The importance of A-DInSAR data post-processing for the interpretation of geomorphological processes

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Study area

SCIENTIFIC CONTEXT

Update the current landslide inventory (PAI) through A-DInSAR processing and post-processing analyses

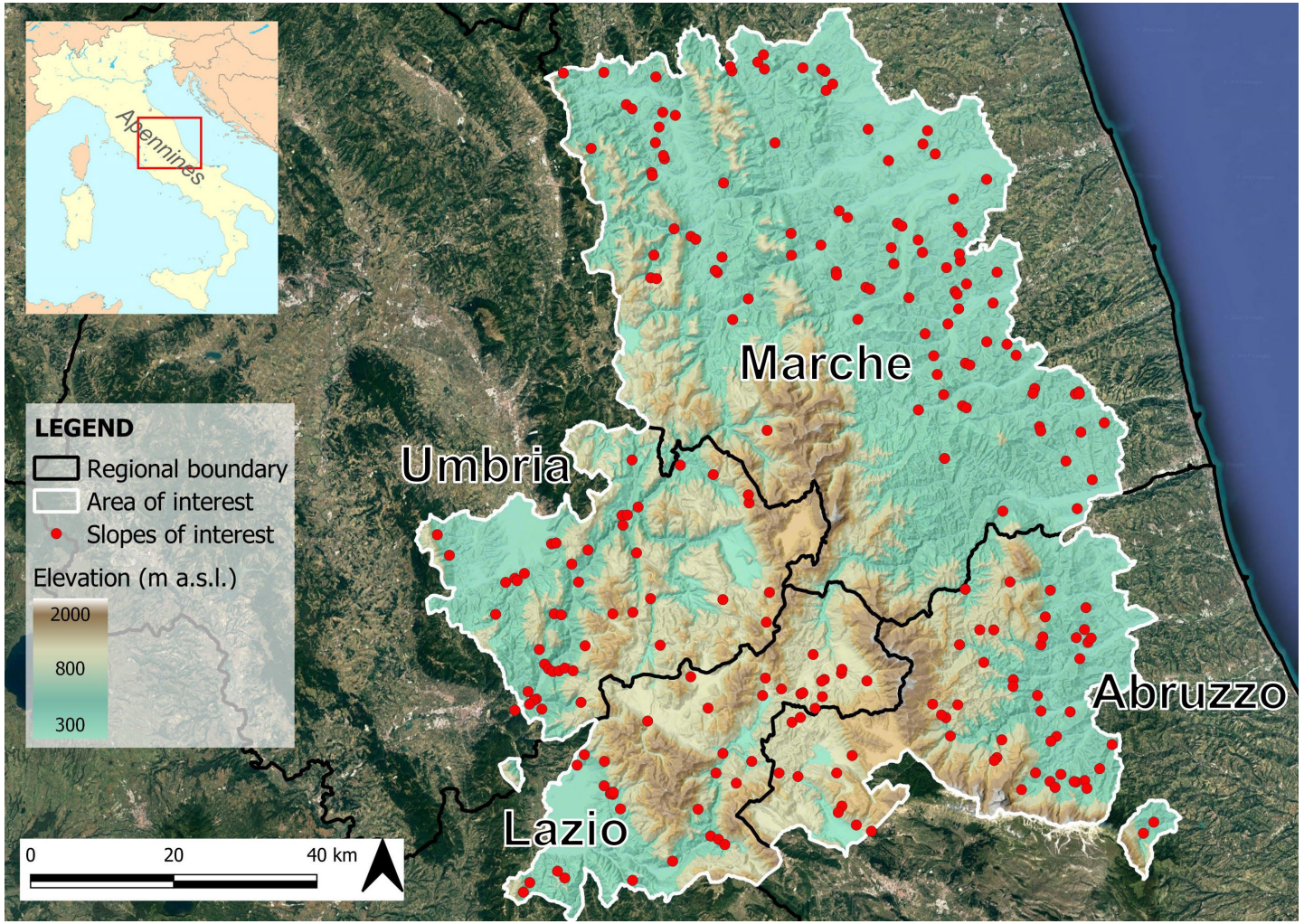
OPEN QUESTIONS

- How to identify and characterize local-scale phenomena starting from regional-scale A-DInSAR analyses?
- How to enhance site-specific morphographic and morphodynamic information?

