

# WASCAL - West African Science Service Center on Climate Change and Adapted Land Use

## Regional Climate and Land Surface Information and Services

C.F. Olusegun, U. Gessner, A. Hirner, S. Salack, G. Forkuor, S. Berger, D. Heinzeller, D. Dieng, M.B. Sylla, H. Kunstmann, J.P.A. Lamers, J. Tondoh

### INTRODUCTION TO WASCAL

With climate change being one of the most severe challenges to Africa in the 21st century, West Africa needs to develop effective adaptation and mitigation measures.

WASCAL, the West African Science Service Center on Climate Change and Adapted Land Use, is a large-scale research-focused climate service center with headquarters in Accra (Ghana) and a research competence center (CoC) in Ouagadougou (Burkina Faso).

By the 10 member countries, WASCAL is mandated to tackle the challenges related to climate change and ultimately enhance the resilience of human and environmental systems to climate change and increased variability. It does so by strengthening the research infrastructure and capacity in West Africa related to climate change and by pooling the expertise of ten West African countries and Germany.

WASCAL conducts research in the fields of climate, land use, agriculture, ecosystems, markets, livelihoods, and risk management. The center concurrently envisages establishing six observation networks, and works towards developing a range of data products and services.

### WASCAL OBSERVATION NETWORKS

Multidisciplinary observation networks are established with a focus on climate, hydrology, biodiversity, socio-economics, remote sensing, land surveys data collection and quality assurance/control.

The remote sensing observation network will include infrastructure to receive satellite data (Figure 1) at WASCAL-CoC.

Similarly, the hydro-climate observation network includes a meso-scale testbed network of several cutting-edge sensors for depicting micro-processes (e.g. EC stations, Figure 4).

There are also other classical sensors such as automatic weather stations (AWS), piezometers, soil moisture probes which have been providing continuous measurements since 2012/2013. The regional hydro-climate observation network includes fifty classical AWS installed in WASCAL countries. Data are shared with the national weather services of these countries on request.

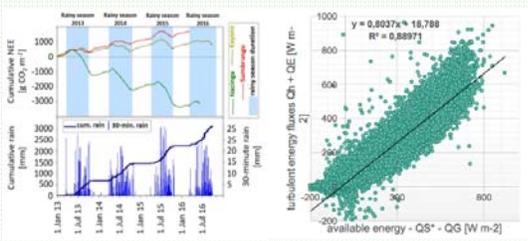


Figure 4: Cumulative net ecosystem exchange (LHS) and energy balance closure (RHS) at EC1 station

WASCAL's EC observations reveal that the natural site (EC1) acted as a carbon sink in contrast to the more degraded sites (EC 2&3). Annual differences in precipitation (2013: 656 mm, 2014: 790 mm, 2015: 782 mm, 2016: 867 mm) correspond with the sites' cumulative net ecosystem exchange. Energy balance closures (EBC) were best during the rainy seasons, but poorer during the dry seasons with largest energy balance residuals between December and February. The natural site (EC1) had the best EBC.

### DOWNSCALING INFORMATION

WASCAL regional climate simulations consist of an ensemble of high spatial/temporal resolution (12 km / 3 hr) over West Africa for further analysis and use in regional downscaling, coupled modelling and process studies by WASCAL members, partners and the research community in Germany and West Africa.

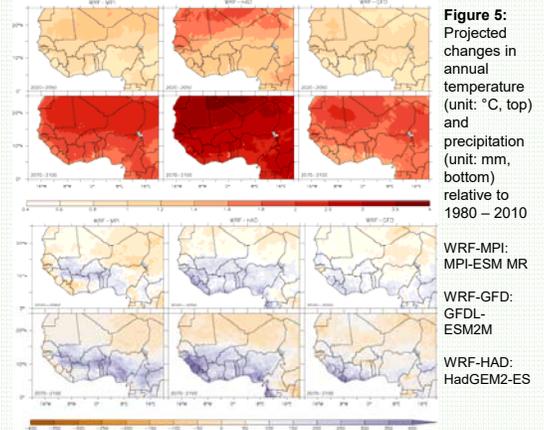


Figure 5: Projected changes in annual temperature (unit: °C, top) and precipitation (unit: mm, bottom) relative to 1980 – 2010

Table 1: WASCAL regional climate simulations

RCM	GCM	Scenario	Period
WRFV3.5.1	ERA-Interim	control	1979-2014
	MPI-ESM MR	historical	1979-2010
	GFDL-ESM2M	historical	1979-2010
CCLM4.18	HadGEM2-ES	historical	1979-2010
	MPI-ESM MR	rcp4.5	2019-2050, 2069-2100
	GFDL-ESM2M	rcp4.5	2019-2050, 2069-2100
CCLM4.18	HadGEM2-ES	rcp4.5	2019-2050, 2069-2100
	ERA-Interim	control	1979-2014
	MPI-ESM LR	historical	1979-2005
	MPI-ESM LR	rcp4.5	2006-2100

### WASCAL SERVICES

WASCAL develops science-based services for West Africa through partnership with local, national and international stakeholders. Selected WASCAL services are e.g. the provision of

- high resolution climate simulations over West Africa
- land surface and land use data as well as other derived products from remote sensing
- climate data and scenarios from model simulations and observation networks
- bias corrected climate model outputs (AFRICA-CORDEX)
- capacity building and training workshops

Contact emails: [christiana.olusegun@kit.edu](mailto:christiana.olusegun@kit.edu), [ursula.gessner@dlr.de](mailto:ursula.gessner@dlr.de), [harald.kunstmann@kit.edu](mailto:harald.kunstmann@kit.edu)



Figure 1: WASCAL's Satellite Data Receiving Station (EUMETCAST)



Figure 2: WASCAL's Eddy Covariance (EC) Stations



Figure 3: WASCAL Land Use/Cover Mapping for WASCAL Services (Gessner et al. 2015)

All WASCAL simulations data will be made available for download. Dissemination of full data sets (all variables, 3-6 hourly resolution) via the DKRZ CERA database

<http://cera-www.dkrz.de>

Dissemination of selected remote sensing-based land surface products and climate variables in daily/monthly resolution via the WASCAL Data Interface WADI [https://wascal-dataportal.org/wascal\\_searchportal/](https://wascal-dataportal.org/wascal_searchportal/)

Data upload and ingestion are ongoing.