What Might We Learn from Climate Forecasts?

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Abstract

Most climate models are large dynamical systems involving a million (or more) variables on big computers. Given that they are nonlinear and not perfect, what can we expect to learn from them about the earth's climate? How can we determine which aspects of their output might be useful and which are noise? And how should we distribute resources between making them "better," estimating variables of true social and economic interest, and quantifying how good they are at the moment? Just as "chaos" prevents accurate weather forecasts, so model error precludes accurate forecasts of the distributions that define climate, yielding uncertainty of the second kind. Can we estimate the uncertainty in our uncertainty estimates? These questions are discussed. Ultimately, all uncertainty is quantified within a given modeling paradigm; our forecasts need never reflect the uncertainty in a physical system.