

Hamburg, 19th May 2014

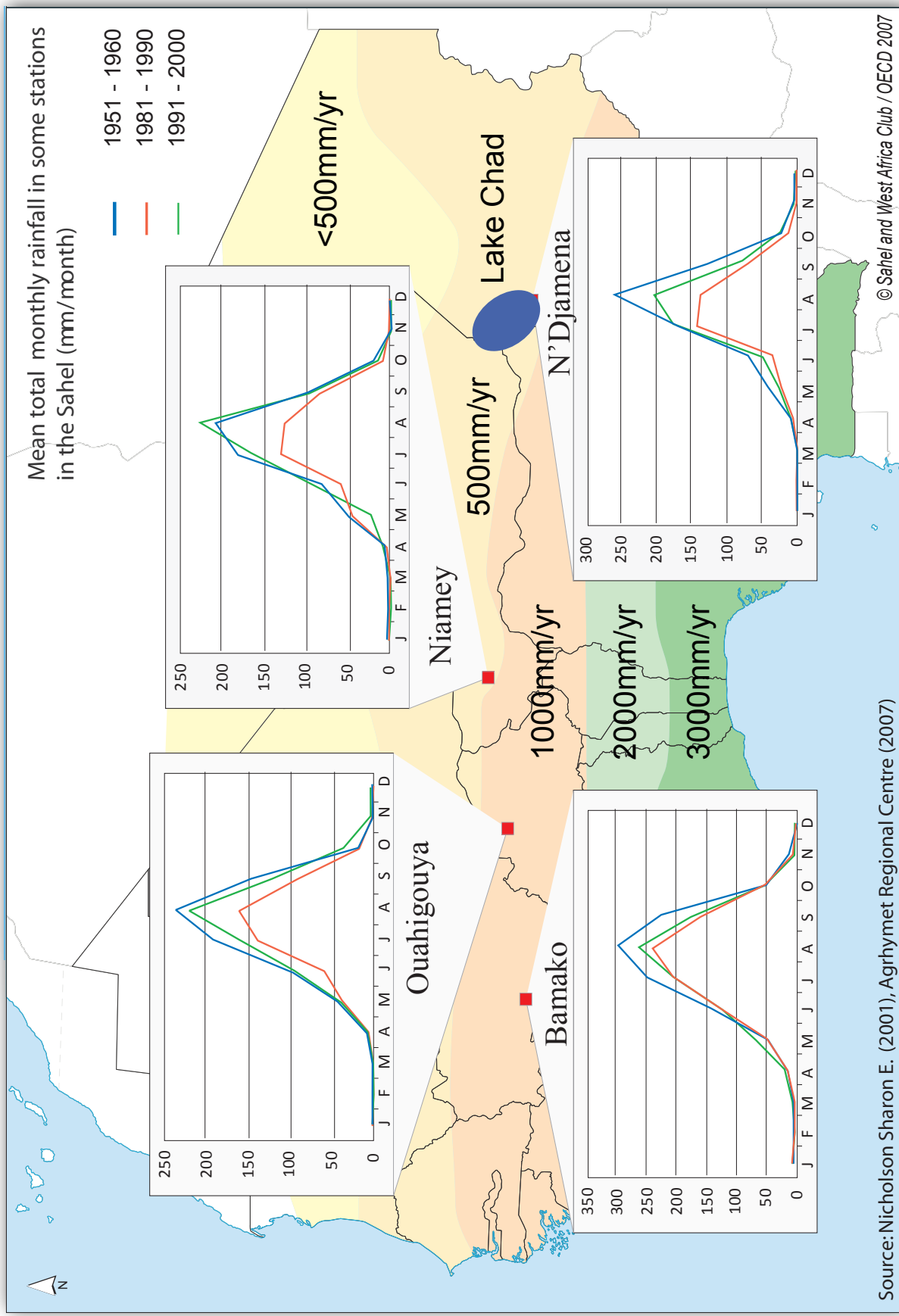
Ilse Hamann & Dominikus Heinzeller



WASCAL

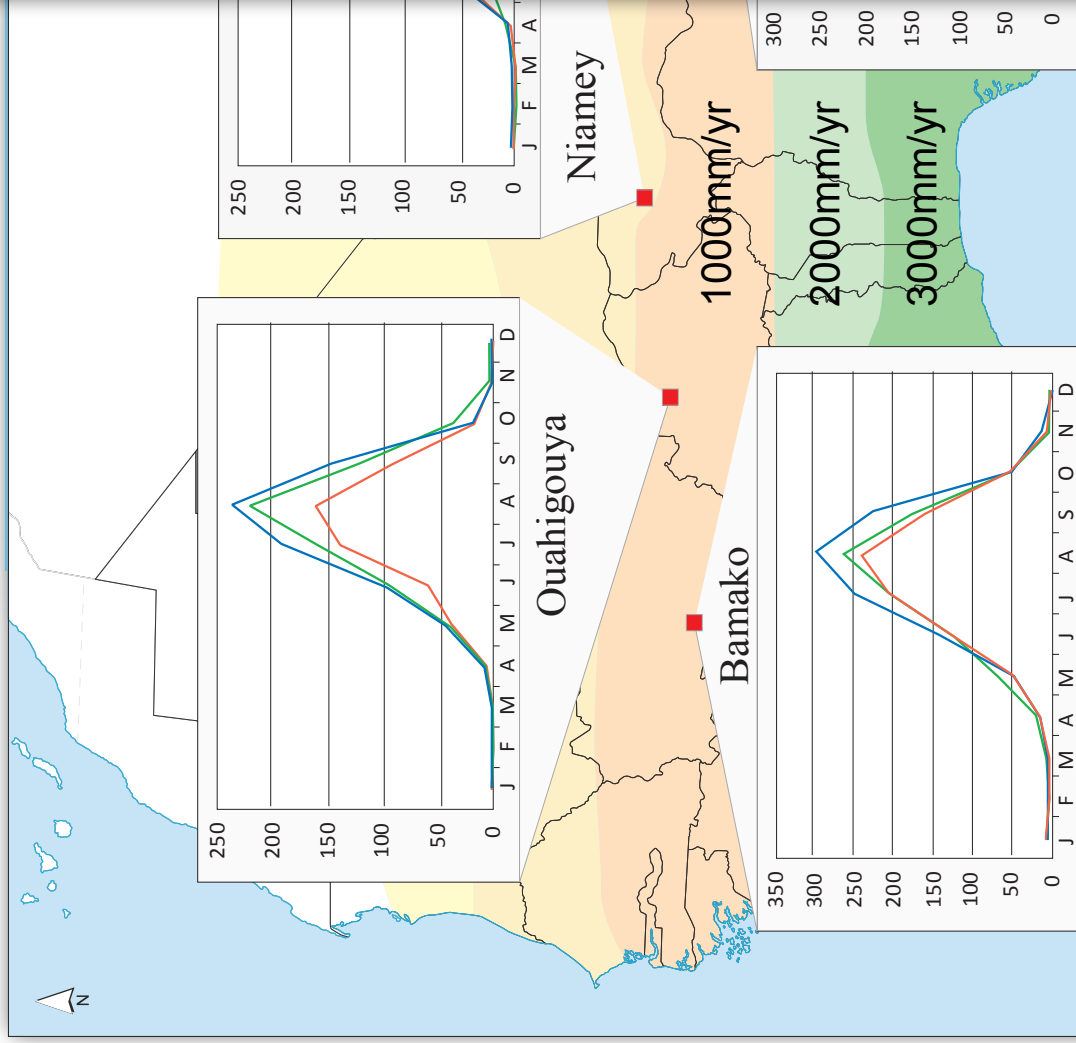
West African Science Service Center on Climate Change and Adapted Land Use

