# EXTREME MASS RATIO INSPIRALS: DETECTABLE SIGNATURES FROM BINARY SEPARATION

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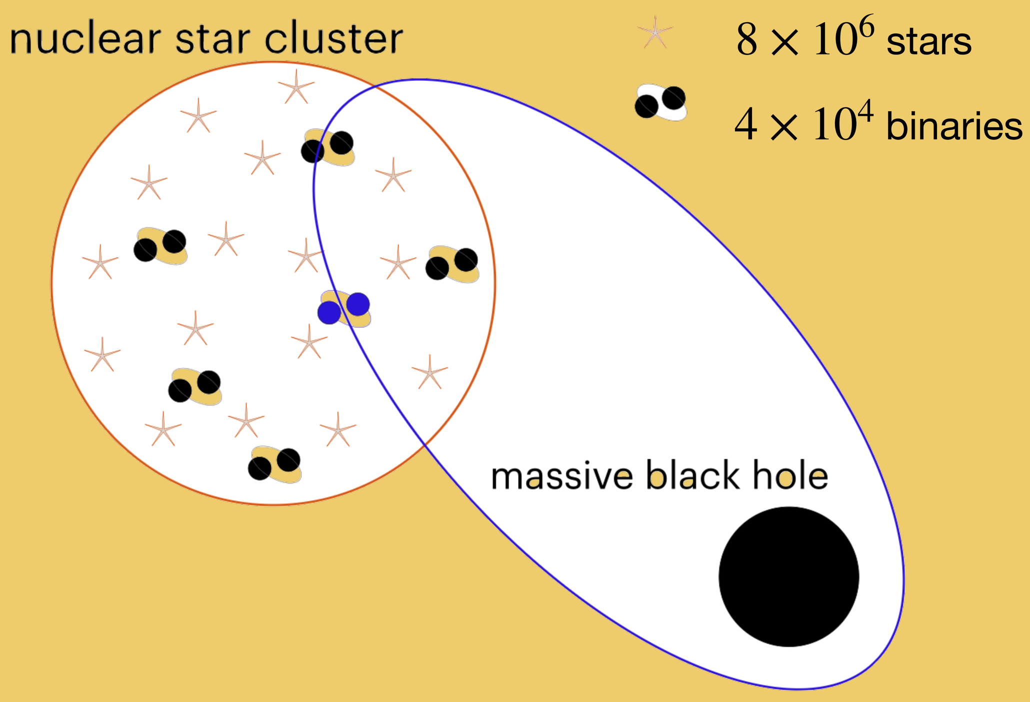
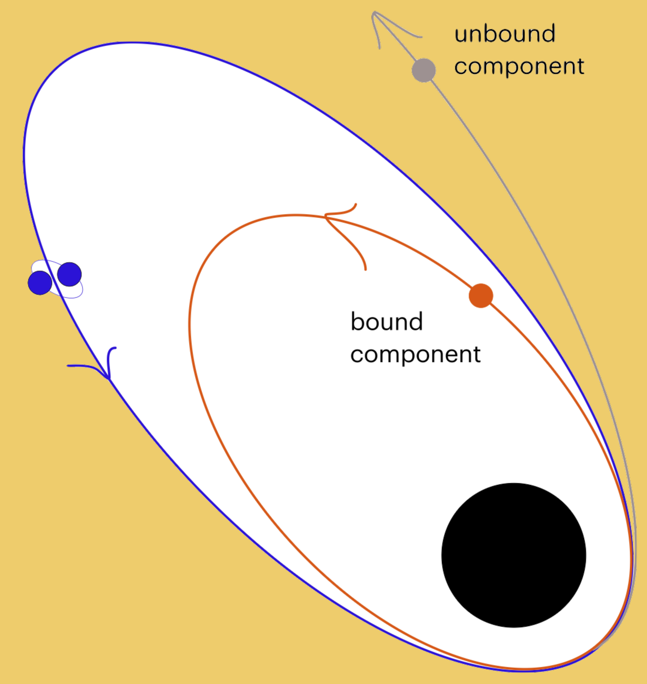
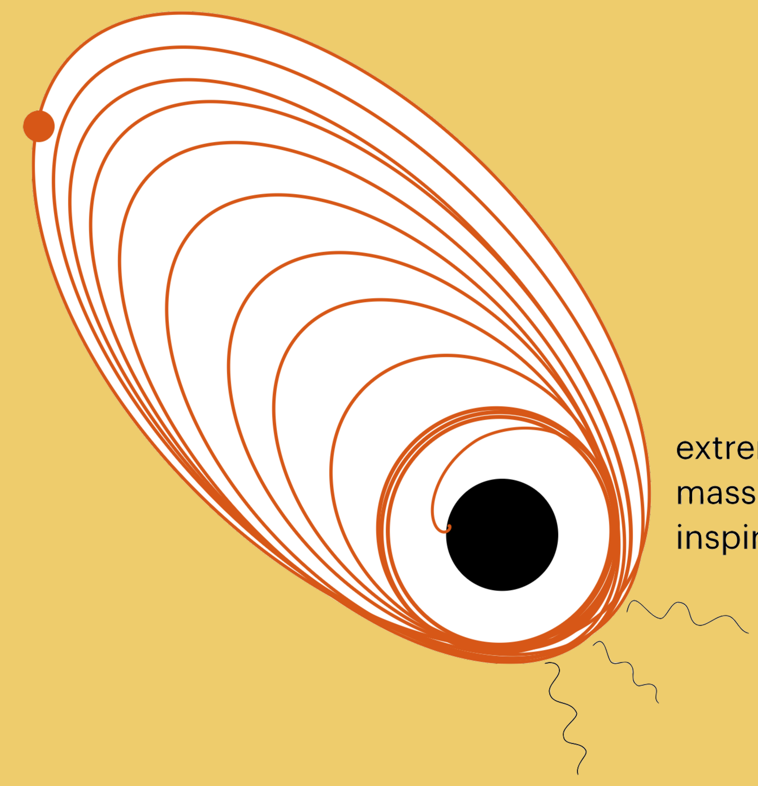
## MODELLING OF THE ASTROPHYSICAL SYSTEM




