



## **The evolution of modelled extremes of global temperature and precipitation from 2001 to 2300 under the influence of climate change**

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This study considers the evolution in time of modelled temperature and precipitation extremes, for the period 2001 to 2300, under the influence of climate change. The data are produced by the CCSR, University of Tokyo, medium-resolution global spectral model on a Gaussian T42 grid (approximately 2.8125 degrees latitude/longitude). The model runs were chosen because they allow consideration of multi-century timescales and the effects of stabilisation of greenhouse gas concentrations at two levels: 550 ppmv and 720 ppmv, respectively. Up to 2100, the 550 ppmv experiment is run under the SRES B1 scenario, and the 720 ppmv experiment is run under the more severe, A1B scenario. After 2100 greenhouse gas concentrations are held stable to 2300. The sample extremes presented here are annual heat wave duration index and the annual maximum number of consecutive dry days in a year.

The changing nature of the response of temperature and precipitation extremes to these conditions is first examined by fitting the Generalised Extreme Value (GEV) model to the data at different time slices of the experiment. Changes in long-term return levels and in the parameters of the GEV model are recorded. The GEV analyses are supplemented by examining autocorrelation, periodicity and trend in the extreme indices, and by fitting a change-point model. A limited examination of the effect of grid spacing is performed by comparing the properties of the GEV model from the T42 experiment with those from the higher resolution T106 run of the same model. Bootstrapping of three ensemble members is used to indicate confidence limits in return levels estimated from extremes for 2001 to 2100 (note that multi-member ensembles were not available beyond 2100).

The study concludes with a review of the response of temperature and precipitation extremes to stabilisation under both scenarios, using the results of the analysis to speculate on the probable consequences of failing to adopt strong emissions controls early this century.