Aerosol optical properties as proxies for different particle populations in the central Amazon

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Figure S1. Monthly data coverage time series for the utilized instruments as heat maps. The 325 m ACSM was installed in October 2021 and the Teledyne T640 began operations in December 2021.

Figure S2. Determination of the seasons using the accumulation mode concentration as a proxy for wet deposition. Panel (a) shows the 1-week moving mean of the number concentration in the accumulation mode measured at 325 m, as well as the wet season median and 90th percentile threshold used to determine the season flags, shown in panel (b). For the determination of the season flags, missing data were completed with 60 m measurements.

Figure S3. Example run of the k-means algorithm with varying number of clusters from 2 to 8. On the bottom right, the average value of the objective function is shown for each attempt. The clusters are shown with different colors sorted randomly for each plot, and the larger dots mark the centroids of each cluster, with their size indicating the average eBC concentration.
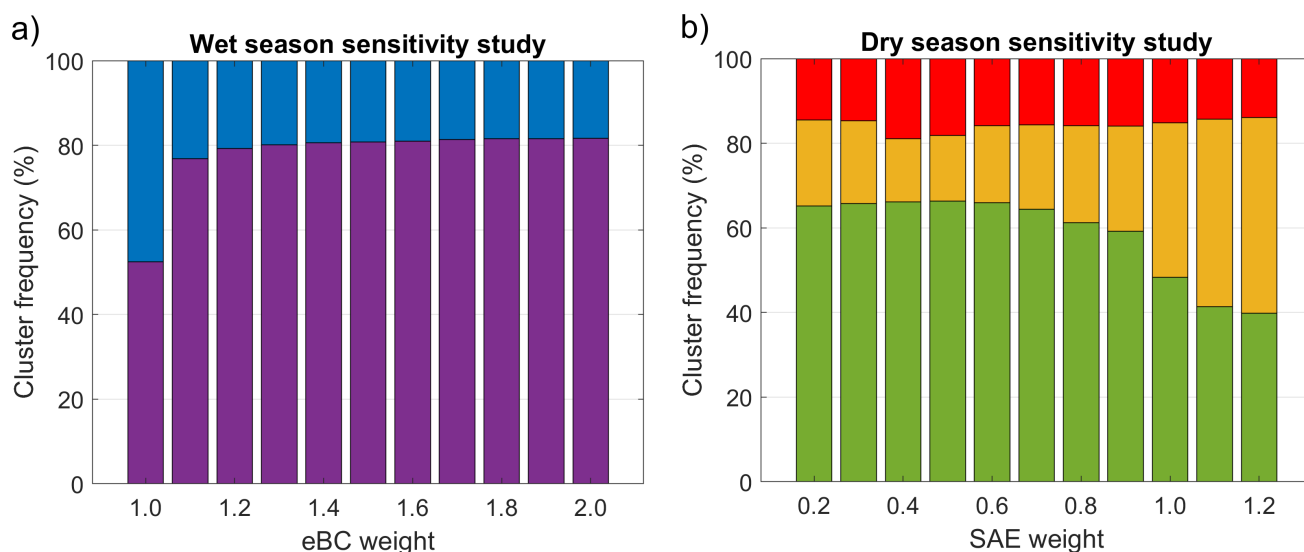
Figure S4. Sensitivity study of the k-means algorithm used in this study as a function of the weights attributed to (a) the eBC in the wet season and (b) the SAE in the dry season.
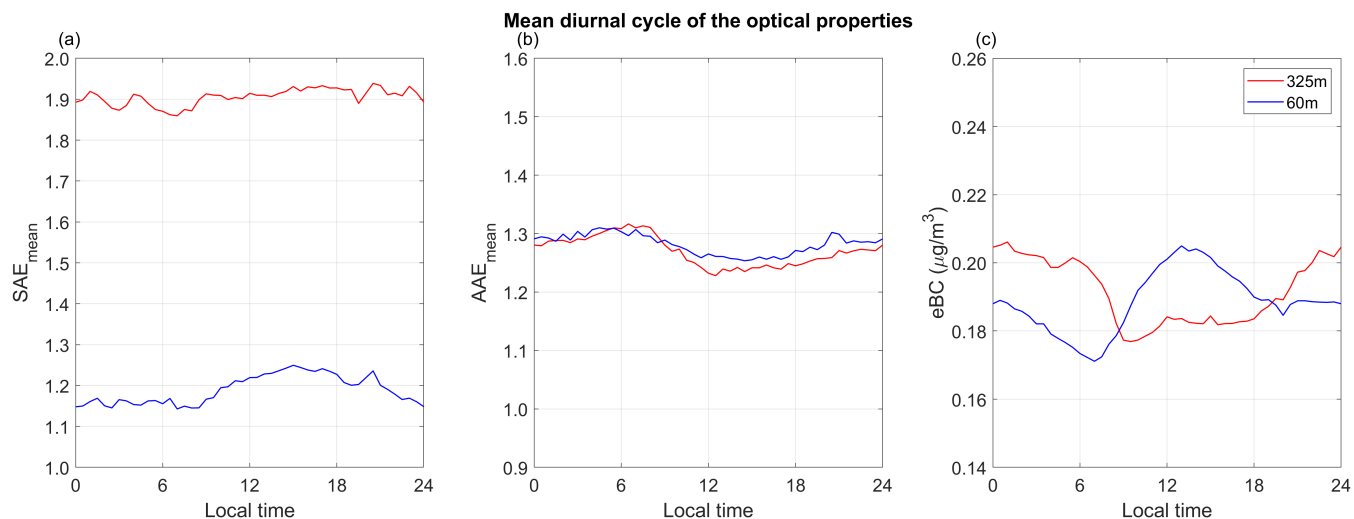
Figure S5. Diurnal cycle of the optical properties (SAE, AAE, and eBC concentration) included in the clustering determination. The blue and red lines indicate 60 and 325 m measurement heights, respectively.
