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OUTLINE OF OBSERVATIONS AND STUDIES RELATED TO THE OZONE LAYER

Submitted by

The Meteorological Agency

Japan

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JAPAN

Outline of Observations and Studies Related to the Ozone Layer by the Meteorological Agency

I. Summary of Observations

(1) Observations of the total amount of ozone (Fig. 1)

(2) Unkehr observations (Fig. 2)

(3) Ozone sonde observations (Fig. 3)

II. Outline of the Studies Related to the Ozone Layer

(Terminated Studies)

Studies Related to estimation of Change in the Stratospheric Ozone

Monitoring of solar UV-B radiation (Fiscal 1982-1984)

(Muramatsu et al.1983,1984,1985)

1. A spectropyranometer to monitor the solar UV-B radiation(280-320 nm) was newly designed. The solar radiation collected by a fisheye lens is separated into spectral components by rotating optical filters and detected by a photodiode.

2. Solar radiation was monitored at Memanbetsu(43.9°N),Tsukuba(36.0°N) and Kanoya(31.4°N) for more than a year. Obtained data contain instantaneous spectral flux at 5-minute intervals and 10-minute integrated flux at wavelengths of 295,300,320,340,368 and 500 nm. Fig.3(a),(b),(c) show the examples of daily values of spectral flux of 300 nm at three stations in March and April. Fig.3(d) shows the example of variation of the spectral flux of 300 nm at Memanbetsu.

(under investigation)

Constituents in middle atmosphere (Fiscal 1982-1985)

3. Measurements of CFC-11,CFC-12 and N_2O from the ground surface to an altitude of 30 km, and of O_3 up to an altitude of 40 km are now under investigation.

4. The results up to the present are as follows:(Hirota et al., 1984a,b; Muramatsu et al., 1984; Chubachi,1984)

Mean tropospheric concentrations of CFC-11 and CFC-12 are increasing by about 5% per year(Fig.4). That of N_2O are almost constant within the exprimental uncertainty.

Annual variations of the vertical profiles of CFC-11, CFC-12 and N_2O in the stratosphere are not ascertained. Ozone amount above the altitude of 30 km at Tsukuba in winter season are increasing since 1982(Fig.5).

Intrusion of the stratospheric ozone into the troposphere (Fiscal 1982-1985)

5. The purpose of the research is to make clear the process of intrusion of stratospheric ozone into the troposphere and to estimate the transported amount of ozone from observations and the analysis of aerological data.

6. Following results have been obtained until now. (Muramatsu et al., 1984)

(1) Stratospheric air and ozone are transported dowmward in the frontal zone associated with polar front jet stream to the altitude of 3 km.

(2) For the diffusion of ozone transported from the stratosphere the turbulent motions with horizontal wavelengths of 5 to 20 km play an important role.

(3) The area that has highest probability of the intrusion is around Hokkaido and Sakhalin in Asia.

Measurement of hydroxyl radical in the troposphere (Fiscal 1982-1986)

