

# LC Microlensing Key Projects Past, Present and Future

# History of microlensing at LCO

- 2005-2013: RoboNet & RoboNet-II
- 2014-2016: RoboNet & the LCO 1m Network
- 2017-2020: ROME/REA
- 2020-2023: OMEGA Key Project
- 2023-2025: OMEGA-II Hidden Populations

+ other projects (talk by Weicheng Zang)



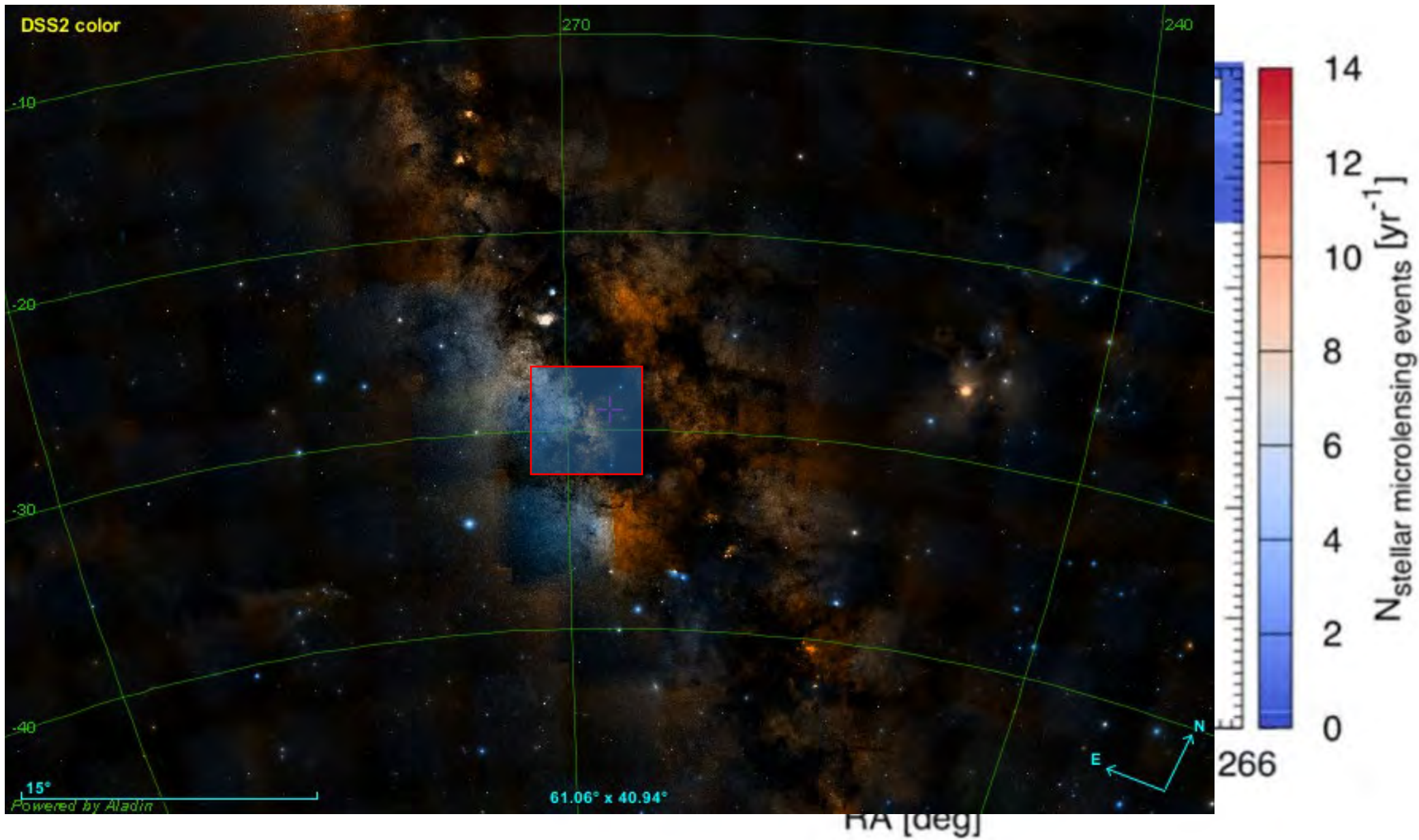
<https://lco.global/science/exoplanets/microlensing/microlensing-at-lco/>

