
# GOCE Swarm Exploration Platform Web Client application

## User's Manual

| | *name*<br>*function*<br>*company* | *date*<br>*signature* |
|---|---|---|
| *prepared by* | Guillaume AUREL<br>*Engineer*<br>VisioTerra<br>*Guillaume.Aurel@visioterra.fr* | |
| *checked by* | Kevin GROSS<br>*Project Manager*<br>VisioTerra<br>*Kevin.Gross@visioterra.fr* | |
| *approved by* | Serge RIAZANOFF<br>*Director*<br>VisioTerra<br>*Serge.Riazanoff@visioterra.com* | |

# DOCUMENT STATUS SHEET

| Issue | Date | Comments | Author |
|---|---|---|---|
| 1.0 | 02/10/2015 | Draft 01 - Creation of the document | G. Aurel |
| 1.0 | 02/10/2015 | Draft 02 - Modification of the document | J. Kazemifard |
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| 2.02 | 26/01/2016 | Draft 01 - Update for VtGsep 2.0 | G. Aurel |
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| 2.03 | 10/02/2016 | Draft 01 – Integration of modifications specified by J. Kazemifard | G. Aurel |
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| 2.03 | 12/02/2016 | Final version | K. Gross |

# TABLE OF CONTENTS

# LIST OF FIGURES

# 1 PURPOSE

Gsep is an application designed to select Swarm and GOCE products, display them on a virtual globe and disseminate views of them. Gsep is intended to work with the use of a recent web browser and doesn't require any software or plug-in installation.

In order to search data, the user needs to specify a time interval and a dataset.

Once Swarm/GOCE products have been listed, they can be added on the layer stack and displayed. The physical measure, its scale and the display colour of the selected data can be set according to the user's needs and will then appear on the VtWeb virtual globe.

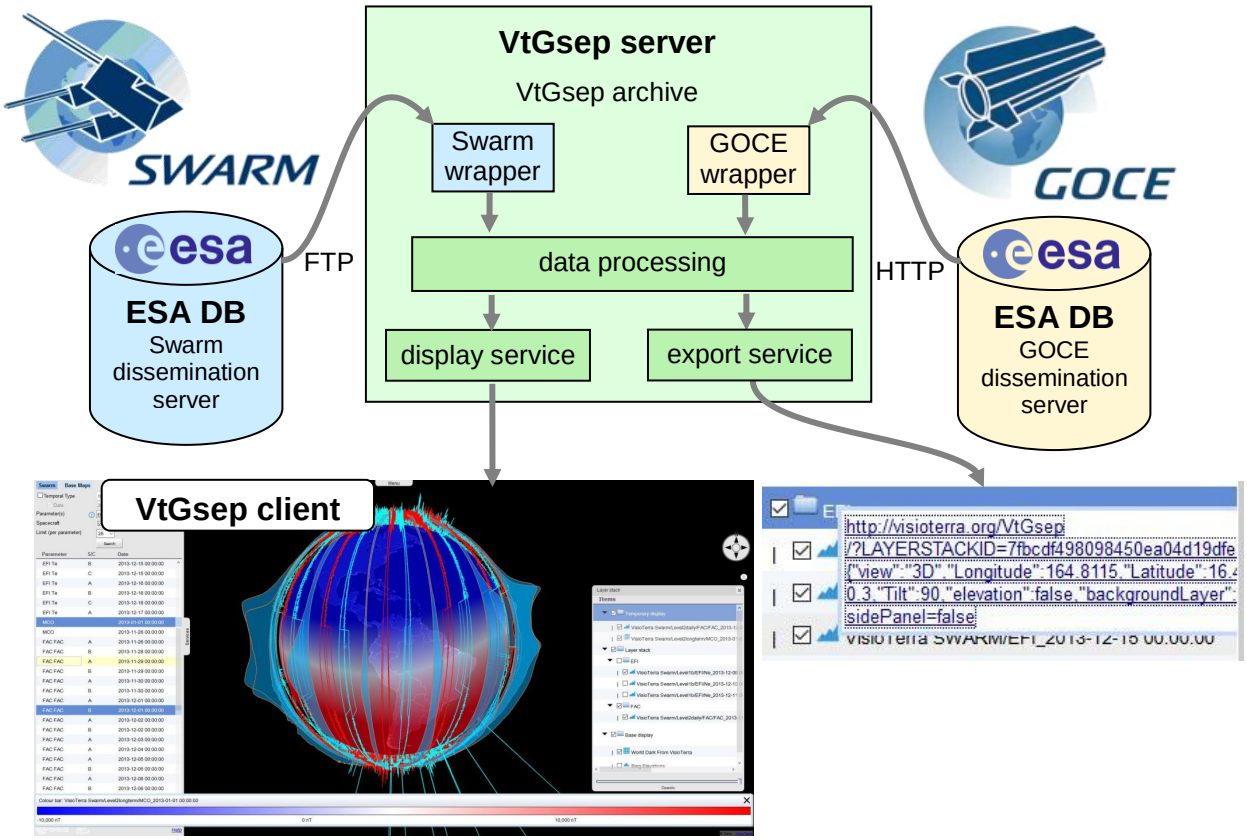



*fig. 1 - VtGsep client-server architecture.*

## 1.1 Reference documents

This section describes the related documents and applied conventions to be considered within the present document.

| | | |
|---|---|---|
| **R-1** | GO-MA-HPF-GS-0110 | GOCE Level2 Product Data Handbook<br>Issue 04, Revision 3 – 09/12/2010<br>Th. GRUBER, R. RUMMEL, IAPG<br>O. ABRIKOSOV, GFZ<br>R. VAN HEES, SRON<br>http://earth.esa.int/pub/ESA_DOC/GO-MA-HPF-GS-0110_4.3%20-%20Product%20Data%20Handbook.pdf<br>..\reference_document\GOCE\GO-MA-HPF-GS-0110_4.3-Product_Data_Handbook.pdf |
| **R-2** | 10.1007/s00190-011-0467-x | First GOCE gravity field models derived by three different approaches<br>25 mars 2011<br>Roland PAIL, IAPG<br>Sean BRUINSMA, CNES<br>Federica MIGLIACCIO, Politecnico di Milano<br>https://doi.org/10.1007/s00190-011-0467-x<br>..\reference_document\GOCE\20110325_PAIL_First_GOCE_gravity_field_models_derived_by_three_different_approaches.pdf |

# 2 THE VTWEB PLATFORM

## 2.1 VtWeb client-server architecture

### 2.1.1 Overall description

The main window of the "VtWeb client" is composed of the panels shown in figure below. Each panel is described in the sections hereafter.

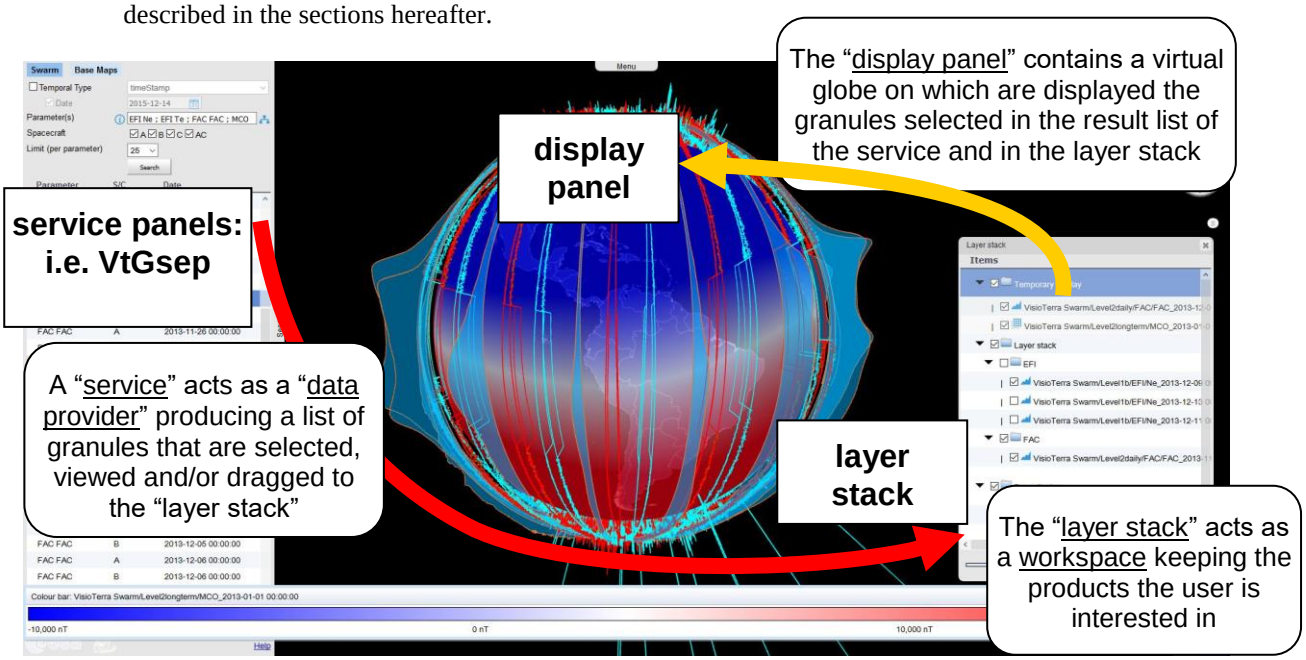
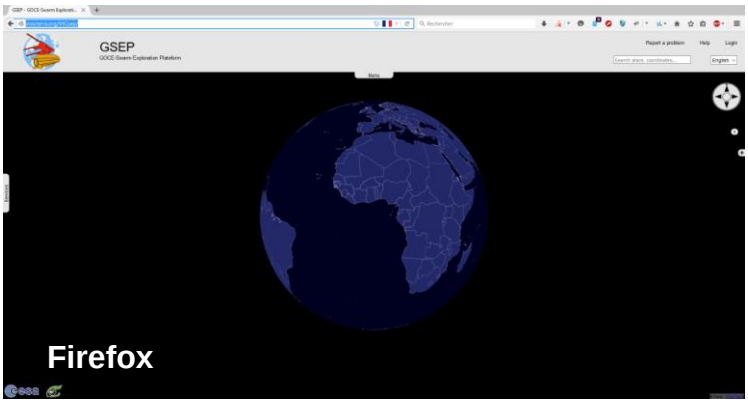


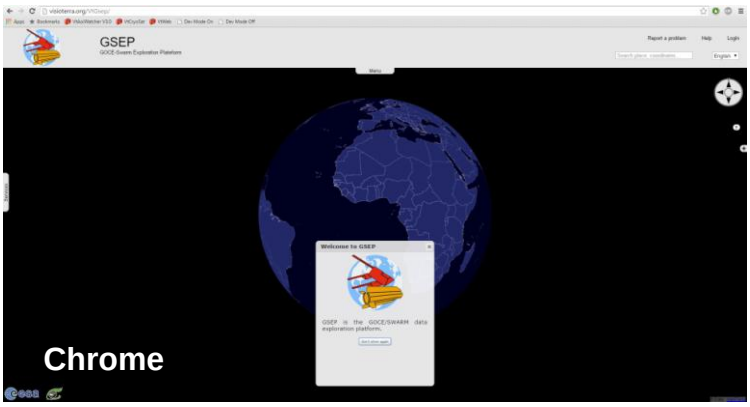

*fig. 2 - The "VtWeb client" main interface.*

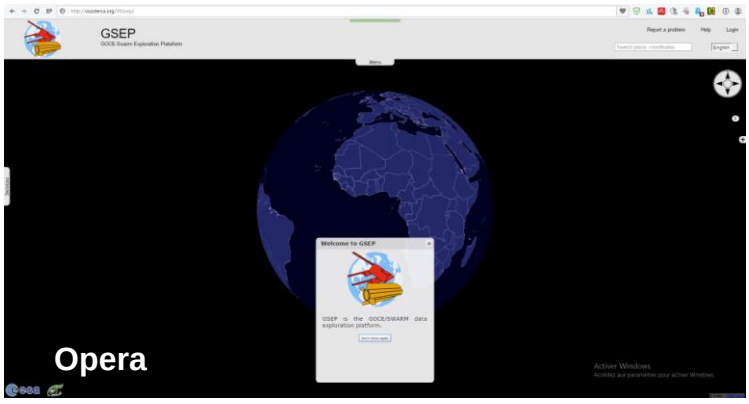
### 2.1.2 Virtual globe in Web navigators

The application can be accessed via a recent Web-browser such as Chrome 45.0.2454 or later (Google™), Firefox 41.0.1 or later (Mozilla™), Opera 32 or later (Opera Software™), Safari 9.0 or later (Apple™) or Edge 20.10240.16384.0 or later (Microsoft™).

It is also functional on WebGL compatible mobile devices with Chrome or Firefox mobile browsers.



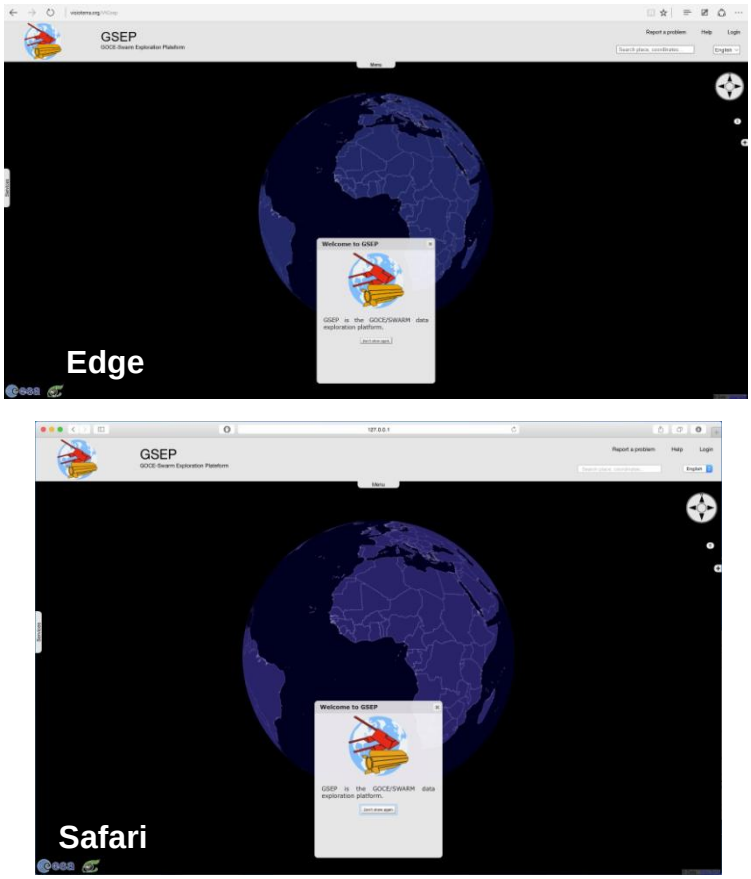



*fig. 3 - "VtWeb client" shown using Firefox, Chrome, Opera, Edge and Safari on PC.*

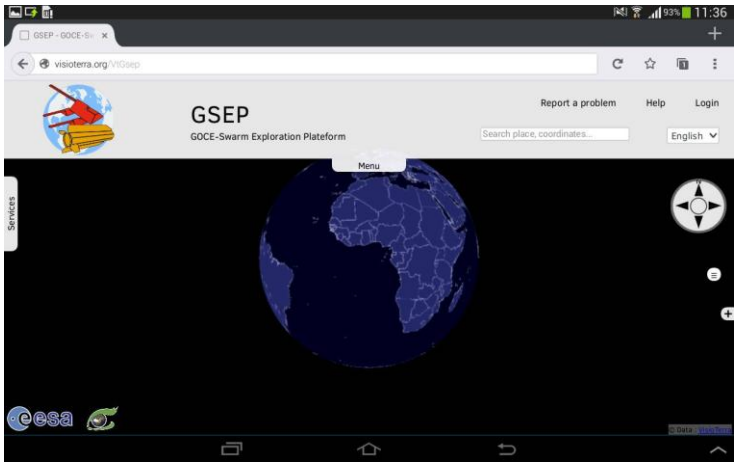



*fig. 4 - "VtWeb client" shown on a mobile device.*

## 2.2 Service panel(s)

This panel depends on the service(s) available for this application and may contain the interface for those different services. **Swarm and GOCE** services are the object of the present document and are detailed in section 3 and 4 but examples may use other VtWeb instances and services that are already running on VisioTerra's servers for development purposes.

It can be shown, hidden and resized by moving the cursor over the "**Services**" tab on the left and dragging it as desired.

## 2.3 Layer stack

The layer stack contains the list of all items that can be displayed in the display panel. It can be accessed by clicking the small button located at the top-right hand corner of the screen and contains three dashes (red).

As shown by the green arrow, items in the layer stack will be processed in a specific order as described: the one at the top of the list will be the last to be drawn.

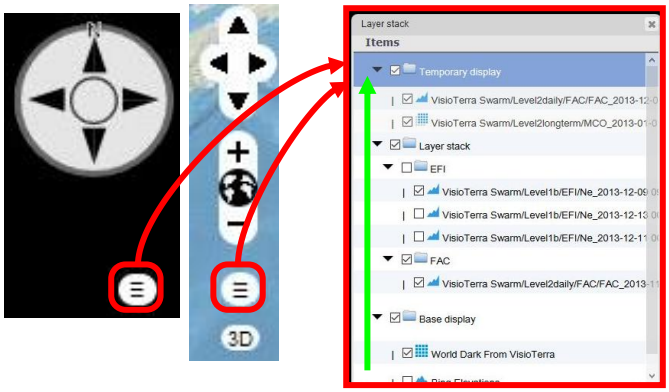



*fig. 5 - Layer stack - Basics.*

### 2.3.1 Main layer stack sections

#### 2.3.1.1 Temporary display

When items of the list are browsed in the Swarm service panel, they are temporarily displayed on the globe and therefore they shall appear in the layer stack folder named "Temporary display". This section of the layer stack is restricted and is to be used only by VtWeb services.

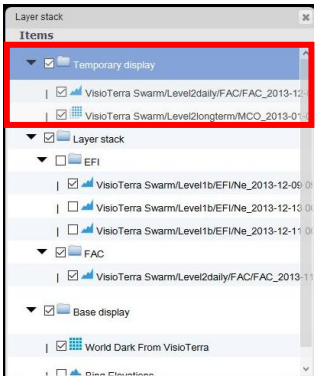



*fig. 6 - Layer stack - Temporary display.*

#### 2.3.1.2 Voluntary display

When items are selected to be displayed in the Swarm service panel, they are added to the layer stack Temporary display. One can click on "**Add to layer stack**" in the context menu or double-click on the item in the list of result to add it to the user's layer stack.

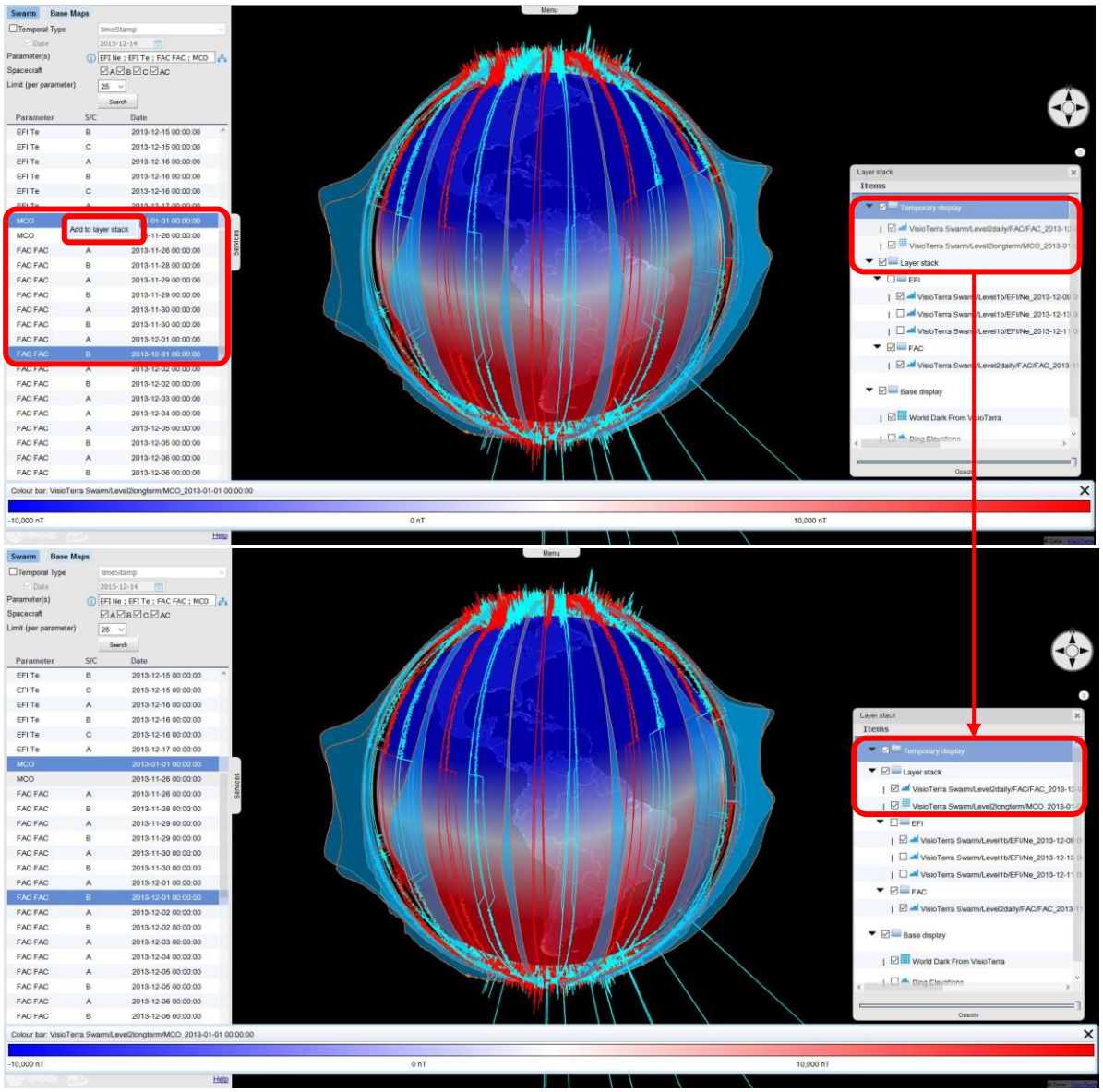



*fig. 7 - Layer stack – Voluntary display.*

#### 2.3.1.3 Base display

The "Base display" section of the layer stack contains an item representing the data used for the globe base map and another item representing data used to shape the globe in 3D (elevation). The base map can be set to invisible if needed (see 2.3.3.1) and elevation can be disabled (the globe is then a perfect sphere).

This section of the layer stack is completely restricted to the Base Maps service and to services managing elevations.

## 2.3.2 Structure

### 2.3.2.1 Creating folders

The layer stack can be organized with folders that can be created in two different ways:

- Right-click on an existing folder and select "**Create folder**" option.
- Right-click on a layer and select the "**Add to new folder**" option. In that way, the layer is directly moved to the new folder.

In the example here below, the "EFI" folder has been added.

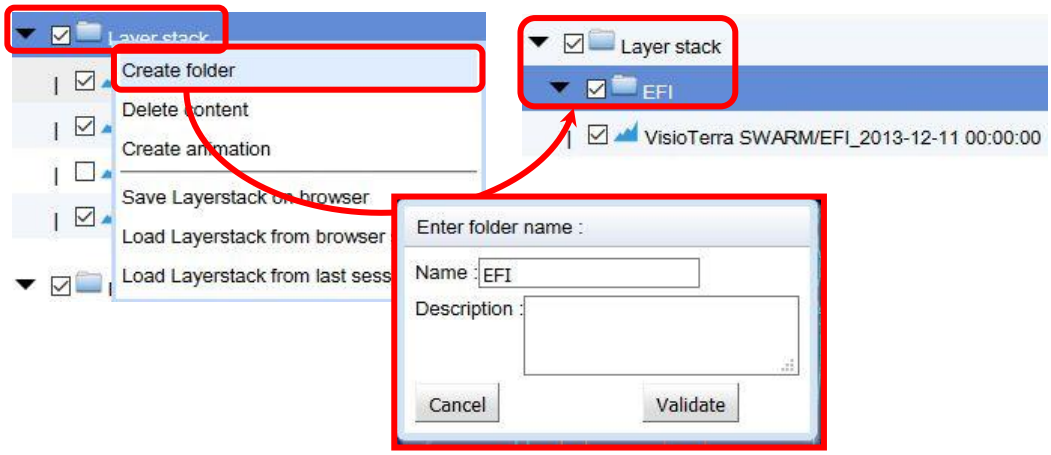


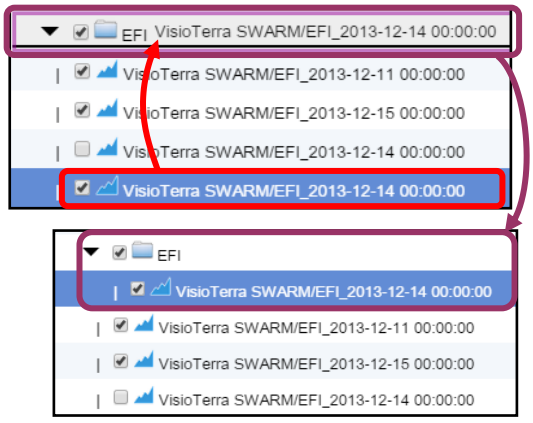

*fig. 8 - Layer stack - Creating folders.*

### 2.3.2.2 Moving items in the layer stack

Any items or group of items can be **moved** across the layer stack by "**drag-and-drop**".

In the example here attached, the bottom EFI layer has been stored in the "EFI" folder, created in the previous section.

Please note that the display order is to change according to the order of the layers in the stack.



#### 2.3.2.3 Adding items to new folders in the layer stack

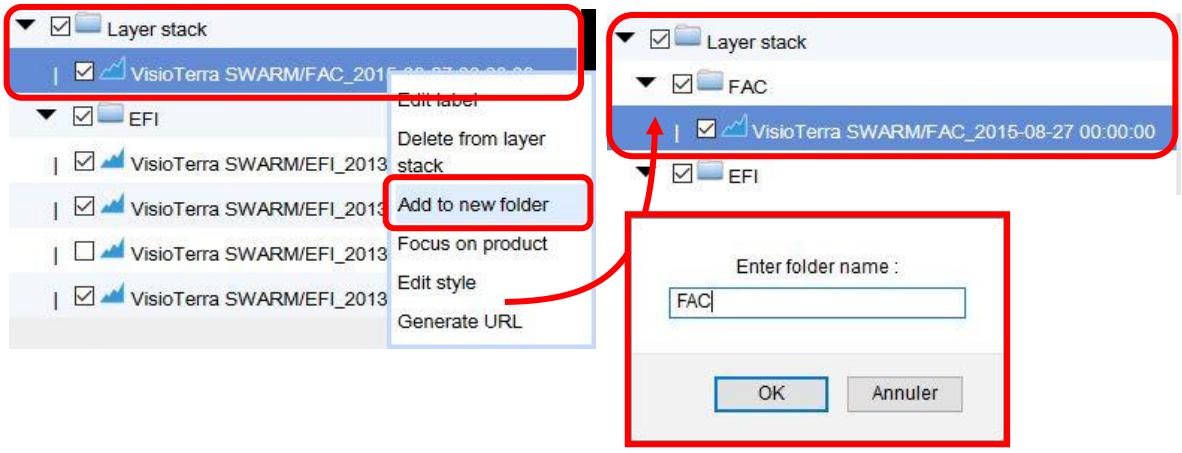



*fig. 9 - Layer stack - Adding to new folders.*

#### 2.3.2.4 Renaming items

To rename granules and folders, right click on them and select the "**Edit label**" option.

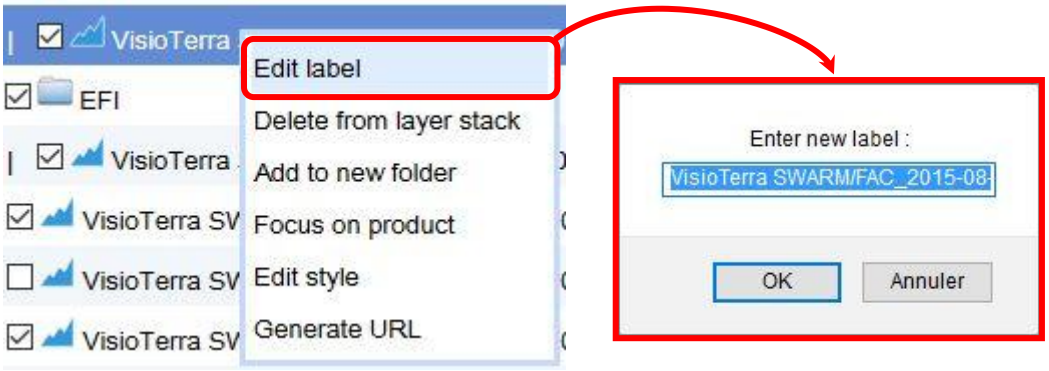



*fig. 10 - Layer Stack - Edit a layer's label.*

### 2.3.2.5 Deleting items

Any items or group of items can be deleted from the layer stack by selecting the "**Delete from layer stack**" option of the context menu.

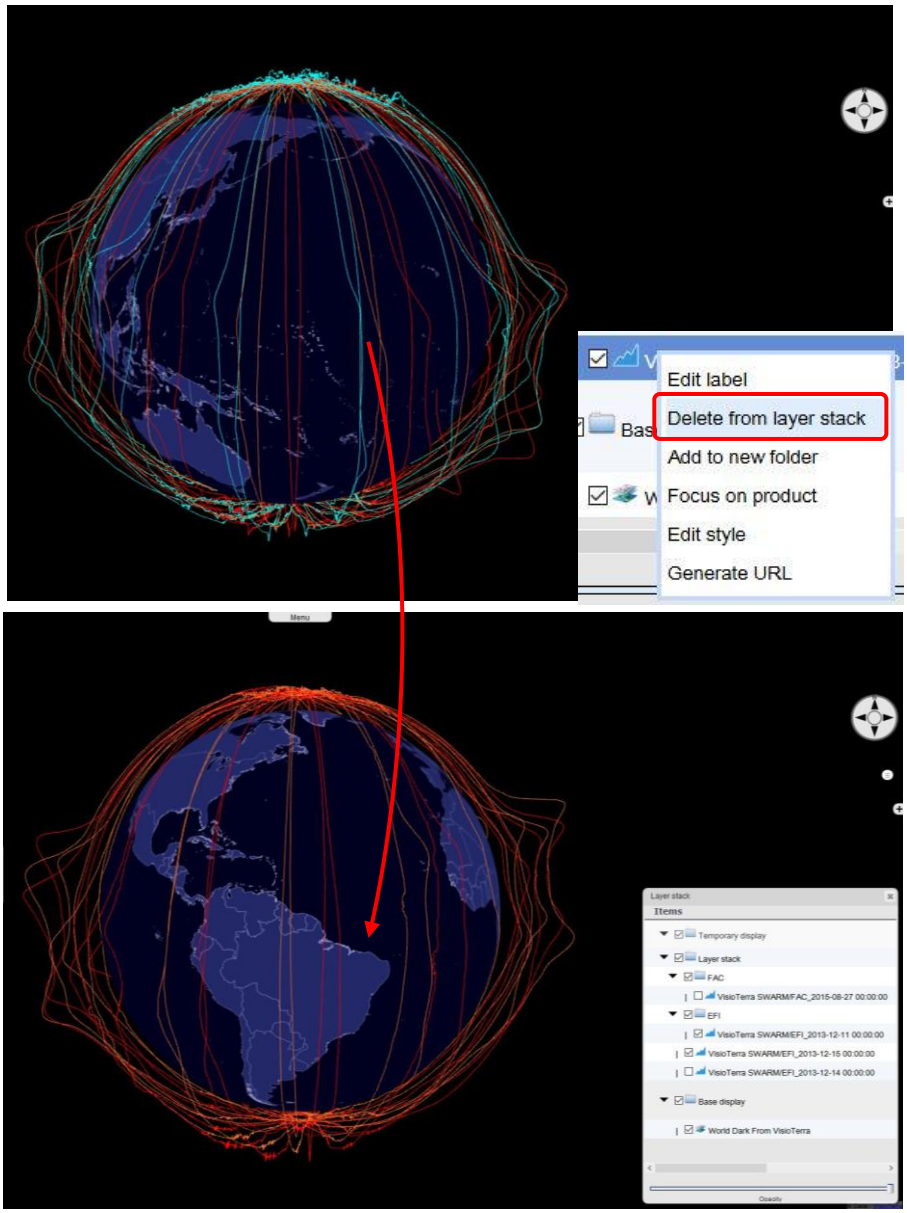



*fig. 11 - Layer Stack - Deleting an object from the layer stack.*

#### 2.3.2.6 Deleting folder content

It is also possible to delete all items of a folder from the layer stack with a right click on the selected folder and by using the "**Delete content**" option in the context menu.

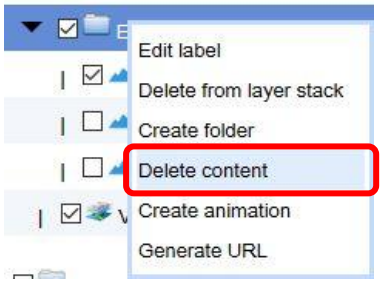



*fig. 12 - Layer Stack - Deleting the content of a folder from the layer stack.*

### 2.3.3 Display capabilities

#### 2.3.3.1 Setting the display on / off

The display of the items, or group of items if the node represents a folder, is controlled by square check-boxes (☑ or ☐). In order to display items, check the corresponding boxes.

