



**The 13th Hellenic
Astronomical Conference**



**Main Sequence Luminosity
Functions in the central 1.5 degrees
of the
main body of the SMC**

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Collaborators

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➤ Dwarf Galaxy-Star Formation History

- Gas Rich
- Interacts with LMC and MW
- Low interstellar absorption

➤ Data

- 6.5m Magellan Telescope
 - Camera: IMACS, adaptive optical
 - Filters: B, I
- 4 fields
 - Diameter of the field 0.44°
- resolution $0.2''$
- Total number of sources 1×10^6
- $B_{\text{lim}} \sim 24.5$

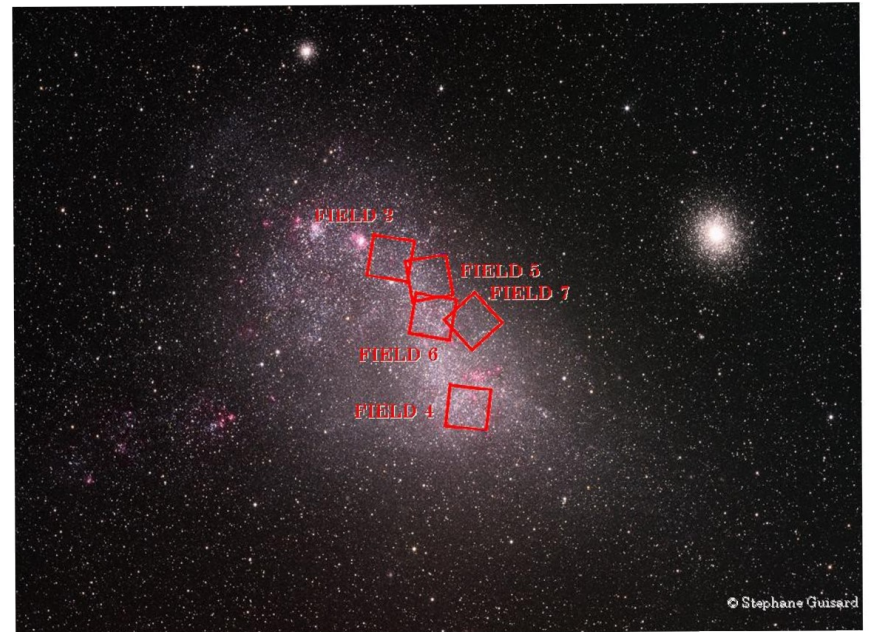
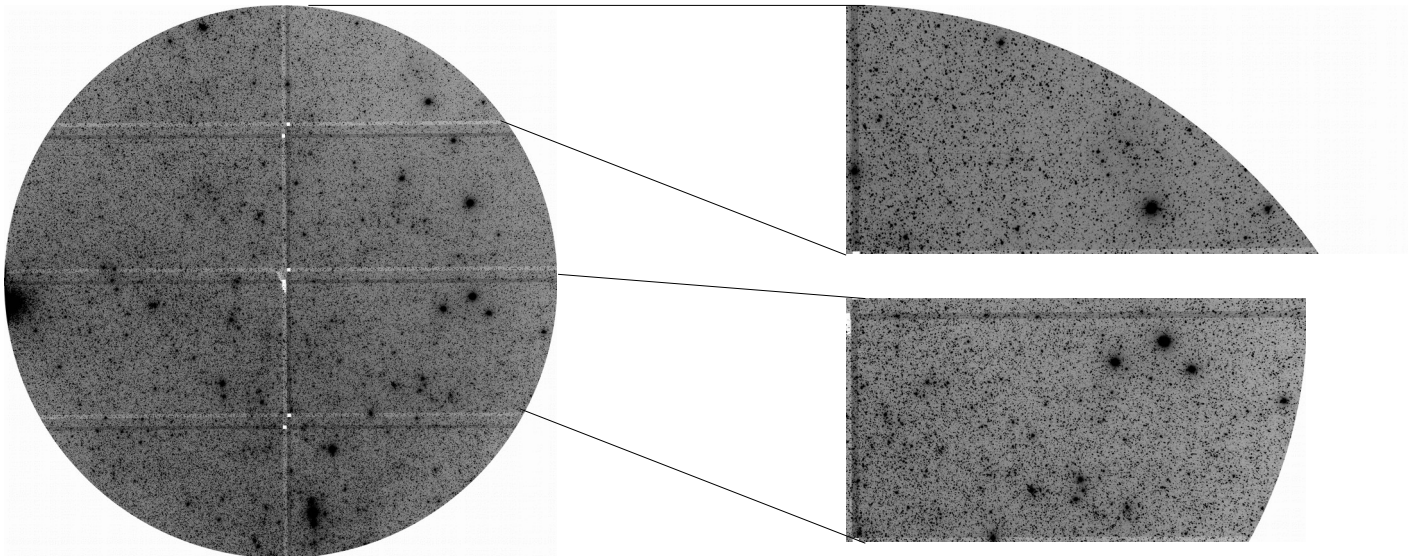


Image analysis

- BIAS subtraction(ccdproc/IRAF).
- Flat Fielding (ccdproc/IRAF)
- Astrometry (ccmap, ccfind/IRAF)
- Mosaic (Swarp)
-

