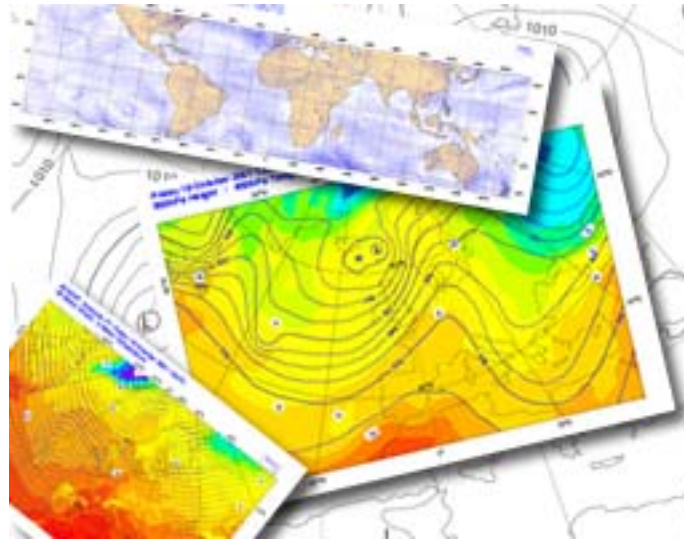# Metview 4
Answering new challenges of increasing volumes of data

Sándor Kertész

Graphics Section
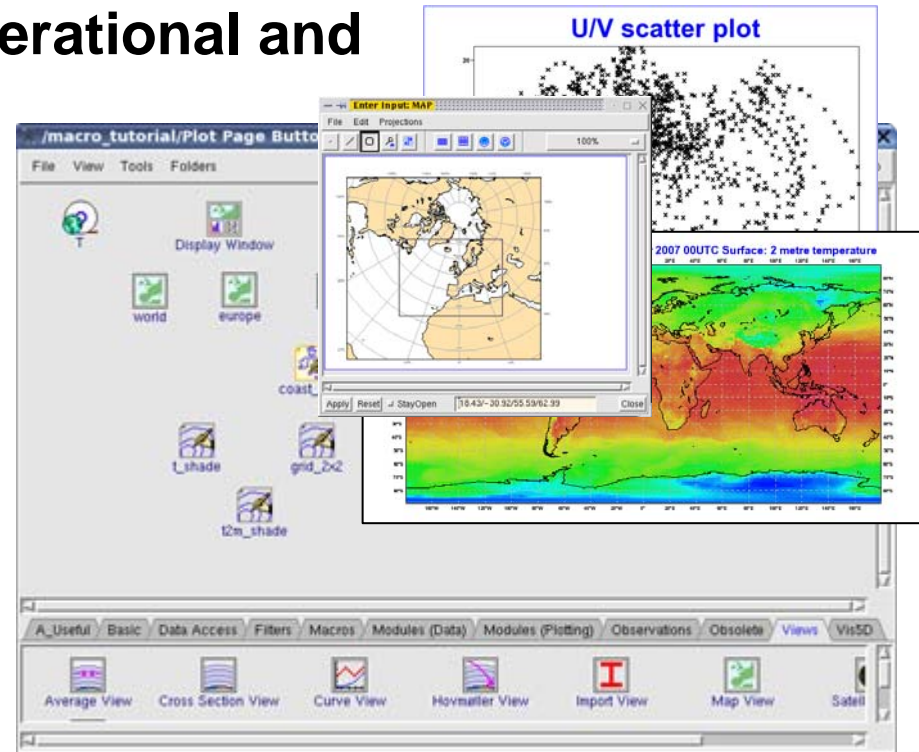
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Metview

- **Working environment for Operational and Research Meteorologists**

- **Co-operative project:**

  - *ECMWF*
  - *INPE/CPTEC (Brazil)*
  - *Météo France*

- **The main focus is now on Metview 4**

  - **Significant changes, a lot of new features**

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Metview in the age of web services?

Now that there is the ability of powerful web services, is there still room for meteorological workstations like Metview? Our answer is: **Yes!**

- **The ever increasing data volume still requires processing speed best achieved by an optimised software**

- **Workstations can offer more tools to analyse and work with data itself**

- **The tool, once installed, is always available and independent of network and other services**

- **We also still need a tool to design the products for the web in the first place!!!**

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Metview 4 - Motivations

- **Offer enhanced tools for:**
  - **post-processing & visualisation of model analysis and forecasts**
  - **observation monitoring**
  - **development of web products**
  - **logging & debugging for operations**
  - **model verification**

- **Better interaction with:**
  - **other libraries (MARS, GRIB API, ODB)**
  - **tools (OBSTAT)**
  - **GIS systems (TerraLib)**

- **Replacement of MAGICS with Magics++**
  - **Offers all features of Magics++**
  - **Enables 64 bit version**

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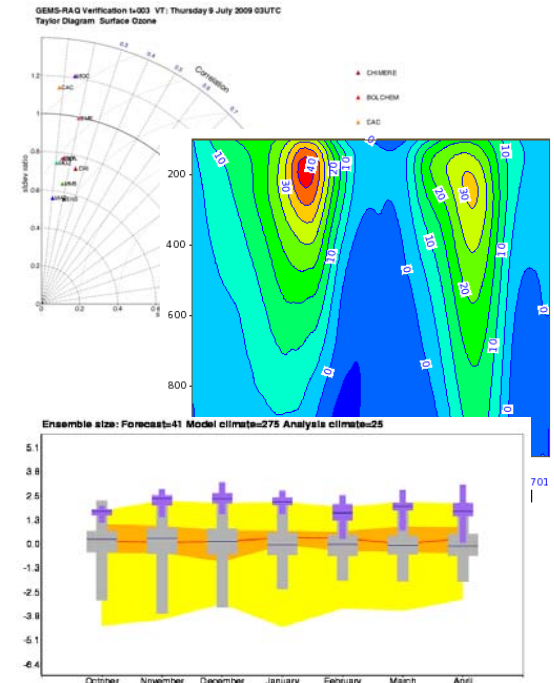
Metview 4 - Development choices


```
# Compute the coriolis parameter
omega = 2 * 3.14 / 86400.
coriolis = 2 * omega * sinlat(grad[1])

# Bitmap the tropics in the gradient fie
trop_mask=mask(grad[1],[15,0,-15,360])
trop_mask=bitmap(trop_mask,1)

for i=1 to count(grad) do
    grad[i]=bitmap(grad[i],trop_mask)
end for
```

