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 commemoi alien of that event, we are planning a one-day mini-s ymposium.

The symposium will be held in the main seminal room at NCAR in Boulder and will focus on a serials of invite.d scientific talks reflecting upon the progress of scientific understanding of Antarctic ozone depletion. 'Jhe emphasis will be on ground-based observations, but we also hope to summarize aircraft, laboratory, satell itc, 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 speciality: we would like to make this anniversary an occasion to take stock of the past decade.

NOZE-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 speciality. We anticipate that each invited talk will last approximately 30 minute.s. 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 Farmer: IR spectroscopy
Adrian Tuck: ER-2 observations
John Gille: 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.
NASA DC-8 aircraft polar campaigns in 1987, 1989 and 1992.
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:
H_2O, CO_2, O_3, N_2O, CO, CH_4, N_2, O_2, NO, NO_2, HNO_3, HNO_4, N_2O_5, H_2O_2, $ClNO_3$, HOCl, HCl, HF, SF_6, COF_2, CF_4, CH_3Cl, $CHFCl_2$, $CFCl_3$, CF_2Cl_2, CCl_4, OCS, SO_2, HCN, C_2H_2, C_2H_6 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 N_2 and CO_2 lines defines observation geometry
- Access to T-sensitive CO_2 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. UARS).
Monitor the atmospheric composition (early detection of changes).

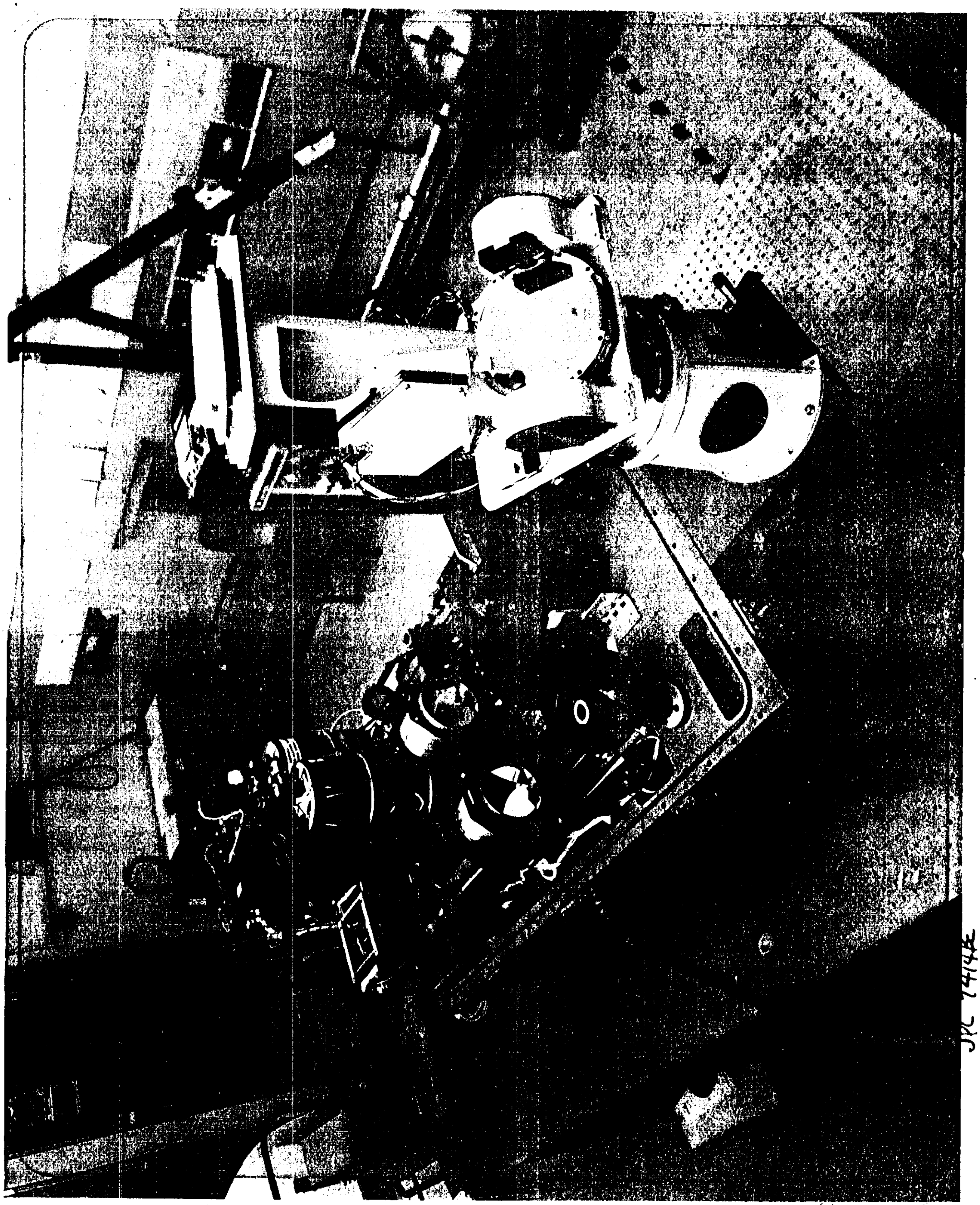
7 of

JPL MkIV Interferometer

Deployment History:

