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Climate model boundary conditions for four Cretaceous time slices

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Abstract. General circulation models (GCMs) are useful tools for investigating the characteristics and dynamics of past climates. Understanding of past climates contributes significantly to our overall understanding of Earth's climate system. One of the most time consuming, and often daunting, tasks facing the paleoclimate modeler, particularly those without a geological background, is the production of surface boundary conditions for past time periods. These boundary conditions consist of, at a minimum, continental configurations derived from plate tectonic modeling, topography, bathymetry, and a vegetation distribution. Typically, each researcher develops a unique set of boundary conditions for use in their simulations. Thus, unlike simulations of modern climate, basic assumptions in paleo surface boundary conditions can vary from researcher to researcher. This makes comparisons between results from multiple researchers difficult and, thus, hinders the integration of studies across the broader community. Unless special changes to surface conditions are warranted, researcher dependent boundary conditions are not the most efficient way to proceed in paleoclimate investigations. Here we present surface boundary conditions (land-sea distribution, paleotopography, paleobathymetry, and paleovegetation distribution) for four Cretaceous time slices (120 Ma, 110 Ma, 90 Ma, and 70 Ma). These boundary conditions are modified from base datasets to be appropriate for incorporation into numerical studies of Earth's climate and are available in NetCDF format upon request from the lead author. The land-sea distribution, bathymetry, and topography are based on the 1°×1° (latitude × longitude) paleo Digital Elevation Models (paleoDEMs) of Christopher Scotese. Those paleoDEMs were adjusted using the paleogeographical reconstructions of Ronald Blakey (Northern Arizona University) and published literature and were then modified for use in GCMs. The paleovegetation distribution is based on published data and reconstructions and consultation with members of the paleobotanical community and is represented as generalized biomes that should be easily translatable to many vegetation-modeling schemes.

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