Metview 5.0 and Beyond, to its Pythonic Future

MOS 2017, ECMWF

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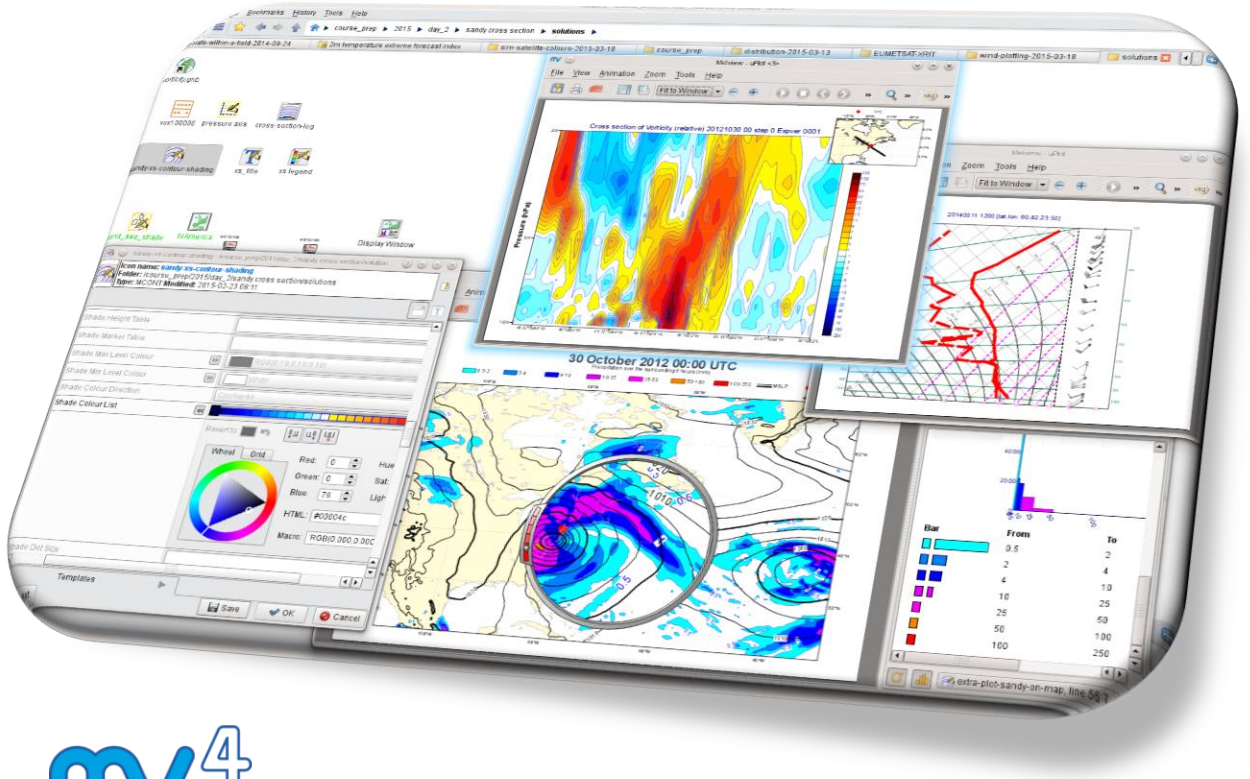
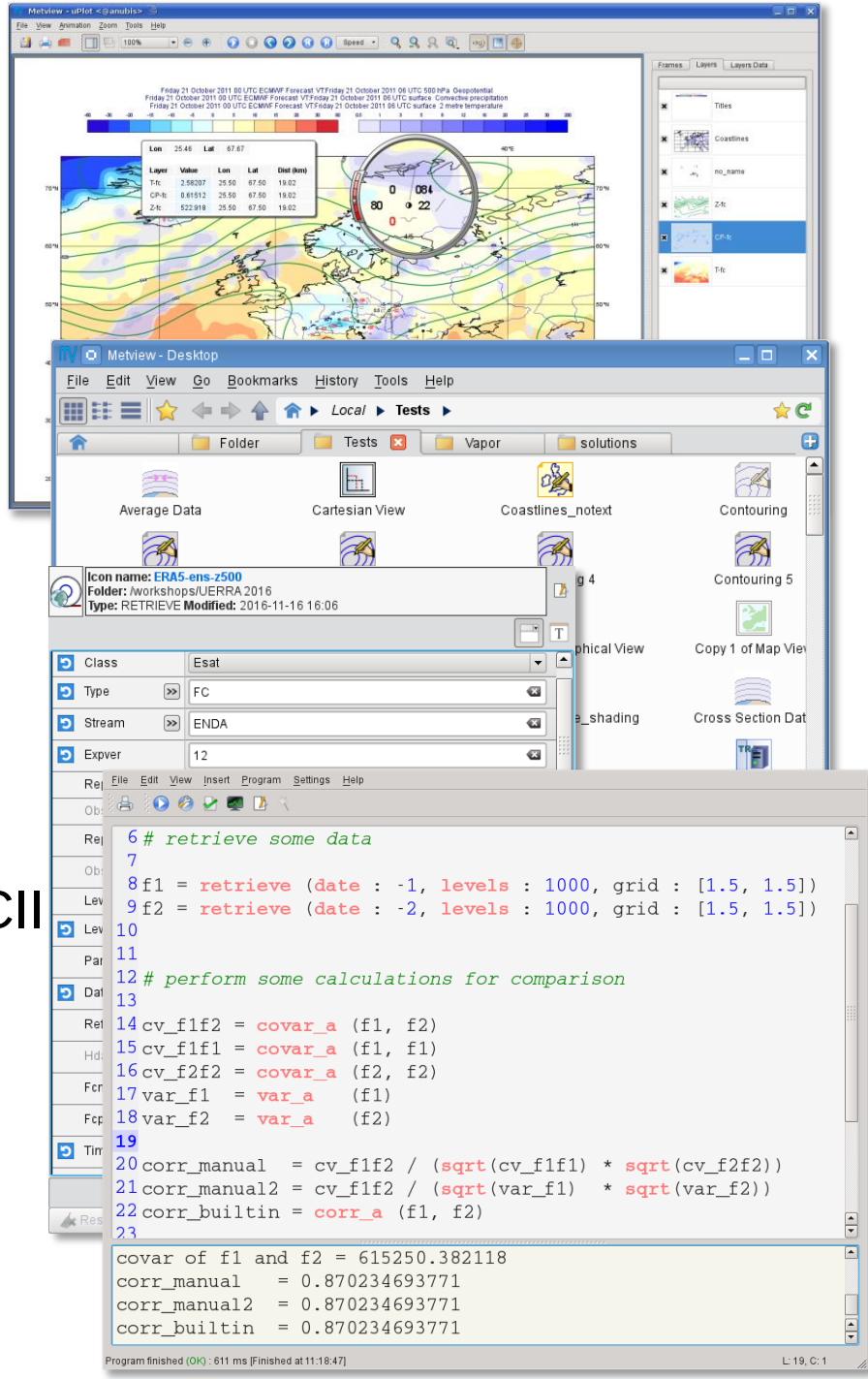


What is Metview?

- Workstation software for researchers and operational analysts
  - Runs on UNIX, from laptops to supercomputers (now includes Mac OS X)
- Retrieve/manipulate/visualise/examine meteorological data
- Drag & drop user interface / powerful scripting language

Built on core ECMWF technologies:
MARS, ecCodes, Magics, ODB, Emoslib
(future: MIR)

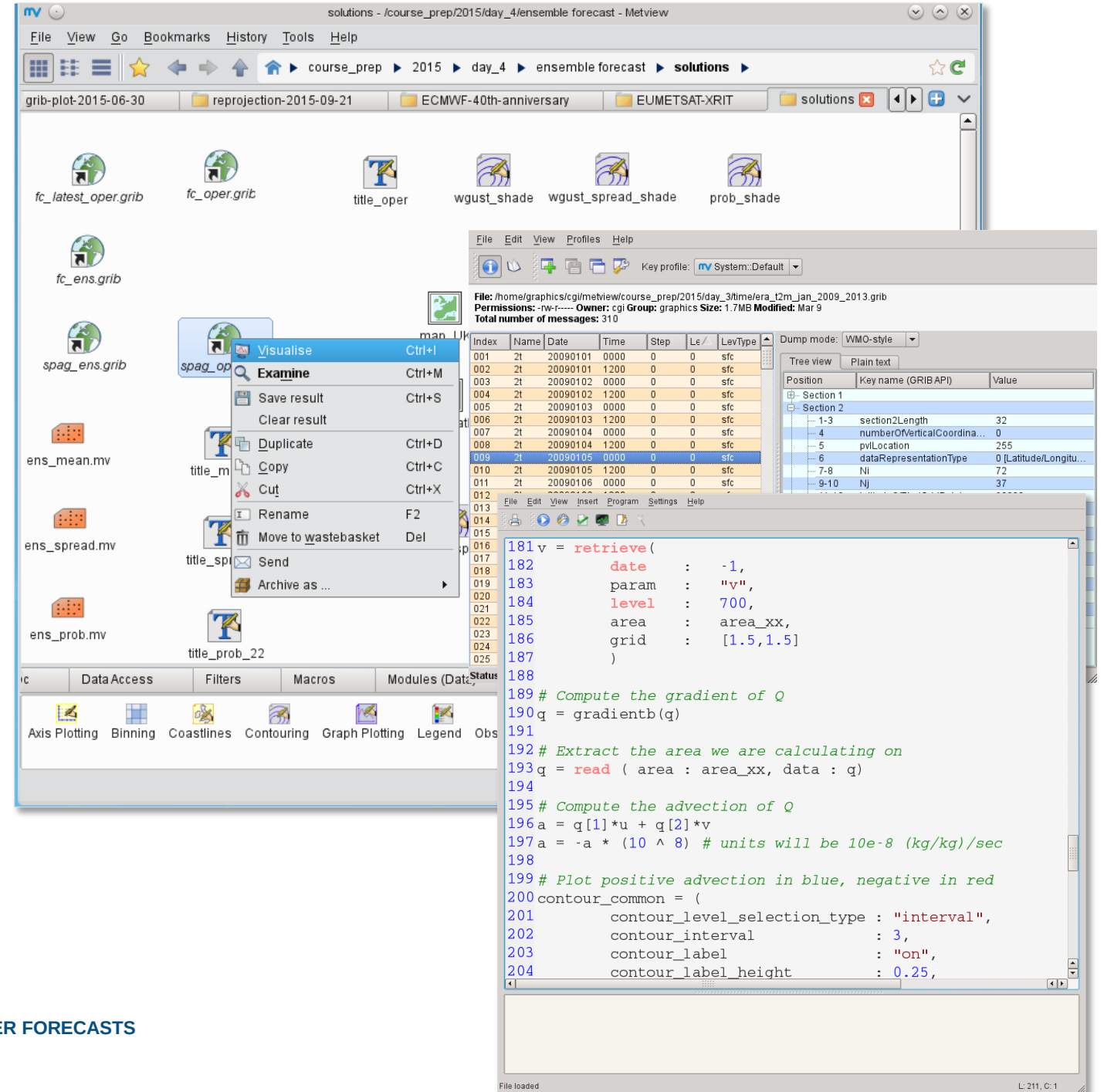
- Handles GRIB, BUFR, NetCDF, ODB, Geopoints, CSV, ASCII
- Can access MARS, either locally or through the Web API
- Open Source under Apache Licence 2.0
- Metview is a co-operation project with INPE (Brazil)



