



## **Rupture properties of the giant Sumatra earthquake imaged by empirical Green function analysis**

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Empirical Green function (EGF) analysis has remained little used to image the rupture properties of the giant 2004/12/26 Sumatra earthquake. The 2002/11/02 foreshock ( $M_w=7.2$ ), close to the mainshock epicenter, gives us the opportunity to use its waveforms to empirically simulate the Rayleigh wave propagation of the Sumatra earthquake. It is first shown, using two earthquakes of the Mexican subduction zone ( $M_w=7.2-7.3$ ), that long period Green functions (100s-2000s) remains very similar, even if event epicenters are separated from about 650km. This justifies the possibility to use the 2002 foreshock as an empirical Green function for the whole rupture process of the Sumatra earthquake, and shows more generally the very broad range of application of EGF technique. Then, a specific analysis reveals that seismic moment magnitude is close to 9.1 (seismic moment equal to  $5.6 \cdot 10^{22}$  N.m). Moment release analysis along Sumatra trench shows two main slip episodes: one next to the northern extremity of Sumatra (~20m slip) and the other one along Nicobar Islands (~10m slip), with a global extension of 1150-1200km. Rupture velocity vary between values around 2.5km/s in the first half of the rupture and values closer to 2km/s in the second half. Total duration imaged by Rayleigh waves is 590s (+/-20s) and no activity of the fault is found in the time scale between 600s and 2000s. In the hypothesis of even longer timescale slip, this phenomenon would be of the order of 10-20% of the global moment and likely restricted to Andaman Islands.