ESA NoR project 1c17a0

Final report of activity

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Goal of the project

Science support for satellite EO and geohazard risk assessment

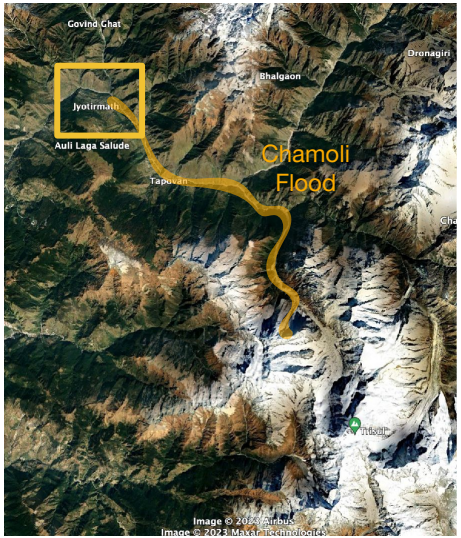
- Generate relevant EO derived products and analysis to the geohazard community when major events occur.
- Sponsorship to GEP services has been requested and sponsored by NoR
- Taking advantage to a the wide catalog of GEP services and processing ressources

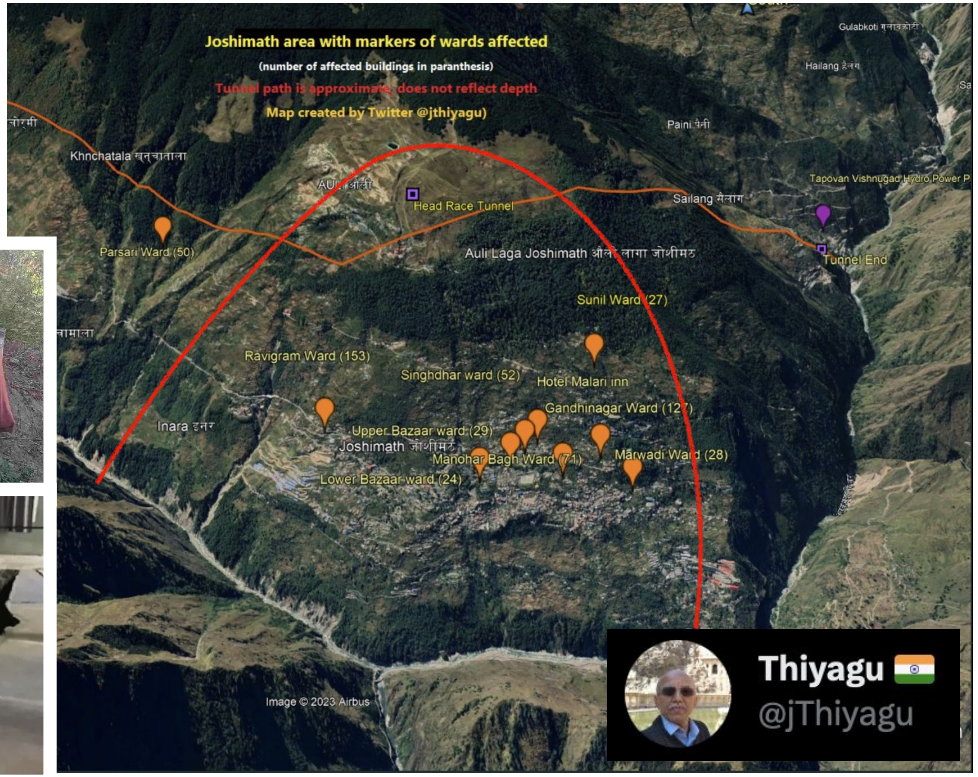
Application 1

January 2023 : Activation of Joshimath landslide

Observations:

- 800+ buildings with cracks / Expulsion of 800 people from 237 families (source: Indiatimes);
- Large cracks with of several centimeters width by meters length are observed on the field;
- Activation of the slope was reported in news in January 2023.
- In the region affected by the Chamoli rock avalanche (2021)



