SVD on ICE - On the Linearity of Climate Change Simulation with GCMs

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This poster focuses on questions of linearity in general circulation model (GCM) simulations of global warming as a function of a increasing atmospheric CO_2 concentration. The assumption that climate response is "linear" is widely used and multiply defined. Indeed, the assumption of linearity is crucial for several applications of climate science including pattern scaling. After noting several different interpretations of what "linear" might mean in the case of climate simulations, the extend to which these approximations hold is evaluated in large ($\sim 2^9$) initial condition ensembles (ICE). These simulations consider the equilibrium response of HadSM3 to three different levels of CO_2 concentration increase. By comparing the singular value decomposition (SVD) and the leading singular vectors of the three initial condition ensembles we evaluate not only the relevance of the linearity assumption, but also the robustness of the principal pattern of temperature change.