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Hydraulic visibility and decomposition of river flow state variables from remote sensing in various hydro-geomorphological contexts

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This contribution presents an analysis of river flow variables in the light of the assimilation of satellite observables into flow hydrodynamic models. It is based on the concept of hydraulic visibility from river surface observations by satellite altimetry introduced by Garambois et al. (2016). They highlighted and characterized the spatio-temporal variations of water surface slope and curvature for different flow regimes and detected a hydraulic control section. Samine Montazem et al. (2018) shown that free surface curvature is a powerful proxy for characterizing the hydraulic behavior and propose consistant spatio-temporal river segmentation in view of rivers flow modeling. Indeed water surface slope and concavity of those shallow flows stem from hydrodynamic behaviour variability driven by hydrological forcings, channel geometry variations and basal friction. The present contribution proposes a thorough investigation of the link between hydraulic variables, channel geomorphology and hydrological forcing. From fine scale perfect academic test cases to real world river datasets, flow variables (wetted areas and discharges) are decomposed and analyzed with respect to satellite observables and channel features. This method will be usefull to directly infer flow variables from satellite observables and improve observation operators for hydraulic and hydrological data assimilation chains (e.g. Monnier et al. 2016).