

EARTH SYSTEM MODEL CONTRIBUTIONS TO INVESTIGATING MESOZOIC ECOLOGICAL TRENDS AND EXTINCTIONS

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Elucidating past ecosystem dynamics and extinction events frequently demands information about local and global climate conditions as well as the mechanisms and timescales of climatic changes. As this can be difficult to extract from empirical records alone, climate models can provide valuable context. Here, we want to provide insights recent and ongoing work on modeling Mesozoic (~252 – 66 Ma) climate states and dynamics. This includes the long-term climate evolution, as well as effects of orbital cycles and rapid perturbations by e.g. volcanism or asteroid impacts, all of which can represent environmental drivers of ecological shifts and even mass extinction events. The CLIMBER-3 α and CLIMBER-X global Earth System Models are employed for these investigations. Besides physical processes in the atmosphere, ocean and sea and land ice, the models are also able to simulate aspects of vegetation dynamics and marine and terrestrial biogeochemical cycles. With these tools, e.g. climatic cooling and warming sequences by pulsed sulfur and carbon emissions from Large Igneous Province volcanism involved in the end-Triassic extinction have been simulated. We show a few examples tentatively evaluating such model results against spatial distributions and assumed thermal niches of some Mesozoic forms of life (e.g. scleractinian corals). Related work has also been focusing on the Cretaceous – Paleogene boundary, modeling e.g. global cooling and ocean fertilization caused by the Chicxulub impact. We would like to further contribute Earth System modeling expertise and data to research on extinction events and deep time ecosystem dynamics and would like to use the opportunity for exchange with the paleontological community.