



Co-seismic moment released by the surface rupturing 1934 Bihar-Nepal earthquake

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The M7.8 April 25, 2015, Gorkha-Nepal earthquake is the latest of a long series of large and great devastating earthquakes documented along the Himalayan megathrust since medieval times. The rupture stopped halfway up the seismogenic fault, leaving no surface rupture. It propagated unilaterally to the East, abutting on the supposed trace of the great M 8+, January 15, 1934, Bihar-Nepal earthquake. Contrary to the smaller 2015 earthquake, this early instrumental earthquake ruptured the megathrust fault up to the surface along a more than 140 km-long stretch of the Main Himalayan Frontal Thrust (Sapkota et al., 2013), and still stands as one of the very few great intercontinental megathrust earthquakes with a documented surface rupture. However, the magnitude of the earthquake, with assigned values between 8.0 and 8.4, is still rather poorly constrained. The estimation of the slip deficit released by the earthquake as well as its average return period thus varies by a factor up to 4, depending on the magnitude and rupture model taken into account. In order to refine these estimates, we re-evaluate the seismic moment it released from a set of 10 independent measures at 6 well-calibrated seismic stations. We obtain a seismic moment of 4.1×10^{28} dyn.cm. We consider several rupture scenarii for the 1934 earthquake and show that the average slip was probably between 9 and 16 meters, yielding average return periods of 500-900 years, values significantly larger than previously estimated.