The Chemistry of Freshwater Mussels as a Proxy for Late Holocene River Conditions in the Netherlands

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The rivers Rhine, Meuse and their branches are the major river systems in the Netherlands. Both rivers can cause damaging flood events in a large part of their catchment areas. Such events happened in the 1990s and may become more frequent as discharges have increased over the last 100 years due to increased precipitation. Each river has its own characteristic seasonal oxygen isotope pattern reflecting rain water and melt water input.

Freshwater mussels of the genus *Unio* are large bivalves that are widely distributed in the Netherlands. They can reach a size up to 10 cm long with an age of approximately 15 years. Shell aragonite is precipitated in clearly visible seasonal growth bands. As characteristics of water chemistry are fixed in these growth bands, freshwater mussels serve as an archive for past water compositions. Traditionally much sclerochronological research has been done on marine bivalves using $\delta^{18}O$ as a proxy for temperature and/or salinity. Recently the scope has broadened to freshwater bivalves initially using growth increment widths as an environmental proxy, but also using $\delta^{18}O$ as a proxy for water source or discharge.

In the light of climate change, flood events are likely to become more frequent. Insight in past river conditions and flood frequencies is crucial to predict impacts of future climate change. The project (BSIK; Climate Changes Spatial Planning) aims at the reconstruction of late Holocene discharge patterns of the Rhine and Meuse rivers through stable isotope and trace element analyses on growth increments of freshwater mussels.

The project consists of a monitoring experiment with living freshwater mussels in both rivers, the calibration of the method with a 20^{th} century collection of shells and the reconstruction of late Holocene river conditions with shells from archaeological finds. Results of the extensive stable isotope work on these collections will be presented here.

Also the preliminary results of a novel technique to unionid research will be presented namely high resolution Laser Ablation ICP-MS records of trace elements on shells from all three time slices.

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