1. **Relaxation** injects a **black hole binary** ($20M_\odot$) close to massive black hole (MBH) ($4 \cdot 10^6 M_\odot$)

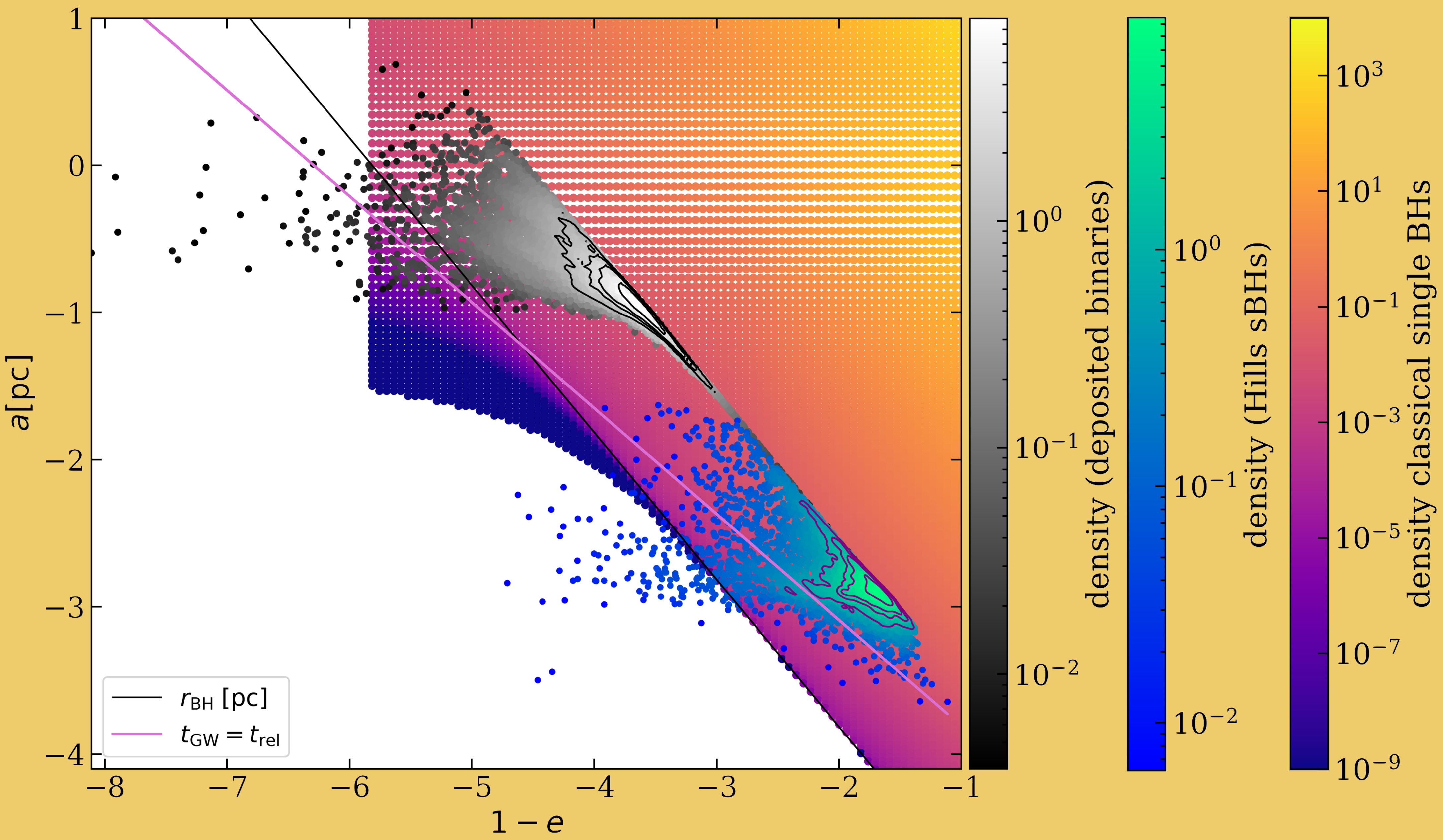


