

Quantifying and presenting uncertainty in the attribution and prediction of climate change

Myles Allen

Department of Physics, University of Oxford, UK

Abstract

Despite valiant efforts by the Intergovernmental Panel on Climate Change to achieve a consistent treatment of uncertainty in its Assessment Reports, consensus is still a very long way away. At the heart of the problem is the fundamental divide between Bayesian and Frequentist approaches to uncertainty, picked up (often implicitly) by IPCC authors. The wording of the Assessment Reports implies that the IPCC intends a Bayesian interpretation of terms such as "likely" (better than 2 in 3 odds of being the case), "very unlikely" (less than 1 in 10 odds of being the case) and so on: these terms are formally supposed to convey posterior probabilities incorporating a combination of expert judgment and observational evidence. Yet the practice does not bear out this formal definition: in IPCC chapters relating to observations of climate change and attribution of causes, these words are used much more to relate the outcomes of classical hypothesis-tests; whereas in chapters relating to prediction, they are used in the Bayesian sense. As a result, a literal reading of recent reports could imply that the IPCC is more confident about the future than it is about the past, which is clearly absurd. There is an urgent need for the statistical community to step in to sort out the mess before it becomes too obvious. Given that IPCC authors are unlikely all to subscribe to a single approach, I personally would favor the adoption of two distinct terminologies, one to convey the outcomes of hypothesis tests, the second to convey posterior probabilities, but welcome discussion on the best way forward. This talk will be illustrated with recent work on the interpretation of ensemble climate change simulations and predictions.