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Quantifying the Single Scattering Albedo with the Absorbing Aerosol Index from OMI and a tentative application to TROPOMI

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The absorbing aerosol index (AAI) is a parameter derived from satellite observations in the near Ultra-Violet (near-UV) channel. Whereas in most studies it is used as a qualitative indicator for absorbing aerosol layers, in this study we present a technique to derive the single scattering albedo (ω_0) from the AAI. This technique combines the AAI as measured by the Ozone Monitoring Instrument (OMI), the aerosol optical thickness (τ) measured by the MODerate-resolution Imaging Spectroradiometer (MODIS) and aerosol micro-physical parameters from the AErosol RObotic NETwork (AERONET). The DISAMAR radiative transfer model is used to simulate the AAI. For these simulations, τ and the aerosol size distribution are constrained by MODIS and AERONET, respectively. The $\omega_0$and aerosol plume height (z_{aer}) are varied to match the OMI AAI data. We apply this technique to the aerosol plume of the Chile wildfires for the period from 26 to 30 January 2017, when the OMI observed AAI of this event reached its peak. The results show that the AAI simulated by DISAMAR are in agreement with the observations. The spatial correlation coefficient is over 0.85 for all cases. The retrieved mean ω_0 is approximately 0.84, slightly smaller than the mean value of 0.90 measured independently by the AERONET. The estimated z_{aer} is around 4.5-5 km, comparing well with other observations. The difference between the AAI derived ω_0 and the AERONET retrievals is attributed to the spatial and temporal distance between these observations, the assumption of homogeneous and static plume properties, the lack of the aerosol profile information, and the uncertainties in observations. Now that we have successfully demonstrated the technique to derive the $\omega_0$from AAI and ancillary data, we will apply it to a combination of the observed TROPOspheric Monitoring Instrument (TROPOMI) measured AAI and chemistry transport model data, to verify the consistency between the modelled and observed absorption by aerosols.