

***Interactive comment on* “Seasonal and diurnal characteristics of water soluble inorganic compounds in the gas and aerosol phase in the Zurich area” by R. Fisseha et al.**

Anonymous Referee #2

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This paper presents semi real-time gas and aerosol data collected using a WEDD/AC in Zurich from August to September 2002 and in March 2003. Interesting results including the difference in the nitrate concentration and the gas-particle partitioning of nitrate in these two periods are revealed. As the authors noted, real-time data for water soluble inorganic compounds are scarce in general. Real-time measurements are useful in understanding the formation of this important group of compounds, in particular, nitrate.

It appears that ammonium measurements were not available and therefore the authors assumed that sulfate and nitrate particles are completely neutralized. In applying

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AIM, they used total ammonia concentration in the range of 3–7 $\mu\text{g}/\text{m}^3$ and found that the model underpredicted the nitrate concentrations. The authors may want to clarify whether they have made ammonia measurements and elaborate on the gas-particle partitioning of ammonia, if available.

A possible reason for the underprediction of nitrate is that there may be the presence of seasalt and crustal aerosols that act as a sink of nitrate. They can “pull” gas phase HNO_3 to become nitrate.

Another interesting issue related to the assumption of complete neutralization has to do with the condition for nitrate to exist. Recently, Pathak and Chan (2005) found that excess ammonium was almost equal to the nitrate concentration in $\text{PM}_{2.5}$ samples they collected in Hong Kong. In their work, excess ammonium is defined as:

$$\text{excess } [\text{NH}_4^+] = ([\text{A}]/[\text{S}] - 1.5)[\text{S}],$$

where $[\text{A}]$ and $[\text{S}]$ are molar concentration of ammonium and sulfate, respectively. Hence, nitrate was present even though the particles are not completely neutralized. If ammonium data were available, it would be interesting to see if a similar relationship between excess ammonium and nitrate could be found in the samples.

Reference

Pathak, R. K. and Chan, C. K. (2005) “Inter-particle and gas-particle interactions in sampling artifacts of $\text{PM}_{2.5}$ in filter-based samplers”, *Atmospheric Environment*, 39, 1597–1607.

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