

## **Nucleic acid insights into present and past microbial activities in marine sediment**

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Marine sediment contains the largest reservoir of reactive carbon on Earth, which represents a vast habitat for microbial life. However, there remains a dearth of data regarding specific microbial activities in situ and how metabolic biogeography is connected to present and past geochemical processes. Messenger RNA (mRNA) and ribosomal RNA (rRNA) are relatively labile molecules that are rich in biological information, and thus can serve as useful proxies for reconstructing present microbial activities. I will present examples of studies utilizing RNA proxies which investigated distributions of active metabolism in subseafloor communities in the context of the geochemical environment. This work supports biogeochemical calculations and models of subseafloor microbial activity and has helped to refine our understanding of subseafloor microbiology by elucidating key microbial players and their metabolic strategies for adapting to, and surviving under, varying geochemical conditions. Compared to RNA however, DNA is much less labile. DNA is preserved over geological timescales under certain sedimentary and geochemical conditions (the “paleome”), and can be used as a paleoproxy for reconstructing the response of plankton to past climate change with high (genus and species level) resolution. Recent paleome studies from the Black Sea have elucidated the historical response of virioplankton, microzooplankton, and zooplankton to historical climate change. New results identifying connections between climate, water column productivity, and subseafloor microbiology over the last glacial maximum in the Arabian Sea will also be discussed.