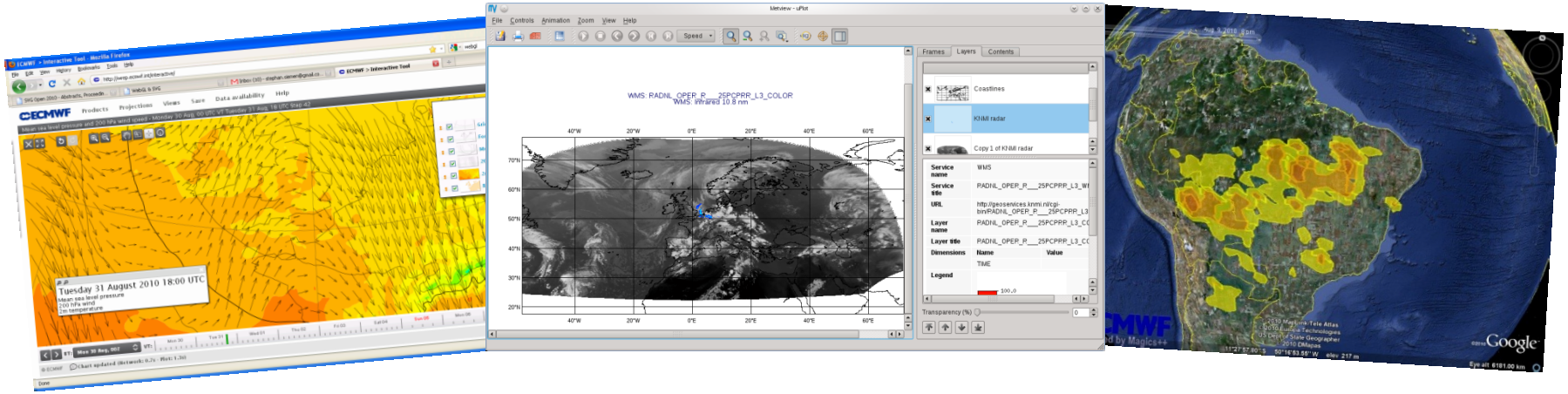
Migration of MAGICS 6 to Magics++



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Meteorological Visualisation Section

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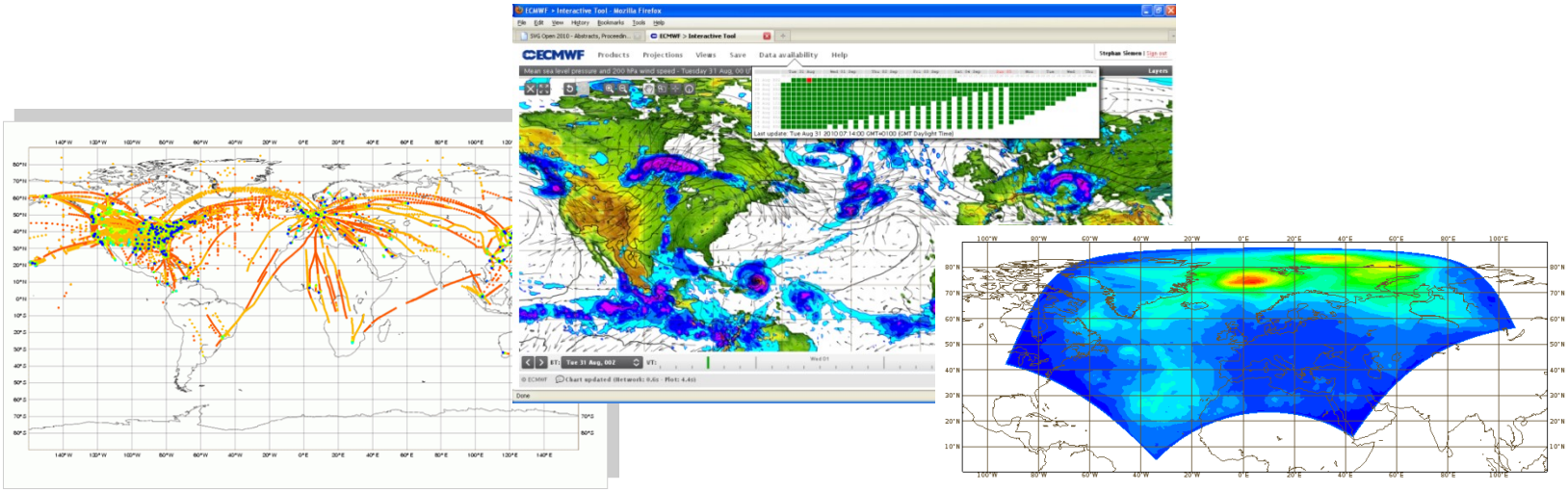
Outline

- Why rewrite Magics?
- What are the benefits of migrating?
- Why now?
- What should I do if I use MAGICS indirectly?
- Will my Magics-Fortran program need to be changed?
- What possible issues might I encounter?
- How can I make best use of the new features of Magics++?



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Why rewrite Magics?

