



THE GENERAL CATALOG OF VISTA VARIABLES IN THE VÍA LÁCTEA

István Dékány

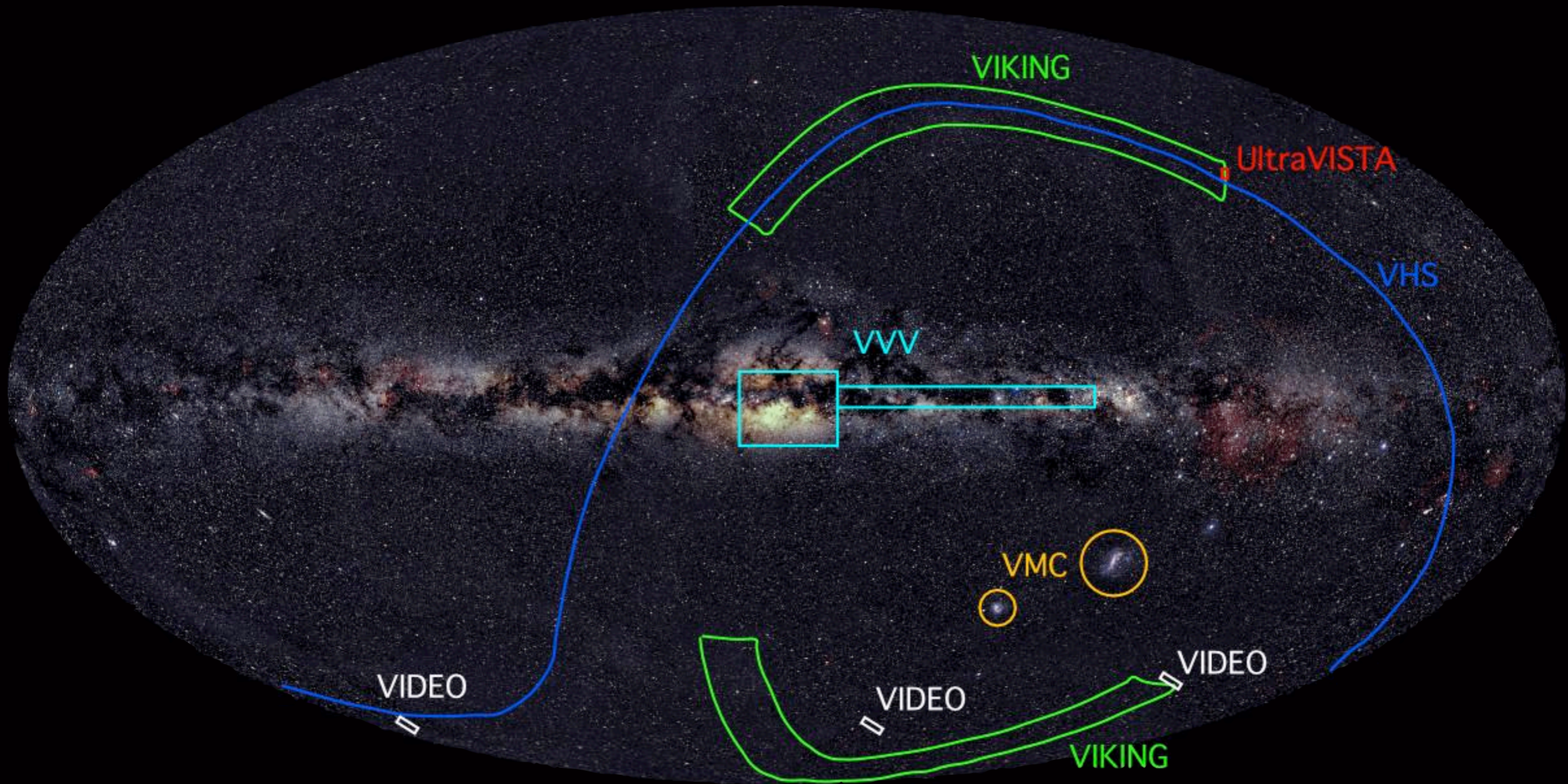
Postdoctoral Fellow

P. Universidad Católica de Chile

Joyce Pullen, Dante Minniti, Márcio Catelan



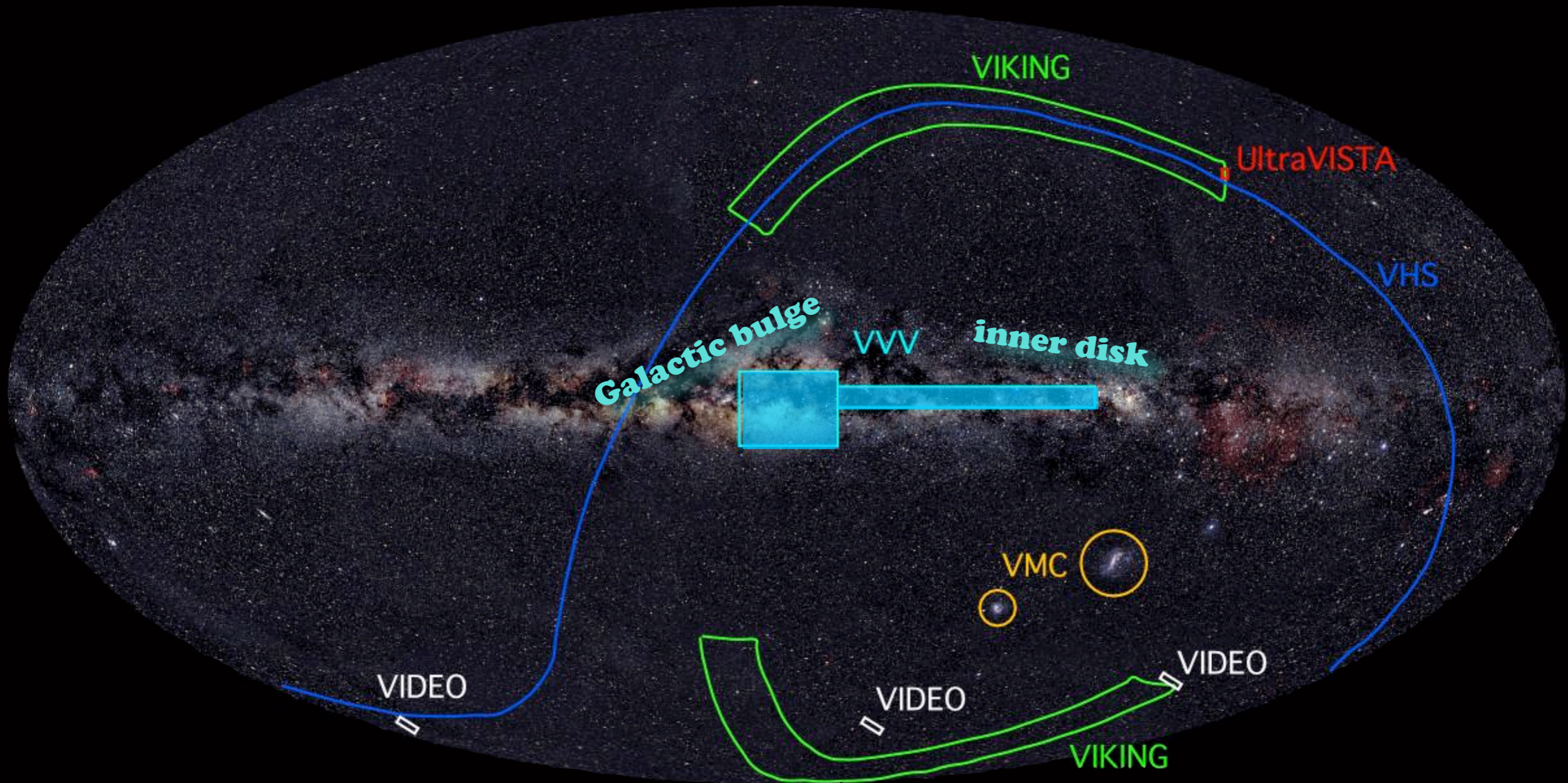
VISTA PUBLIC SURVEYS





VISTA PUBLIC SURVEYS

VVV: VISTA Variables in the Vía Láctea
(PI: Dante Minniti, Chile)





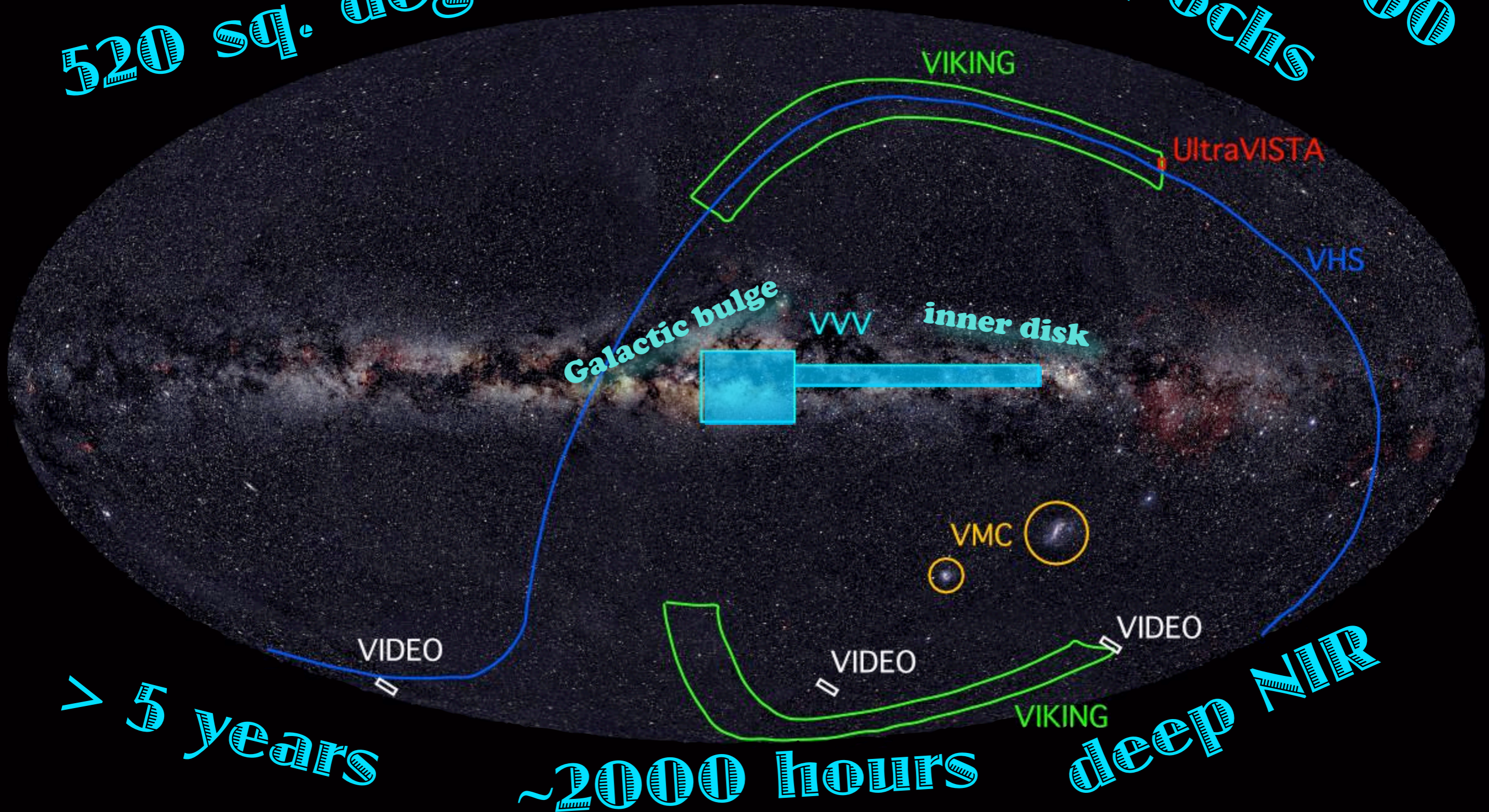
VISTA PUBLIC SURVEYS

VVV: VISTA Variables in the Vía Láctea
(PI: Dante Minniti, Chile)

520 sq. deg.

ZYJHK_s

up to 100 epochs



> 5 years

~20000 hours

deep NIR

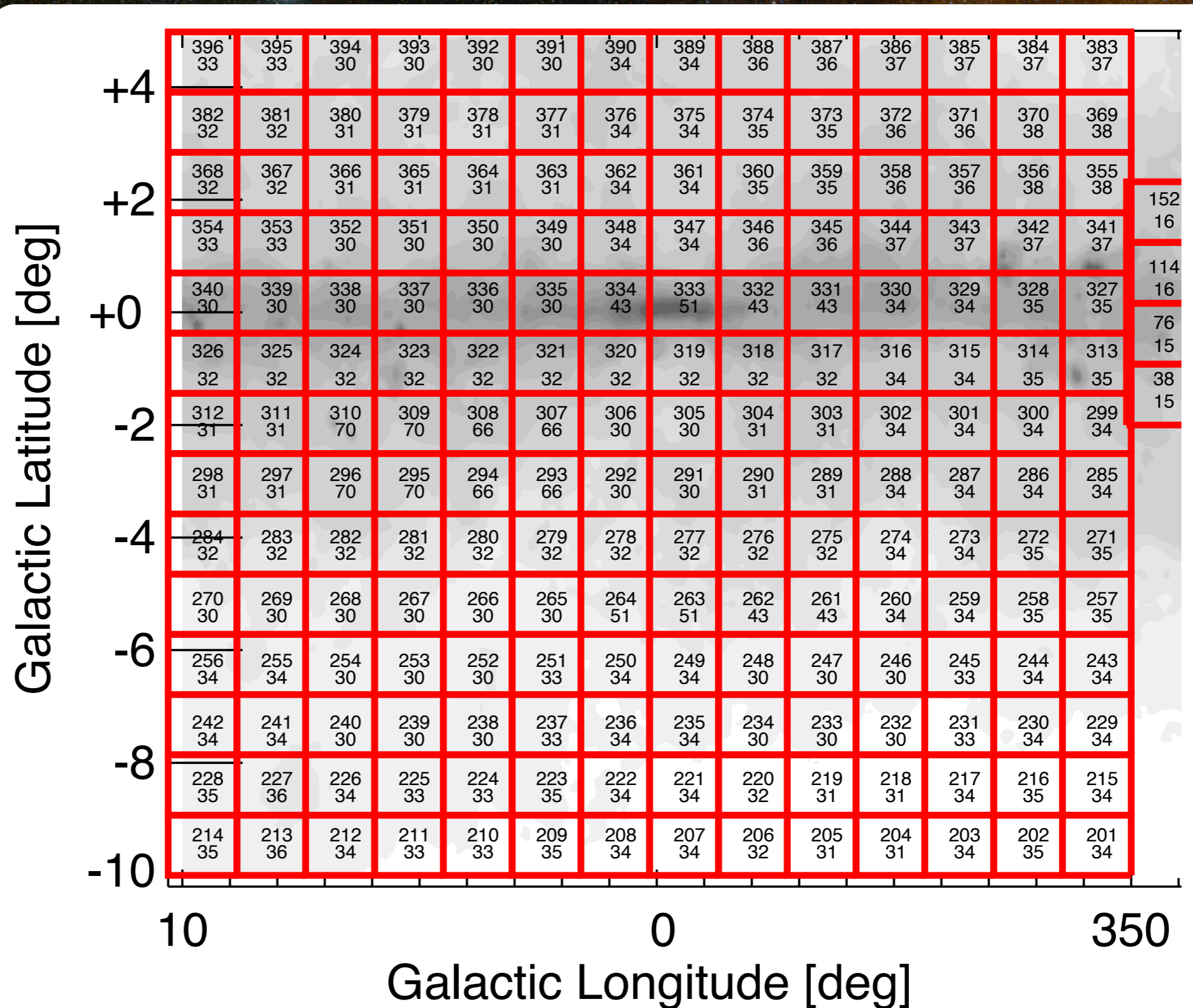
VVV : THE FIRST AND **ONLY** NIR TIME-DOMAIN SURVEY OF THE BULGE

VVV : THE FIRST AND **ONLY** NIR TIME-DOMAIN SURVEY OF THE BULGE

~ **A MILLION
VARIABLE
STARS**

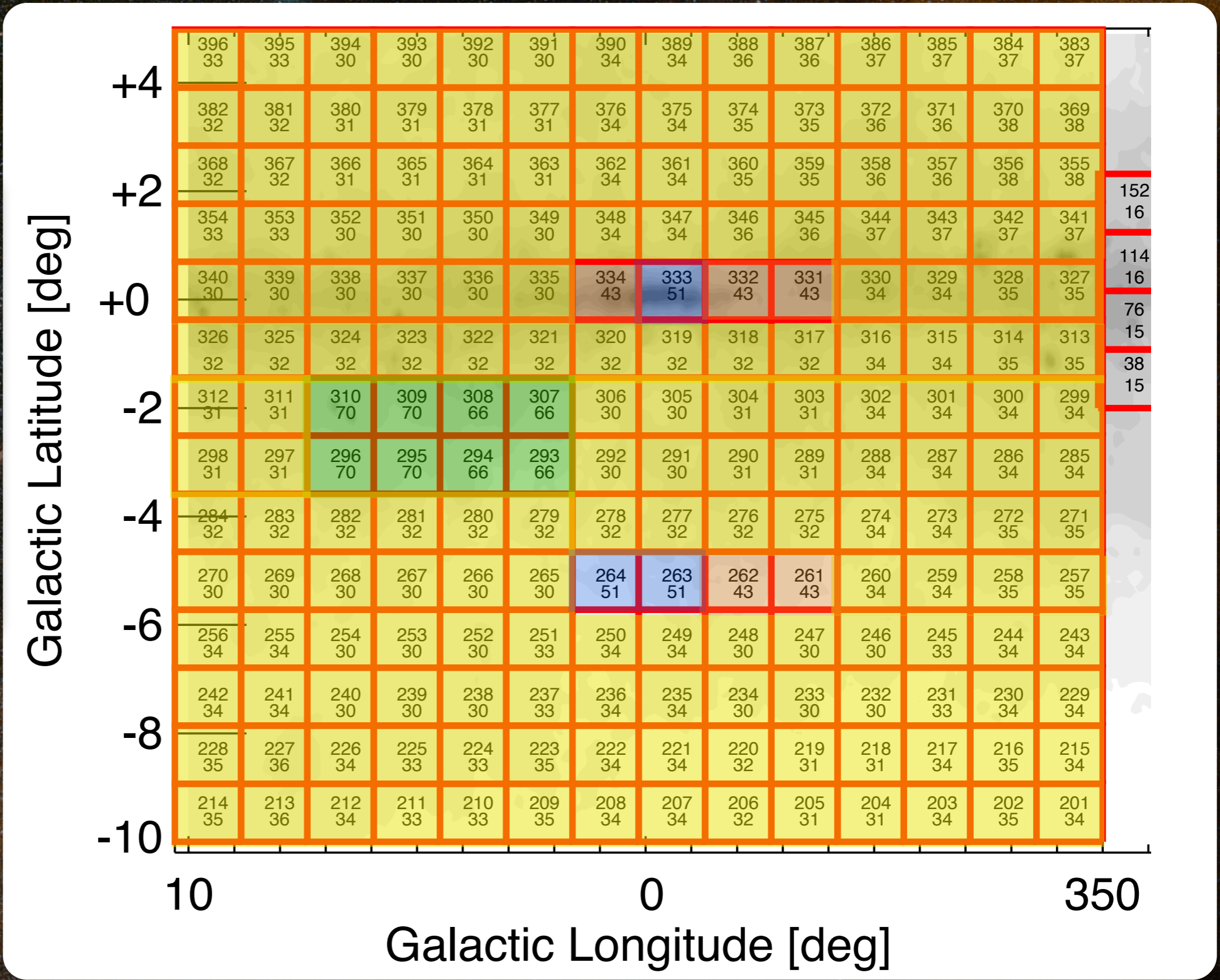
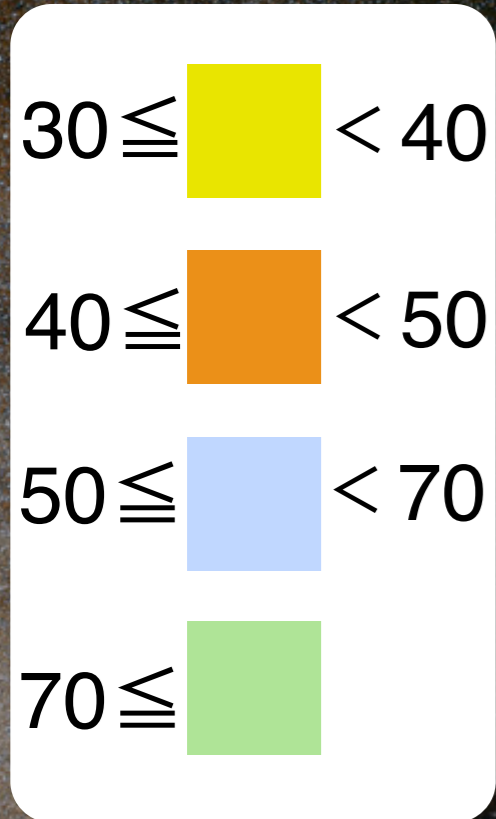
K_s TIME-SERIES STATUS

20 July 2013



K_s TIME-SERIES STATUS

20 July 2013



THE ROUTE OF VISTA DATA



observations



QC

THE ROUTE OF VISTA DATA



observations



QC
image
processing
photometry
calibration



PUBLIC

THE ROUTE OF VISTA DATA



observations



QC



QC
image
processing
photometry
calibration



months

VV SCIENCE TEAM

QC,
data release
preparation
(and..do
science)



PUBLIC

THE ROUTE OF VISTA DATA



observations



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months



VVV SCIENCE TEAM

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science)



PUBLIC

<year



THE ROUTE OF VISTA DATA



observations



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QC
image
processing
photometry
calibration



VVV SCIENCE TEAM



<year



QC,
data release
preparation
(and..do
science)



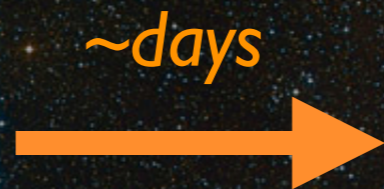
THE ROUTE OF VISTA DATA



observations



QC



QC
image
processing
photometry
calibration



months

VVV SCIENCE TEAM

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data release
preparation
(and..do
science)



PUBLIC



<year



science-ready
data



THE ROUTE OF VISTA DATA



observations



QC



QC
image
processing
photometry
calibration



months

VVV SCIENCE TEAM

QC,
data release
preparation
(and..do
science)



PUBLIC



<year



science-ready
data



VVV : THE FIRST AND **ONLY** NIR TIME-DOMAIN SURVEY OF THE BULGE



VVV VARIABLE STAR CATALOG

VVV : THE FIRST AND **ONLY** NIR TIME-DOMAIN SURVEY OF THE BULGE



VVV VARIABLE STAR CATALOG

A comprehensive *science-ready* relational database of *variable point sources* in the VVV.

VVV : THE FIRST AND **ONLY** NIR TIME-DOMAIN SURVEY OF THE BULGE



USES





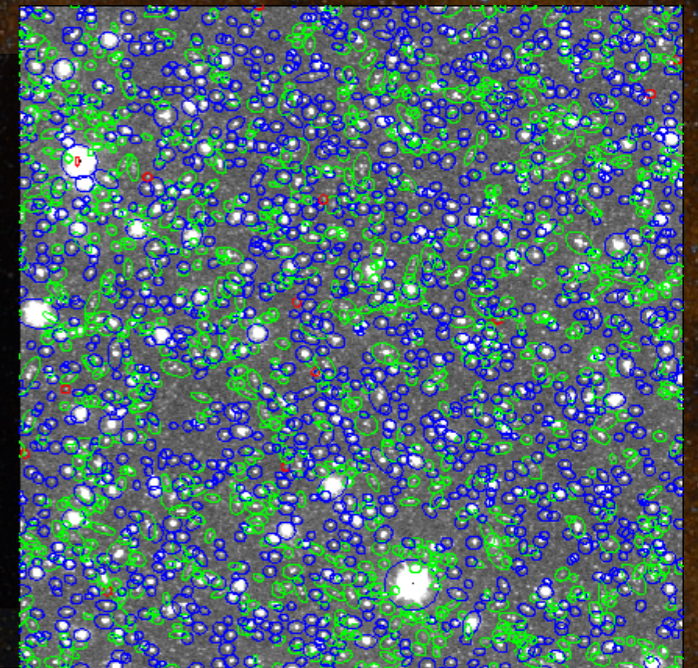
CASU PROCEDURES

PHASE I: The magic

image processing (reduction, mosaicking, grouting, stacking, etc.)

