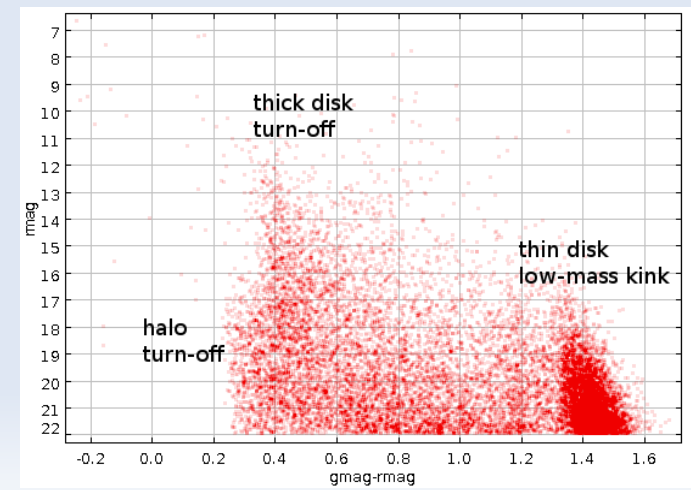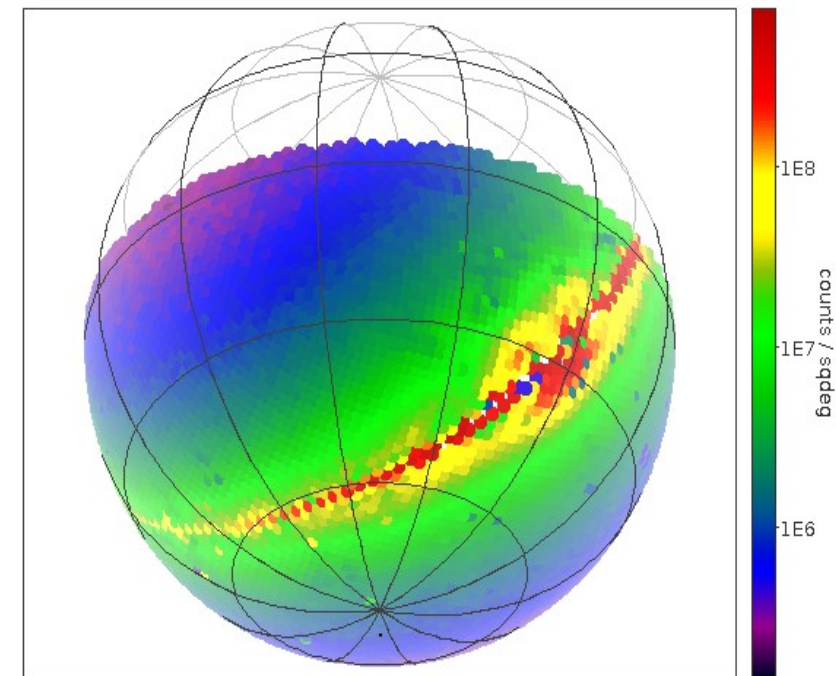# Galactic and Local Group archaeology with LSST

Léo Girardi – OAPD

Objective I:

Replace/improve present simulations of stellar content in LSST catalog (due to Juric's code GALFAST)

- Main tool: TRILEGAL code (Girardi et al 2005; 2012 and updates)

- Phase I: catalog of non-variable, non-interacting single stars, work started 1 month ago at UWashington clusters – in collab. with Juric and Ivezic

  - MW is there (thin+thick disk, halo, bulge, dust)

  - clusters, Magellanic Clouds, dwarf galaxies to come

- Phase II: variability, TP-AGB and WDs – in coll. with STARKEY team

- Phase III: interacting binaries, transits, microlensing – coll. with Barbieri et al.

- **The motivations? From "how much disk space LSST needs" to "let's test our pipelines" to "which cadence/depth for bulge/midplane survey?"**

# Galactic and Local Group archaeology with LSST

Léo Girardi – OAPD

Objective II:

Use the LSST catalog to select best-fitting models for MW and nearby galaxies – main parameters including the SFH, AMR, scale lengths/heigths, truncation radii, normalization factors, kind of stellar models, etc

- Initial difficulty – How to deal with such huge catalogs? – Present 4000 deg2 of DES data can be fitted <u>in a laptop</u>, using just 2 filters, 7 parameters, and at incremental steps of resolution+area+degrees of freedom (work in prep.)

- Next – export to clusters to deal with

  - >>2 filters

  - >30 parameters

  - dwarf galaxies (including previous experience with Magellanic Clouds VMC data; Rubele et al.)

