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Ad Hoc Working Group of Legal and Technical
Experts for the preparation of a
Protocol on Chlorofluorocarbons to
the Vienna Convention for the
Protection of the Ozone Layer (Vienna Group)

Third Session
Geneva 27-30 April 1987

AD HOC SCIENTIFIC MEETING TO COMPARE MODEL GENERATED ASSESSMENTS OF OZONE LAYER CHANGE FOR VARIOUS STRATEGIES FOR CFC CONTROL

WURZBURG, FEDERAL REPUBLIC OF GERMANY
9-10 APRIL 1987

In accordance with th experts request that additional scenarios should be subjected to model analysis (see Section 7 'Changes on Ozone' profile in document UNEP/WG.167/Inf.1), six scenarios were considered:

(a) 1.5% per year growth in all Fully Halogenated Halocarbons (CCOL considered only 11 + 12) (Base 1985)

(b) As (a) but 3.0% per year

(c) Freeze 11, 12, 113 allow 3% per year growth in Halons

(d) Freeze 11, 12, allow 3% per year growth in 113 and Halons

(e) Freeze all fully halogenated compounds in developed world - allow 3% per year growth in developing world assuming that in 1985 developing countries used 25% of total

(f) Same as (e) but assume developing countries only used 10% of total in 1985

The above were analysed using the Lawrence Livermore National Laboratory (LLNL) parameterized model. In addition to these six cases which specify the application of CFC restrictions beginning in 1990, six further cases, identical to those above except that CFC restrictions are assumed to begin in 1985, were also analysed.

For all the above calculations the following assumptions for trace gas emissions were made:

CO_2 NAS 50th precentile

CH_4 0.017 ppm/yr

N_2O 0.2%.yr

The results for the six cases (a) to (f) with CFC restrictions beginning in 1985 can be found in figure 8, and for the six cases (a) to (f) with CFC restrictions beginning in 1990 in figure 9,

Figure 10 presents calculated ozone depletions for changes in CFC 11 and 12 only. CASE A shows the calculated change in ozone column with time for CFC flux continuing at 1980 levels. CH_4 is considered to increase by 1% per year, N_2O by 0.25% per year and CO_2 increases according to the DOE scenario. CASE B is for CFC 11 and 12 emissions beginning at the 1980 rate and increasing at 1.5% per year. CASE C assumes CFC 11 and 12 emissions increase at 3% per year. Other trace gases change as for CASE A. This graph is extracted from the report of the Eight Session of the Co-ordinating Committee on the Ozone Layer (UNEP/CCOL/VIII) of 28 February 1986 and is based on the LLNL 1-D model with temperature feedback.

Several conclusions may be drawn from an examination of the three graphs:

1. The effect of the ozone depleting substances other than CFC 11 and 12 is calculated to significantly enhance ozone depletion estimated to be caused by CFCs 11 and 12 alone.

2. A total freeze on CFC 11 and 12 will have a significant impact on calculated ozone change even though other halocarbons are allowed to grow at 3%. The rate and extent of future ozone depletion depends on when the freeze is applied.

3. A freeze in the emission of all fully halogenatd compounds in the developed world will have significant impact on calculated ozone changes. Future ozone depletion depends strongly on the assumed level of current emissions from developing countries when a 3% year halocarbon growth rate in these countries is assumed.