Global climate trends on regional scales

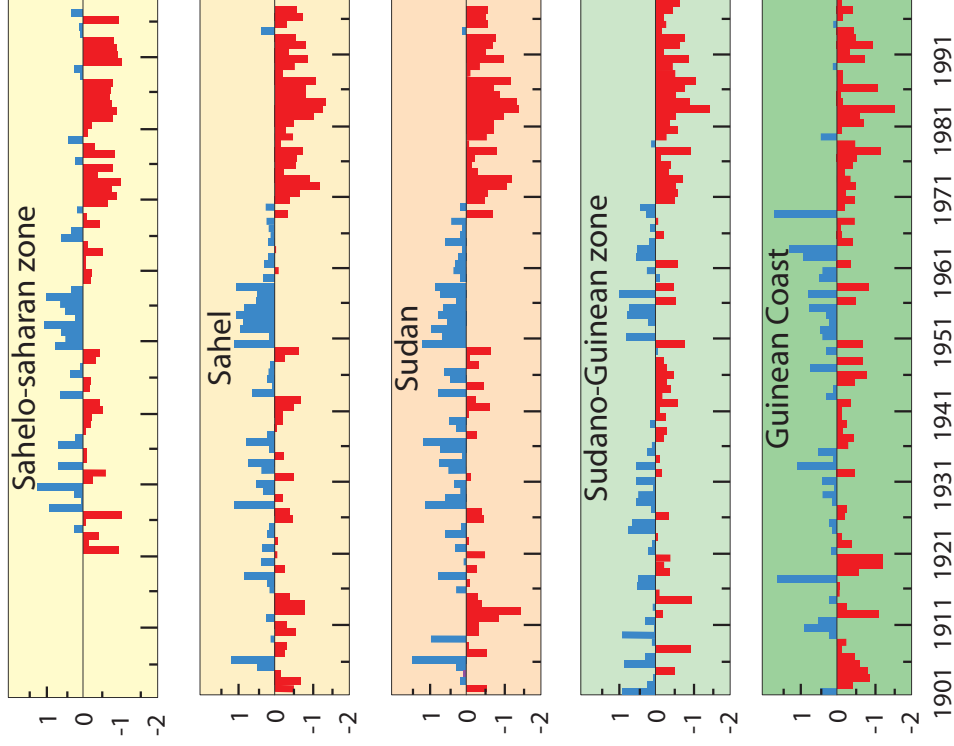


Source: Nicholson Sharon E. (2001), Agrhymet Regional Centre (2007)

