Atmospheric dust input to the Subarctic North Pacific

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The Subarctic North Pacific is one of the three primary high-nutrient-low chlorophyll regions of the modern ocean, where the biological pump is relatively inefficient at transferring carbon from the atmosphere to the deep sea. The system is thought to be iron-limited. Atmospheric dust is an important source of iron and other trace elements that are essential for the health of marine ecosystems and potentially a controlling factor of the high-nutrient-low chlorophyll status of the Subarctic North Pacific. However, spatial patterns of dust fluxes in the present and in the past are poorly known for this region.

We trace and quantify the supply of sedimentary phases across surface sediments from 37 multi-core core-top sediments from the Subarctic North Pacific, obtained during the SO202/INOPEX cruise in 2009, in order to obtain a robust representation of the spatial pattern in the supply of dust. To this end, we map the spatial patterns of Th/U isotopes, helium isotopes and rare earth elements in. In order to deconvolve the detrital endmembers in regions of the North Pacific affected by volcanic material, IRD and hemipelagic input, we use a combination of trace elements with distinct characteristics in the different endmembers. This approach allows us to calculate the relative eolian fraction, and in combination with ^{230}Th-normalized mass flux data, to quantify the dust supply.

We compare the spatial patterns of the reconstructed dust fluxes to results of published reconstructions of modern dust trajectories, model output and water column based estimates. The results from this study will be used for future research focusing on dust flux and productivity changes during the abrupt climate change sequence of the last deglaciation: the sequence from the cold and dusty Heinrich Stadial 1, through the dust-poor Bølling-Allerød warm period and a return to the near-glacial conditions of the Younger Dryas stadial. Ultimately, our results will allows us test the traditional hypothesis of eolian iron input primarily controlling the biological productivity in the Subarctic North Pacific and to evaluate how the Subarctic North Pacific's ecosystem mediates climate change.

Origin and evolution of Red Sea brines - Insights from noble gases

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The Red Sea represents a unique setting where an oceanic basin is actively forming and, thus, is an ideal natural laboratory to study young rifiting processes and to test models of hydrothermal circulation. The central rift zone of the Red Sea is known to contain more than twenty morphological depressions filled by highly saline brines. Historically, one of these deeps, the Atlantis II brine, provided the first geochemical evidence for the existence of hydrothermal vents on the ocean floor [1].

Due to their conservative nature, noble gases represent powerful tools to study the dynamics of fluid systems. They have proven to be useful to decode the complex geochemical processes underlying the origin and formation of the Red Sea brines and their relation to the tectonic setting of the Red Sea. Atmospheric noble gas data are used to reconstruct dynamic processes such as bubble formation and degassing within the brine layer and at the brine/seawater interface or boiling. Non-atmospheric noble gas isotope data, i.e. helium and argon isotopes, are applied to interpret the origin of the brines in the tectonic context of the Red Sea.

Here, we present a compilation of atmospheric and non-atmospheric noble gas data from several brine basins, the Kebrit, Discovery and Atlantis II Deep [2,3] as well as new noble gas data from the Shaban Deep, the northernmost Deep of the Red Sea [4]. The noble gas data provide unique insights into the development of sea floor spreading in this active region. Placing the new data in the context of the previous studies, the Shaban Deep appears to be an isolated seafloor spreading cell similar to, but less developed than the Atlantis II Deep.

[1] Degens and Ross (1969) Hot Brines and Heavy Metal Deposits in the Red Sea. *Springer, New York*. [2] Winckler et al. (2000) *Geochimica et Cosmochimica Acta* **64 (9)**, 1567-1575. [3] Winckler et al. (2001) *Earth and Planetary Science Letters* **184**, 671-68, [4] Aeschbach-Hertig et al. (2012), in prep.