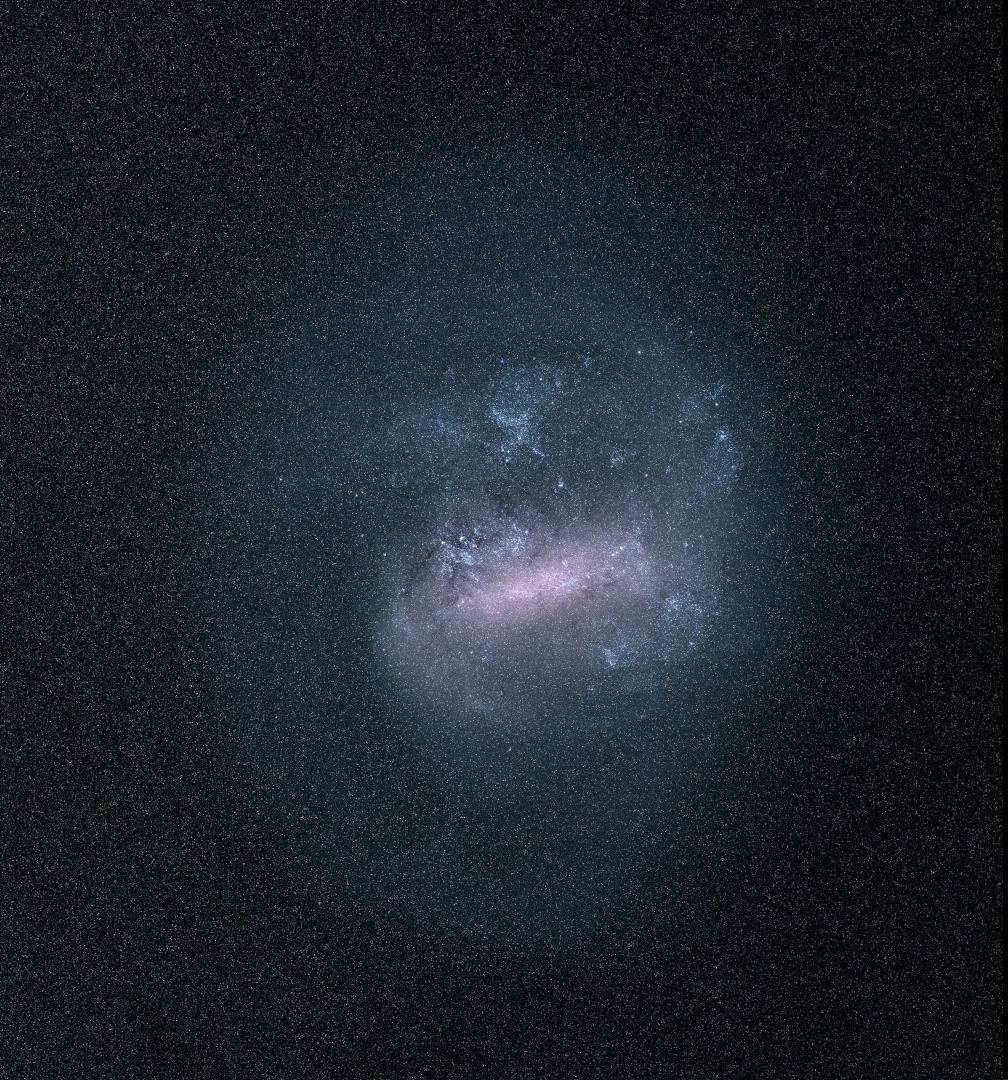
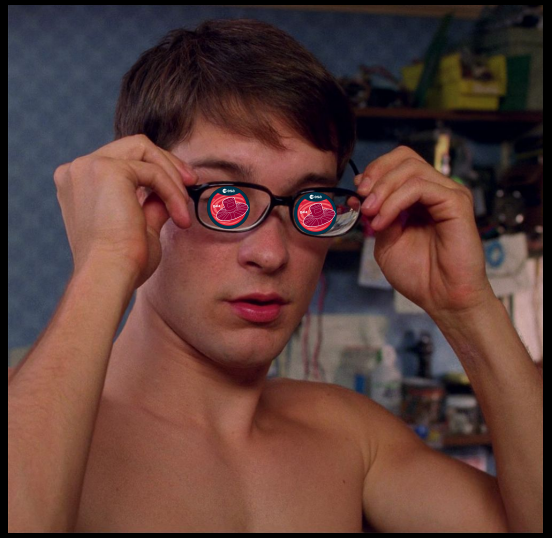
Large Magellanic Cloud





Large Magellanic Cloud

The Large Magellanic Cloud dynamics with high resolution glasses

Óscar Jiménez-Arranz
ojimenez@fqa.ub.edu
Institut de Ciències del Cosmos (ICCUB)

