सत्यमेव जयते

A Preliminary Report of October 03, 2023, Western Nepal Earthquake (M 6.2)

(Report No.: NCS-NSN-EPG-06)

National Centre for Seismology
Ministry of Earth Sciences, Government of India
Mausam Bhavan Complex, Lodi Road, New Delhi - 110 003

An earthquake of magnitude M 6.2 occurred at 14:51:04 IST, located in the District of Dipayal, Western Nepal, whose epicenter at 29.39°N and 81.23°E at a shallow depth of 05 km. The epicenter is 302 Km E of Haridwar; 206 Km SE of Joshimath; 296 Km ESE of Rishikesh and 434 Km NW of Kathmandu. Two aftershocks of magnitude M 3.6 and 3.1 is also occurred with the 10 Km radius of mainshock. The area is seismically very active associated with collisional tectonics where Indian plate subducts beneath the Eurasian Plate.

The event was well recorded by more than 60 broadband seismic stations installed by National Centre for Seismology. The analysis of seismic data shows that the events are occurred on North Almora Thrust (NAT) that provides a very apt location for triggering the mainshock due to appreciable structural heterogeneity in and around mainshock. The preliminary fault plane solution derived from moment tensor inversion suggests a thrust fault. The earthquake is 50 km NNE of recent M6.3 of 9th Nov 2022 event (**Fig. 1**). Felt reports of maximum Intensity VI (MMI scale) in epicentral region and minimum intensity of II (MMI Scale) have been reported from a distance of around 5 km and 500 km from the epicenter respectively (**Fig. 2**).

