

Introduction to Metview



The screenshot displays the Metview software interface. The main window shows a desktop environment with various tool icons such as 'Temperature Cross Section', 'Reading Meteogram', 'UK Map View', 'Rain Contouring', and 'Temperature Contouring'. A window titled 'statistics' is open, showing the following code and output:

```
# retrieve some data
f1 = retrieve (date : -1, levels : 1000, grid : [1.5, 1.5])
f2 = retrieve (date : -2, levels : 1000, grid : [1.5, 1.5])

# perform some calculations for comparison

cv_f1f2 = covar_a (f1, f2)
cv_f1f1 = covar_a (f1, f1)
cv_f2f2 = covar_a (f2, f2)
var_f1 = var_a (f1)
var_f2 = var_a (f2)

corr_manual = cv_f1f2 / (sqrt(cv_f1f1) * sqrt(cv_f2f2))
corr_manual2 = cv_f1f2 / (sqrt(var_f1) * sqrt(var_f2))
corr_builtin = corr_a (f1, f2)
```

Choosing RETRIEVE (MARS)
covar of f1 and f2 = 707195.562425
corr_manual = 0.876684930973
corr_manual2 = 0.876684930973
corr_builtin = 0.876684930973

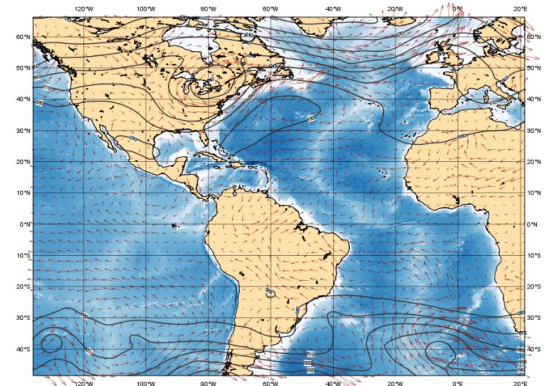
Program finished (OK) : 4.078 s [finished at 14:05:55] L: 14, C: 27

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Development Section - ECMWF

What is Metview?

- ▶ Retrieve/manipulate/visualise meteorological data
- ▶ Working environment for operational and research meteorologists
- ▶ Allows analysts and researchers to easily build products interactively and run them in batch mode



Built on core ECMWF technologies:

MARS, GRIB_API, Magics, ODB, Emoslib

- ▶ Open Source under Apache Licence 2.0
 - ▶ *Increased interest from research community*
- ▶ Metview is a co-operation project with INPE (Brazil)

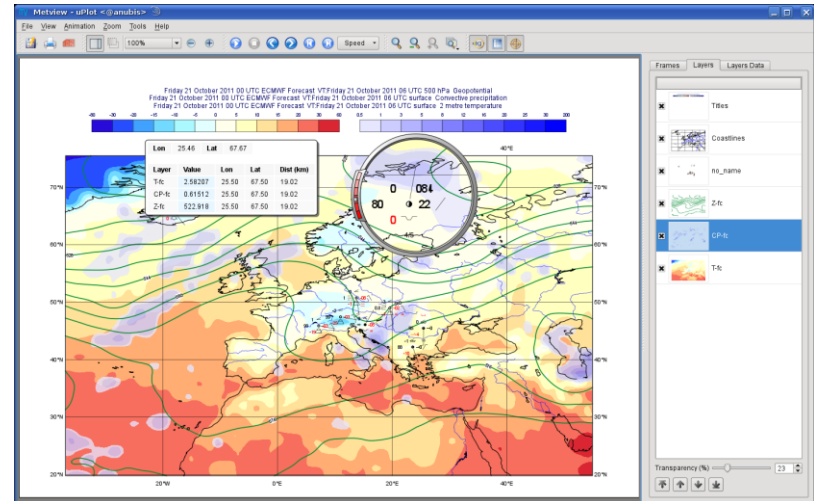


What is Metview?

► Data:

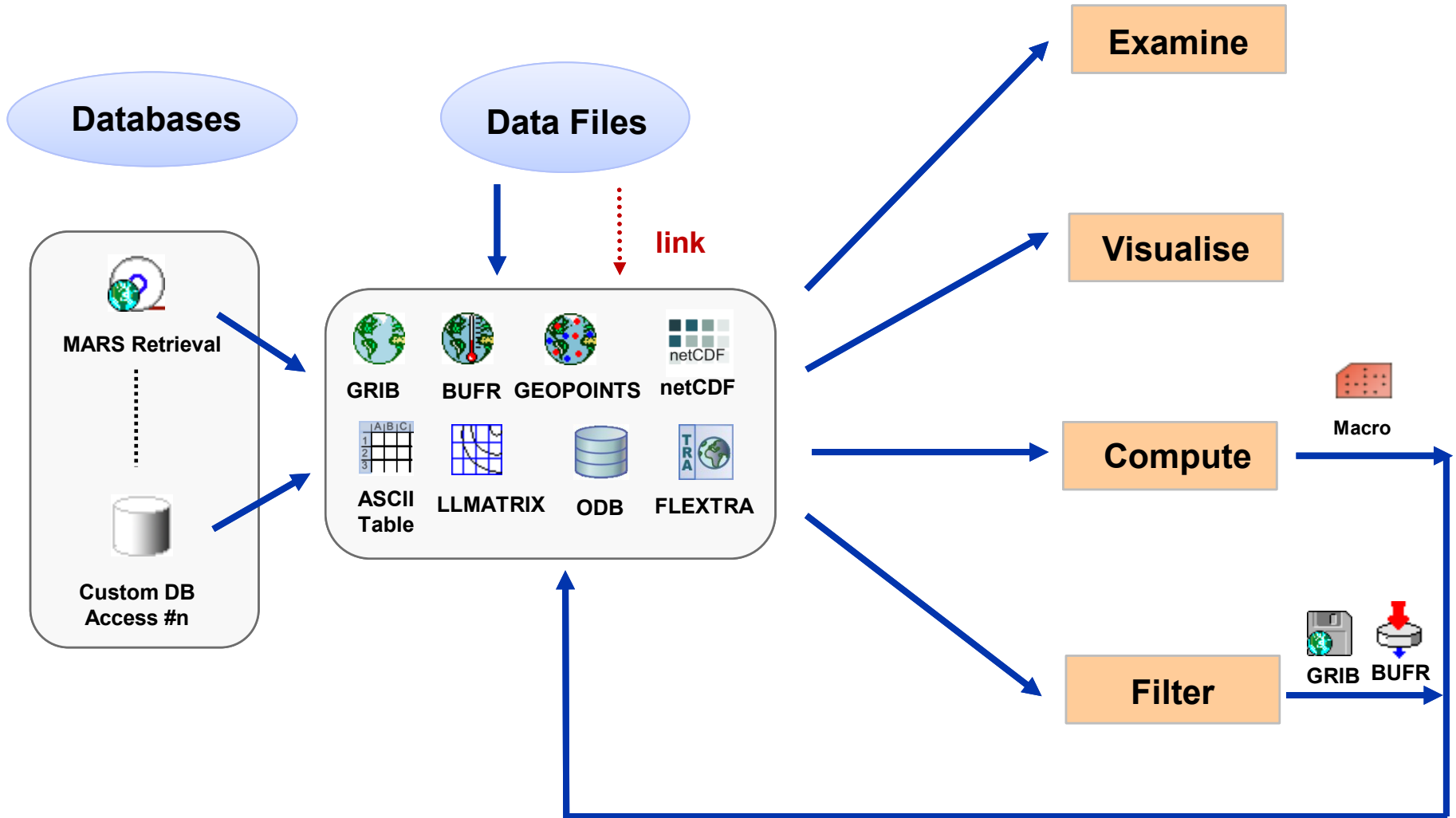
- Access
- Examine
- Manipulate
- Plot
- Overlay

