

Report on the faulting mechanism of the Mw 7.9 Wenchuan earthquake, China

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The magnitude (M_w) 7.9 Wenchuan earthquake occurred on 12 May 2008 in the Longmen Shan region, the transition zone between the Tibetan Plateau and the Sichuan Basin, China, resulting in extensive damage throughout central and western China. Official estimates of casualties released by the Chinese Government as of 4 June 2008 include 69,122 confirmed deaths, 373,606 injured, and 17,991 missing persons.

Preliminary teleseismic waveform analysis shows that the earthquake propagated unilaterally to the northeast for ~300-km-long on a thrust fault dipping at a low angle (~30°) (Chinese Earthquake Network Center, 2008; United States Geological Survey, 2008; Harvard University, 2008). On the basis the preliminary analytical seismic mechanisms and determined epicentral location, we have inferred that the earthquake was triggered by the pre-existing Longmen Shan Thrust Belt striking northeast-southwest.

To understand the seismic faulting mechanism and surface deformation features associated with the earthquake, including rupture length and slip distribution, our survey group traveled to the epicentral area immediately after the earthquake. Here we report the main results of our field investigations that show deformation features resulting from the Wenchuan earthquake. Our field investigations reveal that a 250-300-km-long surface rupture zone formed during the 2008 M_w 7.9 Wenchuan earthquake along the Longmen Shan Thrust Belt. The 2008 Wenchuan earthquake occurred in response to compressive tectonic stress oriented perpendicular to the Longmen Shan Thrust Belt and resulting from relative motion between the Tibetan Plateau and the Sichuan Basin.