The Large Magellanic Cloud dynamics with high resolution glasses

PhD Supervisors:
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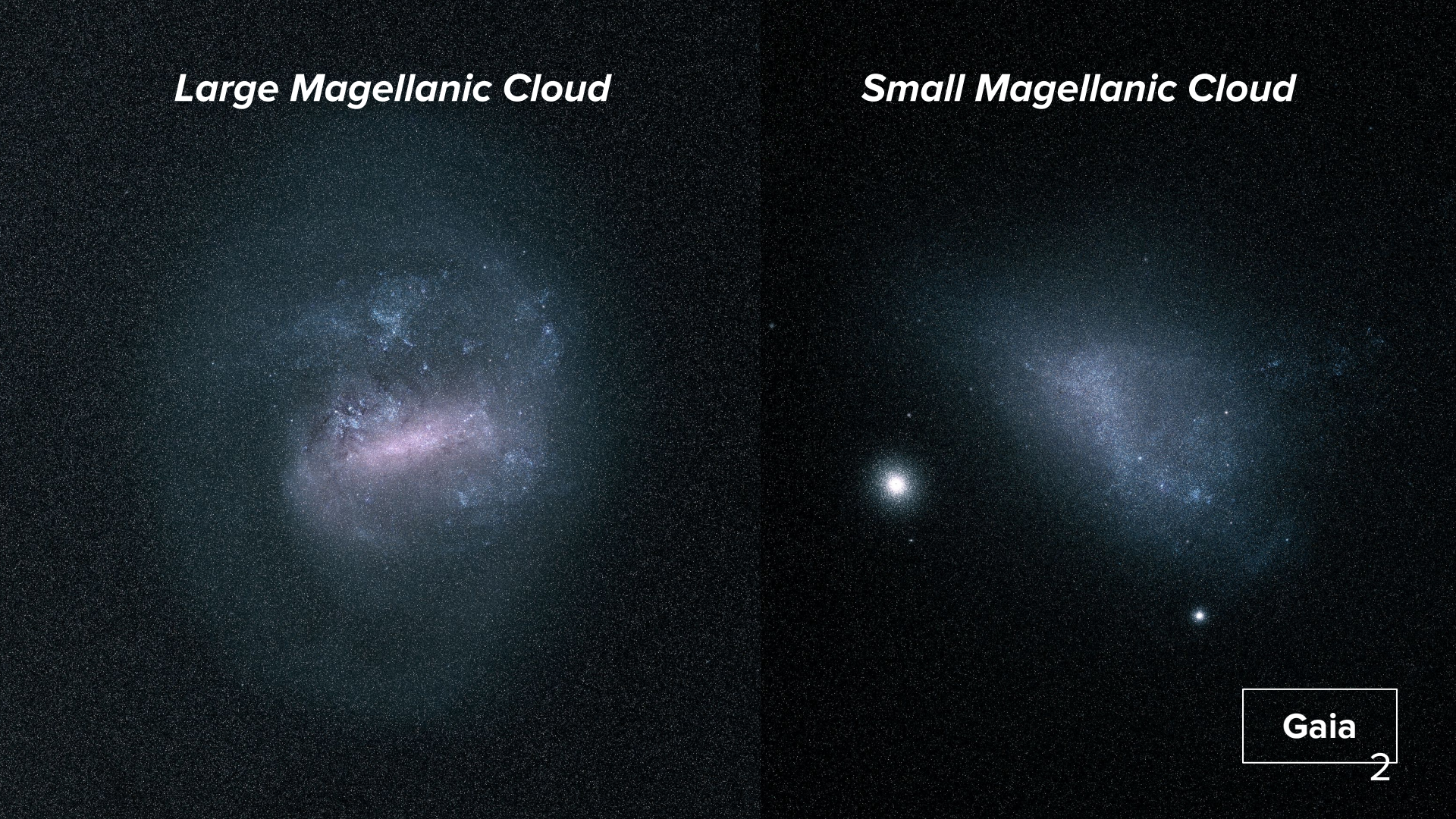
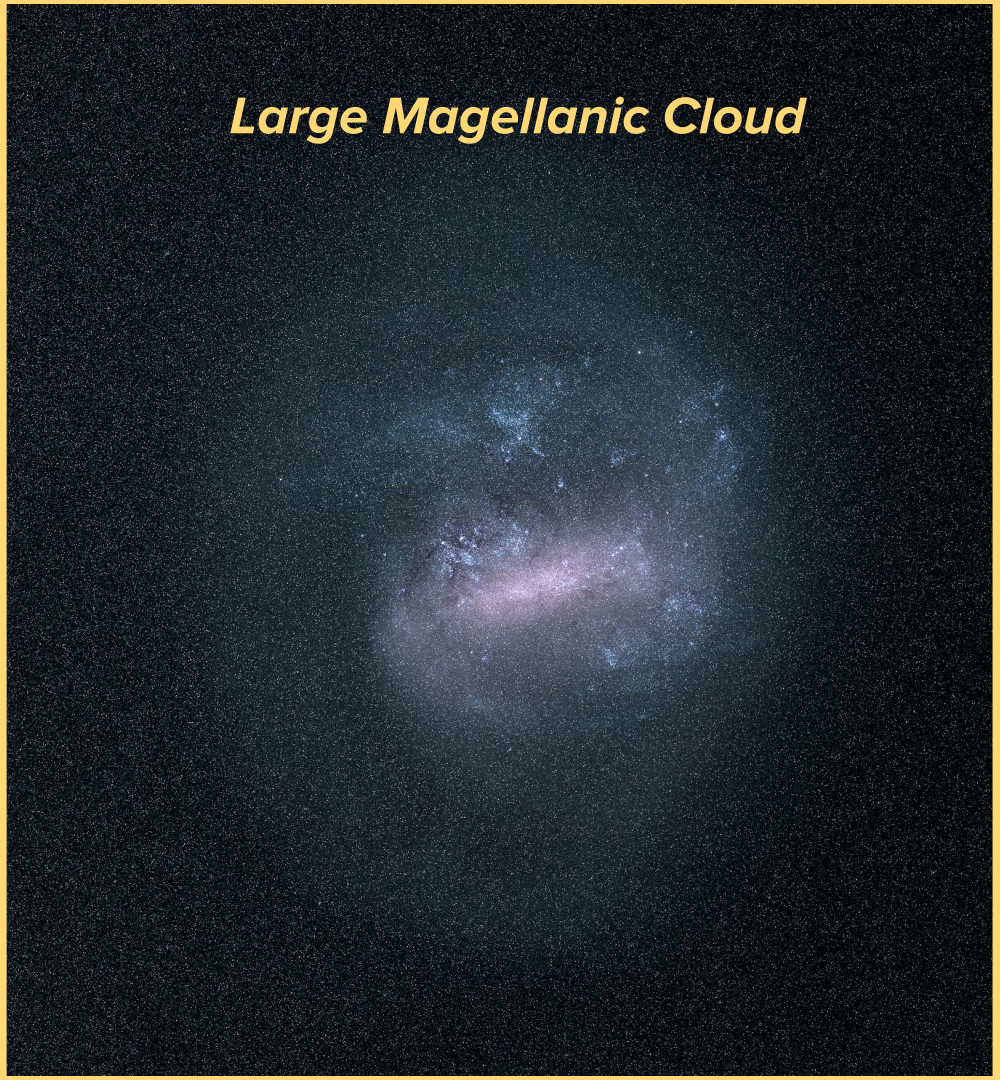
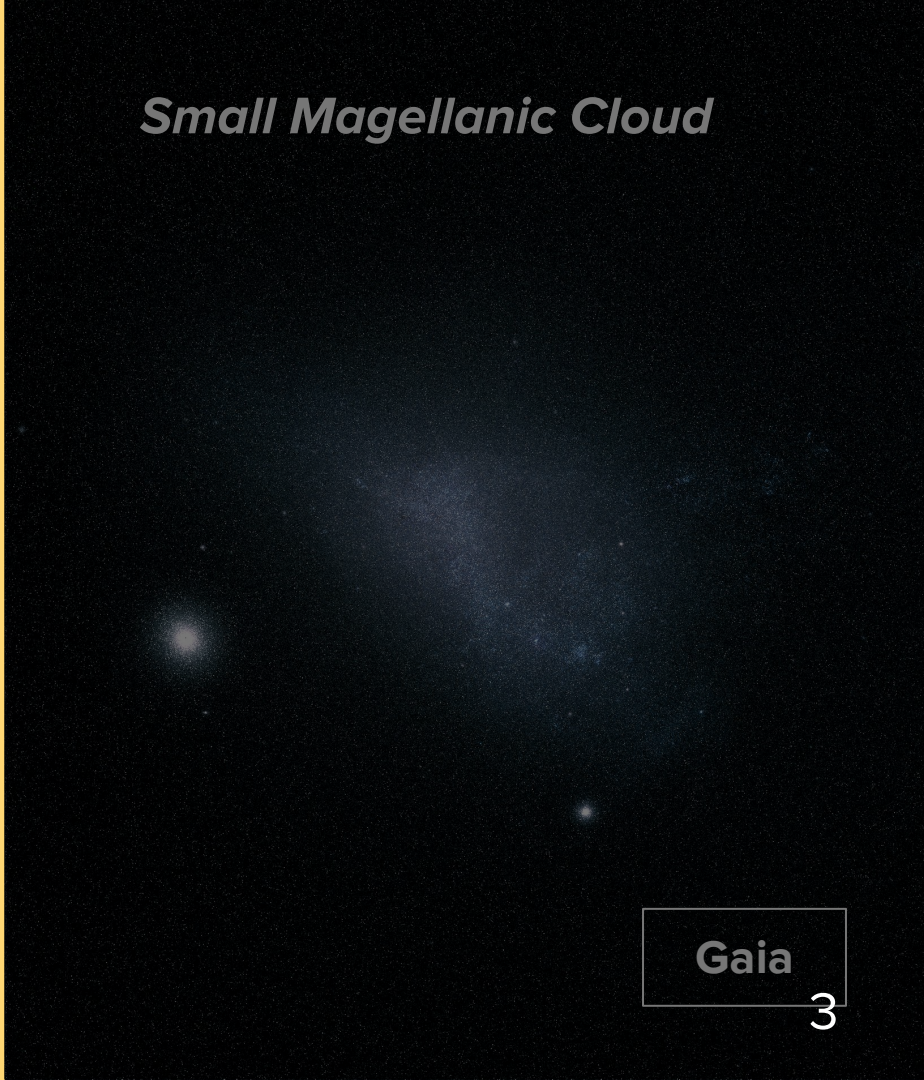

