

## ***Interactive comment on “Investigating Wavelength-Dependent Aerosol Optical Properties Using Water Vapor Slant Column Retrievals from CLARS over the Los Angeles Basin” by Zhao-Cheng Zeng et al.***

**Anonymous Referee #2**

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Review of “Investigating Wavelength-Dependent Aerosol Optical Properties Using Water Vapor Slant Column Retrievals from CLARS over the Los Angeles Basin” by Zeng et al.

This paper discusses Mt. Wilson based CLARS measurements of H<sub>2</sub>O slant column density in the 4000 – 8000 cm<sup>-1</sup> range. The standard deviation of the H<sub>2</sub>O slant column, retrieved in 15 spectral bands, based upon model fits that exclude aerosol, is then compared to an AERONET aerosol optical path (AOP) value. Scatter diagrams of H<sub>2</sub>O standard deviation versus AOP for a variety of dates have a correlation R<sup>2</sup> near

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0.5.

Though the scatter diagrams indicate that the model-fit residuals do indicate the presence of aerosol, the paper as it now stands does not calculate wavelength-dependent aerosol optical properties. Aerosol optical properties, from my perspective, refers to such quantities such as aerosol optical depth, size distribution, real and imaginary refractive indices, etc. When I read the title “Investigating Wavelength-Dependent Aerosol Optical Properties..” I assumed that actual properties (at the very least, aerosol optical depths) would be retrieved from the CLARS measurements. The paper does “suggest that wavelength-dependent aerosol optical properties can be constrained”, but I feel the “suggestion” stage does not in itself go far enough.

Further work, in which optical properties from CLARS retrievals and AERONET observations are compared, is recommended before publication of this paper.

Other comments

Page 3, lines 10-11. The sentence “It is worth noting..” is not clear. Does this refer to other studies which have analyzed CLARS-FTS measurements, or processing that refers to the paper’s calculations?

Page 3, line 26. “They reflect the precision of the H<sub>2</sub>O”

Page 4, line 25. “and changes in the spatial distribution of the aerosol”.

Page 6, line 24. Is the AERONET-Caltech measurements of aerosol optical depth insensitive to H<sub>2</sub>O (e.g. the H<sub>2</sub>O band wavelengths need not be included in the AERONET retrieval)?

Page 6, line 24. How is the Ångström exponent chosen? Please clarify.

Page 7, line 31. In regard to the 5 km distance between West Pasadena and Caltech, why is there not a target installed on the Caltech campus? Is the CLARS observatory to Caltech campus line of sight not possible? Line 16 on page 8 refers to other future

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targets. If Caltech is included in the expanded list of future targets, please mention this.

Page 8, line 1. "Caltech also represents that in West Pasadena."

Page 8, line 19. The claim "We illustrate the robust ability of multi-wavelength retrievals of water vapor slant columns to provide constraints on aerosol optical properties" is not demonstrated by the current paper since optical properties are not retrieved.

Page 8, line 28. The proposed approach is proposed, not demonstrated, in regards to providing "a sensitive way to quantify the effect of aerosol scattering in GHG retrievals". I encourage some additional work that supports this assertion.

Please also note the supplement to this comment:

<http://www.atmos-chem-phys-discuss.net/acp-2016-490/acp-2016-490-RC2-supplement.pdf>

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