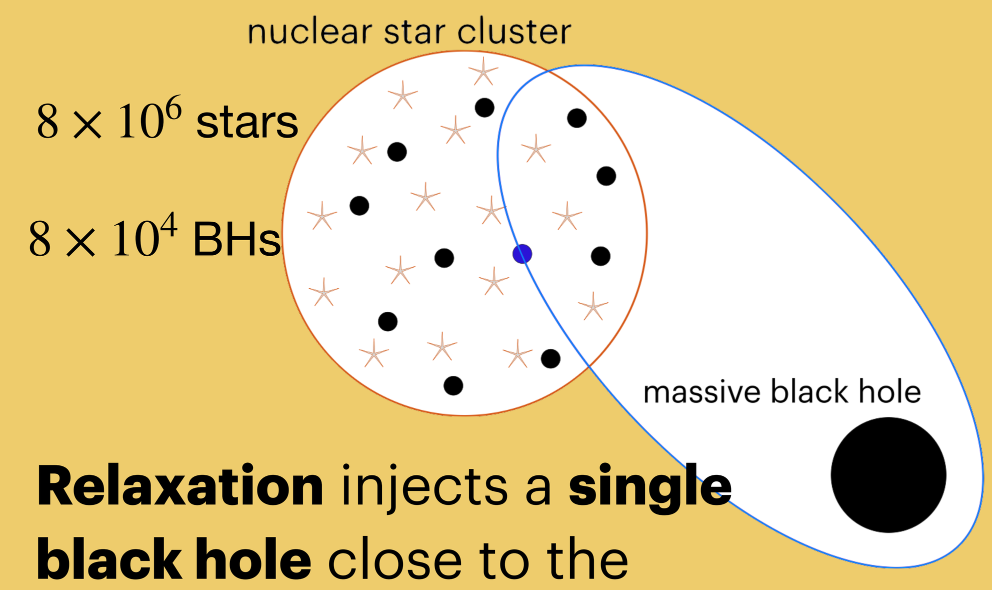

2. MBH's **tidal force separates the binary**: one component ($10M_\odot$) gets bound to the MBH forming an extreme-mass ratio binary




