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2D numerical simulation of shallow water and bedload transport in channel confluences by considering the non-hydrostatic pressure

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Channel confluence is one of the important sections of channel networks which is also common encountered in nature. Six different zones exist at a channel confluence: 1) stagnation zone, 2) flow deflection zone, 3) flow separation zone, 4) maximum velocity zone, 5) flow recovery zone and 6) shear layers between combining flows zone. Due to the complexity of flow pattern at channel confluence, this location is always interesting among researchers. Although there are a number of studies on the flow and sediment pattern at confluences, there are still some gaps to be studied. Hence, a calibrated numerical model should be a good tool for evaluating the various effective parameters on flow and sediment patterns. The numerical 2D shallow-water model used in this paper is SFLOW which was developed by NTNU. Besides, the model calibration part of the current study is done by using a set of data from laboratory experiments.

This study attempt to simulate bed changes at channel confluences with a 2D shallow-water modeling under non-hydrostatic pressure, and show the applicability of the SFLOW model for this complex flow pattern. SFLOW solving the depth-averaged Navier-Stokes equations which is equipped with cutting-edge solvers. Besides, SFLOW modeled turbulency with depth-averaged two-equation RANS. In comparison with other codes, one of the interesting features of SFLOW is solving the non-hydrostatic pressure besides of hydrostatic part. This leads to a more realistic representation of the complex flow and sediment patterns of channel confluences, and consider less computational power than full 3D models.