Review of manuscript 'Measurement Report: Potential of MAX-DOAS and AERONET ground based measurements in Montevideo, Uruguay for the detection of distant biomass burning' by Osorio et al, submitted for publication in Egusphere.

General review

The paper describes the detection of a biomass burning generated plume, consisting of a mixture of aerosol particles and gaseous components, using ground-based observations of UV-VIS scattered radiation by a ground-based multi-axis differential optical absorption spectrometer (MAX-DOAS) in Montevideo, Uruguay during November 2020. The authors made use of collocated AERONET observations on total column aerosol optical depth, particle size distribution, and aerosol single scattering albedo in the inversion MAX-DOAS spectroscopic observations to derive the vertical distributions of formaldehyde (HCHO), glyoxal (CHOCHO), nitrogen dioxide (NO_2), oxygen collision complex (O_4), and aerosols.

The obtained results show that the combined use of MAX-DOAS and AERONET observation can be advantageously used to derive the vertical distribution of transported carbon-containing aerosols generated by biomass burning. Although the authors make a convincing description of their results, a few, mostly minor, modifications are needed before the manuscript is acceptable for publication.

Specific comments

Title: The current title does not adequately convey the main contribution of this work. I suggest slightly modifying the tittle to: 'Combined use of MAX-DOAS and AERONET ground-based observations in Montevideo, Uruguay, for retrieving the vertical distribution of biomass burning generated aerosols.'

Abstract: Since the abstract is a standalone description of the paper, all acronyms therein must be resolved.

Line 5 Resolve MAX-DOAS acronym

Line 7 Resolve AERONET acronym

Line 8 Resolve AOD acronym

Line 11 Resolve TROPOMI and HYSPLIT acronyms

All acronyms must be resolved again in the main body of the manuscript.

Line 29 Resolve BB acronym

Line 38 Provide a reference for the statement on air quality in Uruguay.

Line 40 Suggest using 'sunphotometer' to be consistent with AERONET's terminology.

Line 54-57 The statement on the variability of AERONET AOD and other parameters, and apparent consistency with the detection of 'this plume' should be supported with observations. Likewise, conclusions on satellite data analysis and trajectory simulations do not belong in the introduction section. At this point in the paper, these statements read like unsupported speculations.

Line 73. What is the resulting vertical resolution?

Line 85. Add a reference on AERONET current version and aerosol data products.

Line 90. Resolve UV-VIS-NIR-SWIR acronyms.

Line 94 Resolve CCD acronym.

Line 100 Resolve VOC acronym

Line 106 Resolve TM5-MP and SCD acronyms.

Line 125. Add references on retrievability of aerosol vertical distribution by this technique.

Line 126. List specific AERONET aerosol retrieval results extrapolated to the matching windows and discuss the extrapolation method.

-Which AERONET wavelengths were used in the calculation of Angstrom Exponent?

- For this application, AERONET shortest wavelengths (340 and 380 nm) should have been used.

- AERONET does not retrieve single scattering albedo at wavelengths shorter than 440 nm. How was aerosol absorption accounted for in the UV region?

Line 160. CALIPSO or icesat-2 lidar data may have been available on this day. If so, how does it compare?

Line 173. Can these results be confirmed with CALIPSO or icesat2 lidar observations? CALIPSO data may be affected by the South Atlantic Anomaly. Icesat2, however, reports observations over the analysis period in this paper at https://icesat-2.gsfc.nasa.gov/atmo-data.

Line 175. Discuss the expected lifetimes of the retrieved species. It may be relevant in this analysis.

Line 182. Resolve QDOAS acronym.

Line 182. Discuss Tables 1 and 2 separately. They provide different information. Describe each column of Table 1 in detail. No absorption cross-section data is shown in Table 2.

Line 189 The description of Figure 5 is incomplete. Only the top row is discussed. There is not an adequate discussion of the bottom three rows. The figure caption should accurately describe what is shown in each of the nine panels of the figure. If some of the data shown in this figure is not relevant to the analysis, then remove it.

Line 193. Describe in some detail the mentioned color index classification algorithm. How is the comparison of intensities used to discern clear from cloudy or partly cloudy conditions?

Line 198. Change the x-axis time representation in Figure 6 to the commonly used month-day nomenclature. The figure caption should clearly indicate what is shown on each row from top to bottom, and on each column from left to right.

Line 219. Sentinel 5 (S5P) is just the satellite name. The sensor's name should also be included.

Line 225. Change the x-axis time representation in Figure 7 to the commonly used month-day nomenclature.

Line 227. AERONET does retrieve AOD at 360 nm. Clarify in the text, and in the Figure 7 caption the wavelength of the AERONET AOD retrieval. The same comment applies to the description of AERONET AOD shown in Figure 8a.

Lines 230-232. This statement makes no sense. AERONET measurements are insensitive to formaldehyde and glyoxal. Please rephrase.

Line 243 Resolve CINDI-II acronym.

Line 245. CALIPSO lidar data, if available, should confirm the presence (or not) of aerosols above 4 km.

Line 277. The authors seem to refer to the UV Aerosol Index (UVAI). Since it is the name of a specific satellite product it should be capitalized. The authors should briefly explain why the UVAI readings are relevant in the context of this work and provide relevant references. In addition to the qualitative UVAI product, 388 nm aerosol optical depth and single scattering albedo are also available from TROPOMI observations (Torres et al., AMT, 2020).

Line 283 UV Aerosol Index

Line 291 UV Aerosol index

Line 312 Include the corresponding AERONET wavelength.