April 1985	JPL First ground-based spectra
Sep.-Oct. 1986	McMurdo, Antarctica Ground-Based Measurement Campaign
Sep.-Oct. 1987	Punta Arenas, Chile Antarctic Aircraft Campaign (DC-8)
Jan.-Feb. 1989	Stavanger, Norway Arctic Aircraft Campaign (DC-8)
Oct. 1989	Ft. Sumner, New Mexico Balloon Flight
Sep. 1990	Ft. Sumner, New Mexico Balloon Flight
May 1991	Ft. Sumner, New Mexico Balloon Flight
Jan.-Mar. 1992	Alaska/Norway/Maine Second Arctic Aircraft Camapaign (DC-8)
May-Jun. 1992	Ft. Sumner, New Mexico UARS Correlative Balloon Flight (Postponed)
Sep. 1992	Ft. Sumner, New Mexico UARS Correlative Balloon Flight
Jan. -Apr. 1993	Daggett, California UARS Correlative Balloon Flight
Sep. 1993	Ft. Sumner, New Mexico UARS Correlative Balloon Flight
May 1994	Ft. Sumner, New Mexico

~~why bother to fly from balloons if you can get data~~



JPL 7414E

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 arc less dependent of assumption of LTE

6. Useful spectra can be obtained from the ground

Disadvantages:

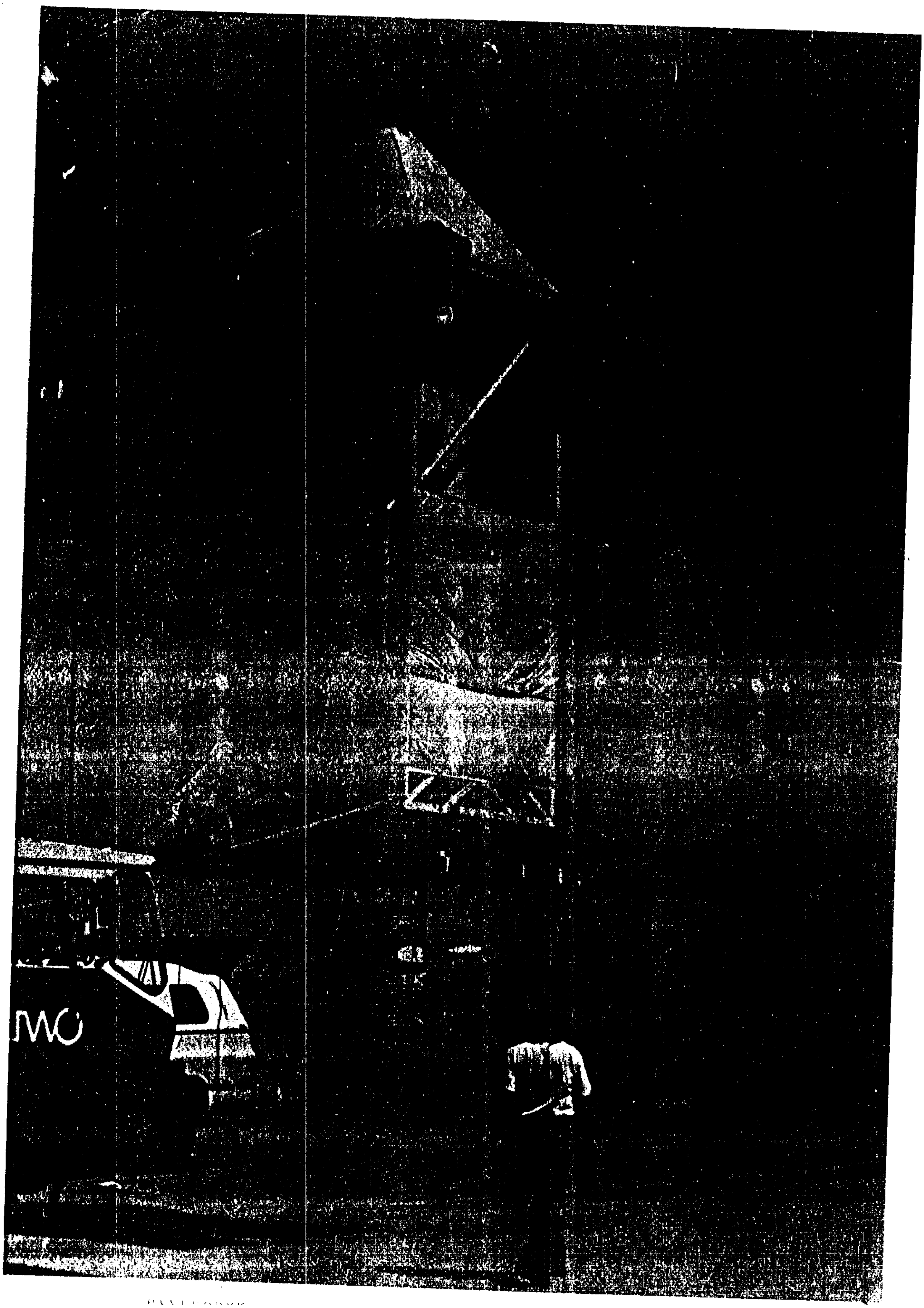
1. No data at night (only 32 profiles per day from orbit)
   (2 or 3 " " " " balloon)

