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Simulation of a Supercritical Fluid Flow with Large Temperature Difference under the Assumption of Constant Pressure[1] SATOKO KOMURASAKI, Nihon Univ - Tokyo — Eruption of geothermally heated water from the hydrothermal vent in deep oceans of depth over 2,000 meters is numerically simulated. The hydrostatic pressure of water is assumed to be over 200 atmospheres, and the temperature of heated water is occasionally more than 300°C. Under these conditions, a part of heated water can be in the supercritical state, and the physical properties can change significantly by the temperature. Particularly, thermal diffusivity at the critical temperature becomes so small, which prevents heat diffusion, and the temperature gradients can become high. Simulation of this kind of fluid flow can be carried out only by using a highly robust scheme. In this paper, a scheme for a highly-unsteady-flow computation is introduced, and a supercritical fluid flow with a large temperature difference is simulated at a constant pressure. In the computation, the compressible Navier-Stokes equations are solved using a method for the incompressible equations under constant pressure. The equations are approximated by the multidirectional finite difference method and KK scheme is used to stabilize the high-accuracy computation.

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