R004-10
C 会場 ：9/26　AM2 （10:45-12:30）
11:30〜12:00

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Problems of relative paleointensity estimations from marine sediments and their relation with biogenic magnetite

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Studies on relative paleointensity (RPI) estimations using sediments started 1970's and progressed rapidly in 1990's and 2000's. Until now, global and regional RPI stacks were constructed for periods after ca. 3 m.y., and the basic features of geomagnetic intensity variations such as large variations within a stable polarity with the timescales of 10^3 to 10^5 were revealed. However, it becomes recognized that lithological changes of sediments associated with environmental changes influence RPI estimations, known as lithological contamination. This problem hinders us to understand fundamental problems of the geomagnetism including possible relations between paleointensity and reversal frequency and possible connections between the magnetic field and climate and/or earth's orbit. Recent studies revealed that the RPI recording efficiency of magnetofossils is lower than that of detrital magnetites. This was contrary to the expectation from the single-domain (SD) sizes of magnetofossils, and we still do not understand the reason. This causes the inverse correlation between the proportion of magnetofossils and detrital magnetic minerals, which is frequently observed in marine sediments. In fortunate cases that coercivity distributions of the two components are separated enough, uncontaminated RPI estimations would be possible using a slope segment representing the magnetofossil or detrital component in NRM-ARM and/or NRM-IRM demagnetization diagrams. The identification of the magnetofossil component is often relied on the recognition of the central ridge in FORC diagrams, which represents the non-interacting SD feature of magnetofossils. However, complication arises from the configurations of magnetofossils such as bacterial magnetosomes being single or multi-stranded and the degree of chain collapse after death of magnetotactic bacteria (MTB). Chain collapse and multi-stranded chains contribute to a component with a vertical spread in FORC diagrams.

I think that problems of RPI estimations ultimately arise from our lack of the understanding of DRM acquisition processes, an old problem. It was revealed that magnetofossils are ubiquitous in marine sediments, and an important carrier of DRM. However, we have not yet understood where in a sediment column and how DRM carried by magnetofossils are acquired. Some species of MTB are known to prefer to live within the oxic-anoxic transition zone (OATZ) in a sedimentary column, whose depth depends on sedimentary environments. However, magnetofossils are abundant even in oxic red clay without OATZ. Do MTB live at the sediment-water interface in such environments? In this way, ecology of MTB may control DRM fixing depths. Then, how well MTB are aligned to the geomagnetic field when they are alive, and after their death how well original magnetofossil chains are preserved?