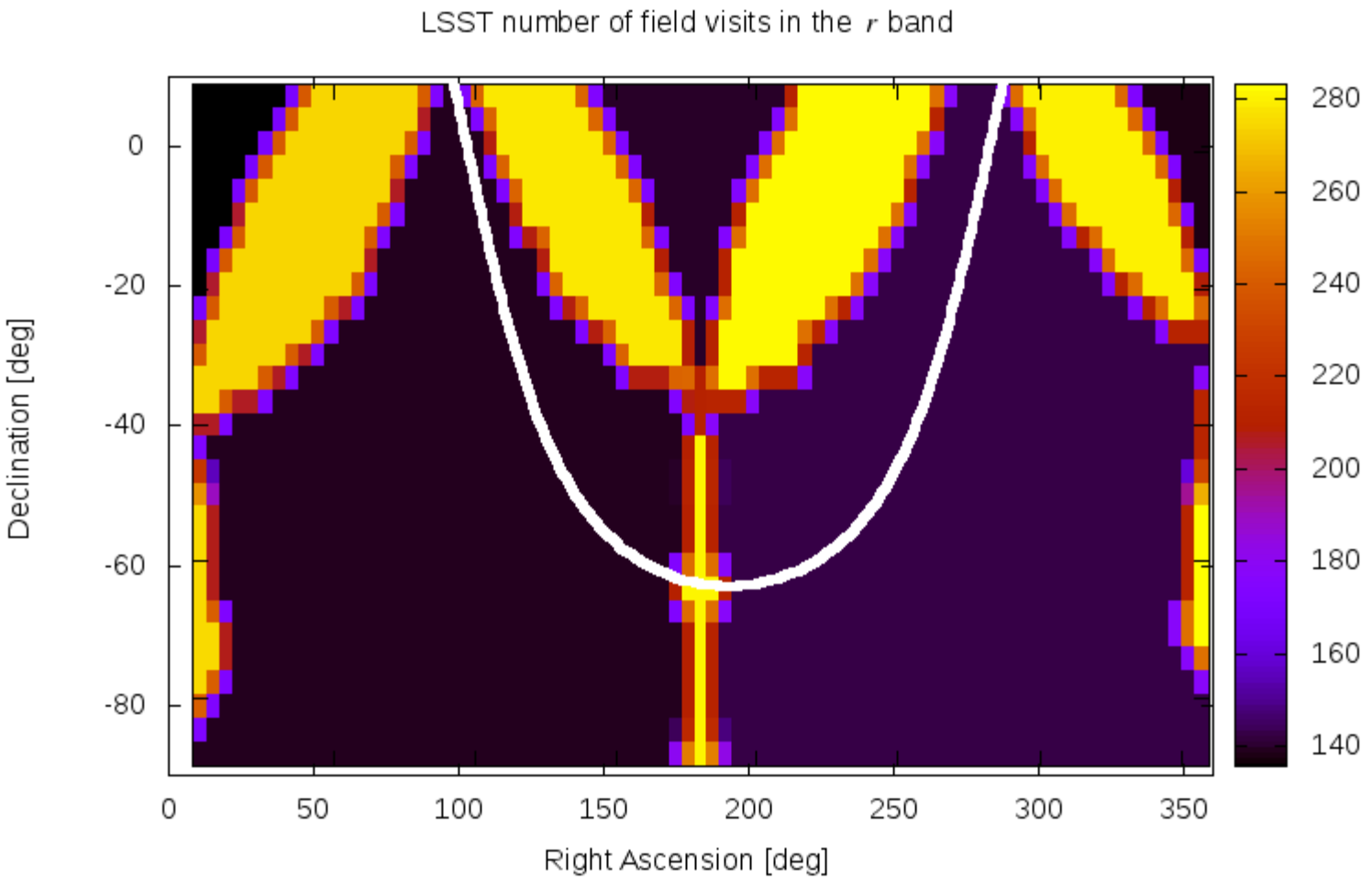
Close (Interacting, Eclipsing, Ellipsoidal) Multis

Andrej Prša (making noise),
Laura Chomiuk, Paula Szkody (contributing ideas),
soon to be identified active members (currently in deep hibernation)

Quick review of (mostly) outdated information:



