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River runoff estimates based on remotely sensed surface velocities

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One promising technique for river runoff estimates from space is the retrieval of surface currents on the basis of synthetic aperture radar along-track interferometry (ATI). The German satellite TerraSAR-X, which was launched in June 2007, will permit ATI measurements in an experimental mode. Based on numerical simulations, we present findings of a research project in which the potential of satellite measurements of various parameters with different temporal and spatial sampling characteristics is evaluated. A sampling strategy for river runoff estimates is developed. We address the achievable accuracy and limitations of such estimates for different local flow conditions at selected test site. High-resolution three-dimensional current fields in the Elbe river (Germany) from a numerical model are used as reference data set and input for simulations of a variety of possible measuring and data interpretation strategies to be evaluated. Addressing the problem of aliasing we removed tidal signals from the sampling data. Discharge estimates on the basis of measured surface current fields and river widths from TerraSAR-X are successfully simulated. The differences of the resulted net discharge estimate are between 30-55% for a required continuously observation period of one year. We discuss the applicability of the measuring strategies to a number of major rivers. Further we show results of runoff estimates by the retrieval of surface current fields by real TerraSAR-X ATI data (AS mode) for the Elbe river study area.