

Long-Term Monitoring of Ozone Profiles in Antarctica

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Measurements

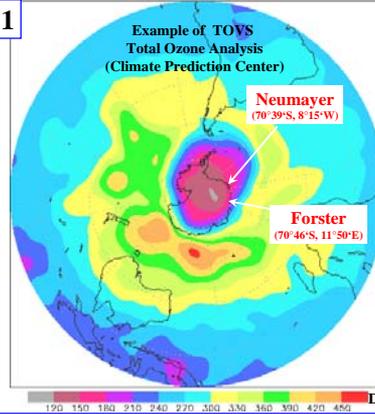
From 1985 to 1992 regular ozone soundings have been performed at Georg Forster Station (70°46'S, 11°41'E). In the beginning of 1992 this ozone sounding program was moved to Neumayer Station (70°39'S, 8°15'W) which is situated at the same latitude 750 km further west, see Fig. 1 and 2. Both stations are situated within the area surrounded mostly by the polar stratospheric vortex.

Typical ozone and temperature profiles during Austral spring and Austral autumn are shown in Fig. 3. The data of both stations can be regarded as one time series now covering two decades as shown in Fig. 4.

Time series

The ozone partial pressure in the lower troposphere - taken at 850 hPa - has a rather sinusoidal shaped annual variation with maximum values of about 3 mPa during Austral winter and minimum values of about 1 mPa during Austral spring, see Fig. 6.

Fig. 1



During Austral spring total ozone depletion events in the lower troposphere have been observed occasionally. Their timescale is short (hours till 1-2 days) and their vertical extension is normally limited to the lowest kilometers above the snow surface.

The values taken at 70 hPa - which corresponds to a height of about 17 km - represent the ozone values in the stratospheric ozone layer. The ozone depletion - occurring during Austral spring - can be recognized clearly, see Fig. 4 and 6.

Trend

Since the beginning of the time series a remarkable mean trend in the seasonal averaged stratospheric ozone concentrations is shown in Fig. 7. During September, October, November a clear ozone depletion is monitored. This depletion is strongly correlated with a cooling of the stratosphere. A corresponding trend during other seasons is not measured.

Fig. 2

Release of an Ozone-Sonde



Annual Variations

The Figures 4 and 5 show the annual cycle of the vertical ozone and temperature distribution above Neumayer. The cold winter stratosphere and the spring ozone depletion is normally well pronounced. In the year 2002 the stratospheric vortex - typically established during Austral spring - broke up which resulted in an unusual warm and ozone rich stratosphere, see Fig. 3 and 4.

Such a strong event did never happen during the last two decades. Only in 1988 and 1993 comparable but much weaker events were observed. The reason for this unusual dynamic of the vortex is not yet understood in all details.

Data Availability

The data from Georg-Forster/Neumayer are stored in the Meteorological Information System from the AlfredWegener Institute (MISAWI). All data are interactively available via: <http://www.pangaea.de/search?q=Ozone+antarctica>.

Fig. 3

Ozone and Temperature Profiles above Neumayer

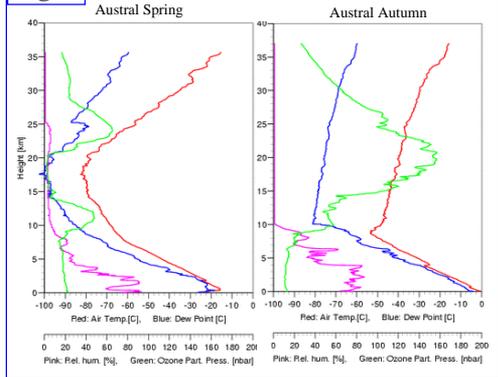


Fig. 4

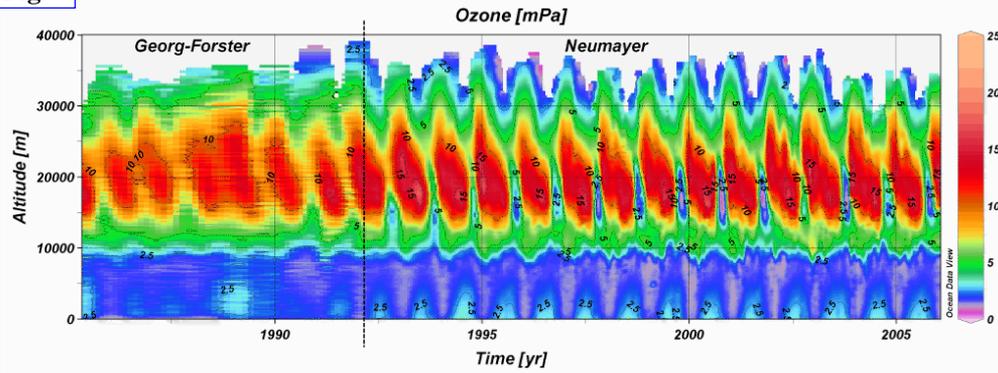


Fig. 6

Time series of Ozone Partial Pressure in the Troposphere (at 850 hPa) And Stratosphere (at 70 hPa)

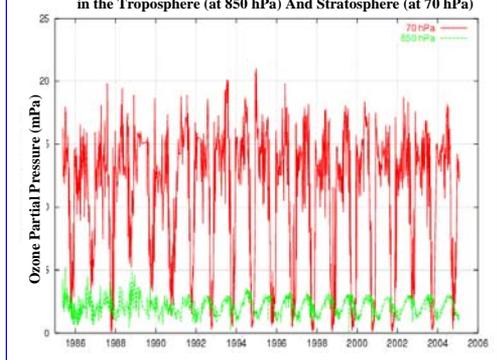


Fig. 5

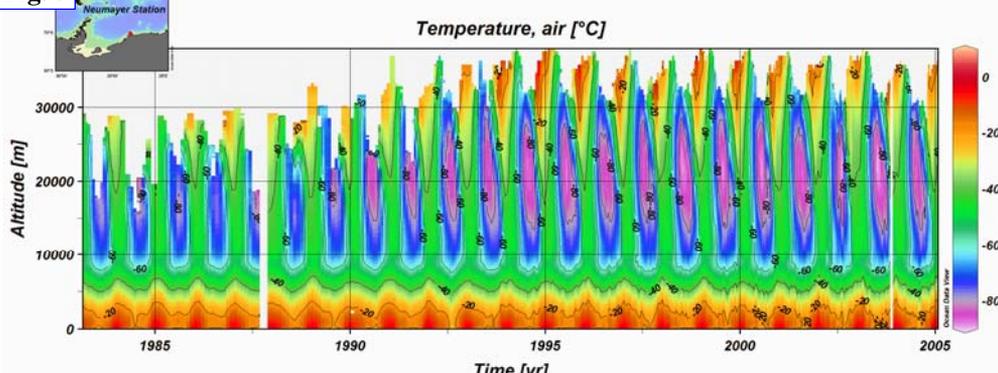


Fig. 7

Timeseries of Seasonal Averaged Stratospheric Parameters (at 70 hPa)

