



December 01, 2020, Haridwar, Earthquake: Fault Plane Solution and Tectonic Implications

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Abstract

On December 01, 2020, a small-sized earthquake ($M_L=4.0$) occurred 25km northwest of Haridwar after a gap of about 45years. The location of the earthquake falls on Main Frontal Thrust (MFT) about 105km southwest of the 1991 Uttarkashi earthquake ($M_w=6.8$). The earthquake was sourced in the Crust-Mantle boundary (40.6 km). Data from the local broadband seismic network around the Tehri region have been used for the study of the source mechanism. The fault-plane solution of this event, suggests that deformation occurred by strike-slip faulting with a significant reverse component. The trend/plunge of the major and minor principal axes P/T are $201^\circ/10^\circ$ and $296^\circ/24^\circ$ respectively. This paper is based on the determination of the focal mechanism through the Moment Tensor Inversion Solution of waveforms derived from the records of the local event, employing ISOLA software. The Moment Tensor solution is considered a stable and more robust method to quantify the fault orientation of faults that slipped due to an earthquake and the method yields more accurate results than any other standard approach. A numerical technique, developed based on forward modeling, is used for the inversion of the observed waveforms for the components of the moment tensors and the earthquake source-time function (STF(t)). We used f_{min} of 0.15Hz and f_{max} of 0.55Hz to perform the waveform inversion of the earthquake.

Keywords: Moment tensor analysis, Source parameter, Focal plane solution, Seismicity