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Monitoring lithosphere dynamics on the Romanian territory: preliminary results

L. Besutiu (1), T. Rus (2), and L. Zlagnean (1)

(1) Institute for Geodynamics of the Romanian Academy, Solid Earth Dynamics, Bucharest, Romania (besutiu@geodin.ro, 00 4021 317.2120), (2) Technical University of Civil Engineering in Bucharest, Faculty of Geodesy, Bd. Lacul Tei 124, sect 2, RO 20396, Romania (rus@utcb.ro)

The paper aims at describing the ground based infrastructure for monitoring lithosphere dynamics on the Romanian territory at the regional scale, and some preliminary results. To observe geodynamic phenomena, several observatories and epoch stations grouped into a national geodynamic network are used.
Crust tilting and gravity evolution are permanently recorded at each geodynamic observatory. The Romanian national geodynamic network mainly consists of specially designed geo-traverses crossing the major lithosphere contacts on the Romanian territory: Peceneaga-Camena Fault (PCF) - the transcurrent contact between Moesian Microplate (MoP) and East European Plate (EEP), the Trans-Getica Fault (TGF) - the transpressive contact between MoP and Intra-Alpine (Intracarpathian) Microplate (IaP), and the Tornquist-Teisseyre Zone (TTZ) - the compressive contact between IaP and EEP. A special net has been dedicated to the monitoring of the Vrancea intermediate-depth seismic zone, located right at the junction of the above-mentioned tectonic plates.
Within each base station of the national geodynamic network a steel-reinforced concrete pillar has been built up to offer the best circumstances for repeated high accuracy gravity and space-geodesy (GPS) determinations. Each pillar is grounded about 1.5 m, leaving above the surface a concrete cube of 0.5 m x 0.5 m x 0.5 m. Right in the middle of its top there is a special device for accurately centring GPS antenna.
Based on this infrastructure, high accuracy relative gravity determinations were conducted in order to transfer absolute gravity on each pillar. A L&R gravity meter was used. The scale factor has been checked up prior and after each field campaign along the UNIGRACE (Cluj Napoca – Belis) and Brasov-Poiana Brasov calibration lines.
The works started with systematic observations on the vertical gradient of gravity for each pillar location, followed by absolute gravity transfer from both Romanian second order national gravity reference network (providing absolute gravity for epoch 1980) and the European UNIGRACE network (providing absolute gravity valid at the epoch 2000). This way pairs of absolute gravity values separated by a time span of about 20 years became available on each pillar.
High accuracy repeated geometric levelling and two GPS campaigns (2007 – 2008) on the network pillars provided additional data to the gravity experiment.
Based on the combined interpretation of the non-tidal gravity change and crust deformation, as revealed by geodetic means, some interesting conclusions regarding the location and nature of the plate boundaries crossed by the geodynamic network came out. Among the others, mention should be made to the following aspects: (i) there are distinct space-time gravity and crust vertical deformation evolutions within each tectonic plate; (ii) transition pattern for both non-tidal gravity change and vertical crust deformation mark location and nature of the plates contact; (iii) GPS determinations across TGF seem to confirm the transpressive nature of the contact between MoP and IaP; (iv) within Vrancea active geodynamic zone, both gravity and geodesy have revealed a crust vertical stretching associated to the seismicity.
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