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Micro-earthquakes monitoring at the Irpinia active fault zone by micro-arrays

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The micro-seismicity monitoring requires the use of local dense network with an optimum azimuthal coverage. In the case of natural seismicity, different stations should be employed around a fault structure in order to characterize at first sights its dimensions, geometry and seismic activity. For induced seismicity, it is necessary to monitor the spatio-temporal evolution of earthquakes in order to follow the fluid migration and the fracture pattern of the reservoir.

We propose the use of seismic arrays as alternative solution to dense and expensive seismic network to monitor and study the micro-seismicity. We designed a field experiment in the Irpinia region (Southern Italy) with seismic micro-arrays and tested its performance to record natural micro-seismicity. In particular, the experiment consisted of three seismic arrays at few tens of kilometers distance installed around one segment activated during the Ms 6.9 Irpinia earthquake in 1980. Each array is made up of seven stations, with three components sensor, small aperture (few hundred meters) and irregular geometries.

Natural seismicity of the area, arranged occasionally in small seismic sequences, was recorded with magnitude (Ml) ranging between 0.5 and 1.6. Through the f-k analysis on three components, we derive for each earthquake apparent velocity and back-azimuth at each array of the incoming wavefront and, combining the information of the three arrays, we try to triangulate the ipocenter for a better estimate of the earthquake location. The results of the experiment are compared with the earthquake locations derived by ISNet, the local operating network that monitors the Irpinia faults system. We discuss our preliminary results and the seismic arrays performance to monitor the micro-seismicity, as valid and alternative tool to study natural or induced seismicity.