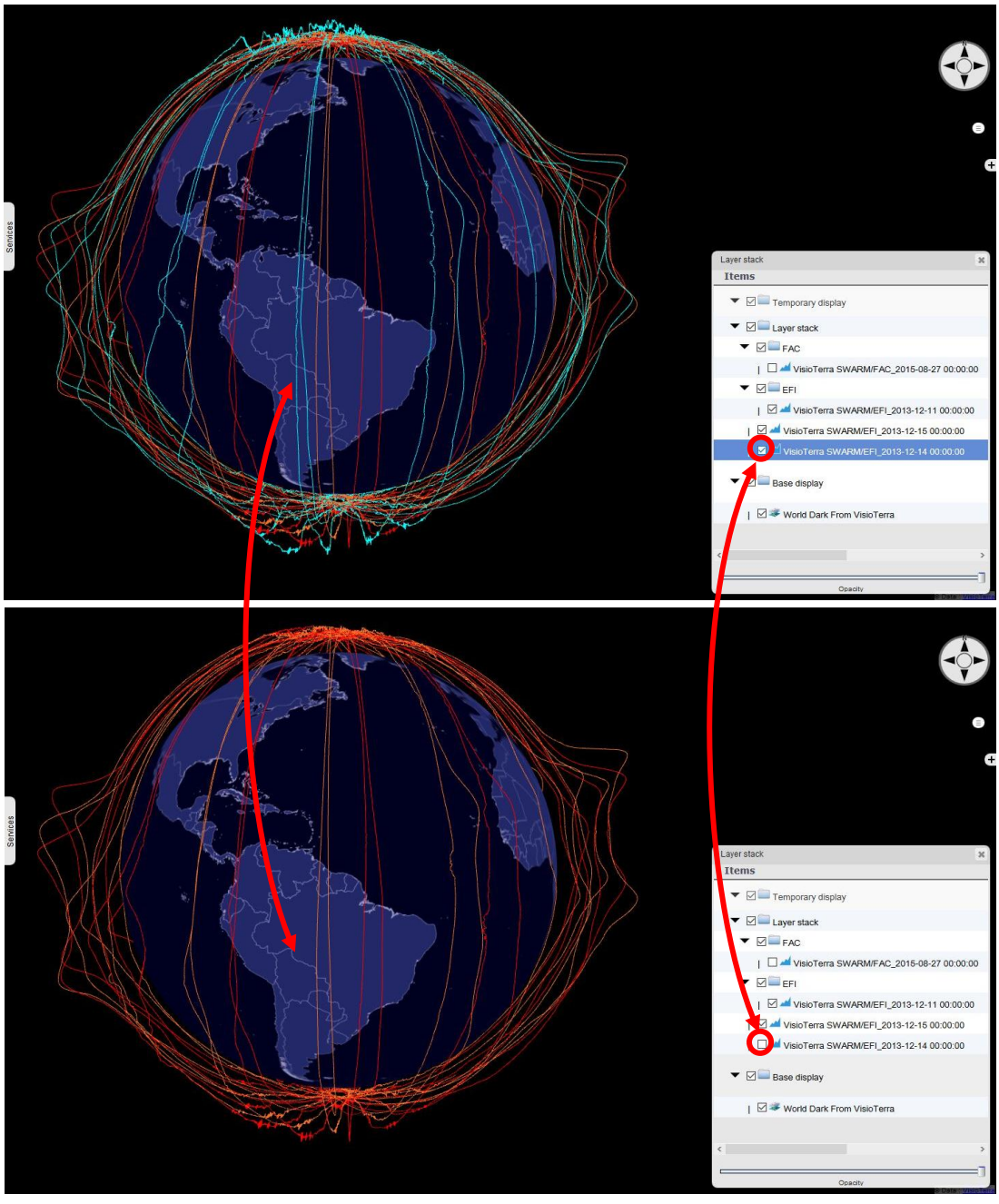



*fig. 13 - Layer stack - Setting display on / off.*

### 2.3.4 Session management

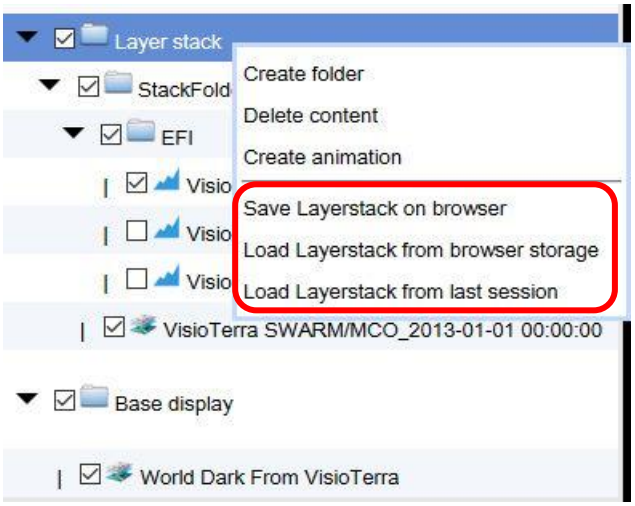
#### 2.3.4.1 Automated session backup

*Saving*

When a user closes a Gsep tab of his browser, the current layer stack is automatically saved, including the folder structure and all items.

*Loading*

A user can load the latest automatically saved session with a right click on the layer stack folder and by choosing the "**Load layerstack from last session**" option.




*Deleting*

The saved session is deleted and replaced by a new one when another Gsep tab is closed.

#### 2.3.4.2 Manual session backup

*Saving*

A user can save the current session state by right-clicking the layer stack folder and choosing the "**Save layerstack on browser**" option. This process also saves the folder structure and all items.

*Loading*

A user can load the latest manual session backup by right-clicking the layer stack folder and choosing the "**Load layerstack from browser storage**" option.

*Deleting*

This manual session backup is deleted and replaced by a new one when another manual session backup is operated. It can also be deleted using advanced browser cache cleaning parameters.

## 2.4 Display panel

### 2.4.1 Navigating across the world

Users can navigate across the globe with the **pan**, the **zoom,** the **rotate** and the **tilt** action.

The controls are similar to those used in the Google Earth ™ software :

- Pan: left-click on globe and drag the pointer to move world. Users can also pan with arrow keys.
- Zoom: scroll the mouse wheel to zoom in and out of the world to pointer position. User may navigate to the native resolution. A double click zooms on the pointer position. Users can also zoom in and out with the "+" and "-" keys or with a right-click and by dragging the mouse up or down.
- Rotate: click on mouse wheel and drag left/right direction to rotate the view. Users can also rotate the view with the help of "shift" and "left"/"down" keys.
- Tilt: click on mouse wheel and drag up/down direction to change tilt. Users can also tilt the view with the help of "shift" and "up"/"down" keys.

### 2.4.2 Resetting the camera view

The Globe camera can be reset using

- '**r**' button: to reset the tilt and the azimuth to the default values.
- '**Shift**'+'**r**' button: to reset the tilt, the azimuth, the position and the altitude to the default values.

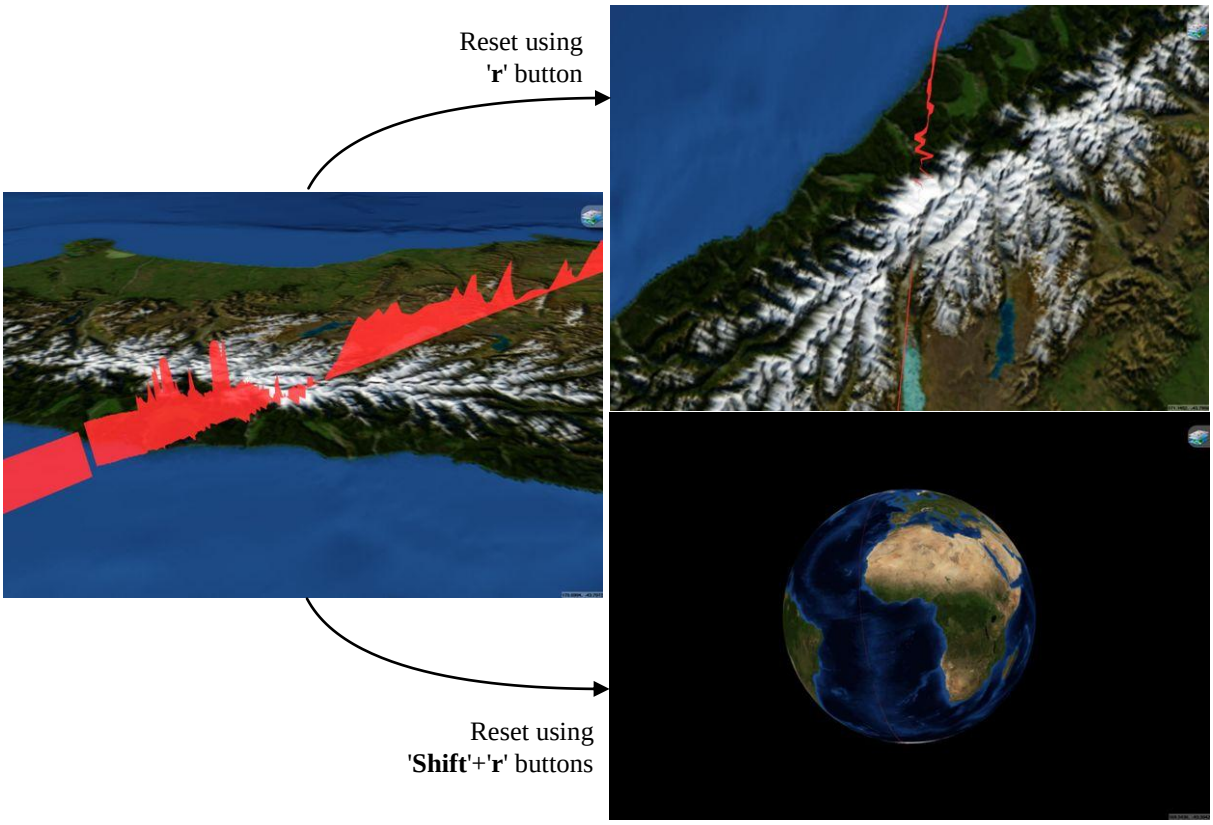



*fig. 14 - Effect of resetting controls on the camera.*

### 2.4.3 Base Map tools

#### 2.4.3.1 Setting the background layer

The "**Base Maps**" tab located at the right of the "**Swarm**" and "**Goce**" tabs in the "**Service panel**" enables to select the background layer. By clicking on the chosen base layer, the "**Display panel**" and the layer in the "**Base display**" folder of the "**Layer stack**" are updated with the selected base map.

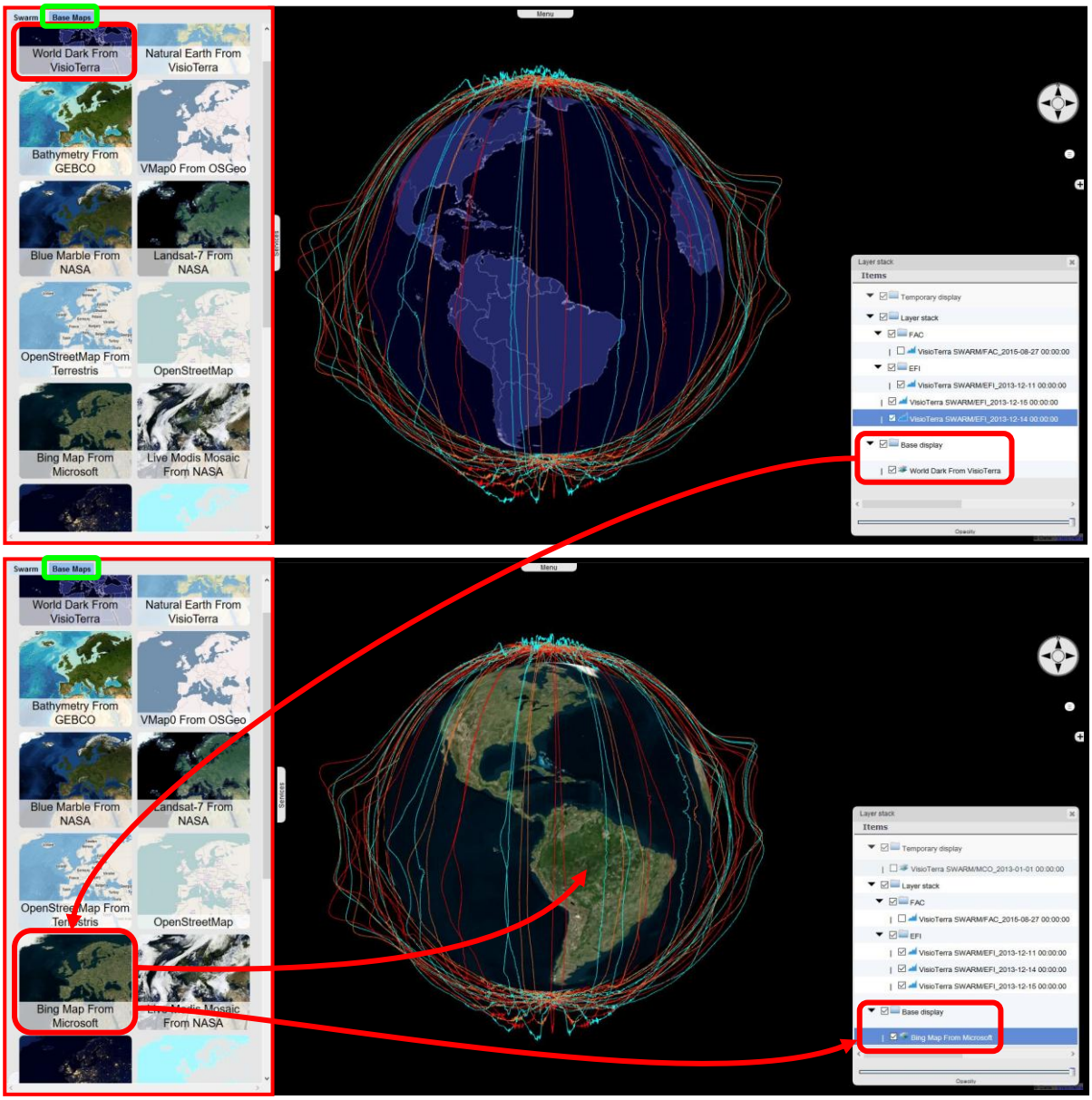



*fig. 15 - Background layer selection menu.*

Figures fig. 17 to fig. 25 here after illustrate the background layers available.

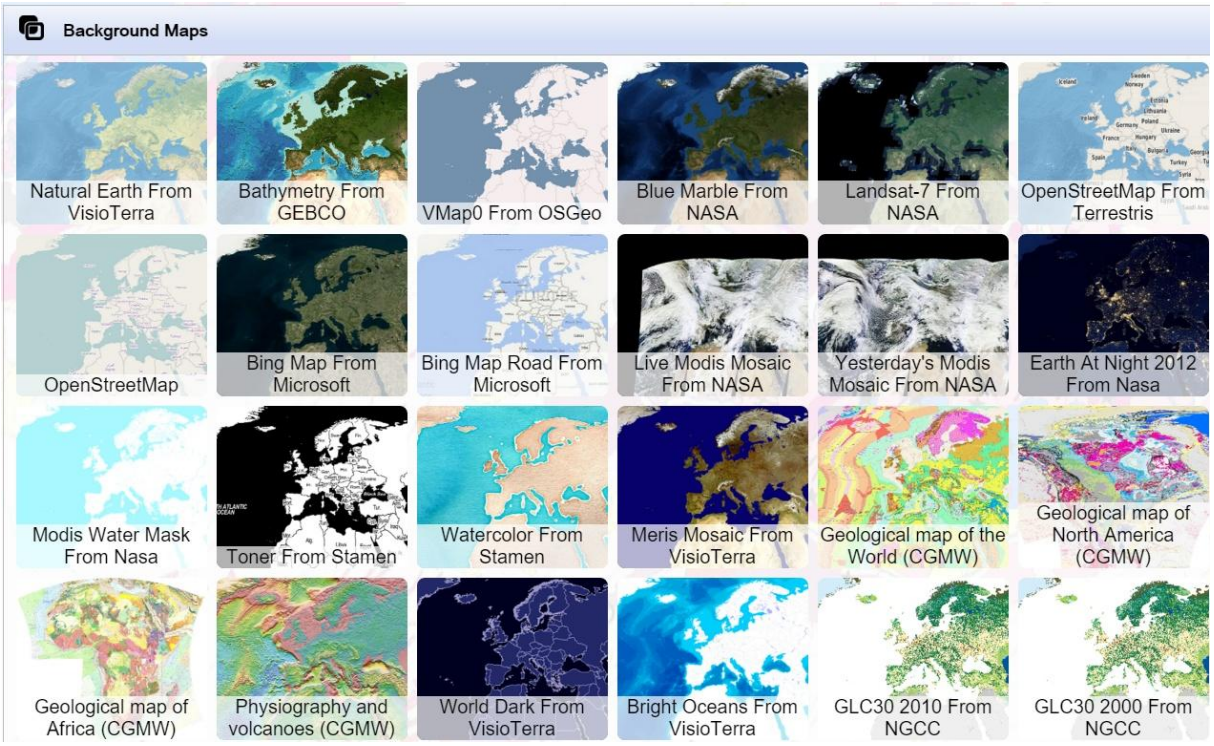



*fig. 16 - Background layers available.*

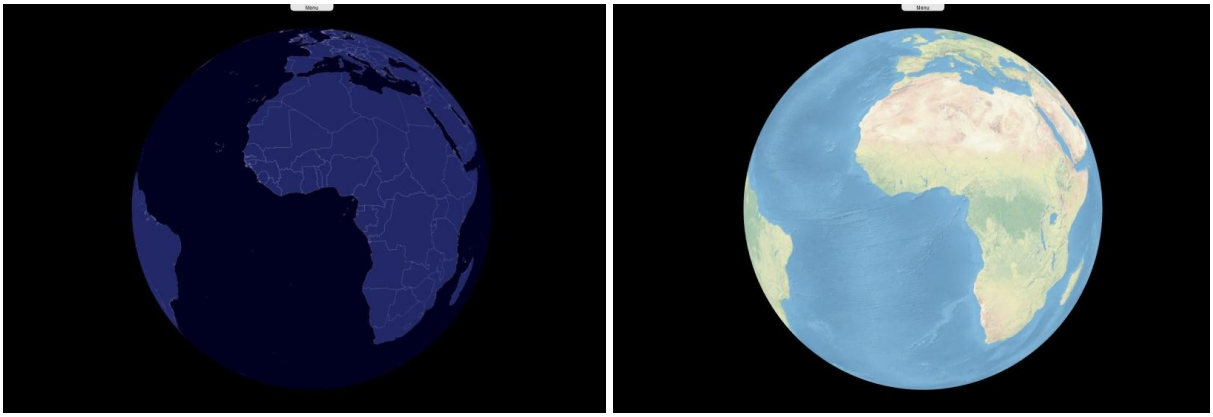


*fig. 17 - Left - VisioTerra - World Dark / Right - VisioTerra - Natural Earth.*

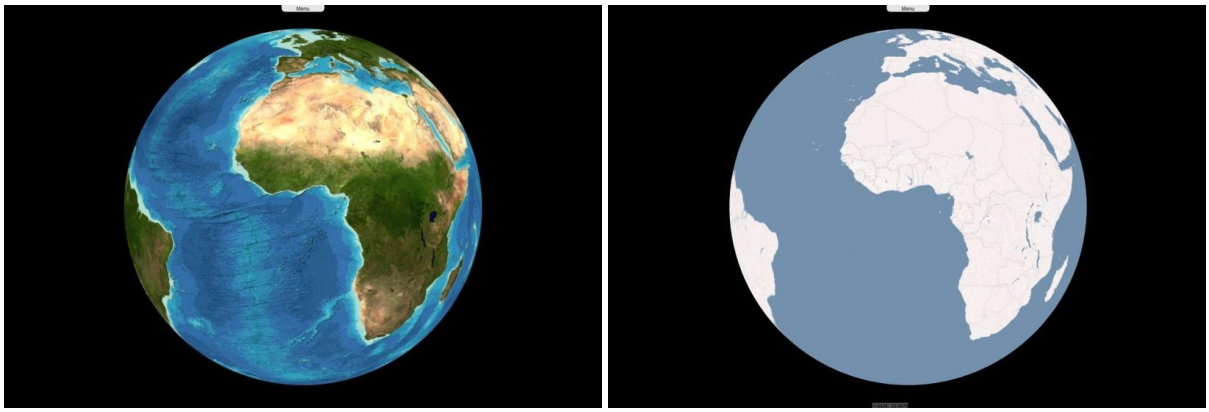


*fig. 18 - Left - GEBCO - Bathymetry / Right - OSGeo - Vmap0.*

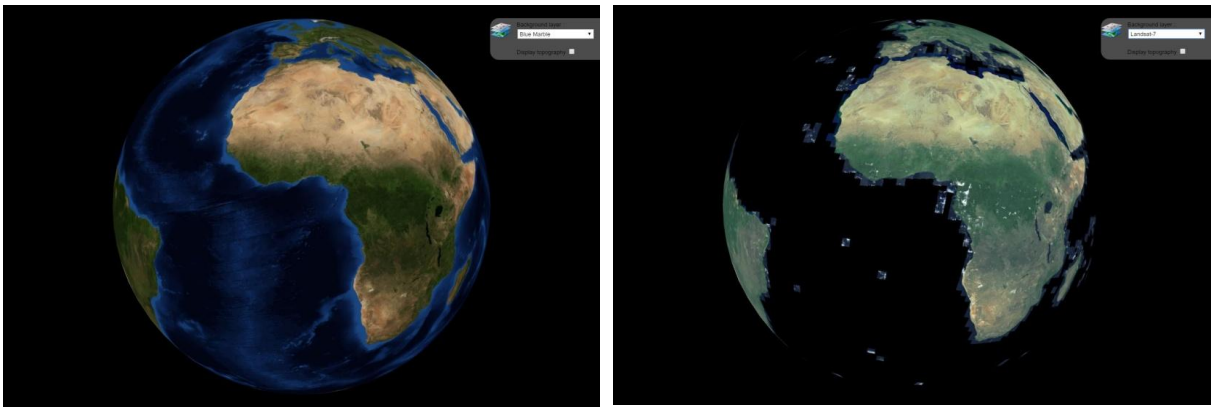


*fig. 19 - Left - NASA - Blue Marble / Right - NASA - Landsat-7.*

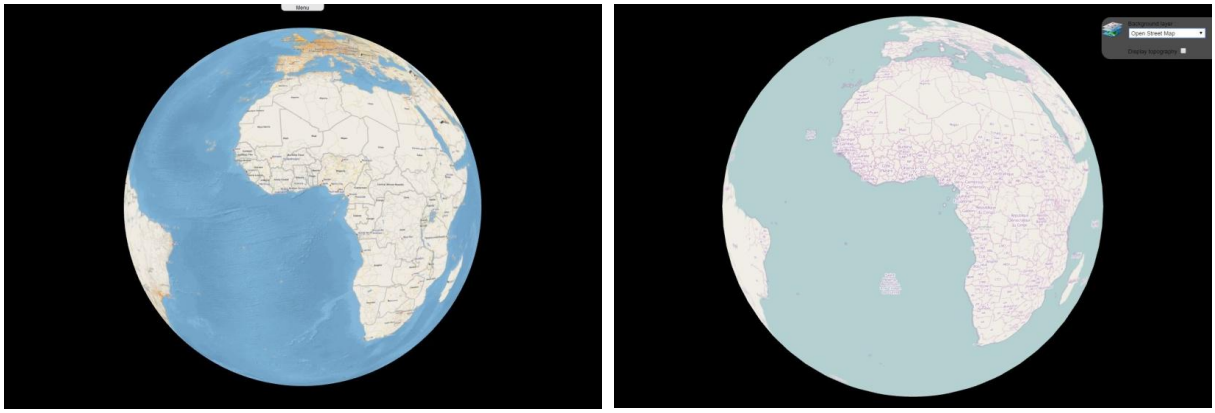


*fig. 20 - Left - Terrestris - OpenStreetMap / Right - OpenStreetMap.*

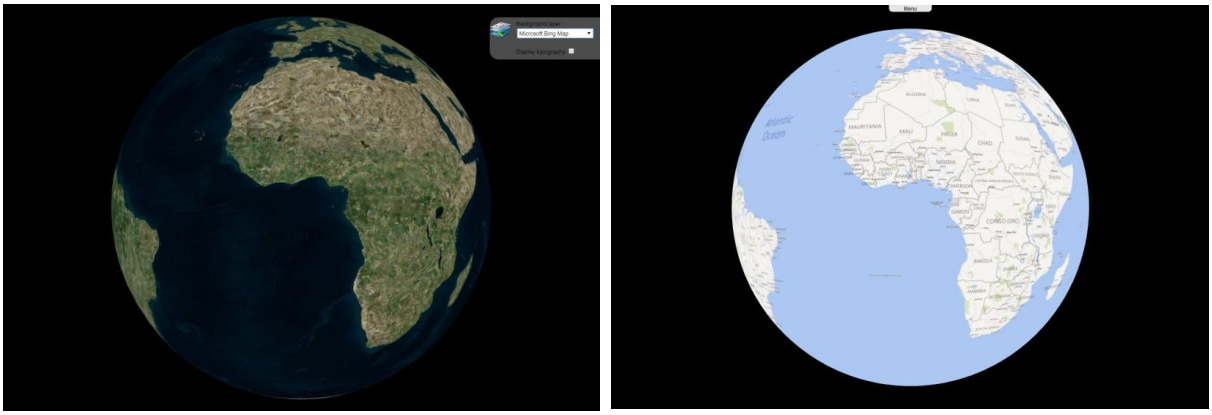


*fig. 21 - Left - Microsoft – Bing Map / Right - Microsoft - Bing Road Map.*

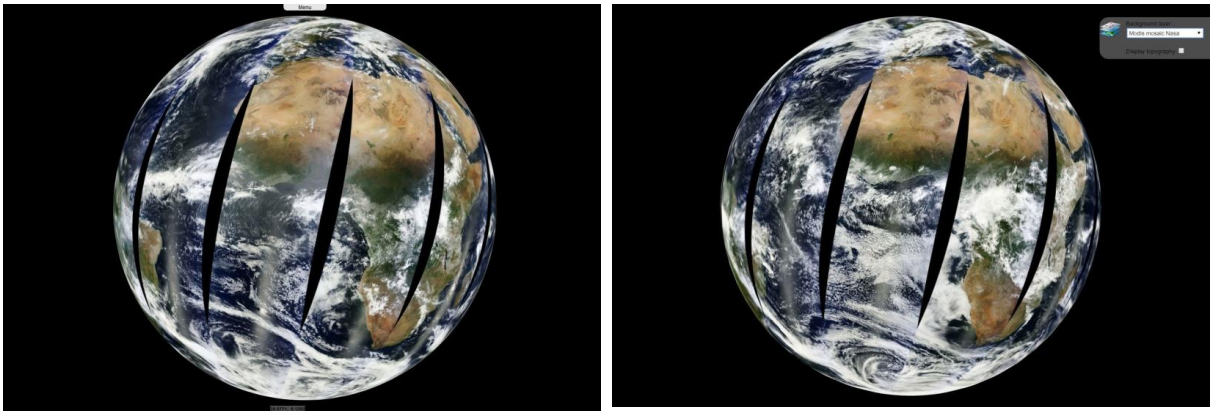


*fig. 22 - Left - NASA - Live MODIS mosaic / Right - NASA - yesterday MODIS mosaic.*

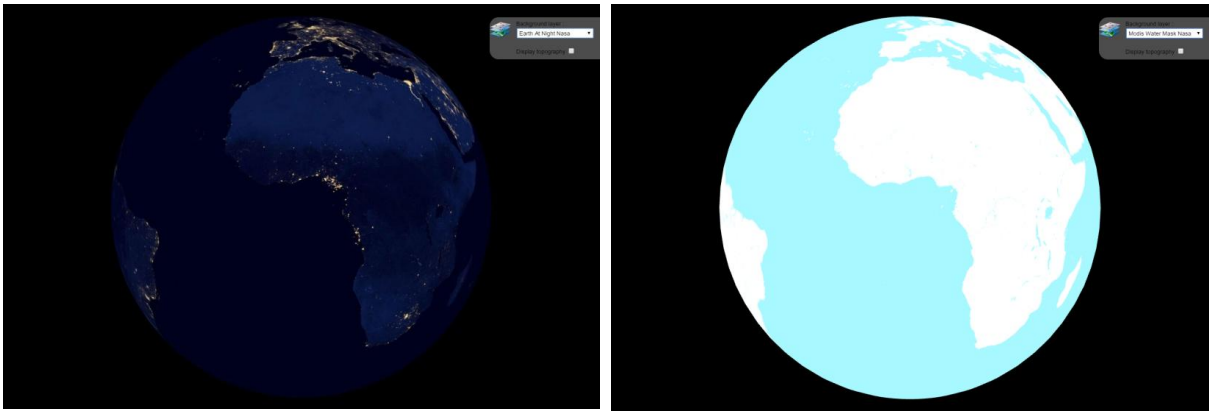


*fig. 23 - Left - NASA - Earth at Night / Right - NASA - MODIS water mask.*

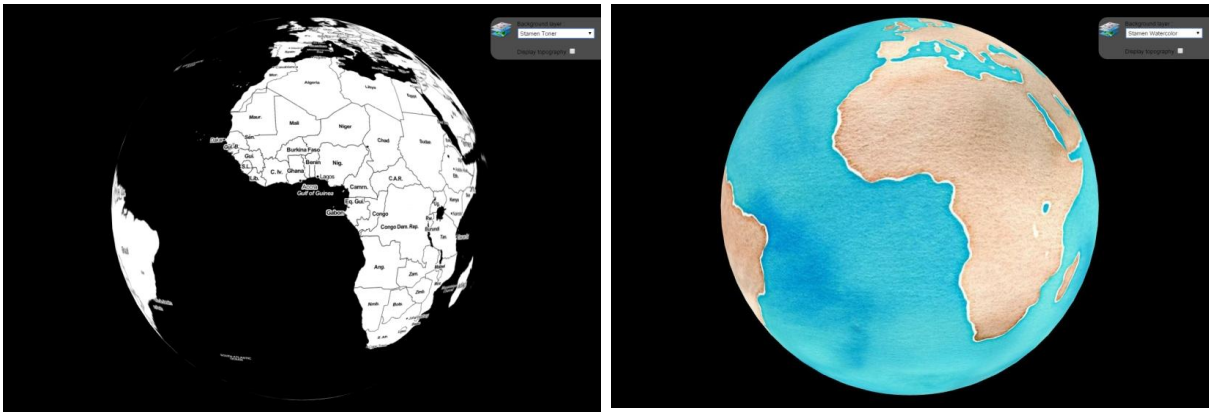


*fig. 24 - Left - Stamen - Toner / Right - Stamen - Watercolor.*

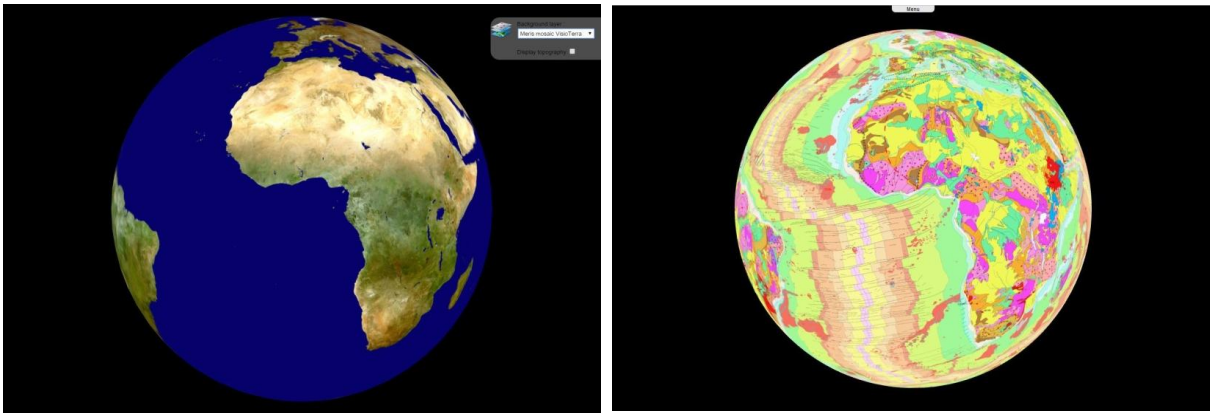


*fig. 25 - Left - VisioTerra - MERIS mosaic / Right - CGMW - Geological map of the World.*

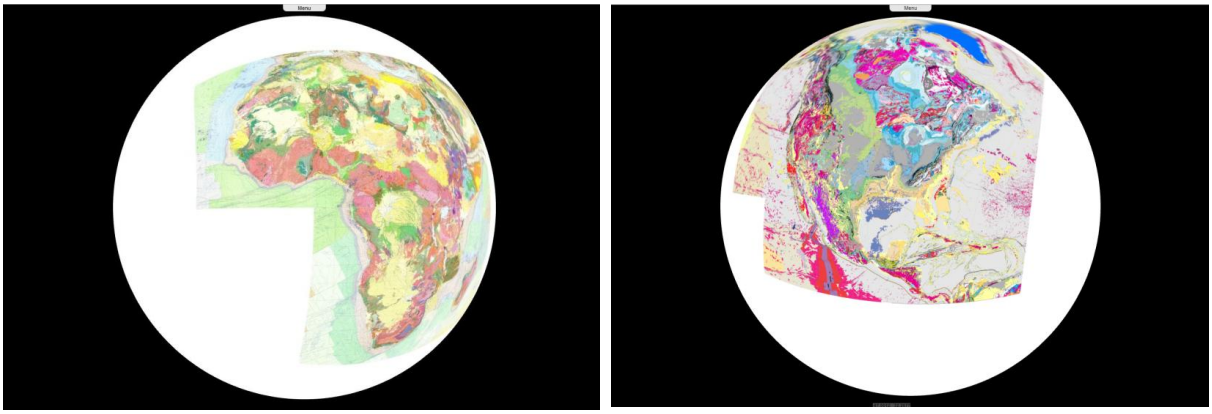


*fig. 26 - Left - CGMW - Geological map of Africa / Right - Geological map of North America.*

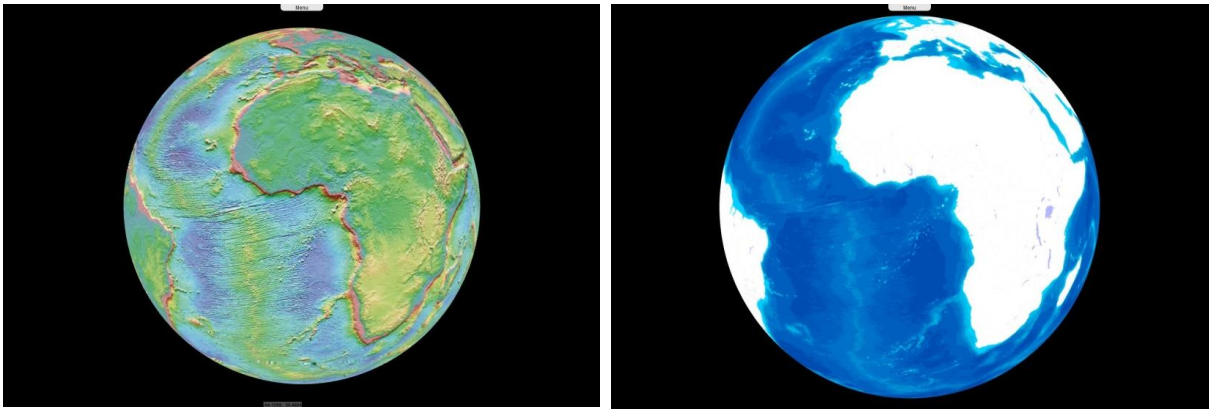


*fig. 27 - Left - CGMW - Physiography and volcanoes / Right - VisioTerra - Bright oceans.*

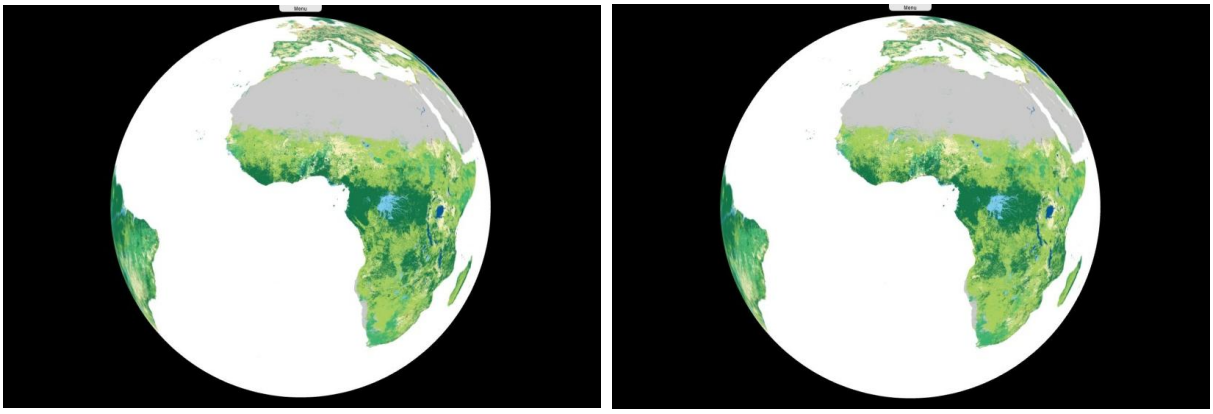


*fig. 28 - Left - NGCC - GLC30 2010 / Right - NGCC - GLC30 2000 background layer.*

It is also possible not to display a globe, by unticking the background layer in the **layer stack**.