GRIB
BUFR
NetCDF
ODB
Geopoints
ASCII



- Can be run interactively or in batch
- 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)

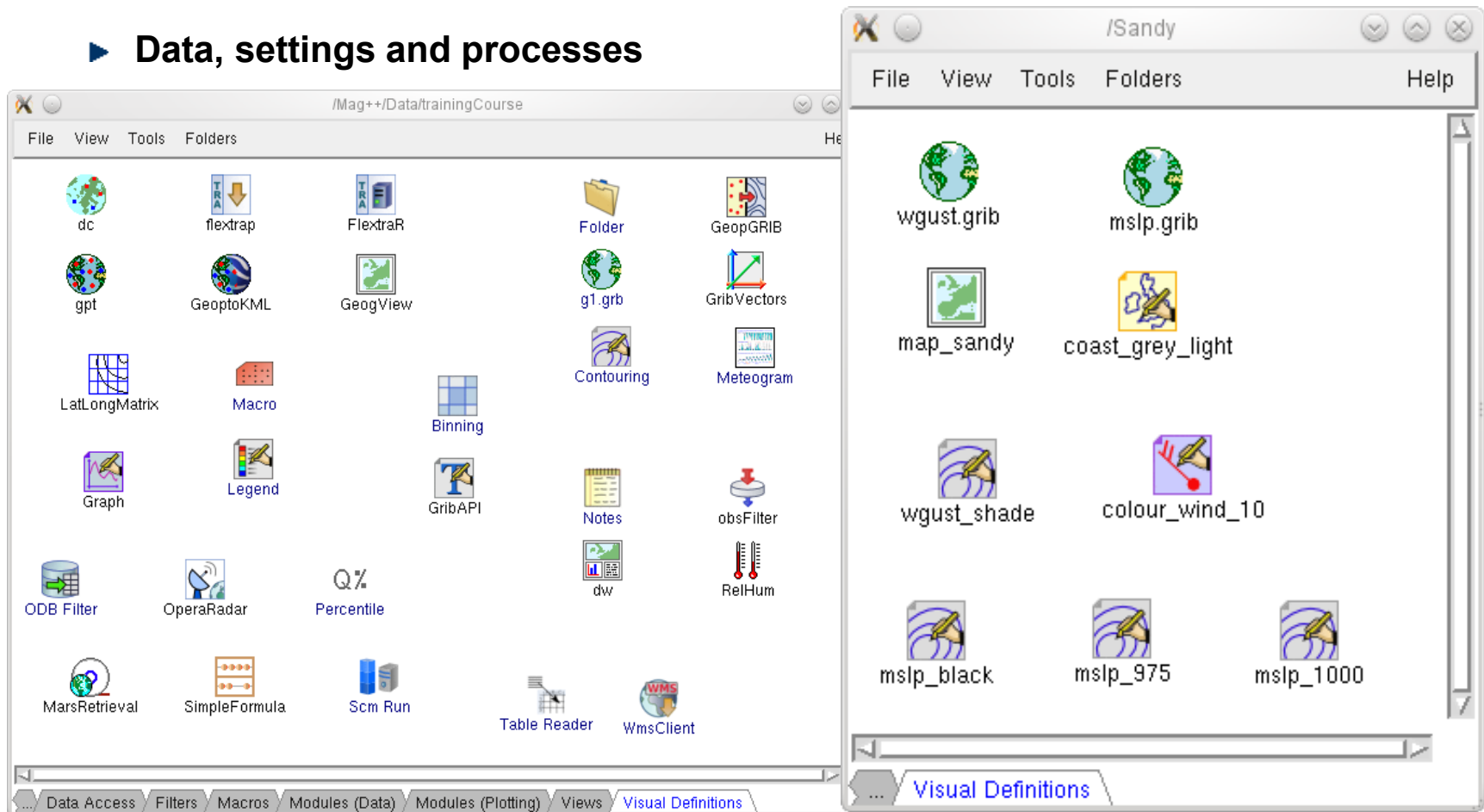
Data handling in Metview



Icon-based interface

► Everything is represented by an icon

► Data, settings and processes



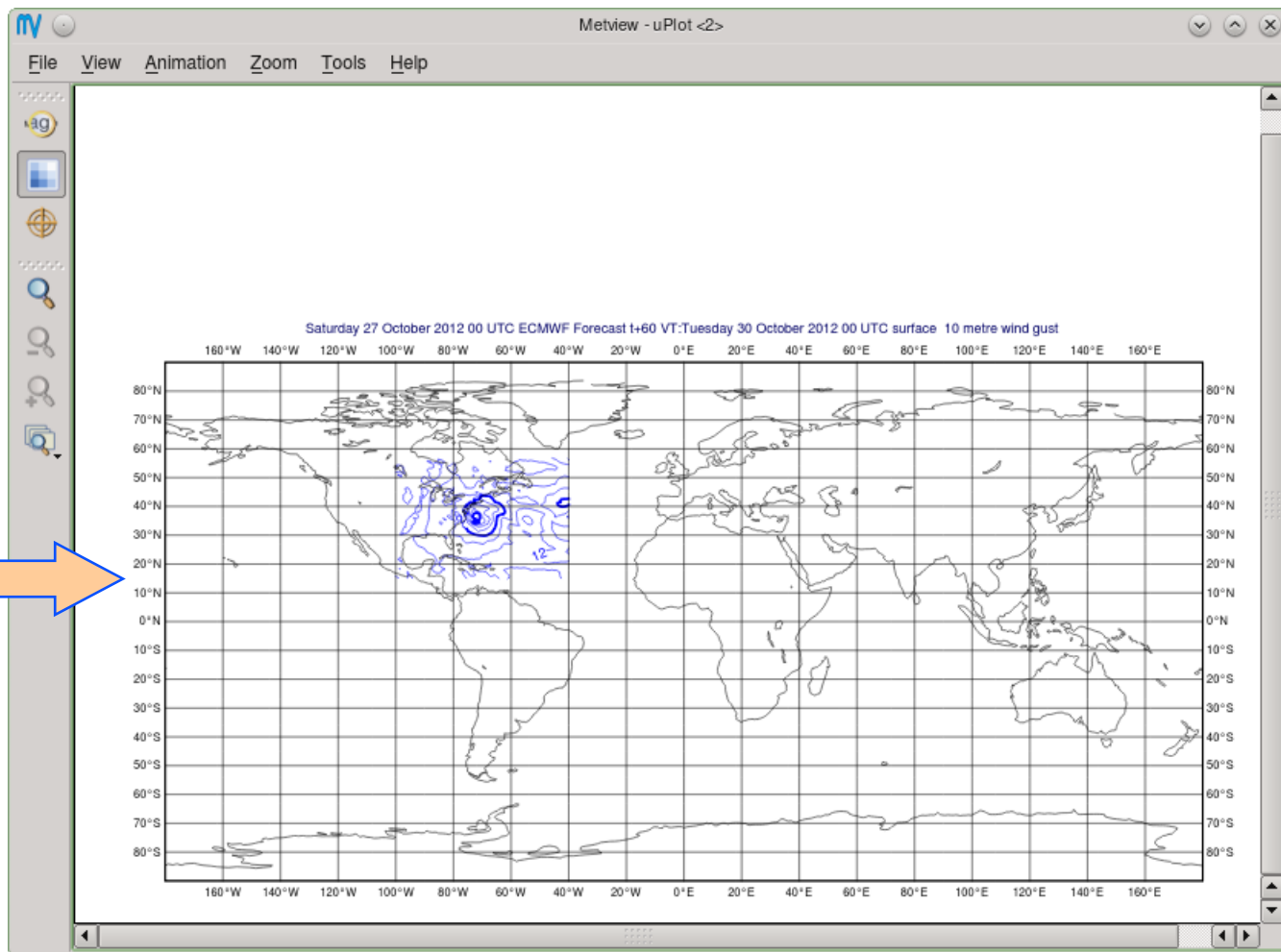
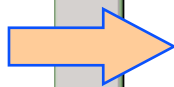
Visualisation

