Regional seasonal forecasting for the Blue Nile and Tekeze-Setit-Atbara Basins

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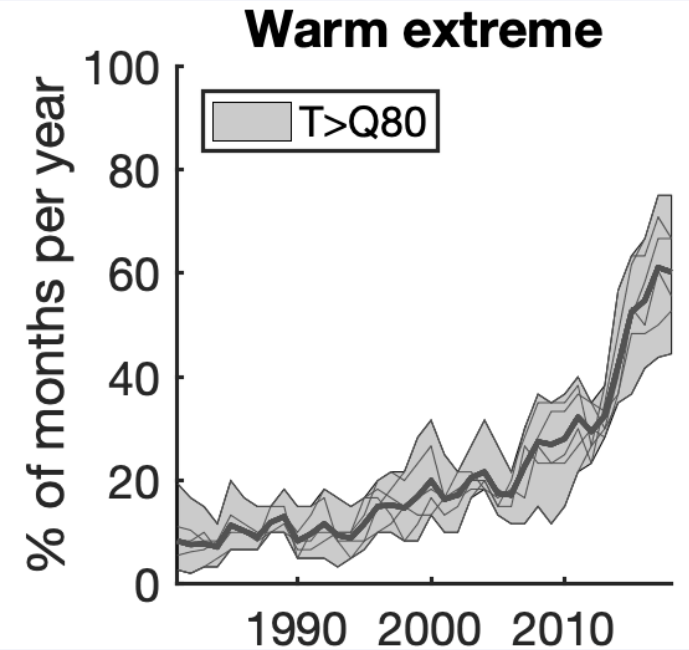
More climatic extremes…

ERA5-Land aggregated over several semi-arid river basins



Numer of very warm months is increasing

From Portele et al. (2020): Seasonal Forecasts offer Economic Benefit for Hydrological Decision Making in Semi-Arid Regions, Scientifc Reports (in review)

Timely pro-active water management is getting more and more crucial!

Seasonal forecasts – but…

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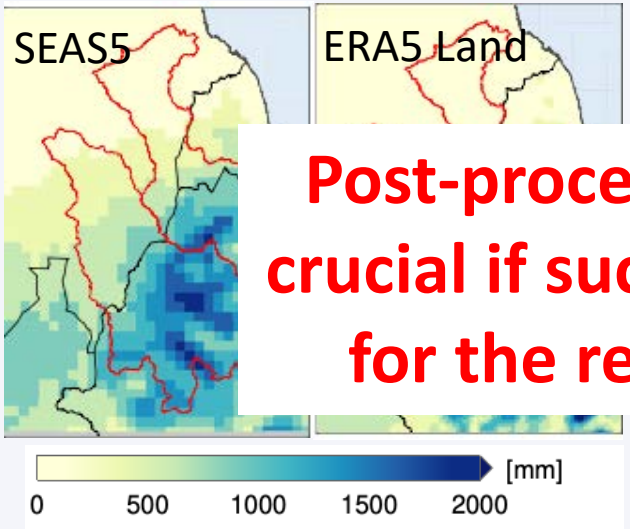
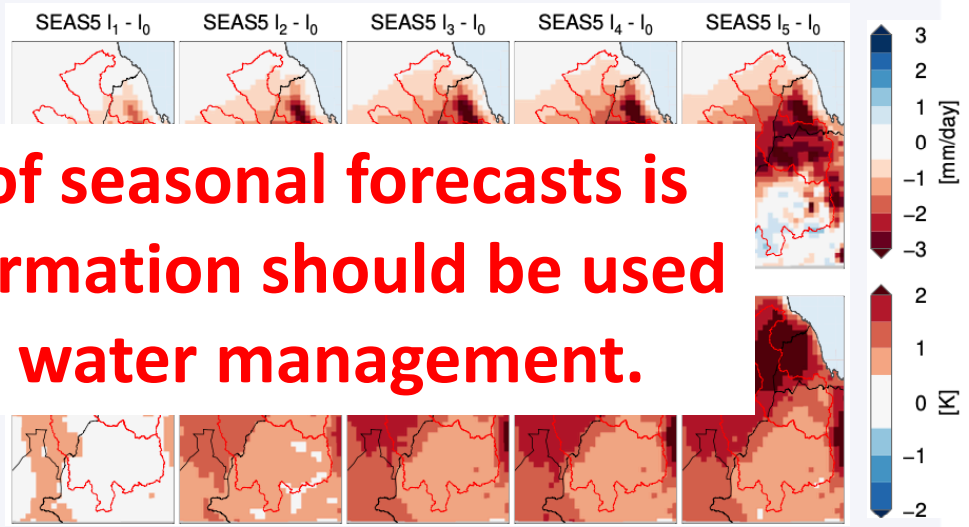
Model biases, coarse resolution



