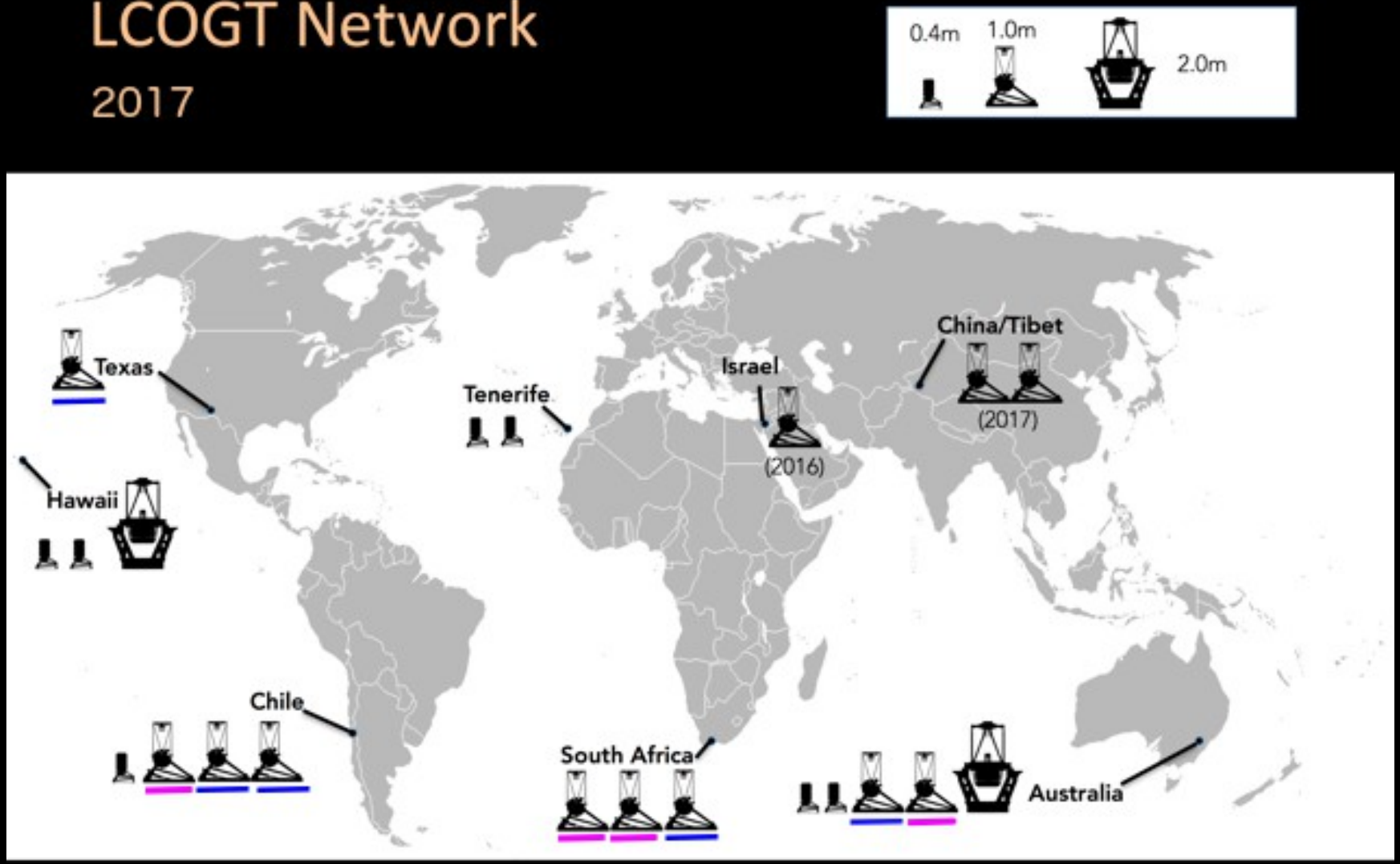
Microlensing at LCO:
Season 2016 and Future Plans

Rachel Street
and the RoboNet Team

Season 2016

- Final year of the microlensing Key Project
- K2 Campaign 9 and Spitzer Program
- Network developments

