

Finding Cataclysmic Variables in the Zwicky Transient Facility

Isabel de Jesus Lima

Nacional Institute of Space Research – Brazil

University of Washington – VISIT program

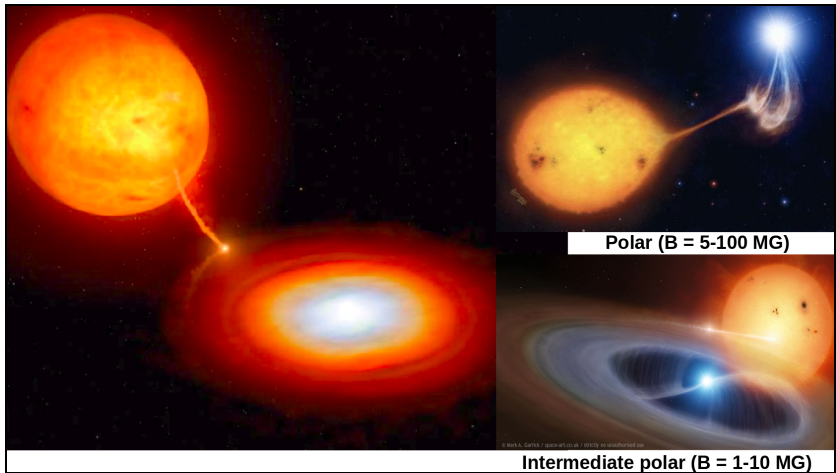
PI: Dr. Paula Szkody



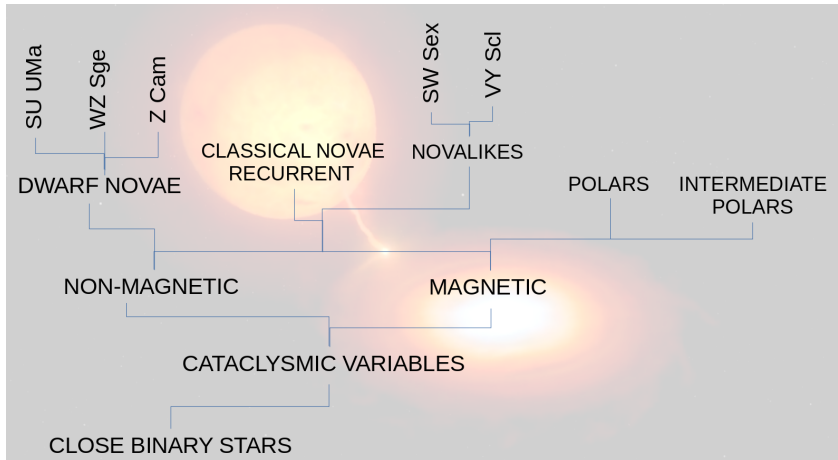
ZTF Collaboration Meeting

September, 2019

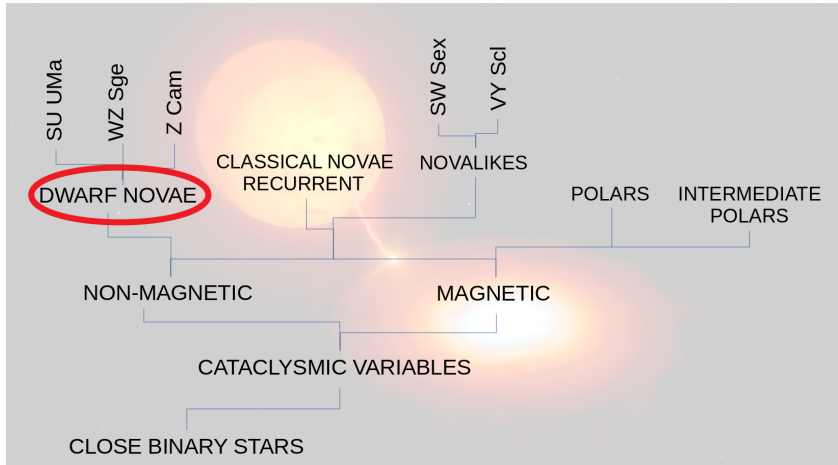
Cataclysmic variables



Cataclysmic variables

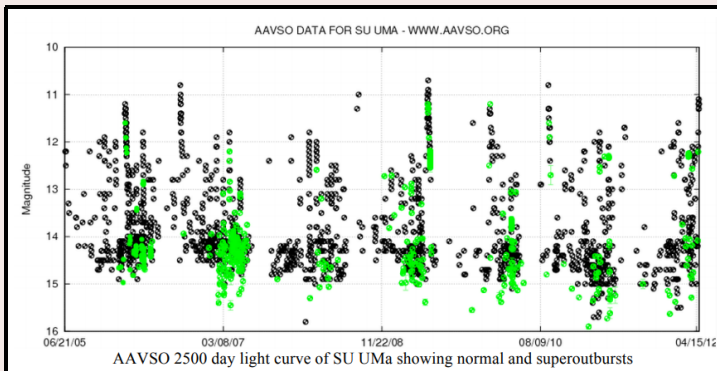


Cataclysmic variables



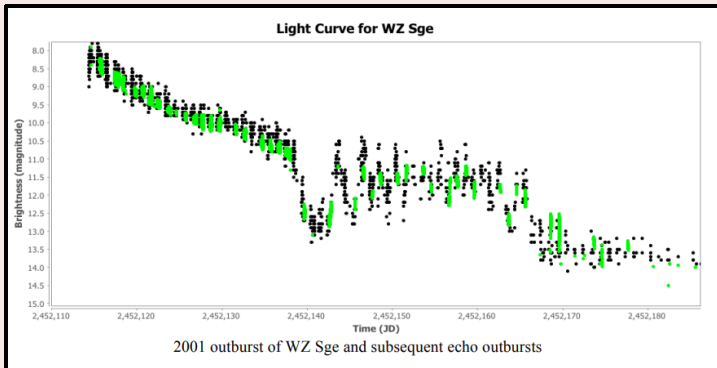
Cataclysmic variables

SU UMa

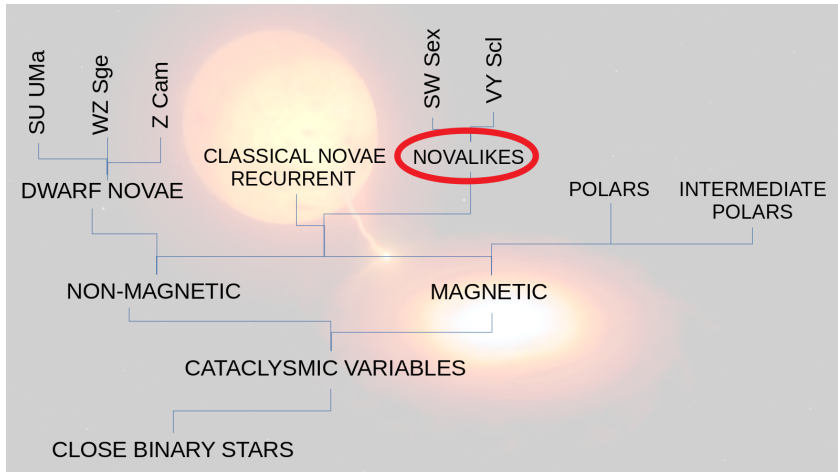


Cataclysmic variables

WZ Sge

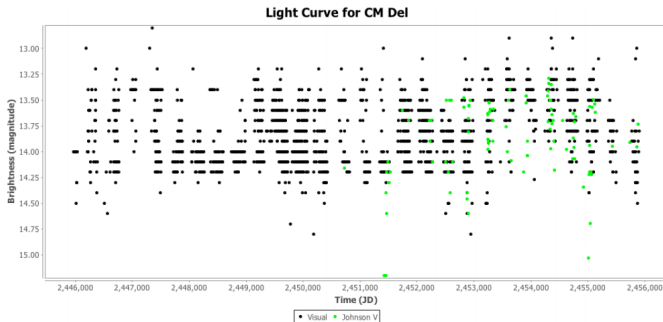


