

InSAR on-demand services and data processing pipelines for deformation modelling

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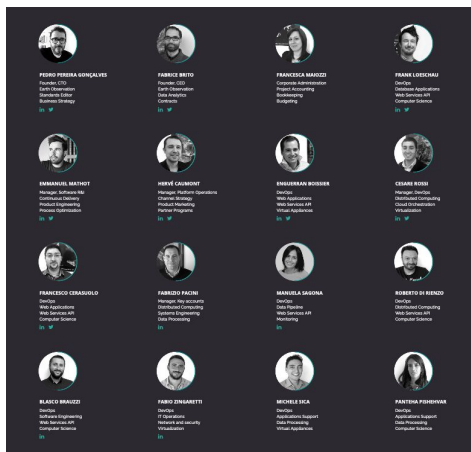
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*Experienced international team,
16 members.*

- Terradue is an Italian SME (ESA spin-off in 2006)
Headquarters: Rome (IT)
- From day one providing **support to application builders in earth sciences**, to use satellite EO data as information source
- Early days Grid Computing. Nowadays, all Cloud Platform-as-a-Service (PaaS) & APIs for the **transfer in production of scalable software applications** (Cloud bursting)
- <https://www.terradue.com>

As part of the EC H2020 project EuroVOLC, Terradue provides the automation of existing approaches to fast modelling of individual data types, in particular the simultaneous and integrated strain tensor estimation from GNSS and InSAR data developed by INGV

Terradue also contributes to the networking activities of the project, especially collaboration and networking between VOs and VRIs, and with international initiatives

Overview

EUROVOLC is developing case studies over European Volcanoes in Iceland, Italy, Spanish Canary islands and Portuguese Azores island.



For the case of Etna, data access and processing automation levels, for simultaneous and integrated strain tensor estimation from GNSS and satellite-based InSAR, are applied to the modelling of deformation and seismicity data.

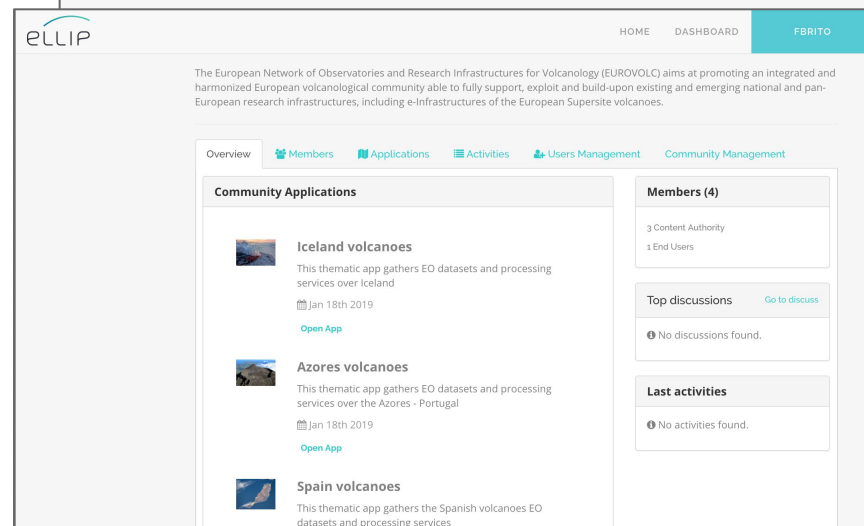
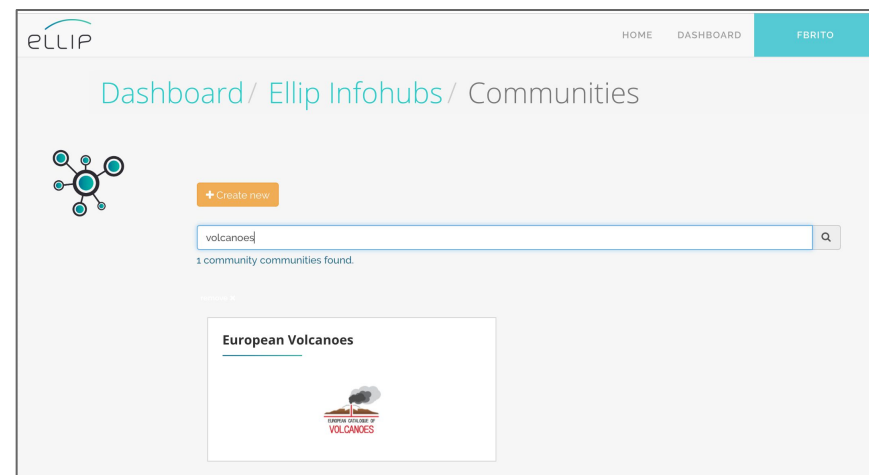
Collaborative work environment

A Cloud platform environment is configured to this end for the EUROVOLC community.

