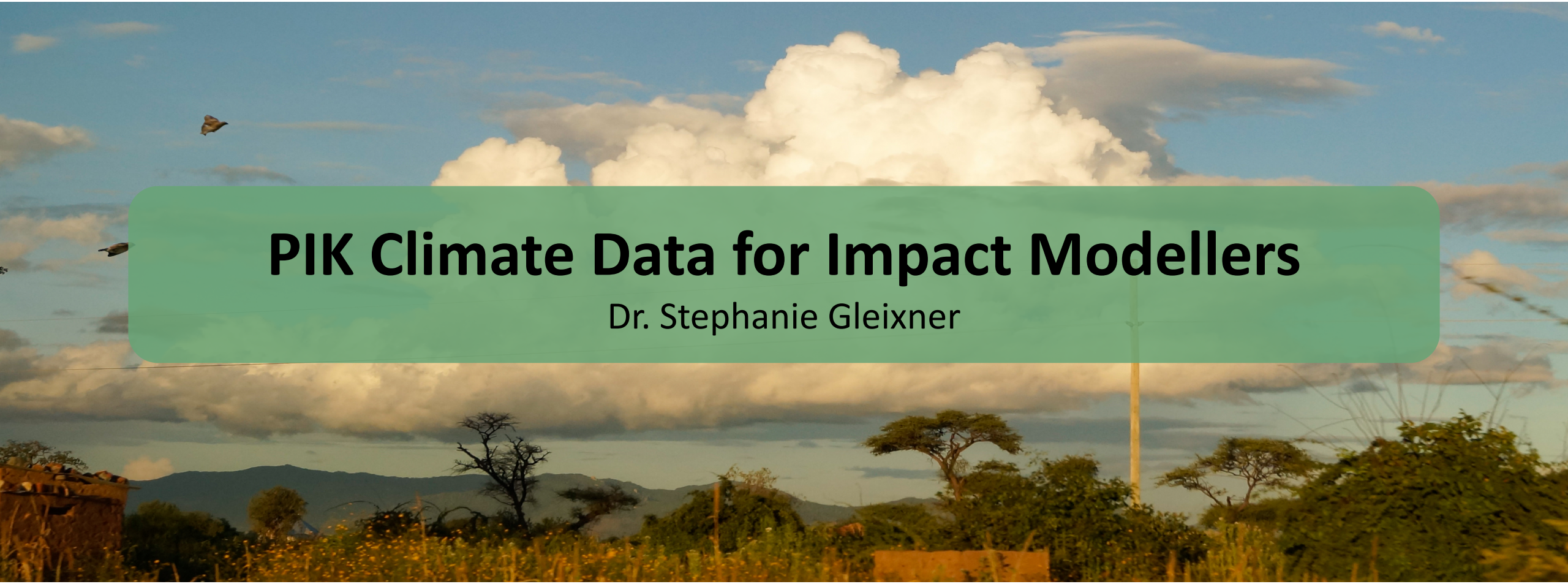
POTSDAM INSTITUTE FOR CLIMATE IMPACT RESEARCH

