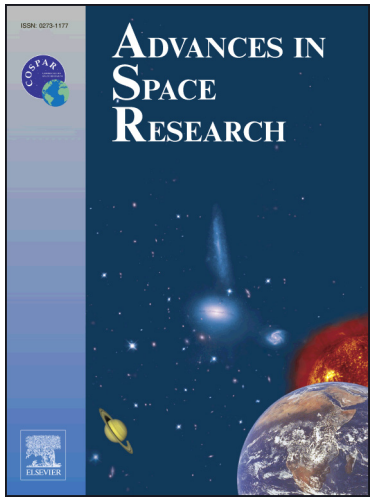

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MEASUREMENTS OF MICROPARTICLE FLUXES ON ORBITAL SPACE STATIONS FROM 1978 UNTIL 2011

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Abstract

This paper presents the results of solid microparticle fluxes in-flight measurements on the Salyut-6, Salyut-7, Mir space stations and the International Space Station over a 33-year period (1978–2011). Fluxes of microparticles within size range of 10–500 μm were evaluated by analyzing the number and sizes of holes in thermal control coatings of plastic track detector for heavy nuclei of cosmic rays (the PLATAN experiment) and by studying craters in polished samples of some ductile and brittle materials and on the surface of a specimen cartridge (the KOMPLAST experiment). Some measurements of PLATAN (2002–2004) and KOMPLAST (1998–2011) experiments on International Space Station were carried out simultaneously. In this paper the experimental data obtained in both experiments are compared with each other as well as with results of other experiments and with ORDEM model predictions.

Keywords: micrometeoroid, space debris, microparticle flux, measurement, space station

1. Introduction

Measurements of microparticle fluxes in the near-Earth space is an important task both for theoretical studying the micrometeoroids and space debris environment and for protecting spacecraft against hypervelocity impacts of solid incident particles. Impact of solid particles with diameters less than ~1 mm (microparticles) on spacecraft materials and equipment is considered as a permanent threat and has been investigated in many in-flight experiments.

The results of earlier measurements were reported in the review of Kesler (1993). In the PLATAN and KOMPLAST time span (1978–2011), investigations of the microparticle environment in the low-Earth orbits were carried out on satellites (McDonnel et al., 1997; Bauer et al., 2014) and on the manned space stations. For instance, the Aragatz (1988–1989, 13 months), ESEF (1995, 3 months), PIE (1996–1997, 11 months) and NASA MEEP/PPMD

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