Magnetic Detection and Ferromagnetic Resonance Characterization of Magnetic Minerals in Fossil Coral Skeletons in Ishigaki Island, Japan

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The remanent magnetization of corals has been one of attractive archives because coral frameworks may provide us high-resolution paleomagnetic records from pre-observatory times, due to their high growth rates. The coral skeletons, mainly composed of aragonite, have following two advandages in the reconstruction of the geomagnetic field: 1) they can be dated by radiocarbon and uranium-thorium dating method, 2) a paleomagnetic standard 1-inch core sample gives an avaraged orientation for two-three years because they grow up at a rapid rate. Especially, the annual banded skeleton of *Porites* might have a great potential as a high-resolution paleomagnetic recorder due to their continuous growths through hundreds of years at a growth rate 11–20 mm-yr. Because of these characteristics, they may be able to record short-term geomagnetic paleosecular variation in a decadal or centennial scale, which are difficult to reconstruct with previus samples (e.g., lava flows, burnt archeological artifacts, lake or marine sediments, and speleothems). Unfortunately, in spite of the enormous possibility for paleomagnetic reconstruction, most coral skeletons have shown an extremely weak magnetization, and their magnetic origin has not been determined. However, a measureable magnetization has been reported in deceased coral tsunami boulders along the shorelines of Ishigaki Island where the coral reefs are grown on bedrock of Ryukyu limestone and Jurassic schist, even using a conventional spinner magnetometer. It is necessary to determine the characterization of magnetic assembladges in this coral skeleton to utilize them as a reliable paleomagnetic recorder, because paleomagnetic records are affected not only by past geomagnetic field variations but also by lithologic factors of samples, such as mineralogy, concentration, and grain size of the magnetic phases. Therefore, by using first-order reversal curve (FORC) measurements, ferromagnetic resonance (FMR) spectroscopy and petrological observations by FE-SEM of acid-treated residuals of our corals, we found that the magnetic mineral assemblage consists of a dominant biogenic-origin single-domain magnetite and a minor detrital component. From AF demagnetization of recently-ceased *Porites* coral skeletons, we also found that the characteristic remanence directions of almost all samples are relatively stable with some fluctuations. However, some samples exhibit obviously different remanence directions from its average, suggesting the rotation by a past tsunami event. Our findings suggest that *Porites* coral framework samples have a potential use as a high-resolution paleomagnetic recorder with careful examination of past rotations.

Keywords: rock magnetism, coral skeletons, ferromagnetic resonance