P I K



PIK Climate Data for Impact Modellers

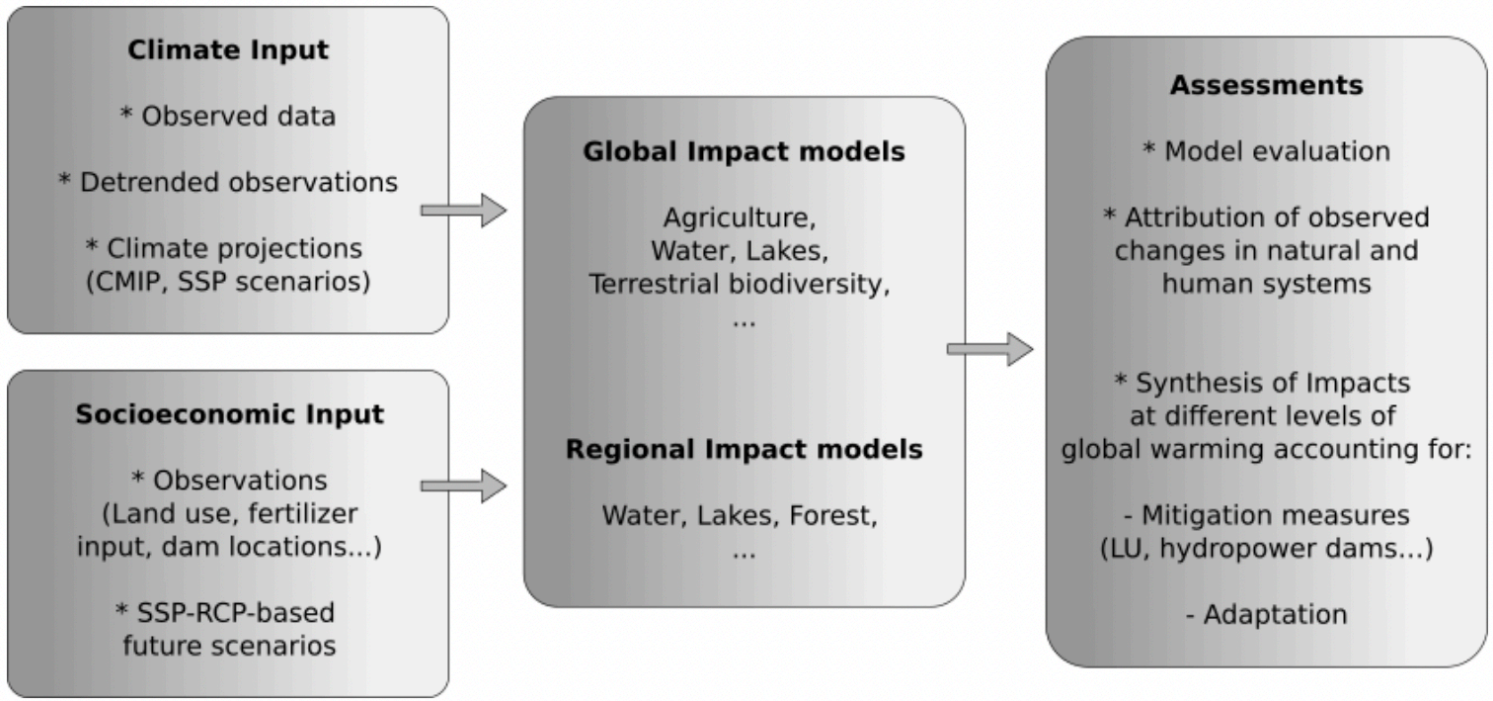
Dr. Stephanie Gleixner

Celebrating 30 years of integrated climate impact research at the Potsdam Institute.

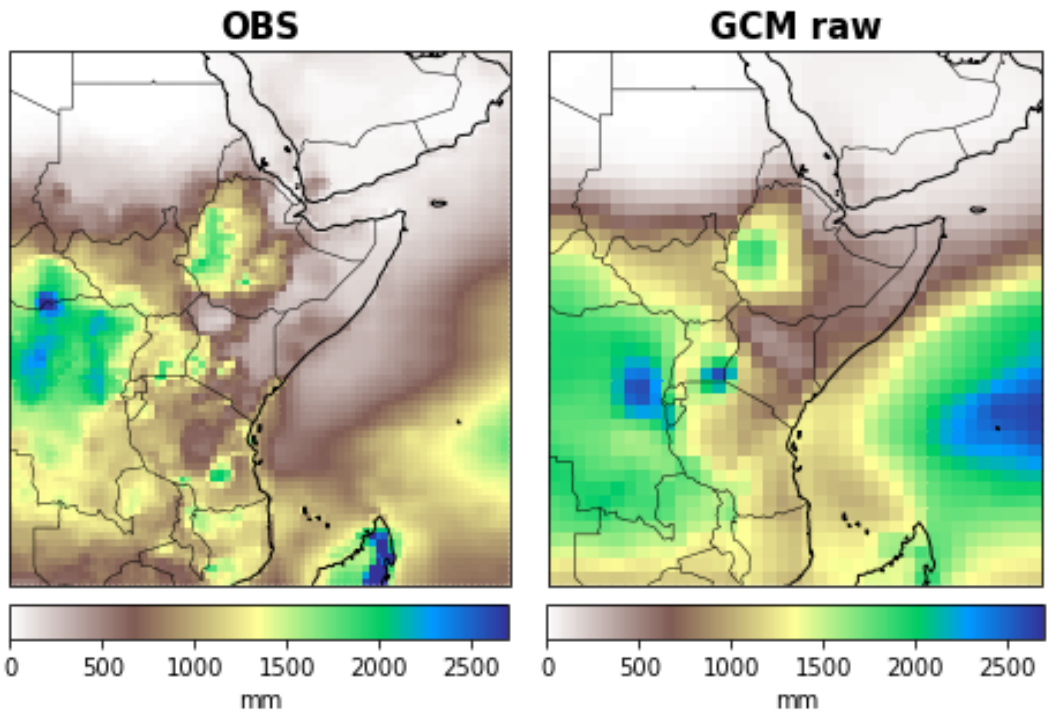
Leibniz Association

ISIMIP - Inter-Sectoral Impact Model Intercomparison Project

- Framework for impact modelling of climate change across sectors
- Provides consistent input data for climatic, geographic and socioeconomic conditions
- Gobal output from 18 sectors, including water, agricultural, health, biodiversity, forest etc
- All data freely available data.isimip.org



