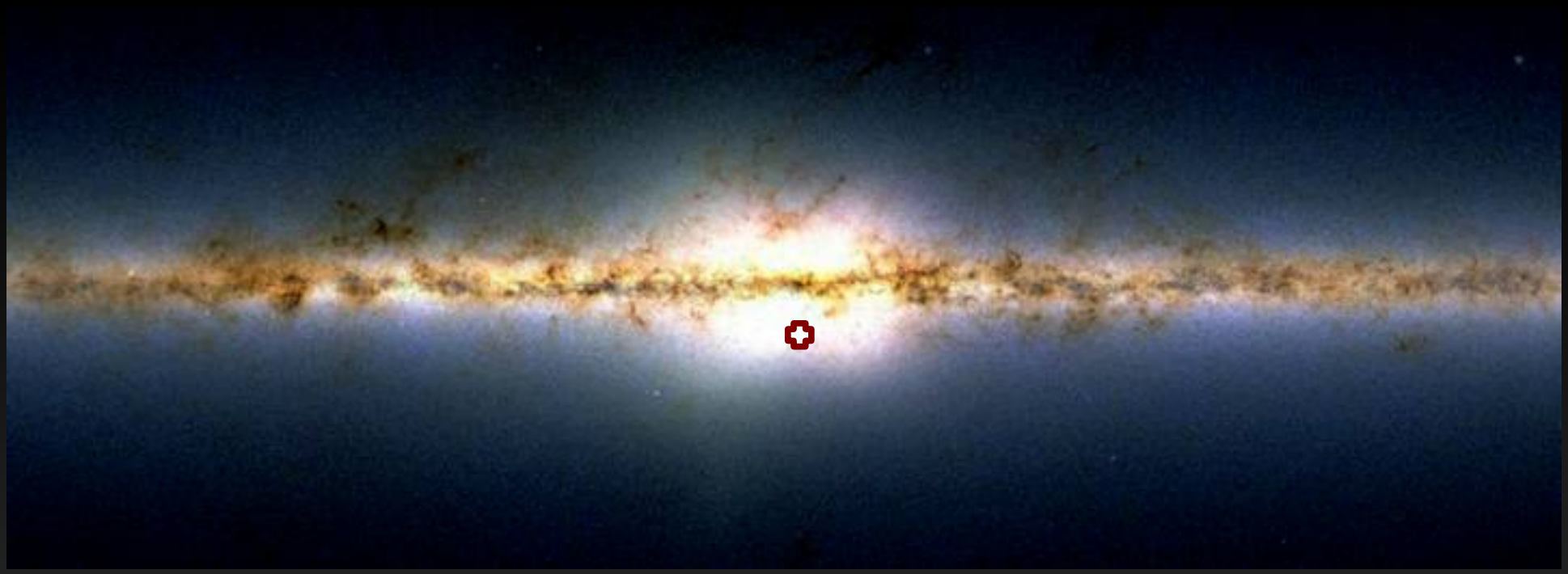
Reddening structure and metallicities of the Milky Way Bulge from VVV and 2MASS

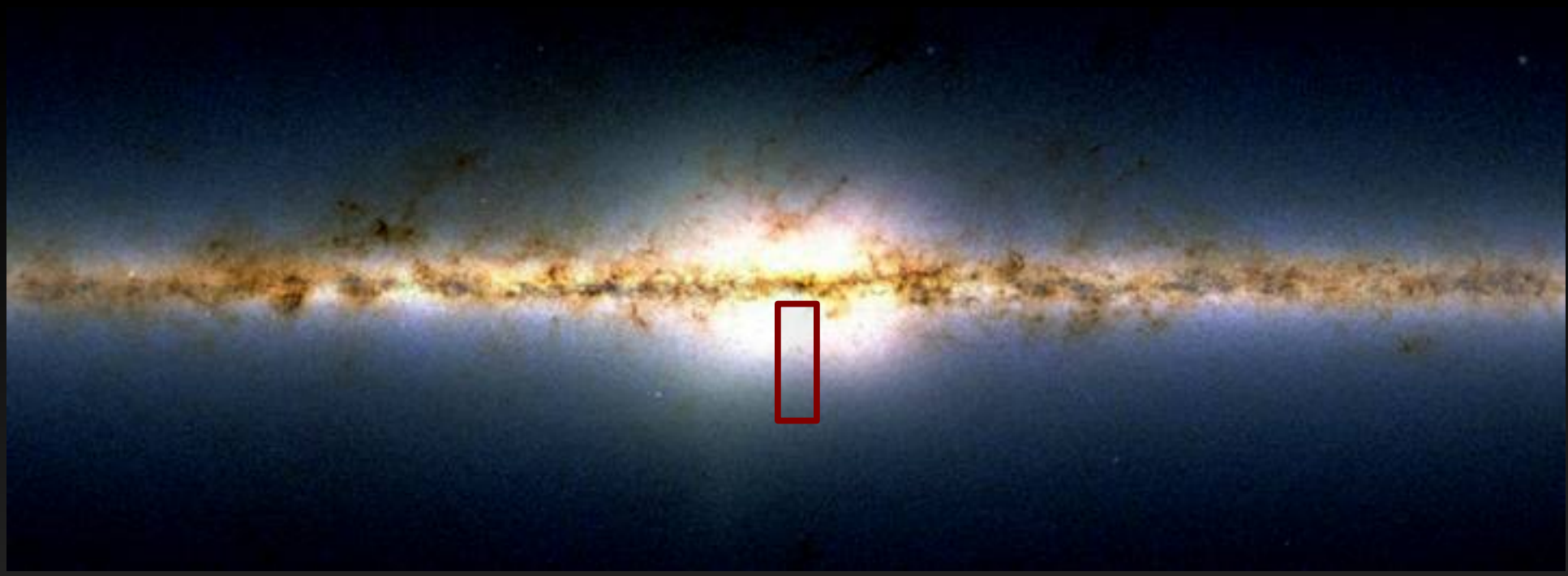
Oscar A. Gonzalez

European Southern Observatory

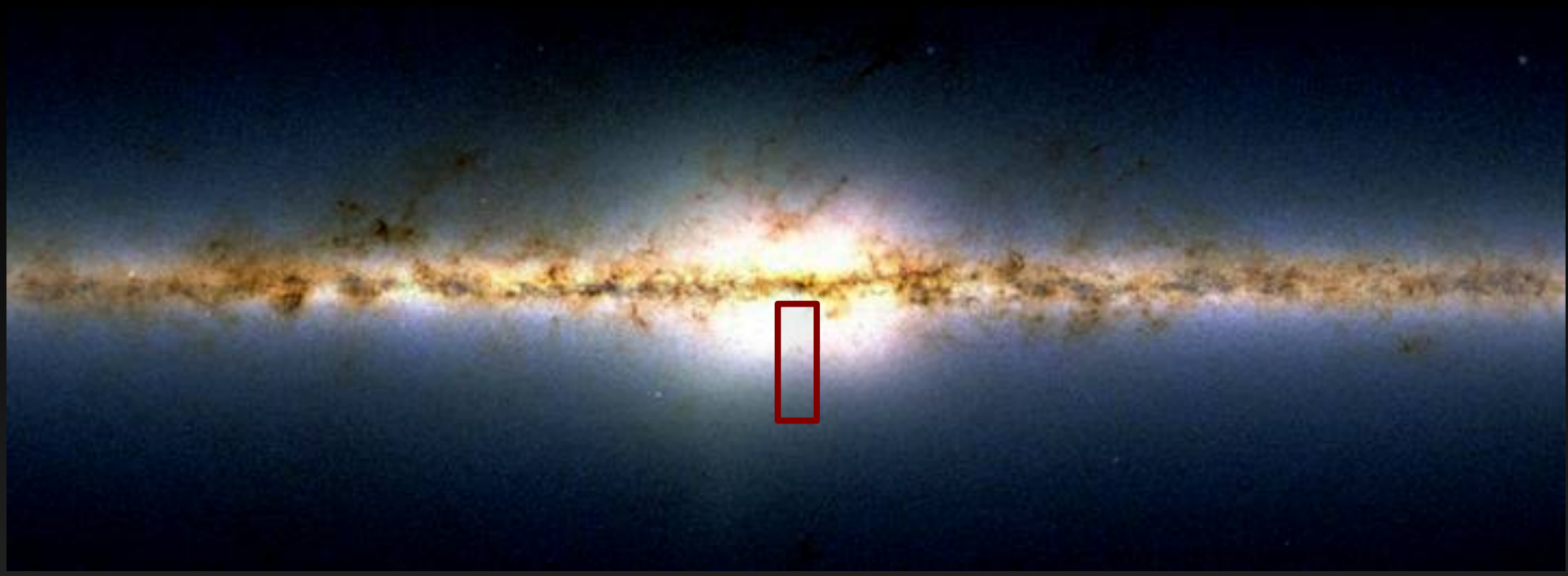
Optical and Infrared Galactic Plane surveys – University of Hertfordshire – July 2011