- MAGICS memory management was hardcoded for 32 bit
- After 25 years of development the code was becoming hard to maintain
  - Many undocumented features (hard to migrate)
  - All original developers left/retired
  - Many features were not considered in the original design
  - Adding new parameters was becoming harder
- Demands changed:
  - Interactive plot generation within 1 second for web (*ecCharts*)
  - More programming interfaces (C/Python)
  - More input formats (GRIB 2, ODB)
  - More output formats (PNG, KML)
- Remove dependency to CONICON and get full control of contouring code
  - Make Magics *Open Source*
- We want to be more flexible for new requirements

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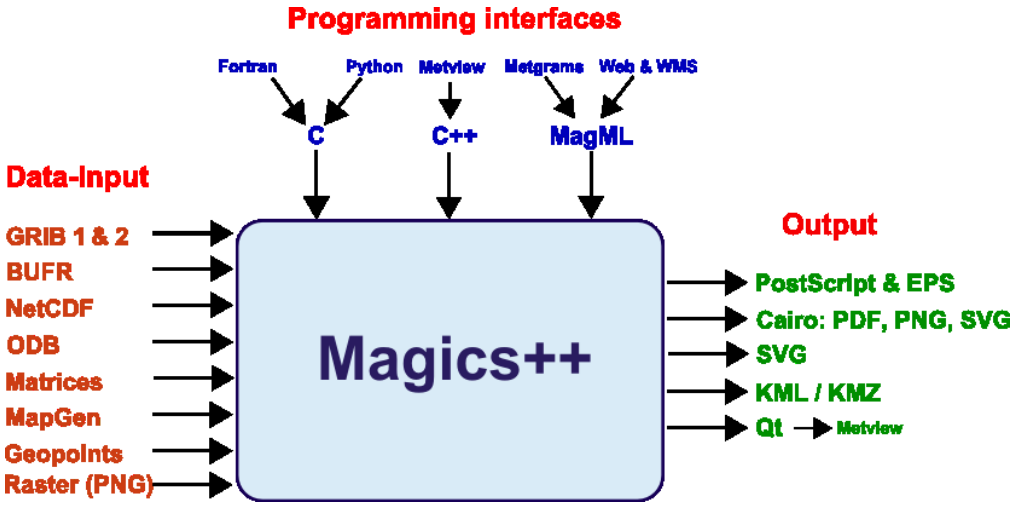
What are the benefits of migrating?

- Long term support and support for new features
- MAGICS 6 will not be available for new 64bit machines
  - LXAB ($OS_VERSION =“**sles11**”) and new desktops ($OS_VERSION =“**opensuse113**”)
- Your programs are more likely to fit into new frameworks, such as WREP/ecCharts, new Verify and new OBSTAT, which use Magics++
- A chance to discuss your programs with MetVis and ‘re-evaluate’ your code
- Faster programs for higher resolution data
- More features:



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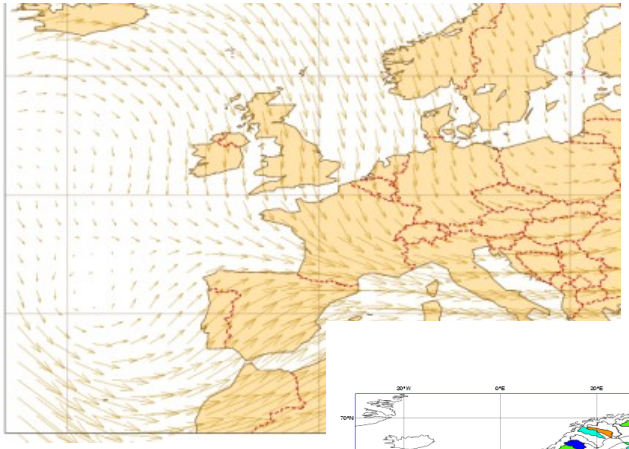
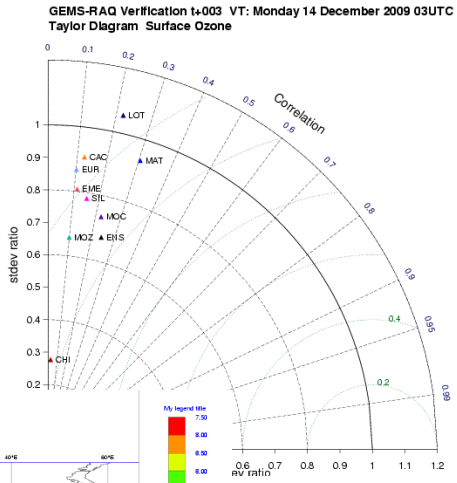
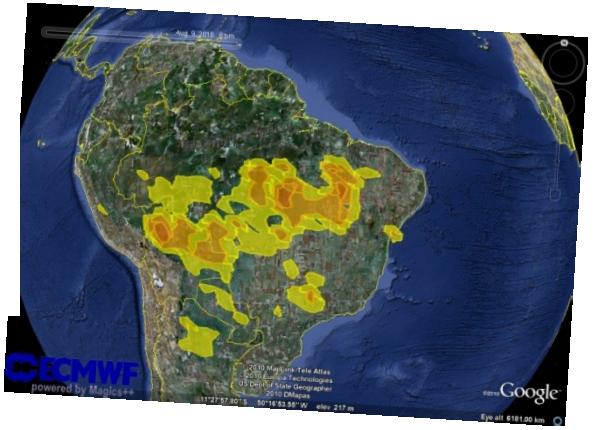
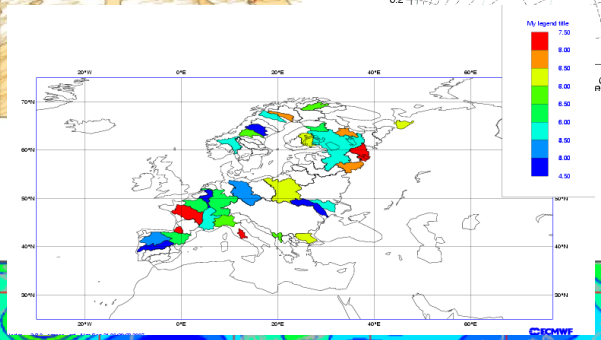
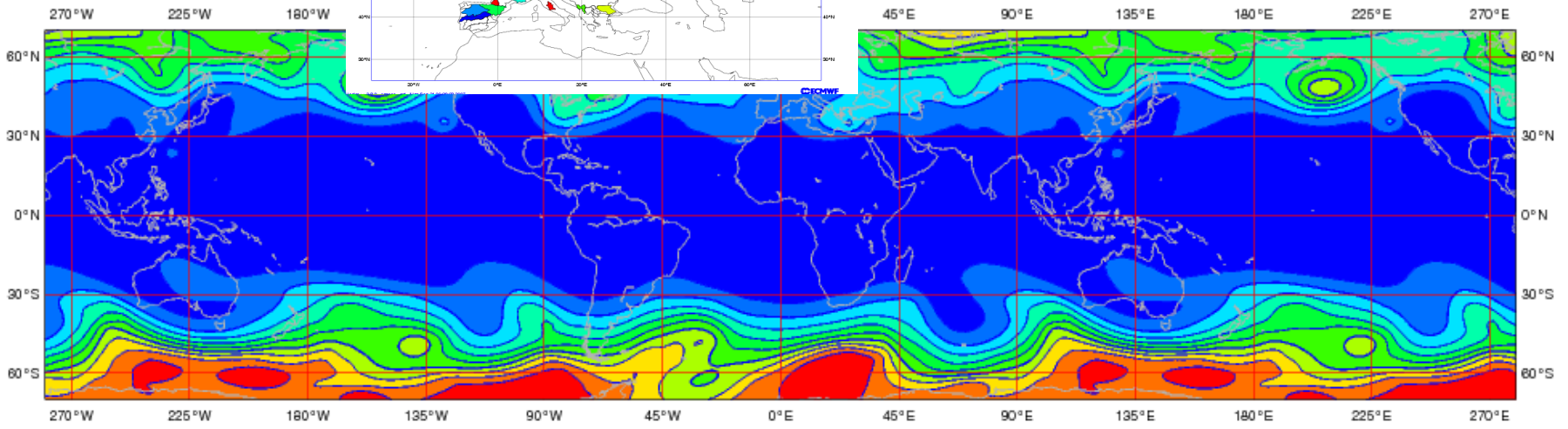
Examples of benefits …











