Impact of vegetation on the Miocene Climate Optimum

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The present day global warming started well before the industrial revolution about 400 years ago, comprising of two components with one natural and another human induced. Palaeoclimate study provides a key for the present warming on the natural component and, therefore, isolates the human input which can then be determined. The Miocene Climate Optimum (MCO) at 15 ma is a geologically most recent warming event with a temperature of 3º-5ºC higher than today but with atmospheric CO₂ only about half its present value, decoupled with the warming. One thus expects that other factors to play more significant roles such as vegetation, altimetry, tectonic movement and other greenhouse gasses. Here we address the vegetation which can potentially contribute about 2º-3ºC warming to the MCO. We develop a novel methodology to merge oceanic palaeo-bathymetry grids with continental palaeo-topography grids to produce Miocene boundary condition for palaeoclimate modelling, compile five vegetation data files as model input and apply updated NCAR coupled climate models, CCSM3 and CAM3.1 and CLM3 coupled with slab ocean and ice models, validated with proxies. Our results show that vegetation played an important role in the MCO development.

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