EGU21-10927, updated on 19 May 2022
https://doi.org/10.5194/egusphere-egu21-10927
EGU General Assembly 2021

Performance of a rotational sensor at Etna, Italy focusing on back-azimuth estimations of volcano-seismic events

Martina Rosskopf[1], Eva P. S. Eibl[1], Gilda Currenti[2], Philippe Jousset[3], Joachim Wassermann[4], Daniel Vollmer[1], Graziano Larocca[2], Daniele Pellegrino[2], Mario Pulvirenti[2], and Danilo Contrafatto[2]

[1]Institute of Geoscience, University of Potsdam, Potsdam, Germany
[2]INGV, Catania, Italy
[3]GFZ German Research Centre for Geosciences, Potsdam, Germany
[4]Geophysical Observatory Fürstenfeldbruck, Fürstenfeldbruck, Germany

The field of rotational seismology has only recently emerged. Portable 3 component rotational sensors are commercially available since a few years which opens the pathway for a first use in volcano-seismology. The combination of rotational and translational components of the wavefield allows identifying and filtering for specific seismic wave types, estimating the back azimuth of an earthquake, and calculating local seismic phase velocities.

Our work focuses on back-azimuth calculations of volcano-tectonic and long-period events detected at Etna volcano in Italy. Therefore, a continuous full seismic wavefield of 30 days was recorded by a BlueSeis-3A, the first portable rotational sensor, and a broadband Trillium Compact seismometer located next to each other at Mount Etna in August and September of 2019. In this study, we applied two methods for back-azimuth calculations. The first one is based on the similarity of the vertical rotation rate to the horizontal acceleration and the second one uses a polarization analysis from the two horizontal components of the rotation rate. The estimated back-azimuths for volcano-tectonic events were compared to theoretical back-azimuths based on the INGV event catalog and the long-period event back-azimuths were analyzed for their dominant directions. We discuss the quality of our back azimuths with respect to event locations and evaluate the sensitivity and benefits of the rotational sensor focusing on volcano-seismic events on Etna regarding the signal to noise ratios, locations, distances, and magnitudes.