

Depositional Framework of the Lower Triassic Montney Formation, West-central Alberta and Northeastern British Columbia

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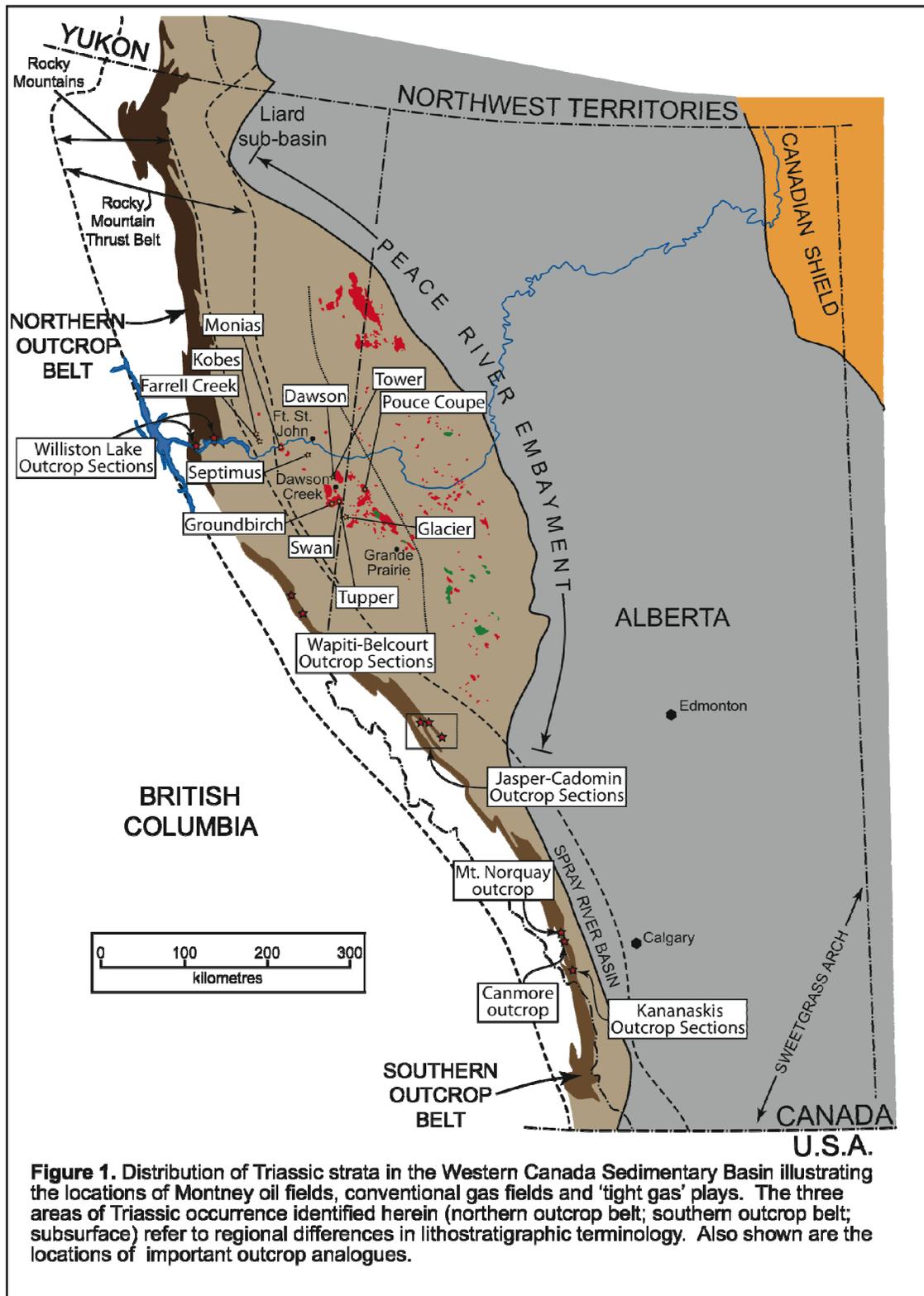
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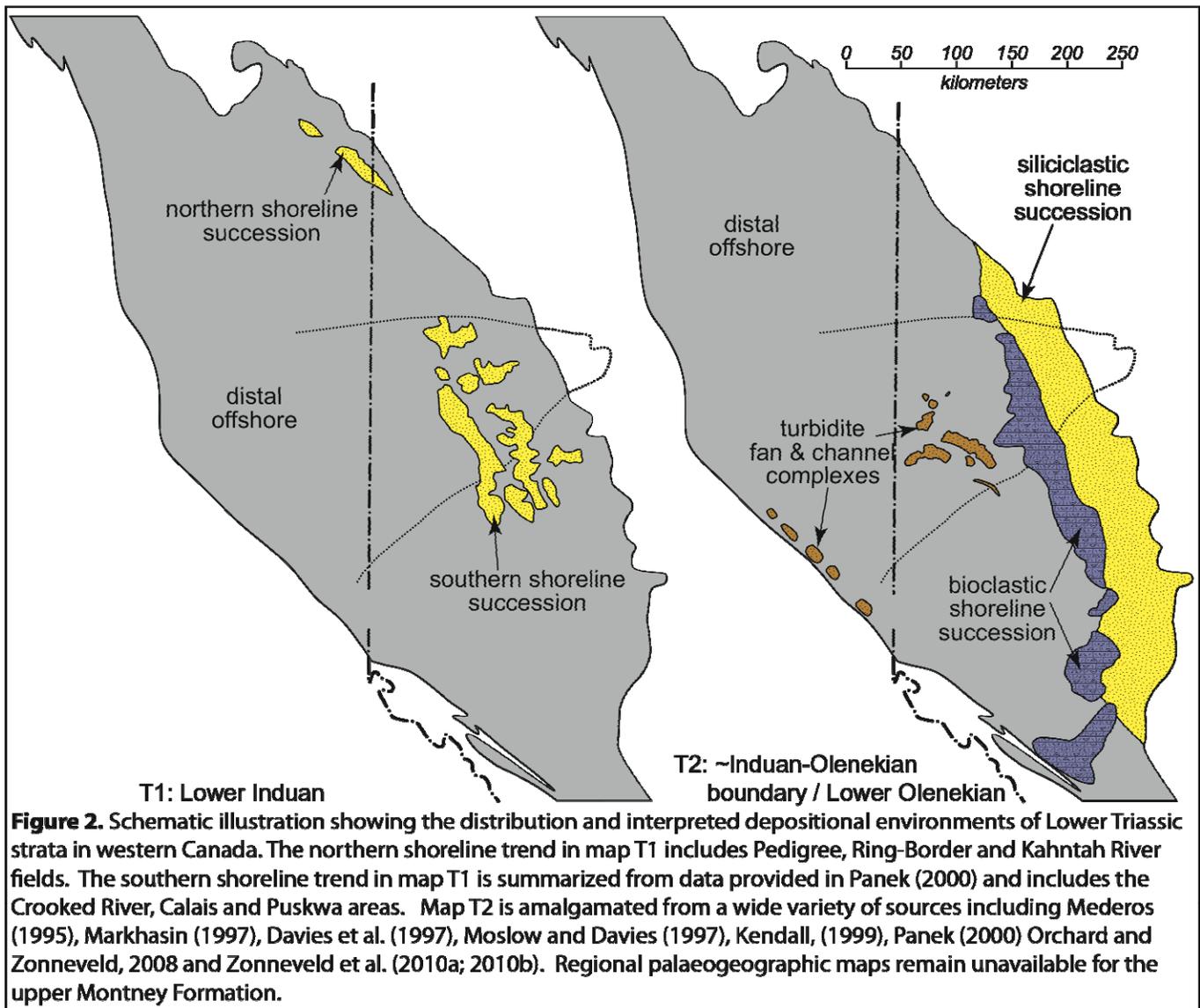
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The Lower Triassic Montney Formation is a complex succession dominated by siltstone and sandstone with shale and bioclastic packstone / grainstone also occurring in some areas and intervals. The Montney was deposited on the western margin of the North American Craton with the thickest accumulation occurring in the vicinity of the collapsed Peace River Arch (Davies et al., 1997) (Figure 1). Deposition in the Montney Formation occurred in a wide variety of depositional environments, from distal offshore successions including turbidite channel and fan complexes to lower to upper shoreface deltaic intervals and estuarine successions (Mederos, 1995; Markhasin, 1997; Davies et al., 1997; Kendall, 1999; Moslow, 2000; Panek, 2000; Zonneveld et al., 2010a; 2010b). The Montney was deposited in an arid, mid-latitude setting, west of an extensive, low gradient continental interior. The aridity of the region, combined with exceptionally long transport distances from sediment source areas, resulted in dominantly fine-grained clastic deposition within all Montney facies associations (i.e. very little sand coarser than ~125 µm). Environmental conditions also dictated that deposition of diagenetic clay minerals was not favored and thus most Montney successions consist of either siltstone or very fine-grained sandstone. Consequently, Montney depositional environments are not easily segregated on the basis of grain size.

