Investigation Title: Mir Sample Return Experiment (MSRE)

Principal Investigator(s): Peter Tsou, Ph.D., Jet Propulsion Laboratoy

Additional Investigator(s): Not provided by PI

INVESTIGATION OBJECTIVES

The objective of the MSRE experiment was to collect intact cosmic dust for chemical, isotopic, organic analysis.

PHASE 1 MISSIONS

STS-76, NASA 2 - NASA 5, STS-86

OPERATIONAL ACTIVITIES

The MSRE experiment was delivered to the Mir Space Station during the launch of the Priroda Module from Baikonur Kazakstan. During an EVA by the Mir 21 crew, the experiment was attached to the exterior of the KVANT-2 Module. PIE remained outside the Mir station, requiring no crewtime during the NASA 2 and NASA 3 missions. During the NASA 4 mission, an EVA was conducted by NASA Astronaut Dr. Jerry Linenger to retrieve the experiment. The experiment was returned for study aboard the STS-84 Space Shuttle mission.

RESULTS

Besides the preliminary examination, which revealed that the longer duration exposure showed higher concentration of particles captured and an alarming number of very small particles observed, MSRE will not be analyzed until early 1999 after STARDUST is launched due to PI involvement with that mission.

CONCLUSIONS

Not provided by PI

PUBLICATIONS

Not provided by PI

Investigation Title: Particle Impact Experiment (PIE)

Principal Investigator(s): Carl R. Maag, Ph.D., T&M Engineering

Additional Investigator(s): S. P. Deshpande

INVESTIGATION OBJECTIVES

The PIE investigation had three main objectives and three tertiary objectives. The main objectives were: to capture micron/submicron dust grains in a manner that insures minimal particle degradation, to return the captured particles to Earth for complete, detailed analysis to determine the grain composition, and to identify the particle remnants of any micron sized extraterrestrial grains to be related with the possible cometary origin of the grains. The tertiary objectives included: the assessment of the level of contamination seen on the returned hardware, to study the effects of UV-radiation on organic molecules in space, and to assess hard radiation environment levels, constituents and effects.

PHASE 1 MISSIONS

NASA 2 - NASA 4, STS-84

OPERATIONAL ACTIVITIES

The PIE experiment was delivered to the Mir Space Station during the launch of the Priroda Module from Baikonur Kazakstan. During an EVA by the Mir 21 crew, the experiment was attached to the exterior of the KVANT-2 Module. PIE remained outside the Mir station, requiring no crewtime during the NASA 2 and NASA 3 missions. During the NASA 4 mission, an EVA was conducted by NASA Astronaut Dr. Jerry Linenger to retrieve the experiment. The experiment was returned for study aboard the STS-84 Space Shuttle mission.

RESULTS

Data analysis is still ongoing. However, a total of 77 impacts have been observed.

CONCLUSIONS

After 327 days on the Mir station, the following preliminary conclusions can be drawn:

- A flux-mass distribution of impacting particles has been derived with reasonable accuracy due to the large time-area exposure. Several intact captured particles have been located and removed.
- The impact data observed at the larger sizes is well above the predicted values: This suggest one of several things:
    1. The population density of larger sized particles is greater than believed at these higher altitudes (and by inference, those immediately above them); and/or
    2. The growth rate at the larger sizes is equivalent or greater that that for the smaller sized particles.
- Silicon contamination (as SiOx) was observed on the returned hardware. This has also been observed previously on other hardware returned from Mir.

PUBLICATIONS

Not provided by PI