

The Geohazards Exploitation Platform v2: moving Cloud Processing services into pre-operations phase

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MDIS Workshop

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Context: Thematic Exploitation Platforms



- TEPs are an ESA originated **R&D activity on the EO ground segment** to demonstrate the benefit of new technologies for large scale processing of EO data
- TEPs are technology R&D, but still fully user driven



- The **geohazards TEP** design started from the **International Forum on Satellite EO and Geohazards** organised by ESA and GEO in Santorini in 2012
- The **geohazards TEP** is an enhancement of the precursor platforms (G-POD, SSEP), and is designed to support the Geohazard Supersites (**GSNL**) and the Geohazards community via the **CEOS WG Disasters**



The Geohazards Exploitation Platform (GEP)

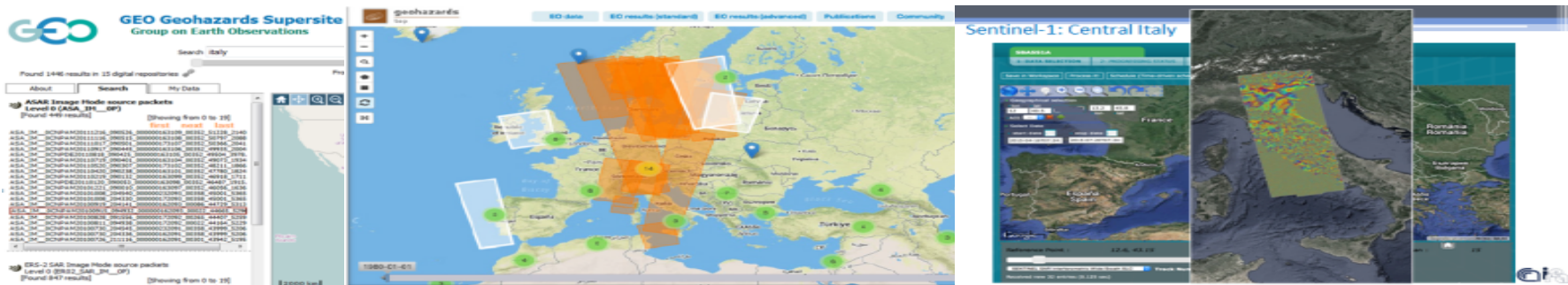
A 27+ months contract started on Nov 2015;

Consortium: **Terradue** (IT), **CNR IREA** (IT), **INGV** (IT), **DLR** (DE), **TRE ALTAMIRA** (ES), **EOST-CNRS** (F), **ENS-CNRS** (F)

- Develop an Exploitation Platform based upon **virtualization & federation of satellite EO data and methods**
- Provide innovative responses to the needs of the geohazards community

As a Platform, GEP:

- Provides **on-demand** processing services for specific user needs
- Runs **systematic** processing services to address “common information” community needs
- Connects to **massive compute** power on multi-tenant Cloud Computing resources, to address the challenges of monitoring tectonic areas, **globally**
- Connects to **full Copernicus Sentinels-1/2/3 repositories**
- Connects to 70+ TB of EO data (**ERS** and **ENVISAT** archive), and specific data collections from EO missions, such as JAXA's **ALOS-2**, ASI's **Cosmo-Skymed** and DLR's **TerraSAR-X**, provided under special arrangements in the framework of the CEOS WG Disaster and GSNL.



Agenda

1. GEP achievements so far

- Iterative development & Early Adopters Programme
- GEP Usage Scenarios

2. Next v2 evolutions: new features & impacted scenarios

- New data exploitation functions
- New Cloud processing capacities
- New community-contributed resources

3. Pre-operations of the Platform v2

- Already running Services & Pilots: Provisioning Agreements (data and ICT)
- Pilots evolutions: Operations Level Agreement, Terms & Conditions
- Pilots users feedback
- Integrated support for applications release: Transfer in production (& Production Center) process

4. Sustainability

- Sustainable Operations concept note
- Pre-operations 2018: six months baseline + six months extension
- Reinforcing collaborations: EPOS, DIAS, Geohazards Lab, ...

-1-

GEP achievements so far



GEP in a Nutshell: Core & Partner services

Portal

ESA
SSO

Geobrowser



Background



Geo Browser



Activities

Blog (full archive)

More early adopters selected on the GEP
 During the month of June, 11 additional users organisations have been selected as part of the GEP Early Adopters programme. These are the University of Tebessa (AL), Wuhan

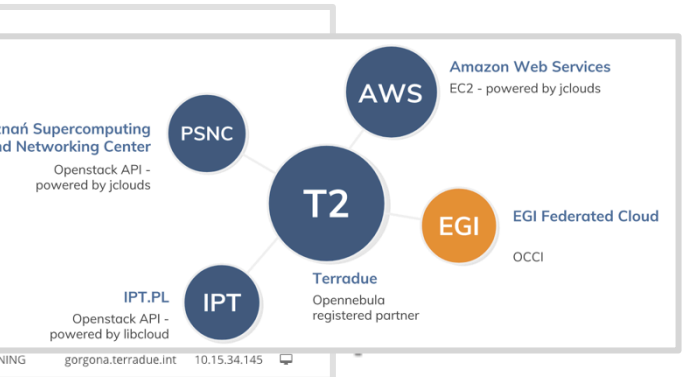
News

ESA EarthObservation @ESA_EO
 Relive the #Sentinel5P launch event here: <https://t.co/xGtqbEVSEs>
 17 minutes ago



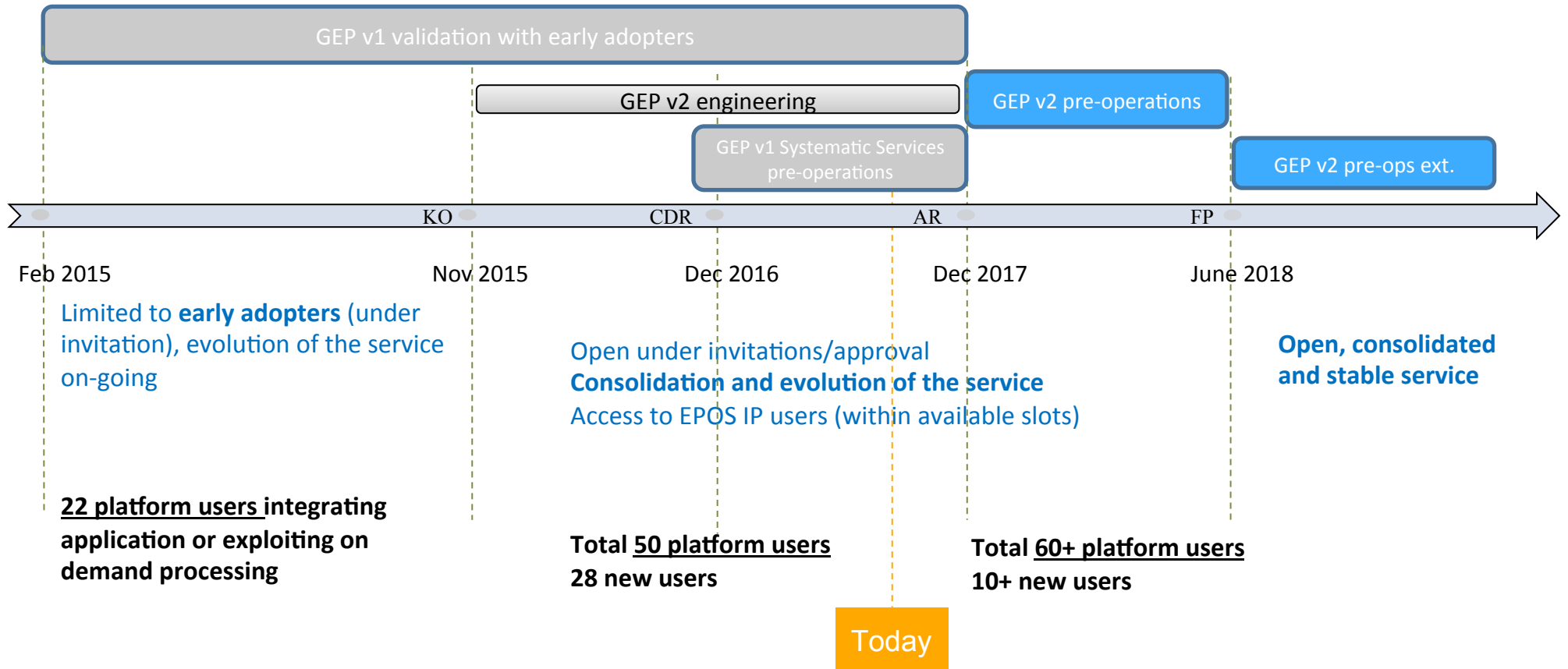
geohazards
tep

GEP in a Nutshell: Core & Partner services



Roadmap

An iterative development, involving early adopters



GEP Early Adopters programme

Want to apply as early adopter of the GEP (limited slots)? geohazards-tep@esa.int

GEP Early Adopters Programme

➤ GEP user-driven activities based on User Registration Forms (= user projects)

- Create your account on the ESA SSO service
- Sign-in on GEP, and follow the guidance on your user profile page



➤ User on-boarding of:

- ESA designated users, based on the approved applications (URFs)
- GEP Pilot services users, based on the consortium partners' processing services integrated on the platform:
 - **TRE Altamira** with an end-to-end InSAR service for terrain motion velocity mapping using SAR data (free and commercial products)
 - **CNR-IREA** with SBAS based Sentinel-1 Surveillance service
 - **DLR** with InSAR-Browse products generation
 - **EOST-CNRS** with MICMAC based optical data processing for landslides
 - **INGV** for optical data processing for volcanoes monitoring
 - **ENS-CNRS/NOA** with the validation by experts of the platform services to serve the Corinth Rift Laboratory
- ESA Projects users, e.g. from the **Disaster Risk Reduction** GSP projects.

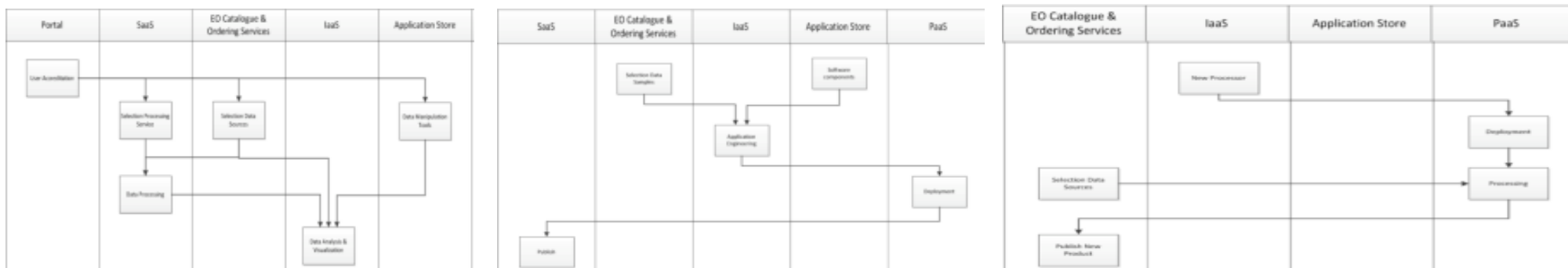


Supported Scenarios for Users

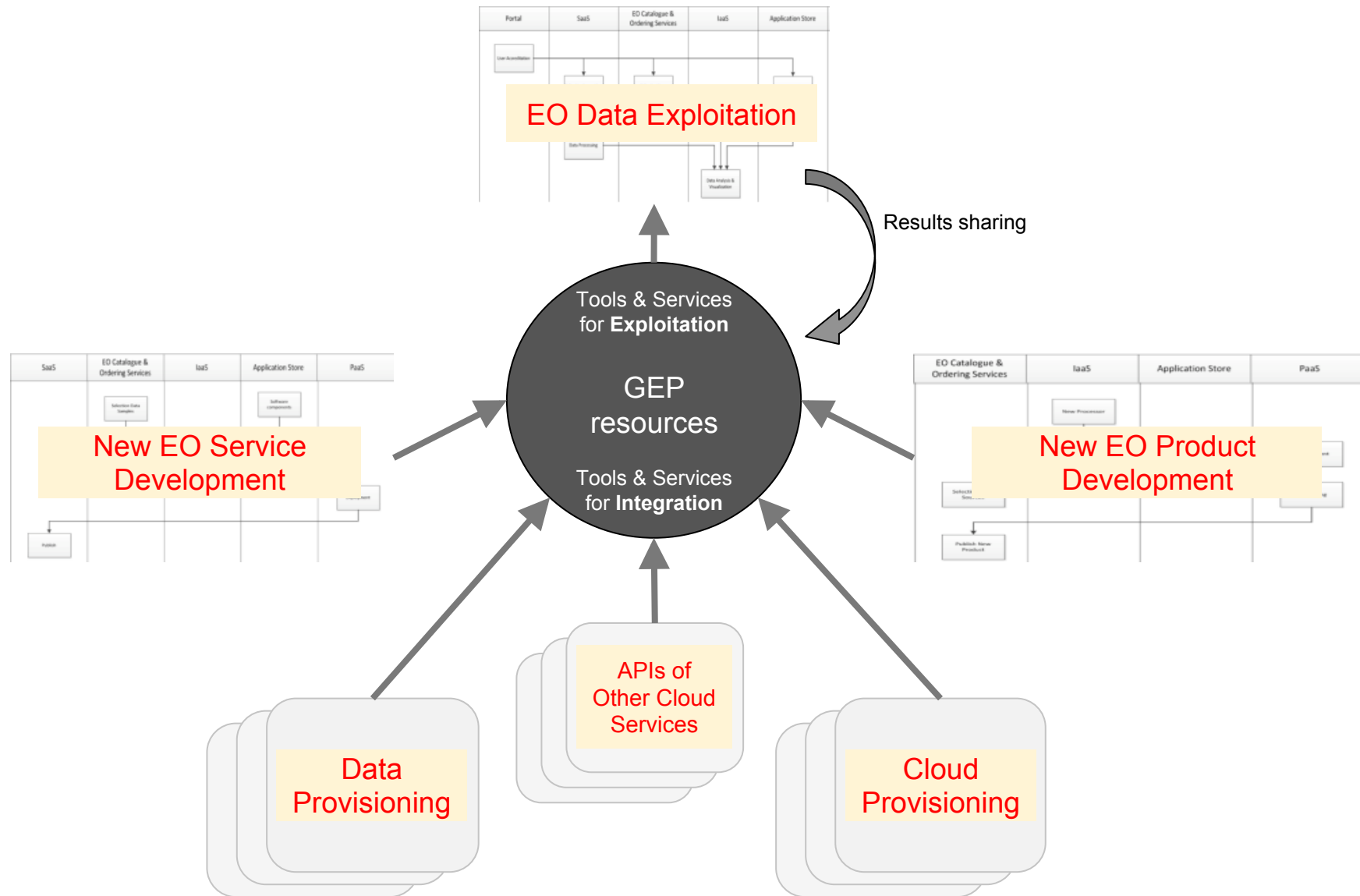
Scenario 1) EO Data Exploitation which allows a user to discover/select data and pre-existing processing service; **process data**; and visualize/analyse results, or select and apply data manipulation tools to the result; share his/her results

