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Exploring Seafloor Nutrient Pools of Dissolved Silicon on the West Antarctic Peninsula

LISA M FRIBERG[1], KATHARINE R. HENDRY[2], LUCIE CASSARINO[1], CHRISTOPHER D. COATH[1] AND AMBER ANNETT[3]

[1]University of Bristol

[2]School of Earth Sciences, University of Bristol

[3]University of Southampton

Presenting Author: kp20894@bristol.ac.uk

Biogeochemical cycling of Silicon (Si) in the Southern Ocean has received widespread attention due to its coupling with the marine carbon cycle via diatom production of biogenic silica (BSi) from silicic acid (DSi). The high degree of undersaturation in seawater with respect to Si results in extensive dissolution of BSi, allowing for it to be remineralised back to DSi upon sediment deposition [1]. This results in an efflux of Si out of the sediments which serve as an important source of Si to marine ecosystems. This benthic Si flux is largely governed by diagenetic processes occurring in sediment pore waters. However, the benthic Si cycle is poorly constrained due to the complexity of these systems, in addition to the lack of understanding of the mechanistic processes during early diagenesis. The West Antarctic Peninsula (WAP) continental shelf is of significant importance due to the extensive diatom population and the high primary productivity rates during the austral summer. Recent studies have shown the presence of reactive sediment silicon pools, with sediment-water interface exchanges of DSi [2].

We present geochemical data from six sediment cores from the Rothera Time Series (RaTS) site near Ryder Bay, WAP. Porewater profiles demonstrate an increase in [DSi] with depth and a corresponding decrease in $\delta^{30}Si_{DSi}$, pertaining to a dissolution effect of Si with an isotopically light composition, such as sponges, and/or amorphous silica. Coupled with diffusion-modelling, our data demonstrate the presence of post-depositional and diagenetic processes during burial, highlighting the sediment-water interface exchanges.

[1] Frings, P. (2017), *Acta Geochimica*, *36* (3), 429-432.

[2] Cassarino, L. et al. (2020), *Global Biogeochemical Cycles*, *34* (12).