

Modelovanje površinskog sjaja galaksije NGC~941

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Mentor: Ana Vudragović

Uvod

DATA:

- SDSS Stripe 82 (<http://research.iac.es/proyecto/stripe82/pages/data.php>)

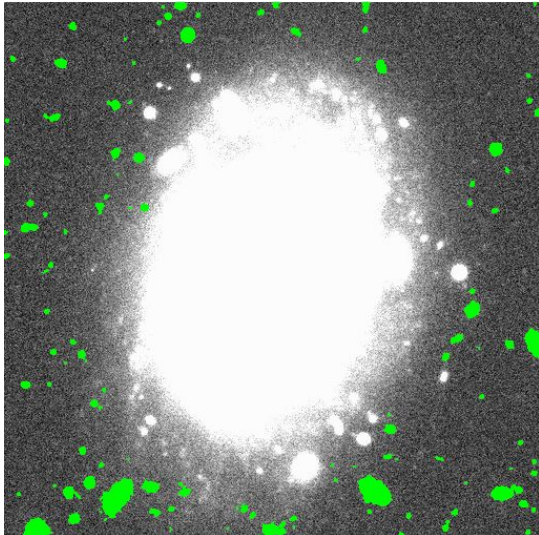
CODE:

- Galfit (Peng et al. 2010, AJ 139, 2097)
 - SExtractor (Bertin & Arnouts 1996, A&AS 117, 393)
 - Iraf
 - Python
-
- Bakos et al. 2012 (arXiv:1204.3082)
 - **„DEEP SURFACE BRIGHTNESS PROFILES OF SPIRAL GALAXIES FROM SDSS STRIPE82: TOUCHING STELLAR HALOS”**

3D model

- Galfit - Sersic funkcija
- Ostaci spiralnih grana

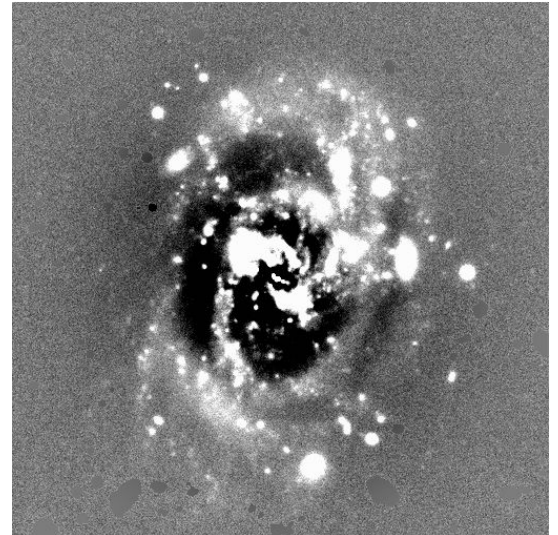
Slika galaksije



Model galaksije



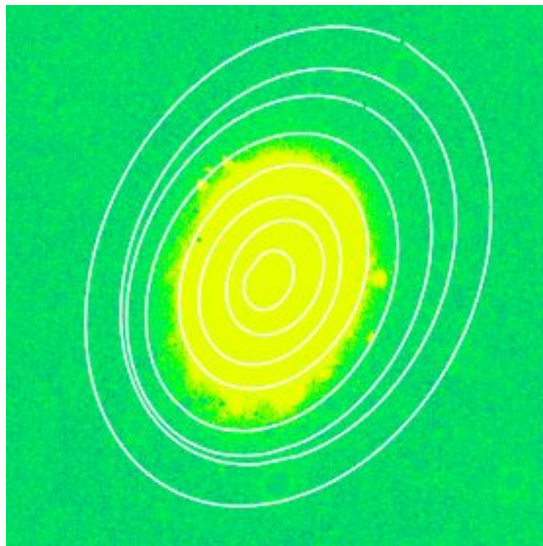
Rezidual



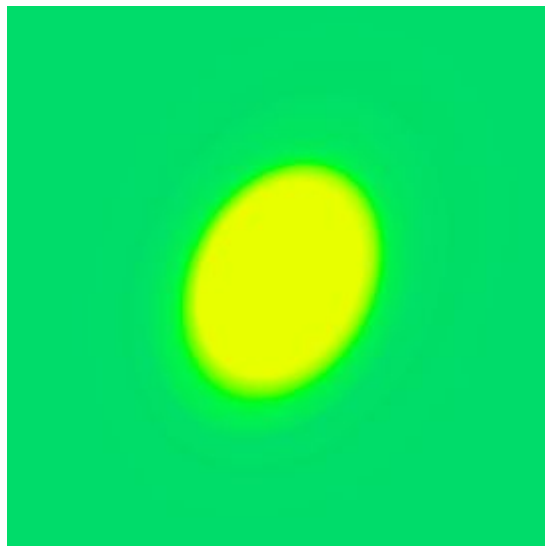
2D model

- Analiza izofota
- Elipstičnost i pozicioni ugao fiksirani
- Ostaci spiralnih grana

