A 150-year variation of Kuroshio transport detected by the nitrate $\delta^{15}N$ records in coral skeletons

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The Kuroshio Current is the strongest ocean current in the world, driving the physical ocean-atmosphere system with heat transport from tropical to temperate in the North Pacific Ocean. The global environment has dramatically changed over the past 100 years, and the global sea surface temperature has increased by ~1°C since the early 1900s. The response of the Kuroshio to global warming is debatable, however, as the variability of the Kuroshio Current during the past 100 years has not been well understood. In this presentation, we describe the variability of the Kuroshio transport over the past 150 years as reconstructed from the nitrogen isotope composition of coral skeletons ($\delta^{15}N_{coral}$). $\delta^{15}N_{coral}$ has been used as a proxy to record nitrate $\delta^{15}N$ values [1-2]. *Porites* coral cores were collected from Tatsukushi Bay, on the Pacific coast of Japan and located on the Kuroshio axis. $\delta^{15}N_{coral}$ varied due to a mixture of Kuroshio water and temperate sea surface water. We discuss the relationship between $\delta^{15}N_{coral}$ and global warming, PDO, and ENSO.

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P-V-T equation of state for ε-iron up to 80 GPa and 1900 K using the Kawai-type high pressure apparatus

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Using the Kawai-type multianvil high pressure apparatus equipped with sintered diamond anvils, we determined the *P-V-T* equation of state of ε-iron by means of in situ X-ray observations with synchrotron radiation at pressures up to 80 GPa and temperatures up to 1900 K. The *P-V-T* data set of ε-iron was fitted to a single EOS model based on the Mie-Grüneisen equation of state as shown in Fig. 1. The present results indicate the unit cell volume at ambient conditions V_0=22.15(5) Å^3, the isothermal bulk modulus K_{T0}=202(7) GPa and its pressure derivative K'_{T0}=4.5(2), the Debye temperature θ_0=1173(62) K, Grüneisen parameter at ambient pressure γ_0=3.2(2), and its logarithmic volume dependence q=0.8(3). Furthermore, thermal expansion coefficient at ambient pressure was determined to be $\alpha_0(K^{-1})=3.7(2)\times10^{-5}+7.2(6)\times10^{-8}(T-300)$ and Anderson-Grüneisen parameter δ_T=6.2(3). Using these parameters, the density of ε-iron at the inner core conditions was estimated to be ~3 % denser than the value inferred from seismological observation. This result indicates that certain amount of light elements should be contained in the inner core as well as in the outer core but in definitely smaller amount.

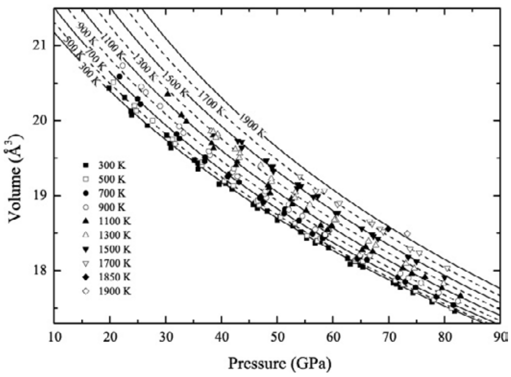

Fig. 1. *P-V* data along isotherms at 300-1900 K.

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