



Earth Observation Open Science 2.0

**A live-link on Sentinel data to
discover, track changes, inform, train...
citizen and scientists**

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Director

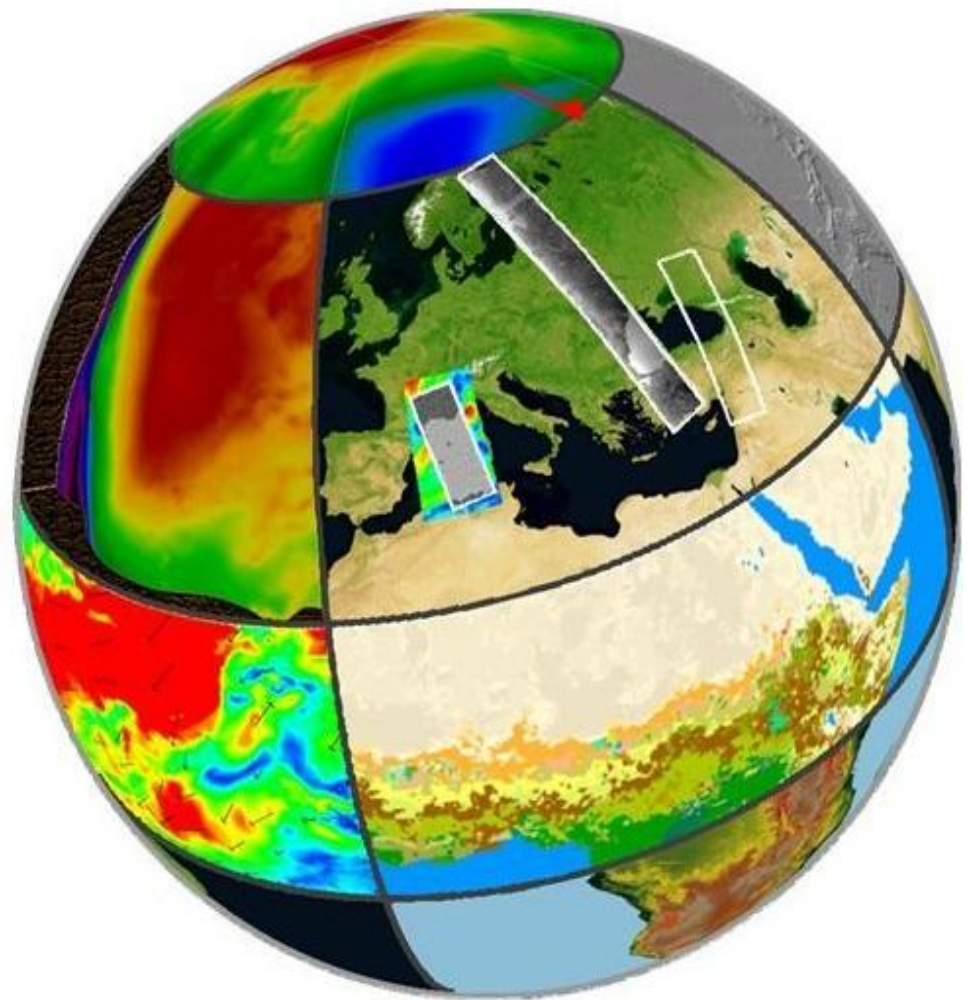
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EO engineering and education

January 1990



GAEL Consultant

March 2004

1. Software development
2. Quality control
3. Cartographic production

May 2004



VisioTerra

Science consulting for Earth observation

1. **Software development** – Virtual globes, access to EO data
2. **Cartographic production** – geometry, radiometry, statistics
3. **Studies** - EO expert support, technical studies, audit
4. **Training** – Remote sensing, Image processing, Geodesy...
5. **Communication** – Web, scientific document editing

March 1993



University Paris-Est Marne-la-Vallée – Gaspard Monge Institute



Professor

1. Image processing
2. Remote sensing
3. Trainees following

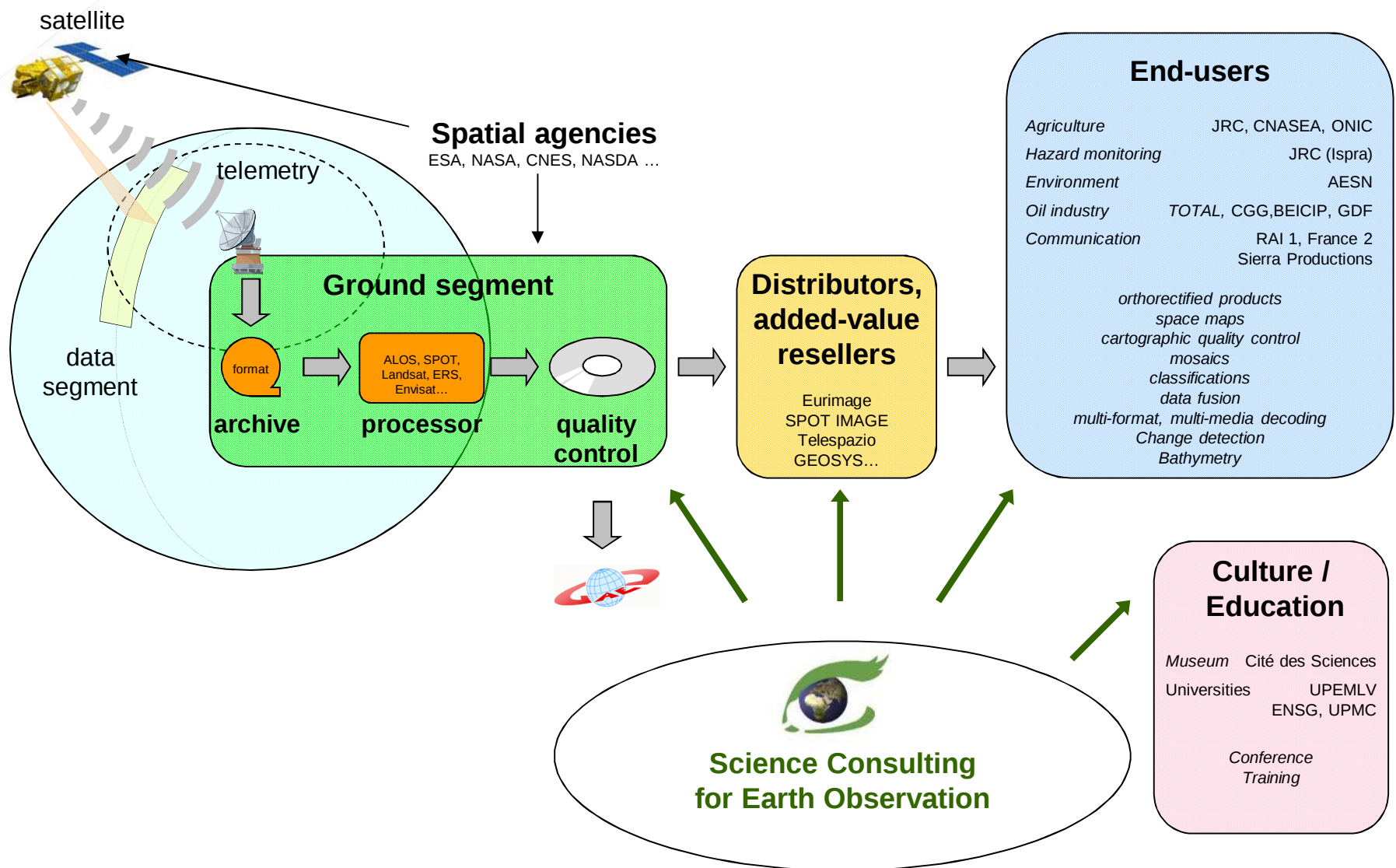
ENSG (IGN school)

University Paris 7

World univ. (Algeria, Morocco, Palestine, Douala, Kinshasa...)



