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Local Seismic Effects Induced by the Crustal Lithosphere Zone of Tulcea, Romania

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The discussed area, Tulcea, is delimitated by the Scythian Platform in the North and Moessian Platform in the South, not far from the Black Sea coast. Geographically it is delimited by latitude 45-45.5°N and longitude 28-29°E. The particularities of this orogenic area and its geotechnical and geophysical considerations will be presented in the extended paper. The Pre-Dobrogean Depression (our interest area) is subjected to many active faults, of which we mention the following: Macin-Cerna, Tulcea-Isaccea, Peceneaga-Camena etc. The information about the seismic zone of Tulcea consist of three seismic catalogues made by Florinescu (1958), Constantinescu and Marza (1980) and ROMPLUS (2008).

Three important seismic events affected the region of interest in the last 30 years, with magnitudes MW=5.1 (13.11.1981) followed in the same day by 6 aftershocks (at depth 0-9 km) with MW=2.9-3.3; MW=5 (27.04.1986) and MW=4.9 (3.10.2004) followed by two aftershocks. In order to discuss the seismic effects in this area we proceed to simulate seismic signals with characteristics of the following two events, that are: gh1, Sfantu Gheorghe fault, (13.11.1981), 29°E, 45.17°N, source depth h=15km, strike-receiver 117°, fault dip 57°, rake 65° and ev1, East Vrancea, (27.04.1986) 26.95°E, 45.48°N, source depth h=40km, strike-receiver 226°, fault dip 44°, rake 78°. The characteristics of the maximum possible events located in the epicenter areas of the two simulated ones will be used. Both areas are seismic active. The generated seismic signal is to be transferred from the source to the bedrock beneath Tulcea zone and then upward to the three points located at the city surface. The absolute response spectra and accelerations at the bedrock and surface points of reference will be calculated and the characteristic transfer functions as well. Nonlinear effects induced by significant deformations need a certain method – linear equivalent - for a multistratified zone as we considered for the Tulcea superficial area. Therefore important nonlinear variations of shear modulus and damping function with state of strain during the earthquakes are expected in superficial soil deposits. Also, the epicenter distribution, the isobats map and 3D image of focal distribution surface will be presented together with the focal mechanisms of the most significant earthquakes which had affected the zone. All these give us a very complete image of the crustal seismic hazard of the Tulcea zone.