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Seismotectonics of the Cyprus Arc and Dead Sea Transfrom Fault and Simulations of the Historical Earthquakes and Tsunamis

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To get a better understanding of the active tectonics and the crustal deformation along the Cyprus Arc and Dead Sea Transform Fault, we have obtained source mechanism solutions and spatio-temporal distribution of the moment release for the recent earthquakes ($M > 5.0$) (Yolsal et al., 2007a,b). Throughout the recorded history, earthquakes and also related tsunamis have been the most damaging natural disasters affecting the Eastern Mediterranean coasts (Guidoboni et al., 1994, 2005; Sbeinati et al., 2005). Hence, it is critical to advance the capability of simulating tsunamis for the purposes of predicting arrival times, water surface fluctuations and describing wave interactions with bathymetrical features.

We have studied the comprehensive seismic activity occurred in the region during the last 15 years, based on newly retrieved and obtained earthquake source parameters and slip distributions. Hence, we compared the shapes and amplitudes of long period P- and SH-waveforms and recorded in the distance range of 30 – 90 degrees, for which signal amplitudes were large enough, with synthetic waveforms to obtain the earthquake source mechanism parameters. We have also studied the rupture histories of earthquakes by using inversion scheme of Yagi and Kikuchi (2000) to determine the fault area (fault length and width), maximum displacement, rupture duration and stress drop. For tsunami simulations, we use the numerical models TUNAMI-N2,

AVI-NAMI and NAMI DANCE based on the method of Okada (1985) for simulation and animation of tsunami generation and propagation, and of coastal amplification of nonlinear long-waves using the GEBCO-BODC bathymetry data (1000 m grid) for the region. As a case study, we have calculated tsunami wave heights as well as their distribution function for the Iskenderun earthquake of August 13, 1822 (M $\sim$ 7.5) to depict the characteristics of tsunami propagation, and effects of coastal topography and of near-shore amplification. The related earthquake source parameters are then adapted by an analogy of current plate boundaries and earthquake source mechanisms obtained by inversion of teleseismic P- and SH- waveforms. Assuming the normal faulting mechanism with the strike slip component for this earthquake, we have estimated that the fault area is $\sim$50 km (length) $\times$ 30 km (width), and displacement is $\sim$6 m using Wells and Coppersmith (1994) equations. According to the reported historical records, the main shock almost destroyed the regions between Gaziantep and Antakya in Turkey and Aleppo and Khan Sheikhun in NW Syria, causing significant loss of human lives (Plassard and Kogoj, 1981).

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