Abstract Submitted
for the DFD11 Meeting of
The American Physical Society

Simulation of a submarine hydrothermal convection using a numerical model for a supercritical water flow[1] SATOKO KOMURASAKI, Nihon University — Hydrothermal convective flows derive from geothermally heated water issued from hydrothermal vents. They are found even in deep oceans of depth over 2,000 meters where the hydrostatic pressure of water is over 200 atmospheres, and temperature of heated water is occasionally more than 300°C. Under these conditions, water emerging from these vents can be supercritical. In reality, it is quickly cooled by ambient water of temperature approximately 2°C and becomes liquid. It is also important to investigate of advection and diffusion of materials which are issued from hydrothermal vents accompanying heated water, in order to deepen understanding of the oceanic crust that possesses abundant resources. A flow simulation is carried out using a numerical model for a supercritical water flow where it is assumed that the pressure is high and almost constant, and the density changes only by temperature. In the computation, the modified compressible Navier-Stokes equations are solved by a method similar to an approach used in solving the incompressible equations. Computation is done employing finite difference method in 2D. Simulated flow fields are displayed using a suitable visualization technique and compared with the results of simulations based on the Boussinesq approximation.

[1]This work was partially supported by KAKENHI (22740261)

Satoko Komurasaki
Nihon University

Date submitted: 05 Aug 2011 Electronic form version 1.4