7. Experiments to measure hydroxyl radicals in the atmosphere by laser technique are under investigation.

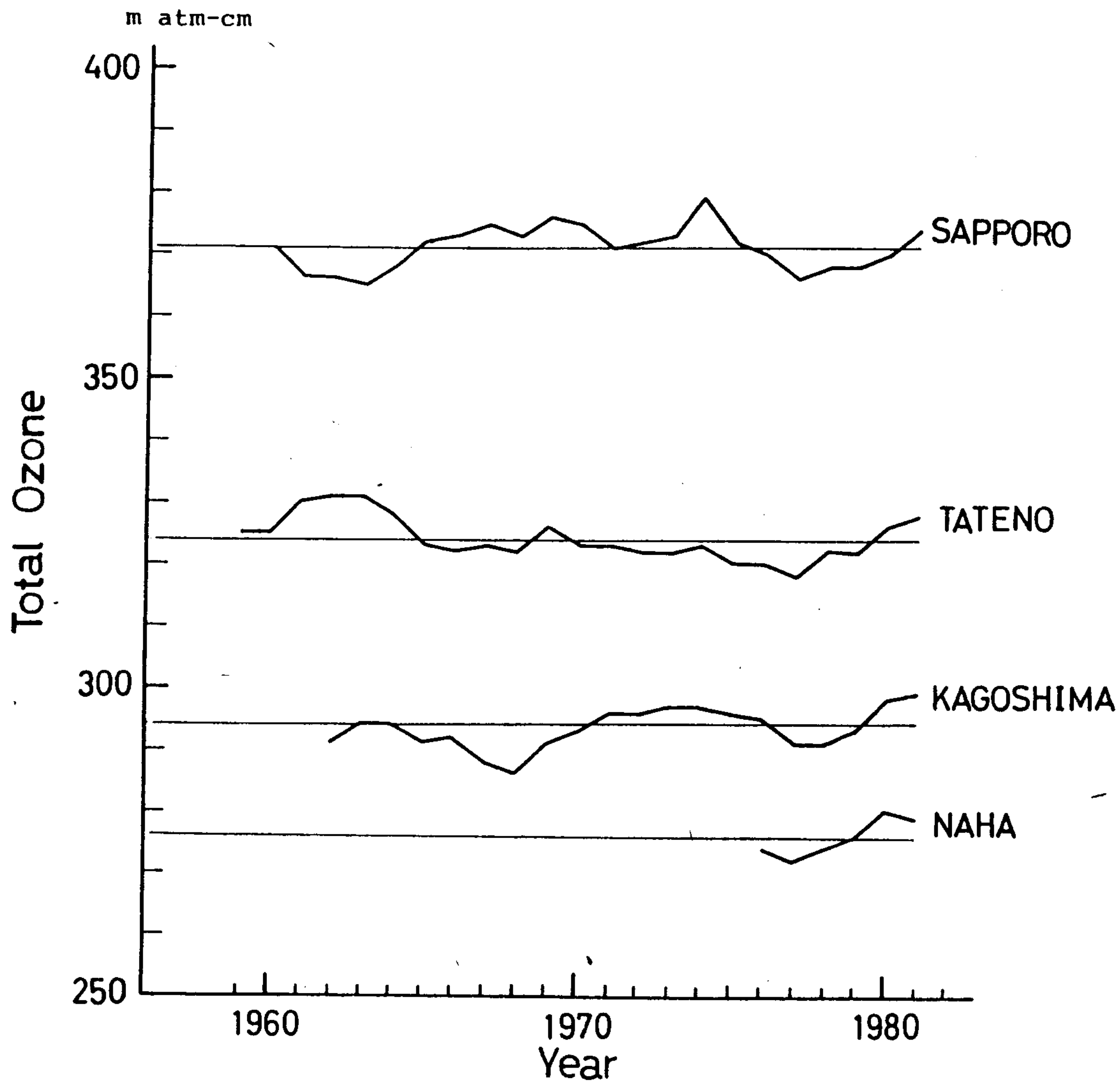

Fig. 1 (a) The year-to-year change of the total amount of ozone in Japan.

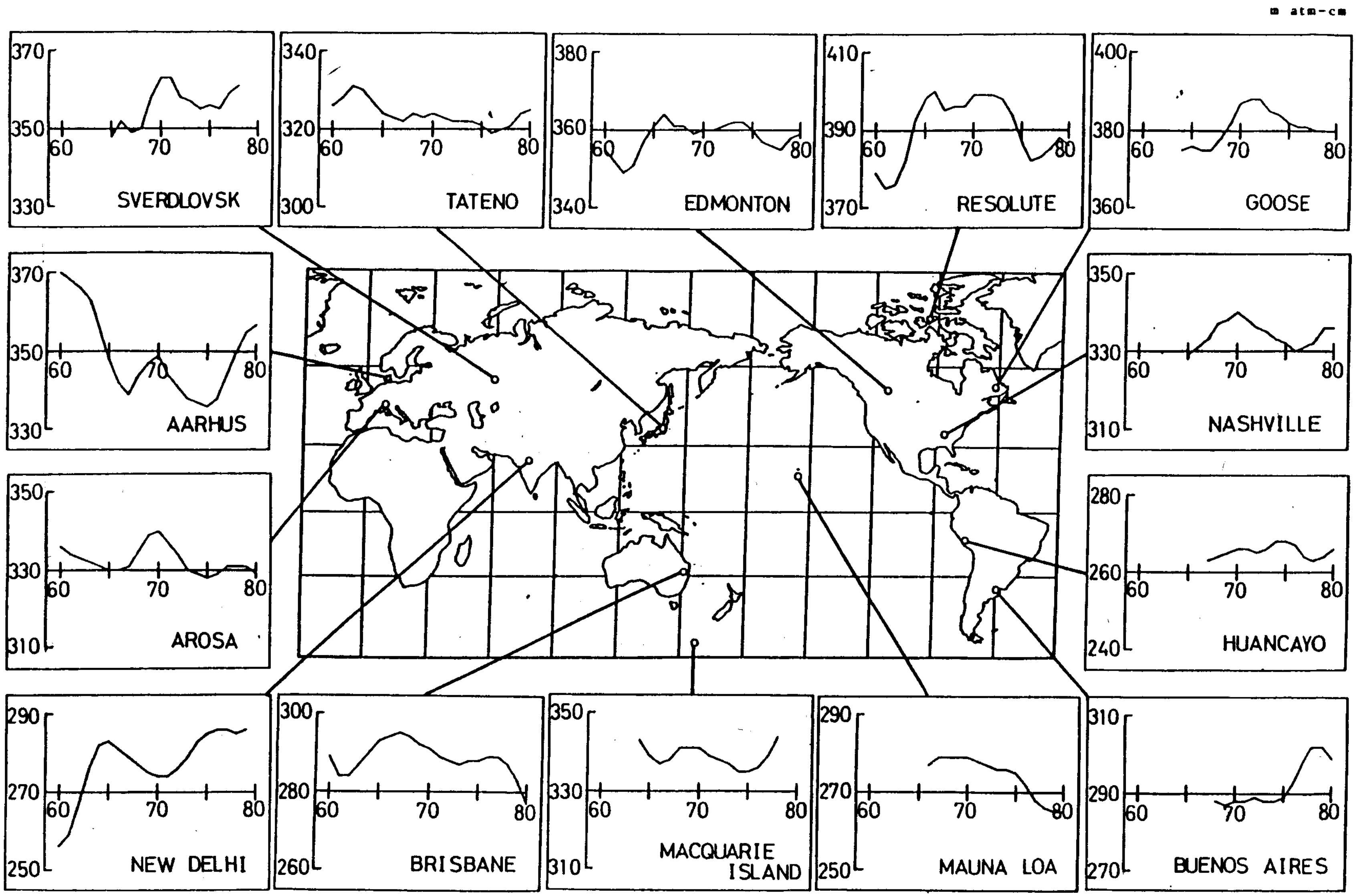

Fig. 1 (b) The year-to-year change of the total amount of ozone in the world.

