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Assessment of bias correction under transient climate change

Bert Van Schaeybroeck and Stéphane Vannitsem
Konlinklijk Meteorologisch Instituut, Research and Development, Brussel, Belgium (bertvs@meteo.be)

Calibration of climate simulations is necessary since large systematic discrepancies are generally found between the model climate and the observed climate. Recent studies have cast doubt upon the common assumption of the bias being stationary when the climate changes. This led to the development of new methods, mostly based on linear sensitivity of the biases as a function of time or forcing (Kharin *et al.* 2012). However, recent studies uncovered more fundamental problems using both low-order systems (Vannitsem 2011) and climate models, showing that the biases may display complicated non-linear variations under climate change. This last analysis focused on biases derived from the equilibrium climate sensitivity, thereby ignoring the effect of the transient climate sensitivity.

Based on the linear response theory, a general method of bias correction is therefore proposed that can be applied on any climate forcing scenario. The validity of the method is addressed using twin experiments with a climate model of intermediate complexity LOVECLIM (Goosse *et al.*, 2010). We evaluate to what extent the bias change is sensitive to the structure (frequency) of the applied forcing (here greenhouse gases) and whether the linear response theory is valid for global and/or local variables.

To answer these question we perform large-ensemble simulations using different 300-year scenarios of forced carbon-dioxide concentrations. Reality and simulations are assumed to differ by a model error emulated as a parametric error in the wind drag or in the radiative scheme.

References

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