



Institut de Ciències del Cosmos
UNIVERSITAT DE BARCELONA



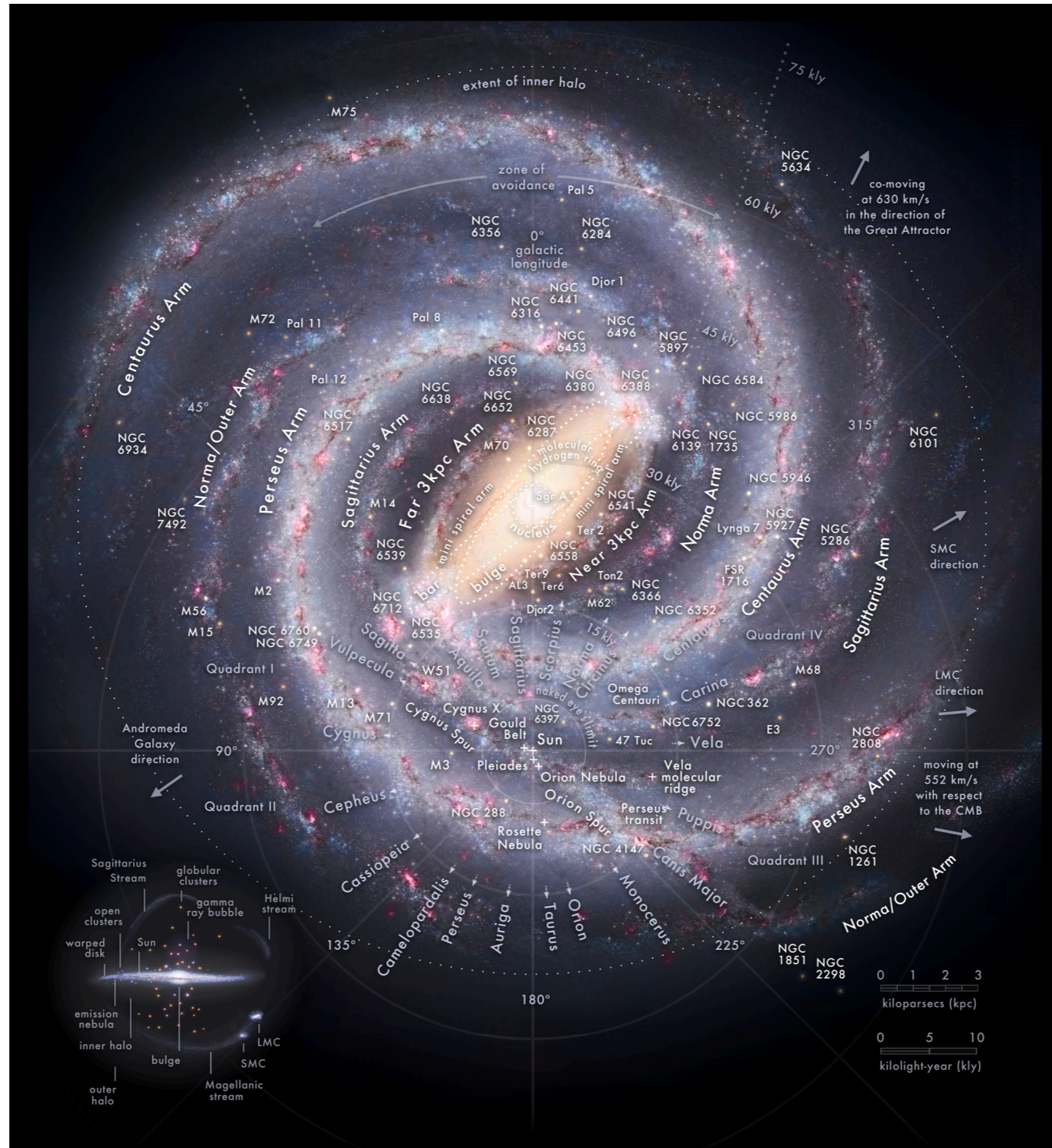
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Angular momentum of the Classical Cepheids and the spiral structure of the Milky Way

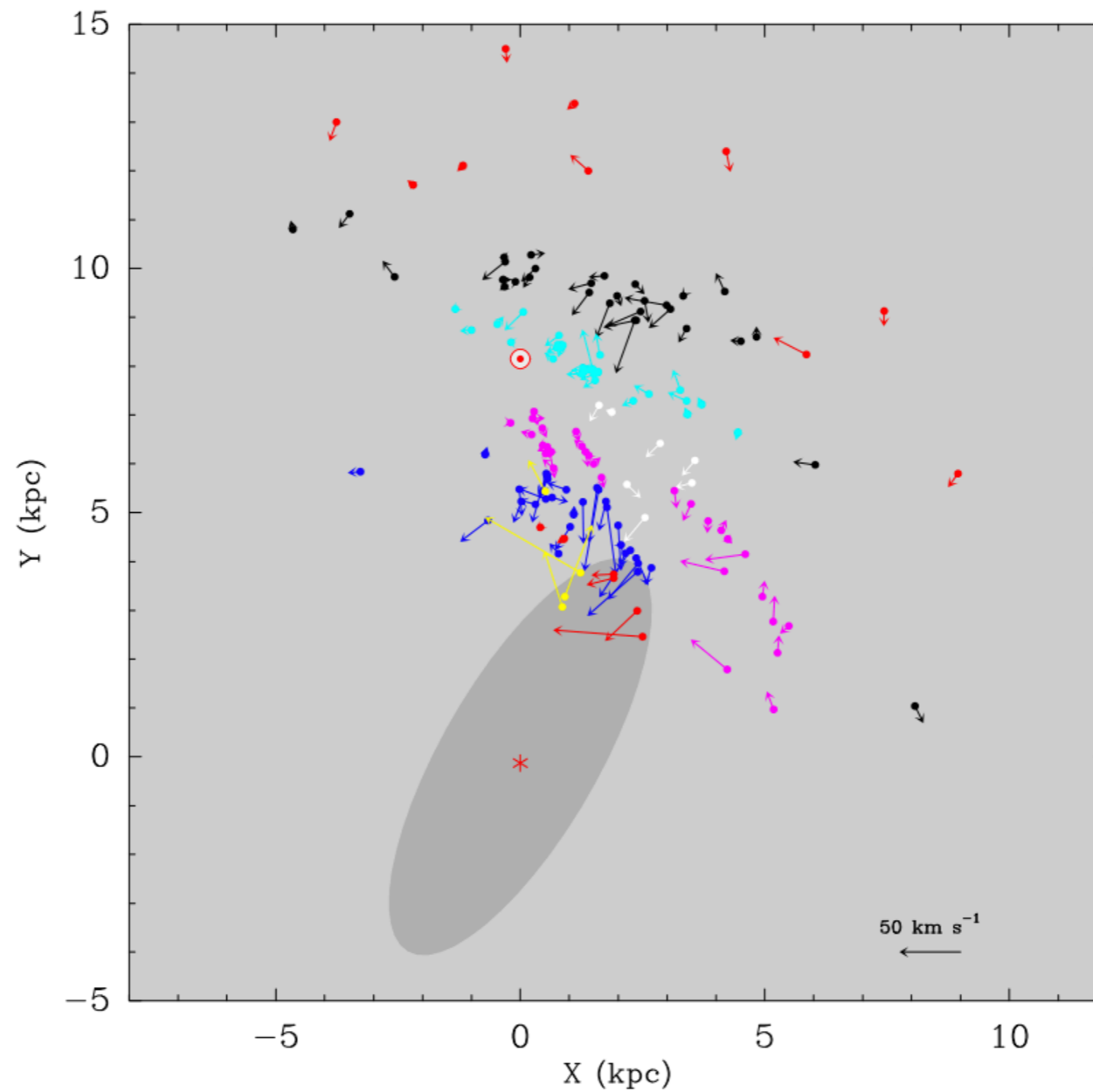
Marcin Semczuk
Universitat de Barcelona

In collaboration with Walter Dehnen, Ralph Schönrich
& Lia Athanassoula

Milky Way as a spiral galaxy



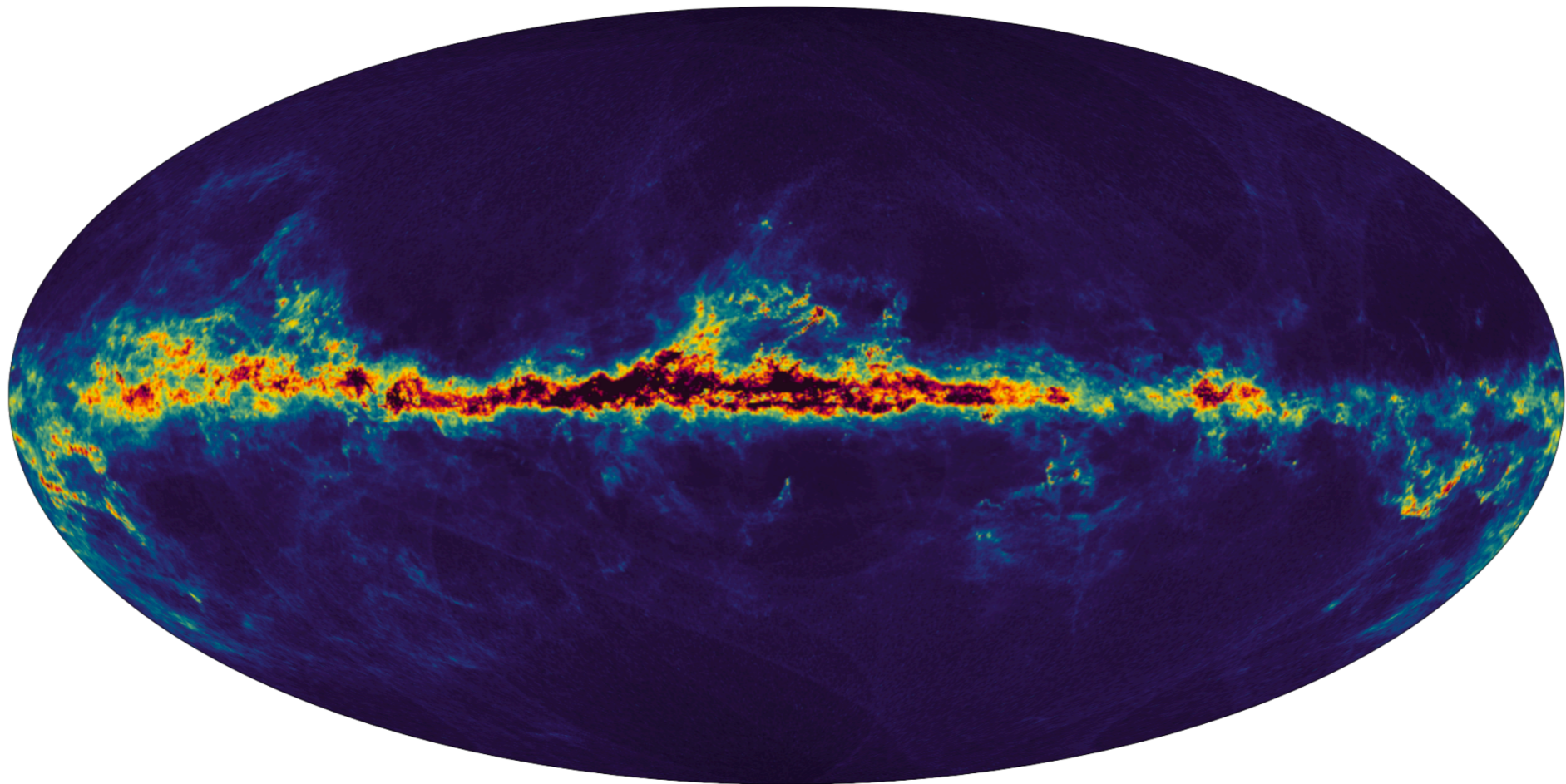
Milky Way as a spiral galaxy



Reid et al. (2019)

