

# The IRSF Magellanic Clouds Point Source Catalog

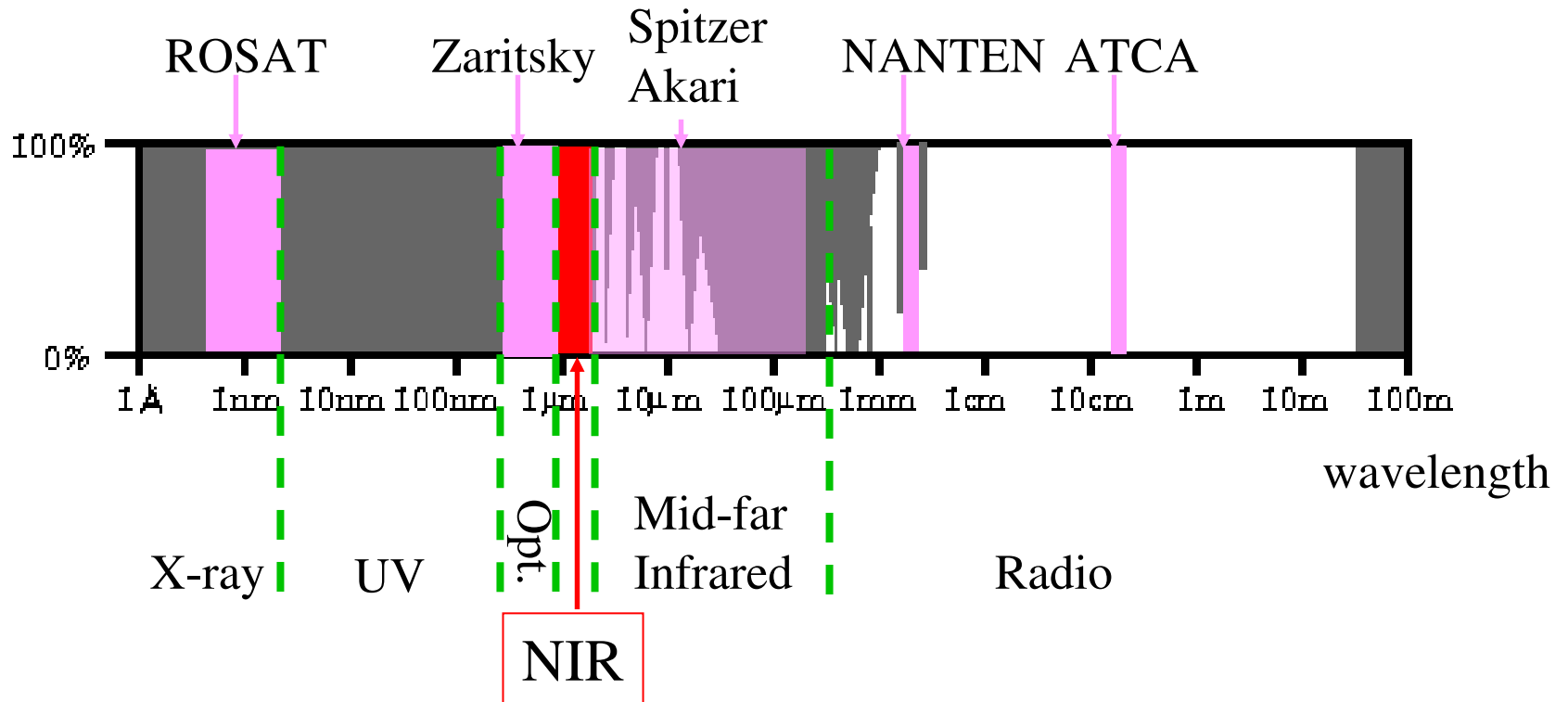
- Near-IR Point Source Catalog for the MCs
- A joint program of Nagoya University, National Astronomical Observatory of Japan, The University of Tokyo, and South African Astronomical Observatory (SAAO)

## Contents

- Outline of the Catalog
- Advantages
- Preliminary Results

Daisuke KATO  
Nagoya → Tokyo

# MCs surveys at a wide range of wavelengths

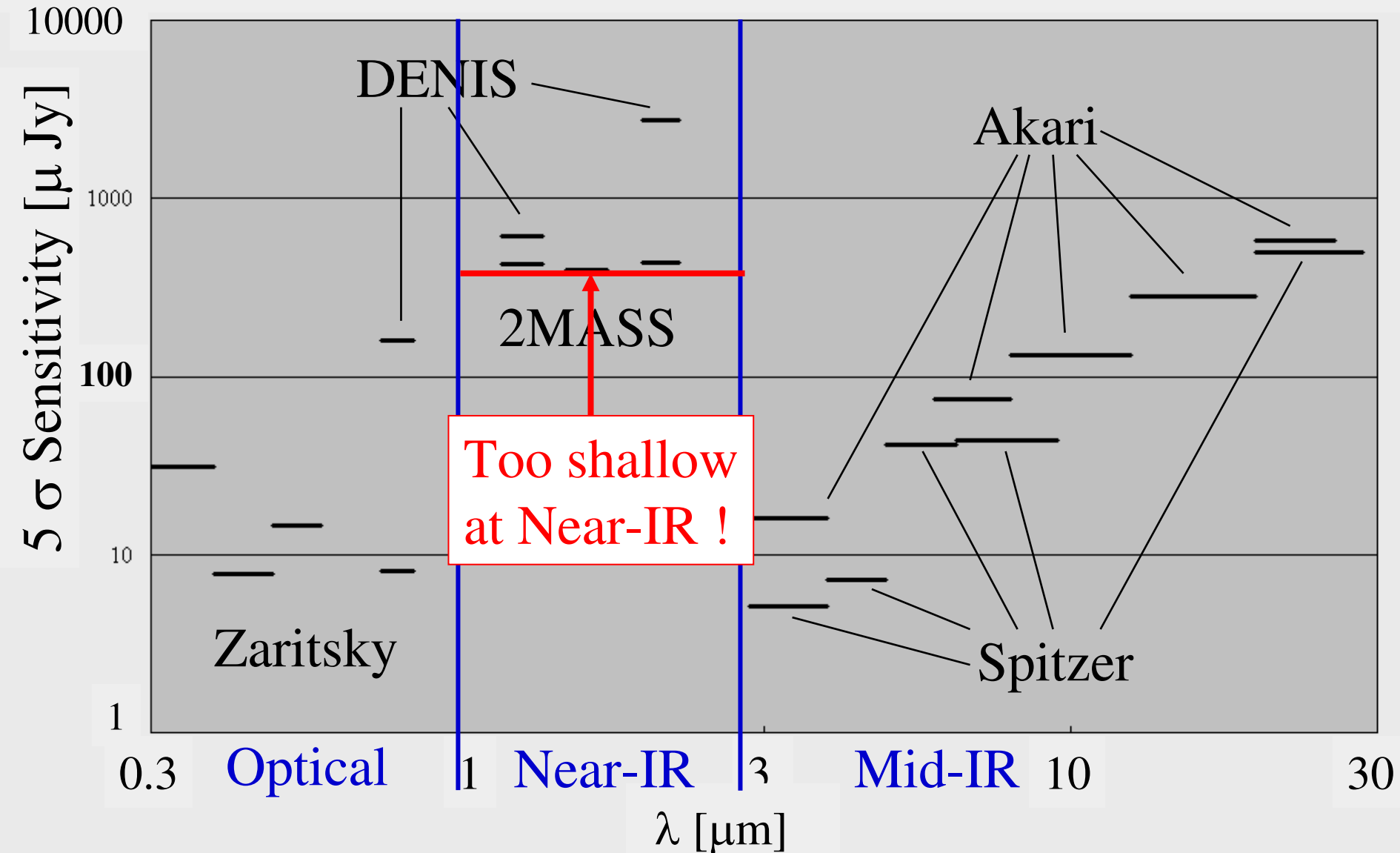


The MCs have been covered from X-ray to Radio wavelengths

NIR: 2MASS and DENIS cover the whole MCs.

