

The first cores by D/V Chikyu -Preliminary results of CK05-04 Leg 2, HPCS coring in off-Shimokita

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We lastly got hold of the first cores that were drilled by D/V Chikyu at off-Shimokita, NE-Japan forearc, in the late November 2005, during CK05-04 Leg 2 cruise. The first cores were obtained by using Hydraulic Piston Coring System (HPCS) from three holes in two sites, C9001A, C9002A and C9002B, at the depth of about 1180 m. Site C9001 is about 800 m away from Site C9002 in the south. Penetrations of C9001A and C9002A-B were 46.5 mbsf and 70.8 mbsf, respectively. This coring operation was carried out primarily in order to evaluate a bearing capability in a 50 m thick formation for the conductor pipe of the Blowout Preventer (BOP) installed in a riser drilling planned in the summer 2006 at the same site.

Recovered cores were composed chiefly of monotonous massive olive black to olive gray diatomaceous silty clay bearing other microfossils such as sponge spicules, foraminifera, coccoliths, radiolarians, etc. Diatoms are contained averagely 30 modal% and microfossils totally occupies more than 50 modal%. In addition, tephra and sandy layers are recognized at approximately 30 each horizons with up to 10 cm thick in the 70 m thick formation. The tephra are varied from fine vitric ash to pumiceous lapilli in grain size, including also scoriaceous coarse ash. The formation at least upper 70 m in the drilling area contains fair amount of interstitial gas, mainly composed of CH₄, therefore many void cracks were generated due to gas expansion before partitioning into sections. The core recovery for each core consequently exceeded 100 %, up to 117 %, except a core whose recovery was 97 %.

For those cores, non-destructive continuous measurements and some discrete sample measurements were carried out onboard. Purposes of these measurements were basically 1) to provide fundamental geologic data for geotechnical evaluation, 2) to examine a core flow, 3) to obtain data for verifying performance and quality of analytical equipments, and 4) to obtain scientific data. Properties acquired by non-destructive measurements were X-ray CT, gamma-ray attenuation (GRA) bulk density, P-wave velocity (PWV), electric resistivity, magnetic susceptibility (MS), natural gamma-ray radiations, color spectra, paleomagnetic polarity and intensity, and bulk petrochemistry. Profiles of each property exhibit characteristic long and short scale variations even with relatively high dispersions due to existence of many gas voids and cracks. MS profiles, for example, were very useful for inter-hole depth correlation among three holes, combined with correlation of tephra and sandy layers. According to this correlation, higher sedimentation rate at Site C9002 is expected in the middle formation compared with that at Site C9001, up to 1.6 times in a certain interval. Among the profiles, however, PWV data were heavily affected by gas voids, showing unrealistic lower values for wet sediments. Moisture and density (MAD), and total organic carbon (TOC) were analyzed for discrete samples collected from every section. Bulk density of the silty clay given by MAD measurements varies from 1.4 to 1.45 g/cm³ below about 5 mbsf, with relatively abrupt increase at about 30 mbsf and also showing general consistency with GRA density. TOC content for the 40 m formation at the site C9001 varies from 1 to 2 wt%, decreasing downward. Shear strength tests, which were performed every section for the first purpose, gave data showing that a sufficient bearing capability was expected for the conductor pipe installation.

Whole-round core samples were taken from mostly C9001A for shore-based investigations of a triaxial compression test and microbiological studies. Discrete samples were taken from both C9001A and C9002A-B for shore-based measurements of XRD and Grain-size, and microbiological studies, besides for onboard measurements. Those shore-based studies using onboard samples are in progress now.