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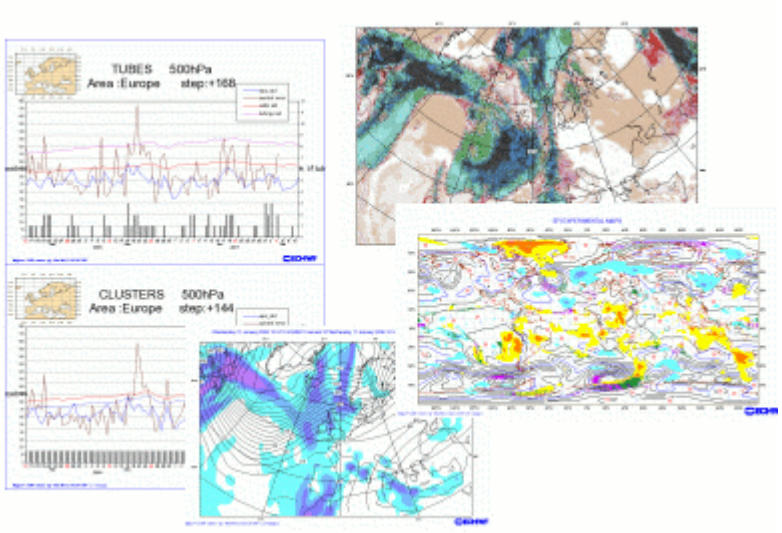
Why “now” ?

- We started 5 years ago!
  - In operations
    - Metgrams
    - Cluster/tubes plots
  - For new developments
    - ecCharts / WREP
  - New generations of software
    - Metview 4
    - Obstat / ODBviewer
    - New Verify



- Urgency now comes from:
  - New 64 bit systems
  - GRIB2: Move away from GRIBEX (integral part of MAGICS 6)
  - You do NOT get support for MAGICS 6 anymore

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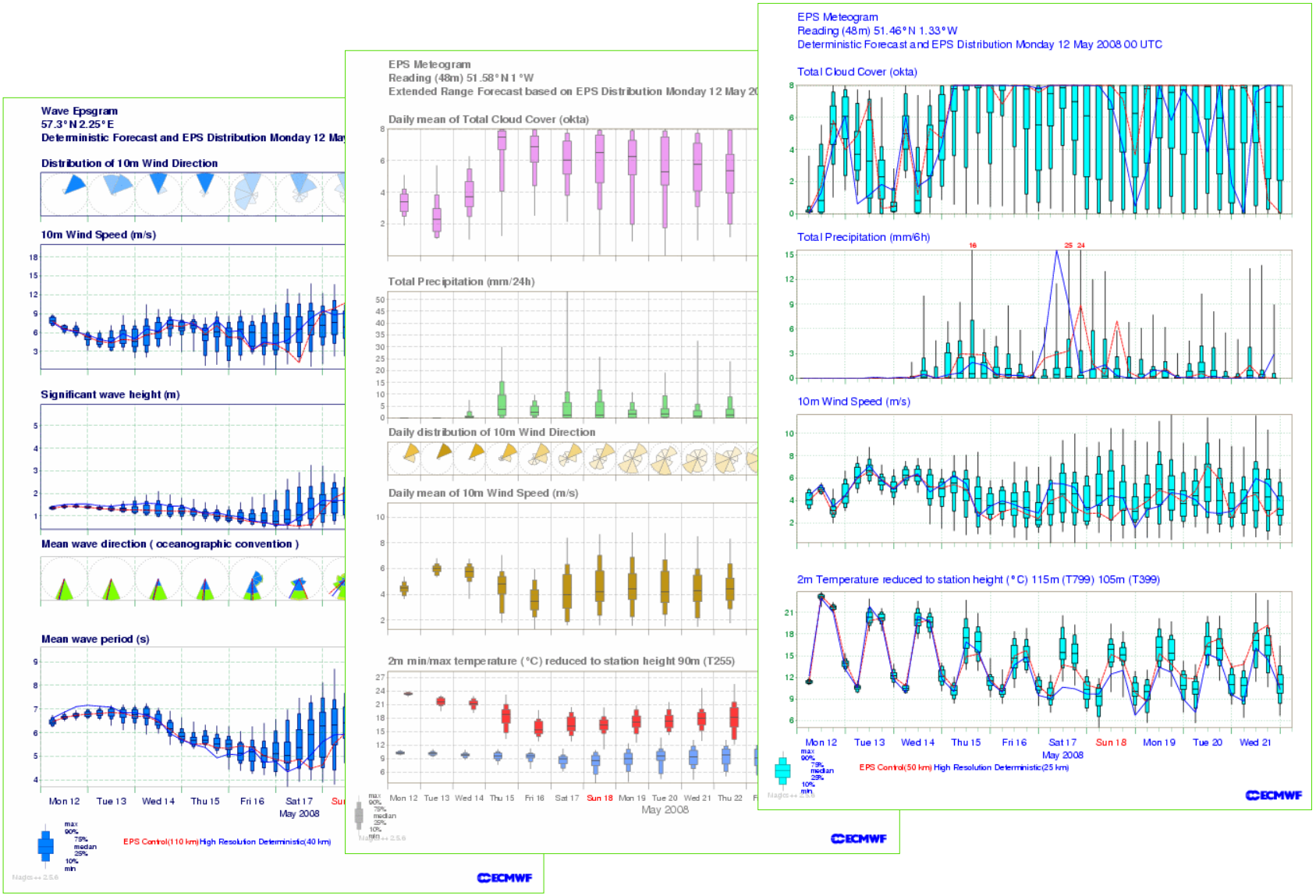
Metgrams, since February 2006



