

Methanogenesis and sulfur-cycling in Eocene phosphatic carbonate lacustrine oil shale

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The precipitation of microcrystalline phosphate is linked directly to the preservation of microfossils, in carbonate oil shale from the Uinta formation of the Eocene Green River Formation. Sampled intervals of this organic-rich carbonate mudrock contain elevated concentrations of carbon and phosphorus (e.g. Keighley, 2018), within which phosphatized microfossils occur. The origins of the hypersaline bottom waters which facilitated the preservation of elevated concentrations of organic matter (OM) in the lake sediments is not universally agreed upon, and numerous sources have been proposed (Lowenstein et al., 2017). Analysis of laser-ablation inductively-coupled-plasma mass-spectrometry (LA-ICP-MS) data provides insights into a confluence of biogeochemical cycling, and inorganic precipitation of distinct mineral phases related to the accumulation of organic matter in the ancient lake sediments. Variations in these elemental abundances highlight transitions in the dominant system of biological autotrophic carbon fixation operating in lake bottom sediments during burial and early diagenesis of organic-rich lake sediments.

References

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Lowenstein, T.K., Jagniecki, E.A., Carroll, A.R., Smith, M.E., Renaut, R.W. and Owen, R.B., 2017. The Green River salt mystery: What was the source of the hyperalkaline lake waters?. *Earth-Science Reviews*, 173, pp.295-306.