

# ecCharts

Introducing ECMWF's web charts application

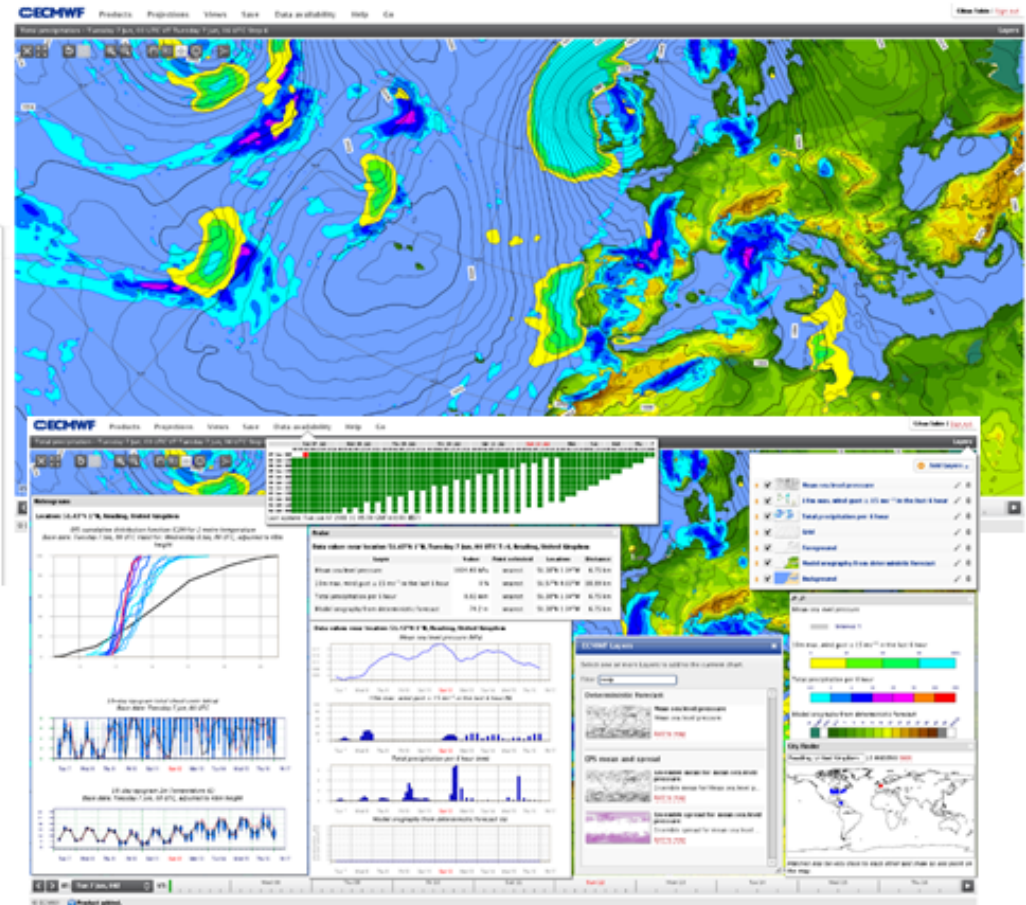
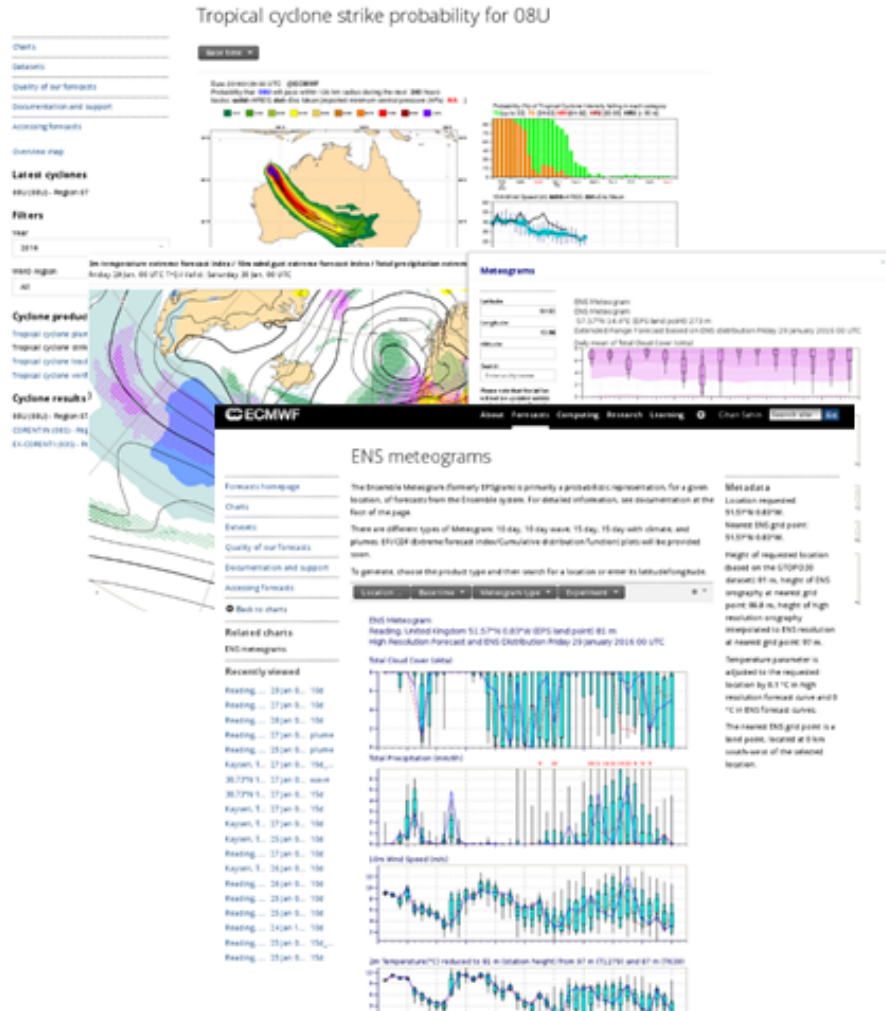
Cihan Sahin

[Cihan.sahin@ecmwf.int](mailto:Cihan.sahin@ecmwf.int)

# ECMWF graphical products

Charts on www

ecCharts



# WWW Charts

High resolution (HRES) forecast charts (Updated at 06:55 and 18:55)

Ensemble prediction system (ENS) charts up to 10 days (Updated at 8:20 and 20:20)

Ensemble prediction system (ENS) charts 10-15 days (Updated at 8:40 and 20:40)

Position generated time series from Ensemble, so called ENS meteograms.

Monthly forecast charts (Every Thursday and Monday)

Seasonal forecast charts (once a month)

Observation monitoring charts (Daily, monthly ...)

Research charts (Model climate based on different IFS cycles, Ocean reanalysis)

The screenshot shows the ECMWF website's 'Charts' page. The navigation bar includes 'About', 'Forecasts', 'Computing', 'Research', 'Learning', and a search bar. The 'Charts' section is highlighted in the dropdown menu. The main content area is titled 'Charts' and contains the following text: 'Select and view our charts - forecasts and analysis. Our Integrated Forecasting System (IFS) provides a range of forecast products to add aspects of the forecast evolution and the associated potential severe weather events include the Extended range. Click on the category title or the associated thumbnail below to access all charts for that category.'

The page is organized into three main columns of chart categories:

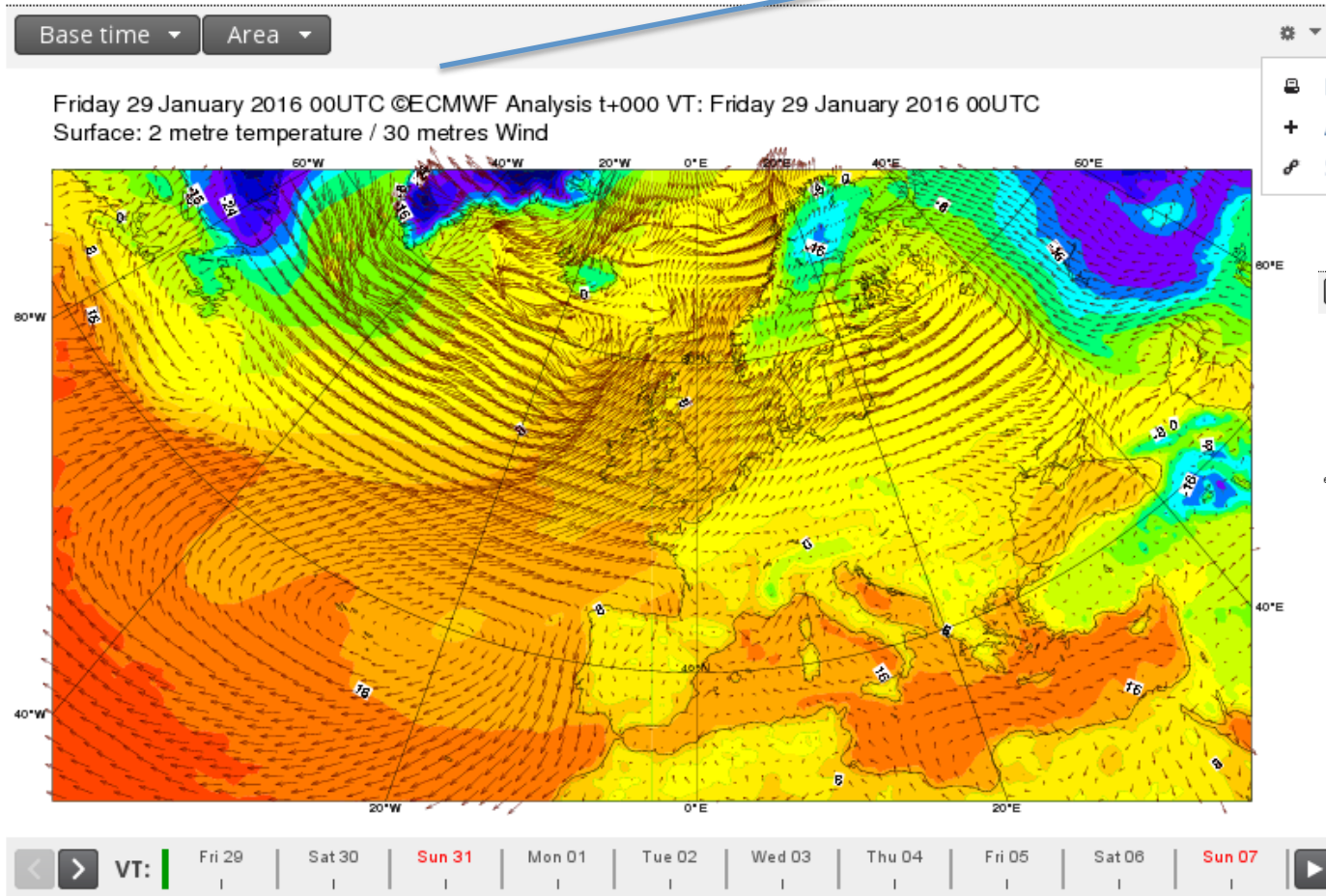
- Medium range**: Up to 10/15 days ahead. Includes links for Overview (text), ENS meteograms, ENS meteograms for WMO member states, Extreme forecast index, Clickable charts (NEW), Extra-tropical cyclones, Tropical cyclones, Ocean waves, and Verification.
- Extended range**: Up to 30 days ahead. Includes links for Overview (text), Plumes, Tropical cyclones, and Verification.
- Long range**: Up to 12 months ahead. Includes links for Overview (text), Niño plumes, Tropical cyclones, and Verification.

There is also a section for 'Additional charts' which includes 'Ocean reanalysis' and 'Severe Weather Forecasting Demonstration Project (SWFDP)'. A sidebar on the right contains a 'Help' section with instructions on how to view all charts in a category.

# Chart functionalities

2m temperature and 30m winds

Chart options



Add to dashboard

- Print
- + Add to dashboard
- Share

URL for batch access to this chart

Base time ▾ Area ▾

Chart permanent link

The following URL can be used to download charts automatically

```
https://apps.ecmwf.int/plots/product-download/medium/w_t2m30mw/?time=2016012900,0,2016012900&area=Europe&token=c9affd84d43ff547cb6510c64ea2f42f&email=mot@ecmwf.int
```

Add '&format=pdf' to the end of URL if you wish to download PDF version.