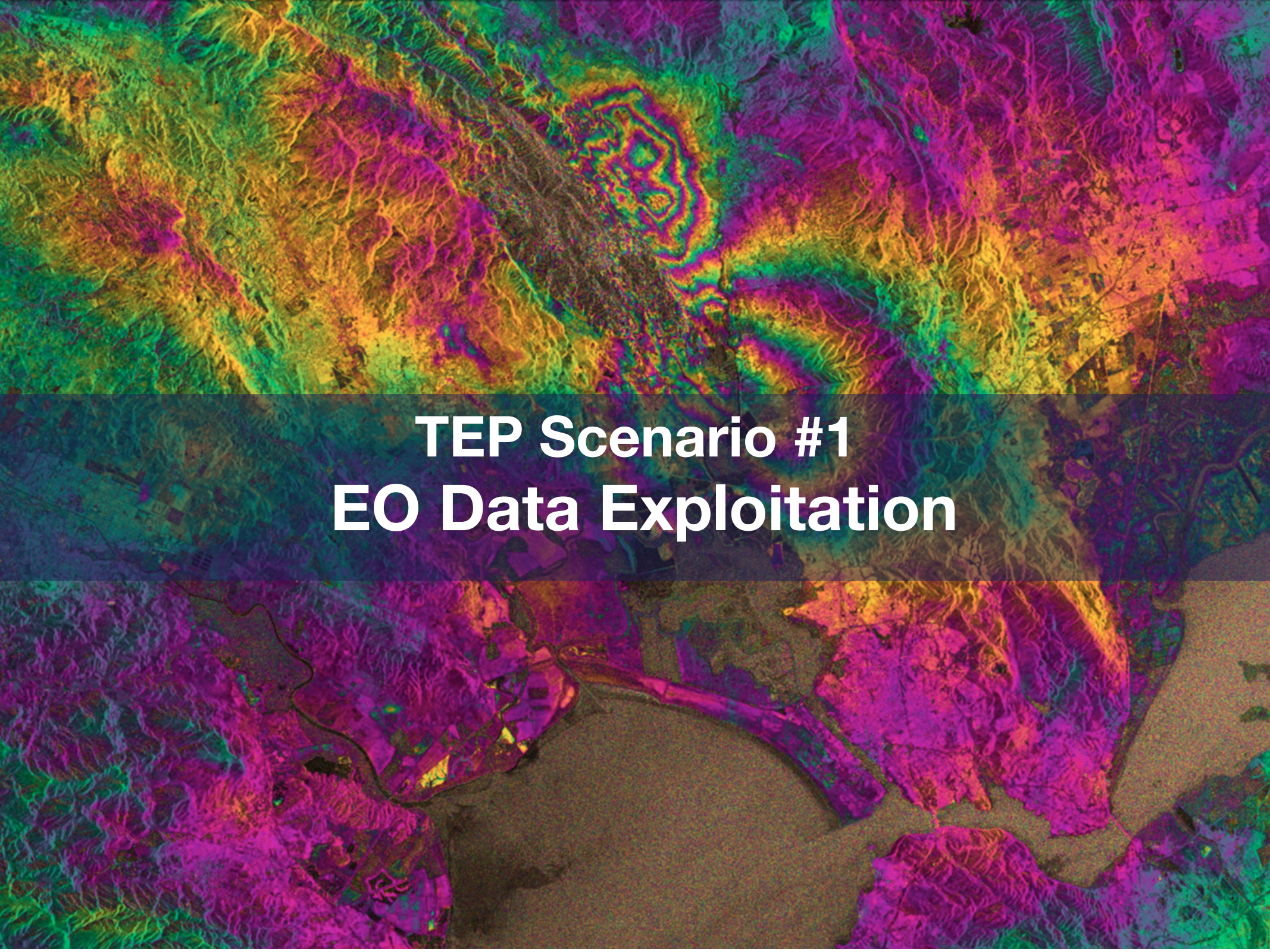
Scenario 2) New EO Service Development which allows a user to discover/select a data sample and software components; engineer (or upload) and validate an application (such as a processor); and **deploy an application on the platform** for use also by other users.

Scenario 3) New EO Product Development which allows a user to discover/select data, define data ingestion triggers on newly uploaded / deployed processor; setup and monitor the data processing tasks; and **publish results as new information layers**.



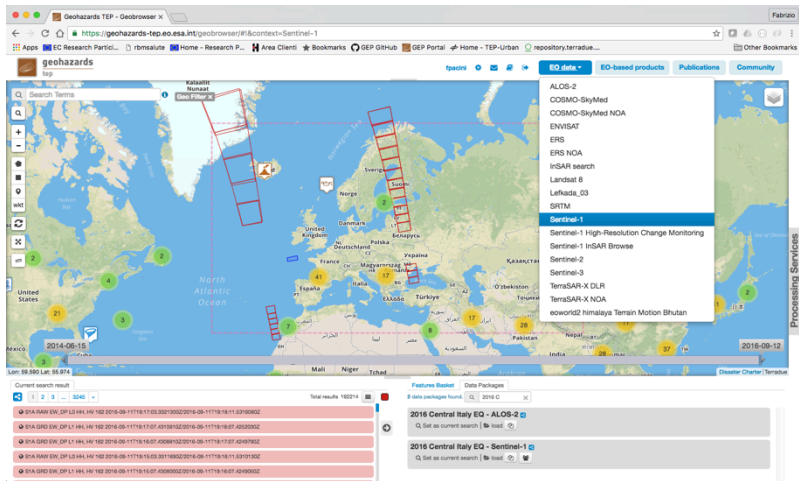
An ecosystem of GEP resources providers



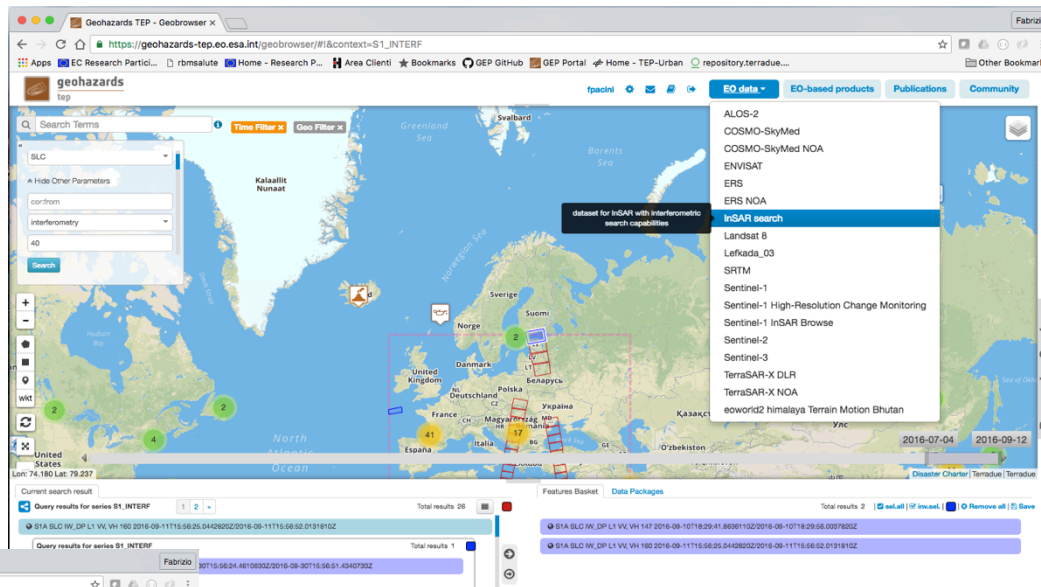


TEP Scenario #1
EO Data Exploitation

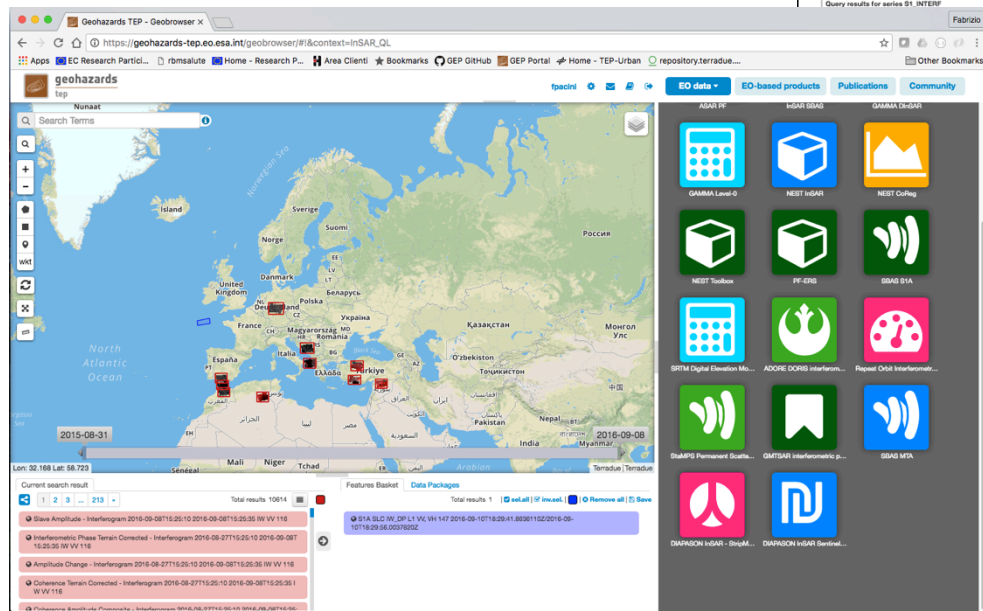
EO Data - discovery and selection



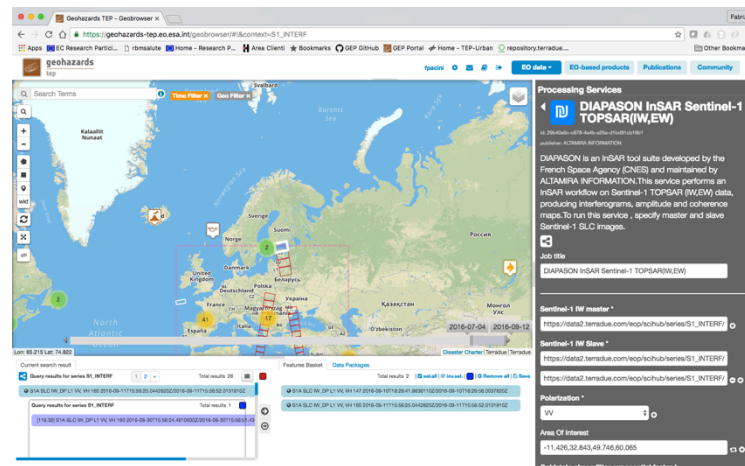
interferometric search



Processing tools - listing



inputs selection and job run



geohazards
tep

Processing tools – monitor progress

The screenshot shows the Geohazards TEP web interface. On the left, a world map displays search results for the series 'S1_INTERF'. Below the map, a list of search results is shown with columns for ID, date, and status. On the right, a sidebar displays a list of processing jobs, including 'ametrico 15-27 test 2', 'DIAPASON IN SAR IW Italy Earthquake T22 2108 - 2708 png', and 'SNAP S1 Interferometric processor'. Each job has a 'SUCCESS' status and a progress indicator.

visualize results

The screenshot shows the Geohazards TEP web interface with a map of Italy. A color-coded overlay is visible on the map, representing the results of a processing job. The map includes labels for cities like Milano, Roma, and Napoli, and countries like Bosnia i Hercegovina and Srbija. On the right, a 'Parameters' panel lists key-value pairs such as 'master', 'slave', 'pol', and 'psfctx'. Below the map, a 'Result' panel shows a list of files and their sizes, including '694_1798_ortho.png' and '694_1798_ortho.tif'.

