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Structural Stability for 1D Semiconductor Hydrodynamic Model with Sonic Boundary

In this talk, I will present our recent research on the structural stability of interior subsonic steady states to the hydrodynamic model for semiconductors with sonic boundary. More precisely, we show that the small perturbation in the subsonic doping profiles leads to the small difference between the corresponding interior subsonic solutions. While it has been proved that this model possesses various physical steady states such as the interior subsonic, interior supersonic, shock transonic and smooth transonic solutions, the singularities at the sonic boundary make it difficult to investigate the structural stability of these solutions. To address this issue, we propose a novel approach, which combines the weighted multiplier technique, local singularity analysis, monotonicity argument and squeezing skill. Our work indicates that the interior subsonic solutions are at least amenable to this approach. Numerical approximations further confirm our theoretical results. These results to some extent provide insights into the structural stability of other types of solutions. This is the joint work with Yuehong Feng and Ming Mei.