

Molecular composition of terrigenous dissolved organic matter after long-term degradation (2.4 years)

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Large amounts of terrigenous dissolved organic matter (DOM) are transported from the continents to the ocean. To investigate the role of photochemical and microbial processing of DOM on the continental shelves, we performed a long-term (2.4 years) experiment with DOM leached from *Juncus effusus*, as a representative for terrigenous DOM [1]. Leachates were analyzed as bulk and after solid phase extraction (SPE-DOM) by Fourier-transform ion cyclotron mass spectrometry (12 Tesla FT-ICR-MS, Bruker-Daltonics, [2]).

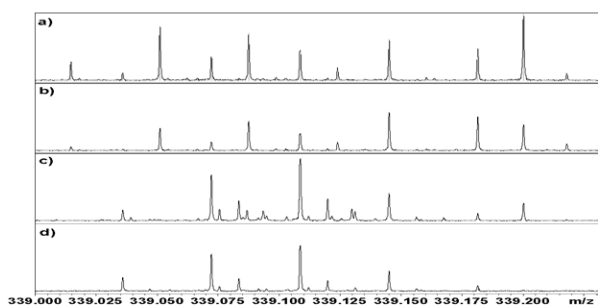


Figure 1: Mass spectrum of SPE-DOM for one exemplary nominal mass. (a) fresh leachate, (b) dark control after 898 days, (c) sterile sample after 459 days exposed to sunlight and (d) photodegraded sample after 439 days biodegradation.

The molecular composition of bulk DOM was similar in all samples, indicating that a group of abundant molecules survive the harsh long-term treatment. We could identify a larger number of molecules in SPE-DOM (Fig. 1), compared to bulk DOM, and strong molecular changes became evident in the different treatments. The results also indicate that photodegradation has a stronger effect than microbial alterations on the molecular composition of DOM.

[1] Vähätalo & Wetze, 2008 *Limnol. Oceanogr.* **53**, 1387-1392. [2] Dittmar & Paeng, 2009 *Nat. Geosci.* **2**, 175-179.

A ⁸⁷Rb decay constant accumulation experiment

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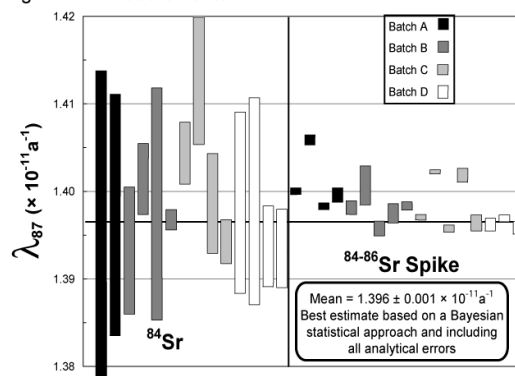
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Mounting evidence suggests that the actual value of the ⁸⁷Rb decay constant (λ_{87}) is 1-2% lower than the conventional value of $1.42 \times 10^{-11} \text{ a}^{-1}$ [1]. We have re-determined λ_{87} by laboratory accumulation of ⁸⁷Sr in a batch of purified RbClO₄ over a ca. 30 year time span. To improve precision in fractionation correction of highly radiogenic Sr isotopic compositions, we used a ⁸⁴Sr-⁸⁶Sr double spike along with conventional ⁸⁴Sr single spike. A weighted average of the λ_{87} measurements (Fig. 1) yields $1.3991 \times 10^{-11} \text{ a}^{-1} \pm 0.0010$ (MSWD = 78). The data scatter outside of their analytical errors in what appears to be an upwardly biased distribution from an unknown source. The scatter is reduced by averaging the 19 lowermost measurements (1.3966 ± 0.0003 , MSWD = 2.8) but is still outside of error. A Bayesian statistical approach assuming a unidirectional half-gaussian bias gives a best estimate for the decay constant of $1.396 \pm 0.001 \times 10^{-11} \text{ a}^{-1}$ (35% probability of fit) including spike calibration errors. This is in agreement with recent estimates for U-Pb age comparisons of 1.398 ± 0.003 [2] and 1.396 ± 0.006 [3] and the most recent laboratory counting estimate of 1.396 ± 0.009 [4]. We propose that it be used for all Rb-Sr age determinations in place of the previously accepted value.

Fig. 1 - λ_{87} measurements



[1] Steiger and Jager (1977) *EPSL* **36**, 359. [2] Nebel *et al.* (2006) *Fall AGU abst.* V21A-0558. [3] Amelin and Zaitsev (2002) *GCA* **66**, 2399. [4] Kossert (2003) *Appl. Rad. Isot.* **59**, 377.