

## INTRODUCTION

This study presents an assessment of the displacements of the Earth's crust generated in the last ten years in the region of the Balkan Peninsula after recorded earthquakes.

The Balkan Peninsula is one of the most seismic areas in Europe, since the beginning of the twentieth century several superficial destructive earthquakes of magnitude greater than 6.0 have been recorded.

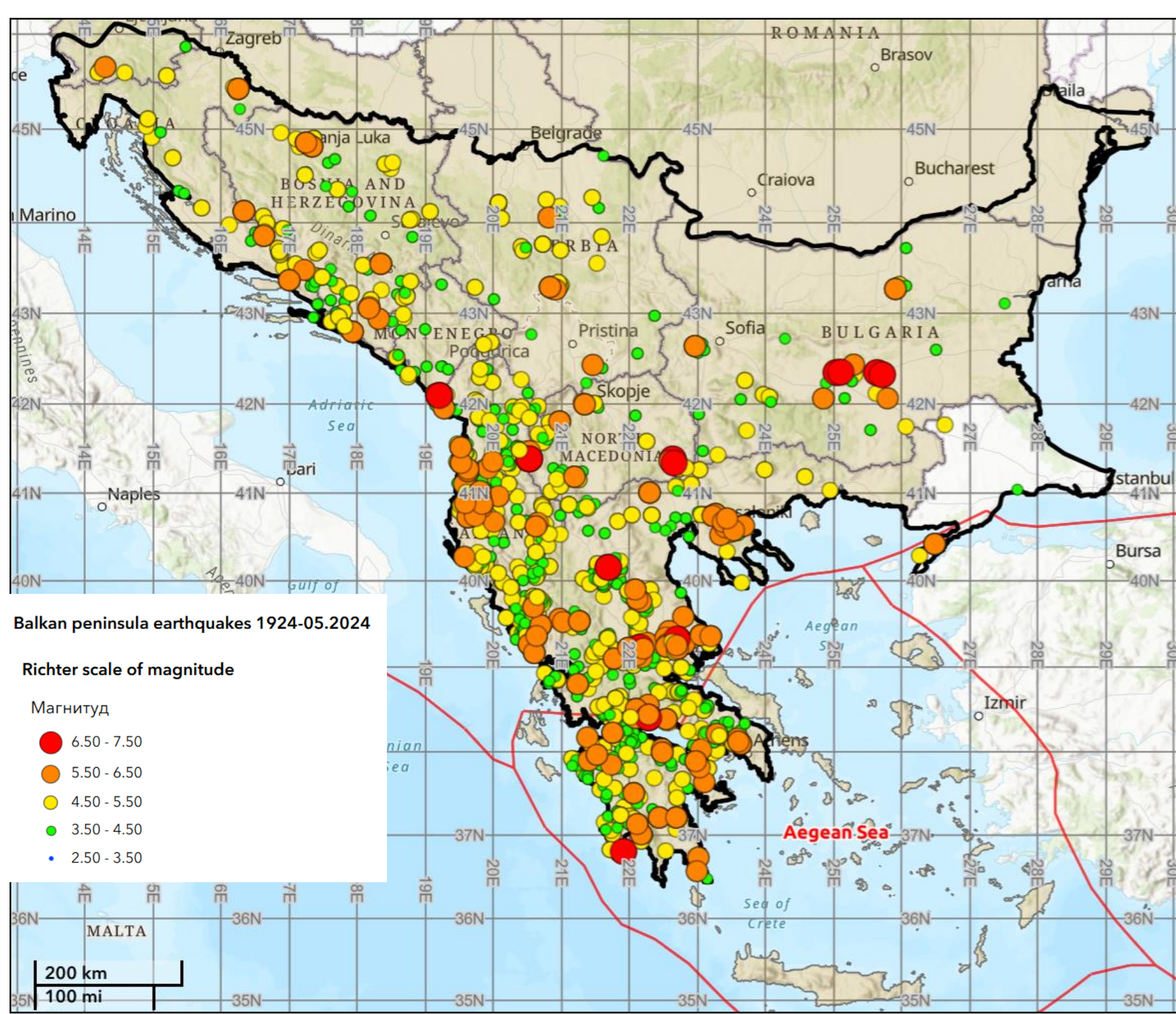


Fig. 1. Balkan peninsula earthquakes 1914-05.2024 [1]

The following web map focuses on earthquakes in the Balkan Peninsula in the last 100 years. Data for it are retrieved from the USGS website.