PHASE II: Measurements

- multi-aperture photometry
- source classification, deblending
- aperture corrections ~ seeing correction!



PHASE III: calibrations

- using 2MASS but 2MASS \neq VISTA
- light-curves are calibrated point-by-point
- astrometric precision ~ 0.3 arc sec.

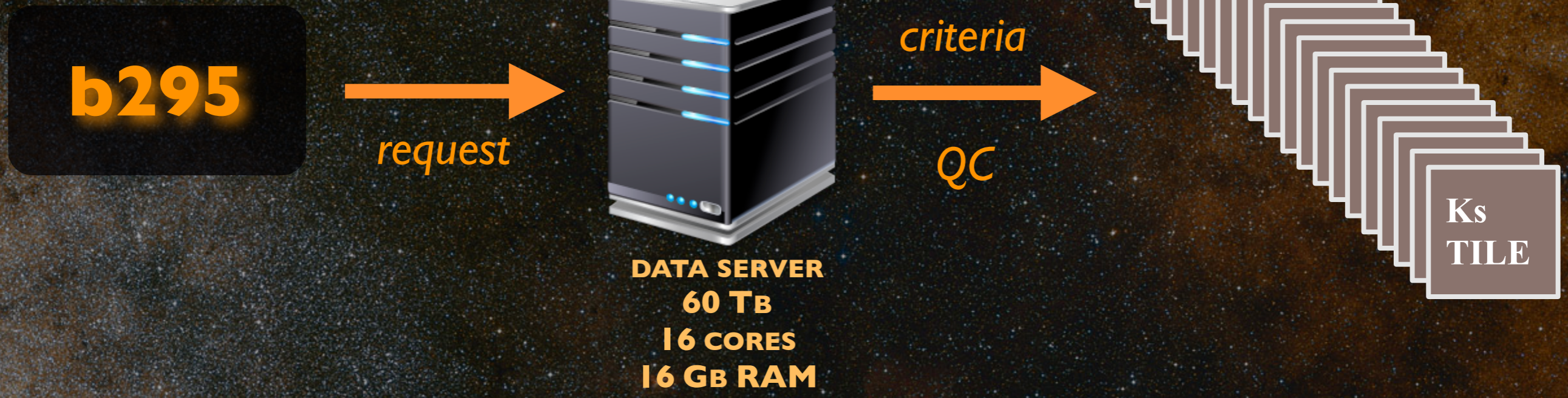


VARIABILITY ANALYSIS

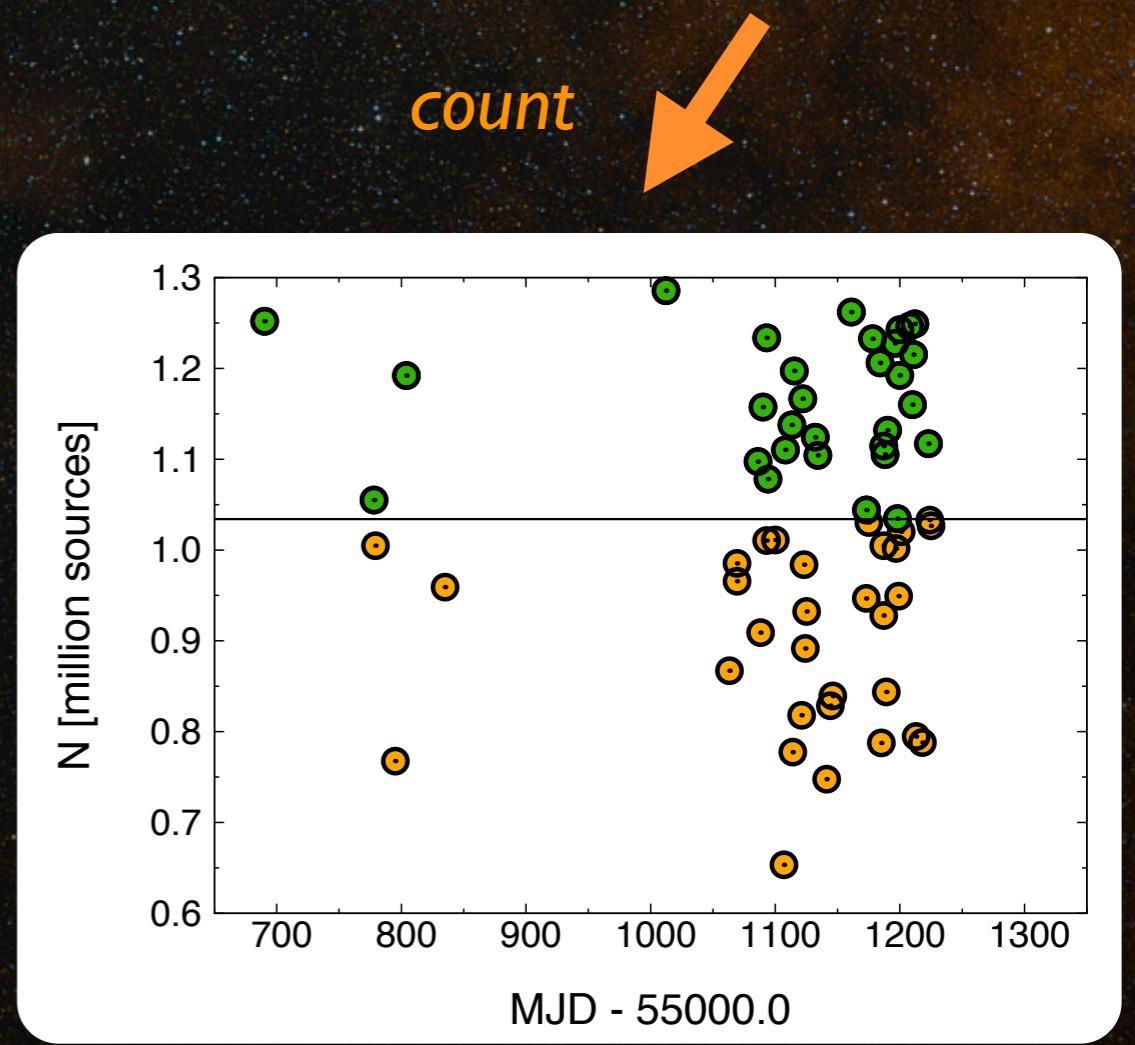
PHASE I

extraction of **master source list** from CASU tile catalogs

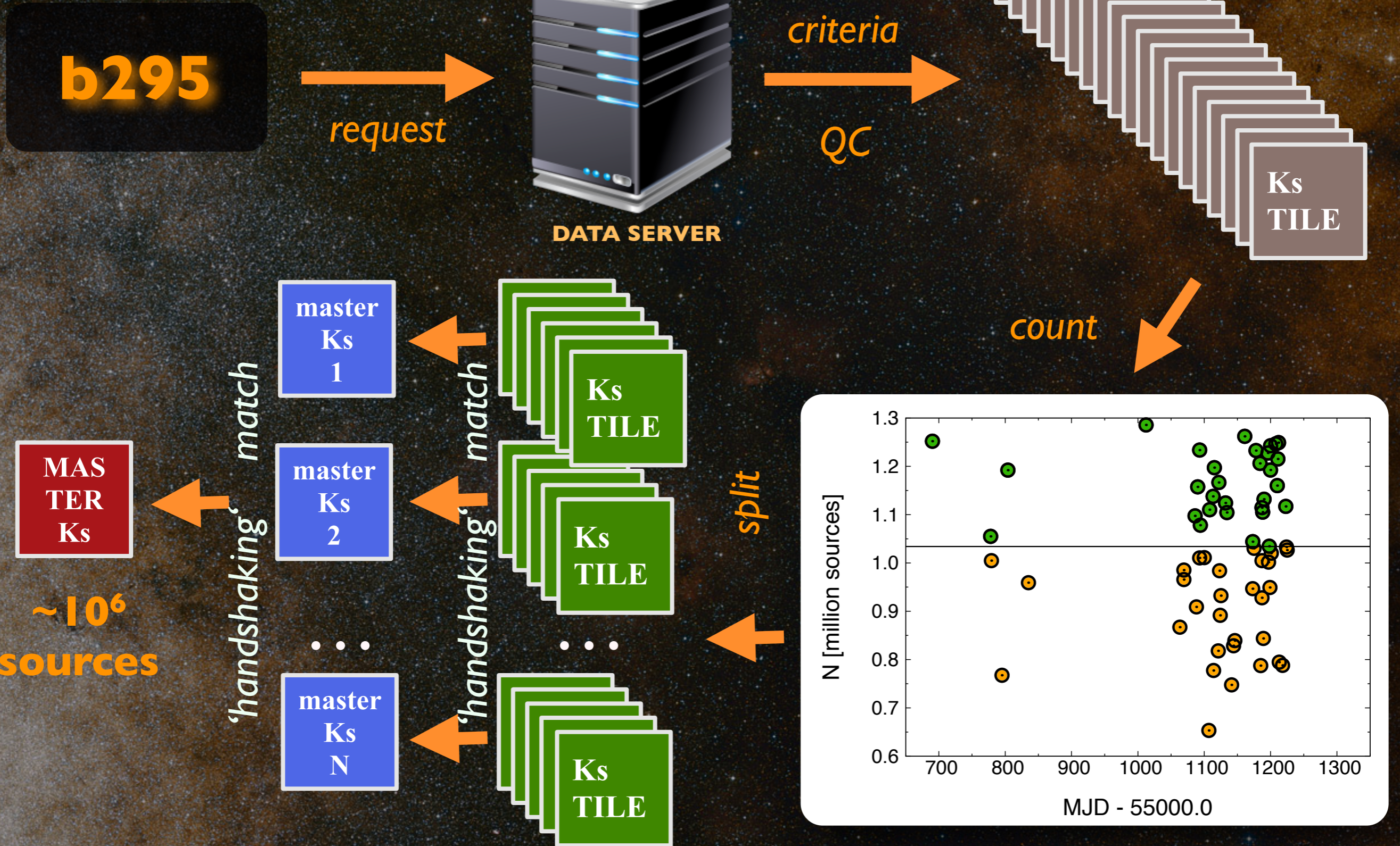
PHASE I : master source catalog



PHASE I : master source catalog



PHASE I : master source catalog





VARIABILITY ANALYSIS

PHASE I

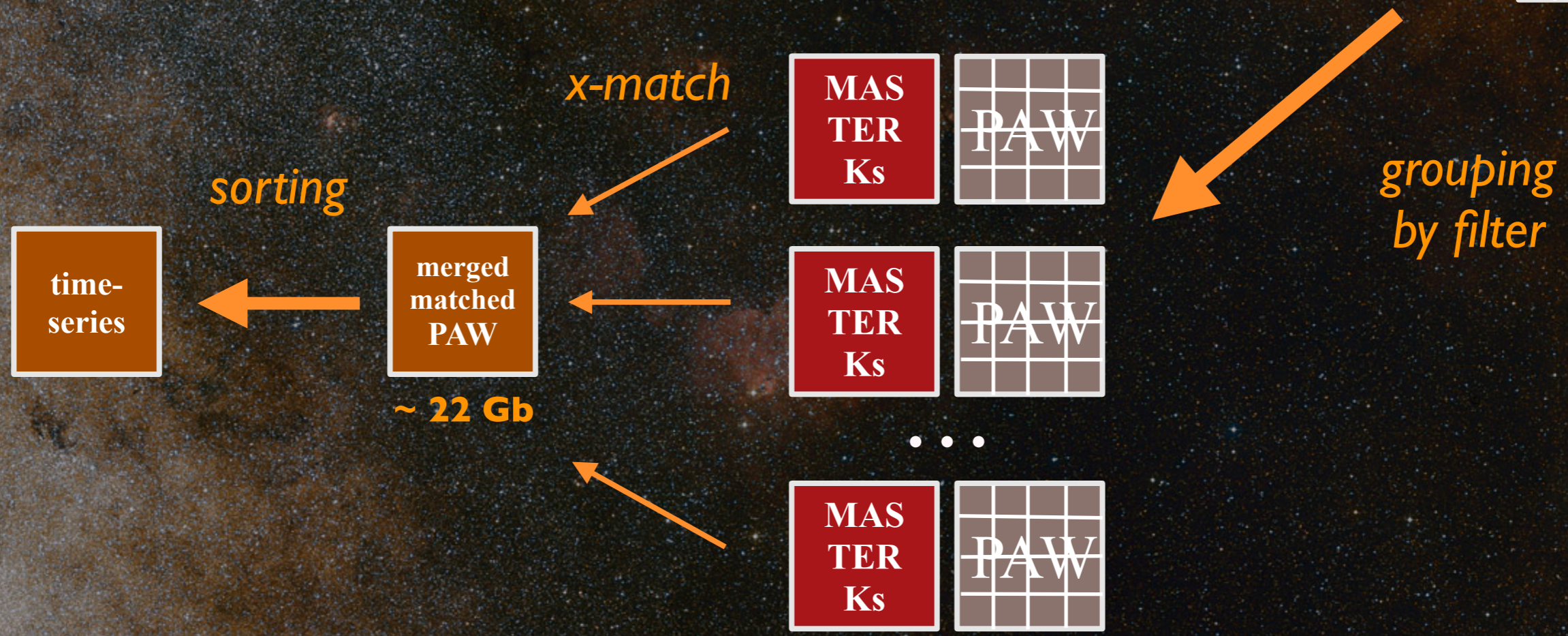
extraction of **master source list** from CASU tile catalogs

PHASE II

cross-match of pawprint catalogs to master catalog

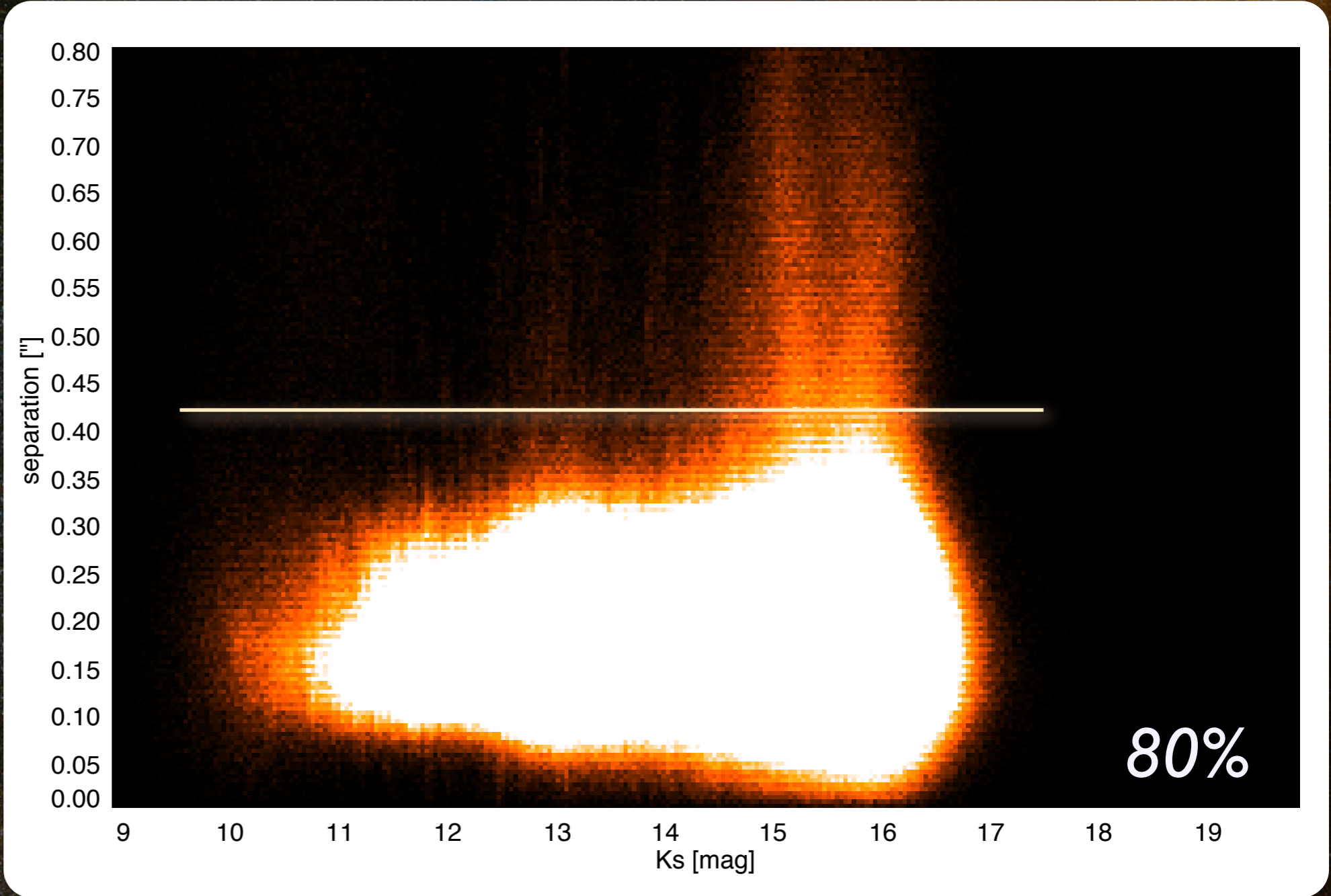
PHASE II : pawprint cross-matches

6 paw / tile,
200-400 paws / field



PHASE II : pawprint cross-matches

**X-match
separations**



PHASE II : pawprint cross-matches

What do we *not* find?

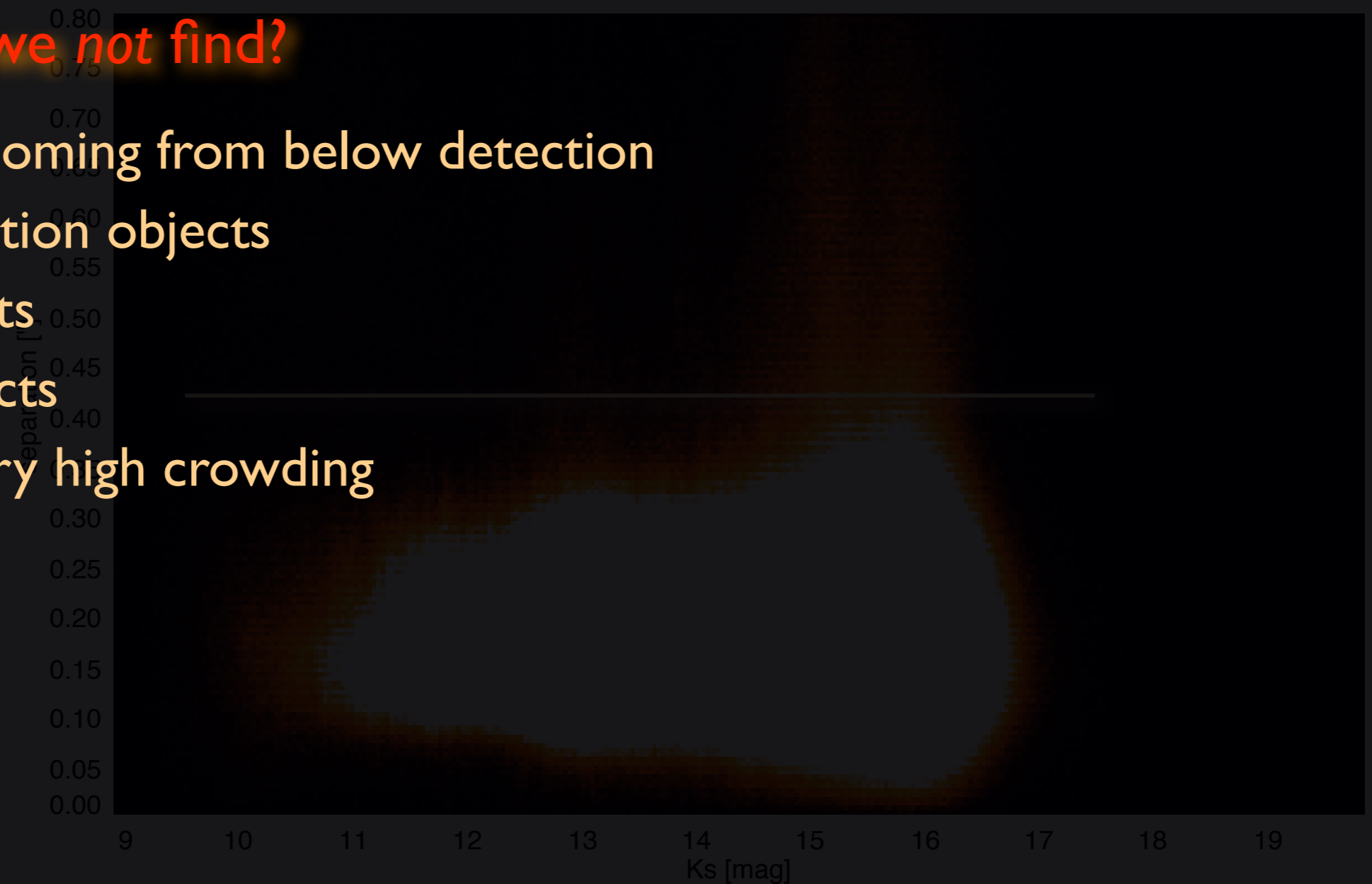
fast transients coming from below detection

high proper motion objects

very faint objects

'very blue' objects

objects with very high crowding



PHASE II : pawprint cross-matches

What do we *not* find?

fast transients coming from below detection

high proper motion objects

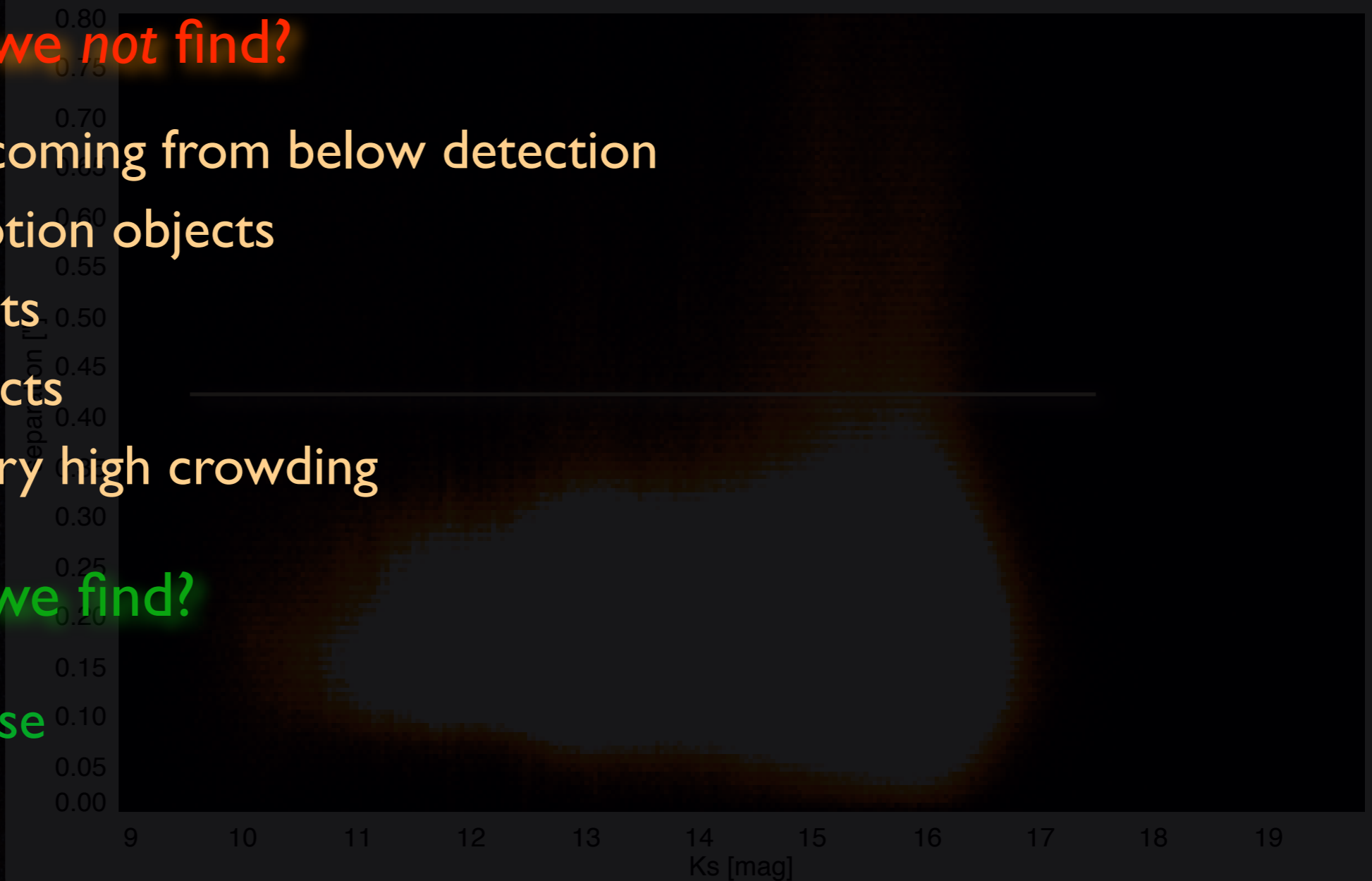
very faint objects

'very blue' objects

objects with very high crowding

What do we find?