# The **ROME/REA** Key Project at **LC** (2017-2020)

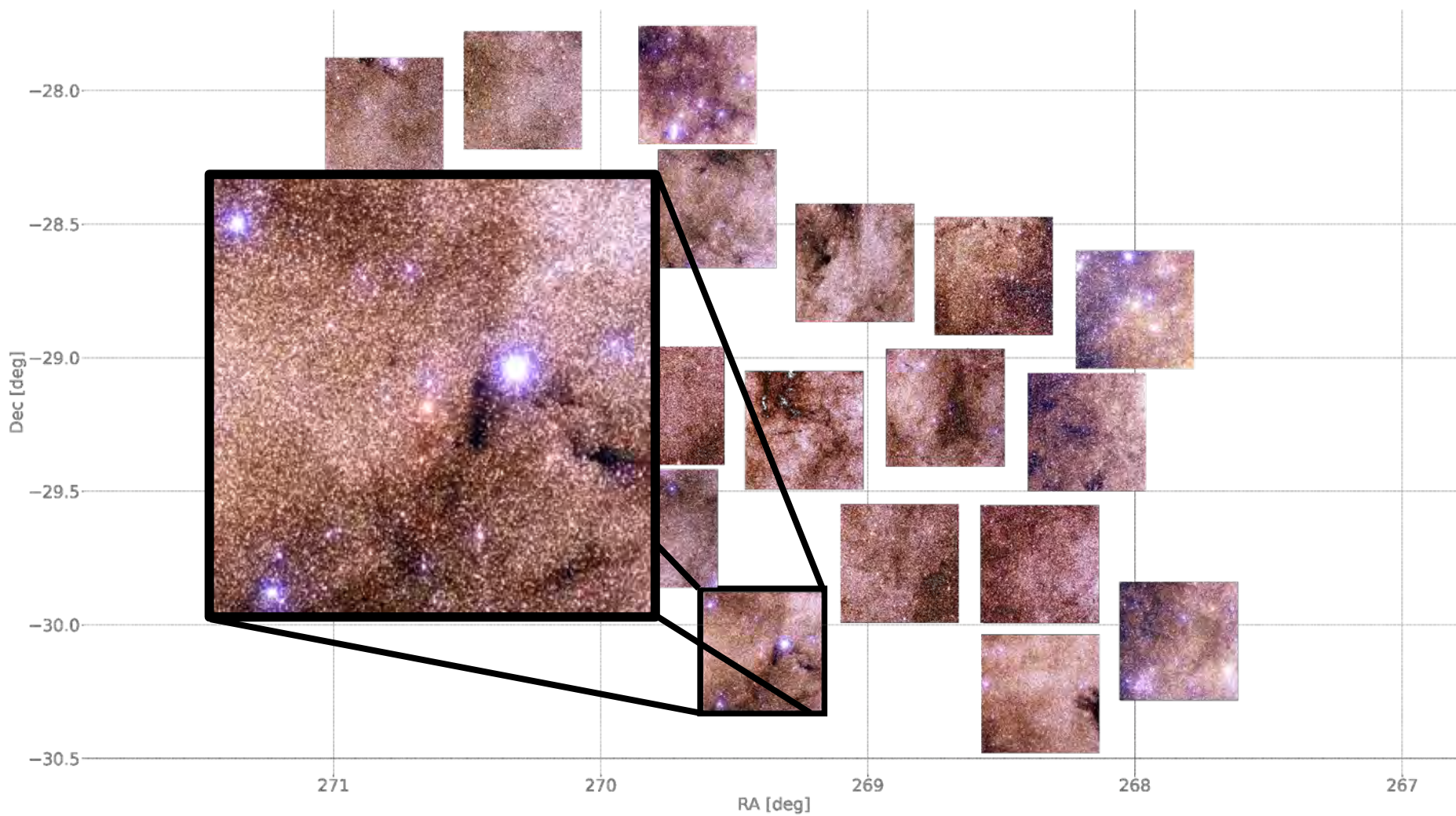
## GLOBAL TELESCOPE NETWORK



[Tsapras et al 2019PASP..131I4401T](#)