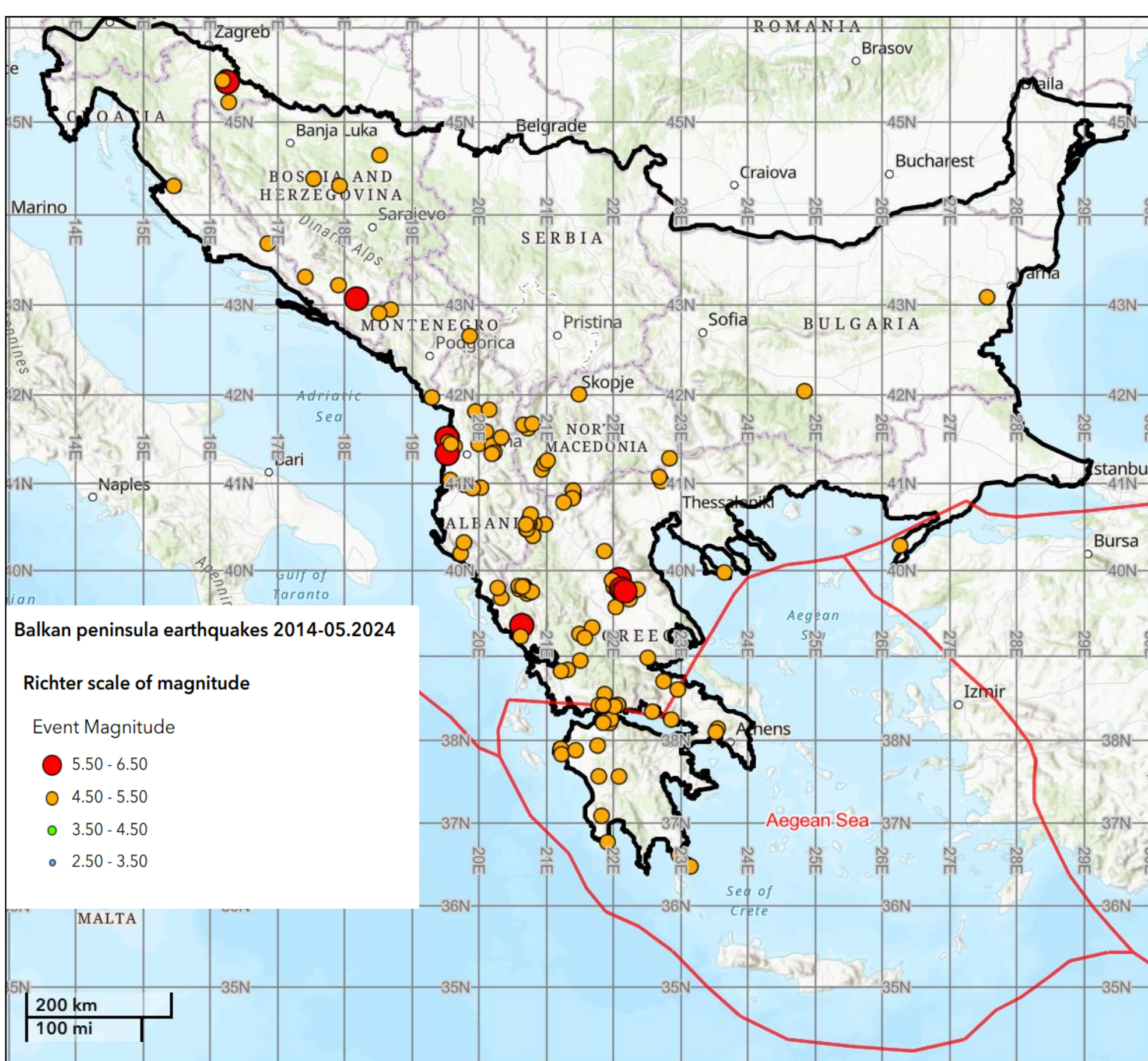


Fig. 2. Balkan peninsula earthquakes 2014-05.2024 [1]

We are focused on studying the co-seismic displacements associated with earthquakes with magnitude 5.5 Mw and more that happened on the Balkan Peninsula. This enables us to review of long-term tectonic a deformation between 2014 and 2024 for the entire peninsula. To the list of earthquakes with a magnitude above 6.0 for the Balkan Peninsula were included in the research and earthquakes that occurred in 2023 in Turkey-Syria, the earthquake on the island of Crete in 2021. This submission presents a short description of the used technique, as well as application of this technique regarding the surface deformations caused by different seismic events.

## METHODS

The main data source are SAR satellite images from Sentinel-1A /B from ascending and descending orbits. The results were obtained applying the differential radar interferometry method (DInSAR).

The Line of Sight (LoS) displacements are converted into vertical and horizontal displacements and compared with deformations of the Earth's surface registered by GNSS and other geophysics methods [2]. The thematic processing of the SAR data was performed entirely by means of freely available software product SNAP [4]. In the processing, a series of interferometric pairs were formed to track the consequences of the every single event, and the information obtained is entirely based on the changes in the phase component of the radar signal reflected from the Earth's surface. This information, recorded in the form of interferometric images, made possible to determine the values of the displacements that occurred.

## RESULTS

The application of Interferometric Synthetic Aperture Radar (InSAR) approach and its modern developments is a remote sensing technique allowing measurements of surface deformation with cm-precision over large areas.