OpSim 1.29
universal cadence

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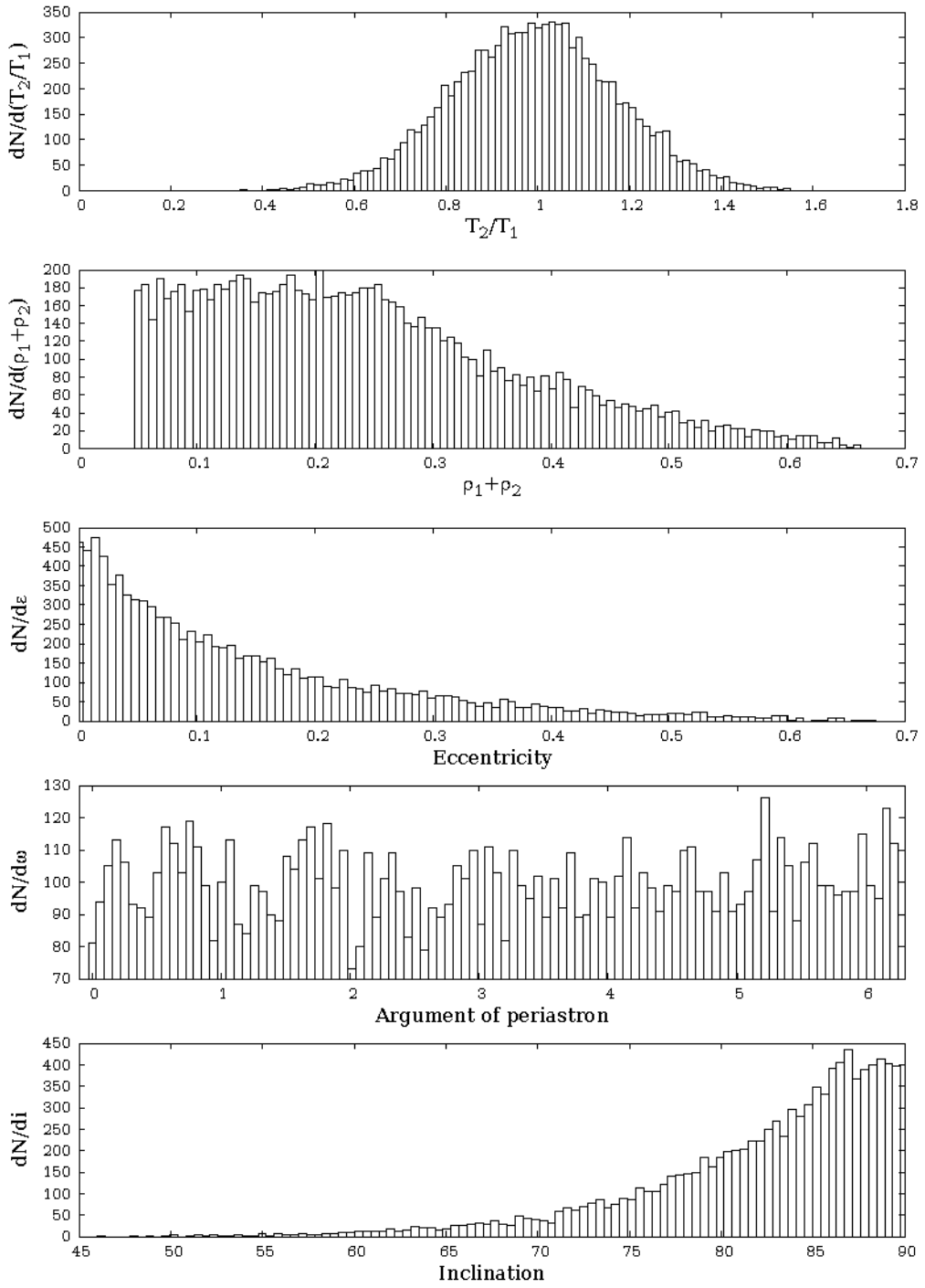

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Prša et al. (2011), AJ

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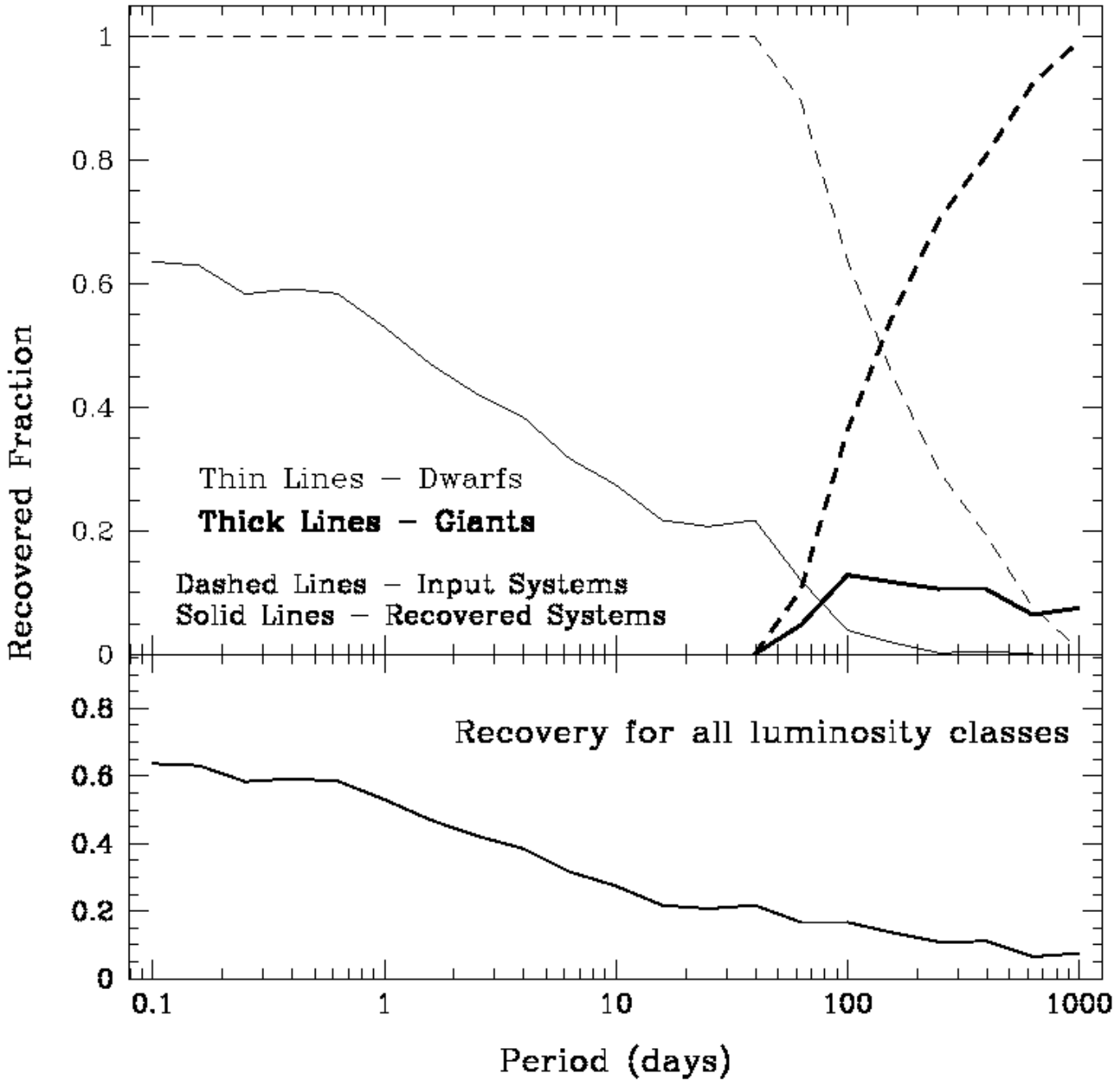

