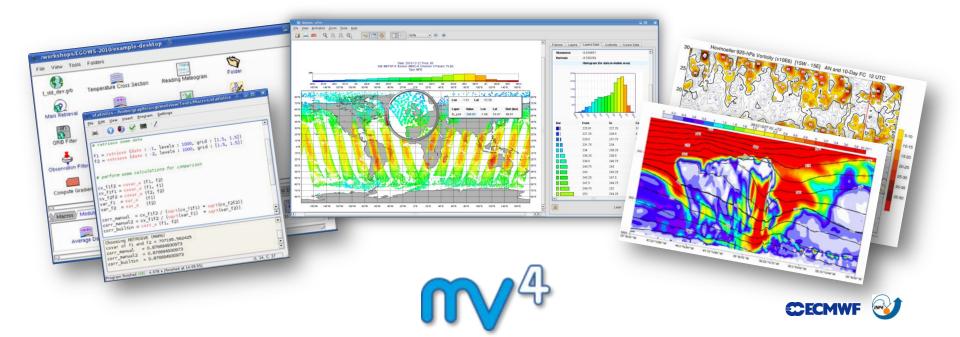
Metview 4: Providing enhanced interaction with meteorological models



Fernando Ii, Iain Russell, Sándor Kertész

Development Section - ECMWF



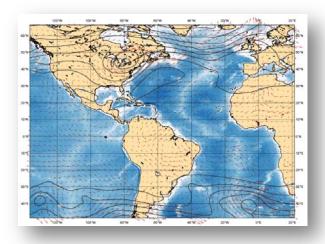
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MOS 2013 - Metview

What is Metview?

- Working environment for operational and research meteorologists
- Retrieve/manipulate/visualise meteorological data
- 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

Since August 2012 Open Source under Apache Licence 2.0

- > Increased interest from research community
- Metview is a co-operation project with INPE (Brazil)



ECMWE

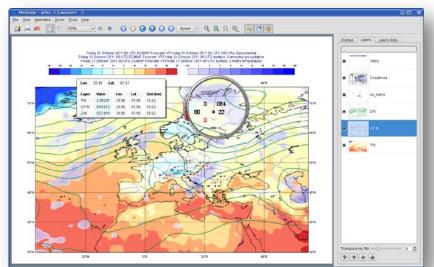


What is Metview?