Large Magellanic Cloud
Small Magellanic Cloud
Gaia


Large Magellanic Cloud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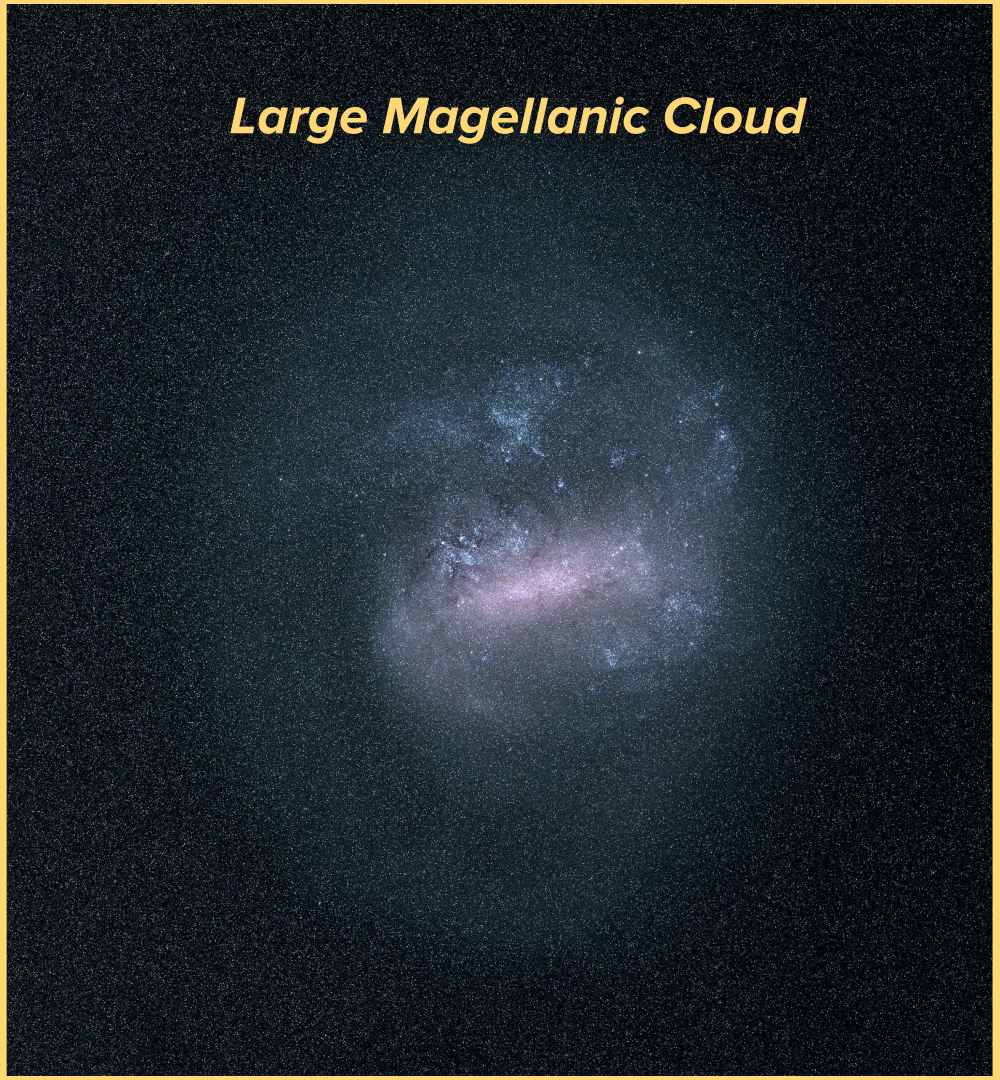


Small Magellanic Cloud

What makes the LMC interesting?

Gaia

Large Magellanic Cloud

Small Magellanic Cloud

What makes the LMC interesting?

- The closest spiral galaxy to the MW

Gaia

Large Magellanic Cloud

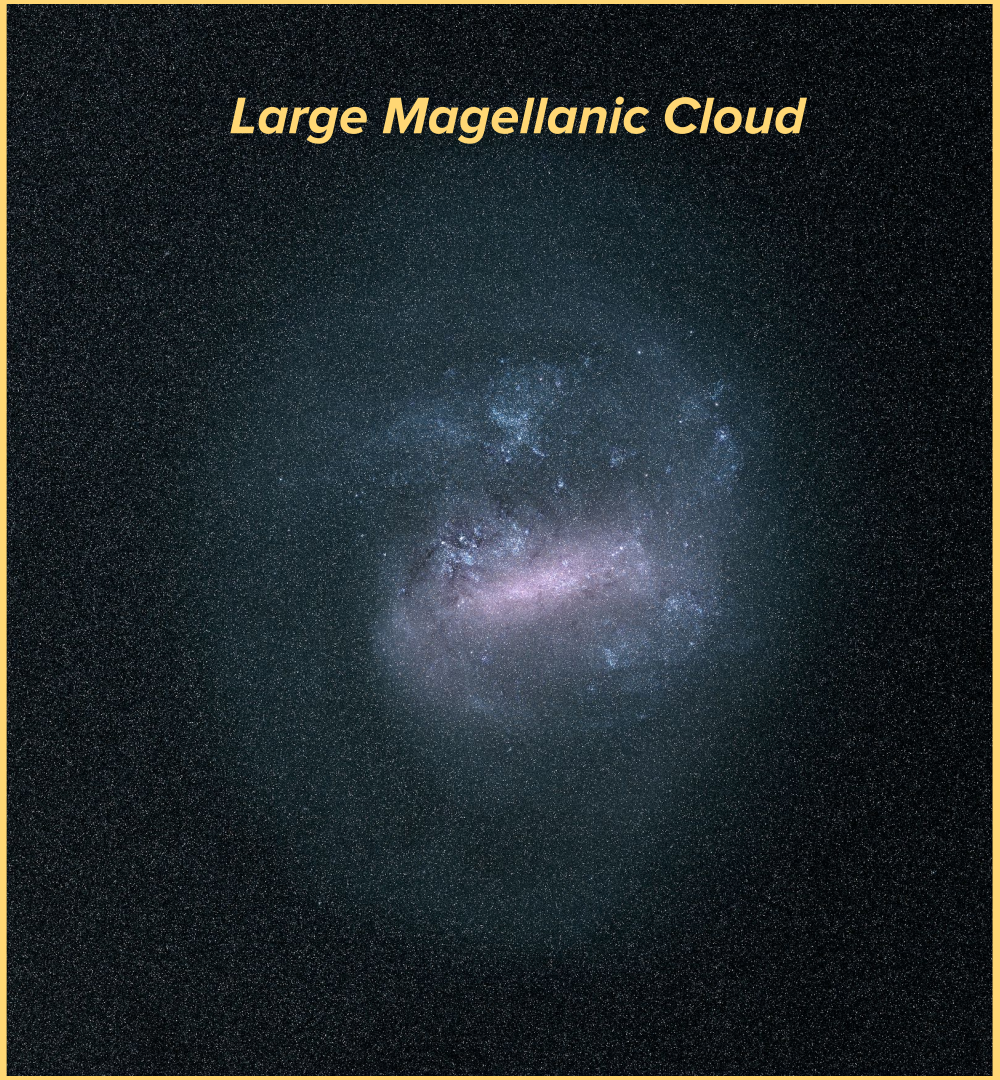
Small Magellanic Cloud

What makes the LMC interesting?

