Oral | Symbol S (Solid Earth Sciences) | S-CG Complex & General

[S-CG68_30AM2]Structure, evolution and geodynamics of island arcs

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Wed. Apr 30, 2014 11:00 AM - 12:30 PM 502 (5F)

The goal of this session is comprehensive understanding of geodynamics of island arcs in subduction margins, including their structural evolution, short- and long-term crustal deformation,seismicity, crustal and mantle architectures overprinted by structuralhistories, volcanisms, and rheological properties of the lithosphereand its response to geodynamic processes. We solicit contributionsfrom a wide range of disciplines, including geodynamics, tectonics, geophysics, geology, geochemistry, seismology and earthquake prediction, from both observational, numerical and experimental approaches.

12:15 PM - 12:30 PM

[SCG68-P01_PG]Tectonic province of the northern Fossa Magna region based on the crustal movement and seismic activity

3-min talk in an oral session

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Keywords:tectonic province, northern Fossa Magna, crustal movement, seismic activity, seismogenic layer

The northern Fossa Magna region is located in an area where the Niigata-Kobe tectonic zone (Sagiya *et al.*, 2000) and geological strain concentration zone along the eastern margin of the Japan Sea (Okamura, 2002) is duplicated. In the past, inland crustal earthquakes, such as the Zenkoji earthquake in 1847 (M7.4) and the Niigata-ken Chuetsu earthquake in 2004 (M6.8), have occurred in this region. In order to discuss the current tectonics of the northern Fossa Magna region that has active crustal movement and seismic activity, it is necessary to clarify the characteristics of "tectonic province". The purpose of this paper is to reveal a detailed three-dimensional tectonic province model from the crustal movement and seismic activity of this region in the recent years. In order to clarify the characteristics of crustal movement and seismic activity, we have analyzed the GEONET observation data (from October 2007 to March 2011) using the GAMIT 10.4 software, and made the E-W cross-sectional view of the JMA hypocenter data. The horizontal strain distribution for three and a half years just before the 2011 Tohoku-Oki earthquake shows that strain concentration zone with NW-SE directional contraction extends from the Niigata plain to the Matsumoto basin continuously. Moreover, the eastern margin of this zone corresponds roughly to the position of the Shibata-Koide tectonic line (Yamashita, 1970) running NNE-SSW direction in the eastern margin of the Niigata plain. The strain rate in the Echigo mountain range is smaller than in the Niigata plain. Takeuchi (1999) showed tectonic province based on the activity and characteristics of active faults. The strain distribution revealed from GPS data corresponds approximately to active faults provinces. The large and small strain region corresponds

approximately to the reverse fault province (Shin'etsu ~ Niigata sedimentary basin) and strike-slip faults province (Central upheaval zone and Echigo mountain range) respectively. Focusing on the depth distribution of the seismogenic layer in the E-W cross-section, the depth of the lower limit of seismogenic layer is shallow (D = 10-15 km) in the strike-slip province but is deeper (D = 20-30 km) in the reverse fault province. The seismogenic layer is located beneath the low P-wave velocity zone corresponding to the thick sediments layer in the sedimentary basin. According to the above results, there is obvious spatial variation of the depth of seismogenic layer and strain distribution at the boundary of the sedimentary basin and Central upheaval zone. It is conceivable that two different tectonic provinces are adjacent along the tectonic boundary where characteristics of the crustal activity are changing greatly. The moderate-large crustal earthquakes around the northern Fossa Magna, such as the Zenkoji earthquake in 1847, the Niigata-ken Chuetsu earthquake in 2004 and the Nagano-ken Hokubu earthquake in 2011, have occurred on or near the tectonic boundary. Stress concentration is likely to occur due to large changing of the physical properties in the tectonic province boundary, and a large crustal earthquake tend to occur at the tectonic province boundary than at the inside province.