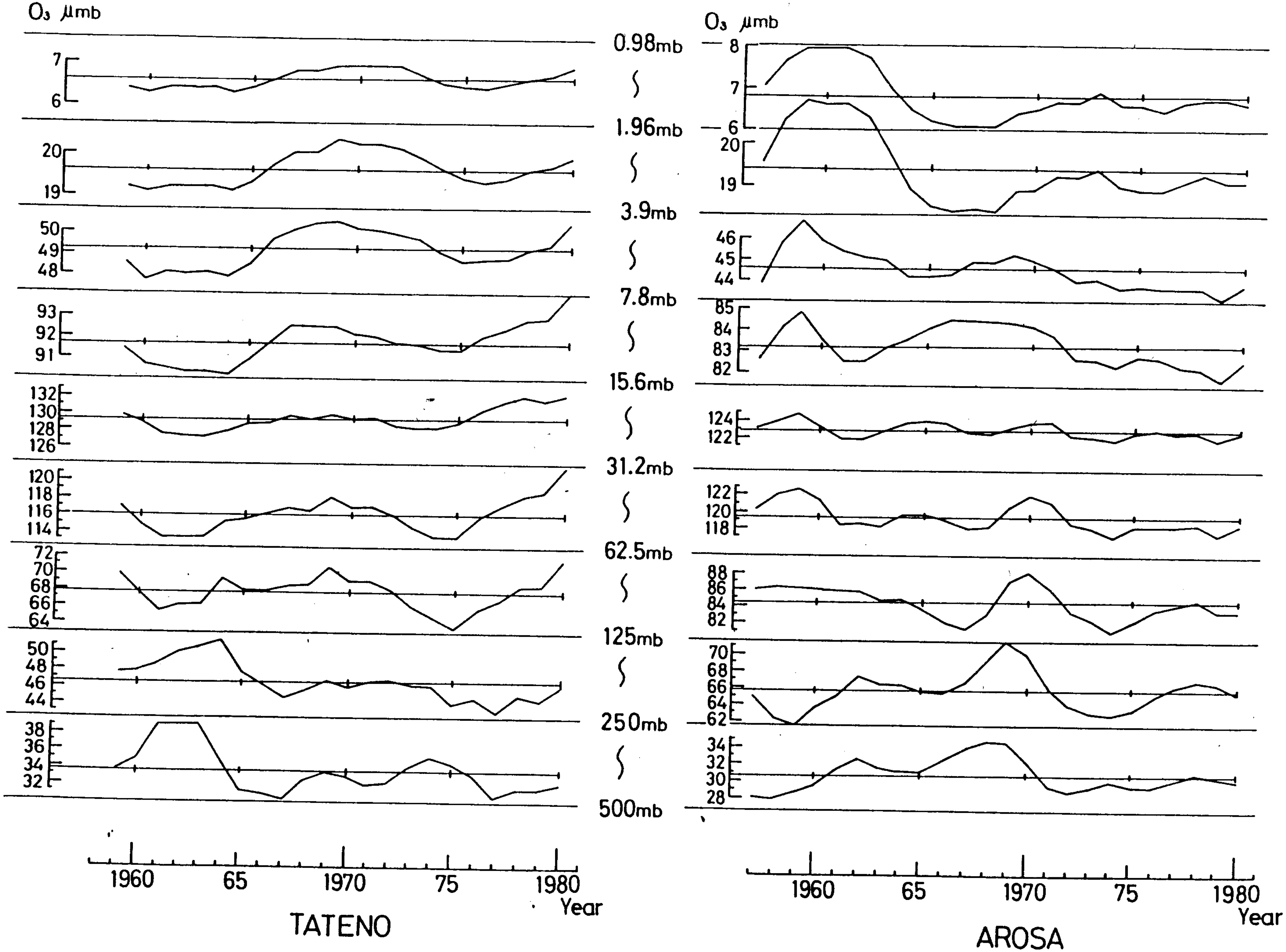

Fig. 2 The year-to-year change of the layer-mean ozone partial pressures.

