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Space debris in LEO region and the reentry in Earth

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Since the launch of the first artificial satellite, several space missions have been realized putting objects around the Earth. In this way, some studies are important to preserve the operability of the artificial satellites. One of these researches considers the increasing number of space debris and collision risks [2].

The constant monitoring of the operational satellites in LEO (Low Earth Orbit) region is necessary, observing the possible collisions between objects and reentry in Earth. The time behaviors of the orbital elements of space debris can be useful for planning evasive maneuvers, and therefore, to avoid collisions and a premature reentry of spacecrafts (including, for example, the ISS - International Space Station).

The orbital dynamics of cataloged objects can be analyzed using the 2-line element group, or TLE of the NORAD (North American Defense) [1, 4].

A method is used to propagate the space debris's orbits. The initial data of space debris are taken from real orbital motions shown in the Two-Line Elements [4]. After that, the real data are corrected and then propagated in time using the SGP4 model. In this process, a Fortran program is used. More details about this method is shown in [1].

The objects, in the reentry process, they are faster when near the Earth's surface. The space debris analyzed can be fragments, tools and rocket bodies from space missions, for example [3]. The predictions described happen in 2021 and they can represent a safety planning and avoid risks to the population in Earth.

In this work, a study is realized about space debris orbiting the Earth. These objects reentry in the Planet from LEO region. The TLE data are used and the orbit propagation is done considering the effects of the Geopotential and Atmospheric Drag. The results show the time behaviors of the semi-major axis, eccentricity and inclination making possible the analysis of orbital dynamics.

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