

# Significant contribution of groundwater to the total water storage in the Congo River Basin

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## ABSTRACT

The Congo River Basin (CRB) holds significant groundwater resources that play a crucial role as the primary source of freshwater for CRB's human population. However, the lack of groundwater monitoring networks leads to a significant gap in the understanding and characterization of the CRB's groundwater resources and variability. In this research study, we used observations from the Gravity Recovery and Climate Experiment satellite mission which provide total water storage anomalies (TWSA), unique means of quantifying groundwater storage anomalies (GWSA) at large spatial scales. We also benefited from satellite-based estimates of surface water storage anomalies (SWSA) to derive the changes in GWSA from 2002 to 2015 at monthly time step. GWSA is derived by subtracting the storage anomalies of SWSA and root zone soil moisture (SMroot) from TWSA, following a water budget method. The analysis revealed that total water storage anomalies variations at the basin level are dominated by SMroot variations (~59%), followed by GWSA (~23%) and SWSA (18%), similar to previous findings. The significant spatial variability in GWSA, influenced by hydrogeological characteristics, showed higher contributions from unconsolidated and consolidated sedimentary aquifers compared to basement aquifers. This study enhances our understanding of groundwater dynamics in the CRB, providing insights into the hydrogeological controls that were previously underexplored.

**Keywords:** Congo River Basin, Groundwater storage anomalies, Hydrogeological control, Baseflow index, Observation-based surface water storage anomalies