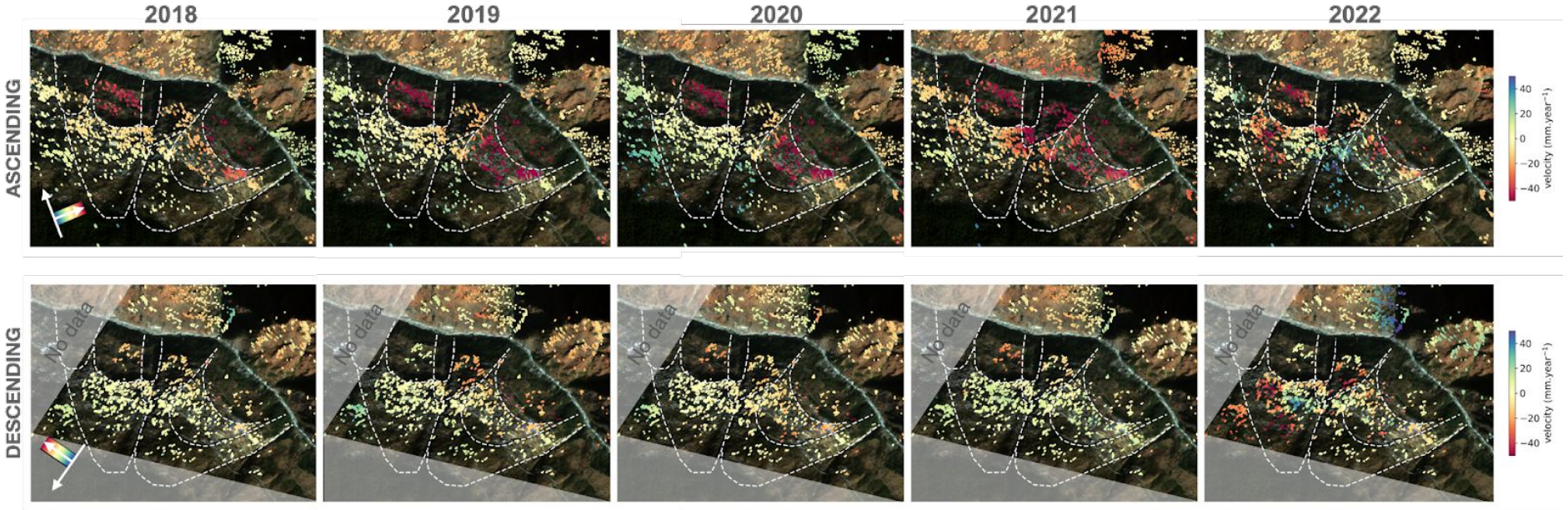


Application 1

January 2023 : Activation of Joshimath landslide

Processing:

- The SNAPPING service (PS-InSAR/S1) of GEP was used to compute the landslide deformation from 2018 to January 2023



Application 1

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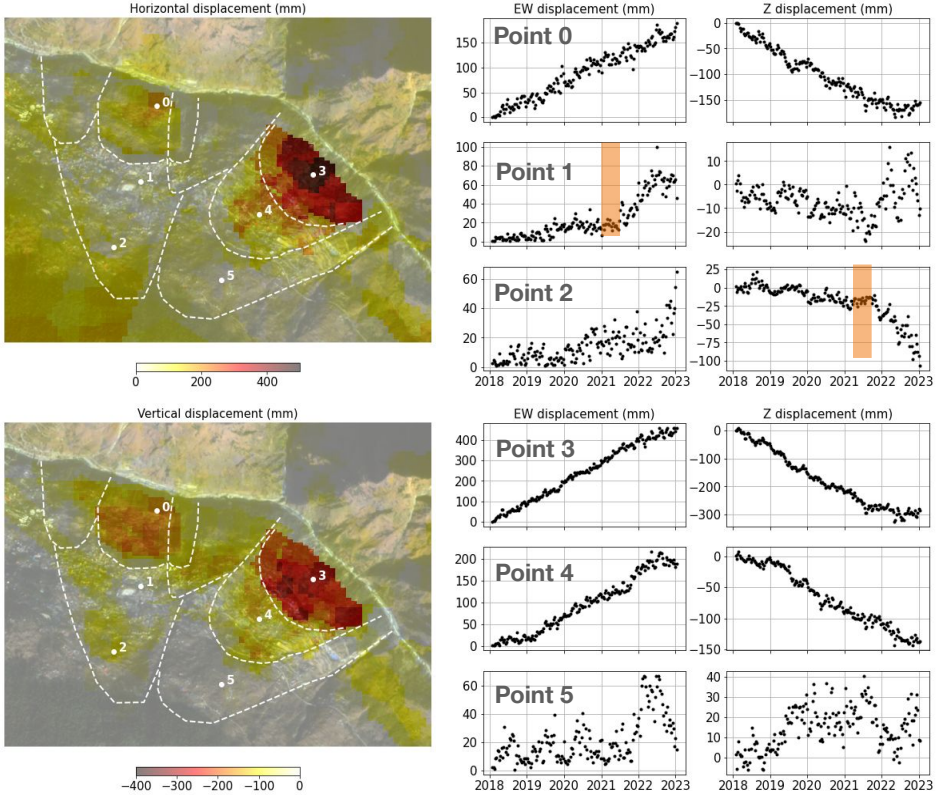


Several blocks can be identified with different acceleration onset
The activation of the landslide seems to have started during year 2021.

