

Application of coral ^{15}N proxy: interannual variability of water mass in Tatsukushi Bay due to Kuroshio volume changes

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The Kuroshio Current transports a large amount of warm and low nutrient seawater northward in the western north Pacific and its variability has been discussed the relationship with global climate change in decadal scales. Coral skeletons have been used as high resolution recorder of past nutrient dynamics with decades to millennia time scales. Nitrogen isotope of organic matter in the coral skeleton could vary with that of nitrogenous sources and be a potential to capture nitrogen isotope changes in marine nitrate. In this study, we tried to detect poor nitrate water mass of Kuroshio through the time series of nitrogen isotope in coral cores from Tatsukushi Bay, Kochi, Japan.

Coral drilling performed in October, 2008 and we took three cores 1.5 meter long from the same *Porites* coral. According to observation of annual bands in x-radiographs of coral cores, that *Porites* colony alive more than 216 years. For nitrogen isotope analysis of coral skeletons, the microsampling from the coral slabs 5 mm thick performed along the major growth axis at 4 mm intervals. Each 28 mg powder samples were then decalcified, and all of organic matter in coral skeleton resolved to nitrate and converted into nitrous oxide to introduce into continuous-flow isotope ratio mass spectrometry. We also determined the time axis of coral cores using coral oxygen isotopes and annual bands in x-radiographs.

Coral nitrogen isotopes varied between +3 and +10. We compared coral nitrogen isotopes with Kuroshio volume observed by Japan meteorological Agency from 1973 to 2008. The 2-year moving averages of coral nitrogen isotopes had inverse variation with that of Kuroshio volume. Coral nitrogen isotope was decreased by intensified Kuroshio volume. We measured nitrogen isotope of nitrate in the mouth of Tatsukushi Bay, which results were +9.5 on June 2011 when Kuroshio leave from the bay, and +6.1 on October 2011 when Kuroshio came close to the bay. This result suggested nitrate in Kuroshio water had low nitrogen isotope composition originated from tropical oceans. As Kuroshio volume decreased, upwelling nitrate with heavier nitrogen isotope supplied Tatsukushi Bay. Coral nitrogen isotopes recorded nitrate isotope composition varied with Kuroshio volumes. In this presentation, we also report time series of coral nitrogen isotope with precipitation anomaly in the northern hemisphere for 160 years. From 1973 to 2008, they have negative correlation ($r=-0.48$) and varied with Kuroshio volume. Using coral nitrogen isotope, we discuss the effect of Kuroshio volume changes to climate in northern hemisphere and their decadal cycle.

Keywords: coral skeletons, nitrogen isotope, nitrate, Kuroshio