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# Development and comparison of weighting metrics for probabilistic climate change projections of Mediterranean precipitation

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Climate protection and adaptive measures require reliable estimates of future climate change. Coupled global circulation models are still the most appropriate tool. However, the climate projections of individual models differ considerably, particularly at the regional scale and with respect to certain climate variables such as precipitation. Significant uncertainties also arise on the part of climate impact research. The model differences result from unknown initial conditions, different resolutions and driving mechanisms, different model parameterizations and emission scenarios. It is very challenging to determine which model simulates proper future climate conditions. By implementing results from all important model runs in probability density functions, the exceeding probabilities with respect to certain thresholds of climate change can be determined. The aim of this study is to derive such probabilistic estimates of future precipitation changes in the Mediterranean region for the multi-model ensemble from CMIP3 and CMIP5. The Mediterranean region represents a so-called hot spot of climate change. The analyses are carried out for the meteorological seasons in eight Mediterranean sub-regions, based on the results of principal component analyses. The methodologically innovative aspect refers mainly to the comparison of different metrics to derive model weights, such as Bayesian statistics, regression models, spatial-temporal filtering, the fingerprinting method and quality criteria for the simulated large-scale circulation. The latter describes the ability of the models to simulate the North Atlantic Oscillation, the East Atlantic pattern, the East Atlantic/West Russia pattern and the Scandinavia pattern, as they are the most important large-scale atmospheric drivers for Mediterranean precipitation. The comparison of observed atmospheric patterns with the modeled patterns leads to specific model weights. They are checked for their temporal consistency in the 20th century and then applied to the precipitation projections for the 21th century. The greater weight of better models entails a more reliable precipitation change signal in the region of investigation.