



Product Visualisation & Analysis Tool

14th Workshop on Meteorological Operational Systems

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"Monitoring Weather and Climate from Space"

<http://www.eumetsat.int>

- EUMETSAT was formed in 1986 with the objective to provide, from space, information that can be used in weather forecasting and climate applications.
- EUMETSAT is an intergovernmental organisation, formed to service the Member and Cooperating States which fund our activities.
- Geostationary: METEOSAT (7, 8, 9 & 10)
- Low Earth Orbit: METOP (A & B)



Data processing & visualisation

- EUMETSAT operates meteorological satellites for its member states
- In addition to image data, level 2 geophysical products are produced
- Products are derived from image data and forecast data
- Products are validated by comparison with observations from balloons, ships, aircraft
- Graphics workstation is used to display all these data, allowing the analysis of the images and products by meteorologists
- MWS - Original system in MTP ground segment, fixed set of products, fixed layout for each product
- PQM - Part of MSG ground segment, uses a data dictionary, and visualization templates to enable analysis of many products in different ways, without software changes
- PQM can handle data in internal formats and in BUFR



Problems with legacy visualisation tools

- COTS or hardware specific implementations
- Not easy to implement new features or products
- Not able to handle newer formats (GRIB2, netCDF, HDF, etc)
- Flexibility implemented only for certain modes of usability

- Result:
 - Tools that cannot be easily enhanced
 - Users creating their own visualisation tools

- Therefore, a need to find a replacement



The hunt for a replacement

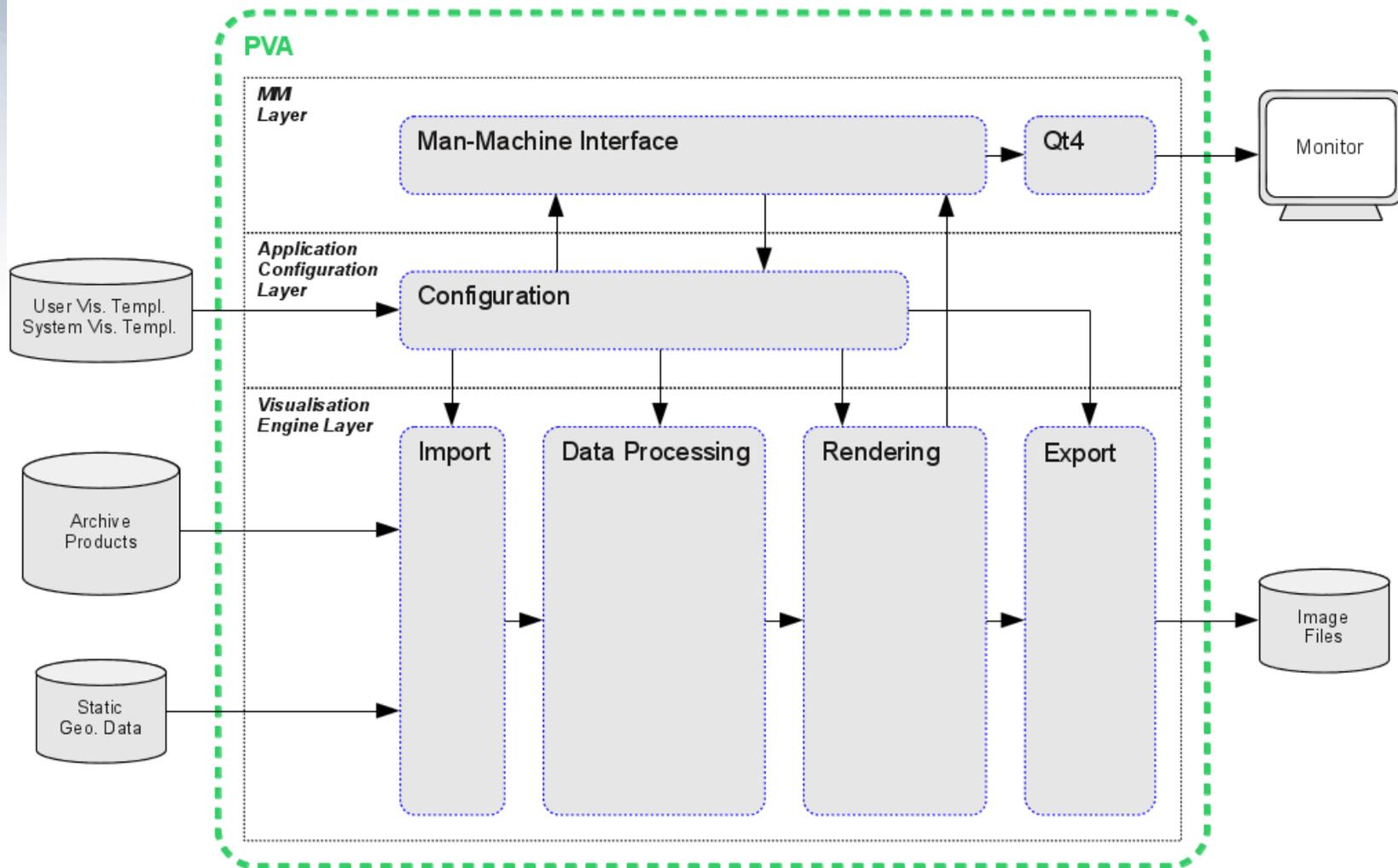
- EUMETSAT have a unique set of requirements:
 - Internal formats unknown to third parties
 - Encoded formats specific to a small community
 - Specific display operations required by EUMETSAT users
 - A focus on product content display