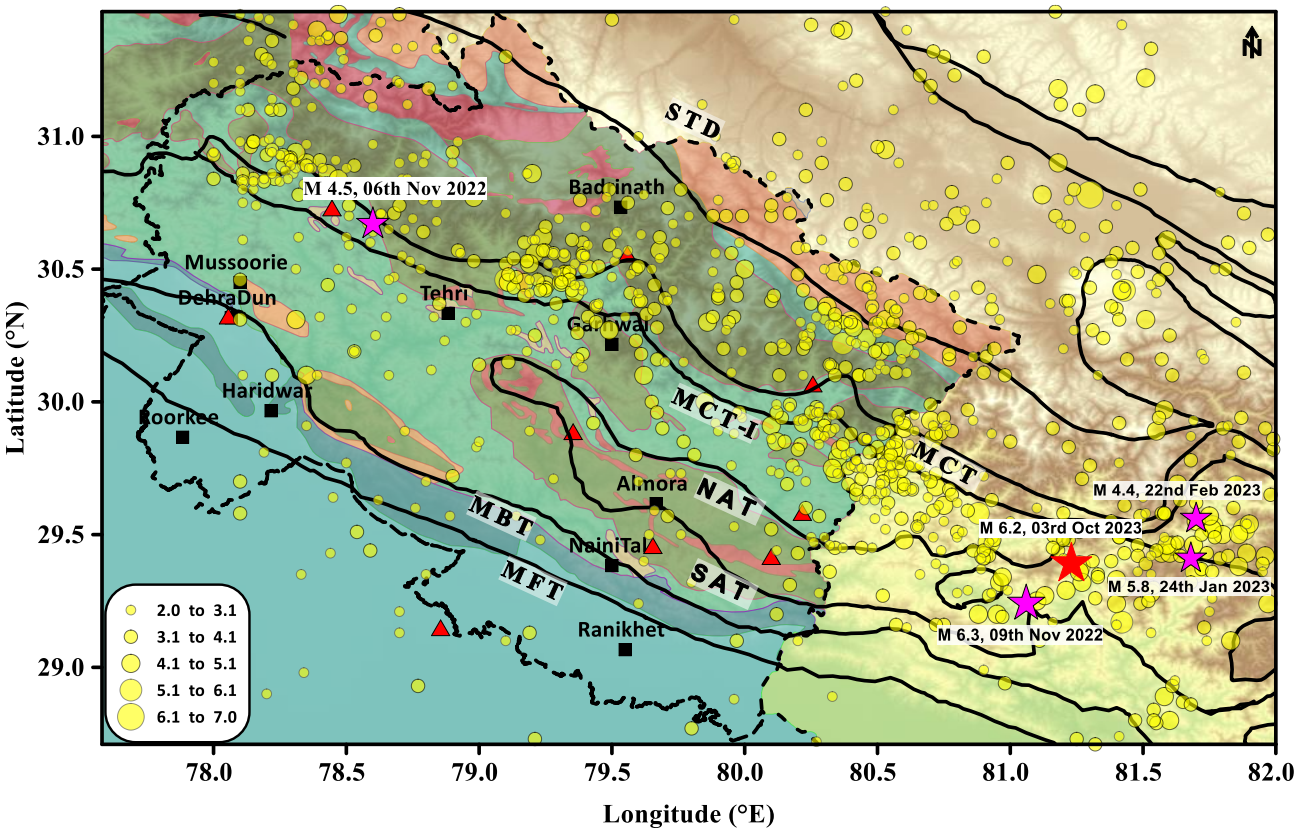

Figure 1: *The present earthquake (M 6.2) of 03rd October 2023 and seismicity in the epicentral and surrounding region (Red Star). (source: www.seismo.gov.in; NCS-MoES). The geological faults and lineament were obtained from Bhukosh, GSI. The red triangles represent the location of seismograph stations of NCS. The magenta star are the past recent earthquake occurred within one year.*

The recorded earthquakes as per EQ Catalogue of NCS reveals that the region is associated with moderate to large earthquakes with varying magnitude (Fig.1) in the last 13 years.

In addition to the above, it is noteworthy that prior to the mainshock, there where three prominently events recorded on 09th November 2022 of M 6.3, 24th January 2023 of M 5.8 and 22nd February 2023 of M 4.4 occurred within 50 square Km of today events which were also felt with slight to moderate intensity in Delhi-NCR and others neighbouring states. The occurrence of earthquakes in the region is attributed mainly to the tectonic settings of the Himalaya 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.

Expected intensity of this earthquake is assimilated by NCS, MoES as shown in **Figure 2**. The earthquake is widely felt in Delhi-NCR region and neighboring states (**Fig. 3**). Within one hour more than 70 felt reports due to this earthquake, have been received from Delhi, Uttarakhand, Uttar Pradesh, Bihar, Himachal Pradesh, Rajasthan, Punjab through NCS website and Mobile App having intensity ranging from I to III on Modified Mercalli Intensity (MMI) Scale (**Fig. 4)**.

