

Remineralization Processes Across the Sulfate-Methane Transition Zone in Contrasting California Borderland Basin Sediments

BURDIGE, D. J.^{1*}, KOMADA, T.², MAGEN, C.³
AND CHANTON, J. P.⁴

¹Department of Ocean, Earth and Atmospheric Sciences, Old Dominion University, Virginia, USA

(*correspondence; dburdige@odu.edu)

²Romberg Tiburon Center, San Francisco State University, Tiburon, California, USA (tkomada@sfsu.edu),

³Chesapeake Biological Laboratory, University of Maryland, Solomons, Maryland, USA (cedric.magen@gmail.com)

⁴Department of Earth, Ocean and Atmospheric Science, Florida State University, Tallahassee, Florida USA (jchanton@mailier.fsu.edu)

We have been studying biogeochemical processes associated with the transition from sulfate reduction to methanogenesis, the sulfate-methane transition zone, or SMT, in the anoxic sediments of Santa Barbara Basin sediments. Here the SMT occurs at a sediment depth of ~1.2-1.3 m. We have also carried out parallel studies at another California Borderland site, Santa Monica Basin. However in Santa Monica Basin sediments the presence of extensive turbidites have prevented us to-date from directly sampling the SMT. Nonetheless, extrapolation of our pore water sulfate profiles suggests that here the SMT occurs at a sediment depth of ~1.8-2 m. These two basins also differ in terms of the sources of methane that drive anaerobic oxidation of methane (AOM) in the SMT, with *in situ* methanogenesis being more important in Santa Barbara Basin sediments, and methane derived from external sources (i.e., relict gas hydrates) being more important in Santa Monica Basin sediments. In this talk we will use pore water concentration and isotope profiles across the SMT and into the deeper methanogenic sediments in Santa Barbara Basin sediments to examine the biogeochemical processes occurring in the SMT. Our discussion will focus on AOM, authigenic carbonate precipitation, pyrite formation, and enhanced organic matter remineralization that may occur in the SMT. We will also compare these observations with inferences about SMT dynamics we obtain from basal pore water gradients and profiles in our Santa Monica Basin cores (maximum depth of penetration ~1.2 m). Similarities and contrasts between these two different types of anoxic sediments will be discussed as they relate in general to processes occurring in deeply-buried marine sediments.