This is an interesting paper that addresses important observations of clouds in the Arctic. Polar clouds are badly represented with NWP and Climate models and this is a good attempt to redress these failures. While I have no hesitation in recommending the paper for publication there are a few minor points that could be clarified.

The authors assume that the vertical distribution of LWC within the cloud is adiabatic (20 2565) and I wonder if that is true of the tenuous clouds observed in the 5th regime? I would like a bit explanation of the physics of the tenuous cloud.

I also wonder about the effect of open water leads on the albedo. The observed albedo seems to be much higher than the model albedo at most times even when a crude
estimate is made of the lead fraction. This could have quite a big impact on the model - could a better estimate of the area averaged albedo be made from satellite measurements?

Figure 2 has the temperature in K not degrees C - is think this may be a mistake.