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SYSTEMATIC OZONE AND AEROSOL LIDAR MEASUREMENTS AT OHP (44°N, 6°E) AND DUMONT D'URVILLE (66°S, 120°E)

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Systematic stratospheric DIAL ozone measurements are performed at the Observatoire de Haute-Provence (44°N, 6°E) since the end of 1986. The measurements range normally from 15 to 45-50km except after the eruption of Mt. Pinatubo, when they were locally pertubed at the altitude of the volcanic cloud. The data base amounts now to up to 500 profiles which allows to obtain a good characterization of the seasonal variation of ozone at this location. As part of the NDSC network and the UARS validation programs, these measurements have been compared to several other measurements such as SAGE, the Umkehr [1] and ozone sondes measurements also performed at OHP, the UARS MLS, CLAES instruments. A NDSC related intercomparison campaign was also organized at OHP in 1992, which involved in particuliar the GSFC mobile lidar system and the NASA langley microwave instrument. The instruments has substantially evolved since 1986 with the implementation at the end of 1993 of a completely new optical and electronic detecting system (figures 1 and 2). The objective of this tranformation was to improve the accuracy of the measurements in the presence of a heavy stratospheric aerosol loading with the detection of the vibrational 1st Stokes raman wavelengths and to increase the temporal resolution with the simultaneous acquisition of the various optical channels.

On the same site, systematic lidar measurements of the aerosol 532 nm scattering ratio allowed to thoroughly follow the evolution of the Pinatubo volcanic cloud after the eruption of 1991. The scattering ratio profiles were obtained according to the Klett method. An iterative algorithm allowed to obtain the temporal evolution of the backscatter to extinction ratio of the particles. This parameter is further used, together with balloonborne optical counter measurements [2] and Mie calculations to infer the size distribution and the sedimentation rate of the particles [3].

In the frame of the POLE project in cooperation with the IROE of Florence, lidar measurements of aerosol and stratospheric clouds are performed since 1989 in Dumont d'Urville (67°S, 120°E) . In 1991, a new multiwavelength lidar intended to measure the aerosol and ozone vertical distributions was implemented [4]. As at OHP, the aerosol measurements performed after the Mt. Pinatubo eruption allow to follow the evolution of the volcanic cloud in the stratosphere. The comparison with the measurements performed in the northern mid-latitudes shows a more rapid decrease of the altitude of the volcanic layer (figure 3) whereas values of the backscatter to extinction ratio obtained with the same method as at OHP are very similar. Parallely, due to the peripheric location of the station with respect to the Antarctic continent, comparisons of the in and out-of-vortex situations in the winter of 1992 allow to study the air subsidence inside the polar vortex.

After several years of operation, the ozone measurements give a good picture of the seasonal variation of ozone at this latitude range, despite the high variability in winter and spring due to the peripheric location of the station. As at OHP, the measurements were pertubed in the low stratosphere by the presence of the Pinatubo volcanic cloud, but the rapid decrease of the altitude of the volcanic layer allowed to obtain correct measurements above 18 km from the beginning of 1993. The lidar measurements are generally in good agreement with the ECC ozone soundings performed on the same site. Several depleted ozone events were detected by both instruments in the springs of 1991 and 1993, as the polar vortex was located above the station.

