

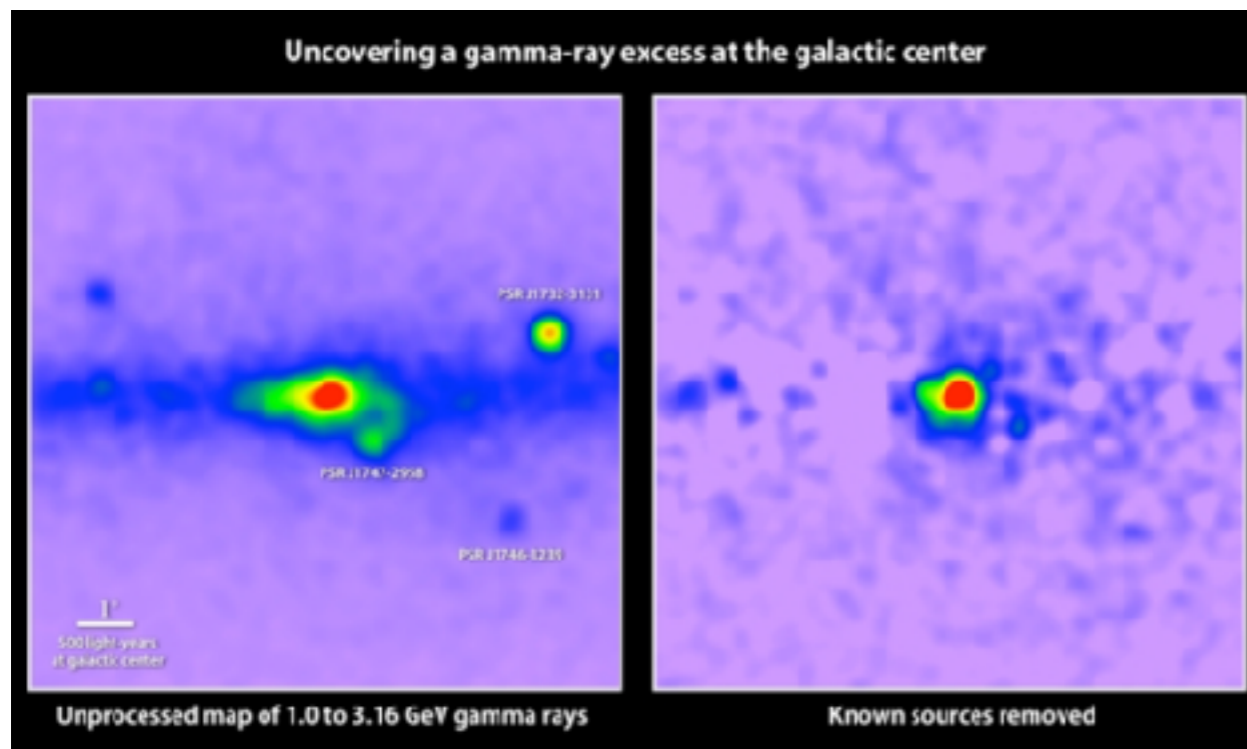
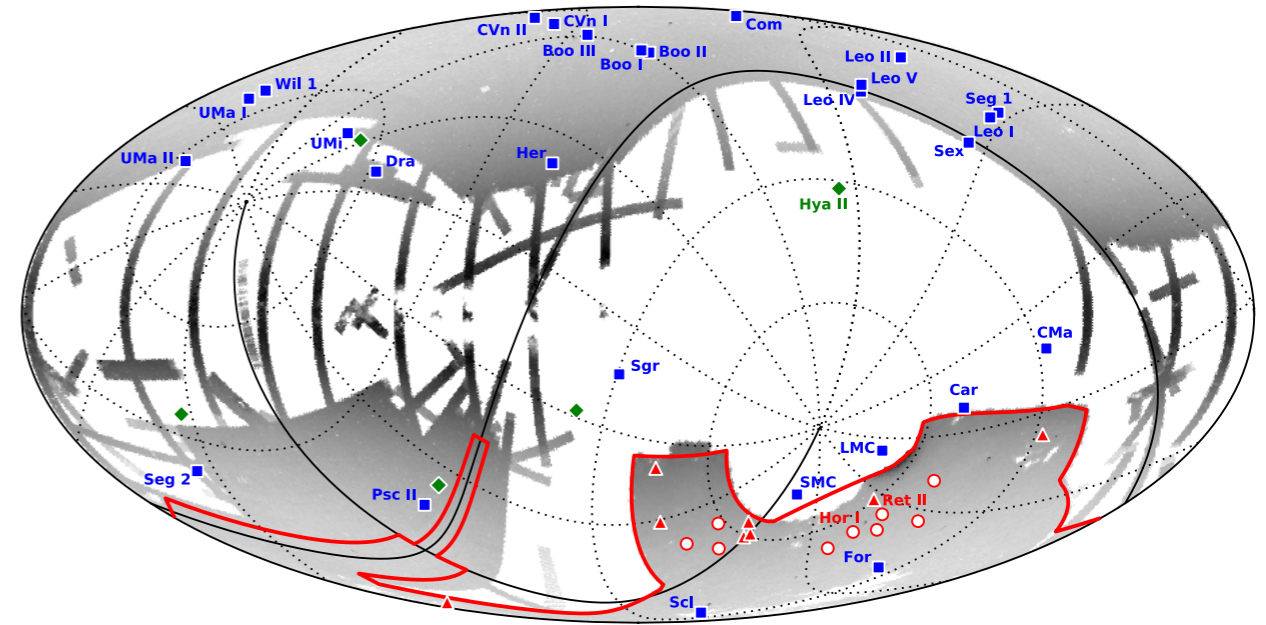
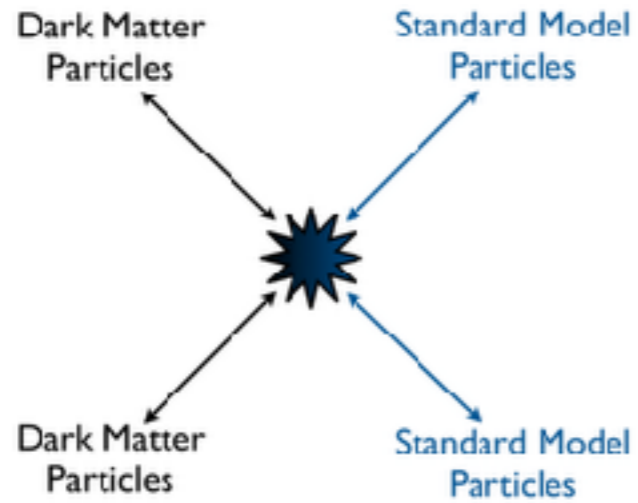
WIMP dark matter limits beyond the thermal relic bound

Louis E. Strigari
Texas A&M University

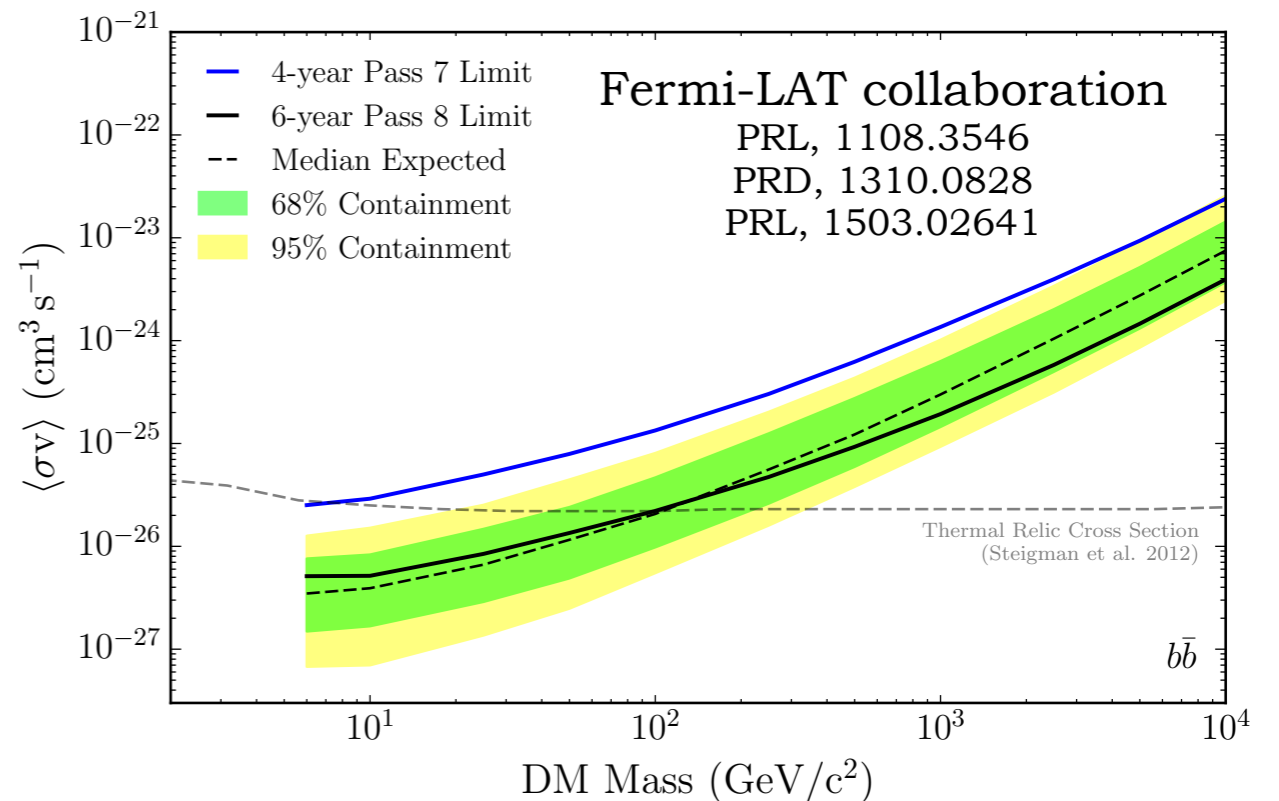
TACOS, SMU
Oct 10, 2022



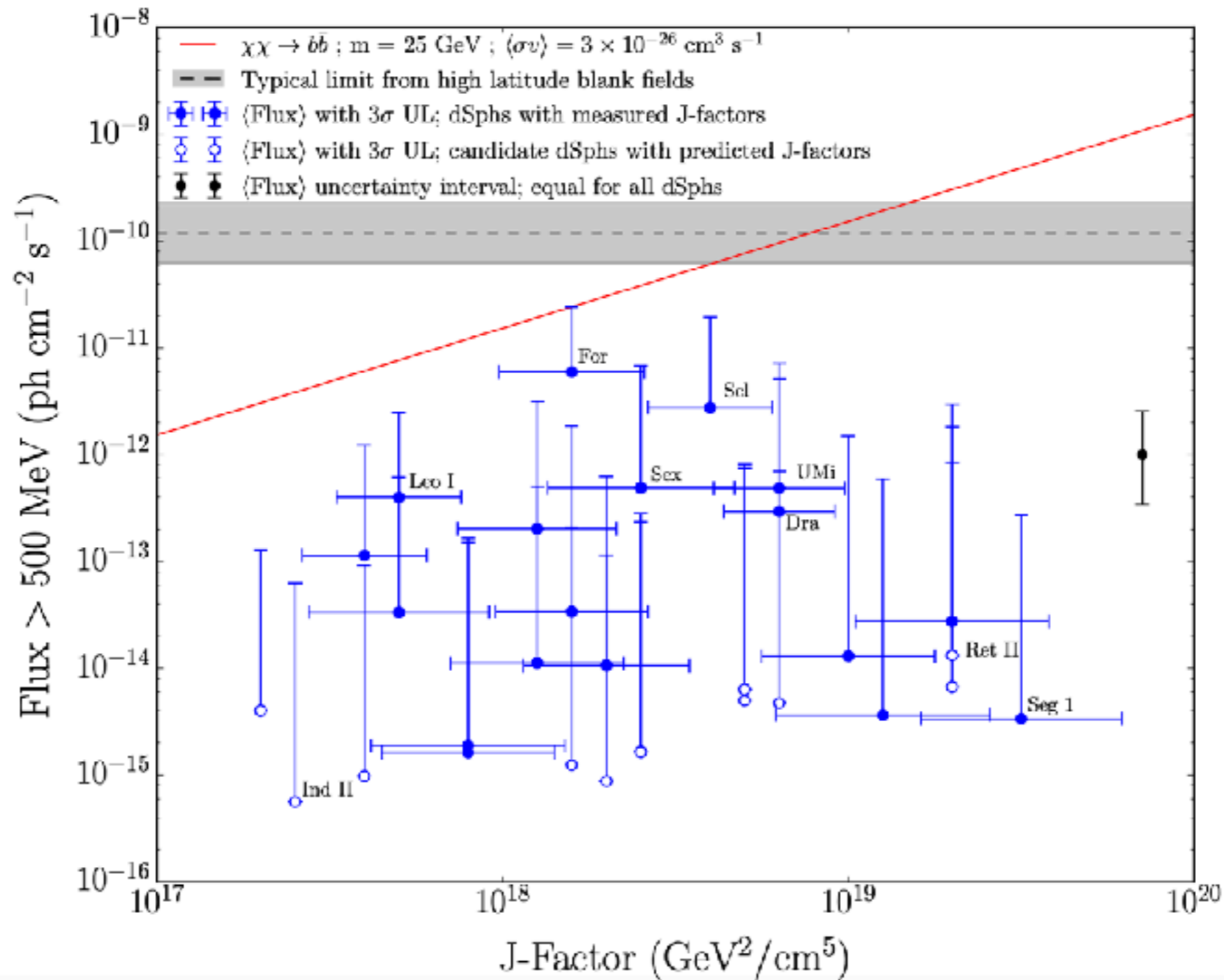
Dark matter and gamma rays in the inner Galaxy and dSphs



