



Laser Scanner for landslide monitoring



THE METHOD

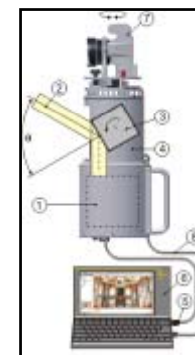
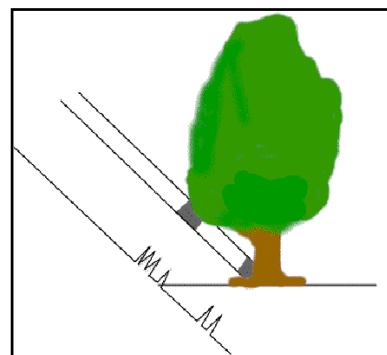
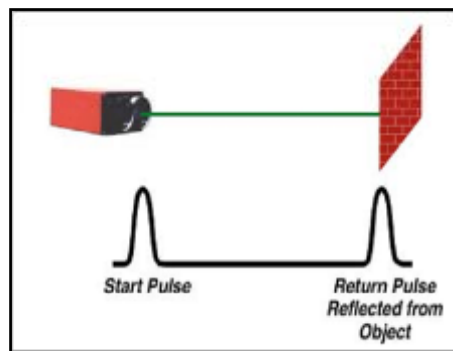
-Laser scanner with high range >1km, drone UAV, total station, GPS

Vertical angles and horizontal

From the angular measurement of a mirror which directs the laser beam

Distance

From the measurement of the laser time to travel distance up to the target and return





TECHNICAL SPECIFICATION OF LASER SCANNER

Model: RIEGL LMS-Z420i

Eye safety class according to EC60825-1:2001: Laser Class 1

Measurement range: for natural targets, r^3 80% up to 800 m
for natural targets, r^3 10% up to 250 m

Minimum range: 2 m

Measurement accuracy: typ. ± 10 mm (single shot)
typ. ± 5 mm (averaged) **Measurement resolution** 5 mm

Measurement rate up: to 12000 pts/sec @ low scanning rate (oscillating mirror)
up to 8000 pts/sec @ high scanning rate (rotating mirror)

Laser wavelength near infrared **Beam divergence:** 0.25 mrad

Scanner Performance:

Vertical (line) scan: Scanning range 0° to 80° Scanning mechanism rotating / oscillating

