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Interfluvial Paleosol Variability on a Dissected Coastal Plain: Implications for Nonmarine Sequence Stratigraphy

Although the importance of paleosols for partitioning continental rocks and understanding accommodation changes in terrestrial basins was largely overlooked in initial attempts at applying sequence stratigraphic methods to nonmarine rocks, paleopedological analyses are now firmly established as a key element in these efforts. Interfluvial paleosols from the Cenomanian Dunvegan Formation have been studied in order to explore the relationships between paleosol development and paleo-landscape position on a dissected alluvial/coastal plain. A detailed stratigraphic framework has been constructed that enables each interfluvial paleosol to be placed in a precise paleogeographic context with respect to distance from coeval valley margins and shorelines. Detailed micromorphological analyses have permitted calculation of a quantitative measure of paleosol development based on a soil micromorphology index. This permits a more objective comparison of paleosols both within and between basins. Pedosedimentary reconstructions indicate that paleosols closest to valley margins are better developed (higher index values) than those further from the valley edges (lower index values). Updip interfluvies also contain paleosols with higher index values than those nearer to paleo-shorelines. Calculated molecular ratios and geochemical mass-balance calculations support these relationships. These results suggest that interfluvial paleosol development is controlled by regional paleodrainage characteristics that are influenced both by the nature of the underlying sedimentary deposits and by distance from the dissected valley edge and coeval shoreline. This suggests that a regional understanding of interfluvial paleosol variability is required to maximize their interpretive value and predictive capability.