



Multi-Mission Altimetry: Observing Water Level Extremes in the Mekong River Basin

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The observation of river water levels with single-mission altimetry is spatially and temporally limited which hinders the observation of the full extent of extreme events such as floodings. However, the combination of the water level data of several altimeter missions in one multi-mission data product increases the resolution significantly. In this study, the Universal Kriging method is employed along the Mekong River and its tributaries for the combination of multi-mission water level time series between 2008 and 2016. In this combination data of short and long-repeat orbit missions are included, most importantly CryoSat-2 both SAR and LRM data. The covariance model used in the Universal Kriging method is a non-stationary model that can incorporate tributaries as well. The multi-mission time series are validated against in situ data of ten gauge stations along the main reach of the river. This shows the good performance of the approach with Nash-Sutcliff-Efficiencies between 0.6 and 0.8. In these multi-mission time series the inter-annual flood behaviour of the river is well depicted, especially the floodings in 2008 and 2011 are nicely seen. These floodings could not be observed with close by single-mission virtual stations of Envisat/SARAL or Jason-2 due to their insufficient temporal resolution. However, even with the high spatial and temporal resolution of the multi-mission altimetry it is not always possible to observe short local flash floods.