Investigating variations in heat flux adjustment in the climateprediction.net ensemble

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Spatially varying adjustments are often applied to the atmosphere/ocean heat flux in global circulation models of the climate system. In some cases they are necessary to maintain the stability of the model. In others they may be considered useful in bringing aspects of the model's climate closer to that of observations of the (current) observed climate. The relationship between these adjustment fields and model behaviour is investigated in HadSM3 using the climateprediciton.net ensemble. It is found that they contain information on climate sensitivity - the global mean temperature response to a doubling of CO2. A pattern is identified which suggests that high sensitivity runs might be anticipated, prior to applying CO2 forcing, using this heat flux field.

The climateprediction.net ensemble includes a perturbed physics ensemble; since different parameterisations can result in different dynamics, the heat flux adjustments are recalibrated for each model version. The heat flux data produced by the experiment may well hold important clues both for improvement of the model and for the design of future experiments. These issues are discussed and illustrated with results from the ensemble. In particular, attempts to use information in the heat flux to constrain the range of expected climate sensitivy are presented.