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Signal durations and local richter magnitudes in Northeast India: An empirical approach

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Abstract

Twenty four analog seismic stations are operated by the Regional Research Laboratory (Jorhat), National Geophysical Research Institute (Hyderabad) and by the India Meteorological Department (IMD) in the Northeastern region (NER) of India. 8000 seismograms of 1992 shallow (5-30km) earthquakes recorded by these stations during the period from January 1985 to December 1999, have been used to establish relationships between signal durations and the local Richter magnitudes (M_L). In order to obtain the empirical relations for the determination of duration magnitudes (M_D), signal duration estimates have been fitted using regression analysis to models of the form Model-I: $M_D = C_0 + C_1 \text{Log}_{10} (S.D) + C_2 \Delta + C_3 h$ Model-II: $M_D = C_0 + C_1 \text{Log}_{10} (S.D) + C_2 \Delta + C_3 h + C_4 [\text{Log}_{10} (S.D)]^2$, where S.D is the signal duration in seconds, Δ epicentral distance in degree and h focal depth in km. The models yielded duration magnitudes at each of the 24 stations having standard deviations as low as 0.07. For these stations, station factors are obtained by finding the average of the deviations of network magnitude (i.e. mean estimate of station magnitudes for each earthquake, denoted by M_D A) from station magnitudes (M_D) for the earthquake events in NER. Over - and under - estimations of station magnitudes with respect to M_L are also determined for each station. It has been observed that the estimates of M_D (A) scatter up to about 0.8units with respect to M_L for both the models. Application of these factors reduced scatter down to ± 0.25 units for both the models. © Geol. Soc. India.

Author Keywords

Empirical relation; Local Richter magnitude; Northeastern India; Seismicity; Signal duration; Station factor

References (26) view in table layout

Output Select: **Page**

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