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# Exploring Mesozoic Climates - Modeling and Evaluation of Proxy Distributions

**Jan Landwehrs**[1,2], Georg Feulner[2], Matthias Hofmann[2], Stefan Petri[2], Benjamin Sames[1], and Michael Wagreich[1]

[1]University of Vienna, Department of Geodynamics and Sedimentology, Wien, Austria (jan.landwehrs@univie.ac.at)
[2]Potsdam Institute for Climate Impact Research, Earth System Analysis, Potsdam, Germany

The Mesozoic Era (~252-66 Ma) is a decisive period in Earth's history. It is marked by a tectonic transition from the Pangea supercontinent towards a modern continental configuration as well as the ecological success of the dinosaurs and the evolution of mammals, flowering plants, stony corals and important groups of planktic calcifiers. The Mesozoic is generally considered as a greenhouse climate period, with especially high global temperatures during the Triassic and the Late Cretaceous. Here, we present novel modeling results on the evolution of global climatic conditions through the Mesozoic.

An ensemble of equilibrium climate states for 40 geological timeslices between 255 and 60 Ma is simulated with the CLIMBER-3α Earth System Model of Intermediate Complexity. The influence of changing paleogeography, sea level, vegetation cover, solar luminosity, orbital configuration and atmospheric $CO_2$ concentration is systematically tested based on constraints from published geological proxy reconstructions and previous modeling work.

Atmospheric $pCO_2$ is found to be the strongest driver of global mean temperatures, which are generally elevated above the present and reach ≥20°C in the Late Triassic to Early Jurassic and the mid-Cretaceous if a recently published $pCO_2$ proxy compilation is employed. The simulated seasonal latitudinal shift of high precipitation zones exhibits a maximum during the mid-Triassic to Early Jurassic and therefore supports the notion of a "Megamonsoon" during this time. Simulated humid and arid climate zones generally agree well with spatial distributions of geologic climate indicators like coal and evaporites, although some discrepancies exist. The same applies to the correlation of fossil stony coral reef distributions with regions where seawater temperatures would have been suitable for (modern) coral reefs. We will discuss which changes of Earth System parameters throughout the Mesozoic can best explain shifts in these distributions.