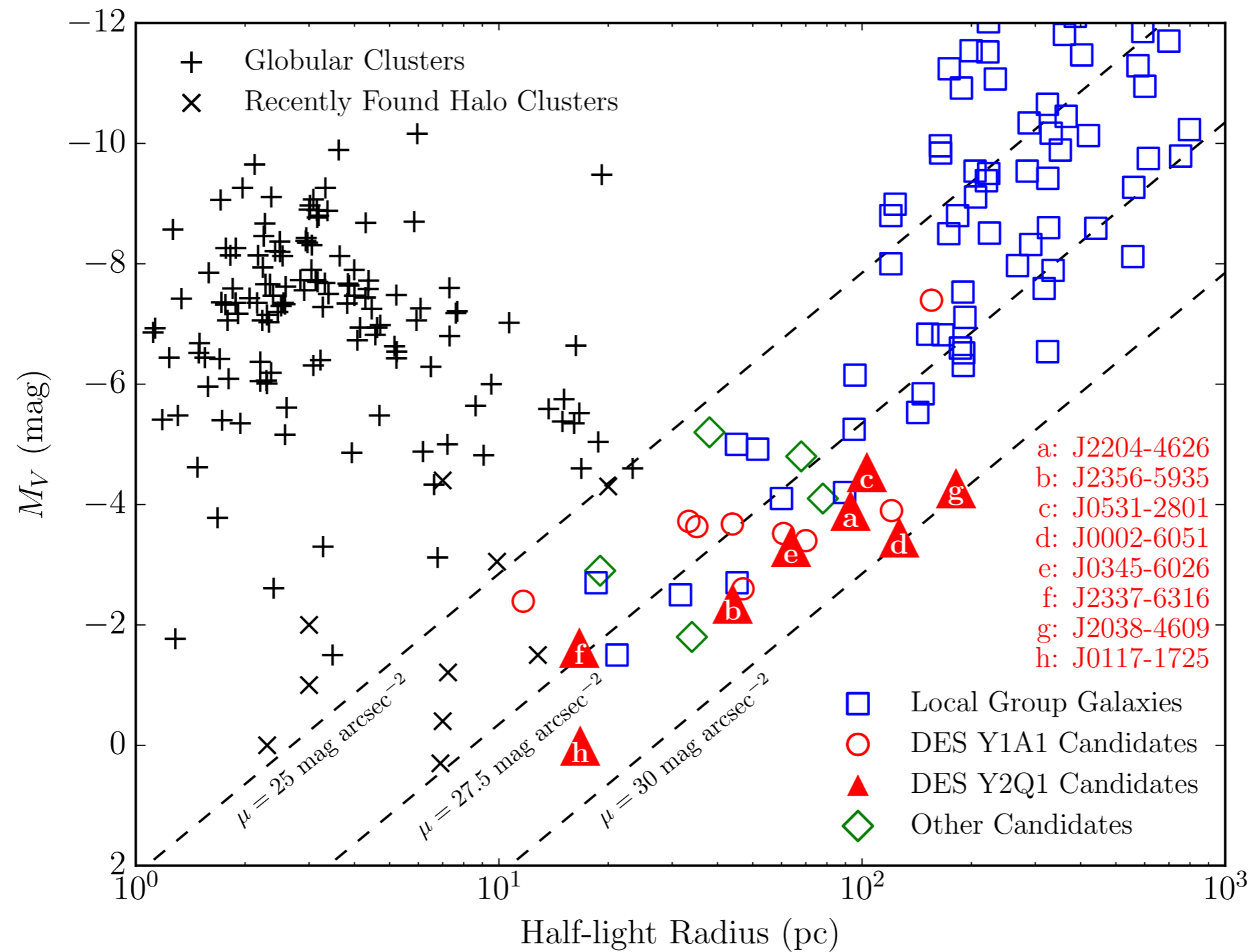
Hooper & Goodenough 0910.2998;
 Abazajian & Kaplinghat 1207.6047;
 Gordon & Macias 1306.5725; Dylan et al. 1402.6703; Calore et al 1409.0042



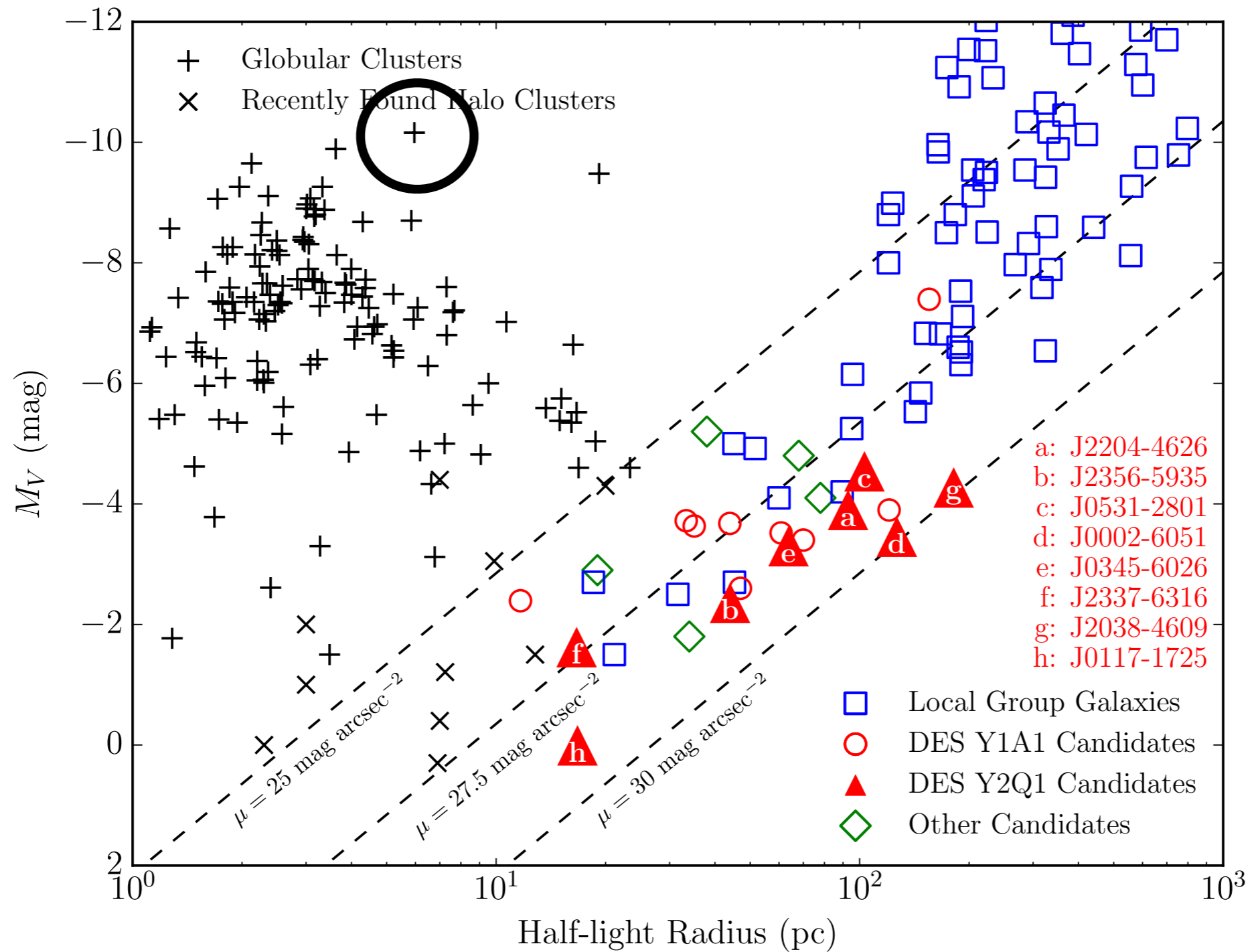
Expectations for pulsar emission in dSphs