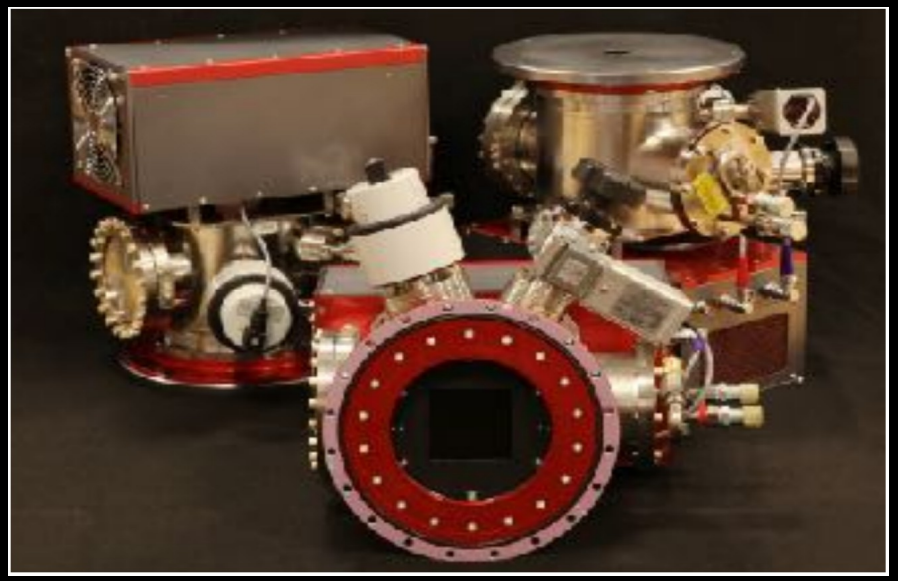
Deployment of Sinistro imagers completed



Sinistros have 26.5x26.5' FOV

Deployment of Sinistro Imagers

Southern network deployments took telescopes offline, so obs strategy had to be adapted



Sinistro FL08 deployed to Australia but never released to network scheduler – dedicated to K2/Campaign 9

K2/Campaign 9

Goals:

- Support reactive Keck program with feed to ExoFOP
- Rapid observations of FFP candidates
- Complement survey coverage of K2 selected targets
- Provide multi-band color observations

K2/Campaign 9 – Feeding ExoFOP

- We developed new software, based on RoboNet's system, to combine available data on microlensing targets and feed it to IPAC's ExoFOP system
- PyLIMA used to fit event data and provide updated models – Etienne Bachelet
- IPAC provided DB, tools for community benefit

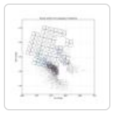
Credit: Melanie Swain, Megan Crane, Rachel Akeson

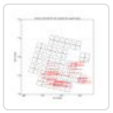
- Shanen Cross developed and operated ROGUE software to issue public alerts of candidate short-t_E events

K2/Campaign 9 – Feeding ExoFOP

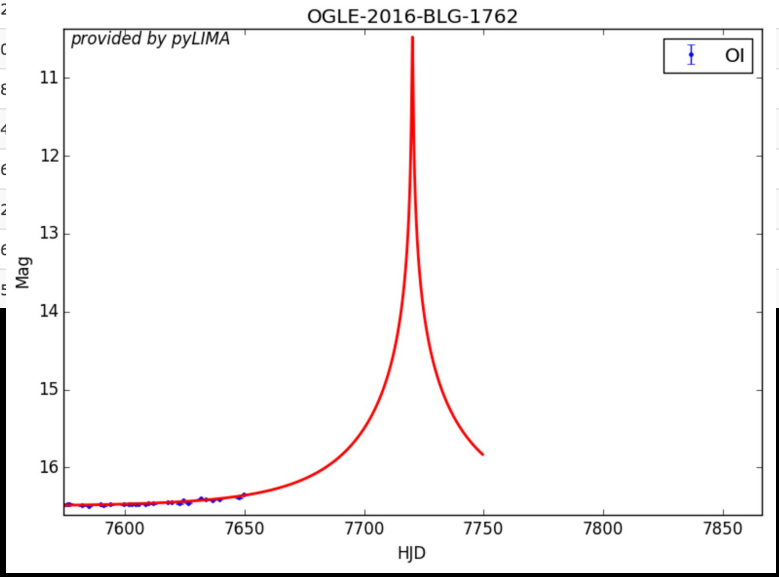
ExoFOP K2 C9 — Home ▾ | Search | Help | Login

K2 Microlensing Events (627) Event Selection Criteria — Download as: Text CSV — *Current JD = 2457781.29* — t_{alert} within last 24 hrs


