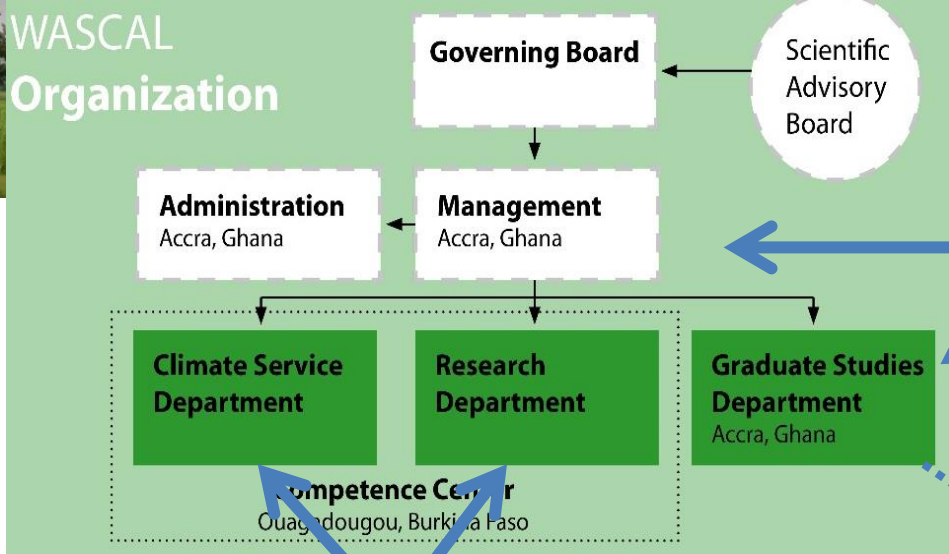


About WASCAL.org



WASCAL, Accra Office (Ghana)



Research & services development

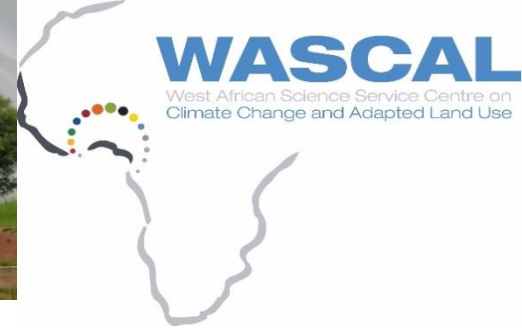


WASCAL, Ouagadougou interim building (Burkina Faso)

10 graduate studies programs (PhD, Msc) in 10 leading West African Universities



WASCAL



***PREFACE-PIRATA-CLIVAR Tropical Atlantic Variability Conference
28th of November – 01st of December 2016, Paris, France***

**Projected changes in climate zones over West Africa for the late 21st
Century**

Presented by:

Mouhamadou Bamba Sylla

**West African Science Service Center on Climate Change and Adapted Land Use
(WASCAL), WASCAL Competence Center, Ouaga, Burkina Faso**