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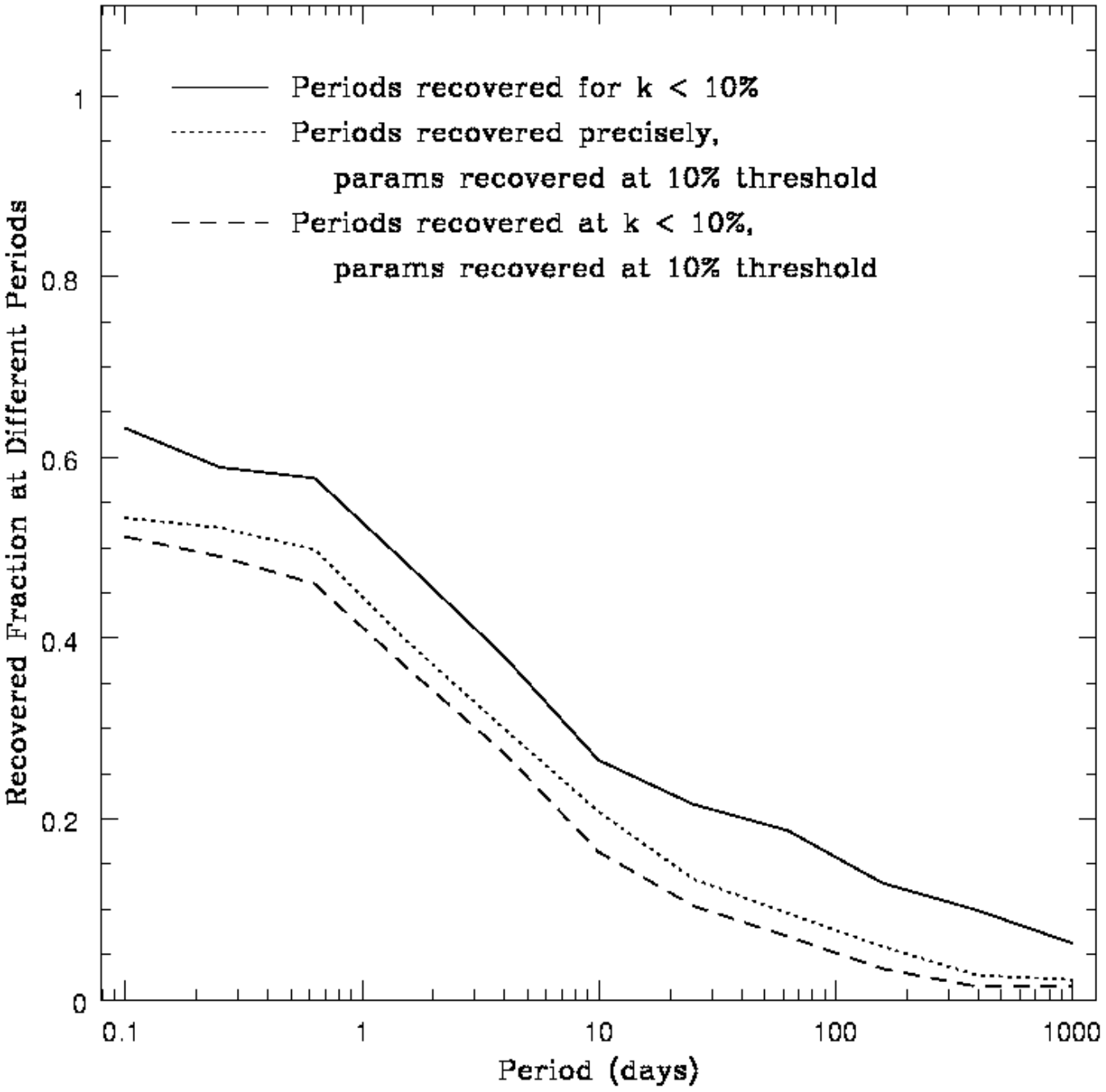