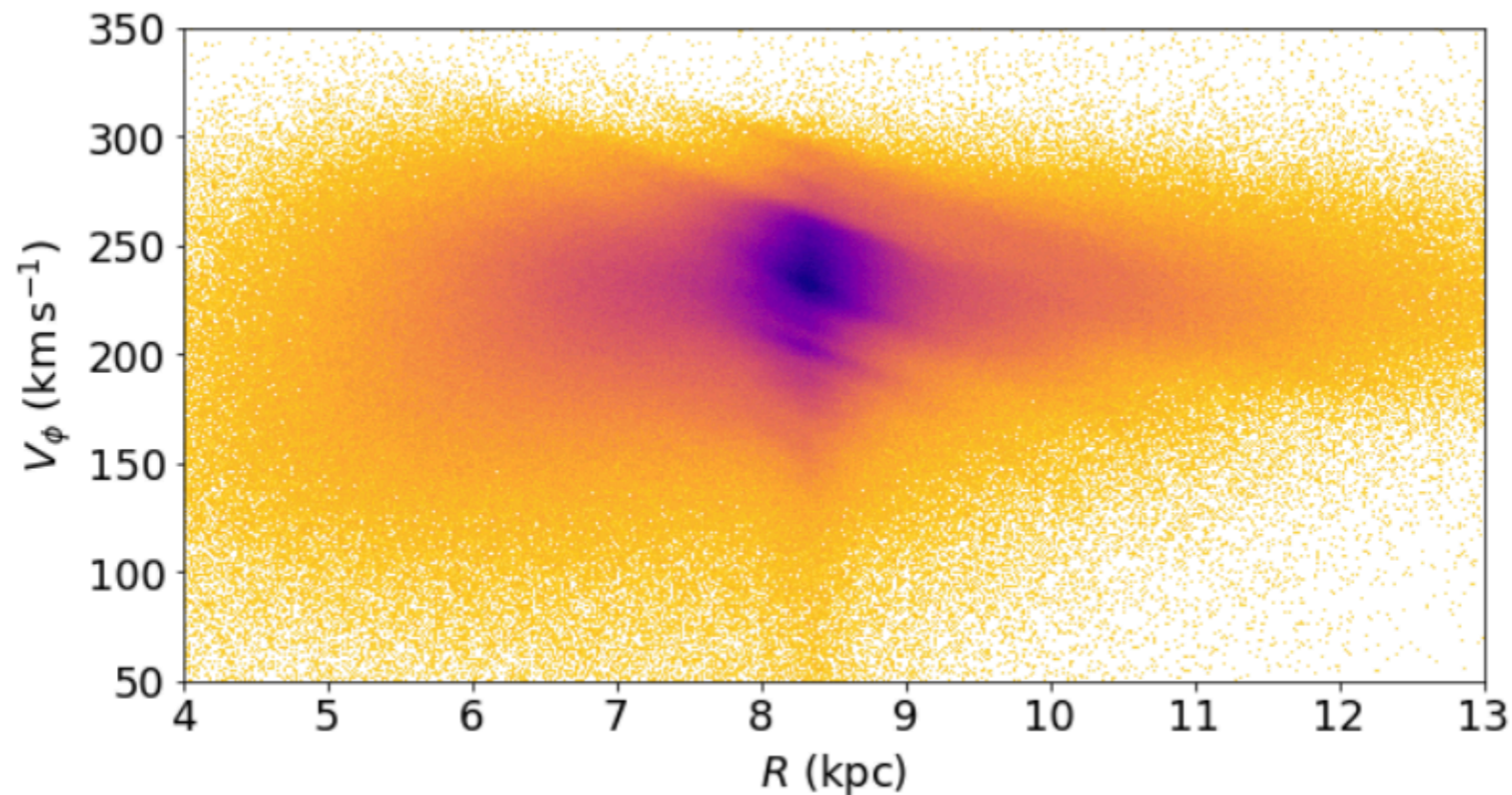
Main obstacles

- Uncertain distances
- Limited coverage



Dust map from Gaia DR3

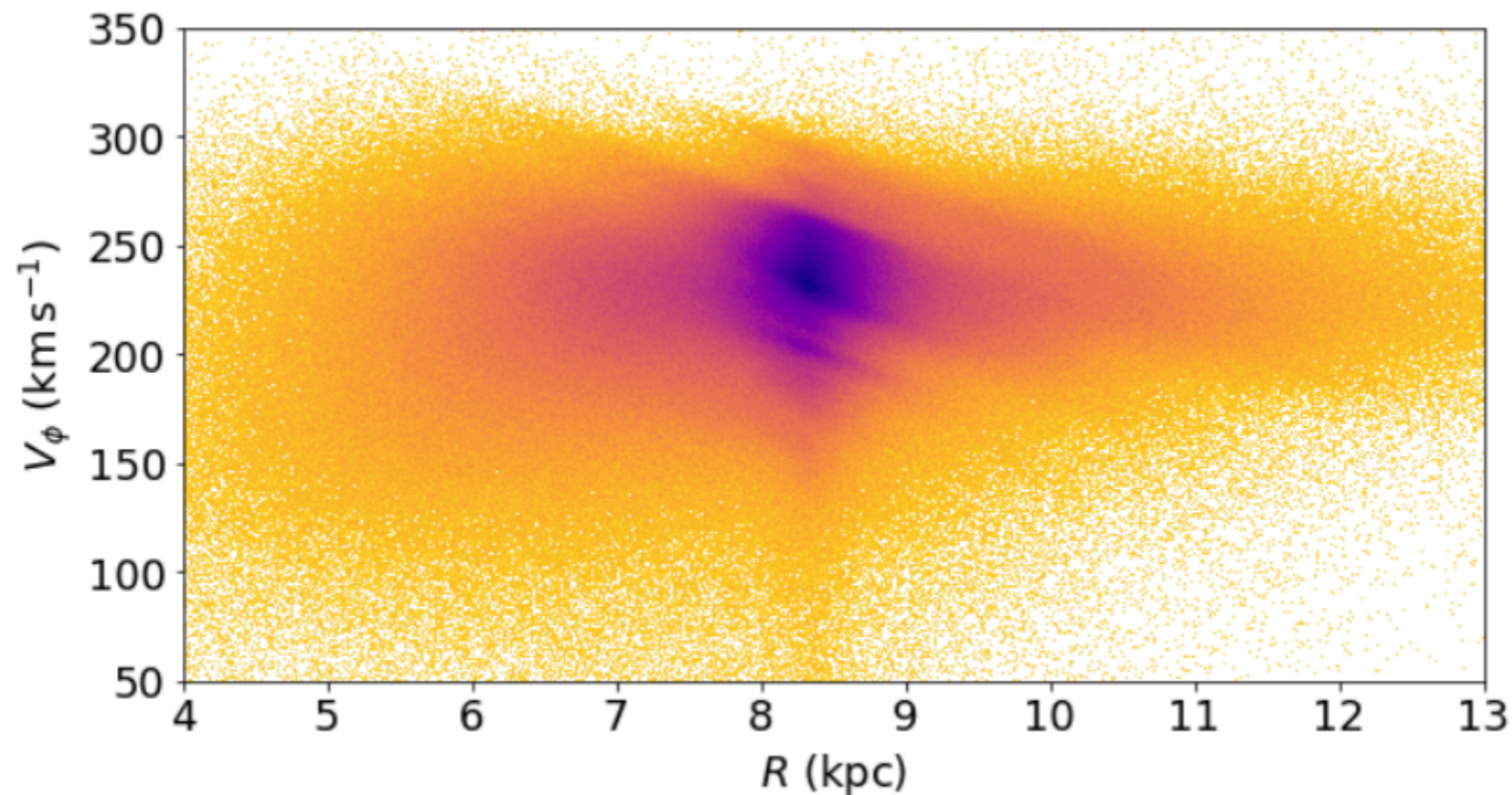
Probing the phase space with Gaia



Antoja et al. (2018)

- Gaia DR2 and following releases shown various new phase space features

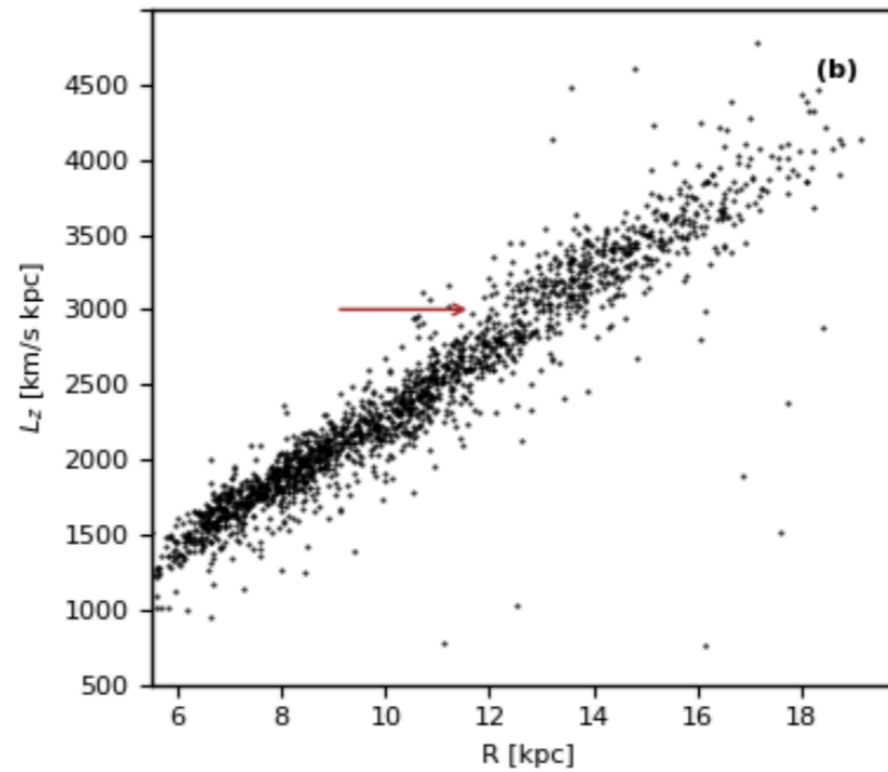
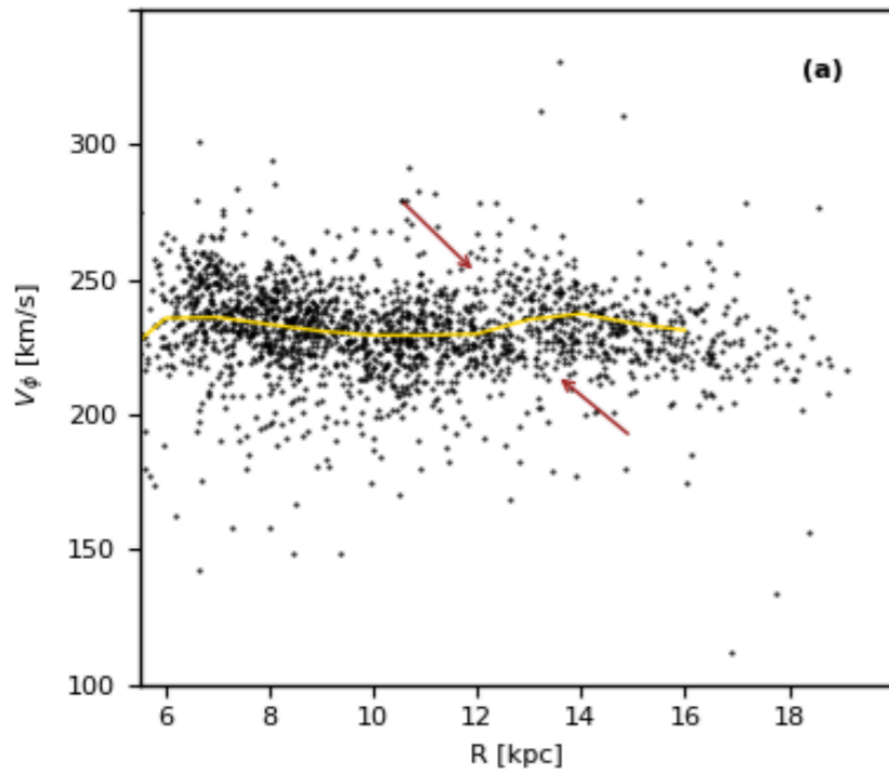
Probing the phase space with Gaia



