Visualisation Week

Welcome

ECMWF

Use of visualisation at ECMWF

Stephan Siemen

Development Section, ECMWF

Thanks to Jens Daabeck, Glenn Carver, Sylvie Lamy-Thepaut,
Iain Russell, Fernando Ii, Sandor Kertesz

Examples shown in this presentations are the work of scientist and analysts at ECMWF

ECMWF

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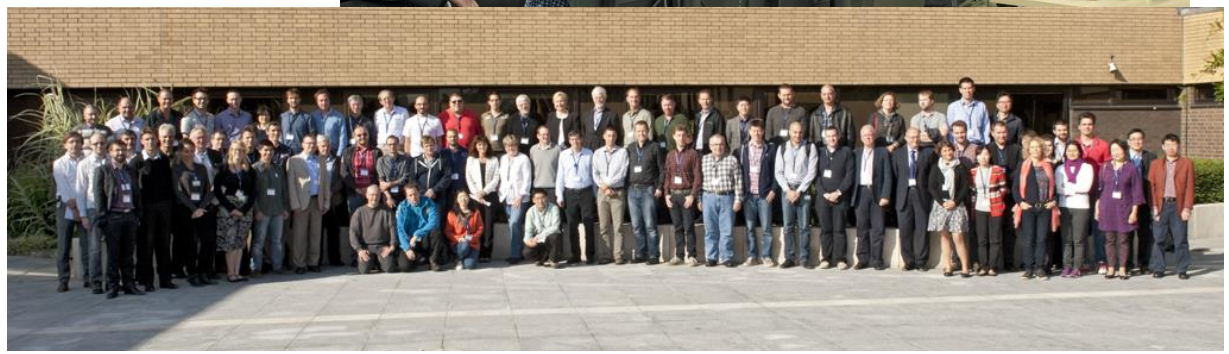
Many events in one week …

- Workshop of Meteorological Operational Systems (MOS)
  - Review of current state and discuss future trends
  - Present technical developments from ECMWF
- European working Group on Operational meteorological WorkStations (EGOWS)
  - Share experiences and discuss new standards
- Royal Meteorological Society
  Seminar on Visualisation in Meteorology
  - Here we are ;-)
- OGC MetOcean Plugfest
  - Exploring the interoperability between OGC services and clients

Visualisation in Meteorology Week 28 September – 2 October 2015				
Monday	Tuesday	Wednesday	Thursday	Friday
	09:30 MOS Sessions Big data & Scalability	09:30 MOS & EGOWS Visualisation for forecasters & public on the web/desktop	9:30 EGOWS Technical challenges in developing forecaster tools	09:30 OGC plugfest Demonstration session
11:00 MOS Opening Keynotes		12:30 MOS Closure		12:00 Conclusion & Recommendations
Lunch break (13:00 – 14:00)				
14:00 MOS Session Cloud services & Visualisation	14:00 MOS & EGOWS Visualisation in operational meteorology	14:00 RMetSoc *The visualisation of meteorological data*	14:00 EGOWS Working groups *Challenges we face in developing forecaster systems*	
17:30 End of day	16:00 MOS & EGOWS Exhibition of Visualisation systems		16:00 EGOWS closure	

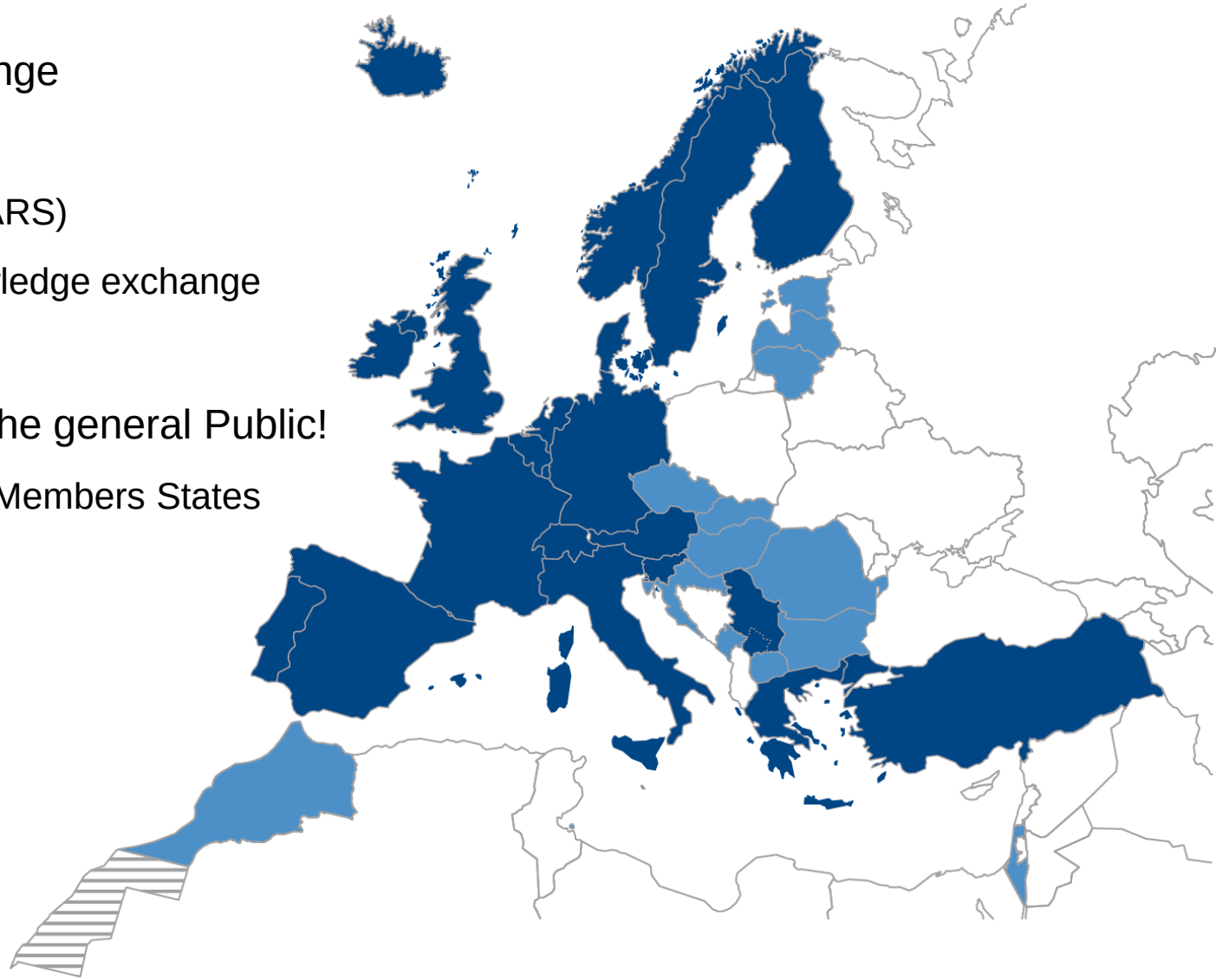


What is ECMWF?

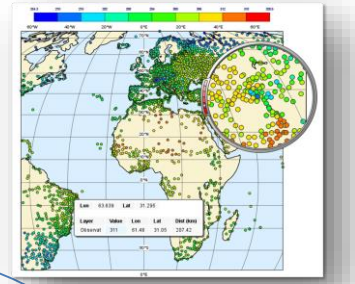
40 YEARS of advancing global NWP through co-operation

- ECMWF is an NWP centre for the medium-range
  - Running operational forecasts
  - Develop & operate meteorological archive (MARS)
  - Meeting place for technical and scientific knowledge exchange

- ECMWF products and services do not serve the general Public!
  - National Weather Services (NWS), especially Members States
  - Commercial customers
  - The users are experts in their field
    - But not always meteorologist!

