External Control on the Architecture of Inclined Heterolithic Stratification of Macrotidal Sukmo Channel, West Coast of Korea: Wave Versus Rainfall

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Sukmo Channel is one of distributary channels of Han River delta, which is flanked by narrow and steep channel bank. At Maeum-ri section, the bank consists of tripartite subdivisions with gentle-sloped upper intertidal salt marsh, steep middle intertidal slope, and gentle-sloped lower intertidal sand flat. A 5-m-thick inclined heterolithic stratification (IHS) is developed in the middle intertidal portion, where it consists of thinly interlaminated sand and mud with dip angle reaching up to 10^{o}. Smooth channel-bank surfaces are interrupted by intermittent occurrence of scarps, rills and gullies. Occurring mainly in the upper to middle intertidal zone, bank-parallel scarps are typically up to 0.5 m high and are generated by wind-induced waves during high tides. On the other hand, bank-normal rills and gullies are 1 to 3 m wide and up to 1.5 m deep, which exist mainly in the upper to middle intertidal zone and resulted from heavy rainfall during low tides. Repeated measurements of channel-bank profiles revealed that bank morphology varied notably in the middle to lower intertidal flat while it remained stationary in the upper intertidal flat. Temporal variation of bank morphology seems to be seasonal. Upper-to-middle intertidal portion of bank maintained smooth convex-up profile during winter. Bank surface was moderately roughed up by wind-induced waves in spring when local winds were strongest. Notable bank erosions occurred during summer when ephemeral rills and gullies were formed by episodic heavy rainfall events. From fall to winter, rugged bank surface was filled with newly deposited sediments through sustained sedimentation, gradually regaining smooth, convex-upward bank morphology. Continuity of IHS is generally better along dip-direction rather than along strike-direction. Rainfall-triggered rill/gully erosion is mainly responsible to the strike-direction discontinuity of IHS, whereas wind-induced waves coupled with tension cracks on the oversteepened bank surface to the dip-direction discontinuity of IHS.