

The nature of spiral structure in NGC 783 inferred from colour gradients in arms

XXIst Serbian Astronomical Conference

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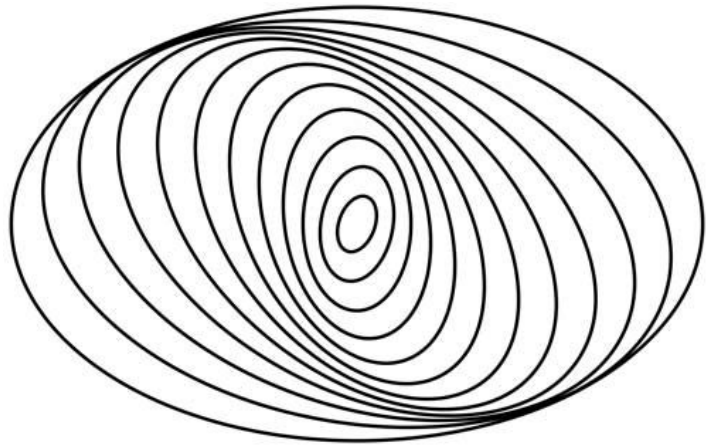
Introduction

The nature of spiral structures in galaxies is still unclear.

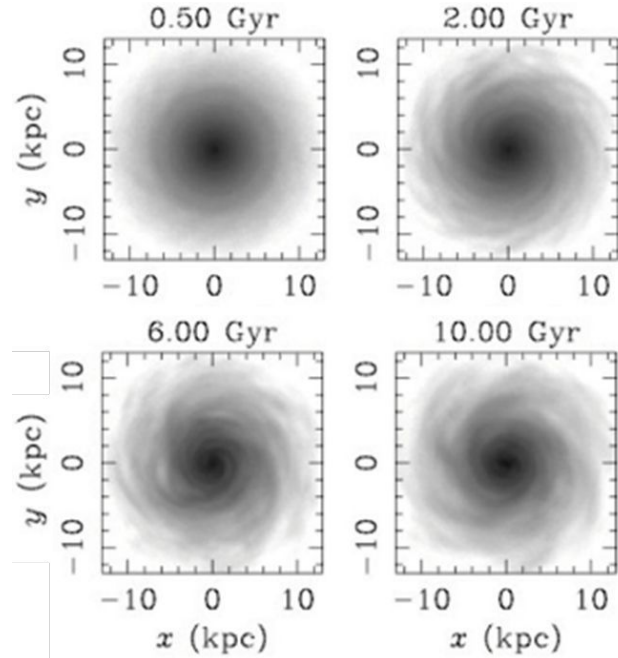


Introduction

There are multiple theories proposed to explain the formation of spirals.
But how one can distinguish them in observations?



