Review of "Investigating the role of typhoon-induced gravity waves and stratospheric hydration in the formation of tropopause cirrus clouds observed during the 2017 Asian monsoon" by Amit Kumar Pandit et al.

1 General comments

This study reports on a subvisible cirrus cloud observed at the tropical tropopause in one of the BATAL soundings. The instrumentation carried by the balloon on this flight includes a backscatter sonde and a particle counter, besides a standard radiosonde. The study first presents how these instruments are used to precisely characterize the cirrus microphysical properties. In the following part, the authors try to identify the mechanisms that could have led to the formation of this cirrus. Combining backtrajectories with satellite brightness temperature maps and lidar soundings, they suggest that ovsershooting convection associated with typhoon Hato over the South China sea a few days before the cirrus observation may have injected water vapor in the lower stratosphere. The formation of the cirrus was then cause by gravity-wave induced cooling while the water-vapor enriched air parcels were advected toward India by the monsoon anticyclone.
The article is to my opinion a very nice observational study, which provides sound evidence for the formation mechanism that is advocated. The paper is well-written and the argumentation is easy to follow. I would thus recommend its publication with only minor revisions, which are described below.

2 Minor issues

- The presentation of Section 2.2.2 (Solair Boulder Counter) may be improved. From line 9 on page 8 to the end of the section, the text does not provide details specifically on the instrument, but rather describes how derived quantities (effective diameter or Ice Water Content) can be inferred from the raw counter or (more confusingly) from the backscatter sonde observations. It may be easier for the reader if an own separate subsection were devoted for this derived quantities.

- Figure 2: It will help the reader to have an additional vertical pressure scale in this figure. Since pressure is very likely measured by the radiosonde, this should not be an issue to add this scale, and it would greatly ease the comparisons with figures 7b, 9 and 10b, which display water vapor on pressure levels.

- Figure 3: I am uncertain about the relevance of the ERA5 cloud cover fraction on the top panel. Since the previous figure showed multiple cloud layers, it is probably quite speculative to make a link between the ERA cloud cover fraction and the CL5 cirrus cloud studied in this paper. The fraction numbers are themselves furthermore very low... On the lower panel of this figure, or on the previous figure, an ERA5 vertical profile of relative humidity over ice might on the other hand provide some additional information.

- p17, l1-2: I am a bit skeptical about the quite optimistic statement that the effective diameter obtained with Eq. (5) is in good agreement with the observations. Indeed, in Table 3, one observes that the effective diameter is monotonically increasing as temperature decreases for the observations (Eq. 3), whereas it is continuously decreasing when estimated according Eq. 5. I have therefore the impression that the claimed agreement is somehow fortuitous here.

- p28, l18-19: actually I do not see the quasi-periodic feature in temperature in Figure 11, but rather in Figure 12.

- p33, l17-18: Be careful though that the 8-10K decrease emphasized in Figure 14 is a Eulerian perturbation. In other words, it is different from the cooling that may have undergone air parcels coming above Hyderabad on that day. The temperature fluctuations felt by air parcels are those shown in Figure 12.

3 Additional corrections

- p9, l15: the sentence that starts here should be rephrased.
- Table 1: please use D_e instead of D_{eff}, as in the text.
- Table 2: Distance rather than displacement?
- p24, l22: a right) is lacking after TEJ.
- p27, l5: a space is lacking before 19 km.
- p29, l22: propagation rather than movement.