→ Their sensitivities are relatively shallow

# Comparison of Sensitivity



We have carried out deep NIR survey with IRSF/SIRIUS.

# IRSF (InfraRed Survey Facility)

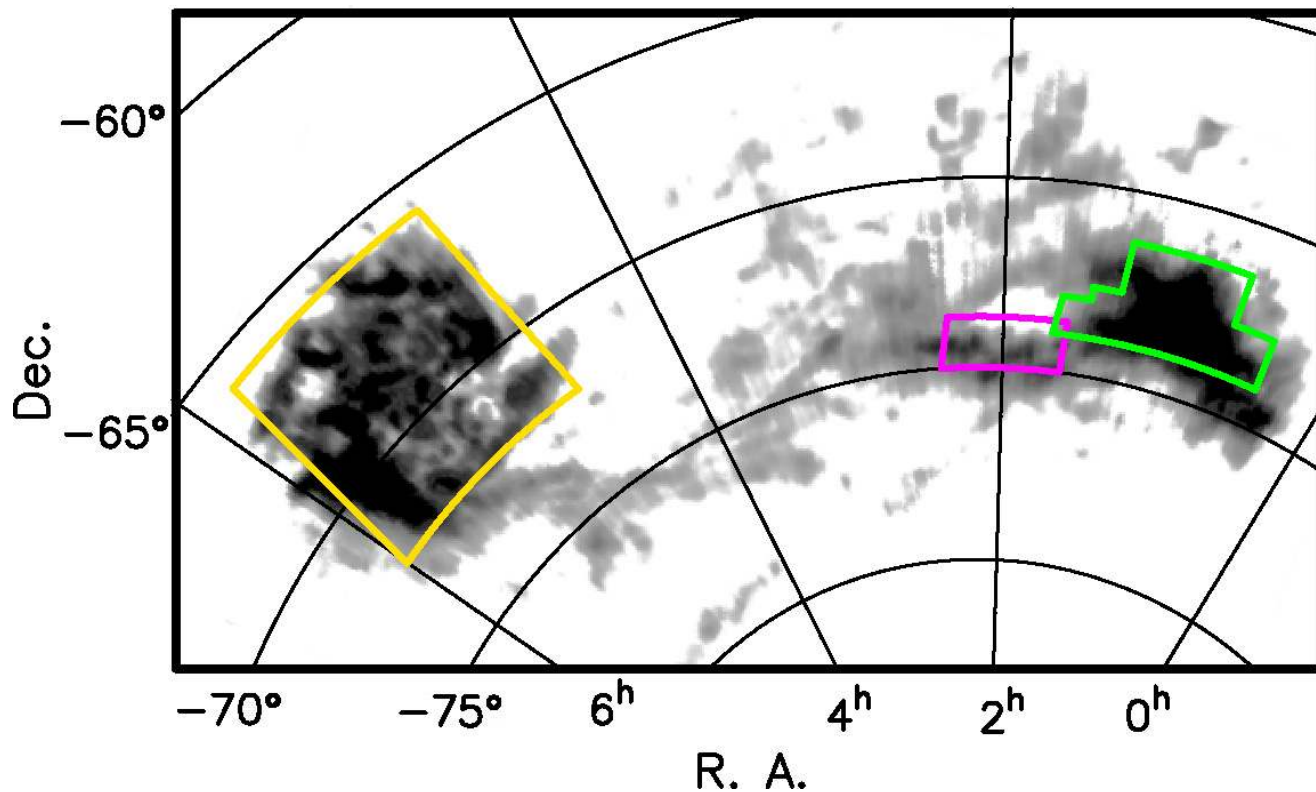


- IRSF 1.4 m telescope  
+Near-IR camera “SIRIUS”
- Developed at SAAO
- Simultaneous Imaging at
  - J -band (1.25  $\mu\text{m}$ )
  - H-band (1.63  $\mu\text{m}$ )
  - Ks-band (2.14  $\mu\text{m}$ )
- FoV: 7 '.7 x 7 '.7
- Pixel scale: 0" .45 / pix
- Exposure time: 300 sec

