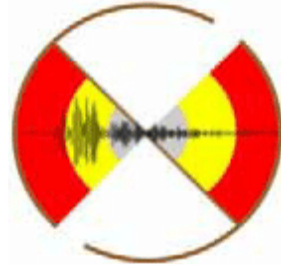




A Preliminary Report of 22nd October 2023, Gorkha, Nepal Earthquake (M 5.3)

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An earthquake of magnitude M 5.3 occurred at 07:24:20 IST, located in Gorkha, Nepal whose epicentre is at 27.92°N and 84.71°E with a shallow depth of 10 km. The epicentre is 72 Km NW of Kathmandu; 211 Km NNW of Muzaffarpur, Bihar; 262 Km N of Patna; 277 Km ENE of Ayodhya and 305 Km NNW of Nalanda. The epicentre of the recent event is south of the 2015 M 7.9 Gorkha earthquake. Three aftershocks of magnitude varying from M 3.8 to M 4.3 were also reported to occur after about 10 hours of the mainshock. The area is seismically very active and associated with collisional tectonics where the Indian plate subducts beneath the Eurasian Plate.

The event was well recorded by more than 25 broadband seismic stations installed by the National Centre for Seismology. The seismic data analysis shows that the events occurred near the Main Boundary Thrust (MBT), providing a very apt location for triggering the mainshock due to appreciable structural heterogeneity in and around the mainshock. The preliminary fault plane solution derived from moment tensor inversion suggests a thrust fault. The earthquake is 370 km SE of the recent M 6.2 of 3rd Oct 2023 event (**Fig. 1**). Felt reports of maximum Intensity of V (MMI scale) in the epicentral region and minimum intensity of II (MMI Scale) have been reported from a distance of around 5 km and 200 km from the epicentre respectively (**Fig. 2**).

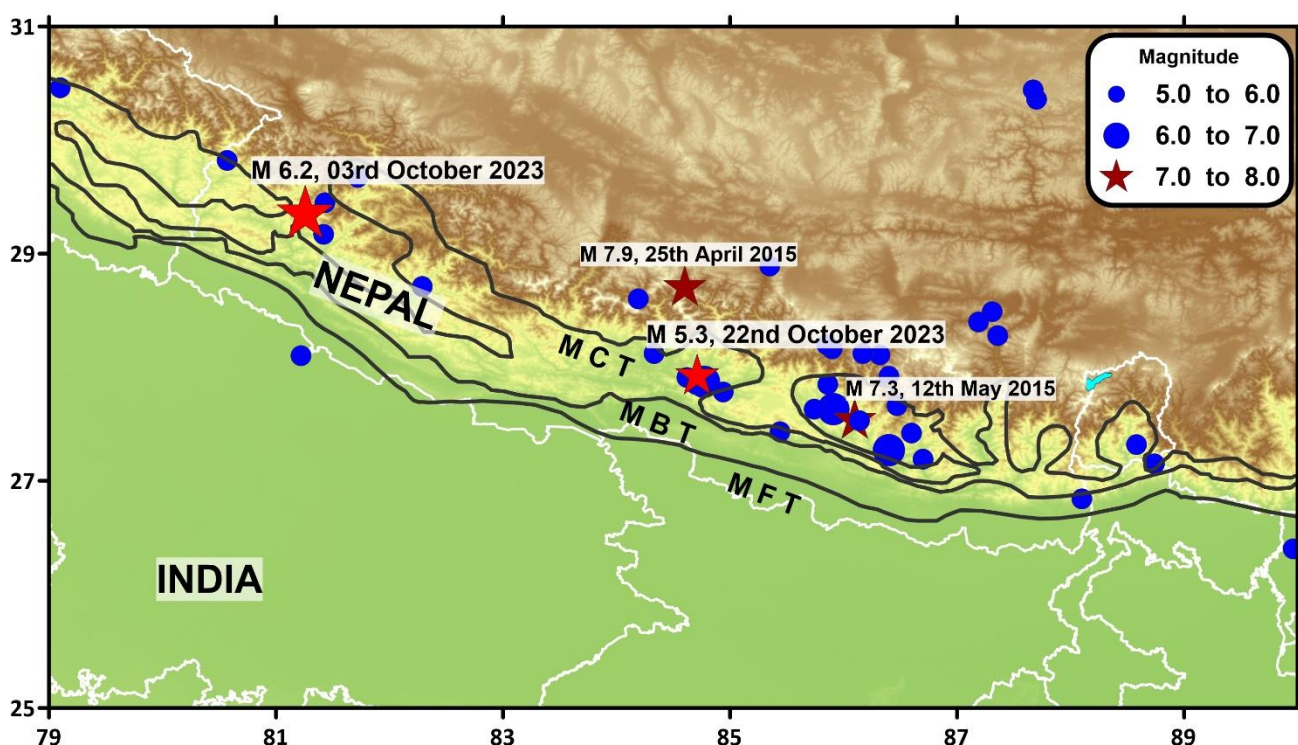


Figure 1: The present earthquake (M 5.3) of 22nd October 2023 and seismicity M > 5.0 in the epicentral and surrounding region (Red Star), (source: www.seismo.gov.in; NCS-MoES). The geological faults and lineament were obtained from Bhukosh, GSI.

