Operating Spacecraft Around Comets: Evaluation of the Near-Nucleus Environment

With proper design and operations planning, the near-nucleus environment of a comet can be a relatively safe region to operate a spacecraft.

- Combining sophisticated engineering models of spacecraft behavior and recent spacecraft proximity operations experience (e.g., Rosetta), we find that the conditions around a comet are generally more benign than a typical day on Mars.
  - Gas densities similar to good laboratory vacuums
  - Dust densities similar to Class 100 cleanrooms
  - Dust particle velocities of 10's of m/s
  - Microgravity forces permit slow, deliberate operations

Lessons-learned:

- Surface contamination only a concern if spending >months to years within kms of the comet nucleus.
- Stochastic forces on spacecraft can be accounted for by using modern Attitude Control Systems.
- Next generation star trackers with improved algorithms will address confusion caused by dust particles.

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