

Recognition and Distribution of the Middle Jurassic Temple Cap Formation in the Central Utah Thrust belt

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The Temple Cap Formation unconformably overlies (J-1 unconformity) the Navajo Sandstone and underlies the Carmel Formation in southwestern Utah. The Temple Cap consists of three members, two formal and one informal. The lower Sinawava Member is red-brown fine-grained sandstone to mudstone, limestone, and gypsum of marine- to marginal-marine origin. This member is overlain by the White Throne Member characterized by thick, large-scale cross-bedded, light-yellowgray sandstone of eolian origin. Capping the formation is a new unnamed member having lithofacies like the Sinawava Member. To the west, the White Throne Member thins and grades into marine lithofacies, and is therefore missing in most areas west of Zion National Park. The Temple Cap Formation contains several air-fall ash beds that have yielded ages between $173\text{-}170 \pm \sim 0.5 \text{ Ma}$ (2σ) (Aalenian to Bajocian), from sanidine, biotite, and zircon crystals. Palynology from near the top of the Temple Cap Formation indicates marine deposition of Bajocian age.

To the northeast, in a similar stratigraphic position in the western part of the central Utah thrust belt, the Middle Jurassic Gypsum Spring Member of the Twin Creek Limestone unconformably overlies (also J-1) the Navajo and mostly equivalent Nugget Sandstones and underlies the Sliderock Member of the Twin Creek Limestone. The Gypsum Spring is mostly red-brown fine-grained sandstone to mudstone, limestone, and gypsum. To the east, the Gypsum Spring was thought to pinch out, placing the Sliderock directly on the Navajo. A core from the Wolverine Federal 17-3 well (Covenant oil field) shows that the Navajo is overlain by red-brown to green-gray finegrained sandstone to siltstone topped by thick, large-scale crossbedded, eolian sandstone with thin interbedded dolomitic limestone. The eolianite was considered upper Navajo, but the limestone interbeds contain Middle Jurassic marine dinoflagellate cysts and the underlying green-gray sandstone contains glauconite, indicating the cored interval is lithologically and temporally similar to the Sinawava and White Throne Members of the Temple Cap Formation of southwestern Utah. Regional correlation of well-log data suggests that the Temple Cap Formation is present in central Utah and that it grades westward into the Gypsum Spring. Therefore, the Temple Cap Formation and the Gypsum Spring Member of the Twin Creek Limestone are considered different lithofacies of chronostratigraphically equivalent units.

The Temple Cap Formation and Gypsum Spring Member were deposited on paleotopography developed on the Navajo and Nugget Sandstones, marked by the J-1 unconformity, as the Middle Jurassic sea flooded into Utah from the north. These units irregularly thin to the south and southeast as the sea inundated irregular topography. Paleohighs in some areas may have remained above sea level during Temple Cap-Gypsum Spring deposition.