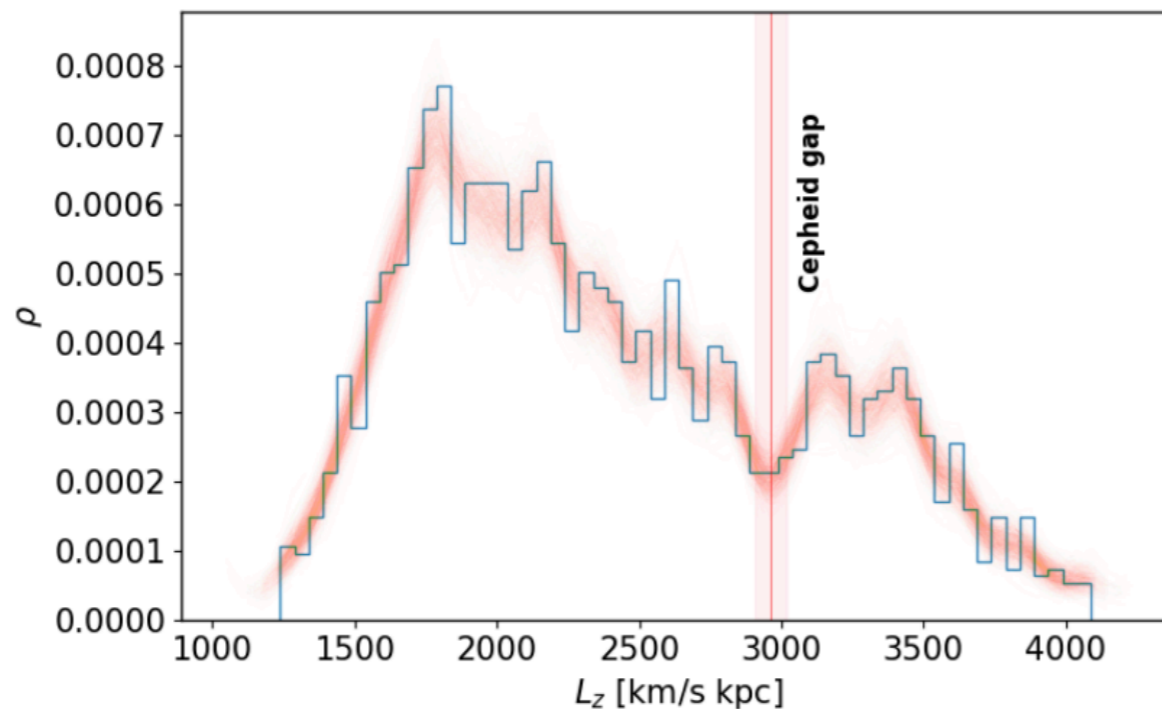
Antoja et al. (2018)

- Gaia DR2 and following releases shown various new phase space features
- Possible explanations: bar resonances, phase mixing, spiral arms, external perturbations

Gaia DR3: Cepheids gap



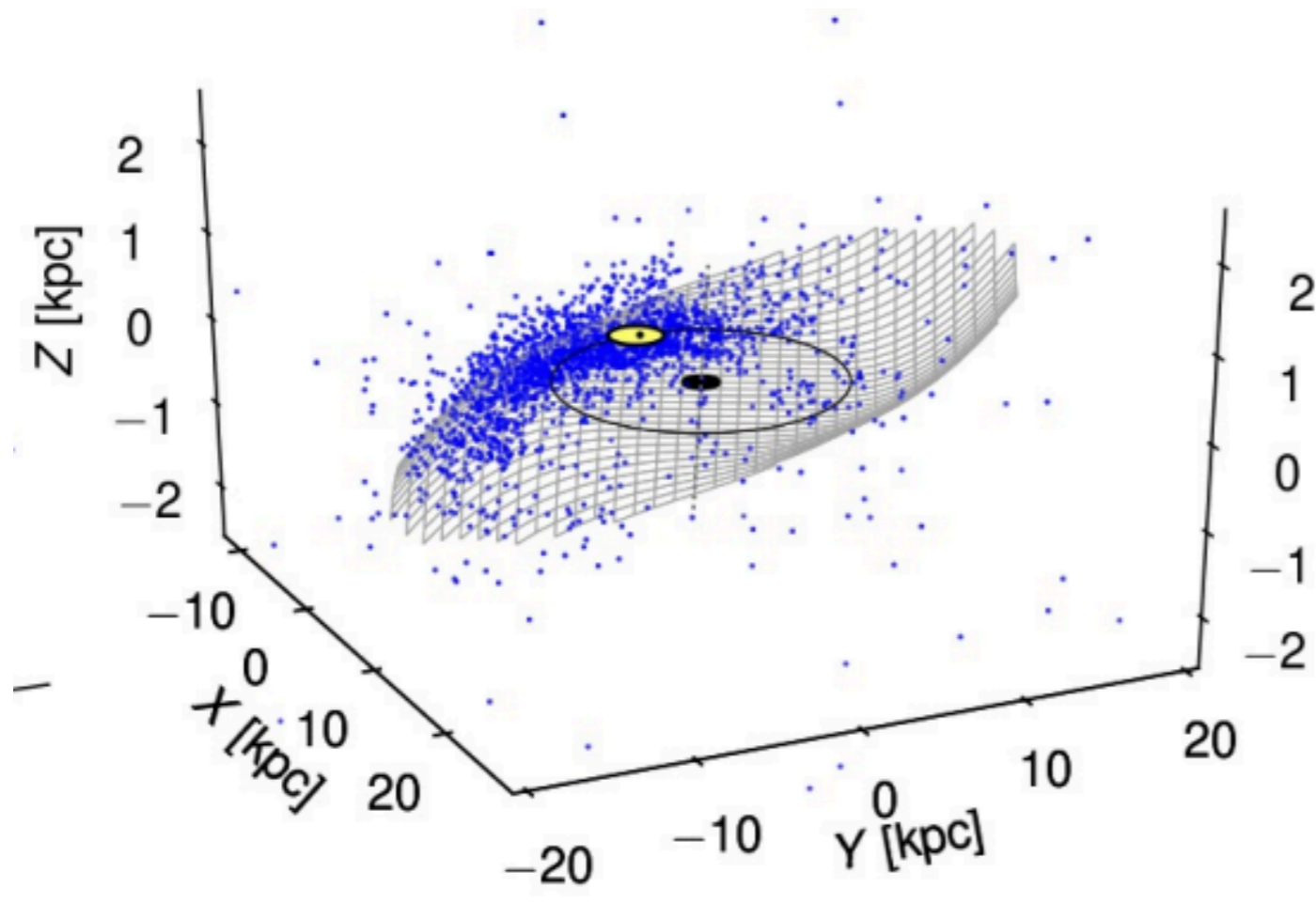
$$L_z = v_\phi R$$



- Cepheids younger than 200 Myr

Drimmel et al. (2023)

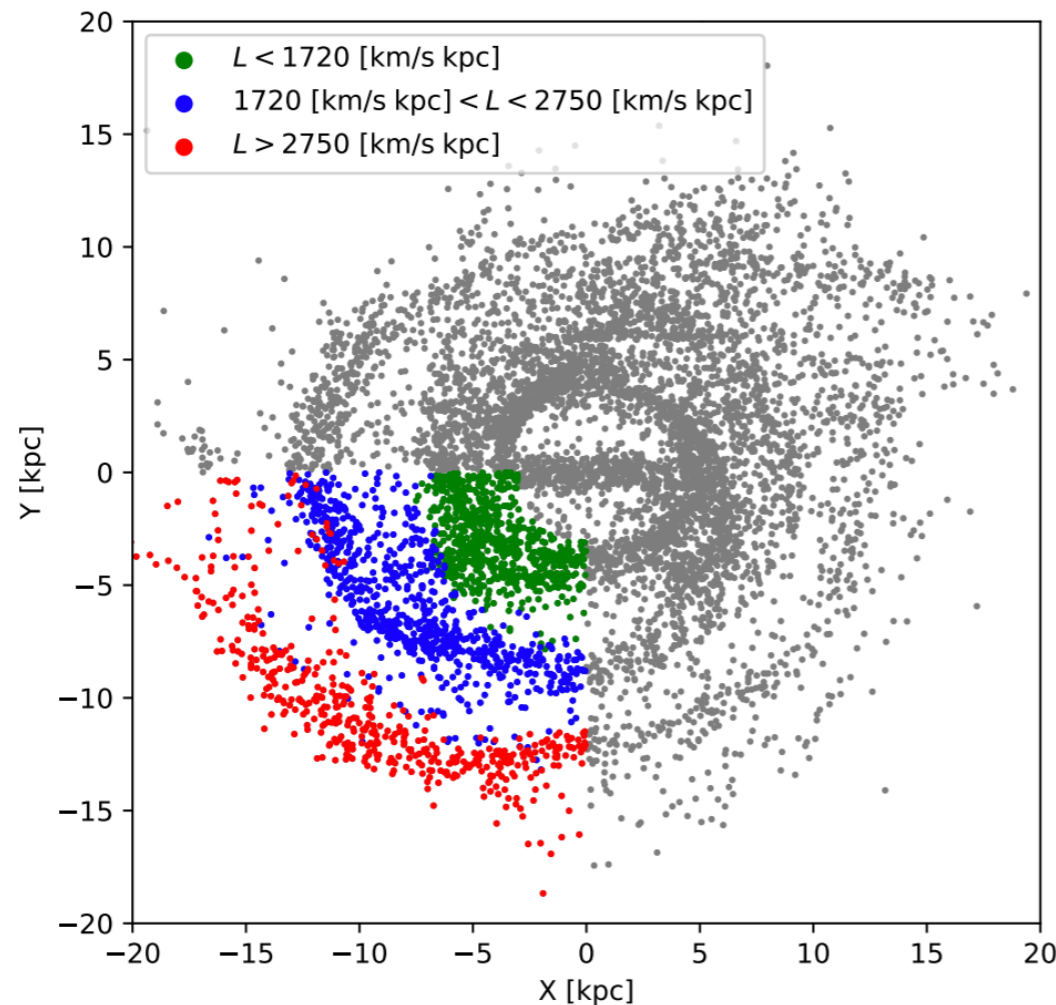
Cepheids: tracers of the young disc



Skowron et al. (2019)

- Pulsating stars of relatively young ages (<300 Myr)
- Used previously to map the Galactic warp
- Some attempts to map the spiral arms

