Geophysical Research Abstracts
Vol. 20, EGU2018-19003, 2018
EGU General Assembly 2018

Application of a methodological advance to calculate 3D flow fields in river channel junctions

Gelare Moradi (1), Bart Vermeulen (3), Colin Rennie (2), Romain Cardot (1), and Stuart Lane (1)

(1) University of Lausanne (UNIL), Institute of Earth Surface Dynamics, Faculty of Geosciences and Environment, Lausanne, Switzerland (gelare.moradi@unil.ch), (2) University of Ottawa, Civil Engineering Department, Ottawa, Canada, (3) University of Twente, Water Engineering and Management Department, Enschede, The Netherlands

Acoustic Doppler current profiler (aDcp) vessel-mounted flow measurements are now commonly used to quantify discharge and velocity in shallow water fluvial environments. Here, we consider the benefits of improving secondary circulation estimates in river confluences through the manner in which moving vessel aDcp data are handled.

Secondary circulation in Alpine river confluences involves a rotational movement of flow, orthogonal to the main flow. It results in a spatial and temporal variation of fluid motion and a relatively high level of morphological change. It is well established that measuring such flows requires repeated surveys at the same cross-section. However, less attention has been given to how to process these data. Most techniques used to process vessel-mounted aDcp data use the assumption of homogeneity between the measured radial components of velocity. This assumption can be problematic where acoustic beams diverge with distance from the aDcp probe. Divergence between the beams increases the volume in which the flow must be assumed homogeneous. In the presence of secondary circulation cells, and where there are strong rates of shear in the flow, the homogeneity assumption may not apply, especially deeper in the water column. To reduce the volume assumed homogeneous, a method proposed by Vermeulen et al. (2014) has been applied for the first application to Sontek Riversurveyor data, collected in medium sized (∼60 m wide) gravel-bed river confluences. The method combines radial velocities in a predefined mesh, based on their position. In this paper, we present the results of this method and compare them with more conventional data processing approaches. The proposed method suggests an improvement in secondary flow cell representation, comparing to more conventional methods whilst also confirming that repeated transects are required to achieve meaningful secondary flow and turbulence estimation. Use of this method resolves two counter-rotating cells in the confluence zone more clearly, with downward velocity in the channel centre. This pattern helps to explain the development of confluence scour holes.

References:

Vermeulen, B., Sassi, M.G., Hoitink, A.J.F., 2014. Improved flow velocity estimates from moving-boat ADCP measurements. Water Resour. Res. 50, 4186–4196. doi:10.1002/2013WR015152