Decision to procure a new tool

- Be based on a commodity Intel/Linux platform
- Be based (as much as possible) on existing tools & COTS
- Use no hardware acceleration features
- Be as flexible as possible in design, implementation & usability
- Be a platform that can be easily enhanced for:
 - new products, new encoding formats, new visualisation types, new projections
- Result: Product Visualisation & Analysis Tool (PVA)
- Developed for EUMETSAT by
ask - Innovative Visualisierungslösungen GmbH

PVA components

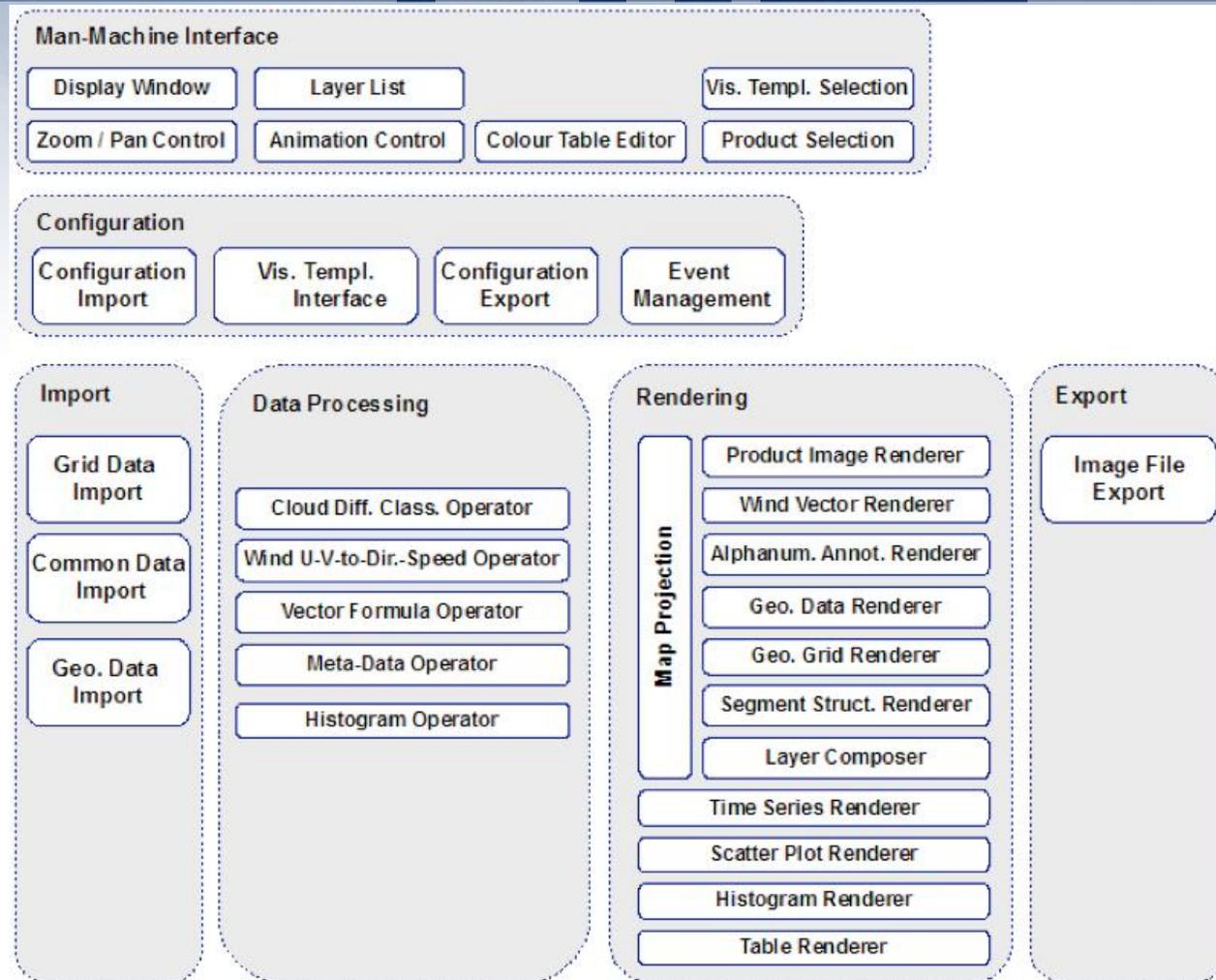