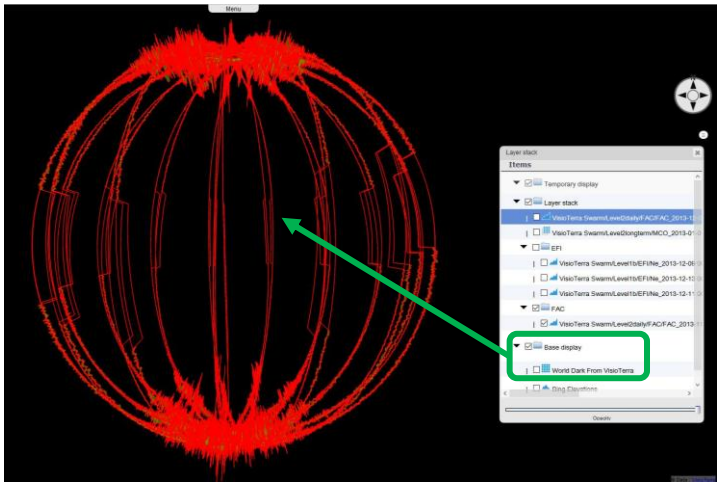


*fig. 29 - No background layer displayed.*

On the opposite, one can superimpose two background layers. Instead of a left-click on the selected background layer "**Base Maps**" tab, it can be added on top of another with a right click on the selected thumbnail and then choosing the "**Add as an overlay**" option. The opacity of this overlay can be modified using the bottom slider bar.

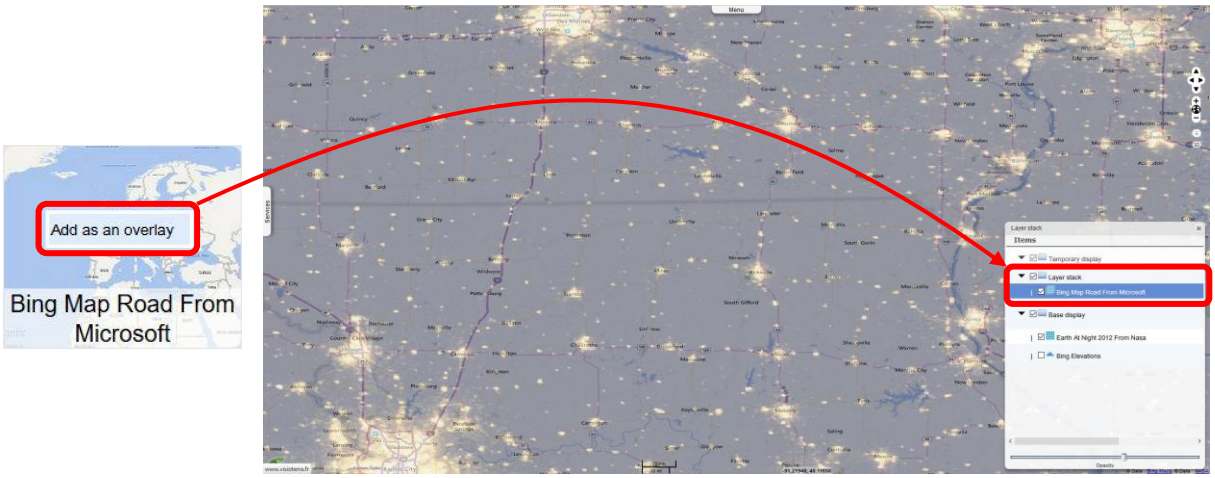



*fig. 30 - Example of a background layer used as a partially transparent overlay over another.*

### 2.4.3.2 Using Overlays

One or more overlays can be added in the layer stack by clicking on the chosen overlay. The overlay is added on the top of the "Layer stack" folder.

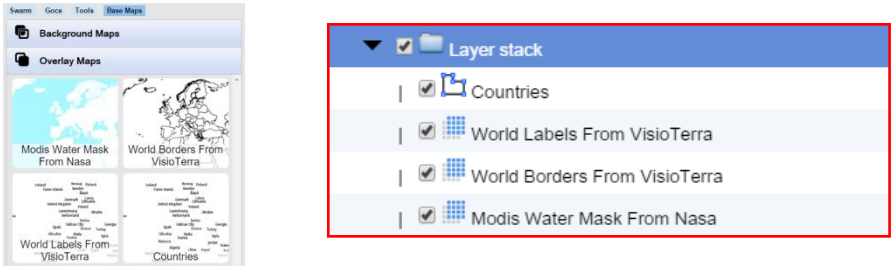



*fig. 31 - Overlays available.*

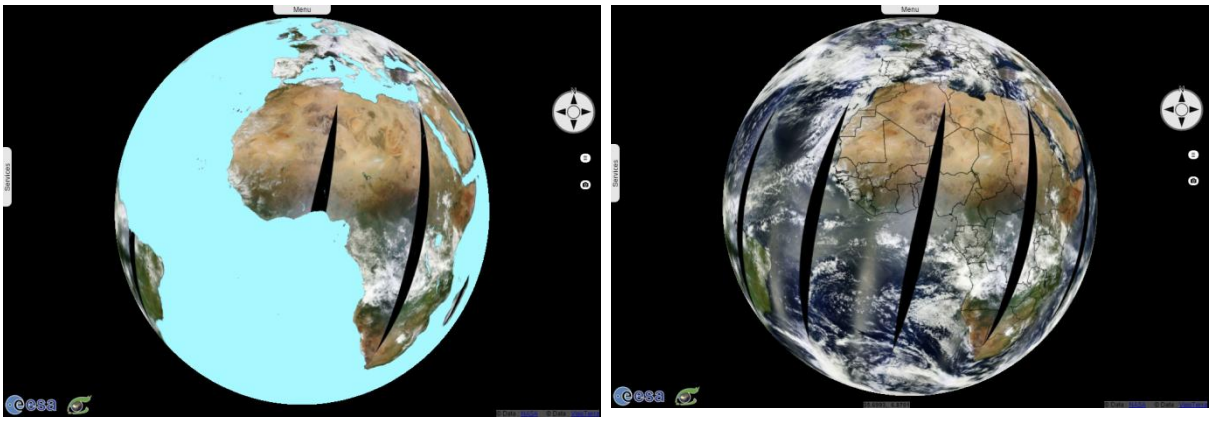


*fig. 32 - Left - NASA - MODIS water mask / Right - World borders.*

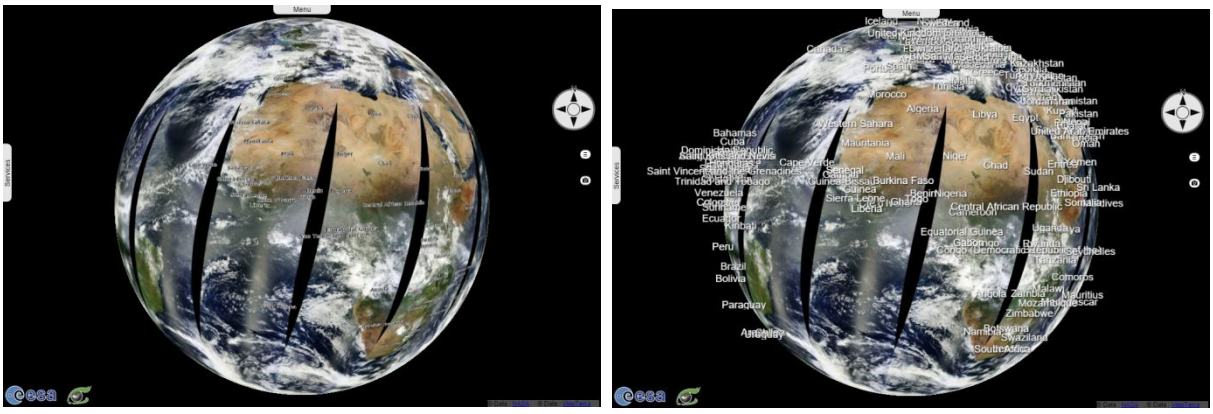


*fig. 33 - Left - World labels overlay / Right - Countries.*

For the "World Borders" overlay, one may right click to select another colour.

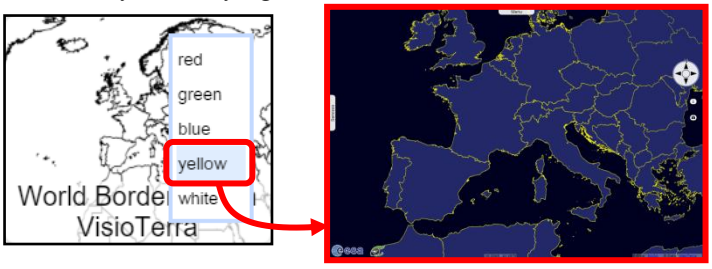



*fig. 34 - World Borders in yellow.*

### 2.4.4 Setting the opacity via the layer stack slider bar

Users can set the opacity of the rendering of a product by selecting a layer in the layer stack and then by moving the opacity slider bar as shown below. By selecting a folder and then moving the opacity bar, one can modify the opacity of all layers inside the folder.

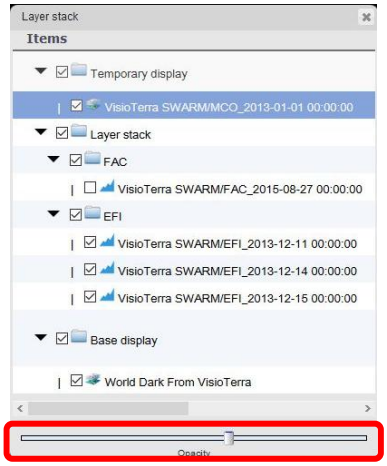



*fig. 35 - Layer stack - Opacity bar.*

### 2.4.5 Displaying topography

One can display topography and or bathymetry on the globe by clicking first the "**Elevations**" tab (red) on the top left hand corner of the service panel, clicking the selected elevation source and then ticking the elevation layer in "**Base display**".

While it has no impact on the textures displayed on the globe, it changes the mesh on which textures are modified.

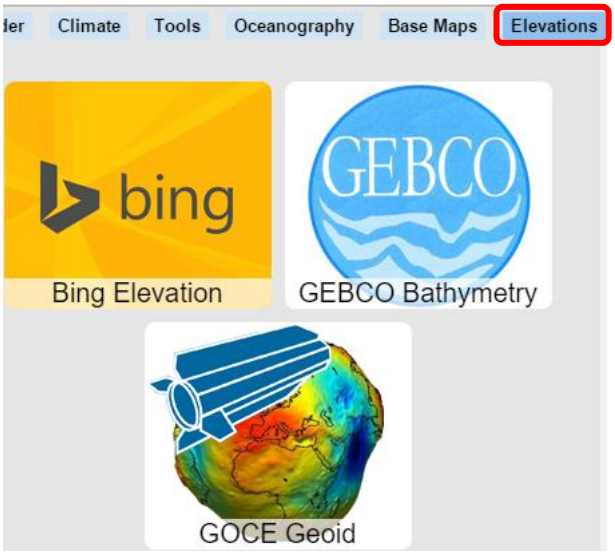



*fig. 36 - Elevation sources.*

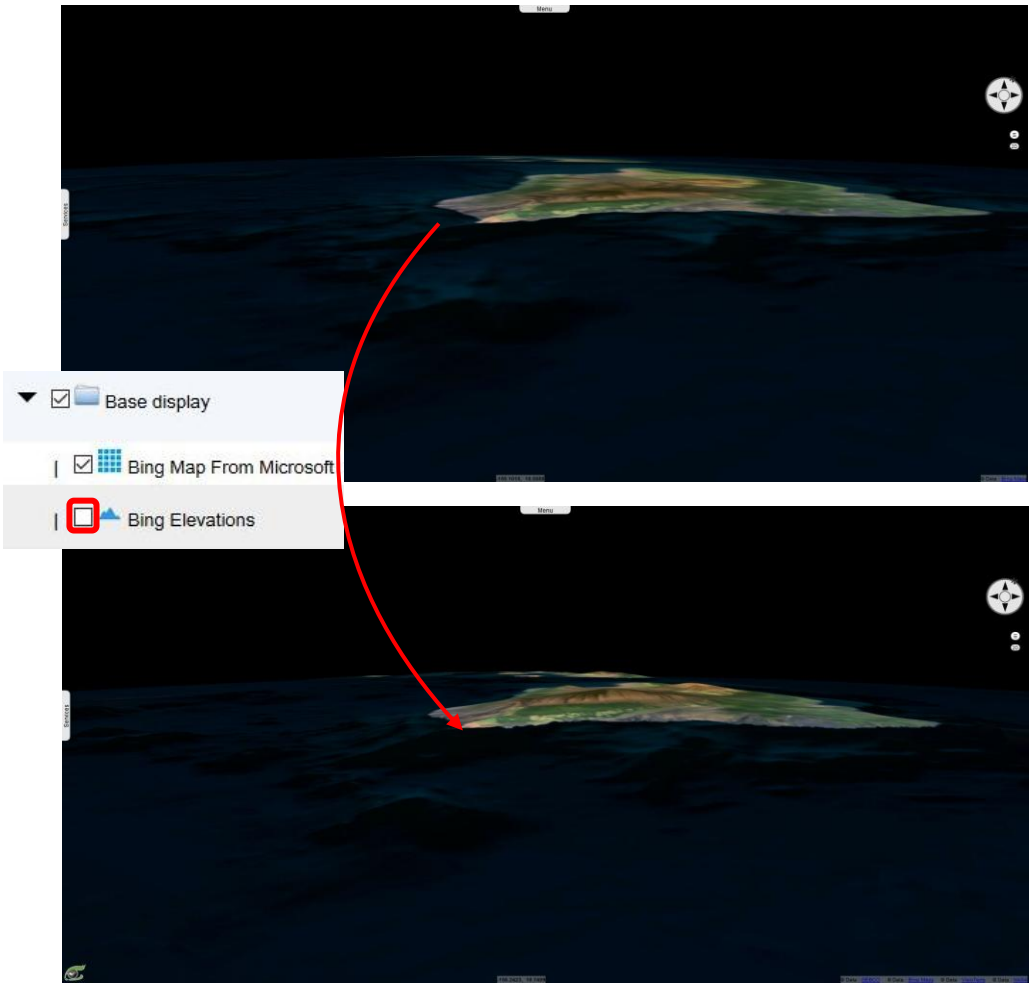



*fig. 37 - Top: no topography displayed, bottom: Bing topography used.*

Once activated, the topography and the bathymetry default scale is 1. It can be modified, for example to exaggerate the elevation, by right-clicking the elevation layer in the layer stack and clicking on "**Settings**".

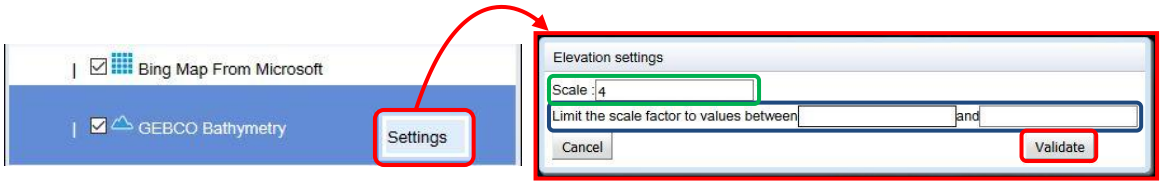



*fig. 38 - Access to the elevation layer settings.*

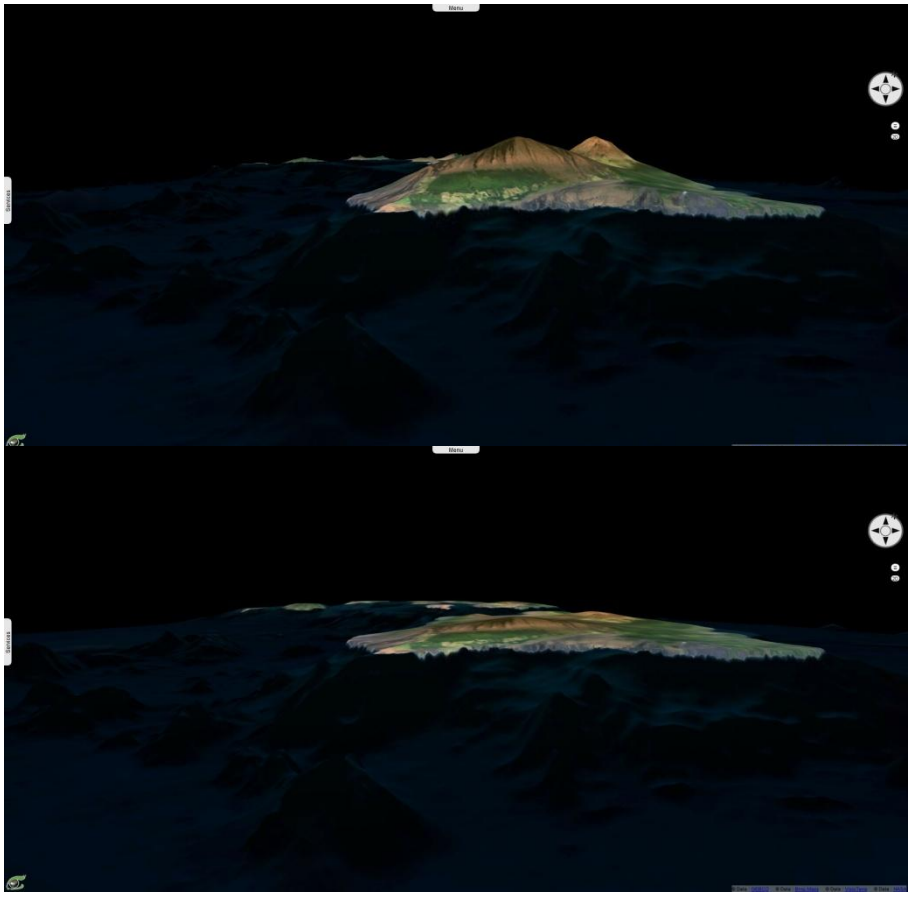


*fig. 39 - Gebco elevation displayed with a scale of 4, top: for all values, bottom, only for negative values.*

### 2.4.6 Capture of the display panel

It is possible to take a screen capture limited to the display panel. To do so, one should use the “camera” button (red) located under the layerstack button. It opens a browser-dependant window that allows saving the globe and the layers displayed on it.

It differs from a screen capture in full screen view. This capture does not include the main panel, the service panel, the layer stack and the non-layer items displayed in the display panel.

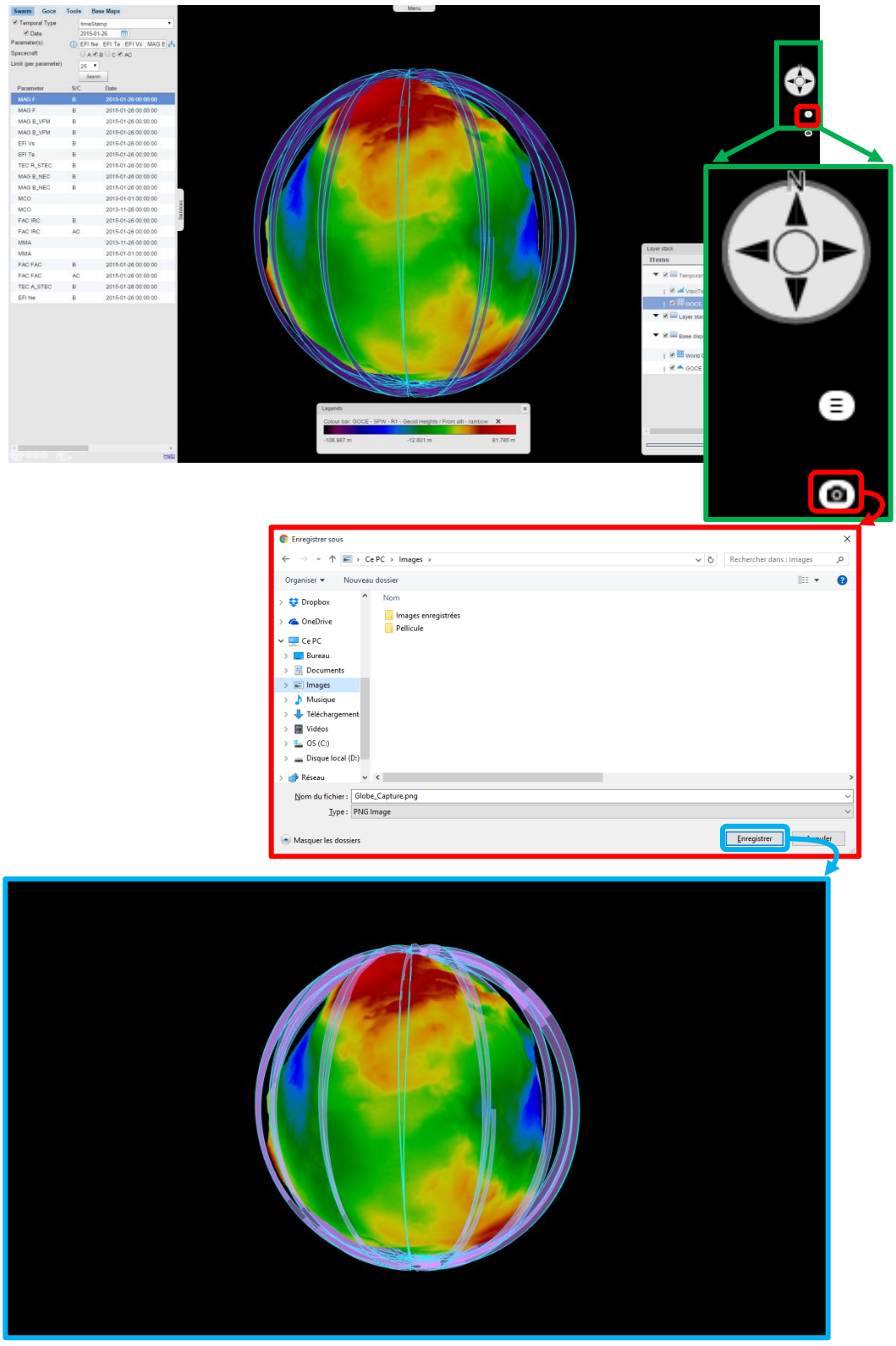



*fig. 40 - Capture of the display panel.*

# 3 SWARM SERVICE FUNCTIONALITIES

## 3.1 Introduction

The Gsep Swarm Service allows users to search and visualise most Swarm products on a virtual globe, whether they are raster, vectors or profiles, and share their work afterwards. Data can be searched according to temporal criteria, to the datasets and spacecrafts selected. Each available dataset has his own default style, with a different colour for Swarm A, B, C and AC, all styles can be modified to better suit the users' need. Finally Gsep Swarm service allows easy and light dissemination of data.

## 3.2 Data search

In order to retrieve data, criteria need to be entered in Gsep. Options need to be selected before pressing the "**Search**" button.

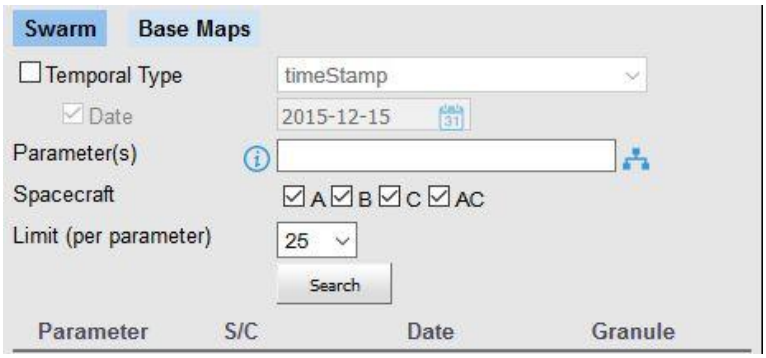



*fig. 41 - The VtSwarm search interface.*

### 3.2.1 Temporal criteria, choice of a time period

By checking the "**Temporal Type**" box, one can select the type of time definition using the pulldown menu (purple): either timestamp (red) or timespan (yellow).

The user should select timestamp to seek products which were being acquired during the defined moment. Otherwise, they can select the time span to seek products acquired between a start date (unused if left unchecked) and an ending date (tomorrow if left unchecked).

A date can be entered manually using the YYYY-MM-DD date format or by using the calendar tool. The user can navigate in the calendar widget (blue) using the pulldown menu to select the year and month, by using the simple / double arrows to switch to the next month / year and can click to pick the day of month.

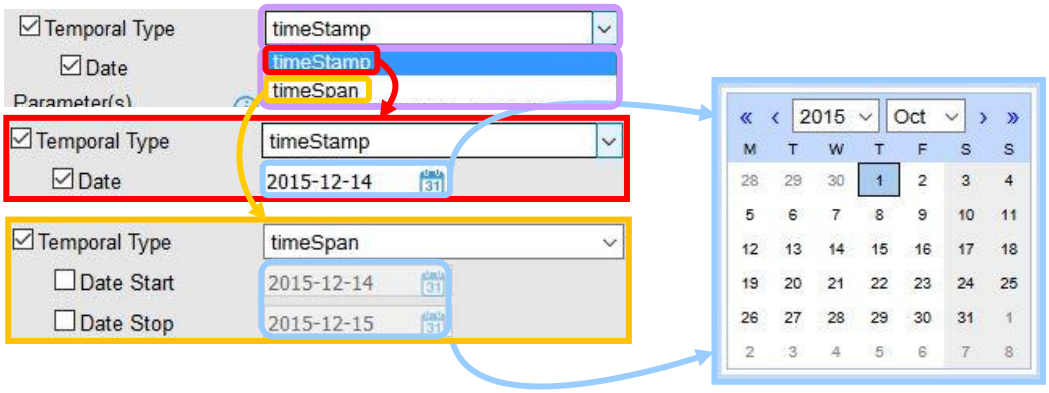



*fig. 42 - Time selection tools.*

### 3.2.2 Choice of dataset

A tree widget lists the measures which are available for search, processing, display and hyperlook dissemination and allows the selection of one or several of them for the search. The complete name of each measure can be accessed by pressing the "**i**" button.

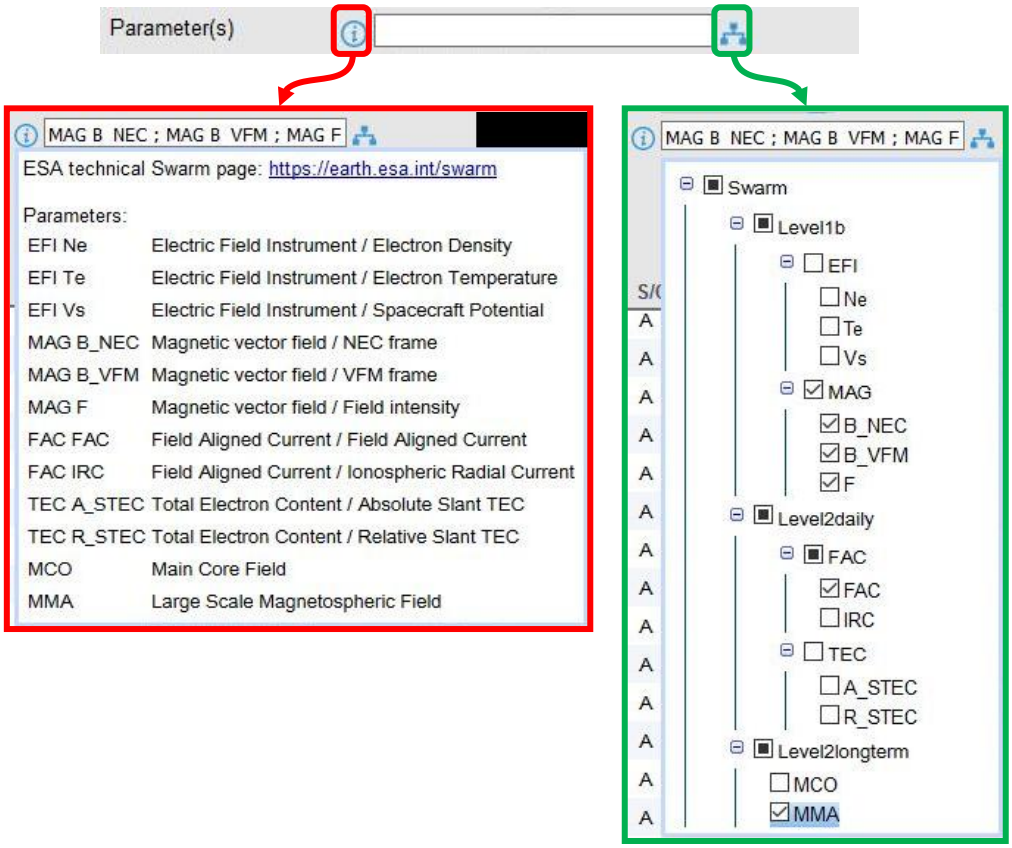



*fig. 43 - Dataset choice tool.*

### 3.2.3 Choice of the source spacecraft

One can choose to select only products coming from one or several Swarm spacecrafts by ticking / un-ticking the afferent checkboxes.


*fig. 44 - Source spacecraft choice widget.*

For each spacecraft, the products have a different default rendering:

Red lines with green filling for Swarm A products,

Blue lines with purple filling for Swam B products,

Orange lines with cyan filling for Swarm C products,

Yellow lines with blue filling for Swarm A+C products.

### 3.2.4 Setting a limit to the maximum number of returned results

The user may limit the maximum number of results returned by a search for each selected dataset. The limit can be set to values between 100 and none ("-"), the default value is 25.

When the number of results is computed, up to this limit, the user can then choose to cancel the search or get the list of found products.

