

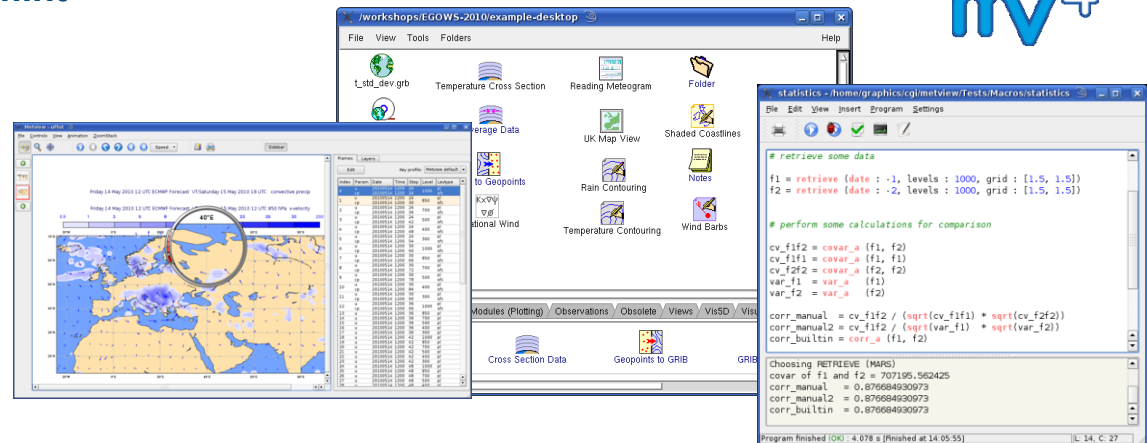
# Introduction to Metview

## Computer User Training Course 2016

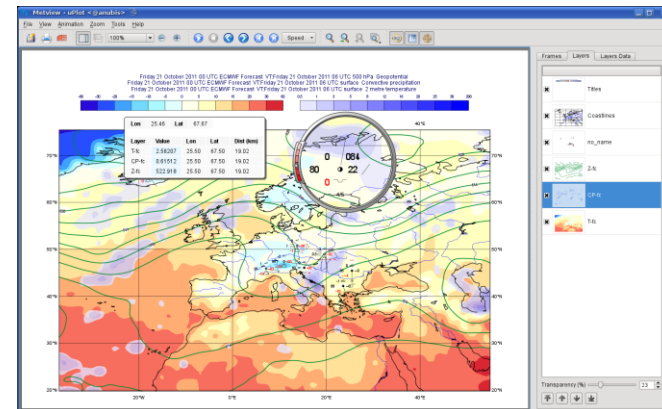
Fernando li, Iain Russell, Sándor Kertész

Development Section

metview@ecmwf.int



# What is Metview?



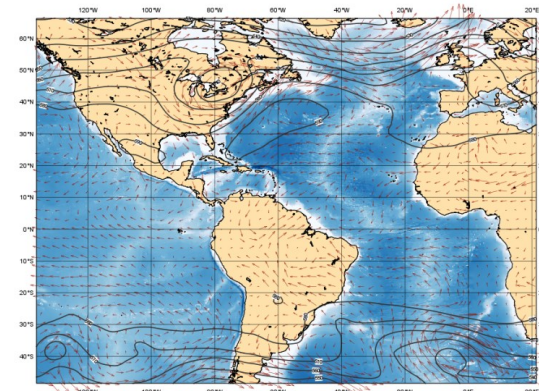
- **Working environment for operational and research meteorologists**
- **Allows analysts and researchers to easily build products interactively and run them in batch mode**

# What is Metview?

**Built on core ECMWF technologies:**

**MARS, GRIB\_API, Magics, ODB, Emoslib**

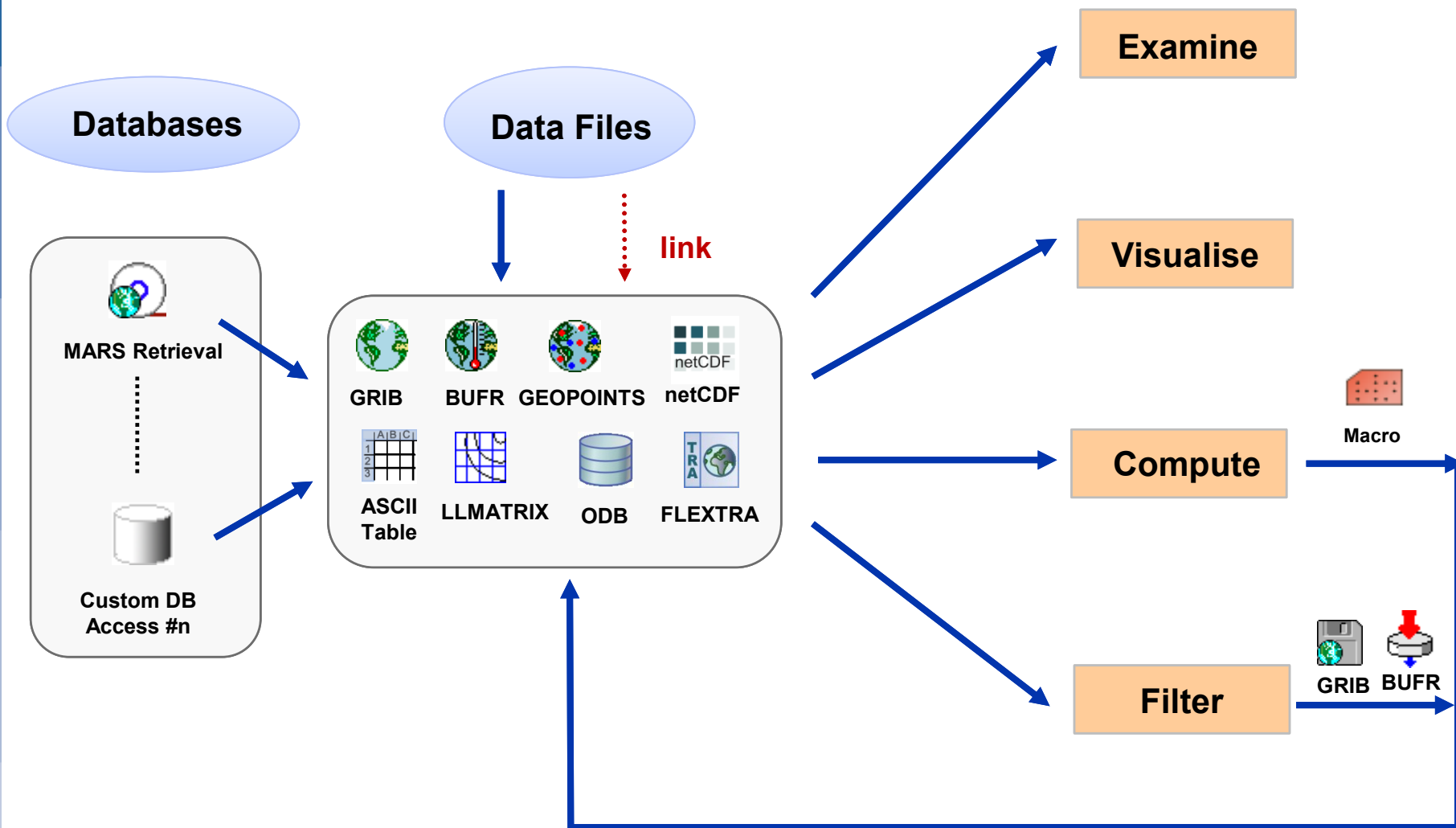
(\* ecCodes, MIR)



- **Can be easily installed and runs self-contained standalone**
  - From laptops to supercomputers
  - No special data servers required (but can be easily connected to MARS or local databases)
- **Open Source under Apache Licence 2.0**
- **Metview is a co-operation project with INPE (Brazil)**

