EGU2020-18781
https://doi.org/10.5194/egusphere-egu2020-18781
EGU General Assembly 2020

Local Seismicity in the Eastern Alps From GPU-Based Template Matching

Rens Hofman[1], Joern Kummerow[1], Simone Cesca[2], Joachim Wassermann[3], Thomas Plenefisch[4], and the AlpArray Working Group[*]

[1]Freie Universität Berlin, Geophysik, Berlin, Germany (rens@geophysik.fu-berlin.de)
[2]Helmholtz-Zentrum Potsdam, Deutsches GeoForschungsZentrum (GFZ)
[3]Ludwig Maximilians Universität München
[4]BGR Hannover
[*]A full list of authors appears at the end of the abstract

The AlpArray programme "Mountain Building Processes in 4D" is an interdisciplinary project aimed to image the structure of the Alps and understand their formation. The goal is to be able to model the entire crust-mantle system in three dimensions, and investigate its evolution through time. Seismicity can reveal spatial and temporal patterns of faulting and thereby help to understand the current tectonic structure and motions in the Earth's crust. The south-eastern Alps are of special interest as they include the current plate boundary between Adria and Eurasia, but their undelying structure is poorly resolved and seismicity seems to be scarce. Being able to detect the smallest earthquakes is therefore of key importance.

Swath-D was an AlpArray complementary experiment in which approximately 150 broadband seismic stations were deployed in the Eastern Alps from late 2017 to late 2019. With a station spacing of around 15 km, it is much denser than the AlpArray Backbone network. In this work, data from these stations, combined with publicly available broadband data from the region, were used to detect, localize, and characterize microseismic events. A combination of energy-based detection and template matching was applied to both discover previously unidentified seismic activity and yield a high number of detections. An efficient GPU-based implementation was of critical importance to handle computationally demanding detection methods and the large data volume. Here, we present our methods and workflow, and a new map of seismicity in the south-eastern Alps.

AlpArray Working Group: AlpArray Seismic Network (2015): AlpArray Seismic Network (AASN) temporary component. AlpArray Working Group. Other/Seismic Network. doi:10.12686/alparray/z3_2015 Datacite Link: http://data.datacite.org/10.12686/alparray/z3_2015