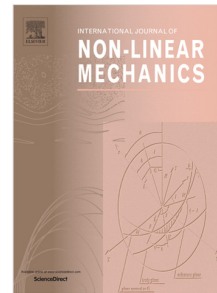


Accepted Manuscript

Conditions of stability and instability for a pair of arbitrarily stratified compressible fluids in an arbitrary non-uniform gravity field

E.I. Ryzhak, Sh.A. Mukhamediev, S.V. Sinyukhina



PII: S0020-7462(17)30353-0

DOI: <http://dx.doi.org/10.1016/j.ijnonlinmec.2017.08.002>

Reference: NLM 2888

To appear in: *International Journal of Non-Linear Mechanics*

Received date: 10 May 2017

Revised date: 2 August 2017

Accepted date: 7 August 2017

Please cite this article as: E.I. Ryzhak, S.A. Mukhamediev, S.V. Sinyukhina, Conditions of stability and instability for a pair of arbitrarily stratified compressible fluids in an arbitrary non-uniform gravity field, *International Journal of Non-Linear Mechanics* (2017), <http://dx.doi.org/10.1016/j.ijnonlinmec.2017.08.002>

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

Conditions of stability and instability for a pair of arbitrarily stratified compressible fluids in an arbitrary non-uniform gravity field

E.I. Ryzhak ^a, Sh.A. Mukhamediev ^a, S.V. Sinyukhina ^a

^a O. Schmidt Institute of Physics of the Earth of the Russian Academy of Science, Moscow, Russia

Corresponding author: E.I. Ryzhak,
e-mail: E_I_Ryzhak@mail.ru

Abstract. The work continues and develops authors' previous investigation of stability in the small for a two-layer system of inhomogeneous compressible fluids in the uniform gravity field. Here we present a solution of a similar problem in the case of arbitrary non-uniform potential gravity field. The equilibrium stratification of both density and elastic properties of the fluids is supposed arbitrary, as well as the shape of open on top reservoir filled by the fluids. The problem of stability of equilibrium is analyzed as the corresponding problem for the non-linearly elastic bodies, basing on the static energy criterion with regard for the boundary conditions at all parts of the boundary. The crucial element of the analysis is conversion of the quadratic functional of second variation of total potential energy of the system into a "canonical" form that enables to determine its sign. Making use of this canonical form, we obtain almost coinciding with each other necessary and sufficient conditions for stability (those being valid also for an arbitrary number of layers).

Highlights: The quadratic functional of second variation of total potential energy is converted into a "canonical" form that enables to determine its sign which governs stability and instability of the system.

Download English Version:

<https://daneshyari.com/en/article/5016416>

Download Persian Version:

<https://daneshyari.com/article/5016416>

[Daneshyari.com](https://daneshyari.com)