THE CHEMICAL COMPOSITION OF CLOUD WATER AND SNOW AT STORM PEAK LAB, STEAMBOAT SPRINGS, COLORADO, JANUARY 2003

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Introduction

Every January, BCC science and technology students take part in an Environmental Field Study in Steamboat Springs, CO. The field study is a joint project with Prof. Hindman and Prof. Bandosz of City College of New York.

Sources of pollution

<table>
<thead>
<tr>
<th>Primary Pollutants</th>
<th>Secondary Pollutants</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO</td>
<td>SO2</td>
</tr>
<tr>
<td>CO2</td>
<td>NO</td>
</tr>
<tr>
<td>SO3</td>
<td>HNO3</td>
</tr>
<tr>
<td>H2SO4</td>
<td>H2O2</td>
</tr>
<tr>
<td>PANs</td>
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Research activities

- Collect cloud water and snow samples and perform chemical analyses
- Make meteorological measurements
- Collect and preserve snow crystals
- Determine sulfur dioxide and nitrogen gases in the atmosphere
- Determine the amount of aerosol particles in the atmosphere
Photos of BCC students in action

Roberto backs up the automatic meteorological measurements at SPLB

Roberto records and operates aerosol particle instruments in the SPLB trailer.

Cheryl records meteorological data at SPLB.

Roberto skiing between SPLB and SPL during a morning shift-change.

Roberto and Cheryl arrive safely at SPL.

The SPL bunk room is warm, dry and comfortable.

Roberto prepares the Forward Scattering Spectrometer Probe to size and count cloud droplets.

Roberto deploys the cloud sieves to collect cloud droplets.

Droplets impact and freeze on the sieves while the crystals impact, shatter and blow by the sieves.

Nelson removing the frozen droplets from a sieve in the SPL cold room.

Cheryl measures the absorbance of the solution that has reacted to SO₂ and NO₂ gasses.

The liquid ion chromatograph in the BCC Chemistry Dept. Used for anion and cation analyses not possible at SPL.
Results

Comparison of Cloud Water & Snow pH at SPL

Comparison of Cloud Water & Snow Conductivity at SPL
Comparison of Cloud Water & Snow Chloride Conc. at SPL

Comparison of Cloud Water & Snow Nitrate Conc. at SPL
Comparison of Cloud Water & Snow Sulfate Conc. at SPL

Mercury Levels in SPL Cloud Water
Discussion and conclusions

- The cloud samples were generally more acidic than the snow samples.

- The pH of both cloud water and snow were on average 3 pH units below that of NYC tap water.

- The nitrate levels in the cloud water samples were on average double that of snow samples and quadruple that of NYC tap water.

- Mercury in SPL cloud water, determined at NYCDEP lab at Wards Island Water Pollution Control, was approximately 7 times that found in NYC sewage effluent.

- This was not an expected result.

- The power plants within eyesight of SPL could contribute significantly to the mercury loading in cloud water.
Acknowledgements

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