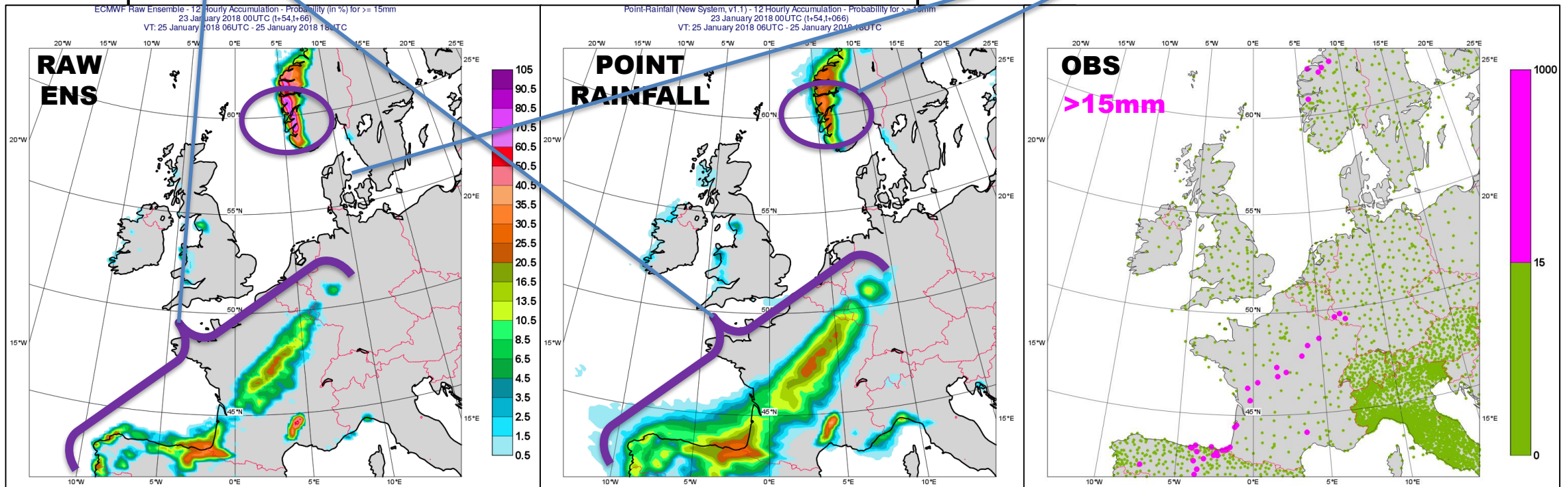
Point Rainfall (“ecPoint”) – new Experimental Global Product

- Post-processed fields delivering probabilities for rainfall at points and not for “gridbox averages”
- Situation-dependent adjustment of probabilities

Probabilities mostly increased
Main reason: Sub-grid variability
expected in this weather scenario

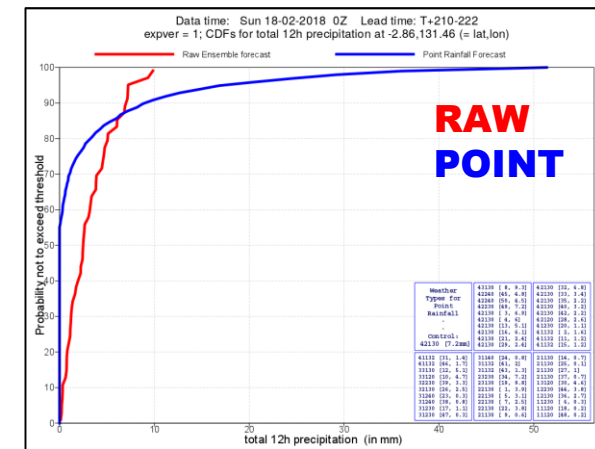
Probabilities reduced
Main reason: IFS over-prediction
expected in this weather scenario

