



## **Development and comparison of metrics for evaluating climate models and estimation of projection uncertainty**

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The COMEPRO project (Comparison of Metrics for Probabilistic Climate Change Projections of Mediterranean Precipitation), funded by the Deutsche Forschungsgemeinschaft (DFG), is dedicated to the development of new evaluation metrics for state-of-the-art climate models. Further, we analyze implications for probabilistic projections of climate change. This study focuses on the results of 4-field matrix metrics. Here, six different approaches are compared.

We evaluate 24 models of the Coupled Model Intercomparison Project Phase 3 (CMIP3), 40 of CMIP5 and 18 of the Coordinated Regional Downscaling Experiment (CORDEX). In addition to the annual and seasonal precipitation the mean temperature is analysed. We consider both 50-year trend and climatological mean for the second half of the 20th century. For the probabilistic projections of climate change A1b, A2 (CMIP3) and RCP4.5, RCP8.5 (CMIP5, CORDEX) scenarios are used. The eight main study areas are located in the Mediterranean. However, we apply our metrics to globally distributed regions as well.

The metrics show high simulation quality of temperature trend and both precipitation and temperature mean for most climate models and study areas. In addition, we find high potential for model weighting in order to reduce uncertainty. These results are in line with other accepted evaluation metrics and studies. The comparison of the different 4-field approaches reveals high correlations for most metrics. The results of the metric-weighted probabilistic density functions of climate change are heterogeneous. We find for different regions and seasons both increases and decreases of uncertainty. The analysis of global study areas is consistent with the regional study areas of the Mediterranean.