ПРИЛОЖЕНИЕ. ВЫВОД КОЭФФИЦИЕНТОВ (67)

Запишем выражение (61) с учетом интеграла (65) в полном виде

$$-8\pi G\cdot W_{\rm in}=-\frac{4}{3}\pi G(n+1)\left(\Omega^2 I_3+W_{\rm t}\right)+\Omega^4\int_V r^2dV+$$
$$+2\Omega^2\left(h_2+\frac{1}{2}\Omega^2 h_1+\frac{(5-n)W_{\rm t}}{3\rho_{\rm m}}-\frac{(5+2n)}{6\rho_{\rm m}}I_3\Omega^2\right). \quad (\Pi 1)$$

Разделим обе части этого выражения на $\frac{4}{3}\pi G$, получим

$$-6W_{\rm in}=-(n+1)\left(\Omega^2 I_3+W_{\rm t}\right)+\frac{3h_1}{4\pi G}\Omega^4+$$
$$+2\Omega^2\left(\frac{3h_2}{4\pi G}+\frac{3h_1}{8\pi G}\Omega^2+\frac{(5-n)W_{\rm t}}{6\pi G\rho_{\rm m}}-\frac{(5+2n)}{8\pi G\rho_{\rm m}}I_3\Omega^2\right). \quad (\Pi 2)$$

Для дальнейших преобразований удобно ввести безразмерные величины

$$\Omega^2\to\frac{\Omega^2}{2\pi G\rho_{\rm m}},\ \mathrm{W}_{in}\to\frac{W_{in}}{\pi G\rho_{\rm m}I_3},\mathrm{W}_t\to\frac{W_t}{\pi G\rho_{\rm m}I_3}. \quad (\Pi 3)$$

Раскрывая (П2), запишем это выражение в виде (66) с коэффициентами

$$a=(2\pi G\rho_{\rm m})^2 I_3\left[\frac{3h_1}{2\pi GI_3}-\frac{5+2n}{4\pi G\rho_{\rm m}}\right];$$
$$b=(2\pi G\rho_{\rm m})I_3\left[\frac{1+n}{2}-\frac{3h_2}{4\pi GI_3}-\frac{(5-n)}{4}W_{\rm t}\right]; \quad (\Pi 4)$$
$$c=\left(6W_{\rm in}-(1+n)W_{\rm t}\right)\pi G\rho_{\rm m}I_3.$$

Сокращая теперь все коэффициенты (П4) на $\pi G\rho_{\rm m}I_3$ и вновь переходя к размерным компонентам $W_{\rm in}$ и $W_{\rm t}$, в итоге получим искомые коэффициенты (67).

NEW FORMULA FOR THE ANGULAR VELOCITY OF ROTATION OF LIQUID EQUILIBRIUM FIGURES

B. P. Kondratyev[1,2]

[1]Sternberg Astronomical Institute of Moscow State University, Moscow, Russia

[2]Central Astronomical Observatory of the RAS at Pulkovo, Saint Petersburg, Russia

**E-mail: work@boris-kondratyev.ru*

The aim of the work is to derive a new dynamic formula for the angular velocity of rotation of equilibrium figures of a gravitating fluid with a polytropic equation of state. In this formula, the angular velocity of rotation depends not only on the polytropic index $0 \leqslant n \leqslant 5$, but, and this is the main thing, on the components of the internal and external gravitational energy of the figure. When solving the problem, the integration constant in the full potential was expressed through three global characteristics: mass, full gravitational energy and rotation energy of the equilibrium figure. The validity of the new formula was confirmed by the limiting transition at $n = 0$ to classical homogeneous Maclaurin spheroids and Jacobi ellipsoids. The results of the work expand the scope of application of the theory of equilibrium figures.

Keywords: equilibrium figures, homogeneous and inhomogeneous, polytropic equation of state, level surfaces, components of external and internal gravitational energy, angular velocity of rotation