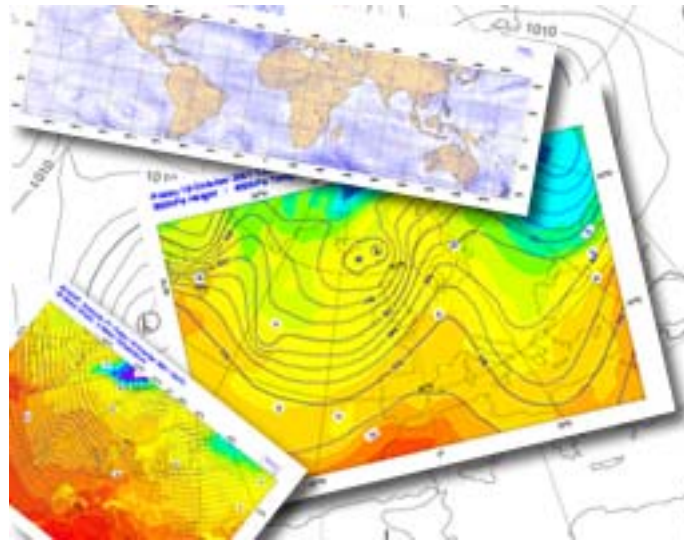


# Magics++ A meteorological graphics library



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*Graphics Section*

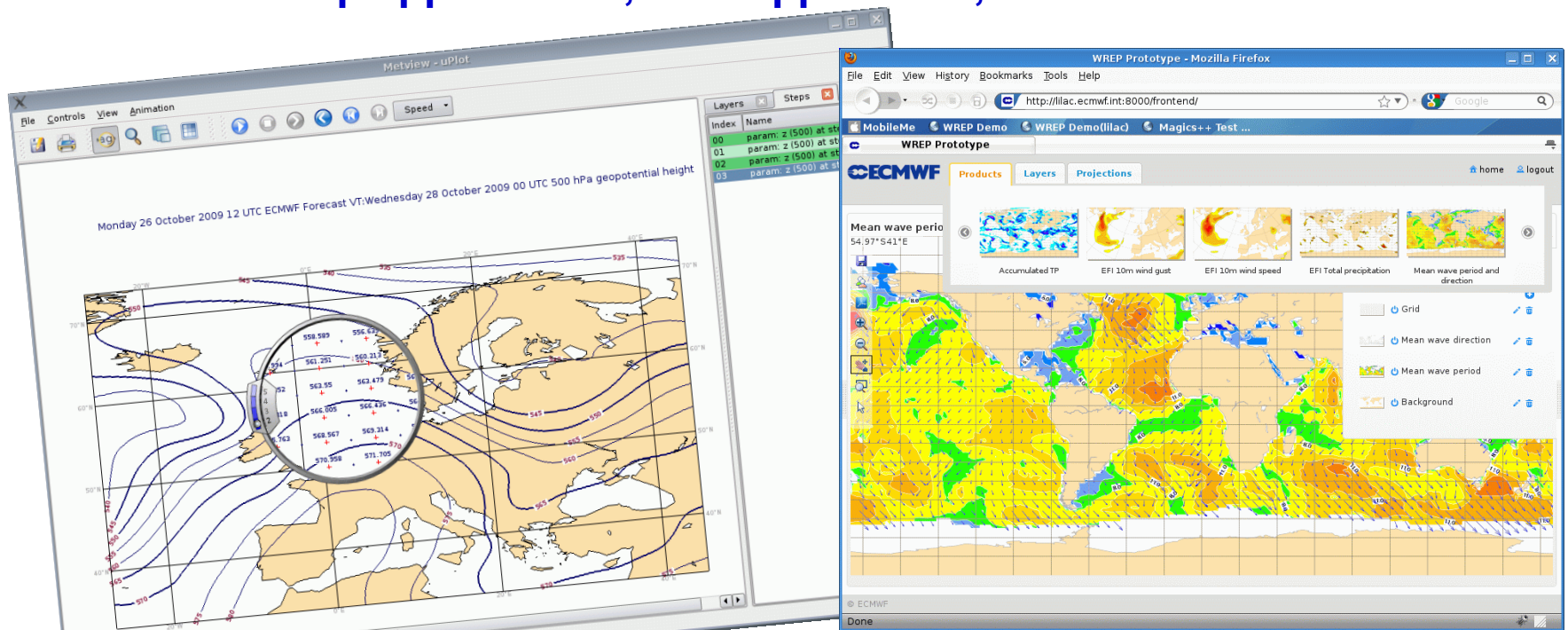
*ECMWF*

## Magics++ enters its consolidation phase...

- **Magics++**, successor of **Magics**, is a graphics library specialized in meteorological plots.
- **Magics++2.8** is now ready for download at :  
<http://www.ecmwf.int/products/data/software/magics++.html>
- It is free under the Apache license.
- **Magics++** is a meteorologically- oriented library, but it is not a standalone application...

