EGU2020-755
https://doi.org/10.5194/egusphere-egu2020-755
EGU General Assembly 2020

Classification of volcanic and tectonic earthquakes in Kamchatka (Russia) with different machine learning techniques

Natalia Galina[1], Nikolai Shapiro[1,2], Leonard Seydoux[2], and Dmitry Droznin[3]

[1]Schmidt Institute of Physics of the Earth, Russian Academy of Sciences, Moscow, Russian Federation
[2]Institut des Sciences de la Terre (ISTERRE), Université Grenoble-Alpes UMR CNRS 5375, Grenoble, France
[3]Kamchatka Branch of the Geophysical Survey, Russian Academy of Sciences, Petropavlovsk-Kamchatsky, Russian Federation

Kamchatka is an active subduction zone that exhibits intense seismic and volcanic activities. As a consequence, tectonic and volcanic earthquakes are often nearly simultaneously recorded at the same station. In this work, we consider seismograms recorded between December 2018 and April 2019. During this time period when the M=7.3 earthquake followed by an aftershock sequence occurred nearly simultaneously with a strong eruption of Shiveluch volcano. As a result, stations of the Kamchatka seismic monitoring network recorded up to several hundreds of earthquakes per day. In total, we detected almost 7000 events of different origin using a simple automatic detection algorithm based on signal envelope amplitudes. Then, for each detection different features have been extracted. We started from simple signal parameters (amplitude, duration, peak frequency, etc.), unsmoothed and smoothed spectra and finally used a multi-dimensional signal decomposition (scattering coefficients). For events classification both unsupervised (K-means, agglomerative clustering) and supervised (Support Vector Classification, Random Forest) classic machine learning techniques were performed on all types of extracted features. Obtained results are quite stable and do not vary significantly depending on features and method choice. As a result, the machine learning approaches allow us to clearly separate tectonic subduction-zone earthquakes and those associated with the Shiveluch volcano eruptions based on data of a single station.