

# **GEOLOGICAL HAZARDS ASSOCIATED WITH THE WENCHUAN EARTHQUAKE, 12 MAY 2008**

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## **ABSTRACT**

The earthquake that struck Wenchuan in Sichuan Province, China, on 2008 May 12, was the most damaging to have occurred world-wide since the 2004 December 26 Sumatra event and the 2005 October 8 Pakistan event. It occurred at 2:28 pm local time, when most people were at work or at school.

The earthquake was on the Longmenshan Fault System, which has reverse faulting resulting from southeast to northwest compression, with the upthrust northwest block being along the eastern edge of the Tibet Plateau. After a long period of quiescence, this event ruptured from southwest to northeast for about 240 km. The earthquake was shallow and the surface wave magnitude was MS 8.0. Compared with similar magnitude subduction earthquakes, it had a high stress drop, leading to relatively high frequency strong motion for an earthquake of this size, high attenuation due to this high frequency, and thus a moment magnitude of Mw 7.9, numerically lower than the surface wave magnitude. The damage on the downthrown (foot-wall) block was surprisingly limited, even within tens of kilometres from the fault, compared with the total destruction along the fault and on the upthrust (hanging-wall) block.

Geological earthquake hazards included surface rupture, liquefaction, landslides and rockfalls. In the Wenchuan tectonic environment, the impact of the geological hazards clearly illustrated the limitations of earthquake hazard studies based only on ground motion recurrence using the traditional Cornell method, especially if consideration is limited to earthquake catalogues and historical activity. Although the topography showed significant deformation occurring until very young geological times, the earthquake quiescence over the past tens and hundreds of years suggested relatively low earthquake recurrence rates.

The earthquake hazard estimated by ground motion recurrence is of no value when rocks as large as houses are dislodged and fall into a city within a steep valley.

The geological hazards are illustrated by photographs taken during a visit to sites along the fault system at Dujiangyan, Yingxiu, Hongkou, Bailu, Hanwang and Beichuan during October 2008