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

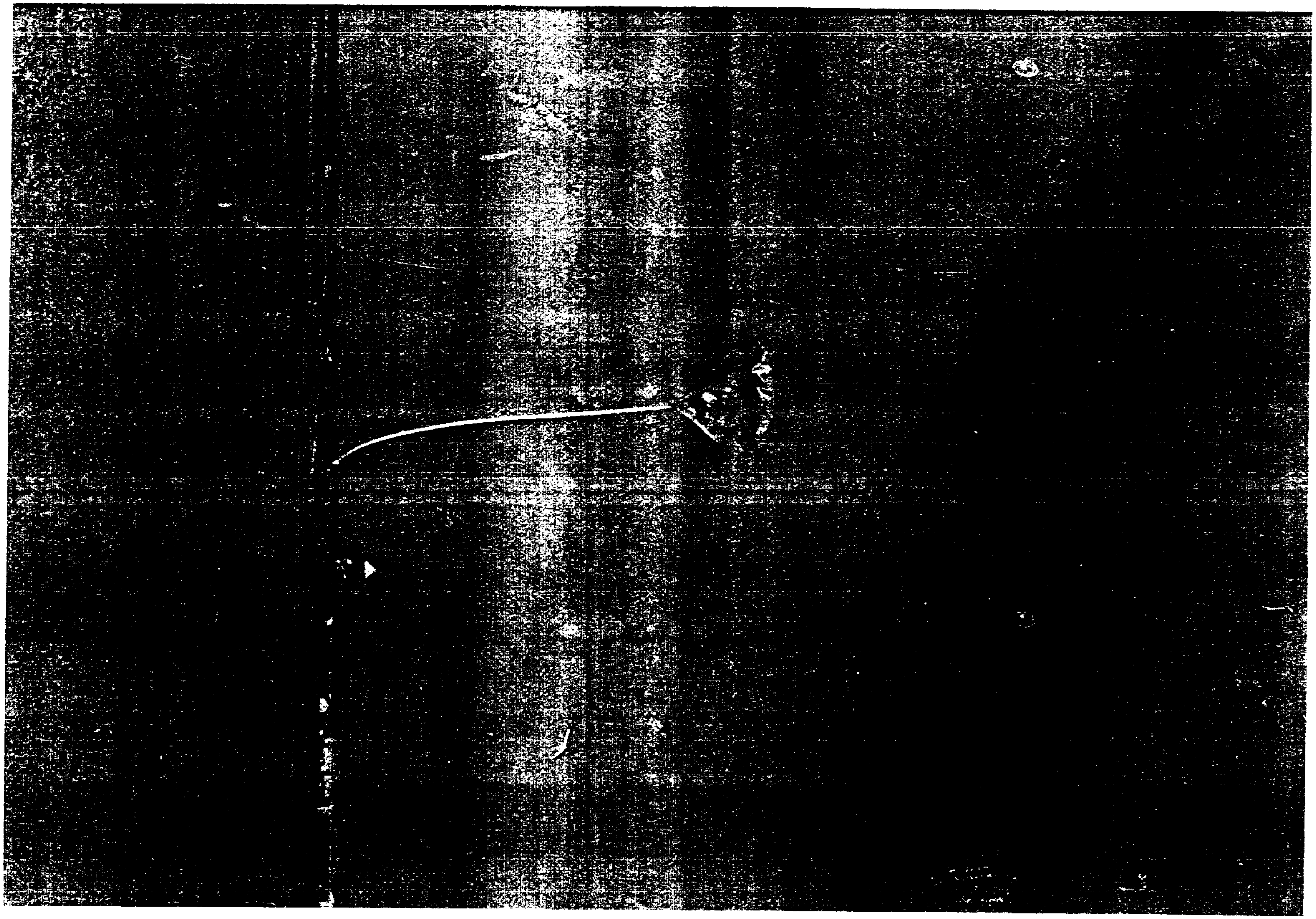
3. Solar absorption confuse spectral fitting