Global climate trends on regional scales

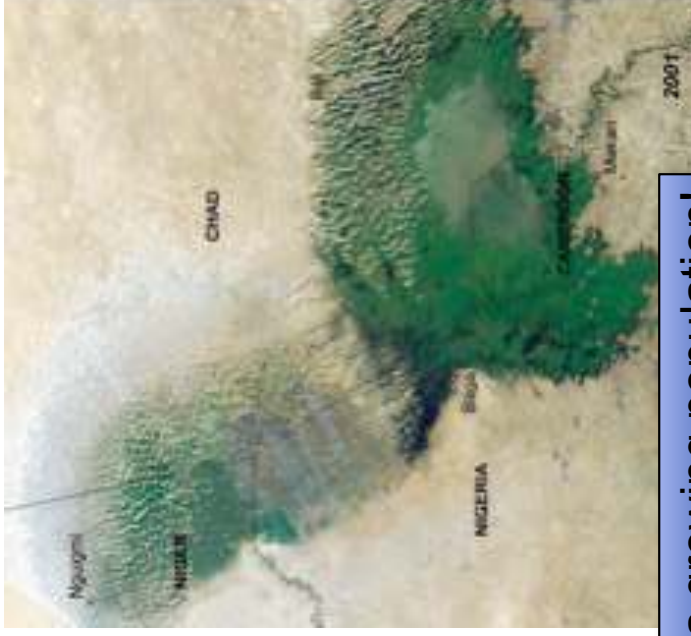
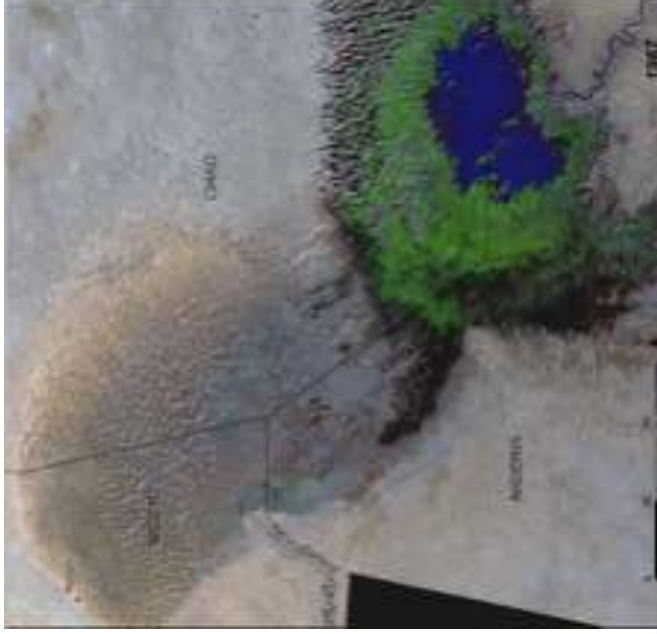
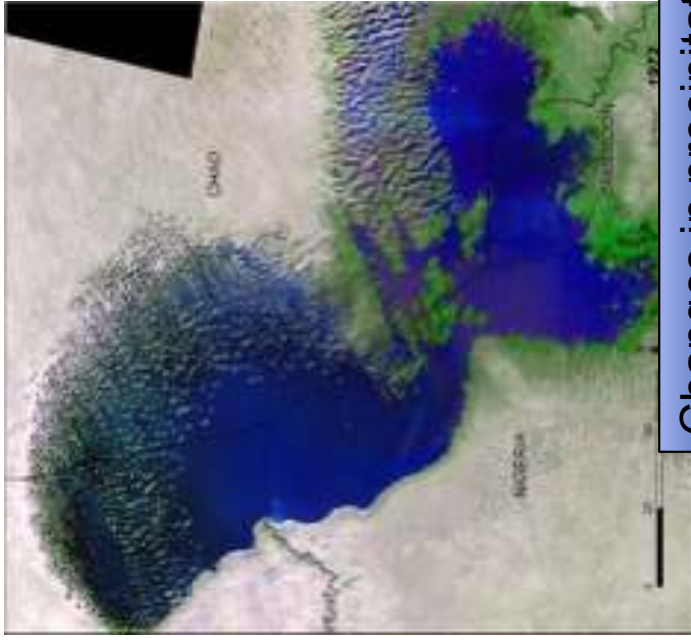


Standardised rainfall indices in West Africa per agro-climatic zone 1921 - 1998

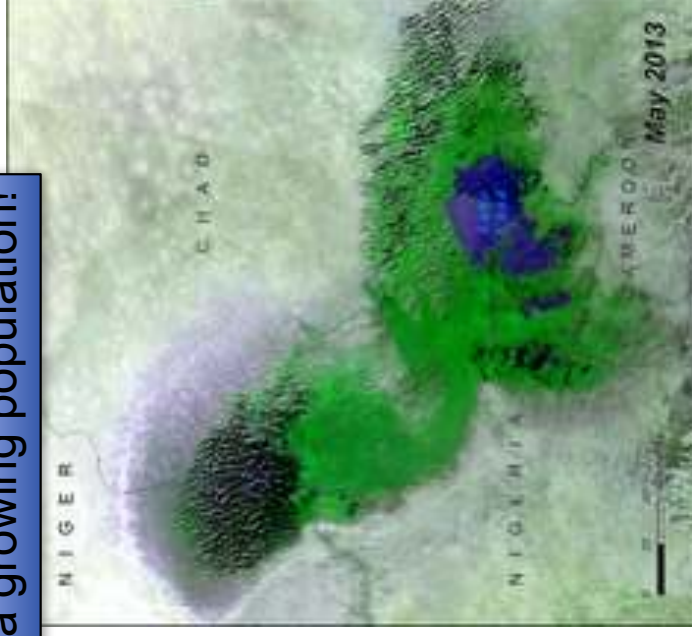


Source: Nicholson Sharon E. (2001), Agrhymet Regional Centre (2007)

© Sahel and West Africa Club / OECD 2007



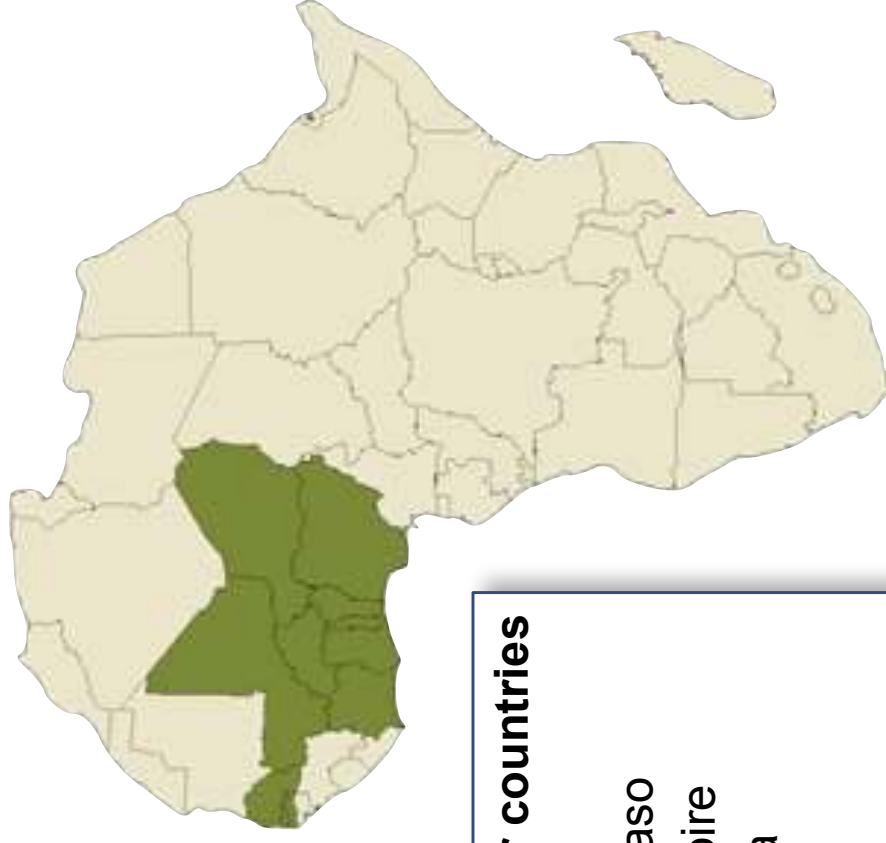
Changes in precipitation *and* increasing demand by a growing population!