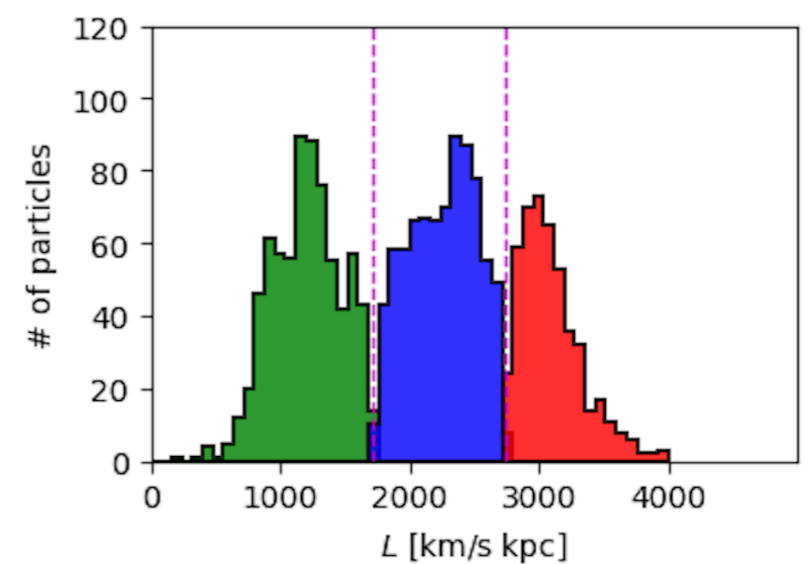
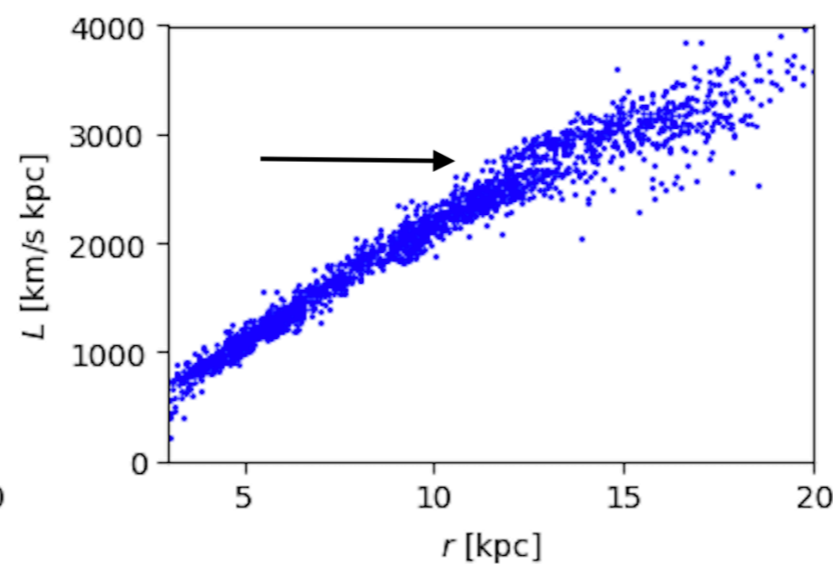
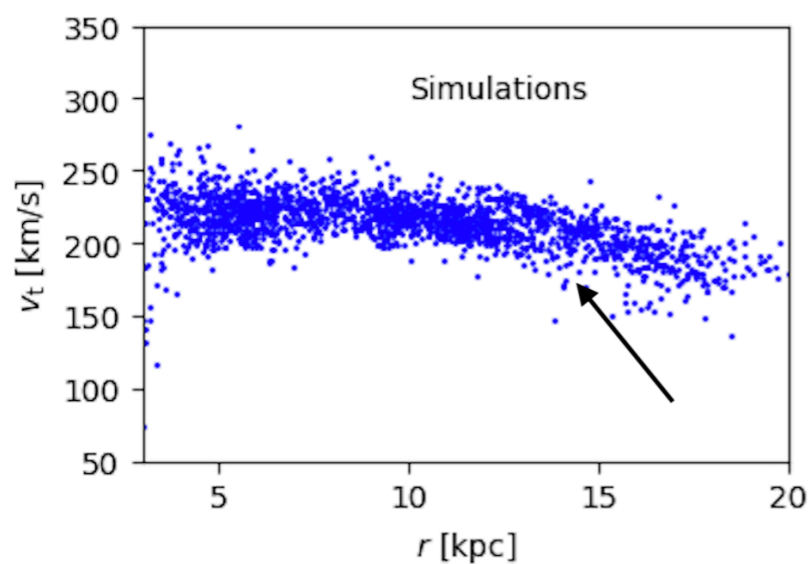
Gap between the spirals



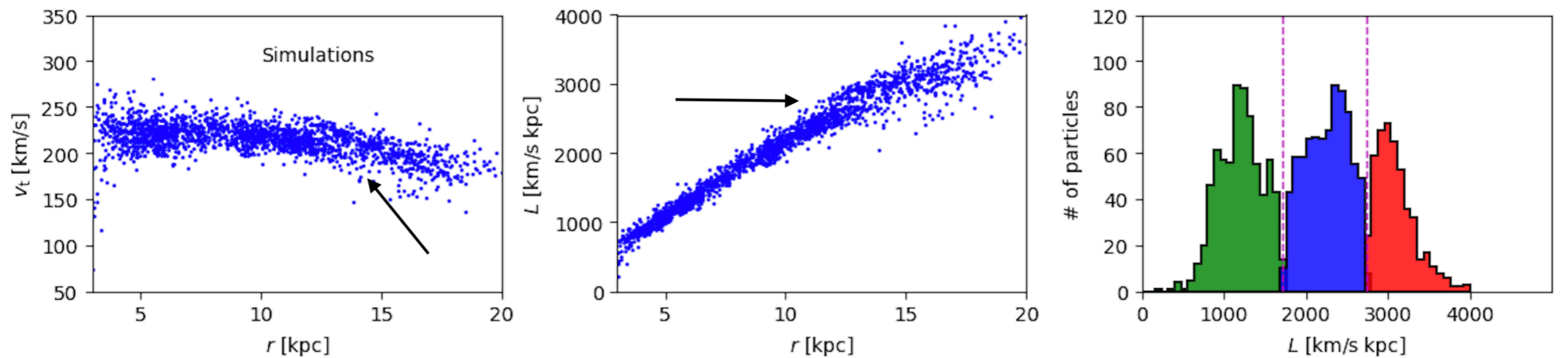
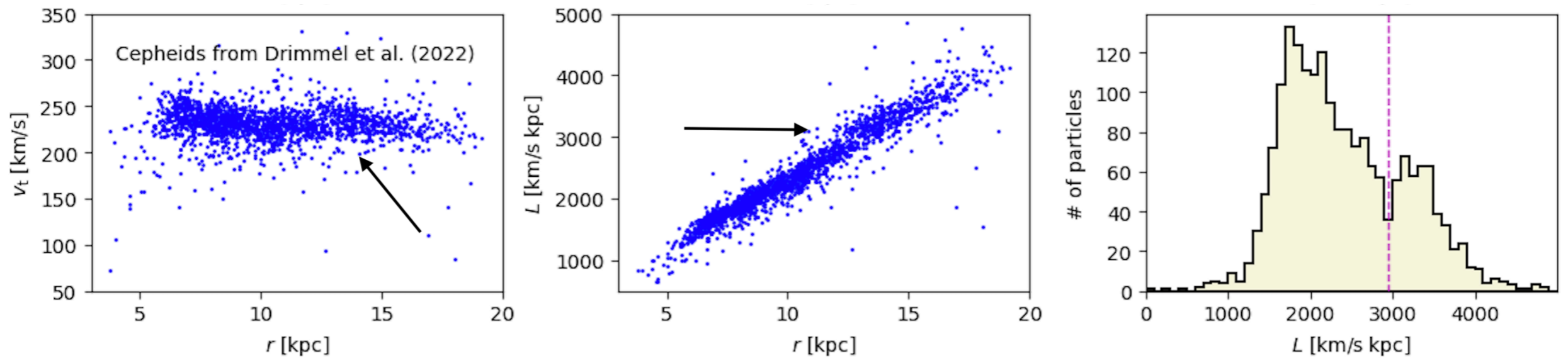
Example spiral galaxy from
TNG50 simulation

(TNG50 - Pillepich et al 2019)

Semczuk et al. (2023)



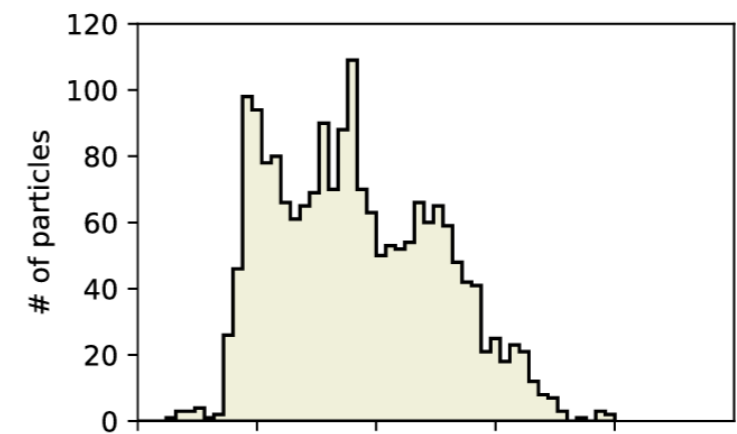
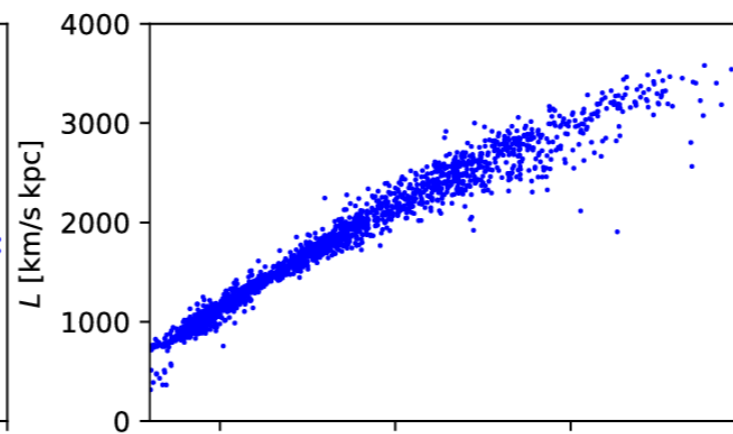
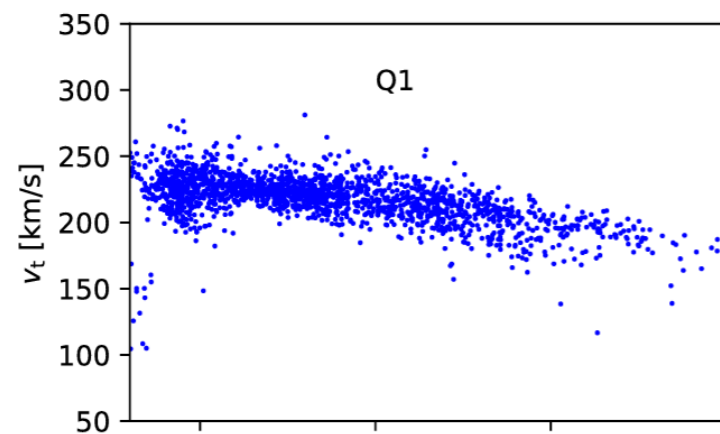
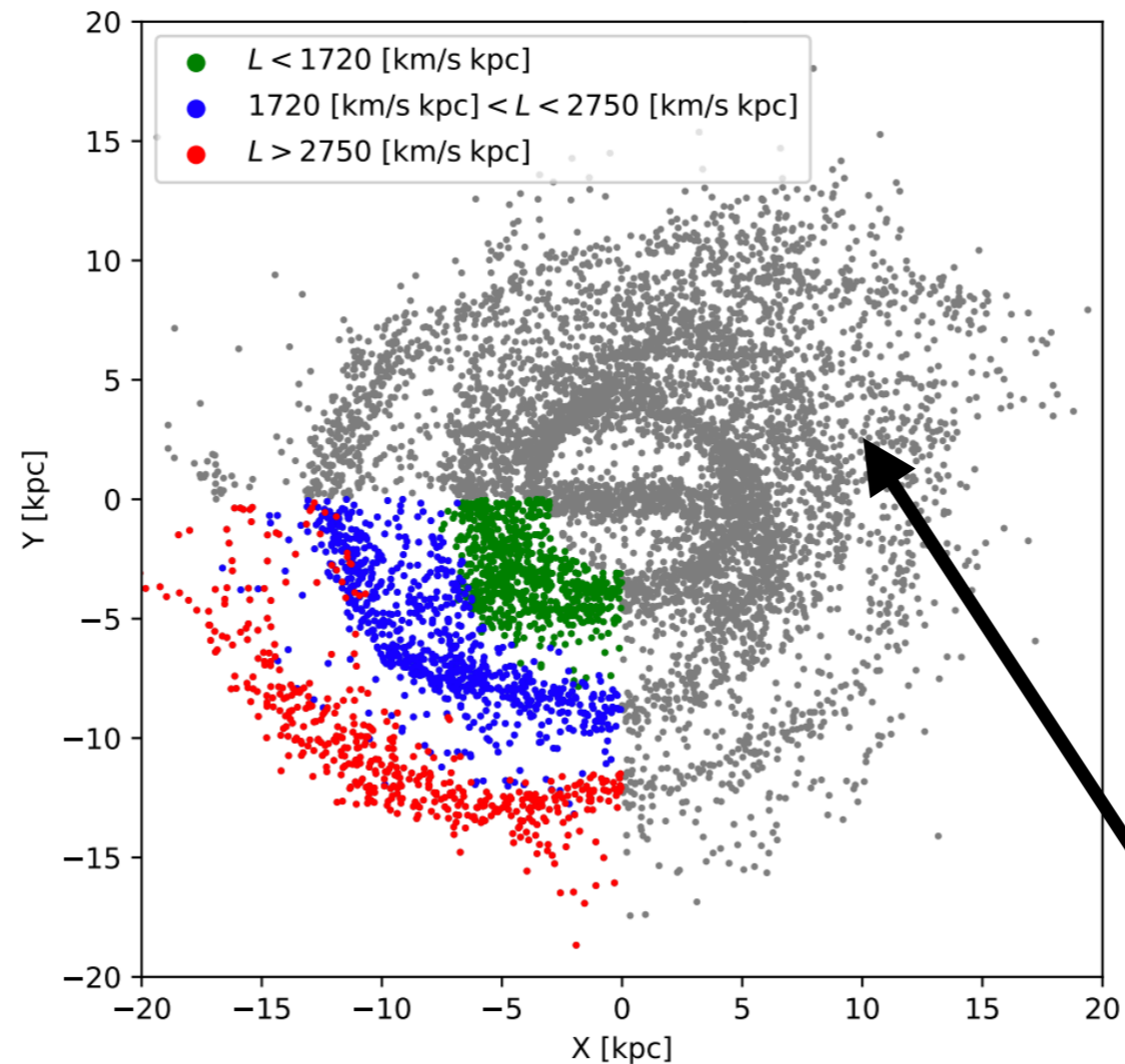
Gap between the spirals



