Automated Meteor Fluxes with a Wide-Field Meteor Camera Network

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Within NASA, the Meteoroid Environment Office (MEO) is charged to monitor the meteoroid environment in near-earth space for the protection of satellites and spacecraft. The MEO has recently established a two-station system to calculate automated meteor fluxes in the millimeter-size-range. The cameras each consist of a 17 mm focal length Schneider lens on a Watec 902H2 Ultimate CCD video camera, producing a 21.7 x 16.3 degree field of view. This configuration has a red-sensitive limiting meteor magnitude of about +5. The stations are located in the South Eastern USA, 31.8 kilometers apart, and are aimed at a location 90 km above a point 50 km equidistant from each station, which optimizes the common volume. Both single station and double station fluxes are found, each having benefits; more meteors will be detected in a single camera than will be seen in both cameras, producing a better determined flux, but double station detections allow for non-ambiguous shower associations and permit speed/orbit determinations.

Video from the cameras are fed into Linux computers running the ASGARD (All Sky and Guided Automatic Real-time Detection) software, created by Rob Weryk of the University of Western Ontario Meteor Physics Group. ASGARD performs the meteor detection/photometry, and invokes the MILIG and MORB codes to determine the trajectory, speed, and orbit of the meteor. A subroutine in ASGARD allows for the approximate shower identification in single station meteors. The ASGARD output is used in routines to calculate the flux in units of #/km^2/hour. The flux algorithm employed here differs from others currently in use in that it does not assume a single height for all meteors observed in the common camera volume. In the MEO system, the volume is broken up into a set of height intervals, with the collecting areas determined by the radiant of active shower or sporadic source. The flux per height interval is summed to obtain the total meteor flux. As ASGARD also computes the meteor mass from the photometry, a mass flux can be also calculated.

Weather conditions in the southeastern United States are seldom ideal, which introduces the difficulty of a variable sky background. First a weather algorithm indicates if sky conditions are clear enough to calculate fluxes, at which point a limiting magnitude algorithm is employed. The limiting magnitude algorithm performs a fit of stellar magnitudes vs camera intensities. The stellar limiting magnitude is derived from this and easily converted to a limiting meteor magnitude for the active shower or sporadic source.