



Maximum likelihood approach for model-data comparison and unbiased estimate of climate sensitivity over the last millennium

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To fully appreciate the implication of climate reconstruction over the past millennium, we propose a new framework of model-data comparison that is based on a variant of maximum likelihood method. In this procedure, all data with associated level of uncertainty are expressed in terms of likelihood, and the overall performance is evaluated as the maximum of multiplied likelihood. For example, the score of a model run is not simply evaluated as the degree of model-data matching nor the likelihood associated with the matching. In this framework, the score of a run is expressed as the multiple of the two likelihoods for model-data comparison in global mean temperature in pre- and post-industrial periods, a likelihood for the choice of proxy scaling in the pre-instrumental period, and a likelihood for the realisation of other observed quantities such as the ocean heat uptake.

To illustrate this procedure, we use the outputs from simple energy balance model and a coarse resolution general circulation model.