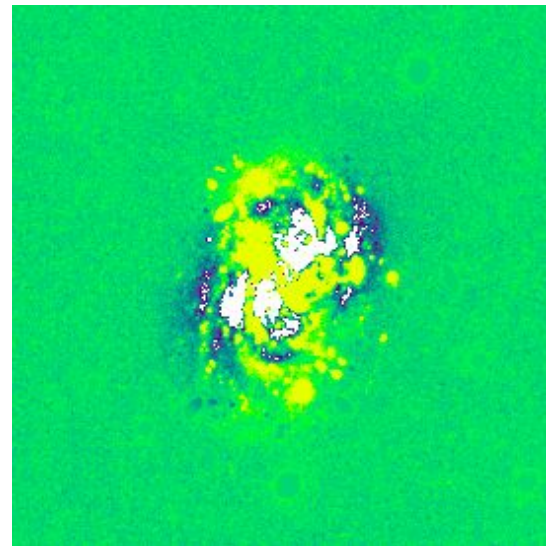
Slika galaksije



Model galaksije



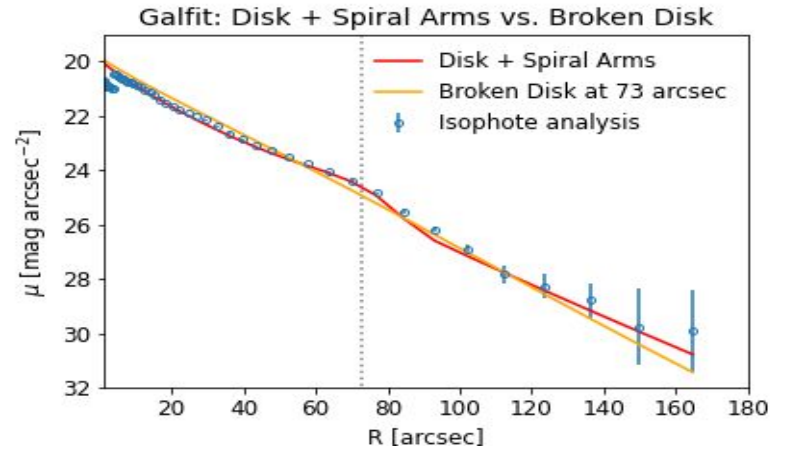
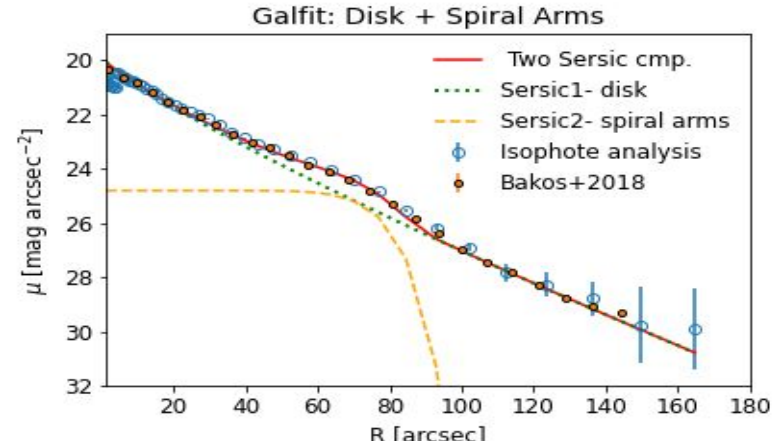
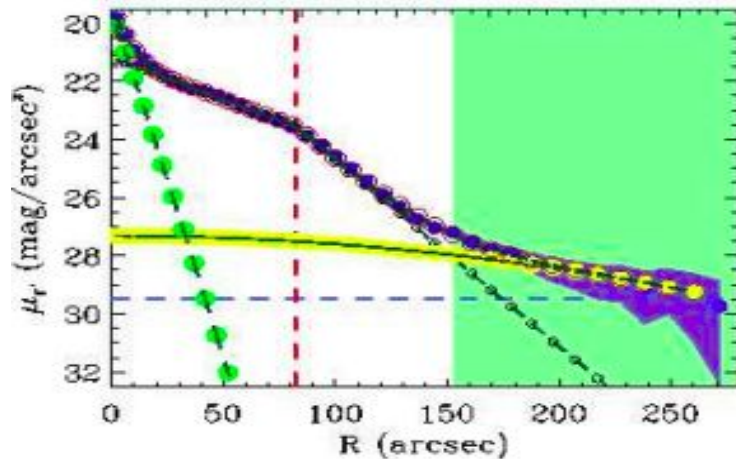
Rezidual



Rezultati

- Bakos - izlomljen profil => tip II
- Naši rezultati
 - Dvokomponentna Sersic funkcija
 - „Broken disk“ => zbog spiralnih grana?

Bakos et al.



Barionska Tali-Fišer relacija (patuljaste galaksije)

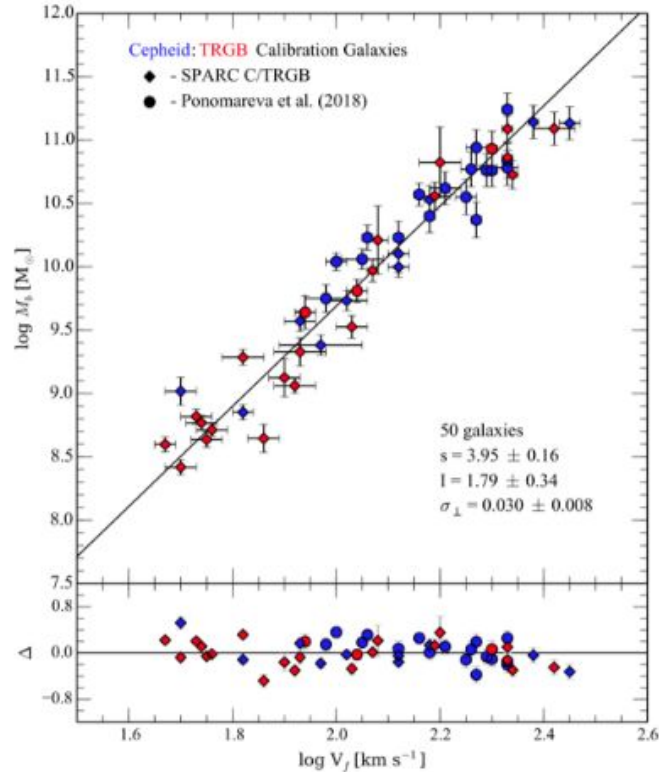
Mentorka:
Ana Vudragović

Student:
Damijan Milić

Seminar katedra za Astronomiju i
astrofiziku 29.12.2020

Ideja

- Schombert+ 15. Jun 2020



$$V_f = H_0 \cdot D$$

$$M_b = A \cdot V_f^4$$

$$M_b = M_* + M_g$$

Uzorak

- **Katalozi:**

- [ALFALFA](#) katalog: A40 A100
 - $N > 30000$ HI spektara vangalaktičkih objekata
 - $z < 0.06$
- [SDSS DR16](#)

- **Podaci:**

- 40 patuljastih galaksija iz Virgo jata
 - 18 galaksija su prošle u uži izbor
- Kontrolna grupa - Mancera et al 2020.

