

BRIDGING THE GAP BETWEEN GILBERT-TYPE BOTTOMSET AND ASSOCIATED TURBIDITIC SYSTEMS: INSIGHTS FOR DEPOSITIONAL PROFILES IN HIGH SEDIMENT SUPPLY SETTING

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Gravity-driven processes produce turbiditic systems with an overall downslope direction. Slope, nature of the sea floor and bottom-currents are key parameters constraining the sediment transfer from the delta to the deep-sea fan. They are extensively described in the literature mainly from seismic and in less proportion from outcrop and modern data. Involved internal processes are also intensively studied by numerical modeling.

To bridge the gap between the marginal coarse-grained delta and the basin axis depocenter in high sediment supply, we propose to study outcrops of the Ilias Gilbert-type pro-delta along the southern margin of the gulf of Corinth in Greece. An entire sedimentological profile is documented from source-to-Sink based on standard field observations enhanced by 3D photogrammetric models (UAV acquisition), and with a focus on the facies distributions, the facies associations, the internal architectures and the morphologies.

The Gilbert-type delta bottomset reveals four bottomset-dynamics under specific processes integrated within a stratigraphic frame. During highstand normal regression, the gravelly bottomset mainly develops under subcritical flow. The supercritical flow undergoes a stationary hydraulic jump in the toeset due to the slope break and becomes subcritical. As a result, a “low-relief channel-levees” system is formed in the bottomset. The channels are reworked by backstepping conglomeratic lenses interbedded with silty concave-up and concave-down levees. During normal regression, the foreset beds are steeper and scoured in the upper part. In the bottomset, significant erosion recording sediment bypass downstream toward the prodelta. During lowstand normal regression, starved fine silt to shale bottomset onlaps onto the major erosional surface. During the transgressive stage, the topset and foreset are eroded by high-density turbidity currents and massive coarse-grained sandy turbidites are deposited in the bottomset, which onlap onto the foreset beds and form a slope apron geometry in the delta toe.

Down-stream of the Gilbert-type delta bottomsets, the sedimentary system is dominated by conglomeratic channels with an axis of 60° from the delta axis (fault controlled). The channels are limited by both external and internal levee with specific facies and architecture. They are commonly characterized by low sinuosity geometries. The external levee could locally include sediment waves.

This study provides the key elements to recognize the specific facies and architectures of the different bottomset typologies in relation with the associated turbiditic system. These sedimentary and stratigraphic models improve the prediction for the sand and conglomerate distribution and their connectivity within the various parts of the delta toe in a clastic depositional profile induced by a high-sediment discharge.