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Abstract 1-04

The tectonic processes in seismogenic zone: an attempt from the aftershock observation to understand the characteristics of mega earthquake and its prediction

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We are using the aftershock data in the subduction zone areas (such as Taiwan, Chile and Indonesia) to discuss the tectonic movements and rupture processes after a big earthquake. The subduction zone area represents 90% of the world earthquake occurrence. In early morning of February 27, 2010, an M=8.8 mega earthquake, known as the "Maule Earthquake", took place in Central Chile. Our team deployed 33 ocean bottom seismometers to measure the aftershocks along the rupture area. We recorded a total of 4,195 aftershocks in 46 days, about 4-month after the main shock.

These events distributed along both sides of the trench. Immediately behind the trench, along the frontal accretionary prism, we observed an aseismic zone. On the other hand, the paleo-accretionary prism on the landward of the trench accumulated most of the earthquakes. These events focus at depth of 50 – 100 km in the subduction zone. This is so called the seismogenic zone. A comparison of events before the main shock and this study show that the events cluster along the edge of the northern portion of rupture zone. In addition, the aftershocks apparently increase west of the trench and north of the main shock. We suggest that the subduction activity of the Nazca Plate released more energy in ruptures after the main shock. The stress is probably totally released yet. These events cluster landward of the trench with a new linear feature. This is a rupture growth.

In Taiwan, we observed the similar tectonic activities. In August 17, 2009, an M=6.8 earthquake occurred south of the Ishigaki, outside of Taiwan earthquake effective network. Similar rupture growth is observed from 1,229 aftershocks of a 20-day monitoring. Even our OBS did not go to the Banda Aceh, Indonesia, for the December 26, 2004 M=9.1 mega event. However, the continuous rupturing and even the tsunami disasters up to date, one can understand the seismic energy is not yet totally released. A study from our group suggests the possible seismic gap in the region. This type of studies, we are aiming to improve our understanding of the characteristics of mega earthquake and eventually dip into the earthquake prediction.