# Its modern object-oriented design allows it to be used in the new generation of meteorological workstations: Desktop or Web-oriented!

- ...Magics++ is the visualisation component of a more complex framework.
  - Desktop applications, Web application, WMS ...



# Magics++ is a library !

## Magics++

### your data

#### Gridded data

Forecasts & Analysis fields  
Grib 1&2, NetCDF, matrices

#### Observations

WMO obs & Analysis feedback  
BUFR ODA

#### Misc data

Statistics, polylines  
NetCDF, MapGen, MV Geopoints

### your interface

#### APIs for software

Fortran & C/C++ programs  
Python scripts

#### Metview

Macro & interactive uPlot

#### (Web) Markup

MagML & JSON

### your presentation

#### Printing & Publishing

PostScript EPS PDF  
SVG PNG

#### Meteorological desktop

Metview (uPlot) & Cairo context

#### Web

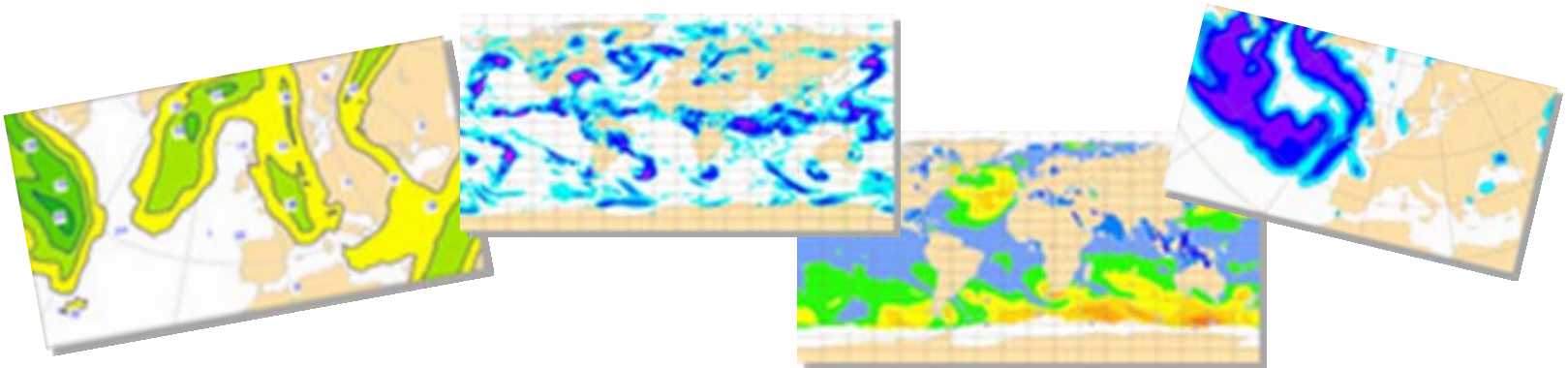
PNG SVG PDF  
+ meta data for JavaScript

#### GIS

KML for Google Earth  
+ PNG for WMS

# Magics++ is meteorologically oriented...

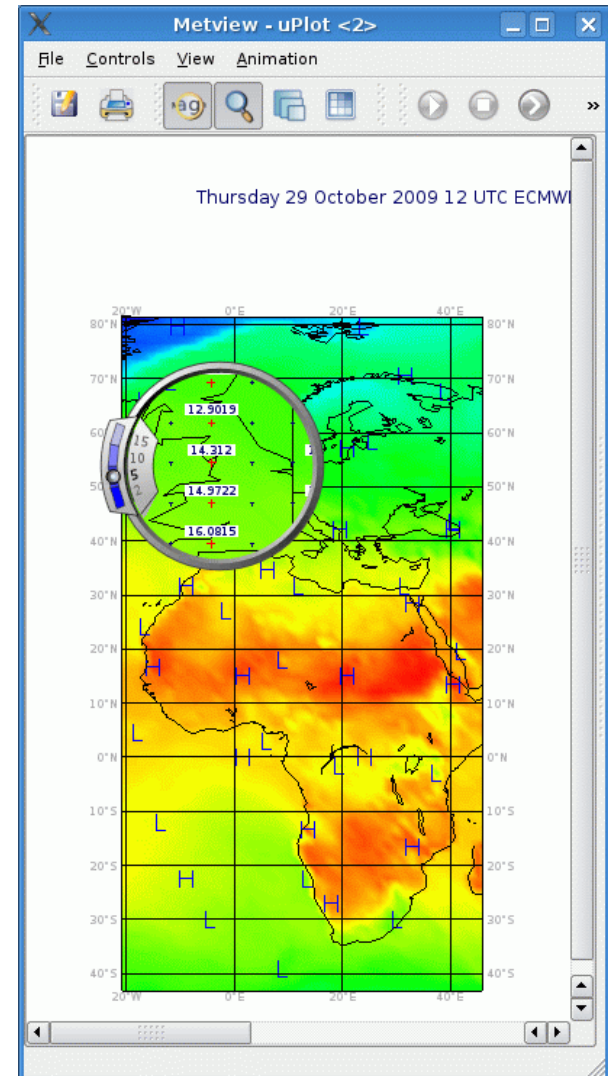
- **Magics++ is a modern meteorologically-oriented software...**
  - **It is able to visualise most of the meteorological data coded in GRIB1/GRIB2 and BUFR formats.**
  - **Its support for netCDF opens it up to the scientific community.**
  - **Work is being done to build a library of typical visualisations for specific meteorological parameters.**