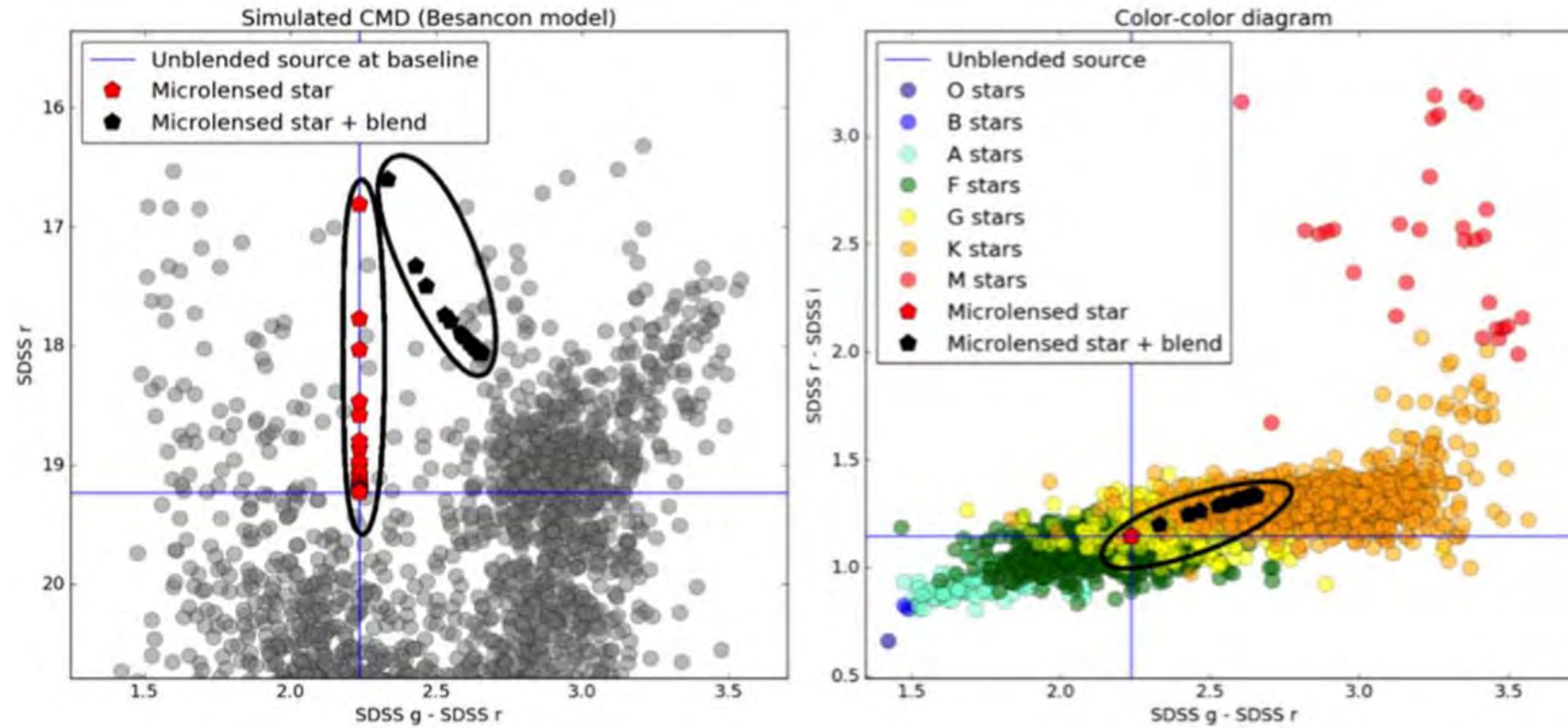
# ROME Survey of the Galactic Bulge



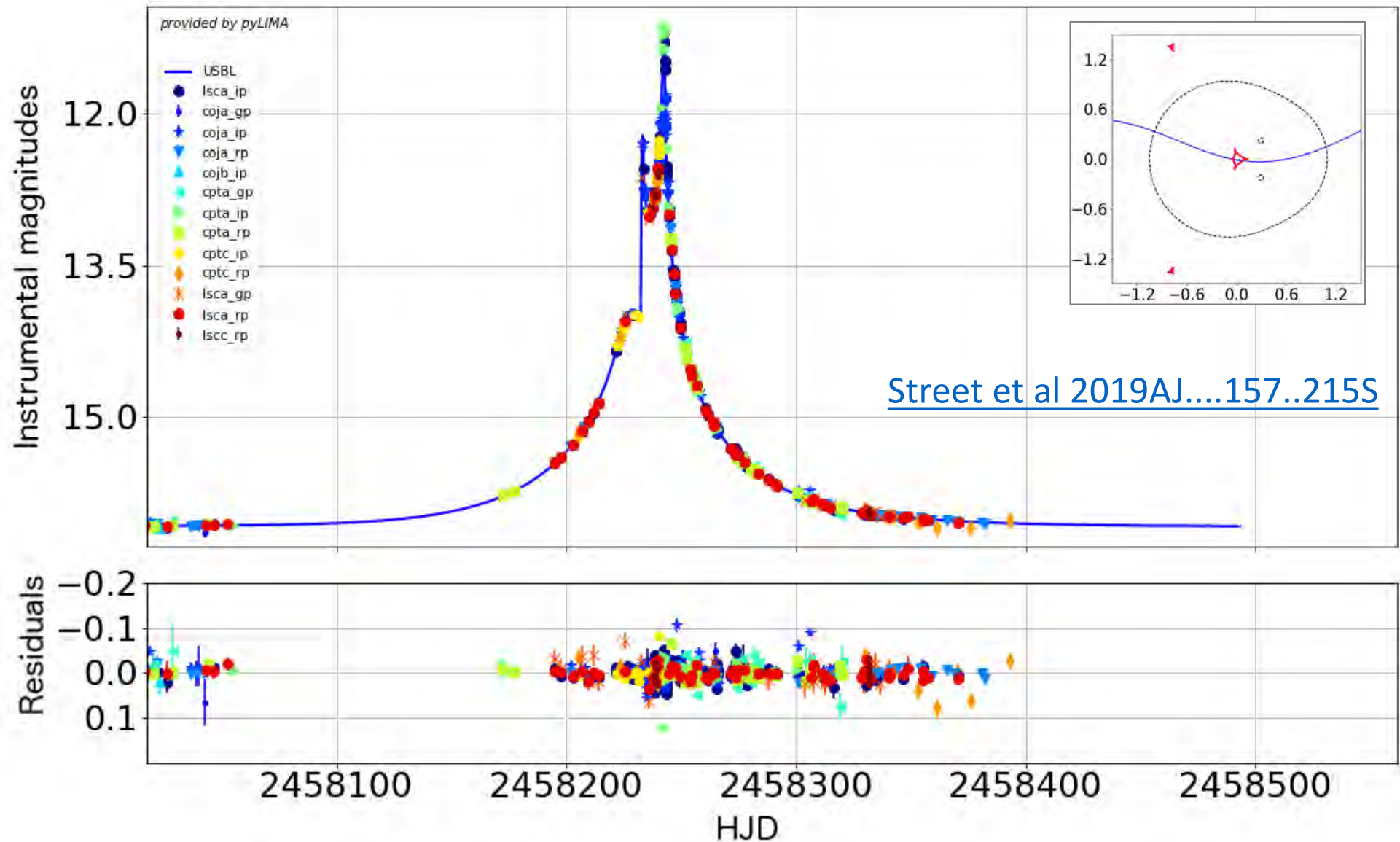
5 million stars • 3 filters • 3 years



# Characterizing the source and blend



# OGLE-2018-BLG-0022: A nearby M-dwarf binary



# ! ROME/REA public data release

- Three observing bands: **SDSS-g',r',i'**
- **7-hour observing cadence+** over **3 observing seasons**
- Individual objects observed: **> 5 million stars**
- Number of images obtained: **>40,000 images**
- Catalog crossmatch results: **>30,000 variable stars**

