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Deutscher Wetterdienst
Wetter und Klima aus einer Hand

User Needs and Products for Decadal Predictions: MiKlip Forecast Webpage and GPCC Drought Index

A. Paxian[1], F. Kreienkamp[1], K. Fröhlich[1], M. Ziese[1], B. Früh[1], S. Hettrich[2], F. Vamborg[3], C. Kadow[4], S. Illing[4], J. Grieger[4], B. Tiedje[5], H. Feldmann[6], A. Pasternack[4], A. Richling[4], W. Müller[1], H. Pohlmann[2]

MiKlip Forecast Webpage

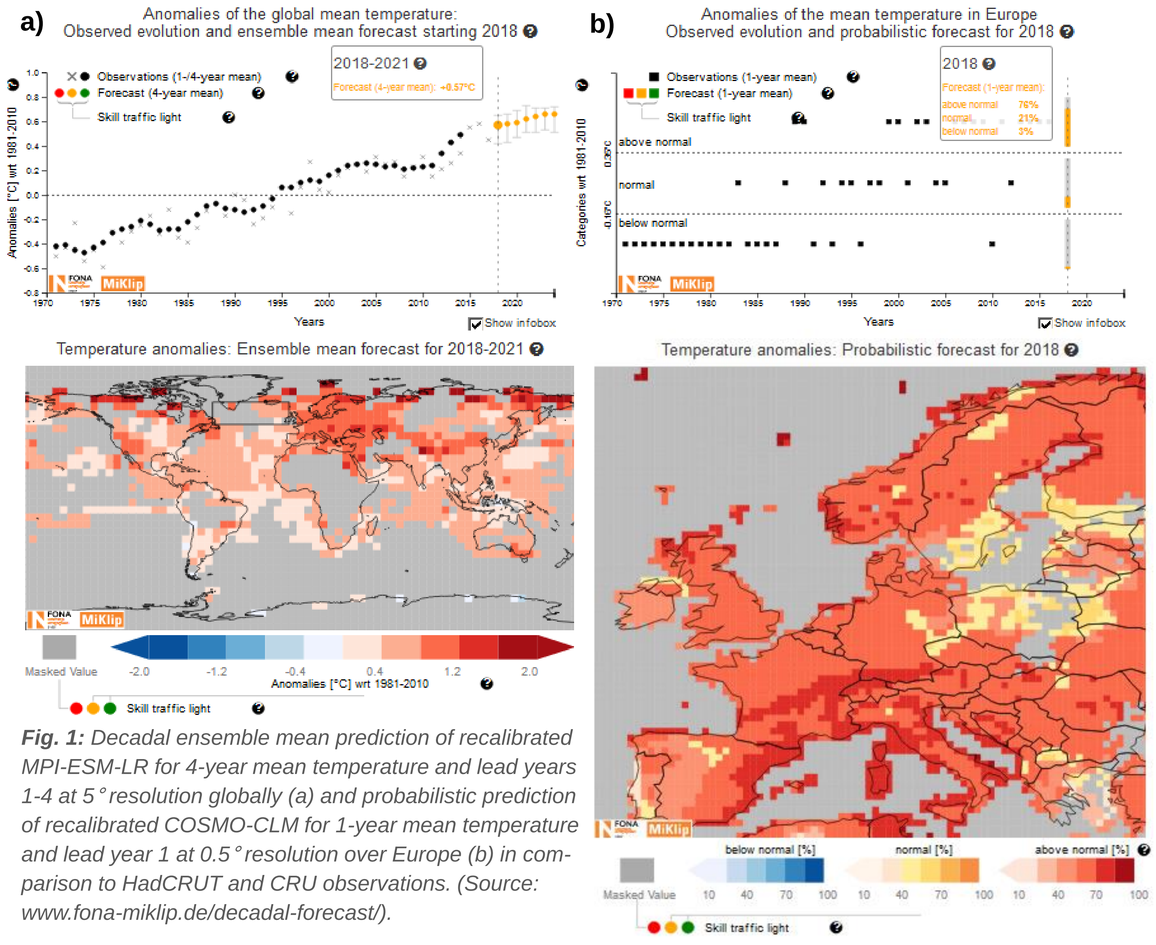

Fig. 1: *Decadal ensemble mean prediction of recalibrated MPI-ESM-LR for 4-year mean temperature and lead years 1-4 at 5 ° resolution globally (a) and probabilistic prediction of recalibrated COSMO-CLM for 1-year mean temperature and lead year 1 at 0.5 ° resolution over Europe (b) in comparison to HadCRUT and CRU observations. (Source: www.fona-miklip.de/decadal-forecast/).*

*The **MiKlip II-SUPPORT** project at DWD collects user needs in decadal predictions from questionnaires and user workshops and develops user-oriented decadal prediction products.*

MiKlip Forecast Webpage

The interactive MiKlip forecast webpage presents decadal predictions as a first insight into research for the public. Time series and maps are shown for 4- and 1-year mean recalibrated temperature predictions of the global earth system model MPI-ESM-LR at 5° resolution and the regional climate model COSMO-CLM at 0.5° resolution over Europe. The prediction skills of ensemble mean and probabilistic decadal predictions in reproducing observed variability are compared to those of the references observed climatology and uninitialized climate simulations (applying MSESS and RPSS). A traffic light system shows green/ yellow/ red if the decadal prediction skill is better than both/ one/ no reference.
For 2018-2021, positive temperature anomalies compared to 1981-2010 are predicted globally, reaching more than +1K over Europe and the Arctic regions (Fig. 1a). For 2018 over Europe, the above-normal tercile is the most probable with 55-70% probability of occurrence in most regions, except over the Baltic Sea area (Fig. 1b).

