

Site effects in the Amatrice municipality through dense seismic network and detailed geological-geophysical survey

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After the first mainshock of the 2016 Central Italy seismic sequence, several Italian Institutions (under the umbrella of the Italian Center for Seismic Microzonation; <http://www.centromicrozonazioneismica.it>) conducted a preparatory survey to seismic microzonation of the Amatrice municipality, badly affected by the Mw 6.0 Amatrice earthquake of August 24.

Despite the difficulties due to the heavily damaged investigated area and the winter weather condition, a large amount of different data were gathered in a very short time: (i) geological and geomorphological surveys (field trip and photo-geological interpretation), (ii) geophysical measurements (noise single-station and arrays, geoelectric, seismic refraction, MASW), and (iii) continuous seismic recordings from temporary network.

In particular, 35 seismic stations were installed from half-September to early-December in an area of 170 km², equipped with both velocimeter and accelerometer. They recorded thousands of earthquakes, including the Mw 6.5 of October 30, 2016; the continuous data will be organized in the EIDA repository (<http://www.orfeus-eu.org/data/eida>) through the INGV EIDA-node.

The sites selection was performed according to the following criteria: representativeness of the geological conditions of 26 hamlets that experienced a damage level greater than VII MCS degree, optimization of the network geometry for array analysis, redundancy of bedrock reference sites, safety and accessibility.

The photo-geology and the field investigations allowed the realization of a detailed geological-technical map of the area, characterized by peculiar features, namely the distinction between bedrock and Quaternary deposits (alluvial deposits and terraces, alluvial fans, landslides) and morpho-structural features (faults, folds, bedding attitude). Preliminary results allowed also the evaluation of the velocity models that show surface shear wave velocities (Vs) ranging from 200 m/s to 600 m/s.

Data analysis of seismic recordings (earthquakes and noise) indicate peculiar amplification effect in several hamlets and in the village of Amatrice itself, even though the correlation with geology is not always straightforward.