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Assessing the Impacts of Atmospheric Conditions under Climate Change on Air Quality Profile over Hong Kong

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Small particulates can cause long term impairment to human health as they can penetrate deep and deposit on the wall of the respiratory system. Under the projected climate change as reported by literature, atmospheric stability, which has strong effects on vertical mixing of air pollutants and thus air quality Hong Kong, is also varying from near to far future. In addition to domestic emission, Hong Kong receives also significant concentration of cross-boundary particulates that their natures and movements are correlated with atmospheric condition.
This study aims to study the relation of atmospheric conditions with air quality over Hong Kong. Past meteorological data is based on Modern Era Retrospective Analysis for Research and Applications (MERRA) reanalysis data. Radiosonde data provided from HKO are also adopted in testing and validating the data. Future meteorological data is simulated by the Weather Research and Forecasting Model (WRF), which dynamically downscaled the past and future climate under the A1B scenario simulated by ECHAM5/MPIOM.
Air quality data is collected on one hand from the ground station data provided by Environment Protection Department, with selected stations revealing local emission and trans-boundary emission respectively. On the other hand, an Atmospheric Light Detection and Ranging (LiDAR), which operates using the radar principle to detect Rayleigh and Mie scattering from atmospheric gas and aerosols, has also been adopted to measure vertical aerosol profile, which has been observed tightly related to the high level meteorology. Data from scattered signals are collected, averaged or some episode selected for characteristic comparison with the atmospheric stability indices and other meteorological factors.
The relation between atmospheric conditions and air quality is observed by statistical analysis, and statistical models are built based on the stability indices to project the changes in sulphur dioxide, ozone and particulate matters due to changes in stability in future years.