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Using the historical climate record to constrain climate system behaviour.

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The historical temperature record provides the most direct evidence for the response of the climate system. The objective of our research is to explore the information content of the historical temperature record in combination with estimates of radiative forcing over this period. Specifically we ask to what extent the parameters of simple bulk models of the climate system (such as that of Winton et al 2010) can be constrained by a single realisation of the climate system, as represented by more comprehensive models for the period between 1850 through the present and for different projections of the future. We further consider the adequacy of such a simple model in representing the response of the climate system given recent understanding of state-dependent changes in climate feedbacks and other nonlinearities. We use outputs from the large ensemble of MPI-ESM simulations to investigate and quantify the effect of internal variability, contrasting idealised 1% pa enrichment scenarios with realistic 20th century simulations.