Detection of nanodust in the solar system

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The mass distribution of solar system bodies extends over more than 35 orders of magnitude, from asteroids to nanodust [1], which bridge the gap between molecules and macroscopic sub-micron grains. The large surface-to-volume ratio of nanograins entails them with a privileged role for surface interactions, and their small size compared to the relevant basic scales gives them peculiar properties [2]. In particular the electric charging processes can be different from those of larger dust [3]. Since nanograins have a very large charge-to-mass ratio, the charge plays a major role in their behaviour. In particular, it drives their acceleration to very high speeds in moving magnetised plasmas, as the solar wind and rotating planetary magnetospheres [4, 5]. These properties have enabled them to be detected serendipitously in various parts of the solar system by several instruments designed to study larger dust, plasma particles, or waves, on a number of spacecraft [5, 6, 1, 7, 8]. These discoveries have opened an emerging field of research, in which many open questions remain, in particular concerning the lower size limit of the particles. We will review these different subjects.

References