Semczuk et al. (2023)

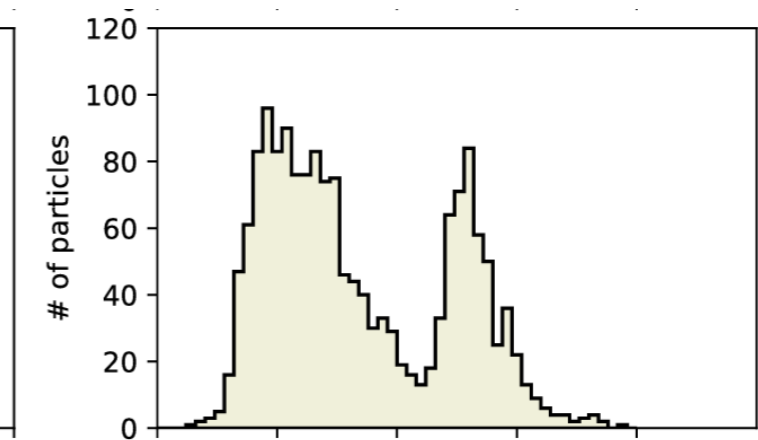
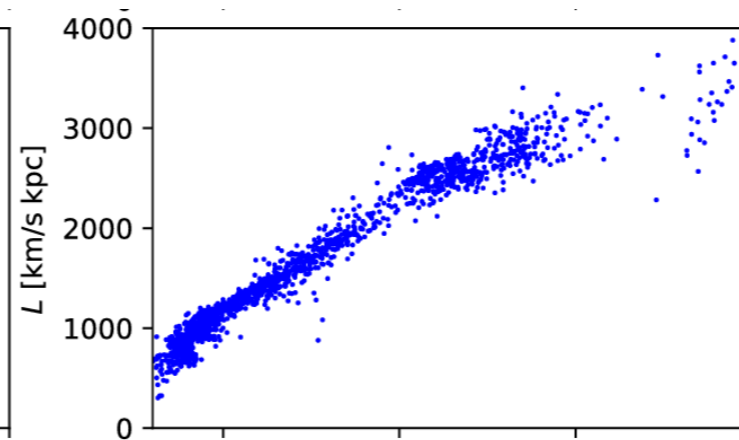
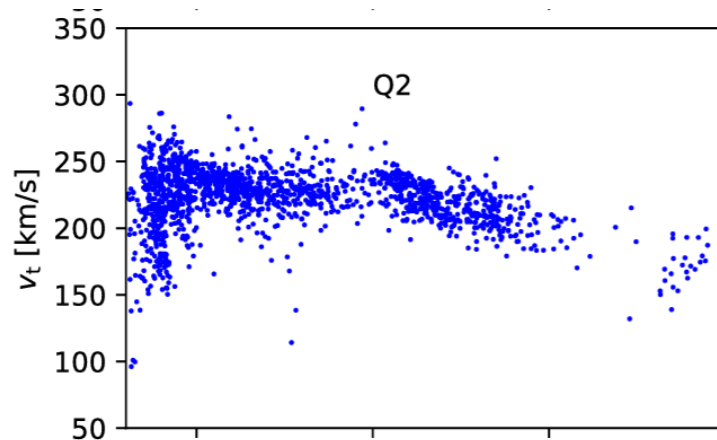
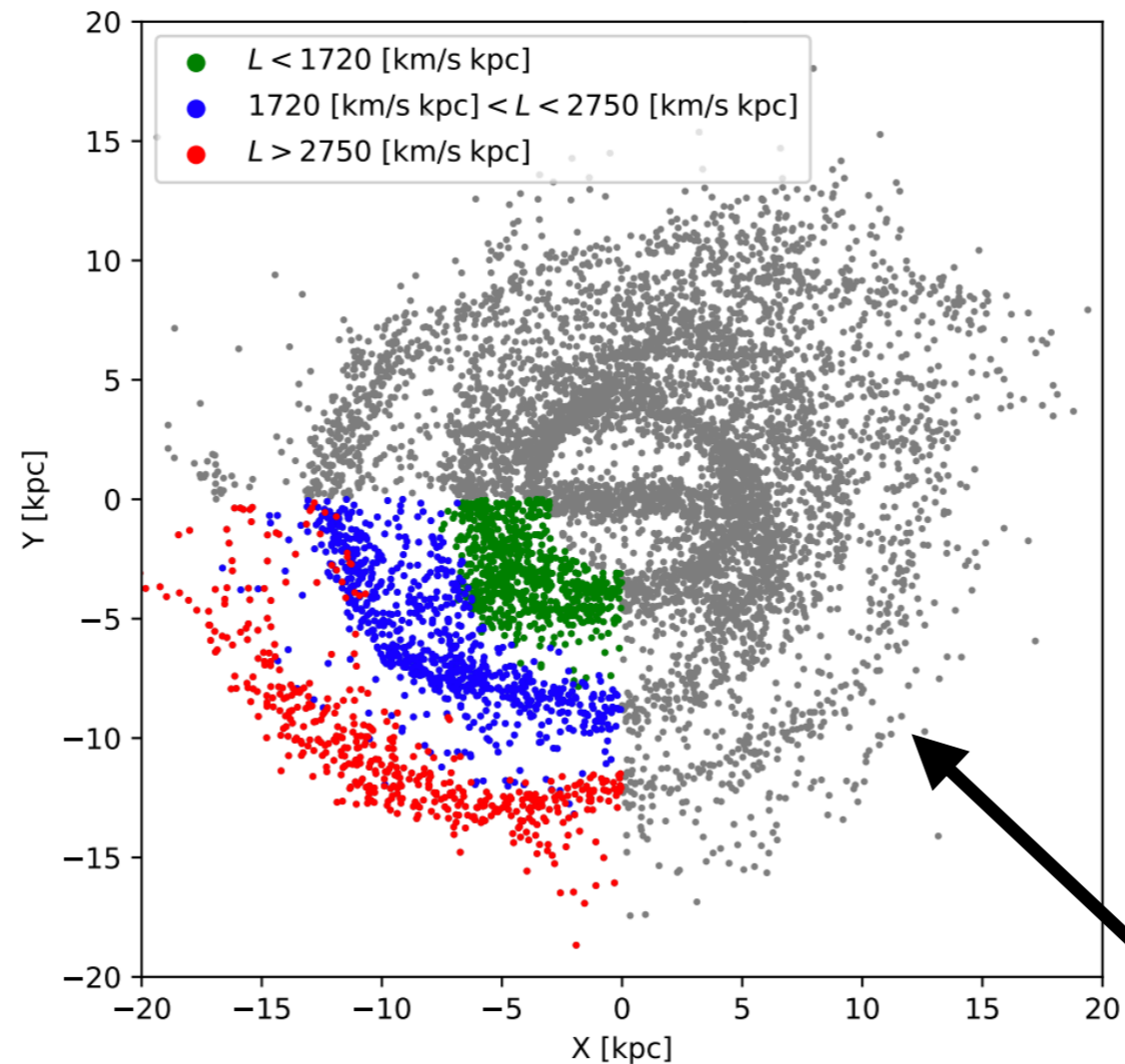
Azimuthal dependance: simulations

Semczuk et al. (2023)