Social Web - promote results

The screenshot shows the Geohazards TEP blog archive page. The page features a list of blog posts with titles, dates, and view counts. The posts include:

- New Interferogram generated in the cloud on the GEP (5 months ago, 131 views)
- How to publish scientific results on the GEP community map (15 days ago, 78 views)
- Example of hosted processing using S-1 data in the aftermaths of the 2016 Central Italy Earthquake: GEP publishes EO data collections in support of the Copernicus EU (14 days ago, 84 views)
- 2016 Central Italy Earthquake: GEP publishes EO data collections in support of the Copernicus EU (14 days ago, 81 views)
- 2016 Central Italy Earthquake: ESA announcing the first Sentinel-1 based EO data collection (15 days ago, 254 views, 1 like)
- GEP Release 1.7 (a month ago, 162 views, 1 like)
- Accessing Sentinel-1 Orbit files (a year ago, 109 views)
- Complex data made easy (4 months ago, 109 views)
- The Geohazards Thematic Exploitation Platform. Terradue presentation done at Living Planet Symposium in Prague (6 months ago, 126 views)

The screenshot shows a Twitter post from Emmanuel Mathot (@emmanuelmathot). The tweet text is:

#Insar #ItalyEarthquake #Sentinel1 A&B with DIAPASON via @esa_gep @CopernicusEU https://geohazards-tep.eo.esa.int/t2api/share?url=https%3A%2F%2Fgeohazards-tep.eo.esa.int%2Fapi%2Fjob%2Fwps%2Fsearch%3Fid%3Dc0adfdb0-df6-4d99-a86d-048a419f9ebd https://pbs.twimg.com/media/Cq5umx7XEAEEHUX.jpg

 The tweet includes a link to the Geohazards TEP website and a link to a blog post. Below the tweet, there is a screenshot of the Geohazards TEP web interface showing a map of Italy with a color-coded result overlay.

The screenshot shows a social media dashboard with three main sections:

- Cloud Dashboard**: A section for managing cloud services.
- Geo Browser**: A section for browsing geospatial data.
- Activities**: A section for tracking user activities.

 Below these sections, there is a 'Blog (full archive)' section with a list of blog posts, including:

- New Interferogram generated in the cloud on the GEP (Post contributed by TRE ALTAMIRA on April 21st (local) Sentinel-1 interferogram of Kumamoto earthquake, on the island of Kyushu in southwest Japan, in April 2016: generated online, using the DIAPASON Processing Service of the Geohazards Exploitation Platform. We have generated a new...)
- How to publish scientific results on the GEP community map (Cloud services for science. Whenever you are working from to generate InSAR products (e.g. in the lab, on the GEP Cloud processing services), you might want to reach-out the Geohazards community active on the GEP Portal. This is made easy as GEP can connect to powerful Cloud services such as...)
- Example of hosted processing using S-1 data in the aftermaths of the 2016 Central Italy EQ

Integrate and deploy your own service

Connect processors to the GEP Catalogue and Geobrowser

geohazards tep

Home Observations & Measurements Information Processing Community EO sector Collaboration

Profile
Cloud Resources
 Github
 Groups
 Usage

Cloud Resources

In this page you can check your access to Cloud Resources from Provider partners.

terradaue cloud platform

- You have access to the Cloud Dashboard.
- Your account is associated to the Terradaue Cloud Platform account *fpacini*

Getting access to the **Developer Cloud Sandbox** environment for Apps:

- Integration
- Validation
- Release packaging

Virtual Machines

INGV Optical chain for Volcanoes
 RUNNING
 x0.5 - 4GB
 CentOS 6.7 Sandbox 100G v1.0
 10.15.34.66 -
 gepadmin 5 Sep

Developer Cloud Sandbox
 RUNNING
 x1 - 16GB
 CentOS 6.7 Sandbox 100G v1.0
 10.15.34.70 -
 direchal

Virtual Machines

Developer Cloud Sandbox-2752
 DEPLOYING (1/3)
 x1 - 4GB
 CentOS 6.6 Sandbox
 10.15.34.16 -
 crossi 1s ago

```
#!/bin/bash
mode=$1

# source the ciop functions (e.g. ciop-log)
[ "${mode}" != "test" ] && source
$(ciop_job_include)

# source extra functions
source $(CIOP_APPLICATION_PATH)/lib
/stamps-helpers.sh

# source StaMPS
source /opt/StaMPS_v3.3b1
/StaMPS_CONFIG.bash

# source sar helpers and functions
set_env
```

Processing Services

Public Jobs

Filter jobs

11 jobs found.

ADORE DORIS Interferometric processor
 4 days ago by Alessandro Marin
 SUCCESS

ADORE DORIS Interferometric processor (5)
 7 days ago by Henrik Coumout
 SUCCESS

ADORE DORIS Interferometric processor
 7 days ago by Henrik Coumout
 SUCCESS

ADORE DORIS Interferometric processor
 7 days ago by Henrik Coumout
 FAILED

ADORE DORIS Interferometric processor
 8 days ago by Henrik Coumout
 SUCCESS

InSAR SBAS WPS
 SUCCESS

The Cloud dashboard allows to:

- Browse the Virtual Machines created on GEP
- Create a new Virtual Machine for processor integration

The Operations Support team is handling the deployment of validated applications on Production clusters

Integrate and deploy your own service

Enrich the GEP Thematic Service Catalogue

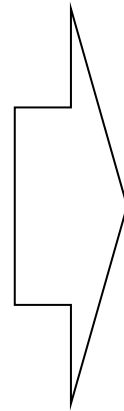
Processing chains
published on the
Platform's code
repositories

+

Deployed on productions
servers for on-demand
(user driven) processing

+

Accessed by users via the
GEP Geobrowser User
Interface



geohazards
tep

Home Observations & Measurements - Information Processing Community EO sector Collaboration

Information Processing

The platform is meant to allow users to easily exploit EO data resources by combining fast data access, processing facilities and flexibility for the user's own data analysis. The platform provides Data Access, Data Processing Services and PaaS (Platform as a Service). Data Access includes the possibility to perform catalogue queries. Data Processing Services enable users to process data available in the repository using a number of well know tools and to exploit the results. PaaS enables users to perform their data exploitation activities with large flexibility and autonomy by using one or several virtual hosts directly provided on the Cloud platform where the data sits. Users can, therefore, use their virtual hosts to efficiently access data and processing services and immediately elaborate results using analysis and visualization tools available from the PaaS or directly installed in virtual hosts by themselves. In addition users can also open their own accounts on a commercial Cloud Provider and directly provision their virtual hosts in an independent fashion (through the Geohazards Platform Services).

Thematic Service Catalogue

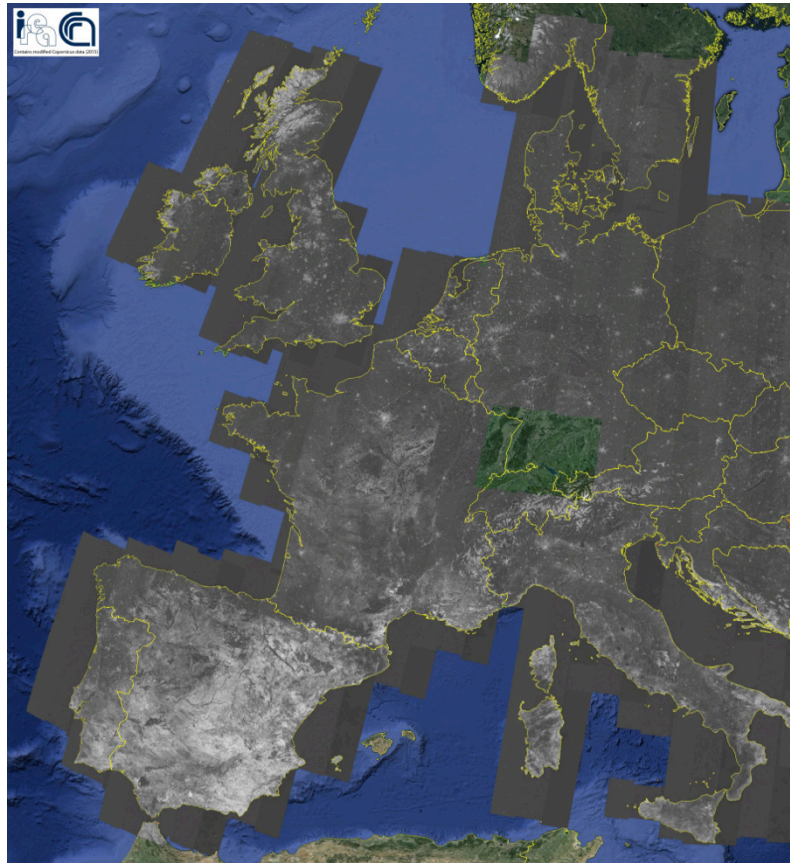
GEP Thematic Service Catalogue
On-demand processing services

A person in a dark suit and tie is holding a tablet. The tablet screen displays a futuristic digital interface with a central globe, various icons, and a network of nodes. The interface is overlaid on a blue-tinted background. The text "TEP Scenario #3" and "New EO Product Development" is prominently displayed in white on a dark blue horizontal band across the middle of the image.

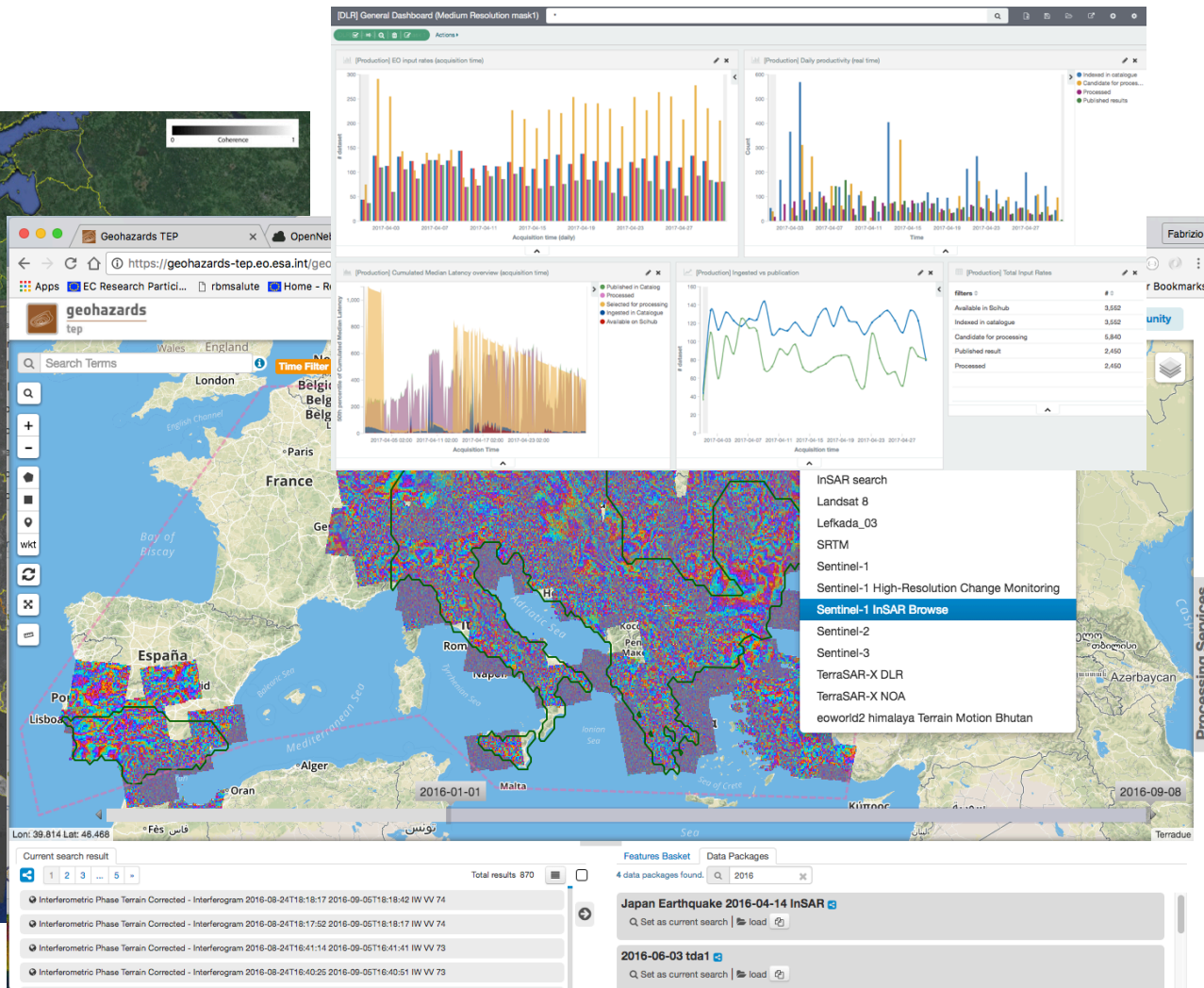
TEP Scenario #3
New EO Product Development

Publish new products as information layers

Monitor processing tasks



S-1A 12-day Coherence Map over Europe



DEM corrected interferograms



Processing Services

Publish new products as information layers

Enrich the GEP Thematic Service Catalogue

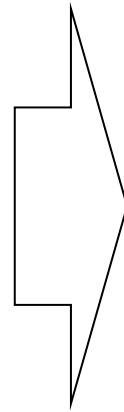
Processing chains
published on the
Platform's code
repositories

+

Deployed on productions
servers for “AOI driven” /
“Time driven” processing

+

Generating outputs as GEP
datasets, catalogued and
stored on the Platform



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Information Processing

The platform is meant to allow users to easily exploit EO data resources by combining fast data access, processing facilities and flexibility for the user's own data analysis. The platform provides Data Access, Data Processing Services and PaaS (Platform as a Service). Data Access includes the possibility to perform catalogue queries. Data Processing Services enable users to process data available in the repository using a number of well know tools and to exploit the results. PaaS enables users to perform their data exploitation activities with large flexibility and autonomy by using one or several virtual hosts directly provided on the Cloud platform where the data sits. Users can, therefore, use their virtual hosts to efficiently access data and processing services and immediately elaborate results using analysis and visualization tools available from the PaaS or directly installed in virtual hosts by themselves. In addition users can also open their own accounts on a commercial Cloud Provider and directly provision their virtual hosts in an independent fashion (through the Geohazards Platform Services).