Photometry

- Interactive PSF.
- Daofind, Phot, Pstselect, Psf, Allstar/IRAF, DAOPHOT

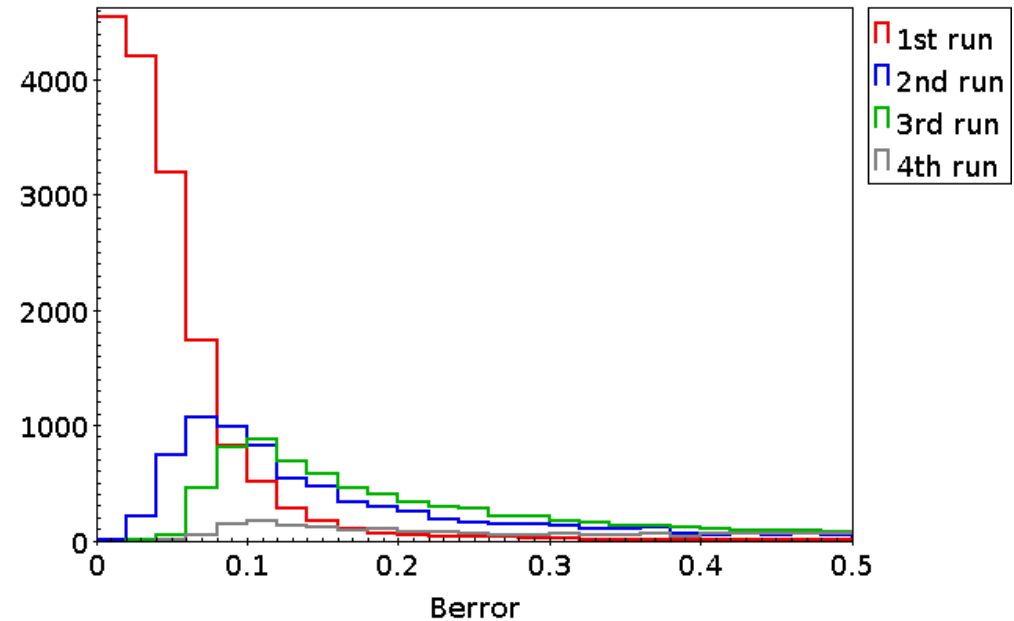
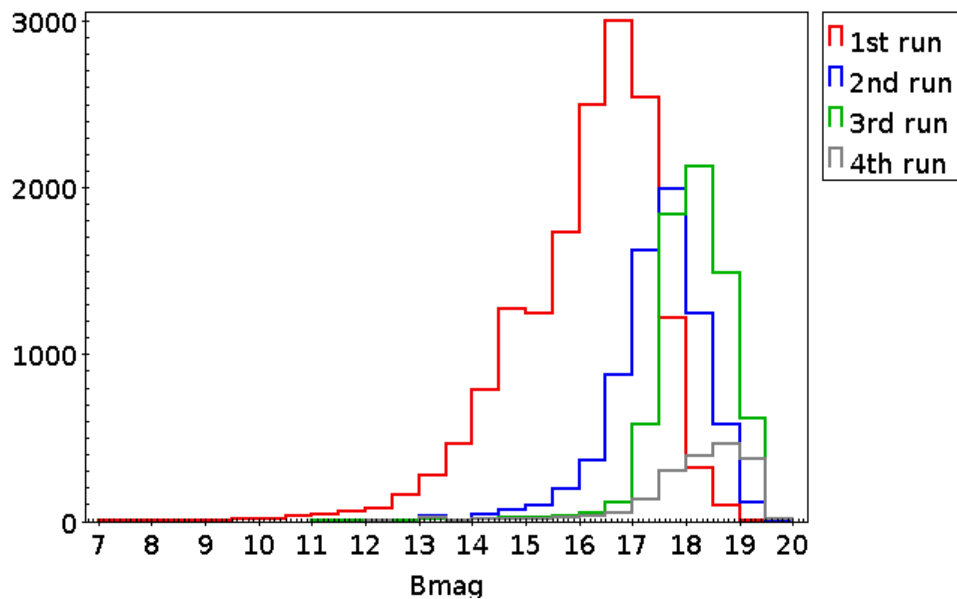
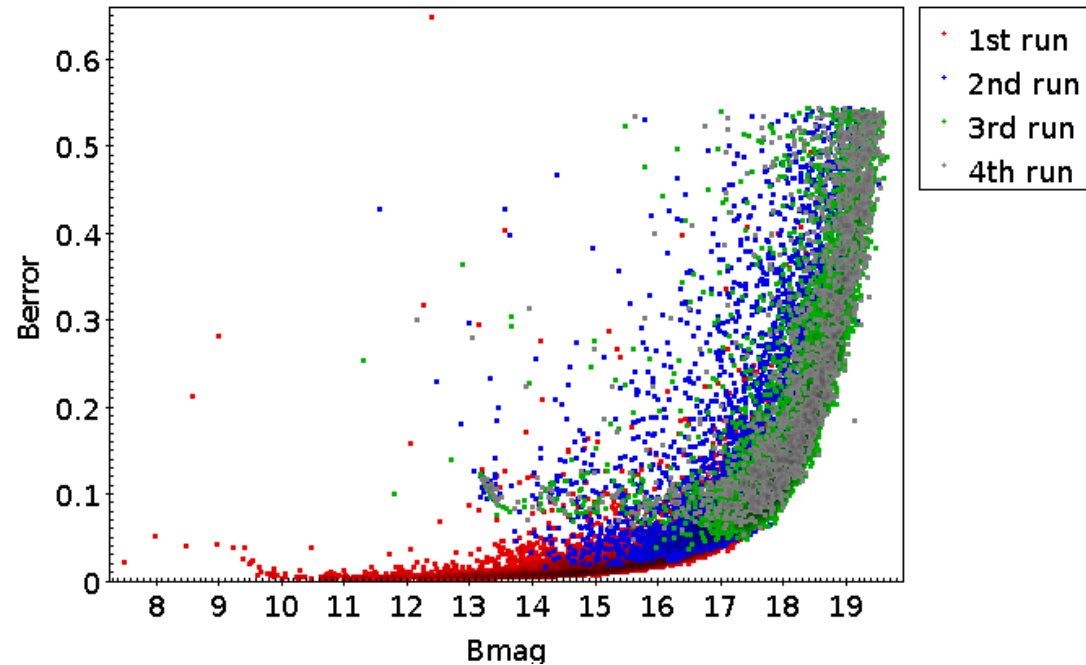


Photometry

4 iterations

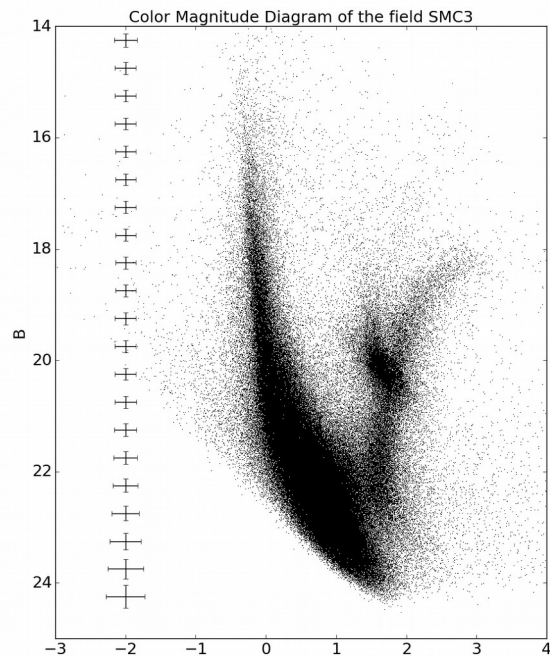
Daofind, Phot,
Allstar/IRAF in each
image.

*PSF was achieved in
the first iteration using
the packages
(Pstselect, PSF/IRAF).*

