WEST AFRICAN CLIMATE: PERSPECTIVES, CHALLENGES, SUCCESS AND OUTLOOK FROM AN EMERGING AFRICAN FEMALE SCIENTIST RESEARCHER

UNIVERSITY OF WARSAW | INSTITUTE OF GEOPHYSICS

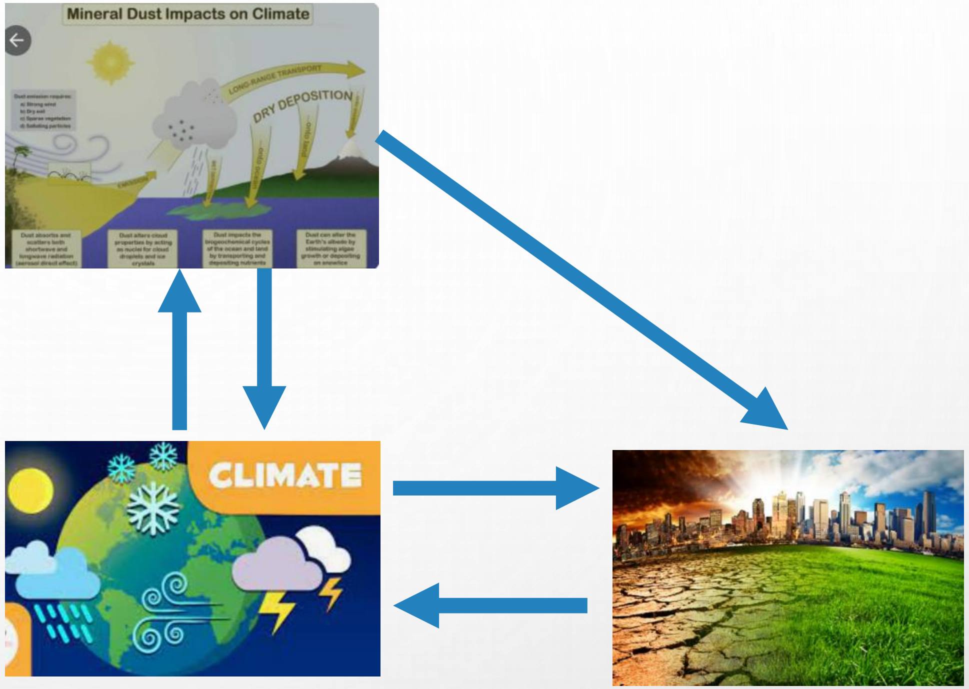
WASCAL West African Science Service Centre on Climate Change and Adapted Land Use
SPONSORED BY THE Federal Ministry of Education and Research
DOCTORAL RESEARCH PROGRAM IN WEST AFRICA CLIMATE SYSTEM

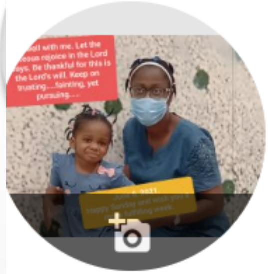
SEMINAR PRESENTATION

FACULTY OF PHYSICS

DR. CHRISTIANA FUNMILOLA OLUSEGUN

PERSPECTIVES





Christiana Funmilola Olusegun, PhD

Atmospheric Scientist
Verified email at fuw.edu.pl

Atmospheric Sciences   Climate   Data Analysis

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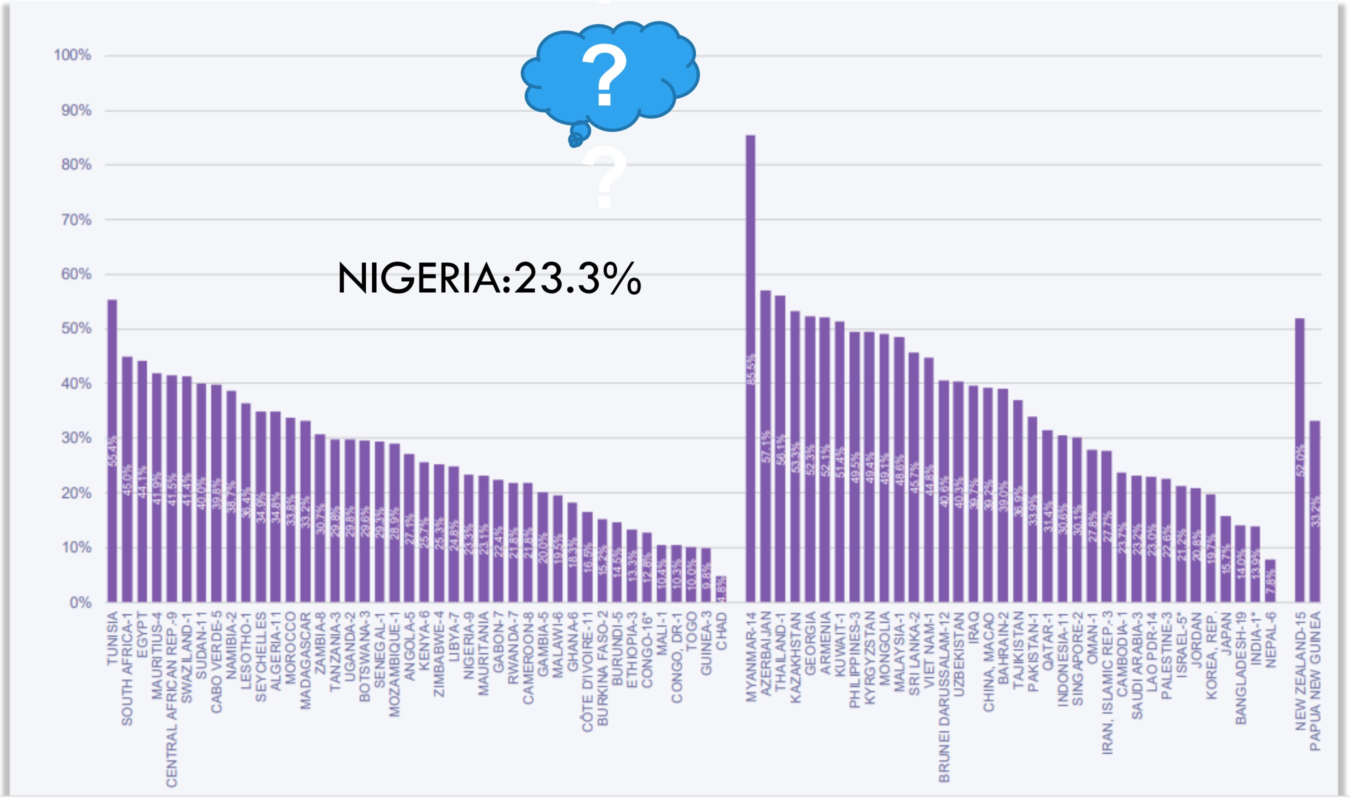
h-index	6	6
i10-index	6	5

Capacity development in West Africa

Female researchers as a percentage of total researchers (HC), 2016 or latest year available



Source:UNESCO

Academic and research career achievement

Scientific Degrees

High School-Science (1998)

B.Tech Meteorology. 2nd Class Upper Division (2006)

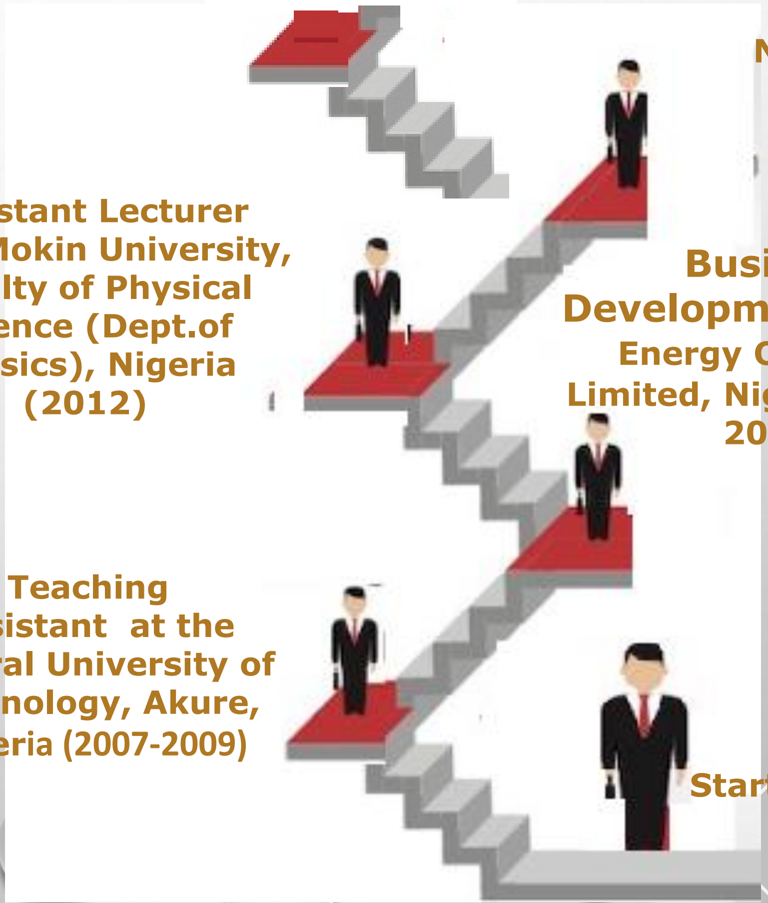
M.Tech in Physics. 4.47/5.00 (2012)

PhD in Meteorology and Climate Science (2016)

Postdoc. in Climate Data Analysis (2017)

Research Career

Partner (FUTA-CONCERT PROJECT)/Guest Lecturer for Phd Students/Facilitator of Training of Phd Students/ Visiting Academic/Contractor/Volunter (UW)



Senior Scientific Officer NASRDA

Business Development Officer Energy Oil and Gas Limited, Nigeria (2009-2010)

Assistant Lecturer Elara-Mokin University, Faculty of Physical Science (Dept.of Physics), Nigeria (2012)

Teaching Assistant at the Federal University of Technology, Akure, Nigeria (2007-2009)

Starting point

Greenhouse gas emissions and mitigation options under climate- and land use change in West Africa: A concerted regional modeling and observation assessment

CONCERT-West Africa (2021-2024)

Partner Institutions and PI's

Institute of Geography (IG), University of Augsburg (UoA):

Prof. Harald Kunstmann, Dr. Souleymane Sy

German Aerospace Center (DLR), Oberpfaffenhofen, Germany:

Dr. Ursula Gessner, Dr. Frank Thonfeld

Institute of Bio- and Geosciences – Agrosphere, Forschungszentrum Jülich (FZJ), Germany:

Dr. Roland Baatz, Prof. Harry Vereecken

United Nations University – Institute for Natural Resources in Africa (UNU-INRA), Ghana:

Dr. Nkem Johnson

Kwame Nkrumah University of Science and Technology (KNUST), Ghana:

Prof. Leonard K. Amekudzi, Dr. Emmanuel Quansah

Federal University of Technology in Akure (FUTA), Nigeria:

Dr. Christiana F. Olusegun, Prof. Debo Adeyewa

AGRHYMET Regional Centre, Niger:

Dr. Moussa Waongo, Prof. Sanoussi Atta

MY RESEARCH INTERESTS

- LAND COVER CHANGES: FOES OR FRIENDS OF CLIMATE CHANGE?
- CLIMATE EXTREME EVENTS
- POST-PROCESSING, ARCHIVING AND ANALYSIS OF CLIMATE DATA
- MONSOON SYSTEMS
- ATMOSPHERIC POLLUTION
- AEROSOL-VEGETATION-CLIMATE INTERACTION