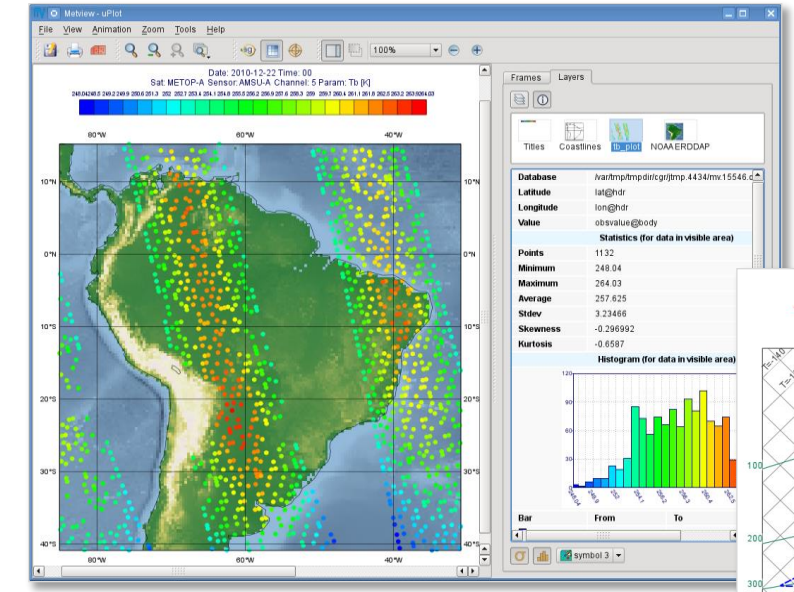
Using Metview

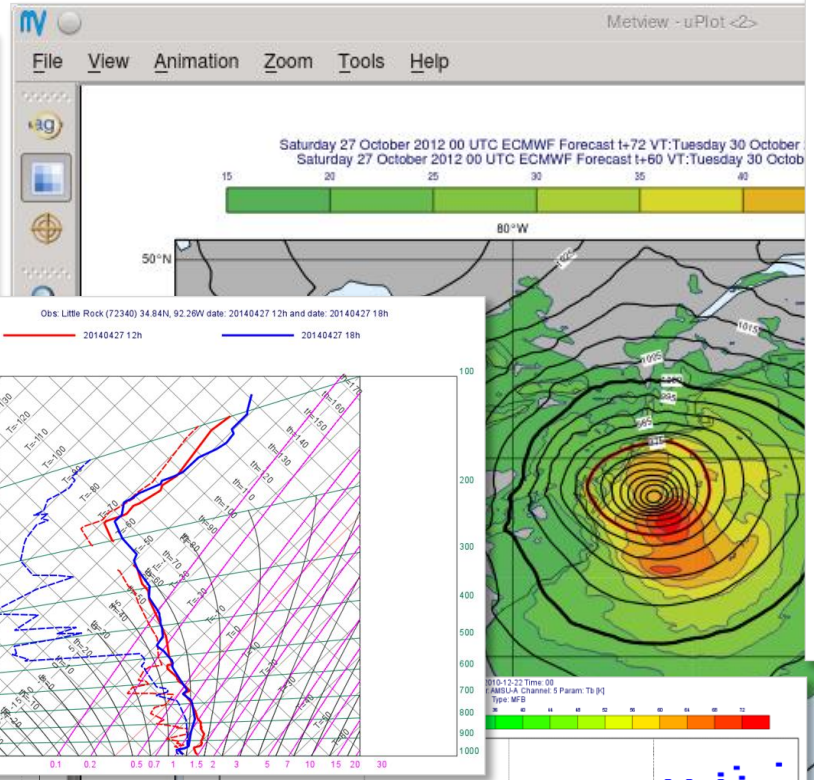
- Icon-based user interface
  - interactive investigation of data
  - icons represent data, settings and processes
  - icons can be chained together – output from one is input to another

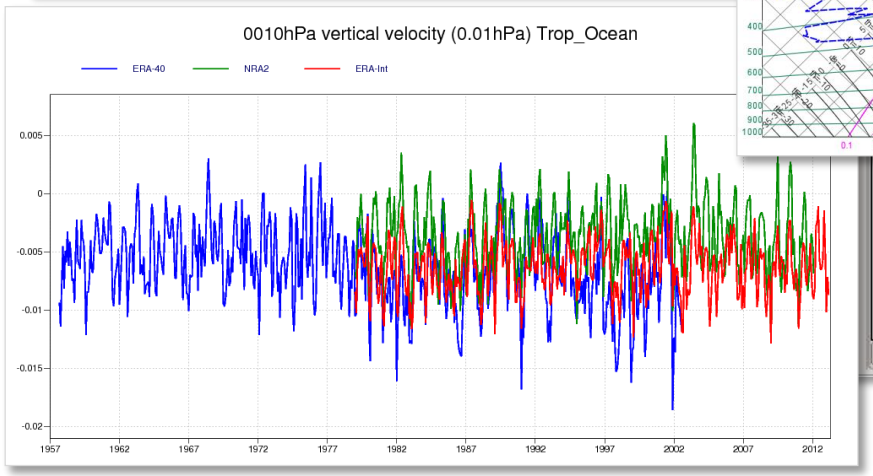
- Powerful Macro scripting language
  - more serious computations
  - batch or interactive usage

