

OGLE-ing the Magellanic System: Stellar Populations in the Magellanic Bridge

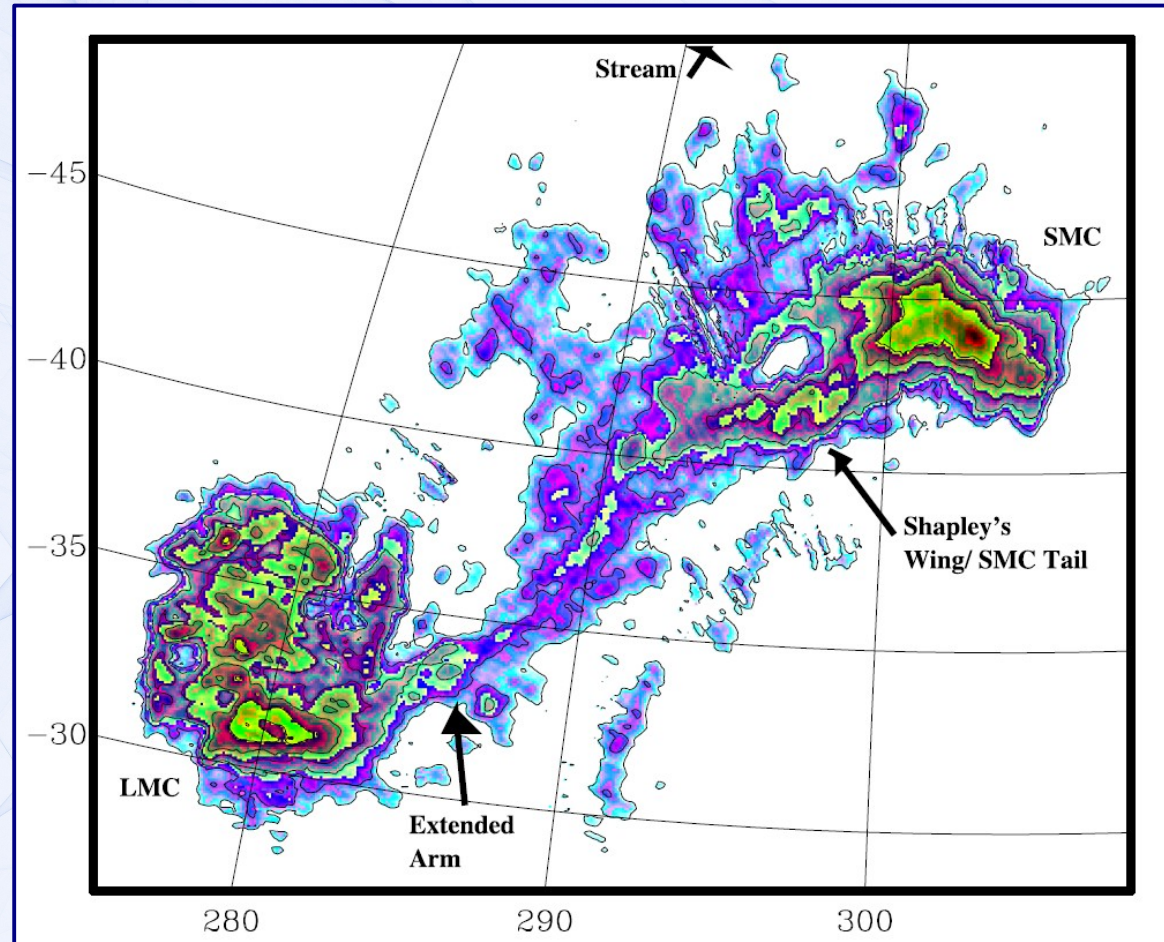
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Stellar Populations between the Magellanic Clouds

- The **Magellanic Bridge** is a direct evidence for interactions between the Magellanic Clouds
- Contains neutral and ionised gas
- Young stars have been observed in the western part of the Bridge (Shapley's Wing) but not in the eastern Bridge
- A search for old populations revealed no old stars in the Bridge (Harris 2007)
- However, recent work by Noel *et al.* (2013) and Bagheri *et al.* (2013) did show older population candidates in the Bridge



Neutral Hydrogen column density map of the Magellanic Bridge in Galactic coordinates, from Putman *et al.* (2000)

