Present-day crustal deformation in Romania from continuous and episodic GNSS measurements

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Abstract

Monitoring of crustal deformations occurring on the Carpathian orogen and the neighboring platforms in Romania in correlation with tectonic processes in South-East Europe (Africa-Europe plate interactions), observation of crustal movements in order to shape the surface expression of deep processes like those generating deep earthquakes in the Eastern Carpathians Bending Zone (Vrancea region) were the fundamental purposes of developing and maintaining a Romanian permanent GNSS/GPS network starting from the beginning of this century. The implementation started in 2001 when the first station was installed at Lacauti in the Vrancea seismogenic area. Nowadays, 27 permanent GPS stations cover the entire area and the network is still expanding. In parallel with the development of the permanent network, episodic campaign measurements sites took place, for a period of 13 years, so that each year every location has been occupied 72 hours uninterruptedly. It has been also more than six years since other three different GNSS reference station networks have been set up in Romania and a comprehensive description of those GNSS networks will be presented in order to reflect the actual capabilities.
This study will present the results of analysing the continuous and episodic GNSS/GPS measurements in Romania from a homogeneous combination of all networks following their objectives, like monitoring the crustal changes in Romania by correlating them with tectonic processes in South-East Europe and monitoring the crustal movements to shape the surface-to-depth relationships of intermediate-depth earthquakes in the Vrancea region. We present an analysis of all available RINEX data processed in daily batches with the "Precise Point Positioning" (PPP) strategy using the GIPSY-OASIS software. From the resulting position time-series, the horizontal and vertical motion vectors were calculated, relative to a stable Eurasian reference frame.

The results of the present study show that the area tends to move slightly southward relative to Eurasia, at velocity rates of about 2.5 – 3.0 mm/yr. We speculate that this could be a

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far-field effect of slab roll-back due to the subduction of the African under the Eurasian plate at the Aegean trench, way far to the south. The involvement in EPOS – IP project as member of GNSS Data and Products Working Group helps us evolve in the same direction, test and implement GLASS software package for the dissemination of GNSS data & dedicated processing outcomes, time-series, velocities, and strain-rates - to be created using state-of-the-art methodologies) for a better understanding and completion of the tectonic puzzle pieces of Solid Earth processes in this challenging structure of Southeastern Europe.

Acknowledgments:

This work was supported by a grant of the Romanian National Authority for Scientific Research, CNCS/CCCDI "UEFISCDI, project number PN-III-P1-1.2-PCCDI-2017-0266, Contract No. 16PCCDI/2018, Nucleu Program, project no. PN 18150203 and European Union Horizon 2020 research and innovation program under grant agreement No.676564.