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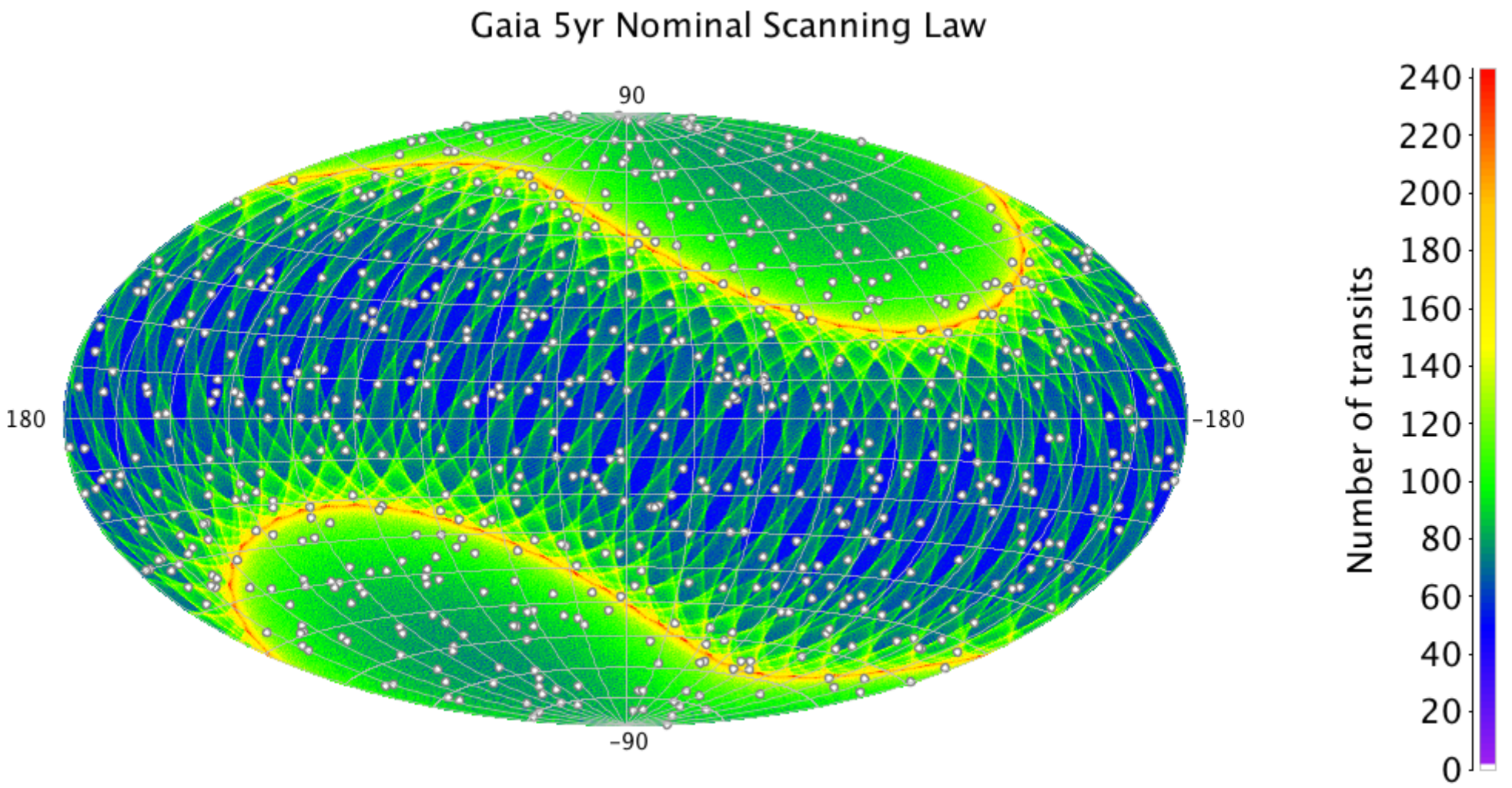
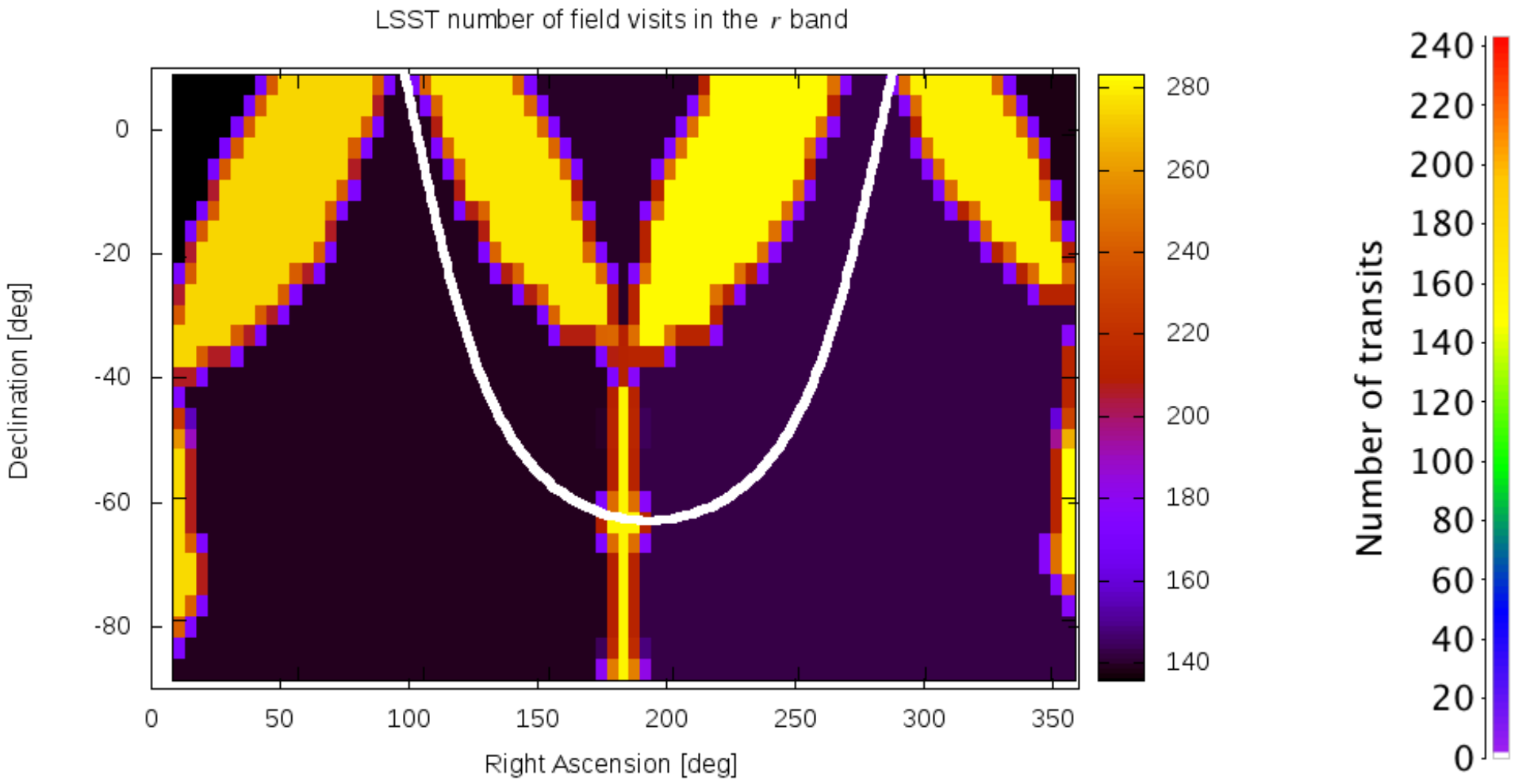