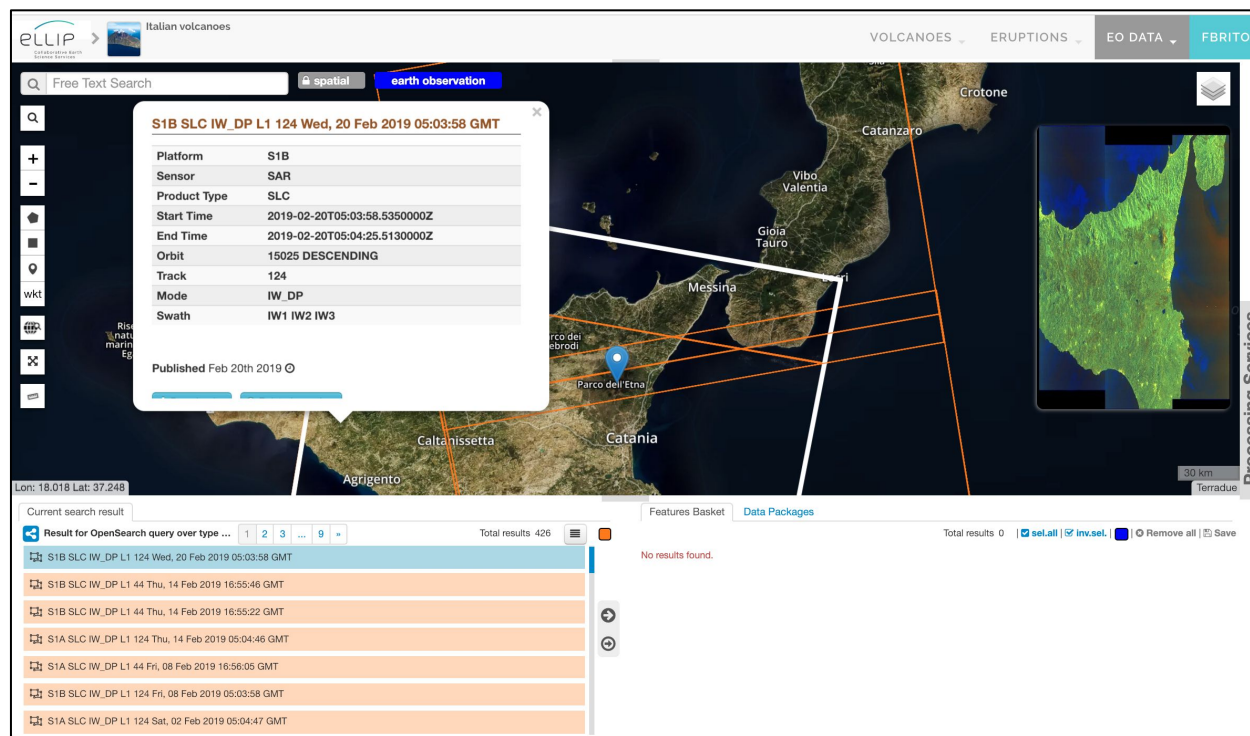
A **community** gathers its members around common thematic areas, in this case volcanoes.

The EUROVOLC community includes several “**Thematic Apps**” per European country volcanoes.

For instance, the Italian Volcanoes Thematic App is focussed on the Etna, Vesuvius, Campi Flegrei and Stromboli volcanoes.



Thematic App services



Each “Thematic App” is implemented as a Geobrowser.

It provides the access point to several services dedicated to the exploitation of Earth Observation (EO) data.

The Thematic App services include data discovery, access, processing and exploitation/visualization.