Forecast steps / animation

# Clickable charts

- New generation of charts that produce Meteograms when clicked

**Charts**

**Datasets**

**Quality of our forecasts**


**Documentation and support**

**Accessing forecasts**


### Medium range charts (Clickable)

4 matching items


No filters currently applied




Ensemble mean and spread for MSLP



MSLP and rain from high resolution



Multi-parameter EFI (24-h up to valid)



Total precipitation probability

Base time: Monday 1 Feb

2m temperature

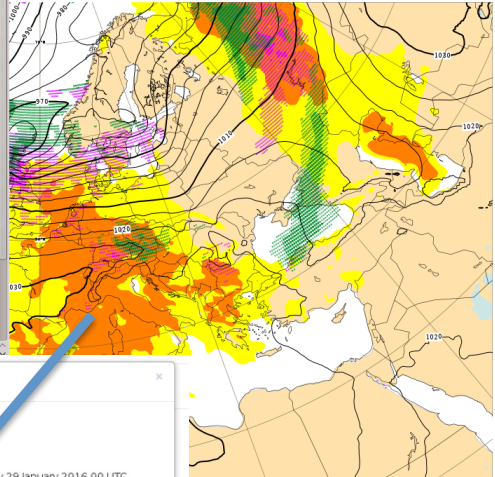
Area: Europe

- Europe
- Global
- Central Europe
- North West Europe
- North East Europe
- South West Europe
- South East Europe
- Northern Africa
- North Atlantic
- Arctic
- Antarctica
- North America
- Central America
- South America
- Eurasia
- Southern Asia
- Western Asia
- Eastern Asia
- South East Asia & Indonesia
- Middle East & India
- Southern Africa
- Australasia
- West Tropic

Product results

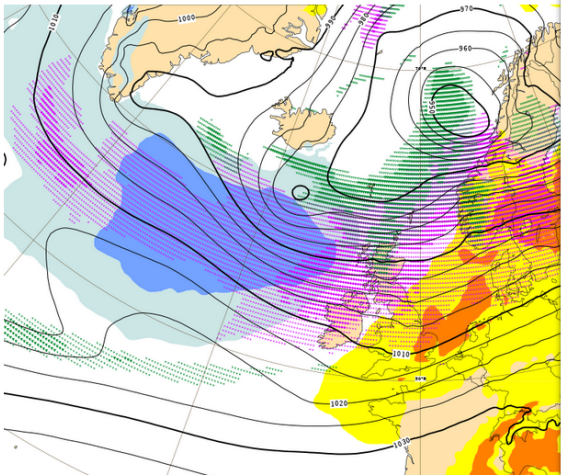
Wind gust extreme forecast index / Total precipitation extreme forecast index / Ensemble mean for mean sea level pressure

Feb, 00 UTC



2m temperature extreme forecast index / 10m wind gust extreme forecast index / Total precipitation extreme forecast index

Friday 29 Jan, 00 UTC T+24 Valid: Saturday 30 Jan, 00 UTC



### Meteograms

Latitude: 57.53

Longitude: 13.98

Altitude:

Search: Enter a city name

Please note that the label will not be updated, unless an item is selected from the drop-down list, otherwise the text will be treated purely as a label

10-day meteogram

15-day meteogram

15-day with climate

Plume

10-day wave

EFI-CDF

**Download**

PDF

Show grid point info

**Recently viewed**

15-day clim(57.53/13.98)

10-day(57.53/13.98)

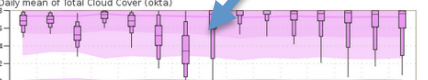
ENS Meteogram

ENS Meteogram

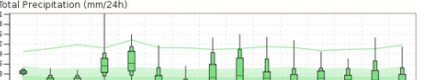
57.57°N 14.4°E (EPS land point) 273 m

Extended Range Forecast based on ENS distribution on Friday 29 January 2016 00 UTC

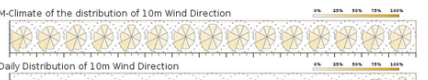
Daily mean of Total Cloud Cover (okta)



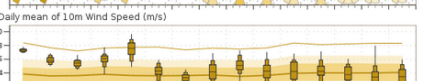
Total Precipitation (mm/24h)



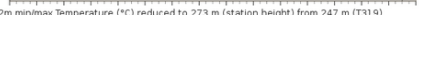
M-Climate of the distribution of 10m Wind Direction



Daily Distribution of 10m Wind Direction



Daily mean of 10m Wind Speed (m/s)



2m min/max Temperature (°C) reduced to 273 m (station height) from 947 m (T31 Q)

# Chart dashboard

Organise multiple charts and meteograms in the same "page".

Access to chart dashboard

ENS meteograms

The Ensemble Meteogram (formerly EPSgram) is primarily a probabilistic representation, for a given location, of forecasts from the Ensemble system. For detailed information, see documentation at the foot of the page.

There are different types of Meteogram: 10 day, 10 day wave, 15 day, 15 day with climate, and plumes. EFI/CDF (extreme forecast index/cumulative distribution function) plots will be provided soon.

To generate, choose the product type and then search for a location or enter its latitude/longitude.

Location:  Base time:  Meteogram type:  Epsgram

ENSMeteogram

Location requested: 38.47°N 27.33°E  
Nearest ENS grid point: 38.47°N 27.33°E  
Height of requested location (based on the GTOPO30): 132 m  
Daily mean of Total Cloud Cover (okta):   
Total Precipitation (mm(24h)):   
M-Climate of the distribution of 1.0m Wind Direction:

Metadata

Location requested: 38.47°N 27.33°E  
Nearest ENS grid point: 38.47°N 27.33°E  
Height of requested location (based on the GTOPO30): 132 m  
Daily mean of Total Cloud Cover (okta):   
Total Precipitation (mm(24h)):   
M-Climate of the distribution of 1.0m Wind Direction:

Temperature parameter is adjusted to the requested location by 7 °C in high resolution forecast curve and 0.8 °C in ENS forecast curves. The nearest ENS grid point is a land point, located at 17 km north-east of the selected location.

Buttons: Print, Add to dashboard, Share

Buttons: Add chart to dashboard

About Forecasts Computing Research Learning Cihan Sahin Search site Go

Chart dashboard

Log out

Autumn newsletter published

Forecasters

Extreme weather Reading EPSGRAMS Precipitation Epsgrams New epsgrams Reading temperature and cloud + Add Tab

Western Turkey More meteograms November 2014 update Location

Rainfall and MSLP  
Friday 29 January 2016 00UTC GECMWF Analysis 1x000 VT: Friday 29 January 2016 00UTC  
Surface: Mean sea level pressure

Cloud cover  
Friday 29 January 2016 00UTC GECMWF Analysis 1x000 VT: Friday 29 January 2016 00UTC  
Cloud: 1x100 1x100 1x100 WxALL: clear

ENS meteograms  
ENSMeteogram  
Location requested: 38.47°N 27.33°E (EPS land point) 132 m  
Extended Range Forecast based on ENS distribution Friday 29 January 2016 00 UTC  
Daily mean of Total Cloud Cover (okta):   
Total Precipitation (mm(24h)):   
M-Climate of the distribution of 1.0m Wind Direction:   
Daily Distribution of 1.0m Wind Direction:   
Daily mean of 1.0m Wind Speed (m/s):   
2m-meteor. Temperature (°C) reduced to 1.32 m (station height) from 298 m (753 ft):

Probabilities, 2m temperature  
M-Climate: this stands for Model Climate. It is a function of real time, date (1-13 days), and model version. It is derived by running a 11 member ensemble over the last 30 years back in week (100 realizations). M-Climate is always from the same model version as the displayed ENS data.

All sky radiances from AMSR2 (Hovmoeller Latit...  
STATISTICS FOR RADIANCES FROM GCOM-W1/AMSR2 CHANNEL 1 (1.1mm STIP - 4 ACQUIS)  
RELAX OBSERVATION - ALL ACQUIS  
EXP - 050 DATA PERIOD - 201510000 - 2016012015  
Min: 78.917 Max: 128.000 Mean: 86.592

Weekly probability anomaly  
ECMWF ENS-Meteorology Forecasting System  
Prob/Prdcs anom at 05  
Forecast: 01-00-2016/01-07-2016  
Weather and climate at ECMWF  
Day 0-11

MJO index  
ECMWF MONTHLY FORECASTS  
FORECAST BASED 28/01/2016 00UTC  
Day 1 Day 5 Day 10 Day 15 Day 20 Analysis

<https://software.ecmwf.int/wiki/display/FCST/Chart+dashboard>

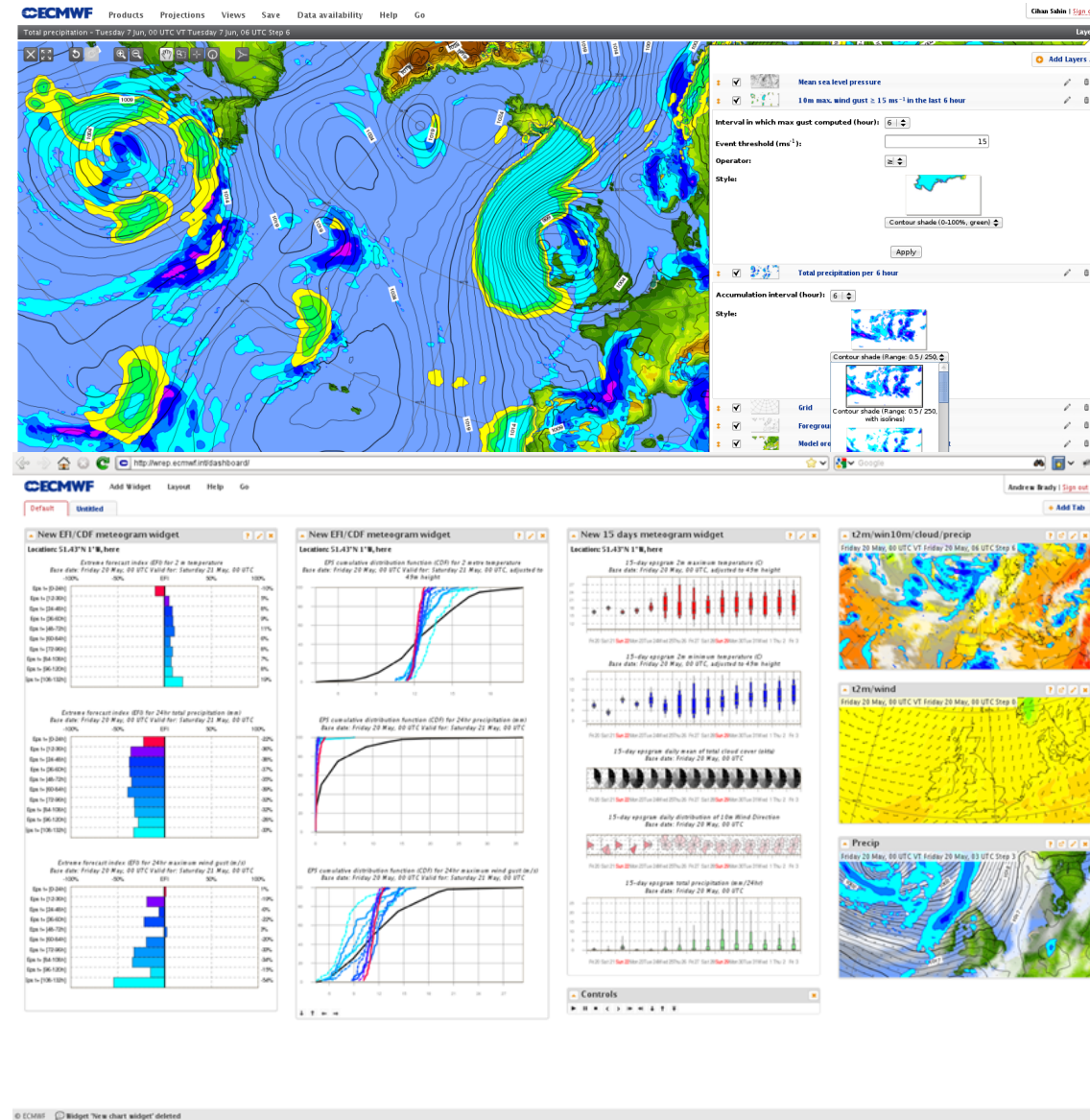
# ecCharts

Web based application to explore and visualize ECMWF data

- Easy and immediate access to charts
- Native data resolution
- Interactive features (zoom, pan, click, extract data information, ...)
- User controlled visualization
- Customisable parameters
- Download charts (through WMS)
- Operationally supported, highly available service

