Variation in argument of perigee for near-earth satellite orbits perturbed by earth's oblateness and atmospheric drag in terms of KS elements

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Abstract

Analytical solutions with the KS element equations of motion due to the combined effect of zonal harmonics J_2, J_3 and J_4 and drag by considering an analytical oblate diurnal exponential density model when density scale height varies with altitude is obtained using series expansion method. Terms up to third terms in e, eccentricity, c, a small parameter depending on the ellipticity of the atmosphere and second order terms in μ, gradient of the scale height altitude are considered. The KS element equations are numerically integrated (NUM) through a fixed step size fourth-order Runge-Kutta-Gill method having a very small step-size of half degree in the eccentric anomaly for comparing analytically integrated (ANAL) values. After 100 revolutions, decrease in argument of perigee, ω, at perigee height = 400 kilometer, e = 0.1 and inclination i = 20 and 80 degrees, are found to be 7.42 and 39.8degrees. At i =80 degree, the percentage error = (ANAL - NUM) / NUM after 1 and 100 revolutions are 0.61 and 2.09.

Biography

Lila S Nair taught mathematics for more than 30 years under University of Kerala, India where she served as an Associate Professor and Head of the Department of Mathematics. She retired in 2012 from her academic career. Her credentials include MSc, MPhil and PhD in Space Dynamics working with the renowned Vikram Sarabhai Space Centre (branch of Indian Space Research Organization). Her major works concentrate on predicting orbits of artificial satellite using perturbed KS element equations of motion. She was COSPAR Associate during 2002-2005 and presented at COSPAR 2002 in Houston. She has completed a major project funded by Government of India on "Orbit predictions of a near-earth satellite under the combined effects of the earth's oblateness and air drag in terms of KS elements"

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