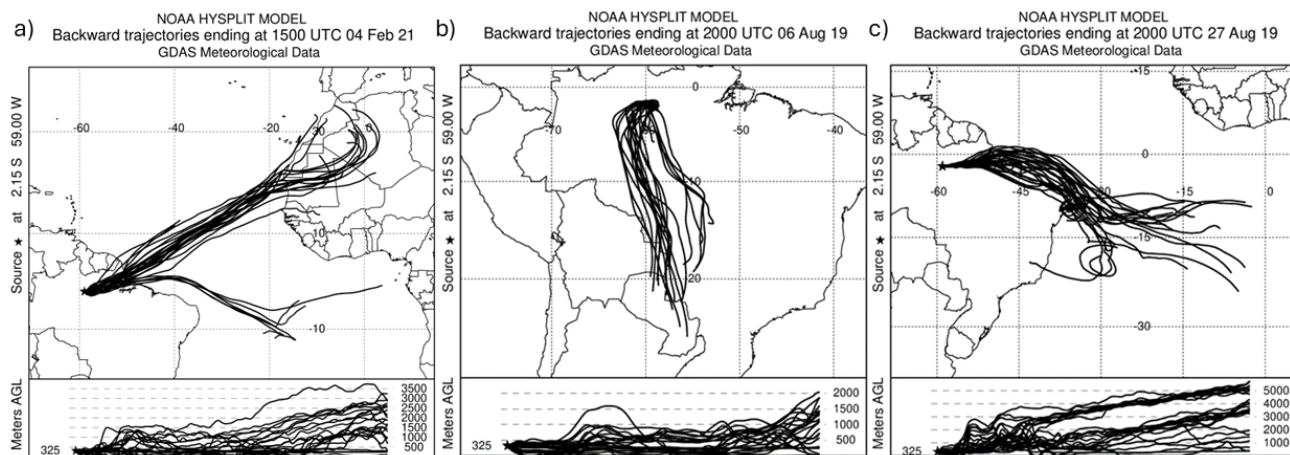
Figure S6. Back trajectories calculated using the NOAA HYSPLIT model for typical days of different clusters. On panel (a), a 10-day simulation showing the movement of air masses from North Africa to Amazonia during Feb 2021. On panel (b), a 72-hour simulation of trajectories arriving at ATTO on 06 Aug 2019, showing the influence of South American air masses, and on panel (c), a 240-hour simulation of air masses coming from Equatorial Africa arriving at ATTO on 27 Aug 2019.