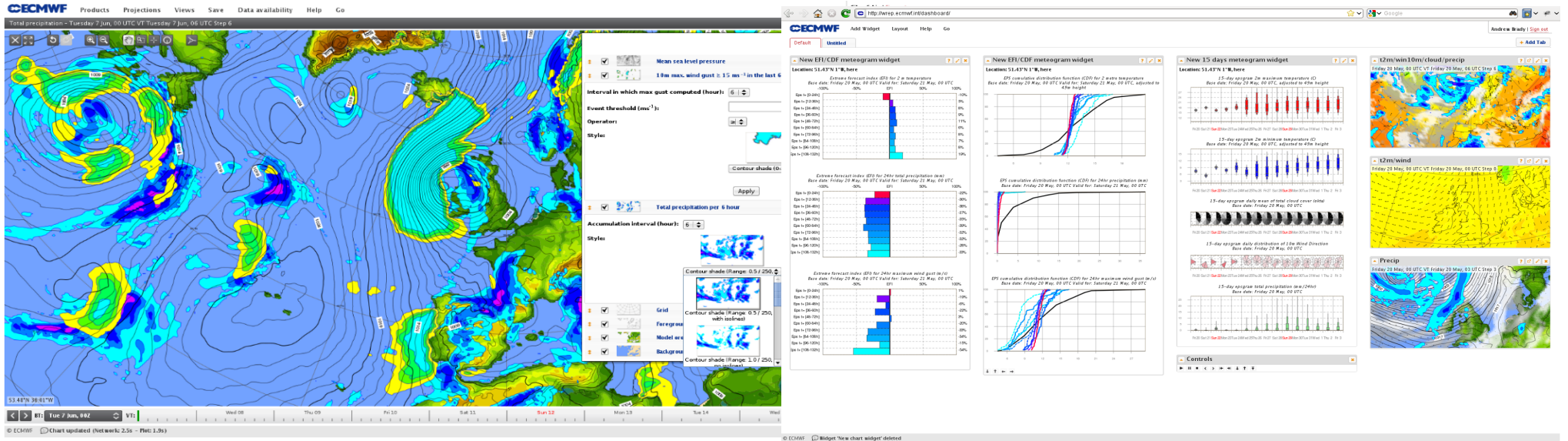
URL

[eccharts.ecmwf.int/forecaster/](http://eccharts.ecmwf.int/forecaster/)

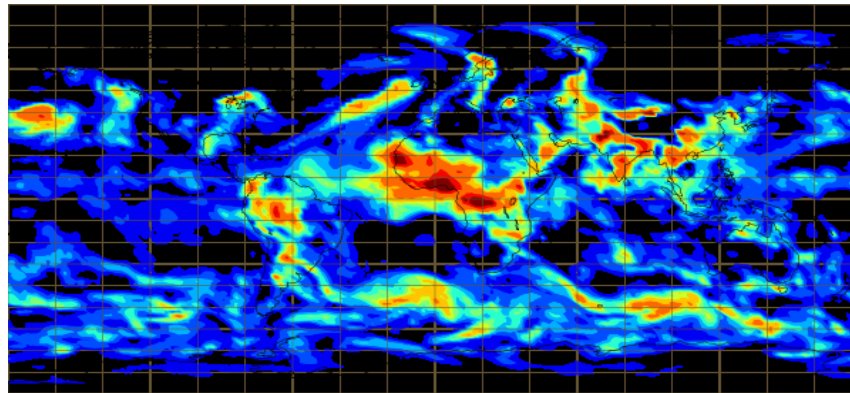


# ecCharts user interfaces

## Forecaster / Dashboard / WMS

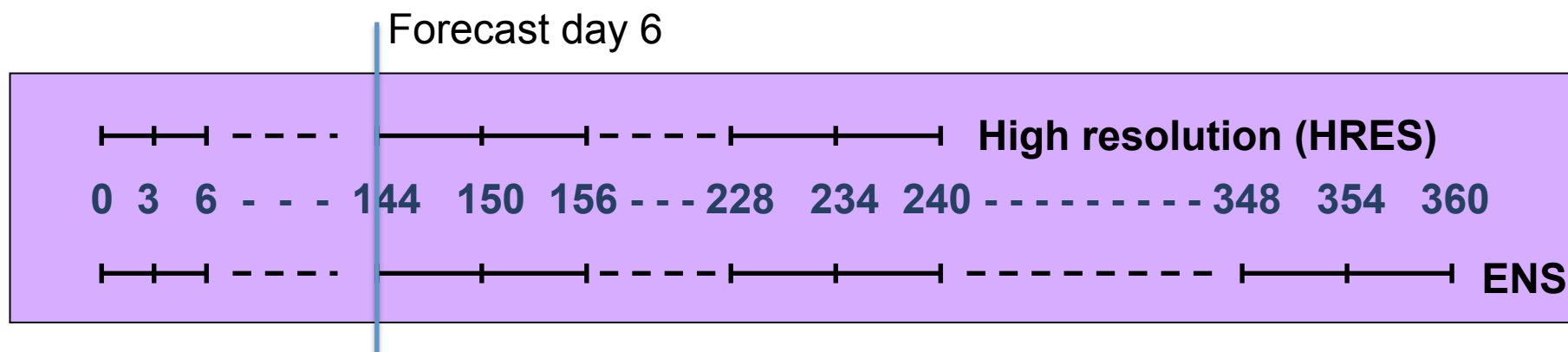


[https://apps.ecmwf.int/wms/?token=public&request=GetMap&layers=composition\\_aod550,grid,foreground&width=600&bbox=-180,-90,180,90](https://apps.ecmwf.int/wms/?token=public&request=GetMap&layers=composition_aod550,grid,foreground&width=600&bbox=-180,-90,180,90)





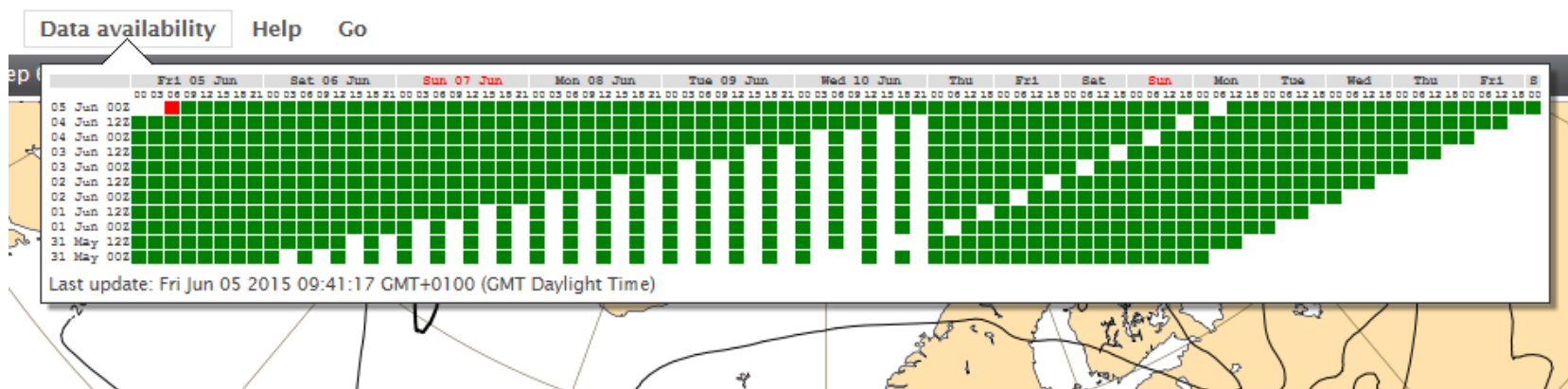
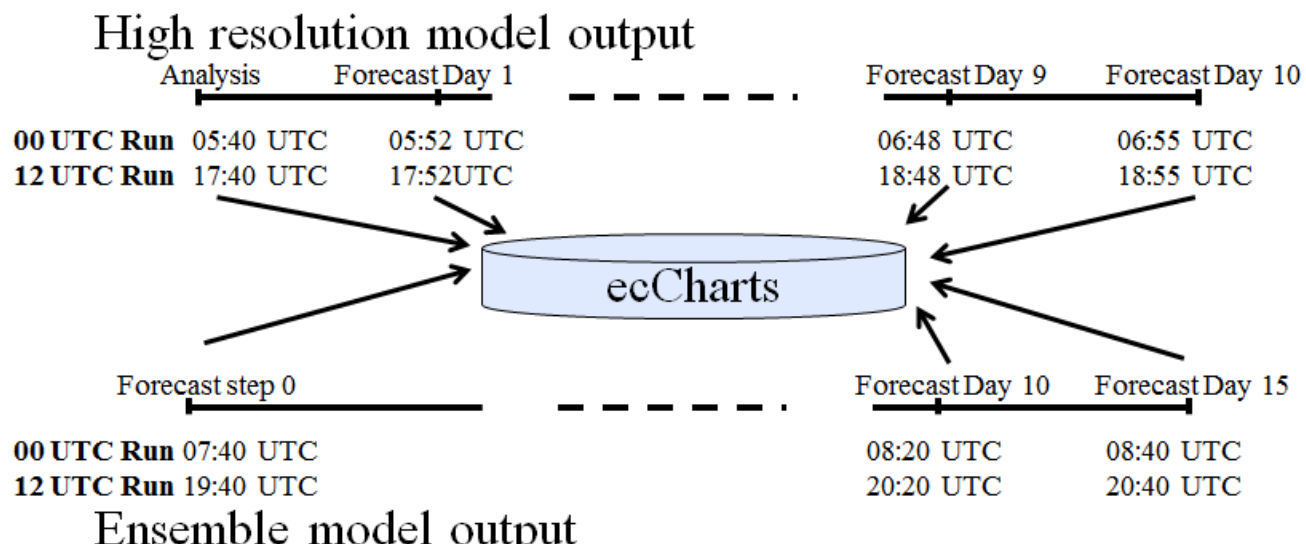
## Data in ecCharts



- High resolution and Ensemble model output (atmospheric & wave parameters)
- Point extracted data (for a given latitude/longitude)
  - Time series from all available parameters
  - ENS meteograms for a selected parameter set
- Ensemble derived data
  - Probabilities, percentiles,EFI/SOTs, Ensemble mean and spread ...

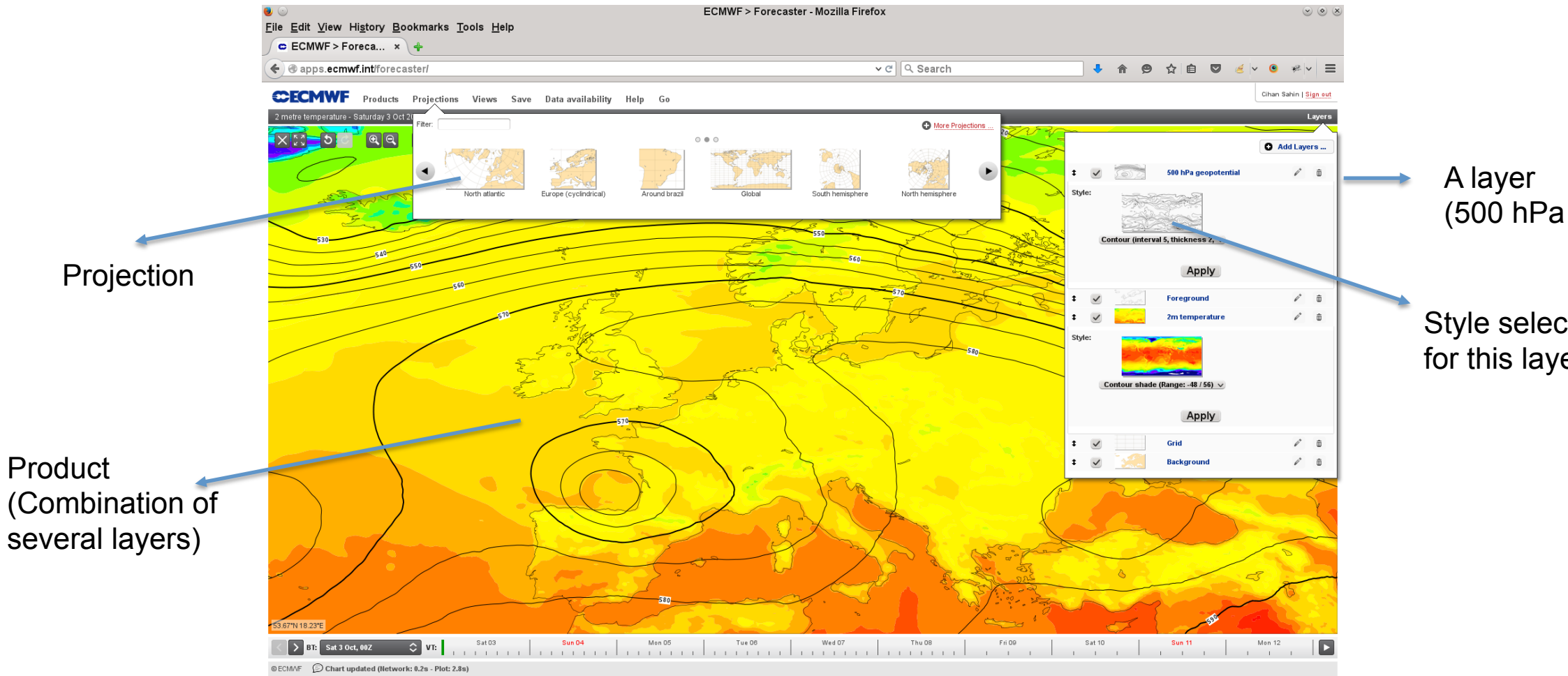
# Data availability

- Data made available based on dissemination schedule.
- Once data is available, all charts are generated dynamically on demand.