From satellite to end users





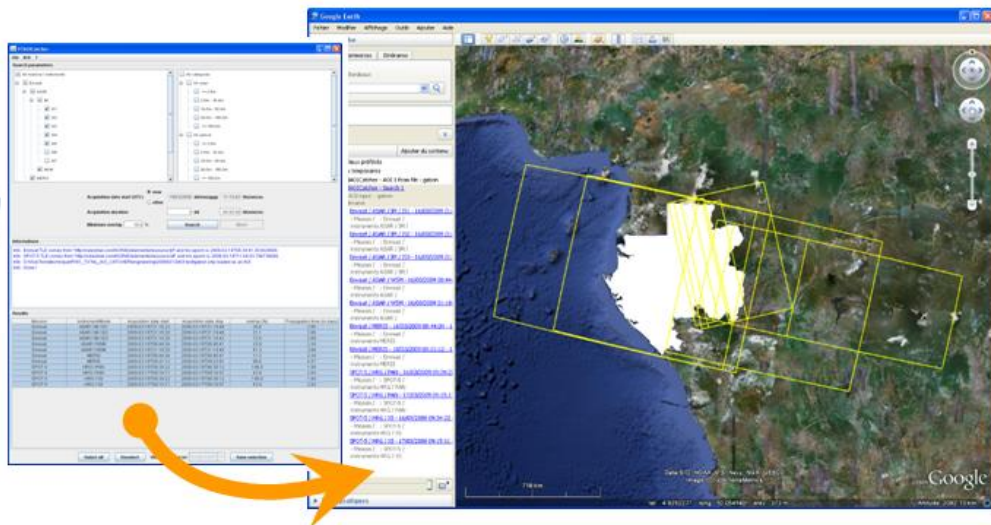
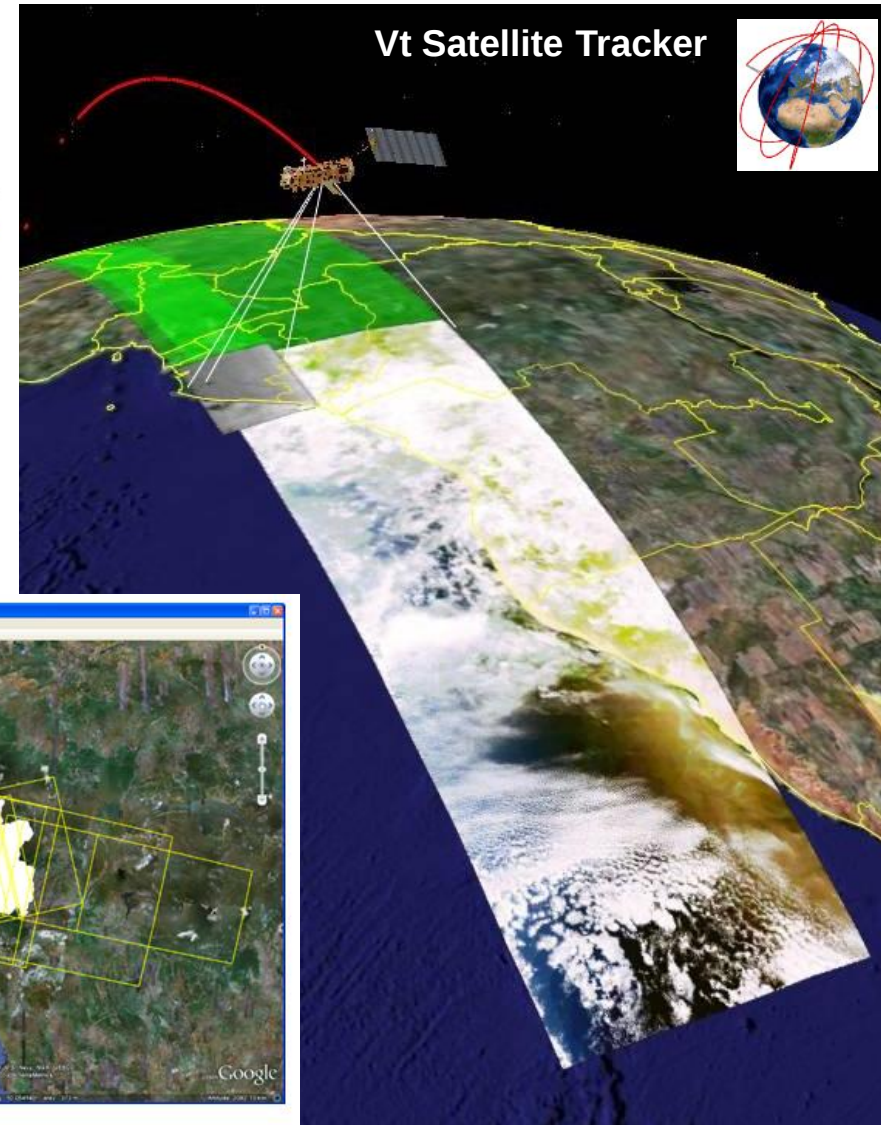
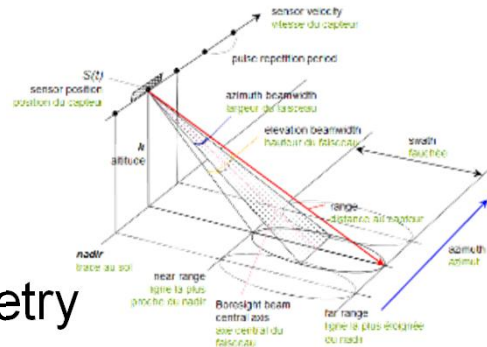
Orbit propagation and acquisition geometry