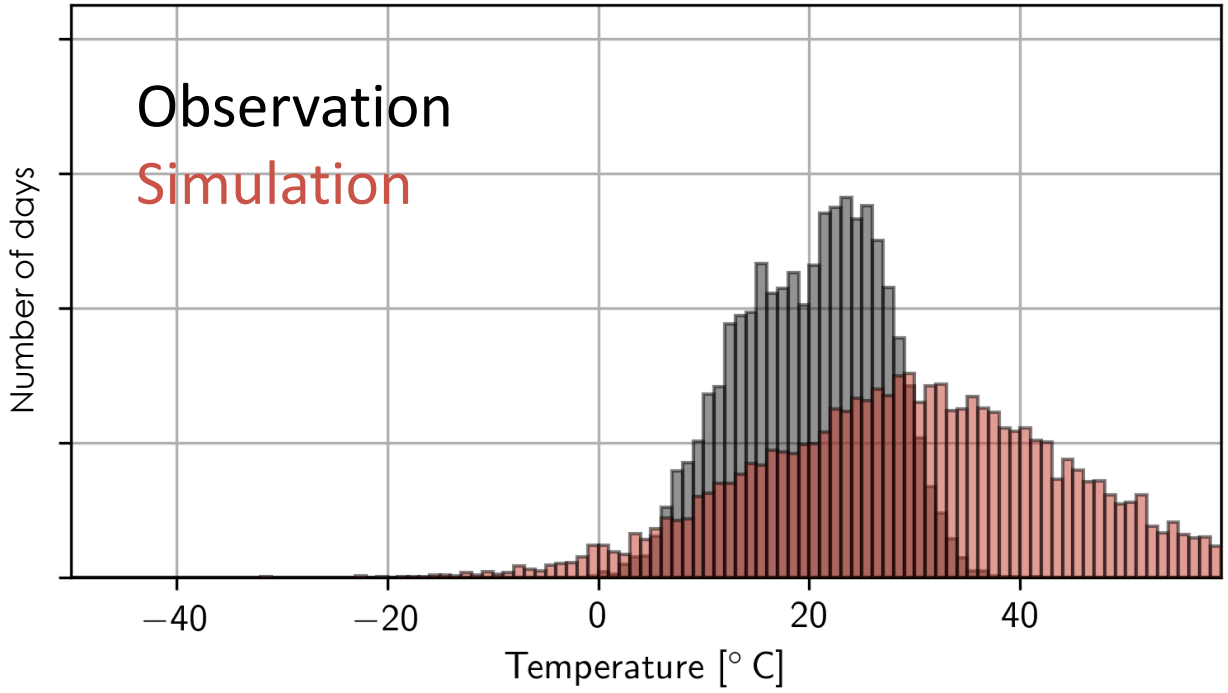
Why do Impact Modellers needs processed climate data?



- Comparison of historical model simulation to observations shows systematic biases.
- Problematic when absolute values or thresholds (e.g. snow melt or number of summer days) are important for impact models

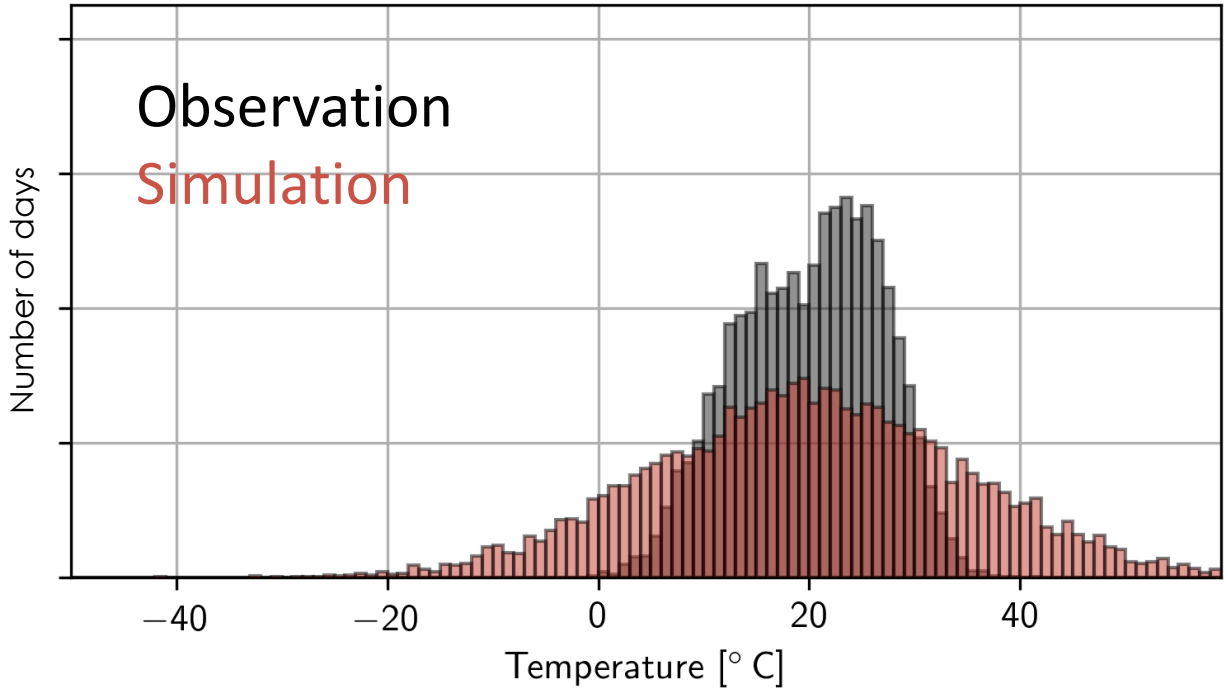
-> Impact models cannot simulate realistic yield/runoff/…