- The closest spiral galaxy to the MW
  (astrometric information for million stars)

Gaia

Large Magellanic Cloud



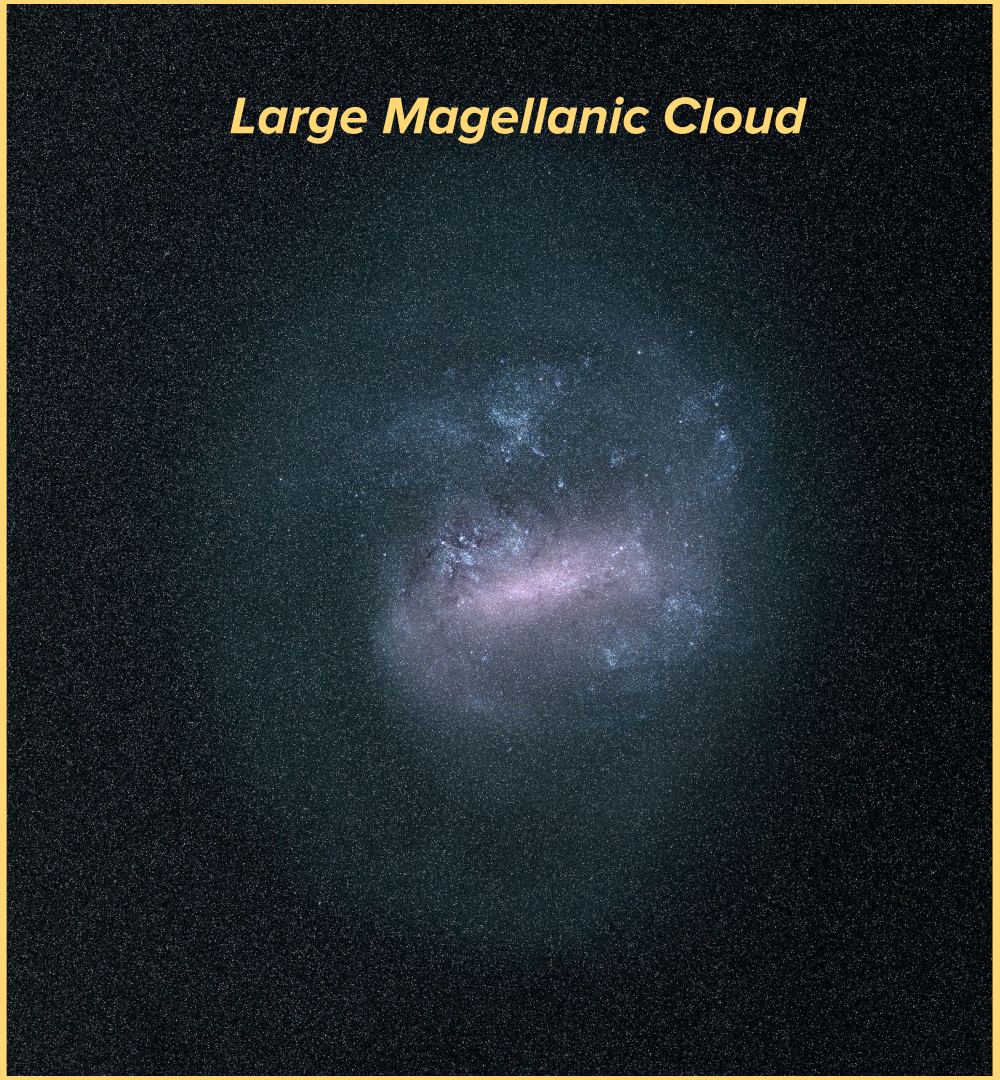
Small Magellanic Cloud

What makes the LMC interesting?

- The closest spiral galaxy to the MW (astrometric information for million stars)
- It is in strong interaction with the SMC

Gaia

Large Magellanic Cloud



Small Magellanic Cloud

What makes the LMC interesting?

- The closest spiral galaxy to the MW (astrometric information for million stars)
- It is in strong interaction with the SMC

The LMC is the perfect laboratory for testing methodologies and models designed for the study of external and interacting galaxies

Gaia

My PhD Journey

My PhD Journey

1) **Kinematic analysis of the Large Magellanic Cloud using Gaia DR3**
   (Ó. Jiménez-Arranz et al. 2023a)

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   - Neural network classifier for the selection of clean LMC samples

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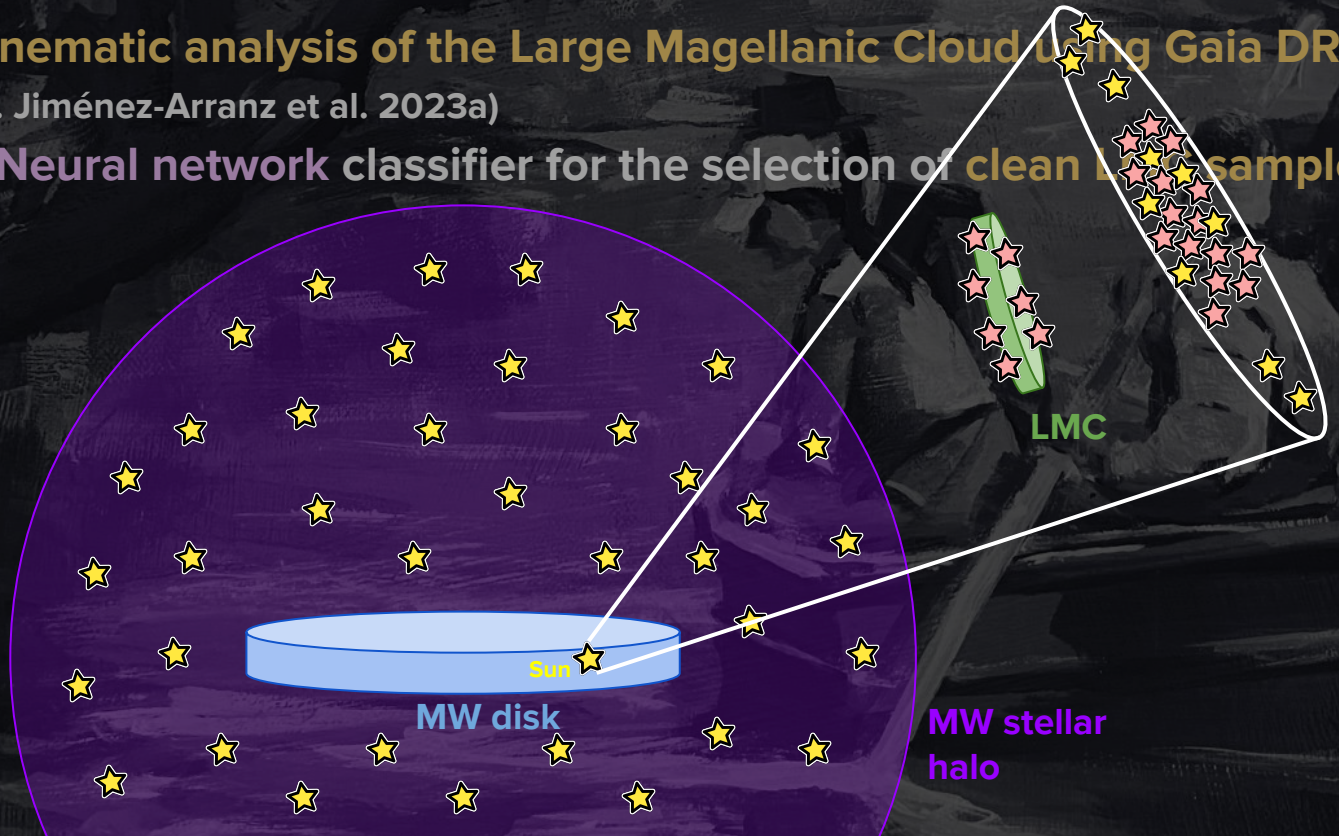