- Studies on Bulge stellar populations are limited by EXTINCTION problems



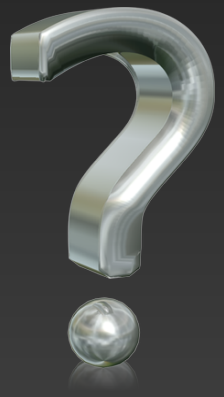
- Studies on Bulge stellar populations are limited by EXTINCTION problems
- Improvement along the Bulge minor axis

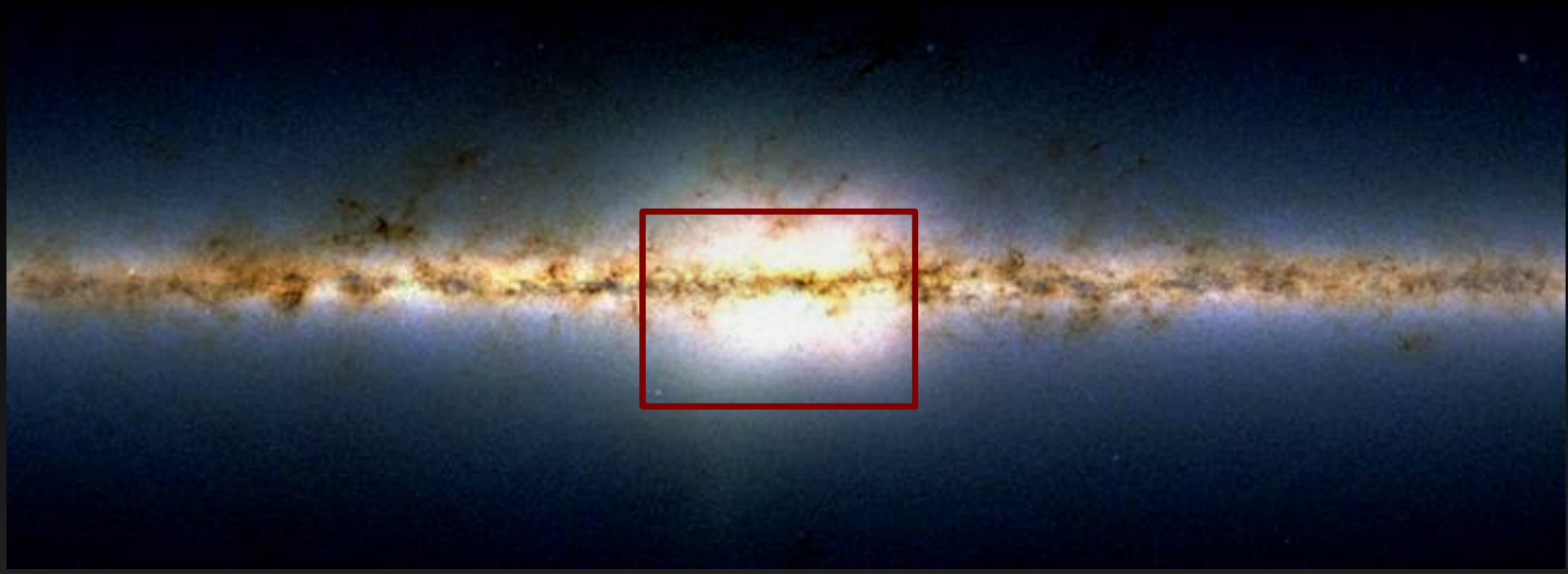


- Studies on Bulge stellar populations are limited by EXTINCTION problems

- Improvement along the Bulge minor axis
  - Same as in the inner Bulge?
  - Along the mayor axis?

- Global picture of Bulge/Bar structure?



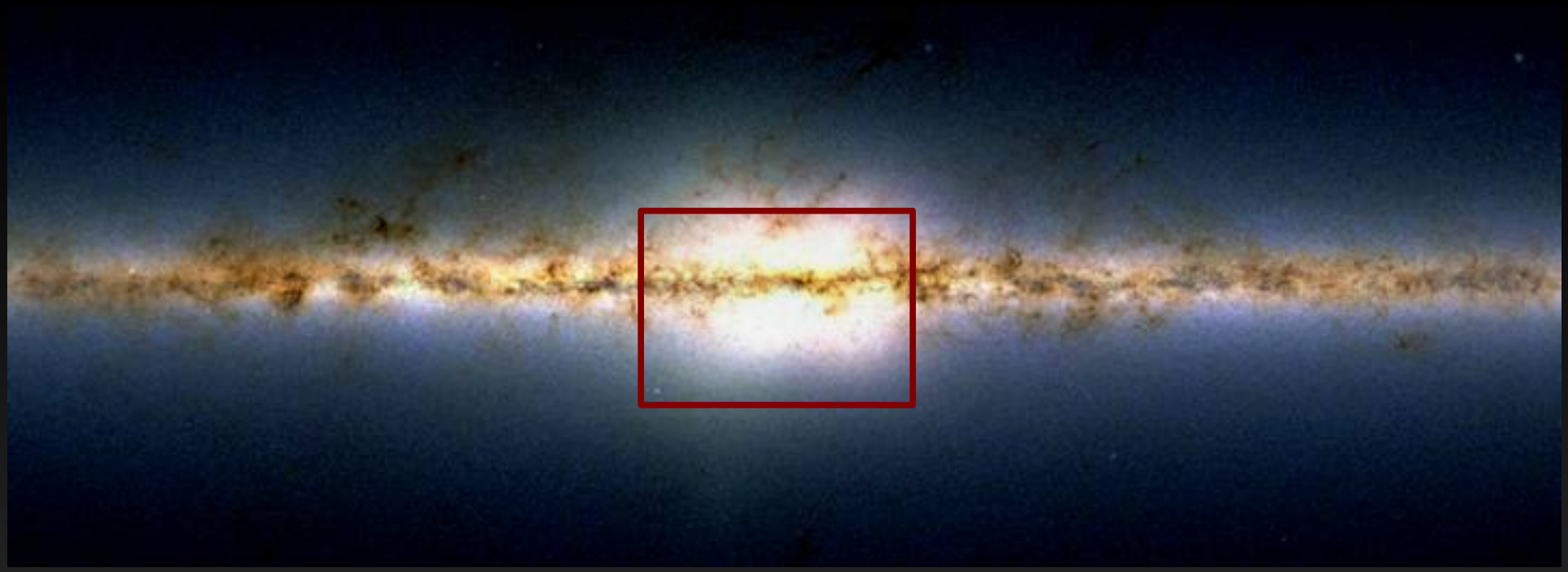


- Studies on Bulge stellar populations are limited by EXTINCTION problems

- Improvement along the Bulge minor axis
  - Same as in the inner Bulge?
  - Along the mayor axis?

- Global picture of Bulge/Bar structure?

