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Seasonal water balance forecasts for drought early warning in Ethiopia



Overview

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- User tailoring of climate forecasts: prediction of indices
 - methods
 - expected skill
- Seasonal forecasts in Ethiopia
 - verification of precipitation and water balance forecasts

Potential of dynamical downscaling

Prediction of indices



- indices: (non-linear) aggregation of meteorological parameter(s) over given period
- direct relevance for users

Meteos



Prediction of indices



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Meteo

forecasts with a user perspective while avoiding complex impact models









- Bias correction of daily values (Mahlstein et al., JGR 2015)
- Indices forecasts (single variables) vs seasonal means of variables
 - Skill of index <= skill in seasonal means of underlying variable



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- Bias correction of daily values (Mahlstein et al., JGR 2015)
- Indices forecasts (single variables) vs. seasonal means of variables
 - Skill of index <= skill in seasonal means of underlying variable
 - Direct relevance of index still provides a benefit



Prediction of drought indices



- Interest from various sectors
 - eg. agriculture, energy, public health



- Ongoing projects:
 - hydrological ensemble predictions for hydropower operations



Energy Turnaround National Research Programme NRP 70 Picture Hydropo wer

Improve usability of seasonal forecasts



www.euporias.eu



Seasonal forecasts in East Africa

- Ethiopia's food security early warning system
- Main cropping season: June-September
- Skill of seasonal forecasts (ECMWF System 4) for predicting precipitation and cumulative water balance?





EUPORIAS





Methods



- ECMWF S4 hindcasts 1981 2012
- WFDEI (www.eu-watch.org)

- Bias-correction of daily data
 - T_{min}, T_{max}: Mean debiasing (Mahlstein et al., JGR 2015)
 - Precipitation: Quantile mapping
- Daily evapotranspiration (EPT) after Hargreaves $f(T_{min}, T_{max})$
- Cumulative precipitation and water balance (precip EPT) for JJAS

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Precipitation vs water balance EUPORIAS ____



- Similar skill for water balance (= $f(T_{min}, T_{max}, prec)$) and precip
- Signifcant regional and temporal (skill of ind. months) differences











skill difference GCM-RCM



Summary & conclusions



- Similar skill of precip sum and cum. water balance
- Indication of potential for multivariate indices, carry-over effects
- Skill in relevant crop areas is dominated by skill in precipitation
- Generally limited skill, no added value by dynamical downscaling



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