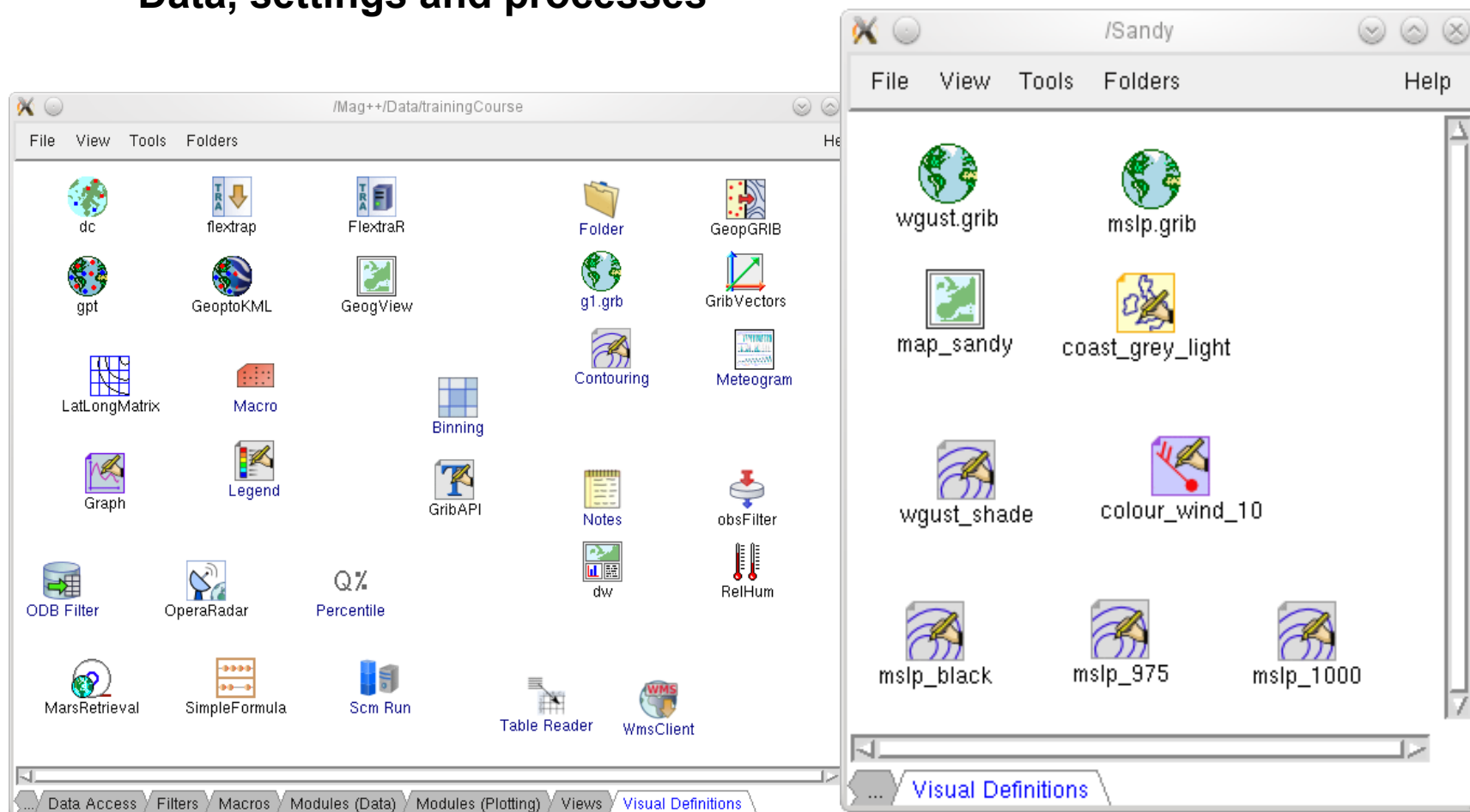


# Data handling in Metview



# Icon-based interface

- **Everything is represented by an icon**
  - **Data, settings and processes**



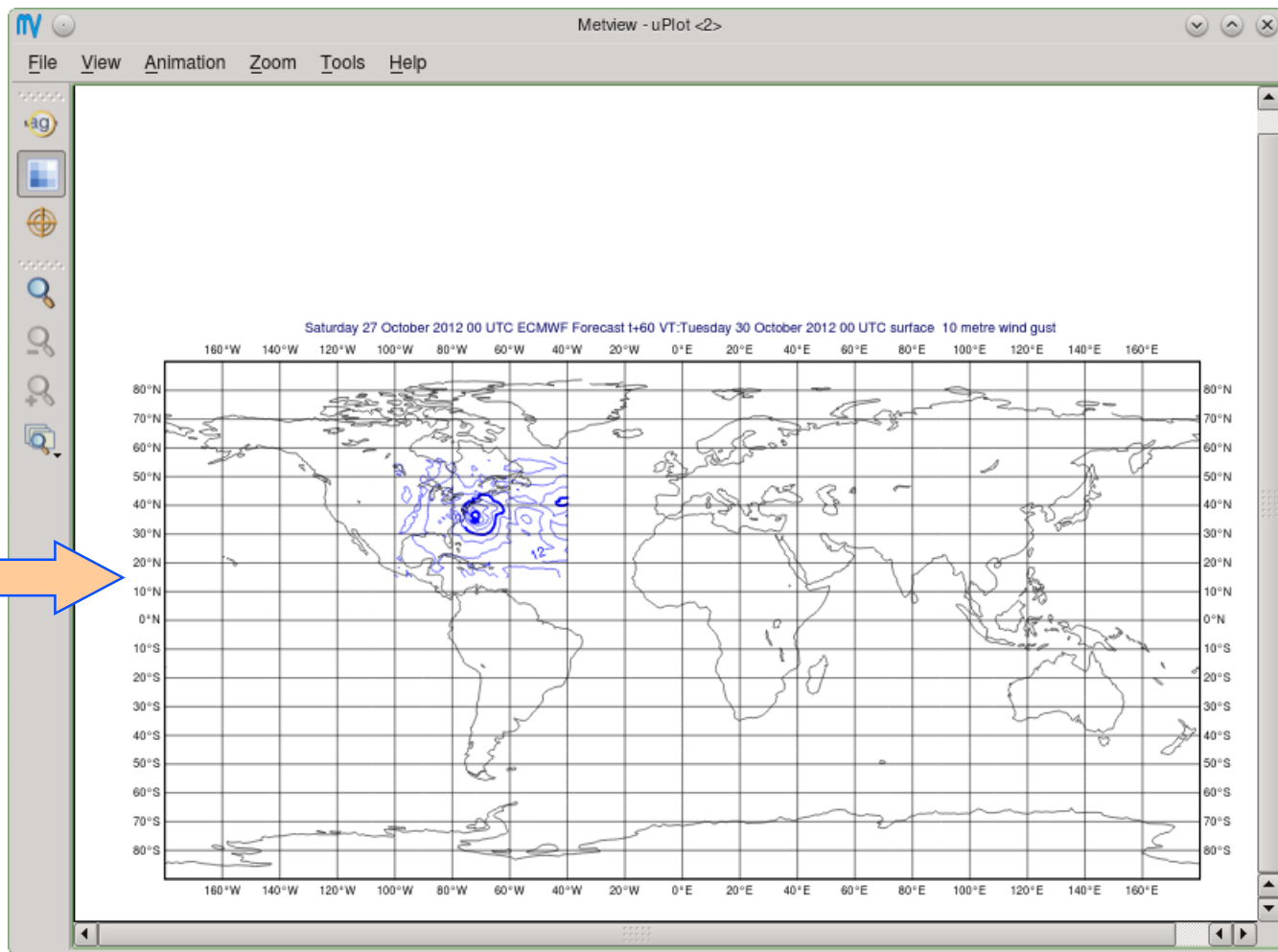
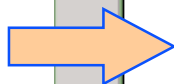
# Visualisation

