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Atmospheric Measurement Techniques Discussions

Interactive comment on "High-resolution optical constants of crystalline ammonium nitrate for infrared remote sensing of the Asian Tropopause Aerosol Layer" *by* Robert Wagner et al.

Anonymous Referee #2

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Spectroscopic methods are often use to probe regions of the atmosphere that are not easy to get to, so to speak. The ability to use these methods to obtain information on the composition, number, size and shape of atmospherically important compounds relies on the availability of high-quality, wavelength-dependent complex refractive indices. This manuscript contributes nicely to the library of such data, this time for ammonium nitrate (AN) at low temperature. The authors have carried out a carefully planned experiment and have followed it up with a detailed optical analysis that sets some basic limits on the applicability of the refractive indices with respect to the value of the real index at high wavenumber as well as shape factor and aspect ratio. To no one's surprise, the optical constants at low temperature are strikingly different from those at room tem-

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Discussion paper

perature. The authors demonstrate the utility of using temperature-appropriate indices in the workup of measurements taken in the field. I for one appreciated the discussion in Appendix B regarding the shifting of peaks in the fingerprint region below 1500 cm-1.

Now for some general comments...

1.) Can the authors provide a sense of how many spectra were recorded and how long the scans were? Although I do not think this is a problem when using AIDA, I was looking for verification that the size distributions of the AN particles were stable over the data collection period.

2.) With regard to the real index at the anchor point, presumably if the density of AN was available as a function of temperature, the Lorentz-Lorenz transform could be used to to get a good estimate of n at 223 K. Nevertheless, the small range used by the authors provides a general sense of the sensitivity of these types of retrievals to the anchor point value.

3.) In Appendix A, the authors note that they extended their computation below 800 cm-1 which is typical in such work to avoid truncation errors in the finite evaluation of the Kramers-Kronig integral. How far was this extension and what was k set to?

4.) Out of interest, have the authors done a retrieval for which k in the inter-band regions was not set to 0.002 (or zero beyond 3500 cm-1), i.e., performed the retrieval with all of the baseline noise in place? If so, are the inter-band values of k warranted?

5.) Additionally, what is meant by the occurrence of "singular spikes" which required the application of a smoothing function. Did they originate in the spectrum from which the initial estimate of k was derived?

Again, I congratulate the authors on a well-done study.

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