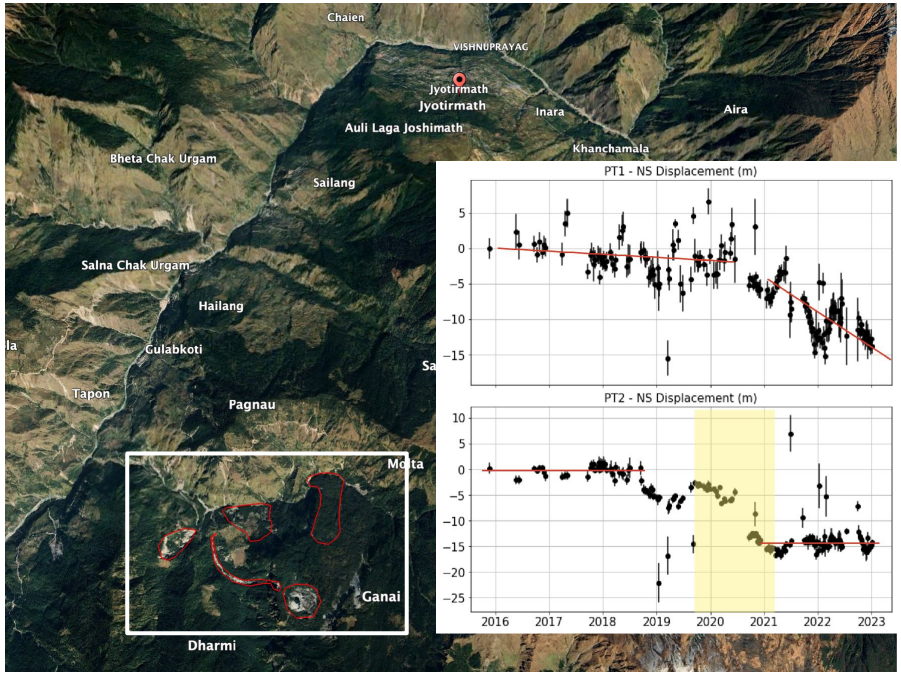
Application 1

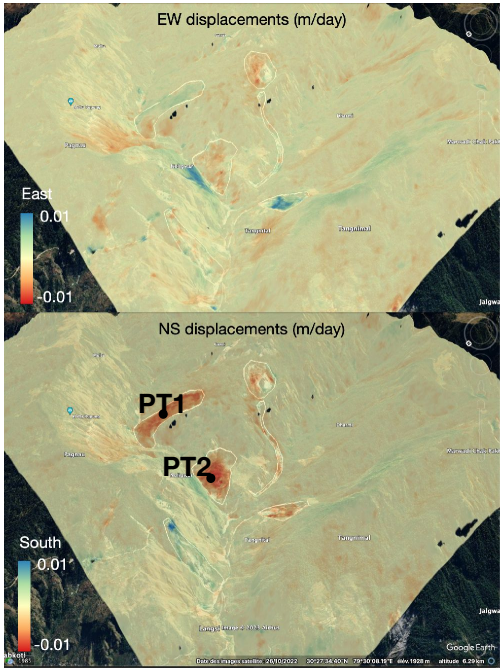
January 2023 : Activation of Joshimath landslide

Processing:

- The GDM-OPT service (Image correlation / S2) of GEP was used to compute the landslide deformation from 2018 to January 2023 in the region. Some rapid instabilities were detected in the vicinity of Joshimath.