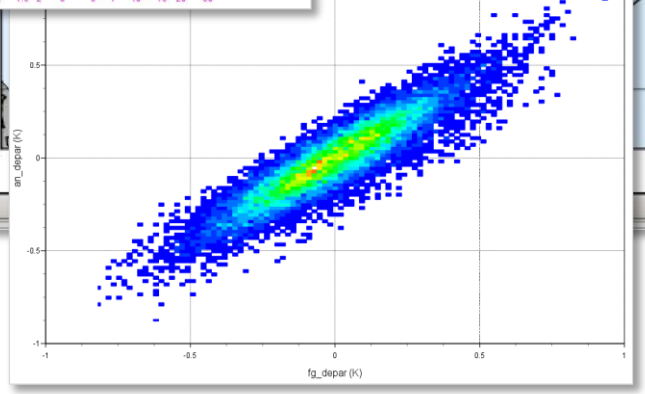


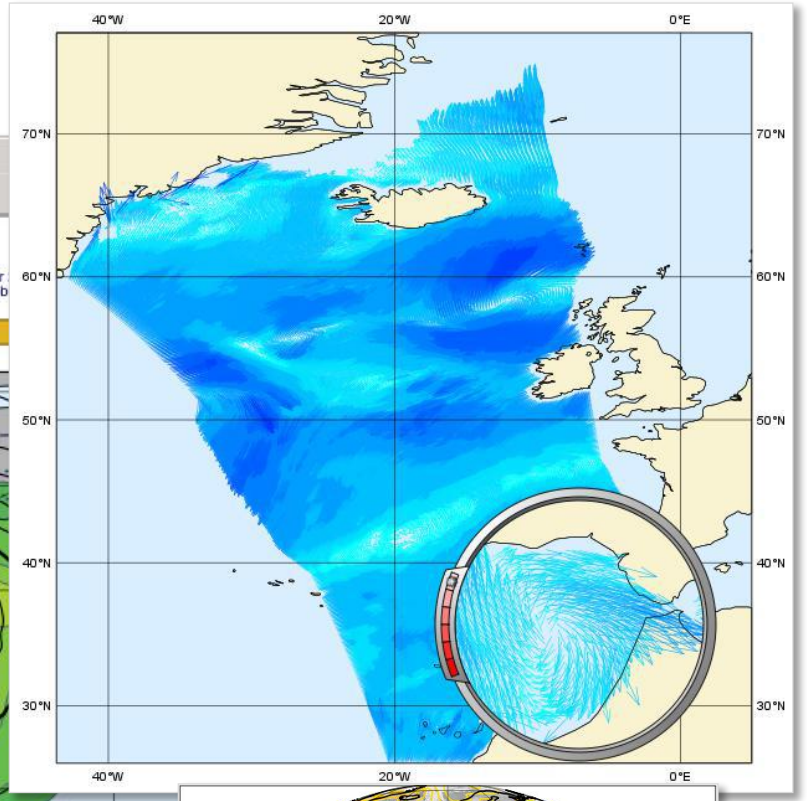
Visualisation

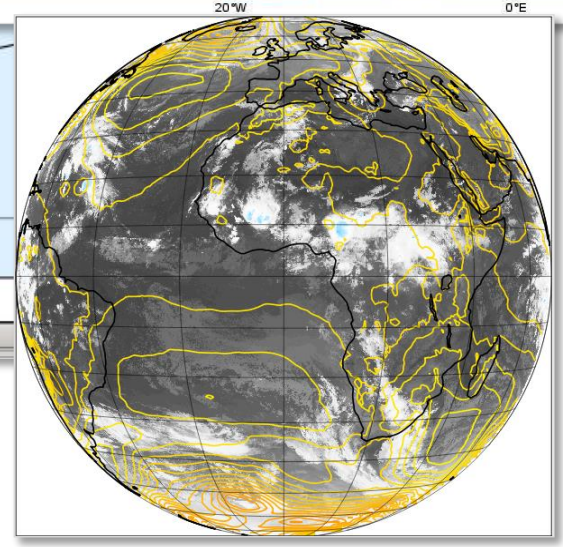




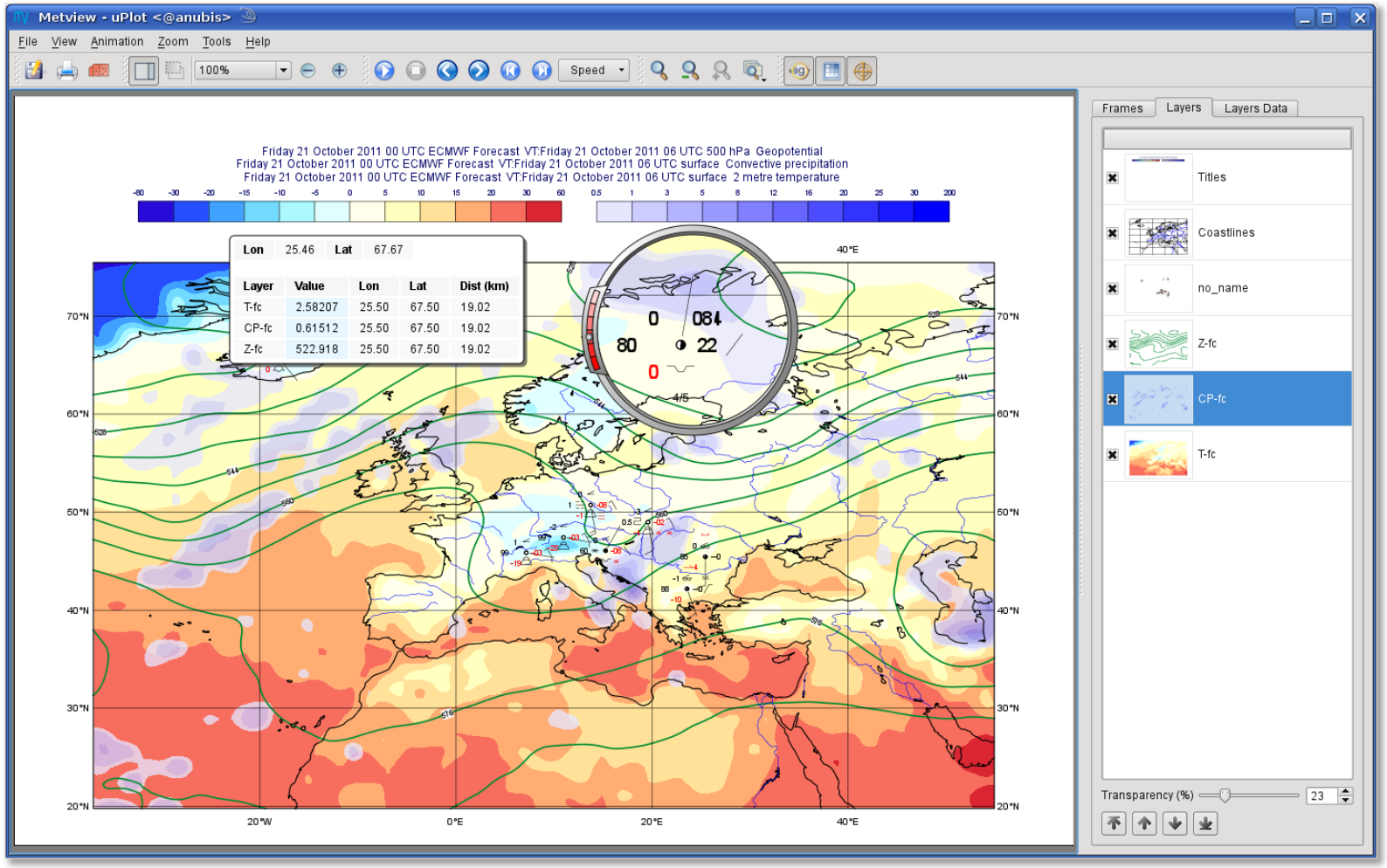




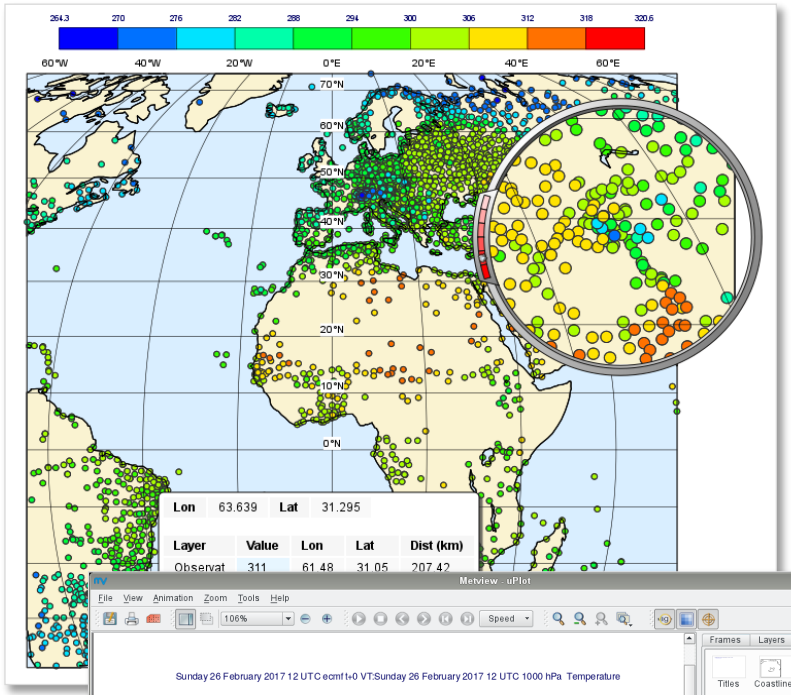


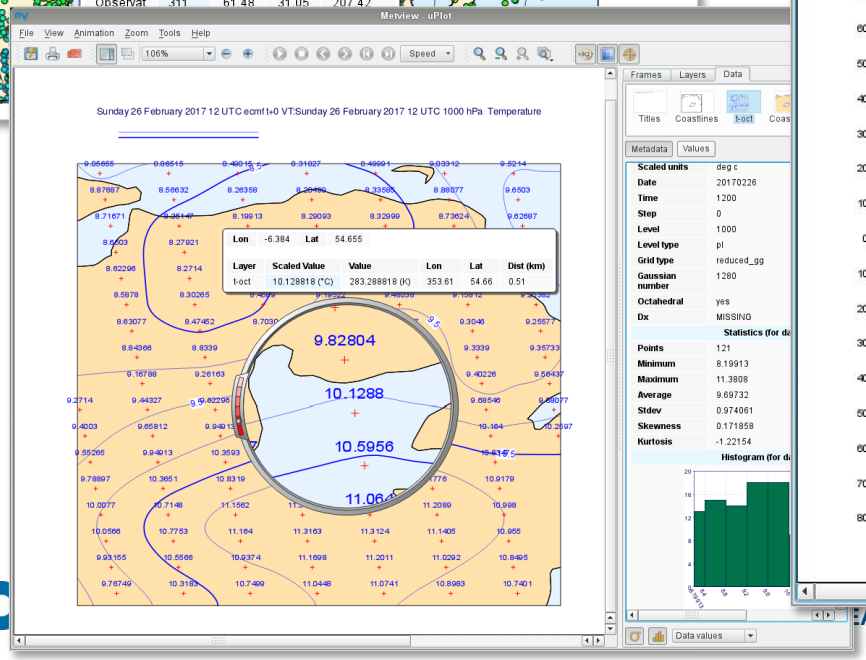


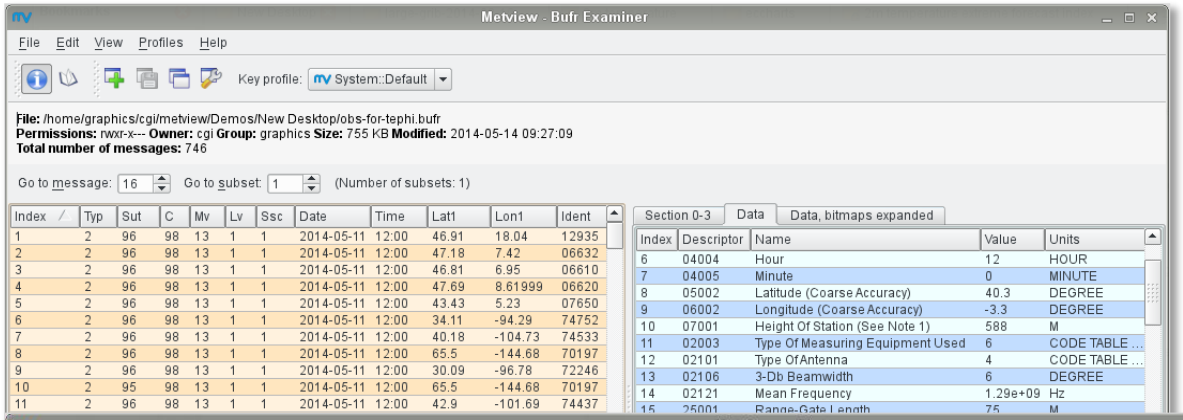
Visualisation - Overlay

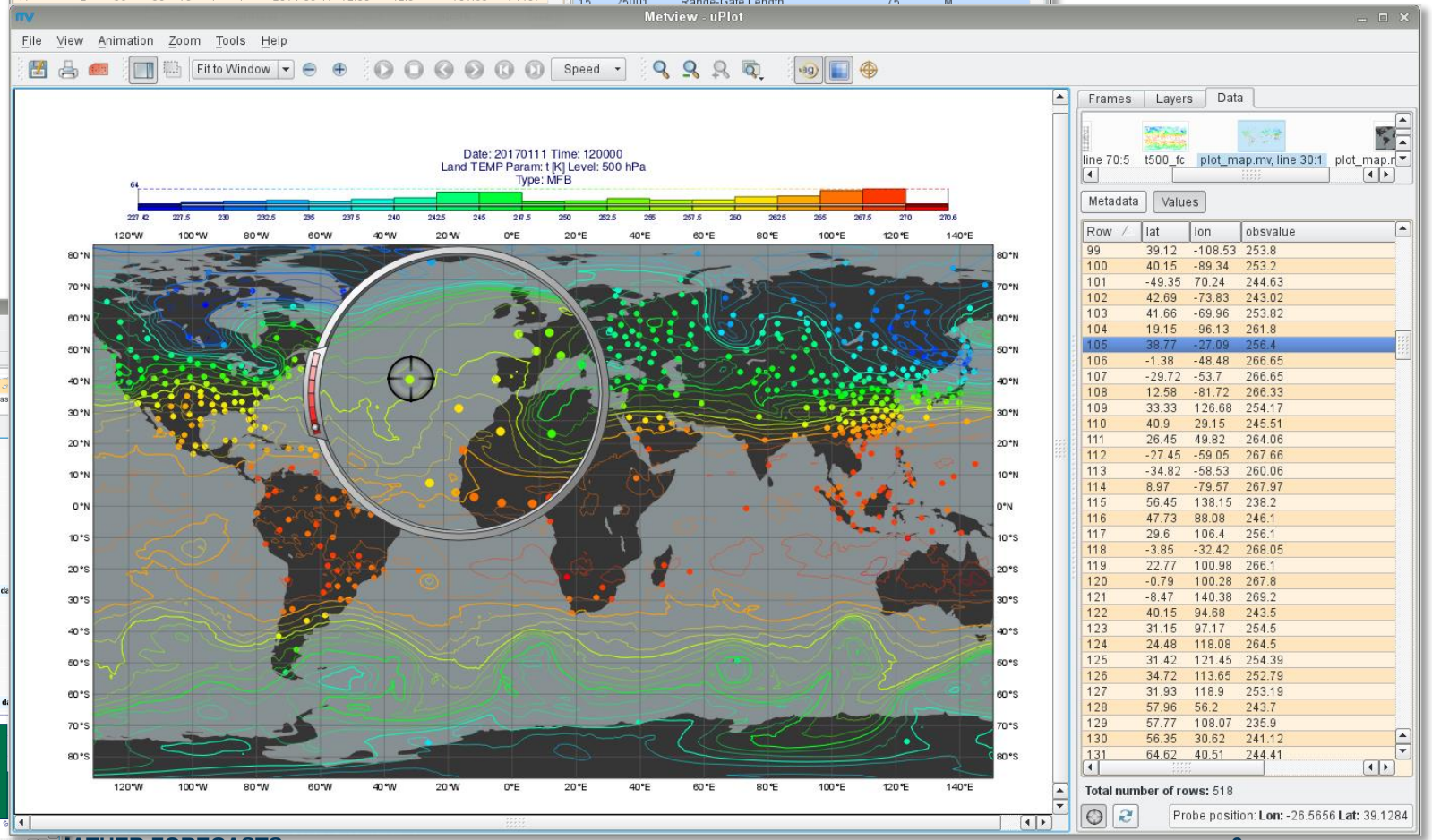


