Authigenic clay formation following Fe-oxide reduction in a Fe-Si-C rich lake sediment

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Authigenic Fe minerals are ubiquitous and important in the turnover of organic matter, nutrients and pollutants, making the iron cycle intrinsic to the water quality of lakes, coastal waters and groundwater.

Surprisingly large gaps still remain in our understanding of the redox transformation reactions of iron oxides and especially the subsequent Fe containing phases formed.

Many studies have looked at the speciation and partitioning of reactive Fe-oxides in lake sediment, however few studies have looked at the conditions and formation mechanisms for the Fe minerals resulting from Fe-oxide reduction.

We are currently investigating a natural Fe-Si-C rich lake sediment (total concentrations are app. 2500, 5000, and 10000 μmole/g, respectively), with only minor influx of detrital minerals. The lake sediment is characterised by a high fraction of Fe-oxides in the top samples, and high relative concentrations of Fe (II) in the lower sediments. In a series of experiements we are tracking the changes in Fe pool reactivity with sediment depth and correlating the findings with mineralogical analysis. The results demonstrate vivianite formation at an early stage, but the bulk of the Fe is found to react with Si from diatom frustrules forming a poorly crystalline clay mineral within 50 years of sedimentation.

U-series evidence for a brief but widespread interval of coral reef development during MIS 5e, Cape Range, Western Australia

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A series of 4 constructional/erosional and laterally continuous marine terraces (paleoshorelines) extend for ~100 km along the western flank of Cape Range, WA. The lowest terrace, known as the Tantabiddi Member (TM), is a broad (up to 5 km wide) constructional reef-lagoon terrace; a laterally continuous palaeo-scarp along the adjacent Jurabi Terrace marks the inner shoreface. The TM was deposited during MIS 5e (Stirling *et al*. 1998) and considered a direct geomorphic analogue of the modern Ningaloo reef-lagoon system. The TM has a maximum terrace elevation of between +1.5 and +2.5 m above MSL, which is consistent with other MIS 5e reef sites from tectonically stable margins. Corrected U-series coral ages (N=31) collected from 5 shoreface localities along a 20 km coastal stretch of Cape Range were found to increase in age from 119.1±2.1 ka (N=7) in the south to 121.7±1.6 (N=7) in the north. This age trend is consistent with a northward narrowing in terrace width, as modern bioerosive processes expose progressively older sections of the TM. A distinct modal age peak between 120-122 ka is observed (14 out of 31 corals). Without knowing the full geomorphic (lateral) or stratigraphic (vertical) extent of TM (i. e. a complete record of reef development), but considering the laterally expansive number of sample localities, this age cluster might suggest a brief but extensive interval of reef development at Cape Range during late MIS 5e.