Bias – Adjustment illustration for one grid point



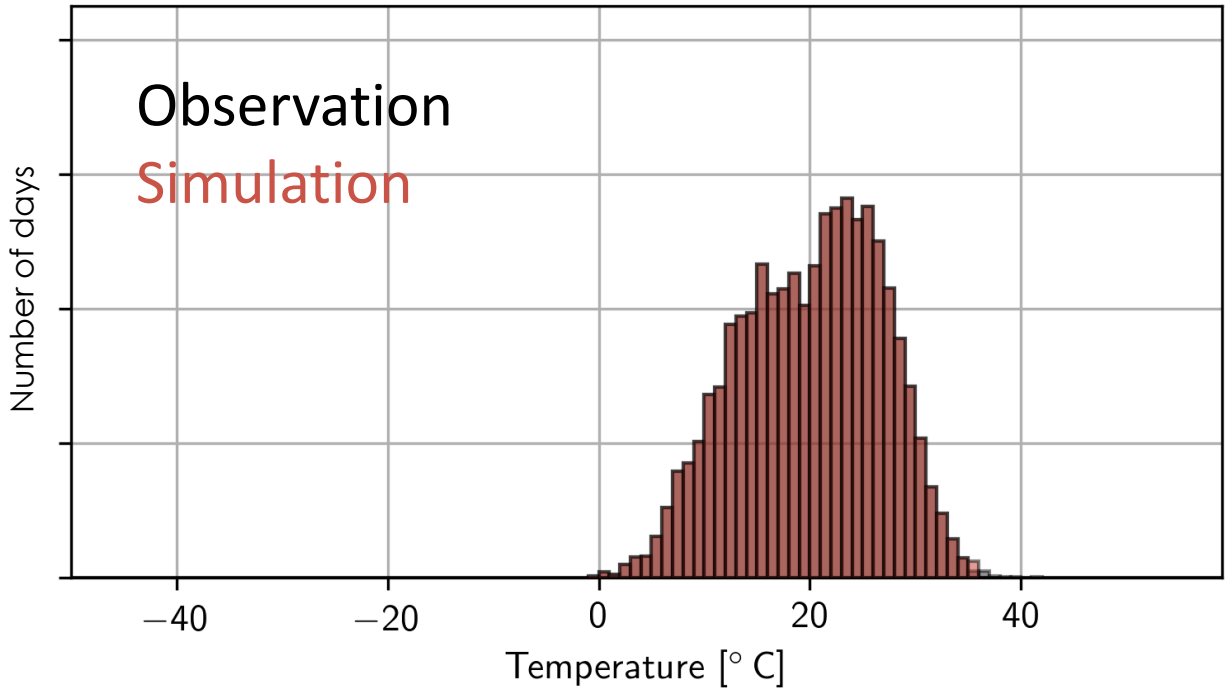
Distribution of simulated and observed climate differ.

Bias – Adjustment illustration for one grid point



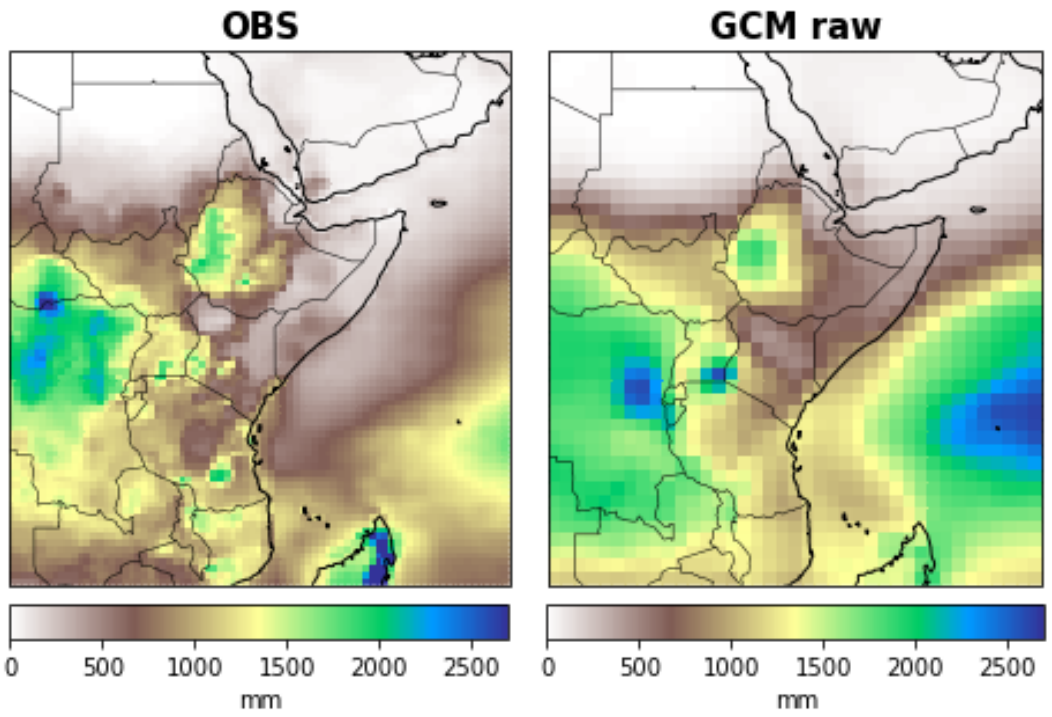
Most simple bias-adjustment: Adjustment of the Mean

