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Applications of EGMS products for detection of coseismic displacements on the Balkan Peninsula

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1. Motivation and Goals

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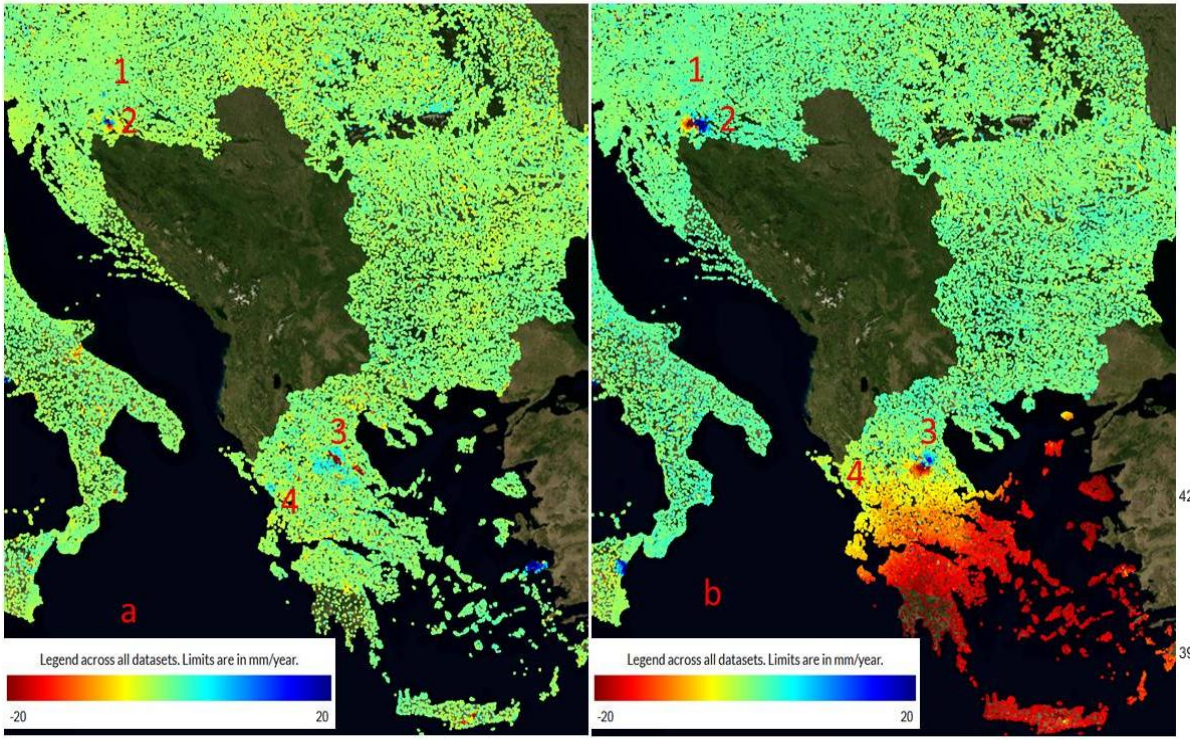
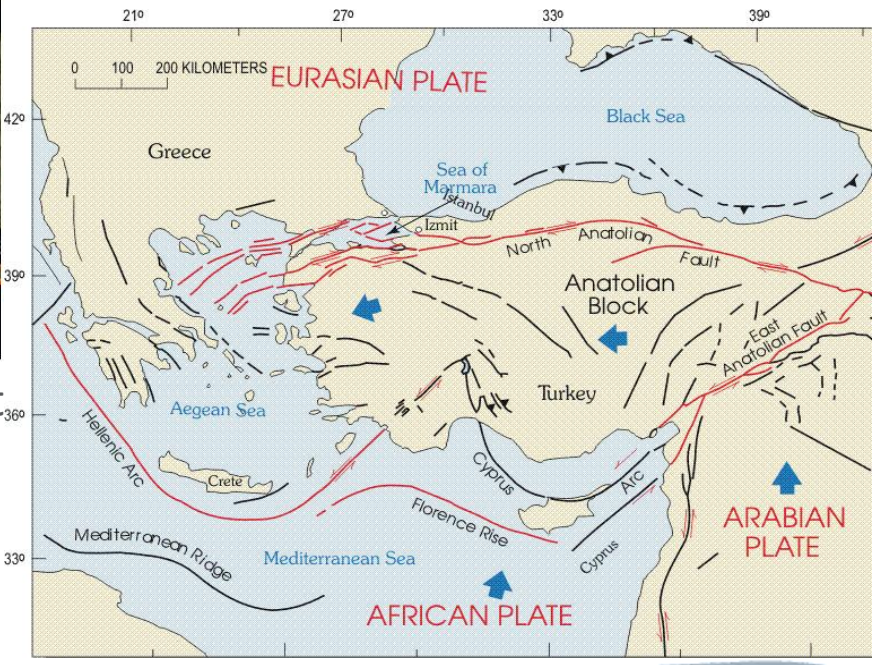
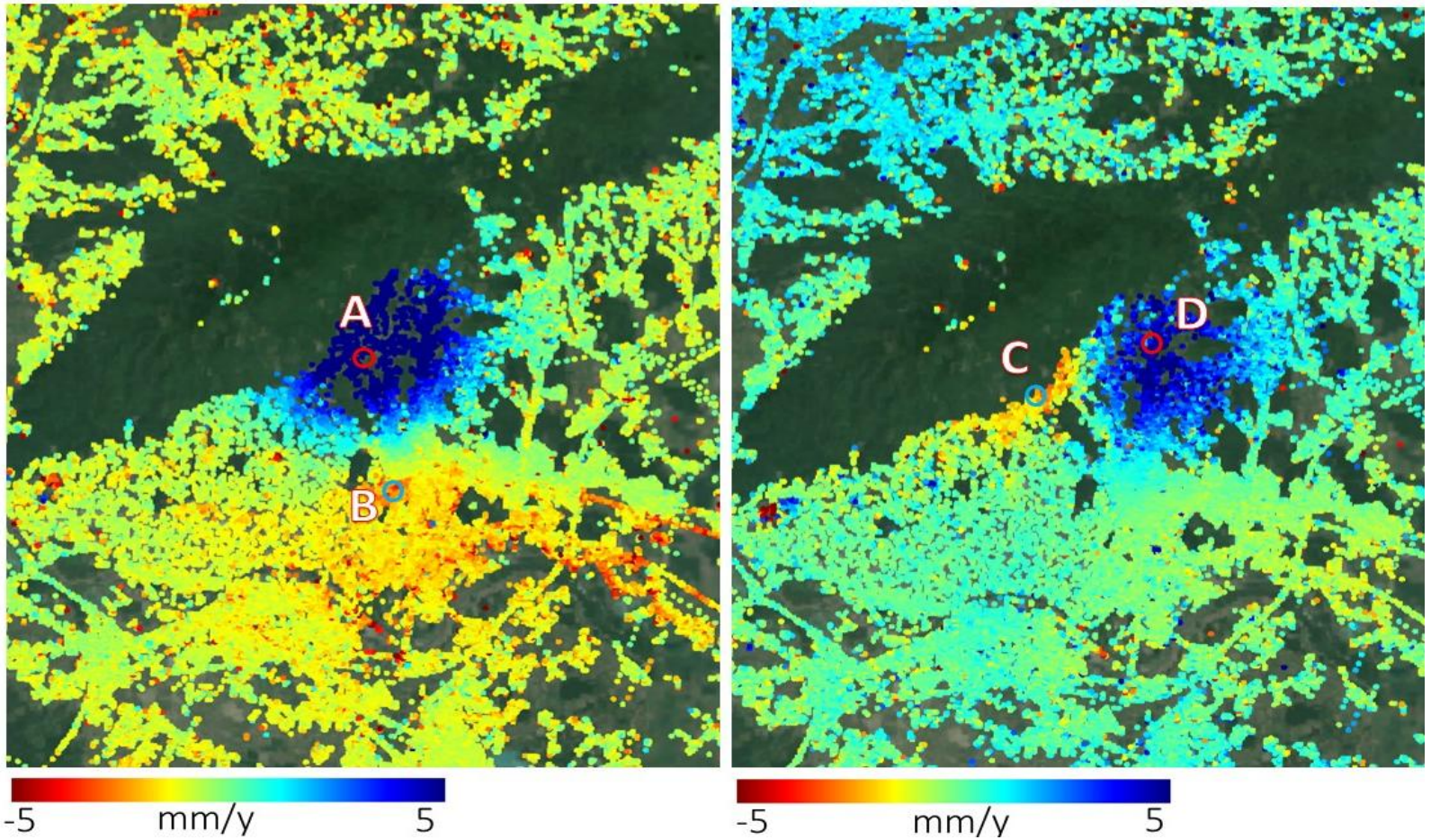