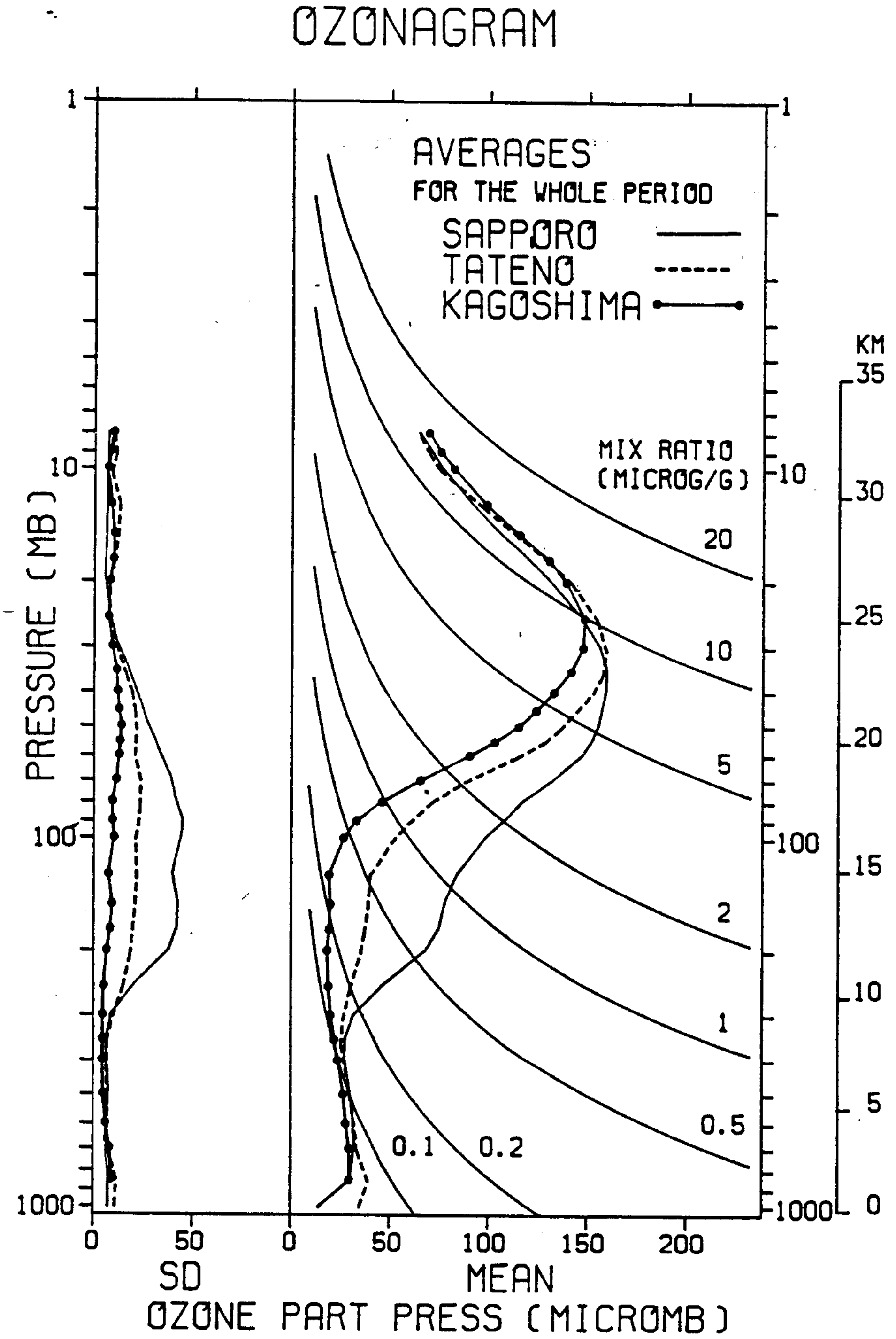

Fig. 3 Vertical distribution from averages for the whole period (1968-1980), computed from the monthly averages of ozonesonde observations.

