
What if modelled signals are too weak?

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Abstract

We present mounting evidence that climate models underestimate the magnitude of some predictable signals. This error is seen on subseasonal to multi-decadal timescales, in both initialized predictions and radiatively-forced simulations, and is especially clear in decadal predictions of the North Atlantic Oscillation where the predictable signal is an order of magnitude too weak in models. In this situation, individual model simulations do not represent alternate realisations of the chaotic climate system, and treating them as such will lead to incorrect estimations of the role of unpredictable internal variability. Instead, skilful predictions can be made by extracting the predictable signal from the mean of a very large ensemble and inflating its magnitude to match the predictable signal diagnosed by comparison of past cases with observations. Implications of this error for attribution of multi-annual to decadal changes in the climate system will be discussed.

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