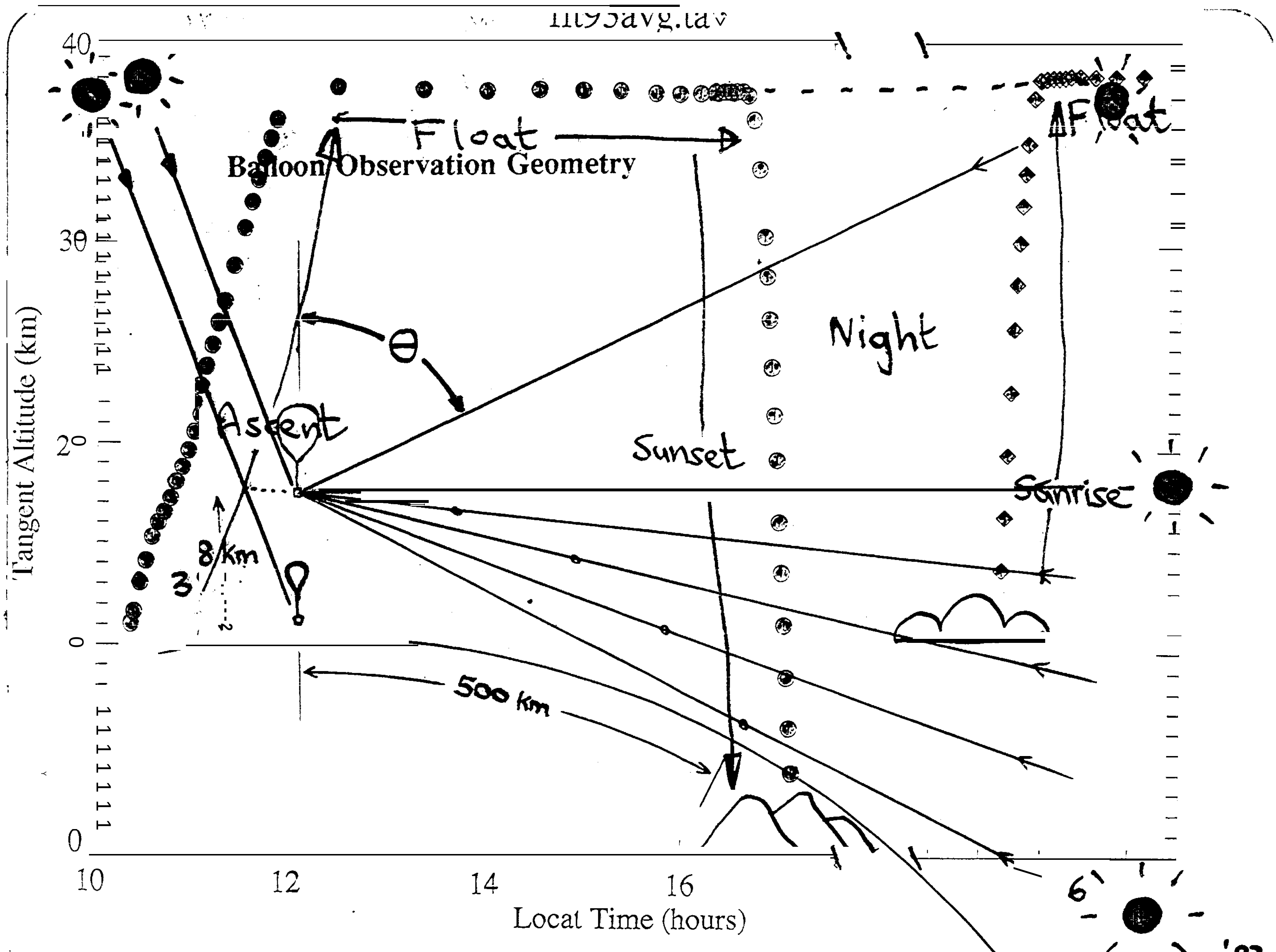
4; High photon fluxes can cause detector non-linearity