GRIB file



wgust.grib

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

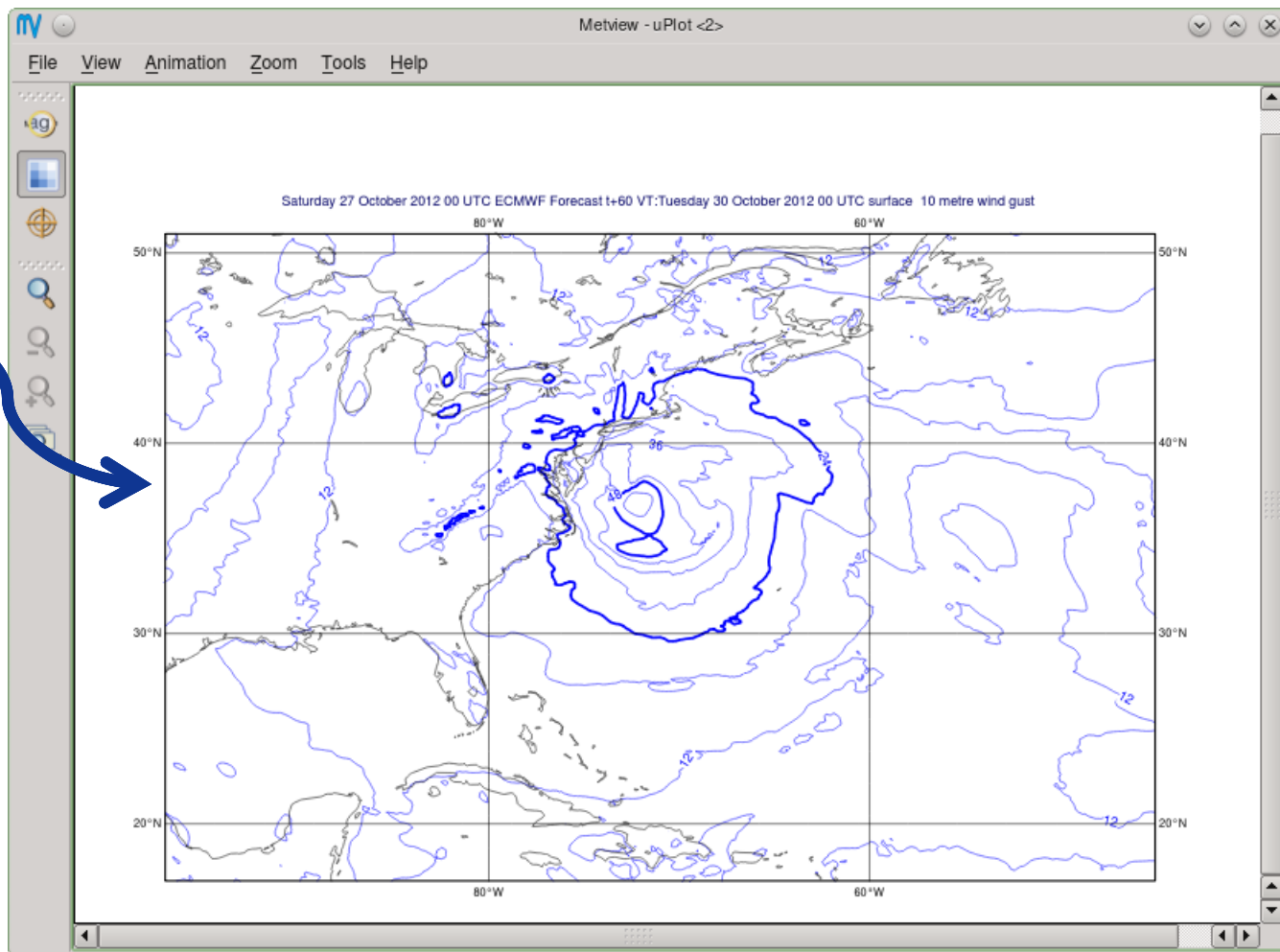


Drag and Drop

Map view



map_sandy

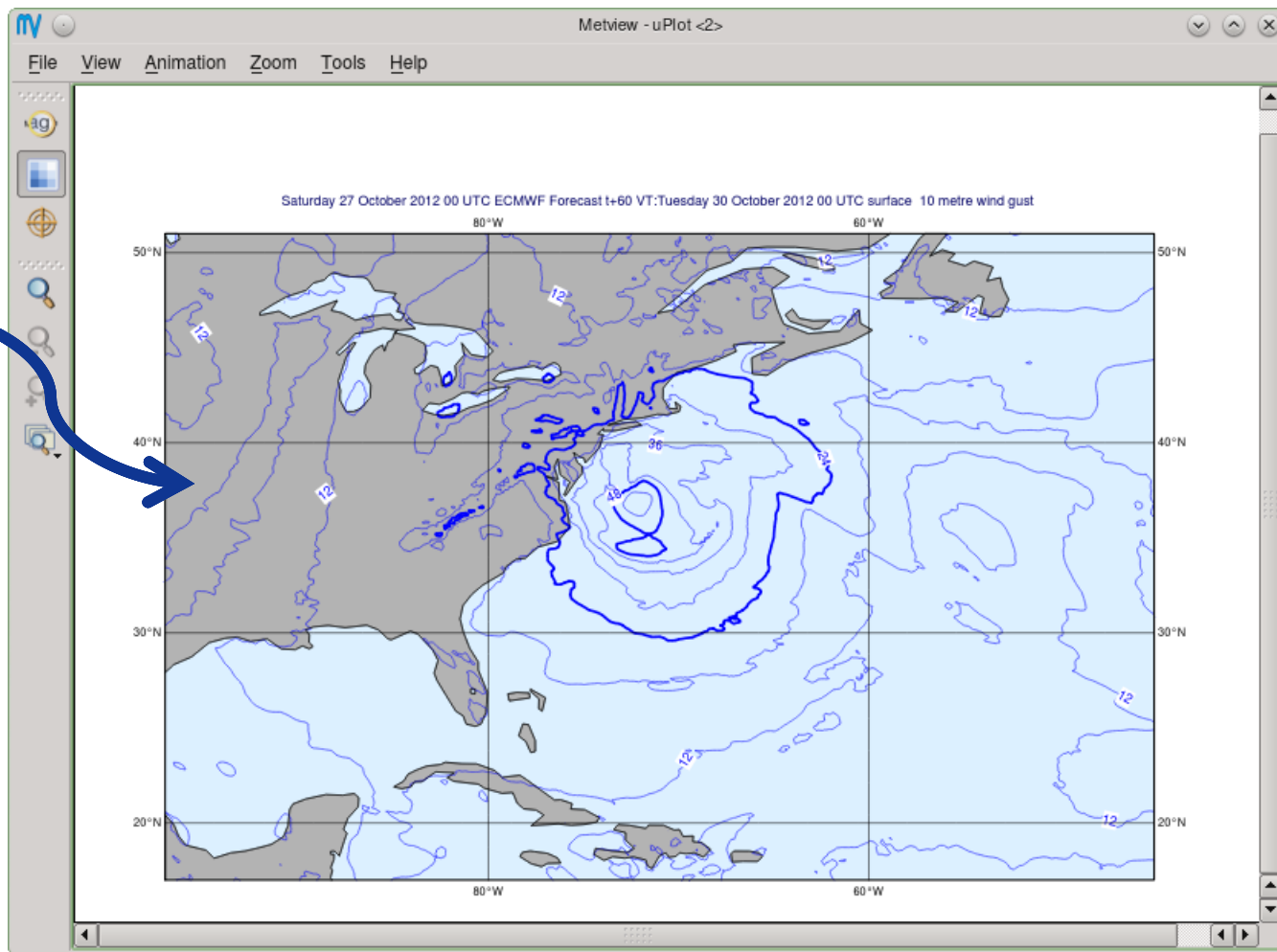
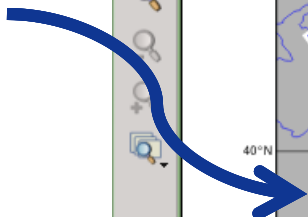