Minimum angle stepwidth 0.01°

Horizontal (frame) scan: Scanning range 0° to 360° Scanning mechanism rotating

Minimum angle stepwidth 0.01°

Max resolutions: 20400 punti/m² @ 100 m

Main dimensions: 463 x 210 mm (Length x Diameter) **Weight** approx. 14,5





SERVICES

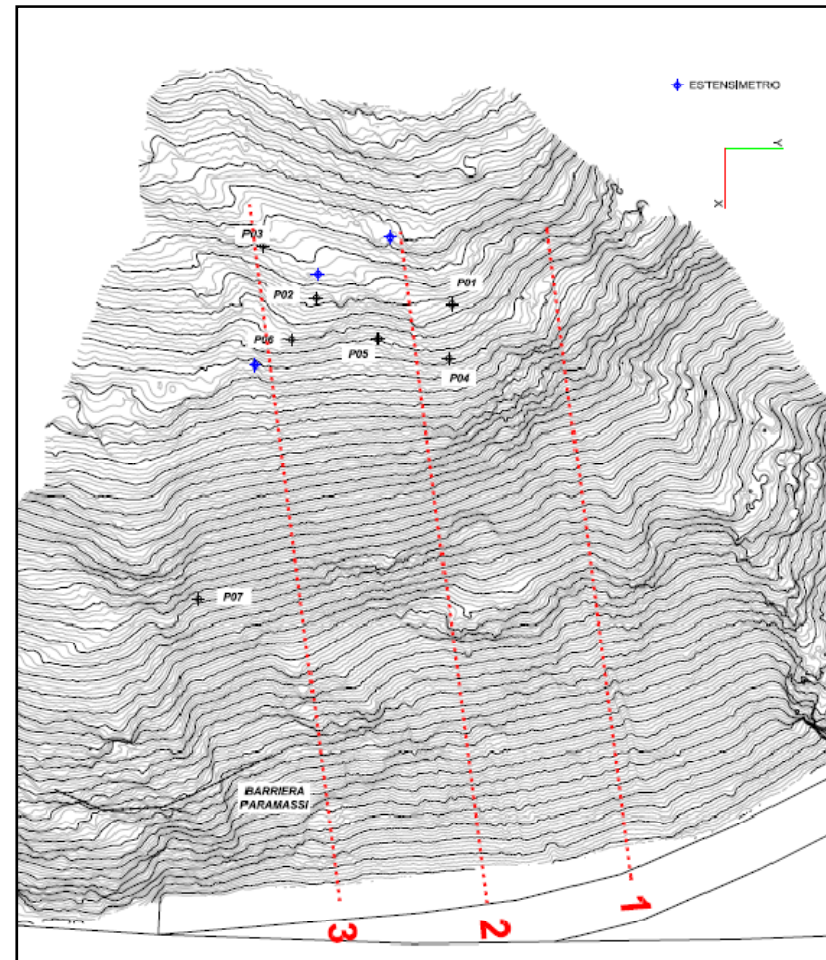
DATA PROCESSING SERVICES AND SUPPORT OF THE ANALYSIS OF ROCKY SLOPES

- **Cloud points, Georeferencing, DTM, DSM**
- **Digital models of geometric variations of the phenomenon**
- **Digital models of temporal variations of the phenomenon**
- **Mapping of evolution of the phenomenon**



EXAMPLE 1: Monitoring on a landslide

Methodology: The monitored slope is performed by periodically measuring laser with a scanner from a fixed-point on the opposite side of slope. They are periodically compared by a comparison to the grid. The instrumental error is 5 mm.





