



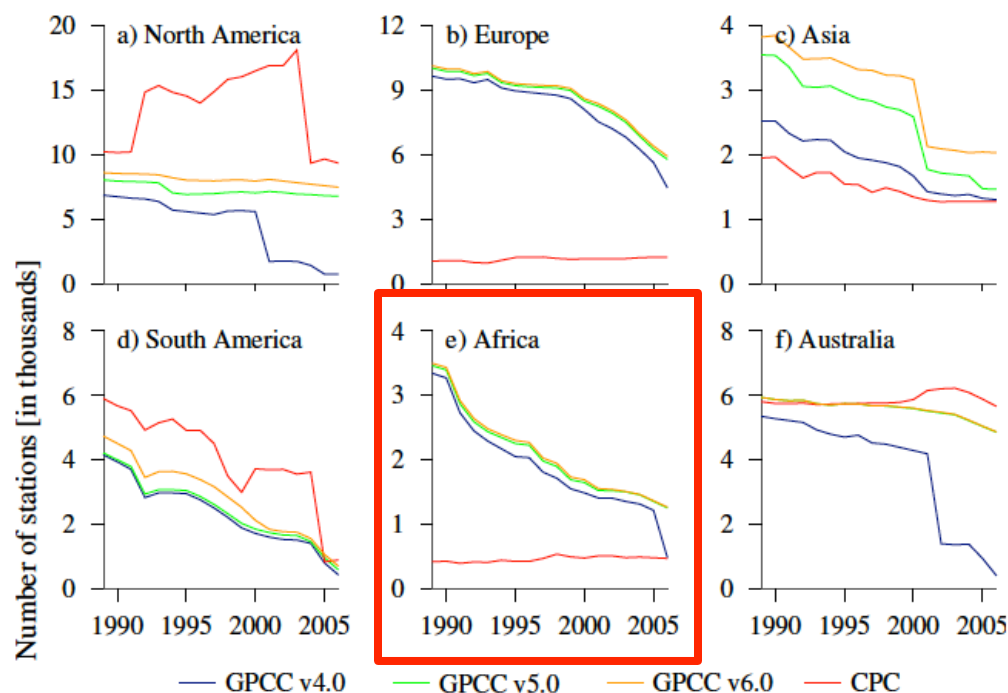
Climate Observation Networks, Research and Capacity Building within the *West African Science Service Centre on Climate Change and Adapted Land Use* (WASCAL)

Harald Kunstmann

with P. Vlek, J. Omotosho, B. Boubacar, M. Ouattara, A. Sarr,
J. Bliefernicht, L. Hingerl, G. Steup, I. Hamann, C. Richter, and M. Denich

Network Densities Decreasing Worldwide

Number of stations [in thousands] per continent



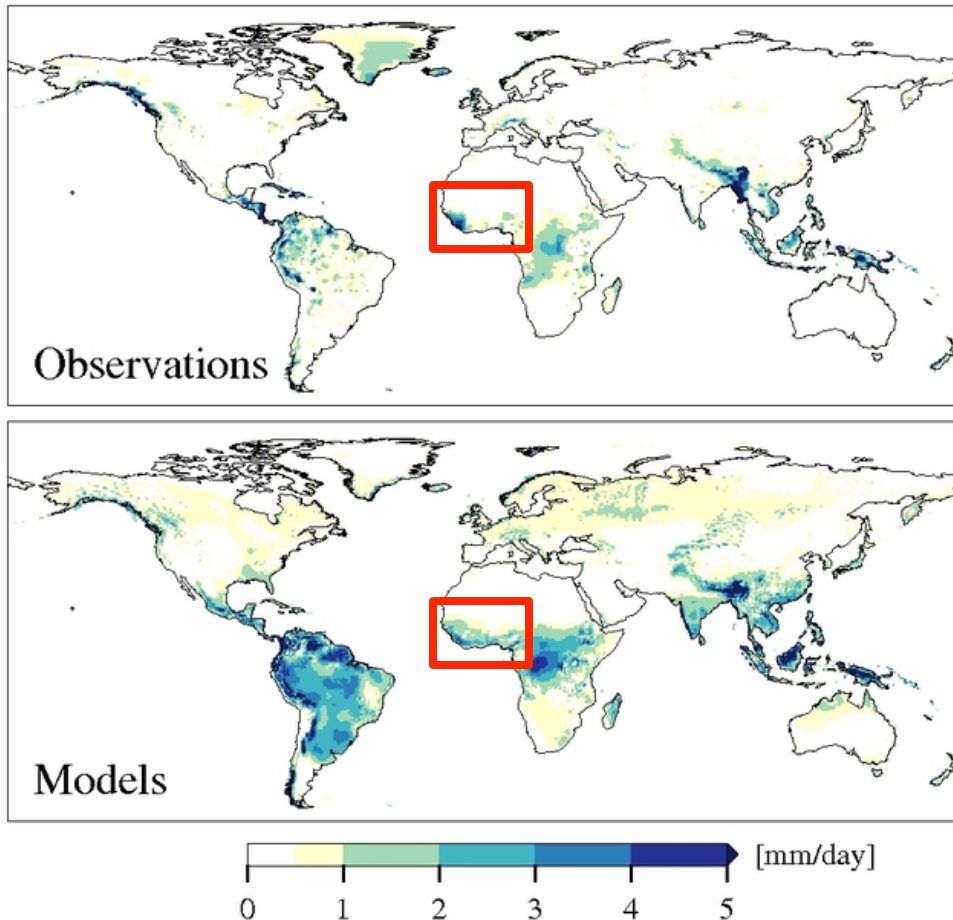
Continent	Area [10^6 km^2]
North America	19.3
Europe	5.7
Asia	37.4
South America	17.8
Africa	30.0
Australia	7.7

