Evidence of a Low Frequency Wave-Packet within Records of the 2016 Central Italy Seismic Sequence

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This work focuses on the observation of data recorded by the seismic temporary network installed in the Amatrice area, under the umbrella of the Italian Center for Seismic Microzonation (http://www.centromicrozonazionesismica.it), following the M 6.0 earthquake of August 24, 2016 in Central Italy. The aim was studying the presence of an evident late low frequency wave packet observed in some of the recorded aftershocks. In order to interpret this phenomenon, we combined a beam-forming analysis performed on these data with the statistics on residuals of localizations related to the same events, recorded by the Italian Seismic Network (RSN). The total number of analyzed events, characterized by M≥=3 and epicentral distances between 30 and 55 Km, is 356. By observing the seismic traces of these events there was an evidence, in some of them, of a low frequency packet appearing 10 seconds after the first arrival. The evidence of this packet was correlated with epicentral distance and focal depth. For a subset of stations, considered as an array, a beam-forming analysis was performed by using the ObsPy toolbox (M. Beyreuther et al., 2010). Results of this analysis gave information in terms of slowness and azimuth to distinguish the main seismic phases of the considered events. In addition, by using locations of the RSN records (Chiaraluce et al., 2017), we performed a parallel analysis within the subset of events with clear evidence of the low frequency packet. We relocated these events by using the NonLinLoc code, with a fixed 1D P-wave velocity model, and varying the Vp/ Vs ratio in the range 1.6–2.0. We found that the P phases residuals are not influenced by the Vp/Vs ratio changes whereas the higher the Vp/Vs the lower are the S phases residuals. Higher values of Vp/Vs ratio, fixing Vp values, could mean a decrease of Vs connected to particular effects during the seismic waves path, that are probably due to geological heterogeneities at local or larger scale.