Modeling the Global micrometeor influx into the Mesosphere/Lower Thermosphere using radar measurements

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We discuss initial results from an effort to model the annual and global micrometeor influx into the Mesosphere/Lower Thermosphere (MLT) atmospheric region based on very precise meteor head-echo radar observations. The principal goal of this effort is to construct a new and more precise sporadic meteoric input function needed for the subsequent modeling of the atmospheric chemistry of the meteoric material and the origin and formation of metal layers in the MLT. Modeling this function requires precise knowledge of the meteor directionality, velocity distributions, mass flux and diurnal and/or annual variability of the sporadic micrometeoroid environment. The model is constructed based on meteor radar observations obtained with the 430 MHz dual-beam Arecibo (AO) radar in Puerto Rico and the 50 MHz Jicamarca (JRO) radar in Peru. We also compare the modeled fluxes with observations from the 1.29 GHz Sondrestrom radar in Greenland , thus utilizing almost the entire NSF ISR chain. The model uses Monte Carlo simulation techniques and at present assumes that most of the detected particles originate from three radiant distributions. The most dominant meteor source has a radiant distribution concentrated around the Earth's apex. The other two sources are centered 80 degrees in ecliptic longitude to each side of the Apex and are commonly known as Helion and Anti-Helion. Each source is introduced with its characteristic particle geocentric velocity distribution. To reproduce the measurements, the Apex source flux was set to three times as many particles as the combined contribution of the two remaining sources. The results of the model are in excellent agreement with observed diurnal curves obtained at different seasons and locations. An empirical atmospheric filtering effect was also introduced in the Monte Carlo simulation in order to obtained agreement with the diurnal and seasonal variability of the meteor rate. This effect prevents meteors with low elevation radiants ($<$ 20 degrees) from being detected by the radars at mesospheric altitudes. The filtering effect is probably produced by a combination of factors related to the interaction of the meteor with

the air molecules such as electron production and/or the ablation at higher altitudes. Based on these results, we calculate the micrometeor global, diurnal and seasonal input in the upper atmosphere.