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# Retrospective prediction of macroseismic intensities using strong ground motion simulation: The case of the Thessaloniki 1978 earthquake (Mw6.5)

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The city of Thessaloniki (Northern Greece) is situated in the vicinity of seismic active faults generating moderate-to large-magnitude events that severely hit the city several times during the last 15 centuries. The most recent of them occurred on 20 June 1978 (M6.5) at an epicentral distance of about 30km, in the Mygdonian basin, causing extended damage in the city, with macroseismic intensities ranging between V+ to VIII+. The majority of buildings affected by the earthquake were of reinforced-concrete typology, typical to many southern European metropolitan areas. Main source properties of the normal faulting causative event as well as the source-to-city propagation path are well known from previous studies. The soil structure under the metropolitan area of Thessaloniki is assigned categories B, C, D according to NEHRP (1997), on the basis of geotechnical zoning, surface geology and single-station ambient-noise measurements. By employing a finite source model of the seismic fault, forward stochastic modeling of strong ground motion is performed – in two steps – for various rupture

scenarios of the 20 June 1978 earthquake in terms of peak ground and spectral acceleration. In step one, bedrock (soil category B) motion is assessed under the city; in step two, the bedrock motion is appropriately transfered to the surface in accordance with the respective soil category. Finally, a GIS tool is employed to compare the estimated strong-motion parameters with the observed damage pattern (macroseismic-intensity map) due to the 1978 earthquake. For selected natural periods, a good correlation is established between macroseismic intensity, on the one hand, and peak ground acceleration and spectral acceleration, on the other, encouraging the application of the forward stochastic modeling for generating realistic ground-shaking scenarios in metropolitan areas.