



Committee on Earth Observation Satellites

WGDisasters-14 Meeting

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ESA, BRGM

CEOS Geohazards Lab

Virtual meeting

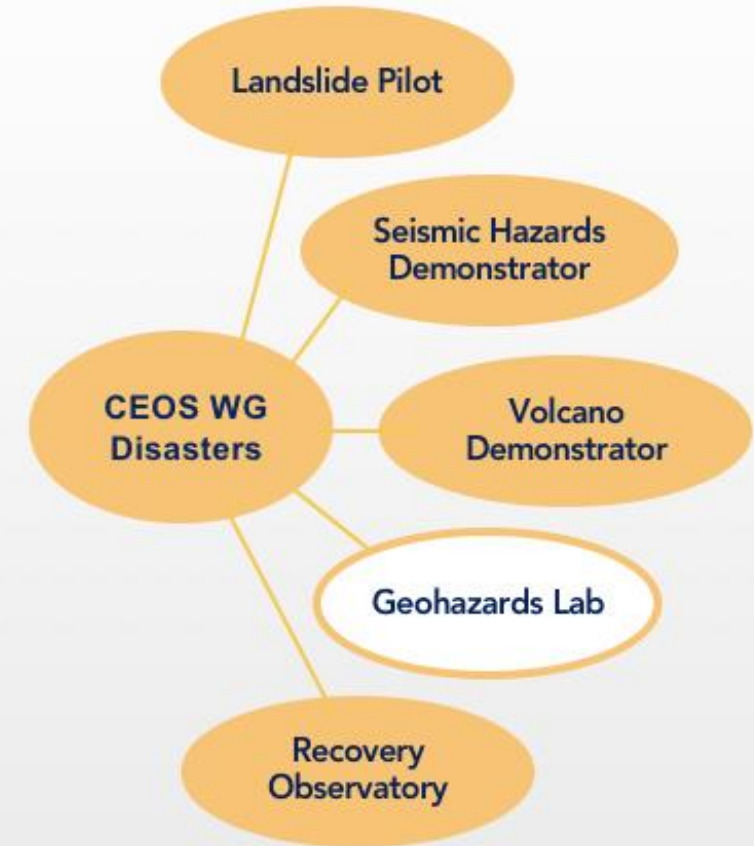
1 – 3 September 2020





A platform with federated resources to provide data access and an online processing and e-collaboration environment to exploit EO data to assess geohazards and their impact

- ✓ Supports and complements the CEOS WG Disasters thematic activities (on-going pilots, follow-on activities and the RO), GSNL and users from the broader geohazards community.
- ✓ Maximize use of EO techniques and cloud processing by the EO expert community
- ✓ Achieve acceptance of EO products by the non-expert EO scientific community, non-EO downstream users and decision makers





- Started Federation with A2S/HPC Mésocentre at CNRS EOST for exploitation of Optical services for landslide detection, inventory mapping and monitoring of landslide motion
- Pleiades licence of CNES signed by ESA TO ALLOW online exploitation of data in place
- Online processing jobs for various CEOS WGD thematic activities (RO, Landside Pilot etc.)
- Animation and promotion of results



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sentinel-2

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Changing lands
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SENTINEL-2 MAPS INDONESIA EARTHQUAKE

5 October 2018: A 7.5-magnitude earthquake and tsunami hit Indonesia on 28 September, destroying homes and hundreds of lives. As the death toll continues to rise, the effects of this natural disaster are far-reaching, with hundreds of thousands of people seeking access food, water and shelter in the aftermath of this tragedy. The European Union activated its Emergency

Artificial Intelligence for disaster mapping with the ALADIM services: It has been used for automated landslide detection after the heavy rains November 2019 in Kenya

jeanphilippe.malet

End of 2019 was particularly damaging in some Eastern African countries due to the heavy rains which triggered numerous mass movements. Extremely heavy rainfall were recorded in West Pokot County (Kenya) on 23 and 24 November 2019. An official from the West Pokot county government indicated that 53 people died from the huge landslides while several roads in the valley have been affected and at least 5 bridges were reported as destroyed. The landslides were detected from a combination of high-resolution Sentinel-2 images and very high-resolution Pleiades images acquired before and after the landslide catastrophe with the engagement of the UNOSAT's rapid mapping service which activated the International Charter Space and Major Disasters. In combination to this effort, science-driven landslide inventories were created by CNRS-EOST with the ALADIM change detection algorithm available on the ESA GeoHazards Exploitation Platform.