All Events


Events outside superstamp

Ogle Name	MOA Name	RA	Dec	t_{alert} (HJD)	t_0 (HJD)	t_E (d)	u_0 (θ_E)	A_0	I_0 (mag)	During Campaign	In Footprint	In Superstamp
	MOA-2016-BLG-596	18:07:25.96	-26:38:27.37	2457662.592	2457956.008	3275.02	0		20.910	Y	Y	
	MOA-2016-BLG-587	17:53:42.67	-29:00:14.67	2457655.435	2457641.633	42.99	32.078		3.730	Y	Y	Y
	MOA-2016-BLG-582	17:55:51.69	-28:50:16.36	2457654.447	2457858.985	1350030.79	0		27.830	Y	Y	Y
	MOA-2016-BLG-575	17:51:36.76	-28:26:10.57	2457654.413	2457654.332	52765.2	0		28.630	Y	Y	Y
OGLE-2016-BLG-1849		18:19:14.52	-27:07:11.8	2457654.161	2457647.652	44.03	0.118	8.511	20.175	Y	Y	
OGLE-2016-BLG-1829	MOA-2016-BLG-579	18:17:27.8	-23:54:09.9	2457653.234	2457668.603	128.2	0.161	6.278	20.509	Y	Y	
	MOA-2016-BLG-562	18:13:15.35	-27:51:41.66	2457652.483	2457649.804	103904.53	0		28.430	Y	Y	
OGLE-2016-BLG-1801		18:02:34.88	-27:51:04.8	2457651.4	2457653.266	52						
OGLE-2016-BLG-1787		18:09:17.2	-25:05:59.4	2457650.026	2457635.501	50						
OGLE-2016-BLG-1770		17:57:12.88	-28:04:15.4	2457646.047	2457649.923	38						
OGLE-2016-BLG-1886	MOA-2016-BLG-550	17:54:18.73	-29:07:21	2457641.727	2457818.52	74						
	MOA-2016-BLG-545	18:18:37.64	-21:43:42.48	2457641.724	2457645.494	56						
OGLE-2016-BLG-1759	MOA-2016-BLG-568	18:05:05.32	-28:23:42	2457640.003	2457658.298	32						
OGLE-2016-BLG-1762		18:16:49.44	-27:35:58.2	2457640.003	2457679.99	16						
OGLE-2016-BLG-1755		18:12:54.46	-23:38:22	2457639.176	2457641.083	35						