⇨ Red clump giants as seen by VVV survey



Outline of the talk

- Building up the data
- Obtaining reddening values and maps
- Tracing the bar with red clump giants
- Photometric metallicity distributions
- A look to the inner bulge (|b|<2)

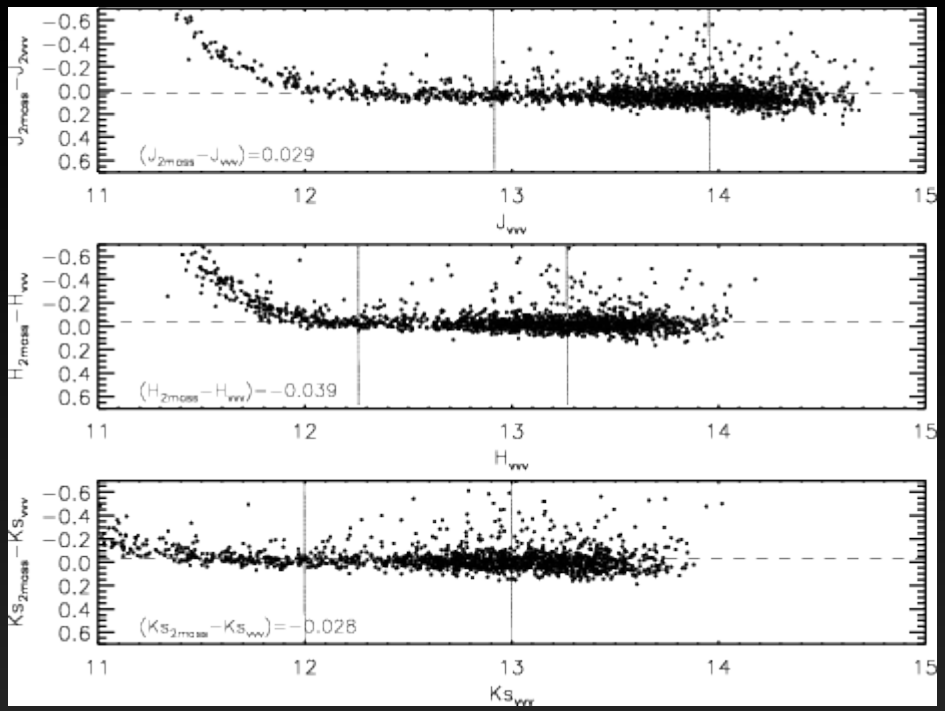
The catalogs

- Multiband catalogs matching on sky positions

- Only sources with stellar flag in 3 bands

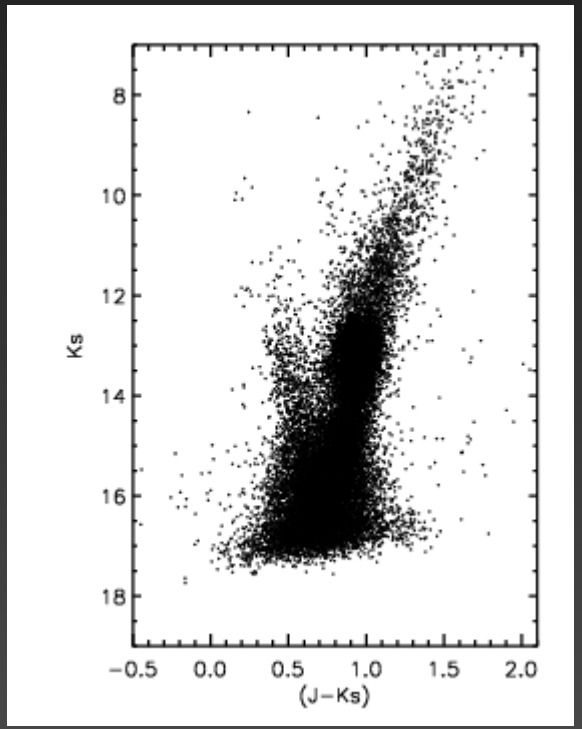
A comparison with 2MASS for each tile and band

- Range: 12 < Ks < 13



A final observed CMD corrected for saturation and fully consistent with 2MASS

Ks > 12 --> VVV
Ks < 12 --> 2MASS

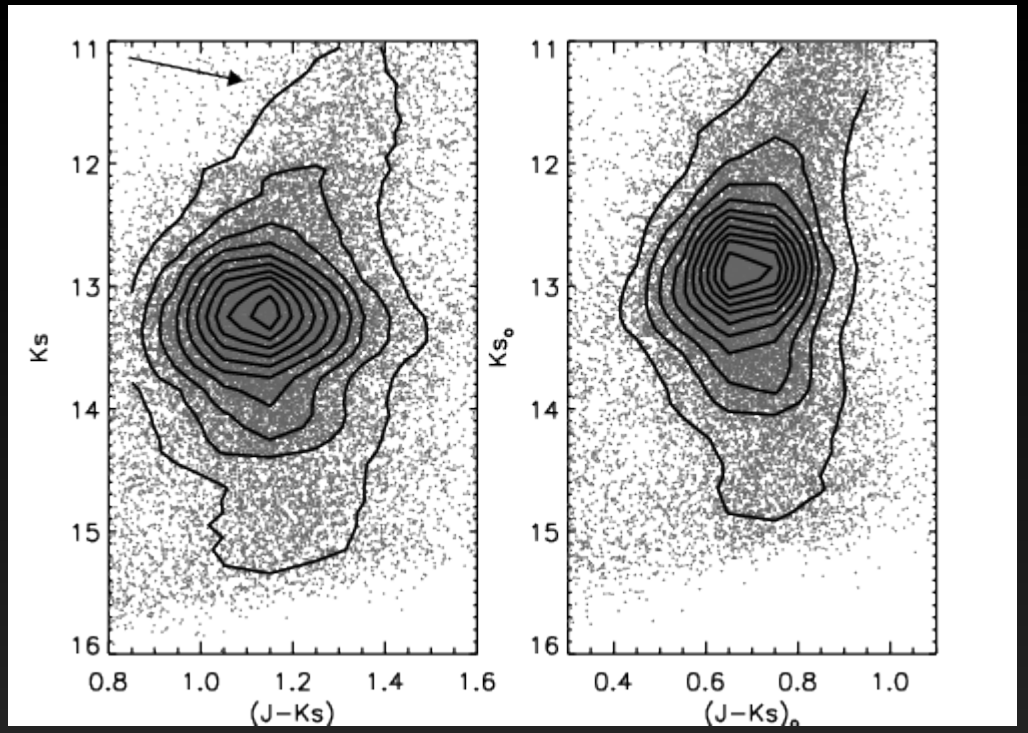


b=-4 (BW)

Extinction

A Red Clump centered CMD
Tile b306 (b=-2)

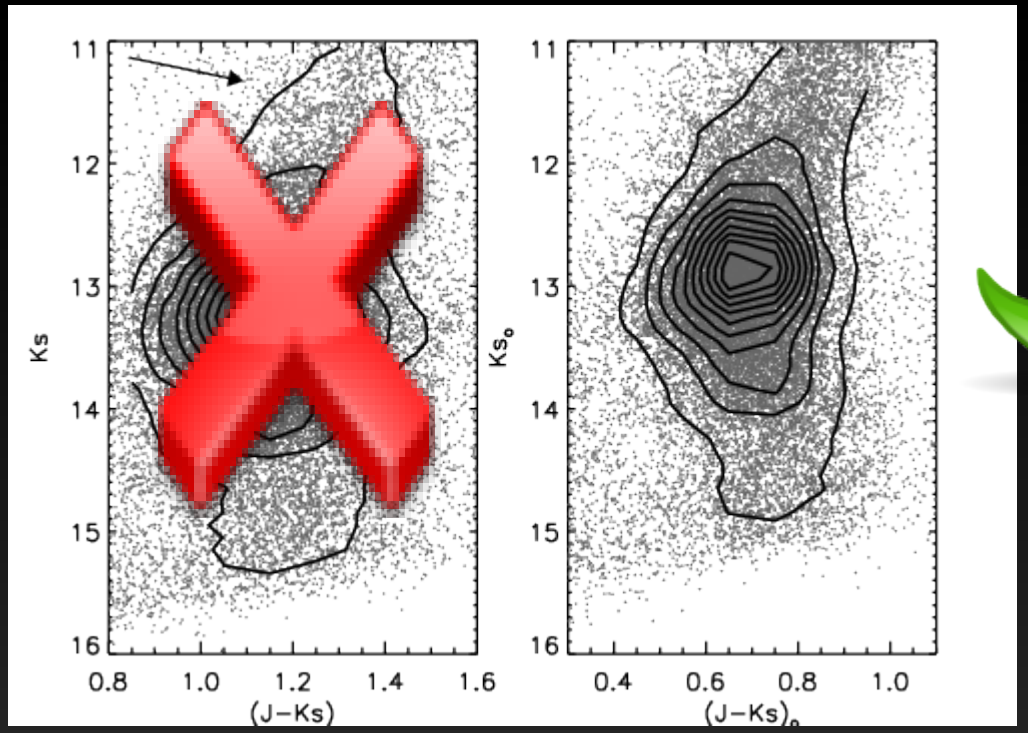
Strong differential reddening implies a wide color distribution of the clump giants