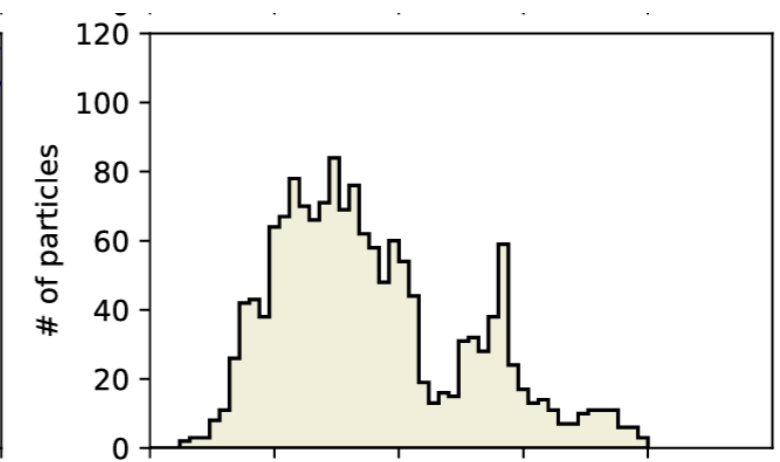
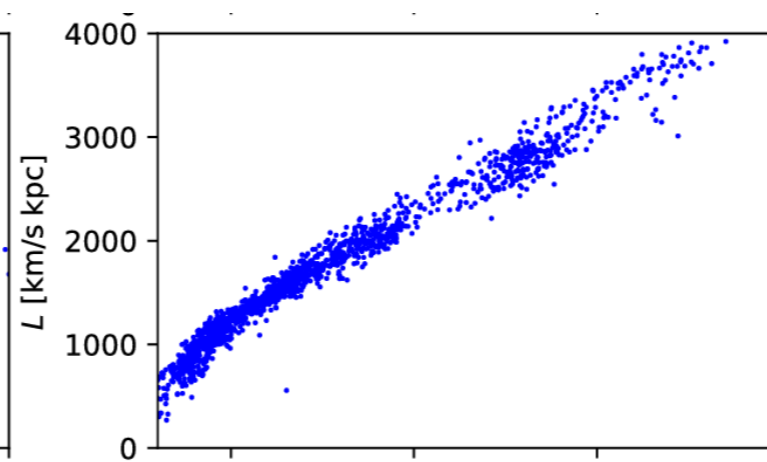
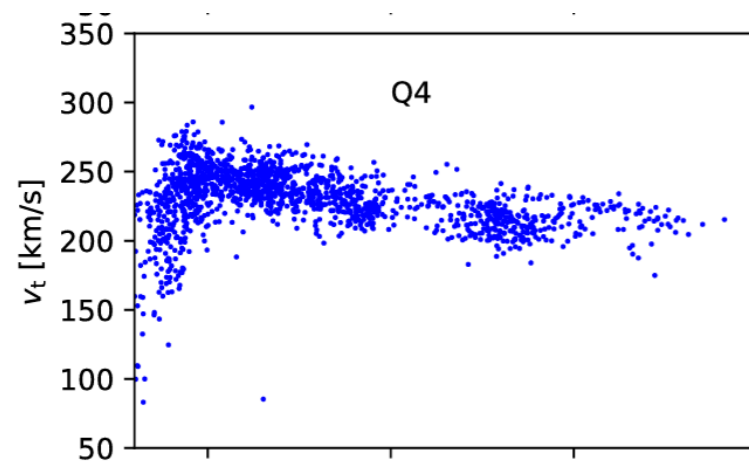
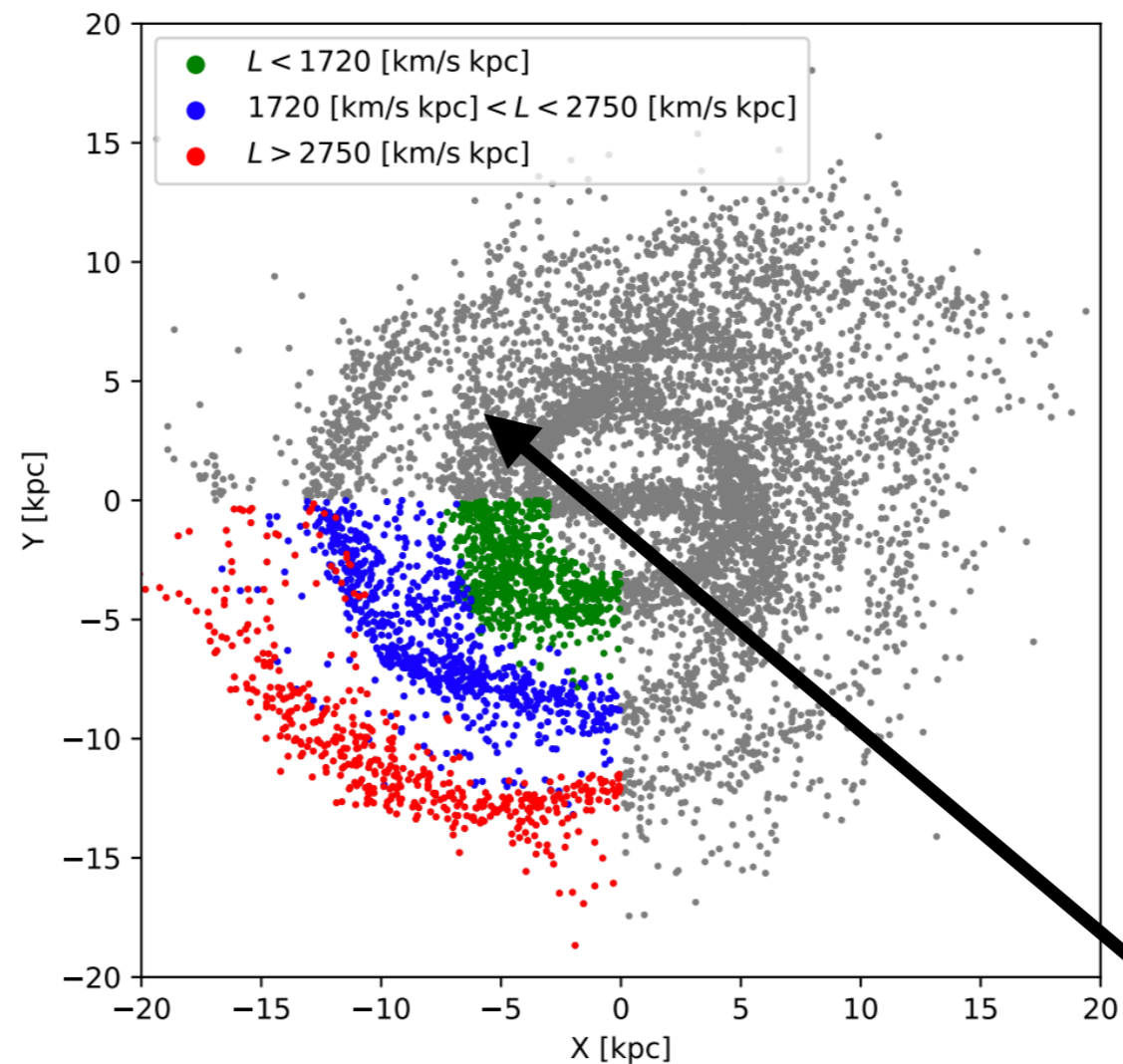
Azimuthal dependance: simulations

Semczuk et al. (2023)

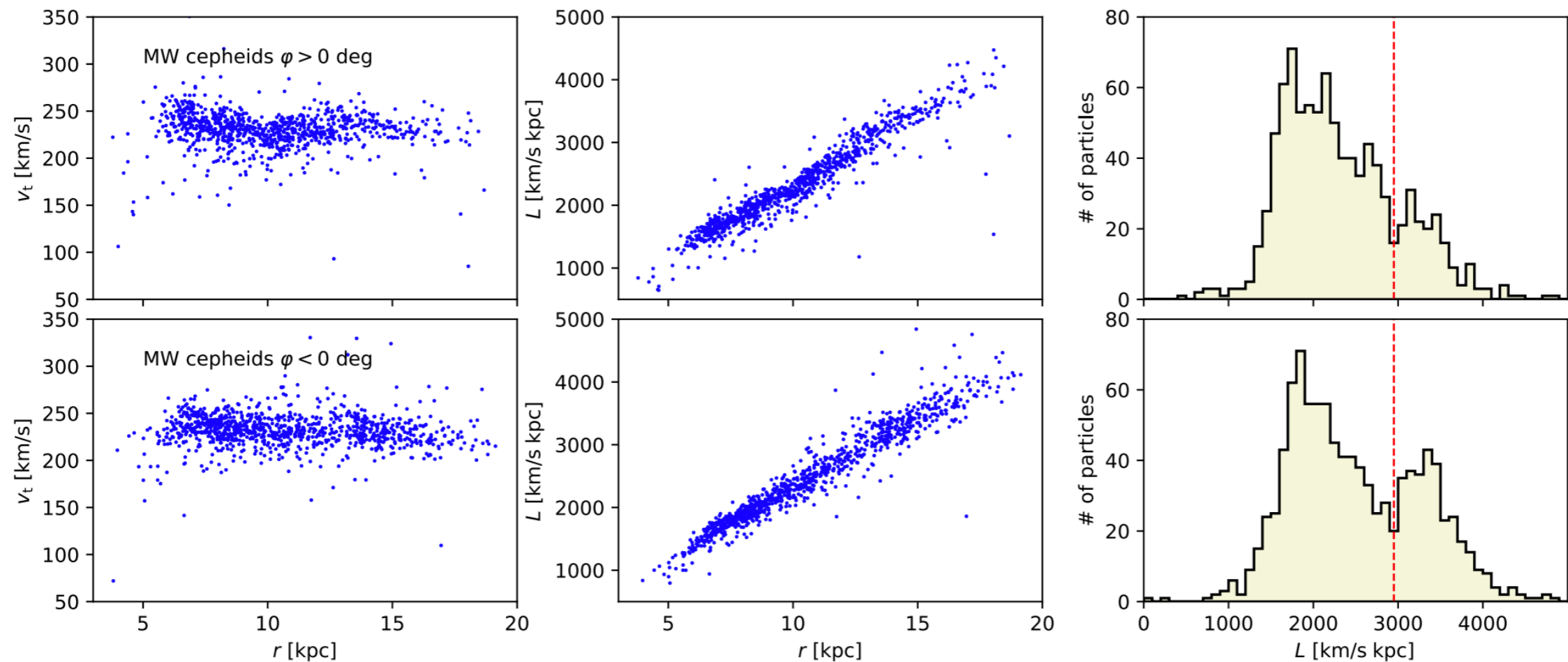


Azimuthal dependance: simulations

Semczuk et al. (2023)

