δ^{30}Si and Ge/Si changes in BIFs along the Archaean

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The Precambrian ocean underwent a long-term cooling as inferred by oxygen isotopes and recently corroborated by an increase in δ^{30}Si values [1]. However, this was questioned because both primary and secondary cherts were considered. To get new insights to the Archaean ocean evolution, we coupled δ^{30}Si and Ge/Si ratios in Banded Iron Formations (BIFs) spanning a large time scale (from 3.8 to 2.46Ga). Trends in Si-rich mesobands of BIFs confirm an increase of δ^{30}Si values from ~-2.1‰ (3.8Ga, [2]) to ~-1.1‰ (2.46Ga) with a simultaneous decrease in Ge/Si ratios from ~29.1μmol/mol (3.8Ga, [3]) to 2.7μmol/mol (2.46Ga). We suggest they both reflect a decrease of high-T hydrothermal inputs to oceans through time. As high-T hydrothermal fluids display high Ge/Si ratios, a decrease in hydrothermal inputs would lower the oceanic Ge/Si ratio as well as it would have contributed to cool the ocean. The maintenance of an Early Archaean high-T ocean would prevent significant direct silica precipitation from the ocean and its gradual cooling would have facilitated direct silica-rich precipitation that may have led the oceans towards heavier δ^{30}Si signatures.

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[2] André *et al*. (2006) *Earth Planet. Sci. Lett.* **245**, 162-173.
[3] Frei and Polat (2007) *Earth Planet. Sci. Lett.* **253**, 266-281.

A warming-cooling cycle between 3.8 and 3.2 ky BP: Correlations of speleothem and bivalve compositions with ice core records

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Climate conditions during the Holocene were relatively stable compared to the entire Quaternary, so that only minor fluctuations are detectable – for example – in the stable isotope records of ice cores. On the other hand, climate fluctuation events have been detected in Europe by geological and geochemical records interpreted to reflect temperature and/or humidity changes, sometimes in contradiction with each other. In this study freshwater bivalve shells (*Unio* sp.) were collected from Bronze age archaeological excavations around Lake Balaton (Central-Western Hungary) spanning the period of about 3 to 4 ky BP and their stable C and O isotope compositions were measured in order to investigate lake evolution processes in this period of time. The data indicate warmer/dryer conditions around 3.7 ky BP, bracketed by relatively cooler and/or wetter environments. These observations seemed to be in contradiction with earlier results that lead us to compare the geochemical data from bivalve shells with speleothem records of the region as well as with the GISP2 ice core oxygen isotope data. H, C and O isotope compositions and trace element data (e.g., Mg/Sr ratios, P concentrations) in stalagmites can be correlated with the bivalve shell data, indicating warming around 3.8-3.6 ky BP associated with lower humidity during summer (elevated winter/summer precipitation ratio), followed by an ~300 year long cool phase with summer-dominated precipitation. Good agreements between different paleoclimate records indicate that the warming-cooling events affected a large region from the North Atlantic at least to Central Europe. Temperature and humidity variations inferred from the data suggest that the North Atlantic Oscillation was a major governing factor in climate changes during the Bronze Age.