OGLE Sky Survey

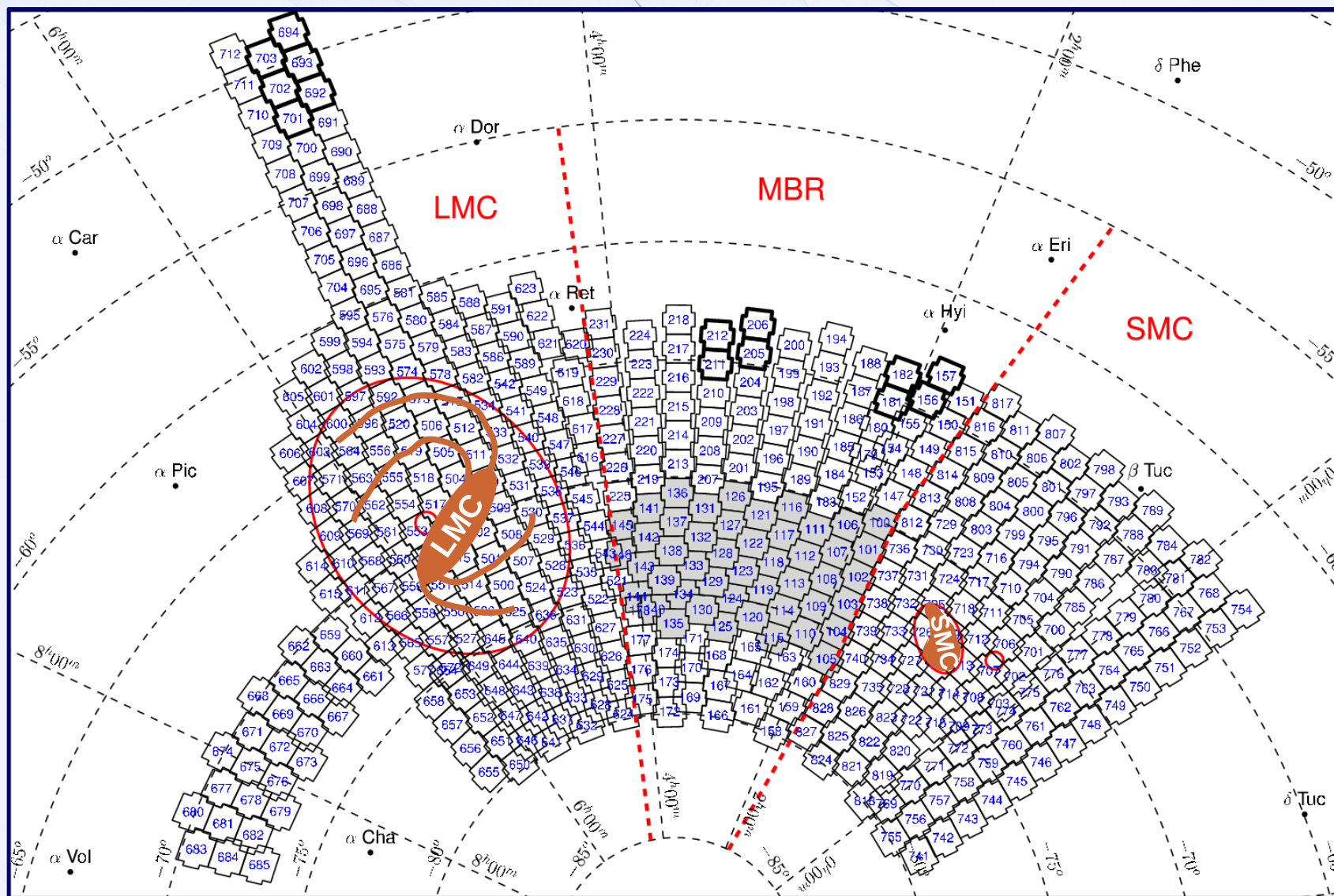
- Continuous, decades-long coverage of
 - Galactic Bulge
 - Milky Way disk
 - Magellanic System
- Located at Las Campanas Observatory, Chile
- 1.3-m telescope with a 268 Mpx camera and 1.4 deg^2 FoV
- *I* and *V-band* filters
- Magnitude range $\sim 12\text{--}21 \text{ mag}$

More about OGLE on Wednesday
in the talk by Szymon Kozłowski:



OGLE-IV: The Largest Survey of Resolved Stellar Populations

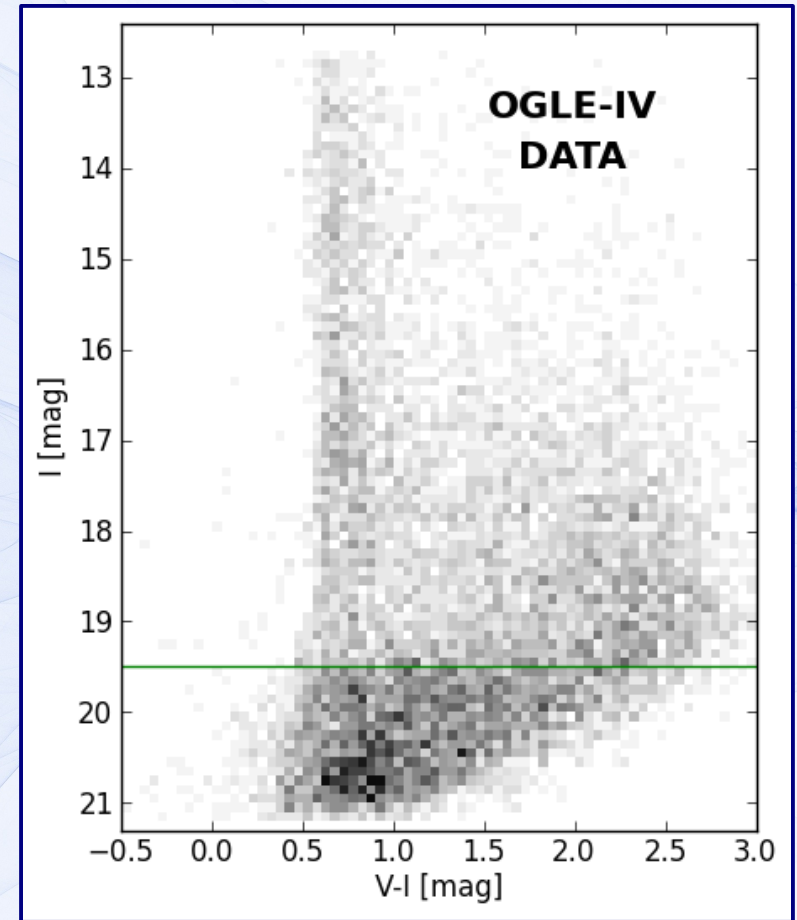
OGLE-IV Sky Coverage in the Magellanic Clouds



670 deg² of coverage in search for stellar variability (every ~2–5 days)
--> a live movie of the whole Magellanic System

