

Relative satellite motion in a formation

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The paper concerns the precise analytical description of the relative motion of satellites flying in a formation. We study the relative satellite motion without any restriction as to the plane of the satellite orbits as well as their eccentricity and inclination. In our analysis we take into account the influence of geopotential and luni-solar perturbations.

We present two completely different methods for analytical calculation of differential perturbations. In the first one we present formulas for differential perturbations in the radial, transverse and normal components of the radius vector. The second method contains analytical formulas for differential perturbations in orbital elements. Using the both methods we calculated differential perturbations in relative positions of satellite formation members. We also calculated predicted positions of the formation units with the use of these two methods. Good agreement, on a level of 0.1%, between results obtained from the two methods confirms the correctness of the theories. Our paper will present some numerical results of differential perturbations for different formations with the use of different force models.