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The use of ERS-2 and ENVISAT altimetry data for hydraulic model calibration

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Over the last decades, the use of remote sensing has been shown to be feasible and potentially useful for several hydrological-hydraulic applications in river sites wherein data are difficult to obtain. Furthermore, the recent developments in radar altimetry technology have encouraged the use of remotely sensed water levels for inland water, which are increasingly being used to complement, or replace, the traditional hydrometric data in the several hydraulic hydrological analyses. In this study, taking advantage of a large satellite data set of about 16-year provided by ERS-2 and ENVISAT, we investigate the reliability of remotely-sensed data for the calibration of a quasi-twodimensional (quasi-2D) hydraulic model, which was set up for a ∼140 km reach of the middle-lower portion of the Po River (Northern Italy) where detailed topographical and in-situ hydrometric data are available. We perform the model calibration referring in turn to satellite and traditional data in order to provide possible answers to the two following research questions: i) can water surface elevation data derived by ERS-2 and ENVISAT be used, in place of in-situ observations, for the calibration of a quasi-2D hydraulic model? (ii) Can remotely-sensed water elevation data integrate traditional (i.e. in-situ) data improving the calibration and reliability of a hydraulic models? Although the low frequency of satellite overpasses (∼35 days) and the limited accuracy of remotely-sensed water surface levels evaluated in similar context the results of the analysis clearly demonstrate that for medium-to-large rivers, and for large satellite data-sets, satellite data can effectively describe the hydrometric regime for a given river reach, while the direct integration of long satellite times-series into the calibration process increases the trustworthy and reliability of hydraulic models. The presented results, even though referred to a preliminary analysis carried out on a specific case study, clearly reveal the potentiality of large satellite data-sets provided by ERS-2 and ENVISAT satellites, exposing new and interesting possibility for the application of altimetry data for hydraulic analysis in un-gauged or poorly gauged area. Finally, the presented analysis assumes a more relevant meaning in the light of the potentialities ensured by the forthcoming satellite missions (e.s. SENTINEL-3), from which improvements on vertical and spatial resolutions on altimetry data are expected.