Review of

Drastic shrinking of the Hadley circulation during the mid-Cretaceous supergreenhouse"

by H. Hasegawa, R. Tada, X. Jiang, Y. Suganuma, S., Imsamut, P. Charusiri, N. Ichinnorov, and Y. Khand

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General comment:

The submitted paper gives evidence for changes in atmospheric circulation during the Cretaceous Greenhouse period. Data is based on distribution of climate-sensitive sediments, i.e. desert sediments. Deserts are then interpreted as proxies to descending parts of ancient Hadley cell positions. As the distribution and extend of deserts are minimal during mid-Cretaceous super-greenhouse, the authors interpreted that as evidence for shrinkage of Hadley cells during these times. All in all this is a nice and provocative paper that will stimulate discussion and research in the investigated field - more a pioneer paper than a concise review. There remain a lot of data to be integrated and a much higher time resolution can be achieved in the future. But the paper is good and should be published with minor modifications.

Detailed Review

Cretaceous eolian sandstones are the main feature of interest, and the main area of investigation of the authors seems to be the large land mass of Asia. The main arguments of the authors are put forward clearly. Shrinking of Hadley cells during warmer periods is a plausible theory.

The data base has errors of +/- 5 to 10° on paleolatitudes - the authors should discuss this in the light of significance of their conclusions then - see also p.124, line 15 and following.

However, I find it hard to follow the arguments in chapter 3.5, where the consequences for ocean circulation are discussed. There exist other models (e.g. Hay, 2011) and the effects are not straightforward.

Reference s I miss are the work by Floegel and Beckmann on ITCZ and African climate variability. Cite that and discuss significance for your study.

Beckmann, B., Flögel, S., Hofmann, P., Schulz, M., and Wagner, T., 2005a, Orbital forcing of Cretaceous river discharge in tropical Africa and ocean response: Nature, v. 437/8, p. 241-244.

Beckmann, B., Wagner, T., and Hofmann, P., 2005b, Linking Coniacian-Santonian (OAE3) black-shale deposition to African climate variability: a reference section from the eastern tropical Atlantic at orbital time scales (ODP site 959, off Ivory Coast and Ghana) *in* Harris, N.B., ed., The Deposition of Organic-Carbon-Rich Sediments: Models, Mechanisms, and Consequences, SEPM Society for Sedimentary Geology Special Publication, v. 82, p. 125-143.

Floegel, S., and Wagner, T., 2006, Insolation-control on the Late Cretaceous hydrological cycle and tropical African climate – global climate modelling linked to marine climate records: Palaeogeography, Palaeoclimatology, Palaeoecology, v. 235, p. 288-304.

Flögel, S., Beckmann, B., Hofmann, P., Bornemann, A., Westerhold, T., Norris, R. D., and Wagner, T. (2008): Evolution of tropical watersheds and continental hydrology during the Late Cretaceous

greenhouse; impact on marine carbon burial and possible implications for the future. Earth and Planetary Science Letters, doi: 10.1016/j.epsl.2008.06.011.

p.121, line 6: delete /so

p.122, line 21: delete been

p.122, line 25: delete the

p.124, line 7: Late Cretaceous (and later in manuscript, also Early Cretaceous)

p.146, Fig. 1: I dont recognized the a notion of the significance of red bed deposition in that respect.

p.148, Fig. 3: Write out Alb, Tur, Camp, Maas or explain abbreviations. Is see some desert islands swimnimg in the Tethys during Cmp-Maa - is there really evidence for that (I dont think so)?

p.149, Fig. 4: Very good compilation, but I wont call Coniacian to Maastrichtian as "cool", its still greenhouse climate ("moderate greenhouse").

p.151, Fig. 5: Highly speculative and provocative.

Michael Wagreich, 2011-03-24