GRIB file



wgust.grib

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

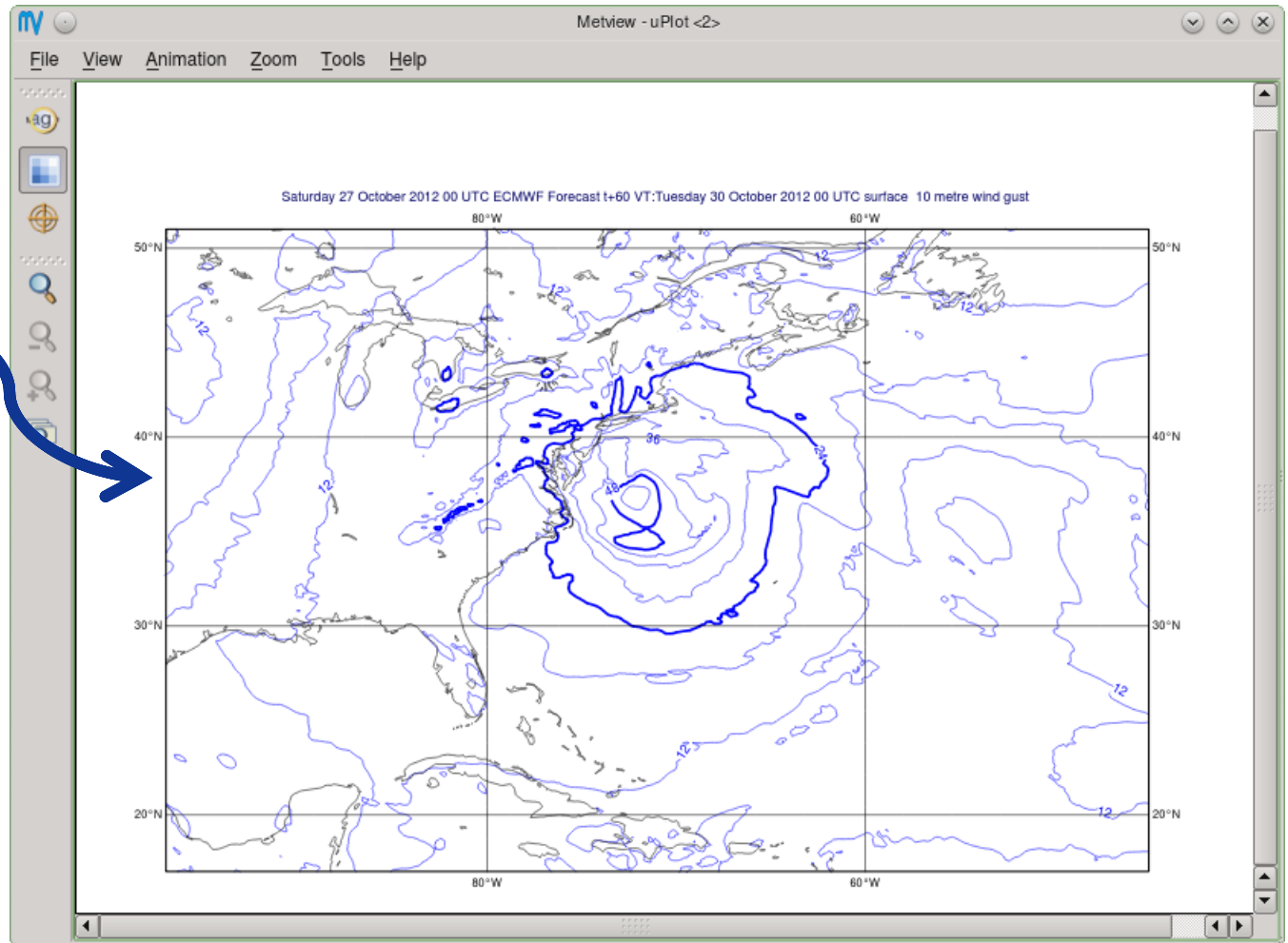
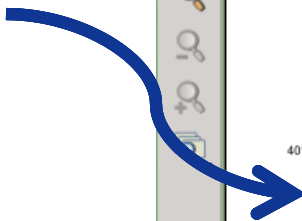


# Drag and Drop

Map view



map\_sandy

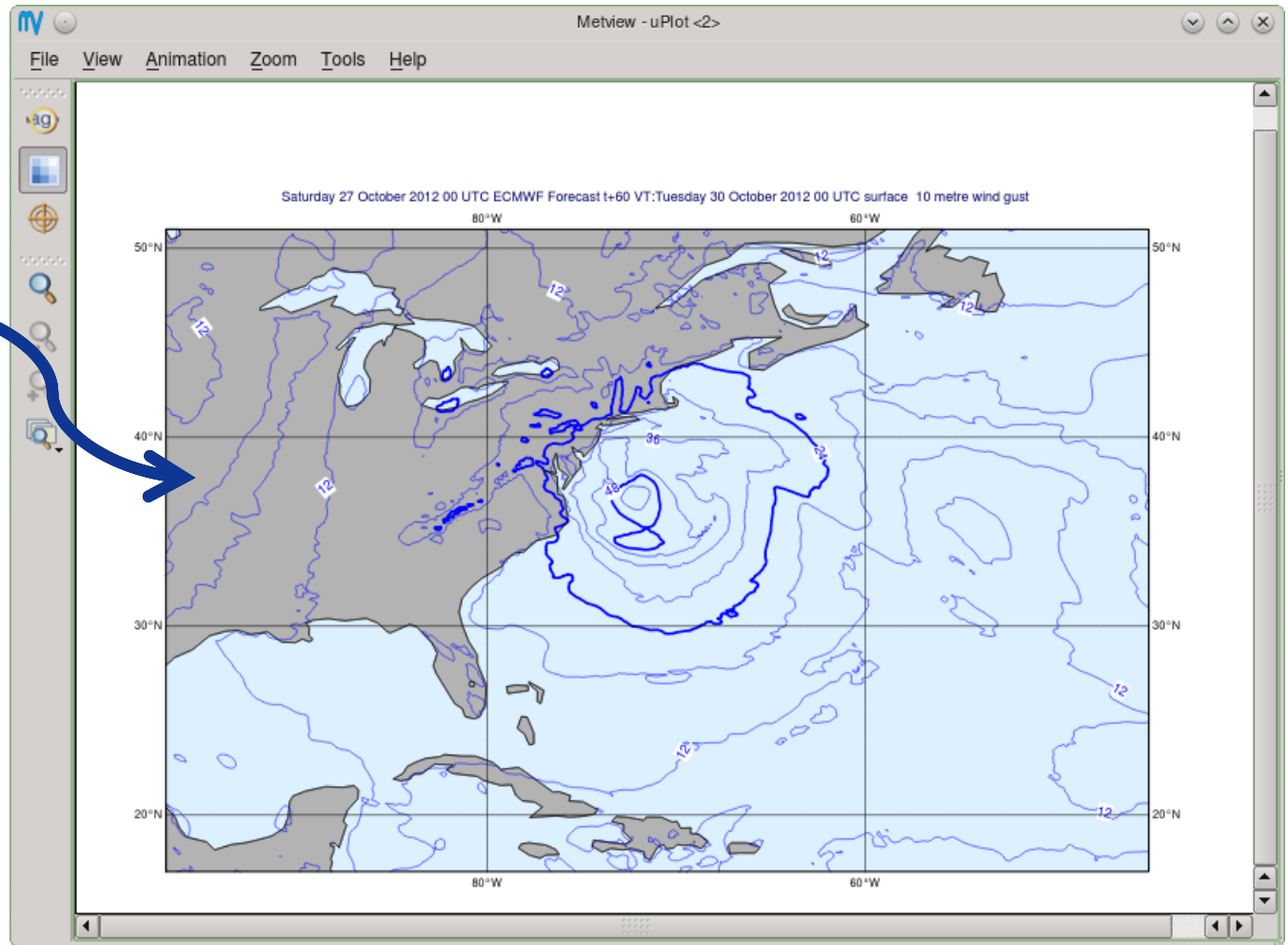
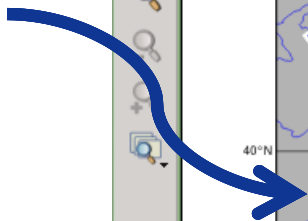


