

General comments

The study by Liu et al., entitled “Aerosol hygroscopicity derived from size-segregated chemical composition and its parameterization in the North China Plain”, characterizes the aerosol composition and sources near two large steel plants in a coastal city in Shandong using a PM_{2.5} TOF-ACSM. While it is generally well presented, I have a few concerns about the data interpretation which is sometimes questionable. Specifically, in the OA Source Apportionment section, HOA was apportioned to traffic which was shown to have a pronounced morning and evening rush hour peaks. However, HOA was also shown to have a good correlation with NO_x ($R^2=0.82-0.87$). The tight correlation between HOA and NO_x means NO_x also had such diurnal trends and could be exclusively from traffic. However, contrasting results appeared in the Industrial Plumes Section where it shows NO_x was also correlated with CO ($R^2=0.83$). Later, Liu et al., stated that CO, NO_x, and SO₂ were co-emitted from steel plants. So my question, how is the correlation between CO and HOA, and what on earth NO_x is from. If NO_x is from traffic then other correlated species (i.e., CO and SO₂) are also from traffic, which means the NO_x/SO₂ ratios or NO_x/CO ratios would be invalid diagnostic ratios for steel plant emissions. If NO_x was indeed from steel plant, then the source apportionment of OA factor is questionable. Because the tight correlation between HOA and NO_x, HOA would also be from steel plant, however, which shows morning and evening rush hour peaks. This would be more questionable.

Specific comments

My other major concern is how to prove that SO₄ are exclusively from power plant, but not regionally transported. The good correlation between LO/MO-OOA and SO₄/NO₃ indicates regional transport. And the increase of SO₄ above background level before and after the plume could be stronger secondary production during transport. The wind rose only shows a huge source from the southwest region which could be other sources (e.g., general industries activities) other than power plant. You need more evidence to show the sulfate/ammonium were exclusively from the power plants.

Are these two power plants coal-powered? Could you comment why CCOA was only resolved in March but not in September. Does it mean the CCOA was actually not from the power plants but from residential sectors? What is the correlation between CCOA and NO_x/CO/SO₂ during the industrial plume? What are the mass spectra during industrial plume, any sign of CCOA? If no sign of CCOA, does it mean the SO₄ was not from power plants?

What are the tools to perform the PMF analysis. How the factors are systematically evaluated?

In the Method section, it states “Considering the limited sensitivity of the ToF-ACSM, m/z ’s larger than 120 and 180 were excluded in PMF analysis” However, in the PMF Section, and Fig. 4, it states “Compared with HOA, CCOA presented a higher mass fraction of larger m/z ’s (>120) indicating that coal combustion can be an important source of high molecular-weight organic matter during heating period.” Is m/z ’s >120 really excluded?