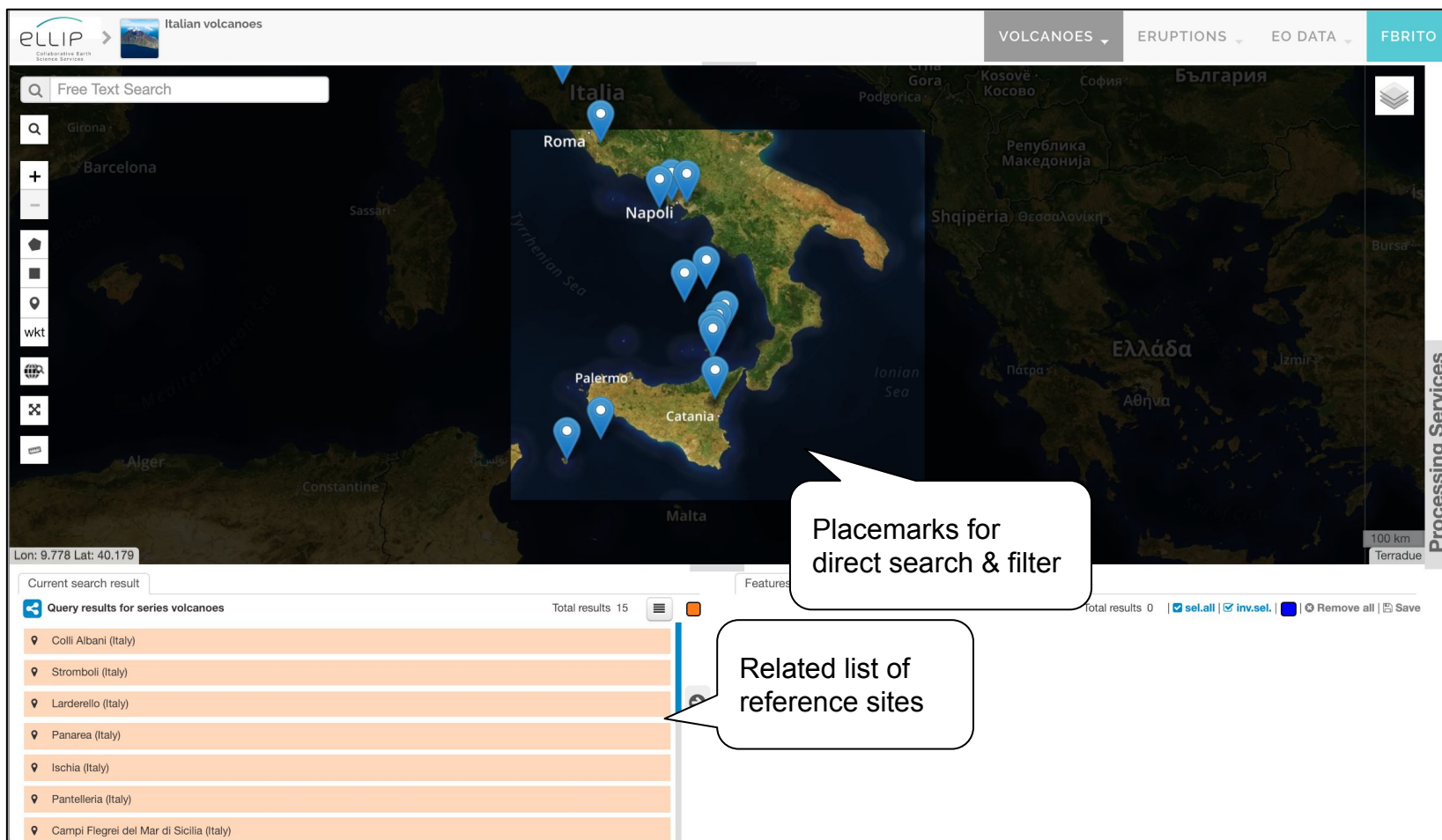
Data Discovery

The data discovery service provides the EUROVOLC community with custom and tailored catalogue access for several EO missions.

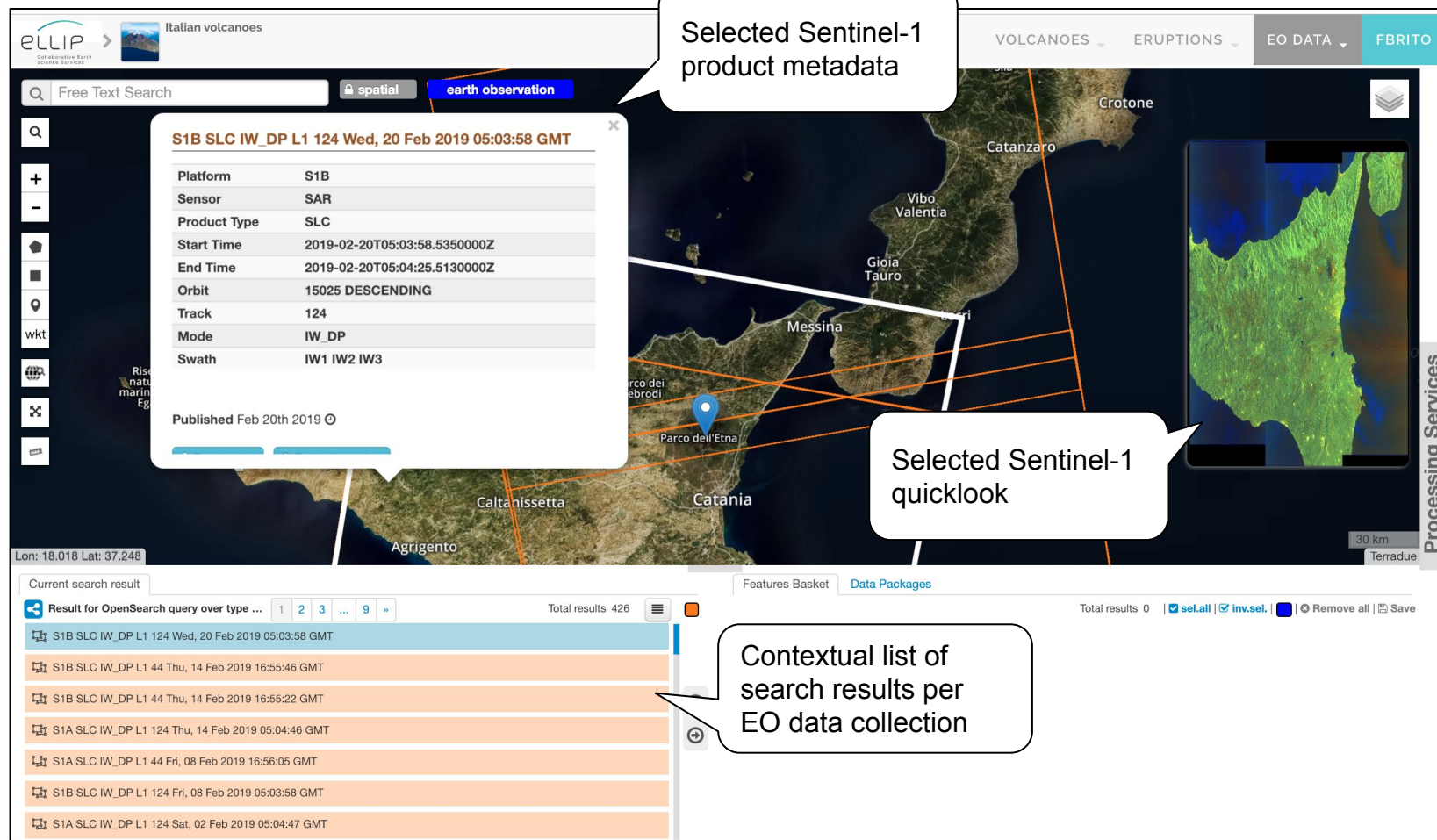
At this stage, the platform provides access to **Sentinel-1, Sentinel-2, Sentinel-3, Envisat ASAR, Landsat-8** and **ASTER**.

