Aerosol Types from 25 Southeast Asian AERONET sites obtained using specified clustering and Mahalanobis distance

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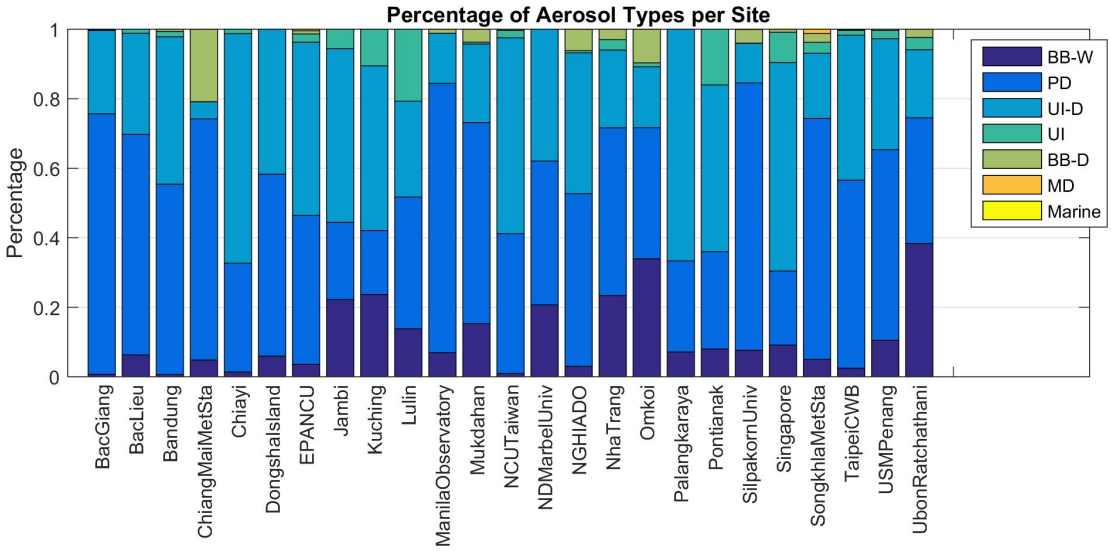
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This study aims to identify aerosol types over 25 southeast Asian sites using Aerosol Robotic Network (AERONET) level 2.0 inversion data in a five-dimensional specified classification method. The classification method makes use of the Mahalanobis distance in five dimensions to classify each point of the data to the closest reference cluster. This study relies on the fact that the method is scale-free and takes into account the obliqueness of the clusters. AERONET data from 7 sites is used to define 7 aerosol reference clusters: mineral dust (MD), polluted dust (PD), urban industrial (UI), urban industrial developing (UID), biomass burning white smoke (BBW), biomass burning dark smoke (BBD), and marine aerosols (Russell et al., 2014). These are applied on the following AERONET sites: Thailand (ChiangMaiMetSta, Mukdahan, Omkoi, SilpakornUniv, SongkhlaMetSta, UbonRatchathani); Singapore (Singapore); Vietnam (BacGiang, BacLieu, NGHIADO, NhaTrang); Philippines (ManilaObservatory, NDMarbelUniv); Taiwan (Chiayi, DongshaIsland, EPANCU, Lulin, NCUTaiwan, TaipeiCWB); Malaysia (Kuching, USMPenang); and Indonesia (Bandung, Jambi, Palangkaraya, Pontianak). The results of applying this method to the AERONET data from these sites show that the most dominant aerosol types in the region are PD, UID, and BBW. PD aerosols are characterized by mean Angstrom Exponent (AE) values of 1.19 (±0.238) and mean Single Scattering Albedo (SSA) values of 0.886 (±0.0400). UID aerosols are characterized by mean AE of 1.34 (±0.151) and mean SSA of 0.955 (±0.0249). BBW is characterized by mean AE of 1.87 (±0.144) and mean SSA of 0.925 (±0.0201). This implies that BBW aerosols are finer compared to PD and UID while PD aerosols are more absorbing compared to UID and BBW. The dominance of PD and UID aerosols may be attributed to vehicular emissions (with complete and incomplete combustions). The dominance of BBW in this region may be attributed to open burning of crop residues after harvesting. In this work, the sites where PD is most dominant are BacGiang (75%), BacLieu (63%), Bandung (55%), ChiangMaiMetSta (69%), DongshaIsland (52%), Lulin (38%), ManilaObservatory (77%), Mukdahan (58%), NDMarbelUniv (41%), NGHIADO (50%), NhaTrang (48%), Omkoi (38%), SilpakornUniv (77%), SongkhlaMetSta (69%), TaipeiCWB (54%), and USMPenang (55%). In these sites, PD is generally dominant during the months of January to May, although it is observed to be scattered throughout the year for some sites. The months of January to May are usually considered as dry months in some sites although exact dry months differ for each site. UID is the most dominant aerosol type in Chiayi (66%), EPANCU (50%), Jambi (50%), Kuching (47%), NCUTaiwan (56%), Palangkaraya (67%), Pontianak (48%), and Singapore (60%). BBW is most dominant in UbonRatchathani (38%), but is also found in significant amounts in Jambi (22%), Kuching (24%), Lulin (14%), Mukdahan (15%), NDMarbelUniv (21%), NhaTrang (23%), Omkoi (34%), USMPenang (11%). During September and October

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when biomass burning is common in the region, traces of BBW and BBD are found in Kuching, Pontianak, Singapore, and Taipei. UID type is commonly observed all throughout the year.

Keywords: Aerosols, AERONET, Southeast Asia, Angstrom Exponent, Single Scattering Albedo, Biomass



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