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

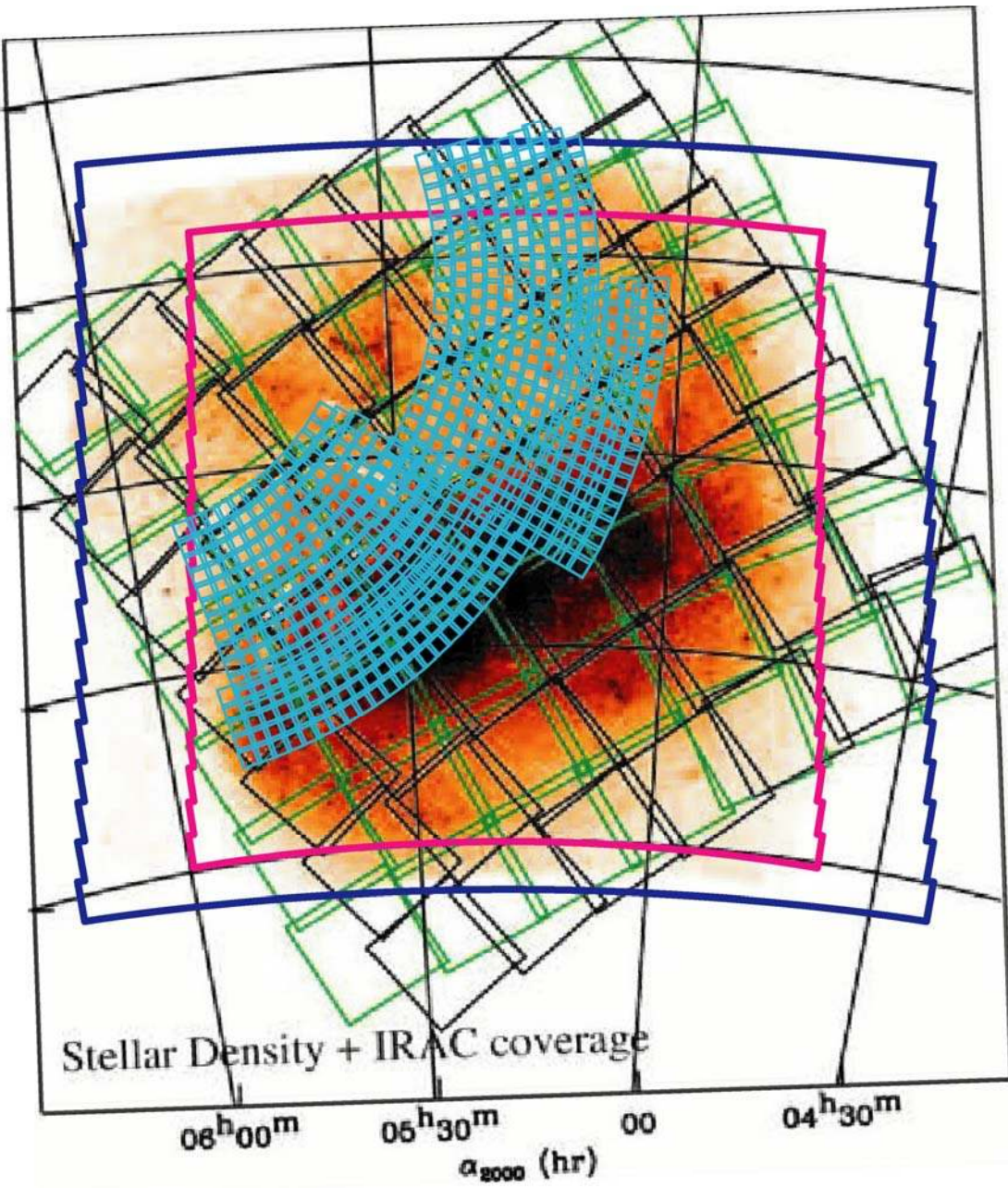
# Coverage

- 55 deg<sup>2</sup> of LMC, SMC, and a part of the Bridge



HI gas (Putman et al. 1998)

# Coverage

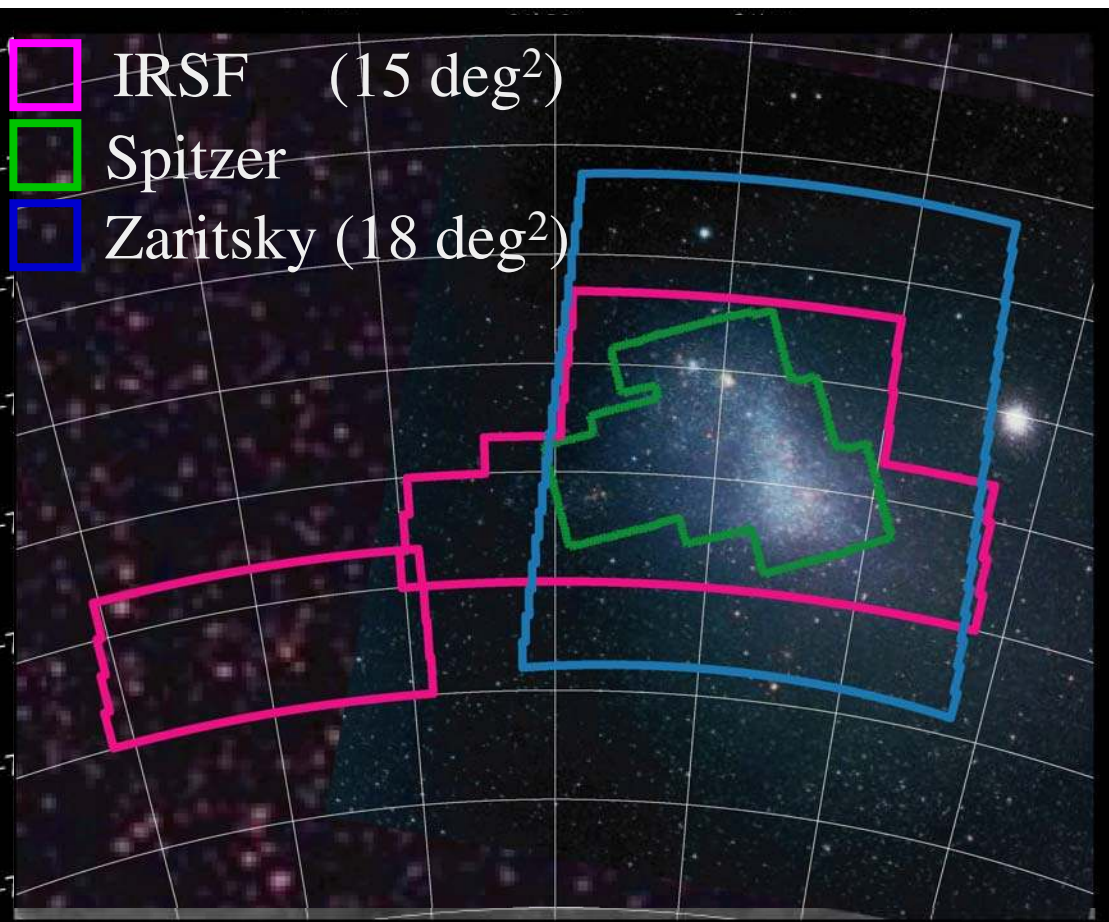


- 55 deg<sup>2</sup> of LMC, SMC, and a part of the Bridge

- LMC 40 deg<sup>2</sup>  
(3,249 fields)

- IRSF (40 deg<sup>2</sup>)
- Zaritsky (64 deg<sup>2</sup>)
- Spitzer (50 deg<sup>2</sup>)
- Akari (10 deg<sup>2</sup>)