THE BEGINNINGS……

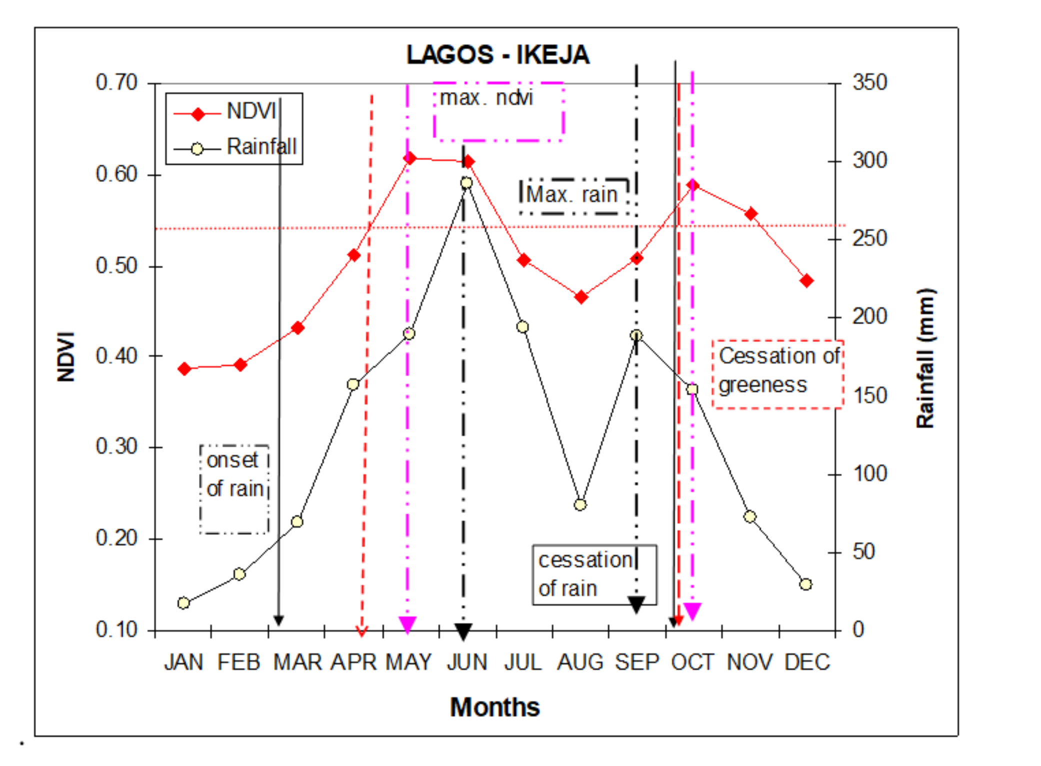
Atmospheric and Climate Sciences, 2013, 3, 421-426
http://dx.doi.org/10.4236/acs.2013.34043 Published Online October 2013 (http://www.scirp.org/journal/acs)

Scientific Research

Spatial and Temporal Variation of Normalized Difference Vegetation Index (NDVI) and Rainfall in the North East Arid Zone of Nigeria

Christiana F. Olusegun[1*], Zachariah D. Adeyewa[2]
[1]Department of Physical and Chemical Sciences, Elizade University, Ilara-Mokin, Nigeria
[2]Department of Meteorology, Federal University of Technology, Akure, Nigeria
Email: *chrystali2002@yahoo.co.uk, *christiana.olusegun@elizadeuniversity.edu.ng

Received June 3, 2013; revised July 2, 2013; accepted July 10, 2013



PHD QUEST

climate

MDPI

Article

Simulating the Impacts of Tree, C3, and C4 Plant Functional Types on the Future Climate of West Africa

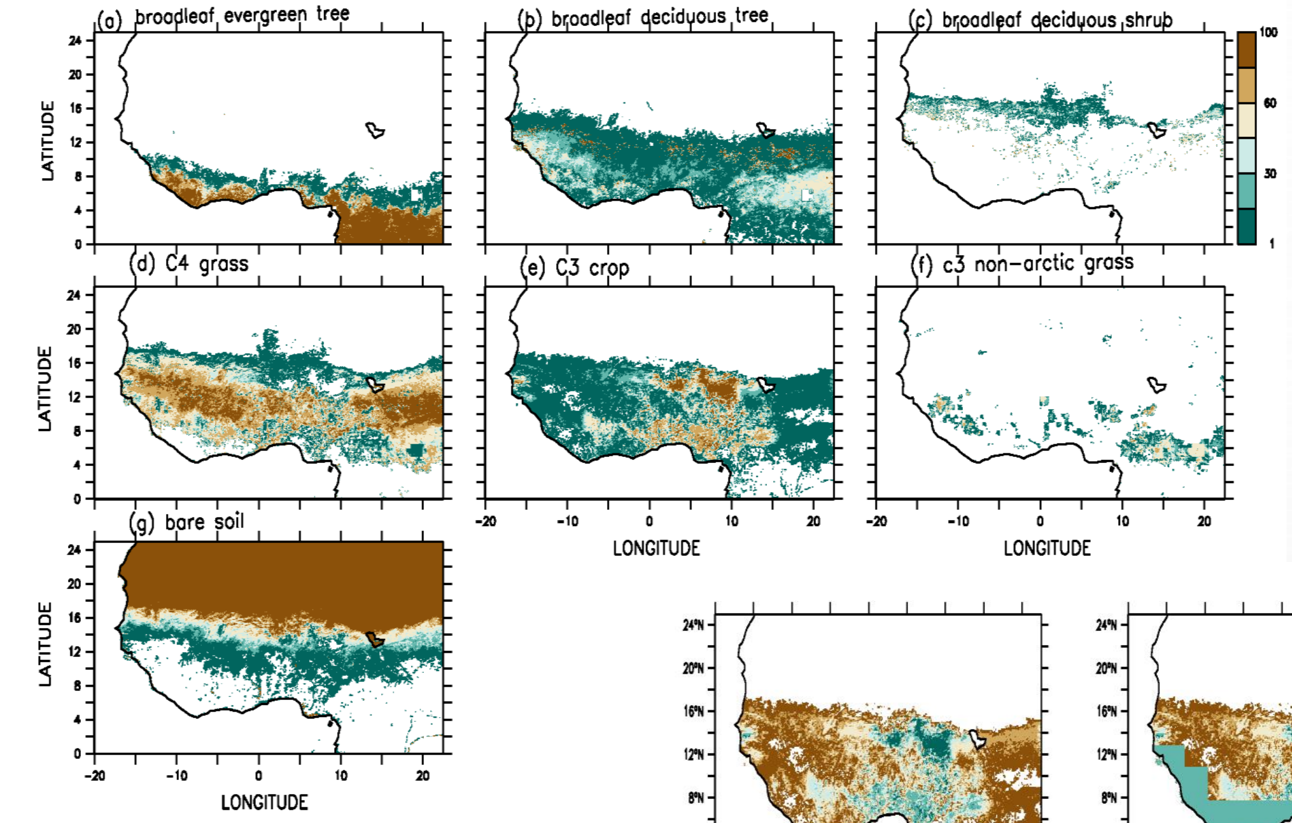
Christiana Funmilola Olusegun [1,*], Philip G. Oguntunde [2] and Emiola O. Gbobaniyi [3]

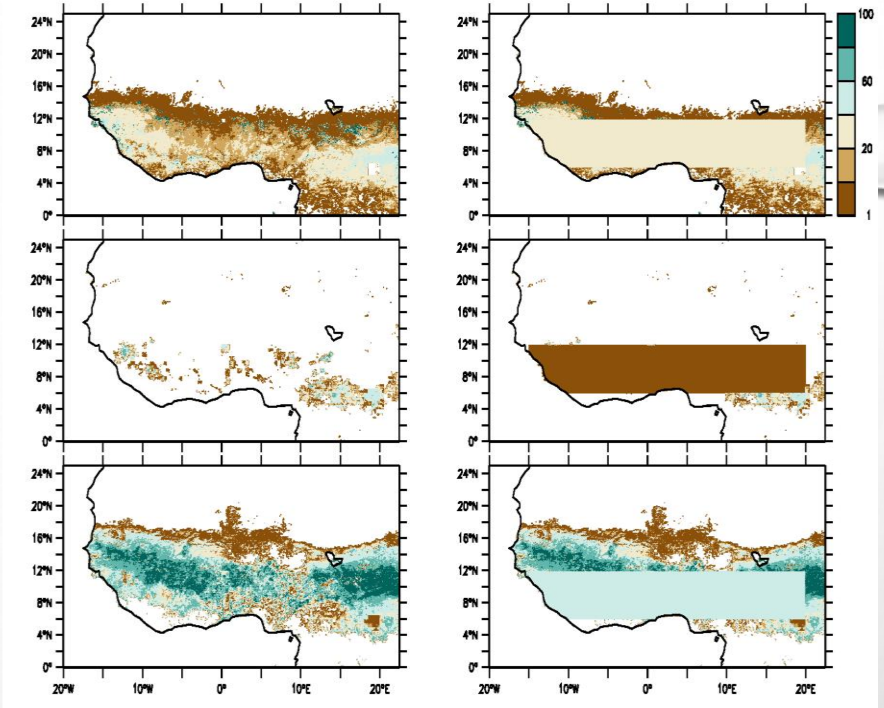
1. West African Science Service Center on Climate Change and Adapted Land Use (WASCAL), Federal University of Technology Akure, P.M.B. 704, Akure 340001, Ondo State, Nigeria
2. Department of Agricultural and Environmental Engineering, Federal University of Technology Akure, P.M.B. 704, Akure 340001, Ondo State, Nigeria; pgoguntunde@futa.edu.ng
3. Rossby Centre, Swedish Meteorological and Hydrological Institute, SE-601 76 Norrköping, Sweden; bode.gbobaniyi@smhi.se