Seasonal precipitation sum from June to September, averaged over the period 1981 to 2016

Model drifts



Differences of precipitation (top) and temperature (bottom) forecasts for July between different lead times, averaged over the period 1981 to 2016

Post-processing of seasonal forecasts is crucial if such information should be used for the regional water management.

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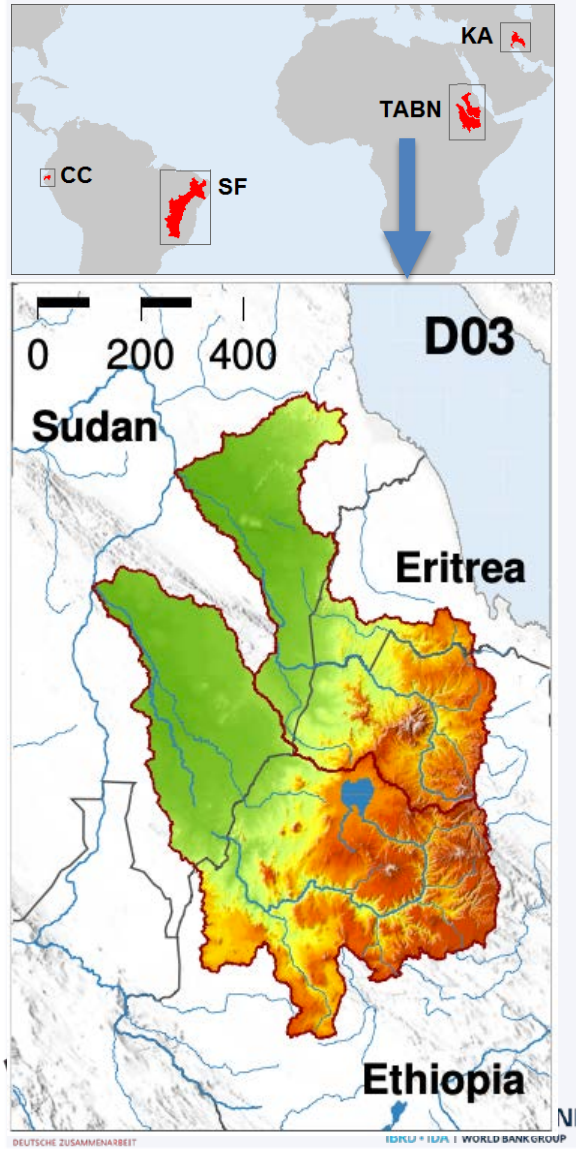
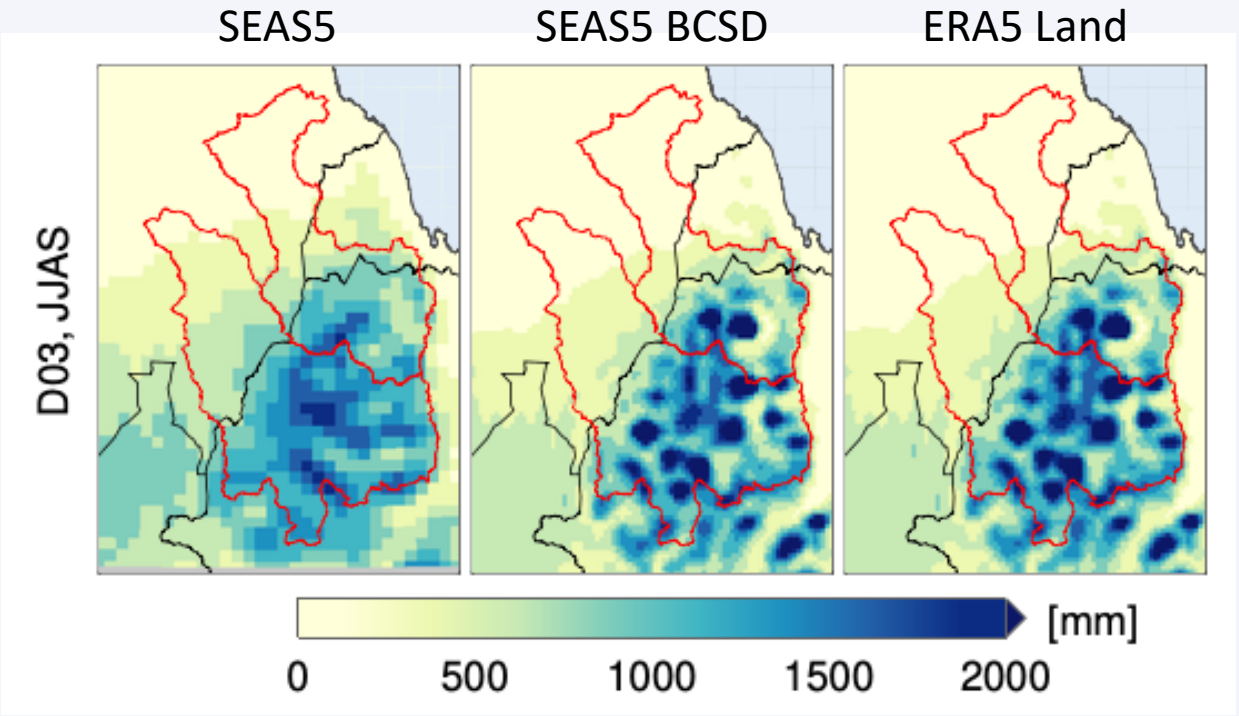
SEAS-BCSD in a nutshell…



