4.008 Characteristics and influencing factors of PM1 over Shanghai and its impact on visibility.

Presenting Author:  
Guangqiang Zhou, Shanghai Meteorological Service, Shanghai 200030, China, zhougq21@163.com

Abstract:

The relative long-term continuous *in situ* measurements during Jan 1st, 2015 and Dec 31st, 2016 were employed to study the characteristics of submicron particles (PM1) over Shanghai and investigate the influence of precursors and meteorological factors on PM1 as well as the impact of PM1 on visibility. A discretization method was introduced to emphasize the general regularity of PM1 with related factors. The results show that Shanghai has a relatively high PM1 level of ~28 μgm⁻³ annually and accounts for 69% of PM2.5. PM1 concentration shows obvious temporal variation in year, month, week, and day. In discretized approach, PM1 has good linear relationship with its precursor gases and meteorological variables in most conditions. Its concentration can be highly determined by SO2, NO2, and NO (<34 ppb) with increasing rate of 3.37, 1.17, and 1.08 μgm⁻³ per ppb precursor, respectively. It was validated by the comparison of PM1 change in day of week. PM1 is negatively related with precipitation intensity, relative humidity (RH, >35%), and wind speed (>1.5ms⁻¹) with rate of -3.3, -0.27, and -5.9 μgm⁻³, respectively. Effect of ozone on PM1 is in two linear relationships inflected at ~30 ppb. For other factors or situation, their relationship is not linear due to the indirect influence on transportation, formation, or accumulation. PM1 concentration has distinct impact on visibility and PM1/PM2.5 ratio is found to be a key indicator to represent the impact of particulate matter hygroscopicity on visibility. PM1/PM2.5 ratio has a good exponent relationship with RH, PM1/PM2.5 = 0.76 [(1-RH)/(1-40%)]⁰.¹¹ with determination coefficient of 0.98. It well describes the impact of particulate matter and its hygroscopicity on visibility companying with PM2.5 concentration.