~ everything else





VARIABILITY ANALYSIS

PHASE I

extraction of **master source list** from CASU tile catalogs

PHASE II

cross-match of pawprint catalogs to master catalog

PHASE III

adding ZP errors

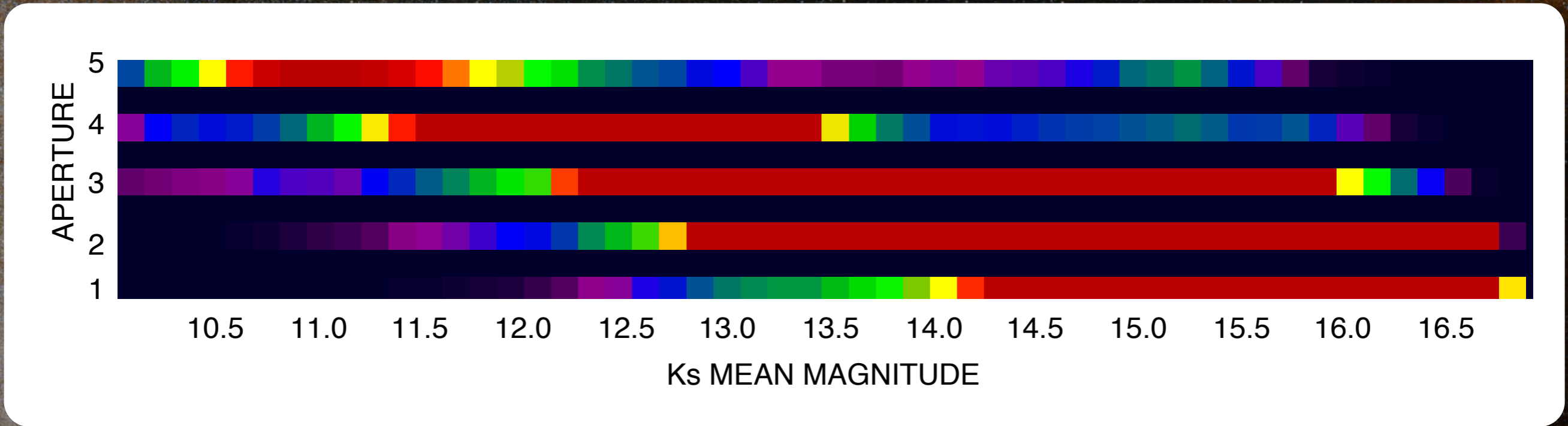
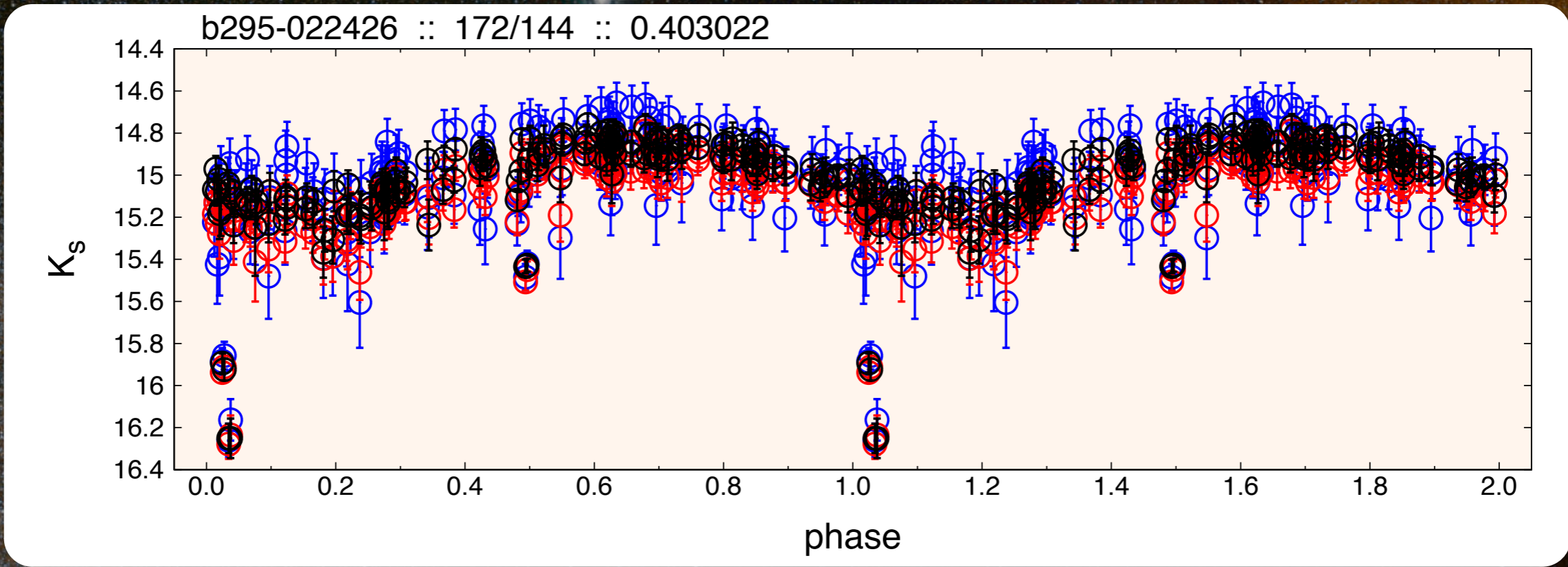
threshold rejection

aperture optimization (minimal weighted RMS)

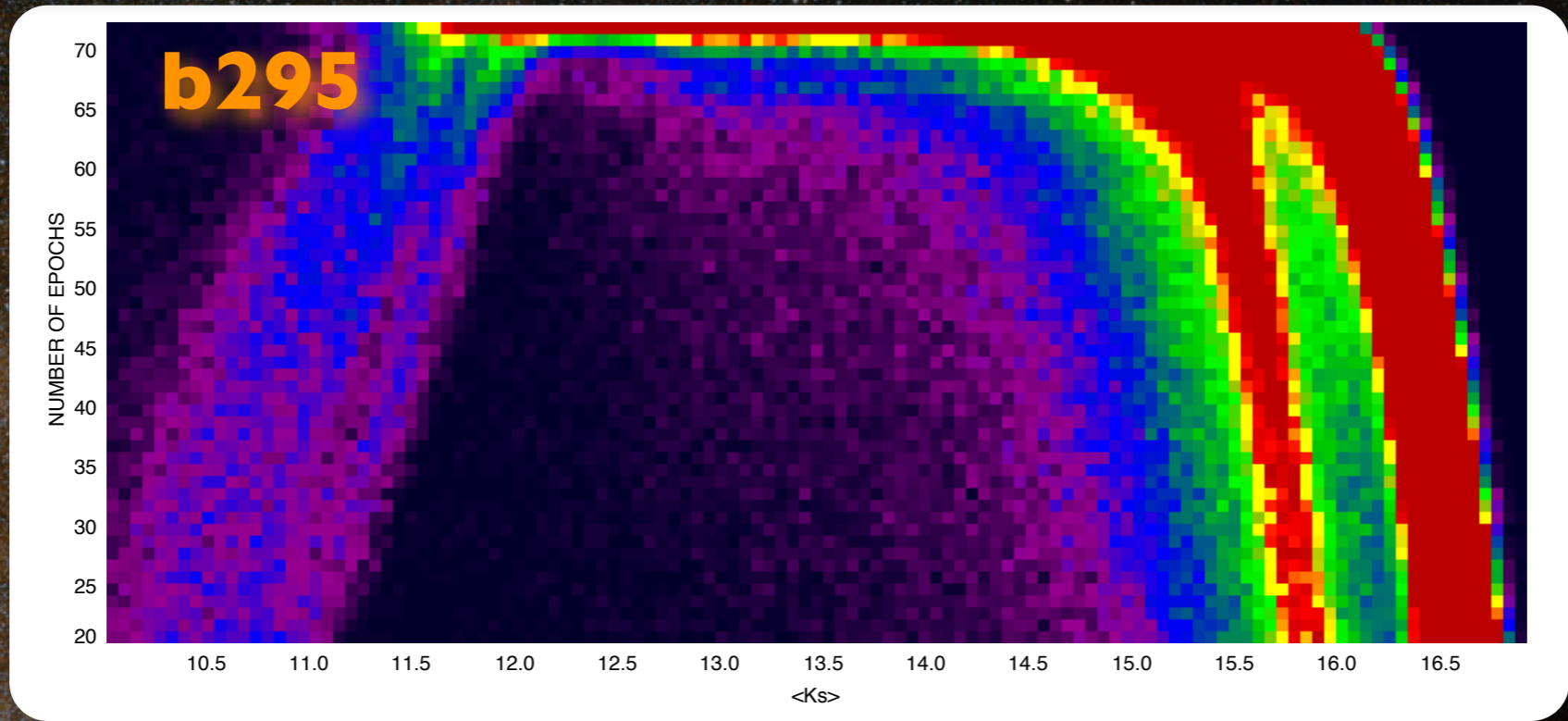
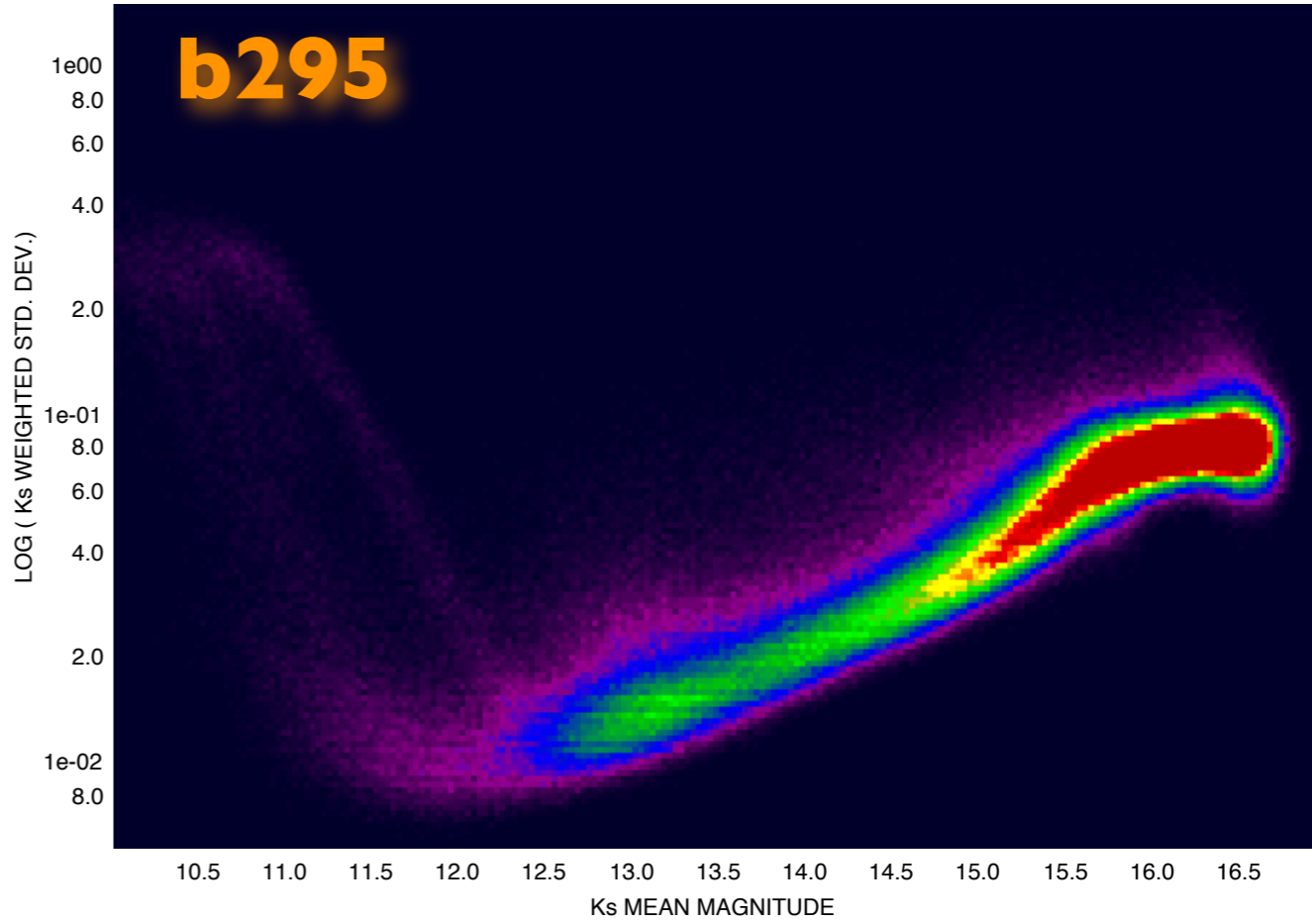
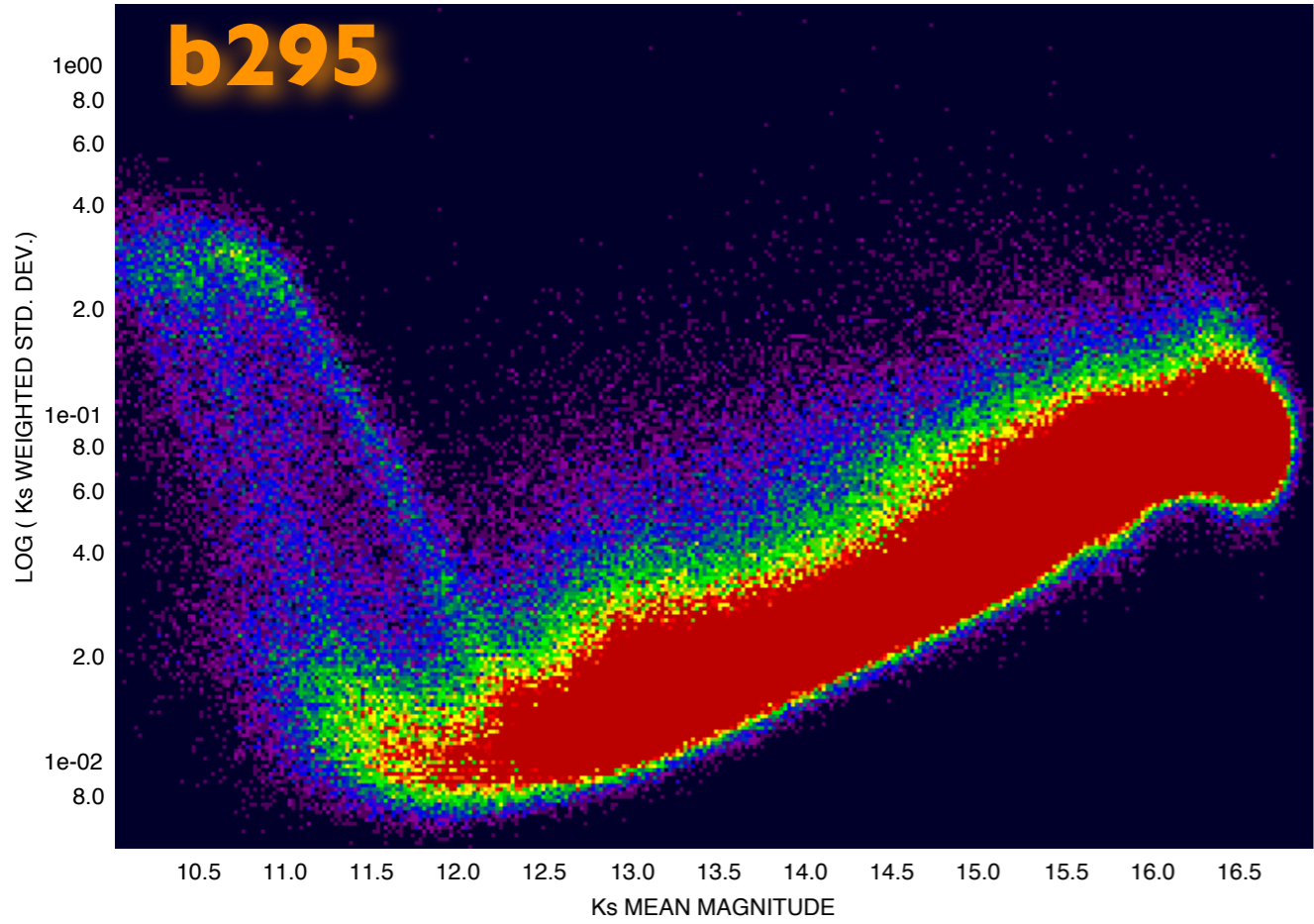
computation of descriptive statistics

