WORKSHOP
NEMO - NumErical MOdelling using high performance computing infrastructures

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Solid Earth Dynamics Department,
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1) PRESENTATION TITLE:

SLAB BEAK-OFF AND MANTLE FLOW IN THE CARPATHIAN REGION: NEW INSIGHTS FROM 4D NUMERIC MODELS

2)AUTHORS, AFFILIATION

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2) ABSTRACT:

One of the common hypothesis related with the origin of the Vrancea seismogenic region is the Miocene subduction of oceanic crust of the Tethian Ocean accompanied by rollback of the subduction zone and finally slab break-off after continental collision started in Mid Miocene. In this paper we show for the first time 4D (3D + time) numeric modeling results of a complex subduction scenario tailored to the plate tectonic reconstructions available for this region, as the Neogene tectonic evolution of the Carpathians, which was mainly driven by the eastward retreat of a NW-SE dipping subduction zone, followed by the rotation of a crustal block which resulted in an oblique collision with the European foreland that started in the north and successively propagated towards the SE and E.
One of the first modeling results show that incorporating this tectonic scenario, a slab break-off and subsequent lateral slab tearing is obtained. Only a small region, corresponding to the Vrancea area, still remains attached to the overriding plate, consistent with the present day observations.
Another important outcome of this study is related with the upper mantle flow in the vicinity of the subduction system. According to several recent studies, the direction of fast polarization direction of the near vertically propagating SKS phase for the East-Carpathian region shows a NW-SE orientation. In our 3D numeric models we traced the upper mantle flow using several groups of tracers placed initially at the slab edges. The upper mantle flow shows increased velocity rates during the slab-tearing phase, and the asthenospheric flow trajectory is parallel to the strike of the subducting slab, consistent with the observations.
Although the hypothesis of subduction followed by roll-back, collision and subsequently slab break-off for the origin of the Vrancea siesmogenic zone is still under debate, our preliminary modeling results show a remarkably good correlation with the observations.

4) POSITION OF CORRESPONDING AUTHOR:

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