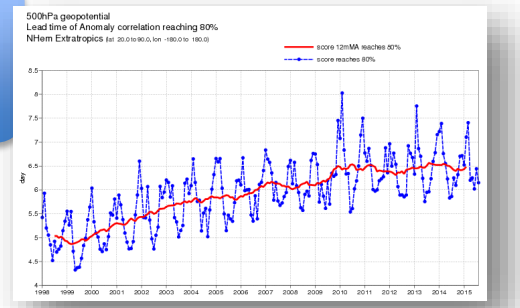


The roles of visualisation at ECMWF

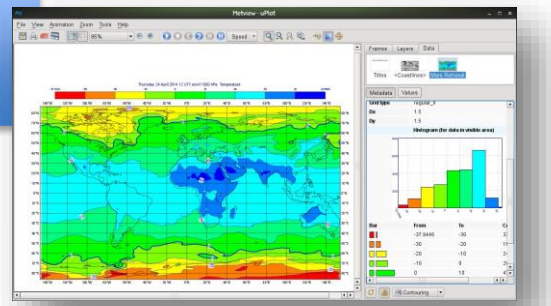


Monitor

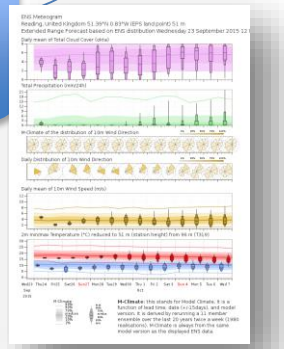
Verify



Analyse

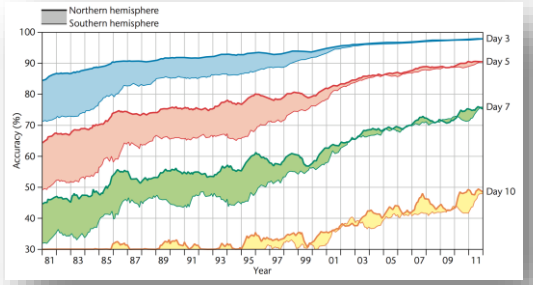


Disseminate forecast



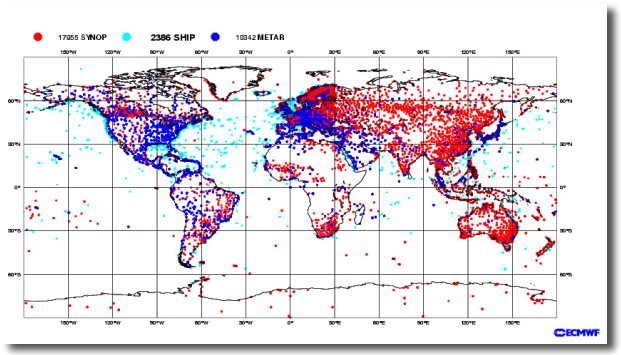
Training/ education

Communicate

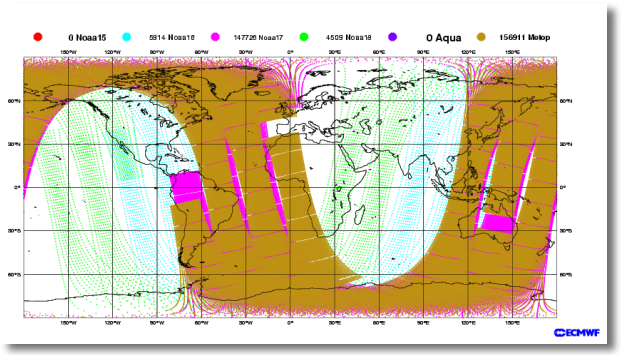


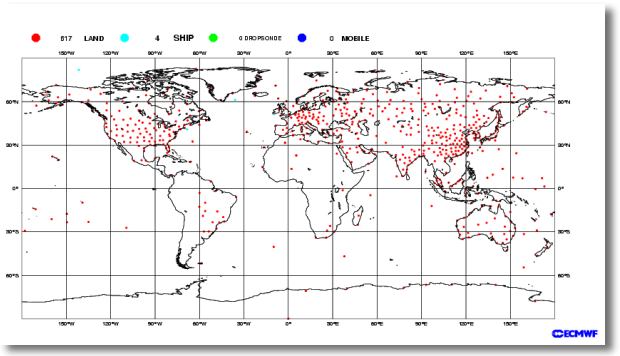
NWP

Visualisation for observation monitoring …

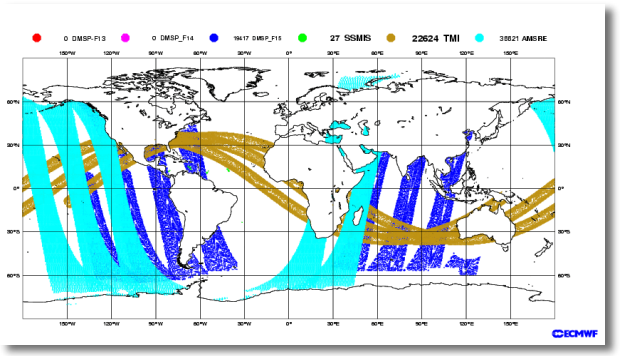


Polar, infrared



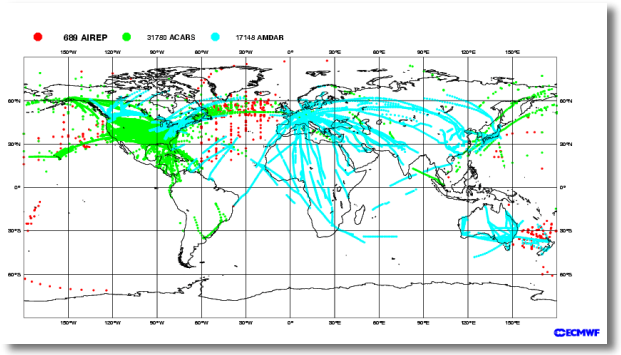


Radiosonde balloons

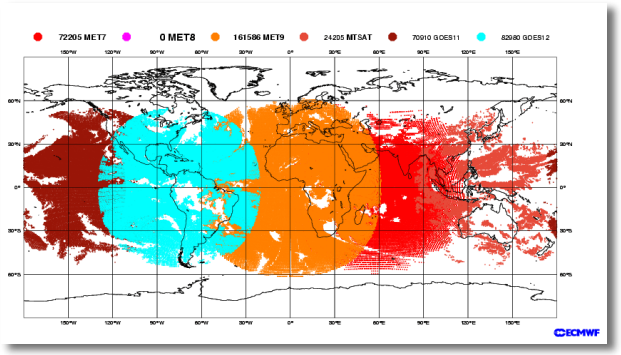


Polar, microwave

Aircraft

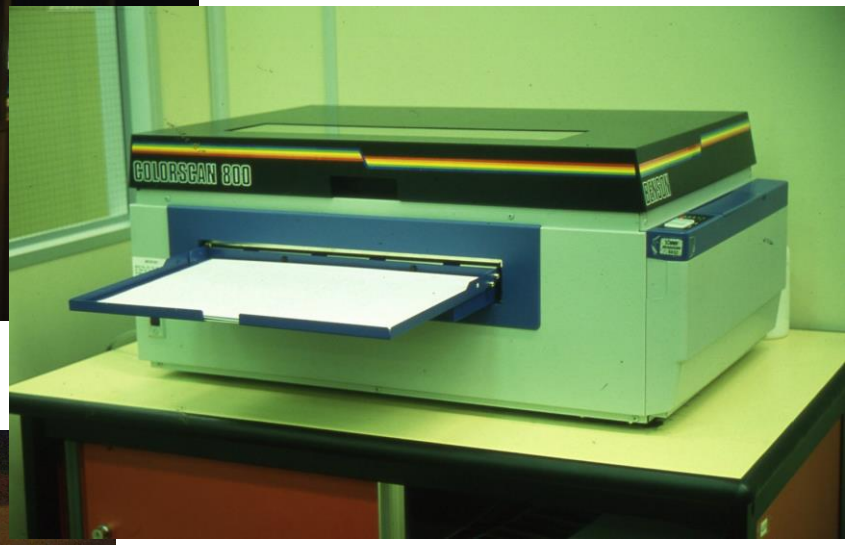


Geostationary, IR

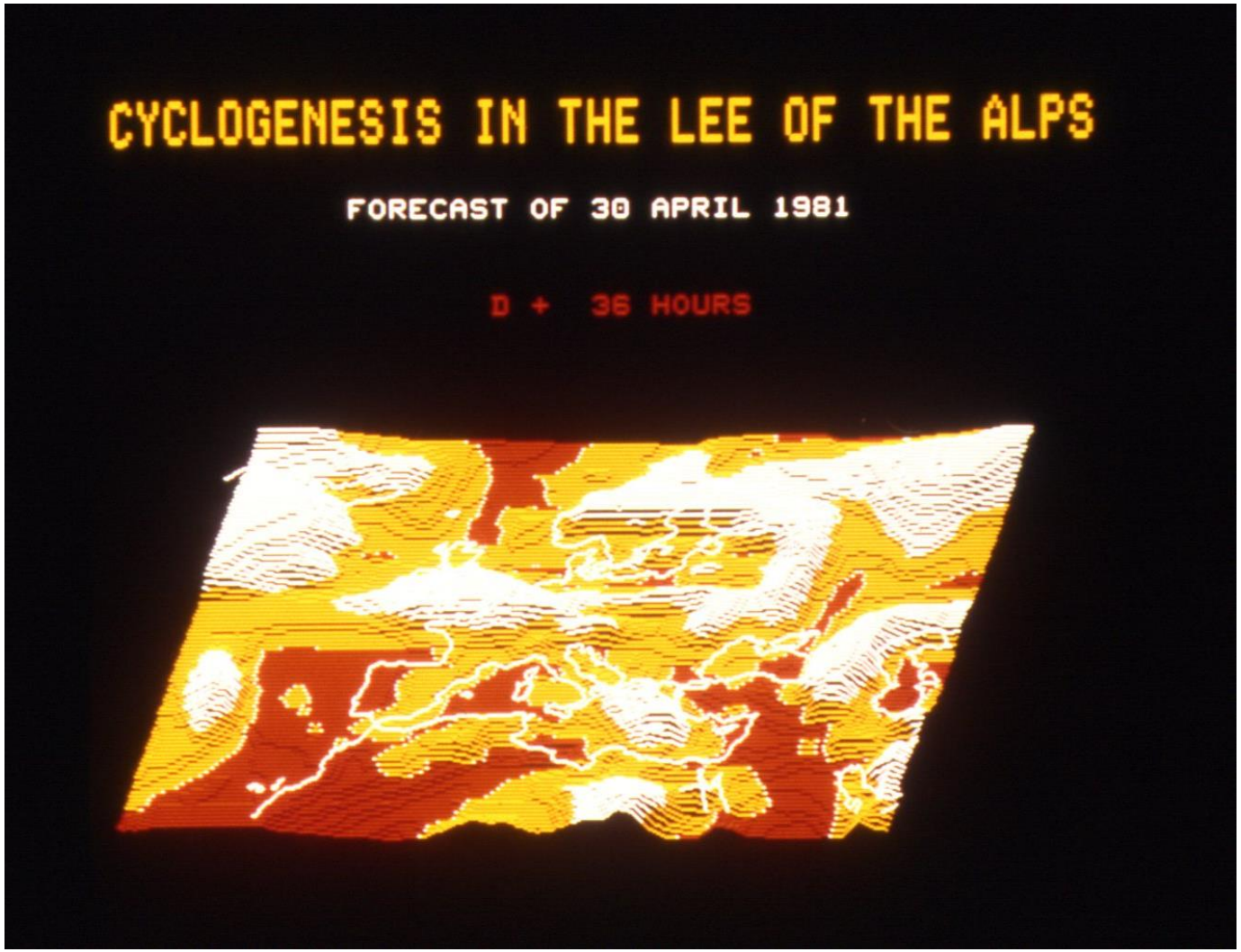


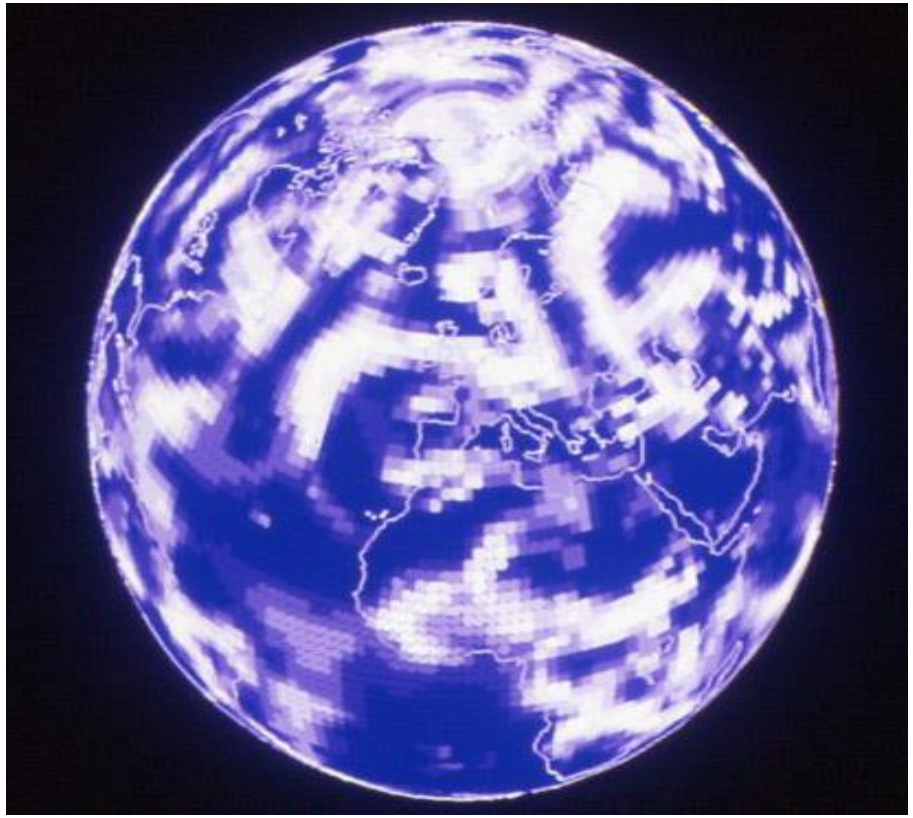
A bit of history …

Early days at ECMWF …



On screen graphics …

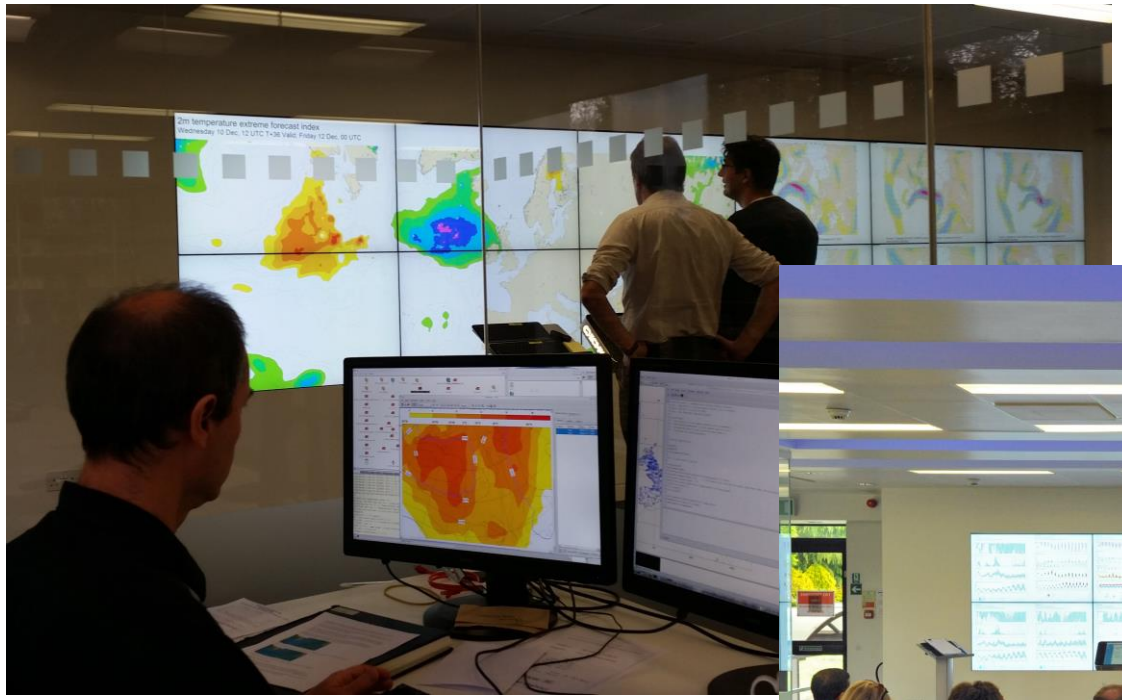


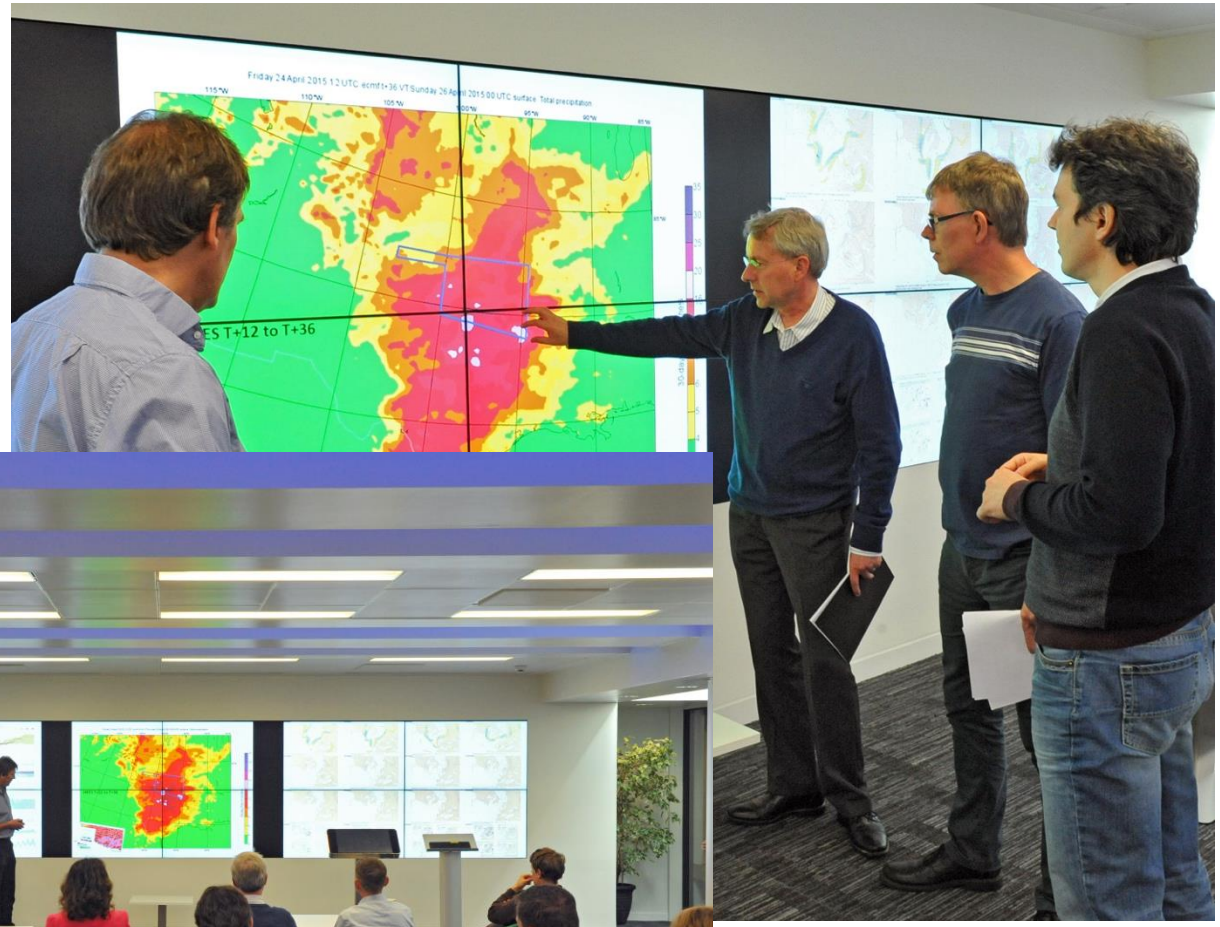


