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Interactive comment on "A synthetic data set of high-spectral resolution infrared spectra for the Arctic atmosphere" *by* C. J. Cox et al.

Anonymous Referee #1

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This manuscript reports a dataset of infrared spectra calculated with RT models for cloud retrieval applications. The objective of this study is good. The idea and method is straightforward. The presentation is clear. However, this study, except the amount of effort, is weak in reporting something new. The measurement data and RT models shouldn't have problem since they are widely applied. But the treatment of the data and the assumptions in modeling for the dataset are questionable. The examples for these drawbacks are listed below. Based on these concerns, this reviewer cannot recommend this manuscript be published at current status. Major revision need be considered.

1. In Abstract, "Retrievals of cloud ... from ... infrared remote sensing ... are critical for understanding clouds." Why infrared is critical? For polar regions, sunlight problem?

2. In Introduction, the authors discuss the difference of retrieval results for clouds from different measurements, and say the difference is largely due to perspective and measurement sensitivity between different sensors. Is this true? Instrument idea (Is an instrument specifically applies a suitable physics/technique in remote sensing a specific target?) and retrieval algorithms, how reliable they are, are also or even more important here.

3. Assuming clouds, no matter ice or water, are composed of spherical particles in modeling, this may have significant effect on ice results. A sensitivity study need to be done for this treatment.

4. For cloud particle size 10 micron for water and 25 micron for ice, are these true in polar region?

5. Phase partitioning 1:6 and 2:3. Give the reason for these settings.

6. The manuscript lacks validation of modeling results by other means. This should be given for some cases.

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