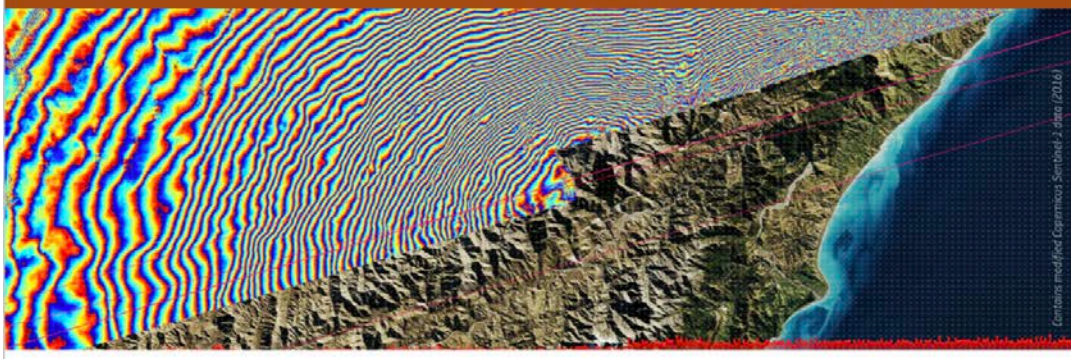
DIS-19 Outputs
Deliverables:

1. <u>Brochure:</u>

SUPPORTING GEOHAZARDS USERS WITH CLOUD-BASED EO SERVICES

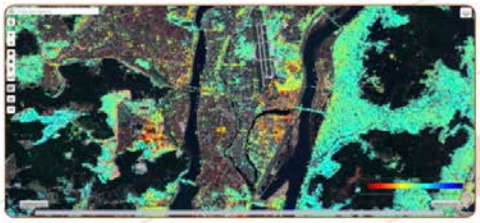
The **Geohazards Exploitation Platform (GEP)** is part of the Thematic Exploitation Platforms (TEP) initiative set up by ESA to provide an environment to process EO data and support the user community concerning data exploitation through cloud-based services. The platform is in pre-operations with an Early Adopter programme, supporting approximately 100 user organisations in 35 countries whose access is sponsored by ESA.



On-demand Advanced Terrain Motion services

Based on Radar data

Advanced services for SAR time series analysis provide surface deformation measurements over point targets, called Persistent Scatterers, using multiple SAR acquisitions. Deformation monitoring is measured in the line of sight of the satellite and accuracy can reach sub-centimetre level depending on the observation period considered.



Services available

FASTVEL

The **FASTVEL** service is developed by TRE-Altamira for generating differential interferograms and PSI-based mean displacement velocity maps. Copernicus Sentinel-1, ERS and ENVISAT missions are supported.

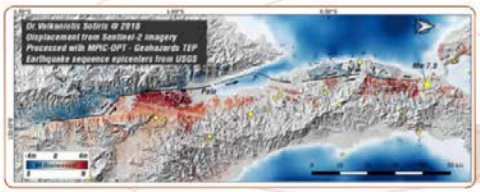
The **P-SBAS** processing chain is developed by CNR-IREA for the generation of ground deformation time series and mean displacement velocity maps. Copernicus Sentinel-1, ERS and ENVISAT missions are supported.

Other services include StaMPS.

Pusan city, South Korea - Mean displacement velocity processed with FASTVEL from 43 Sentinel-1 acquisitions from 01/08/2017 to 18/10/2018. Credits: TRE Altamira. Contains modified Copernicus Sentinel-1 data (2017,2018).

Based on Optical data

Image correlation techniques provide surface deformation information from the combination of pairs or time series of satellite images. This kind of service provides maps of horizontal displacements. They are particularly suitable for monitoring large displacements (cm to m) such as co-seismic slip (especially for strike-slip faults), lava flows from volcanoes or landslides. The techniques require very accurate co-registration of image time series.



Services available

MPIC

The **MPIC-OPT** service is developed by CNRS EOST for the processing of optical image time series to monitor persistent surface motion. It enables on-demand processing of time series of Sentinel-2 as well as very high resolution imagery from Pleiades and Spot6/7.

Sulawesi Earthquake, Indonesia – North-South surface motion processed by MPIC-OPT between the Sentinel-2 acquisitions of 17/09/2018 and 02/10/2018. Credits: Dr. Vaikaniotis. Contains modified Copernicus Sentinel-2 data (2018).

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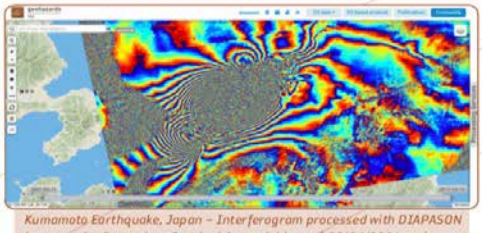
To apply, fill in the **User Request Form** and send it at: **contact@geohazards-tep.eu**

On-demand Conventional Terrain Motion services

These services are based on Differential SAR Interferometry (DInSAR) to measure surface displacements occurring between two dates.



