# XXII Brazilian Colloquium on Orbital Dynamics, 2 - 6 December, 2024

### **CBDO**



## Program and Book of Abstracts



National Institute for Space Research INPE Av. dos Astronautas, 1758 São José dos Campos, SP, Brazil

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### **CBDO 121**

### Searching for orbits around Io considering the Laplacian resonance

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The planning of space missions to visit small bodies in the Solar System has been a subject of great interest for space agencies. The main targets are the moons of Jupiter and Saturn, due to the possibility that they may support life, so the composition and geology of these moons will be investigated. In this sense, the Europa Clipper mission will have the main objective of investigating sites below the surface of the ice moon Europa that could support life. Therefore, this mission is scheduled to be launched at the end of this year and the insertion of the spacecraft into the orbit of Jupiter should take place by 2030. Another important moon to be studied is Io, because it has many Earth-like phenomena, such as intense volcanic activity, so it is a possible target for future exploration missions. In this context, the goal of this work is to study the timing of orbits around Io, considering perturbations from Jupiter and the Laplacian resonance. The effects of the non-uniform mass distribution of the Io will also be considered. The possibility of losing the spacecraft due to collisions with the surface of Io and the cases in which the probe leaves the region of interest will be investigated. It will be considered that the probe describes a three-dimensional orbit around Io. The package IAS15, which is part of the REBOUND integration package, will be used to integrate the equations of motion. The integration will be performed at the center of mass of the system and the reference plane considered will be the plane of the equator of Io. The resonant argument will be calculated at each integration step. Therefore, the best initial orbital conditions which would allow orbits with durations suitable for space missions will be mapped.

### References

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