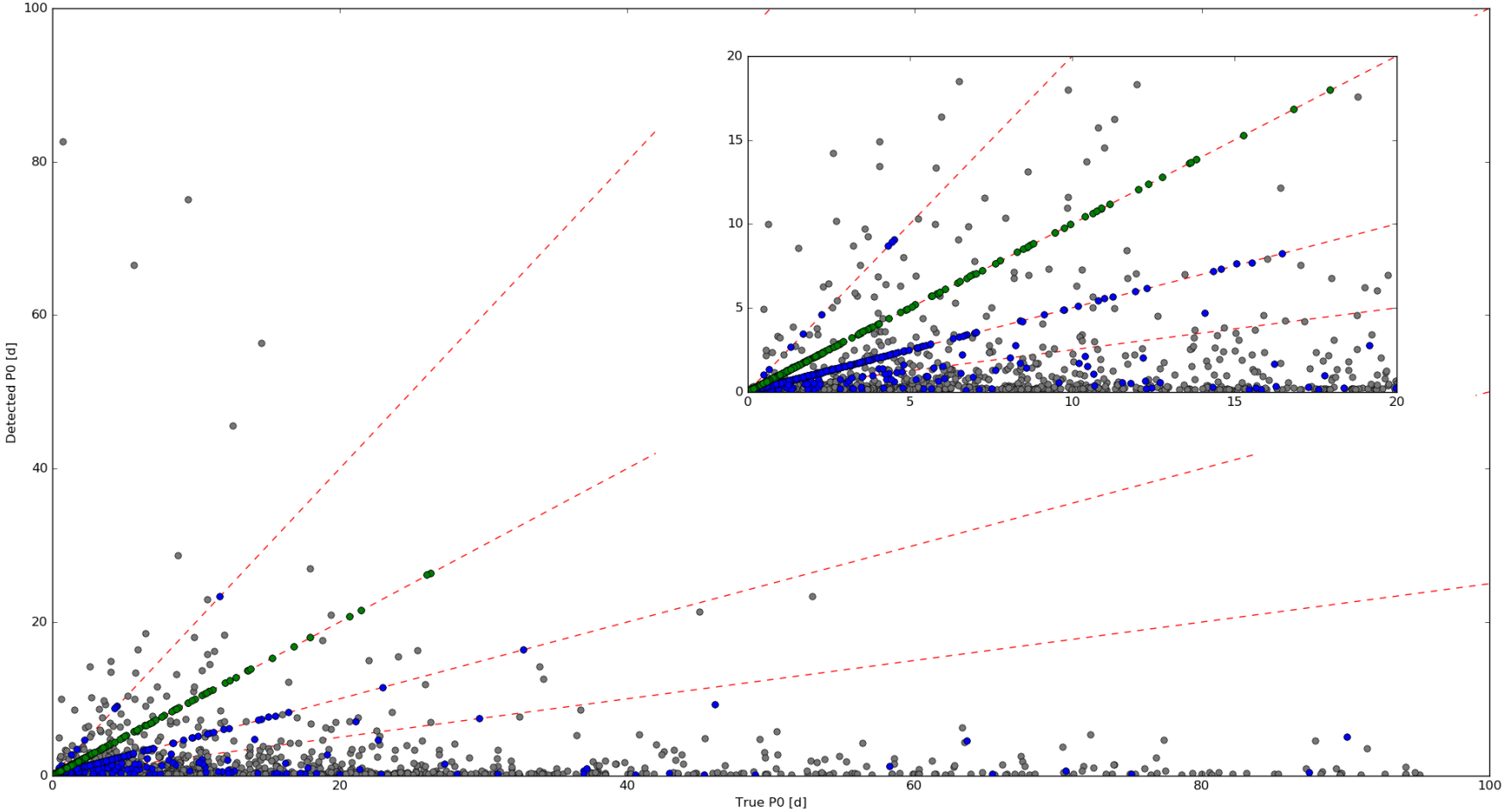
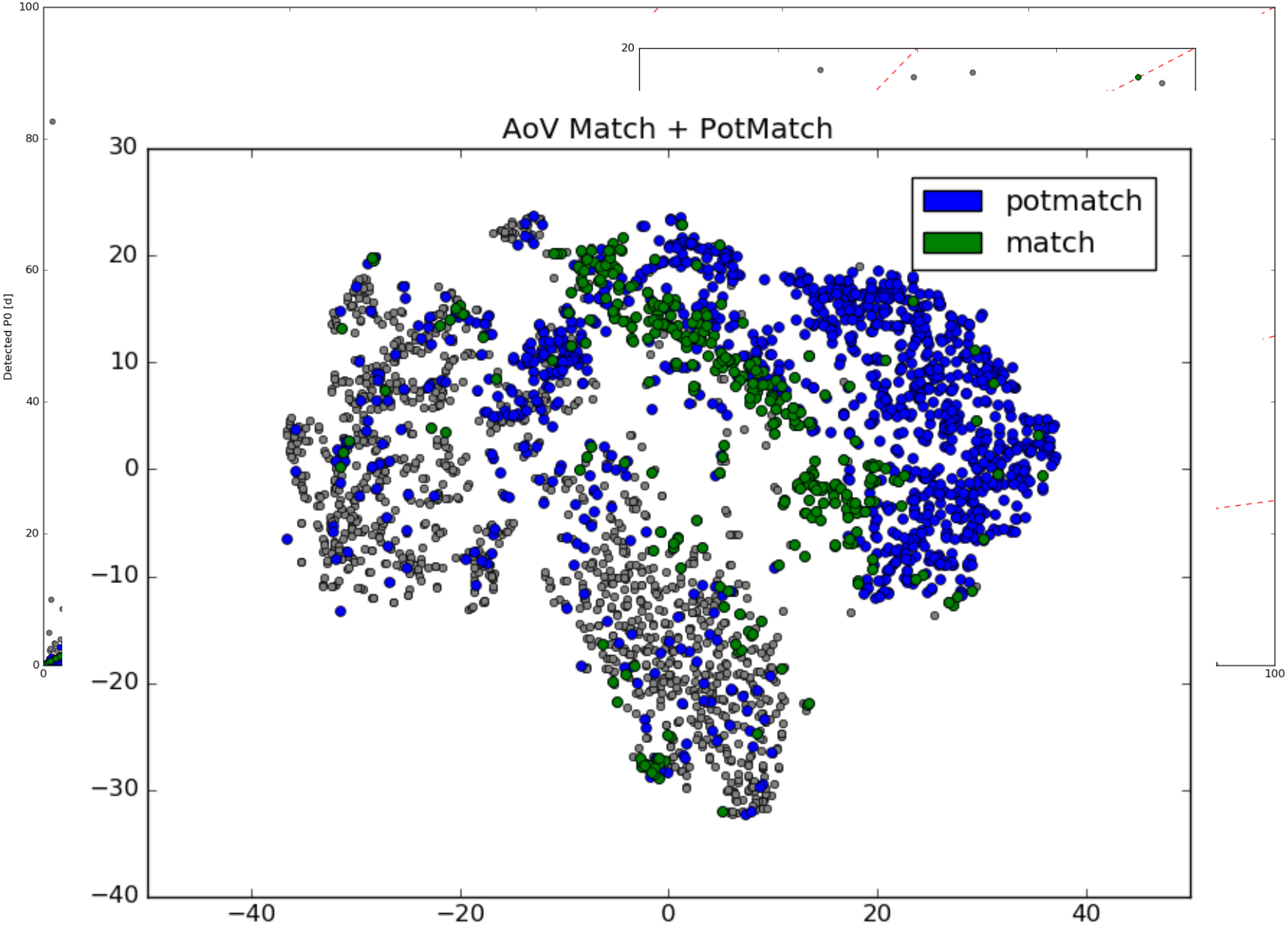
Prša et al. (2011), AJ

