

Manuscript: Dynamic interaction of lakes, climate and vegetation over northern Africa during the mid-Holocene

Major remarks

The authors investigated the effect of large lakes in the Sahel and Sahara on the West African summer monsoon during the mid-Holocene. In order to ensure consistency between the lake expansion and the simulated climate and the associated water balance, they developed a dynamic endorheic lake (DEL) model and implemented it into the atmosphere-land model ICON-JSBACH4. Their mid-Holocene simulations showed that both, lake and vegetation expansion during the mid-Holocene caused a precipitation increase over northern Africa, while the lake-vegetation interaction is somewhat counteracting the overall effect with a relative drying response over the entire Sahel. The study is well written and contributes valuable insights into mid-Holocene dynamics and land-atmosphere interactions over northern Africa.

I have only one major remark that is related to Fig. 11. It shows only relatively small areas where the lake depth is changed. However, the results show a comparatively large effect. Can't it be that the effect is related to natural variability? In order to consider this, you may separate your 150-200 years evaluation period into 30-year time slices and check whether the impact of the lake depth change is a robust feature or has a larger natural variability.

I suggest adding a table with regional averages (e.g. Sahel and Sahara) in precipitation for the different experiments that would allow an easy comparison of the different precipitation changes (see also my comment to Line 323-325).

I also suggest a thorough proof reading as the current version of the manuscript comprises several typos. Below I suggested correcting those I found.

In summary, I suggest accepting the paper for publication after minor revisions are conducted.

Minor remarks

In the following suggestions for editorial corrections are marked in *Italic*.

Line 11

... Basin, *the lake area is slightly* ...

Line 16

... lake expansion *that is dominated by* the expansion ...

Line 16-18

Sentence is somewhat difficult to read. Please rephrase, e.g. separate into two sentences!

Line 54

... treated, *all previous simulation studies* prescribe ...

This statement seems to be too general. I guess you mean studies with GCMs? With regard to hydrology, there are several studies that use climate forcing to simulate lake area expansion in the mid-Holocene, e.g. Coe 1997; Stacke 2011.

Coe, M.: Simulating continental surface waters: An application to holocene Northern Africa, J. Climate, 10, 1680–1689, 1997.

Stacke, T. (2011). Development of a dynamical wetlands hydrology scheme and its application under different climate conditions. Phd Thesis, Hamburg: University of Hamburg. Berichte zur Erdsystemforschung, 99

Line 69

In the end of sect. 1, an outline about the following sections is missing. The last sentence only describes the content of Sect. 2.

Line 91

...applied *over northern* Africa.

Line 142

... concept of *the* endorheic ...

Line 214

... *represented as* a mixed ...

Line 228

...*orography is* used ...

Line 242

... less *sensitive* to ...

Line 245

... growth and *shrinking* of ...

p.12 – Figure 5 caption – last sentence

It is written:

“The black boundary in subplot c) ...”

I assume you mean panel d) not c)?

In addition, I suggest writing ‘*panel*’ instead of ‘subplot’ throughout the paper.

Line 272

Considering *these* large ...

Line 313

... presence of *dynamic lakes in the* ICON-JSBACH4 ...

Line 324

... *to the* total ...

Line 323-325

I suggest providing some values (e.g. averaged over the Sahel) to allow an easy comparison of the precipitation changes.

p. 16 – Fig. 8 caption:

Simulated a) lake extent changes ...

Line 333

In fact, *the* comparison ...

Line 340

... the *different scaling*).

Line 355 and 357

There are no arrows in Fig. 9c. Please correct!

Line 373-376

Sentence is too long and difficult to read. Please rephrase into two sentences.

Line 385

However, the simulated ...

Line 391

...contributes *a* large ...

Line 402

... updrafts, *which* occurs ...

Line 406-408

Sentence is difficult to read and understand. Please rephrase!

Line 417

...relates to *the known* dry ...

Line 447-457

This paragraph comprises the same or similar sequence of references several times. Please rephrase and avoid redundant use of the same references if possible.

Line 465

... over *northern* Africa.

Line 466

... effect *of* exorheic ...