

## TEMPORAL AND FACIES CONTROLS ON THE DISTRIBUTIONS OF UNCOMMON STERANES FROM NEOPROTEROZOIC SEDIMENTS AND OILS

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Molecular fossils provide a means to evaluate paleoenvironmental redox conditions and broad-scale aspects of carbon cycling. This information can be used to study the changing environmental conditions over the Neoproterozoic-Cambrian boundary during the radiation of multicellular organisms. We are analyzing Neoproterozoic sedimentary rocks and oils from Australia, Siberia, and Oman to determine how the distributions of steranes change as a function of age, lithology, maturity, and paleoredox conditions. The origins of uncommon steranes of interest including C<sub>19</sub> norsteranes, 21-norsteranes, 27-norcholestanes, and 24-isopropylcholestanes are also being investigated (Figure 1).

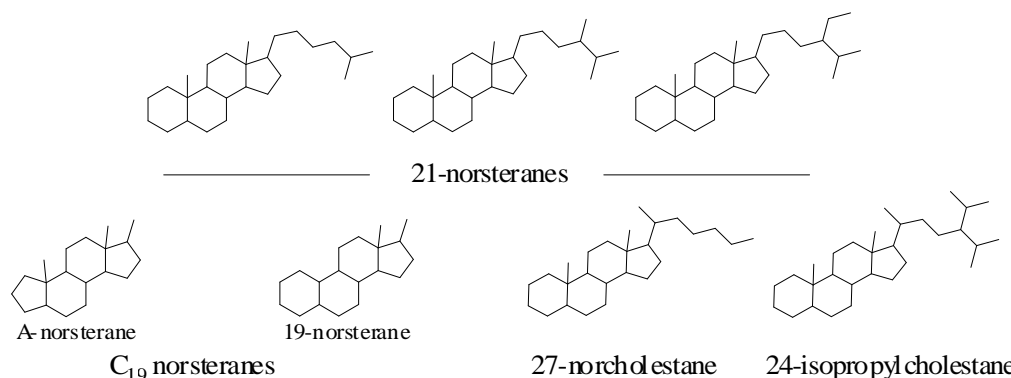


Figure 1. Chemical structures of the compounds of interest, including possible structures for the C<sub>19</sub> norsteranes.

In recent studies of late Neoproterozoic source rocks and oils from Oman, a series of C<sub>19</sub> steranes with three isomers, referred to as A, B, and C, were identified (Grosjean et al., 2005). The relative abundance of compound C increases with the salinity of the depositional environment in these samples, implying that compound C has the potential to be a salinity indicator.

21-norsteranes have been known to exist as 21-norcholestanes, and recently their 24-methyl and 24-ethyl homologues have been identified in saline depositional environments (Bao & Li, 2001; Grosjean et al., 2005). These are valuable salinity indicators in immature

rocks and oils, but for samples in the mid oil window or of higher maturity it is difficult to resolve diagenetic versus original sources.

Two other biomarker series of key interest are 27-norcholestanes and C<sub>30</sub> 24-isopropylcholestanes. High ratios of 24-isopropylcholestanes to 24-*n*-propylcholestanes have been detected in late Neoproterozoic sediments and attributed to inputs of organic matter from demosponges (McCaffrey et al., 1994; Love et al., 2006). A high abundance of 27-norcholestane, relative to total C<sub>27</sub> steranes, is also a putative sponge marker. Supporting this is the occurrence of 27-norcholesterols in extant sponges (Itoh et al., 1983; Love et al., 2006).

Preliminary results of a series of Ediacaran Australian shales indicate that 24-isopropylcholestanes are not significant relative to 24-*n*-propylcholestanes, the ratio of 27-norsteranes to C<sub>27</sub> steranes is low (~0.1), 21-norsteranes are present, and the B isomer is the most common C<sub>19</sub> norsterane found, while the abundance of compound C is very low in these samples. The low values for the ratios of 24-isopropyl to 24-*n*-propylcholestanes and 27-norsteranes to C<sub>27</sub> steranes do not indicate the presence of abundant demosponges. The host shales represent a relatively deep marine setting, which may have been too deep for sponges to have survived in the Neoproterozoic, most likely due to lack of dioxygen. The low abundance of compound C suggests that the depositional environment was not an evaporitic basin, which is supported by the lithology. The maturity of these rocks is high, so the presence of 21-norsteranes is most likely due to early diagenetic modification of steroids. Ongoing biomarker work on Siberian samples will help to clarify these results.

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