Density waves

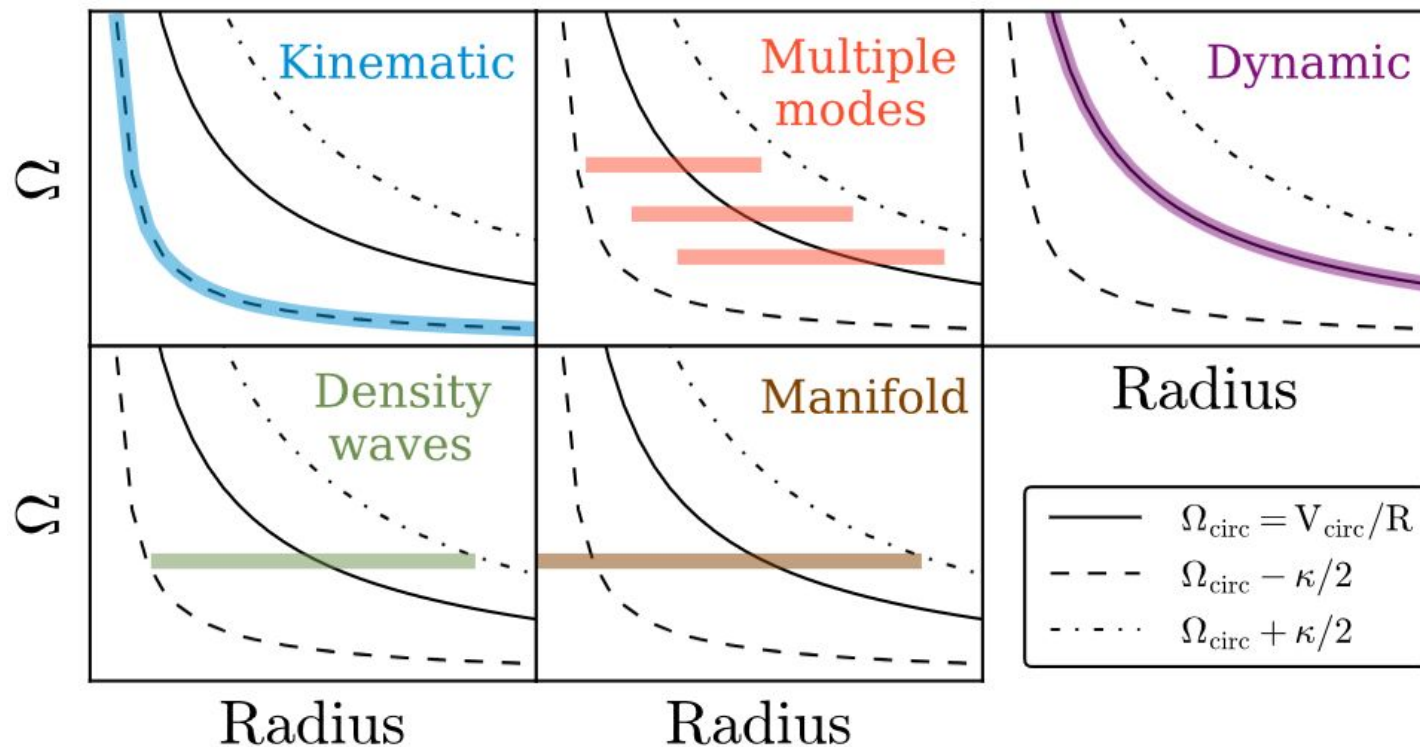


Dynamic spirals

and not only... 3

Introduction

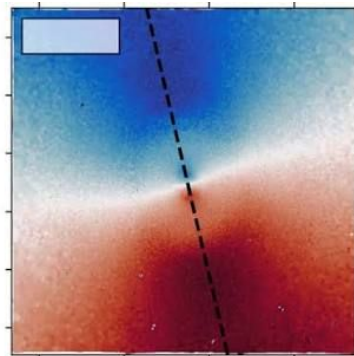
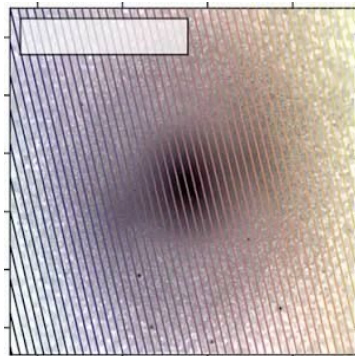
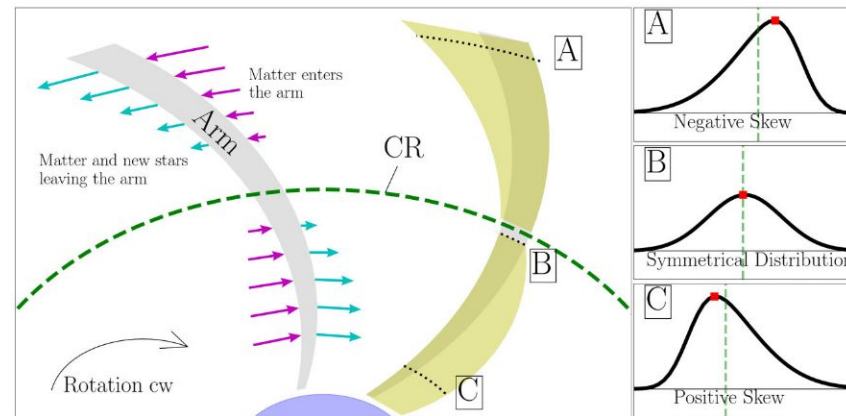
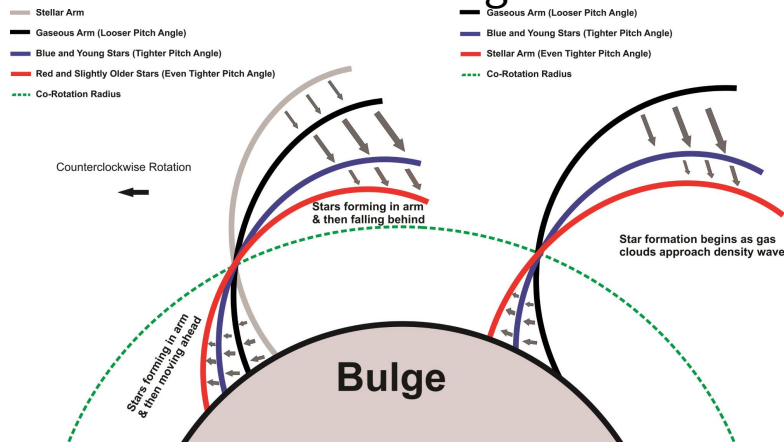
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Pattern speed vs
radius is different