The EO data discovered can be downloaded if needed.

Italian Volcanoes Thematic App



Italian Volcanoes Thematic App



The screenshot displays the 'Italian volcanoes' app interface. At the top, there's a navigation bar with 'VOLCANOES', 'ERUPTIONS', 'EO DATA', and 'FBRITO'. A search bar is present with 'Free Text Search' and filters for 'spatial' and 'earth observation'. A map of Sicily is shown with various locations labeled. A popup window displays 'Selected Sentinel-1 product metadata' for 'S1B SLC IW_DP L1 124 Wed, 20 Feb 2019 05:03:58 GMT'. Below the map, a 'Contextual list of search results per EO data collection' is shown, listing several Sentinel-1 products. A 'Processing Services' sidebar is visible on the right.

Selected Sentinel-1 product metadata

Platform	S1B
Sensor	SAR
Product Type	SLC
Start Time	2019-02-20T05:03:58.535000Z
End Time	2019-02-20T05:04:25.513000Z
Orbit	15025 DESCENDING
Track	124
Mode	IW_DP
Swath	IW1 IW2 IW3

Published Feb 20th 2019

Selected Sentinel-1 quicklook

Contextual list of search results per EO data collection

- S1B SLC IW_DP L1 124 Wed, 20 Feb 2019 05:03:58 GMT
- S1B SLC IW_DP L1 44 Thu, 14 Feb 2019 16:55:46 GMT
- S1B SLC IW_DP L1 44 Thu, 14 Feb 2019 16:55:22 GMT
- S1A SLC IW_DP L1 124 Thu, 14 Feb 2019 05:04:46 GMT
- S1A SLC IW_DP L1 44 Fri, 08 Feb 2019 16:56:05 GMT
- S1B SLC IW_DP L1 124 Fri, 08 Feb 2019 05:03:58 GMT
- S1A SLC IW_DP L1 124 Sat, 02 Feb 2019 05:04:47 GMT

On-demand Data Processing

The access to **on-demand data processing services** exploiting such EO missions is available from the Thematic Apps.

This includes several services according to the nature of the EO data used.

For Sentinel-1, users can access InSAR processing services for interferometry (e.g. DIAPASON and SNAP) and for coherence and backscatter generation.

For Sentinel-2, Sentinel-3, Landsat-8 and ASTER, users can access the INGV Hot Spot detection services.

