Learning from Earthquakes

M7.8 New Zealand Quake of July 16, 2009

Andrew King, Section Manager of New Zealand’s GNS Science, provided the following information.

Focal mechanisms for the main-shock and aftershocks.

The largest earthquake in the world so far this year struck a remote area of New Zealand on July 16, 2009. The epicenter of the M7.8 event was located in Dusky Sound at the southwest corner of the South Island, the Fiordland region. The mainshock was a large reverse faulting or thrust mechanism resulting from the Australian plate subducting beneath the Pacific plate upon which Fiordland lies. The aftershocks are concentrated at either end of the faulting area and are mainly a mixture of reverse faulting and strike-slip faulting mechanisms reflecting the complexity of the tectonics in the area.

The earthquake rupture started at about 30 km depth and propagated upwards and to the south, focusing energy offshore. The motion was more like a lurch than a snap (meaning the energy was released more slowly); this is typical for a deep subduction thrust event. This explains the low number of landslides and why the damage was less than expected for this size earthquake. The motion was slower (with lower frequency shaking) and “rolling” rather than the sharp movements (higher frequency shaking) that cause building damage.


Yaoan (Yunnan Province, China) Ms6.0 Earthquake of July 9, 2009

Junwu Dai of the Institute of Engineering Mechanics in the China Earthquake Administration provided the following information.

An Ms6.0 earthquake struck Guantun of Yaoan County in the Yunnan Province of China at 19:19 p.m. July 9, 2009. The epicenter was located at latitude N25°36’, longitude E101°06’, with maximum damage intensity VIII. One person was killed and 31 severely wounded. The earthquake caused about 2.15 billion Chinese yuan in direct economic losses, including damage to local buildings and lifeline systems as well as other structures in seven counties (Yaoan, Dayao, Nanhua, Mouding, Yongren, Xiangyun and Binchuan). The total damaged area is about 6,958 square km, with 230 square km of intensity VIII, 883 square km of intensity VII, and 5,845 square km of intensity VI.

Building damage: In the damage intensity VIII area, adobe/wood structures are the principal building type. Severe damage or collapse occurred to 42% of them, 48% were lightly damaged, and 10% undamaged. A small quantity of brick buildings collapsed; most were lightly damaged or undamaged. In the intensity VII area, few adobe/wood and brick/wood buildings collapsed or were seriously damaged. In the intensity VI area, most buildings remained intact except for a few seriously damaged very old adobe or brick houses.

Lifeline damage: Impacts to transportation systems included roadbed collapse, road subsidence, road surface cracks, slope collapse, culvert cracks, and bridge damage. Impacts to the power supply system included transmission pole collapse, lines broken, and damage to transformers and meters. Damage occurred to network and telecommunication facilities and broadcasting facilities. The water supply and wastewater systems sustained cracked pipelines, and reaction tank walls and joint leakage. Impacts to the hydraulic system included individual dam deformation, dam shoulder and foot leakage, anchor gate deformation, culvert leakage, irrigation canal cracks, and operation panel damage.

Damage to adobe buildings in Yaoan earthquake.