1. Title

2. Research Term
FY2002—2003

3. Research Fields
Space Utilization Technology Development

4. Research Categories
Germinating Research

5. Research Theme
Development of self-controlled and self-powered space experiment support system with passive vibration isolation system

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8. Summary of Research
In the previous research entitled “Microscopic and Macroscopic Effects of G-jitter on Fluid Phenomena,” the impact of g-jitter on fluid phenomena, such as diffusion, convection and so on, has been systematically investigated involving g-jitter analysis and development of a vibration isolation system. The results have shown the existence of the influence of g-jitter on diffusion phenomena. Thus, experimental cells, a control unit, a power unit and a passive isolation system and so on for a diffusion experiment were developed receiving support from JSUP as shown in Fig.1. Their functions were successfully examined by parabolic flights. With these results, this experimental equipment was presented at JUSTSAP (Japan-US Science, Technology and Space Application Program) Workshop in 2001 and our
experimental concept on diffusion was proposed as a candidate of space experiment. There, our proposal has been officially decided as a post-JUSTSAP (Japan-US Thermal Science Accelerometer Project) experiment.

In this research, to increase the possibility of space flight of our experiment, a self-controlled and self-powered experimental equipment, whose engineering model has been already developed as mentioned above, has been improved on its weight, controllability and power transport method using new passive dampers as shown in Fig. 2. Parabolic flight experiments have been made to validate the dampers. They achieve much better performance than older ones as shown in Fig. 3 on damping factor and resonance frequency. Moreover, some improvements as an experiment support system for generic use have been also made to the equipment. To analyze the experimental results as low-diffusion factor phenomena, several numerical simulation methods has been investigated. It has been found out that even periodic accelerations can move a diffusion material to one direction like steady accelerations.

In September, 2003, we got the information from SPACEHAB about an opportunity to fly this experiment on a Shuttle mission to the ISS in the first half of 2005. We gave a firm commitment to them in December. We decided to have an agreement for the experiment in FY 2004. But in this March, NASA informed us that they will terminate the agreement because they will not conduct activities that do not relate to President Bush’s exploration initiate. Therefore we are sorry we have shut the commitment down.

9. Publication List

*Journal Papers


*Presentations


10.URL