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Estimation of Source Parameters and Scaling Relations for Moderate Size Earthquakes in North-West Himalaya

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Abstract

The scaling relation and self similarity of earthquake process have been investigated by estimating the source parameters of 34 moderate size earthquakes (m_b 3.4-5.8) occurred in the NW Himalaya. The spectral analysis of body waves of 217 accelerograms recorded at 48 sites have been carried out using in the present analysis. The Brune's ω^{-2} model has been adopted for this purpose. The average ratio of the P-wave corner frequency, $f_c(P)$, to the S-wave corner frequency, $f_c(S)$, has been found to be 1.39 with $f_c(P) > f_c(S)$ for 90% of the events analyzed here. This implies the shift in the corner frequency in agreement with many other similar studies done for different regions. The static stress drop values for all the events analyzed here lie in the range 10 – 100 bars average stress drop value of the order of 43 ± 19 bars for the region. This suggests the likely estimate of the dynamic stress drop, which is 2-3 times the static stress drop, is in the range of about 80-120 bars. This suggests the relatively high seismic hazard in the NW Himalaya as high frequency strong ground motions are governed by the stress drop.

The estimated values of stress drop do not show significant variation with seismic moment for the range $5 \times 10^{14} - 2 \times 10^{17}$ N-m. This observation along with the cube root scaling of corner frequencies suggests the self similarity of the moderate size earthquakes in the region. The scaling relation between seismic moment and corner frequency $M_0 f_c^3 = 3.47 \times 10^{16} N -$

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