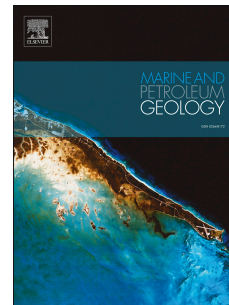


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Inorganic geochemical evaluation of hydrocarbon source rock potential of Neoproterozoic strata in the Amadeus Basin, Australia

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1 **Inorganic geochemical evaluation of hydrocarbon source rock potential of**  
2 **Neoproterozoic strata in the Amadeus Basin, Australia**

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7

8 **Abstract**

9 The Neoproterozoic sedimentary succession of the Amadeus Basin, Central Australia, includes  
10 potential hydrocarbon source and reservoir rocks with maturity indicators in the oil to dry-gas  
11 window. However, petroleum well distribution across the basin is sparse and a general lack of organic  
12 geochemical data encourages the use of whole-rock inorganic geochemistry and mineralogy as proxy  
13 for the evaluation of the hydrocarbon-generating potential. The present study provides a detailed  
14 investigation of the geochemistry and mineralogy of the majority of Neoproterozoic strata across the  
15 Amadeus Basin and suggests that the Pertatataka and Aralka formations are the most favourable  
16 potential source rocks. A decreasing K/Rb ratio in these units is interpreted as higher degree of  
17 illitisation and therefore increased maturity. Sulphide versus sulphate abundance show that the  
18 Pertatataka and Aralka formations are the only units of significant stratigraphic thickness deposited  
19 under dominantly anoxic conditions. However, low concentrations of the redox-sensitive trace  
20 elements Mo, U and V, and low organic matter abundance suggest that these units were deposited  
21 under anoxic-ferruginous, not anoxic-sulphidic (euxinic) conditions. We interpret this to reflect an  
22 overall low hydrocarbon-generating potential. The present study highlights the benefit of using a  
23 multi-proxy approach for large-scale evaluation of the hydrocarbon potential in sedimentary  
24 successions, especially when organic geochemical data are sparse.

25 **Keywords:** Neoproterozoic, source rocks, Amadeus Basin, mineralogy, redox

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