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PVA components

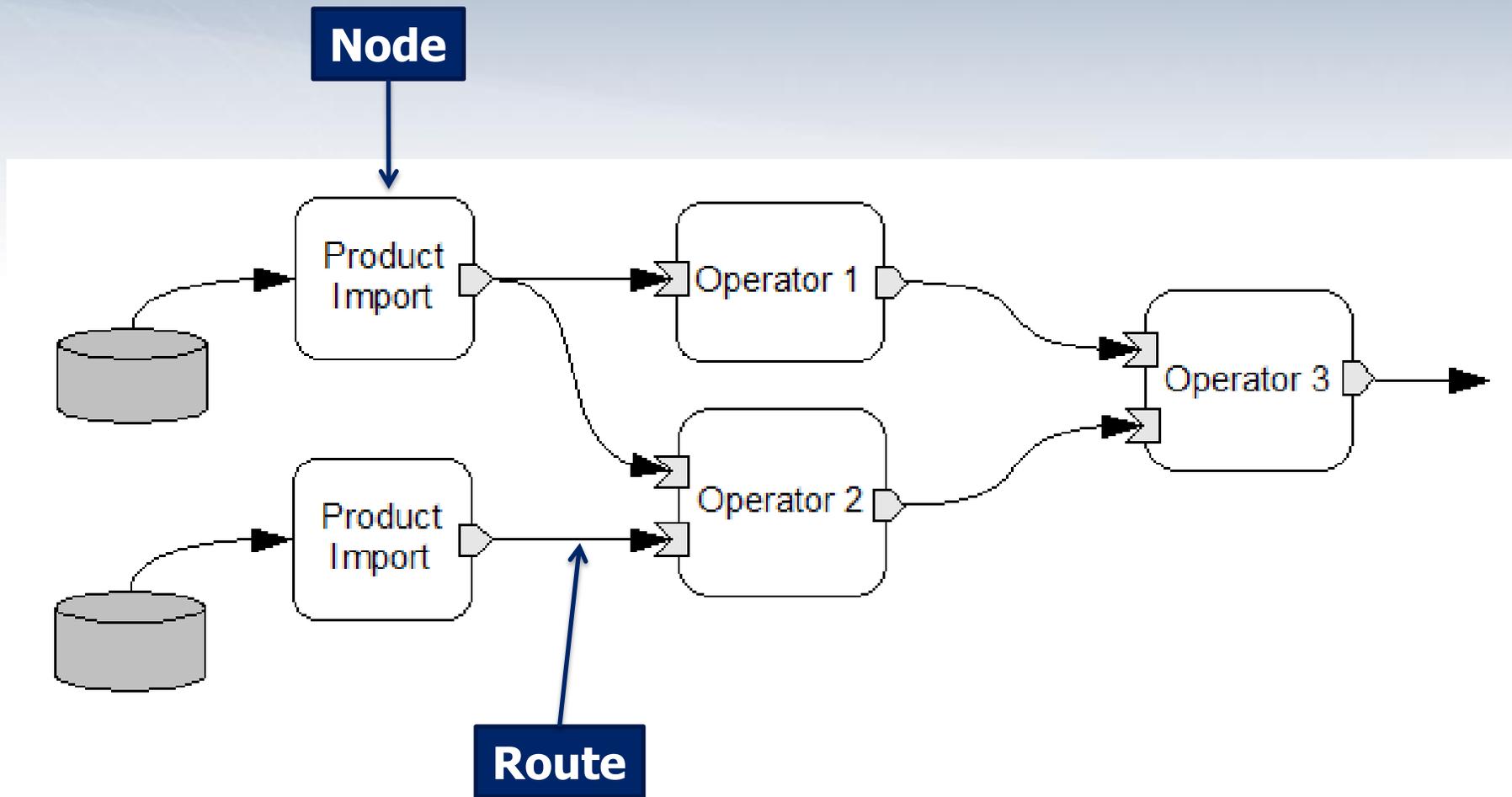


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PVA lattice concept



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PVA template

- Lattice structure
 - Node instances
 - All node property settings, defining amongst others:
 - base product, anchor time, explicit/implicit frame sequence (time slots)
 - Routing information
- MMI settings
 - Panels
 - All panel property settings, defining amongst others:
 - Visibility, position, size, state (legend, minimised, maximised, ...), docking

