Paper Number: 305

Genetic Process Underlying the M_w 7.8 Nepal Earthquake Sequence

Zhang, J.G.[1, 2]

[1] Key Laboratory of Neotectonic Movement and Geohazard, Ministry of Land and Resources, Beijing 100081, China, jiagui62@sina.com.
[2] Institute of Geomechanics, Chinese Academy of Geological Sciences, Beijing 100081, China.

On April 25, 2015, a M_w 7.8 earthquake occurred in Nepal. Successive aftershocks occurred near the epicenter, including the M_w 7.3 aftershock on May 12, 2015. The M_w 7.8 Nepal earthquake sequence was composed of these earthquakes. To date, no surficial rupture zone has been found. The earthquake sequence is not closely related to previously identified faults and at least does not account for the spadelike segment within the top part of the main Himalayan thrust (MHT) [1-3]. The genetic process underlying this earthquake sequence requires an in-depth investigation. Universally, explaining the genetic process underlying any earthquake sequence is a difficult project in the seismological field. From this viewpoint, the author conducts research on the seismic genetic process in Nepal. The research methods include literature survey, seismic data search, data arrangement, statistics, mapping, and comprehensive analysis. The earthquake events from April 25, 2012 to May 25, 2015, during which 135 aftershocks are involved, are gathered.

Based on statistics and mapping, foreshock activity was slight, the aftershocks were predominantly located in a bananalike arc zone parallel to the Himalayan arc. The arc zone is equal to the focal area of the M_w 7.8 earthquake. Small aftershocks were located mainly at a depth of 10 km, and strong earthquakes were located predominantly in a depth range of 15–17 km. Based on the literature survey and previous research, deep flow and thrust dynamics from the Indian and Pacific Oceans, respectively, act on this region [4]. The interlayer slides in the lithosphere are caused by these dynamics. The top face of the crystal basement (G) caused the interlayer to slide at a depth of 10 km (Figure 1). As a result of the Himalayan gravity and uneven crustal structure, the interlayer slides were obstructed under the Himalayas, and the stress concentrated along or near the interrupted interface (G).

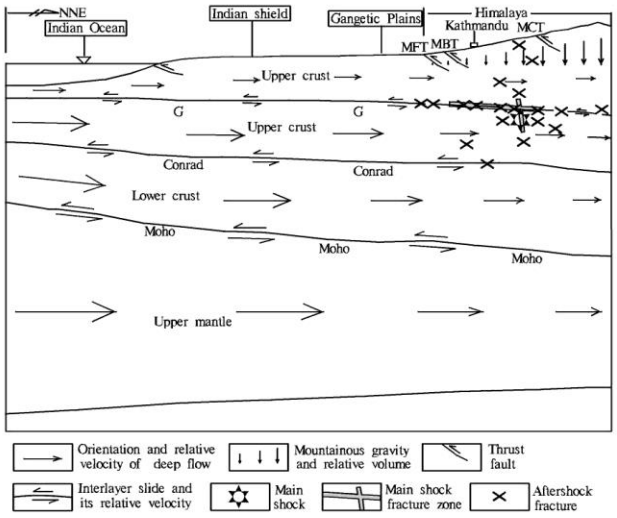

Figure 1: Schematic diagram of the geodynamic framework within the lithosphere and its control over the earthquakes around the earthquake-stricken region of Nepal. MFT: main frontal thrust; MBT: main boundary thrust; MCT: main central thrust. G: top face of the crystalline basement

The maximum stress concentration points were located at the NW and NE corners of the bananalike arc zone. The fractures of few strong earthquakes started at these points. Massive interlayer slide at a depth of 10 km was the dominant movement, and the earthquake sequence was mainly generated by this slide. Earthquakes at a depth of 10 km commonly occur in the earth's crust and are predominantly controlled by the interlayer slide. The earthquake sequence is continueing, and the scope of seismicity at a depth of 10 km extends to the northern and southern sides of the MHT.

References:

[1] Tapponnier, P et al. (1982) Geology 10(12): 611–616

[2] Lavé, J et al. (2001) Journal of Geophysical Research 106(BII): 26,561–26,591

[3] Gahalaut, V K et al. (2011) Gondwana *Research* 21: 1,080–1,088

[4] Zhang, J (2001) J. of Chengdu University of Technology (Science and Technology Edition) 28(S): 195–199