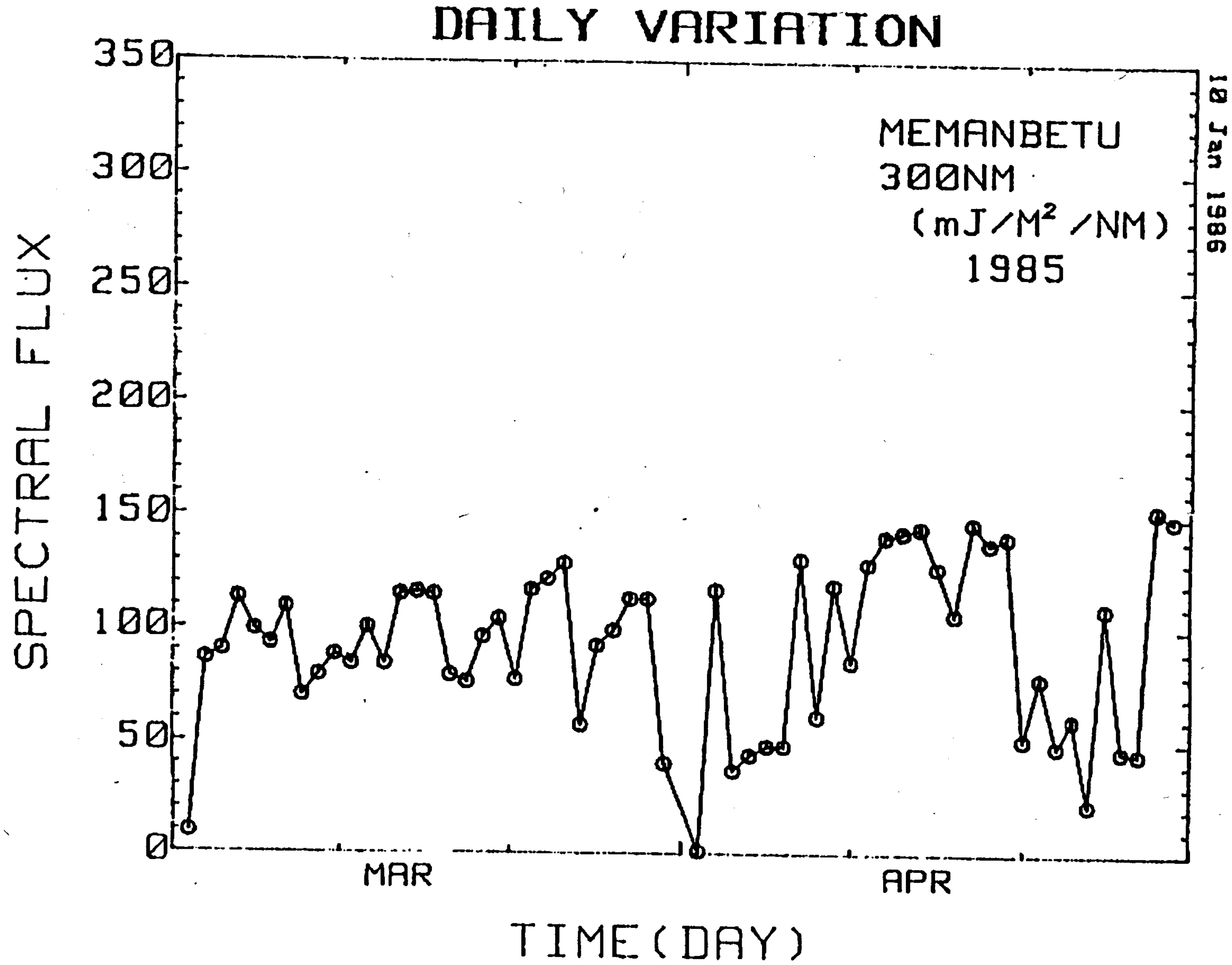

Fig. 4 (a) Daily variation of solar radiation at 300 nm at Memanbetsu (43. 9°N)

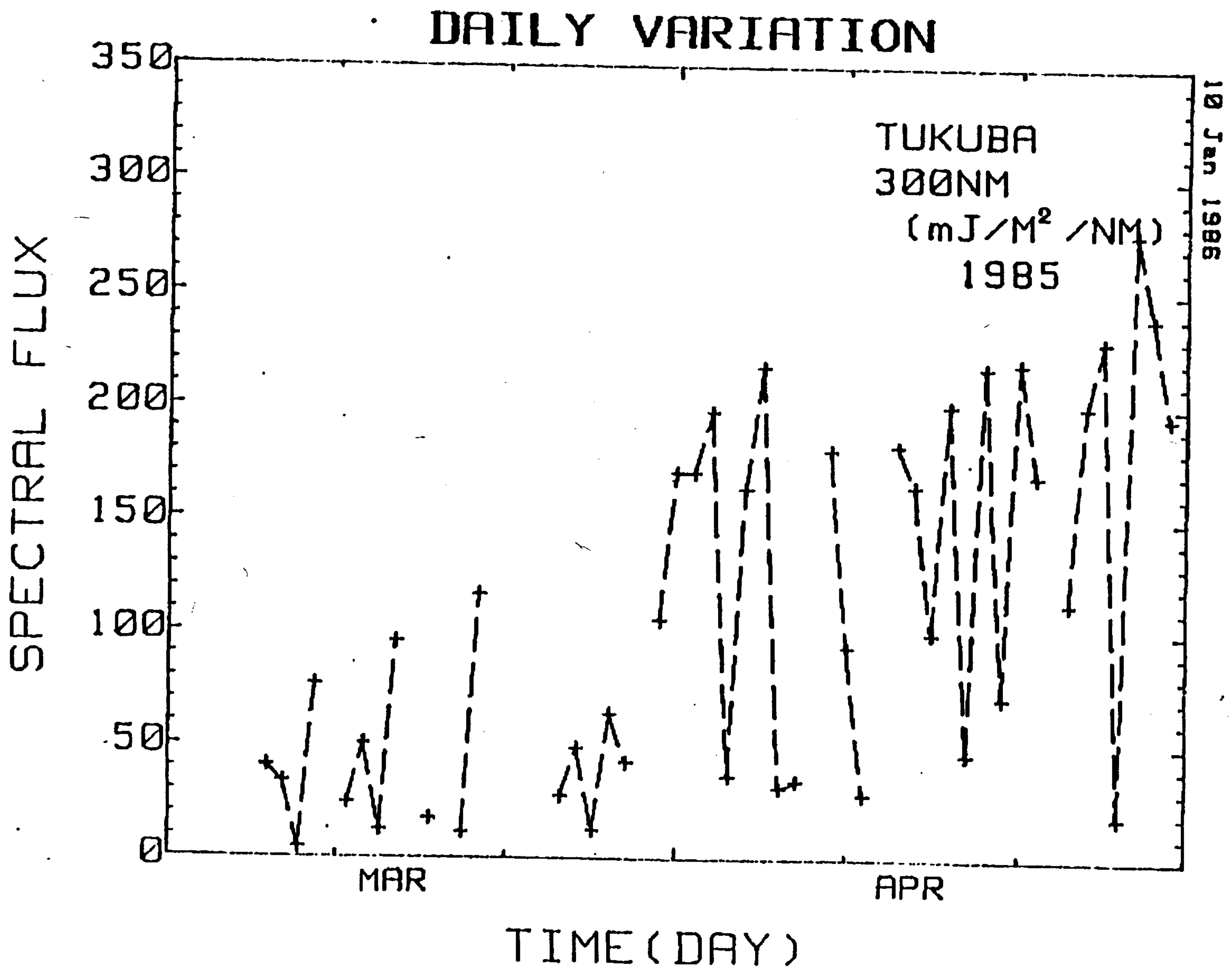

Fig. 4 (b) Daily variation of solar radiation at 300 nm at Tsukuba (36. 0°N)