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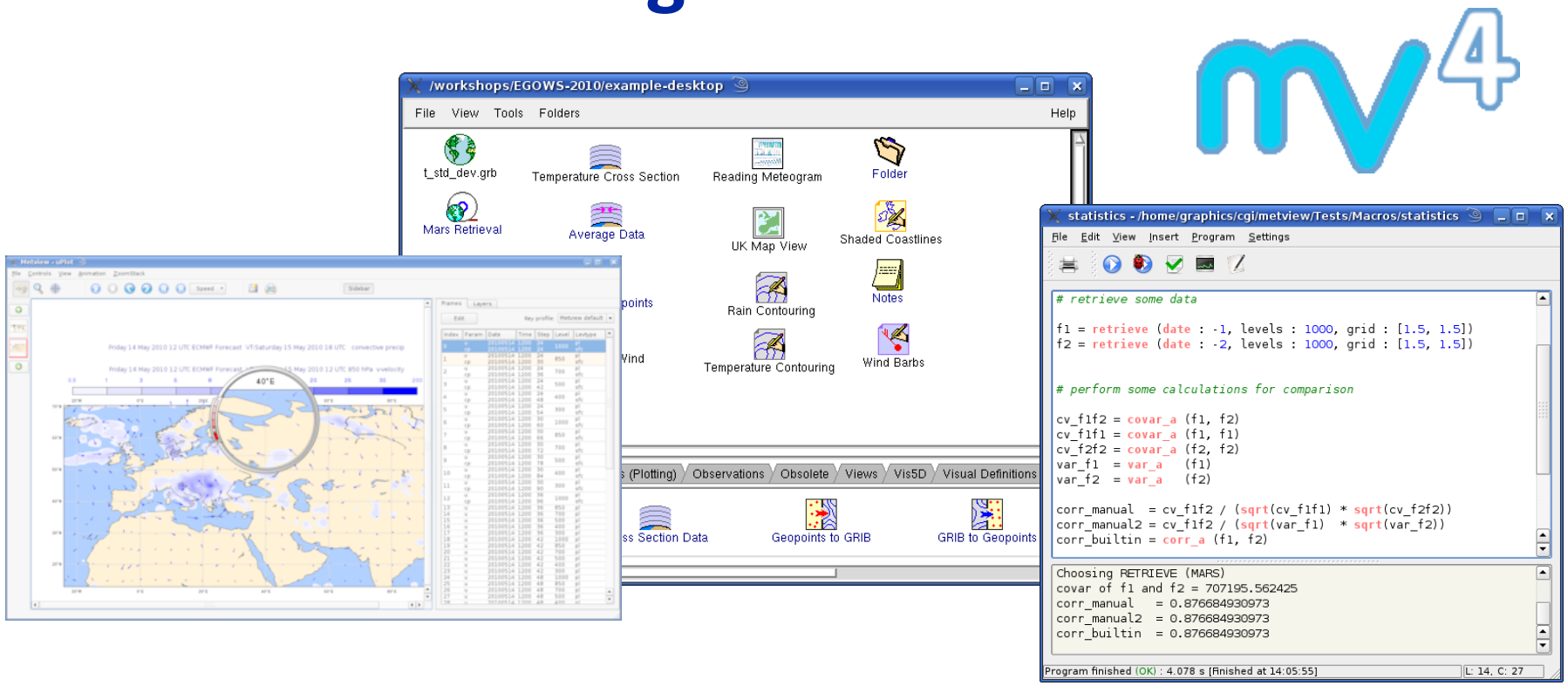
Metview 4 – ECMWF's next generation meteorological workstation



