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Stacking Pattern, Facies Distribution and Depositional Processes from Sediment Gravity Flows in Structurally Controlled Depressions: Examples from the Tertiary Piedmont Basin (Northwestern Italy)

Outcrop-based observations have been carried out on the Oligocene succession of the Tertiary Piedmont Basin (Northwestern Italy). The results of these observations permit to partly understand the geologic processes controlling the deposition from sediment gravity flows forced by fault-related topography. Four coarse-grained lenticular units, 30 to 50m thick and covering areas comprised between 2 and 5 km^2, crop out in the western sector of the basin. Beds in these units are characterized by short correlation distance, lenticular geometry, erosive features and abrupt grain-size breaks. Facies vary from structureless to crudely-stratified poorly-sorted conglomerates and to structureless to crudely-laminated sandstones. They were deposited by small-volume and poorly-efficient currents which were constituted by a basal high density flow overlain by a less-dense and fully turbulent flow (bi-partite currents). Flowing along narrow depressions bounded by steep faults, these currents produced stacking patterns and sediment dispersal patterns which are the result of the interaction between flow rehology and morphology of the depositional profile.

Examples of onlap and sidelap geometries, showing characteristic asymmetric cycles at the bedset scale, are discussed. Each cycle is coarsening and thickening at the base and fining and thinning at the top. Facies of thinner and finer beds are considered as deposited by fully turbulent flows through traction-plus-fallout processes; facies of thicker and coarser beds are considered as deposited by basal high density flows through freezing processes.

The understanding of the depositional processes, through which a current undergoes when it flows in confined or ponded conditions, permits to propose a model where the concept of bi-partite current is coupled with the concepts of non-uniformity and unsteadiness.