- **Metview Macro language has been reviewed and it was decided not to change its current implementation**

    - **Keep possibilities open for adding new features**

- **Replacement of Motif with Qt**

    - **New user interface**

    - **New applications**

- **Use Autotools to make installation easier**

- **More functionality to handle netCDF**

- **Implement clients for OGC web services**

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The challenge of increasing data volume

In recent years the amount of data to be handled has increased significantly

- **Large increase in satellite data**
  - **More channels, better resolution**

- **High-resolution NWP models**
  - **ECMWF (IFS): increase from T799 to T1279 meant data volume increase by factor of 2.5. In total: 2,140,704 grid points!**

- **Complex data structures**
  - **1000s of messages in GRIBs, table hierarchy in ODBs**

- **More and more data needed from non-meteorological sources**

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The challenge of increasing data volume (2)

What we can do?

- **Revise how we handle data to make it more efficient (GRIB API, ODB)**

- **Offer tools to quickly comprehend the data and its structure (→ data examiners)**

- **Find ways to visualise data in its complexity (→ layers)**

- **Make more use of various dimensions (→ animations)**

- **Constantly working on optimising batch performance (→ Metview Macro)**

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Metview 4 - Redesigned display module

- **Takes advantage of both Magics++ and Qt**

- **New animation control**

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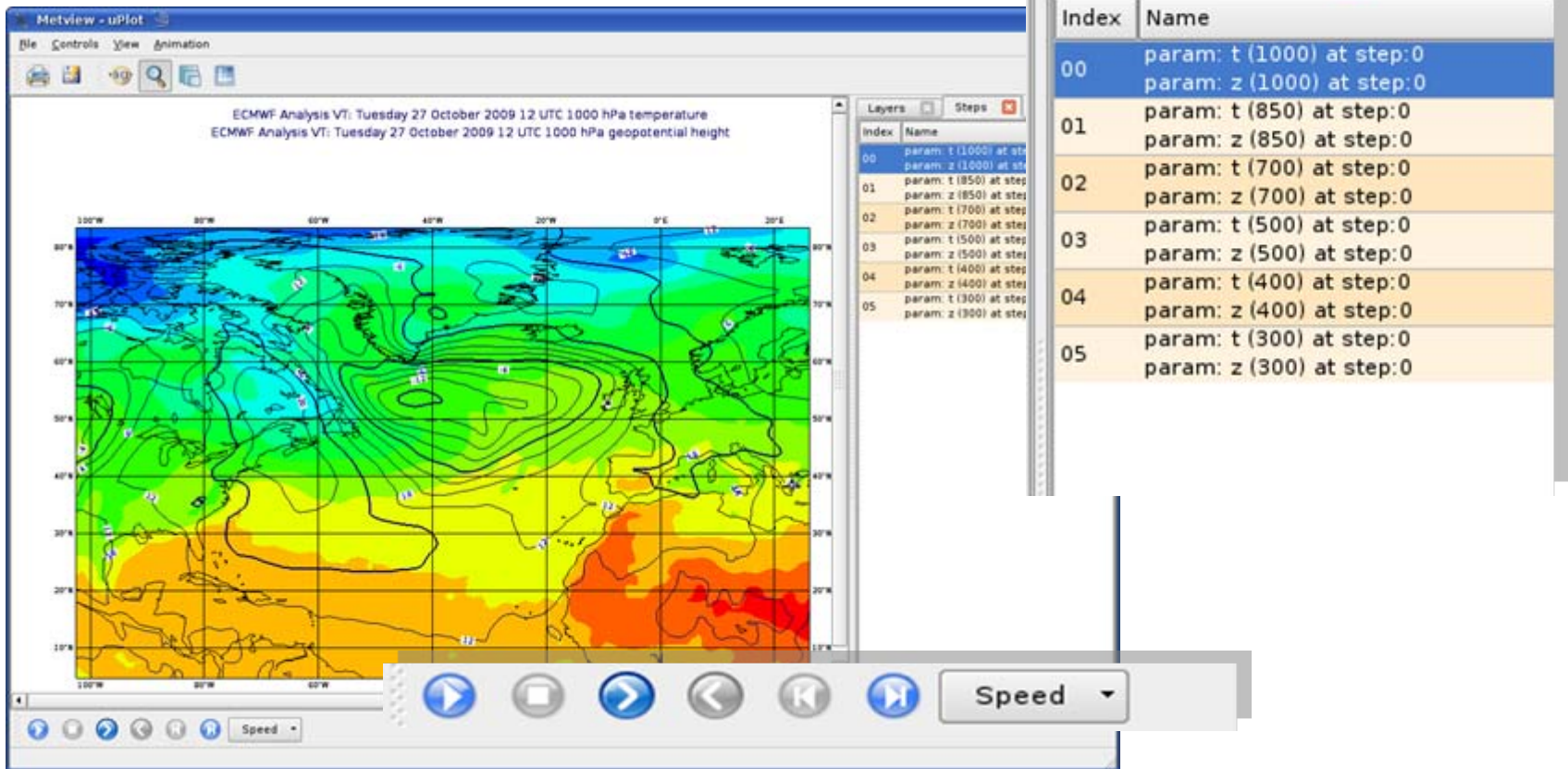
Display module – Layers
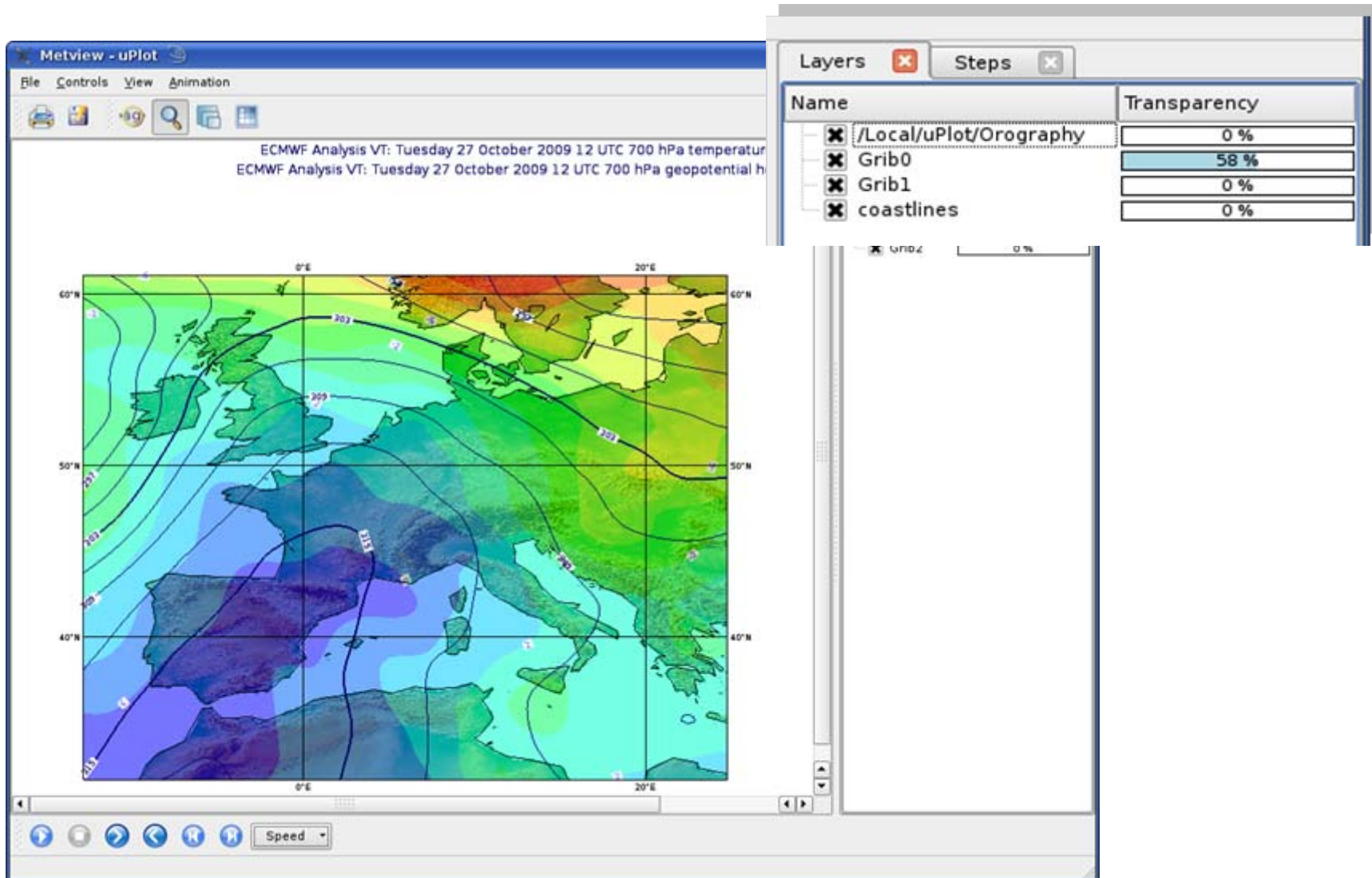
Display module - Magnifier

