

Tsunamis in the Eastern Mediterranean: History, Probability and Reality

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The Eastern Mediterranean is one of the regions of the highest risk of catastrophic earthquakes and tsunamis. Numerous earthquakes and tsunamis occurring in this region have been documented in historical records. The fault zones and possible landslide-prone areas are located at east of Rhodes Island and north of the Nile Delta; the Volcanic Arc that extended parallel to the trench and internal volcanic arc in the center of Aegean Sea include several active volcanoes (Milos, Antimilos, Antiparos, Santorini, Christiana, Columbus, Kos, Yali, Nisiros and others) being the potential tsunami sources in the Eastern Mediterranean region. Several numerical experiments were made for this region to evaluate tsunami risk and develop an efficient tsunami warning system for this region. A new effective tsunami simulation software (NAMI-DANCE) based on nonlinear shallow-water equations was elaborated and used for these purposes. The entire model procedure includes the following stages: i) tsunami source from either rupture characteristics or pre-determined wave form; ii) tsunami propagation; iii) estimation of arrival times; iv) shelf/coastal amplification; v) inland inundation; vi) distribution of near-shore current velocities; vii) distribution of near-shore sea levels; viii) relative damage levels according to drag forces and impact forces; ix) simulated tsunami records for selected points; x) 3D snapshots of tsunami waves; and xi) animation of tsunami propagation. Several fault zones and various sources related to rupture characteristics, volcanic activities, and probable submarine landslides have been used in these numerical simulations. As a result we could examine and describe historical tsunamis in the Eastern Mediterranean, estimate the potential tsunami risk of future tsunamis and examine the effects of tsunami generation, propagation and coastal amplification in this region.