after several countries, notably the USA, had placed a ban on the essential uses of F-11 and F-12. Nonetheless, F-11 is still increasing in the atmosphere and a vigilant check on its growth has to be maintained. Carbon tetrachloride has shown a small, but steady rise (3,7 pptV/year^{-1}) since 1980, which agrees well with estimates made in other parts of the world.

Nitrous oxide is, like F-11, relatively inert in the troposhere, whilst in the stratosphere it reacts with excited oxygen atoms to yield nitric oxide, which plays a pivotal role in O_3-destroying reactions. Micorbial activity in anaerobic soils and ocean sediments produce N_2O. The strength of this source is magnified by the world-wide use of N-fertilizers. Measurements of N_2O were initiated at Cape Point in March this year. To date little monthly changes have been detected (average : 295 ppbV).

The basic project of monitoring gases, which absorb IR radiation or which influence stratospheric chemistry, will continue at Cape Point. Additionally, it is planned to expand the measuring programme to include such parameters as solar flux, HCNO, NO_x and H_2, in order to obtain a better understanding of the chemical cycle involving CH_4, OH and CO.

In air-chemical research circles, a general need exists to verify and quantify theoretical models of trace gas cycles by good-quality in situ measurements. In this way the ability of the atmosphere to absorb and neutralize man-made pollutants can best be checked.

With the technical ground work already being laid and its favourable geographic position in the South Atlantic Ocean, Cape Point is ideally suited for such a study.

E G Brunke Atmospheric Sciences Division National Physical Research Laboratory CSIR

August 1983

LONG-TERM TRENDS IN SMOKE AND SULPHUR DIOXIDE POLLUTION IN SOUTH AFRICA

DR E KEMENY & C M VLEGGAAR
ATMOSPHERIC SCIENCES DIVISION
NATIONAL PHYSICAL RESEARCH LABORATORY

At present 33 cities and towns participate in the national survey on smoke and sulphur dioxide and in a recently issued report [1] the results obtained between October 1980 and September 1982 were statistically analysed together with those collected in previous years. This report reveals the alarming fact that the concentrations of smoke and sulphur dioxide no longer have the tendency to decrease as was the case up to 1978. Instead, between 1978 and 1982 the concentrations of smoke fluctuated without showing any tendency at 95% of the 112 monitoring sites and the SO_2 concentrations did likewise at 81% of the 64 measuring sites. As far as the tendency to increase is concerned, 1% of the smoke and 13% of the SO_2 stations have this tendency, which for SO_2 represents an increase of 4% in comparison with the past.

