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Hyperpycnal Flows: Triggering, Motion and Deposits

Hyperpycnal flows form in the marine environment when the suspended sediment concentration at a river mouth is in excess of 36-42 kg m^{-3} due to buoyancy considerations, or as little as 1-5 kg m^{-3} when convective instability is considered. They form during flood of small and medium size rivers or during extreme events such as jökulhaups, artificial or natural dam breaking and draining, or lahars. Because they occur during peaks of suspended load, hyperpycnal flows can transport considerable volumes of sediment to ocean basins. Stacking of hyperpycnal deposits called hyperpycnite can locally generate high-sedimentation rates, in the range of 1-2 m per 100 yrs. A typical hyperpycnite is a compound of a basal coarsening-up unit, deposited during the waxing period of discharge, and a top fining-up unit deposited during the waning period of discharge. Hyperpycnites differ from other turbidites because of their well-developed inversely-graded facies and frequent intrasequence erosional contacts. They usually contain climbing ripples and continental organisms. These observations can lead to a complete redefinition and interpretation of fine-grained turbidites. As hyperpycnites are related to climate through flood frequency and magnitude, their record should vary with sea level and climate change. They can also be associated with proximal ice-melting settings. Hyperpycnal flows could also be involved in the formation of meandering canyons and channels frequently observed in deep-sea turbidite systems.