

## **Insights into Mudstone Sedimentology, Organic Richness, and Anoxia at the Opening of the Cretaceous Interior Seaway: The Lower Cretaceous Skull Creek Formation, Colorado**

**Patrick M. Sullivan<sup>1</sup> and Stephen Sonnenberg<sup>1</sup>**

<sup>1</sup>Colorado School of Mines

### **Abstract**

The Skull Creek Formation is a succession of marine mudstones and sandstones within the Lower Cretaceous Dakota Group. The formation contains the earliest record of marine deposition and ocean connection in the Western Interior Seaway (WIS), yet its depositional environments, stratigraphic correlations, and paleogeographic evolution remain poorly understood. This study addresses those uncertainties and presents new sedimentological and geochemical data from four cores and 38 well logs in the central Denver Basin, integrating them into previous outcrop and subsurface studies of the Skull Creek Formation.

Three regional flooding surfaces divide the Skull Creek Formation into informal lower, middle, and upper units which record the paleogeographic evolution of the early WIS. The lower Skull Creek Formation was deposited in a restricted lobe of the Arctic ocean, contains predominately oxygenated, organic matter (OM)-poor basinal to lower slope facies and includes the Eldorado Springs Member, a northwest to southeast-oriented wave-dominated sandstone. The Eldorado Springs Member is the only documented coeval shoreline of the Skull Creek seaway in the Rocky Mountain Region. The middle Skull Creek Formation exhibits anoxic, OM-rich calcareous basinal facies and is hypothesized to represent the earliest connection between the Arctic and Tethyan lobes of the WIS. A unique bioclastic calcareous facies in the middle Skull Creek Formation is interpreted to signal the onset of this seaway connection, and an associated increase in bottom current strength and biological productivity. These lithofacies persist into the upper Skull Creek Formation, indicating the WIS remained connected until the deposition of the overlying Muddy Formation.

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