Contributors: Nellie Elguindi, Dominik Wisser, Filippo Giorgi

SPONSORED BY THE



Federal Ministry
of Education
and Research

I/ Background and Motivation

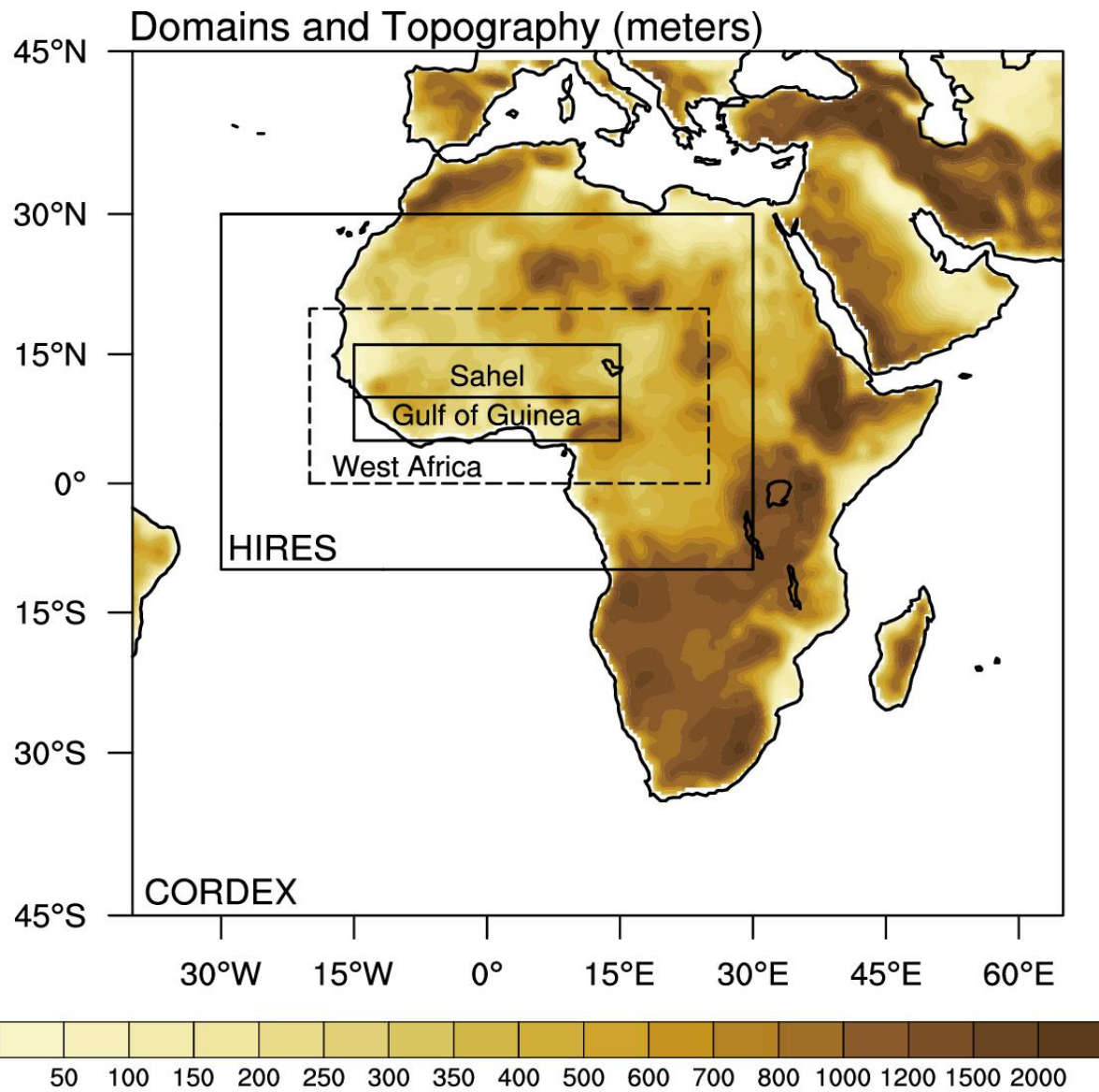


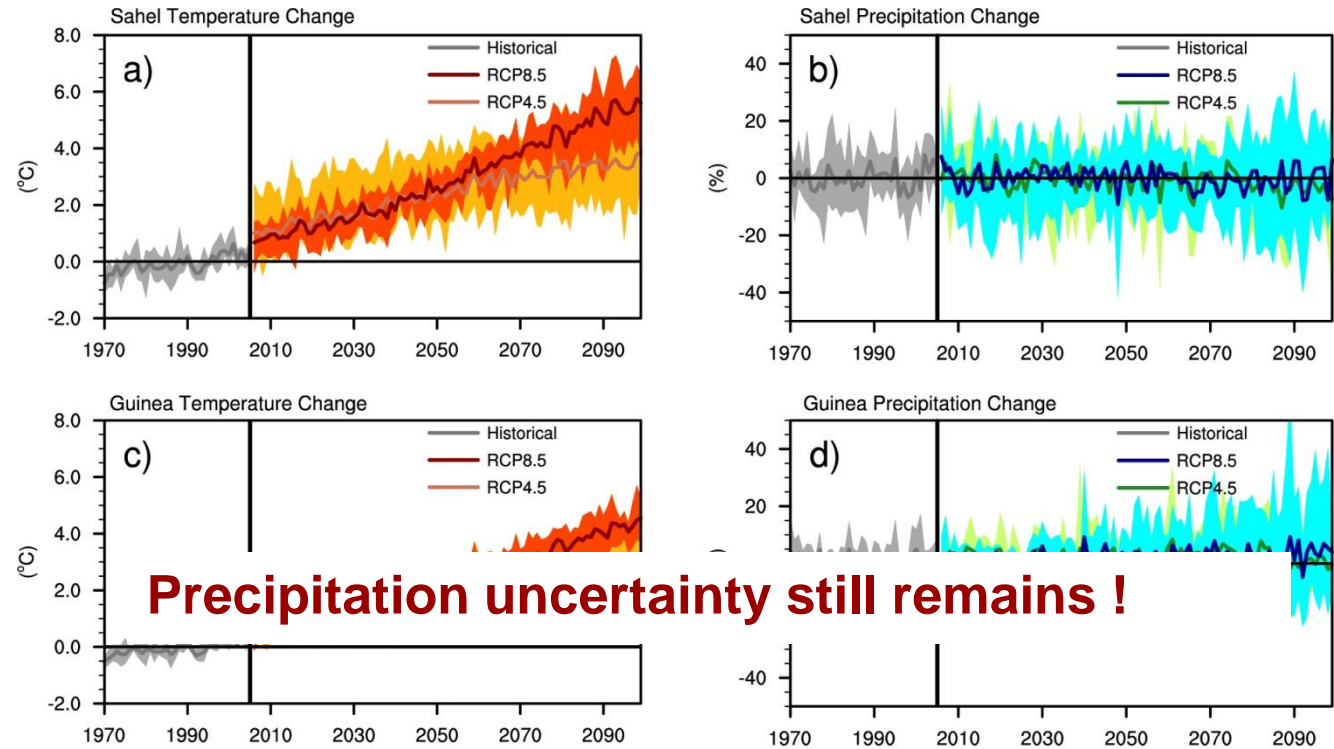
Figure 1

I/ Background and Motivation ...

CORDEX

➤ IPCC (2013):

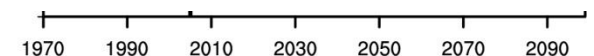
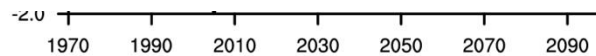
- Acceleration of future warming
- Large uncertainties in precipitation change



➔ Combining temperature and Precipitation --- Climate Classification

Is there any consistent pattern that emerges for the future?

What's the added value by CORDEX?



II/ Experiment and Data Description

CMIP5	CanRCM4	RegCM4	CCLM4	RCA4	RACMO22T	HIRHAM5	HIRES-RegCM4
BNU-ESM							
CSIRO-Mk3							
EC-EARTH			&	&	&	&	
GFDL-ESM2M				&			&
HadGEM2-ES		&	&	&			&
IPSL-CM5A-MR							
MIROC-ESM				&			
MPI-ESM-MR		&	&	&			&
CESM1-CAM5							
Nor-ESM1-M				&			
CNRM-CM5			&	&			
CanESM2	&			&			