Probabilities for >15mm/12h (D3, VT 25 Jan 2018)



Point Rainfall - Benefits for Users

- Consistently better probabilistic forecasts of rainfall for individual sites
 - With larger spread than the raw ENS, which is under-dispersed (for sites)
- Bias correction of the PDF mean appropriate to the meteorological / geographical situation
 - Range of ~ x0.35 to x2.5
 - Could improve hydrological forecast inputs
- The probability distribution has a longer “wet tail” in most situations
 - Extremes predicted in convective situations can be much higher (very low probability) – flash flood applications
 - Extremes verify much better than for the raw ENS (e.g. for 50mm/12h D5 as good as D1 in Raw)
- Much more reliable forecasts of zero rainfall – again notably in convective situations



Point Rainfall - Status

- Will become an “Experimental product” in ecCharts during the summer – feedback welcome! Not yet in catalogue.
- Co-operation agreements reached with various NMHSs around the world to test this product out – (Ecuador, Canada, Hungary, Costa Rica,...). Regional point rainfall forecast grib files being provided via ftp in real time, in exchange for feedback reports (and also extra observations - precipitation totals, discharge - for non-European countries).

ECMWF website

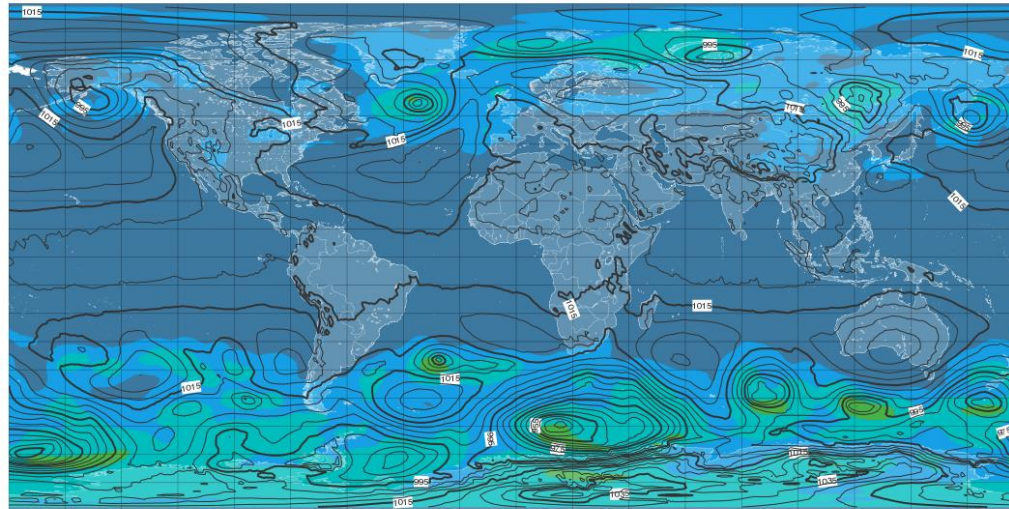
ECMWF En Fr De ff [Contact](#) [David Richardson](#)

[Home](#) [About](#) [Forecasts](#) [Computing](#) [Research](#) [Learning](#) [Library](#)

[View published](#) [New draft](#) [Revisions](#)



Advancing global NWP through international collaboration



High resolution mean sea level pressure and ensemble spread

Friday 18 May, 00 UTC T+96 Valid: Tuesday 22 May, 00 UTC

Ensemble forecasts explained

One 'ensemble forecast' consists of 51 separate forecasts made by the same computer model, all activated from the same starting time. The starting conditions for each member of the ensemble are slightly different, and physical parameter values used also differ slightly. The differences between these ensemble members tend to grow as the forecasts progress, that is as the forecast lead time increases.