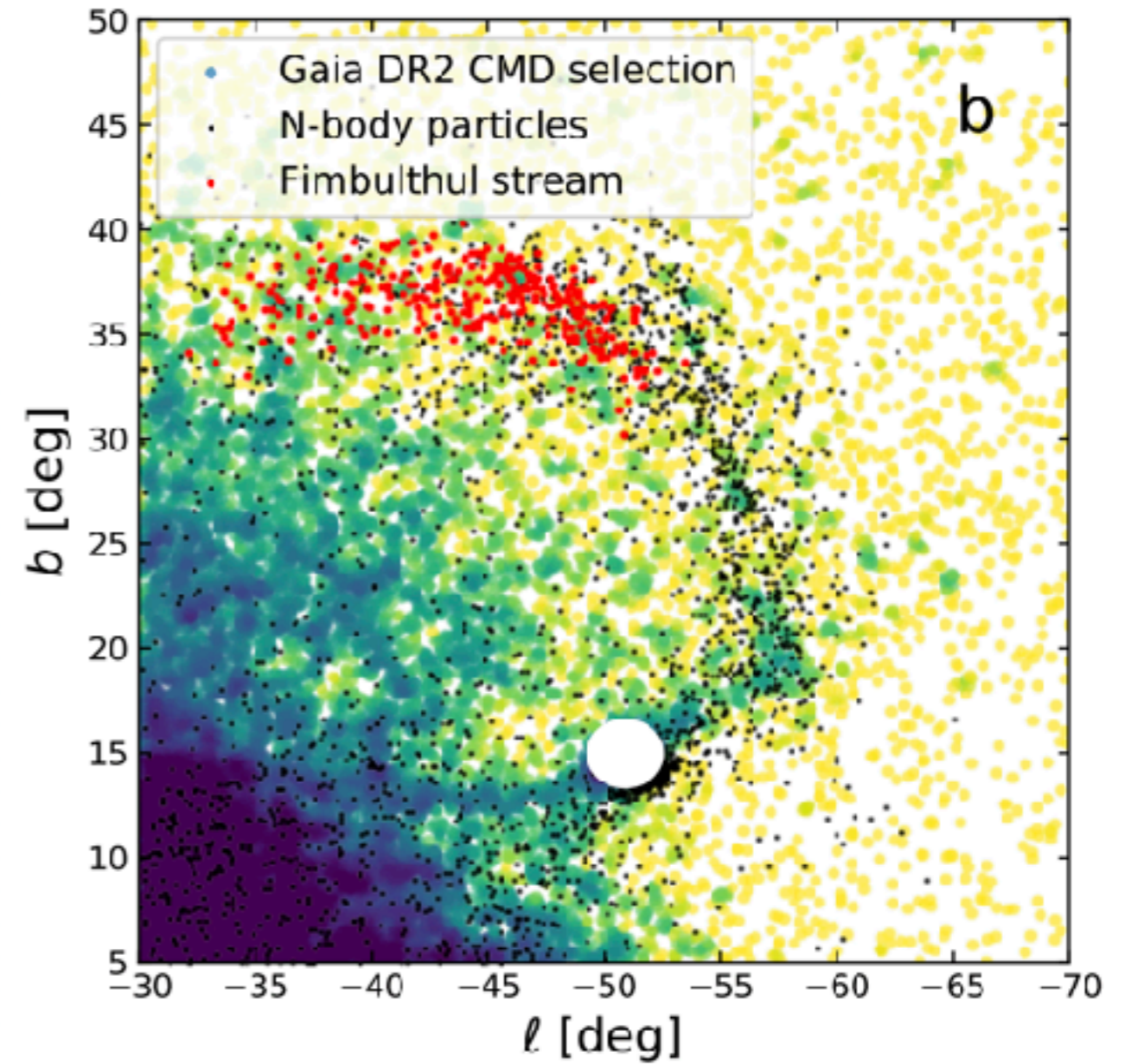
Dwarf galaxies and globular clusters



Dwarf galaxies and globular clusters

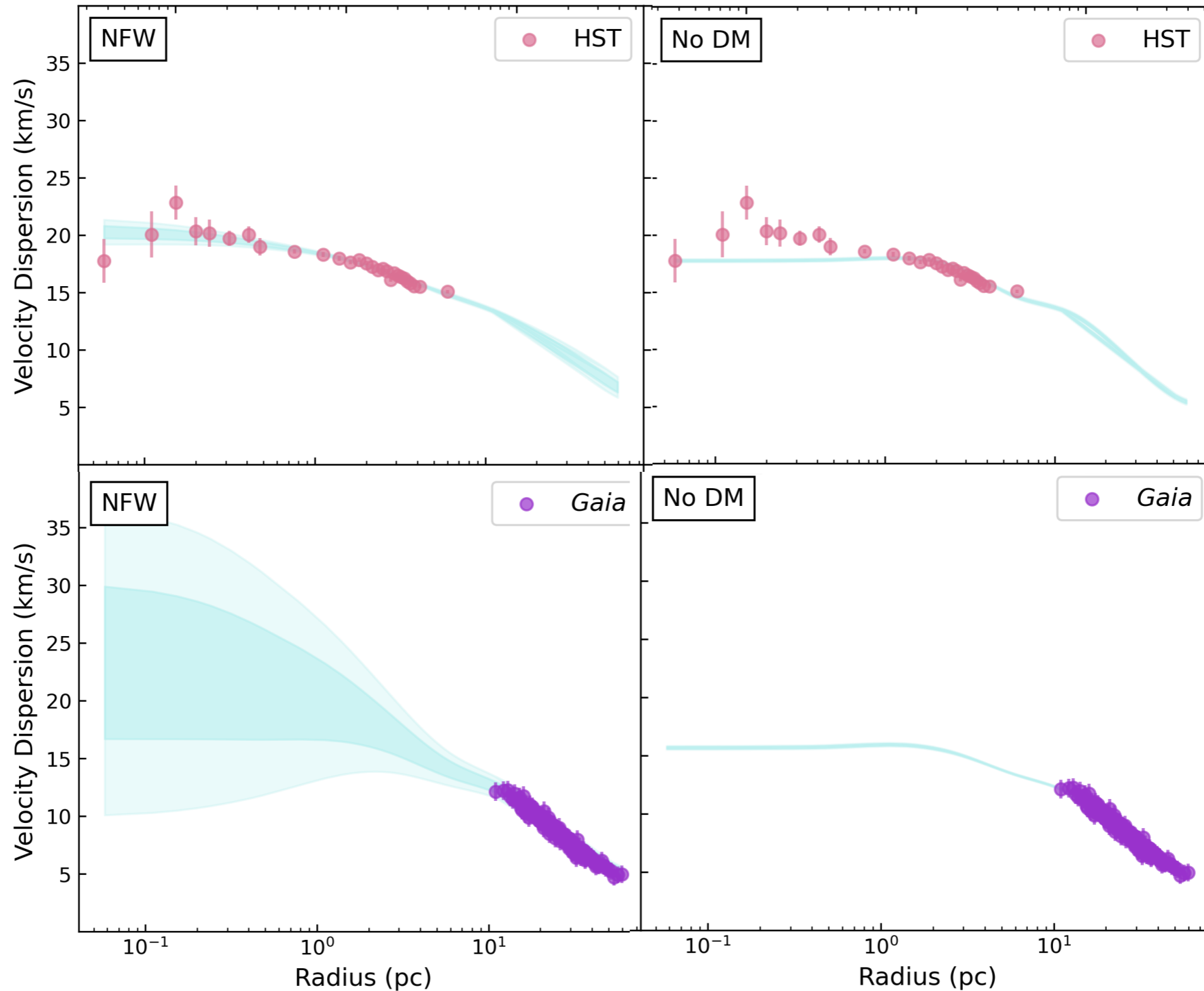


Omega centauri globular cluster



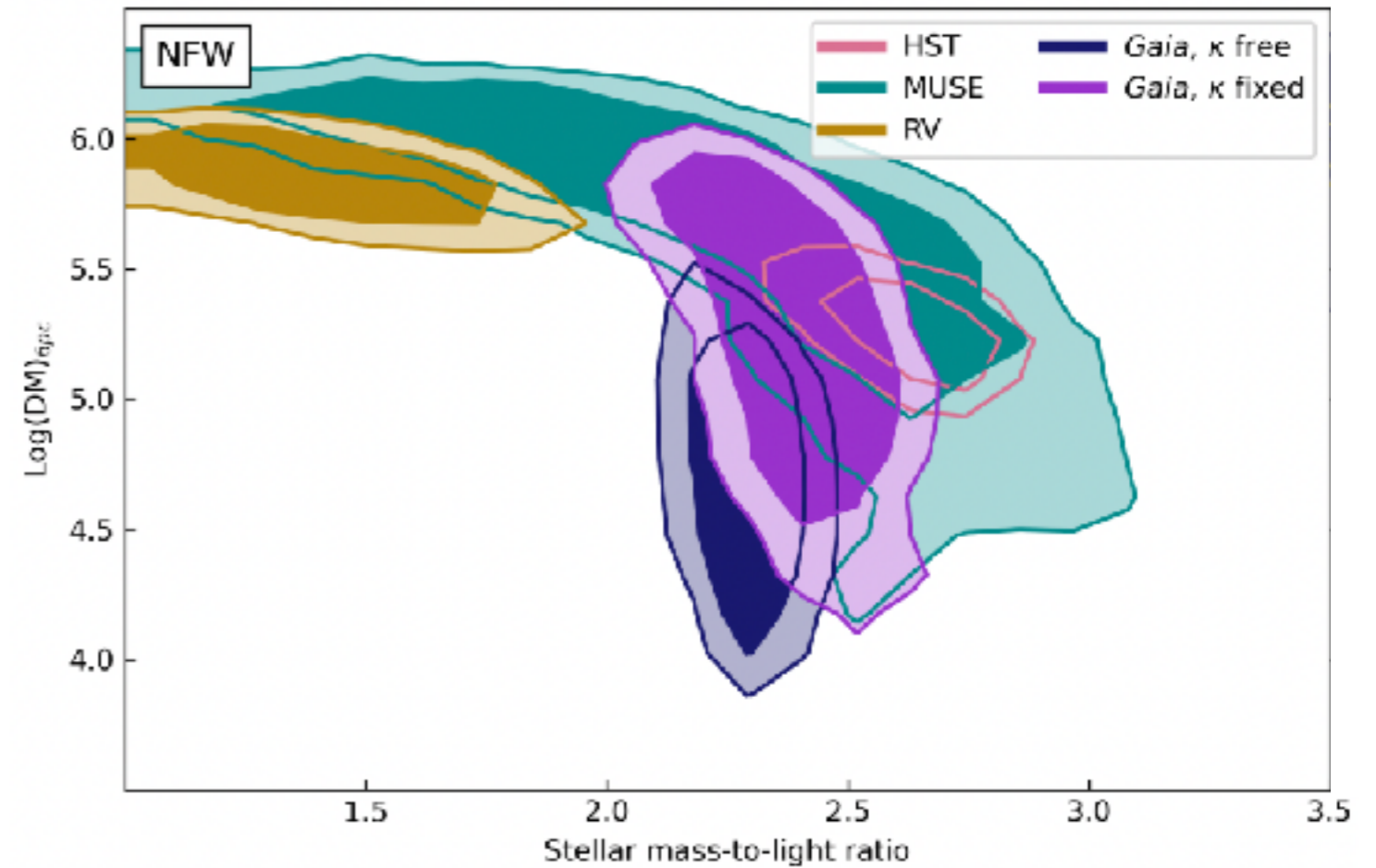
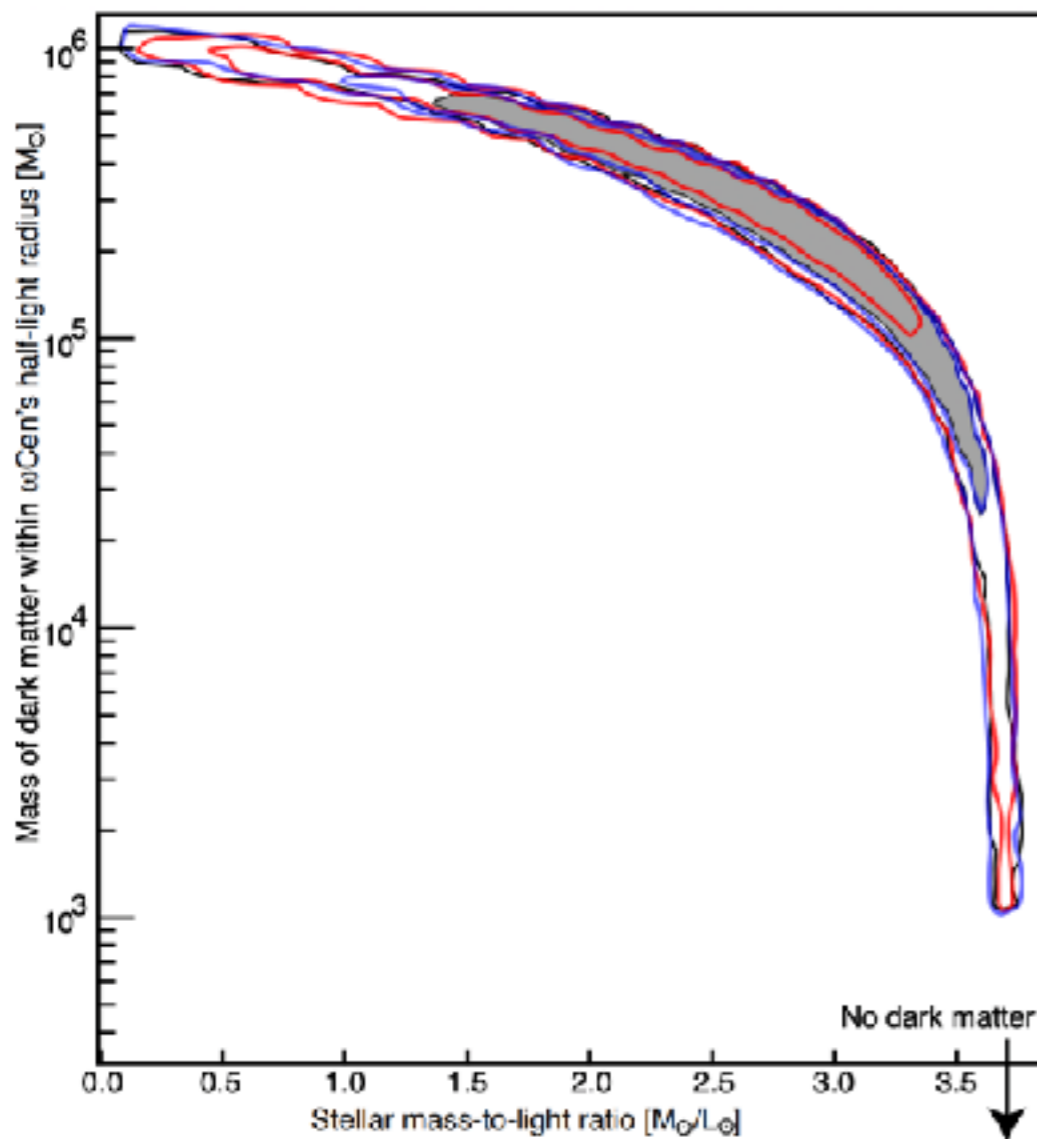
Dark mass in omega Centauri

Van der marel & Andreson 2010
Watkins et al. 2015
Addy Evans, LS, P. Zivick MNRAS 2022



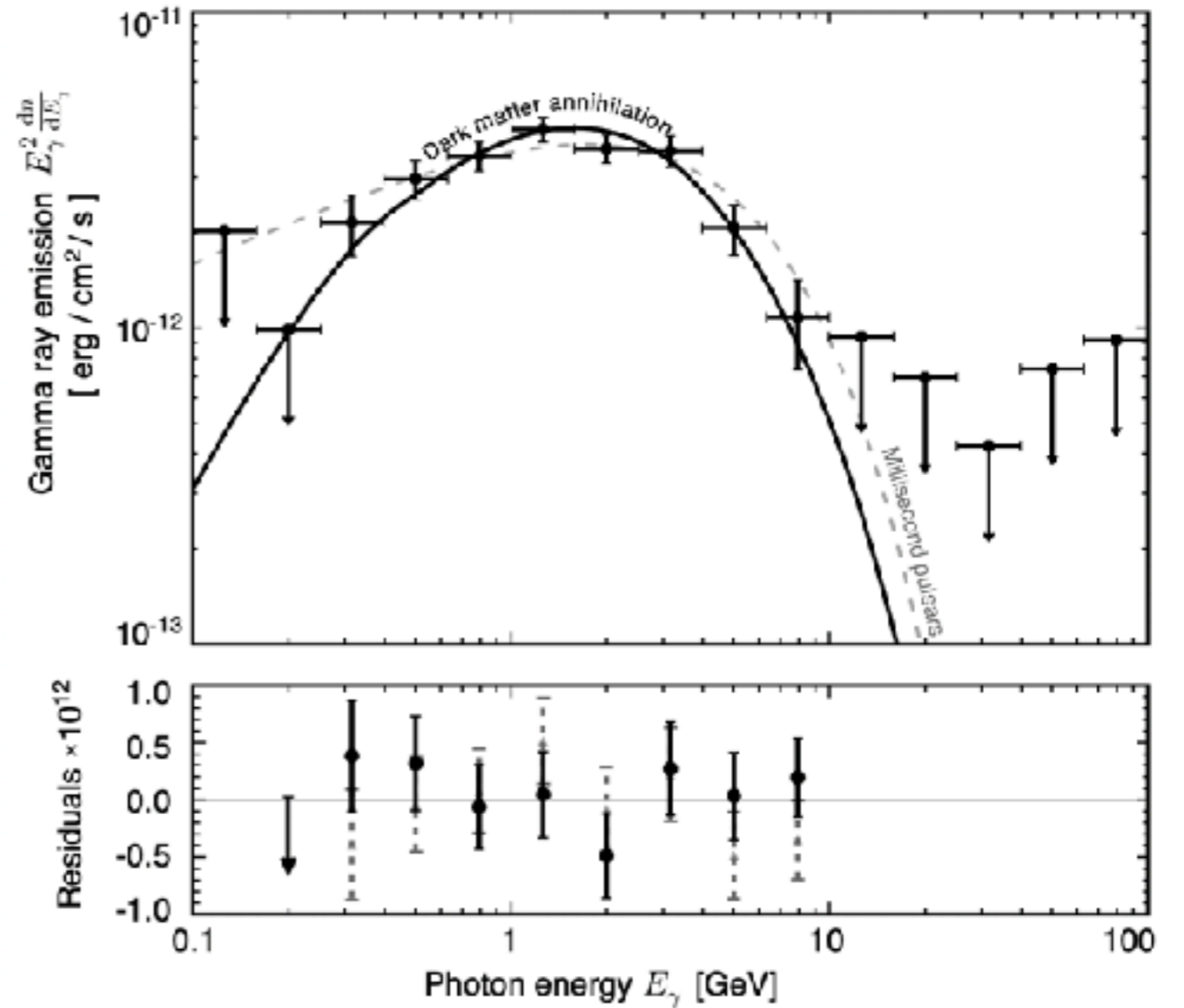
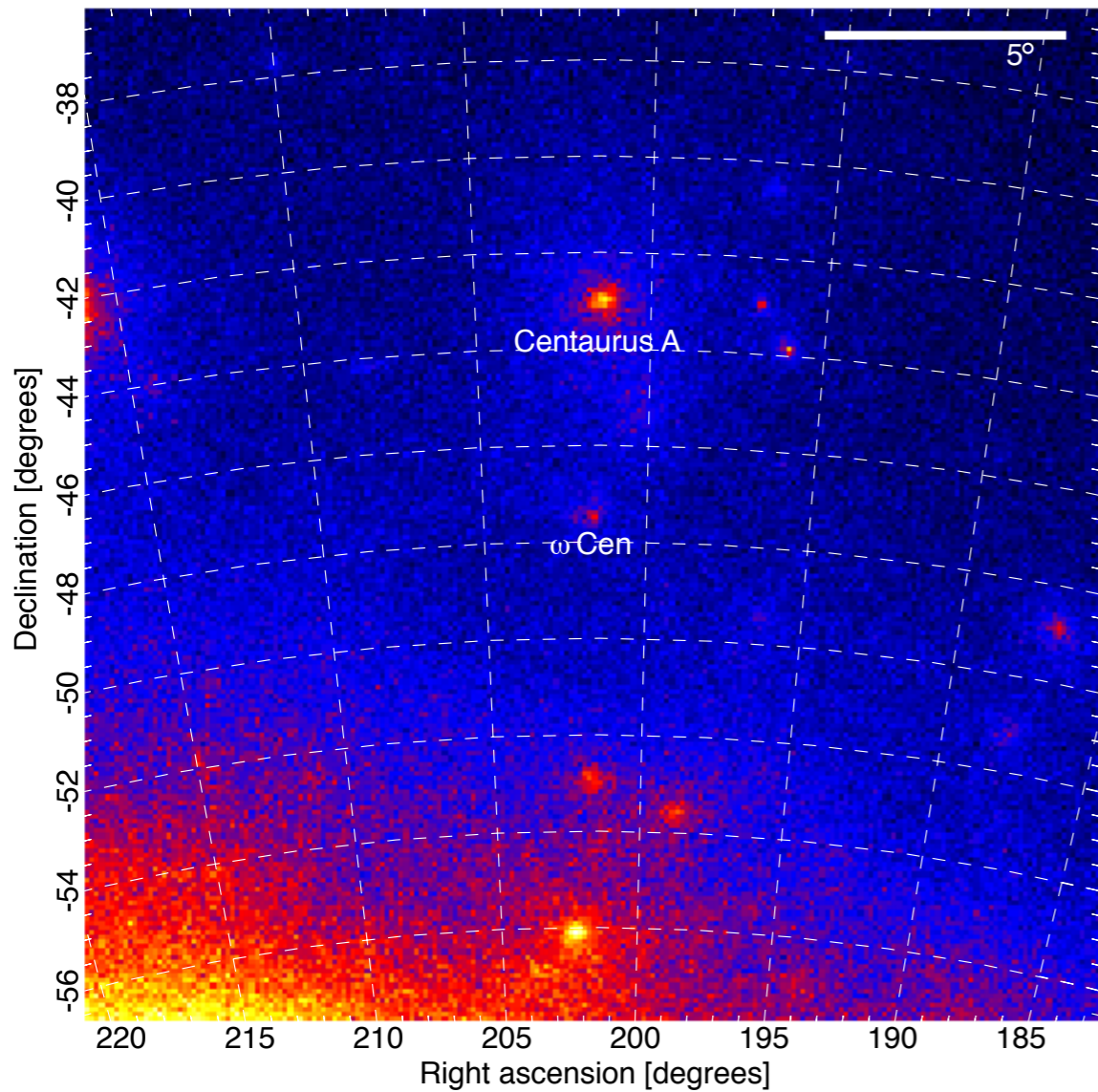
Dark mass in omega Centauri

Addy Evans, LS, P. Zivick MNRAS 2022



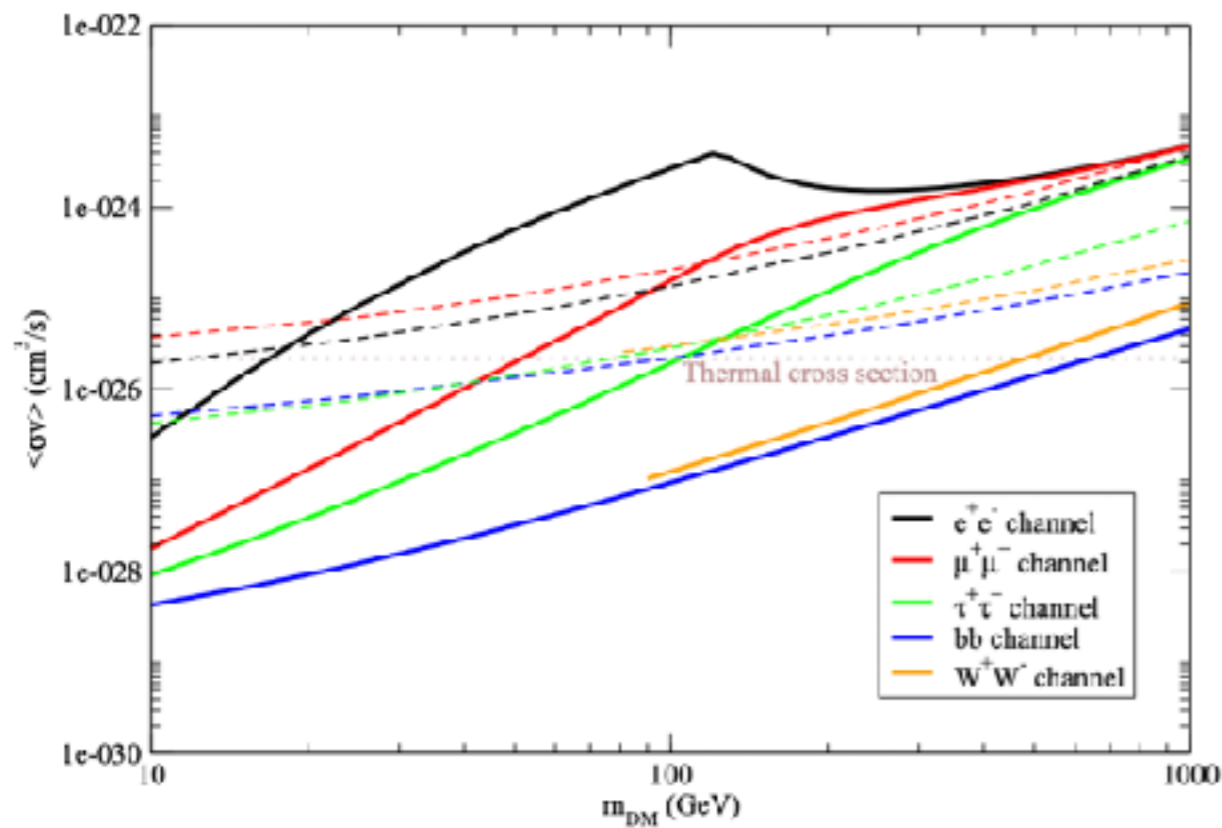
Stellar remnant interpretation [Baumgardt et al 2018]

