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Lacustrine Mega-Flooding Surfaces and Overlying Sequence Boundaries in Nested Lake Basins: Recent and Ancient Examples

Analysis of numerous nonmarine basins indicates that base level is defined by lake level and watertable. In a closed lake system, even slight changes in annual precipitation (input) and evaporation (output) can change base level. Base level is more stable when a lake is open, with an outflow across some form of sill. Base level rise above the sill is extremely limited, unless a lake in an adjacent, downstream basin can fill to the same sill, owing to the absence of a lower elevation outflow point (nested basins). The lakes can then form a single mega-lake that can fill to a new, higher sill elevation. The evolution of a mega-lake can be demonstrated for the recent Lake Bonneville and has been interpreted from facies architecture for the Eocene Uinta basin of Utah. Specifically, Uinta basin strata commonly demonstrate aggradational/retrogradational carbonate parasequences above a flooding surface, followed by a progradational clastic parasequence, and a thin retrogradational clastic-carbonate parasequence capped by an oil shale. The oil shale represents the maximum flooding surface produced by the mega-lake.

Lake highstand terraces and deltas can form the equivalent of marine shelf breaks and these commonly unlithified deposits can be rapidly incised following subsequent lake level fall. The present day Weber delta in Utah is cannibalizing the rapidly incising Bonneville Weber delta. In the Uinta basin, amalgamated fluvio-deltaic deposits, which sharply overlie or incise into mega-lake oil shales, are interpreted as the reworking of highstand deposits.