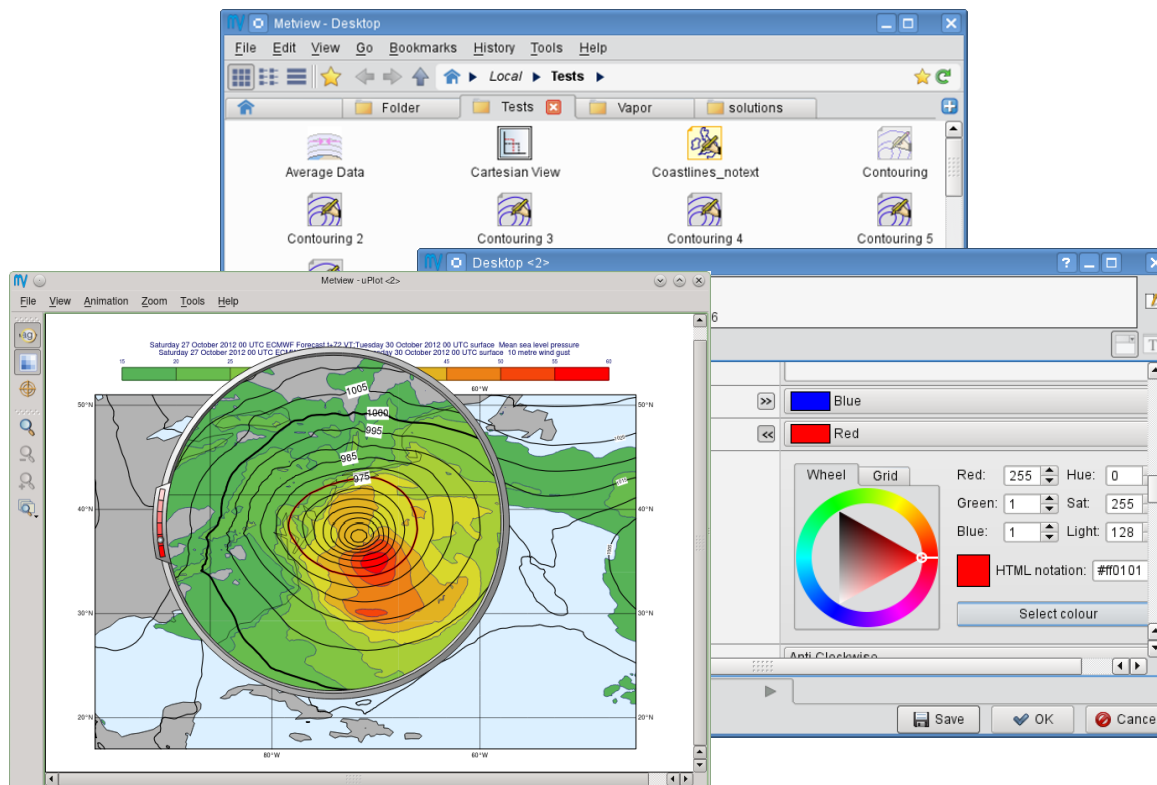


# Recent Developments in Metview



Iain Russell

*Development Section  
ECMWF*

# Metview history (summary 1)

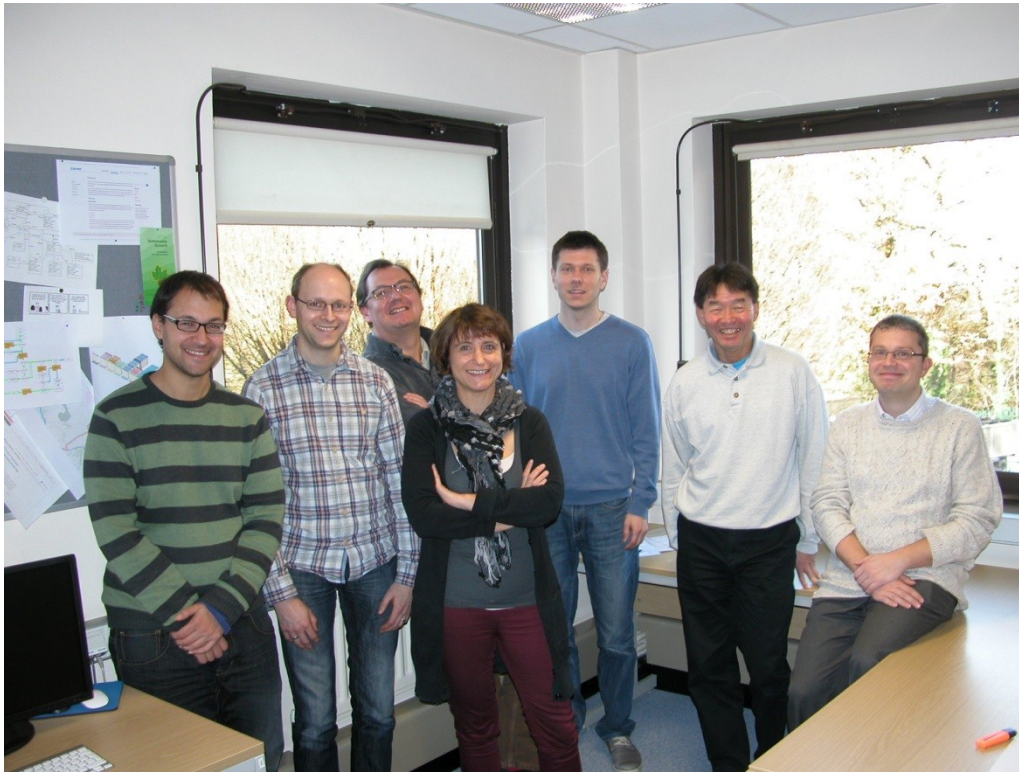
- ▶ Announced at first EGOWS in June 1990 (Oslo)

## Metview

*There are plans to develop a general and unique system for the visualization of meteorological data at ECMWF which should serve the scientist and the operational analyst alike. The Metview concept will provide a standard framework within which applications relating to the retrieval, processing and visualization of meteorological data can be implemented, and will enable both Operations and research*

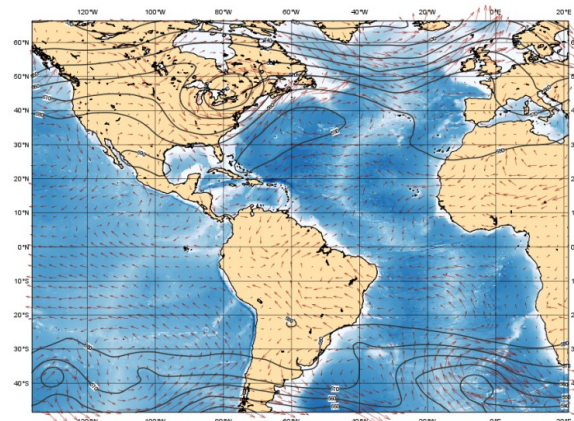
# Metview history (summary 2)

- ▶ First operational version (1.0) Dec 1993
- ▶ Metview's 20<sup>th</sup> birthday celebrated Dec 2013



# What is Metview?

- ▶ Workstation for researchers and operational analysts
- ▶ Retrieve/manipulate/visualise/examine meteorological data
- ▶ Drag & drop user interface / powerful scripting language for batch mode