Drag and Drop

Coastlines



coast_grey_light

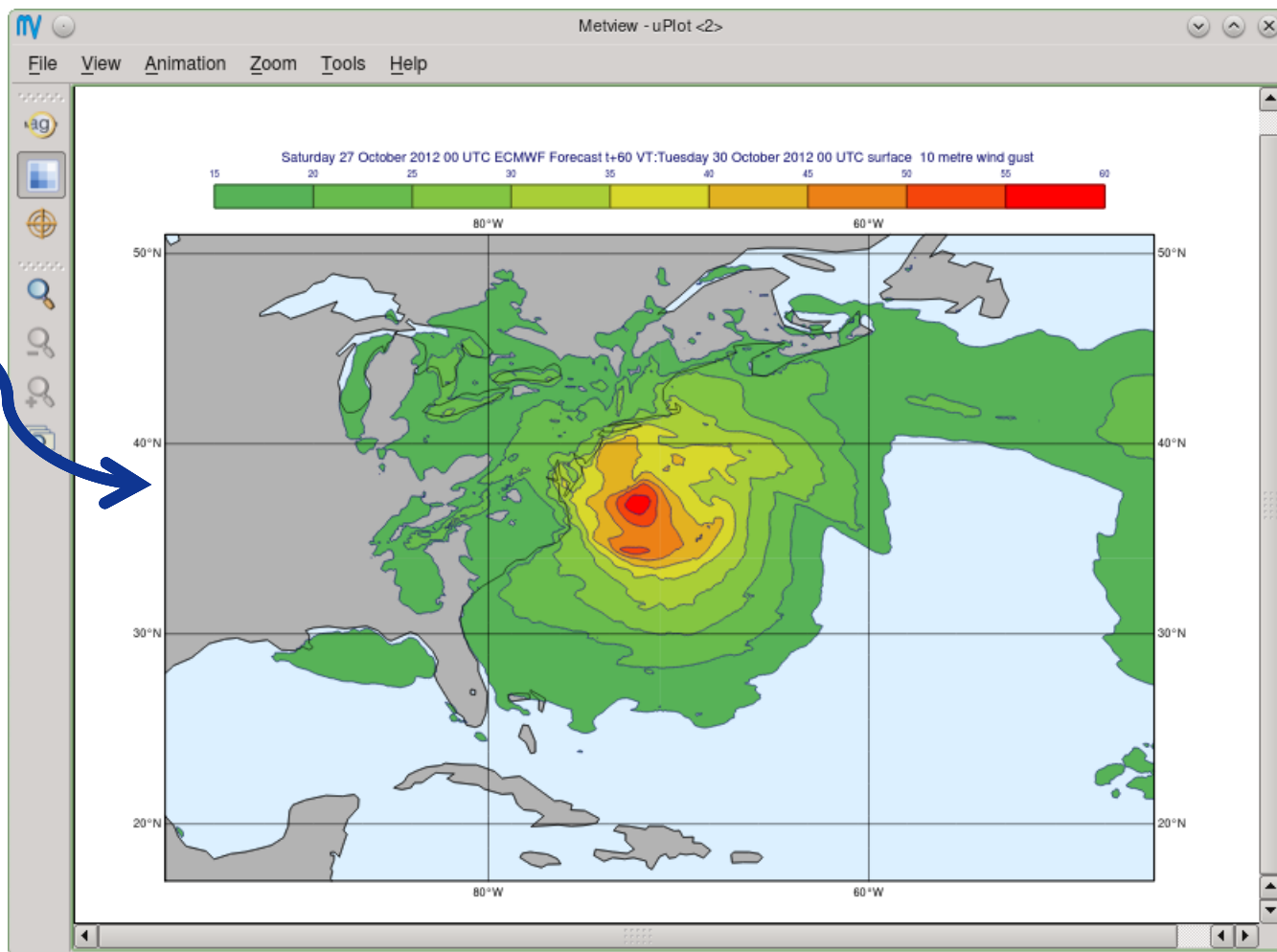


Drag and Drop

Contour shading



wgust_shade



Drag and Drop - Overlay

Overlay works for all the data types!

MSLP (GRIB)



