Thank you very much for the comments. The comments (bolded) from the reviewer Dr. Zeli Tan are fully addressed in the following.

Thanks for the authors to address my comments patiently. Overall, the response is great.

Just to remind that MODIS data is probably not good for lake model validation at specific lakes, especially at the spring and fall mixing periods when the rapid change of weather would introduce significant uncertainties (such as cloud cover). Thus, the uncertainty of MODIS data need to be acknowledged.

Responses: Yes, we will acknowledge the uncertainties of MODIS data in the manuscript. Previous studies have evaluated MODIS water surface temperature data for lakes based on *in situ* observations (Crosman and Horel, 2009; Schneider et al., 2009). Zhang et al. (2014) compared the nighttime water surface temperature of MODIS and *in situ* observations for Nam Co with a correlation coefficient of 0.89 and a bias of -1.4 ℃, which showed an acceptable accuracy for MODIS. Thus, due to limited observed temperature data for Nam Co, we chose MODIS data to validate CLM-ORG and CLM-KPP.

In addition, I do not think that the overestimation of surface temperature by CLM-ORG in summer is due to lack of mixing (Fig. R1). The other causes, such as the representation of latent and sensible heat, need to be acknowledged.

Responses: Yes, Figure R2 showed that K_w^{KPP} was slightly smaller than K_w^{ORG} mostly in the mixed layer of the lake during summer time. In the deeper part of the lake, K_w^{KPP} was much smaller than K_w^{ORG} during summer time. In the spring and fall seasons, K_w^{KPP} was significantly larger than K_w^{ORG} (see the previous responses to Dr. Zeli Tan in detail).

In CLM-KPP, the eddy diffusivity formulation is different for the boundary layer and lake interior. In the lake boundary layer, the eddy diffusivity is related with boundary layer depth and surface forcing. In the lake interior, the eddy diffusivity is relatively weak, associated with internal wave activity and shear instability. Overall, CLM-KPP enhances the eddy diffusivity during the spring and fall and maintains a weak eddy diffusivity in the lake interior during the summer when stratification is strong when compared to CLM-ORG. In addition, the overestimated water surface temperature with CLM-ORG before the summer affects the energy budget at the lake surface, which further influences lake temperature simulations during the summer.

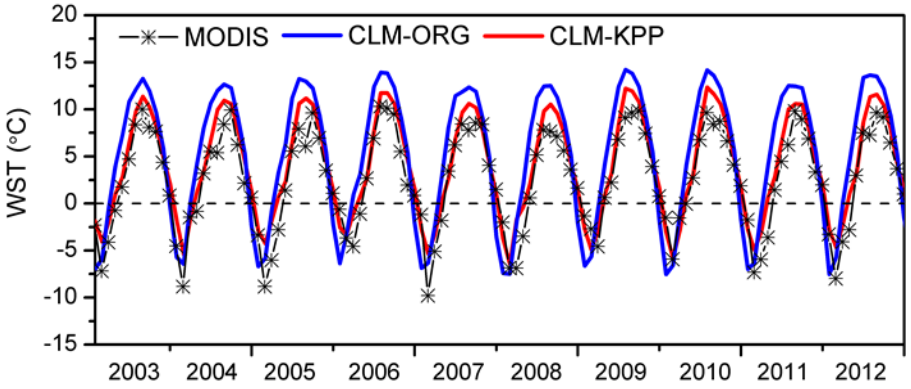

Figure R1. The time series over the period of 2003 through 2012 of monthly WST observations from MODIS (black star line) and simulations with CLM-ORG (blue line) and CLM-KPP (red line) (Unit: ˚C).

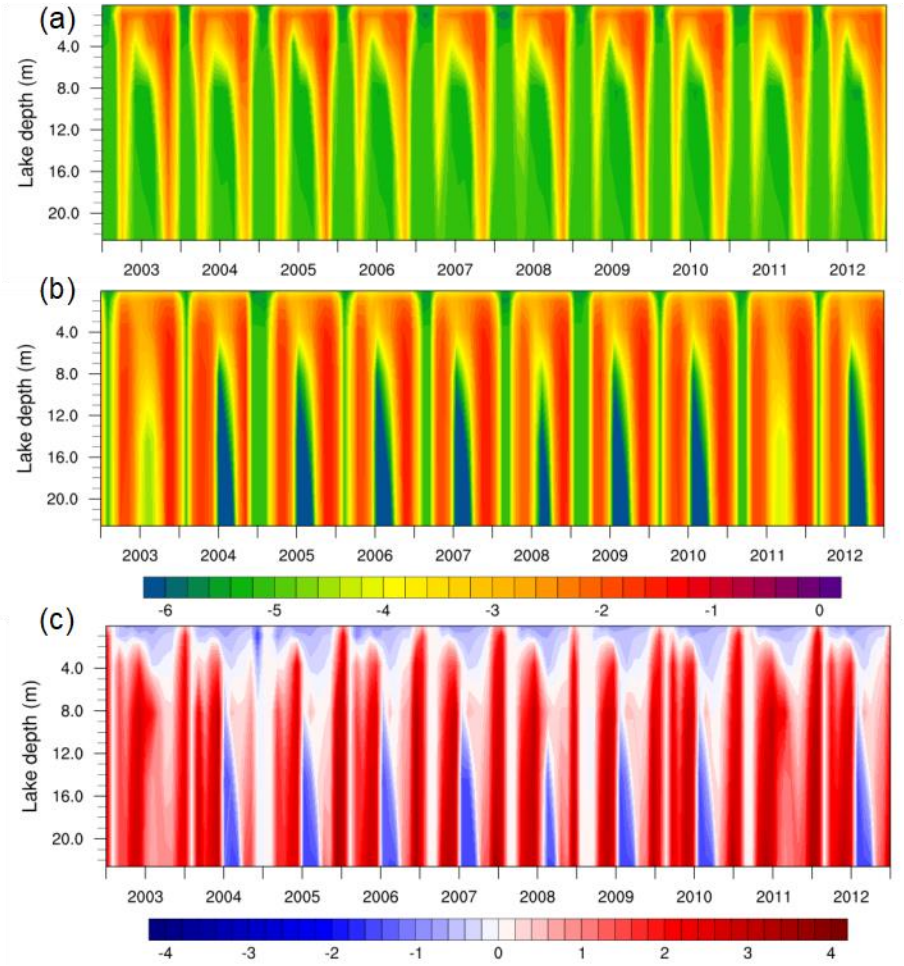

Figure R2. The simulated (a) $\log_{10} K_w^{ORG}$ with CLM-ORG, (b) $\log_{10} K_w^{KPP}$ with CLM-KPP (Unit: m^2/s) averaged over the water columns with the depth greater than 25 m (28 of 34 grid cells), and (c) the differences between $\log_{10} K_w^{KPP}$ and $\log_{10} K_w^{ORG}$ ($\log_{10} K_w^{KPP} - \log_{10} K_w^{ORG}$).

References

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