Combining satellite radar altimetry, SAR surface soil moisture and GRACE total storage changes for hydrological model calibration in a large poorly gauged catchment - DTU Orbit (09/08/2019)

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The availability of data is a major challenge for hydrological modelling in large parts of the world. Remote sensing data can be exploited to improve models of ungauged or poorly gauged catchments. In this study we combine three datasets for calibration of a rainfall-runoff model of the poorly gauged Okavango catchment in Southern Africa: (i) surface soil moisture (SSM) estimates derived from radar measurements onboard the Envisat satellite; (ii) radar altimetry measurements by Envisat providing river stages in the tributaries of the Okavango catchment, down to a minimum river width of about one hundred meters; and (iii) temporal changes of the Earth's gravity field recorded by the Gravity Recovery and Climate Experiment (GRACE) caused by total water storage changes in the catchment. The SSM data are shown to be helpful in identifying periods with over-respectively underestimation of the precipitation input. The accuracy of the radar altimetry data is validated on gauged subbasins of the catchment and altimetry data of an ungauged subbasin is used for model calibration. The radar altimetry data are important to condition model parameters related to channel morphology such as Manning's roughness. GRACE data are used to validate the model and to condition model parameters related to various storage compartments in the hydrological model (e.g. soil, groundwater, bank storage etc.). As precipitation input the FEWS-Net RFE, TRMM 3B42 and ECMWF ERA-Interim datasets are considered and compared.

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