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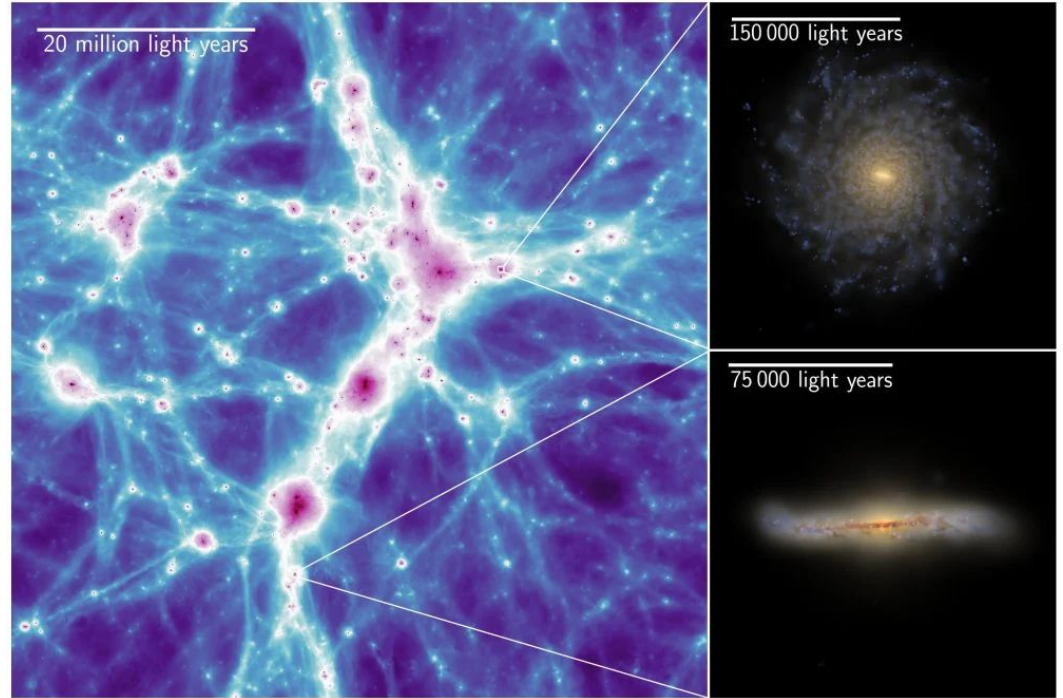
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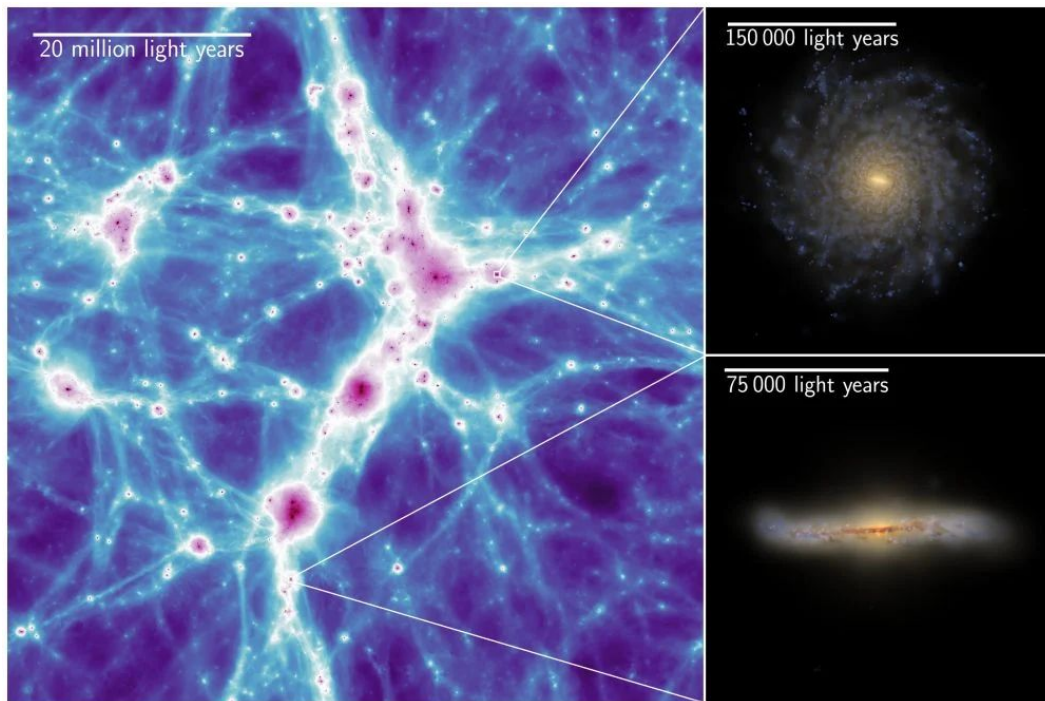
Cosmological simulations: we can apply existing methods to them...



