Hubble Space Telescope

Cycle 15 AR Proposal

Scattering and Absorption Properties of Porous Dust Grains: A Library for Modeling the HST Optical and near-Infrared Scattered Light Images of Protoplanetary and Debris Disks

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Abstract

We propose a theoretical program to calculate the scattering and absorption properties of porous dust grains grown by coagulation in protoplanetary disks, using the powerful discrete dipole approximation code DDSCAT which can accurately calculate the scattering properties of porous aggregates. This program will create a web-based library of scattering and absorption cross sections, and albedos, asymmetry parameters and phase functions for porous dust as a function of grain size, porosity and wavelength. This library will be made publicly available via the WWW at http://www.missouri.edu/~lia/. These scattering parameters are essential for interpreting the scattered light images of protoplanetary and debris disks in the visible and near-infrared wavelengths obtained with HST, allowing us to reliably determine the disk geometry and dust size distribution. The latter is of particular astrophysical significance since it can tell us whether grain growth -- the first stage of planet formation -- has indeed occurred in protoplanetary disks.

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