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On the Robustness of Particle Concentration by the Streaming Instability

The origin of planetesimals in gaseous disks is a longstanding problem with many barriers to growth from centimeter-sized solids up to kilometers and beyond. The streaming instability (hereafter SI) is a robust particle clumping mechanism to overcome these impediments (Youdin & Goodman 2005, Johansen & Youdin 2007). Recently, Yang & Johansen (2014) studied how numerical box size and resolution affects non-linear SI in vertically stratified models using the PENCIL code. We extend their work in two ways. First, we investigate box-size dependence of SI with a different numerical code, ATHENA. We find the main results are independent of the choice of numerical code. Secondly, we investigate the role of vertical boundary conditions (BCs). In addition to the previously used periodic and reflecting BCs, we also explore outflow BCs with Static Mesh Refinement. Outflow BCs are generally considered more realistic. Our preliminary results indicate stronger particle concentration by SI when we use outflow BCs.