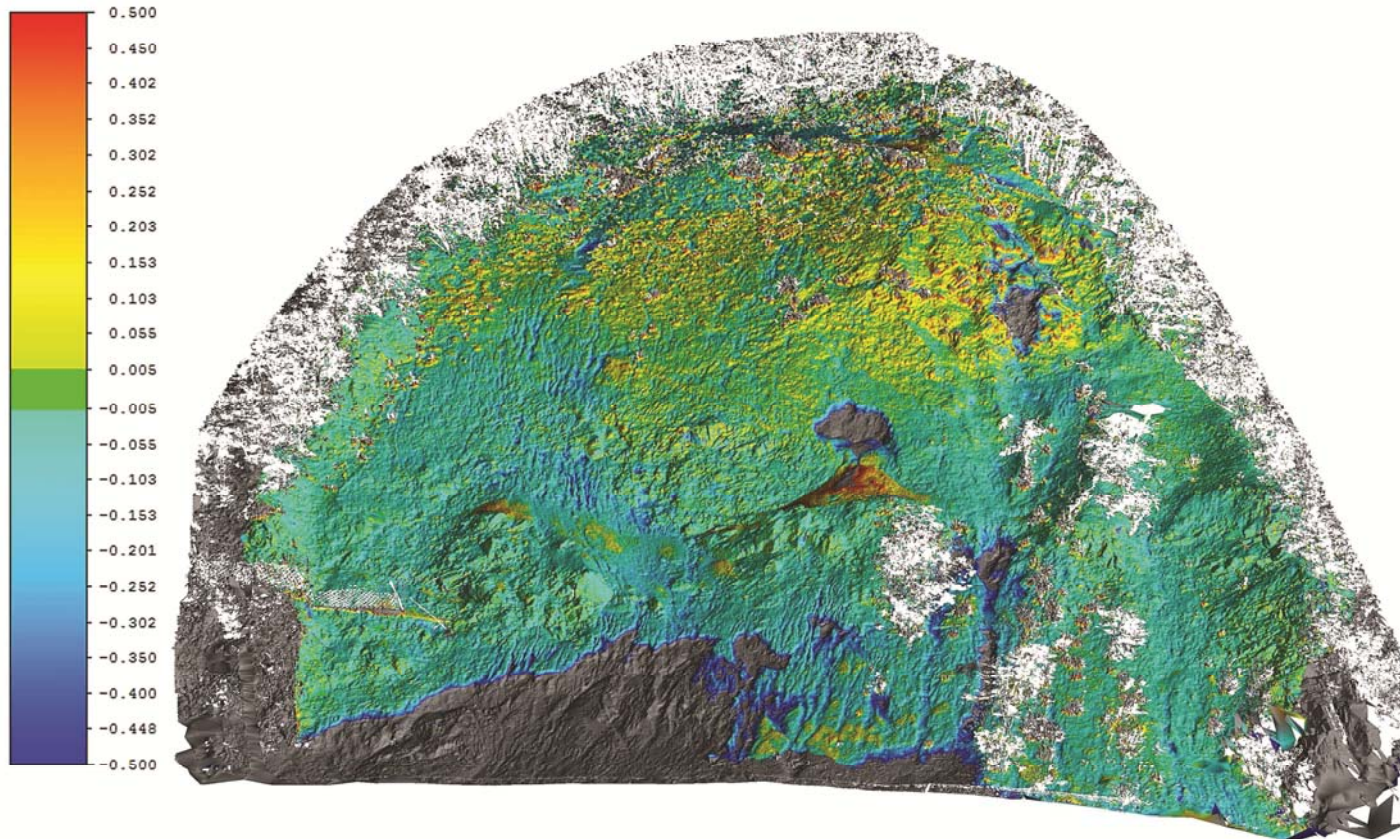
Frontal view





Time 1.0