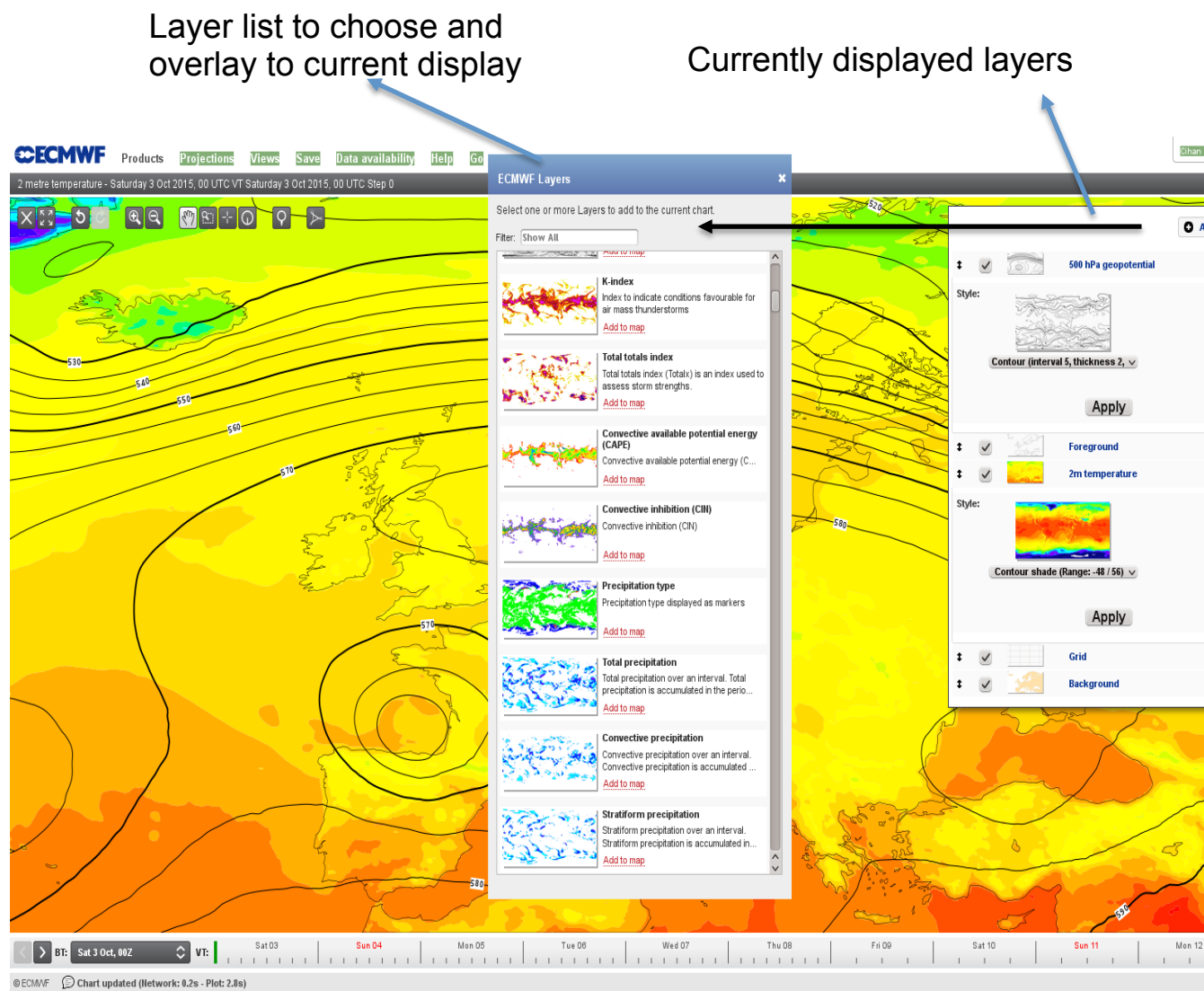
# Basic ecCharts concepts

- Basic components to build a plot : Style, Layer, Projection
- What you have on your screen is combination of those components and is called a Product



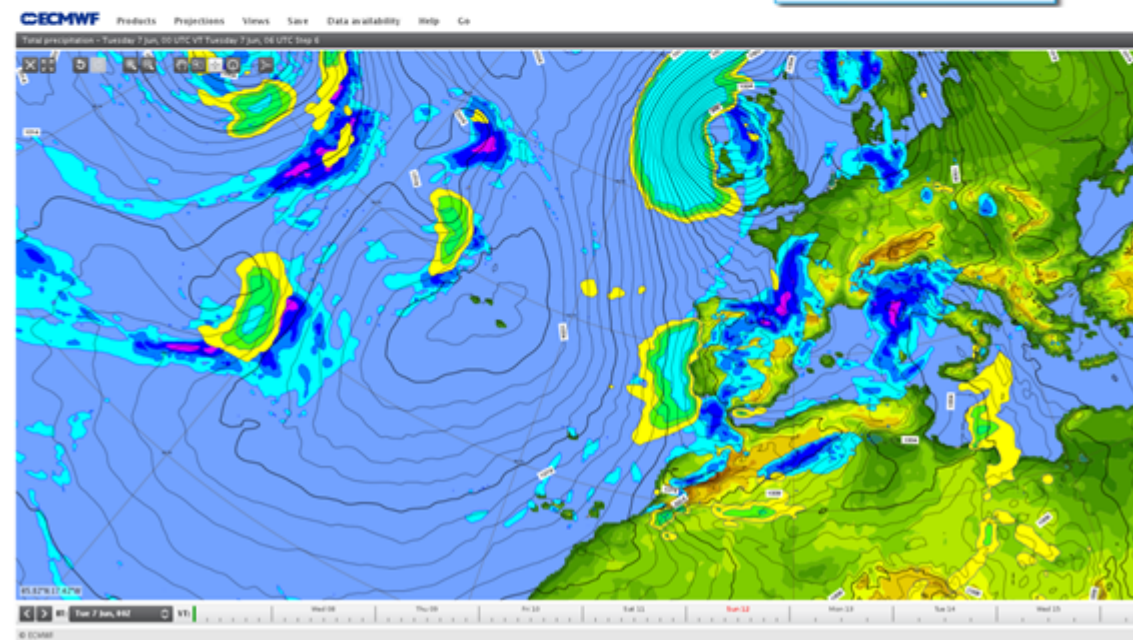
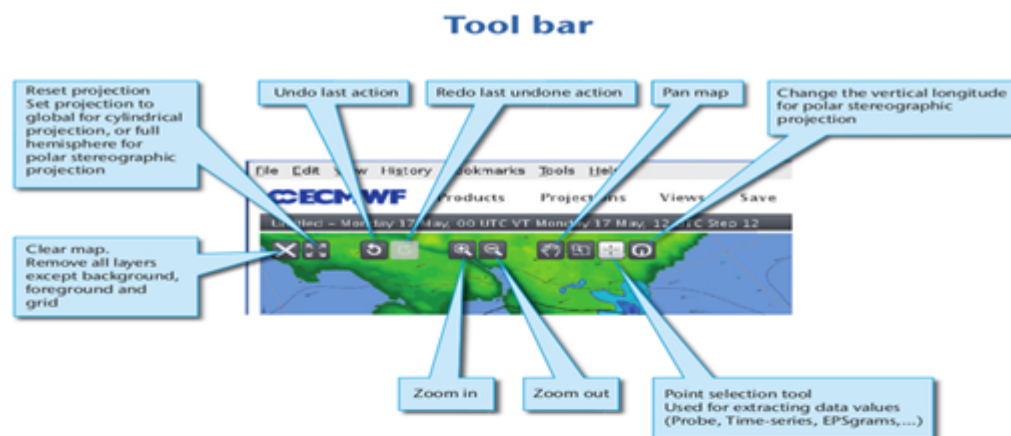
## More on layers and products

- Layers are basic visual elements (meteorological parameters, result of complex computations, coastlines ...)
- Overlay-able
- Customisable (ie. Accumulation period for total precipitation, Event threshold and event operator for probability layers, Interval in which maximum wind gust computed ...)
- Can be re-ordered
- Final display is “Product”. Can be saved for re-use.
- A small set of pre-defined Products are available. But idea is that user creates products as they wish.



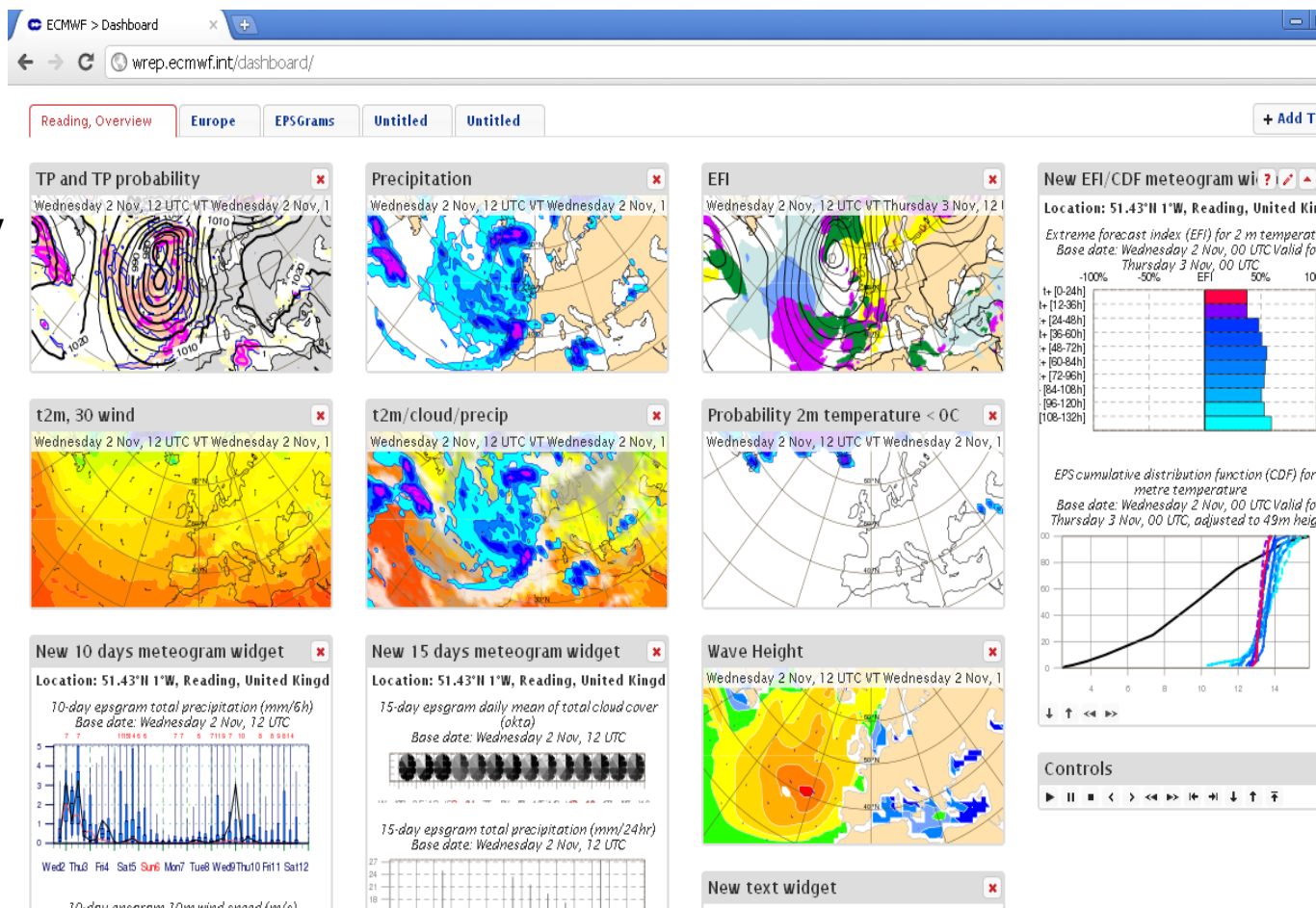
## User interfaces – Forecaster tool

- Zoom, pan, undo, redo a plot
- Plot area maximised
- Work and create a product and save as your own.
- Data fields are global.
- Charts are clickable to extract information
- Overlay any combination of parameters (currently around 200) from HRES and ENS.
- Design and save as your “own” product to re-use.
- Control projection
- Control time (Animation, steps, base time ...)



# User interfaces - Dashboard

- Organise multiple charts and meteograms in the same “page”. Basic elements are called widgets.
  - A chart widget is used to display a product either from ECMWF pre-defined set or your saved products.
  - ENS meteograms widgets (10 days, 15 days, EFI/CDF)
  - Control widget to apply collective actions for the charts on the same page ie. All charts in a tab animate simultaneously.
- User can create many tabs each containing many widgets.



## More on Ensemble data

ecCharts provides an easy way to access and visualise ECMWF Ensemble data

Ensemble data = 50 perturbed forecasts (lower resolution) + Control forecast (No perturbation)

What is the probability of precipitation > 5 mm/ 6 hr ?  
How about over 24 hr ?

What is the probability of precipitation > 5 mm/ 6 hr  
AND wind speed > 10 m/s ?  
How about over 24 hr ?