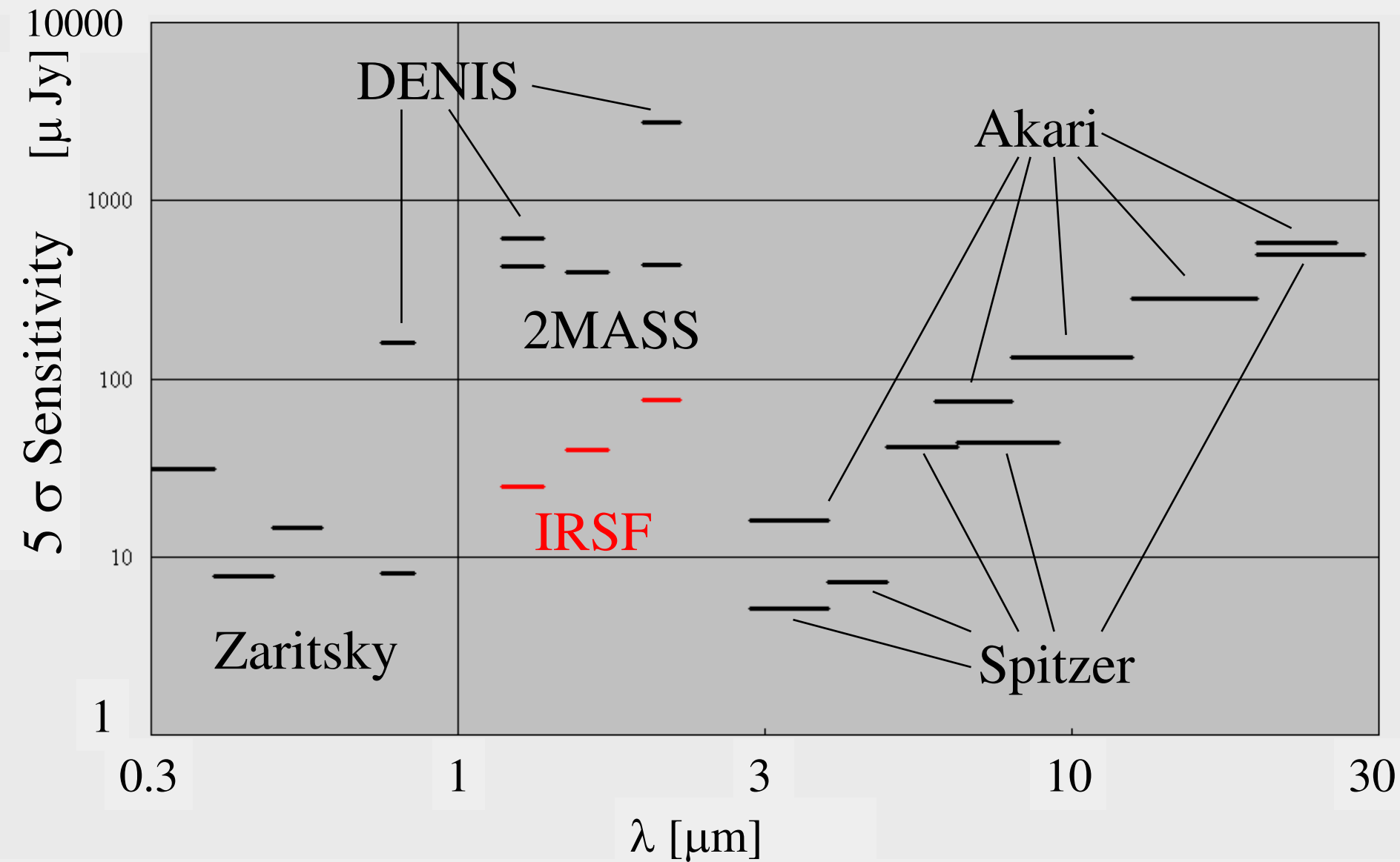
# Coverage



- 55 deg<sup>2</sup> of LMC, SMC, and a part of the Bridge
- LMC 40 deg<sup>2</sup>  
(3,249 fields)
- SMC 11 deg<sup>2</sup>  
(882 fields)
- Bridge 4 deg<sup>2</sup>  
(324 fields)
- Total 55 deg<sup>2</sup>  
(4,455 fields)

What are our advantages?

