



EuroGEO Disaster Resilience Action Group Overview



Flood



Landslide



Earthquake Erosion



Forest Fire



Extreme Phenomena



Volcano



Industrial accident



Tsunami



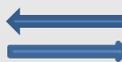
Aim

Disaster monitoring
Area of interest:
Southeast Europe, Mediterranean, Middle East, North Africa

Aim

Risk and disaster assessment and mitigation measures
Area of interest:
Global scale
Copernicus
The European Earth Observation Programme

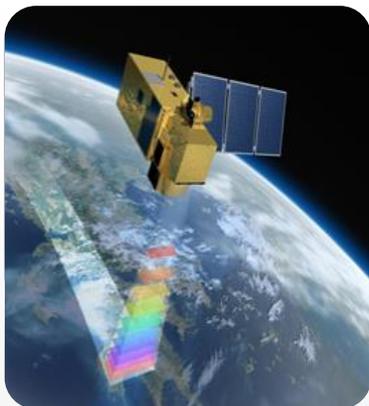
www.beyond-eocenter.eu



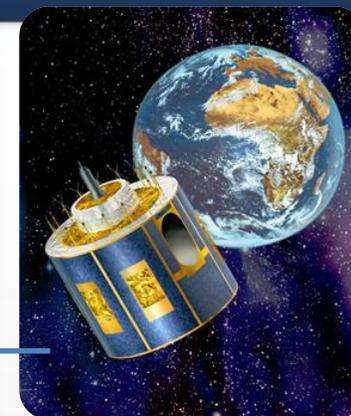
Project funded by the EUROPEAN UNION



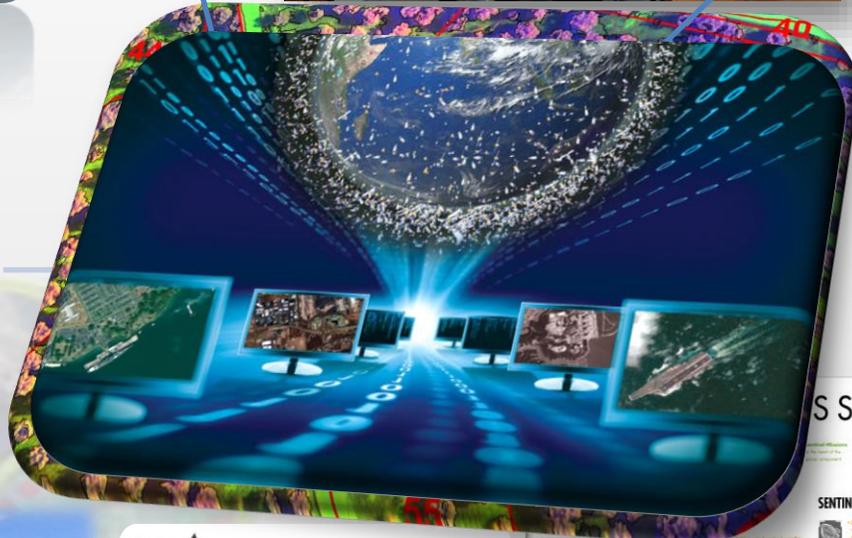
Monitoring Systems



Satellites
Polar Orbit
X-/L-band
Station
Sentinel
Mirror Site



Satellites
Geostationary
Orbit
MSG Seviri



in-situ

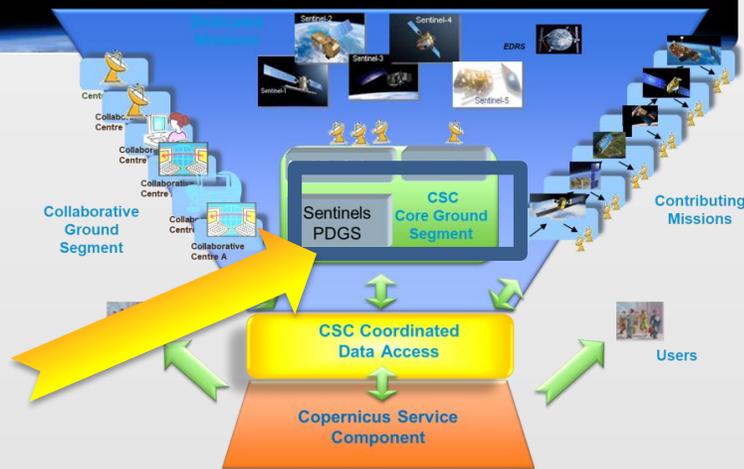
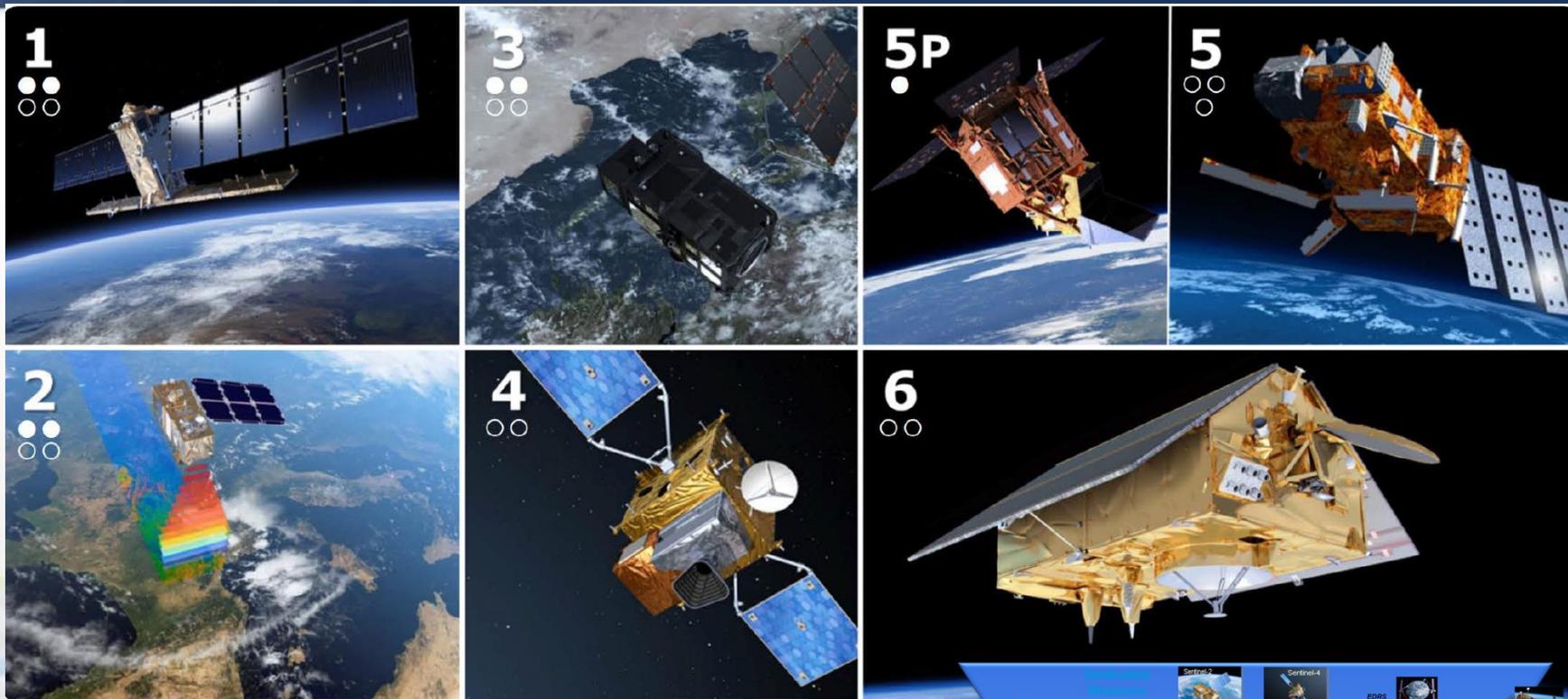


Terrestrial
Platforms and
Networks

Unmanned
Aerial
Vehicle

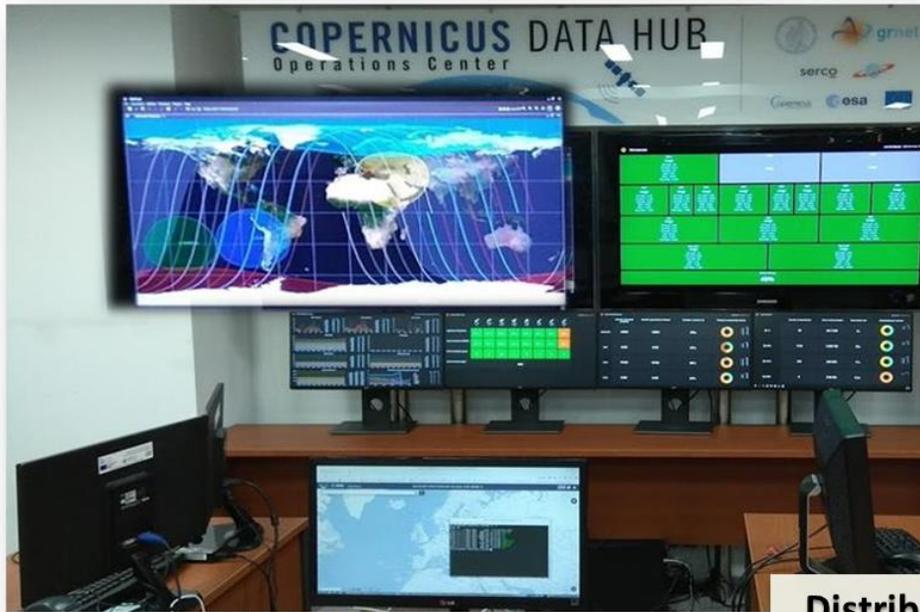


Copernicus Sentinel Missions and Data Access



Sentinel DataHub PARTNERSHIP ESA – NOA – GRNET S.A.