Gamma-rays from omega centauri

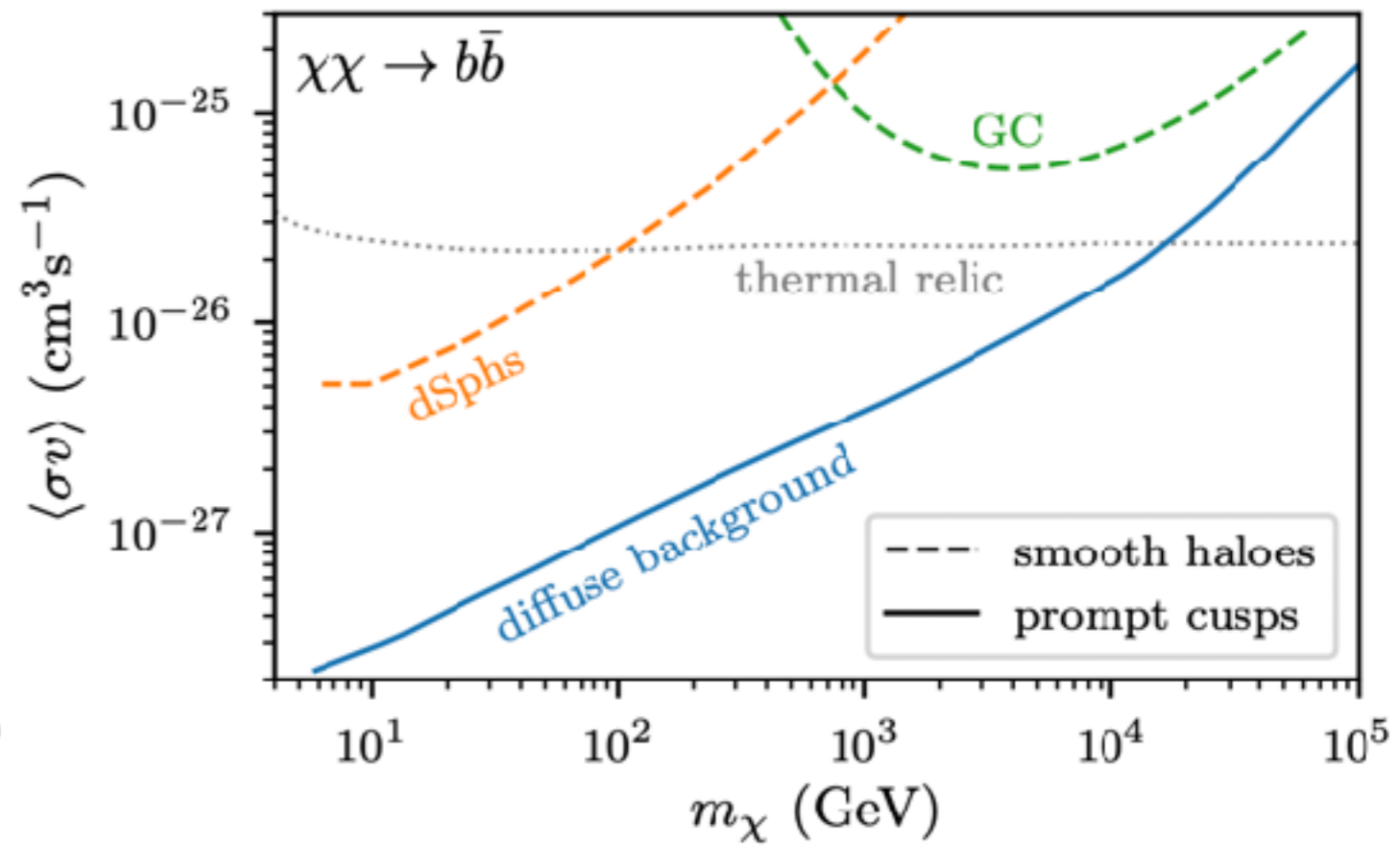


Dark matter interpretation: Brown et al., Reynosa-Cordova et al. 2019
Pulsar interpretation: Dai et al. 2020

