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WASCAL - West African Science Service Center on Climate Change and Adapted Land Use Regional Climate Simulations and Land-Atmosphere Simulations for West Africa at DKRZ and elsewhere

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Changing climate and hydro-meteorological boundary conditions are among the most severe challenges to Africa in the 21st century. In particular West Africa faces an urgent need to develop effective adaptation and mitigation strategies to cope with negative impacts on humans and environment due to climate change, increased hydro-meteorological variability and land use changes.
To help meet these challenges, the German Federal Ministry of Education and Research (BMBF) started an initiative with institutions in Germany and West African countries to establish together a West African Science Service Center on Climate Change and Adapted Land Use (WASCAL). This activity is accompanied by an establishment of trans-boundary observation networks, an interdisciplinary core research program and graduate research programs on climate change and related issues for strengthening the analytical capabilities of the Science Service Center.
A key research activity of the WASCAL Competence Center is the provision of regional climate simulations in a fine spatio-temporal resolution for the core research sites of WASCAL for the present and the near future. The climate information is needed for subsequent local climate impact studies in agriculture, water resources and further socio-economic sectors.
The simulation experiments are performed using regional climate models such as COSMO-CLM, RegCM and WRF and statistical techniques for a further refinement of the projections.
The core research sites of WASCAL are located in the Sudanian Savannah belt in Northern Ghana, Southern Burkina Faso and Northern Benin. The climate in this region is semi-arid with six rainy months. Due to the strong population growth in West Africa, many areas of the Sudanian Savannah have been already converted to farmland since the majority of the people are living directly or indirectly from the income produced in agriculture.
The simulation experiments of the Competence Center and the Core Research Program are accompanied by the WASCAL Graduate Research Program on the West African Climate System. The GRP-WACS provides ten scholarships per year for West African PhD students with a duration of three years. Present and future WASCAL PhD students will constitute one important user group of the Linux cluster that will be installed at the Competence Center in Ouagadougou, Burkina Faso.
Regional Land-Atmosphere Simulations
A key research activity of the WASCAL Core Research Program is the analysis of interactions between the land surface and the atmosphere to investigate how land surface changes affect hydro-meteorological surface fluxes such as evapotranspiration. Since current land surface models of global and regional climate models neglect dominant lateral hydrological processes such as surface runoff, a novel land surface model is used, the NCAR Distributed Hydrological Modeling System (NDHMS). This model can be coupled to WRF (WRF-Hydro) to perform two-way coupled atmospheric-hydrological simulations for the watershed of interest.
Hardware and network prerequisites include a HPC cluster, network switches, internal storage media, Internet connectivity of sufficient bandwidth. Competences needed are HPC, storage, and visualization systems optimized for climate research, parallelization and optimization of climate models and workflows, efficient management of highest data volumes.