Geophysical Research Abstracts
Vol. 21, EGU2019-13381-1, 2019
EGU General Assembly 2019

Fast magnitude estimation based on regression analysis of single station local record

Sk Shamim (1), Sandeep Kumar Aggarwal (1), Luis Hernan Ochoa (2), and Prosanta Kumar Khan (1)

(1) Indian Institute of Technology (ISM), Dhanbad, Applied Geophysics, Dhanbad, India (skshamim@agp.ism.ac.in), (2) Universidad Nacional de Colombia, Carrera 45 N° 26-85 Edificio Manuel Ancizar - Of: 330, Bogotá, Colombia

Real-time magnitude estimation from single station seismic record is quite challenging. The issue is taken-up in the present study by 'support vector machine regression (SVMR)' analysis using first P-wave onset 5, 10, 15 second data of 718 local earthquakes recorded at IIT(ISM), Dhanbad broadband observatory. This study is based on descriptor estimation where the input regression parameters were exponential functions of waveform envelop estimated by least squares and maximum value of the observed waveform for each component. Total 25 descriptors are used for regression analysis to predict the magnitude, and algorithm was trained subsequently. Initial 12 descriptors were computed from consecutive peaks of each component, which gives four parameters i.e. slope M, independent term B, correlation coefficient R and maximum peak-value for three components. Another 9 descriptors were added to account the travel path and its attenuation effect on the waveform. Similarly 4 descriptors related to back azimuth were computed, which account for source of the earthquakes using a time window of 1.0 second, consecutive eigen values of the covariance matrix for each time window were computed. A linear regression of these eigen values was performed for 5, 10, 15 second time windows. This regression provides three descriptors i.e. slope Meigen, independent term Beigen, correlation coefficient Reigen. The final descriptor represents magnitude of the earthquake. Finally, a SVMR model was trained for the 25 descriptors using python scikit-learn v0.20.2 tool, which allowed us to train a model using variety of inbuilt as well as custom kernels. The dataset used in this study were trained with different kernels and the magnitude error of $\sim$0.1 unit with respect to Richter local magnitude was found. The proposed algorithm is useful for real-time early magnitude estimation for single station.