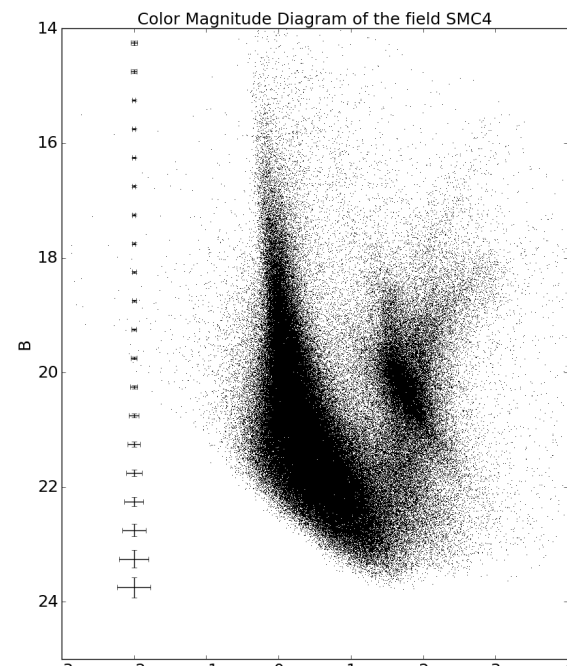


**CMDs: B-I,
corrected
errors of B
and I
 ≤ 0.2**

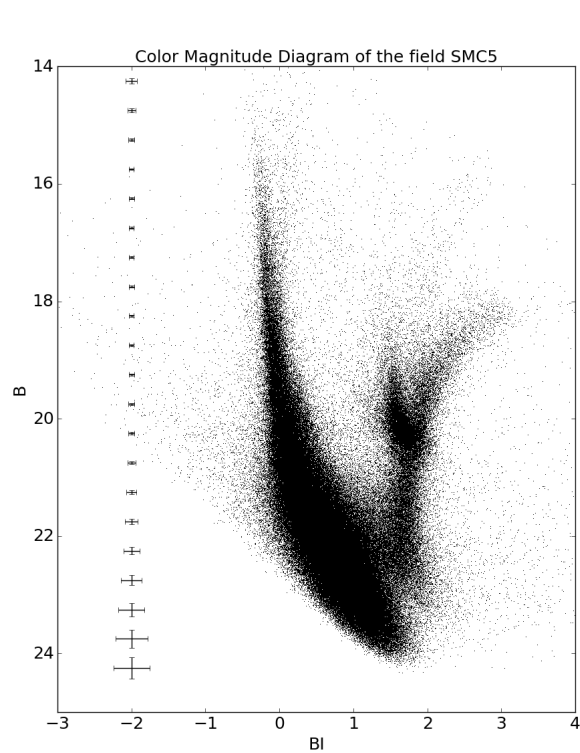
287134
sources



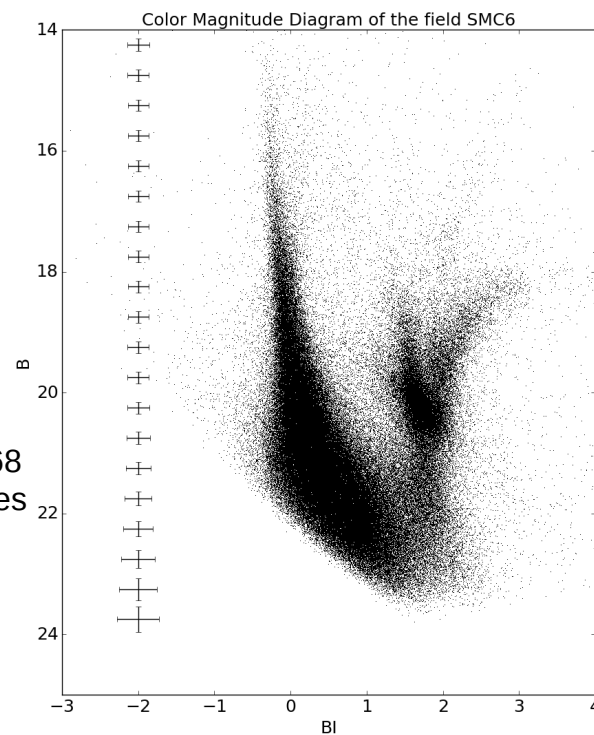
269404
sources



302985
sources

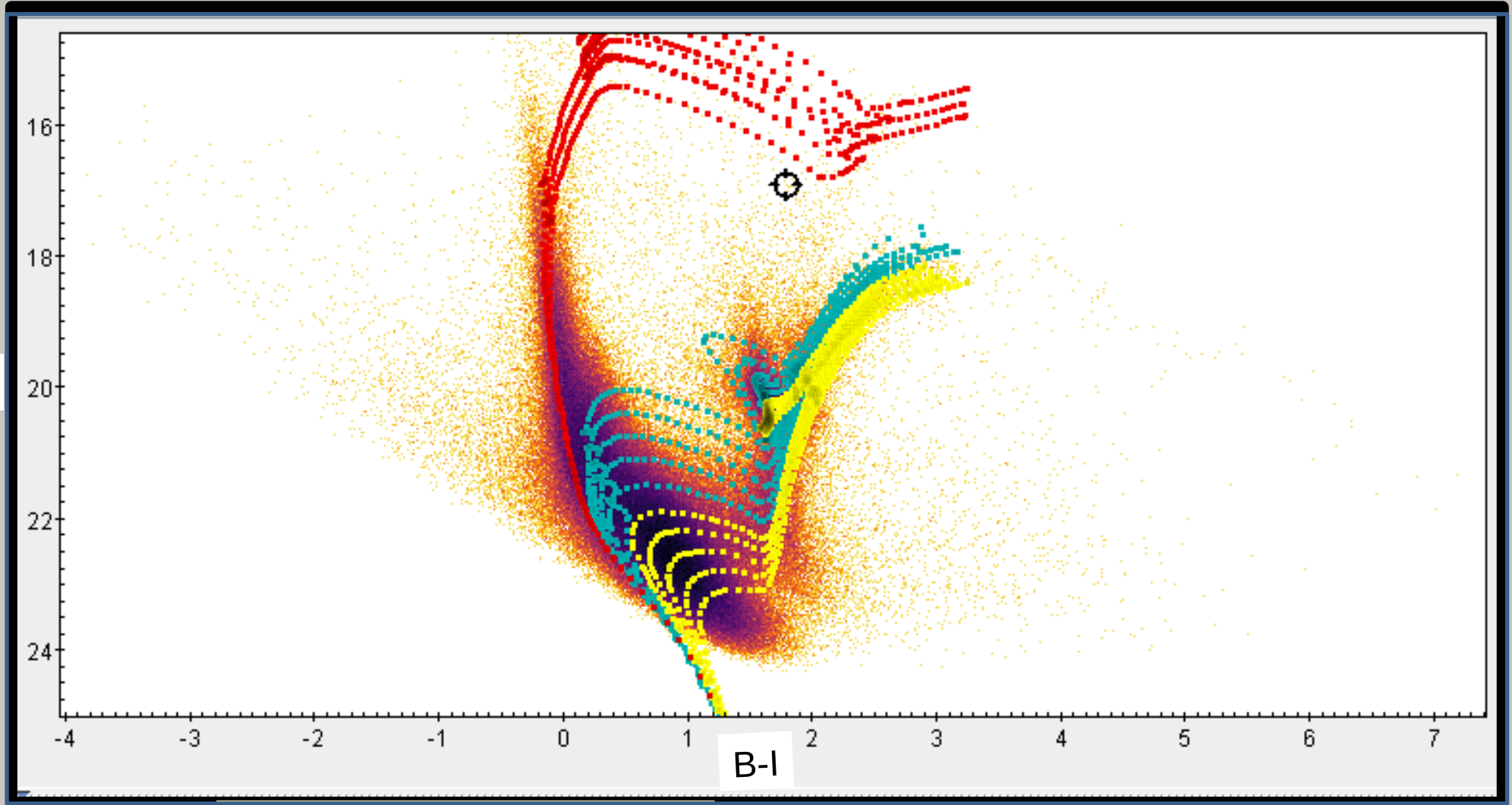


213268
sources



B-I

Diagram Color - Magnitude 0.44° F5



PARSEC Isochrones

$\log t = 7.6-7.8$ $Z = 0.001$

$\log t = 9.0-9.5$ $Z = 0.001$

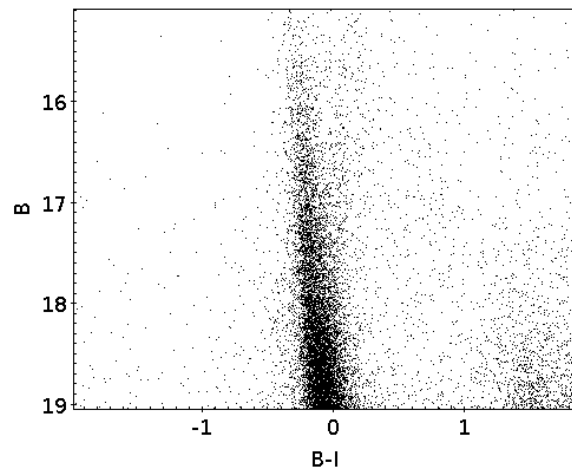
$\log t = 9.5-10.0$ $Z = 0.0005$

Assume $E(B-I) = 0.3$, $\delta B = 19.7$

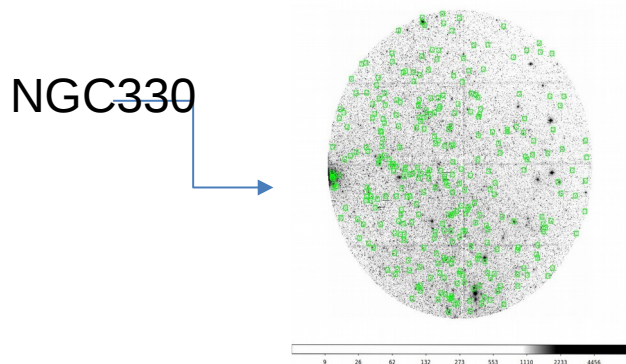
In order the curve passes from the clump

A first study: CMD – Field 5