* Correspondence: chrystali2002@gmail.com; Tel.: +234-806-609-1208

Received: 11 January 2018; Accepted: 27 April 2018; Published: 2 May 2018

check for updates

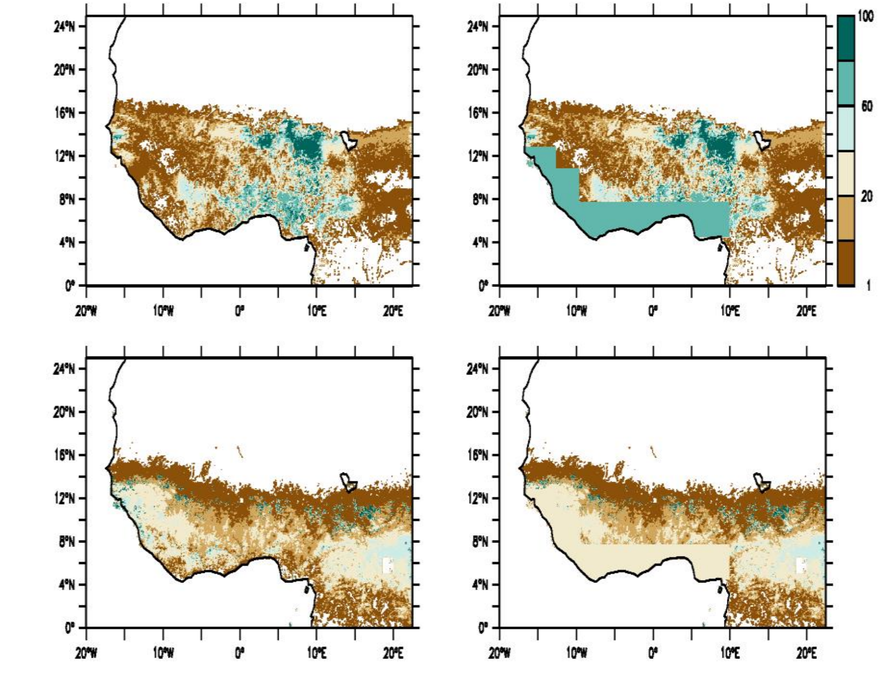




30% broadleaf deciduous

10% C3 grass

60% C4 grass

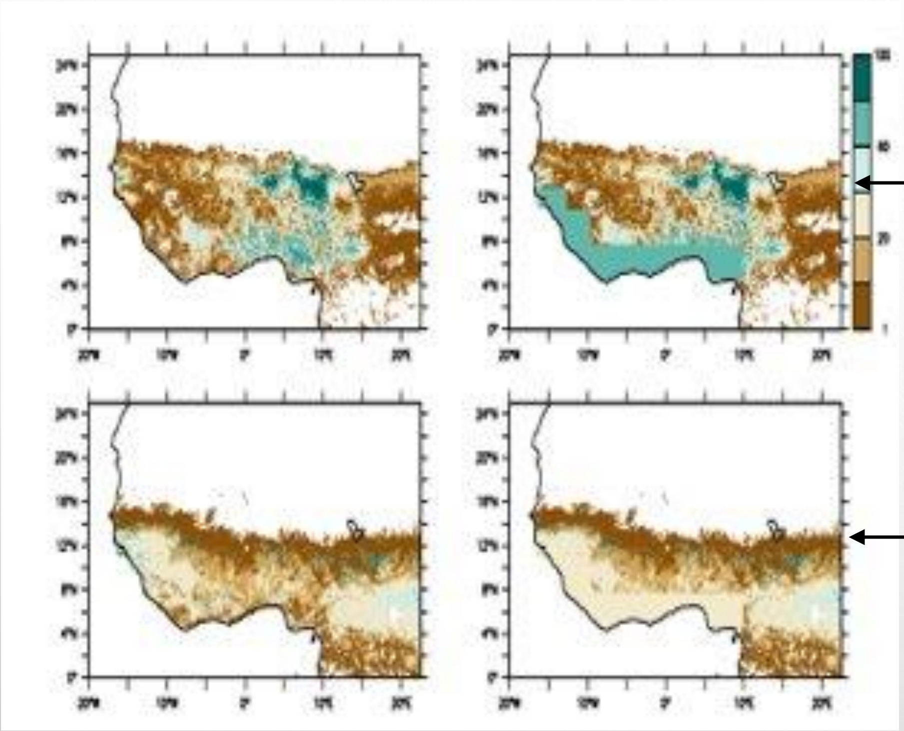


70% C3 crop

30% broadleaf deciduous

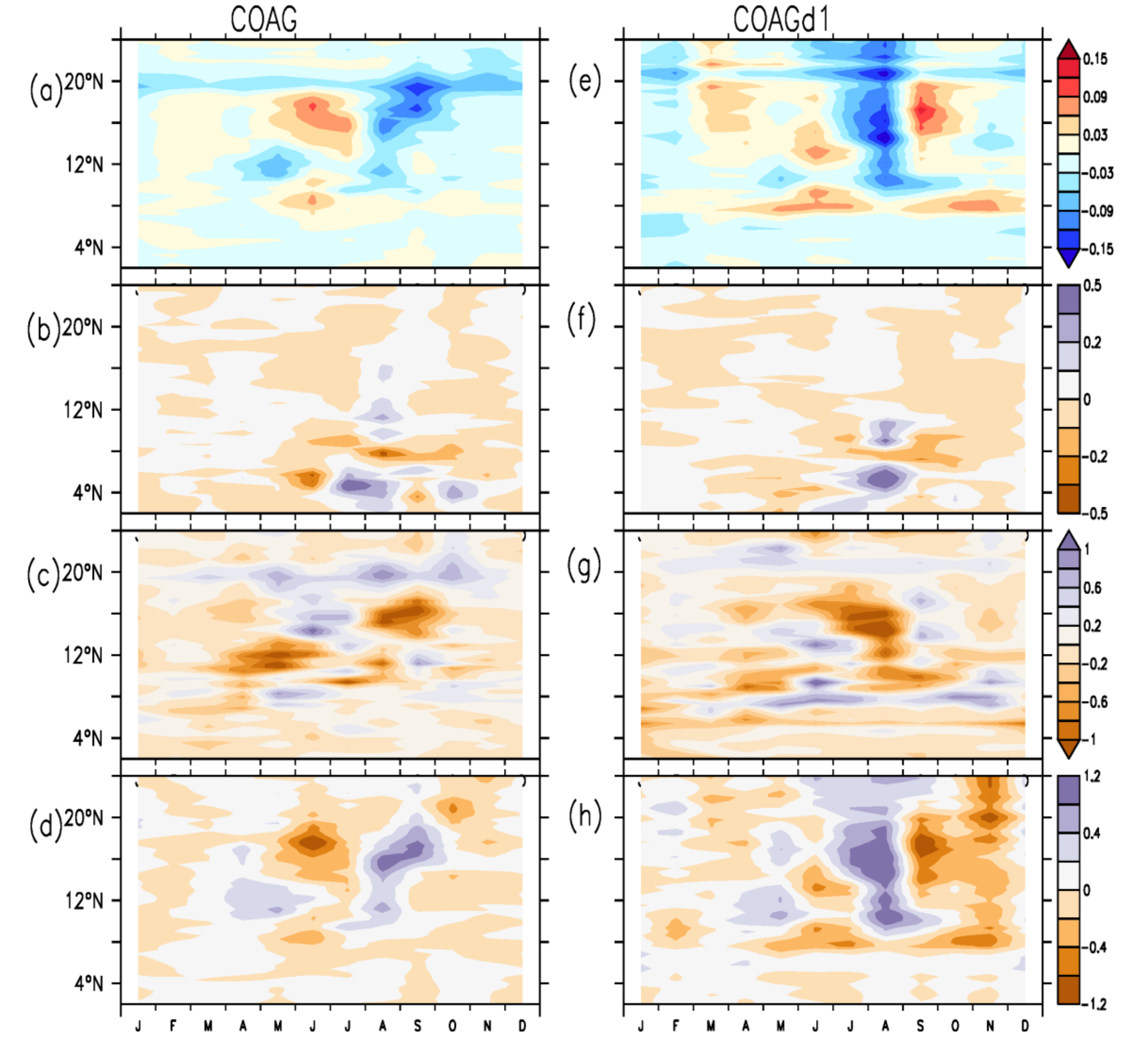
1980-2004
2030-2054
(RCP4.5)

Challenges???

