



Using prior information to separate the temperature response to greenhouse gas forcing from that of aerosols – Estimating the transient climate response

Andrew Schurer and Gabriele Hegerl

University of Edinburgh, Edinburgh, United Kingdom (a.schurer@ed.ac.uk)

The evaluation of the transient climate response (TCR) is of critical importance to policy makers as it can be used to calculate a simple estimate of the expected warming given predicted greenhouse gas emissions. Previous studies using optimal detection techniques have been able to estimate a TCR value from the historic record using simulations from some of the models which took part in the Coupled Model Intercomparison Project Phase 5 (CMIP5) but have found that others give unconstrained results. At least partly this is due to degeneracy between the greenhouse gas and aerosol signals which makes separation of the temperature response to these forcings problematic.

Here we re-visit this important topic by using an adapted optimal detection analysis within a Bayesian framework. We account for observational uncertainty by the use of an ensemble of instrumental observations, and model uncertainty by combining the results from several different models. This framework allows the use of prior information which is found to help separate the response to the different forcings leading to a more constrained estimate of TCR.