New possibilities for researchers …

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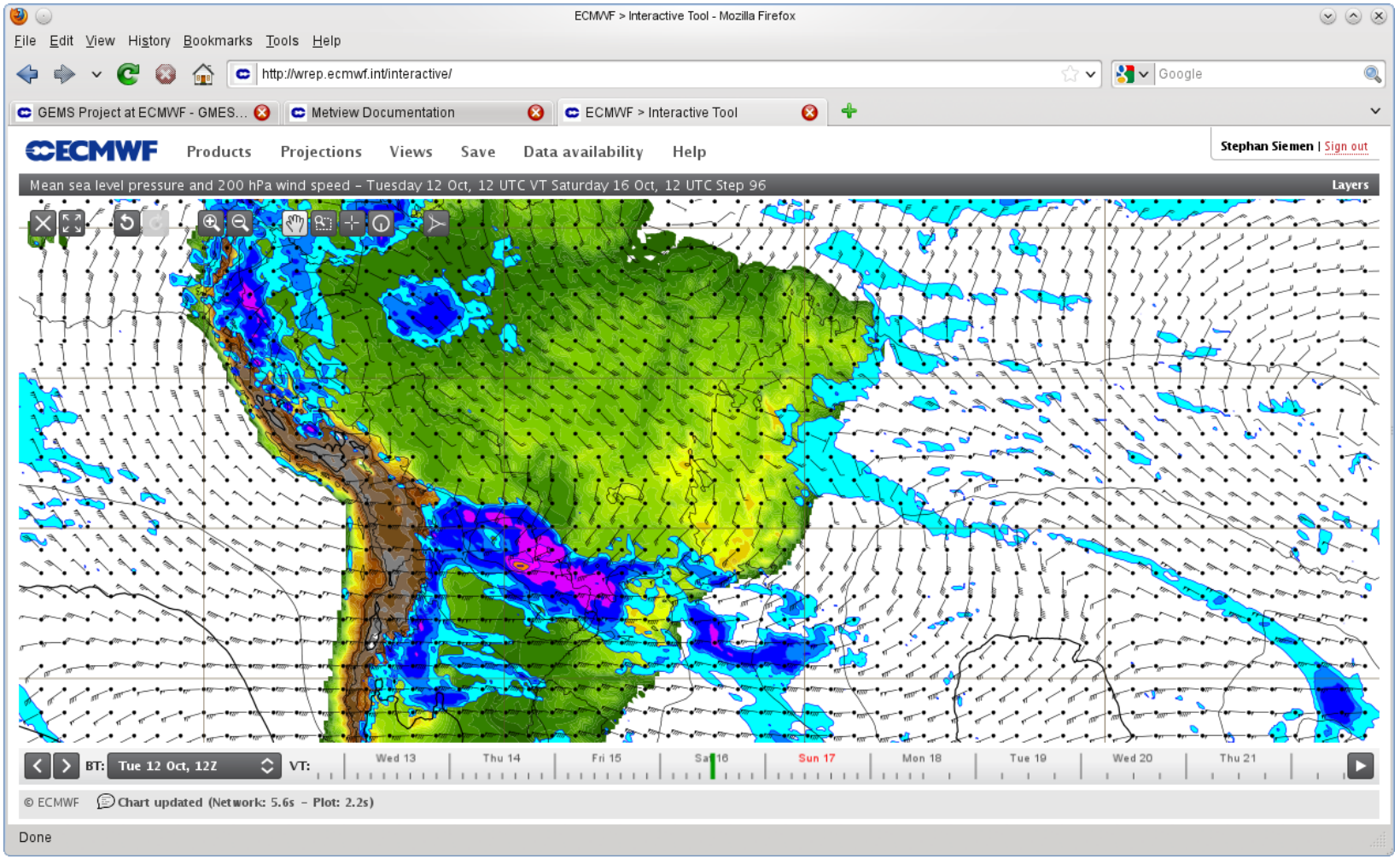
ecCharts / WREP



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What happens if you use Magics indirectly?

- Thanks to the hard work of the package maintainers, many packages have been migrated to Magics++:
  - Obstat
  - ODBviewer
  - Verify
  - Metview 4

- Only the new desktop/cluster you should only find versions using Magics++

- Feel free to contact us or the maintainers directly

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Will my Magics-Fortran program need to be changed?

- Yes, quite likely. Simple Fortran programs often work, BUT …
  - Text sizes might be different
  - Layout is slightly different
  - Legends need sometimes adjustment

  → Users should check carefully the resulting plot if it is as expected

- Users should use the compatibility checker to indicate if any parameters are used we do not support anymore

  use magics++

  magicsCompatibilityChecker myprogram.f

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Changes for compilation and run-time

- To ensure that MAGICS 6 and Magics++ can be used in parallel we have change the names of environment variables, e.g. instead of **$MAG_HOME** we use **$MAGPLUS_HOME**.

- For the compilation you need to change

  use magics

  pgf90 myprog.f –o myprog $MAGLIB $EMOSLIB

  To

  use magics++

  pgf90 myprog.f –o myprog $MAGPLUSLIB_SHARED *(or **_STATIC**)*

  → Please note: If you want use a different version of EmosLib than what Magics is linked with, you need to add the link command for your own Emoslib BEFORE $MAGPLUSLIB_SHARED

  → Double precision versions can be linked by adding **_DOUBLE** to the Magics++ environment variables (e.g. **$MAGPLUSLIB_SHARED_DOUBLE**)