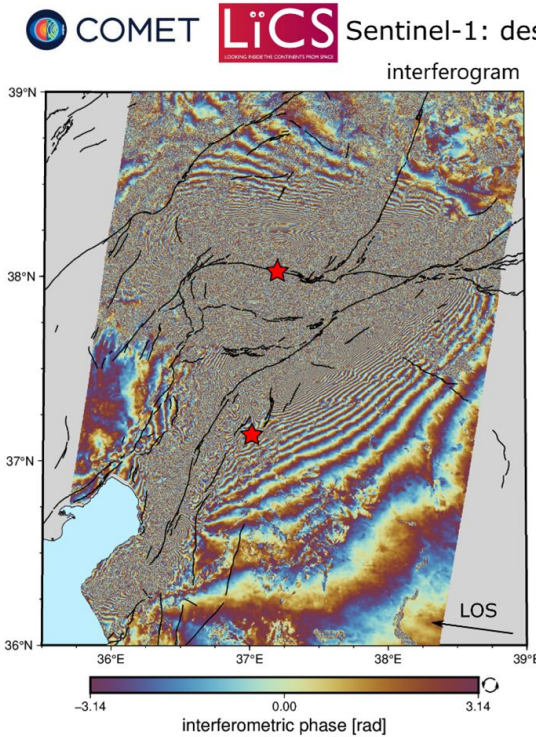
Ganai
GDM-OPT-Slide





Application 2

February 6, 2023 : Kahramanmaraş earthquakes



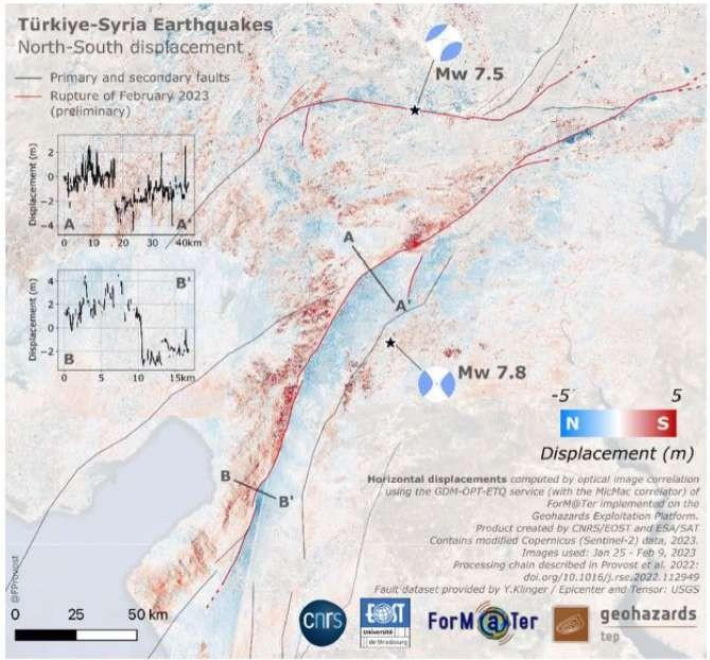
(c) COMET 2023. Lazecky, M., Maghsoudi, Y., Watson, S., Wrig

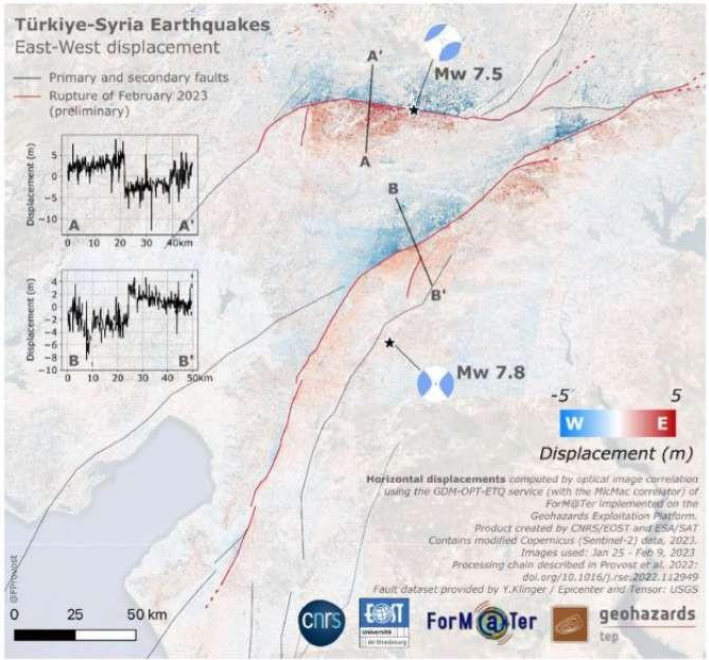
Application 2

February 6, 2023 : Kahramanmaraş earthquakes

Processing:

- The GDM-OPT-ETQ (image correlation / S2) was used to measure the ground deformation generated by the earthquake in the North-South and East-West direction.





