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The historical and recent destructive earthquakes along the Sumatran fault zone: The March 6th, 2007 doublet event in west Sumatra.

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The Sumatran fault zone is a major transcurrent fault accommodating most of the dextral component of the Sumatran oblique convergence. Its 1900-km-long strand runs along the backbone of Sumatra bisecting the volcanic arch. The Sumatran fault is highly segmented, consists of 20 major geometrically defined segments, which range in length from about 60 to 200 km, which constraint seismic source dimensions and have limited the magnitudes of major historical fault ruptures to between Mw 6.3 and 7.7. In average, major earthquakes occur one or twice every decade. As the obliquity increases, slip rates along the fault increase northwestward, from about 5 mm/yr around the Sunda Strait to 27 mm/yr around Toba Lake. These sliprate values together with fault-segment lengths provide a quantitative basis for calculating level of earthquake hazard of each segment. Most recent destructive earthquake occurred on March 6th, 2007. Two earthquakes (Mw 6.4 & Mw6.3), separated by two hours, ruptured two major segments of the Sumatran fault south and north of the Singkarak Lake in west Sumatra. This earthquake doublet killed more than 70 inhabitants and destroyed many houses and other constructions on and near the fault ruptures. The shaking was strongly felt in Padang, the capital city of west Sumatra on the west coast, and even in Singapore, especially in high-rise buildings. The surface ruptures of the first event were observed south of the lake with a total length up to 15 km and slips varies up to 25 cm right lateral and 25 cm vertical movements. The second event ruptured a 22 km fault strand north of the lake and produce dextral slip up to 25 cm. Timing and locations of the first and the second ruptures were consistent with the shake intensity felt by people in the north and south of the Singkarak region. People who live south of the lake felt the first event the strong shake and destroyed their houses, but people live north of lake witnessed that the second event produced the strongest shake and most devastated effects. The predecessor event occurred in 1926 was also a doublet, very similar to the recent one, but with larger magnitudes. Ruptures of both the 1926 and the recent events did not extent northward beyond the Koto Gadang village near Bukit Tinggi, the second largest city after Padang. From this village, the fault segment still continues about 40 km northward and terminates at a large dilatational step over. This remaining unbroken section, therefore, may still pose a threat of another major earthquake in the future.