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How porosity of dust particles affect cometary polarization

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It is now well accepted that cometary dust particles (alike other cosmic dust particles) are highly porous. The scattered radiation that we receive from the dusty coma of the comets is mostly characterized in terms of polarizations and color. The information of polarization is used as a diagnostic to understand the size and the composition of the dust particles. However, the porosity of the particles is a key parameter which at times is not given due attention in many simulation works.

Nowadays, various numerical codes (T-Matrix, DDA, etc.) are available to investigate the light scattering properties of porous particles – including fractal particles -. However, it is difficult to generate particles with controlled porosities through numerical simulations. In our present work, we use Reaction-Limited Aggregation algorithms, RLA and RLCA (Meakin & Jullien 1988) to generate particles with different porosities (Yue Shen et al 2008). Using then Discrete Dipole Approximation code (Draine & Flatau 1994), we calculate the multispectral light scattering properties of porous grains for various particle sizes, at various wave lengths.

The optical polarization values obtained through the above simulation work are compared with observed polarization data from recent comets, in order to understand how the porosity of coma dust particles impact cometary polarization.

References :

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