The Celestial Bodies Motion Theories: On the Required Accuracy of the Motion Theories of the Perturbing Bodies

E.D. Kuznetsov
Department of Astronomy and Geodesy, Urals State University
Lenin prospekt 51, 620083 Ekaterinburg, Russia
edkuz@astro.urgu.e-burg.su

To construct the celestial body motion theories one needs to calculate coordinates of the perturbing bodies. The algorithm of coordinate calculation must be simple but sufficiently accurate. The problem of an estimation of allowed error for modelling of the per -turbing bodies motion is considered. The equation $\Delta\rho = \gamma\Delta F$ relates the accuracy ΔF required to take into account perturbing acceleration ac -ting on the celestial body with the accuracy $\Delta\rho$ of the motion theory of the perturbing body. Here γ is a coefficiant depending on coordinates of celestial and perturbing bodies. For calculation of function XX in spherical coordinates both "external" ($r < \rho$, here r is distance from attraction center to celestial body, ρ is distance from center to perturbing body) and "inner" ($\rho < r$) problems are considered. The general equation for calculation of *gamma* in Cartesian coordinates is obtained. The limitary cases both $r << \rho$, $\rho << r$ and $\Delta << \rho$(Δ is distance from celestial body to perturbing body) are considered. Calculation of coefficient γ for perturbations of artificial satellites of the Earth from the Moon and Sun, and perturbations of small bodies of the Solar System from the planets is considered as an example.