For long time paper was the main medium …

Meteorological Operations “MetOps” Room
1999 - 2014

Now is more interactive screens …

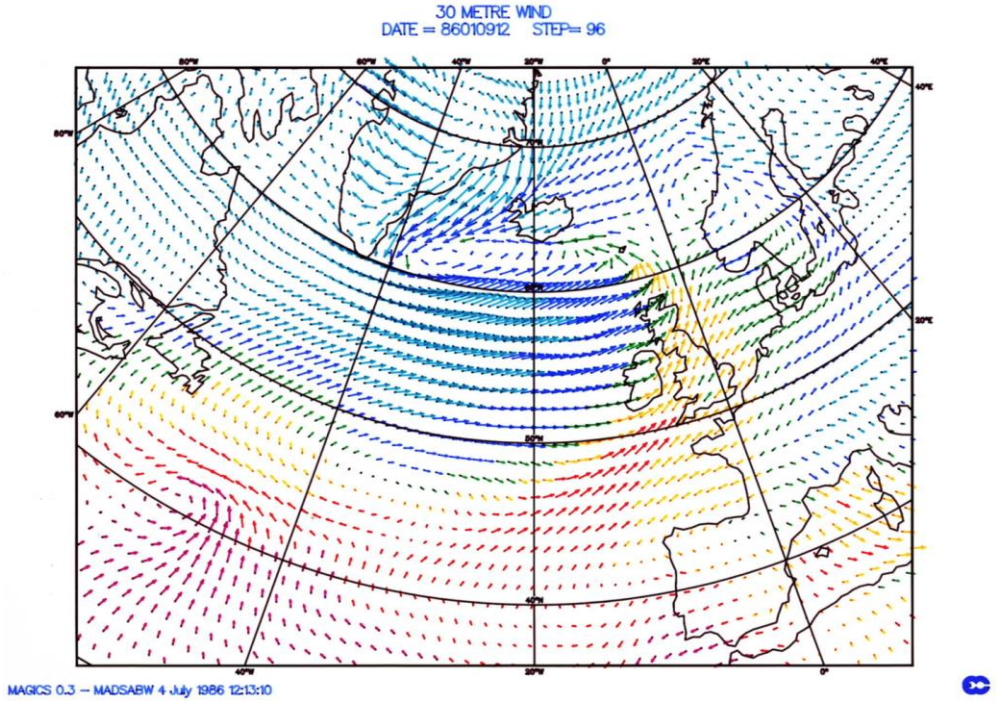




Weather Room
2014 -

History of graphics/visualisation at ECMWF

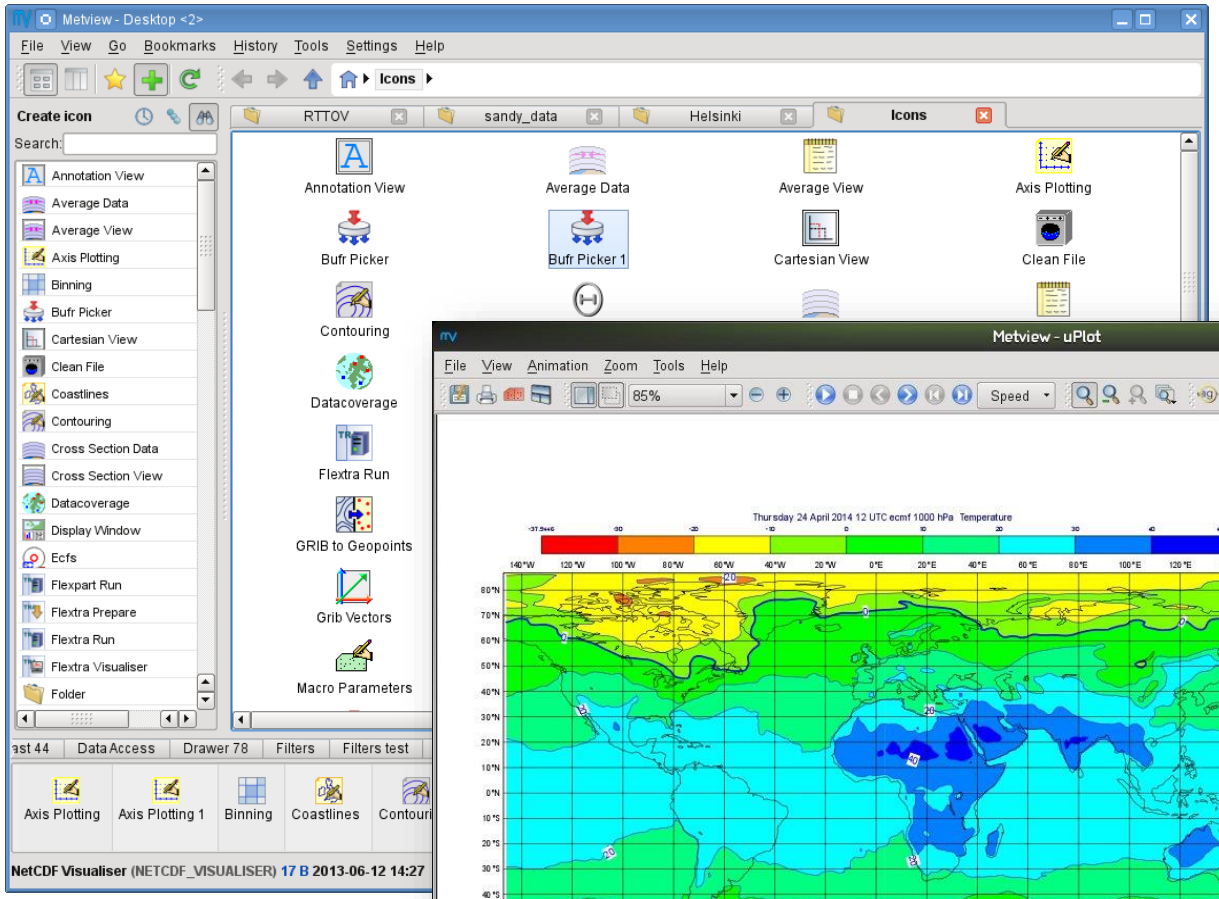
- 1983 Start developments on **M**eteorological **A**pplication **G**raphics **I**ntegrated **C**olour **S**ystem
  - Library with extensible API running on HPC
- 1985 MAGICS 0.3 plotting coloured wind arrows
- 1987 MAGICS 1.0
  - Many contributions from external users
- 1988 MicroMagics (on DOS by INPE)
- 1990 Start development of Metview
- 2003 Start work on Magics++
  - Increasing call for on on-demand web plots
- 2012 Release of Metview as Open Source
- 2013 Dedicated graphics/visualisation team is merged with other development teams

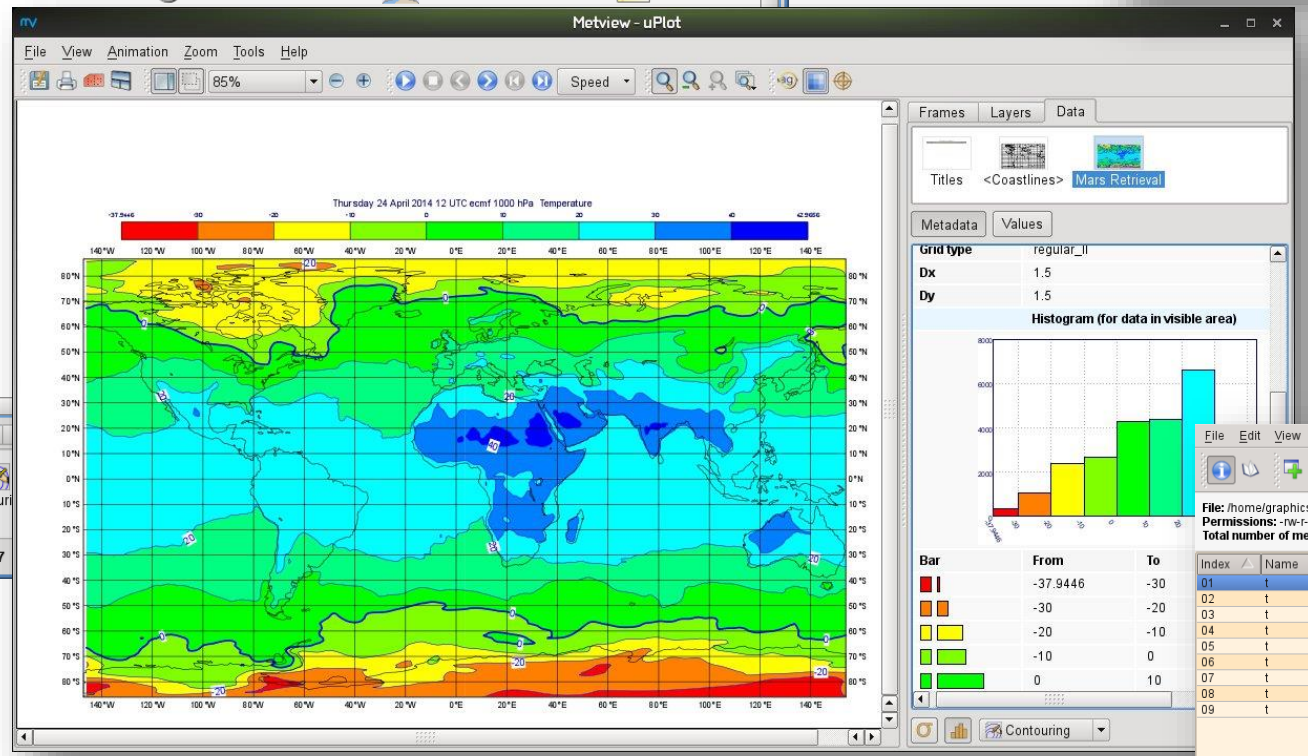


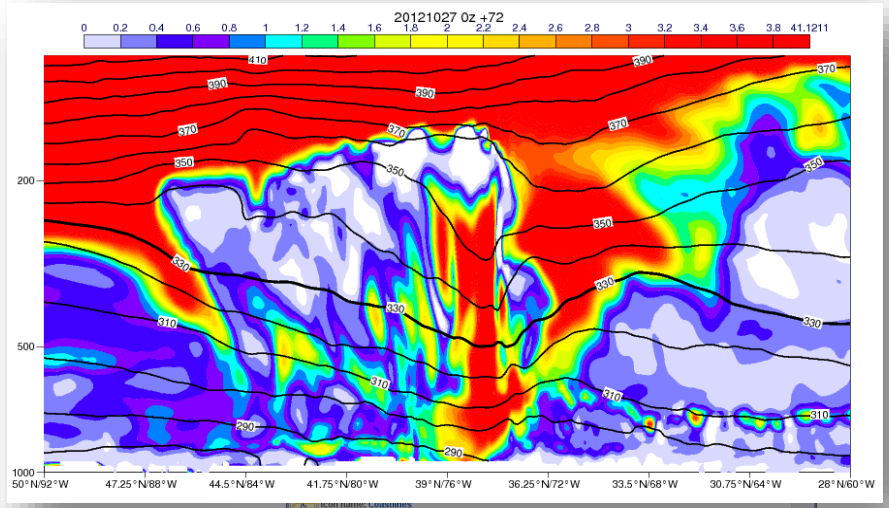
→ Challenges move from hardware (networks, printers) to software and styling