PVA on-screen

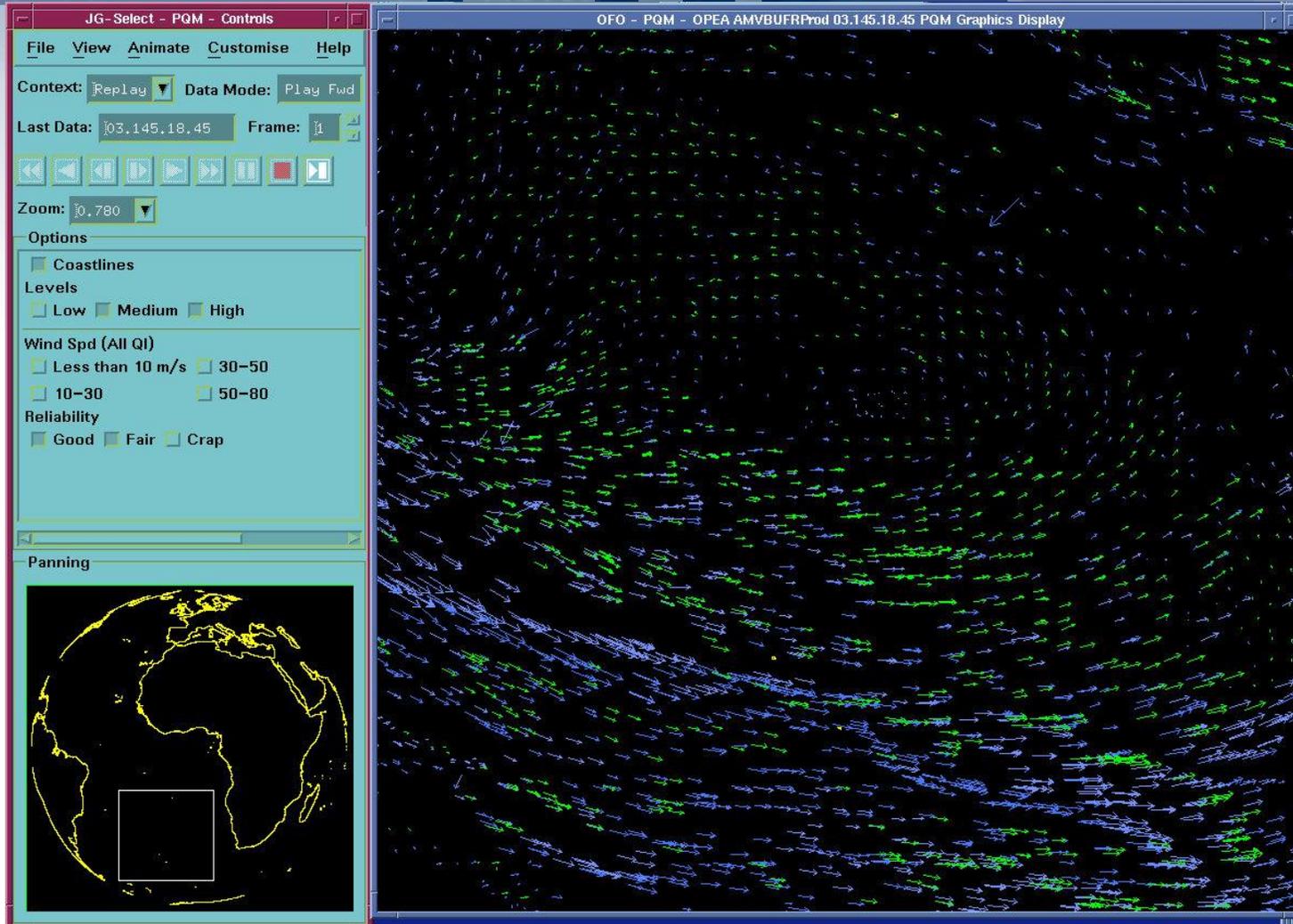
The screenshot displays the PVA on-screen software interface, which is used for visualizing and animating vector data on a globe. The interface is divided into several panels:

- PVA Projection Control:** Includes a dropdown for 'Projection' (set to 'Meteosat'), 'Central Longitude' (0.00°), and 'Valid from Frame' (1).
- SSG Segment Structure Grid:** Features a 'Color' selector and a 'COA Coastline' section with its own 'Color' selector.
- LLG Latitude/Longitude-Grid:** Includes 'Latitude Delta' and 'Longitude Delta' (both set to 10.00) and a 'Type' dropdown (set to 'Grid').
- VEC Tabular Data:** Contains a 'Data Header' table with 'Parameter' and 'Value' columns, and a 'Selected Position' table with 'Parameter', 'Value', and 'Unit' columns.
- PVA Layer Control:** A table showing the status and opacity of various layers:

| Status | Layer | Name | Opacity (%) |
|-------------------------------------|-------|-----------------------------|-------------|
| <input type="checkbox"/> | LGD | LGD Legend | 100 |
| <input checked="" type="checkbox"/> | COA | COA Coastline | 75 |
| <input checked="" type="checkbox"/> | LLG | LLG Latitude/Longitude-Grid | 50 |
| <input checked="" type="checkbox"/> | SSG | SSG Segment Structure Grid | 25 |
| <input checked="" type="checkbox"/> | VEC | VEC Base Product | 100 |
- PVA Navigation Control:** Includes a globe view, 'Lat.' and 'Lon.' fields, a 'Zoom' slider (set to 61%), and 'Fit', '1:1', and 'Reset' buttons.
- VEC Input:** Shows 'Product Path' (D_3_P_MET10) and 'Product' (I001551Z_20130220001500Z_00_O_MPF506_WORLD_3_P_MET10).
- VEC Vector Creator:** Includes 'Latitude', 'Longitude', 'Speed', 'Direction', 'Color by' (Speed), 'Type' (Feathered), and 'Scale' (0.45) controls.
- VEC Colour Table:** Features a color gradient bar and a table for defining colors:

| Value | Red | Green | Blue | Alpha |
|-------|------|-------|------|-------|
| 1 | 50 | 196 | 0 | 255 |
| 2 | 25 | 255 | 0 | 255 |
| 3 | 10 | 255 | 255 | 0 |
| 4 | 0.25 | 0 | 255 | 0 |
| 5 | 0 | 0 | 0 | 0 |
- Animation Control:** Includes 'Frame' (0/0 0), 'Speed' (10.0), and 'Loop' checkbox.
- Animation Selection:** Includes 'From' (2000.01.01 00:00), 'Increment' (00:15), and 'Until' (2013.12.31) controls.
- PVA Message Log:** A log window at the bottom left showing error and warning messages.

