



Some aspects of seismic wave attenuation in the Vrancea (Romania) zone confirmed by the tidal tomography

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Among the actions of different geophysical fields at the intermediate-depth levels of the seismic events, the role of the gravity field variations is predominant in the case of Vrancea slab. Its systematic variations are controlled by the lunar-solar attraction forces through the precisely defined periods of the earth-tides.

Concomitantly, local and regional heterogeneities lead to a different response from a zone to another in accordance with the geological and tectonic characteristics of each zone. This response is also influenced by the regional characteristics of the mantle-crust interface, probably associated with a viscous coupling mechanism.

The high-resolution imaging of the upper-mantle structure obtained by non-linear tele-seismic body wave tomography (CALIXTO'99) in Romania and the seismic attenuation investigations in the Vrancea region (Romania) reveals strong lateral variations ascribed to the upper mantle structure inhomogeneity. A very high attenuation volume (QP values down to 33) has been observed in the north-western part of the Vrancea seismogenic volume, acting like an effective filter mainly for high-frequency of the seismic waves propagating in this direction.

We compared the tidal tomography with the Vrancea seismicity pattern, seismic wave attenuation analysis, and seismic tomography for intermediate-depth activity section.

We selected nearly 2500 events between 1981 and 2006 with Richter magnitude higher

than 3 from the RomPlus catalogue provided by the National Institute of the Earth Physics, Bucharest. The tidal phase of each event is calculated by HiCum. Then tidal modulation tendencies of the Vrancea seismic activity are investigated in a spatial 3D - sliding windows for different periodicities existing in the earth-tides spectrum.

The idea of evaluating spatial distribution of the correlation coefficient (p - value) between earthquakes and earth tides is originated from the seismic tomography; here the differences are that the p - value is set up as the factor to construct the 3D map which reveals the possible to detect local geometric reactions to tidal effects at spatial domain. For this purpose, we calculate the correlation coefficient for a series of events included in a space sliding volumes defined by its surface and height. Each layer is equal in volume with same thick and height. For every cells in which the p - value is less than 5% we valid like before by the help of 1000 random synthetic time series of events

The patterns of the tidal tomography partly represent reaction of regional tectonic structure to the earth tide. Especially at Vrancea, the tidal tomography of M2 and S2 waves gives the similar pattern with classical seismic tomography. This fact confirms the potentiality of our method to complete other geophysical techniques in the rheological pattern determination.

Key words: seismic wave attenuation, Vrancea zone, intermediate-depth seismicity, seismic tomography, tidal tomography, HiCum method.