- **Two modes:**
  - Text magnification
  - Grid point values

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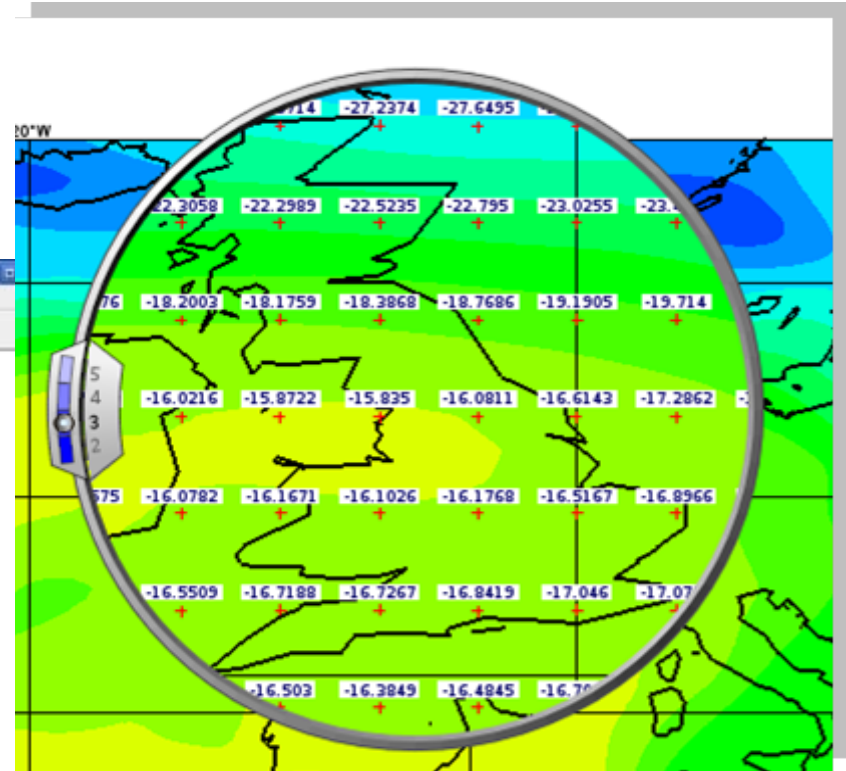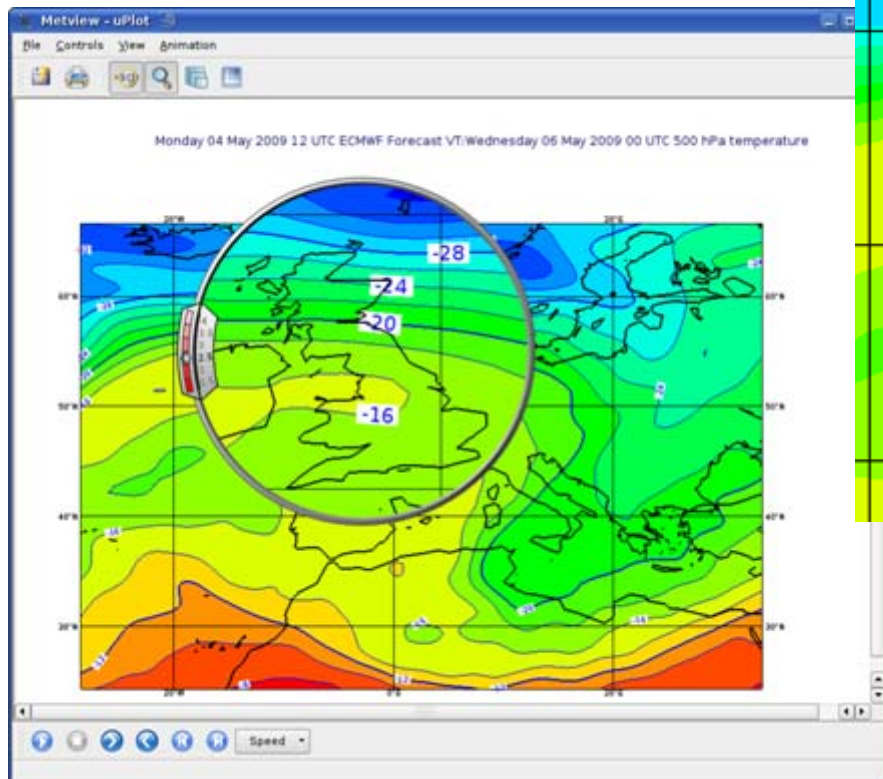
New GRIB Examiner (using GRIB API)