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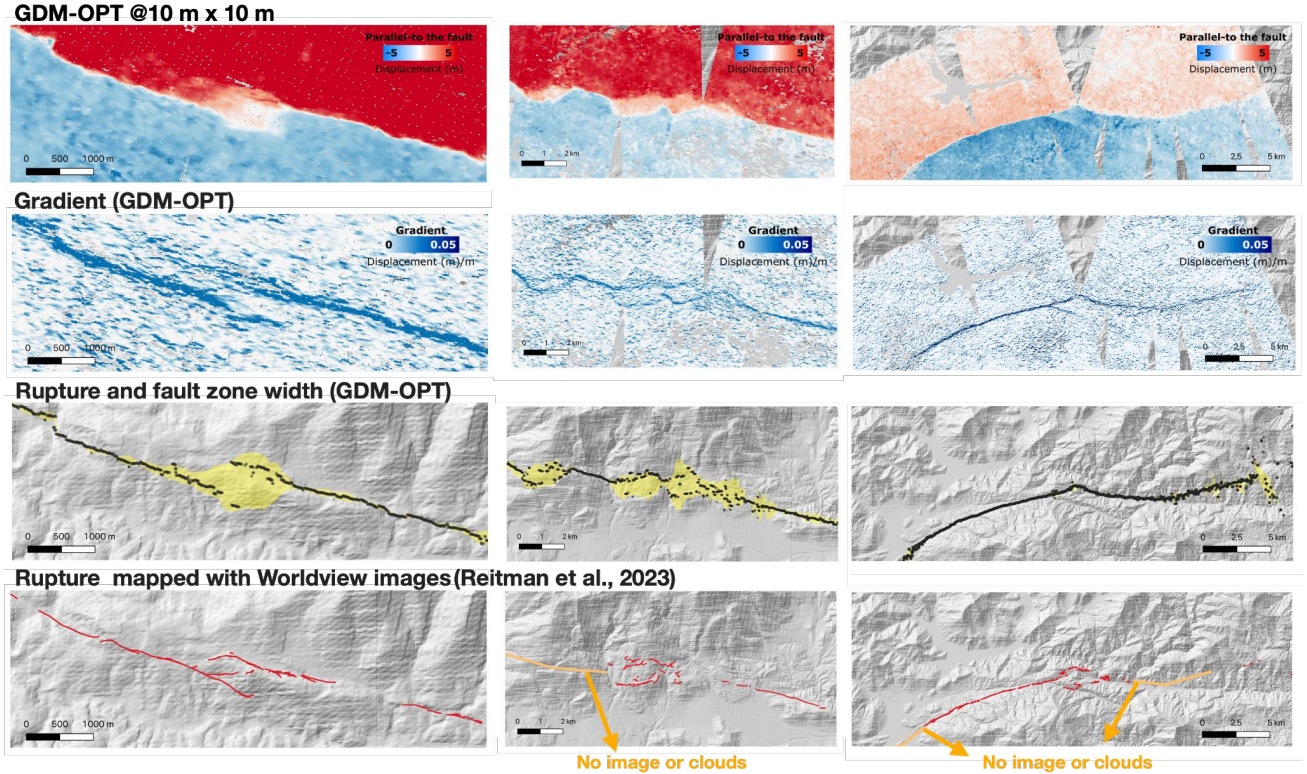

The fault can be mapped with the generated products and the deformation along the fault can be measured.

More details on:
https://assets.researchsquare.com/files/rs-3543910/v1_covered_0f0241d2-1fdf-4ed8-aea8-4842ea24a651.pdf?c=1699418478

Application 3

August 2023 : Shovi ski resort (Georgia)

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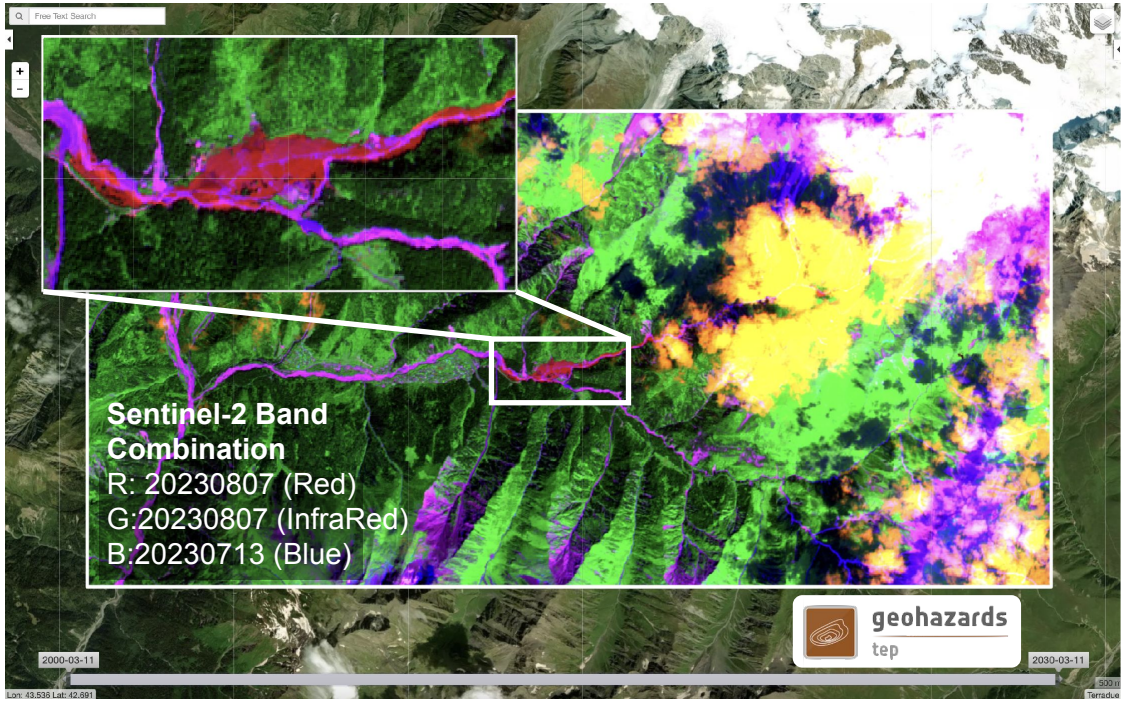
August 2023 : Shovi ski resort (Georgia)