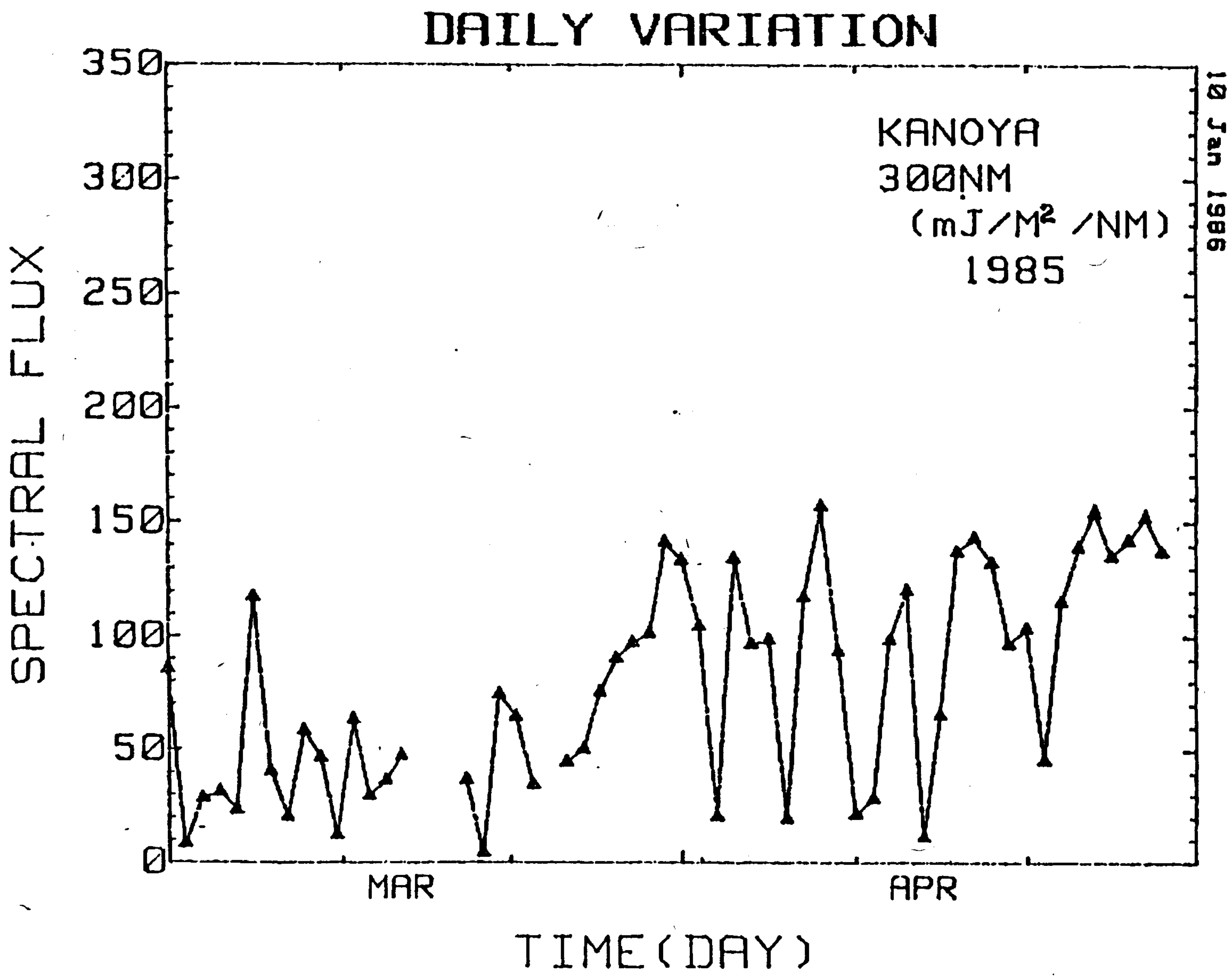

Fig 4 (c) Daily variation of solar radiation at 300 nm at Kanoya (31. 4°N)