→ **Caution necessary when these gridded products are used for validation in climate studies**

... and particularly in Africa!

(Lorenz and Kunstmann, 2012, *Journal of Hydrometeorology*)

Large Scale Water Cycle: Still big Differences within Observation Datasets & Reanalyses



Uncertainty in water balance expressed by ensemble range:

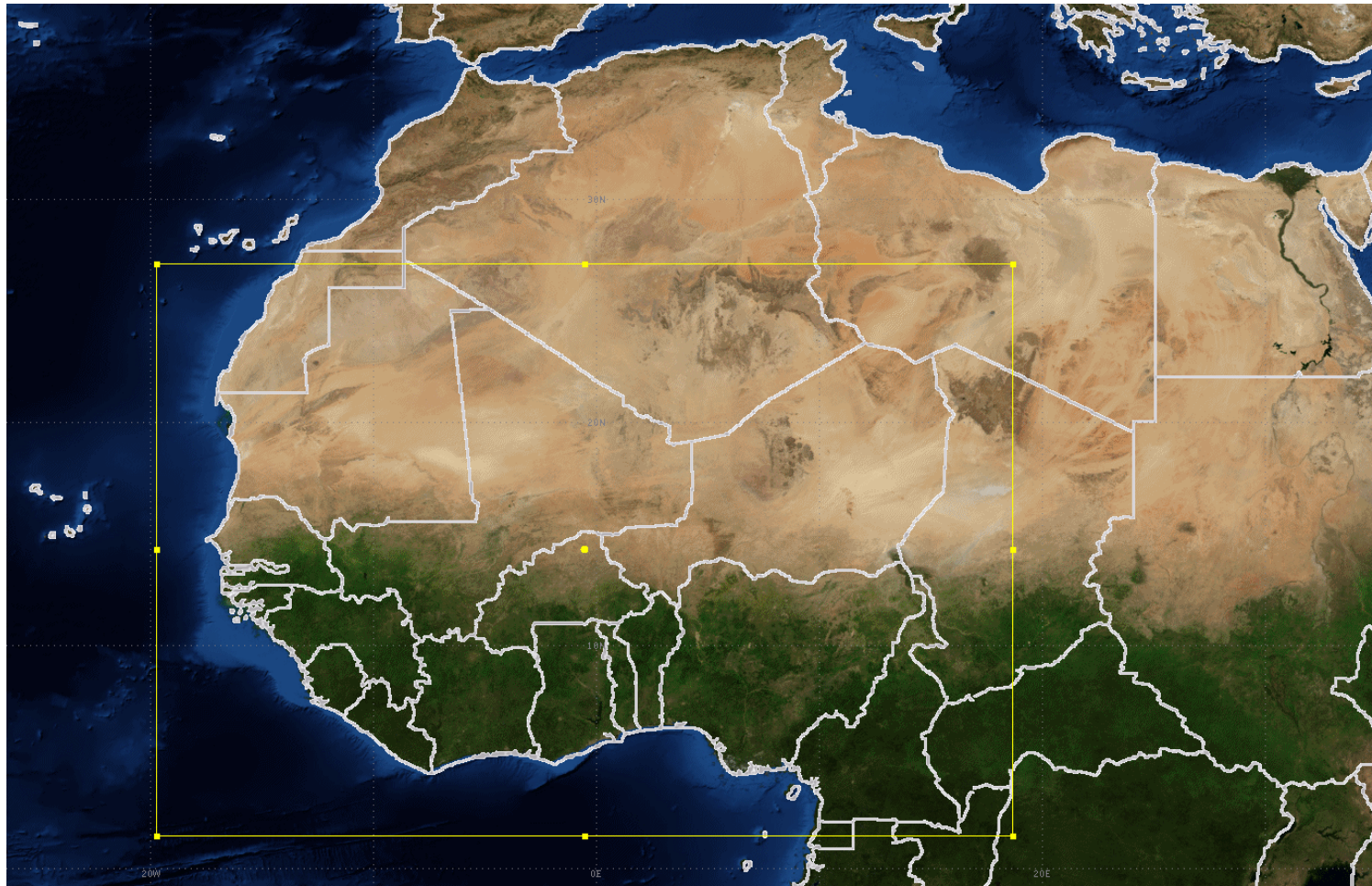
1) Precipitation observation ensemble:
GPCC, GPCP, CPC, CRU, DEL

