

Classification of Urban Fine and Coarse Aerosol Using Aerosol Robotic Network (AERONET) Data From January To October 2024 in Banting, Selangor

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Structured Abstract

Background: Banting which is one of the Klang Valley regions experienced rapid development where the urban and industrial emissions contributed to the air pollutants there. Aerosols can be classified into two sizes which are fine particles (PM_{2.5}) and coarse particles (PM₁₀). Fine aerosols are sourced from anthropogenic sources and land cover activities while coarse aerosols are from natural sources such as sea salt and desert dust. This study examined aerosol types and sources by classifying fine and coarse aerosols in Banting from January to October 2024 using data from Aerosol Robotic Network (AERONET) and Moderate Resolution Imaging Spectroradiometer (MODIS).

Methods: Two aerosol properties which are Aerosol Optical Depth (AOD) and Angstrom Exponent (AE) were used in this study. The trend of aerosols will be analysed using time series analysis, while classifying them based on their types and sources by using threshold analysis, and comparing both measurements, AERONET and MODIS using statistical analysis to evaluate the value of Coefficient of Determination (R^2) and Root Mean Square Error (RMSE).

Results: The results showed that fine-mode aerosols dominated with the highest mean of AOD₄₄₀ (0.61322) recorded in April during dry season that lead to the suspended aerosol caused by urban industrial and land use activities while the lowest mean of AOD₁₀₂₀ (0.19781) recorded in January during the wet season where coarse aerosols less contributed. The highest mean value of AERONET AE₃₄₀₋₄₄₀ was 1.0878 and MODIS AE₄₇₀₋₅₅₀ was 2.0875 with overall mean values was more than 1.0, confirming fine-mode aerosols dominance. Then, a weak correlation between AERONET and MODIS was recorded due to low R^2 (0.0813) as MODIS overestimated the AE values compared to AERONET, while low RMSE (0.0383), suggest a better agreement between the two datasets.

Conclusion: In conclusion, this study fulfilled its aims by analysing the trends of fine and coarse aerosols in Banting, while demonstrating how urban and biomass burning sources predominantly influence fine aerosols. AERONET was more accurate than MODIS for aerosol classification. These findings were helpful in air quality monitoring and emission control strategies in urban regions like Banting.

Keywords: Fine aerosols, coarse aerosols, AERONET, MODIS

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