STUDY AREA → TEST SITE

- 2016-2017 Amatrice seismic sequence area
- 8000 km^2, 4 Regions

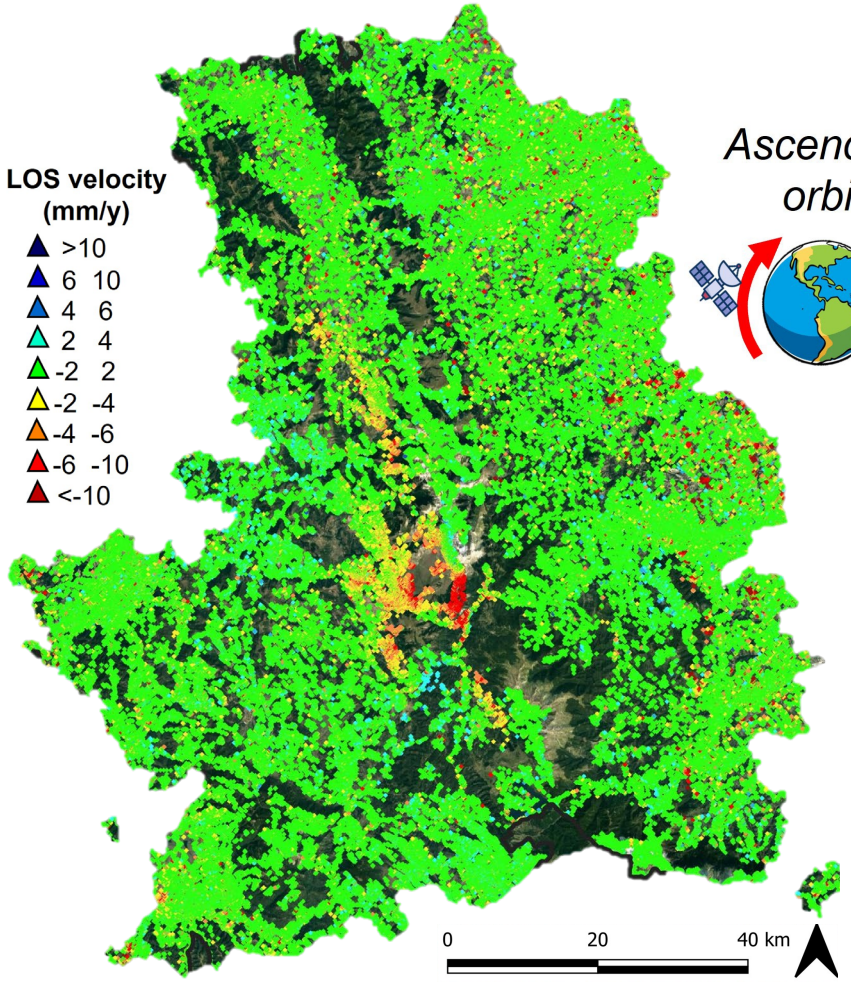
245 slopes of interest



A-DInSAR analysis

sentinel-1

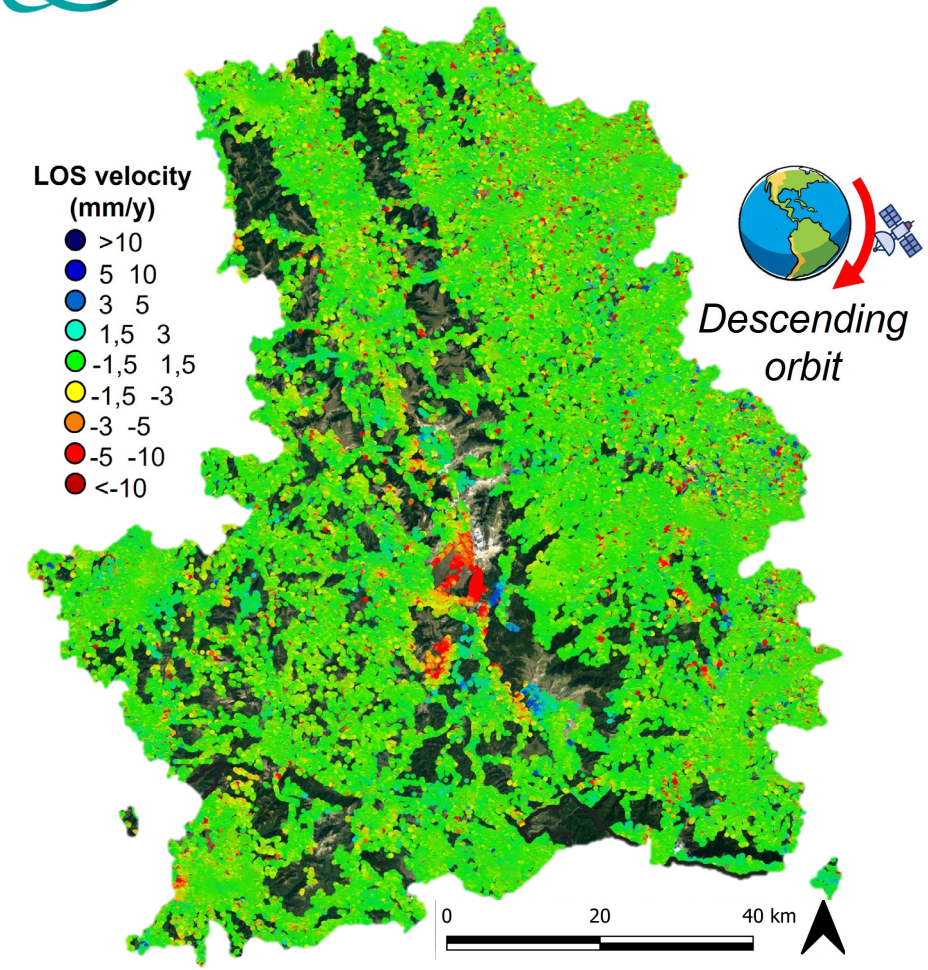
Radar image pixel size: 5x20 m
Time interval: 2017-2021



Combination of different satellites

COSMO SkyMed