Interactive Data Inspection



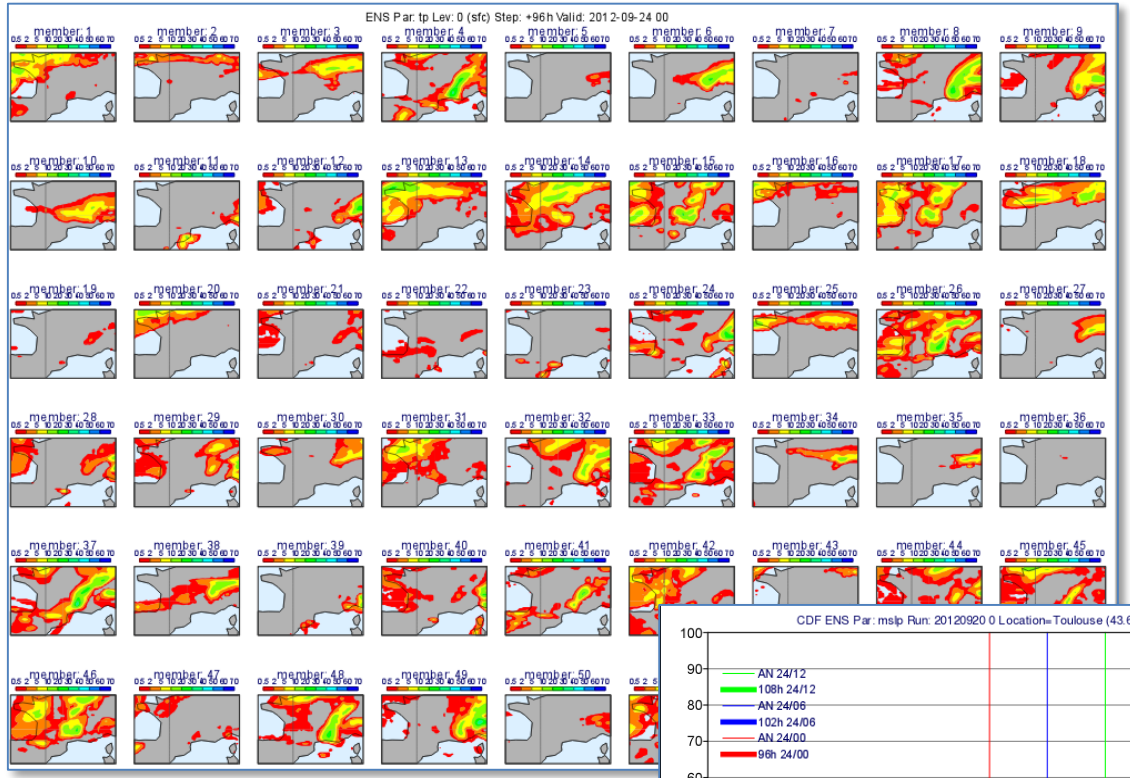


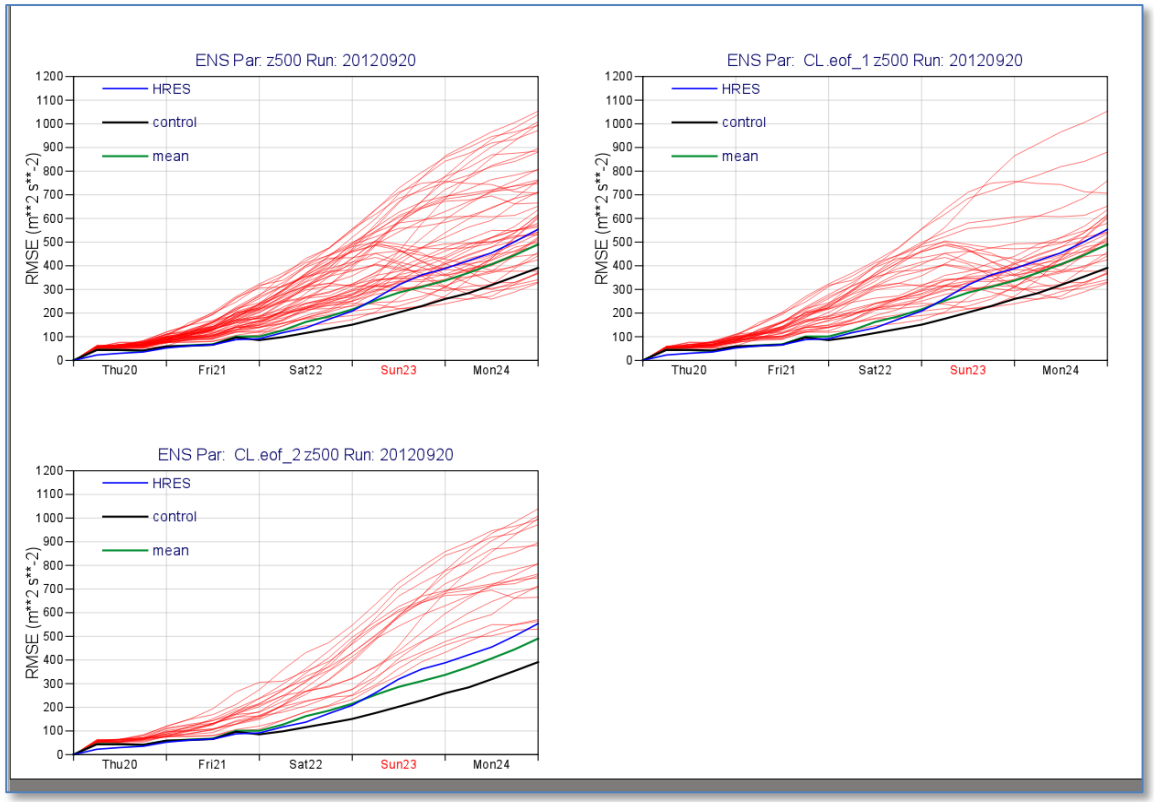


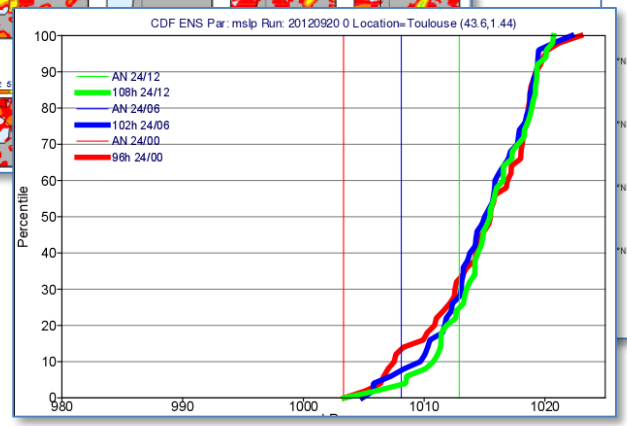


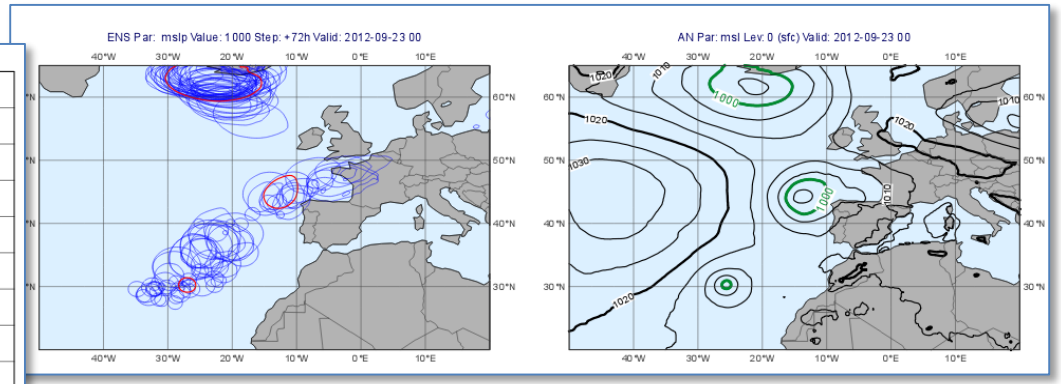
Metview and ensemble data

- Many ways to process and visualise ENS data







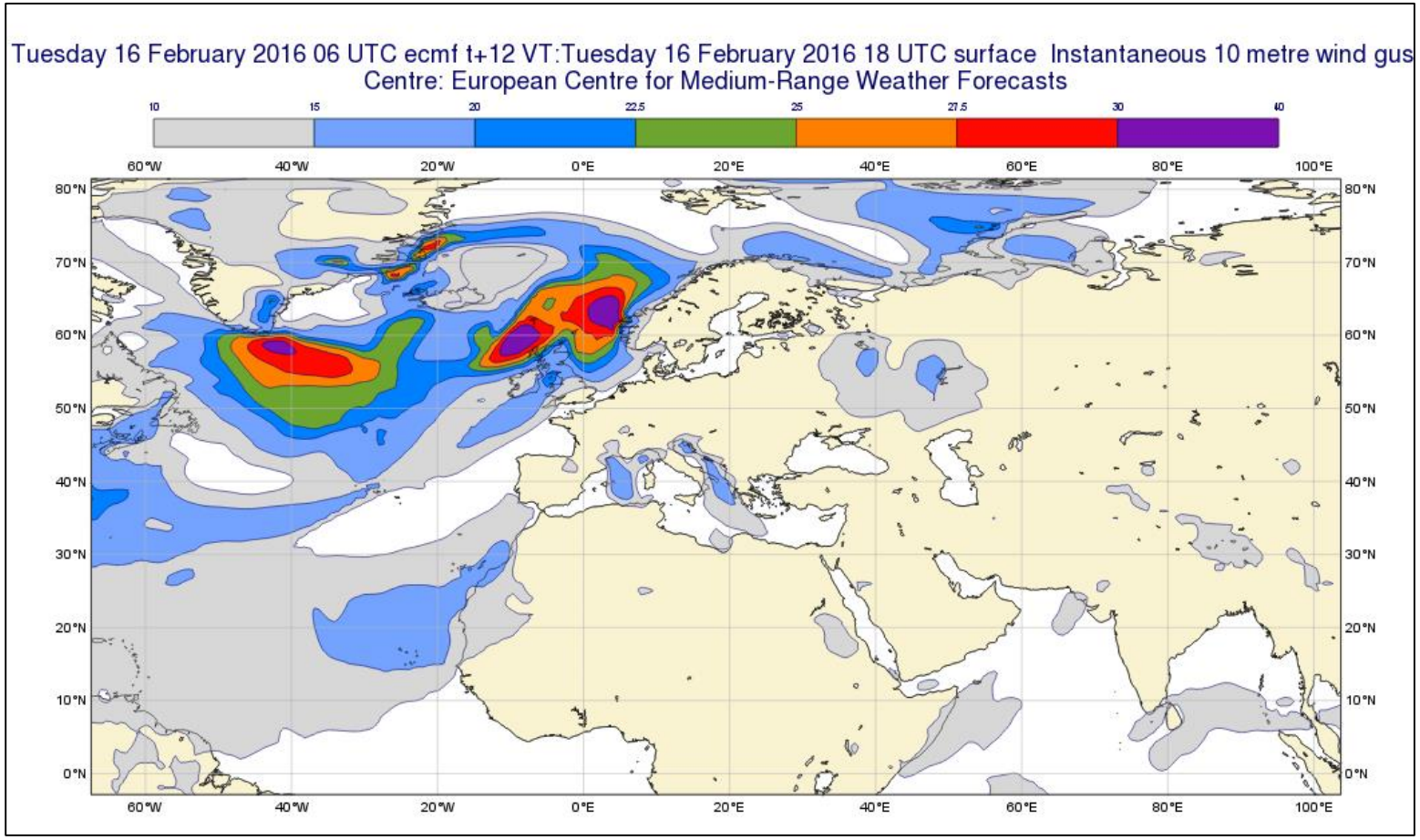


Stamp, RMSE plumes, CDF and spaghetti plots

Metview and ensemble data

- Ensemble mean:

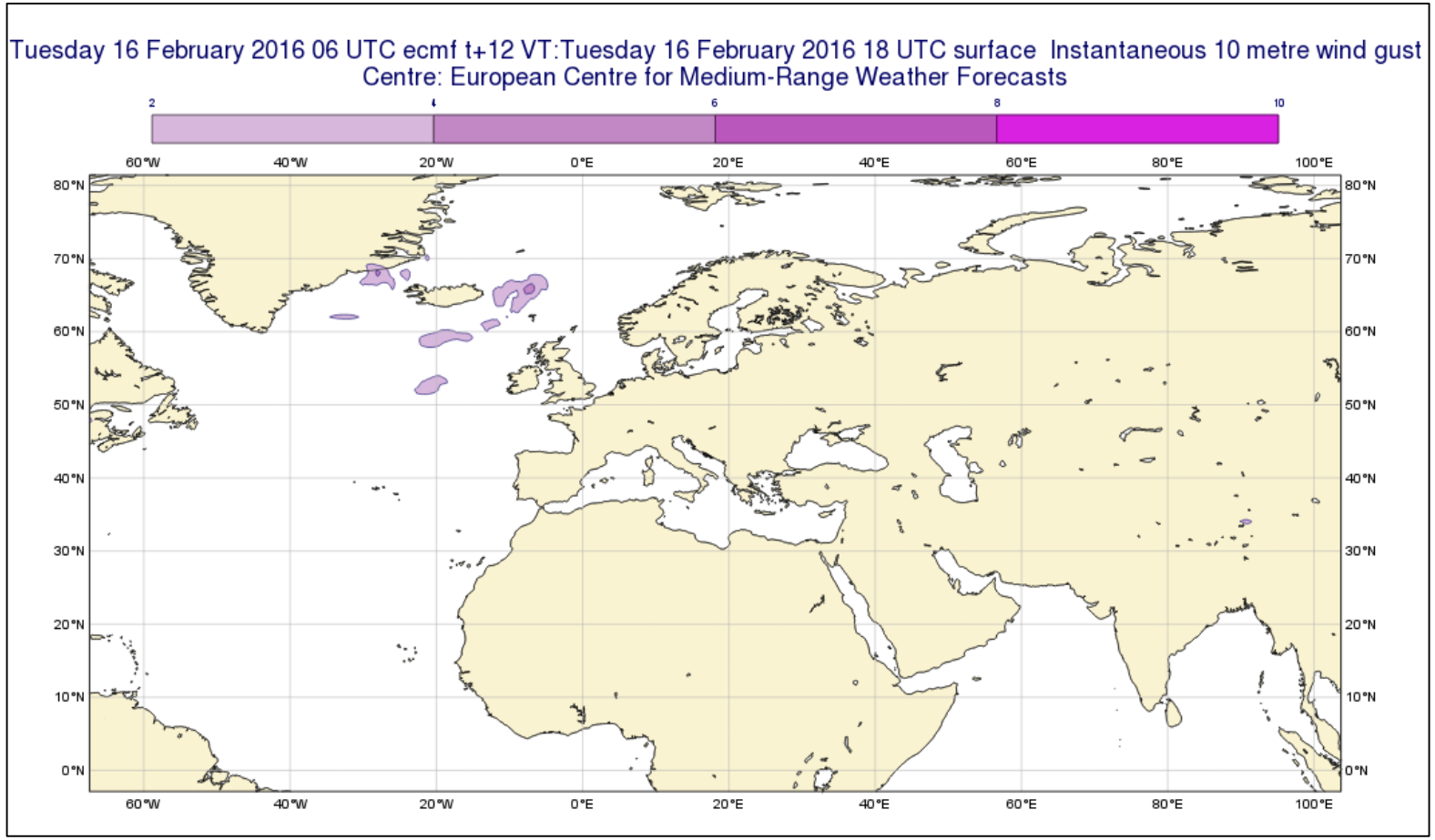
```
data = retrieve (…)
ens_mean = mean(data)
```



Metview and ensemble data

- Ensemble spread:

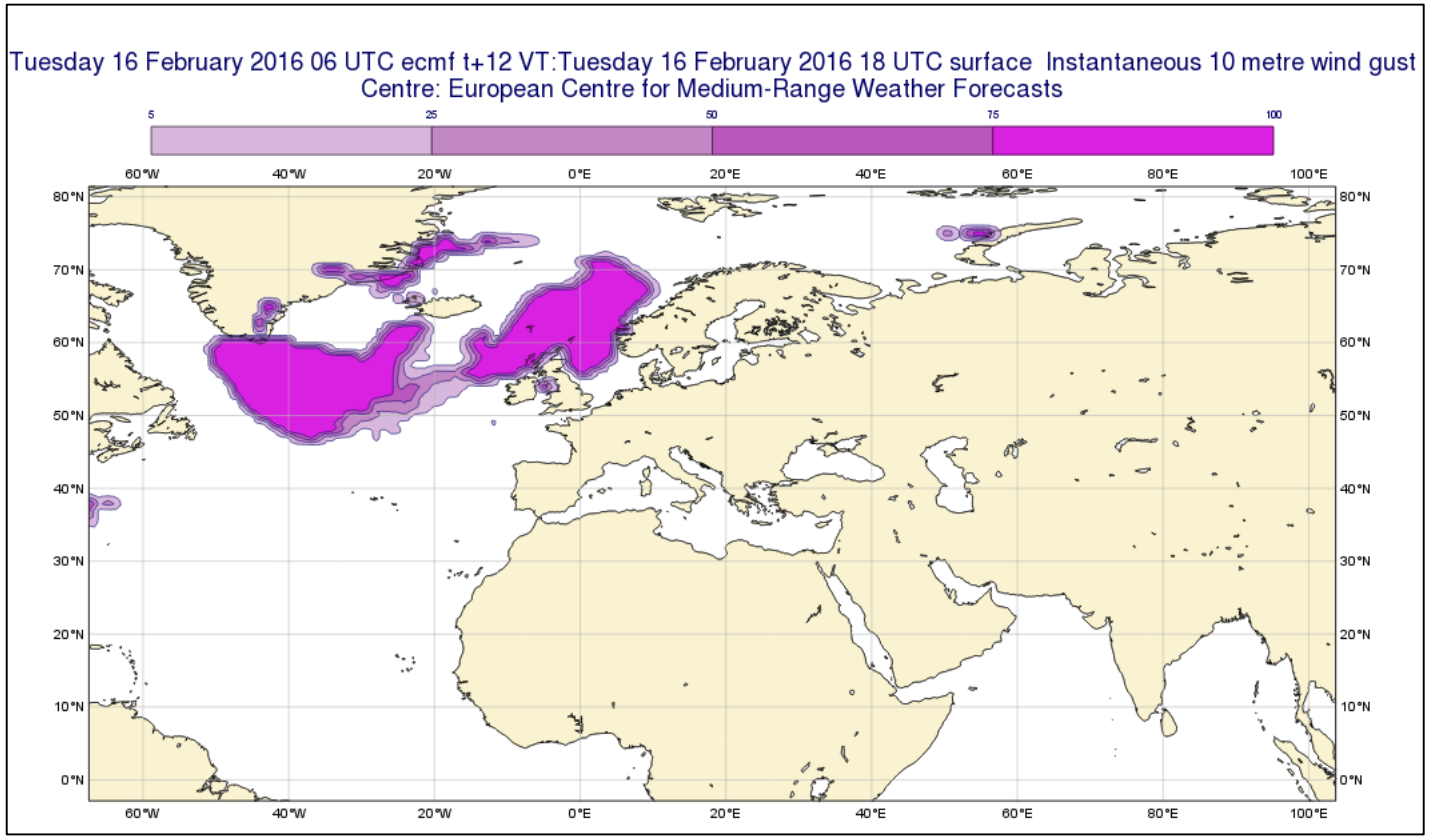
```
data = retrieve (…)
ens_spread = stdev(data)
```



Metview and ensemble data

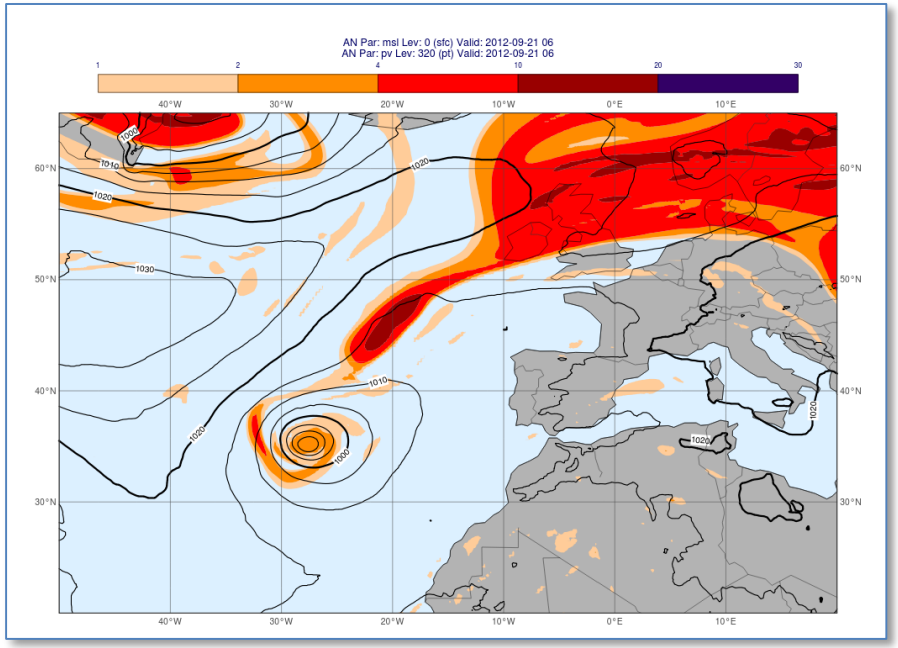
- Ensemble probability:

```
data = retrieve (…)
ens_prob = mean(data>22)*100)
```