Vector products previously



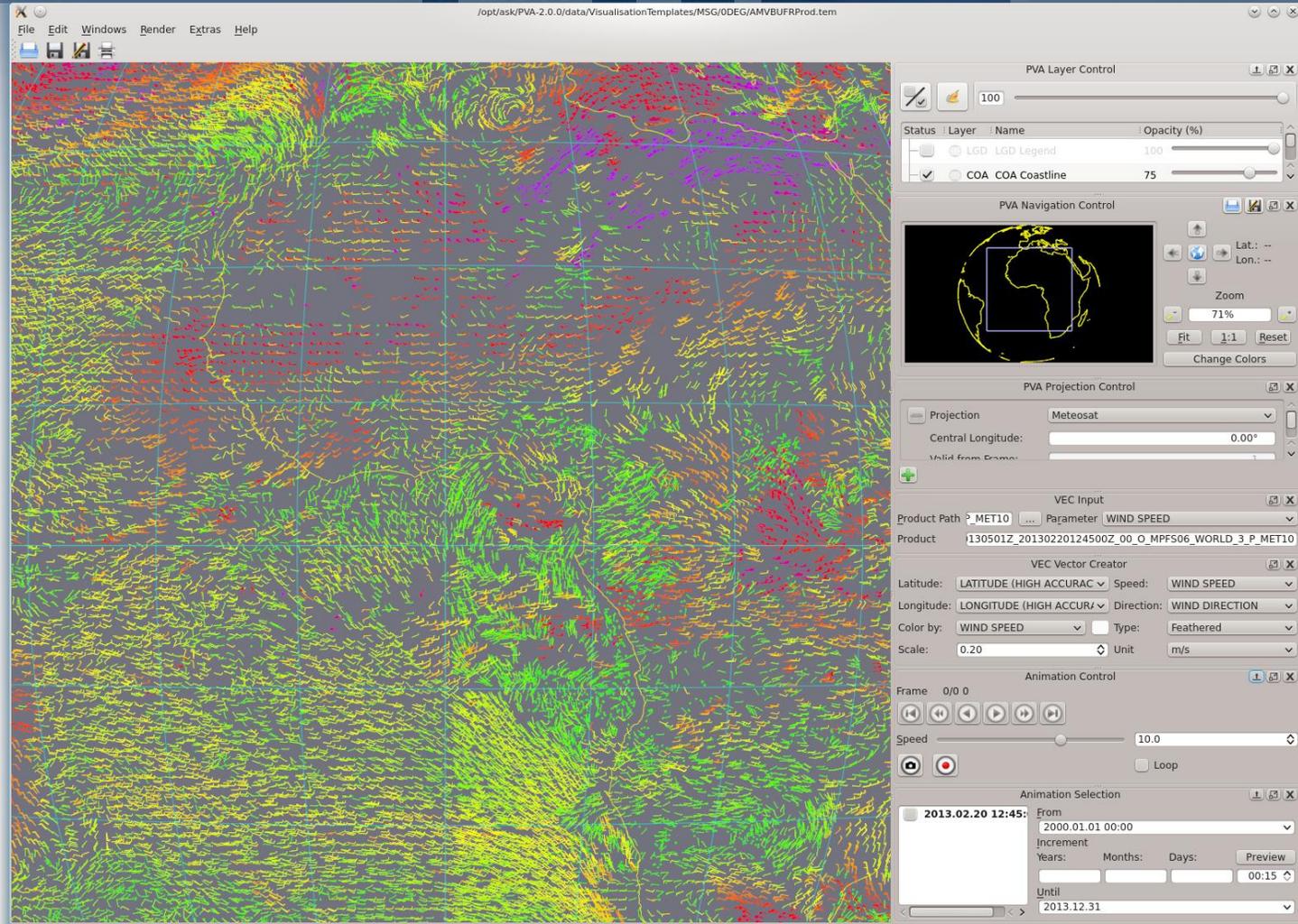
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Vector products