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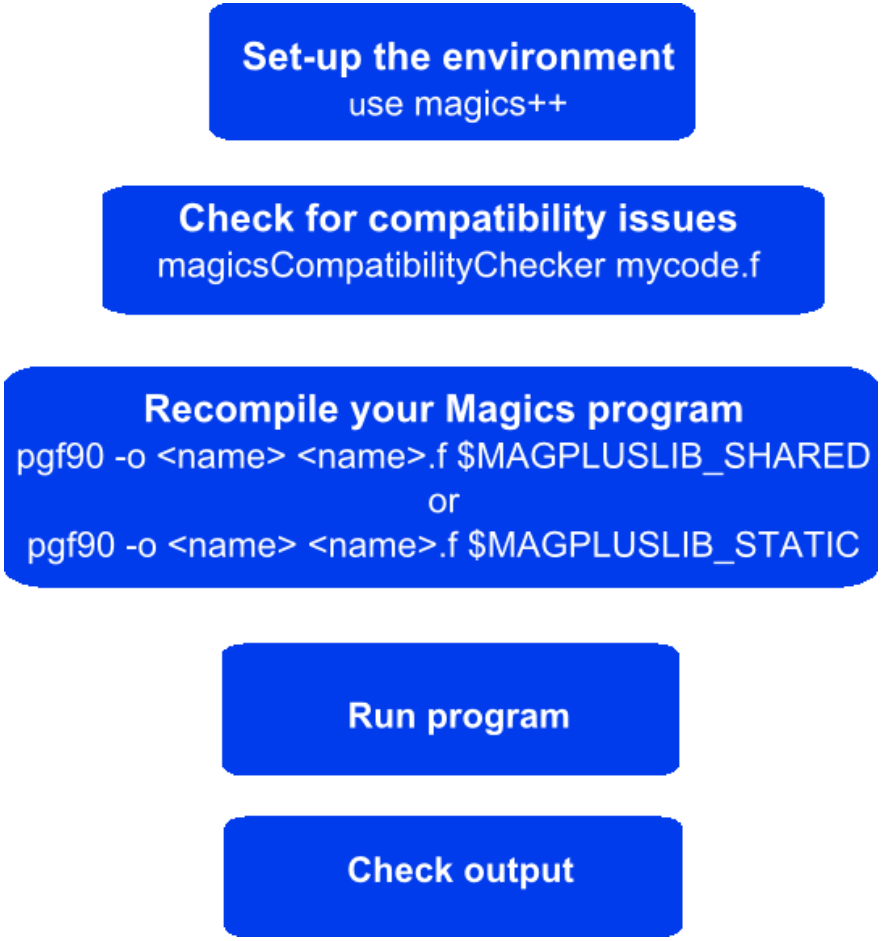
The migration process



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Magics++ versioning (1)

- **New scheme for version numbers**
  - Even minor numbers (2.10.x, 2.12.x, 2.14.x) indicate stable operational versions
    - These versions will only contain bug fixes between releases
  - Odd minor numbers (2.9.x, 2.11.x, 2.13.x) indicate changing NON-operational versions
    - These version might contain experimental changes
  - Odd numbered version are **likely to be removed** from the system over time, while even numbered version should stay available!

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Magics++ versioning (2)

- **“Emos” version is 2.14.x** (on operational demand)
  - Stable version which made be slightly older
  - Version to use for operational jobs

- **“Current“ user version is 2.12.9** (~2 to 3 times a year)
  - Stable version which has had the most testing
  - First version to test

- **“New” version is 2.13.9** (~monthly)
  - This is the test version for next release

- **“Daily” version is 2.13.10** (~daily/hourly)
  - Rapid updates which might contain regressions
  - This version will have latest changes
  - Only use if you are advised to do so

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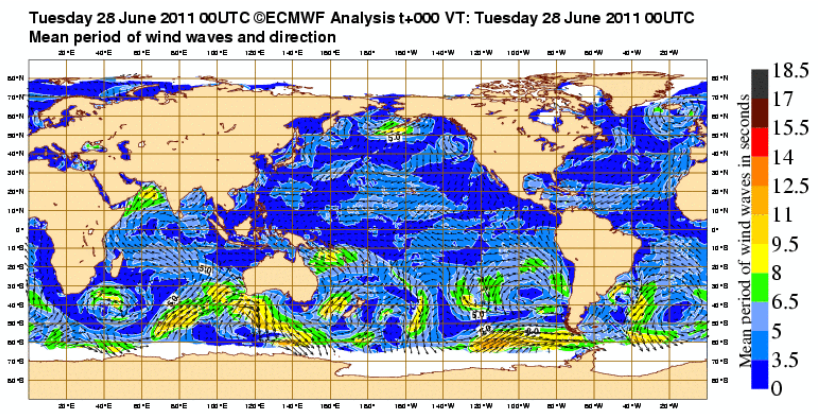
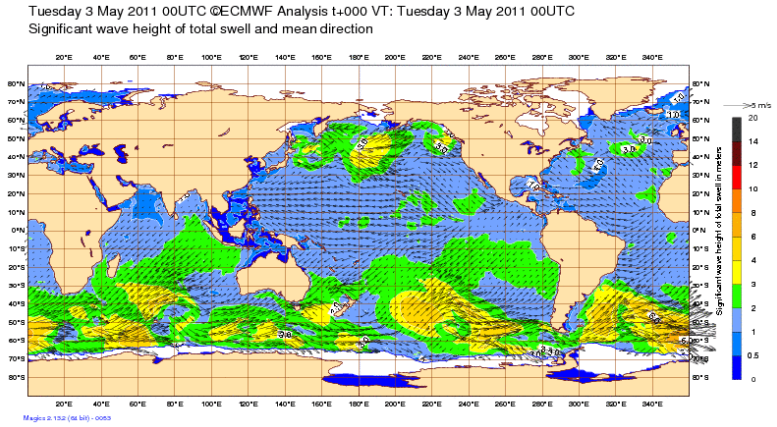
Backwards compatible Fortran interface

- It was decided that the **API of Magics++** should be backwards compatible

  →NOT the parameters themselves or their exact behaviour!





(same style definition – different data!)

  →Ease the migration

  →Keep familiar naming conventions

- **Exception:** Specification Groups
  - Not much used and difficult to maintain
  - MagML offers alternative
- Compare with GRIBEX to Grib_API changes

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Technical changes (1)

- **Magics++ does not support fields in spherical harmonics (SH)**
  - Seldom used (data is already interpolated at time of retrieval)
  - New interpolation package (SCIN) will offer command line tool
  - *MARS read* command can perform interpolation
  - Metview's *MARS client* and *GribFilter* can interpolate SH to LL or GG

- **Coastlines are black by default**
  - Not yellow anymore

- **Sharper lines and look-and-feel**
  - Look might be different
  - No automatic text size adjustment (more consistent)
  - Legend text does not change any more

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Technical changes (2)

- **Shared versus Static linking**
  - **Shared libraries**

    + smaller executables

    + update to newer Magics++ version automatically without recompilation

    + enables us to use debug versions of libraries

    - You need to be aware that the Magics++ library is picked-up at run-time!
  - **Static libraries**

    + Always same version used even if library disappears

    - You need a compatible MAGPLUS_HOME !

