CYCLOSTRATIGRAPHY, STRONTIUM ISOTOPE GEOCHEMISTRY, AND ARGON GEOCHRONOLOGY OF THE LACUSTRINE GREEN RIVER FORMATION, PICEANCE BASIN, COLORADO

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ABSTRACT

The main objective of this project is to relate evaporative concentration cycles from the Piceance Basin center to the margin. The prevailing method has been the use of “rich” and “lean” zones, determined by Fischer Assay oil yields, to correlate across the basin. This method is problematic in the Piceance Basin because oil shale breccias, interpreted as debris flow deposits, have been described in as many as 50% of basin center cores. Because debris flow deposits are not in situ deposits, they do not reflect the paleo-environmental conditions of the location in the lake where they were deposited. In the Bridger Basin, cycles in the coeval Wilkins Peak Member have been thoroughly mapped and described, and individual cycles can be traced for tens of kilometers. These lake cycles are justifiably well-known, as they record a systematic variation in lake size, lake chemistry and in the amount and type of evaporites that formed. Moreover, careful dating of ash layers preserved in the Bridger Basin has led to precise determinations of cycle durations. Finally, the 87Sr/86Sr ratios of lacustrine carbonate sediments and saline brines in a closed continental basin may preserve the 87Sr/86Sr ratios that existed at the time of deposition, recording the provenance of water entering the basin and changes in lake level. Compared to the Wilkins Peak Member, the basic stratigraphy, nature and extent of lacustrine cycles, age constraints on deposition, and strontium isotope evolution of the coeval rocks in the Piceance Basin are less well known. Our study aims to correct this disparity.

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