

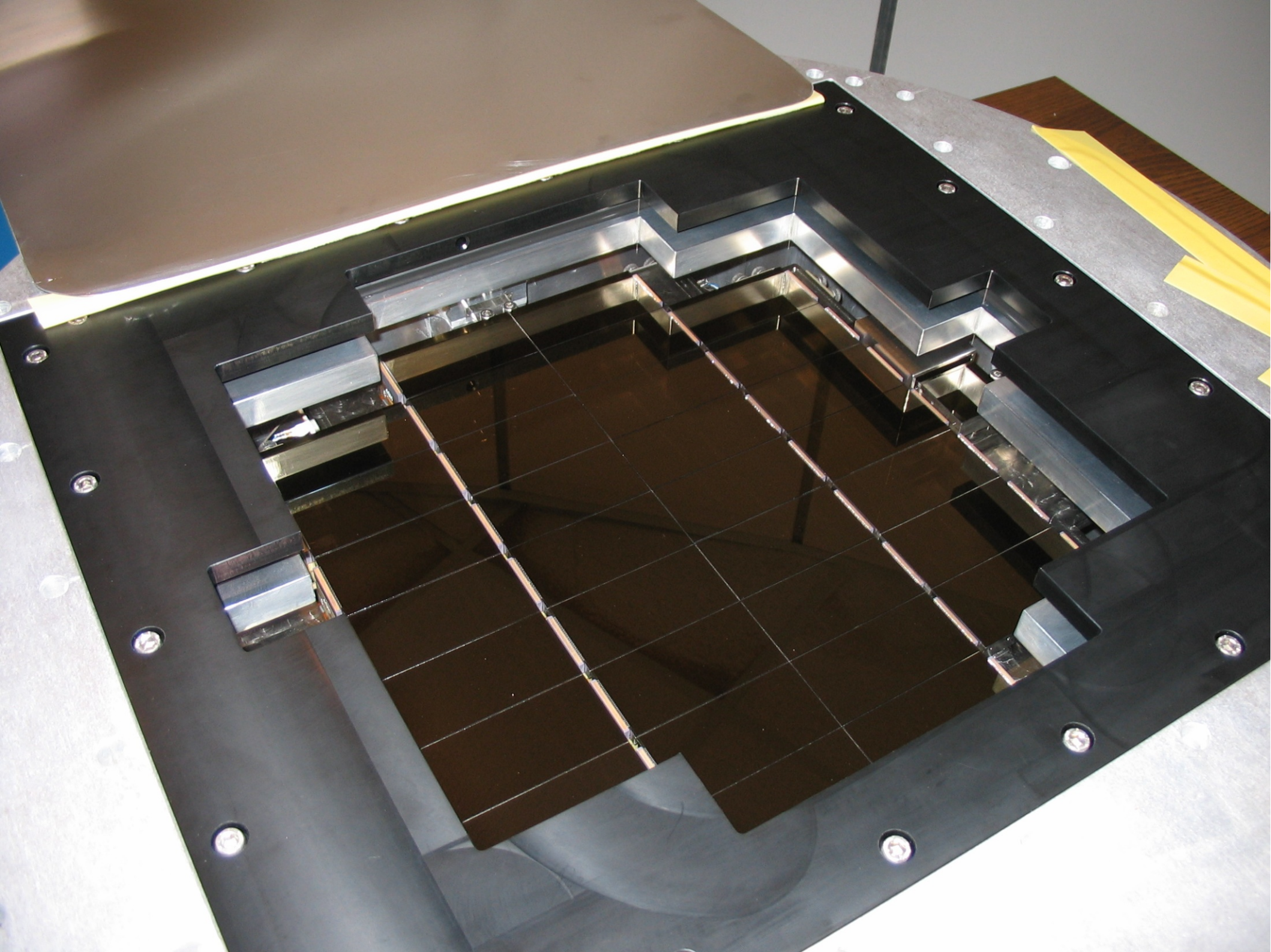
OGLE-IV

The Largest Survey of Resolved Stellar Populations

Szymon Kozłowski
Warsaw University Observatory

OGLE

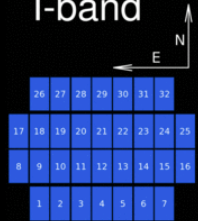




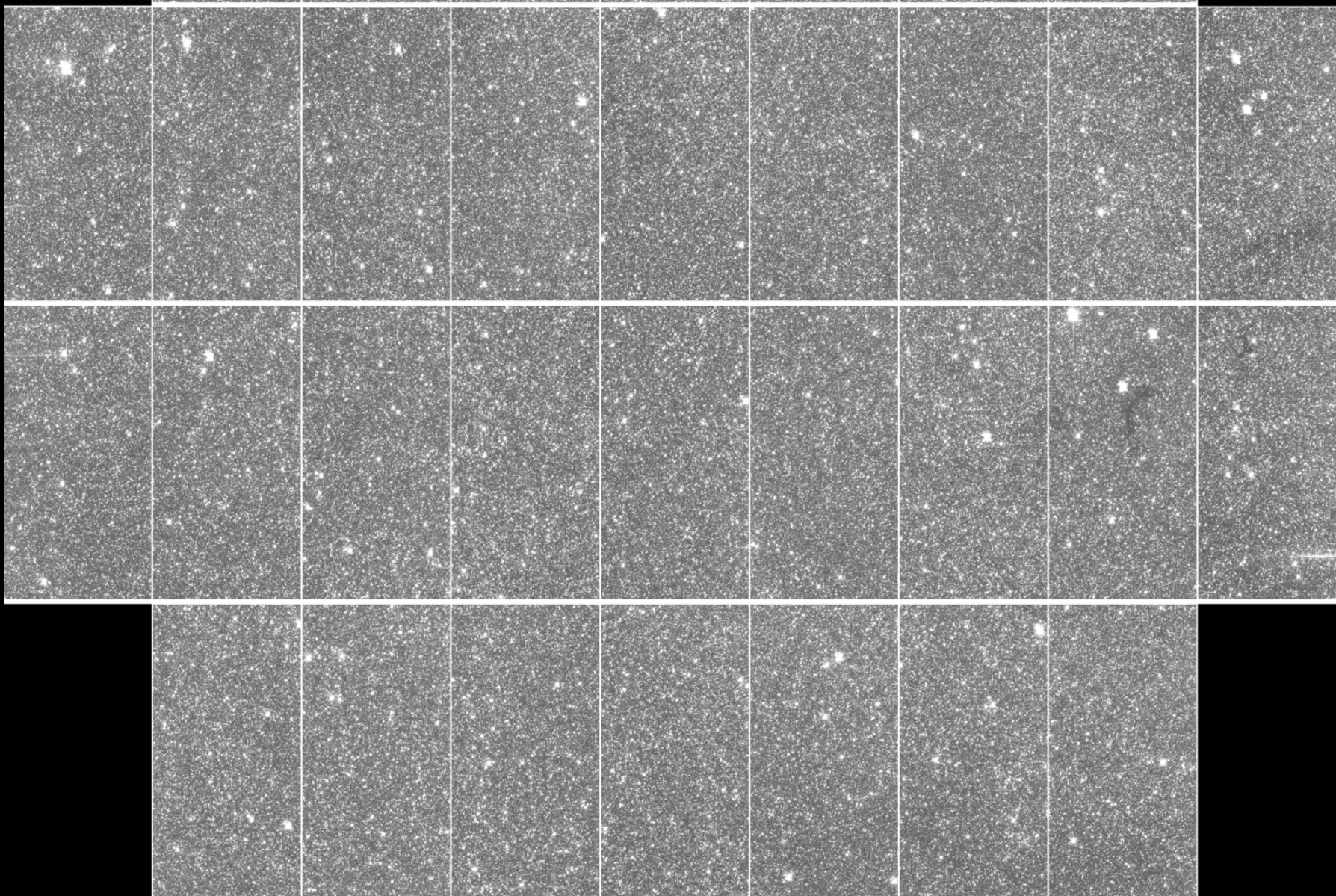
OGLE-IV

CCD mosaic

BLG509
I-band



1.4 deg²
268 Mpix
0.26"/pix