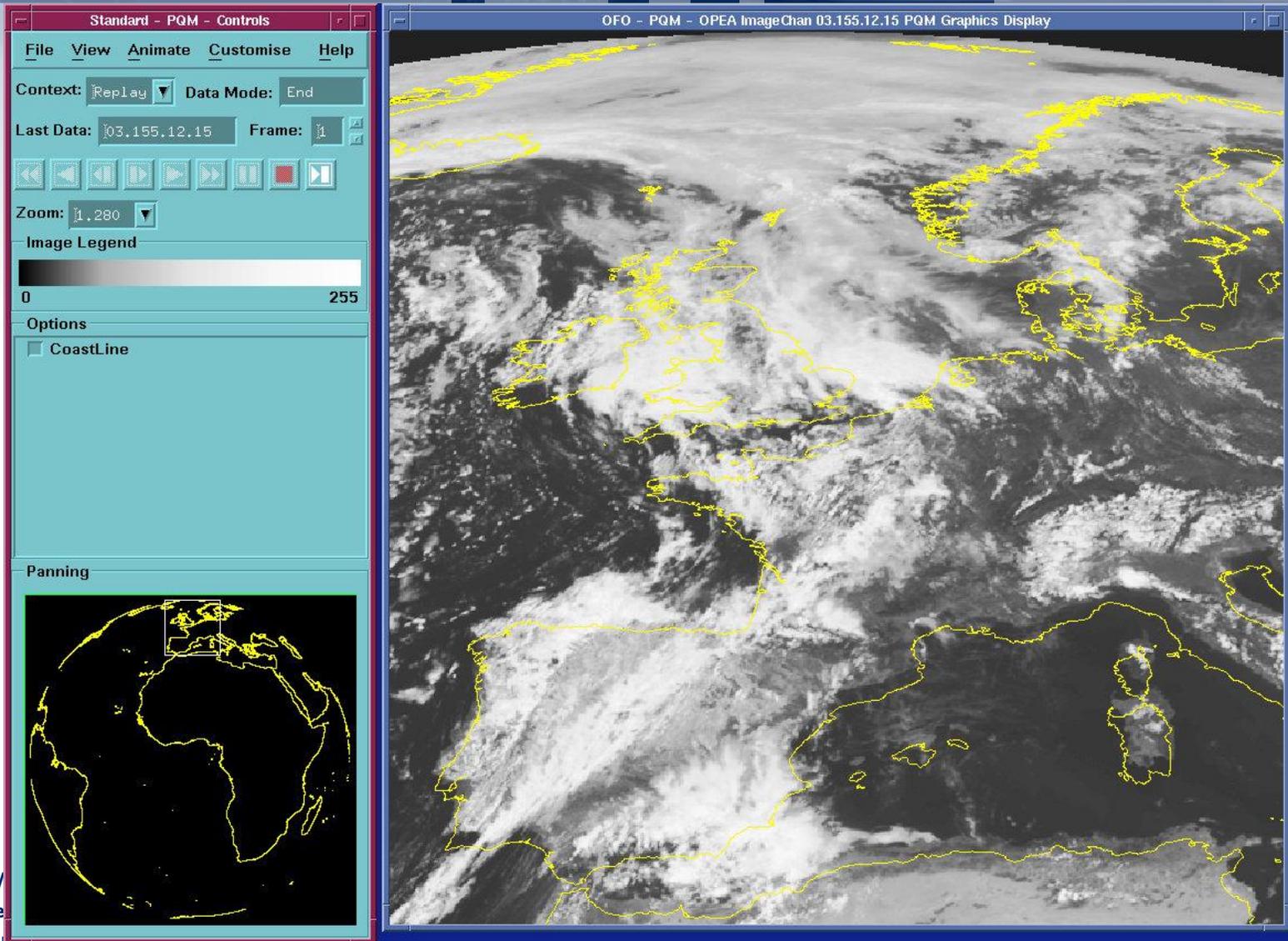
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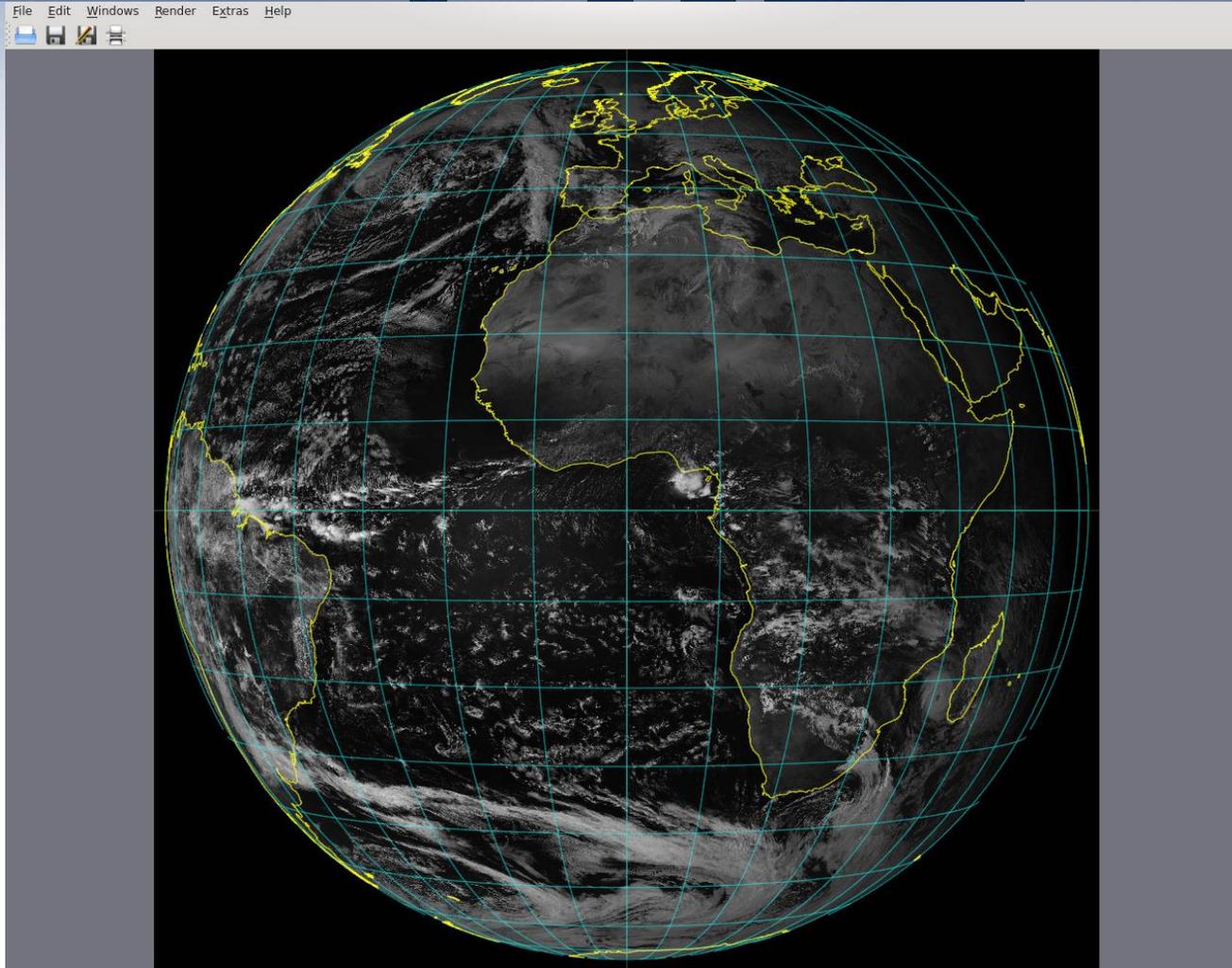
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Satellite images previously



