Goldschmidt 2023 Abstract
https://doi.org/10.7185/gold2023.20071

Determining the impact of organic matter coatings on dissolution rates of carbonate produced by marine fish

AMANDA M OEHLERT[1], KAT ARISTA[2], JAZMIN GARZA[1], ERIK J FOLKERTS[1], SARAH WALLS[1], SADEGH TALE MASOULE[2], BROOKE E. VITEK[1], CLÉMENT G. L. POLLIER[1], RACHAEL HEUER[1], ALI GHAHREMANINEZHAD[2] AND MARTIN GROSELL[1]

[1]University of Miami, Rosenstiel School of Marine, Atmospheric, and Earth Science
[2]University of Miami

Presenting Author: aoehlert@rsmas.miami.edu

Marine carbonate mineral and organic matter production in the ocean are important biogeochemical processes that drive the marine carbon cycle, atmospheric CO_2 concentrations, and thus Earth's climate through time. Marine fish make significant contributions of carbonate and organic matter to the marine carbon cycle. Carbonate precipitated by marine fish (ichthyocarbonate) was estimated to be 3-15% of new carbonate production in the oceans each year [1]. Marine fish were also found to contribute ~16% of the carbon export flux from the euphotic zone [2]. Despite prior work on both aspects of marine fish contributions, direct assessment of their impact on climate within fully coupled carbon-climate models has not yet been achieved. The inability to incorporate marine fish products into these Earth system models is the consequence of significant knowledge gaps regarding the composition, magnitude, and fate of fish contributions [2]. In this study, we will address uncertainties in ichthyocarbonate composition. Using a combination of petrographic, geochemical, and microCT approaches, we will assess the quantity and distribution of organic matter in ichthyocarbonate produced by two species of marine fish. New compositional data, including carbonate content, total organic carbon content, and PIC:POC ratios, will be presented. Our preliminary results suggest ichthyocarbonate contains significant organic matter, including a relatively thick exterior coating. Thus, we will also test the hypothesis that this exterior coating plays a significant role in the dissolution rate of ichthyocarbonate through controlled experiments with natural and oxidized ichthyocarbonate. Given the rapid sinking rates expected for carbonate mineral ballasted ichthyocarbonate, it is possible that the embedded organic carbon will evade shallow ocean remineralization, and thus may represent an overlooked contribution to the ocean's biological pump.

[1] Wilson et al. (2009) *Science,* 323(5912), 359-362.

[2] Saba, et al. (2021) *Limnology and Oceanography*, 66(5), 1639-1664.