Introduction

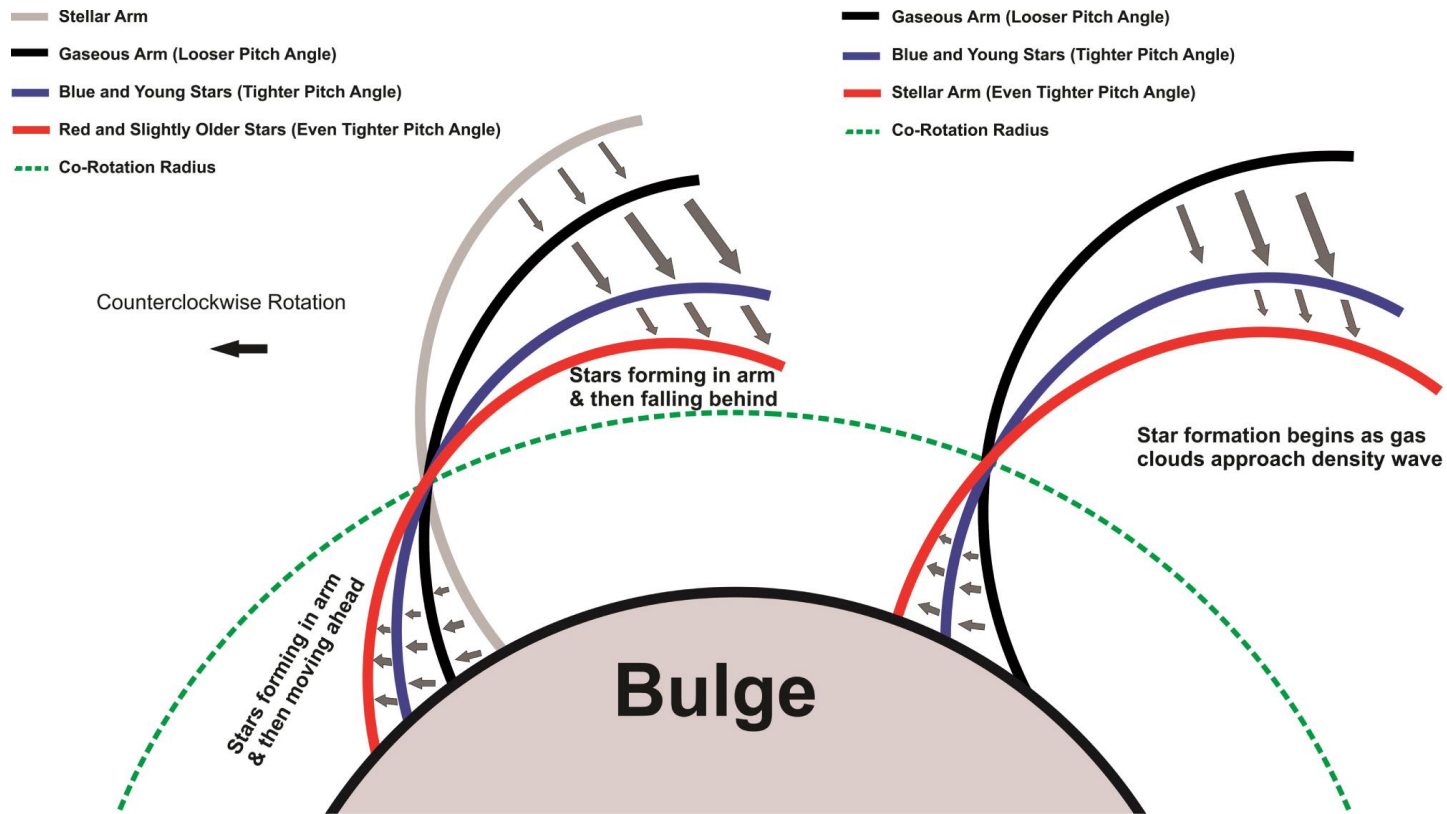
Cosmological simulations: we can apply existing methods to them...