Metod

- Rotaciona brzina:

$$W_{50} = 2 \cdot \sin i V_{max W_{50}}$$

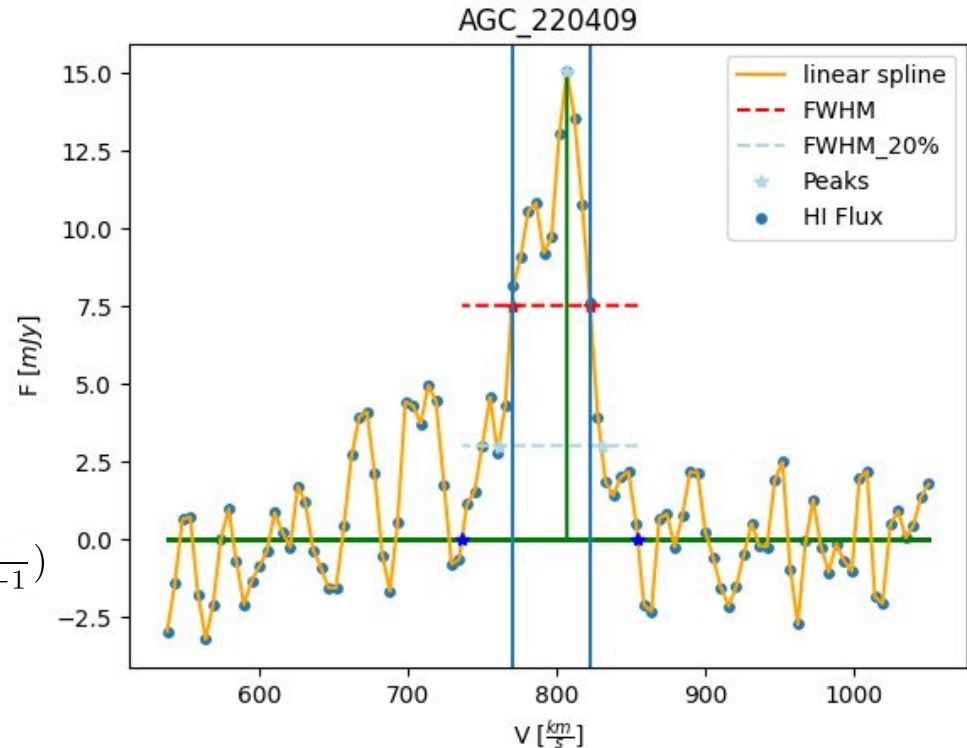
$$W_{20} = 2 \cdot \sin i V_{max W_{20}}$$

- Masa HI:

$$\frac{M_H}{M_\odot} = 2.36 \cdot 10^5 \cdot \left(\frac{D}{Mpc}\right)^2 \int \frac{F(v)}{Jy} \left(\frac{dv}{kms^{-1}}\right)$$

- Ukupna masa gasa:

$$M_{gas} = 1.33 \cdot M_{HI}$$



Metod

- Alat:

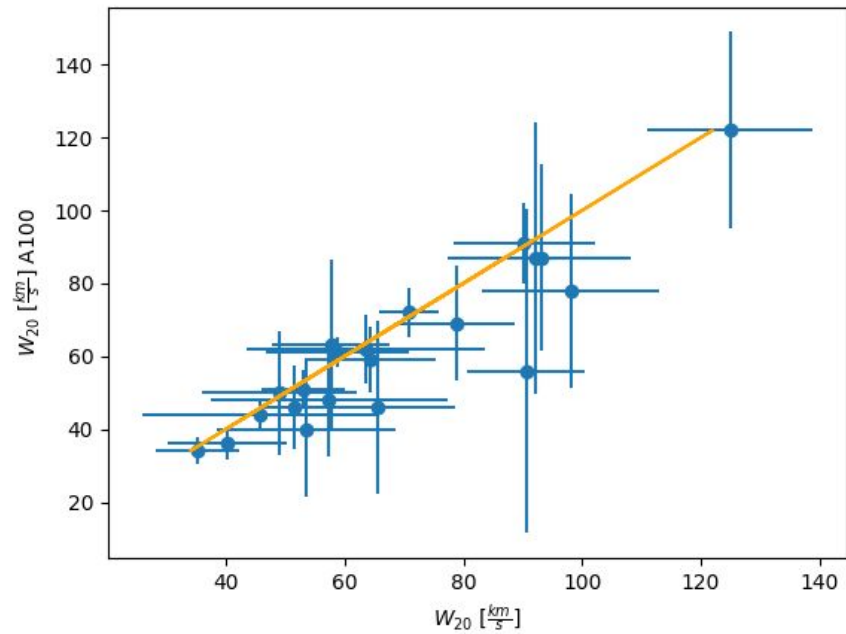
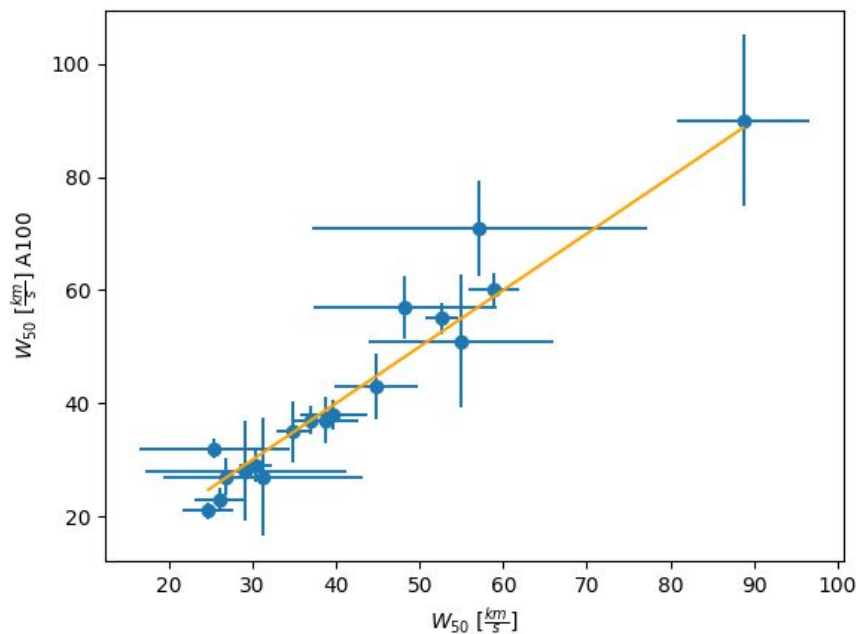
- [SDSS Query / CasJobs](#)
- [SkyServer SDSS](#)

- Zvezdana masa :