selection of variable star candidates via *variability indices*

PHASE III : light-curve processing

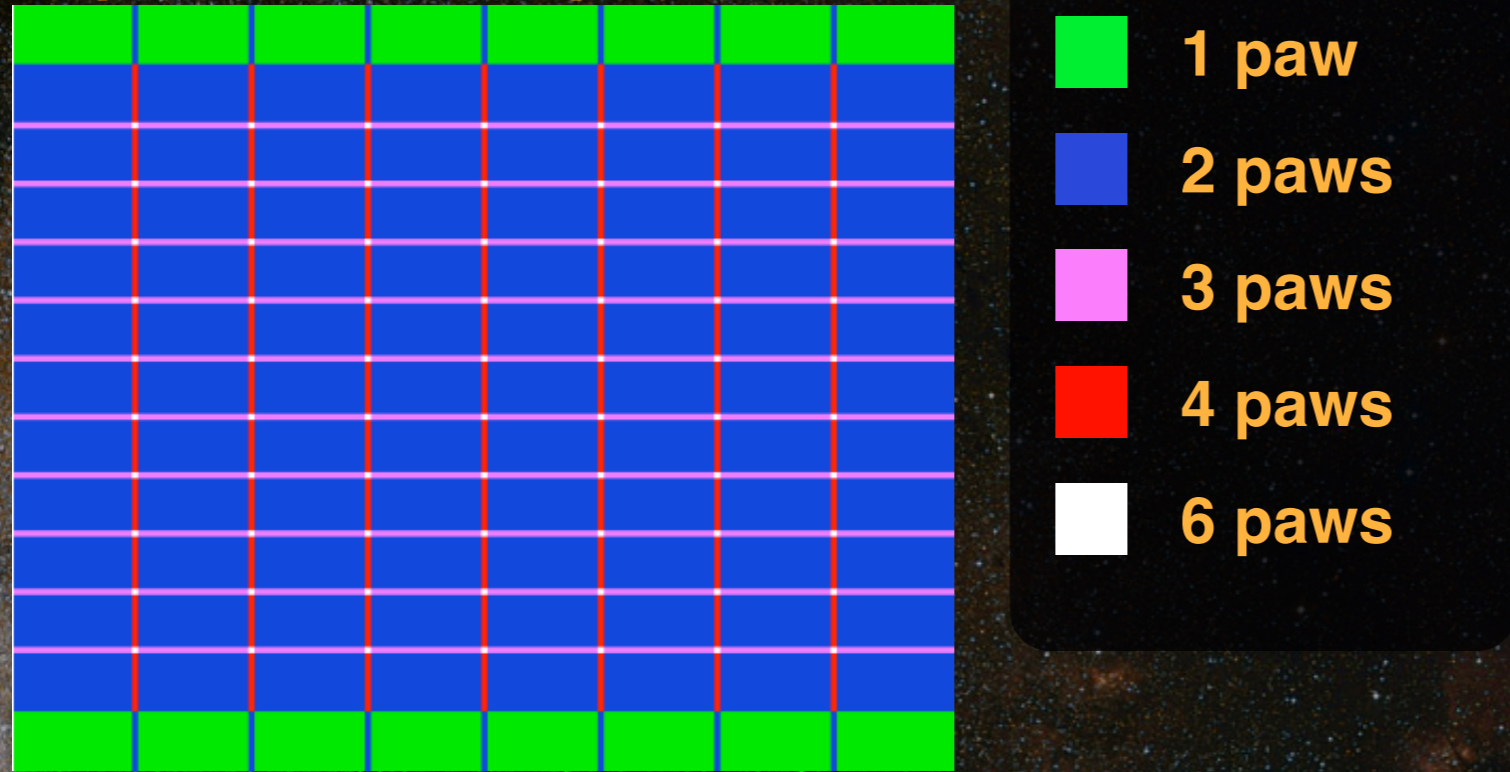


PHASE III : light-curve processing



PHASE III : light-curve processing

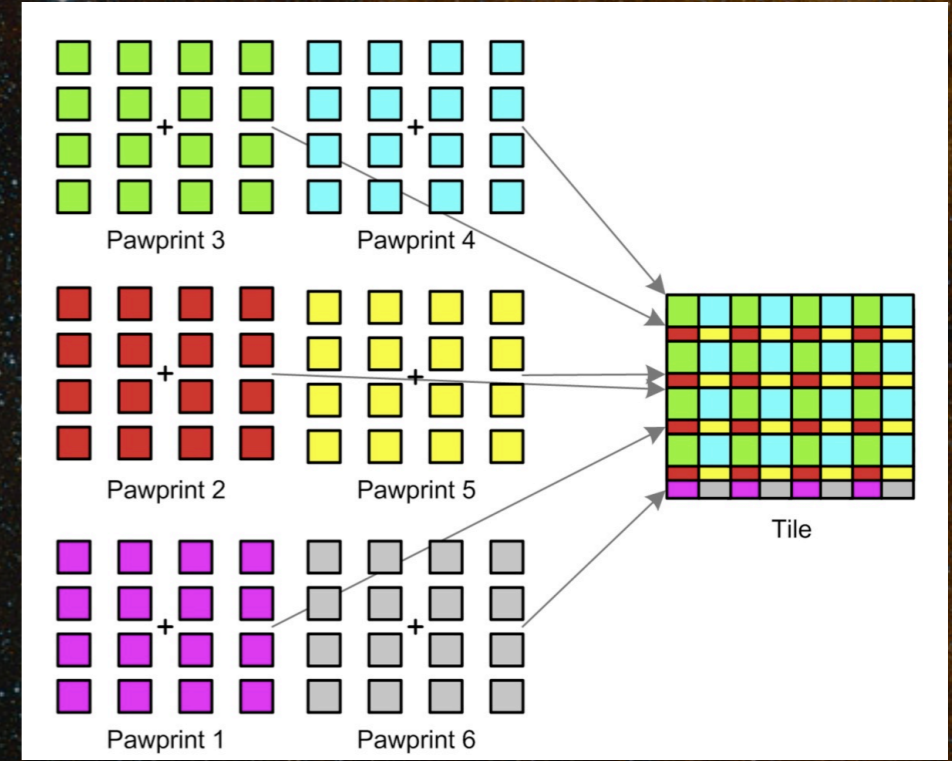
Exposure time map



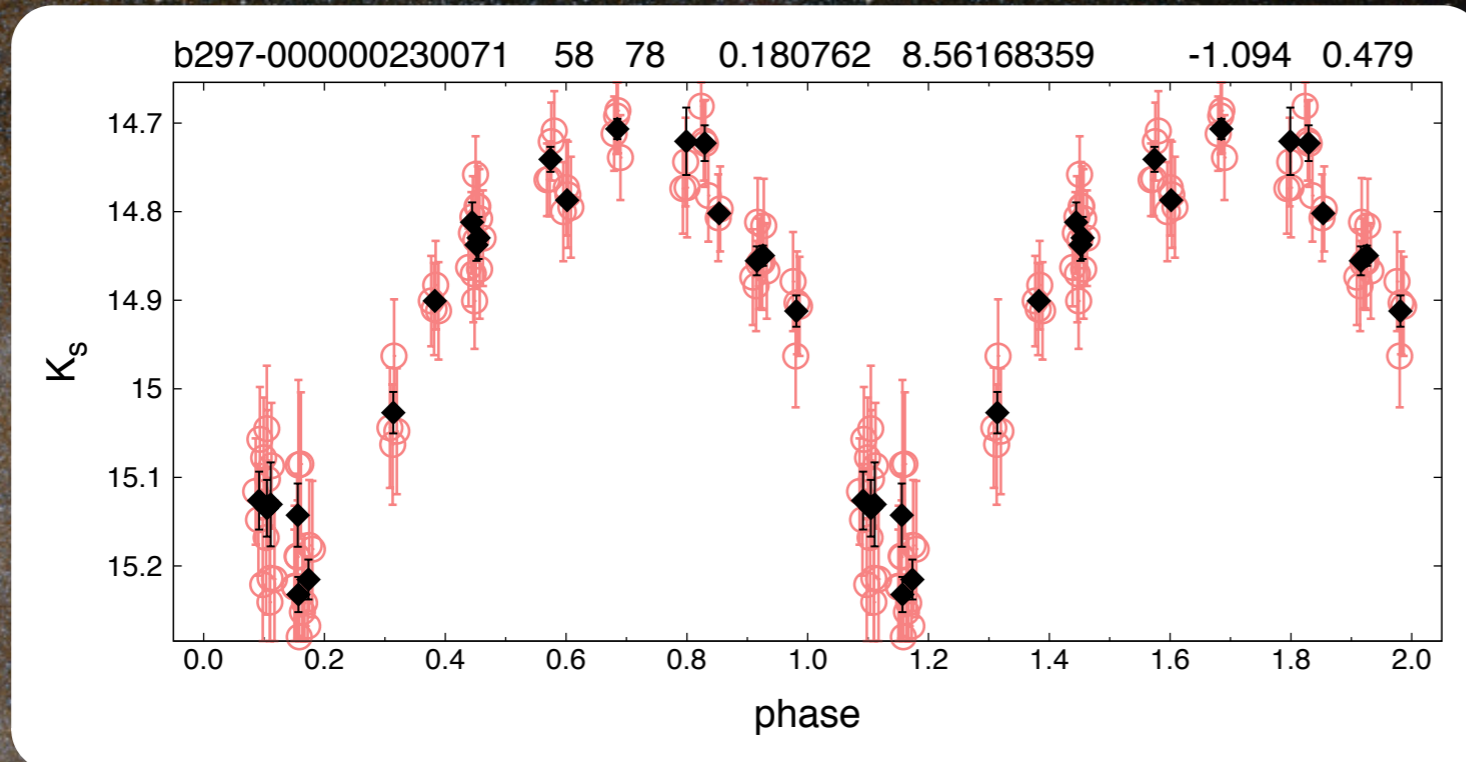
Cross et al. 2012

Mosaicking map

source: CASU



CORRELATED SAMPLING



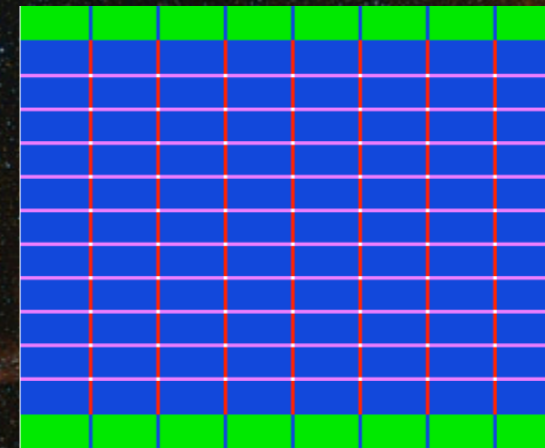
PHASE III : light-curve processing

Modified Weighted Mean of Squared Successive Differences

$$\delta^2(N, M) = \frac{\sum_{i=1}^{N-1} w_i (m_i - m_{i+1})^2}{\sum_{i=1}^{N-1} w_i}$$

$$\text{where: } w_i = \begin{cases} (\sigma_i^2 + \sigma_{i+1}^2)^{-1} & \text{if } t_{i+1} - t_i \leq T_{\text{tile}} \\ 0 & \text{if } t_{i+1} - t_i > T_{\text{tile}} \end{cases}$$

$$P(N, M) \left(\frac{\delta^2}{\sigma_w^2} < \frac{\delta_0^2}{\sigma_0^2} \right) \text{ are evaluated by MC}$$



Stetson's (1996) variability index

$$I_S = \frac{\sum_{k=1}^N w_k \text{sgn}(P_k) \sqrt{|P_k|}}{\sum_{k=1}^N w_k}$$

$$\text{where: } P_k = \begin{cases} \delta_{i(k)} \delta_{j(k)} & \text{if } i(k) \neq j(k) \\ \delta_{i(k)}^2 - 1 & \text{if } i(k) = j(k) \end{cases}$$

$$t_i - t_j \leq T_{\text{tile}}$$

$$\delta = \sqrt{\frac{n}{n-1} \frac{m - \bar{m}}{\sigma_m}}$$



VARIABILITY ANALYSIS

PHASE I

extraction of **master source list** from CASU tile catalogs

PHASE II

cross-match of pawprint catalogs to master catalog

PHASE III : light-curve processing

selection of variable star candidates via *variability indices*:

typically 50,000 candidates per tile

PHASE IV : frequency analysis

time-frequency transformation

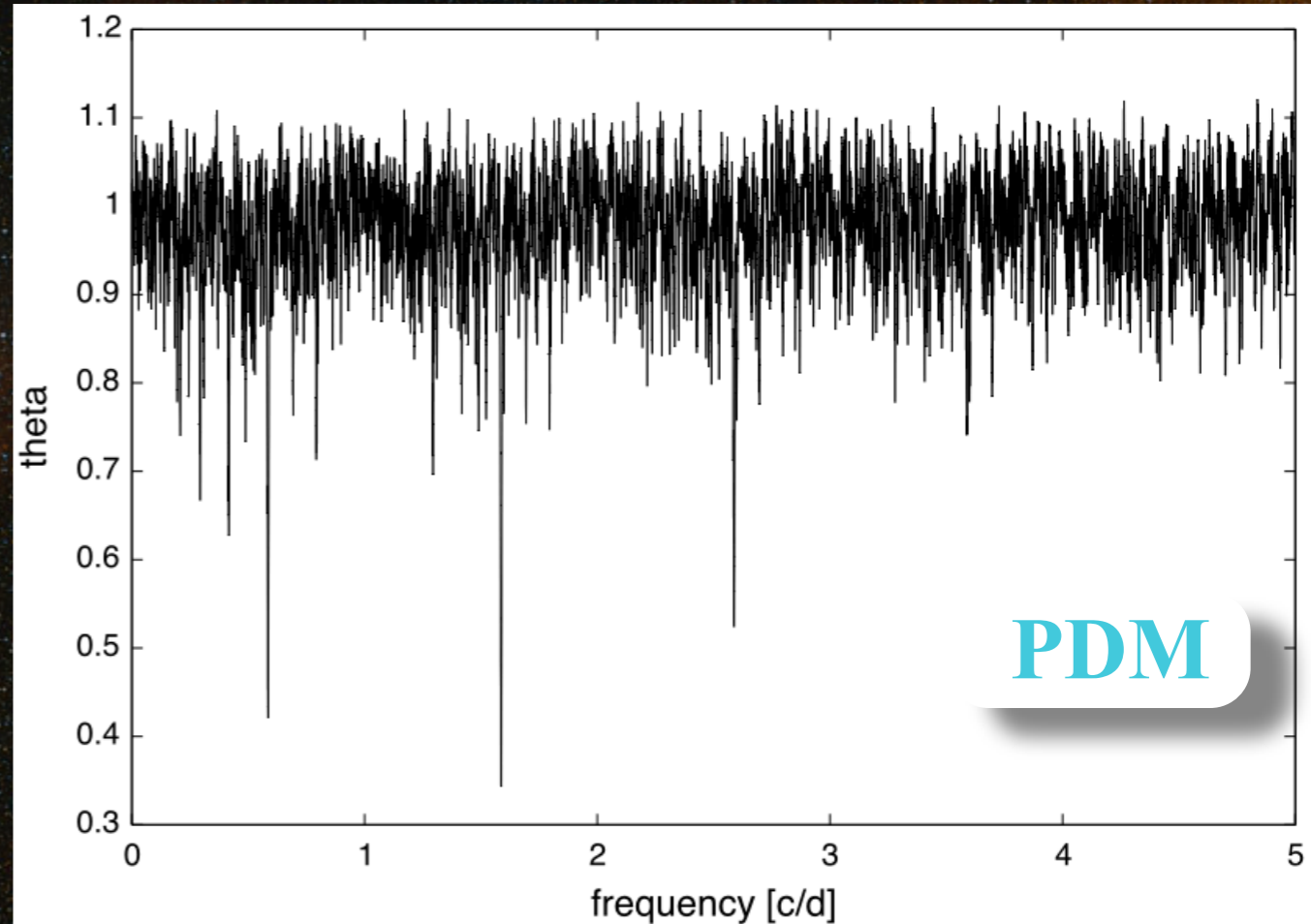
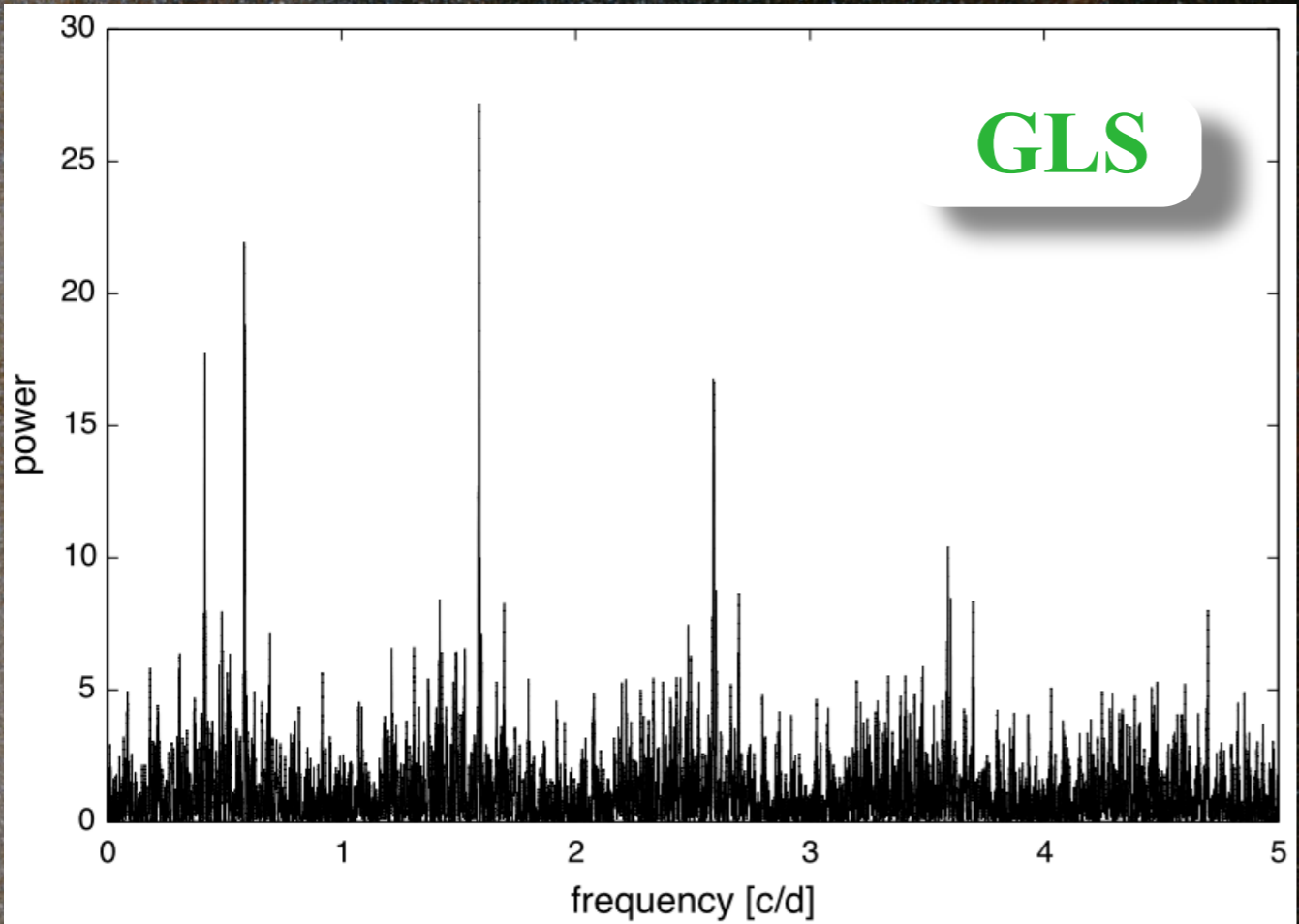
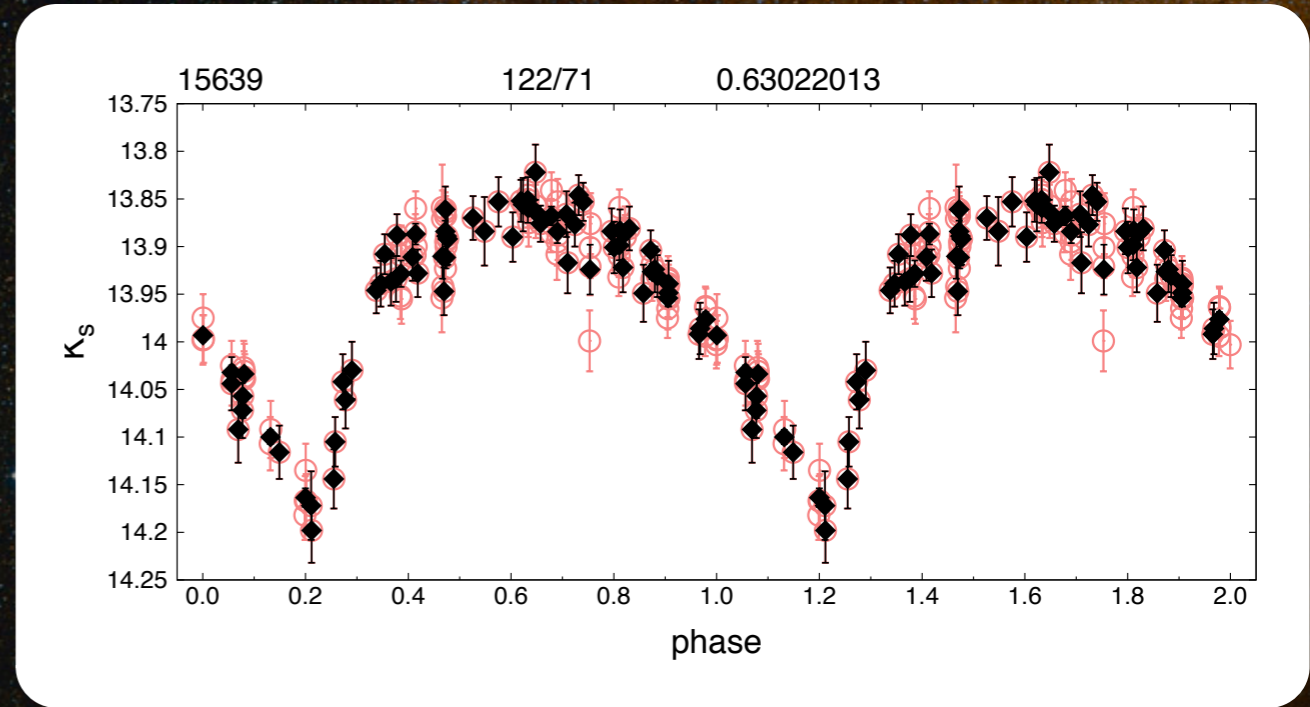
find periodic and long-term signals

PHASE IV : frequency analysis

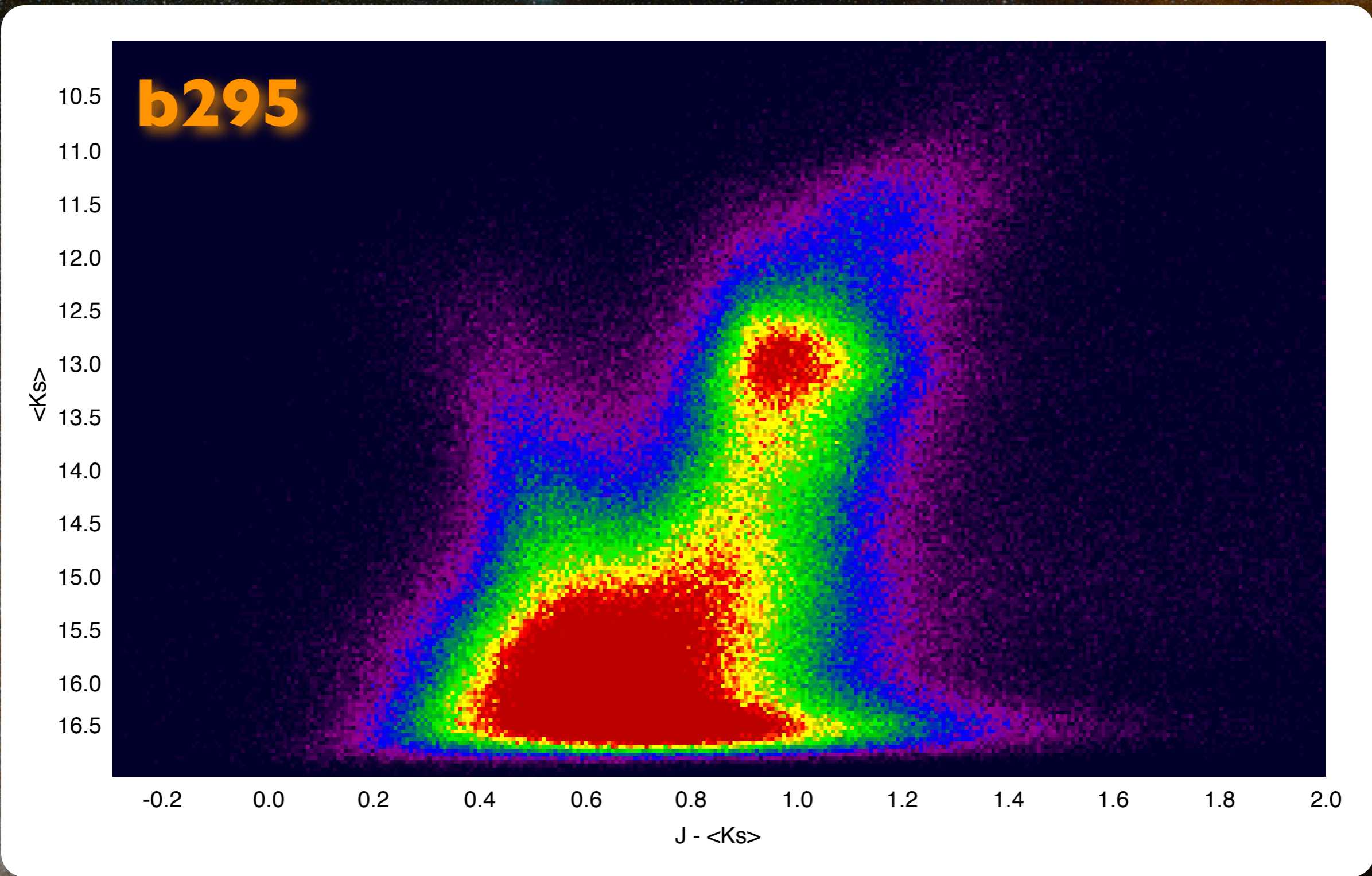
Frequency analysis

- Generalized Lomb-Scargle periodogram (GLS)
- Phase dispersion spectrum (PDM)