Satellite images



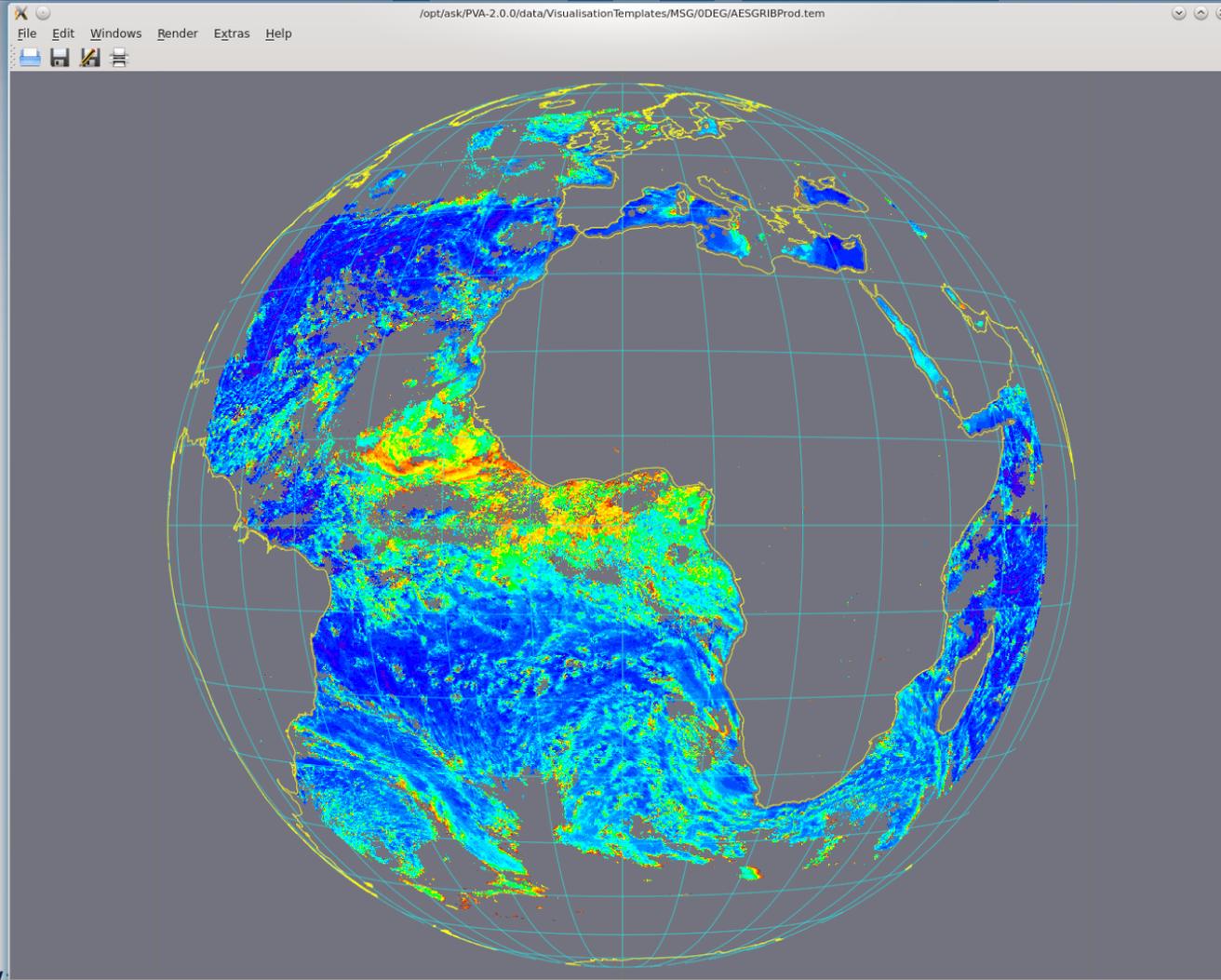
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Newer types of Encoded Products