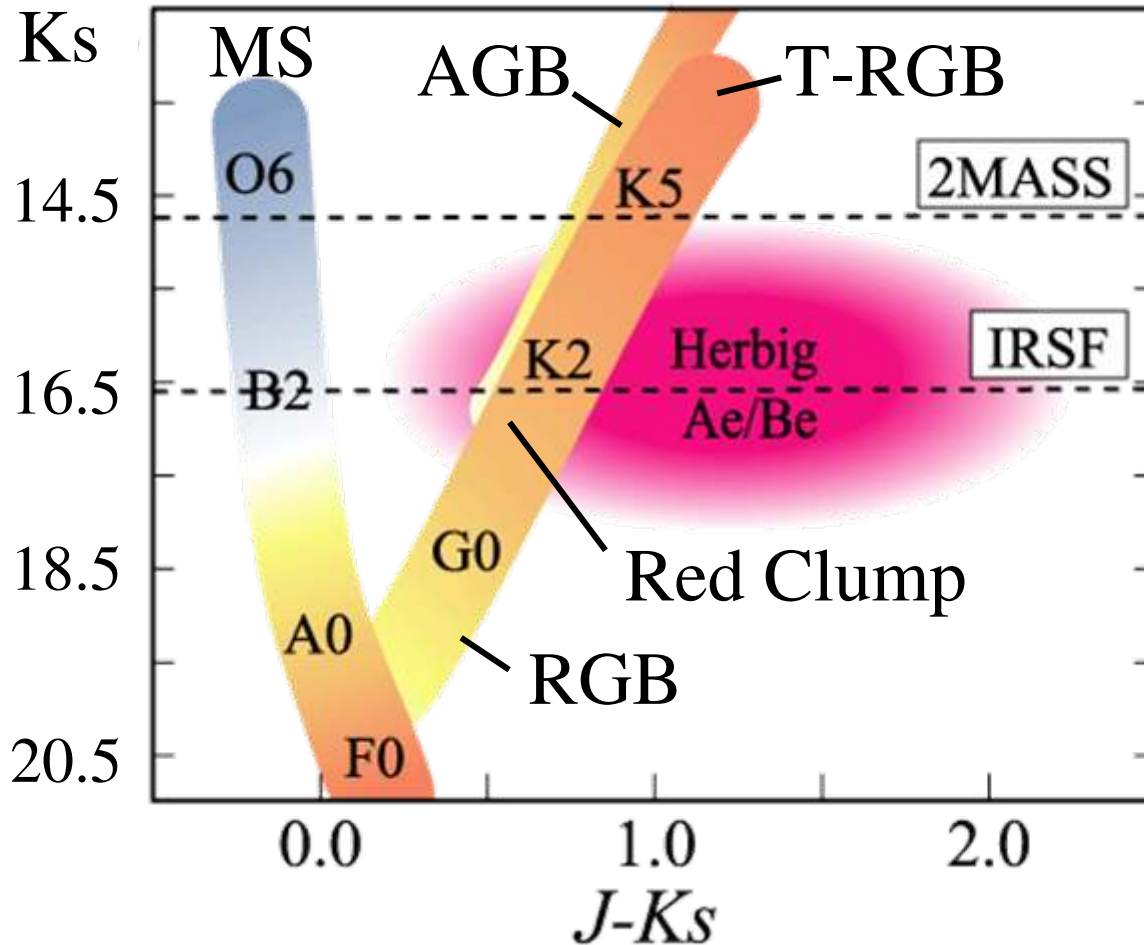
# Sensitivity



IRSF: comparable to Zaritsky, Spitzer, and Akari



# Pre- and post-MS stars can be detected



Schematic CMD

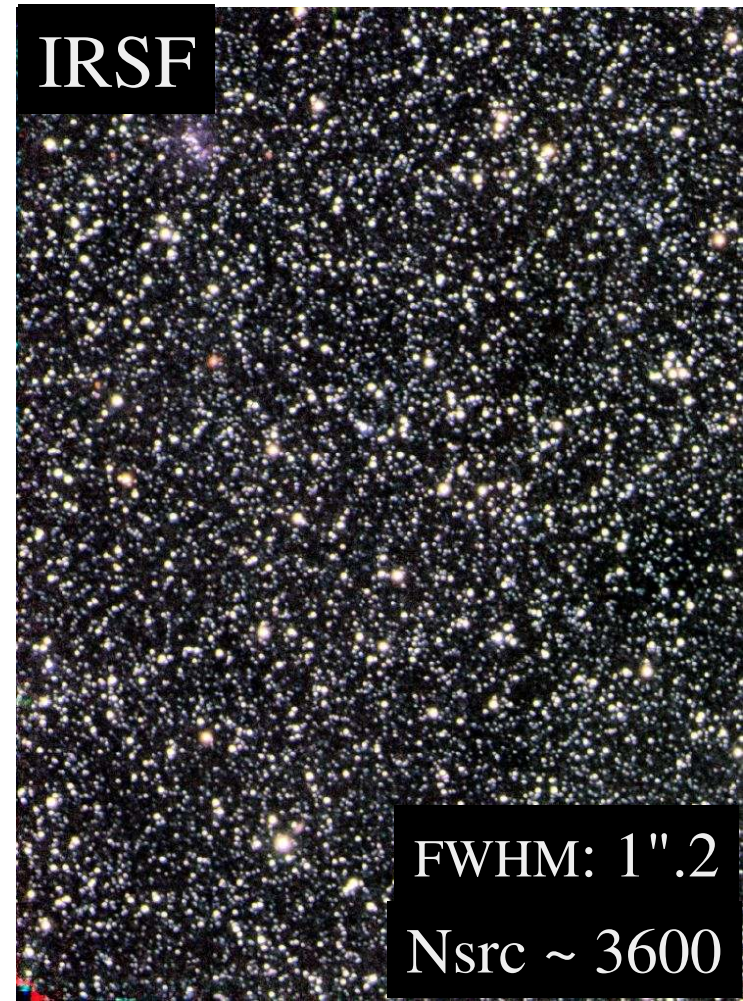
( $J-K_s$ ) vs.  $K_s$

Detectable Objects

- dwarfs earlier than B2
- giants later than K2
- AGB stars
- Herbig Ae/Be stars with more than 3 $M_{\odot}$
- red clump stars

# Spatial Resolution

In a field of the LMC bar



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  $4\sigma$  at least one band)

LMC : 14,822,341

SMC : 2,769,682

Bridge : 434,145

Total : 18,026,168

- $10\sigma$  limiting magnitudes

J: 18.8 mag, H: 17.8 mag, Ks: 16.6 mag

(cf. 15.7 15.3 14.7 for 2MASS)

- Accuracies

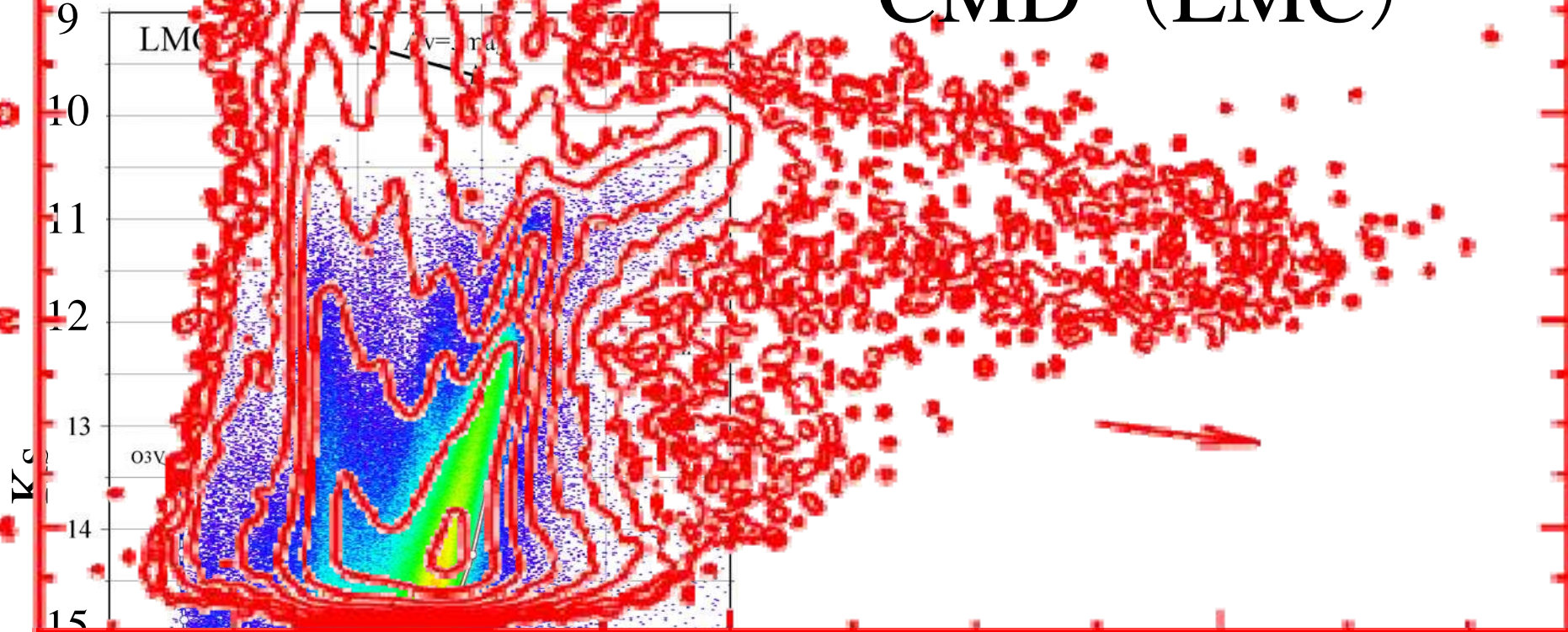
–Photometric accuracy : 0.03 - 0.04 mag

–Astrometric accuracy : 0.1 arcsec

→ What appear?

1,936,123 sources ( $>10\sigma$  at JHKs)