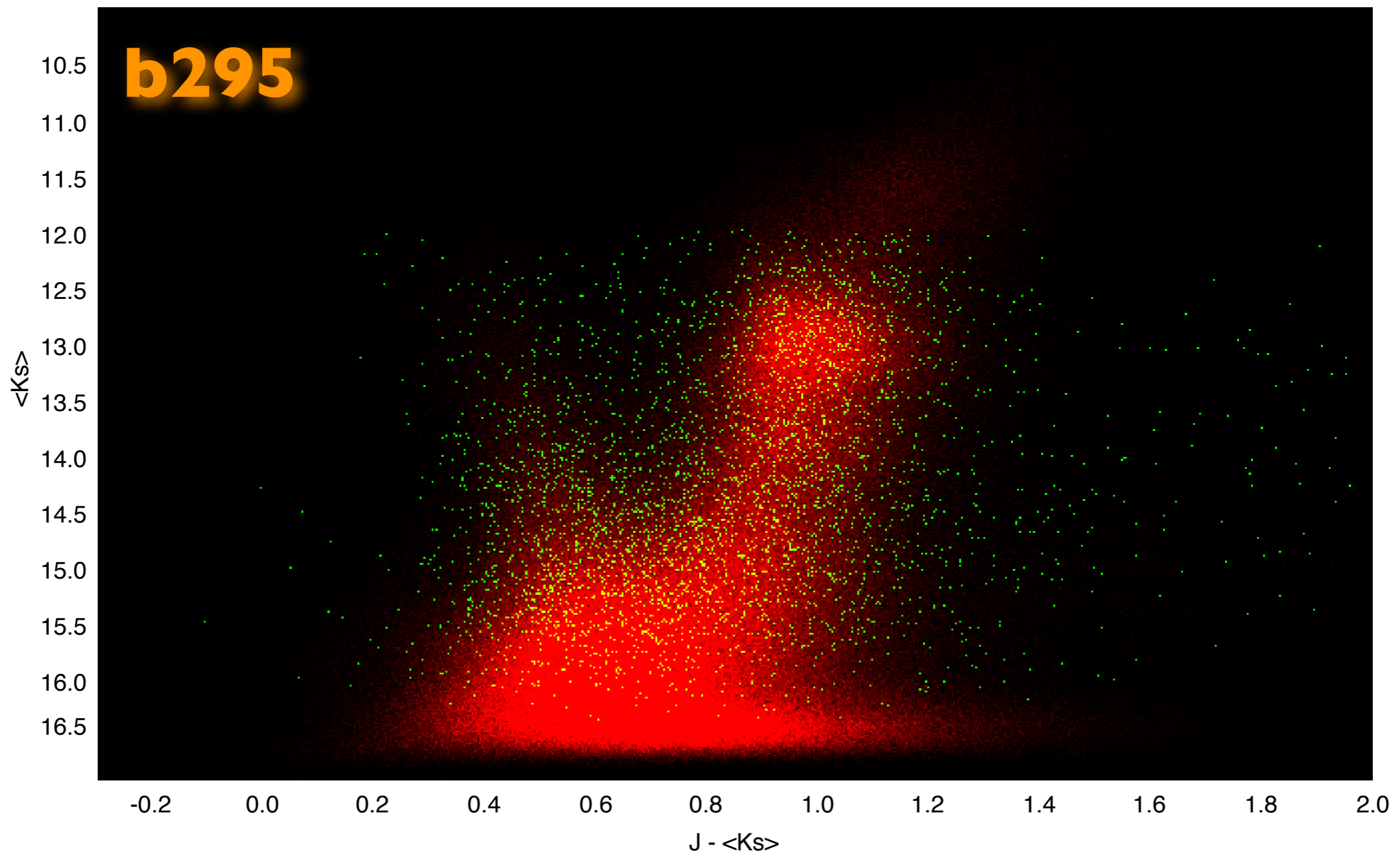
Analytical significance estimation



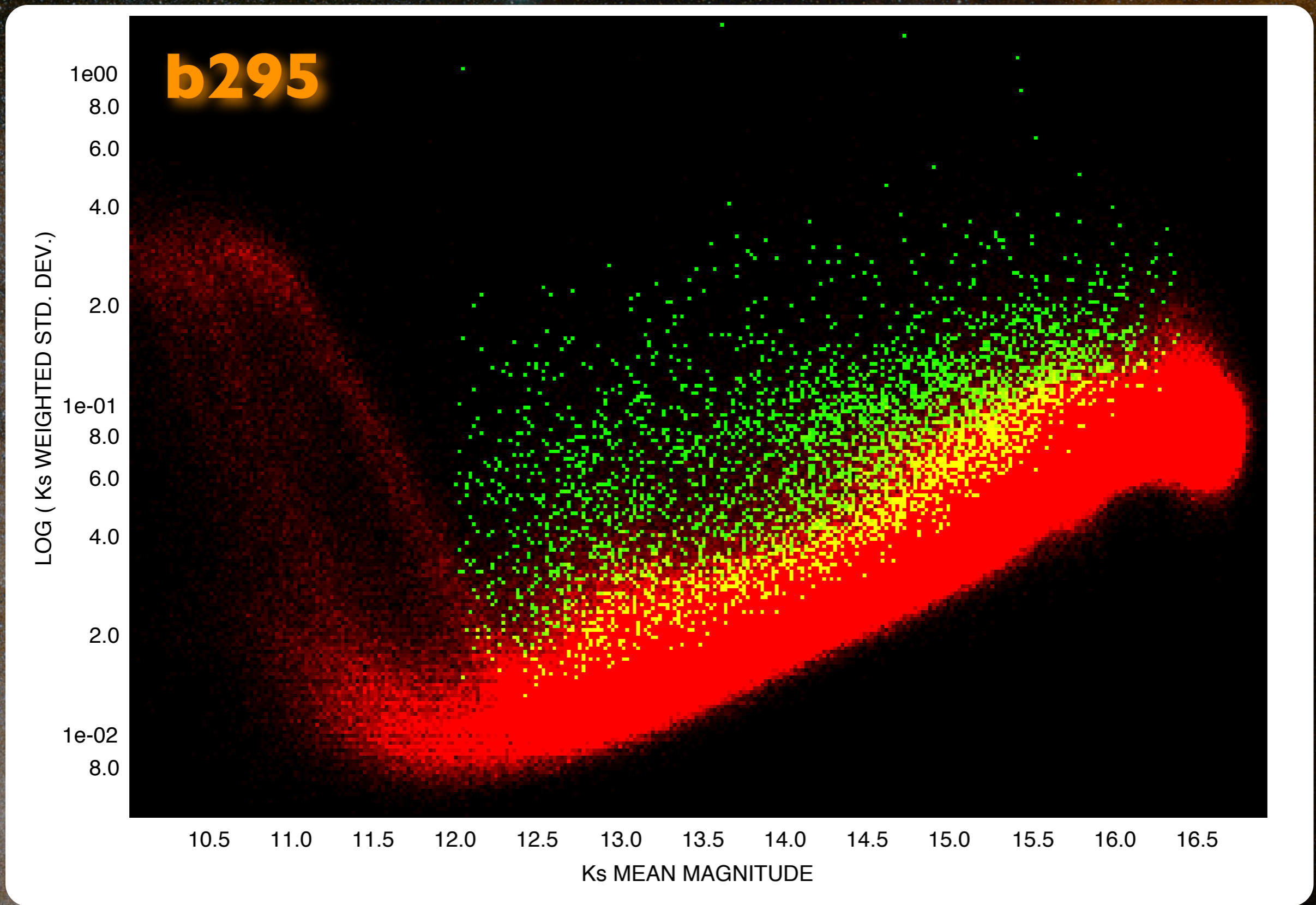
PHASE IV : frequency analysis



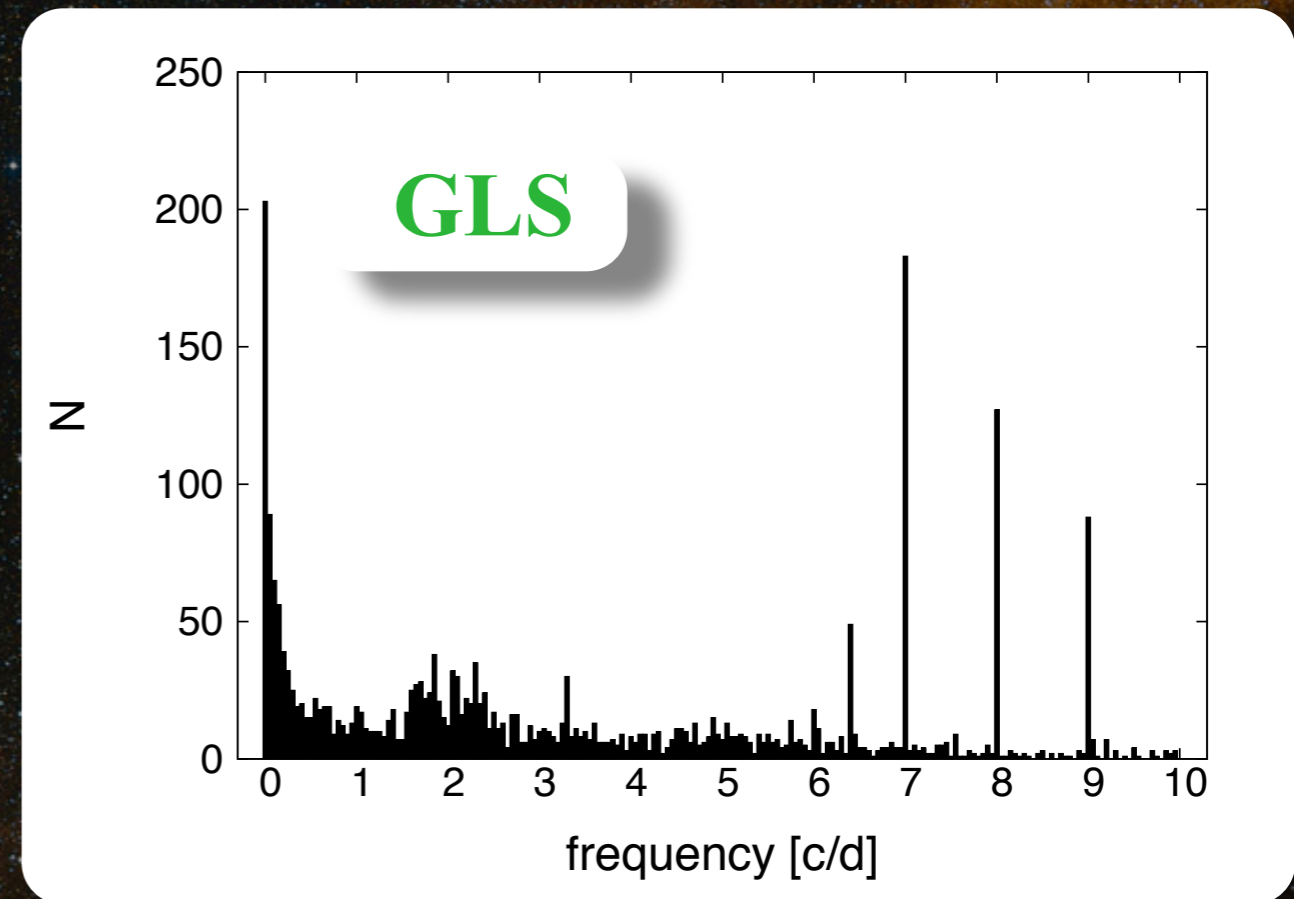
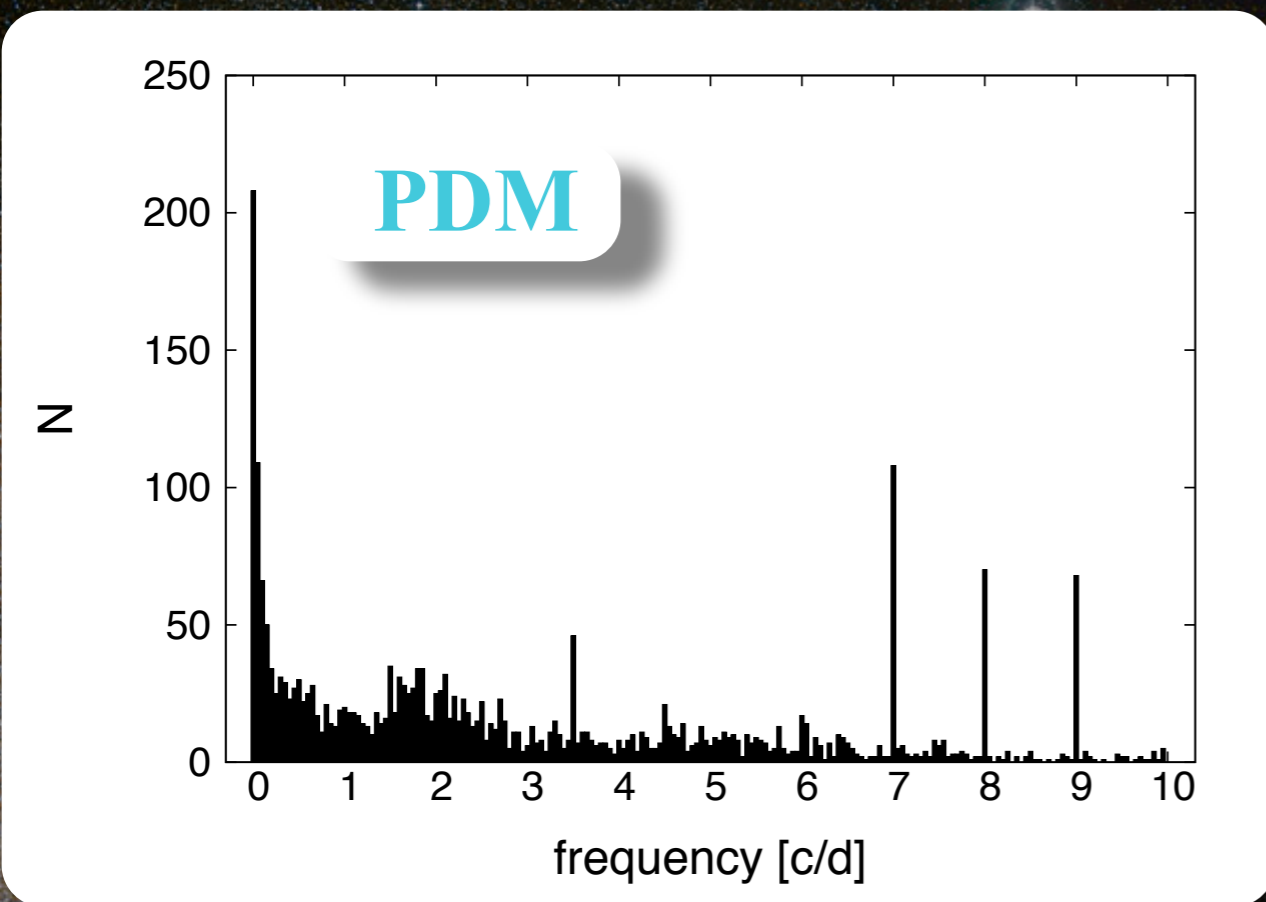
PHASE IV : frequency analysis



PHASE IV : frequency analysis

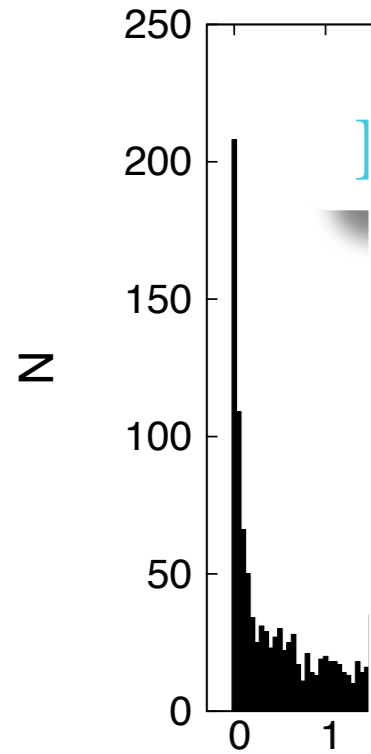


PHASE IV : frequency analysis

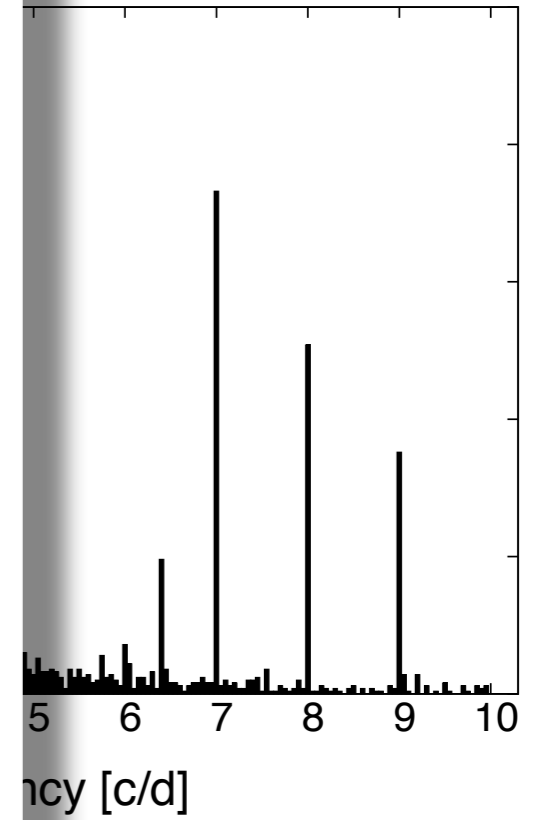
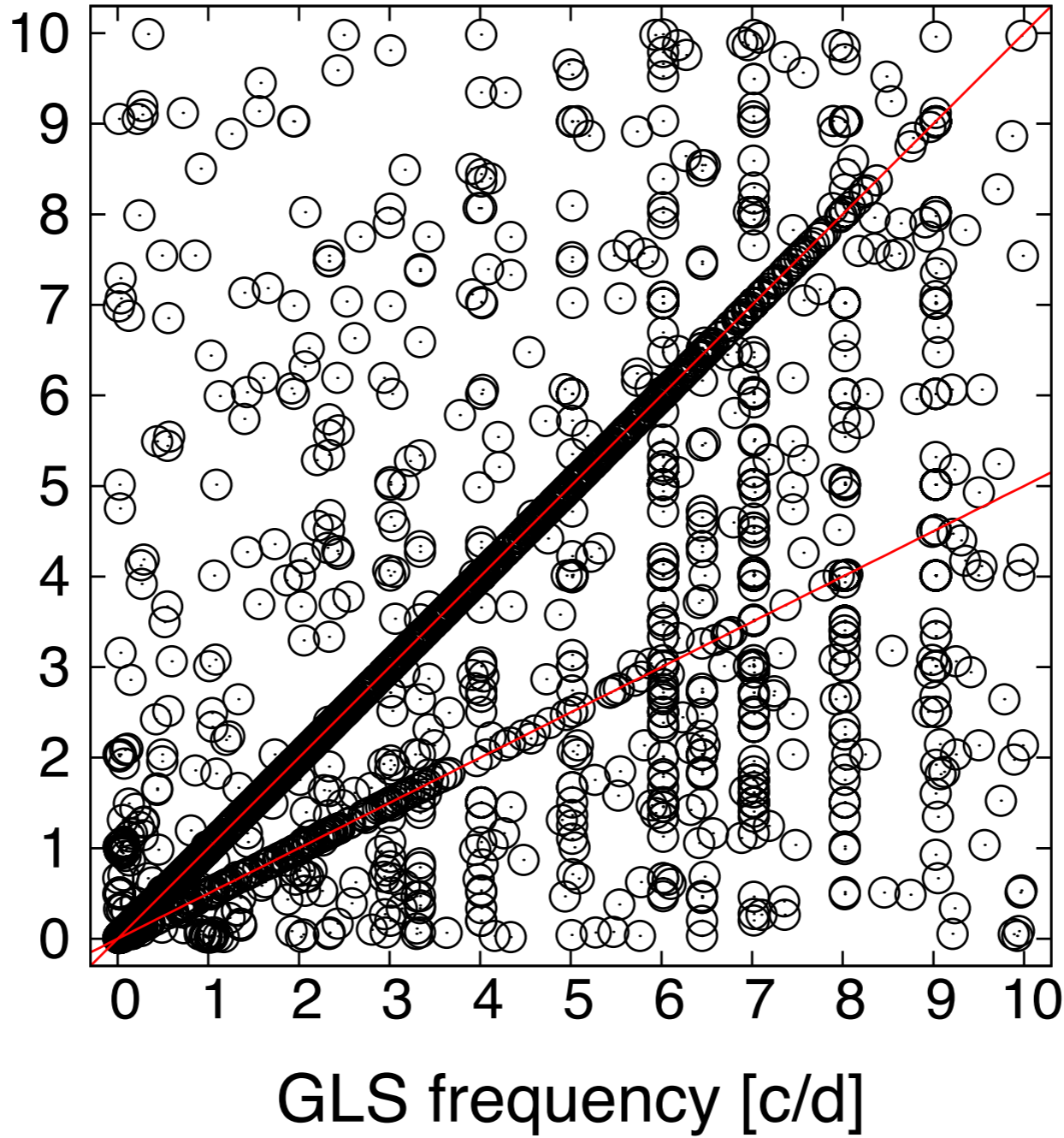


b295 : 4065 candidates

PHASE IV : frequency analysis

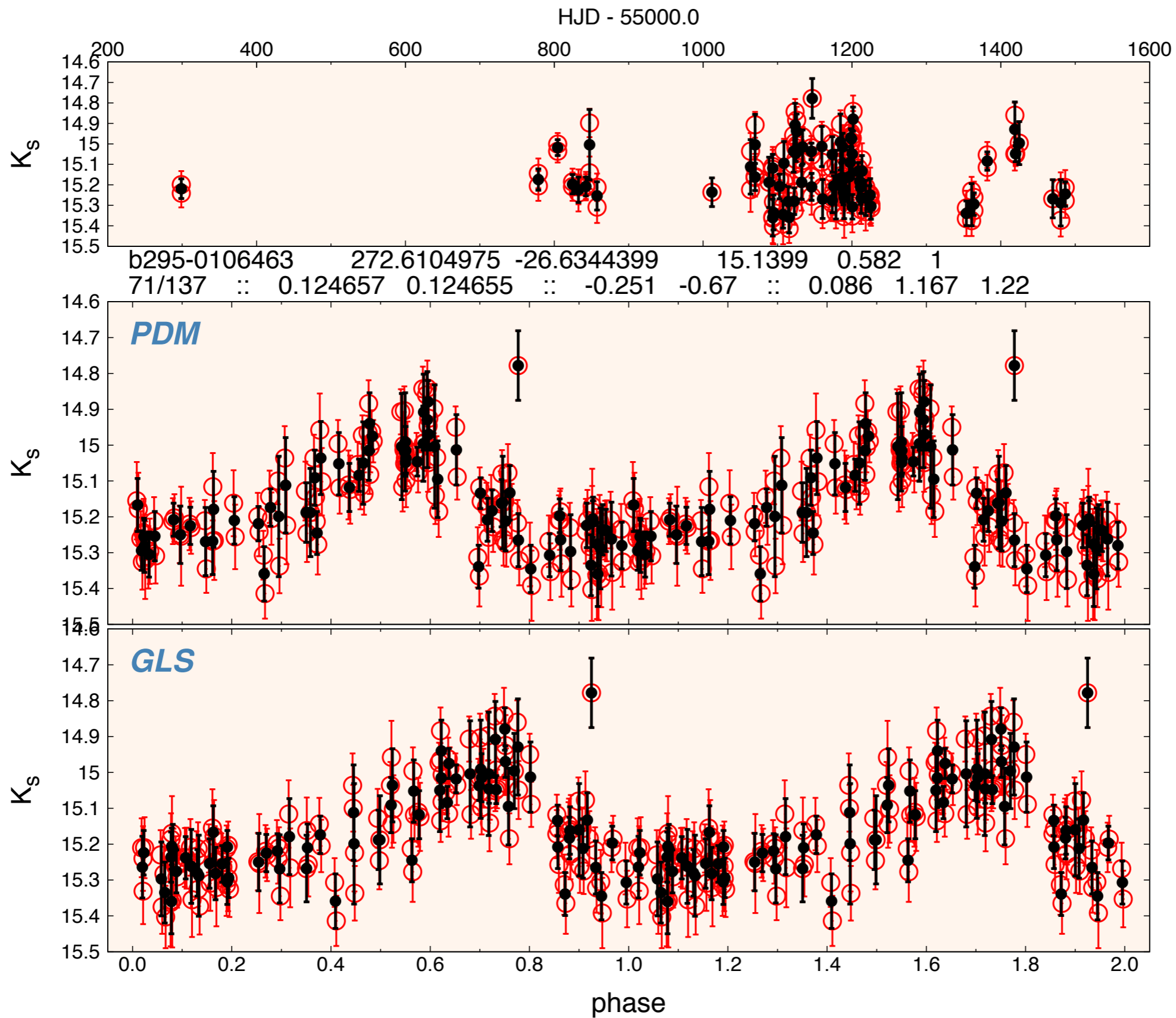


PDM frequency [c/d]