➤ Orbit propagators

- ☐ SGP4
- ☐ Nominal

➤ Acquisition geometry

- ☐ Optical / Radar
- ☐ Mission / Instrument / Mode

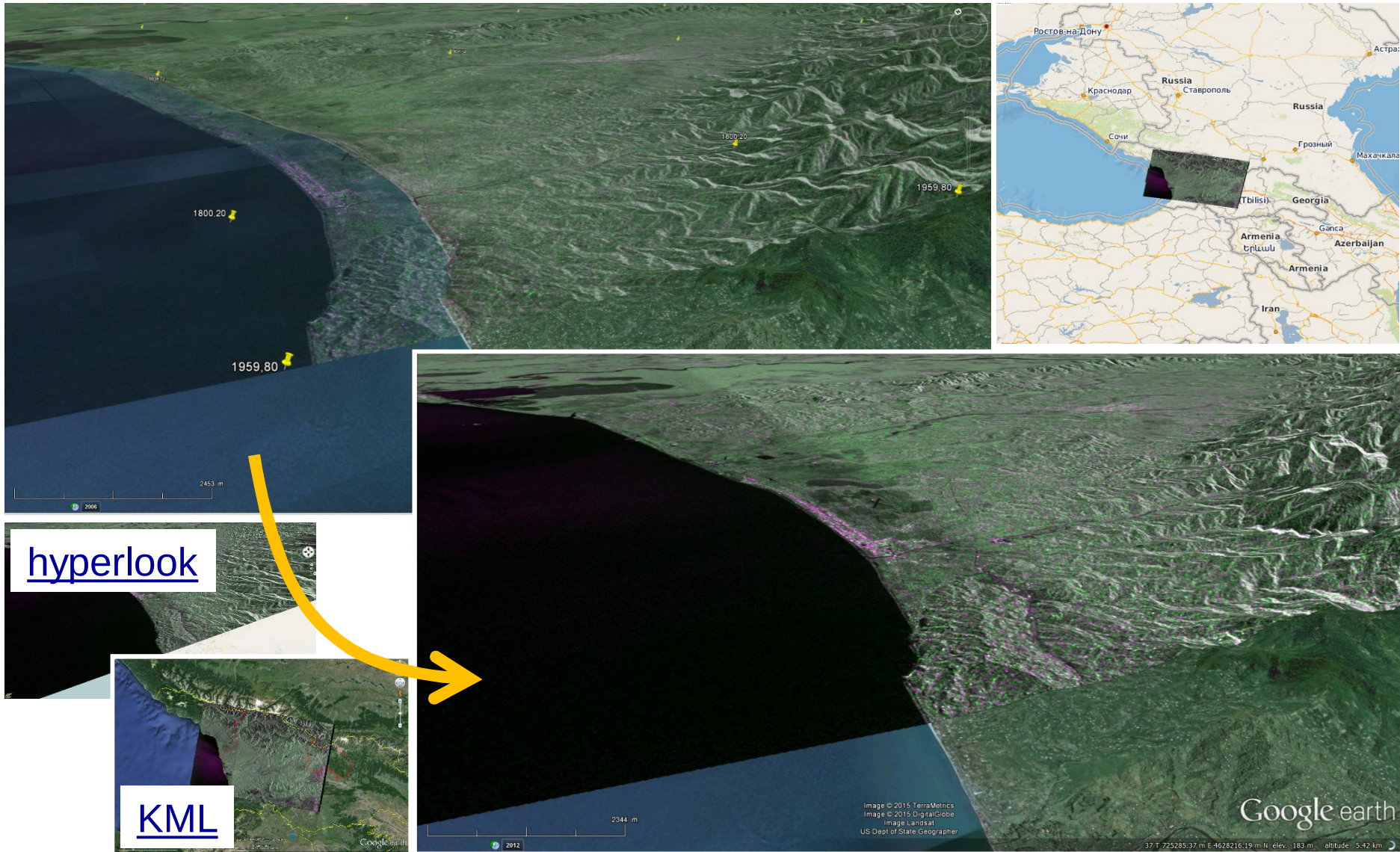


Vt Aoi Catcher



Modification of the Sentinel-1 tie-points grid

S1A_IW_GRDH_1SDV_20141009T031601_20141009T031626_002747_003156_9DF0





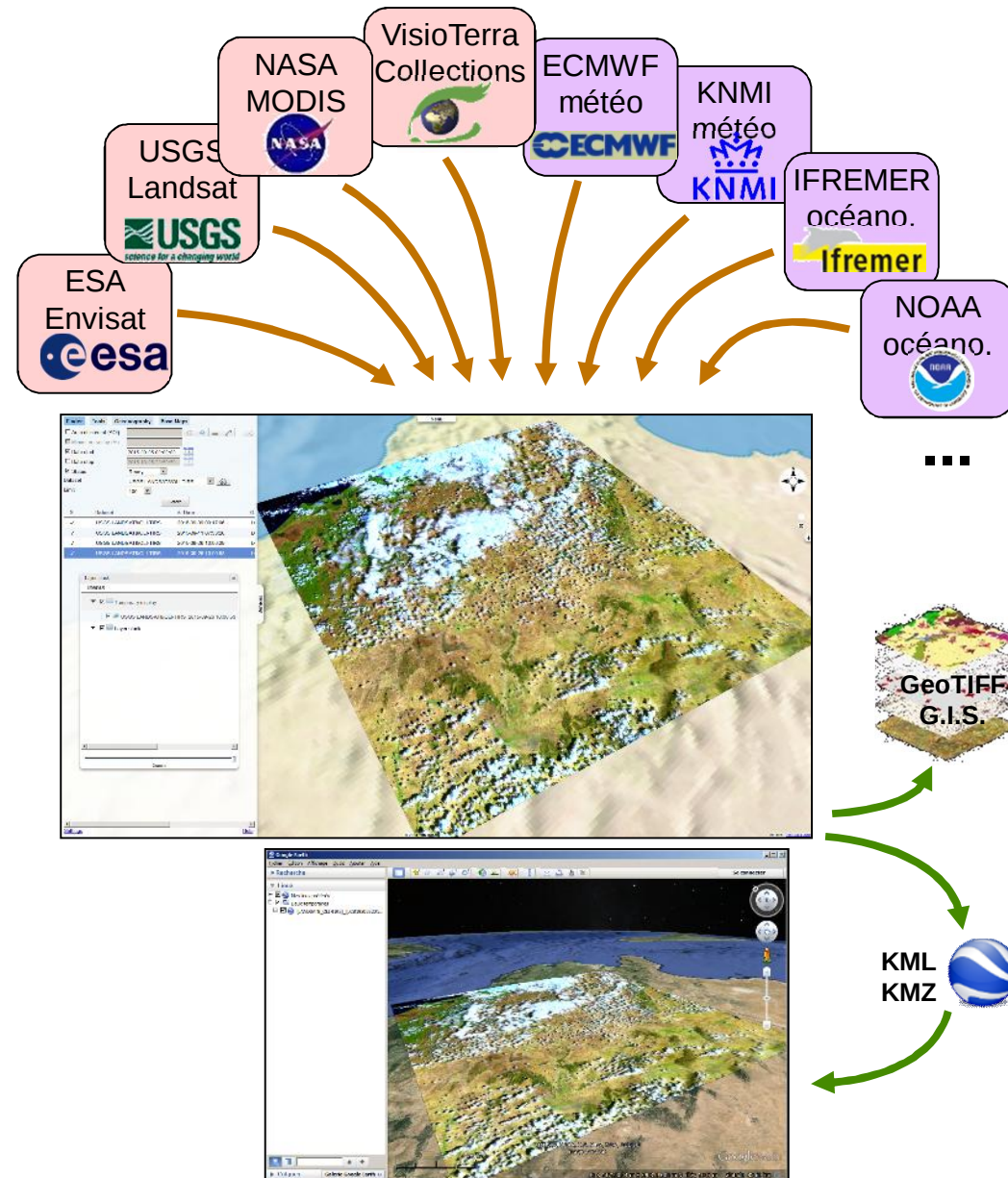
VtWeb – From high-level requirements up to design

High-level requirements	Design concepts	VtWeb features
Better exploit EO data	Hide the complexity of data access, representation, processing levels, projection... Enable user to only check	Dataset modules Near real-time access Immediate access
Bring users to data	Enable users to focus on his/her core business / skill Provide a wide range of data types and time-series	Worldwide free data 2D / 3D display in their classical Web navigators without any installation
Extract information from big data	Enable users to interactively browse / transform / merge data Cross / aggregate products	Processing on-the-fly (POF) Get associated data Change tracker Layer stack of mixed data
Share this information	Enable users to download the processed AOI only: - for a view - for their GIS	Smart dissemination: - “hyperlook” - KML script - GeoTIFF



VtWeb principles

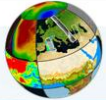
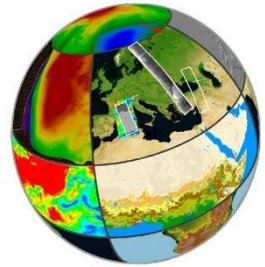
- global / free data
- data retrieval / data mining
- satellites / meteo / ECV / altimetry models / maps...
- Near Real-Time access
- automated processing
 - ☐ for citizen
 - default style
 - predefined styles
 - ☐ for scientists
 - parameter tuning
 - toward a P.O.F. toolbox
- collaborative infrastructure(s)
- project management
- webmapping / 3D virtual globe
- on your area of interest
- archives to analyse changes
- value-added services, recurring monitoring, alarms...





Sentinel-1 – Last of the day

VtWeb



VtWeb

The world at your fingertip

[Report a problem](#) [Help](#) [Login](#)

