

Seawater $^{234}\text{U}/^{238}\text{U}$: A centennial data compilation of the past 60 kyrs

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The seawater $^{234}\text{U}/^{238}\text{U}$ isotopic composition has been presumed constant for long given the residence time of U of 380 kyrs in the ocean. Nevertheless during the past two decades, more and more evidence has shown significant deviations from a constant value of today 146.8‰. However, variations are confined in narrow ranges of 15‰ over the past 360 kyrs according to Henderson [1]. Recent explanations of small deviations from the modern value invoke source driven changes related to rise and fall of sea level [2, 3], variable discharge of U from rivers [4], the relative ratio of chemical and physical weathering [5], and possible redox changes in the deep ocean. Here we present an update of seawater $^{234}\text{U}/^{238}\text{U}$ activity ratios spanning the past 60 kyrs in great detail and covering a total of 200 kyrs. We have compiled data from U-series dated corals in shallow tropical and deep waters. A total of 1500 measurements is included which required the identification of laboratory biases, coral preservation, recalculation for a common half-life etc. The resulting record is evaluated for its possible regional and species dependent differences and a resulting 250 year binned record is obtained. During the past 18 kyrs a minor decreasing trend is visible from $\delta^{234}\text{U}$ of 150‰ to 147‰, but variations from this trend are less than 2.5‰. Colder climate periods MIS 3 and 2, including rapid climate instabilities, reveal on average a 5 ‰ lower seawater value of 142 ± 1 ‰. However, statistical variance is three fold larger prior to 18 kyrs compared to the last 18 kyrs. We hypothesise that the sudden rise of seawater $^{234}\text{U}/^{238}\text{U}$ roughly 18 kyrs ago must be related to a major change of the isotopic composition of continental U-discharge.

[1] Henderson, G. (2002) *Earth Planet Sci. Let.* **199**, 97-110 [2] Esat, T. M. & Yokoyama, Y. (2006) *Geochim Cosmochim Ac* **70**, 4140-4150 [3] Esat, T. M. & Yokoyama, Y. (2010) *Geochim Cosmochim Ac* **74**, 7008-7020 [4] Dunk, R. M., Mills, R. A. & Jenkins, W. J. (2002) *Chemical Geology* **190**, 45-67 [5] Robinson, L. F., Henderson, G. M., Hall, L. & Matthews, I. (2004) *Science* **305**, 851-854.