Extinction

A Red Clump centered CMD
Tile b306 (b=-2)

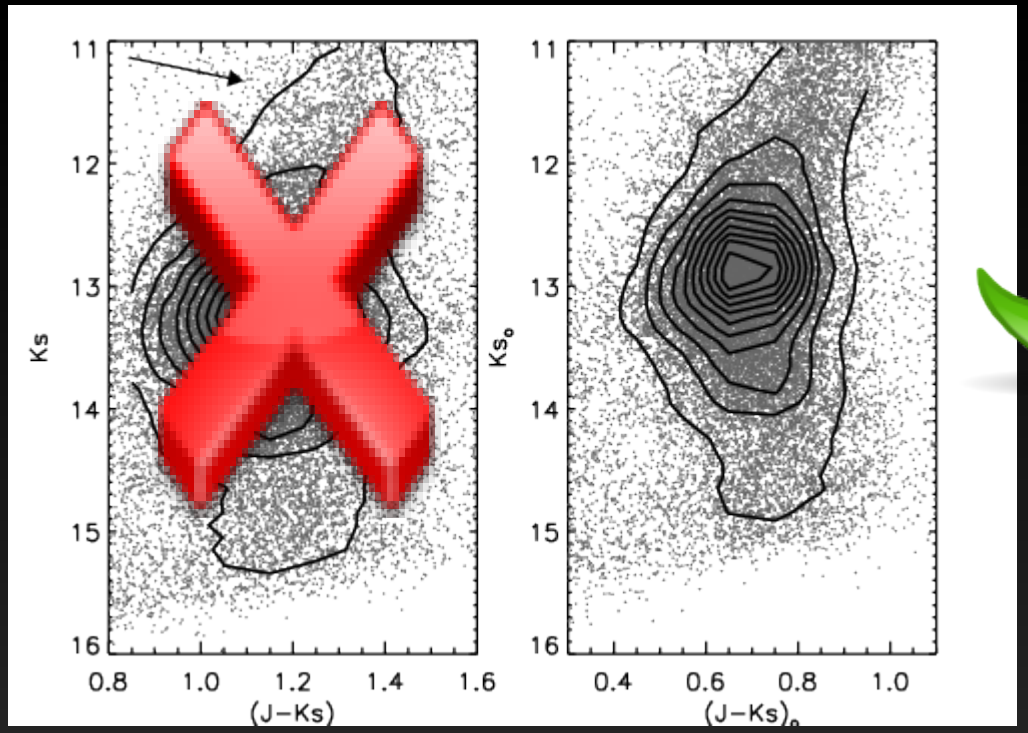
Strong differential reddening implies a wide color distribution of the clump giants



Extinction

A Red Clump centered CMD
Tile b306 (b=-2)

Strong differential reddening implies a wide color distribution of the clump giants

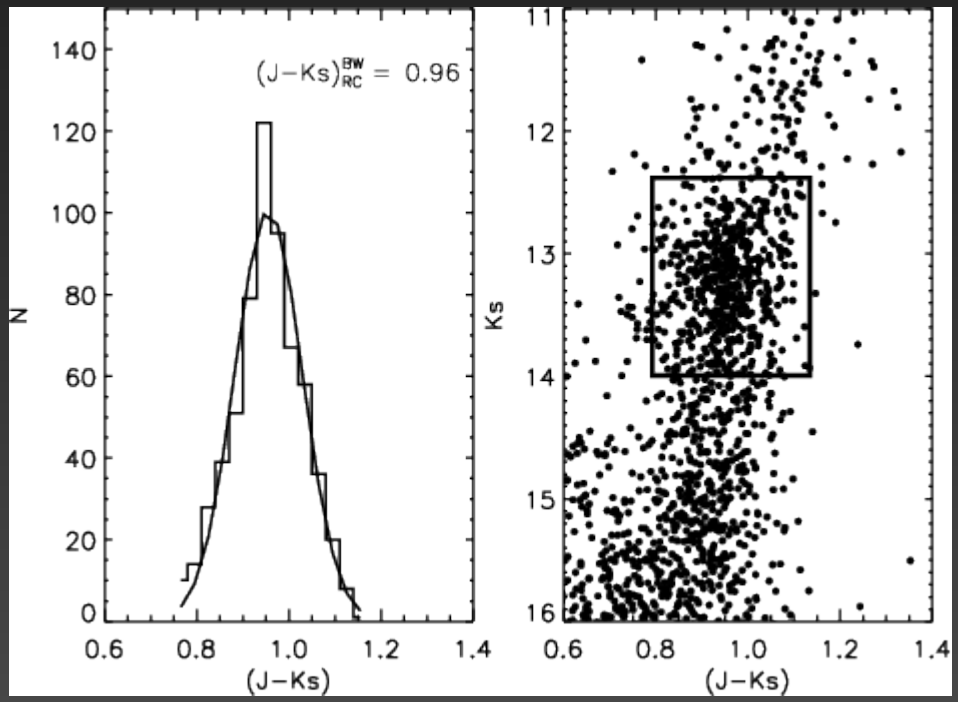


An empirical method based on the RC color

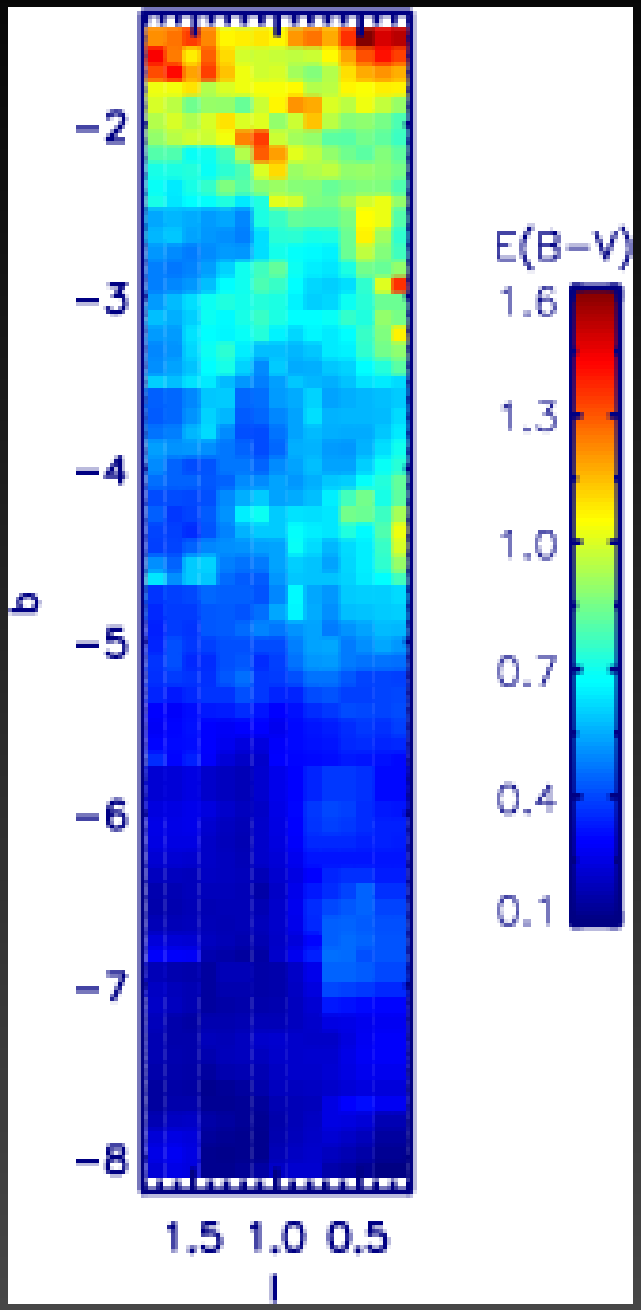
RC(J-Ks) in Baade's Window E(B-V)=0.55

The difference between the RC color in BW and any field l,b is a function of reddening

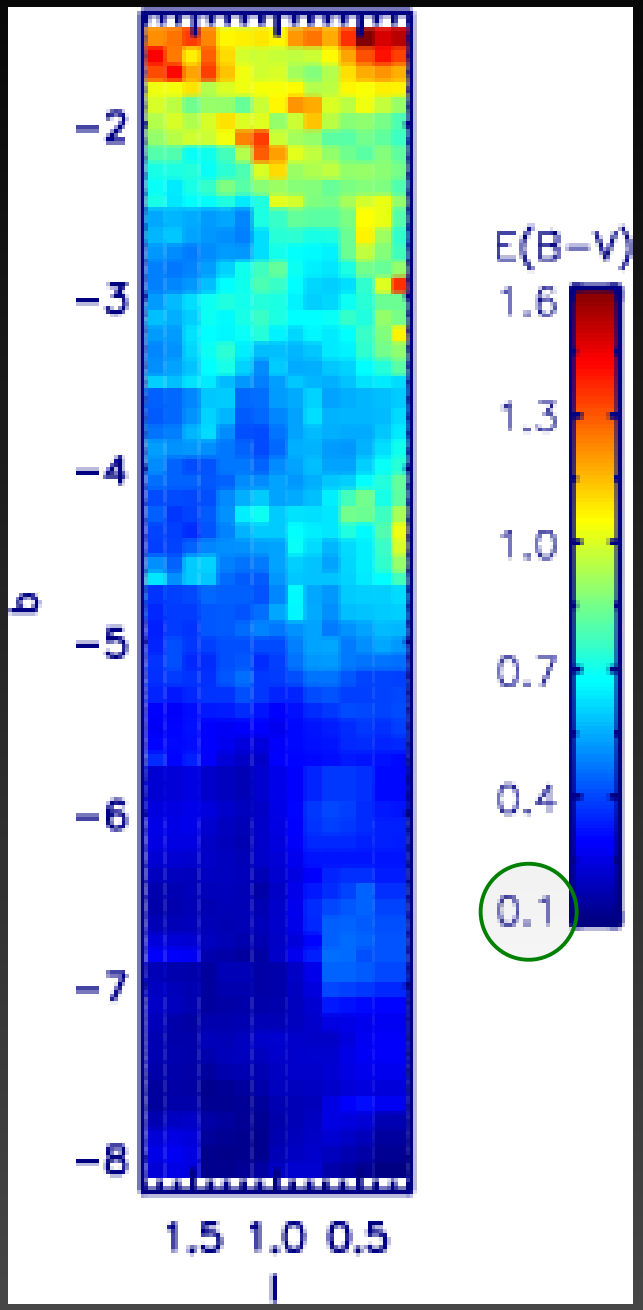
- Small fields to avoid differential reddening
- We assume same population than in BW

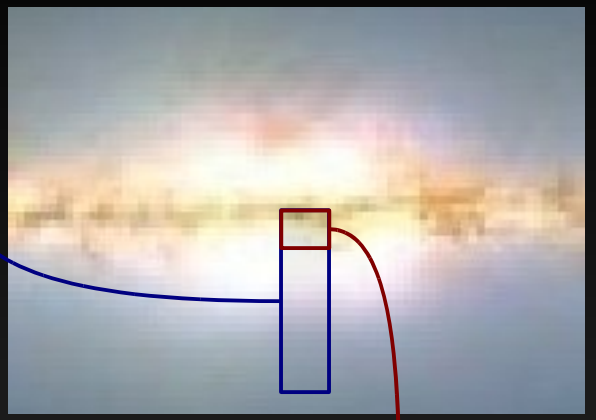


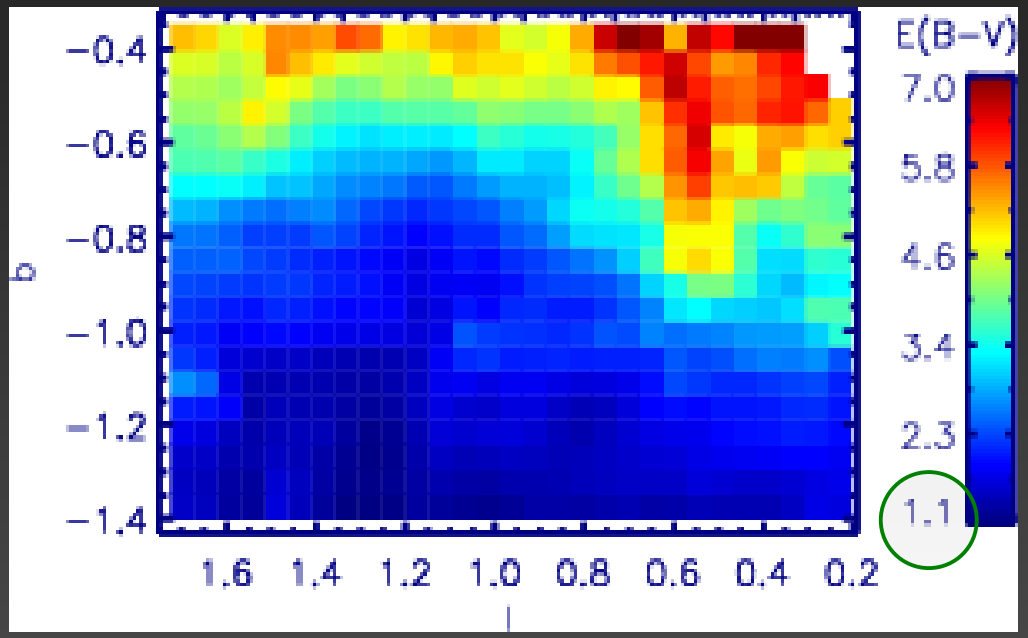
The maps (a look to the Bulge Minor axis)



The maps (a look to the Bulge Minor axis)

