1133-49-211 **Ugur G Abdulla**, **Evan Cosgrove*** (ecosgrove2011@my.fit.edu) and **Jonathan Goldfarb**.
On the Frechet differentiability in optimal control of coefficients in parabolic free boundary problems.

We consider the inverse Stefan type free boundary problem, where the coefficients, boundary heat flux, and density of the sources are missing and must be found along with the temperature and the free boundary. We pursue an optimal control framework where boundary heat flux, density of sources, and free boundary are components of the control vector. The optimality criteria consists of the minimization of the L_2-norm declinations of the temperature measurements at the final moment, phase transition temperature, and final position of the free boundary. We prove the Frechet differentiability in Besov-Hölder spaces, and derive the formula for the Frechet differential under minimal regularity assumptions on the data. Necessary condition for optimality opens the way to the application of projective gradient methods in Besov-Hölder spaces for the numerical solution of the inverse Stefan problem. The results are published in *Evolution Equations and Control Theory,* **6**, *3(2017).* (Received July 26, 2017)