Microbial response in benthic alkalinity enhancement experiments

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Ocean alkalinity enhancement (OAE) has been proposed as a technique for actively reducing atmospheric carbon dioxide levels. One of the tools for OAE is enhanced benthic weathering via addition of alkaline minerals such as dunite or calcite to surface sediments. This study investigates the effects of mineral additions on the benthic microbial community and possible feedbacks related to shifts in the microbial community. For this purpose, dunite and calcite were added to organic-rich sediments originating from the Baltic Sea (Eckernförde Bight) under fully oxic and under low oxygen conditions. Based on RNA-profiling the microbial communities shifted in all of these incubation experiments over time. At the beginning of the incubation experiments *Beggiatoaceae* were highly abundant in most surface sediments but decreased significantly over the course of the different experiments. Under fully oxic conditions, the microbial community shifts showed no clear relationship with the type of mineral added. In contrast, the oxygen low incubation experiments demonstrated an increase of cable bacteria after adding calcite to the sediments. This could be related to cable bacteria possessing a carbonic anhydrase. This enzyme transforms carbonate into carbon dioxide that is then converted into biomass. Possessing such an enzyme could be an advantage to grow under oxygen low conditions in the presence of calcite. The shift towards cable bacteria is in line with the measured pH profiles, typically associated with cable bacteria activity, where the pH is lowered in the deeper sediment horizons. This is the first study demonstrating that artificial benthic weathering using calcite promotes cable bacteria activity under low oxygen conditions.