



Iron distribution in a supratidal/intertidal zone in Zeeland, The Netherlands

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Frequent and unexplained iron enrichments have been localized in Holocene, marine sediments in the coastal provinces of The Netherlands. In order to understand the formation of these enrichments, it is necessary to understand the Fe-diagenesis in such areas. Studies of Fe diagenesis in coastal or estuarine environments in the Netherlands typically focus on the early diagenesis of Fe in soil profiles (upper 50 cm). Nevertheless, these studies seem not to give any explanation to these Fe enrichments.

Here, we hypothesize that the Fe-enrichments are a consequence of oscillating hydrodynamics which are driven by tidal rise and fall. The oscillating hydrodynamics cause highly dynamic redox gradients which might lead to local Fe enrichments, in particular at the surface water/groundwater interface in the tidal gullies. We further hypothesize that these enrichments are preserved by diagenetic transformation to Fe-sulfides when the sediments are buried.

This study focusses on the coupling of hydro- and iron dynamics in intertidal and supratidal flats with emphasis of the Fe diagenesis at greater depths (several meters). Geochemical field data was combined with geohydrological modelling of the groundwater system at a combined supratidal/intertidal flat to characterize the groundwater flow directions and velocities in the area. The spatial distribution of reactive iron and the underlying biogeochemical processes were deduced from geochemical analyses of porewater and sediment material. The latter included sequential extractions as well as determination of C, N, and S contents. With these information the relationship between the hydrodynamics and the redistribution of iron in the area will be discussed.