5. Diurnal variations cause ambiguity in retrieved profiles

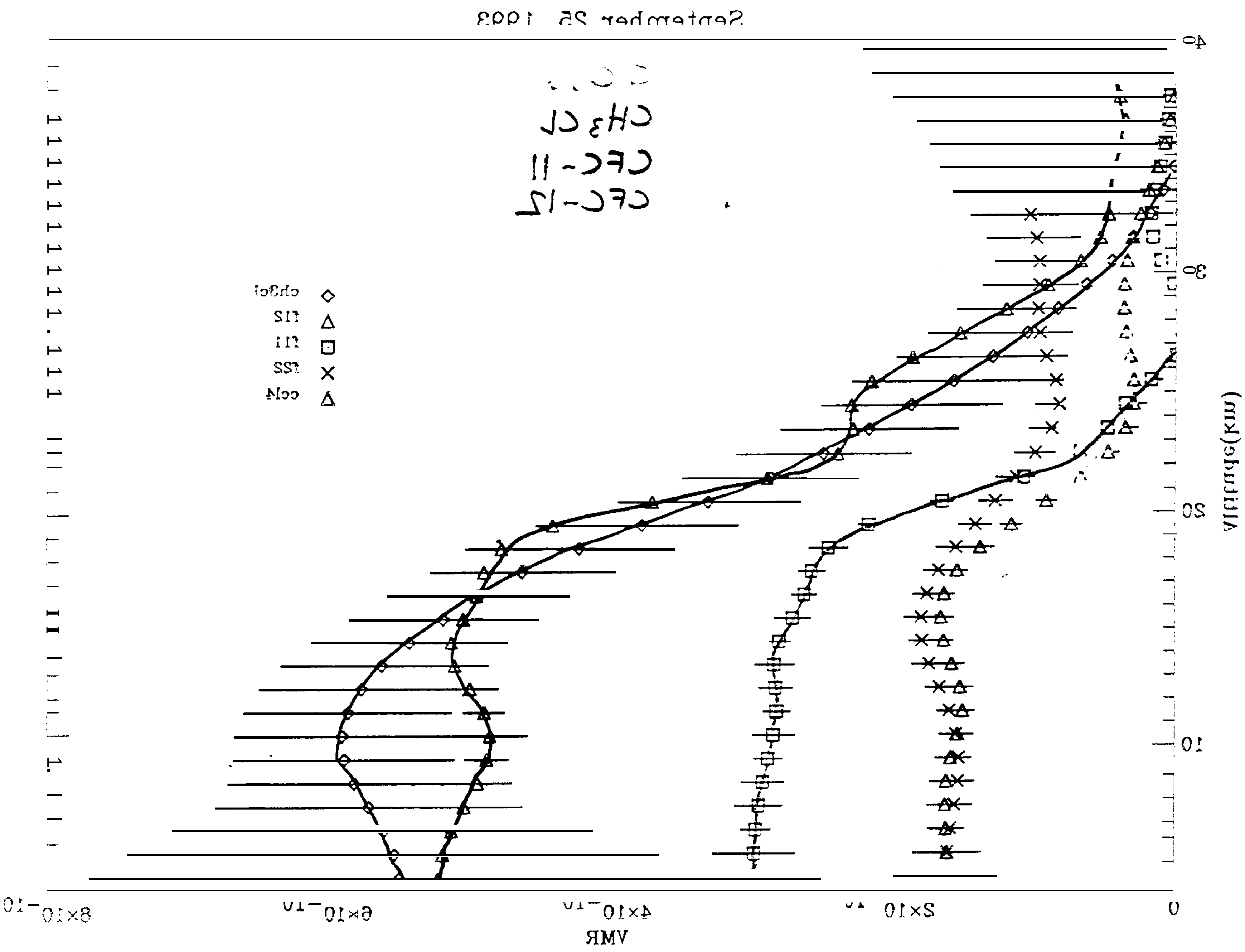


S-43038G

