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Stratigraphic Architecture of a Non-Uniformly Subsiding, Sea Level-Dominated, Icehouse Shelf: A Case Study from the Antler-Sonoma Foreland of the Western United States

The Ely Limestone and Mormon Gap Formation of western Utah record the effects of icehouse sea level changes on a non-uniformly subsiding carbonate platform lacking a proximal siliciclastic source area. Microfacies, cycle stacking patterns, and index fossils indicate that the Ely shelf was continuously flooded during Morrowan through Desmoinesian time and during Sakmarian time. However, emergence of the West-Central Utah High (WCUH) resulted in only intermittent flooding of the Ely shelf during the intervening Missourian through Sakmarian interval.

Sequences forned during continuous flooding of the shelf (Ely Limestone and upper part of Mormon Gap Formation) are comprised of regionally extensivelimestone cycles bounded by marine flooding surfaces. Capping beds lack exposure features indicating that accommodation space remained unfilled across the shelf even during fourth order lowstands. Palaeoaplysina, Komia, and Syringopora biostromes attests to the presence of well circulated, normal marine waters across the entire shelf.

By contrast, sequences formed during emergence of the WCUH (Missouran through Artinskian) are comprised of restricted marine dolostones with abundant exposure features (breccias, oxidized surfaces, peloids, blackened crusts). Sequences developed during intermittent flooding of the WCUH are thin, often represented by a single meter-scale cycle. Together these sequences form a wedge of silty dolostone that pinches-out updip over a distance of 40 miles. Packaged between non-porous limestones, this dolostone wedge could form a regionally extensive stratigraphic trap. Insights from this study may be used to predict the lithofacies and depositional geometries of other updip, carbonate-dominated icehouse shelves.