# A pan-African inter-comparison of the relationship between precipitation and groundwater recharge from in-situ observations and large-scale models
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Global coverage of groundwater-level monitoring networks is limited so assessments of groundwater recharge and storage changes in many regions rely upon output from- (1) global-scale hydrological and land-surface models (GHMs, LSMs) and (2) GRACE satellite observations in which groundwater storage changes are isolated using model data. Such models are also the primary source of information on projected climate change impacts on groundwater resources. There has, however, been a paucity of studies examining the robustness of terrestrial water balances including estimates of groundwater recharge simulated by LSMs and GHMs in Sub-Saharan Africa and other regions where observational records are limited. Such comparisons require careful consideration given the inherent differences between gridded data and point observations+ our inter-comparison aims to improve conceptual and numerical models of groundwater recharge. We report on preliminary analyses that assess the relationship between precipitation and groundwater recharge indicated by both LSMs and GHMs and observational records of groundwater levels collated under The Chronicles Consortium and stable-isotope ratios collated by the IAEA and published sources. Initial results derive from the analysis of the relationship between monthly precipitation and subsurface runoff (i.e. proxy for groundwater recharge) from four 1°x1° global-scale GLDAS LSMs (CLM, NOAH, MOSAIC, VIC) across Africa and at 9 locations across Sub-Saharan Africa where observational records have been analysed (i.e. Ethiopia, Mali, Tanzania and Uganda). Our analyses reveal substantial spatial variability among the GLDAS LSMs in subsurface runoff across Africa. Precipitation and subsurface runoff in LSMs show non-linear (i.e. reflecting bias to heavy rainfall), linear, or no bivariate associations in contrast to consistently non-linear relationships noted in in-situ observations. Our analyses will further examine- (1) two global-scale hydrological models (WaterGAP and PCR-GLOBWB) and CLM4.0 that simulate recharge explicitly+ and (2) an additional number of in-situ observational records.