mstp.grib



mstp_black

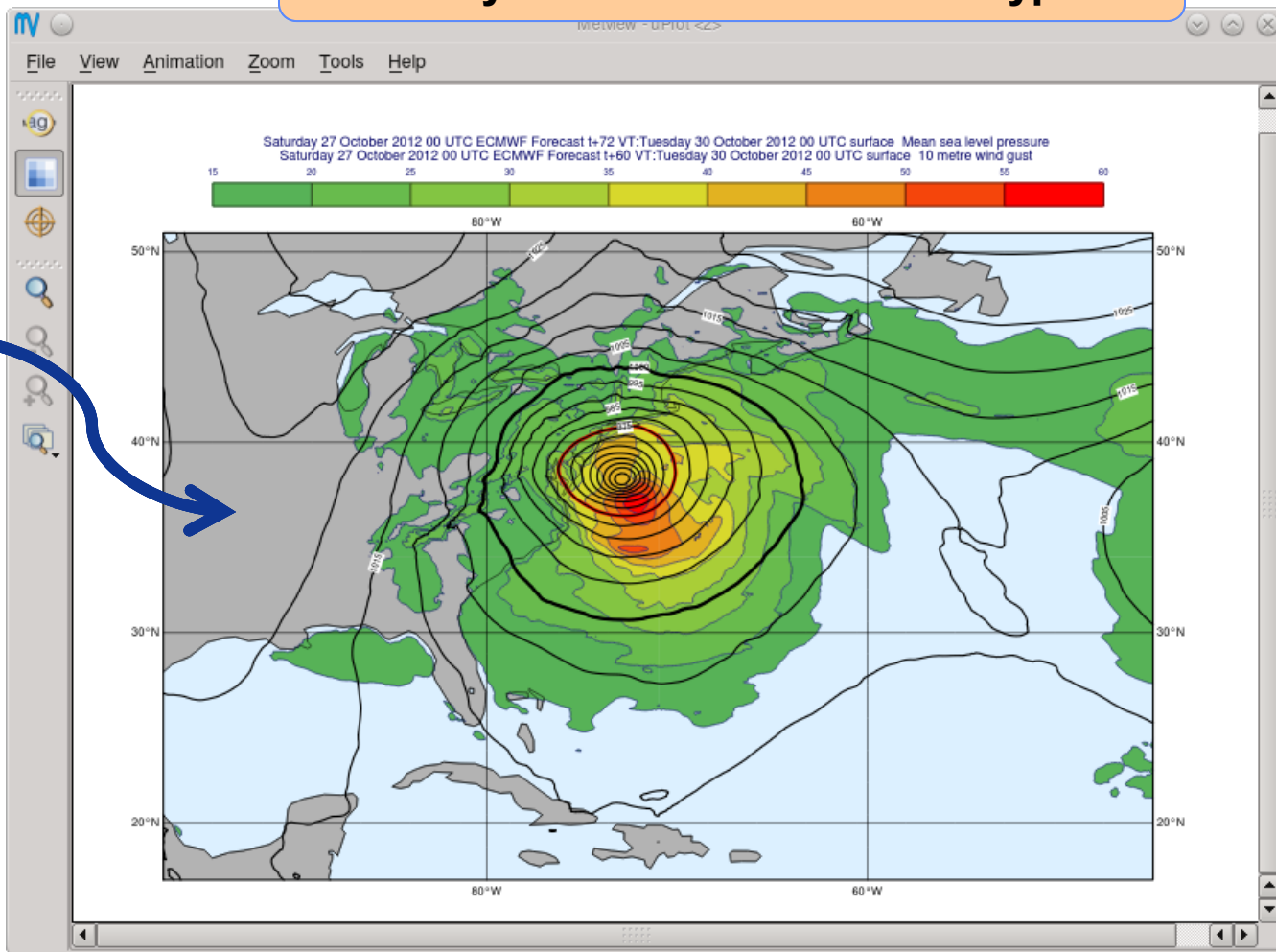


mstp_975

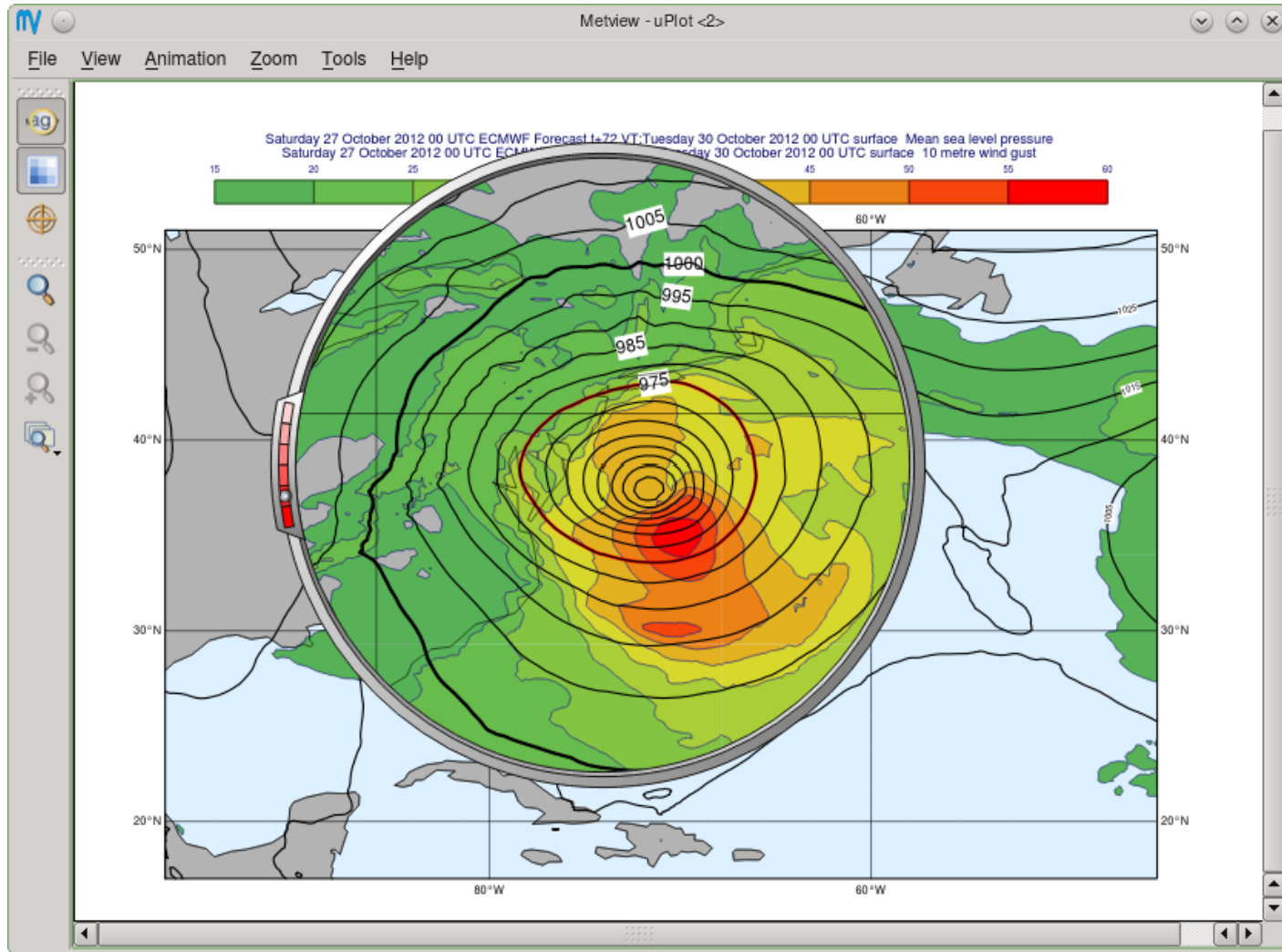


mstp_1000

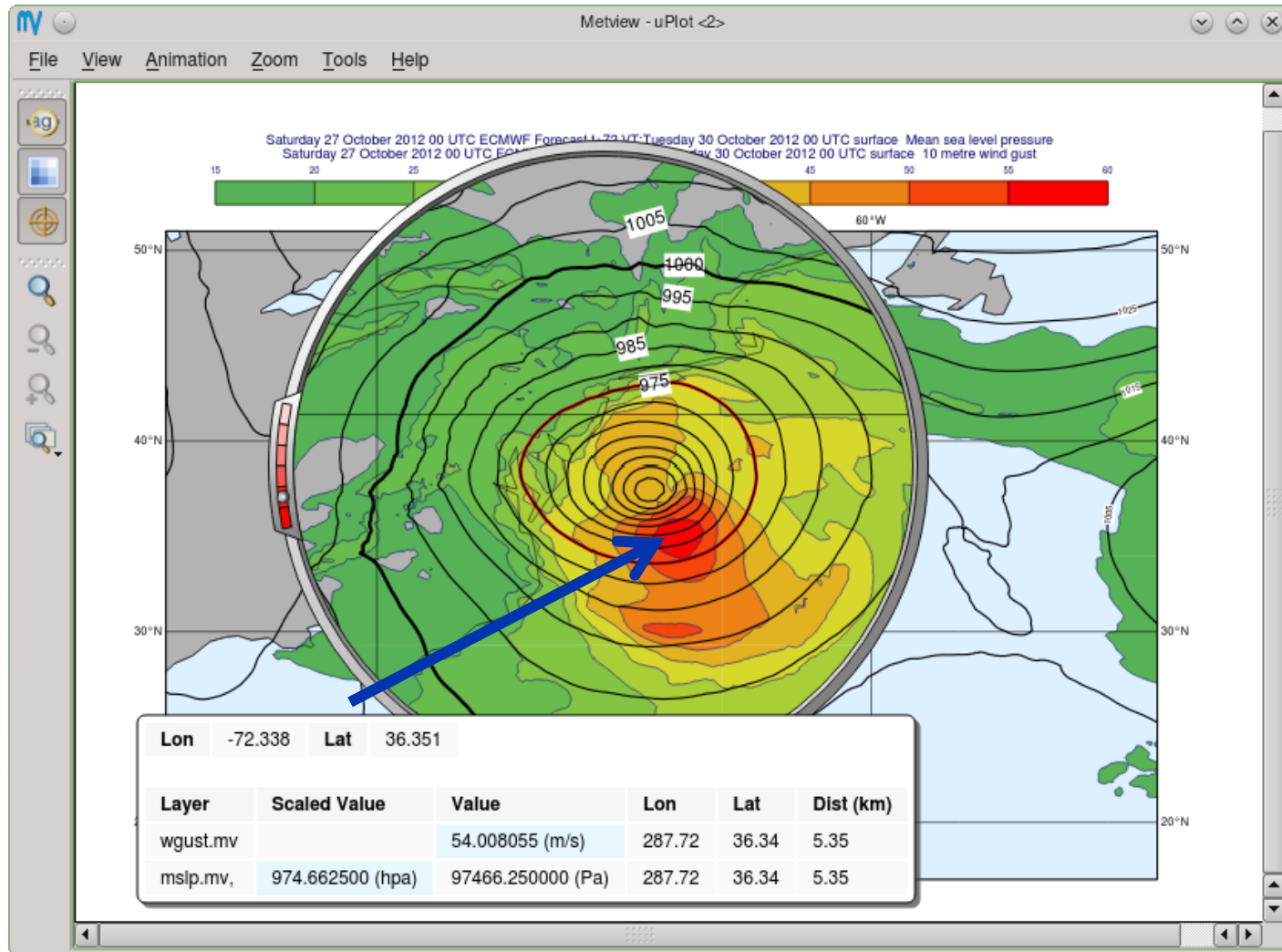
Contouring



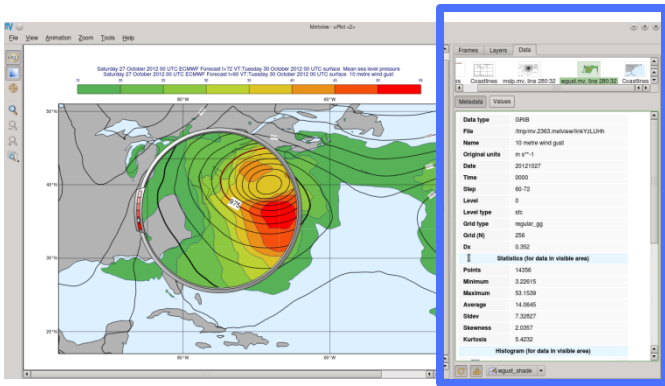
Display Window - Magnifier



Display Window - Cursor Data



Display Window - Layer Metadata



Sidebar with various tabs

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

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

wgust_shade

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 )

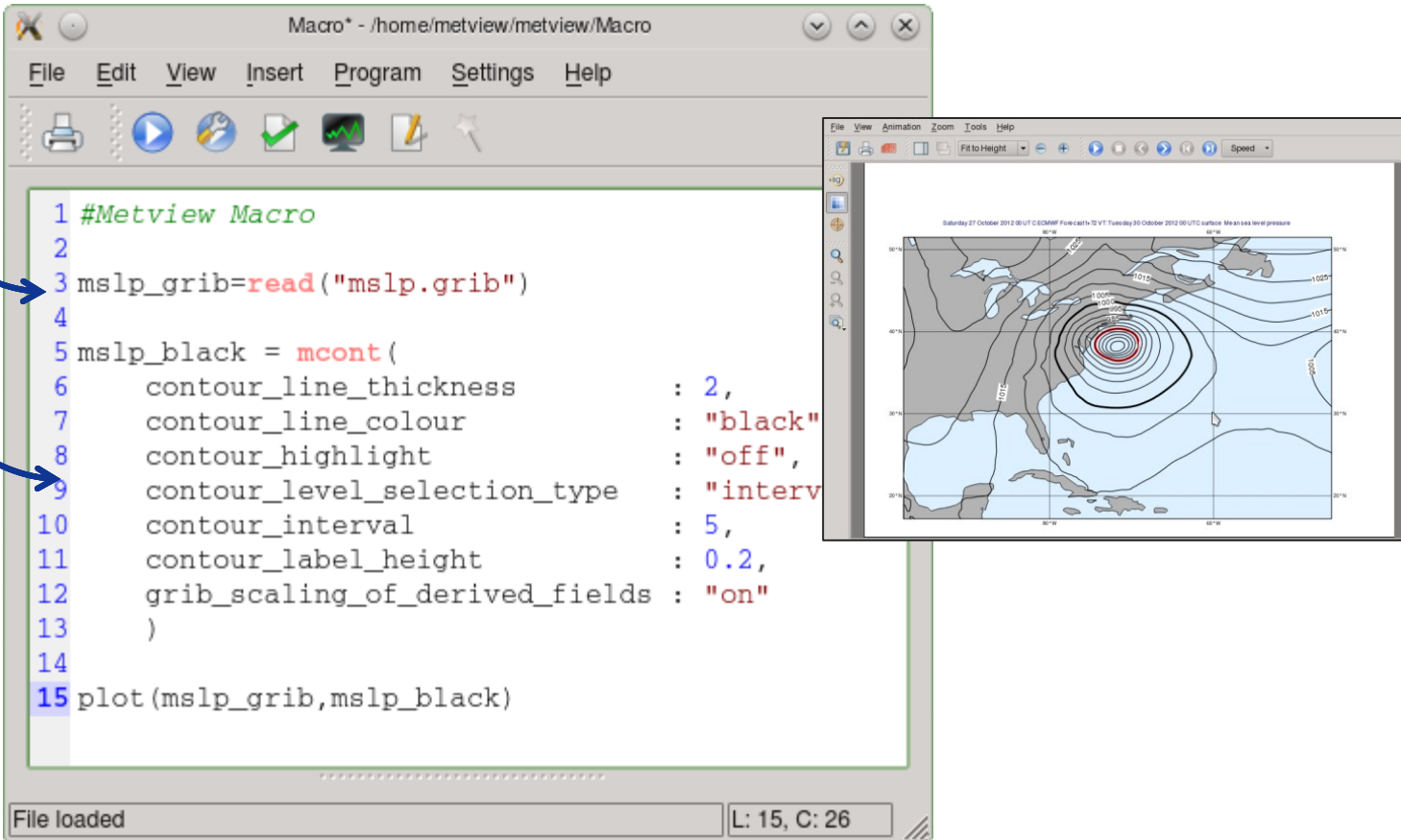
# Save field
write ( "/home/graphics/gradient.grb" , q )

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

Metview Macro drag and drop

