N87-10340

# LIDAR OBSERVATIONS OF THE DECLINE OF THE EL CHICHON STRATOSPHERIC LOAD

H. Jäger and W. Carnuth, Fraunhofer-Institute for Atmospheric Environmental Research, D-8100 Garmisch -Partenkirchen, FRG

The eruption of the Mexican volcano El Chichon in April 1982 enhanced the stratospheric aerosol load to a level which so far has not been observed by remote sensing techniques. The ruby lidar system at Garmisch-Partenkirchen (47.5 N, 11.0 E) recorded an increase of integral stratospheric particle backscattering of about two orders of magnitude above the background level of the years 1977/78. At northern midlatitudes backscattering was peaking in January/February 1983, as shown in Figure 1. This paper will discuss the decline of the El Chichon stratospheric perturbation.

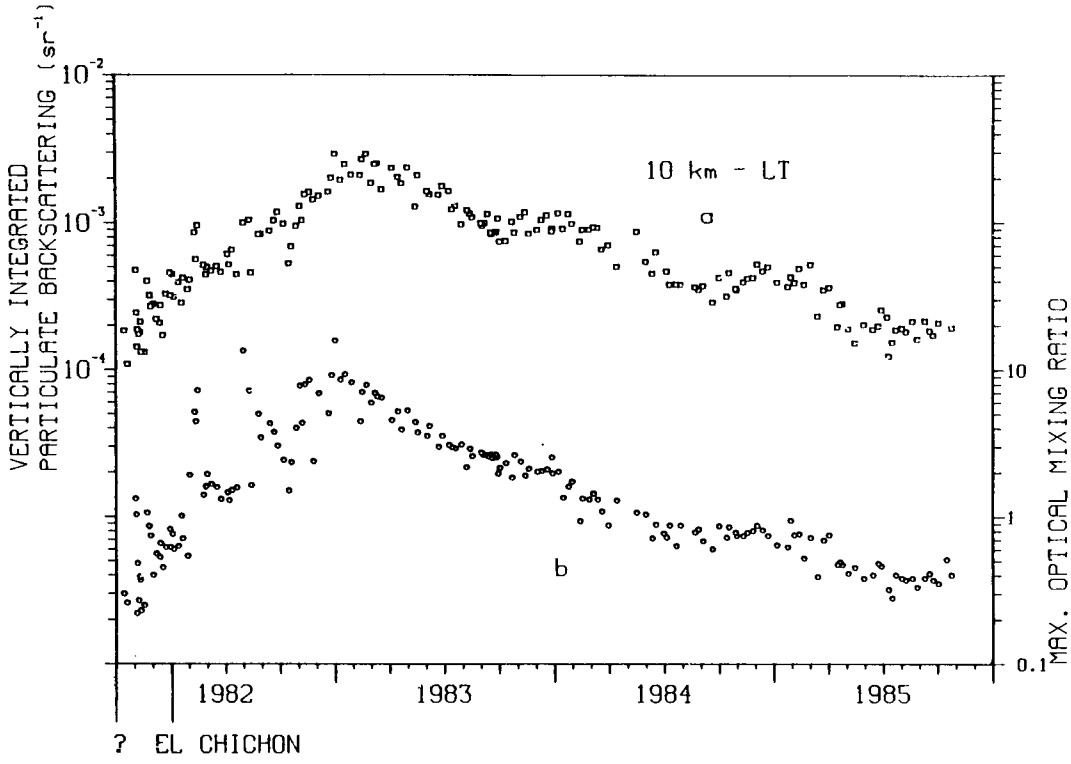


Figure 1. Time variation of the vertically integrated particulate backscattering coefficient (from 10 km to top of layer) and maximum optical mixing ratio (maximum scattering ratio - 1).

The decay of the El Chichon stratospheric cloud is characterized by an overall 1/e lifetime of about 12 months. Thus the background level of 1977/78 can again be reached in 1987. But recently (January 1986) observed fresh stratospheric aerosol layers at 18 to 21 km point at a new volcanic phase,

probably caused by the November 1985 eruption of the Ruiz Volcano in Colombia.

The El Chichon decay is further characterized by seasonal variations of the integral backscattering coefficient (integral between 10 km and layer top, Fig. 1a), which exhibit a winter maximum and a summer minimum. These variations are inversely correlated with the seasonal mean movement of the tropopause height, which was also noticed by Hofmann and Rosen (1984), indicating transport processes. At Garmisch-Partenkirchen the tropopause height usually varies between 9 and 13 km. Since the maximum optical mixing ratio, which is found well above the tropopause between 16 and 20 km, shows comparable - though less prominent - variations (Fig. 1b), a seasonal temperature effect due to particle growth at decreasing temperature (as discussed by Steele and Hamill, 1981) might add to the observed backscatter variations.

References

Hofmann, D.J. and J.M. Rosen , Intern. Radiation Symposium, Perugia, 1984.

Steele, H.M. and P. Hamill, J. Aerosol Sci. 12, 517, 1981.