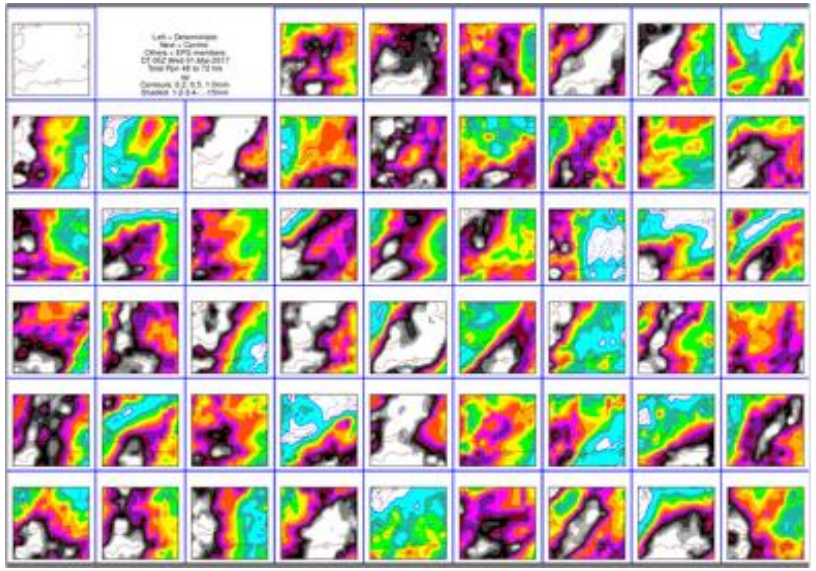
Metview 5

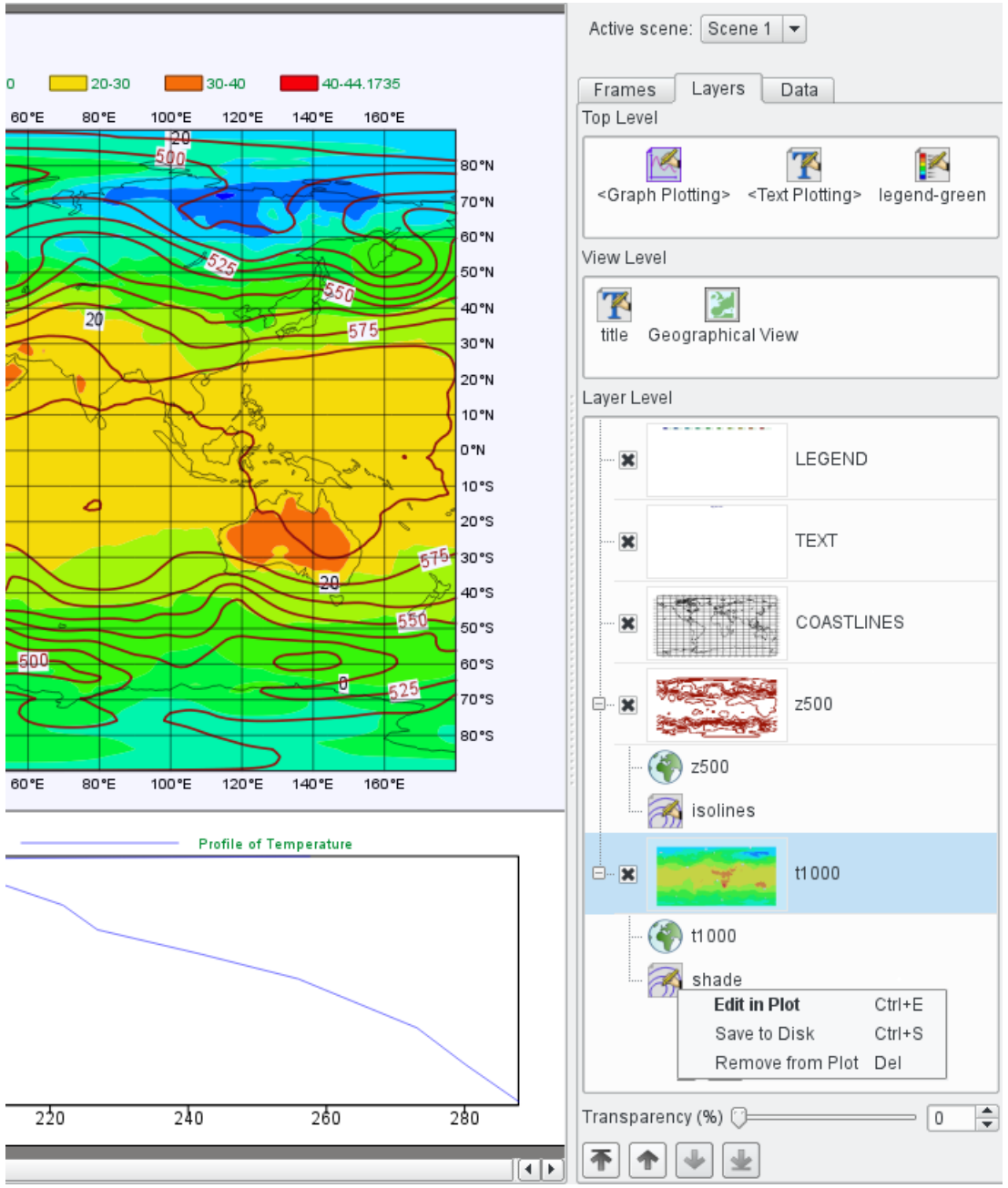
- Expected in the coming months
- First major version number update since 2010
- We plan to update the major version number more often
  - Users should not be worried by it!
- Metview 4 to 5 transition should involve no work for the majority of users



Metview 5 – new features

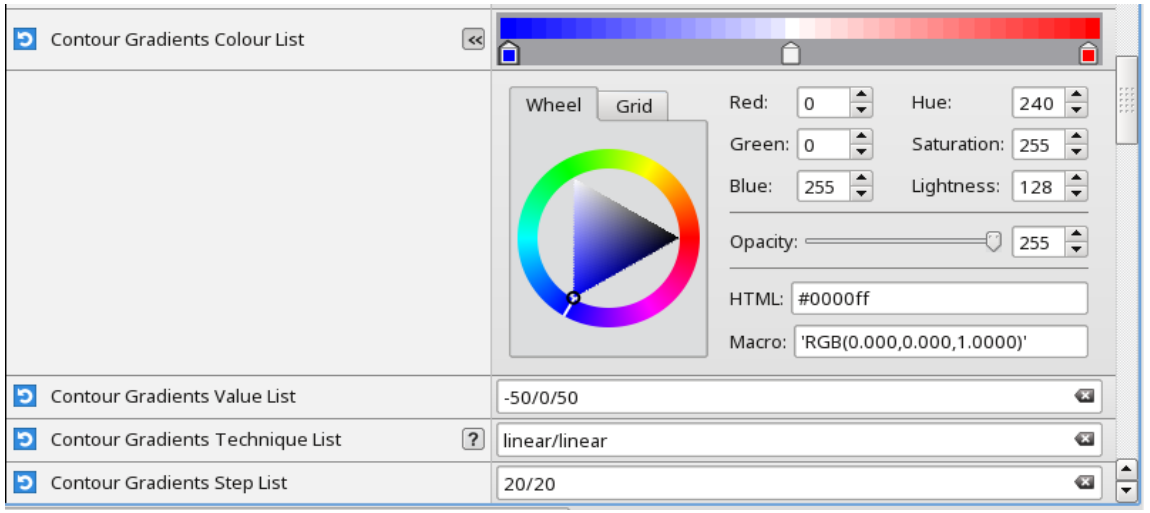
- Layer Management
  - Possible to make changes to the plot “inline” in the plot window
  - Can drop visual definition icons onto a particular data layer
  - Can drop icons at different ‘levels’ of the plot hierarchy, e.g. to apply contouring to all maps in a stamp plot

