

Geosci. Model Dev. Discuss., referee comment RC1
<https://doi.org/10.5194/gmd-2021-381-RC1>, 2022
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Comment on gmd-2021-381

Anonymous Referee #1

Referee comment on "Improving Madden–Julian oscillation simulation in atmospheric general circulation models by coupling with a one-dimensional snow–ice–thermocline ocean model" by Wan-Ling Tseng et al., Geosci. Model Dev. Discuss., <https://doi.org/10.5194/gmd-2021-381-RC1>, 2022

Review paper "Improving Madden–Julian Oscillation Simulation in Atmospheric General Circulation Models by Coupling with Snow–Ice–Thermocline One-dimensional Ocean Model".

This is an interesting work investigating the improvement of the MJO simulation by coupling the AMIP to the Sea-Ice-Thermocline single-column model. And the most important is the fine resolution of the upper oceanic temperature could play such an important role. From the MSE analysis, it is apparent to observe the prominence of the latent heat, which has been underestimated in AMIP simulation. However, it is not sure if that is also the case in the coupled models. The authors mentioned the diurnal warm and cold skin; however, it is not addressed well in the paper. If the authors could provide more explanation or references on it is suggested. Figure S5 is a very interesting plot. Although all experiments use the same SIT module, the temperature penetration depth seems very different in between models. The depth is different, but the stronger variance is shown in the ECHAM5-SIT experiment. To have the storage when running the HIRAM-SIT is understandable, but the magnitude of the 3m at the 1.5S, 90E seems much weaker at the 9m, and the centre seems shifted. What will cause that different penetration? I hope the authors could provide a little explanation, and it might be useful information for the global coupled model teams. I am happy with this version of the article and agree the article meets the standard of the GMD journal. However, an extra description of the oceanic dynamics and the labelling adjustment in Figure 5S will be more appreciated.