

## Stable silicon isotopes in porewaters off Peru – diatom dissolution versus authigenic clay mineral formation

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The stable silicon isotope compositions ( $\delta^{30}\text{Si}$ ) of dissolved silicic acid and of diatom opal have been used successfully to investigate changes in nutrient utilisation and biogeochemical cycling processes in the present and past ocean. Opal dissolution, however, might have an effect on the preserved  $\delta^{30}\text{Si}$  signal of diatom opal in the sediment and therefore on the interpretation of paleo  $\delta^{30}\text{Si}$  records.

To investigate the effects of dissolution processes on the preserved diatom  $\delta^{30}\text{Si}$  signal we analysed the sedimentary biogenic opal content and dissolved silicic acid concentrations of the porewaters, as well as their  $\delta^{30}\text{Si}$  signals in the upper 20-50 cm of three short sediment cores from different water depths within the Peruvian upwelling region. The cores show large variations in biogenic opal content ranging from 10-25% in the shallowest core to only 1-2% in the deepest one. The dissolved silicic acid concentration in all three profiles increases with sediment depth. The dissolved  $\delta^{30}\text{Si}$  signature of the porewaters is unexpectedly high (+1.1‰ to +1.9‰) with the highest values occurring in the uppermost 5-10 cm of the deepest station. These  $\delta^{30}\text{Si}$  signatures are significantly higher than the diatom opal (+0.6‰ to +1.0‰) and the seawater above (+1.0‰ to +1.5‰). In the shallowest profile the porewater  $\delta^{30}\text{Si}$  does not show significant variations with profile depth, whereas the deepest profile is characterised by a pronounced decrease in the porewater  $\delta^{30}\text{Si}$  with increasing profile depth.

Based on these results we suggest that the heavy  $\delta^{30}\text{Si}$  signatures near the top of the profiles are the result of the precipitation of authigenic clay minerals with a very light Si isotope composition leaving the porewaters isotopically heavy. With increasing profile depth the effect of clay precipitation diminishes and the dissolution of diatom opal becomes dominant. So far we cannot unambiguously conclude on any significant effect of these processes on the preserved  $\delta^{30}\text{Si}$  of the diatom opal itself and therefore on the interpretation of the downcore paleo records.

## Early stage uptake of Se into rice (*oryza sativa japonica*) seedlings depending on medium and Se concentration

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Selenium is a ubiquitously present trace element which is of interest because of its essentiality for human nutrition but also because of its toxicity in slightly elevated concentrations [1]. Various factors like pH-/ redox-conditions, organic matter content, microbial activity or competing ions can influence the Se cycling in the rhizosphere [1,2]. In order to investigate and quantify the influence of individual parameters on the Se uptake we carried out simple experiments in artificial and controlled systems.

The early stage uptake of Se into rice seedlings depending on the concentration was investigated in the range of 0 to 50 ppb Se using hydroponic systems. Selenium was added as Selenate ( $\text{SeO}_4^{2-}$ ) to nutrient solution and to phytoagar (0, 20 ppb). The rice plants were grown in a climatic chamber and were harvested after 10 (1<sup>st</sup> harvest) and 17 days (2<sup>nd</sup> harvest), respectively.

The results show a linear increase of plant Se accumulation with increasing Se concentration in the nutrient solution. The Se enrichment was >3 times higher after the 2<sup>nd</sup> harvest compared to the 1<sup>st</sup> one. Also, 3.7 times more Se was taken up by shoots compared to roots. It is striking that already 50 ppb of Se in the nutrient solution lead to an accumulation of 10 ppm in the rice, a concentration that normally assigned to plants grown on seleniferous soils [3]. An even higher Se content of 17.1 ppm was reached (2<sup>nd</sup> harvest) if Se (20 ppb) was added to phytoagar. Generally, 6 to 8 times more Se was accumulated if the Se bearing medium was phytoagar and not the nutrient solution. This is probably due to interaction and competition of Se with other ions in the nutrient solution.

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