SEMI-ANALYTICAL METHOD TO STUDY GEOPOTENTIAL PERTURBATIONS CONSIDERING HIGH ECCENTRIC RESONANT ORBITS

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A dynamic system describing the orbital motion of artificial satellites with mean motion commensurable with the rotation of the Earth, including harmonics of high degree and order in the geopotential perturbations, is studied. The equations of motion and the geopotential are expressed in terms of convenient modified Delaunay variables. Hansen's coefficients are used and the dynamic system doesn't contain restriction for any eccentricity $0 \leq e < 1$. An integrable kernel is searched through canonical transformations. One resonant angle is fixed and the dynamic system can be reduced to a two degree of freedom system. Thanks to the properties of the Hansen's coefficients, all the coefficients of the reduced Hamiltonian are computed analytically. For low eccentric orbits analytical solutions can be obtained and expressed in terms of elliptic functions. Numeric simulations for highly eccentric orbits and 2:1 resonance are presented. The behavior of the dynamical system near the resonance is shown. Phase planes, variation of orbital elements with the resonant angle, time variation of the semi-major axis and time variation of the resonant angle are exhibited.