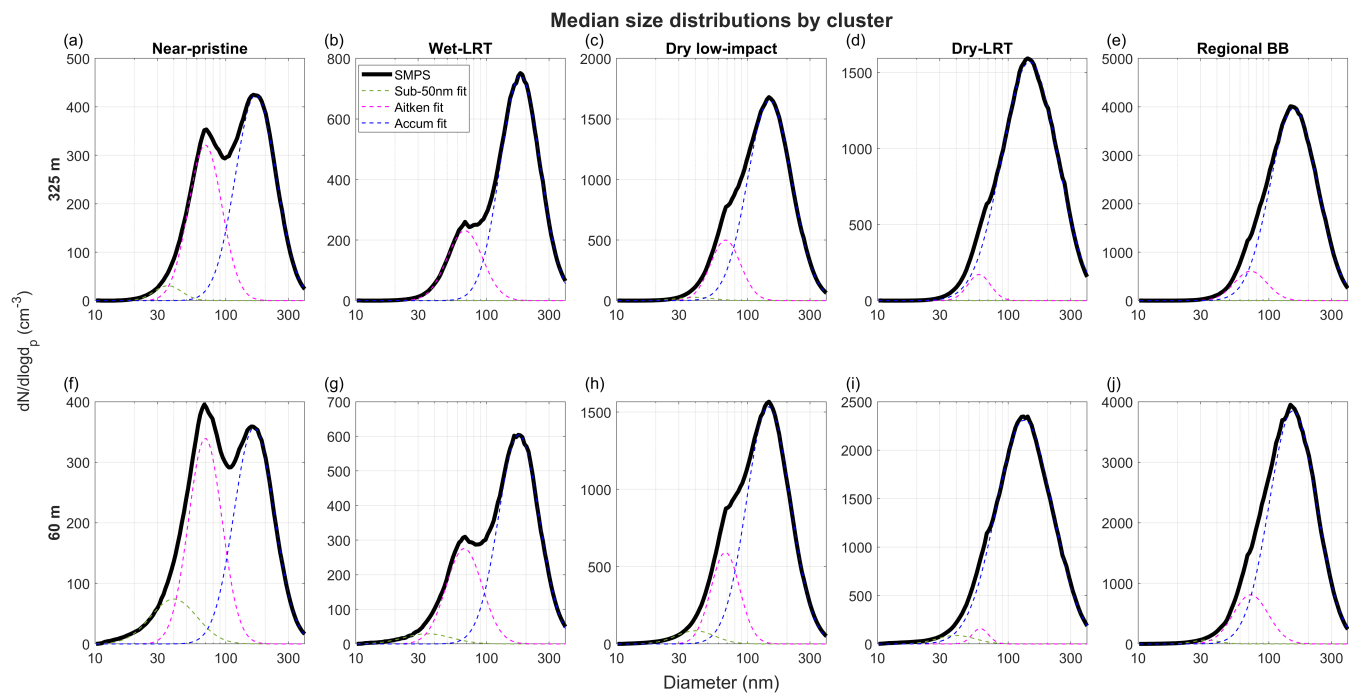
Figure S7. Median size distributions of the aerosol particles at (a-e) 325 m and (f-j) 60 m during the periods outlined by each cluster, with their respective multi-modal log-normal fits.
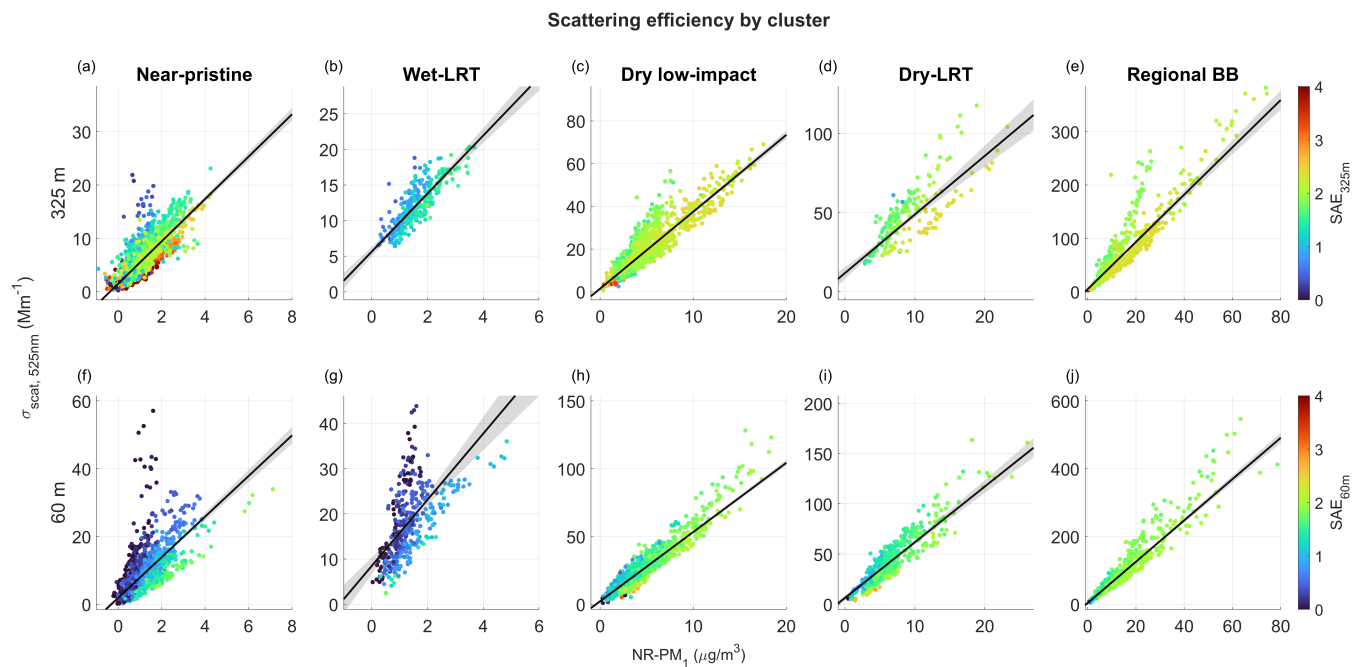
Figure S8. Scatter plots of non-refractive PM$_1$ mass and scattering coefficient at 525 nm measured at 325 m (a-e) and 60 m (f-j) for each cluster, with linear fit. The shaded areas indicate the 95% confidence interval. The colors indicate the average SAE for each dot.