Processing:

- The COMBI service (Image band combination / S2) of GEP was used to highlight the extent of the debris propagation (in violet).

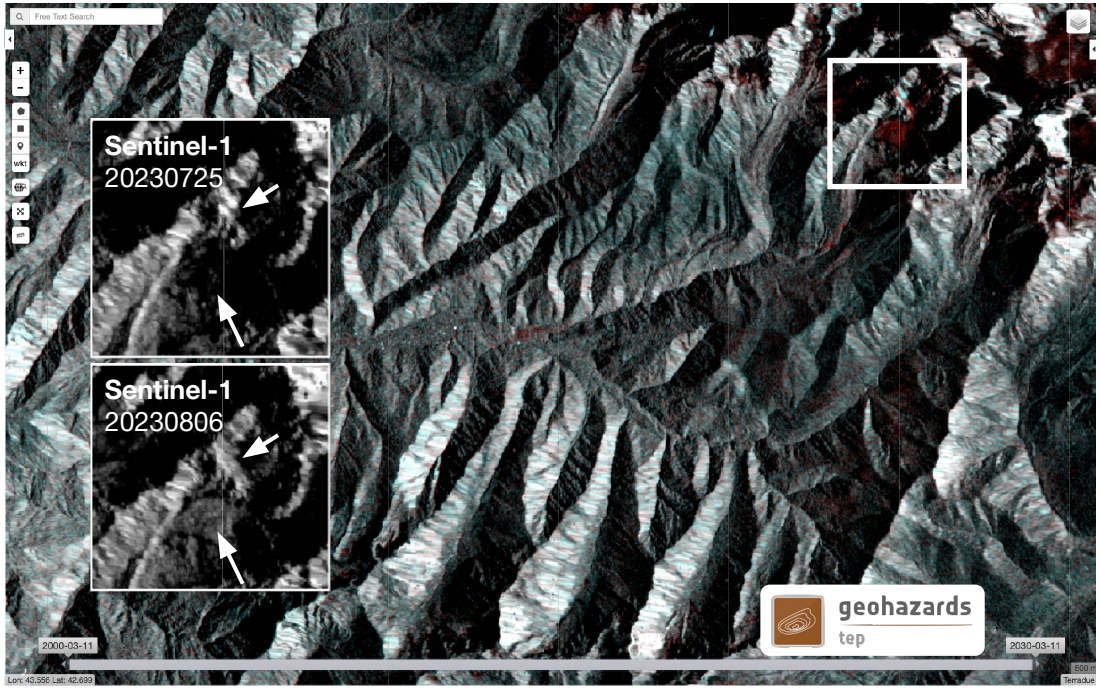


Application 3

August 2023 : Shovi ski resort (Georgia)

Processing:

- The COIN service (image combination / S1) of GEP was used to the source of the debris propagation (in red). The debris flow seem to have initiated from the glacier upstream. Later observations confirmed that the melting of the glacier lead to its partial collapse and that propagated down to Shovi resort.

