

Uranium isotope composition changes with past climate changes

Yusuke Yokoyama^{1*}

¹Atmosphere and Ocean Research Institute, University of Tokyo

Uranium series nuclides have unique chemical properties and have been widely used for determining the timing of the past climate changes (Edwards et al., 1988; Yokoyama and Esat, 2004; 2011). Rivers supply uranium to the oceans globally with excess ²³⁴U relative to secular equilibrium and ²³⁴U incorporated with coral skeletons can be used for dating. The ²³⁴U abundance in seawater, at the time the coral was growing, can also be measured independently. The reliability of Uranium series dates used in determining past sea-level variations is dependent on selecting pristine corals free from diagenetic alteration. A quantitative test for alteration assumes invariant ²³⁴U abundances in the oceans for at least the past ca. 500 kyrs and results from samples outside of a narrow range in modern ocean ²³⁴U abundance are excluded from data sets. It has been known that this can be constant and thus is able to use rigorous tests for diagenesis of corals. We combined data obtained from uplifted coral terraces in Papua New Guinea with previously reported values. A systematic trend emerges indicating shifts in the ²³⁴U/²³⁸U ratio at times of major glacial?interglacial transitions that involve large variations in sea-levels (Esat and Yokoyama, 2008; 2010). From last glacial to Holocene, the rate of change in ²³⁴U/²³⁸U is approximately 1 permil per thousand years. In this presentation, we introduce potential mechanism to explain these variations, which is closely linked to the sea-level changes and coastal environmental changes.

References:

Edwards et al. (1988) *Earth Planet Sci. Lett.*

Esat & Yokoyama (2006) *Geochimica et Cosmochimica Acta*, 70, 4140-4150.

Esat & Yokoyama (2010) *Geochimica et Cosmochimica Acta*, 74, 7008-7020.

Yokoyama & Esat (2004) *Global environmental change in the ocean and on land*, 1, 279-309.

Yokoyama & Esat (2011) *Oceanography*, 24, 54-69, doi:10.5670/oceanog.2011.27.

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