Fig. 8

LTA O_3

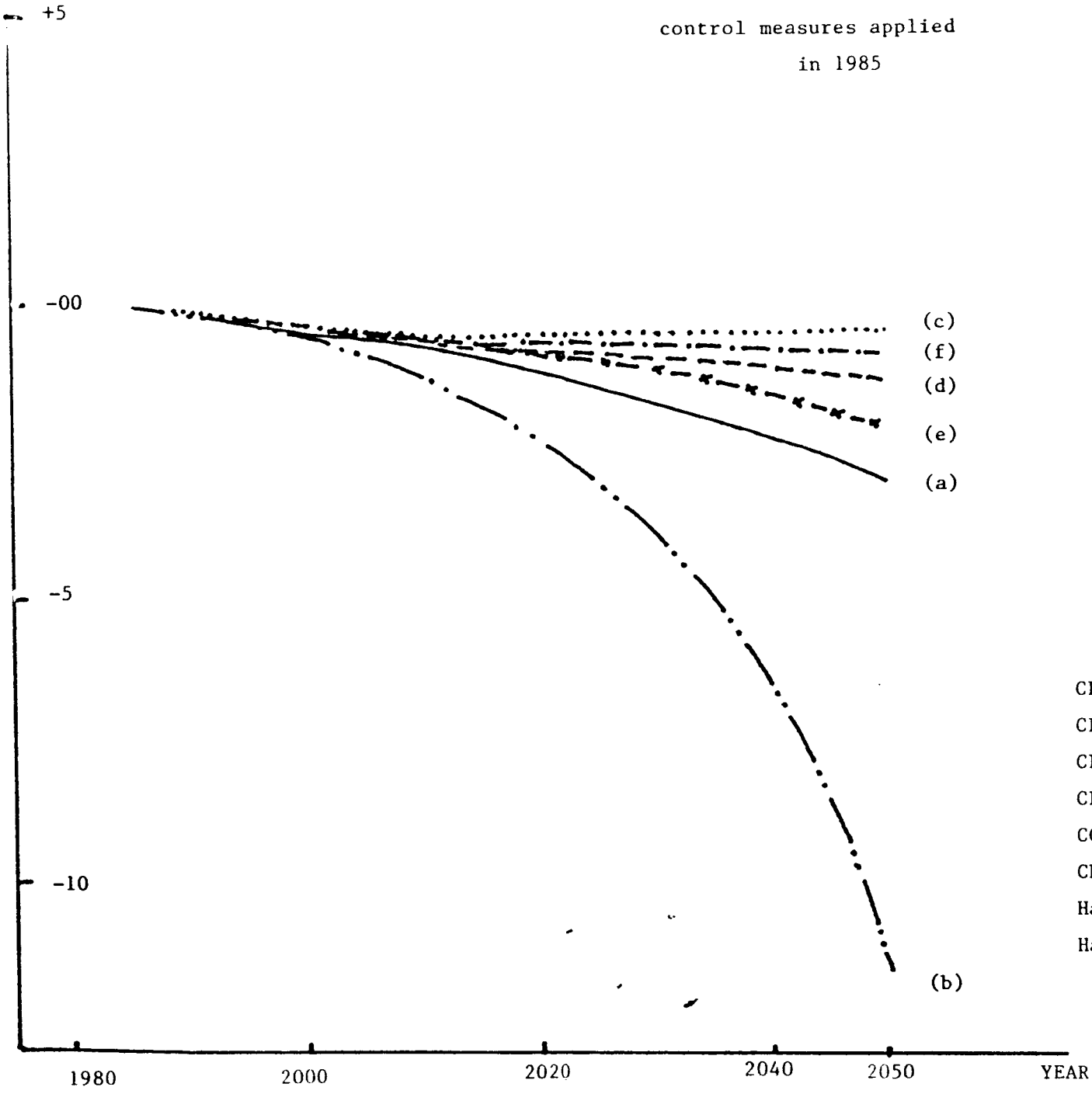
LINEAR METHANE GROWTH

DELTA O_3

CASES a, b, c, d, e, f

control measures applied

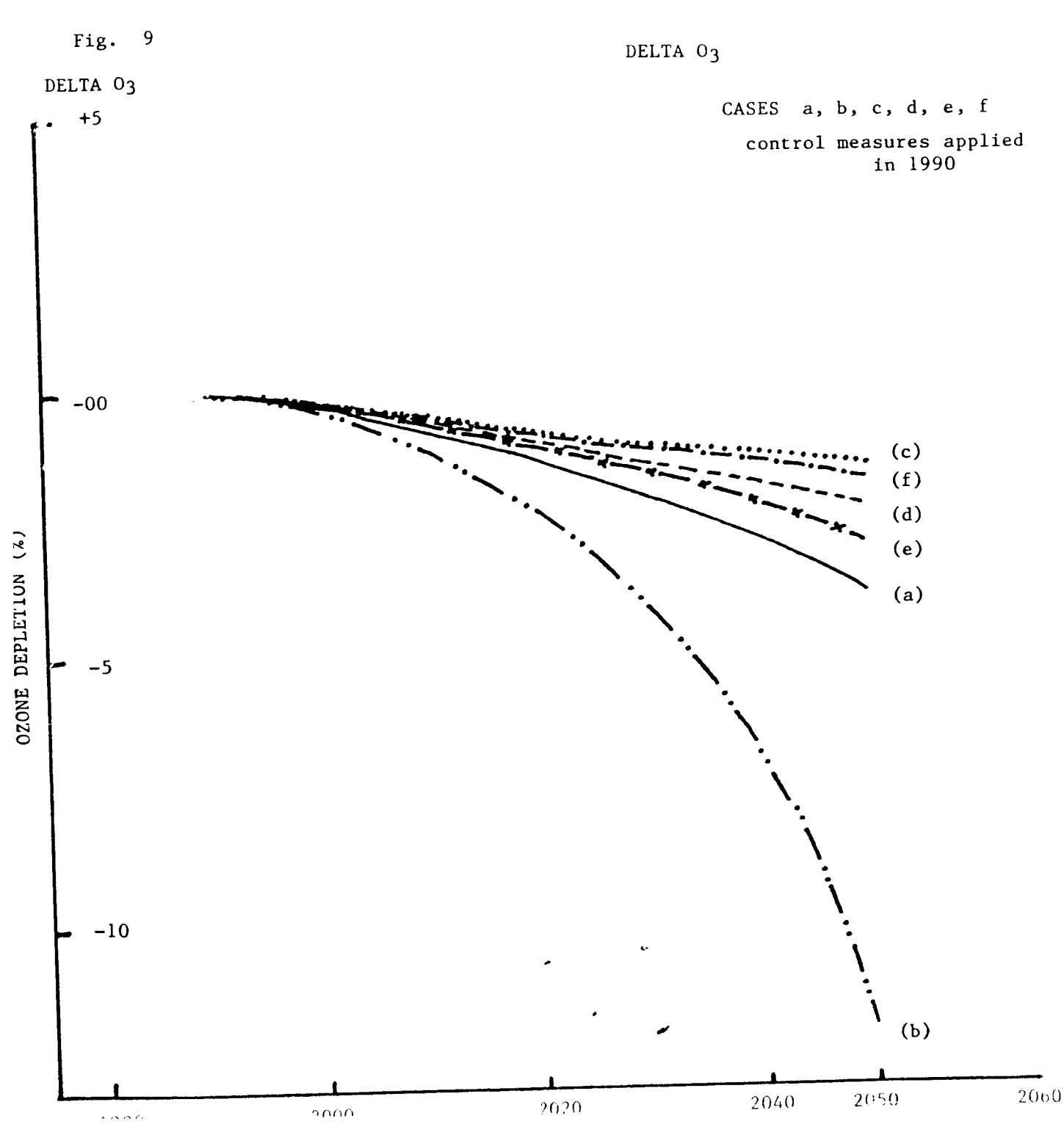
in 1985



	1985 EMISSIONS 10^6 kg/yr
CFC-11	298.0
CFC-12	438.0
CFC-22	81.2
CFC-113	138.5
CCl_4	71.2
CH_3CCl_3	499.5
Halon-1211	2.6
Halon-1301	2.6

Fig. 9

DELTA O_3



1990 EMISSIONS

10^6 kg/yr

CFC-11	343.4
CFC-12	504.5
CFC-22	117.6
CFC-113	166.5
CCl_4	80.5
CH3 CCl_3	564.8
Halon 1211	4.5
Halon 1301	4.5

Fig. 10

DELTA O_3 CFC 11 and 12 ONLY