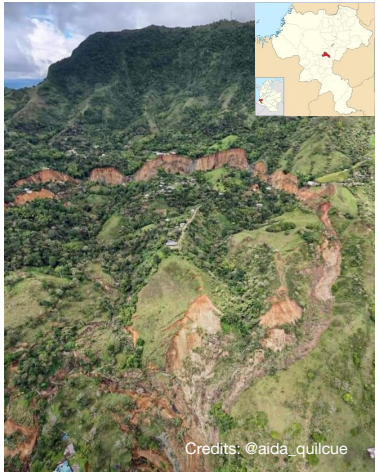


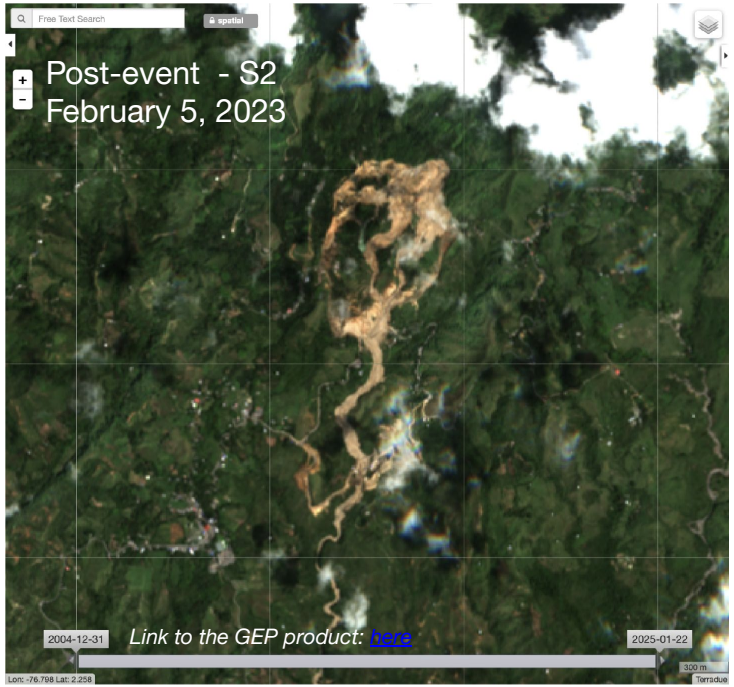
Application 4

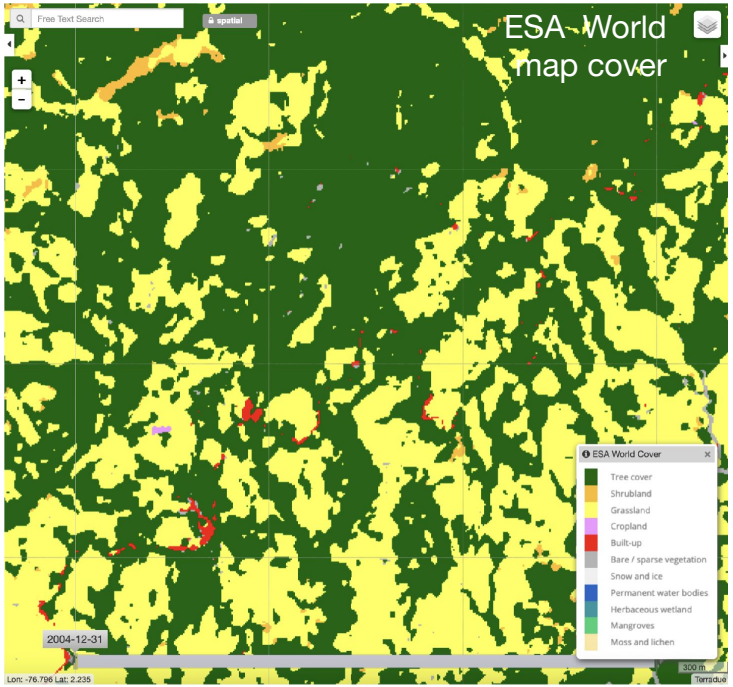
Demonstration of EO applications for landslides in South America

Processing:

- Simple screening of the data in GEP with external high-level products available on GEP such as the ESA world map cover. Example on the Las Rocas landslide that activated on February 2023.





