1032-76-95 **Thomas Hagstrom** (hagstrom@math.unm.edu) and **Jens Lorenz*** (lorenz@math.unm.edu).

Analysis of the Brenner-Klimontovich Modifications of the NSF-System.

The Navier-Stokes-Fourier equations form a coupled hyperbolic-parabolic system for which:

i. Classical solutions to the Cauchy problem for almost-constant data exist globally in time;

ii. The required number of boundary conditions is dependent on whether the flow is incoming or outgoing at the boundary.

Here we analyze two modified systems of equations suggested by Brenner and Klimontovich to better model viscous, heat-conducting fluids via the introduction of a second velocity field, the volume velocity. We prove that each of these systems is essentially of parabolic type, that the Cauchy problem is locally well-posed, and that global solutions exist for almost constant initial data. We also show that the number of boundary conditions required is independent of the local flow, so that an additional condition is needed when the flow is not incoming. We suggest some particular conditions producing well-posed problems for linearizations.

We also note a difference between the two modified systems. For one, where the volume velocity appears in the momentum density, we prove that the temperature remains positive. For the second, where the usual mass velocity appears, we argue that negative temperatures may develop. (Received August 15, 2007)