Built on core ECMWF technologies:  
MARS, GRIB\_API, Magics, ODB, Emoslib

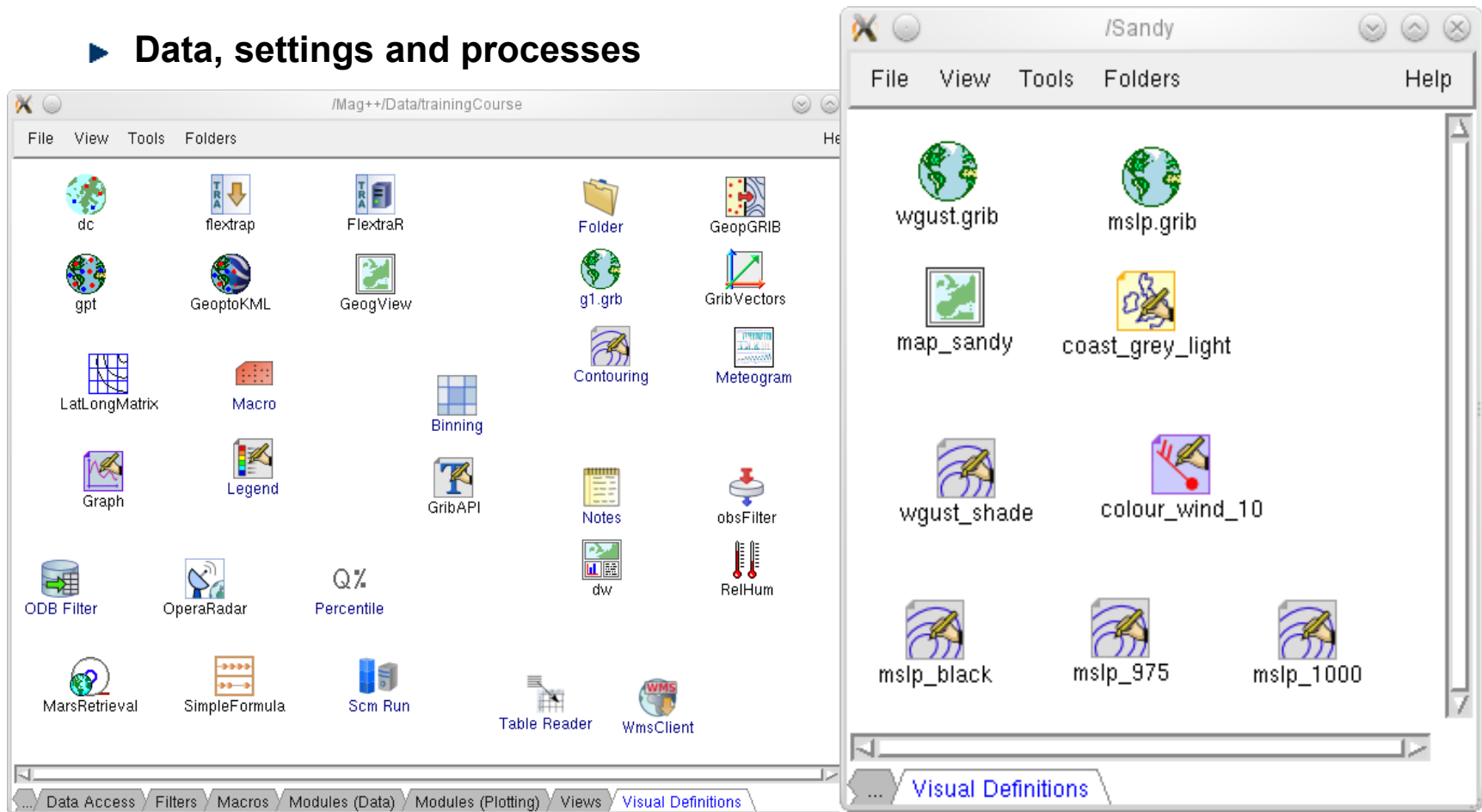
- ▶ Handles GRIB, BUFR, NetCDF, ODB, Geopoints, CSV, ASCII
- ▶ Can access MARS, either locally or through the Web API
- ▶ Open Source under Apache Licence 2.0
- ▶ Metview is a co-operation project with INPE (Brazil)



# Icon-based interface

► Everything is represented by an icon

► Data, settings and processes



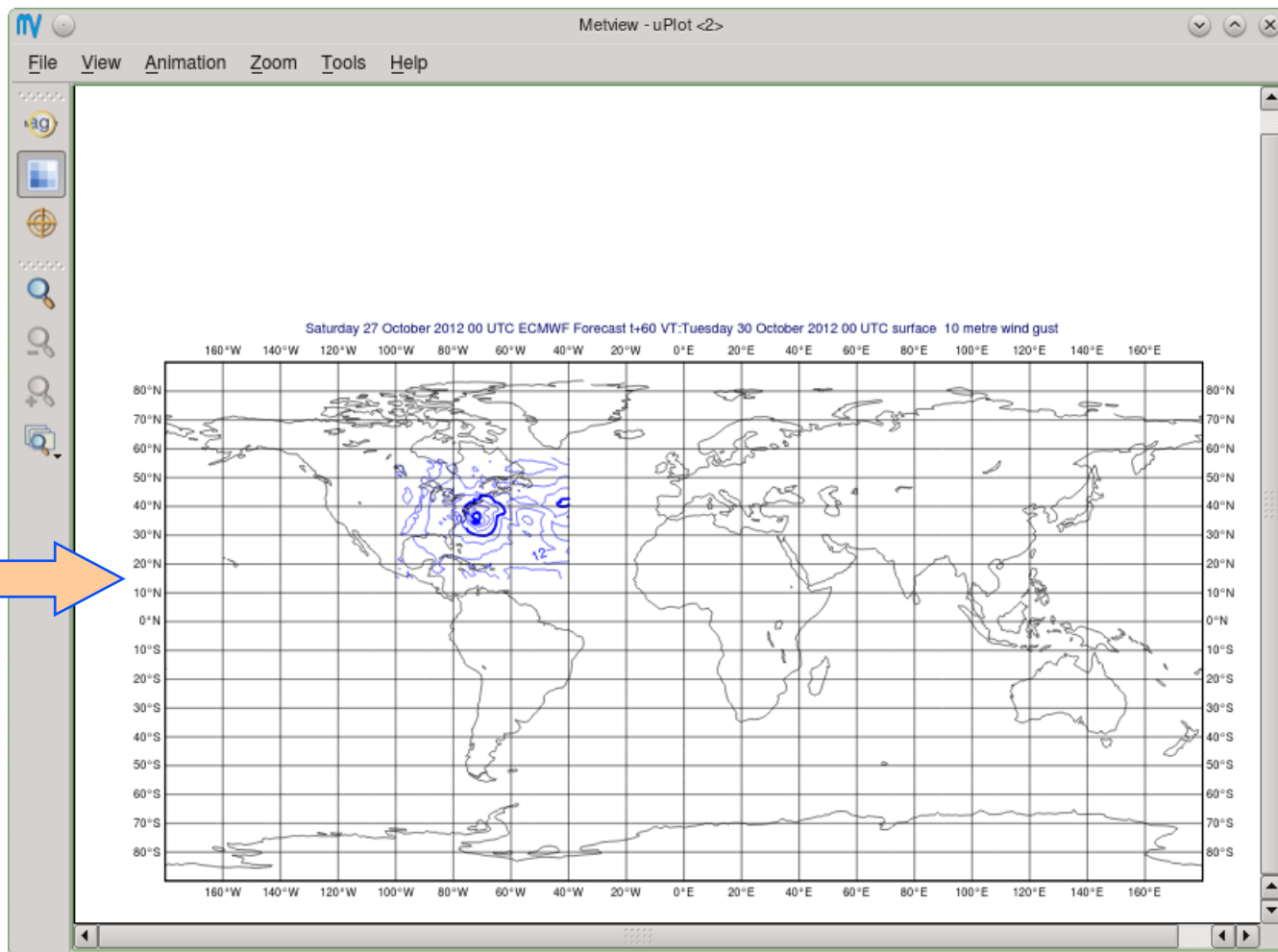
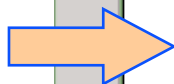
# Visualisation

GRIB file



wgust.grib

- execute
- visualise
- examine
- save
- analyse
- edit
- duplicate
- delete
- empty
- output

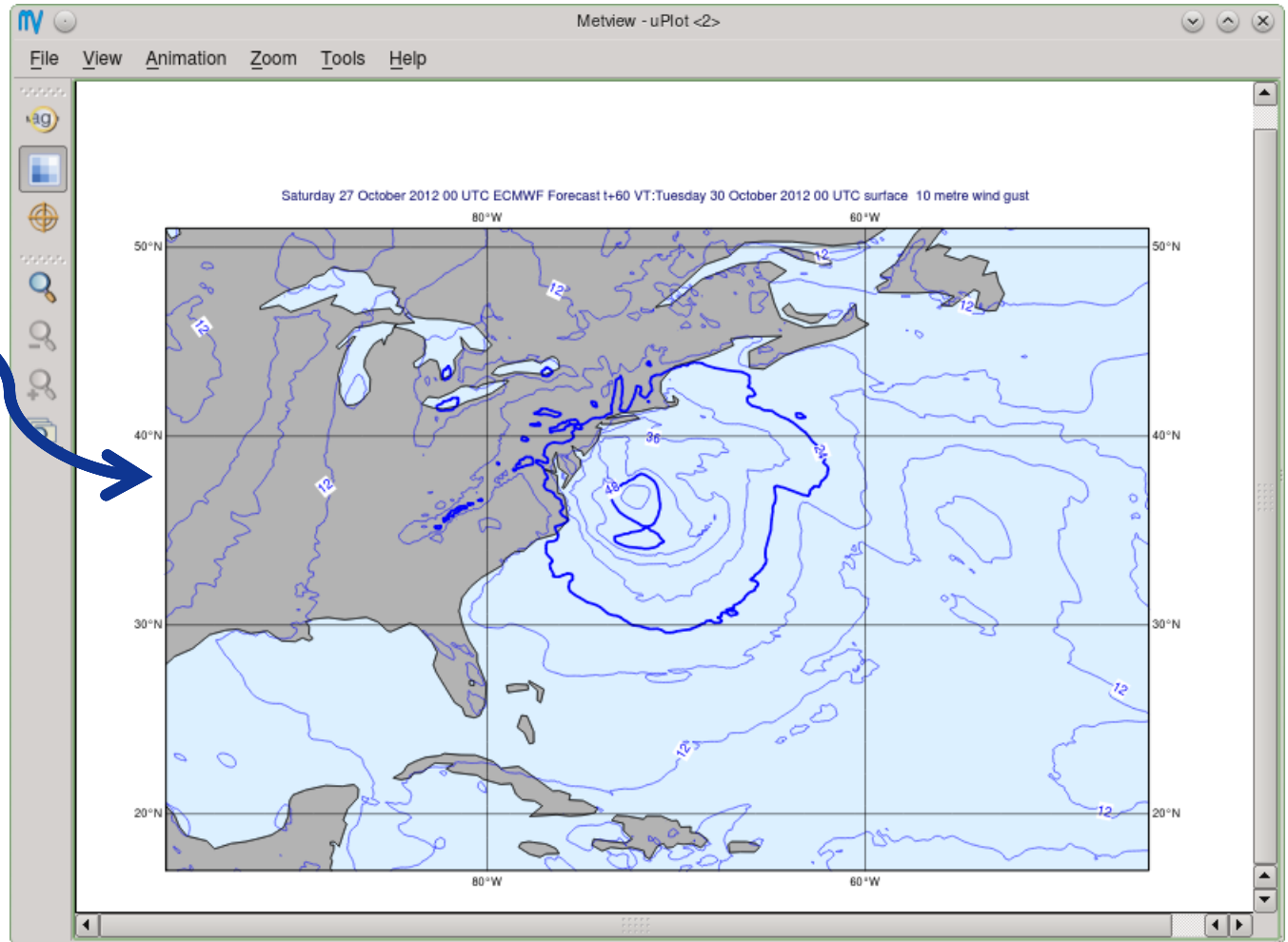
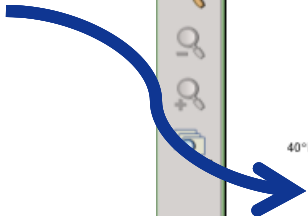