Cataclysmic variables



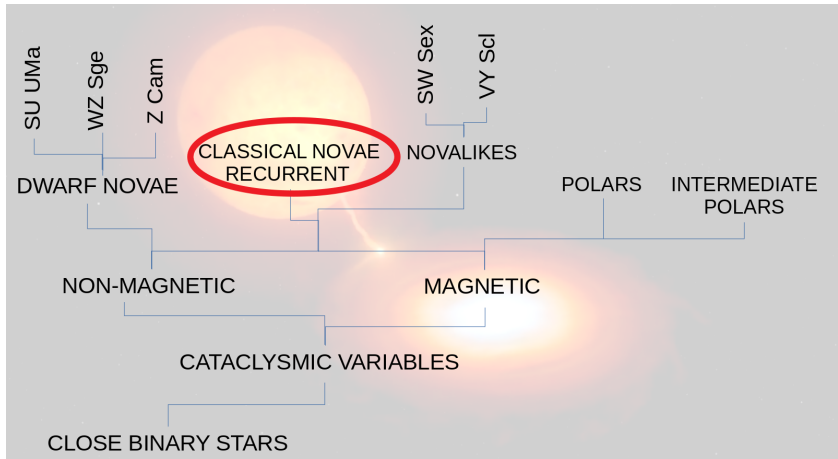
Cataclysmic variables

Novalike



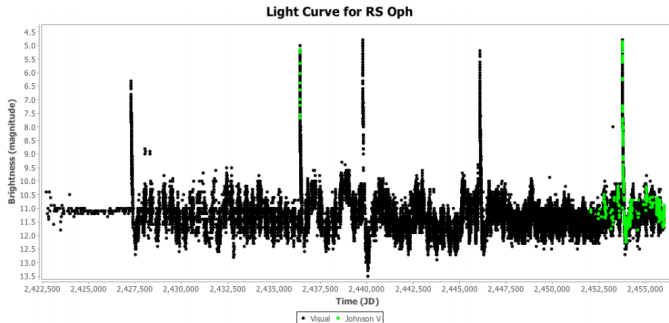
AAVSO light curve of CM Del, a nova-like variable showing activity limited to about 1 magnitude in V

Cataclysmic variables



Cataclysmic variables

Recurrent Novae



The entire historical AAVSO light curve of RS Ophiuchi showing the known outbursts

GROWTH Marshal

GROWTH Followup Marshal

 view source
 cone search
 view report
 view spectra
 at an observing run
 scan for candidates
 add source
 transfer source

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Transient Advocate: n/a

 **Isabel de Jesus Lima** classified [ZTF18acabezi](#) and [ZTF19abrtxhei](#) as "CV candidate"
2 days ago

 **Isabel de Jesus Lima** classified [ZTF18ablvynr](#) as "CV candidate?"
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 **Sjoert van Velzen** commented on [ZTF19aapcvao](#): "allWISE: w1-w2=0.86+/-0.19"
3 days ago

 **Sjoert van Velzen** commented on [ZTF19aazxpgk](#): "allWISE: w1-w2=-0.41+/-0.31"
3 days ago

 **Sjoert van Velzen** commented on [ZTF19aazxpgk](#): "neoWISE: N(w1)=30; N(w2)=30; <w1>=15.88; <w2>=16.53; chi2(w1)=1.6"
3 days ago

 **Sjoert van Velzen** commented on [ZTF19aazxpgk](#): "large flux increase wrt ref: dm=-4.2 (g-band) dm=-3.3 (r-band)"
3 days ago