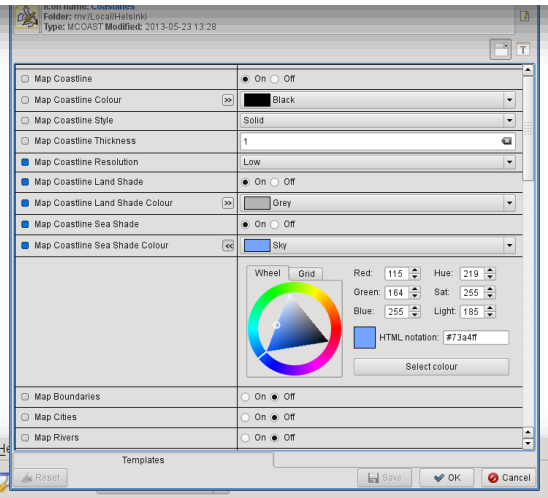
Metview's desktop & Batch system

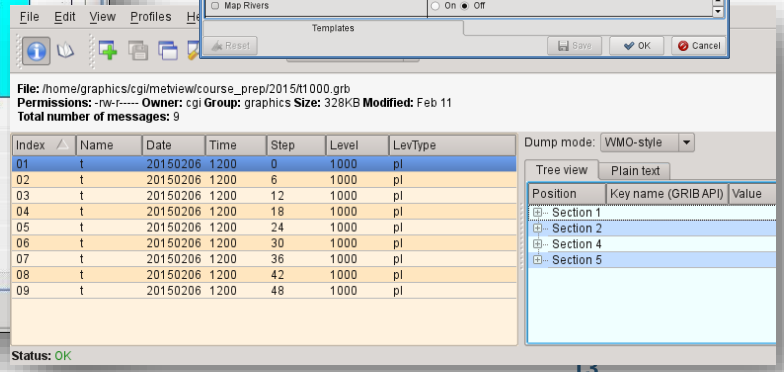
Allows fast prototyping and conversion to Macro for batch processing





