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Super volcanic eruptions and the Earth's climate

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To investigate the interactions between large volcanic eruptions and the atmosphere and oceans, a number of volcanic eruptions ranging in magnitude from Pinatubo-sized to 100 x Pinatubo were simulated in the UKMO Unified Global Circulation Model (GCM) "HadCM3", some of the results of which will be discussed here.

A multitude of climatic processes, from advancing ice sheets to large dynamical changes in both the atmosphere and oceans, which occur following 100xPinatubo-sized eruptions, were observed and investigated through the model data. Further measurements of these processes across the whole range of eruption sizes then provided a basis for the construction of empirical simple scaling relations which give first order predictions of global-mean changes following large to super-volcanic eruptions. These simple scaling relations differ from previously published versions as they are based on GCM simulations of relevant eruption sizes and not on anomalies extrapolated from a handful of relatively small historic eruptions. The simple scaling relations of temperature and precipitation were then investigated further and applied on a regional level, thus providing information regarding local responses to super-volcanic eruptions and ultimately giving a quantitative measure of the varying degrees of response across the Earth's surface.