2) Reanalysis ensemble:
ERA-Interim, MERRA, CFSR

→ Again: Caution necessary

(Lorenz and Kunstmann, 2012, *Journal of Hydrometeorology*)

WASCAL Window



Climate Change in West Africa

- Increase in temperature

In selected regions:

- Decrease in rainfall?
- Higher variability in rainfall?
- Higher frequency of weather extremes?
- Prolongation of the dry season?
- Onset of the rainy season more variable?
- More dry spells during the rainy season?

Climate Change Adaptation

Adjustment of natural or human systems in response to climate change

- to moderate potential damage or
- to cope with the consequences

Adaptation is the most important strategy for developing countries as results can be achieved directly

Adaptation Measures in Agriculture

- Change of planting/sowing dates
- Irrigation
- Adapted tillage methods
- Change of crop species
- Adapted crop varieties



WASCAL

- aims at strengthening the capacities and competences in research, education & policy making of West-African countries
- ... to deal with issues of climate change through adapted land use on a scientific basis
- ... in partnership with German institutions (research institutes & universities)

WASCAL: the Three Pillars

OBSERVATION NETWORK

&

COMPETENCE CENTRE

CORE

RESEARCH

PROGRAM

GRADUATE

RESEARCH

SCHOOLS

Preparatory phase: July 2010 - September 2012

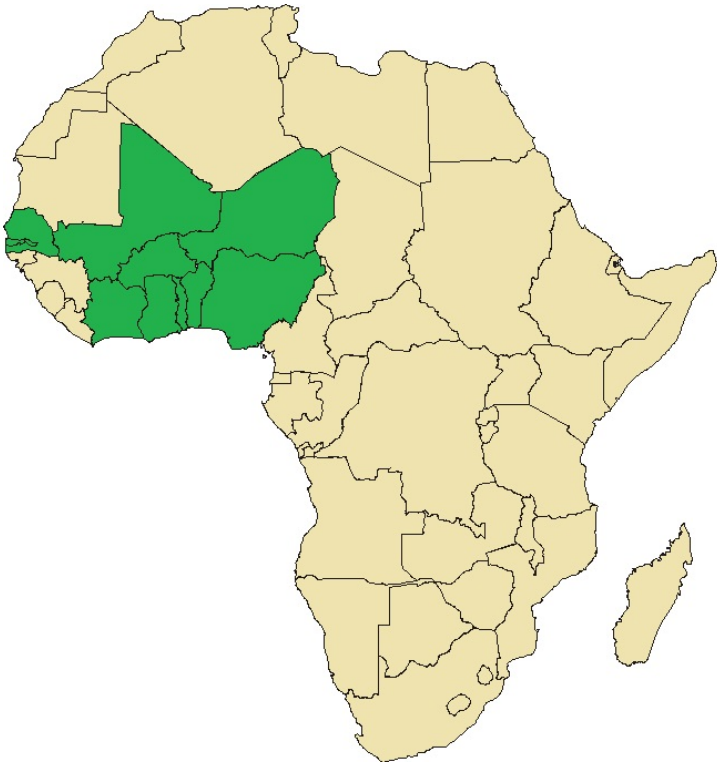
1. Development of the research concept & scientific agenda
2. Initiate first activities within the *Core Research Program*
3. Initiate the *Graduate Research Program*

