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タヒチサンゴ化石から推定される南太平洋熱帯域の海洋環境
Tropical South Pacific Climate Variability Inferred from Tahiti Fossil Corals: IODP Expedition 310 -Tahiti Sea Level-

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Massive Porites corals, living in shallow waters of the tropical to subtropical oceans, precipitate annually-banded aragonite skeletons. These colonies provide robust chronological control and allow sampling at subseasonal resolution. Ages of fossil corals can be determined accurately by radiocarbon and uranium/thorium dating. Coral strontium/calcium (Sr/Ca) ratio has been widely used as a robust paleothermometer (e.g., Beck et al., 1992). Coral oxygen isotopes (d18O) reflect variations in sea surface temperature and seawater d18O with the latter being closely related to salinity reflecting the precipitation?evaporation balance at the sea surface and changes in water mass transport (e.g., Tudhope et al., 1995). Therefore, coupled determinations of Sr/Ca and d18O in a coral enable the construction of proxy records for both sea surface temperature and salinity (e.g., Gagan et al., 1998, Felis et al., 2009). Fossil corals were shown to provide subseasonally-resolved proxy records of sea surface temperature and salinity for time windows of the Holocene, the last glacial period and older interglacials. However, most fossil reefs of glacial age are located today at water depths of >100 m, as a result of the lower sea level caused by ice sheet build-up during glacial periods (e.g., Bard et al., 1990). Therefore, it has been difficult to collect corals of glacial and deglacial age for paleoclimatic studies.

In 2005, the Integrated Ocean Drilling Program (IODP) Expedition 310 (Tahiti Sea Level), conducted by the European Consortium for Ocean Research Drilling-Science Operator using the mission-specific platform (DP Hunter), drilled the coral reef system off Tahiti (French Polynesia), an island located in the central tropical South Pacific (Camoin et al., 2007). During the expedition, massive fossil coral colonies, mostly of Porites, were recovered in-situ at depths of about 40 to 150 m below modern sea level. We present monthly resolved Sr/Ca and d18O records from well-preserved fossil corals recovered during the expedition (Asami et al., 2009). Our coral-based estimates of sea surface temperature and seawater d18O document thermal and hydrologic variations around Tahiti for selected time windows during the Quaternary, furthering our understanding of tropical South Pacific climate change that accompanied the sea-level change.

Keywords: coral skeleton, Tahiti, oxygen isotope composition, paleothermometer, tropical South Pacific, IODP