Service Oriented Architecture

- 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



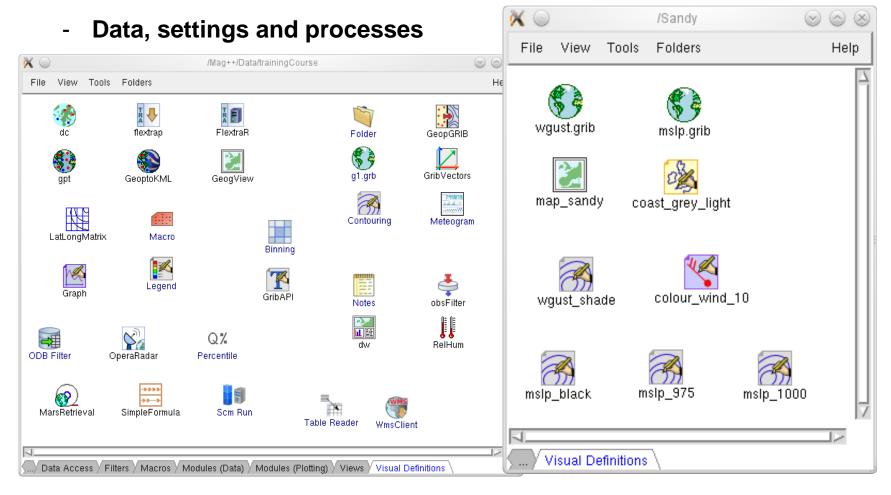
Metview's main features



MOS 2013 - Metview

Icon-based interface

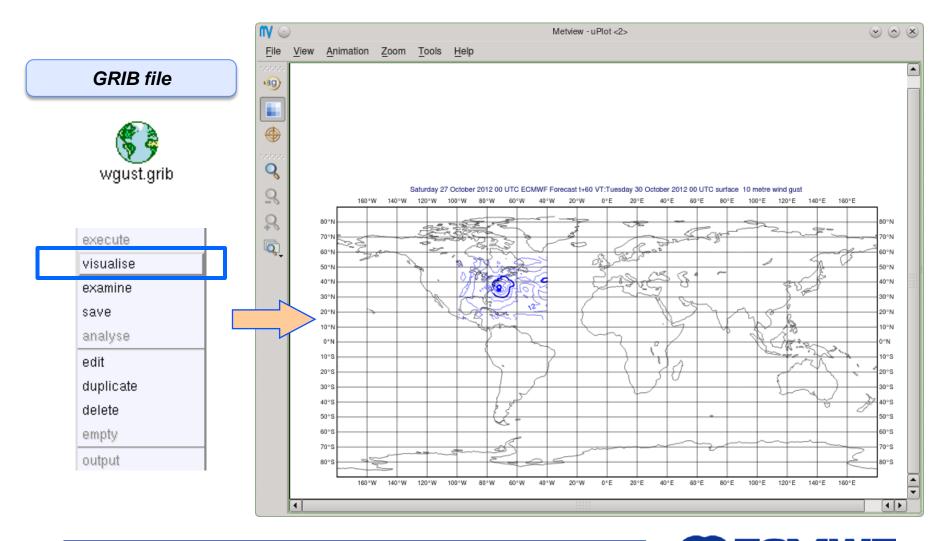
Everything is represented by an icon



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5

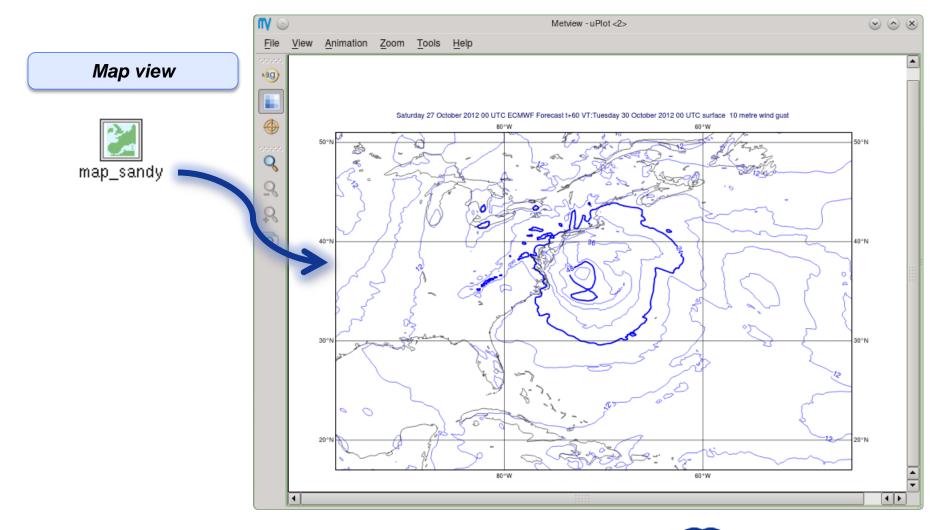
Visualisation







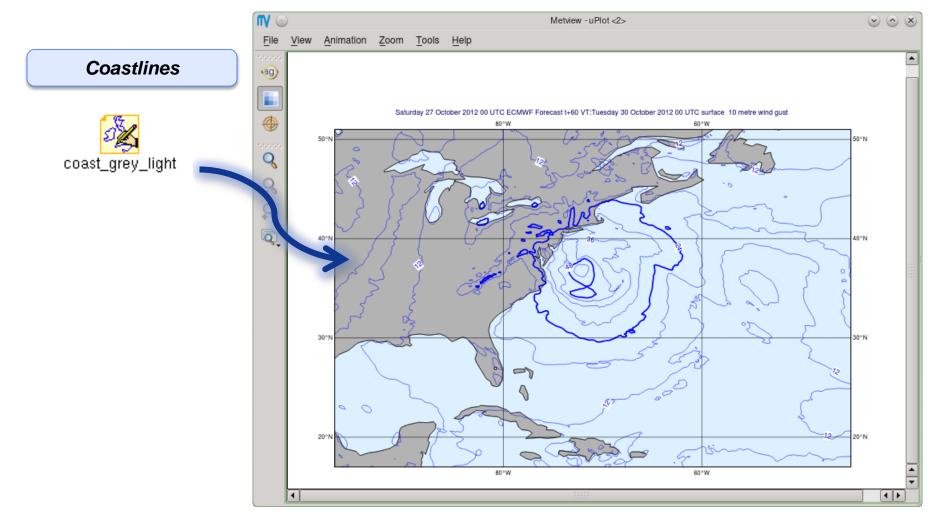
Drag and Drop



MOS 2013 - Metview



Drag and Drop

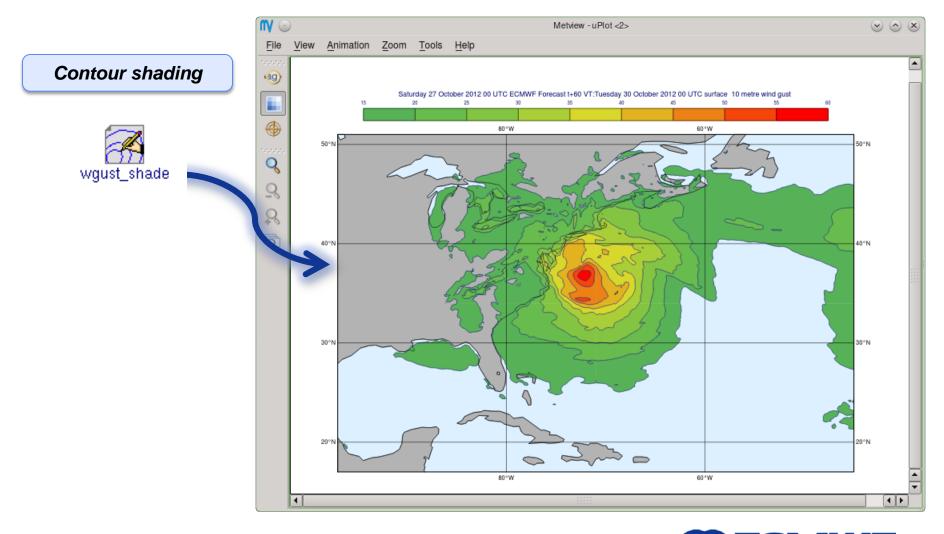


MOS 2013 - Metview





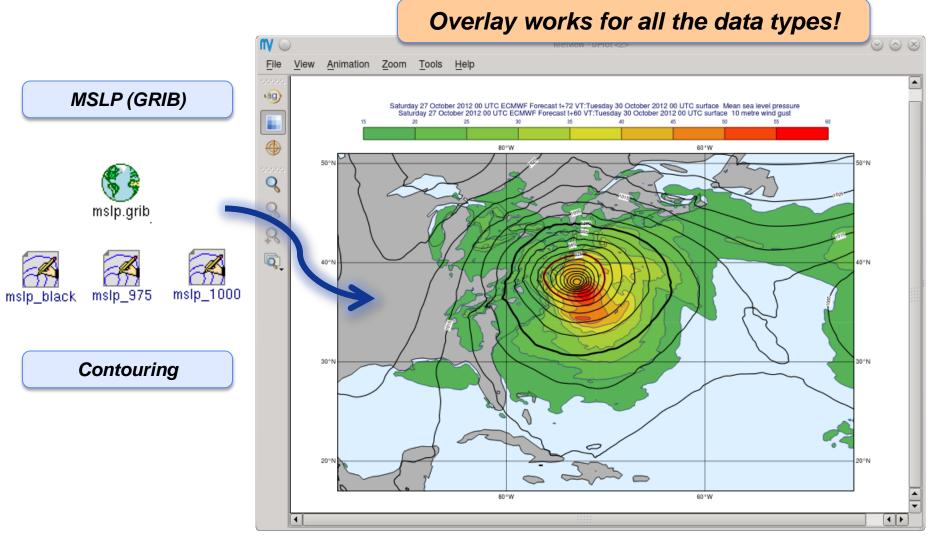
Drag and Drop