How about ENS distribution for a given point ?

Show ENS temperatures for 90th percentile ?

Show all ENS members for a chosen isoline ?

Customising charts is the key functionality to explore Ensemble data in detail.

- Charts need to be generated dynamically from raw data.

# Probabilities

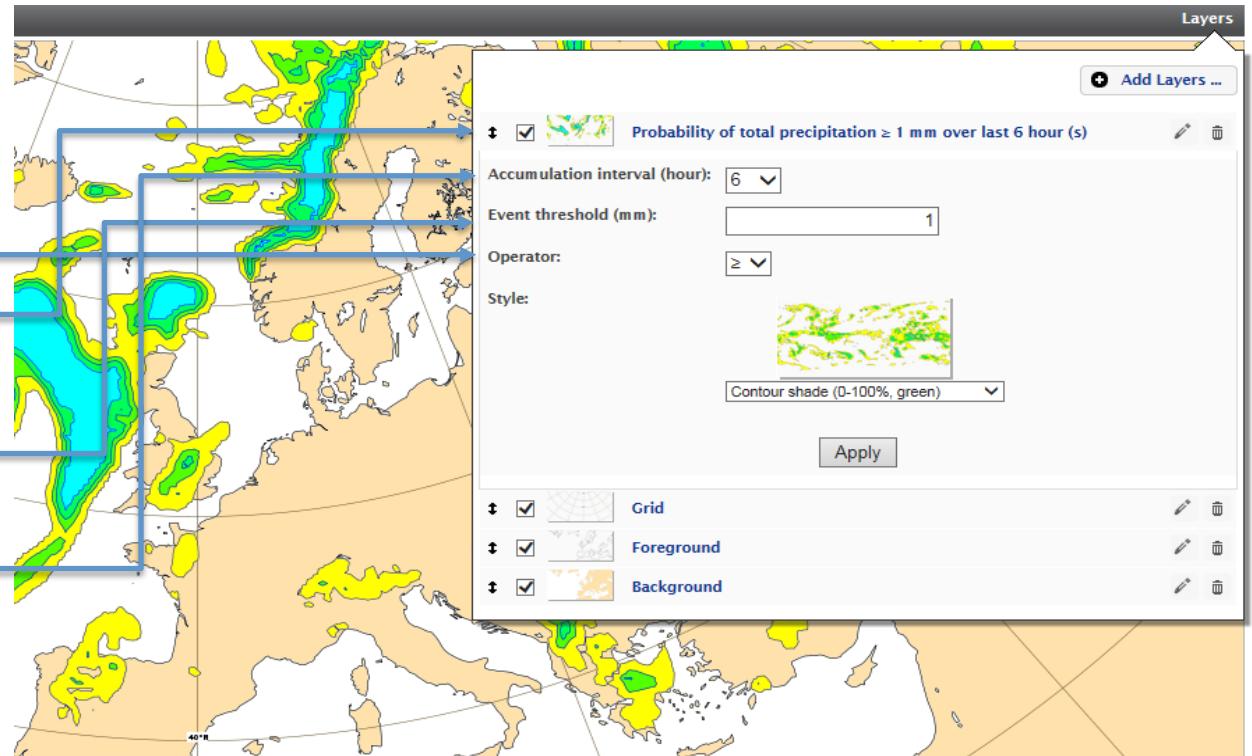
- To convey forecast uncertainty information by the probability of the occurrence of an event.

What is the probability of precipitation

>

5 mm/ 6 hr ?

How about over 24 hr ?

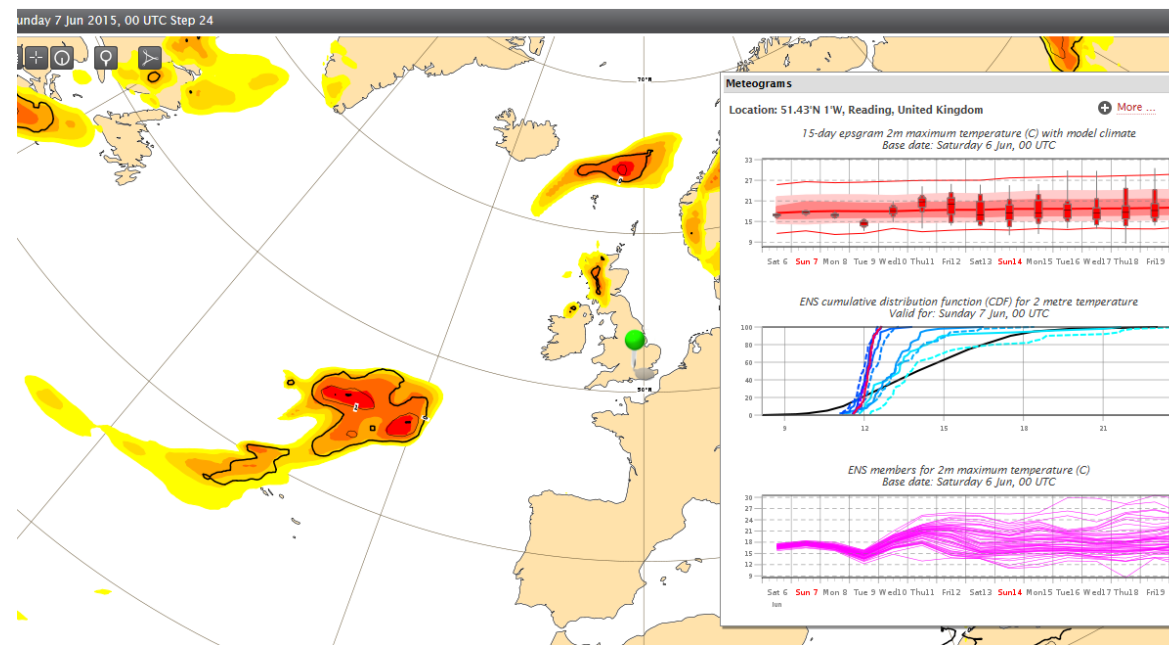
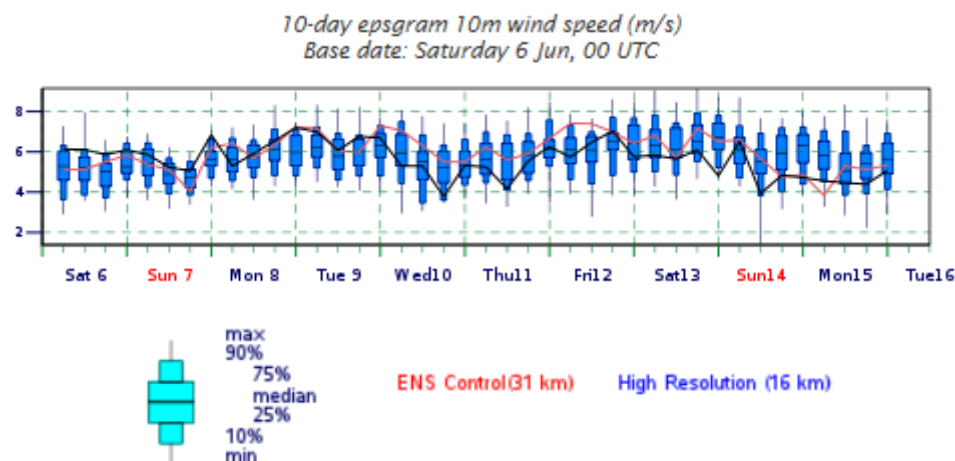


- Similar customisation applies for percentiles and probability of combined events.



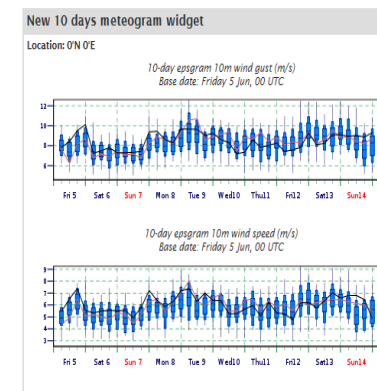
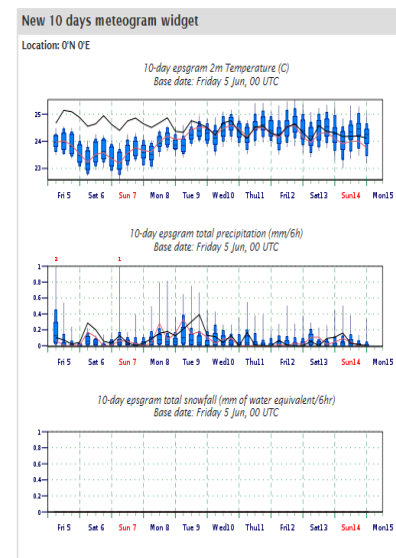
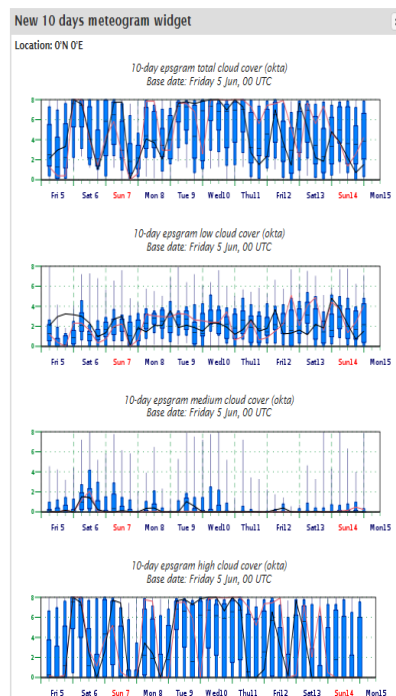
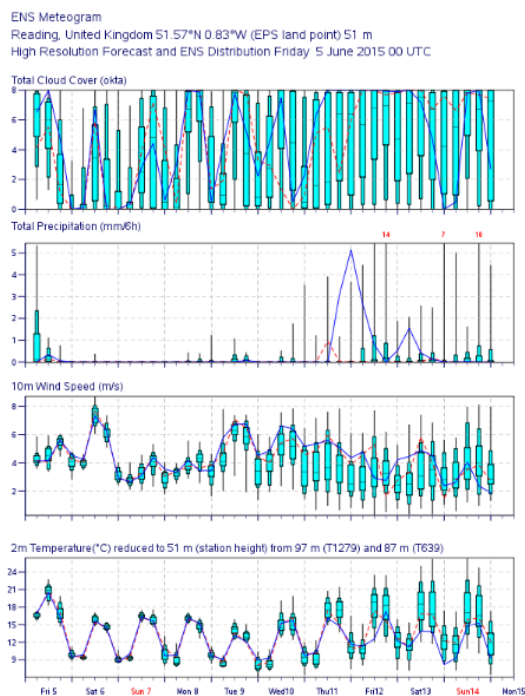
# Meteograms

- Special databases to retrieve pre-defined percentiles from ENS efficiently.
- Distributions are displayed using a box and whisker plot.
- Types of meteograms & point based distributions;
  - 10-day meteograms
  - 10-day meteograms for wave parameters
  - 15-day meteograms
  - 15-day meteograms with model climate
  - Plumes
  - ENS members (individual lines)
  - EFI and CDF diagrams
- All charts are clickable to show selected meteograms for a chosen location.