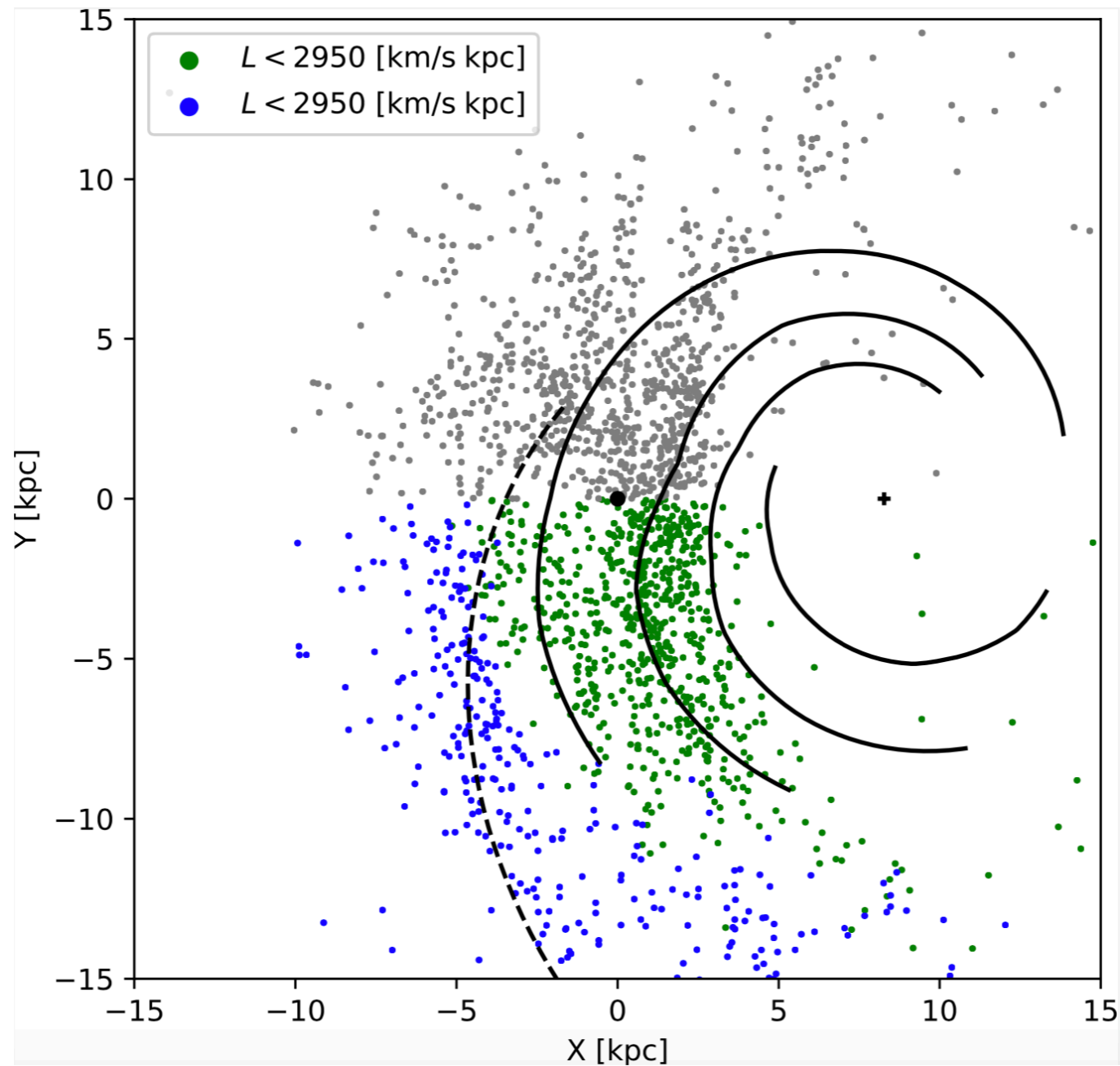


Azimuthal dependance: MW data



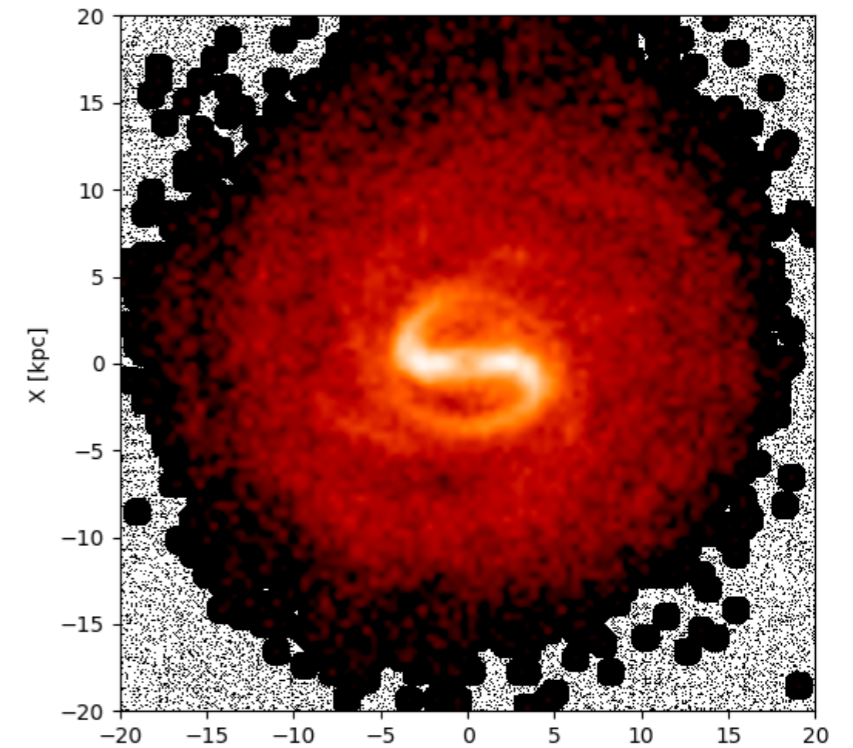
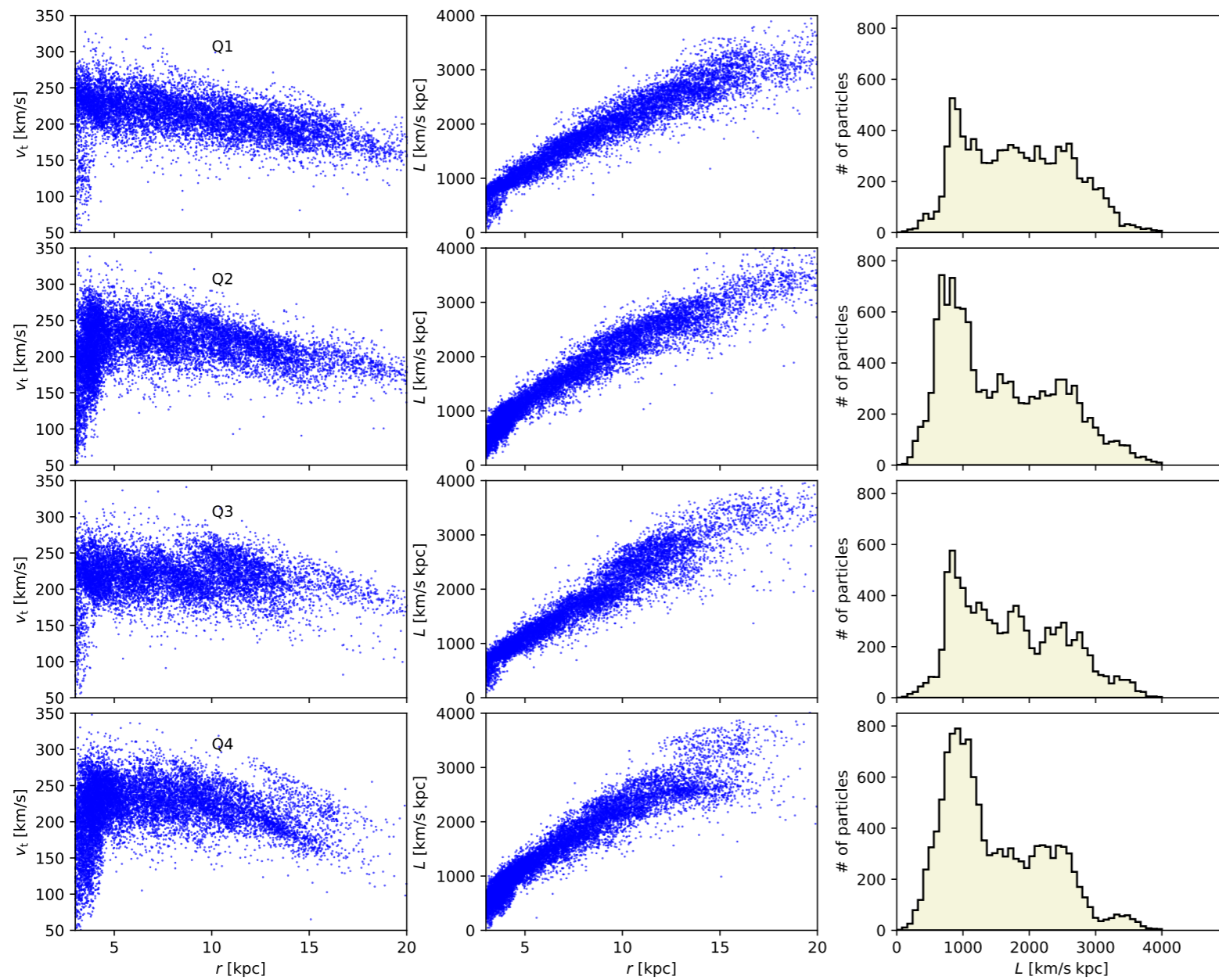
Semczuk et al. (2023)

Azimuthal dependance: MW data



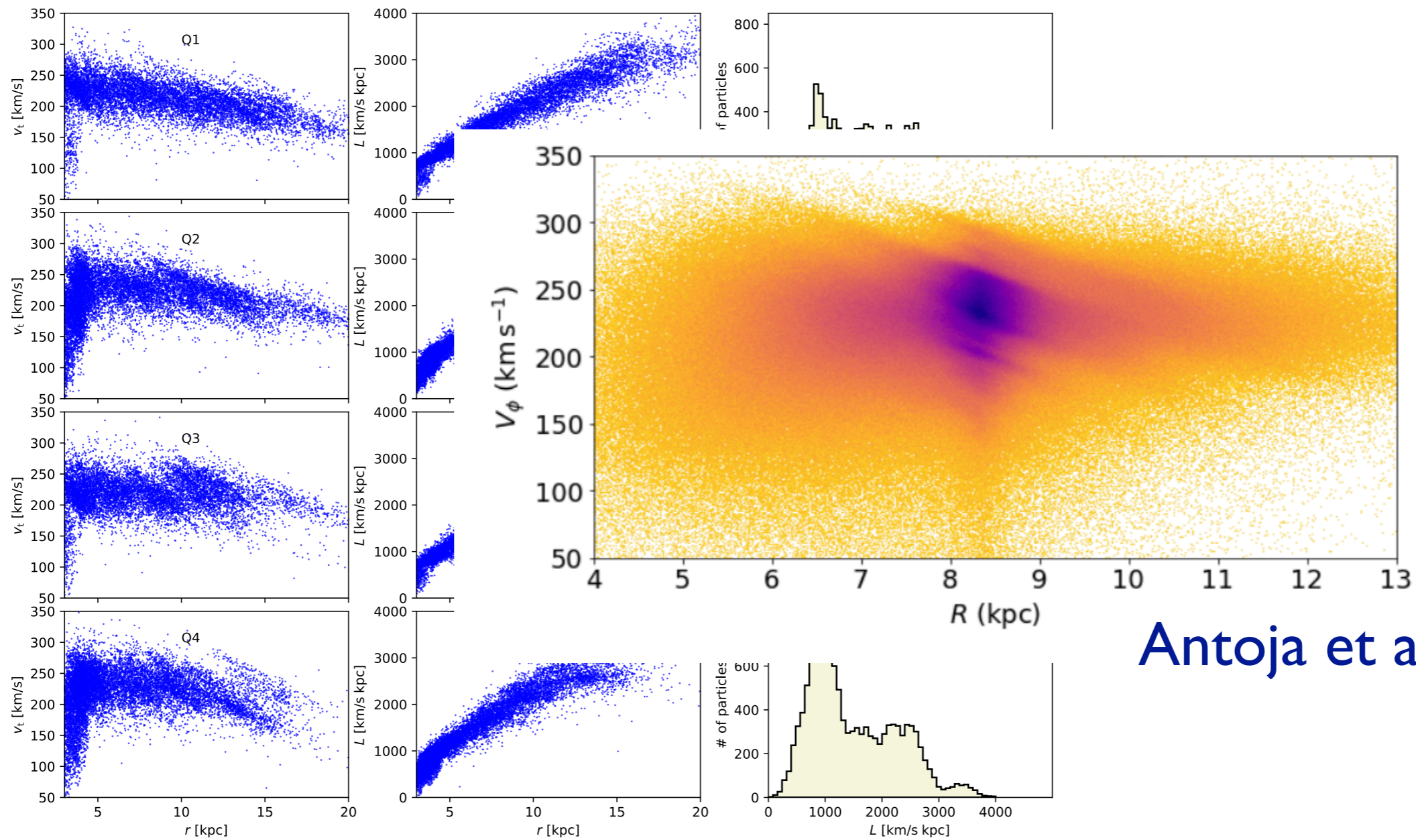
Semczuk et al. (2023)

