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# Scenarios for local seismic effects of Tulcea (Romania) crustal earthquakes, preliminary approach for the seismic microzoning of Tulcea city

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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.
Natural disasters in the city could occur due to Vrancea intermediate-depth (subcrustal) earthquakes and crustal earthquakes caused by active faults. In the last 30 years three important seismic events affected the region of interest with the following recorded 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. Information about the seismic zone of Tulcea is from three seismic catalogues made by Florinescu (1958), Constantinescu and Mârza (1980) and ROMPLUS (2008), but for urban planning of Tulcea city is very important to be better understood the effect of active faults (Măcin-Cerna, Tulcea-Isaccea, Peceneaga-Camena etc) located in the Pre-Dobrogean Depression (our interest area) in the two parts of the city. Regarding the effects of Vrancea subcrustal earthquakes, as the Tulcea city is situated relatively at a large distance from the epicenters, there is necessary to improve the actual method of microzonation based on Medvedev's method.
In order to discuss the local seismic site effects we have considered two scenarios, which take into account the characteristics of the seismogenic area. The first one considers the city exposed to a seismic event with magnitude Mw = 5.1 from Sf. Gheorghe fault and the second one considers the city exposed to an earthquake from the EV zone (superficial). The earthquake epicentres are located in very active seismic areas.
The absolute response spectra at the bedrock and at surface 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 distributions, 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.
This study proposes itself to take in consideration only the local effects of the crustal seismic hazard from Tulcea zone, like a preliminary step for the seismic microzoning of Tulcea city. The latter is a broader research which implies the interdisciplinary work between specialists from different fields of research. Finally, by comparing the seismic microzoning map with the vulnerability distribution mapping for each building type and damage distribution maps, the general aspect of the real earthquake effects over the city is figured out.

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