Global patterns of dust deposition deduced from dissolved Al in the surface ocean

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High resolution dissolved aluminium data (Al) from surface waters obtained during the CLIVAR repeat hydrography program is being used to create a global map of dust deposition to the surface of the oceans. The results so far show generally good agreement with the existing GESAMP predictions of oceanic deposition that were based on land based aerosol sampling. In some regions though we see evidence of surface water dust input that is not represented in current atmospheric deposition models, notably the southern Indian and Pacific oceans, downwind of Australia. Additionally, in the NW Pacific the models appear to be overestimating dust deposition. High resolution depth profiles along the CLIVAR cruise tracks show preferential imprinting of the sub-tropical mode waters formed in the western parts of the Pacific and Atlantic Ocean. These sub-surface signals result from the subduction of surface water labeled with Al by dust deposition in the mode water formation regions. Thus the Al signal may be a potential paleo proxy of the mode water formation process. The GEOTRACES sampling program which will incorporate multiple trace element and isotope sampling across geochemical gradients, will help identify new geochemical tracers of processes such as atmospheric deposition. These new tracers will constrain our understanding of both contemporary geochemical processes in the ocean as well as forming the basis of new paleo proxies of physical and biological processes.

Anaerobic degradation of polycyclic aromatic hydrocarbons (PAH): From lab to field

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In recent years, the field of anaerobic degradation of aromatic hydrocarbons has developed with the same growth characteristics as the responsible organisms: slowly but surely. Whereas the degradation pathways of substituted monoaromatics (toluene, ethylbenzene, xylene) have been elucidated to a large extent, anaerobic degradation of benzene and polycyclic aromatic hydrocarbons (PAH) are still largely unknown. The best investigated PAH with respect to anaerobic degradation is 2-methylnaphthalene. Here, enzyme reactions of the upper degradation pathway to 2-naphthoic acid have been measured and the genes have been identified. We will give an overview on the current state of the art in anaerobic degradation of PAH. Furthermore, we will show the latest results on naphthalene and methylnaphthalene degradation and the occurrence of these reactions in contaminated aquifers by different methods.

As one of the most important factors limiting biodegradation in contaminated aquifers we identified the spatial separation of electron donors and acceptors. We will show high spatial resolution data indicating very steep geochemical gradients and the location of degradation processes at the fringes of an aromatic hydrocarbon plume in a contaminated aquifer.