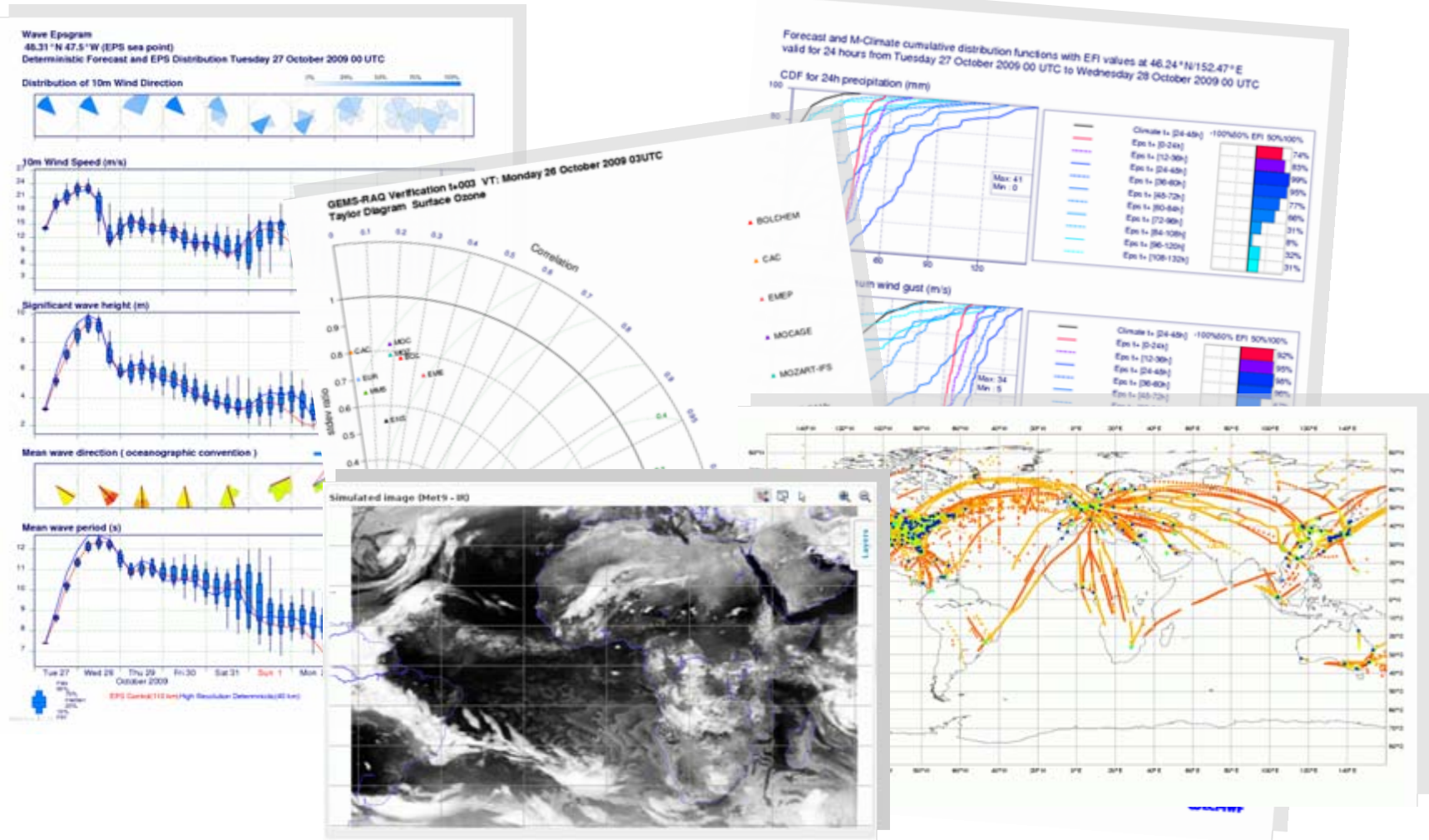
# Magics++ and high resolution data...

## ➤ Magics++ offers solutions :

- Choosing an tailored visual definition
- Tuning the resolution of the input data
- Tuning the resolution of our contouring algorithm ( Akima – INPE/CPTEC)
- It also provides facilities to examine data in depth.



