Contributions of NATIVE to DISCOVER

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# NATIVE Capabilities

<table>
<thead>
<tr>
<th>Instrument (Mfg.) (Model)</th>
<th>*Detection Limit or range</th>
<th>*Response Time (s)</th>
<th>Uncertainty (at typical ambient concs)</th>
<th>Field Calibration Frequency</th>
<th>Calibration Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>NO-NO$_3$ (Thermo Scientific) (42 C-Y)</td>
<td>50 ppt</td>
<td>60</td>
<td>3%</td>
<td>daily</td>
<td>gas cylinder (Math-Tri, inc.)</td>
</tr>
<tr>
<td>O$_3$ (Thermo Scientific) (49C)</td>
<td>1 ppb</td>
<td>20</td>
<td>4%</td>
<td>weekly</td>
<td>UV ozonator</td>
</tr>
<tr>
<td>SO$_2$ (Thermo Scientific) (43C)</td>
<td>0.2 ppb</td>
<td>80</td>
<td>5%</td>
<td>weekly</td>
<td>gas cylinder (Math-Tri, inc.)</td>
</tr>
<tr>
<td>CO (Thermo Scientific) (48C)</td>
<td>40 ppb</td>
<td>60</td>
<td>5%</td>
<td>weekly</td>
<td>gas cylinder (Math-Tri, inc.)</td>
</tr>
<tr>
<td>Temperature (R.M. Young) (41382)</td>
<td>-50-50°C</td>
<td>10</td>
<td>0.3°C</td>
<td>per field campaign</td>
<td>water bath</td>
</tr>
<tr>
<td>Relative Humidity (R.M. Young) (41382)</td>
<td>0-100%</td>
<td>10</td>
<td>2%</td>
<td>per field campaign</td>
<td>water bubbler</td>
</tr>
<tr>
<td>Pressure (R.M. Young) (61202)</td>
<td>500-1100 hPa</td>
<td>10</td>
<td>0.3 hPa</td>
<td>per field campaign</td>
<td>NIST-calibrated barometer</td>
</tr>
<tr>
<td>Wind Speed and Direction (R.M. Young) (05103)</td>
<td>1 m/s</td>
<td>1</td>
<td>0.3 m/s; 3 deg</td>
<td>per field campaign</td>
<td>Compass/GPS</td>
</tr>
</tbody>
</table>

* Specifications provided by Thermo Electron Corporation or R.M. Young

<table>
<thead>
<tr>
<th>Instrument (Mfg.) (Model)</th>
<th>Measured Parameter(s)</th>
<th>Response Time</th>
<th>Spatial Range/Resolution</th>
</tr>
</thead>
<tbody>
<tr>
<td>UV Shadowband Radiometer (YES, Inc.) (UVMER-7)</td>
<td>diffuse and direct irradiance, total-column ozone</td>
<td>30 s</td>
<td>Total View</td>
</tr>
<tr>
<td>J(NO$_2$) Filter Radiometer (Metcon) (2-pi-JNO2)</td>
<td>NO$_2$ photolysis rate</td>
<td>~1 s</td>
<td>Total View</td>
</tr>
<tr>
<td>Pandora (DS-DOAS)</td>
<td>Total column NO$_2$</td>
<td>~2 min</td>
<td>Total column</td>
</tr>
<tr>
<td>Sun-Tracking Photometer (Cimel) (CE318N-EBS9)</td>
<td>total-column water vapor, ozone, aerosol size distribution and aerosol optical thickness</td>
<td>~30 s</td>
<td>Total column</td>
</tr>
<tr>
<td>Ozonesonde/Radiosonde Ground Station (ENSCI/Vaisala)</td>
<td>vertically-resolved ozone mixing ratio, temperature, pressure, and water vapor</td>
<td>&lt;30 s</td>
<td>0-30 km/~10 m</td>
</tr>
</tbody>
</table>
Additional NATIVE Capabilities

MOPS - Measurement of Ozone Production Sensor *(courtesy B. Brune)*

Pandora – Column NO₂

Turbulence and ozone flux measurements *(courtesy J. Fuentes)*
NATIVE Requirements

Physical Dimensions

- Length: 7.2 m
- Width: 2.8 m
- Height: 3.6 m
- Total Height: 11 m

Power Requirements:
- Connection: Female, 200A, 240/120V, 60Hz
- Maximum start up: 80 Amps
- Normal operation: ~35 Amps

Standard Gases:
- Nitric oxide (~5 ppm in nitrogen)
- Nitric oxide (2% in nitrogen – for O₃ flux)
- Sulfur dioxide (~5 ppm in nitrogen)
- Carbon monoxide (~5 ppm in nitrogen)
- Helium (1 per 2 ozonesonde launches)

Clearance from FAA to launch ozonesondes!!
Potential Summer 2011 Sites

Aldino

Edgewood

Essex

MDE Monitoring Stations - 2009
Highest concentrations of ozone observed during easterly (from the ocean) flow

Results from CAPABLE – Summers 2009 and 2010

* Numbers within bars indicate sample sizes
Much Thanks to Past and Present Supporters:

NASA’s Aura Validation Program (M.J. Kurylo, K.W. Jucks)
GEO-Cape (B. Doddridge, M. Pippin, J. Fishman, D. Neil, J. Murray)
DISCOVER Partners