- **Development** of **regionalized seasonal forecasts** for several semi-arid river basins
- …including the Basins of the Blue Nile and the Tekeze-Atbara (domain D03)
- **Bias-Correction and Spatial Disaggregation** (BCSD) of ECMWFs seasonal forecast product **SEAS5** towards **ERA5-Land**, which is the offline re-run of ERA5s land surface component with an enhanced resolution of 9km.
- **Free publication** of the dataset to **build capacity and knowledge** in the field of **seasonal ensemble forecasts**.
- **Operationalization** for providing **up-to-date seasonal forecasts and derived products** for supporting the regional water management

Reduced biases and drifts, higher spatial resolution!

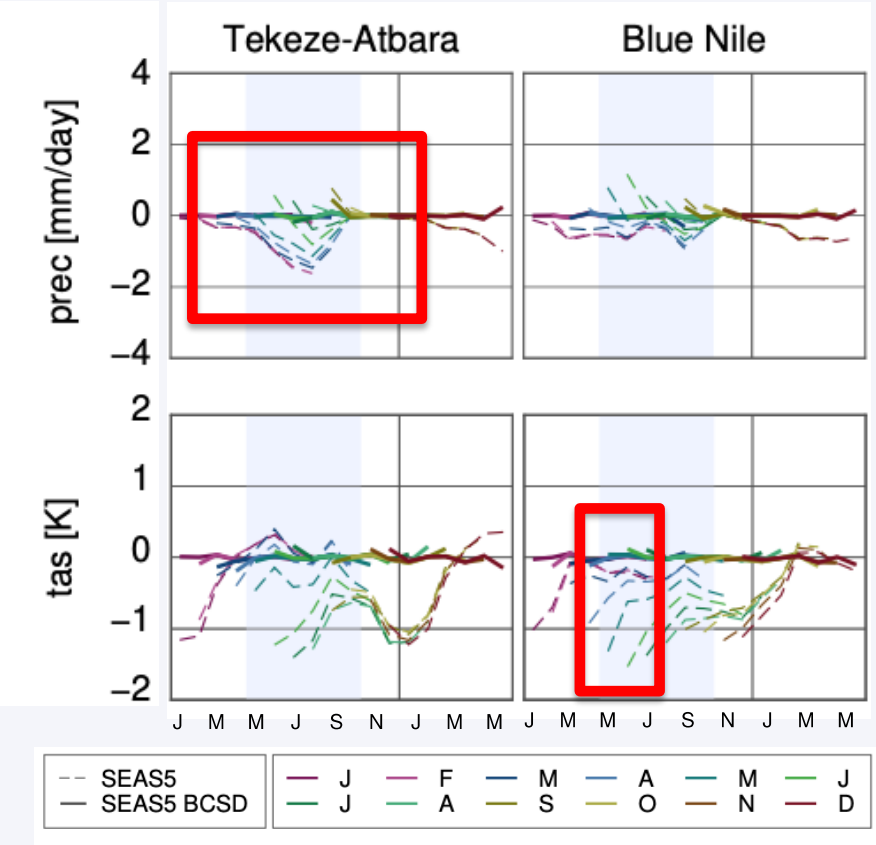


Seasonal precipitation sum from June to September, averaged over the period 1981 to 2016

Significantly improved level of agreement w.r.t. ERA5 Land; reduced biases and drifts!

Improved basin-scale forecasts

Bias of precipitaton (top) and temperature (bottom) between SEAS5 (dashed), SEAS5-BCSD (straight) and ERA5-Land from different issue months (colors)



- Biases after BCSD are close to 0
- Seasonality of biases is reduced
- Improved consistency across the lead times

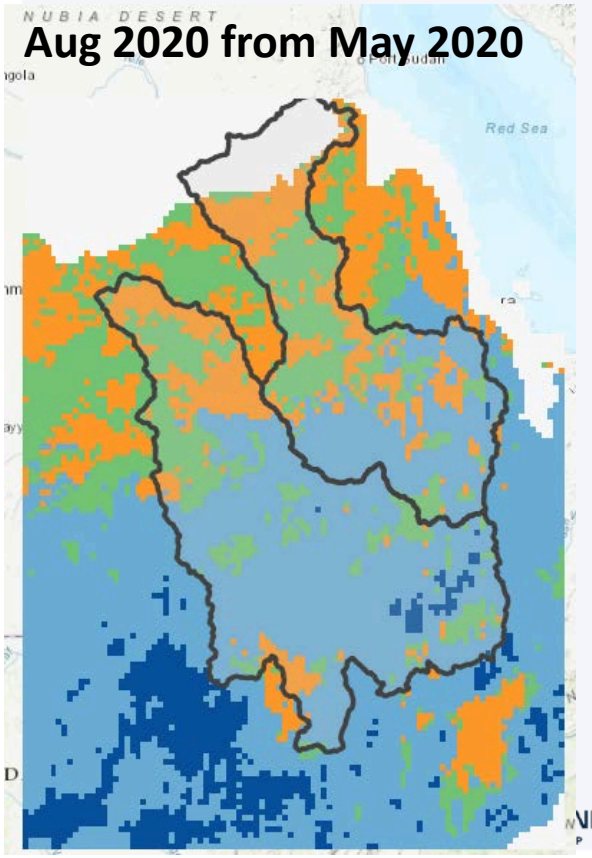
BCSD is a simple, but effective method for reducing biases and model drifts.