# Drag and Drop

Coastlines



coast\_grey\_light



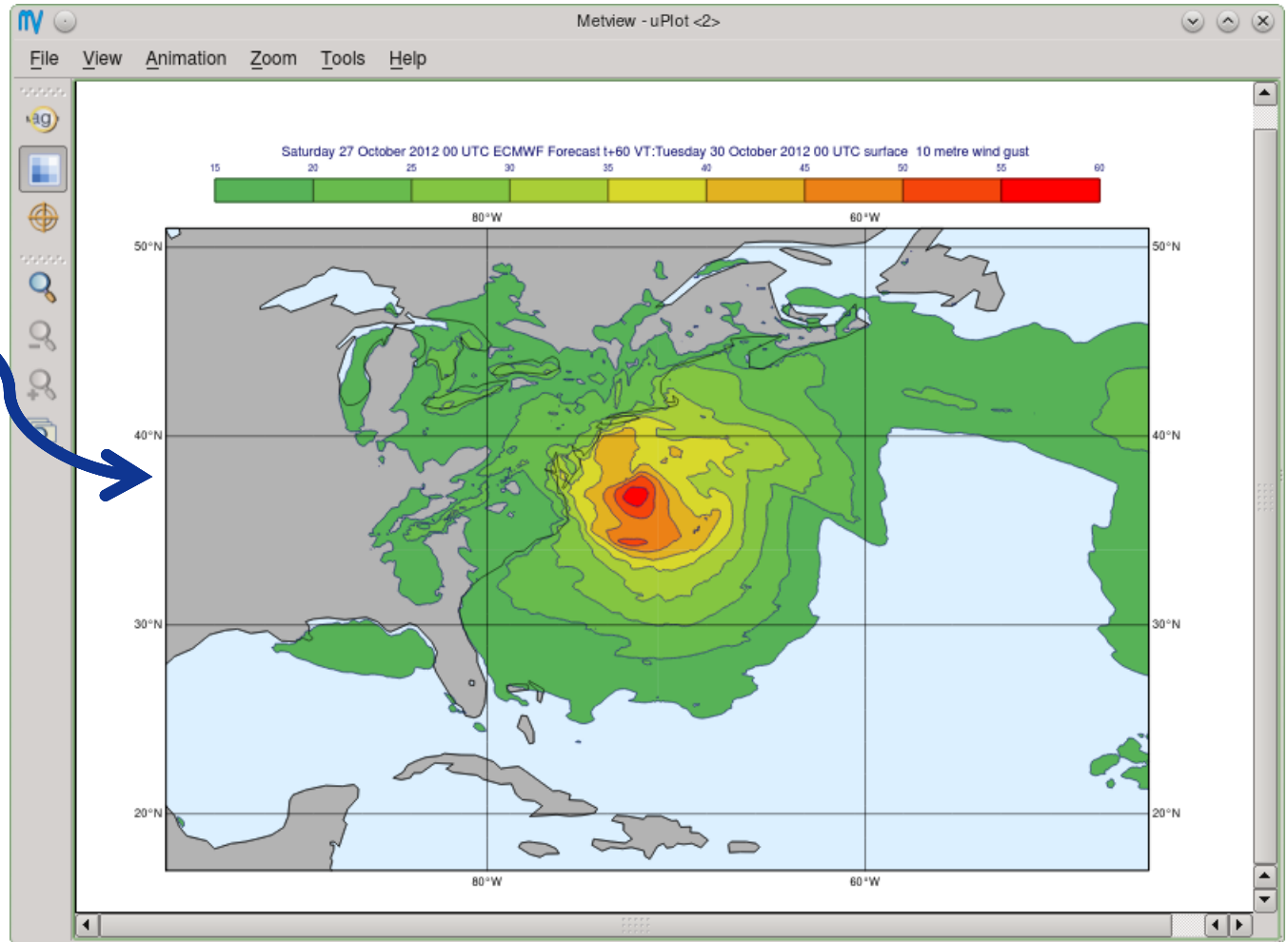
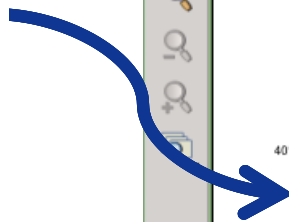


