EARTH OBSERVATION SYMPOSIUM (B1)
Poster Session (P)

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ORBIT DESIGN AND ANALYSIS FOR MIT COUPLING CONSTELLATION

Abstract

The Magnetosphere-Ionosphere-Thermosphere(MIT) coupling constellation is a candidate mission before engineering phase of the Space Science Strategic Pioneer Program. Its primary objective is to investigate the mass coupling and electro-dynamic coupling of the magnetosphere and ionosphere and thermosphere, such as the origin of the outflow ions and their acceleration mechanism, the impact of the outflows ions on magnetic storm development, etc. The key exploration regions for MIT coupling constellation are in the up-flow and acceleration region of ionospheric ions with altitude from 600-800km to 5- 9 earth radius and magnetic latitude above 70 degree. So the MIT requires a constellation with several satellites flying in different altitude to get a joint observation. The optimization criterion for orbit design of MIT coupling constellation is to guarantee the joint observation time is as long as possible. In this representation, we have designed a four-satellite constellation and optimized their orbital elements to make sure that the joint observation time is long enough. Simulation has shown that the design is satisfied with optimization criterion .To get a stable constellation, we take into account the orbit compensation for the non-spherical perturbation of the earth, the atmospheric drag, the third-body perturbation. In our design, we also show you the orbit control strategy with the limitations such as the launcher capability and the orbit accuracy, etc.