English

Menu



1000 km
1000 mi

-6.32813, -4.65820

© Data : Natural Earth

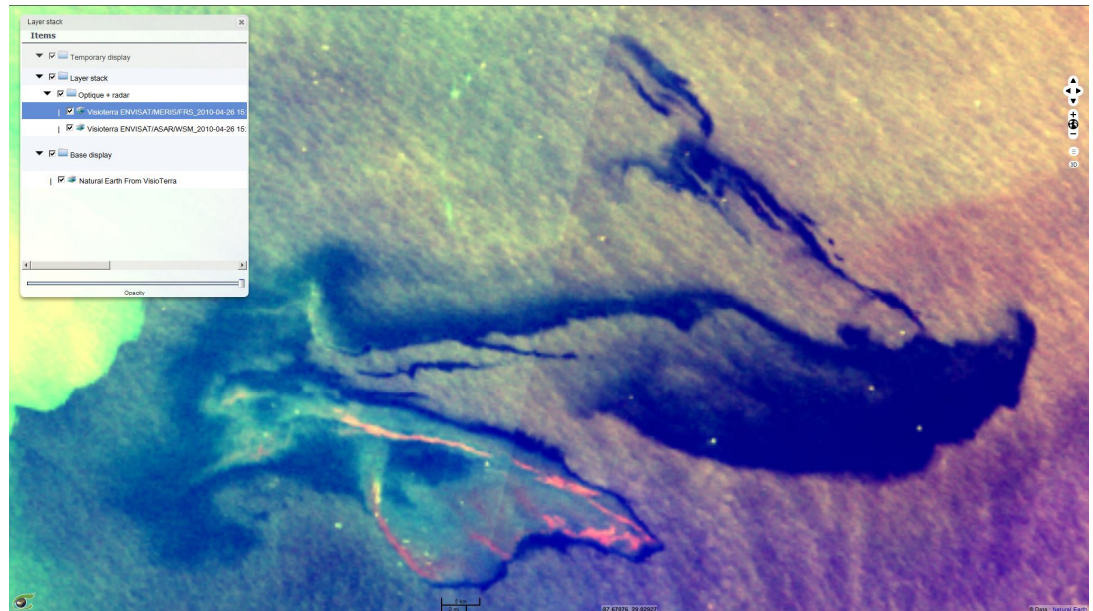
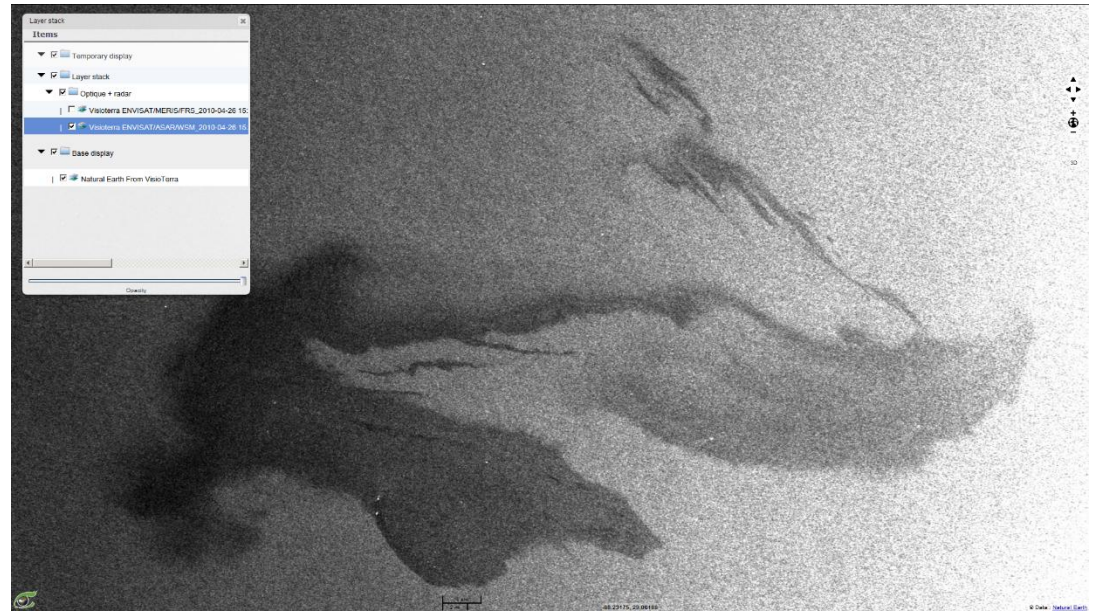


Radar + Optical - Envisat ASAR and MERIS

➤ Envisat ASAR + MERIS
26.04.2010 15:56 GMT

➤ Hyperlook: [2D view](#)

➤ Animation





Heritage: ERS SAR → Envisat ASAR → Sentinel-1 C-SAR

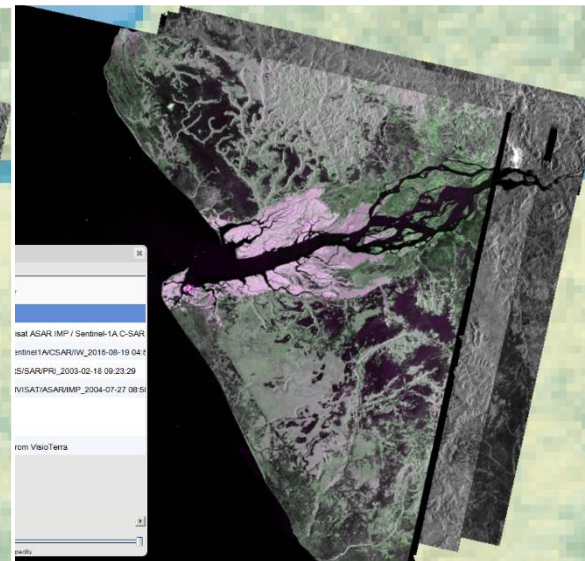
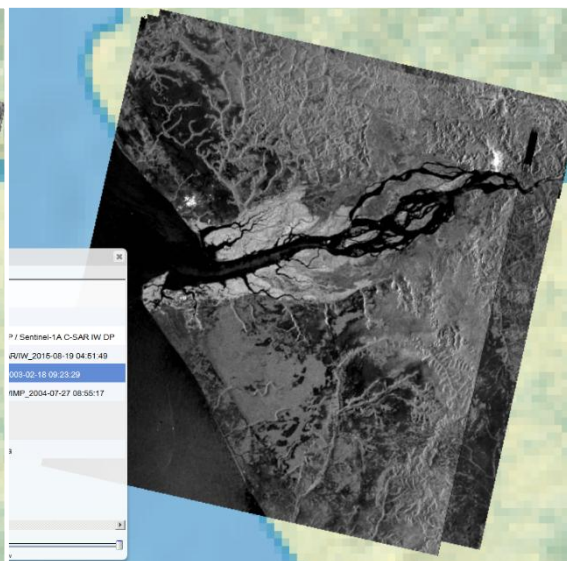
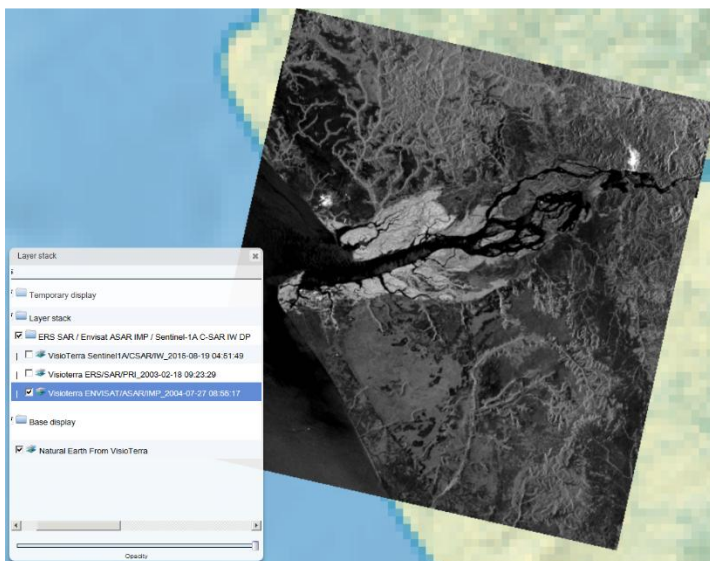
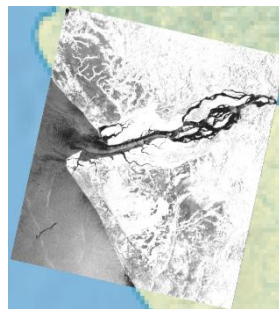
- ERS SAR PRI
- Envisat ASAR IMP
- Sentinel-1 C-SAR IW

27.07.2004 08:55
18.02.2003 09:23
19.08.2015 04:51

- Hyperlook:

- ☐ Land processing
- ☐ Sea processing

[2D view](#)
[2D view](#)