WASCAL - a large-scale international program

With climate change being one of the most severe challenges to rural Africa in the 21st century, West Africa is facing an urgent need to develop effective adaptation and mitigation measures.

WASCAL is a large-scale research-focused program designed to help tackle this challenge ...



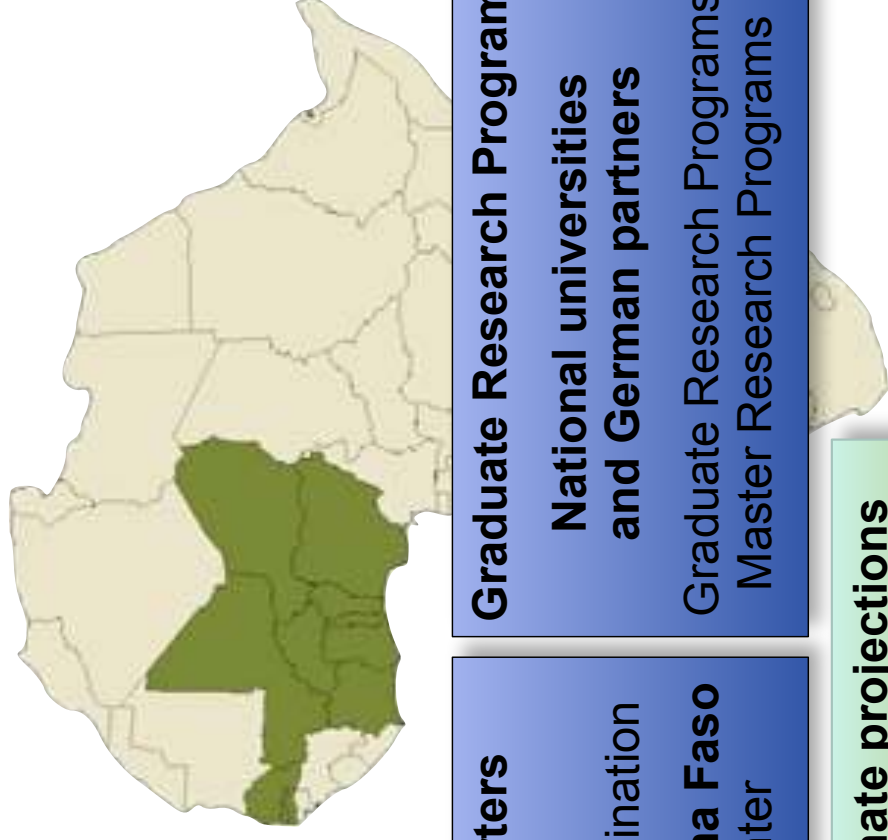
WASCAL partner countries

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

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Core Research Program

Climate and land-use change, social/scientific impact studies

**West-African Consortium
German Consortium**

Wascal Headquarters

Accra, Ghana

Administration, coordination

Ougadougou, Burkina Faso
Competence Center

Graduate Research Program

**National universities
and German partners**

Graduate Research Programs
Master Research Programs

High-resolution regional climate projections

Regional climate system for West Africa
Validation through joint observation networks
Climate change and land-use change
Impact studies, forcing data for further studies