# Drag and Drop

Contour shading



wgust\_shade



# Drag and Drop - Overlay

**Overlay works for all the data types!**

**MSLP (GRIB)**



mstp.grib



mstp\_black

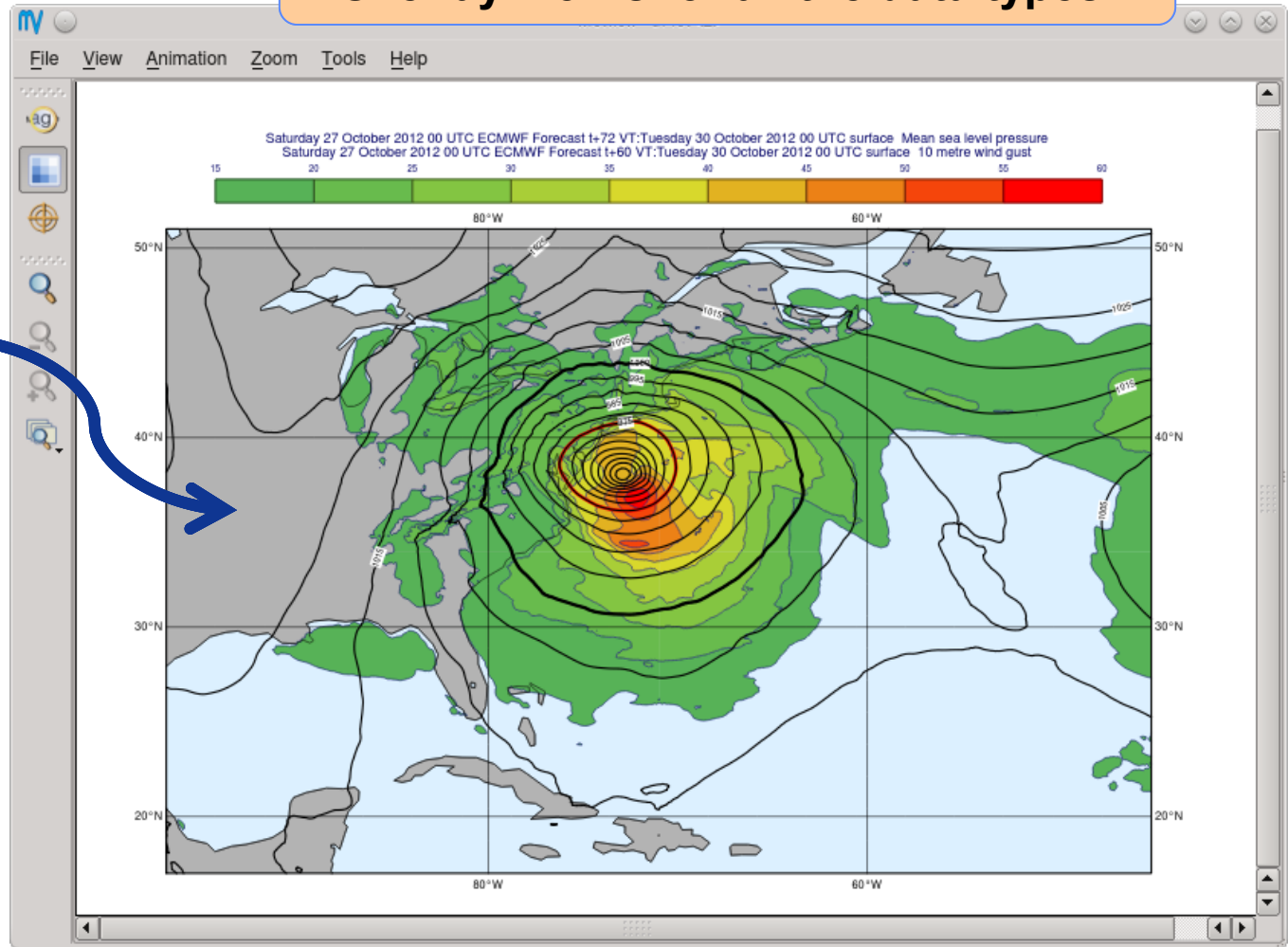


mstp\_975

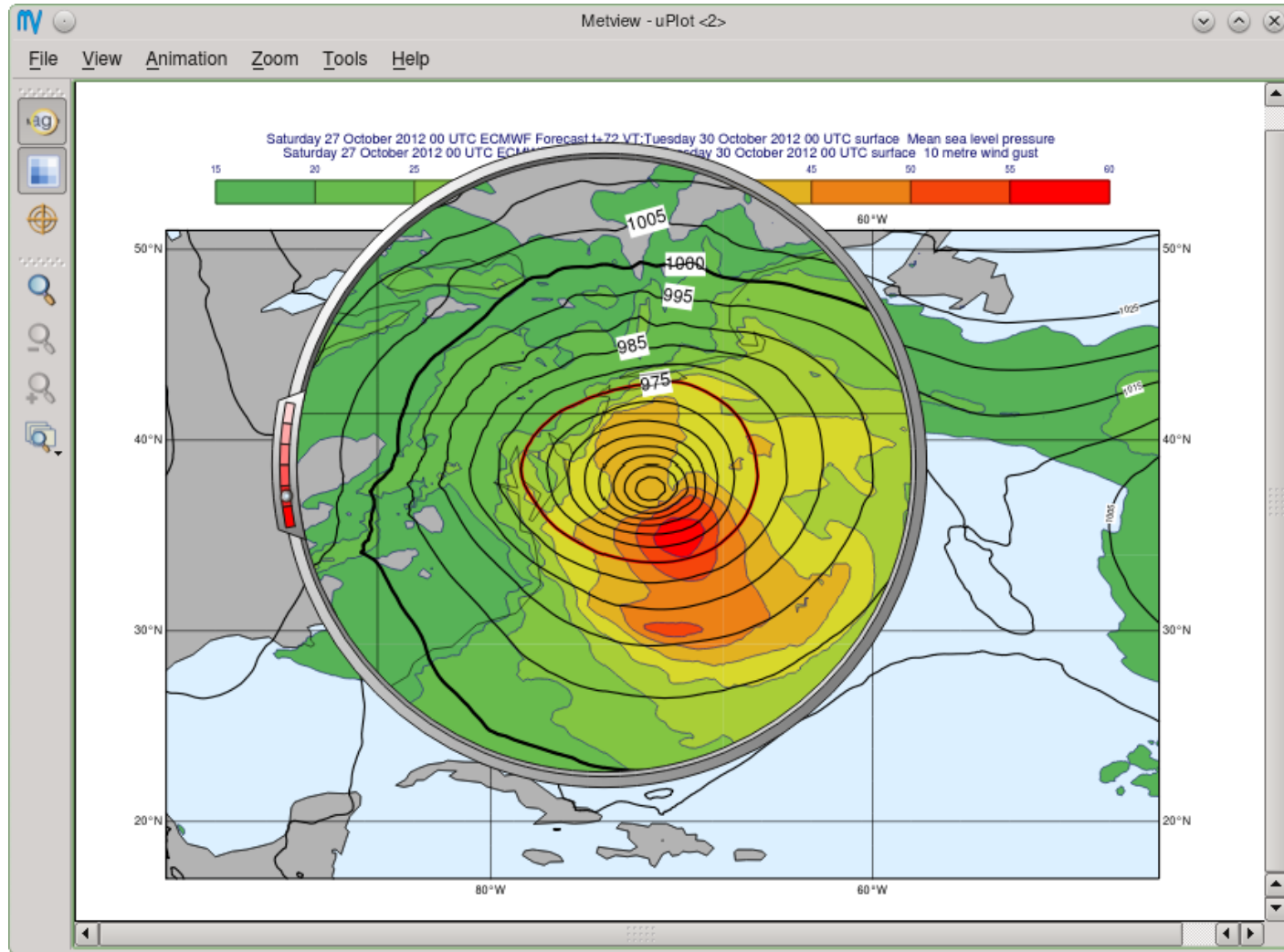


mstp\_1000

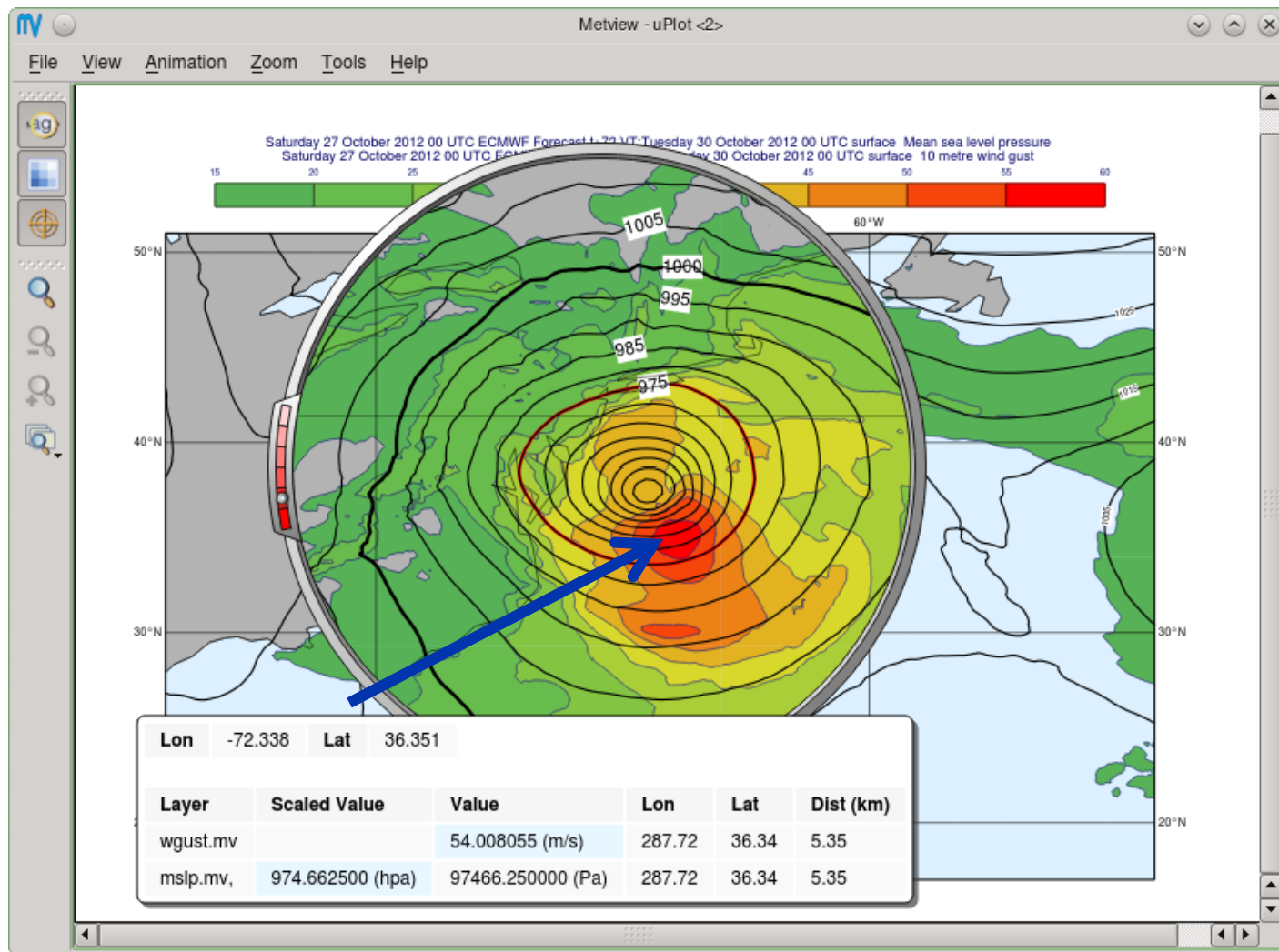
**Contouring**



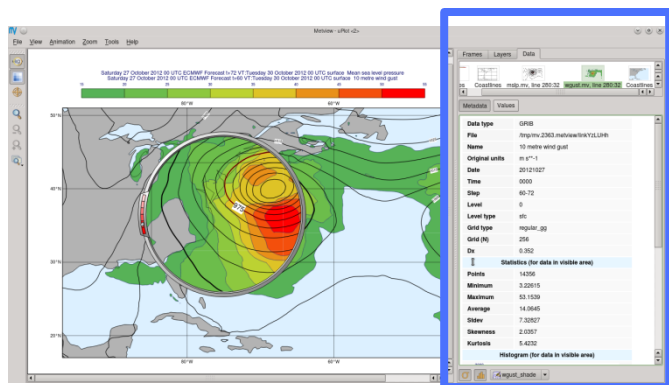
# Display Window - Magnifier



# Display Window - Cursor Data



# Display Window - Layer Metadata



**Sidebar with various tabs**

<b>Data type</b>	GRIB
<b>File</b>	/tmp/mv.2363.metview/linkYzLUHh
<b>Name</b>	10 metre wind gust
<b>Original units</b>	m s <sup>-1</sup>
<b>Date</b>	20121027
<b>Time</b>	0000
<b>Step</b>	60-72
<b>Level</b>	0
<b>Level type</b>	sfc
<b>Grid type</b>	regular_gg
<b>Grid (N)</b>	256
<b>Dx</b>	0.352

Statistics (for data in visible area)	
<b>Points</b>	14356
<b>Minimum</b>	3.22615
<b>Maximum</b>	53.1539
<b>Average</b>	14.0645
<b>Stdev</b>	7.32827
<b>Skewness</b>	2.0357
<b>Kurtosis</b>	5.4232

**Histogram (for data in visible area)**

Bar	From	To	Count
	15	20	2638
	20	25	739
	25	30	355
	30	35	240
	35	40	245
	40	45	123
	45	50	62
	50	55	34

Histogram (for data in visible area)