Vertical and Horizontal (East/West) component movement determined by MT-SAR for period 2019-2023 from EGMS

The Region is a seismically active tectonic zona with high deformation rates due to its location at the convergence area of the African and Eurasian plates, including the Aegean-Anatolian microplate.



2. Movement by MT-SAR from EGMS for period 2019-2023 for point Zagreb region



Vertical movement

Horizontal movement

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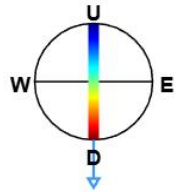
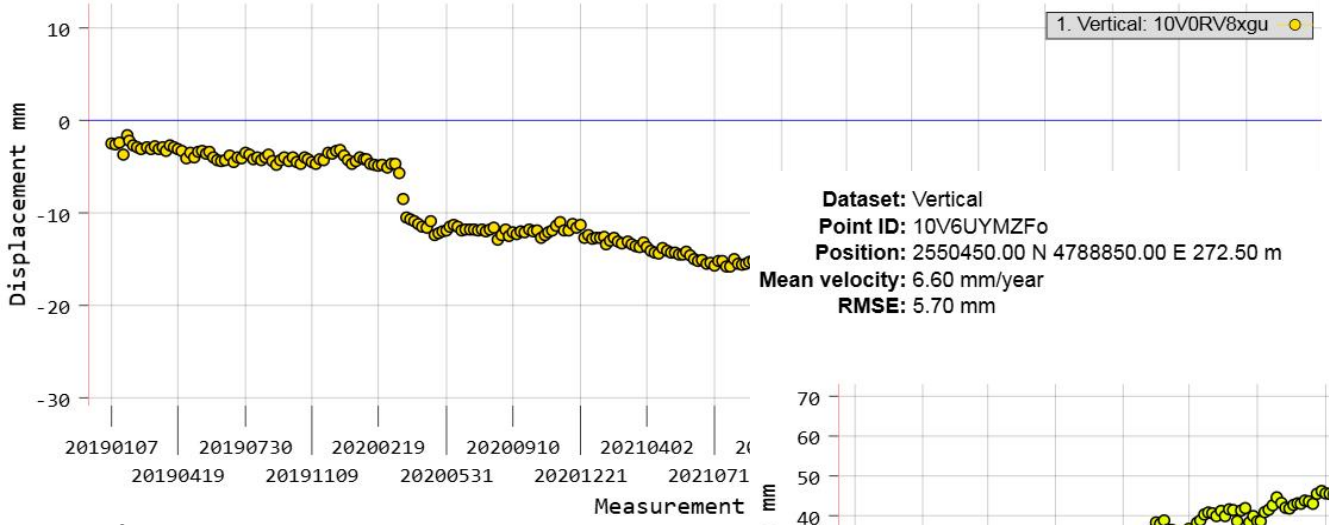
3. Vertical displacements by MT-SAR from EGMS for period 2019-2023 for point Zagreb region

Dataset: Vertical
Point ID: 10V0RV8xgu
Position: 2542450.00 N 4790450.00 E 124.90 m
Mean velocity: -3.80 mm/year
RMSE: 1.10 mm

Incidence angle: 0.00°



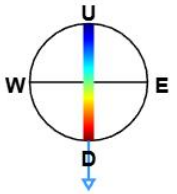


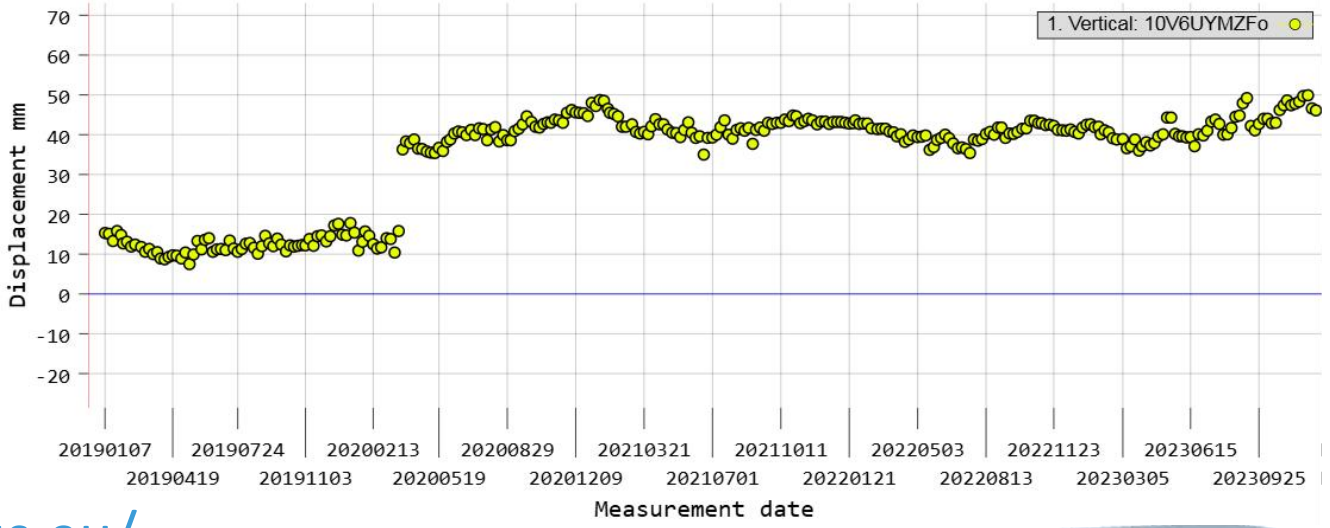
Point A

Point B

Dataset: Vertical
Point ID: 10V6UYMZFo
Position: 2550450.00 N 4788850.00 E 272.50 m
Mean velocity: 6.60 mm/year
RMSE: 5.70 mm

