

Seismicity & active tectonics: New insights from Sikkim Himalaya

A dense seismic network operational since 2019 to date is providing new insights into the tectonics of seismically active Himalayan regions.

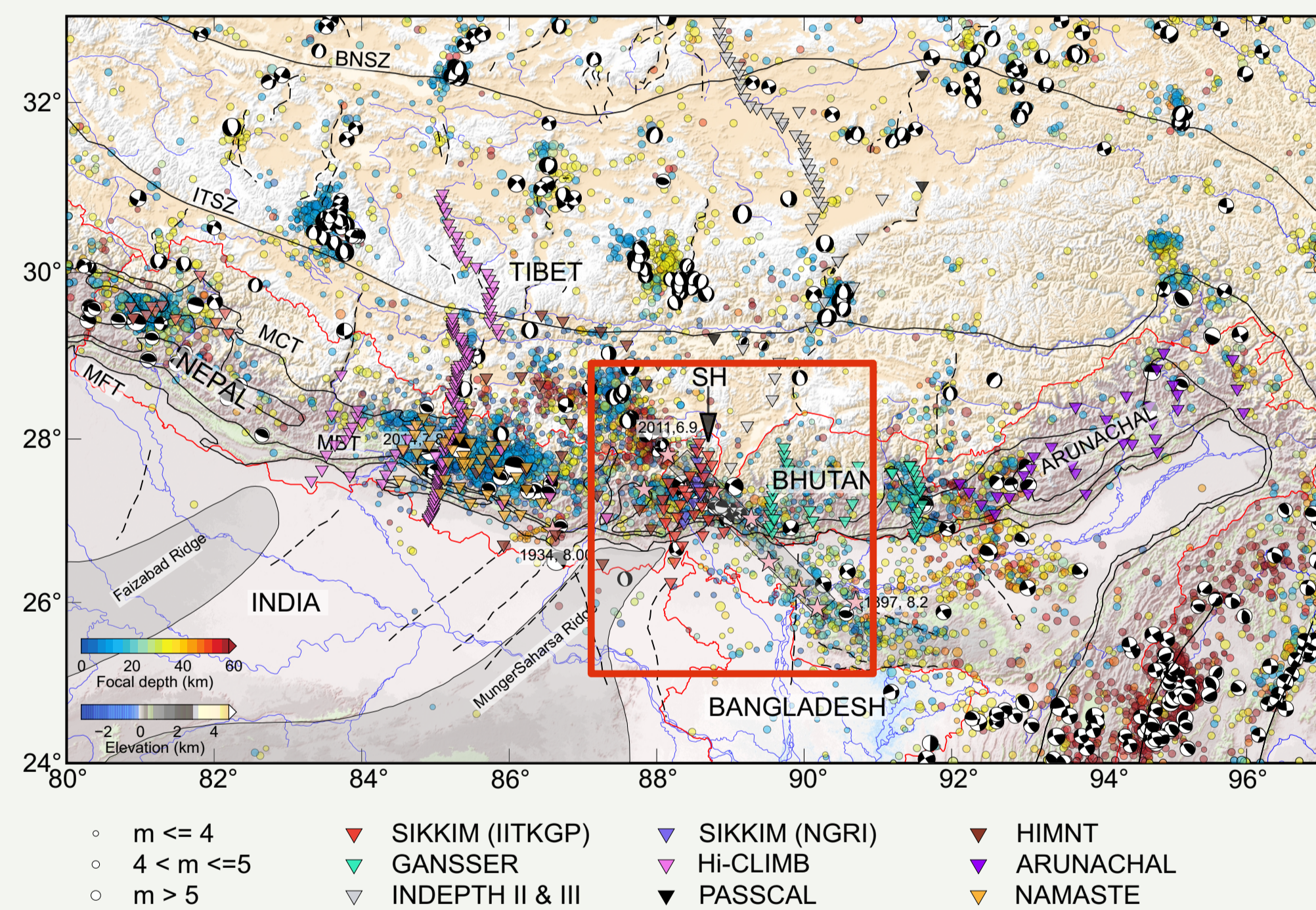


Figure 1: Seismotectonic map of Himalaya with previous seismological experiments, seismicity and focal mechanism results. Area bounded by red rectangle highlights our study region.

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MOTIVATION

27 broadband seismometers deployed across Sikkim Himalaya with an aim to understand the seismic structure, lithospheric deformation and seismicity. The continuous monitoring of seismicity in the dense network will enable in obtaining high resolution results.

OBJECTIVES

- This study focusses on analysing the local earthquakes (epicentral distance < 250km) recorded at the network to determine the seismotectonic evolution of the study region.
- Analysis involves accurate hypocentral location, determination of focal mechanisms, and rupture characterization from focal mechanisms.

METHODS

- Initial hypocenter location using Geiger's method.
- Iteratively relocate events while simultaneously modifying the velocity model using JHD. Final hypocenter location using double-difference algorithm.
- Focal Mechanism determination using moment tensor inversion.
- Invert focal mechanisms for rupture type.