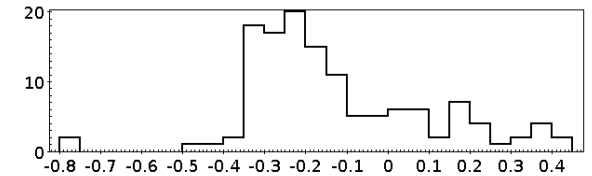
Burst of star formation or
star cluster dilution ?



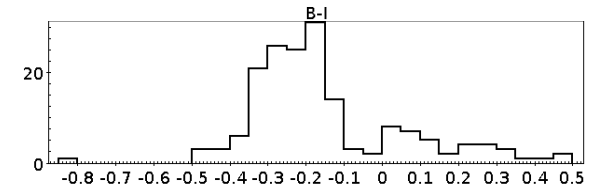
Connection with star cluster
NGC330



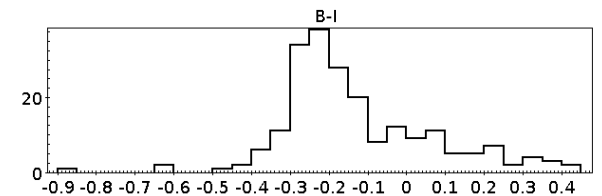
$15.75 \leq B < 16$



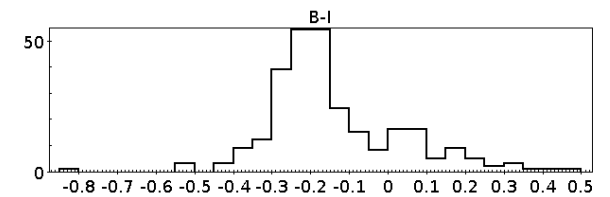
$16 \leq B < 16.25$



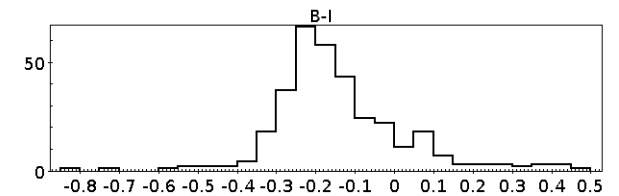
$16.25 \leq B < 16.5$



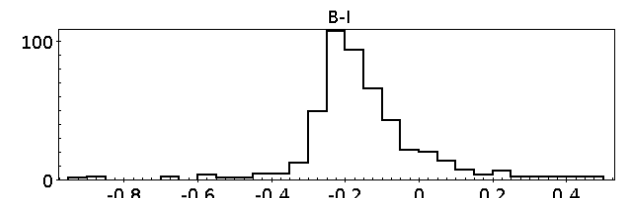
$16.5 \leq B < 16.75$



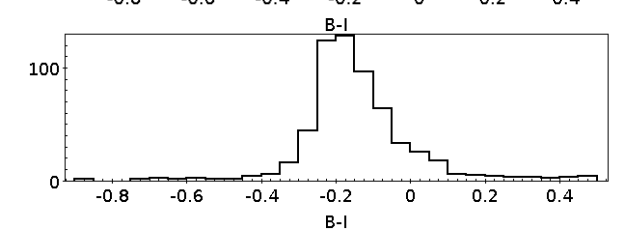
$16.75 \leq B < 17$



$17 \leq B < 17.25$



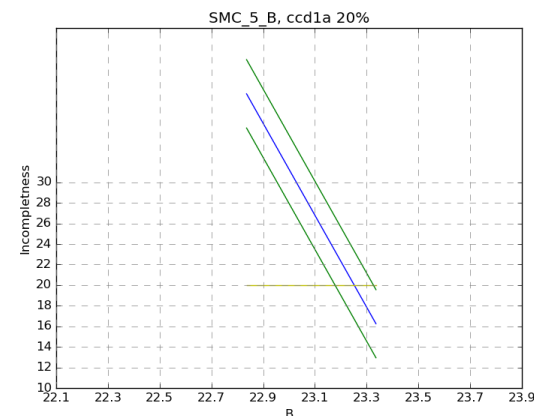
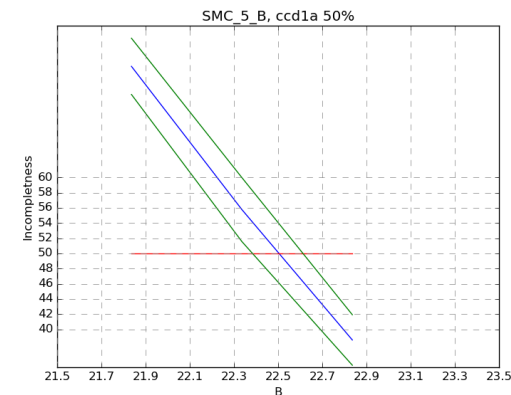
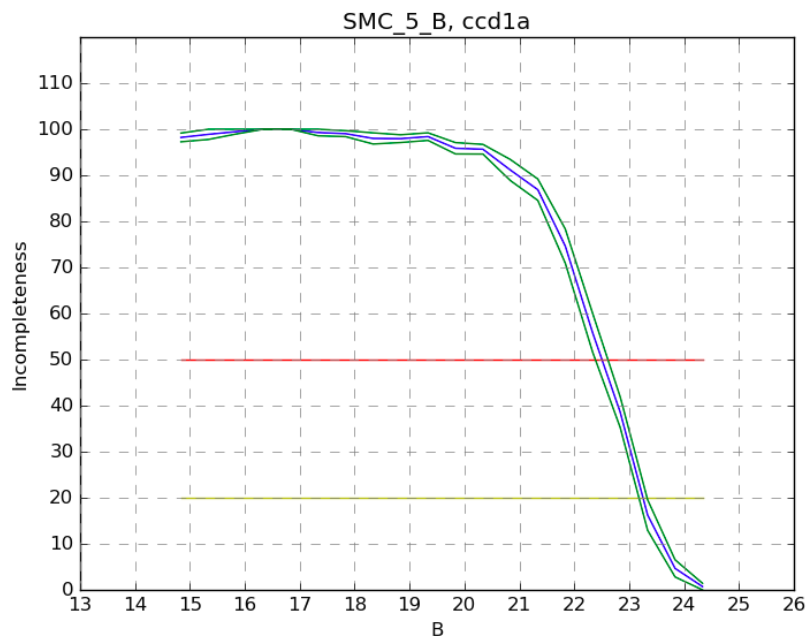
$17.25 \leq B < 17.5$



