Aerosol Types Classification Using Ground Based Measurement In Selected Malaysian Cities for Year 2024

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Abstract

Natural and anthropogenic aerosols in the atmosphere can impact human health, air quality, and the regional climate of Malaysia. To better understand the sources of air pollution and air quality trends in 2024, this study classified aerosol particles over Peninsular Malaysia with ground observations from the AErosol RObotic NETwork (AERONET) at Penang and Banting. Level 1.5 daily mean Aerosol Optical Depth (AOD_{440nm}) and the Ångström Exponent ($\alpha_{440–870nm}$) were assessed as its automated cloud/pointing screening and significantly higher (>50 %) data availability compared to post-field-calibrated Level 2.0. In order to identify the different types of aerosols that existed, threshold values were applied based on their optical properties like urban/continental, biomass burning, marine, and desert dust. The findings showed that urban and continental aerosols—possibly produced by activities like traffic, industry, and urban emissions— were the most dominant in both Penang and Banting. Penang had higher readings with 2,621 occurrences while Banting had 1,111. This means urban activity affects air in both places considerably, and Penang feels it more frequently. Penang's highest (AOD_{440nm}) value of 0.879 was seen on 15 August 2024, meaning that aerosols level is moderate. By contrast, Banting recorded a much higher reading of 1.608 on 22 January 2024, which means higher aerosol loading—might be due to seasonal or meteorological factors. This reflects spatial and temporal variability in the presence of aerosols over the region. Aerosol classification at selected Malaysian urban had been validated by using Google Earth Engine.

Keywords: Classification of aerosol type; Aerosol Optical Depth; AERONET.