

Interactive comment on “Application of Oxygen A-band Equivalent Width for Cloud Optical Depth Measurement” by E. R. Niple et al.

Anonymous Referee #3

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General Comments: The manuscript “Application of Oxygen A-band Equivalent Width for Cloud Optical depth Measurement” presents a new technique for measuring Cloud Optical Depth (COD). This method is based on ground-based visible band zenith spectral radiance, similar to the AERONET Cloud-Mode sensors. Compared to the previous studies that using the zenith spectral radiances measurements to derive COD, this paper used O₂ A-Band to help determine COD. This method advances the measurement technique of COD. I recommend its publication in ATM after major revision.

According to this paper, the TWST Cloud optical depth sensor that used by the authors is a new instrument. Regularly, the instrument should be introduced firstly and in detail, which performance has direct impact on the accuracy of the measurement. The authors can give more paragraphs to the introduction of this instrument. The core component of this instrument is the spectrometer, and more detailed information about

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it should be presented, e.g., the slit function (which shows the spectrum resolution and out-of-band rejection directly), the pixels number and size of the detector, spectral response of the detector and so on. The other parameter is that whether the spectrum is stable when the environment temperature is changing, for example, does the spectrum shift in the detector with temperature? For the new instrument, radiation closure testing is often made before its data is used to do retrieval. For example, Min et al. (2014) developed a high resolution ground based spectrometer, it can detect both zenith and direct beam solar radiation with narrow field of view. Min, Q., Yin, B., Li, S., Berndt, J., Harrison, L., Joseph, E., Duan, M., and Kiedron, P. (2014), A high-resolution oxygen A-band spectrometer (HABS) and its radiation closure, *Atmos. Meas. Tech.*, 7, 1711-1722.

For the readers of this paper, they also hope to see some simple observation cases of this new instrument, such as different spectra (clear day case, thin cloud case, heavy cloud case, with similar SZA) in the same figure.

For Figure 2, if the authors can add the plots of spectra radiance@440 nm vs. COD, Equivalent width vs. COD, it will be better.

Please also note the supplement to this comment:

<http://www.atmos-meas-tech-discuss.net/amt-2016-67/amt-2016-67-RC3-supplement.pdf>

Interactive comment on *Atmos. Meas. Tech. Discuss.*, doi:10.5194/amt-2016-67, 2016.

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