The automated change detection processing service ALADIM-S2 for High-Resolution imagery was initiated early December 2019 using a post-event cloud-free Sentinel-2 image available on November 28, 2019 and a pre-event Sentinel-2 image acquired on September 19, 2019. The processing used as input a small reference training dataset of a few landslides digitized over a region of interest of ca. 400 km². The ALADIM-S2 processing allows the detection of nearly 6000 landslides representing 18 km² of affected lands for a density of ca. 5%.

The activation of the 'Space and Major Disasters' charter protocol and the support of the CREST 'Cellule d'Intervention et d'Expertise Scientifique et Technique' from CNES and INSU for the science-driven analysis of the data available allowed refining the inventory with the use of a set of Very-High-Resolution Pleiades images lever the area identified with the highest landslide density. For the CREST processing, only one Pleiades post-event image was available. 170 landslides were manually digitized over a region of interest of ca. 31 km². The ALADIM-VHR processing allows mapping nearly 5500 landslides representing 3.8 km² of affected lands for a density of ca. 12%. By comparison to the Sentinel-2 dataset over this area, 1041 landslides were detected by the ALADIM-S2 processing associated with a total surface of 3.4 km².

As shown in Around 140 more than those people will t

The Mio-PH death toll cc and Major C Centre on 2 place to org

Scientific pr better lnds

Michael Fournelis @mfournelis · Jul 24, 2019

Sentinel-1 descending interferogram of the Athens 2019 earthquake via @esa_gep does not show any obvious ground deformation pattern near the epicentre. Interesting is the pattern within the basin. #BRGM #ESA #DIAPASON

Sotiris Valkaniotis @SotisValkan · 21 Auy

Copernicus #Sentinel1 interferogram for the 18 Aug Mw6.6 Masbate, Philippines #earthquake. Complex slip, NW-SE s-s rupture along eastern coast (Phil.Fault System/Masbate segment), also prob. secondary/distributed slip to the west? #EarthquakeMasbate Proc. w/DIAPASON at @esa_gep

Floriane Provost @FlorianeProvost · Jan 16

First processed of the latest #Sentinel1 acquisitions over the #TaalVolcano showing complex deformation and important amplitude changes. Using the DIAPASON and COIN services on @esa_gep.

Sotiris Valkaniotis @SotisValkan · 28 Auy

Clear post-seismic slip along the main rupture of the Aug 18 M6.6 Masbate, Philippines #earthquake. Almost linear NW-SE trace, from Cataingan to Dimasalang, possibly extending offshore to the SE. Copernicus #Sentinel1 interferogram - processed w/DIAPASON at @esa_gep.