# Drag and Drop

Map view



map\_sandy

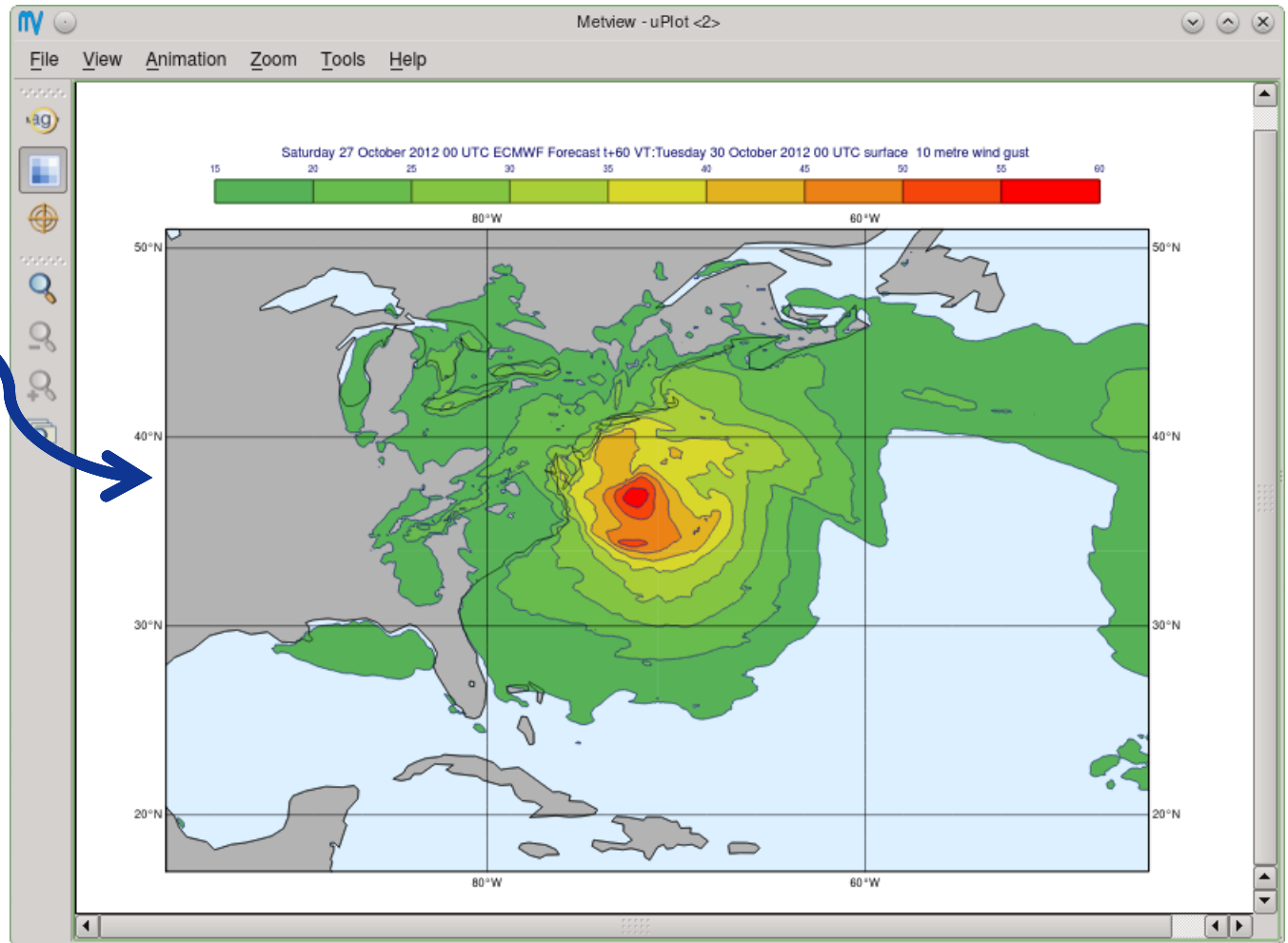
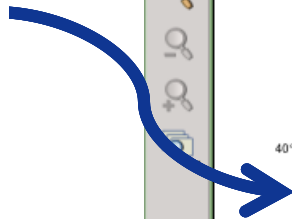


# Drag and Drop

Contour shading



wgust\_shade





# Drag and Drop - Overlay

Overlay works for all the data types!

MSLP (GRIB)