The regional climate modelling team



Dominikus Heinzeller¹



Bamba Sylla²



Cornelia Klein^{1,3}



Joël Arnault^{1,3}



Ilse Hamann⁵



Jan Bliefert³



Ursula Gessner⁴



Harald Kunstmann^{1,3}

¹ IMK-IFU, KIT, Garmisch-Partenkirchen

² WASCAL Competence Center, Ouagadougou

³ Institute for Geography, Augsburg University

⁴ DFD-LA-DL, DLR, Oberpfaffenhofen

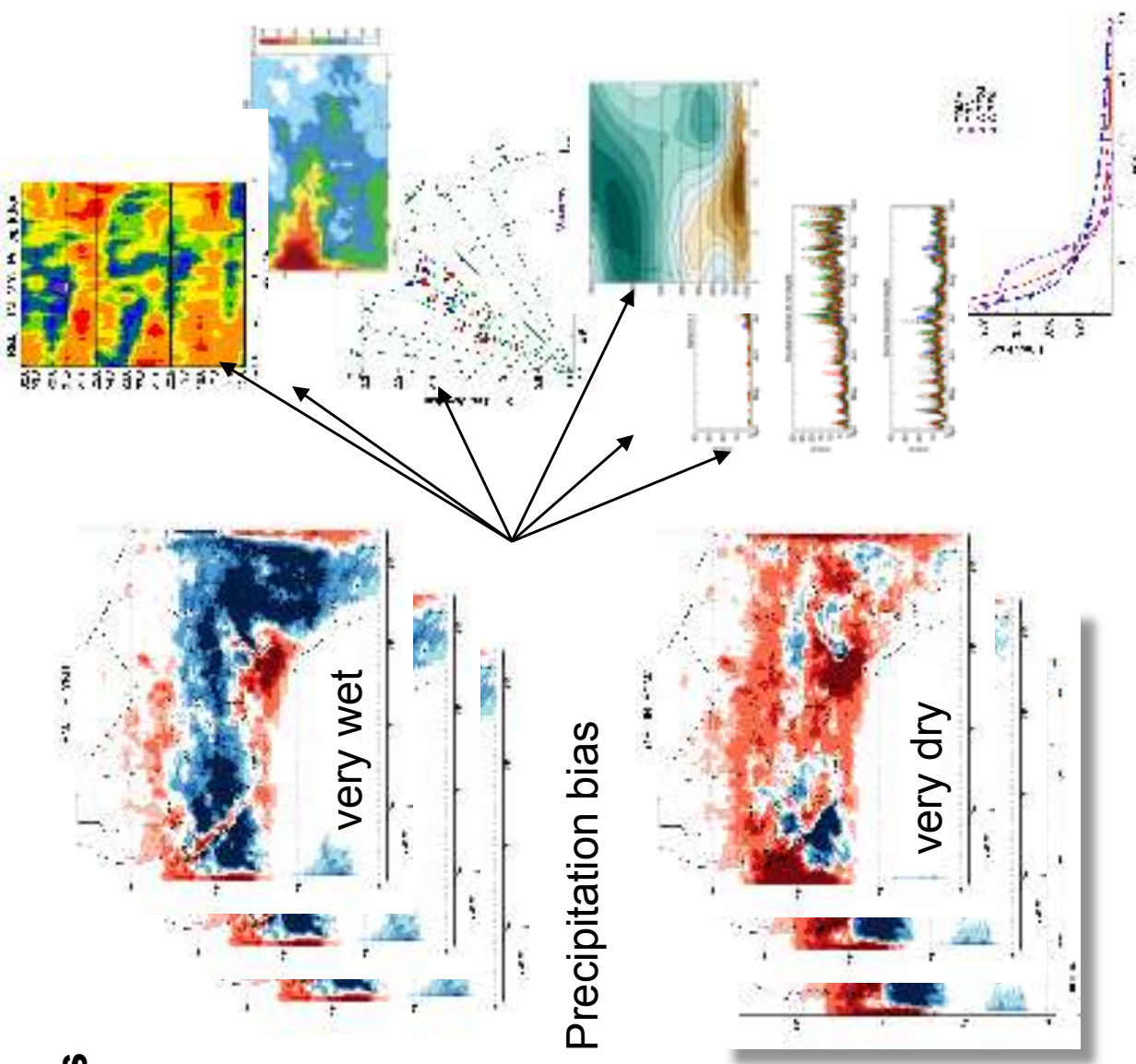
⁵ German Climate Computing Center DKRZ, Hamburg

