Geophysical Research Abstracts
Vol. 16, EGU2014-4231, 2014
EGU General Assembly 2014


# Modeling Niger river surface water changes from radar altimetry and space gravity missions

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We derive surface water storage of the Niger river and its main tributary, the Benue river, using a simple routing method, forced by runoff outputs of different Land Surface Models (LSM) from GLDAS (Global Land Data Assimilation System) hydrology models for the 1990-2013 period. The free parameter of such routing model is the flow velocity which can be adjusted by fitting the modeled surface equivalent water heights with water level observations. Because of unavailability of gauge records, we use radar altimetry time series obtained from ENVISAT satellite at about 30 virtual stations. Modeled water levels have to be rescaled to real level variations by taking into account the temporal and spatial variability of the river width, deduced from satellite remote sensing. A spatially variable velocity is also required to obtain a good concordance with the observations.

Thanks to the launch of the GRACE (Gravity Recovery And Climate Experiment) mission in 2002, the total continental water storage variations are recorded with spatial and temporal resolutions of respectively about a few hundreds of kilometers and 10 to 30 days. We compare GRACE equivalent water height from different solutions, corrected for the soil moisture components using GLDAS LSMs, to our estimates of surface water storage for the Niger river basin.