Geophysical Research Abstracts
Vol. 12, EGU2010-5041, 2010
EGU General Assembly 2010

On the dependence of the regional climate change signal on the regional model bias

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An analysis is presented of the dependence of the simulated regional temperature and precipitation change signal (2071-2100 minus 1971-2000) on the corresponding regional model bias compared to present day observations (1971-2000). The analysis is based on the CMIP3 ensemble of AOGCM simulations for the 20th and 21st century (A1B scenario). December-January-February (DJF) and June-July-August (JJA) data are considered for twentysix land regions of sub-continental size throughout the World. Correlations are first calculated between the regional biases and changes for the ensemble of models. It is found that for temperature the regional change signal is largely independent of the corresponding regional model bias. This is because the regional temperature change is essentially determined by the global model climate sensitivity regardless of the model regional biases. For precipitation a significant correlation between simulated regional change and regional model bias is found in 15 regional/seasonal cases out of 52 (26 each for DJF and JJA). These cases span a wide range of climate regimes, so the bias-change relationship is of varied nature. It is shown that for the cases in which the model bias affects the simulated change, the choice of sub-sets of models in deriving ensemble-based climate change signal is highly relevant. A discussion is presented of the implications of our results for the use of ensembles of models to derive regional climate change information.