



CESM simulation of the middle-late Eocene: effects of geography changes and radiative forcing

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The climate of the Eocene was profoundly different to that of today, mainly as a result of higher greenhouse gas concentrations and a different global geography. Using the results from new fully-coupled CESM simulations, we successfully reproduce the middle-late Eocene (40-34Ma) climate. The implementation of a new 38Ma geography and improved model resolution allows for a better representation of the circulation patterns.

Using 2x and 4x pre-industrial levels of both CO₂ and CH₄, we cover the range of temperatures seen over the considered period. Comparing both Eocene runs, we determine equilibrium climate sensitivity and find significant polar amplification even in an ice-free world. When considering a pre-industrial reference as well, we can distinguish between the climate response to radiative forcing from greenhouse gases and geography changes over the last 38Ma. We find that the latter provide a major contribution to the Eocene warmth, equivalent to a quadrupling of CO₂. Changes in continental geometry, ice cover, vegetation and the implied circulation patterns are thus of great importance to understand the Eocene climate.