…more results in Lorenz et al. (2020): Bias-corrected and spatially disaggregated seasonal forecasts: a long-term reference forecast product for the water sector in semi-arid regions, ESSD, in review, doi: 10.5194/essd-2020-177

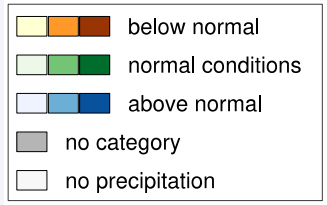
Abnormal events in the past…

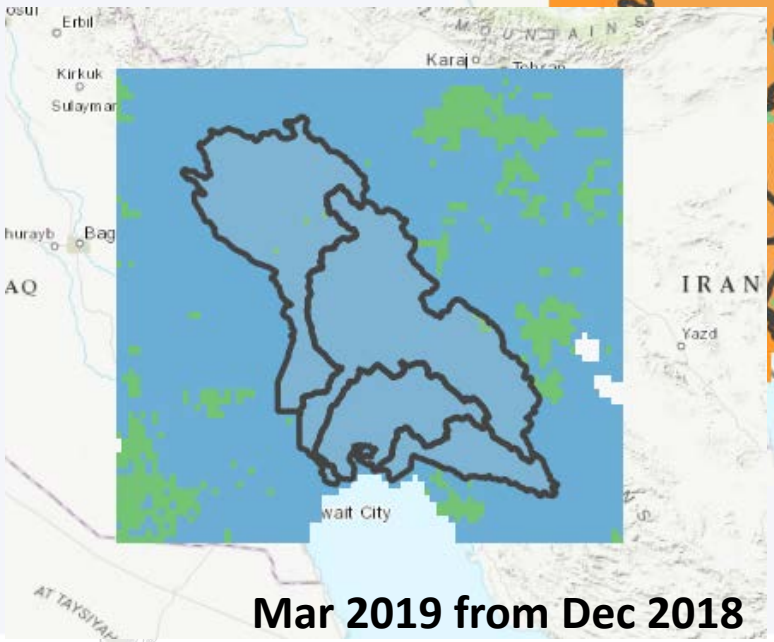
Wet conditonditions during July/August 2020 across large parts of Ethiopia/South Sudan were predicted from around May 2020

Over Iran, below normal conditons during the first months of the rainy season 2017/2018 were predicted from October 2017; above normal conditons during the rainy season 2018/2019 were predicted from autumn 2018;