User access to Data Processing services

Data visualisation toolbar

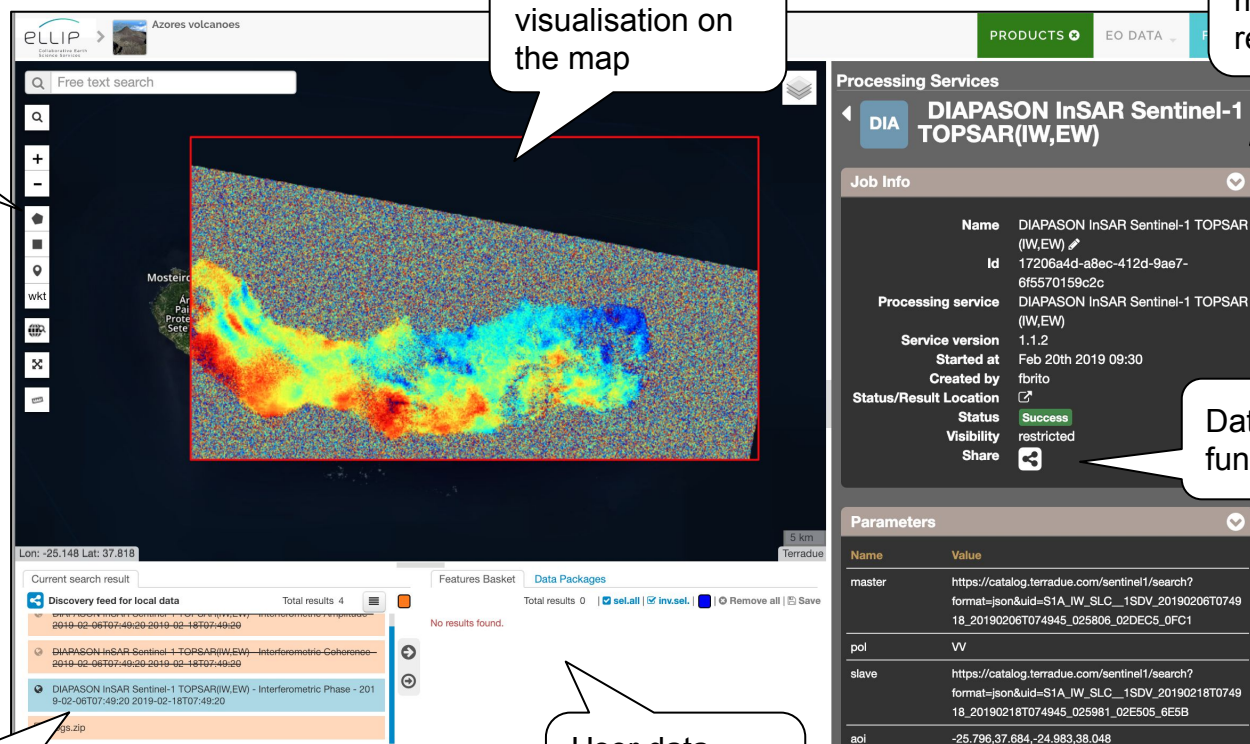
Data product visualisation on the map

Data processing job management and result summary

Data sharing functions

Contextual data products list & selectors

User data management area



The screenshot displays the TERRADUE web application interface. The main map area shows a satellite image of the Azores volcanoes with a color-coded data product overlay. A sidebar on the left contains a search bar and a list of data products. The right panel shows details for a specific processing job, including its name, ID, status, and parameters.

Processing Services

DIAPASON InSAR Sentinel-1 TOPSAR(IW,EW)

Job Info

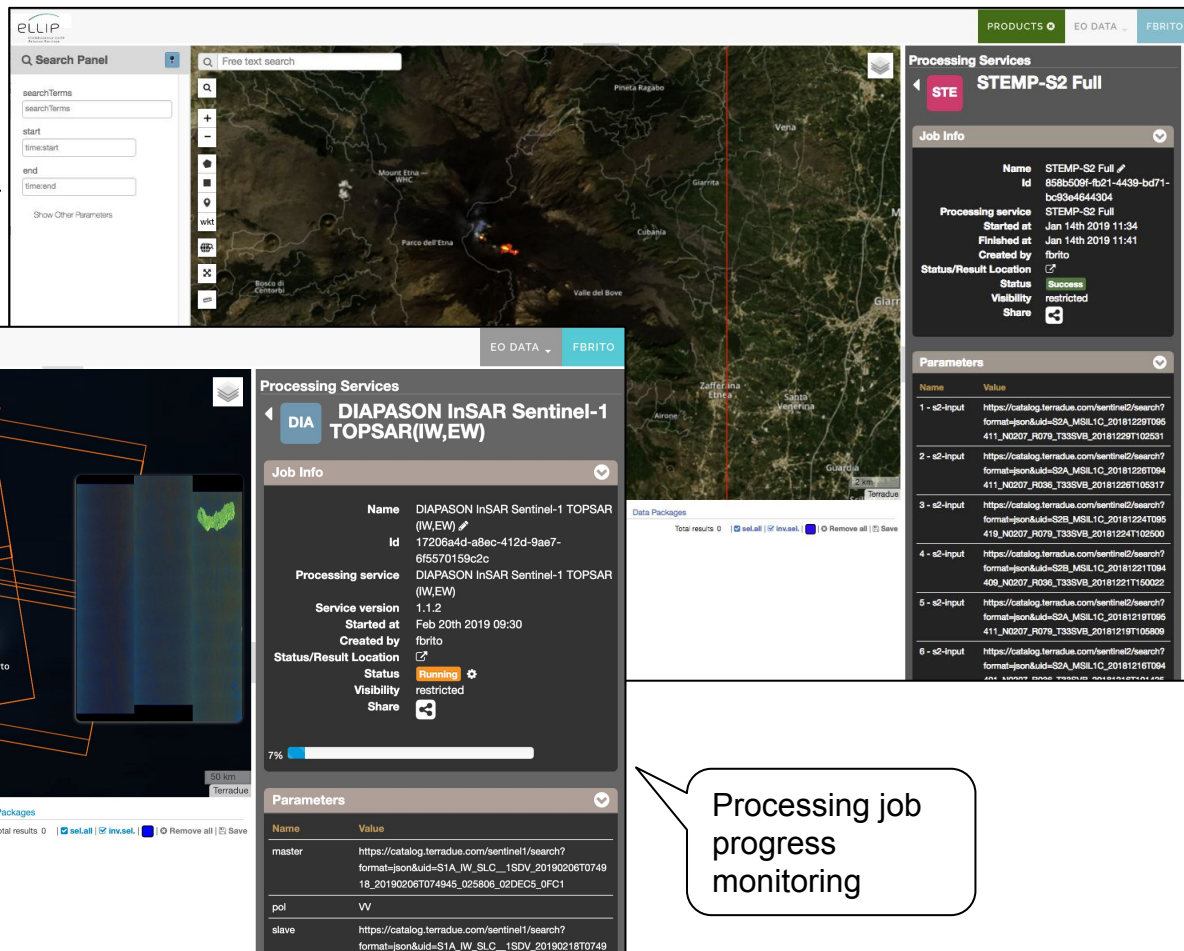
Name	DIAPASON InSAR Sentinel-1 TOPSAR (IW,EW)
Id	17206a4d-a8ec-412d-9ae7-6f5570159c2c
Processing service	DIAPASON InSAR Sentinel-1 TOPSAR (IW,EW)
Service version	1.1.2
Started at	Feb 20th 2019 09:30
Created by	fbrito
Status/Result Location	View
Status	Success
Visibility	restricted
Share	Share

Parameters

Name	Value
master	https://catalog.terradue.com/sentinel1/search?format=json&uid=S1A_IW_SLC_1SDV_20190206T074918_20190206T074945_025806_02DEC5_0FC1
pol	VV
slave	https://catalog.terradue.com/sentinel1/search?format=json&uid=S1A_IW_SLC_1SDV_20190218T074918_20190218T074945_025981_02E505_6E5B
aoi	-25.796,37.684,-24.983,38.048

User access to Data Processing services

Products search



The screenshot displays the TERRADUE web interface. On the left, a 'Products search' panel is visible with fields for search terms, start/end time, and spatial coordinates. The main map area shows a satellite view of a volcanic region with various geographical labels. On the right, a 'Processing Services' panel is shown, detailing a specific service: 'DIAPASON InSAR Sentinel-1 TOPSAR (IW,EW)'. This panel includes job information, status (Running), and a list of parameters.

