MOTIVATION

- Ammonia and nitric acid are important to measure because they can both react to become a particle. Particles can decrease visibility as well as have adverse health effects.
- Currently, denuders are being used to measure the concentration of atmospheric ammonia and nitric acid in the RoMANS II project. While these sampling instruments are quite efficient for collecting ammonia and nitric acid, they also are time and labor intensive.
- The mist chamber is an attractive alternative because it is simple to run, it has a better time resolution and could potentially be automated.

METHODS

- DESCRIPTION OF A MIST CHAMBER
  - Trapping solution is pumped to the bottom of the mist chamber
  - Air is pulled through a filter to remove particles and then through the larger entrance tube
  - The air is pulled at a high enough rate so that the solution is forced into the small inner tube
  - The solution in the small inner tube collides with the air, creating a fine mist
  - The mist chamber collects water soluble gases from the air
  - A hydrophobic filter prevents solution from escaping out of the top of the mist chamber

OBJECTIVES

- Find the optimal running conditions of the mist chamber
- Sample ammonia and nitric acid in both the laboratory and field environment

RESULTS- AMMONIA

Ammonia
- The sampling time was originally 20 minutes, but was changed to 1 hour, which improved consistency among the data
- Variables such as pH, volume and temperature of the trapping solution were adjusted without a significant change in the efficiency of the mist chamber
- The efficiency of the mist chamber was in direct correlation with the concentration of ammonia sampled, which was a result that could not be explained

RESULTS- NITRIC ACID

Nitric Acid
- Denuders that were setup near the lab also measured the amount of ammonia, which was compared to the ammonia measured by the mist chamber. Most of the time the denuder collected a higher concentration of ammonia

CONCLUSIONS

- The mist chamber required less time and labor for preparations than the denuders but parameters must be better established for the mist chamber in order for it to be confidently deployed in the field
- Throughout this research, the mist chamber had lower efficiencies and was more inconsistent than denuders when sampling ammonia and nitric acid
- The mist chamber had low efficiencies when the concentration of ammonia was low but the same effect was not observed for nitric acid

FUTURE WORK

- More research should be done to determine why the mist chamber has a low efficiency especially at low concentrations
- It could be determined if all mist chambers have approximately the same efficiency by running two mist chambers simultaneously
- Sampling for a species that has previously been measured by a mist chamber with positive results, such as SO2, would provide a good comparison of the efficiencies obtained by the mist chamber in this research

REFERENCES


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