Towards a regional climate system for W/Africa

Evaluation of 55 WRF configurations

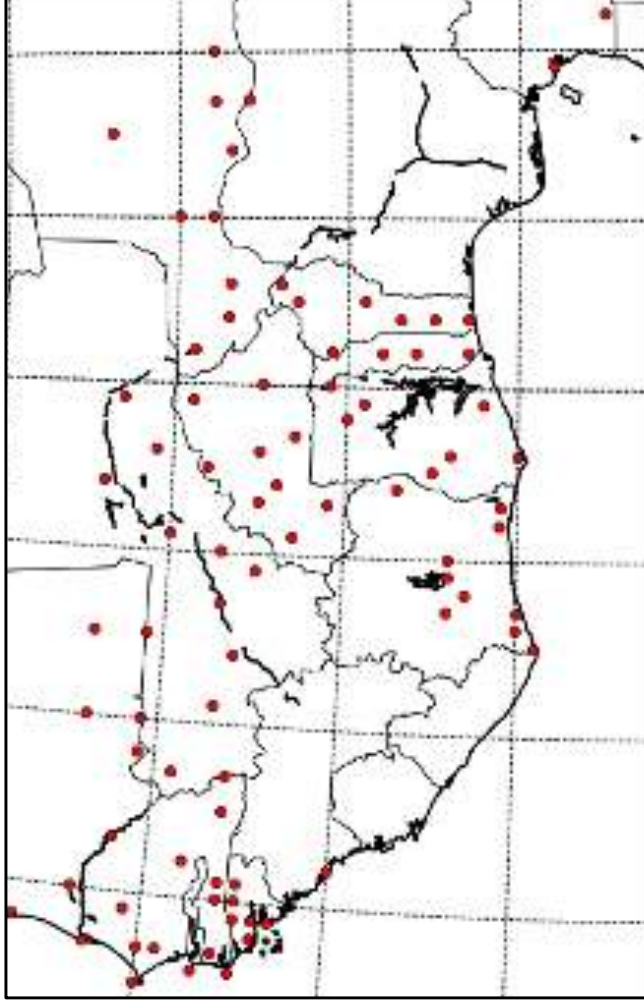


WRF/ERA-Interim @ 24km

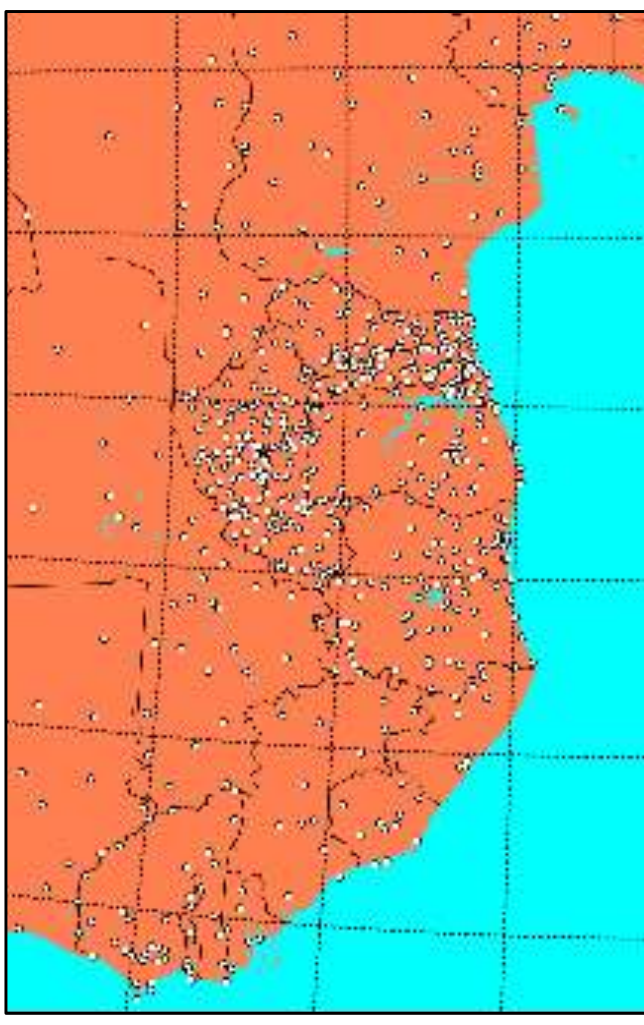


Credits: C. Klein (2014)

Joint observation network and remote sensing



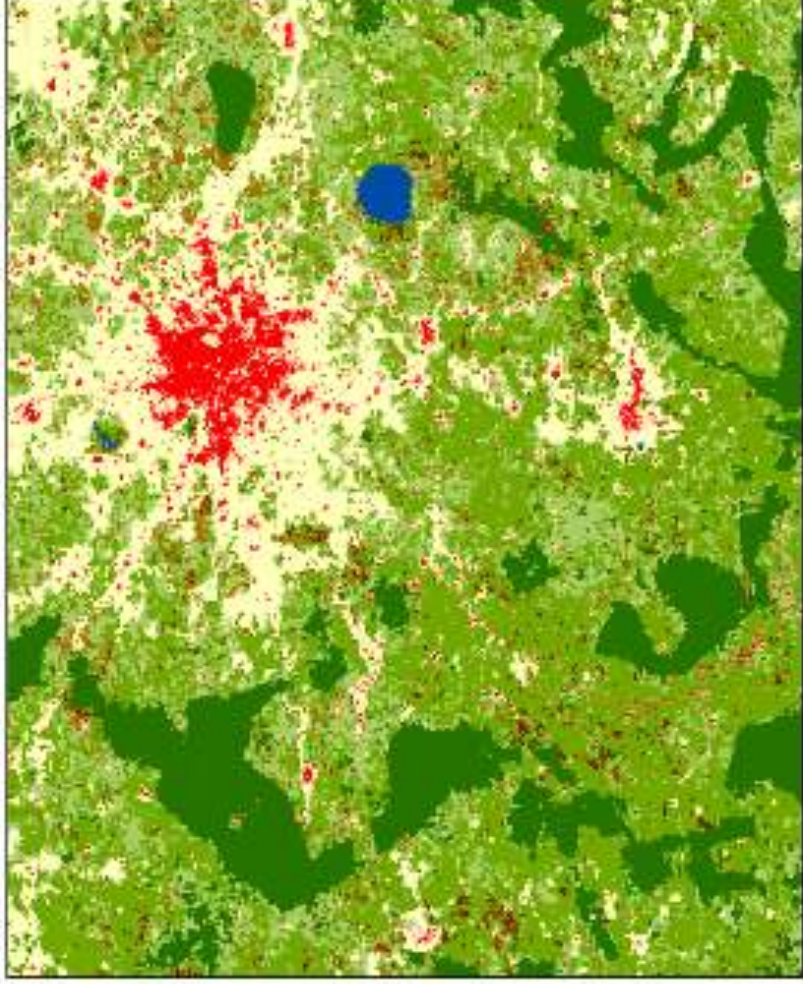
TRMM rain gauge stations



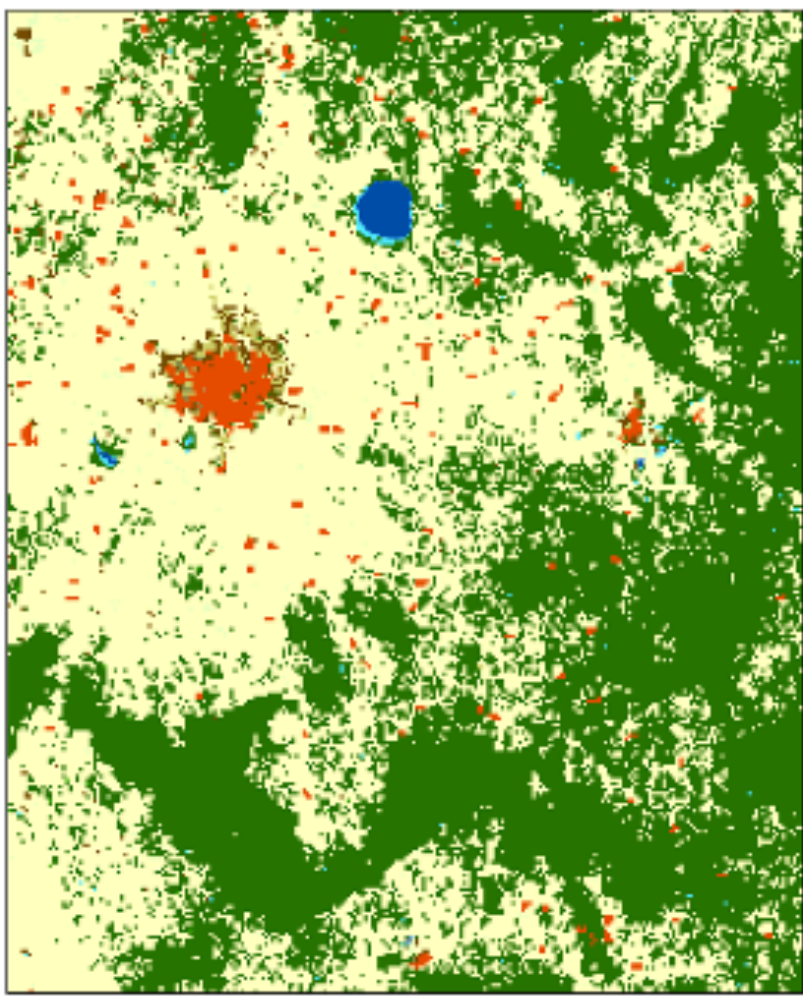
Rain gauge stations available to WASCAL

Credits: J. Bliefernicht (2014)

