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EVASIVE MANEUVERS ON A COLLISION COURSE WITH CLOUD OF SPACE DEBRIS

Abstract

Collisions with space debris can completely derail a space mission. The collisions between debris generate fragments that form a cloud of smaller debris, increasing the possibility of collision with the operational vehicle. In this study we investigated the relative collision dynamics between an operational vehicle and a cloud of space debris. Additionally, we analyze the characteristics of evasive maneuvers before the collision between the debris cloud. Our results show a distribution of the collisional debris sizes on the celestial sphere, whose radius is equal the initial relative distance between the operational vehicle and the cloud. They indicate that there is a higher risk of collision between debris, if one moves in the longitudinal direction than in the polar direction. We find the collision possibilities between sizes of debris up to 10m along the radius of the celestial sphere equal to 3km and a time of collision of 3,000 s. These results vary with collision time over the sphere. Considering small angles, and relatively large distances, the dynamics with 5 debris favors the debris of the sizes between 3.5 and 4.5 cm. Size debris of the order of 10cm collide less frequently.