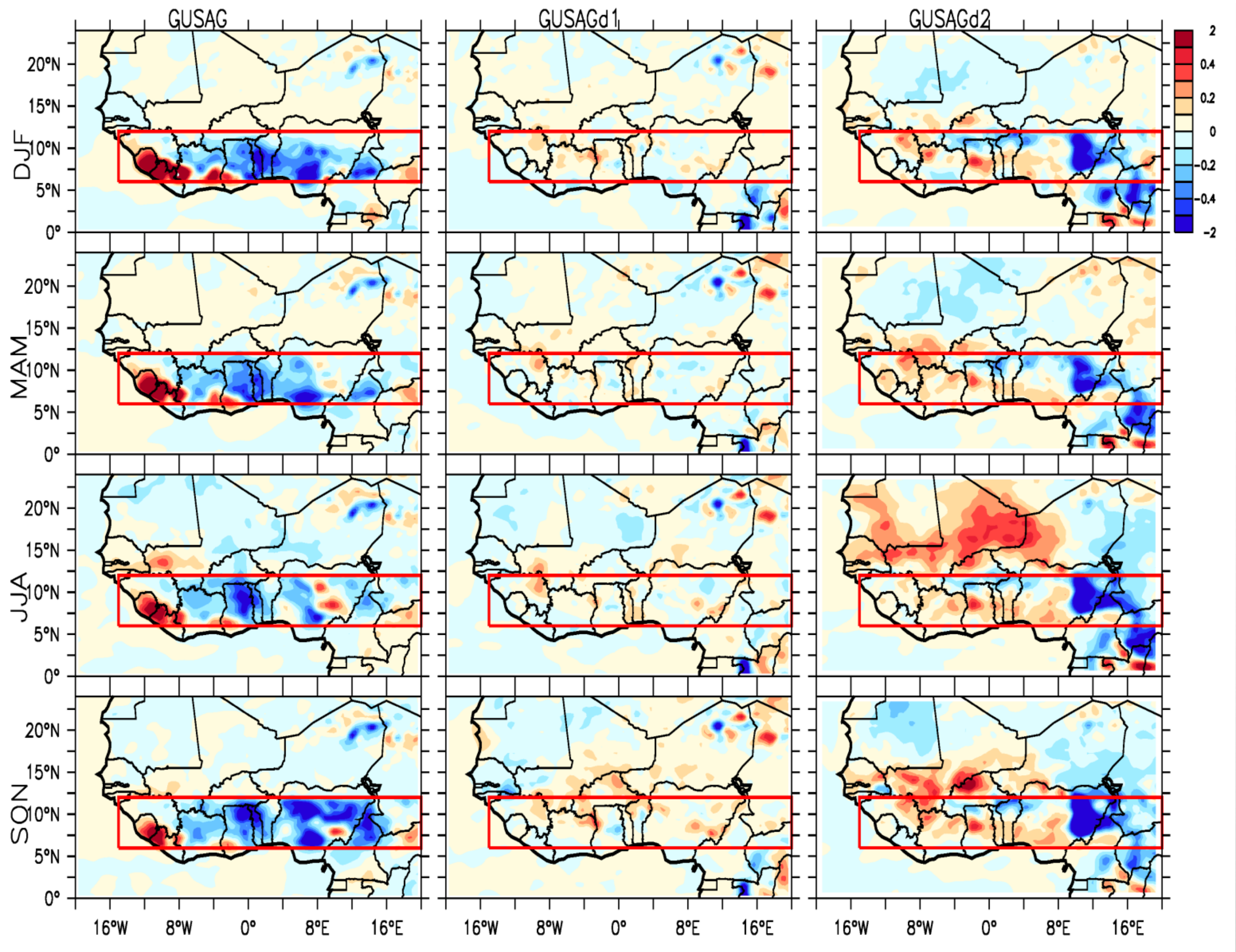


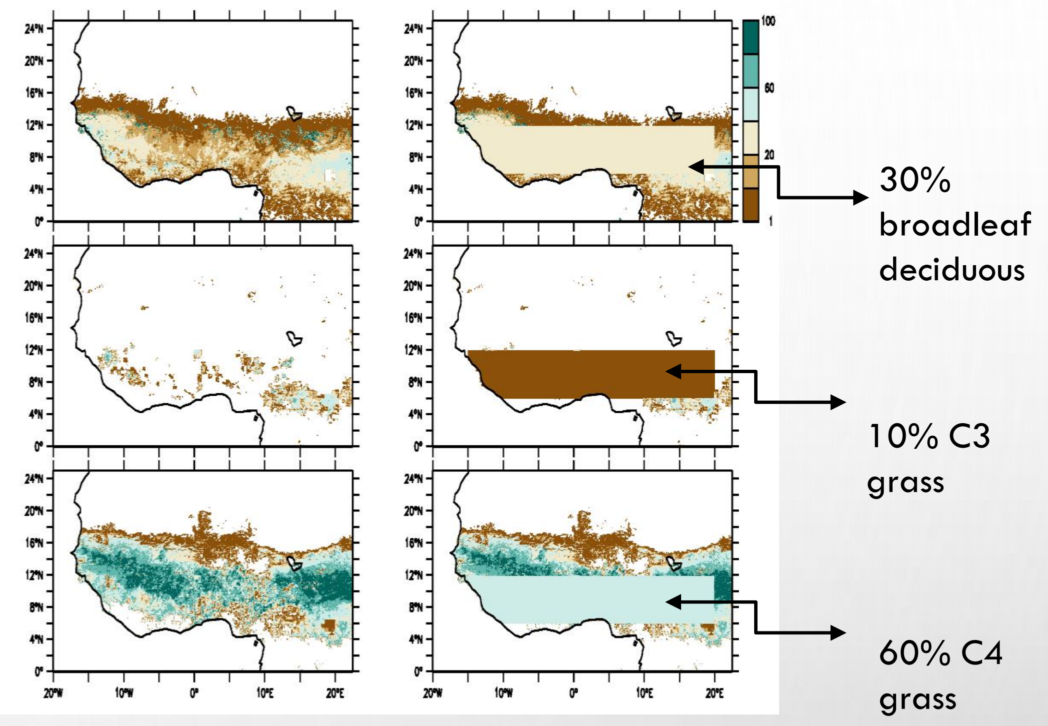
70% C3 crop

30% broadleaf deciduous

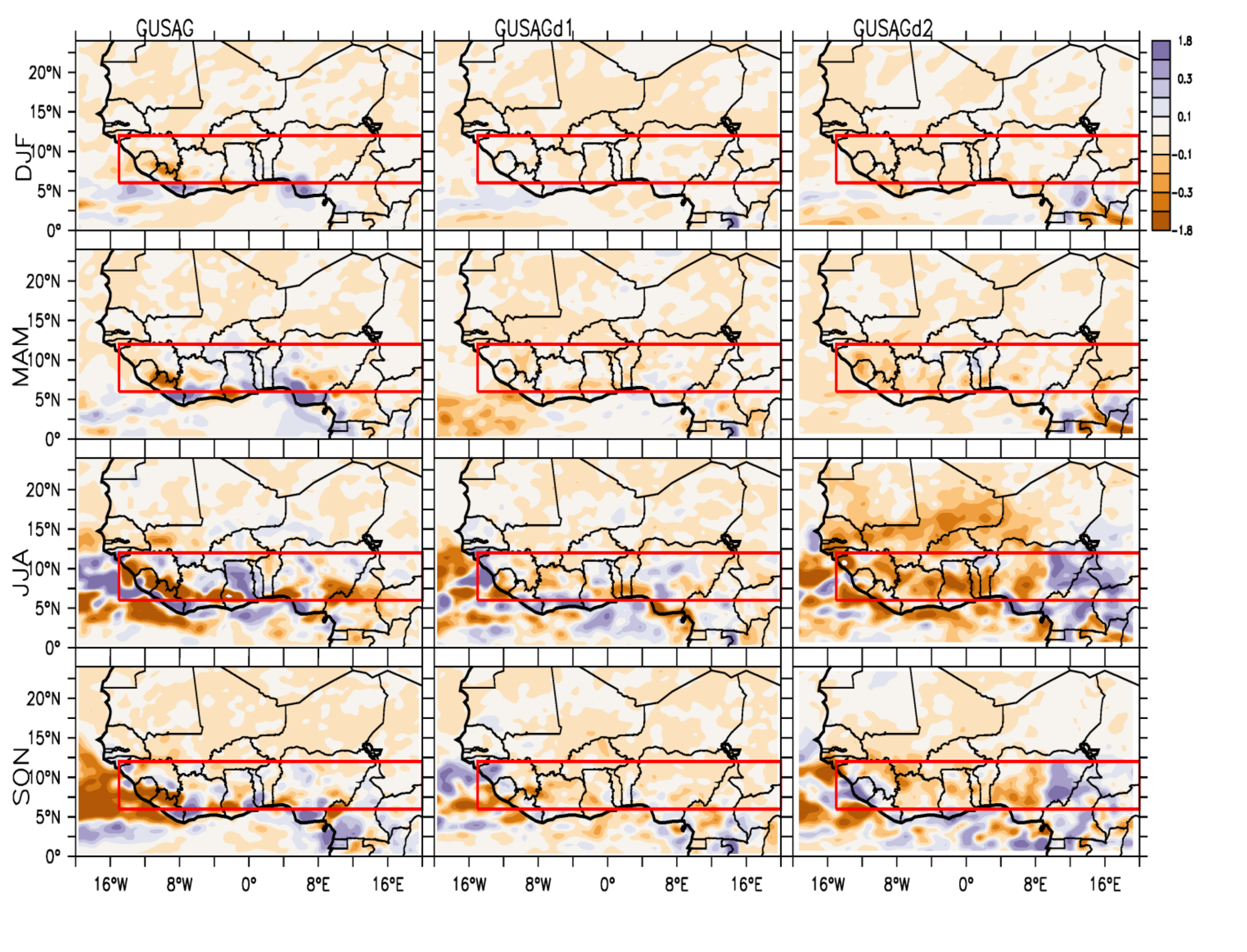


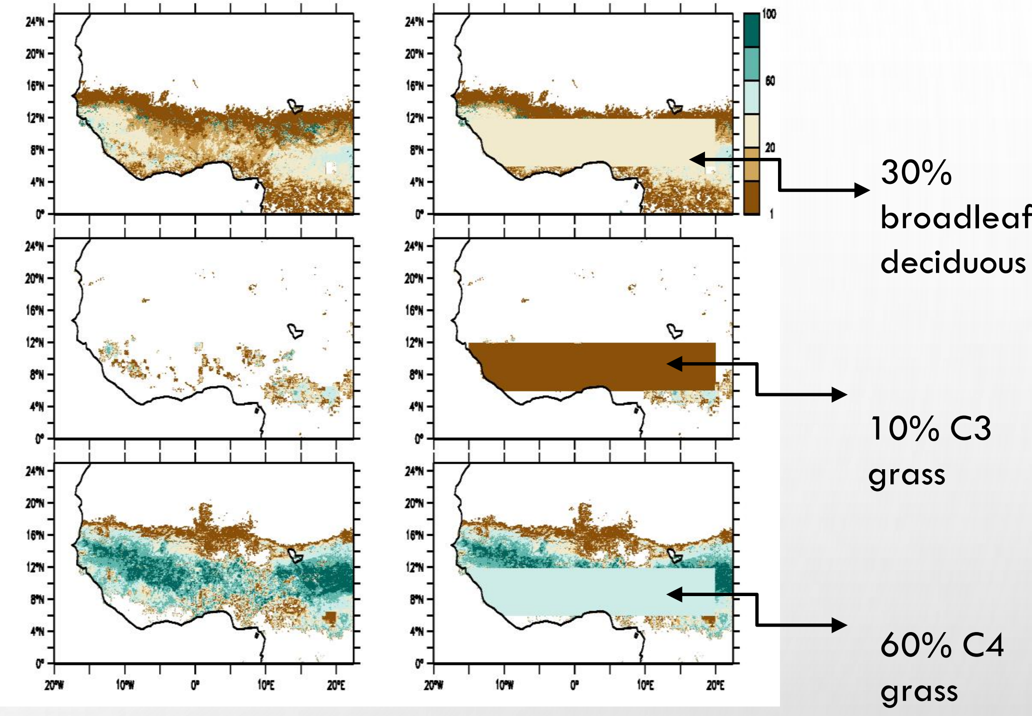
Latitude–time section of future changes in (a) surface 2 m temperature (°C) (b) precipitation (mm/day) (c) sensible heat flux (W m^{-2}) (d) relative humidity (%) due to agri-silviculture practice along West Africa coasts. Zonal averages between 15°W and 15°E.





Projected future (RCP 4.5; 2030-2054) changes in temperature (°C) over West Africa due to agri-silviculture practice along the Guinea Savanna zone from GUSAG, GUSAG*d1* and GUSAG*d2* experiments





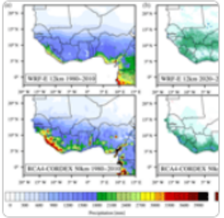
Projected future (RCP 4.5; 2030-2054) changes in precipitation (mm/day) over West Africa due to agri-silviculture practice along the Guinea Savanna zone from GUSAG, GUSAG*d1* and GUSAG*d2* experiments

POSTDOC: (12 KM) CLIMATE SIMULATIONS OVER WEST AFRICA

Article | Assets | Peer review | Metrics | Related articles

23 Apr 2018

The WASCAL high-resolution regional climate simulation ensemble for West Africa: concept, dissemination and assessment



Dominikus Heinzeller[1,a], Diarra Dieng[1,2], Gerhard Smiatek[1], Christiana Olusegun[1], Cornelia Klein[3], Ilse Hamann[4], Seyni Salack[5], Jan Bliefernicht[2], and Harald Kunstmann[1,2]

[1]Karlsruhe Institute of Technology, Institute of Meteorology and Climate Research, Garmisch-Partenkirchen, Germany
[2]University of Augsburg, Institute of Geography, Augsburg, Germany
[3]Centre for Ecology & Hydrology, Wallingford, UK
[4]German Climate Computing Center, Hamburg, Germany
[5]WASCAL Competence Center, Ouagadougou, Burkina Faso
[a]now at: University of Colorado Boulder, Cooperative Institute for Research in Environmental Sciences, NOAA/OAR/ESRL/Global Systems Division, Boulder, CO, USA

Correspondence: Dominikus Heinzeller (dom.heinzeller@noaa.gov)

Received: 21 Aug 2017 – Discussion started: 22 Sep 2017 – Revised: 23 Mar 2018 – Accepted: 25 Mar 2018 – Published: 23 Apr 2018

Regional climate simulations are generated at high (12 km) and intermediate (60 km) resolution using the Weather Research and Forecasting Model (WRF).

