Japan Geoscience Union Meeting 2011
(May 22-27 2011 at Makuhari, Chiba, Japan)

SSS035-P19 Room:Convention Hall Time:May 25 14:00-16:30

Determination of three-dimensional stress orientation in the accretionary prism in Nankai Subduction Zone, Japan by ASR

Weiren Lin[1*], Timothy B. Byrne[2], Yuhji Yamamoto[3], Yuzuru Yamamoto[4], Masataka Kinoshita[4]

[1]Kochi/JAMSTEC, [2]University of Connecticut, USA, [3]Kochi University, [4]IFREE/JAMSTEC

During IODP Expedition 319, the first riser-drilling borehole in ocean was penetrated by D/V CHIKYU at Site C0009 in the Nankai convergent margin, Japan. From 0 mbsf (meters below seafloor) to 1285 mbsf, the borehole crossed the Kumano forearc basin and from 1285 mbsf to the bottom depth of 1604 mbsf, the Nankai accretionary prism.

In a short depth range of 84.20 m from 1509.7 to 1593.9 mbsf, core samples were retrieved by rotary core barrel drilling. We collected 3 whole-round core samples for measurements of anelastic strain recovery (ASR) by the same methods of sample preparation and anelastic strain data acquisition conducted in the previous Stage-1 expeditions of the same NanTroSEIZE drilling program (Byrne et al., 2009; GRL, Vol.36, L23310). Anelastic normal strains, measured every ten minutes in nine directions, including six independent directions, were used to calculate the anelastic strain tensors. All three samples showed coherent strain recovery over a long period more than 1 month. The three samples were from C0009A (3R,1531 mbsf; 4R, 1540 mbsf and 8R, 1577 mbsf, respectively) in lithologic Unit IV interpreted as accretionary prism or deformed slope sediments. All samples are composed of silty clays or hemipelagic muds with relatively high porosities (30%˜).

The ASR measurement results in Kumano Forearc Basin obtained from C0002 (Byrne et al., 2009) showed the maximum stress orientation is nearly vertical and a normal stress regime. However, the ASR results in the accretionary prism from C0009 show that the maximum principal stress axes plunge gently or are nearly horizontal and the stress regimes appear to be strike-slip or thrust (reverse fault) types. The maximum horizontal principal stress orientaions obtained from the ASR tests also show very good consistency with the stress orientaions determined from borehole breakouts in the same borehole and the same depth range (Lin et al., 2010; GRL, Vol.37, L13303). These results suggest that three-dimensional maximum principal stress (Sigma 1) and the stress regimes change with depth and/or formation. Possibly, the depth range around 1500 mbsf may be a transition zone of stress regime from normal faulting above to thrust faulting below.

We gratefully acknowledge the IODP for providing core samples and the supports of the IODP Exp319 scientists, D/V Chikyu drilling crew, and laboratory technicians.

Keywords: NanTroSEIZE, Stress, ASR