Main phase: October 2012 – February 2016

Σ 50 Mio €

WASCAL Partner Countries

- Benin
- Burkina Faso
- Côte d'Ivoire
- Gambia
- Ghana
- Mali
- Niger
- Nigeria
- Sénégal
- Togo



WASCAL Partners

- West African universities (11+)
- National meteorological services (6 countries)
- National water resources authorities (6 countries)
- National agricultural research systems (6 countries)
- Regional and international institutions (9+)
- German universities and research centers (10)

West African Universities

- Université d'Abomey-Calavi (Benin)
- Université de Ouagadougou (Burkina Faso)
- University of the Gambia (The Gambia)
- Kwame Nkrumah University of Science and Technology (Ghana)
- Université de Cocody-Abidjan (Côte d'Ivoire)
- Université de Bamako (Mali)
- Université Abdou Moumouni de Niamey (Niger)
- Federal University of Technology Akure (Nigeria)
- Federal University of Technology Minna (Nigeria)
- Université Cheikh Anta Diop de Dakar (Senegal)
- Université de Lomé (Togo)

National Institutions

- **National Meteorological Services**
Benin, Burkina Faso, Ghana, Côte d'Ivoire, Mali, Togo
- **National Water Resources Authorities**
Benin, Burkina Faso, Ghana, Côte d'Ivoire, Mali, Togo
- **National Agricultural Research Systems**
INRAB - Benin, INERA - Burkina Faso, CSIR - Ghana, CNRA - Côte d'Ivoire, IER - Mali, ITRA - Togo

Regional and International Institutions

- VBA, AGRHYMET/CILSS, Institut 2iE, FARA, AGRA
- UNU-EHS, IWMI, IFPRI, WMO

Research Clusters

- **Climate and Weather**
e.g. Interactions between land surface changes and regional climate
- **Landuse Dynamics and the Social-Ecological System**
e.g. Adapting to water scarcity, effect of changing climate patterns
- **Agricultural Systems**
e.g. Locally-evolved land management options as coping measures
- **Markets and Livelihood Diversification**
e.g. Demography and land use under increasing climate variability
- **Risk Management**
e.g. Economic evaluation of risk management strategies
- **Integrated Assessment**
e.g. Agent-based models for scenario analysis under climate change conditions

Research Clusters

- **Climate and Weather**

**Regional Climate Modelling
System Development for the
West African Region**

**Interactions between Land
Surface Change and Regional
Climate**

- Risk Management
e.g. Economic
- Integrate
e.g. Agent-b

**Seasonal Climate Forecast and
Regional Weather Prediction**

**Graduate Research Programme on the
West African Climate System
FUTA, Akure/Nigeria
Started in Jan 2012
Capacity: 10 PhDs /year**

GRADUATE

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SCHOOLS



International Lecture March 2012

OBSERVATION NETWORK

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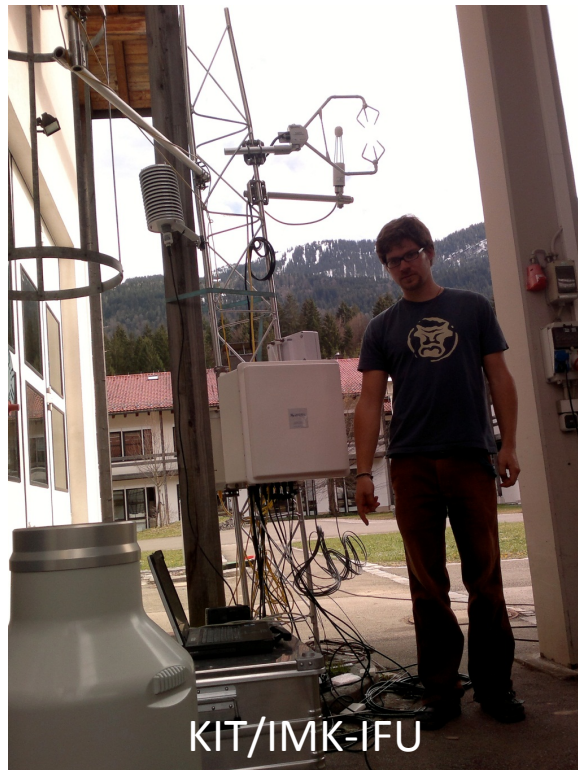


