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Constraining the Galactic Centre environment with hypervelocity stars in Gaia

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Following a close dynamical encounter with Sgr A, *stellar binaries in the Galactic Centre (GC) can be tidally separated. One member star remains bound to Sgr A* and the other is ejected as a hyper-velocity star (HVS) with a velocity beyond the escape speed of the Milky Way. The abundance and properties of these objects can provide insight into still-uncertain aspects of the stellar environment in the inner parsec of the Galaxy. We perform a suite of simulations ejecting HVSs from the GC, focusing on those which would appear in current and/or future data releases from the Gaia space mission with precise astrometry and measured radial velocities. We show that the current known lack of confident HVS candidates in Gaia Early Data Release 3 places competitive constraints on the shape of the stellar initial mass function in the GC and the ejection rate of HVSs from the GC, complementing existing constraints. These constraints will improve further as more HVS candidates are unearthed in future Gaia data releases. This work represents the first time constraints have been obtained on the GC stellar environment using Gaia data alone.

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