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Atmospheric Measurement Techniques Discussions

Interactive comment on "The Aerosol Limb Imager: acousto-optic imaging of limb scattered sunlight for stratospheric aerosol profiling" *by* B. J. Elash et al.

Anonymous Referee #2

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General comments on Elash et al. [2015]:

This paper provides the technical specifications for a new limb imaging instrument, and describes its initial deployment on a balloon-based platform to allow retrieval of aerosol profiles. The text and the instrument both require some follow-up work, but both contain promise.

Specific comments:

Sect. 1, 2nd paragraph:

"the observations are essentially always limited to some degree" - This statement is

unclear, but maybe it means that no single measurement technique provides the full range of aerosol properties unambiguously?

"... Charlson et al., 1969); acquire ..." – the semicolon should be removed.

Sect. 1, 3rd paragraph:

"... there are challenges associated with comparing the retrieved extinction profiles to other microphysical parameters" – Do you mean that it is difficult to derive other microphysical parameters from the retrieved extinction profiles?

"... allowing for straight forward retrieval" – should be one word (straightforward).

Sect. 1, 4th paragraph:

It appears that the SAGE – OSIRIS merged aerosol dataset is described as an "essentially continuous long term record" earlier. In that case, it might be useful to quantify how consistent retrievals from the 2 missions are, rather than simply reporting that they agree "relatively well."

Sect. 1, 4th paragraph:

"... has been studied extensively and somewhat controversially..." – I agree that controversy has arisen, but don't like this wording. The conclusions are controversial, but the issue hasn't really been "studied controversially," has it?

Sect. 1, 7th paragraph:

It might be useful to measure the CATS mission, which recently began operation of a lidar on the International Space Station.

Sect. 2.1, 2nd paragraph:

All equations are labeled oddly: The equation number appears to be part of the equation text (rather than right-justified). This is difficult to read and should be fixed.

Sect. 2.1, 3rd paragraph:

"... acousto-optic diffraction angle is not constant angle with wavelength..." – Do you mean "... angle varies with wavelength..."?

Sect. 2.2, 1st paragraph:

"We also attempted to pay careful attention to stray light..." Unless you have something you'd like to confess in this paragraph, I think you can honestly say that "We paid careful attention to stray light..."

Sect. 2.2, 4th paragraph:

"... this wavelength dependant change is negligible..." – should say "dependent", and could you quantify how small the change is?

Sect. 2.2, 6th paragraph:

"..., a not insignificant fraction of light" – again, could you quantify this?

"... extraordinary signal compresses at most..." – do you mean "comprises"?

Sect. 4.2, 1st paragraph:

This paragraph reports that an unexpectedly large amount of stray light was seen at high altitudes in the field measurements, but neither the magnitude of the expected stray light level nor the observed excess stray light level is clearly quantified here. I would like to see both numbers estimated.

Sect. 4.4, 2nd paragraph:

"There are also several possible systematic errors not accounted for in the inversion including the choice of retrieval altitude ranges, particle size composition and distributions, stray light, and the high altitude aerosol load."

This sentence is confusing in a few respects:

1. Couldn't you adjust several of these parameters (such as retrieval altitude range, particle size distribution, and particle composition) to use the same assumption in the

ALI retrieval as in the OSIRIS retrieval? Was this tried, in an attempt to sort out which differences might be most significant?

2. How is the high altitude aerosol load a source of systematic differences? Again, couldn't the same assumed value be used for both retrievals? (I assume we're talking about the aerosol above the retrieval range.)

3. The phrase "particle size composition and distributions" is confusing. Maybe some commas are missing, but I think you mean particle size distribution and particle composition.

It might be useful to state the scattering angle for the solar beam for the ALI observations, and to compare its value to the same value for the OSIRIS observations.

Sect. 4.4, 3rd paragraph:

It sounds like the same aerosol size distribution is assumed at all altitudes in the retrieval, so can you explain what it means when an Angstrom coefficient that varies with height is observed in the retrieved extinction profiles? And how does the observed value compare to the value that Mie theory would predict for the assumed size distribution?

Sect. 5, 2nd paragraph:

"...should be tacked in future iterations..." – should this say "tackled"?

Interactive comment on Atmos. Meas. Tech. Discuss., 8, 13285, 2015.