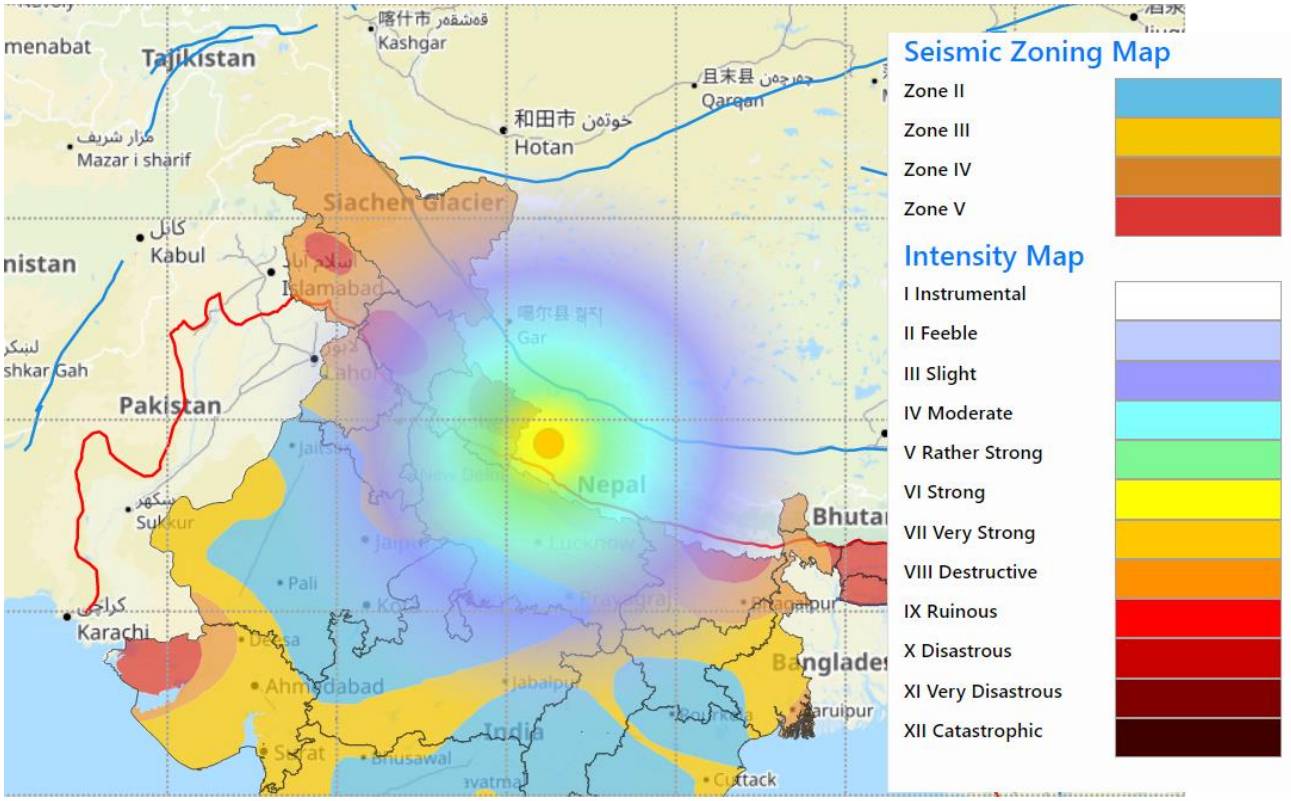

Figure 2: Estimated earthquake Intensity Map *of the earthquake of M:6.2 of 03rd October 2023.*

