

Uplift Controlled “Offshore Bar”: A Case Study of the Upper Cretaceous Second White Specks Sandstone, Southeastern Alberta

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It has long been controversial to explain the processes by which sand and gravel are transported basinward over muddy shelf to form the “offshore bar”. The Upper Cretaceous Second White Specks Sandstone (SWSS) provides a good example to probe the formation of the so-called “offshore bar”. The SWSS is an important unconventional gas producer in southeastern Alberta, southwestern Saskatchewan, and northeastern Montana. It was deposited in the Western Interior Seaway during the late Cenomanian, and consists of hummocky-cross-stratified very fine sandstone and siltstone of 2-4 m thick, fining westward into shale in extensive southwestern Alberta and outcrops.

This study investigates an area of about 60,000 km² in southern Alberta, using data from 60 cores and 1500 wells. We suggest that two critical factors controlled the deposition of the SWSS, based on a detailed sequence stratigraphic study. There was a remarkable migration of depocenters from west to east in southern Alberta during the late Cenomanian. In the meantime, a NWW-trending linear uplift, about 200 km long, 25-30 km wide and 0-10 m high, developed in southwestern Alberta. These scenarios led to the exposure and erosion of the top of the uplift and the formation of the inner-shelf to lower shoreface environment around the uplift. Very fine sands, originally from shallow marine environment near the coastline, were reworked by sea flow and deposited along the two sides of the uplift, especially along its northeastern side. We interpret that the linear uplift as a peripheral forebulge, related to the corrosion and convergence events at the western boundary of the North American continent.