The recorded earthquakes in the last 10 years as per the EQ Catalogue of NCS revealed that the region is associated with moderate to large earthquakes with varying magnitudes (Fig.1). The occurrence of earthquakes in the region is attributed mainly to the tectonic settings of the Himalayas comprising Himalayan Frontal Thrust (HFT), Main Boundary Thrust (MBT) and Main Central Thrust (MCT) besides several local faults and geological demarcated lineaments, the neighbouring states of India that felt earthquake shaking falls under the seismic hazard zones V and IV.

The expected intensity of this earthquake is assimilated by NCS, MoES as shown in **Figure 2**. The earthquake was felt in Bihar, India (**Fig. 3, Left**). Within 2 hours, 2 felt reports due to this earthquake were received from Bihar through the NCS website and Mobile App having intensity ranging from I to II on the Modified Mercalli Intensity (MMI) Scale (**Fig. 3, Right**).

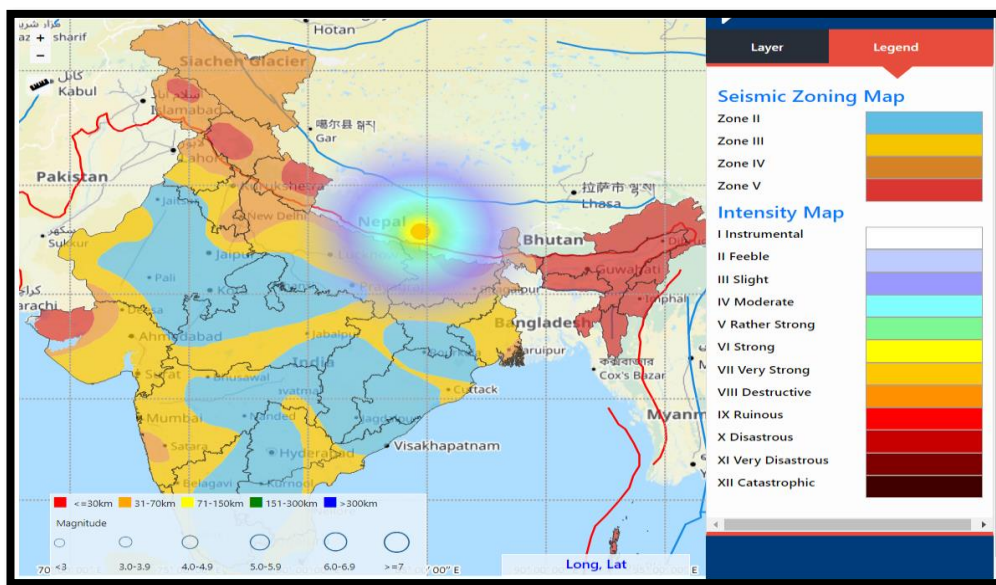


Figure 2: Estimated earthquake Intensity Map of the earthquake of M: 5.3 of 22nd October 2023.

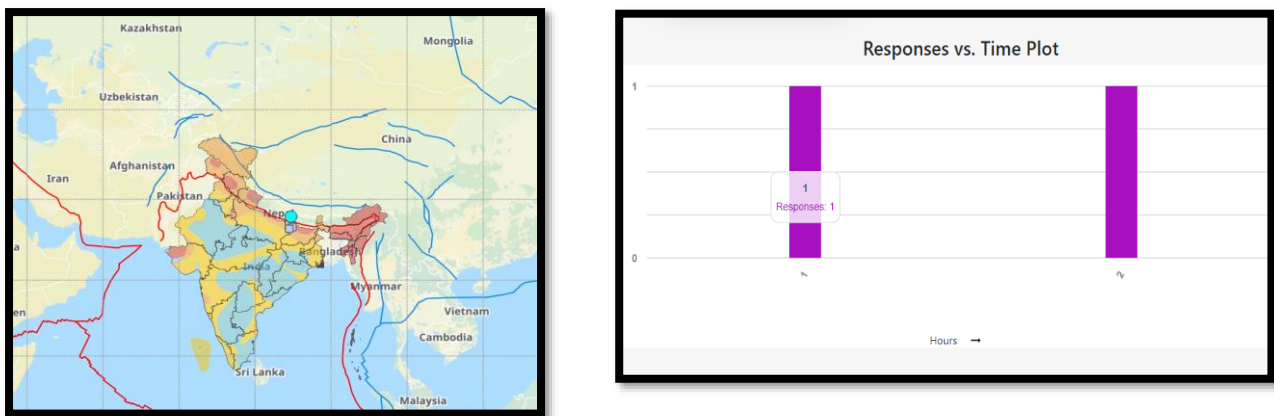


Figure 3: Felt responses (squares) of the 22nd October 2023 earthquake M: 5.3 (circle) from different users reported on www.seismo.gov.in and BhooKamp mobile app (Left). Number of felt responses with respect to time lapses (Right).