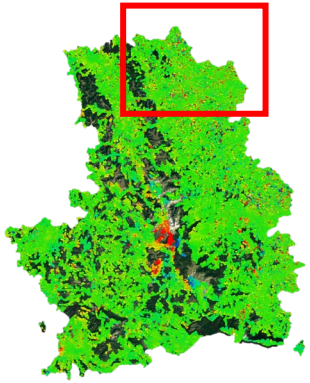
Radar image pixel size: 3x3 m
Time interval: 2017-2021



Methodology

REGIONAL SCALE

A-DInSAR datasets for Sentinel-1 and COSMO-SkyMed in ascending and descending geometry



SEMI-AUTOMATIC SELECTION

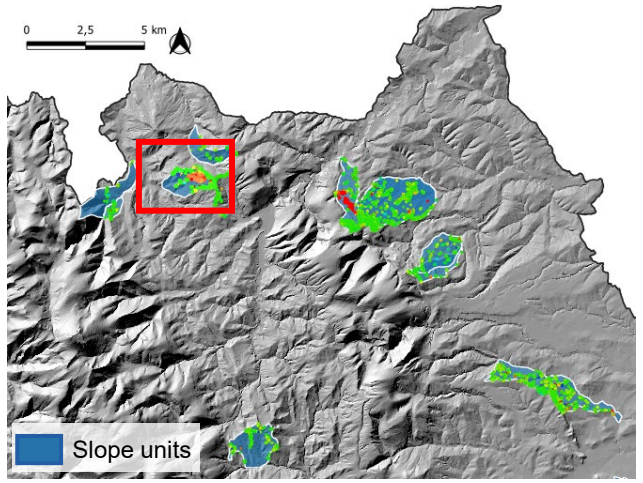
Automatic classification

Coverage (PS density and uniformity distribution)