# Magics++ is ready to plug in new types of visualisation...



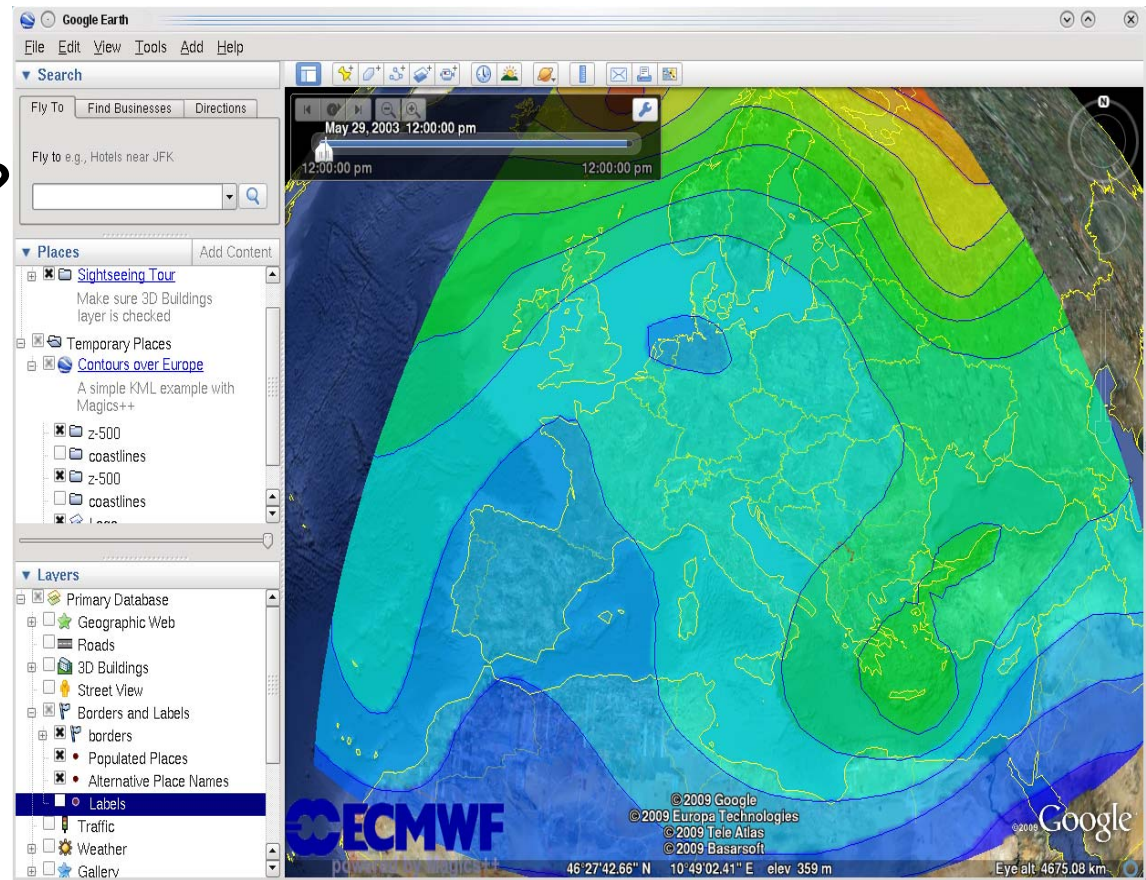
## Magics++ produces high quality outputs

- **Magics++ produces better publication-quality plots by supporting PNG, EPS and by optimising PostScript output**
- **Magics++ uses Cairo to generate PNG and PDF**
- **Magics++ has an enhanced OpenGL driver to fulfil the requirements of Metview 4.**
- **We wrote our own SVG driver to have full control over the output.**
- **We are creating our own meta internal format for speeding the web production.**