Hydromet Observation Network (established with services & WMO):

- 36 automatic climate stations (GCOS compatible)
- 80 discharge- and 120 groundwater gauges

Core Research Programme: Establishment of

- 3 Eddy Covariance Stations
- 10 automatic (online data) and 15 non-automatic climate stations
- 30 discharge- and 60 groundwater gauges

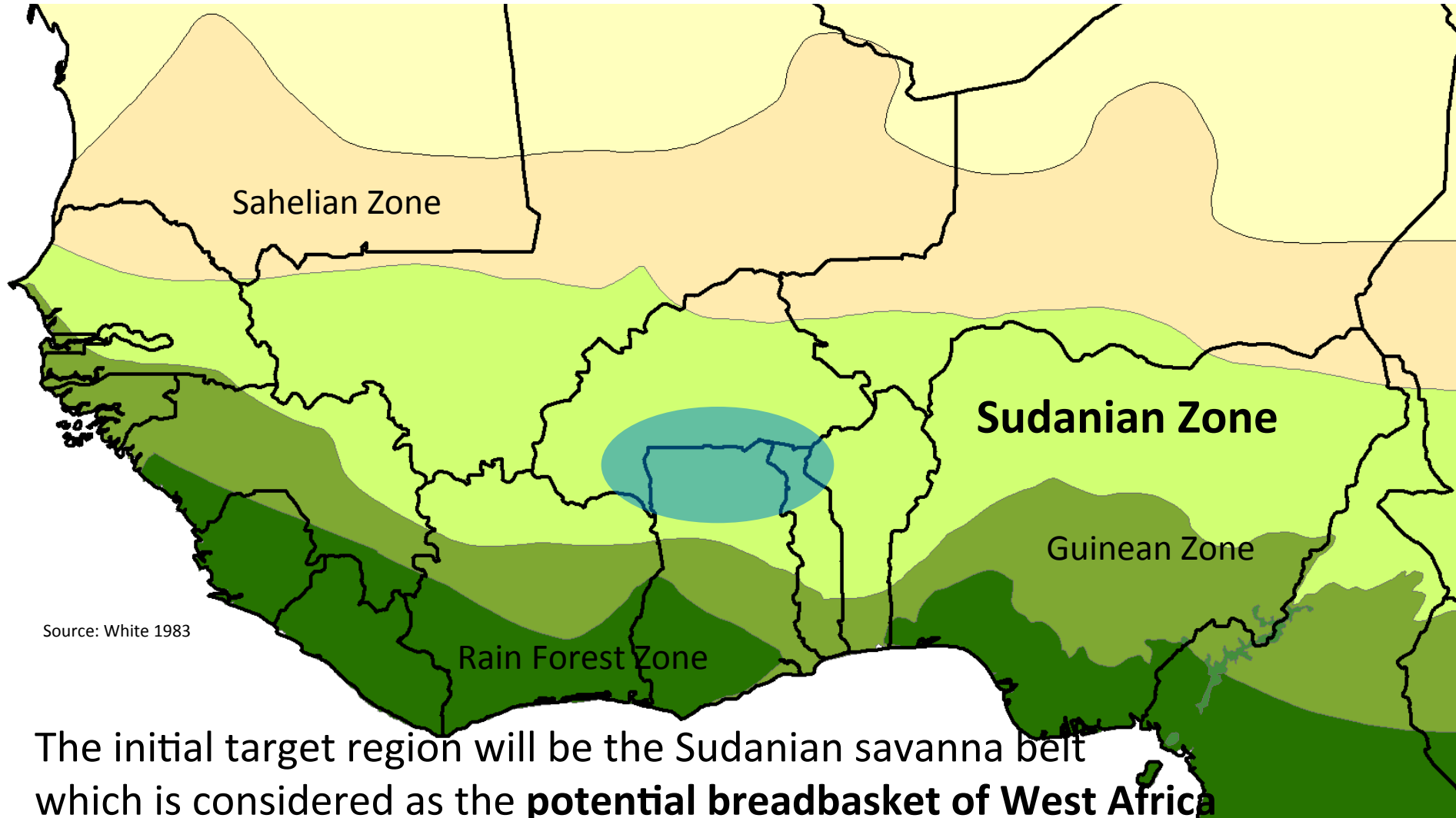


State of the Art July 2012

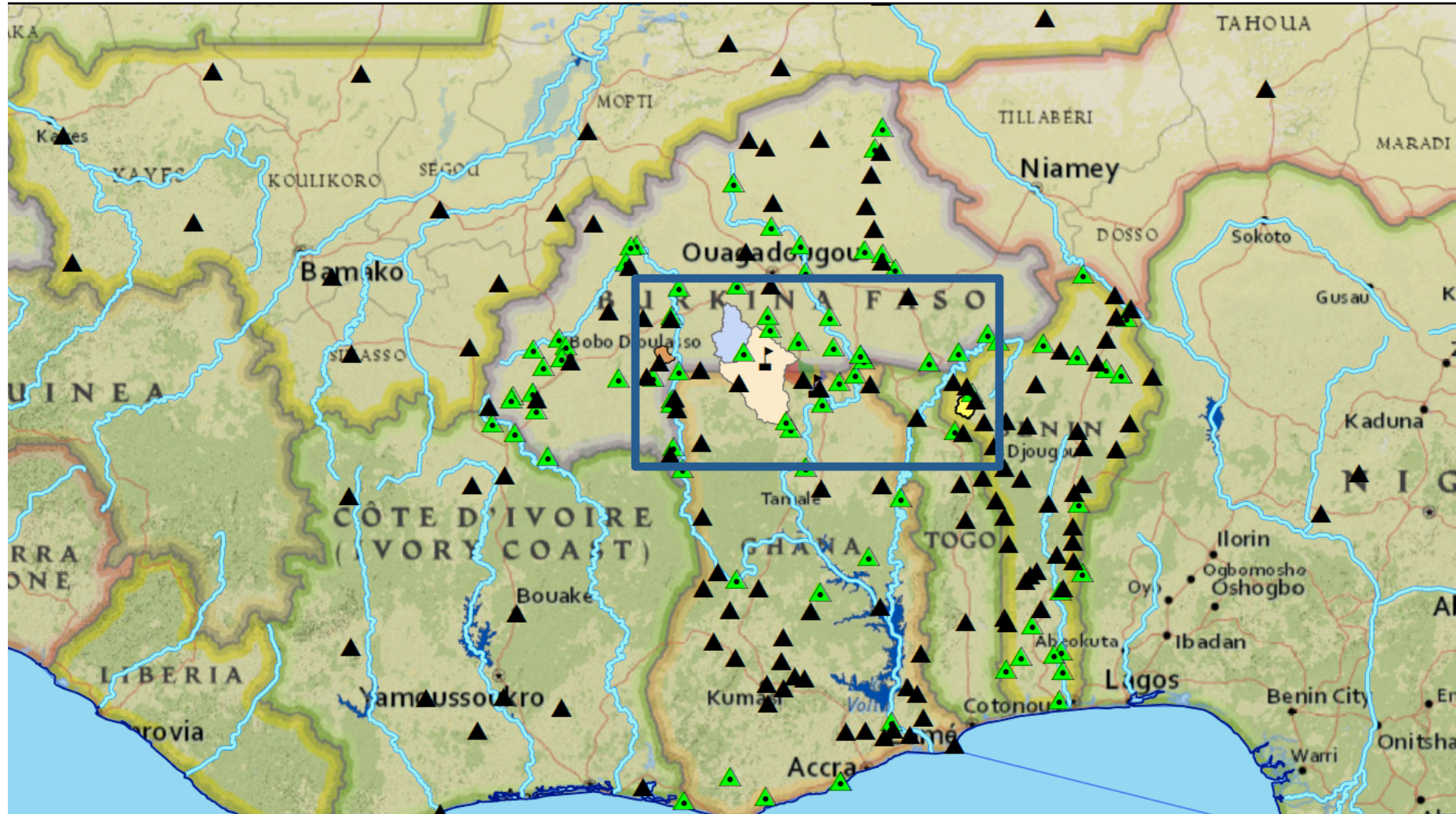
Core Research Programme Climate & Weather:

- EC & climate stations prepared at KIT/IMK-IFU
- Shipped to Tema/Ghana in June
- **Expected to arrive at Tema harbor 8th July!**
- Established in field from this August on

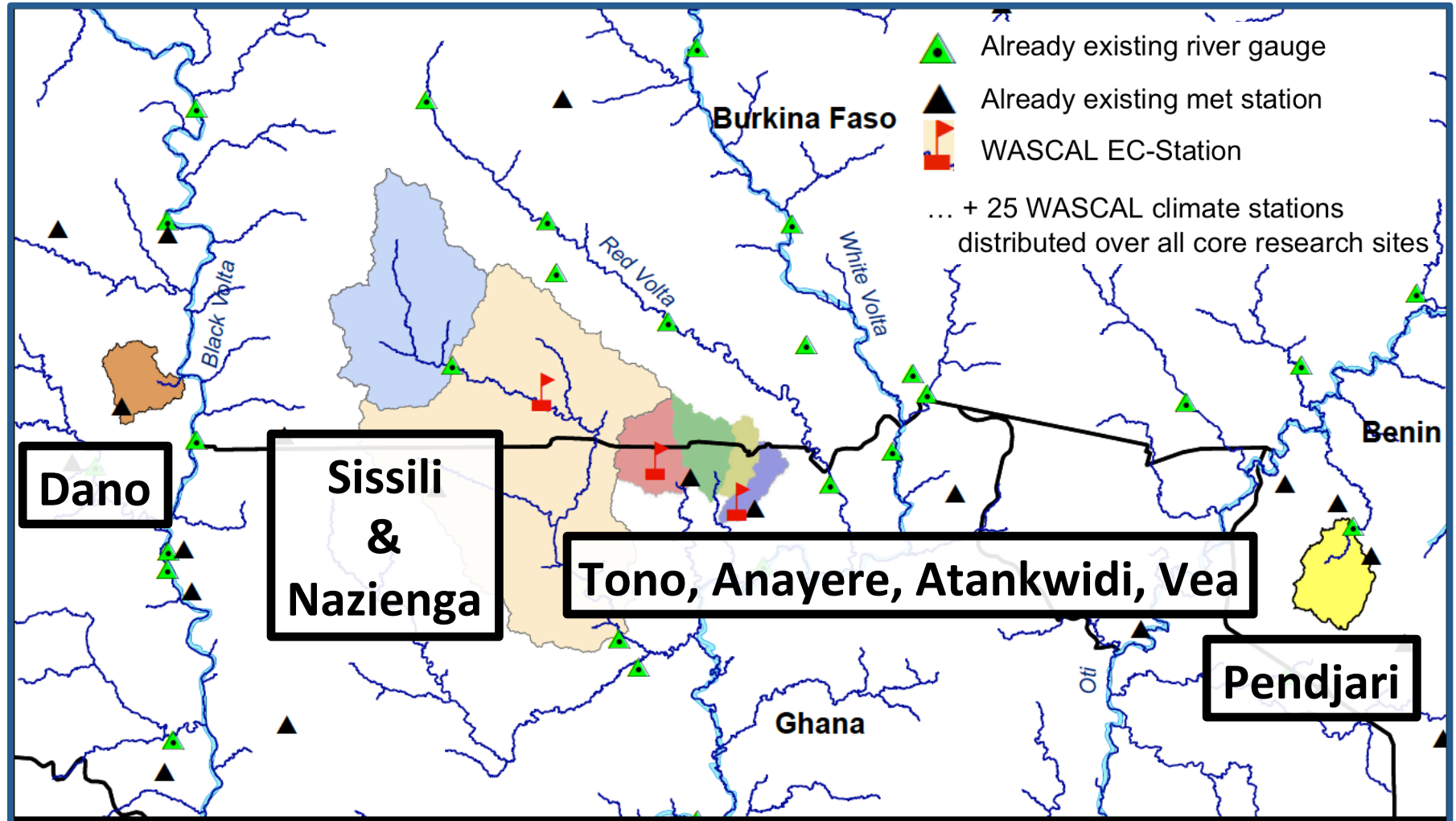
Focus on the Sudanian Savanna Belt



Core Research Test Sites



Core Research Test Sites



Thank you for your attention

www.wascal.org

Application for GRP *West African Climate System Climate*

<http://wascal.futa.edu.ng>

Application for GRP *Climate Change and Hydrology*

<http://www.uac.bj.refer.org>