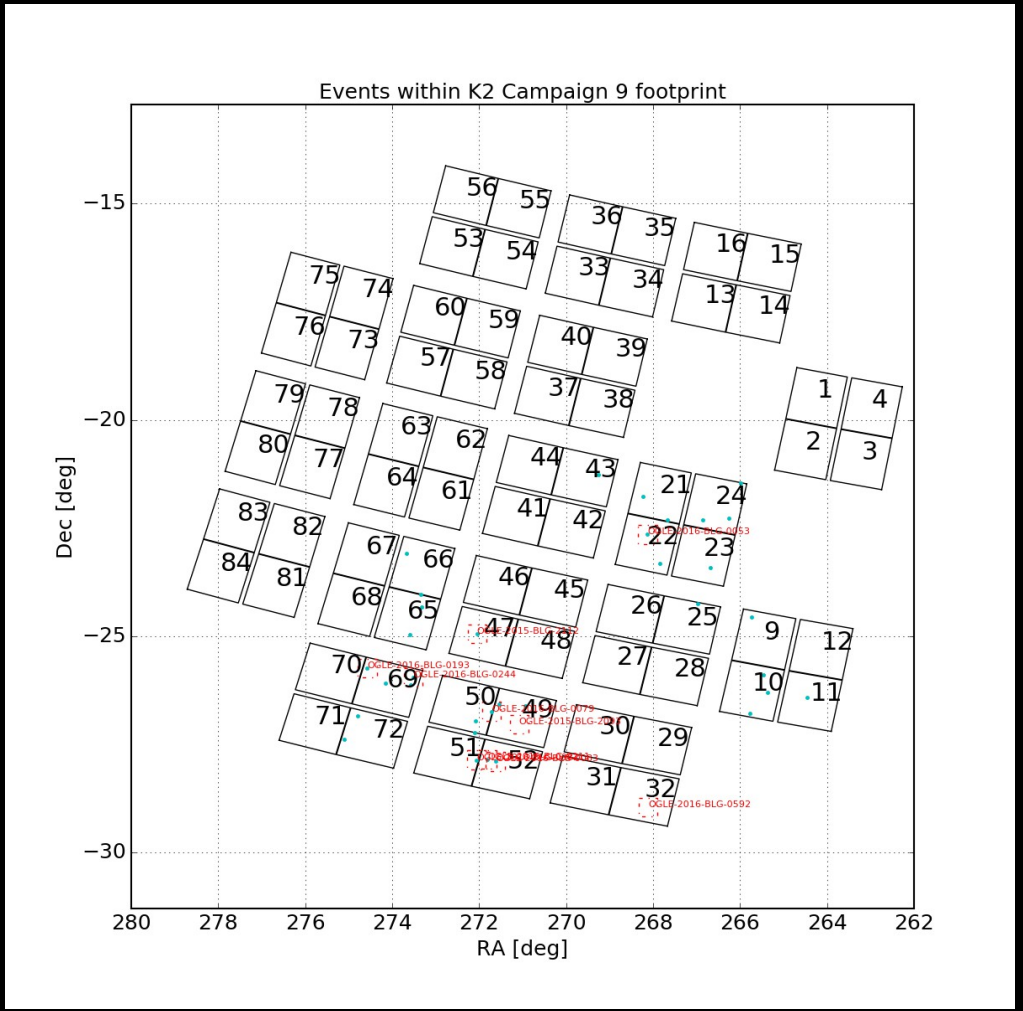
K2/Campaign 9 - Observations

Network focused on selected targets from the out-of-superstamp fields, selected for lower survey coverage

Sinistro pointings adjusted to cover multiple events

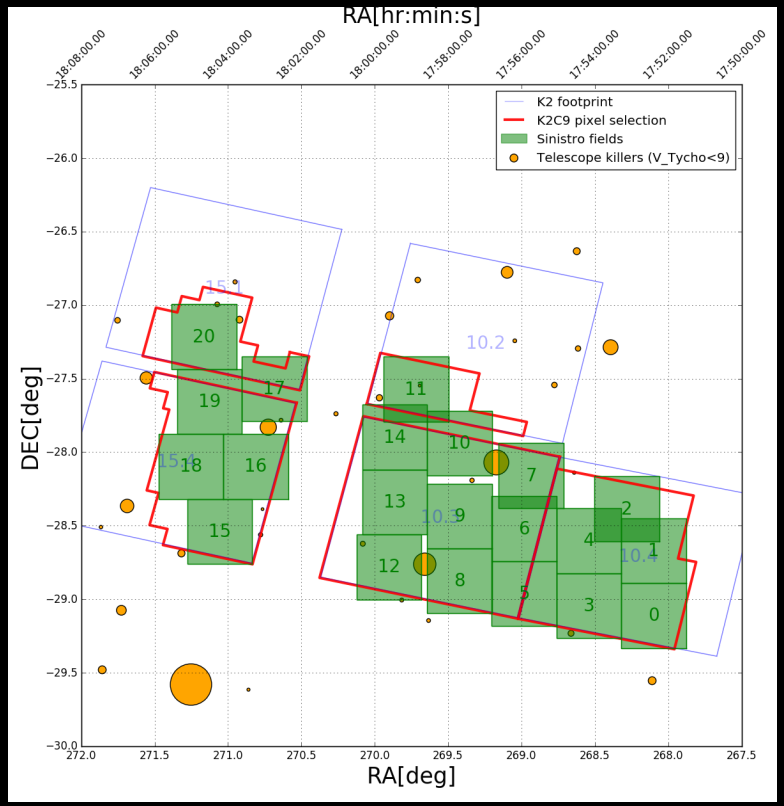
Consistent telescopes used

Rapid observations triggered for short-t_E candidates on LCO+LT



K2/Campaign 9 - Observations

FL08/COJ
Not released to network scheduler
Only available through direct-DB submission
Set to monitoring limited number of fields in the K2 superstamp



