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Assessment of morphological parameters in altimetry-based rating curves

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A set of altimetry-based rating curves have been obtained by polynomial fit of ENVISAT water stages and discharges obtained from MGB-IPH model, with constraints on parameters values. The rated discharges, e.g. the discharge obtained from ENVISAT heights through the rating curves were successfully validated towards simulated discharges ($meanEns = 0{,}70$) and in-situ discharges ($meanEns = 0{,}71$). Results also showed that rating curves are not mission-dependent, as we were able to obtain accurate discharge estimates from Jason-2 stages through a RC calculated from ENVISAT time series. In addition, RC parameters have proven to provide reliable information of river's morphological parameters, as water depths for example.

The water depth can be inferred at any date with stage information by subtracting to it the parameter ($Z0$ is such as $Q = 0$ when $Halti = Z0$) from the RC. The result of this operation was tested towards measured water depths from ADCP obtained during ground missions. ADCP water depth is inferred by dividing cross-section area by width. We obtained great results at the seven sites tested, with error in depth estimate always inferior to 10% of the river depth. The $Z0$ parameter also was validated through inverse modeling. Using the effective bathymetry given by a series of $Z0$ values along a river reach, a hydraulic model (with simple hypothesis like permanent shallow water flow for each satellite pass and continuous roughness for a continuous discharge) was able to return free surface elevations and slopes similar to observed ENVISAT water elevations. These experiments show that altimetry-based rating curves provide effective estimates of morphological parameters of river reaches that can be used as inputs into hydraulic models.