Thematic Service Catalogue

GEP Thematic Service Catalogue
Information feed layers

Examples of achievements so far



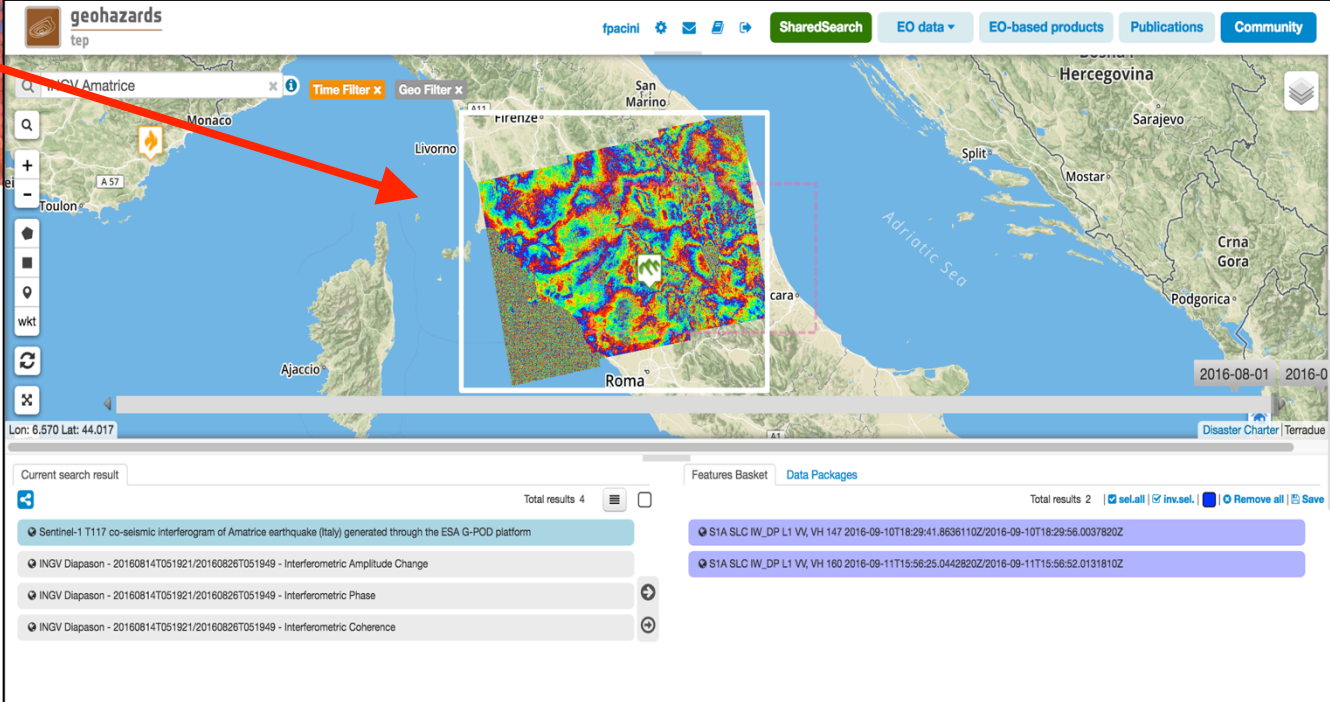
Results dissemination (1)

Center Italy Earthquake

On 24 August 2016, a 6.2 magnitude earthquake struck central Italy. Check interferograms from GEP community processed just few hours later the acquisition availability.

[View Community](#)

All products generated on the GEP for the Central Italy earthquake have been gathered under a link on the carousel of the GEP portal homepage: **direct access to results**



The screenshot shows the geohazards tep web application interface. At the top, there is a navigation bar with the logo and menu items: Home, Observations & Measurements, Information Processing, Community, and EO sector Collaboration. Below the navigation bar is a search bar with the text 'INGV Amatrice' and filters for 'Time Filter' and 'Geo Filter'. The main content area displays a map of the Mediterranean region with a red box highlighting a specific area in central Italy. Below the map, there is a list of search results under the heading 'Current search result'. The results include:

- Sentinel-1 T117 co-seismic interferogram of Amatrice earthquake (Italy) generated through the ESA G-POD platform
- INGV Diapason - 20160814T051921/20160826T051949 - Interferometric Amplitude Change
- INGV Diapason - 20160814T051921/20160826T051949 - Interferometric Phase
- INGV Diapason - 20160814T051921/20160826T051949 - Interferometric Coherence


On the right side of the results list, there are two data packages listed:

- SI_A_SLC_IW_DP_L1_VV_VH_147_2016-09-10T18:29:41.8636110Z/2016-09-10T18:29:56.0037820Z
- SI_A_SLC_IW_DP_L1_VV_VH_160_2016-09-11T15:56:25.0442820Z/2016-09-11T15:56:52.0131810Z










Results dissemination (2)

← → ↻ 🏠 <https://geohazards-tep.eo.esa.int/#!blog>

Apps EC Research Partici... rbmsalute Home - Research P... Area Client ★ Bookmarks GEP GitHub GEP Portal Home - TEP

 Home Observations & Measurements Information Processing

Blog archive

-  **New interferogram generated in the cloud on the GEP**
🕒 5 months ago 👁 131 views
-  **How to publish scientific results on the GEP community map**
🕒 15 days ago 👁 78 views
-  **Example of hosted processing using S-1 data in the aftermaths of the 2016 Central Italy EQ**
🕒 14 days ago 👁 84 views
-  **2016 Central Italy Earthquake: GEP publishes EO data collections in support of the CEOS Seismic Pilot**
🕒 14 days ago 👁 81 views
-  **2016 Central Italy Earthquake: ESA announcing the first Sentinel-1 based measurements after the Earthquake**
🕒 15 days ago 👁 254 views 👍 1 like
-  **GEP Release 1.7**
🕒 a month ago 👁 162 views 👍 1 like
-  **Accessing Sentinel-1 Orbit files**
🕒 a year ago 👁 109 views
-  **Complex data made easy**
🕒 4 months ago 👁 109 views
-  **The Geohazards Thematic Exploitation Platform. Terradue presentation done at Living Planet Symposium in Prague**
🕒 4 months ago 👁 108 views

DISCUSS20 Log In

2016 Central Italy Earthquake: GEP publishes EO data collections in support of the CEOS Seismic Pilot

gep-blog

 abeumann 1 / 14d

Following the request from INGv, the GEP is providing access to EO data from CEOS Contributors to authorised users. See first collections of [ALOS-2 data](#) as well as [Sentinel-1A and 1B data](#).

More datasets as Pleiades, Sentinel-2, Radarsat-2, TerraSAR-X and COSMO Skymed will follow.



Figure 1: Footprints of the «2016 Central Italy EQ - Sentinel-1» data package.

A number of posts have been published on the GEP blog regarding CEOS datasets, first products generated by the CEOS Seismic pilot team, etc.

Kos island, M6.6 earthquake 20th July 2017

The screenshot displays the Geohazards platform interface. At the top, the logo 'geohazards tep' is visible, along with user information 'HerveCaumont' and navigation buttons for 'Result', 'EO data', 'EO-based products', 'Publications', and 'Community'. The main area features a map of the Aegean Sea region, with a color-coded SAR interferogram overlaid on the island of Kos. The map includes a search bar, navigation controls, and a date range selector set to '1980-01-01'. Below the map, a 'Current search result' section shows a list of 7 files, including SAR coherence and displacement maps for the period 12/07/2017 to 24/07/2017. To the right, a 'Processing Services' panel provides details for the job 'LTC2017 SNAP Sentinel-1 IW SLC KOS EQ- Ascending 4th', including job name, Wps Job Id, Remote Id, start date (Aug 31st 2017), creator (Vassilis Sakkas), status (Success), and visibility (public). A 'Parameters' section below lists the master and slave processing URLs.

Name	Value
master	https://catalog.terradue.com/sentinel1/search?format=atom&uid=S1B_IW_SLC_1SDV_20170712T160601_20170712T160628_006457_00B59F_07CB
slave	https://catalog.terradue.com/sentinel1/search?format=atom&uid=S1B_IW_SLC_1SDV_20170724T160602_20170724T160629_006632_00BA9C_9977

Differential SAR interferogram generated through a small baseline 12 days pair of SAR images acquired by the Sentinel1 constellation (pre-event image acquired on 12/07/2017 and post-event image acquired on 24/07/2017).

This result was generated using hosted processing on the Cloud based Geohazards Exploitation Platform (GEP).

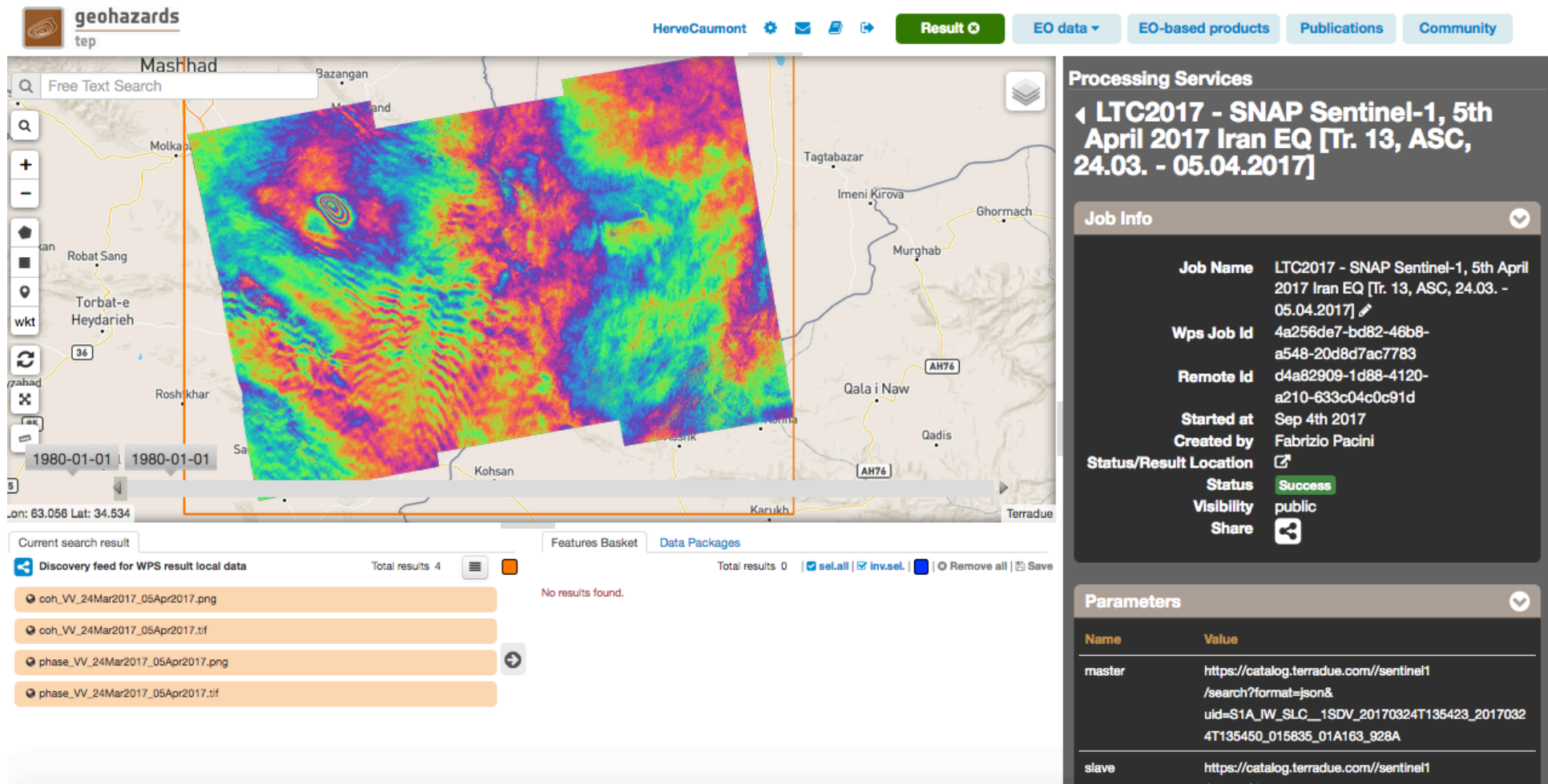
The processing chain is the SNAP chain of ESA integrated on the GEP by ESA RSS.

Sentinel1 data are copyright of Copernicus (2015).



Northeastern Iran, M6.1 earthquake

5th April 2017



Differential SAR interferogram generated through a small baseline 12 days pair of SAR images acquired by the Sentinel1 constellation (pre-event image acquired on 24/03/2017 and post-event image acquired on 05/04/2017).

This result was generated using hosted processing on the Cloud based Geohazards Exploitation Platform (GEP).

The processing chain is the SNAP chain of ESA integrated on the GEP by ESA RSS.

Sentinel1 data are copyright of Copernicus (2015).



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Central Italy earthquake

24th August 2016



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Central Italy Earthquake

On 24 August 2016, a 6.2 magnitude earthquake struck central Italy. Check interferograms from GEP community processed just few hours later the acquisition availability.