Street et al 2024 – accepted



# The OMEGA Key Project at LC (2020-2023)



- Process **alert streams from multiple surveys**
- Fully-automated system to **identify microlensing events in real-time**
- Planet sensitivity calculations performed by software agents  
([Hundertmark et al 2018A&A...609A..55H](#))
- **Optimize observation requests** and schedule to telescope network
- **Aim: observe and characterize** microlensing events across entire sky

# The OMEGA Key Project at LC (2020-2023)



- **Photometry in SDSS-*i'* and *g'*:**
  - Three observing modes:
    - **Regular:** daily observations for all ongoing events
    - **Priority:** 30 minute cadence for 3 days
    - **Anomalous:** 15 minute cadence for 2 days
- **Spectroscopy:**
  - (At least) Two low-resolution ( $R < 1000$ ) spectra
  - High-resolution NRES ( $R \sim 55,000$ ) when possible ( $V < 11$  mag)

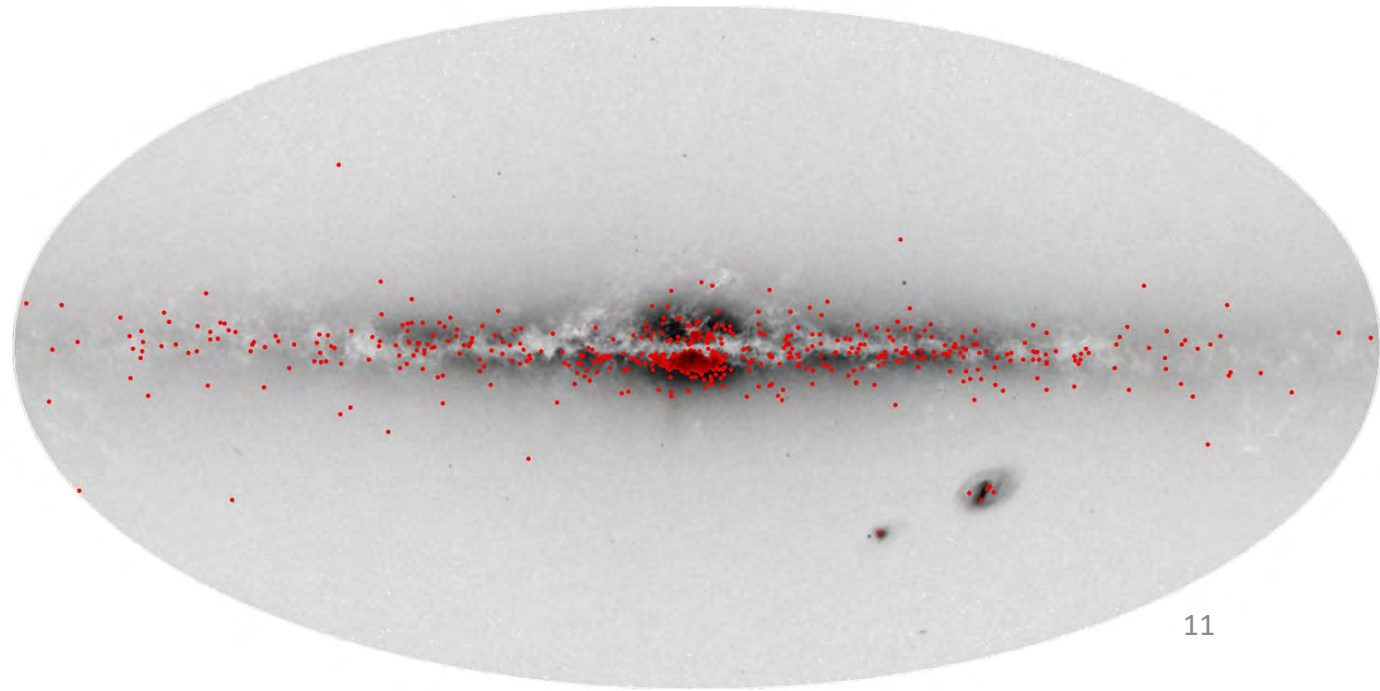
# The OMEGA Key Project at LCO (2020-2023)



