Characterisation of particle mass and number concentration on the east coast of the Malaysian Peninsula during the northeast monsoon

Doreena Dominick a, b, Mohd Talib Latif a, c, *, Liew Juneng a, Md Firoz Khan d, Norhaniza Amil a, c, Mohammed Iqbal Mead f, g, Mohd Shahril Mohd Nadzir a, d, Phang Siew Moi f, Azizan Abu Samah f, Matthew J. Ashfold h, William T. Sturges i, Neil R.P. Harris i, Andrew D. Robinson j, John A. Pyle k

a School of Environmental and Natural Resource Sciences, Faculty of Science and Technology, Universiti Kebangsaan Malaysia, 43600 Bangi, Selangor, Malaysia
b Centre for Atmospheric Chemistry, University of Wollongong, Wollongong, NSW 2522, Australia
c Institute for Environment and Development (Lestari), Universiti Kebangsaan Malaysia, 43600 Bangi, Selangor, Malaysia
d Centre for Tropical Climate Change System (IKLIM), Institute for Climate Change, Universiti Kebangsaan Malaysia, 43600 Bangi, Selangor, Malaysia
e School of Industrial Technology (Environmental Division), Universiti Sains Malaysia, 11800 Penang, Malaysia
f Institute of Ocean and Earth Sciences, University of Malaya, 50603 Kuala Lumpur, Malaysia
g School of Earth, Atmospheric and Environmental Science, University of Manchester, Brunswick Street, Manchester M139PL, United Kingdom
h School of Biosciences, University of Nottingham Malaysia Campus, Jalan Broga, 43500 Semenyih, Selangor, Malaysia
i School of Environmental Sciences, University of East Anglia, Norwich Research Park, NR4 7TJ Norwich, United Kingdom
j Department of Chemistry, University of Cambridge, Lensfield Road, Cambridge CB2 1EW, United Kingdom
k National Centre for Atmospheric Science, NCAS-Climate, UK

HIGHLIGHTS

- Multivariate analysis used for the characterisation and distribution of particles.
- Particle number variations dominated by smaller particles (Dp ≤ 4.50 μm).
- Local activities influence the daily pattern of particles.
- Wind trajectory plays important role in the variability of particles.

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ABSTRACT

Particle mass concentrations (PM10, PM2.5 and PM1) and particle number concentration ([PNC]; 0.27 μm ≤ Dp ≤ 34.00 μm) were measured in the tropical coastal environment of Bachok, Kelantan on the Malaysian Peninsula bordering the southern edge of the South China Sea. Statistical methods were applied on a three-month hourly data set (9th January to 24th March 2014) to study the influence of north-easterly winds on the patterns of particle mass and PNC size distributions. The 24-h concentrations of particle mass obtained in this study were below the standard values detailed by the Recommended Malaysian Air Quality Guideline (RMAQG), United States Environmental Protection Agency (US EPA) and European Union (EU) except for PM2.5, which recorded a 24-h average of 30 ± 18 μg m−3 and exceeded the World Health Organisation (WHO) threshold value (25 μg m−3). Principal component analysis (PCA) revealed that PNC with smaller diameter sizes (0.27–4.50 μm) showed a stronger influence, accounting for 57.6% of the variability in PNC data set. Concentrations of both particle mass and PNC increased steadily in the morning with a distinct peak observed at around 8.00 h, related to a combination of dispersion of accumulated particles overnight and local traffic. In addition to local anthropogenic, agricultural burning and forest fire activities, long-range transport also affects the study area. Hotspot and backward wind trajectory observations illustrated that the biomass burning episode (around...