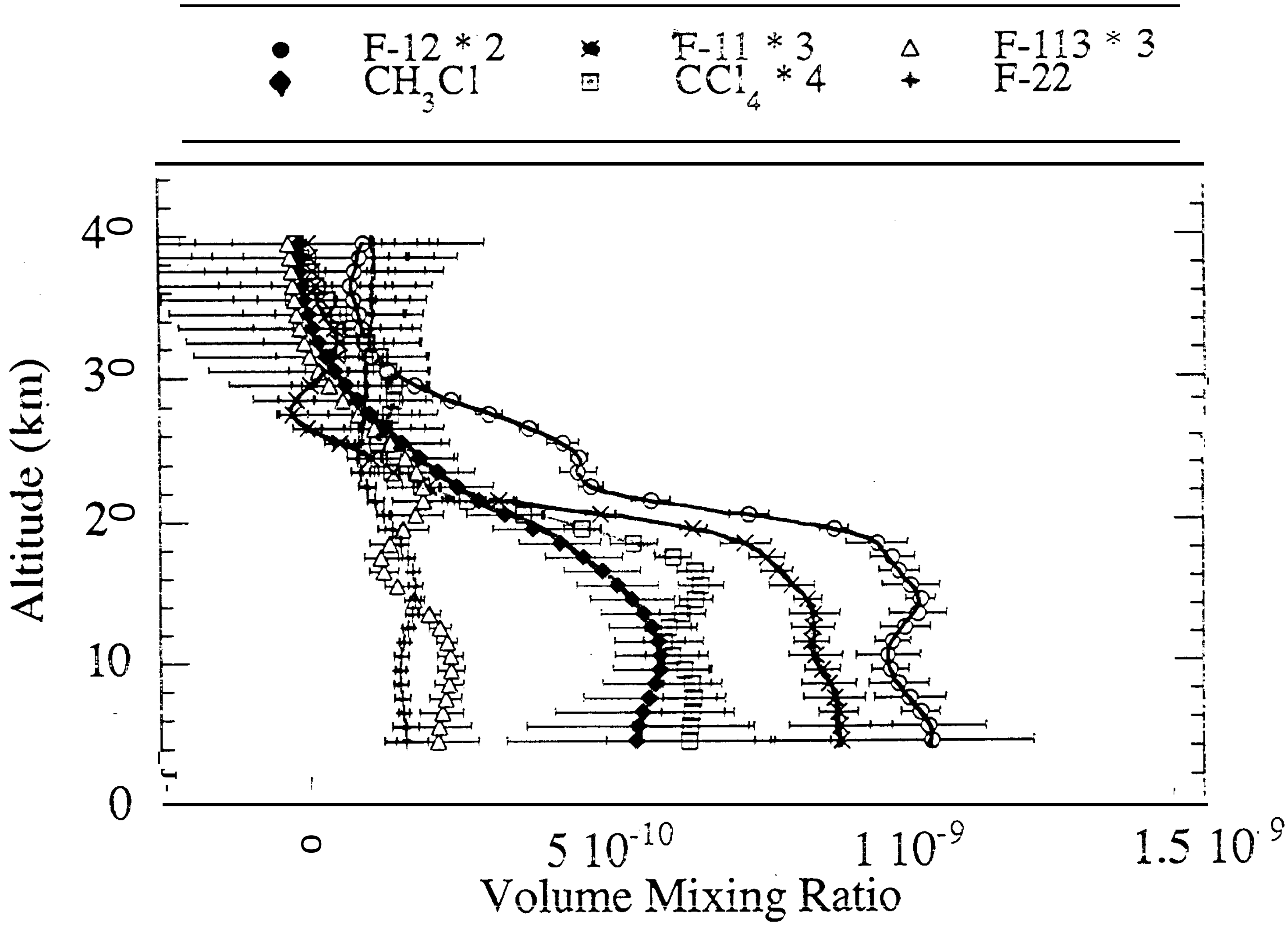




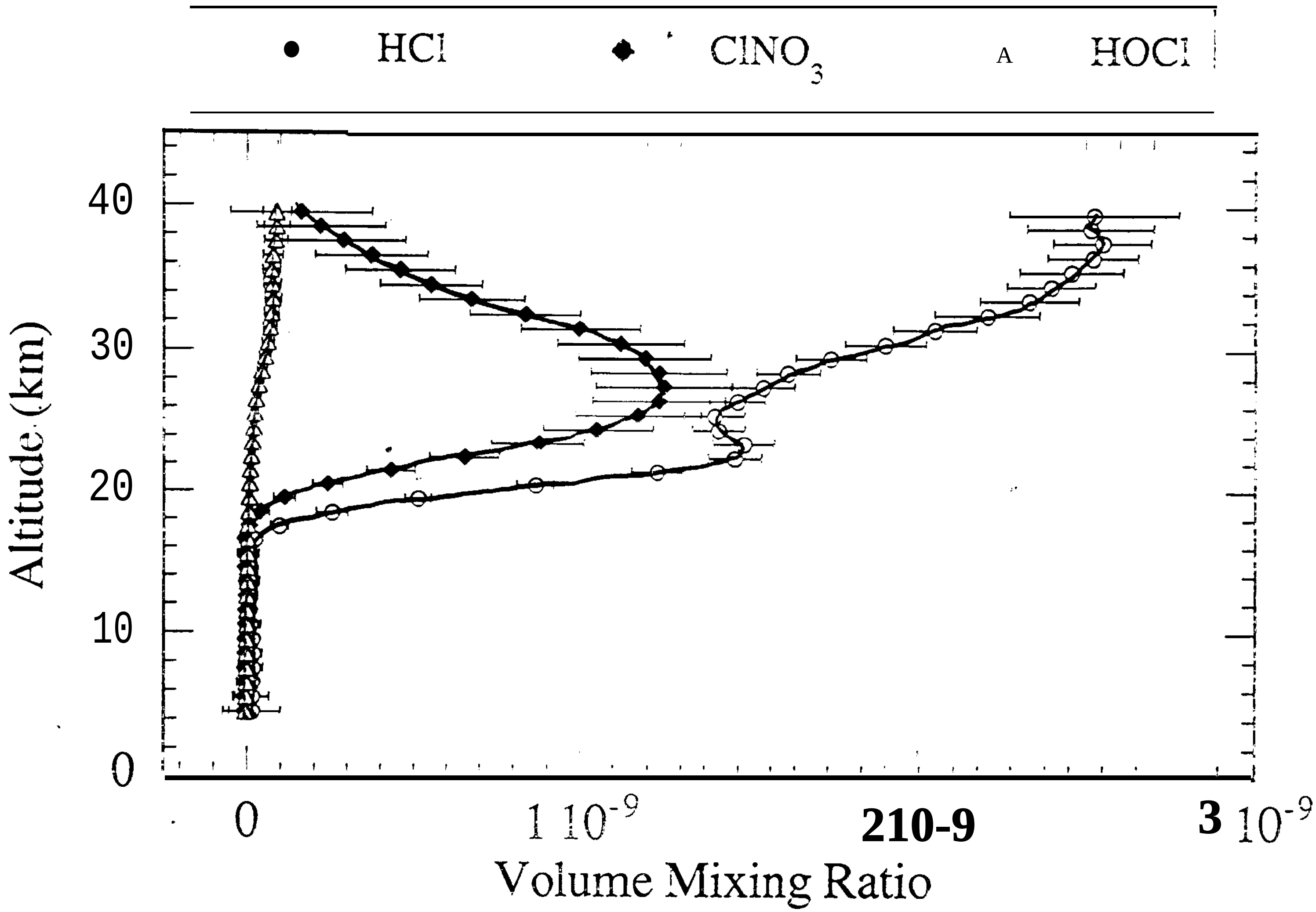
Typical Balloon Flight Profile (25/26 Sep '93)