# Macro language

- Powerful high-level meteorologically oriented script language
- All Metview tasks can be written or saved as macros, and run in batch or interactive modes
- Interfaces with Fortran/C/C++ code
- Outputs:
  - derived data
  - interactive plotting window
  - graphics formats (e.g. PS, PNG, SVG, KML, PDF)
- Metview provides different ways to automatically generate Macro code

```
# Read a grib file
temp = read ( "/home/graphics/temp.grb" )

# Re-scaling field
if threshold > 0 then
    temp = temp - 100
    a = integrate ( temp )
end if

# Compute the gradient
q = gradientb ( temp )

# Save field
write ( "/home/graphics/gradient.grb" , q )

# Plot field
plot ( [ps,svg], q )
```

# Strong synergy between Icons & Macros

- Every icon can be translated into a Macro command

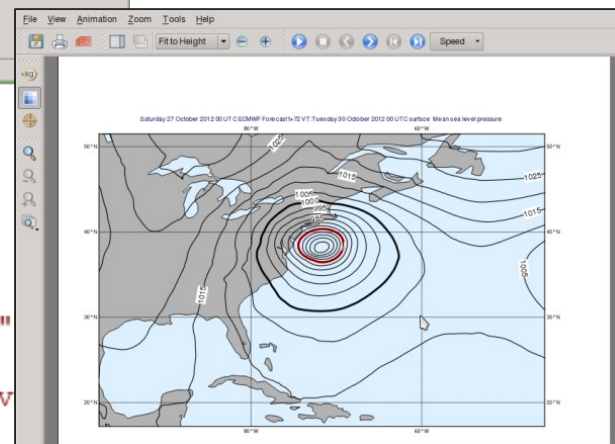


mslp.grib



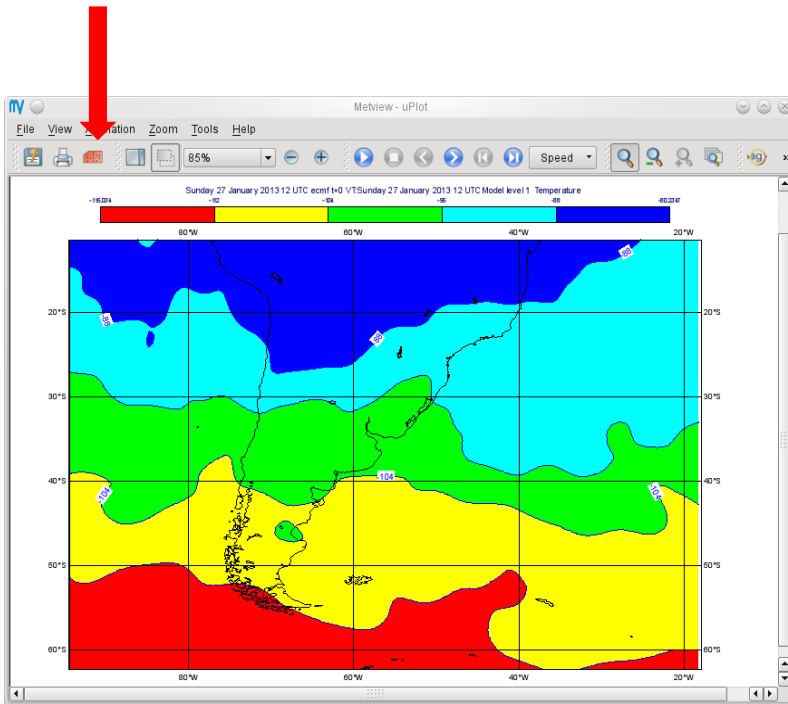
mslp\_black

```
Macro* - /home/metview/metview/Macro
File Edit View Insert Program Settings Help
[Icons]
1 #Metview Macro
2
3 mslp_grib=read("mslp.grib")
4
5 mslp_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(mslp_grib,mslp_black)
File loaded L: 15, C: 26
```



