Eriguchi, Y.; **Müller, E.**; **Hachisu, I.**

Meridional flow in a self-gravitating body. I. Mechanical flow in a barotropic star with constant specific angular momentum. (English) Zbl 0601.76039

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The mechanical part of the equations governing meridional circulation in a self-gravitating body is solved. Stationary axisymmetric solutions are computed neglecting the effects of viscosity and assuming that the fluid is incompressible and has a constant specific angular momentum ($j = j_0 = const$). Then the vorticity has a simple relation to the stream function.

Three types of models are investigated; (1) non-rotating ($j_0 = 0$) configurations of spherical topology, which are deformed due to the internal motion (pure circulation case), (2) rotating configurations of toroidal topology, and (3) models consisting of a rotating toroidal configuration and a central point mass (accretion disk case). Assuming appropriate choices of the vorticity - stream function relation, we computed several stationary sequences. The models obtained contain one or several large scale circulations in the meriodional plane. The configuration change due to circulation is small, i.e., the shape is mainly determined by three forces, the pressure gradient, the gravity, and the centrifugal force.

MSC:

76E20 Stability and instability of geophysical and astrophysical flows
85A05 Galactic and stellar dynamics
76M99 Basic methods in fluid mechanics

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meridional circulation; self-gravitating body; Stationary axisymmetric solutions; constant specific angular momentum; stream function; non- rotating; spherical topology; internal motion; pure circulation case; rotating configurations; rotating toroidal configuration; central point mass; accretion disk; vorticity - stream function relation