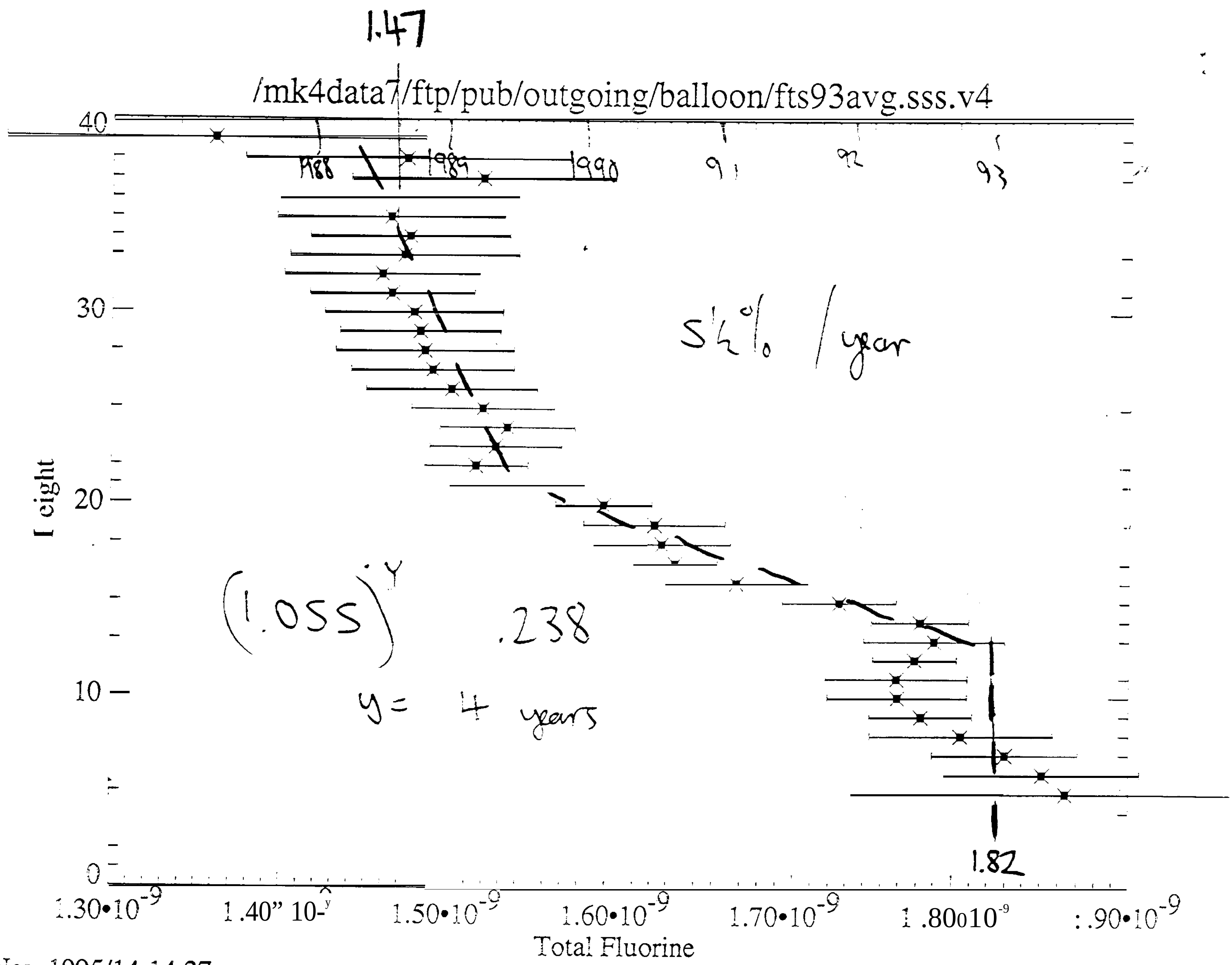

September 25 1993
CH3 CL
CFC-11
CFC-12
ch3cl
f12
f11
f22
ccl4
VMR
Altitude(km)
0
2×10
4×10^-10
6×10^-10
8×10^-10
10
20
30
40