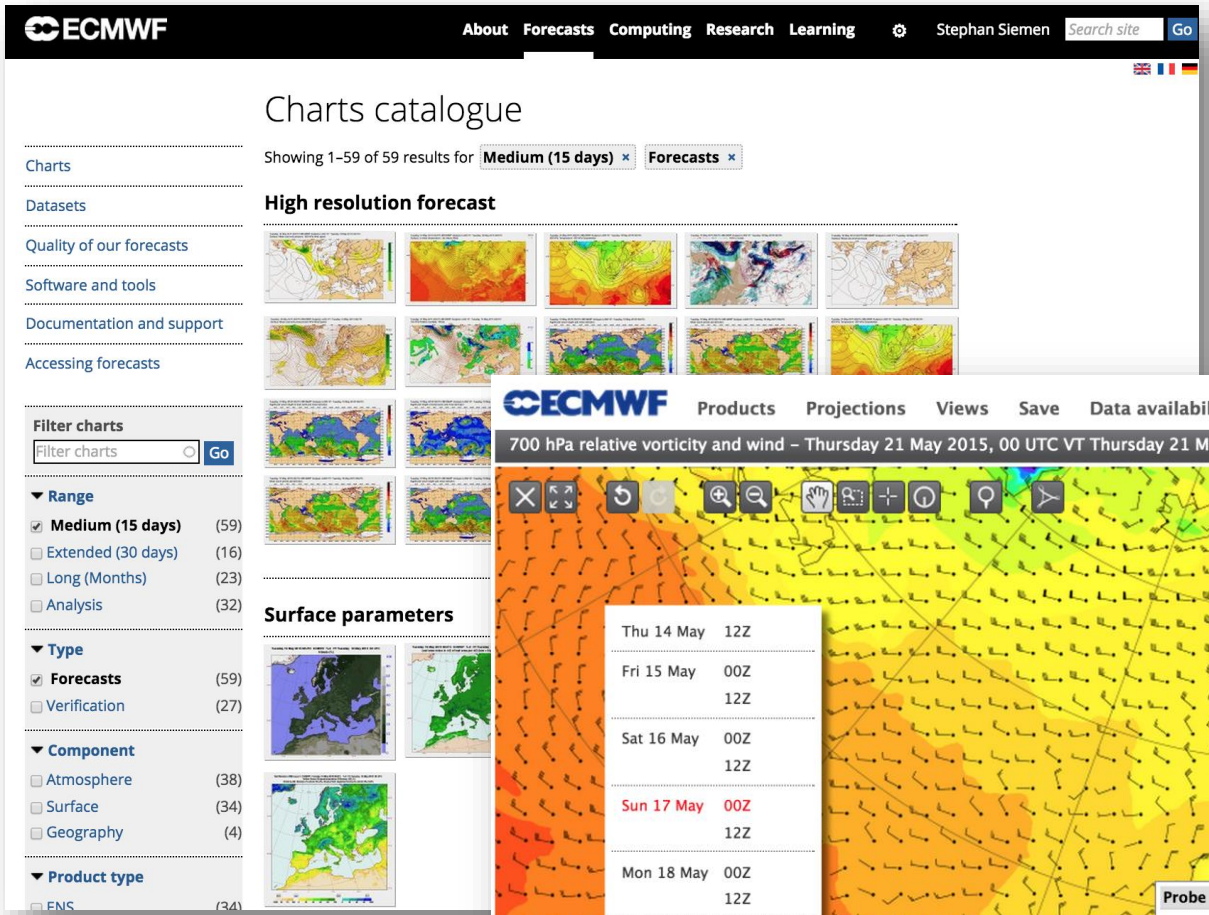


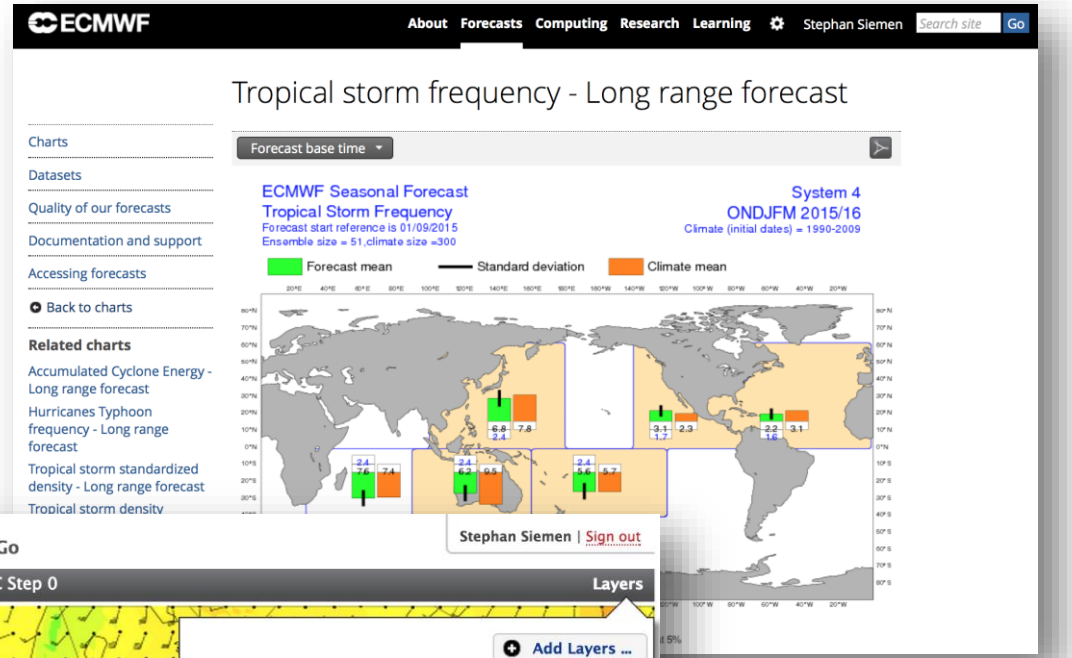


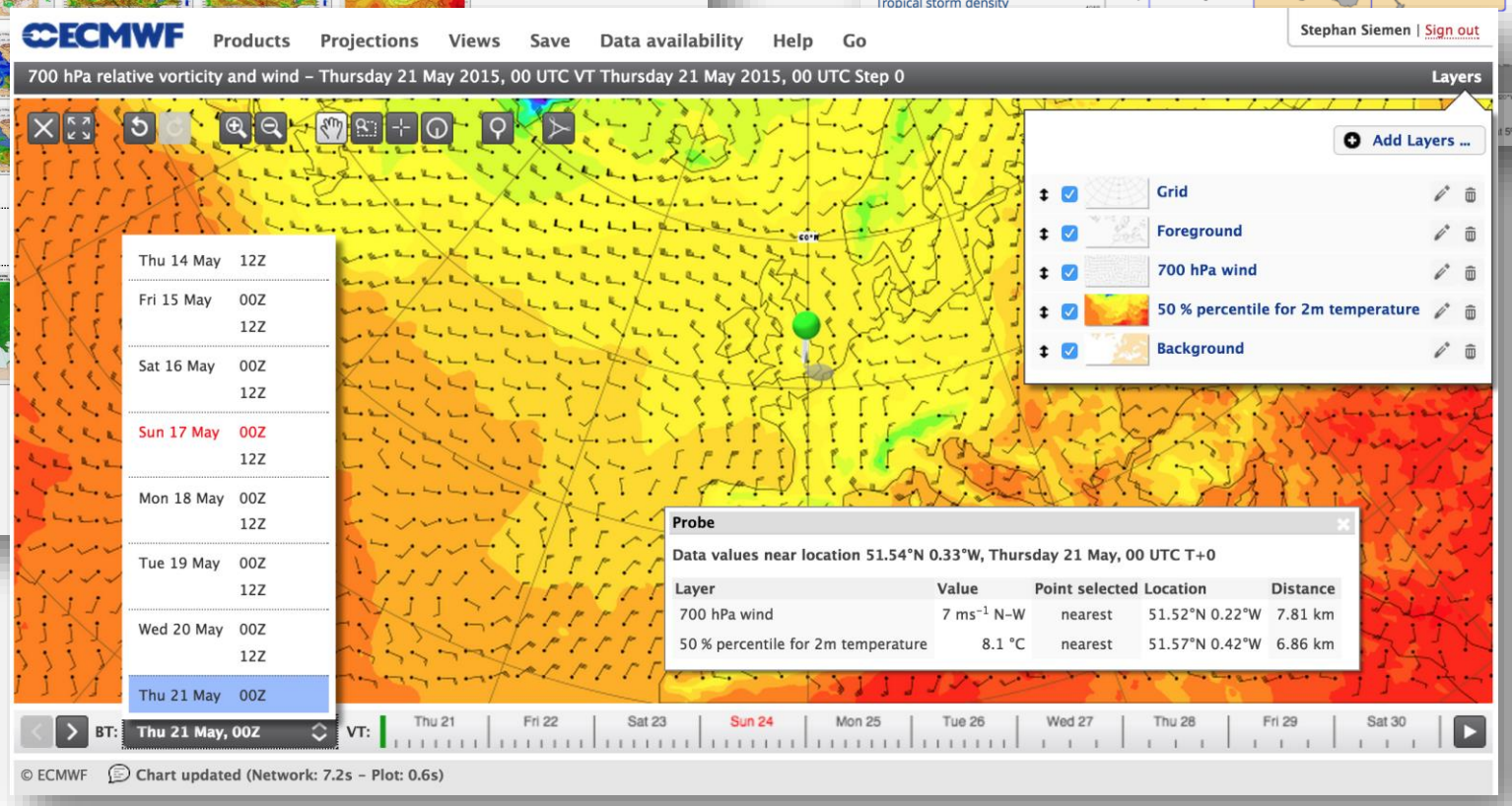


Presenting our forecast in graphical form …

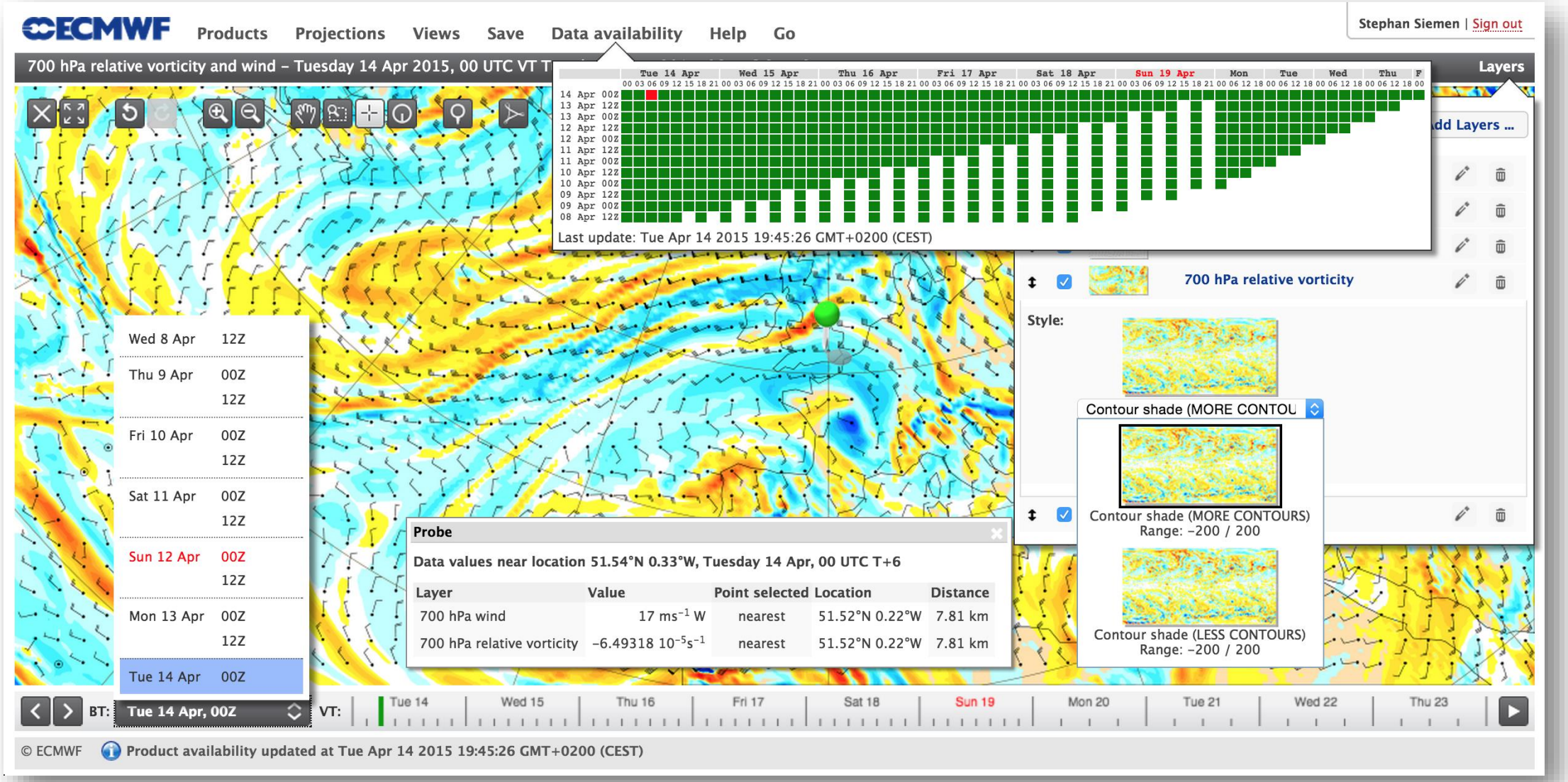
Web is the medium



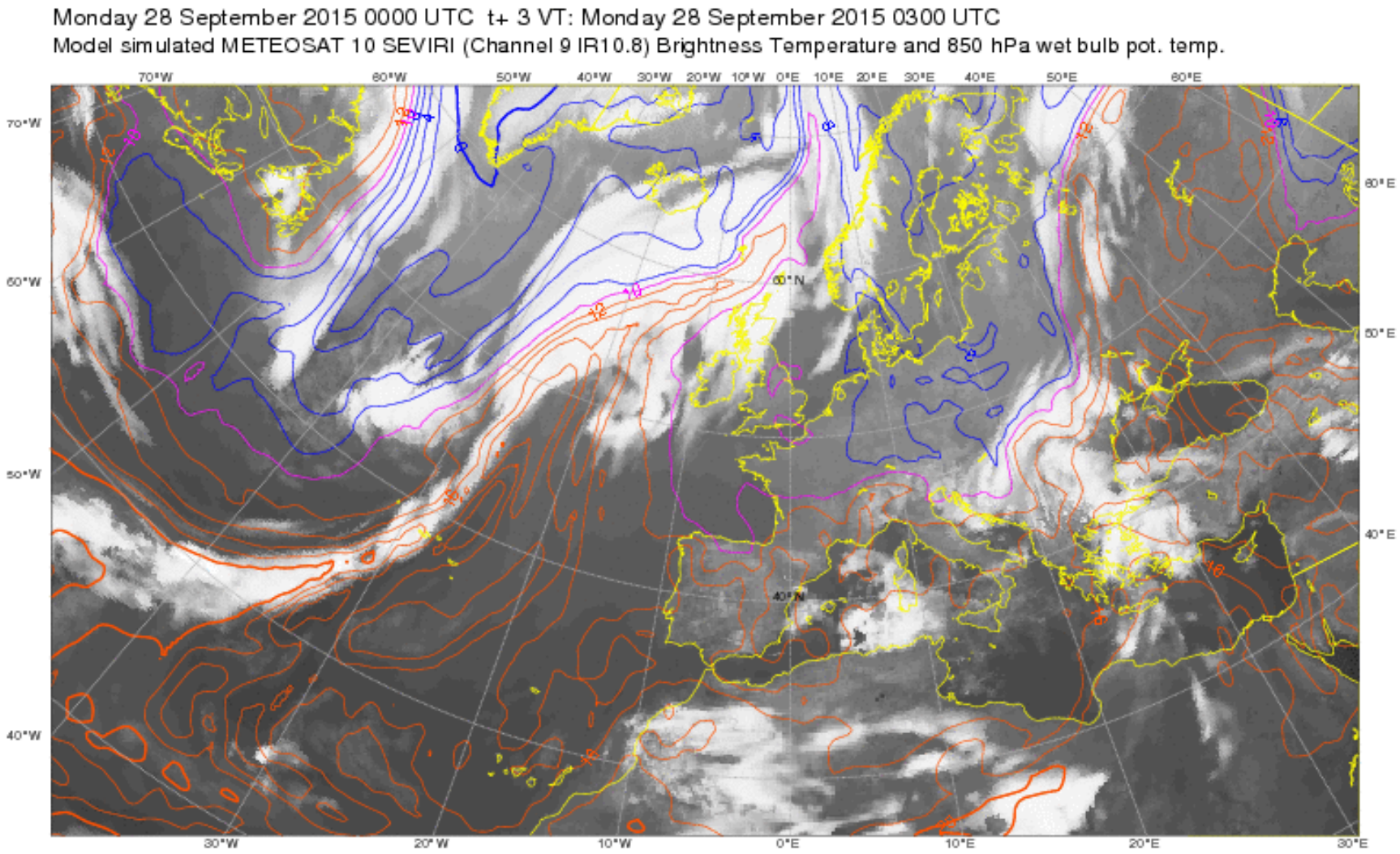




What is the best user interface?

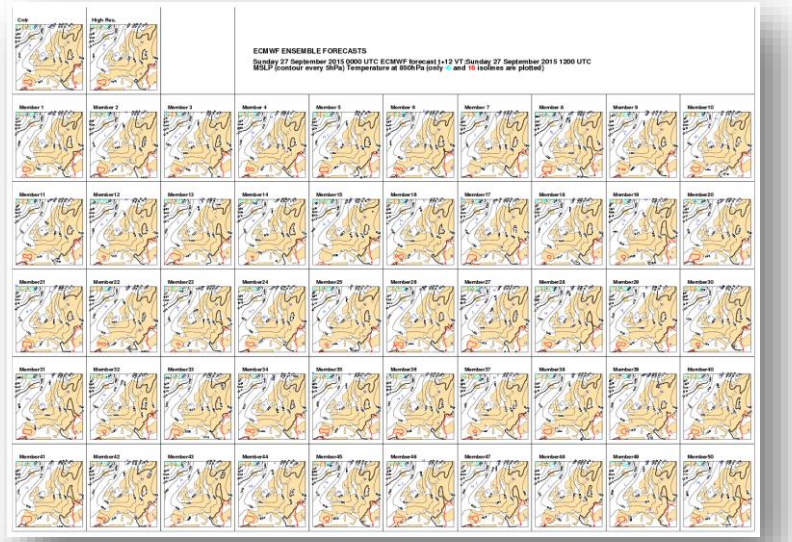


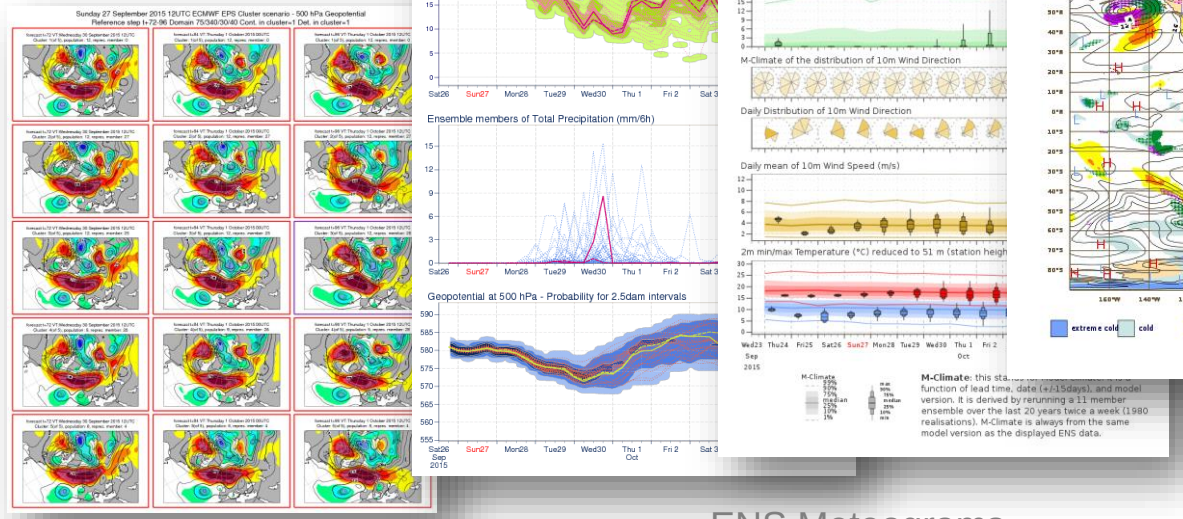
Overlay is essentials



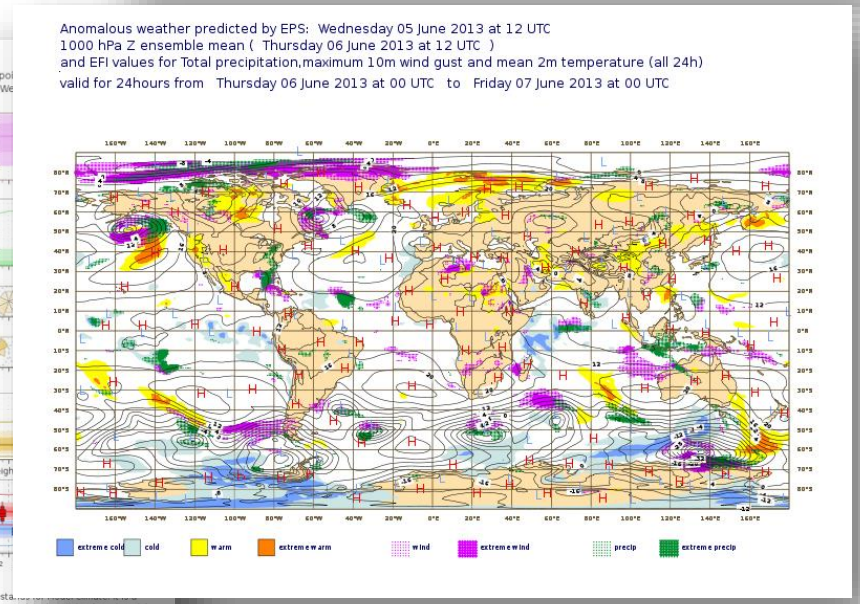
The challenge of Ensemble forecast (ENS) products