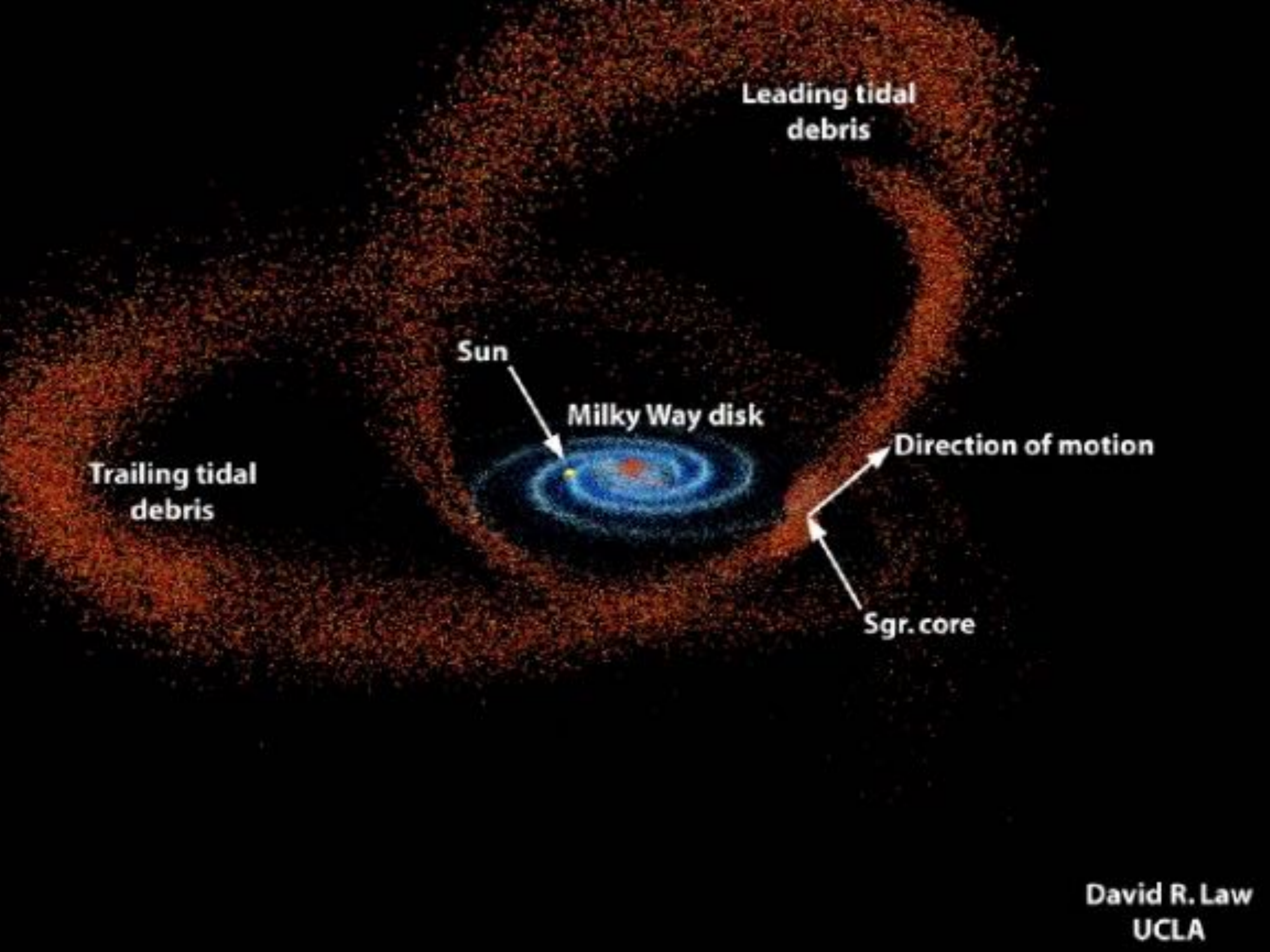
Dark matter limits from Omega Centauri

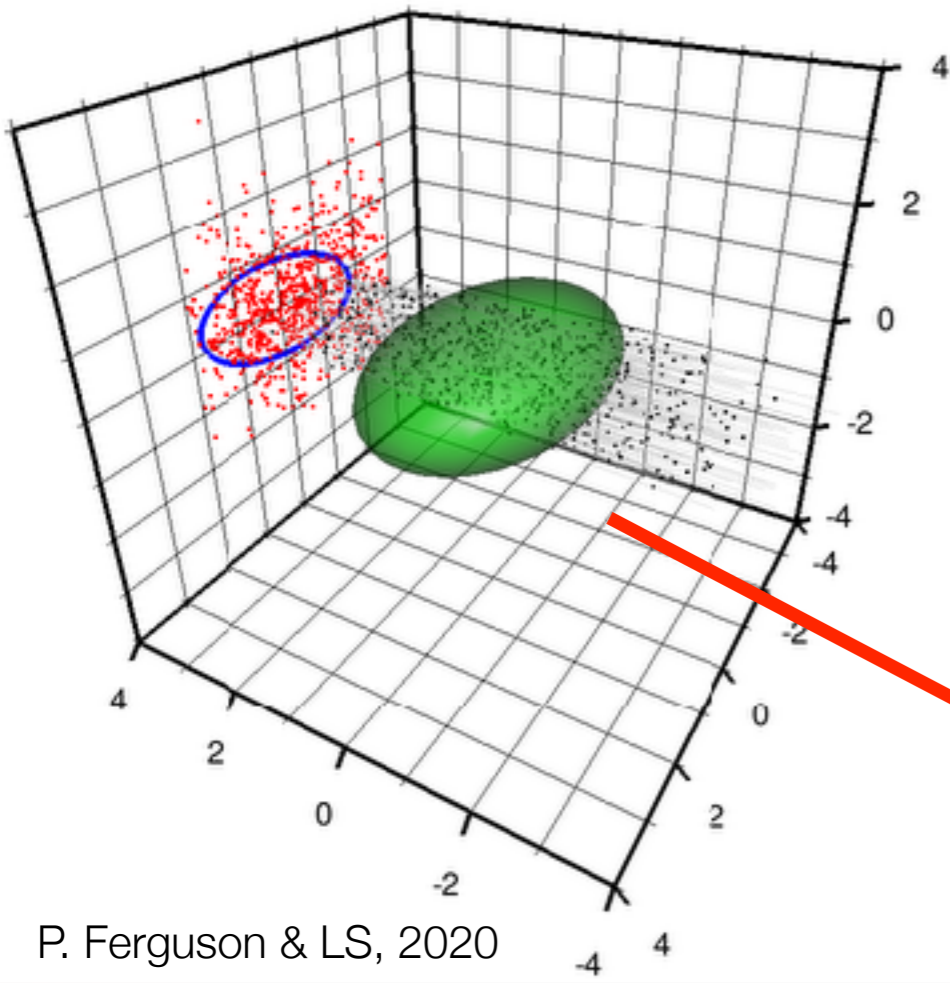


Dutta, Kar, LS 2021; Chan and Lee, 2022

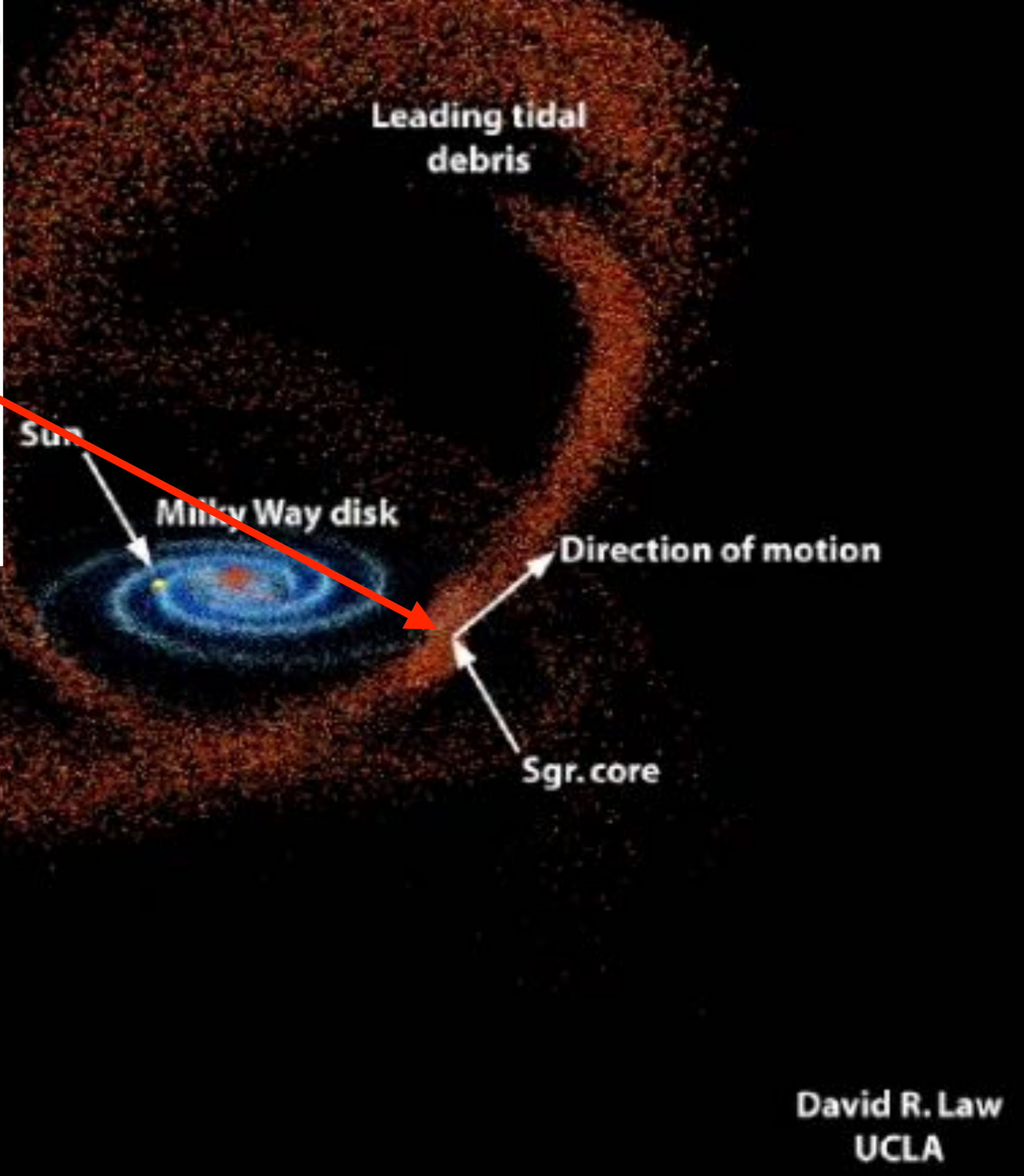


Delos and White, 2022

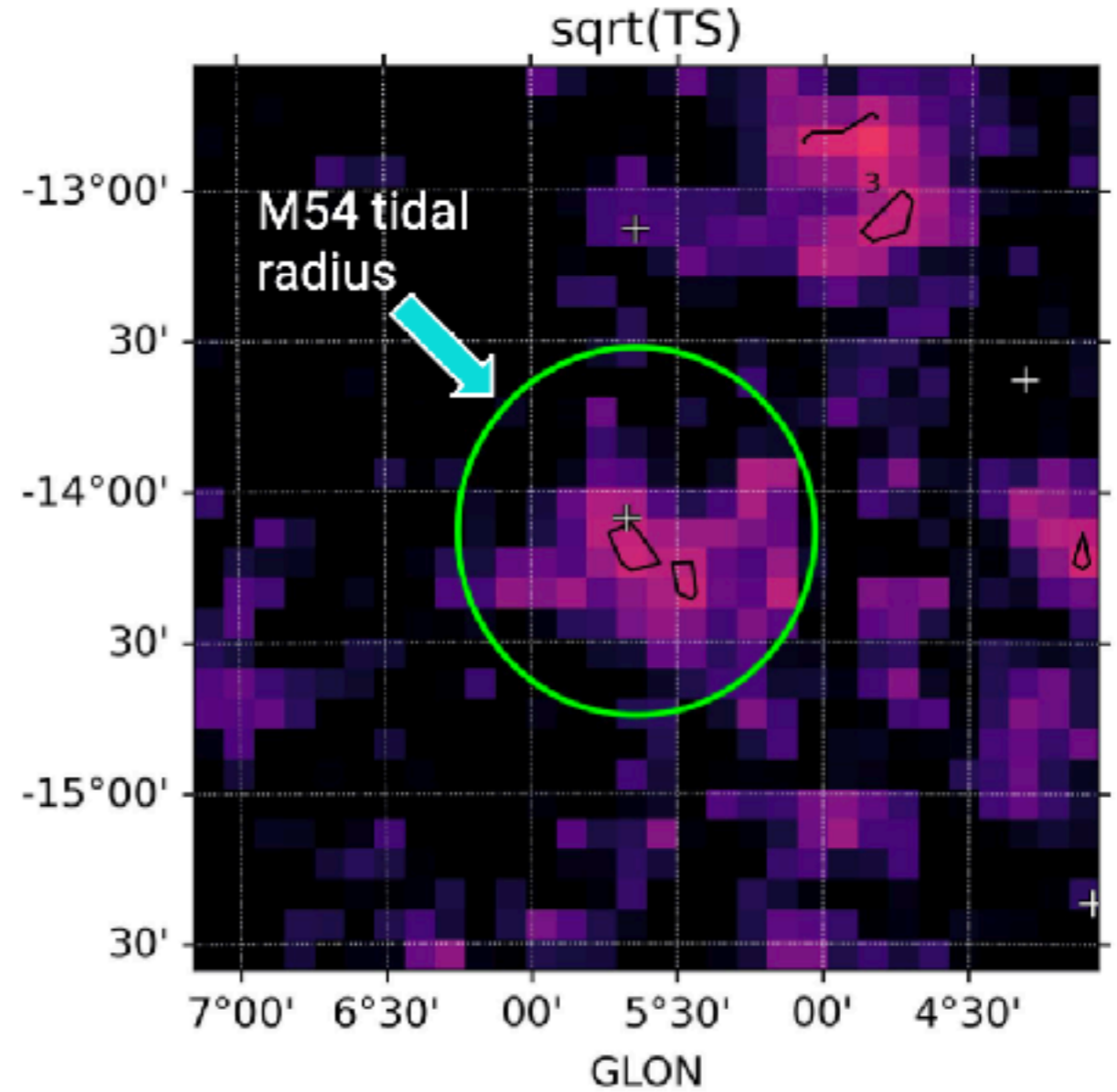
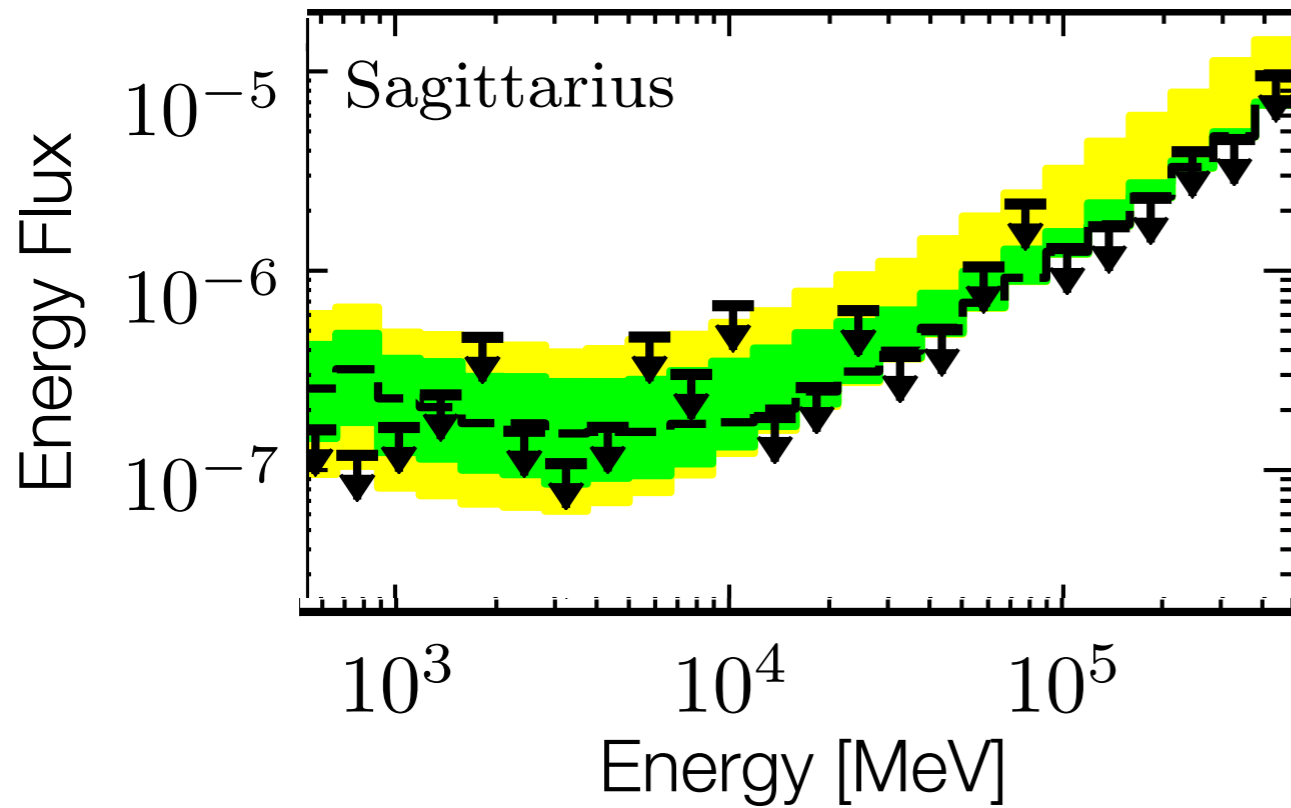
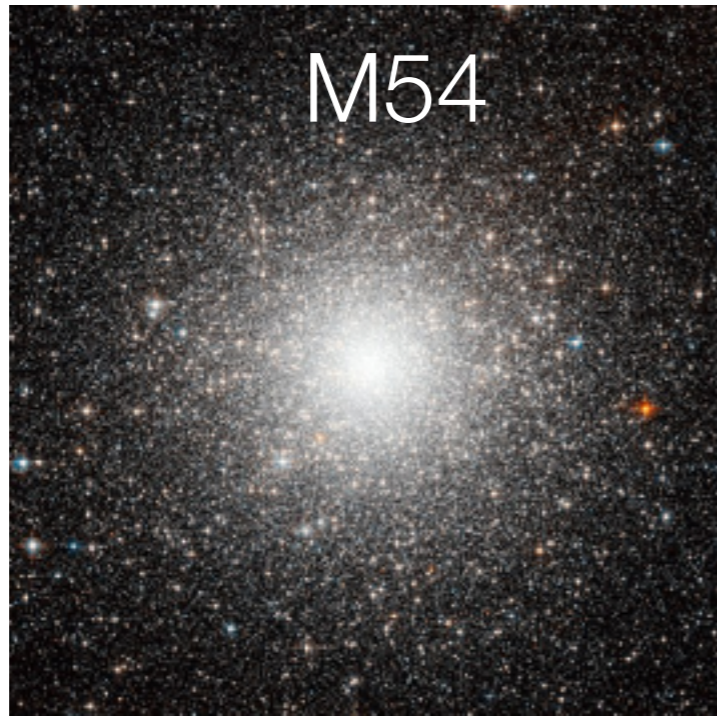




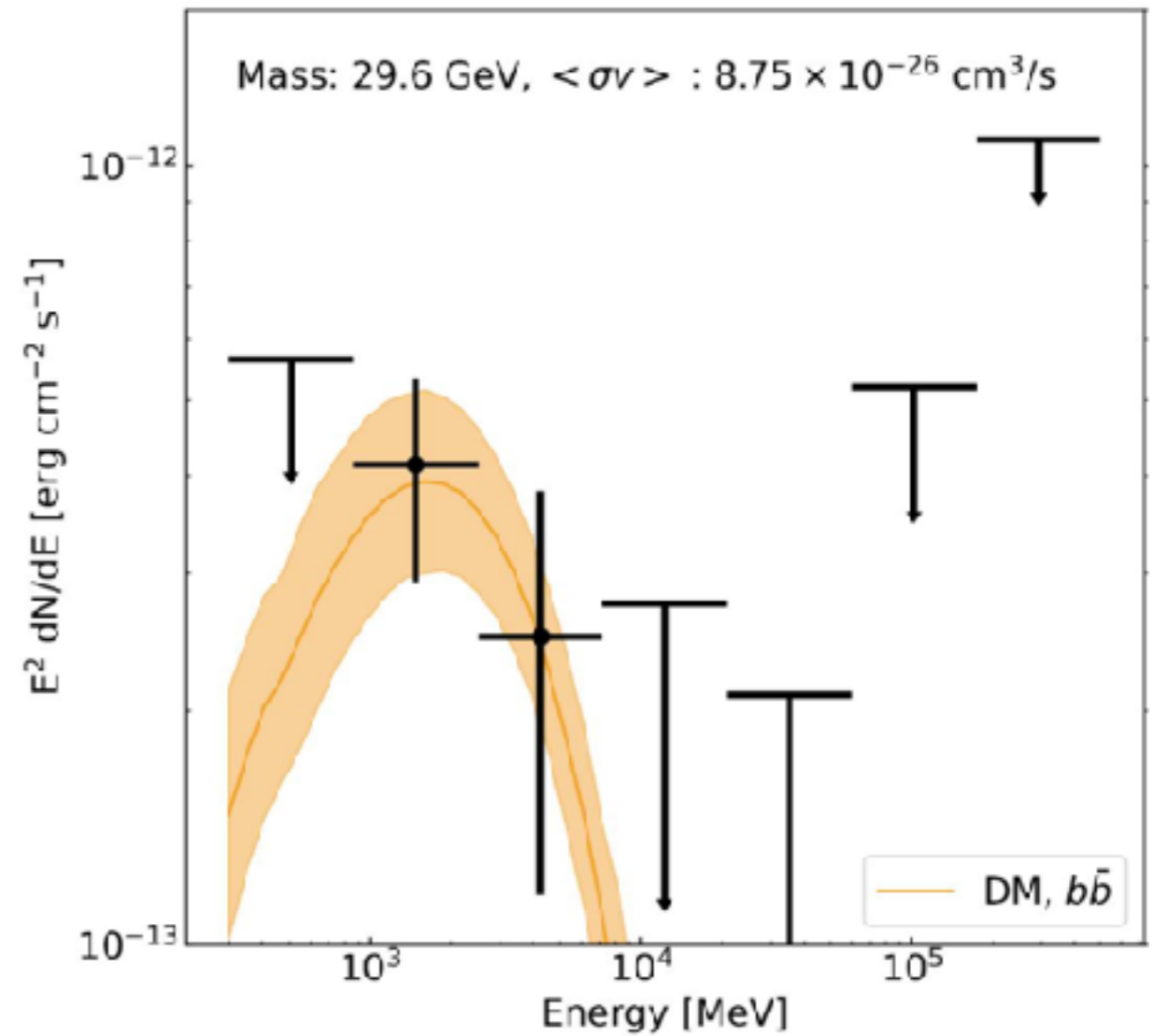
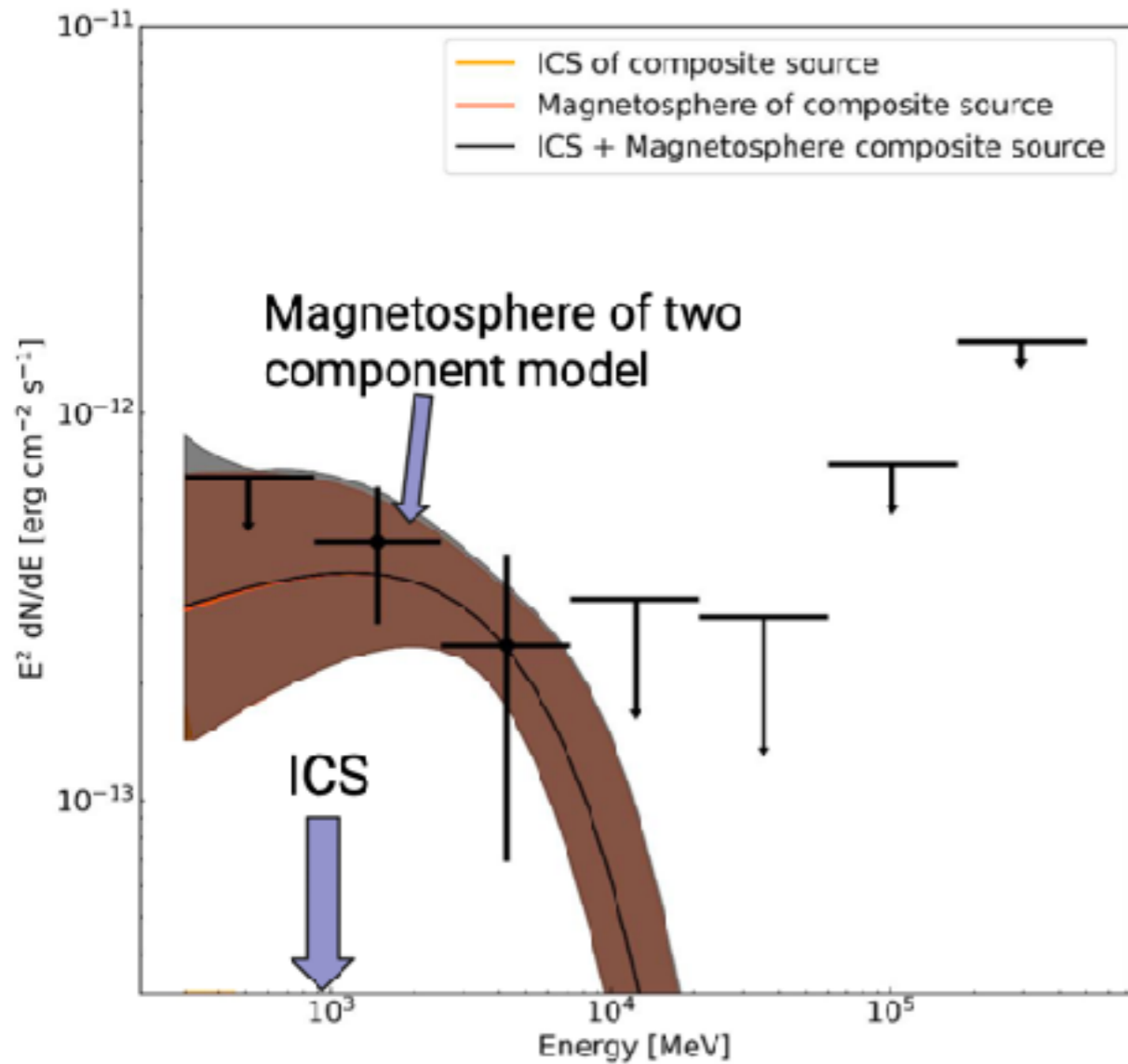
P. Ferguson & LS, 2020