 **Anna Ho** commented on [ZTF19abraqpf](#):
3 days ago

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 next runs

2019-09-01 P200+DBSP
2019-09-02 Lick 3-m+KAST
2019-09-03 Lick 3-m+KAST
2019-09-04 Lick 3-m+KAST
2019-09-05 P200+DBSP
2019-09-06 P200+DBSP
2019-09-06 Keck2+NIRES

 Today's toO runs

No toO Runs Today

 P60 schedule

 most viewed this week

 [ZTF19abraqpf](#)
14 views

GROWTH Marshal

	ZTF18abvcsay (63.7 d)	None	None	18:27:30.92 +75:38:19.2	$r = 18.6$ (0.8 d)		no spectra found	[Reference]: 2018-05-09 2019-08-07 45:30 to 2018-08-08 15:06:02:00 [In TESS field]: True [passed_filter]: Catadysmic Variables
	ZTF19ubpszu (15.8 d)	CV candidate	None	18:28:58.17 +32:55:15.2	$r = 18.3$ (2.9 d)		no spectra found	[Reference]: 2018-03-27 2019-08-11:24:03 to 2018-04-21 24:11:56:06 [passed_filter]: Catadysmic Variables
	ZTF18scatce (11.7 d)	DN: V513 Peg	None	22:16:31.14 +29:00:19.8	$g = 12.9$ (1.7 d)		no spectra found	[Reference]: 2018-07-01 2019-08-09:47:14 to 2018-09-28 24:06:46:04 [passed_filter]: Catadysmic Variables
	ZTF19ubpszu (17.6 d)	CV candidate?	None	19:14:51.00 -11:32:35.2	$r = 20.0$ (6.9 d)		no spectra found	[Reference]: 2018-06-07 2019-08-10:32:42 to 2018-06-22 24:09:39:27 [passed_filter]: Catadysmic Variables
	ZTF18ubmxav (8.6 d)	CV candidate	None	00:10:19.31 +41:04:54.6	$g = 17.9$ (2.6 d)		no spectra found	[Reference]: 2018-07-27 2019-08-09:25:55 to 2018-11-21 02:20:03 [passed_filter]: Catadysmic Variables
	ZTF18ubpsya (90.6 d)	CV candidate	None	20:42:56.96 +23:52:46.4	$g = 18.6$ (0.8 d)		no spectra found	[Reference]: 2018-04-20 2019-08-11:40:08 to 2018-07-14 22:08:50:01 [In TESS field]: True [passed_filter]: Catadysmic Variables
	ZTF18ubrvud (44.7 d)	CV candidate	None	20:16:28.18 +16:53:31.2	$r = 18.9$ (9.8 d)		no spectra found	[Reference]: 2018-04-22 2019-08-11:27:13 to 2018-05-13 22:07:07:43 [passed_filter]: Catadysmic Variables
	ZTF18ubphid (92.6 d)	CV candidate?	None	20:34:59.64 +25:55:29.8	$g = 19.8$ (0.8 d)		no spectra found	[Reference]: 2018-04-09 2019-08-11:45:55 to 2018-09-09 20:06:37:10 [passed_filter]: Catadysmic Variables
	ZTF18ubryms (97.6 d)	CV candidate	None	20:53:55.98 +34:14:09.4	$g = 19.7$ (0.8 d)		no spectra found	[Reference]: 2018-04-21 2019-08-12:05:37 to 2018-08-16 20:07:41:26 [In TESS field]: True [passed_filter]: Catadysmic Variables

GROWTH Marshal

GROWTH Followup Marshal

view source

cone search

view report

view spectra

at an observing run

scan for candidates

add source

transfer source

ToO Marshal

Welcome, Isabel

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customize

newsfeed

Transient Advocate: n/a

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3 days ago

Anna Ho commented on ZTF19abraqp: "nothing in VizieR"
4 days ago

Anna Ho commented on ZTF19abraqp: "no LegacySurvey coverage"
4 days ago

Isabel de Jesus Lima classified ZTF18ablvynr as "CV candidate?"

