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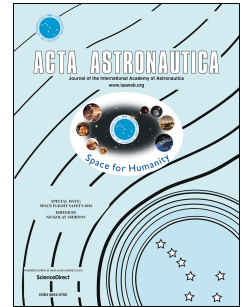
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# Geosynchronous inclined orbits for high-latitude communications

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## Abstract

We present and discuss a solution to the growing demand for satellite telecommunication coverage in the high-latitude geographical regions (beyond  $55^\circ\text{N}$ ), where the signal from geostationary satellites is limited or unavailable. We focus on the dynamical issues associated to the design, the coverage, the maintenance and the disposal of a set of orbits selected for the purpose. Specifically, we identify a group of highly inclined, moderately eccentric geosynchronous orbits derived from the Tundra orbit (geosynchronous, eccentric and critically inclined). Continuous coverage can be guaranteed by a constellation of three satellites in equally spaced planes and suitably phased. By means of a high-precision model of the terrestrial gravity field and the relevant environmental perturbations, we study the evolution of these orbits. The effects of the different perturbations on the ground track (which is more important for coverage than the orbital elements themselves) are isolated and analyzed. The physical model and the numerical setup are optimized with respect to computing time and accuracy. We show that, in order to maintain the ground track unchanged, the key

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