III/ Methods

➤ Thornthwaite climate classification

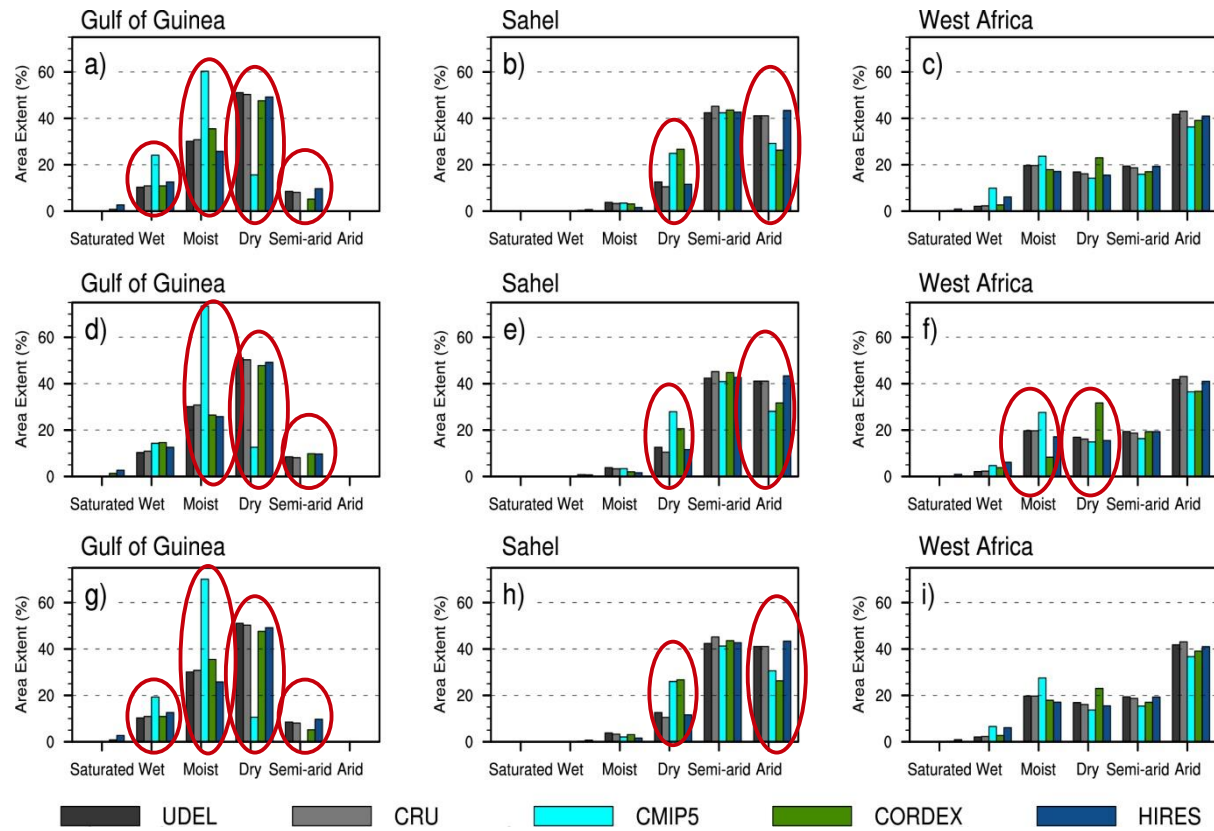
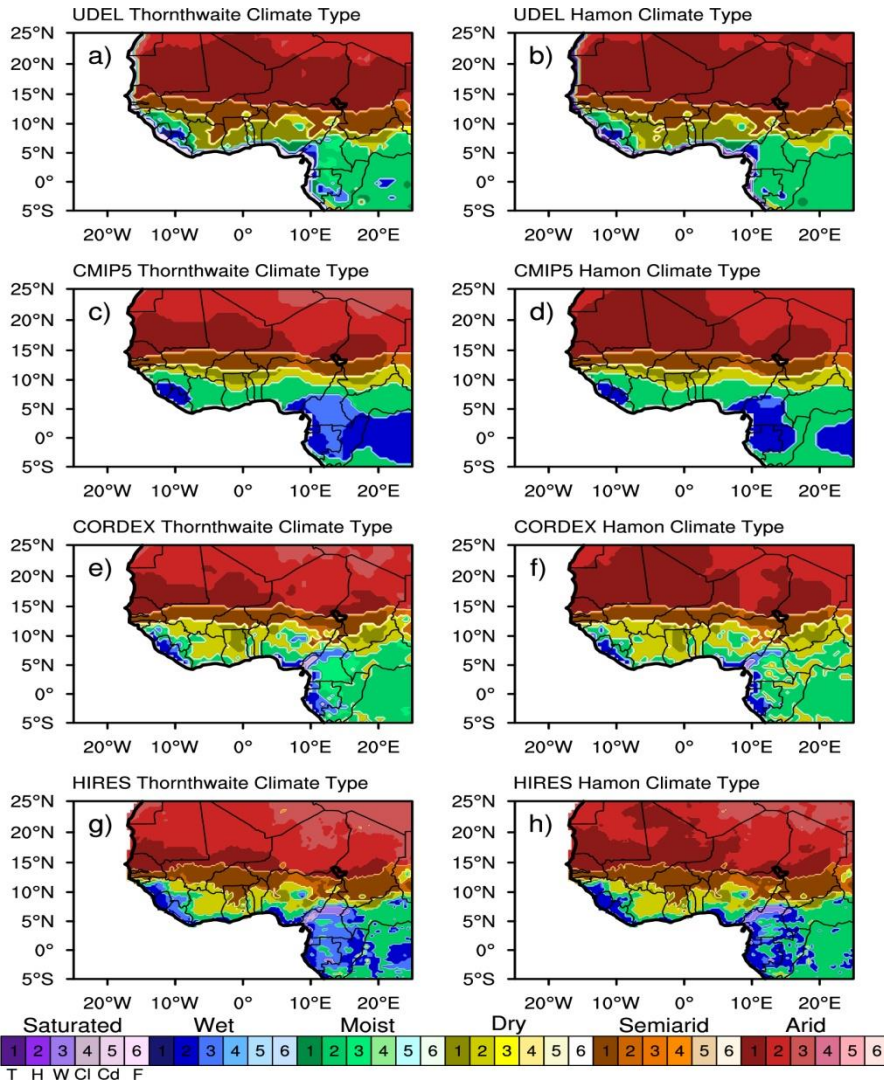
- Thermal Factor: Potential Evapotranspiration