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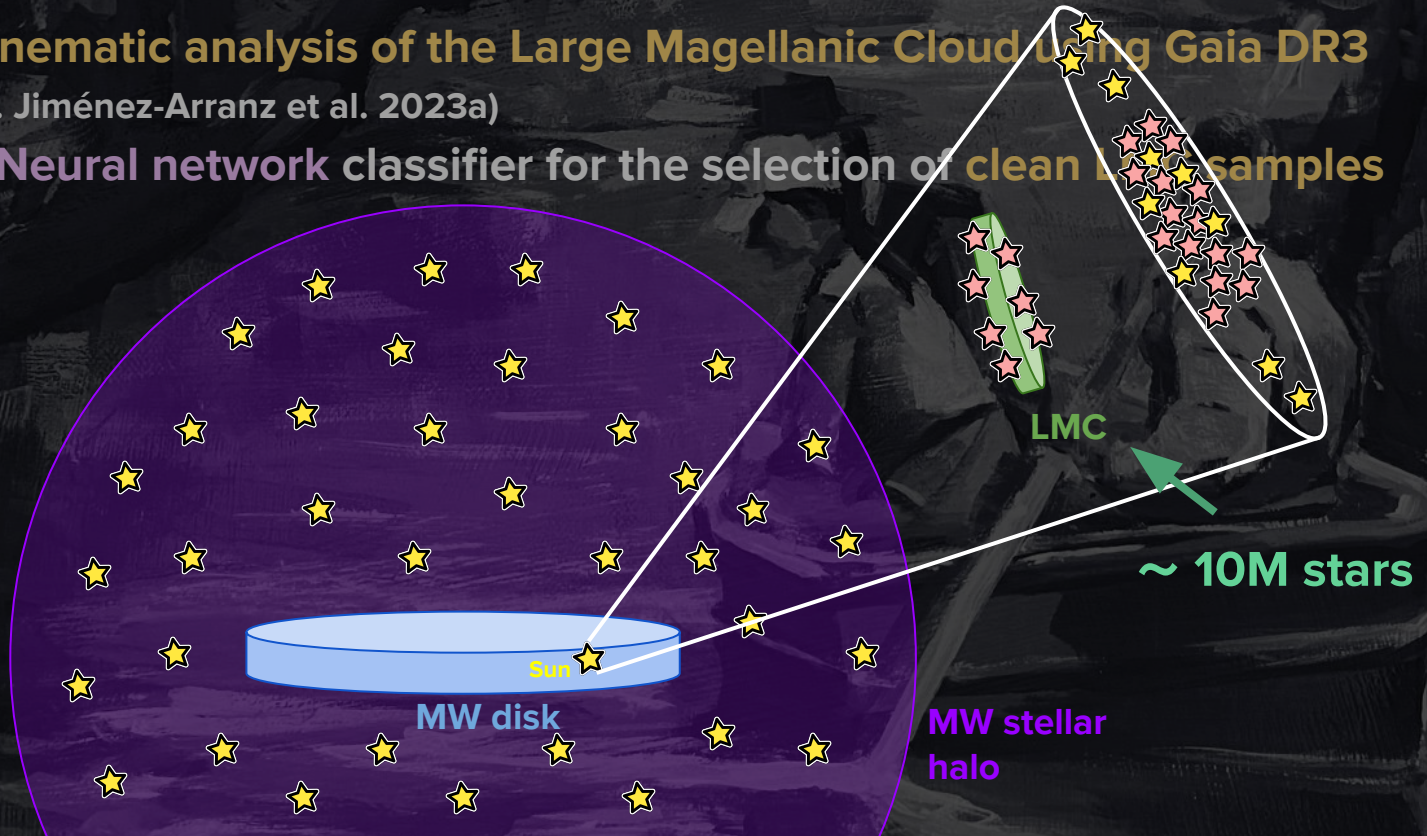

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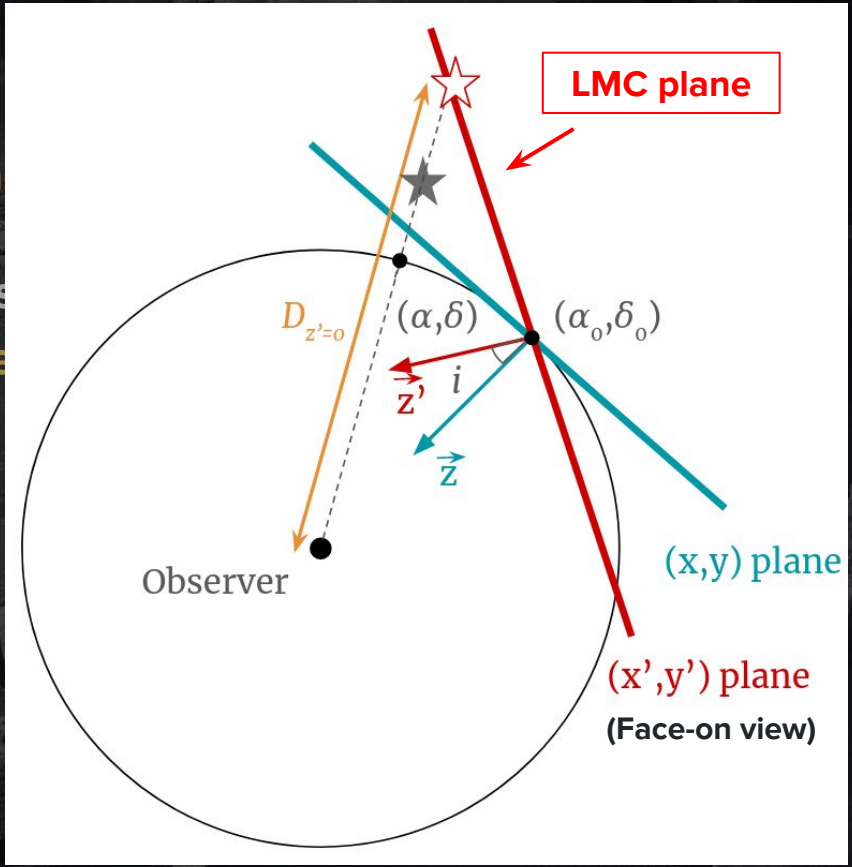
   - Kinematic analysis of the in-plane velocities for the LMC

My PhD Journey

1) **Kinematic analysis of the Large Ma**

   (Ó. Jiménez-Arranz et al. 2023a)

   - **Neural network** classifier for the s
   - Kinematic analysis of the **in-plane**



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KRATOS suite
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Methods:

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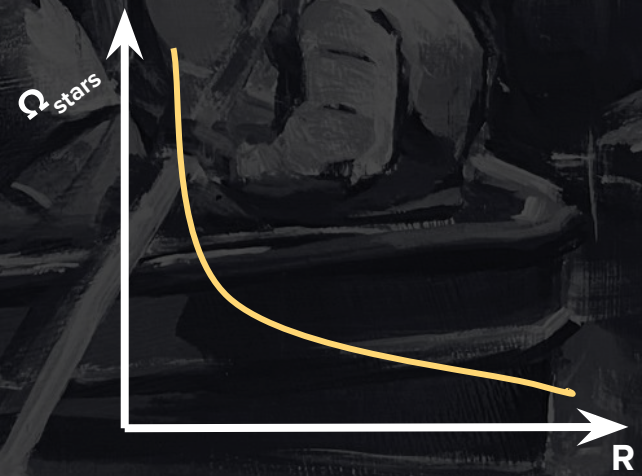