[View Community](#)

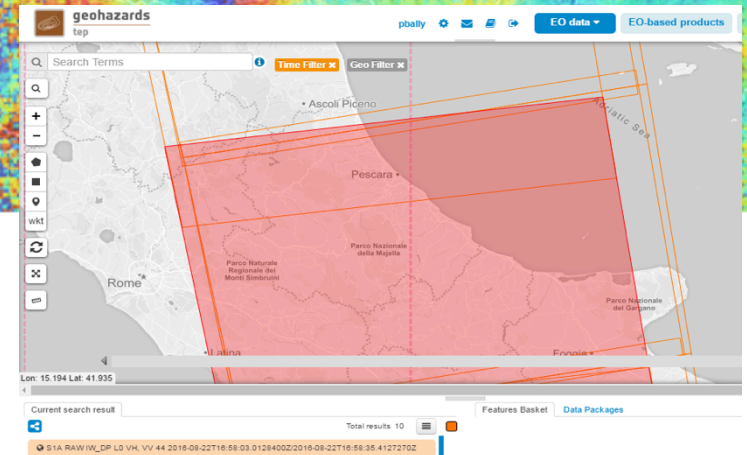
GEP contributions

- The CEOS Seismic Pilot led by ESA and INGV was activated on 24th August to provide EO data and EO derived science products

- CEOS Pilot Objective C: advanced products for operational seismology

- Several EO data collections accessed or planned to be accessed via CEOS were made available on the GEP

- JAXA's ALOS-2 acquisition of 24 August
- Sentinel-1 A (26 & 27 August)
- Sentinel-1 B* (27 & 28 August)
- Radarsat-2 planned, TerraSAR-X awaiting feedback
- Pleiades data (incl. Tristereo) planned



- GEP as a repository to access / exploit / share data & results
- Hosted and published EO measurements from the community (e.g. InSAR results generated offline)
- Access to Cloud based hosted processing (e.g. on demand) and systematic processing (e.g. DLR's S-1 InSAR Browse service)
- Collaboration, exchange and sharing
- Scientific experiments to test new methods (e.g. S-1 based coherence signatures)

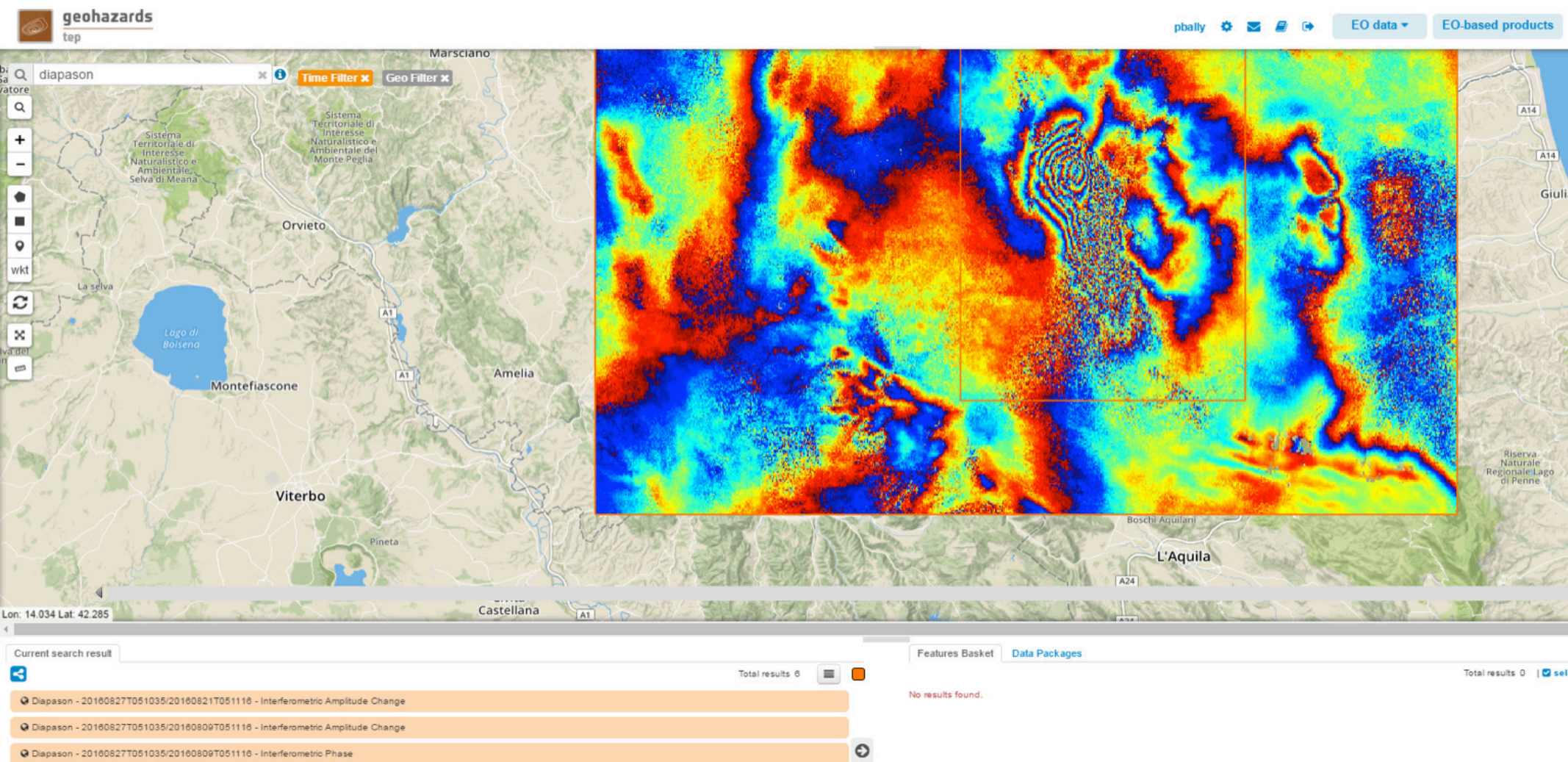
*: S-1B not yet in full operations, but data made available for this event



geohazards
tep

Central Italy earthquake

First results generated on GEP (1)



Differential SAR interferogram generated through a small baseline 18 days pair of SAR images acquired by the Sentinel1 constellation (pre-event image acquired on 09/08/2016 and post-event image acquired on 27/08/2016).

This result was generated by Terradue using hosted processing on the Cloud based Geohazards Exploitation Platform (GEP).

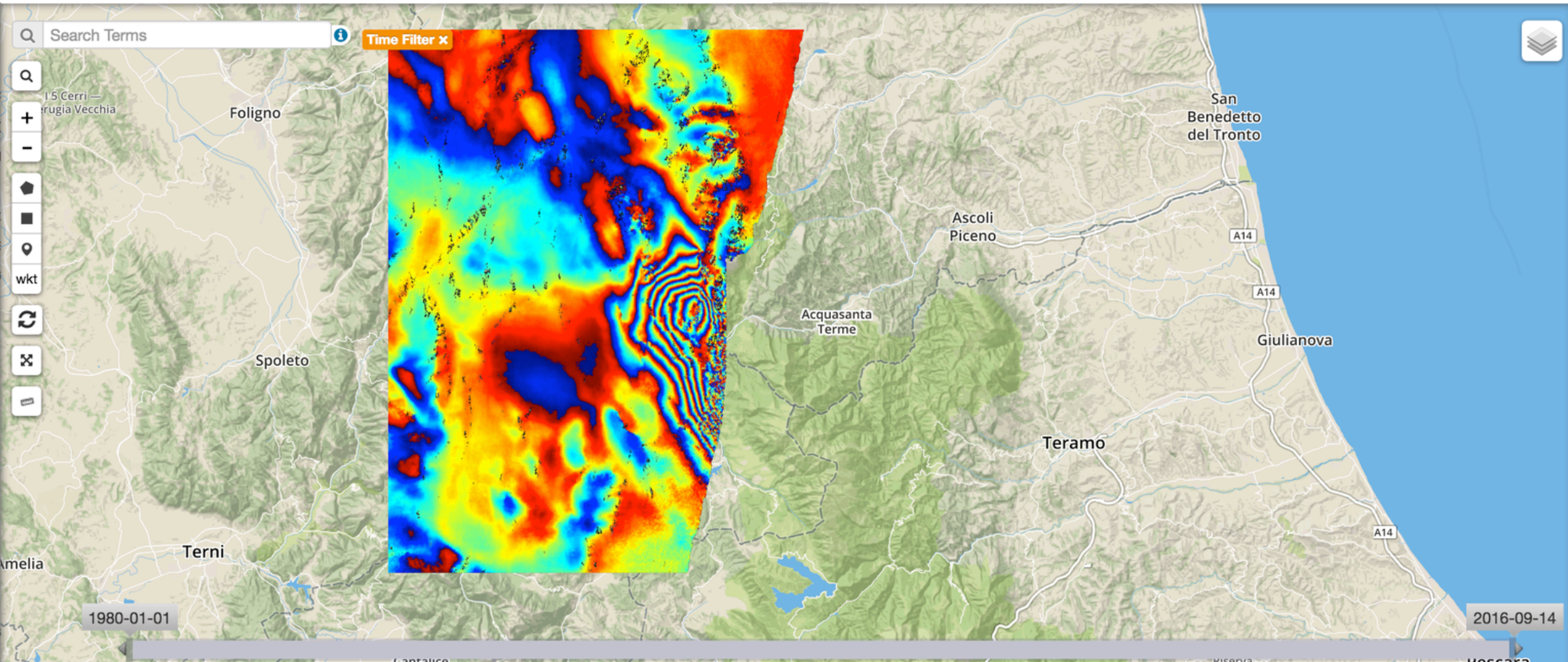
The processing chain is the DIAPASON chain of CNES integrated in the GEP by TRE ALTAMIRA.

Sentinel1 data are copyright of Copernicus (2015).



Central Italy earthquake

First results generated on GEP (2)



Interferogram based on the GEP-hosted processing chain DIAPASON of the French space agency CNES. Sentinel-1 interferogram processed by INGV using acquisitions of 14th and 26th August 2016 covering the western part of the earthquake area.

Central Italy earthquake

First results generated on GEP (3)

The screenshot displays the Geohazards TEP Geobrowser interface. The main map shows a 3D view of Central Italy with SAR data overlays in red and black. A search panel on the left contains the following fields:

- Search Terms: searchTerms
- AMPL_CHANGE: dropdown menu
- Hide Other Parameters: checkbox
- 200: input field
- dct:modified: input field
- Search: button

A dropdown menu is open on the right side of the map, listing various data sources and services:

- ALOS-2
- COSMO-SkyMed
- COSMO-SkyMed NOA
- ENVISAT
- ERS
- ERS NOA
- InSAR search
- Landsat 8
- Lefkada_03
- SRTM
- Sentinel-1
- Sentinel-1 High-Resolution Change Monitoring**
- Sentinel-1 InSAR Browse
- Sentinel-2
- Sentinel-3
- TerraSAR-X DLR
- TerraSAR-X NOA
- eoworld2 himalaya Terrain Motion Bhutan

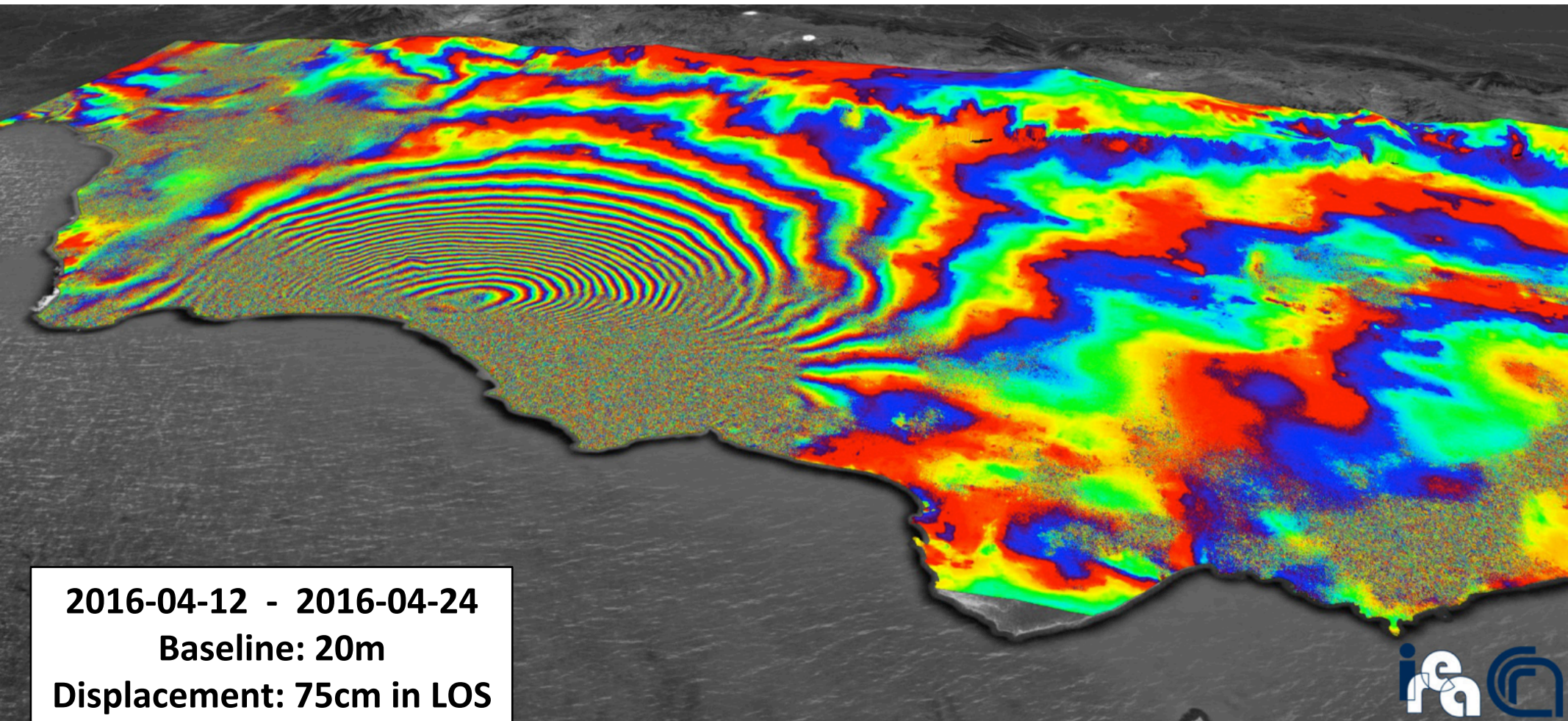
The bottom panel shows search results for "2016":

- Current search result: [empty]
- Total results: 25
- 4 data packages found.
- Japan Earthquake 2016-04-14 InSAR [icon]
- 2016-06-03 tda1 [icon]

The map interface includes a search bar, a "Geo Filter" button, and a "Processing Services" sidebar on the right. The bottom status bar shows coordinates: Lon: 17.347 Lat: 44.606.