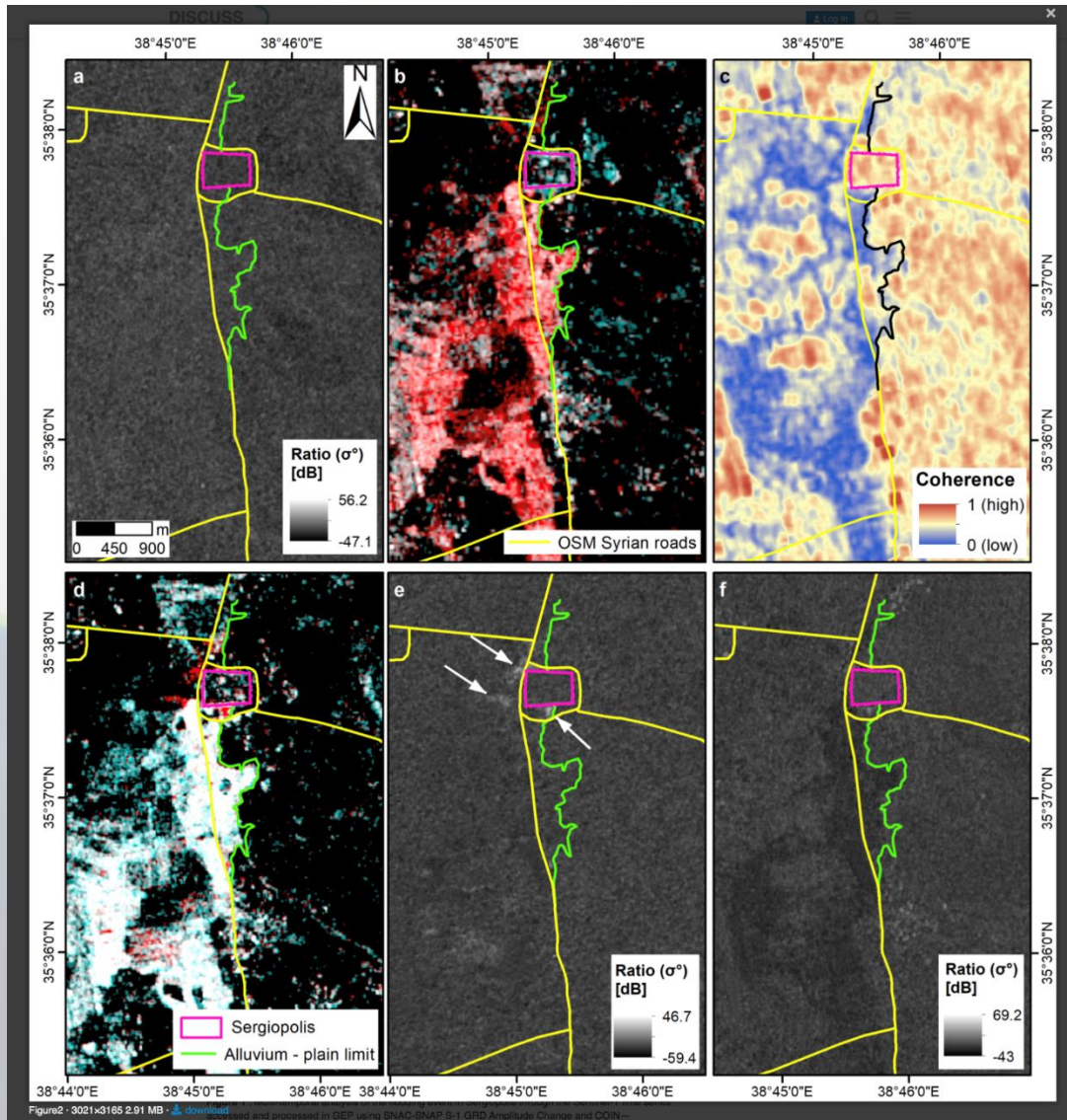
Results are public and can be accessed by following this link for the Sentinel-2 processing and this link for the Pleiades processing. Click on "Show results" at the bottom of the right panel to see the generated landslide inventories not filtered.

This work was supported by CNRS-EOST, UNITAR, ESA and CNES. Aline Dágrez, Romy Schöglgel and Jean-Philippe Malet

Dorella Papadopoulou @dorella_pap · Jan 28

Copernicus #Sentinel1 interferograms of the #TurkeyEarthquake (15/01/2020 -27/01/2020) generated using DIAPASON #InSAR service on @esa_gep. The video shows the comparison of the wrapped and unwrapped phases capturing the west-end of the rupture.

0:04 631 views



Multi-temporal analysis of the flooding event in Sergiopolis through the Sentinel-1 time series accessed and processed in GEP using SNAC-SNAP S-1 GRD Amplitude Change and COIN—Coherence and Intensity change for Sentinel-1 services.

