Joining efforts between studies of cometary dust and meteoroids?

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Various approaches have progressively suggested that a significant fraction of dust particles in the interplanetary dust cloud (i.e., zodiacal cloud), which enter the Earth atmosphere and suffer ablation [1], may originate from Jupiter Family Comets [2-5]. These particles had been ejected from the nuclei of active comets, and had formed meteoroid streams and (for the largest fragments) cometary dust trails. The Rosetta mission to comet 67P/Churyumov-Gerasimenko (67P), together with remote observations of comets and their interpretation, may thus provide clues to the physical properties of meteoroids and micrometeorites.

Main results on cometary dust properties, as reviewed with emphasis on 67P [6], establish i) that the refractory organic phase in cometary dust is dominated by complex organic compounds, meaning that comets are an important reservoir of carbon and organic matter, ii) that the dust particles are aggregates of grains presenting a hierarchical structure, with morphologies ranging from extremely porous to quite compact, and volume filling factors covering many orders of magnitude. Results also point out clear similarities between CP-IDPS and UCAMMs, collected in the Earth's stratosphere and in Antarctica, respectively.

While numerous studies of meteoroids are presently taking place, remote observations of bright comets are tentatively obtained, and future space missions to comets and other small bodies are proposed. Comparisons between properties of cometary dust, meteoroids, and micrometeorites are certainly needed. They should provide, through further joined studies, a better understanding of these objects, the sizes of which range from tens of nanometers for the grains building cometary dust aggregates to meters for chunks released from cometary nuclei or meteoroids.

Results might be of interest, on the one hand for a better quantification of the contribution of dust from space to organics compounds in the Earth atmosphere, on the other hand for some modeling of protoplanetary disks and disks of debris in stellar systems.

References

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