- Moisture Factor:
$$\left\{ \begin{array}{l} P/PE - 1 \text{ if } P < PE \\ 1 - PE/P \text{ if } P > PE \end{array} \right.$$

Thermal Classification		Moisture Classification	
Thermal Type	Thermal Index	Moisture Type	Moisture Index
Torrid	> 1,500	Saturated	0.66 – 1.00
Hot	1,200 – 1,500	Wet	0.33 – 0.66
Warm	900 – 1,200	Moist	0.00 – 0.33
Cool	600 – 900	Dry	-0.33 – 0.00
Cold	300 – 600	Semi-arid	-0.66 – -0.33
Frigid	0 – 300	Arid	-1.00 – -0.66

IV/ Results

✓ Present-day: 1975-2004



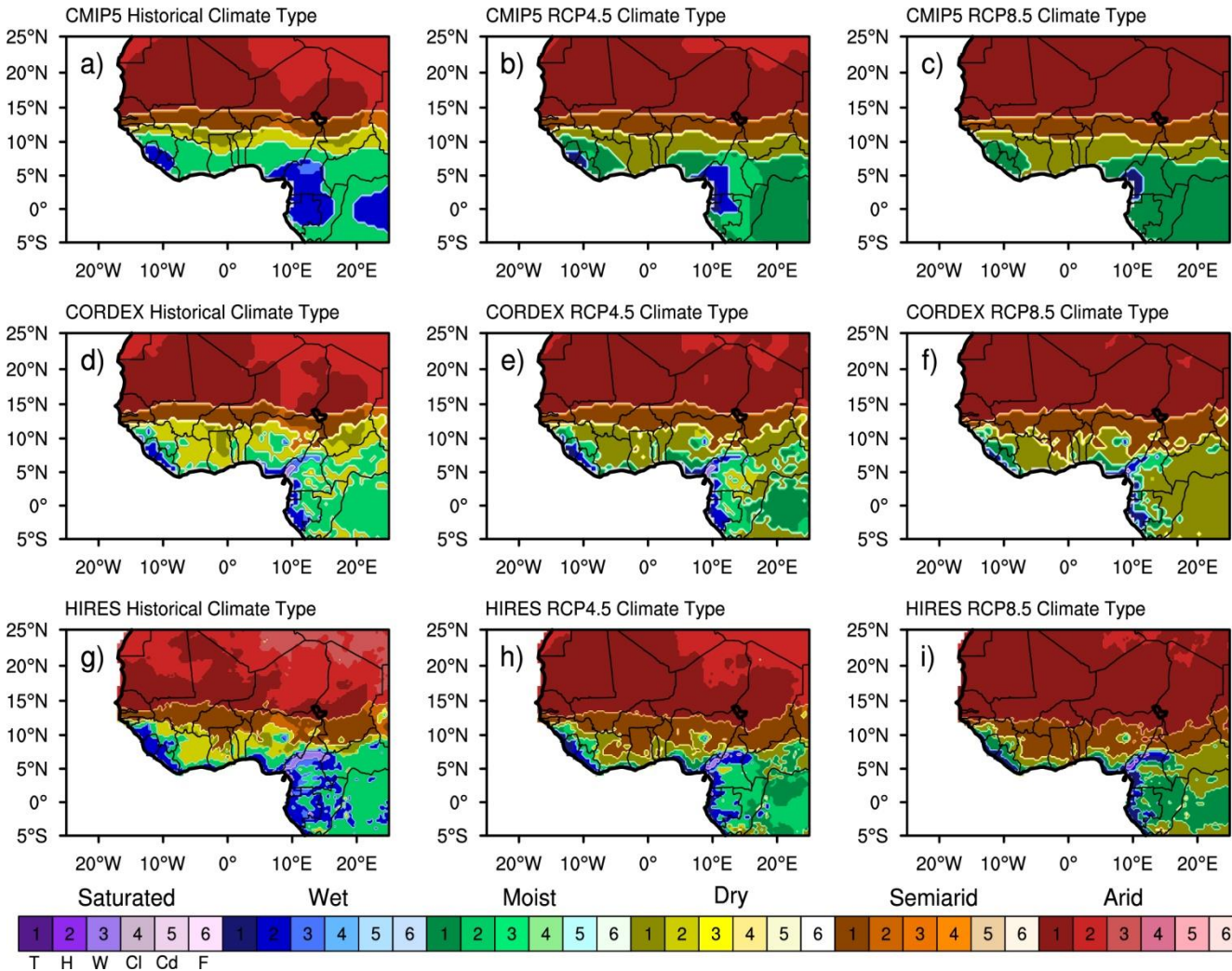
- General pattern captured – Hamon more consistent
- Ensemble types and sizes are consistent:
 - Gulf of Guinea: mostly dry, few areas moist
 - Sahel: both semiarid and arid, few areas dry
 - West Africa: arid at 40% with 20% wet, dry and semiarid

- Added Value?

Sylla et al. 2016 [Climatic Change]

III/ Results

✓ Late 21st Century: 2080-2099 spatial patterns



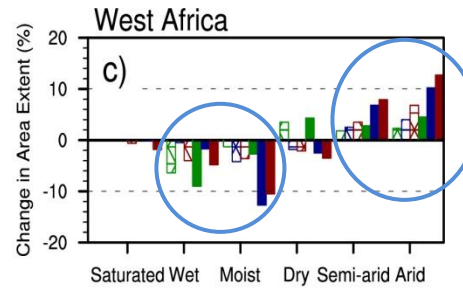
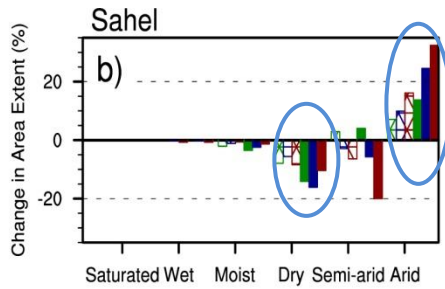
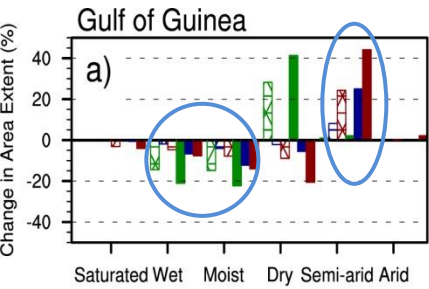
- Generalized torrid climates
- More extended arid conditions
- Shift and extension of semiarid band

**Shifts more pronounced in HIRRES
– the role of resolution –**

Sylla et al. 2016 [Climatic Change]