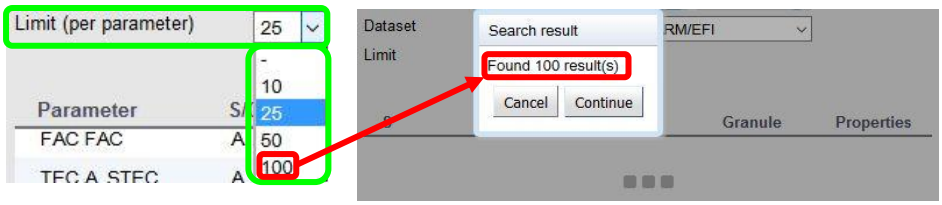



*fig. 45 - Number of returned results limit tool.*

## 3.3 List of Swarm products

Once the "Continue" button is pressed, products that match the criteria are listed as shown below.

| Parameter | S/C | Date | Granule |
|---|---|---|---|
| MAG F | B | 2015-01-26 00:00:00 | SW_OPER_MAGB_LR_1B_20150126T000000_20150126T235959_0405 |
| MAG F | B | 2015-01-26 00:00:00 | SW_OPER_MAGB_LR_1B_20150126T000000_20150126T235959_0408 |
| MAG B_VFM | B | 2015-01-26 00:00:00 | SW_OPER_MAGB_LR_1B_20150126T000000_20150126T235959_0405 |
| MAG B_VFM | B | 2015-01-26 00:00:00 | SW_OPER_MAGB_LR_1B_20150126T000000_20150126T235959_0408 |
| EFI Vs | B | 2015-01-26 00:00:00 | SW_PREL_EFIB_LP_1B_20150126T000000_20150126T235959_0103 |
| EFI Te | B | 2015-01-26 00:00:00 | SW_PREL_EFIB_LP_1B_20150126T000000_20150126T235959_0103 |
| TEC R_STEC | B | 2015-01-26 00:00:00 | SW_OPER_TECBTMS_2F_20150126T000000_20150126T235959_0201 |
| MAG B_NEC | B | 2015-01-26 00:00:00 | SW_OPER_MAGB_LR_1B_20150126T000000_20150126T235959_0405 |
| MAG B_NEC | B | 2015-01-26 00:00:00 | SW_OPER_MAGB_LR_1B_20150126T000000_20150126T235959_0408 |
| MCO | | 2013-01-01 00:00:00 | SW_OPER_MCO_SHA_2D_20130101T000000_20150303T000000_0101 |
| MCO | | 2013-11-26 00:00:00 | SW_OPER_MCO_SHA_2C_20131126T000000_20150301T000000_0101 |
| FAC IRC | B | 2015-01-26 00:00:00 | SW_OPER_FACBTMS_2F_20150126T000000_20150126T235959_0201 |
| FAC IRC | AC | 2015-01-26 00:00:00 | SW_OPER_FAC_TMS_2F_20150126T000000_20150126T235959_0201 |
| MMA | | 2013-11-26 00:00:00 | SW_OPER_MMA_SHA_2C_20131126T000000_20150228T235959_0101 |
| MMA | | 2015-01-01 00:00:00 | SW_OPER_MMA_SHA_2F_20150101T000000_20160101T000000_0104 |
| FAC FAC | B | 2015-01-26 00:00:00 | SW_OPER_FACBTMS_2F_20150126T000000_20150126T235959_0201 |
| FAC FAC | AC | 2015-01-26 00:00:00 | SW_OPER_FAC_TMS_2F_20150126T000000_20150126T235959_0201 |
| TEC A_STEC | B | 2015-01-26 00:00:00 | SW_OPER_TECBTMS_2F_20150126T000000_20150126T235959_0201 |
| EFI Ne | B | 2015-01-26 00:00:00 | SW_PREL_EFIB_LP_1B_20150126T000000_20150126T235959_0103 |

*fig. 46 - List of matching products.*

This list can be arranged by mode or by product names. Each product keeps the name defined by ESA, using the pattern MM_CCCC_TTTTTTTTTT_<instance_id> where:

- MM = Mission ID
- CCCC = File Class
  - CCCC = OPER for Routine Operations files
  - CCCC = RPRO for Re-Processing Files
  - CCCC = PREL for preliminary Files
- TTTTTTTTTT = File Type
- <instance_id> = File Instance ID

When applied to Swarm product available in Gsep, this pattern becomes

SW_CCCC_FFFxDDDDDD_yyyymmddThhmmss_YYYYMMDDTHHMMSS_vvvv.ttt where:

- FFF = File Category
  - FFF = MAG for Magnetic data

  - FFF = EFI for Plasma data
  - FFF = MCO for Main (COre) field and its temporal variation
  - FFF = MMA for large-scale magnetospheric field and its Earth-induced counterpart
  - FFF = FAC for Field-Aligned Currents
  - FFF = TEC for ionospheric Total Electron Content
- x = mission
  - x = A for Swarm A
  - x = B for Swarm B
  - x = C for Swarm C
  - x = _ for combined products
- DDDDDD = Semantic Descriptor
  - DDDDDD = XXXX1B for Level-1b products where
    - XXXX =Description specific for each product
    - 1B = Product Level 1B
  - DDDDDD = DDD_2z for Level 2 products where
    - DDD = Description specific for each product, which of
      - DDD = SHA for Spherical harmonic model
      - DDD = TMS for Time series
    - _2 = final level 2 product
    - z = Origin or the purpose of the product
      - z = C when derived from Comprehensive Inversion
      - z = D when derived from dedicated chain
      - z = F for Fast Track product
      - z = E for Extended, only applied for lithospheric field maps
- yyyymmddThhmmss is the start time window as extracted from Job Order,
- YYYYMMDDTHHMMSS is the stop time window as extracted from Job Order,
- vvvv is the version number of the file,
- ttt is the data extension.

## 3.4 Managing search results

### 3.4.1 Display product

A Swarm product can be displayed in the default style. It is the style in which it is displayed by default in the temporary layer stack.

#### 3.4.1.1 Editing vector style

*Access to the Edit style window*

The display style of the item can be edited using the "**Edit style**" window. It can be opened with a right click on the product either from the layer stack or the search results and then clicking the "**Edit style**" option in the context menu.

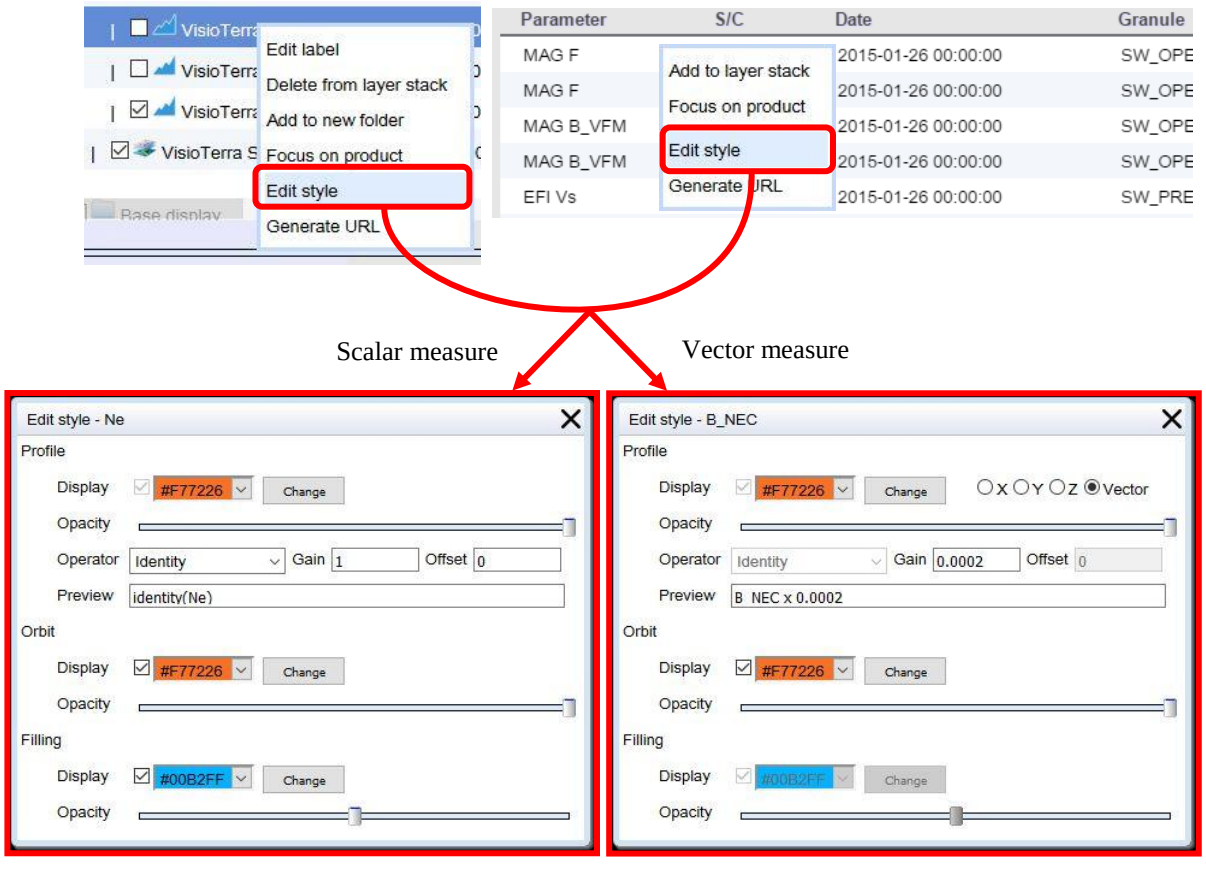



*fig. 47 - Access to the "Edit style" window.*

The "**Edit style**" window slightly varies depending if the Measure displayed is of scalar or vector type.

*Choice of the vector component to display*

Vector measures can be displayed as vectors or any of its available components using the component choice radiobutton.

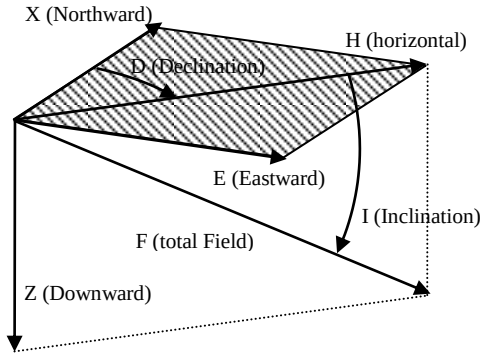



*fig. 48 - Vector field components.*

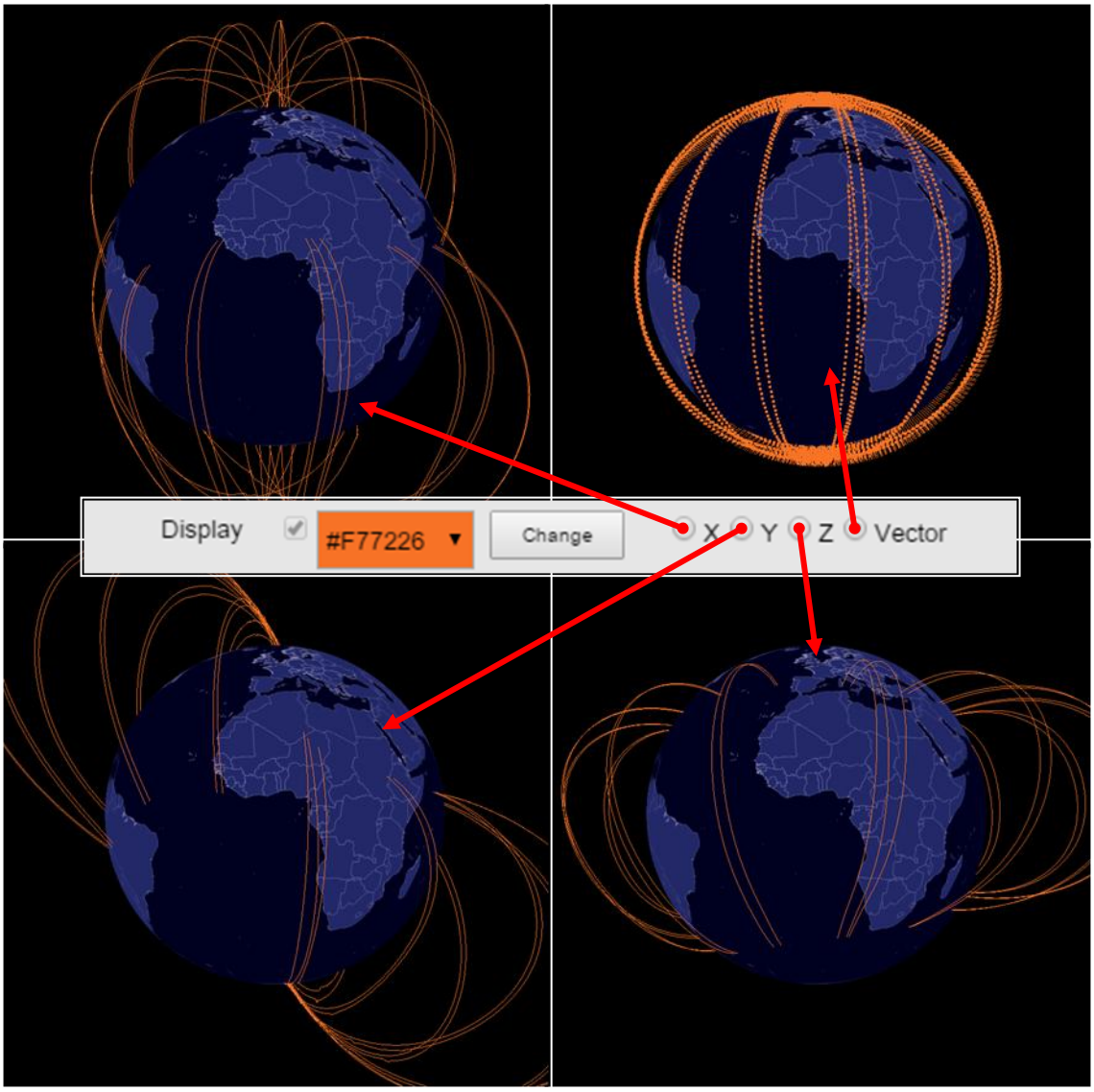



*fig. 49 - Edit style window - Use of the vector component selection.*

*Choice of the display colour*

The display colour of the selected item can be changed using a pulldown button that gives access to several preset colours. It is also possible to use the "**Change**" button that opens a widget allowing RGB and HSV colour definition.

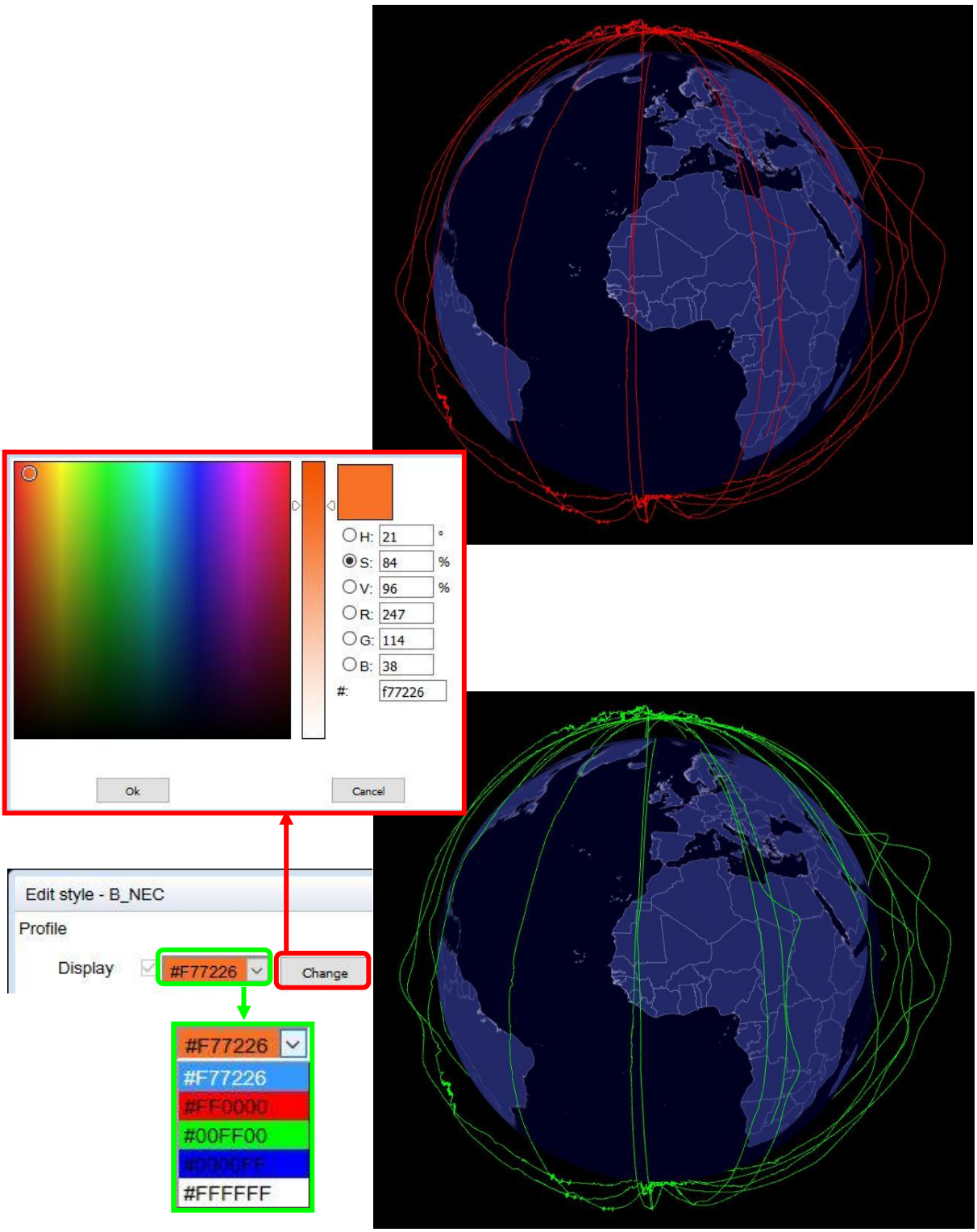



*fig. 50 - Edit style window - Choice of the colour of the display.*

*Choice of the display opacity*

The display opacity of the item can be changed using the "**Opacity**" slider bar of the "**Edit window**".

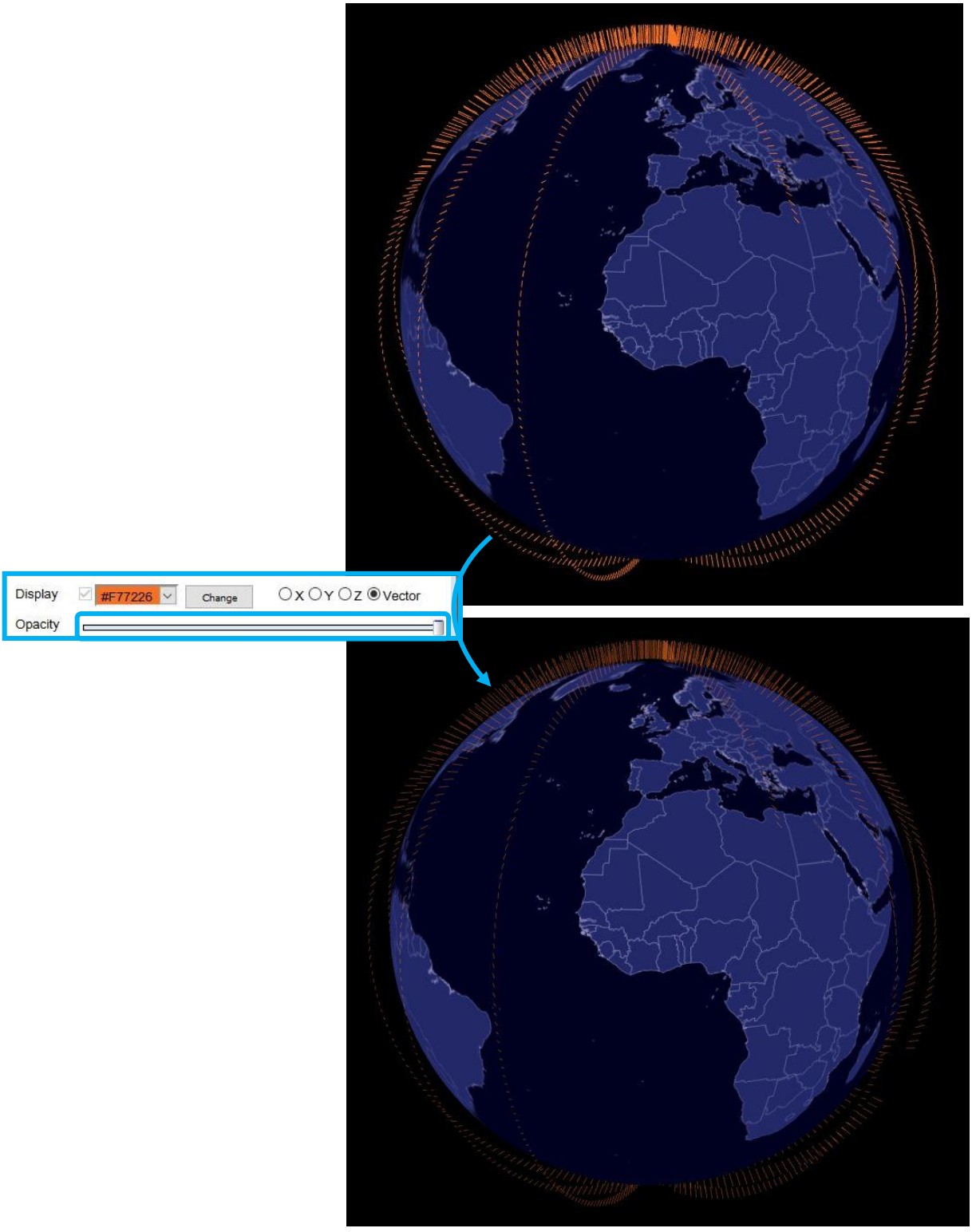



*fig. 51 - Edit style window - Setting the style opacity.*

*Choice of the unitary operator to apply*

A unitary operator is applied to a scalar item selected using the "**Operator**" pulldown menu from the Edit style window. The final operation applied to the item measures is shown in the "**Preview**" field.

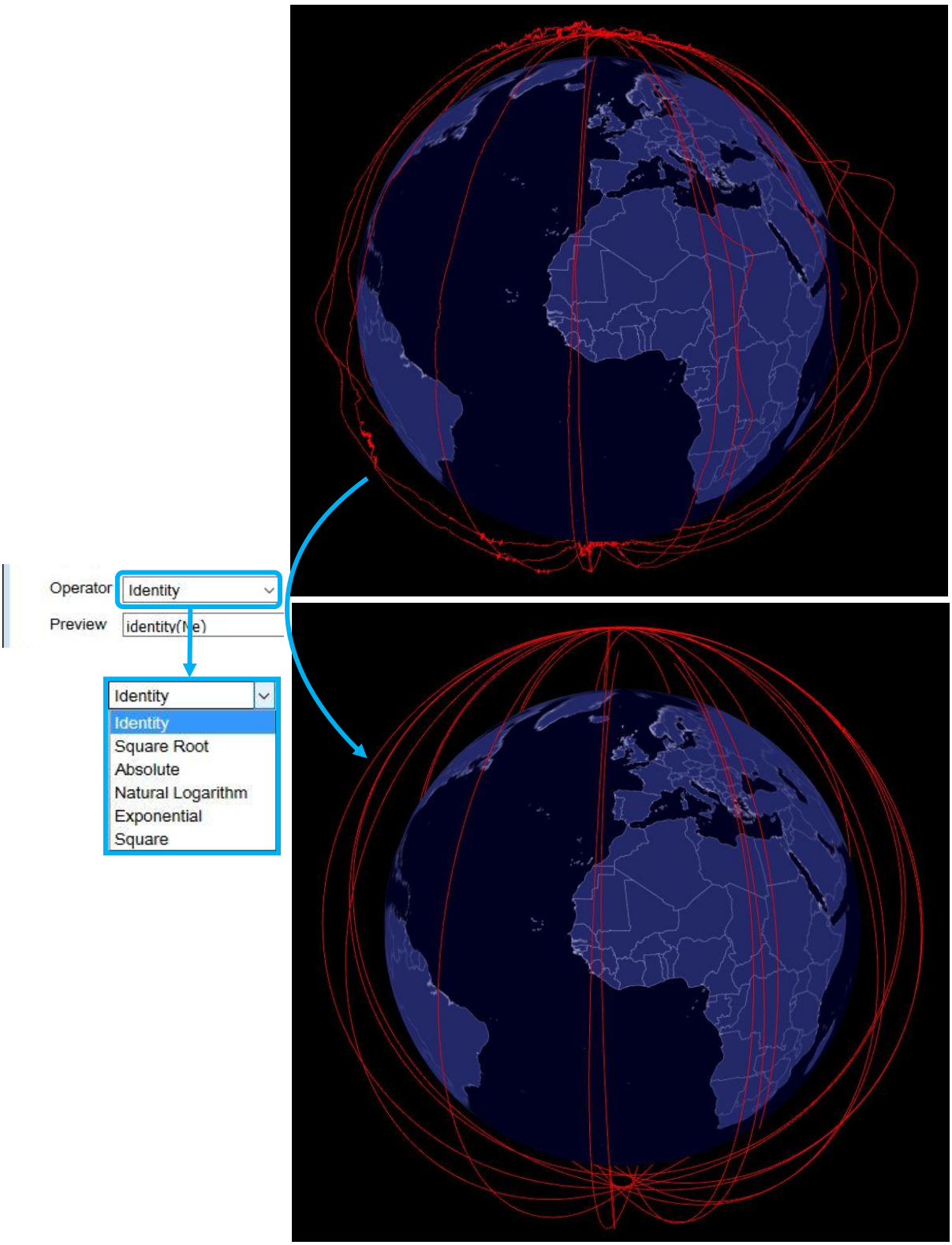



*fig. 52 - Edit style window - Application of unitary operator.*

*Choice of display gain*

The default gain of the display can be changed using the "**Gain**" text field. It affects the measure value not the orbit.

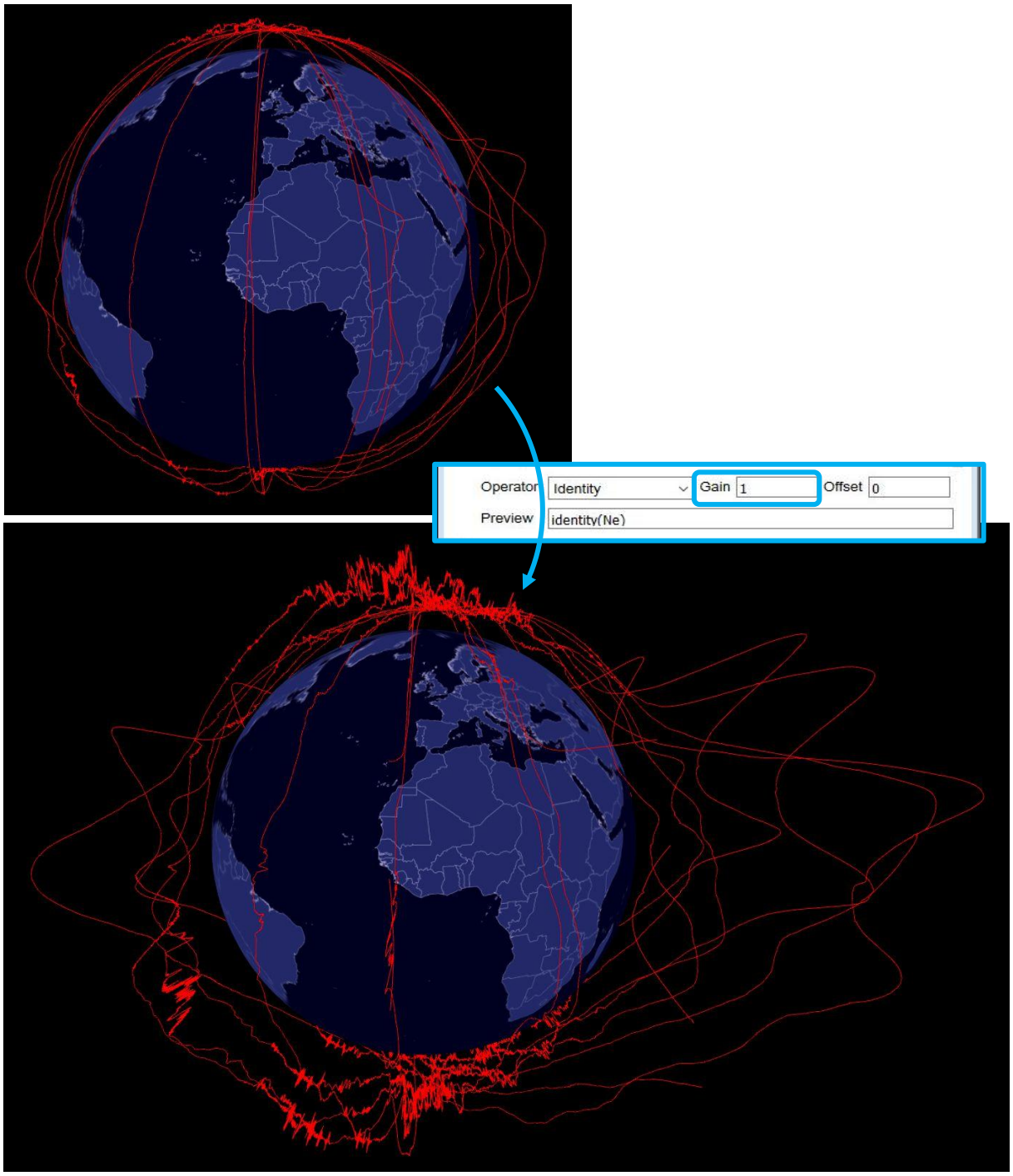



*fig. 53 - Edit style window - Choice of the display gain.*

*Choice of the display offset*

The user can add a positive of negative offset to the display using the "**Offset**" text field. It affects the measure value and leaves the orbit unchanged.

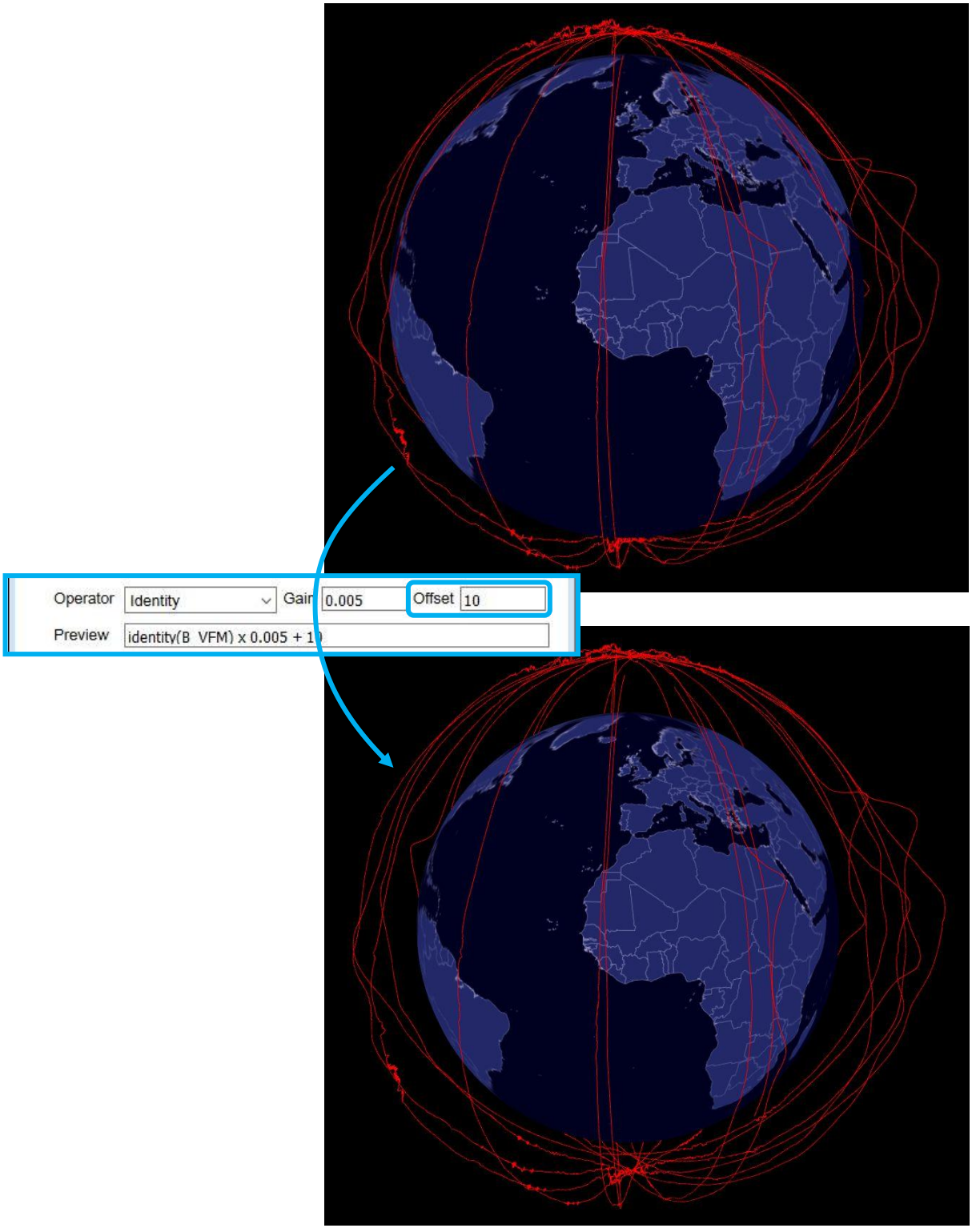



*fig. 54 - Edit style window - Addition of a 100 km offset to the display.*

*Displaying orbit*

The orbit of the displayed item can be hidden or shown by using the "**Display**" checkbox in the "**Orbit**" section.

