Atmos. Meas. Tech. Discuss.,
doi:10.5194/amt-2016-153-RC2, 2016

Atmospheric Measurement Techniques Discussions
Open Access
EGU

Interactive comment on "A Wavelength Dispersive Instrument for Characterizing Fluorescence and Scattering Spectra of Individual Aerosol Particles on a Substrate" *by* Donald R. Huffman et al.

Anonymous Referee #2

Received and published: 6 July 2016

This manuscript describes the development of a new instrument to obtain scattering and fluorescence spectra from individual aerosol particles collected on a microscope slide. The new technology will certainly be of interest to the atmospheric science community and the manuscript is generally well structured however I think it could say more about certain aspects of the technology and the implementation. Therefore I recommend publication after the following comments have been addressed:

1. It seems that the size range of particles detectable by this instrument is a critical piece of information that is currently not addressed quantitatively. The authors state that they are targeting "micron-sized" particles, however, all of the known particles that they look at are pollen species which are significantly larger than a micron.

Printer-friendly version

Discussion paper

Can the authors show what it looks like when this technology is applied to samples of smaller particles such as bacteria, spores or man-made size-selected particles such as polystyrene latex spheres? Since detection of spores seems to be one of the main motivations it would be nice to show that this instrument can work with something other than pollen. Along similar lines, I believe the authors state that the height of the swath is related to the particle size. More explicit discussion of this relationship would be helpful.

2. In general, it would be nice if all of the graphics could be accompanied with a quantitative statement of what is "found" in the view graph. For example, in figure 2, what percentage of the particles appearing in panel a result in a spectrum in panel d? Clearly it is most of them but it would be nice to know if it's 100% or something less than that. Then in figure 4, quantitative information is given for the top panels but not for the bottom. Here it would be nice to know how many quartz particles are identified in the viewgraph and what fraction of that number the "fluorescent needle in the haystack" contributes. If only 10% of all particles are identified as fluorescent in an ambient sample, then a "false positive" rate of even a few percent could be significant.

3. Related to comment 1 above, the functional minimum size for fluorescent detection may also not be a limitation purely of how small a particle can be imaged through the microscope optics but, rather, how much fluorophore a particle must contain to yield a detectable spectrum given the hardware. What is the primary limitation to detection of "less bright" fluorescent things? For example, in Figure 4c, I can see the 7 spectra discussed in the paper but I can also see 5 or 6 other, more faint spectra that could also be fluorescent particles. How have the authors determined the intensity threshold required to call a particle fluorescent?

4. Can the authors provide the dimensions (distance to camera and angle theta for collection) of their two instrumental set-ups along with the imaging area and pixel size of the cameras and phones used? I believe the combination of these choices is what determines the spectral resolution achieved and it would be nice to walk the reader

through these relationships.

5. In section 4, I don't follow why a 3000 k blackbody spectrum is used to approximate a theoretical scattering curve for NaCl. Is that supposed to read 300 k? If so the same type-o occurs in the legend of Figure 5.

Interactive comment on Atmos. Meas. Tech. Discuss., doi:10.5194/amt-2016-153, 2016.

Printer-friendly version

Discussion paper