The Montney Formation can be subdivided into several stratigraphic sequences separated by regionally extensive erosional surfaces in more proximal settings. The lowermost Montney consists of an overall transgressive succession. Associated shorelines occur in the eastern part of the basin (Figure 2a) with producing reservoirs occurring solely in the Pedigree – Ring Border – Kahntah River area in the northeastern part of the basin. A regionally extensive subaerial exposure surface has been identified in the mid-Montney, characterized by a major shift of the Montney shoreline westward into the centre of the basin. Progradational shoreline successions, associated with the underlying highstand systems tract, are overlain by transgressive shoreface successions in the eastern side of the basin (Figure 2b). These shallow marine accumulations, again limited primarily to the basin's eastern reaches, consist of both quartz sand-dominated successions as well as bioclastic packstone / grainstone successions (i.e. coquina). Sand accumulations in the central part of the basin to the west are interpreted as a complex of turbidite channels and fan lobes, deposited concomitant with the regional sea level lowstand (Figure 2b).



Prior to the past decade, exploration in the Montney focused on conventional sandstone- and coquina-dominated reservoir successions in the medial Montney Formation in west-central Alberta. Exploration in the mid-Montney Formation focused primarily on deepwater turbidite plays in the Valhalla-



La Glace-Knopsic region and shallow marine / shoreface sandstone and coquina in the Kaybob-Sturgeon Lake-Dixonville region (Figure 2). Prolific gas fields were also discovered in older Montney strata in the north, in the Pedigree-Ring Border and Kahntah River fields (Sturrock and Dawson, 1990; 1991).

More recently exploration interest has focused on fine-grained intervals in both the lower and upper Montney, particularly in northeastern British Columbia and westernmost Alberta. Although depositional models are lacking for these intervals, the assumption has been made that these intervals represent 'basin-center' facies, deposited in quiescent, offshore depositional settings. Core analyses do not fully support this supposition. Although distal offshore successions do occur in the lower and medial Montney, particularly in the west, much of the Upper Montney exhibits evidence of deposition in shallow marine environments influenced by both storm and, in many intervals, fair-weather waves. Evidence supports previous interpretations (i.e. Wilson, 2009, 2010) that the upper Montney comprises a laterally extensive progradational clastic ramp succession, with progressive parasequences offlapping to the west. Thus, facies characteristic of shallow water deposition occur considerably further west than has previously been postulated. This progradational succession is overlain abruptly by a regionally extensive coplanar *Glossifungites* and *Trypanites* demarcated discontinuity surface that demarcates the Montney-Doig boundary and approximates the Early-Middle Triassic boundary.

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