Any other mission we can learn from?

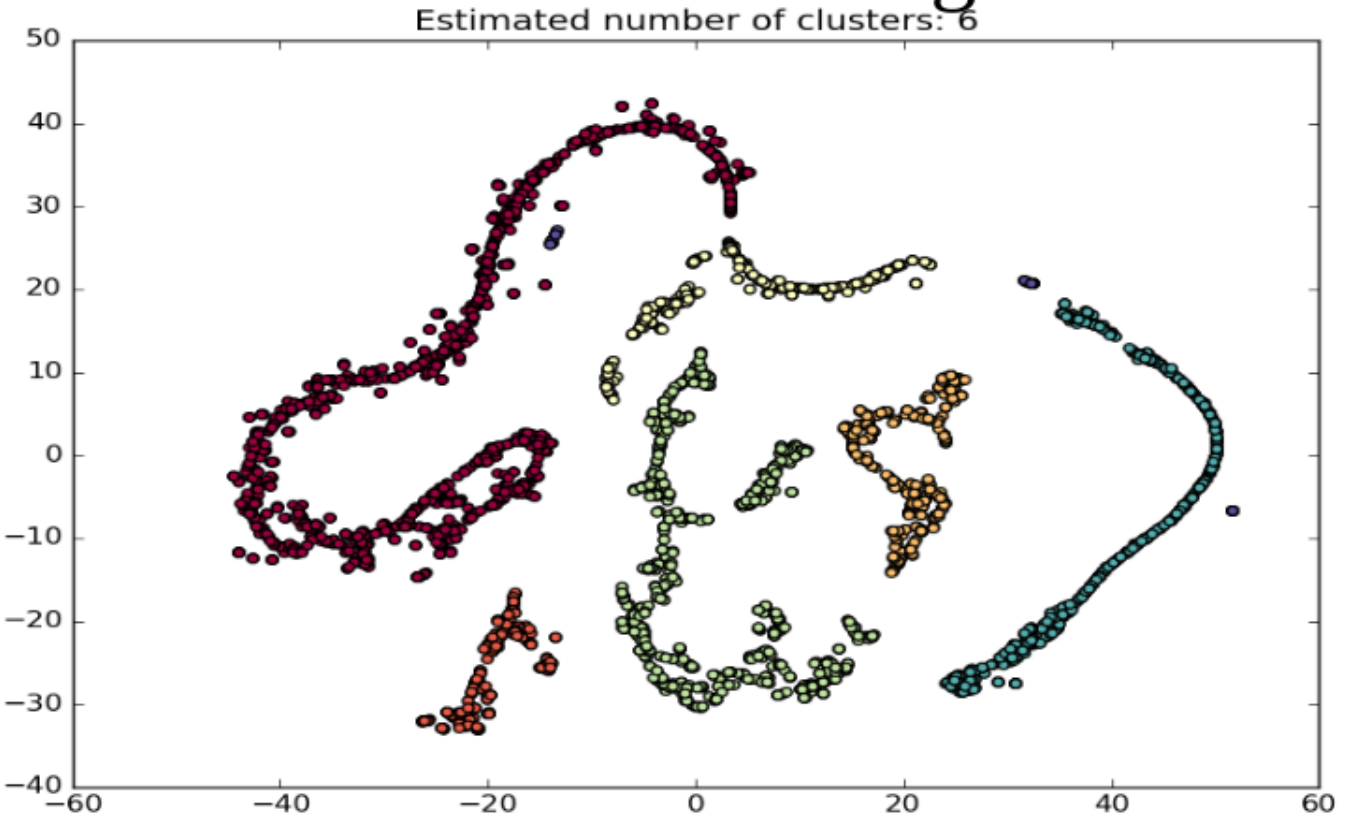

Gaia 5yr Nominal Scanning Law
90
180
-180
-90
Number of transits
240
220
200
180
160
140
120
100
80
60
40
20
0