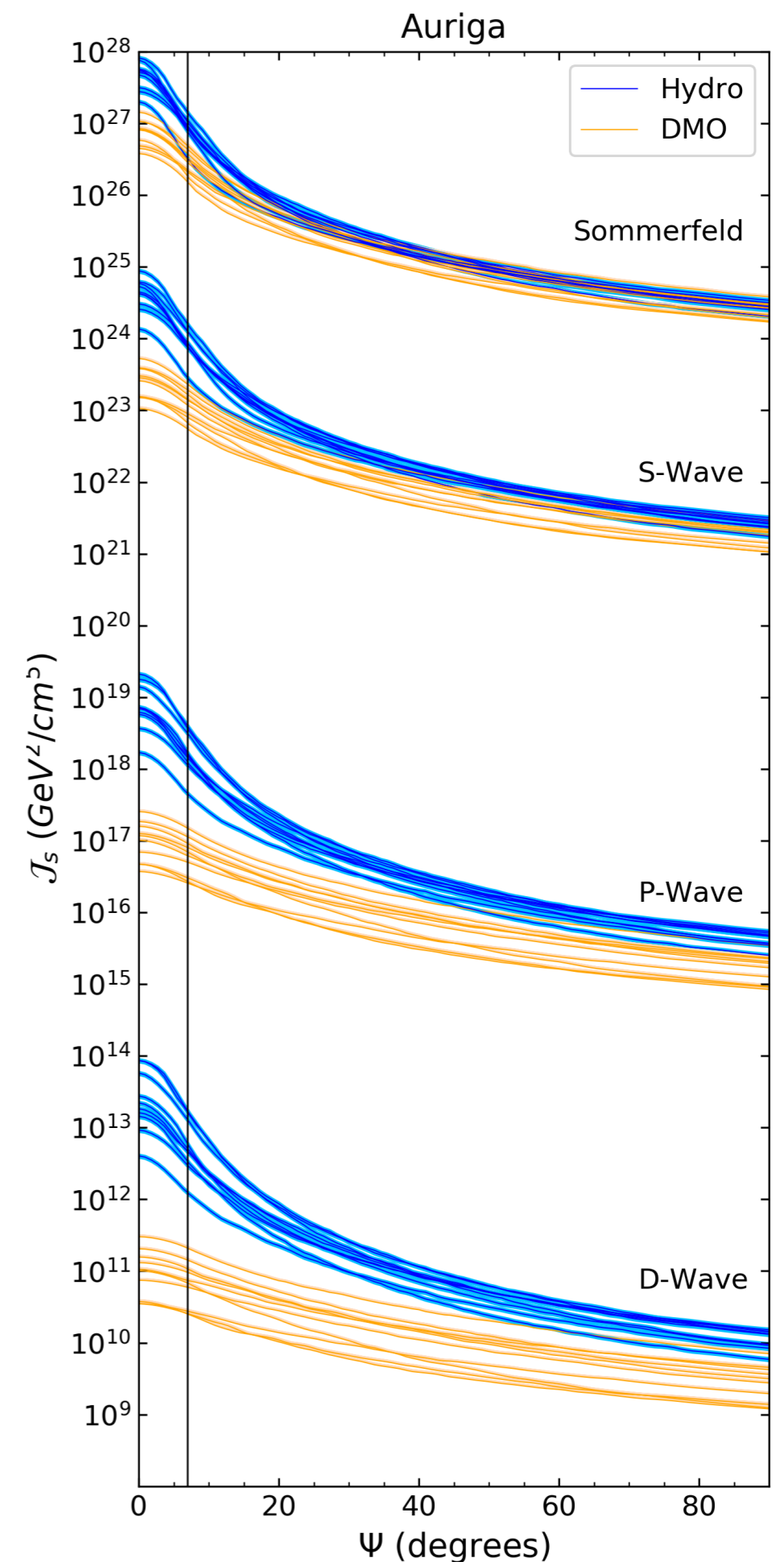
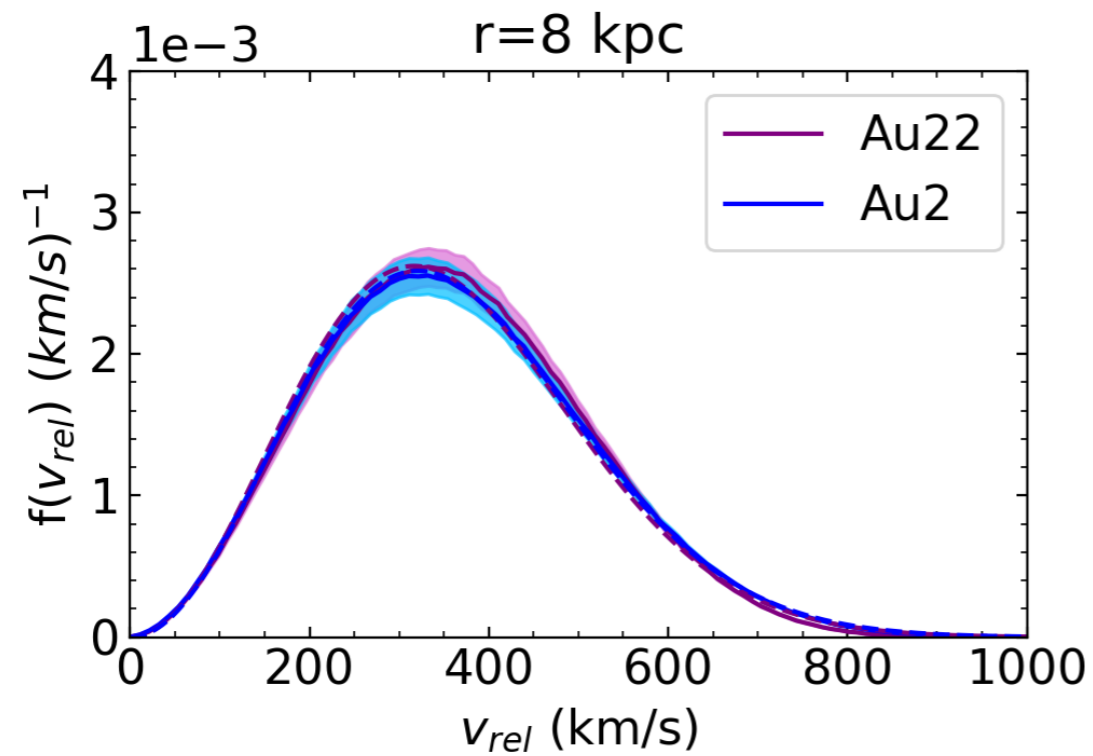
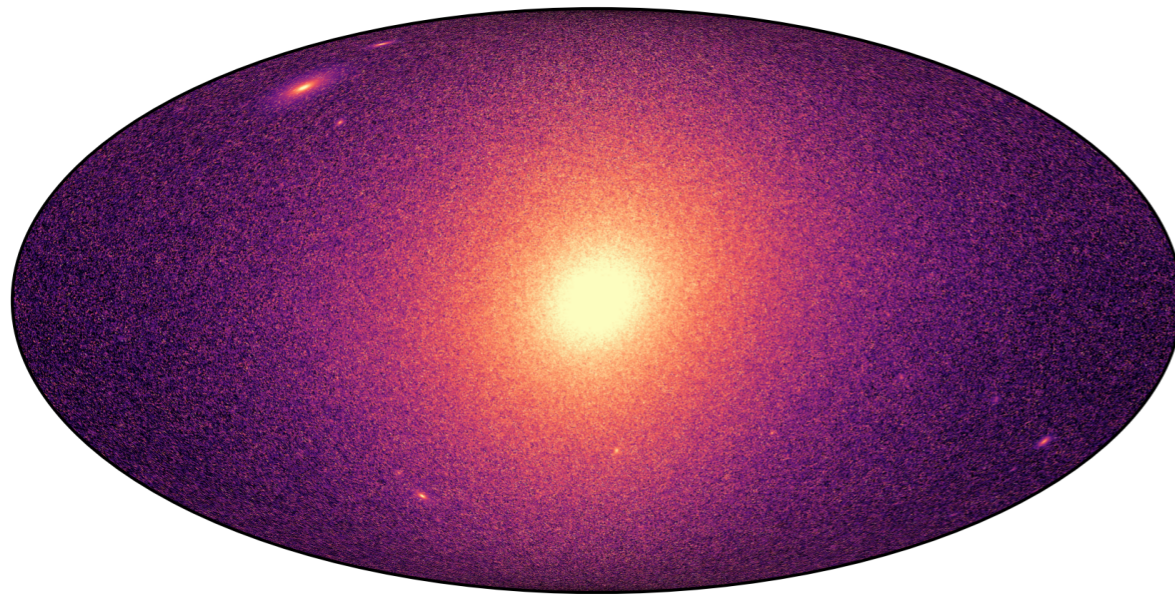
Gamma-ray view of Sagittarius dSph