# Strong synergy between Icons & Macros

- Plots can be translated into a Macro program

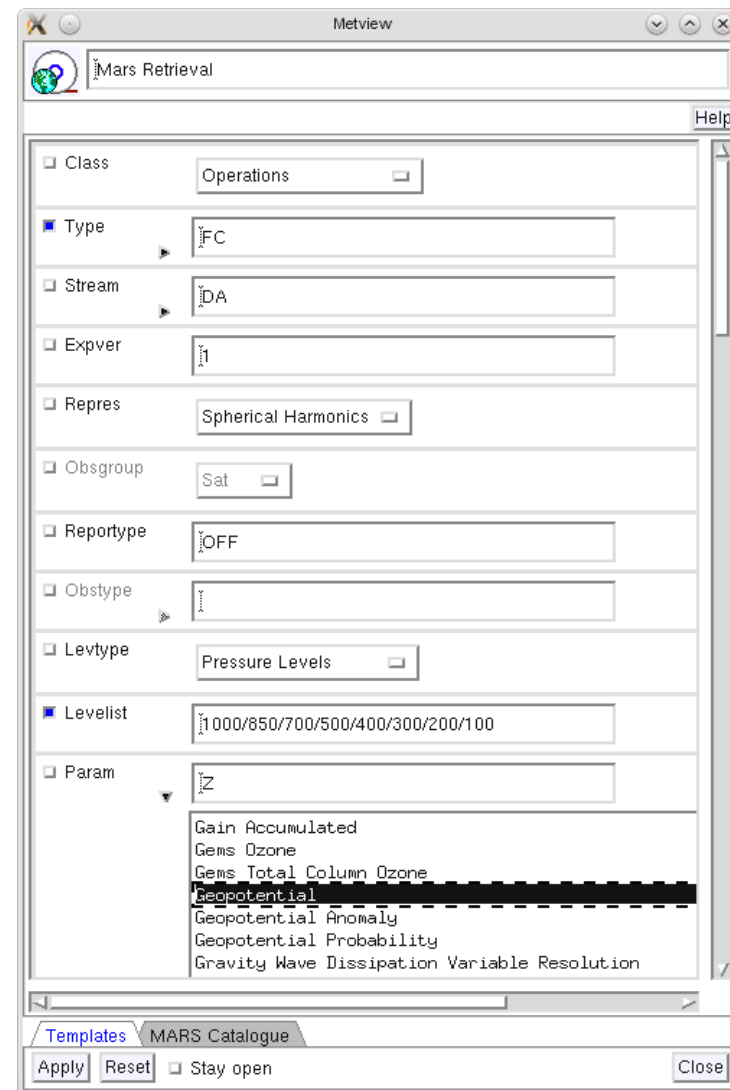


```
File Edit View Insert Program Settings Help
# Metview Macro
# Importing T91_grb
temp = read ( "/home/graphics/cgk/T91.grb" )
cont4 = mcont(
  LEGEND : "ON",
  CONTOUR_LEVEL_SELECTION_TYPE : "INTERVAL",
  CONTOUR_LABEL_TEXT : "",
  CONTOUR_SHADE : "ON",
  CONTOUR_SHADE_METHOD : "AREA_FILL"
)
# Plot command
plot ( temp, cont4 )
File saved L: 16, C: 1
```





- **Metview incorporates a MARS client module**
  - **Built from same source code**
  - **All processing options are available**
  - **Direct access to local MARS archive, or through the Web API for external access**
- **All MARS parameters can be accessed**
- **Metview caches retrieved data**
- **Metview can examine, visualise and process any data formats in MARS**

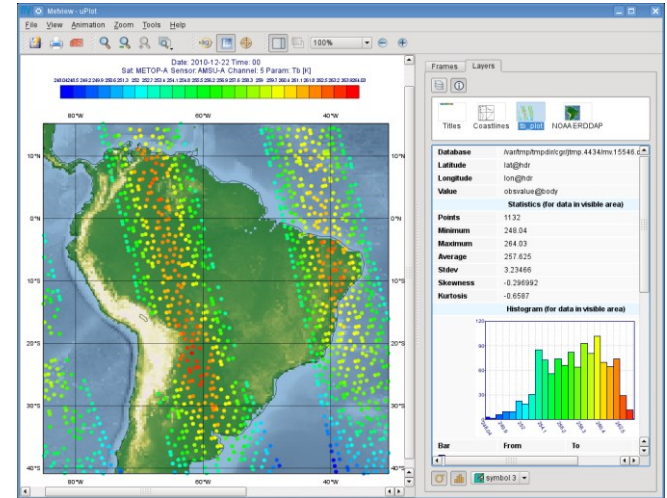


# Examining data

- Metview provides tools to inspect data to
  - check contents and structure
  - inspect headers
  - spot errors or inconsistencies
- Supported formats: GRIB, BUFR, ODB, netCDF, GeoPoints
- Statistics of data are shown in sidebar of plot window
- Or through the *Examiners*

- from the user main interface
- standalone:

```
metview -e grib test.grib
(-e bufr, -e odb)
```



Display window with data statistics (right)

The screenshot shows the 'Metview - Grib Examiner' window. It features a 'Message list' table on the left, a 'Meta data' table on the right, and a 'Log' window at the bottom. Annotations with arrows point to these specific areas.

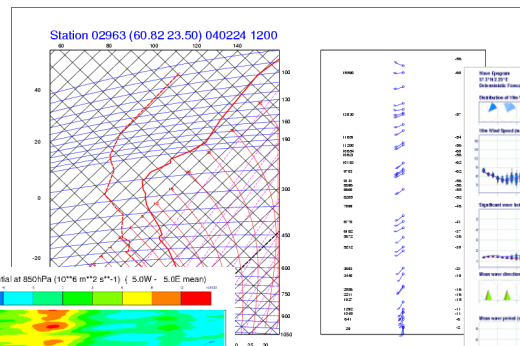
Index	Date	Time	Step	Param	Rep	Level
019	20100301	1200	0	v	8	pl
020	20100301	1200	0	v	8	pl
021	20100301	1200	0	v	8	pl
022	20100301	1200	0	t	8	pl
023	20100301	1200	0	z	8	pl
024	20100301	1200	0	u	8	pl
025	20100228	1200	24	z	500	pl
026	20100228	1200	24	t	500	pl
027	20100228	1200	24	u	400	pl

Position	Key name (GRIB API)	Value
1-3	section2Length	32
4	numberOfVerticalCoordinateValues	0
5	pvLocation	255
6	dataRepresentationType	0 [Latitude/Longitude G
7-8	Nj	240
9-10	Nj	121
11-13	latitudeOfFirstGridPoint	90000
14-16	longitudeOfFirstGridPoint	0

