Role of climatic factors on the terrestrial distribution of selenium

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Selenium (Se) is of key importance for human health . However, due to the highly uneven global distribution of selenium in agricultural soils, it is estimated that 0.5 to 1 billion people have too low Se intake. As a result Se supplementation and fortification of foods are being increasingly discussed as possible strategies for improving human Se status. Despite observations that the Se distribution in the natural environment is closely related to human health issues and our growing awareness of the importance of this element, the behavior of Se in the natural environment is still poorly understood. It is therefore of major importance to better understand the factors that control this distribution.

The atmosphere is an important transient reservoir for Se, which is largely fed by volatile Se compounds formed via biomethylation in marine and terrestrial environments. In turn, the atmosphere can also function as a source of terrestrial Se when it is returned to the Earth's surface via wet and dry deposition. In this talk we will give new insights into the processes that are relevant to the atmospheric Se reservoir. We will also present new evidence on how climatic conditions play a major role in the large-scale terrestrial Se distribution, both directly as a source of Se (via atmospheric deposition) and indirectly by controlling pedoclimatic regimes and thus Se bioavailability. Therefore, it can be expected that changes in climatic conditions will have a significant impact on the Se distribution in the environment. We will show how climatic factors can be used to predict large-scale terrestrial Se distribution. This will be crucial in helping to understand and prevent future health hazards resulting from the uneven distribution of Se in the environment.

Reconstruction of humid phases in the Caribbean during the Late Pleistocene

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For the Caribbean, high-resolution terrestrial records are mainly available for the Holocene and suggest a linkage to North Atlantic climate variability (e.g. [1]). During the Late Pleistocene climate in the North Atlantic area was also subject to large and rapid changes, which are evident in climate records from Central America as well [2]. We present precise MC-ICP-MS ^{230}Th/U-dating, together with stable isotope and trace element data from three speleothems from Puerto Rico and Cuba, which grew between 80 and 7 ka BP. Growth phases of Caribbean speleothems are assumed to reflect humid phases in the tropical Atlantic. Stalagmite ENS2 from Puerto Rico grew in several phases (63-61, 40-39, 34-31 and 17-13 ka BP), coinciding with periods of weak East Asian Summer Monsoon recorded in speleothems from China [3]. A large stalagmite from Puerto Rico (Larga1) reveals a variable growth rate between 35 and 17 ka BP. Stalagmite CM from Cuba grew, interrupted by a few short-term hiatuses, between 80 and 7 ka BP. High-resolution multi-proxy (stable isotope and trace element) records from these speleothems are currently in preparation. They will deliver a deeper understanding of climate variability during the Late Pleistocene in the tropical Atlantic region and identify potential teleconnections to the North Atlantic.

[1] Hodell *et al*. (2008). *QSR*. **27**, 1152-1165. [2] Fensterer *et al*. (2012). *The Holocene* **22**, 1405-1412. [3] Wang *et al*. (2001). *Science* **294**, 2345-2348.

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