

Focal mechanisms computation and seismicity distribution of major earthquakes in lesser and Central Himalaya

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Abstract

Pakistan is a country with moderate to high seismicity, as it is situated at the junction of the world's three great mountain ranges: The Himalaya, The Hindu Kush and the Karakoram. The severity of seismic hazards of major seismic events is not ignorable. The focal mechanism solution and spatial distributions of major earthquakes of local magnitude > 4.5 , occurred in lesser and central Himalaya, mostly in the northern and central parts of Pakistan in the last fifty years, are examined and discussed. The earthquake data of three international catalogues is used along with computer based algorithms. The spatial distribution of their epicenters as a function of depth shows that most of the earthquakes are shallow to intermediate depths. The relationship between major faults and their source mechanism is also investigated. The majority of the focal plane solutions in the study area show strike-slip faulting with a left-lateral sense of motion, followed by thrust faulting along with some normal faulting. The subduction of the Indian plate under the Eurasian Plate is a source of some of the major events with thrusting and reverse faulting. These low-to-intermediate angle thrust faulting is dominant to a depth 40 – 70 km. This suggests that the Indian plate is moving with respect to the Eurasian plate along the Chaman fault, Quetta Transverse Zone, the Suleiman Ranges and the Hazara thrusts region joining the Hazara/Kashmir syntaxis. It is seen that in a large number of events the compressive stress is acting nearly in NNW-SSE to N-S directions. For deeper events, focal mechanism solutions are mostly characterized by down-dip compression in both lesser and upper Himalaya.