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ABSTRACTS VOLUME

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# A genetic facies tract for the analysis of coarse-grained hyperpycnal flow deposits

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Understanding of hyperpycnal flow deposits represents a deep challenge for sedimentologist since facies types associated to river- generated turbidites could be very different with respect to those related to conventional (re-sedimented surge-like) turbidity flows. Direct fluvial discharges result in subaqueous flows with associated deposits having characteristics often considered typical of alluvial sedimentation. A hyperpycnal flow is a land-derived, relatively slow moving, and fully turbulent sediment gravity flow having the ability of carrying basinward interstitial freshwater and plant material. In contrast with surge like ("classical") turbidites, hyperpycnal flows have a slow moving and more diluted leading head which will be very sensitive to the subaqueous topography. The moving of a hyperpycnal flow will not necessarily require steep slopes since the flow could be maintained as long as the high-density fluvial discharge continues . Therefore, the distance reached by a hyperpycnal flow will be more dependent on the duration of the related flood event. In contrast with surge-like flows where deposition is dominated by the head, in hyperpycnal flows deposition mainly occurs along the flow body. These characteristics allow the preservation in the hyperpycnal deposit of evidences of flow fluctuations that occurred during the passing-by discharge resulting in the accumulation of composite beds. In contrary with classical models of turbidity sedimentation, coarse grained materials are not transported at the flow head, but are dragged at the flow base as bedload related to shear forces provided by the overpassing long-lived turbulent flow. Facies analysis performed during more than ten years in a number of lacustrine and marine units dominated by hyperpycnal flows allowed the distilling of a genetic and predictive facies tract of general application to the analysis of long-lived and coarse-grained hyperpycnal deposits. This facies tract is composed of three main genetically-related facies groups termed B, S and L, corresponding to bedload, suspended load and lofting transport processes respectively. Type B (bedload) facies are the coarsest grained and relate to shear and frictional drag forces provided by the overpassing long-lived turbulent flow. Three main facies types are recognized, termed B1 (massive or crude bedding conglomerates), B2 (pebbly sandstones with low angle asymptotic cross-stratification) and B3 (pebbly sandstones with diffuse planar lamination and aligned clasts). Type S facies are almost fine grained and relate to the gravitational collapse of sand-size materials transported as suspended load. Four facies types are recognized, denominated S1 (massive sandstones), S2 (parallel laminated sandstones), S3 (sandstones with climbing ripples) and S4 (massive siltstones and mudstones). Facies L (lofting) relates to the buoyancy reversal of the hyperpycnal flow provoked by the lift-up of a less dense fluid (in this case freshwater) typically in marine and other saline basins. Finest materials suspended in the flow (very fine grained sand, silt, plant debris and mica) are lifted from the substrate and settle down forming silt/sand couplets of great lateral extension (lofting rhythmites). Facies L develops only in marine/saline environments while facies S3 and S4 are more common in lacustrine environments. Hyperpycnites are often very complex showing internal erosional surfaces and gradual facies recurrences related to deposition from long-lived and highly dynamic (fluctuating) flows. This complex behavior results in the accumulation of composite beds, having an internal facies arrangement which strongly departs from conventional facies models built-up from surge-like flows. Facies B characterize transfer zones and its occurrence allows predicting sandstone deposits (facies S) basinward. Facies L mostly accumulates in flow margin areas.