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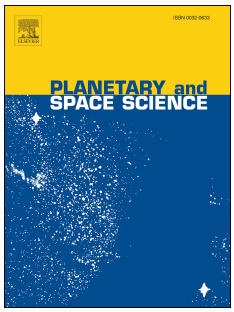

Numerical simulation of surface roughness impact on dust optical properties

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Numerical simulation of surface roughness impact on dust optical properties

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Abstract

A stochastic differential equation method is introduced for geometric modeling of dust surface roughness along with discrete differential geometry technique. Optical scattering properties are computed for randomly oriented spheroidal particles with uniformly random surface roughness. Invariant imbedding T-Matrix and geometric optics method are applied to compute light scattering properties of dust particles covering from Rayleigh to geometric optics region. We simulated optical scattering properties of feldspar with these new model particles, which shows better performance than smooth spheroids. In addition, we also introduce entropy and relative entropy as similarity measures of particle scattering properties, especially phase functions.

Keywords: optical properties; surface roughness; numerical simulation; random field; discrete differential geometry.

1. Introduction

Light scattering by small particles is of great importance both in scientific research[1], and in industrial technology[2][3], examples include dusts, cloud particles, ocean particles, nano metal particles et. al.. In order to characterize these particles, especially dusts, it is necessary to know how they interact with light.

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