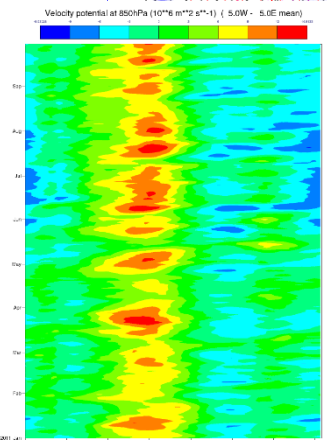
GRIB Examiner

# Many more features ...

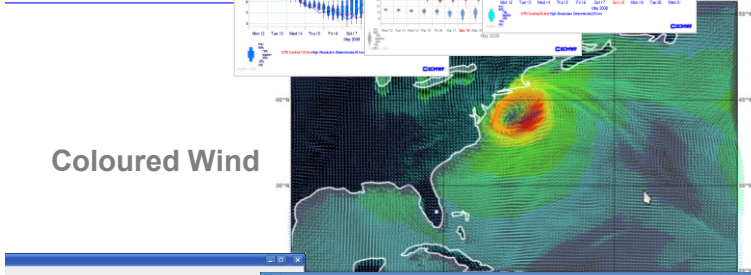
Tephigram



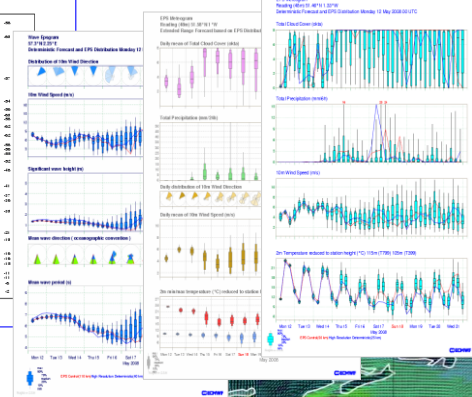
Hovmøller



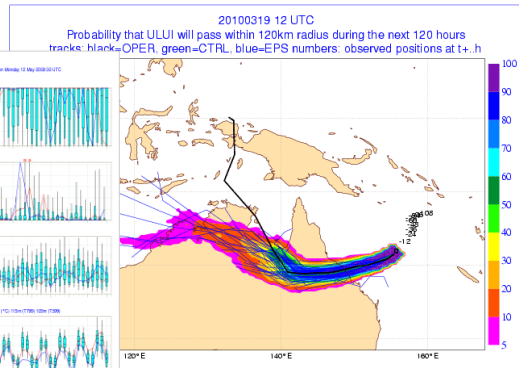
Coloured Wind



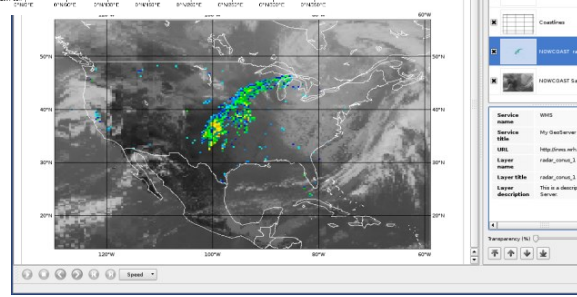
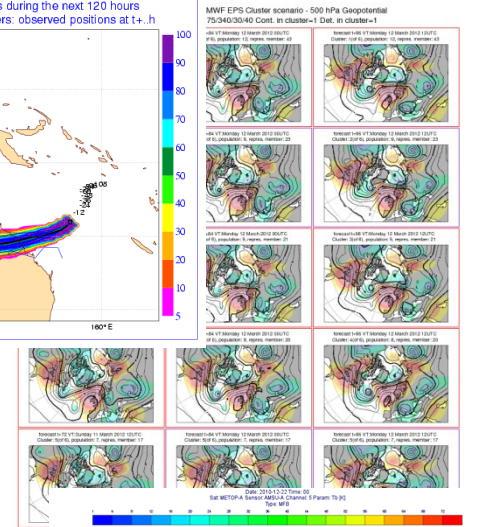
Metgrams



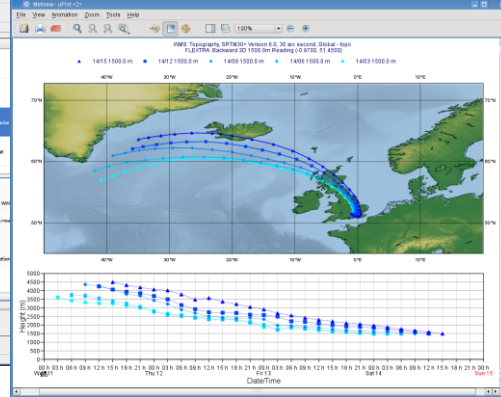
Strike Probability Map



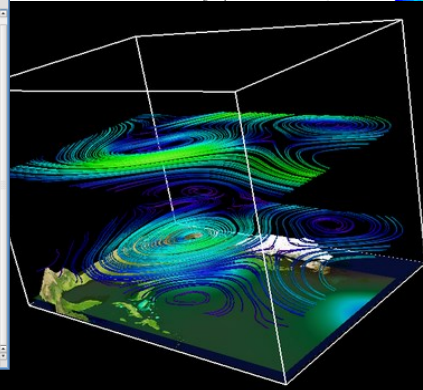
Clusters



WMS with Satellite and radar by NOAA nowCOAST

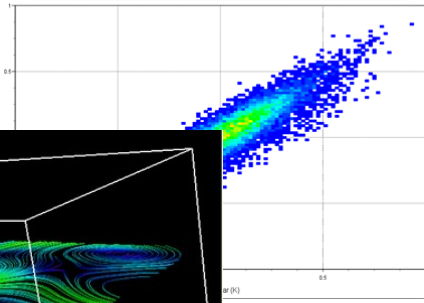


Interface with FLEXTRA



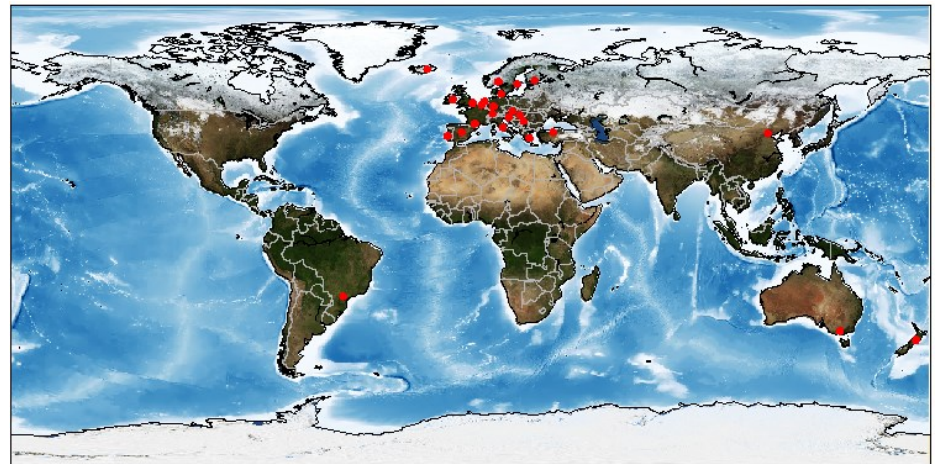
VAPOR interface

Scatter plots



# Who uses Metview?

- **Used internally at ECMWF by researchers and operational analysts**
  - To assess the quality of Observations/Forecast
  - To develop new (graphical) products
  - For general research activities
- **Member States**  
(local installations and remotely on our *ecgate* server)
- **Other national weather services and Universities**
- **Commercial customers**



# For more information ...

email us:

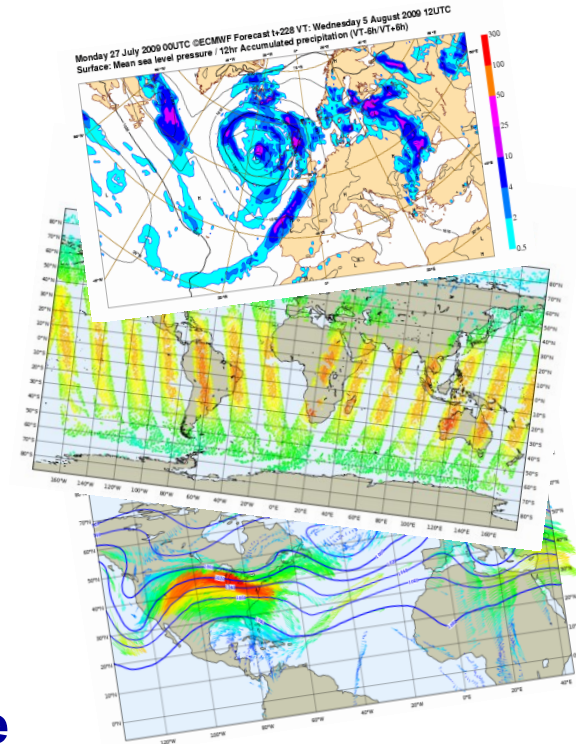
🖱 **Metview:** [metview@ecmwf.int](mailto:metview@ecmwf.int)

web pages:

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

- **Download**
- **Documentation and tutorials available**
- **Metview articles in recent ECMWF newsletters**

🖱 <http://download.opensuse.org/repositories/home:/SStepke/>



**Metview training course at ECMWF, 26 - 30 September 2016**