WORKSHOP
NEMO - NumErical MOdelling using high performance computing infrastructures

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Solid Earth Dynamics Department,
Institute of Geodynamics of the Romanian Academy, Romania.
Jean-Louis Calderon str. 19-21 nr. sector 2, Bucharest

1) PRESENTATION TITLE:

MODELLING NON-TIDAL GRAVITY CHANGES WITHIN VRANCEA ACTIVE GEODYNAMIC ZONE

2)AUTHORS, AFFILIATION

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2) ABSTRACT:

Despite many years of research, the intra-continental intermediate-depth seismicity within Vrancea zone still represents a challenge for scientists of the 21st century.
To monitor deep geodynamic processes in the region, combined gravity and geodesy tools were chosen. A special network aimed at observing space-time evolution of gravity within the active seismic area has been designed and implemented and systematic observations are conducted.
Both L&R, and, later on, Scintrex CG-5 high accuracy relative meters were used to observe gravity changes at each base-station of the network. Absolute gravity was transferred to each pillar of the above-mentioned network through gravity ties to the both second-order national gravity network of Romania (providing a consistent gravity dataset for years 80's), and the UNIGRACE European network (providing absolute gravity for the 2000 epoch). This way, pairs of absolute gravity values related to two distinct epochs, separated by a time-span of about 20 years were obtained on each pillar.
An examination of the non-tidal gravity change during the above-mentioned time-span revealed a significant decrease (over 200 microgals) well focused on the epicentre area (Fig. 1).

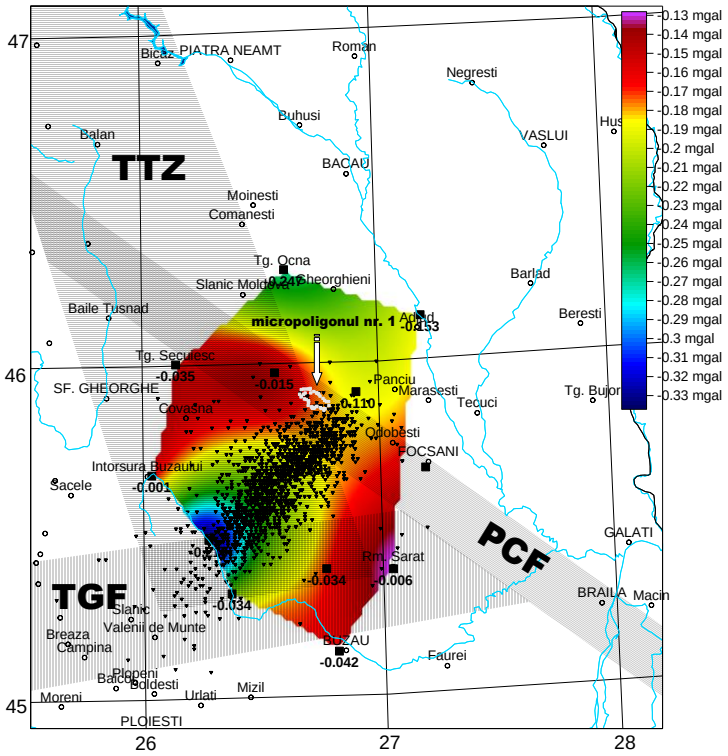

Fig. 1 Non-tidal gravity change within Vrancea zone over a time-span of 20 years. Black dots mark epicentres of the intermediate-depth earthquakes (according to ROMPLUS catalogue). The white arrow shows location of the geodynamic micro-poligon Tulnici-Valea Sarii-Vrancioaia
TTZ, Tornquist-Teysseire Zone; TGF, Trans-Getica Fault; PCF, Peceneaga-Camena Fault.

Attempts to numerically model the time-space evolution of gravity starting from the subduction-based hypothesis failed because of the depth of the assumed sinking slab relict generating a large misfit between wavelengths of the predicted and observed gravity.
Instead, an appropriate solution has been obtained by considering the top of the mass deficit responsible for the above-mentioned gravity low at a depth of about 10 km below topography. This has been interpreted in terms of the crust vertical stretching generated by the eclogitization of the lower crust sunken into the upper mantle. The densification of the lower crust generates a gravity pull able to stretch the lithosphere of the Vrancea zone, thus creating a mass deficit (through the volume increase), and vertical extension seismic events within the upper (brittle) part of the crust.
3D numerical modelling has succeeded to make estimates of the stretching rate.
The observed unusual association of the gravity decrease with topographic subsidence in the epicentre area is in agreement with the above-mentioned assumption.
The suggested model is also supported by the presence of crustal earthquakes with vertical extension focal mechanism, exclusively located in the epicentre area of the sub-crustal events, while for the neighbouring regions horizontal strike-slip mechanisms were revealed.

4) POSITION OF CORRESPONDING AUTHOR:

Student	~~**yes**~~	no
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Researcher	yes	~~**no**~~