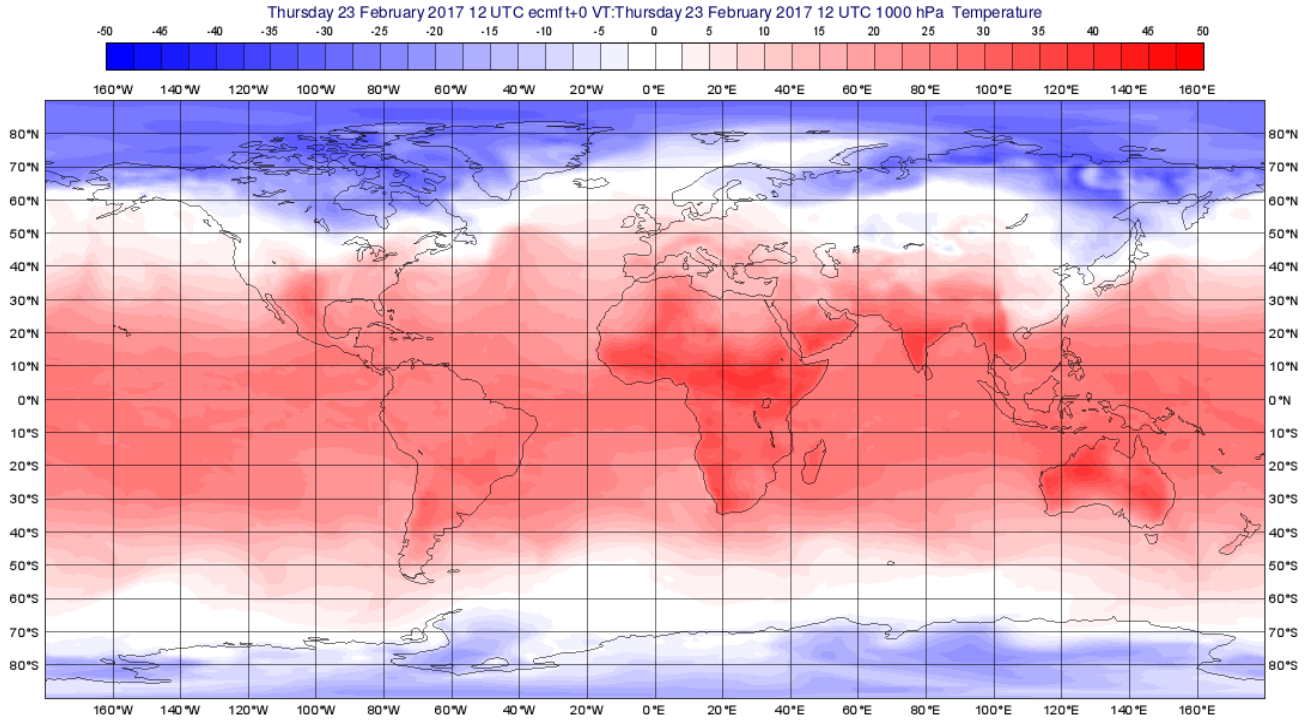




Metview 5 – new features

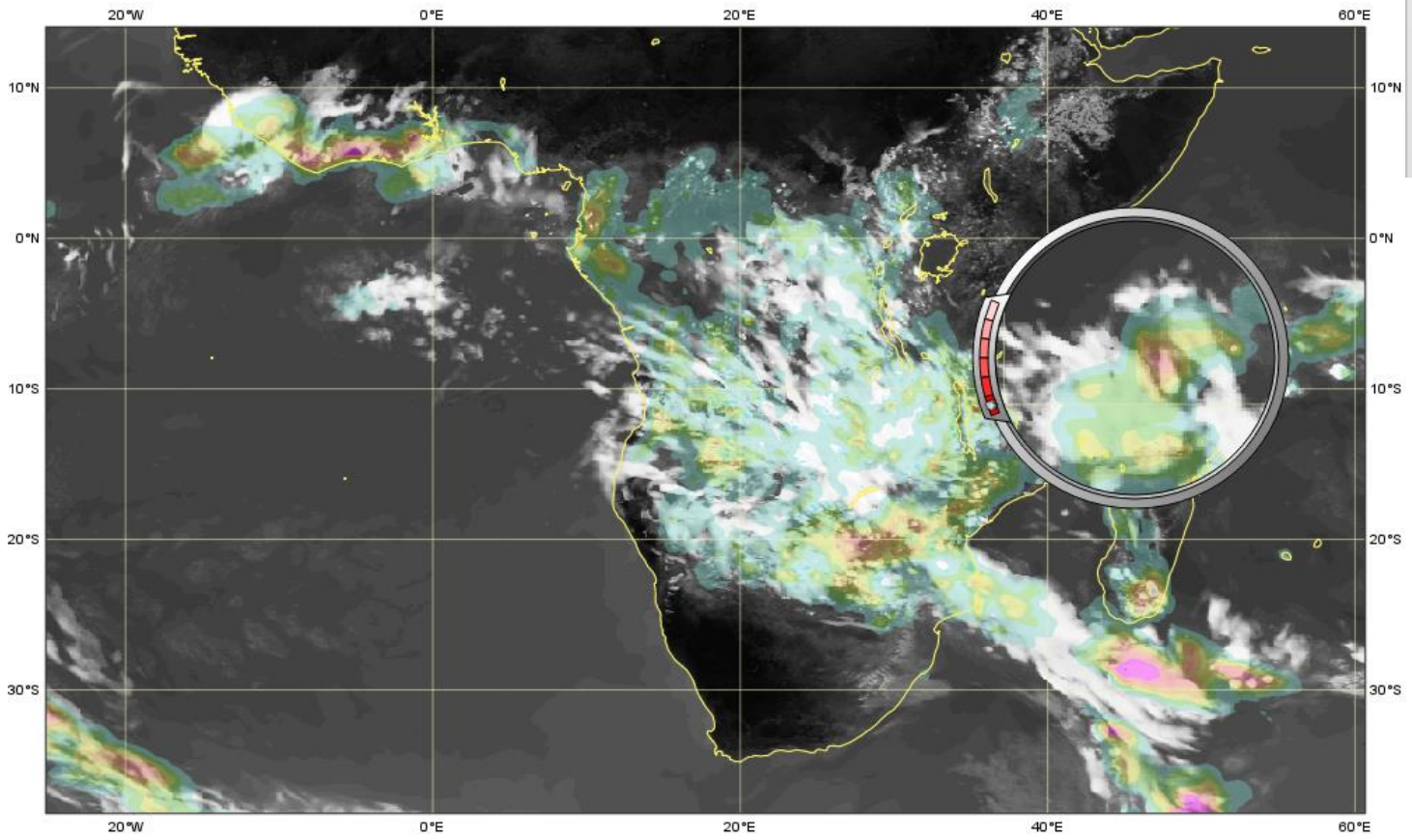
- Colour gradients
  - More sophisticated colour gradient definition
  - Can use a single Contouring icon where multiple icons were needed in the past
  - Takes advantage of new developments in Magics

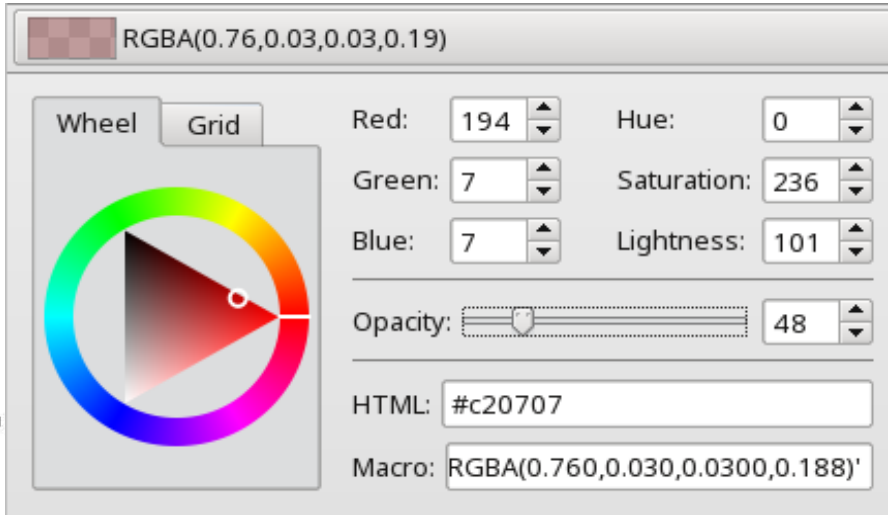




Metview 5 – new features

- Improved support for transparency
  - Can now have transparent colours and gradients in the interactive plot window

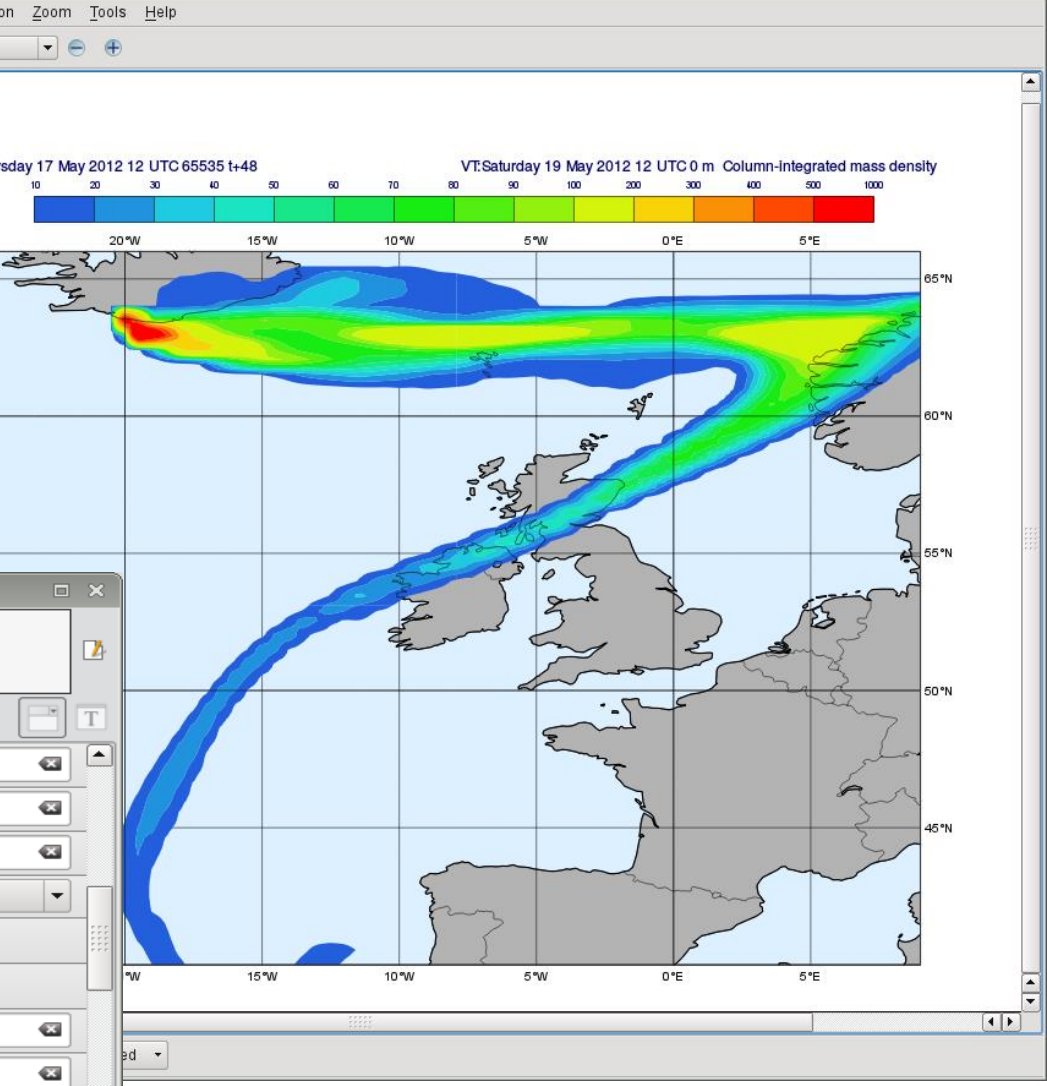


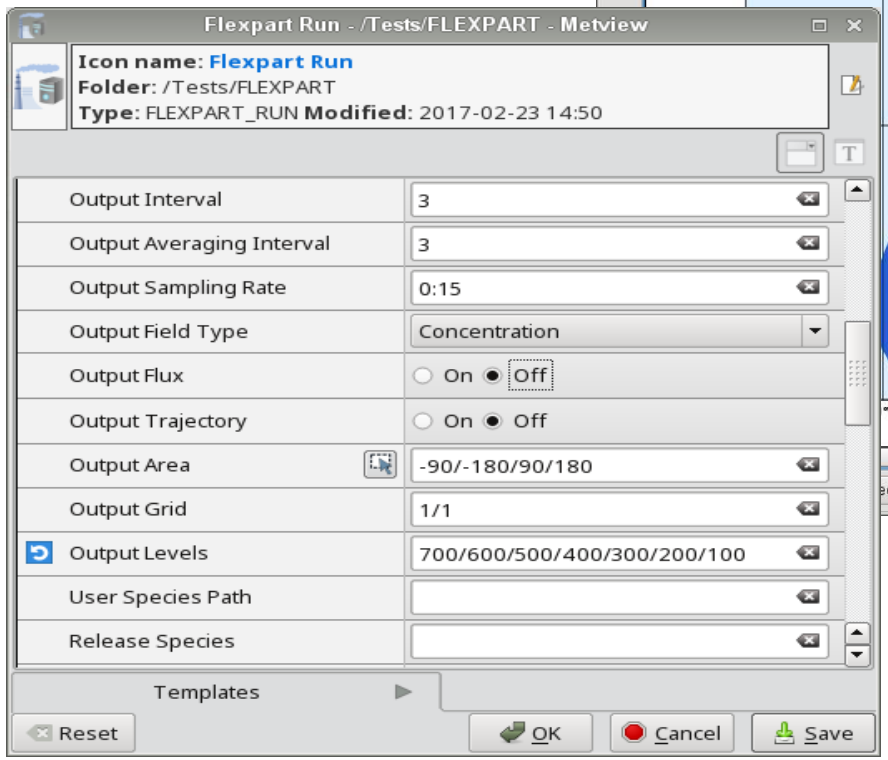


Simulated satellite (b&w) plus probability of total precipitation > 5mm (semi-transparent colours)

Metview 5 – new features

- FLEXPART
  - particle dispersion model
- Metview can
  - prepare input data
  - run FLEXPART
  - process and visualise the output