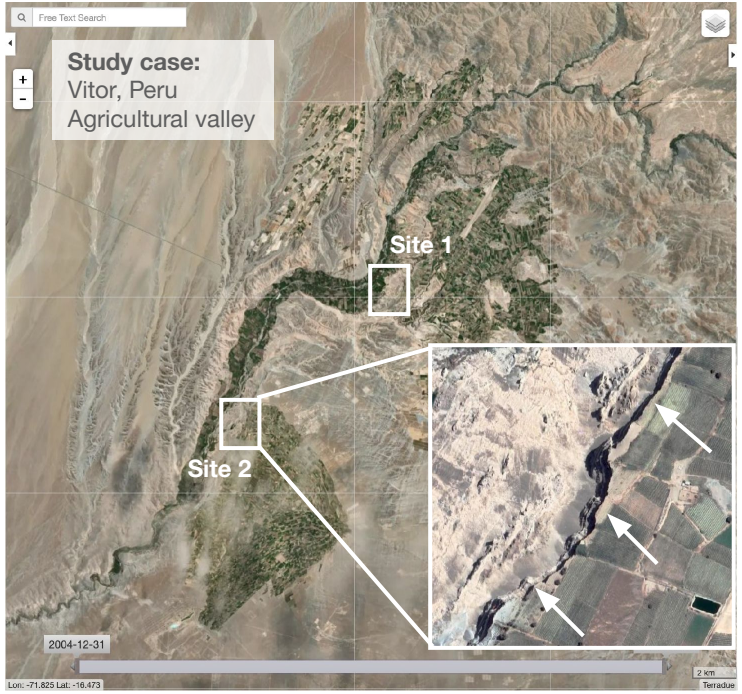


Application 4

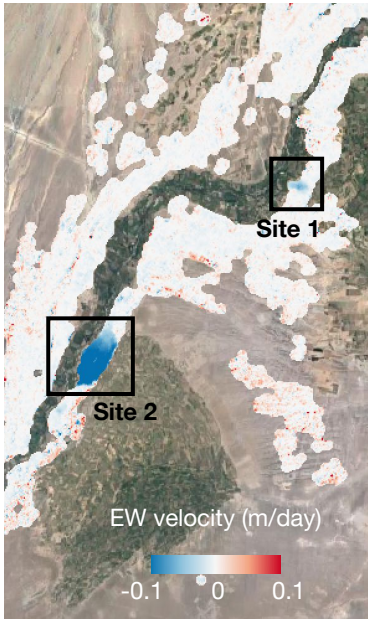
Demonstration of EO applications for landslides in South America

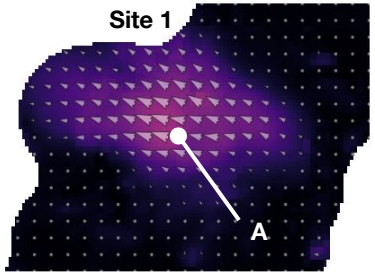
Processing:

- Demonstration of EO monitoring with high level services such as the GDM-OPT-SLIDE service of the GEP. The service is tailored to measure ground motion of active landslides (> 1 m/year). The showcase was created on a region of Peru with active landslides.

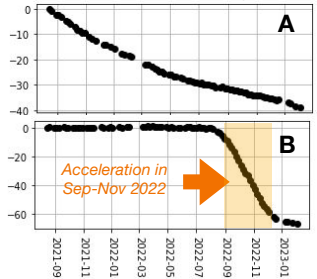


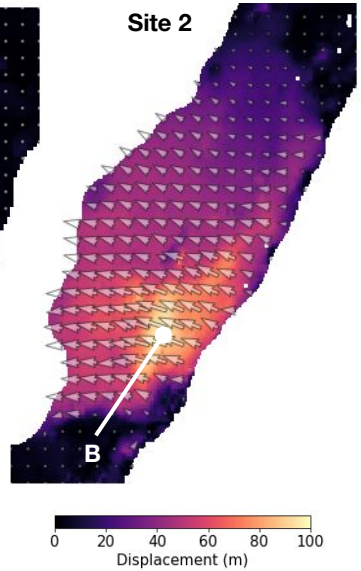
Outputs of GDM-OPT-Slide service (@GEP)
Sentinel-2 image correlation (Sep 2021 - Jan 2023)





EW Cumulative Displacement (m)
Toward EAST is positive





Benefits to society

Application 1: Joshimath landslide

- The processing on the Joshimath landslide was shared among local authorities in India (ISRO) and regional initiatives (ADB). The goal was to highlight the potential of accessing high-level EO services such as the SNAPPING service deployed on high computing environment with a friendly interface. The quality of the measurement and information it brings to the analysis of such type of crisis was demonstrated.

Application 2: Turkiye Earthquakes of February 2023

- The processing over Türkiye was rapidly produced and shared with the geoscience community. The product was exploited by other teams to rapidly propose a model of the fault. The product was further exploited to fit the needs of the geoscience community and seismological model. Those models are crucial to better understand seismological processes and quantify future seismic hazard in the region.

Application 3: Shovi glacier burst

- The processing over Türkiye was rapidly produced and shared with the geoscience community. The product was exploited by other teams to rapidly obtain information about the properties of the surface ruptures.

Application 4: EO applications in South America

- The processing over South America was shared with ESA for a demonstration of EO and web platform environment for monitoring natural risks.