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Repeated Cycles of Fluvial Incision and Estuarine Backfill in Eocene Central Basin, Spitsbergen

The fluvial and estuarine deposits, and the coeval shelf-slope-basin-floor clinoforms are exposed on 1x15km-scale mountainside outcrops on Spitsbergen.

Each of the documented 20 fluvial-estuarine depositional cycles, is based by an erosion surface that cuts (>15-20m) into the coastal plain and the older shelf. Above the erosion surfaces lie channeled fluvial deposits that reach in places the previous shelf-edge position. This fluvial package is covered by a landwards backfilling succession of estuarine deposits. The large scale and excellent quality of outcrops, allow to follow stratigraphic levels in dip-direction from the feeding fluvial systems in the landward end, to inner-estuarine tidal-channel deposits, upper-flow-regime tidal-flat deposits, outer-estuarine tidal bars and channel fills, and to shallow-marine deposits outside the estuary. More strike-oriented outcrops expose sandy to muddy tidal flat deposits, and organic rich mud and coal lateral the the described succession.

In ~50% of the studied cycles the backfilling estuarine successions are cut by younger fluvial erosion surfaces. The other half of the cycles include an upper portion with seaward-stepping estuarine deposits.

Volumetrically, the successions are dominated by transgressive estuarine deposits, most probably due to overall high subsidence rates in the basin (-transpressional foreland basin). The basal fluvial intervals represent forced regressive to lowstand deposits, whereas the highstand deposits are poorly developed or lacking. Thus, the sediments were able to escape the coastal plain, and feed the shelf-slope and basin floor only during forced regressive and lowstand times, when the fluvial channels reached the shelf edge.