1097-65-118 **Abner J Salgado*** (asalgad1@utk.edu), Department of Mathematics, University of Tennessee, Knoxville, TN 37996. *From Micropolar Navier-Stokes equations to Ferrofluids: Analysis and Numerics.* Preliminary report.

The Micropolar Navier-Stokes Equations (MNSE), is a system of nonlinear parabolic partial differential equations coupling linear velocity, pressure and angular velocity: material particles have both translational and rotational degrees of freedom. The MNSE is a central component of the Rosensweig model for ferrofluids, describing the linear velocity, angular velocity, and magnetization inside the ferrofluids, while subject to distributed magnetic forces and torques. We present the basic PDE results for the MNSE (energy estimates and existence theorems), together with a first order semi-implicit fully-discrete scheme which decouples the computation of the linear and angular velocities. Similarly, for the Rosensweig model we present the basic PDE results, together with a fully-discrete scheme combining Continuous Galerkin and Discontinuous Galerkin techniques in order to guarantee discrete energy stability. Finally, we demonstrate the capabilities of the Rosensweig model and its numerical implementation with some numerical simulations in the context of ferrofluid pumping by means of external magnetic fields. (Received January 15, 2014)