- Operating ensemble of forecasts brings its own challenges
  - Ensembles should be seen only in their context, not on their own
  - The 51 forecasts are too much for most users to process
- Users can make use of statistical products
  - Mean, Standard-deviation, …
- ECMWF can offer graphical products
  - ENS Metgrams & Extreme Forecast Index(EFI) are successful examples of this



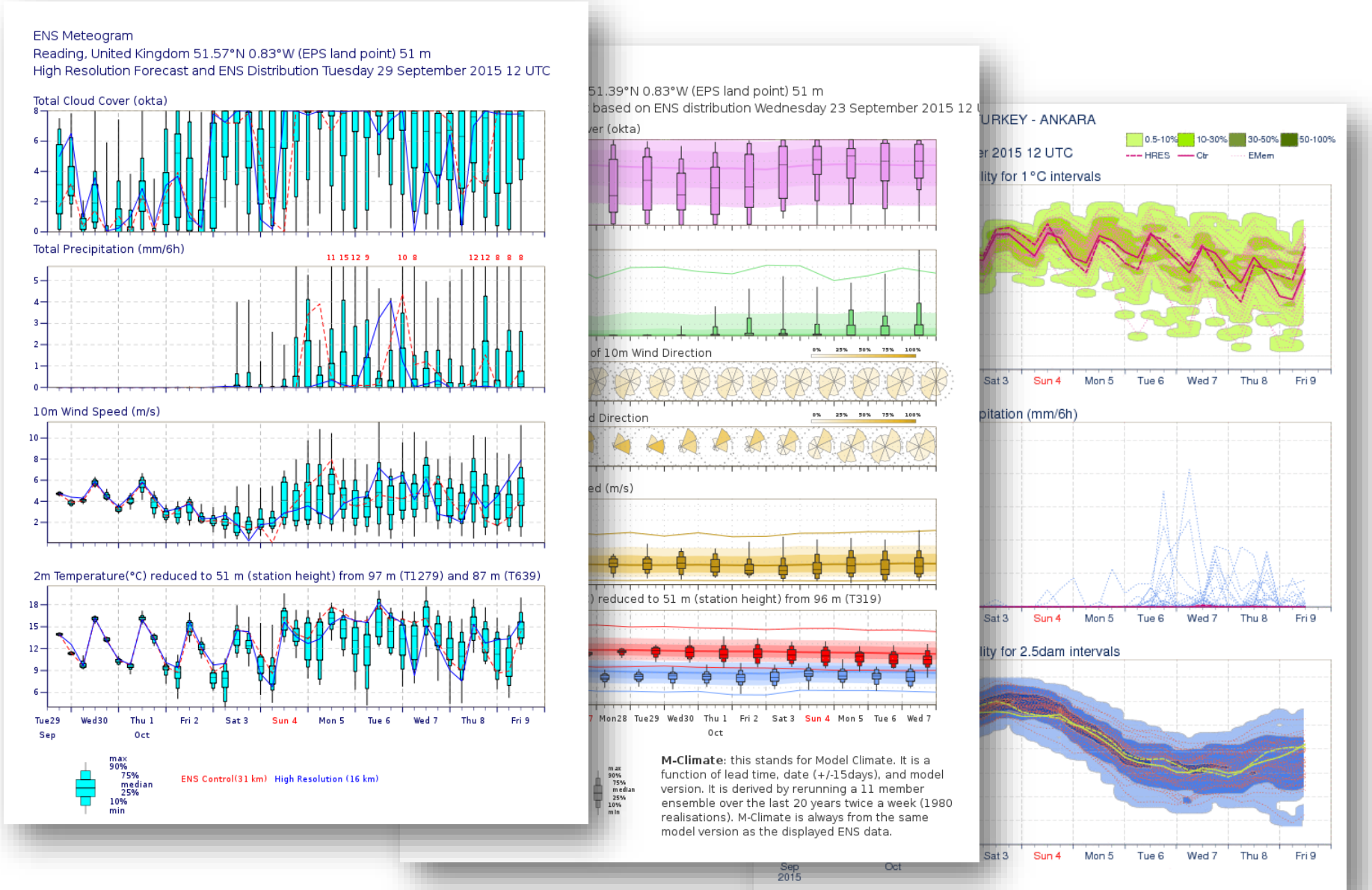


ENS Meteograms

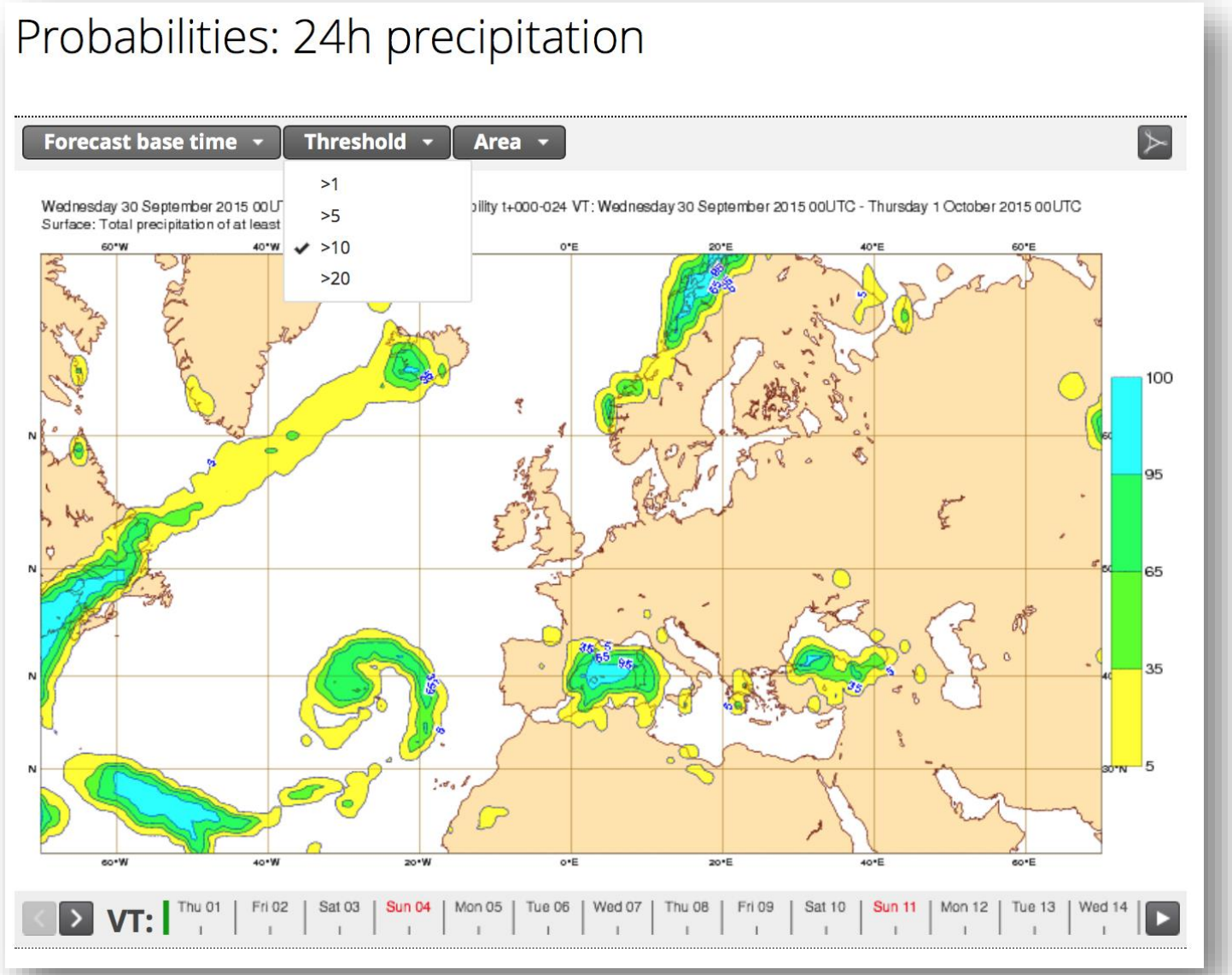


Extreme Forecast Index (EFI)

