

Review of “Understanding the model representation of clouds based on visible and infrared satellite observations” by Geiss, Scheck, de Lozar, and Weissmann.

Second review by Matthew R. Igel. Review requested 28<sup>th</sup> June 2021. Review performed 9<sup>th</sup> July 2021.

The manuscript presents satellite and model comparisons from 2 days during a 30-day ICON-D2 hindcast to motivate the use of visible and infrared analysis in tandem when assessing model clouds. Then statistics from the full 30 days are shown to illustrate systematic model deficiencies. An attempt is made to understand the source of these deficiencies by focusing on cloud parameters and parameterizations within ICON. Tweaks to these schemes are used to motivate possible ways to improve ICON.

The authors effectively argue that using both shortwave and longwave information together to relate models to observations is more effective than using either in isolation. I don't think this is a surprising conclusion to draw, but it is certainly worth making. The combination of 2 snapshot case studies with statistics from 30 days of simulations is well conceived. The framework developed for thinking about how observations and models might be usefully compared is the best part of the paper, but I think could be more systematic. The authors make some suggestions for improving models that seem logical given their results.

The authors addressed my major concerns from round 1.

I suppose the basic question that remains unanswered by this study (to which the authors themselves allude in section 5) is whether the modifications suggested in section 4.3 from Fig. 11 can really be made. They rely on the effects resulting from the modified-simulations being linearly additive. I simply don't know whether they are. Clouds are often very non-linear systems, so I think there is reason to question whether these effects would add. But, this study does a good job of making implementable suggestions for model improvements that are derived from novel analyses from which a follow-up study can easily launch.