

The nature of (sub-)micrometre cometary dust particles detected with MIDAS

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Abstract

The MIDAS Atomic Force Microscope (AFM) on-board Rosetta collects dust particles and produces three-dimensional images with nano- to micrometre resolution. To date, several tens of particles have been detected, allowing determination of their properties at the smallest scale. The key features will be presented, including the particle size, their fragile character, and their morphology. These findings will be compared with the results of other Rosetta dust experiments.

1. The MIDAS atomic force microscope

MIDAS (Micro-Imaging Dust Analysis System) [1] is an AFM combined with a dust collection and handling mechanism. MIDAS exposes slightly sticky targets in the vicinity of comet 67P to collect cometary dust. After every exposure, a section of the target is imaged and, if a particle is detected, a follow-up scan performed with optimised parameters. After continuous operation since Summer 2014, MIDAS has detected several tens of particles and is expecting to detect many more around perihelion.

2. Properties of (sub-)micrometre cometary dust particles

The dust particles collected so far are larger and less numerous than initially expected. However, MIDAS' grain detections are in agreement with measurements of other dust experiments on Rosetta if a relatively shallow dust size distribution is assumed.

An overview and a first interpretation of the particle properties is given, focussing especially on the large particles that show fluffy surfaces and very fragile morphology and the smaller particles that are possibly fragments. Comparisons will also be made to the findings of other Rosetta dust experiments.

References

- [1] Riedler, W., Torkar, K., Jeszenszky, H., Romstedt, J., et al. MIDAS The Micro-Imaging Dust Analysis System for the Rosetta Mission, *Space Science Reviews* 128 (1-4), p. 869-904 (2007). doi:10.1007/s11214-006-9040-y