by Etienne Bachelet

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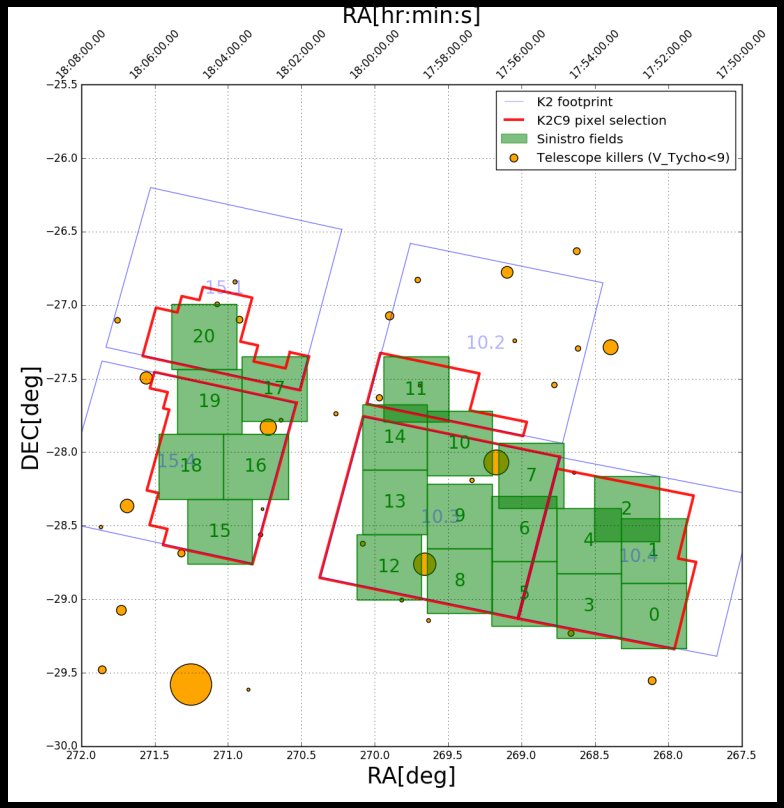

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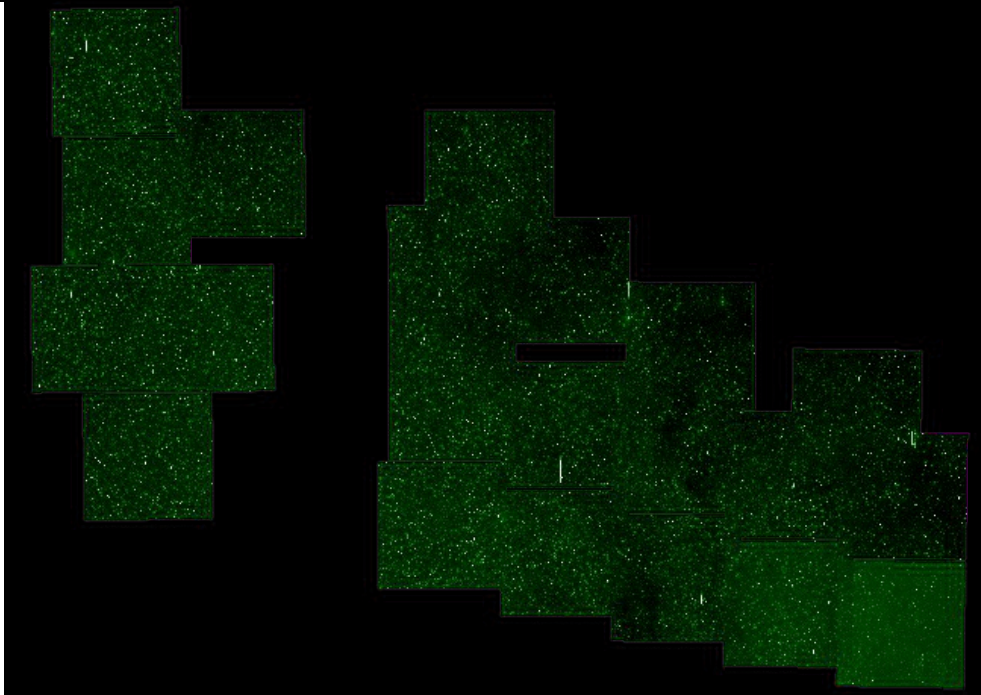


Reference frames by Roberto Figuera Jaimes
Mosaic by Rob Siverd

Events & Data

K2/Campaign 9

40 targets within out-of-superstamp fields
52 within the Sinistro survey fields

263 targets inside the superstamp

14 short-t_E alert triggers

Colour data
- VST survey by Markus Hundertmark
- WIYN survey by Etienne Bachelet
- LT Optical/NIR obs
  18 targets observed in SDSS-i & H