COPERNICUS DATA HUB Operations Center



- INTHUB #1
- COLHUB #3
- DIASHUB #3
- AfricaCastHub
- S-5p PreOps Hub
- S-5p Expert Users Hub
- TMPHUB #1
- HNSDMS

Distributes 55 TB Data/ Day
Operations 24/7/365
Speed GEANT 500-700 Mbps

60 VMs
storage: 800 TiB,
680 CPU cores,
2.2 TiB RAM

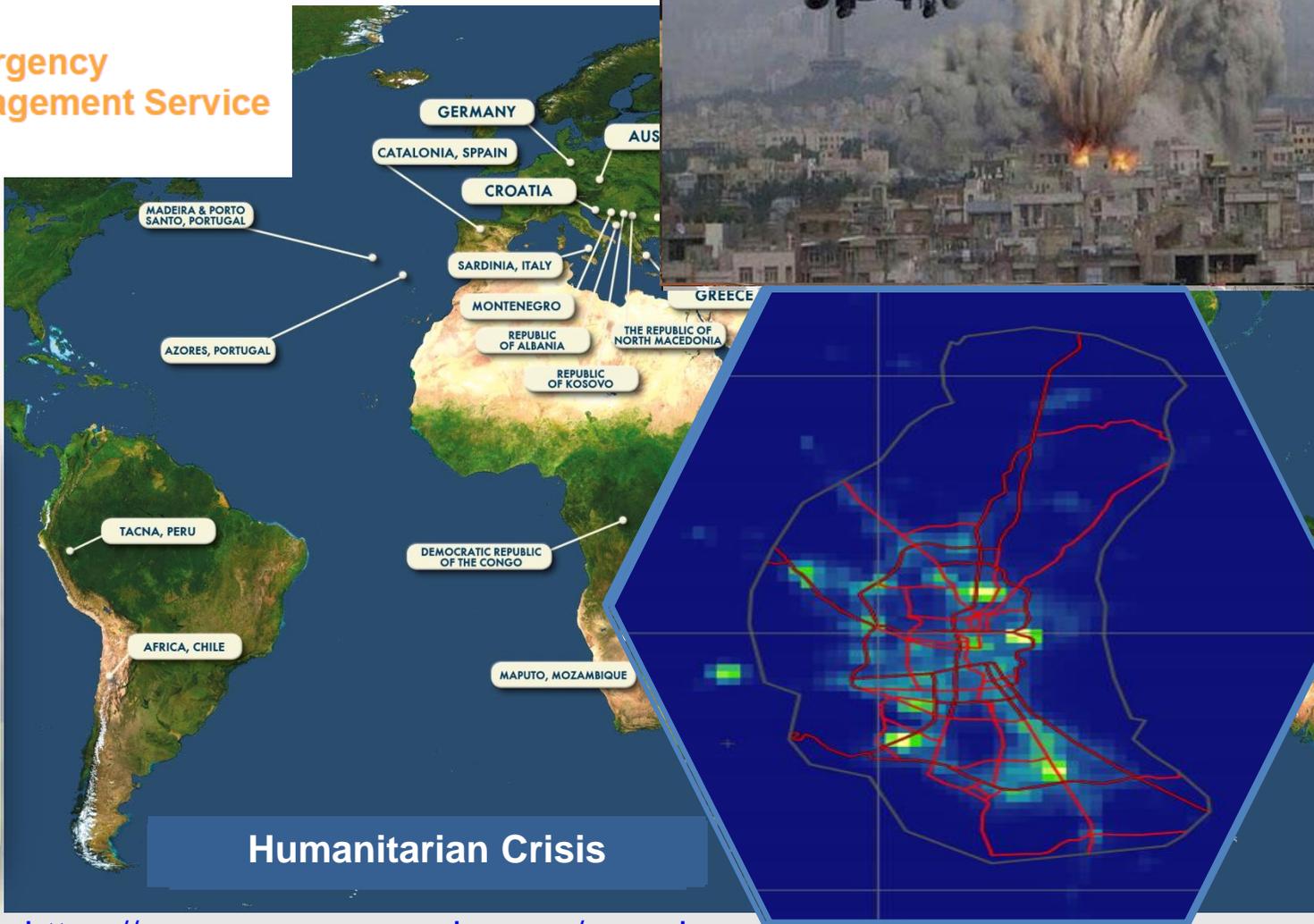
A 550 TB network filesystem for storing > 500 thousand Sentinel products at any time



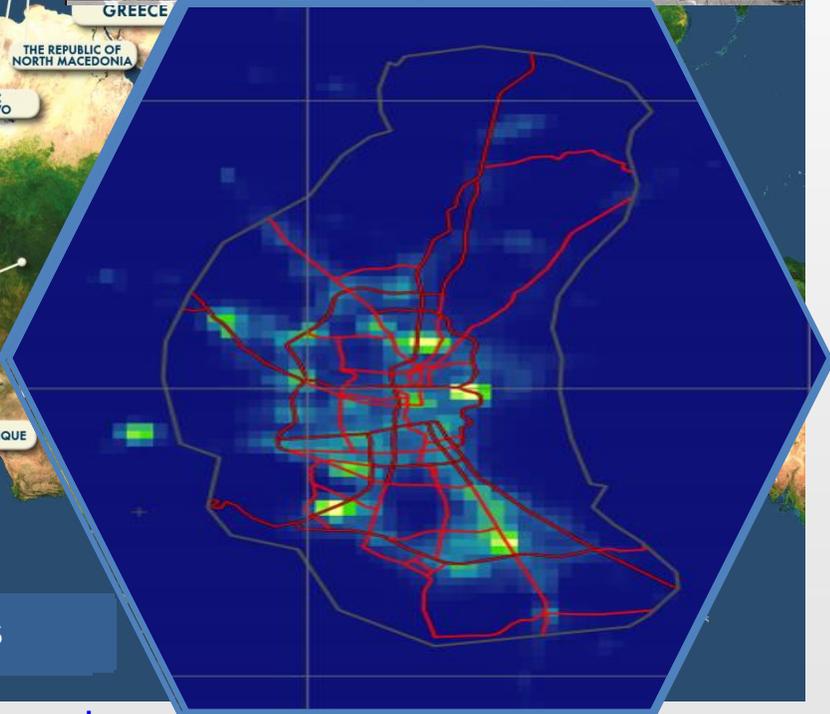
Implemented by the European Commission as part of the Copernicus Programme



Emergency Management Service



Humanitarian Crisis



Activation of the BEYOND in the Copernicus Emergency Management Service EMS
Prevention – Preparedness – Assessment – Response – Recovery



Reference map



Activation of the BEYOND in the framework of the European Fire Information System Program Real time EFFIS – Collaboration NOA - DLR-e-GEOS-SERTIT

Areas of responsibility: Europe, N. Africa, M. East, Balkans





UNITED NATIONS Office for Outer Space Affairs
UN-SPIDER KNOWLEDGE PORTAL
 Space-based information for Disaster Management and Emergency Response

Home Space Application Risks & Disasters Links & Resources Advisory Support Network Projects News

Regional Support Offices

A Regional Support Office (RSO) is a regional or national centre of expertise that is set up within an existing entity by a Member State or group of Member States that have put forward an offer to set up and fund the proposed RSO. An RSO can be hosted by a space agency, a research center, a university, or a disaster management institution, to name but a few examples. These offices communicate and coordinate with UN-SPIDER on a regular basis, covering the realms of outreach and capacity building, as well as of horizontal cooperation and technical advisory support.