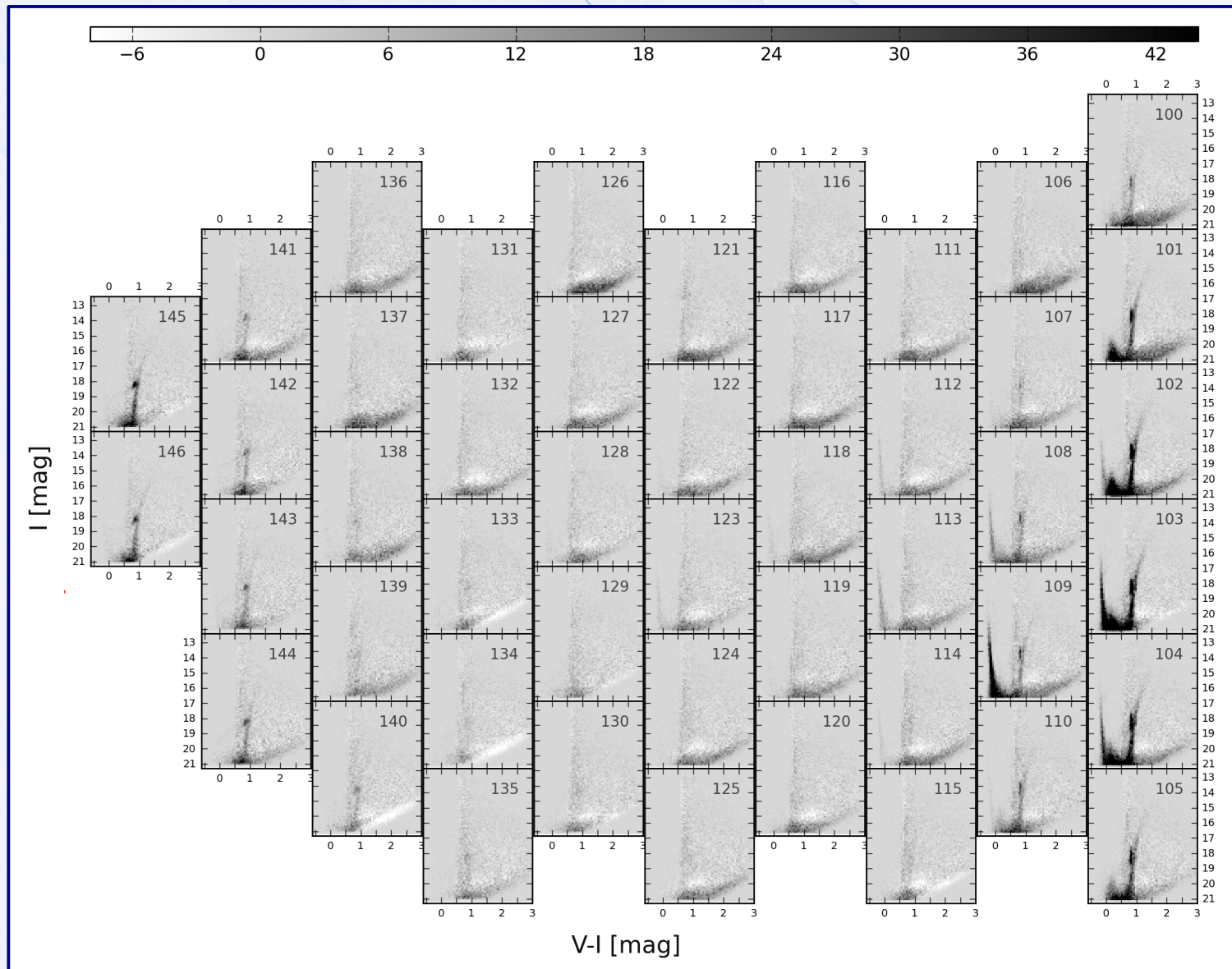
Data Preparation

- About **280** epochs in I and **30** in V for the shaded region (main Bridge) and about 85 in I and 8 in V for the rest, averaged
- Data were cleaned from artifacts, duplicates, and stellar clusters, and corrected for interstellar extinction
- Only data within completeness limits of the luminosity function were used
- Galactic foreground was accounted for by subtracting Galactic Hess diagrams from science Hess diagrams



