



## **Paleoseismic evidence for two major historical earthquakes in Bhutan: new insight for rupture segmentation along the Himalayan arc**

Romain Le Roux-Mallouf (1), Matthieu Ferry (1), Jean-François Ritz (1), Théo Berthet (2), Rodolphe Cattin (1), and Dowchu Drukpa (3)

(1) Géosciences Montpellier, CNRS, UMR5243, Université de Montpellier, Place E. Bataillon, 34095 Montpellier, France, (2) Department of Earth Sciences, Uppsala University, 75236 Uppsala, Sweden, (3) Seismology and Geophysics Division, Department of Geology and Mines, Post Box 173, 9 Thimphu, Bhutan

We present the first paleoseismic study along the Main Frontal Thrust in southern Bhutan. Paleoseismological excavations at two sites and related OxCal modeling reveal that Bhutan has been struck by at least two great earthquakes in AD 1713 and over medieval times with a total cumulative vertical offset greater than 10 m. Combined to previous published works carried out in Central Nepal, Sikkim and Assam, our study supports the occurrence of either i) a giant earthquake between AD 1107 and AD 1141 or ii) a sequence of great earthquakes between AD 1025 and AD 1547. Following several studies on the relation between segmentation and rupture area of great subduction earthquakes, we propose to interpret our results in term of along-strike variations of the Himalayan arc. The Yadong cross structure crosses the Himalaya obliquely and likely acts as a barrier that may limit the rupture propagation of great earthquakes. In contrary, giant earthquakes such as the medieval event could cross this structure and rupture more than one segment. In this case, the 800-km-long-rupture could produce an event with a magnitude in the range of Mw 8.7-9.1.