Geophysical Research Abstracts
Vol. 18, EGU2016-3408, 2016
EGU General Assembly 2016

Vertical PM10 Characteristics and their Relation with Tropospheric Meteorology over Hong Kong

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Small particulates or PM10, those with aerodynamic diameters less than 10 mm, can cause long term impairment to human health as they can penetrate deep and deposit on the wall of the respiratory system. Hong Kong receives significant concentration of cross-boundary particulates but at the same time produce domestic pollutants which altogether contribute to the total pollution problem.
Recent research interest is paying more attention on the vertical characteristic of PM in the lower atmosphere as possible correlations exist along different altitude. Besides, there exists potential relationship between PM concentration aloft and the high-level weather condition. Yet, most studies focus only up to around 200 meters above sea level due to the proposed significance and the lack of technology. Undoubtedly, this is not enough in investigating the relation between vertical atmospheric profile and PM vertical characteristics.
New technology development has allowed measuring PM concentration along the vertical atmospheric profile up to tropopause. This measurement relies on the Atmospheric Light Detection and Ranging (LiDAR) which operates using the radar principle to detect Rayleigh and Mie scattering from atmospheric gas and aerosols.
The research involves (1) study of the seasonal vertical PM10 characteristics in five studying site of Hong Kong covering urban, suburban and rural area; (2) the relationship of the PM10 characteristics with meteorological parameters; (3) the vertical PM10 characteristics under the approach of tropical cyclones. A portable Micro Pulse Lidar (MPL) is adopted to collect PM data aloft while surface PM data is collected from ground stations. High-level meteorology data is received from Hong Kong Observatory. Statistical analyses are operated to investigate the correlation between weather conditions and PM concentration along the vertical profile.
The research study is divided in phrases. The ultimate goal of the study is to develop models simulating high-level PM concentration under different meteorological conditions and predict the impacts under global and urban climate change.

Keywords: PM10; High level meteorology; Seasonal variations; Tropical cyclone; Hong Kong; LiDAR