Processing Services

DIAPASON InSAR Sentinel-1 TOPSAR (IW,EW)

Job Info

- Name: DIAPASON InSAR Sentinel-1 TOPSAR (IW,EW)
- Id: 17206a4d-a8ec-412d-9ae7-6f570159c2c
- Processing service: DIAPASON InSAR Sentinel-1 TOPSAR (IW,EW)
- Service version: 1.1.2
- Started at: Feb 20th 2019 09:30
- Created by: fbrito
- Status/Result Location: fbrito
- Status: **Running**
- Visibility: restricted
- Share: [icon]

Parameters

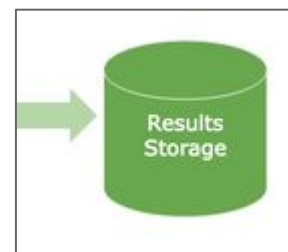
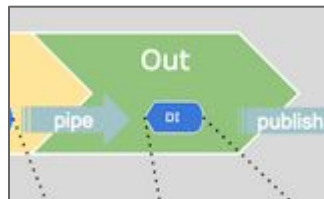
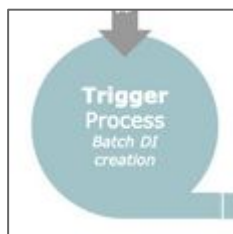
Name	Value
master	https://catalog.terradue.com/sentinel1/search?format=json&id=S1A_MSL_1C_20191229T064411_N2007_R070_T33SVB_20191229T102931
pol	VV
slave	https://catalog.terradue.com/sentinel1/search?format=json&id=S1A_MSL_1C_20191221T084409_N2007_R090_T33SVB_20191221T150022

Processing job progress monitoring

Data Processing Pipeline

Project activities is scope: the simultaneous and integrated strain tensor estimation from GNSS and InSAR data.

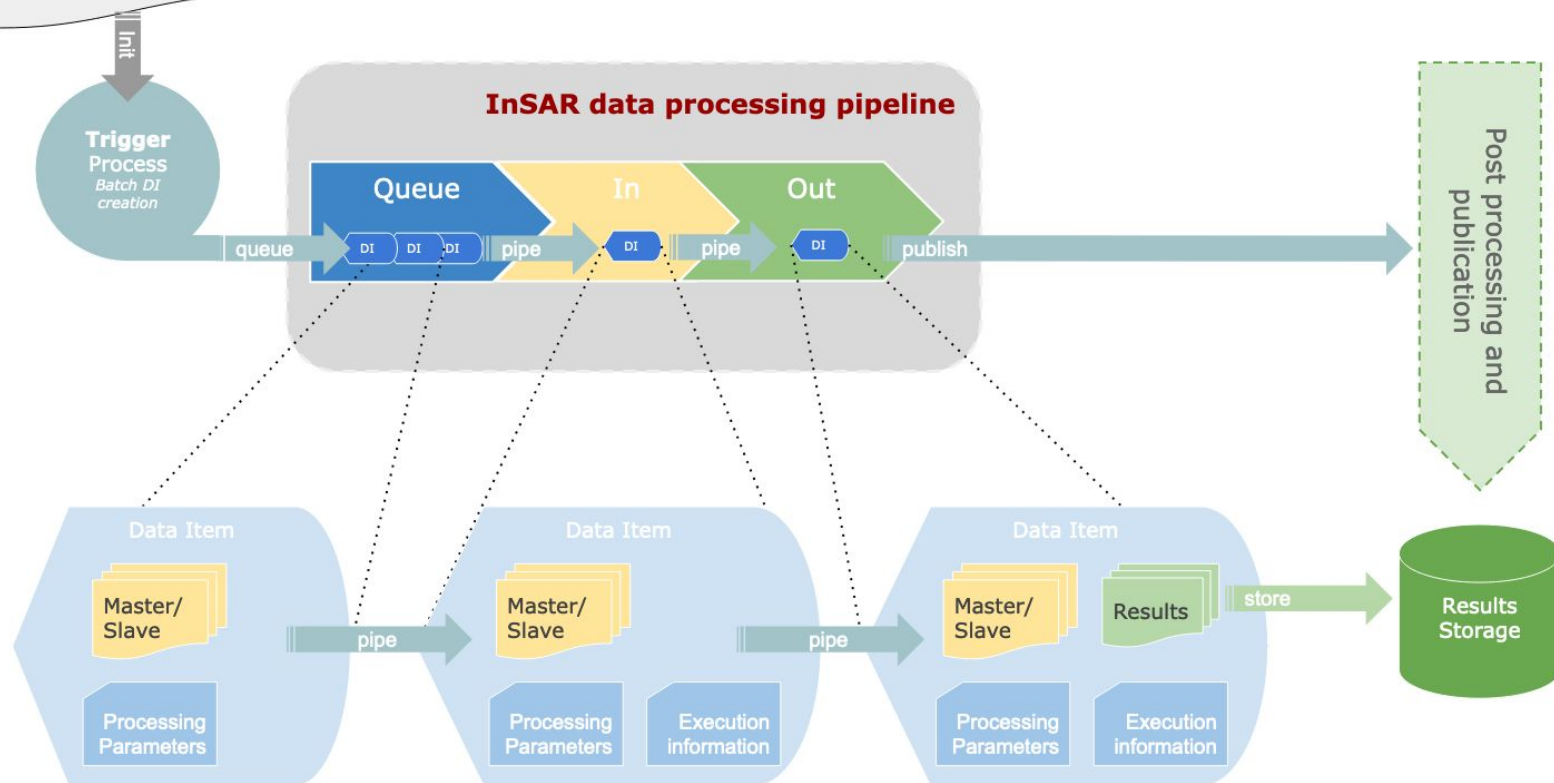
Data preparation automated: the access to **Envisat ASAR IMS data** is feeding an InSAR data processing pipeline, which generates and delivers **interferogram stacks**, then used as inputs to INGV's strain tensor estimation tool.



