Elliptic Anomaly Expansions to Construct High–Eccentricity Artificial Satellite Theory

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Abstract. In the recent paper (E.Brumberg *et al.,* 1995) the Kaula's satellite linear perturbation theory has been modified for the case of highly eccentric orbits by replacing the mean anomaly M and eccentricity e by the elliptic anomaly w and Jacobi nome q associated to the modulus $k = e$ of Jacobi elliptic functions. The main perturbations due to the Earth's asphericity referred to the fixed equator were treated there. This technique is generalized here in three aspects:

- inclusion of the third-body (luni-solar) perturbations,
- employment of the arbitrary reference plane (the fixed ecliptic) enabling one to take into account the perturbations due to the rotation of the equatorial plane, and
- representation of the final perturbations explicitly in terms of w resulting in improved efficiency of the technique.

With minor modifications this technique may be used to represent the motion of asteroids and comets in highly eccentricitry orbits.

Key words: Satellite motion, Kaula's theory, elliptic anomaly.

References

Brumberg, E., Brumberg, V.A., Konrad, Th., and Soffel, M.: 1995, 'Analytical Linear Perturbation Theory for Highly Eccentric Satellite Orbits', *Celes. Mech. and Dynam. Astron., in press.*