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Defining the geochemical composition of the newly discovered NEOM brine pool and underlying sedimentary pore waters, Gulf of Aqaba, Red Sea

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Brine pools are dense bodies of highly saline water that accumulate in depositional lows in the seafloor and often host rich extremophile microbial communities with metabolisms analogous to those that arose on early Earth. Since the 1960's, several deep-sea brine pools have been discovered in the Red Sea[1]. Two types of brine pools have been previously described: hot axial brine pools like Discovery and Atlantis II, and cool coastal-shelf brine pools like Afifi and Thuwal Seeps[2]. In 2020, a new type of brine pool was discovered in the Gulf of Aqaba during the NEOM-facilitated OceanX 'Deep Blue' research cruise[3]. The NEOM brine pool is a cold-water, anoxic, brine pool situated at abyssal depths (1,770m) near the coastline, and was the first brine pool discovered outside the Red Sea proper[3]. During the OceanX cruise, a transect of 5 sediment cores (50-150cm) were collected across the western edge of the pool. Understanding the geochemical characteristics of extreme environments like brine pools provide insight into plausible environmental conditions characteristic of early Earth and evolving microbial communities. Thus, motivated to better understand the geochemical conditions characterizing the NEOM brine pool, we compare elemental measurements of the brine chemistry to interstitial pore waters extracted using Rhizon samplers in each of the sediment cores. These pore water samples will be analyzed for elemental composition, alkalinity, and pH. Preliminary results suggest that sediments directly underlying the center of the pool (0-10 cm below the sediment-brine pool interface) contain pore waters that are less saline than the overlying brine. Further analysis of the pore waters from additional cores will provide insight into the geochemical composition, and better delineate the geometry of the sediment-brine pool interface. This dataset will allow for comparison to other brine pools of the Red Sea, as well as an evaluation of potential environmental controls on this anoxic brine complex.

[1] Degens, E.T. & Ross, D.A. *Springer*, 600 (1969).

[2] Duarte, C.M. *et al*. *Scientific Reports* **10**, 910 (2020).

[3] Purkis, S.J. *et al.* (under review).