Completeness

Artificial stars is **7.5-8% of the total stars**. It has uniform distribution from **14.5 mag to 24.5 mag**.

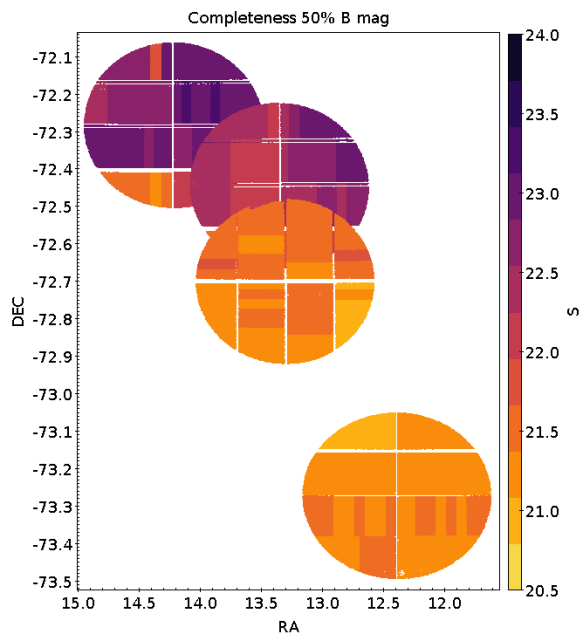
- Repeat the same process (is the same process with previous photometry) **ten times**.
- Input and output **positions** agree within **0.7 pixels** and the **fluxes** agree within **0.7 mag** similarly.