The RSO section comprises a list of the UN-SPIDER RSOs as well as a brief description of each Office, and an overview of its facilities, expertise and infrastructure.



UNITED NATIONS Office for Outer Space Affairs

UN-SPIDER KNOWLEDGE PORTAL

Space-based information for Disaster Management and Emergency Response

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Greece Regional Support Office



UN-SPIDER conducts Technical Advisory Mission to Tunisia



Get in touch

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 GR-15236 Athens
 Greece

At a glance:

The Institute for Astronomy, Astrophysics, Space Applications and Remote Sensing (IAASARS/NOA) is one of the three institutes of the National Observatory of Athens, the oldest research institution of Greece. Between the main activities of the Institute are basic and applied research in a number of topics relating to astrophysics, space science, remote sensing, and signal processing, as well as ground, and space based earth observation services. The institute is also committed to outreach and science dissemination for the general public.

IAASARS/NOA hosts the operations of BEYOND (www.beyond-eocenter.eu): a European Centre of Excellence for Earth Observation based monitoring of Natural Disasters, which situates IAASARS/NOA as a dynamic actor for multi-hazard management at regional, Mediterranean, and European level. BEYOND meets the clear need for operating a regional Centre for disaster risk assessment, and monitoring, and disaster mapping with remote sensing means. It systematically provides products and services mainly for South-Eastern Europe, N. Africa, Middle East, and the Balkans. The IAASARS/NOA has successfully achieved, through the operations of BEYOND, to enhance its observational capacities, drawing new creative perspectives in EO-based disaster management and service delivery, while allowing sustainable collaborative schemes to be formed.

Capacity Building:

The BEYOND Center of Excellence substantially contributes to human, institutional and infrastructure capacity building, via the uptake of a crucial role in coordinating local and regional actors. It creates multi-directional communication and co-operation channels with research centers, and universities, as well as space agencies, international organizations, and institutional authorities all around Europe, N. Africa, Middle East, and the Balkans. It is not only building around new EO monitoring infrastructures, but also seeks to the effective integration and exploitation of the existing know-how, and skills, as well as the technical, and financial resources, in the context of the environmental monitoring and disaster risk reduction. It deploys advanced modeling capacities to meet operational needs, for real-time multi-hazard assessment such as fires, and fire progression, smoke, dust, and toxic pollutant dispersion, flooding monitoring and flooding risk, as well as earthquake, volcanic, and landslide risk.

About EuroGEO

EuroGEO brings together environmental and Earth observation resources in Europe. This page explains what it does, who it is for and how it fits into the global Earth observation system.

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What is EuroGEO?

The Group on Earth Observations (GEO)

Earth observation in Europe today

Focusing on users – who will benefit?

Other regional GEO initiatives

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What is EuroGEO?

EuroGEO is Europe's part of the Group on Earth Observations (GEO) - a worldwide network working to build a Global Earth Observation System of Systems (GEOSS).

On 3 July 2019 during the annual EuroGEOSS workshop, EuroGEOSS (as launched on 23 October 2017) was renamed EuroGEO following a decision by the GEO XV Plenary (2018). The other regional initiatives have also made this change.

EuroGEO enables Europe to position itself as global force in Earth observation thanks to the vast knowledge gained through running the [Copernicus programme](#) and others.

GEOSS is a worldwide system which aims to use earth observation data to improve the lives of citizens and help governments make good, evidence-based decisions.

GEOSS is operated by the Group on Earth Observations (GEO).



The EuroGEO Disaster Resilience Action Group includes 7 Expressions of Intent



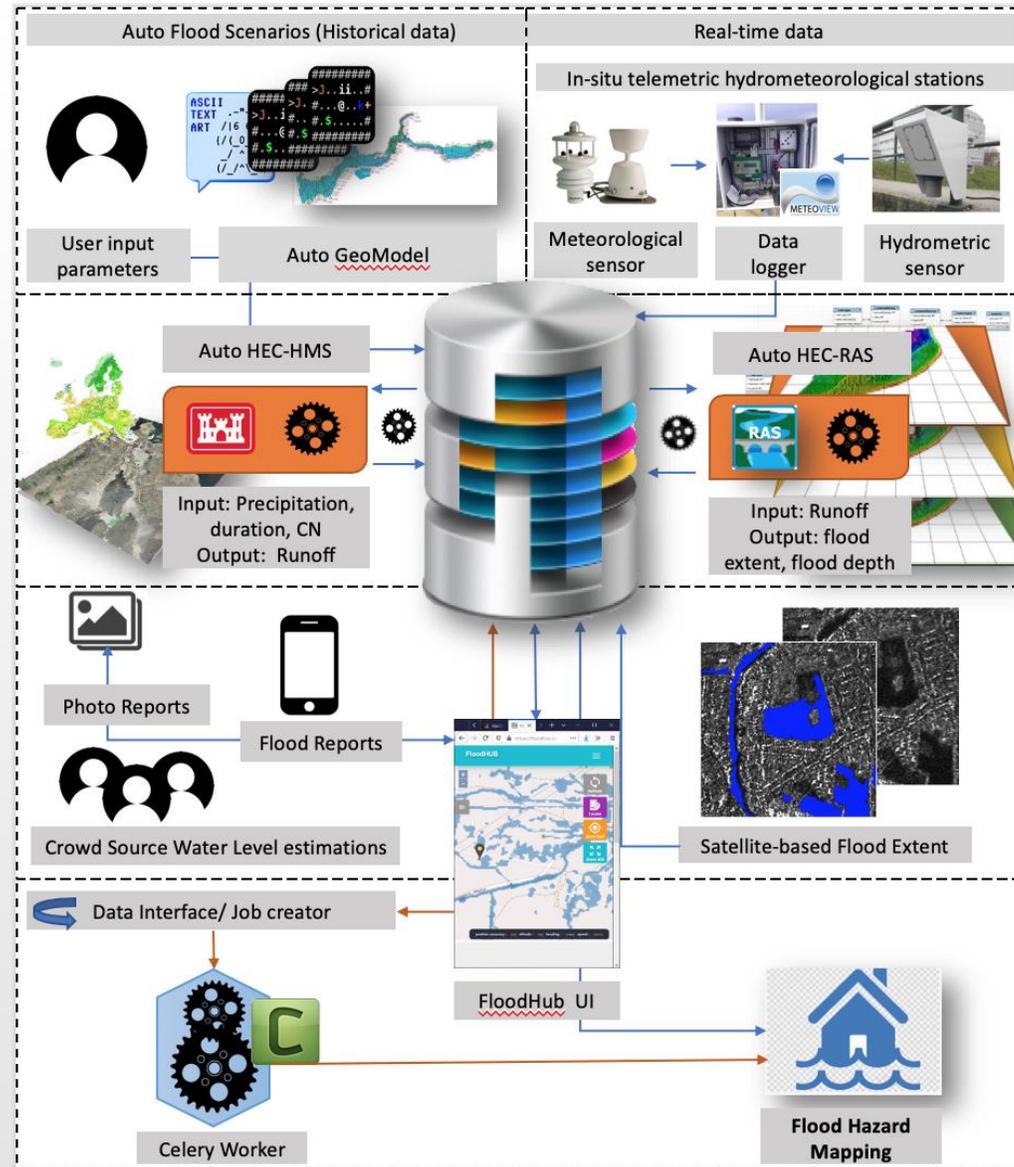
FloodHUB

Earth Observation for Disaster-Resilient Societies (EO4DisasterS) led by IAASARS/NOA

The focus is on flash flood mapping at large scale (city level) and creation of operational awareness pictures for crisis management in real time by assimilating in flash flood models multiple sources of data including mostly satellite data (Sentinel), in-situ sensors, and crowdsourced data.

You can see our progress so far in the [video](#) that we presented in the GEO Week 2019 in Canberra.

