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Abstract: The phenomenon in which disproportionately higher percentage of near-bed sediment enters the later-channel of a diversion, compared to the flow, is often referred to as the Bulle-Effect. Previously 3D numerical simulations at experiment-scale diversions have been used to study the mechanism behind the phenomenon (Dutta et al., 2017), though in all the studies the bottom of the channel was assumed to be non-erodible. The current study explores the impact of Bulle-Effect on morphology of the bed at an experimental diversion, while further evaluating how the changing morphology impacts the hydrodynamics of the flow at the diversion. The non-hydrostatic version of Telemac-3D has been used for modelling the hydrodynamics, and SISYPHE has been used for modelling the evolution of the channel bed. Results show scouring at the high-flow zone in the diversion channel, along with deposition at the flow-separation zone. The study also explored the dependence of the bed morphdynamics on the size of the sediment and different sediment loading.

Reference:

Dutta, S., Wang, D., Tassi, P., and Garcia, M. H. (2017). Three-Dimensional Numerical Modeling of the Bulle-Effect: the non-linear distribution of near-bed sediment at fluvial diversions. Earth Surf. Process. Landforms