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Paleosalinity of South Australian Ediacaran fossils

GREGORY RETALLACK

University of Oregon

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By Gregory J. Retallack

Department of Earth Sciences, University of Oregon, Eugene, Oregon, 97403-1272, USA (gregr@uoregon.edu)

Ediacaran fossils of South Australia have been assumed to have been marine invertebrates, but paleosols with desert roses (Retallack 2022) and eolian adhesion warts (McMahon *et al*. 2020) are two lines of evidence among many (Retallack 2016) for non-marine deposition. A variety of geochemical paleosalinity indices provide new tests of these divergent interpretations (Wei & Algeo 2020). Boron content is low in freshwater, but high in marine waters, and as a paleosalinity proxy can be compared with gallium (freshwater has B/Ga < 3). Boron can also be compared with potassium, but only after correcting for burial alteration using Weaver crystallinity index (freshwater has ΔB/K<0). Both freshwater and marine waters and rocks are very low in germanium compared with silicon, with a Ge/Si ratio <1 μmol/mol, but soils and paleosols have an order of magnitude more. Freshwater has much lower sulfur than carbon, and a paleosalinity index is S/C ratio (fresh has S/C<0.1). Strontium is more abundant in the ocean than in freshwater as revealed by Sr/Ba ratios (fresh has Sr/Ba <0.2). The results of these various analyses (Fig. 1) for previously studied fossiliferous Ediacara Member of Brachina Gorge, and three fossils from the Nilpena Member and one from Ediacara Member near Nilpena, demonstrate fully freshwater or paleosol conditions, and only limited estuarine influence.

McMahon, W.J., Liu, A.G., Tindal, B.H., & Kleinhans, M.G., 2020. Ediacaran life close to land: Coastal and shoreface habitats of the Ediacaran macrobiota, the Central Flinders Ranges, South Australia. J. Sedim. Res. 90,1463–1499.

Retallack, G.J., 2016, Field and laboratory tests for recognition of Ediacaran paleosols. Gondwana Res.36, 107–123.

Retallack, G.J., 2022, Reconsideration of the Ediacaran problematicum *Aulozoon*. J. Palaeosci 71, 143–157.

Wei, W. & Algeo, T.J., 2020, Elemental proxies for paleosalinity analysis of ancient shales and mudrocks. Geochim. Cosmochim. Acta 287, 341-366.

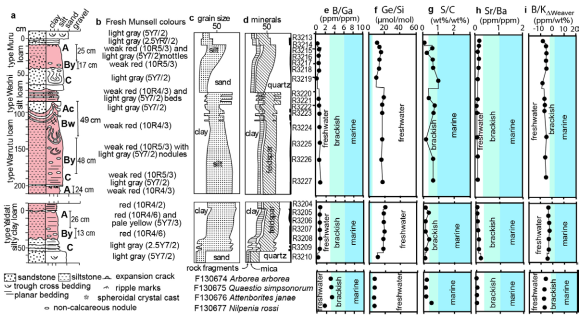

Fig. 1. Petrography and paleosalinity indices of fossil beds of Ediacara Member, Brachina Gorge, and fossils from Ediacara (*Nilpenia* only) and Nilpena Members near Nilpena, South Australia.