**Meeting:** 1003, Atlanta, Georgia, SS 28A, AMS-SIAM Special Session on Reaction Diffusion Equations and Applications, I

1003-35-253 **Ronald E Mickens*** (`rohrs@math.gatech.edu`), Clark Atlanta University, Box 172 - Physics Department, Atlanta, GA 30314. *A Nonstandard Finite Difference Scheme for Coupled Nonlinear PDE's Modeling Heat Transport.*

The following coupled differential equations appear in the modeling of heat transport at the microscale:

$$C_1(T_1)\frac{\partial T_1}{\partial t} = \frac{\partial}{\partial x}\left[K_1(T_1, T_2)\frac{\partial T_1}{\partial x}\right] - G(T_1 - T_2) + Q(x, t), \tag{1}$$

$$C_2(T_1, T_2)\frac{\partial T_2}{\partial t} = G(T_2 - T_1). \tag{2}$$

This type of phenomena is of importance for understanding the processing of materials with pulsed-lasers. In these equations $(T_1, T_2)$ are the respective electron and lattice temperatures; $G$ is a constant; the heat capacities, $C_1$ and $C_2$, and the diffusion coefficient $K_1$ are given functions of $T_1$ and $T_2$; and the laser source function is $Q(x, t)$. In our presentation, the following issues will be discussed: (i) the origin of Eqs. (1) and (2); (ii) the specification of the physically correct initial and BC's; (iii) general qualitative features of the solutions; (iv) the construction of a finite difference scheme which uses as its basis a positivity condition; (v) the stability of this scheme and possible functional relations between the time and space step-sizes. We will demonstrate the validity and efficiency of the scheme by using it to determine numerical solutions and comparing them with other existing numerical results. (Received September 03, 2004)