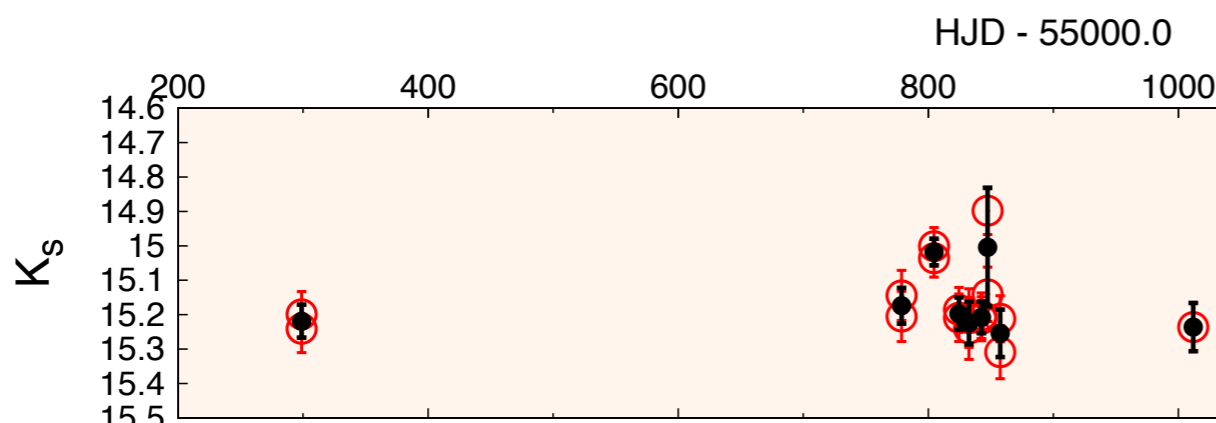


b295 : 4005 candidates

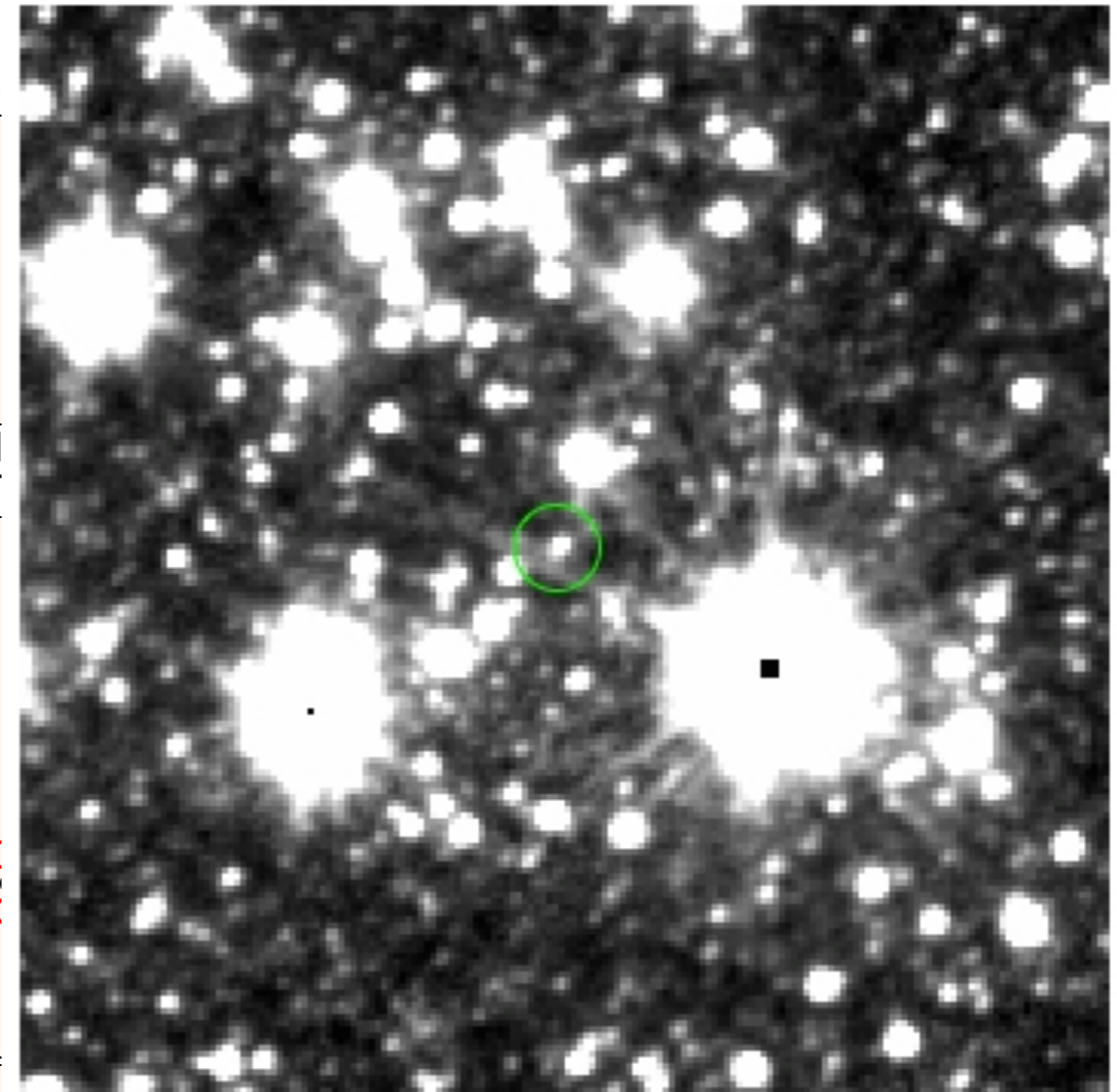
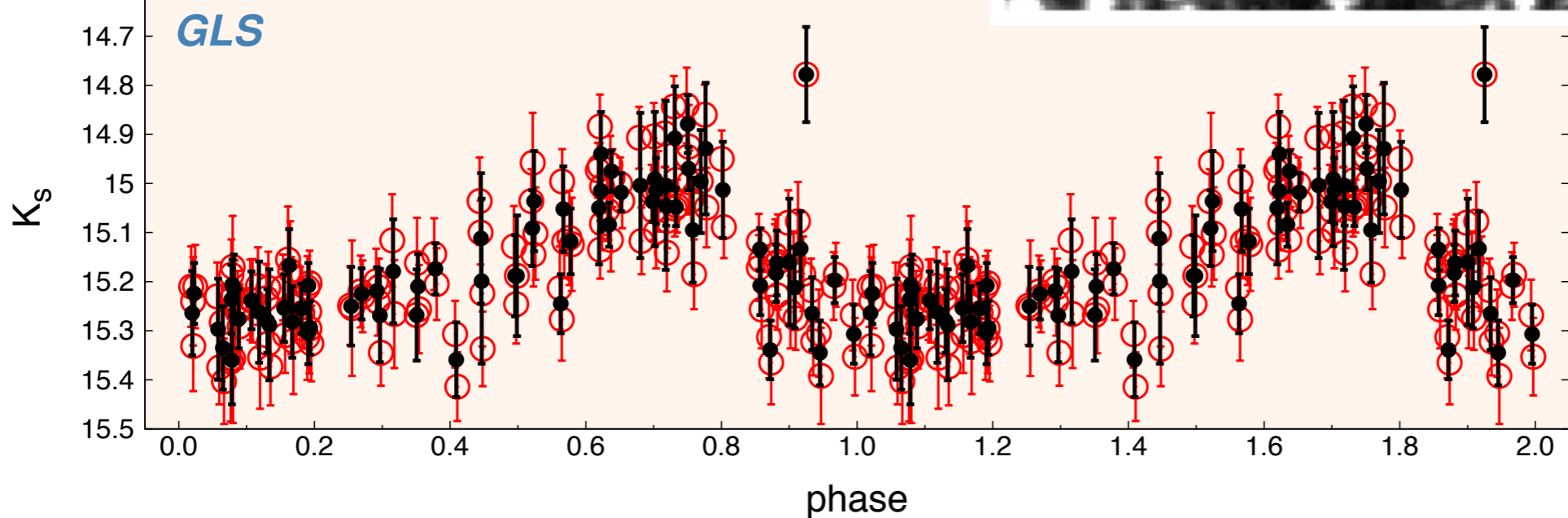
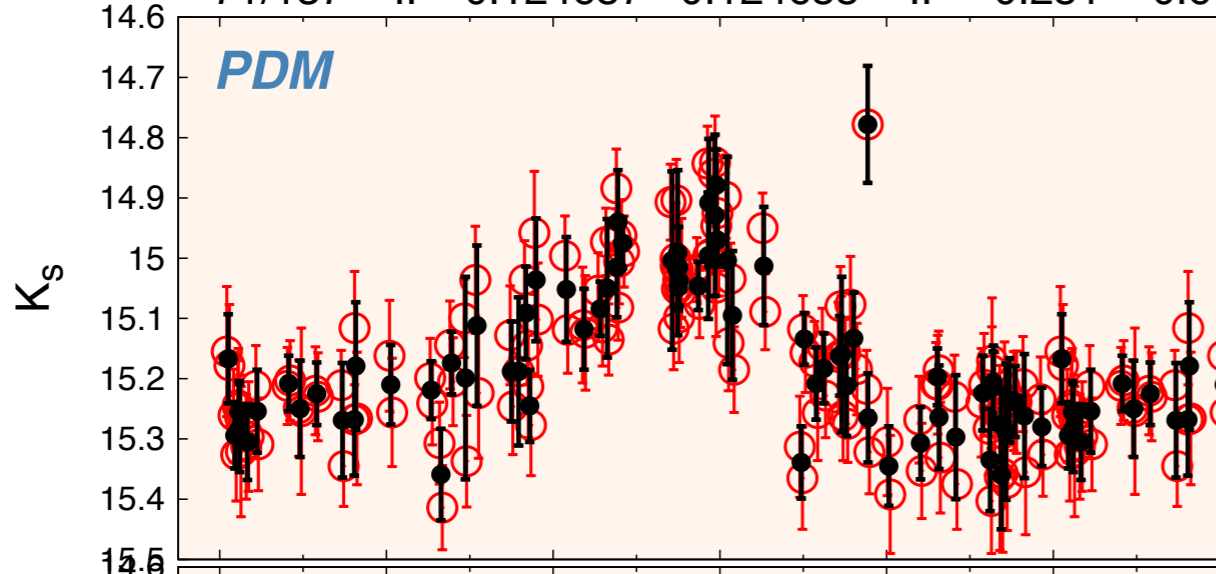
PHASE IV : frequency analysis

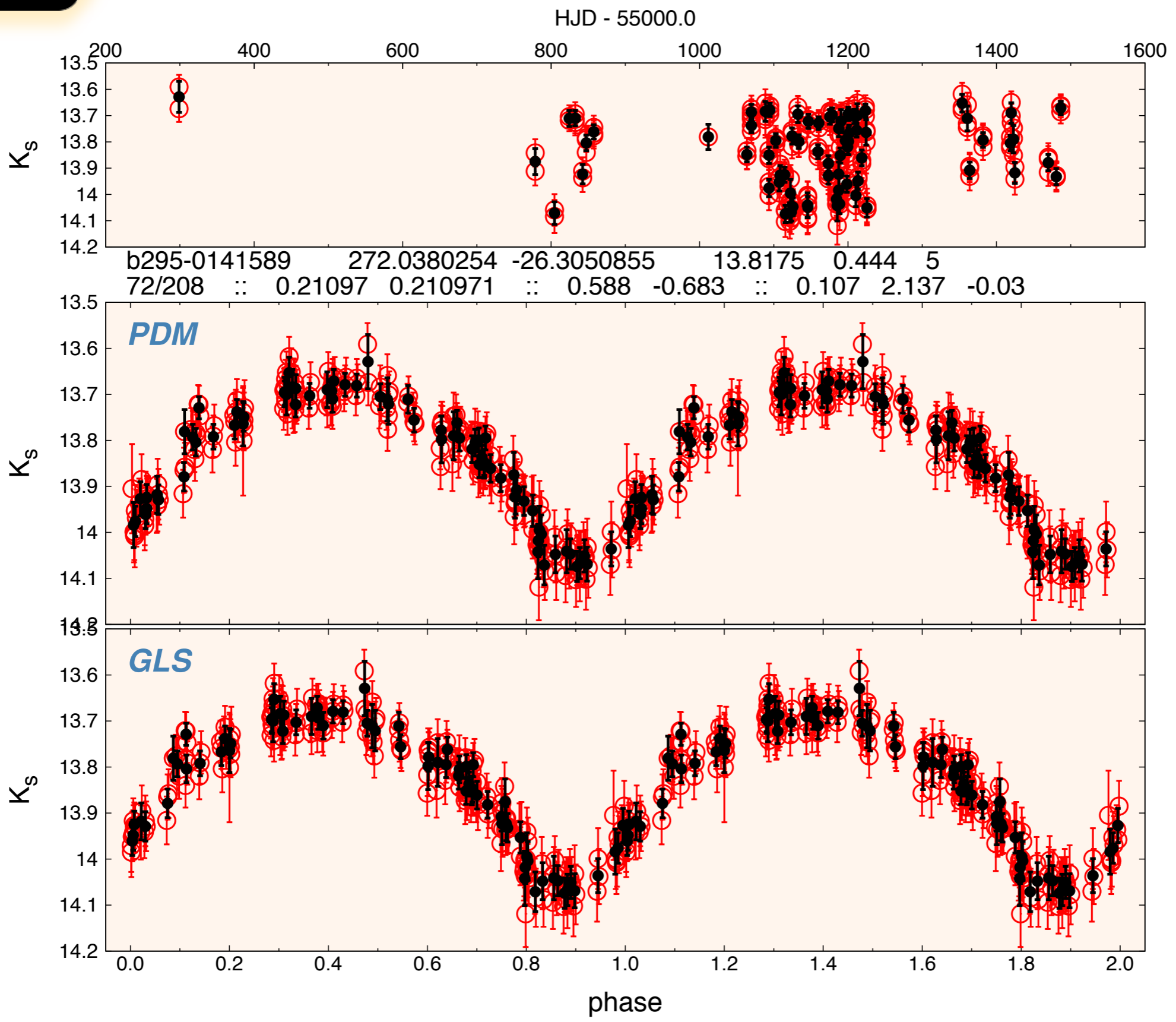


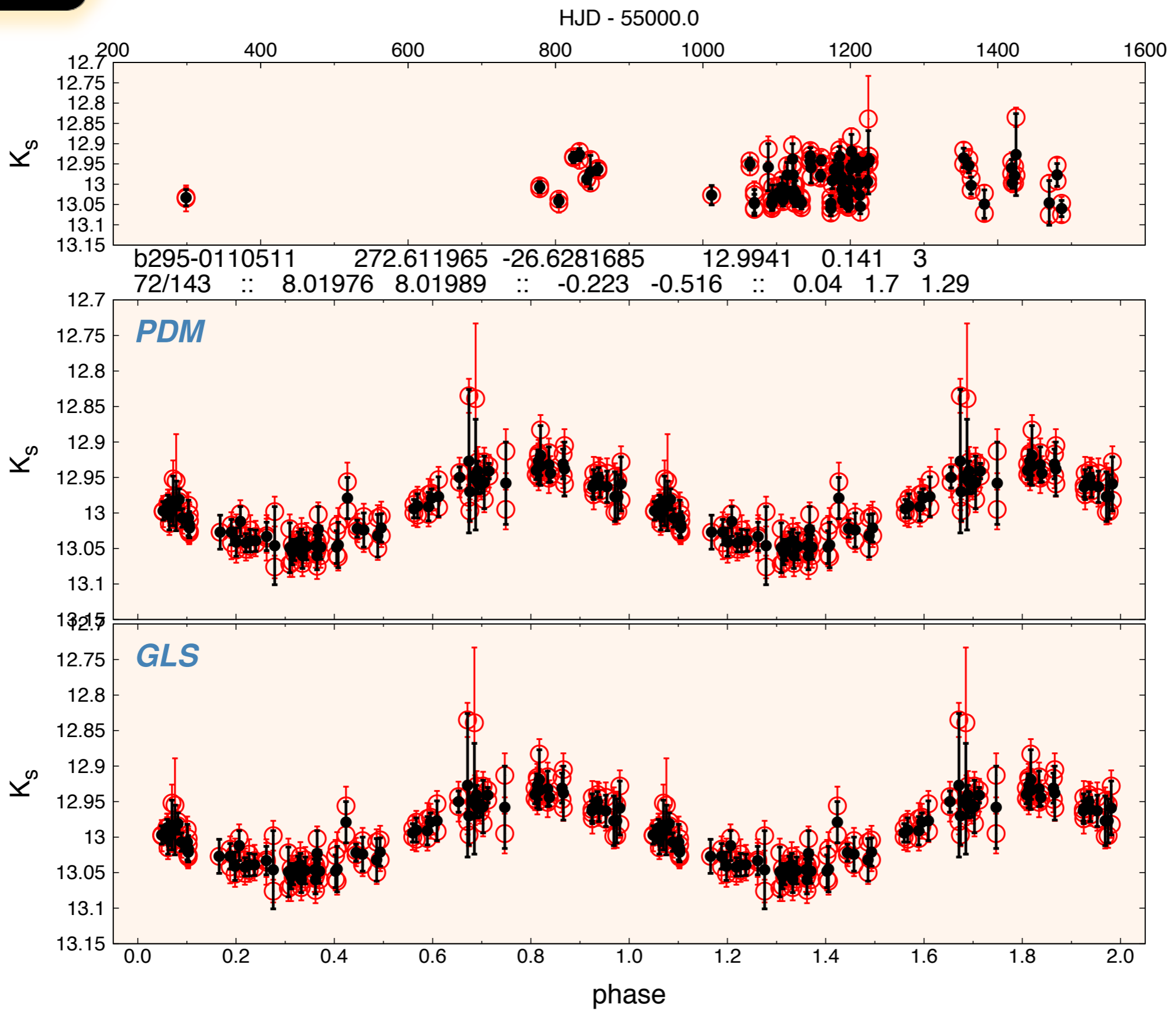
PHASE IV : frequency analysis

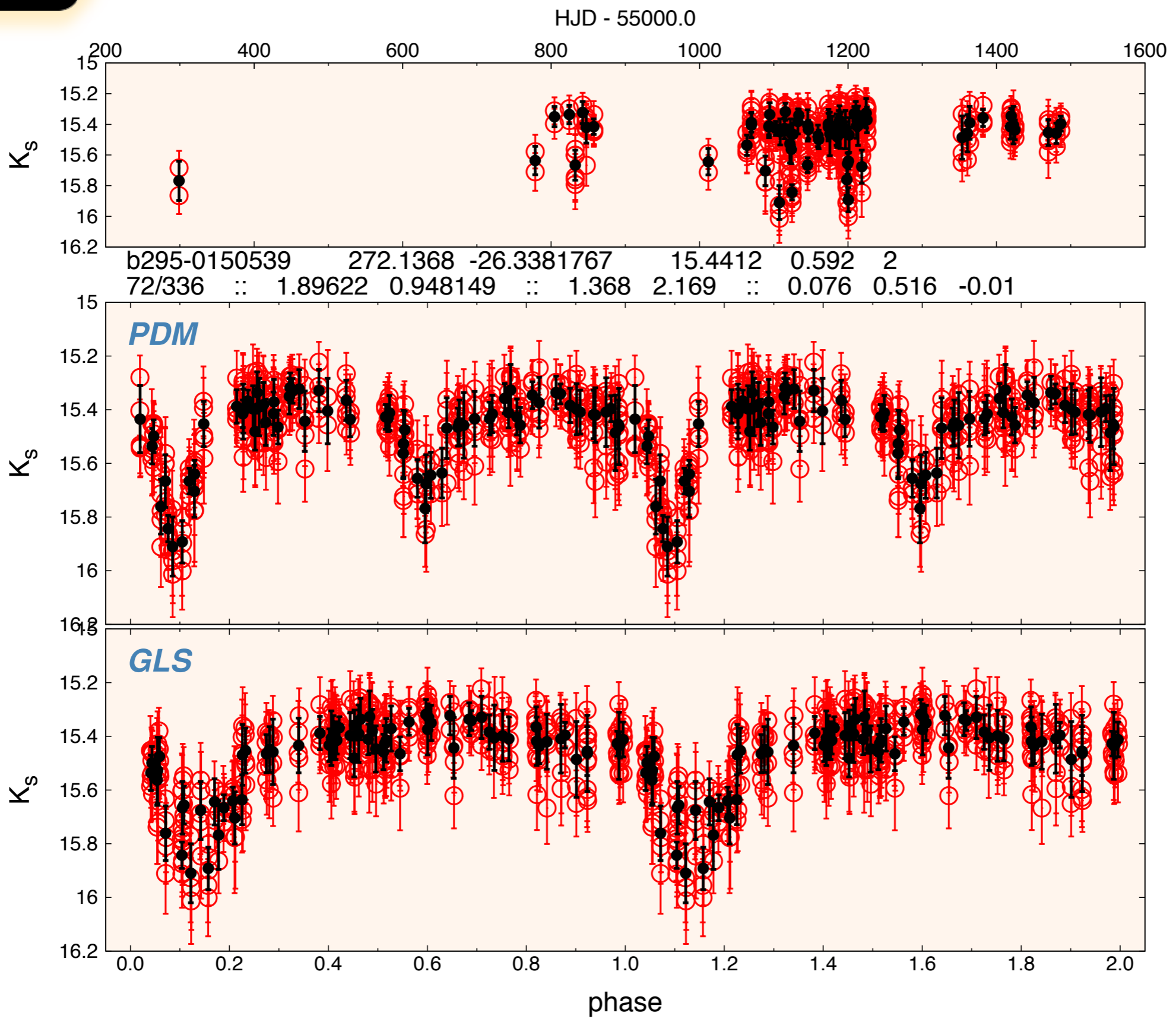


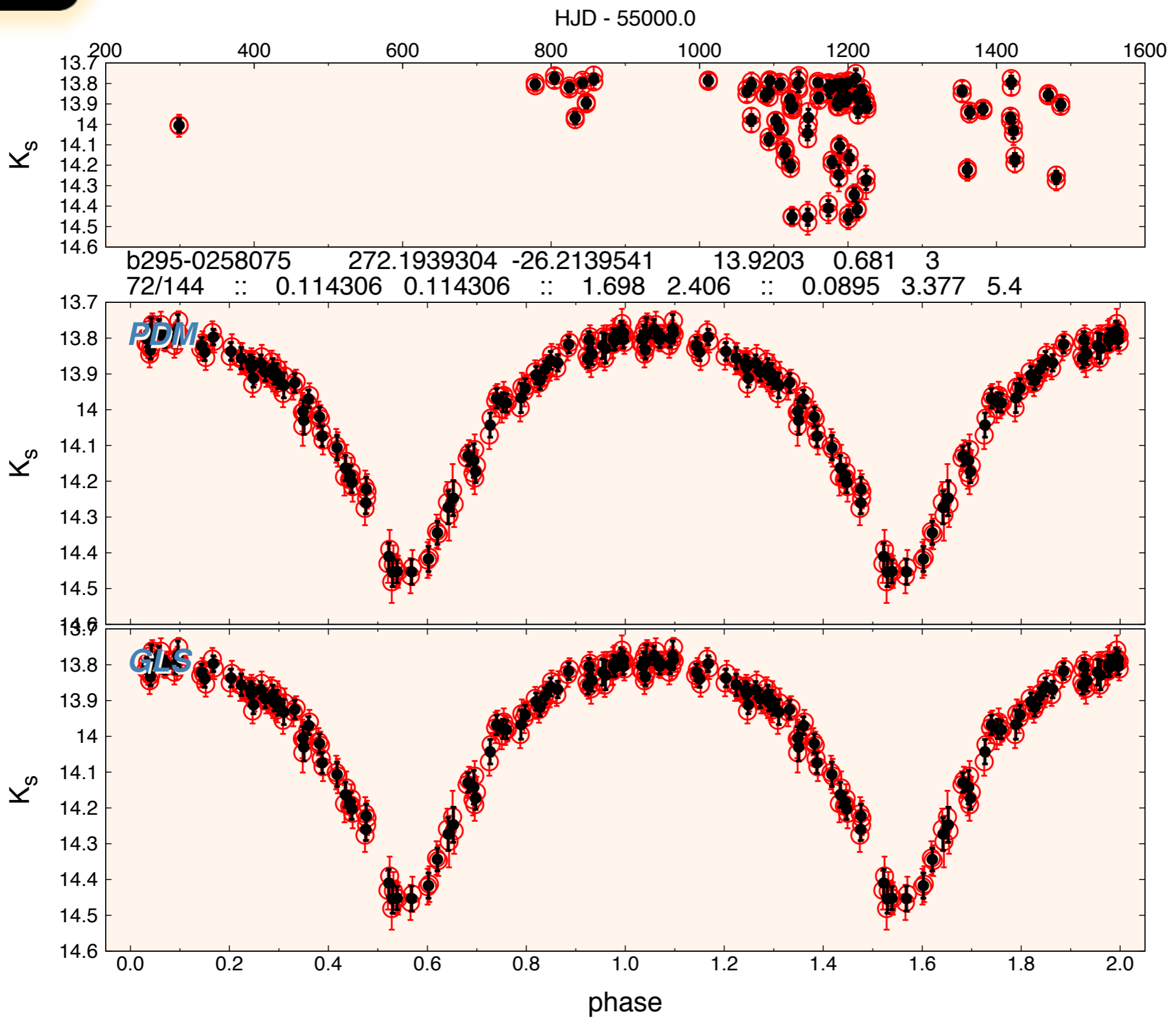
b295-0106463 272.6104975 -26.6344399 1
 71/137 :: 0.124657 0.124655 :: -0.251 -0.6

