

Coal as a Correlation Tool in Terrestrial Sediments

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Terrestrial sediments are difficult to correlate because they lack easily identifiable chronostratigraphic surfaces. However, based on studies at different sites across a foreland basin, we have been able to identify systematic variations in coal petrographic properties that respond to changes in local accommodation. These properties enable us to distinguish between transgressive and regressive peat cycles, based on their wetting- and drying upward behaviour linked to variations in the groundwater table. We also recognize a range of sequence stratigraphic surfaces, unique to coal-bearing terrestrial sediments.

Results show that: (1) Coals contain internal sub-units, analogous to ultra-high resolution parasequences, indicating either regressive or transgressive styles. Recognition of this is critical when trying to determine if a coal is initiating or terminating a larger scale parasequence; (2) Coals comprising multiple transgressive and /or regressive sub-units are compound coals. They span more than one accommodation cycle and may contain internal discontinuity surfaces including sequence boundaries; (3) The petrographic signature of coal sub-units appears to be laterally consistent over long distances and has the potential to record relative proximity to marine influence and (4) Multivariate analysis of coal sub-unit parameters (petrography, thickness, stacking pattern, and magnitude of internal changes) indicates that coals have a distinctive suite of characteristics at different positions across the foreland basin, and can potentially be used as a diagnostic indicator of the regional accommodation setting.

In summary, distinctive high-resolution sequence stratigraphic signatures in terrestrial rocks can be recognized when coal petrography is viewed in context with the facies characteristics of the surrounding terrestrial and marginal marine rocks. This in turn provides a previously unavailable ability to correlate stratigraphic units from their downdip marine position and into the terrestrial realm.