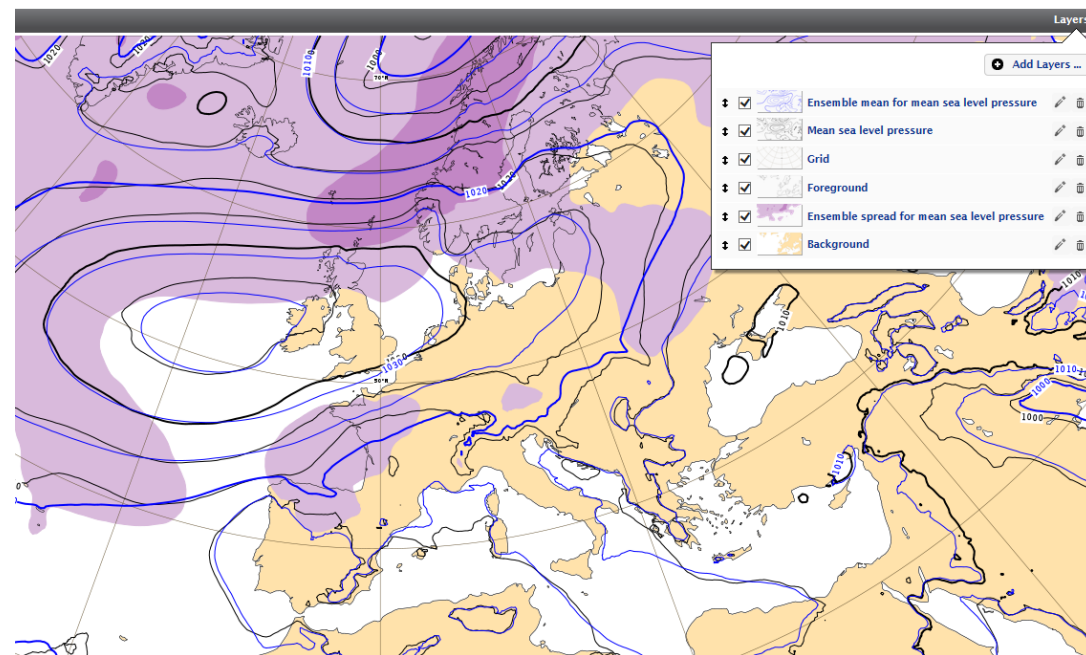
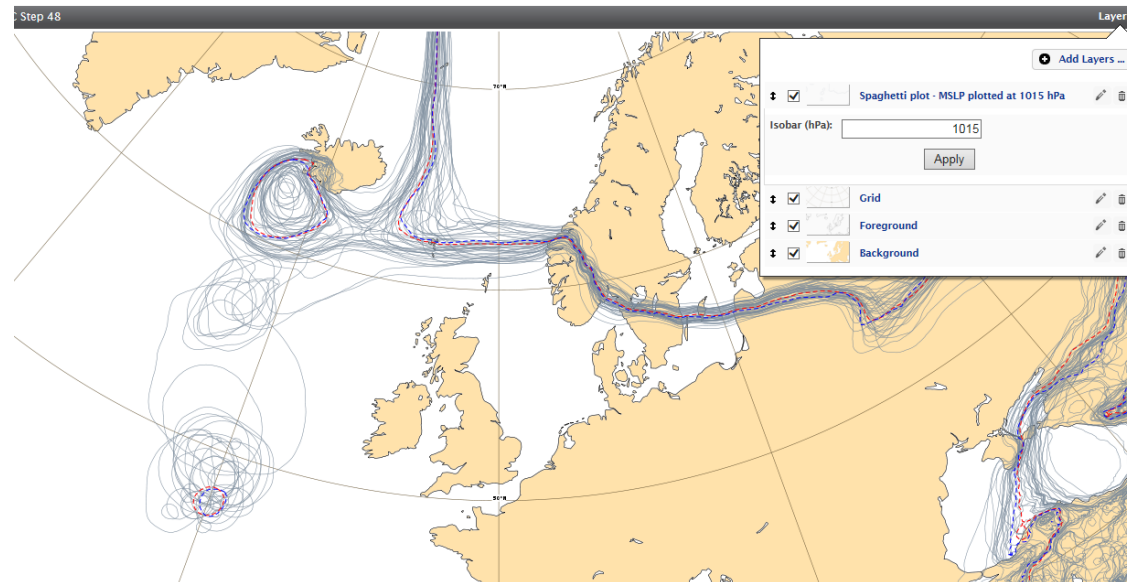
# Meteograms – more parameters in ecCharts

- Classical meteograms have a limited number of parameters (4 for 10-day meteogram)
- ecCharts displays meteogram parameters individually. That allows us to produce and present new parameters.
- (2t, total precipitation, wind gust, low/medium/high/ total cloud cover, snowfall, wind speed, mean wave period/direction, wave direction, significant wave height)



# Other ensemble data

- Derived products
  - ENS mean
  - ENS spread
  - EFIs
  - SOTs
  - Cyclone strike probabilities
  - Cyclone tracks



# ecCharts – Updates December 2015

- Dedicated to new IFS cycle upgrade (e-suite cycle 41r2)
- All e-suite data/charts made available for 3 months until implementation date.
- Operational layers were duplicated for e-suite to overlay/compare with operational data.
- Meteograms from e-suite were available on Meteogram page on www.

**ENS meteograms**

The Ensemble Meteogram (formerly EP5gram) is primarily a probabilistic representation, for a given location, of forecasts from the Ensemble system. For detailed information, see documentation at the foot of the page.

There are different types of Meteogram: 10 day, 10 day wave, 15 day, 15 day with climate, and plumes. EFI/CFD (Extreme forecast index/Cumulative distribution function) plots will be provided soon.

To generate, choose the product type and then search for a location or enter its latitude/longitude.

Location:  Base time:  Meteogram type:  Experiment:

Operational model  
 E-suite

**ENS Meteogram [0069]**  
 Reading, United Kingdom 51.52°N 0.97°W (EPS land point) 81 m  
 High Resolution Forecast and ENS Distribution Wednesday 2 December 2015 00 UTC

**Total Cloud Cover (okta)**

**Total Precipitation (mm/h)**



**ECMWF** Products Projections Views Save Data availability Help Go

Cloud cover - Thursday 3 Dec 2015, 00 UTC VT Thursday 3 Dec 2015, 00 UTC Step 0

**ECMWF Layers**

Select one or more Layers to add to the current chart.

Filter: geopo

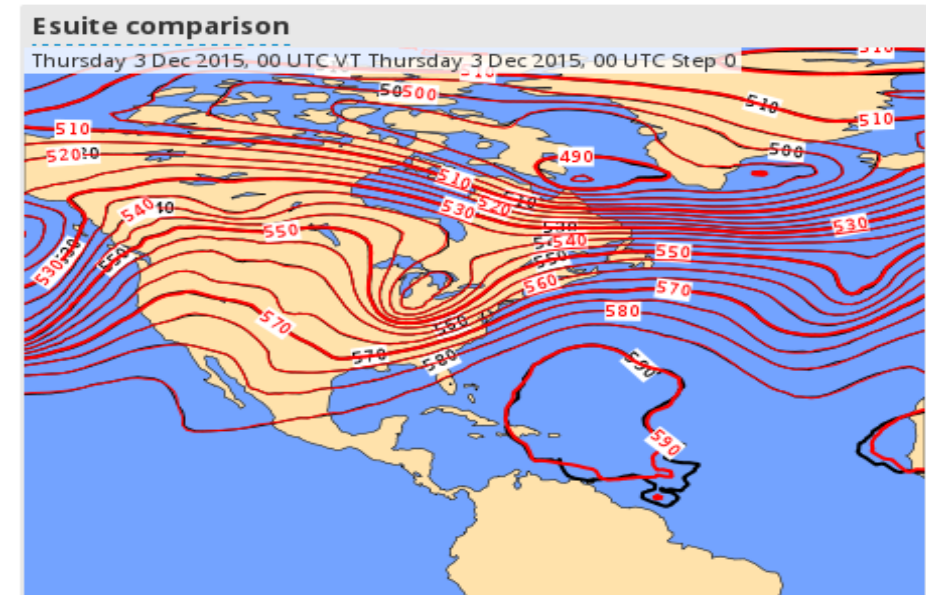
- 925 hPa geopotential (Esuite: 0069) 925 hPa geopotential Add to map
- 925 hPa geopotential (Esuite: 0069) 925 hPa geopotential Add to map
- 850 hPa geopotential (Esuite: 0069) 850 hPa geopotential Add to map
- 850 hPa geopotential (Esuite: 0069) 850 hPa geopotential Add to map

**Layers**

- 500 hPa geopotential (Esuite: 0069)
- 500 hPa geopotential
- Foreground
- Background

**ECMWF** Add Widget Layout Help Go

eccharts ESuite z500 forecast

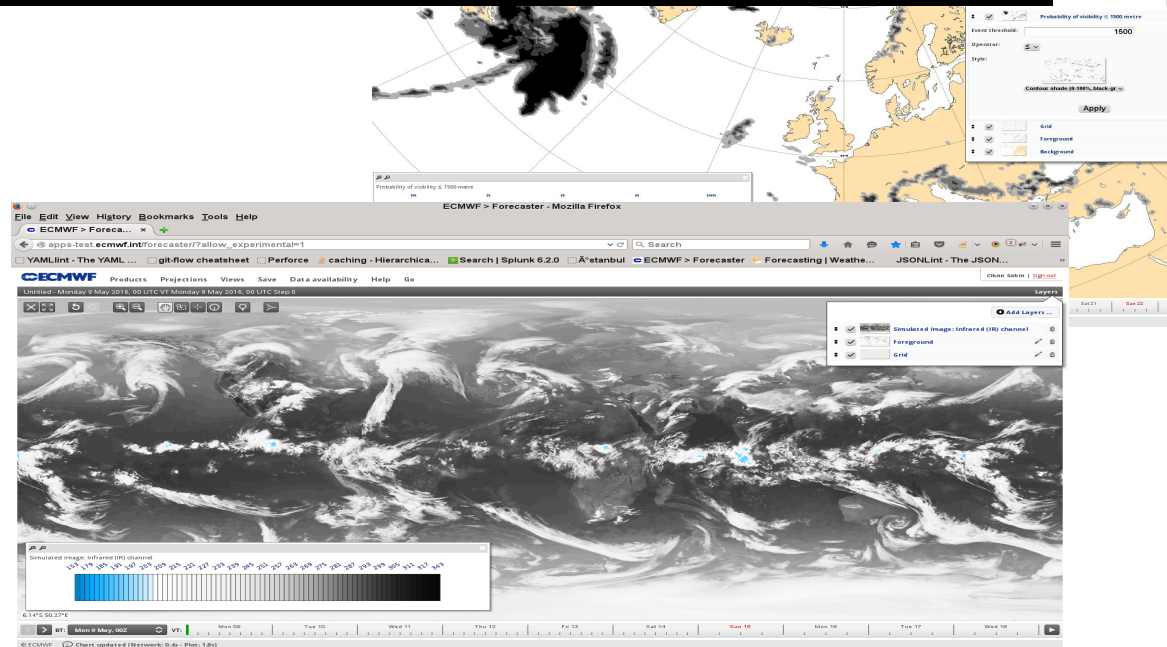
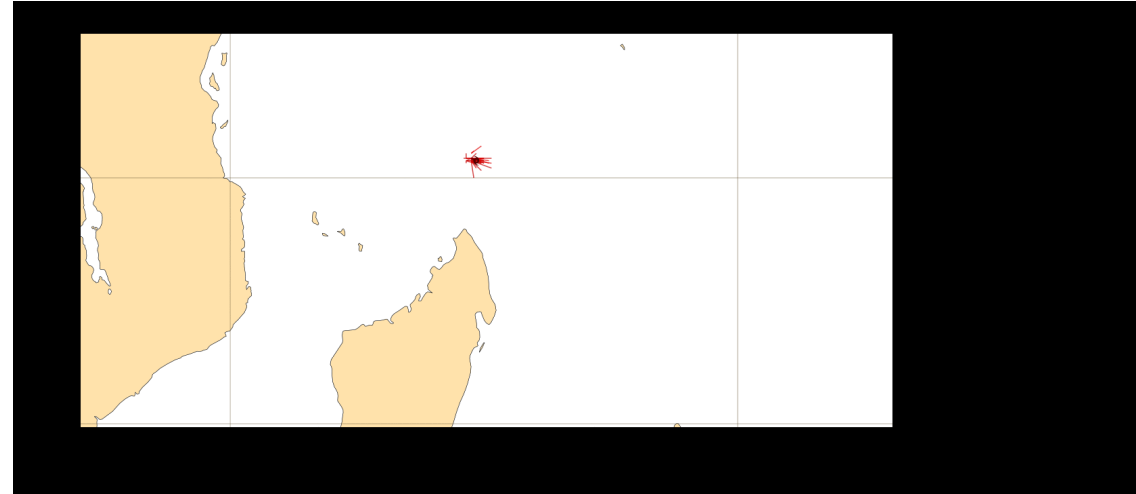


## June updates

- Implementation of new parameters (~20) (end of May) as requested by users;
  - Thickness, SST, Visibility, Albedo, Leaf area index
  - Simulated satellite data
  - Probability of precipitation rates, visibility
  - EFI CAPE and CAPE-SHEAR
  - Named tropical cyclone tracks
  - Weighted probabilities
- Some additional CAMS layers