Spitzer

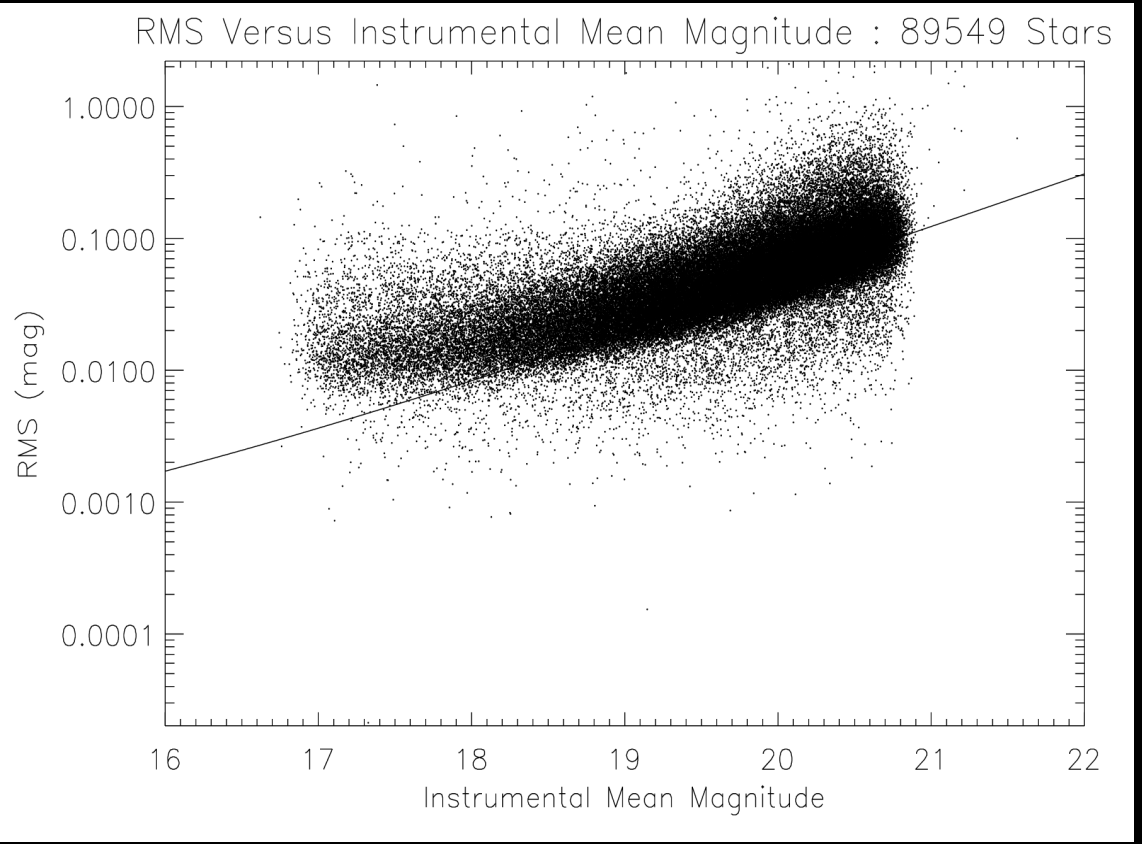
Reactive follow-up of 17 events

Targetlist overlaps K2/C9

Some LT NIR data

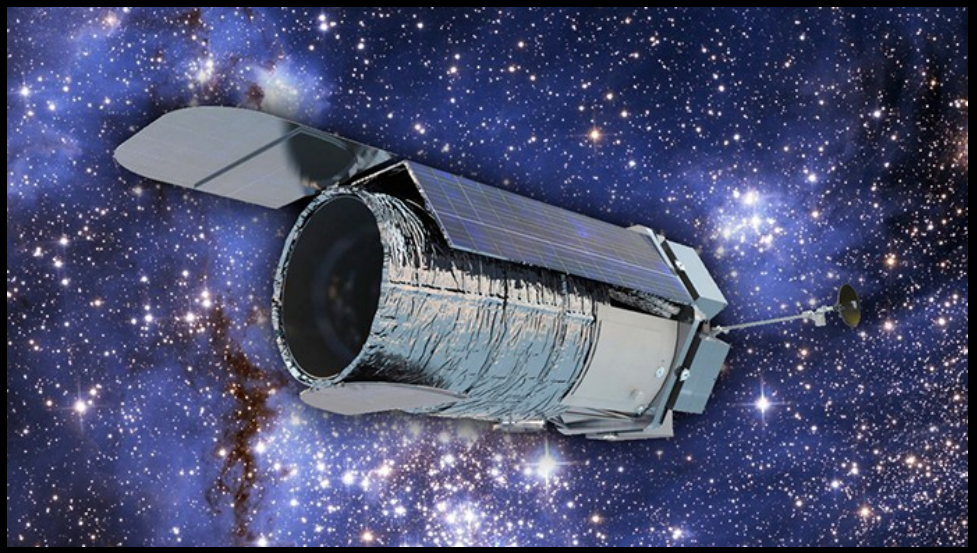
Data Release Plan

- Over 15,000 frames in total this year by LCO alone
- Roberto Figuera Jaimes reducing full-frames data for all events
- Plan to publicly release entire dataset with accompanying paper, to incorporate VST data from Markus and Salerno data from Valerio



