STERANE PATTERNS AND DEEP WATER REDOX IN THE NEOPROTEROZOIC. A. E. Kelly[1,2], G. D. Love[1] and R. E. Summons[2], [1]University of California, Riverside, CA 92521 (amy.kelly@ucr.edu, gordon.love@ucr.edu), [2]MIT, Cambridge, MA 02139 (rsummons@mit.edu).

The Proterozoic was a time of great change on the Earth, during which complex life evolved. Here we discuss the unusual redox conditions of the ocean at that time and the sterane patters with which they are potentially associated.

All eukaryotes biosynthesize sterols, which over geological time are converted to steranes. In Neoproterozoic rocks and oils, C_{29} steranes are often dominant though in some basins C_{27} steranes are dominant. Given known sterol patterns in modern algae, we relate the sterane dominance to the possible redox conditions of their depositional environments.

Green algae are likely responsible for C_{29} steranes in late Neoproterozoic rocks [1]. Green algae became ecologically important 600-800 Ma [2] likely due to an increase in dissolved iron in the ocean [3]. Iron is an essential nutrient.

Though many organisms are capable of synthesizing C_{27} sterols, the most ecologically important at this time were red algae. Red algae have an advantage over green algae in euxinic waters. Sulfide strips the water column of Fe^{2+}, and red algae have a lower Fe^{2+} requirement than green algae [4].

It is therefore hyporthesized that a water column with ferruginous deep water would allow green algae to dominate the photic zone and leave C_{29} sterols in the sediment. This was likely the case for the South Oman Salt Basin (minus the source of the Q oils) and Eastern Siberian basins (Figure 1). Conversely, a water column with sulfidic deep water would allow red algae to outcompete green algae in the photic zone, which would leave C_{27} sterols in the sediments. This may have been the scenario for the Walcott Member and Q oil of the South Oman Salt Basin (Figure 1). This hypothesis will be tested with iron speciation data.

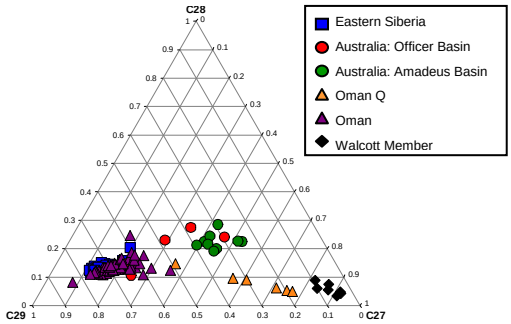

Figure 1. Sterane ternary diagram showing the distribution of steranes in a variety of Neoproterozoic rocks and oils.

In conclusion, the predominance in Neoproterozoic sediments of C_{29} or C_{27} steranes seems to be influenced by whether green or red algae dominated the local ecosystem , respectively, which in turn may be an indication of the redox of deep waters. This yields another potential proxy with which to understand ancient deep water paleoredox.

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