2.2.8 Balloon-borne and rocket-sonde UV optical sonde.

Dr P C Simon

Institute d'Aeronomie Spatiale de Belgique
B-1180 BRUXELLES, Belgium.

The following measurements or observations, relevant to SAGE validation, are contemplated :

1. Parameter to be measured : ozone concentration
2. Accuracy of measurement : 5%
3. Altitude region : 25-40 km balloon - > 40 km rocket
4. Altitude resolution : < 1 km
5. Observation period : from Feb. 1979
6. Frequency of observation : once per month max. following requirements and launching facilities.
7. Measurement technique : in situ
8. Instrument type : optical sonde
9. Measurement platform : balloon and/or rocket
10. Type of data product : vertical profiles of O_3
11. Funding authority : IASB
12. Measurement program : Stratospheric minor constituents profiles
13. Status of prime instrument : 1st model tested by balloon flight in Sept. 78
14. Assurance of instrument availability in Jan. 1979-July 1979 : 80% for balloon-borne instrument.
15. Location of measurement : France, Aire sur l'Adour (44N,0W) and Gap (44N, 6E)
16. Experimental limitations : day
17. Instrumental physical characteristics : weight : < 5 kg without telemetry or power supply.
18. Experimenter operation experience : 6 years

(Information given in Questionnaire prepared by Dr P C Simon dated 7 Dec 1978).
Some information, concerning the technique and sensor, is given on the following page.

OZONE OPTICAL SONDE

The objectives of this experiment are to measure ozone vertical profiles between 25 and 40 Km by means of a balloon-borne optical sonde. Higher altitude profiles require a rocket-borne instrument, which can be derived from the balloon-borne optical sonde.

The experimental principle is based on solar absorption measurements at two wavelengths, by means of double channel filter radiometers. Two different radiometers, centred at 290 and 300 nm, are required to cover the altitude range from 25 to 40 Km. The reference channel, for which absorption by ozone is negligible by comparison to the measurement channels, is centred for both radiometers at 340 nm. The ozone profile can be deduced from the ratio of the signal measured for each radiometer at the two wavelengths, versus altitude. The spectral bandpasses and the equivalent absorption cross-sections of ozone must be known. Correction for Rayleigh scattering is negligible above 30 Km, but must be calculated for lower altitude. This system avoids any requirement for solar pointing. The measurement can be made during the ascent and/or the descent of the balloon.

The same principle of measurement can be used for a rocket-borne ozone sonde using a filter centred at 265 nm in order to have measurable absorption between 40 and 55 Km.