

Improving the Nomenclature of the Brookian Depositional System in Northern Alaska: the Role of Sequence Stratigraphy

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The Brookian stratigraphic nomenclature largely evolved from outcrop-based studies, often in support of geologic mapping. In this context, the criteria for formation designation were principally lithostratigraphic in nature and favored easily recognizable characteristics such as color, grain size, bedding, etc. Recent sequence stratigraphic interpretations of seismic and well data have dramatically improved our understanding of the basins' evolution, drawing attention to the time-transgressive nature of many stratigraphic units. In recognition of this complexity, revisions to the regional stratigraphic nomenclature should emphasize the importance of subdividing genetically related packages of rock on the basis of facies (e.g. nonmarine vs. marine) and position within the depositional profile (topset, foreset or bottomset).

Building on this framework we've continued to integrate subsurface and surface observations to arrive at a regional sequence stratigraphic model for the Brookian. In particular, consideration of regionally significant stratal surfaces has allowed for an improved subdivision of Brookian units. In this contribution, we'd like to suggest three modest changes in stratigraphic nomenclature that emphasize the importance of widely recognizable sequence boundaries and more accurately capture significant changes in relative sea level.

1) The Schrader Bluff Formation should be restricted to topset facies; where it transitions into slope and basinal settings, the names Canning Formation and Hue Shale should be applied. The Schrader Bluff can be readily subdivided into three regional members (note: these do not coincide with the now abandoned Rogers Creek, Barrow Trail, and Sentinel Hill members found in the greater Umiat area). The lower member is largely confined to the region west of the terminal Nanushuk and Tuluvak shelf edges, beyond which it is eroded by a major Campanian lowstand unconformity (largely submarine). The middle member overlies this unconformity and records a prominent regressive phase during which the shoreline rapidly migrated eastward. The middle and upper members are separated by a major Campanian transgressive flooding surface that is recognized in both surface and subsurface data.

2) The middle member of the Schrader Bluff Formation locally grades upward into dominantly nonmarine facies that are typically excluded from definitions of the shallow marine Schrader Bluff. In the Toolik River area, we apply the name "lower tongue of the Prince Creek Formation" to this nonmarine tract, a distinction that better elucidates Campanian changes in relative sea level and paleogeography.

3) East of the Dalton Highway, many Brookian units condense into the distal Hue Shale. In the Echooka River area, we recognize a mappable lower and upper tongue of Hue Shale, separated by sandstone-bearing Seabee Formation. This distinction allows for more nuanced discussion of the distal record of major sequence stratigraphic events.