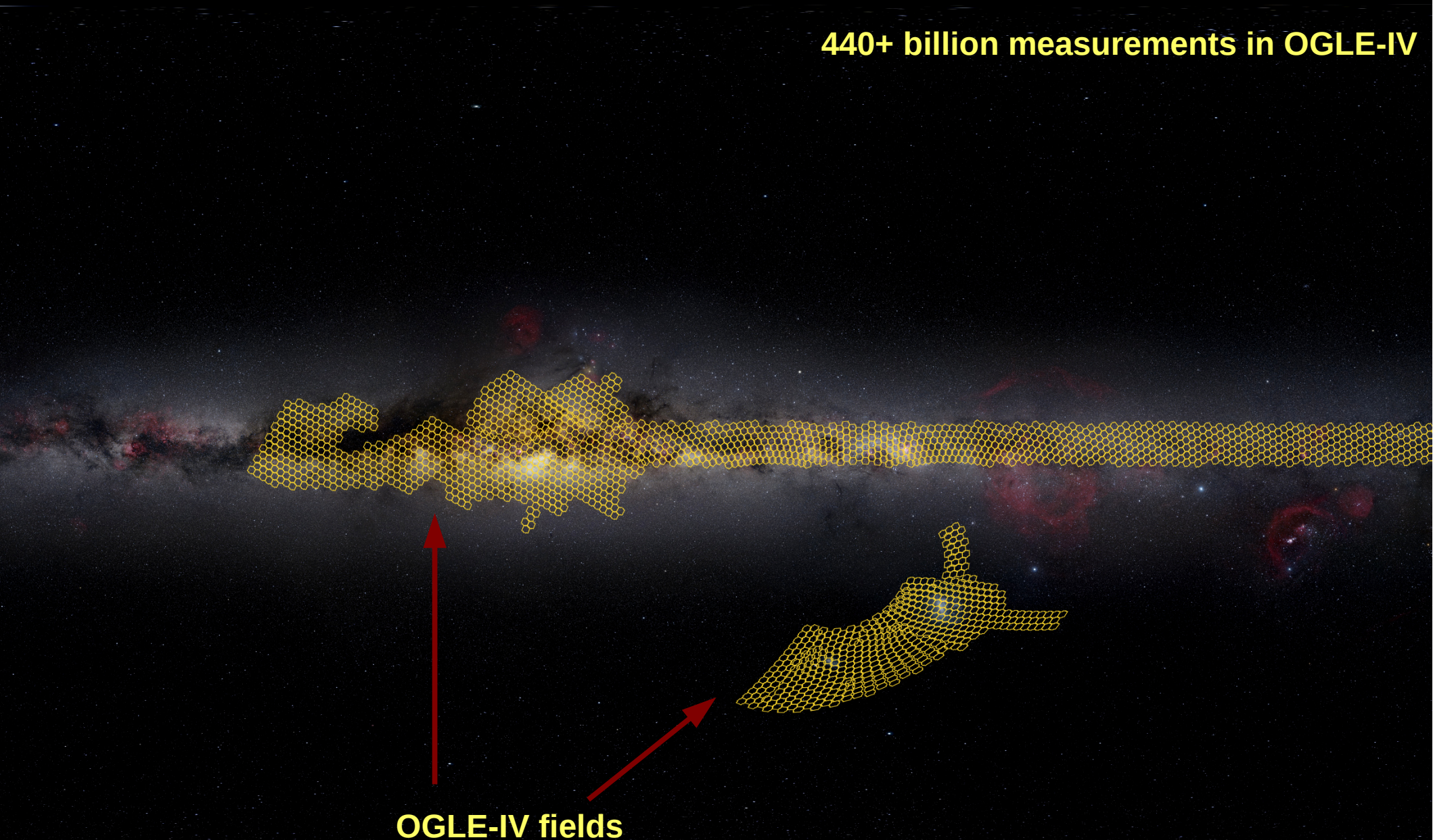
OGLE-IV Sky Coverage

3000 deg²

1.5 billion sources monitored

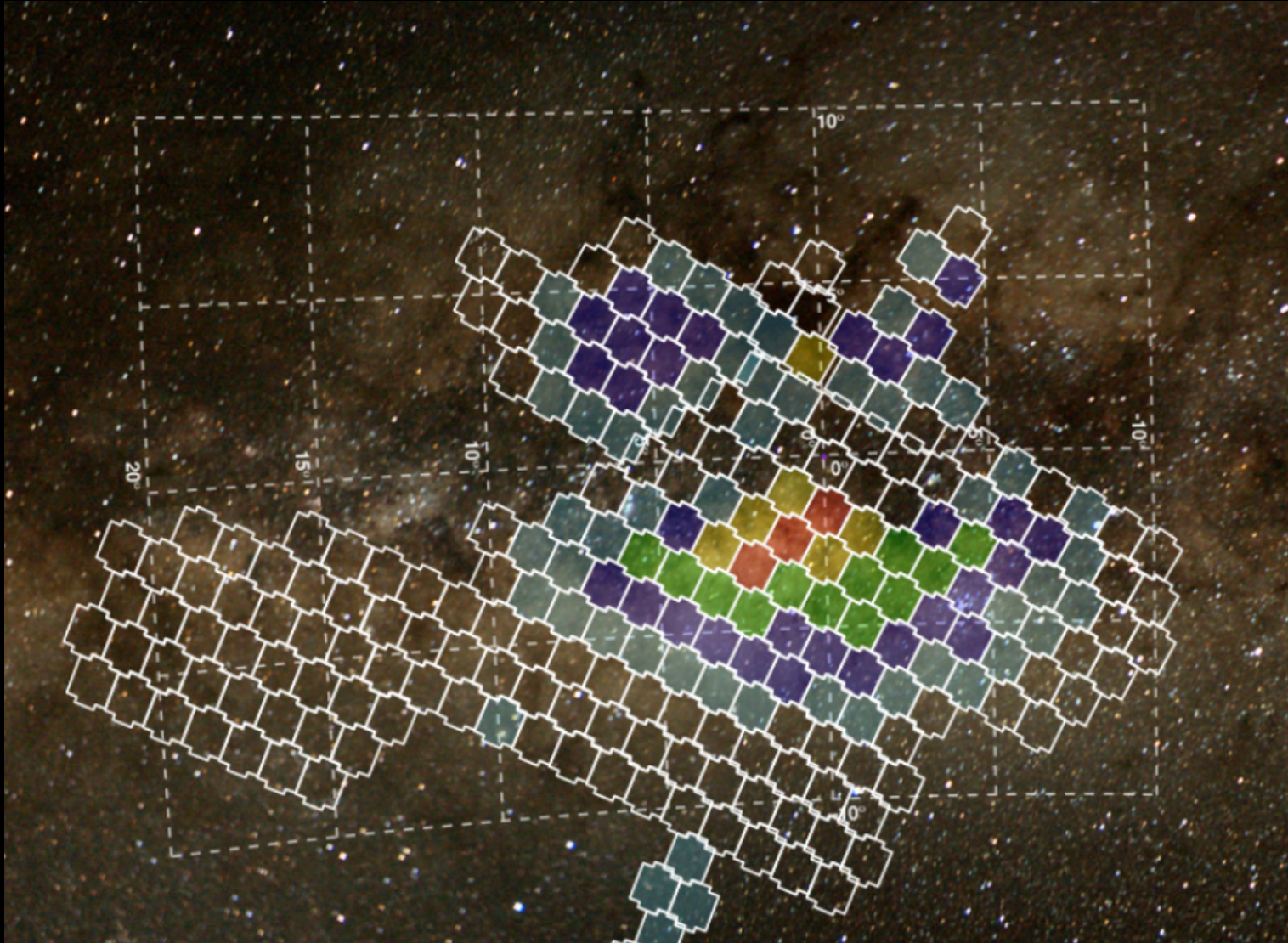
I < 21 mag

440+ billion measurements in OGLE-IV



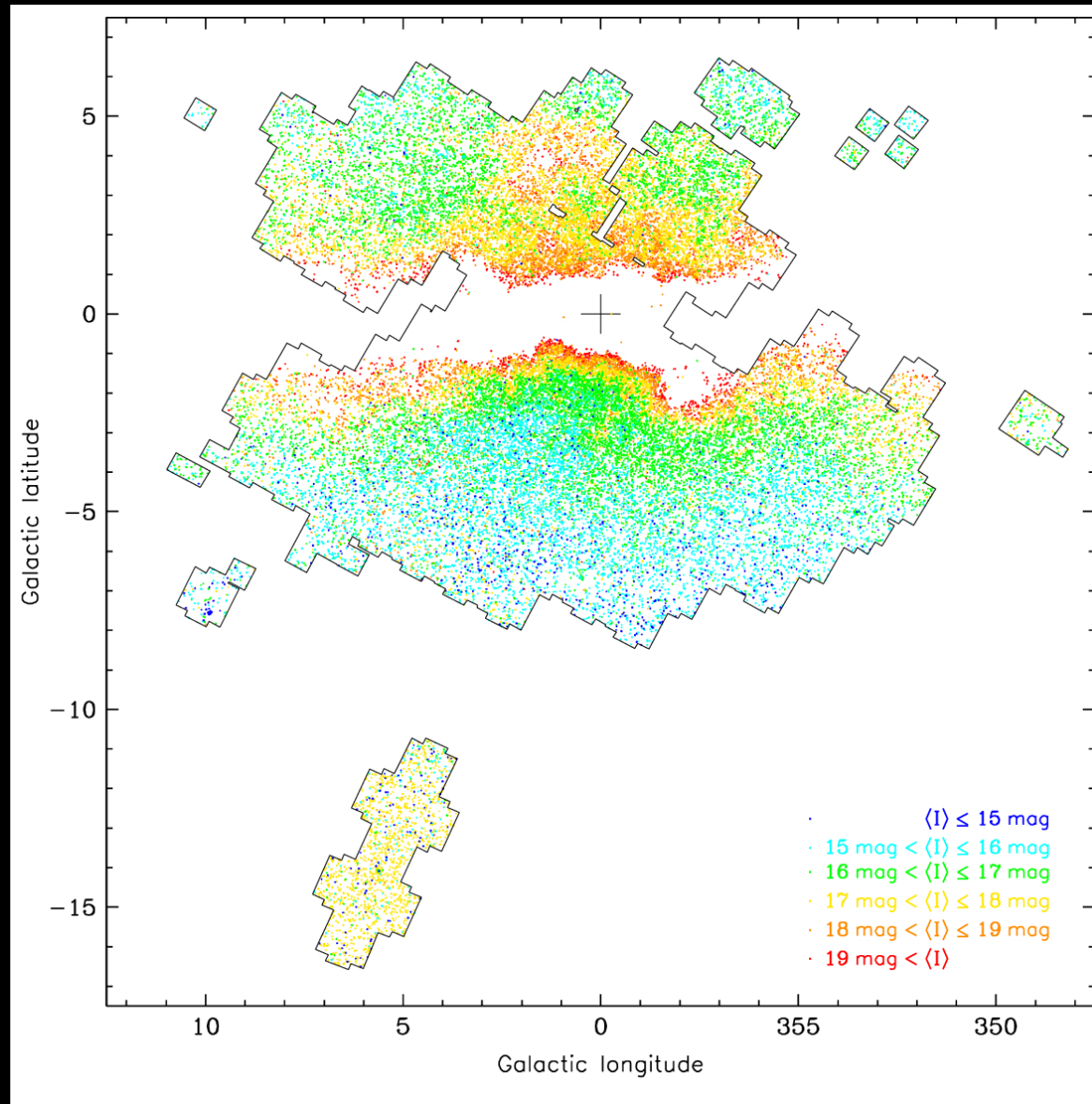
OGLE-IV: The Galactic Bulge

182 deg² 0.5 billion sources monitored some objects with over 10000 epochs