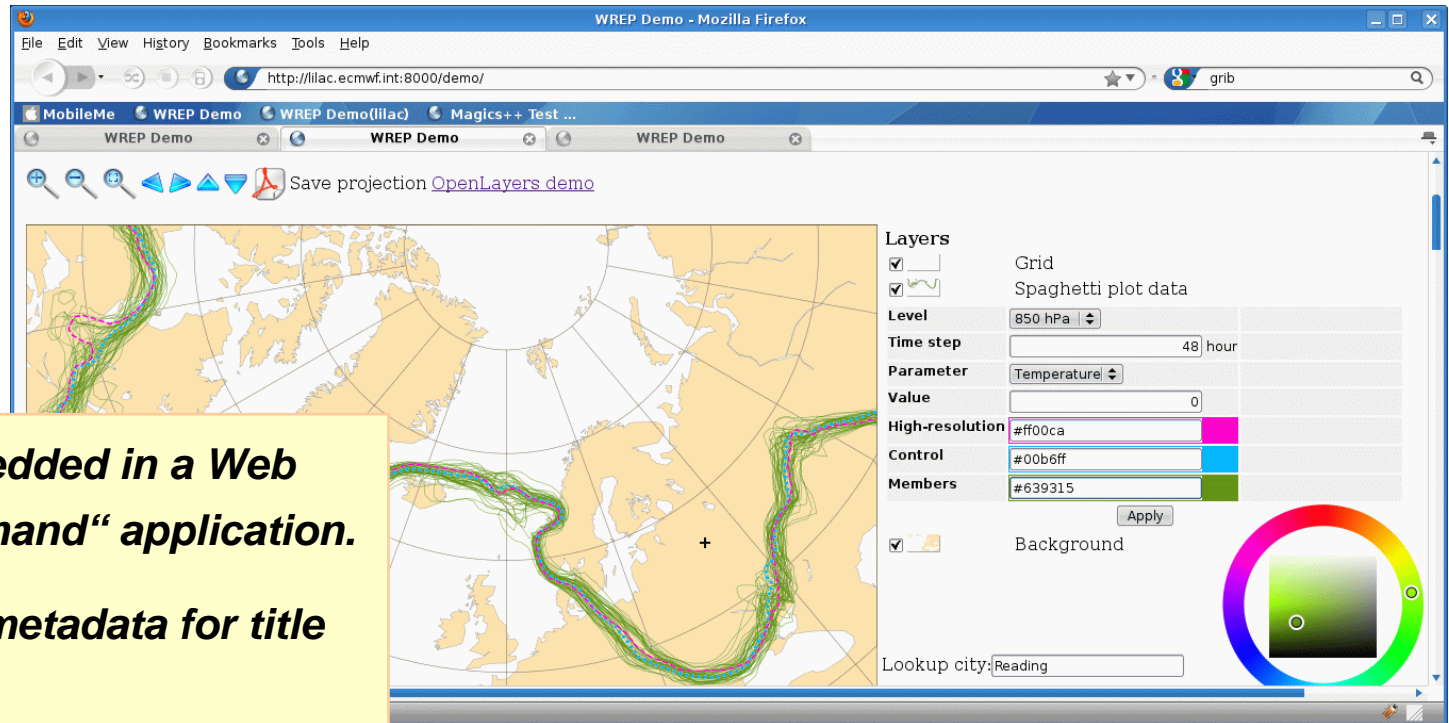
# KML : A very different driver!

- KML and projection?
- Concept of time
- Concept of height
- Concept of layers
  
- Generates OGC compliant KML 2.2



# Magics++ is WEB-aware !

- As a modern software, it knows about the web requirements ...



***-Easily embedded in a Web  
“Plot on demand“ application.***

***-Generates metadata for title  
and legend.***

***-Generates simple javascript  
to enable the navigation of the  
maps ( click-zoom-pan )***

# Magics++: our programming experience...

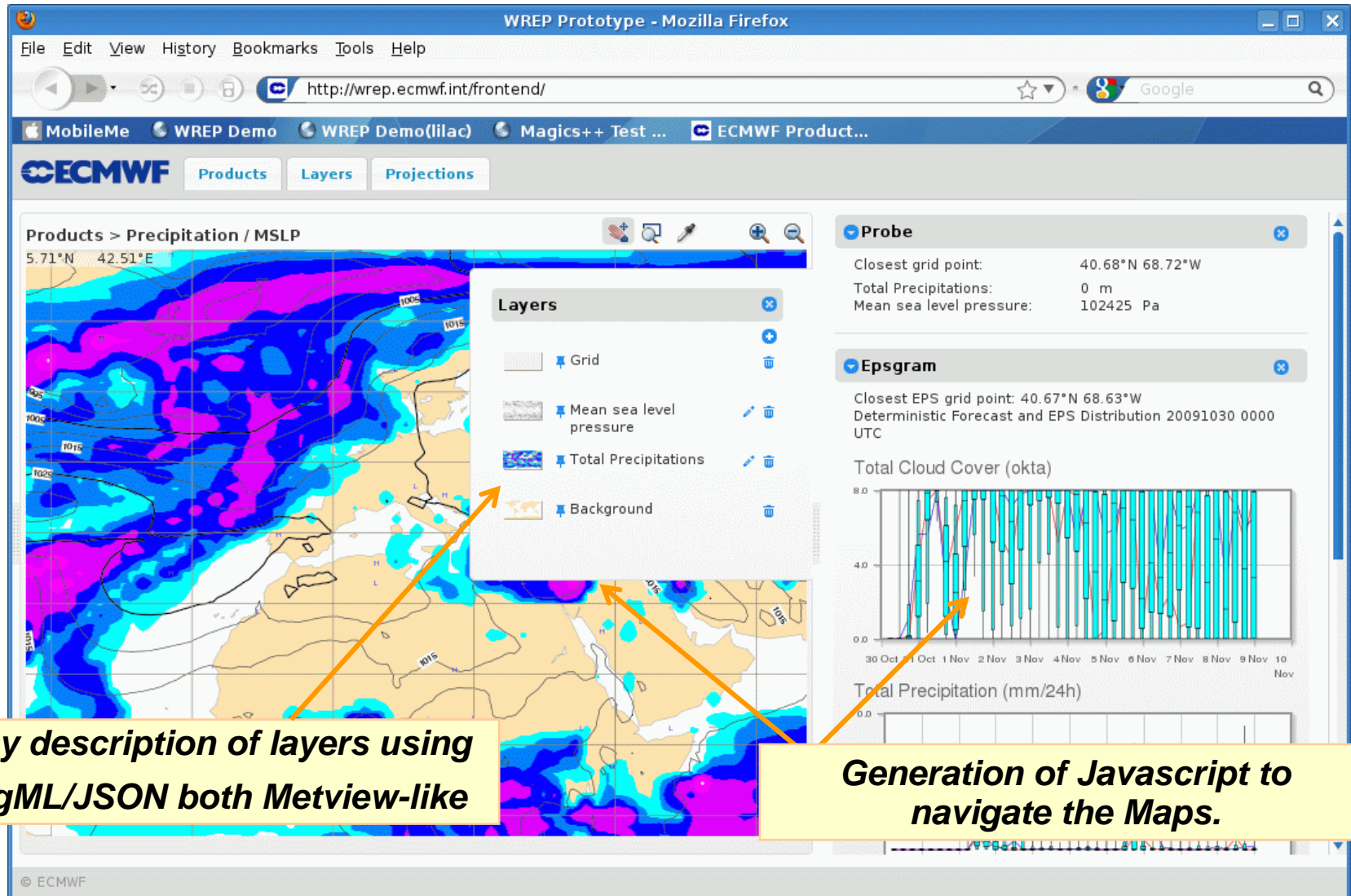
- **Autotools (configure) based installation enables easier spread of Magics++**
  - Users are more confident to update
  - Debian and Fedora community have or plan to package Magics++
- **C++ proved again to be a good choice**
  - Already used in Metview for 15 years
  - Fast, clear structured object-oriented code
  - Only issue: compiler support
- **Cairo**
  - A modern vector graphics library
- **Backwards compatibility**
  - Important in an operational environment, but...
  - Can limit new developments, and slow the developments down.

