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Climate of the Past Discussions

Interactive comment on "Warm Paleocene/Eocene climate as simulated in ECHAM5/MPI-OM" *by* M. Heinemann et al.

Anonymous Referee #1

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This paper presents a coupled model simulation of the climate of the equable climate of the Paleocene/ Eocene. The simulation is compared to a present day run and analyzed using a simple energy balance model. I find the subject to be very interesting and relevant, the model experiment planning to be very well done, and the analysis to be complete and interesting. (An example of the meticulous experiment planning is the careful treatment of the SSO parameterization and of ENSO tuning). The paper is also clear and very well written. I recommend publication as is. Some suggestions are attached for the consideration of the authors, and I think it would be best to leave it to them to decide which of these suggestions to address.

Comments

1) The authors explain that this is the first Eocene GCM simulation that is consistent

with the proxy record. The difference from Huber and Sloan who also used CO2=560 is especially interesting, as their results were significantly further away from the proxy record. Can the authors explain, or at least attempt to discuss, what is different about this model that made this result possible?

2) High latitude vs polar vs global cloud emissivity effects: If I understood this correctly, clouds seem to have some important effects: warming over polar areas, and cooling over low-latitudes. these effects seem very relevant to the Eocene challenge of reducing the equator to pole temperature gradient while keeping the equator cool. The use of the 0d global EBM masks this to some degree because of the cancellation of cloud effects between the different regions. How about applying it selectively to the polar areas, the mid-to-high latitudes, and the low-latitudes? In any case, discussing the cloud effects separately for these latitude ranges in the conclusions section may help clarify the different role of clouds in different areas.

3) Antarctic emissivity: perhaps I just missed this: is the large difference in antarctic long-wave emissivity a consequence of the topographic changes, allowing more water vapor at lower elevations there during the PE?

4) Reduction & increase...: the discussion of emissivity is somewhat confusing because a reduction of emissivity is repeatedly mentioned. Upon careful reading I think I understand that the emissivity was higher in the PE and lower in the PR, but saying so explicitly throughout rather than using "decreasing" or "increasing" may help avoiding some confusion.

5) Hydrological cycle and clouds: would it be difficult to discuss and analyze the polar areas separately from the mid-latitudes? As the manuscript explains, the clouds can have opposing effects (albedo vs emissivity) in the mid-latitudes, but there are only emissivity effects during polar night over the poles. These different behaviours may justify separate analysis? Also, how about briefly discussing the seasonality of the behavior over the poles, given the potentially different behavior of clouds during polar

day and polar night.

Interactive comment on Clim. Past Discuss., 5, 1297, 2009.