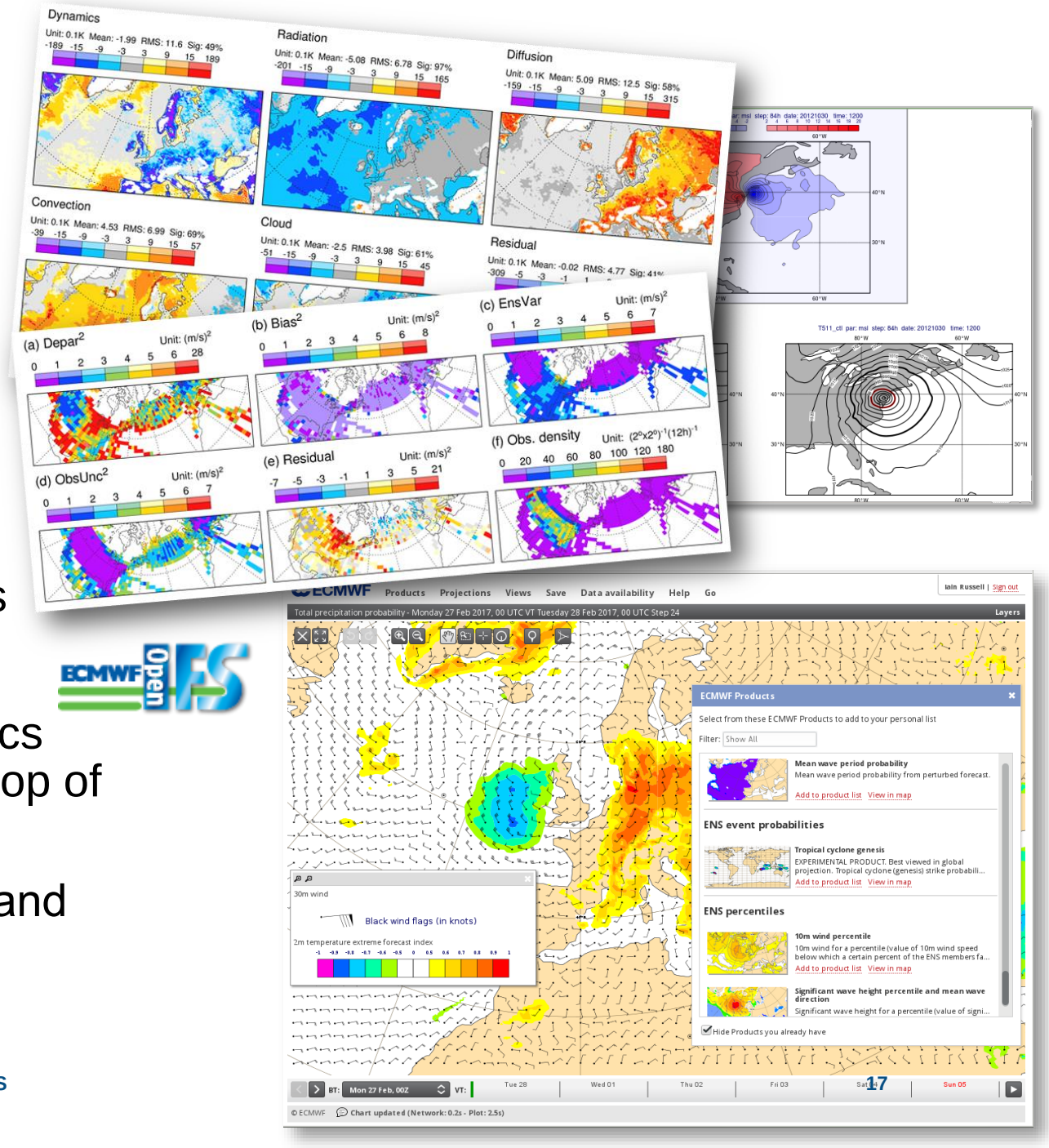


Metview 5 – Changes and Removals

- Remove all Motif code (pre-2015 user interface gone)
- Change (improve) netCDF handling in Macro
  - E.g. handle **time** variables properly, automatically apply **scaling factors**, understand **missing values**, etc.
- Harmonise the output drivers (e.g. font sizes and line widths in PDF, PNG, SVG, PostScript and on-screen)
  - Actually coming with Magics 3.0

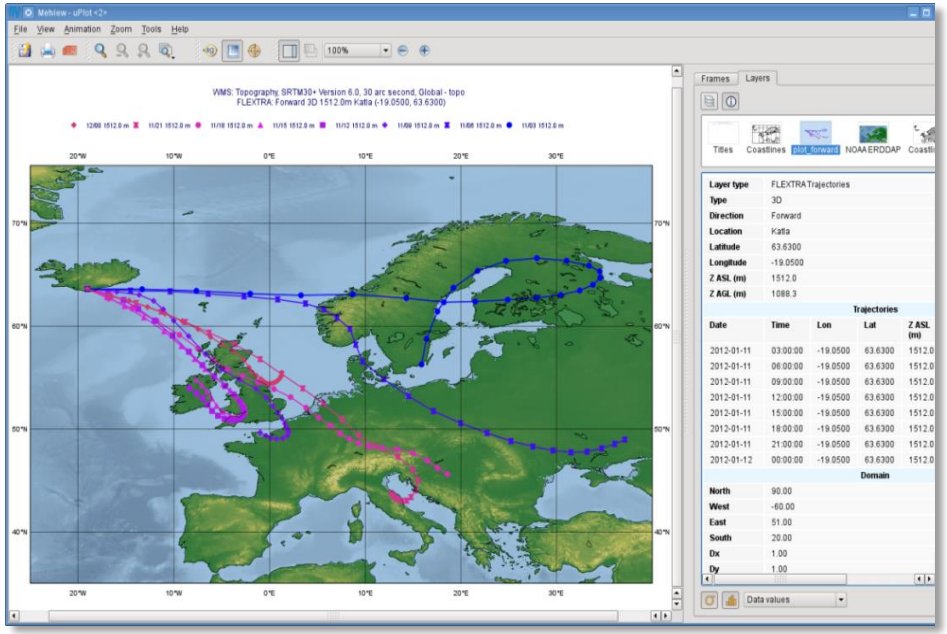
25 years of Metview so far

- Serving users of ECMWF data since…
  - 1990 **Announced at EGOWS (Oslo)**
  - 1991 **First prototype (INPE)**
  - 1993 **Metview 1.0**
  - 1998 **Metview 2.0**
  - 2000 **Metview 3.0**
  - 2010 **Metview 4.0**
  - 2017 **Metview 5.0**
- Used daily by many analysts and researchers
  - also by commercial users of our data
- Some large developments, e.g. the Diagnostics Toolbox, OpenIFS workshops, are based on top of Metview
- ecCharts is based on Metview's architecture and takes it onto the web



Metview's Trajectory (Beyond Metview 5)

- Continue to develop Metview, providing a high-level interface to ECMWF packages
  - In-house software gives us full control for scalability and research
- Bring Metview forward and allow more interoperability with other packages
- Therefore…



Metview + Python (1)

- Project to design and prototype a Python interface to Metview

```
import metview
```

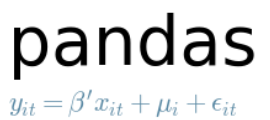
- Should provide an environment where ECMWF libraries can work seamlessly together, and with the Python eco-system in general

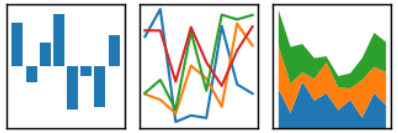
- Better unify the Python-based interfaces at ECMWF where we currently have different solutions (e.g. verification)

- Bring in the expertise of an external company to help with this design phase
  - Greater knowledge of the wider Python community
  - Helps us during another very busy year

Metview + Python (2)

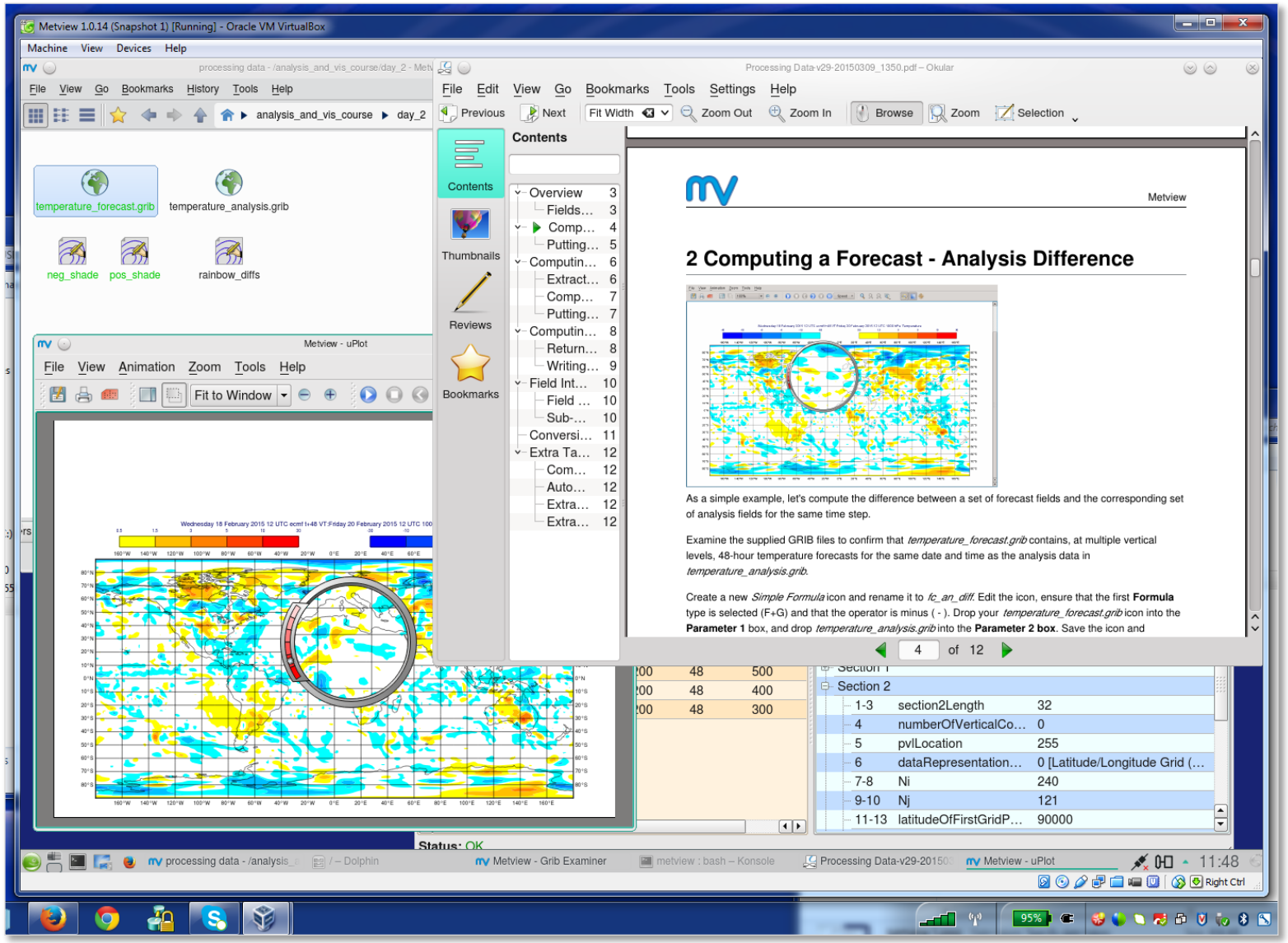
- Requirements to be based on existing Metview functionality, plus input from users (and non-users)
- Should be able to interact with the Copernicus Climate Data Store Toolbox (in development)
- Use existing solutions where possible (e.g. for multi-dimensional data arrays, data models)
- Ensure the new framework can smoothly interact with existing high-level packages





Metview Availability

- **The Metview Virtual Machine**
  - Comes with Metview and other ECMWF software pre-installed
  - Contains the latest Metview training course material
- **Available on ecgate** (just type ‘metview’)
- **Alternatively**:
  - Install from binaries
  - Build from source
  - Build from bundle
- **Thanks** to the Ubuntu community for incorporating Metview into its default distribution



For more information…

- Email us:
  - metview@ecmwf.int
- Visit our web pages:
  - http://software.ecmwf.int/metview
- Download (Metview source, binaries, virtual machine)
- Documentation and tutorials available
- Metview articles in ECMWF newsletters
- **Coming soon – e-Learning material**

- **See us at the exhibition this afternoon!**

Questions?