

Comment on **essd-2021-101**

Anonymous Referee #2

Referee comment on "The first global 883 GHz cloud ice survey: IceCube Level 1 data calibration, processing and analysis" by Jie Gong et al., Earth Syst. Sci. Data Discuss., <https://doi.org/10.5194/essd-2021-101-RC2>, 2021

This paper describes the detailed procedures for IceCube Level 1 data calibration, processing and validation, and the scientific values of the data. IceCube provides the first global ice cloud observation at 874-883 GHz, which is a critical dataset to the satellite and science communities. The manuscript is relatively well structured, even though the presentation still has room for improvement. I only have some minor questions and comments.

- Lines 214-216: Large discrepancies are shown in Figure 7 for TB > 200 K. The authors claim that this is due to the instrument noises. It would be more convincing to readers/me if the comparison was shown between the noises-added simulation and no-noise simulation.
- Lines 221-224: What is the definition of the spheroid particles in the simulations. I am pretty surprised that this assumption is particularly bad compared to the obs. Smaller ice particles tend to be more sphere or somewhat spheroid, but it's odd to me that there are such differences between the two simulations. What could be the reason for that?
- Lines 364-366: The ocean vs. land comparison is very interesting, but the explanation for the noon IWP minimum over the ocean is not that clear in the text. It states that "stratiform precipitation from top down is likely the dominate physical processes rather than bottom-up convective precipitation in determining the surface precipitation diurnal cycle over the tropical ocean" The stratiform and anvil clouds associated with convection tend to last a bit after the maximum precipitation happens, but we see a decrease in IWP from 5 to 10 LST. Could you comment on that?