# Magics++ in the Web era

**Re-engineering the Web system with a view to providing a resilient service with interactive features such as zooming and on-demand production of customised plots for Members States...**

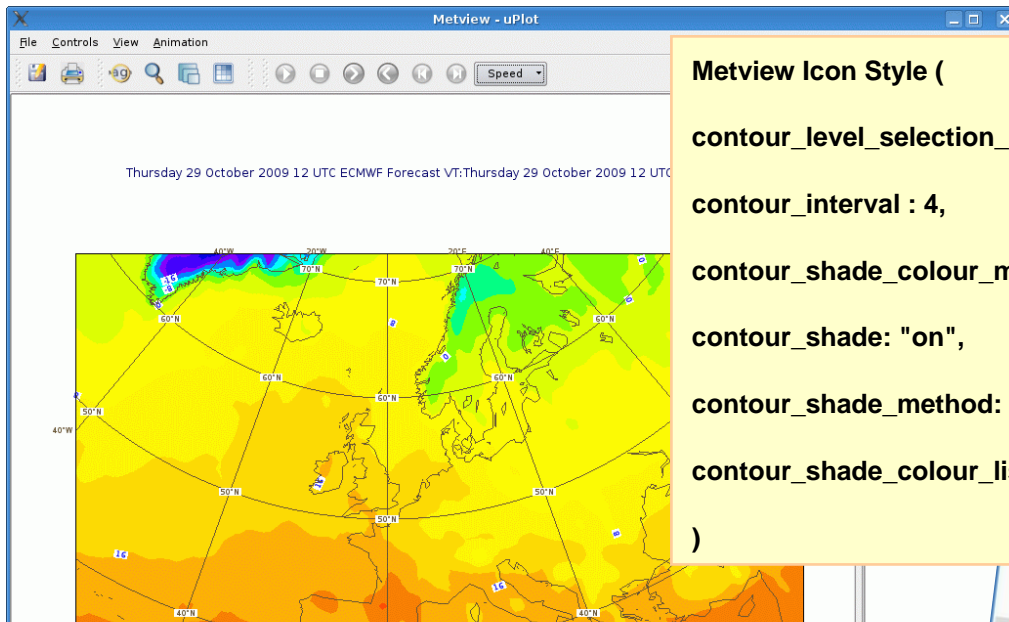
- **Users expectations of web services are increasing**
  - **Large catalogue of products**
  - **High availability**
  - **More interactivity: zooming, panning, customisation of visualisation or computation**
  - **Clickable maps**

