Determination of stress province by using focal mechanisms in Tokara Islands area, northern Ryukyu arc, Japan

Makoto Otsubo[1]; Atsushi Yamaji[2]; Atsuki Kubo[3]; Noriaki Teramae[4]

[1] IGG, GSJ/AIST; [2] Div. Earth Planet. Sci., Kyoto Univ.; [3] KEO; [4] Sci., Ryukyu Univ.

Deformation and stress state in active island arcs are important for understanding the dynamics. Especially, forearc stress and deformation are key to understand mechanical interaction of the backarc and subduction. Present crustal stress states are derived from focal mechanism solutions of earthquake. Otsubo and Yamaji (2006, JPGU) proposed a new method which is proposed to separate stresses from heterogeneous data of focal mechanisms of earthquakes.

In this study, we apply the technique into the focal mechanisms in Tokara Islands area, northern Ryukyu arc because stress province was likely to be distinguishable using the P-/T-axis of the solutions in domain which sandwiched volcanic line. The data were obtained from 60 earthquakes since January 1st, 1997 to July 30th, 2006. All foci were located in the depth range between 5 and 23 km. All local magnitudes were greater than 3.3.

As a result, present study shows different stress province from one found by P-/T- axis. Two extensional stresses (NNE-SSW and NW-SE) were detected from the solutions. Under regional radial extensional stress state, spatial variation of state stress allows was to divide the Tokara Islands area into 3 tectonic domains; (1) Eastern area, (2) Southern western area and (3) Eastern margin of Okinawa Trough.

On the other hand, geological faults at Takarajima Island where is located in southern part of study area records only NW-SE extension. Temporal difference between seismic faults data and geological ones may show spatio-temporal variation of state stress in the area.

References:
Otsubo, M. and Yamaji, A., 2006. Abstract of Japan Geoscience Union Meeting 2006.

Acknowledgements:
We thank National Research Institute for Earth Science and Disaster Prevention (NIED) for permission to use the focal mechanism data of the earthquakes.