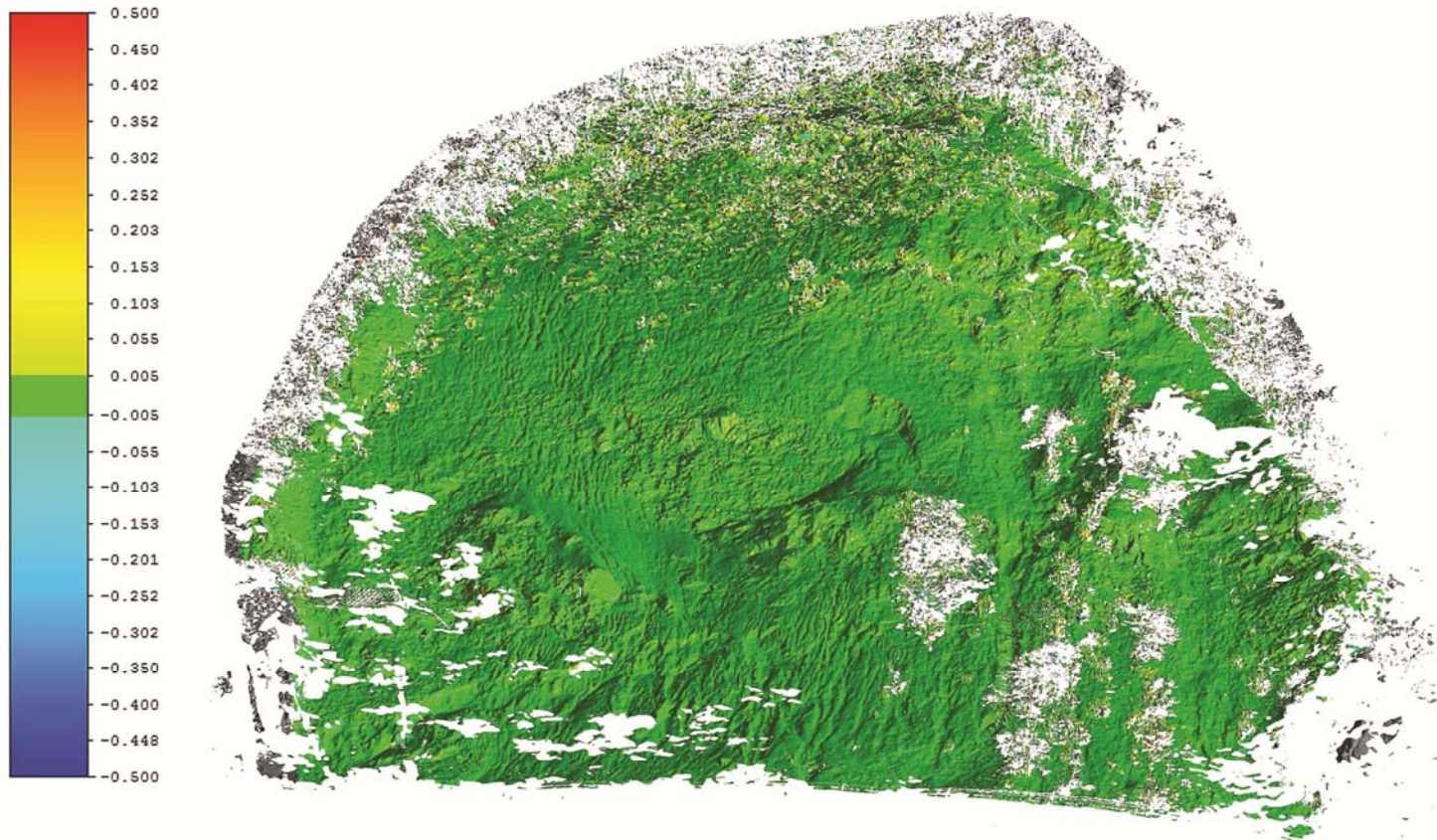
03.04.2014 >> 21.04.2015





Time 2.0

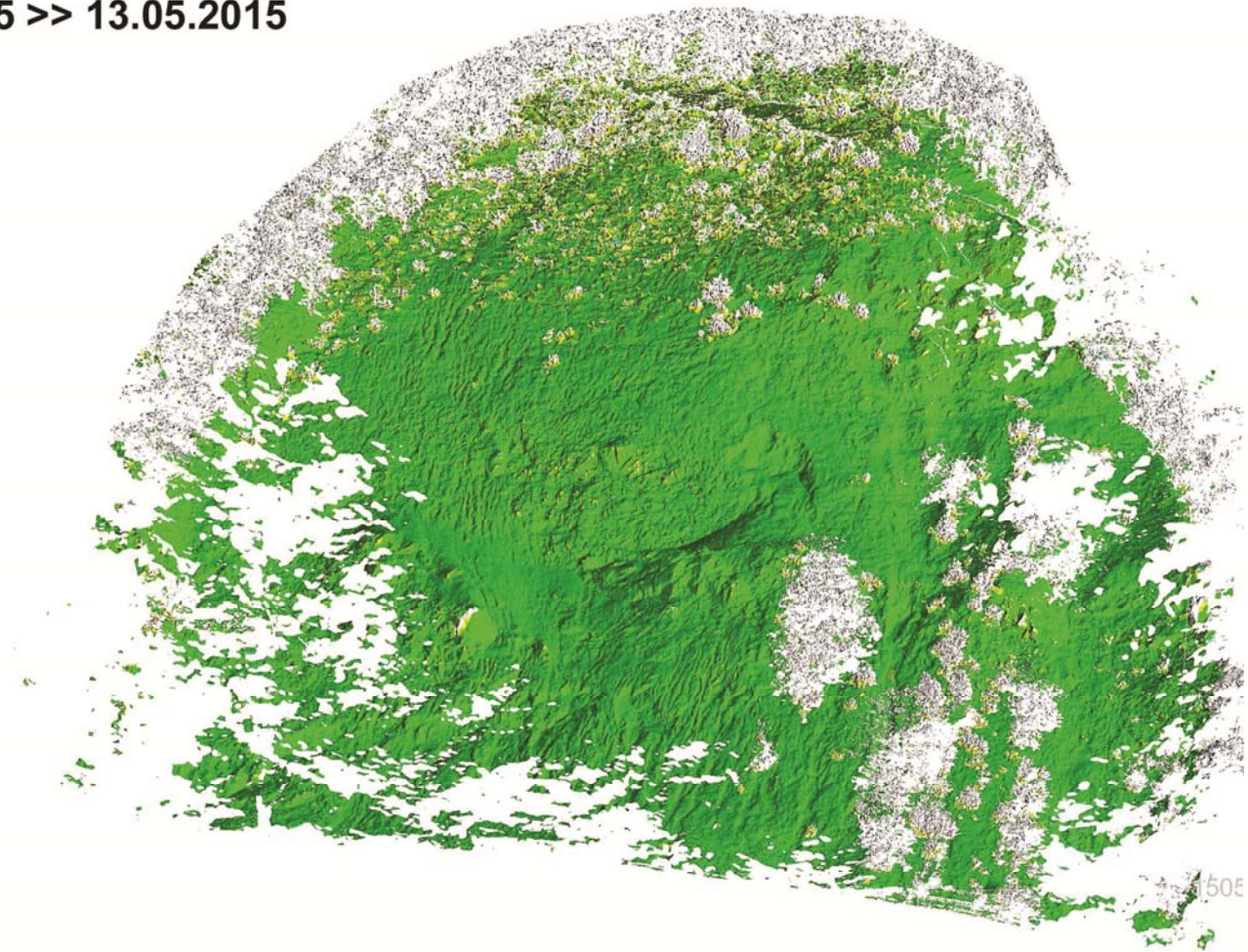
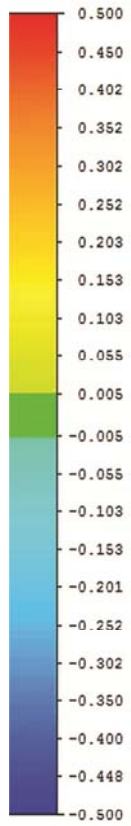
21.04.2015 >> 29.04.2015





