A great deal of work has gone into this paper, and I think it is certainly appropriate for publication. I made a few notes, included here, based on our practical as well as our theoretical experience with the MISR multi-angle, radiance-only retrieval algorithm mentioned in the paper, in case they are of use.

• The main reference for the MISR MINX algorithm is:

Nelson, D.L., M.J. Garay, R.A. Kahn, and B.A. Dunst, 2013. Stereoscopic Height and Wind Retrievals for Aerosol Plumes with the MISR INteractive eXplorer (MINX). *Remote Sens. 5*, 4593-4628, doi:10.3390/rs5094593.
This paper contains important points relevant to the current study that are not included in the earlier references cited in the discussion paper.

• The vertical resolution of MINX retrievals is between 250 and 500 m, due to the pixel resolution of the MISR imagery and to the geometric nature retrieval algorithm, ***which does not depend on radiometric calibration uncertainty, AOD uncertainty, or retrieved or assumed particle microphysical properties*** (relevant to Lines 95-100 in the discussion paper). What is required is ***sufficient AOD to produce contrast features*** in the multi-angle imagery of the layer – the rest is geometry. (MISR particle properties are retrieved using separate, radiometric retrieval algorithms that do depend on calibration, etc.)

Note that a constraint on AOD magnitude applies to ***all*** techniques, including those that apply polarization information. The specific AOD requirements vary among the techniques, and depend on the wavelengths used, viewing and solar geometry, the actual aerosol size distribution and light-absorption properties, and in some cases, surface properties, as you know. (For lidar, aerosol concentration as a function of elevation matters for the backscatter signal.) Note that a wind correction is included in the MINX algorithm, to account for any proper motion of the layer over the time it takes for MISR to acquire images at multiple angles.

• MINX keys on the layer of maximum spatial contrast in the multi-angle images. As such, the results tend to skew lower than the highest elevations reported by the CALIPSO lidar, but higher than the infrared spectral methods that typically sample deeper into and even below the aerosol layer (e.g., *IEEE Geosci. Remt. Sens. Lett.* 2020, doi:10.1109/LGRS.2019.2936332); the UV height retrievals (e.g., TropOMI) can be higher or lower relative to other techniques, depending on several factors, as you know. A point made in several papers (e.g., *J. Volcanology and Geothermal Research* 2017, doi: /10.1016/j.jvolgeores.2017.03.010, Figure 2 and associated text) is that these techniques ***can yield different layer-height results and still all be correct***, as they are sensitive to different aspects of the aerosol layer.

• On theoretical ground, one would expect the addition of polarization to the multi-angle data in the new algorithm to increase sensitivity to single-scattering (relative to multiple-scattering) and to smaller particles, other factors being equal. So, looking at Figs. 2-6, I'm wondering in a bit more detail than discussed in the current manuscript how results using this algorithm when polarization is included differ from those for the same algorithm and layers when only the multi-angle data are used. Understandably, the biggest differences tend to appear when the surface albedo is 0.5, especially when the AOD is just 0.3 (and I think you are assuming fine-mode particles).

One thing I could not find is the view-angle range for HARP-2. The 80˚ VZA is quite steep; for MISR the VZA range is nadir to ±70.5˚, and from our sensitivity studies, the ***range*** of VZAs sampled is one of the leading factors in determining layer-height sensitivity, more important for geometric height-retrieval applications than the number of view angles, once at least 4 or 5 well-spaced view angles are available. (This also shows up in your Fig. 7.) At the steepest view angles, however, atmospheric refraction, surface texture and shadowing, and other factors become increasing issues. In our experience, another factor of practical relevance is pixel resolution, which sets a limit on height resolution for geometric retrievals. For HARP-2, the pixel-resolution is 2.5 km at nadir and varies with view angle (you use the 3.5 km pixel product), vs. 275 m at nadir in all channels and at all angles in the red band for MISR; full resolution is used in the MINX retrieval for this reason.