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Polarization as a tool to study dust in small solar system bodies, in the context of future space missions

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The analysis of linear polarization induced by the scattering of sunlight on low-density dust media is of great help to infer the properties of the dust layers forming a regolith, both on the surfaces of asteroids and comet nuclei, and in the dust clouds (cometary comae, zodiacal cloud) that may surround them.
The way the observed linear polarization depends on phase angle and on wavelength allows us to classify the dust comae and the asteroidal surfaces [e.g. 1-3]. Complemented with numerical and experimental simulations on analogue particles (such as meteoritic powders), polarimetric observations provide a wealth of information on the albedo of some asteroids, on the size distribution, and on the porosity of the dust present on such surfaces and in their surrounding clouds [e.g. 4-6].
Compared to main-belt asteroids and other distant objects, near-Earth objects (NEOs) are specially interesting targets for polarimetric measurements, because they can be monitored in a much larger phase-angle range [7]. This allows us a to perform a refined classification, and to easily find out the (primitive) objects of major scientific interest.
In this talk we present statistical estimates of the observations that are needed to classify all newly discovered NEOs in a given year. Future polarimetric observations with large telescopes will allow us to efficiently search for multiple or back-up targets of the anticipated space missions to primitive objects (e.g., NASA OSIRIS-Rex, JAXA Hayabusa II, or ESA MarcoPolo-R). We also discuss the scientific case for polarimetric instruments in space missions, which may for instance lead to a better understanding of different terrains before a landing is attempted.

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