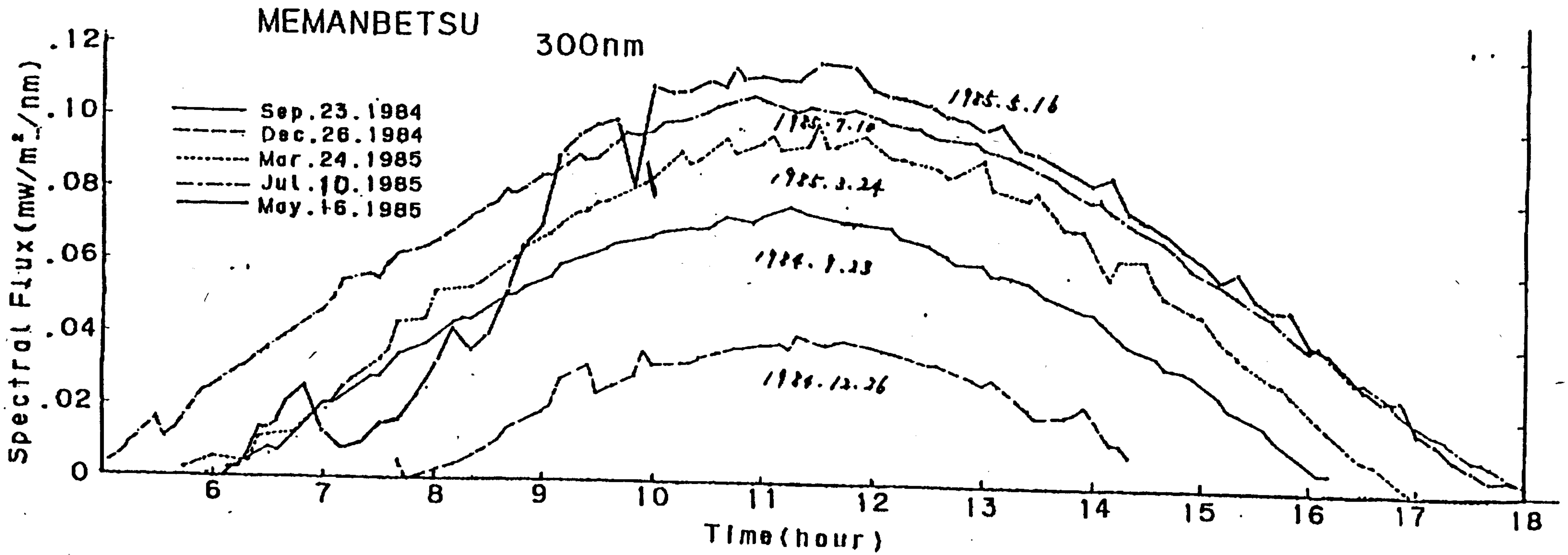

Fig. 4(d) Diurnal variation of solar radiation at 300 nm, Memanbetsu (43.9°N)