## Results

- 1808 events in total
- 1405 towards the Galactic Bulge
- 397 in the Galactic Disk
- 6 towards the Magellanic Clouds
- >500 with good photometry
- 106 spectra

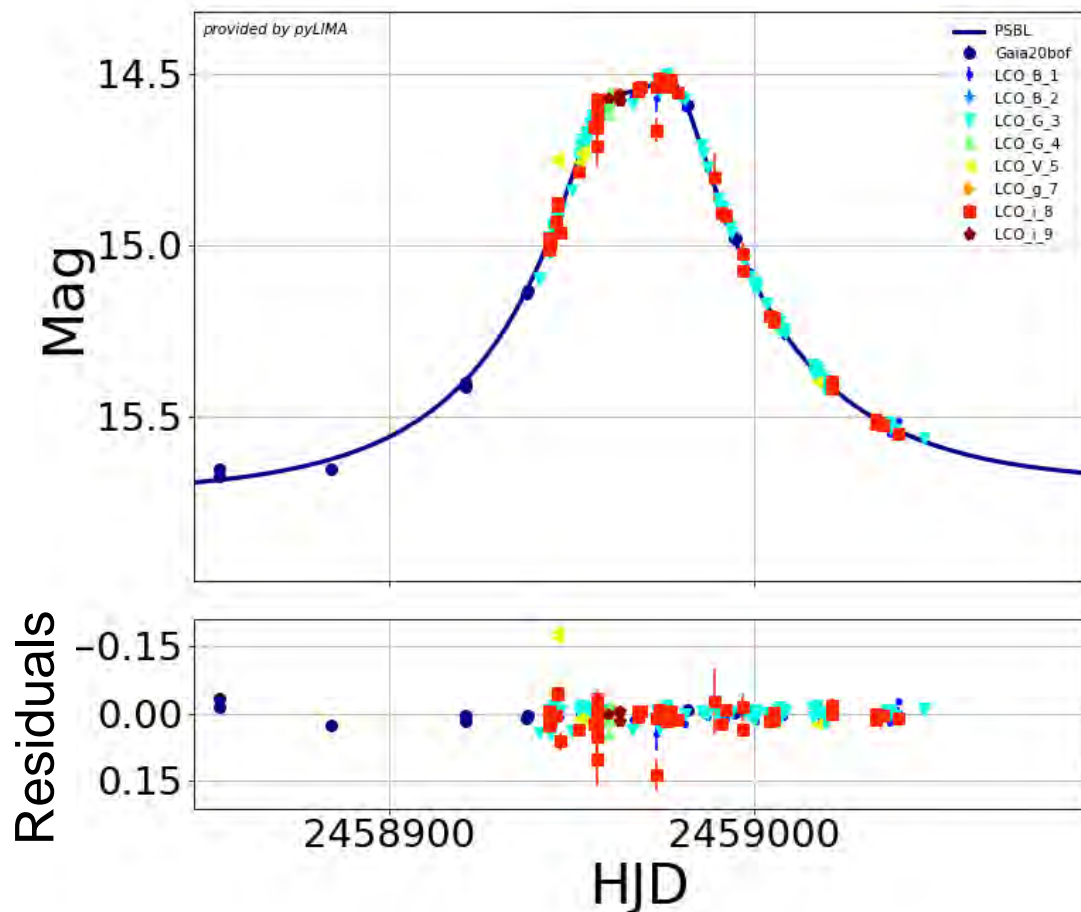
- 62 “Events Of Interest”:
- >10 planets
- Many binary lenses
- Several stellar remnant candidates