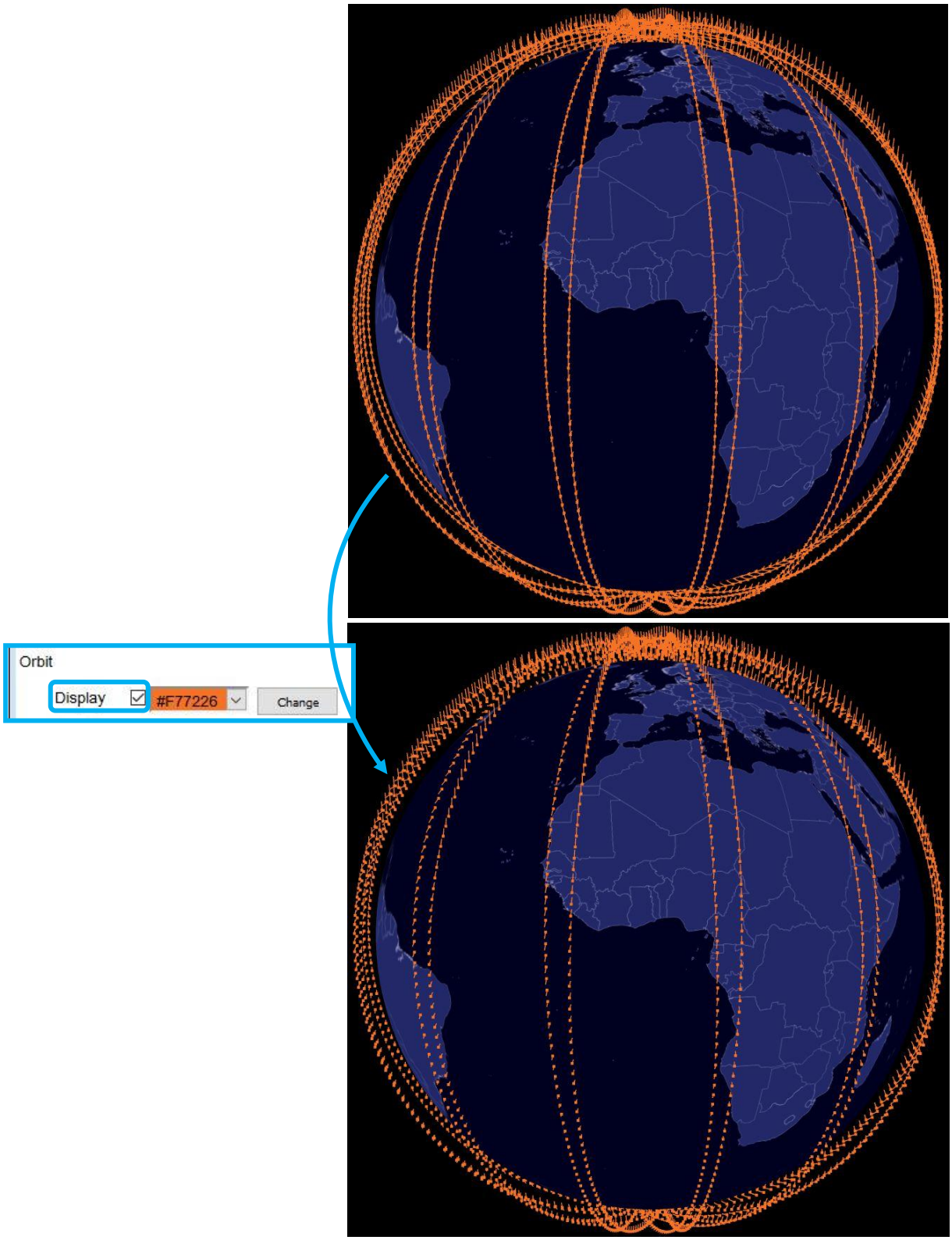



*fig. 55 - Edit style window - Use of the display orbit option.*

*Displaying the filling*

The filling of the displayed item can be hidden or shown by using the "**Display**" checkbox in the "**Filling**" section.

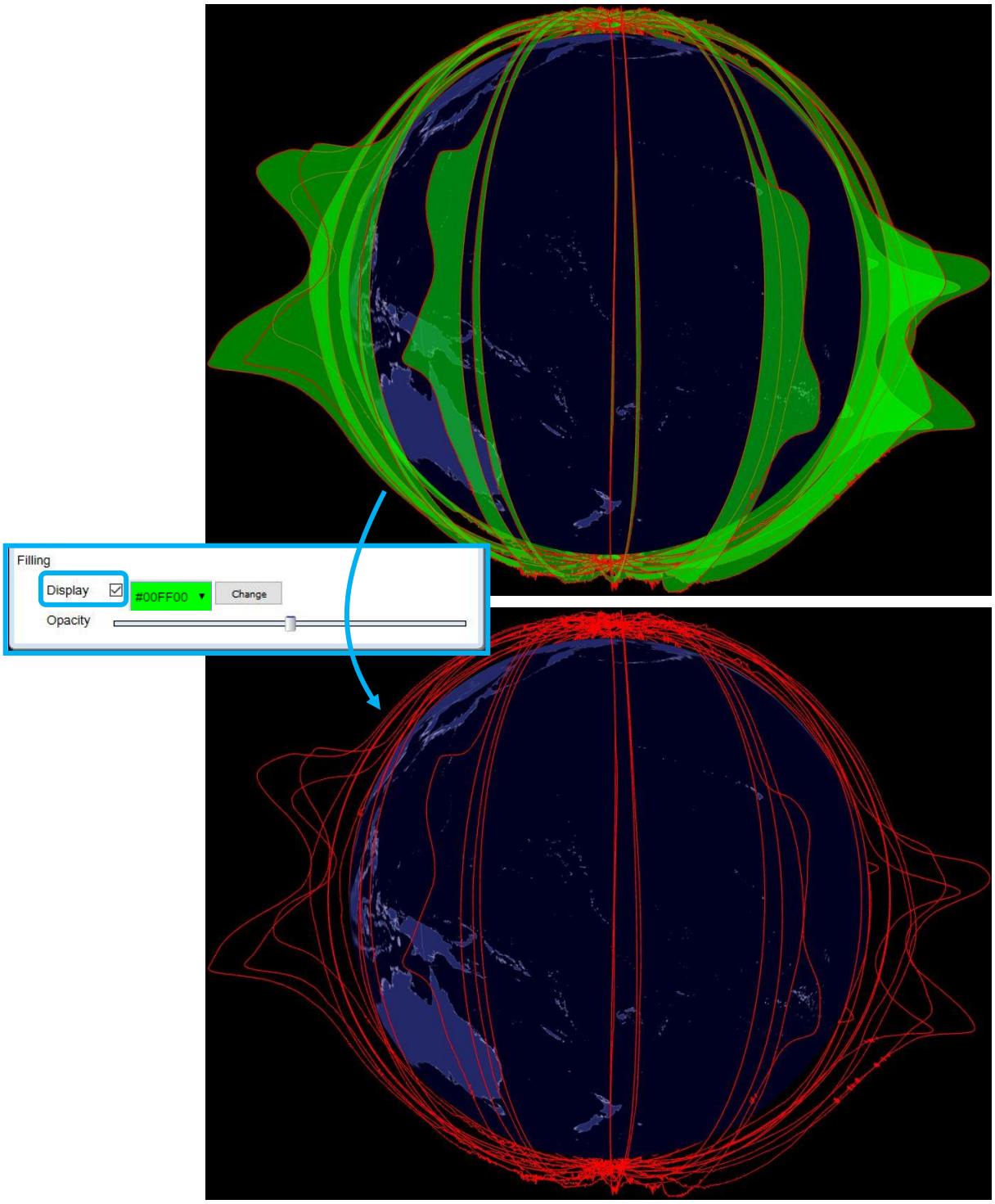



*fig. 56 - Edit style window - Use of the display filling option.*

*Choice of the opacity of the filling*

The opacity of the filling displayed for the item can be changed using the "**Opacity**" slider bar of the "**Edit window**".

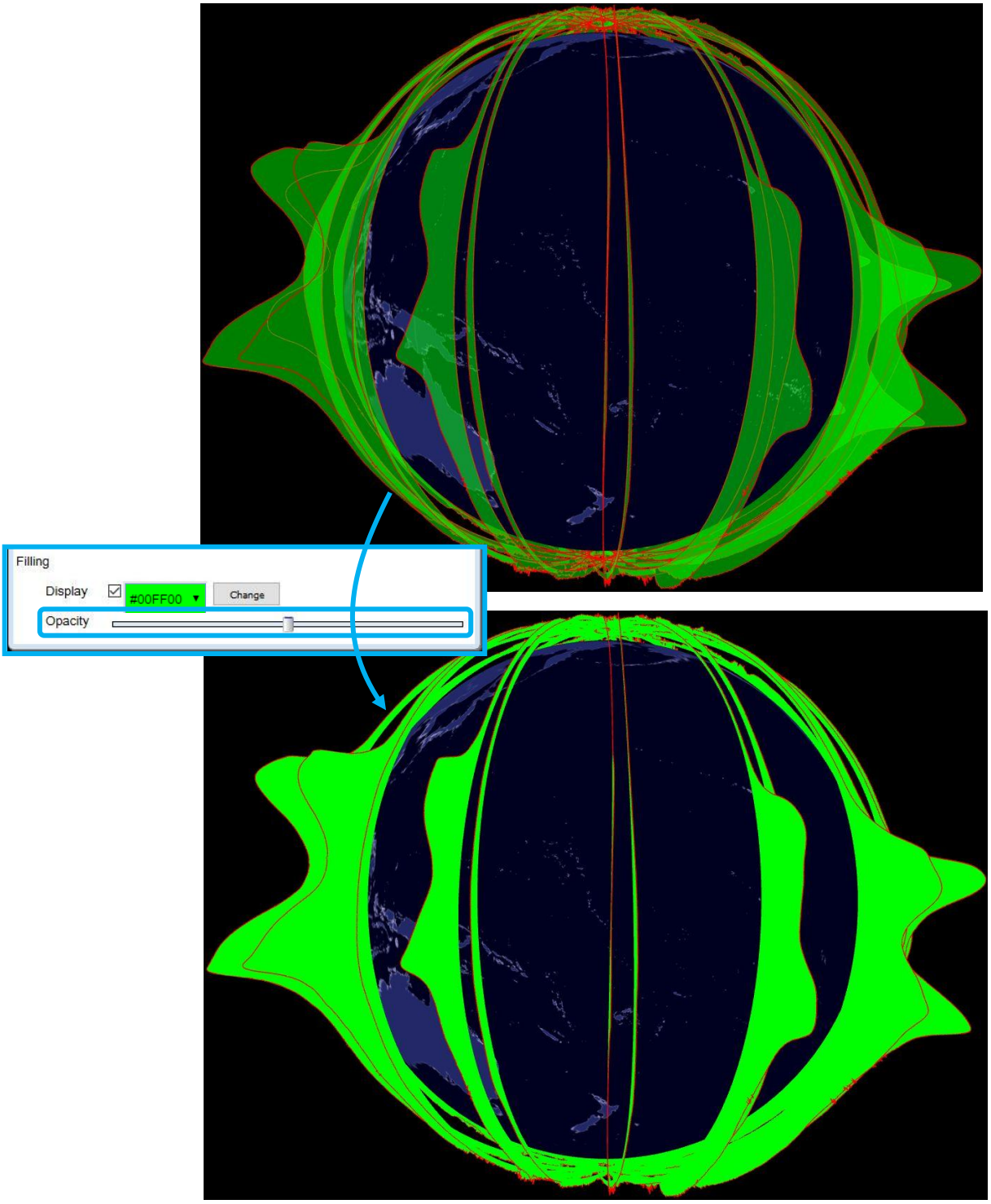



*fig. 57 - Edit style window - Setting the style filling opacity.*

### 3.4.1.2 Editing raster styles

*Selecting an existing style*

Users can select a style for a selected raster layer. Styles are defined by rendering parameters and are valid for a dataset. A set of styles is predefined for each dataset.

For each dataset, one can

- create a new style,
- view or edit an existing style.

From the layer stack, users may apply a style to a layer by right-clicking on this layer and selecting a style in the "**Style**" menu. Please, note that the style is processed "on the fly".

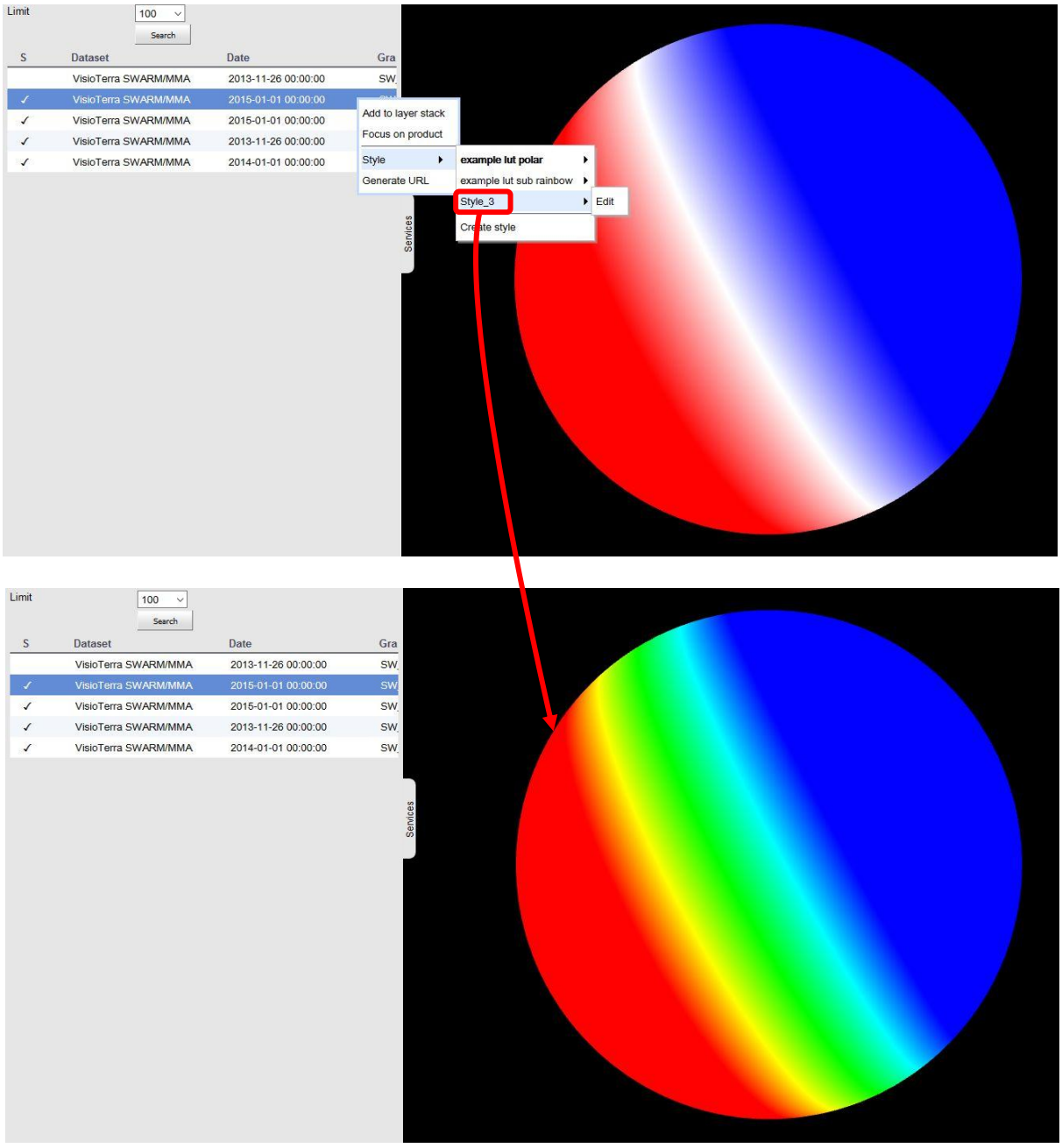



*fig. 58 - Layer stack – Selecting another style.*

### *Creating a new style*

One can create a new style with a right-click on an item in the search results (which is then in the "**temporary display**") or in the layer stack. In the context menu, the user then needs to click "**Style**" and finally to select "**Create style**", which opens the "**Dataset rendering**" window.

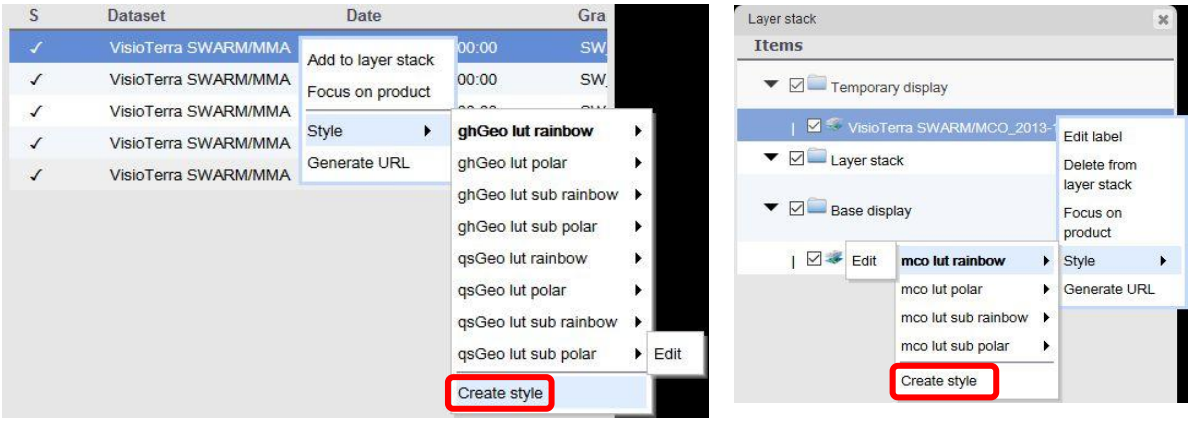



*fig. 59 - Creation of a new style.*

### *Editing an existing style*

One can create a new style with a right-click on an item in the search results (which is then in the "**temporary display**") or in the layer stack. In the context menu, users then need to click "**Style**", select one of the existing styles and finally select "**Edit**", which opens the "**Dataset rendering**" window.

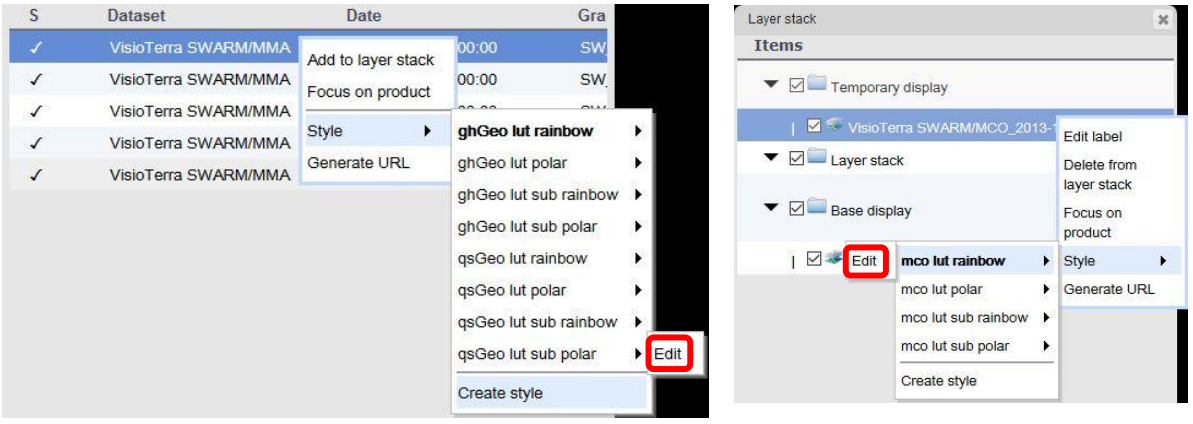



*fig. 60 - Edition of an existing style.*

### *Choice of style name*

Users can change the name given by default for the style being edited.


*fig. 61 - Dataset rendering window - Style name.*

*Choice of measure to display*

When opening this "**Dataset rendering**" window and by using the pulldown menu called "**Measure**", users can choose the measures which should be displayed.

- Level 2
  - MCO Spherical harmonic model of the main (core) field and its temporal variation
  - MMA Spherical harmonic model of the large-scale magnetospheric field and its Earth-induced counterpart,
    - F Fast Track product
      - gh_geo Internal induced gauss coefficients in geographic frame
      - qs_geo External induced gauss coefficients in geographic frame
    - C derived from Comprehensive Inversion
      - gh1 Internal induced Gauss coefficients g (cosine) and h (sine) in dipole frame to time instants t_qs_1
      - gh2 Internal induced Gauss coefficients g (cosine) and h (sine) in dipole frame to time instants t_qs_2
      - qs1 External Gauss coefficients q (cosine) and s (sine) in dipole frame corresponding to time instants t_qs_1
      - qs2 External Gauss coefficients q (cosine) and s (sine) in dipole frame corresponding to time instants t_qs_2

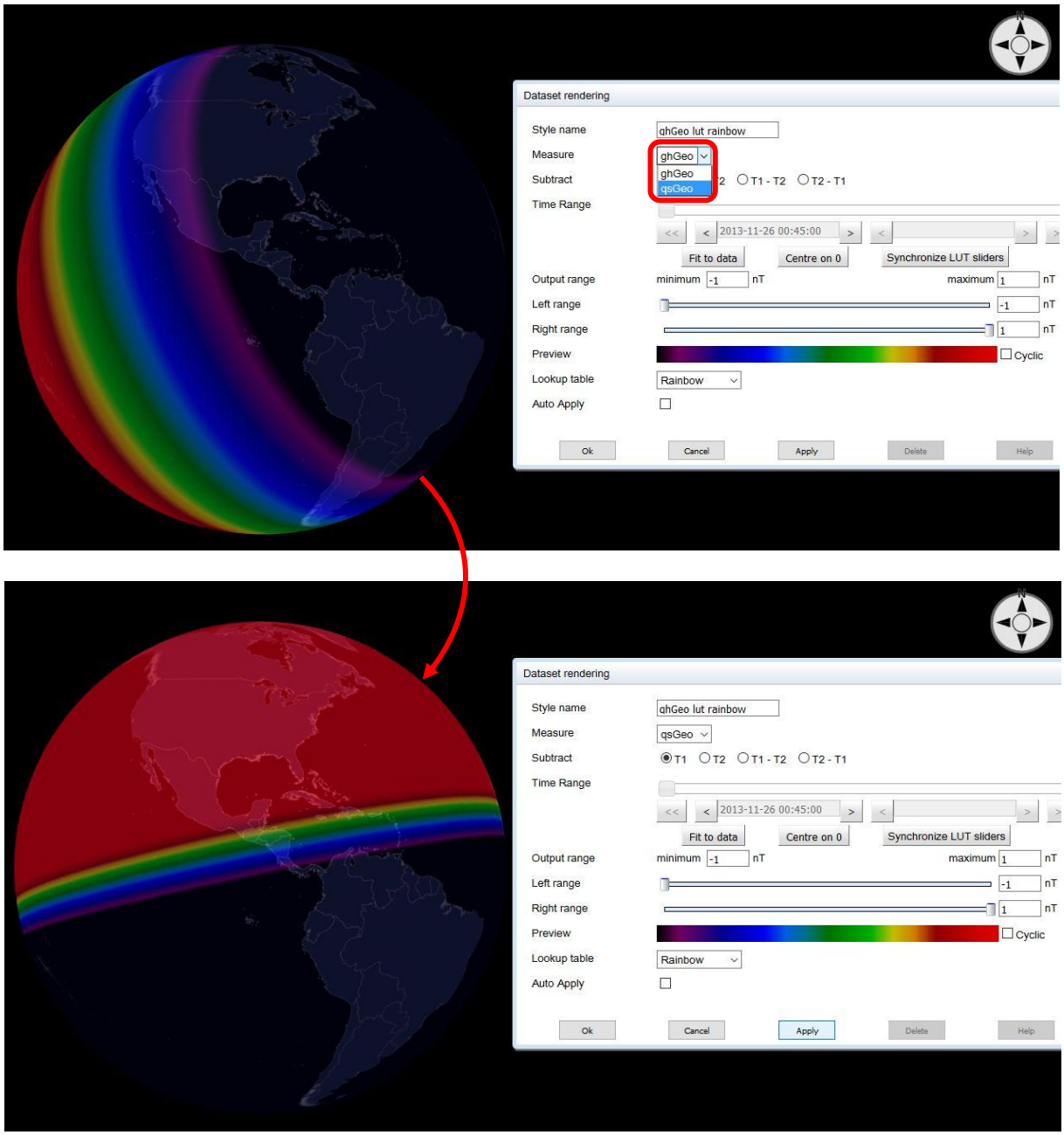



*fig. 62 - Dataset rendering window - Measure change from gh to qs.*

*Choice of sub-track setting*

For the multi-date raster data, two dates are used by default:

- T1 corresponds to the first date available in the product. It can be accessed by choosing the "**T1**" radiobutton.
- T2 corresponds to the last date available in the product. It can be accessed by choosing the "**T2**" radiobutton.

It is also possible to compare products acquired at the two dates T1 and T2 by choosing either the "**T1-T2**" or the "**T2-T1**" radiobutton. The difference is computed on the fly.


*fig. 63 - Dataset rendering window - Subtrack selection tool.*

*Choice of the time-range*

It is possible to edit T1 and T2 values by moving the left or right section of the slider bars, this updates the text fields below.

Another possibility is to set T1 and T2 by using the arrows surrounding the text fields, this updates the slider bars and the text fields. T1, on the left, and T2, on the right can be edited more precisely using the arrows to move to the previous or next date available for the product.

The double arrows allow modifying both dates at once (T1 and T2).


*fig. 64 - Dataset rendering window - The time selection tool.*

*Choice of scale factor of the display*

It is possible to change the style by changing the right and the left range of the LUT (Look-Up Table).

The quickest method is to use the "**Fit to data**" or the "**Centre on 0**" buttons.

- "**Fit to data**" computes the data minimum and maximum and uses it as thresholds to maximize the rendering dynamic.
- "**Centre on 0**" also computes the absolute values of the minimum and the maximum, keeps the largest of both values, and puts it as right range and its opposite value as left range.

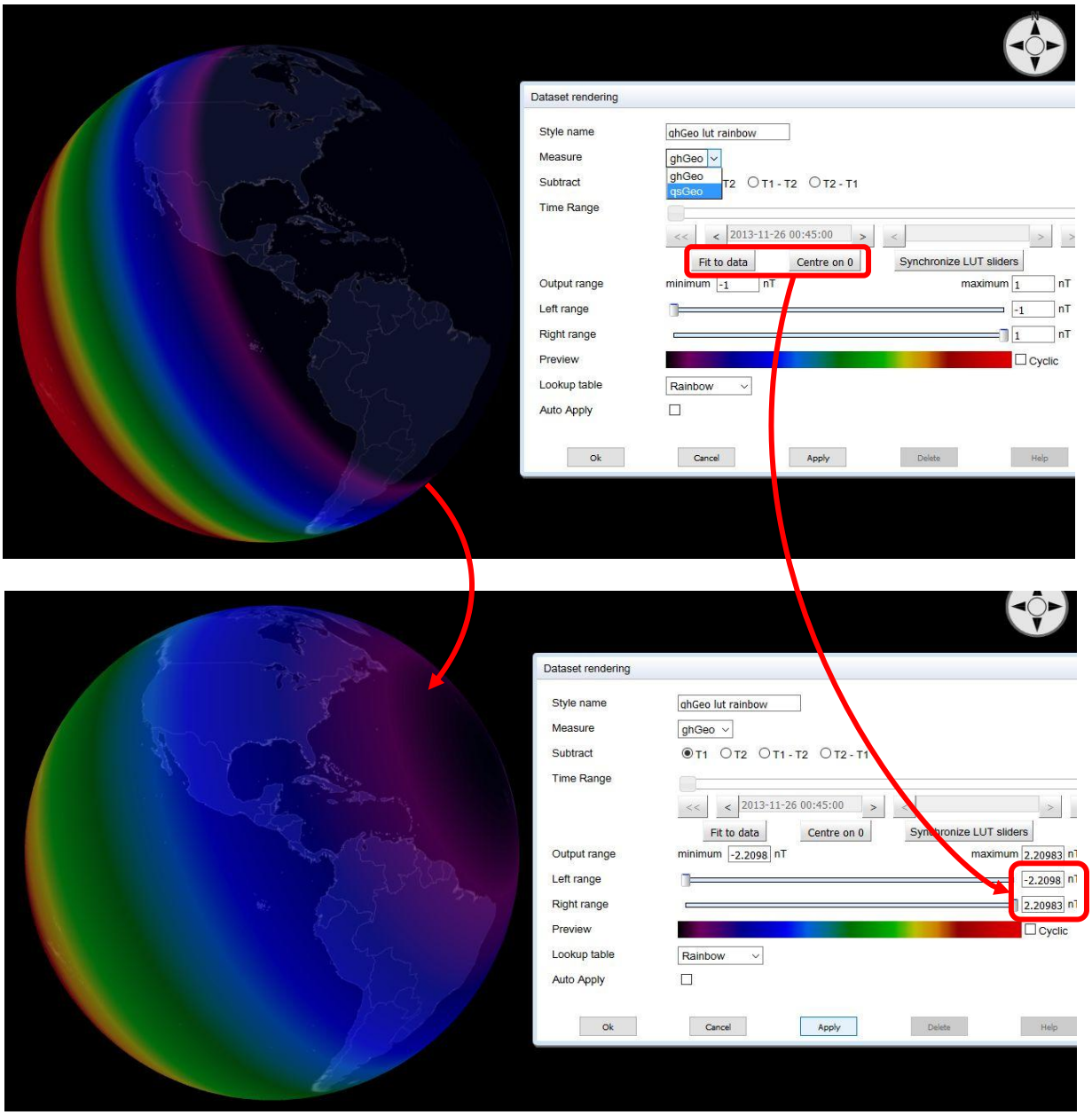



*fig. 65 - Dataset rendering window - Using quick setting buttons.*

It is also possible to change the threshold values by moving the "**Left range**" or "**Right range**" slider bars, this updates the text fields. Another possibility is to set the "**Output range**", "**Left range**" or "**Right range**" by editing the text fields manually, this updates the slider bars.

By using the "**Synchronize LUT sliders**" buttons, which is applied by default, any change on the right or left output range also applies to the other threshold by the same amount.

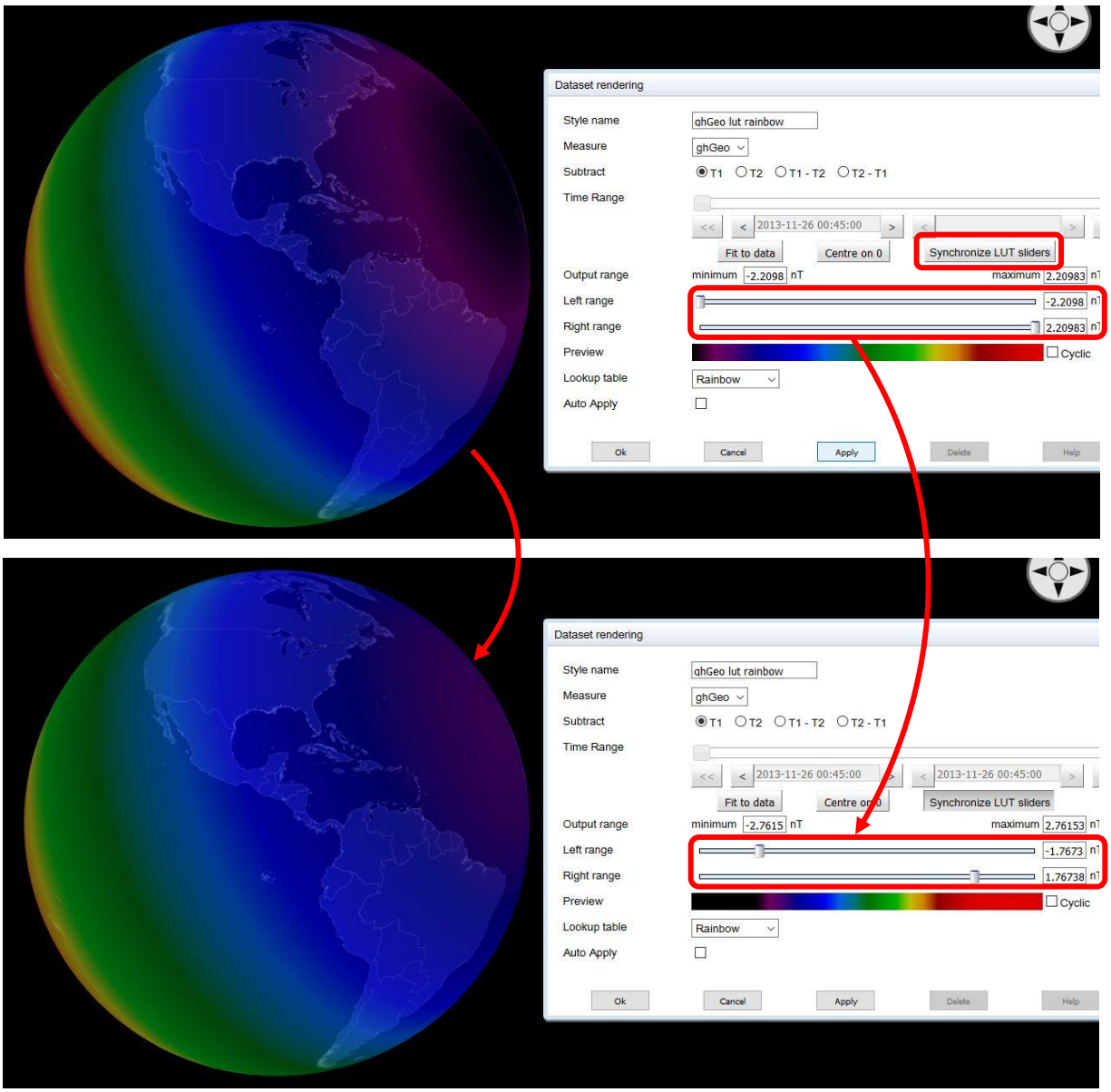



*fig. 66 - Dataset rendering window - Applying fringes.*

By clicking the "**Cyclic**" checkbox (red), it is also possible to apply fringes to the LUT used if the "**Output range**" is not fully encompassed by the left and right range. Fringes are visible only if the left and / right range had been saturated before the application of fringes.

