
On the motion of Molniya spacecraft ruled by manifold dynamics

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Abstract

During this talk I will describe the phase space structures related to the semi-major axis of Molniya-like artificial satellites subject to tesseral and lunisolar resonances. In particular, I will discuss the dynamics beyond the resonant integrable approximation. By using tractable models averaged over fast angles, I will delineate the hyperbolic structures organising the long-term dynamics via Fast Lyapunov Indicators cartography. Finally, based on the publicly available two-line elements space orbital data, I will provide evidence that two satellites, namely M1-69 and M1-87, display fingerprints consistent with the dynamics associated to the hyperbolic set. This research therefore reports on actual artificial satellites in the near-Earth environment whose dynamics are ruled by manifolds and resonant mechanisms. This is a joint work with Elisa Maria Alessi, Joseph O’Leary, Anne Lemaitre and Alberto Buzzoni.

Keywords: Molniya orbit, Tesseral resonance, Lunisolar resonance, Fast Lyapunov Indicator, Space Situational Awareness.

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