Geophysical Research Abstracts, Vol. 7, 10495, 2005
SRef-ID: 1607-7962/gra/EGU05-A-10495
© European Geosciences Union 2005

New estimations for the radius of geo-stationary satellite orbits based on spherical and ellipsoidal gravitational models

A. Ardalan, T Silavi

Department of Surveying and Geomatics Engineering, University of Tehran (ardalan@ut.ac.ir)

Geo-stationary orbit has been in used since 1964 for telecommunication purposes. Our investigation on orbit of such satellites revealed that the radius of geo-stationary satellites are so far computed based on the point mass $W = GM/r$ gravitational model of the Earth. To investigate the effect of more improved Earth's gravitational models on the radius of the Geo-stationary satellites we have considered following models: (i) Bjerhammar gravitational potential field, (ii) first term of ellipsoidal harmonic expansion of the Earth's gravitational field, (iii) Somigliana-Pizzeti gravitational potential field. According the results of the computations the radius of the Geo-stationary satellite computed based on the aforementioned gravitational potential models are deviated from the radius computed based on point mass model $W = GM/r$, by (i) $0.5km$, (ii) $2.15km$, and (iii) $2.7km$, respectively. Since such an error in the radius of geo-stationary satellites results in small movements of the satellite in orbit that justifies why the current geo-stationary satellites require fuel and racket engine to fine tune the position of the satellite in its orbit at the specific interval of time. This orbital maneuvers are so important that even the life time of those satellites is determined from the time span that their fuel allows for the fine tuning of the orbit. Based on the computations the radius of $42,161,465.71m$, computed based on the Somigliana-Pizzeti gravitational potential field is recommended for the placement of geo-stationary satellites.