- **The default filename for PostScript changed from ps to ps.ps**
  - Request from users: Caused many support queries ☹
  - Some SMS scripts have to be updated
  - File managers detect through file extension

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Technical changes (3)

- **No direct decoding of GRIB fields**
  - Use Grib_API instead

    ~~CALL PSETC('GRIB_MODE','DECODE')~~

    CALL PGRIB

- **There is NO Fortran UNIT anymore for INPUT_TYPE**
  - There is only type FILE

    ~~CALL PSETC('GRIB_INPUT_TYPE','FILE')~~

- **No PIE charts**
  - Excel is an alternative
  - Magics++ has a wind rose

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Axes

- Because the same set of parameter names and the same action routines are used to specify vertical and horizontal axes, Magics++ can get confused.
- To be on the safe side, the user should **always set first the type of axis**:

```
call psetc('axis_orientation', 'horizontal')
call psetc('axis_type', 'regular')
...
call paxis
call psetc('axis_orientation', 'vertical')
call psetc('axis_type', 'date')
...
call paxis
```


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New convention for formatting text

- Another useful change to have in mind is the use of HTML convention to define the colour and size of the font used in text:

  call psetc("text_user_line_1", " my small red text ")

  Please note: The characters '**<**' and '**>**' become '*<*' and '*>*' respectively!

- We added a grib_api tag to allow the extraction of grib api keys to build text.

  call psetc("text_user_line_1", "<grib_info key='name' /> at <grib_info key='level' />hPa")

- The limitation of 10 lines for title can now be avoided by handing arrays of strings as user text:

  call pse1c("text_user_line**s**", titles, **5**)

→ **We recommend users to use the HTML convention. We did not put back all the previous MAGICS 6 conventions.**

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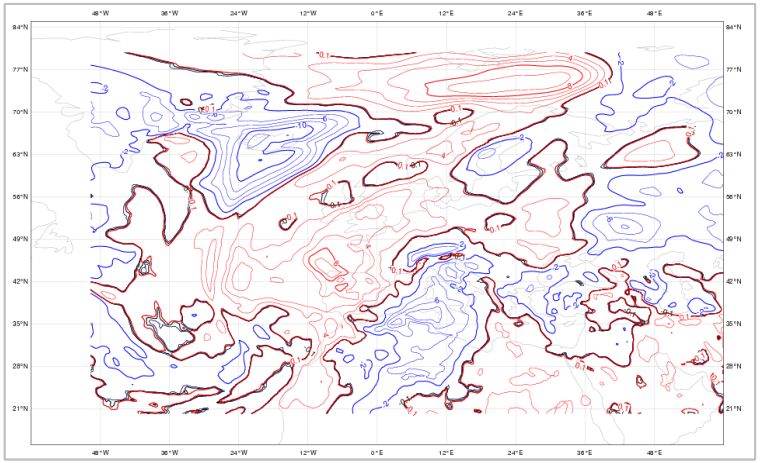
Contouring

- **No CONICON anymore**
  - Some parameters are ignored now

- **No split contouring**
  - Setting CONTOUR_LINE_PLOTTING has no effect anymore.
  - This is also true for all parameters starting CONTOUR_SPLIT_, CONTOUR_ABOVE_ and CONTOUR_BELOW_.
  - Please split your contours in separate PCONT calls



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How I can make best use of Magics++?

- **Separate Magics calls from rest of code**
  - Easier to change and to debug
  - Clear separation between data processing and visualisation

- **Always define geographical area and projection first**

- **Keep Parameters and their action routine together**

- **Legends**: if you turn it “on” at the beginning of your program (recommended), each action routine will put information in the legend box. If you do not want a legend for a certain action, legend should be turned “off” before the call to this action.