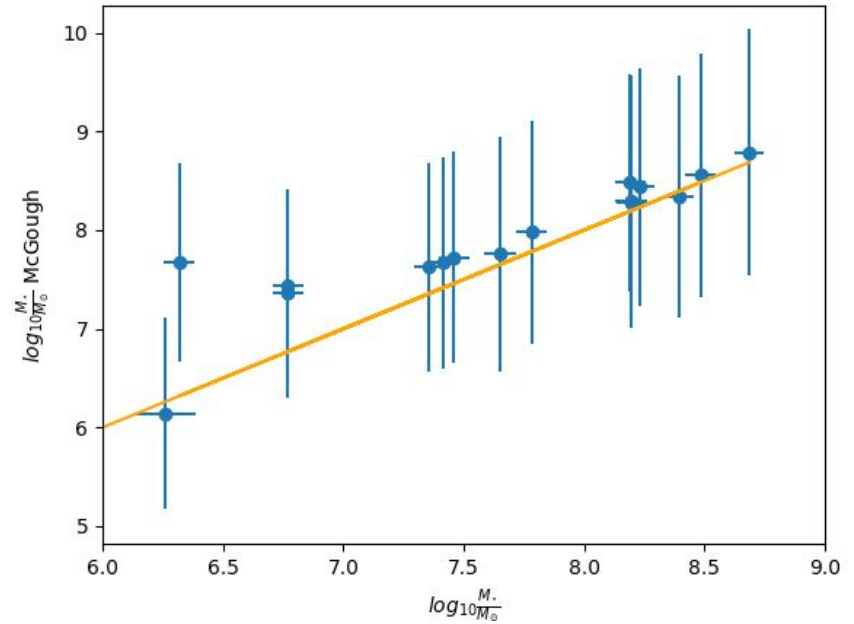
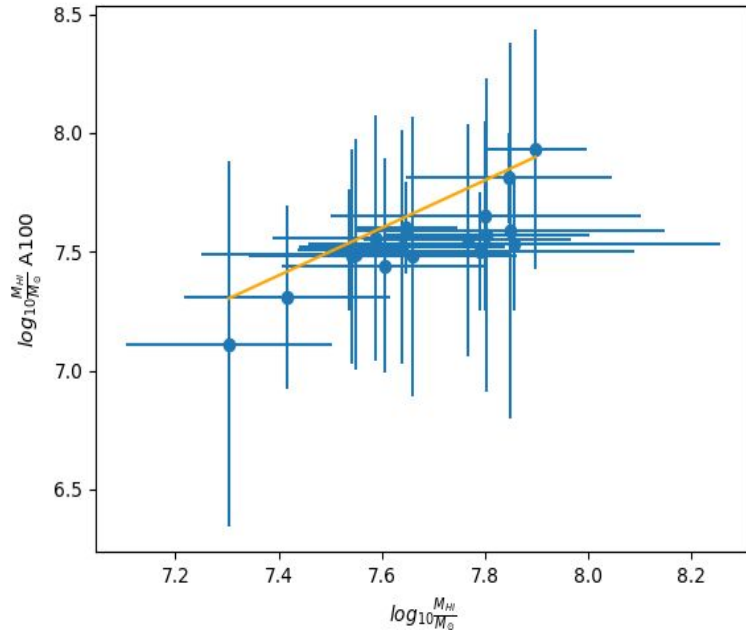
$$\log \frac{M_*}{L_i} = -0.68 + 0.70(g - i)$$



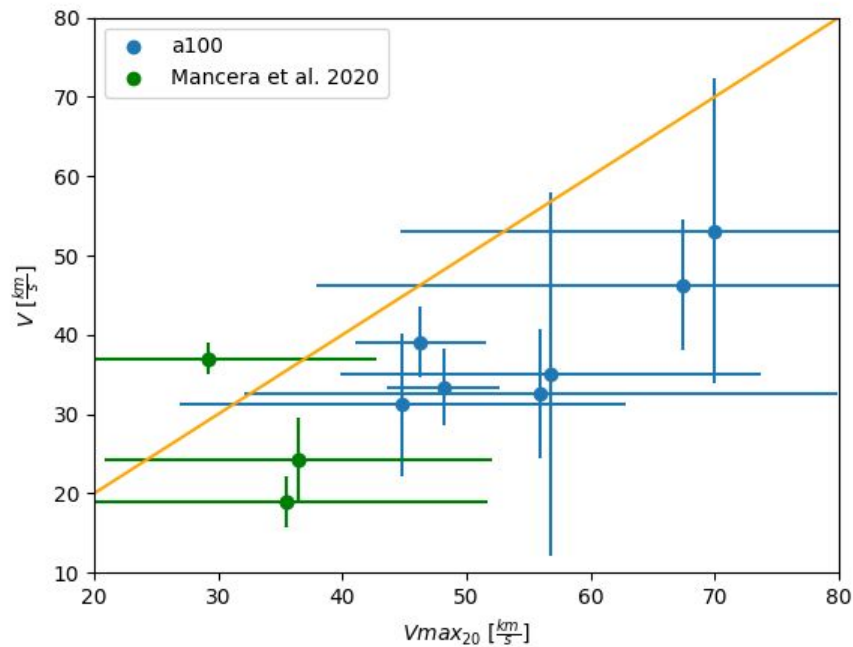
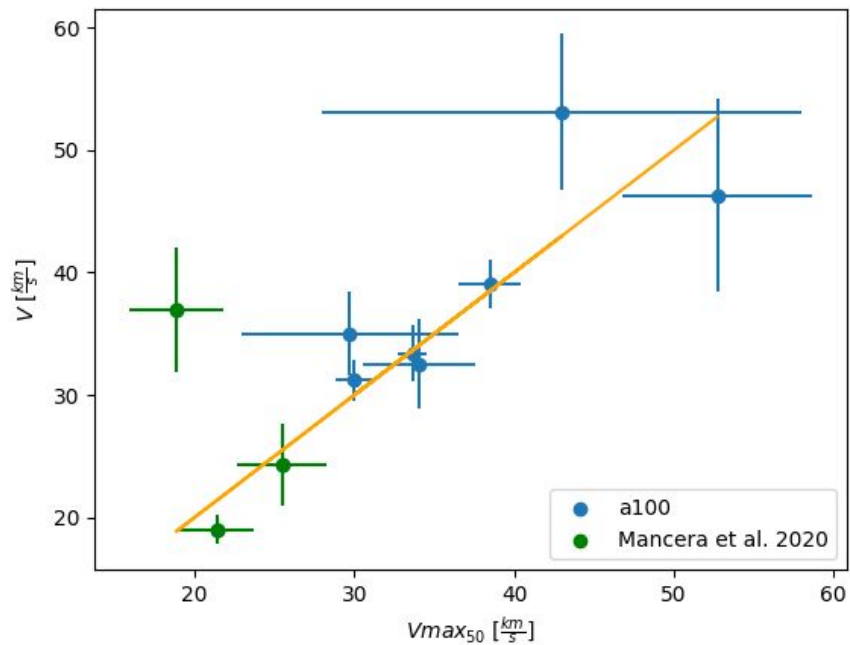
Rezultati - W50 i W20