Incidence angle: 0.00°





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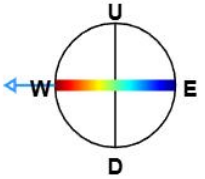
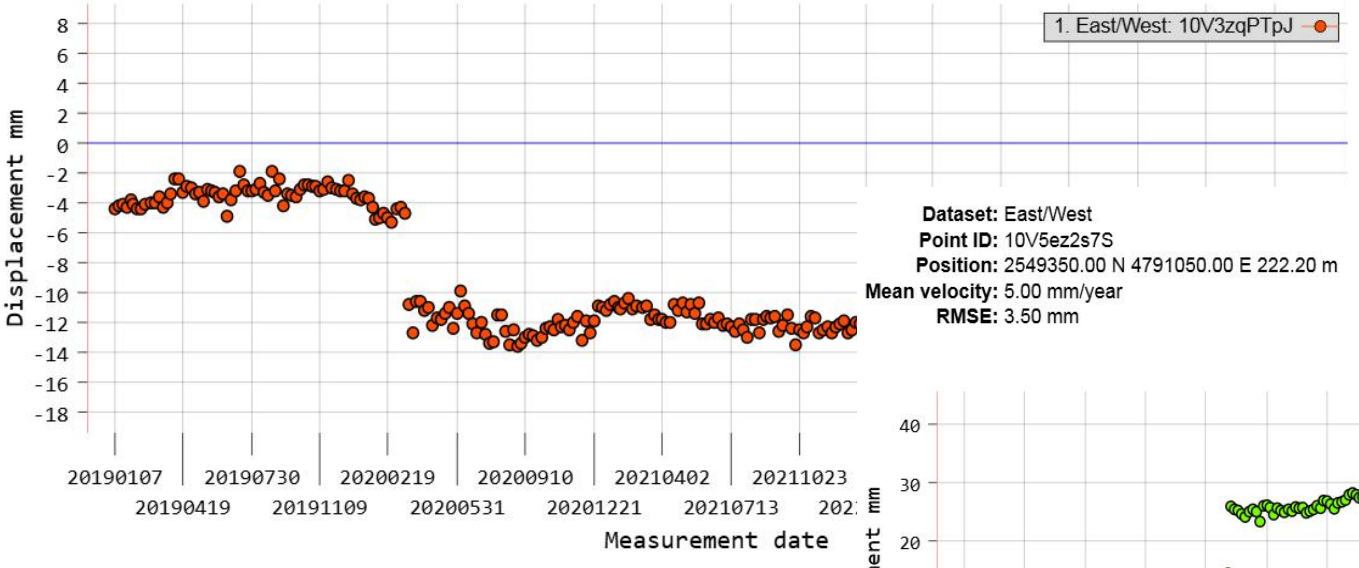
4. Horizontal displacements by MT-SAR from EGMS for period 2019-2023 for point Zagreb region

Dataset: East/West
Point ID: 10V3zqPTpJ
Position: 2547150.00 N 4786550.00 E 273.60 m
Mean velocity: -1.80 mm/year
RMSE: 1.80 mm

Incidence angle: 270.00°



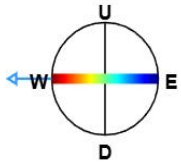


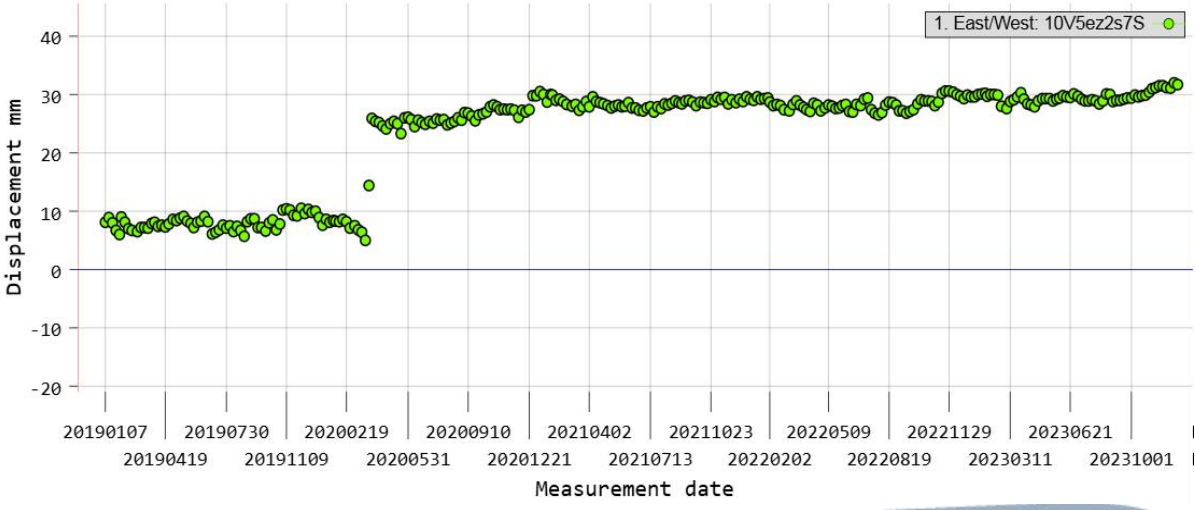
Point C

Point D

Dataset: East/West
Point ID: 10V5ez2s7S
Position: 2549350.00 N 4791050.00 E 222.20 m
Mean velocity: 5.00 mm/year
RMSE: 3.50 mm