File information

Message list (with user defined GRIB API key selection)

Meta data (grib_dump)

Log

GRIBTool – A new framework

The main motivation is to support observation monitoring at ECMWF

- **OBSTAT at ECMWF produces GRIB outputs with 1000s of messages containing grid based statistics**

- **Users want to quickly:**

  - **analyse file contents**

  - **select and visualize a subset of the messages**

  - **generate and visualize custom products: profiles, histograms, cross sections, etc.**

- **GRIBTool is the newly developed integrated environment in Metview 4 to implement these features**

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GRIBTool: Message list
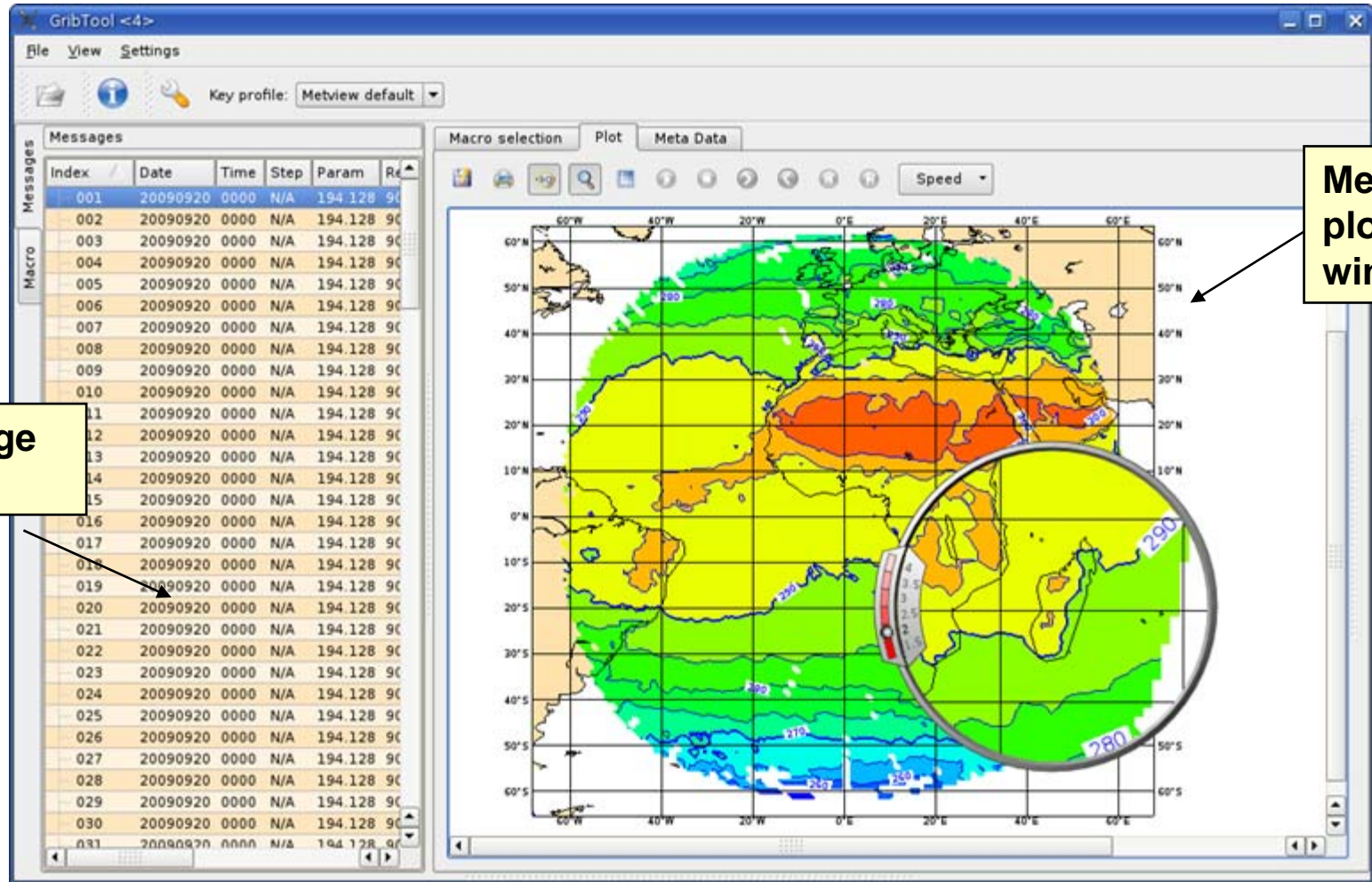
GRIBTool: Macro based GUI
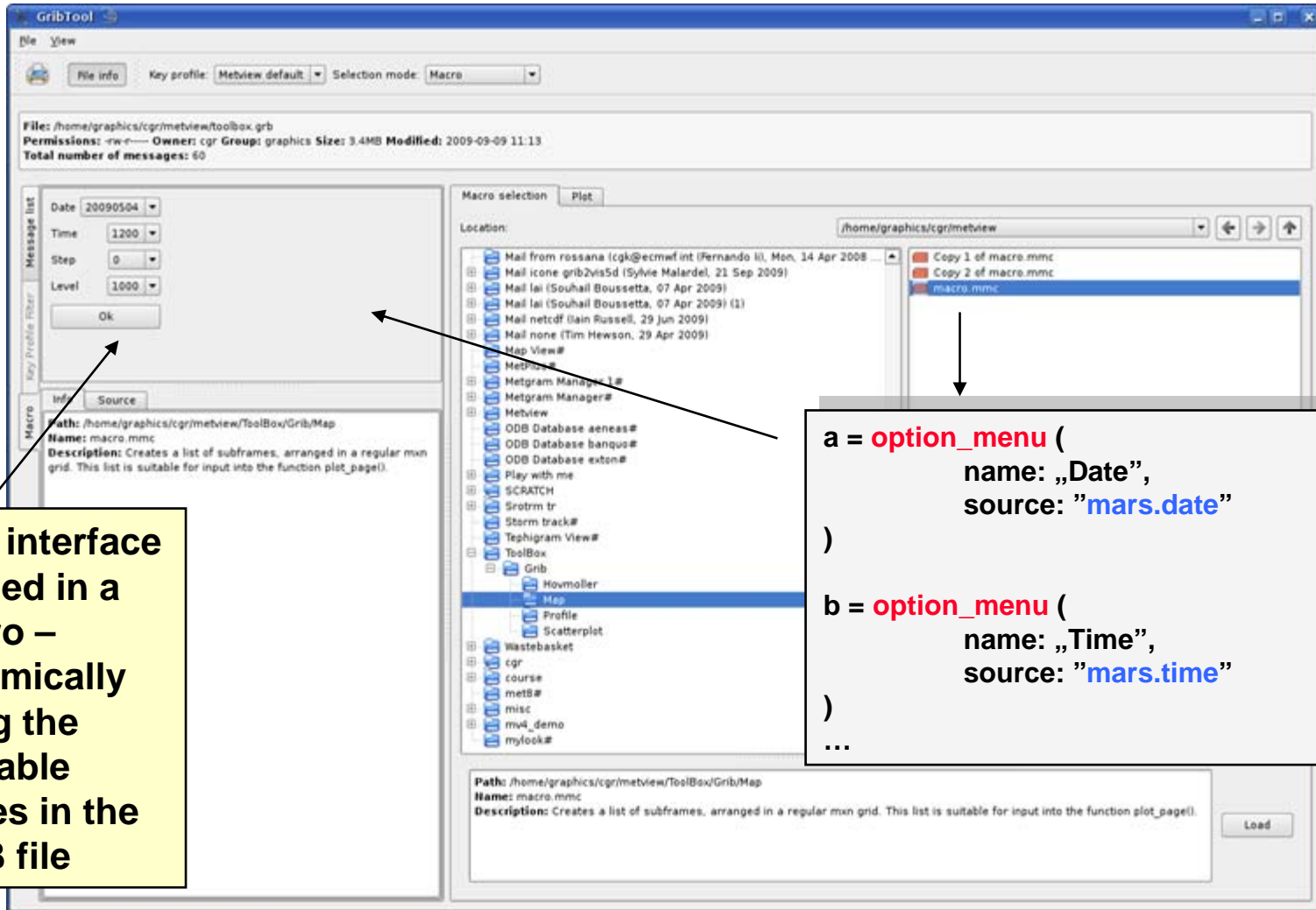
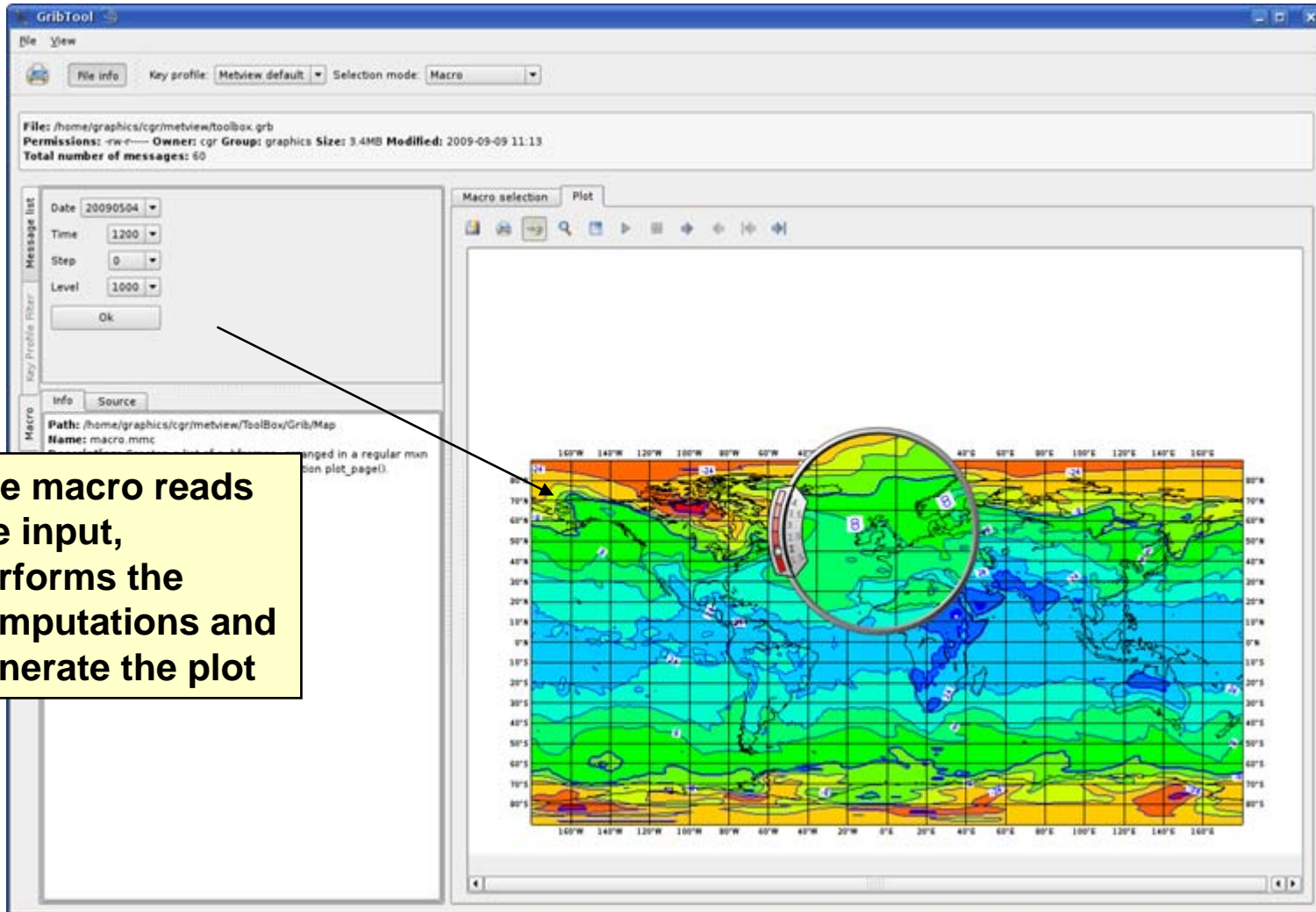**User interface defined in a macro – dynamically using the available values in the GRIB file**

```
a = option_menu (
        name: „Date",
        source: "mars.date"
)

b = option_menu (
        name: „Time",
        source: "mars.time"
)
…
```

