ABSTRACT

SOURCE ROCK ANALYSIS OF THE LOWER CRETACEOUS BEAR RIVER FORMATION, WESTERN WYOMING OVERTHRUST BELT[1]

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Source rock analysis was performed on shales from the Lower Cretaceous (Albian) Bear River Formation in the Darby Thrust Plate of the western Wyoming Overthrust Belt. Measurements of total organic carbon (T.O.C.); vitrinite reflectance (R_o); visual kerogen analysis, including determination of thermal alteration index (T.A.I.) and kerogen morphology; and pyrolysis provide information concerning the amount, type and maturation levels of kerogen in the Bear River shales. T.O.C. analysis indicates that the shales are moderately rich in organic matter (1.0-1.5 wt. % T.O.C.). Kerogen morphology (structured) and pyrolysis data (suggestive of Type III organic matter) indicates that organic matter in the Bear River Formation is humic and gas-prone. T.A.I. and R_o values suggest that Bear River shales are in the oil-early gas generating range (.7-1.1% R_o) in the northern and southern portions of the Darby Plate, whereas organic maturities are substantially more advanced (1.8-2.0% R_o) in the central portion of the plate.

The levels of thermal maturation, as defined by T.A.I. and R_o values, were used as constraints on a Lopatin-type Time Temperature Index (T.T.I.) thermal model. The T.T.I. modeling suggests that normal depositional burial could account for the levels of thermal maturation observed in the northern and southern portions of the Darby Plate. However, an additional heat source is necessary to account for the relatively advanced thermal maturation measured in the central portion of the Darby Plate. The favored explanation for the advanced thermal history is that of increased temperatures resulting from burial of the Bear River Formation beneath the Absaroka Thrust Plate. Reconstructed pre-erosional cross sections demonstrate that this is a valid possibility and T.T.I. thermal modeling indicates that this could account for the thermal maturities indicated by source rock analysis.

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