EGU26-7959, updated on 11 Nov 2026
https://doi.org/10.5194/egusphere-egu26-7959
EGU General Assembly 2026
© Author(s) 2026. This work is distributed under
the Creative Commons Attribution 4.0 License.

From Machine-Learning detection to fault imaging: high-resolution seismology in the Val d'Agri (Southern Italy)

Elisa Caredda[1,2], Simone Cesca[3], and Andrea Morelli[1,2]
[1]Istituto Nazionale di Geofisica e Vulcanologia-Bologna, Italy
[2]University of Bologna, Department of Physics and Astronomy, Bologna, Italy
[3]GFZ Helmholtz Centre for Geosciences, Potsdam, Germany

Recent advances in seismology, driven by the deployment of dense seismic networks and the development of machine-learning-based earthquake detection, have enabled the generation of high-quality seismic catalogs with unprecedented spatial and temporal resolution. These dense microseismic datasets provide a robust foundation for detailed waveform-based analyses, that allow individual earthquakes to be reliably linked to fault segments and enable constraints on fault geometry and slip style at fine spatial scales.

We present an integrated seismological workflow that starts from automated earthquake detection using machine-learning techniques (PhaseNet) applied to continuous seismic recordings in the Val d'Agri region (Southern Italy). The resulting high-resolution microseismic catalog is then analyzed through waveform similarity-based clustering to identify events associated with the same seismogenic structures, followed by high-precision relative relocation to delineate fault segments, and Bayesian moment tensor inversion to robustly characterize faulting style.

This waveform-based workflow enables the association of earthquakes with individual seismogenic structures, allowing to resolve fault geometries and slip styles at fine spatial scales. Results indicate that seismicity predominantly clusters on steeply southwest-dipping normal faults, with focal mechanisms consistent with the regional extensional stress regime.

These analyses illustrate how machine-learning-driven seismic monitoring combined with waveform-based analysis can bridge the gap between large microseismic datasets and fault-scale imaging. Beyond increasing detection rates, this workflow provides new insights into the geometry and kinematics of active faults in regions affected by diffuse seismicity.