Preservation processes of paleoflood in stalagmite –case study of Inazumi Underwater Cave, Oita, NE Kyushu,Japan –

*Tatsuro Shindoh[1], Shinji Ohsawa[2], Taketoshi Mishima[2], Yumiko Watanabe[1], Takahiro Tagami[1]

1. Division of Earth and Planetary Science, Graduate school of Science, Kyoto University, 2. Institute for Geothermal Sciences Graduate School of Sciences, Kyoto University

Detrital sediments and mud trapped in stalagmite have been used for reconstruction of frequency of past extreme rainfall events associated with hurricane and cyclone (e.g., Dasgupta et al., 2010 EPSL; Frappier et al., 2014 AGU; Finné et al., 2014 Quat. Res.), yet more efforts should be put in for better understanding of the formation mechanism of so-called “flood layer”. This research presents the features and formation processes of the flood layer using microscopic observation (stereomicroscope, polarized microscope and fluorescence microscope) of the stalagmite’s thin section (SUI-1 and SUI-2) sampled from Inazumi Underwater Cave, Oita, Japan, where experiences episodic cave flooding during summer due to the East Asian Summer Monsoon.

Both of SUI-1 and SUI-2 showed (1) the presence of troughs filled by mud and rock-forming minerals such as augite, magnetite and quartz on the stalagmite’s flank; (2) the presence of numerous microcrystalline $CaCO_3$ on the flood layers; (3) alternating couplets of thick and porous layers on upper part of the stalagmite, which the porous layers were frequently filled by mud, and; (4) that no fluorescence layers were observed.

The (1) indicates that large size suspended solids carried during cave flooding induce physical weathering on the stalagmite’s surface, resulting in formation of the troughs and fill-up by small size suspended mud in the troughs while water level of cave river is decreasing. The large size minerals are considered to be washed away toward the stalagmite’s flank by dripping water. The (2) indicates that the $CaCO_3$ growth was temporarily ceased by the coverage of the suspended solids on the stalagmite’s surface, and that the numerous microcrystalline $CaCO_3$ are the evidence of nucleation and growth competition of newly precipitated $CaCO_3$ from dripping water. The (3) infers that the period of forming the porous layers corresponds to the one of the cave flooding (summer and autumn), and hence seasonality. The (4) indicates that either the concentration of humic substance in the dripping water was too low to provide the fluorescence layers or the humic substance contained in the mud trapped in the stalagmite should be incorporated in the crystal lattice of $CaCO_3$ for the fluorescence.

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