The simulations cover the validation period 1980–2010 and the two future periods 2020–2050 and 2070–2100 under RCP4.5 scenario

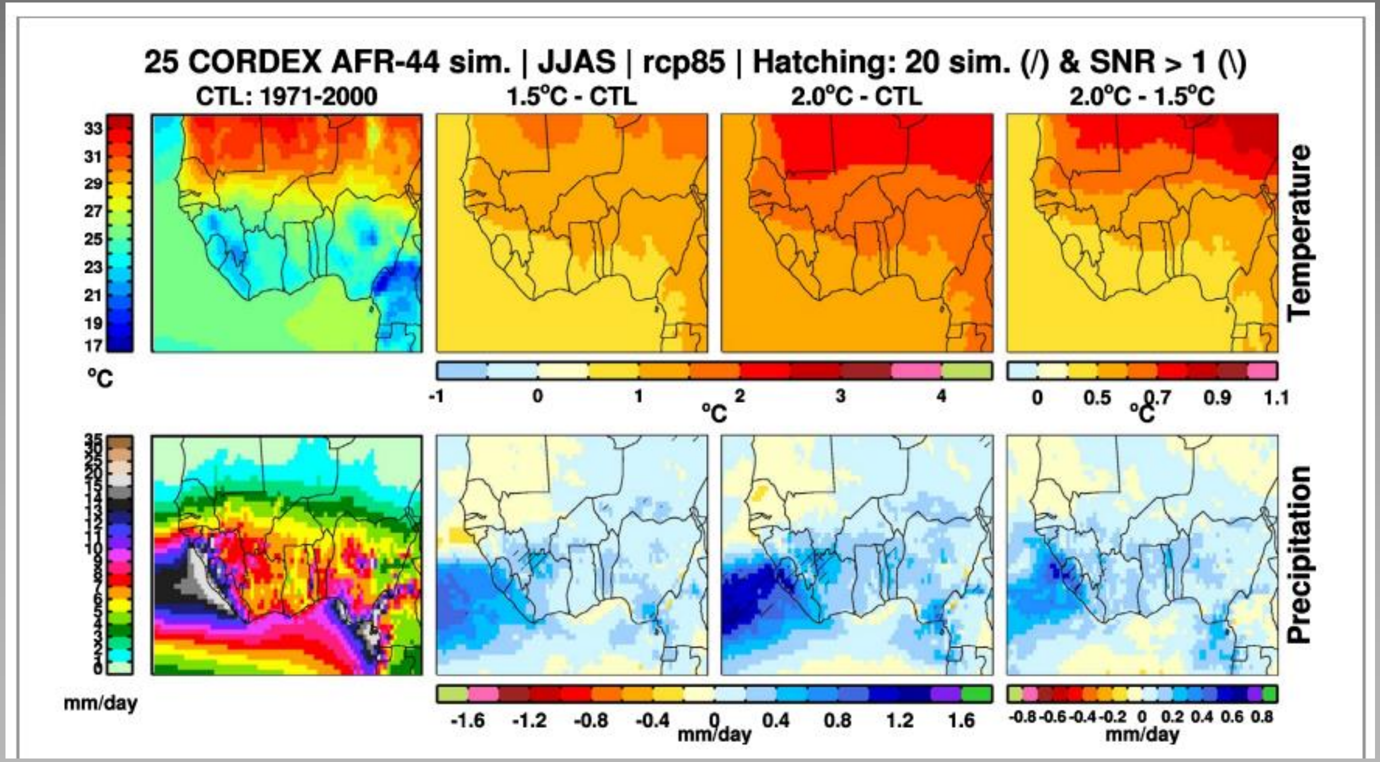
CLIMATE EXTREME EVENTS

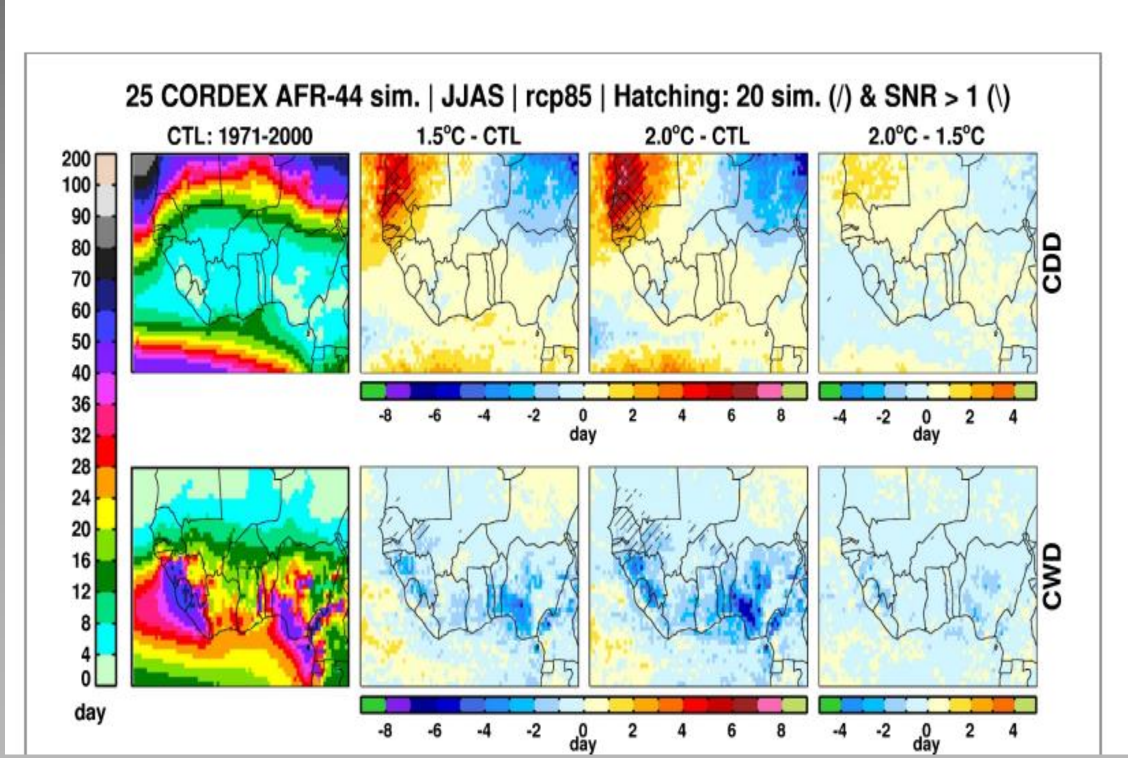
LETTER • OPEN ACCESS

Potential impact of 1.5 °C and 2 °C global warming on consecutive dry and wet days over West Africa

Nana Ama Browne Klutse[1,10], Vincent O Ajayi[2], Emiola Olabode Gbobaniyi[3], Temitope S Egbebiyi[4], Kouakou Kouadio[5], Francis Nkrumah[6], Kwesi Akumenyi Quagraine[4,6], Christiana Olusegun[2], Ulrich Diasso[7], Babatunde J Abiodun[4], Kamoru Lawal[8], Grigory Nikulin[3], Christopher Lennard[4] and Alessandro Dosio[9] — Hide full author list

Published 16 May 2018 • © 2018 The Author(s). Published by IOP Publishing Ltd
Environmental Research Letters, Volume 13, Number 5





Global monsoon systems: contribution

Open Access | Published: 04 June 2020

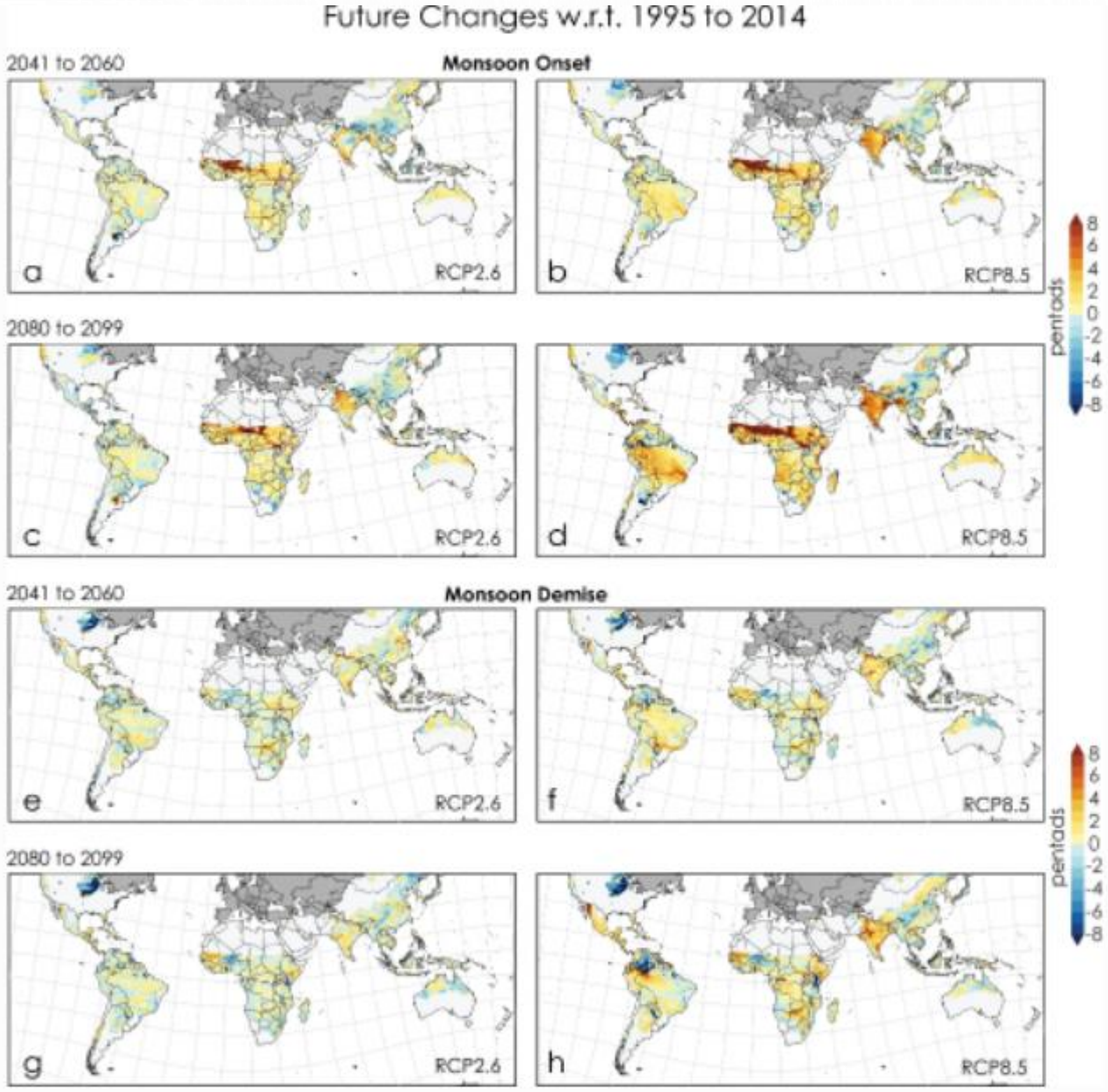
Robust late twenty-first century shift in the regional monsoons in RegCM-CORDEX simulations

Moetasim Ashfaq, Tereza Cavazos, Michelle Simões Reboita, José Abraham Torres-Alavez, Eun-Soon Im, Christiana Funmilola Olusegun, Lincoln Alves, Kesondra Key, Mojisola O. Adeniyi, Moustapha Tall, Mouhamadou Bamba Sylla, Shahid Mehmood, Qudsia Zafar, Sushant Das, Ismaila Diallo, Erika Coppola & Filippo Giorgi

Climate Dynamics **57**, 1463–1488 (2021) | Cite this article

Abstract

In the future period, regional monsoons exhibit a spatially robust delay in the monsoon onset, an increase in seasonality, and a reduction in the rainy season length at higher levels of radiative forcing.