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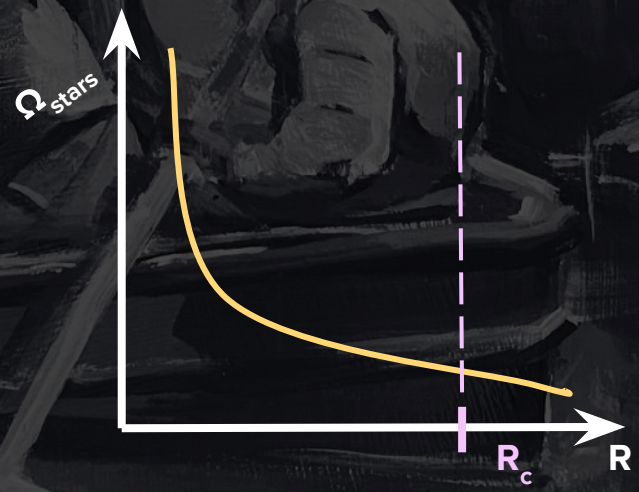

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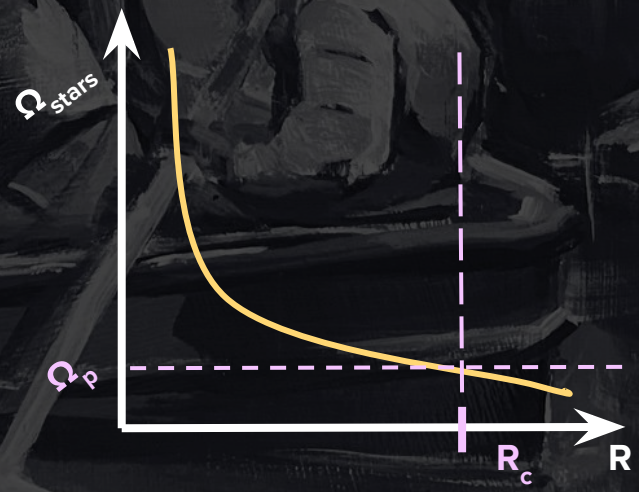

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    - LMC Toomre parameter Q
    - SMC mass
    - MW mass
    - ...

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    2) LMC + SMC system
    3) LMC + SMC + MW system

View the video at:
https://drive.google.com/file/d/1BYa70XAfEFOQNQtidNtuoNbjC0ZlafcX/view?usp=sharing

KRATOS suite
(Ó. Jiménez-Arranz+23d, in prep.)

My PhD

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Tested…
- B5…
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- 12… of 30 simulations
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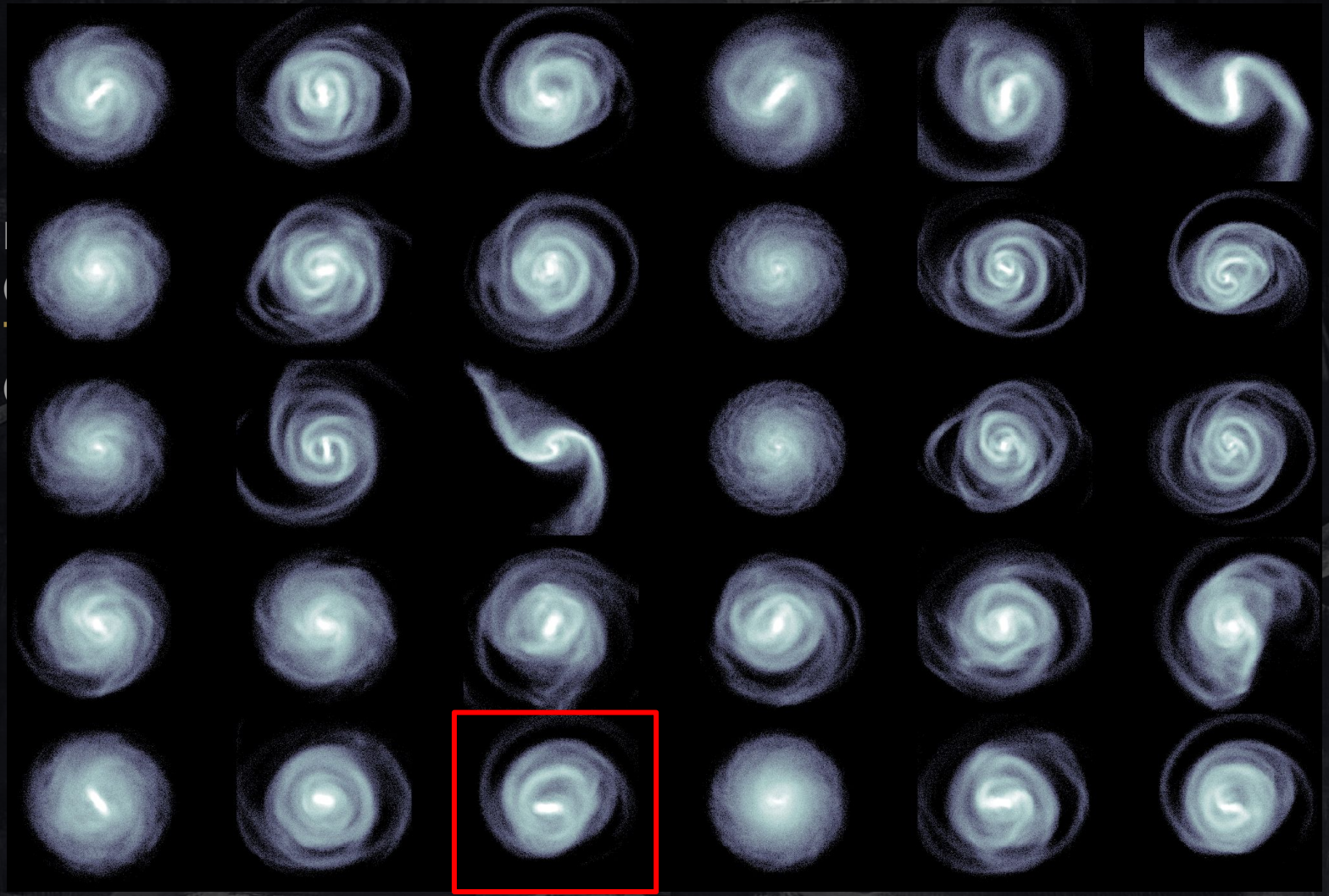
KRATOS suite
(Ó. Jiménez-Arranz+23d, in prep.)

My

1)

2)



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In-plane velocity

$$\Omega_p = \frac{\langle v_y \rangle}{\langle x \rangle}$$

In-plane position

My PhD Journey

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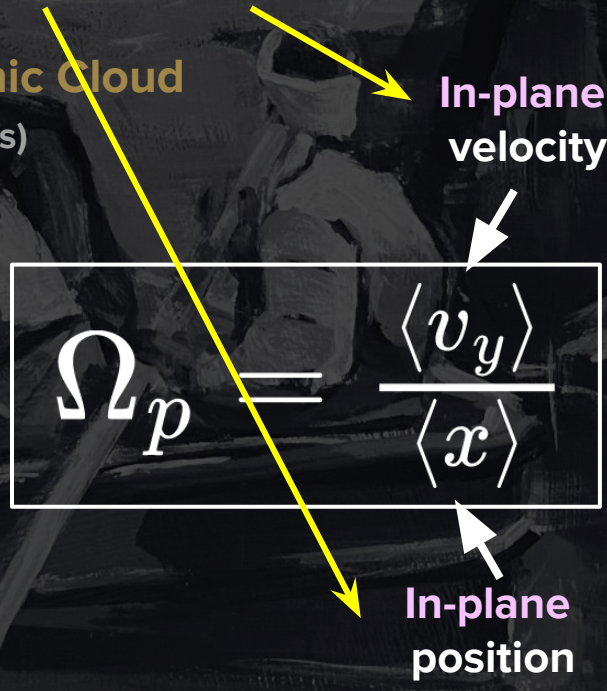

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In-plane velocity

$$\Omega_p = \frac{\langle v_y \rangle}{\langle x \rangle}$$

In-plane position

The x-y axes can be arbitrarily chosen (!!)