Pulsar and dark matter fits

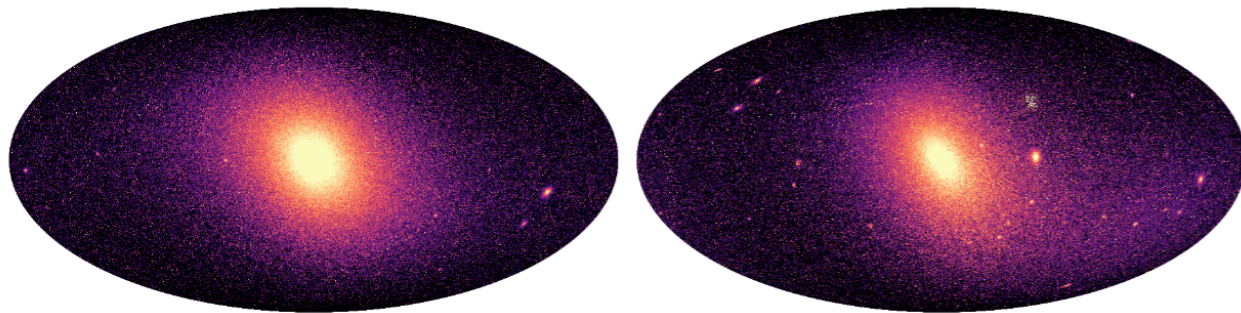


Velocity dependent dark matter annihilation

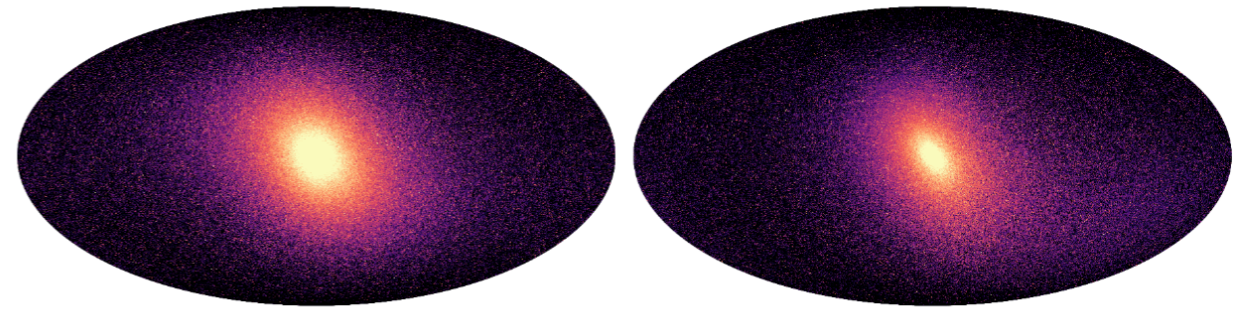


Subhalos in velocity dependent dark matter models

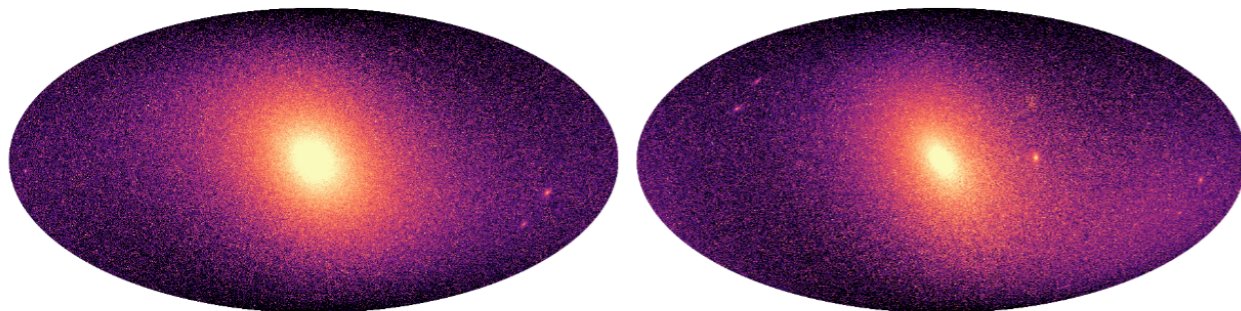
Sommerfeld



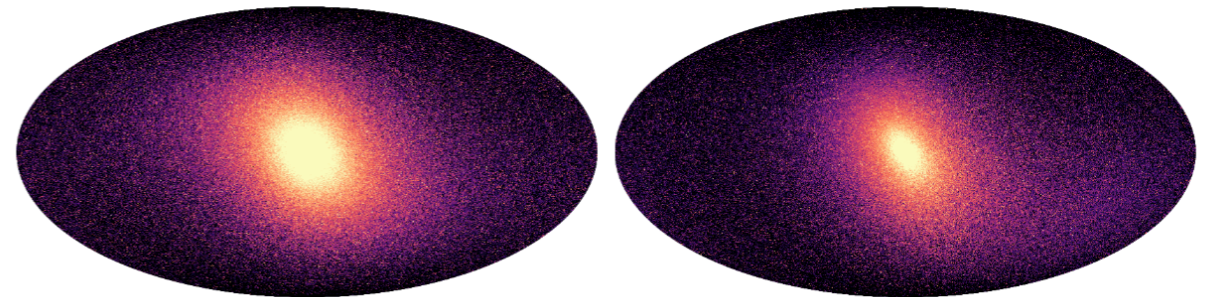
P-wave



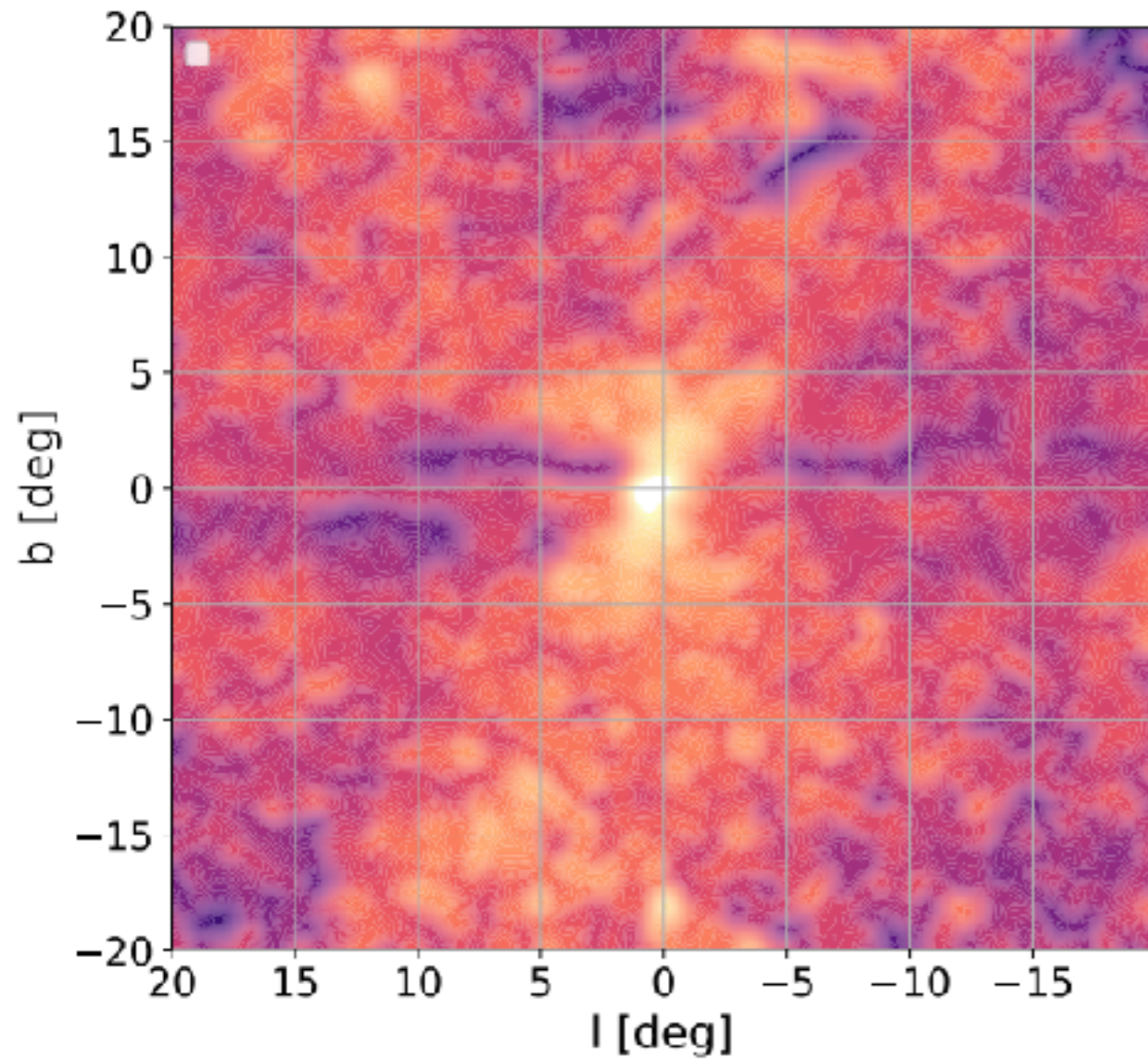
S-wave



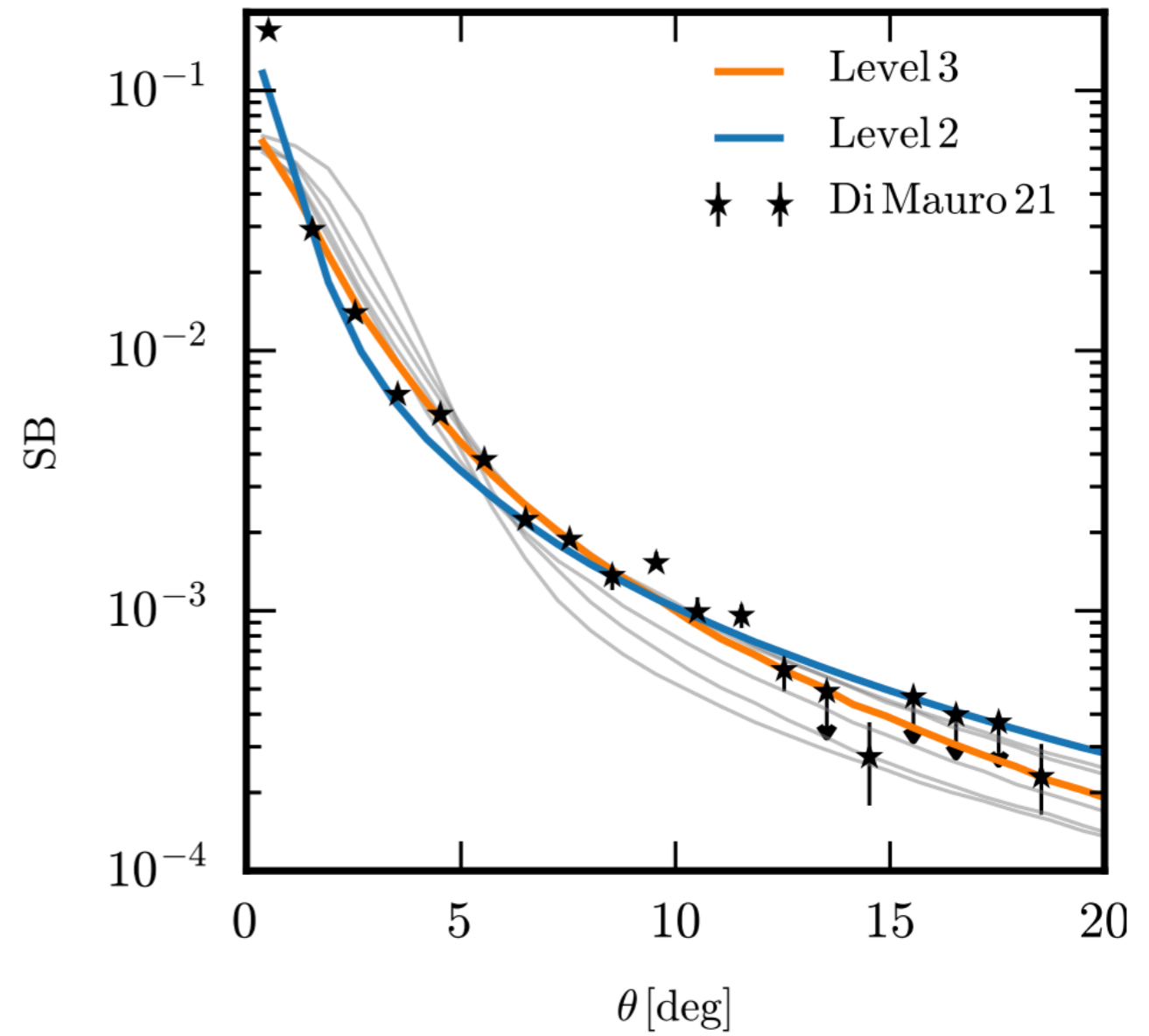
D-wave



Implications for gamma-ray excess at the Galactic center



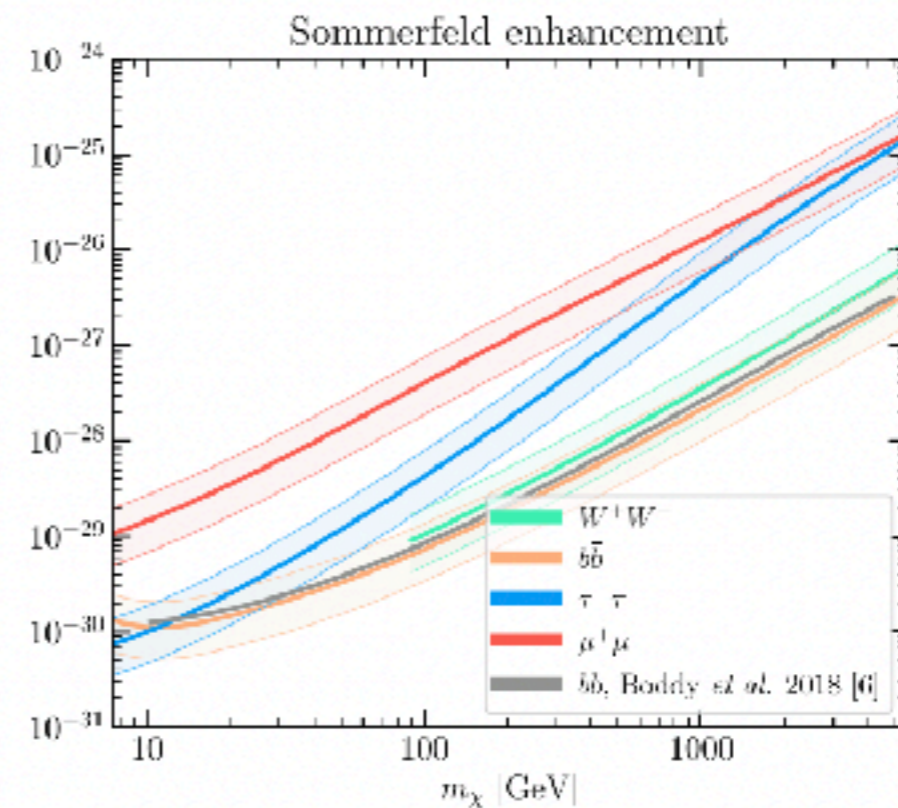
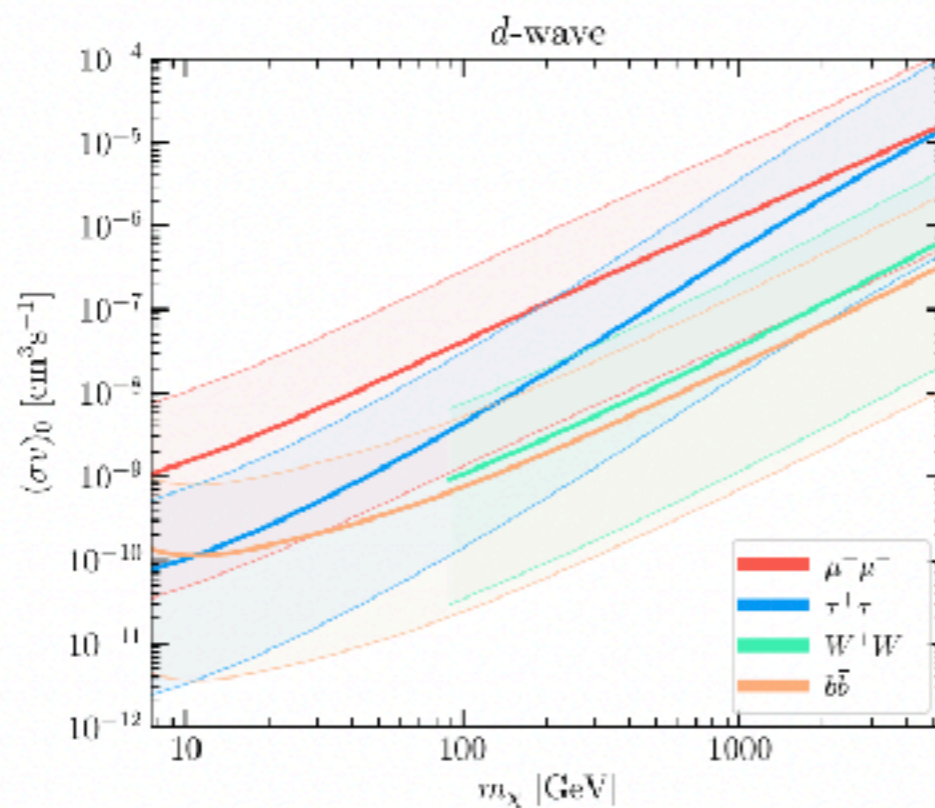
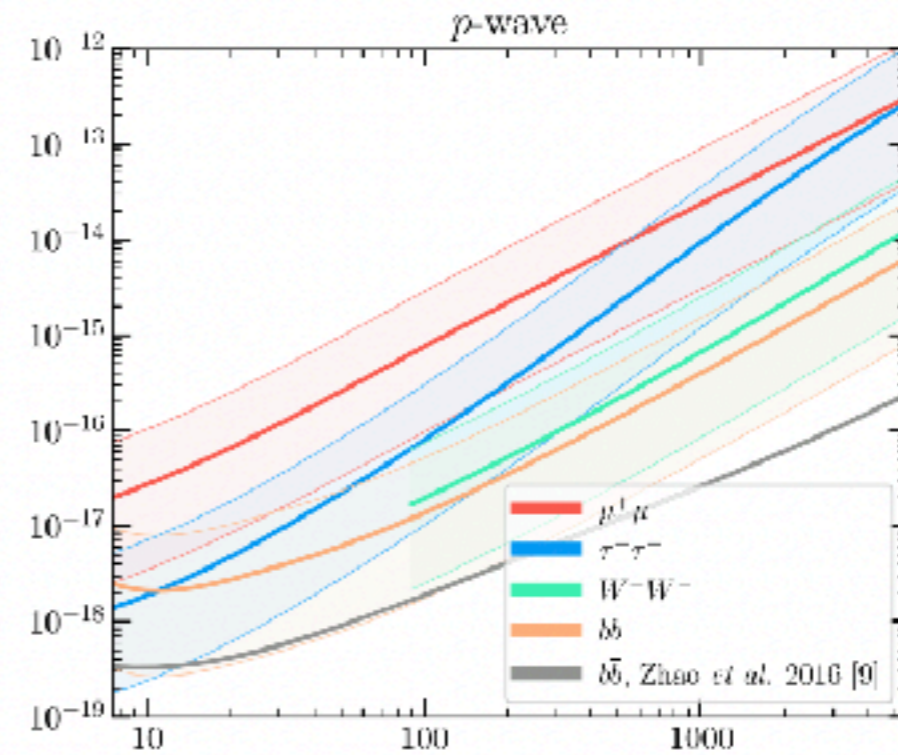
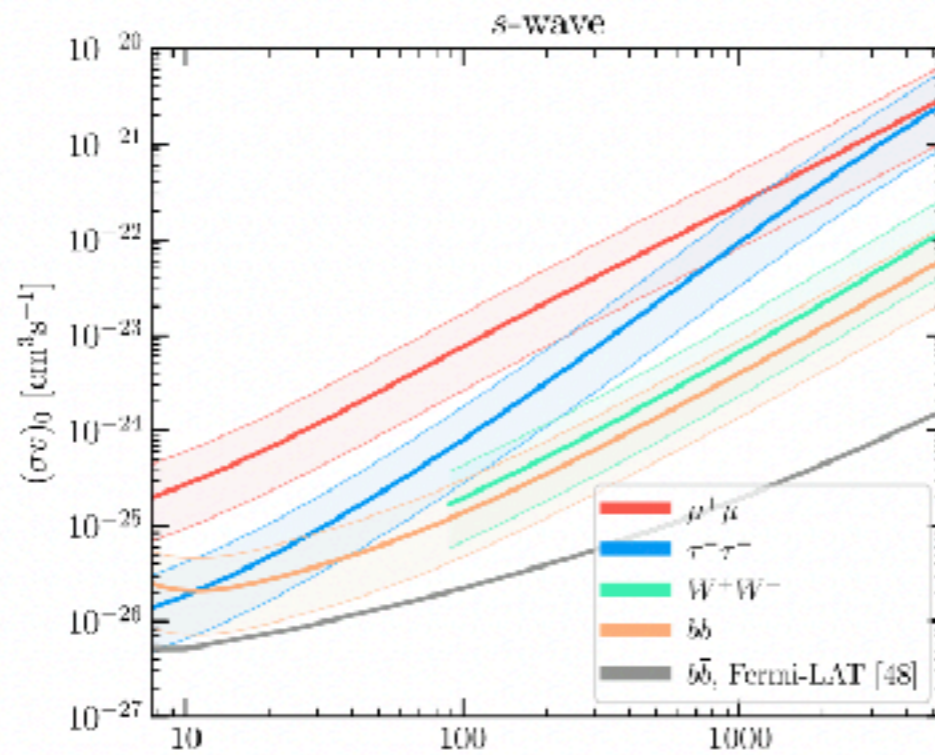
DiMauro 2021