Started the Sentinel-1 High-Resolution Change Monitoring service of DLR for systematic processing over the earthquake area. Amplitude and coherence product at 50m resolution are generated processing Sentinel-1 data acquisitions pre- and post-event starting from 9th August

Cloud-based DInSAR services: Ecuador earthquake



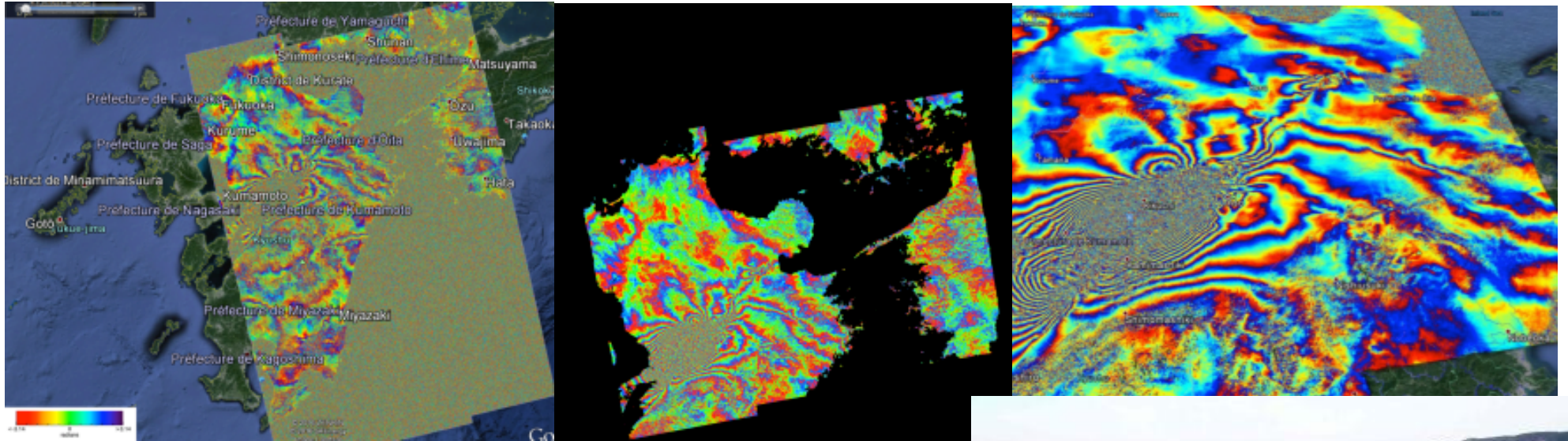
Contains modified Copernicus data ©2016



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Cloud-based DInSAR: Kumamoto earthquake

Integrated SBAS, DIAPASON and the InSAR Browse to exploit Sentinel-1



➤ Sentinel-1 interferogram of Kumamoto earthquake, on the island of Kyushu in southwest Japan, in April 2016:

- SBAS chain of CNR IREA (Left),
- DLR InSAR Browse chain (Centre),
- DIAPASON Processing Service of CNES/Altamira Information (Right).

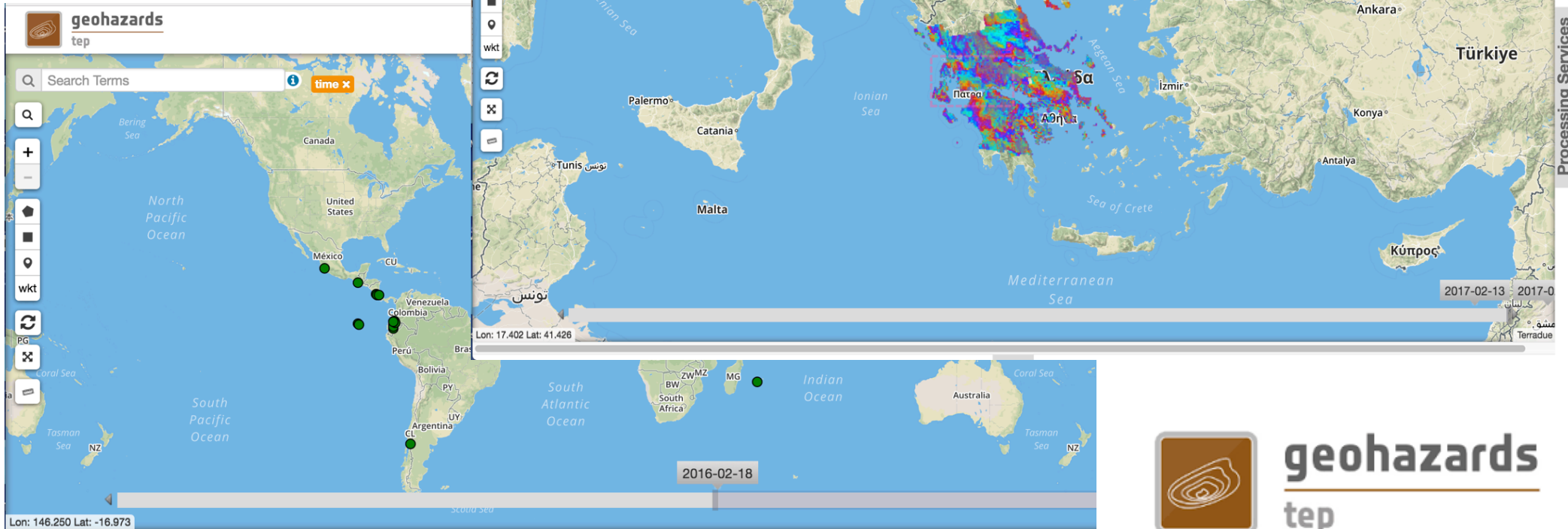


High-Resolution change monitoring

22 Volcanoes and Corinth Rift Laboratory

- Performing systematic processing with the DLR High-Resolution InSAR Browse service (50m resolution - 25m spacing) of all S-1 pairs over
 - 22 active volcanoes worldwide
 - The CRL-NFO area

Examples of DEM corrected interferograms generated over CRL-NFO area.
Credits DLR.





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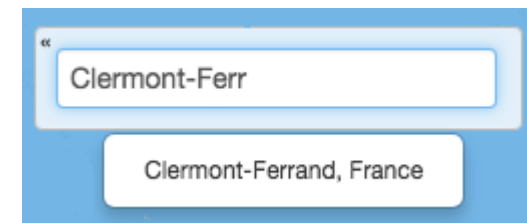
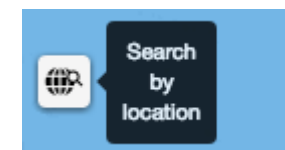
**Next v2 evolutions
new features & impacted scenarios**

New data exploitation functions

- **Quicklooks** systematic generation, for the Geobrowser views over data collections
- **Gazetteer search**
- **Thematic Apps:** rule-based bundling of data collections and processing services
 - Processing services accessed on the GEP Portal via “Discover Thematic Apps”
 - My data uploads App: for user uploads on Data Gateway, with automated cataloguing
- **Visualisation of processing outputs:** handling of additional results file types, for CSV time series, KML & SHP vector, full resolution rasters (including legends)
- **Results publication Web Service**, accessed / shared by all Virtual Machines

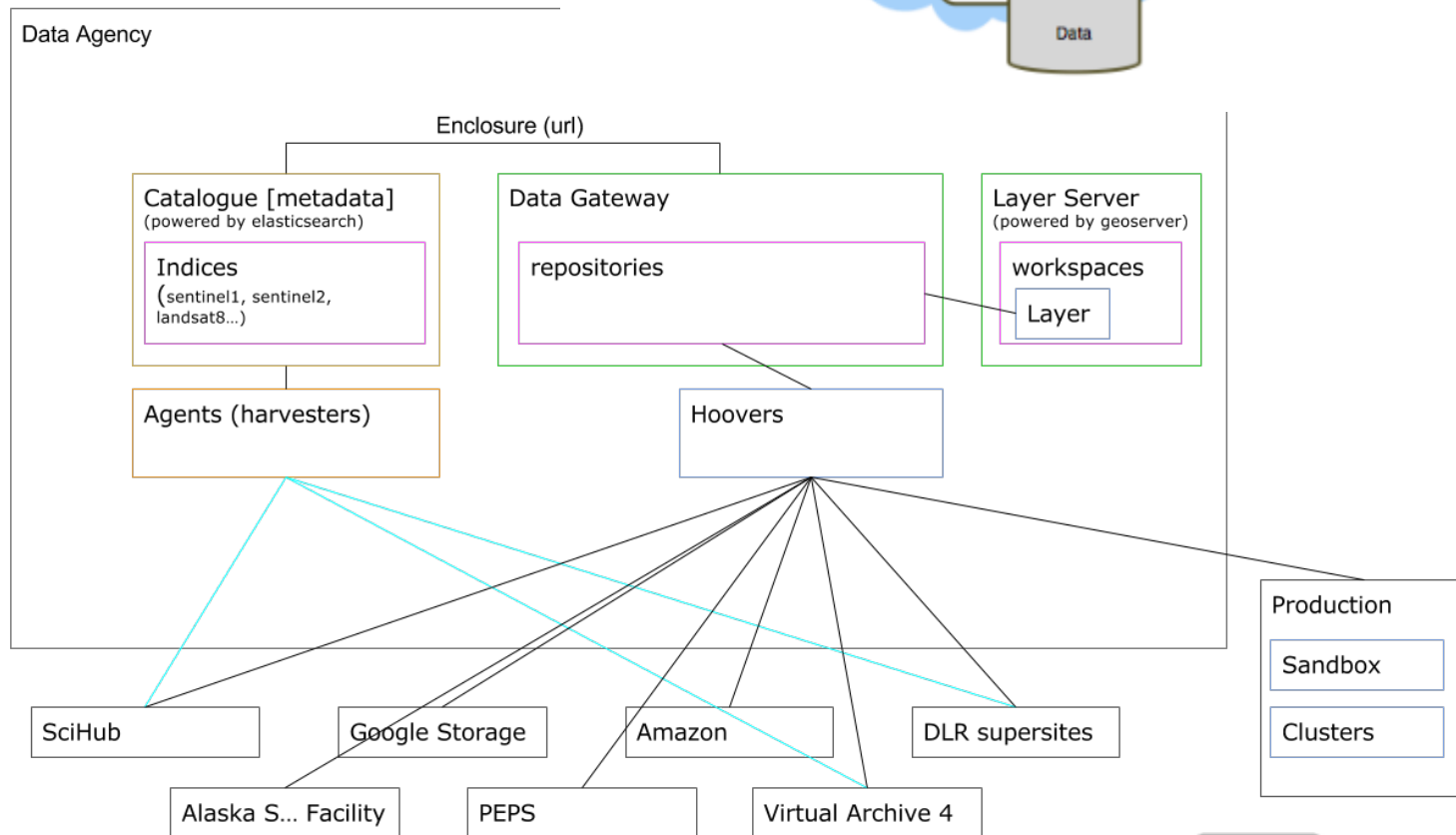
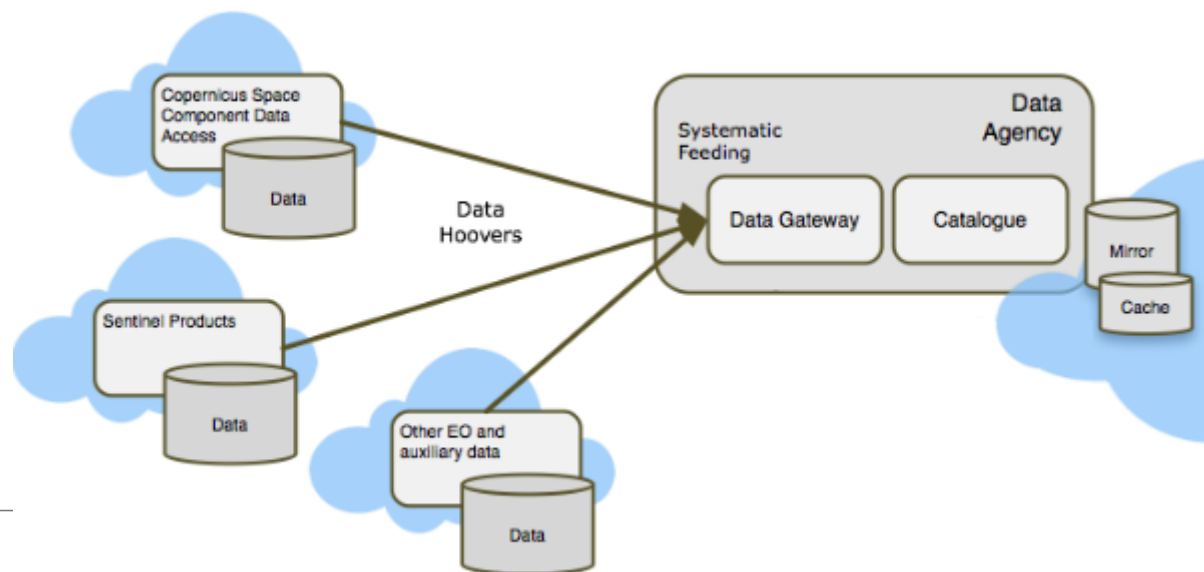
The screenshot shows the geohazards tep website interface. At the top, there is a navigation menu with 'Home', 'Background', 'Observations & Measurements', and 'Information'. Below the menu, the 'Thematic Applications' section is displayed, featuring a search bar and a list of 9 results. A callout box is overlaid on the right side of the page, titled 'Discover Thematic Apps', with the text 'Click to find out the existing thematic applications' and a 'View apps' button. The list of applications includes:

- Manage my data** by Terradue: Manage your data by viewing data stored in your repository or published in your catalogue index. This thematic app allows you to upload new dataset... (Oct 9th 2016)
- Test my processor** by Terradue: Test my processor application allows an expert user to discover and test its newly deployed processing service. (Oct 9th 2016)
- InSAR Small Baseline Subsets (SBAS)** by CNR-IREA: The InSAR Small Baseline Subsets (SBAS) algorithm has been developed by IREA-CNR for monitoring temporal evolution of surface deformations and to... (May 16th 2015)
- Rapid EarthQuake mapping** by TRE ALTAMIRA: This application delivers with a service to produce Inteferograms over a recent earthquake zone. It uses DIAPASON that is...