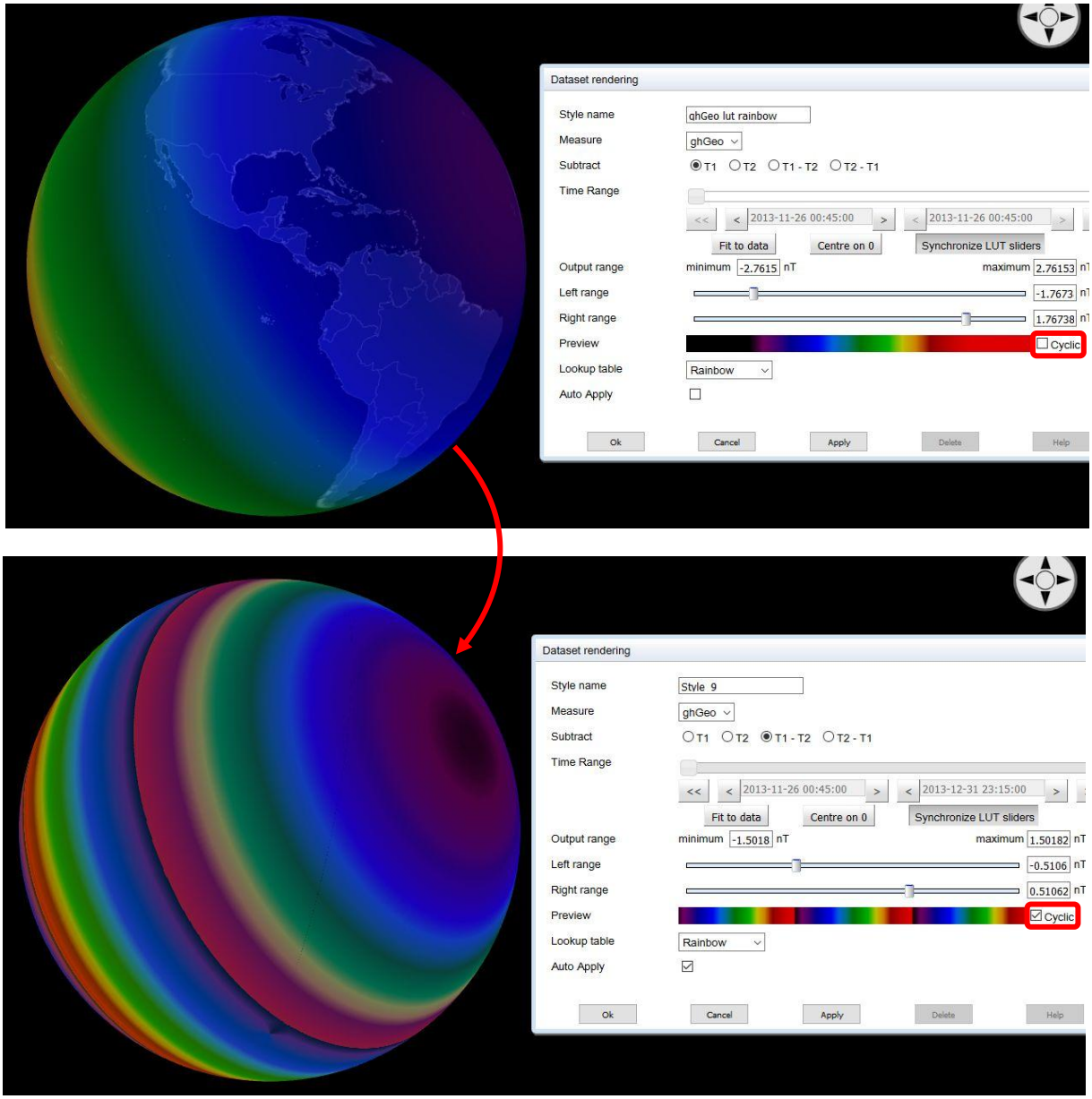



*fig. 67 - Dataset rendering window - Application of fringes.*

*Choice of the base LUT used for the display*

It is possible to change the base LUT used for the display. One can change this by using the "**Lookup table**" pulldown menu in the "**Dataset rendering**" window.

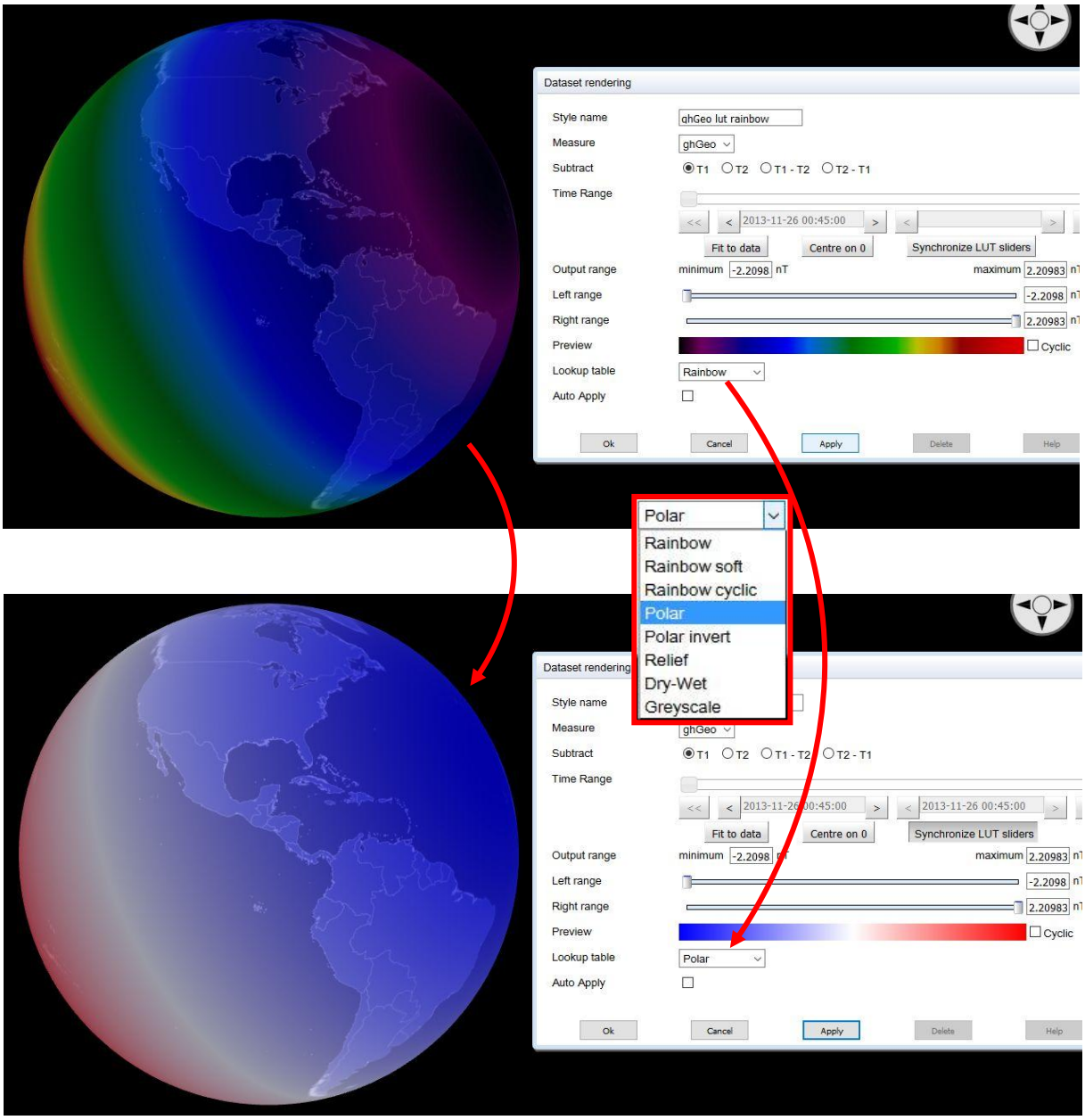



*fig. 68 - Dataset rendering window - Changing the base LUT.*

### *Applying the style*

The style may be tested and displayed on the selected product by using the "**Apply style**" button. It is also possible to apply each change automatically by checking the "**Auto Apply**" button.


*fig. 69 - Dataset rendering window - Applying the style.*

Alternatively pressing the "OK" button applies the style and closes the "**Dataset rendering**" window at the same time.

### *Cancelling the style creation / edition*

The current unapplied style edition may be cancelled by pressing the "**Cancel**" button. It also closes the "**Dataset rendering**" window.

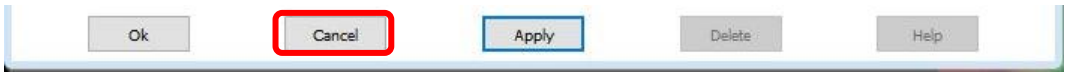



*fig. 70 - Dataset rendering window - Cancelling the style edition.*

### *Ending style edition*

The dataset rendering window is closed by pushing either the OK or the Cancel button.

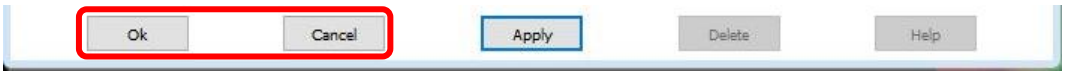



*fig. 71 - Dataset rendering window - Ending style edition.*

# 4 GOCE SERVICE FUNCTIONALITIES

## 4.1 Introduction

The Goce service allows the user to display a single Goce product or a combination of such products as altimetry models. Gsep allows displaying altimetry models

- as VtWeb globe mesh with a customisable vertical exaggeration factor,
- as the texture displayed on this mesh with a customisable Look Up Table (LUT).

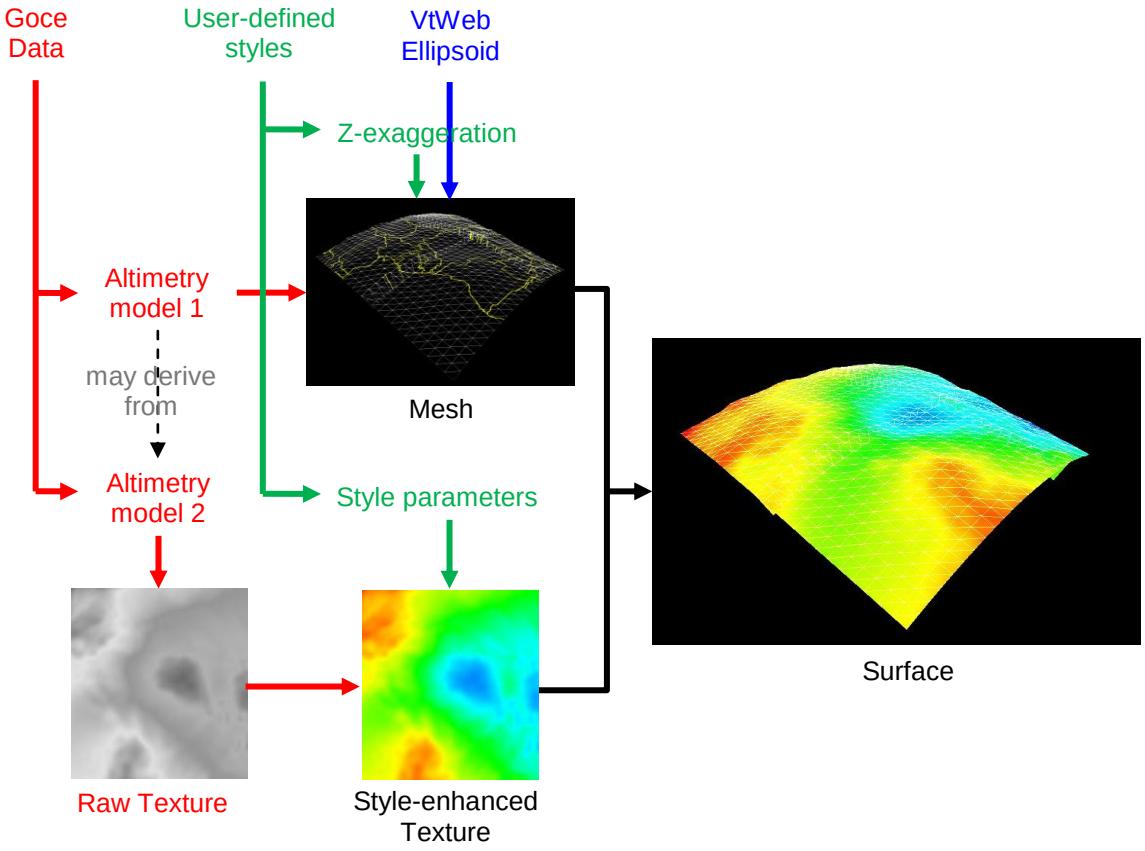



*fig. 72 - Surface as a pair of altimetry model and texture(s) in Goce Service.*

The Goce functionalities are not shown by default. To switch from Swarm to Goce service, one needs to click the "**Goce**" tab. The Gsep GOCE service is then divided in three panels:

- the altimetry manager used to define a mesh for the virtual globe,
- the texture manager used to define the texture applied on the mesh,
- the surface manager used to customise both aspects.

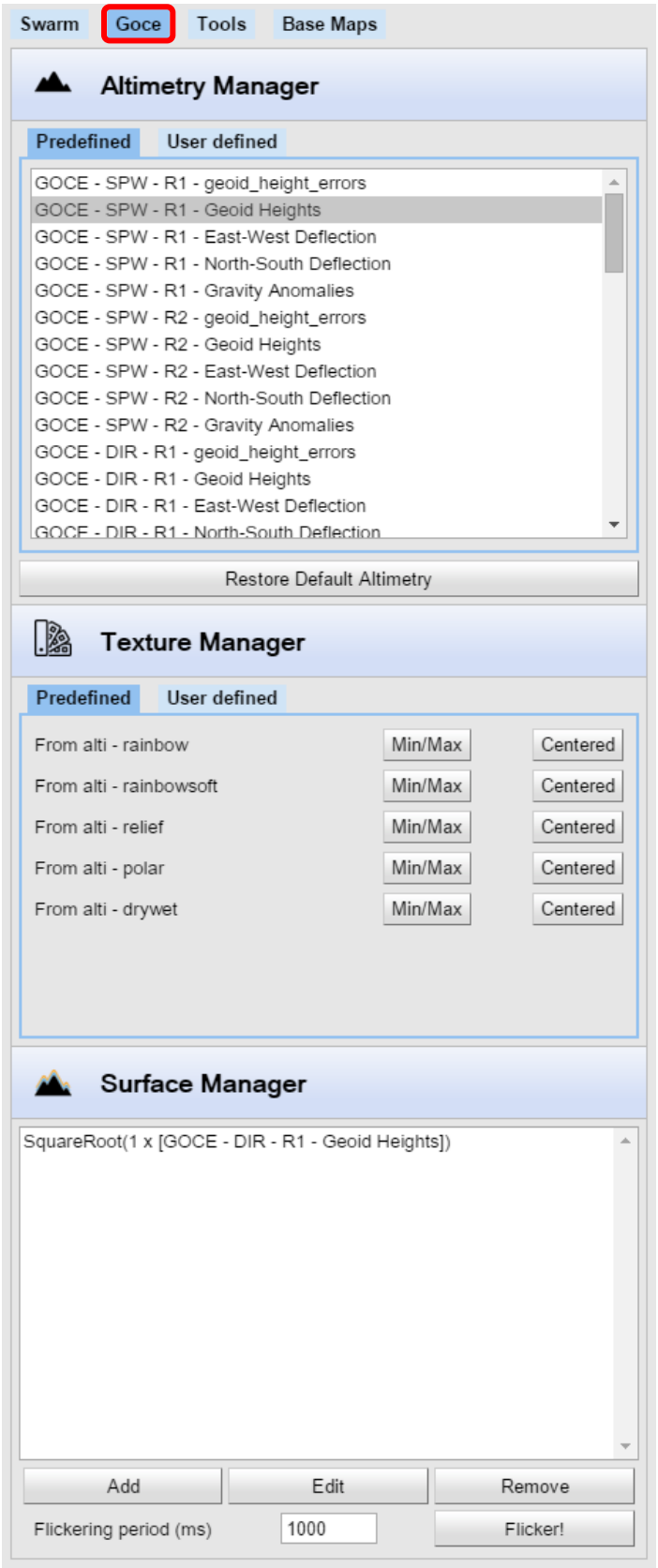



*fig. 73 - Goce service panel.*

## 4.2 Selection of the altimetry model

The altimetry manager allows users to use either an existing altimetry product or build a custom one. This choice modifies both the virtual globe altimetry (its mesh) and the texture applied on it. The globe altimetry is generating by

- multiplying by 10 000 the values of the surface chosen as elevation model,
- adding the result to the ellipsoid, here a sphere which radius equals the Earth radius at equator.

Only one altimetry model can be selected at a time. When it is, it is added both as the virtual globe altimetry and as a layer in the temporary layer stack. While the globe can only use one altimetry model at a time, several altimetry layers can be visualized simultaneously as textures in the layer stack.

### 4.2.1 Products available by default as altimetry models

The predefined tab for the altimetry manager shows a list of available gravity-related products that can be used as altimetry models. This list can be navigated using a vertical scrollbar or clicking the desired product.

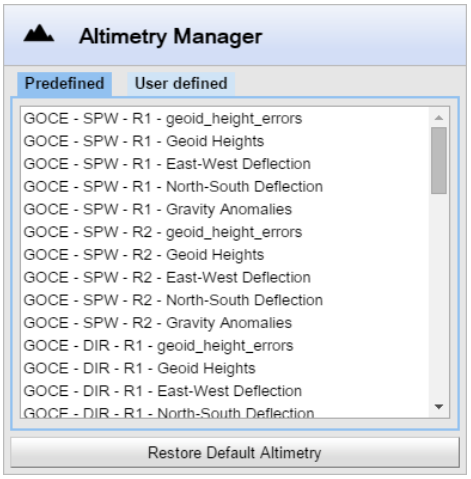



*fig. 74 - List of the products available by default as altimetry models.*

Each product uses the following pattern "MISSION - PRO - R# - Measure name" where:

- MISSION is the mission from which the product originates, e.g. GOCE,
- PRO is the processing strategy used for the product :
  - DIR for "DIRect solution",
  - TIM for "TIMe-wise solution",
  - SPW for "Space-Wise Solution",
- R# corresponds to the release version,
- Measure name is the type of measure contained in the product :
  - Geoid Heights,
  - East-West Deflection,
  - North-South Deflection,
  - Gravity Anomalies,
  - Geoid_height_error.

#### 4.2.1.1 Processing strategy characteristics

The processing strategy characteristics are defined here below:

**Table 4** Key features of the 3 gravity field processing strategies

| | DIR | TIM | SPW |
|---|---|---|---|
| Gravity field model | GO_CONS_GCF_2_DIR | GO_CONS_GCF_2_TIM | GO_CONS_GCF_2_SPW |
| Rationale | Improvements by GOCE relative to prior model | Pure GOCE-only model | Model from grids of GOCE data |
| Prior model | EIGEN-5C | No prior gravity field information | EGM2008 (in very low degrees + Quick-look model) |
| Method | Least squares using full normal equations<br>SST: numerical integration using reduced-dynamic orbits | Least squares using full normal equations<br>SST: energy integral based on kinematic orbits | Orbital Wiener filter + least squares collocation<br>SST: energy integral based on kinematic orbits |
| SGG stochastic modeling | ARMA filtering within the MBW | ARMA filtering of entire spectrum (full decorrelation) | Covariance functions (time-correlated for the noise and space-correlated for the signal) |
| Resolution | 240 | 224 | 210 |

*table 1 - Summary of the three different product types (R-2).*

#### 4.2.1.2 Release version characteristics

Here below are listed the acquisition period and order of precision of each generation of each processing strategy.

| | Sensing start | Sensing stop | Degree/Order |
|---|---|---|---|
| SPW_R1 | 30/10/2009 | 11/01/2010 | 210 |
| SPW_R2 | 31/10/2009 | 05/07/2010 | 240 |
| DIR_R1 | 01/11/2009 | 10/01/2010 | 240 |
| DIR_R2 | 01/11/2009 | 30/06/2010 | 240 |
| DIR_R3 | 01/11/2009 | 11/04/2011 | 240 |
| DIR_R4 | 01/11/2009 | 01/08/2012 | 240 |
| DIR_R5 | 01/11/2009 | 20/10/2013 | 260 |
| TIM_R1 | 01/11/2009 | 11/01/2010 | 224 |
| TIM_R2 | 01/11/2009 | 05/07/2010 | 250 |
| TIM_R3 | 01/11/2009 | 17/04/2011 | 250 |
| TIM_R4 | 01/11/2009 | 19/06/2012 | 250 |
| TIM_R5 | 01/11/2009 | 20/10/2013 | 280 |

*table 2 - Release version characteristics.*

#### 4.2.1.3 Available measures

Available quantities are described in section 4.3.3 of (R-1) where they are defined as:

- The geoid height is defined as the distance between the ellipsoid and the geoid, given in metres [m],
- The deflection of the vertical for a point on the Earth surface is defined as the angle between the real plumb line direction and the ellipsoidal normal vector, given in arc-seconds [as],
- The height anomaly is defined as the distance between the telluroid and the Earth's surface, given in metres by square second [m/s²],

- The geoid height errors are defined as the standard deviation of the geoid height, given in metres [m].

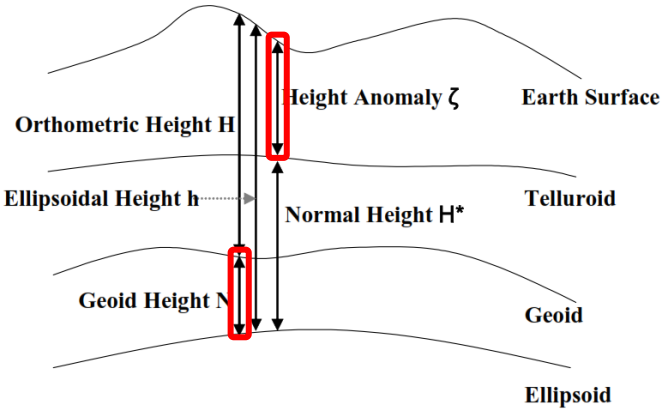



*fig. 75 - Representation of the geoid height and the height anomaly.*

## 4.2.2 User-defined altimetry model

### 4.2.2.1 Managing user-defined altimetry model

In order to build his own altimetry model on the fly, one needs first to select the "**User-defined**" tab (red). The user is shown a list of custom operations between products; each can be used as an altimetry model. This list (blue) can be navigated using a vertical scrollbar or clicking on the desired model.

These user-defined altimetry models are saved from one session to the next and are loaded automatically when the "**User-defined**" tab is opened. A removed user-defined altimetry model will not be reloaded at start-up unless it is later imported.

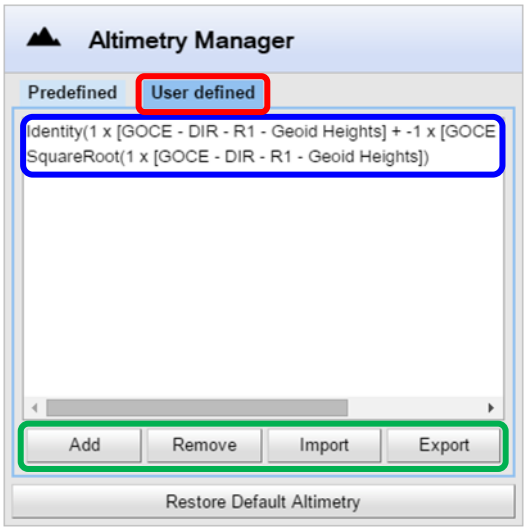



*fig. 76 - Interface used to manage user-defined altimetry models.*

The interface contains four buttons (green) that allow the user to

- create and add a new user-defined model by using the "**Add**" button,
- remove a model from the list by using the "**Remove**" button,
- import a model previously exported from another session using the "**Import**" button,
- export locally a model from the list by using the "**Export**" button.

#### 4.2.2.2 Adding user-defined altimetry model

A user-defined altimetry model is created using the "Add" button described above. The user accesses the interface described below.

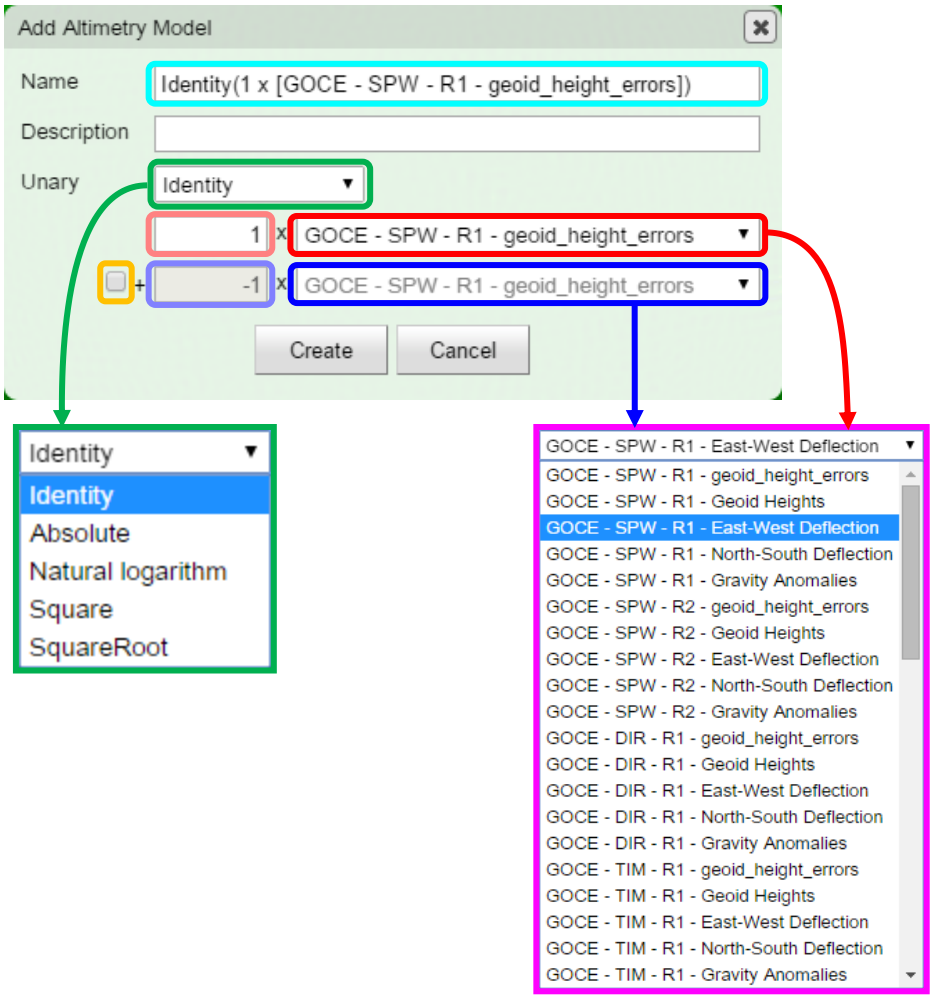



*fig. 77 - Interface used to create user-defined altimetry models.*

- The "**Name**" field (cyan) is updated according to the altimetry surface, created according to the formula :
  - By default, **Unary(scalar1 x [product 1])**,
  - If the checkbox is ticked, **Unary(scalar1 x [product 1] + scalar2 x [product 2])**.
- A description text can be filled freely using the "**Description**" field.
- The "**Unary**" pull down menu (green) allows selecting the mathematical function to apply to the products combination :
  - Identity, by default,
  - Absolute value,
  - Natural Logarithm,
  - Square,
  - Square root.
- One of the predefined products can be selected using a pull down menu. If the checkbox (yellow) is ticked, one can define a linear combination of two of these products,
- A scalar multiplier, one by default, is applied to each product before any other operation,
- The altimetry model is generated on the fly if the "**Create**" button is clicked,
- The creation is aborted when the "**Cancel**" button is clicked.

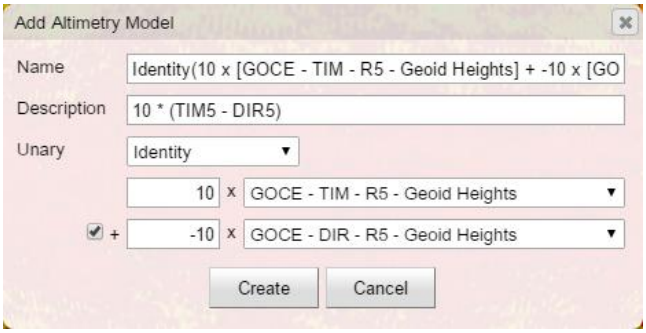



*fig. 78 - Interface filled, just before the addition of a user-defined altimetry model.*

### 4.2.3 Default altimetry model

One may restore the default altimetry model by clicking on the "**Restore Default Altimetry**" button. All the layers in the "**Temporary display**" will be removed and the default "**Bing Elevation**" will be set.

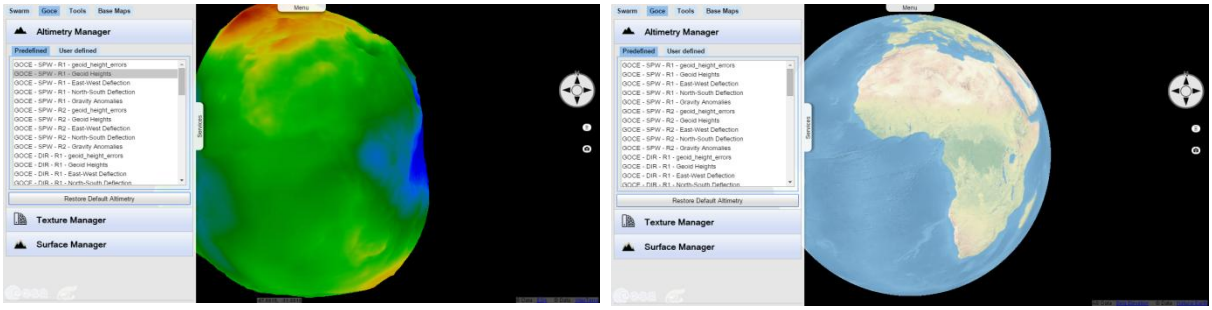



*fig. 79 - View before (left) and after (right) restoring the default altimetry model.*

## 4.3 Selection of the applied style

The texture manager allows the user to change the style of the single altimetry model that is selected in the altimetry manager.

### 4.3.1 Predefined styles

One can modify the style-enhanced texture by choosing among the predefined styles the combination of:

- a LUT
  - rainbow,
  - rainbow soft,
  - relief,
  - polar,
  - drywet,
- and a stretching
  - min/max [min, max],
  - centered [-max(abs(min), abs(max)), max(abs(min), abs(max))].

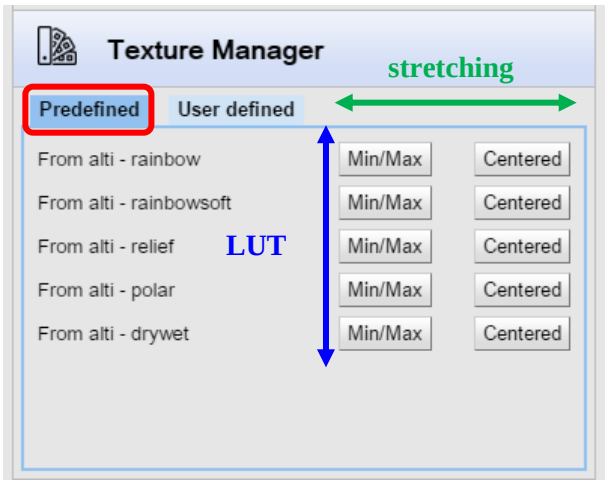



*fig. 80 - Graphical interface of the texture manager.*

Clicking the desired style applies it on the raw-texture. This style is discarded, reverted to default when another raw texture is selected in the "**Altimetry Manager**" or the "**Surface Manager**".