...and recover “ground truth” from internal data



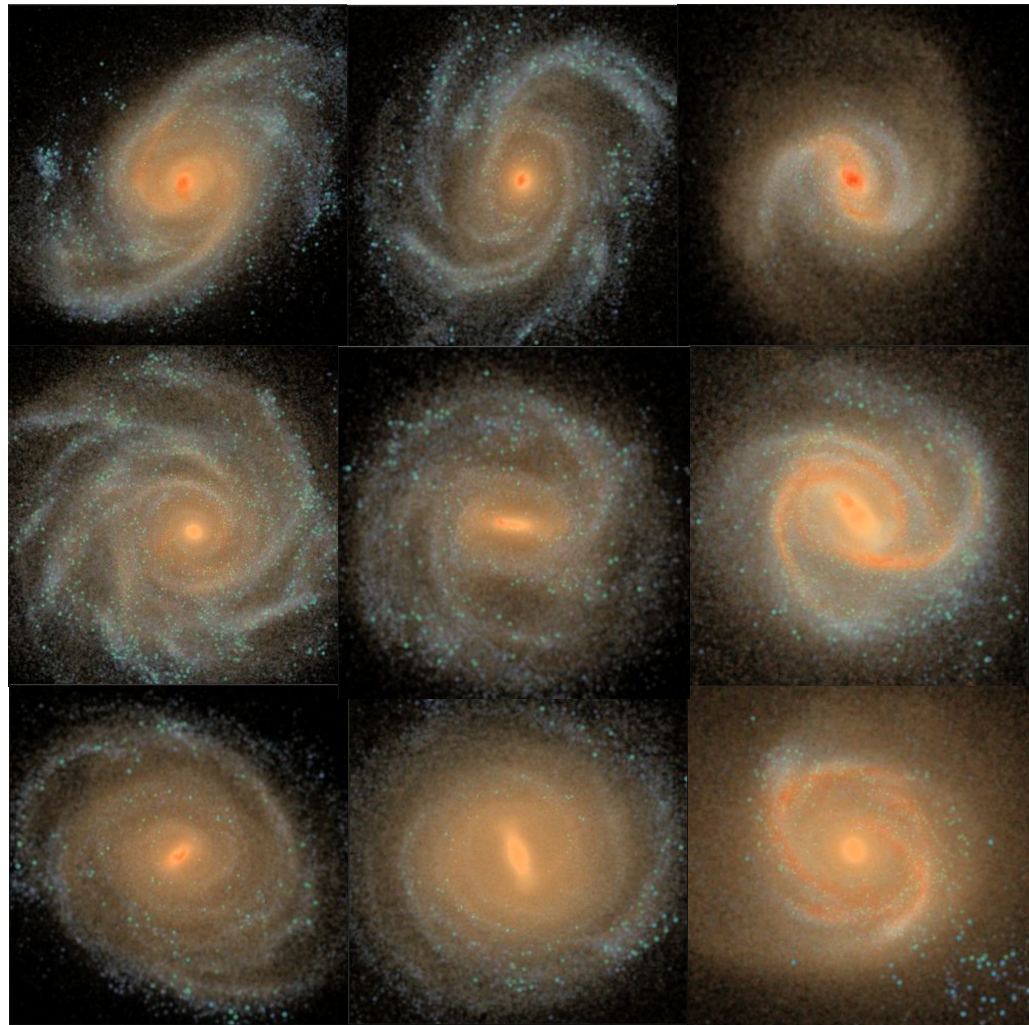
Introduction

Offset method: observed in different filters, spirals will be offset a little, corresponding their pattern speed



