

Reply to Reviewer#2 Dr. Ryan Teuling

First of all, as editor of this manuscript, I would like to apologize for the delay in the review of your manuscript. I had found reviewers that agreed to provide a review within the given timeframe, but it sometimes happens that these review reports are not being submitted in spite of numerous requests. Because of the large pressure on the pool of potential reviewers, I normally aim for the (minimum) number of required reviewers rather than building in a safety margin from the start. Unfortunately this can in some cases lead to delays in the procedure. For this reason, I have decided to provide the second review myself to avoid further delays.

We greatly appreciate for the editor's efforts to obtain reviews for on our manuscript under such unfortunate circumstances.

The manuscript provides an interesting analysis of diurnal variability in precipitation and convection as induced by one of the largest lakes in Africa, Lake Malawi. By comparing RCM simulations with and without the lake present, it is shown that the lake provides an important control on surface energy exchange variability and regional circulation. The study is well designed, and the manuscript and illustrations are generally of high quality. In particular, I appreciate the combination of satellite data analysis and RCM modelling experiments. The results are supported by the evidence provided, and I only have relatively minor suggestions for improvement. These relate to the title, the structure of the manuscript, the focus of the discussion, literature referenced, and some of the illustrations.

We are very grateful for the many helpful and constructive comments. Below we respond to each comment point-by-point.

General comments

The title doesn't seem to reflect the focus of the manuscript. The manuscript investigates the impact of the lake, not just the diurnal variability. Furthermore the focus is on precipitation rather than all other aspects of diurnal variability, although other aspects are investigated to explain the mechanisms underlying signals in precipitation. Consider changing.

We agree with the comment. The reviewer#1 also suggested rethinking of the title of this manuscript. Following both comments, we changed the title of this work to "[Influences of Lake Malawi on the local diurnal cycle of precipitation](#)".

The structure of the manuscript confused me initially. By focussing first on precipitation (a more indirect effect), and discussing impact on surface fluxes and wind fields (more direct effects) only later, the suggestion is raised that the authors use the model merely as a black-box tool by looking at impacts rather than processes. In my view, the manuscript is easier to understand if the Results section starts with material currently presented in the Discussion.

We agree. Thank you so much for the constructive comment. We re-read the manuscript and we will consider the structure of the manuscript as suggested.

Related to the previous point, I missed a discussion on some important points. In my view, a discussion should focus on the potential impact of methodological choices on the main conclusions, rather than presenting additional results to interpret other results. So I would expect a discussion on the way the lake is removed in the modelling experiment: what would happen if not the lake water surface but the topography of the lakebed was used, or what if other soil or land use types had been chosen? Since no second experiment was performed in which the topography was removed, a discussion on how the lake and topography interact would be helpful.

Thank you very much for the useful comments for the discussions. The points suggested by the reviewer are quite important for the local precipitation and diurnal cycle. Regarding topography, we will expand the discussion on the possible impacts of the topography on the diurnal cycle in Section 4.3 (Topography Impact). For the soil type, we will add more discussions on it by referring previous literatures.

While the authors reference a large body of literature on Lake Malawi and the climate of South-eastern Africa, I miss a general overview of the impact of lakes on surface exchange and regional climate, as well as an introduction to, and comparison with, other studies on impact of lakes (like Lake Victoria, see e.g. Thiery et al., Nature Communications 7, 12786) and other surface heterogeneities like soil moisture in Africa (see e.g. Taylor et al., Nature Geoscience 4, 430–433).

Thank you very much for the useful comments for the literatures. We will add some overview of the lake's impacts in the introduction and some comparison with other lake cases in the conclusion.

While the figures are generally of excellent quality, I suggest to use a bit more variation in display types where possible. For instance, Figure 8 shows very little variability over the lake and can easily be replaced with a bar plot summarizing the 6 average values over the lake. Some figures also lack a clear title sentence in the caption (like Figs 1, 9, 10).

Thank you very much for the suggestions. We will remake Figure 6 with bar plot and improve the captions of those figures.

Specific comments

Line 80-81: Most, if not all, places on Earth have diurnal variability in incoming radiation?

Exactly. We will add “strong” in the sentence to emphasize the radiation in the tropics.

Line 84: remove comma after “Although”

We will remove it.

Line 88: This study aims to . . .

We will correct it.

Line 180: This is not an equation

We will modify the function like, $R(t) = a_{24}\cos(\dots)$, where $R(t)$ is the hourly variation in the total rainfall.