mstp.grib



mstp\_black

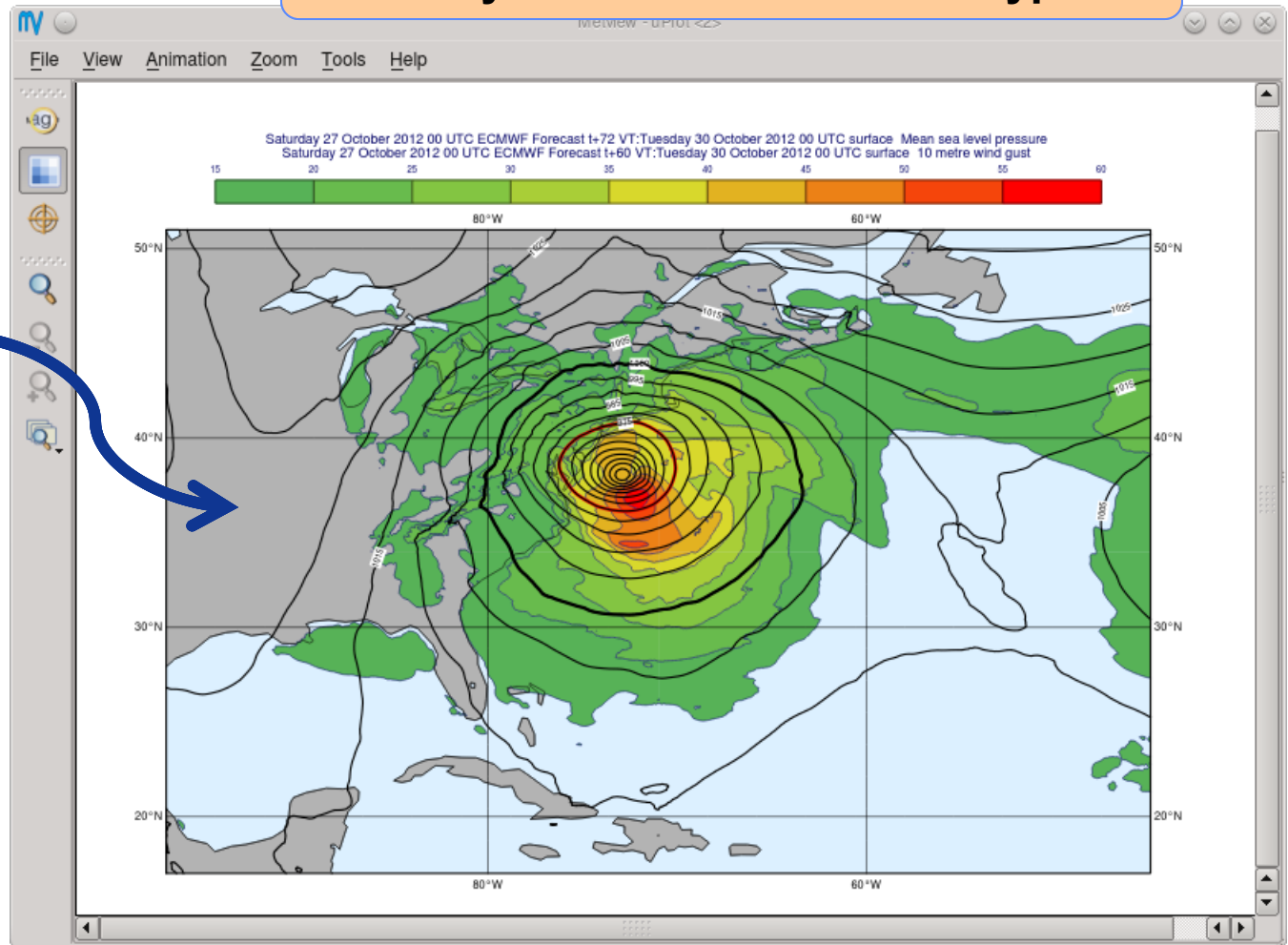


mstp\_975



mstp\_1000

Contouring



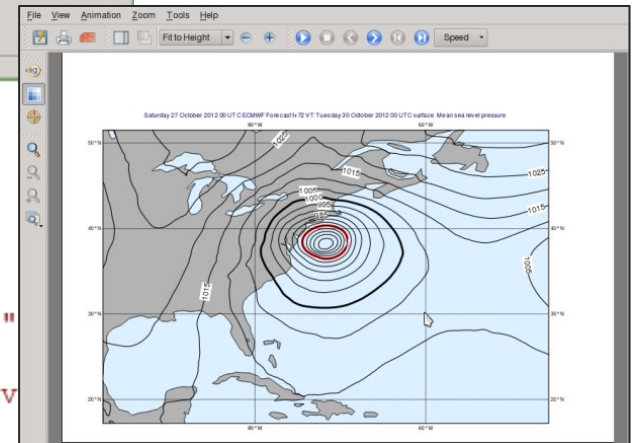
# Metview Macro drag and drop

## Strong synergy between Icons & Macros

- ▶ Every icon can be translated into a Macro command



```
Macro* - /home/metview/metview/Macro
File Edit View Insert Program Settings Help
[Icons]
1 #Metview Macro
2
3 mssl_grib=read("mssl.grib")
4
5 mssl_black = mcont(
6     contour_line_thickness      : 2,
7     contour_line_colour        : "black"
8     contour_highlight          : "off",
9     contour_level_selection_type : "interv
10    contour_interval           : 5,
11    contour_label_height      : 0.2,
12    grib_scaling_of_derived_fields : "on"
13 )
14
15 plot(mssl_grib,mssl_black)
File loaded L: 15, C: 26
```



# Metview + GRIB

The image displays several screenshots from the Metview software suite:

- Top Left:** A screenshot of the 'Metview - Grib Examiner' window. It shows a table of data with columns for 'index', 'Name', 'Date', 'Time', 'Step', 'Level', 'LevType', and 'Dump mode'. Below the table is a 'Tree view' showing a hierarchical structure of data sections.
- Top Center:** A plot titled '20140512 1200 step 0 [0.00,0.00] saturation over water'. It shows a grid of data points with a color scale ranging from 0 to 4.10.
- Top Right:** A large contour plot showing atmospheric data with a color scale from 0 to 41.1211. The plot includes contour lines and a color gradient from blue to red.
- Middle Left:** A screenshot of the 'Metview - uPlot' window. It displays a map of the North Atlantic region with a color scale for temperature, ranging from 10 to 30. The title is 'Thursday 24 April 2014 12 UTC exmf 1000 hPa Temperature'.
- Middle Center:** A map showing 'Velocity potential at 850hPa (10^6 m^2 s^-1) ( 5.0E - 5.0E mean)'. It includes a color scale and a bar chart below it.
- Middle Right:** A screenshot of a terminal window showing a shell script. The script includes commands like 'retrieve', 'some calculations for comparison', and 'RETRIEVE (MARS)'. The output shows values for 'f1 and f2', 'Ja1', 'Ja2', and 'ltin'.
- Bottom Center:** A vertical plot showing a time series of data from 2011 to 2014. The x-axis represents months and years, and the y-axis represents a numerical value. A color scale is provided on the left.

# Metview + BUFR

Metview - BUFR Examiner

File Edit View Profiles Help

Key profile: **nv System:Default**

File: h:\nrtmp\dir\cgl\tmp\6086\m\13931\cgl\marsi\WQscvk  
 Permissions: -rwx-- Owner: cgl Group: graphics Size: 1 OMB Modified: 2013-02-27 09:35  
 Total number of messages: 4713

Go to message: 1 Go to subset: 1 (Number of subsets: 1)

Index	Typ	Sut	C	Sec	Date	Time	Lat1	Lon1	Ident
1	0	1	98	1	2013-02-24	12:00	32.55	35.85	40255
2	0	1	98	1	2013-02-24	12:00	-17.88	36.88	67283
3	0	1	98	1	2013-02-24	12:00	-23.87	35.38	67323
4	0	1	98	1	2013-02-24	12:00	-19.8	34.9	67297
5	0	1	98	1	2013-02-24	12:00	-19.12	33.47	67295
6	0	1	98	1	2013-02-24	12:00	-8.52	179.22	91443
7	0	1	98	1	2013-02-24	12:00	7.45	151.83	91334
8	0	1	98	1	2013-02-24	12:00	-26.53	31.3	68396
9	0	1	98	1	2013-02-24	12:00	30.17	35.78	40310
10	0	1	98	1	2013-02-24	12:00	31.98	35.98	40270
11	0	1	98	1	2013-02-24	12:00	-12.98	40.53	67215
12	0	1	98	1	2013-02-24	12:00	-46.87	37.87	68994
13	0	1	98	1	2013-02-24	12:00	-7.97	-14.4	61902
14	0	1	98	1	2013-02-24	12:00	36.15	-5.33	68495
15	0	1	98	1	2013-02-24	12:00	35.85	14.48	16597
16	0	1	98	1	2013-02-24	12:00	9.95	-84.13	78764
17	0	1	98	1	2013-02-24	12:00	7.33	134.48	91409
18	0	1	98	1	2013-02-24	12:00	-77.85	166.87	89664
19	0	1	98	1	2013-02-24	12:00	7.08	171.36	91576
20	0	1	98	1	2013-02-24	12:00			

Log

Method: BUFR EX subroutines: BUPRS0, BUPRS1, BUPRS2, BUPRS3  
 Status: OK

Task: Generating BUFR data dump for message: 1 and for subset: 1  
 Method: BUFRX  
 Status: OK

Task: Generating BUFR bitmap dump for message: 1 and for subset: 1  
 Method: BUFRX  
 Status: OK

20140510 1200 [lat,lon: 60.82,23.50]

Section D-3 Data Data bitmaps expand

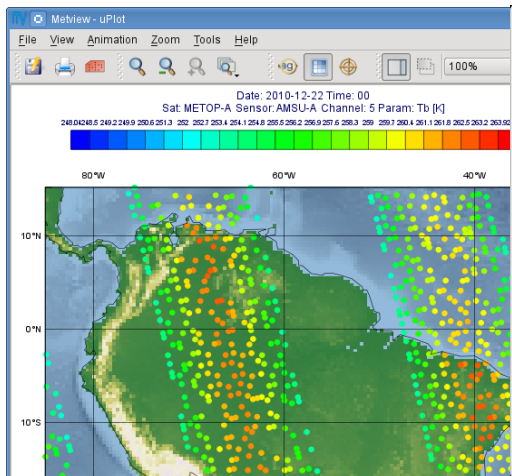
Index	Descriptor	Name
0	01001	Wmo Block Number
1	01002	Wmo Block Number
2	02001	Type Of Station
3	04001	Year
4	04002	Month
5	04003	Day
6	04004	Hour
7	04005	Minute
8	05001	Latitude (High Accuracy)
9	06001	Longitude (High Accuracy)
10	07001	Height Of Station (See Not)
11	10004	Pressure
12	10051	Pressure Reduced To Mea
13	10061	3-Hour Pressure Change
14	10063	Characteristic Of Pressure
15	11011	Wind Direction At 10 M
16	11012	Wind Speed At 10 M
17	15004	Directional Temperature At

```

19 obs = retrieve(
20   type : "ob",
21   repres : "bu",
22   date : -3
23 )
24
25
26 # extract the temperature values from the observations
27 t_obs = obsfilter(
28   output : "geopoints",
29   data : obs,
30   parameter : 012004
31 )
32
33 # compute the difference
34 diff = t_analysis - t_obs
35
41
  