Strong synergy between Icons & Macros

- ▶ Every icon can be translated into a Macro command



The image shows a Metview Macro editor window titled "Macro* - /home/metview/metview/Macro". The window contains a macro script with the following code:

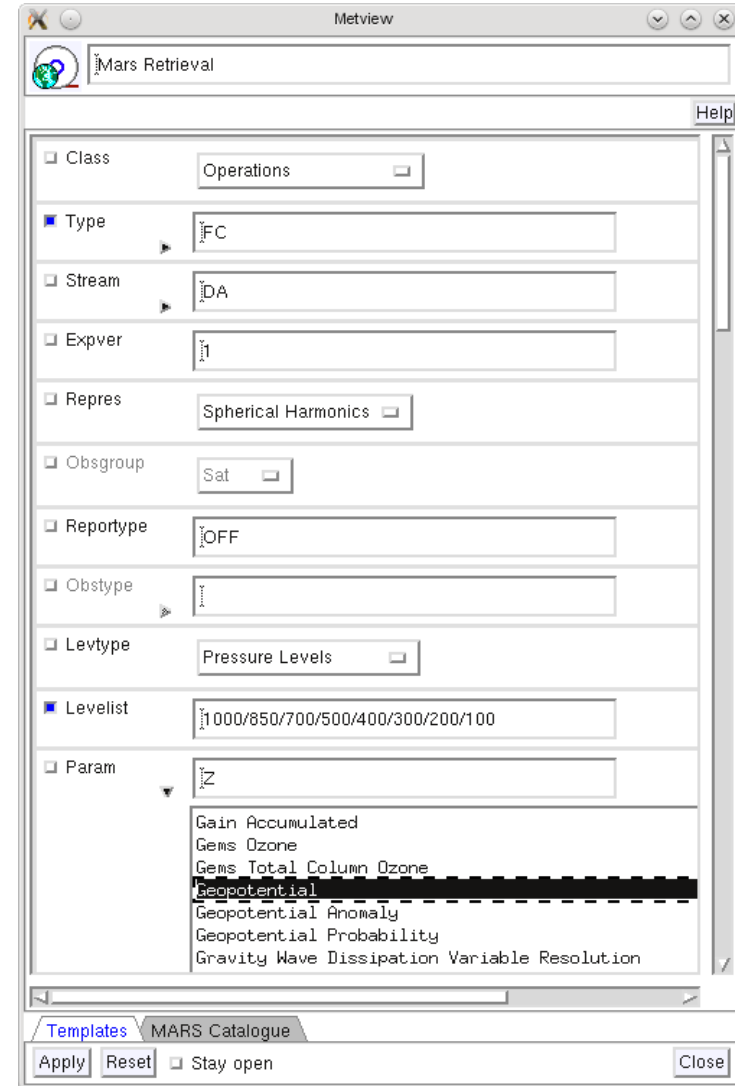
```
1 #Metview Macro
2
3 msslp_grib=read("msslp.grib")
4
5 msslp_black = mcont(
6     contour_line_thickness      : 2,
7     contour_line_colour        : "black"
8     contour_highlight          : "off",
9     contour_level_selection_type : "interv
10    contour_interval            : 5,
11    contour_label_height       : 0.2,
12    grib_scaling_of_derived_fields : "on"
13 )
14
15 plot(msslp_grib,msslp_black)
```

