SANAE total column ozone: 1980 to 1990

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TOMS (Total Ozone Mapping Spectrometer) data have been processed for a period of 11 years, from 1980 to 1990, for an area extending from 10° W to 39° E and from the equator to the South Pole. This area includes South Africa, much of the South African southern oceans and the South African Antarctic research base, SANAE. Daily total column ozone values have been obtained for SANAE, and monthly and yearly means have been calculated. Decreases in monthly averages are clearly evident while yearly averages show a decrease of 4,9 DU/year. For comparison purposes, Durban shows a decrease of 1,5 DU/year over the same period.

INTRODUCTION

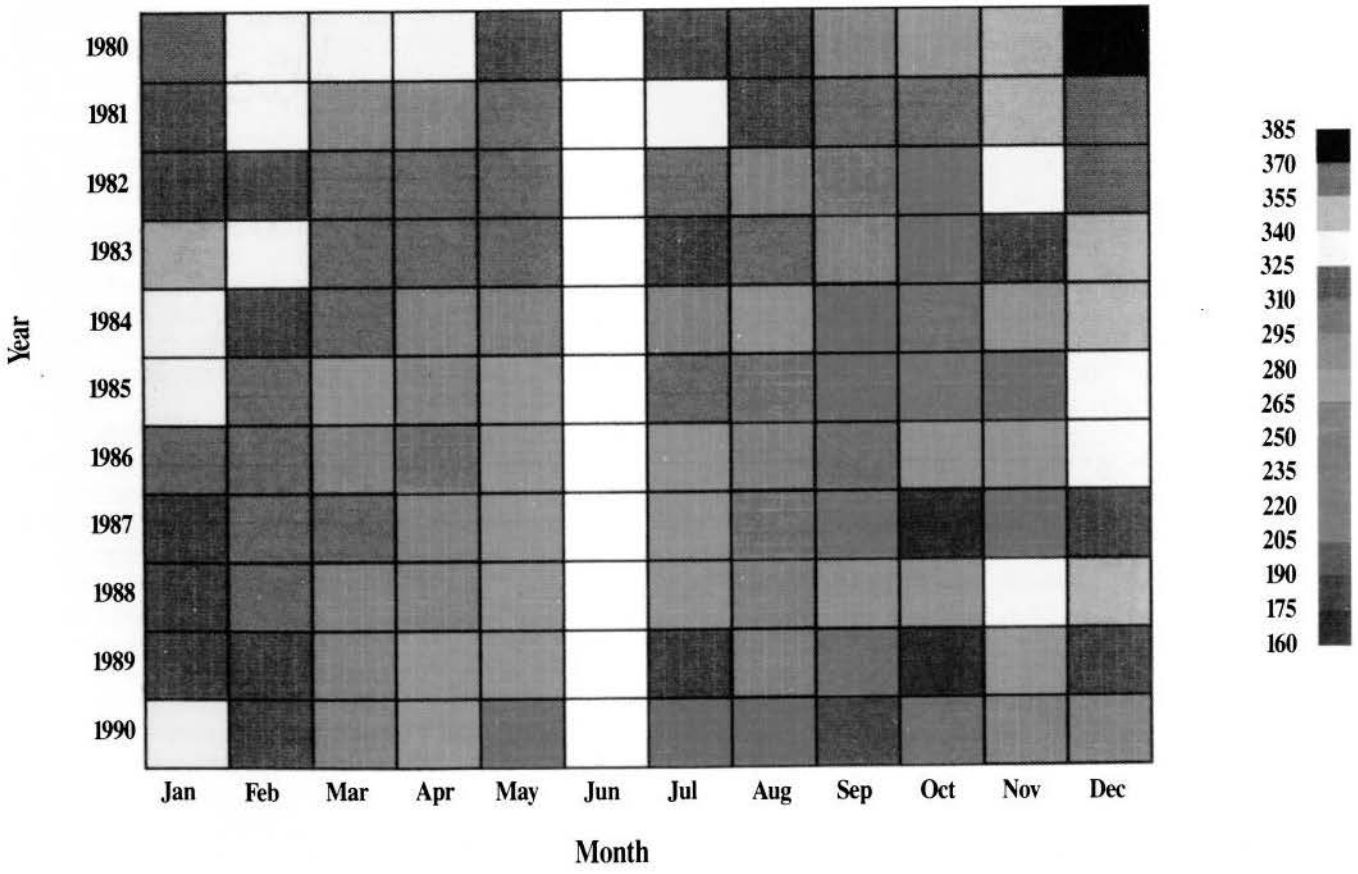
For the observations reported here, ozone data were obtained from the TOMS instrument aboard the sun-synchronous Nimbus 7 satellite. This experiment provides, on a daily basis, the global distribution of total column ozone. Each data point represents a mean total column ozone taken over an average cell size of 60 km x 60 km as determined by the field of view of TOMS.

Investigations since the mid-1980s have revealed a marked decrease in Antarctic total column ozone. Monthly and yearly averages of TOMS data for SANAE, which is located within the region of the ozone hole, are used to quantify the extent of ozone depletion.

OBSERVATIONS AND DISCUSSION

Monthly averages of SANAE total column ozone for each of the years 1980 to 1990 are shown in Figure 1. Data for June is not available since SANAE is in darkness during this month and no satellite measurements are possible. Each year is shown on the vertical axis while the months of each year are displayed on the horizontal axis. The monthly average total column ozone is shown by a colour code, the direction of increasing averages being from blue through green to red with the highest values being shown in yellow and white. Each hue corresponds to a range of ozone values e g red indicates monthly average total column ozone between 265 and 280 DU.

