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A MASSIVE BINARY SYSTEM CAN FEED SGR A*

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The enigmatic G2 cloud just passed pericentre around the Galactic Centre super-massive black hole, Sgr A*. Despite all theoretical and observational efforts, its nature remains unclear. If purely gaseous, it is possible to explain it as a gas clump formed in a colliding wind binary. Here we study the hypothesis of G2 being one of such clumps ejected from the massive binary IRS 16SW.

Gillessen et al. (2012) discovered a source on a very eccentric orbit towards the central supermassive black hole, Sgr A*. The emitting gas has a mass of $\sim 3\ M_{\oplus}$. Its interaction with the accretion flow could give insights on the history of the galactic nucleus of the Galaxy.

The inner parsec of our Galaxy is populated by hundreds of massive stars. About ~ 30 of them are identified as Wolf-Rayet stars. Their strong outflows fill the region with diffuse, very hot plasma (Cuadra et al. 2008).

Currently, there are three confirmed massive binary systems (Pfuhl et al. 2014). In this work, we study how often cold gas clumps formed in such binaries approach enough to Sgr A* to be disrupted and/or accreted. To do so, we follow a test-particle approach computing the trajectories of such clumps (see Figure 1). The model considers Sgr A* gravitational field, the stellar motion, the drag exerted by the ISM, the ejection speed and the clump lifetimes. The latter is set by thermal conduction between the hot ISM and the cold clumps (Burkert et al. 2012).

We studied the problem for the three binaries whose orbits are already determined. As parameters we used: *i*) clump ejection speeds about half of the stellar wind speed; *ii*) ISM models given by the X-ray emission (Burkert et al. 2012); *iii*) clump masses of the order of Earth-masses (Calderón et al. (2016).

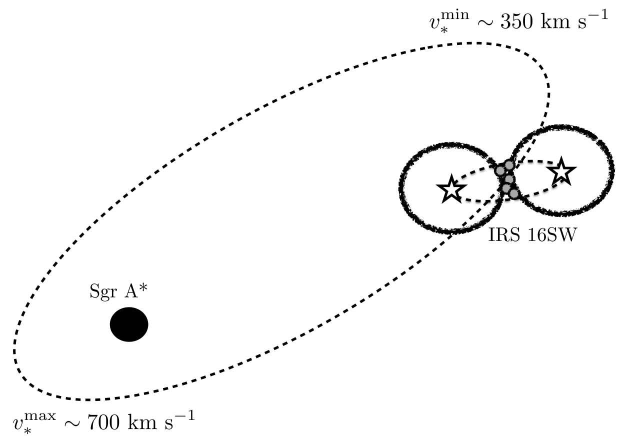

Fig. 1. Schematic representation of the model. The colliding wind binary IRS 16SW ejects clumps while orbits around Sgr A*.

We have found that the massive binary IRS 16SW is the only capable of depositing material within 10^4 $R_{\rm Sch}$ from Sgr A*. Other systems have orbits with larger semi-major axes, therefore, clumps do not survive long enough to reach the black hole. Interestingly, our results show that IRS 16SW could have deposited about $\sim 3\ M_{\oplus}$ in the last fifty years. This result favors G2 origin in the young stellar clockwise disk as suggested earlier (Gillessen et al. 2012; Schartmann et al. 2015), in particular from the binary IRS 16SW.

REFERENCES

Burkert A. et al., 2012, ApJ, 750, 58
Calderón D. et al. 2016, MNRAS, 455, 4388
Cuadra J., Nayakshin S., Martins F., 2008, MNRAS, 383, 458
Gillessen S. et al., 2012, Nature, 481, 51
Pfuhl O. et al., 2014, ApJ, 782, 101
Schartmann M. et al., 2015, ApJ, 811, 155

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