Simulated projected changes in the monsoon onset (**a–d**) and demise (**e–h**) in the RCP2.6 (left column) and the RCP8.5 (right column). Changes are shown for the near-term (2041–2060) and the long-term (2080–2099) with respect to 1995–2014. White land areas are masked where observed seasonality is < 0.025. Results are not meaningful outside the monsoon regions

ON-GOING RESEARCH

CLIMATE EXTREME EVENTS: CONTRIBUTIONS

Original Article | Published: 14 May 2022

Evaluation of dry and wet spell events over West Africa using CORDEX-CORE regional climate models

Christiana Funmilola Olusegun, Oluwayomi Awe, Itunu Ijila, Opeyemi Ajanaku & Samuel Ogunjo

Modeling Earth Systems and Environment (2022) | Cite this article

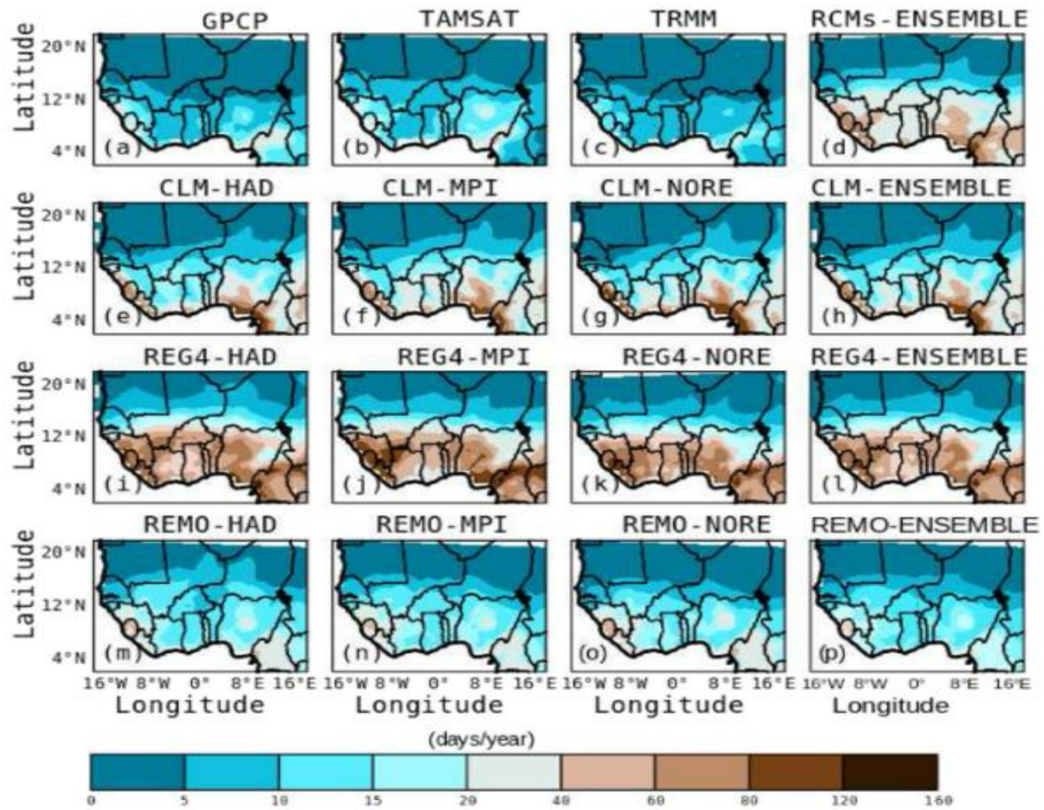
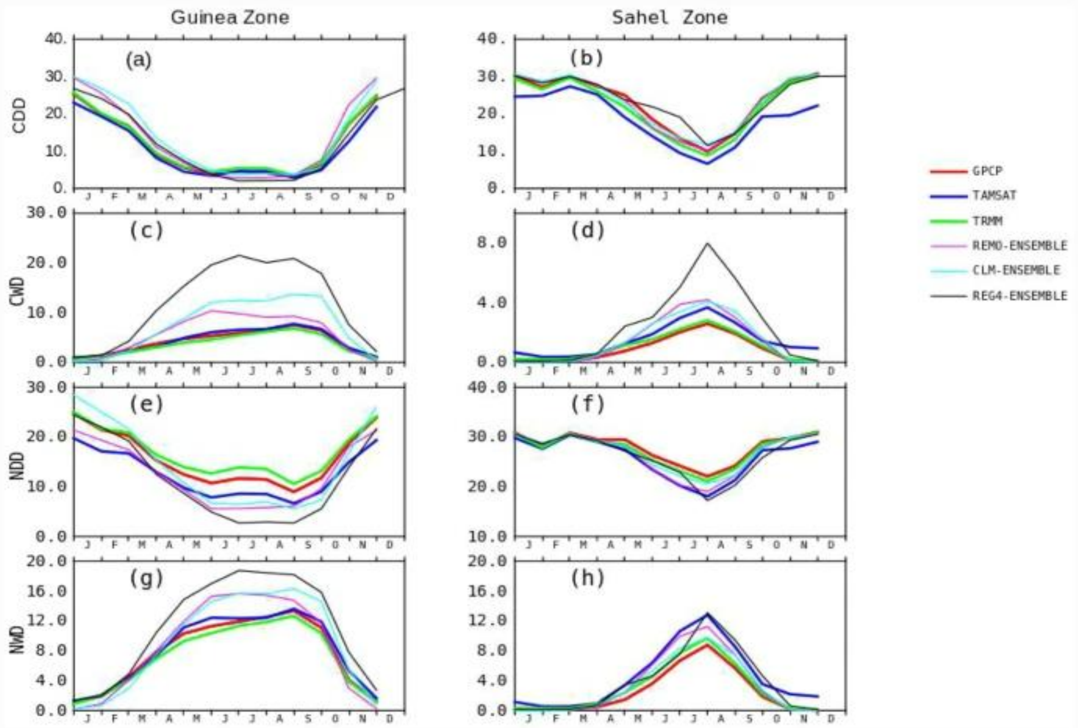


Fig. 2 Maximum consecutive wet days (days/year) from different observations (**a–c**), all RCMs ensemble (**d**), CLM RCMs (**e–g**), CLM RCMs ensemble (**h**), REG4 RCMs (**i–k**), REG4 RCMs ensemble (**l**), REMO RCMs ensemble (**m–o**), REMO RCMs ensemble (**p**) across the West African region all averaged for the period 1997-2014 with the exception of TRMM which is 1998–2014



Annual cycle of monthly averaged consecutive dry days (**a–b**); consecutive wet days (**c–d**); number of dry days (**e–f**); number of wet days (**g–h**) averaged along the Guinea (2° N – 12° N; 16° W – 16° E) and Sahel (12° N – 20° N; 16° W – 16° E) zones of West Africa averaged for the period 1997–2014

Other Accepted Articles in 2022

Evaluation of monthly precipitation data from three gridded climate data products over Nigeria

Samuel T. Ogunjo[a,*], Christiana F. Olusegun[c,b], Ibiyinka A. Fuwape[a]

[a] *Department of Physics, Federal University of Technology, Akure*
[b] *Department of Meteorology and Climate Science, West African Science Service Centre on Climate Change and Adapted Land Use (WASCAL), FUTA*
[c] *Department of Meteorology, Federal University of Technology, Akure*

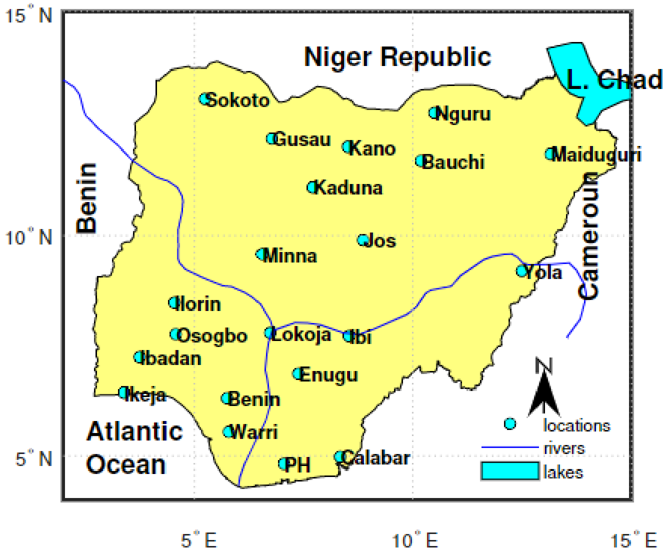


Figure 1: Map of study area showing the locations of the synoptic stations within Nigeria.

Table 3: Correlation (ρ) for the locations under investigation.

Location	ρ_{gpcc}	ρ_{noaa}	ρ_{udel}
Lokoja	0.92	0.91	0.93
Osogbo	0.87	0.88	0.90
Ikeja	0.79	0.78	0.52
Yola	0.83	0.85	0.85
Jos	0.77	0.79	0.80
Minna	0.70	0.75	0.74
Maiduguri	0.87	0.88	0.88
Nguru	0.87	0.88	0.63
Gusau	0.90	0.94	0.92
Sokoto	0.79	0.82	0.80
Kaduna	0.91	0.92	0.93
Kano	0.92	0.88	0.90
Bauchi	0.91	0.91	0.92
Ilorin	0.90	0.88	0.90
Ibi	0.72	0.69	0.37
Ibadan	0.76	0.77	0.50
Benin	0.90	0.88	0.41
Warri	0.78	0.83	0.30
Port Harcourt	0.72	0.78	0.39
Enugu	0.71	0.76	0.40
Calabar	0.68	0.76	0.40

Sample size=162

Submitted

Evaluation of High Resolution (25 km) Coupled Model Intercomparison Project Phase 6 (CMIP6) on extreme monsoon precipitation over West Africa

Christiana Funmilola Olusegun[1,2*], Adeyemi Olusola[3,4†], Samuel Ogunjo[5†] and Iwona Stachlewska[1]

[1]Faculty of Physics, University of Warsaw, ul. Pasteura 5, Warsaw, 02-093, Warsaw Poland.
[2]Doctoral Research Program - West African Climate System (DRP-WACS), West African Science Service Centre on Climate Change and Adapted Land Use (WASCAL), Federal University of Technology, Ilesha-Owo Expressway, Akure, 340001, Ondo State, Nigeria.

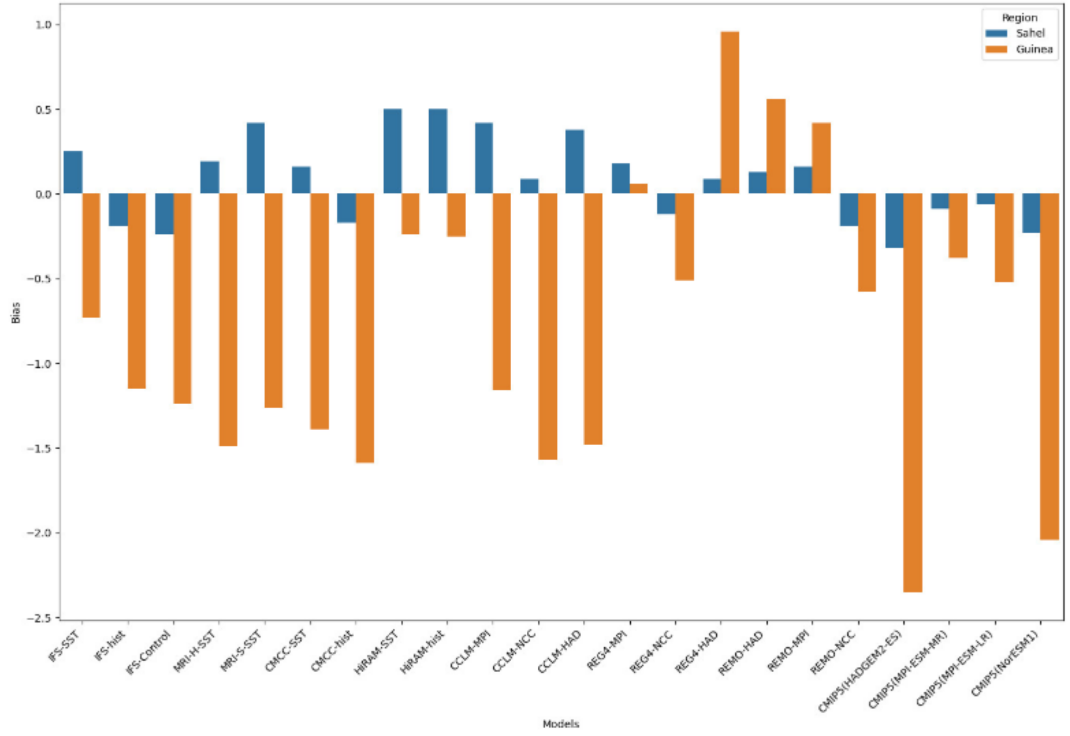


Fig. 6 RX20mm biases from HighResMIP, CORDEX-CORE RCMs and its driving GCMs for the period 1997 2014 relative to Chirps Units: days