Joint observation network and remote sensing



DLR land cover (MODIS, ASAR, TanDEM-X)



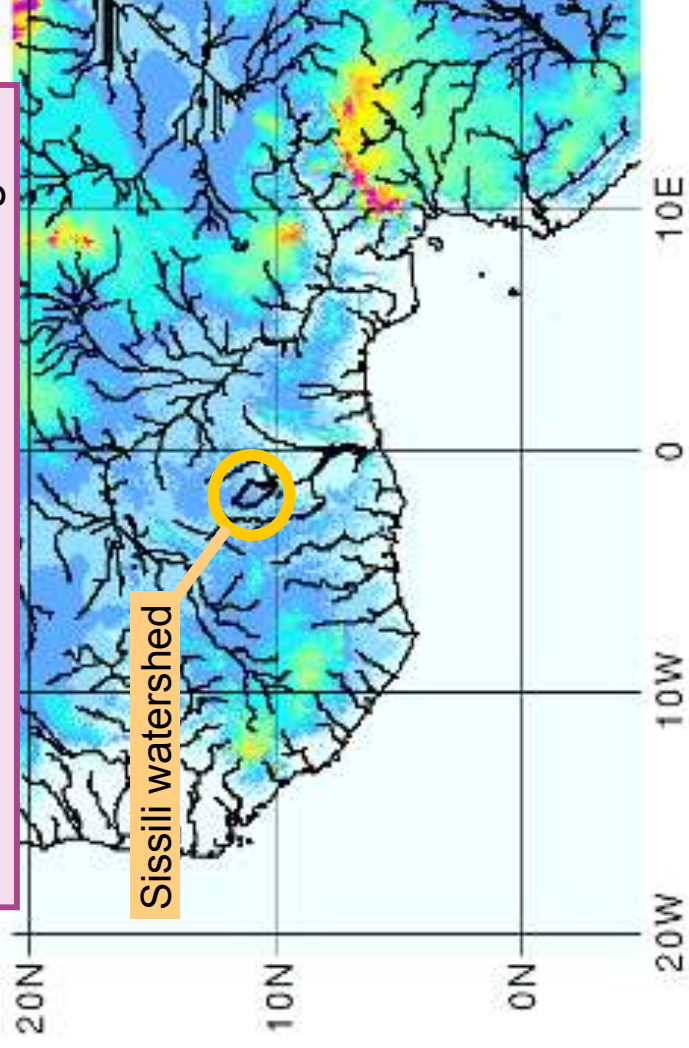
Standard land cover (MODIS)

Credits: U. Gessner (2014)

Example application: coupled modelling

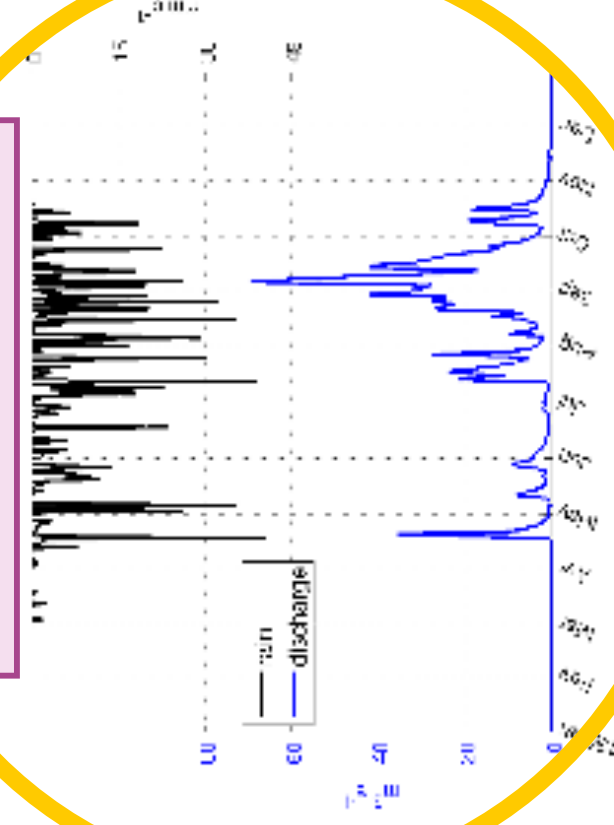
Evaluation of a fully coupled atmospheric-hydrological modelling system for the Sissili watershed in the West African Sudanian Savannah (WRF-Hydro)

Topography and river network of the simulated West African region



Sissili watershed

Simulation result for the Sissili watershed



Credits: J. Arnault (2014)

Regional climate model for long-term runs

Domain configuration for climate simulations with WRF

Longitude x Latitude [-30, +30] x [-10, +30] (Paeth et al. 2011, Brown & Sylla 2012)
Resolution 12km, model top 10hPa
570 x 400 x 40 grid points, 72s time step

WRF model performance

BLIZZARD (DKRZ)

6x64 threads
12 min realtime/day
14000 CPUh/year

JUROPA (FZJ)

