



Committee on Earth Observation Satellites

WGDisasters-14 Meeting

Philippe Bally, Stefano Salvi, Theodora

Papadopoulou

ESA, INGV

CEOS Seismic Hazards Demonstrator

Virtual meeting

1 – 3 September 2020





Aims to provide satellite data to generate EO based scientific information to be shared with decision makers for seismic hazard assessment

Objectives (not on an emergency basis)

- Pursue global tectonics mapping in the long term
- Expand active fault mapping from regional to global coverage primarily using VHR optical data supporting supporting geomorphological and morpho-tectonics studies

Objectives (on an emergency basis)

- Exploit EO data to derive advanced research products for earthquake response: expand to target of at least 10-12 EQ per year
- Articulate with EO disaster response capabilities e.g. the Charter to make sure users are aware of and use it.

**Space agencies:**

- ESA
- ASI
- DLR
- CNES

Partners from the community:

- COMET /UK
- University of Leeds /UK
- CNR-IREA /Italy
- INGV /Italy
- ISTERre/Institut de Recherche pour le Développement (IRD) /France
- National Observatory of Athens (NOA) /Greece
- BRGM /France
- Harokopeion University of Athens (HUA) / Greece
- CEO-YachayTech / Ecuador
- University of Oxford / UK
- CNRS IPGP /France
- **GFZ Potsdam / DE (via collaboration with the University of Oxford)**



Agency	ASI Cosmo-SkyMed	CNES Pleiades	DLR TerraSAR-X	ESA Sentinel-1 & 2
Quota <u>per year</u>	650 images	20000 sq. km.	Upon request	Open

Request no.	Request status	Prime Investigator Affiliation	Data requested	AOI	Number of images requested
2019-R02	Approved	University of Leeds	Pleiades	Central Asia	2322 sq. km. in Central Asia
2019-R03	Approved	University of Leeds	Pleiades	Indonesia	316 sq.km. in Indonesia
2019-R04	Approved	University of Leeds	Pleiades	Ecuador	approx. 3000 sq. km. in Ecuador
2019-R05	Approved	University of Leeds	Pleiades	Nepal	approx. 3000 sq. km. in Nepal
2019-R06	Not received	University of Leeds	Pleiades	Turkey	approx. 3000 sq. km. in Turkey
2019-R07	Approved	University of Leeds	Pleiades	Kenya	approx. 3000 sq. km. in Kenya
2019-R08	Not received	HUA	TerraSAR-X, Cosmo-SkyMed, Pleiades	Greece	N/A in Greece
2019-R09	Not received	HUA	TerraSAR-X, Cosmo-SkyMed, Pleiades	Iran	N/A in Iran
2019-R10	Approved	University of Oxford	Pleiades	Turkmenistan	3,648 (tri-stereo total)
2019-R11	Approved	Argans c/ESA	Cosmo-SkyMed	Durres (Albania)	
2020-R12	Approved	University of Leeds	Pleiades	Elazig (Turkey)	
2020-R13	<i>Rejected by DLR</i>	INGV	TanDEM-X	North Zanjan fault (Iran)	
2020-R14	Awaiting approval	University of Oxford	Pleiades	Tajikistan	

- Updated **Data Requests spreadsheet** uploaded on www.ceos.org under Document Management



