The primary objective of the Ammonia CASTNET CSN Study (ACCS) is to conduct a comparison of natural and nitrogen-containing compounds at five CASTNET sites for one year. Currently, the traditional open face CASTNET 3-stage filter pack captures only particulate ammonium (NH₃) and nitrate (NO₃⁻), which only represents a portion of the total nitrogen dry deposition budget. Therefore, it is desirable to explore possibilities, including using a modified CASTNET-style filter pack, for collecting measurements of other total nitrogen components. Using duplicate annular denuder systems (ADS) with a 2.5 μm size cut as the reference method, the goals of the ACCS are to:

1. Assess the precision, accuracy, and bias of passive ammonia samplers,
2. Test a traditional CASTNET filter pack with an additional fourth stage filter impregnated with phosphoric acid (H₃PO₄) to collect atmospheric NH₃ and any volatilized NH₄⁺ (open face ~10 μm effective size cut),
3. Characterize Met One SuperSASS mini-parallel plate denuders for NH₃ collection (2.5 μm size cut), and
4. Compare Met One SuperSASS ion module species collection with traditional CASTNET 3-stage filter pack (2.5 μm size cut for SuperSASS).

Site selection was based on proximity to predicted or known ammonia emissions sources, site operator capability, and collaboration with the National Atmospheric Deposition Program (NADP) Ammonia Monitoring Network (AMoN). Sites selected and measurements scheduled to be performed:

<table>
<thead>
<tr>
<th>Site</th>
<th>Filter Packs</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>LTH115-NY</td>
<td>AMoN Passive sampler</td>
<td>1 and 3 Standard CASTNET filter pack</td>
</tr>
<tr>
<td>PML193-TX</td>
<td>Single denuder (&quot;short&quot;) NH only ADS</td>
<td>4-stage CASTNET filter pack</td>
</tr>
<tr>
<td>ARE128-PA</td>
<td>AMoN Passive sampler</td>
<td>4-stage CASTNET filter pack</td>
</tr>
<tr>
<td>CHE185-OK</td>
<td>Two denuder (&quot;long&quot;) ADS</td>
<td>SuperSASS mini-parallel plate denuder for NH₃</td>
</tr>
<tr>
<td>ROM935-CO</td>
<td>SuperSASS CSN ion module</td>
<td>SuperSASS CASTNET filter pack</td>
</tr>
</tbody>
</table>

Test Study Details

Prior to the start of field sampling, three test studies were conducted at the Gainesville, FL MACTEC facility. All sample types that would be analyzed by the MACTEC laboratory were included in the tests:

- 4-stage CASTNET filter pack
  - "Short" ADS
  - "Long" ADS
  - SuperSASS MPPD

Two problems were encountered during Phase 1 of the testing. First, the initial ADS design featured a nylon filter for the collection of particles, which proved to be inadequate as there was evidence of particle breakthrough. For Phase 3, a Teflon filter was added to the ADS for the collection of particles, and results improved.

The second problem involved the 4-stage filter pack. Expected results were not obtained. No NH₃ was collected by the H₃PO₄ impregnated filter. It appears that in high humidity environments use of a 4-stage filter pack is not viable. The NH₃ may react with SO₄ not effectively collected.

Because of this issue, 4-stage filter packs will not be included during the first several ACCS sampling periods. Additional testing of other configurations will be performed, and it is hoped that a modified CASTNET filter pack will join the study by its midpoint.

Study Schedule

ACCS field sampling began at all five sites on August 31. To match the 2-week exposure time of the AMoN passive sampler (which will run throughout the study on the standard AMoN schedule), ACCS samples will run for two sequential 1-week sampling periods at every six weeks for one year. Standard 3-stage CASTNET filter packs will continue to run each week throughout the study.

Before the end of the year, MACTEC will test other configurations for the CASTNET 4-stage filter pack and make a decision along with other partners about the deployment of a modified filter pack for ACCS. Possibilities include:

- Using a different arrangement of impregnated filters (switch the K₂CO₃ and H₃PO₄ filters)
- Use a different acid for impregnating the filter for NH₃ collection
- Deploy a 3-stage filter pack with the K₂CO₃ filter removed and replaced with an H₃PO₄ filter (tested during Phase 3)

Acknowledgements

The ACCS is a collaborative effort among multiple groups at EPA:

- Office of Air and Radiation (OAR) / Clean Air Markets Division (CAMD)
- Office of Research and Development (ORD) / National Exposure Research Laboratory (NERL)
- Office of Air Quality Planning and Standards (OAQPS) / Air Quality Assessment Division (AQAD)
- Labs participating: MACTEC, CAL, and RTI