<http://beyond-eocenter.eu/index.php/web-services/floodhub>





FloodHUB

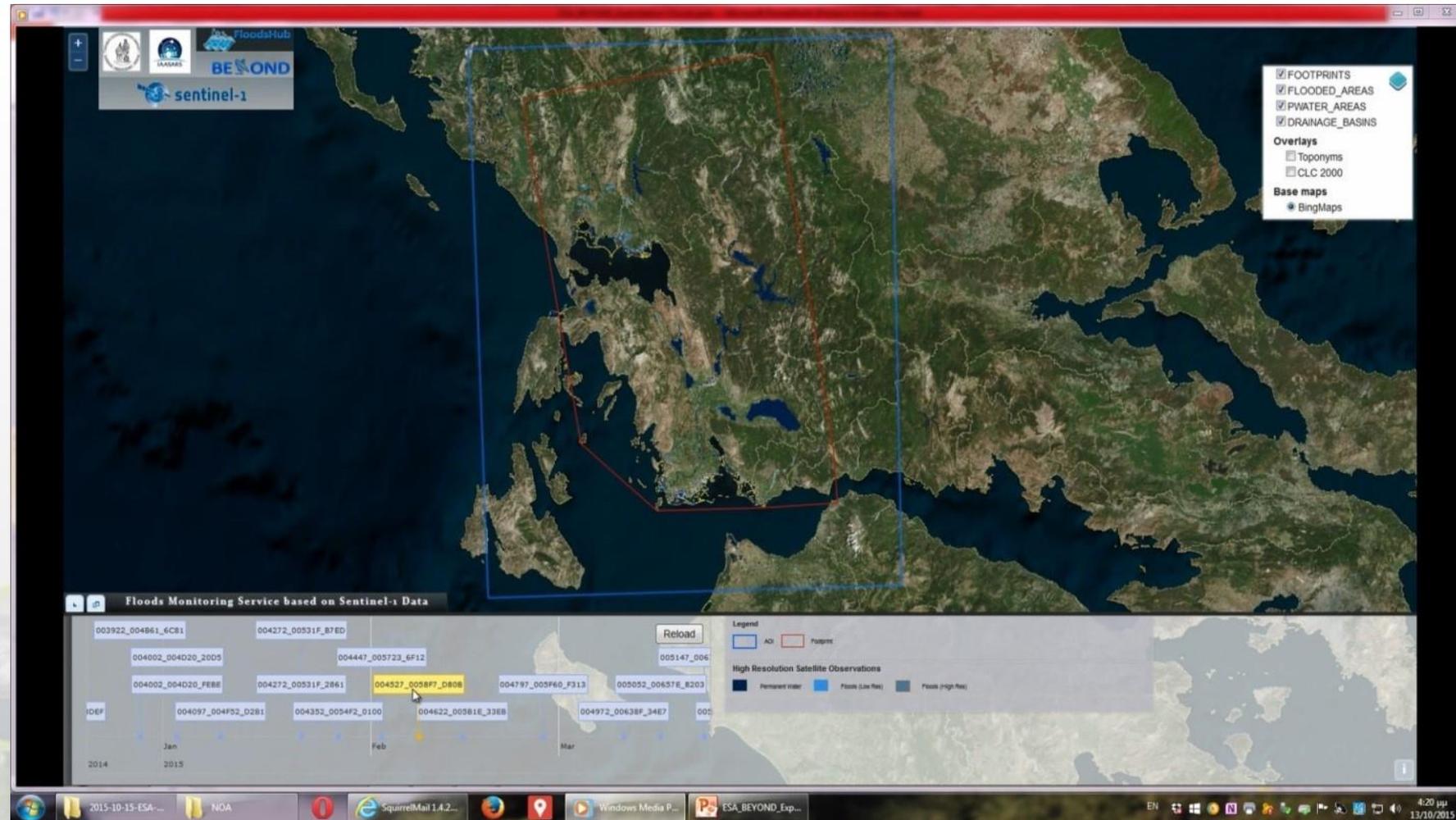
Real-Time Flood Monitoring service for Mandra, Attica



FloodHUB

DIACHRONIC FLOODS MAPPING

Depicting the results of the diachronic mapping of flooded areas in selected river basins of special interest, following the processing of Sentinel images from the Hellenic National Sentinel Data Mirror Site, through a fully automated process.



<http://beyond-eocenter.eu/index.php/web-services/floodhub>



EuroGEO Showcases: Applications Powered by Europe

**Disasters
Resilience
Showcase**



The e-shape project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement 820852

- **Pilot 6.1 | EO4D_ASH - EO Data for Detection, Discrimination & Distribution (4D) of Volcanic ash**
 - **Lead Partner: CNR, Partners: INGV, FMI, NOAA, IMO, CNRS**
- **Pilot 6.2 | GEOSS for Disasters in Urban Environment**
 - **Lead Partner: Fondazione CIMA, Partners: EU SATCEN, NOAA**
- **Pilot 6.3 | Assessing Geo-hazard vulnerability of Cities & Critical Infrastructures**
 - **Lead Partner: EGS, Partners: PLANETEK, EU SATCEN**
- **Pilot 6.4 | ReSAgri - Resilient & Sustainable ecosystems including Agriculture & food**
 - **Lead Partner: NOAA, Partners: NP, IIASA**

Consortium → 54 partners
Starting date → 01/05/2019
Project duration → 48 months
EU contribution → 14 998 976.27 €

<https://e-shape.eu/>



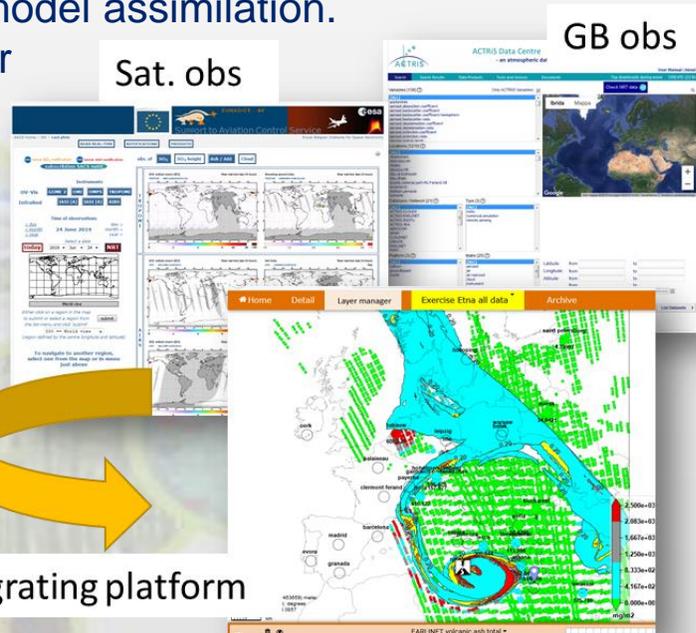
Pilot 6.1 | EO4D_ASH - EO Data for Detection, Discrimination & Distribution (4D) of Volcanic ash

- **Lead Partner: CNR, Partners: INGV, FMI, NOAA, IMO, CNRS**
- ✓ Strengthening the EO and in-situ data exploitation and multi-source (satellite, remotely sensed, crowd, and ground-based network) data integration to derive innovation and tailor methodologies for volcanic ash detection, discrimination and monitoring.
- ✓ Application of Early Warning lidar product developed in ACTRIS RI to lidar observations at volcanic observatories.
- ✓ Use of lidar observations in model assimilation.
- ✓ Use of a common platform for visualizing the integrated and synergistic products.

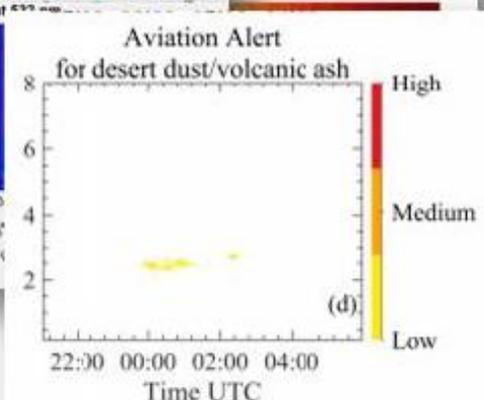
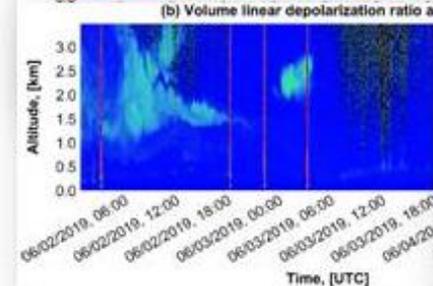
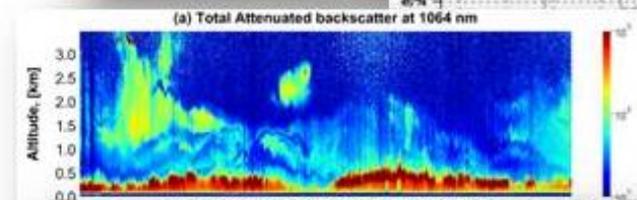
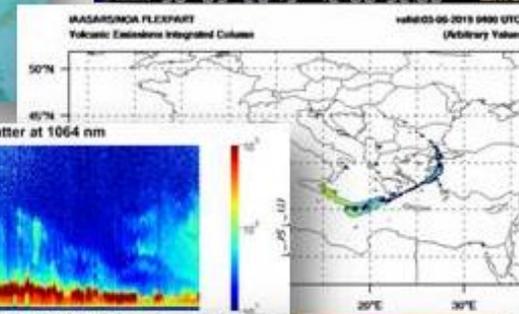
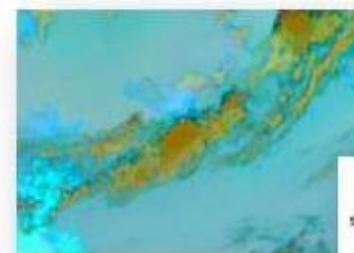
Key Users: Volcanic Ash Advisory Centers (VAACs), Airlines, Policy Makers, Tourism Investors

