

Regional Cambro-Ordovician Stratigraphy: Severn Arch, Manitoba to Western Canadian Sedimentary Basin

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Periodic uplift of the Severn Arch in Manitoba has exhumed and eroded the Precambrian basement. Progressively younger Mesozoic and Paleozoic strata offlap the Severn Arch along the western margin in western Manitoba and eastern Saskatchewan as well as to the east in the Hudson Bay Lowlands.

A deep incised paleo-erosion pattern with weathered outliers is preserved on the Precambrian basement surface along the western margin in western Manitoba and into eastern Saskatchewan, normal to the Severn Arch. Weathered detrital sediments, possibly late Precambrian in age, are found upon the eroded basement beyond the western margin of the arch in south central Saskatchewan. Clastic sediments of the Cambro-Ordovician Deadwood Fm. in eastern Saskatchewan and Manitoba were likely sourced from Severn Arch uplands to the east. Evidence of continued uplift and erosion is evident in the stratigraphy of the Deadwood Fm., deposited unconformably upon the weathered Precambrian basement. Several thin coarsening upwards fanglomerates of the lower Deadwood Fm. lie proximal to the Severn Arch, suggesting periodic uplift and re-deposition of coarse clastics. Lower Deadwood shales and siltstones thicken progressively westwards towards the deep depositional trough in Alberta.

A major regional unconformity separates the Cambro-Ordovician Deadwood Fm. from the overlying Ordovician Winnipeg Fm. A west to east transect of the Deadwood Fm. onto the Severn Arch reveals interbedded porous sands truncated abruptly at the post-Deadwood unconformity, overlain by Ordovician Winnipeg Fm. sand and shale.

The Winnipeg Fm. depocenter in northwestern North Dakota represents the early development of the Williston Basin where thick Winnipeg sands found along the basin margin grade into thick basinal shale. To the west in Saskatchewan, the north-south trending Wood Mountain Arch developed during deposition of the Winnipeg Fm., and separates the Williston Basin from the Alberta Basin to the west. Thin Winnipeg Fm. sands onlap both the Wood Mountain and Severn Arches. Red River Fm. shelf limestone lies conformably upon the Winnipeg sand and shale.