Bias – Adjustment illustration for one grid point

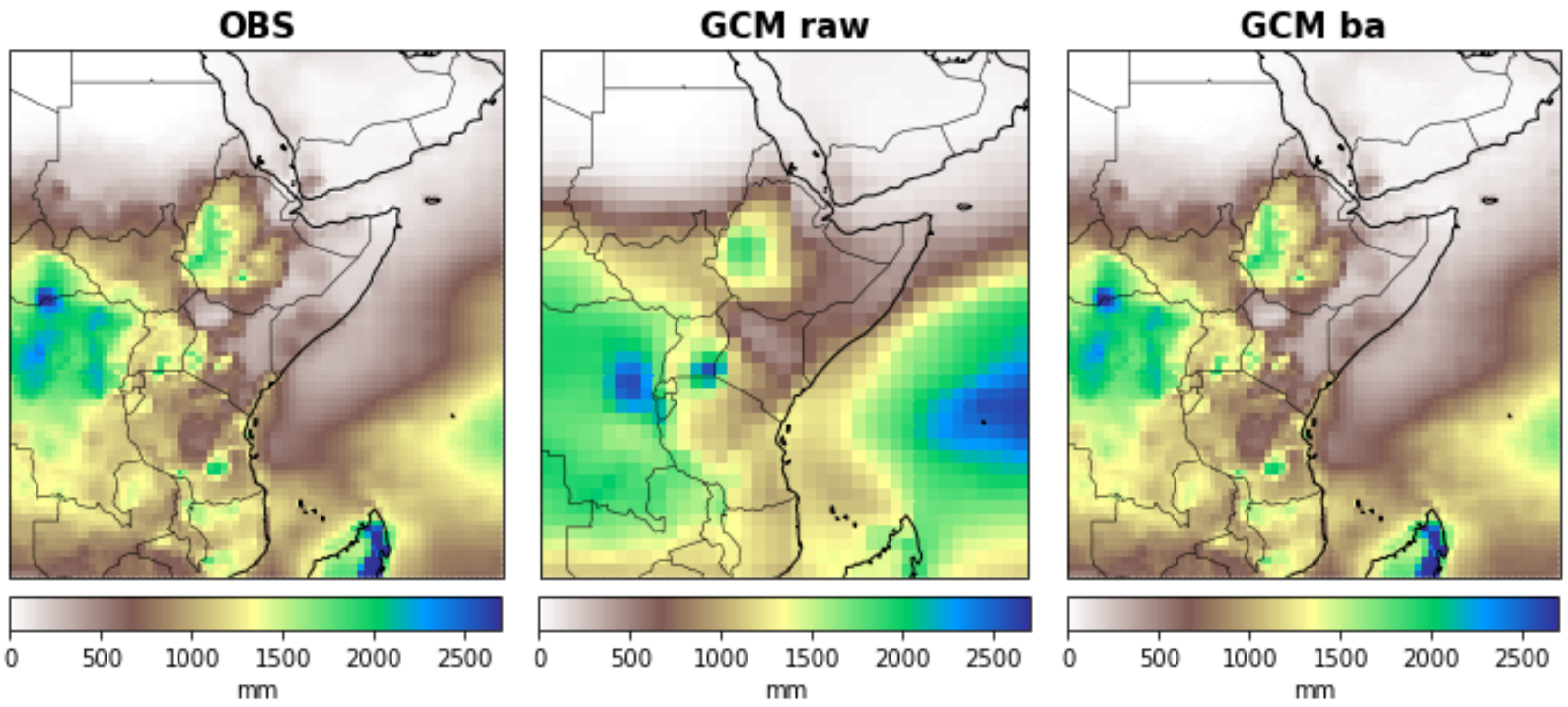


State of the art:
Quantile mapping

The PIK Bias-Adjustment Approach



The PIK Bias-Adjustment Approach



ISIMIPBASD

1. Trend-preserving, non-parametric quantile mapping at native GCM resolution
2. MBCn algorithm with additional conservation applied to downscale to observation resolution
3. Transfer functions defined from historical simulations applied to historical and future simulations

Lange, S.: Trend-preserving bias adjustment and statistical downscaling with ISIMIP3BASD (v1.0), Geosci. Model Dev., 12, 3055–3070, https://doi.org/10.5194/gmd-12-3055-2019, 2019

ISIMIP Climate Data Input (ISIMIP3b phase)

Bias-adjusted observational dataset W5E5

- WATCH Forcing Data methodology applied to ERA5 reanalysis
- 1979-2019
- Global coverage with resolution of 0.5º

Bias-adjusted Climate Simulations from ISIMIP3b

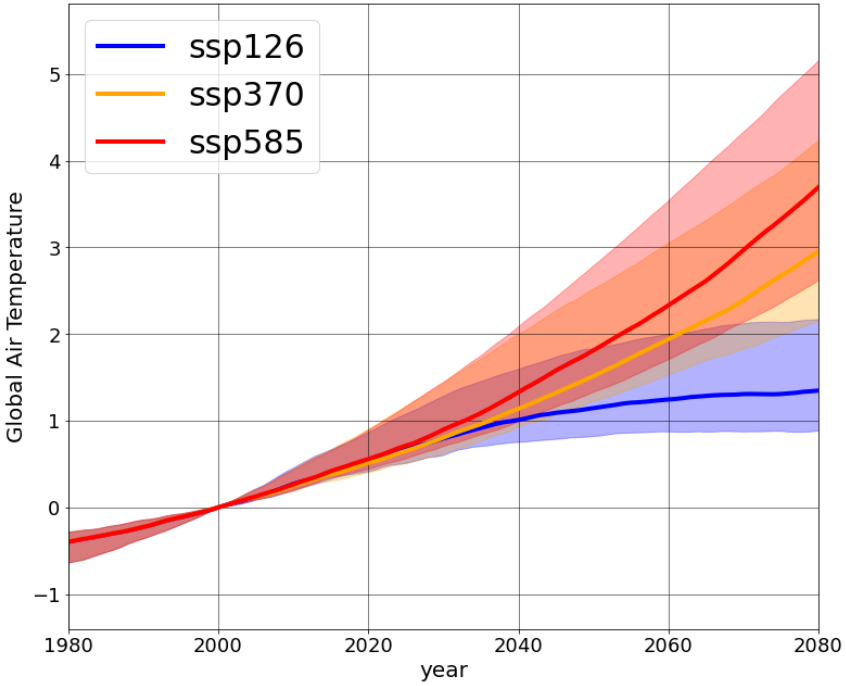
3 scenarios	10 GCMs	7 variables	Period
• SSP1-2.6 • SSP3-7.0 • SSP5-8.5	• CanESM5 • IPSL–CM6A–LR • UKESM1–0–LL • CNRM–CM6–1 • CNRM–ESM2–1 • MIROC6 • GFDL–ESM4 • MRI–ESM2–0 • MPI–ESM1–2–HR • EC–Earth3	• Precipitation • Minimum temperature • Mean Temperature • Maximum temperature • Wind • Solar radiation • Relative humidity	• Historical simulation (1850–2014) • Future projections (2015–2100)

