

Allogenic Controls on Deposition of the Peace River Formation, Alberta and British Columbia, Canada

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Abstract

The Middle to Upper Albian Peace River Formation was deposited in the Western Canada Foreland Basin and consists of three members: the Harmon Member is a broadly transgressive marine mudstone that is overlain by broadly regressive shoreface sandstones of the Cadotte Member. Sandstones of the Cadotte are capped by a subaerial unconformity that defines the base of the Paddy Member. This regional study incorporates over 800 geophysical well logs, 15 outcrop sections and 21 cores covering an area of over 38,000 km².

High frequency (~100 ky) sea-level fluctuations, indicated by regionally-mappable flooding surfaces, provided accommodation for a succession of at least three stacked, progradational shoreface sandstones within the Cadotte Member. These sea-level changes, probably attributable to eustasy, also resulted in stacked shallow marine and lagoonal sequences in the Paddy Member.

Isopach maps of 17 allomembers within the Peace River Formation reveal patterns of subsidence as they evolved through time. Reactivation of basement structures including the Dawson Creek Graben Complex and faults associated with the Pouce Coupe High resulted in localized, intermittent pulses of subsidence. Rates of flexural subsidence during deposition of the Peace River Formation are indicated by progressive changes in stratal geometry within depocentres, and by spatial changes in depocentre location and orientation.

The Cadotte and most of the Paddy are composed of chert-rich lithic arenite of Cordilleran provenance. In the eastern part of the basin however, parts of the Paddy consist of essentially chert-free quartz arenite, typically comprising very well-rounded quartz sand. It seems likely that the quartz arenites were derived from erosion of Lower Cretaceous strata in eastern Alberta, that ultimately were of cratonic provenance. Erosion in the east may indicate forebulge uplift, dynamically linked to a phase of flexural subsidence in the west that generated accommodation for the entire Paddy wedge.