III/ Results

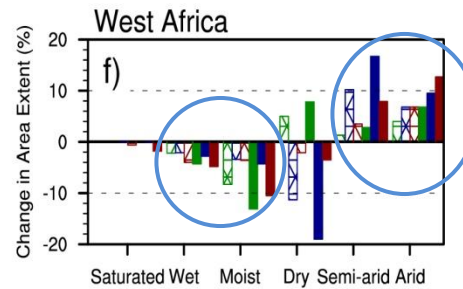
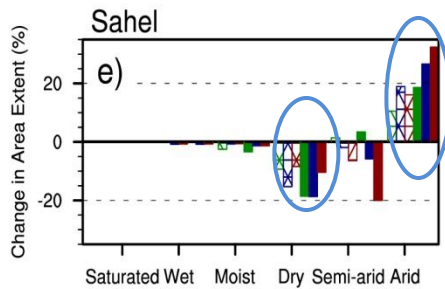
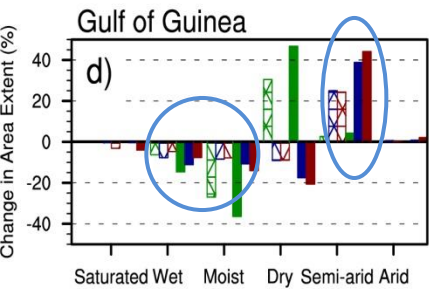
✓ Late 21st Century: 2080-2099 quantitative assessment



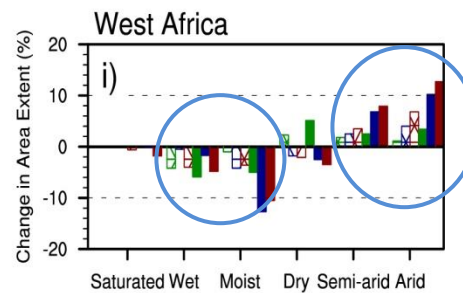
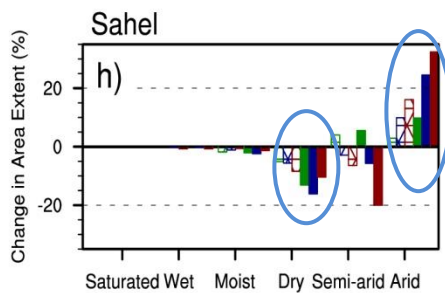
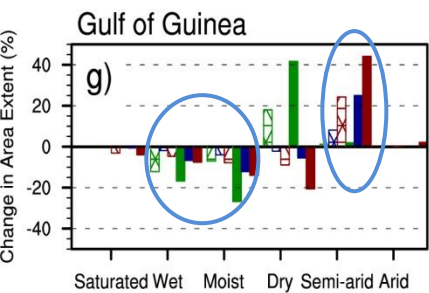
→ Guinea: Increased semiarid