My PhD Journey

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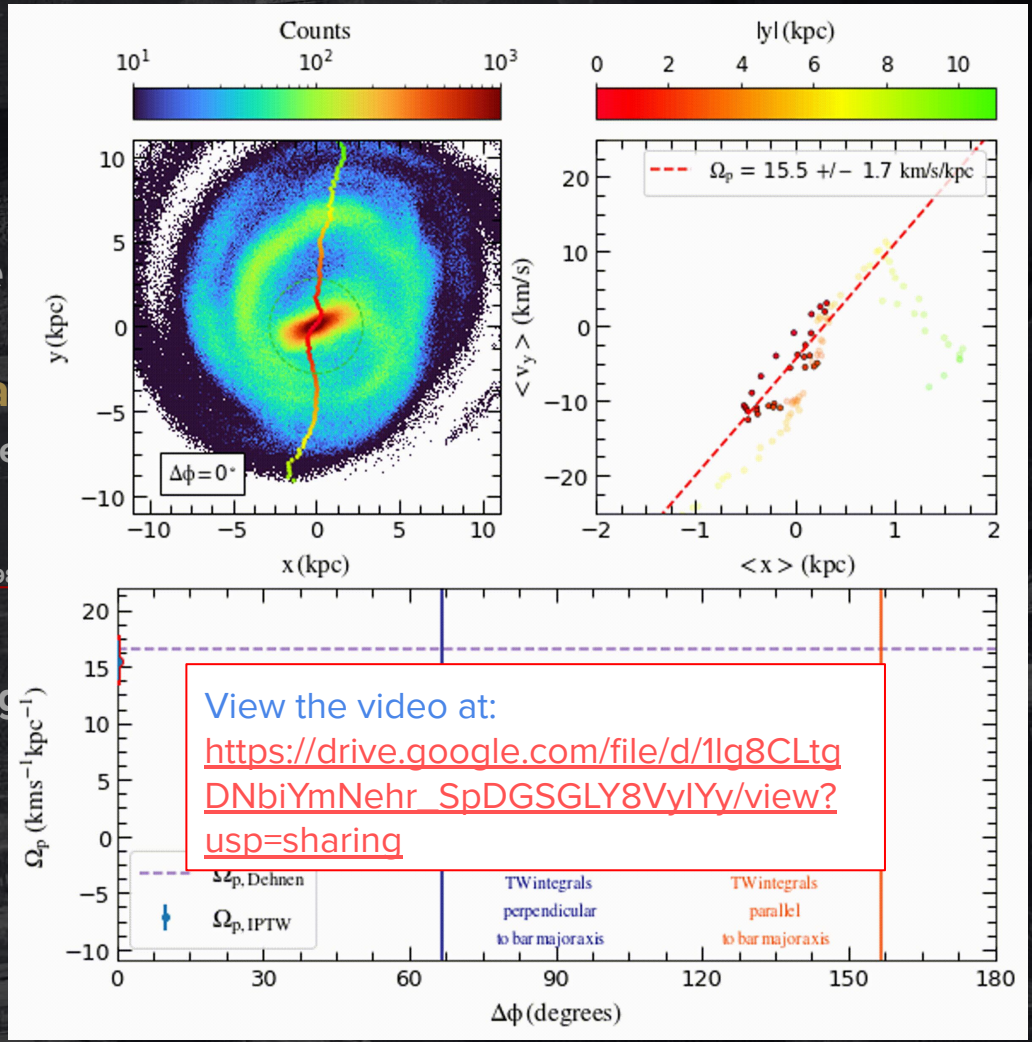

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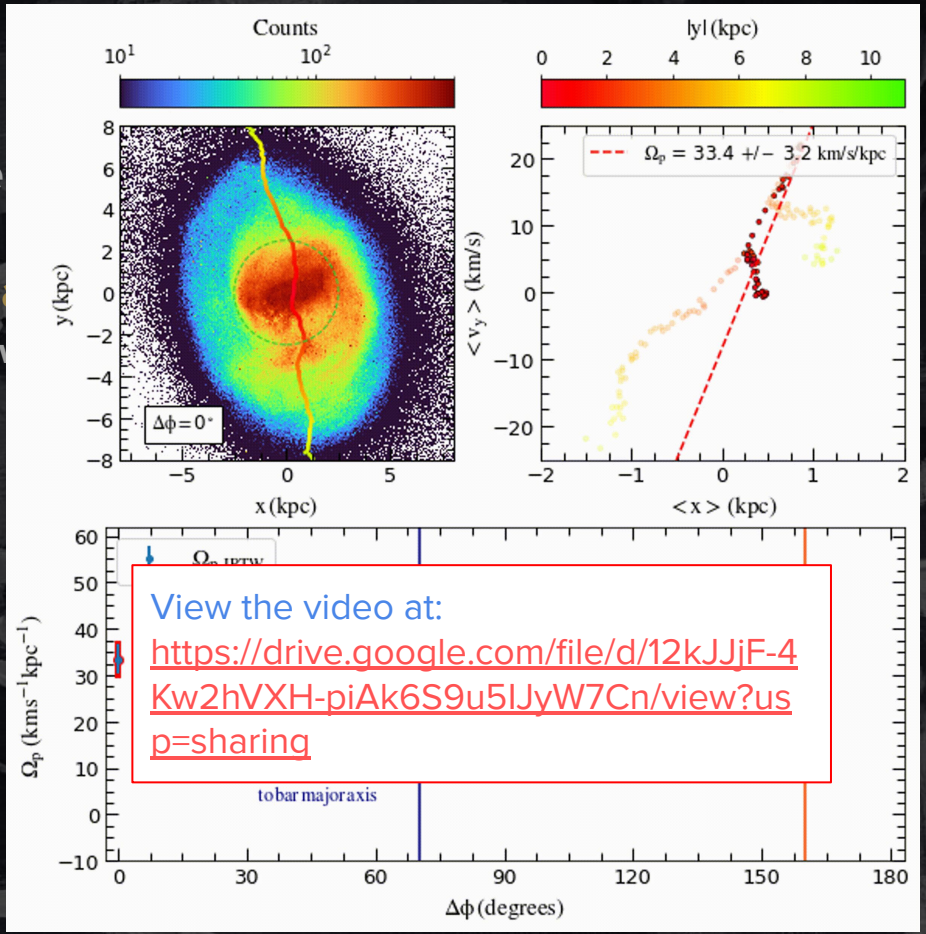

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https://drive.google.com/file/d/12kJJjF-4Kw2hVXH-piAk6S9u5IJyW7Cn/view?usp=sharing