Global Precipitation Climatology Center Drought Index (GPCC-DI): Skill

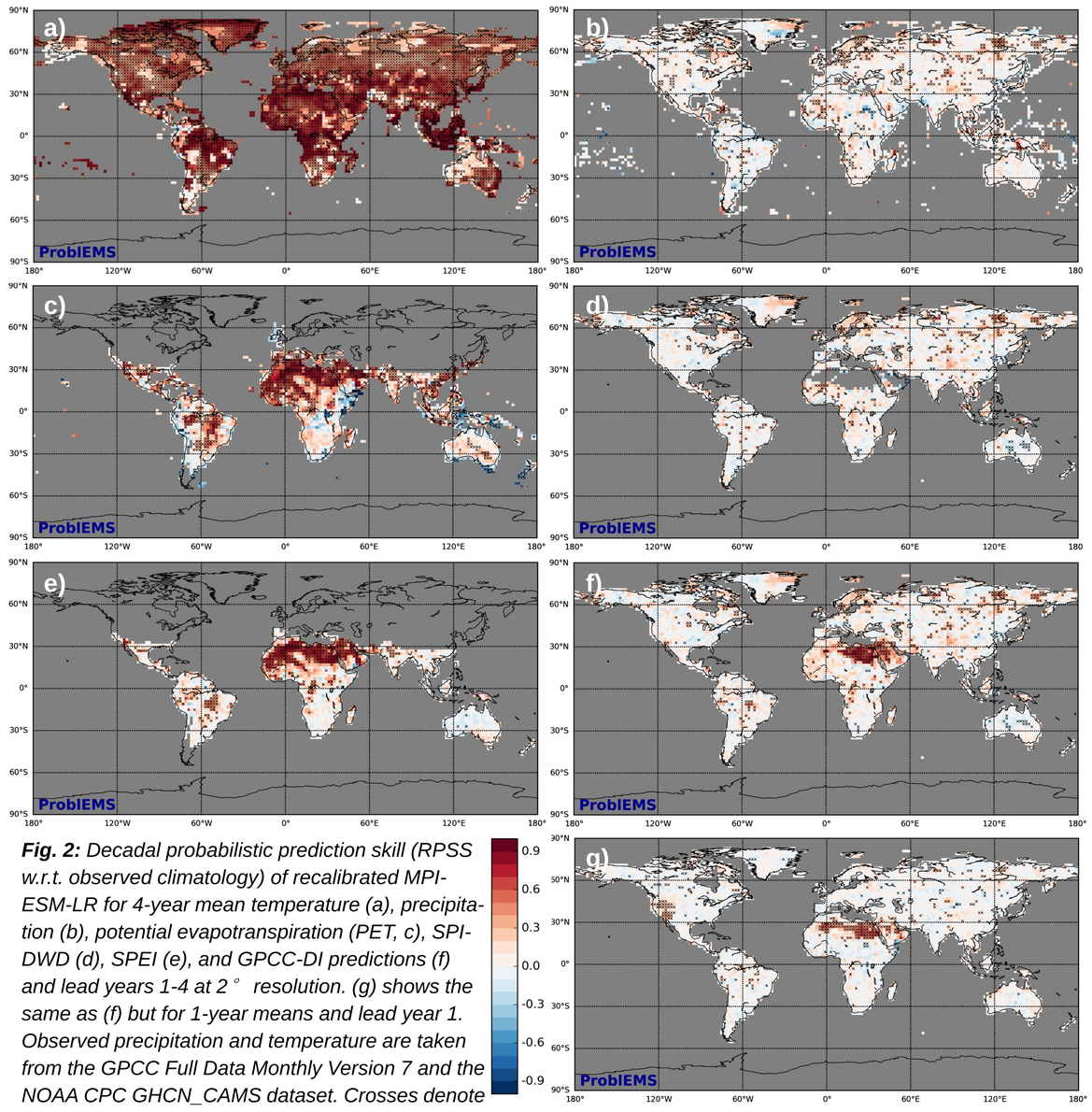

Fig. 2: *Decadal probabilistic prediction skill (RPSS w.r.t. observed climatology) of recalibrated MPI-ESM-LR for 4-year mean temperature (a), precipitation (b), potential evapotranspiration (PET, c), SPI-DWD (d), SPEI (e), and GPCC-DI predictions (f) and lead years 1-4 at 2 ° resolution. (g) shows the same as (f) but for 1-year means and lead year 1. Observed precipitation and temperature are taken from the GPCC Full Data Monthly Version 7 and the NOAA CPC GHCN_CAMS dataset. Crosses denote significant skill at a 95% significance level. The Central Evaluation System of MiKlip has been used.*

