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Formation and evolution of stream channels during continuous base level lowering, exemplified at Ein-Fesh'ha, the Dead Sea, Israel

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Considerable research has been undertaken on the initiation of channels in alluvium, however, the understanding of channel forming processes and evolution in the cohesive environment is limited. We focus on the formation and the evolution of channels in a lacustrine-cohesive depositional environment due to the abrupt but continuous lowering of base level. Our data is derived from Ein Fesh'ha, a series of springs along the NW coast of the Dead Sea, where a drastic sea level drop of ca. 20 m since 1980's initiated vertical and horizontal erosion of the channels draining the springs. The evolution of the fluvial system, taking place in an extreme hydro-climatic environment, is constrained by a very short time scale system response to base level lowering. For the determination of the short-term (2003-2006) changes of channel dimensions, they are routinely resurveyed while evolving and their flow structure is successively monitored by electromagnetic current metering at shore-adjacent sites, where the newly-formed channel segments are generated. The downstream increase in stream channel development causes bed instability at the sea interface and is accompanied by an asymmetric flow structure and evident contemporaneous bed development. The spanwise flow pattern produced by an asynchronous response varies with distance from shore, producing a time- and space-dependent channel shape. This study emphasizes the significance of the control of hydraulic parameters of the flow on the initiation and evolution of stream channels with clayey cohesive beds and banks, both in the spatial and the temporal scales.