LSST number of field visits in the r band
Declination [deg]
0
-20
-40
-60
-80
0
50
100
150
200
250
300
350
Right Ascension [deg]
280
260
240
220
200
180
160
140
Number of transits
240
220
200
180
160
140
120
100
80
60
40
20
0


Detected P0 [d]
True P0 [d]
0
20
40
60
80
100
0
5
10
15
20


AoV Match + PotMatch
potmatch
match
Detected P0 [d]
100
80
60
40
20
0
30
20
10
0
−10
−20
−30
−40
−40
−20
0
20
40
20
100

DBSCAN clustering results



Class #	Color on graph	# of objects	%	Description (based on visual inspection)
0	dark red	1009	35	Detached, most with one minimum only or wrong secondary minimum
1	bright red	185	6	Detached, two minima, ok fits
2	orange	272	9	Mainly asymmetric OCs and ELVs
3	yellow	281	9	Detached to semi-detached, broader primary eclipse
4	green	635	22	Symmetric OCs and ELVs
5	bright blue	448	15	1gaussian ½ period plots
-1	dark blue	34	1	Scattered weird fits

Kepler Period recovery in CU7 pipeline with Gaia sampling on the "gauge" data (1336 sources)

In percentages (run 7315: 4 peaks, detrend = false)

	Characterisation Fourier model				SOS 2 gaussian model			
	P=Pref	P=Pref/2	P=Pref*2	Total	P=Pref	P=Pref/2	P=Pref*2	Total
1336 gauge	0.74	**18.3**	0	19.1	**20.6**	2.6	1.6	24.8
583 1 or 2 Ecl	0.3	**37.7**	0	38.1	**44.3**	4.6	1.9	50.8
337 2 Ecl	0.3	**61.7**	0	62	**72.4**	6.8	0.9	**80.1**

80 % of period recovery for light curves with 2 eclipses

51 % of period recovery for light curves with 1 or 2 eclipses

Science drivers:

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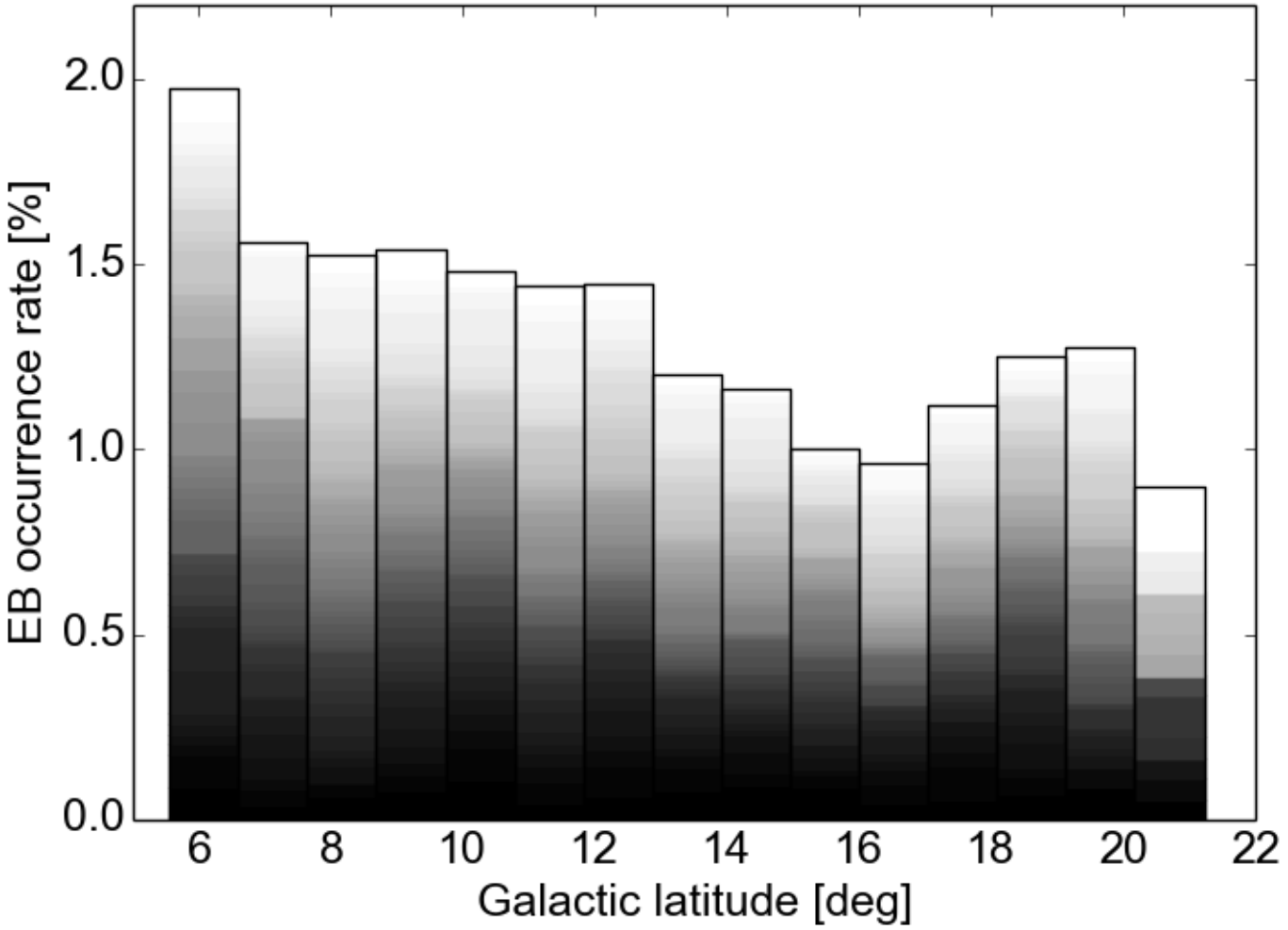