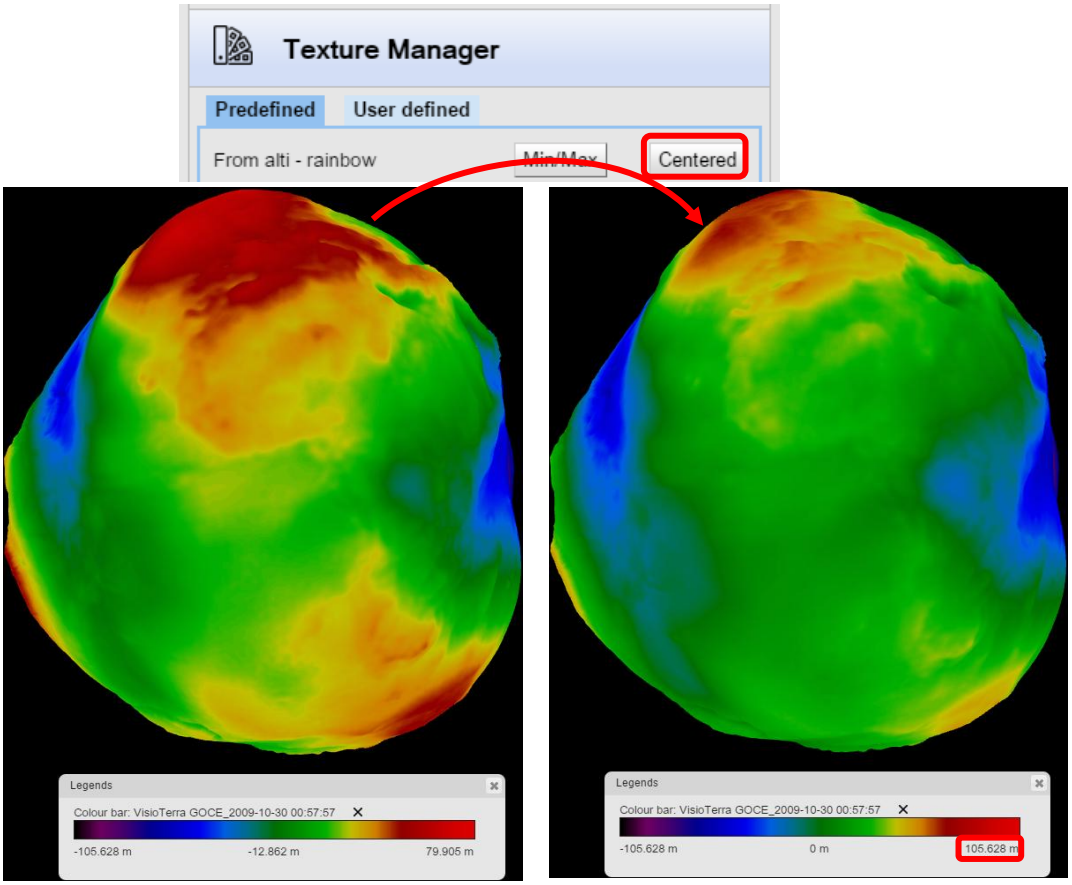



*fig. 81 - Layer stack - Selecting another style.*

### 4.3.2 User-defined styles for custom surfaces

A user-defined style can also be defined for each raw texture used by the surfaces in the "**Surface Manager**". They can be accessed by clicking the "**User-defined**" tab.

A style is shown for each texture parameter of each surface.

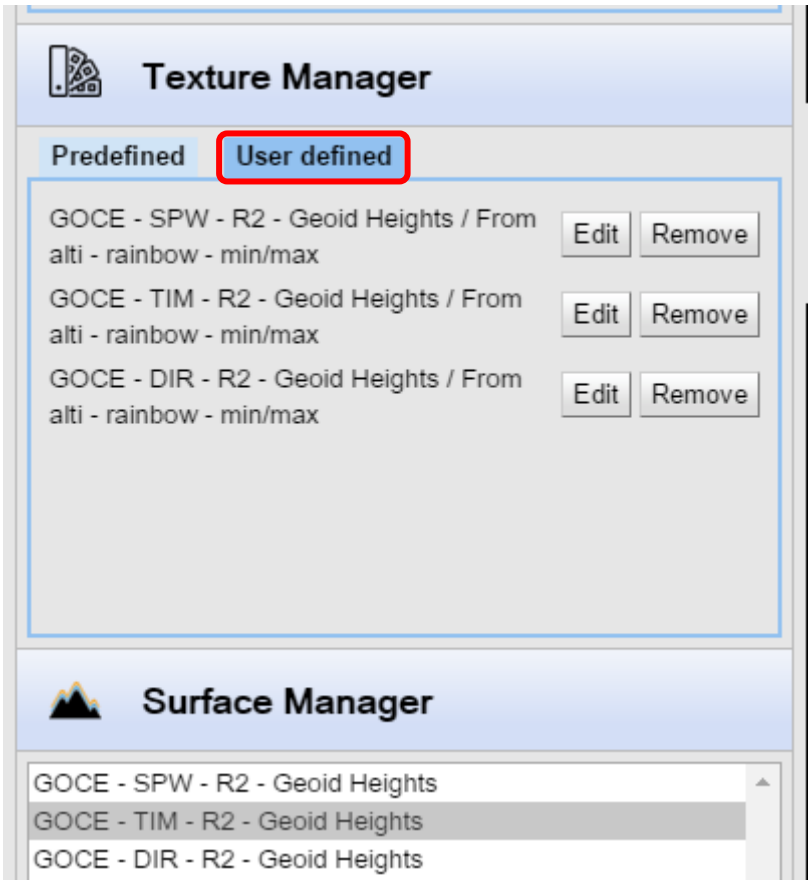



*fig. 82 - The user-defined texture tab.*

#### 4.3.2.1 Editing styles of surfaces

One can edit one of the styles of an existing surface by clicking the "**Edit**" button in the "**User-defined**" tab of the "**Texture Manager**". This opens the "**Dataset rendering**" window, shown here below: Its use is detailed in section 3.4.1.2.

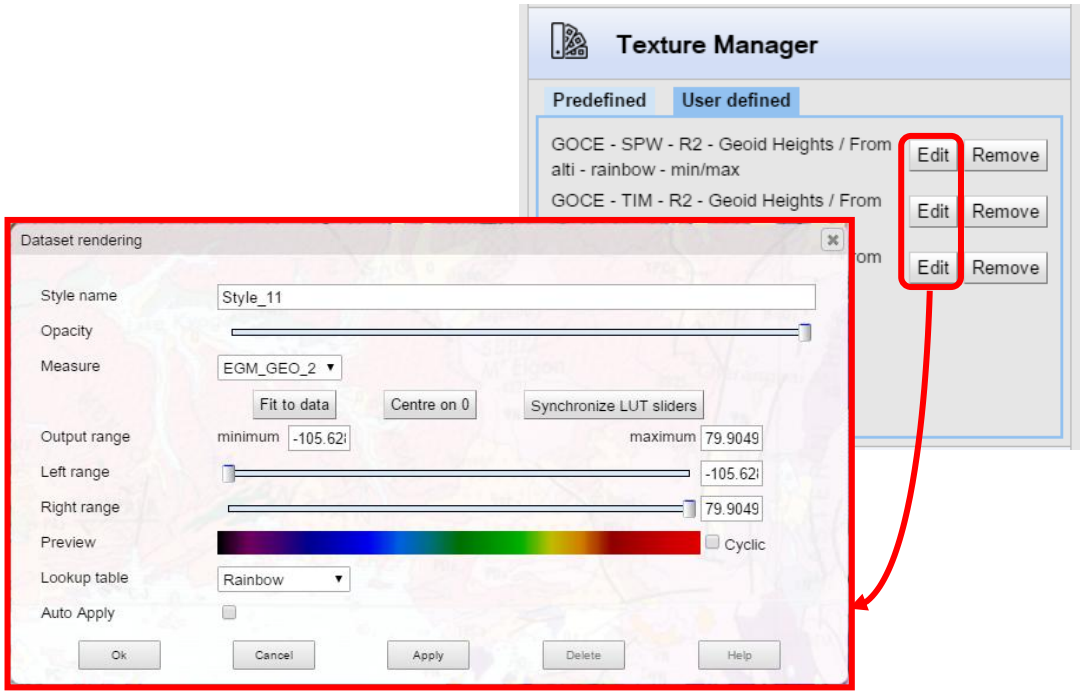



*fig. 83 - The dataset rendering window.*

In order to edit the texture of any altimetry model used as raster, one can also follow the alternative procedure described hereafter:

- Display the layer stack, as shown in fig. 5,
- Right click the surface to edit,
- Select "**Style**",
- Then, mouse over the selected style,
- Finally, its style should be edited using the "**Edit**" option, this opens the "**Dataset rendering**" window described in section 3.4.1.2.

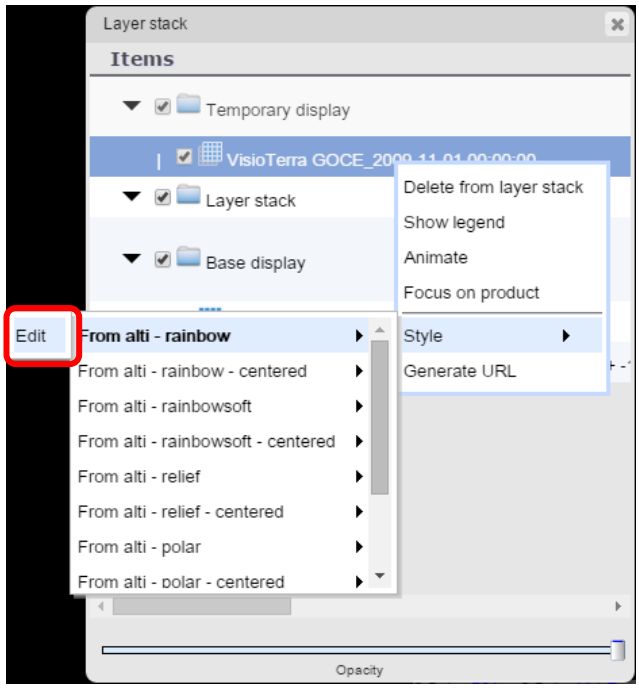



*fig. 84 - Access to the dataset rendering window via the layer stack.*

#### 4.3.2.2 Removing texture styles

Styles used by custom surfaces will remain in the "**Texture Manager**", accessible for future sessions, until they are removed. One can remove a user-defined texture style by selecting the "**Remove**" option.

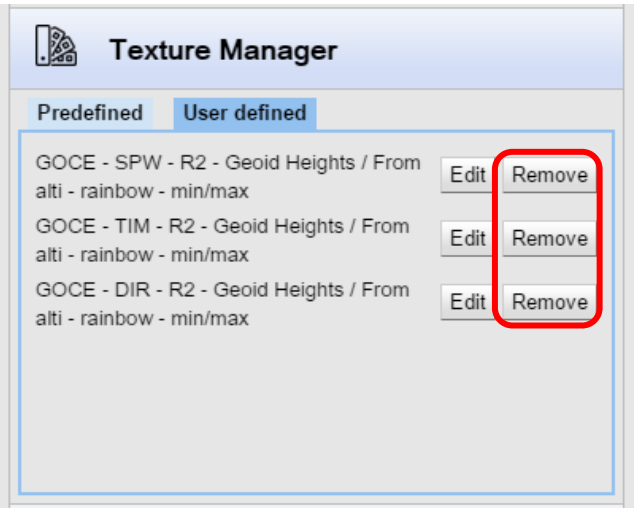



*fig. 85 - Access to the dataset rendering window via the layer stack.*

## 4.4 Use of the Surface Manager - Advanced functionalities

The "**Surface Manager**" can be used to create a surface with a customized style, such as an altimetry model used for the mesh that differs from the altimetry model used for the texture displayed on it. Those surfaces are saved from one session to the next and are loaded automatically when the "**Surface Manager**" is called.

For example, one could apply a geoid_height_errors raster to a Geoid Height mesh, as shown with rainbow style below.

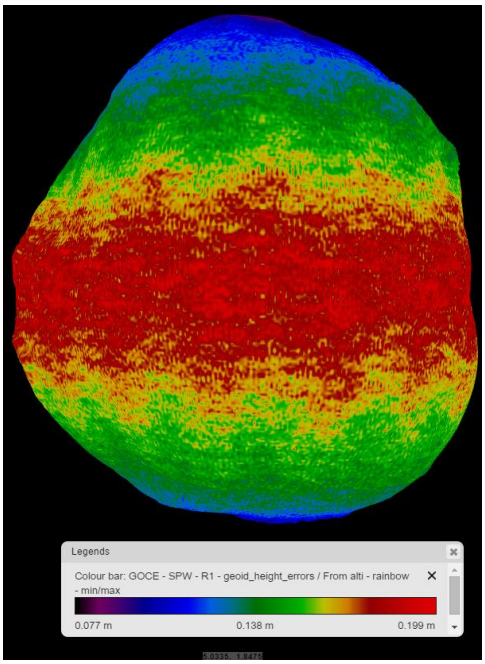



*fig. 86 - geoid_height_errors raster displayed on a Geoid height mesh.*

Another use of the "**Surface Manager**" is to create a flickering in order to display alternatively several surfaces.

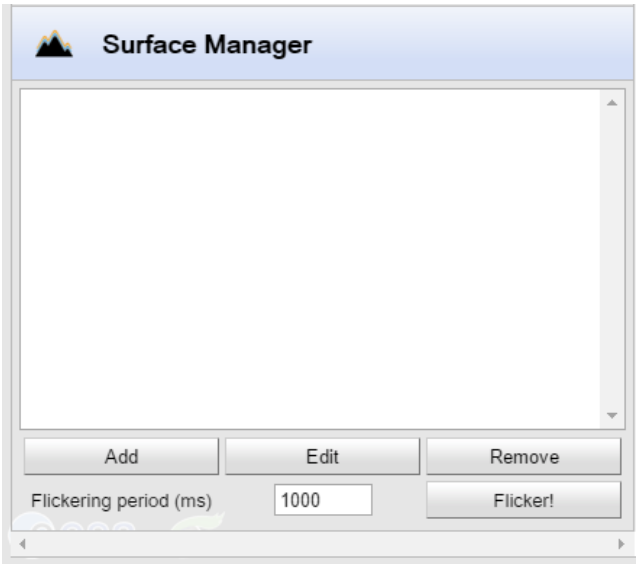



*fig. 87 - Surface manager graphical interface.*

### 4.4.1 Adding a surface

To use these advanced functionalities, one or several surfaces needs to be added, using predefined or user-defined altimetry models to define the mesh and using the texture manager to define the style applied.

When a surface is selected for display, a layer is added to the temporary layer stack for each of its associated styles and a legend is added to the legend bar.

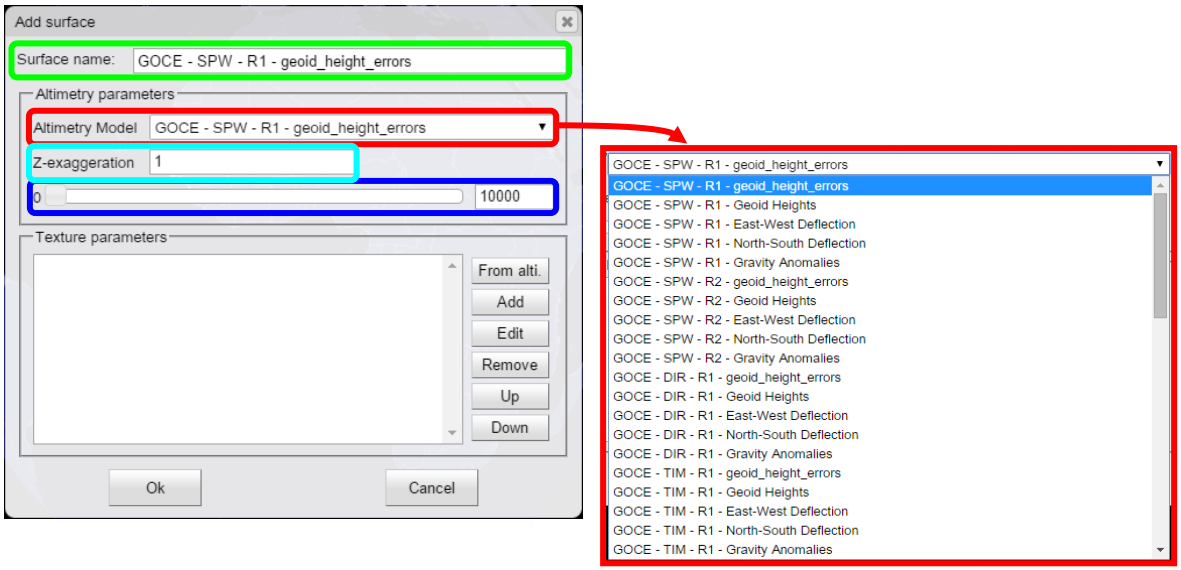



*fig. 88 - Surface addition graphical interface.*

#### 4.4.1.1 Name

The surface can be named to ease further use (green).

#### 4.4.1.2 Mesh

*Selection of the product to use as the mesh altimetry model*

Each predefined and user-defined product that can be used as an altimetry model is added to the drop down menu (red) in which the user can select a single elevation model.

*Z-exaggeration to apply*

A Z-exaggeration is applied to the surface altimetry before adding it to the ellipsoid. This factor can be set either by editing the text field (cyan) or by moving the slider bar (blue) to the desired value. Both widgets are linked, changing one updates the other.

The default Z-exaggeration value depends on the elevation model dynamic. It is scaled to a decade that applies visible deformation on the globe without altering its topology.

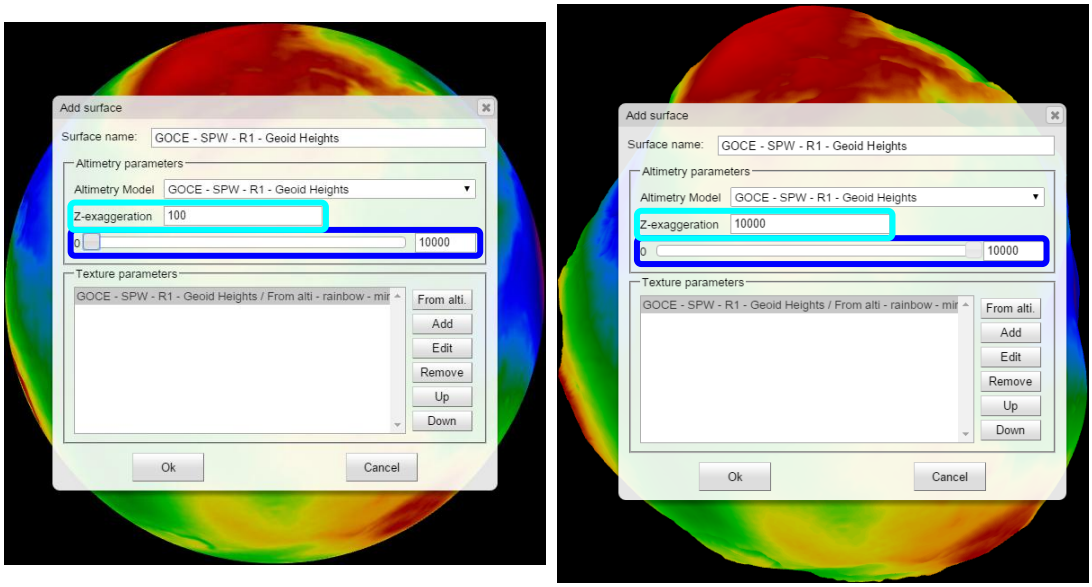



*fig. 89 - Changing the Z-exaggeration from 100 to 10000.*

#### 4.4.1.3 Texture parameters

One or more texture styles can be added to each surface. All of these style-enhanced textures are then added as layers in the layer stack and displayed on their common mesh when the surface is selected. Textures can be generated using default parameters with the "**From alti**" button or customised using the "**Add**" button.

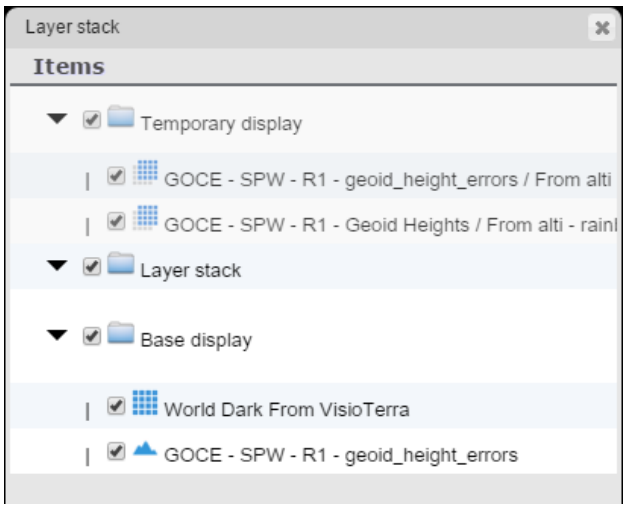



*fig. 90 - A layer stack with a single surface duplicated for its two "Texture parameters".*

They are ordered as the layer stack, so that the top layer of the list is the top layer on the globe. Each new style-enhanced texture added is put on the top, thus visible by default. The "**Up**" and "**Down**" buttons (red) allow modifying the order of the textures of the surface.

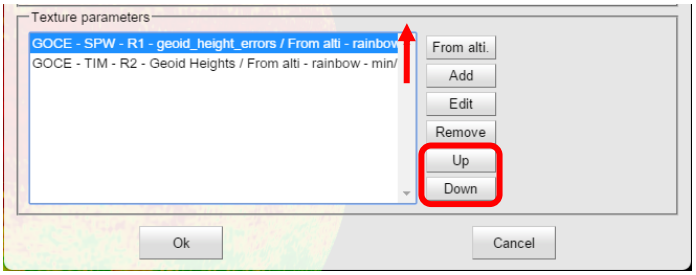



*fig. 91 - Order of the stack of texture parameters added to a surface.*

*Generating texture from the selected mesh*

For the selected mesh, this feature generates the default style for the raw raster that uses the altimetry model of this mesh. One can add such a texture by clicking the "**From alti**" button.

*Generating texture from the mesh used by other surfaces*

For the selected mesh, the following feature allows the choice of any surface or any available user-defined altimetry model as raw texture.

One should proceed as follow to generate such a texture:

- the user should press the "**Add**" button (red) which opens a window (yellow) called "**Add texture**",
- in the pull down menu that appears (blue), one should be select one of the available altimetry models,
- the texture is added using the default style when the user presses the "**Add**" button (green).

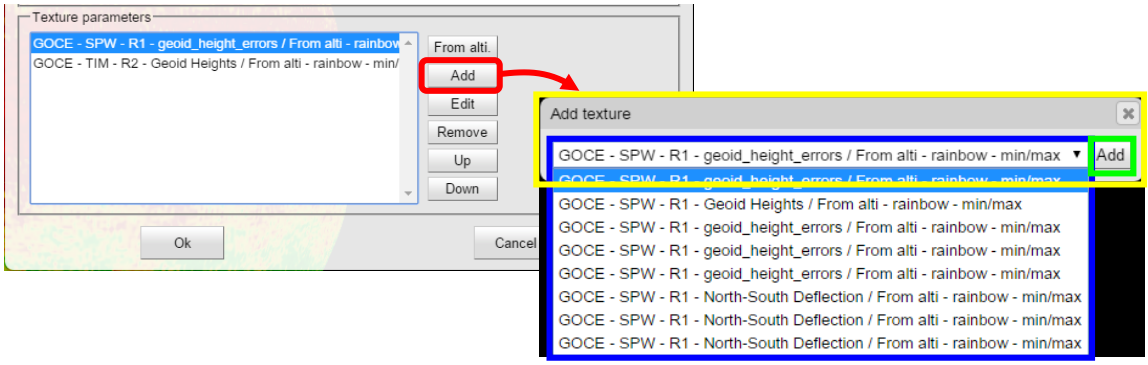



*fig. 92 - Choice of the mesh to use to generate the raw texture.*

*Editing a texture style*

When a texture is generated, the default style is applied: a rainbow LUT stretched between the min and max values.

While the Raw texture cannot be modified, the style of the selected texture can be modified by pressing the "**Edit**" button (red) which opens the "**Dataset Rendering**" window detailed in section 3.4.1.2.

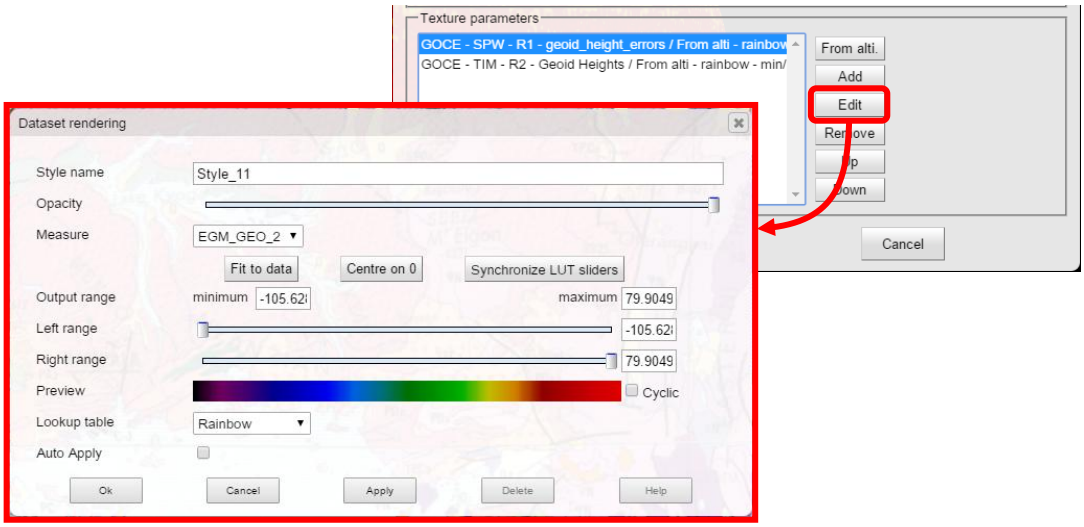



*fig. 93 - Access to the "Dataset rendering" window from "Texture parameters".*

It is also possible to create a new style to apply to an existing raw raster by using the following steps:

- Displaying the layer stack, as shown in fig. 5,
- Right-clicking on the altimetry model which texture is to be changed,
- In the context menu, the user needs to click "**Style**",
- Then select "**Create Style**",
- This opens the "**Dataset rendering**" window, described in section 3.4.1.2.

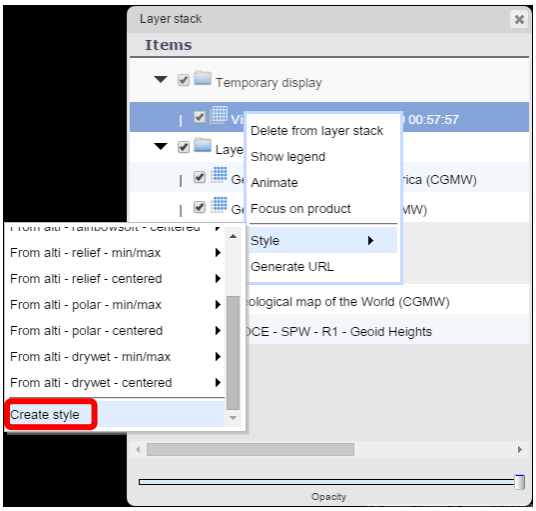



*fig. 94 - Creation of a new style.*

### *Removing a texture*

A texture remains available for a surface even when the session is closed. One can remove a texture from a surface by selecting it and pressing "**Remove**".

### *Returning to the texture parameters of the surface*

The surface creation is validated by the "**Ok**" button or cancelled either by the "**Cancel**" button or using the cross at the top-right hand corner of the window.

### *Alternative procedures*

One can also apply a raw texture that differs from the altimetry model used as mesh using the following steps:

- Displaying the layer stack, as shown in fig. 5,
- Selecting the altimetry model to use as raw texture,
- Selecting its style, as described in section 4.3 or in section 3.4.1.2.
- Dragging it from the temporary layer stack to the layer stack as described in 2.3.2.2,
- Selecting the altimetry model to use as mesh,
- For a Z-exaggeration, that differs from 10 000, it should be built with as a user-defined altimetry model, as described in 4.2.2,
- Deselecting it from the temporary layer stack, the mesh remains while the previous texture now on top of the layer stack is displayed on it as texture.

### 4.4.2 Editing a surface

One can edit a surface by following the steps described hereafter:

- In the "**Surface Manager**", one should select an existing surface and press "**Edit**",
- It opens an edition window similar to the creation window except the fields are filled with the current values,

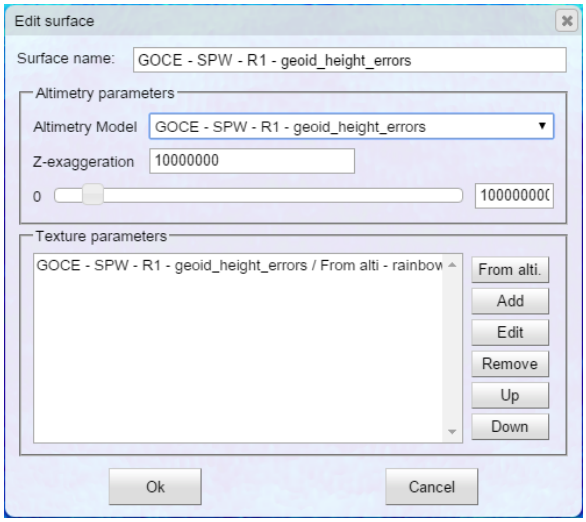



*fig. 95 - The surface edition window.*

### 4.4.3 Removing a surface

One can remove a surface by selecting it and by pressing the "**Remove**" button.

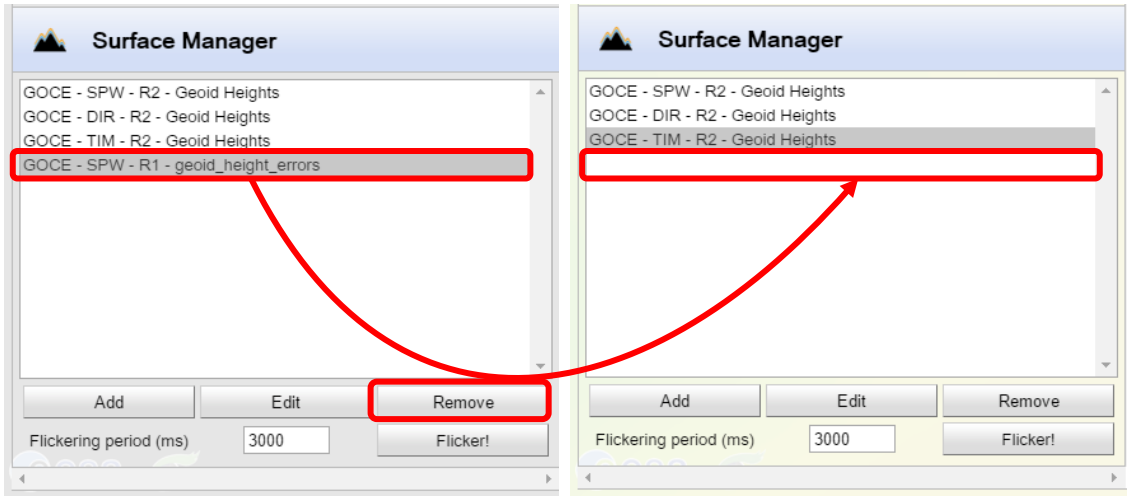



*fig. 96 - Removal of a surface.*

The surface that has been removed however stays in the temporary layer stack. It remains visible until it is swapped in the temporary layer stack, which happens when another surface is selected.

### 4.4.4 Setting a flickering

One can create a flickering between the surfaces added in the surface manager by setting the desired **Flickering period** (green), 1000 milliseconds by default, and pressing the "**Flicker**" button (red).

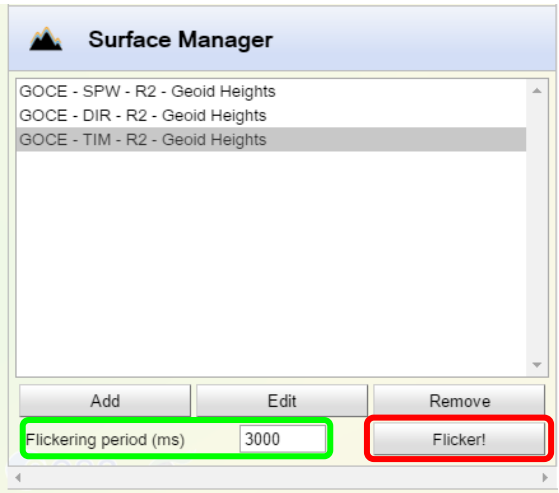



*fig. 97 - Setting a flickering.*

# 5 DISPLAY FUNCTIONALITIES OF THE VTWEB PLATFORM APPLICABLE TO GSEP

## 5.1 Edition of an uploaded kml style

The style of an uploaded kml can be edited by right-clicking the kml name in the layerstack. Then one should select "**Edit style**" which opens a specific window. Users can edit the colour and the opacity of the rendering using the controls.

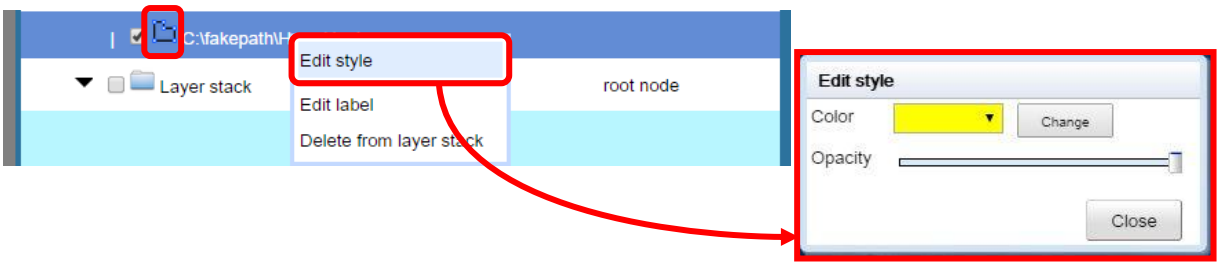



*fig. 98 - Layer stack - Edition of an uploaded kml style.*

## 5.2 Accessing products value

### 5.2.1 Accessing vector products value

By right-clicking a vector product in the layer stack, one can select "**Display value**".