Future directions

- Modeling and analysis software – see talk by E. Bachelet
- Public outreach and education
- Data Challenge



WFIRST Data Challenge

Goals:

- Stimulate development of event detection and analysis tools for microlensing
- Tackle outstanding limitations of microlensing modeling

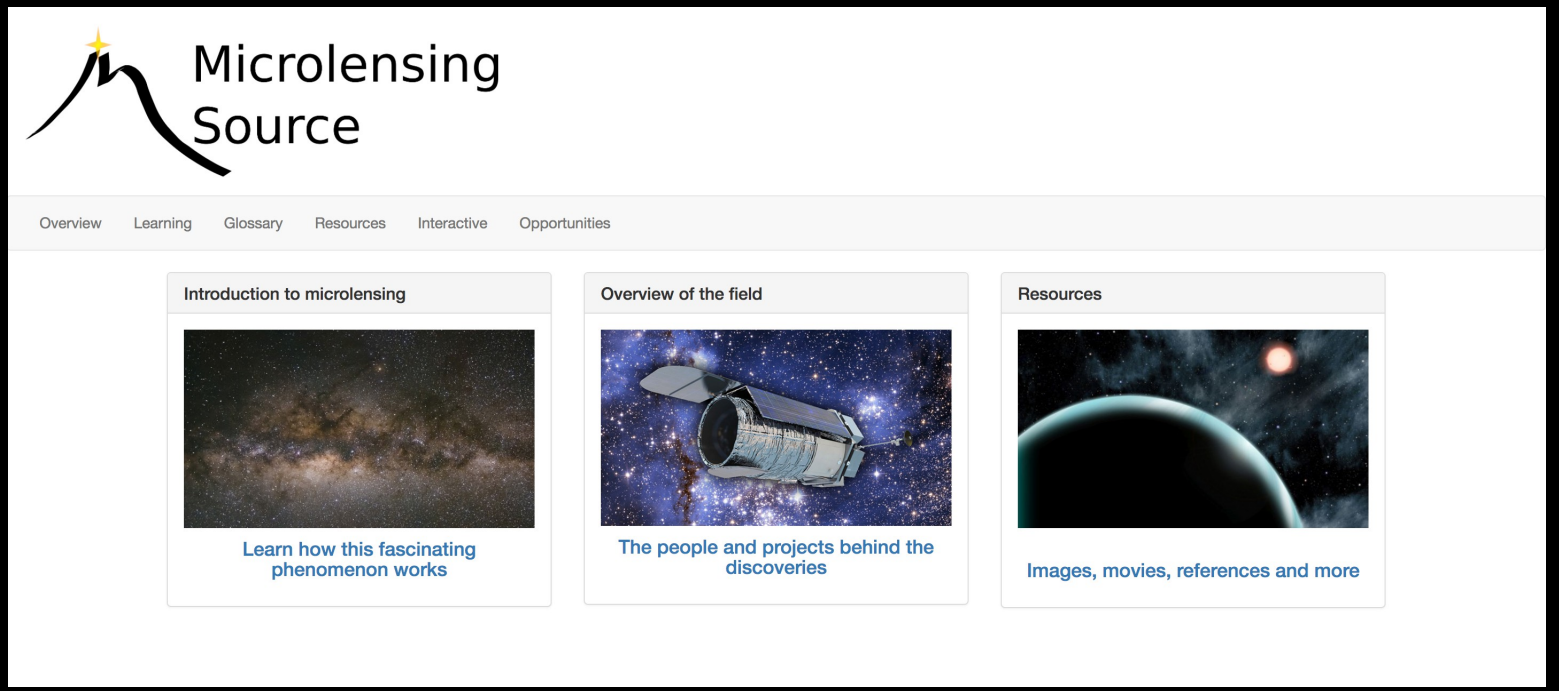
Approach:

- Make public realistic, simulated datasets (~thousands of lightcurves), with progressively more challenging microlensing events injected into them.
- Datasets will include variable stars, second-order effects
- Invite community and interested parties to analyze all or part of the data within appropriate timeframes
- Independent evaluation of results, identify outstanding challenges

Microlensing-source.org

Resources aimed at both active researchers and newcomers to the field

- Introduction to the field for newcomers
- Educational materials from concept level up to undergraduate
- Simulation tools
- Public use images, movies
- Meetings, jobs, grant listings



