Peculiar velocity flow field in the Zone of Avoidance
Khaled Said

at low Galactic latitude

Large Scale Structure and Galaxy Flows, Tuesday, July 5, 2016

Supervisors: Renée C. Kraan-Korteweg & Thomas H. Jarrett (UCT)
Lister Staveley-Smith (ICRAR, UWA)

Collaborators: W. Williams, C. Springob, A. Schröder, W. van Driel & P. Henning
Motivation?

CF-3; Tully et al (2016)

6df; Springob et al (2014)

2MTF; Hong et al (2014)
How we map these galaxies?

1. Calibrated TF relation to work in the ZOA
2. Follow-up NIR observations of HIZOA galaxies
3. 21-cm HI observations of the edge-on galaxies in the NIR imaging
4. Measuring distances and peculiar velocities
1. Calibrate TF relation to work in the ZoA

Why isophotal and not total magnitude?

- Depth of 2MASS survey.
- IRSF (0.45''/pix) & 2MASS (2''/pix)
- Difficulty to determine total magnitude in ZoA even with IRSF survey.
- High offsets between 2MASS and IRSF in total magnitude (create artificial peculiar velocity).
- Sample of 66 galaxies in ZoA.

\[ \Delta m = m(2MASS) - m(IRSF) \]

1. Calibrate TF relation to work in the ZoA

Sample of 888 galaxies used in 2MTF. I (Masters et al. 2008)

**Bias correction:**
1. Morphological correction.
2. Incompleteness Bias.
3. Cluster Size Bias.
   - Mean Distances to Cluster.
   - Sample Incompleteness.

**K-Correction:**

**Internal Extinction:**

**Galactic Extinction:**

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2. Follow-up NIR imaging of HIZOA

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**Photometry:**

1. Find the galaxy.
2. Run star-subtraction.
3. Run photometry pipe-line.

Results:
ellipticity, isophotal radius, isophotal magnitude, central surface brightness, stellar density.

Said et al., submitted
2. Follow-up NIR imaging of HIZOA

Comparisons

1. IRSF vs. 2MASS (285 galaxies)

2. IRSF vs. UKIDSS (30 galaxies; NE)
2. Follow-up NIR imaging of HIZOA

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- 300 hours on Parkes radio telescope
- High Quality (HQ) narrow-band observations of 238 galaxies and 104 additional HIZOA galaxies with HQ HI profiles

Blue >>> Staveley-Smith et al. (2016)
Green >>> Donley et al. (2005)
Red >>> Kraan-Korteweg (in prep.)
3. 21cm HI Follow-up of the NIR follow-up of the HIZOA

Comparison

Said et al., (2016)
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4. Measuring Peculiar Velocities (PRELIMINARY)
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Same Method as in Springob et al. (6df; 2014 & 2MTF; 2015)

Selection bias

• Inhomogeneous Malmquist bias (negligible)
• homogeneous Malmquist bias
  A. volume effect
  B. selection effect
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in progress
Summary & take home messages

• T-F Template relation (Said et al. 2015, MNRAS, 447, 1618); less scatter than 2MTF. I (for small galaxies, log W < 2.5)

• NIR observations using the IRSF telescope in SA (Said et al., submitted); NIR photometry for over a thousand galaxies in the ZOA (catalog and Fits files will be available)

• 21cm radio observation using Parkes telescope in AU (Said et al. 2016, MNRAS, 457, 2366); 342 galaxies with S/N > 5 (catalog and Fits files are available)

• Distance and Peculiar velocity calculations; Work still in progress (stay tuned)

• Extend to Northern sky using Nancay & UKIDSS data; Anja Schröder talk
Extra slides
2. Follow-up NIR imaging of HIZOA Completeness

\[
\begin{align*}
\log M_{HI} [M_{\odot}] &\geq 9.5 & N = 620 \\
9.5 > \log M_{HI} [M_{\odot}] &\geq 8.5 & N = 417 \\
\log M_{HI} [M_{\odot}] &< 8.5 & N = 71
\end{align*}
\]
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Same Method as in Springob et al. (2014, 2015)