```

Layer	Value	Lon	Lat	Dist (km)
Observat	311	61.48	31.05	207.42

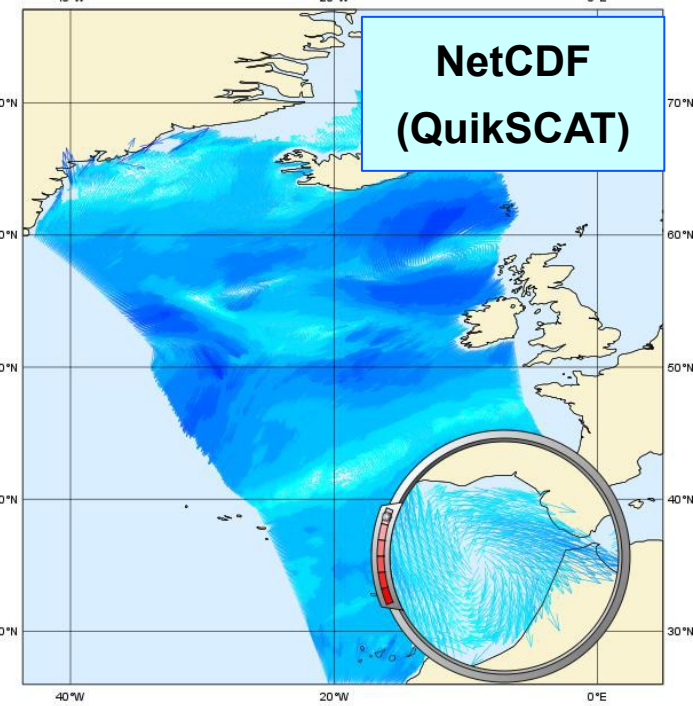
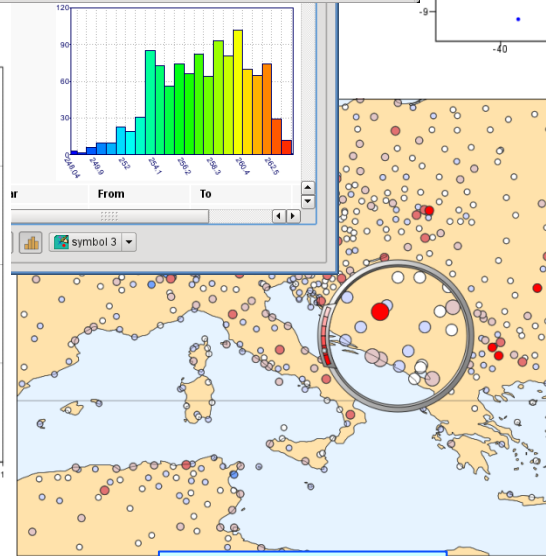
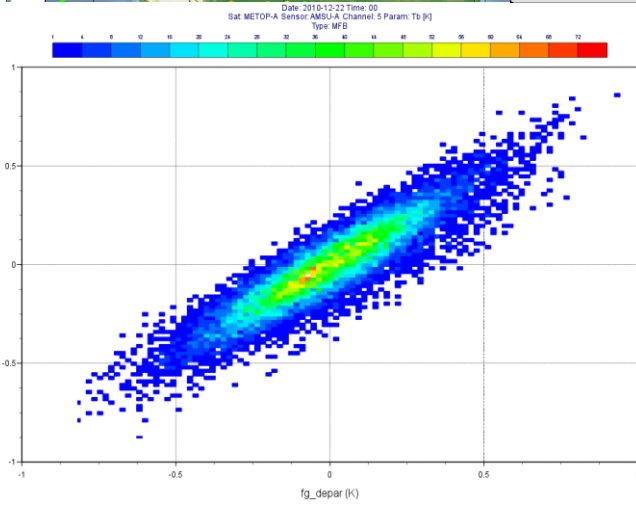
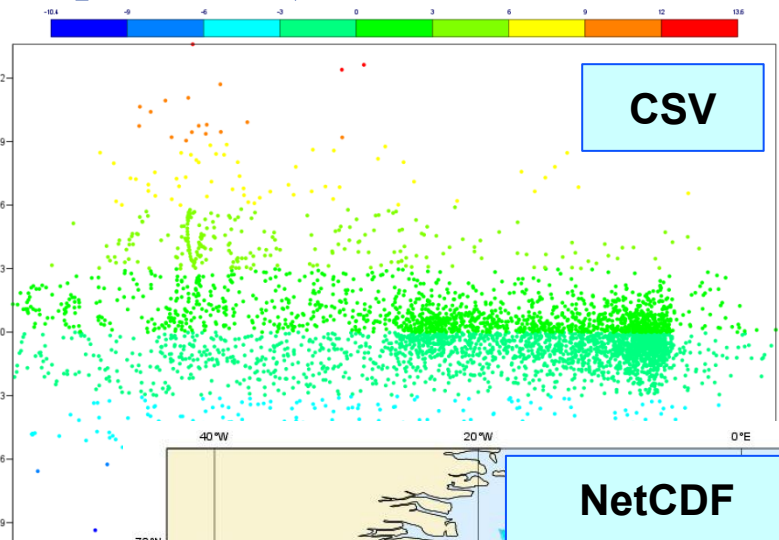
# Metview + ODB, NetCDF, Geopoints, CSV



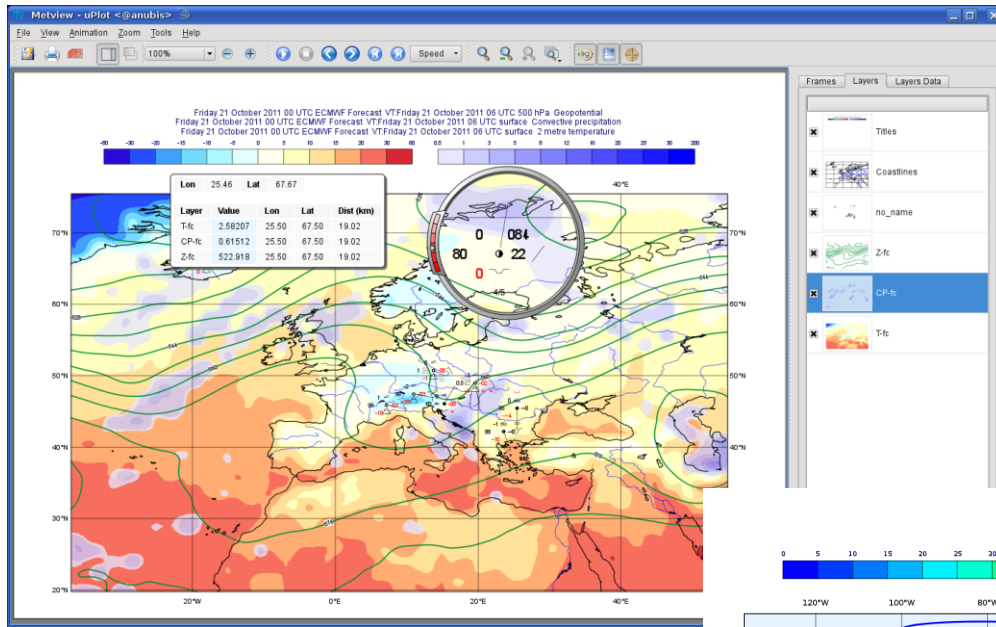
Metview - ODB Examiner

File: /home/graphics/cgi/mahewmacro\_tutorial\_prep/2014/data\_sources/ODB Database  
 Symlink target: /cscratch/graphics/cgrod\_data/AM5UA/odb  
 Permissions: /www/ Owner: cgi Group: graphics Size: 17MB Modified: 2014-04-23 15:08

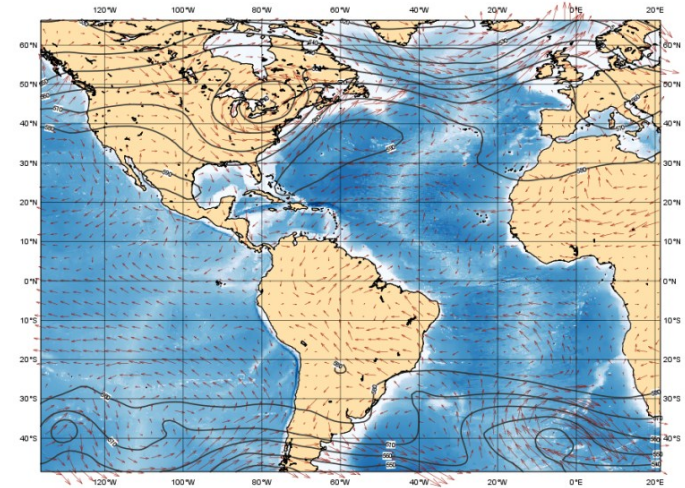
Name	Type	Constant	Min	Max	Table
an_depar@body	float	n	-3.47203	3.95354	body
an_sens_obs@body	float	y	0	0	body
andate@desc	int	y	20101222	20101222	desc
antime@desc	int	y	0	0	desc
biascorr@body	float	n	-0.739071	4.33658	body
biasctrl@body	float	n	-0.737179	4.35366	body
bufrtype@hdr	int	y	3	3	hdr
class@desc	string	y	N/A	N/A	desc
codetype@hdr	int	y	210	210	hdr
datastream@sat	int	n	0	1	sat
date@hdr	int	n	20101221	20101222	hdr
datum_anflag@body	bitfield	n	N/A	N/A	body
datum_event1@body	bitfield	y	N/A	N/A	body
datum_rstiflag@body	bitfield	y	N/A	N/A	body
datum_status@body	bitfield	n	N/A	N/A	body
entyno@body	int	n	3	14	body
expver@desc	string	y	N/A	N/A	desc
fc_sens_obs@body	float	y	0	0	body
fg_depar@body	float	n	-3.34557	3.28031	body
fg_err@errstat	float	n	0.0603554	3.8495	errstat
final@update_1	float	n	-2.14748e+09	-2.14748e+09	update_1
final@update_2	float	n	-2.14748e+09	-2.14748e+09	update_2
groupid@hdr	int	y	2	2	hdr
hires@update_2	float	n	-3.43453	3.41744	update_2



