

Bacteria protecting Holland from flooding

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The interaction between bacteria and minerals, or bacteria and the sedimentological environment in more general terms, is important in understanding Earth system functioning. In estimating rates of nutrient cycling, mineral formation and weathering, it is essential to account for microbial life.

In a study at the ETH from 1997 – 2001, we demonstrated that sulfate-reducing bacteria are actively involved in dolomite precipitation. The sulfate-reducing bacteria not only produce bicarbonate and make magnesium ions available, but they actively capture calcium and magnesium ions on their cell wall and thereby act as nucleation seeds. Only in experimental settings with active, metabolizing bacterial cells present we found dolomite precipitating from solutions with brackish to marine salinity. This valuable insight in primary dolomite formation is a key in the search for geological dolomite formations that form a source rock for ore deposits and oil.

Based on this proven concept of active involvement of bacteria in sedimentological processes, I will present two practical applications of bacterial - sediment interaction. In a study at Utrecht University from 2001 – 2005, the results of the ETH study were adopted to model the release of metals from estuarine sediments. The outcome of this study was used in the decision to open the Haringvliet dam and re-establish a natural estuary with a high diversity of flora and fauna. Ultimately, I will show in this presentation that the results of the same 2001 ETH study provides essential input today in developing strategies for protecting the Dutch soils from flooding.