1133-49-374 **Jonathan M Goldfarb*** (jgoldfar@fit.edu) and **Ugur G. Abdulla** (abdulla@fit.edu).
Frechet Differentiability in Besov Spaces in the Optimal Control of Parabolic Free Boundary Problems.

We consider an inverse Stefan type free boundary problem for a general second order linear parabolic PDE, for which the temperature, domain, heat flux on the fixed boundary, density of sources, and coefficients are to be determined; the cost functional consists of the L_2-declination of the trace of the temperature at the final moment, temperature at the free boundary and final position of the free boundary from available measurements.

This problem arises when considering a phase transition process with unknown temperature function, phase transition boundary, source term and boundary heat flux. A new variational formulation developed in

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which addresses the dual issues of possible measurement errors and large computational cost associated with classical variational formulations of the inverse Stefan problem.

With the delicate use of sharp embedding theorems in Sobolev-Besov spaces the Frechet differentiability is proven, and the formula for the Frechet gradient expressed in terms of the traces of the state vector and the solution of the adjoint problem. (Received August 02, 2017)