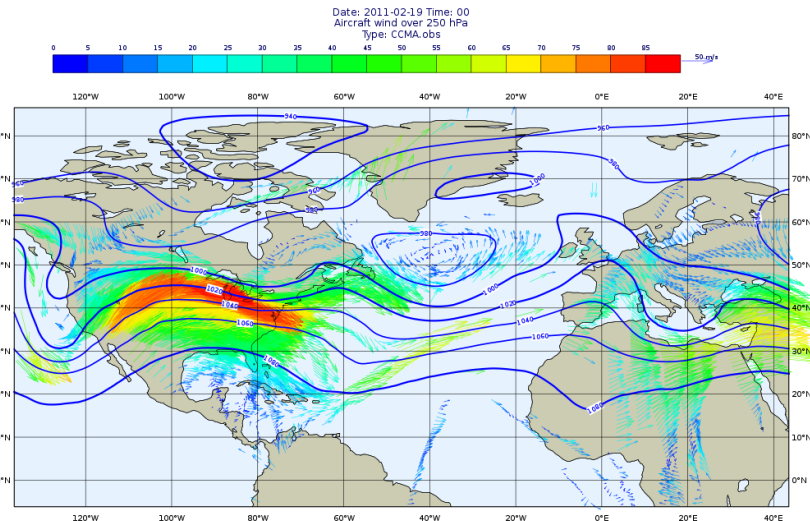
# Metview Overlay



**GRIB x 3 + BUFR**

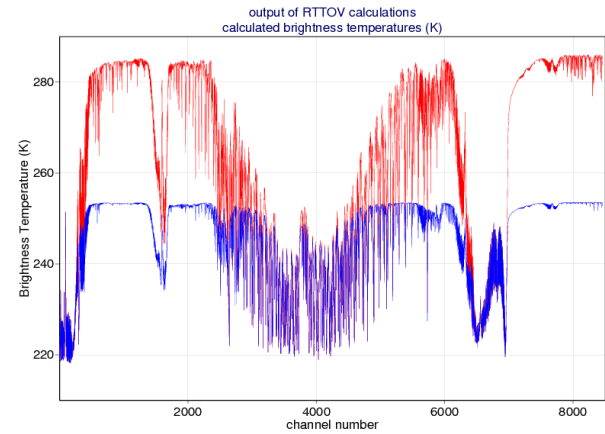
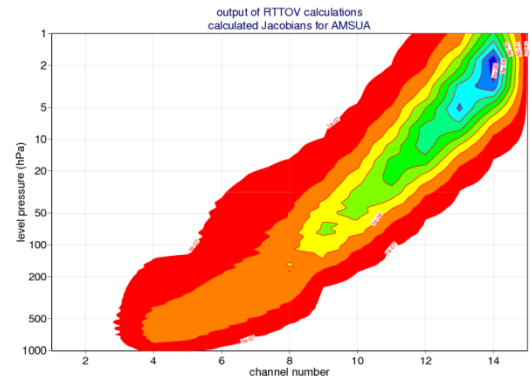
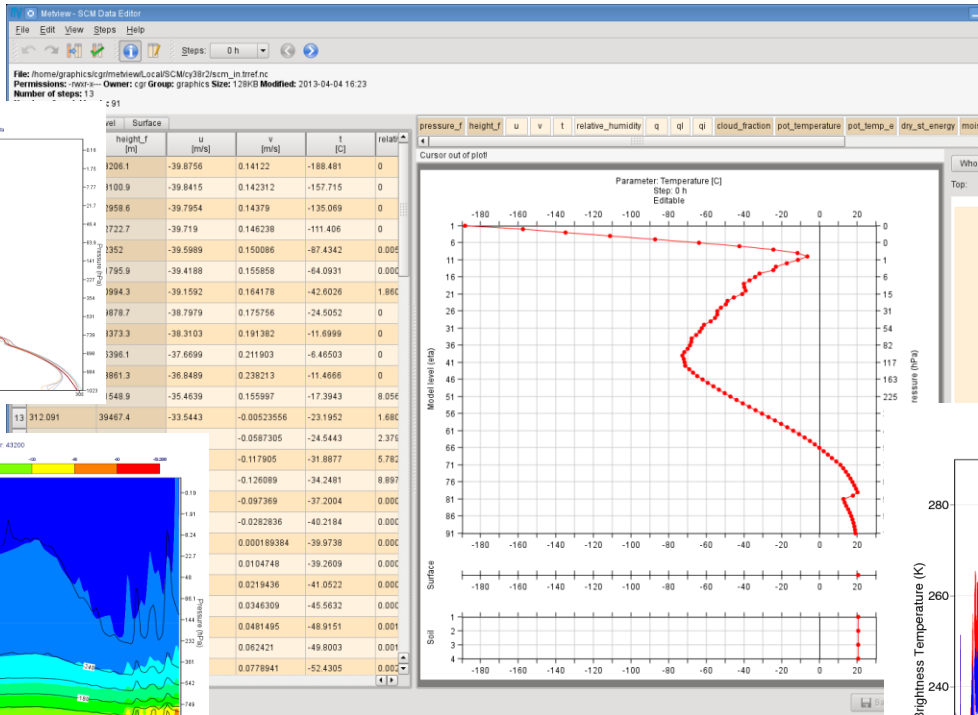


