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Qingshan Chen, Max Gunzburger and Mauro Perego* (mperego@fsu.edu), Tallahassee, FL 32304. *Well-posedness results for a nonlinear Stokes problem arising in Glaciology.*

In this talk we present well-posedness results for a nonlinear, incompressible Stokes problem that models the flow of ice in glaciers and ice sheets, e.g., Greenland and Antarctica. An important feature of the problem, in addition to the highly nonlinear rheology, are boundary conditions which describe the Coulomb-like friction at the ice-bedrock interface. Results available in the literature for similar nonlinear Stokes problems do not fully account for boundary conditions typical of glaciology. Difficulties in the analysis of the Stokes model are generated by the fact that boundary conditions can possibly depend on the normal stress. In this case, led by arguments typical in the linear elasticity context, we prove an existence result for nonlocal friction boundary conditions. Moreover, we prove that Coulomb friction problem can be approximated by differentiable boundary conditions that render numerical simulations more affordable. (Received September 22, 2011)