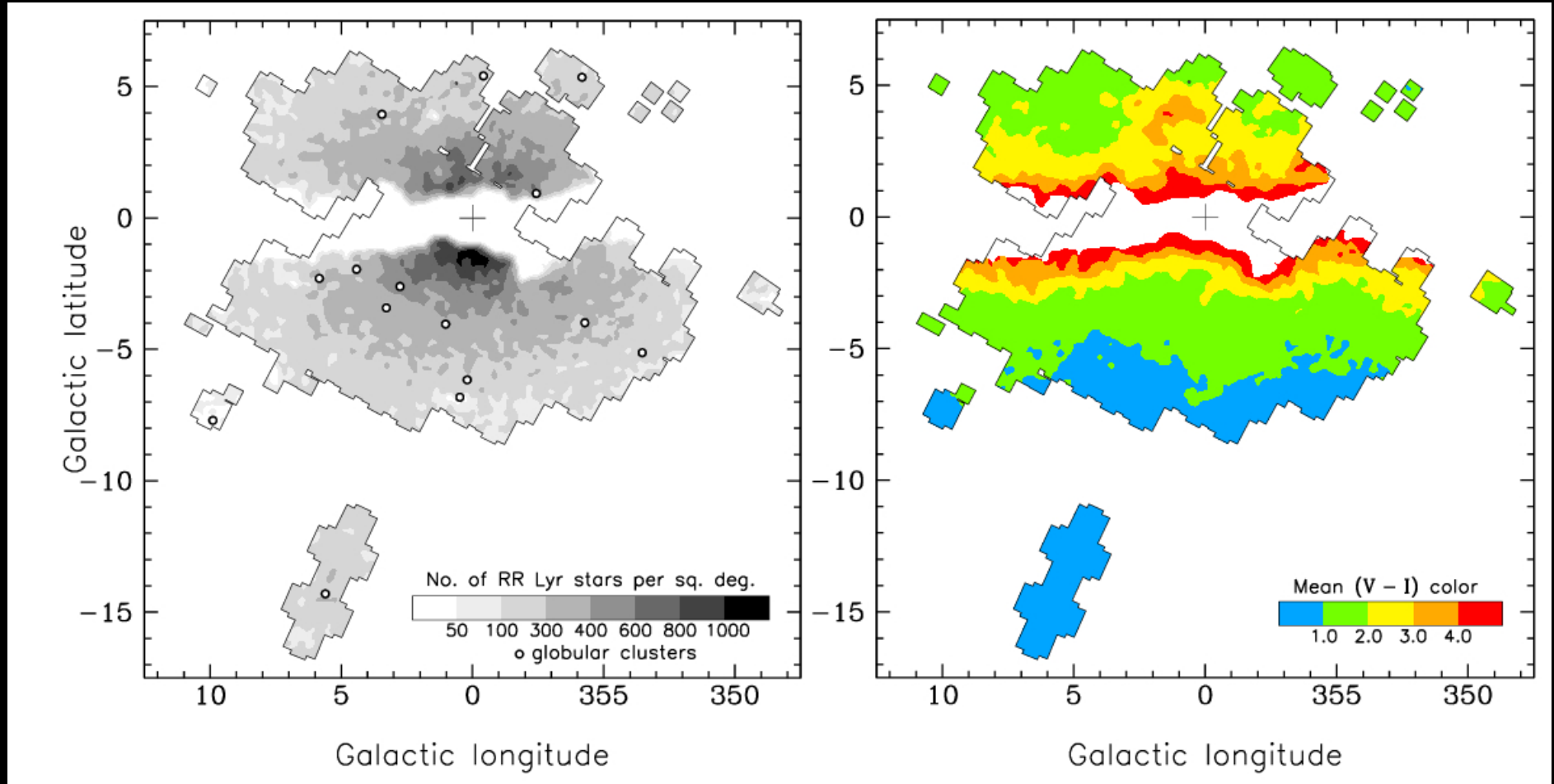
CADENCE (epochs/night): red – 30, yellow – 10, green – 3,
blue – 1, cyan – a single epoch every 2 nights

OGLE-IV: RR Lyr Stars in the Bulge



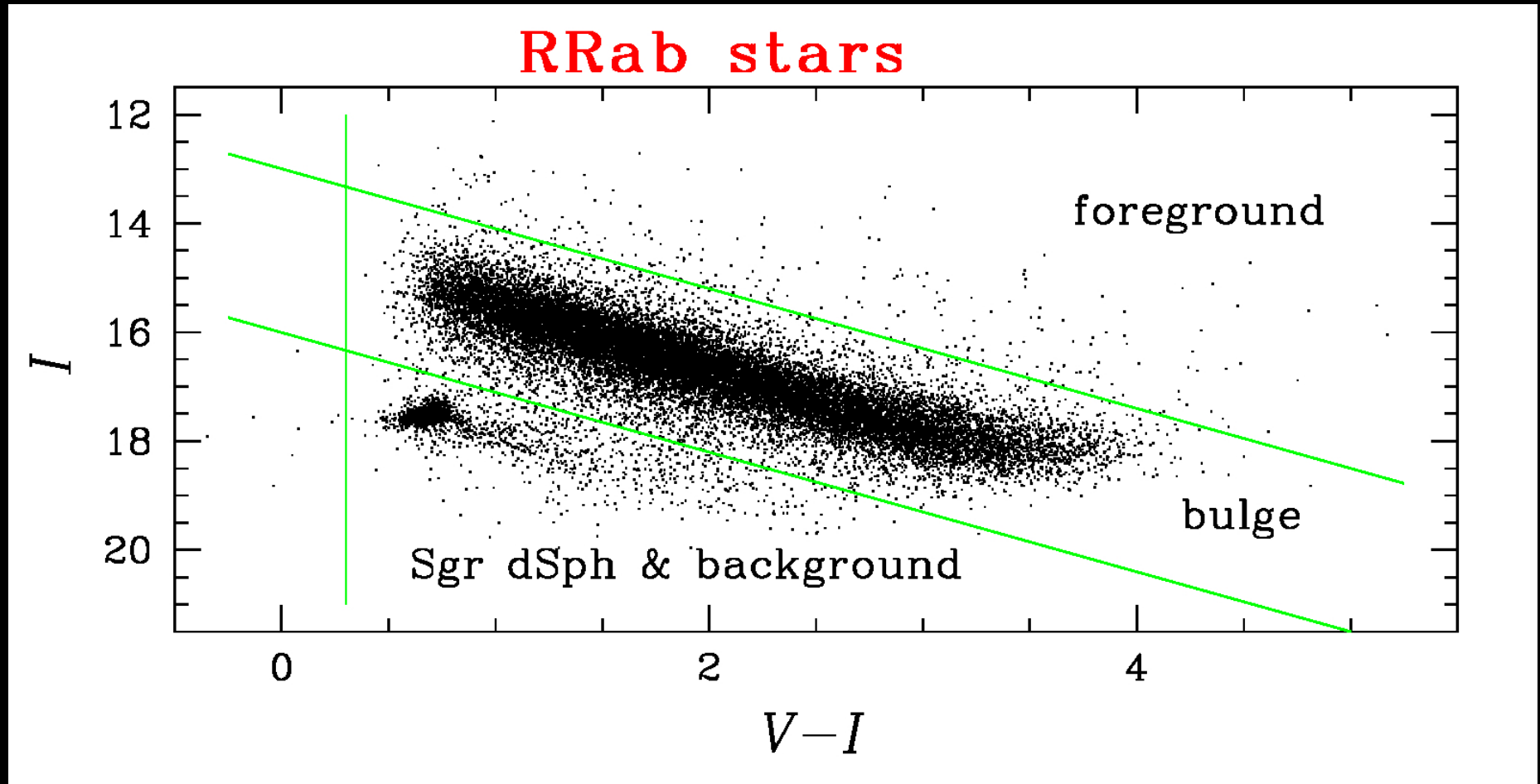
Over 38 000 RR Lyr stars: Soszyński et al. 2014, arXiv:1410.1542