Heritage: Landsat-4,5/7/8 TM / ETM+ / OLI → Sentinel-2 MSI

- Landsat-5 TM
Sentinel-2 MSI

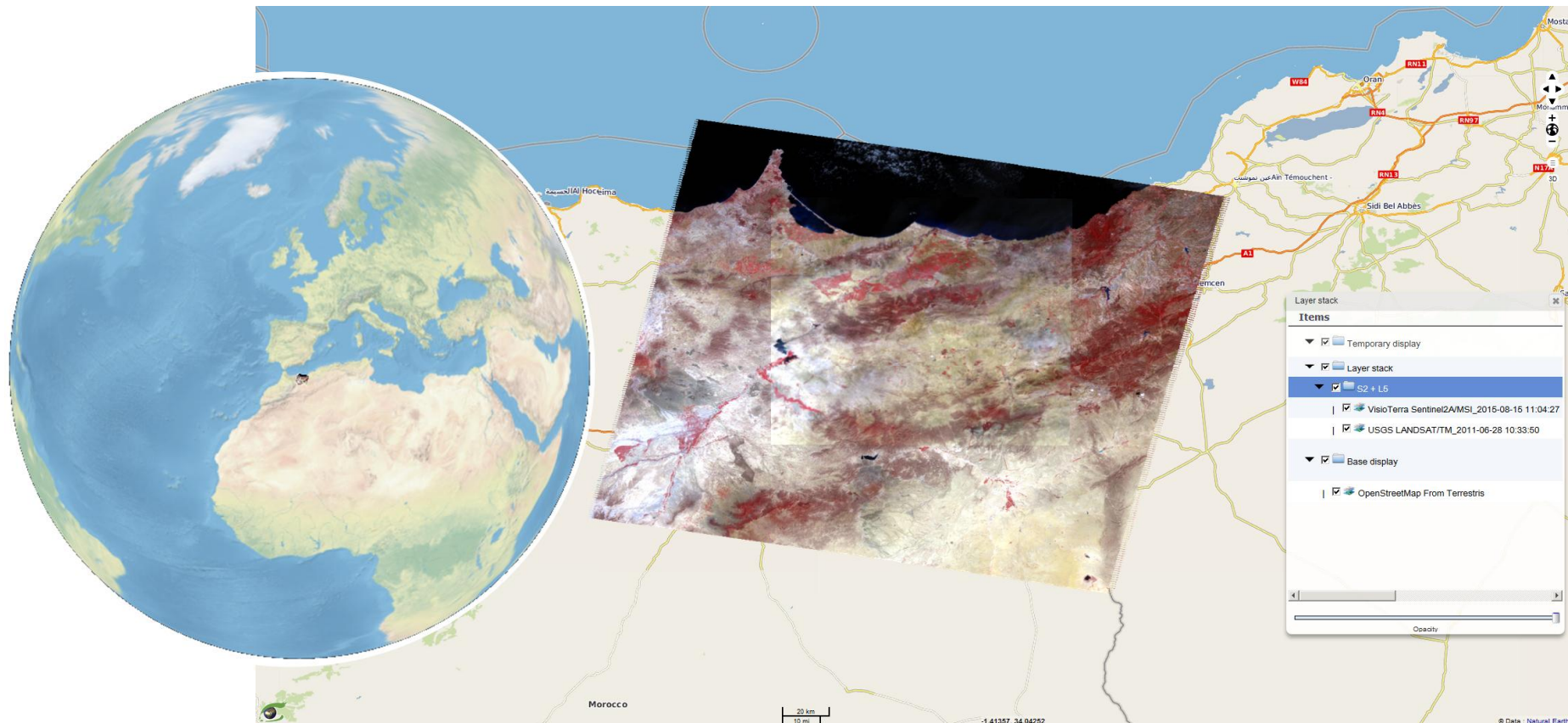
28.06.2011 10:33

15.08.2015 11:04

- Hyperlook
Video

[2D view](#)

<https://www.youtube.com/watch?v=nzQiD-vTgzs>





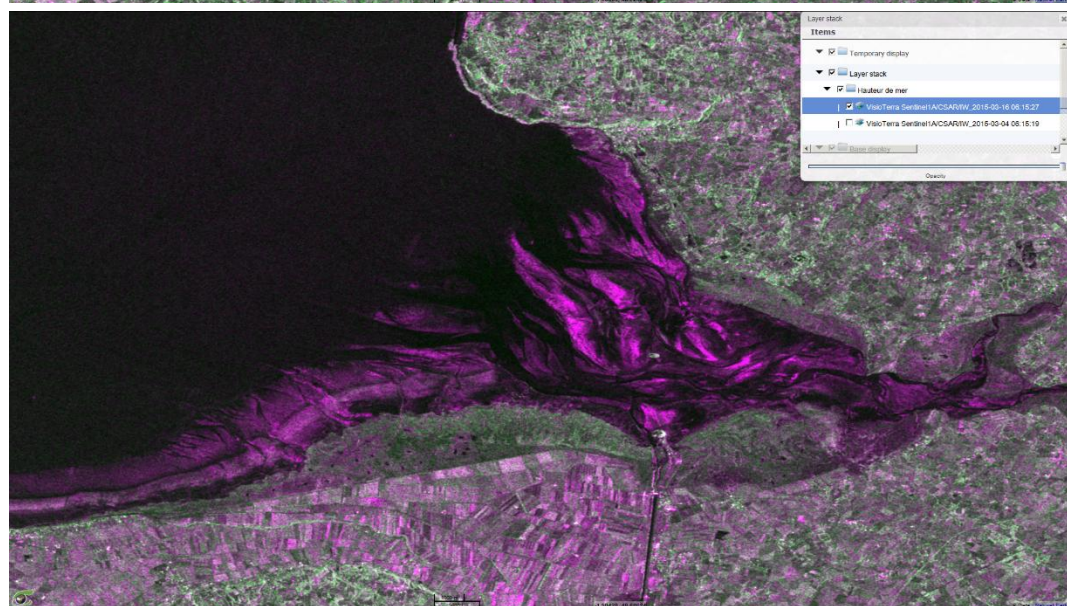
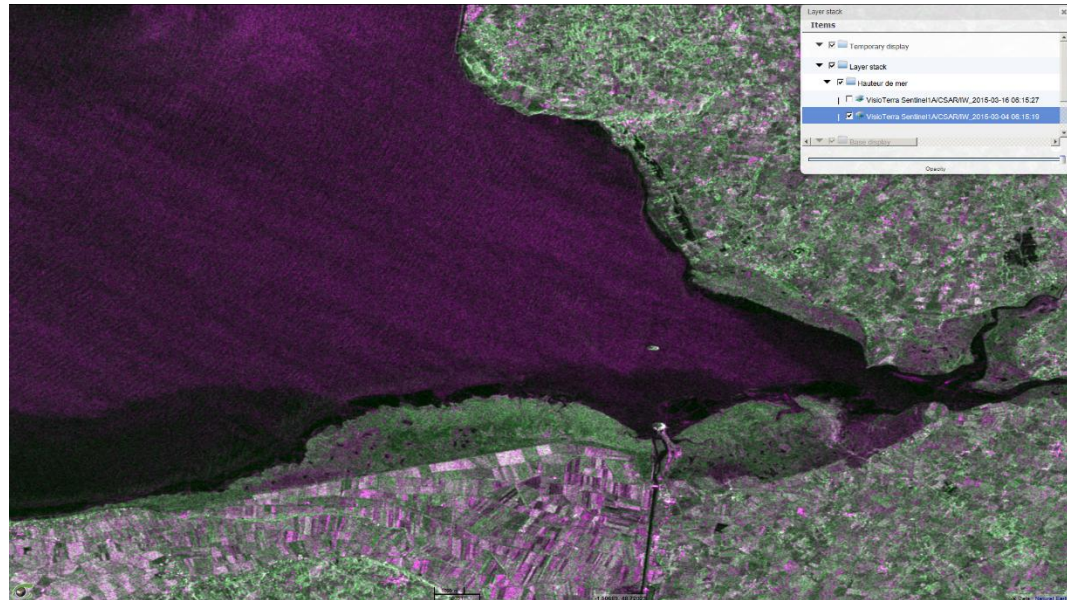
Sentinel-1 time series - An example of tides monitoring

➤ Sentinel-1 C-SAR IW

❑ 04.03.2015 06:15

❑ 16.03.2015 06:15

➤ Hyperlook [2D view](#)