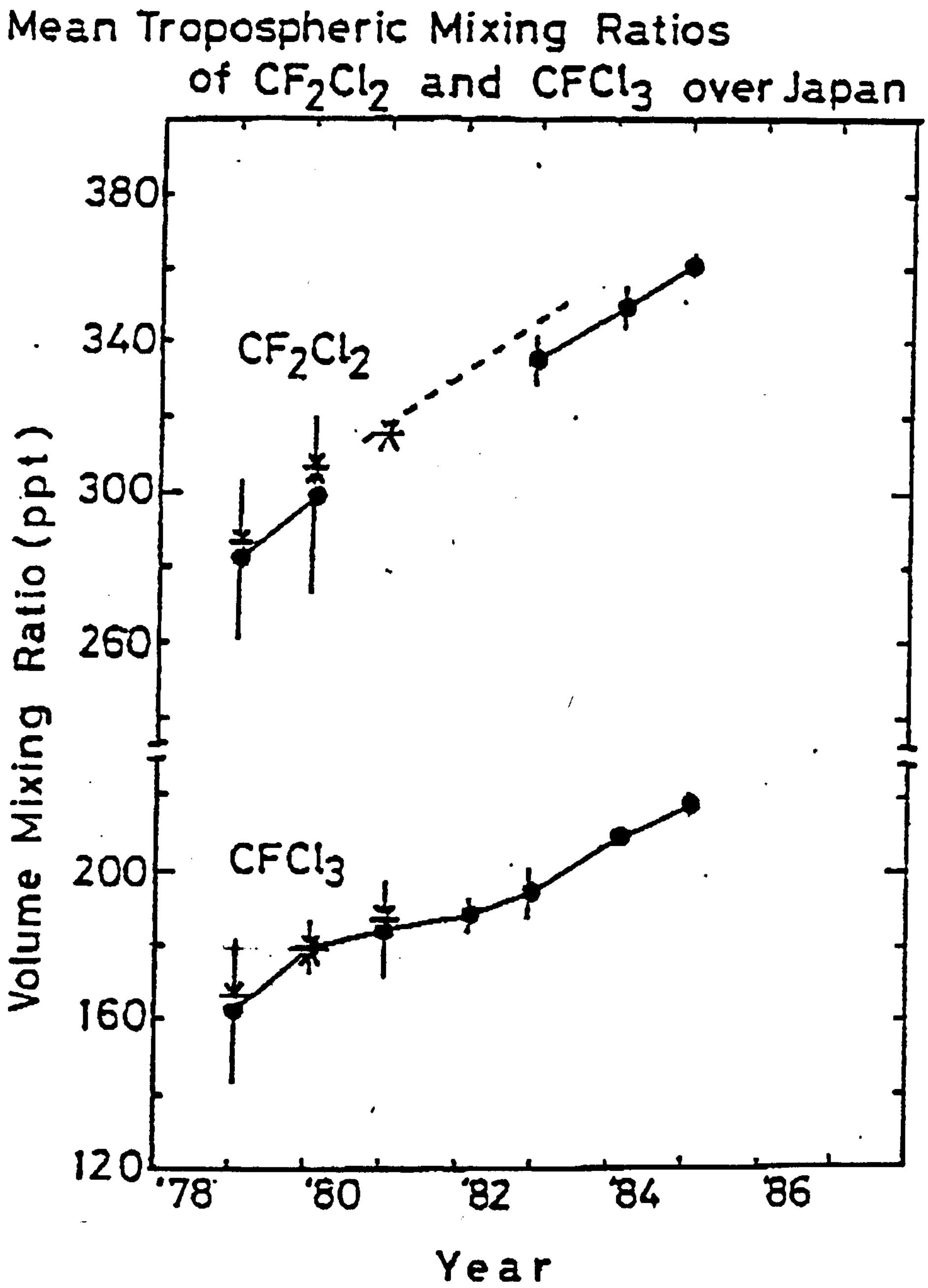

Fig. 5 Mean tropospheric mixing ratios of CFC-11 and CFC-12
ɸ : Mean value and standard deviation
---: Linear trend obtained by continuous measurements at Memanbetsu (43.9°N)
* : Mean value in Oregon, USA (45°N)

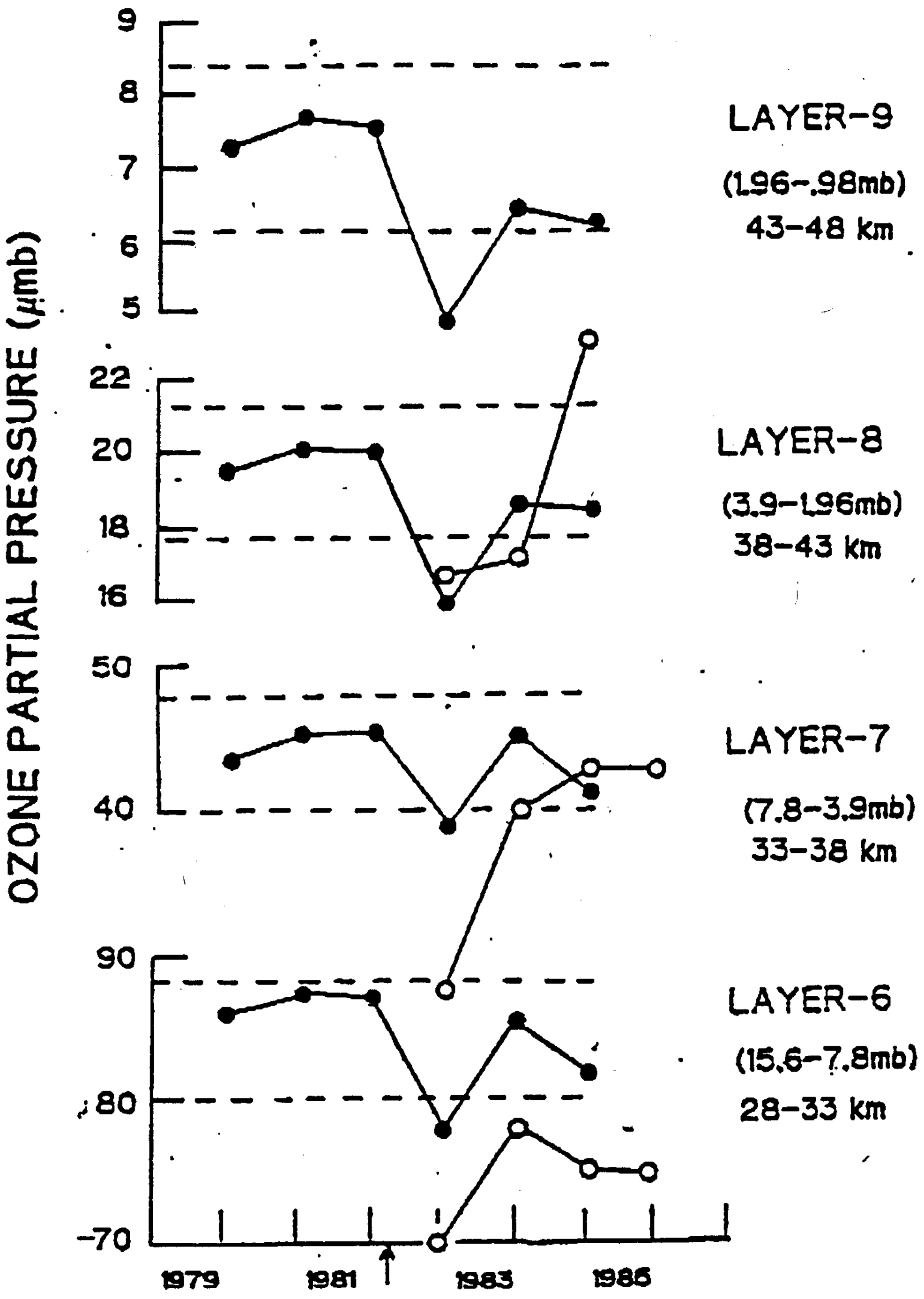

Fig.6 Variation of ozone amount

o-o: Ozone sonde observation

•-•: Umkehr observation

⟶: Eruption of El Chichon

LOW OZONE AMOUNTS OF UMKEHR OBSERVATION AFTER THE ERUPTION OF EL CHICHON ARE BELIEVED TO BE CAUSED BY THE OPTICAL EFFECT OF THE STRATOSPHERIC AEROSOL.