The Three Radars: Radio and meteor science outcomes from comparisons of meteor radar observations at AMISR Poker Flat, Sondrestrom, and Arecibo.

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Radio science and meteor physics issues regarding meteor "head-echo" observations with high power, large aperture (HPLA) radars, include the frequency and latitude dependency of the observed meteor altitude, speed, and deceleration distributions. We address these issues via the first ever use and analysis of meteor observations from the Poker Flat ISR (PFISR: 449.3 MHz), Sondrestrom (SRF: 1290 MHz), and Arecibo (AO: 430 MHz) radars that, due to the large differences in sensitivity and beamwidth, also sample different meteoroid size populations. The PFISR (least sensitive) and SRF (medium sensitivity) radars are located near the arctic circle while AO (most sensitive) is in the tropics. The meteors observed at each radar were detected and analyzed using the same automated FFT periodic micrometeor searching algorithm. Meteor parameters (event altitude, velocity, and deceleration distributions) from all three facilities are compared revealing a clearly defined altitude "ceiling effect" in the 1290 MHz results relative to the 430/449.3 MHz results. This effect is even more striking in that the Arecibo and PFISR distributions are similar even though the two radars are over 2000 times different in sensitivity and at very different latitudes, thus providing the first statistical evidence that HPLA meteor radar observations are dominated by the incident wavelength, regardless of the other radar parameters. Comparisons among these radar meteor results also reveals that meteoroid fragmentation—including striking two- and three-body events—and "terminal" processes can be studied in significant detail. We will show modeled radar "head-echo" results from fragmented meteoroids.