Evolution and copula modelling of drought duration and severity over Africa using CORDEX-CORE regional climate models

C. F. Olusegun[a], S. T. Ogunjo[b,*] and Adeyemi Olusola[c]

[a] *University of Warsaw, Faculty of Physics, ul. Pasteura 5, Warsaw, 02-093, Poland*
[b] *Department of Physics, Federal University of Technology Akure, Akure, 340001, Ondo State, Nigeria*
[c] *Department of Geography, University of the Free State, Bloemfontein, Free State, South Africa*

ARTICLE INFO

Keywords:
CORDEX-CORE
COPULA modelling
Drought
Severity

ABSTRACT

This study assessed the dependance of drought severity and duration across 4 sub-regions (Southern, Western, Eastern and Central) in Africa using copula modelling. The analysis were carried out for the reference period 1991-2020 and future period 2071 -2099. Simulated daily precipitation at a horizontal resolution of 0.22^o were obtained from three regional climate models (RCMs) participating in the Coordinated Output for Regional Evaluations within the Coordinated Regional Downscaling Experiment (CORDEX-CORE). The RCMs were downscaled by 3 global climate models and validated using three high resolution gridded daily precipitation products obtained from The Climate Hazards Group InfraRed Precipitation with Stations data (CHIRPS), Climate Prediction Center Africa Rainfall Climatology Version 2.0 (CPC-ARC2) and Tropical Applications of Meteorology using SATellite data and ground-based observations (TAMSAT). The analysis consideref two families of copulas: Archimedean (Frank, Clayton, Gumbel) and Elliptical (Gaussian, Student-t). The performance of the copula functions were estimated using the Akaike Information Criteria (AIC). Generally, there is a good agreement in the distribution of observed precipitation among the three observational data products across the subregion of Africa, with slight differences attributed to the different processing algorithms of the products. Across West Africa, mean precipitation values from CPC, CHIRPS, and TAMSAT were found to be 2.86, 3.16, and 3.07 mm/day respectively. The CCLM-NCC underestimated the mean values of precipitation reported in the observation data while CCLM-MPI and CCLM-HAD overestimated the mean values of precipitation in the West Africa region.

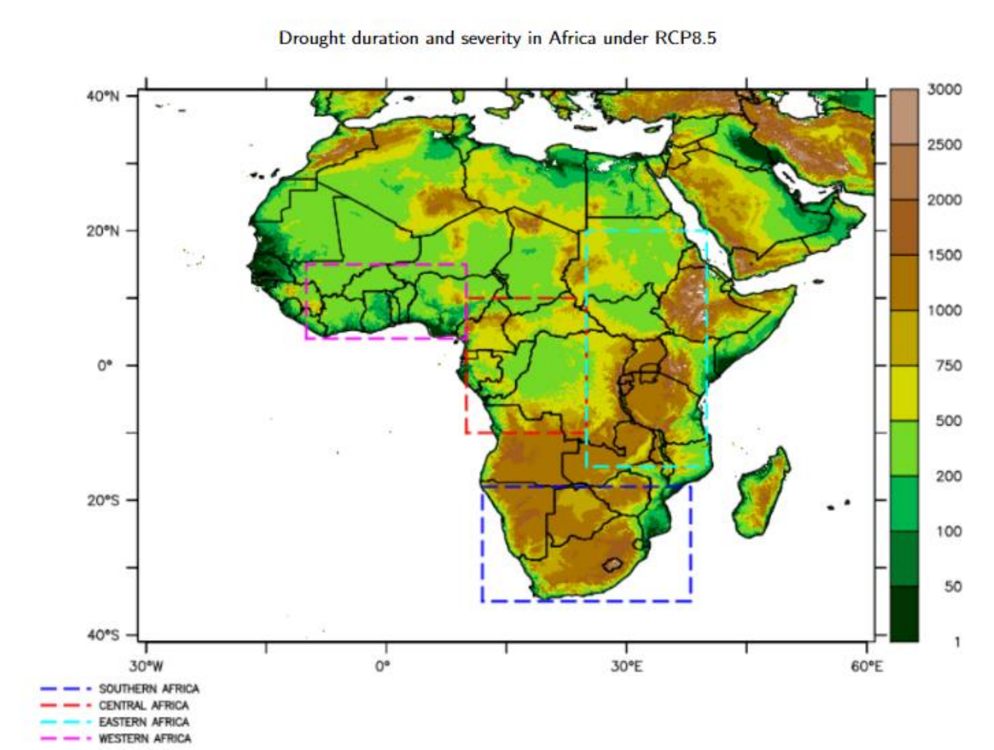


Table 3

Correlation values of drought duration - severity from CORDEX-CORE models in different regions of Africa.

Model	Model	Historical WA	Historical EA	Historical SA	Historical CA	Forecast WA	Forecast EA	Forecast SA	Forecast CA
OBS	CHIRPS	0.93	0.94	0.96	0.98				
	TAMSAT	0.99	0.99	0.97	0.97				
	CPC	0.99	0.97	0.92	0.98				
REMO	HAD	0.85	0.92	0.94	0.70	0.94	0.95	0.91	0.78
	MPI	0.98	0.86	0.94	0.96	0.96	0.96	0.97	0.98
	NCC	0.98	0.94	0.98	0.96	0.87	0.98	0.98	0.97
CCLM	HAD	0.91	0.92	0.94	0.78	0.95	0.96	0.96	0.95
	MPI	0.97	0.86	0.97	0.99	0.97	0.89	0.97	1.00
	NCC	0.94	0.94	0.86	0.88	0.96	0.98	0.98	0.95
REG	HAD	0.92	0.93	0.96	0.67	0.92	0.96	0.91	0.70
	MPI	0.95	0.94	0.95	0.94	0.93	0.82	0.97	0.85
	NCC	0.96	0.93	0.97	0.97	0.97	0.85	0.98	0.99

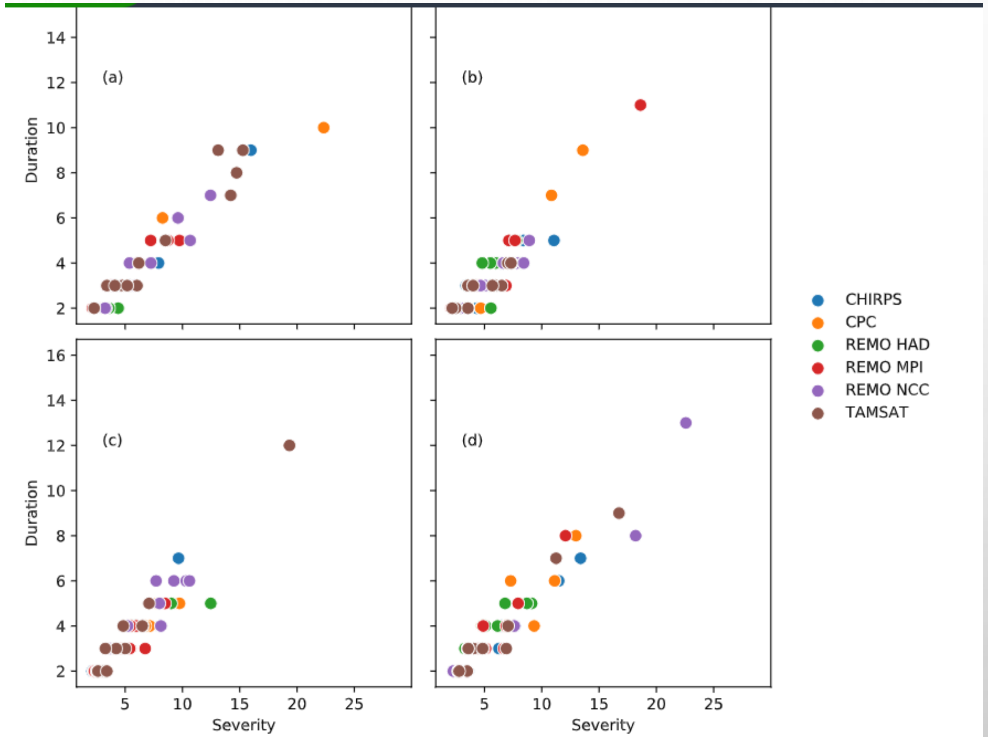


Figure 4: Comparison of duration-severity graphs for REMO based models in (a) Central Africa (b) Western Africa (c) Eastern Africa, and (d) Southern Africa

Potential of Using Floating Solar Photovoltaic and Wind Farms for Sustainable Energy Generation in an Existing Hydropower Station in Sub-Saharan Africa

Samuel T. Ogunjo[a], Adeyemi O. Olusola[b,*], Christiana F. Olusegun[c,d]

[a]*Department of Physics, Federal University of Technology, Akure, Ilesha-Owo Expressway, Akure, 340001, Ondo State, Nigeria*
[b]*Department of Geography, University of the Free State, Bloemfontein, Free State, South Africa*
[c]*Doctoral Research Program - West African Climate System (DRP-WACS), West African Science Service Centre on Climate Change and Adapted Land Use (WASCAL), Federal University of Technology, Akure, Ilesha-Owo Expressway, Akure, 340001, Ondo State, Nigeria*
[d]*Faculty of Physics, University of Warsaw, ul. Pasteura 5, Warsaw, 02-093, Warszawa, Poland*

GeoHealth

Research Article | Open Access

The Role of Meteorological Variables and Aerosols in the Transmission of COVID-19 During Harmattan Season