Incidence angle: 270.00°





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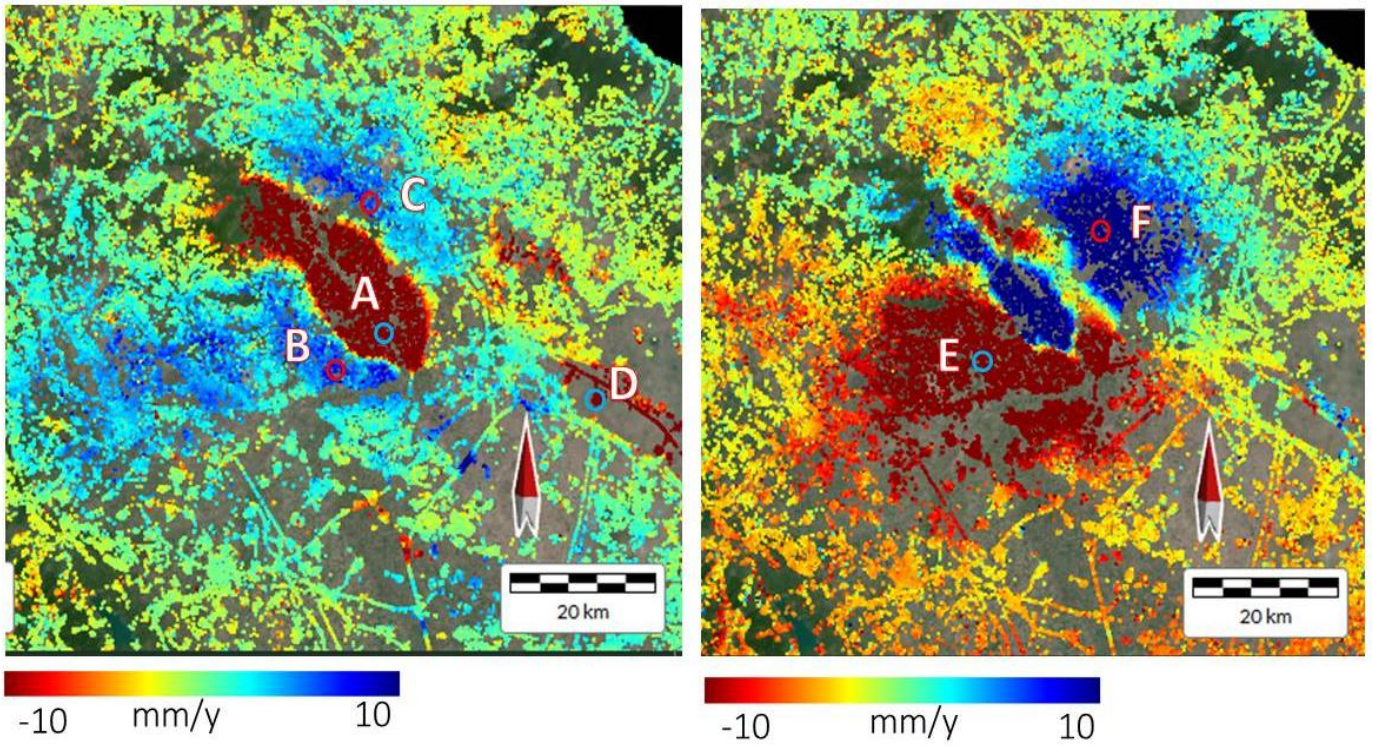
5. Coseismic displacements after Larisa earthquake on 3 March 2021



Vertical and Horizontal (East/West) component movement determined by MT-SAR for period 2019-2023 from EGMS for Larisa area.

The EGMS data are also based on interferometric satellite radar images from the Sentinel 1-A mission and for a relatively long time period from January 2019 to December 2023

The DinSAR method was used and time series of MT-InSAR interferograms were created from both types of satellite orbits D36, A58 and A131.

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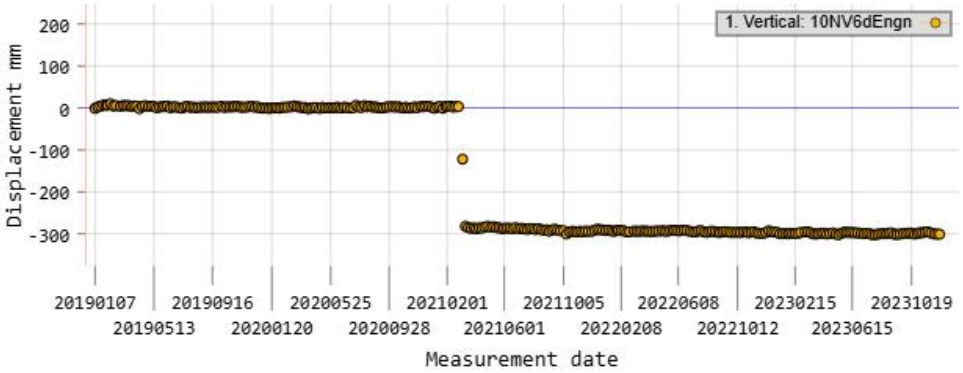
6. Vertical displacements by MT-SAR from EGMS for period 2019-2023 for points Larisa area

