The diurnal variability of the micrometeor altitude distribution and its relation to meteoroid astronomical and physical characteristics

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In this paper we present a study of the diurnal behavior of the observed meteor altitude distribution at different seasons at both, polar and tropical latitudes. We perform this study utilizing meteor head-echo observations collected with the 430 MHz Arecibo Observatory radar in Puerto Rico and the 450 MHz Poker Flat Incoherent Scatter Radar (PFISR) in Alaska. Although it strongly depends on radar sensitivity, the meteor altitude distribution provides an indication of where the meteoric mass deposition occurs in the mesosphere and lower thermosphere (MLT). This can be utilized to model the input of metallic constituents into the MLT to accurately understand the chemistry of this region. We determine hourly peaks of the altitude distributions at both sites for different months. The results show that the observed altitude distributions have distinct variability at each location. In particular, at high latitudes there is a weak diurnal and strong seasonal variability. At tropical latitudes, on the other hand, the opposite behavior is observed. We explain these results by correlating them with the astronomical and physical properties of the meteoric flux. At different geographical locations the meteoroid entry angles vary differently with time of the day and season. This is due to the position of the main meteoroid radiant distributions relative to the particular radar. This effect potentially filters the mass/velocity particle populations influencing the local MLT and producing the distinct observed results. Finally, we discussed the potential influences that these results have on the metal chemistry and aeronomy of this atmospheric region.