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Interactive comment on "MAX-DOAS retrieval of aerosol extinction properties in Madrid, Spain" *by* Shanshan Wang et al.

Anonymous Referee #1

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The paper entitled "MAX-DOAS retrieval of aerosol extinction properties in Madrid,Spain"by Wang et al.present a half-year aerosol extinction properties retrieval based on MAX-DOAS measurement of O4 absorption in Madrid, Spain. The O4 DSCDs in the UV band was used to retrieve the aerosol extinction profile via the HEIPRO inversion algorithm. Not only the retrieved aerosol optical depth show anoverall good agreement with the correlative AERONET product, but also the surface aerosol extinction coefficients derived from MAX-DOAS measurement are comparable to in situ PM2.5 concentrations. The time series of AOD shows higher levels in summer season due to more frequent dust intrusions. Moreover, a case of severe dust intrusion was discussed for the performance of the MAX-DOAS retrieval to capture the dust event with an elevated particle layer. The potential causes of the systematical underestimation of MAX-DOAS retrieved AOD were discussed, especially during high aerosol

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Discussion paper

loading condition according to the case study. I have no major concerns that need to be addressed. The manuscript is generally well written, clearly presented and is recommended for publication in AMT after some minor corrections. Minor comments: P1, L9: UV-> UV spectral region P2, L27:Since no long-term aerosol extinction profile results were presented in the manuscript, it's better to describe with aerosol extinction properties, i.e. AOD, surface AEC. P3, L17&L22:The MAX-DOAS measurements are working in both UV and visible band, however, why did the authors only use the O4 absorptions in UV to retrieve the aerosol extinction profiles? Is it possible to show some inter-comparison of aerosol retrieval results between different wavelength bands? P6, L26:Why the sensitivity study of the a priori profile was tested with these four specific shapes? Is it restricted with the algorithm itself or any other reasons? Obviously, it is not realistic that Gaussian distribution as shown in Fig. 3(b). P7, L31: The comparison of AODs from MAX-DOAS and AERONET is not so well under high aerosol loading situation. If the correlation between them was improved if the dust days was excluded from the statistics? P8, L10: Please add one more sentence or proper reference for the estimation of light path based on O4 SCD at horizontal direction. P9, L32: Figs. -> Figure Figure 3: delete 'vertical' Figure 6: correlation plots -> linear regression plots

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