Geophysical Research Abstracts
Vol. 18, EGU2016-5841-1, 2016
EGU General Assembly 2016

Optimizing event detection and location in low-seismicity zones: Case study from Western Switzerland

Naomi Vouillamoz (1,2), Martinus Abednego (2), Gilles Hillel Wust-Bloch (3), and Jon Mosar (2)

(1) Geophysik, Stuttgart University, Stuttgart, Germany (naomi.vouillamoz@geophys.uni-stuttgart.de), (2) Geosciences, Fribourg University, Fribourg, Switzerland, (3) Geophysics, Tel-Aviv University, Tel-Aviv, Israel

Obtaining robust event catalogs in regions of low-seismicity rate can be time-consuming since quality events are less frequent and sensor coverage is generally sparse. Optimizing event detection and location in such regions is all the more crucial that they host a higher density of sensitive infrastructures. The methodology consists in reprocessing existing data recorded by a permanent network and in boosting the final catalog resolution by temporarily deploying portable sparse mini-arrays in the target area. Sonogram analysis is applied on existing and new datasets to detect waveforms barely emerging from the background noise. A visual interactive event analysis module is used to test for picking simulations, event association, spatial cross-correlation and location ambiguities. It also provides backazimuth and slowness estimations when sparse array data is available. The method was applied to a low-seismicity region in the Western Swiss Molasse Basin where two sparse mini-arrays were temporarily deployed. A 90% increase in earthquake detection was achieved when reprocessing 4 years of available data recorded by two fixed Swiss accelerometers and one broadband station in the target area (2009-2013). Low magnitude estimations were empirically calibrated over four magnitude units, down to -1.7 ML, lowering the existing catalog completeness by close to one magnitude unit. After validating picking and location accuracies with standard residual-based scheme, 174 new events were relocated, illuminating zones of previously undetected microseismic activity.