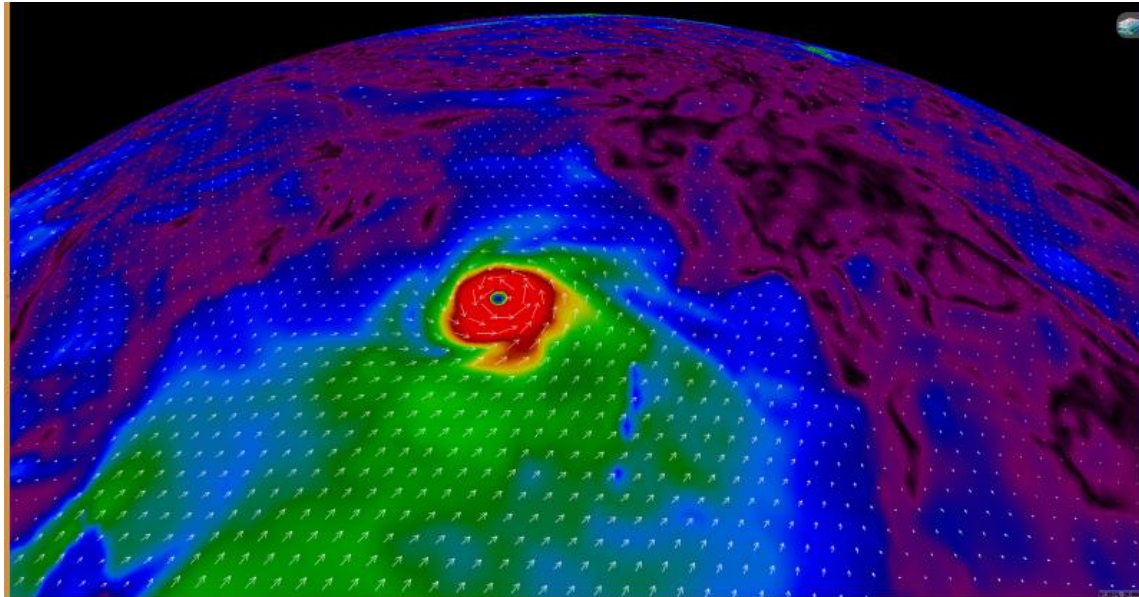
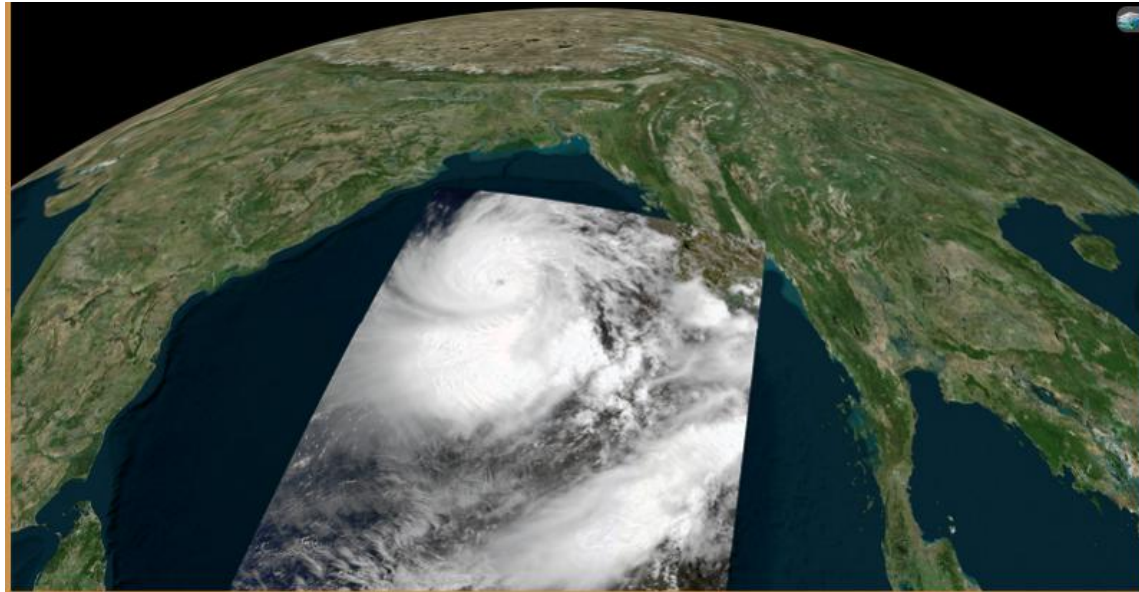




Coupling EO and meteo data

➤ Nargis cyclone

- ☐ [MERIS](#) 01.05.2008 04:03
- ☐ [Wind](#) 01.05.2008 00:00
- ☐ [Wind](#) 01.05.2008 06:00



