Stratigraphic Architecture of the Jurassic-Cretaceous Nikanassin Group, British Columbia and Alberta: Evidence for Tectonic Influence on the Initial Coarse Clastic Depositional Cycle in the Western Interior Foreland System

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The tectonostratigraphic details of the initial, Late Jurassic to Early Cretaceous, foreland cycle in the Alberta Basin are complex and to date remain poorly understood. Siliciclastics of the Nikanassin Group represent the first coarse clastic units deposited in the retro-arc foreland basin in northwest Alberta and northeast British Columbia, Canada. Regional isopach maps of the formations that make up the Nikanassin Group (Monteith, Beattie Peaks, and Monach formations) reveal substantial westward thickening, providing evidence for the presence of a foredeep during sedimentation. Distinctive changes in the mapped isopach trends through the Nikanassin Group suggest that the location and rate of subsidence varied along the strike of the basin, linked to the flexural response of the craton to terrane accretions in the west. Mapped changes in regional subsidence vary spatially over a magnetic lineament in the Pre-Cambrian basement suggesting that rheological properties of basement provinces resulted in differential flexural response to tectonic loads. Variability in regional accommodation was closely associated with paleogeographical and facies trend shifts, highlighting the significance of the basin setting on regional scale exploration models. Strata of the Nikanassin Group are erosionally truncated by a basin-wide unconformity (sub-Cadomin), which marks a major readjustment in basin configuration and a period of isostatic uplift and significant erosion.

Sedimentological evidence from the Nikanassin Group suggests that the transition from the marine shales of the underlying Fernie Group, through deltaic (Monteith Formation), coastal plain (Beattie Peaks Formation) and fluvial environments (Monach Formation) of the Nikanassin Group is representative of a complete basin filling cycle, capped by the regional unconformity. Thickness trends, sedimentological evidence, and provenance information from rare earth element geochemistry and detrital zircon geochronology provide insight into the basin architecture and un-roofing sequence, which to date has not been studied in the northern portion of the Western Interior Seaway.