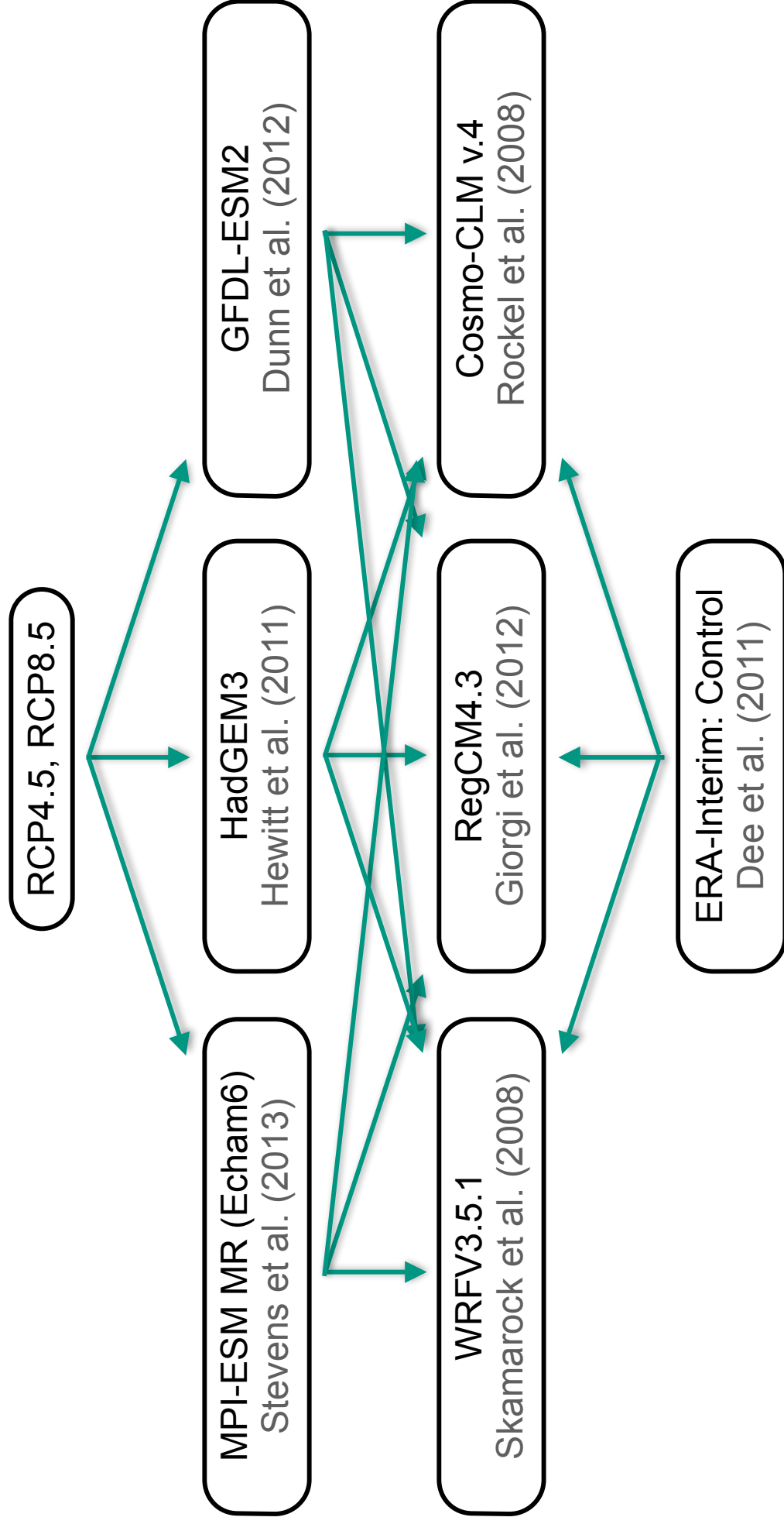
32x8 threads
6 min realtime/day
9300 CPUh/year

WRF model output

3-hourly, 24 pressure levels
NetCDF4, CF-1.6
1Gb/day, 3.6Tb/10years



Reducing the uncertainty in climate projections



Poor man's ensemble approach: 3 control runs + 9 climate projections per scenario

Scrambling for computing and storage resources



KIT
Karlsruhe Institute of Technology

Institute for Meteorology and Climate Research (IMK-IFU)

Pre-processing of global model data



 DKRZ DEUTSCHES KLIMARECHENZENTRUM	2014-2015 WRF/MPI-ESM hist. WRF/MPI-ESM RCP4.5 CCLM/ERA-INT control	 JÜLICH FORSCHUNGSZENTRUM	2014-2015 WRF/ERA-INT control WRF/MPI-ESM RCP8.5	 ICTP The Abdus Salam International Centre for Theoretical Physics	2014-2016 RegCM/ERA-INT control RegCM/MPI-ESM runs <i>more possible?</i>	 TGCC	2014-2015 WRF/GFDL-ESM control WRF/GFDL-ESM RCPs WRF/HadGEM3 control WRF/HadGEM3 RCPs
2015-2016 CCLM+RegCM runs, depends on ICTP/TGCC	2015-2016 CCLM+RegCM runs, depends on ICTP/TGCC	2015-2016 CCLM+RegCM runs, depends on ICTP/TGCC	2015-2016 CCLM+RegCM runs, depends on ICTP/TGCC	2015-2016 CCLM+RegCM runs, depends on ICTP/TGCC	2015-2016 CCLM+RegCM runs, depends on ICTP/TGCC	2015-2016 CCLM+RegCM runs, depends on ICTP/TGCC	2015-2016 CCLM+RegCM runs, depends on ICTP/TGCC



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Post-processing of global model data, storage of output, transfer to WADI

Application submitted, expect results anytime

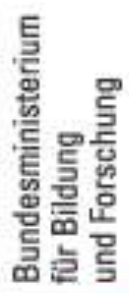
Application submitted, expect results in June

Setup of climate station Gwasi in Northern Ghana (Nov. 2013)





DKRZ
DEUTSCHES
KLIMARECHENZENTRUM



MÉTÉO TOGO