Fourier Law and Non-Isothermal Boundary in the Boltzmann Theory, Chanwoo Kim

In the study of the heat transfer of the Boltzmann equation, it is important to solve the steady state Boltzmann equation with the diffuse boundary condition where the wall Maxwellian μ^{θ} is determined by $\theta(x)$, a non-constant (non-isothermal) wall temperature. For $|\theta(x) - \theta_0| < \delta \ll 1$, we construct a unique solution which is asymptotically stable for general domains. In convex domain the solution is continuous but not if domain is not convex. We also establish $\delta-$expansion such that $F = \mu^{\theta_0} + \delta F_1 + O(\delta^2)$. As a corollary, in a slab geometry $0 \leq x \leq 1$, we prove that if the general Fourier Law holds for this system, then temperature of $\theta_1(x)$ for F_1 has to be linear. This is joint work with R. Esposito, Y. Guo and R. Marra