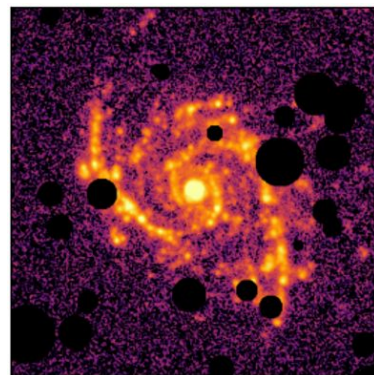
Data

9 galaxies from TNG50;
UV-optical-IR images
from TNG50-SKIRT Atlas

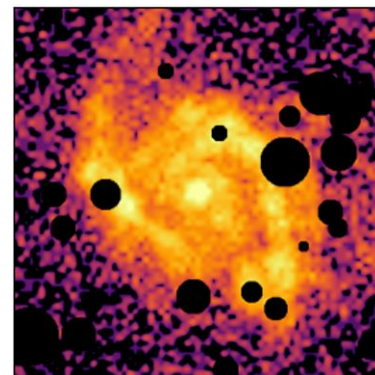


Data

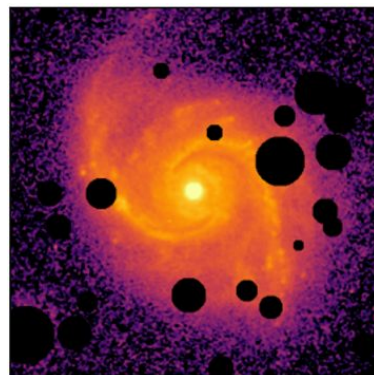
Real galaxy NGC 783:
UV-optical-IR and H α



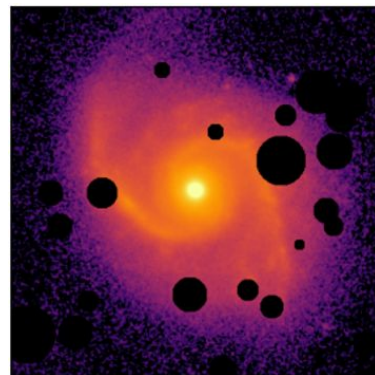
H α (SF, $<10^7$ yr)



FUV (SF, $<10^8$ yr)



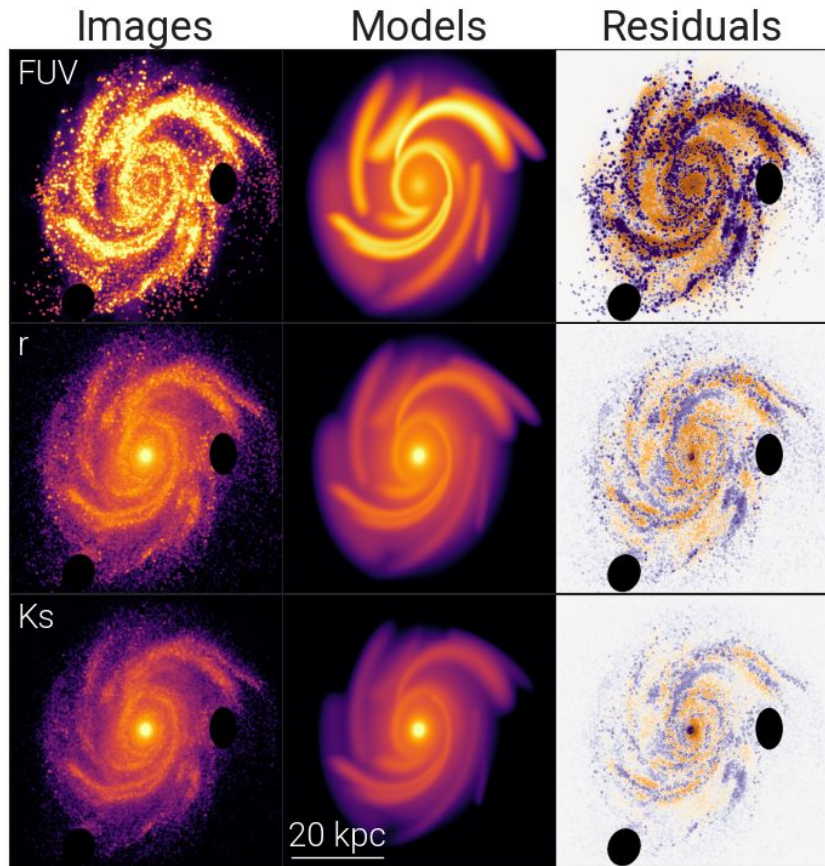
V (SF + mass)



