



## **Surface faulting and paleoseismicity in highly glaciated areas: A case study from Eastern Lunana (NW Bhutan) with important implications for the glacial and seismic hazard potential of the Kingdom of Bhutan.**

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Eastern Lunana, a highly glaciated area in NW Bhutan, comprises major debris-mantled glaciers all in the state of decay. As a consequence of these decaying glacier tongues several glacial lakes evolved and today more than  $50 \cdot 10^6 \text{ m}^3$  of water are stored in moraine-dammed and supraglacial lakes. In deed, since the middle of the last century Lunana is known to be the source area for disastrous glacial lake outburst floods.

Paleoseismological investigations, brittle fault analysis and paleostrain calculations combined with the interpretation of satellite imagery and a digital elevation model were used to investigate the seismic and glacial risk in this remote part of the Bhutan-Himalaya. We found evidence for high magnitude earthquakes within this high altitude periglacial environment and thus provide data about the strongest earthquakes ever been reported for the Kingdom of Bhutan. Strong earthquakes may trigger glacial lake outburst floods easily and the impact of such flash floods may be worst 85km downstream where the valley is broad and thus densely populated. Consequently tectonic

models of active deformation have to be closely linked with glacial hazard evaluation and need fundamental modification and rethinking as these earthquakes raise the natural hazard potential in the Kingdom of Bhutan.