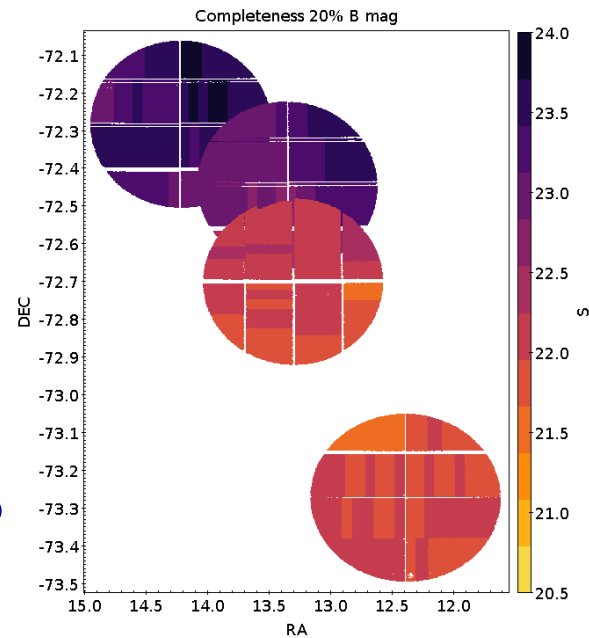
Map of Completeness

**Completeness
of B**

50%

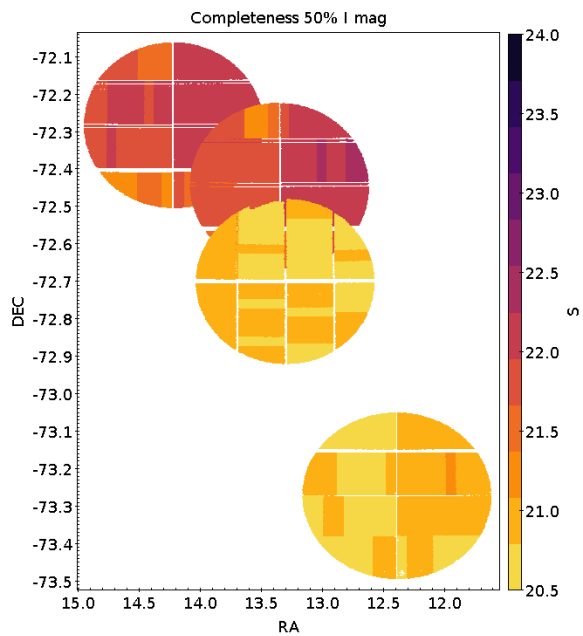


20%

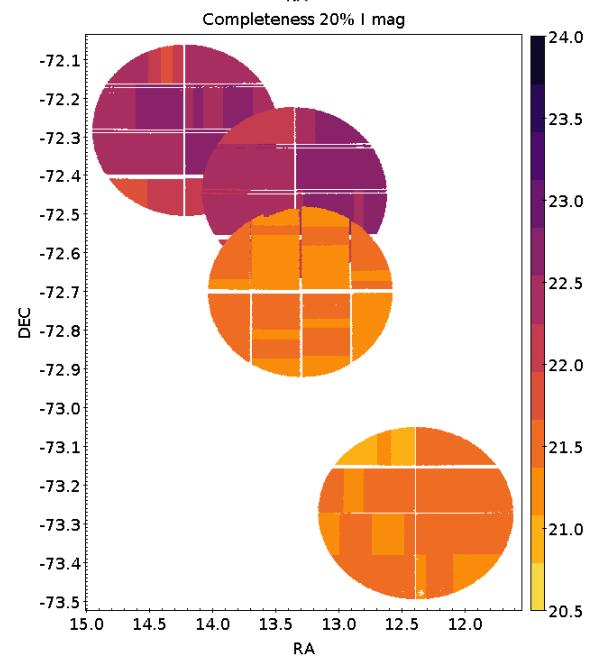


**Completeness
of I**

50%

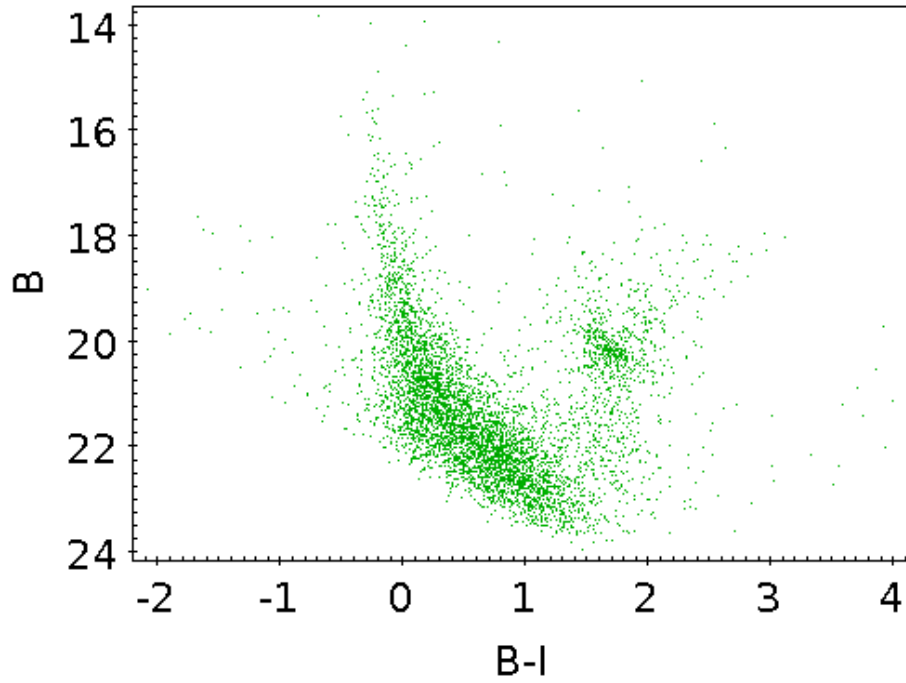


20%

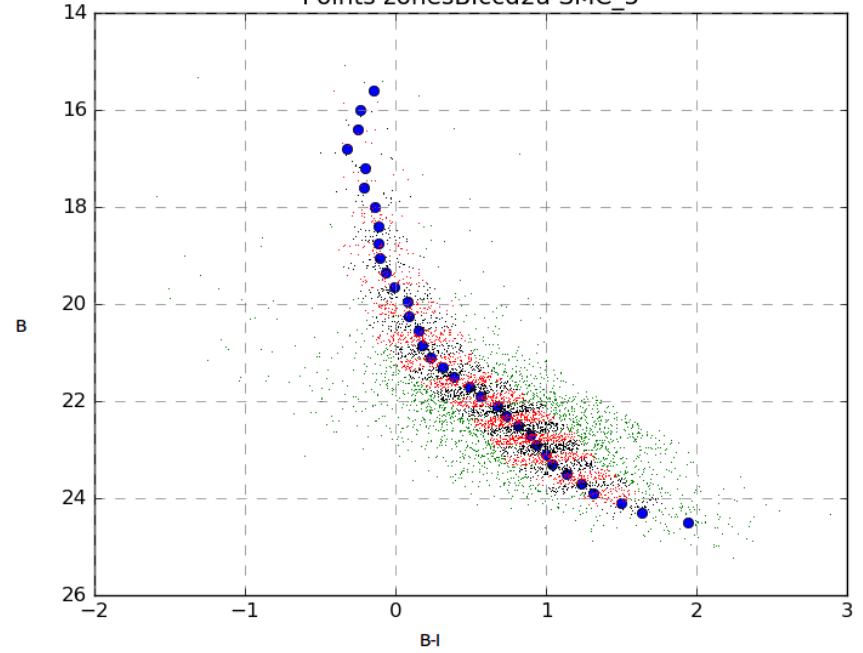


Luminosity Function of Main Sequence

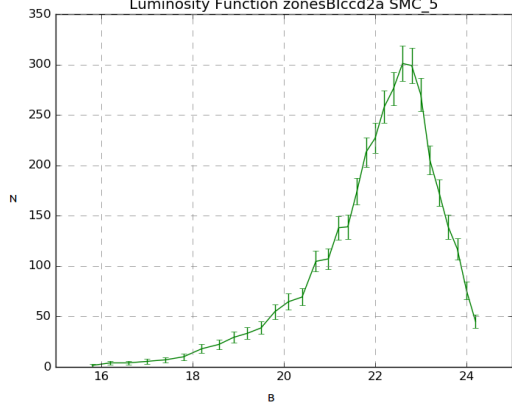
CMD ccd2a



