

MICROGRAVITY SCIENCES AND PROCESSES SYMPOSIUM (A2)  
Microgravity Experiments from Sub-Orbital to Orbital Platforms (3)

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IMPROVEMENT, EVALUATION AND MEASUREMENT OF THE MICROGRAVITY LEVEL IN  
RECOVERABLE SATELLITES

**Abstract**

The recoverable satellite is the major platform for space microgravity scientific experiments in China. These experiments are usually expected to carry out in a perfect gravity-free environment in outer-space. However, due to the existence of some disturbing factors such as atmosphere drag, tide forces, solar radiation pressure, attitude and orbit control, movable components on satellite and so on, it is difficult to obtain a high quality of microgravity environment, consequently there may be adverse effects of these disturbing factors on space microgravity experiments. So, to obtain and keep a high quality of microgravity environment is a very important research topic for the space science satellite.

In this paper, firstly, the system design technologies to improve and keep microgravity environment have been introduced for the recoverable satellite, including raising the orbit altitude of satellite, choosing the low-thrust thruster, and so on. Secondly, the evaluation results of the microgravity level of a recoverable satellite have been given. The quasi-steady acceleration (frequency under 0.1 Hz) was evaluated analytically, and the micro-vibration (frequency between 0.1Hz and 300Hz) was evaluated by utilizing the analytical and experimental method. The results have been shown that the maximum value of the quasi-steady acceleration was about  $2 \times 10^{-6}g_0$  on the recoverable satellite, which mainly depends on the atmosphere drag and tide forces. And the maximum value of the micro-vibration was about  $10^{-3}g_0$ , which was mainly determined by the pumps of the fluid loop thermal-control system. Finally, the in-orbit microgravity measurement technology of China recoverable satellites has been detailed described, including the system configuration, measurement principle, operating modes and technical specifications, etc.