Diurnal Variation and Duration of Meteors Usable for Radio Communications

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This project set about to build a radio astronomy station capable of receiving radio signals reflected from ionized meteor trails to measure two important characteristics affecting their use in one type of radio communications system. The parameters of interest are: diurnal variation of the rate of meteor occurrence and the distribution of meteors of different durations within a population. In order to measure this, a pair of systems were developed and data ultimately combined to arrive at a prediction which could be shared with users of this medium to optimize their communications based on these parameters. To measure diurnal variation, an antenna, receiver, and signal processing were employed to count occurrences per hour. The collected dataset was averaged across days, by hour, to generate an “average day” which followed the expected sinusoidal pattern showing a maximum at ~04:00 and a minimum at ~16:00 local time. To measure duration, the previous system was extended with an additional filter and detection algorithm which measured the time during which each meteor reflected the signal. Detections were then grouped based on duration with each group’s proportional size following the expected decaying exponential trend. Analysis of the data from both systems allowed for combining to produce a product distribution. As this accounts for both diurnal variation, using the sinusoidal pattern, and duration, using a distribution generated based on the decaying exponential, the resulting graph is a useful reference for those users of this means of communications.

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