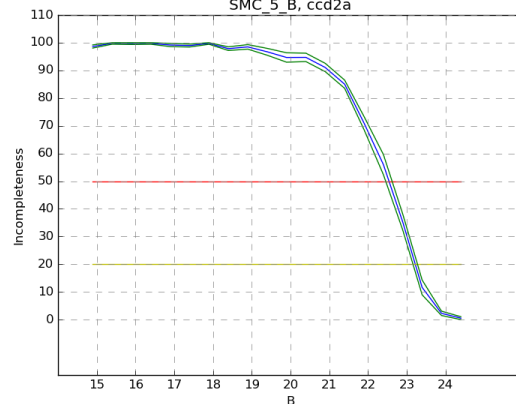
Points zonesBlccd2a SMC_5



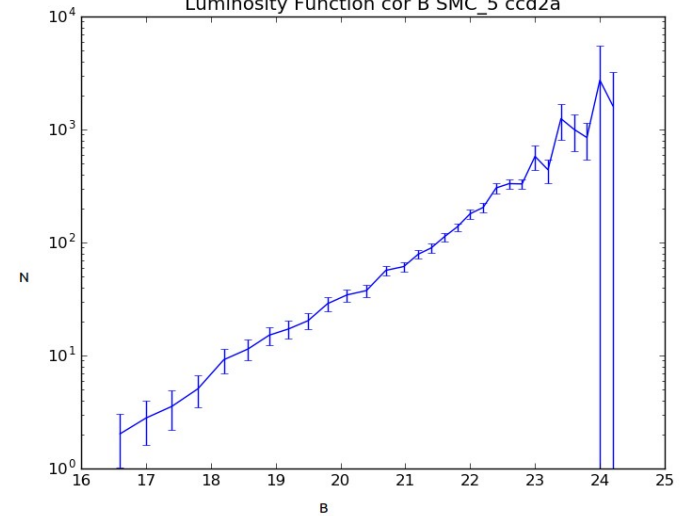
Luminosity Function zonesBlccd2a SMC_5



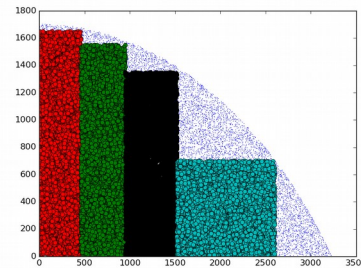
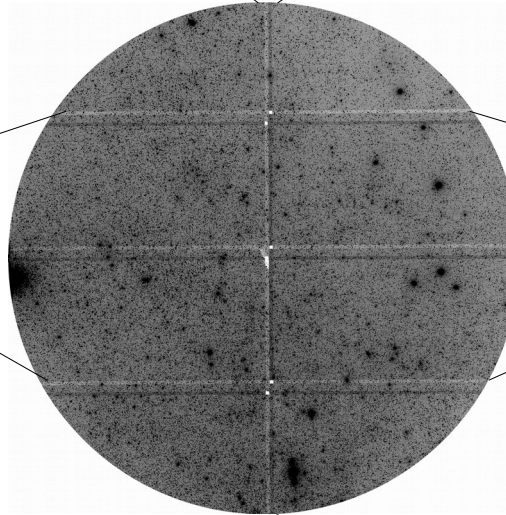
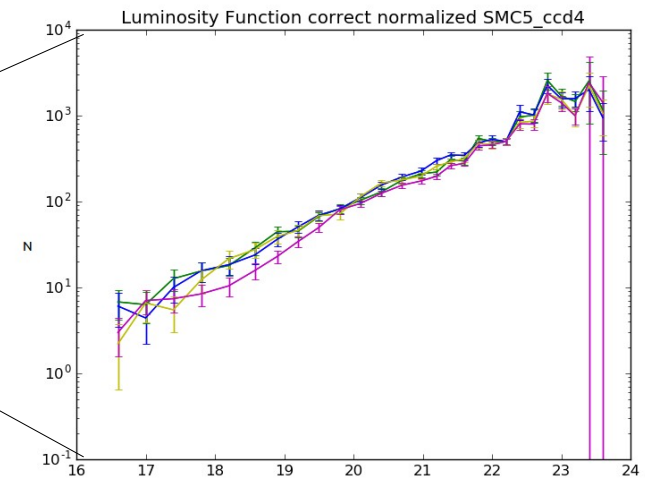
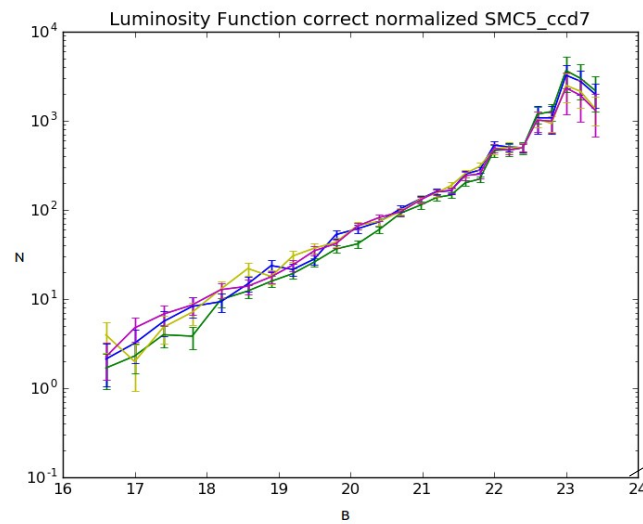
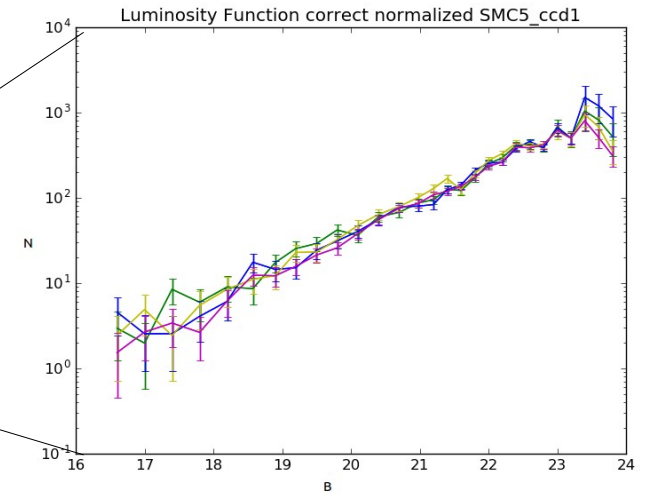
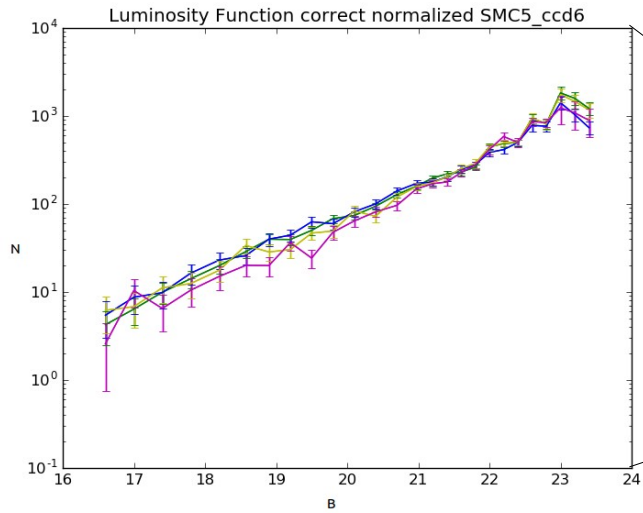
SMC_5_B, ccd2a



