

SHORT PAPER

Laser scatter measurements in the mesosphere and above

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Abstract—Recent papers by Sandford are discussed in relation to results from an improved optical radar which was in use during the period January–February 1967.

TWO RECENT papers by (SANDFORD, 1967*a*; SANDFORD, 1967*b*) discuss optical radar probing of the atmosphere with pulsed ruby lasers. Sandford presents his own observational data and develops useful general parameters for systems evaluation. He also evaluates the equipment and discusses the experimental results of several other groups including one at the University of Maryland. Sandford's discussion of the Maryland system is based upon data that was published in February of 1966 (McCORMICK *et al.*, 1966).

The purpose of this communication is to present improved system parameters for the University of Maryland's optical radar based upon experimental data obtained during the period January–February, 1967.

The Maryland equipment was operated during several observational periods after February, 1966 with modifications being made before each period. The most significant modification was the installation of a rotating shutter in front of the photomultiplier tube which eliminated the high noise level that was evident in the early data. The improved system has been described, and observational data obtained during January–February, 1967 was presented (McCORMICK *et al.*, 1967). It was pointed out that the noise level is equal to the expected dark current plus night sky background and is constant in time. Calibration techniques, such as stellar measurements on α UMI (Polaris), were described. A good (absolute) fit to the predicted molecular return was observed in the altitude region 45–60 km when a value of 0.7 is assumed for the atmospheric transmission. Based on these results the performance parameters for the Maryland system (in February, 1967) that are

given in Table 1 (SANDFORD, 1967*a*) would be:

1. $h_m \simeq 75$ km
2. $\tau \simeq 500$ min
3. $t(50-55 \text{ km}) \simeq 2.1$ hr
4. $t(70-75 \text{ km}) \simeq 119$ hr.

After dismissing the early Maryland results and those of Fiocco *et al.* (FIOCCO and SMULLIN, 1963; FIOCCO and COLOMBO, 1964) Sandford states that "... there is no reliable evidence for aerosol scattering above 90 km." This statement is probably correct. However, an inspection of Sandford's data and conclusions would suggest that there is no reliable evidence for aerosol scattering above about 72 km and, even from this region, he reports a return that is only about 50 per cent greater than the expected molecular return.

The later Maryland results show enhanced returns from 77–82 km that are about a factor of 10 above the expected molecular value on the nights of February 4–7, 1967. No enhanced return was detected on the nights of January 30, 31 (1967). Possible sources for these returns, in addition to aerosol scattering, have been suggested (McCORMICK *et al.*, 1967).

Except for a single sporadic return from about 120 km in an atmospheric profile based on 50 laser pulses no enhanced scattering above about 85 km was observed.

It should also be pointed out that the Maryland optical radar was operated during July–August 1967 with results similar to those of February 1967. The average performance parameters $t(50-55 \text{ km})$ and $t(70-75 \text{ km})$ were improved to 0.9 hr and 65 hr respectively.

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