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next runs

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2019-09-04 Lick 3-m+KAST
2019-09-05 P200+DBSP
2019-09-06 P200+DBSP
2019-09-06 Keck2+NIREX

Today's toO runs

No ToO Runs Today

P60 schedule

most viewed this week

ZTF19abraqp
14 views

ZTF17aaawglf (DN)
6 views

GROWTH Marshal

Edit Candidate Filter for Program:

Cataclysmic Variables ▾

Please fill out the form below to update a comment in the database (* = REQUIRED)

Filter:

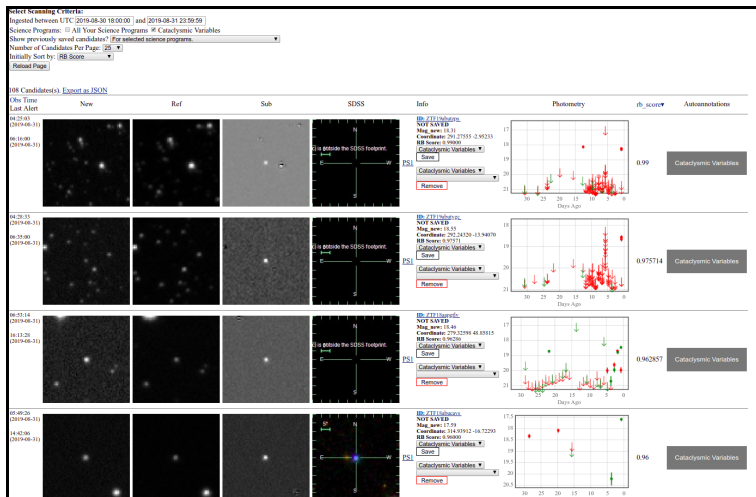
```
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is_asteroid = True;
real = False;
hostgr = -99;
blue_host = False;
bright = False;
brightstar = False;
hostless = False;
rapid = False;
dt = -99;
dmag = -99;

prevcandidates = observation["prv_candidates"];