Application of ISIMIP Data for Ethiopia

- Most work based on previous data generation

  (e.g. all modelling for AGRICA study)
- Plans to include data in coffee research
- Supplying data for hydrologal modelling

-> much potential for more studies

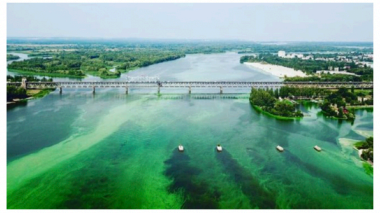


ISIMIP Impact Data Output

Fire

Water (global)

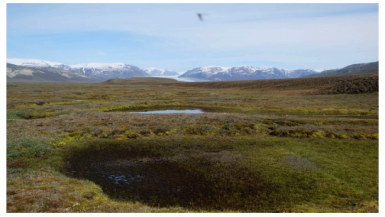
Water (regional)



Water Quality (in development)

Groundwater (in development)

Fisheries & Marine Ecosystems



Peat

Health

Energy Fluctuations and Extremes

Regional Forests

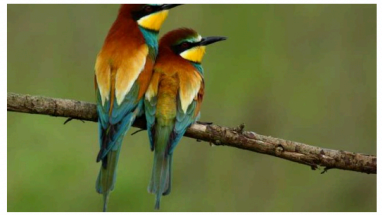
Global Biomes

Agriculture Sector

Labour supply and labour productivity (in development)