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Drag and Drop - Overlay

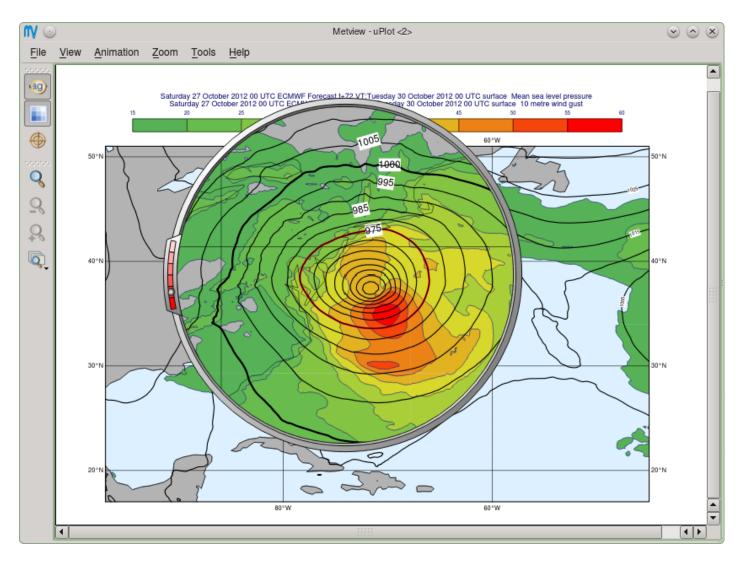


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10



Display Window - Magnifier

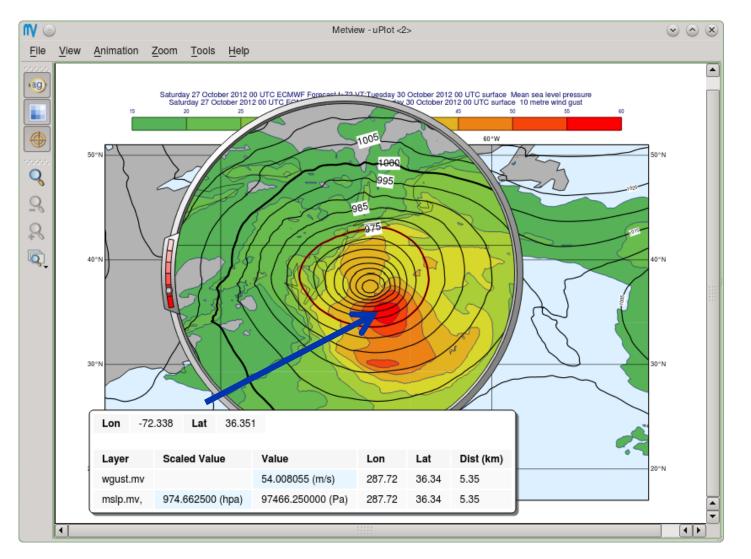


MOS 2013 - Metview





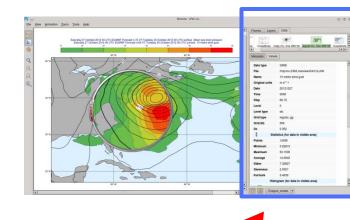
Display Window - Cursor Data







Display Window - Layer Metadata



Sidebar with various tabs

Data type	GRIB			_	
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Original units	m s**-1	Hi	stogram (for da	ata in visible a	rea)
Date	20121027	3000	orogram (ror at		
Time	0000	2400			
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Level	0				
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] Sta	tistics (for data	Bai	15	20	2638
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Average	14.0645		35	40	245
Stdev	7.32827		40 45	45 50	123 62
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Kurtosis	5.4232				
Hist	ogram (for data		gust_shade -		-
2000	-			-	

MOS 2013 - Metview

ECMWF



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)

```
# 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 = qradientb (temp)
# Save field
write ( "/home/graphics/gradient.grb", q )
# Plot field
plot ( [ps,svg], q )
```

