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Using altimetry waveform data and ancillary information from SRTM, LANDSAT and MODIS to retrieve river characteristics

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Spaceborne radar altimeters are shown to have the potential for monitoring the height of large rivers with accuracies of approximately 1 m. However, the need for a better height accuracy and the observations of smaller continental basins have led to studies on how to improve and extend the use of nadir altimeter data. Conventional retracking techniques over land are limited to the examination of altimeter waveforms on a case by case basis. Due to the arbitrary geometry which may be present at altimeter river crossings, this approach may be limited to large rivers, which approximate ocean crossings. To overcome this limitation, we introduce a waveform fitting method which uses the entire set of waveforms associated with a water crossing, rather than individual waveforms. By using ancillary data, such as a digital elevation model (obtained from SRTM) and classification maps (obtained from Landsat and Modis), it is possible to recast the retracking problems as a maximum likelihood estimation problem. Theoretical power returns based on the a priori knowledge of the observed scenes are generated resulting in a parametric library of waveform histories, which is then used to constrain the estimation. For demonstration, we concentrate on the rivers Meuse and Lena in Europe. They present a challenge to conventional nadir altimeter waveform retracking. We will present both theoretical performance results and demonstrate the feasibility based on real altimeter data.

Keywords: altimetry, waveform, hydrology, Europe