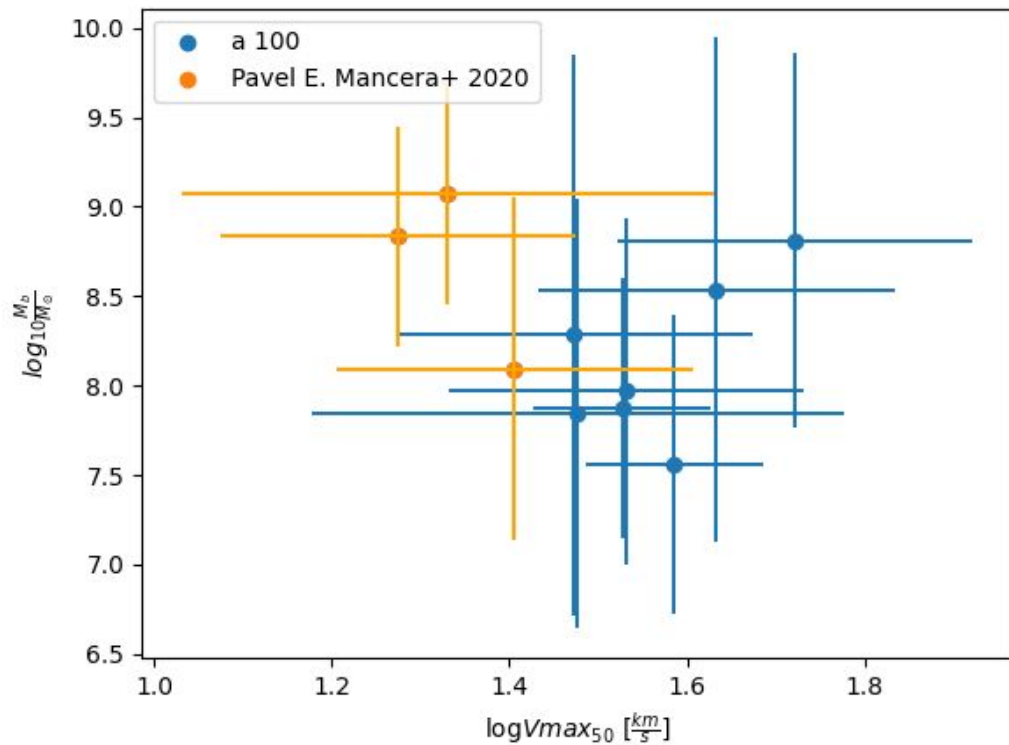
Rezultati - masa



Rezultati - Vrot



Rezultati - bfr



Rotaciona kriva Mlečnog puta: Modeliranje i analiza

Student:

Petar Jovanović

(broj indeksa):

346/2017

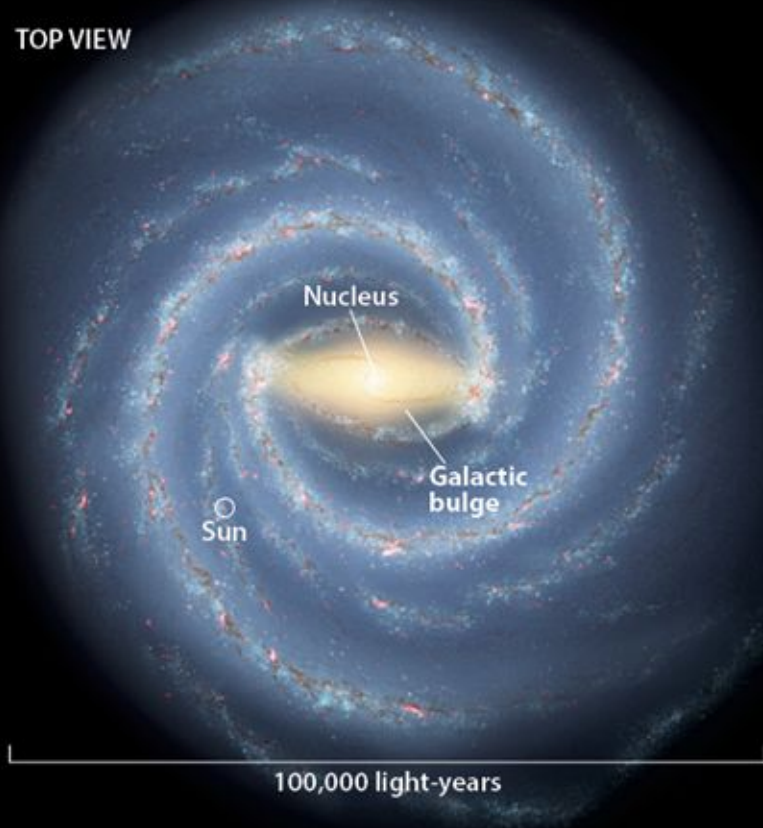
Mentor:

Dr. Milan Stojanović (AOB)

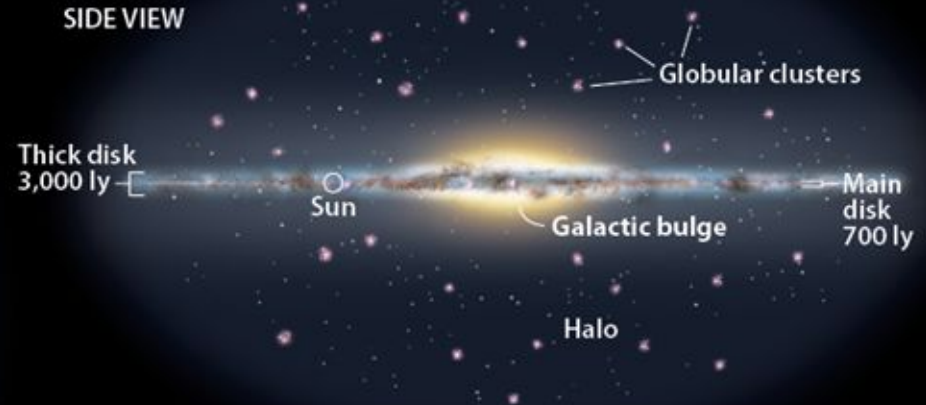
Beograd, decembar 2020

Anatomy of the Milky Way

TOP VIEW



SIDE VIEW



Mapping the galaxy is hard. That's why Gaia has such a gigantic mission to undertake. But it's not just the stars in the disk Gaia is mapping — it's also globular clusters and other objects nearby. The Milky Way itself is 100,000 light-years across and 700 light-years high in the main disk, with some areas stretching as high as 3,000 light-years, thanks to the presence of diffuse older stars. LEFT: NASA/JPL-CALTECH; RIGHT: ESA; LAYOUT: ESA/ATG MEDIALAB

