

Architecture of Ancient Channel Bodies and Paleovalley Fills in High-Frequency Carboniferous Sequences, Sydney Basin, Atlantic Canada: Implications for Offshore Hydrocarbon Exploration

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Fluvial channel bodies in the Upper Carboniferous Sydney Mines Formation are contained within high-frequency sequences that represent relative sea-level fluctuations, linked to climate change, on a gently subsiding craton. Channel-body style within coastal-plain deposits was controlled by the position within sea-level transit cycles, modulated by climate and substrate resistance. *Coarse bedload systems* are deeply incised, multi-storey bodies up to 30 m thick. Some represent valleys backfilled during late lowstand and transgression, probably under a humid climate. *Sand-flat systems* consist of plane-laminated sand sheets and downstream-accreting macroforms, laid down under ephemeral flow conditions, adjacent to deep sinuous channels. They are interpreted as valley fills that were incised during forced regression and filled during falling stage to lowstand under a strongly seasonal climate. Calcrete caps on some bodies suggest that they filled prior to the main lowstand phase of paleosol development. *Sinuous channel systems* display well-developed lateral accretion surfaces and ridge-and-swale topography. *Distributary systems* are narrow channel bodies that cut bayfill deposits. These two groups lie within highstand deposits, and represent the readvance of coastal rivers following maximum transgression. A complex relationship is apparent between channel / valley fills and mature paleosols that bound sequences. Resistant substrates (coals, indurated limestones) influenced channel-body geometry by promoting lateral expansion and localising incision. Natural gas outbursts from fluvial sandstones in coal mines demonstrate their importance as potential hydrocarbon reservoir exploration targets, especially where the channel bodies rest upon coals and organic-rich shales.