- **Feel free to involve the Magics team to have a look at your code**

  Provide example code to MetVis to be run in their regression test suite

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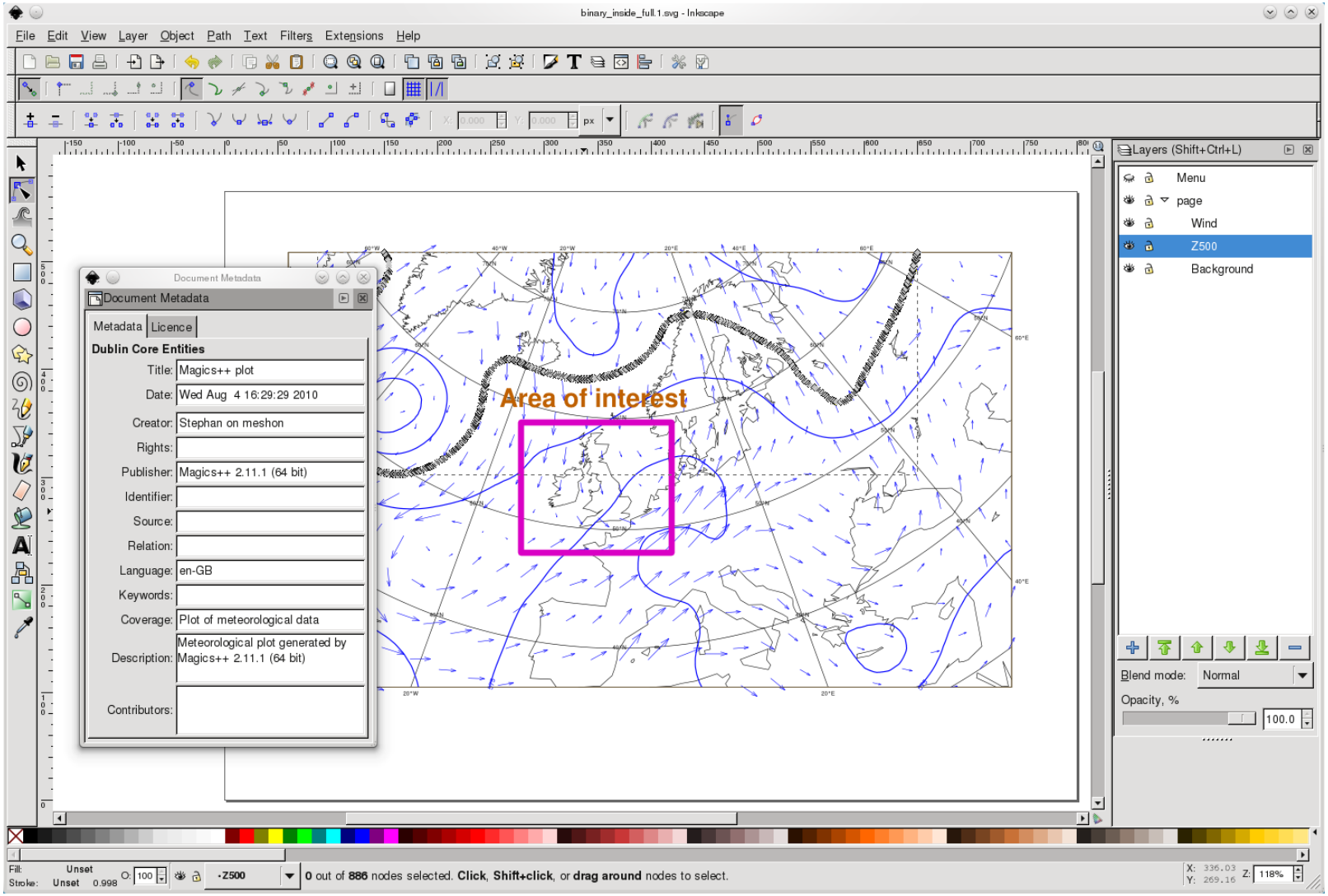
Make use of new formats …



Example: Editing SVGs in Inkscape

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Recommendations for new desktop/cluster (1)

- Avoid using ‘convert’
  - Very expensive to run (often more expensive than Magics program itself!)
  - Magics++ might directly support the format you’re after (PNG, EPS, …)
  - Magics++ can generate multiple output formats in ONE run
    This saves resources since Data reading and contouring is only performed ONCE
  - Be aware that ‘*convert*’ behaves differently on the new platforms!
  - Feel free to contact MetVis if you see any problems
    This includes if you try to create an animation

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Recommendations for new desktop/cluster (2)

- Try ***okular*** instead of *gv*, *acroread* and *xpdf*
  - BUT: *MAGICS 6* user manual PDF's only open in *acroread*

- Say good-bye to *nedit* → ***kwrite*** (UNICODE)

- Please consult the web pages for …
  - **New Desktop:** *https://desktop113.ecmwf.int/*
  - **LXAB:** *http://intra.ecmwf.int/publications/cms/get/LinuxCluster/16880*

- Please feel free to contact MetVis if you need help to use your graphical products on the new platforms.

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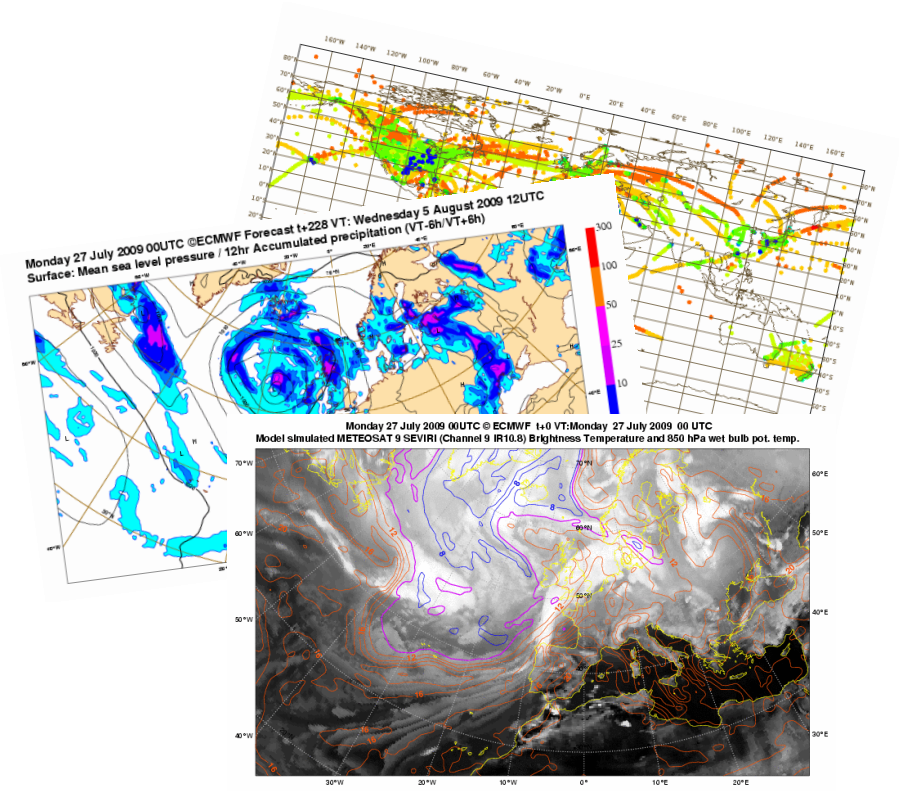

email us:

- ***Magics: magics@ecmwf.int***

visit our web pages:

- ***http://www.ecmwf.int/publications/manuals/magics/***

  (check out the tutorial on this page)

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