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SATELLITE SWARM SYSTEM FOR MEASURING GRAVITATIONAL FIELDS OF JOVIAN
PLANETS

Abstract

The gravitational field of outer solar system planetary bodies can be expressed in terms of spherical harmonic functions. They are essential to characterise the gravitational anomalies due to mass transport processes in the planetary interiors. Doppler measurements from satellites are utilized to determine the gravitational potential around the planet and its spatial variations. Missions to outer planets like Voyager 2, Juno and Cassini have provided estimates of gravitational harmonics widening the understanding of planetary interiors. In this paper, a satellite swarm system concept is proposed to study the gravitational field in environments of Jovian planetary systems. The study proposes a concept to utilize frequency residuals from multiple satellites as a probe to understand planetary interiors. Retrieval methods are proposed for multi-satellite observations and the effects of different sources of error are discussed. Further, the challenges and opportunities associated with different planetary environments are explored to aid the advancement of outer solar system exploration.