Credits: ASI

- *This example shows how the CEOS Flood Pilot could use a processing environment with advance processors (e.g. InSAR coherence) for flood monitoring*



Enabling seamless job submission from the GEP of all processing services implemented by CNRS EOST on their HPC infrastructure.

Since these services have been specifically designed to run optimally on HPC resources rather than on Cloud resources, the **main advantage for users is better performances and the possibility to always access up-to-date software.**

Activities performed to allow seamless access of these services and related results from the GEP:

- Implementation of a REST interface to the internal resource management system of the A2S/HPC-Mésocentre
- Implementation of a component for synchronizing user management at the GEP and at the A2S/HPC-Mésocentre
- Implementation and setup of an OGC WPS compliant front-end to the A2S/HPC-Mésocentre system in order to allow submission and monitoring of processing jobs from the GEP
- Implementation of a Workflow Management System for the services running on the A2S/HPC-Mésocentre infrastructure to allow EO data provisioning and results publication through the GEP
- Implementation of compute-cost estimation measure and metrics module to allow proper accounting for services on this infrastructure

ESA and CNES reached an agreement:

CEOS-Pleiades users can now access via GEP any existing (or newly requested) Pleiades images stored on GEP

SCA signed by ESA in July 2020



1. A CEOS user submits a Pleiades data request form to isis-pleiades@cnes.fr , provided the request is approved by the thematic CEOS Demonstrator/Pilot lead*
2. CNES checks that the entity/public institution to which belongs the « User » has signed the SCA
3. If 2 is OK, CNES asks Airbus to acquire/produce the image
4. Airbus informs the user and the platform operator for the delivery of the images by FTP
5. The dataset is made available on the platform by the platform operator
6. The platform operator grants access to all CEOS-Pleiades users and the Pleiades licence is signed (electronically if possible) before each download
7. The dataset is shown on the catalogue for all platform users; no processing/download is permitted but any user can see the (metadata) catalogue of imagery.

***Leads responsible for Pleiades data requests**

Landslides: Jean-Philippe Malet

Seismic: Theodora Papadopoulou, Stefano Salvi

Volcano: Michael Poland

RO: H  l  ne Deboissezon



Myanmar, Jade mines region
(Sentinel-2 RGB, May 10, 2020)



Jade mines landslide in Myanmar 2020

Pre-and post-event Sentinel-1 amplitude extracted using COIN service show the mine on June 28, 2020 before the collapse and the mine on July 10, 2020 after the wall collapse. **White dotted lines show the possible part of the mine that collapsed.** *Contains modified Copernicus Sentinel-1 and -2 (2020).*

Credits: ESA

- *The Charter has decided to have a processing environment. The system will use the same processing environment as the GEP. In this basis for the Charter Processing Environment provided by ESA.*



- GEP on-boarded on NoR since June 2020
- **Single access point for:**
 - Resource tier providers (ICT Providers hosting collocated EO data)
 - Platform service providers (built on top of a resource tier provider)
- **Addressing:**
 - **Self-funded user:** Any user world wide requiring for any reason Resource Tier or Platform Services (e.g. Science, Development, Pre-commercial and Commercial) who funds the consumption themselves;
 - **Sponsored user:** (Science, Development, Pre-commercial) by ESA and other entities via Announcement of Opportunity
 - ✓ Sponsorship upon application (evaluation depends on project merit on a scientific and engineering viewpoints, schedule adequacy to complete the project and achieve positive results etc.)
- Article and detailed guide published on GEP <https://discuss.terradue.com/t/gep-offer-expands-to-include-commercial-service-packs/917>

- CEOS GLab **webpage updated**
- Blog posts and tweets
- **Demo of GEP services to the World Bank for the Cities Resilience Programme**, under which 10 cities in Africa and Asia have been processed on GEP

Upcoming:

- **A paper under preparation** by BRGM and the World Bank on the City Resilience Programme
- **Demo & training** on GEP services to support the **CRL 2020 Workshop** (organized by NOA) in September 2020.



Thank you

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