Evidence of hyperpycnally fed turbidites in a basin floor setting, Eocene of Spitsbergen, Arctic Norway

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The Eocene of Spitsbergen, Svalbard, has received considerable attention in the literature because of its spectacular seismic-scale clinoforms exposed along many fiords and valleys. Previous investigations particularly focused on the slope segment of the clinoforms and demonstrated how sustained-type, hyperpycnal flows deriving from shelf-edge deltas played a major role in bringing sand onto the slope, contributing to slope accretion. Periodic sand delivery beyond the slope is evident by the presence of sandstone-dominated turbidite lobes in the basin floor segment of some clinoforms. By combining outcrop and core data from central Spitsbergen, our study focus on sedimentary processes that formed these turbidite lobes. At bed-to-bed scale, many of the turbidite beds deviate from the classical Bouma-type facies patterns typical of deposition from surge-type, low-density turbidity currents. Thick (0.5–3 m) turbidite beds characterized by pervasive amalgamation, internal scouring surfaces, and various soft-sediment deformation structures dominate. Further, beds exhibiting a lower sandstone-dominated turbidite division succeeded by a mud-rich upper division containing abundant coal/plant fragments occur frequently. The latter bed architecture is typical of deposition from hybrid sediment gravity flows and indicate that some turbidity flows transformed into slurry flows or debris flows on their way to their final destination on the basin floor. The dominance of thick, amalgamated turbidite beds and the abundance of coal/plant fragments documented in this study, as well as the presence of hyperpycnal flow turbidites on the slopes documented in previous studies, suggests that hyperpycnal flows are capable of delivering sand onto the basin floor.