LINEAR DENSITY WAVES IN GLOBULAR CLUSTERS

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ABSTRACT.   It   is   often   maintained   that   Antonov's   equation,   a
linearization   of   the   collisionless   Liouville-Boltzmann   equation,
governs small perturbations of a stellar system.   The variational
integrals resulting from Antonov's equation are in six dimensional
phase space.   However, expanding the perturbations in the velocity
coordinates and carrying out the integrals over the velocity components
gives   integrals   in   the   three   dimensional   configuration   space.
Solutions in successive approximations lead to standing density waves.
The first order equations involve a vector field $\xi(x)$ related to but
not identical with the Lagrangian displacements of a volume element of
the system.   In this respect the problem is analogous to the linear
oscillations of a fluid star.   The analogy is exploited to provide a
classification for the modes of oscillation and to obtain suitable data
for   variational   calculations.   The   normal   modes   appear   to   be
trispectral, in the sense that the associated vector field $\xi(x)$ is
derived predominantly either from a scalar potential, a toroidal vector
potential, or a poloidal vector potential.   The eigenfrequencies of the
radial ($\iota = 0$) and non-radial ($\iota = 1$) modes are calculated.   The
associated density waves are analyzed.