Combination of multi-mission altimetry data along the Mekong River with spatio-temporal kriging

Abstract:
River water-level time series at fixed geographical locations, so-called virtual stations, have been computed from single altimeter crossings for many years. Their temporal resolution is limited by the repeat cycle of the individual altimetry missions. The combination of all altimetry measurements along a river enables computing a water-level time series with improved temporal and spatial resolutions. This study uses the geostatistical method of spatio-temporal ordinary kriging to link multi-mission altimetry data along the Mekong River. The required covariance models reflecting the water flow are estimated based on empirical covariance values between altimetry observations at various locations. In this study, two covariance models are developed and tested in the case of the Mekong River: a stationary and a non-stationary covariance model. The proposed approach predicts water-level time series at different locations along the Mekong River with a temporal resolution of five days. Validation is performed against in situ data from four gauging stations, yielding RMS differences between 0.82 and 1.29 m and squared correlation coefficients between 0.89 and 0.94. Both models produce comparable
results when used for combining data from Envisat, Jason-1, and SARAL for the time period between 2002 and 2015. The quality of the predicted time series turns out to be robust against a possibly decreasing availability of altimetry mission data. This demonstrates that our method is able to close the data gap between the end of the Envisat and the launch of the SARAL mission with interpolated time series.

Stichworte: spatio-temporal ordinary kriging; inland altimetry; Mekong River; stochastic space-time processes; covariance models along river; non-stationary covariance models

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