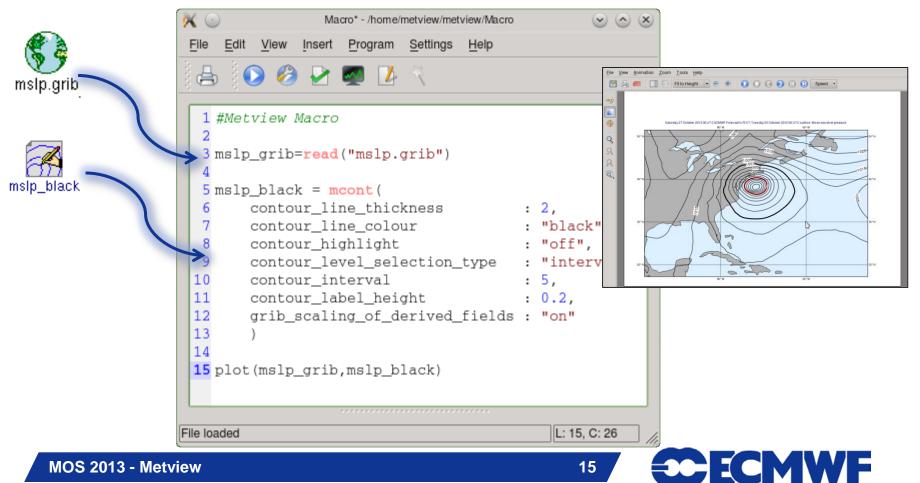
CMWF

© ECMWF 2013

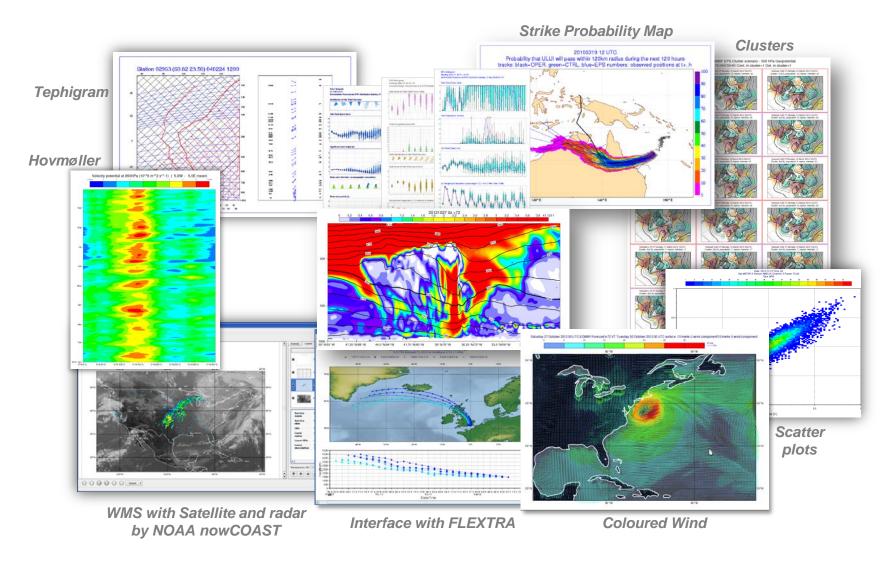
Metview Macro drag and drop

Strong synergy between Icons & Macros

- Every icon can be translated into a Macro command



Large variety of meteorological charts



MOS 2013 - Metview





Metview's interface with meteorological models



MOS 2013 - Metview

OpenIFS with Metview



Portable, easy-to-use version of the ECMWF IFS model

- Reduced version of IFS
- Based on previous operational model
- Started Dec 2011
- In development phase
- For training and academic research



Metview: ideal application for analysing and displaying OpenIFS output GRIB files

 Metview was used in OpenIFS training course in Helsinki (June 2013)

