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西部赤道太平洋の生物生産量と底層流への地球軌道要素の影響：環境岩石磁気学による考察
Orbital influence on productivity and bottom current in the western equatorial Pacific: environmental magnetic approach

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The Western Pacific Warm Pool (WPWP) has highest water temperature in the global ocean, and its spatiotemporal variations have significant impacts on large-scale atmospheric circulation and global hydrology. An environmental magnetic study was conducted on sediment cores of late Pleistocene age taken from water depths of 2500 to 4500m in the West Caroline Basin (WCB) offshore northern New Guinea to understand better the paleoceanography in WPWP. Sediments in the southern part of WCB are deposited under the influence of relatively strong bottom water currents parallel to the New Guinea Trench; this is evidenced by sediment grain-size spectra, anisotropy of magnetic susceptibility, and 3.5 kHz sub-bottom profiling records.

Magnetite dominates magnetic mineral assemblages of the sediments. This is evidenced by that isothermal remanent magnetization (IRM) acquisition curves are mostly explained by a low-coercivity component, and that the Verwey transition is obvious in low-temperature measurements. Existence of the sharp central ridges on first-order reversal curve (FORC) diagrams and transmission electron microscopy indicate the occurrence of biogenic magnetite, in addition to magnetostatically interacting pseudo-single-domain and multi-domain magnetites of probably terrigenous origin.

The ratio of anhysteretic remanent magnetization susceptibility to saturation IRM (k_{ARM}/SIRM, a proxy of biogenic to terrigenous magnetic mineral component) and acid solvable component (~carbonate content) are synchronous with northern-hemisphere summer insolation; peaks of the former two correspond to the insolation maxima. This suggests that in WCB ocean productivity and then population of magnetotactic bacteria are higher when the Australia-Indonesian summer monsoon is stronger at the insolation maxima. The precessional frequency is visible in volumetric magnetic susceptibility (k) variations at sites shallower than the carbonate compensation depth (CCD), but the eccentricity frequency becomes dominant in carbonate-free mass susceptibility (χ_{cf}). Sediment redistribution by bottom water currents, whose strength and paths may vary with glacial/interglacial changes, may be responsible for the eccentricity frequency in χ_{cf}.

On the Ontong-Java Plateau (OJP) to the east of WCB, on the other hand, the precessional frequency appears in k, but the eccentricity frequency dominates k_{ARM}/SIRM variations. This suggests that the k_{ARM}/SIRM ratio at OJP could be influenced by a terrigenous supply via the Equatorial Undercurrent, but not by the strength of the monsoon.

Keywords: environmental magnetism, Western Pacific Warm Pool, West Caroline Basin, paleoceanography