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Climate changes during the third millennium : A study with LOVECLIM, an Earth system model of intermediate complexity

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A series of climate-change projections are conducted with LOVECLIM, a threedimensional Earth system model of intermediate complexity that consists of a quasigeostrophic atmospheric model, an ice-ocean general circulation model, a dynamical model of the terrestrial biomass, a thermomechanical model of the Greenland and Antarctic ice sheets, and a model of the oceanic carbon cycle (which is not interactive in this study). Climate changes during the 21st century are first studied through simulations performed with the model driven by various IPCC's SRES scenarios for greenhouse-gas and sulphate-aerosol concentrations. The model performance is assessed by comparing its results with similar results obtained with climate general circulation models. This analysis reveals that the model response is within the range of current uncertainty, although a bit weak. Stabilisation experiments are then carried out over the whole third millennium to investigate the possibility of human-induced abrupt climate changes.