If there is the one graphics …

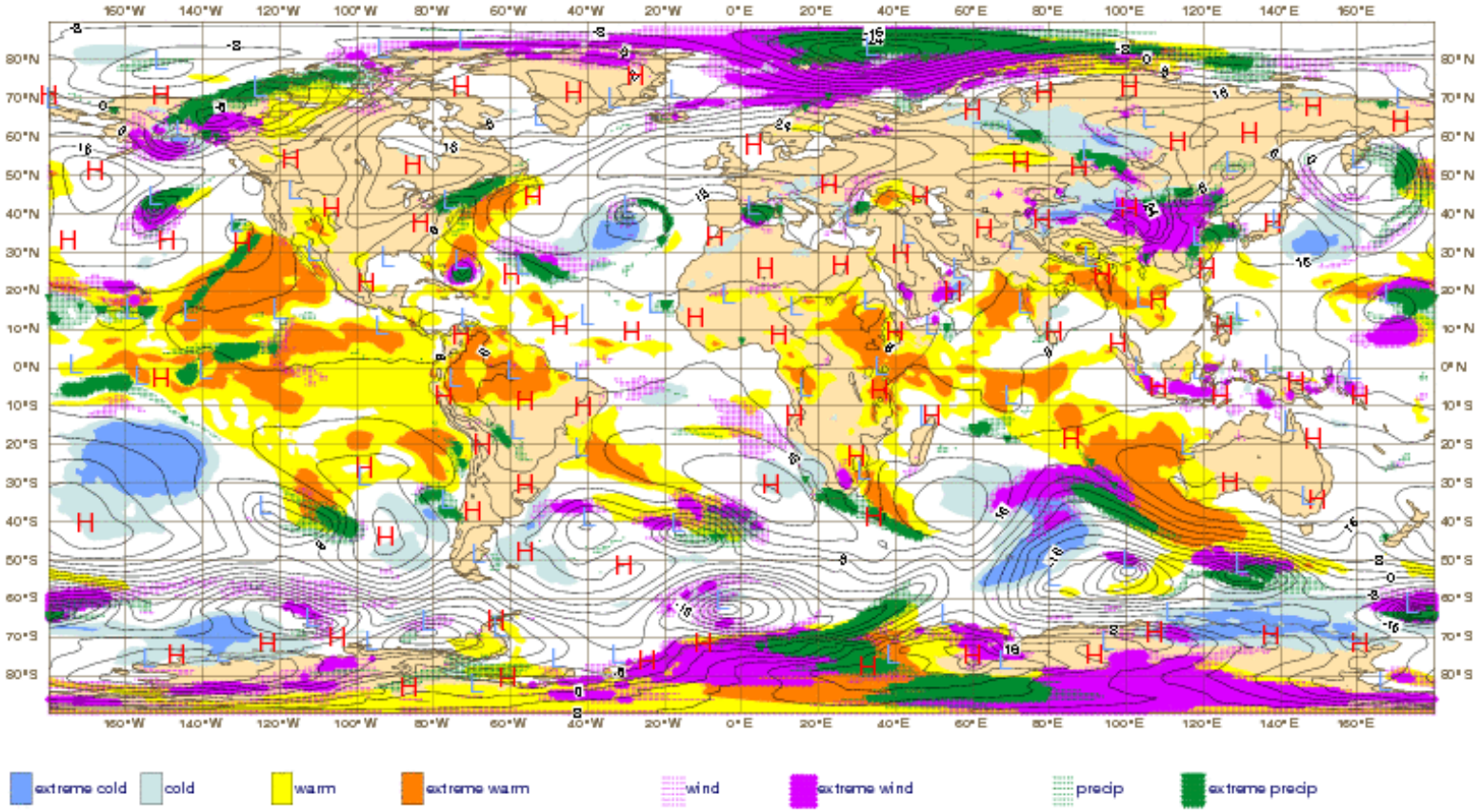


Probabilities

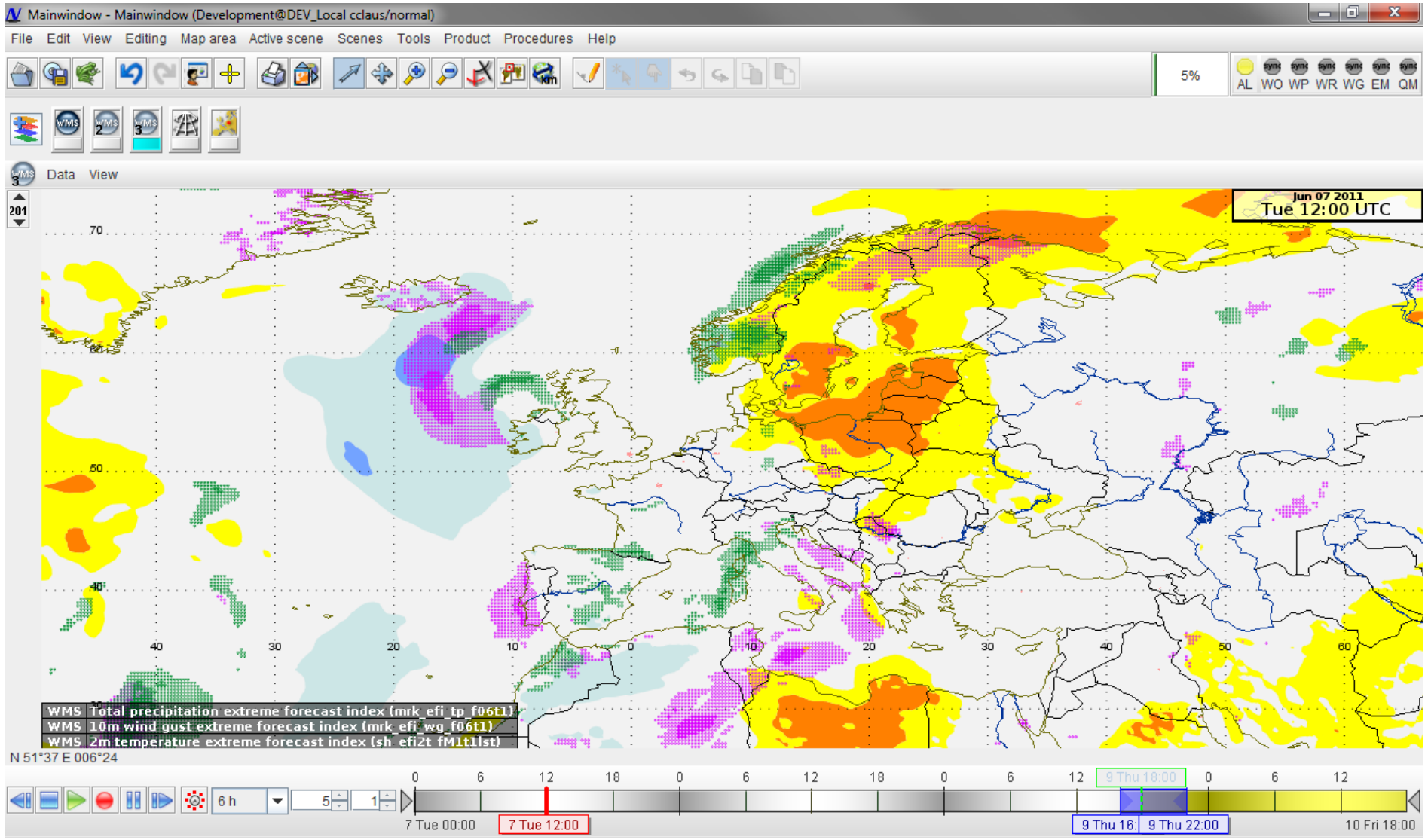


Another success – the Extreme Forecast Index (EFI)

Anomalous weather predicted by EPS:Tuesday 29 September 2015 1200 UTC
1000 hPa Z ensemble mean (Wednesday 30 September 2015 1200 UTC)
and EFI values for Total precipitation,maximum 10m wind gust and mean 2m temperature (all 24h)
valid for 24hours from Wednesday 30 September 2015 0000 UTC to Thursday 01 October 2015 0000 UTC

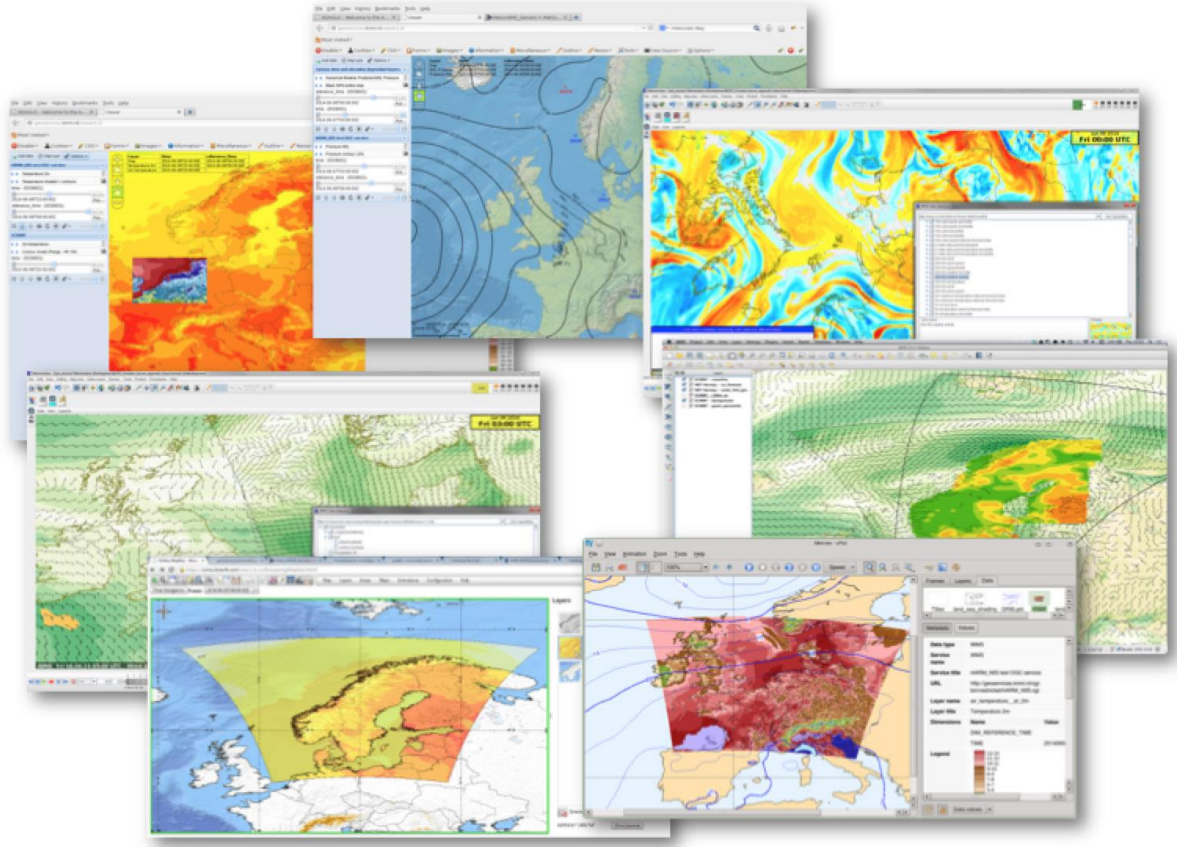


ECMWF map overlaid in NinJo



New ways of exchanging maps and data

- The last decade saw the need to develop machine-to-machines web services
- This was raised and discussed at the MOS workshop in 2007 here at ECMWF
  - Engage with the well established GIS community and explore their existing services for delivering maps and data
  - Open Geospatial Consortium (OGC)
    - Establishment MetOcean Domain Working Group



What about 3D/4D at ECMWF?

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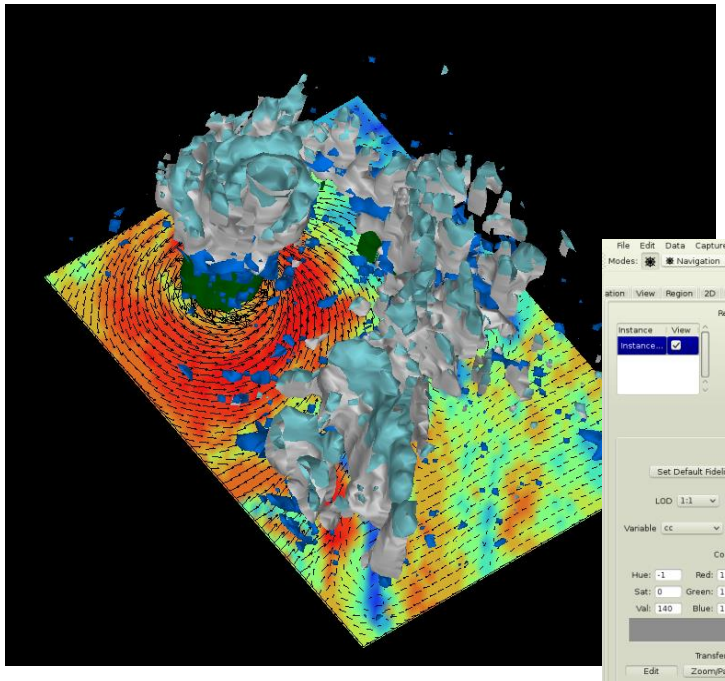
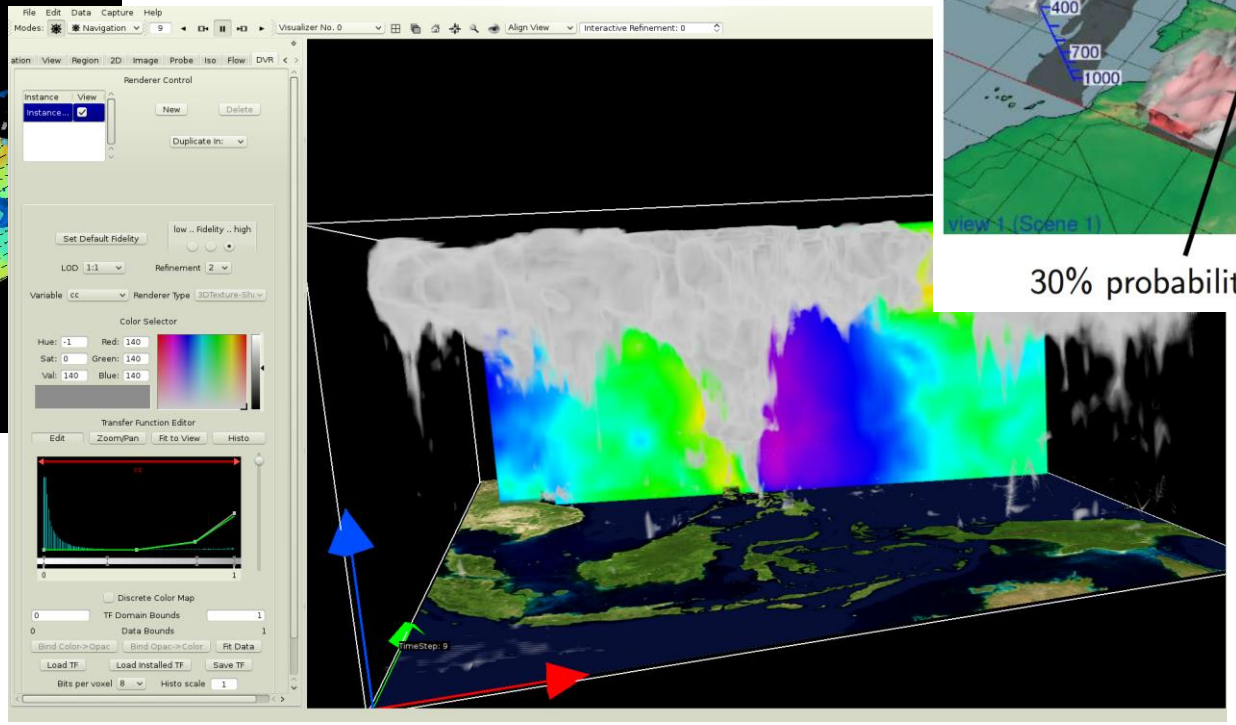
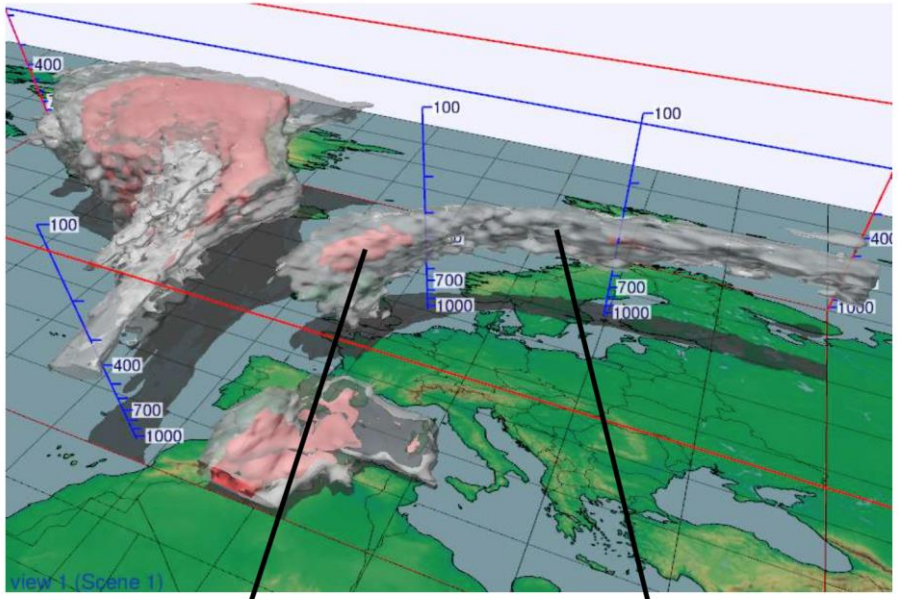


