UP Gro Unlocking the Potential of Groundwater for the Poor

BRAVE

BRAVE: Building understanding of climate variability into planning of groundwater supplies from low storage aquifers in Africa.

Work Package Progress Report:

Work Package 3 Review

WP3 Improving Understanding of the Hydroclimate

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WP3.1 Improved conceptual understanding of the hydroclimate

WP3.2 Model development

WP3.3 Sensitivity analysis and trends

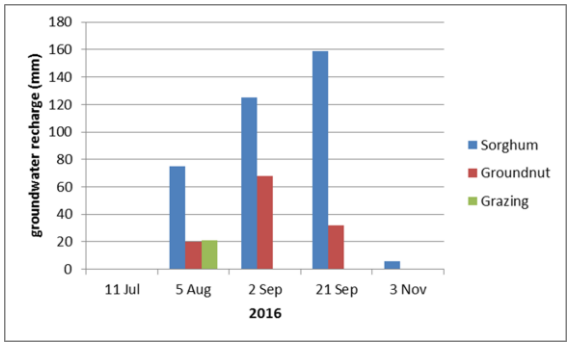
Year 1 – Key Actions

- Decision made to use sites already partly characterised and monitored by 2iE and WASCAL as the focus study sites within the BRAVE project, i.e. Sanon in Burkina Faso and the Vea Catchment in Ghana/Burkina Faso (specifically in the Aniabisi community and the Nazinga Wildlife Reserve).
- Agreements made with 2iE and WASCAL allowing their staff to work collaboratively on the project, primarily in the joint instrumentation and monitoring of the Sanon and Vea sites.
- Infrastructure and instrumentation installed at the Sanon and Vea sites to allow all aspects of the water balance to be monitored. West African-based staff, students and local community helpers trained in the use of the monitoring equipment.
- A PhD project within the WASCAL Graduate Programme has been devised that will complement research being undertaken on BRAVE, with BRAVE UK scientists as co-supervisors
- Used high-resolution ensembles from the UK Met Office Unified Model coupled to the JULES land surface model with present and future climate, and also ERA-Interim Land reanalysis, to examine the water balance across West Africa.

Ongoing Work/Outputs

Monitoring is ongoing following equipment installation at 3 study sites. This includes:

- Climate variables via automatic weather stations at both sites;
- 4x20m plots at Sanon and Aniabisi, with three different land use types, measuring runoff, soil moisture, groundwater recharge using lysimeters and vegetation/crop growth and transpiration;
- Groundwater levels: new drilling complementing existing network in Sanon; drilling to be undertaken in Aniabisi and Nazinga once results available of ongoing geophysics to map weathered zone;
- Vertical profiles of soil moisture content in a series of transects across the study sites;
- Stream flow at the catchment outlet and variation in groundwater level in vicinity;
- Measurement of water chloride concentration in rainfall, groundwater and runoff to estimate groundwater recharge using the chloride balance method.
- Pumping tests on new and existing boreholes will be undertaken in the coming months.

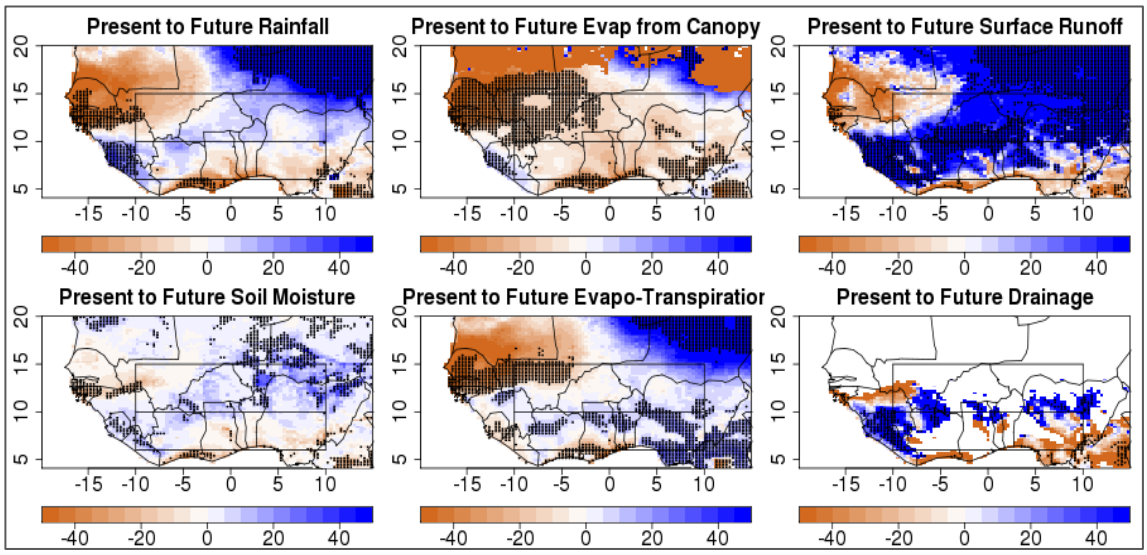


Preliminary results from lysimeters show land use type may have a significant control on groundwater recharge.

WP 3
Ongoing Work/Key Results

Modelling West African Water Balance

- Compared wet and dry years and found large inter-annual variations; almost all runoff and drainage is in wet years. Examined how the water balance is predicted to change in the future; suggests both rainfall total and intensity will increase while total evaporation will decrease leading to significant increases in runoff and drainage. Compared modelled estimates with estimates made using field measurements from peer-reviewed literature.
- Running land surface models at individual locations using the same driving data as for the climate models to enable us to investigate the how changes in the weather and land cover may affect the water balance.
- Starting an inter-comparison of CMIP5 model results for the water and energy balances across West Africa, to determine the differences between models and the sensitivity of groundwater recharge to emissions scenario.



High-resolution present (2000) and future (2100) climate runs of UK Met Office global climate model, showed percentage changes for: annual rainfall, evaporation from the canopy, surface runoff, soil moisture, evaporation from the soil and vegetation, and drainage.

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