(slika preuzeta sa: www.eso.org)

Uvod

Kružna brzina kao funkcija potencijala:

$$V_c = \sqrt{-R \frac{d\Phi}{dR}}, \quad z = 0$$

Poasonova jednačina:

$$\nabla^2 \Phi = -4\pi G \rho$$

Kružna brzina u funkciji raspodele mase:

$$V_c = \sqrt{\frac{GM(R)}{R}}$$

Ukupna kružna brzina:

$$V_c^2 = V_b^2 + V_d^2 + V_{dm}^2$$

Model 1

Bulge: Plummer (1911)

$$\Phi(R) = \frac{GM_b}{\sqrt{R^2 + r_b^2}}$$

Disk: Miyamoto-Nagai (1975)

$$\Phi(R, z) = \frac{GM_d}{R_{MN}},$$
$$R_{MN} = \sqrt{R^2 + \left(a_d + \sqrt{z^2 + b_d^2}\right)^2}$$

Dark matter halo:
Navarro-Frenk-White (1996)

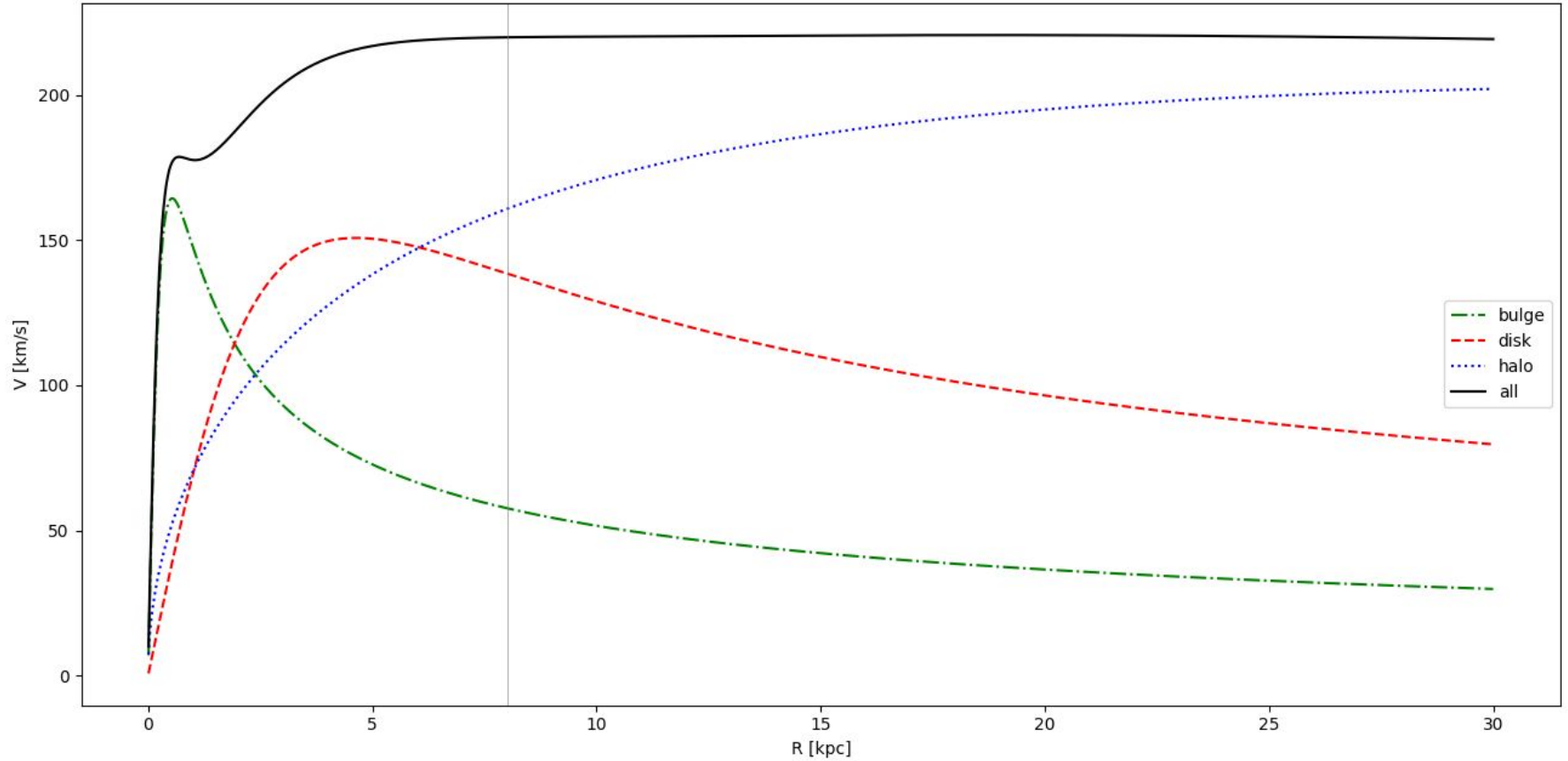
$$\rho = \frac{\rho_0}{\xi(1 + \xi)^2}, \quad \xi = \frac{r}{r_c}, \quad \xi \in (0, \xi_l], \quad \xi_l = \frac{r_l}{r_c}$$

$$M_{dc} = 4\pi\rho_0r_c^3 \left(\ln(\xi + 1) - \frac{\xi}{\xi + 1} \right)$$

Parameters:
Kamdar et al. (2020)*

*Kamdar, H., Conroy, C., Ting, Y.-S., Bonaca, A., Johnson, B., and Cargile, P. 2019, *Apj*, 884, 173

