Tectonic Influence on Late Carboniferous Sedimentation in the Coal-Bearing Sydney Basin, Nova Scotia

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The Morien Group of Westphalian B to Stephanian age shows a series of NE-trending synclines and anticlines. Early workers attributed these structural elements to an "Appalachian" orogenic phase, but later workers invoked synsedimentary differential subsidence, based principally on studies of the coals.

Quantitative analysis of 20 coastal sections totalling 3600 m of strata in the Sydney Mines Formation (upper Morien Group) shows that the Emery-Hub Seam interval in the Glace Bay Syncline differs in thickness and character from coeval strata across the adjacent Bridgeport and Perce Anticlines. The thicker Glace Bay strata show a higher proportion of coal, carbonaceous shale, limestone and grey strata, but virtually no redbeds. The adjacent anticlinal areas show a higher proportion of channel sandstone (individual channel fills are also significantly thicker), red beds and pedogenic duricrusts.

These results suggest that the Glace Bay Syncline formed a persistent topographic low where high groundwater levels favoured lake and swamp deposits. The adjoining anticlinal areas formed topographic highs where lower groundwater levels favoured alluvial plains with red, oxidized strata and active pedogenesis. Topographic relief was gentle, however, because many coal seams cover both synclinal and anticlinal areas.

Paleoflow was NE, subparallel to the fold axes, throughout deposition of the Morien Group. Paleoflow during deposition of the basal Morien strata diverged strongly around anticlinal areas but later became more uniform.

The structural elements were sufficiently pronounced to exert a strong influence on sedimentation. Aeromagnetic maps show that the elements commonly correspond to the topography of the underlying basement (pre-Late Devonian). Basement fragmentation, with active vertical and horizontal motion of blocks, took place during the Early Carboniferous. Gentle, and progressively decreasing, differential motion continued to influence sedimentation during the Late Carboniferous.