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The sensitivity of the ECHAM/MESSy Atmospheric Chemistry model to selected early Earth parameters during the Archean

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The contradiction of a reduced solar luminosity by 15-25% during the Archean and the geologic evidence for relative high surface temperatures that allowed the presence of liquid water is known as the faint young sun problem. It is supposed that the cooling induced by a fainter sun was offset by higher levels of greenhouse gases during the Archean.
We use the Chemistry Climate model EMAC(ECHAM/MESSy Atmospheric Chemistry) to analyse the sensitivity of the model dynamics to parameters valid for the late Archean Earth. These are the composition of the atmosphere, the land sea mask, and the solar irradiance.
Our experimental setup includes a control run, which has a zero land fraction, a slab ocean, the present day atmospheric composition, and the present day solar luminosity. Two sensitivity experiments are performed for: (1) 15% reduced solar irradiance, and (2) increased CO2 concentration.
We concentrate on the thermal and dynamical state of the atmosphere with emphasis on the middle atmosphere.