Two icons are shown on the left: a globe icon labeled "msslp.grib" and a pencil icon labeled "msslp_black". Blue arrows point from these icons to the corresponding lines in the macro script. A separate window on the right displays a map of the North Atlantic region with sea level pressure contours, showing a low-pressure system over the ocean.

Metview and MARS



- ▶ **Metview incorporates a MARS client module**
 - ▶ Built from same source code
 - ▶ All processing options are available
- ▶ **All MARS parameters can be accessed**
 - ▶ Menu in editor is built automatically
- ▶ **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

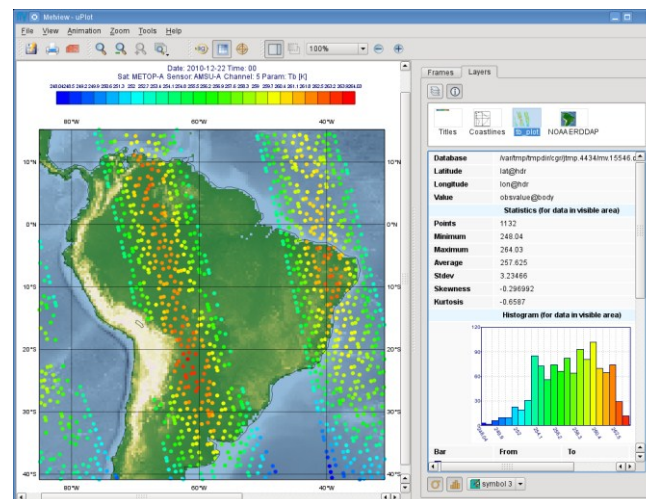
► Supported formats: GRIB, BUFR, ODB, netCDF, GeoPoints

► Statistics of data are shown in sidebar of plot window

► Or through the *Examiners* from the user main interface by *Right click > Examine* or standalone:

`metview -e grib test.grib`

(`-e bufr` , `-e odb`)



Display window with data statistics (right)

The figure shows the Metview - Grib Examiner interface. It includes a message list, file information, meta data (grib_dump), and a log.

Message list (user defined GRIB API key selection)

Index	Date	Time	Step	Param
019	20100301	1200	0	u
020	20100301	1200	0	v
021	20100301	1200	0	z
022	20100301	1200	0	t
023	20100301	1200	0	u
024	20100301	1200	0	v
025	20100228	1200	24	z
026	20100228	1200	24	t

File information

Files: /home/graphics/cg/mview/cg/gribv.grb
Permissions: -rwxr-xr-x. Owner: cg Group: graphics Size: 8.0MB Modified: 2010-03-02 09:59
Total number of messages: 144

Meta data (grib_dump)

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

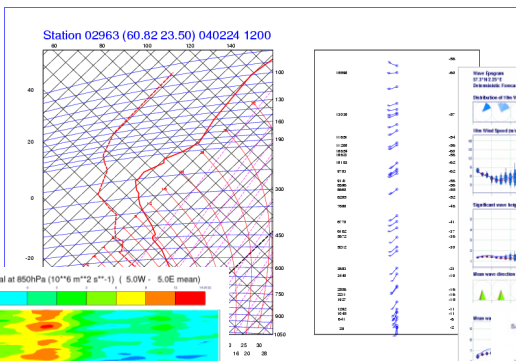
Log

```
Status: OK
Task: Generating WMO-style dump for message: 31
Command: /usr/local/lib/metaps/grib_api/8.4b/cgrib_dump -o -w count=31 "/home/graphics/cg/mview/cg/gribv.grb"
Status: OK
Task: Generating default dump for message: 31
Command: /usr/local/lib/metaps/grib_api/8.4b/cgrib_dump -w count=31 "/home/graphics/cg/mview/cg/gribv.grb"
Status: OK
```

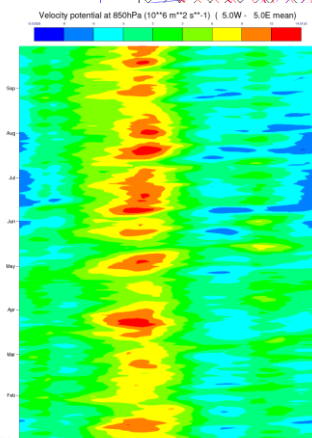
GRIB Examiner

Many more features ...