K (mass)

Multiwavelength photometric decomposition

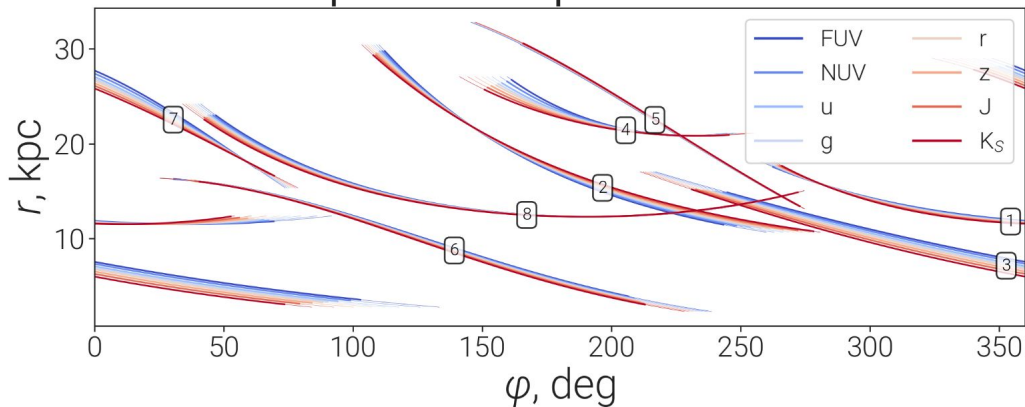
Galaxy id550934, orientation 02



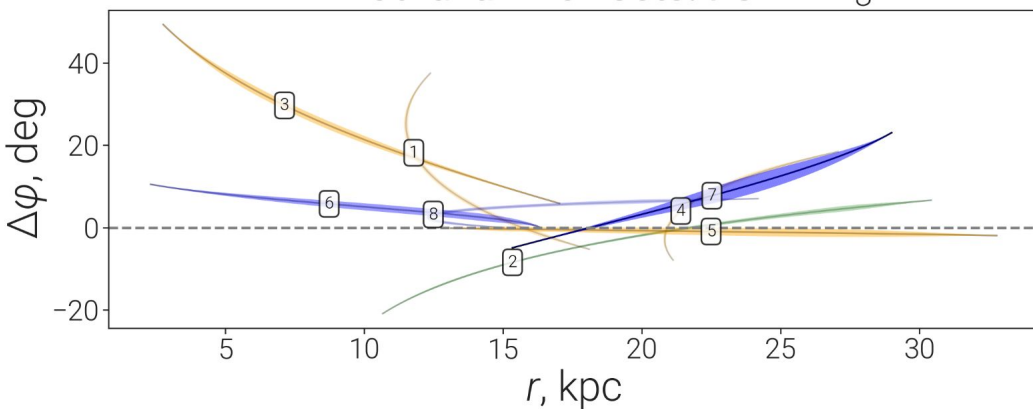
- New open-source project: IMFIT-MW
<https://github.com/IVChugunov/IMFIT-MW>
- Allows joint constraints of parameters between wavelengths
- Ensures model consistency between filters