GRIBTool: Macro based GUI (2)

The macro reads the input, performs the computations and generate the plot

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GRIBTool

- **It can be used for <u>arbitrary</u> GRIB files (not limited to OBSTAT output)**

- **It is built from reusable software components:**

  - **Shares embedded features from the Display module, GRIB Examiner, Macro module, etc.**

  - **It will ease the development of similar tools**

- **Similar tools will be developed for all the other formats supported by Metview (BUFR, ODB, netCDF etc.)**

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ODB related developments

- **ODB: Observational DataBase (developed at ECMWF)**

- **A basic ODB interface (interactive and batch) is available in Metview3/Metview4**

- **Currently only available internally**

- **The ODB interface comprises two new icons:**

  - **ODB Database icon**

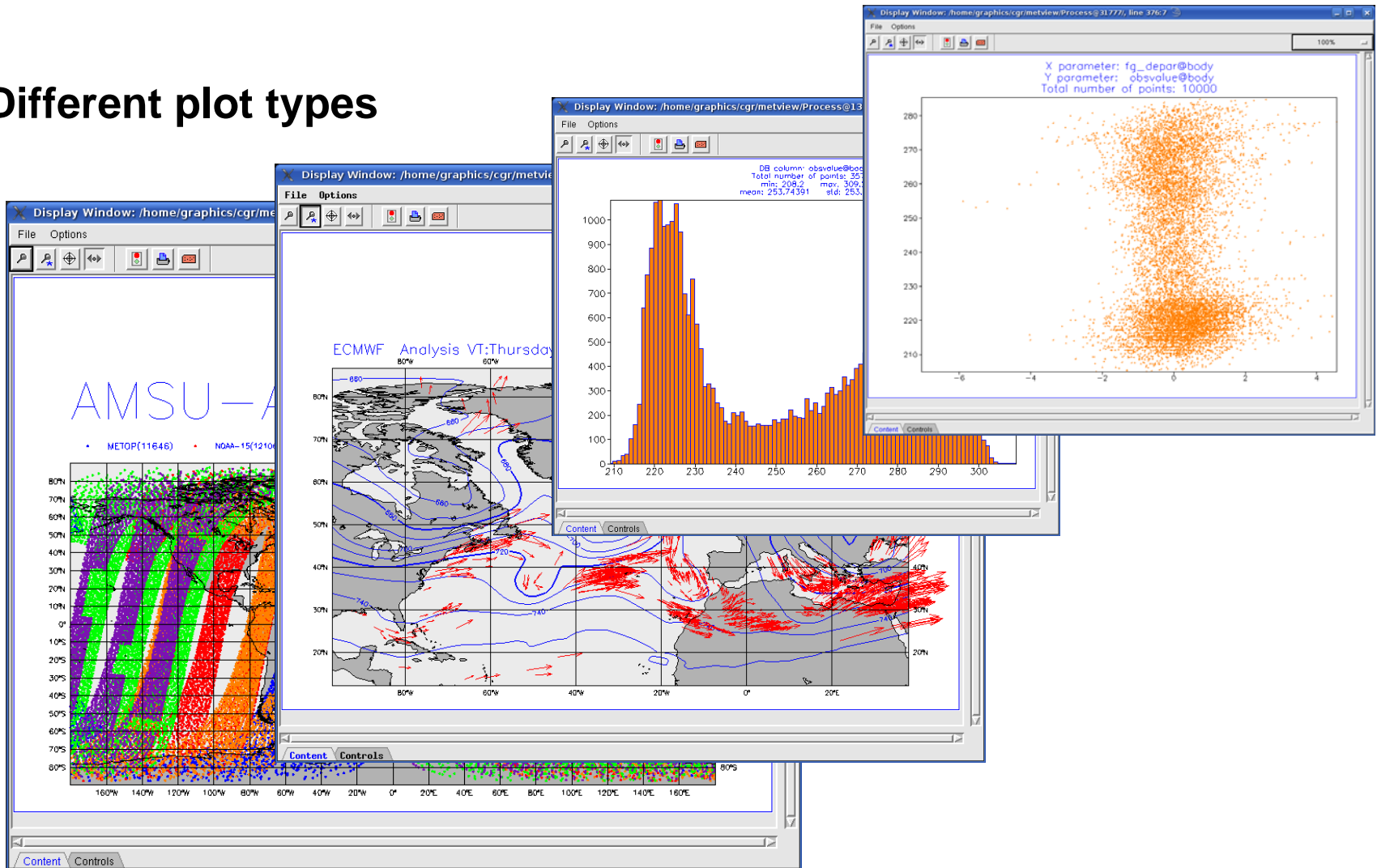

  - **ODB Access icon (defines the ODB/SQL query)**


```
SELECT lat, lon, obsvalue

FROM hdr, body

WHERE

    obstype = $AIREP and

    status.active@hdr = 1 and

    varno = $t
```
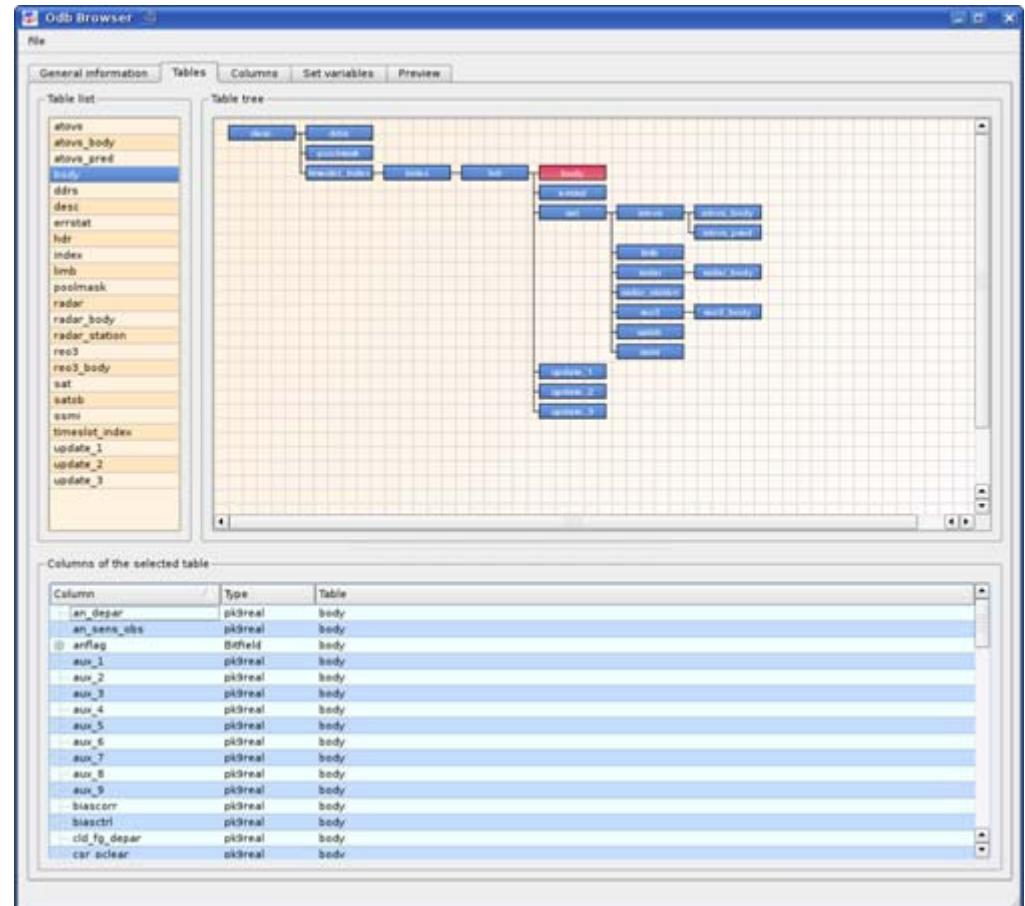
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ODB visualisation in Metview

- **Different plot types**
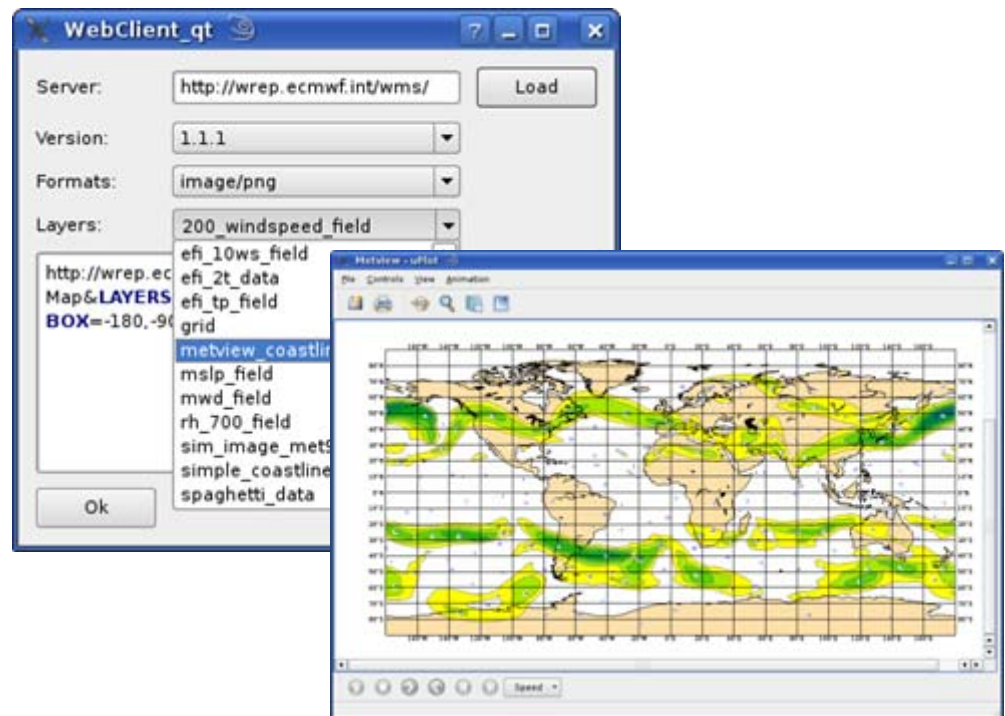
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ODB tools in Metview

- **The ODB Examiner allows the fast analysis of the metadata contents of an ODB**

  - **Data structure is shown graphically**

- **ODBTool (similar to GRIBTool) is being developed**

OGC standards in Metview

- **ECMWF is committed to investigating the use of OGC standards and (web) services**

