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TITLE: Orbital-scale changes in the global silicate weathering intensity: the Mesozoic bedded chert sequence in Japan as its potential measure

AUTHORS (FIRST NAME, LAST NAME): Masayuki Ikeda[2], Ryuji Tada[1], Paul E Olsen[3]

INSTITUTIONS (ALL): 1. the Univercity of Tokyo, Bunkyo, Japan.
2. Earth Sciences, Ehime University, Matsuyama, Japan.
3. Columbia University, New York, NY, United States.

ABSTRACT BODY: Silicate weathering is one of the most important regulators of the Earth system dynamics through nutrient supply and consumption of atmospheric CO2. However, its changes in the geologic past using geologic records have been controversial due to the lack of appropriate method to quantitatively reconstruct the past global silicate weathering intensity. One way for its measurement would be an estimation of the pelagic biogenic silica burial rate, because the silicate weathering and pelagic biogenic silica burial are the major source and major sink of dissolved silica in the present ocean, respectively (e.g. Treguer et al., 1995). During the Mesozoic, the pelagic bedded chert is the potential major sink of the biogenic silica in the ocean. We therefore first estimate the biogenic silica burial rate for the Inuyama bedded chert in Japan based on the major elements chemical analysis of individual chert and shale beds on the continuous sequence with bed-by-bed resolution. The rhythmically alternation of chert and shale beds were reflected by the precession cycle (Ikeda et al., 2010). By using the chert-shale couplet as time scale, we reconstructed the variation in the biogenic silica burial rate for the Inuyama bedded chert from the Early Triassic to Early Jurassic. Together with paleogeographic distribution of bedded chert compiled from previous studies, the biogenic silica burial rate in the low latitude Panthalassa ocean in the form of bedded chert was several times higher than the biogenic silica burial rate in the modern global ocean (DeMaster, 2002). This result suggests that bedded chert was the major sink of the dissolved silica in the ocean at least during the early Mesozoic. Therefore, the variations in the biogenic silica burial rate for bedded chert should be proportional to the variations in the dissolved silica input to the ocean in time-scales longer than its residence time in the ocean (15 kyr; Treguer et al., 1995). The variation in 87Sr/86Sr isotopic ratio, which is a possible measure for the global silicate weathering rate assuming the constant hydrothermal flux, show similar relative amplitude and phase of changes in the biogenic silica burial rate for the Inuyama bedded chert, except for the interval of increased hydrothermal flux during the Early Jurassic. Our results support the idea that the biogenic silica burial rate for bedded chert was the potential measure for the global silicate weathering intensity.

https://sites.google.com/site/masayukiikedaswebsite/ikeda-s-wedsite

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Additional Details

Previously Presented Material:

Contact Details

CONTACT (NAME ONLY): Masayuki Ikeda

CONTACT (E-MAIL ONLY): m_ikeda@eps.s.u-tokyo.ac.jp

TITLE OF TEAM:
