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ORBITS OF SPORADIC METEORS

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A survey of sporadic meteor orbits has been made using a spaced receiver technique. The apparatus consists of three receivers spaced on the ground by about 4 km. The received signals are brought together by radio links and displayed on a single film. In this way both diffraction pattern and the time delay between the diffraction patterns received at the different stations can be measured. From this the velocity and the direction of motion of the meteor can be calculated. The range of the echo and the local sidereal time are also recorded on the film.

From May 1954 to April 1955 twelve 24-hr. periods have been analyzed at the rate of one per month, thus yielding a general picture of the distribution of sporadic meteor orbits. The number of meteors measured in 24 hr. varied from 120 in February to 330 in July, the total for the year being approximately 2400. The aerial system used was designed to provide approximately equal sensitivity to meteors from all parts of the sky north of declination $-10°$ in the course of 24 hr., and the sensitivity of the equipment was such that most meteors measured were of magnitude $+7{\cdot}5$ to $+8$.

Not one of the 2400 orbits measured is hyperbolic, except for a few close to the parabolic limit which may be ascribed to the effect of experimental errors on long-period orbits.

Orbits with aphelion distances between 3 and 10 a.u., about 35 % of the total, show considerable concentration in the plane of the ecliptic. In the case of aphelion distances greater than 10 a.u. there is a slight concentration towards the ecliptic. Since the accuracy is often insufficient to distinguish between an orbit with aphelion distance 10 a.u. and a parabolic orbit, this may in fact represent errors of measurement on medium-period orbits.

Over 50 % of the orbits have aphelion distances less than 3 a.u. Of these orbits 40 % are nearly circular (eccentricities less than $0{\cdot}5$) and show concentrations in inclinations 60° and 120°. Inclinations less than 30° and close to 90° are rare in this class of orbit.

The proportion of low eccentricity orbits increases towards fainte magnitudes. At magnitudes $+6$ and $+7$ the low eccentricity orbits are more concentrated at high inclinations than at magnitude 8.

A few meteors of magnitude $+4{\cdot}5$ and brighter have also been observed. The low eccentricity group is absent, and most orbits have aphelion distances greater than 5 a.u.

The Geminid shower was observed in 1954 to assess the accuracy of the experiment. The results indicate clearly that accuracy of velocity measurement is limited by atmospheric deceleration of the meteors to about ± 2 km./sec., and the accuracy of direction measurement to $\pm 3°$ by distortion of the meteor trail by non-uniform winds in the upper atmosphere. The mean correction for deceleration to be applied to these faint Geminid meteors was found to be about four times greater than the value inferred from Harvard photographic observations on bright meteors. This correction has been applied in the experiment on sporadic meteors described above.

The method and results of the observations on the Geminid stream are described in detail elsewhere [1], and a further paper relating to the sporadic meteor observations is in preparation. It is planned to continue the work on sporadic meteors, and to make a study of shower meteors.

REFERENCE

[1] Gill, J. C. and Davies, J. G. *M.N.R.A.S.* **116**, 105, 1956.