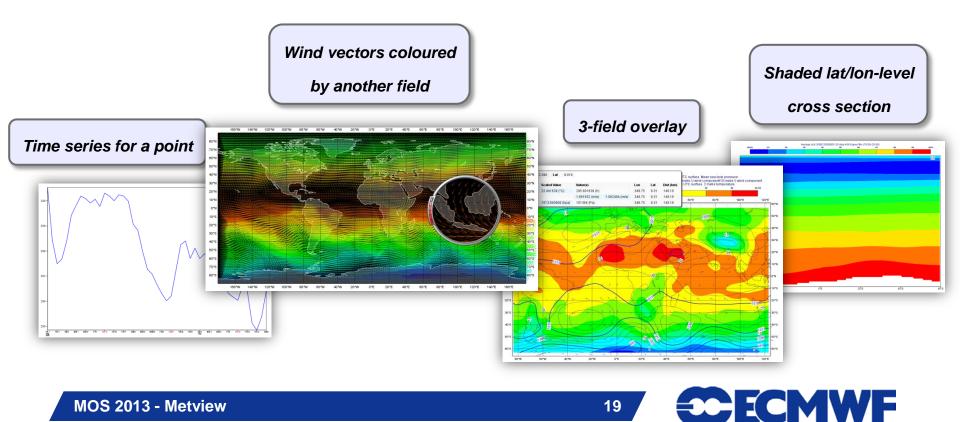




OpenIFS support in Metview

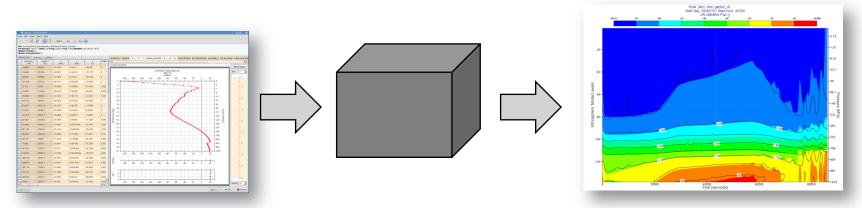
- All the Metview functionality works with the OpenIFS output
- Examples icons are available from:

https://software.ecmwf.int/wiki/display/OIFS/Using+MetView+with+OpenIFS



Interfacing external models

- Researchers use various smaller, more specific models for their research
- These models are seen by Metview as a 'black box'
 - Metview prepares the input
 - Metview runs (external) model executable
 - Metview handles (visualises) the output



 This concept works easily with Metview's serviceoriented architecture (SOA)

MOS 2013 - Metview



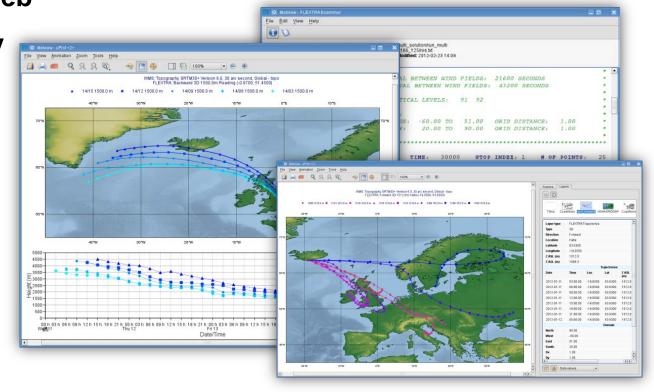


Metview - Trajectories

- Metview has been interfaced with FLEXTRA via modules which:
 - prepare the data, run the calculation by FLEXTRA and display the results
- Detailed description can be found in Newsletter article and tutorial on the web

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 We are currently integrating the dispersion model FLEXPART in similar fashion

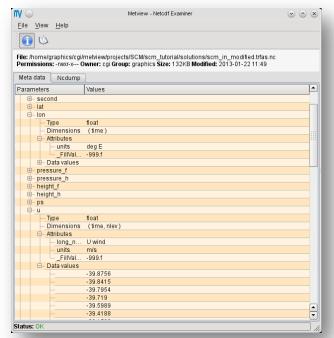


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ECMWF

IFS Single Column Model (SCM)

- Simplistic approach: simulate IFS for a single grid point
- Useful tool to study the physics in more detail
- Allows to study subset of processes or single process only
- Very useful for comparing different models or different versions of the same model
- Computationally cheap
 - →Ideal for interactive research work with Metview