Results

Arm positions in polar coordinates



Azimuthal arm offsets: FUV - K_S

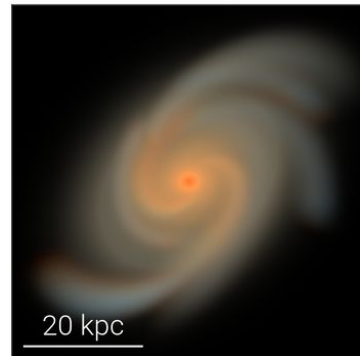


Galaxy id502995, orientation 02

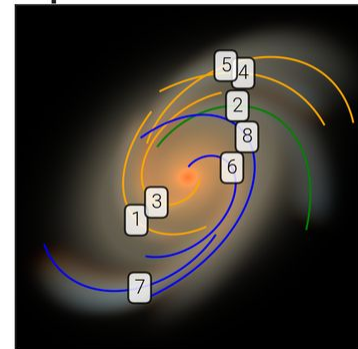
Image



Model



Spiral locations



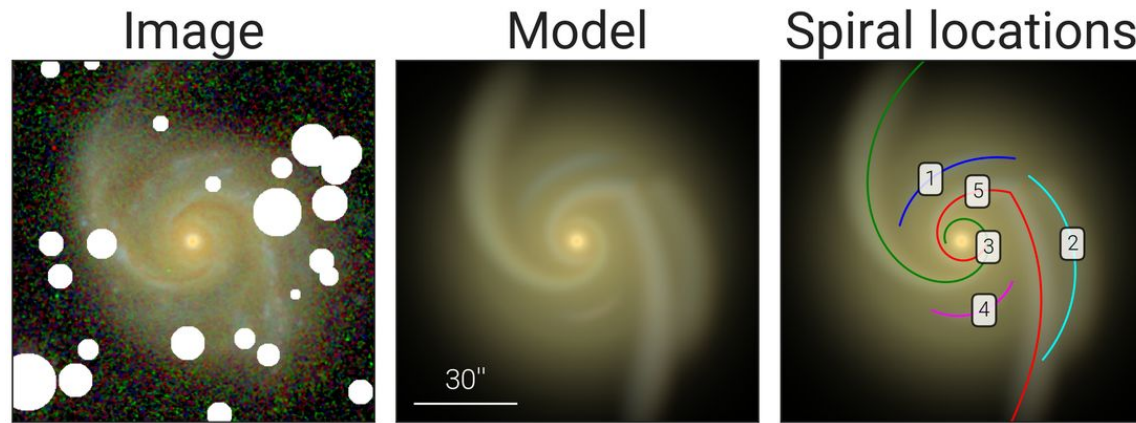
Offsets are positive
→ kinematic spirals

Aligns with
“internal” data!

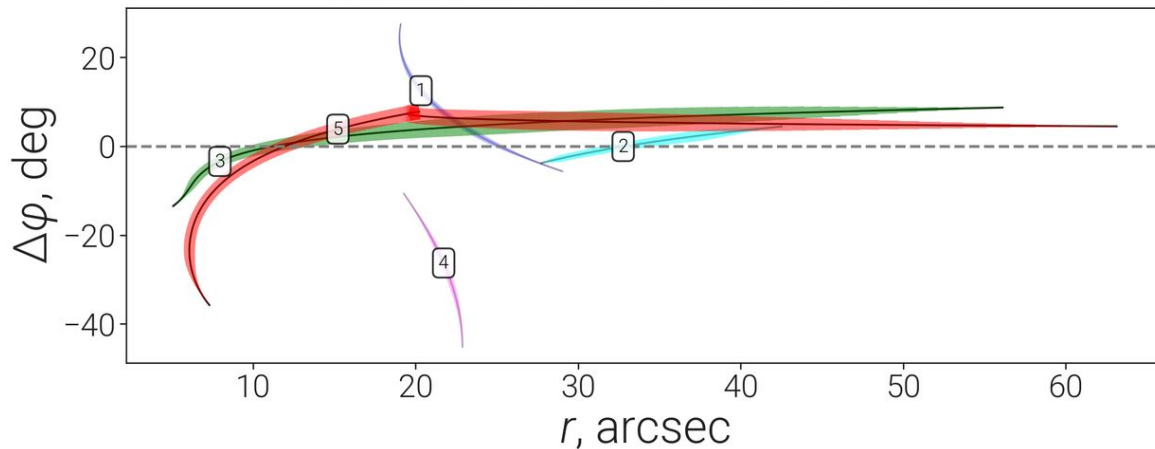
Results

NGC 783: density wave,
corotation radius = 12
arcsec

NGC783



Azimuthal arm offsets: $H\alpha - K$



Conclusions

- Multiwavelength decomposition algorithm is developed.
- Offset method generally works.
- NGC 783: density wave is found.

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Thank you for your attention!