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Seismic characterization of Pizzoli (Central Italy) to estimate site effects induced by near-fault earthquakes

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Most of the towns, villages and infrastructures settled in Central Italy are placed nearby active faults and, consequently, the ground motion evaluation and the ground failures characterization under near-fault earthquakes are noteworthy issues to be investigated. The Madonna delle Fornaci - MDF - site, close to Pizzoli village (L'Aquila in Central Italy), has been selected as an emblematic site for assessing the effects induced by near-fault earthquakes, because it is located very close to the Pizzoli-Barete active Fault accountable for the February 2, 1703 Mw 6.67 earthquake. After this historical earthquake, remarkable surface manifestations, attributed to soil liquefaction and coseismic ground sinkholes, were observed at the MDF site, occurred in the Holocene alluvial deposit of the Aterno River, as witnessed by several written sources (among which Uria De Llanos, 1703). As concerns the geological setting, the MDF site is placed in the Plio-Quaternary NW-SE elongated L'Aquila intramontane basins which is bounded by a framework of active NW-SE trending and SW-dipping extensional faults which includes also the above mentioned Pizzoli-Barete active Fault. A comprehensive geophysical, geological, and geotechnical campaign has been carried out at the MDF site with the goal to obtain the seismic site characterization and the shallow and deep subsoil model preparatory to the quantitative estimation of the near-fault ground motion and the evaluation of the soil liquefaction potential induced by the 1703 seismic event.

The field survey consisted of three shallow continuous core drilling 15-20 m-deep boreholes; in one of the them, a down hole test and SPT measurements were conducted every 1 m depth; an open tube piezometer at the 11-12 m depth was installed in one of the boreholes; a couple of undisturbed samples were sampled for geotechnical laboratory tests; a MASW, Seismic refraction and ERT investigations were performed along two perpendicular 70-m long alignments; several single station microtremor measurements performed also in the neighbouring area. These data permitted preliminary to elaborate a quite confident 1-2D litho- and seismo-stratigraphic model for the MDF test site.

The MDF site is characterized by mainly calcareous grain-supported Holocene alluvial deposit: sandy gravel and gravelly sand with a silty component, sometimes predominant, in the matrix with water table level about 8-12 m b.g.l. Moreover, the following horizons are noteworthy to mention: an orange sand level at 11-12 m b.g.l. which could be considered preliminary as a liquefaction-prone level and an organic reddish-brown silty clay at 14-15 m b.g.l., which could be used for C14

dating.

Further, a 200 m-deep continuous core drilling borehole, executed nearby the MDF site by ISPRA for the mapping of the Italian geological sheet 348 "Antrodoco", was also taken into consideration to obtain the complete 1D subsoil model for the near-fault ground motion amplification modelling.

The near-fault ground motion evaluation of the MDF site, considered as paradigmatic of the Central Italy seismicity, will go on through the geotechnical characterization of the alluvial deposits, the shear wave velocity versus depth profile and the seismic input evaluation to use for the numerical modelling.