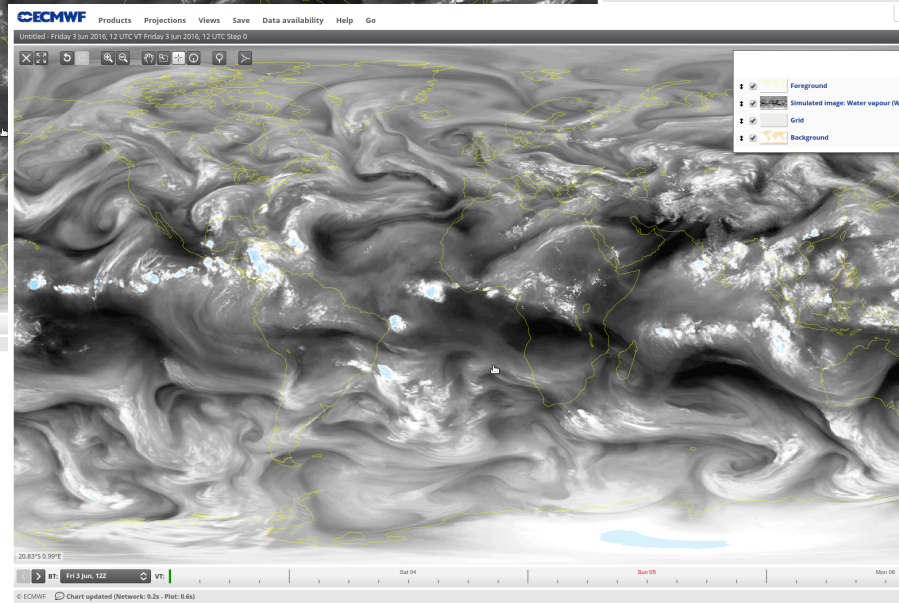
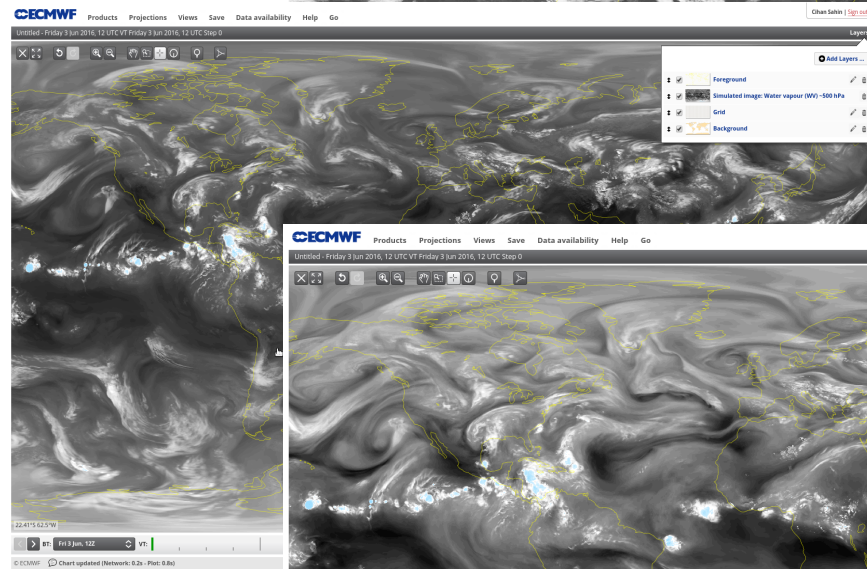
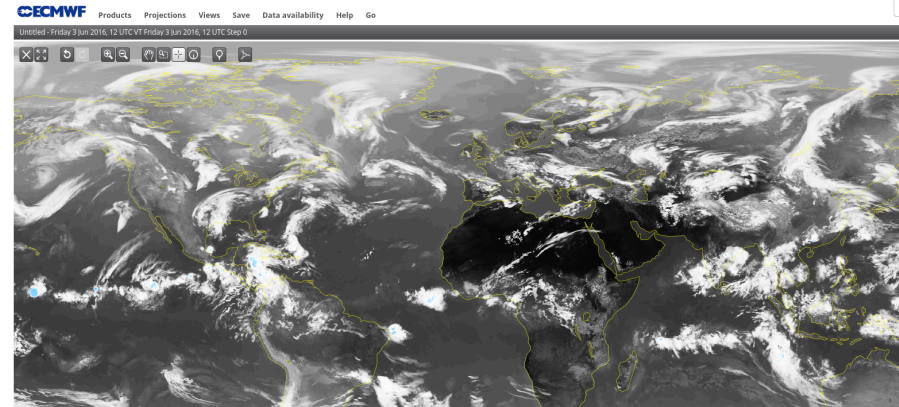
Full list available at;

- <https://software.ecmwf.int/wiki/display/ECCHARTS/ecCharts+updates+-+2016>



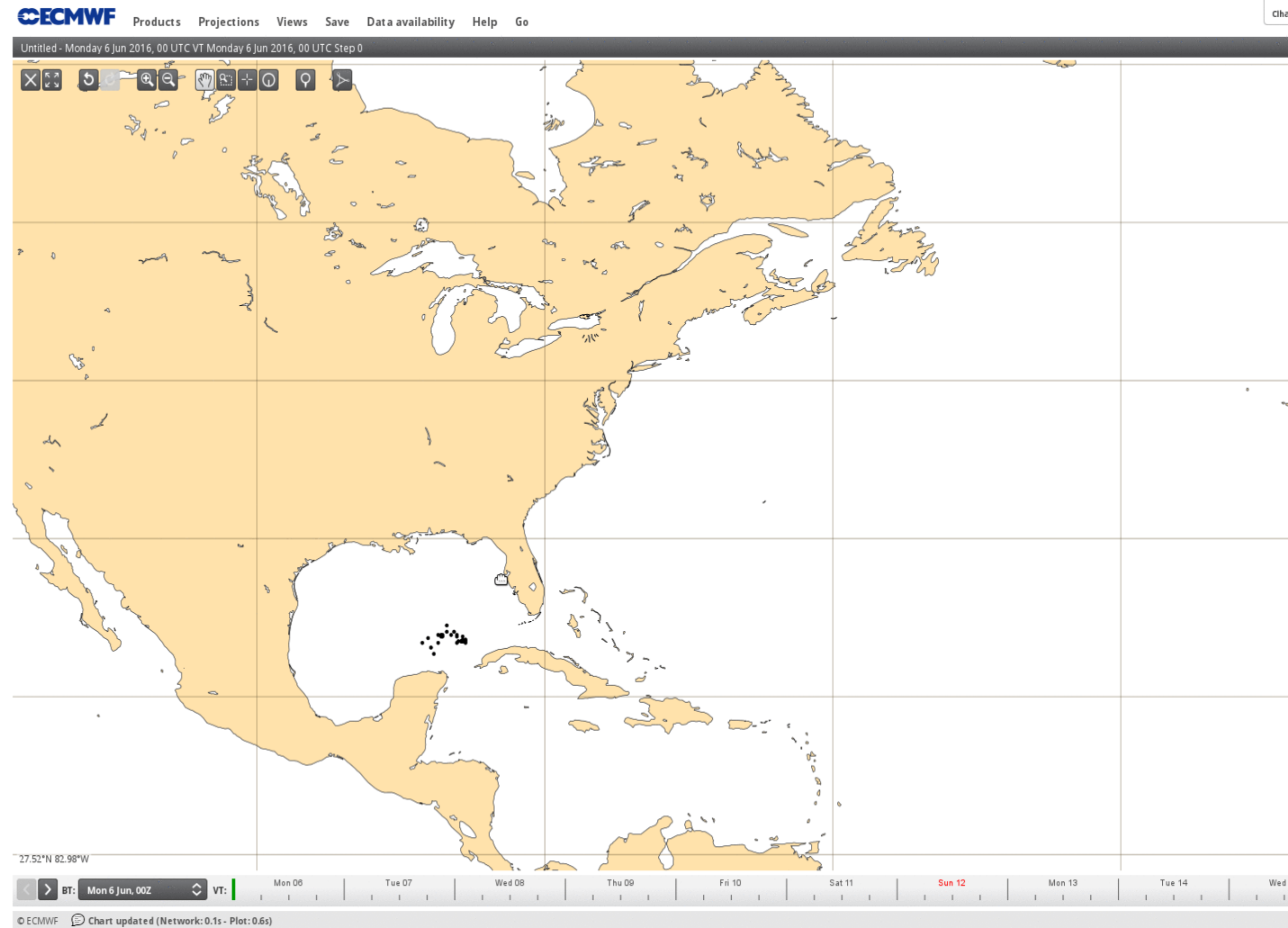
# June update – Simulated satellite data

- Simulated data available (Meteosat-10 like)
- Global fields up to day 10.
- 3 layers;
  - Water vapour at ~300 hPa
  - Water vapour at ~500 hPa
  - Atmospheric window channel (Clouds and surface)



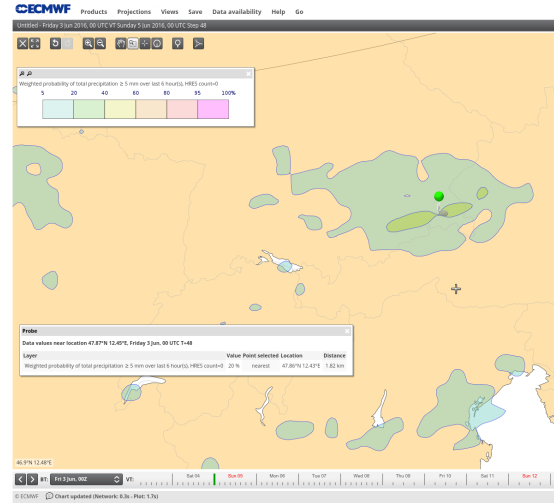
## June update – Tropical cyclone tracks

- Tracks are generated for all TCs that have been officially observed.
- 2 layers available
  - Named tropical cyclone (name and positions only)
    - Displays track positions (HRES and ENS members) and name
  - Named tropical cyclone tracks
    - Displays tracks of HRES and ENS members.
- Parameters to track
  - Minimum pressure
  - Maximum wind speed
- Various track visualisations available

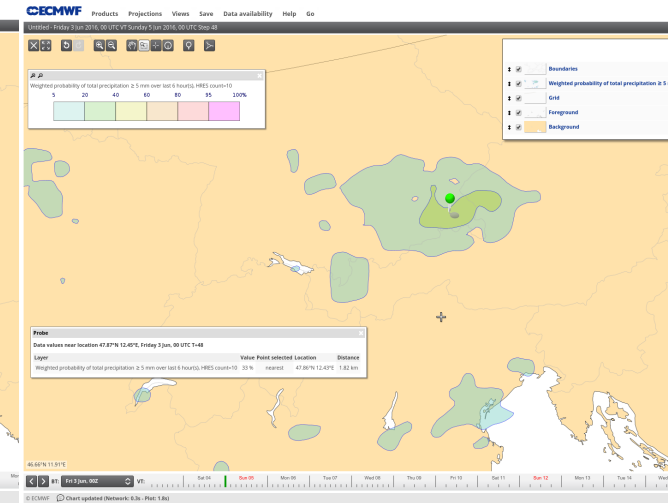


# June update – Weighted probabilities

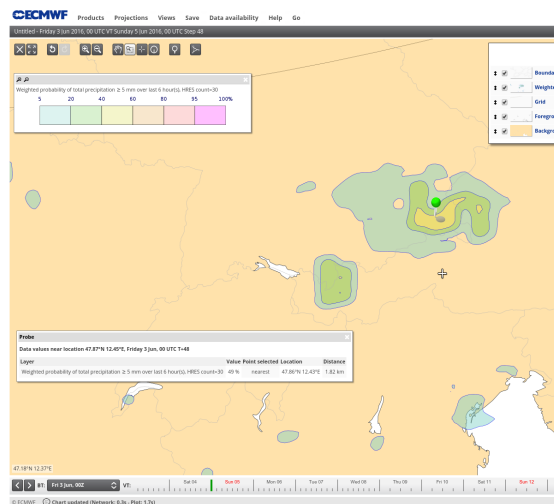
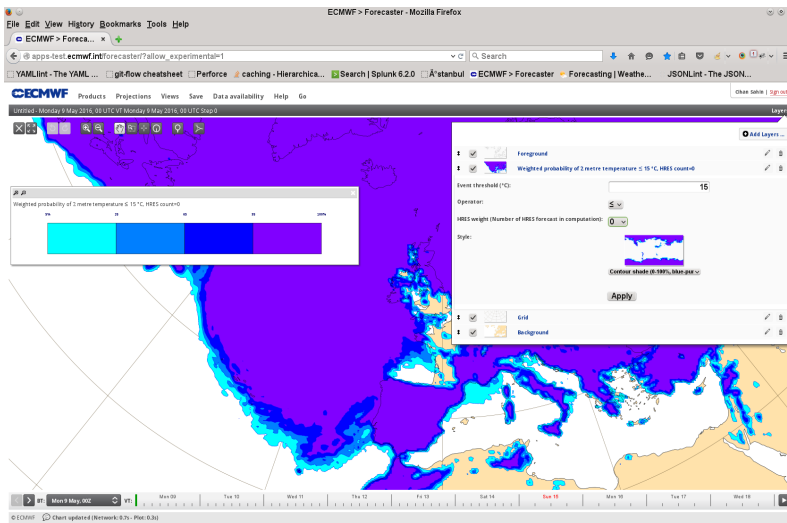
- An experimental set of probability layers
- Probabilities are computed by taking into account a user controllable weighting of High resolution forecast.
- As all probability layers, probability threshold and probability operator (less than, more than, equal to ...) can be customized by the users.



