Japan Geoscience Union Meeting 2010
(May 23-28 2010 at Makuhari, Chiba, Japan)

SSS019-09 Room: 303 Time: May 24 09:30-09:45

P and S-wave velocity measurements for hanging-wall of the Megasplay fault: NantroSEIZE Stage 1 Site C0002 and C0004

Yoshitaka Hashimoto[1*], Akinobu Harada[1], Harold Tobin[2], Matthew Knuth[2]

[1]Kochi University, [2]University of Wisconsin

Changes in elastic moduli as expressed by the acoustic properties of sediments may reflect diagenetic and strengthening processes related to mechanical porosity decrease, cementation, strain history, and fluid release. The distribution of acoustic properties within accretionary prisms is important to our understanding of variations in chemical and structural processes occurring within the accreted material. This variability may have implications for wedge geometry, fluid migration, and seismogenesis.

In this study, we describe the results of laboratory measurements of P-wave and S-wave velocities through sediments obtained from Sites C0002 and C0004. Both sites are located in the hanging wall of the Mega-splay fault in the Nankai accretionary prism.

Our measurement procedure is as follows: Pore fluid pressure of 500kPa was kept and confining pressure was changed to control the effective pressure. The maximum effective pressure was estimated for each sample from the accumulation of the bulk density of sediments and hydrostatic pore fluid pressure at the depth of recovery. 1MHz Lead Zirconate Titanate (PZT) shear wave transducers are used in a source-receiver pair to measure wavespeed. PZT in a shear orientation generates a weak compressional mode in addition to its primary shear mode. This allowed us to identify P and S-wave arrivals in each test, although the S wave arrival time was often difficult to locate precisely within the coda of the P-wave arrival. We found that the S-wave arrival is identical across an array of waveforms at different effective pressures, although the error can be as large as ~2 micro-second (about 5% error).

Sites C0002 and C0004 were drilled during NantroSEIZE Stage 1 (IODP Expeditions 315 and 316). We selected three samples from each for testing. For Site C0002, one sample is from forearc basin sediments and the others are from accreted sediments.. For Site C0004, one sample is from shallower cover sediments and the others were again taken from accreted sediments. These samples are all composed of silty clay, with porosity ranging from ~30 - ~45 % for Site C0002 and ~40 - ~50 % for Site C0004.

The p-wave velocity ranges from ~2000 - ~2360 m/s for C0002 samples and from ~1700 ? ~2200 m/s for C0004 samples. S-wave velocity ranges from ~720 - ~950 m/s for Site C0002 samples and from ~650 ? ~940 m/s for Site C0004. The Vp/Vs ratio ranged from ~2.4 - ~2.7 for Site C0002 and from ~2.3 - ~3.7 for Site C0004, with a mean of ~2.5. One sample from C0004, taken from the shallow cover sediments, has a large Vp/Vs ratio, but others consistently around ~2.3 - ~2.7.

The porosity vs. Vp relationship shows a higher slope than that predicted by a global empirical relationship, except for the sample from Site C0004 from the shallower cover sediment. This relationship was also observed for the accreted sediments from Site C0001. A similar relationship is also reported by Gettermy and Tobin (2003) for the Costa Rica sediments. They classified the

sediments into three groups: sediments in the reference site, underthrusted sediments, and accreted wedge sediments. The wedge sediments tend to show the higher slope in the p-wave velocity vs. porosity relationship than that of global relationship. The P-wave and S-wave velocities in terms of porosity from this study represent a kind of accordance with that reported by Gettemy and Tobin (2003). As Gettemy and Tobin (2003) pointed out, the different acoustic properties between accreted sediments and cover sediments indicate a different diagenetic process between them which may be related to strain history or cementation processes.

Keywords: Acoustic properties, NantroSEIZE, Megasplay-fault