Signatures of background Dust derived from Radar Backscatter from Meteor Trails

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Meteoroids impinging on the Earth's atmosphere burn up at altitudes between about 120 km and 70 km. The evaporating meteoroids form ionized trails which can be located by VHF radars. The decay times of radar echoes from underdense meteors are determined by ambipolar diffusion. Model studies about the influence of a possible background of mostly neutral or positively charged dust (radius $\approx$ 5–15 nm) on the ambipolar diffusion indicate that trails of weak meteors should mostly be influenced. Significant smaller decay times should be observed for weak meteors than for strong meteors.

Continuous radar observations of underdense meteors at high and low latitudes (69˚N/ 22˚S) are used for a systematic study of the variation of decay times of underdense meteors in dependence on echo strength, height, and season. Significantly reduced decay times were found for weak underdense echoes at high and low latitudes at altitudes above about 85 km but slightly different in summer at high (arctic) latitudes. Here reduced decay times of weak echoes are found at altitudes between about 82 km and 88 km during the occurrence of noctilucent clouds (NLC) and polar mesosphere summer radar echoes (PMSE). Both phenomena rely on the existence of charged ice particles. The correlation of reduced decay times with the appearance of NLC/PMSE is a strong indication for the presence of nanometer-sized neutral or positively charged particles which act as condensation nuclei for the formation of NLC/PMSE particles.