Kepler data;
Kirk et al. (2016), AJ

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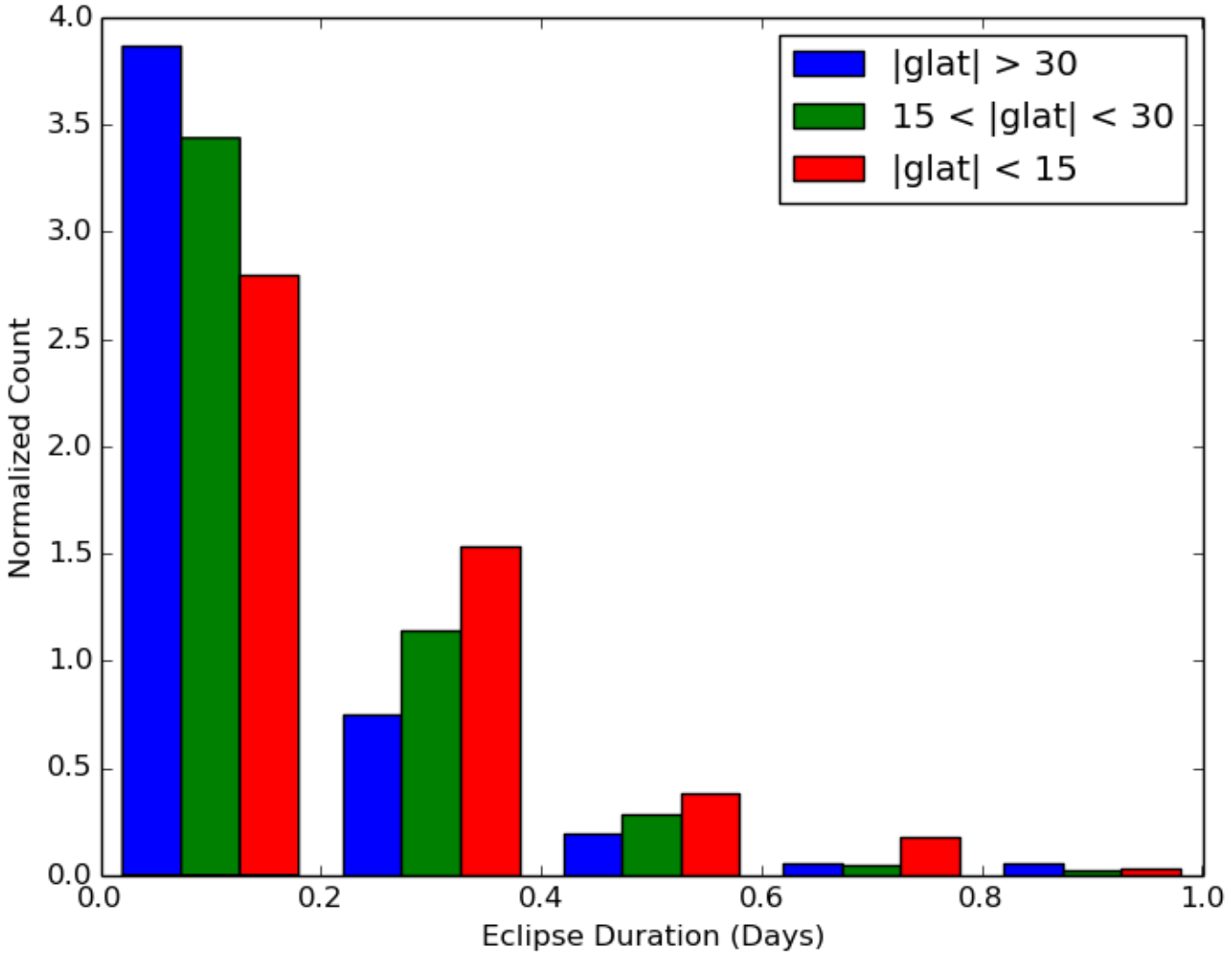

K2 data;
Prša et al. (2016, in prep.)

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(b) determining the correct population numbers and locations of interacting binaries in the galaxy in order to understand close binary evolution;

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(e) can we use optical observations (in synergy with high-energy observations) to find new X-ray binaries in quiescence/low states without waiting for them to go into outburst?

Observational challenges:

* observed cadence for detecting short period binaries and multis;

* determining correct types of interacting binaries solely from photometry in 1-2 filters and missing gaps in coverage;

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Key questions that can only be answered by LSST:

* faint end of the eclipsing binary systems (M-M pairs);

* volume-limited sample of “nearby” stars;

* where are the period bouncers predicted by theory for CVs;

* what are the nova populations like in distant galaxies?

Current status:

* exploratory study for standard cadence and deep drilling, i.e. the LMC and SMC white papers;

* minimal work done, minimal connections established;

* overlap with Classification, Eruptive, MultiWL, Galactic, SN, Pulsators, Magnetic Activity sWGs identified.

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WORKSHOP GOALS:

* kickstart collaborations with common interest members;

* get a broader idea of bi-directional communication with the Project;

* establish communication channels (telecons, focus meetings);

* cadence cadence cadence cadence cadence cadence cadence cadence.