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Title: Are Current Flaws in Bayesian Approaches to Climate Projection Fatal?

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Bayesian approaches to the statistical analysis of observational data relevant to climate science offer tremendous advantages both to the science and to decision makers. When applied to climate projections with an eye to supplying conditional probabilities for adaptation or mitigation, on the other hand, in-practice Bayesian approaches can be expected to yield false confidence and poor decision support. Fatal flaws in currently deployed methods, such as the estimation of an irrelevant "discrepancy" term, are illustrated in a simple celestial mechanics example. Here an ensemble of Newtonian models is deployed in an application solvable given the theory of general relativity, but in which the discrepancy term estimated from an ensemble of Newtonian models yields false over-confidence and poor decision support. A relevant point here is that one may be able to identify the estimated discrepancy as irrelevant long before one can rectify the physics. The empirical inadequacy of the Newtonian model was identified 50 years before the proposal of general relatively; similarly we do not expect the empirical inadequacy of today's climate models to be rectified for decades.

The general prospects of the Bayesian approach in the context of physical science questions involving extrapolation of systems best modeled as nonlinear, with access only to empirically inadequate models, are discussed. Bayes' rule is, of course, never called into question; the heart of the matter here does not lie in a divide between competing tribes of statisticians, but rather with the rational interpretation and in-practice interpretation of physical models by physical scientists. For risk management in climate-like problems, ambiguity (second order uncertainty) can limit the relevance of Bayes' rule to the questions on the table: can we find a Bayesian path relevant to decision makers in the time available?