Galactic Hess diagram

Color-Magnitude Diagrams in the Central Bridge



Galaxy-subtracted Hess diagrams of the „classical” Bridge

Population Selection Regions on a Cumulative CMD

YOUNG POPULATION

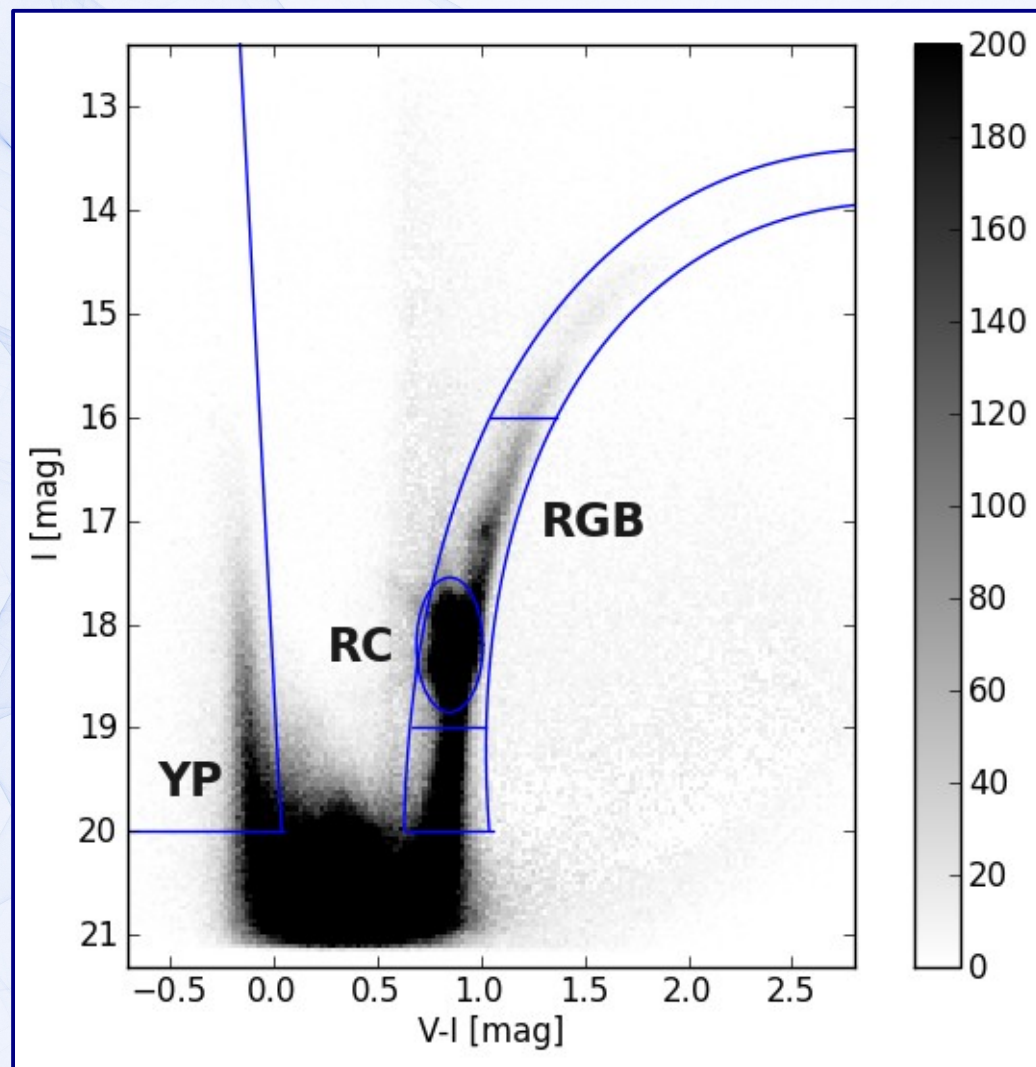
- **YP** – ages < 1 Gyr

INTERMEDIATE AGE

- **RC** – red clump stars
ages ~ 1 to a few Gyr
- **RGB TOP** – top part of the red giant branch stars and asymptotic giant branch stars

OLD POPULATION

- **RGB BOTTOM** – oldest stars that only started evolving off the Main Sequence

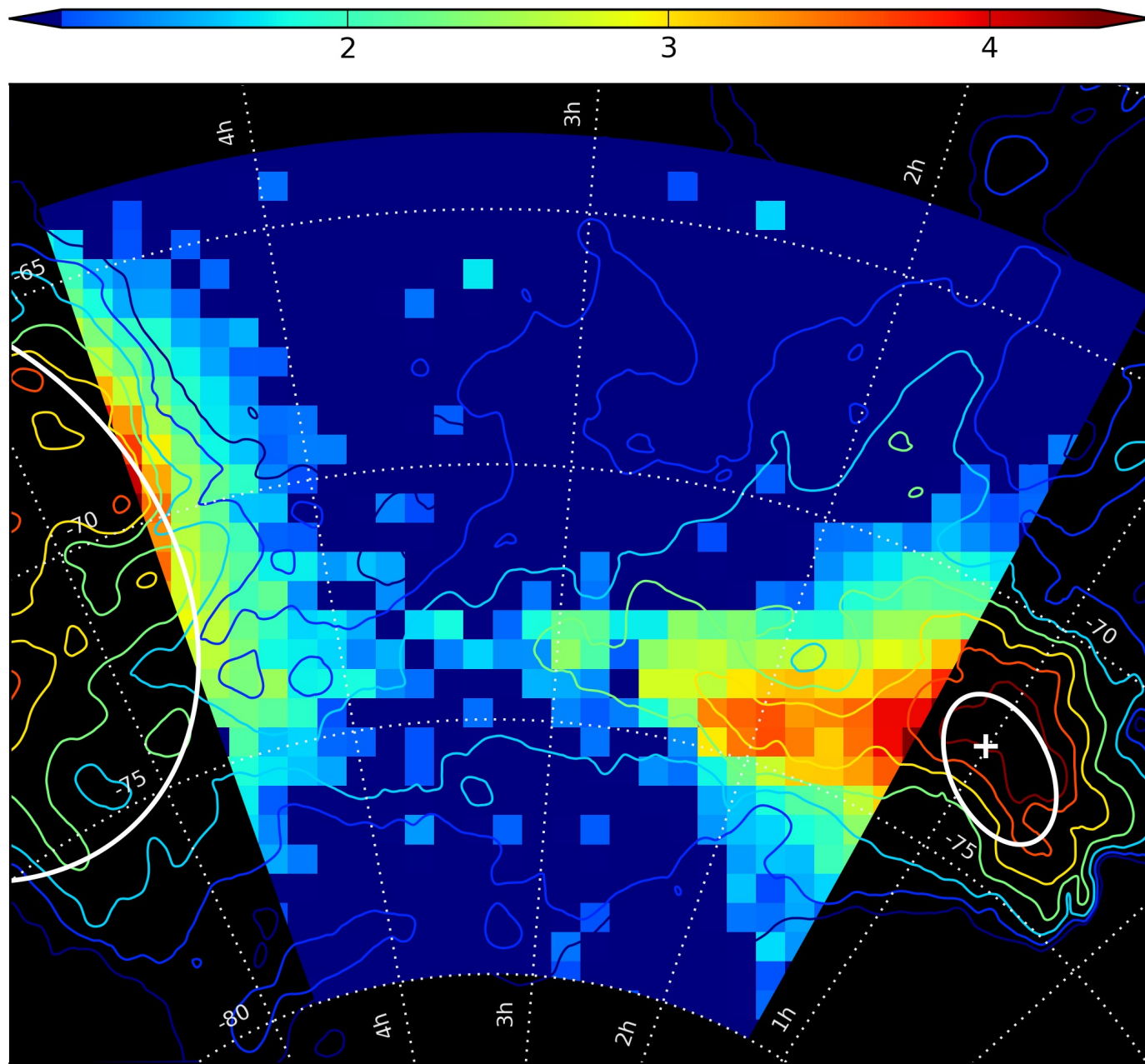


Hess diagram of the combined CMDs of 47 central Magellanic Bridge fields.