**GRIB x 2 + WMS**



**GRIB + ODB**

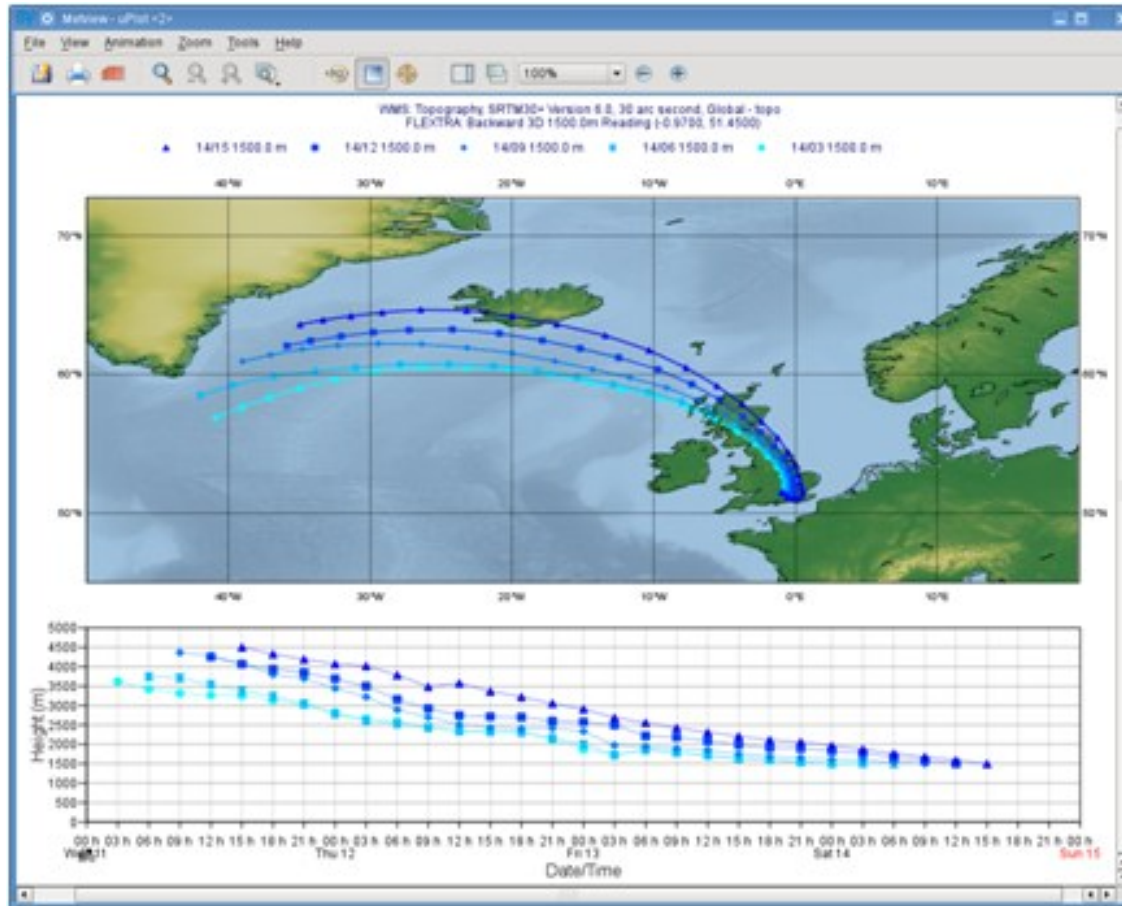
# Metview + models



**Metview + Single Column  
Model / OpenIFS**

**Metview + RTTOV**

# Metview + external packages

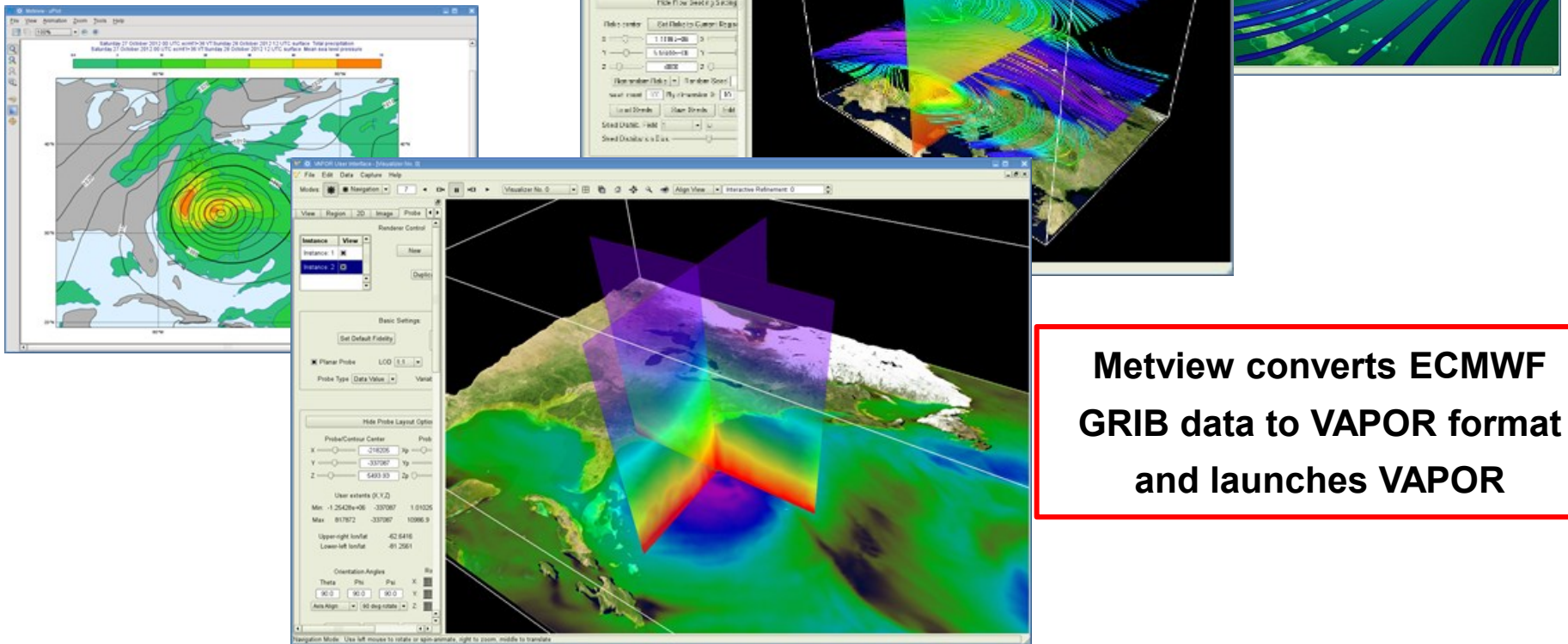


FLEXTRA (trajectories)



## **What's new since last EGOWS?**

# NEW: Metview + VAPOR



**Metview converts ECMWF GRIB data to VAPOR format and launches VAPOR**

VAPOR development is led by the National Center for Atmospheric Research's Scientific Computing Division in collaboration with U.C. Davis and Ohio State University.

# NEW: Metview + MARS Web API



Mars Retrieval

- ▶ Allows access to ECMWF's MARS research datasets
- ▶ For non-commercial use
- ▶ When built outside ECMWF, the Mars Retrieval icon will be able to retrieve data using the Web API
  - ▶ Only requires the curl library
- ▶ Not a replacement for dissemination!
- ▶ Need to set up an access key first, and register for each dataset you wish to download

Desktop

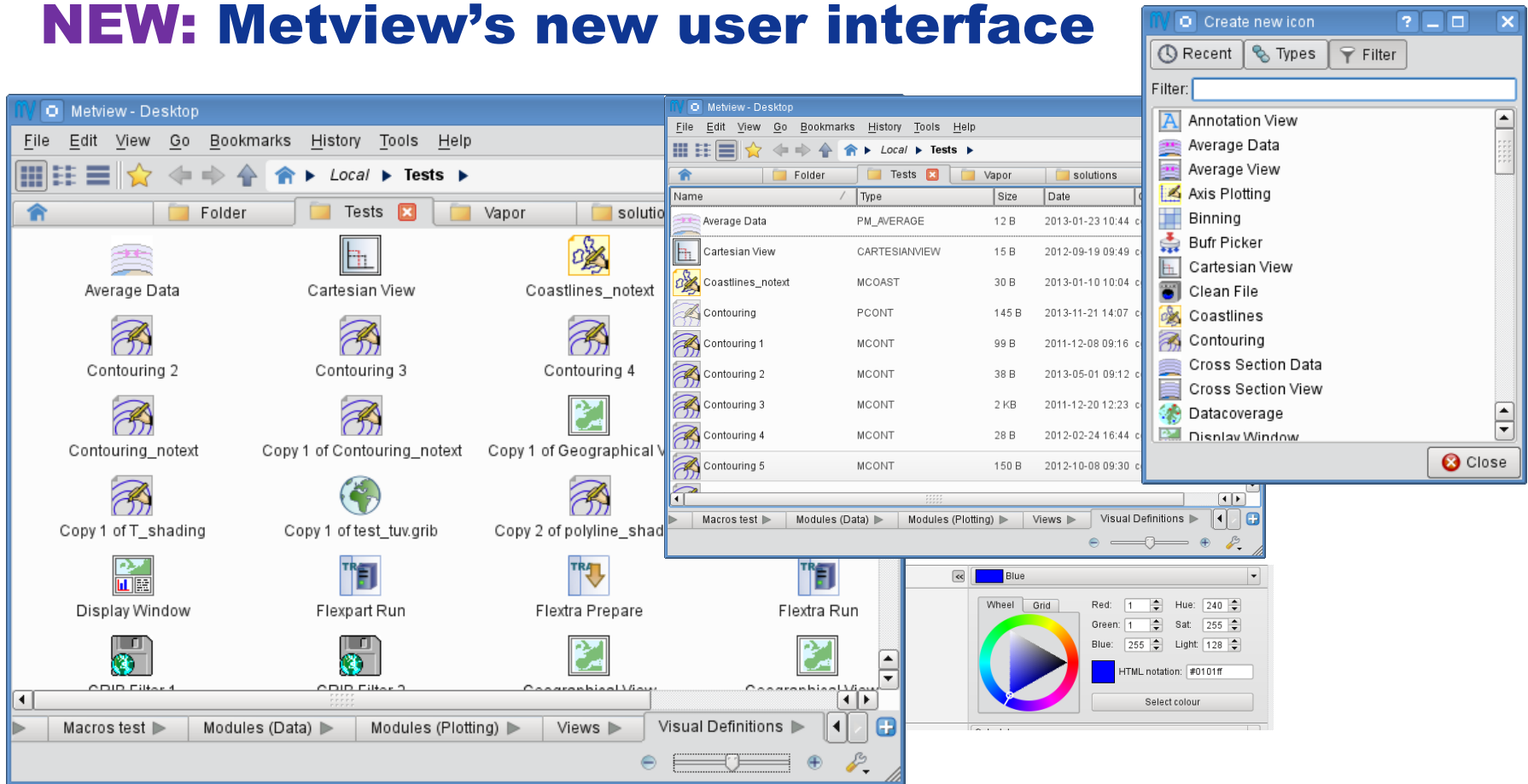
Icon name: era-precip-fc  
Folder: /Demos/New Desktop  
Type: RETRIEVE Modified: 2014-05-14 14:41

Dataset	interim
Class	Era Interim
Type	FC
Stream	DA
Expver	1
Repres	Spherical Harmonics
Obsgroup	Off
Reportype	OFF
Obstype	
Levtype	Surface
Levelist	
Param	228.128
Date	2014-01-26/TO/2014-01-30
Refdate	OFF
Hdate	
Fcmonth	OFF
Fcperiod	OFF
Time	0/12