m_now = observation["candidate"]["magpsf*"];
m_app = observation["candidate"]["magap"];
t_now = observation["candidate"]["id"];
fid_now = observation["candidate"]["fid"];
sgscore = observation["candidate"]["sgscore1"];
sgscore2 = observation["candidate"]["sgscore2"];
sgscore3 = observation["candidate"]["sgscore3"];
srmag = observation["candidate"]["srmag1"];
srmag2 = observation["candidate"]["srmag2"];
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sgmag = observation["candidate"]["sgmag1"];
rb_score = observation["candidate"]["rb*"];
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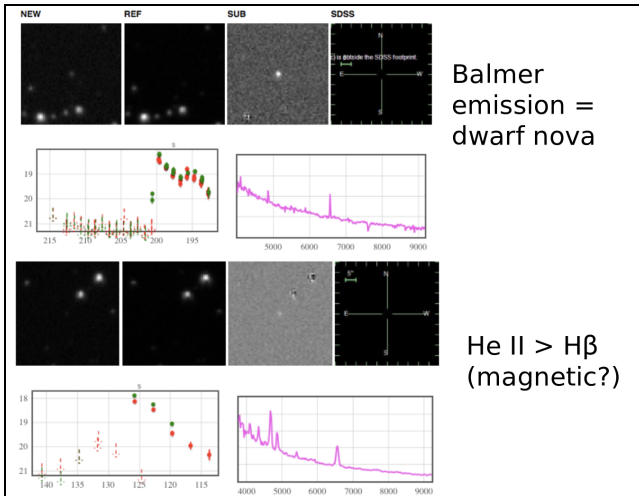
$g - r < 0.6$
and
 $dmag \geq 2$
and
 $dt \leq 3 \text{ days}$



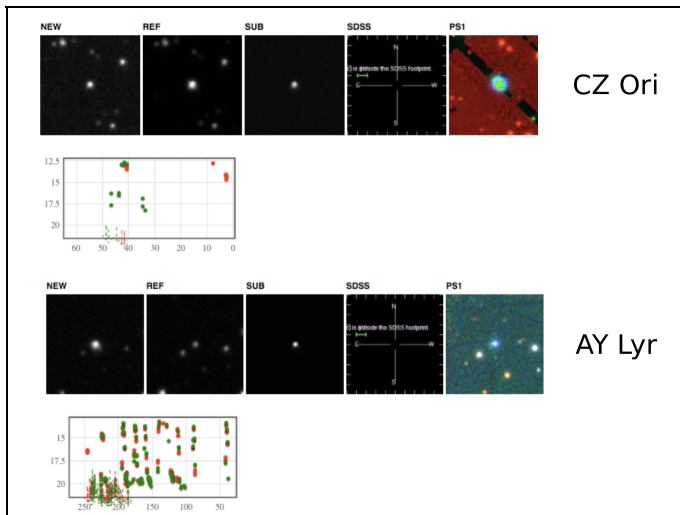
GROWTH Marshal



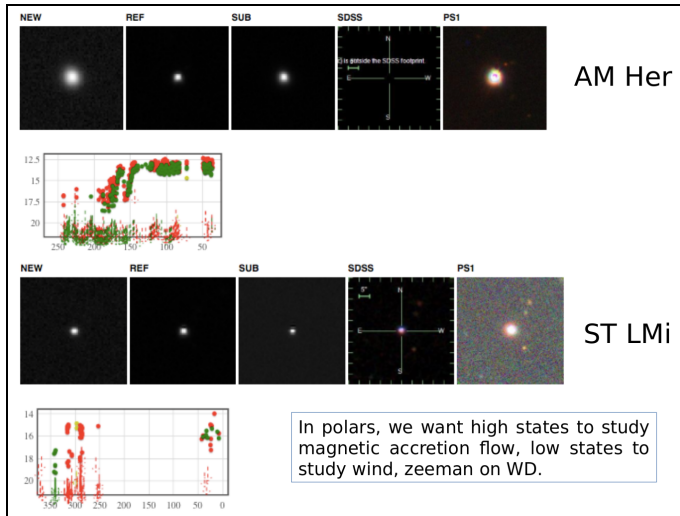
Spectra provide confirmation



