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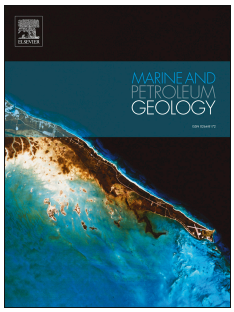

Inorganic geochemical evaluation of hydrocarbon source rock potential of Neoproterozoic strata in the Amadeus Basin, Australia

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

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Abstract

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

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