Age resolved stellar populations in galaxy disks using data from GHOSTS

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GHOSTS: a large survey

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Number of stars: 4.4 million (public)
5.1 million (internal)
...more to come

distance errors: 5%
photometric errors: 0.06 mag
GHOSTS: the data

- HST (ACS+WFC3) photometry of 16 nearby disk galaxies, 7 edge-on
- F606W (V) and F814W (I)
- Resolved stars down to two magnitudes below the TRGB
  => create halo profiles to 70kpc projected distance (Roelof's talk)
  => CMDs allow to distinguish stellar populations

- Data is public:
Method: CMD analysis

Definition of populations:
- MS (<50 Myr)
- upHeB (50-150 Myr)
- lowHeB (150-400 Myr)
- AGB (0.5-2 Gyr)
- RGB (>3 Gyr)
Star count profiles

- Count stars, measure area, correct for incompleteness
- Fit 1D-model:
  - two sech\(^2\) components
Results: Thin and thick disks

- Scaleheights increase with mass
- Scaleheights increase with population age
- In low mass galaxies, single component fits are sufficient
- Massive galaxies need two component fit
Thin and thick disks

- Scaleheights compare well with
  - Yoachim & Dalcanton (2006)
  - Comeron et al. (2011)
Disk heating

- Thin disk heating on timescales $> 500$ Myr
- Thick component heats as well:
  - RGBs are twice as thick as AGBs
  => thick disk heating or intermediate disk or young (compact) halo or additional component?
Scaleheights as function of radius

scaleheights along the disk of ic5052

scaleheights along the disk of ngc5023
Scaleheights as function of radius

Scaleheights of all populations are essentially constant within the disk.
Radial profiles

• Truncated exponential disks
Scaleheights vs. -lengths
• Milky Way: Thick disks has shorter scalelength

Bovy et al. 2012c
Other galaxies: thick disks have larger scalelengths
Summary

- Scaleheights of stellar populations increase with age.
- There is an extended component of AGB stars.
- Scaleheights for young and old populations are constant with radius.

- Scaleheights / Scalelengths ratios can constrain thick disk formation
Future Work

- Modelling dust effects:
  - How far do we look into the disk?

- Fit a complete 2D model, that includes bulge and halo (not only a truncated disk)

- New data is coming in spring 2014
  - gives a more complete spatial coverage of the disks