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Simulation of highly-unsteady hydrothermal convection above the critical temperature in the deep sea[1] SATOKO KOMURASAKI, College of Science and Technology, Nihon University — 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 temperature of heated water 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. The compressible Navier-Stokes equations are solved using a method for the incompressible equations under the assumption that the pressure is almost constant at the hydrostatic pressure and the density is a function of the temperature. The equations are approximated by the multidirectional finite difference method, and for the highly-unsteady-flow computation, KK scheme and a hybrid upwind scheme are used to stabilize the high-accuracy computation. Computational results show that complexity and the unsteadiness of the flow are significantly influenced by whether the issuing high temperature water is in the supercritical state or not.

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