The IRSF Magellanic Clouds Point Source Catalog

• Near-IR Point Source Catalog for the MCs
• A joint program of Nagoya University, National Astronomical Observatory of Japan, The University of Tokyo, and South African Astronomical Observatory (SAAO)

Contents
• Outline of the Catalog
• Advantages
• Preliminary Results

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MCs surveys at a wide range of wavelengths

The MCs have been covered from X-ray to Radio wavelengths

NIR: 2MASS and DENIS cover the whole MCs.

→ Their sensitivities are relatively shallow
We have carried out deep NIR survey with IRSF/SIRIUS.
IRSF (InfraRed Survey Facility)

- IRSF 1.4 m telescope
  +Near-IR camera “SIRIUS”
- Developed at SAAO
- Simultaneous Imaging at
  - J-band (1.25 μm)
  - H-band (1.63 μm)
  - Ks-band (2.14 μm)
- FoV: 7'.7 x 7'.7
- Pixel scale: 0'.45 / pix
- Exposure time: 300 sec

Observations were made from Oct. 2001 to Mar. 2006.
Coverage

- 55 deg$^2$ of LMC, SMC, and a part of the Bridge

HI gas (Putman et al. 1998)
Coverage

- 55 deg$^2$ of LMC, SMC, and a part of the Bridge
- LMC 40 deg$^2$
  (3,249 fields)

- IRSF  (40 deg$^2$)
- Zaritsky (64 deg$^2$)
- Spitzer  (50 deg$^2$)
- Akari   (10 deg$^2$)
Coverage

• 55 deg² of LMC, SMC, and a part of the Bridge

• LMC 40 deg²
  (3,249 fields)

• SMC 11 deg²
  (882 fields)

• Bridge 4 deg²
  (324 fields)

• Total 55 deg²
  (4,455 fields)

What are our advantages?
IRSF: comparable to Zaritsky, Spitzer, and Akari
Pre- and post-MS stars can be detected

Schematic CMD (J-Ks) vs. Ks

Detectable Objects
- dwarfs earlier than B2
- giants later than K2
- AGB stars
- Herbig Ae/Be stars with more than 3Mo
- red clump stars
Spatial Resolution

2MASS

FoV: 7.7'
FWHM: 2".6
Ns = 800

IRSF

In a field of the LMC bar

FoV: 7.7'
FWHM: 1".2
Ns = 3600

Our higher resolution enables to detect many sources.

Based on the survey data (~2TB), we constructed a point-source catalog.
Outline of the IRSF catalog

- NIR point-source catalog for the LMC, SMC and Bridge
- Source Counts (more than 4σ at least one band)
  LMC : 14,822,341
  SMC : 2,769,682
  Bridge : 434,145
  Total : 18,026,168
- 10σ limiting magnitudes
  J: 18.8 mag, H: 17.8 mag, Ks: 16.6 mag
  (cf. 15.7 15.3 14.7 for 2MASS)
- Accuracies
  - Photometric accuracy : 0.03 - 0.04 mag
  - Astrometric accuracy : 0.1 arcsec

→ What appear?
1,936,123 sources ($\sim 10\sigma$ at JHKs)

CMD (LMC)

O 2MASS
(Nikolaev & Weinberg 2000)

$\sim 2$ mag extended to deeper
1,936,123 sources (> 10 \( \sigma \) at JHKs)

CMD (LMC)

Features

- Main Sequence
- RGB
- AGB stars
- Galactic foreground
- Background galaxies
  - (HAeBe stars)

→ Color-color diagram
Color-color diagram (LMC)

Populations
- giants
- AGB stars
- O3-B2 dwarfs
- reddened giants (Av>3)

(- - -) NIR-excess sources
- b.g. galaxies + HAeBe
- Classical Be + HAeBe
( O HAeBe stars )

→How about SMC & MB?
CMD : LMC, SMC, Bridge

LMC

SMC

Bridge

SMC : similar to LMC
Bridge : no RGB and AGB features, Galactic foreground is dominant.
SMC: similar to LMC
Bridge: no RGB and AGB features, Galactic foreground is dominant.
Luminosity Function (LMC; $K_s$)

Features by T-RGB and RC

Tip of RGB

red clump

undetectable by 2MASS
LFs

RC, T-RGB:
- seen in the LMC and SMC
- not seen in the Bridge

LCs

$J$

$H$

$K_s$

$\log_{10} N$

$\log_{10} N$

$\log_{10} N$

[8 10 12 14 16 18 20] [mag]
Summary

“The IRSF Magellanic Clouds Point Source Catalog”

• a NIR point-source catalog for the MCs
• covering 55 deg$^2$ of the LMC, the SMC, and the MB
• ~2 mag deeper and ~2 times finer than previous surveys
• with high photometric and astrometric accuracies
  • photometric accuracy: 0.03-0.04 mag
  • astrometric accuracy: 0.1 arcsec
• including many kinds of populations

Available at web sites
ftp://dbc.nao.ac.jp/DBC/ADACnew/ or
http://pasj.asj.or.jp/v59/n3/590315

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