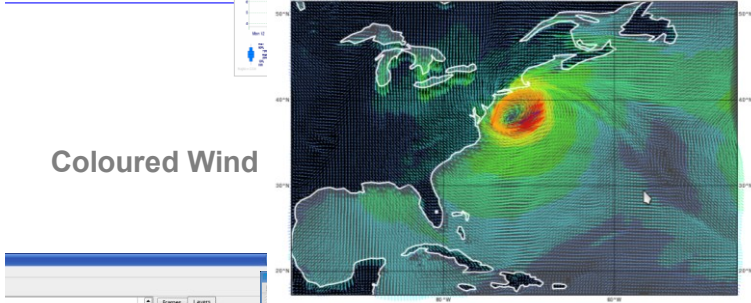
Tephigram



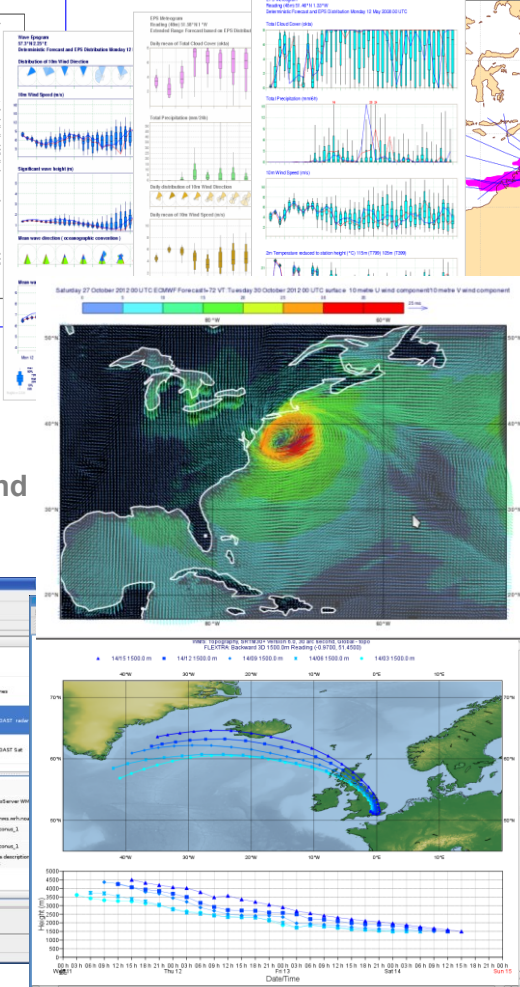
Hovmøller



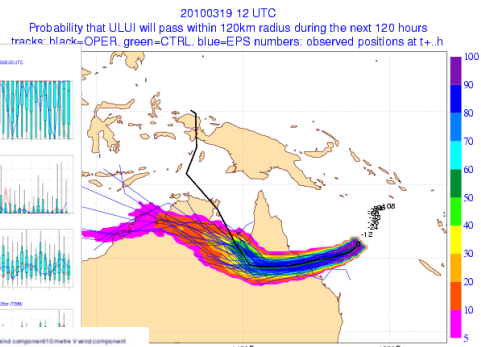
Coloured Wind



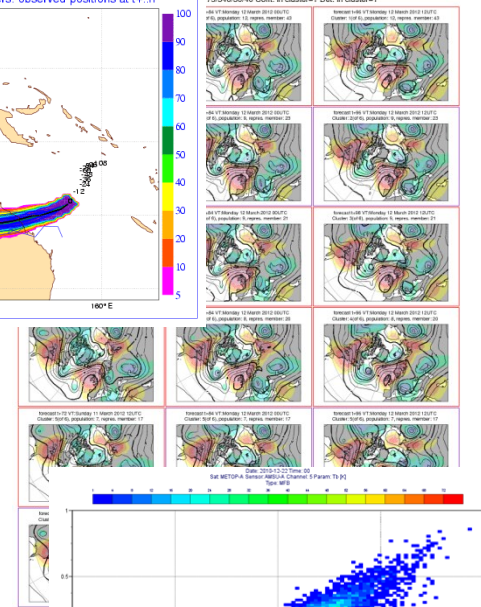
Metgrams



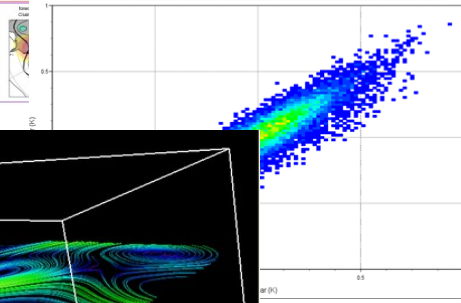
Strike Probability Map



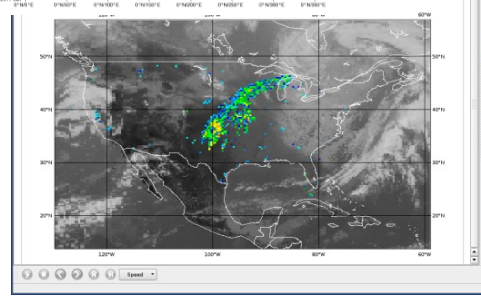
Clusters



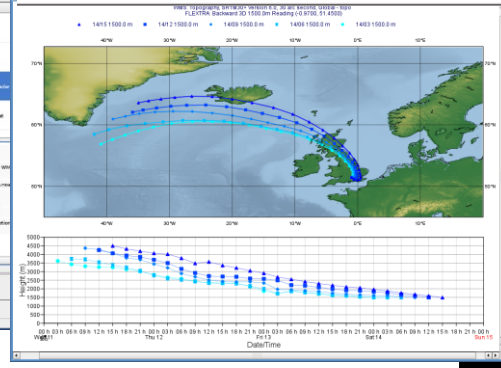
Scatter plots



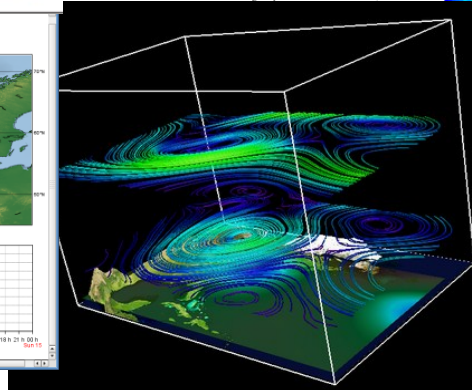
WMS with Satellite and radar by NOAA nowCOAST



Interface with FLEXTRA

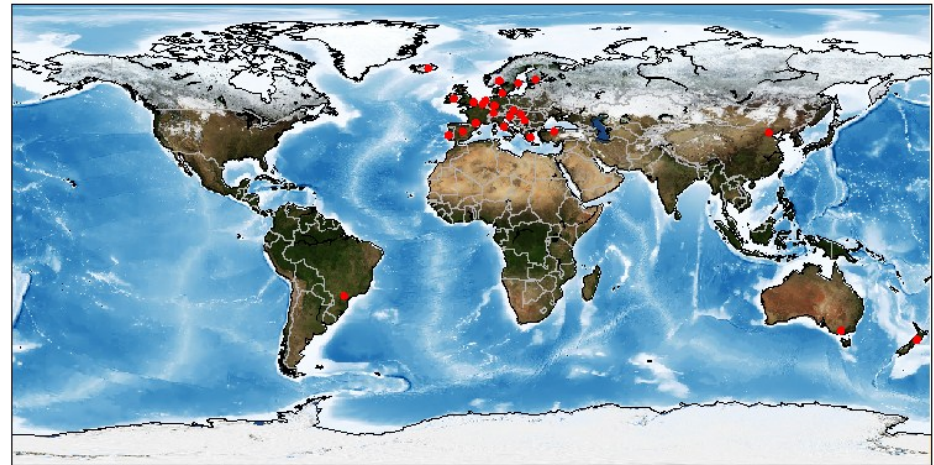


VAPOR interface



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

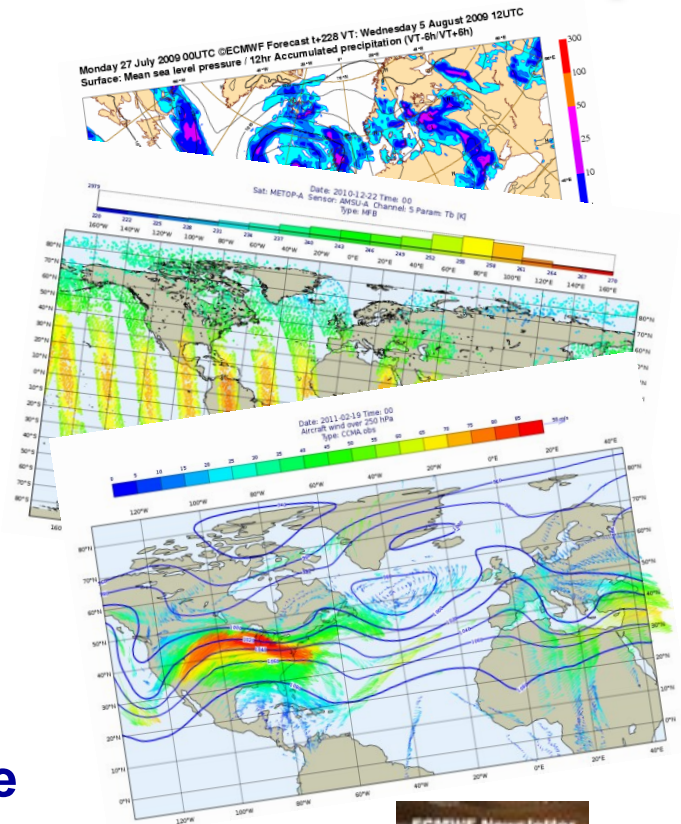
visit our web pages:

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

➤ **Download**

➤ **Documentation and tutorials available**

➤ **Metview articles in recent ECMWF newsletters**



Metview training course at ECMWF, 29 Apr - 02 May 2014