Aug 2020 from May 2020





Mar 2019 from Dec 2018

Dec 2017 from Oct 2017

Current forecasts indicate wet conditions during rainy season

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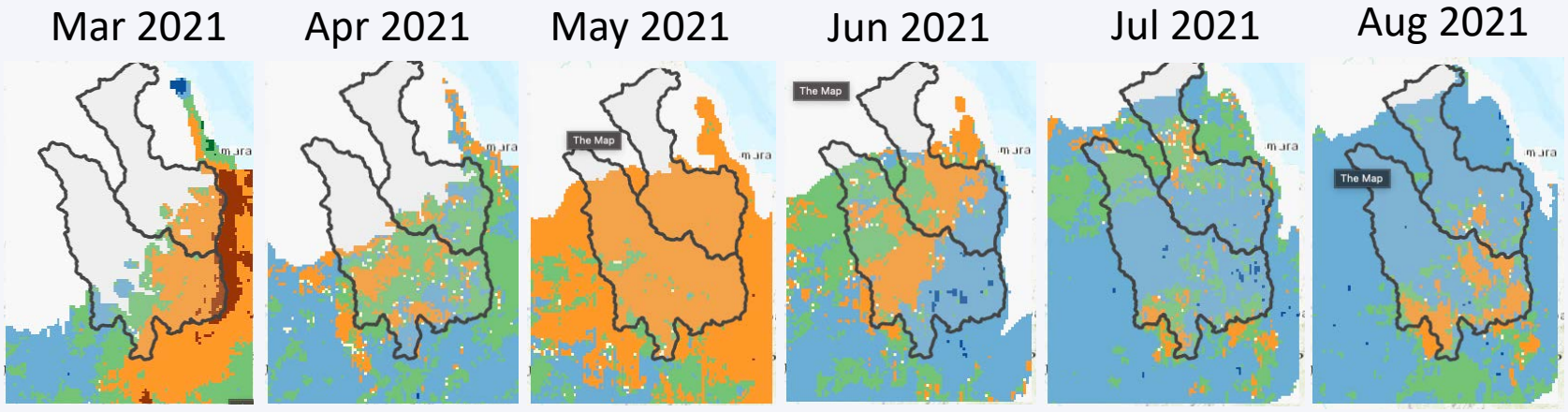
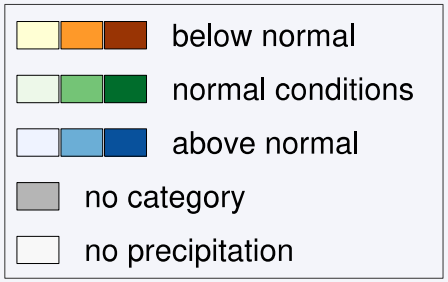
Categorical (tercile) precipitation forecasts from 1.3.2021





- Dry conditons across large parts of the headwaters during March and May
- Wet conditions across the South-Western part of the domain throughout the season
- Period Jun to Aug 2021 seems to become (very) wet and warm (similar to last year…)

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SEAS5-BCSD is publicly available

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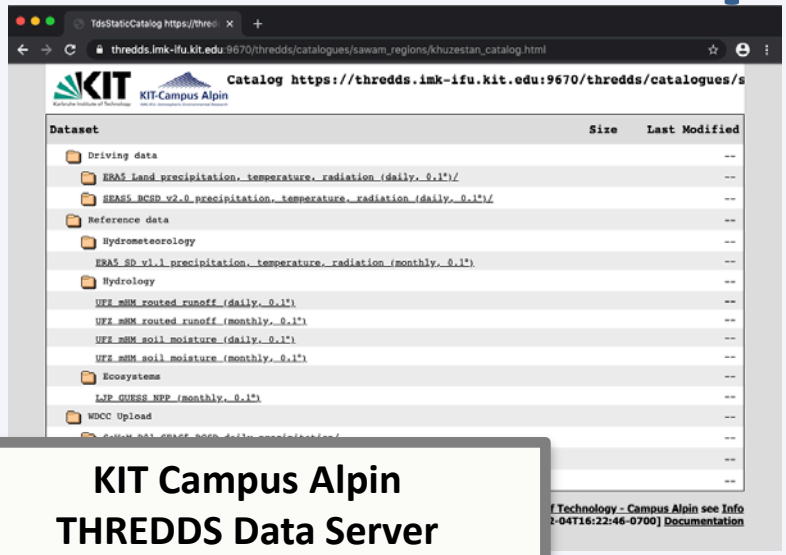

