Geophysical Research Abstracts
Vol. 12, EGU2010-7760, 2010
EGU General Assembly 2010

Status Report of Development of a Sensor for In-Situ Space Dust Measurement

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The importance of measuring dust particles (larger than 100 μm) has increased, especially from engineering viewpoints (e.g. space system design and operations). However, it is difficult to measure the impact flux of these large particles because of the low spatial density of large particles (larger than 100 μm). Sensor systems to monitor these sizes must have a large detection area, while the constraints of a space environment deployment require that these systems be low in mass, low in power, robust and have low telemetry requirements. The in-situ measurement data are useful for; 1) verifications of meteoroid and debris environment models, 2) verifications of meteoroid and debris environment evolution models, 3) real time detection of unexpected events, such as explosions on an orbit (Ex. ASAT: Anti Satellite Test). JAXA has been developing a simple in-situ sensor to detect dust particles ranging from a hundred micrometers to several millimeters. Multitudes of thin, conductive strips are formed with fine pitch on a thin film of nonconductive material. A dust particle impact is detected when one or more strips are severed by the impact hole. The sensor is simple to produce and use and requires almost no calibration as it is essentially a digital system. The authors have developed prototypes of the sensors and performed hypervelocity impact experiments. As a result, prototype models have been manufactured successfully and the projectile diameter (debris diameter) is able to be estimated from the number of broken strips.This presentation reports the development status and actual flight plans of the sensor.