Vis5D

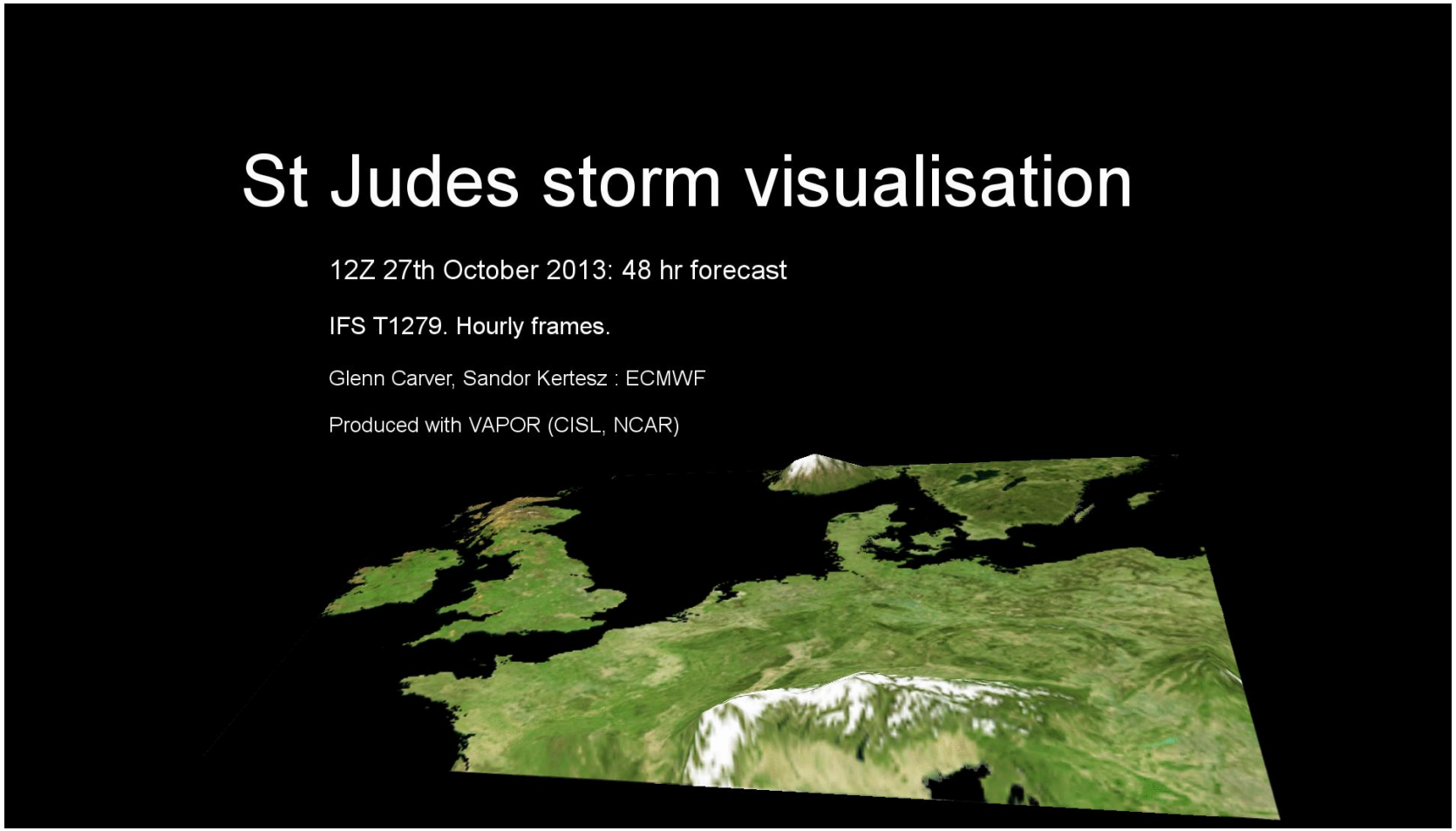


Vapor



Met3D

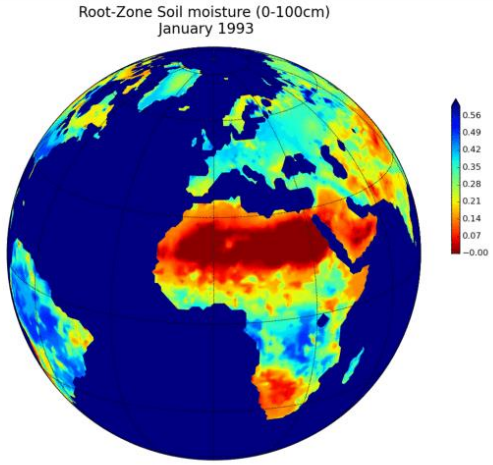
The comeback of 3D/4D?



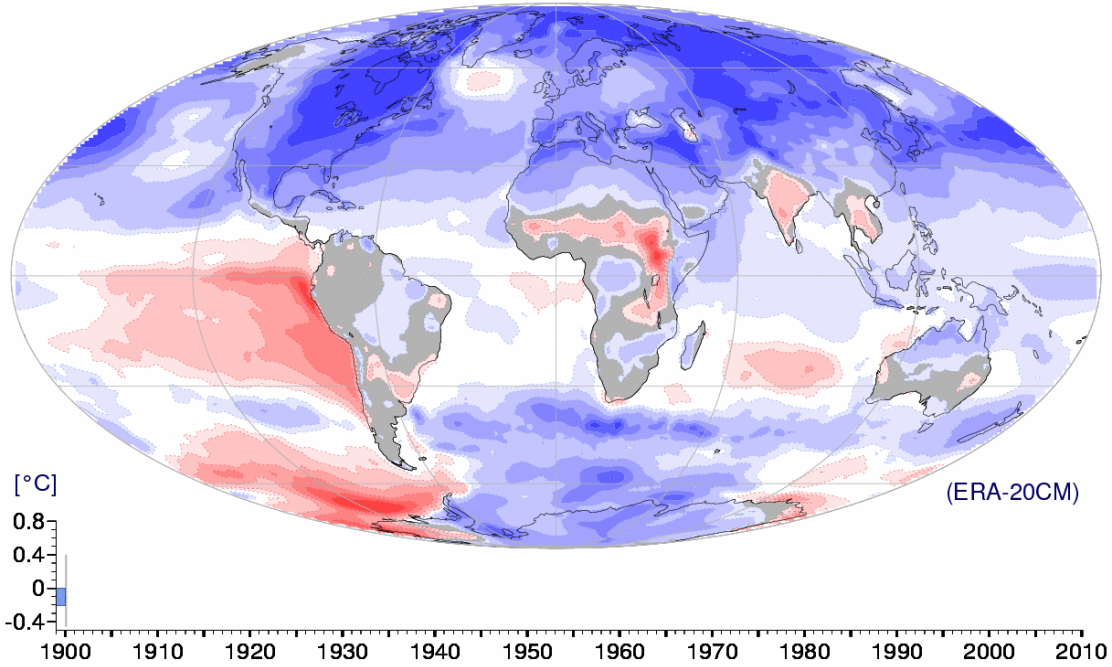
St Judes storm, 27th October 2013
Thanks to Glenn Carver from the OpenIFS project
(Using Metview and Vapor)

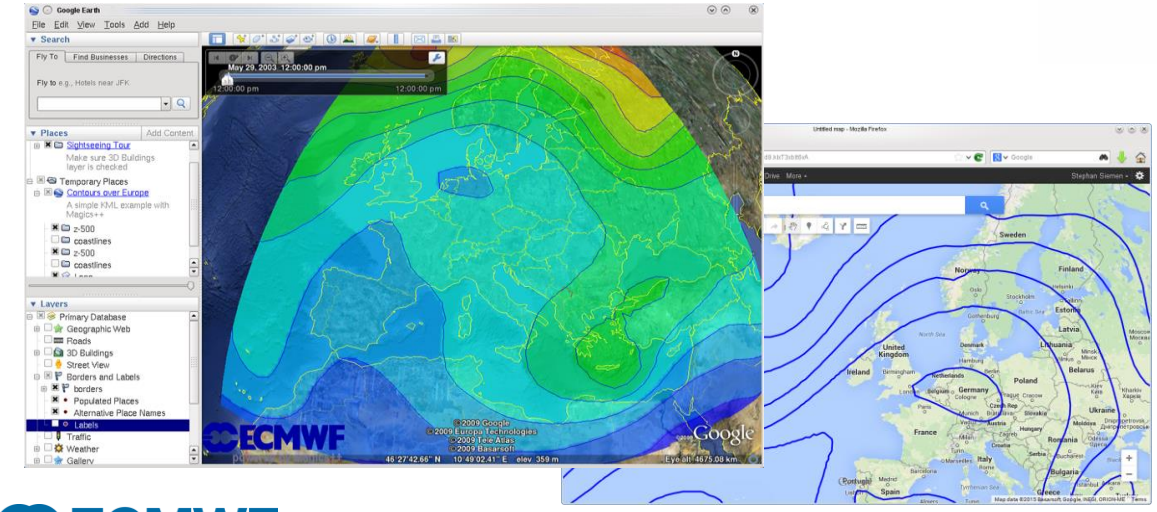
Get the message?

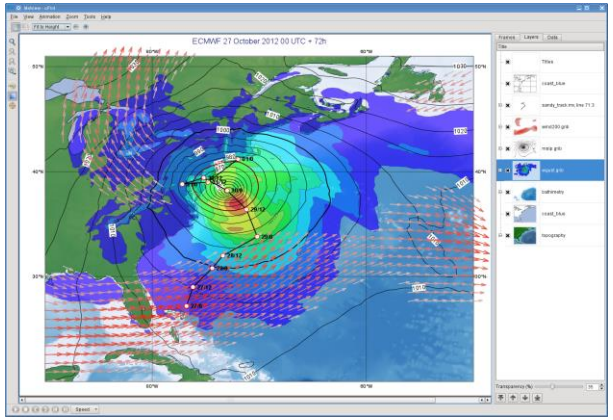
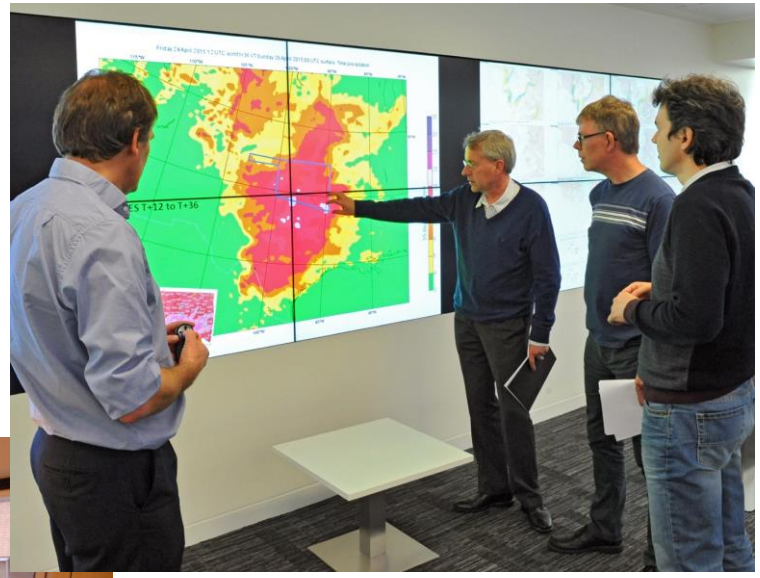
Supporting communication and outreach



Global warming relative to 20th-century average







Any questions?