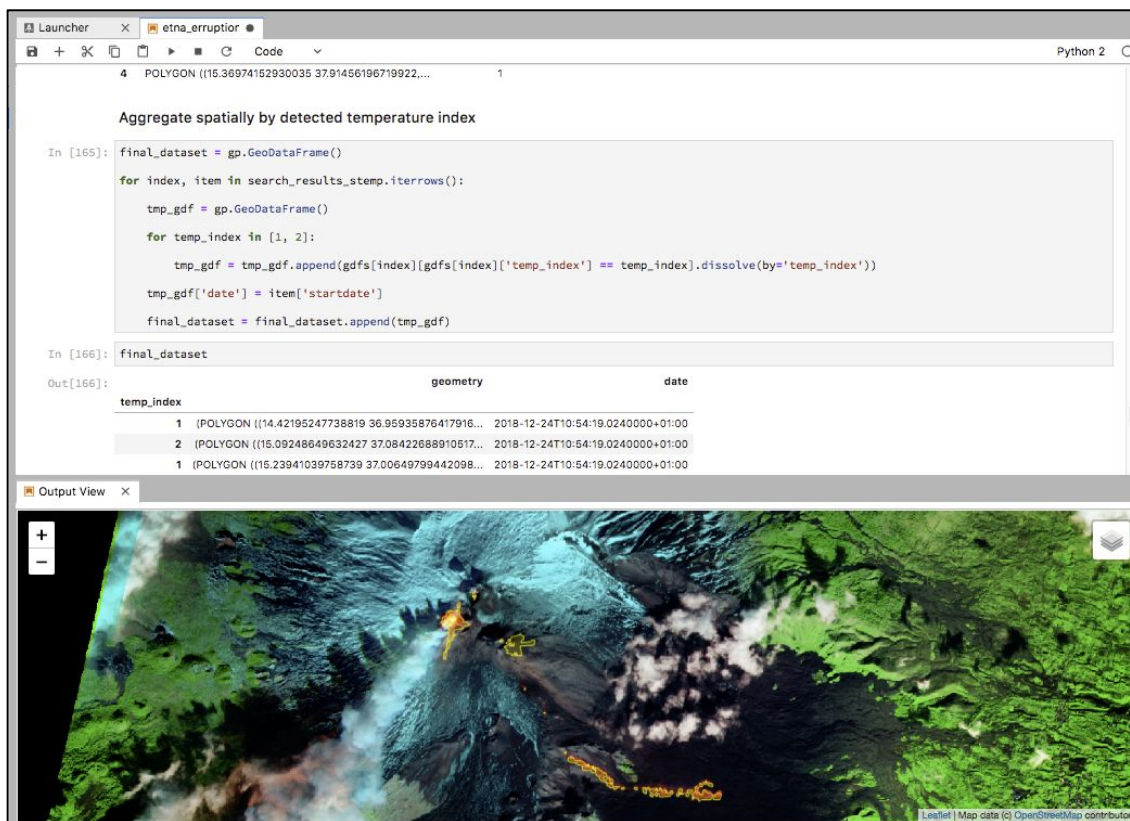
Data Processing Pipeline

Data processing pipeline spec:

- **Data Source** Envisat ASAR L1 IMS
- **Processor** DIAPASON
- **Method** all master/slave pairs over Etna for 2008 and 2009



