SPACE EXPLORATION SYMPOSIUM (A3)
Solar System Exploration (5)

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ORBIT DESIGN FOR SOLAR POLAR ORBIT TELESCOPE

Abstract

Solar Polar Orbit Telescope (SPORT)will be the first mission to image the propagation and evolution of ICMEs continuously from out of ecliptic plane, which is proposed and studied by the Center for Space Science and Applied Research, Chinese Academy of Sciences. To achieve this mission, the inclination angle between the orbit of SPORT and ecliptic plane should be above 70 degrees. As known, solar polar orbit can be achieved with the Jupiter gravity-assist like Ulysses, but one problem of the trajectory with Jupiter gravity-assist was the long period(about 5 years), with a minimum aphelion radius at about 5 Auwhich did not fit for frequent scientific observation of the polar region of the Sun. This paper presents one method to achieve short period out of ecliptic trajectories by using the Earth or the Venus gravity assists after a Jovian gravity first. Several Simulations in Satellites Tool Kit(STK) has proved that the Earth/Venus gravity-assists at a high speed velocity after a Jovian gravity first still can effectively amending the trajectories periods. Once Earth or Venus flyby after a Jovian gravity can change the orbit period from more than 5 years to almost 3 years by reducing the heliocentric velocity about 1.8km/s. Simulations of multiple Earth or Venus flybys after a Jovian gravity have also been performed in STK. The minimum orbit period can be reduced into 1.5 years with only about 80m/s delta-V.