Laboratory experiments for light scattering by clouds of small dust particles

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Small dust particles are present in different scenarios in the Solar System like in the atmospheres of planets, satellites, and comets, and surfaces of different objects. By analyzing the solar light scattered by those particles, we can retrieve valuable information about their physical properties (shape, size, and composition). The main purpose of this talk is to show how experimental data of intensity and polarization of the scattered light of different cosmic dust analogues can be used to shed light on the nature of dust particles. In particular, we will focus on samples relevant for the study of cometary comae and asteroids. The measurements of the complete scattering matrix as a function of the scattering angle at visible wavelengths have been performed at the IAA COsmic DUst LABoratory (IAA-CODULAB) [1]. The experimental data can be used in a direct manner, e.g., by comparison with astronomical observations of light scattered in single-scattering conditions in a certain direction, as is the case of cometary dust. Furthermore, the data can be used in an indirect manner if a method is applied to extrapolate the measured angular distributions of the scattering-matrix elements to the full scattering-angle range, including forward and backward scattering [2]. The extrapolated functions can be used to perform multiple-scattering calculations by realistic particles in dense media such as the surfaces of asteroids, cometary nuclei, and planets [3]. The experimental data are freely available in digital form in the Amsterdam-Granada Light Scattering Database at www.iaa.es/scattering [4]. The database consists of two branches, one with experimental data from the Amsterdam light scattering setup [5], and the other one with experimental data from the IAA-CODULAB.

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