Sat. obs

GB obs



Integrating platform



e-shape <https://e-shape.eu/>



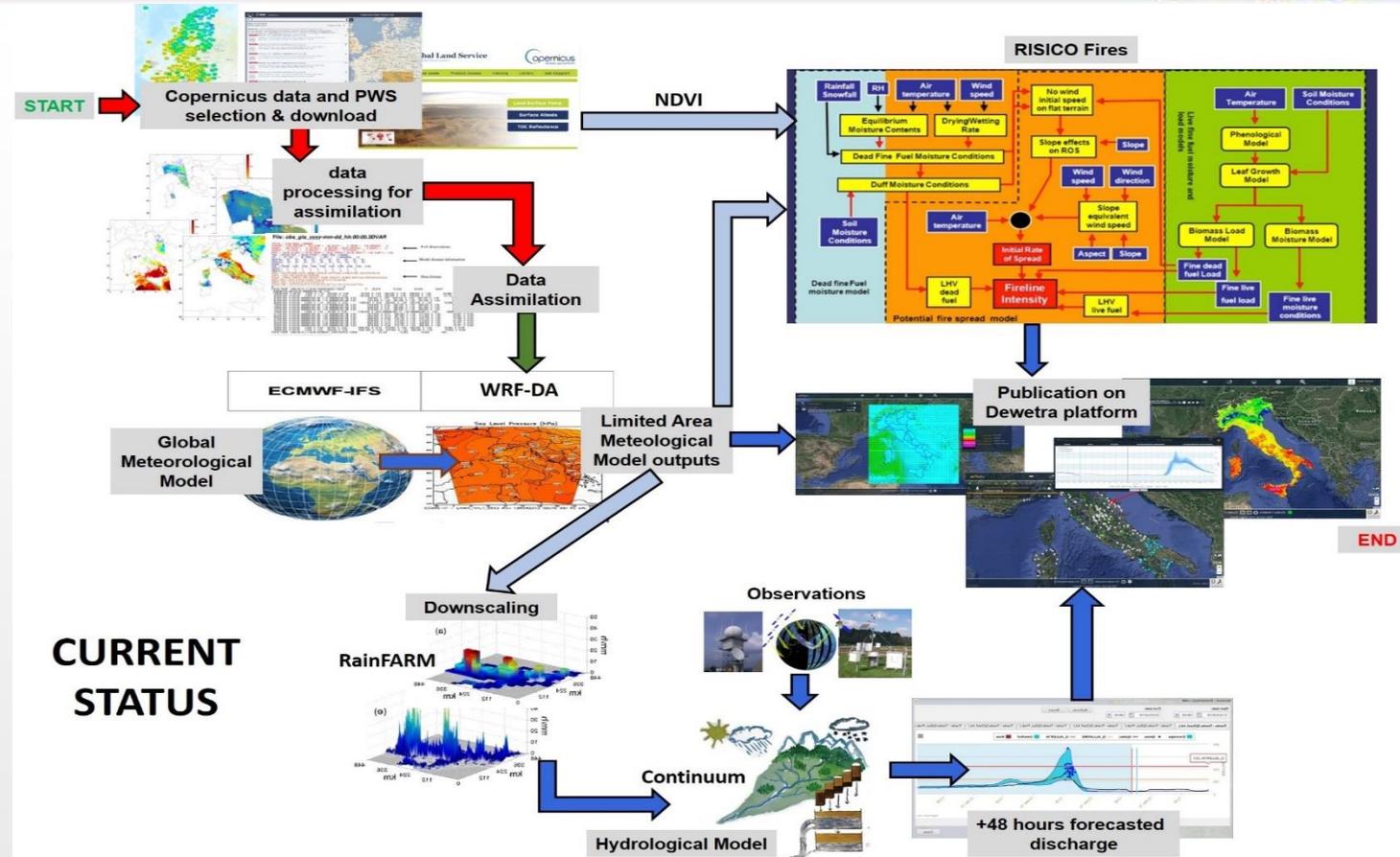
Pilot 6.2 | GEOSS for Disasters in Urban Environment

• Lead Partner: Fondazione CIMA, Partners: EU SATCEN, NOA

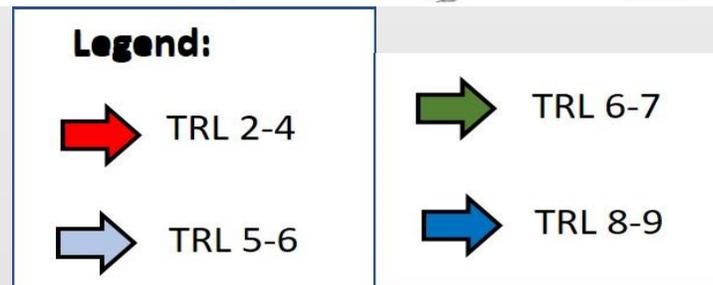
- ✓ Using available in situ authoritative weather stations, existing citizen scientist weather stations, observations, low-cost sensors, to deploy an hydro-meteorological forecasting system for high-impact weather events, such as flash-flood, wind storms, hail storms, lightning storms, peri-urban fires.
- ✓ Exploring the possible added value of the assimilation of Sentinel data and Personal Weather Stations data for the hydro-meteorological forecasting of flash-flood and forest fire events.

Key Users: Civil Protection Agencies, hydro-meteorological predictions agencies, disaster risk reduction institutions

<https://e-shape.eu/>



CURRENT STATUS



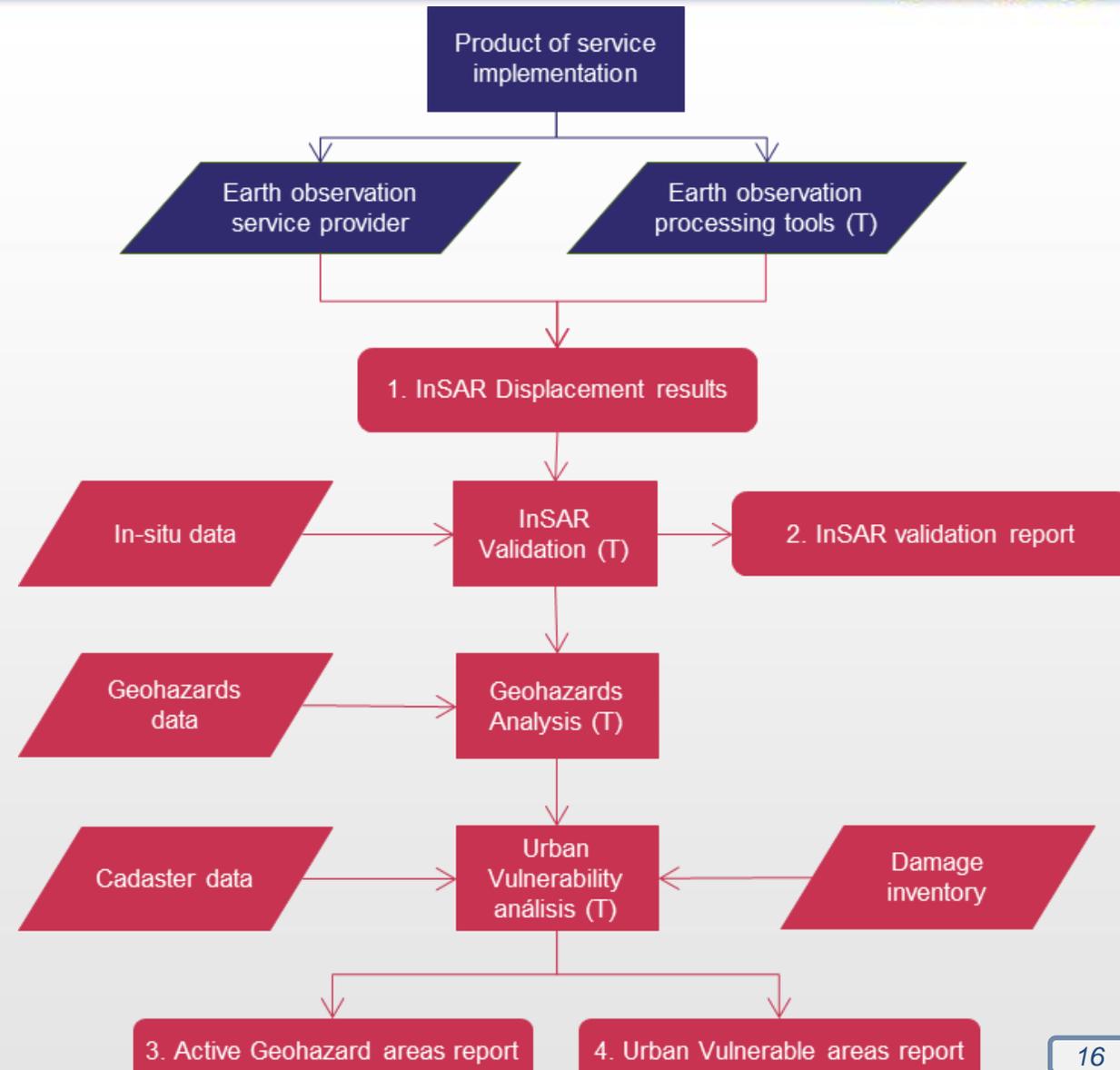


Pilot 6.3 | Assessing Geo-hazard vulnerability of Cities & Critical Infrastructures