 Metview was used in the "Parameterisation of diabatic and subgrid processes" training course at ECMWF (April 2013)



SCM-Metview : Modifying an input data file

Custom editor for SCM input netCDF files

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MOS 2013 - Metview



SCM-Metview : Running the model

• SCM Run icon:

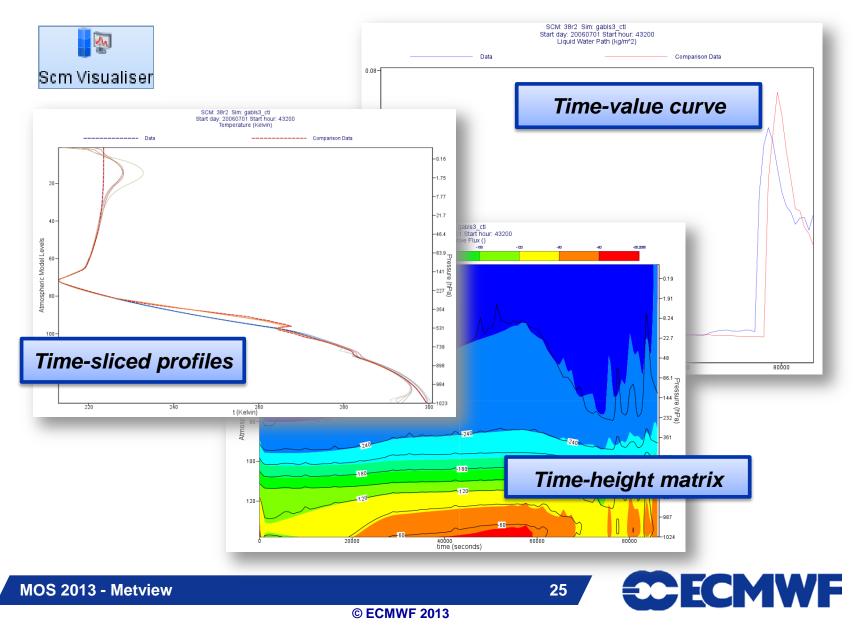
- allows users to specify how to configure and run the model
- runs the model and caches the result



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SCM-Metview : Visualising the result



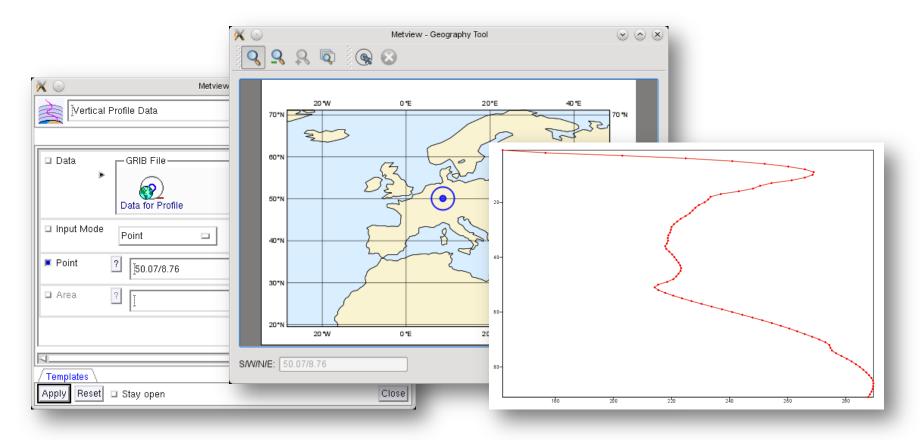
RTTOV Introduction

- A fast radiative transfer model
- Models infra-red and microwave satellite radiometers
- Inputs:
 - Atmospheric profile of temperature and gas concentrations
 - Surface / cloud / satellite properties
- Outputs:
 - Top of atmosphere radiances / brightness temperatures for each simulated sensor channel
 - Jacobian matrix shows which atmospheric layers are most sensitive to changes in the input profile for each channel
- Metview was used in "ECMWF/EUMETSAT NWP-SAF Satellite data assimilation" training course at ECMWF (July 2013)



