

SCG058-11

Room:302

Time:May 22 14:45-15:00

Distribution and focal mechanisms of very low frequency earthquakes along the Ryukyu trench axis in 2007-2008

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Broadband seismograms from BATS (Broadband Network in Taiwan) and F-Net (NIED broadband network in Japan) were analyzed to find very low frequency earthquakes (VLFs) along the Ryukyu trench. All seismograms in the years of 2007-2008 were band-path-filtered (0.02-0.05 Hz) to pick-up VLFs. Several clusters of very low frequency events were found along the Ryukyu trench. First, high signal-to-noise-level events were selected out the broadband seismograms. Then, local and teleseismic earthquakes were removed from these events using the hypocenter catalogs of the PDE, the Central Weather Bureau (CWB) and the Japan Meteorological Agency (JMA). Through the procedure, about 1200 and 1000 events were identified as VLFs in 2007 and 2008, respectively. Spectra of typical events in these earthquakes show peak frequencies between 0.06 to 0.1 Hz. These VLFs were selected and grouped into three main clusters. The regionalization is possible based on arrival time, amplitude and similarity in waveform: 1) Yonaguni-Ishigaki, 2) Okinawa Island, 3) Amami Island. The CMT solutions were obtained for these VLFs using the inversion technique by Nakano et al. (2008). The accurate locations and focal mechanisms were determined further by a grid-search method where a minimum residual is searched within each area of latitude range of 5 degrees and longitude range of 5 degrees and a depth range 0 to 100 km. About 100 events from the Ishigaki-Yonaguni group were well located with low residuals. For the analysis of this group, data from BATS were used. However, events in Okinawa Island and Amami Island groups were not as well located because they are small in terms of magnitude. Among the selected events, low angle thrust fault was found to be dominant. Although some strike-slip and normal faults are included, their reliability is low and they are not included in the list of reliable solutions. Based on the events herein studied, the distribution and depth of VLFs suggest that these events occurred mostly in the accretionary prism along the Ryukyu trench similar to those found in Central Honshu. This similarity may suggest that the upper interface of Ryukyu trench is locked.

Keywords: Very low frequency earthquake, Subduction, Ryukyu trench, Source inversion