

The review and the analysis of heat-mass transfer research in the stratified seawater in the conditions of thermal convection

© D.A. Krylov¹, N.I. Sidnyaev¹, Y.S. Ilina¹, A.A. Fedotov¹

¹ Bauman Moscow State Technical University, Moscow, 105005, Russia

The review presents the results of the research connected with studying the density of water change at low temperatures. We studied heat and mass transfer in conditions of thermal convection under the action of the expulsive force in the absence of concentration gradients. The reasons for changes of a direction of the expulsive force are found out and two-dimensional profiles of velocity and the detected inversion of convection driven by the extreme density are identified. Dependence of the density of water on temperature and the initial evaluation of a number of characteristic values is received. Level of speed, the lower limit of the transport coefficients, the border between different modes of the process, initial geometric configuration of various trends are defined. It is noted that in the single-phase fluid in connection with the rapid changes of the density in the vertical direction, wavelike movement for example, in thermoclines located in the volume of fluid arise. It is shown that the conditions imposed on the temperature of the surface, immersed in a resting environment, and the environment itself, differ so much, that in the field of heat diffusion, transfer viscosity and the thermal conductivity of the fluid vary significantly. Stratification has a significant impact on the transfer.

Keywords: heat-mass transfer, thermal convection, stratification of water, buoyancy, density, turbulent flow.

Krylov D.A. (b. 1987) graduated from Bauman Moscow State Technical University in 2010. Post-graduate Student, Assistant at the Higher Mathematics Department of Bauman Moscow State Technical University. Author and coauthor of 14 scientific articles in the field of applied mathematics. Sphere of scientific interests: numerical methods, mathematical modeling. e-mail: dmitrykrylov@rambler.ru

Sidnyaev N.I. (b. 1955) graduated from Bauman Moscow Higher Technical School in 1981. Dr.Sci. (Eng.), Professor, Head of the Higher Mathematics Department of Bauman Moscow State Technical University. Author of about 200 publications in the field of applied mathematics and mechanics. Sphere of scientific interests: numerical methods, mechanics, non-stationary processes, differential equations. e-mail: sidnyaev@yandex.ru

Ilina Yu. S. is a graduate student, Assistant at the Higher Mathematics Department of Bauman Moscow State Technical University. e-mail: jm.bmstu@yandex.ru

Fedotov A.A. (b. 1954) graduated from Lomonosov Moscow State University in 1977. Ph.D., Assoc. Professor of the Higher Mathematics Department of Bauman Moscow State Technical University. Author of more than 55 scientific papers in the field of applied mathematics and mechanics. Sphere of scientific interests: hydrodynamics of a wing, numerical methods, equations of mathematical physics. e-mail: le-tail@list.ru