- **Lead Partner: EGS, Partners: PLANETEK, EU SATCEN**
- ✓ Generation of different products that evaluates the activity of different geo-hazards (like subsidence, landslides and mining-related activities) on urban areas. Final reports are comprehensive maps useful for non-technical land managers.
- ✓ Turning of complex and big InSAR data with thousands of measurement points into useful products and maps remarking the most vulnerable areas using geological, geotechnical, hydrogeological and economical data.
- ✓ Based on Sentinel 1A/B image processing and in situ data (GNSS station, geological and Geohazard layers as well as urban layers and pipeline network layers).

Key Users: Urban planners and managers, Policy Makers, Industry and engineering companies, Insurance companies, Civil protection authorities

<https://e-shape.eu/>





Pilot 6.4 | ReSAgri - Resilient & Sustainable ecosystems including Agriculture & food

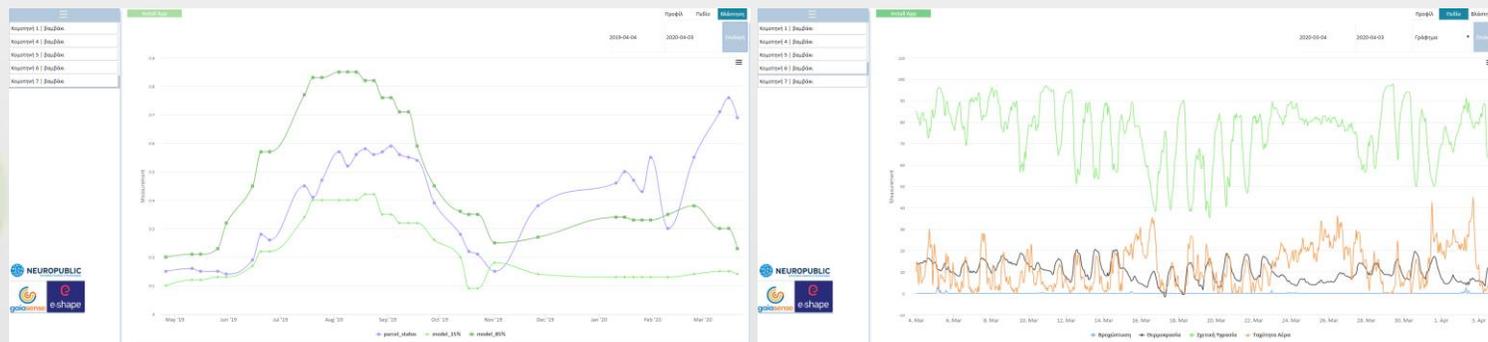
- **Lead Partner: NOA, Partners: NP, IIASA**

- ✓ Providing novel products and services that were not available until today to accommodate the needs of the insurance sector as well as the farmers' associations such as risk and damage assessment, adverse selection (underwriting), high-level monitoring, and early warning for perils in agriculture.
- ✓ Effective combination of climatological, earth observation, in-situ and NWP-based data towards a more sophisticated monitoring of the agricultural needs.

- ✓ **Scenarios 1 & 3 (NP):** Development of smart-farming applications at parcel scale to accommodate Risk/Damage Assessment. For each parcel, in-situ observations from a dense network of smart farming sensors is presented, alongside a comparison of measured vs observed NDVI indices from high-resolution Sentinel data. The service is implemented in Gaiasense platform and is expected to promote rapid pay-outs and simplify claims processes after a disaster.

Key Users: Interamerican SA,
GR Association of farmers
GAIA EPICHEIREIN, GRNET

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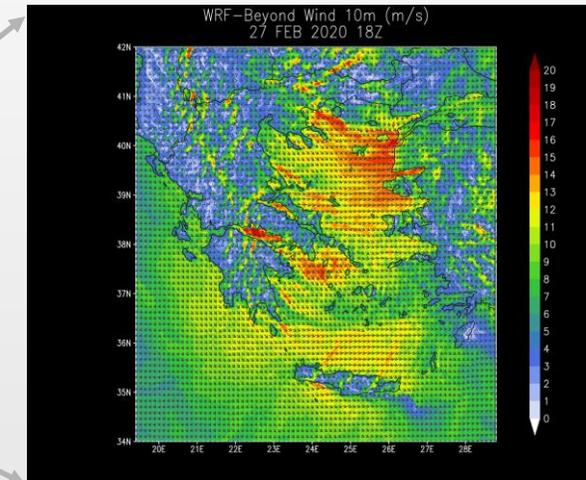
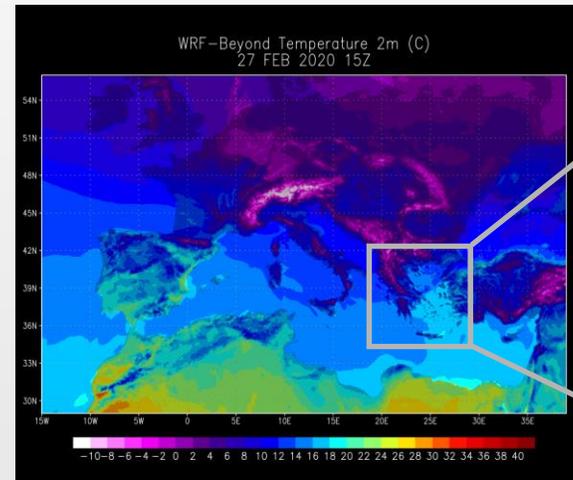
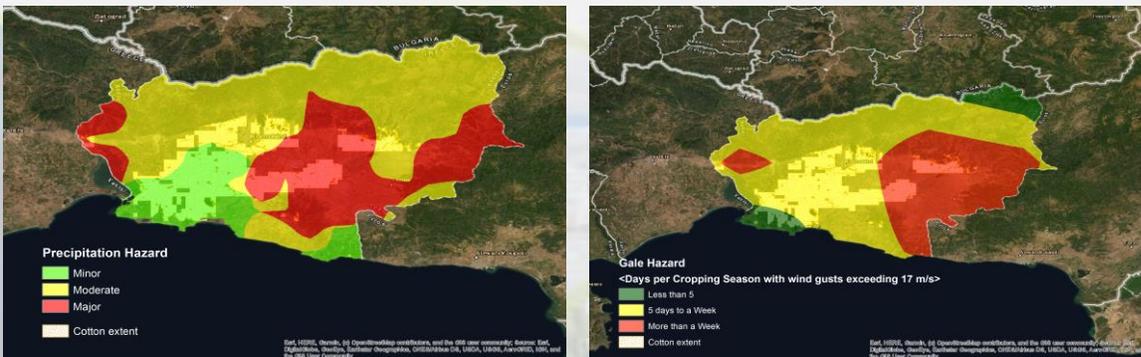




Pilot 6.4 | ReSAgri - Resilient & Sustainable ecosystems including Agriculture & food

- **Lead Partner: NOA, Partners: NP, IIASA**
- ✓ **Scenario 2 (NOA):** Statistical analysis of the main weather perils for cotton over a time-span of 4 decades (1980-2019) were performed using data from ECMWF ERA5-land, ERA5 and CHIRPS precipitation estimates. Segments of the crop extent that have high risk are denoted in order to accommodate the needs of the underwriter.

- ✓ **Scenario 4 (NOA):** A dedicated high-performance server has been acquired to implement the latest version of WRF-ARW model. Model scripts have been finalized and the model is running operationally daily, initialised from the 12Z cycle of GFS.





