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Sequence Stratigraphy and Facies Architecture of a Deltaic-to-Estuarine Clinoform (Battfjellet Formation, Norway) Influenced by Syn-Sedimentary Faulting

A sand rich clinoform of the Battfjellet Formation (Eocene), deposited in a foreland basin, in Spitsbergen, Norway has been studied. This is a good outcrop analogue for study of a regressive delta and the overlying transgressive estuarine environment. The clinoform is cut by a fault and shows a change in thickness and facies architecture across the fault plane due to syn-sedimentary fault activity.

Eight vertical profiles (totally 288 meters) have been measured along a landward to basinward transect of the clinoform. The clinoform shows a prograding delta that consists of slumped prodelta, wave influenced delta-front and coarsening-upward mouthbars. This passes landwards into fluvial distributary channels and floodplain deposits. Retrograding tide-dominated deposits, formed in an estuarine depositional environment, succeeds vertically the prograding delta environment. The estuarine depositional environment includes tidal channels, bars and flats that are seen to interfinger with coastal plain deposits landwards.

An increase in stratal thickness across the fault is found in the underlying succession below the deltaic-to-estuarine clinoform, which implies that this fault was active during deposition of the clinoform. The prograding delta shows a pronounced thickness increase across the fault plane and this seems to be the part of the clinoform with the greatest loading effect on the growth fault. A thinning of the back-stepping estuarine segment of the clinoform is recorded across the fault plane. Thus the loading-effect on the growth fault is inferred to have been negligible for the estuarine environment because the point of sediment loading had moved landwards during transgression. These observations show how changes in thickness of particular sequence stratigraphic packages and facies can be predicted with respect to syn-sedimentary faulting.