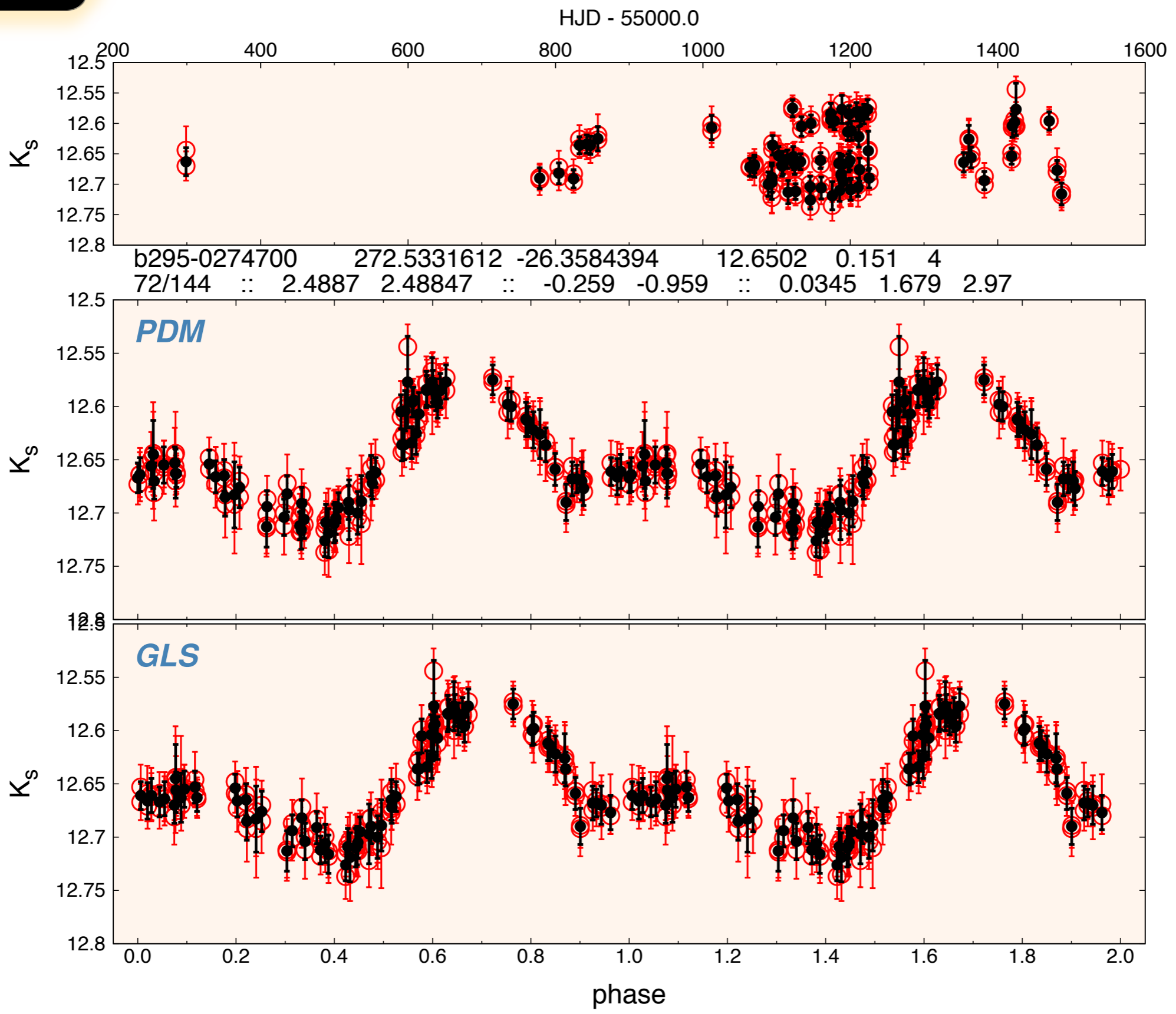


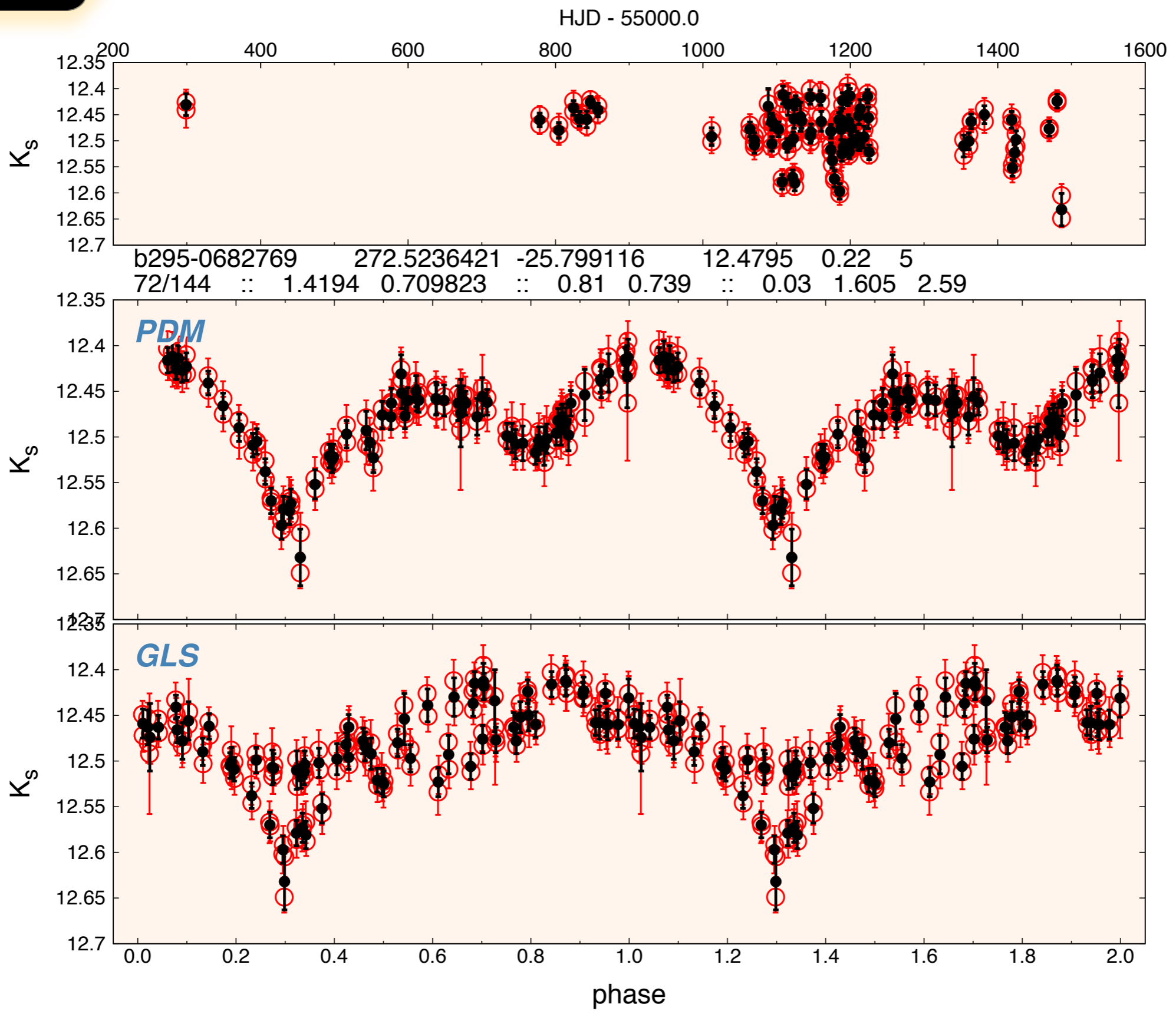


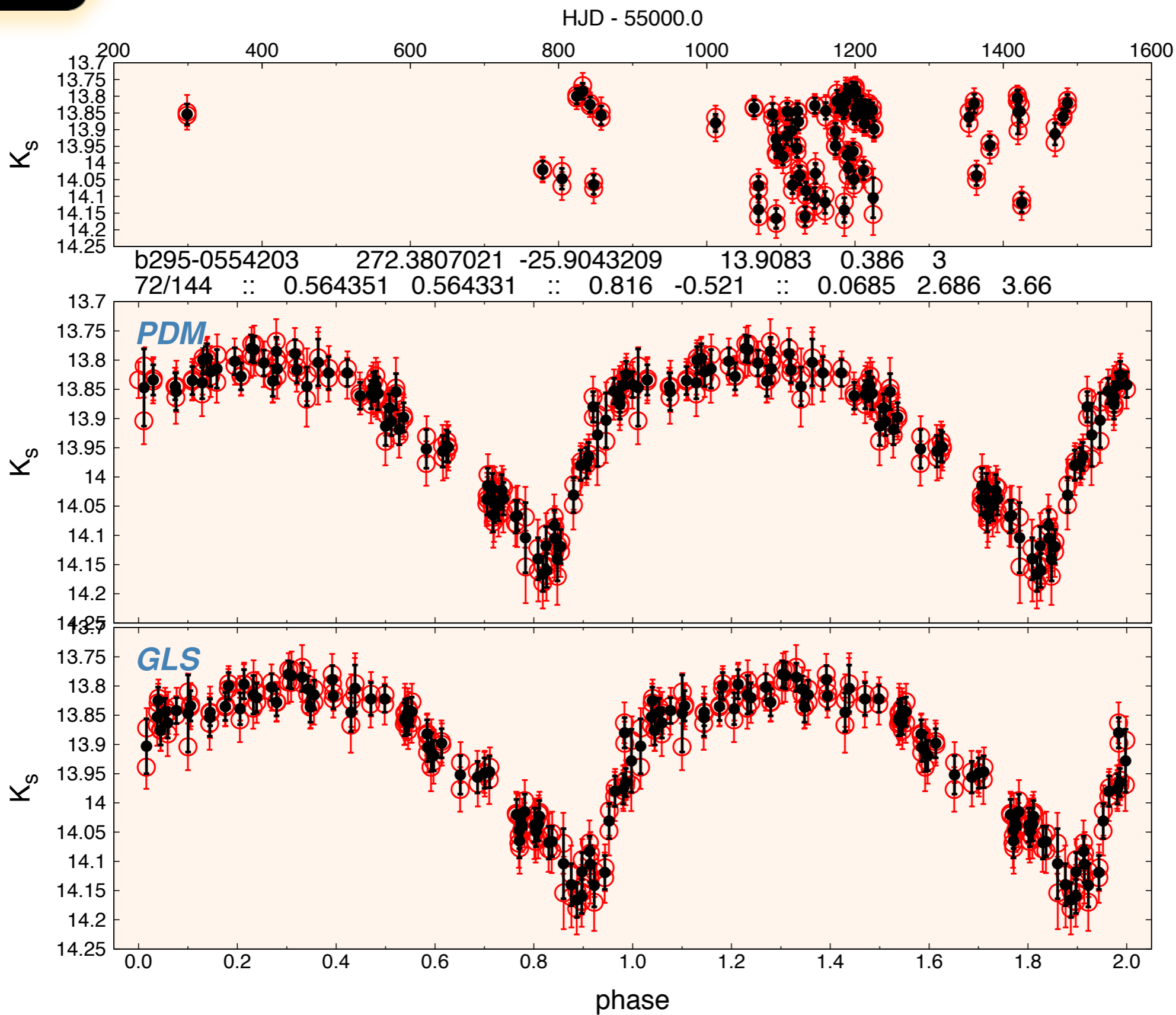


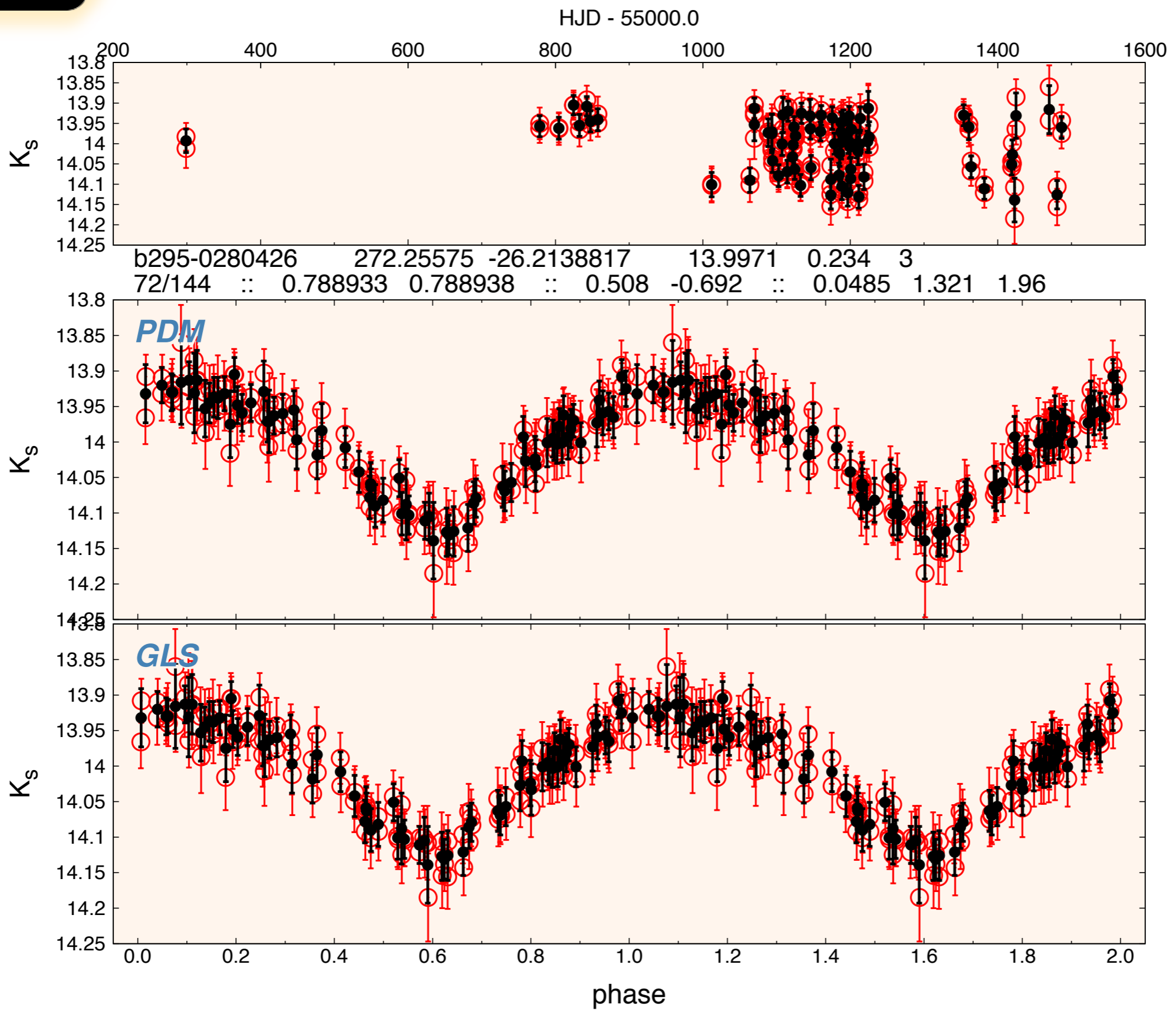


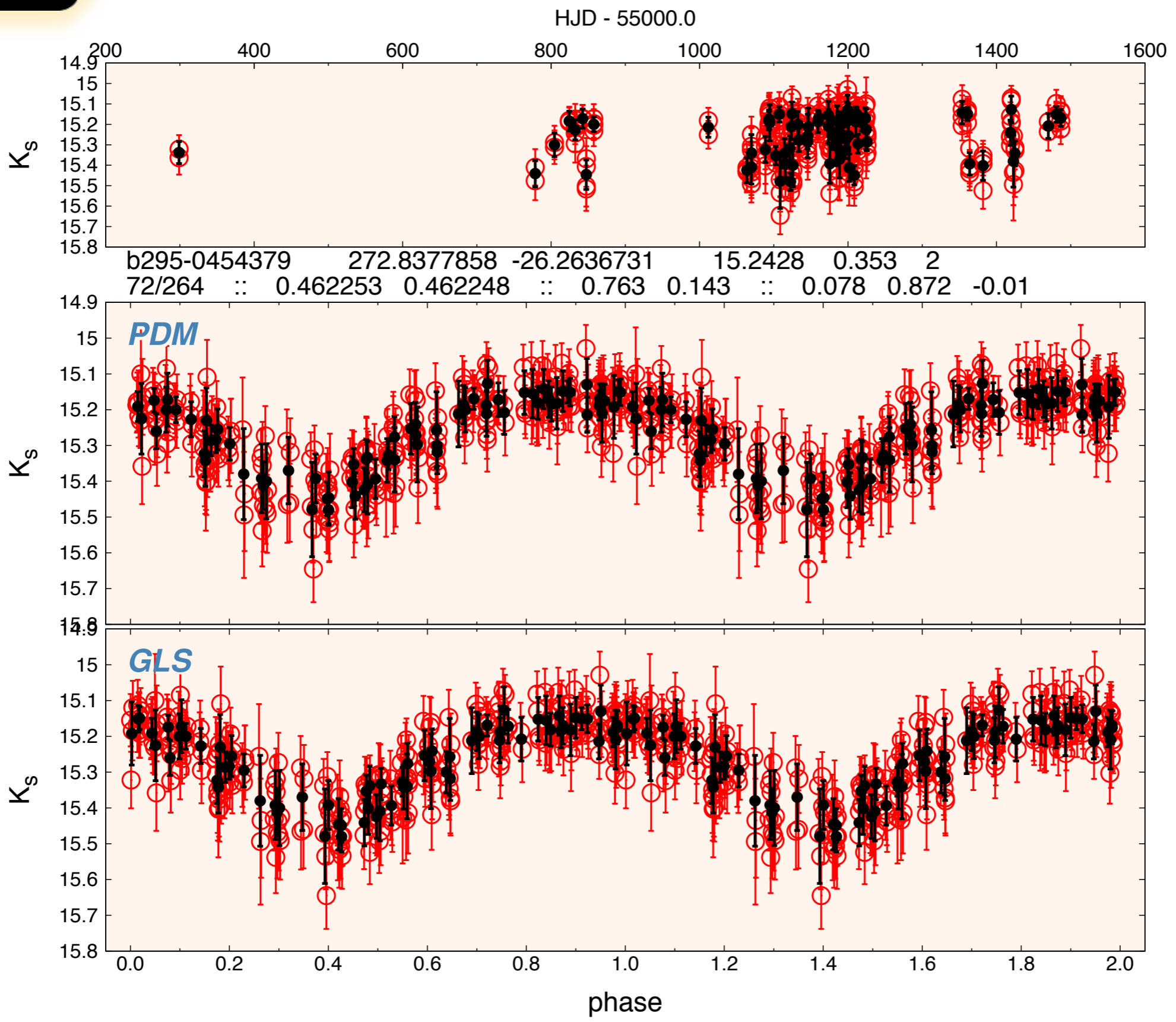


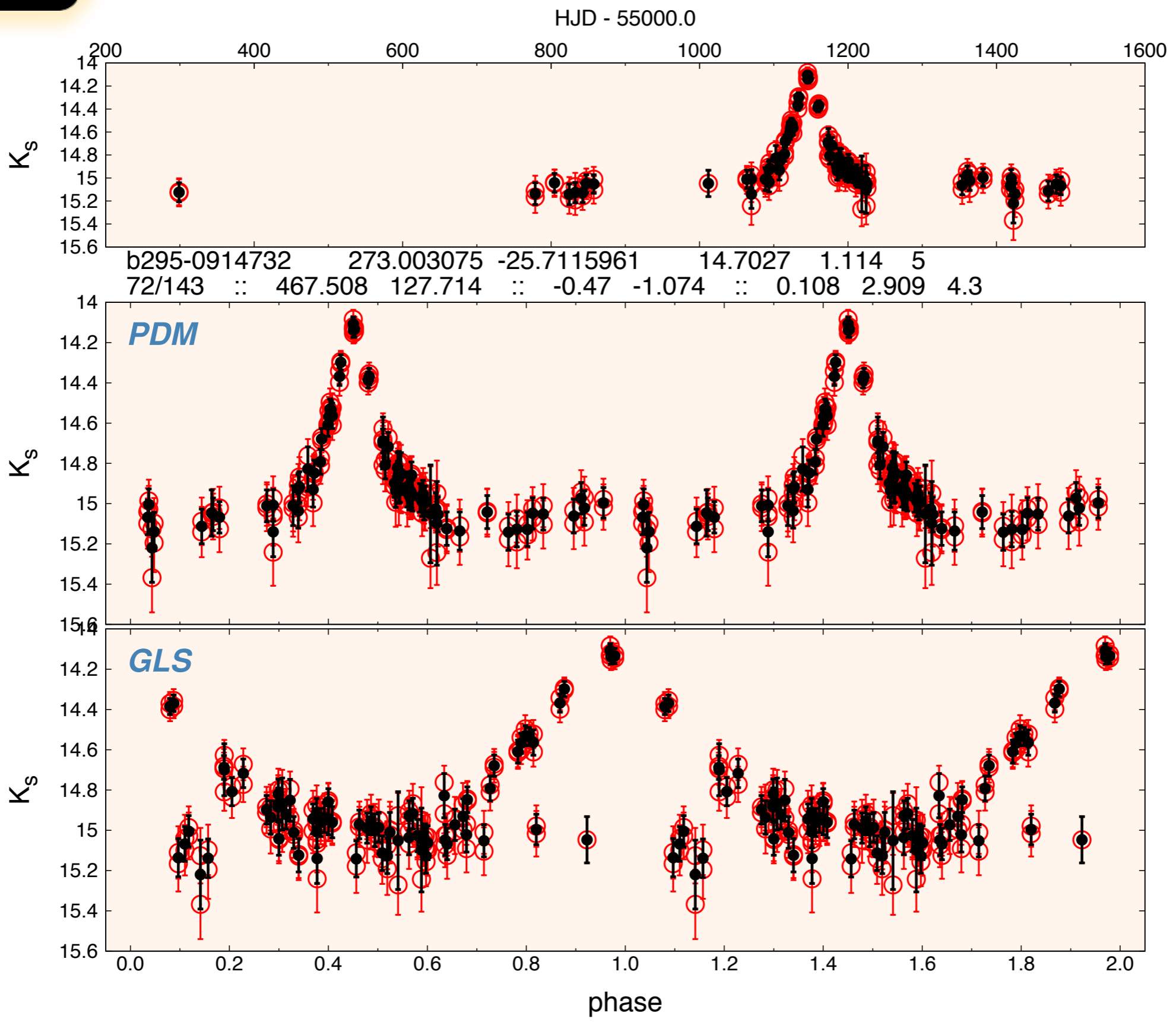


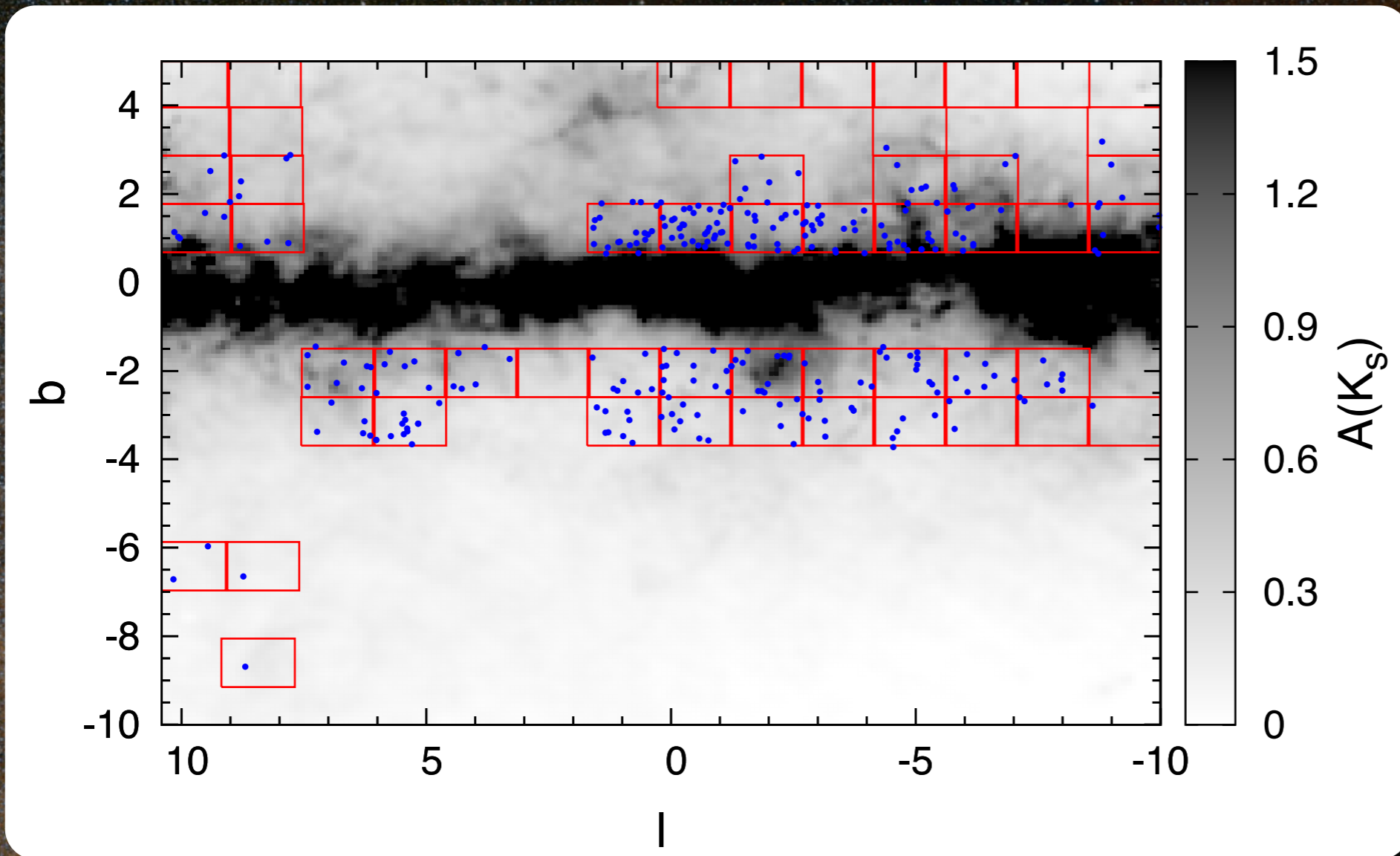












>200 microlensing events



DATA PRODUCT: relational database

Variability tables

min./max., weighted average, w. std. dev., median, internal scatter, N_{paw} , N_{tile} , $N_{\text{om.}}$, skewness, kurtosis, I_s , MWMSSD, RA, DEC, ZYJH averaged pawprint magnitudes, etc.
(~1 million rows / tile)