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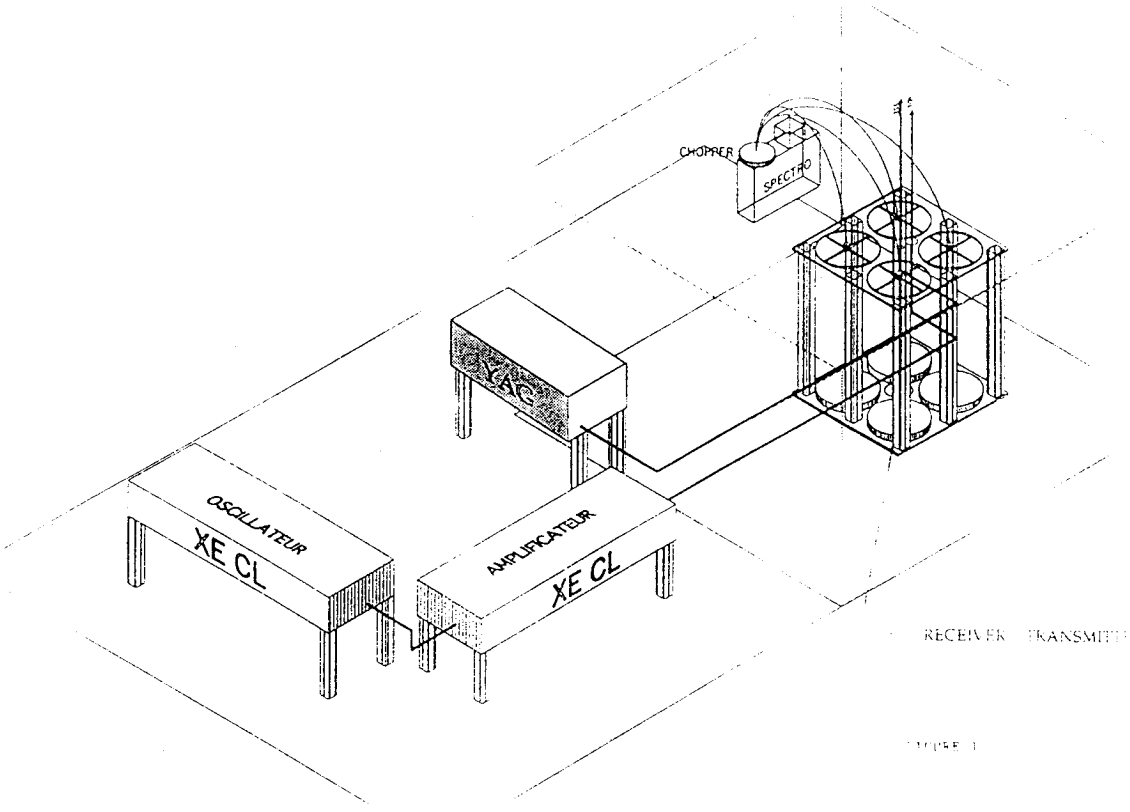