OGLE-IV: RR Lyr Stars in the Bulge



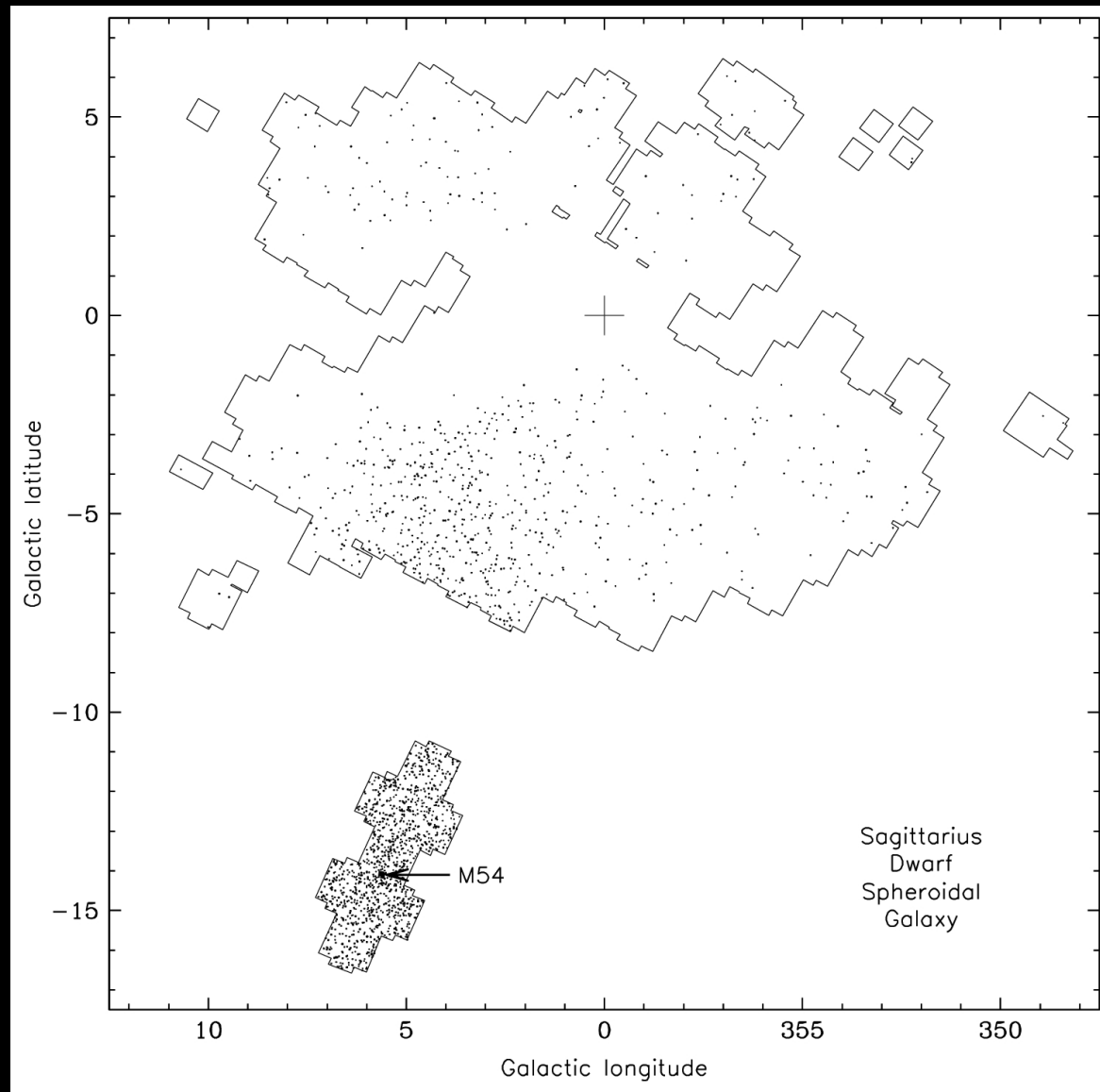
Over 38 000 RR Lyr stars: Soszyński et al. 2014, arXiv:1410.1542

OGLE-IV: RR Lyr Stars in the Bulge



Deciphering the 3D GB structure with RR Lyr stars: Pietrukowicz et al. 2014, in prep.

OGLE-IV: Beyond the Galactic Bulge



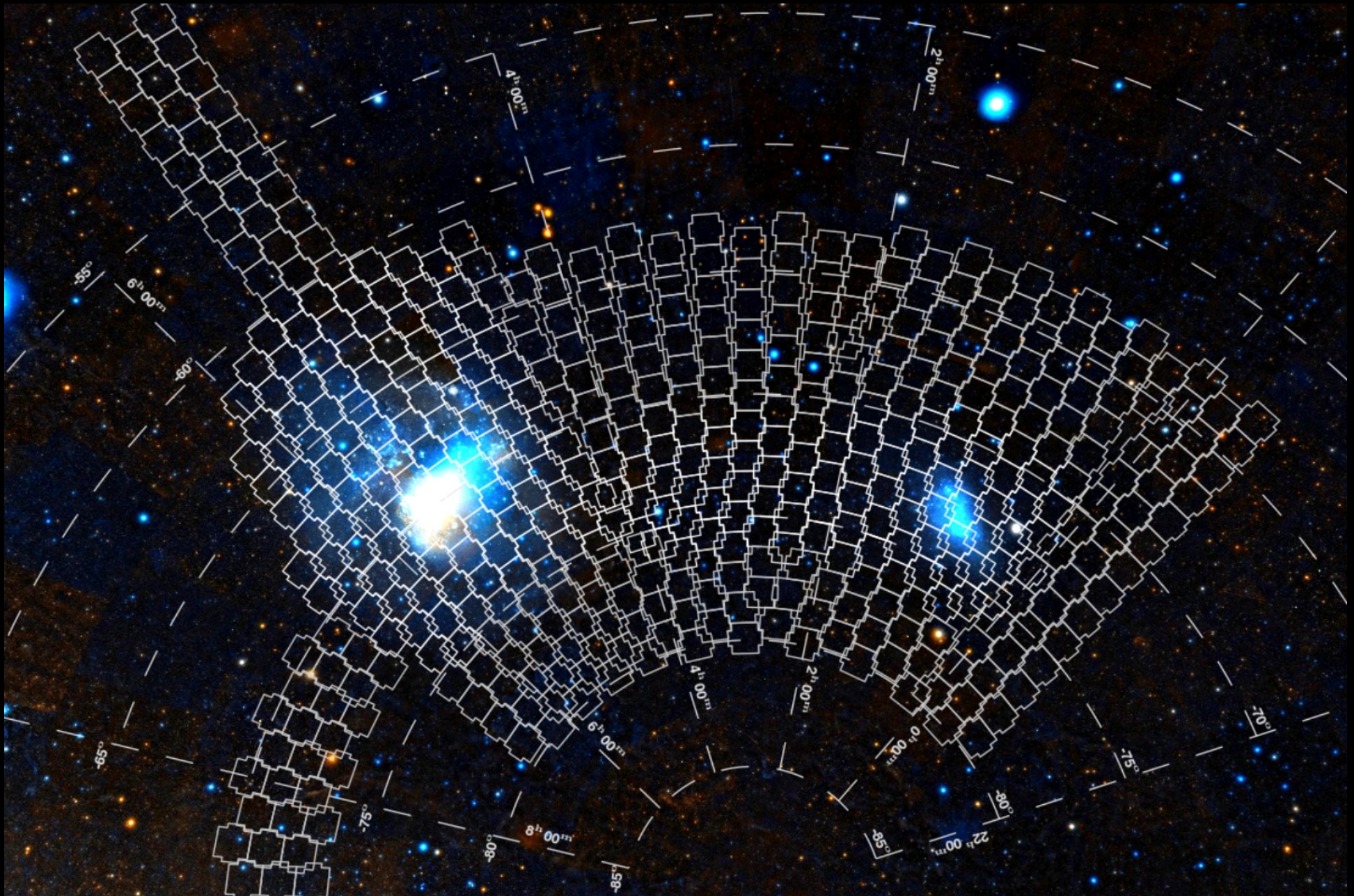
~2000 RR Lyr stars in Sgr dSph: Soszyński et al. 2014, arXiv:1410.1542

