



Contribution ID: 561 Contribution code: P3.5-561

Type: e-Poster

Massive earthquake detection techniques: Matched filter and fingerprinting

Thursday, 1 July 2021 11:45 (15 minutes)

Seismology data analysis is becoming a challenge due to the exponential growth of continuous data being stored. In this study we present and compare two methods to massive detect earthquakes: the matched filter and fingerprinting. We have tested matched filter over several study zones of interest: in the Western part of Mexico to study general seismic activity, in the Isthmus of Tehuantepec in Southern Mexico to track aftershocks from the September, 2018 Mw8.2 earthquake, and in the North Pole to study seismic activity mainly caused by ice cracking, or ice-quakes. We have demonstrated the accuracy of this technique especially detecting low amplitude signals hidden in the noise and coming out when we stack the resulting correlation coefficients over multiple stations. We are now testing fingerprinting, a technique much more efficient computationally, where we focus on extracting a fingerprint of the waveform for several templates in the time-frequency domain by compressing the resulting scalogram at different time steps. The information for each time step for every template is stored. We then perform a similarity search computing the Jaccard similarity and the probability for each query signal to every template, so that we can classify similar events automatically.

Promotional text

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Primary authors: Mr GONZALEZ, Guillermo (Instituto de Geofísica, Universidad Nacional Autónoma de México, Mexico City, Mexico); Mr HUSKER, Allen (Instituto de Geofísica, Universidad Nacional Autónoma de México, Mexico City, Mexico)

Presenter: Mr GONZALEZ, Guillermo (Instituto de Geofísica, Universidad Nacional Autónoma de México, Mexico City, Mexico)

Session Classification: T3.5 e-poster session

Track Classification: Theme 3. Verification Technologies and Technique Application: T3.5 - Data Analysis Algorithms