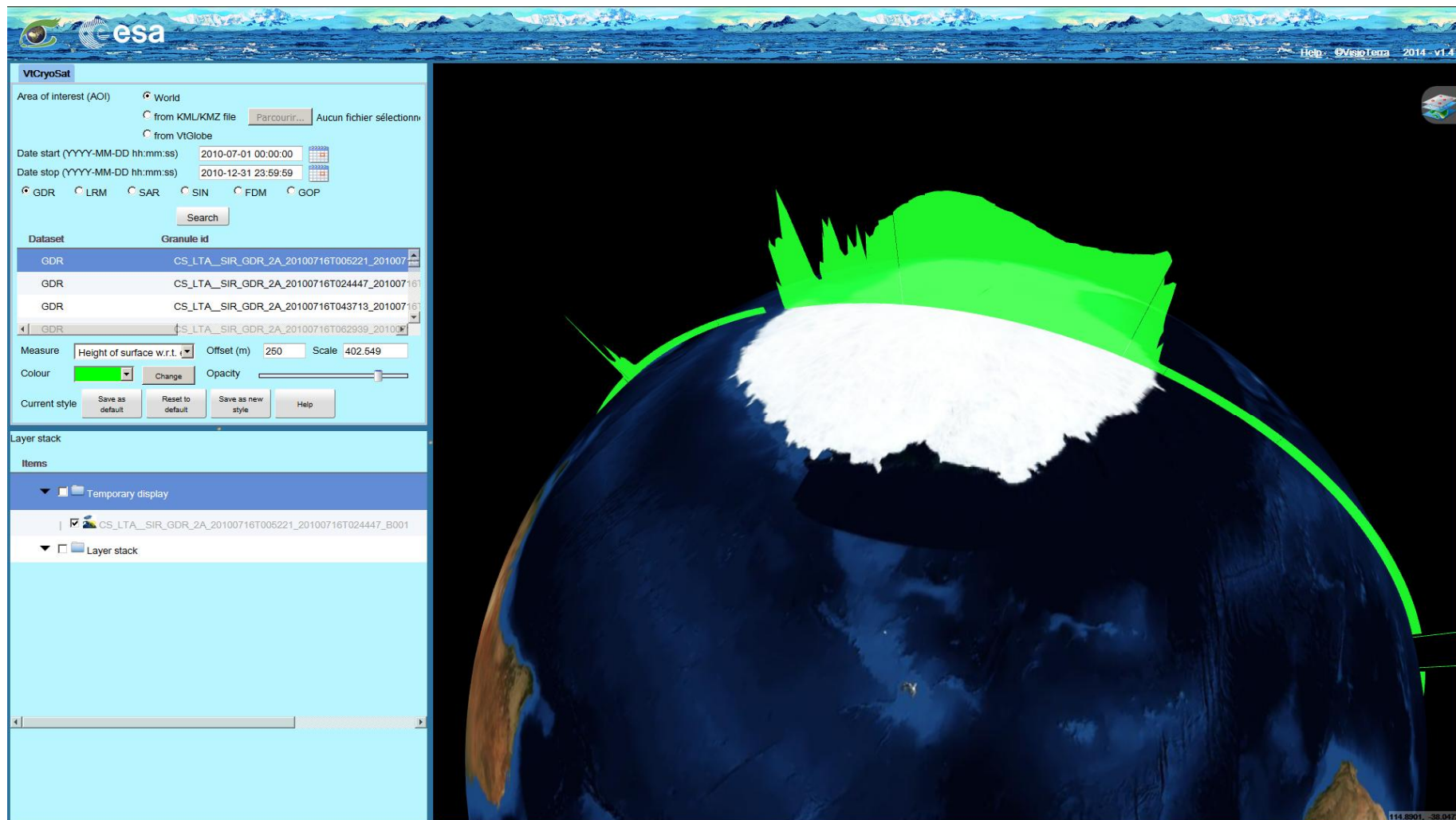


VtCryoSat - SIRAL altimeter products

VtCryoSat



- Requiring a high-tech spatial engine, radial representations



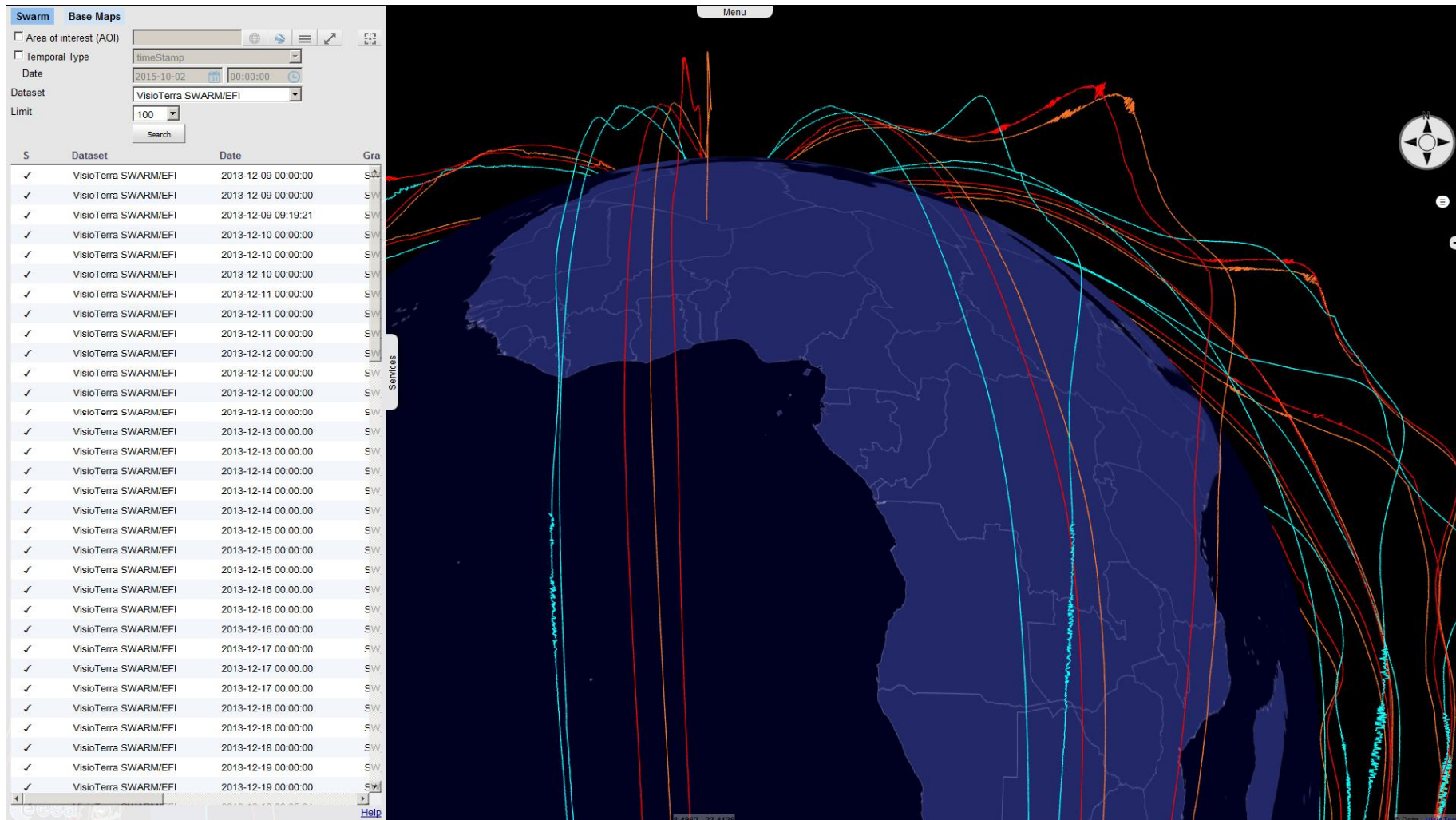


VtGsep - GOCE and Swarm Exploration platform

VtGsep



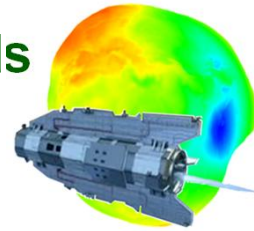
- Let scientists and citizen discover new correlations / applications



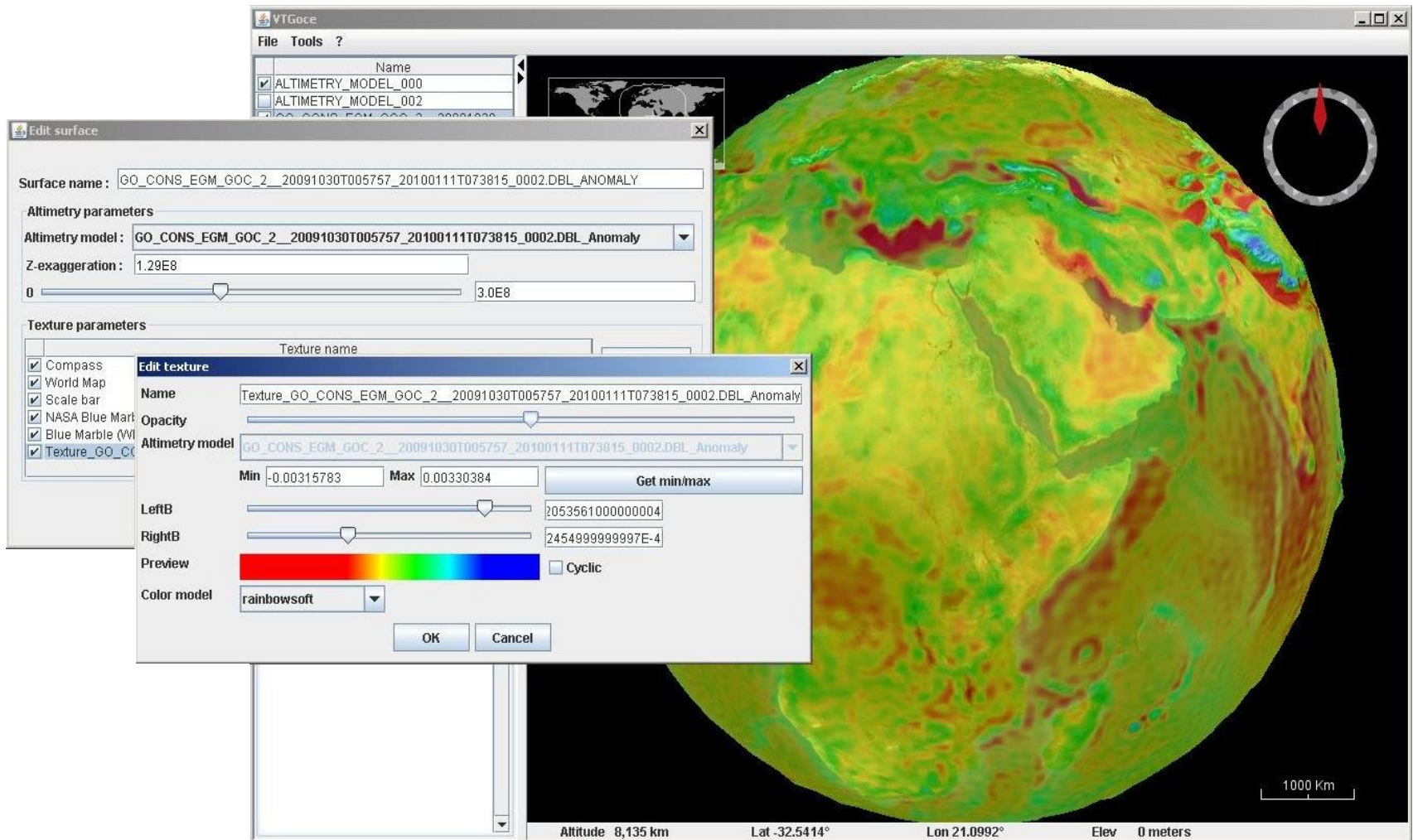


VtGoce - GOCE application to compute / display geoids

VtGoce



- 3D display of altimetry models, surface difference, serial profiles

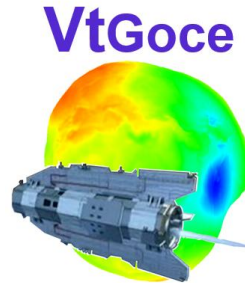




ESA vs. VisioTerra collaborations

➤ Collaborations with ESA

- ❑ GAEL Consultant - Since 1994
- ❑ Quality control of ESA products
- ❑ Envisat / MERIS / ASAR
- ❑ VTGoce / VtCryosat / VtSwarm
- ❑ DHuS Sentinel-1 / Sentinel-2