Kumamoto Earthquake, Japan – Interferogram processed with DIAPASON between the Copernicus Sentinel-1 acquisitions of 08/04/2016 and 20/04/2016. Credits: TRE-Altamira. Contains modified Copernicus Sentinel-1 data (2016).

Services available

DIAPASON Stripmap / DIAPASON Sentinel-1

The **DIAPASON** DInSAR service is developed by the French Space Agency (CNES) and maintained by TRE-Altamira. Two versions of DIAPASON are available supporting **stripmap** acquisitions of ERS, Envisat and Sentinel-1 missions and **TOPSAR** acquisitions of Sentinel-1.

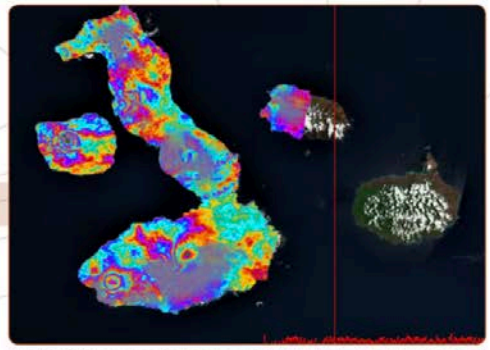
SNAP InSAR

The **SNAP InSAR** service provides an interferometric processor using ESA SNAP toolbox. Copernicus Sentinel-1 mission is supported.

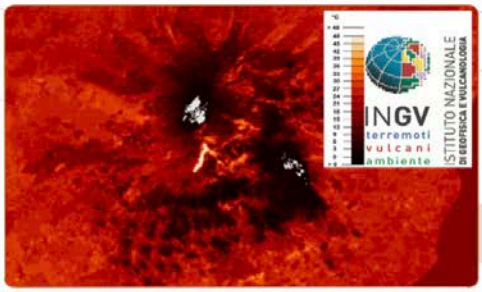
Other services include GMTSAR, GAMMA DInSAR, ADORE DORIS, P-SBAS.

Systematic Services – application example to volcano monitoring

The **Sentinel-1 InSAR Browse** service is developed by DLR. Medium- (50m spacing and 100m resolution) and High- resolution (25m spacing and 50m resolution) InSAR Browse provides interferometric products since 2015 and is updated for every new Copernicus Sentinel-1 acquisition. In particular, the High-Resolution InSAR Browse (25m spacing and 50m resolution) provides interferometric products on-request over target-areas defined by the user through the GEP operator (e.g. the 22 predefined volcanoes of the Volcano-2 Trial Case).



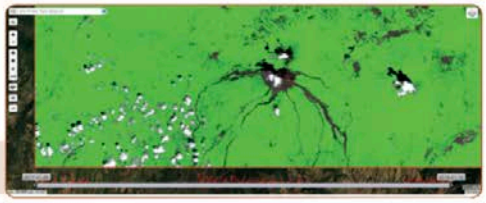
Interferogram generated by the InSAR Browse over the Galapagos Islands, Ecuador. Credits: DLR. Contains modified Copernicus Sentinel-1 data (2017).



The **STEMP** service is developed by INGV in the framework of the Volcanoes Thermal Applications (VOLTAGE) pilot of GEP. It generates surface temperature maps over volcanic areas from Landsat-8, Sentinel-2 and Sentinel-3.

Surface Temperature Map of Etna volcano, Italy, on 27/03/2017. A lava flow in bright white-yellow is clearly visible. Credits: INGV. Contains modified Landsat-8 data from USGS/NASA Landsat Progam.

The **VEGAN** Hot Spot and Vegetation Index systematic service is developed by NOVELTIS and INGV within the framework of the VEGAN project. It provides operational monitoring of volcanic eruptions by detecting temperature anomalies and the impact of the eruption on the vegetation through a vigor index. It is based on Sentinel-2 data.



Vegetation Vigor maps of the 20/11/2018 delivered by the VEGAN service over the El Fuego volcano, Guatemala. Credits: NOVELTIS. Contains modified Copernicus Sentinel-2 data (2018).

In the context of the **CEOS Working Group Disasters**, the GEP allows to access EO missions' data from different CEOS space agencies and provides an on-line environment to process imagery and share EO based products within a community of users. It also allows expert users to deploy their processing chains. In addition, external products from third parties can be published on the GEP. In particular, through the **Geohazards Lab initiative**, a **terrain motion mapping demonstration** is available to explain and show full scale results based on different terrain motion techniques using Optical and Radar data. In the spirit of the CEOS WG Disasters, the Geohazards Lab is also collaborating with EO practitioners of the geohazards community working on the standardisation and harmonisation of EO services and using the GEP to support this activity.

2. Terrain Motion Demo: https://geohazards-tep.eu/geobrowser/?id=terrainmotion_demo (DIS-19)