Goldschmidt 2023 Abstract
https://doi.org/10.7185/gold2023.14630

The Elusive Sedimentary Sinks of Seawater Potassium

ANN DUNLEA[1], DANIELLE SANTIAGO RAMOS[2], KAZUTAKA YASUKAWA[3,4], ERIKA TANAKA[5] AND YASUHIRO KATO[4,6,7]

[1]Woods Hole Oceanographic Institution
[2]Rutgers University
[3]Frontier Research Center for Energy and Resources, School of Engineering, The University of Tokyo
[4]Department of Systems Innovation, School of Engineering, The University of Tokyo
[5]Center for Advanced Marine Core Research, Kochi University
[6]Ocean Resources Research Center for Next Generation, Chiba Institute of Technology
[7]Research and Development for Submarine Resources, Japan Agency for Marine-Earth Science and Technology

Presenting Author: adunlea@whoi.edu

To balance the global ocean budgets of dissolved cations and alkalinity, the fluxes in must equal the fluxes out. Alterations to this balance can drive climate changes over million-year-timescales. Yet, the ocean sinks of K, Mg, Na, and alkalinity remain unconstrained. Detrital minerals mix with and dilute the authigenic minerals making it very difficult to determine the total amount of cations taken up into the solid phase sediment. Thus, the global marine sediment sink for cations has largely evaded detection and quantification.

This study investigates a dataset of major and trace element concentrations of 2492 marine sediment samples from eighty-nine sites in the Pacific Ocean for evidence of authigenic enrichment of K. Samples range in age from modern to eighty-six million years. We apply a series of discrimination techniques to identify samples that have K that cannot be easily explained by aluminosilicates derived from continental or volcanic material. Techniques used include 2-D scatter plots, ternary diagrams, q-mode factor analysis, and constrained least squares multiple linear regression. We locate the regions where the most enrichment in K occurs and discuss the oceanographic conditions under which they formed. Along with a better understanding of where and when the authigenic K enrichments are most prevalent, we estimate the amount of dissolved K taken up into marine sediments in the Pacific Ocean. Building on previous work [1], we discuss the potential impact of this sedimentary cation sink on global changes in climate over the past 66 million years.

[1] Dunlea et al. (2017) Nature Communications 8, 844. doi:10.1038/s41467-017-00853-5