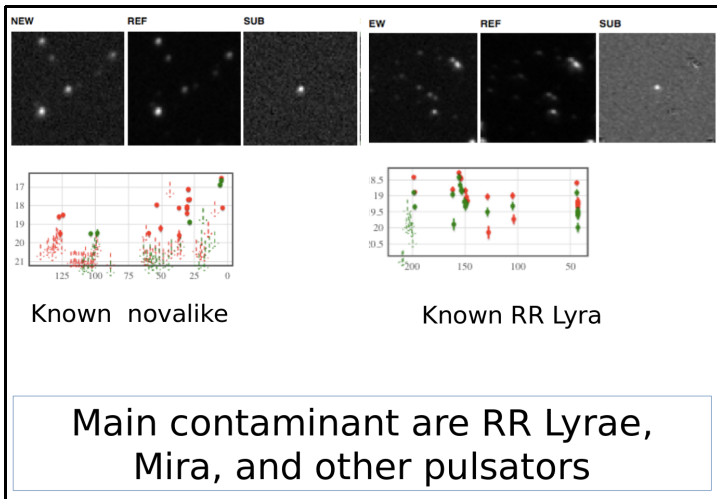
Known CV



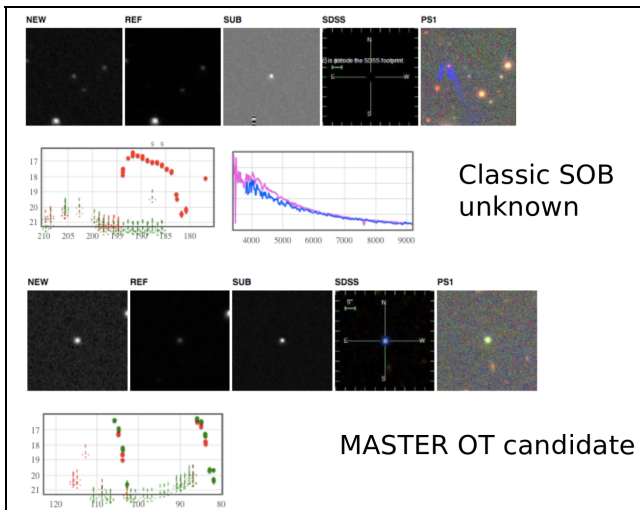
Known CV



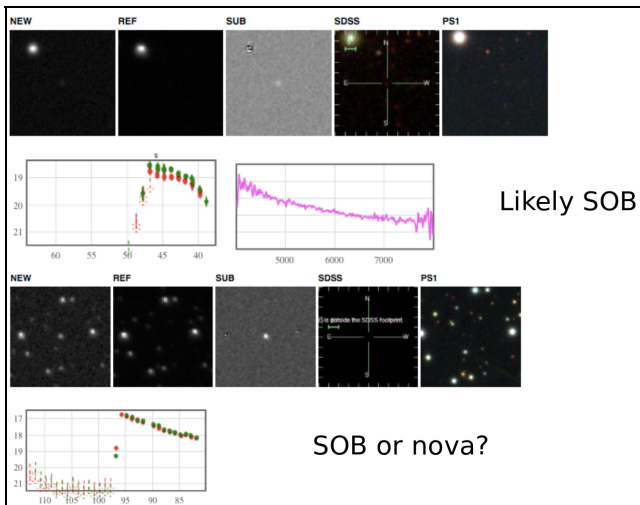
Other sources



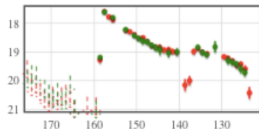
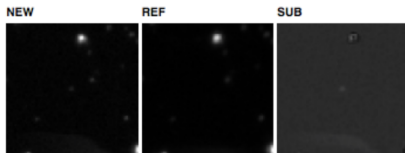
CV candidates



CV candidates



CV candidates

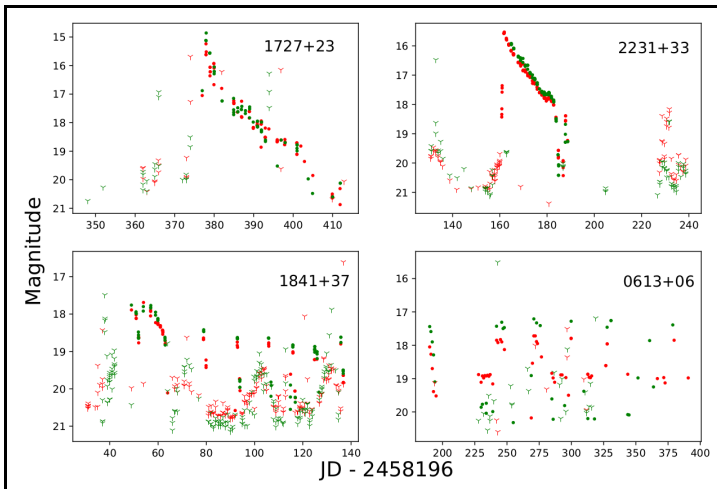


$r = 20.4$ (123.6 d) | [Upload New Photometry](#)

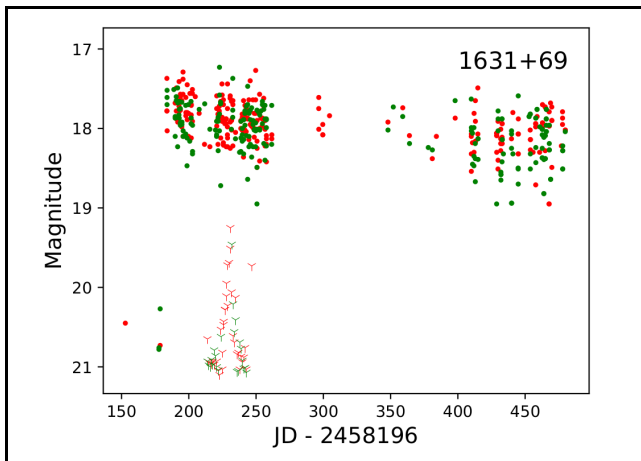
[Upload New Spectroscopy](#)

Likely nova found 5 days before ATLAS

CV candidates

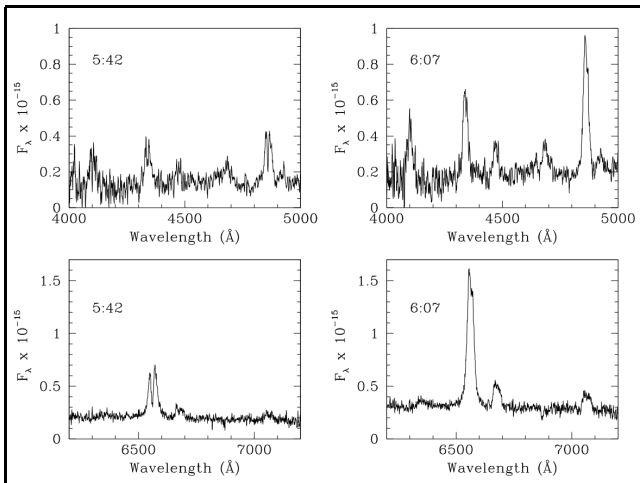


CV candidates



Szkody et al.+2019

CV candidates



ZTF results

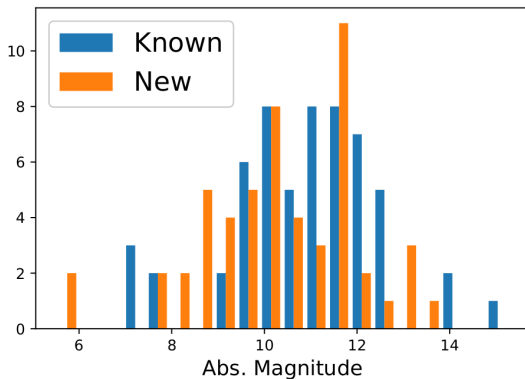


Figure 4. The number of systems in Tables 1 and 2 as a function of their absolute magnitude as determined from available Gaia parallaxes. Note