Value adding services



The screenshot shows a Jupyter Notebook window titled 'etna_earthquake'. The code in the notebook is as follows:

```

Aggregate spatially by detected temperature index

In [165]: final_dataset = gp.GeoDataFrame()
for index, item in search_results_stemp.iterrows():
    tmp_gdf = gp.GeoDataFrame()
    for temp_index in [1, 2]:
        tmp_gdf = tmp_gdf.append(gdfs[index][gdfs[index]['temp_index'] == temp_index].dissolve(by='temp_index'))
    tmp_gdf['date'] = item['startdate']
    final_dataset = final_dataset.append(tmp_gdf)

In [166]: final_dataset

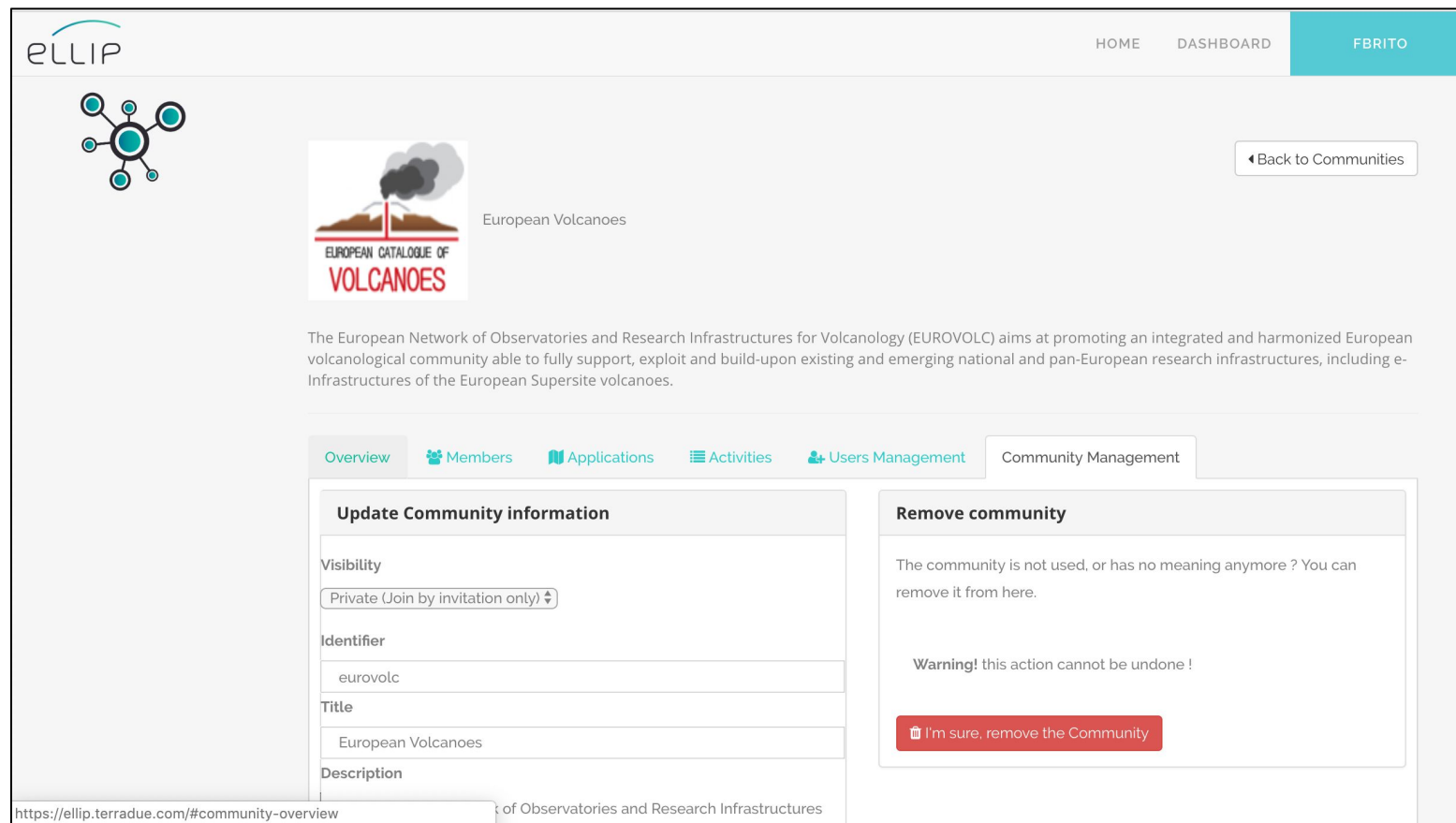
Out[166]:
   temp_index  geometry  date
1  (POLYGON ...  2018-12-24T10:54:19.0240000+01:00
2  (POLYGON ...  2018-12-24T10:54:19.0240000+01:00
1  (POLYGON ...  2018-12-24T10:54:19.0240000+01:00
  
```

Below the code, the 'Output View' shows a map of a volcanic area with green and yellow overlays, indicating the spatial distribution of the data.

Programmatically access the Platform APIs and data resources from a Jupyter Notebook workspace.

e.g. to post-process on-demand processing datasets, or time series of a data processing pipeline results

The Ellip Notebooks service allows to combine distributed data and services into a single, sharable application.



ELLIP

HOME DASHBOARD FBRITO

Back to Communities

European Volcanoes

The European Network of Observatories and Research Infrastructures for Volcanology (EUROVOLC) aims at promoting an integrated and harmonized European volcanological community able to fully support, exploit and build-upon existing and emerging national and pan-European research infrastructures, including e-Infrastructures of the European Supersite volcanoes.

Overview Members Applications Activities Users Management Community Management

Update Community information

Visibility
Private (Join by invitation only)

Identifier
eurovolc

Title
European Volcanoes

Description

Remove community

The community is not used, or has no meaning anymore ? You can remove it from here.

Warning! this action cannot be undone !

I'm sure, remove the Community

<https://ellip.terradue.com/#community-overview> of Observatories and Research Infrastructures

Contact us support@terradue.com