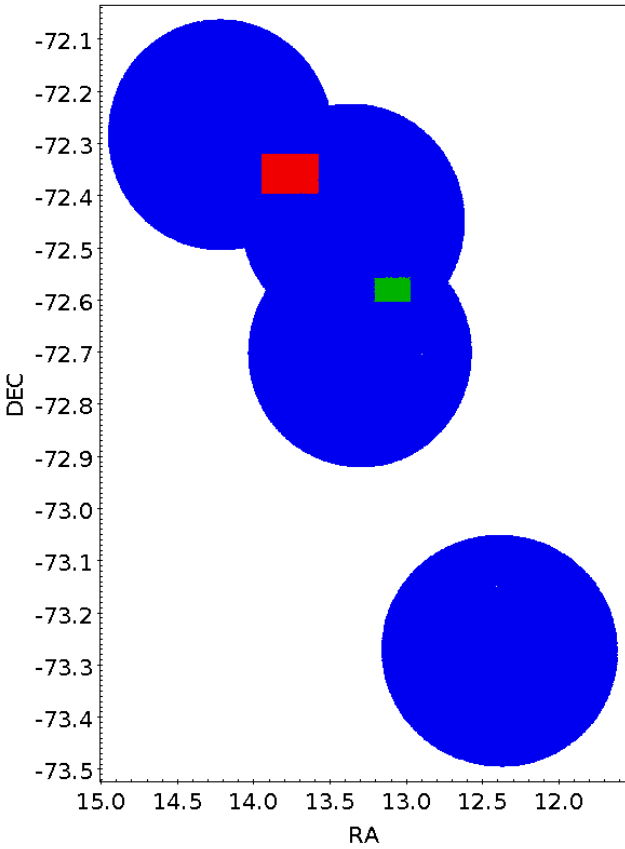
Luminosity Function cor B SMC_5 ccd2a



Diagrams of Luminosity Function of the Field 5

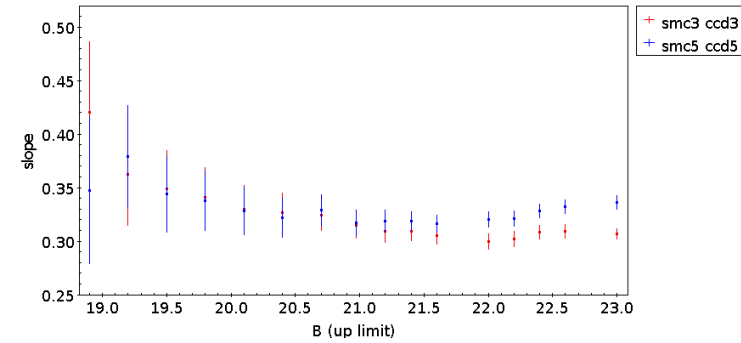
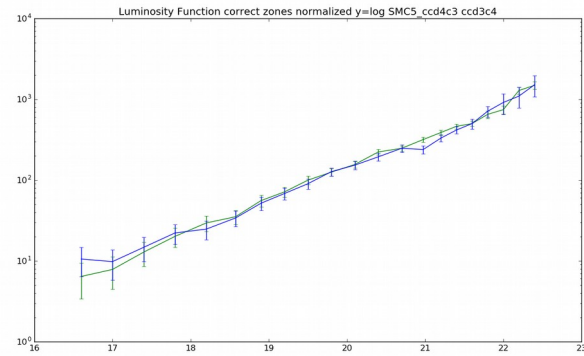


Comparison Luminosity Function of common fields

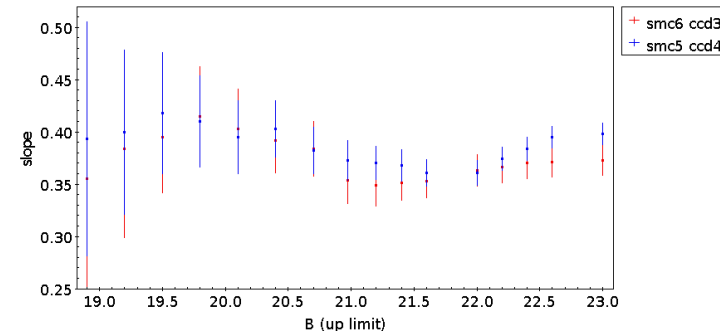
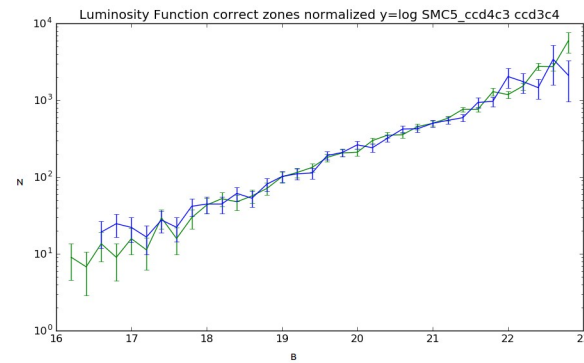
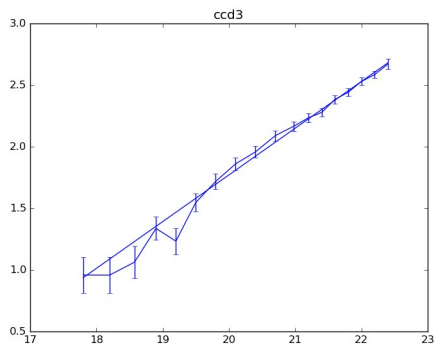


• smc3-smc5 ccd3-ccd5
• smc5-smc6 ccd4-ccd3

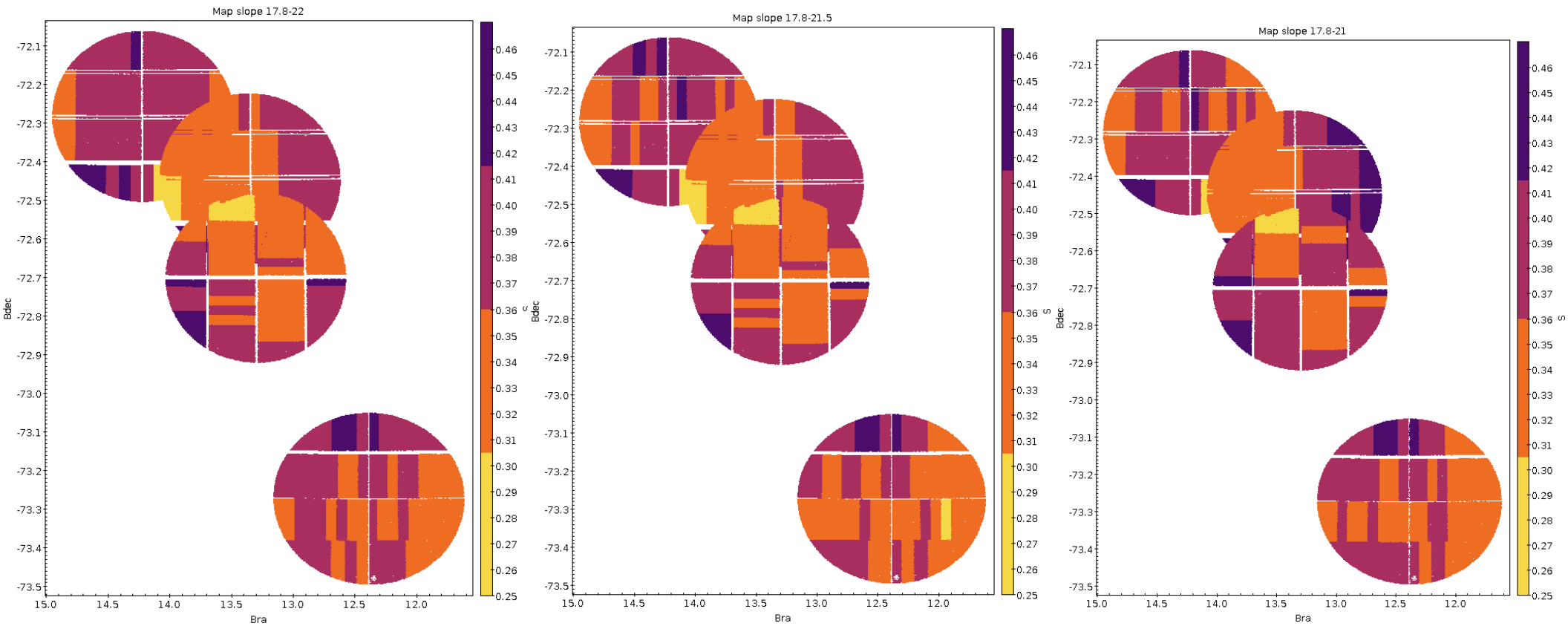
smc3-smc5 ccd3-ccd5



smc5-smc6 ccd4-ccd3



Maps of slope of Luminosity Function



**Slope's limits 17.8-
22.0**

**Slope's limits 17.8-
21.5**

**Slope's limits 17.8-
21.0**

The yellow regions are dominated by younger stars

The purple regions are dominated by older stars

Study of star cluster

Identification of star clusters

- Friend of Friend algorithm
- isopleth contours
- radial profiles and CMD's of the
- identified clusters