Comparison with older stars



Ages of 1-2 Gyr

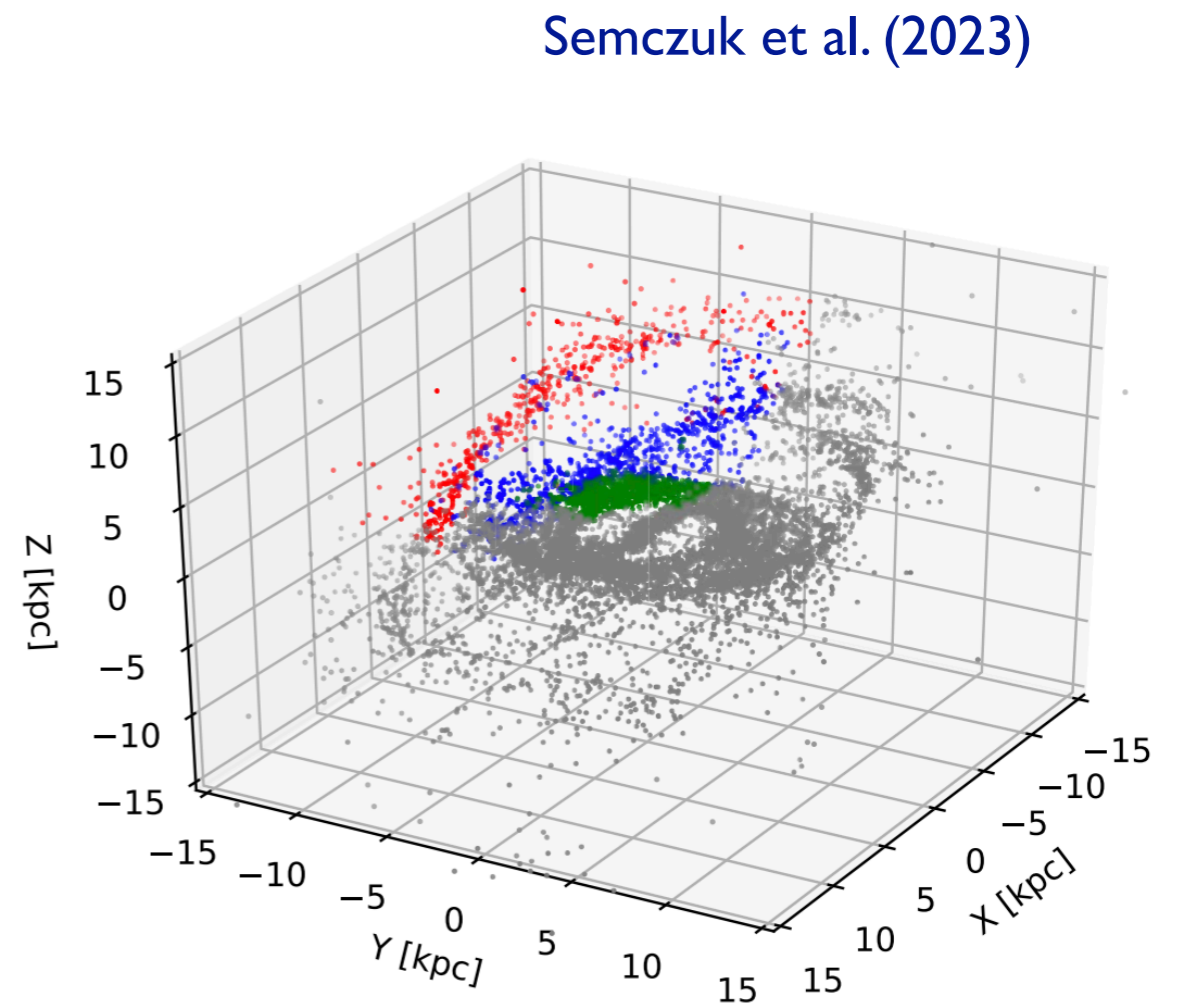
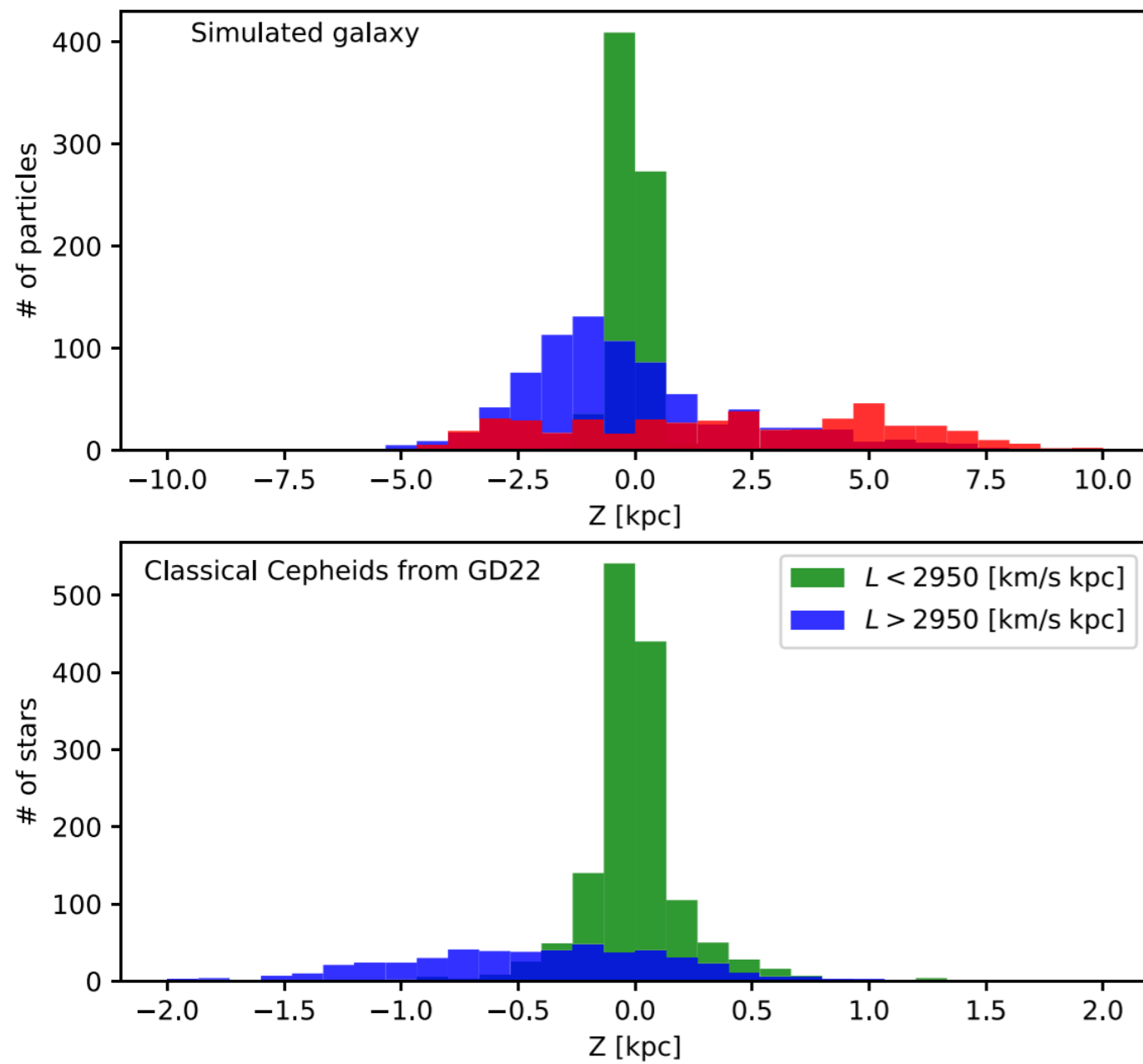
Comparison with older stars



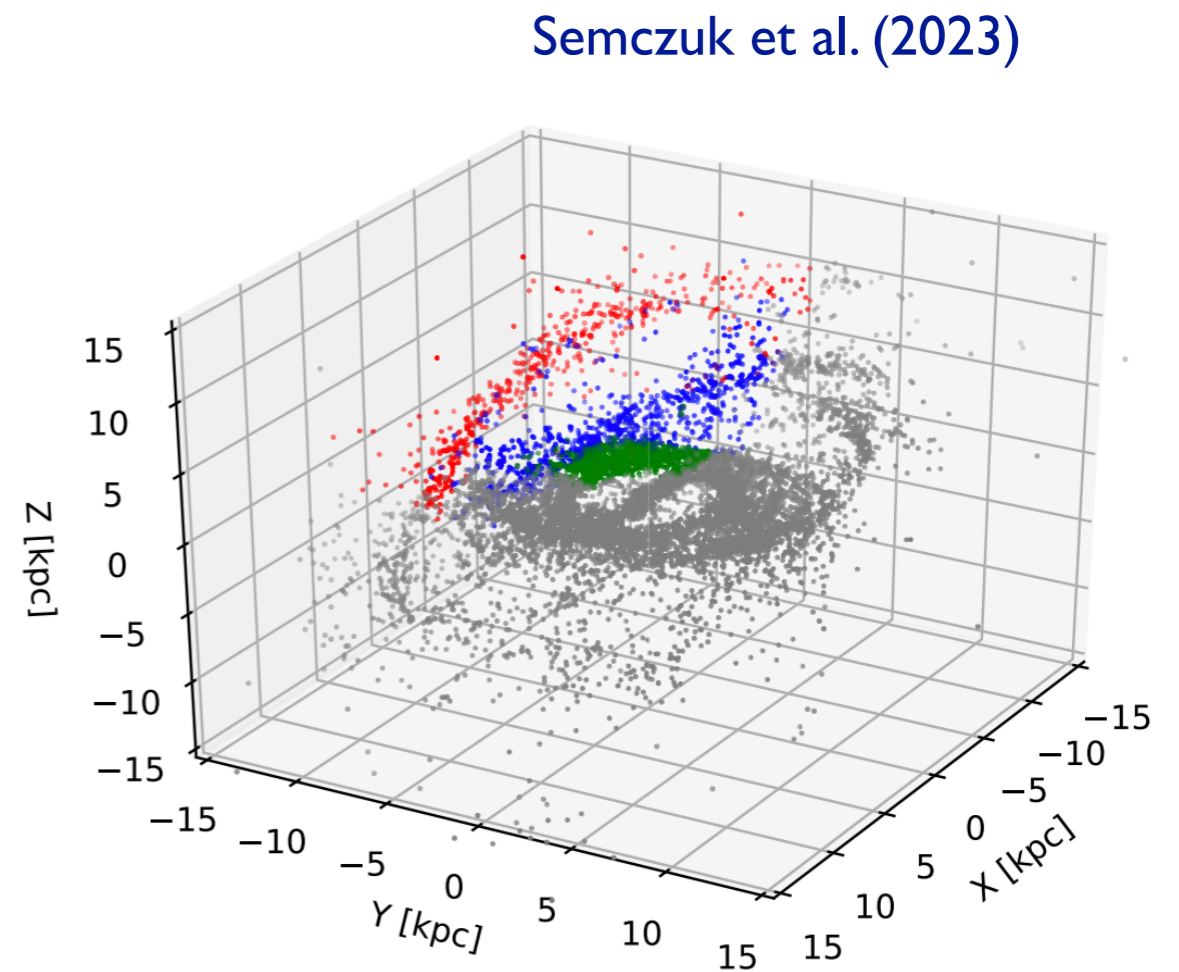
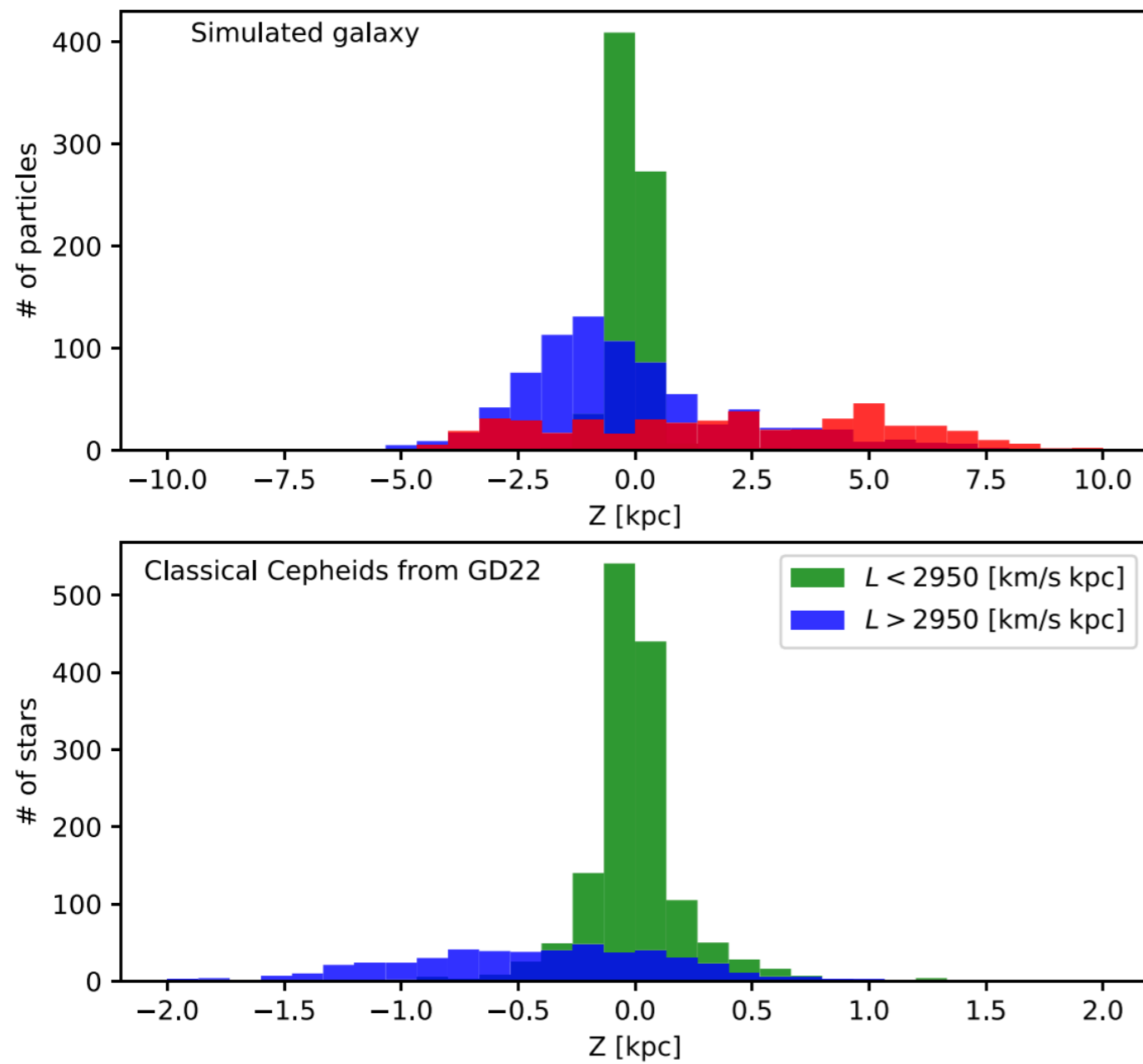
Antoja et al. (2018)

Ages of 1-2 Gyr

Connection to the warp



Connection to the warp



More on warp in:

- Dehnen, Semczuk & Schoenrich (2023)
- Next talk by Mauro

Summary

- Recently discovered phase space gap in Classical Cepheids (Drimmel et al. 2023) can be explained by gap between spiral arms (Semczuk et al. 2023)
- Azimuthal and age dependance support this explanation