Advanced research products for earthquake response

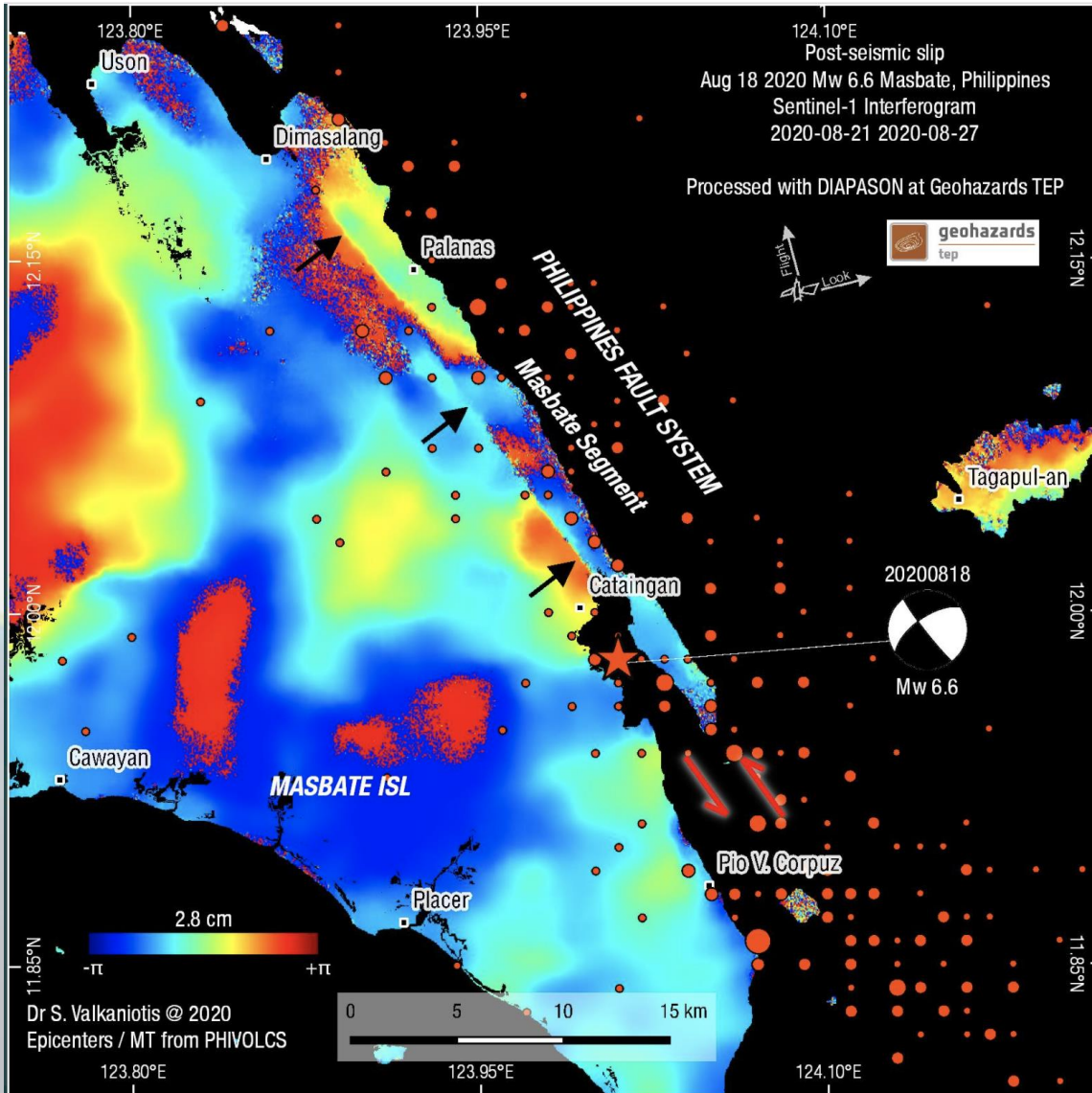
- ✓ Philippines - August 2020 (CRL/NOA)

On-going studies on active fault mapping with VHR optical imagery

- ✓ Sulawesi, Indonesia (University of Leeds)
- ✓ Central Asia (University of Leeds)
- ✓ Turkmenistan and Central Asia (University of Oxford)

Articulating with EO disaster response capabilities

- ✓ Proposition of EO products to be shared with the International Charter on a best effort basis (presentation to the Charter focusing on all CEOS WGD thematic activities)



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 Sentinel-1 interferogram - processed with DIAPASON on GEP.



EROICA – The Earthquake Ruptures of Iran and Central Asia

LEVERHULME
TRUST



Above: Large (Mw 7+) earthquakes in central Asia

Project Rationale

- Limited database of modern examples to study large continental interior earthquakes
- Early-mid 20th century events constitute an important dataset of rupture
- Focus on central Asia, inc. China and Iran
- Many of these earthquakes are in regions undergoing rapid urban growth – results help in estimating hazard
- The project combines geophysical data (remote sensing, seismology) with historic, prehistoric and geologic data



Above: ruptures of the 1889 Chilik earthquake (Mw 8+) as identified from satellite imagery (Abdrakhmatov et al., 2016)



Papers, Presentations, Posters:

- Paper in review: **Contrasting seismic risk for Santiago, Chile, from near-field and distant earthquake sources** (University of Leeds *using Pleiades imagery*)
- Paper published: **Magnitude of the 1920 Haiyuan Earthquake Reestimated Using Seismological and Geomorphological Methods** (University of Leeds and University of Oxford *using Pleiades imagery*)

Web articles:

- <https://eo4society.esa.int/2019/07/30/mapping-the-faults-of-2019-california-earthquakes-with-sentinel-1-2/>



The Demonstrator supports various projects with focus in various regions worldwide, but requests continue to arrive from a small closed group of partners.

- **Need to promote that CEOS WGD data can be requested from the broader EO seismic community.** To achieve that we need to:
 - ✓ Publish web-articles inviting the EO seismic community to submit requests
 - ✓ Define criteria of data request evaluation
 - ✓ Define a semi-automated data request procedure (e.g. data request form submission via GEP to each WGD lead and then evaluation by each CEOS agency concerned)
- **Need for activity extension.** Demonstrator activity started in 2017, although data quota were not agreed until 2018, hence data were not used up to mid-2018. Therefore, a 1-year extension (until Q3 2021) is requested to make sure data provision for on-going users continues.