Estimating continental hydrology parameters from space missions

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Different instruments on board Earth Observing satellite missions that were designed either for ocean missions or land surface classification have been used to retrieve continental surface hydrology parameters. While altimeter measurements provide an estimate of height over water bodies of typically a few km in size, it is necessary to complement these measurements with imagers, either optical or microwave, to estimate water extent. A comparison of the estimates of water elevation derived from the Topex/Poseidon, ERS2, ENVISAT and Icesat altimeter missions, with in situ gauge measurements provides RMS errors between 10 and 50 cm. Analysis of satellite altimeter time series over lakes and rivers in Asia clearly indicates superimposed seasonal and interannual variabilities. The synergy of altimeter water height estimate with the water extent provided by radiometers is a means of estimating water volume variations. The case of the Mekong river will be presented and the seasonal and interannual variability will be analyzed and compared with estimates of the total water content variability obtained with the GRACE gravimetry mission. The synergy between the GRACE gravimetry mission, that provides the variations of the integrated water mass, with the surface water component estimated from the combination of altimeter and radiometer measurements will be analyzed. The satellite altimeters currently available are not designed to provide accurate measurements over continents, they have a resolution of at best 1 km and since they are profiling instruments they provide a discontinuous coverage of the largest rivers and lakes. In fact, approximatively 70% of the lakes and 30% of the rivers are not sampled by a pulse-limited altimeter mission. The community of hydrologists is proposing a dedicated continental surface hydrology satellite mission: WatER (Water Recovery Elevation) an interferometric near-nadir viewing altimeter with a 120 km wide swath that will cover the entire globe (except the poles) every 16 days, with a 5 days subcycle yielding global water level h measurements, with a resolution of 100m and a height accuracy of about 3 cm.