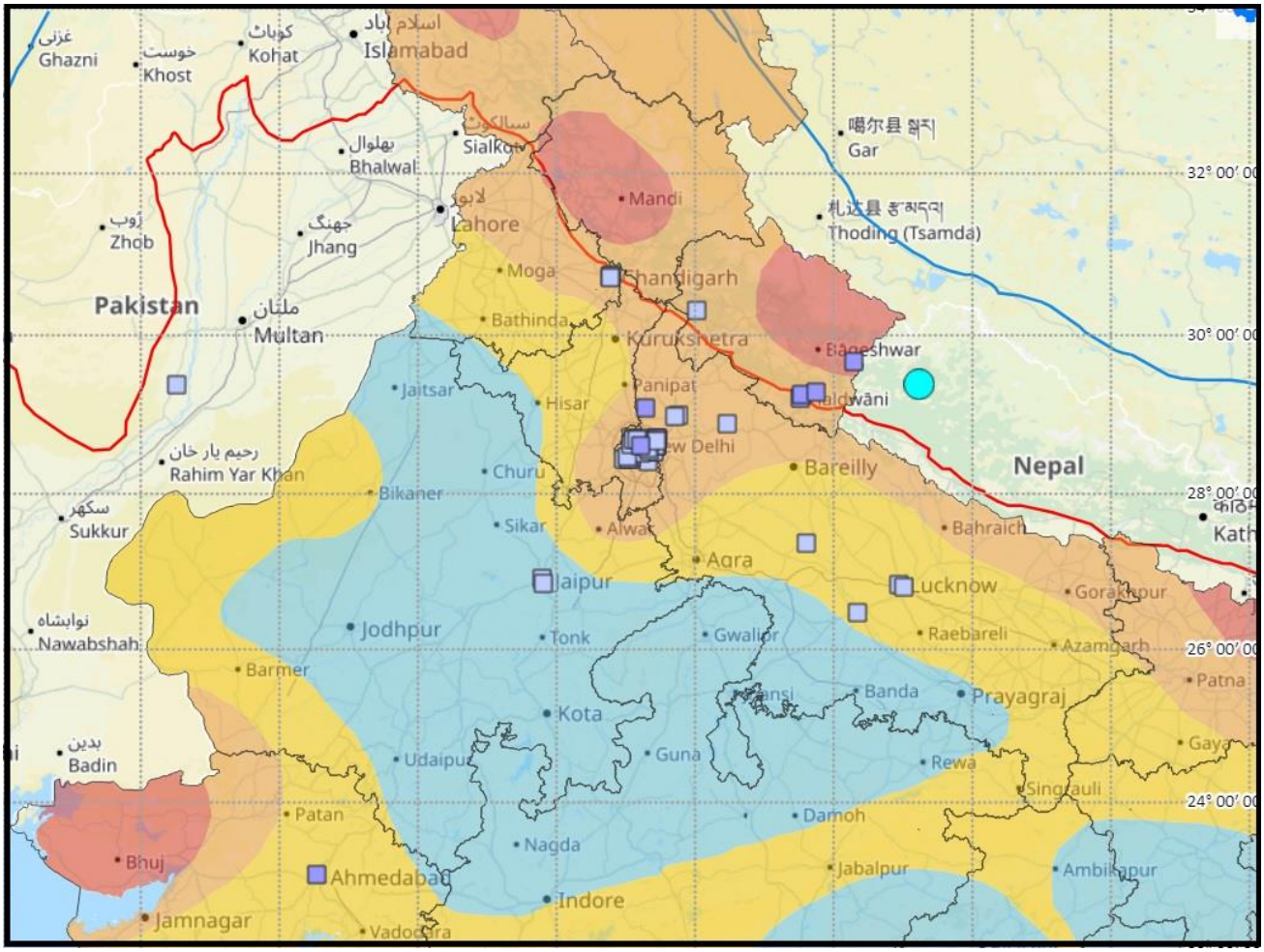

Figure 3: Felt responses (squares) of the 03rd October 2023 earthquake M:6.2 (circle) from different users reported on www.seismo.gov.in and BhooKamp mobile-app. More than 70 responses were received within one hours from the time of occurrence of earthquake.

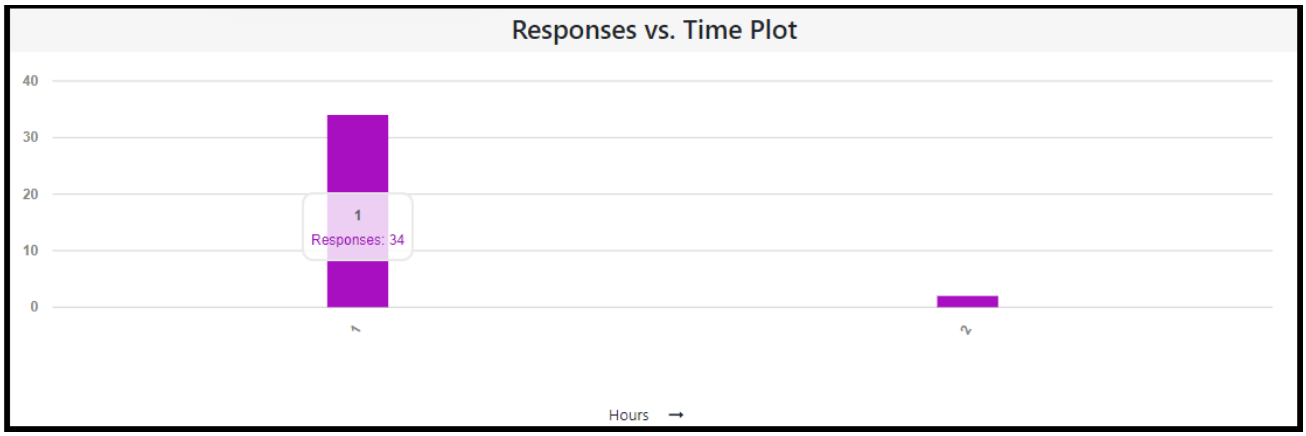

Figure 4: Number of felt responses with respect to time lapses