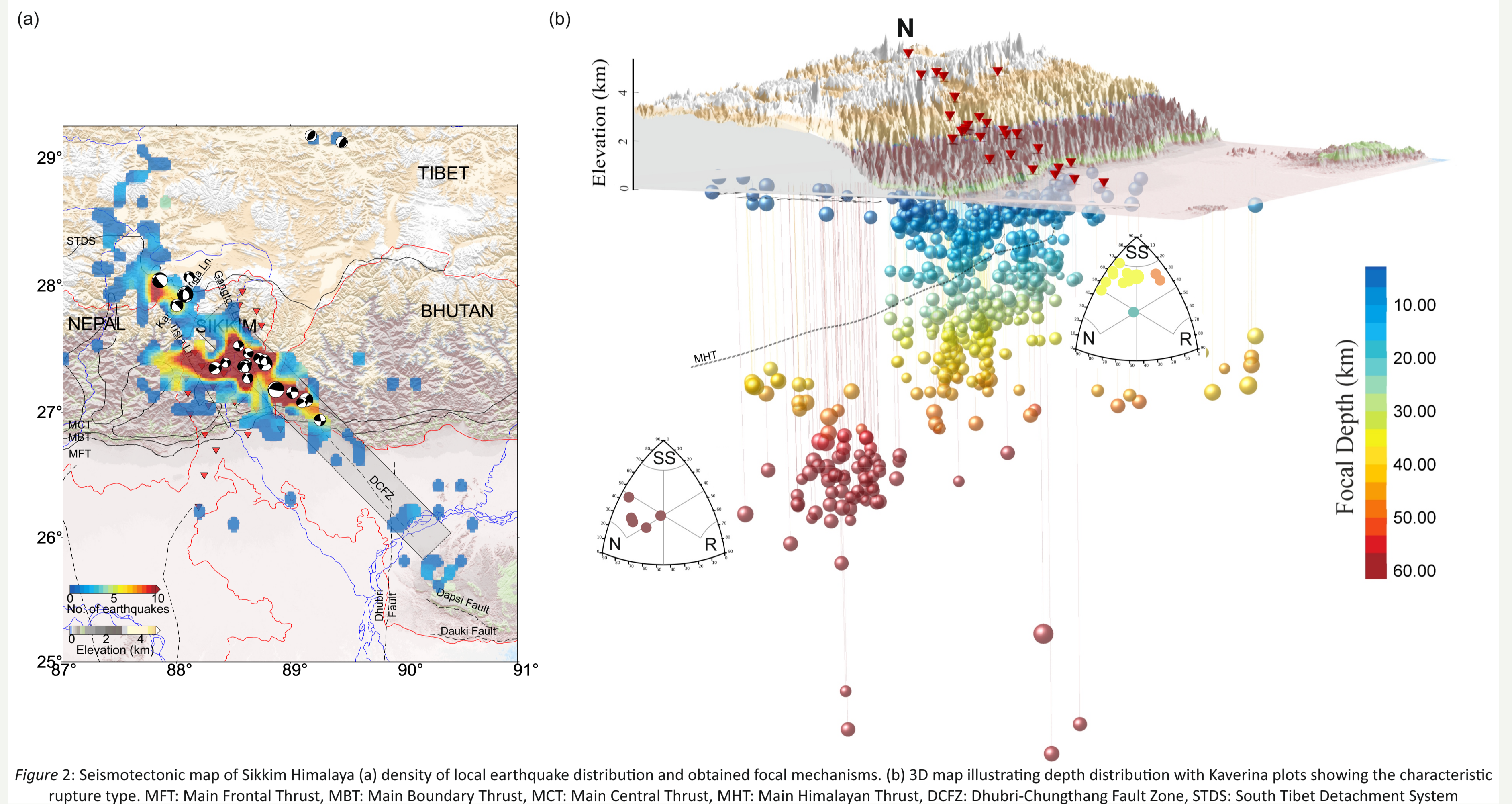


Figure 2: Seismotectonic map of Sikkim Himalaya (a) density of local earthquake distribution and obtained focal mechanisms. (b) 3D map illustrating depth distribution with Kaverina plots showing the characteristic rupture type. MFT: Main Frontal Thrust, MBT: Main Boundary Thrust, MCT: Main Central Thrust, MHT: Main Himalayan Thrust, DCFZ: Dhubri-Chungthang Fault Zone, STDS: South Tibet Detachment System

DISCUSSION

- 0 - 10 km: shallow seismicity possibly brought about by variation in surface loading during monsoonal cycles
- 10 - 20 km: originating in transtensional shear zone above MHT
- 20 - 40 km: originating in DCFZ below MHT
- 40 - 50 km: originating at the junctions of different blocks in an imbricated crust
- > 60 km: mantle earthquakes in southern Tibet

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