3. The lighter black hole **inspirals** due to **gravitational wave emission, eventually merging into the MBH**

## RESULTS FROM BINARY SEPARATION vs CLASSICAL EMRIS

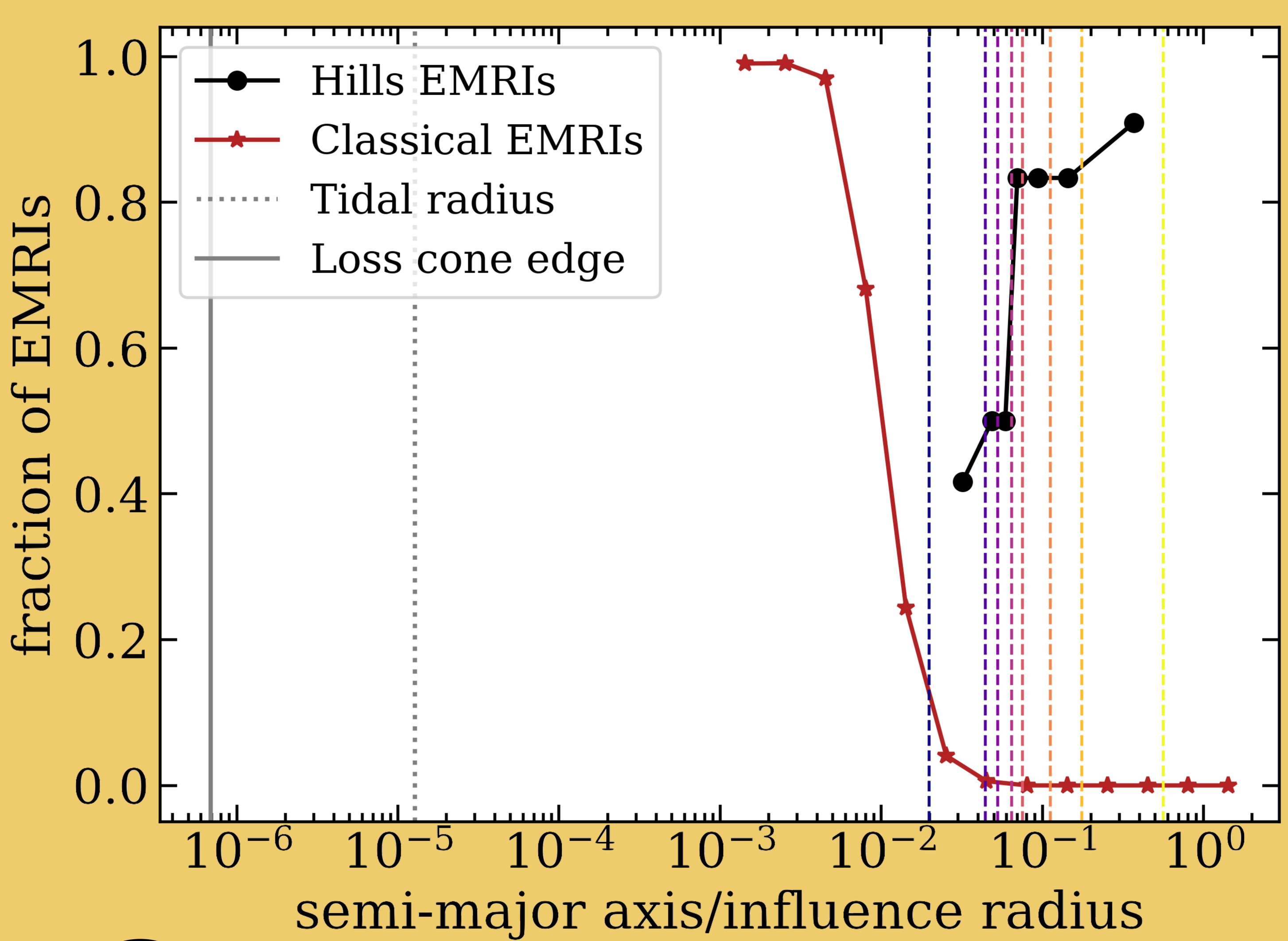


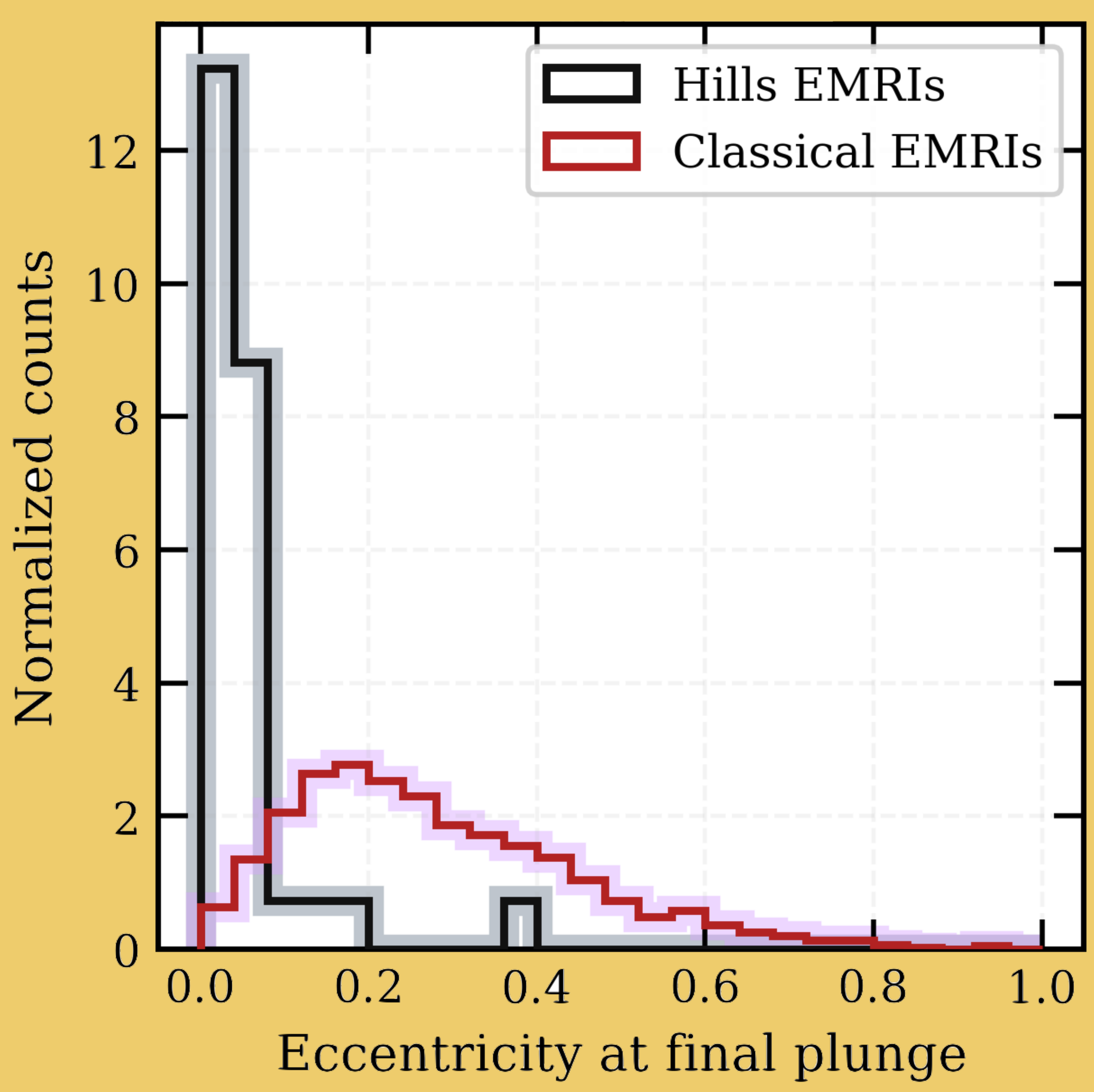

**Relaxation** injects a **single black hole** close to the massive one

Binary separation **deposits BH on more circular orbits that will circularise faster** than *classical* EMRIs

## CONCLUSIONS




1 Binary separation **produces a signficant fraction of EMRIs at larger semi-major axes than the classical channel:**
**0.17%< fraction of EMRIs <0.46%, classical EMRIs: 0.84%**




2 Binary separation produces a significantly more circular populations of BHs by the time of final plunge. The corresponding signal detectable with LISA **is more monochromatic and stable**.

**BINARY SEPARATION EMRIs COULD ALLOW A SIMPLER MODELLING AND THUS TO EXTRACT EMRI SIGNALS FROM THE LISA DATA STREAM, PROVIDING MEASUREMENTS WITH SUB-PERCENT LEVEL PRECISION, AND YIELDING RICH ASTROPHYSICAL INFORMATION**