

Probabilistic verification of decadal CMIP5 hindcast experiments

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The development of a system for decadal climate predictions is the main objective of the German research programme MiKlip (Mittelfristige Klimaprognosen). It is funded by the Federal Ministry of Education and Research and began in autumn 2011.

We will present the project VeCAP-Bonn (Verification, Calibration and Assessment of Predictability of medium-range climate predictions using satellite data) which is part of the validation module in MiKlip. One goal is to contribute a verification package for the validation of the MiKlip system focusing on the probabilistic evaluation of the decadal hindcasts and in the near future of forecasts. The package is split in two parts: the evaluation of necessary statistics for successful predictions assessing potential sharpness and reliability. For this we implemented one-way and two-way anova (analysis of variance) with fixed effects and without interactions for sharpness evaluation and the analysis rank histograms parameterized by Beta-distributions for reliability. Secondly there is a basic suite of sufficient tests based on the mean square error and correlation for continuous variables and sea level pressure based circulation indices. For discrete variables and their predictive probabilities, Brier scores and Brier skill scores relative to climate or other reference forecasts are implemented.

As basis observation data we include the ERA-Interim reanalyses from the ECMWF (European Centre for Medium-Range Weather Forecasts) as well as the satellite data HOAPS (Hamburg Ocean Atmosphere Parameters and Fluxes from Satellite Data). The simulations to be compared are based on the MPI-ESM model output of the baseline 0 and baseline 1 MiKlip system which differ in the way the initialized starting conditions in atmosphere and ocean are generated.

Comparing these two simulation products the improvement of the baseline 1 model data can obviously be seen for the surface temperatures and the sea level pressure. Although the potential predictability seems to be higher in baseline 0, especially in the tropical regions, the correlation values between observations and ensemble mean of baseline 1 increase. Betascores summarizing the graphical character of analysis rank histograms show that for the annual mean the underestimation of the ensemble forecast uncertainty in the tropics in baseline 0 is improved in the updated MiKlip simulation system.