S. Ogunjo, O. Olaniyan, C.F. Olusegun, F. Kayode, D. Okoh, G. Jenkins

First published: 28 January 2022 | https://doi.org/10.1029/2021GH000521

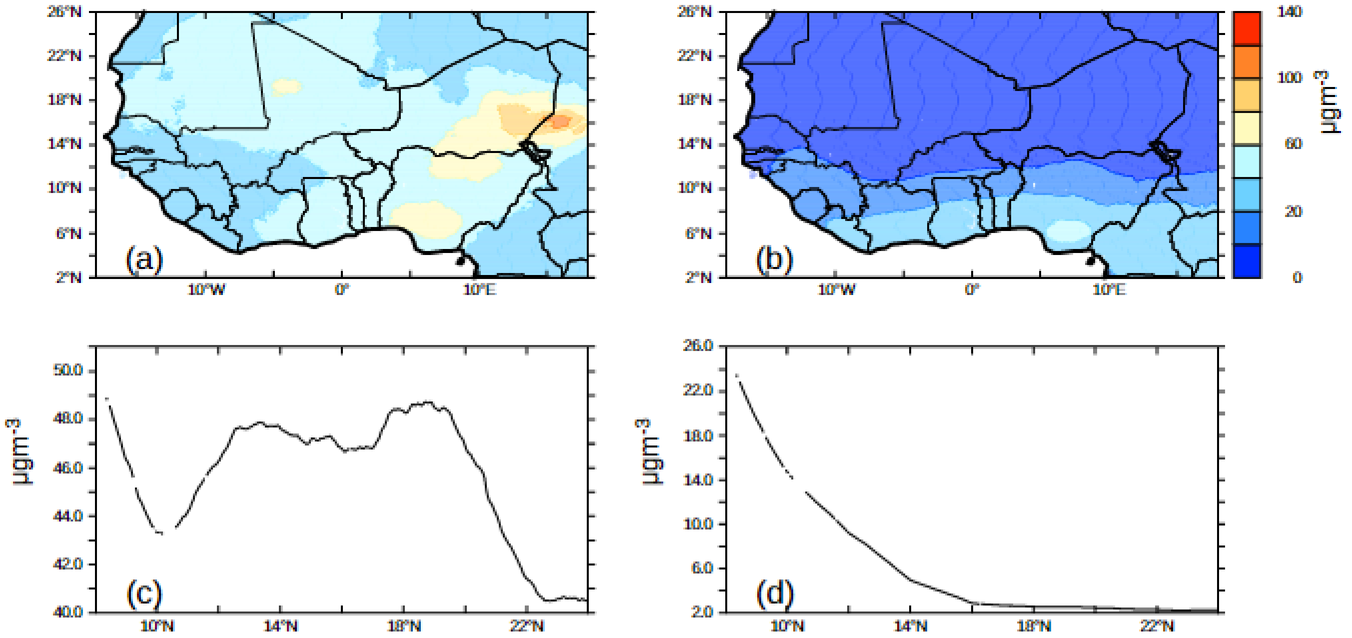
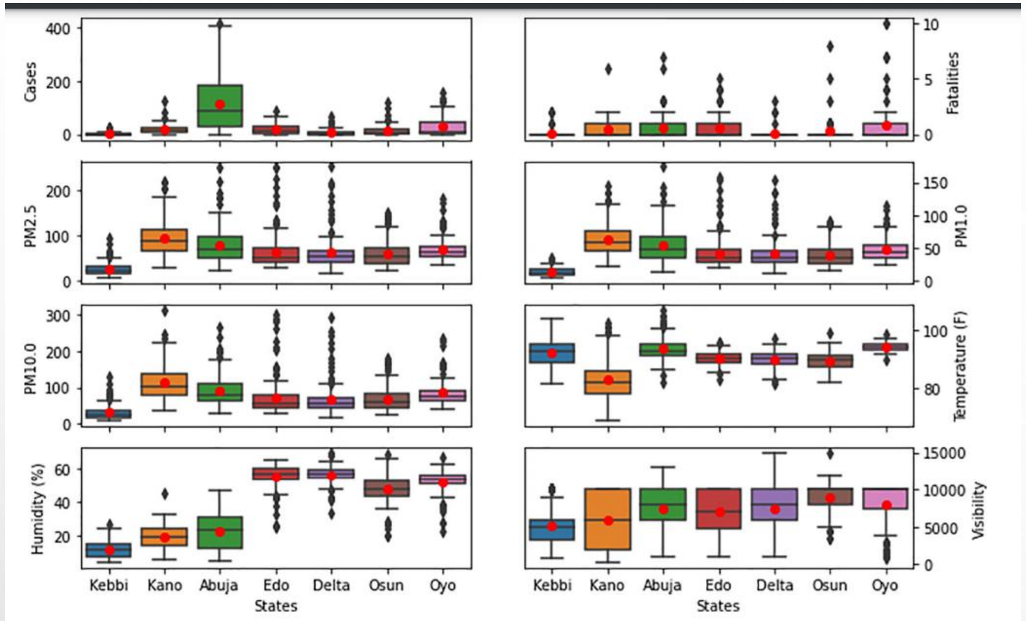
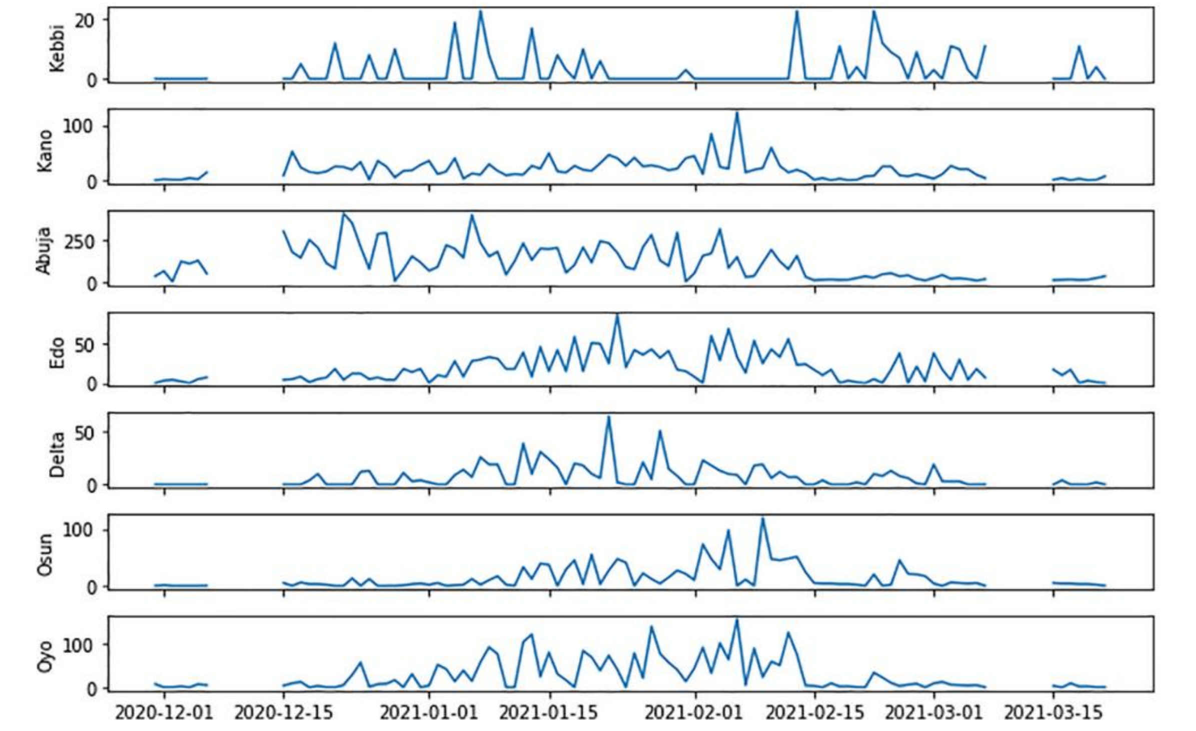
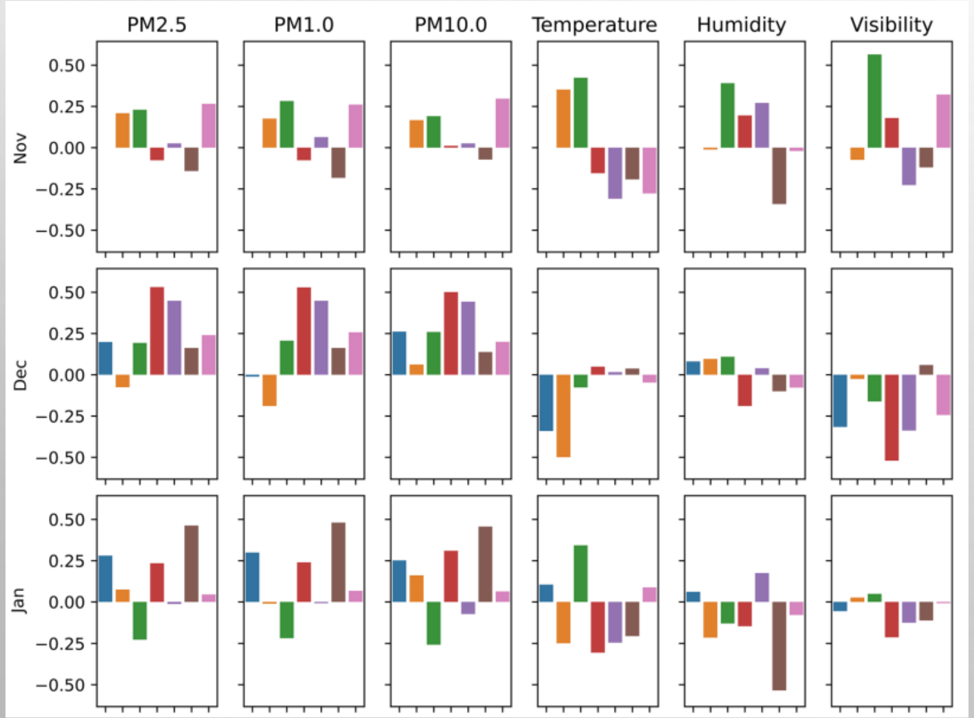


Figure 1. PM2.5 horizontal distribution (a–b) and latitudinal variation (c–d) averaged over 10°W to 10°E across West Africa. LHS shows PM2.5 with Dust and Sea Salt and RHS shows PM2.5 without Dust and Seasalt.





gure 4. Temporal variation of COVID-19 cases at different locations for the period under consideration.



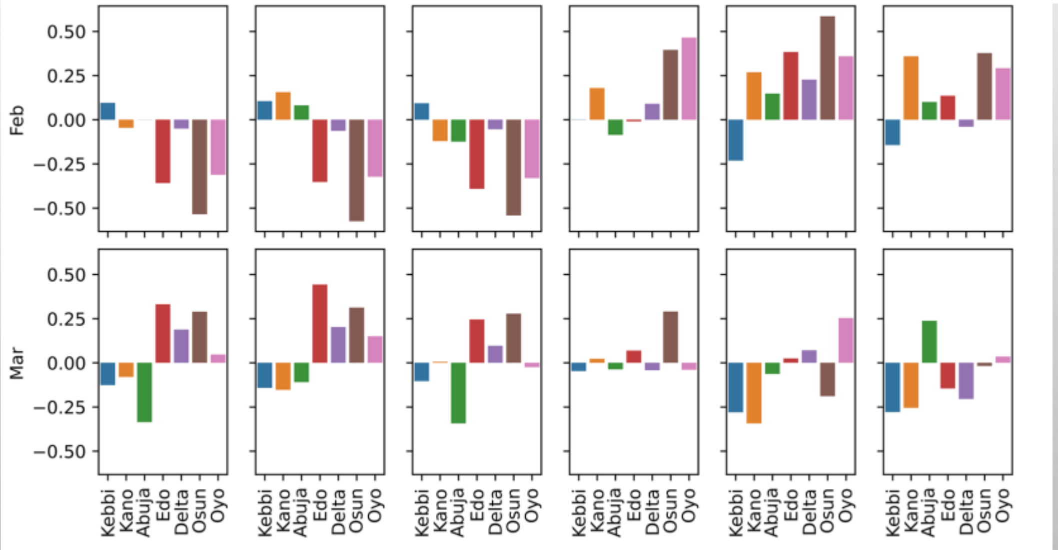


Figure 6. Monthly correlation between COVID-19 cases and selected parameters.

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FUTURE OUTLOOK

- TRAINING MORE WOMEN IN WEST AFRICA
- PROVIDING TRAINING AND DESIGNING CURRICULUM FOR HIGH SCHOOL ON CLIMATE CHANGE MITIGATION
- DEPLOYING LOW-COST WEATHER MEASURING STATIONS ACROSS WEST AFRICA

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