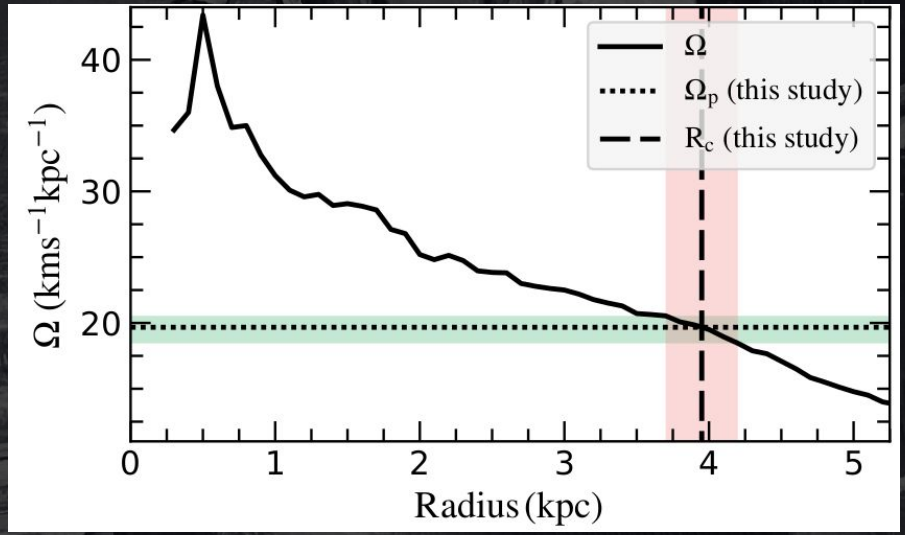
Tremaine-Weinberg method (1984)

My PhD Journey

1) Kinematic analysis of the Large Magellanic Cloud using Gaia DR3
   (Ó. Jiménez-Arranz et al. 2023a)
2) The bar pattern speed of the Large Magellanic Cloud
   (Ó. Jiménez-Arranz et al. 2023c, in referee review process)

Methods (w/ LMC Gaia data):

Bisymmetric model of the tangential velocity
(Gaia Collaboration, Drimmel, et al. 2022)



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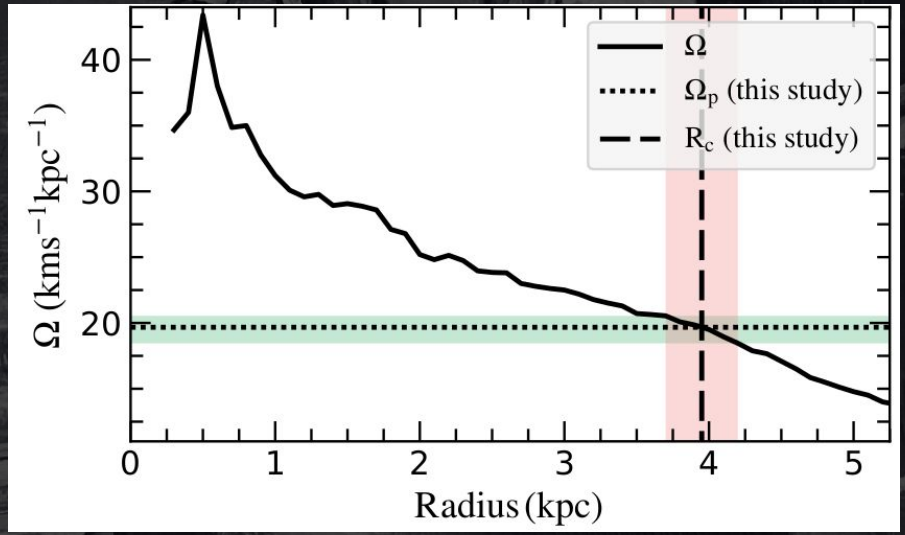

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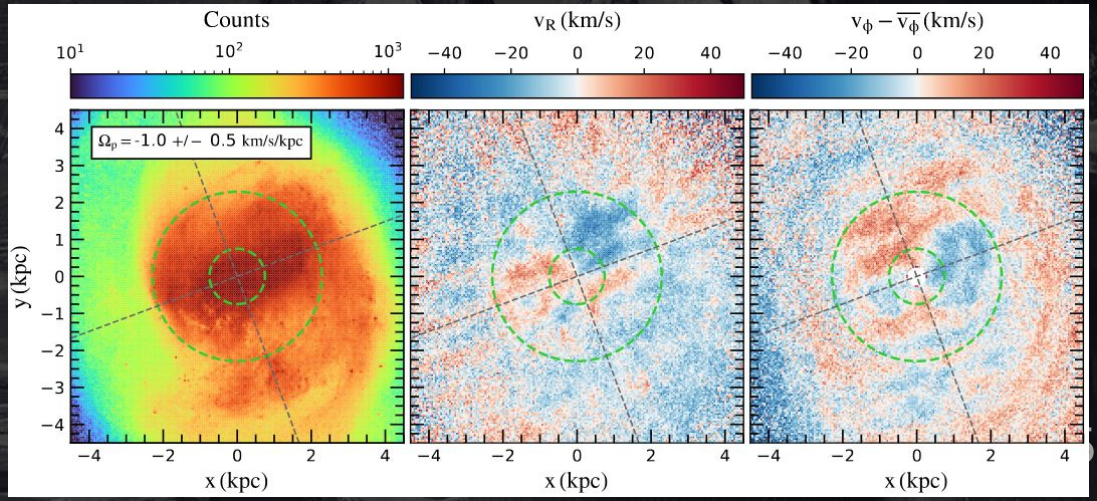

Dehnen method (2023)

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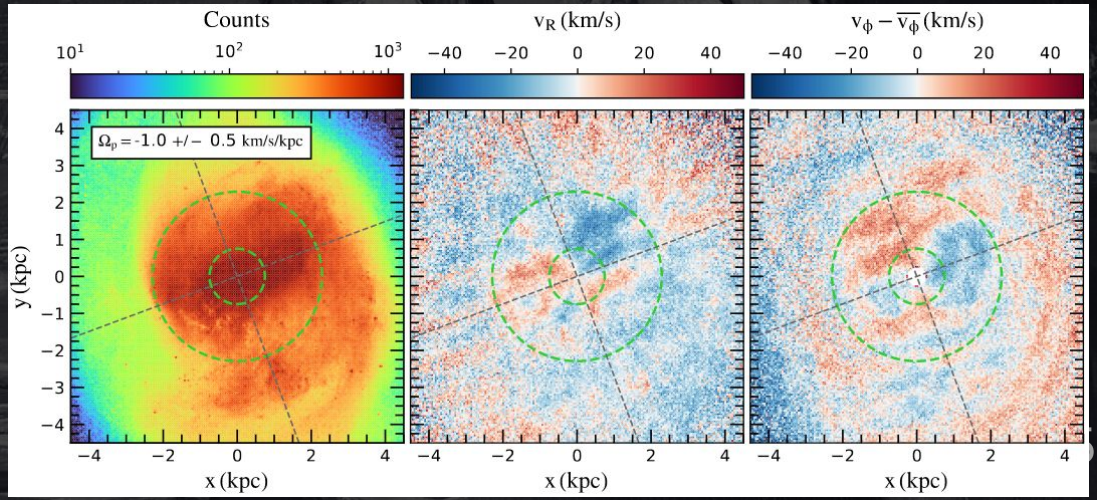
Methods (w/ LMC Gaia data):

$$\Omega_p = -1.0 \pm 0.5 \ \mathrm{km\ s^{-1} kpc^{-1}}$$



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Conclusions

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TW method shows a large dependency on the frame orientation. This is an issue that should be revisited for the results obtained for external galaxies

The bar pattern speed of the Large Magellanic Cloud is still quite uncertain: from 0 to 20 km/s/kpc


Gràcies!