Rotaciona kriva za 1. model



Model 2

Bulge: Hernquist (1990)

$$\Phi(R) = \frac{GM_b}{r_b + R}$$

Disk: Miyamoto-Nagai (1975)

$$\Phi(R, z) = \frac{GM_d}{R_{MN}},$$

$$R_{MN} = \sqrt{R^2 + \left(a_d + \sqrt{z^2 + b_d^2} \right)^2}$$

Dark matter halo:
Allen-Martos (1986)

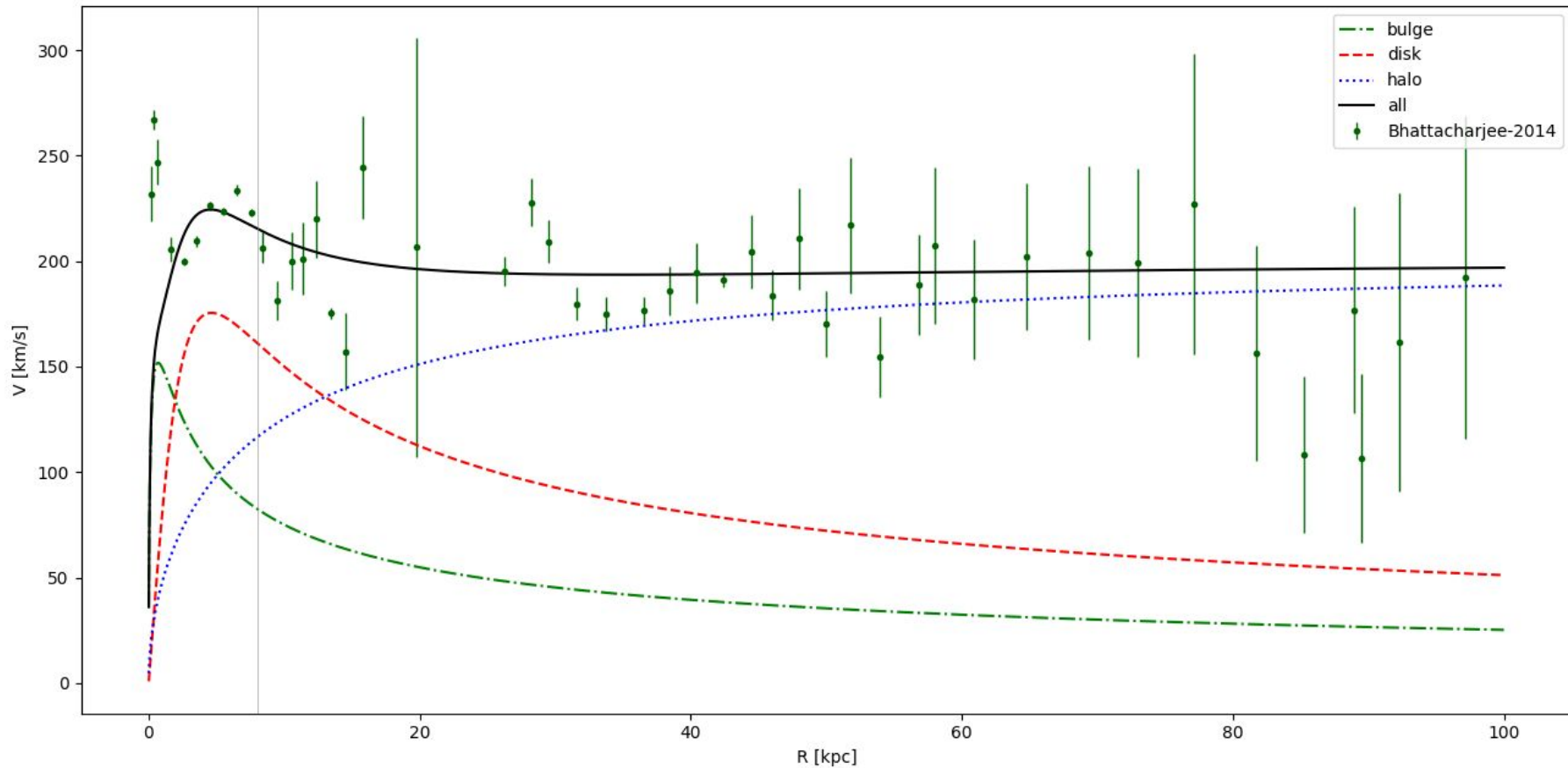
$$M(R) = \frac{M_h (R/r_h)^\gamma}{1 + (R/r_h)^{\gamma-1}}$$

Data:

Bhattacharjee et al.
(2014)*

*Bhattacharjee, P., Chaudhury, S., and Kundu, S.
2014, ApJ, 785, 63

Rotaciona kriva za 2. model



Model 3

Dark matter halo:
Ninković (2017)

Bulge: Kuzmin & Veltmann (1973)

$$\Phi(R) = \frac{GM_b}{r_a + \sqrt{r_b^2 + R^2}}$$

$$M_{dc} = 4\pi\rho_0r_c^3 \left(\frac{\ln 1 + \zeta^3}{3} - \frac{\zeta^3}{3(1 + \zeta_l^3)} \right)$$

Disk: Ninković (2015)

$$\Phi(R, z) = \frac{GM_d}{R_{MN} - R_N},$$
$$R_N = \frac{1}{2}R_d \left[\left(1 + \frac{R^2}{R_d^2} \right)^{\gamma_1} \left(1 + \frac{z^2}{R_d^2} \right)^{\gamma_2} \right]$$