Grand & White 2022

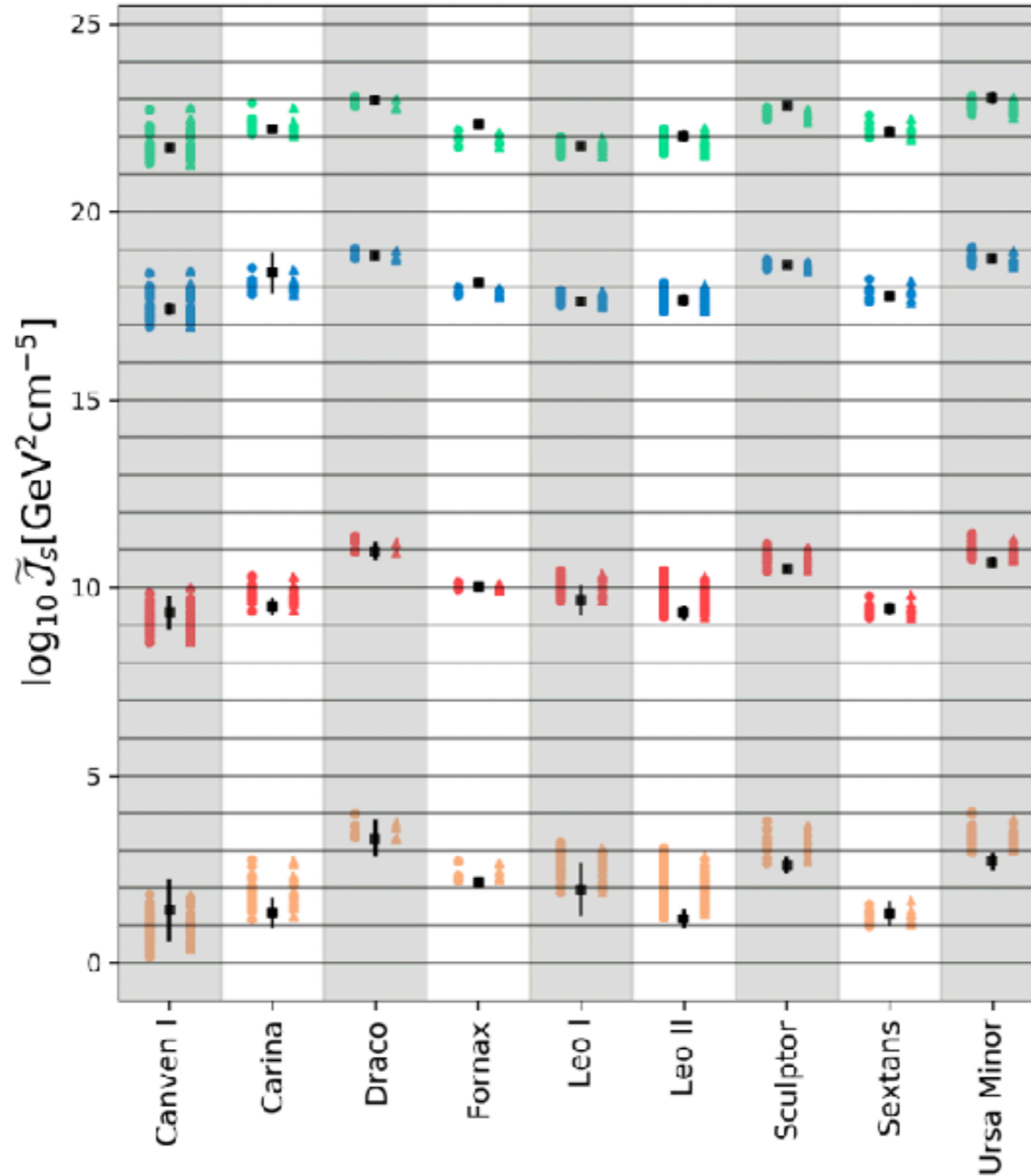
Velocity dependent annihilation in dSphs

Boddy et al. 2020

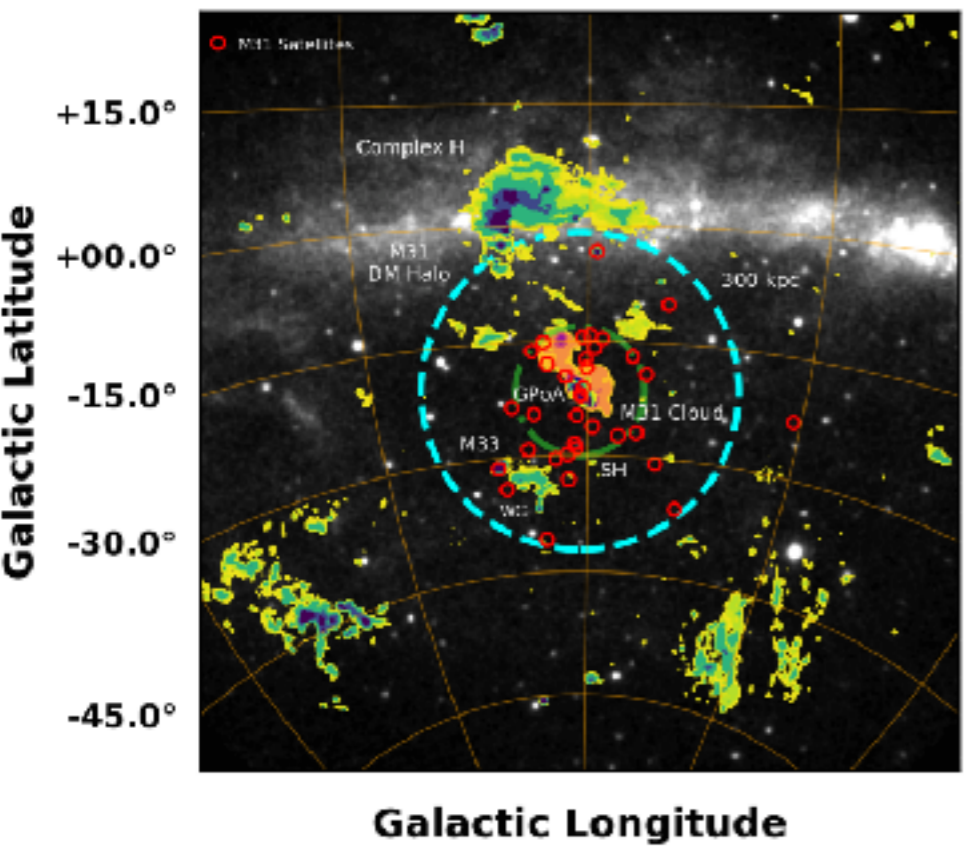


J-factors velocity dependent dark matter models

Blanchette, Bozorgina, LS, et al. 2022

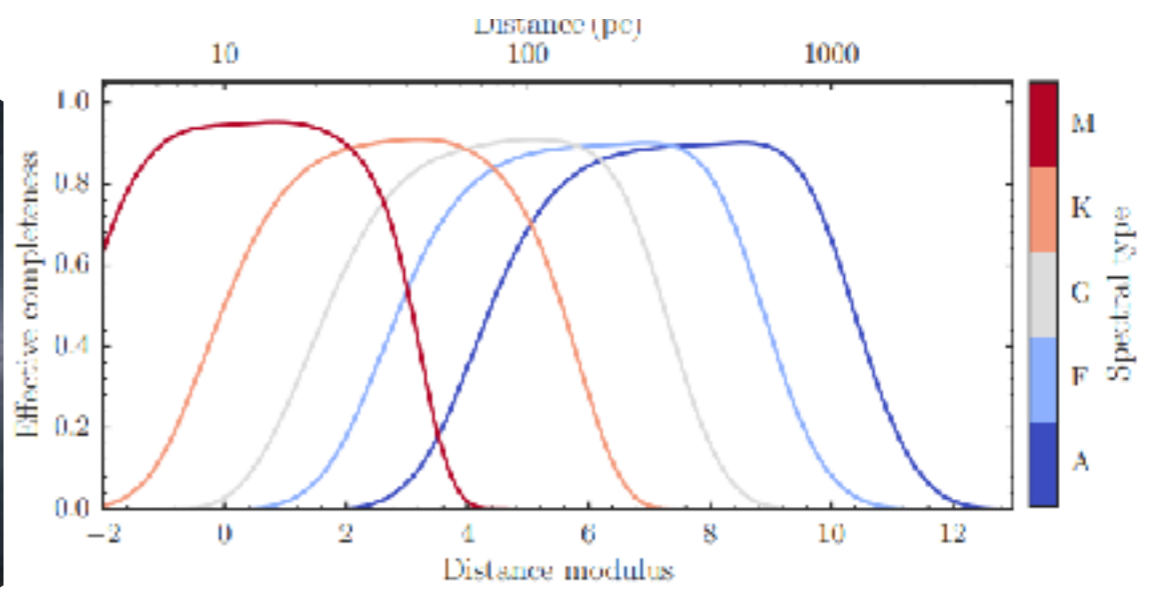
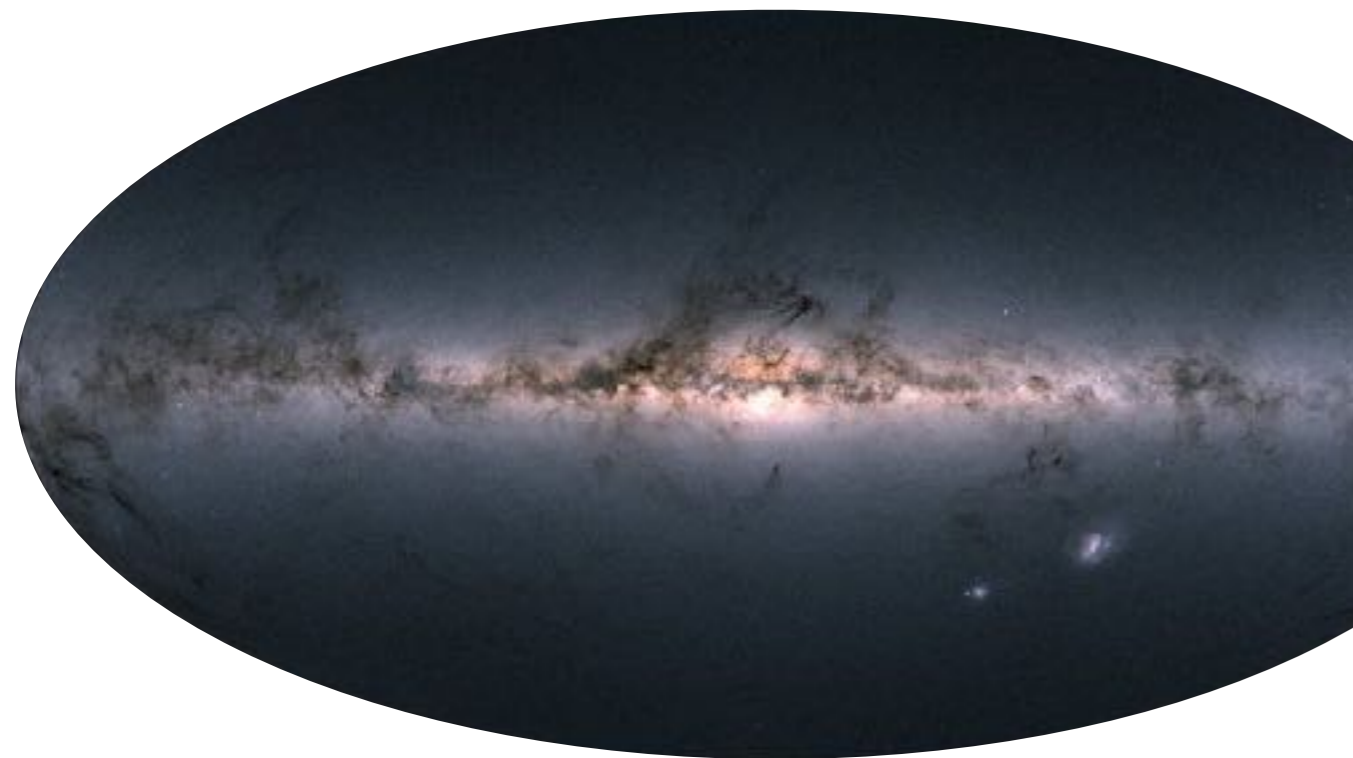
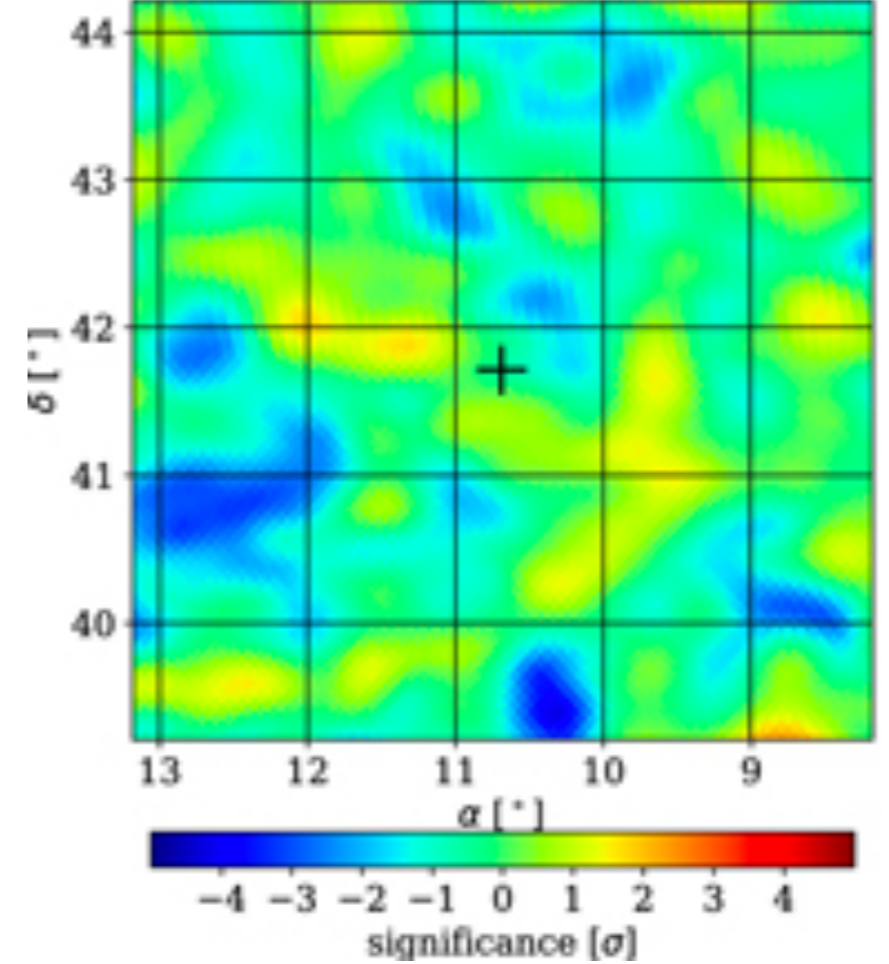


The MW-M31 Field



Karwin et al. 2020

M31: $E^{-2.0}$ fit (point source)



Bovy et al. 2016