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REDUCTION REQUIREMENTS OF RESIDUAL NON-GRAVITY DISTURBANCES OF THE INNER FORMATION FLYING SYSTEM FOR EARTH GRAVITY MEASUREMENT

Abstract

The Inner Formation Flying System consisting of an outer satellite and an inner satellite can construct a pure gravity orbit to precisely measure the earth gravity field. The inner satellite is a sphere proof mass freely flying in the shield cavity of the outer one, which is controlled to follow the inner satellite and not contact with it. So the inner satellite is shielded from non-gravitational forces such as atmosphere drag, radiation pressure and et al, flying along a pure gravity orbit ideally. Then the global gravity field model can be evaluated by the precision orbital data of the inner satellite after one or more whole earth coverage. However, the inner satellite is disturbed by the residual non-gravity disturbances in practice and will drift away from the pure gravity orbit. The residual disturbances acting on the inner satellite mainly include mass attraction of the outer-satellite, radiometer effect, radiation pressure, residual gas damping, electromagnetic forces, impaction of the space particle and relative measurement disturbance. To achieve the mission goal, the total effect of residual disturbances must be kept less than 10-10 m/s2. This paper addresses the problem of analysis and reduction of the residual disturbances. Firstly, the analytical models and numerical methods of the main disturbance sources are presented. It can be indicated that the disturbances lie on the corresponding parameters. Then, restrictions of the environment physical parameters and the satellite design are given to meet the disturbance reduction requirements feasibly.