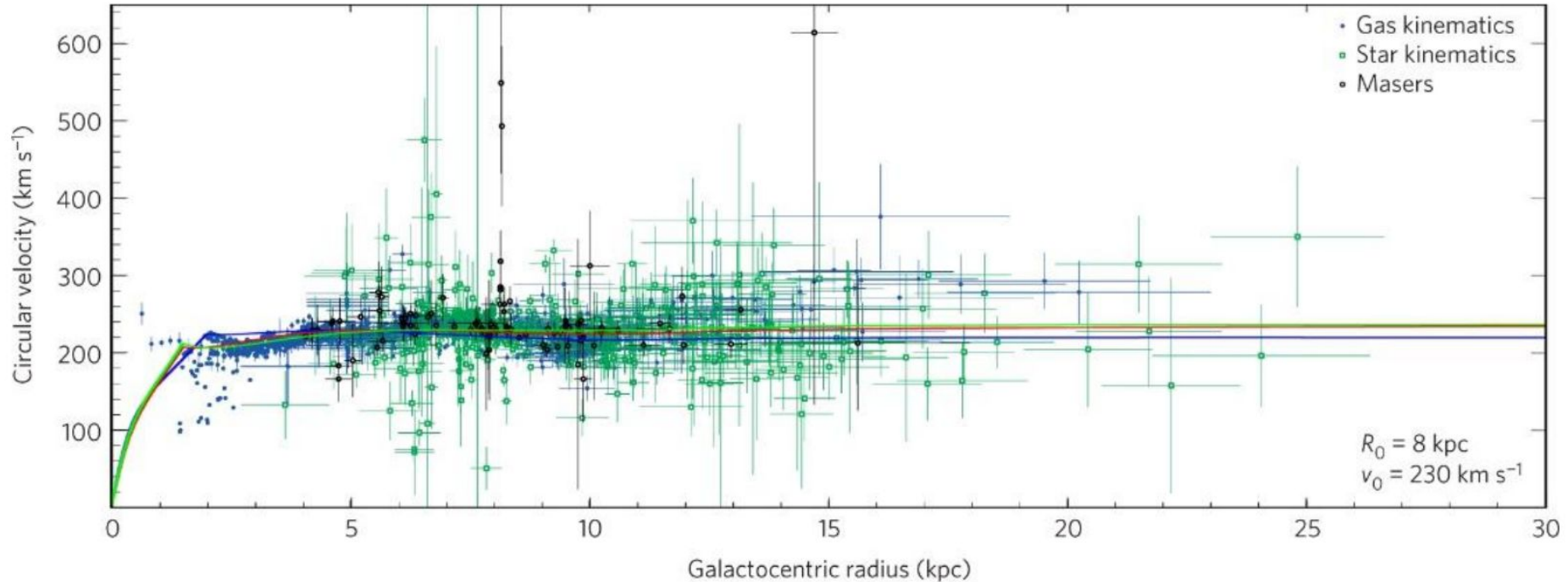
Innermost dark matter:
Stojanović (2018)

$$V_c(R) = R \sqrt{\frac{GM_{idm}}{r_{idm}^3}}, \quad R < r_{idm}$$

$$V_c(R) = \sqrt{\frac{GM_{idm}}{R}}, \quad R > r_{idm}$$

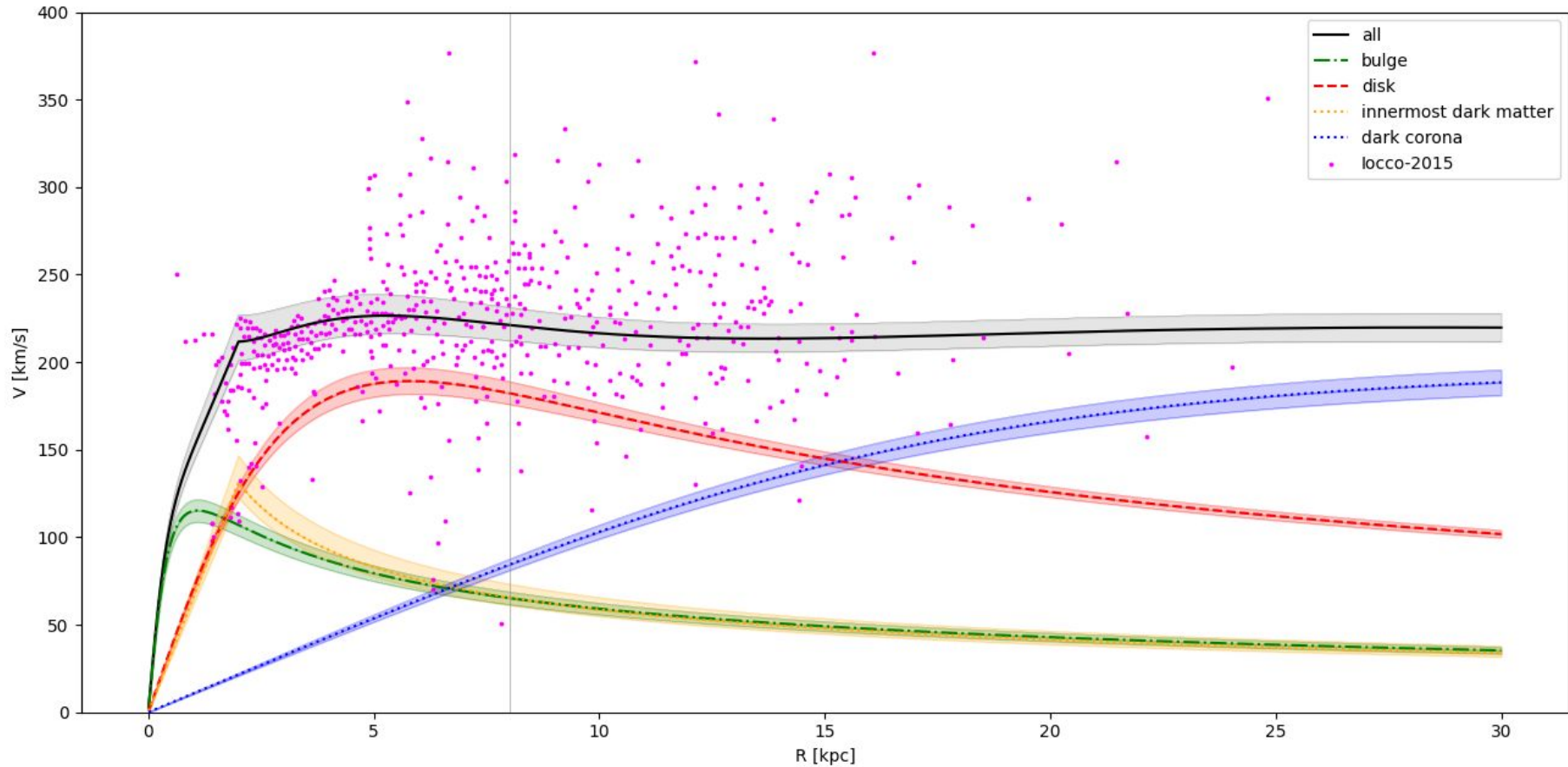
Stojanović et al. (2018)

Korišćeni podaci iz rada: locco et al. (2015)*



*locco, F., Pato, M., & Bertone, G. 2015, Nature Physics, 11, 245.

Rotaciona kriva za 3. model



Planovi za budući rad

- Dalja analiza i poređenje dobijenih modela
- Istraživanje novih modela
- Prilagođavanje dobijenih modela novim posmatranjima