

## A symplectic integrator for geosynchronous space debris

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Understanding the motion of such uncontrolled objects is of great importance in order to reduce the risks of hypervelocity impacts with manned and unmanned spacecraft. We present an accurate symplectic integration scheme to numerically propagate space debris orbits over long periods of time. Among the perturbations that influence debris motion, we mainly bring new results about the effects of solar radiation pressure on debris characterized by high area-to-mass ratios. In this case, Earth’s shadow crossings cannot be neglected. Hence we propose an innovative method that successfully models shadow crossings and does not break the symplectic properties of our propagator. Both cylindrical and conical shadows are considered. We show that the cylindrical model is only a poor approximation of the more realistic conical model, especially for high area-to-mass ratios.

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