OGLE-IV: The Magellanic System

670 deg²

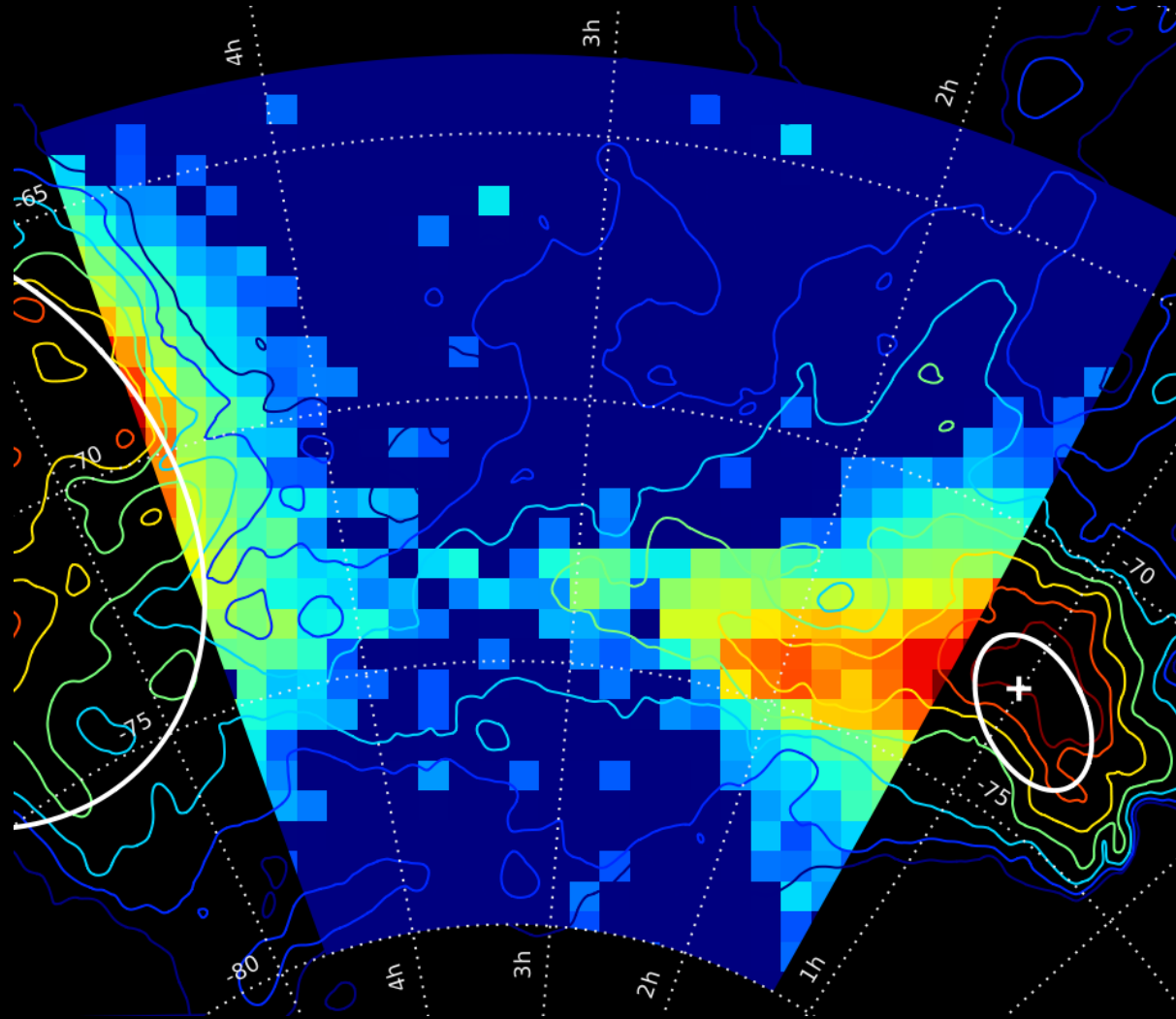
82 million objects with $I < 21$ mag

cadence every 2-5 nights



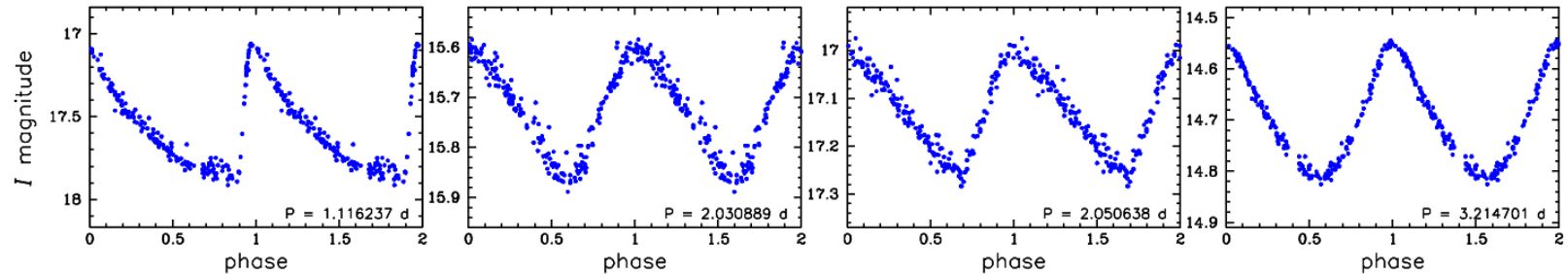
OGLE-IV: The Magellanic Bridge

OGLE-ing the Magellanic System: D. Skowron et al. 2014



YOUNG POPULATION COUNTS (stars/deg²):
red – 10000, yellow – 1000, cyan – 100, blue – 1 star

