Hess-2019-242

ABSTRACT

Land surface models combined with river routing models are widely used to study the continental part of the water cycle. They give global estimates of water flows and storages but not without non-negligible uncertainties; among which inexact input parameters have a significant part. The incoming Surface Water and Ocean Topography (SWOT) satellite mission, with a launch scheduled for 2021 and an at least three years required lifetime **[R#1-M#1]**, will be dedicated to measure water surface elevations, widths and surface slopes of rivers wider than 100 meters, at global scale. SWOT will provide a significant amount of new observations for river hydrology and could be combined, through data assimilation, to global-scale models in order to correct their input parameters and reduce their associated uncertainty. However, comparing simulated water depths with measured water surface elevations remains a challenging and can introduce large bias in the system. A promising alternative to assimilate water surface elevations consists in assimilating water surface elevation anomalies, that do not depend on a reference surface **[R#2-M#1]****[R#3-M#1]**. The objective of this study is to present a data assimilation platform based on the asynchronous ensemble Kalman filter (AEnKF) that can assimilate synthetic SWOT observations of water depths and water elevation anomalies **[R#2-M#1]** to correct the input parameters of a large scale hydrologic model over a 21-day time window. The study is applied to the ISBA-CTRIP model over the Amazon basin and focuses on correcting the spatial distribution of the river Manning coefficients. The data assimilation algorithm, tested through a set of Observing System Simulation Experiments (OSSE), is able to retrieve the true value of the Manning coefficients within one assimilation cycle most of the time (basin- averaged Manning coefficients RMSEn is reduced from 33% to [1%-10%] after one assimilation cycle) and shows promising perspectives with assimilating water anomalies **[R#2-M#1]** (basin-averaged Manning coefficients RMSEn is reduced from 33% to [1%-2%] when assimilating water surface elevation anomalies over one year) that allows us to overcome the issue of unknown bathymetry **[R#3-M#1]**.