EuroGEO Showcases: Applications Powered by Europe

Water Resources Management Showcase



The e-shape project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement 820852

- **Pilot 5.2 | Satellite Earth Observation-derived water bodies & floodwater record over Europe**
 - **Lead Partner: LIST, Partners: SMHI**
- ✓ Co-designing and providing the final water bodies and flood hazard products in close collaboration with selected members of the Global Flood Partnership (GFP).
- ✓ Estimating flood hazard at a large-scale based on EO-derived flood maps and long-term hydrological modelling simulations.
- ✓ Using the unique data set generated by the 'water bodies and floodwater record' pilot to support many different applications and research activities of GFP in the fields of climate research, large scale flood forecasting, flood hazard and risk analyses, land use monitoring etc.

Key Users: Global Flood Partnership
(chair: Joint Research Centre)

<https://e-shape.eu/>



ECMWF
EUROPEAN CENTRE FOR MEDIUM-RANGE WEATHER FORECASTS



European
Commission

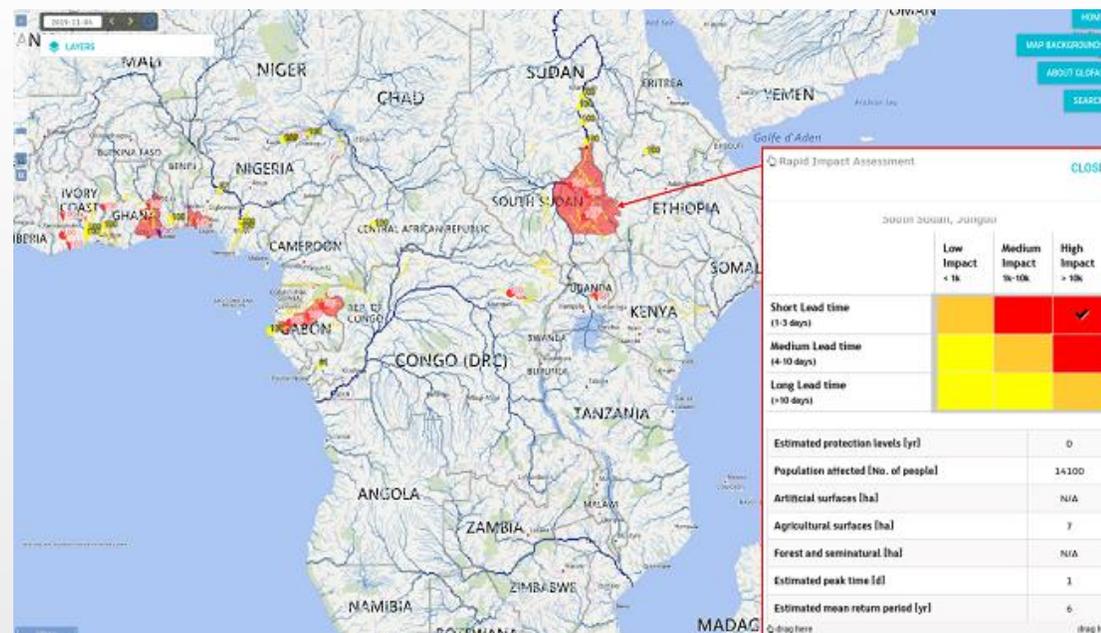
• Global Flood Awareness System (GloFAS)

- Lead Partner: European Centre for Medium-Range Weather Forecasts (ECMWF)

The Global Flood Awareness System (GloFAS), jointly developed by the European Commission (EC) and the European Centre for Medium-Range Weather Forecasts ([ECMWF](https://www.ecmwf.int)), is a **global hydrological forecast and monitoring system** independent of administrative and political boundaries.

It couples state-of-the-art weather forecasts with a hydrological model and with its continental scale set-up provides downstream countries with information on upstream river conditions as well as continental and global overviews.

GloFAS produces daily flood forecasts (since 2011) and monthly seasonal streamflow outlooks (since November 2017). GloFAS has been fully operational as a [Copernicus Emergency Management Service](https://www.copernicus.eu/en/emergency-management-service) since April 2018.



GloFAS system upgrade to 2.1 on 5 November 2019:

- ✓ Upgraded river discharge reanalysis in near real-time
- ✓ Upgraded flood thresholds
- ✓ New set of river discharge reforecasts
- ✓ New flood impact assessment and mapping products
- ✓ Additional ancillary map layers



- **NextGEOSS – Enhanced landslide risk assessment framework**
 - **Lead Partner: NOA**

NEXTGEOSS

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 730329

- ✓ Providing an enhanced multi-hazard risk assessment framework based on the statistical analysis of long time series of data accessible through the NextGEOSS Data Hub. Focus is given on landslide events monitoring and landslides susceptibility estimation.
- ✓ In this pilot, three discrete steps are taking place:
 1. Generation stack of interferograms derived from SENTINEL-1 images for a specific area of interest, calculated on the NextGEOSS cloud environment;
 2. Stack of interferograms are used as input data for the generation of line-of-sight ground velocities based on Persistent Scatterer Interferometry technique, processed on the NextGEOSS cloud environment. This component provides ground velocities as output feature data (WFS) with ground deformation information embedded;
 3. The third step updates the landslide inventory, based on the ground velocities (Step 2) and a specific reasoning (e.g. volume, slope, LU/LC). After the identification of new landslides, NOA's enhanced landslide model runs and provides the updated landslide susceptibility map (WMS). This model runs on NOA's dedicated server based on the ground velocities;



- **NextGEOSS – Multi-scale Change Detection for Space and Security**
 - **Lead Partner: SatCen**

NEXTGEOSS

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 730329

- ✓ Providing tools for detecting and characterizing changes occurring on the Earth's surface.
- ✓ Exploring methods for extracting information on changes at different scales.
- ✓ Fostering extensive exploitation of the GEOSS data hub.
- ✓ The pilot demonstrates the usage of the GEOSS Data Hub for discovery and access of Copernicus data (in particular Sentinel-1 and Sentinel-2 Level 1) as well as the exploitation of these datasets for the detection of changes occurring at different temporal and spatial scales.
- ✓ The pilot allows the user to execute the provided services on specified areas of interest, generally ranging from local to regional level.
- ✓ The main pilot beneficiaries are the stakeholders interested in EO data exploitation for security applications such as decision-makers in the field of the Common Foreign and Security Policy (CFSP). Moreover the transversal nature of the Change Detection topic expands the relevance of the pilot to several other user communities with an interest in detecting changes on the Earth's surface (e.g. to address environmental or humanitarian issues).



- **Strengthen multilevel governance in natural hazards and disaster management**
 - **Lead Partner: Multi-hazards Functional Centre of the Regional Environmental Protection Agency of Calabria**
- ✓ Design, develop and test application useful for strengthen multilevel governance in natural hazards forecast and management, and in preparedness and prevention phases of disaster management.
- ✓ End user dimension: Civil emergencies agency, Decision Makers
- ✓ Market potential: National authorities, Environmental Agencies
- ✓ Transnational deployment in Europe
- ✓ Coupling with Copernicus EMS

