Sequence stratigraphic framework for coals of the Sydney Basin, Nova Scotia

Martin Gibling[1], Ken Saunders[1], Neil Tibert[1] and J.C. White[2]
[1]*Department of Earth Sciences, Dalhousie University, Halifax, Nova Scotia B3K 1W8, Canada*
[2]*Atlantic Coastal Action Program Cape Breton, P.O. Box 28, Station A, Sydney, Nova Scotia B1P 6G9, Canada*

Coals have a periodic occurrence in the rock record, and "windows" for the accumulation of peat (coal precursor) commonly were available with a periodicity of tens to hundreds of thousands of years. Sequence stratigraphy has highlighted the relationship between peats and base-level/climatic changes over these time scales. Upper Carboniferous cyclothems of the Sydney Basin have a systematic succession of facies that allows the setting of coals studied to date to be inferred with some confidence. Our broad conclusions are:

(1) Thick, economic coals (e.g., Backpit, Point Aconi coals) developed under transgressive conditions (in the Transgressive Systems Tract, TST), and near the transgressive maximum as indicated by their close proximity to an inferred maximum flooding surface (MFS). The accumulation of these rheotrophic (groundwater-fed) peats was closely related to the rate of creation of accommodation space and to minimal detrital supply. Peat accumulation was initiated as transgression inundated a stable, alluvial platform, and kept pace with rising sea level for thousands of years. Humid climatic conditions are indicated.

(2) Some coals (e.g., the split Hub and Bonar coals) lie close to a maximum transgressive zone, but a discrete maximum flooding surface (MFS) cannot be identified. These coals could span the upper TST and lower Highstand Systems Tract (HST).

(3) Coals in the HST are thin and impure, cap bayfill units (parasequences), and die out upward. Conditions for peat accumulation became progressively less favourable as the rate of creation of accommodation space decreased, the coastline began to advance seaward, and detrital supply resumed.

(4) Lowstand surfaces (sequence boundaries) are represented by calcretes with fabrics indicative of relatively arid conditions. Braided-fluvial sandstones above the Mullins Coal form an erosional sequence boundary.

(5) Red, vertisol-like palaeosols with ephemeral, anastomosed channel bodies overlie the calcretes. Rare restricted-marine foraminifera suggest that these beds belong to the TST and that abundant sediment supply promoted aggradation of alluvium during initial transgression. Climates were probably too arid and groundwater level too low for peat to accumulate.