# How can Magics++ help?



**Easy description of layers using MagML/JSON both Metview-like**

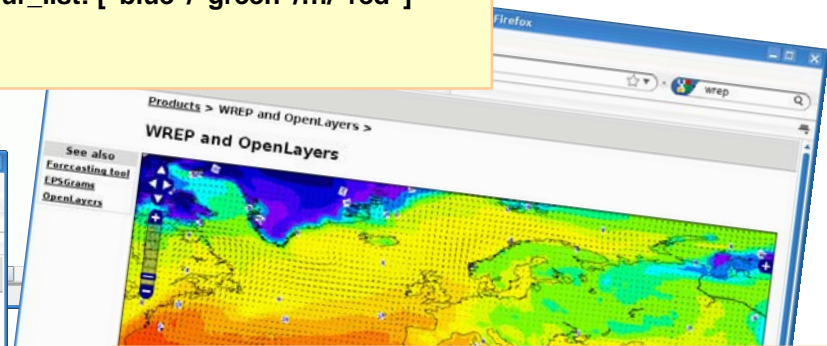
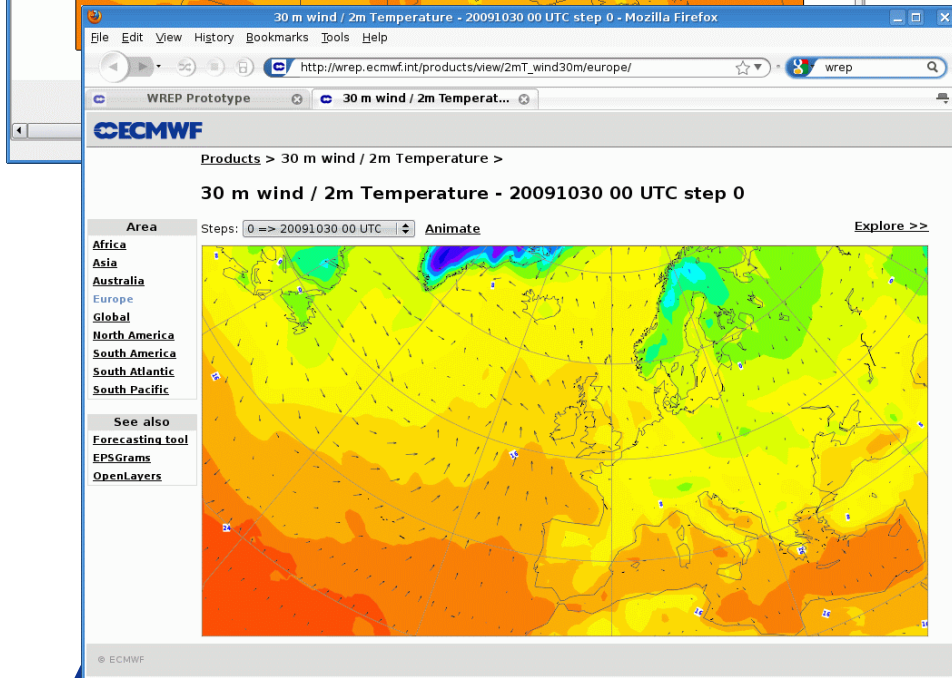
**Generation of Javascript to navigate the Maps.**



```

Metview Icon Style (
  contour_level_selection_type: "interval",
  contour_interval : 4,
  contour_shade_colour_method: "list",
  contour_shade: "on",
  contour_shade_method: "area_fill",
  contour_shade_colour_list: ["blue"/"green"/..."red"]
)

```



```

JSON/ MagML {
  "contour_level_selection_type": "interval",
  "contour_interval" : 4,
  "contour_shade_colour_method": "list",
  "contour_shade": "on",
  "contour_shade_method": "area_fill",
  "contour_shade_colour_list": "blue/green/.../red"
}

