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Characterization of dust aggregates in the vicinity of the Rosetta spacecraft

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Abstract

In a Rosetta/OSIRIS imaging activity in June 2015, we have observed the dynamic motion of particles close to the spacecraft. Due to the focal setting of the OSIRIS Wide Angle Camera (WAC), these particles were blurred, which can be used to measure their distances to the spacecraft. We detected 108 dust aggregates over a 130 minutes long sequence, and find that their sizes are around a millimetre and their distances cluster between 2 m and 40 m from the spacecraft. Their number densities are about a factor 10 higher than expected for the overall coma and highly fluctuating. Their velocities are small compared to the spacecraft orbital motion and directed away from the spacecraft, towards the comet. From this we conclude that they have interacted with the spacecraft and assess three possible scenarios. We prefer a scenario where centimeter-sized aggregates collide with the spacecraft and we would observe the fragments. Ablation of a dust layer on the spacecraft's *z* panel when rotated towards the sun is a reasonable alternative. We could also measure an acceleration for a subset of 18 aggregates, which is directed away from the sun and can be explain by a rocket effect, which requires a minimum ice fraction in the order of 0.1%.

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