The Early Eocene Climatic Optimum (~53-50 Ma) represents the most recent episode of sustained greenhouse climate, during which the deep oceans were as much as 12°C warmer than today. The lacustrine Wilkins Peak Member of the Green River Formation (Wyoming, USA) is one of the premier locations to study this period of global warmth due to its rich terrestrial archive of climate dynamics, biology, and geomorphology. Using radioisotopic geochronology, cyclostratigraphy, sedimentology, and geochemistry, previous studies have leveraged this extensive record to evaluate the ancient lake system's temporal evolution and response to climate.

Much prior work on Green River Formation cyclostratigraphy, including that of Alfred G. Fischer, has focused on the evaluation of oil yield, a measure of organic richness. In this study, X-Ray fluorescence (XRF) core scanning of a basin center core, Solvay S-34-1, is used to produce a high resolution (5mm), continuous, multi-proxy elemental record of the complete Wilkins Peak Member, spanning 240 meters. This new geochemical assessment is a component of a larger multidisciplinary investigation that that is underway, including new magnetostratigraphic and radioisotopic geochronology. Elemental abundances for a range of measured elements, such as Si, S, Cl, K, Ca, Ti, Fe, Zn, Br, and Rb, are interpreted in terms of evaporitic, siliciclastic, and redox-sensitive sedimentation, and show variable responses at specific Milankovitch (eccentricity, obliquity, precession) and sub-Milankovitch time scales. Using this long high-resolution geochemical dataset of the Early Eocene Climatic Optimum, we consider potential linkages between Milankovitch forcing and sub-Milankovitch forcing, and plausible non-linear transfer functions that translate the astronomical insolation signal into the stratigraphic archive.