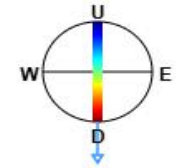
Dataset: Vertical
Point ID: 10NV6dEngn
Position: 1927050.00 N 5366550.00 E 334.90 m
Mean velocity: -90.40 mm/year
RMSE: 53.60 mm
Incidence angle: 0.00°

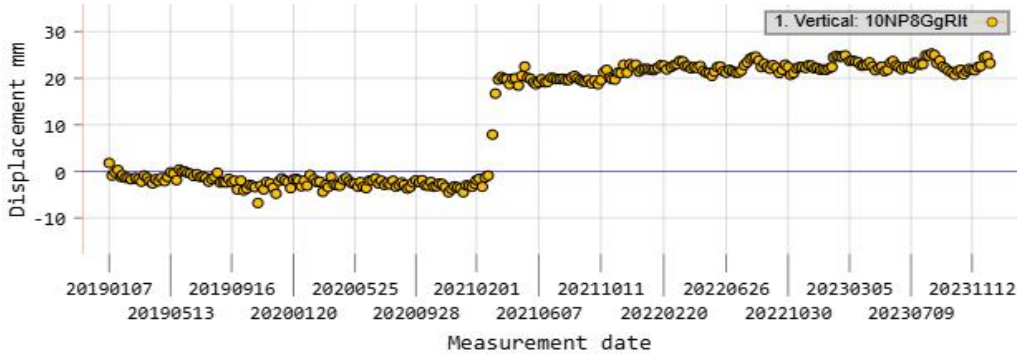
Point A



Dataset: Vertical
Point ID: 10NP8GgRIt
Position: 1919150.00 N 5361550.00 E 200.10 m
Mean velocity: 7.40 mm/year
RMSE: 4.10 mm
Incidence angle: 0.00°

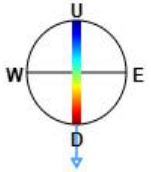
Point B

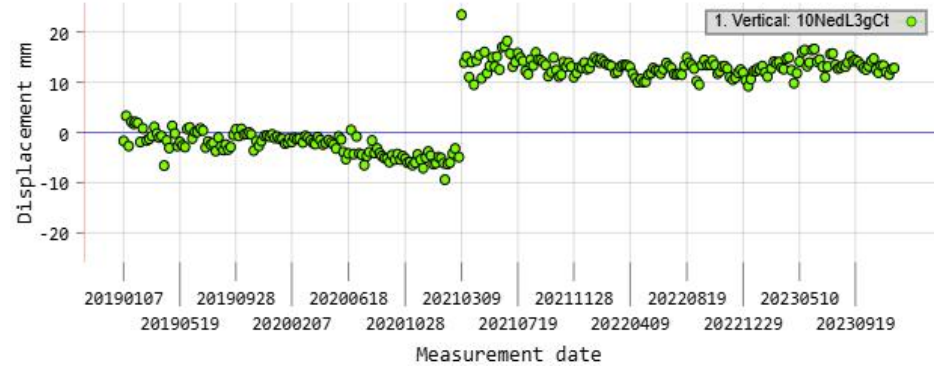




Dataset: Vertical
Point ID: 10NedL3gCt
Position: 1939650.00 N 5366350.00 E 532.20 m
Mean velocity: 4.50 mm/year
RMSE: 4.20 mm
Incidence angle: 0.00°

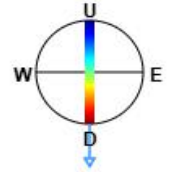
Point C

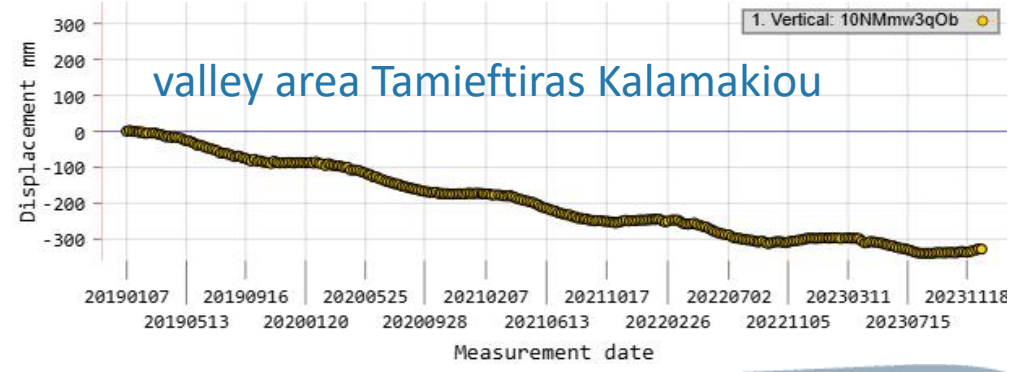




Dataset: Vertical
Point ID: 10NMmw3qOb
Position: 1916050.00 N 5409350.00 E 58.20 m
Mean velocity: -69.80 mm/year
RMSE: 2.30 mm
Incidence angle: 0.00°

