Water level dynamics in the Amazon River from CryoSat radar altimetry

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Project description:

Artists impression of CryoSat 2, which was launched by the European Space Agency in April 2010. The satellite carries a unique instrument on board: a dual radar altimeter system called SIRAL (SAR/Interferometric Radar Altimeter).

The SIRAL is designed to provide high accuracy elevation estimates over areas that conventional radar altimeter systems have struggled with. This includes inland water bodies such as large lakes and river systems. Some success has been achieved using conventional altimeters over the Amazon but the large footprint (~4 km) limits their accuracy and ability to monitor river levels uniformly. A satellite laser altimeter, ICESat, has shown the potential of this technology for deriving river gradients and absolute elevations [*Hall et al.*, 2011; *Hall et al.*, 2012]) but was severely limited by poor temporal sampling. The SIRAL on board CryoSat will overcome both these limitations using interferometric processing to produce an effective footprint of 450 m and, with a dense track spacing (~4km), which will provide excellent sampling in space and time of water level variations over the Amazon.

The aim of this project will be to assess the capability of CryoSat to derive river gradients and their evolution over time and to use the results for data assimilation into a hydrodynamic model of a section of the Amazon basin. For rivers such as the Amazon, both friction and bathymetry are poorly known and the goal is to use CryoSat data to help constrain these unknowns in the model. A second, but equally important goal will be to assess whether CryoSat data can improve the topographic information that exists for large river systems such as the Amazon. Currently the best available data comes from the Shuttle Radar Topographic Mission (SRTM) but, for vegetated terrain, these data are seriously compromised. In principle, CryoSat will be able to improve the SRTM representation and this would provide a major step towards an effective global flood forecasting system (e.g. Schuman *et al*., 2013)

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Schumann, G. J.-P., J. C. Neal, N. Voisin, K. M. Andreadis, F. Pappenberger, N. Phanthuwongpakdee, A. C. Hall, *and* P. D. Bates (2013), A first large scale flood inundation forecasting model, Water Resour. Res., 49, *doi:*10.1002/wrcr.20521.