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The Sumatra M9 earthquake and the seismicity gaps

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The seismicity of the Sumatra region was analyzed using PDE and QED catalogues (USGS) from 1964 and the Utsu catalogue for the historical events (released June 2002). A low seismicity region was detected in the source region of the Sumatra M9 earthquake before the occurrence of this event. It was difficult to spot this low seismicity prior to the occurrence of the mainshock because the high seismicity in the Andaman Sea masked this anomaly. The size of this low seismicity region is smaller than the one at the source region of the Sumatra M9 earthquake. Using time-space distribution diagrams along the plate boundary, it was found that a second kind of the seismic gap (Mogi, 1979) existed for about 14 years before the occurrence of the mainshock. The size of this second kind of seismic gap is similar to the one of the source region, but wider than the one of the low seisicity region.

A similar anomaly was found in the region midwest off Sumatra island. The low seismicity area was found along the plate boundary and it coincided with the source regions of the 1833 (M8.7) and the 1861 (M8.4) events. In case of the 1861 (M8.4) event, the low seismic region is slightly shifted from the source region toward offshore. But in case of the 1833 event, it coincides very well with the low seismicity area and the estimated source region defined after Natawjdaja et l. (2004). A second kind of seismic gap was also found in this region. The seismic activity along the plate boundary between India-Australian and Eurasian plates was analyzed. The active and quite period has been repeatative and the most recent active period started in 1995. During the 20th century the super-great earthquakes (M>=9.0) occurred in a time span of 13 years only. Such huge events appear to have a tendency to occur focused in time.

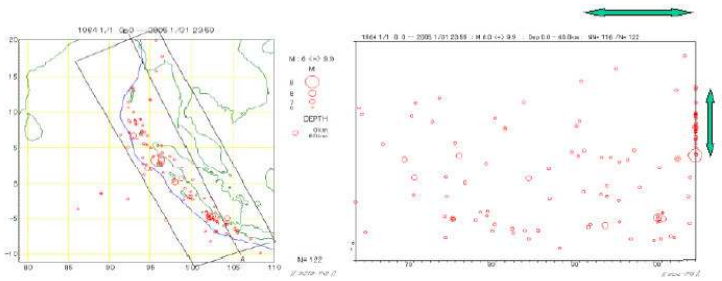

Fig.1. Time-space ditribution along the source fault in the Sumatra subduction zone. The figure on the right shows a second kind of seismic gap before the mainshock of December 25, 2004.