Aromatic Steroids Biomarker applied to high resolution Stratigraphy: Irati Formation, Southern of Paraná Basin, Brazil

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Introduction

The use of aromatic steroids in geochemical studies is almost absent in Brazilian sedimentary basins. For this reason, it is intended to test the application of these compounds in high-resolution stratigraphy in the relatively well known Lower Permian Irati Formation. The Irati Formation is around 40 meters thick, thermally immature, and comprise two lithological distinct Members: siliciclastic lower Taquaral and calcareous member and the siliciclastic upper Assistência Member. Based on whole rock data, mostly TOC, sulfur, Rock-Evalpyrolysis and alkanes biomarkers, was possible to split the Irati Formation in eight chem stratigraphic units, named from A to C in the Taquaral Member and from D to I in the Assistência Member. Each one of these units represents a distinct input of land derived organic matter type and/or a response of the organisms living in the water system to change in salinity and anoxia during sedimentation.

Methods and samples

A total of 29 rock samples previously analyzed for bulk geochemical parameters were selected from the well SC-20-RS drilled by CPRM, located 6 Km southern from the Pinheiro Machado city, Rio Grande do Sul State, Brazil.

The powdered rock samples were extracted using dichloromethane and fractionated in alkanes and aromatic hydrocarbons. The biomarker analyses were performed using a GC-MS (Agilent Technologies 6890 G Ccoupled to an Agilent 5977 Mass Detector) and Mass Spectrometry Agilent 7000 GC-MS-MS System with a triple quadrupole analyzersystem.

Results and discussions

Distribution patterns of triaromatic steroids

The fingerprint of the demethylated triaromatic steroids, best studied by the m/z 231 (Riolo et al., 1986), normally shows much less variation than their methylated counterpart does. However, compositional variations could be observed in the oil shale interval, in which occurs a net increasing of C26 e C27 homologous compared to the composition of others chem stratigraphic units.

On the other hand, the methylated triaromatic steroids has shown the best possibilities to be applied as a source parameter in the Irati Formation (Figure 1). The predominance of C29 homologous in the low TOC siliciclastic intervals C and F; increasing of C27 and C28 homologous in the interbeds of shales, marls and limestones (interval D); and predominance of C28 homologous in the oil shale interval E.

Distribution patterns of monoaromatic steroids

Variations in the relative amount of different homologous are another geochemical parameter difficult to be considered because of the co-elution of the different isomers and homologues.

Up to now, the best source rock parameter correspond to the higher amounts of rearranged structures in the low TOC siliciclastic intervals C and F, compared to the others intervals where practically no rearranged structures were observed.

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References