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Input, Colour, Coastline & Reference Controls

The screenshot displays a software interface with a central globe showing a color-coded map of the world. The map uses a color scale from blue (low values) to red (high values), with green and yellow in between. The interface includes several control panels:

- IMG Input:** Product Path: 3_P_MET10, Parameter: ClusterData[1].Clusterid, Product: 100027Z_20130220100000Z_00_O_MPF506_WORLD_3_P_MET10
- IMG Colour Table:** Interpolation: Floor, Stepsize: 10.00, Range Min.: 0.000000, Range Max.: 109.000000, Fetch Range button.
- Colour Table:** A table with columns for Value, Red, Green, Blue, and Alpha. The table contains 17 rows of data.
- COA Coastline:** Color: Yellow
- LLG Latitude/Longitude-Grid:** Color: Cyan, Latitude Delta: 10.00, Longitude Delta: 10.00
- SSG Segment Structure Grid:** Color: Olive Green

| | Value | Red | Green | Blue | Alpha |
|----|-------|-----|-------|------|-------|
| 1 | 109 | 0 | 0 | 0 | 255 |
| 2 | 108 | 255 | 0 | 0 | 255 |
| 3 | 107 | 255 | 255 | 255 | 255 |
| 4 | 106 | 220 | 220 | 220 | 255 |
| 5 | 101 | 195 | 195 | 195 | 255 |
| 6 | 99 | 128 | 128 | 128 | 255 |
| 7 | 98 | 255 | 255 | 0 | 255 |
| 8 | 18 | 255 | 0 | 0 | 255 |
| 9 | 17 | 0 | 0 | 255 | 255 |
| 10 | 15 | 134 | 255 | 5 | 255 |
| 11 | 13 | 145 | 73 | 0 | 255 |
| 12 | 9 | 0 | 128 | 0 | 255 |
| 13 | 8 | 0 | 64 | 64 | 255 |
| 14 | 7 | 0 | 128 | 128 | 255 |
| 15 | 5 | 107 | 125 | 18 | 255 |
| 16 | 1 | 91 | 41 | 0 | 255 |
| 17 | 0 | 0 | 0 | 0 | 255 |

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Layer, Navigation & Projection Controls

The screenshot displays a software interface for controlling a globe visualization. The main window shows a globe with several data layers overlaid, including a legend, coastline, latitude/longitude grid, and a base product. The interface includes a menu bar (File, Edit, Windows, Render, Extras, Help) and three control panels:

- PVA Layer Control:** A panel with a toolbar and a table of layers. The table has columns for Status, Layer, Name, and Opacity (%).

| Status | Layer | Name | Opacity (%) |
|-------------------------------------|-------|-----------------------------|-------------|
| <input type="checkbox"/> | LGD | LGD Legend | 100 |
| <input checked="" type="checkbox"/> | COA | COA Coastline | 75 |
| <input checked="" type="checkbox"/> | LLG | LLG Latitude/Longitude-Grid | 50 |
| <input checked="" type="checkbox"/> | SSG | SSG Segment Structure Grid | 25 |
| <input checked="" type="checkbox"/> | IMG | IMG Base Product | 100 |
- PVA Navigation Control:** A panel with a toolbar, a small globe view, and navigation controls. It includes fields for Latitude (Lat.: --) and Longitude (Lon.: --), a Zoom slider set to 39%, and buttons for Fit, 1:1, Reset, and Change Colors.
- PVA Projection Control:** A panel with a dropdown menu for Projection (set to Meteosat), a text field for Central Longitude (0.00°), and a text field for Valid from Frame (1).

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Animation Selection & Controls

File Edit Windows Render Extras Help

Animation Control

Frame 0/0 0

Speed 10.0

Loop

Animation Selection

From 2000.01.01 00:00

Increment

Years: Months: Days: Preview 00:15

Until 2013.12.31

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