Stratigraphy and Sedimentology of the Peace River Formation: Abrupt Facies Changes across a Flexural Depocentre

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Abstract

In northeastern British Columbia and northwestern Alberta, progradational shoreface sandstones of the Middle Albian Cadotte Member of the Peace River Formation are capped by a subaerial unconformity that defines the base of the Paddy Member. Towards the north, the clean, medium- to coarse-grained sandstones of the Cadotte Member pass laterally, over ~9 km, into hummocky cross-stratified (HCS) glauconitic sandstones interbedded with silty bioturbated mudstones. This facies transition trends ENE-WSW and can be mapped for over 180 km. The Paddy Member represents three main depositional environments: Coastal plain and brackish lagoonal deposits are represented by paleosols, mudstones with brackish- and freshwater molluscs, channel fills, crevasse splays and coals. These facies thicken and become progresssively more terrestrial towards the Foothills in the SW. Nonmarine deposits pass laterally northward into a belt of clean sandstone characterized by parallel lamination and cross bedding with *Skolithos* and *Ophiomorpha* suggestive of deposition in marine shoreface. The shoreface sandstones trend ENE-WSW and pass abruptly northward into heterolithic glauconitic sandstone and mudstone deposits typified by HCS and a *Cruziana* ichnofauna, indicative of a shallow shelf. The lateral facies change from shoreface sandstone into offshore HCS facies is similar in character, and parallel to that of the underlying Cadotte shoreface. However, the shoreface sandstone facies of the Paddy Member prograded northward about 7 km beyond the seaward margin of the underlying Cadotte shoreface sandstone, but shortly thereafter, grade into offshore deposits.

From a lithostratigraphic point of view, the depositional edge of both the Paddy and Cadotte Members is defined by the northern extent of the clean shoreface sandstone. However, from a genetic, or allostratigraphic standpoint, this definition masks the true depositional geometry of these units. Allomembers in both the Paddy and Cadotte members can be correlated northward

beyond the clean shoreface sandstones where they are represented by interbedded HCS sandstones and siltstones. Both offshore sediments equivalent to the Cadotte shoreface sandstone and marine mudstones of the underlying Harmon Member (containing prominent mappable bentonites), thin markedly towards the north, diminishing to as little as 26 m by Twp. 90. Similarly, allomembers representing offshore facies of the Paddy gradually thin and progressively onlap the underlying Cadotte Member towards the NE, thinning to 12 m. The consistent lateral thinning of the Harmon, Cadotte and Paddy members indicate diminishing accommodation to the north and east at this time. Regional isopach mapping of the entire Paddy Member shows that the unit thickens to about 125 m in the B.C. Foothills, and fills a flexural depocentre centred on about Twp. 69. The thinning and onlap of Paddy strata to both the east and north suggests active loading in the SW and a contemporaneous forebulge in the NE. Local thickening and rapid facies changes along linear belts in both the Cadotte and Paddy members is poorly understood, but may be related to movement along faults associated with deep-seated structure in the underlying Peace River Arch and Fort St. John Graben Complex.