Velocity thresholds

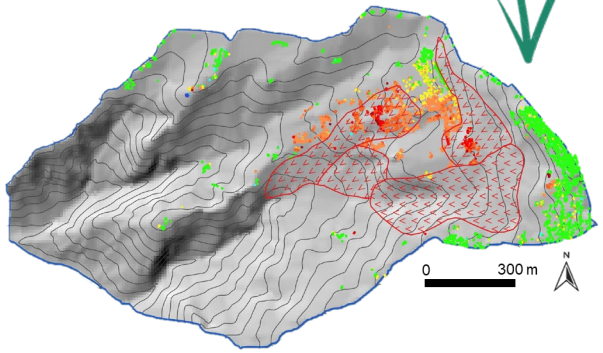
PAI landslide inventory

Slope units DEM-based (Alvioli et al., 2016)



Manual sub-selection

Cases of interest based on S1 and CSK datasets



LOCAL SCALE

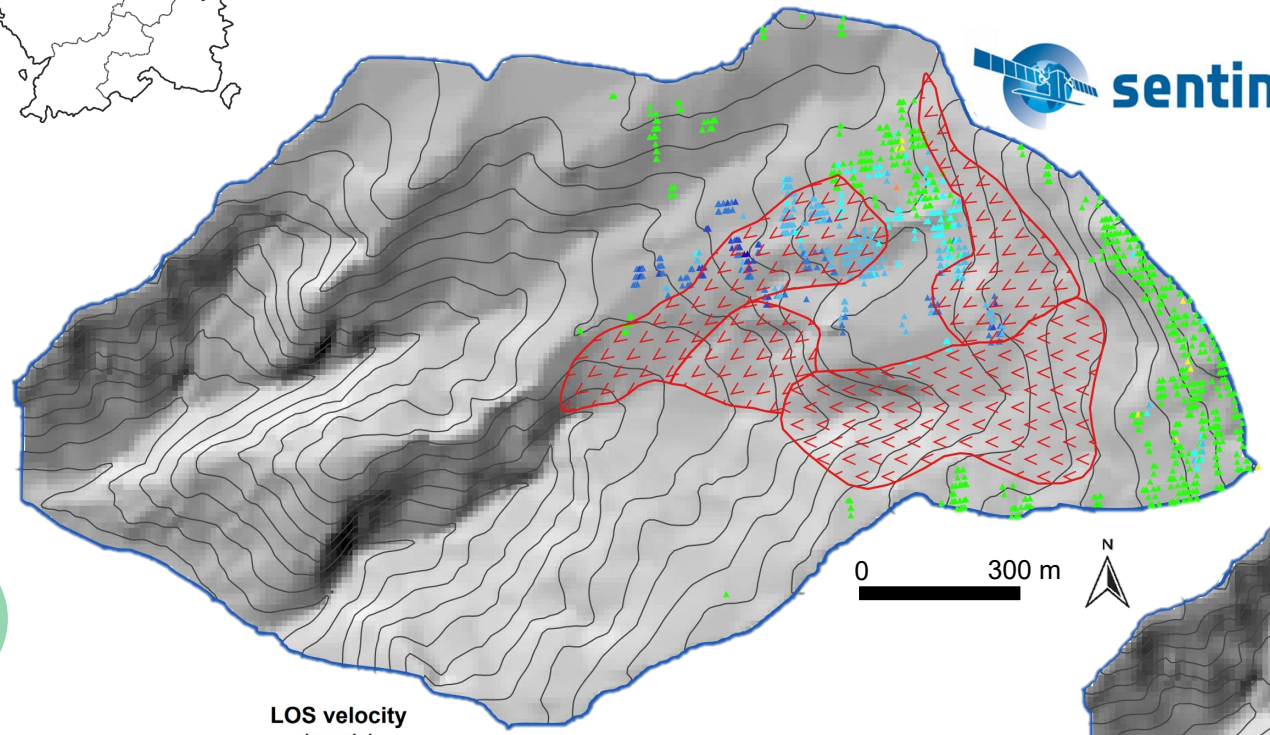
Advanced post-processing analysis of the selected case studies