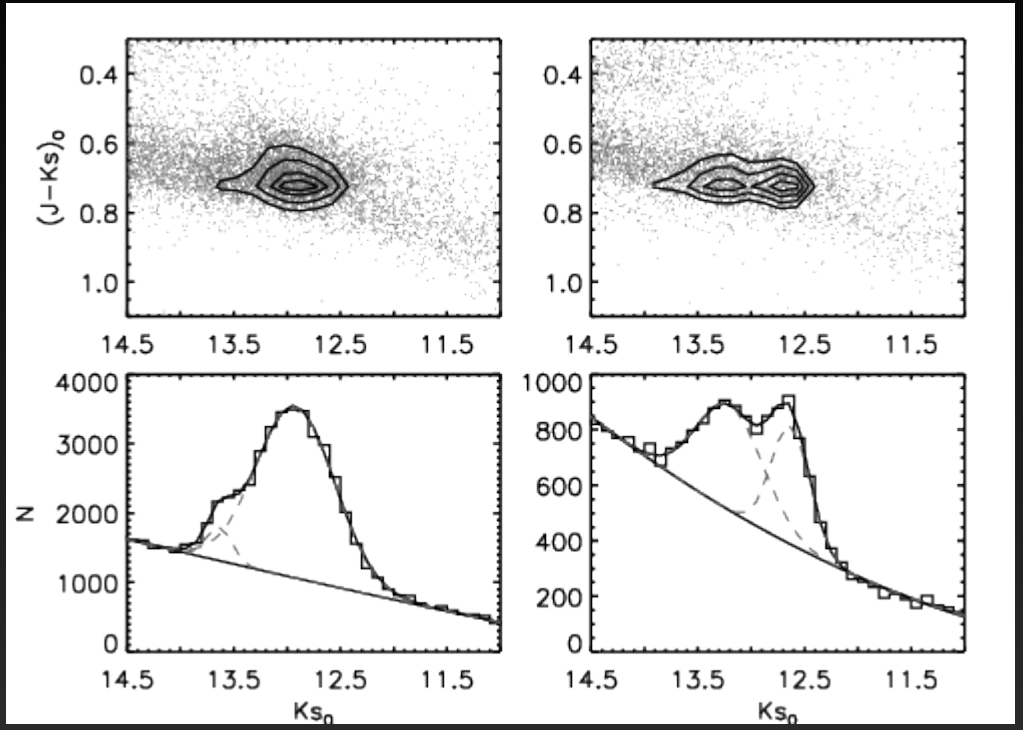






Using de-reddened RC magnitudes

Build the Luminosity function to study the Ks distribution of RC giants

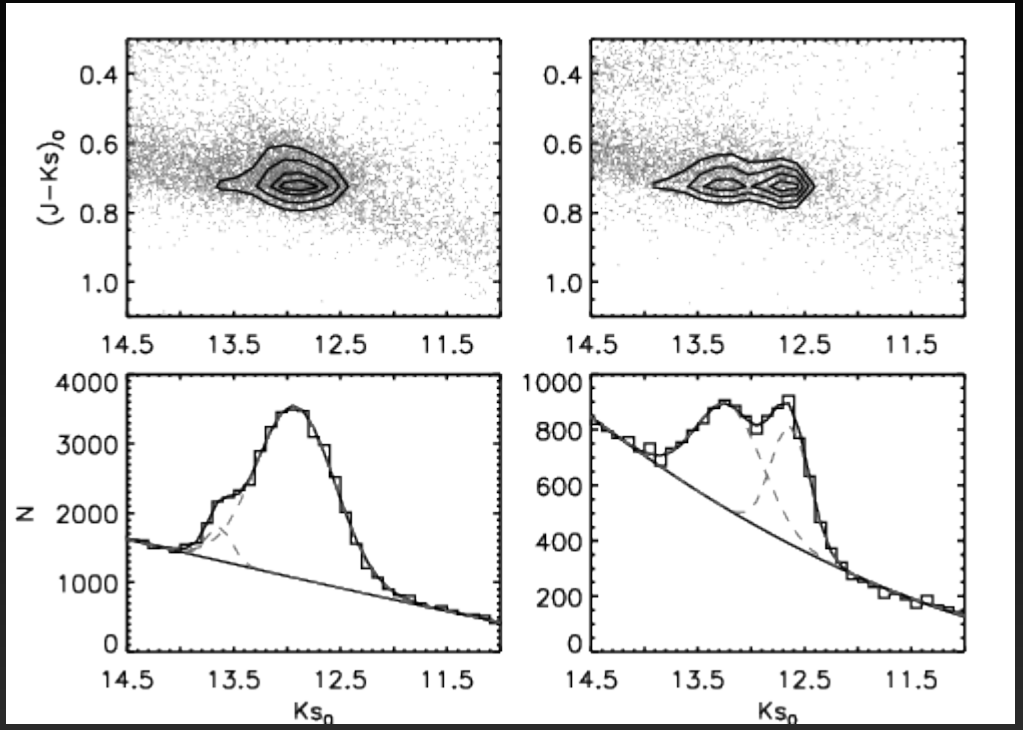


Using de-reddened RC magnitudes

Build the Luminosity function to study the Ks distribution of RC giants

Intrinsic magnitude of the RC is known for a given population

Mk=-1.55
10Gyr, Bulge-like [Fe/H]



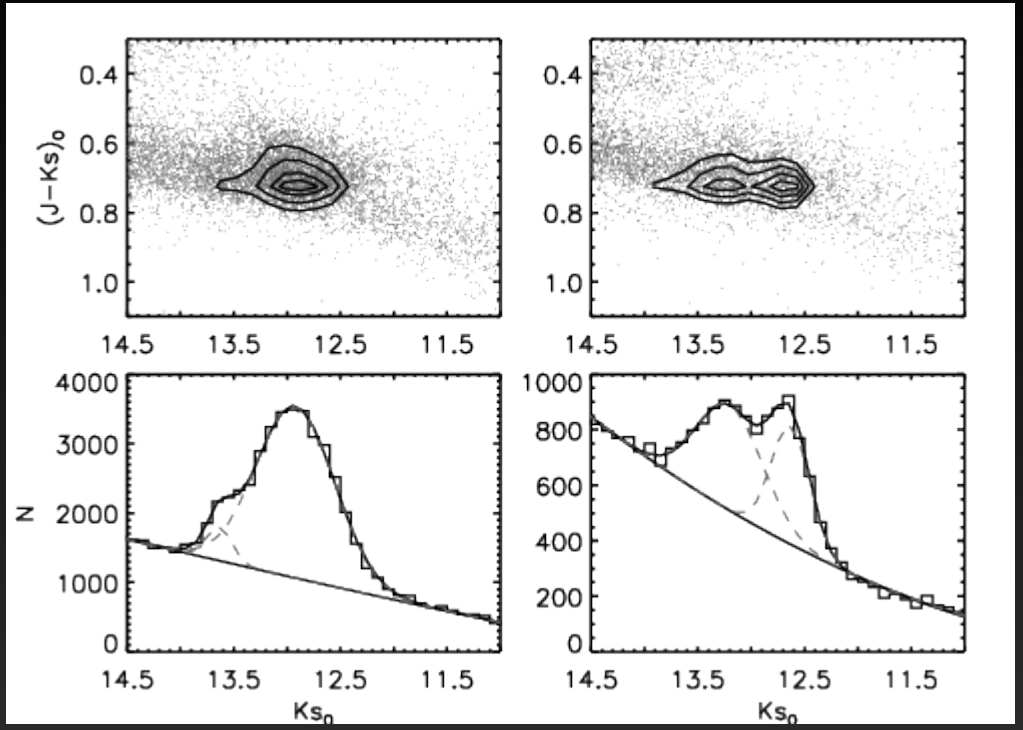
Warning: Again assuming an homogeneous population

Using de-reddened RC magnitudes

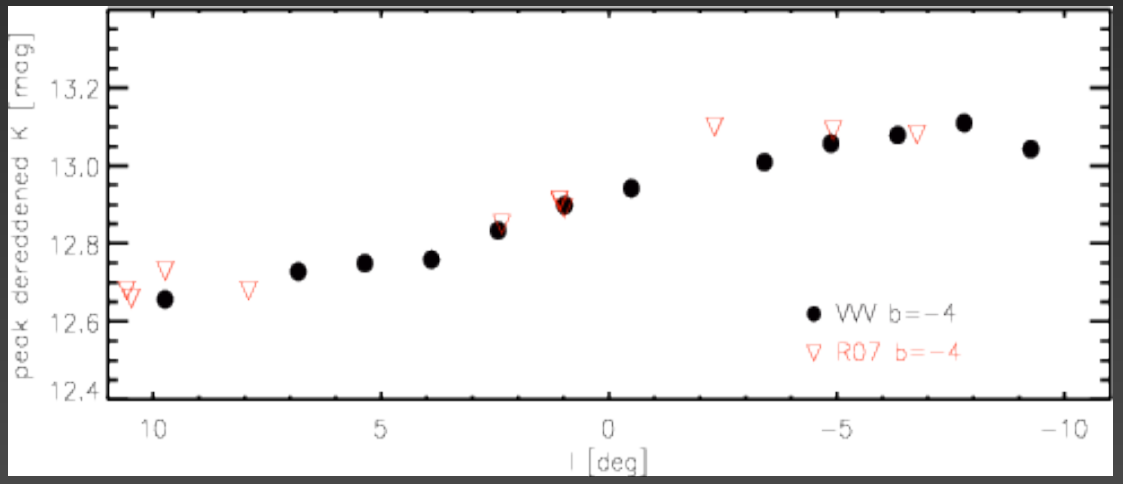
Build the Luminosity function to study the Ks distribution of RC giants

Intrinsic magnitude of the RC is known for a given population

Mk=-1.55
10Gyr, Bulge-like [Fe/H]



