

Tectonic Setting of the Lower Fernie Formation: Insights from Subsidence Analysis

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Abstract

In this study, the Fernie Formation in west-central Alberta is informally divided into upper and lower Fernie. The lower Fernie contains the Nordegg, Gordondale, Red Deer, Poker Chip and Rock Creek Members. These are separated from the Upper Fernie shales by many unconformities, simplified here as a single regional unconformity. The Nordegg and Gordondale Members of the Fernie Formation were deposited during the early stages of tectonic loading in the Cordillera to the west. These members, along with the Poker Chip and Rock Creek Members, were studied to look for evidence of this tectonic activity in the sedimentary record. The results give new insights into current understandings of the lower Fernie Formation. The subsidence curves for all wells in the study showed low subsidence rates during deposition of the oldest members of the Fernie Formation: the Nordegg and Gordondale Members. The low subsidence rate is attributed to the backbulge depozone of the foreland basin system. This data suggests that the Fox Creek Escarpment, an erosional scarp thought to have uplifted prior to deposition of the lowermost Cretaceous units, began uplifting during deposition of the Fernie Formation. Furthermore, boundaries within the data, for example the boundary between the Nordegg and Gordondale Members, appear to be related to underlying basement features.