Continental scale modelling to advance the inclusion of groundwater processes

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To close the terrestrial water balance, land surface models require a groundwater modelling component. The Joint UK Land Surface Environment Simulator (JULES), a community model jointly supported by UKCEH and UK Met Office, is no exception. Various attempts have been made to add saturated groundwater flow to JULES. Recent work on the UK's NERC-funded Hydro-JULES programme has enabled the inclusion of groundwater, creating the JULES Dynamic Groundwater or JULES_DGW model. Using LEAFHYDRO as a basis, a single layer saturated groundwater model, using both exponential variation of hydraulic conductivity with depth and the product of saturated thickness and hydraulic conductivity, has been added alongside the inclusion of river–aquifer interaction and abstractions.

The implementation has been tested using the River Kennet catchment of the Cretaceous-aged chalk in south-east England and applied at a continental scale to Africa. The latter was developed using the conceptual understanding provided by the Africa groundwater atlas () and the model has been parameterised and initial runs undertaken. These have shown that a simulation is possible as well as producing results that demonstrate that evaporation is modified by the inclusion of saturated groundwater flow. The next steps include analysing the output in more detail as well as applying different mechanisms: spatial variability of vertical variation of hydraulic conductivity; representation of basins; focussed vs diffuse recharge.