

Measurements of Water-Soluble Aerosol and Gases During Pittsburgh Air Quality Study

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Introduction / Motivation

- Automated high-time resolution instruments are needed for understanding processes leading to PM formation
- What is the response of PM_{2.5} when emissions of SO₂ are reduced?
- What about changes in NH₃ emissions?

Approach

- High resolution measurements of aerosol sulfate, nitrate, and total (gas+aerosol) nitrate and ammonium using modified Steam-Jet Aerosol Collector (no denuder was used).
- Use of numerical models (GFEMN) to assess PM sensitivity to changes in precursor concentrations.

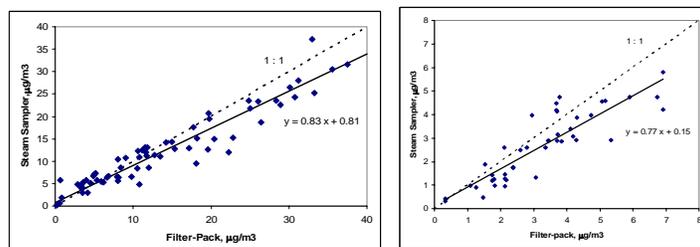


Fig. 1. Comparison of the sampler with denuder-FP.

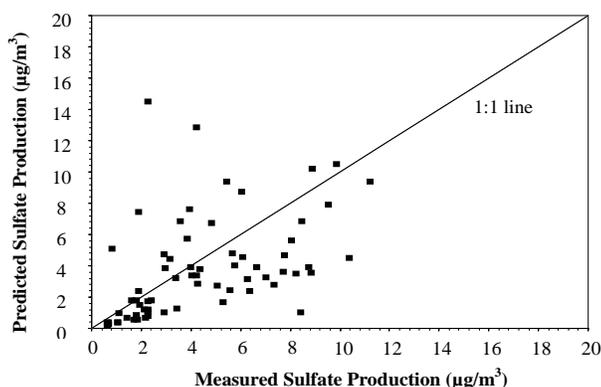


Fig. 2. Modeled and measured sulfate artifact production in the sampler.

Results

- The sampler showed good agreement with the denuder – filter pack method (Fig.1), however sulfate suffered from SO₂ interference.
- It was possible to correct for SO₂ interference by modeling SO₂ absorption and oxidation in the sampler (Fig. 1, 2).
- Modeling of the PM response to changes in precursors has shown that:
 - Sulfate reductions result in nitrate level increases
 - Ammonia is controlling the ammonium nitrate formation both during the summer and the winter.
- PM_{2.5} control efficiencies for Pittsburgh (Fig.3):
 - July: Sulfate > Ammonia
 - January: Ammonia > Sulfate
- Increases in ammonia levels result in cooling of the planet, decreases of the acidity of particles and clouds, but increases of the fine particulate matter concentrations and reductions of visibility

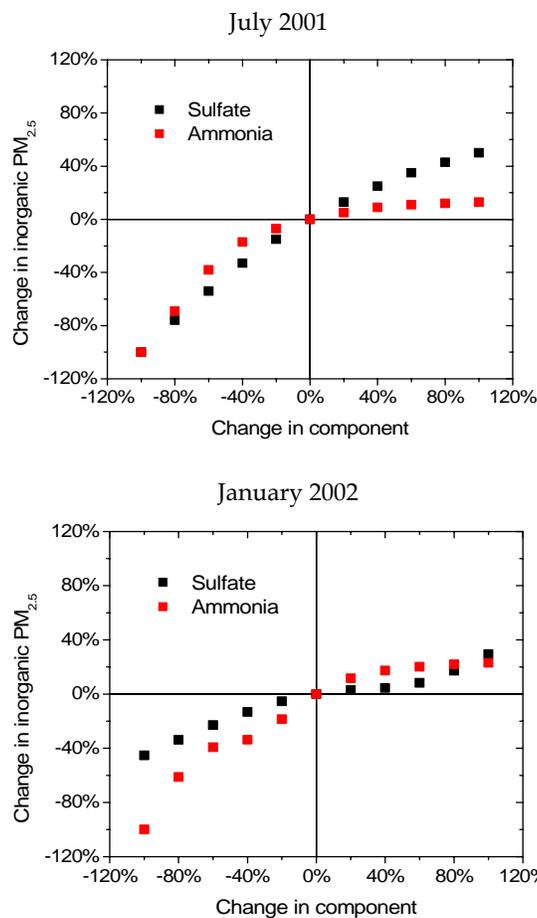


Fig. 3. PM_{2.5} sensitivity to sulfate and ammonia for July 2001 and January 2002.

Acknowledgements

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