Point D





valley area Tamieftiras Kalamakiou

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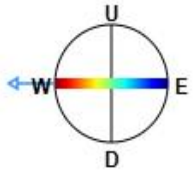
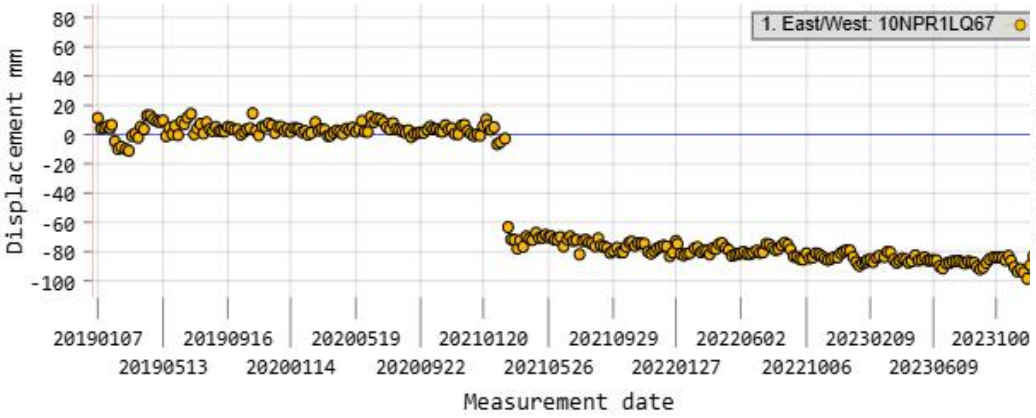
7. Horizontal (East/West) displacements by MT-SAR for period 2019-2023 points for Larisa area

Dataset: East/West
Point ID: 10NPR1LQ67
Position: 1919550.00 N 5367550.00 E 274.50 m
Mean velocity: -26.60 mm/year
RMSE: 14.30 mm
Incidence angle: 270.00°

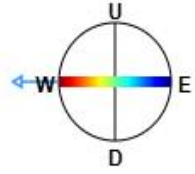
Point E

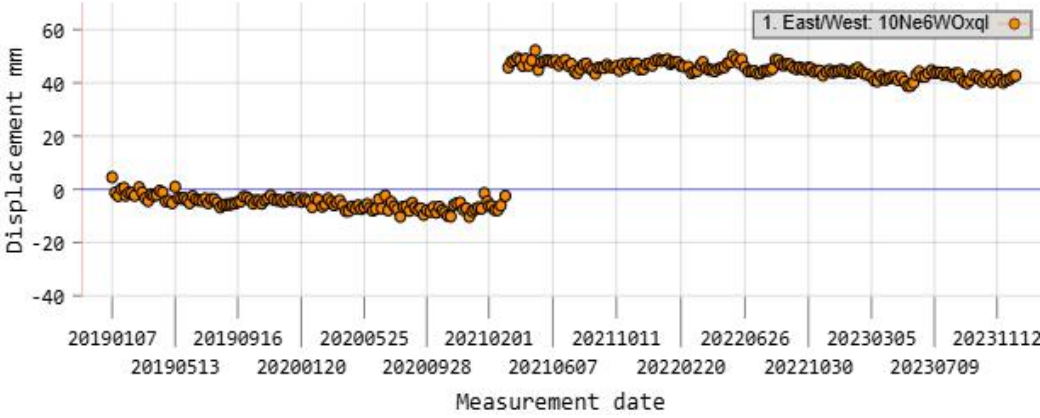




Dataset: East/West
Point ID: 10Ne6WOxql
Position: 1938950.00 N 5368350.00 E 568.50 m
Mean velocity: 14.40 mm/year
RMSE: 10.60 mm
Incidence angle: 270.00°