that upper limits on the magnitudes for the fainter sources means that they are brighter limits to the true absolute magnitude at quiescence.

ZTF results

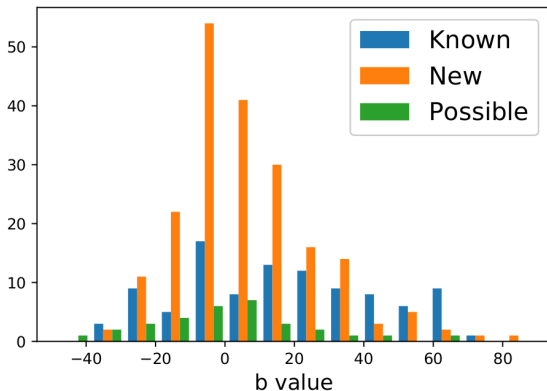


Figure 3. The number of systems in Tables 1-3 as a function of galactic latitude (in 5 deg bins).

Summary

Results from 1st year:

- About 40 candidates/month.
- 335 total CVs/candidates:
 - 100 previously known (27%)
 - 207 good candidates
 - 30 maybe

Summary

Results from 1st year:

- Spectral Resources:
 - Palomar 60 in - SEDM
 - 200in- double-beam spectrograph
 - Keck- LRIS
 - APO – DIS
 - Liverpool – SPRAT
 - SDSS
- 23 Confirmed as CVs!

Summary

Implications of ZTF for LSST

- Need better classifier for initial pass
- Need followup spectra to confirm dubious
- LSST will have 10x more alerts/night!

THANKS