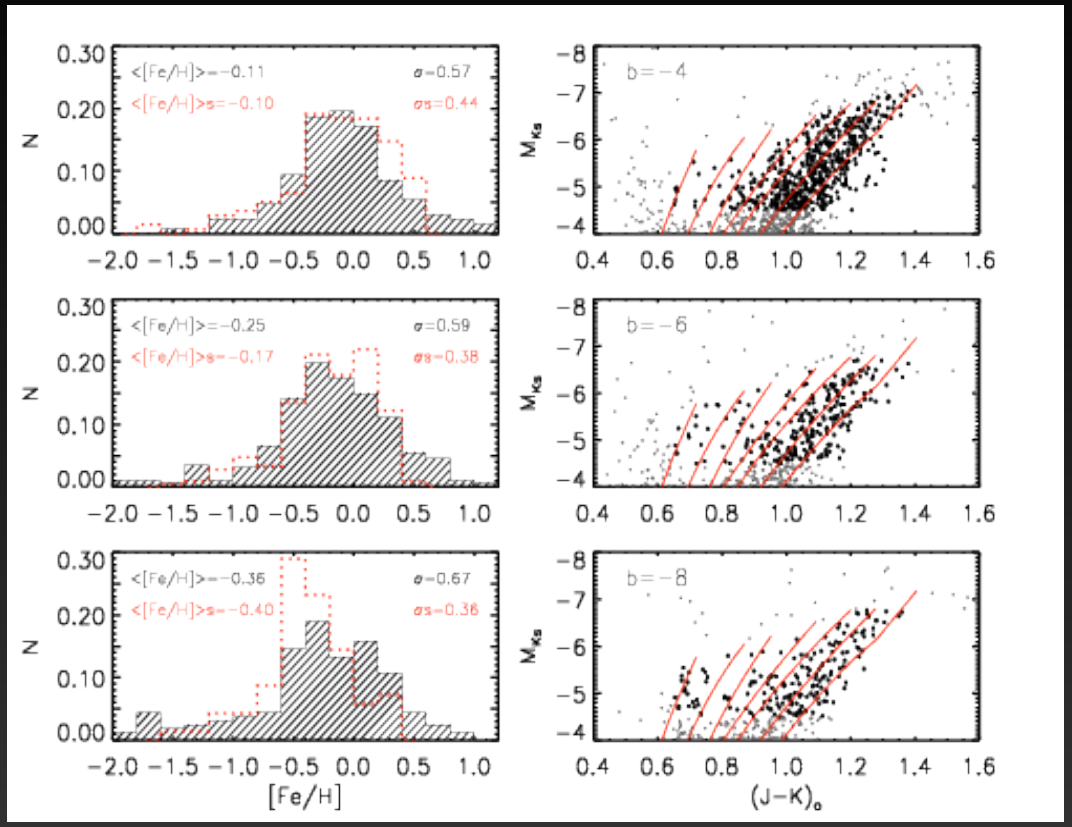
Warning: Again assuming an homogeneous population



We can use all this to obtain clues for metallicity distributions

Photometric metallicities from CMDs in the absolute plane

$(J-Ks)_0$ Interpolation between GC ridge lines with known [Fe/H]

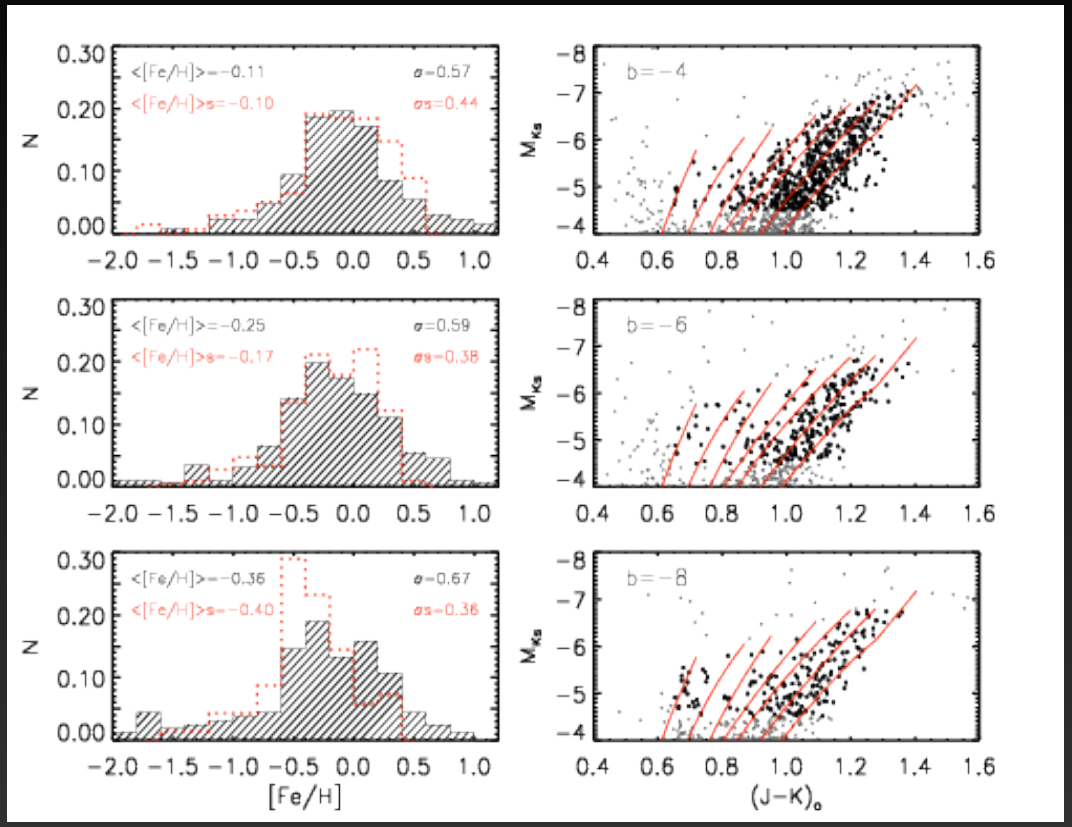


We can use all this to obtain clues for metallicity distributions

Photometric metallicities from CMDs in the absolute plane

$(J-Ks)_0$ Interpolation between GC ridge lines with known [Fe/H]

⇨ Assigns [Fe/H] to RGB stars from Mk > -4.5 to the Tip of the RGB



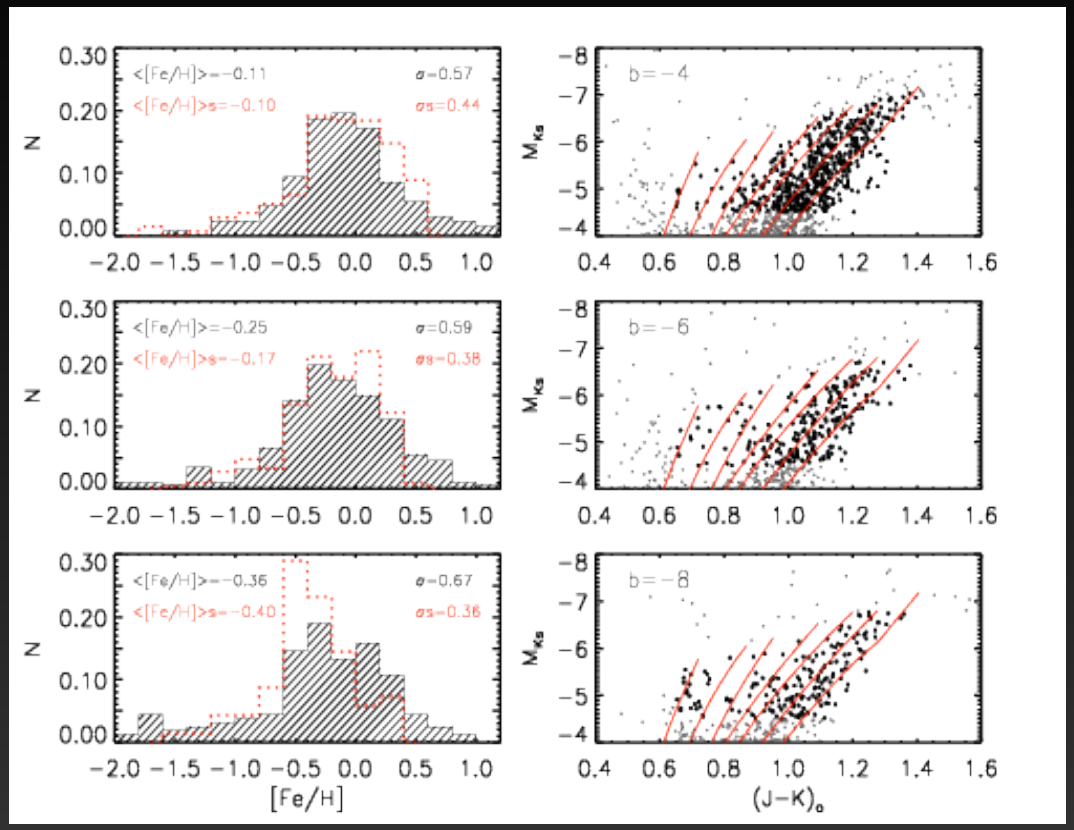
A comparison to spectroscopic [Fe/H] distributions

