Geophysical Research Abstracts
Vol. 20, EGU2018-15263-1, 2018
EGU General Assembly 2018

SCOTER: a Python program package for multiple-event location by using static and source-specific station correction terms

Nima Nooshiri (1), Sebastian Heimann (1), Frederik Tilmann (1), Joachim Saul (1), Steven J. Gibbons (2), and Torsten Dahm (1)

(1) GFZ German Research Centre for Geosciences, (2) NORSAR, Norway

There has been growing recognition of the importance of the accurate seismic locations in quantitative seismological studies, such as seismic hazard analyses, fault zone characterization, and Earth's deformation. Accurate estimation of seismic locations is critical since a wrong estimate of the seismic source location will result in wrong interpretations in the subsequent analyses.

We present an open-source Python program package that is designed to relocate multiple seismic events by using *P*- and *S*-wave station correction terms. The package, called SCOTER, implements static and shrinking-box source-specific station terms techniques (Richards-Dinger and Shearer 2000; Lin and Shearer, 2005) extended to regional and teleseimic distances and adopted for probabilistic, non-linear, global-search location for large-scale multiple-event location (Nooshiri et al., 2017). This program provides robust relocation results for seismic event sequences over a wide range of spatial and temporal scales by applying empirical corrections for the biasing effects of three-dimensional velocity structure. The dynamic weighting and re-weighting scheme implemented in the program allows each data to be directly weighted during the iterative station terms calculation. The weights are defined according to the location quality, inter-event distance and residual performance. These criteria are revisited after each location iteration.

SCOTER is run as a command line tool and also provides a set of sub-commands to develop inputs (dataset, configuration etc) and export results (hypocenter parameters, travel-time residuals etc).

We demonstrate the applicability of this tool through an example based on a catalogue of several hundred events in the Arctic plate boundary region using regional and teleseismic seismic arrival times. The relocated dataset highlights the future potential for applying the SCOTER relocation tool to greatly improve the relative location accuracy among nearby events.