OSPP

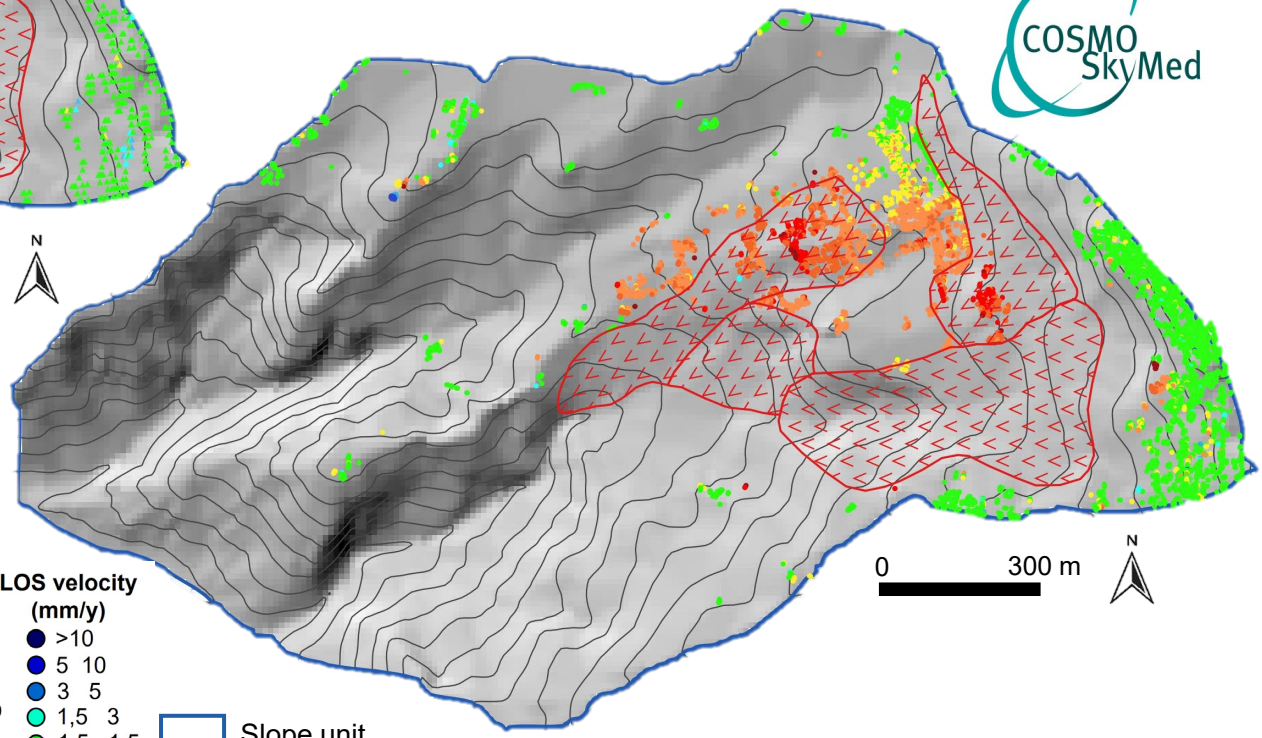
Selected case study

APIRO

sentinel-1



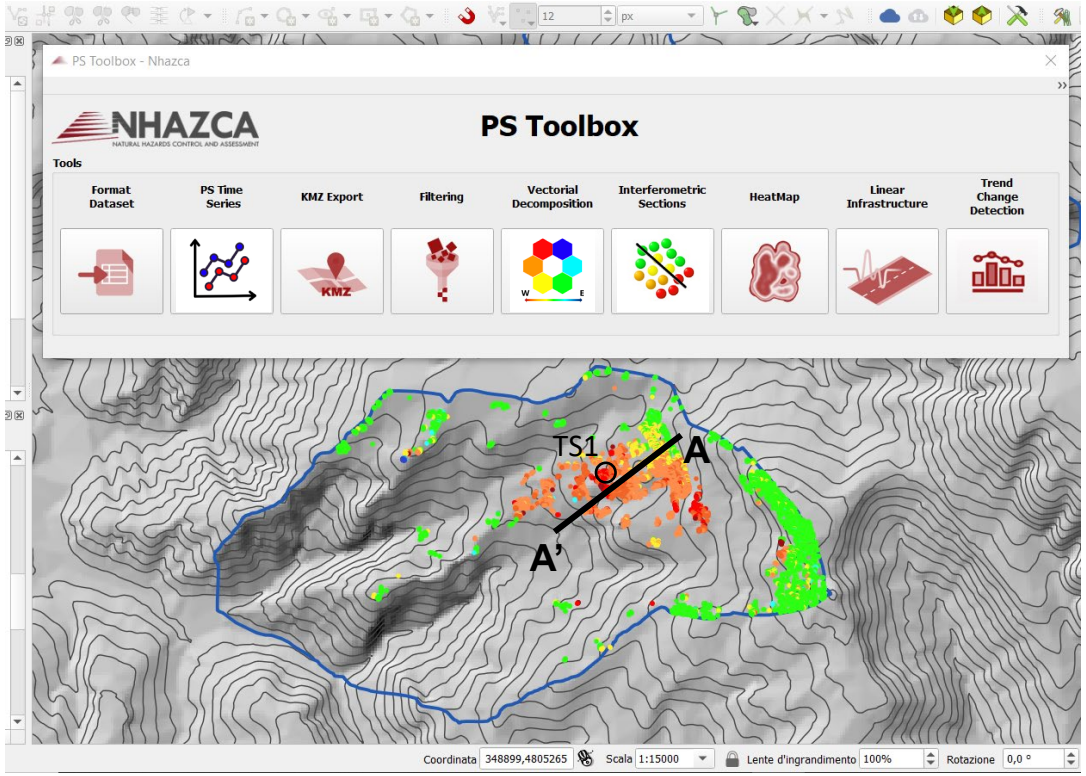
COSMO SkyMed



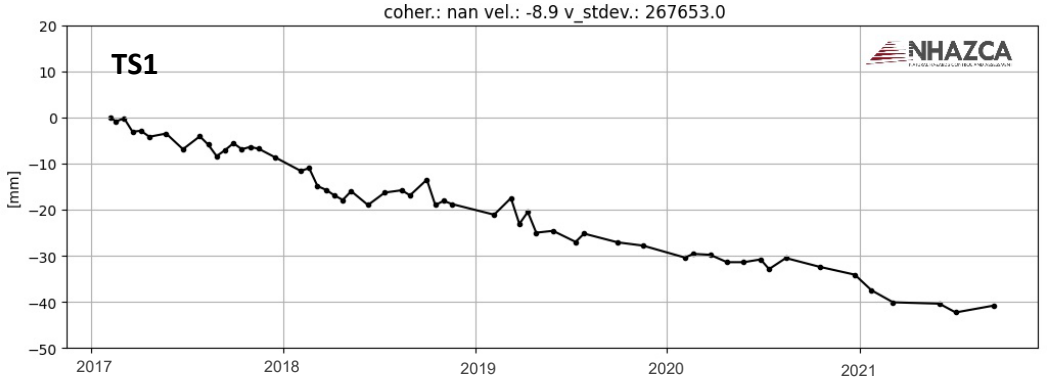
OSPP

Post-processing

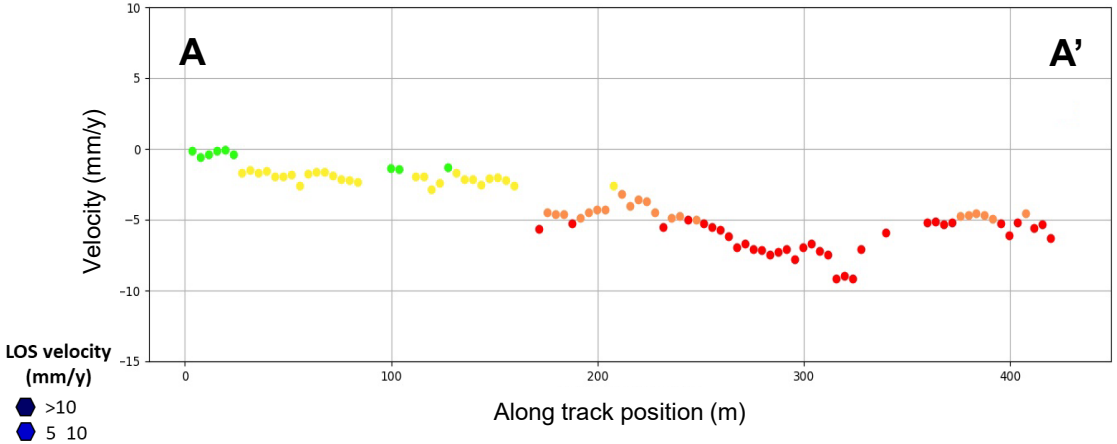
PS Toolbox: A-DInSAR post-processing toolbox for QGIS



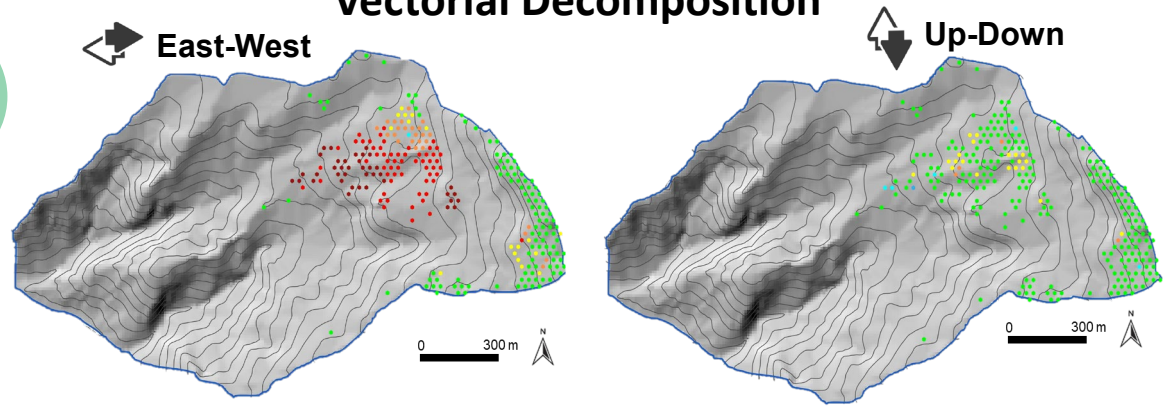
PS Time series



Interferometric Sections



Vectorial Decomposition



Sentinel-1 ASC + COSMO-SkyMed DESC decomposition

Conclusions

How to identify/characterize local-scale phenomena starting from regional-scale InSAR analyses?

Semi-automatic selection of case studies characterized by high PS coverage (density and uniform distribution) and exceeding velocity thresholds inside the slope unit and considering the current inventory

How to retrieve site-specific morphographic and morphodynamic information?

Refining the current inventory through post-processing analyses integrated in a specific plugin: in-depth delimitation of landslide area and characterization of its internal displacement patterns

Future perspectives

From national/international-scale (*European Ground Motion Service*) to local-scale: Improving methods that automatically select and classify areas showing significant displacements

This presentation participates in OSPP

Outstanding Student & PhD candidate Presentation contest

THANK YOU FOR YOUR ATTENTION!

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