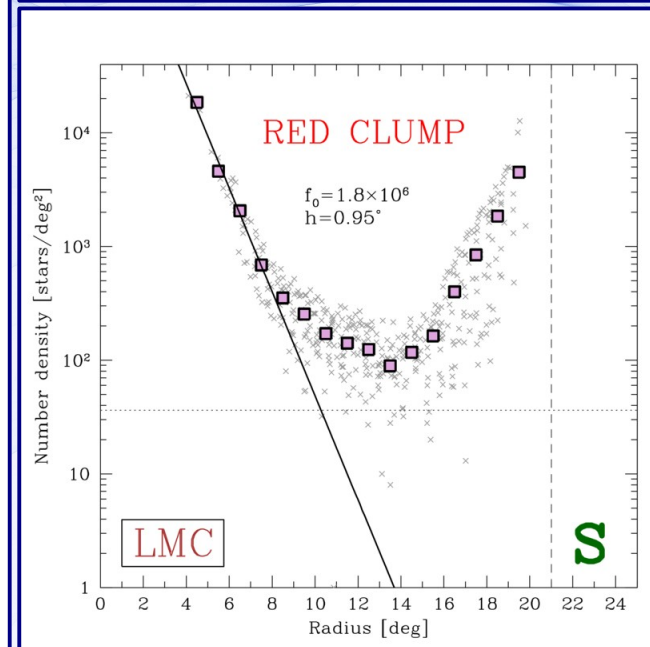
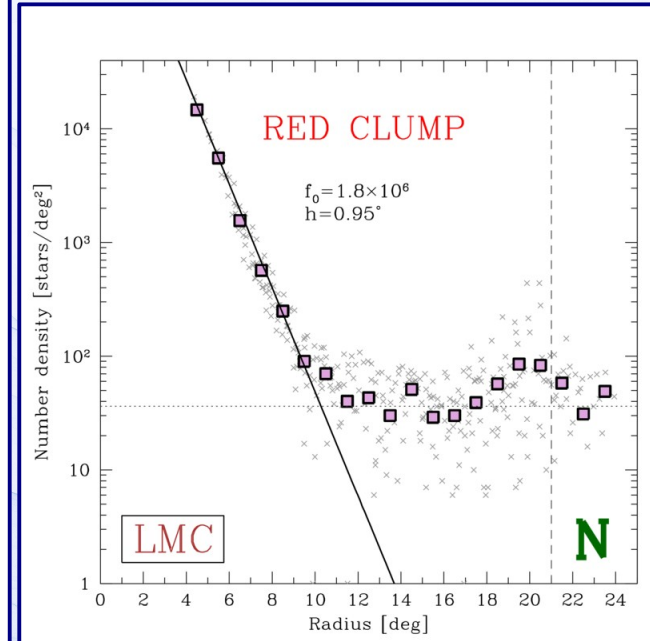
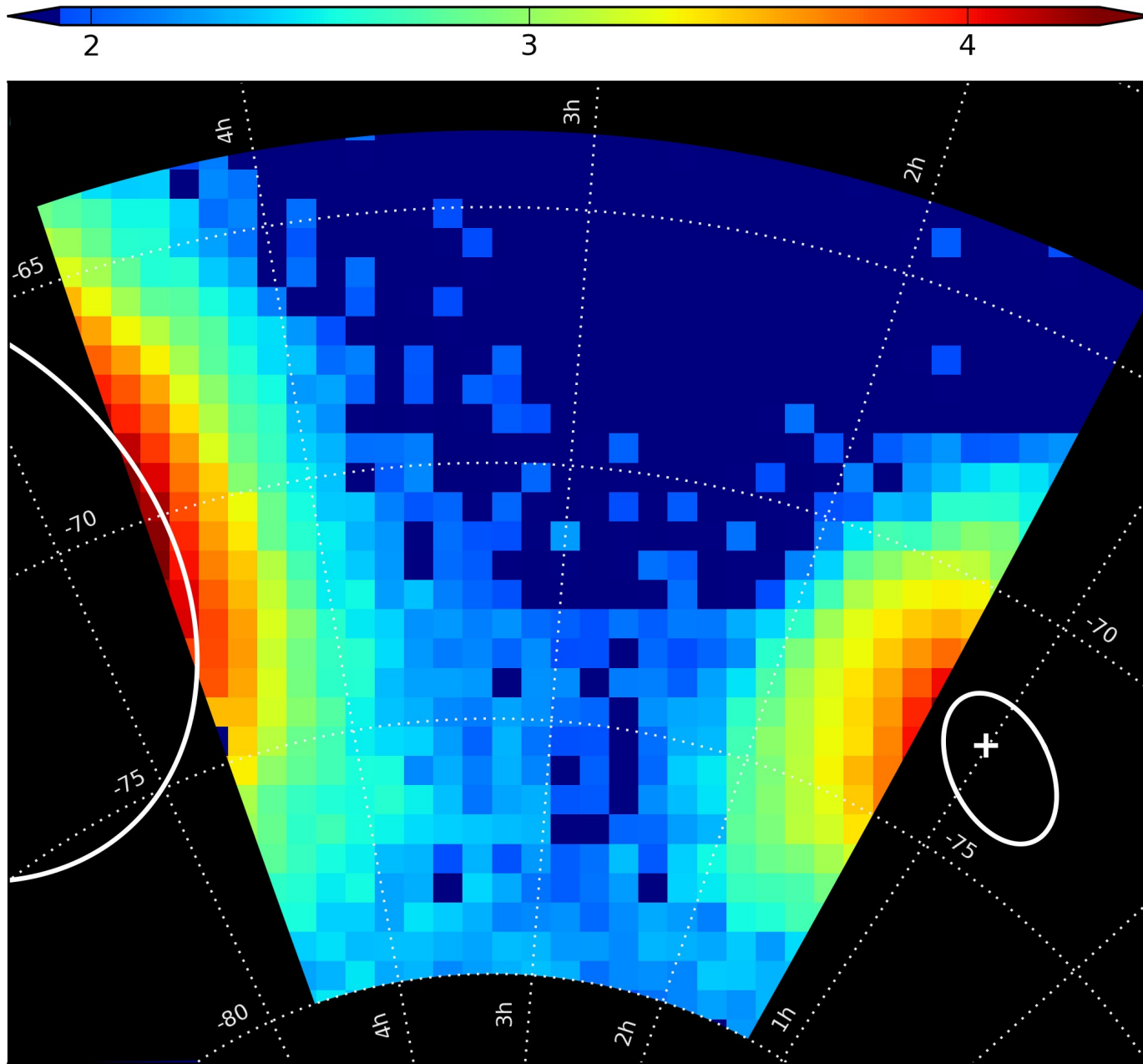
Final Results – Stellar Density Maps