# CMD (LMC)

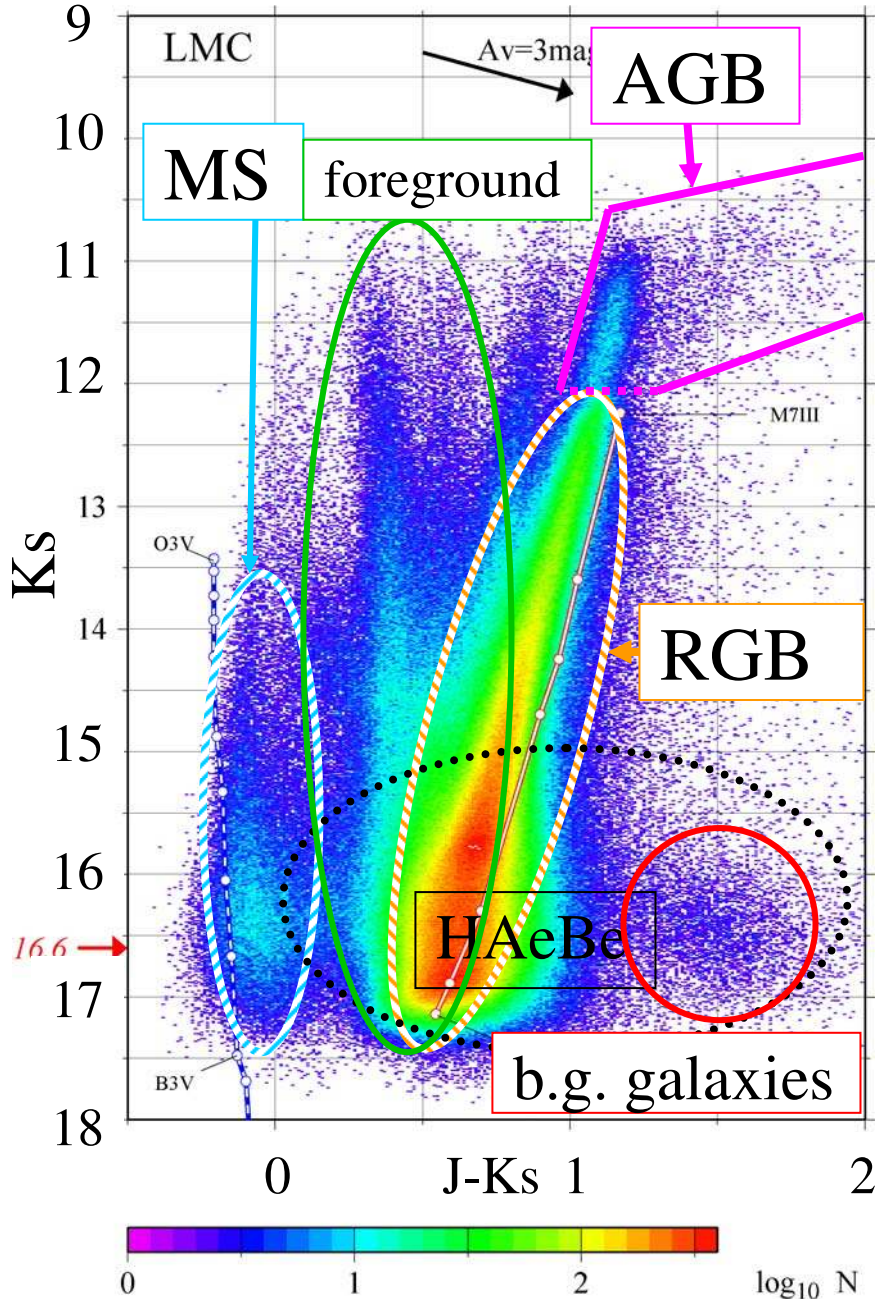


**O** 2MASS  
(Nikolaev & Weinberg 2000)

~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
- (○ H A e Be stars)

→ Color-color diagram

# Color-color diagram (LMC)

## Populations

○ giants

○ AGB stars

○ O3-B2 dwarfs

○ reddened giants ( $A_V > 3$ )