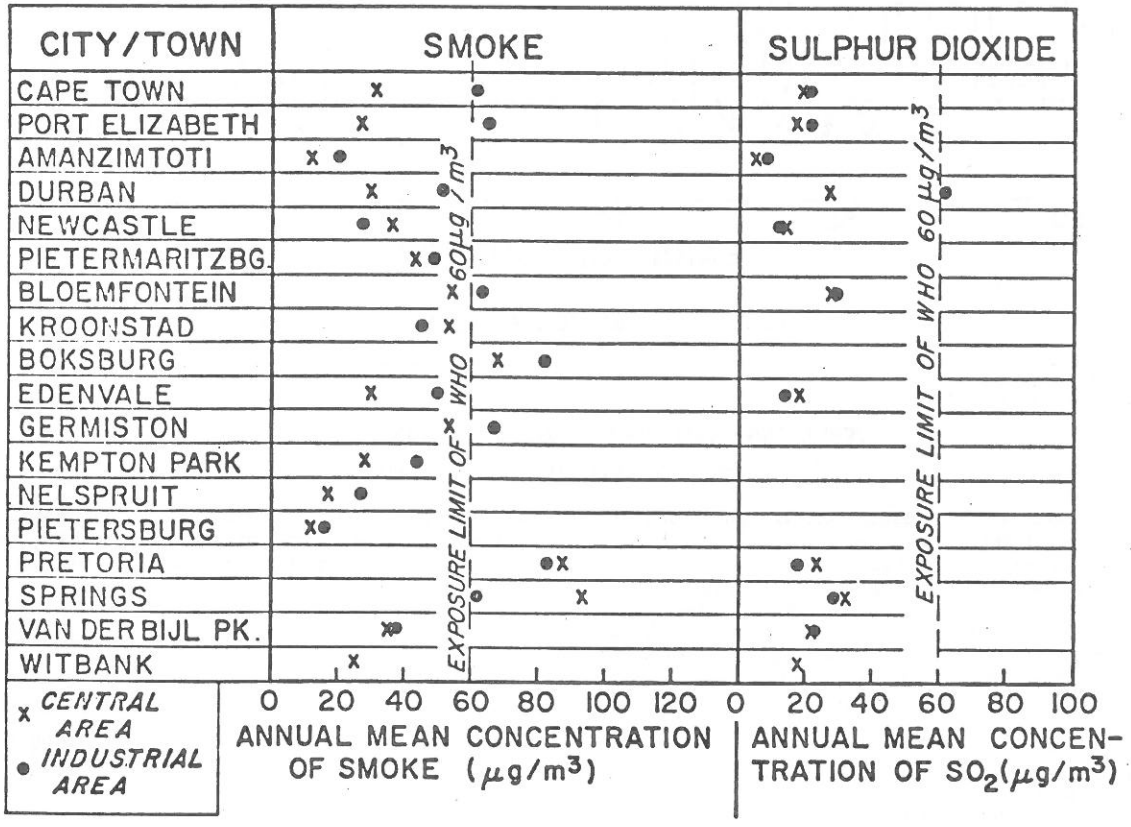

FIGURE 1 SOUTH AFRICAN SMOKE AND SULPHUR DIOXIDE LEVELS IN RELATION TO EXPOSURE LIMITS OF WORLD HEALTH ORGANIZATION

The fact that smoke concentrations no longer decrease gives cause for concern. Despite the noteworthy decreases which occured in the past, the concentrations are still relatively high in areas where the atmospheric conditions are unfavourable for the dispersal of pollutants and would not meet the guidelines which the World Health Organization have recommended for the protection of the public health (2). Cities and towns where central and/or industrial areas have annual mean concentrations which are higher than the recommended 60 ug/m^3 (equivalent soiling index is 12) are : Pretoria, Springs, Germiston, Boksburg, Bloemfontein and Kroonstad on the Highveld. Industrial areas in coastal cities like Cape Town, Port Elizabeth and Durban also exceed this limit. As far as SO_2 is concerned, the situation is not as serious since only the industrial areas in Durban exceeds the exposure limit of the World Health Organization which is also 60 ug/m^3 of SO_2. Figure 1 gives an indication of how the South African smoke and SO_2 levels compare with the recommended exposure limits.

Figure 2 depicts the long-term trends in smoke and SO_2 pollution in the centre of Pretoria and gives a clear picture of the change from a decreasing trend to a tendency to increase and to fluctuate without a significant change, respectively. Similar figures have been obtained from many of the monitoring sites where smoke and SO_2 are being measured and it becomes obvious that stringent control measures will have to be applied in the near future.

REFERENCES

1. KEMENY, E. and VLEGGAAR, C.M. **Statistics on smoke and sulphur dioxide pollution in South Africa - Period: October 1980 to September 1982.** CSIR Special Report ATMOS/83/6 - FIS 301, Pretoria, p 57, 1983.

2. WORLD HEALTH ORGANIZATION, Sulphur oxides and suspended particulate matter. Environmental Health Criteria 8, Geneva p 107, 1979.