Classical Cepheids in the Magellanic Clouds

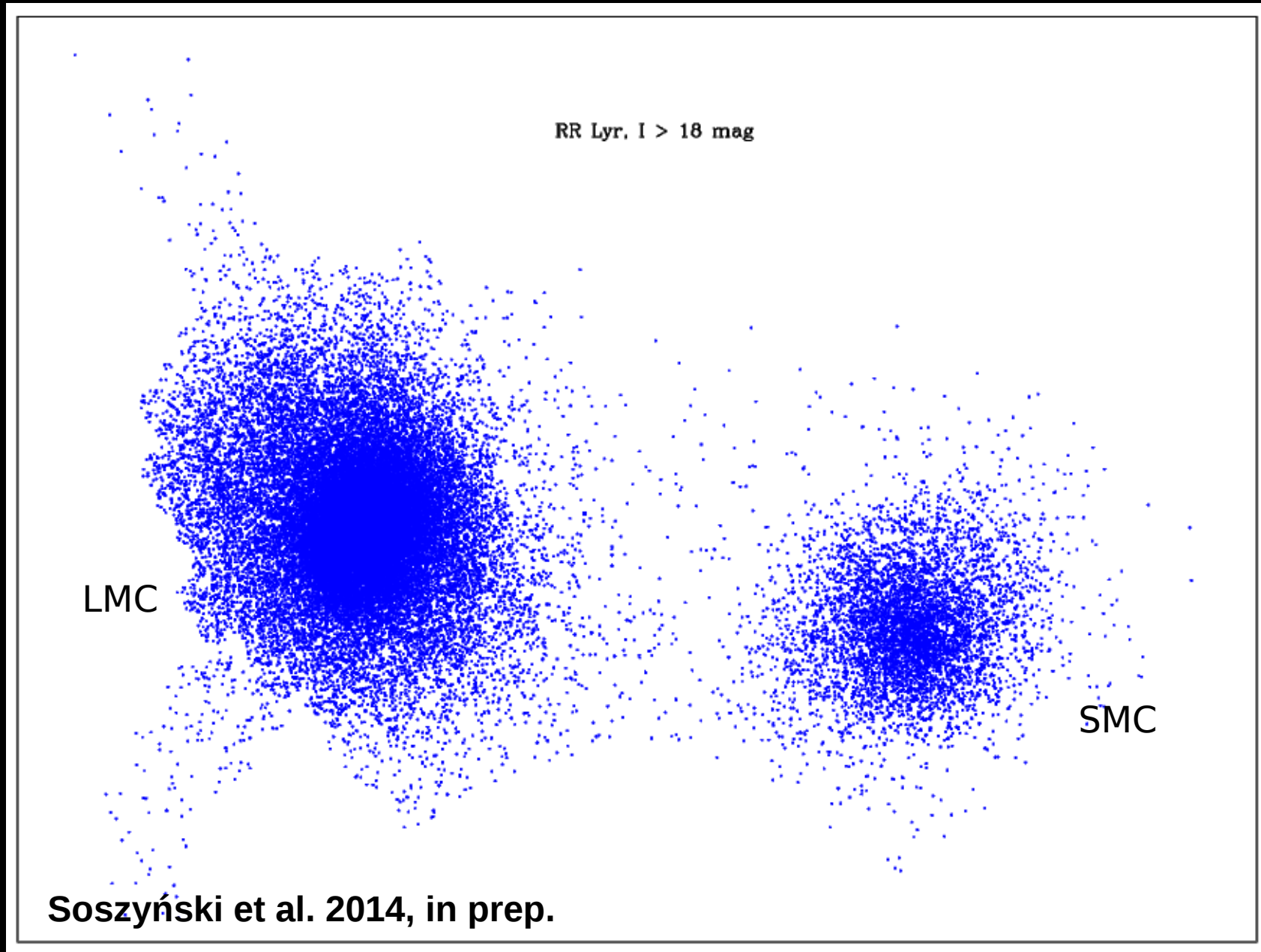


LMC

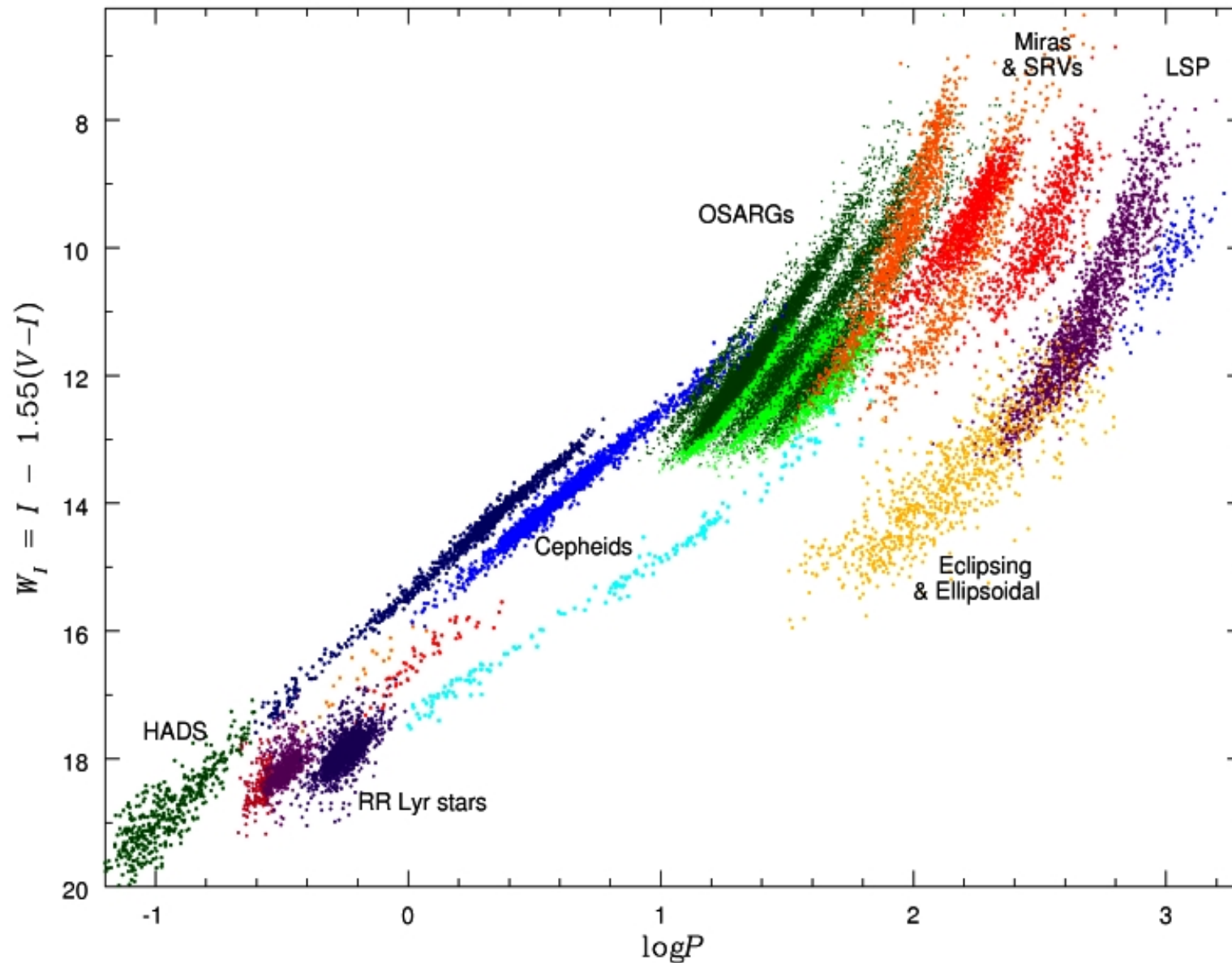
SMC

Soszyński et al. 2014, in prep.

RR Lyrae Stars in the Magellanic Clouds



OGLE Pulsating Stars



OGLE Variable Star Collection

The total number of var. stars exceeds 500 000

OGLE-III Catalog of Variable Stars

(Soszyński *et al.*...)

- **LMC:** 3361 Class. Cepheids, 280 Pop. II Cepheids, 24906 RR Lyrae stars, 2786 Delta Scuti, 91995 LPVs, 26121 Eclipsing Binaries
- **SMC:** 4630 Class. Cepheids, 43 Pop. II Cepheids, 2475 RR Lyrae stars, 19384 LPVs
- **Galactic Bulge:** 16836 RR Lyrae (~400 from SGR Dwarf Galaxy), 32 Classical Cepheids, 357 Pop. II Cepheids, 232406 LPVs
- **Galactic Disk:** ~30000

OGLE-IV: Many more, e.g. Mag.Sys.: ~9500 Cepheids, ~46000 RR Lyrae. Time range of variability: minutes to decades

