

Operation of the SWIFT CMT analysis system in Colombia and characteristic of seismicity in the complex subduction zones

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Colombia is located in the triple junction of the Nazca, Caribbean, and South American plate, and the complex plate subductions cause various seismicity pattern. The great earthquakes such as the 1906 Ecuador-Colombia earthquake (Mw8.8) and the 1979 Tumaco (south west of Colombia) earthquake (Mw8.2) occurred at the boundary between the subducting Nazca plate and the South American plate. There are no historical records of large earthquakes in the northern part of the boundary, and a potential for a future large earthquake is unresolved issue. An intermediate earthquake concentration known as the Bucaramanga nest is observed in the inland region. The 1967 M6.3 earthquake of the nest also caused much damage in Bucaramanga. However, most of nest earthquakes are not included in the global CMT catalog because of their small magnitude. Despite highly concentrated seismicity in the nest, the CMTs reported in the global CMT catalog also indicate various focal mechanism. This may causes difficulty in understanding the nature of the nest. To understand the nature of the nest activity and the complex plate interactions, it is very important to determine the focal mechanisms including small events.

The JST/JICA SATREPS project of "Research and development of disaster mitigation techniques of earthquake, tsunami, and volcano in Colombia" was started in 2015. We installed the SWIFT system (Nakano et al., 2008) in the Colombia Geological Survey and determined CMT solutions and source time functions of the Colombian regional earthquakes. We now carry out the following studies: 1) detection of very low frequency (VLF) earthquakes and tremors in Colombia, 2) determination of CMT solutions including small events which are not listed in the global CMT catalog. Although we have not been able to detect any VLF events until now, we obtained CMT solutions including small events by the SWIFT. The smallest magnitudes are Mw4.3 for shallow events and Mw4.6 for intermediate depth events. The global CMT catalog shows that the focal mechanisms in the Bucaramanga nest are highly variable, but our many CMT solutions show the mostly strike-slip faulting with some dip-slip components and SW-NE directions of P axis. Other events show focal mechanisms opposite to these mechanisms. Prieto et al. (2012) found repeating and "anti-repeating" earthquakes in the nest and suggested that the nest is not a volumetric but a planar seismic activity. Our results also support their idea, but we need more information of further past events. Toward understanding the nature of the nest and the complex subduction processes, we will also analyze the focal mechanisms of smaller events using P wave polarities.

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