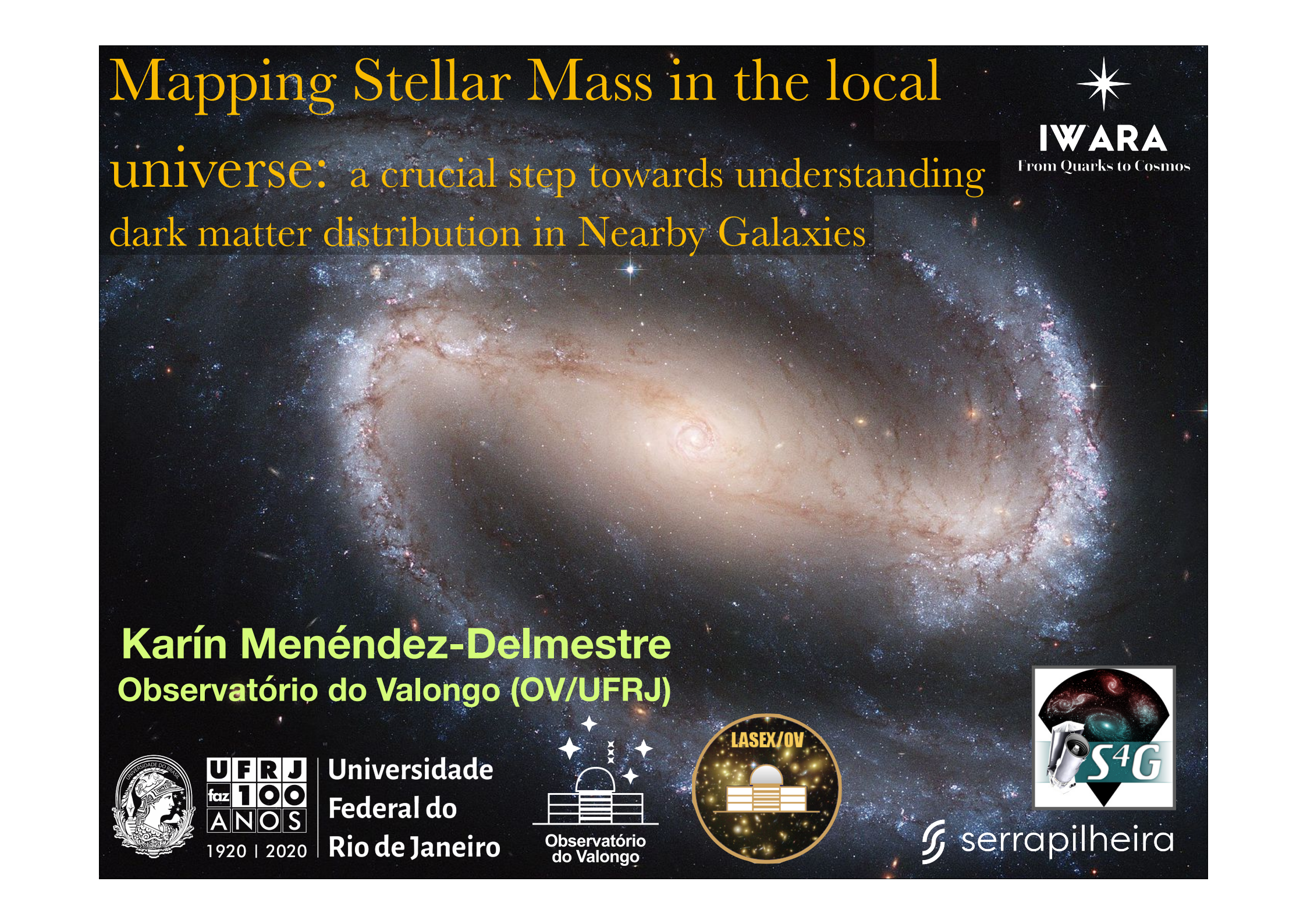
# Mapping Stellar Mass in the local universe: a crucial step towards understanding dark matter distribution in Nearby Galaxies



IWARA
From Quarks to Cosmos

**Karín Menéndez-Delmestre**
**Observatório do Valongo (OV/UFRJ)**

UFRJ faz 100 ANOS 1920 | 2020
Universidade Federal do Rio de Janeiro

Observatório do Valongo

LASEX/OV

S4G

serrapilheira

What we're after:

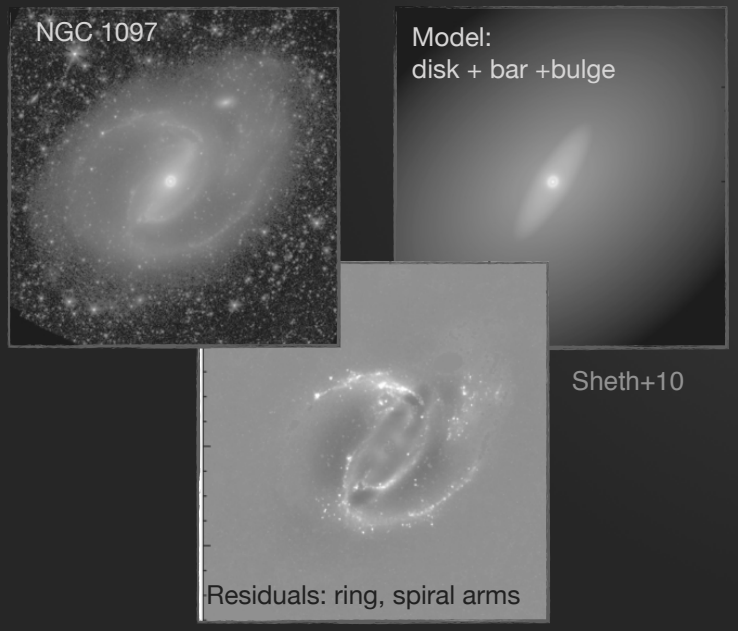
# Distribution of Baryonic Mass within Galaxies