OGLE

Atlas of Variable Star Light Curves

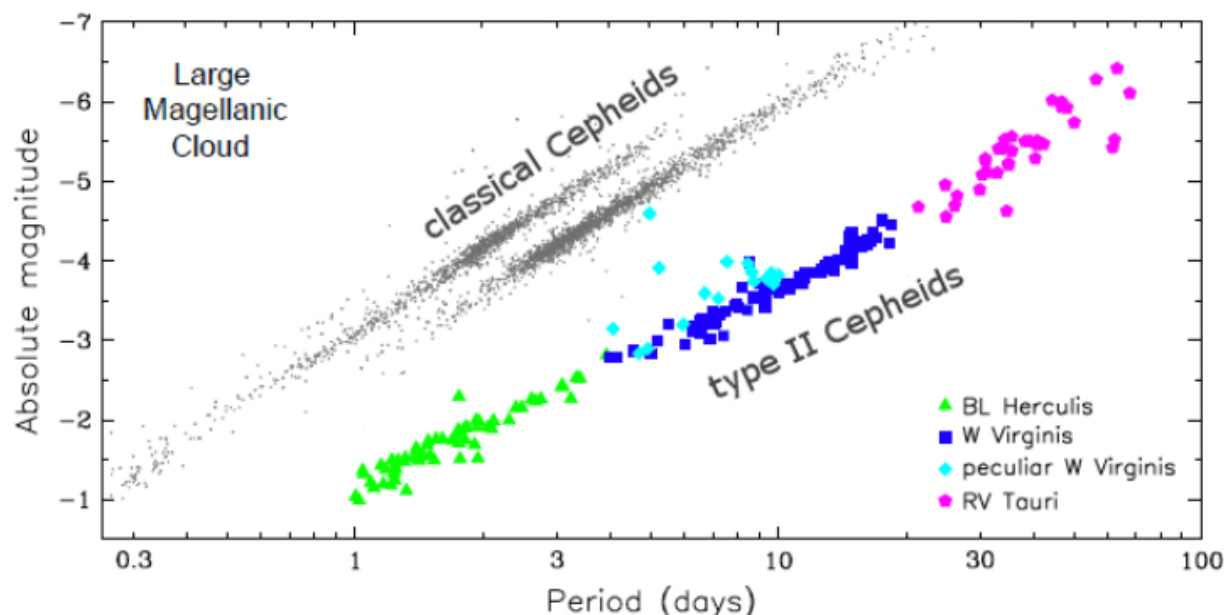


photo by K. Ulaczyk

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Type II Cepheids

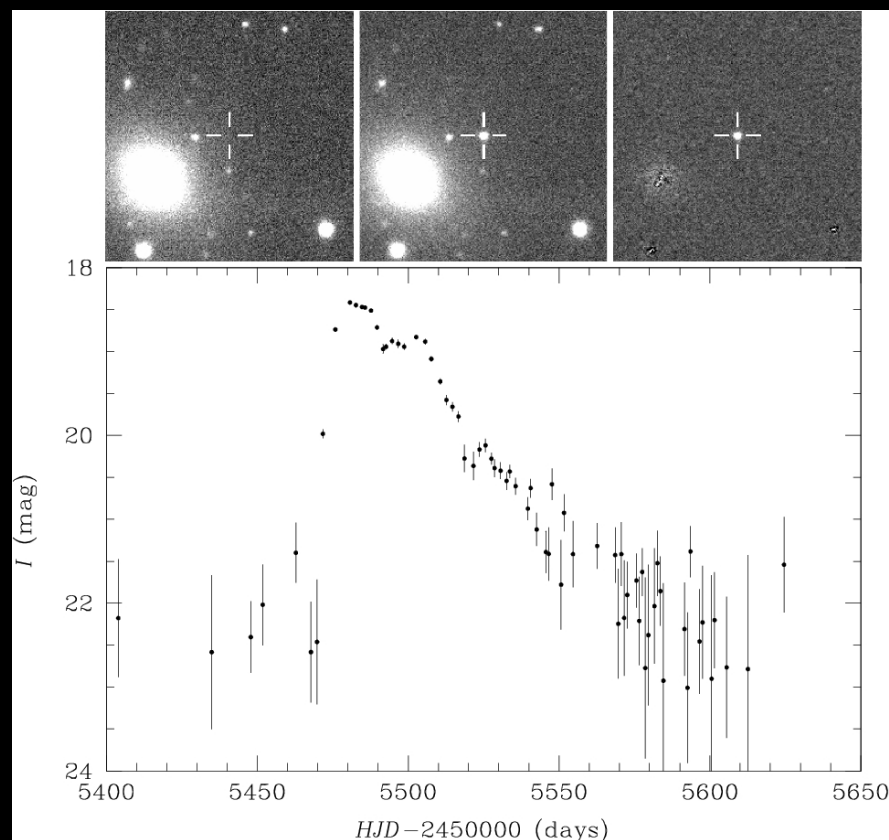
Type II Cepheids (sometimes called Population II Cepheids) are low-mass pulsating stars of the intermediate disk or halo population. They were distinguished from **classical (type I) Cepheids** in 1952 by Walter Baade, who realized that each type of Cepheid follows a different period-luminosity relationship.



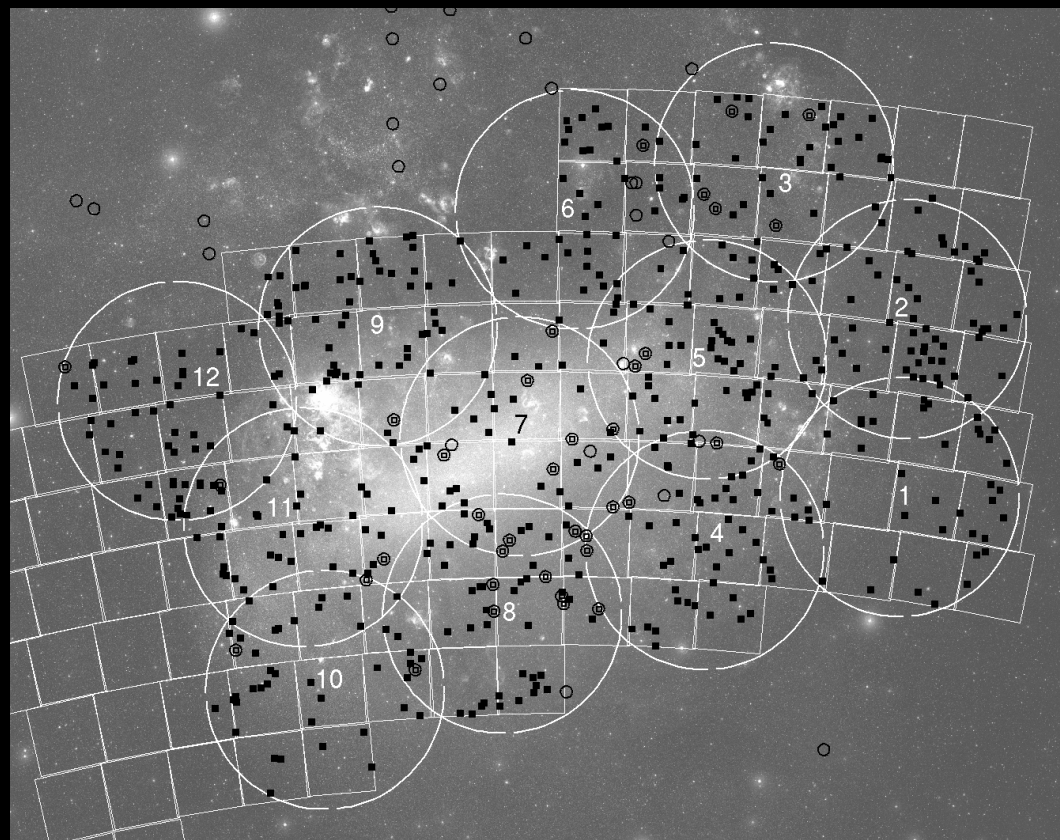
Period-luminosity relations of classical (grey points) and type II Cepheids (color symbols) in the Large Magellanic Cloud. As the "luminosity" we used the reddening-free Wesenheit index, defined as $W_1 = I - 1.55(V - I) - DM$, where I and V are mean luminosities of Cepheids in these passbands, and $DM = 18.5$ mag is the distance modulus of the Large Magellanic Cloud.

- Pulsating variable stars
 - **Classical Cepheids**
 - **Type II Cepheids**
 - **BL Herculis stars**
 - **W Virginis stars**
 - **RV Tauri stars**
 - **Anomalous Cepheids**
 - **RR Lyrae stars**
- Delta Scuti stars
- Long-period variables
 - Mira variables
 - Semiregular variables
 - OGLE small amplitude red giants
- Binary systems
 - Eclipsing binaries
 - Ellipsoidal variables
 - Cataclysmic variables
- Rotating variables

Supernovae and AGNs in OGLE



150 SNe/year



800 AGNs behind the MC

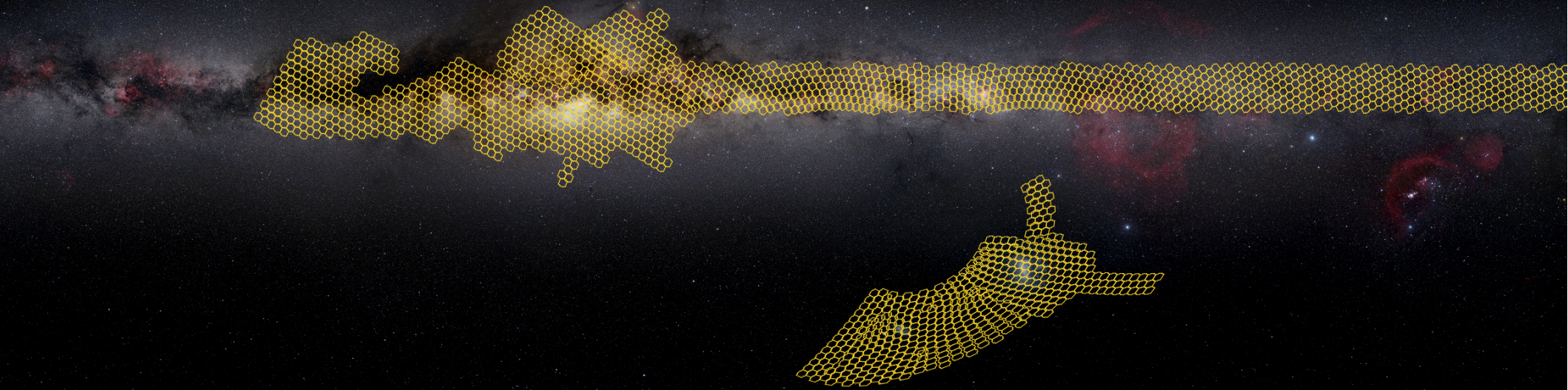
OGLE-IV Transient Detection System
ogle.astrouw.edu.pl/ogle4/transients