```

# Magics++ serving maps for a WMS...

## ➤ Styling

- Fits well for with our Visual Definition concept

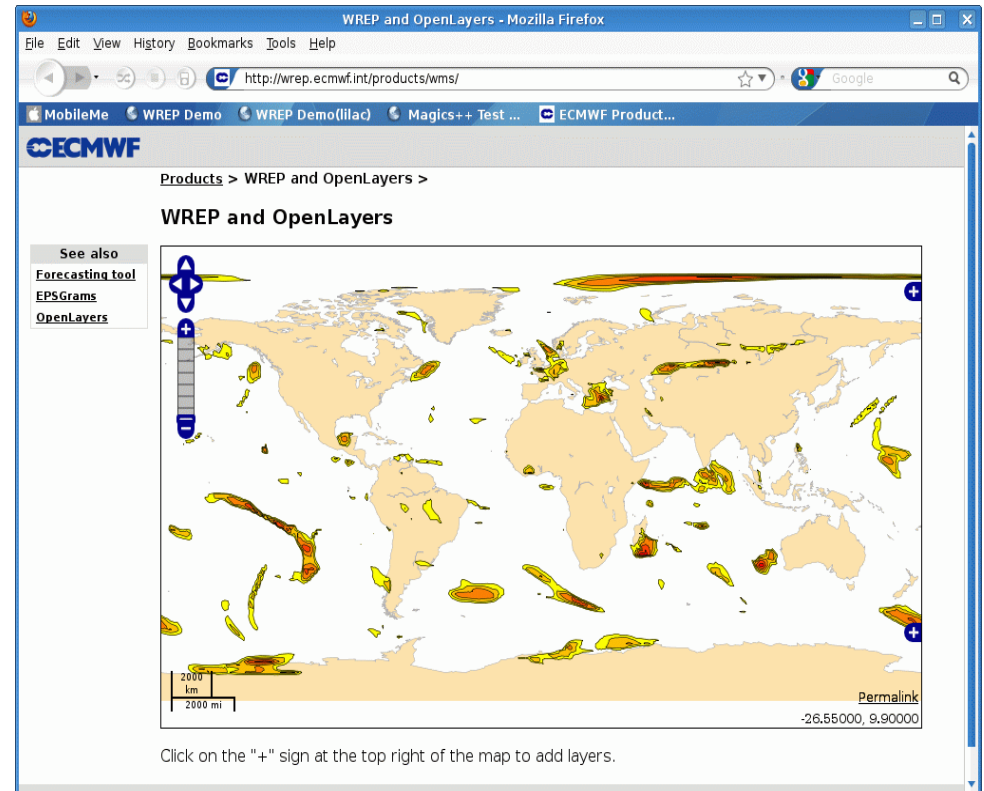
## ➤ Tiling

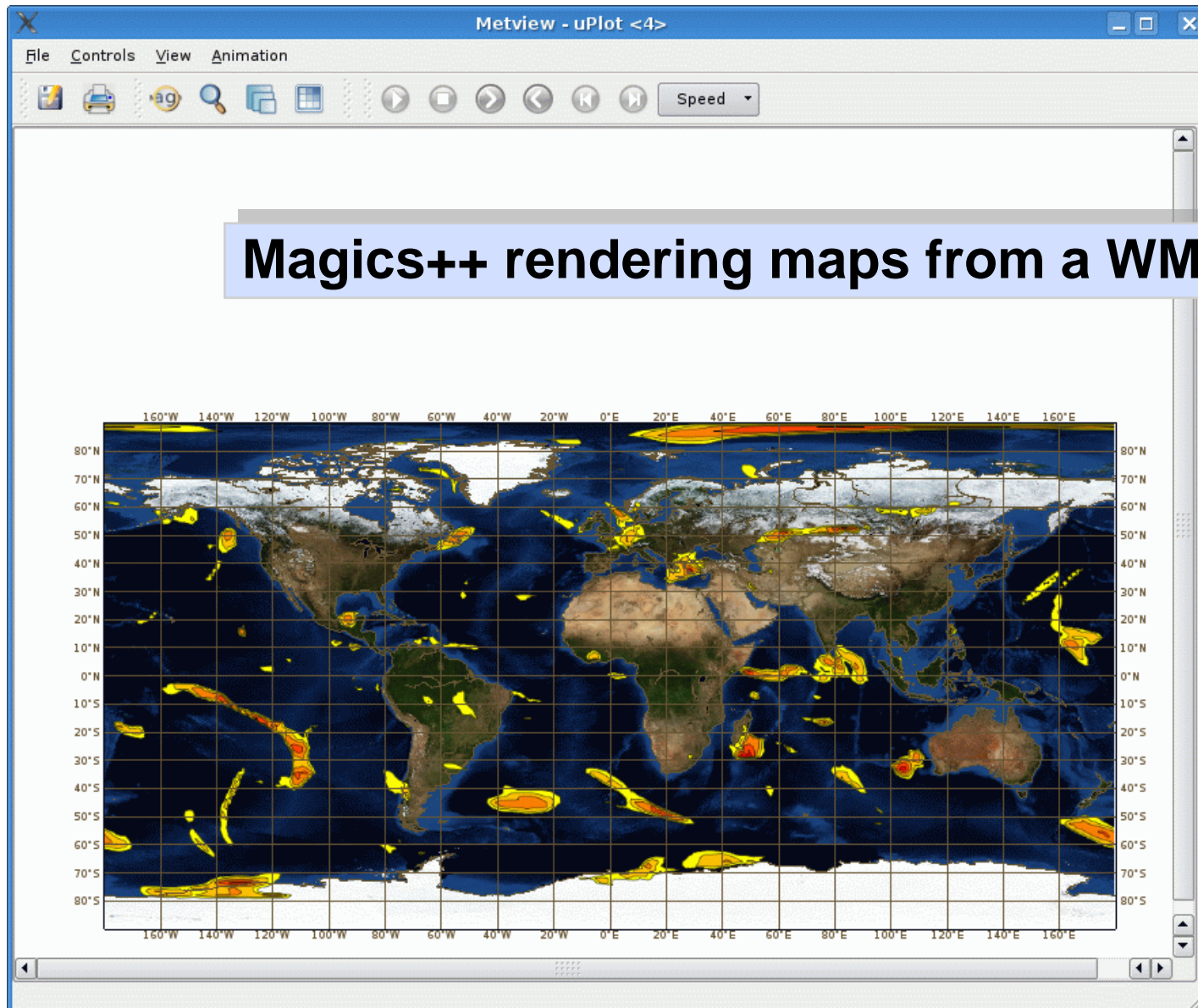
- Can trigger border effects!

## ➤ Projection

- Should be compliant.

## ➤ GetLegendGraphics





Magics++ rendering maps from a WMS...



# Magics++ in action in Metview 4...