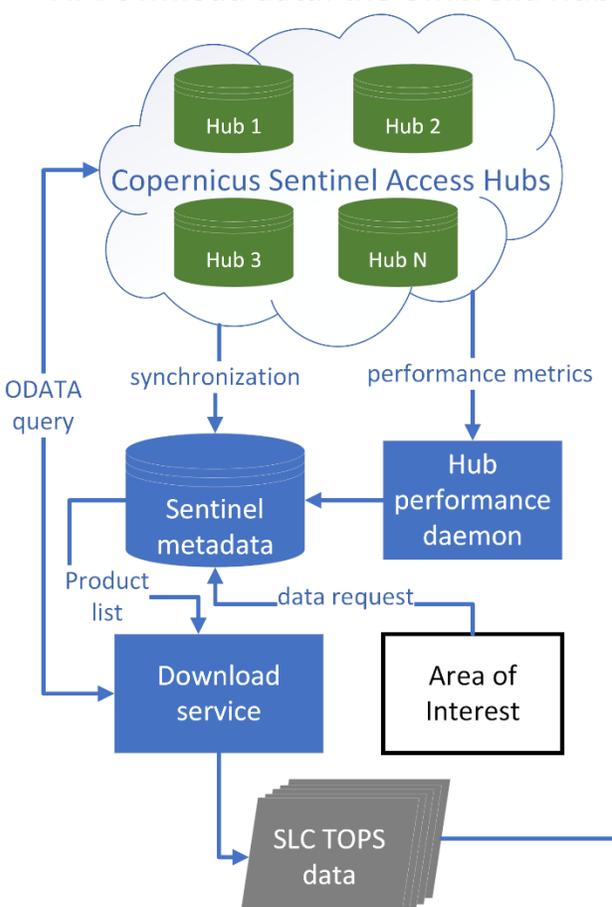




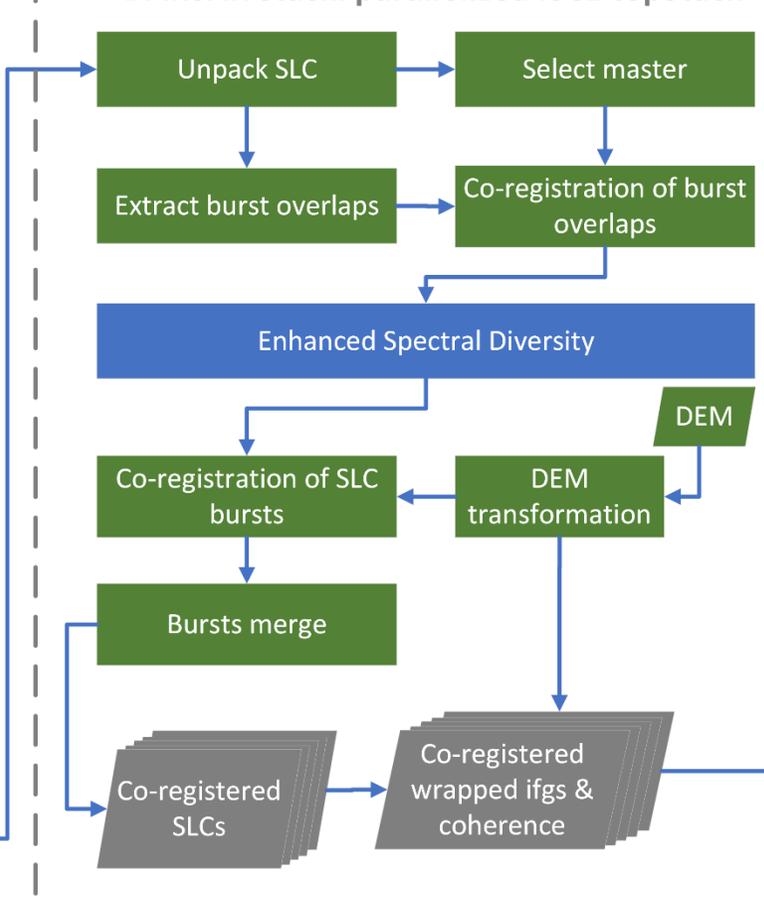
GeoHUB

InSAR Greece: A national ground motion service, based on big Copernicus Sentinel-1 data

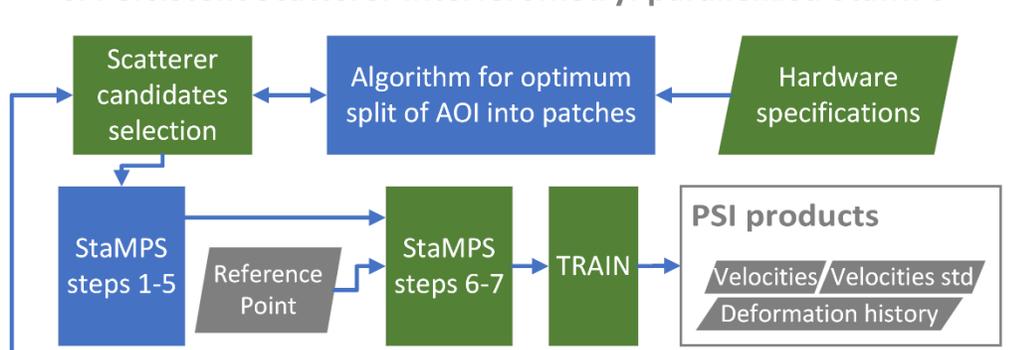
A. Download data: the Umbrella Hub



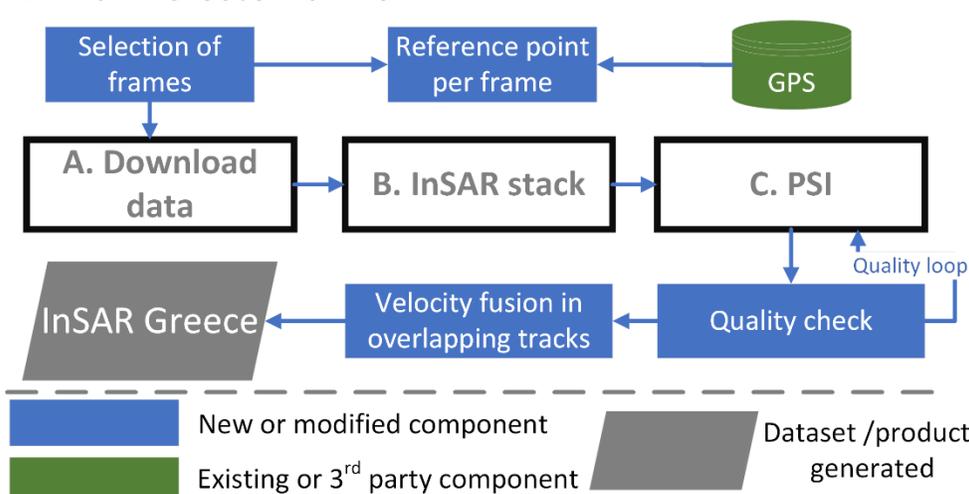
B. InSAR stack: parallelized ISCE topStack



C. Persistent Scatterer Interferometry: parallelized StaMPS



D. InSAR Greece workflow





Action Group
CLIMATE

EO4EViDence (Earth Observation for Epidemics of Vector-borne Diseases)

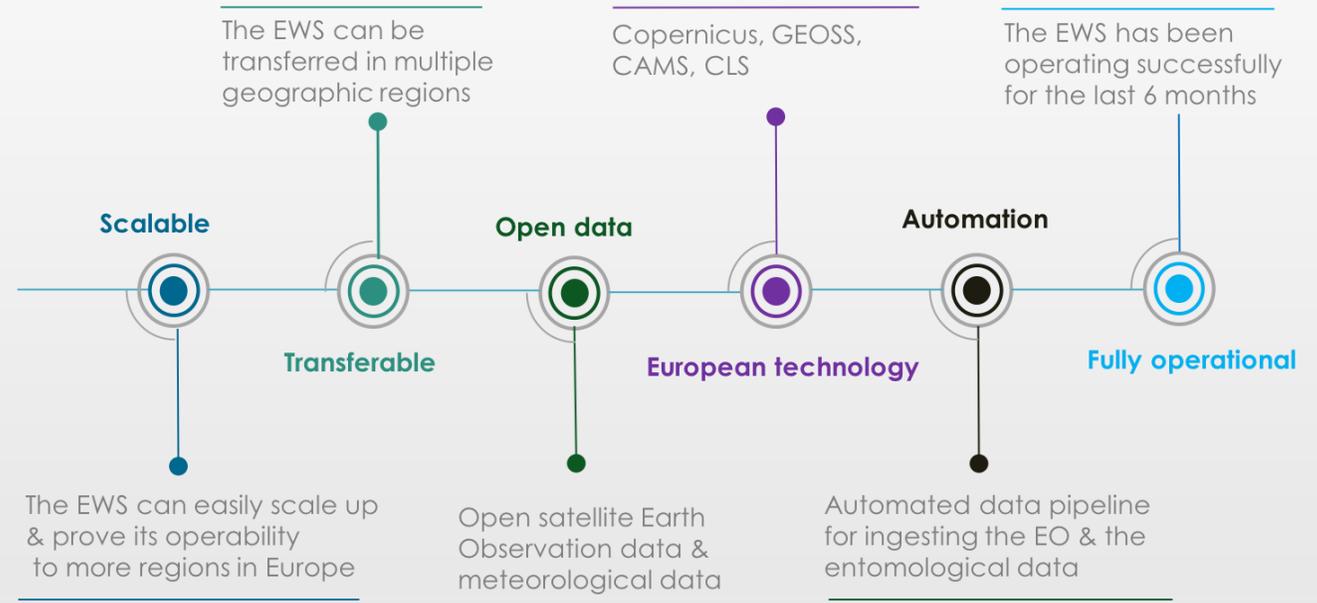
→ Early Warning system using EO Data to **forecast & monitor** mosquito-borne diseases in Europe (Greece, Italy, Serbia, France & Germany)

Innovation:

- **Multi sourced data: Space & ground** – Earth Observation data, **entomological, epidemiological & ornithological** data
- **Open source: Free** and **open** data & technologies
- **Innovative technological solution** for **big data - AI**
- **Scalable** and **sustainable** system
- System potential/ added value **demonstrated at local level**
- **Technologies** developed in the EU
- **European** scale

Impact:

- Tool for helping decision-makers to improve health system responses, take preventive measures in order to curtail the spread of mosquito borne diseases
- Address the relevant priorities of the SDGs such as good health and well-being (SDG 3) and climate action SDG 13.



thank you!