RTTOV-Metview : Input Data Generation

Retrieve data from MARS and extract profiles (using existing modules)



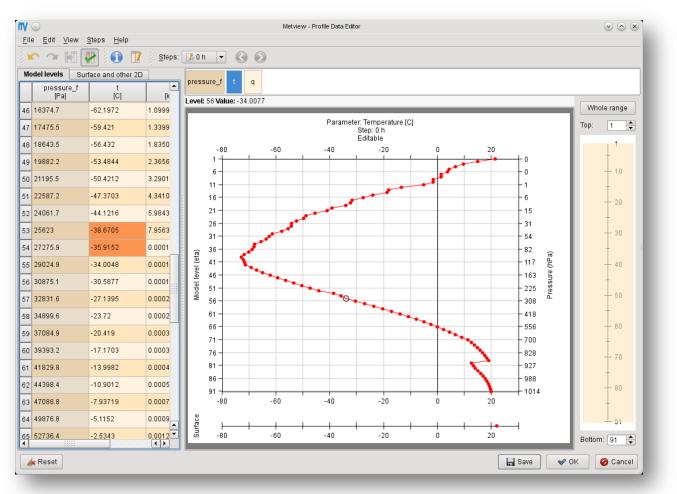
© ECMWF 2013



RTTOV-Metview : Input Data Inspection

The SCM editor can also be used for RTTOV data





MOS 2013 - Metview



RTTOV-Metview : Running the Model

• RTTOV Run icon:

- allows users to specify how to configure and run the model
- runs the model and caches the result

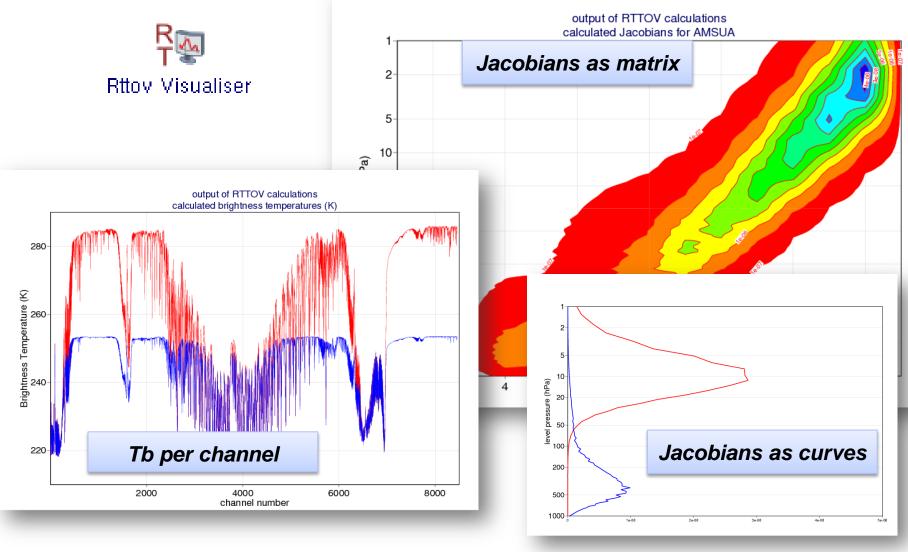


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RTTOV-Metview : Visualising the result



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MOS 2013 - Metview



Future developments (1)

New Qt based desktop (alpha version stage)

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MOS 2013 - Metview



Future developments (2)

Short term

- Thermodynamic diagrams
- More clients for OGC web services formats (SOS, WaterML)
- Integrate ECMWF's new interpolation package
- Exploring interfaces to 3D packages (e.g. Vapor)
- New MARS client access through MARS web-api
 - External users can directly access ECMWF's MARS

Long term

- Python based Macro Language
- Combine experience of WREP (ecCharts) with long-term experience of Metview to produce a common architecture



For more information ...

email us:

Metview: metview@ecmwf.int

visit our web pages:

Download

- > source tarball or virtual machine
- Documentation and tutorials available
- > Metview articles in ECMWF newsletters

