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# A Quantitave Archaeoseismological Study of the Great Theatre of Larissa (Thessaly, Greece)

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Larissa, the capital of Thessaly, is located in the eastern part of Central Greece, at the southern border of a Late Quarternary graben, the Tyrnavos Basin. Palaeoseismological, morphotectonic and geophysical investigations as well as historical and instrumental records show evidences for seismic activity in this area. The investigations documented the occurrence of several moderate to strong earthquakes during Holocene time. These active structures show recurrence intervals of few thousands of years. The historical and instrumental records suggest a period of seismic quiescence during the last 400 to 500 years. The present research, based on an archaeoseismological keynote is a multi disciplinary approach to improve the knowledge on past earthquakes, which occurred in the area. This study focuses on damages on walls of the scene building of the Great Theatre of Larissa. The Theatre was built at the beginning of the 3rd century BC and consists of a semicircular auditorium, an almost circular arena and a main scene building. Archaeological and historical investigations document a partial destruction of the theatre during the 2nd-1st century BC. Recent excavations show that the building complex after it was repaired suffered additional structural damages, probably from seismic loading. The damages investigated in detail are displacements, rotations and the rupture of numerous blocks at the walls of the scene building. In order to test the earthquake hypothesis as cause of the damages a simplified seismotectonic model of the Tyrnavos Basin and its surroundings was used with a composite earthquake source model to calculate synthetic seismograms at the Larissa site for various earthquake scenarios. HVSR measurements in the theatre and

its vicinity were used to estimate local site effects. The synthetic seismograms are used as the input acceleration for a numerical model of the walls, which simulates seismically induced in-plane sliding within the walls. First results show that some of the surrounding faults have the potential to produce seismic ground motion, which can induce in-plane sliding of blocks. Extended model calculations are being used to narrow down the characteristic of the ground acceleration and the causative earthquake by comparing the calculated and observed distribution of the displacements of the blocks.