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Diagenetic complexities of iron oxide cements in Mesozoic sandstones of Utah, U.S.A.

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Stratigraphic units of the Colorado Plateau comprise a remarkable Mesozoic section in Utah. Thse units are ideal for studying sandstone diagenesis where there is established basinal context of depositional facies and tectonics, as well as continuity of exposure. To untangle the complex relationships and diagenetic histories, it is crucial to understand host rock properities (porosity and permeability), authigenic mineralogies (that give clues to fluid composition), diagenetic textures, and age dating. This study is a review and synthesis of previous work that has contributed to the understanding of the diagenetic history recorded in authigenic iron oxide precipitates. We discuss cement generations and mineralogies, fluid chemistries, origins and mobilization of iron, and timing of precipitation. Spheroidal cemented mineral masses (concretions) are common within many Mesozoic units of Utah – most notably the Jurassic Navajo Sandstone. However, formation of these concretions is still not completely understood. Spheroidal concretions are currently a “hot topic”, especially since the discovery of similar “blueberry” features on Mars with their implications for habitability, and the potential for these nodules to host biosignatures. Several models for spheroidal concretion formation are evaluated. Understanding how iron is mobilized and precipitated and how spheroidal concretions form have implications for similar geometries and mineralogies in many terrestrial regions, but will require continued integrated studies across multiple scales (see Baker and Potter-McIntyre, this session). These scales include the submicroscopic levels of understanding and detecting the potential role of microbes in mineral precipitation, to the larger scale mapping of regional diagenetic coloration and mineral patterns that could represent records of basinal fluids and the response to climate, tectonics, and regional hydrology.