- **Metview 4 supports KML/KMZ as output format**

- **Current developments concentrates on WMS**

  - **Metview 4 as client enables users to integrate maps from other providers**

  - **New user interface is developed to build the GetMap request dynamically (using the information from the GetCapabilities request)**

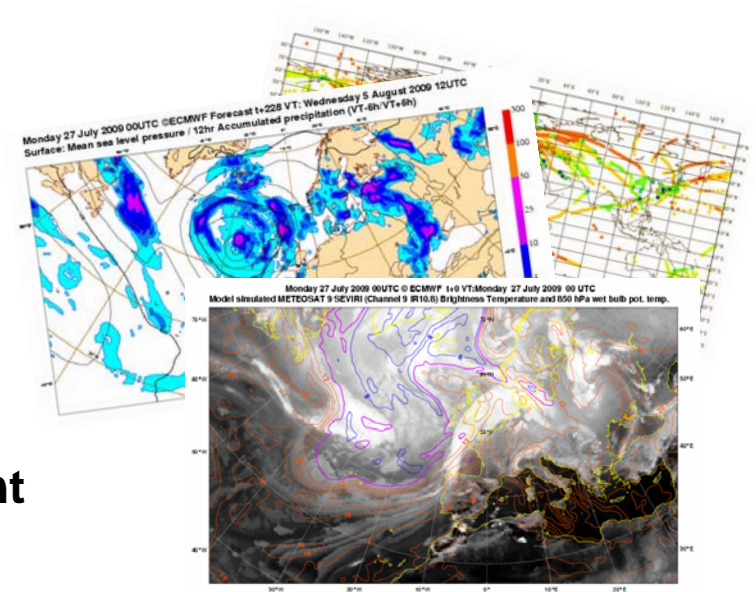**ECMWF**

OGC WMS client in Metview
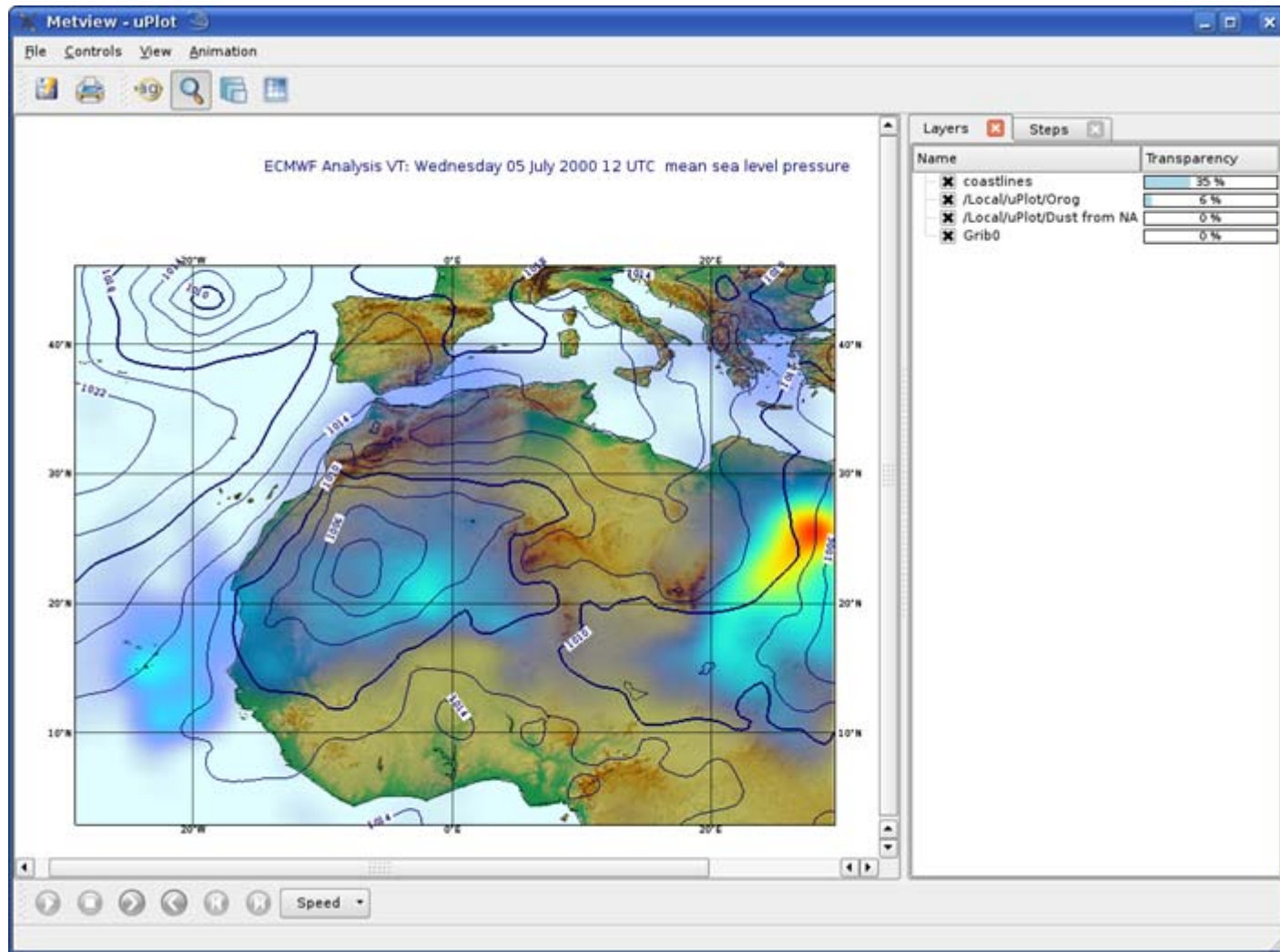
The Last Slide

- **Contact details:**

    - **Metview:** **metview@ecmwf.int**

    - **Magics++:** **magicsplus@ecmwf.int**

    🖰 **http://www.ecmwf.int/publications/manuals/metview/**

    🖰 **http://www.ecmwf.int/publications/manuals/magics/magplus/**

- **See us at the exhibition**

    - **Thursday, 5:00 pm**

    - **Meeting room 1 near the atrium in the new building**