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In the context of Comet Interceptor: Unexpected polarimetric properties of some dust particles in cometary comae and on small bodies surfaces

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The ESA-JAXA Comet Interceptor mission is expected to flyby a dynamically new comet (or an interstellar one) and better reveal the properties of its dust particles and nucleus surface. We therefore tentatively compare polarimetric properties of dust released by some comets, as well as present on surfaces of some small bodies.

Phase curves of the linear polarization of cometary dust particles (observed in equivalent wavelength ranges) show analogous trends. Some unique dynamically new comets or fragmenting comets (e.g. C/1995 O1 Hale-Bopp, C/1999 S4 LINEAR) may nevertheless present a higher positive branch than Halley-type or Jupiter-family comets (e.g. 1P/Halley, 67P/Churyumov-Gerasimenko). Such differences are clues to differences in the properties (sizes, morphologies, complex optical indices) of the dust particles. Dust particles, ejected by nuclei frequently plunging in the inner Solar System, might indeed partly come from quite dense a surface layer, as detected on the small lobe of comet 67P by Rosetta [1].

Although polarimetric observations of surfaces of cometary nuclei are almost impossible, observations of the rather quiescent nucleus of 1P/Encke have been obtained [2]. Similarities between polarimetric properties of 1P/Encke and atypical small bodies (e.g. Phaeton and particularly Bennu [3]), and of dust in cometary comae may be pointed out. Numerical and laboratory simulations could represent a unique tool to better understand such similarities. It may also be added that dust particles originating from comets, with emphasis on those of Jupiter-family, may survive atmospheric entry, as CP-IDPs collected in the Earth's stratosphere, and that dust found in debris disks of stellar systems shows levels of polarization similar to those of highly-polarized comets [4].

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