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The effect of solar radiation on dust in near-Earth space

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Calculations of the temperatures of dust particles (using the example of carbon particles) heated by solar and terrestrial radiation at altitudes of 65–100 km have been carried out. It is shown that the particles reach temperatures at which visible luminescence begins (T > 900 K) at altitudes exceeding 70 km. The maximum temperature of the particles (T = 2385 K) and the maximum intensity of the light blue glow is reached at an altitude of 85 km. It is shown that particles with sizes of 10 microns or more have a minimum temperature at this height. Their temperature does not depend on the size and is estimated at 300 K. The temperature of particles with sizes smaller than 10 microns increases with a decrease in their size. Carbon particles with sizes smaller than 210-7 m are heated to temperatures of 2385 K, sublimate and eventually cease to exist. The radiation of clusters of such particles against the background of a dark sky in the pre–dawn or post-sunset time can be presented to observers in the form of luminous clouds - Silvery clouds. Dust particles from other materials sublimate at lower temperatures and, consequently, solar radiation leads to the burning of similar dust particles located in near-Earth space not only with submicron, but also with micron sizes. Based on the calculations and analysis of the literature data, the following hypothesis is formulated about the nature of silvery clouds: Silvery clouds are clusters of incandescent nanoparticles

Keywords: Planck's law, Stefan-Boltzmann's law, Wien's displacement law, Kirchhoff's law, diffraction, radiation flux density, radiation coefficient, absorption coefficient, spatial spectral mode, mode energy, sublimation, Knudsen–Langmuir formula, thermal emission, interplanetary dust, subwavelength particles, silvery clouds, mesospheric clouds.

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