Time 3.0

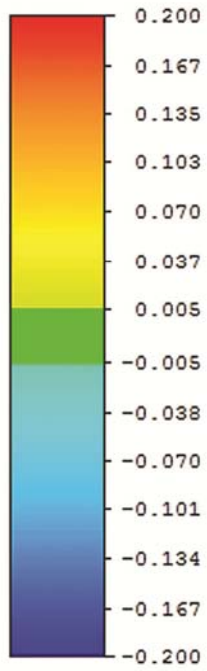
21.04.2015 >> 13.05.2015





Time 4.0

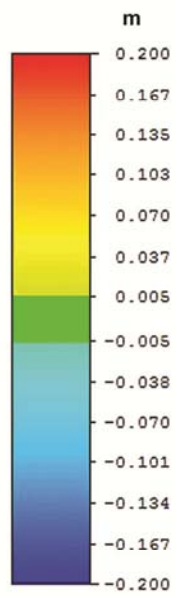
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Time 5.0

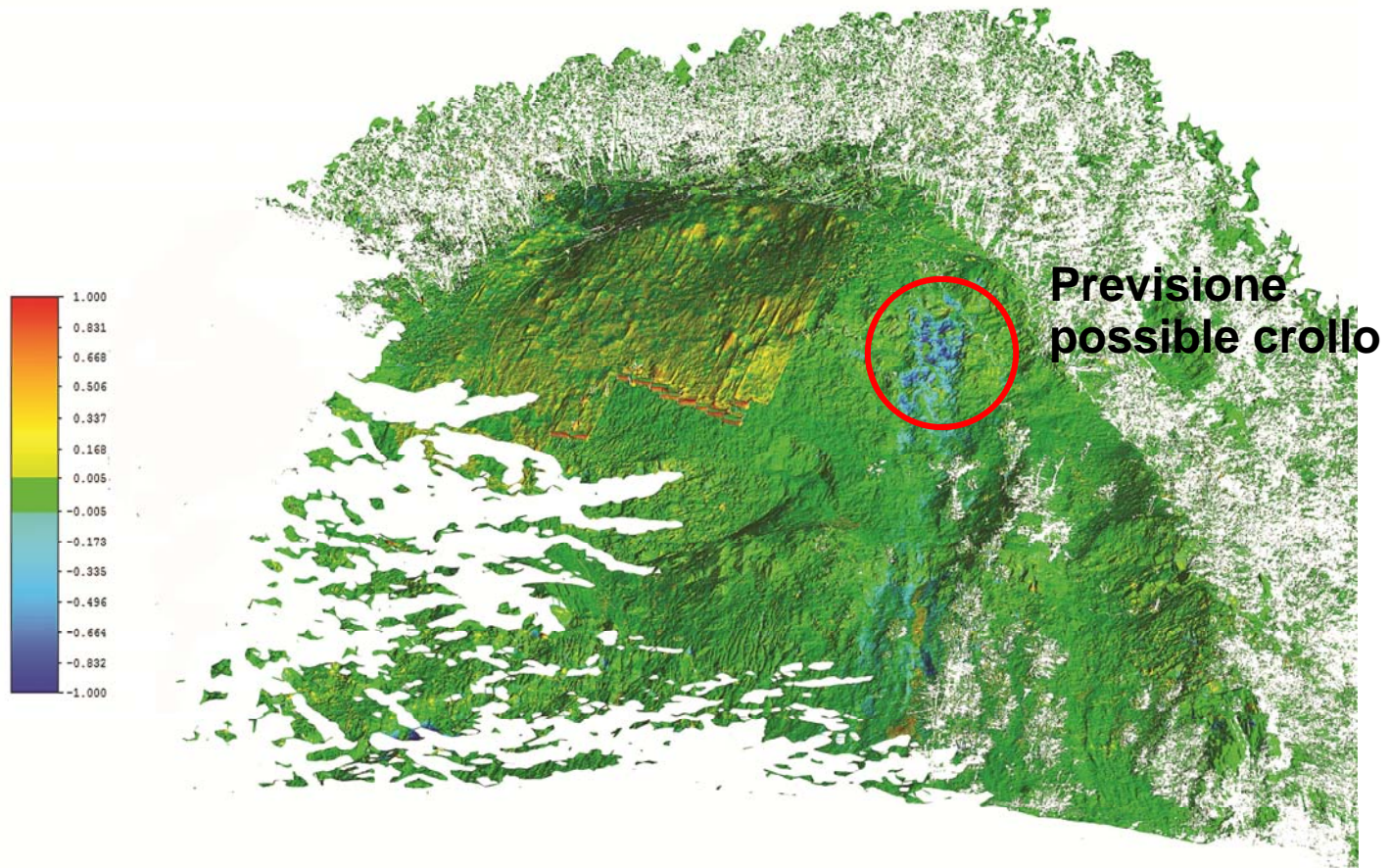
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Time 6.0

