Meeting: 999, Nashville, Tennessee, SS 11A, Special Session on Nonlinear Partial Differential Equations and Applications

999-35-205 **Y. Giga**, **K. Inui**, **A. Mahalov**, **S. Matsui** and **J. Saal***
(saal@mathematik.tu-darmstadt.de), Vanderbilt University, Department of Mathematics, 1326 Stevenson Center, Nashville, TN 37240. *An Analytical Approach to the Ekman Boundary Layer Problem.*

Boundary layers appear in a natural way in geophysical fluid dynamics. The boundary layer in the theory of rotating fluids, known as the *Ekman layer*, is between a uniform geostrophic flow and a solid boundary at which the no slip condition applies. The observed effect inside the layer, i.e. close to the boundary, is that the flow vector behaves as a growing spiral, the *Ekman spiral*, converging to the geostrophic flow while increasing the distance to the boundary.
Mathematically this situation is modelled by the Navier-Stokes equations with Coriolis force in a half-space. The Ekman spiral solution is an exact solution of this system. We will discuss existence and uniqueness of (time-) local strong solutions of the problem for a certain class of initial data including the Ekman spiral solution. The method is to apply a standard iteration procedure to the nonlinear Navier-Stokes equations. The main difficulties arising in this approach are caused by the particular class of initial data. Since the Ekman spiral solution depends on the normal component only, we have to deal with spaces of initial data nondecreasing at infinity. (Received August 23, 2004)