

ABSTRACT

An earthquake with a magnitude of 6.8 occurred in Chuetsu region of Niigata Prefecture of Japan on October 23, 2004 at 17:56 on JST. The earthquake caused the loss of more than 37 lives and injured more than 2500 people. The earthquake inflicted heavy damage to Kanetsu Expressway and Hokuriku Shinkansen Line and Joetsu railway line, and the Shinkansen train traveling at a speed of 200km/h was derailed.

The earthquake was caused by a blind-thrust fault, which was not indicated on the active fault map of Japan. It had an unusual after-shock activity and at least 4 large after-shocks having a magnitude greater than 6 took place. The most heavily damaged towns were Kawaguchi with an intensity of 7 on the intensity scale of Japan Meteorological Agency (JMA), Tokamachi and Ojiya City. Yamakoshi village was heavily damaged due to slope failures induced by the earthquake.

High ground accelerations with pronounced directivity effects did occur although the magnitude of earthquake is relatively small. Due to close proximity of the epicenter, the shaking effects become more pronounced. Furthermore, the U-shape of valley may further amplify and elongate the ground shaking

Permanent deformations of ground associated with faulting did occur although no distinct ground ruptures observed. The permanent ground deformations as well as ground shaking caused some structural damage to residential houses, buildings, bridges, roads, highways, railways, expressways, lifelines. Among them, the derailment of Shinkansen train is of great importance, which will definitely have a high impact on the rehabilitation and retrofitting of existing Shinkansen lines as well high-speed railway transportation in other countries.

Widespread ground liquefaction was observed throughout the epicentral region. The liquefaction caused lateral spreading and structural damage on various structures due to relative movements, uplifting or settlement.

Many rock and soil slope failures took place, particularly in the mountainous area and along Shinano River and its streams. These slope failures destroyed roadways, expressways and railways. The large failure scale slope failures were directly associated with structural discontinuities in rock mass such as existing faults, bedding planes, and folds.