Interacting stellar winds: clump formation and accretion onto SGR A*

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Abstract

The central parsec of the Milky Way is one of the most intriguing environment in the galaxy. The presence of enigmatic objects as well as the way in which the gas behaves in the vicinity of Sgr A* are remaining unknowns that have attracted special attention in the last decade. As the region is populated by tens of Wolf-Rayet stars with strong outflows we expect the interstellar medium to be filled with hot, diffuse plasma. Then, multiple stellar wind collisions are the unavoidable result of this scenario. In this work, we make use of the hydrodynamics AMR code RAMSES to model stellar wind collisions (see Figure 1) aiming to:
i) constrain properties and fate of clumps formed in unstable wind interactions.
ii) make a high resolution model of the complete system of mass-losing stars around the central super-massive black hole (see Figure 2).
Firstly, we conducted a parameter study of clumps formed in wind collisions. We tested several values of wind terminal velocity and stellar separation. Our results show that the most massive clumps formed are thousand times lighter than the possible theoretical limit. Furthermore, the ejection velocity from the system are about one third of the terminal wind speed.
On the other hand, we simulated the system of the ˜30 mass-losing stars around Sgr A* in high-resolution compared to previous work. This combined with our knowledge of the stellar orbits in the GC allow us to quantify the cold, dense material present close to Sgr A*. Furthermore, we can estimate how variable the gas inflow/outflow rate is at different radii from the central black hole over time. We present first results, and discuss future implementations on our model.

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