Using Cubesats to Monitor Debris Flux

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Recent updates to NASA's Orbital Debris Engineering Model (ORDEM 3.0) include a population of small particles (1-2 mm in size) composed of high-density materials (e.g., steel) that drive much of the predicted risk for satellites in the 700-1000 km altitude regime. This modeled population was based on the analysis of returned surfaces of the Shuttle, which flew below 600 km altitude. The cessation of Shuttle missions, plus the lack of *in situ* data above 600 km means that a data source is being sought to either confirm or modify this high-density population.

One possible data source would be a database of anomalous sporadic changes in spacecraft orbit/orientation that might be due to momentum transfer from small particles too small to seriously damage the spacecraft. Because the momentum imparted from an impact would be tiny, it would most likely show up in the orbital behavior of cubesats and other small satellites. While such small satellites were few in number, this was not a particularly attractive option, but now with the proliferation of cubesats in multiple orbit planes and altitudes, the possible collecting area has increased significantly.

This presentation will discuss the physics of momentum-transferring impacts from hypervelocity collisions, and make predictions about rates, directions, and locations of such impacts. In addition, it will include recommendations for satellite users on what kind of data might be worth archiving and investigating.