Templates

Reset Save OK Cancel

# NEW: Metview's new user interface



**More intuitive and easy to use.**

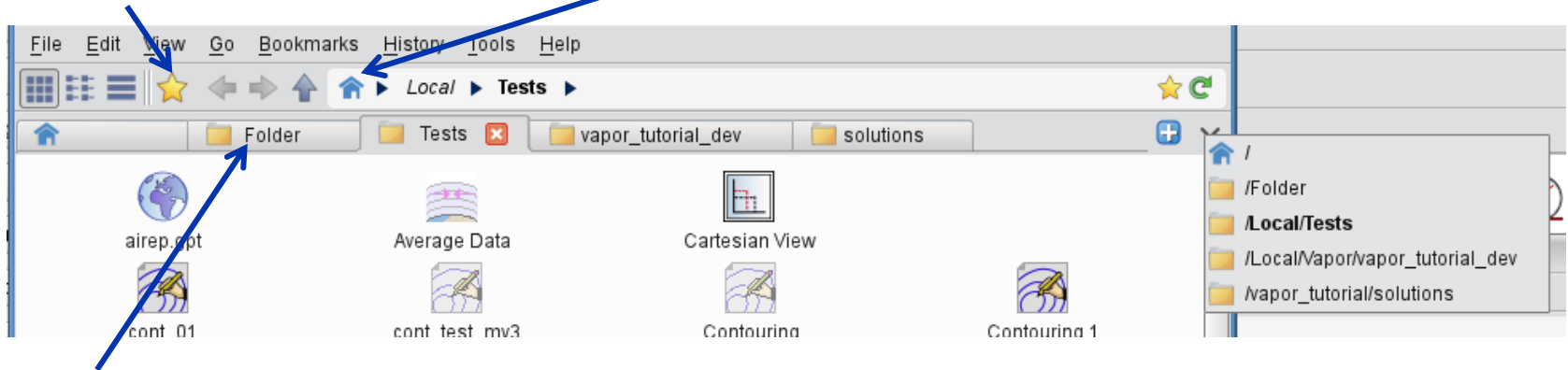
**Same (and more) functionality.**

**Beta in version 4.4.7 and above. Will become default in 4.5.**

# NEW: Metview's new user interface

Bookmarks

Folder navigation

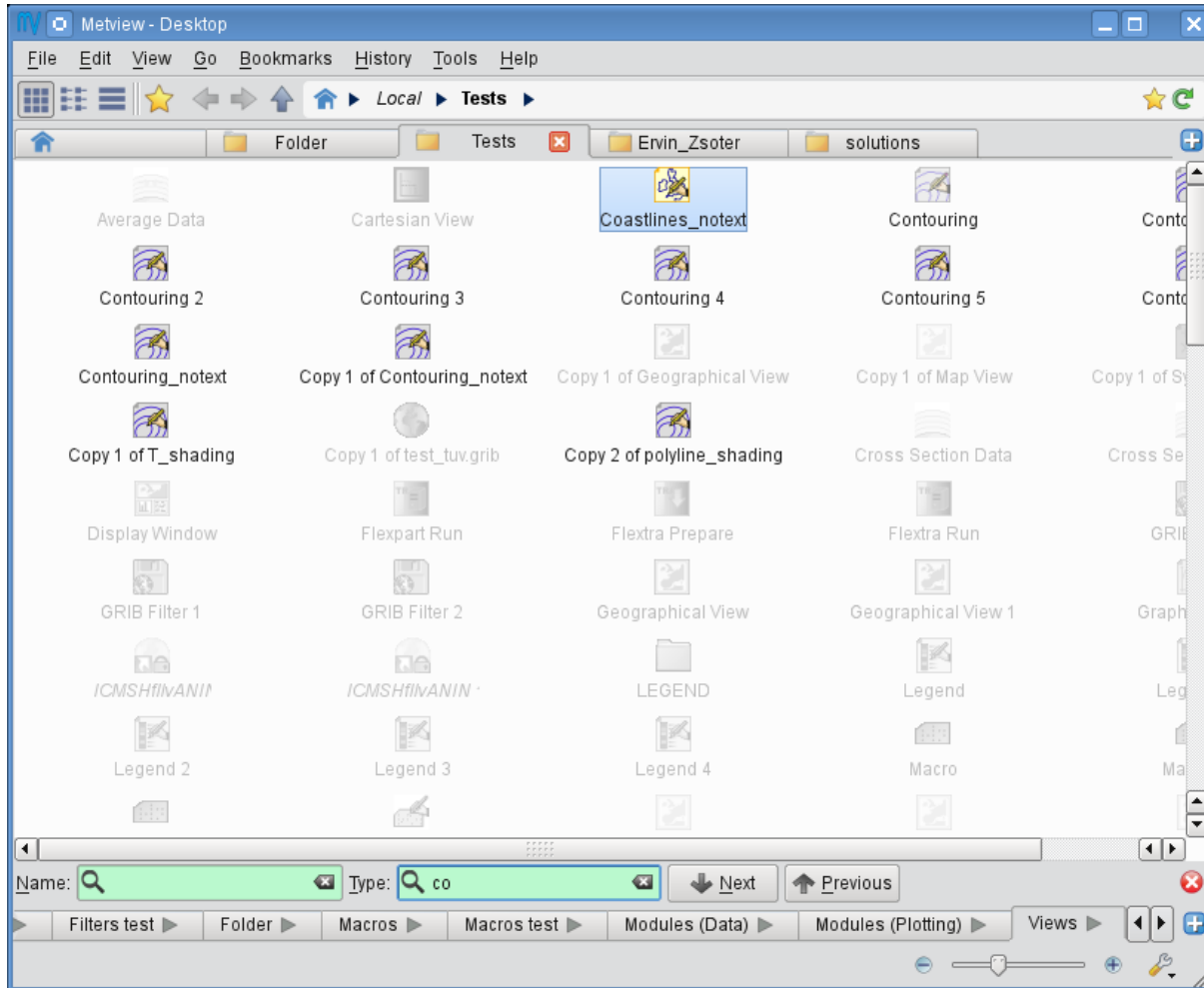


Tabbed interface

Should be familiar to existing users

But easier to pick up for new users

# NEW: Metview's new user interface



Icon filtering (search)

# **NEW: Metview's new user interface**

- ▶ **Written in Qt (was Motif)**
- ▶ **The user interface can now progress**
- ▶ **Lesson: take the given Qt styles as they are, or completely redesign**
  - ▶ **Especially if you want to retain the ability to switch between Qt styles**

# Builds and distributions

- ▶ The current release is 4.4.7 (new UI enabled with a switch)
- ▶ Coming this Summer: Metview 4.5
  - ▶ New UI will be the default
  - ▶ Built using CMake
  - ▶ Testing on Mac OS X
  - ▶ Can now build Metview without Motif!
  - ▶ Will also be moved from Perforce to git
- ▶ The downloadable Metview virtual machine has been popular
  - ▶ Quick way to try Metview
- ▶ Future possibility to have a Metview virtual appliance, providing 'software as a service' (SaaS)



# For more information ...

email us:

🖱 **Metview:** [metview@ecmwf.int](mailto:metview@ecmwf.int)

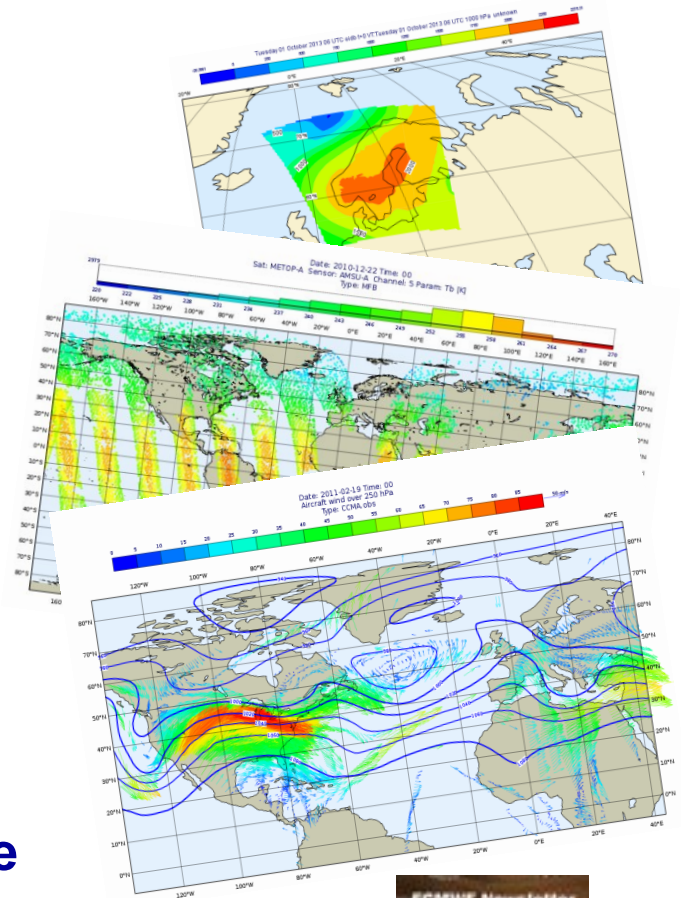
visit our web pages:

🖱 <https://software.ecmwf.int/metview>

➤ **Download**

➤ **Documentation and tutorials available**

➤ **Metview articles in recent ECMWF newsletters**



## Questions?