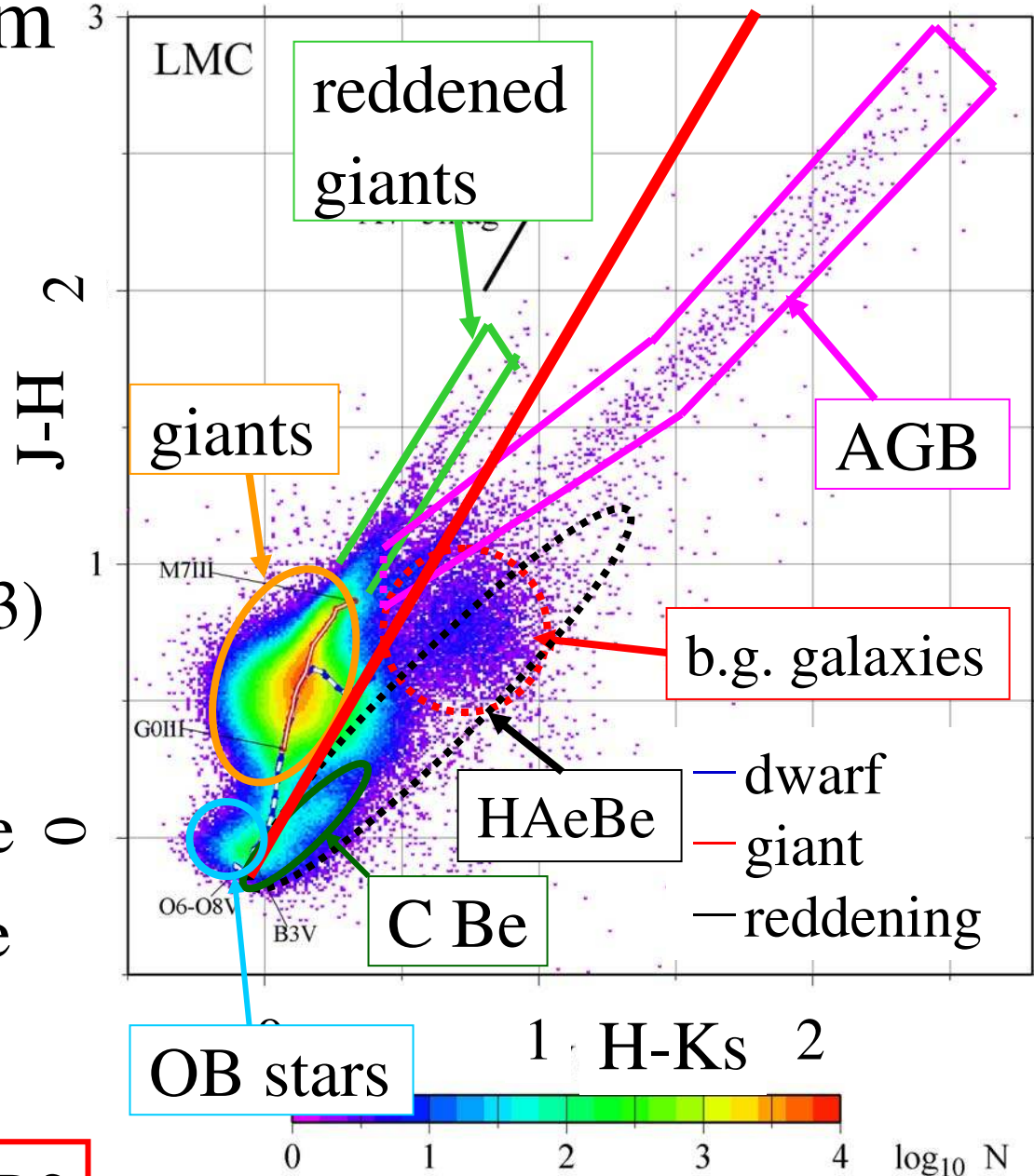
(---) NIR-excess sources

○ b.g. galaxies + HAeBe

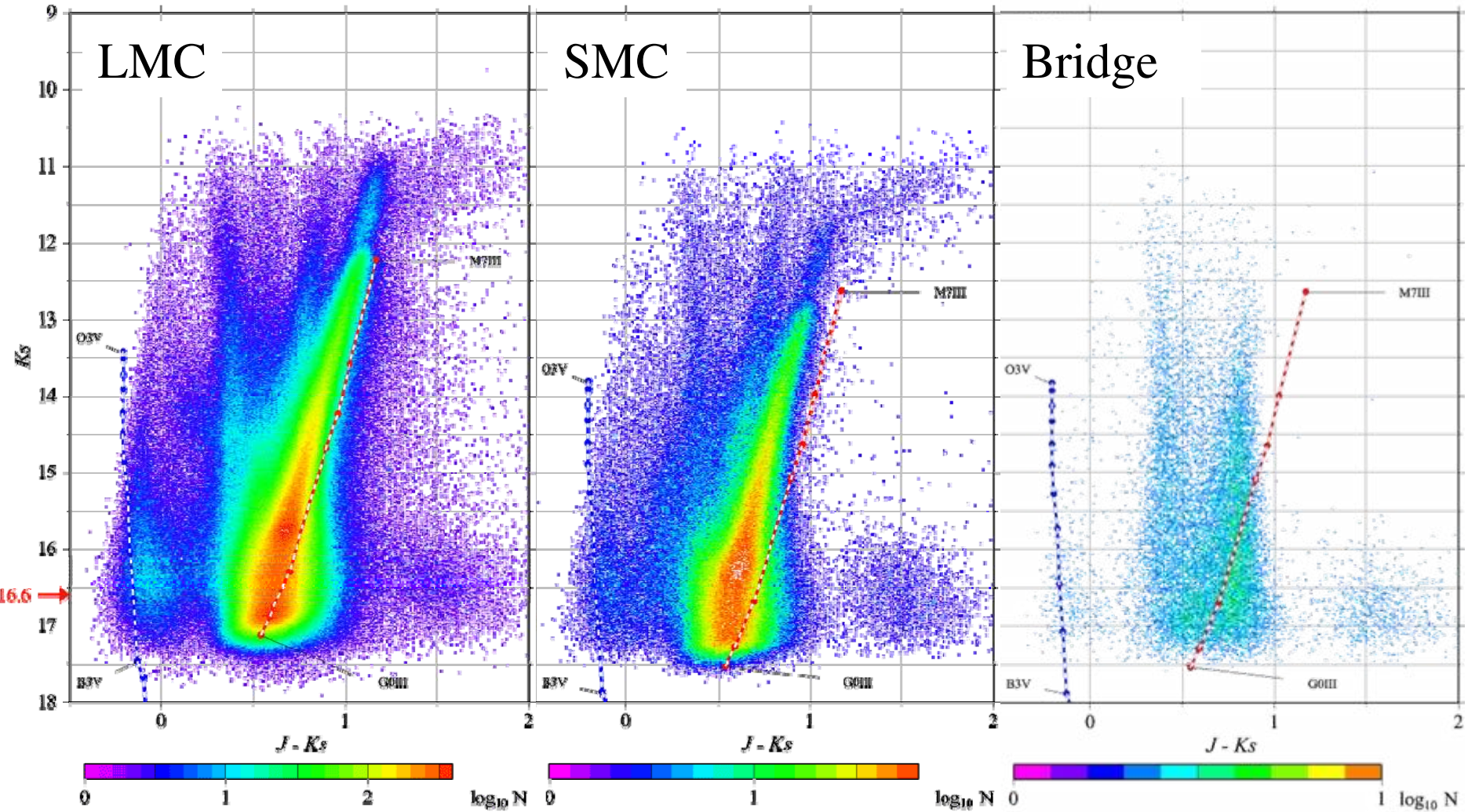
○ Classical Be + HAeBe

(○ HAeBe stars)

→ How about SMC & MB?



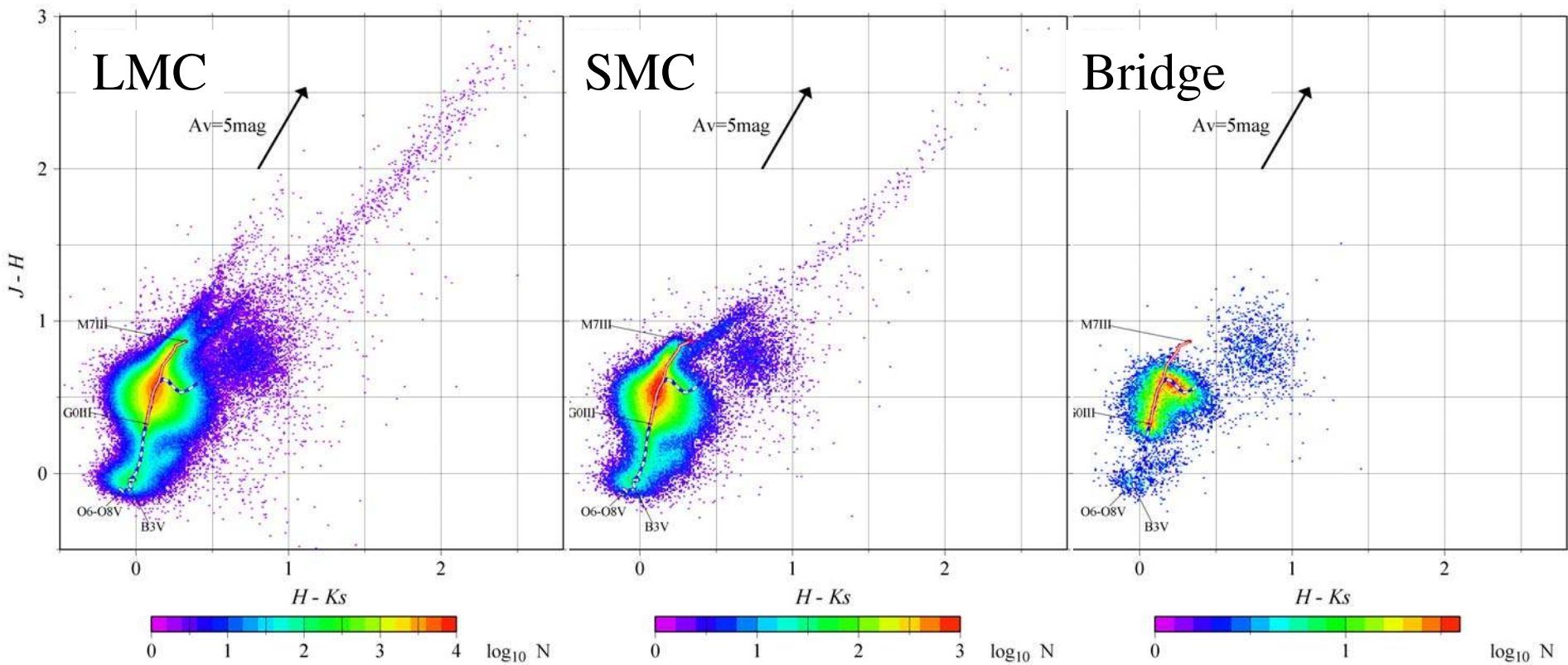
# CMD : LMC, SMC, Bridge



SMC : similar to LMC

Bridge : no RGB and AGB features, Galactic foreground is dominant.