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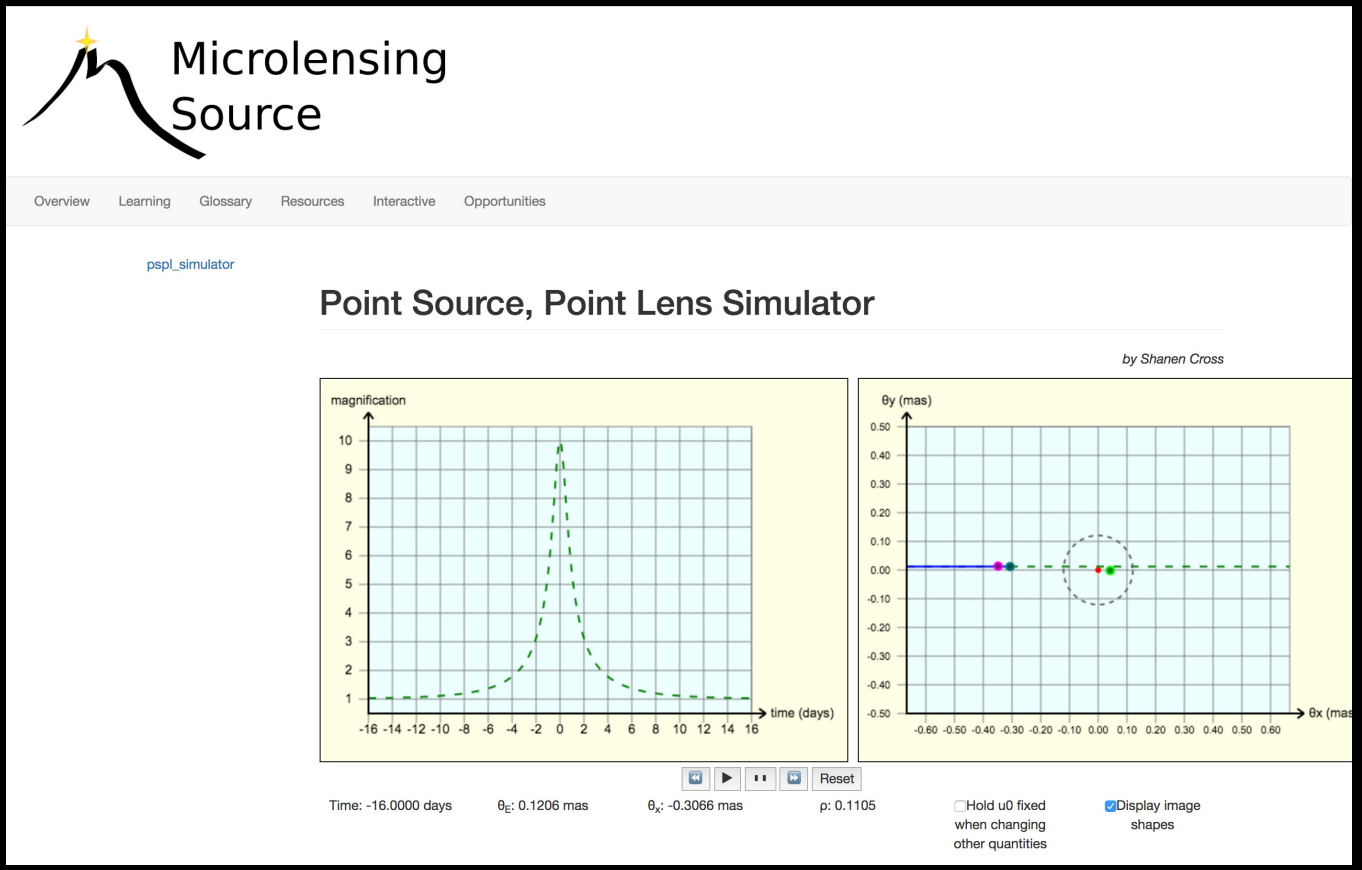
Javascript simulation tools by Shanen Cross



Future Directions: LCO Open-Access Program

Anyone in the US can apply for time on the LCO network via NOAO:
1200hrs/semester on 1m network
220hrs/semester on the 2m network

Purpose: stimulate science by following alerts from current time domain surveys
Motivation: prepare for time domain research in the LSST era by developing relevant programs, methods, and technologies.

Reactive follow-up of alerts will be needed for a range of science

Future Directions: LCO Open-Access Program

Microlensing as a pathfinder program, building on experience and tools from RoboNet

Developing program to respond to a wider range of alerts serving the needs of multiple proposals
Collaborations with:

- Jennifer Yee - selected Spitzer events
- Lukasz Wyrzykowski - selected Gaia follow-up
- PTF/ZTF Galactic Group