Exploring comet dust through advanced numerical modeling of scattered and emitted light

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Scattered solar and thermally emitted light by cosmic dust particles can reveal important information on their physical properties such as size, morphology and composition. Interpreting remotely observed light poses a non-trivial challenge, and it requires solving an inverse problem for Maxwell's equations coupled with a thermopysical model. This is possible only for particles that are small or the same size compared to wavelength and, for practical problems where particles can be much larger that the wavelength, some approximations are needed. Furthermore, a solution to the inverse problem for Maxwell's equation is not unique, thus relying solely on one observable for fitting may result in a misleading interpretation.

In this talk, I will present some recent developments of the approximate and numerically exact solvers for different types of dust particles, and discuss their capabilities and applicability ranges. Further, I will show examples on how to better constrain comet dust properties using multi-instument observations and self-consistent numerical modeling together with dust dynamical modeling.

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