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ON THE OSCILLATIONS AND THE STABILITY OF GRAVITATING FLUID ELLIPTICAL CYLINDERS WITH LINEAR VELOCITY FIELD

B.P. Kondratyev

In this paper the problem of small oscillations with arbitrary perturbations of two-dimensional elliptical cylinders, which consist of homogenious incompressible gravitating liquid, is solved.The equilibrium cylinders have, in general case, both the proper rigid rotation and the internal motions with homogeneous vorticity. Imposing on the boundary of the cylinder a disturbing layer, we find small perturbations of the pressure, of the gravitational potential, of the stream function, and other characteristics of the cylinder. Inserting these perturbations in the linearized integral of hydrodynamical equations, we obtain the basic characteristic equation of the problem. In partial case from the equation result two bifurcation equations. Both the characteristic equation and the bifurcation equations thoroughly are studied.

RESEARCH OF THE SECULAR STABILITY OF A GRAVITATING DIFFERENTIALLY ROTATING RING OF FREE-MOTION PARTICLES

V.A.Antonov, A.A.Vakhidov

Problem of the secular stability of a gravitating differentially rotating ring is considered on the basis of the model f local hydrodynamical approximation. For solving the problem the energy variation principle is used. In particular, a functional of energy of small perturbations of hydrodynamical parameters of the system is constructed. Research of the sign of this functional for different numerical values of particles density and angular velocity of rotation gives a possibility to obtain a criterion of the secular stability of the system. For the model under consideration the conclusion about secular nonstability is done for all possible values of the system parameters.