Session: C34 Poster: W214A

An alternative method for model weighting applied to climate projection

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Uncertainty regarding the quality of the climate model ensemble average has sparked recent interest and debate regarding the feasibility of unequal weight methods. In preparation for the upcoming release of CMIP5 data, this study uses the current CMIP3 archive to demonstrate the results of an alternative model weighting system. The proposed scheme applies a weight for each model that is dependent on its performance in simulating the present (or past) climate. Performance can be measured by the bias Bj produced in the difference between the model simulation of the j-th model Mj and the observed climatology C using the ratio Bj = Mj[present]/ C[present], such that models better able to produce observed climate are given a larger weight. The new scheme is applied to the CMIP3 ensemble data for the SRES A1B scenario projection for future precipitation (2080-2099) relative to past precipitation (1980-1999). The results are then compared to those produced by an equal weight method for the same ensemble data set. Selected regions are highlighted to demonstrate the subtle but important differences that our weighting scheme produces. Up to a 14% difference in the projected change in precipitation is found for the southwestern US, and an average of a 10% difference is found for the Mediterranean region. Overall, model results for the unequal weight scheme show a good agreement with the equal weight scheme, suggesting that the proposed method does not drastically change the outcome of a multimodel ensemble average.