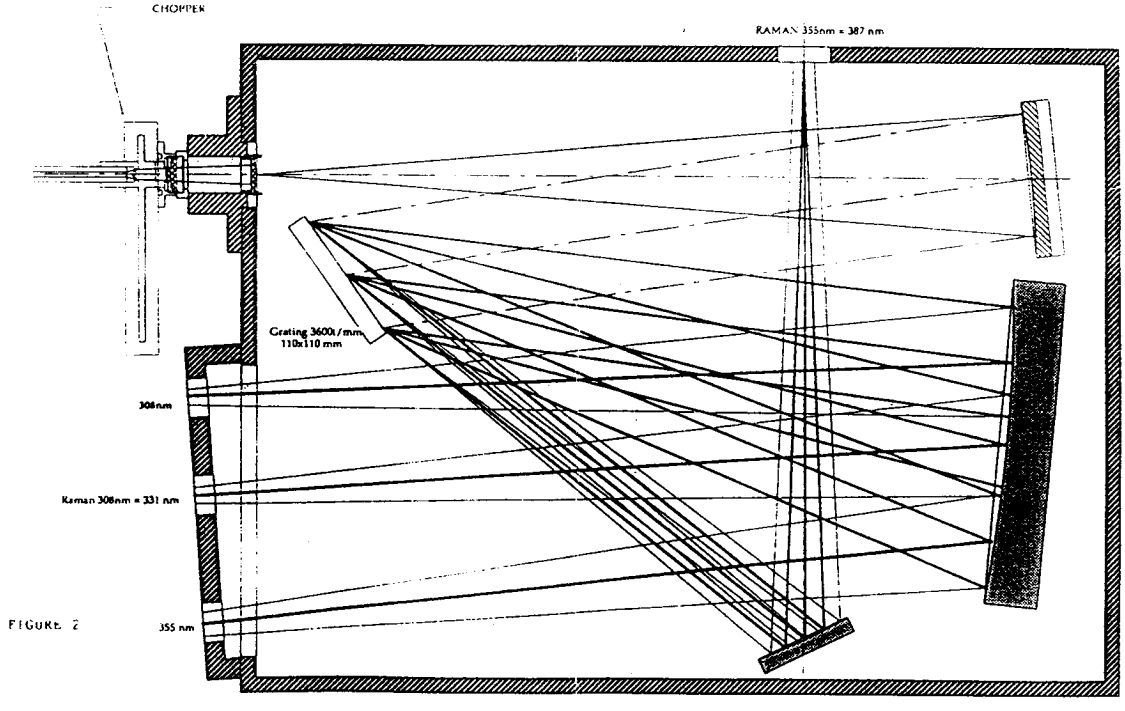
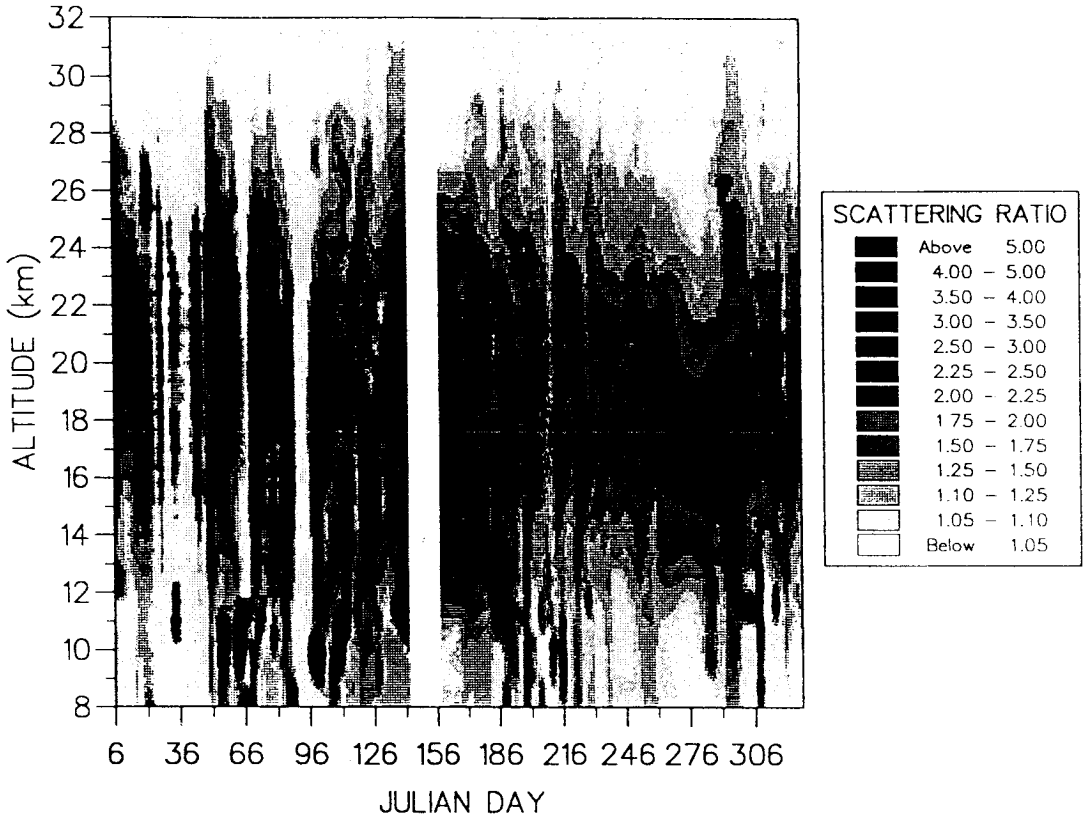


FIGURE 2

GRATING MULTICHANNEL MONOCHROMATOR FOR OZONE LIDAR OHP

EVOLUTION OF AEROSOL ABOVE OBS. DE HAUTE–PROVENCE

6 January to 23 November 1992



EVOLUTION OF AEROSOL ABOVE DUMONT D'URVILLE

10 January to 23 November 1992