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Rarefaction Waves in Van der Waals Fluids[1] ALBERT YUEN, UC Berkeley - LBNL, JOHN BARNARD, RICHARD MORE, LBNL — As the simplest description of material that exhibits a liquid- vapor two-phase state, the Van der Waals' fluid model can be used to obtain qualitative (and sometimes quantitative) information about the fluid dynamics of material in the two-phase regime. We apply the general one-dimensional self-similar solution of a rarefaction wave in an initially semi-infinite liquid, uniform in temperature and density, to the specific case of a Van der Waals' fluid. We obtain a set of profiles for the fluid density, temperature and velocity, that describes the fluid for a wide range of space, time, initial conditions, and Van der Waals' parameters. These results may be used to interpret experiments in which a material is rapidly isochorically heated. In particular, "plateaus" in temperature and density as a function of position are observed characterizing entrance into the two-phase regime.

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