- Data were subdivided into smaller regions: $\sim 0.33 \text{ deg}^2$ to increase spatial resolution of the maps
- Maps show **number of stars per square degree**, corrected for the completeness factor that originates from gaps between fields and chips, as well as masked regions around bright stars and clusters
- Only **detections $> 2 \sigma$** above the median background level are shown, the rest are given the background colour
- The **median background level** was calculated from 50 most northern fields
- The colourbar shows a **logarithm of the number of stars per square degree**
- Colour contours show HI column density levels from Kalberla *et al.* (2005)

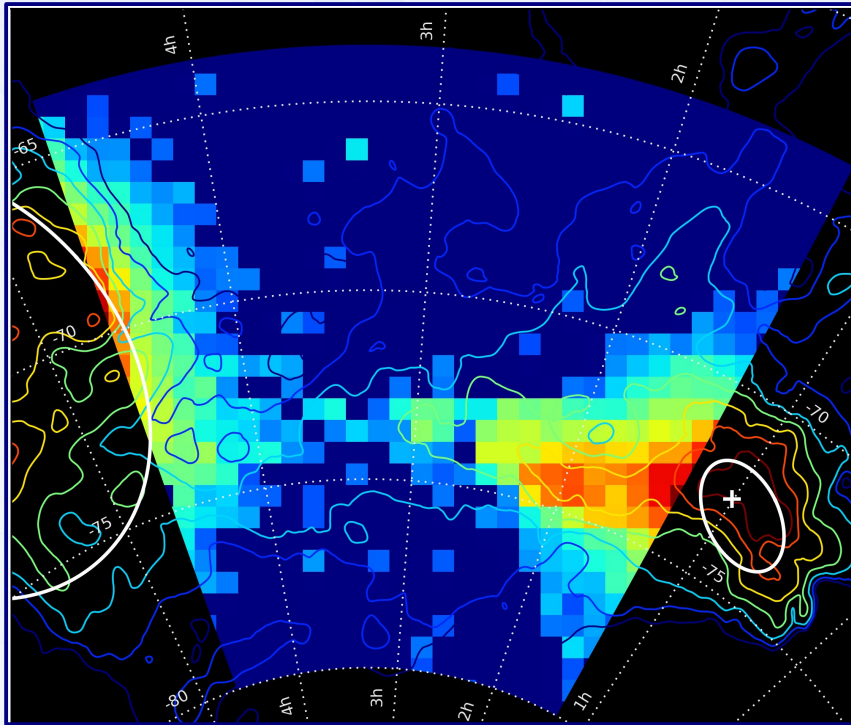
YOUNG POPULATION



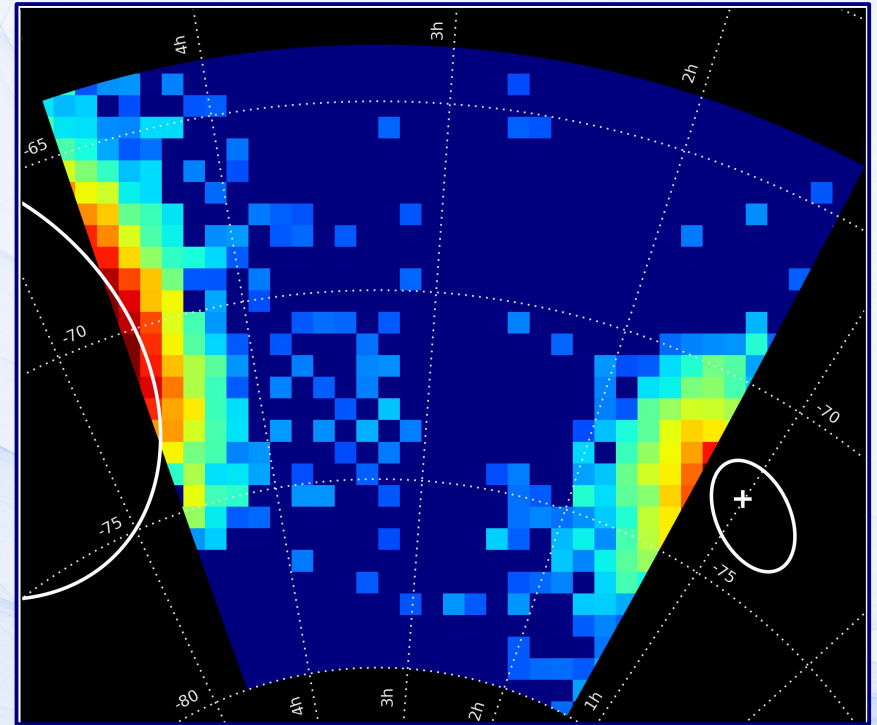
RED CLUMP



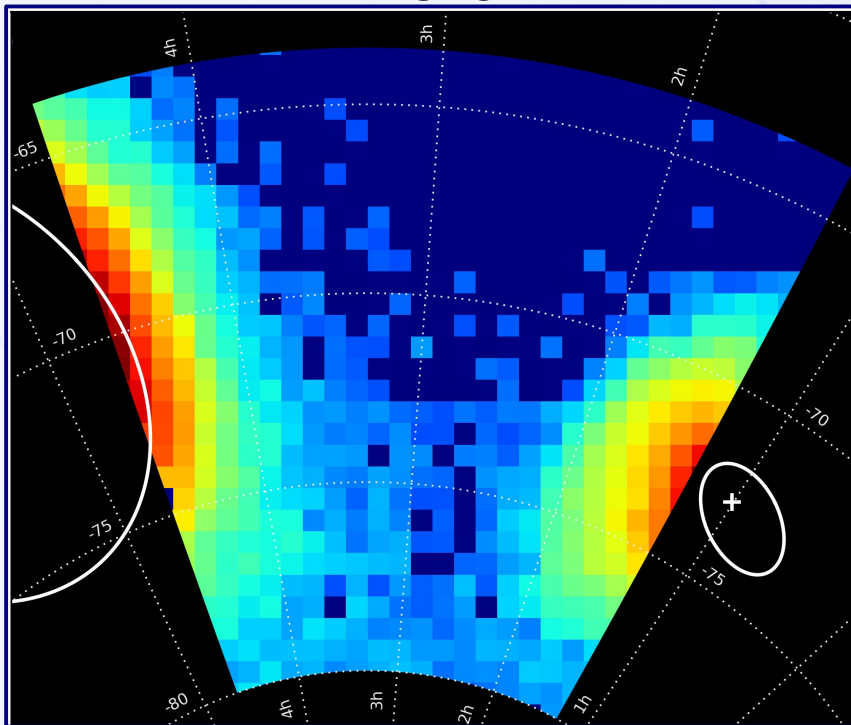
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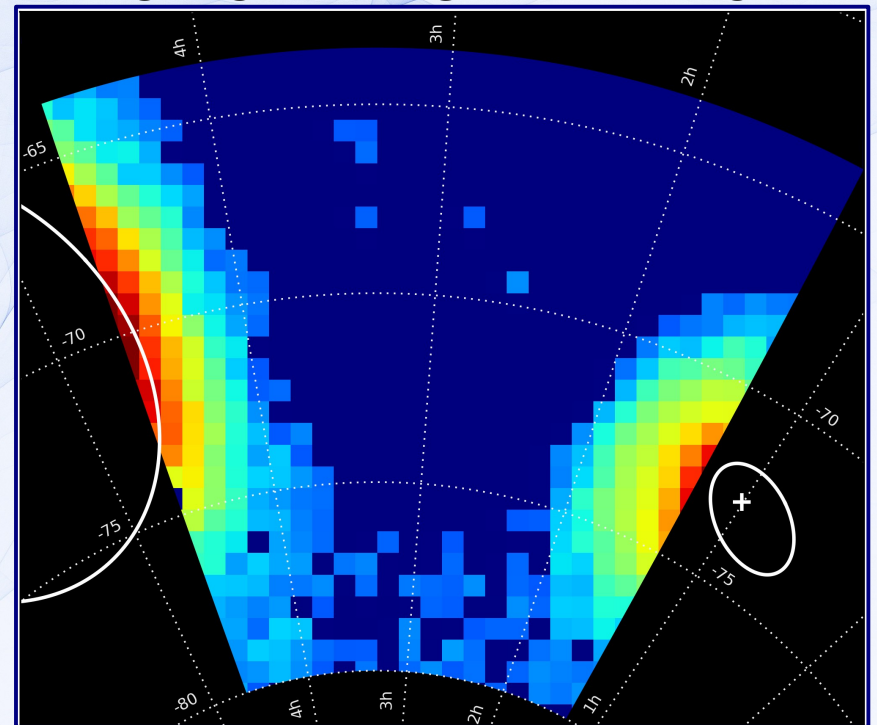
TOP RED GIANT BRANCH