  - tests with public data (SDSS, PanSTARRS1, Gaia)

- **The motivations? Galactic Archaeology: translate star counts into "masses, shapes, histories" – improve present libraries of stellar models**

Objective III: Do it all again using also kinematics + parallaxes + variability data
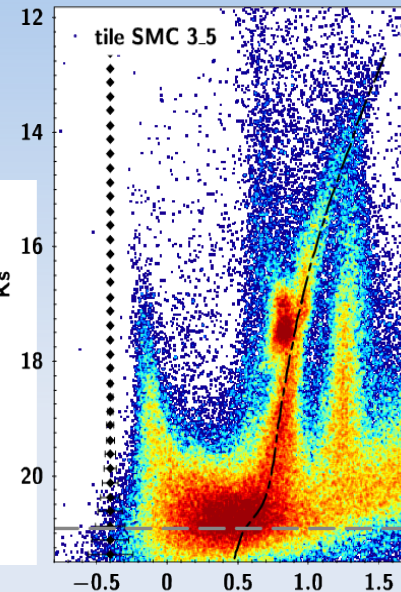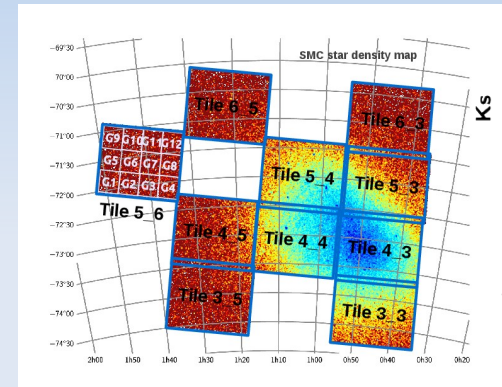
Example: Rubele+15 SMC with VMC data
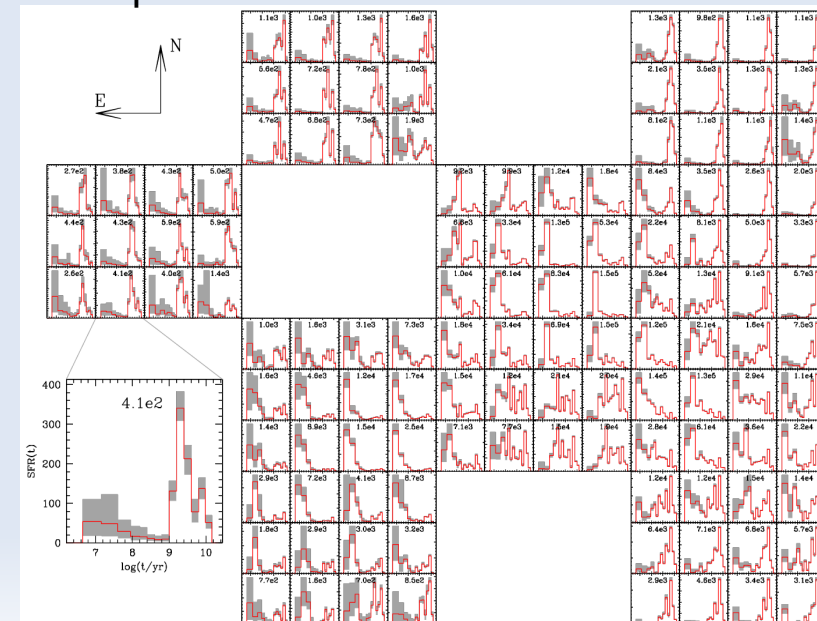
The team

The TRILEGAL-PARSEC-COLIBRI-STARKEY team

LSST Junior members, all doing TRILEGAL devel. + something else
- Thaise Rodrigues: new tracks
- Yang Chen: new atmospheres
- Giada Pastorelli: Magellanic Clouds
- Michele Trabucchi: long-period variables

Other main collaborators for LSST:
- Simone Zaggia + Yazan Momany (OAPD)
- University of Washington MW group (Ivezic, Dalcanton, Juric, Williams, Quinn)
- DES-GA group (LIneA: Santiago, da Costa, Fausti, et al.)
- Chilean group led by M. Barbieri