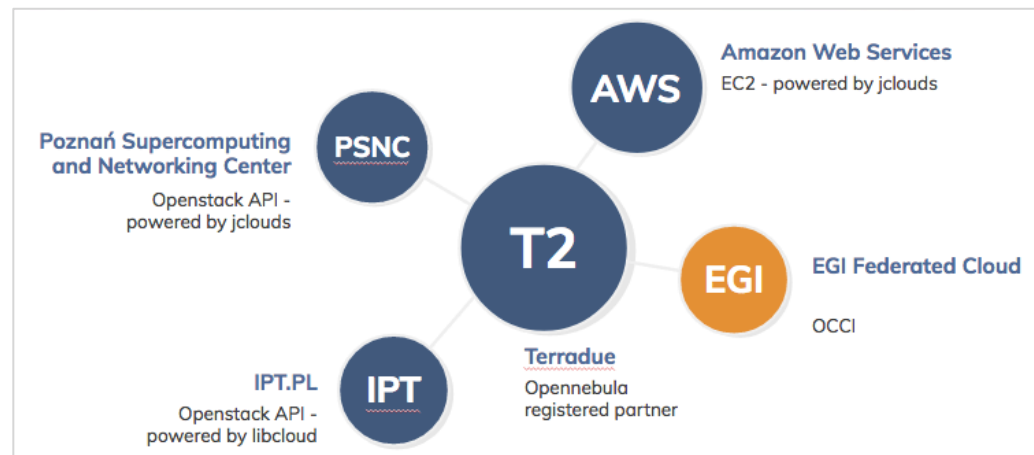
Data Gateway

- Automatic multi-sourcing
- Programmed cache
- Personal storage (repository)
- Production staging
- Data usage accounting

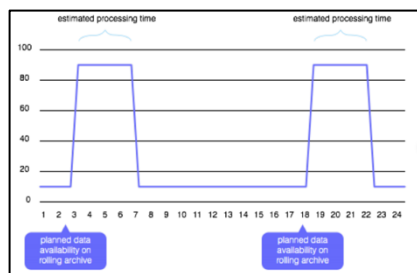


New Cloud processing capacities

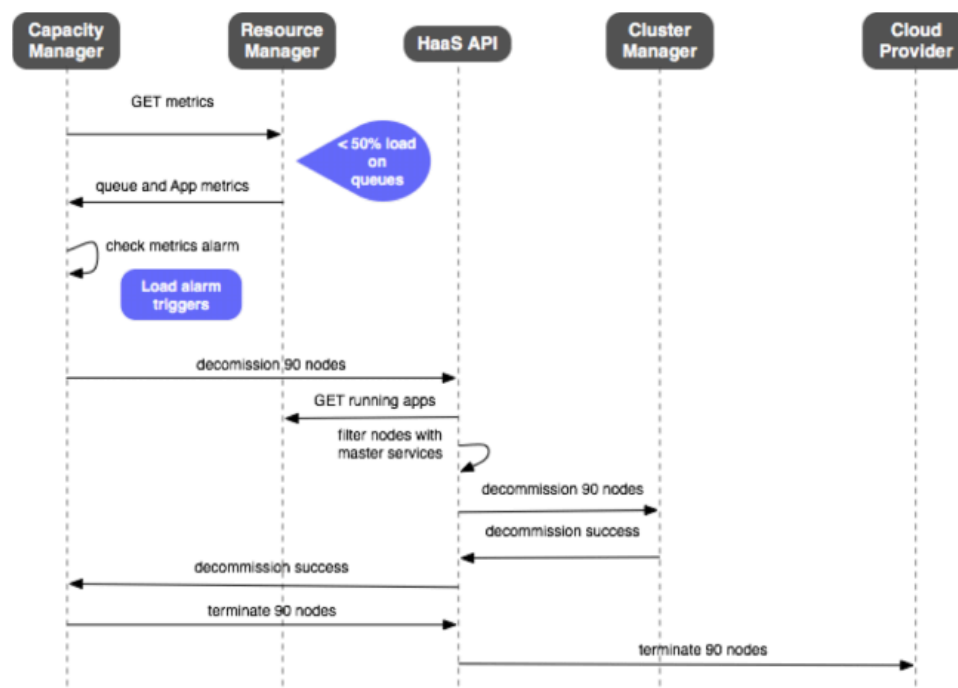
- Federation of new Cloud providers:
 - IPT Poland
 - EGI.eu (BELNET, INFN RECAS BARI)
 - CNR IREA Private Cloud's GEP domain



Processing load over time

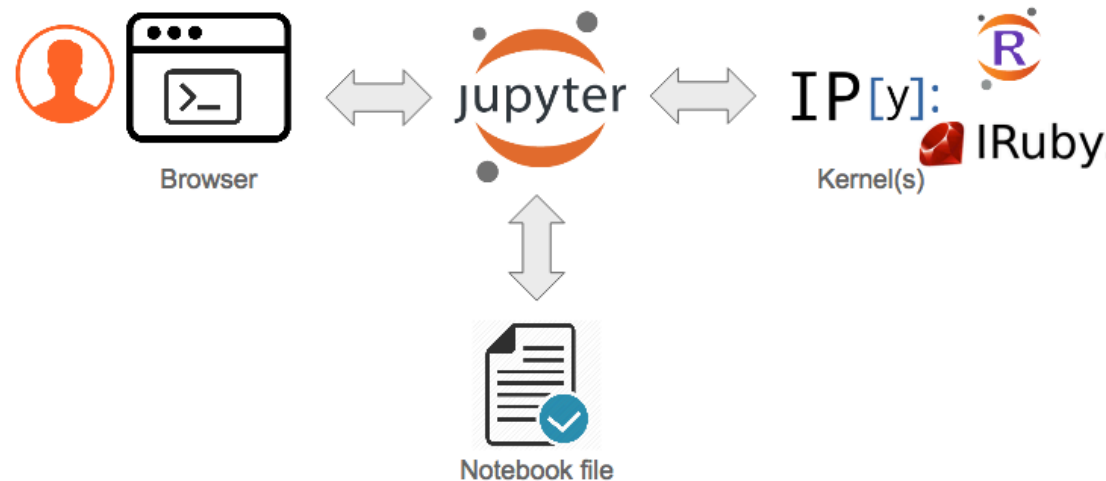


- Production Center instances (x2, funded for 12 months) running on:
 - either Hetzner / Terradue Cloud Platform (InSAR services)
 - and/or IPT Poland (Optical services, accessing Sentinel-2 mirror) based on ESA funding.
 - Future funding expected over 2019, with Terradue brokering.
- Accounting:
 - initial capability allowing the tracking of user credits for processing



New community-contributed resources

- New toolboxes installers for DCS Application integrators:
 - Orfeo
 - SNAP extensions
 - StaMPS extensions
- New toolboxes installers for Virtual Desktops:
 - Monteverdi
- New processing services contributed by the users community:
 - ISTerre TIO
 - ISTerre NSBAS
 - SATIM MineSAR
 - ESA RSS SNAP Sentinel-1 COherence and INTensity (COIN)
- GEP results post-processing, using Jupyter notebooks: the MPIC case



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Pre-operations of the Platform v2

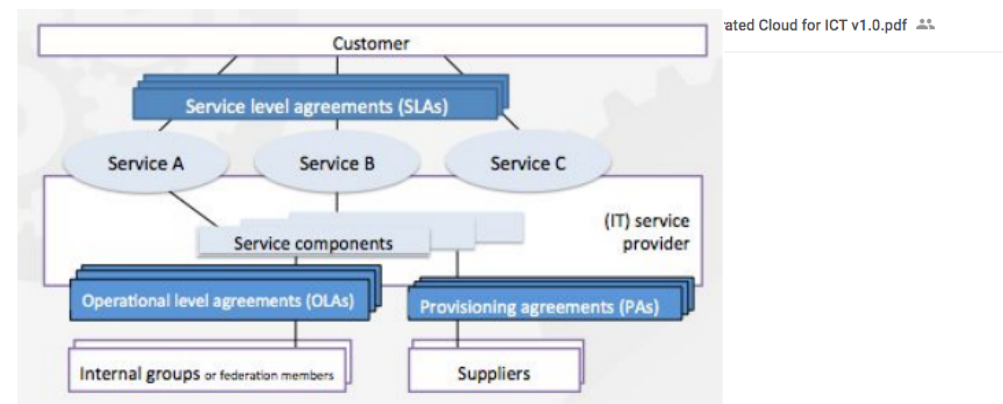


Provisioning Agreements (data and ICT) for all running Services & Pilots

- Monitor & perform accounting on Cloud resources provisioned (CPU power, storage) as production servers for the GEP processing services
- Optimise the data provisioning processes for specific requirements (e.g. access to data quotas based on CEOS & GSNL Agreements)

Also, formalise the terms & conditions related to the reuse and adaptation of processing chains already contributed to GEP, that are managed under 'Open Source' license.

PDF	T2-ESA-GEP-TN-15-047 D1.13 GEP Provisioning Agreements v1.1.pdf	↗
PDF	T2-ESA-GEP-TN-16-031 Provisioning Agreement with ASF for data v1.0.pdf	↗
PDF	T2-ESA-GEP-TN-16-039 Provisioning Agreement with DLR Supersite for data v1.0.pdf	↗
PDF	T2-ESA-GEP-TN-16-010 Provisioning Agreement with CloudSigma for ICT v1.0.pdf	↗
PDF	T2-ESA-GEP-TN-16-035 Provisioning Agreement with CNES PEPS for data v1.0.pdf	↗
PDF	T2-ESA-GEP-TN-16-040 Provisioning Agreement with ASI Virtual Archive for data v1.0.pdf	↗
PDF	T2-ESA-GEP-TN-16-016 Provisioning Agreement with Spectral for software v1.0.pdf	↗
PDF	T2-ESA-GEP-TN-16-068 Provisioning Agreement with Sinergise for data v1.0.pdf	↗
PDF	T2-ESA-GEP-TN-16-023 Provisioning Agreement with USGS for data v1.0.pdf	↗
PDF	T2-ESA-GEP-TN-16-024 Provisioning Agreement with ESA for GPOD Processing Services v1.0.pdf	↗
PDF	T2-ESA-GEP-TN-16-011 Provisioning Agreement with Interoute for ICT v1.0.pdf	↗
PDF	T2-ESA-GEP-TN-16-015 Provisioning Agreement with ESA for data v1.0.pdf	↗
PDF	T2-ESA-GEP-TN-16-067 Provisioning Agreement with GAMMA for software v1.0.pdf	↗



Adapted from FITSM



GEP Pilots (1/2)

Operations Level Agreement, Terms & Conditions, Users Feedback

CNR IREA

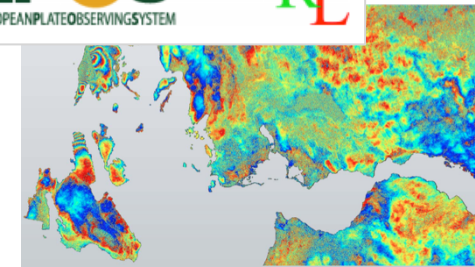
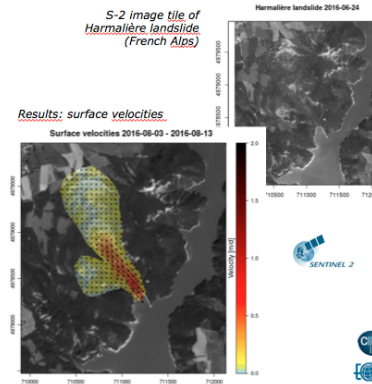
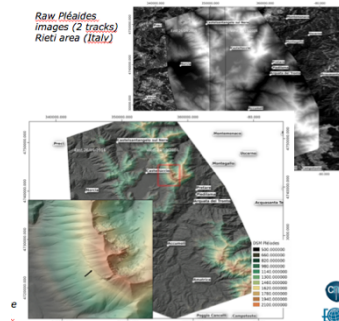
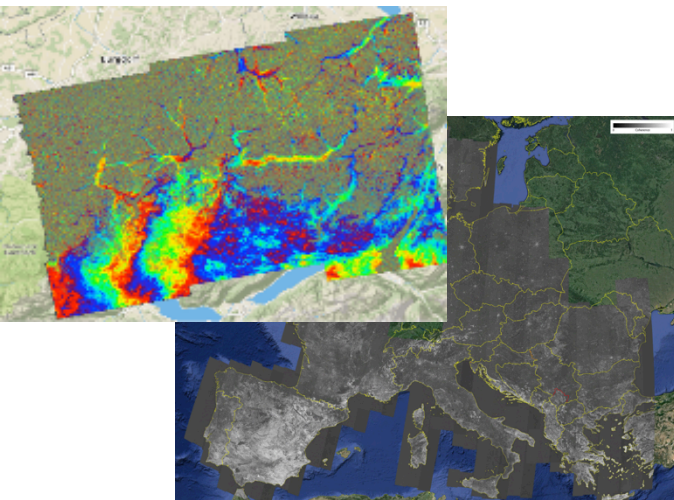
- Terrain motion surveillance
 - Data provisioning: S-1 SLC
 - Results visualisation: displacement time-series, mean velocity maps
- Engagement of designated users
 - EPOS Community & Italian Department of Civil Protection
- Validation goal
 - On-demand generation of Earth deformation time series and mean velocity maps
 - Automatic “Sentinel-1 Surveillance Service” over Mt Etna & Napoli Bay volcanic area

CNRS/EOST

- Processing chains for optical images
 - Data provisioning: HR (S-2 & L7/8), VHR (Spot6/7, Pléiades)
 - Results visualisation: digital surface models,
- Engagement of designated users
 - CEOS Pilot on Seismic Hazards
- Validation goal
 - DSM-OPT: Automation of satellite-photogrammetry pipeline for rapid processing of multi-views images (Pléiades, Spot6/7)
 - MPIC-OPT: Monitoring of surface deformation from optical image time-series, based on Multiple-pairwise image correlation