Sheth+S4G collaboration 2010

- Challenge: observations measure light and not mass
  - go infrared!
    - dust extinction minimal
    - IR luminosity is dominated by old stars - the best marker of the distribution of stellar mass in galaxies.

Specific objetive:

Establish what the distribution of stellar mass content is in stellar structures in galaxies (e.g., bulge, disk, bars) — using 2D decomposition




Sheth+10

- Spitzer Survey of Stellar Structures in Galaxies (S4G): a volume-, mag-, size- limited survey of >2300 nearby galaxies @ 3.6/4.5μm (d <40 Mpc, $m_B < 15.5$, $D_{25} > 1'$)
  - low surface densities not achievable from the ground: $\Sigma_* << 1\ M_\odot\ pc^{-2}$ !

→ Largest, deepest (~27 mag arcsec$^2$), most homogeneous survey of nearby galaxies in the mid-IR

http://irsa.ipac.caltech.edu/data/SPITZER/S4G/

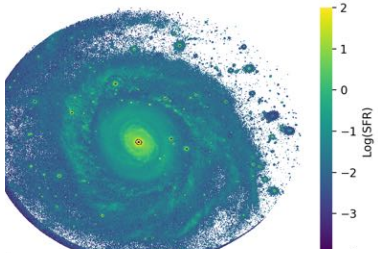
- 3.6 and 4.5 μm – excellent tracers of stellar mass distribution
  - Effect of dust extinction is negligible
  - Still, contaminated by young stellar populations

→ To convert from light distribution to mass maps, need spatially-resolved analysis of stellar ages.

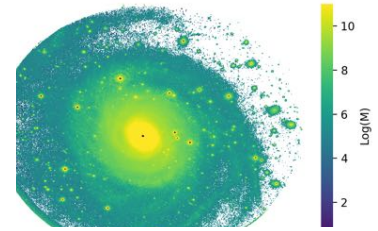
What we need:

# Convert light to (stellar) mass maps

- Deep imaging (to match S$^4$G stellar surface densities) with Goodman on SOAR telescope
- Optical coverage of local-volume galaxies (<40 Mpc) in the South
- Reach equivalent of S4G depth: 1 $M_{Sun}/pc^2$




Star formation [$M_{Sun}$ / yr]



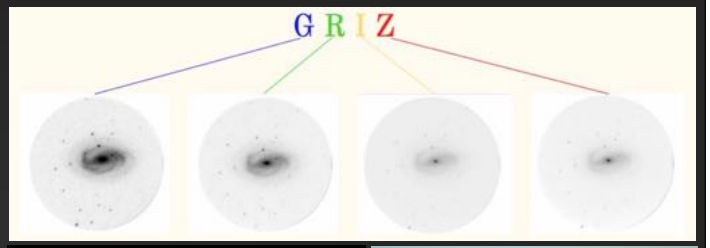

Stellar mass [$M_{Sun}$]

Specific objetive:

Careful characterization of stars in galaxies to isolate dark matter component in rotation curves — construct a more realistic dark matter halo for our own galaxy and establish restrictions on the local density of dark matter.

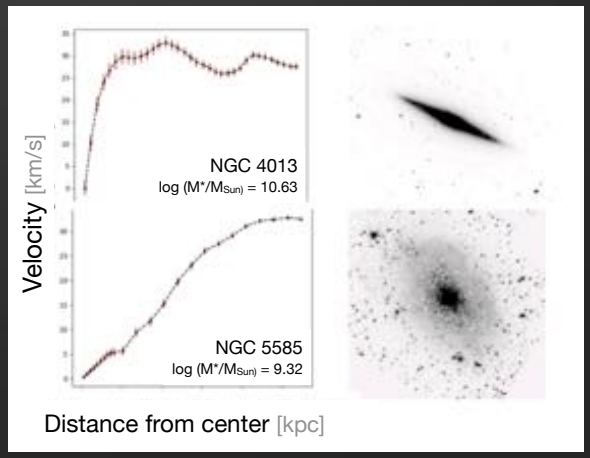
## Census of Austral Nearby Galaxies

[PIs: Menéndez-Delmestre + T. S. Gonçalves]



CANGA:
the largest, deepest, most homogeneous survey of southern galaxies in the optical

**Galaxy formation in 2D!!**




50 galaxies done
100s to go
**STAY TUNED!**

➡ optimize predictions in the direct detection of dark matter (e.g., LZ)