Tenth Anniversary of the National Ozone Expedition: A mini-symposium

August 22, 1996 marks the tenth anniversary of the date that the first National Ozone Expedition arrived in Antarctica. In commemoration of that event, we are planning a one-day mini-symposium.

The symposium will be held in the main seminal room at NCAR in Boulder and will focus on a series of invited scientific talks reflecting upon the progress of scientific understanding of Antarctic ozone depletion. The emphasis will be on ground-based observations, but we also hope to summarize aircraft, laboratory, satellite, and theoretical advances. We encourage each speaker to make their talks as general as possible and to historically review the current status of understanding in their particular specialty. We would like to make this anniversary an occasion to take stock of the past decade.

NOZ/1:1 memorabilia will also be shown. The symposium will be open to everyone, although we expect that it will draw mainly from the Boulder community (since it is only one day long).

We are writing to request your participation in the symposium as an invited speaker in your area of specialty. We anticipate that each invited talk will last approximately 30 minutes. The preliminary list of invited speakers (not confirmed, but this is just to give you an idea of scope) is:

- Jerry Deshler: Particles
- Maggie Tolbert/David Hanson: What are PSCs and what do they do chemically?
- Holger Voemel: How wet is it?
- Ryan Sanders: UV/Vis spectroscopy
- Bob de Zafra: Cl<
- Geoff Toon or Barney l'Armer: IR spectroscopy
- Adrian Tuck: IR-2 observations
- John Gill: UARS observations
- nob Portmann/XX Tie: Theoretical modelling of Antarctic ozone depletion and its variability

Please let Susan Solomon know if you are willing to present an invited talk on August 22 at NCAR. You can contact her via e-mail at solomon@al.noaa.gov; phone at 303-497-1456 and fax at 303-497-1415.

Thank you for your interest. We hope to see you in August.

Susan Solomon and Dave Hofmann
The JPL MkIV Interferometer

Instrument.
High resolution Fourier Transform Infra-Red spectrometer, designed to remotely sense the atmospheric composition (very similar to ATMOS).
Weight = 400kg, Size = 1.5 x 1.0 x 1.0 m, Power == 300 W.

Deployment History.
Ground-based observations from McMurdo, Antarctica, in 1986.
7 high altitude (36-40 km) balloon flights since 1989.

Observation Mode.
Operates in solar absorption mode (using direct sunlight).
Vertical profiles during sunset, sunrise, and balloon ascent & descent.
Entire 650-5700 cm⁻¹ spectral region is observed simultaneously.

Gases Measured.
Over 30 different gases have identifiable spectral signatures:
1-120, C02, 03, N2O, CO, CH4, N2, 02, NO, N02, HN03, HN04, N205,
1-1202, CINO3, HOCl, HF, SF6, COI², Cl²4, CIH3Cl, CIH2CI2,
CI²Cl3, Cl₂2CI2, CCl4, OCS, S02, HCN, C2H2, C2H6 and many isotopes.
Temperature, Pressure, and aerosol extinction can also be determined.

Advantages.
Dual detectors provide broad, simultaneous spectral coverage.
This provides highly accurate vmr profiles:
- Access to N2 and CO2 lines defines observation geometry
- Access to T-sensitive CO2 lines defines atmospheric T & P
Simultaneity of different gases provides more stringent model comparisons.

Objectives.
Test computer models of atmospheric transport and chemistry.
Perform correlative measurements for other experiments (e.g. 1-JARS).
Monitor the atmospheric composition (early detection of changes).
## JPL MkIV Interferometer

### Deployment History:

<table>
<thead>
<tr>
<th>Date</th>
<th>Location/Activity</th>
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<tbody>
<tr>
<td>April 1985</td>
<td>JPL First ground-based spectra</td>
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<tr>
<td>Sep.-Oct. 1986</td>
<td>McMurdo, Antarctica Ground-Based Measurement Campaign</td>
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<td>Sep.-Oct. 1987</td>
<td>Punta Arenas, Chile Antarctic Aircraft Campaign (DC-8)</td>
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<tr>
<td>Jan.-Feb. 1989</td>
<td>Stavanger, Norway Arctic Aircraft Campaign (DC-8)</td>
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<td>Oct. 1989</td>
<td>Ft. Sumner, New Mexico Balloon Flight</td>
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<td>Sep. 1990</td>
<td>Ft. Sumner, New Mexico Balloon Flight</td>
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<tr>
<td>May 1991</td>
<td>Ft. Sumner, New Mexico Balloon Flight</td>
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<tr>
<td>Jan.-Mar. 1992</td>
<td>Alaska/Norway/Maine Second Arctic Aircraft Campaign (DC-8)</td>
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<tr>
<td>May-Jun. 1992</td>
<td>Ft. Sumner, New Mexico UARS Correlative Balloon Flight (Postponed)</td>
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<tr>
<td>Sep. 1992</td>
<td>Ft. Sumner, New Mexico UARS Correlative Balloon Flight</td>
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<tr>
<td>Jan. -Apr. 1993</td>
<td>Daggett, California UARS Correlative Balloon Flight</td>
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<tr>
<td>Sep. 1993</td>
<td>Ft. Sumner, New Mexico l-JARS Correlative Balloon Flight</td>
</tr>
<tr>
<td>May 1994</td>
<td>Ft. Sumner, New Mexico</td>
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*Note: Better to fly from balloons if you can get data.*
Solar Absorption Spectroscopy

Advantages over Thermal Emission:

1. Sun is very bright and stable
   - high signal-to-noise ratio
   - broad wavelength coverage
   - room temperature optical components

2. Spectra are self-calibrating (no time wasted looking at calibration targets)
   - zero level determined from opaque spectral regions
   - full scale determined from transparent spectral regions (windows)

3. Known observation Geometry (you know where you are looking)
   - solar ephemeris is very accurately known
     - knowledge of platform attitude not necessary (active tracking)

4. Spectral Features are less temperature sensitive

5. Spectral features are less dependent of assumption of LTE

6. Useful spectra can be obtained from the ground

Disadvantages:

1. No data at night (only 32 profiles per day from orbit)

2. Vertical profiles only at sunrise/set or during ascent/descent

3. Solar absorption confuse spectral fitting

4. High photon fluxes can cause detector non-linearity

5. Diurnal variations cause ambiguity in retrieved profiles
MkIV: Organic chlorine
September 25, 1993

- F-12 * 2
- F-11 * 3
- F-113 * 3
- CH₃Cl
- CCl₄ * 4
- F-22

![Graph showing altitude vs. volume mixing ratio for different compounds.](image-url)
MkIV: Inorganic Chlorine
September 25, 1993

- HCl
- ClNO$_3$
- HOCl
- MkIV Cl

\[ \text{MkIV CCl}_2 \]

- MkIV Cl\(_2\) (CFC-11)

\[ \text{MkIV Clt} \]

\[ \text{Clt (SF}_6) \]

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\[ \text{Jøgge et al. 1996} \]