Simulation-based parameter space classification for transonic, sub-Keplerian accretion flow onto non-rotating black holes

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Non-dissipative, transonic, sub-Keplerian accretion flow onto black holes is characterized by two conserved parameters: specific energy and specific angular momentum of the flow. For certain range of these parameters, the accretion flow shows shock formation and the post-shock matter forms a boundary layer which is believed to shape the radiative properties of the accretion disk. In this work, we perform the parameter space classification using multi-dimensional numerical simulations for such flows around non-rotating black holes and find that the shock formation parameter space is much larger than the analytically calculated one. We also find the boundary layer to be dynamic for a significant part of the parameter space and self-consistently produce outflow from the accretion disk.