Barbat 2020 → Data is Bovy 2014

- HVS almost radial trajectories
- Paper that doesn't neglect evolution of MW & LMC
- First evidence of Hill's Mechanism w/ $3M_\odot$ MS Star moving at 700 km s^{-1} ~100 kpc away (Brown et al. 2005)

$$\Phi_B = -\frac{GM_b}{r + a_b}$$

$M_b = 5 \times 10^9 M_\odot$ ← LMC $2 \times 10^{10} M_\odot$

$a_b = 500$ pc $a_b = 0.43$

$$\Phi_D = -\frac{GM_d}{\sqrt{R^2 + \left(a_d + \left(z^2 + b_d^2\right)^{1/2}\right)^2}}$$

→ Pouliasis 2016, Besla 2007, Erkal ~1.4×10 2019

$M_d = 6.8 \times 10^{10} M_\odot$ ✓

$a_d = 3000$ pc ✓

$b_d = 280$ pc ✓

Values don't differ much w/ Kenyon 2014

$$\Phi_H = -\frac{GM_H}{r} \frac{\ln\left(1 + \frac{r}{r_h}\right)}{\ln(1+c) - \frac{c}{1+c}}$$

$M_H = 8 \times 10^{11} M_\odot$ ✓

$r_h = 16000$ pc ✓

$c = 15.3$ ✓

- Treat LMC & MW as rigid (ind. V particles)
  - → no deformation
- Sun at (8.3, 0.027) kpc & move $(v_R, v_\phi, v_z) = (-11.1, 232.24, 7.25)$ km s^{-1}

Based on Chen et al. 2001

Gillessen et al. 2009

Bovy 2015

- Track HVS3 till cross plane of G
- Neglecting the trajectory of MW & LMC causes deflections in ↑ trajectory of HVS w/ reality, Measured

however need more precise proper motion data in order of 10 μas yr^{-1} to get accurate results.

we are at mas yr^{-1}

↳ We will have to neglect fly by of LMC & MW as well as data is not yet precise & gives huge errors.

↳ Reflex motion = $\vec{v}$ at which MW moving towards by center of LMC system during fly by.

↳ Also no time → complicated

- Don't account for dynamical friction → 6 constraints