Lakes

Agro-economic Modelling



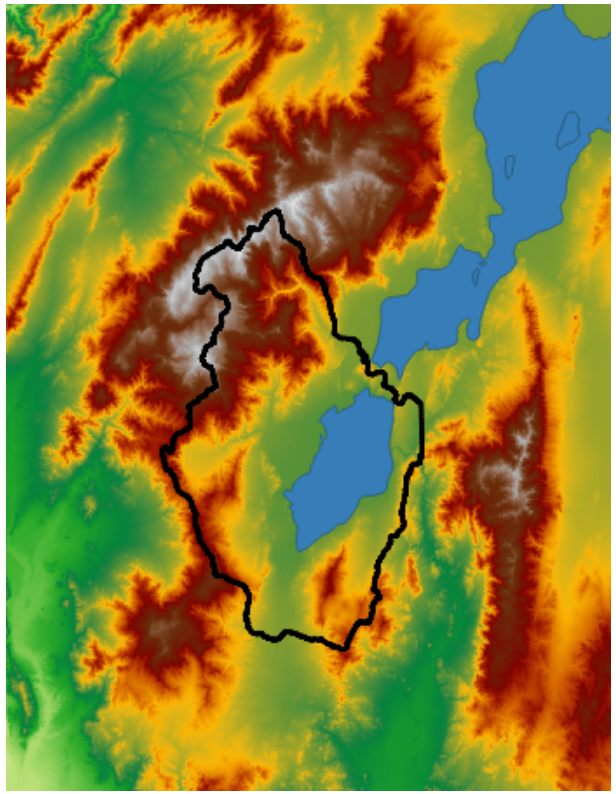
Terrestrial Biodiversity

Permafrost

Coastal Systems

Further downscaling of climate data for AGRICA Ethiopia

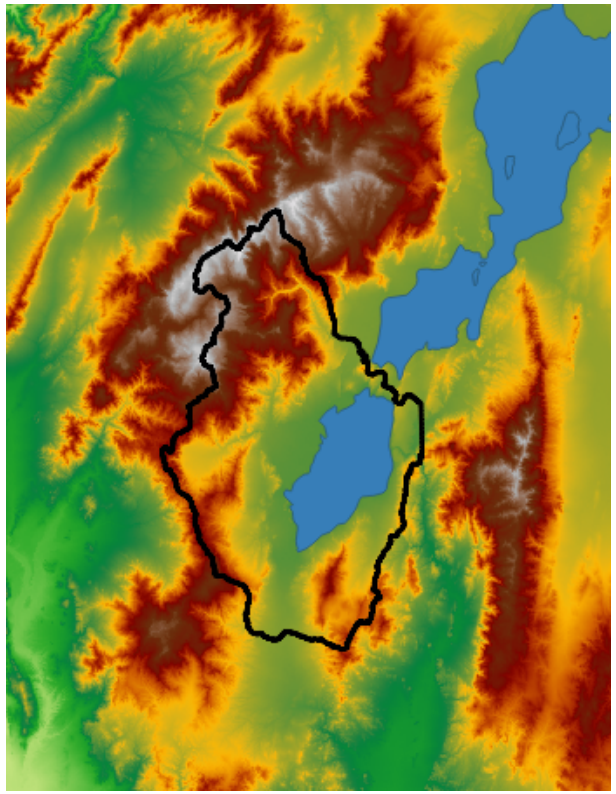
Study region Lake Chamo



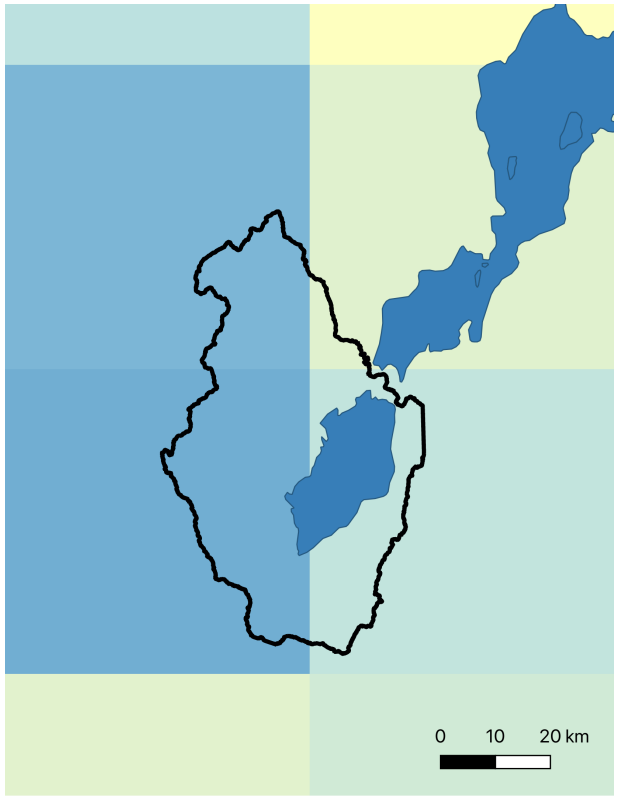
- Lake Chamo is located in Rift Valley at elevation of about 1100 m
- Study region has a topographic range of 1100-3500 m
- Lake is approximately 32 x 13 km
- Study region is approximately 87 x 52 km

Further downscaling of climate data for AGRICA Ethiopia

Study region Lake Chamo



Data at typical PIK resolution



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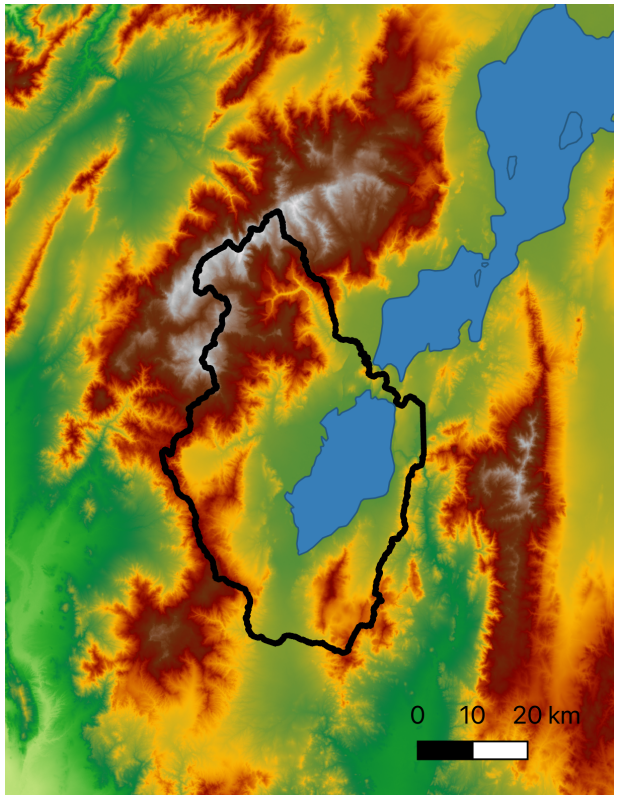

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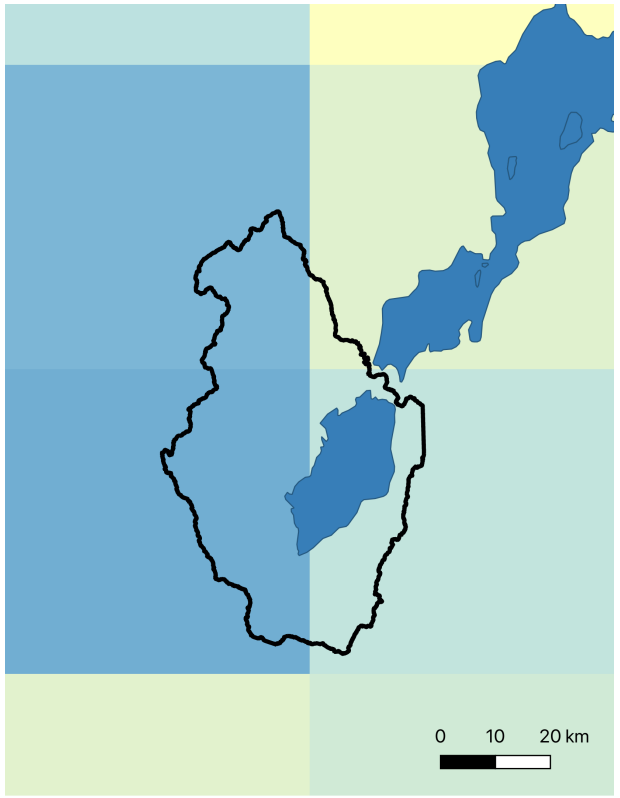
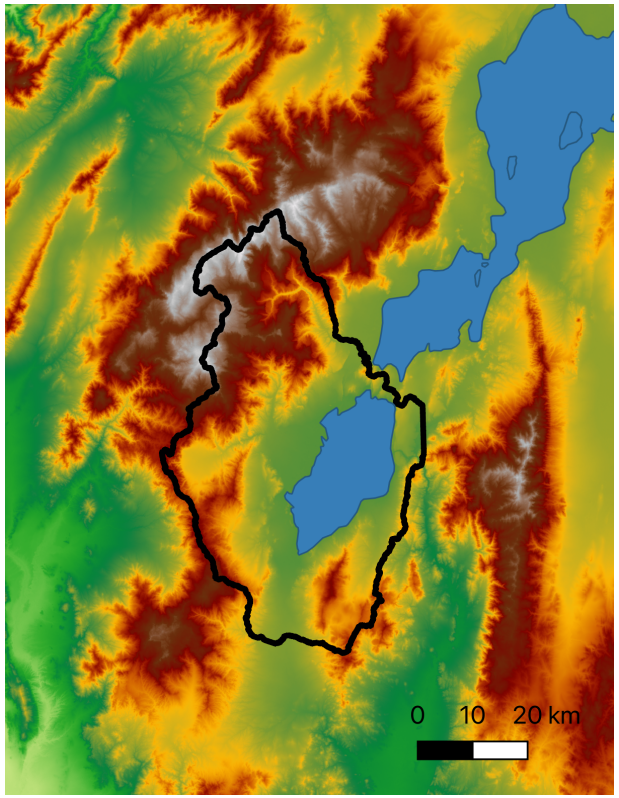