We can use all this to obtain clues for metallicity distributions

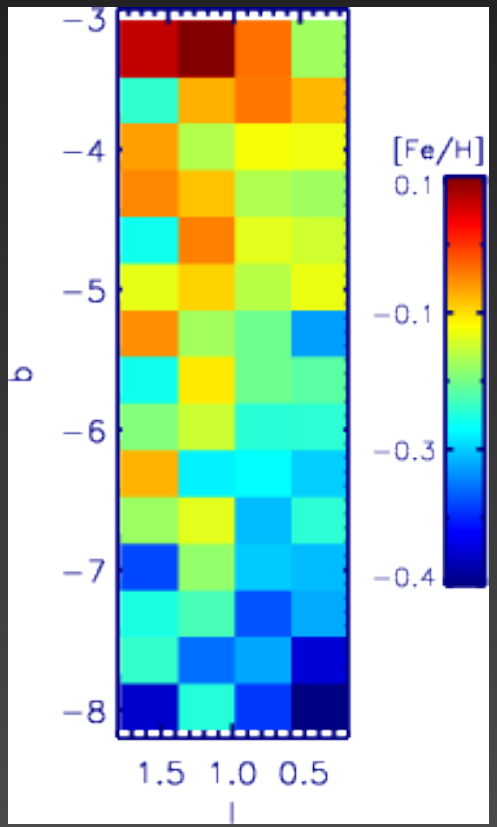
Photometric metallicities from CMDs in the absolute plane

$(J-Ks)_0$ Interpolation between GC ridge lines with known [Fe/H]

⇨ Assigns [Fe/H] to RGB stars from Mk > -4.5 to the Tip of the RGB



A comparison to spectroscopic [Fe/H] distributions



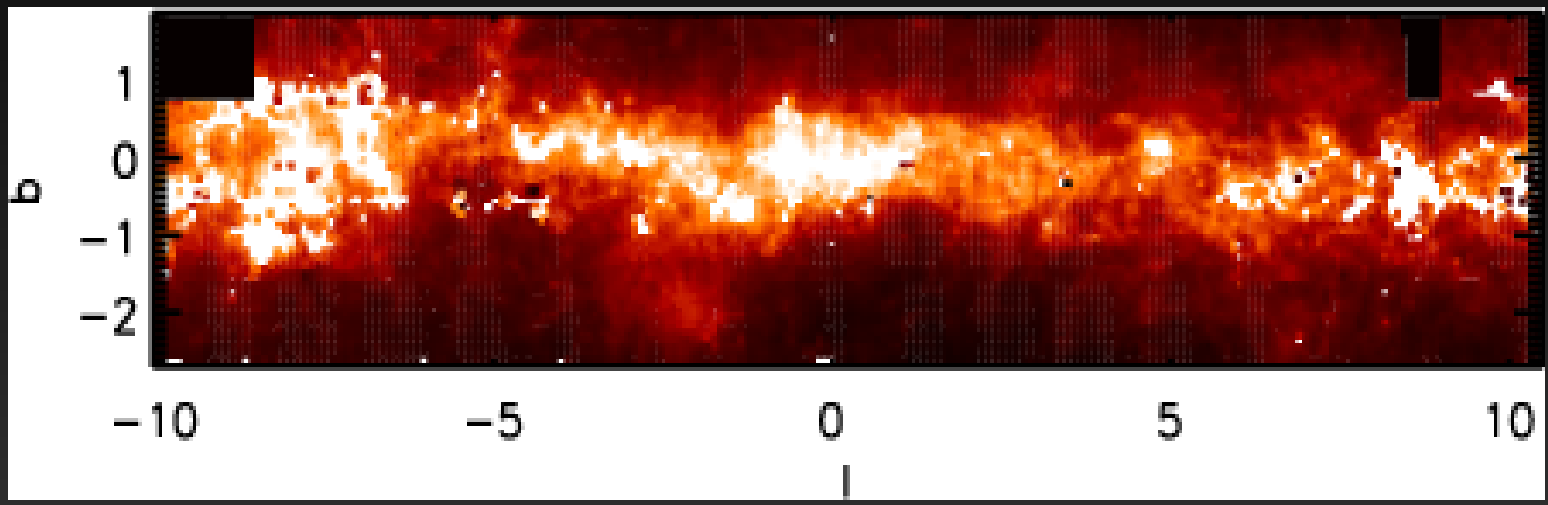
0.4x0.4 deg metallicity map for the Bulge minor axis

⇨ The Bulge metallicity gradient as seen from photometry

Oscar A. Gonzalez - ESO

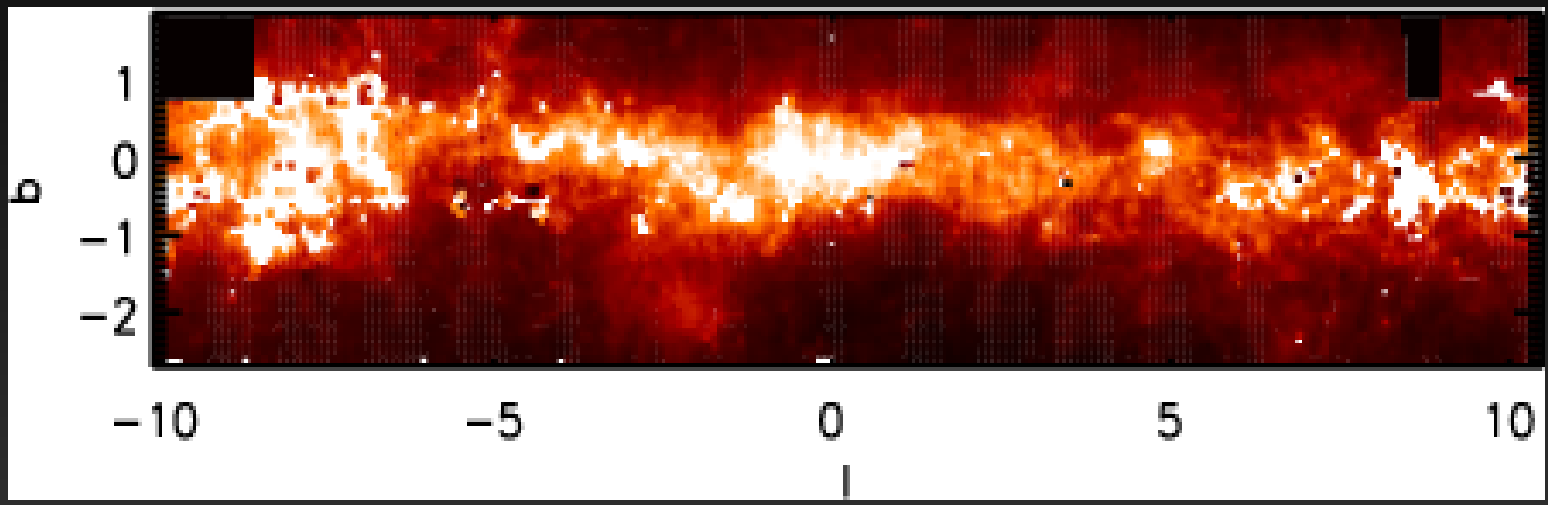
A look to the inner Bulge

Applying the same technique we can characterize reddening properties in the very inner Bulge regions



A look to the inner Bulge

Applying the same technique we can characterize reddening properties in the very inner Bulge regions



More on this, soon....

Summary

- VVV data allows to trace the photometric properties of the RC in order to:
  - Obtain extinction maps sensitive to small scale variations
  - Trace the Bulge structure
- When coupled with 2MASS to correct for saturation it allows to:
  - Measure photometric metallicity distributions with resemble spectroscopic measurements
  - Trace the bulge metallicity gradient.
- The method was succesfull in reproducing properties along the minor axis and will be extended to other Bulge regions

Summary

- VVV data allows to trace the photometric properties of the RC in order to:
  - Obtain extinction maps sensitive to small scale variations
  - Trace the Bulge structure
- When coupled with 2MASS to correct for saturation it allows to:
  - Measure photometric metallicity distributions with resemble spectroscopic measurements
  - Trace the bulge metallicity gradient.
- The method was succesfull in reproducing properties along the minor axis and will be extended to other Bulge regions

Thank you!