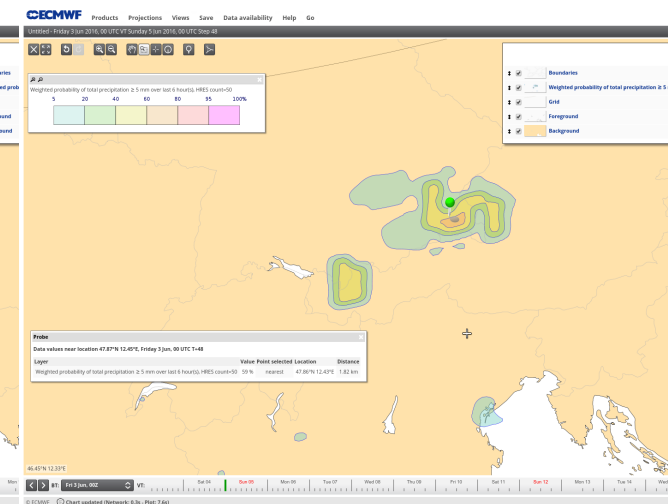
HRES count =0 , 20 %



count=10, 33%



count=30, 49%

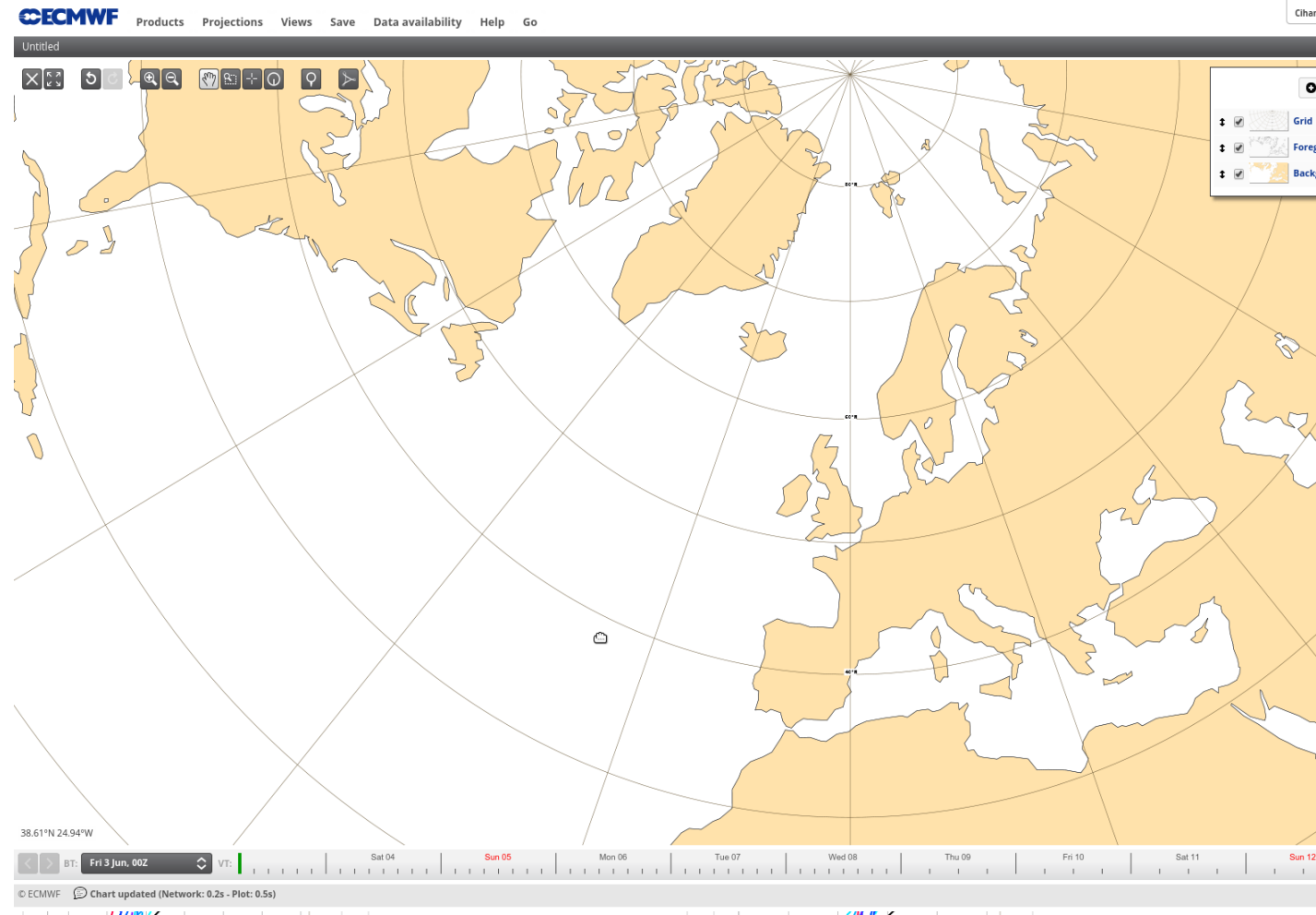


count =50, 59%



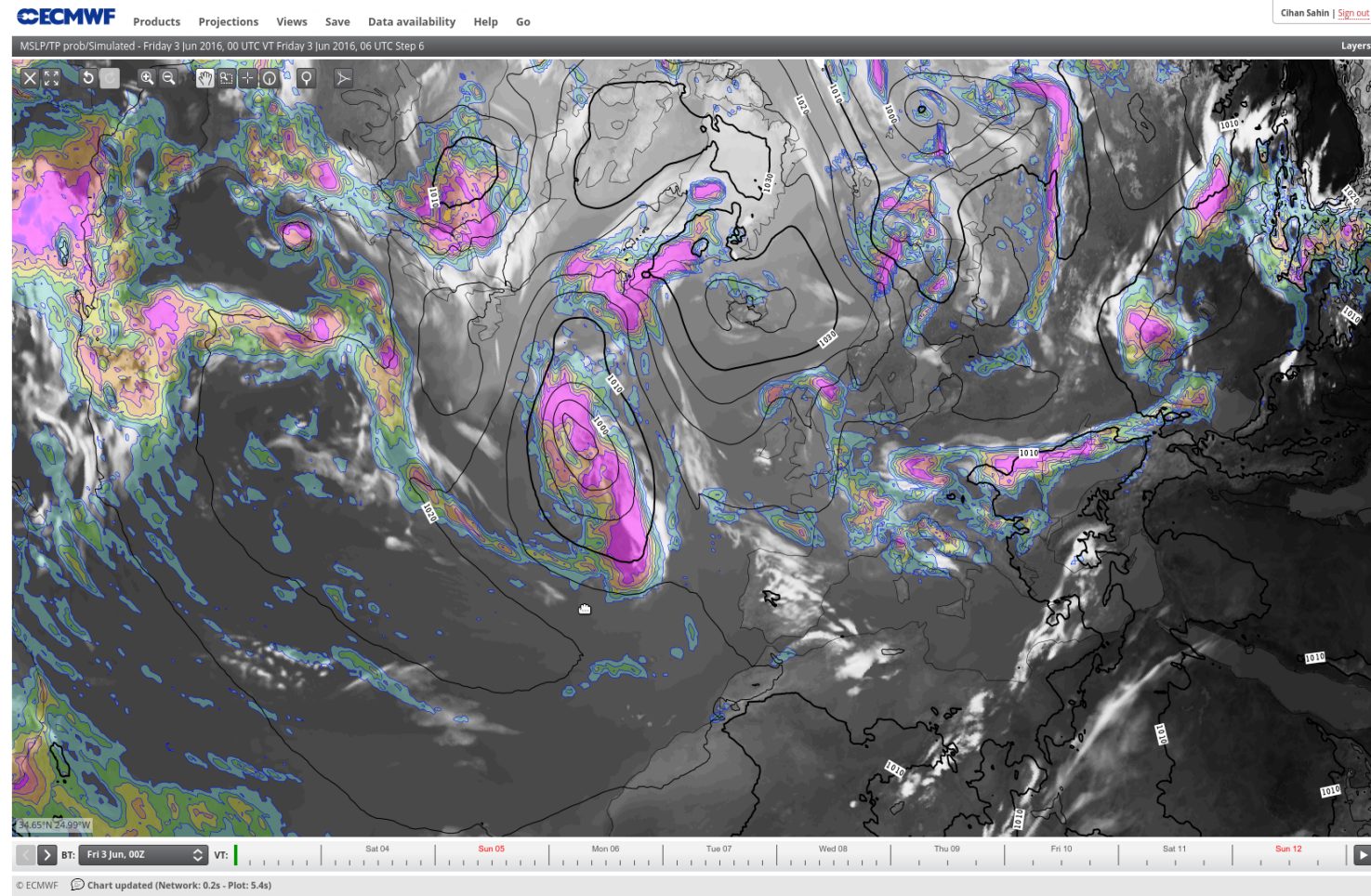
# Use case: Make your own products

- Design your product
- Save as your own product
- Display in your Dashboard



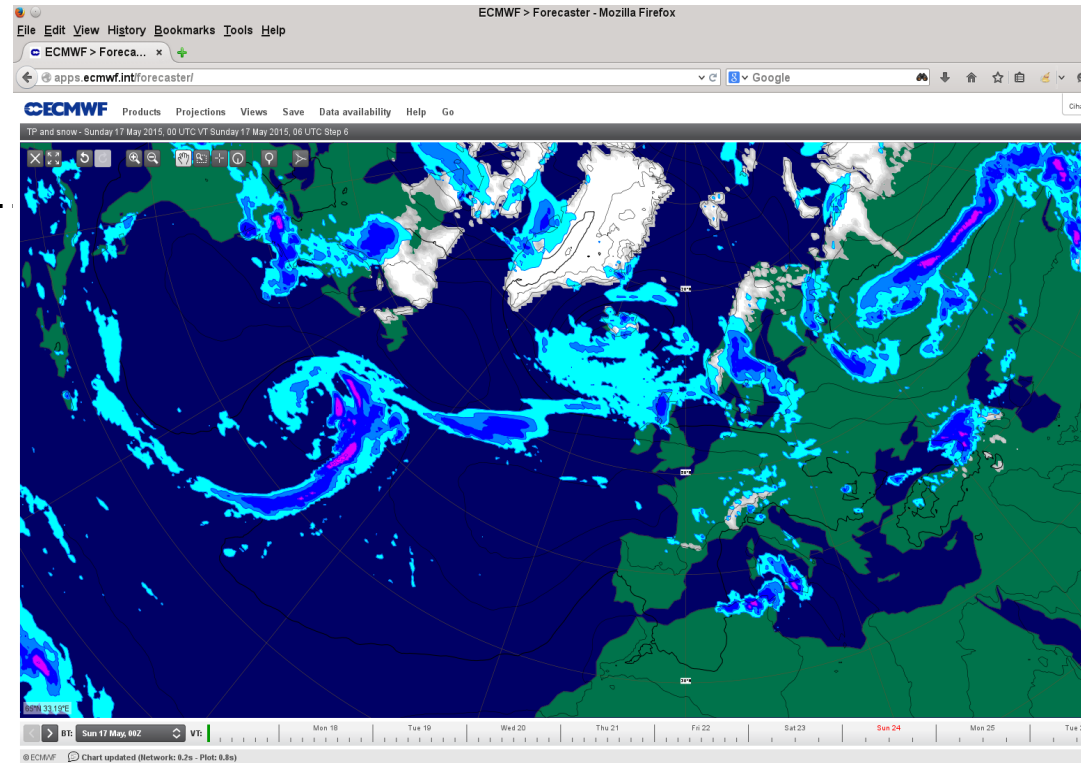
# Use case: Explore data

- Display your product
- Probe data values
- Generate time series
- Display meteograms



## Next update

- Adding more parameters based on user requests
  - More Meteogram parameters
  - Extra-tropical cyclone feature tracks (Fronts ...)
  - Model climate parameters, ensemble clustering .
  - Provide IFS cycle upgrades (e-suites) when available
- Next content update is in November 2016.



## Update procedure

- Product updates are done twice a year June and November.
- Requests are collected via meetings, requests coming to ECMWF documentation pages, e-mails, Training courses ...
- ecCharts will contain only parameters that are in [The Catalogue of ECMWF Real-Time Products](#)
- Full information available in ecCharts documentation pages.

You can follow the updates here;

<https://software.ecmwf.int/wiki/display/ECCHARTS/Updates>

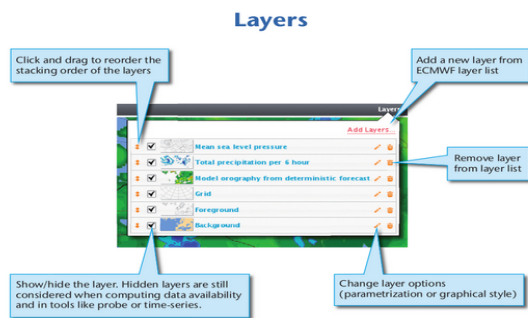
Please contact us if you wish to see additional parameters in ecCharts.

## ecCharts documentation & feedback

- Documentation is under ECMWF wiki pages. Help > ecCharts on ecCharts user interface.
  - <https://software.ecmwf.int/wiki/display/ECCHARTS/Home>
- Request new product or feature
  - [Click here to make a new product or feature request](#)
- Report bug or general communication
- ecCharts updates
  - Follow recent and planned updates

# Practicals

## Please follow hands-on practicals



### Overview

