Analysis of historical and present earthquakes at Vesuvius for seismic hazard evaluation

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At Vesuvius about 600,000 people live on the volcano and the risk associated to a large eruption is very high, but its complete evaluation includes also the potential damage due to earthquakes accompanying the largest eruptions. Moreover low-moderate energy earthquakes are also observed in volcanic active areas during quiescent periods. Generally such events are shallow and produce high intensities in the epicentral area. Today at Vesuvius the high housing density and economic value exposed make the area of considerable importance for mitigating seismic risk. To evaluate the maximum earthquake at Vesuvius, data are required on the location, source mechanism and damage levels of historical earthquakes, in addition to understanding how Vesuvius works. From the historical data there is no clear evidence for events with magnitudes greater than 4.0–4.5 except the earthquake which occurred in 62 AD, 17 years before the 79 AD plinian eruption which completely buried the towns of Pompeii, Herculaneum, Oplontis and Stabiae. This earthquake could be located in the magma feeding shallow structure or rather along an active fault in the boundary of the volcano.

Through an integrated analysis of both historical and current seismicity as well as the geological conditions of Vesuvius and the surrounding areas, the seismogenetic structures may fall within a crater axis and at the boundaries of the volcanic complex and the magnitude maximum expected is evaluated for the two conditions. In the first case the damage is simmetrically decreasing from the crater, while in the second one the areas of maximum damage differs according to the orientation of the hypothesized structure.