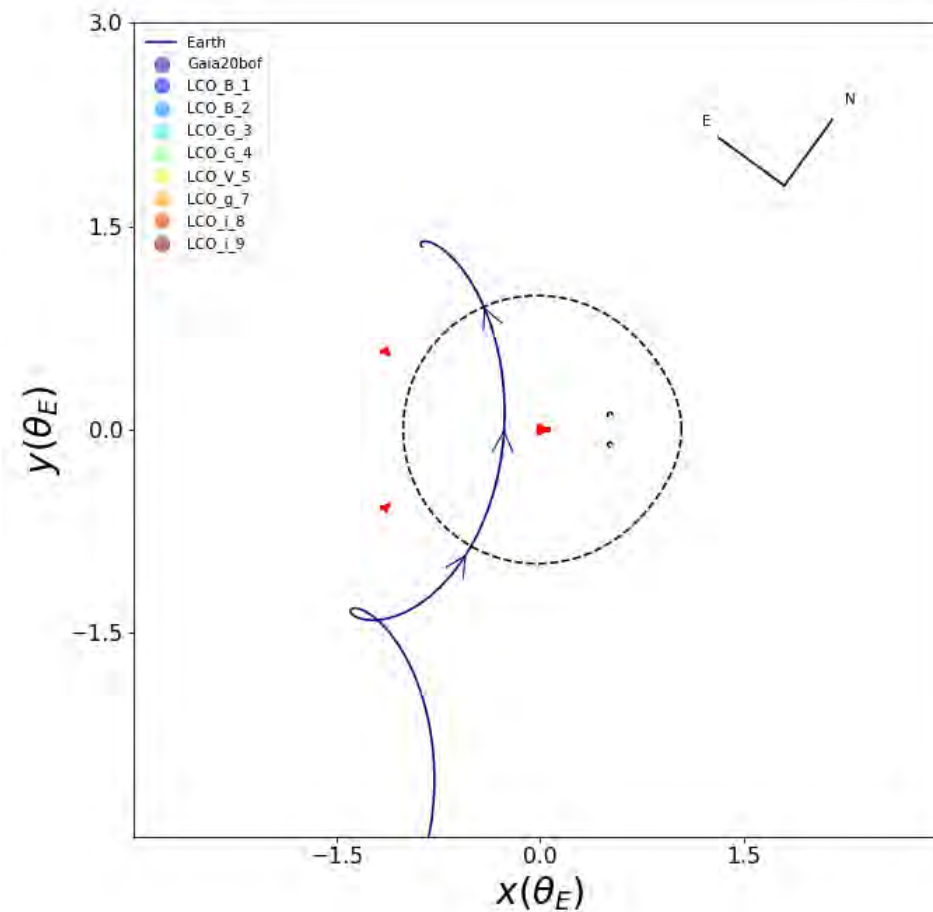


OMEGA

# First Gaia planet candidate?



$D_L < 2.6$  kpc,  $q \sim 0.04$



Bachelet et al (to be submitted soon)



# The OMEGA-II Key Project at (2023-2025)

- Monitor **anomalous events** as well as events potentially caused by **stellar remnants**
- Two observing modes: **responsive & regular** cadence
- **Outside the bulge – no overlap with high cadence fields of microlensing surveys**
- Targets from Gaia, ZTF, (BlackGEM), preparing for LSST
- Use additional facilities to help classify events (spectroscopy, interferometry with VLTi/GRAVITY)



Microlensing  
Observing  
Platform

# Beyond OMEGA-II - Microlensing @

talks by Natasha Abrams & Rachel Street



- Microlensing subgroup (Transients and Variable Star Science collaboration)

- 2 white papers describing science drivers



- Current goals:

- Assessing different observing strategies to evaluate expected microlensing detection rates from LSST

- Once LSST alert stream comes online:

- Identify microlensing candidates for follow-up (all across the sky)
- Publicly announce candidate events and coordinate observing response with wider community

Thank you for your attention