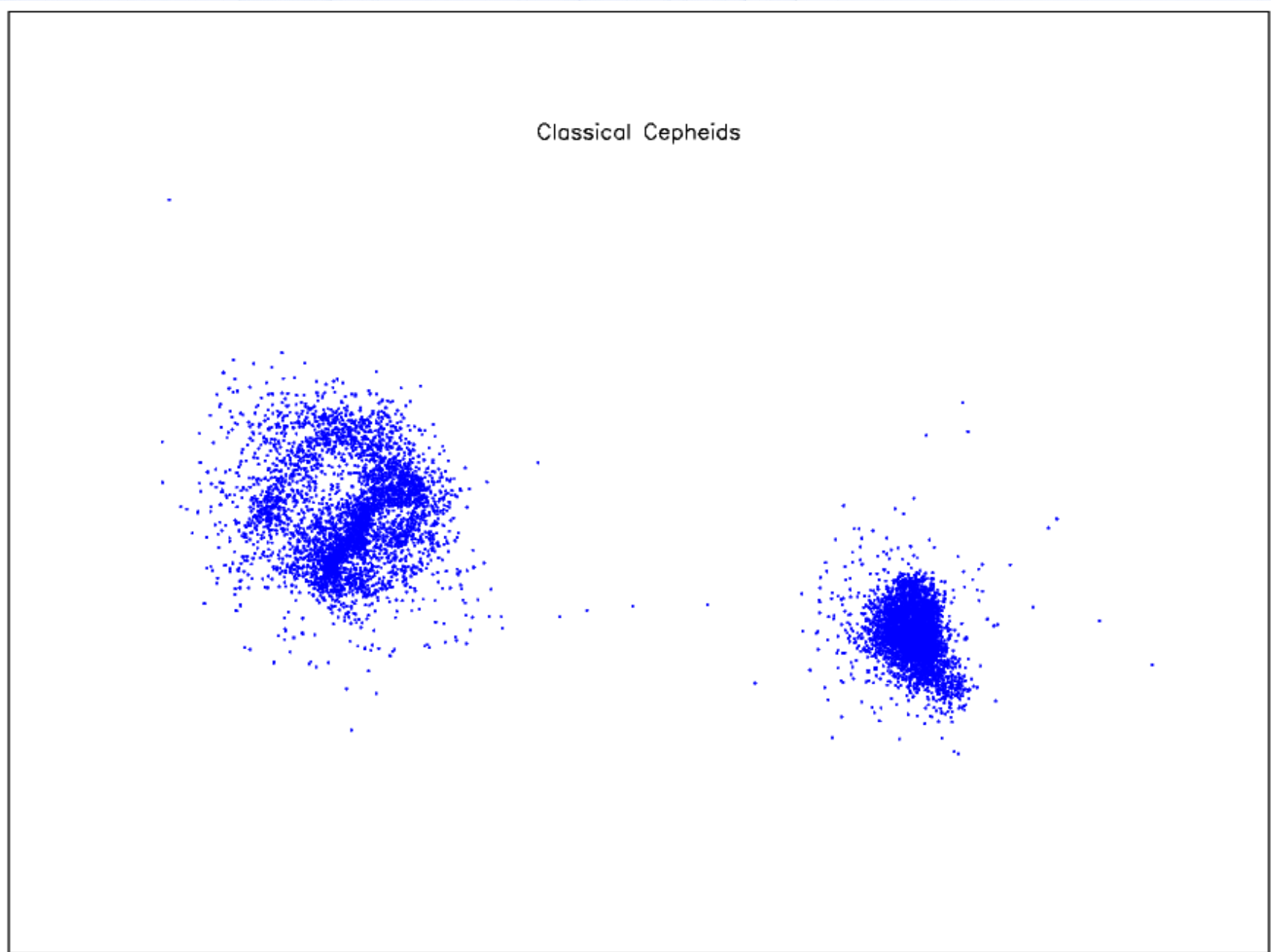
RED CLUMP



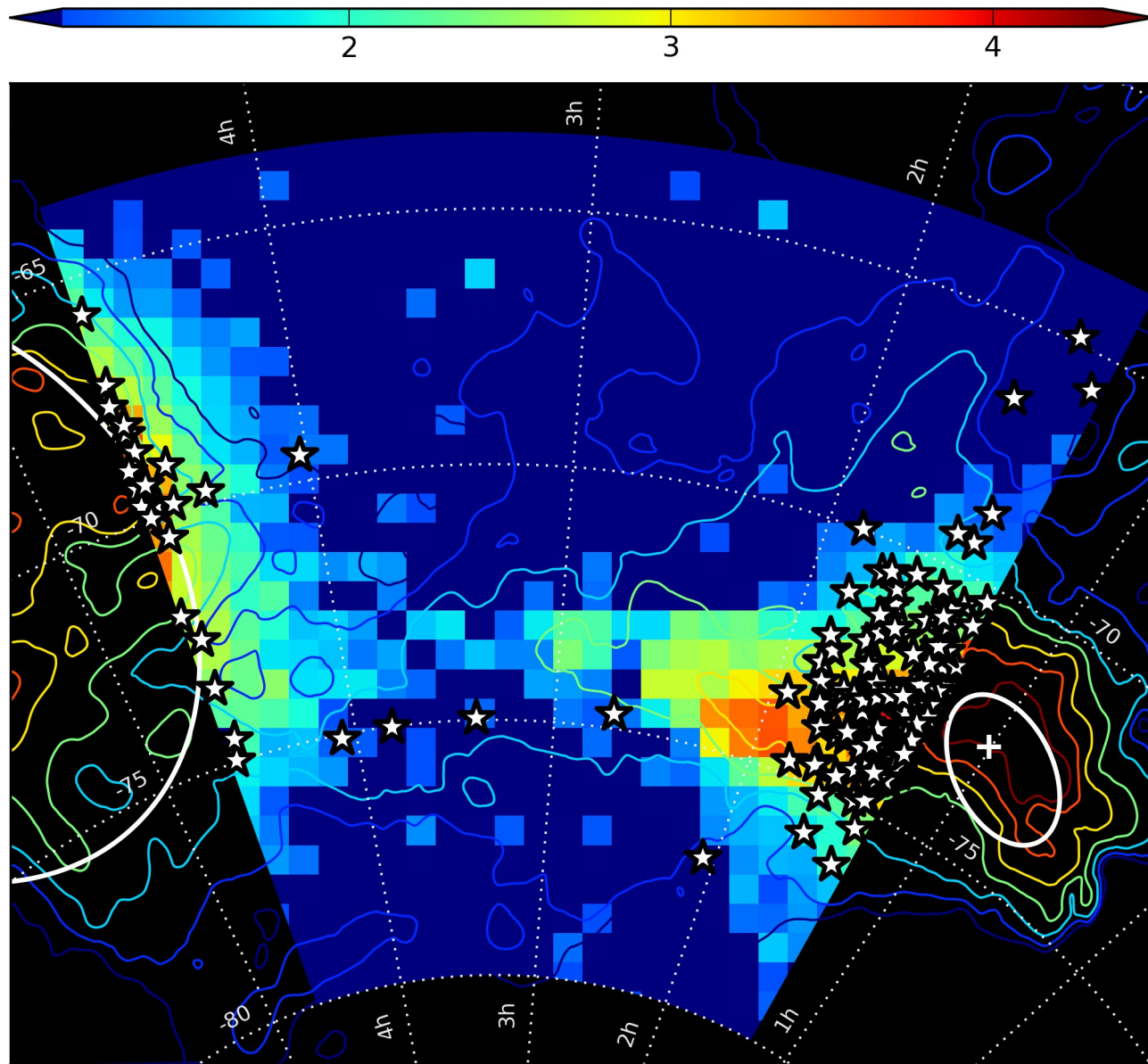
BOTTOM RED GIANT BRANCH



OGLE Cepheids in the Magellanic System



YOUNG POPULATION



Periods of these four cepheids are 1–3 days, indicating ages of 100–250 Myr.
This is consistent with a recent encounter of the MCs ~200 Myr ago.

Summary

- **OGLE Survey provides the first, complete view of the Magellanic System stellar populations**
- **There is a continuous stream of young stars connecting the Magellanic Clouds**
- **Intermediate-age populations of the Magellanic Clouds represented by Red Clump giants overlap**

**For a brief summary of this talk
see poster by [Anna Jacyszyn](#)**

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