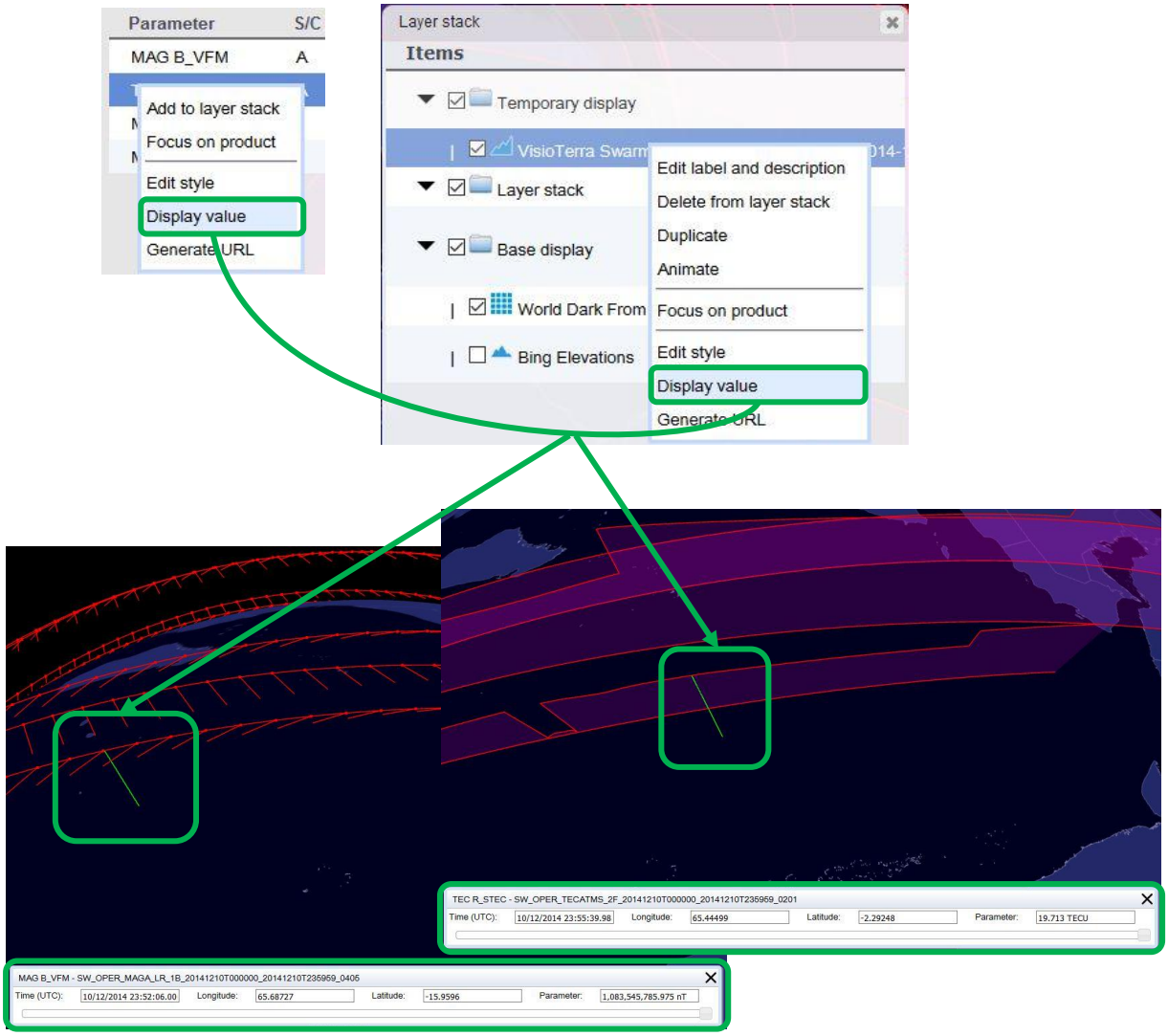



*fig. 99 - Access to the measurements value.*

The opened window allows users to move a slider bar by dragging it with the **mouse** or the **right/left arrows** for precise positioning. This displays a green cursor according to the curvilinear abscissa of the slider bar (**red**). The longitude, latitude, time and value of the measurement (green) are updated accordingly.


The value is displayed with the unit delivered in the format specification. The decimals are separated by a point while the groups of three digits are separated by a comma.

In case of vector data, the value displayed is the norm of the selected vector.

### 5.2.2 Accessing raster products value

With a right-click on a raster product in the layer stack, one can select "**Show legend**" to call a legend bar. This bar shows the look-up table and the extrema values associated to the selected style for the product. The bar is scaled with intermediate values and displays their units.

The look-up tables available are the following:

| | |
|---|---|
| Rainbow |  |
| Rainbow soft |  |
| Rainbow cyclic |  |
| Polar |  |
| Polar Inverted |  |
| Relief |  |
| Dry/Wet |  |
| Greyscale |  |

*fig. 100 - Look-Up Tables available.*

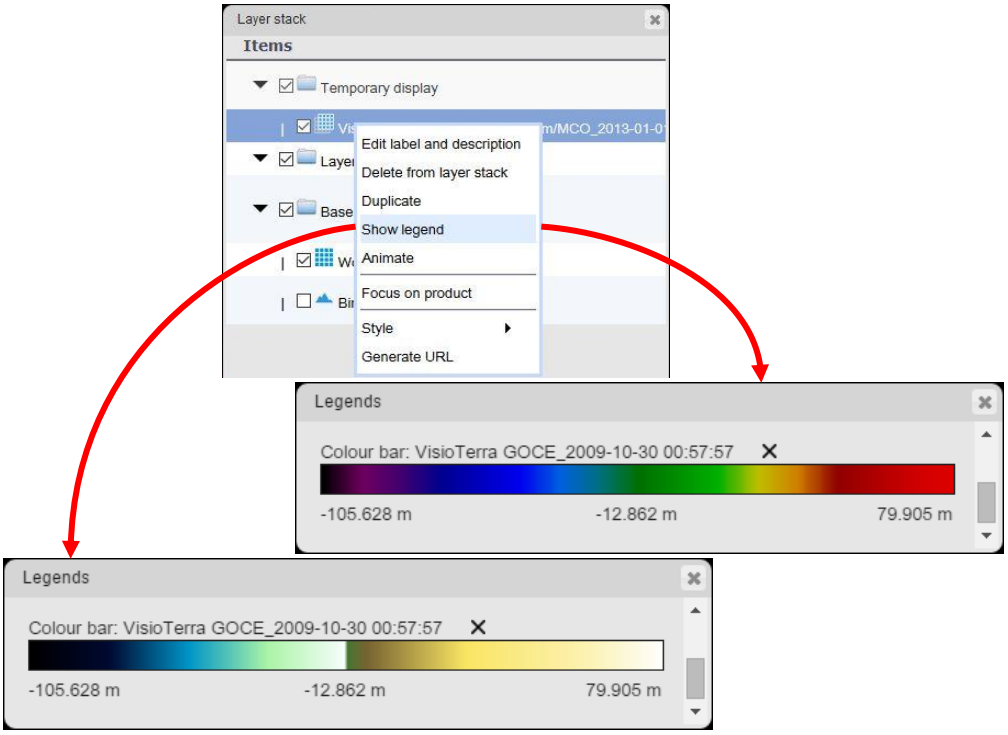



*fig. 101 - Access to the legend resulting of two different styles.*

## 5.3 Using serial profiles

GOCE service users can access altimetry values of the selected mesh by using serial profiles.

### 5.3.1 Accessing profiles tools

The serial profiles functionality can be accessed by clicking the "**Tools**" tab (red) and then pressing the "**Create profile**" button (green) in the "**Profile**" panel.


*fig. 102 - Accessing the serial profile tools.*

This action opens the "**Profile window**" (red) and a small bar of widgets at the top right of the screen (green).

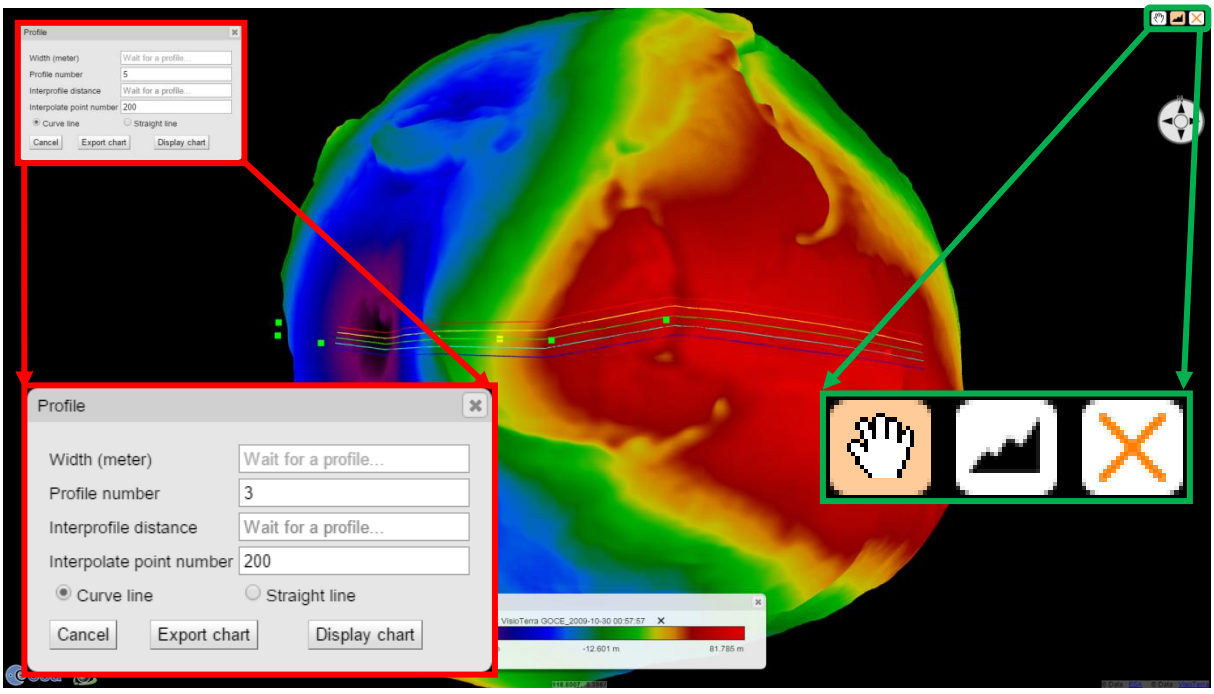



*fig. 103 - Serial profiles drawing tools.*

### 5.3.2 Creating the central profile

The central serial profile is defined by a series of points drawn on the globe using the profiles widget bar.

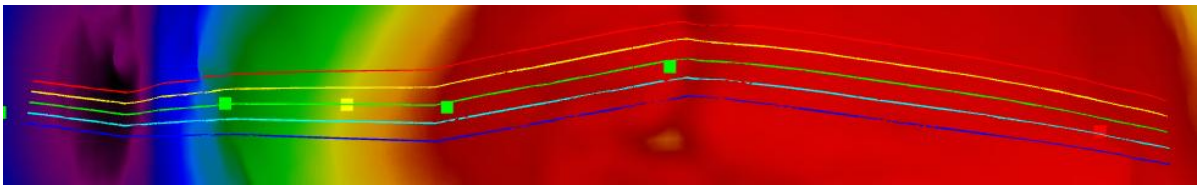


*fig. 104 - Serial profiles drawn.*

#### 5.3.2.1 Edition / Panning

Users can toggle between the panning and drawing mode the same way they can between panning and drawing mode during the definition of an AOI in VtWeb. To choose the panning mode, one should click the "hand" button (red). To revert to the edition mode, one should click the "profile" button (green).

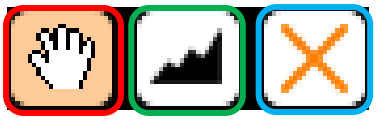


*fig. 105 - Serial profiles widget bar.*

#### 5.3.2.2 Erasing drawn profiles

Users can erase drawn profiles the same way they can erase drawn AOI in VtWeb, by clicking the orange cross (blue).

#### 5.3.2.3 Selecting a point

An inactive point is displayed in green while an active button is displayed in red. To activate a button, one should position the mouse over this point using the edition mode. When the cursor changes from a white arrow to a white cross , it becomes possible to select the point as active by clicking it.

#### 5.3.2.4 Adding a point

One can add a series of points after the active point by positioning the globe as desired, switching to the edition mode and then clicking the surface where the next point should lie.

#### 5.3.2.5 Editing a point

To edit a point, one needs to position the mouse over this point. When the cursor changes from a white arrow to a white cross, it is possible to move the point by dragging it to the desired position.

#### 5.3.2.6 Removing a point

One can remove the active point by pressing the "**delete**" key.

#### 5.3.2.7 Moving profiles

The whole central profile can be moved by dragging the yellow point which is usually positioned near the middle of the profiles as detailed in "editing a point".

#### 5.3.2.8 Changing interprofile distance

The interprofile distance can be increased or decreased by dragging the green point which is usually positioned near the first point of profile one.

### 5.3.3 Profiles window

When users click the "**Create Profile**" option, it also opens the "**Profile window**". This allows the setting of several parameters of the serial profiles.

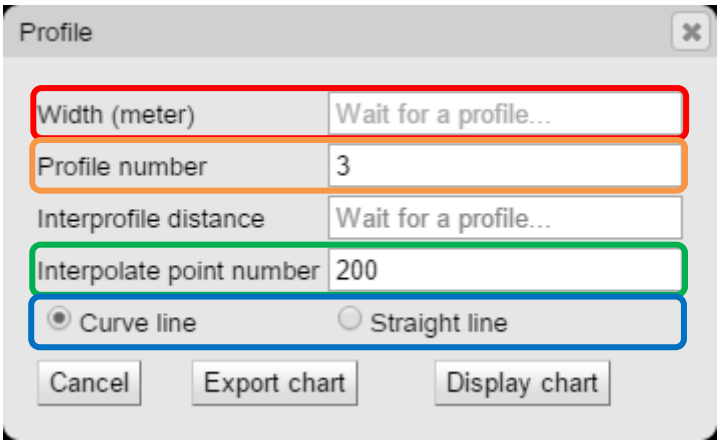



*fig. 106 - Profile window.*

#### 5.3.3.1 Profiles width

Instead of using the green point drawn on the side of the serial profiles, one can also edit the interprofile distance by changing the value of the "**Width**" textfield (red).

#### 5.3.3.2 Number of profiles

There are three serial profiles displayed by default. This number can be increased or decreased by changing the value of the '**Profile number**" textfield (orange). The profiles are then equally spaced, spread as much as possible inside the chosen width.

#### 5.3.3.3 Number of interpolated point

This value corresponds to the number of points used to compute the heights of the serial profiles. By default, 200 points will be added for each profile. This number can be increased or decreased by changing the value of the '**Interpolate point number**" textfield (green) and must be lower than 10.000.

#### 5.3.3.4 Line type

This option allows changing the line representation in the chart. If "**Curve line**" is selected (by default), each point of a profile will be joined by a spline. If "**Straight line**" is selected, each point will be joined by a segment.

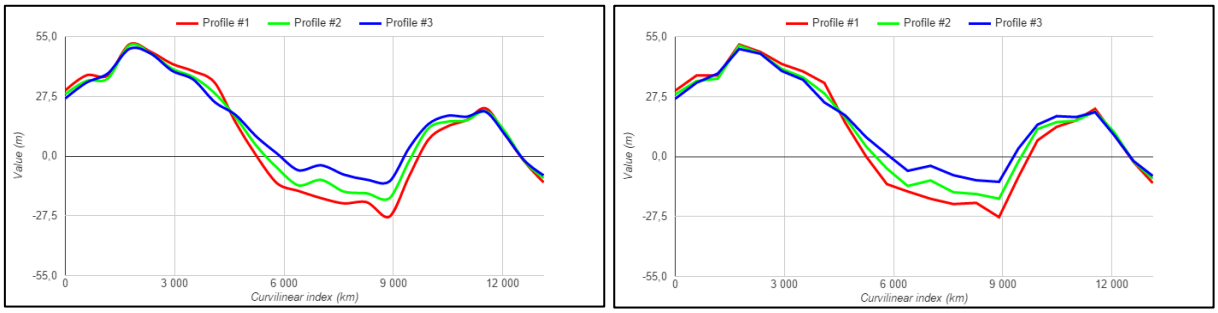



*fig. 107 - Difference between "Curve line" (left) and "Straight line" (right).*

#### 5.3.3.5 Exporting the chart

The serial profiles chart can be exported in Comma Separed Value (CSV) format by using the "**Export Chart**" button. The displayed text should then be selected manually (click then CTRL+A works) and copied in a software that can handle this format such as Excel or Libre Office Calc. One may also download directly a CSV file by clicking on "**Download CSV**" button.

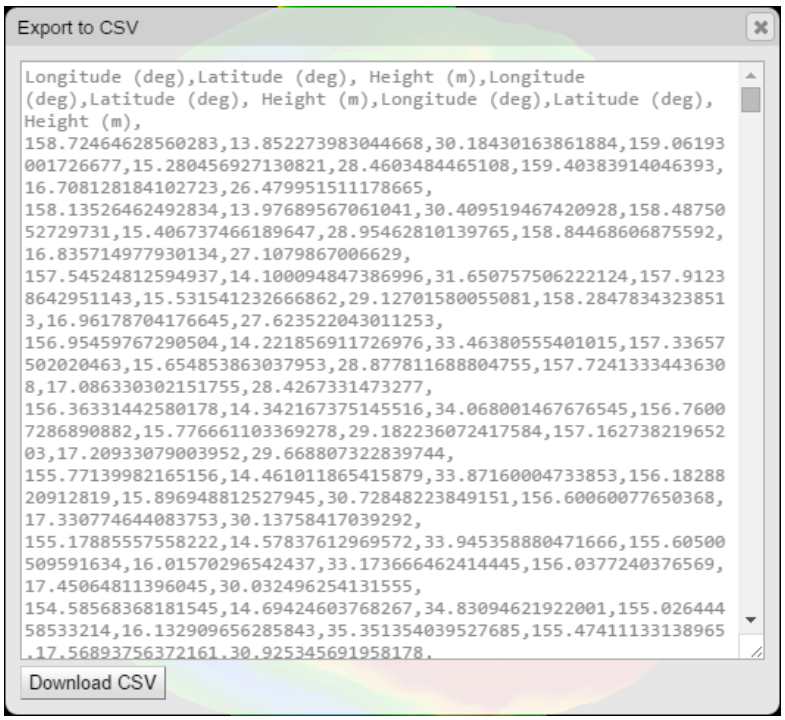



*fig. 108 - "Export chart" window.*

#### 5.3.3.6 Displaying / updating the chart

The serial profiles chart can be displayed or updated by pressing the "**Display chart**" / "**Update chart**" button. The altimetry of all serial profiles is then computed and displayed in a new window.

#### 5.3.3.7 Closing the profile window

It is otherwise possible to quit the serial profile mode either by pressing the "Cancel button" or by clicking to top-right cross in the "**Profile window**".

### 5.3.4 Serial profiles chart

The serial profiles chart represents the altimetry of each profile according to their curvilinear abscissa. It is divided between a zoomed graph on the top (blue) and a general outlook (green) on the bottom.

Each serial profile does not necessarily have the same length on the globe however they are all scaled in curvilinear abscissa on this chart. It is possible to display the value of a point on a profile on the chart (red) and to highlight the position of this point on the globe thanks to a witness bar (yellow).

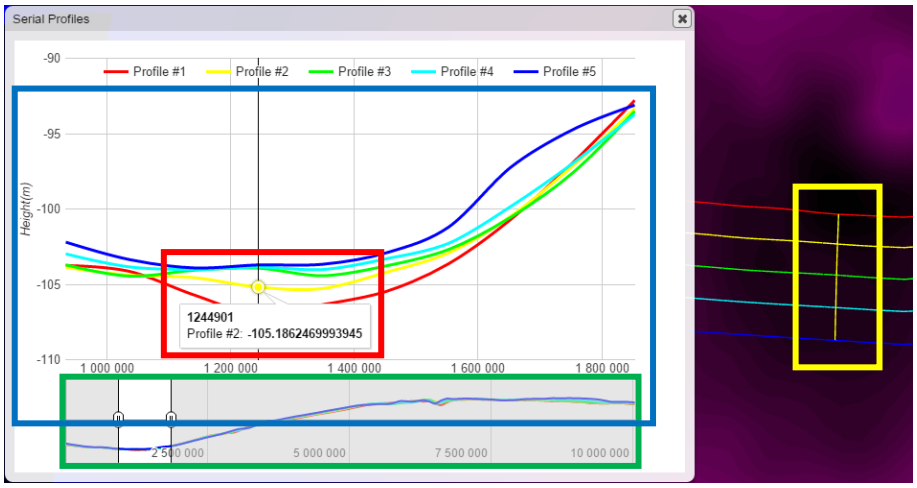



*fig. 109 - Tools of the serial profiles chart.*

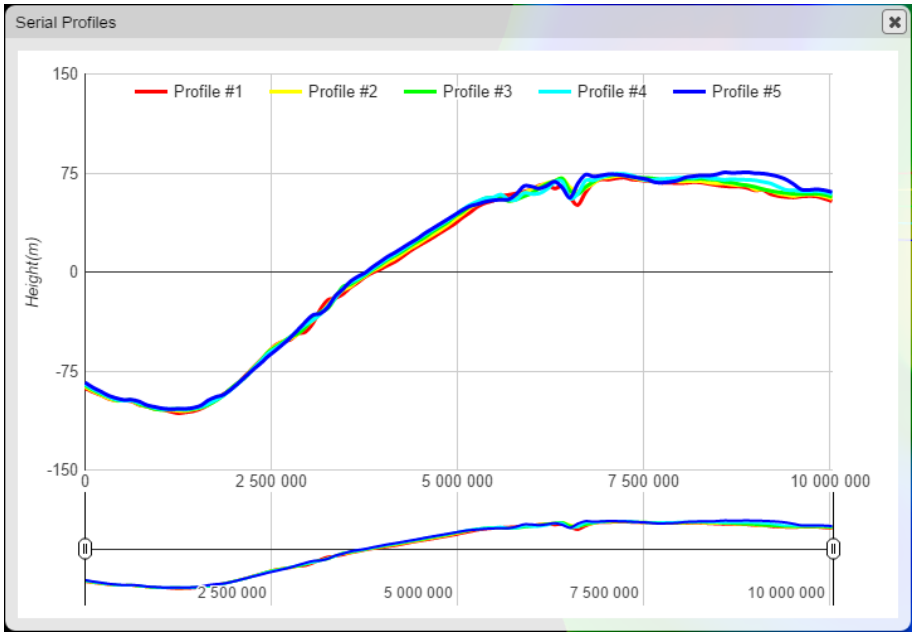



*fig. 110 - A serial profiles chart displaying five profiles.*

### 5.3.4.1 Zoom

In order to focus on details, it is possible to zoom on a part of the chart by setting one or both curvilinear abscissa (magenta) thresholds to delimit the zoomed graph (green), the ordinate axis is zoomed accordingly (orange).

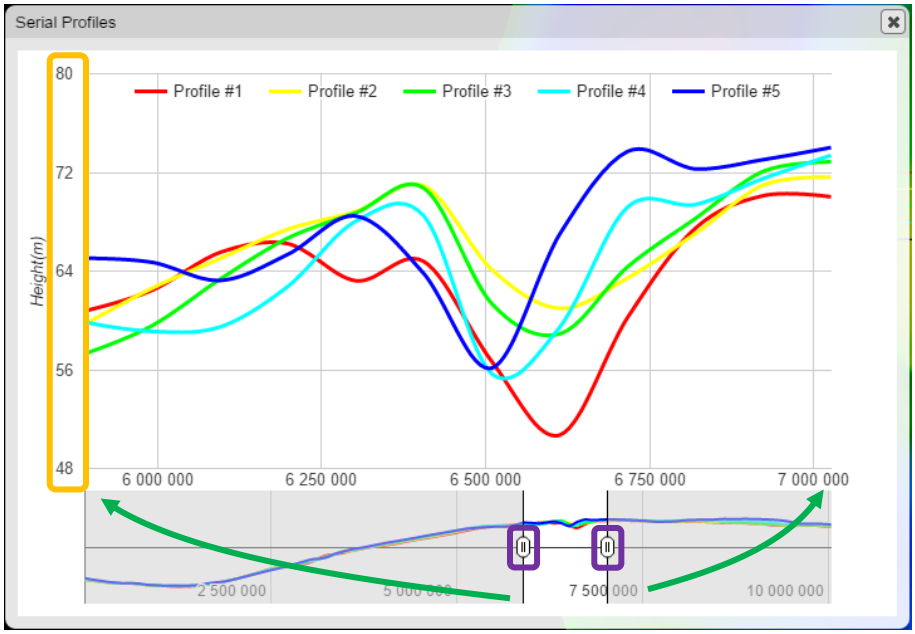



*fig. 111 - A serial profiles chart with a zoom applied.*

### 5.3.4.2 Reading values

On each serial profiles, the altimetry of a large number of equally spaced points are computed. By clicking on any point of the profiles displayed on the "Serial Profiles" chart, a white label displays the value of the point.

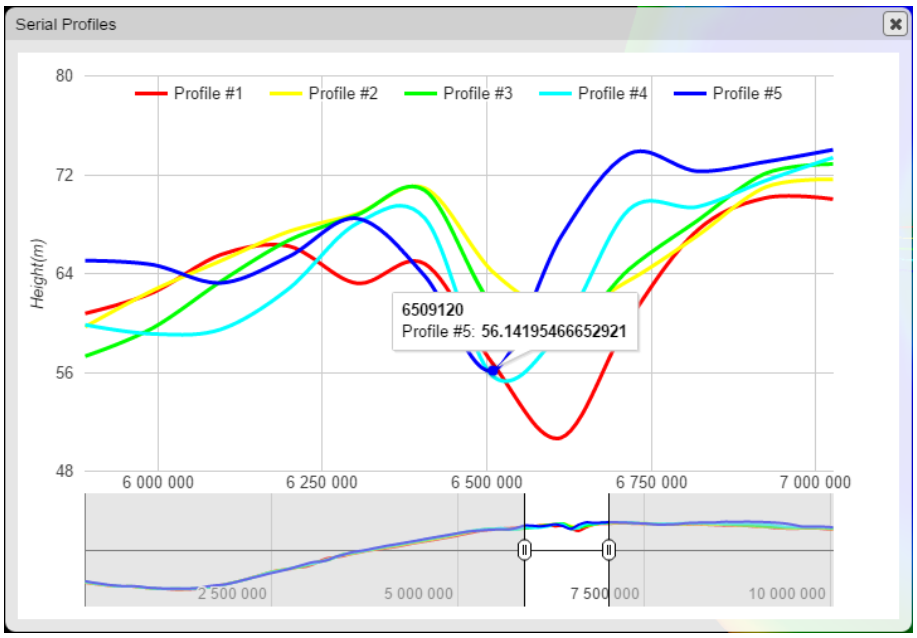



*fig. 112 - Altimetry label displayed when a serial profile is hovered.*

#### 5.3.4.3 Displaying the cursor

A cursor bar can be displayed to highlight on the globe the position of a point located on a serial profile. To do so, one needs to click a point located on the zoomed chart. A yellow cursor (yellow) then appears on the globe over the click point, connecting the points of each serial profile at the same relative abscissa (magenta).


*fig. 113 - Cursor displayed when a serial profile is clicked.*

#### 5.3.4.4 Closing the chart

The “Serial Profiles” chart can be closed by using the cross at the top-right of the window.

## 5.4 Animating the content of a folder

One can create an animation that alternates between items of the same folder. This is managed by right-clicking the selected folder and selecting the "**Create animation**" option in the context menu.

This opens the "**Animation**" window. It contains a slider that allows to manually shift the image that remains visible among those of the folder.

The user can also use the "**Delay time**" to set a chosen delay between the animation frames. By clicking the "**Launch**" button '(green), the image that remains visible among those in the folder changes every two seconds. The slider bar is animated as well and the name of the visible frame evolves correspondingly.

The animation can be stopped by using the "**Stop**" button and the window can be closed by pressing the "**Close**" button.

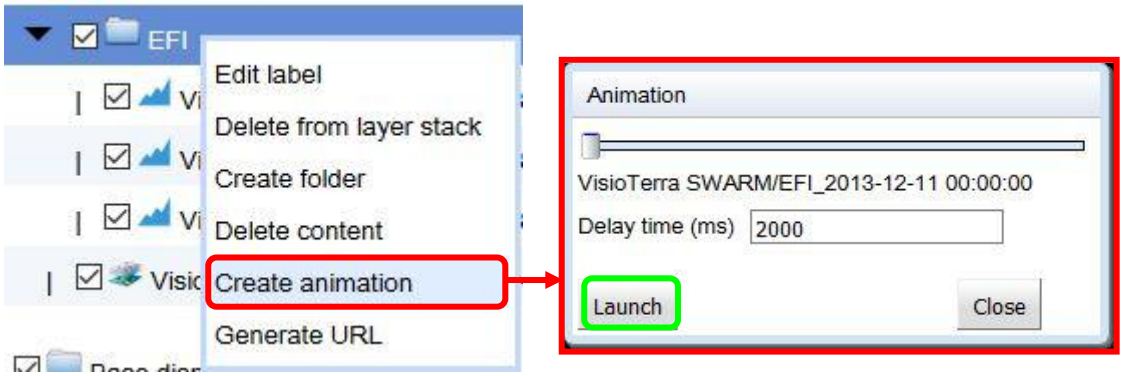



*fig. 114 - Folder content animation tool.*

## 5.5 Generating URLs

Users can generate an URL that can be copied to share a group of products, their styles, order and visibility, the camera and the background layer parameters. This feature can be reached by right clicking a folder or a product either in the search results or in the layer stack and then choosing the "**Generate URL**" option in the context menu.

Opening this link opens a new VtWeb instance with the same features but in "full screen" with the side panel and the layer stack hidden.

The generated URL contains information to preserve

- the folder selected and all its products or the product selected,
- their style and opacity,
- the 2D/3D view,
- the camera position,
- the camera angles,
- the background layer selected,
- the display altimetry parameter if selected.

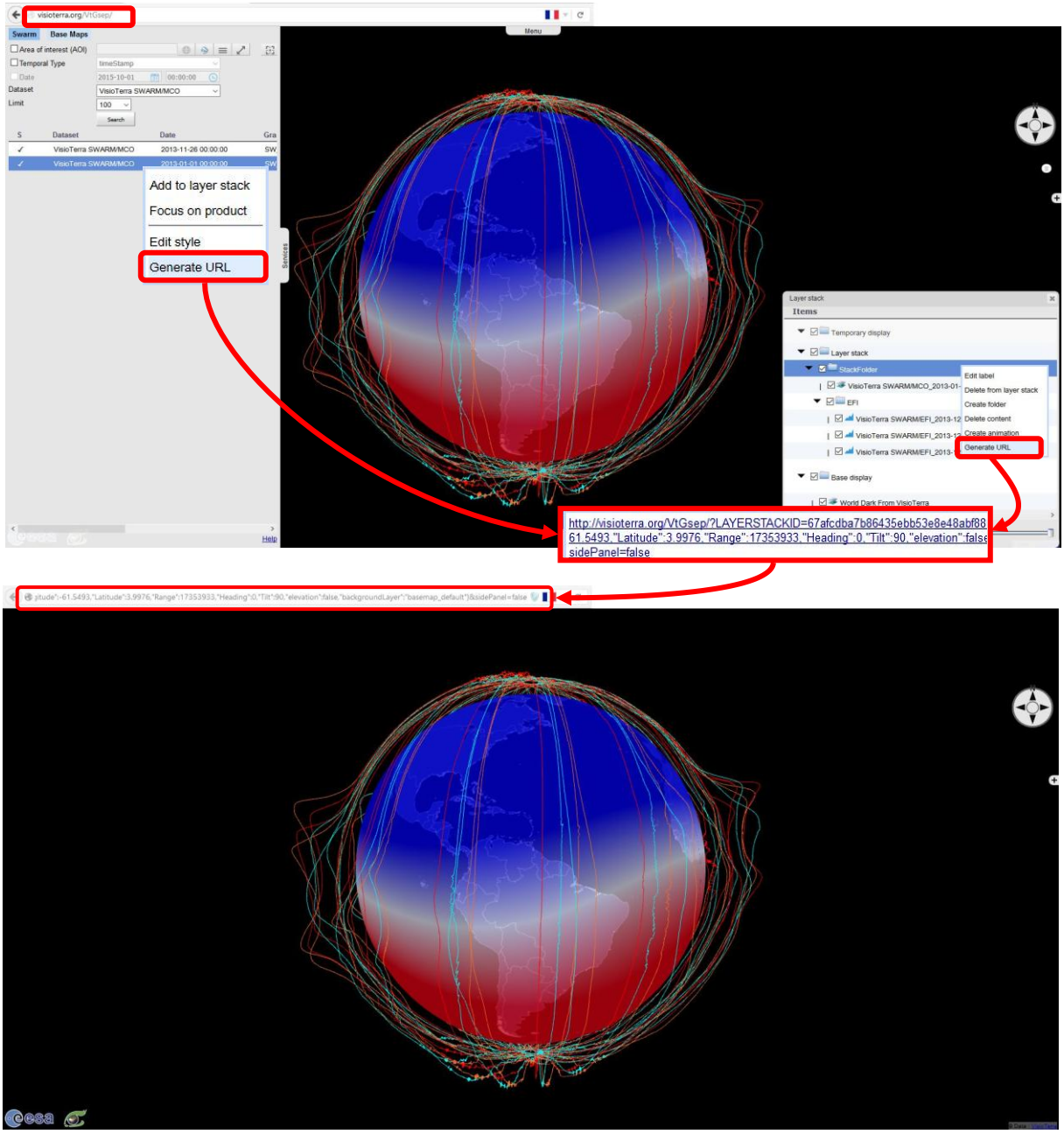



*fig. 115 - The link created by "Generate URL" and the view obtained by opening it in a web browser.*