

南アフリカの太古代海洋底玄武岩から見積もる約35億年前の海水水素同位体組成 Hydrogen isotopic composition of ca. 3.5 Ga seawater estimated from Archean MORB in South Africa

富安史也^{1*}, 三島郁¹, 斉藤拓也¹, 上野雄一郎¹, デヴィット マーチン²

Fumiya Tomiyasu^{1*}, Kaoru Mishima¹, Saitou, Takuya¹, Yuichiro Ueno¹, de, Wita, Maatin²

¹ 東京工業大学大学院理工学研究科地球惑星科学専攻, ² ネルソン・マンデラ大学理学系

¹Department of Earth and planetary Sciences, Tokyo Institute of Technology, ²Nelson Mandela Metropolitan University

Origin of Earth's seawater and its subsequent evolution are still poorly understood. Hydrogen isotopic composition is a key to constrain secular change of seawater volume through hydrogen escape and degassing from mantle, and thus critical to estimate the original isotopic composition of the primitive ocean. A fragment of the Archean seafloor is well preserved in Barberton Greenstone Belt, South Africa. We have systematically analyzed hydrogen and oxygen isotopic compositions of sub-greenschist facies pillow basalts in upper part of Hoogenoeg Complex. Petrographic observation together with XRD analysis showed that almost hydrous mineral in the sample is composed of chlorite with minor amounts of epidote and actinolite. Chlorite is useful to deduce seawater isotopic composition because of little temperature dependence both for hydrogen and oxygen isotope fractionations against H₂O. Based on the relationship between isotopic composition and water contents, we have concluded that the 3.5 Ga seawater was depleted in deuterium by more than 20‰ compared to modern seawater. These results indicate the seawater volume may have decreased by hydrogen escape into space through the Earth's history.

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