

D. Erkal et al. 2018

A HVS w/ Magellanic origin

Abstract:

- HVS highly likely from center of LMC
- Closest approach $\sim 21.1^{+6.1}_{-4.6}$ Myr, $v = 870^{+69}_{-66}$ km s⁻¹
 \rightarrow only consistent w/ Hills mechanism
- $M_{BH} \rightarrow 4e3 - 10^4 M_{\odot}$

Introduction:

- HVS is star whose v is quick enough to escape MW g.
- First HVS (HVS1) was found by Braun et al. 2005 with $v = 831.1 \pm 5.7$ km s⁻¹, $3 M_{\odot}$ B star & is 107 ± 15 kpc from Sun
- HVS3 is $8 M_{\odot}$ B star w/ $d_0 = 61$ kpc
- B stars short lives ! so extreme v is needed to reach position @ halos
- HVS is too young to originate from MW
- Perets (2009) suggested that discrepancy between t_{flight} from galactic center & t_{lifetime} may be resolved by assuming \rightarrow ejected as binary & later merged w/ companion due to internal processes.
 \rightarrow However ejection of HVS binary this way unlikely (Fragione & Gualandri 2018)
- SN of companion can also cause

Proper motion = $(1.91, 0.22)$ mas yr⁻¹
 $d_{\text{star}} = 49.97 \pm 1.18$ kpc
 (Pietrzynski et al 2013)
 $V_{\text{rad}} = 262 \pm 0.3$ km s⁻¹ (under M_{bol} 2002)
 $M = 1.5 \text{ ell } M_{\odot}$ \propto absolute matching
 (Moster, McB, et al 2013)
 (Behroozi, Wechsler, et al 2013)

2.1 Method:

- Use g field of MW $\{ \text{LMC} \}$
 MW Pritzard 2014
 Bay (2015)
 has NFW D.M halo (1997)
 a Miyamoto-Nagai disk
 { pair law like
- Sun offset $\Rightarrow (U_0, V_0, W_0) = (-11.1, 24, 7.3)$
 Bay et al. (2012), Morel { Kallivayalil 2014
- Sun at 8.3 ± 0.1 kpc center MW
- Dynamical fric between LMC { MW \propto Hashimoto, Furuta, Makino (2003)
- \int back 500 Myr \gg MS lifetime
 \rightarrow Monte Carlo samples of the 6D phase space
 coords \propto dist, proper motion, V_{rad}
 \rightarrow HVS3, Sun { LMC

HVS3:

- Fig 2 shows location HVS3 passed MW { LMC
- Porteges Zwart (2007)
- Reflex motion of MW can shift trajectory \rightarrow when treated as a particle since no diff
- Guillardis, Porteges, Sivar (2005) showed that max V_{ej} of big w/ SN is ≤ 100 km s⁻¹ even w/ metal kicks

$$H: 116 (1488) \rightarrow v_{\text{ej}} \sim 640 \text{ km s}^{-1} \left(\frac{q_b}{0.2} \right)^{-1/2} \left(\frac{m_1, m_2}{16 M_{\odot}} \right)^{1/3} \times \left(\frac{M_{\text{BH}}}{10^5 M_{\odot}} \right)^{1/6}$$

- Can do max samples on LMC | Compres 41. 26 Stars
 - ↳ paper shared at 4, 'Coul' original @ LMC
 - ↳ sim graph to fig 4.