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# Aggradational chute-and-pool bedforms in supercritical sediment-laden carbonate density flows: An outcrop study

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Chute-and-pools are unstable, hybrid bedforms that prevail in a significant range of the upper flow-regime, populating the stability field in between two stable end-members (antidunes and cyclic steps). Chute-and-pools are manifested by supercritical flow (chute) down the lee side and subcritical flow (pool) on the stoss side, linked through a hydraulic jump in the trough. Reported here are upper flow-regime sedimentary structures generated at the toe-of-slope of a Pleistocene carbonate ramp dominated by the resedimentation of skeletal sand and gravel by supercritical density underflows. Quarry exposures enable the timewise morphodynamic reconstruction of the sediment bed. It is shown that wave-breaking on growing antidunes occurred without the destruction of the antidune as is commonly observed in free-surface (subaerial) flows. This led to the formation of chute-and-pools that are not preceded by intense upstream scouring, interpreted to be the result of high bed aggradation rates. The term aggradational chute-and-pools is proposed for these bedforms, which is associated with the formation of build-up-and-fill structures consisting of interstratified convex-upward (in-phase wave regime) and concave-upward (hydraulic jump regime) half-lenses. Such structures contrast the scour-and-fill structures commonly created by chute-and-pools in free-surface flows. The observed geometry demonstrates the potential difference in flow behaviour between free-surface flows and density flows in the supercritical regime. Adequate identification of aggradational chute-and-pool structures is important for the correct estimation of porosity, permeability and connectivity distribution in subsurface reservoirs formed by supercritical density flows.