# Geodynamics of the Romanian Territory Inferred from a Dense Continuous GNSS Network

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## Summary

No Summary provided

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## Abstract

Over the last two decades the Romanian territory has been covered by a dense permanent Global Navigation Satellite System (GNSS) network, presently including more than one hundred stations established and maintained by several Romanian agencies. We refer to these as continuous GNSS (cGNSS) stations. For the study presented here we exclusively use the data of the Global Positioning System (GPS), which is the oldest and most widely-used element of GNSS. At the beginning of this century, we realized the potential of cGNSS for scientific purposes. Applications include monitoring of crustal deformations associated with the Carpathian orogen and the neighbouring platforms in Romania, in correlation with tectonic processes in South-East Europe (Africa-Europe plate interactions), observation of (vertical) crustal motions to study the surface expression of deep earthquakes in the Eastern Carpathians Bending Zone (Vrancea region).

This study presents the results of our analysis of the aggregated cGNSS measurements in Romania. The results cover the period 2000-2020, but focus on the period 2013-2020 when the majority of the stations became operational. We processed the Receiver Independent Exchange Format (RINEX) daily data (sampled at 30-second intervals) of all available stations. For this purpose, we used the GipsyX scientific GPS analysis software, applying the so-called Precise Point Positioning (PPP) strategy. This resulted in time-series of the horizontal and vertical position components of each station in the International Terrestrial Reference Frame 2014 (ITRF14). Subsequently, the time-series were converted to a stable Eurasian tectonic reference plate using the ITRF14 plate rotation model for Eurasia. All data processing in this study is based on this reference frame.

The results of this complex, long-term study indicates that the Romanian territory trends to move slightly southward relative to stable Eurasia, at velocity rates of about 1.0 mm/yr in the north and up to 3.0 mm/yr in the south. This may be an indication of plate-stretching due to slab-rollback of the African plate relative to the Eurasian plate. Until now we did not find an obvious correlation between the deep Vrancea earthquakes and (vertical) surface motions. That is probably because the recent earthquakes were too small.

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