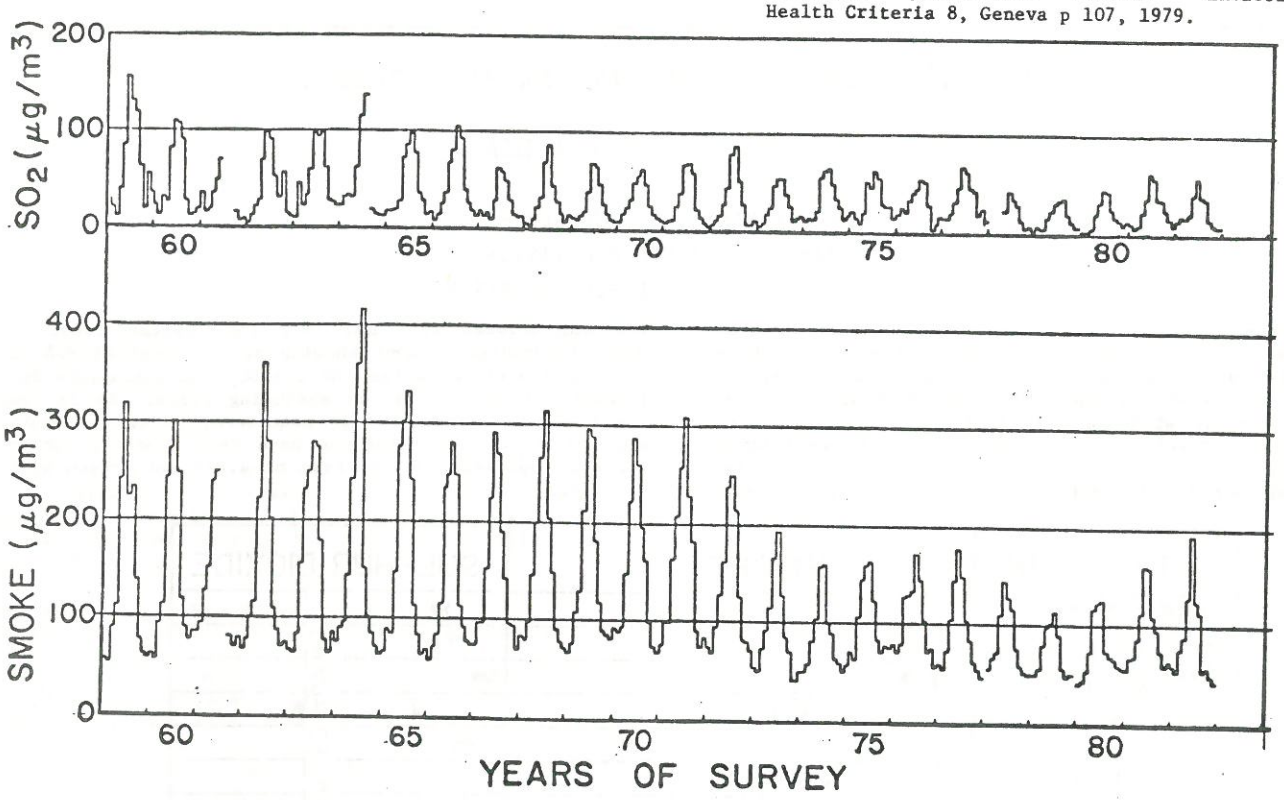

FIGURE 2 LONG-TERM TRENDS IN SMOKE AND SULPHUR DIOXIDE POLLUTION PRETORIA CENTRE

VERLAGING VAN OPPERVLAKKONSENTRASIE TYDENS STERK KONVEKTIEWE TOESTANDE

Een algemene metode om besoedelstofkonsentrasies op grondvlak te verminder, is om hoër skoorstene te bou. Tydens sterk konvektiewe atmosferiese toestande kom sogenaamde lusvormende ('looping') pluime taamlik algemeen gedurende die grootste deel van die dag voor. Afhangende van die turbulensieskaal kan sodanige pluime die grond tref, met gevolglike hoë besoedelstofkonsentrasies. Die bestaande dispersiemodelle, soos byvoorbeeld in Turner se bekende handleiding, maak voorsiening vir metodes om grondvlakkonsentrasies in 'n wye verskeidenheid dispersiegevalle te bereken. Hierdie metodes geld egter nie vir gevalle waar die pluim terwyl dit nog relatief onverdun is, naby die skoorsteen grondwaarts gewarrel word nie.

Om hierdie rede is 'n model ontwikkel om vir sulke gevalle voorsiening te maak. Die model toon dat skoorsteenhoogte 'n redelike sterk invloed op grondvlakkonsentrasie het. Die meegaande tabel gee die maksimuminvloed van hoogte op konsentrasie. In die praktyk sal die effek minder waarneembaar wees. Die eenhede van hoogte en konsentrasie in die tabel is arbitrêr.

Hoogte	Konsentrasie
100	100,0
110	86,7
120	76,1
130	67,5
140	60,4
150	54,4

Dr O L Fourie Afdeling Atmosferiese Wetenskappe, Nasionale Fisiese Navorsingslaboratorium WNNR