Abstract Submitted
for the MAR05 Meeting of
The American Physical Society

1-D Numerical Simulation of Heat Transfer near the Liquid-Vapor Critical Point FANG ZHONG, MARTIN BARMATZ, Jet Propulsion Laboratory, California Institute of Technology, Pasadena, California 91109-8099 — Near a liquid-vapor critical point, a constant volume fluid undergoes both a fast adiabatic and a slow diffusive heat transfer when heated at the boundary. Earlier numerical studies of this equation revealed the main features of the solution. This numerical technique had many limitations, such as large errors for a highly nonlinear system very close to the critical point, or for a fast varying boundary condition. In this talk, we will present a newly developed numerical solution of the heat transfer equation that utilizes the full implicit method simultaneously for both the differentiation and spatial integration of temperature. The new numerical solution is applicable to the cases of both the single phase above and liquid-vapor coexisting phases below the critical temperature. This new solution is valid for any boundary conditions. In this talk, we demonstrate several case studies for ground-based and microgravity conditions. The special case of an amplified temperature response in the vapor phase when the liquid boundary is subject to an AC temperature oscillation will also be presented.

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Date submitted: 06 Dec 2004 Electronic form version 1.4