

## ***Interactive comment on “Technical challenges and solutions in representing lakes when using WRF in downscaling applications” by M. S. Mallard et al.***

**Anonymous Referee #2**

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This paper presents a brief overview of several problems in generating lake surface temperatures from global climate models (GCM) with underrepresentation of lakes to be used to run WRF as a regional climate model (RCM). It gives a good deal of information about many of techniques that can be used to achieve this, as well as the drawbacks from these methods. While most things are considered, there are a few areas that could use further explanation. Most of these are minor in nature.

Overall Comment:

I think some background information on how WRF, being run as a regional climate model, treats lakes would be beneficial for context. Are surface properties like lake temperature taken from the GCM at each time step, or does the land surface model within WRF deal with this temperature calculation? When temperatures are initialized

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for a scenario without a lake model, is it simply a one-layer slab model, or multiple layers similar to land points? Does WRF apply a diurnal cycle? I think answering some of these questions would help to put some of the methods into better context and show how errors in initialization may propagate in a model, especially when no lake model is being used.

Specific Comments:

Pg. 7124 line 21- Pg. 7125 line 2. I am not sure this paragraph is entirely needed. The previous paragraph describes the same situation with visuals that is shown by M14. Some further explanation is either needed to show how this is a different problem than what is presented in Figures 1 and 2, or this section should be pared down. This section could also be worked into the first paragraph of Page 7126.

Pg. 7130 Section 2.2. Has this method been used by any other study? You state that linearly increasing lake states maybe useful for some lakes, but you give no examples of this approach being employed. It seems like this approach offers very little in terms of realism and upside, so is it necessary to be mentioned?

Page 7131 Section 2.3. In the use of this method, I understand where the land-lake temperature contrast would be lost, at least in the short-term. But given enough spin-up time (similar to what is shown in section 2.6), could these contrasts be generated from lake-atmospheric interactions, or is this still a case of poor initialization leading to poor results?

Page 7135, lines 8-10. What do you mean by “looped” here? Do you mean using the atmospheric conditions from the year 2005, and ran that same data 10 times while allowing the lake conditions to evolve? Some clarification might be beneficial here.

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Interactive comment on Geosci. Model Dev. Discuss., 7, 7121, 2014.

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