GPCC Drought Index (GPCC-DI)

User-oriented decadal drought forecasts are needed in forestry, hydrology and disaster risk reduction. The GPCC-DI combines the SPI-DWD (stand. index of precipitation) and the SPEI (stand. index of precipitation – pot. evapotransp. PET) to reach a global coverage. The evaluation of 4-year means for lead years 1-4 at 2° resolution shows high skills for temperature globally and for PET and SPEI in the tropics, e.g. over northern Africa (Fig. 2a, c, e). Heterogeneously distributed hot spots are found for precipitation and SPI-DWD (Fig. 2b, d). GPCC-DI hardly enhances the SPI-DWD and SPEI skills (Fig. 2f). 1-year means show smaller skills for lead year 1 due to larger small-scale noise, but new areas with skill emerge, e.g. the western United States (Fig. 2g).
For 2018-2021, high probabilities for droughts are predicted over North Africa, Arabia and South America. Wet conditions are very probable over many Northern Hemispheric areas. For 2018, the probabilistic prediction often reveals similar tendencies but with less probabilities of occurrence (Fig. 3).

Global Precipitation Climatology Center Drought Index (GPCC-DI): Forecast

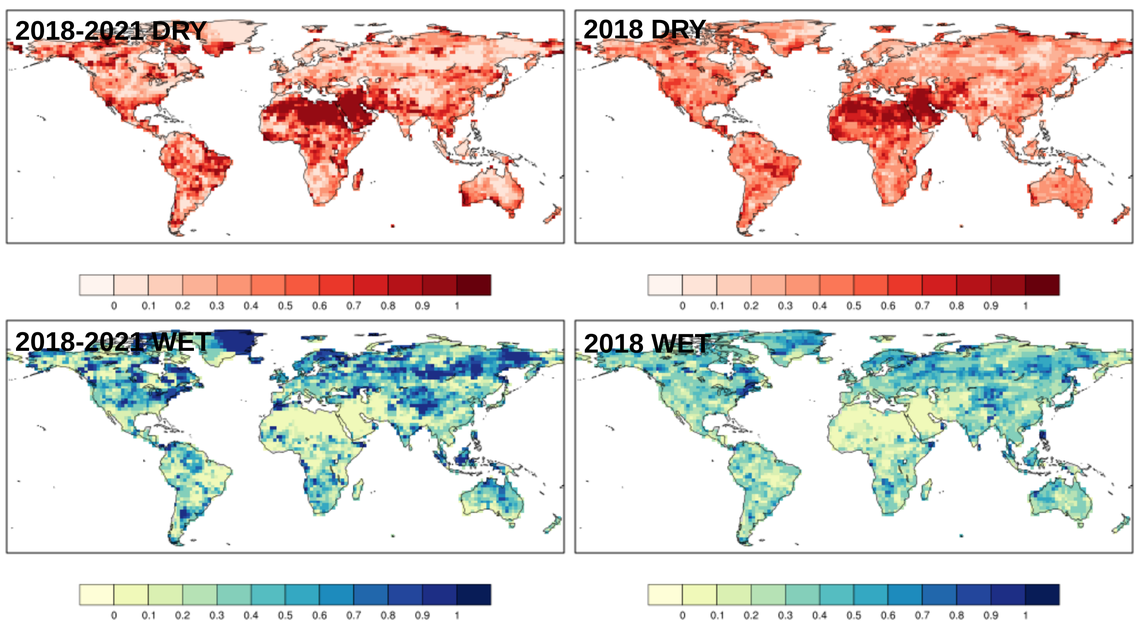

Fig. 3: *Decadal probabilistic prediction of MPI-ESM-LR (initialized in 2018) for 4-year mean GPCC-DI and lead years 1-4 (2018-2021, left) as well as 1-year means and lead year 1 (2018, right) at 2 ° resolution: probabilities of terciles based on the distribution of ensemble members for below-normal or dry conditions (above) and for above-normal or wet conditions (below). Observed precipitation and temperature are taken from the GPCC Full Data Monthly Version 7 and the NOAA CPC GHCN_CAMS dataset. The Central Evaluation System of MiKlip has been used.*

[1] DWD, Offenbach, Germany
[2] MPI-M, Hamburg, Germany
[3] ECMWF, Reading, Great Britain
[4] Freie Universität, Berlin, Germany
[5] GERICS, Hamburg, Germany
[6] KIT, Karlsruhe, Germany

Summary

➢ The interactive MiKlip forecast webpage presents decadal ensemble mean and probabilistic temperature predictions updated once a year, but more specific user products are needed.
➢ The user-oriented GPCC-DI and related drought indices reveal prediction skill for 4-year and 1-year means over several areas.

FONA Decadal Climate Prediction BMBF
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Climate and Environment Consultancy, www.dwd.de
andreas.paxian@dwd.de