Antarctic climate record in Illite Crystallinity (IC) and Crystal-size distributions (CSDs)

JAEWOO JUNG[1], JAE IL LEE[2], KYU-CHEUL YOO[2], HO IL YOON[2], CHUNG YEON HWANG[2], YEONG BAE SEONG[3], EUGENE DOMACK[4], DAE-HWAN PARK[5] AND JINWOOK KIM[1*]

[1] Department of Earth System Sciences, Yonsei University, Seoul 120-749, Korea

[2] Korea Polar Reseach Institute, Incheon 406-840, Korea

[3] Department of Earth and Environmental Sciences, Korea University, Seoul 136-704, Korea

[4] Geological Oceanography,College of Marine Science-University of South Florida, Florida, USA

5 Center for Intelligent Nano-Bio Materials (CINBM),Department of Bioinspired Science and Department of Chemistry and Nano Science, Ewha Womans University, Seoul 120-750, Korea

*Corresponding author : jinwook@yonsei.ac.kr

Illite Crystallinity (IC) and Crystal Size Distributions (CSDs) are frequently used to determine the crystal formation and growth mechanism in diagenetic and experimental conditions. Recently, microbial process, particularly Fe-respiration is considered to be an important factor to induce the chemical/structural alteration of clay minrals resulting in the modification of clay packet size distribution. Marine sediment cores from Larsen C Ice Shelf, Antarctic Peninsula were investigated to test the hypothesis – "Glacial/interglacial environmental changes may be reflected in IC and CSDs of illite associated with biotic/abiotic mineral alteration during Holocene and Last Glacial Maximum (LGM)". Physical and biological effects on IC and CSDs of illite were discussed utilizing X-ray diffractometer profile analysis, Transmission electron microscopy, Electron Energy Loss Spectroscopy, and Pyrosequencing analysis. Decrease in IC and the averaged illite packet size with depths may be due to the temperatural variation that affects the microbial activity as well as flocculation of suspended illite particles. Microbial diversity, particularly Fe-reducers inversely related to IC. Grain-size histograms of illite packets broaden, flatten and shift to larger sizes with decreasing depth. CSDs of illite from the sediments from 0 cmbsf showed a pseudo-log normal distribution compared to the log normally distributed illite particles from the deeper depths (61, 121, and 218 cmbsf) suggesting a new population of illite particles forms during inter-glacial period.