

Impact of Mass-Movement Processes on Mineralogy and Organic Richness Trends in the Lacustrine Eocene Green River Formation, Piceance Basin, Western Colorado

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ABSTRACT

The lacustrine Eocene Green River Formation in the Piceance Basin of western Colorado is widely known for its laminated oil shales. Less known are the interbedded brecciated or "blebby" oil shales that were deposited by mass-movement processes, accounting for more than 50% of the rocks in some sections. Blebby oil shales generally consist of mineral-rich rip-up clasts in an organic-rich fine-grained matrix. Transgressive-regressive cycles, as well as seismic activity including earthquakes, may have been the cause of the mass-movement events that formed blebby oil shale beds. In this study, the mineralogy and organic richness of blebby and laminated oil shales in the different stratigraphic sections are compared to assess how the influx of material from marginal areas of Eocene Lake Uinta affected the distribution and properties of the oil shale resource in the Piceance Basin. We also use the recently published and extensive U.S. Geological Survey mineral occurrence database compiled, in part, from data collected by the former U.S. Bureau of Mines to assess mineralogical trends related to these mass-movement deposits. Previous analysis has shown that organic matter content, inferred from Fischer assay oil yield, is generally greater in mass-movement deposits when compared to adjacent laminated units, with the laminated Mahogany oil shale zone being a notable exception. This indicates that large amounts of organic matter from marginal areas were entrained with mineral matter as unconsolidated sediments moved into the paleolake depocenter. In fact, the Piceance Basin would not be the most concentrated oil shale deposit in the world without the contribution of organic matter in the central part of the lake from more marginal areas by mass-movement processes.