CHELSA

- **C**limatologies at **h**igh resolution for the **e**arth's **l**and **s**urface **a**reas
- Collaboration of Swiss Federal Institute for Forest, Snow and Landscape Research and PIK
- Mechanistical statistical downscaling to 30 arc sec (~ 1km)
- High computational cost
- www.chelsa-climate.org

Further downscaling of climate data

Study region Lake Chamo



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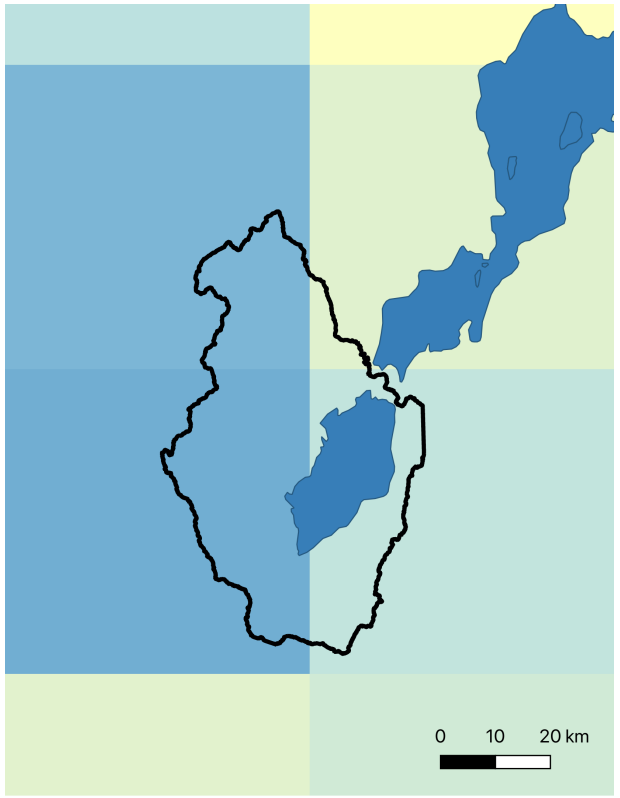
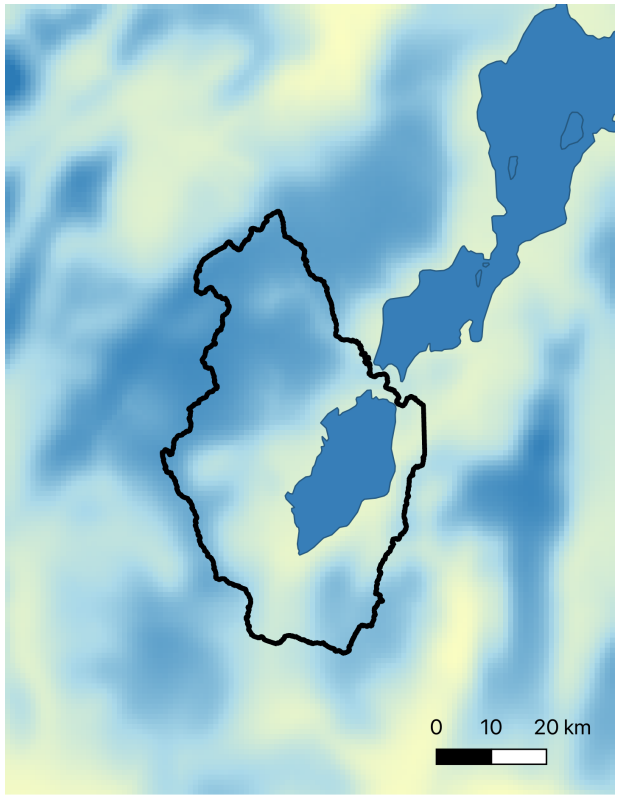


CHELSA Downscaled



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Data available at **data.isimip.org**

Feel free to ask me for support at

gleixner@pik-potsdam.de