MkIV : Organic chlorine
September 25, 1993

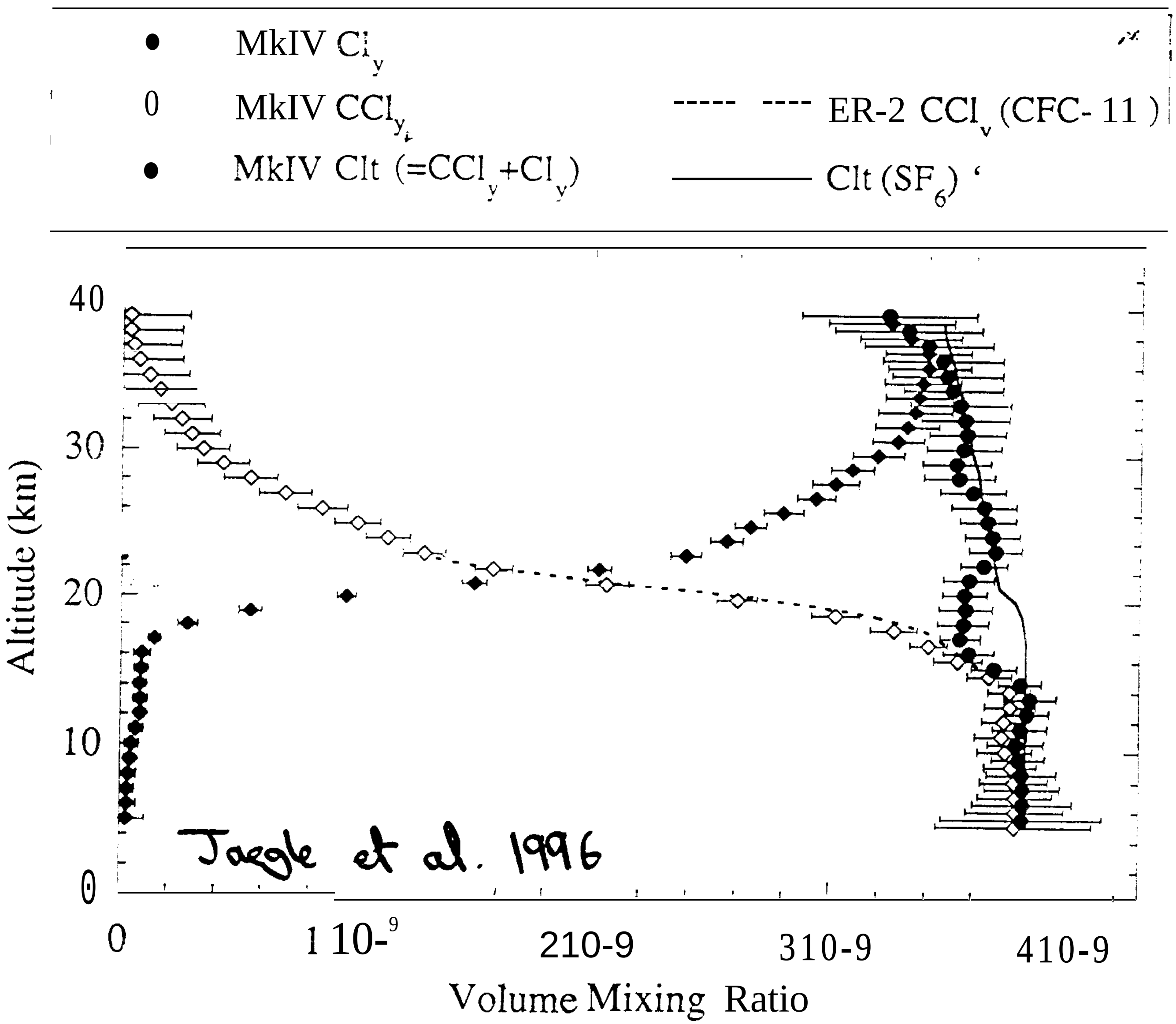


MkIV: Inorganic Chlorine
‘ September 25, 1993





8-Nov-1995/14:14:27



MkIV Cl_y
MkIV CCl_y
MkIV Clt (=CCl_y+Cl_y)
ER-2 CCl_y (CFC-11)
Clt (SF_6)
Altitude (km)
40
30
20
10
0
0
1 10-9
210-9
310-9
410-9
Volume Mixing Ratio
Jaeglé et al. 1996