OGLE-IV: The Galactic Variability Survey (GVS)

2000 deg²

1 billion objects

$10 < I < 19$ mag

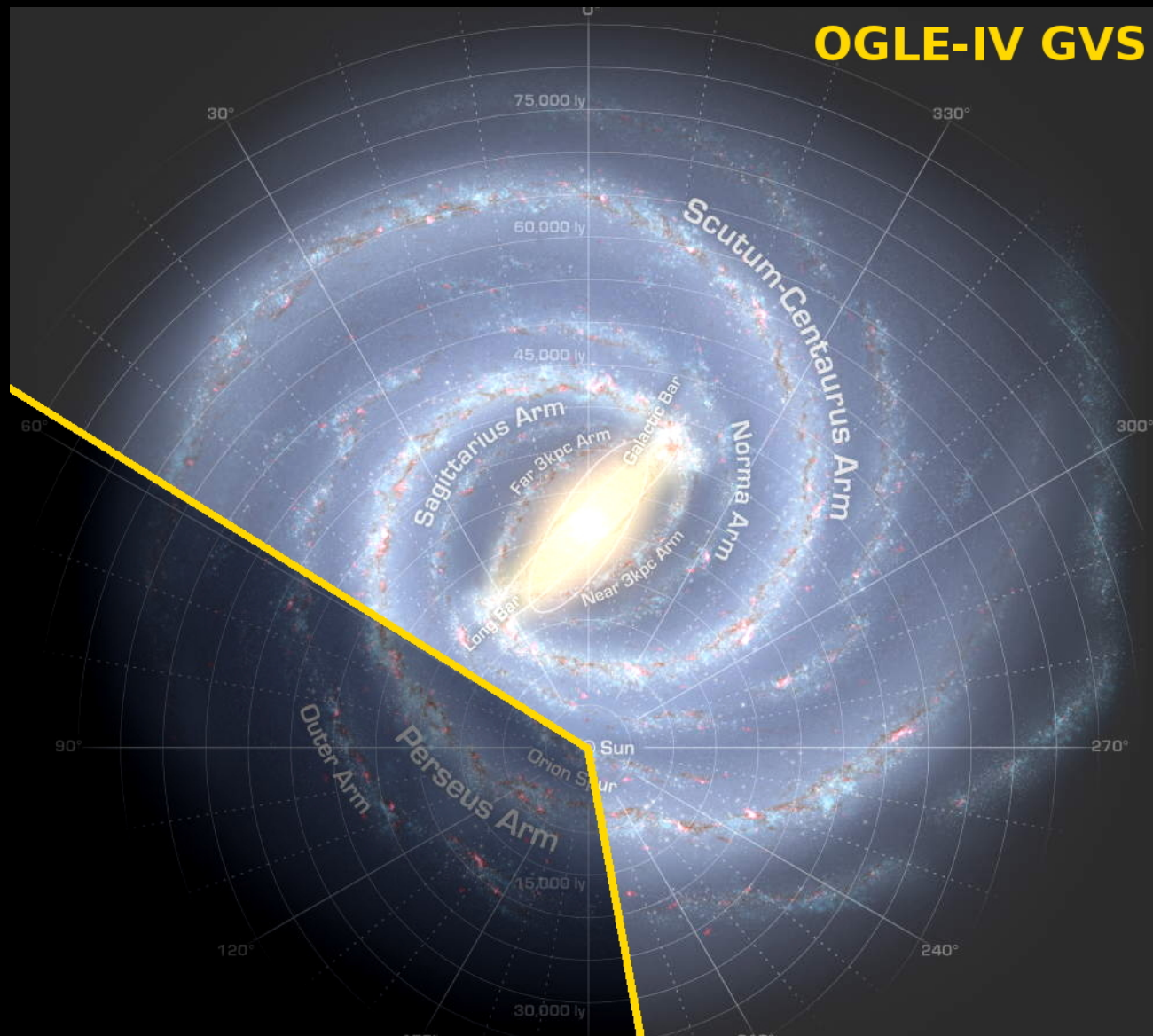


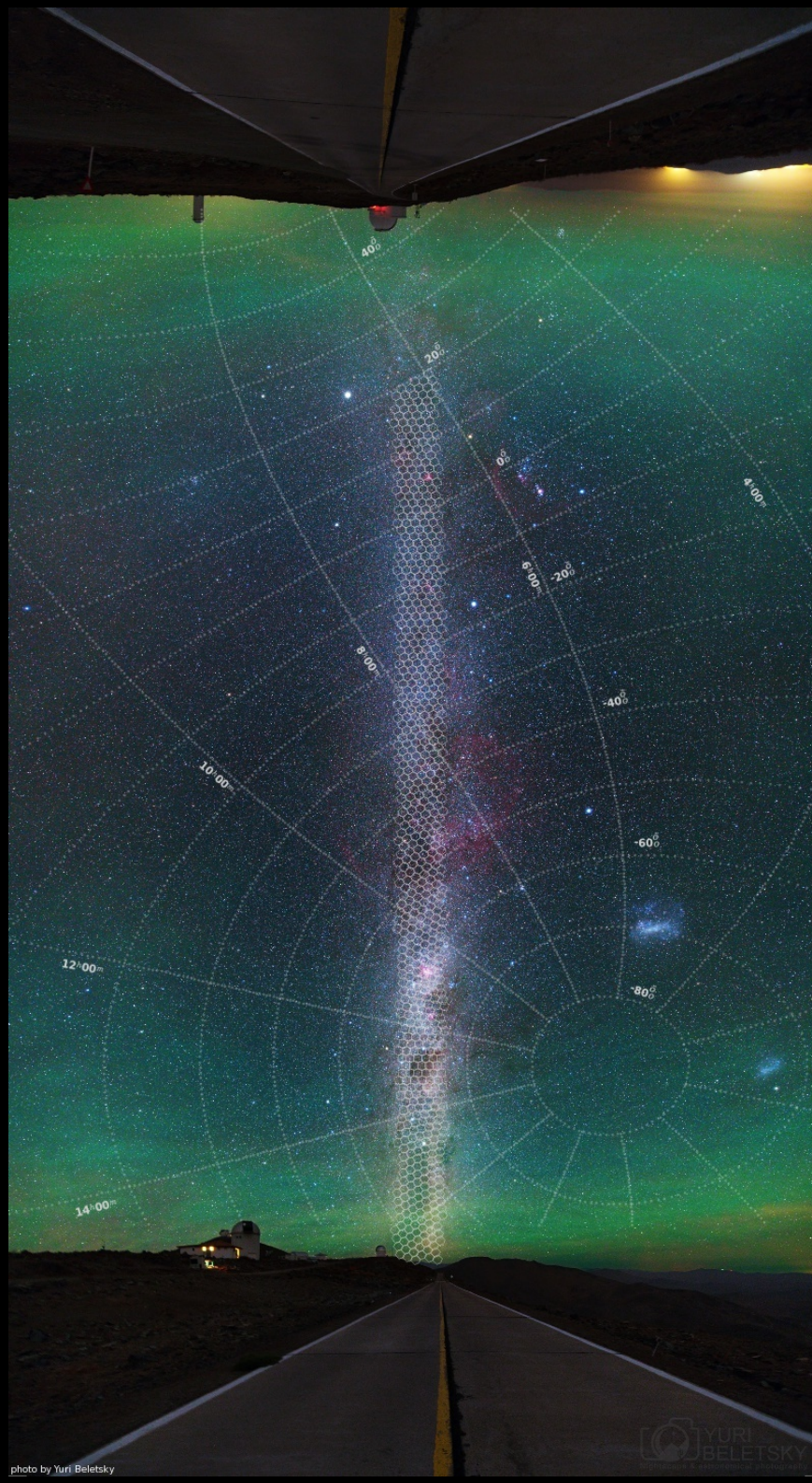
OGLE-IV: The Galactic Variability Survey (GVS)

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ogle.astrouw.edu.pl

...and enjoy our data products.

Thank you.