→ Sahel: Increased arid

→ West Africa: arid and semiarid



→ Recession of wet, moist, dry



→ Sensitive to number of models and bias

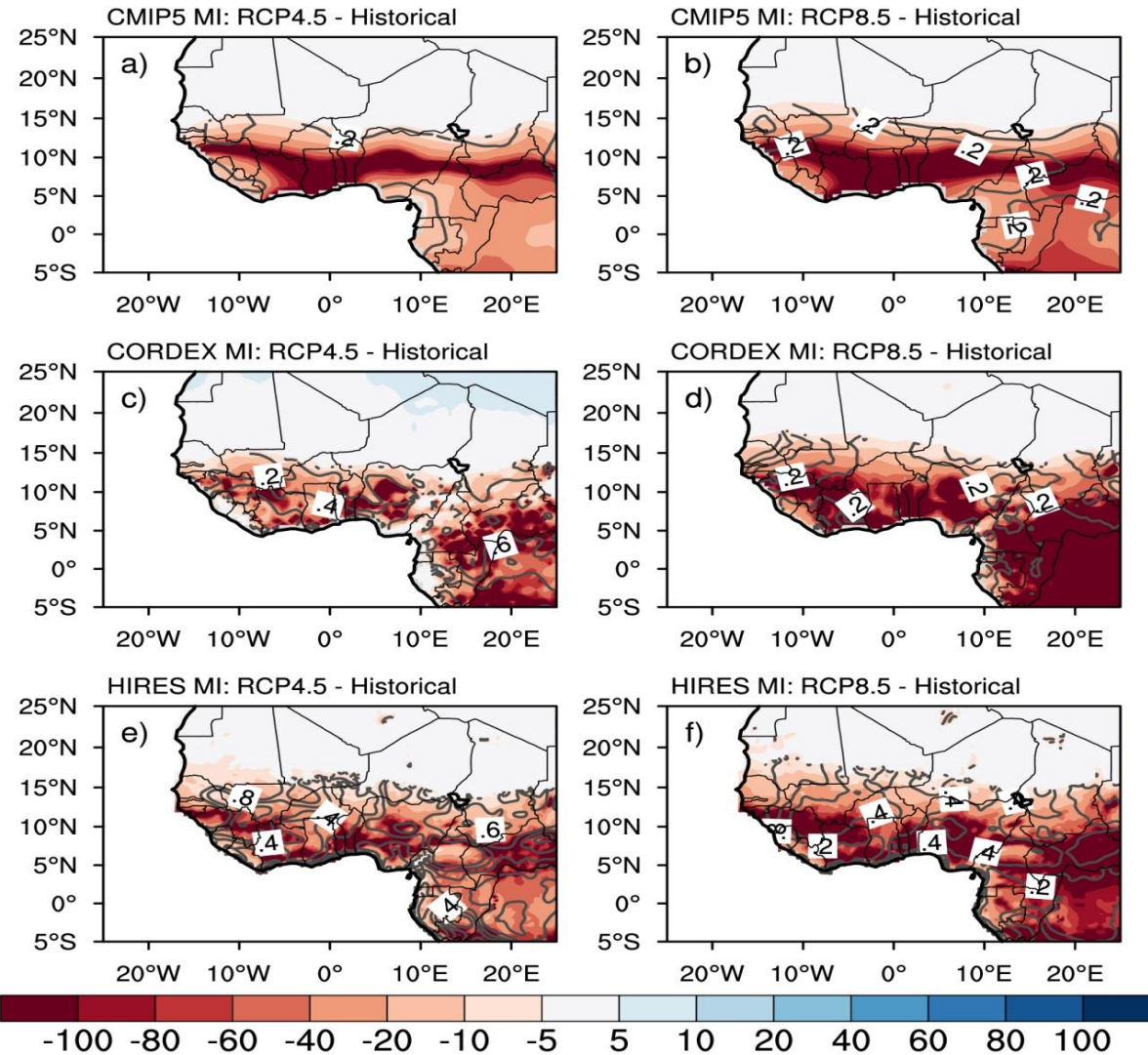
→ Uncertainties

■ CMIP5
 ■ CORDEX
 ■ HIRES

Sylla et al. 2015 [Climatic Change]

III/ Results

✓ Late 21st Century: 2080-2099 cause of the shifts



← Change in moisture component

← Ratio between $\Delta P / \Delta PE$



Temperature is the primary driver

Other Topics of interests

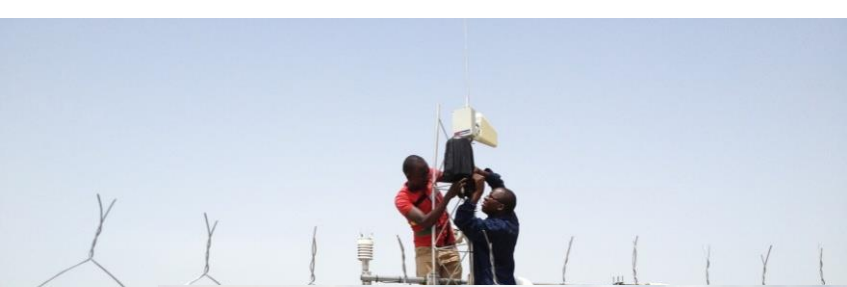
- Rainy season characteristics (onset, length, withdrawal)
- Extreme events: High intensity precipitation events occurrences
- Intra-seasonal dry spells and wet spells
- Droughts
- Marine climate

Thank you for your attention

SPONSORED BY THE



Federal Ministry
of Education
and Research



www.wascal.org

WASCAL

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