CRL (ENS,NOA,HUA)

- Corinth Rift Laboratory
 - Data provisioning: S-1 SLC
 - Results visualisation: all possible interferograms from archive over CRL, e.g. ~5000 S1 asc. and ~5000 S1 desc. then all pairs after each new acquisition
- Engagement of designated users
 - Workshops & Summer Schools involving MSc, PhDs
- Validation goal
 - Deliver methods & data products as part of the Near fault observatory of EPOS

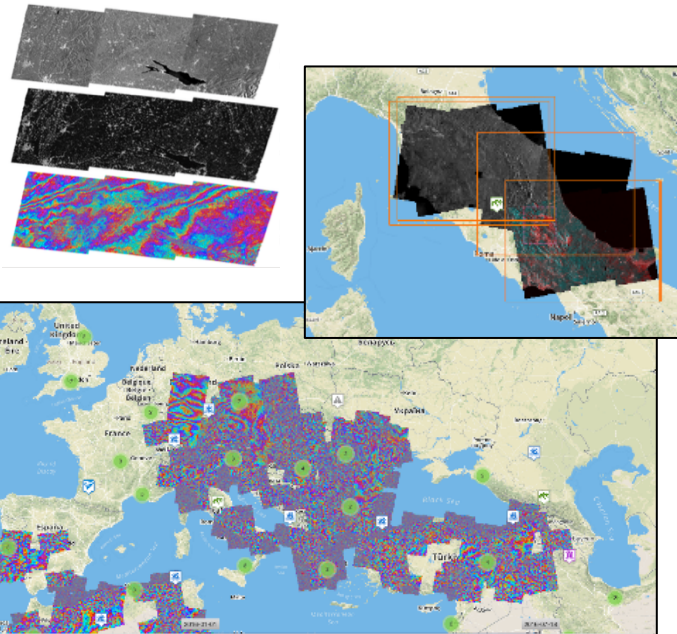


GEP Pilots (2/2)

Operations Level Agreement, Terms & Conditions, Users Feedback

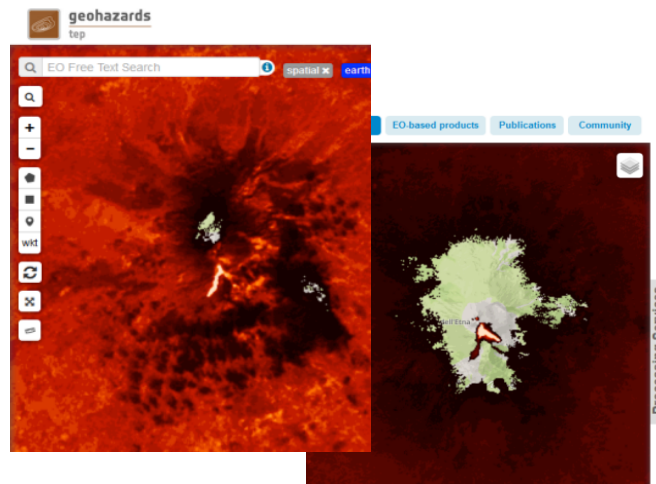
DLR

- Systematic InSAR QuickLook service
 - Data provisioning: S-1 SLC
 - Results visualisation: geocoded quicklooks of Amplitude, Coherence, Diff. interferograms
- Engagement of designated users
 - CEOS Pilot on Seismic Hazards
- Validation goal
 - Monitoring service of the CEOS Seismic & Volcanoes areas



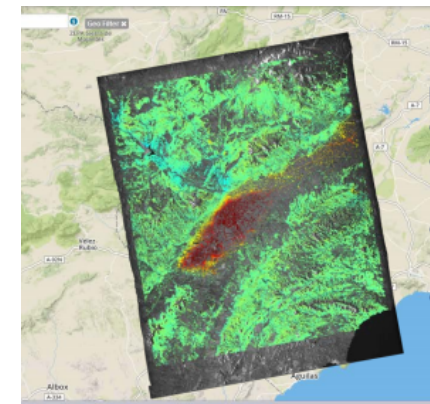
INGV

- Volcanic hazard monitoring
 - Data provisioning: L8 (L1B), S-2 (L1C), S-3 (SLSTR, L1B/L1C)
 - Results visualisation: Surface temperature maps/hotspot detection
- Engagement of designated users
 - Italian Civil Protection
- Validation goal
 - Generation of time series relevant for the CEOS Pilot on volcanoes, for Mount Etna and Phlegrean field



TRE-ALTAMIRA

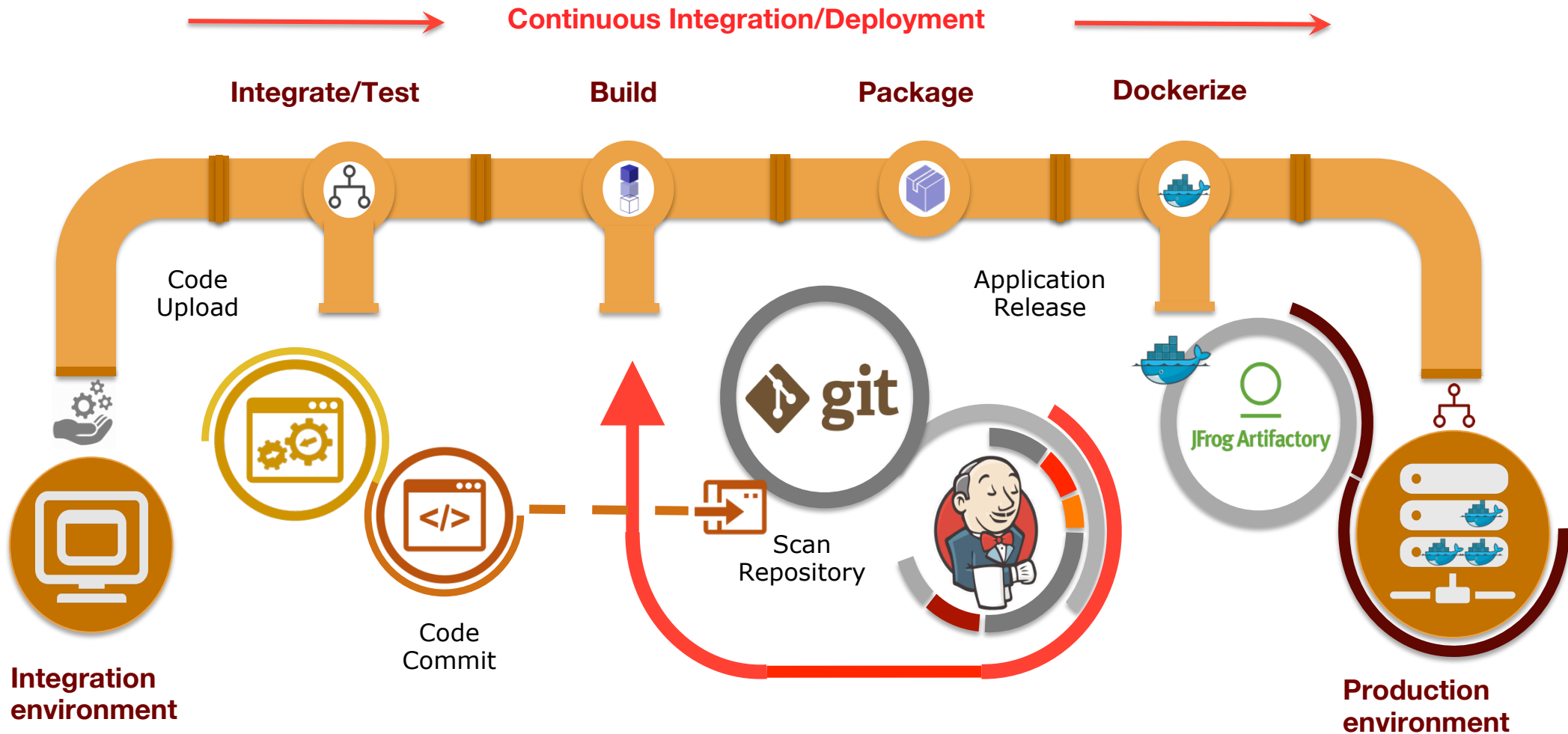
- PSInSAR for precise terrain motion mapping
 - Data provisioning: S-1 SLC
 - Results visualisation: ground motion velocity map, corrected topography map
- Engagement of designated users
 - Commercial sector (pay-per-use via TRE-ALTAMIRA Sales Dept.)
- Validation goal
 - Define a SaaS business model for GEP hosted InSAR services



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Cloud processing services integration & deployment

Continuous integration & better automation



Integration environment

Production environment

(GEP pre-ops)



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Sustainability

GEP and EPOS

GEP selected as the gateway for the Satellite Data Thematic Core Service in EPOS



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*The agency is an associate partner of EPOS IP, contributing in-kind with EO data processing expertise and the **GEP platform**, in exchange of access to the EPOS in-situ data network.*

EPOS
EUROPEAN PLATE OBSERVING SYSTEM



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Sustainability actions

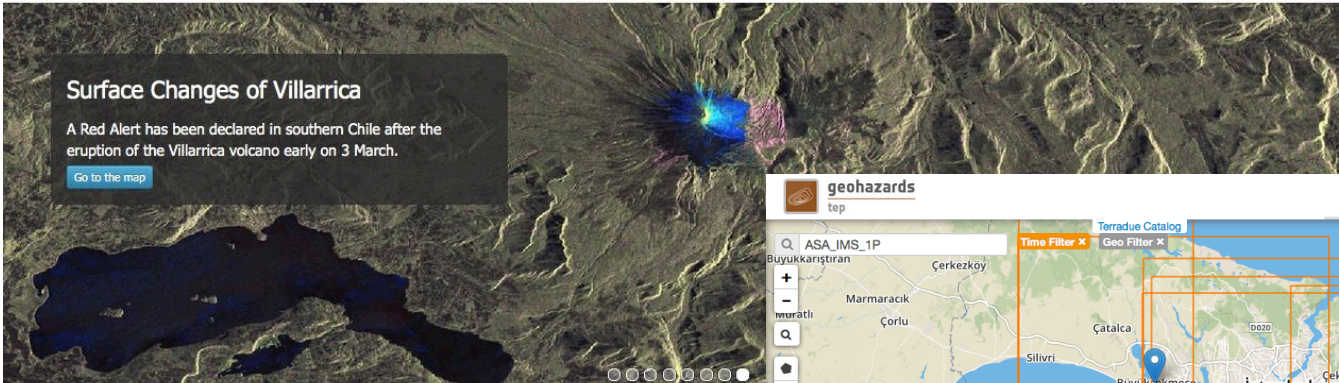
- Positive dynamic:
 - Interest from **Private sector** companies (VACs) for the GEP service provisioning model, and for establishing partnership (based on revenue sharing) for their Service integration & deployment on the platform
 - Access requests received from some industry users
 - Research networks like **EPOS** and **Geohazards Lab** are both planning to use the platform
- Additional funding opportunities:
 - In the context of the **European Regional development funds**
 - GEP inclusion in proposal led by CNRS EOST to Interreg Alpine Space Call about Landslides mapping across the Alps
 - In the context of **EC Horizon 2020 calls** targeting the development and deployment of e-infrastructures, by fostering the innovation potential of research infrastructures:
 - EINFRA-22-2016 (DG Connect)
 - EINFRA_12 (DG Connect)
 - EO-2-2017 EO Big Data Shift (DG Research)
 - In the context of **ESA ITT** being issued starting from Q4 2017 under the "EO Exploitation Platforms" component of EOEP5 - Block4 programme of ESA



Examples of Identified challenges/opportunities

- **Extend the GEP Early Adopter programme**
 - to allow achieving more impact and gather more feedback
 - to accommodate current demand that exceeds the planned 60 EA
 - to extend the pre-operations period (from 6 months to at least 12 months)
- **Integration of the GEP on Copernicus DIAS**
 - Integrate GEP as Third Party Service for front-office operations
 - Take advantage of GEP to have a Pilot about the performance of DIAS with a complete VA Layer
- **Federation with DLR to support the expansion of GEP through the **Geohazards Lab**, approved by CEOS**
 - Integrate innovative InSAR services of DLR
 - *e.g. TerraSAR-X based InSAR*
 - Federate with the DLR infrastructure
 - *e.g. using CODE.DE*





Background



Geo Browser



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geohazards tep

ASA_IMS_1P

Time Filter X Geo Filter X

Results Table

- Total results: 23
- Villarrica processing
- TERRAFIRMA PSI - istanbul1_tf_ps_ts
- TERRAFIRMA PSI - istanbul3_tf_ps_avvel
- Layer - Grenada_roads
- Layer - Grenada_water_bodies
- Layer - StVincent_Grenadines_water_bodies

Features Basket

You have no features in your basket. Services Remove all Load

Save

- ENVISAT ASAR ASA_IMS_1P, 2010-09-21T08:21:29.631Z, Track: 107
- ENVISAT ASAR ASA_IMS_1P, 2010-07-13T08:21:30.676Z, Track: 107

EO data EO processing Publications Community

Processing Services

ADORE DORIS interferometric processor (5)

This job has been created using the service ADORE DORIS Interferometric processor

Job Info

Job Name: ADORE DORIS interferometric processor (5)

Wps Job Id: 14b12cf2-a025-4b4b-b20d-b3ec474ee73a

Started at: Mar 20th 2015

Created by: Hervé Caumont

Status/Result Location

Status: Success

Visibility: private

Parameters

Name	Value
slave	https://data.terradue.com/gs/catalogue/tepqw/gtfeature/search?format=json&

<https://geohazards-tep.eo.esa.int>

WATCH THE SPACE !

Contact us: geohazards-tep@esa.int