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Numerical simulations of polarized microwave emission from cosmic particles in the upper atmosphere of the Earth.

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Abstract

Tons of cosmic material enter the Earth atmosphere every year, most of them being leftovers and debris from comets and shattered asteroids. Many of the estimates of this material influx rely on measurements carried out by observations of meteor showers and by ground-based searches of meteorites in deserted areas, either in hot deserts or in Antarctica. However, global space-based surveys are still missing; these surveys will provide valuable clues on the chemistry and physical properties of near-Earth bodies prior to its fragmentation in the Earth's atmosphere and its later shock with the surface. The thermal emission from this space dust is expected to be polarized due to the alignment of the grains with the solar radiation field and/or the Earth's magnetic field by radiative torques (RATs), depending on their properties (size and composition). In this work, we analyse the expected properties (strength and polarization) of space dust as seen from space. This is done at microwave wavelengths in the context of the project MARTINLARA funded by the Comunidad Autónoma de Madrid, to build a cubesat operating in the 80-220 GHz range, to test new technologies and probe the properties of space dust. The calculations have been carried out using the Monte Carlo code RADMC-3D for a grid of models simulating various possible properties of the dust grains and of their spatial distribution.

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