Fig 1 Total column ozone, SANAE monthly averages



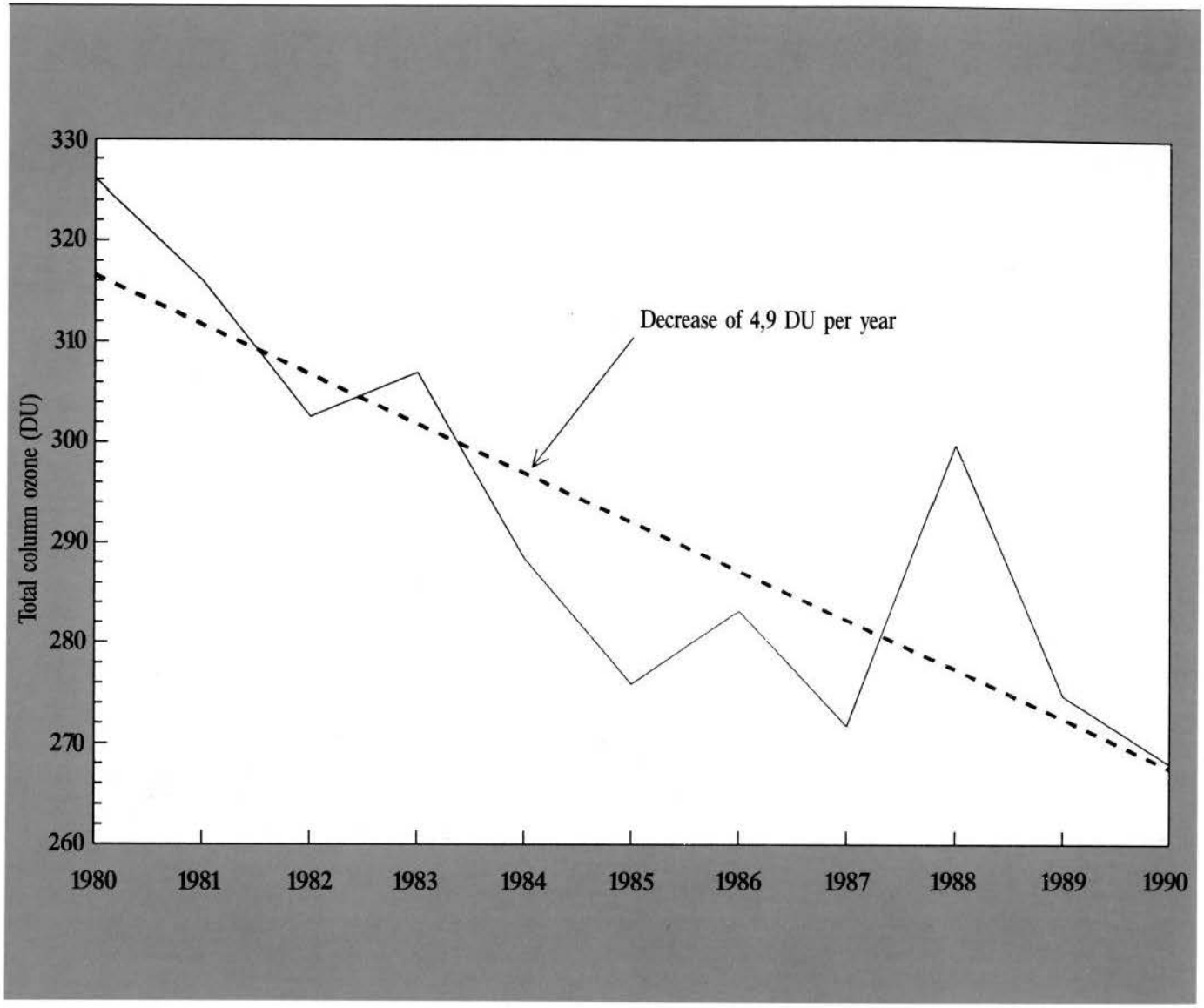


Fig 2 Yearly average total column ozone SANAE: 1980 to 1990

Figure 1 shows that monthly averages tend to be highest during the summer months (November, December, January and February) with typical values of 330 to 375 DU (yellow and white hues) Minimum values around 275 DU (1980) to 195 DU (1990) occur during September and October. Moving down the vertical scale of Figure 1 one sees that annual maxima have decreased i e yellow and white hues in Figure 1 are less evident. On the other hand, annual minima are seen to decrease with blue hues becoming more evident. It can also be shown that the decrease in the latter half of the year is more severe than in the earlier half of the year.

The solid line in Figure 2 shows the yearly average SANAE total column ozone over the 11-year period. Values have fallen from a high of between 320 and 330 DU in 1980 to values near 270 DU in 1990, a decrease of approximately 17%. The year of 1988 appears as an anomaly with an unusually high yearly average. It has been reported that the 1988 ozone hole was particularly shallow, thus accounting for the high annual average observed above SANAE in this year. A linear fit to the data is indicated by the dashed line in Figure 2. The slope of this line shows that over the 11-year period, the total column ozone has decreased at 4,9 DU/year.

CONCLUSION

This study has revealed a definite negative trend in SANAE total column ozone over the 11-year period 1980 to 1990. The decrease has been more severe during the second half of the year and yearly averages have shown a long-term decrease of 4,9 DU/year.

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