3.2 Ga oceanic sedimentary sequence: preliminary results of the Dixon Island-Cleaverville Drilling Project, Pilbara, Australia.

Shoichi Kiyokawa[1]; Shoichiro Koge[2]; Takashi Ito[3]; Minoru Ikehara[4]; Kosei E. Yamaguchi[5]; Fumio Kitajima[6]; Yusuke Suganuma[7]

[1] Earth & Planetary Sci., Kyushu Univ.; [2] Earth and Planetary Sci., Kyushu Univ; [3] College of Education, Ibaraki University; [4] Center Adv. Marine Core Res., Kochi Univ.; [5] XBR-JAMSTEC and NASA Astrobiology Institute; [6] Earth and Planetary Sci., Kyushu Univ.; [7] Tokyo Univ.

'Dixon Island-Cleaverville (DXCL) Drilling Project' was successfully completed to obtain modern-weathering free fresh geologic samples of the 3.2 Ga Cleverville Group at the Cleaverville Beach, west Pilbara, Australia. We drilled three holes (CL1, CL2, and DX) that cover two formations (SBF: Snapper Beach Formation and DIF: Dixon Island Formation of the Cleaverville Group). SBF and DIF consist mainly of hydrothermal volcanic rocks (komatiite, rhyolite tuff and pillow basalt), organic-rich black chert, and iron-rich chert. The Archean succession along the Cleaverville Coast dips approximately vertically, so each drillhole was inclined at the lowest practical drilling angle of 51 degree. Approximately 100m-long core was obtained from Hole DX in the upper part of the DIF, and 50m-long cores were obtained from Hole CL1 and Hole CL2 in the SBF. All sequences of CL 1, CL2, and DX are younging to southwest. We observed at least 40˜50m deep uppermost sections that are visibly affected by modern weathering; however, the remaining portions are indeed 'fresh', evidenced by preservation of fine grains/laminations and nodules of pyrite. CL1 and CL2 cores contain massive black shale and cross-bedded siltstone - fine sandstone. The black shales preserve nodules and veins of pyrite. DX core contains very finely laminated shale of the uppermost Dixon Island Formation. Its (gray) chert- (black) shale sequence, with very fine-scale lamination, contains various types of pyrite mineralization. The DX core also contains highly weathered (oxidized) Dixon Pillow Basalt.

Organic carbon contents of black chert in the DX drillcore, 0.1-4.5 wt.%, are much higher than those of equivalent surface outcrops, suggesting near-surface carbon depletion by weathering (and probably by silicification). Carbon isotopic compositions of organic carbon in the black chert of the DX drillcore are between -32 to -28 per mil, likely reflecting microbial activity in the hydrothermal environments and/or oceans 3.2 Ga ago. The lower units of each drillholes are therefore suitable for not only geological and stratigraphical studies but also geochemical and isotopic studies that apparently require samples of very high quality.