RAPIDLY ROTATING AND FULLY GENERAL RELATIVISTIC POLYTROPES

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A technique used in the numerical computation of Newtonian rotating polytropes has been generalized and applied to the rapidly rotating polytropes in general relativity.

The star is assumed to rotate uniformly and to be axially and equatorially symmetric. The polytropic relation

$$P=K\varepsilon^{1+1/N}$$

is also assumed. The full equations for the rotating polytrope in general relativity have been numerically integrated without any approximation. Strength of relativity is measured by $\mu = P_c / \varepsilon_c c^2$ where P_c, ε_c, and $\underline{c}$ are the central pressure, the central energy density, and the light velocity, respectively. Rotating sequences with $\mu = 0.001$ (almost Newtonian case), 0.25 (mildly relativistic case), and 0.5 (highly relativistic case) have been computed for the polytropic index N=1.5 .

For the same value of the central energy density and the same value of $\underline{K}$, the rest mass increases as the angular momentum increases but the increase for the large value of μ case is rather mild one.

For the same value of the rest mass the gravitational mass always increases as the angular momentum increases. The rotation does not act as stabilizing the highly relativistic models.

D. Sugimoto, D. Q. Lamb, and D. N. Schramm (eds.), Fundamental Problems in the Theory of Stellar Evolution, 274.