# Color-color Diagram : LMC, SMC, Bridge

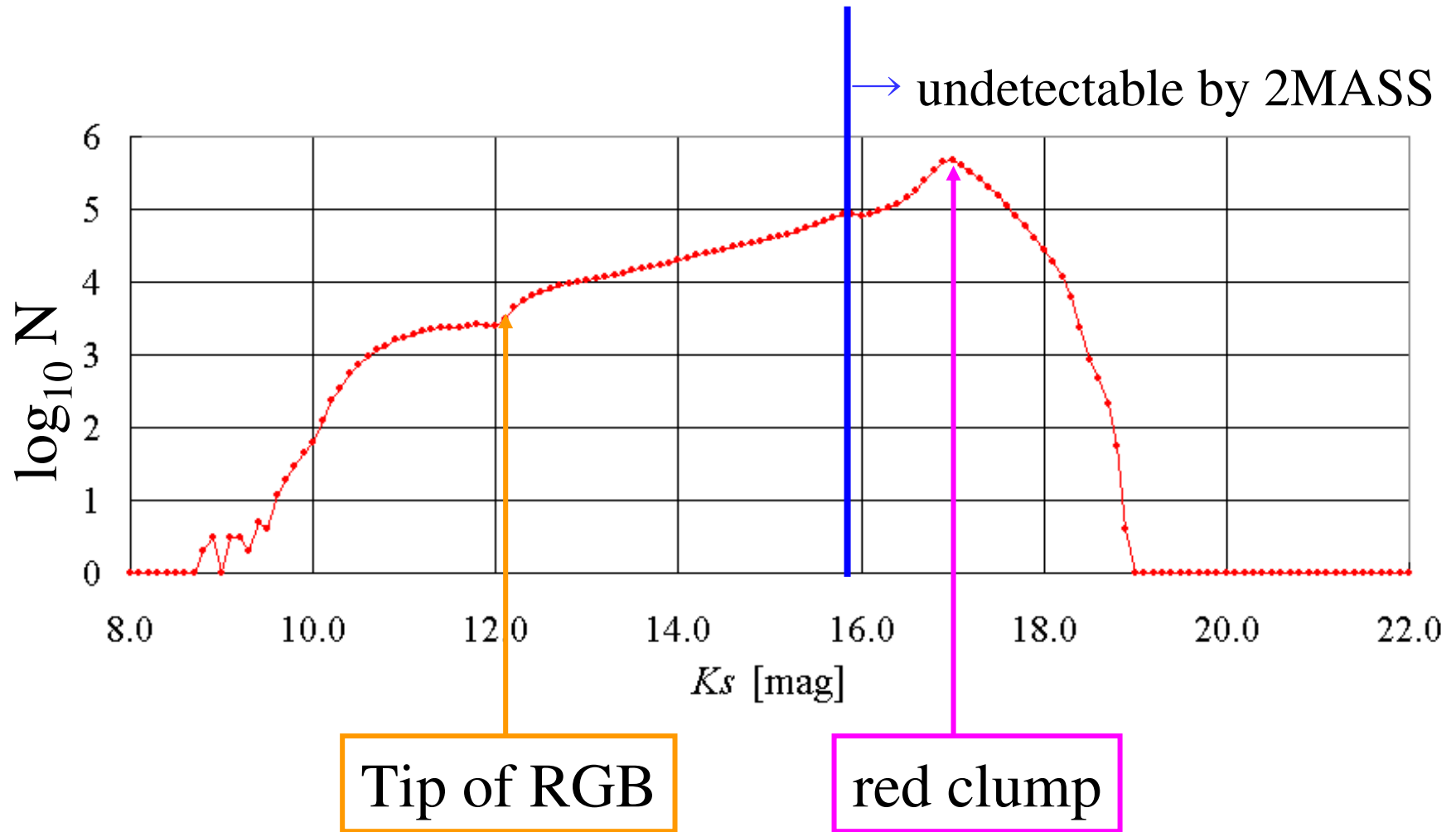


SMC : similar to LMC

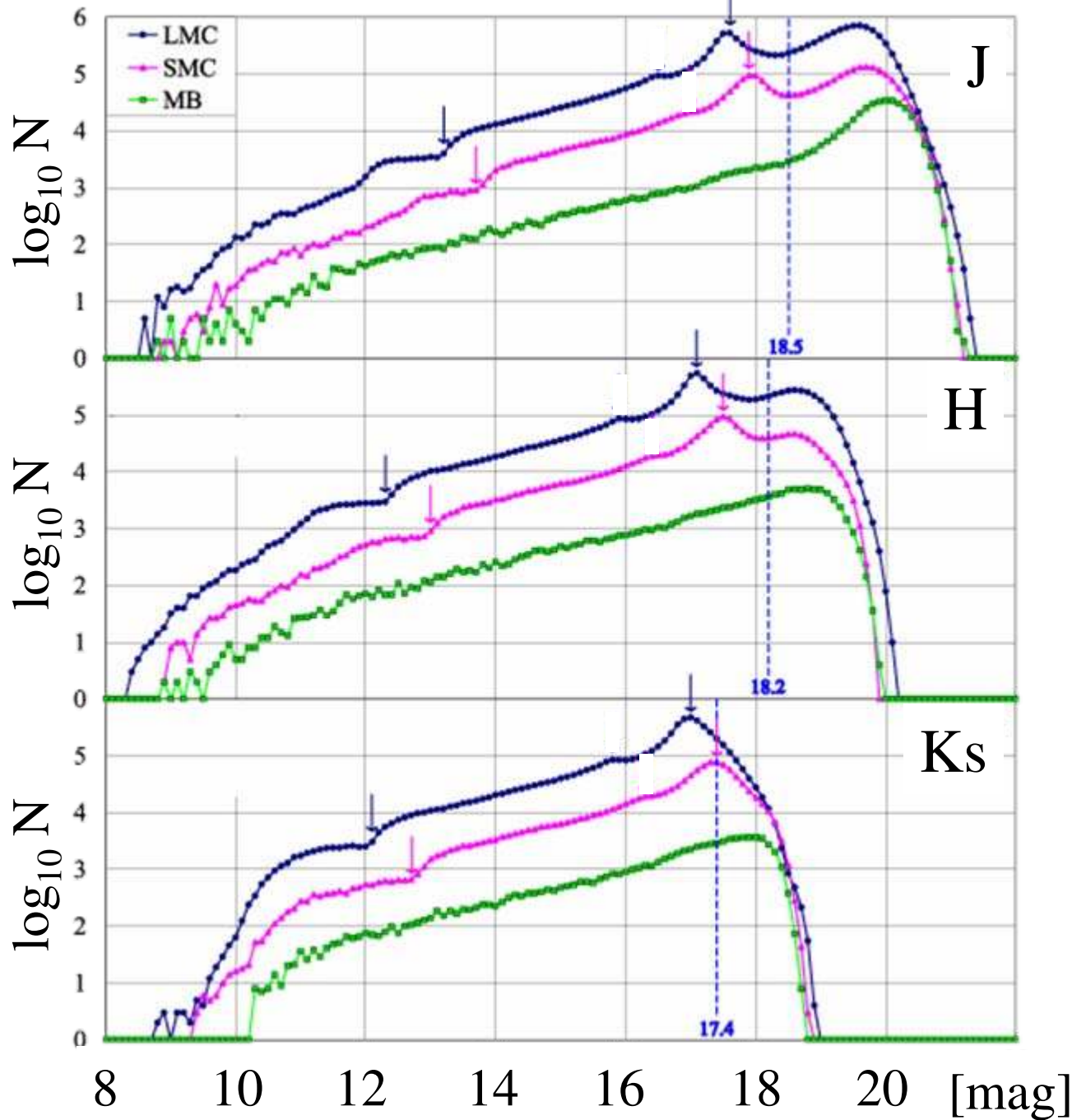
Bridge : no RGB and AGB features, Galactic foreground is dominant.



# Luminosity Function (LMC; $K_s$ )



Features by T-RGB and RC



## LFs

- : LMC
- : SMC
- : Bridge

RC, T-RGB:

- seen in the LMC and SMC
- not seen in the Bridge

# Summary

## “The IRSF Magellanic Clouds Point Source Catalog”

- a NIR point-source catalog for the MCs
- covering 55 deg<sup>2</sup> 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>

(PASJ 2007, 59, 615)