Point F





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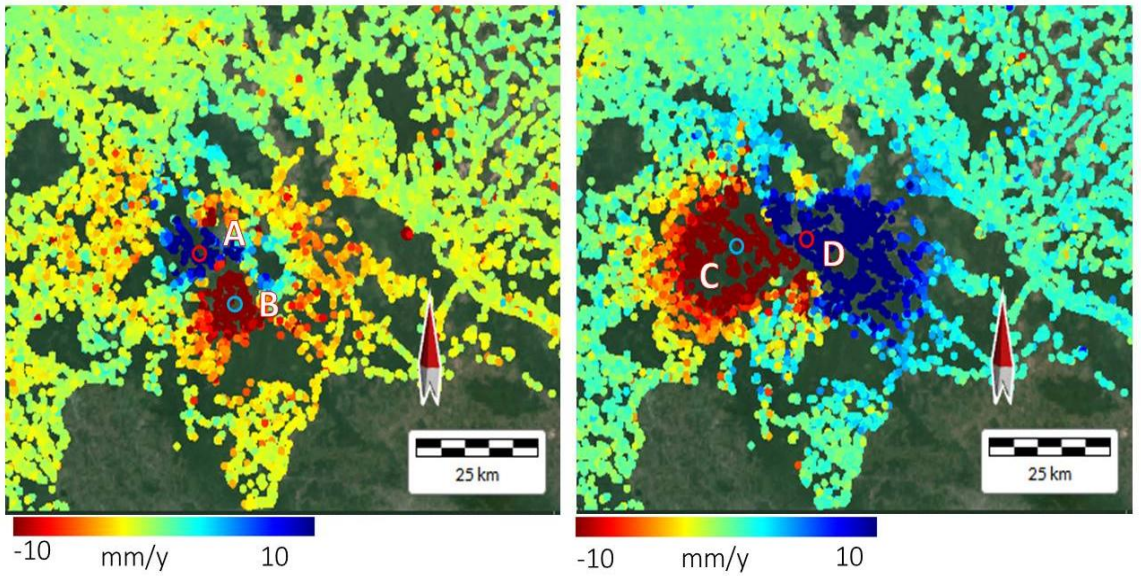
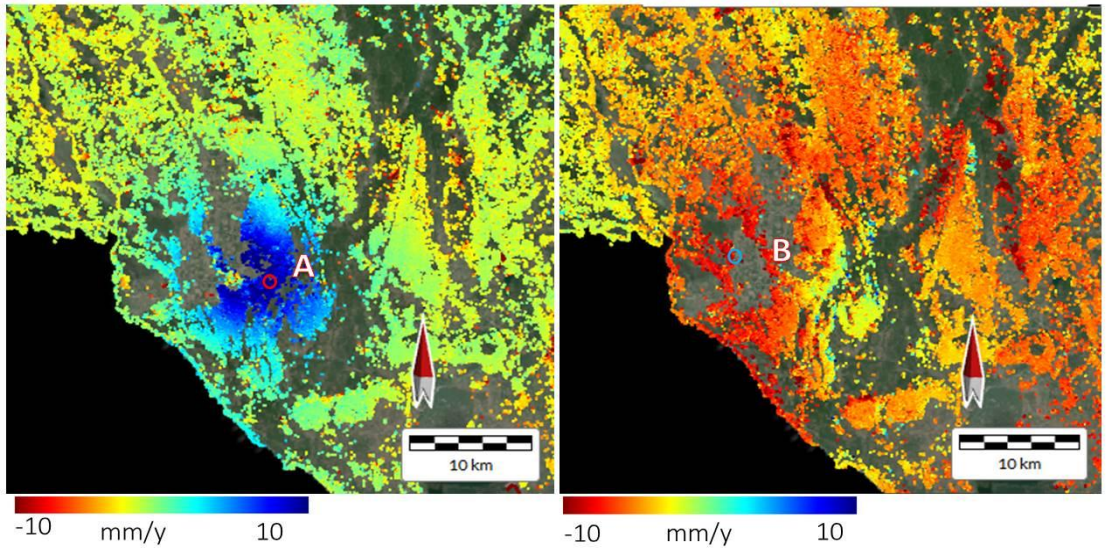
Examples



Coseismic displacements after earthquakes on the December 29, 2020 near the town of Petrinja



Coseismic displacements after Kanalaki earthquake of 21 March 2020 in Western Epirus

8. Conclusions

- This study aimed to demonstrate the application of EGMS products technologies for Earth observation for the study and monitoring of the seismogenic areas of the Balkan Peninsula and their importance and advantages in establishing regularities in the movements in these zones.
- Results show Interpretation of the spatial distribution on co-seismic deformations caused by large earthquakes occurred in the Balkan Peninsula provides clarity studying into geodynamic and tectonic processes.
- The application of CLSM products and mainly EGMS are part of build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation.
- The accuracy of EGMS data compared coseismic displacements from previous work has shown the data set to be reliable to mm-scale or con note discrepancies between EGMS and previous results of several mm, attributed residual atmospheric effects or temporary low coherence during image acquisition.

Thank you!

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1) project: "National Geoinformation Center (NGIC)", funded by the National Roadmap for Scientific Infrastructure 2020-2027 of Bulgaria. Contract No. D01-321/30.11.2023

2) project: "Study of coseismic deformations of the earth's crust for the territory of the Balkan Peninsula based on satellite data", financed by " Competition for financial support of basic research projects – 2023" of Bulgaria.Contract No. KP-06-N74/2 from 14.12.2023.