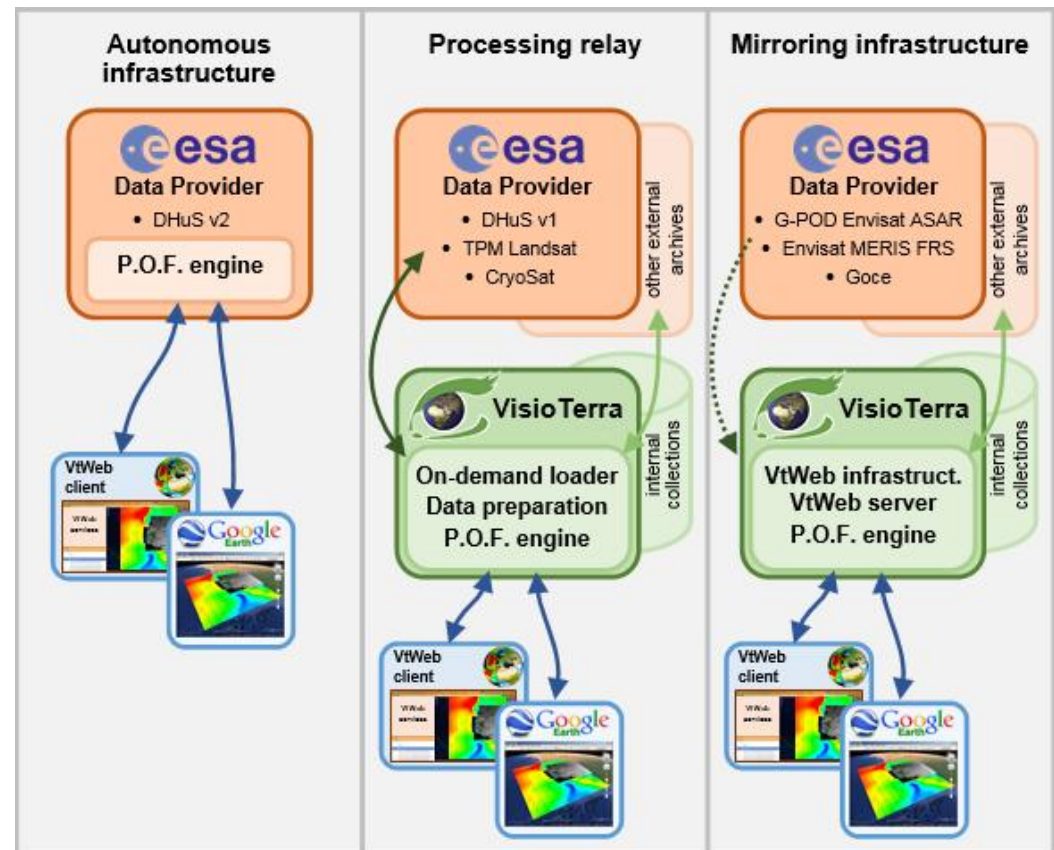


➤ VtWeb infrastructure

- ❑ 300 TB available
 - 50 TB ASAR and ERS
 - 150 TB MERIS
 - 100 TB/year S1A
- ❑ 1 Gbps symmetric fibre

➤ VisioTerra promoting ESA

- ❑ ESA data in VisioTerra trainings
- ❑ Enhancement of ESA products
- ❑ Communication, papers
- ❑ Towards distributed DHuS





A new “change tracking” service

➤ Objectives

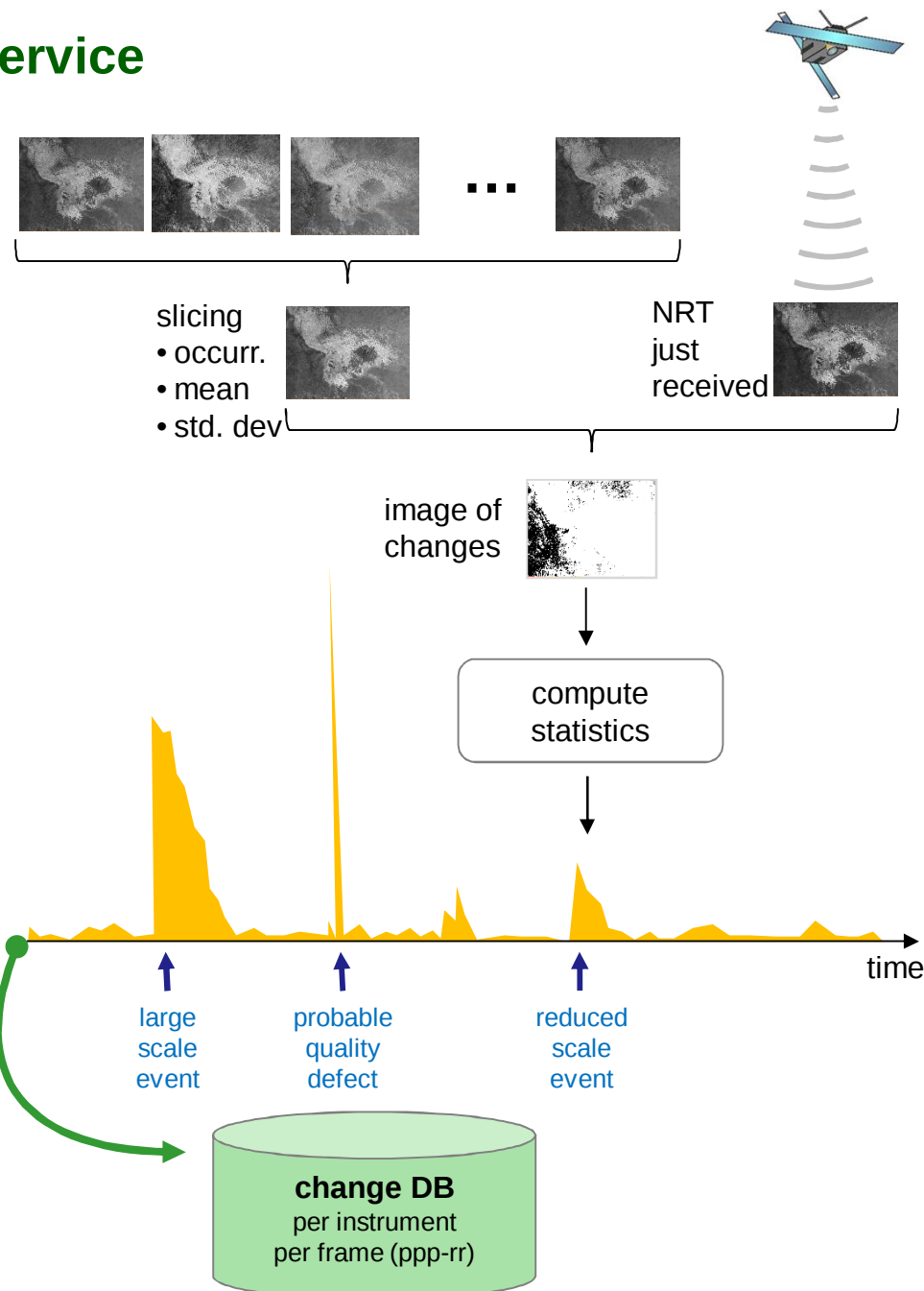
- ❑ To face the large amount of data
- ❑ To help users monitoring their AOI
- ❑ To initiate a collaborative assessment
- ❑ To detect quality defects

➤ Principles

- ❑ “Slicing statistics” ($N, \bar{m}, \sigma$)
- ❑ Systematic computation of change
→ change coefficient

➤ Actions

- ❑ Check change statistics of the day
- ❑ Warn quality team for probable defect
- ❑ Warn communities via “hyperlooks”
 - civil protection, local bodies,
 - press, NGOs,
 - social networks
 - science / education communities
 - ...





Merci de votre attention.
Thank you for your attention.

Questions ?



VisioTerra

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