Temporal Variation and Chemical Composition of Coarse and Fine Particulate Matter in an Urban Coastal Environment

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This study aims to determine the temporal variations and composition of coarse particles (CP) and fine particles (FP) in Kuala Terengganu, an urban coastal city in the northeast of Peninsular Malaysia. The samples were collected from January to June 2009 using Gent-stacked low volume air sampler. The measurement took place on the rooftop of Politeknik Kota. Samples were analyzed for elemental concentrations and water-soluble ions using Inductively Couple Plasma-Optical Emission Spectrometry (ICP-OES) and Ion Chromatography (IC), respectively. The average concentration of 9.55 ± 1.43 μg m^{-3} and 12.4 ± 2.63 μg m^{-3} were reported for CP and FP, respectively. The gravimetric result confirmed that the FP average mass concentration was well below the World Health Organization (WHO) $PM_{2.5}$ 24-hr average (25 μg m^{-3}). In general, mass concentration of CP and FP appeared to be influenced by rainfall intensity; relatively lower concentration was observed during higher rainfall period. In addition, higher concentration of FP relative to CP seems to suggest the importance of long-range transport of aerosols into this area. Na^+, K^+, and Cl^- were the main ions in coarse fraction and occupied about 64% of the CP ionic mass, while K^+, NH_4^+, and Na^+ were the main ions in fine fraction and occupied about 69% of the FP ionic mass. Na, Ca, and Al were the main elements in both coarse and fine fraction and occupied about 71% and 65% of the CP and FP elemental mass, respectively. The presence of trace metals (Cd, Co, Cr, Cu, Mn, Ni, Pb, Zn) were also observed and occupied ca. 6% and 12% of the CP and FP elemental mass, respectively. Furthermore, results indicated that activities such as marine aerosol, biomass burning, soil dust, and traffic-related emissions affected both CP and FP to a certain degree.

Keywords: water-soluble ions, trace elements, marine aerosol, biomass burning, traffic related emissions.