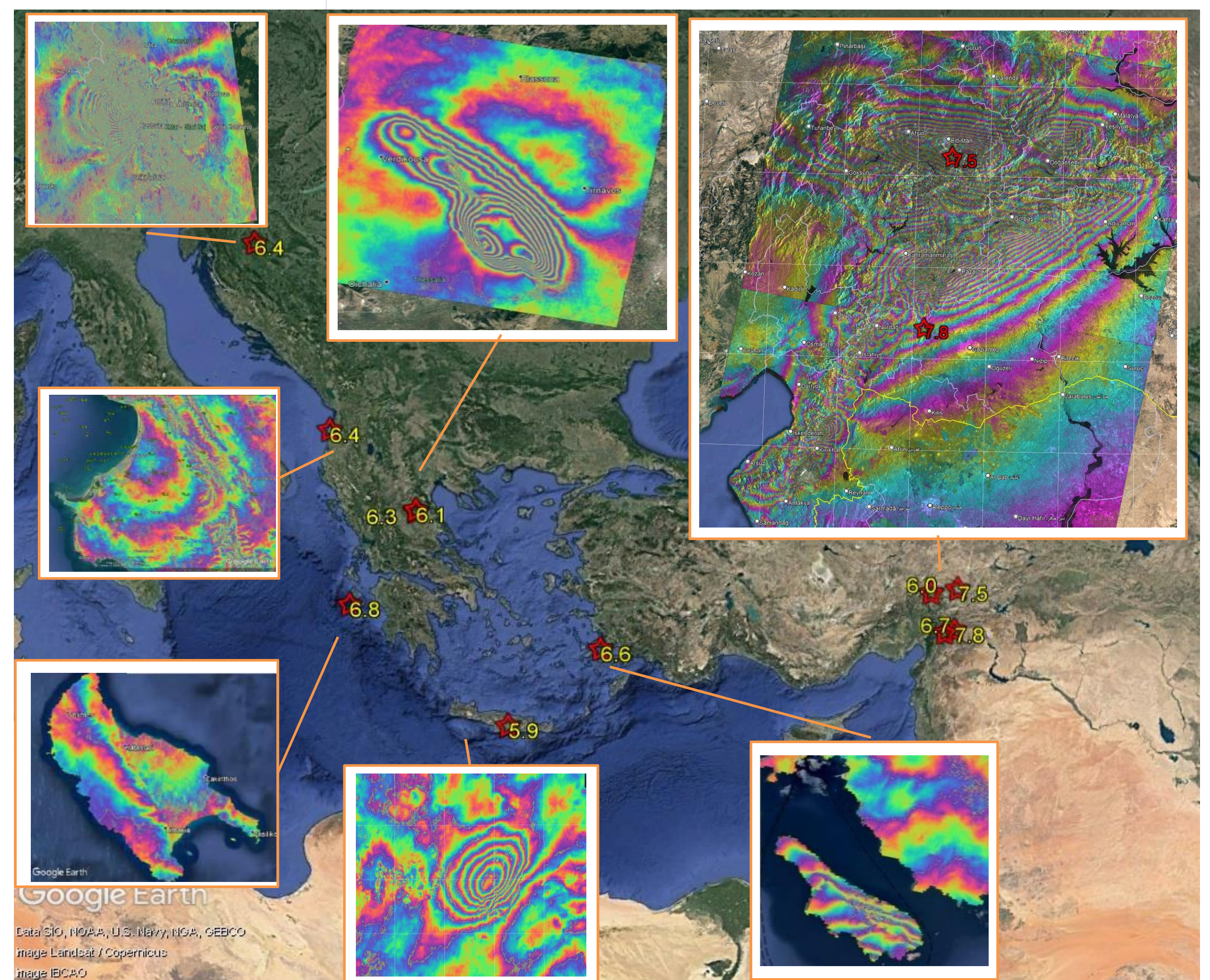


Fig. 3. Interferometric images formed by ascending orbits - 7 areas-epicenters of earthquakes

## CONCLUSIONS

1. The main objective is to demonstrate the possibility of determining the degree of deformation of the earth's surface and to prepare displacement maps that might be used by a large number of experts in different fields.
2. The applied processing methodology, successfully generates interferometric images that visually depict the displacements around the epicenters.
3. The presented examples demonstrate the application of satellite Earth observation technologies such as InSAR for the study and monitoring of the seismogenic zones of the Balkan Peninsula, highlighting their importance and advantages in establishing regularities in the movements in these zones.
4. Interpretation of the spatial distribution and co-seismic deformations caused by large earthquakes also provides insight into geodynamic and tectonic processes.

