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Impact of *Thiomargarita* on the rates of N, S and P turnover in mudbelt sediments from the Benguela Upwelling System: a model study

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The availability of major nutrients, nitrogen (N) and phosphorus (P), largely controls primary productivity in eastern boundary upwelling systems. The oxygen minimum zone (OMZ) on the Namibian shelf is characterized by high productivity and extraordinarily high particulate organic carbon (POC) contents (up to 19 % dry weight) in the surface sediments. The anaerobic degradation of POC by bacterial sulfate reduction leads to the production of hydrogen sulfide (H_2S) that supports extensive communities of large sulfur bacteria *Thiomargarita namibiensis* in surface shelf sediments. These bacteria oxidize sulfide by reducing nitrate (NO_3^-) to either ammonium (NH_4^+) or dinitrogen (N_2). *Thiomargarita* also affect phosphorus cycling by intracellular incorporation of polyphosphates and extracellular formation of hydroxyapatites. In order to understand and quantify the complexity of the coupled benthic cycles of C, N, P, S, Fe in the Benguela Upwelling System, a reaction-transport model (RTM) was used to simulate sediment biogeochemical data collected from the RV Meteor cruise (M157, August 4th-September 16th 2019) off Namibia. This allowed deeper insights into the role of sulfur-oxidizing bacteria on P and N fluxes across the sediment surface. Results are presented that point toward potentially strong feedbacks by *Thiomargarita* on primary production in response to ongoing global warming and ocean deoxygenation.