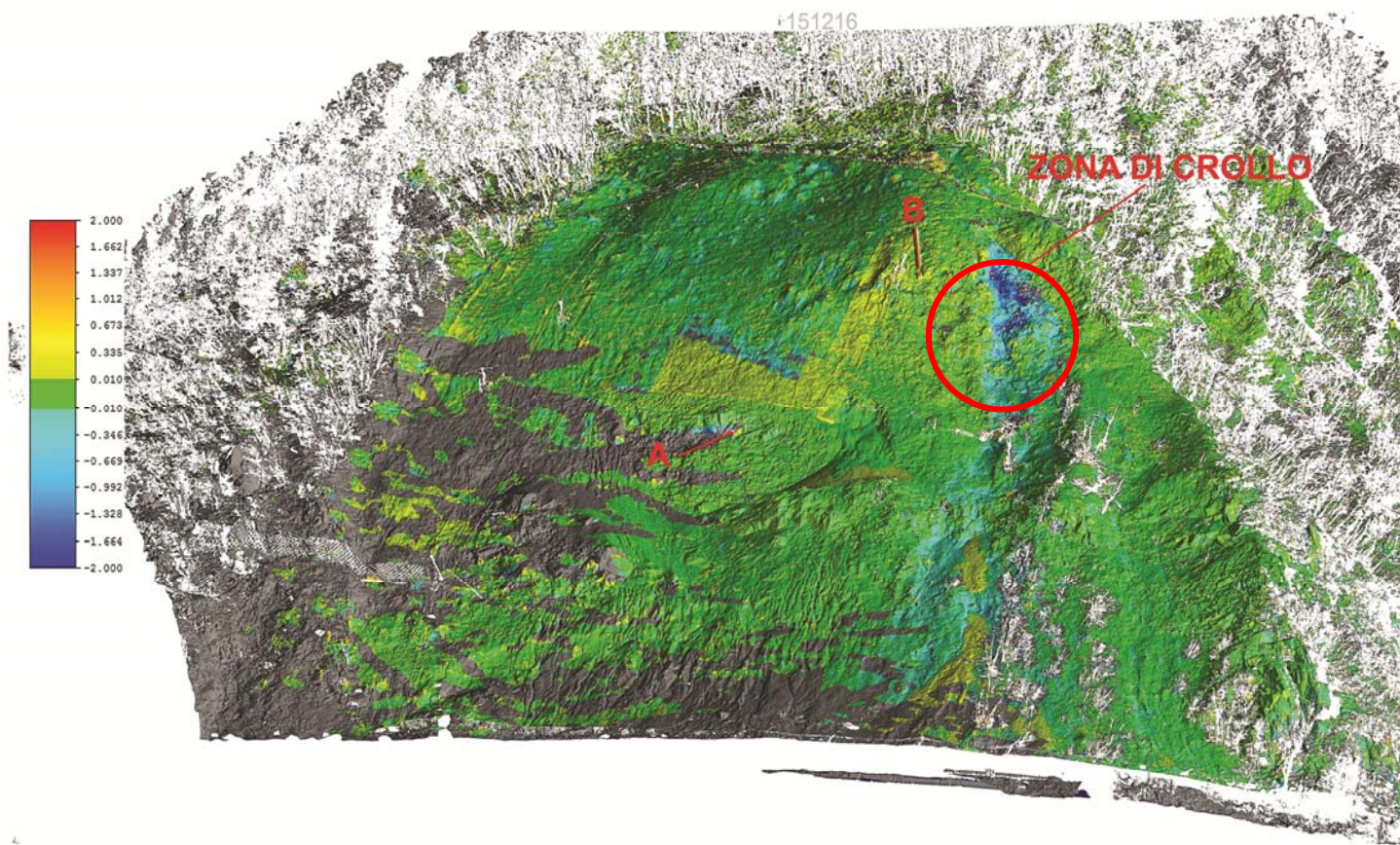
04.11.2015 >> 21.09.2015





Time 7.0

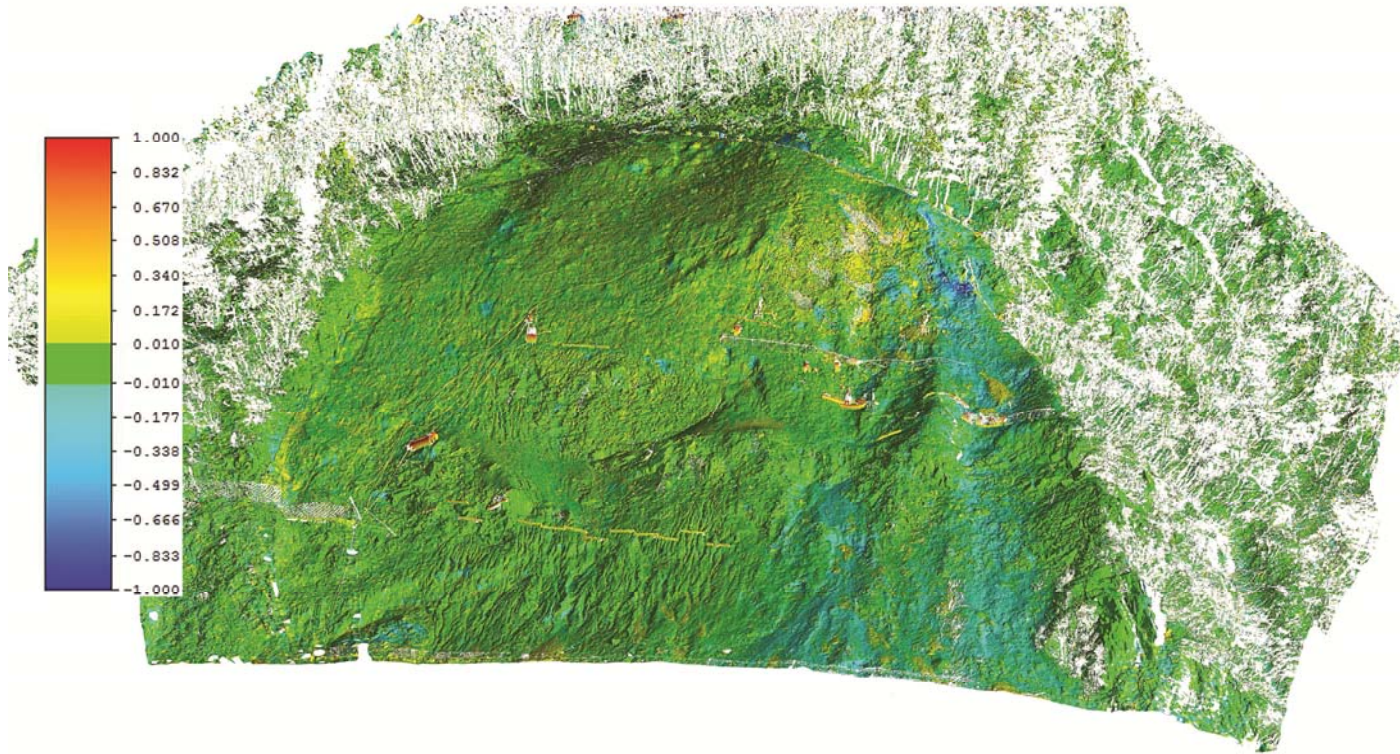
04.11.15 >> 16.12.15





Time 8.0

29.03.2016 >> 16.12.2015





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