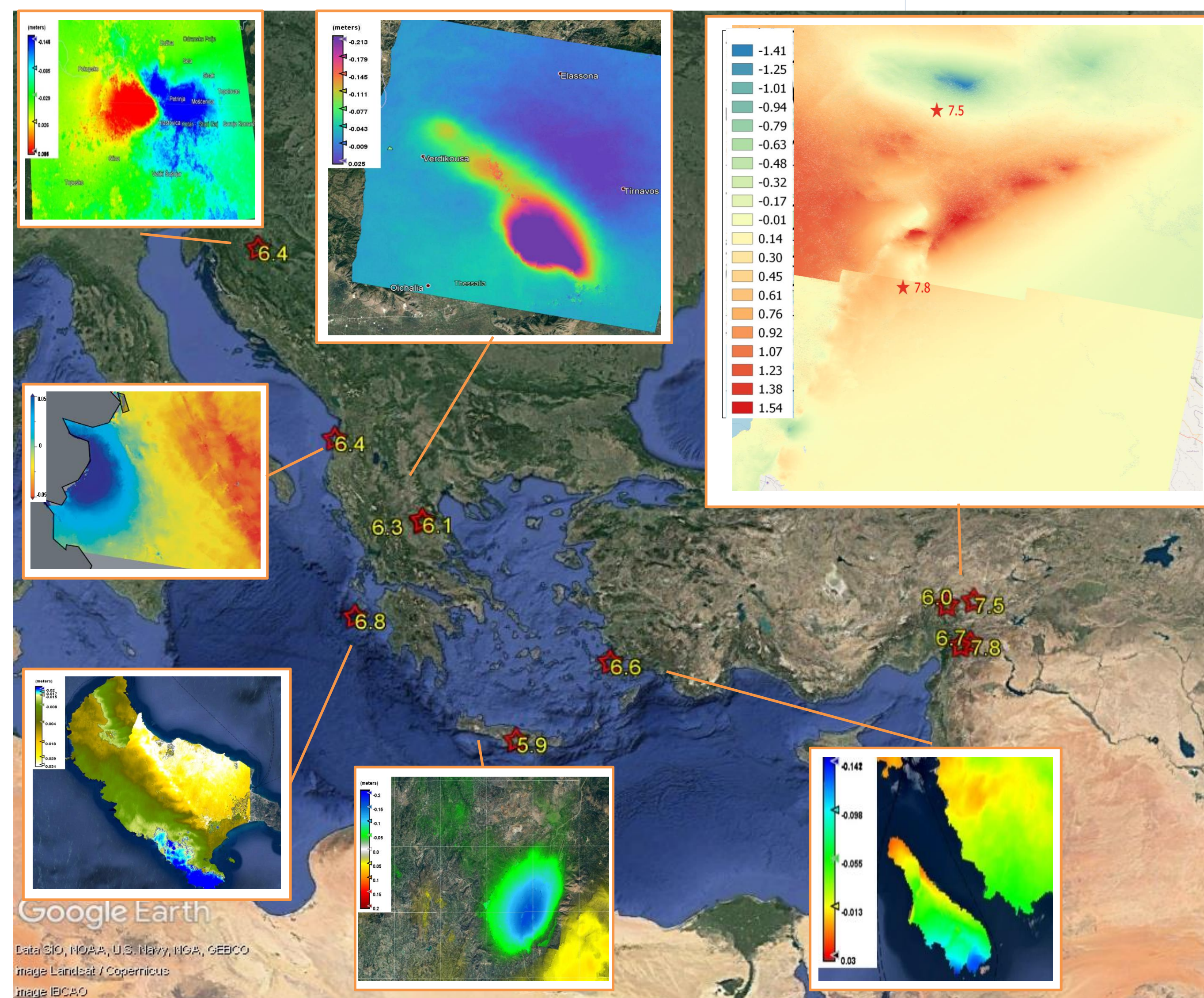


Fig. 4. Coseismic displacement using SAR data - application for the Balkan Peninsula

## REFERENCES

1. Latunov P., (2024) Web mapping of earthquakes in the Balkans peninsula; MS Graduation thesis, UASEG, 2024 <https://www.arcgis.com/apps/dashboards/a1dd3fa1be0743f795da9a47c2f4e058>
2. Atanasova-Zlatareva M, Nikolov N, Dimova L, Raykova R. (2024) Mapping and modelling of 27 sept 2021 Crete Earthquake deformation. Proceedings 9th International Conference on Cartography and GIS, 16-21 June 2024, Nessebar, Bulgaria; ISSN:1314-0604, 781-7883.
3. Atanasova-Zlatareva M., Nikolov H., Protopotova-Kakar V., (2024) WGAAL2023 proceedings/ International Workshop Geosciences in active areas (WGAAL2023), (IGEO) Books and parts of books; ISBN:978-84-128033-6-5, DOI:<https://doi.org/10.20350/digitalCSIC/16338>, 40-47
4. <http://step.esa.int/main/toolboxes/snap/>