M31 PHAT Survey
432 Hubble WFC3/IR pointings
2 AFTA pointings
MakeAGIF.com

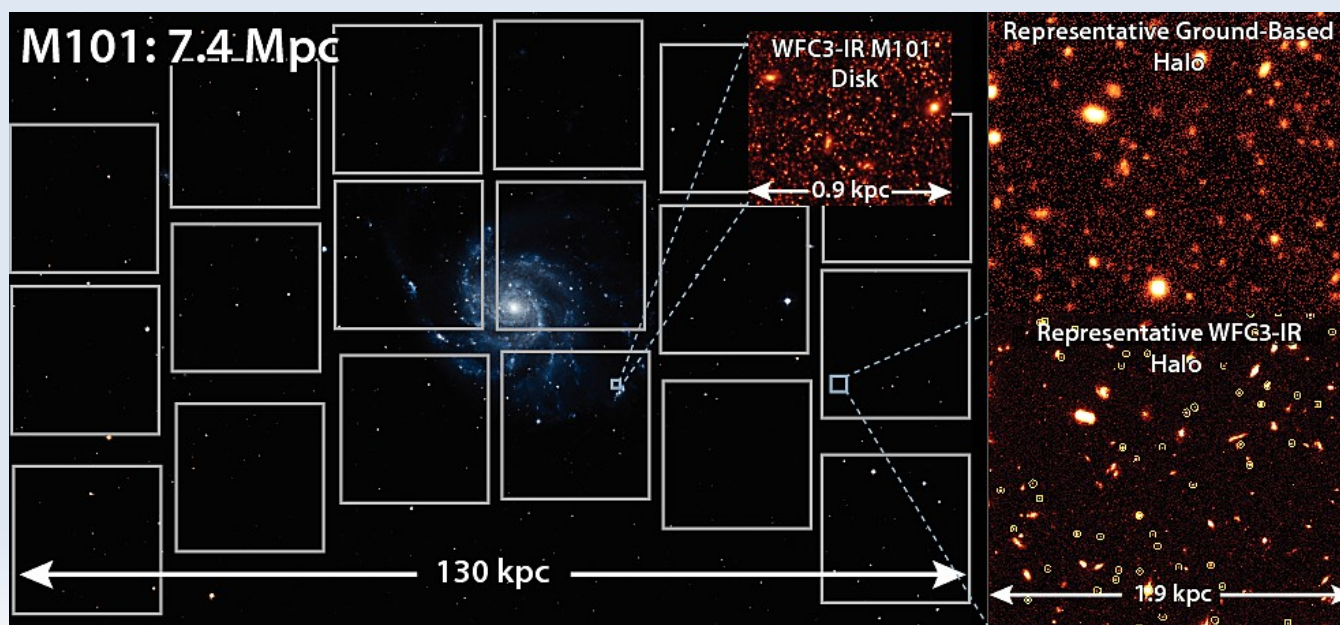## Preparing for the LSST + WFIRST era (2024 –)

- WINGS: a NASA-approved Science Investigation Team to prepare a ~100 Nearby Galaxies' Survey using WFIRST (PI Williams, CoI Girardi)

- Planning for companion LSST variability surveys
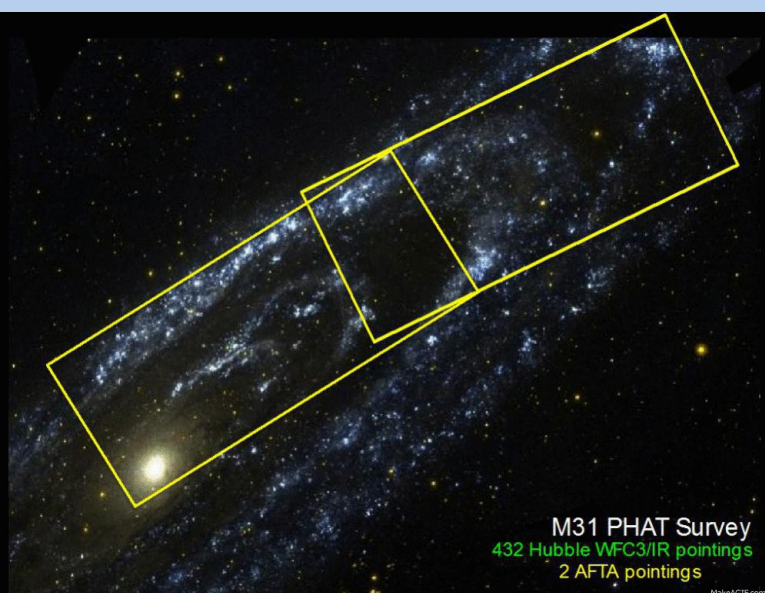
+ a lot of other surveys involved (all will be public): VMC, DES, Gaia, WISE, Kepler, APOGEE, PanSTARRS, ...

M101: 7.4 Mpc

WFC3-IR M101 Disk

0.9 kpc

Representative Ground-Based Halo

Representative WFC3-IR Halo

130 kpc

1.9 kpc

Tipo di analisi dati prevista/necessaria, inclusa di sviluppo e cadenza temporale
1 slide

- We need catalogs: photometry (mean + periods/amplitudes), with quality maps (depth, coverage, S/G classification), for wide areas – no need of specific work here: everything already planned in LSST

- Computers: initial work at UW + LineA clusters, let's see how it goes

- Until LSST start: simulations, simulations – at least 1 release per year

- One year after start: first analyses of star counts