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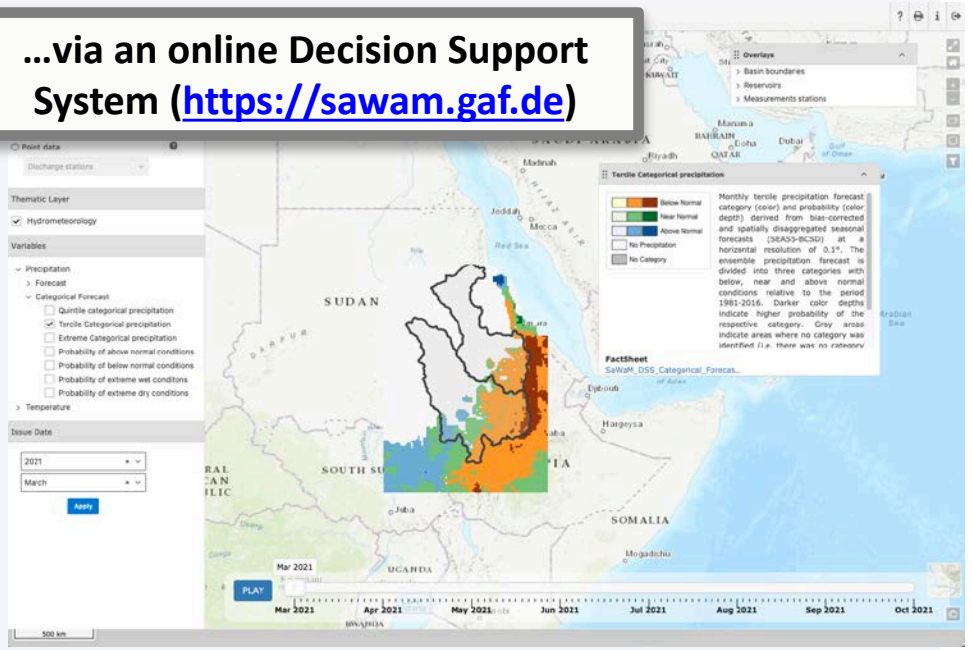
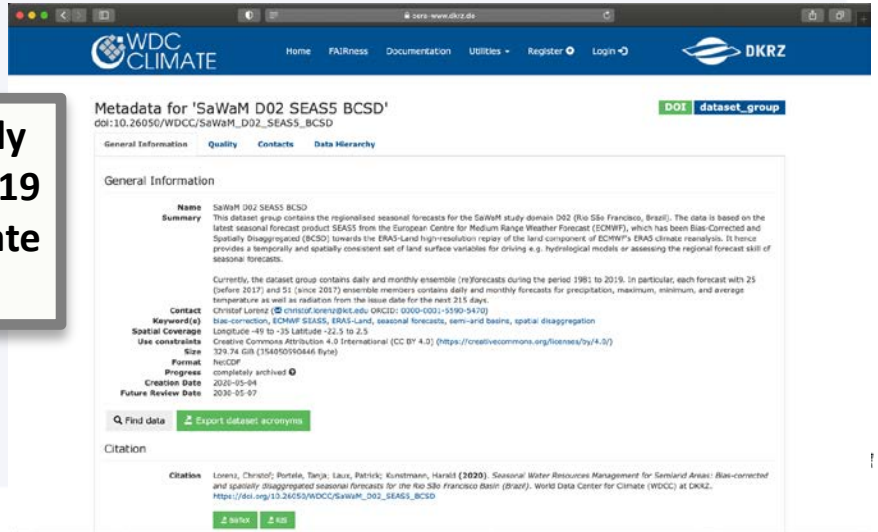
THREDDS Data Server
for operational products

…via an online Decision Support System (https://sawam.gaf.de)



Publication of the full daily and monthly ensemble (re)forecasts from 1981 to 2019 though the World Data Center for Climate (WDCC)



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Conclusion & outlook

- A baseline forecasting product for the Blue Nile and Tekeze-Atbara including precipitation, temperature and radiation is freely available
- Improved performance compared to the raw SEAS5 forecasts
- Release of new forecasts approx. 1 day after official ECMWF release (5th of each month)
- Next:
  - Extension of variables (e.g., wind, humiditiy, etc.)
  - Extension of domain (e.g., White Nile)
  - Evaluation of new and innovative regionalization approaches (e.g., machine learning)
  - Hydrological modeling approaches


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THANK YOU!