



## **Sedimentary facies analysis and depositional model of Eocene gravity flow deposits in Weixinan Depression, Beibuwan Basin, South China Sea**

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During the deposition of the lower submember of first member of Liushagang formation in Eocene, the lacustrine gravity flow deposits were widely developed in Weixinan Depression, Beibuwan Basin, South China Sea. Seven lithofacies types are identified, which are further summarized into four groups lithologic succession by sedimentary structures, core examination and vertical sequence analysis. Quantitative analysis of lithofacies thicknesses based on four groups lithologic succession from cored wells indicates that the gravity flow deposits are dominated by debris flows, whereas turbidity currents and sandy slumps are less important. The climate-sensitive Sr/Cu ratio demonstrates a general warm humid climate in the sedimentary period of the lower submember of L1. The active tectonics and the humid climate favor the formation of gravity flows which are associated with the delta-collapse origin or/and flood-related origin. Based on lateral and vertical lithofacies distribution, it is proposed that erosion, entrainment and dilution in the flow direction lead to an organized distribution of sandy slumps, sandy debrites, muddy debrites and turbidites. Sandy debrites may become transformed into muddy debris flow due to the flow erode the muddy substrate and the eroded light material then enter the flow. Debris flows are transformed into turbidity currents, which take place in the middle to upper part as well as in the tail of the flows, because sandy debris flows mix with ambient water. In the lower submember of L1 of Paleogene, sandy debrites have higher porosity and permeability than the turbidites, therefore the sandy debrites constitute potential petroleum reservoir. The deposition model of gravity flows may be applicable to other deep lacustrine basins for predicting reservoir distribution.

**Key words:** gravity flows; Liushagang formation; Weixinan Depression; Beibuwan Basin; debrite; turbidite