[View all charts >](#)



SCIENCE BLOG

Improving prediction and climate monitoring of polar regions – challenges and priorities

As WMO's Year of Polar Prediction gets well



NEWS

NOAA satellite launch 20 years ago marked start of new era

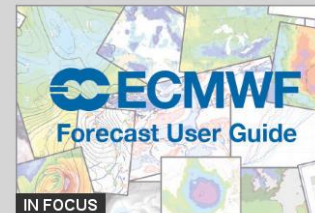
Sunday 13 May marks the 20th anniversary of the start of a new era in meteorological satellite



NEWS

Countdown to registration deadline for physics-dynamics coupling workshop

Registration for a workshop on physics



IN FOCUS

User guide to ECMWF forecast products

A new edition of ECMWF's user guide is now available online. The ECMWF Forecast User

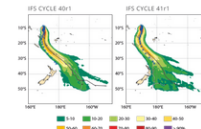
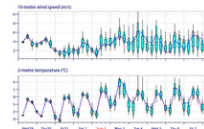
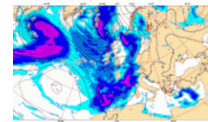
ECMWF website

Charts

Here you will find forecasts and associated verification.

Our Integrated Forecasting System (IFS) provides forecasts for multiple time ranges. Our range of forecast products present key aspects of the forecast evolution and the associated uncertainty to address different user requirements.

Who you are will determine your level of [access to forecasts](#).



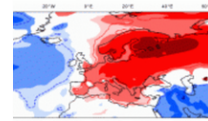
Medium range

Up to 10/15 days ahead

Overview

Forecast charts

Verification



Extended range

Up to 32 days ahead

Overview

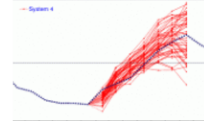
Forecast charts

Meteograms

Up to 10/15 days ahead

ENS meteograms

ENS meteograms for WMO member states



Long range

Up to 13 months ahead

Overview

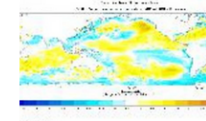
Forecast charts

Cyclones

Up to 10/15 days ahead

Tropical cyclones

Extra-tropical cyclones



Additional charts

Ocean Reanalysis

EUROSIP Multi-model system

Quick links

- [ecCharts](#)
- [Chart Dashboard](#)

See also

- [Monitoring of the observing system](#)

Information and updates

- [Forecasting Issues](#)
- [Product News](#)
- [Model Changes](#)
- [Past Severe Events](#)

Guides

- [Forecast User Guide](#)
- [Guide to Dashboard](#)

User guide to ECMWF forecast products

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

The screenshot shows the ECMWF Forecast User Guide website. The top navigation bar includes the ECMWF logo, 'Spaces', 'Calendars', and a 'Create' button. A search bar is located in the top right. The main content area is titled 'Forecast User Guide' and features a search box with the placeholder text 'Search this user guide for ...'. Below the search box is a quote: *"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 central image is a collage of various meteorological forecast products, including maps, charts, and data visualizations. Below the image, there is a paragraph explaining the aim of the User Guide:

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 to build up trust in the forecast information. A good forecast that is not trusted is a worthless forecast. The emphasis is on the medium-range forecast products, as this is ECMWF's primary goal, and because medium-range NWP output generally differs significantly from dealing with short-range or seasonal NWP.

 This guide is intended to give an outline of structure and use of the ECMWF IFS and how the high-resolution forecast (HRES), ensemble forecast (ENS), extended range forecast and seasonal forecast models inter-depend and interact. Links to more detailed descriptions of processes are given, mainly at the end of each section, whilst separate online ECMWF training resources are also available to explain aspects of the ECMWF IFS 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))

Summary

Review the efforts made by ECMWF to address feedback and requests from users of ECMWF forecasts over the last year

- New forecast output fields:
 - lightning
 - Integrated water vapour transport
 - Max CAPE/CAPES
- Additions to ecCharts – vertical profiles, extended-range forecasts
- Updated www
- New edition of User Guide