Frequency analysis tables

as above + P_{LSP} , theta, f_{LSP} , f_{PDM} , etc.
(~50000 rows / tile)

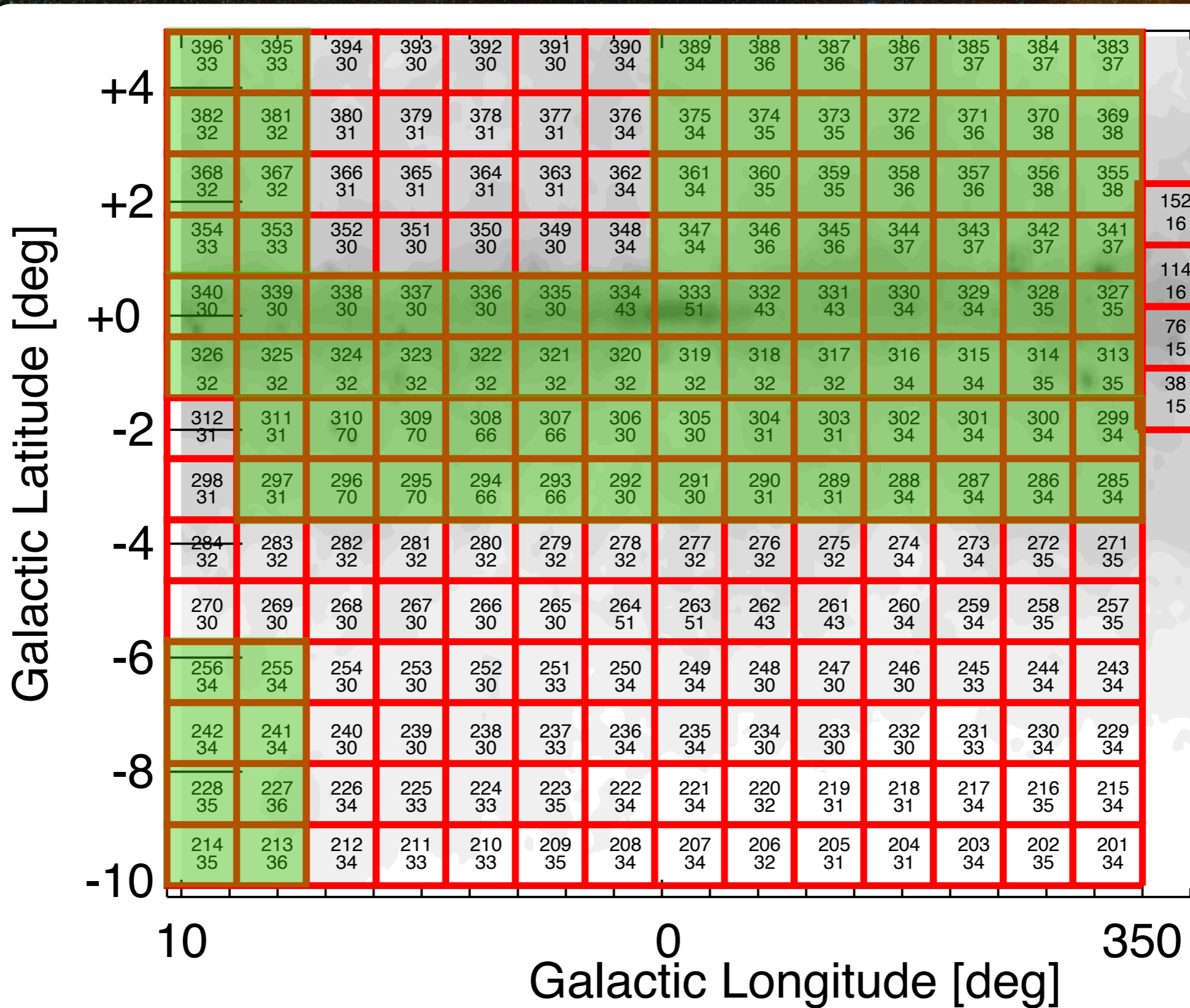
Queryable light curves + plots

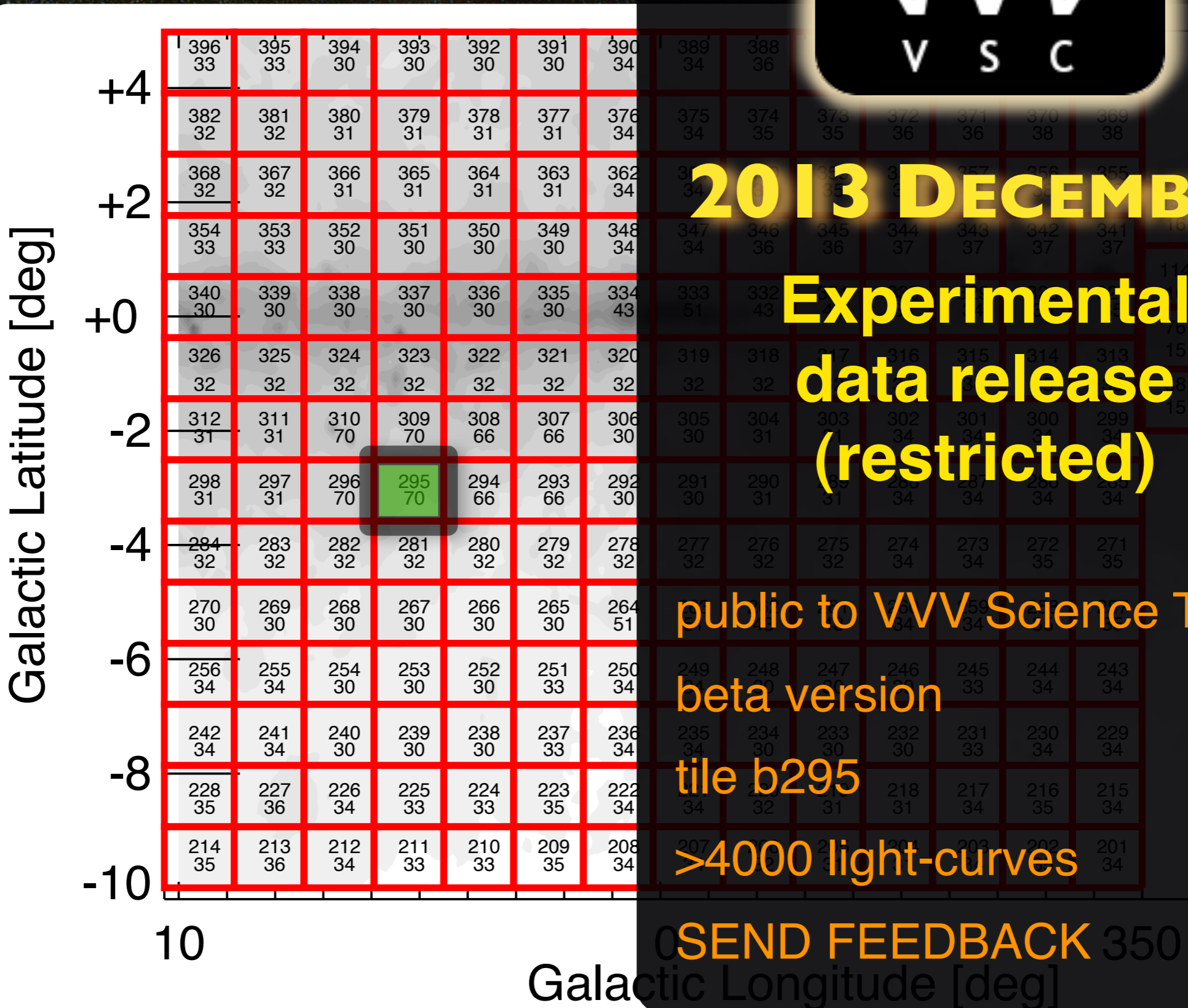
ZYJHKs processed & raw data in all apertures



PROCESSING STATUS

Credit: ESO





2013 DECEMBER

Experimental data release (restricted)

public to VVV Science Team

beta version

tile b295

>4000 light-curves

SEND FEEDBACK



(Recent tables) ...

- + information_schema
- + mysql
- + performance_schema
- vvv
 - + New
 - + b295_lc
 - + b295_plc
 - + b295_tlc
 - + b295_var
 - + b331_lc
 - + b331_plc
 - + b331_tlc
 - + b331_var
 - + b384_lc
 - + b384_plc
 - + b384_tlc
 - + b384_var

Server: localhost:3306 » Database: vvv

Structure SQL Search Query Export Import Operations Privileges Routines Events Triggers

Table	Action	Rows	Type	Collation	Size	Overhead
<input type="checkbox"/> b295_lc		-3,761,949	InnoDB	utf8_general_ci	370.9 MiB	-
<input type="checkbox"/> b295_plc		-3,722,691	InnoDB	utf8_general_ci	189.7 MiB	-
<input type="checkbox"/> b295_tlc		-1,903,581	InnoDB	utf8_general_ci	87.6 MiB	-
<input type="checkbox"/> b295_var		-3,156	InnoDB	utf8_general_ci	1.6 MiB	-
<input type="checkbox"/> b331_lc		-4,511,628	InnoDB	utf8_general_ci	373.9 MiB	-
<input type="checkbox"/> b331_plc		-4,497,993	InnoDB	utf8_general_ci	205.7 MiB	-
<input type="checkbox"/> b331_tlc		-2,174,445	InnoDB	utf8_general_ci	99.6 MiB	-
<input type="checkbox"/> b331_var		-6,074	InnoDB	utf8_general_ci	1.6 MiB	-
<input type="checkbox"/> b384_lc		-554,442	InnoDB	utf8_general_ci	54.6 MiB	-
<input type="checkbox"/> b384_plc		-536,952	InnoDB	utf8_general_ci	27.6 MiB	-
<input type="checkbox"/> b384_tlc		-277,029	InnoDB	utf8_general_ci	13.5 MiB	-
<input type="checkbox"/> b384_var		-2,241	InnoDB	utf8_general_ci	1.5 MiB	-
12 tables	Sum	21,952,181	InnoDB	utf8_general_ci	1.4 GiB	0 B

Check All With selected:

Print view Data Dictionary

Create table

Name: Number of columns:

Galactic Longitude [deg]



(Recent tables) ...

- + information_schema
- + mysql
- + performance_schema
- vvv
 - + New
 - + b295_lc
 - + b295_plc
 - + b295_tlc
 - + b295_var
 - + b331_lc
 - + b331_plc
 - + b331_tlc
 - + b331_var
 - + b384_lc
 - + b384_plc
 - + b384_tlc
 - + b384_var

Server: localhost:3306 » Database: vvv » Table: b295_var

Browse Structure SQL Search Insert Export Import Operations Triggers

#	Name	Type	Collation	Attributes	Null	Default	Extra	Action
<input type="checkbox"/>	1 ID	int(7)			No	0		Change Drop Primary Unique Index Spatial Fulltext More
<input type="checkbox"/>	2 AP	int(1)			Yes	NULL		Change Drop Primary Unique Index Spatial Fulltext More
<input type="checkbox"/>	3 MINMAG	decimal(5,3)			Yes	NULL		Change Drop Primary Unique Index Spatial Fulltext More
<input type="checkbox"/>	4 MAXMAG	decimal(5,3)			Yes	NULL		Change Drop Primary Unique Index Spatial Fulltext More
<input type="checkbox"/>	5 TAMPL	decimal(4,3)			Yes	NULL		Change Drop Primary Unique Index Spatial Fulltext More
<input type="checkbox"/>	6 AVRGMAG	decimal(6,4)			Yes	NULL		Change Drop Primary Unique Index Spatial Fulltext More
<input type="checkbox"/>	7 STDEVM	decimal(5,4)			Yes	NULL		Change Drop Primary Unique Index Spatial Fulltext More
<input type="checkbox"/>	8 WAVRMAG	decimal(6,4)			Yes	NULL		Change Drop Primary Unique Index Spatial Fulltext More
<input type="checkbox"/>	9 WSTDVM	decimal(5,4)			Yes	NULL		Change Drop Primary Unique Index Spatial Fulltext More
<input type="checkbox"/>	10 MEDIAN	decimal(6,4)			Yes	NULL		Change Drop Primary Unique Index Spatial Fulltext More
<input type="checkbox"/>	11 MAD	decimal(5,4)			Yes	NULL		Change Drop Primary Unique Index Spatial Fulltext More
<input type="checkbox"/>	12 INTSCT	decimal(6,4)			Yes	NULL		Change Drop Primary Unique Index Spatial Fulltext More
<input type="checkbox"/>	13 RATSCT	decimal(4,2)			Yes	NULL		Change Drop Primary Unique Index Spatial Fulltext More
<input type="checkbox"/>	14 NDI	int(3)			Yes	NULL		Change Drop Primary Unique Index Spatial Fulltext More
<input type="checkbox"/>	15 NPT	int(3)			Yes	NULL		Change Drop Primary Unique Index Spatial Fulltext More
<input type="checkbox"/>	16 NTL	int(2)			Yes	NULL		Change Drop Primary Unique Index Spatial Fulltext More
<input type="checkbox"/>	17 SKEWNS	decimal(5,3)			Yes	NULL		Change Drop Primary Unique Index Spatial Fulltext More
<input type="checkbox"/>	18 KURTOS	decimal(5,3)			Yes	NULL		Change Drop Primary Unique Index Spatial Fulltext More
<input type="checkbox"/>	19 NOM	int(2)			Yes	NULL		Change Drop Primary Unique Index Spatial Fulltext More
<input type="checkbox"/>	20 CRTRAT	decimal(4,2)			Yes	NULL		Change Drop Primary Unique Index Spatial Fulltext More
<input type="checkbox"/>	21 RCRTR	decimal(4,2)			Yes	NULL		Change Drop Primary Unique Index Spatial Fulltext More
<input type="checkbox"/>	22 STETSON	decimal(5,3)			Yes	NULL		Change Drop Primary Unique Index Spatial Fulltext More
<input type="checkbox"/>	23 NST	int(3)			Yes	NULL		Change Drop Primary Unique Index Spatial Fulltext More
<input type="checkbox"/>	24 STKURT	decimal(4,3)			Yes	NULL		Change Drop Primary Unique Index Spatial Fulltext More
<input type="checkbox"/>	25 STETMOD	decimal(5,3)			Yes	NULL		Change Drop Primary Unique Index Spatial Fulltext More
<input type="checkbox"/>	26 CRTSTET	decimal(4,3)			Yes	NULL		Change Drop Primary Unique Index Spatial Fulltext More
<input type="checkbox"/>	27 RCRTS	decimal(5,3)			Yes	NULL		Change Drop Primary Unique Index Spatial Fulltext More

Galactic Longitude [deg]



(Recent tables) ...

- + information_schema
- + mysql
- + performance_schema
- vvv
 - New
 - + b295_lc
 - + b295_plc
 - + b295_tlc
 - + b295_var
 - + b331_lc
 - + b331_plc
 - + b331_tlc
 - + b331_var
 - + b384_lc
 - + b384_plc
 - + b384_tlc
 - + b384_var

Server: localhost:3306 » Database: vvv » Table: b295_tlc

[Browse](#)
[Structure](#)
[SQL](#)
[Search](#)
[Insert](#)
[Export](#)
[Import](#)
[Operations](#)
[Triggers](#)

✓ Showing rows 0 - 29 (1903093 total, Query took 0.0010 sec)

```

SELECT *
FROM `b295_tlc`
LIMIT 0, 30

```

Profiling [[Inline](#)] [[Edit](#)] [[Explain SQL](#)] [[Create PHP Code](#)] [[Refresh](#)]

1 > >> | Show : Start row: 30 Number of rows: 30 Headers every 100 rows

+ Options

ID	KsTHJD	KsTmag	KsTmagErr
3335	55298.83478	13.731	0.025
3335	55778.642745	13.701	0.039
3335	55804.60505	13.709	0.016
3335	55824.589115	13.73	0.015
3335	55832.573955	13.689	0.041
3335	55842.56738	13.728	0.017
3335	55857.521485	13.735	0.018
3335	56011.83518	13.747	0.027
3335	56069.87426	13.749	0.024
3335	56093.67101	13.762	0.033
3335	56094.604065	13.765	0.018
3335	56102.68114	13.716	0.025
3335	56107.55324	13.78	0.019
3335	56108.65187	13.731	0.02
3335	56114.56141	13.682	0.026
3335	56115.588985	13.758	0.026
3335	56122.534925	13.742	0.017
3335	56124.60276	13.735	0.016
3335	56132.552885	13.695	0.018

Galactic Longitude [deg]



(Recent tables) ...

- + information_schema
- + mysql
- + performance_schema
- vvv
 - New
 - + b295_lc
 - + b295_plc
 - + b295_tlc
 - + b295_var
 - + b331_lc
 - + b331_plc
 - + b331_tlc
 - + b331_var
 - + b384_lc
 - + b384_plc
 - + b384_tlc
 - + b384_var

Server: localhost:3306 » Database: vvv » Table: b295_plc

[Browse](#)
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[Export](#)
[Import](#)
[Operations](#)
[Triggers](#)

Showing rows 0 - 299 (3722290 total, Query took 0.0041 sec)

```
SELECT *
FROM `b295_plc`
LIMIT 0 , 300
```

Profiling [[Inline](#)] [[Edit](#)] [[Explain SQL](#)] [[Create PHP Code](#)] [[Refresh](#)]

1 > >> | Show : Start row: 300 Number of rows: 300 Headers every 100 rows

+ Options

ID	KsPHJD	KsPawNum	chip	KsPmag	KsPmagErr
3335	55298.83462	107316	2	13.746	0.035
3335	55298.83494	107318	2	13.715	0.037
3335	55778.64251	340973	2	13.729	0.025
3335	55778.64298	340975	2	13.674	0.025
3335	55804.60485	364589	2	13.709	0.021
3335	55804.60525	364591	2	13.708	0.025
3335	55824.58891	382066	2	13.735	0.021
3335	55824.58932	382068	2	13.724	0.022
3335	55832.57376	389226	2	13.72	0.028
3335	55832.57415	389228	2	13.662	0.025
3335	55842.56718	397008	2	13.723	0.025
3335	55842.56758	397010	2	13.732	0.024
3335	55857.52129	405505	2	13.743	0.027
3335	55857.52168	405507	2	13.728	0.024
3335	56011.83518	480643	2	13.747	0.027
3335	56069.87426	516122	2	13.749	0.024
3335	56093.67101	535069	2	13.762	0.033
3335	56094.60386	535802	2	13.775	0.024
3335	56094.60427	535804	2	13.752	0.027

Galactic Longitude [deg]



Server: localhost:3306 » Database: vvv » Table: b295_lc

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[Structure](#)
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[Search](#)
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[Import](#)
[Operations](#)
[Triggers](#)

Showing rows 0 - 29 (3761816 total, Query took 0.0205 sec)

```

SELECT *
FROM `b295_lc`
LIMIT 0, 30

```

Profiling [[Inline](#)] [[Edit](#)] [[Explain SQL](#)] [[Create PHP Code](#)] [[Refresh](#)]

> >> | Show : Start row: Number of rows: Headers every rows

+ Options

ID	filter	HJD	pawNum	ZPErr	ap1mag	ap1magErr	ap2mag	ap2magErr	ap3mag	ap3magErr	ap4mag	ap4magErr	ap5mag	ap5magErr	chip	PSFclass	ell	angSep
3335	5	55298.83462	107316	0.03	13.771	0.017	13.746	0.018	13.671	0.021	26.972	9.328	13.547	0.034	2	1	0.19	0.185
3335	5	55298.83494	107318	0.032	13.746	0.016	13.715	0.018	13.647	0.021	26.972	9.324	13.483	0.032	2	1	0.16	0.203
3335	5	55778.64251	340973	0.014	13.767	0.021	13.729	0.021	13.594	0.023	26.909	9.401	13.122	0.026	2	1	0.2	0.188
3335	5	55778.64298	340975	0.012	13.746	0.023	13.674	0.022	13.53	0.022	26.88	9.388	13.283	0.03	2	1	0.03	0.187
3335	5	55804.60485	364589	0.01	13.742	0.018	13.709	0.019	13.618	0.022	26.912	9.364	13.282	0.029	2	1	0.08	0.204
3335	5	55804.60525	364591	0.015	13.762	0.02	13.708	0.02	13.601	0.022	26.897	9.371	13.349	0.031	2	1	0.01	0.186
3335	5	55824.58891	382066	0.01	13.784	0.019	13.735	0.019	13.625	0.021	26.952	9.337	13.648	0.038	2	1	0.22	0.214
3335	5	55824.58932	382068	0.01	13.741	0.02	13.724	0.02	13.625	0.022	26.958	9.395	13.366	0.031	2	1	0.13	0.174
3335	5	55832.57376	389226	0.012	13.746	0.025	13.72	0.025	13.565	0.024	26.91	9.495	13.685	0.046	2	-2	0.38	0.179
3335	5	55832.57415	389228	0.011	13.75	0.026	13.662	0.023	13.48	0.022	26.909	9.427	13.163	0.027	2	1	0.42	0.162
3335	5	55842.56718	397008	0.015	13.788	0.02	13.723	0.02	13.61	0.022	26.955	9.396	13.324	0.03	2	1	0.07	0.203
3335	5	55842.56758	397010	0.013	13.788	0.019	13.732	0.02	13.633	0.022	26.959	9.385	13.395	0.031	2	1	0	0.213
3335	5	55857.52129	405505	0.017	13.782	0.021	13.743	0.021	13.6	0.022	26.946	9.428	13.228	0.028	2	1	0.18	0.172
3335	5	55857.52168	405507	0.013	13.798	0.021	13.728	0.02	13.592	0.022	26.952	9.411	13.248	0.028	2	1	0.18	0.2
3335	5	56011.83518	480643	0.019	13.794	0.018	13.747	0.019	13.657	0.022	26.914	9.31	13.2	0.025	2	1	0.02	0.179
3335	5	56069.87426	516122	0.01	13.818	0.023	13.749	0.022	13.61	0.024	26.938	9.453	13.362	0.032	2	1	0.04	0.175
3335	5	56093.67101	535069	0.024	13.781	0.023	13.762	0.023	13.616	0.024	26.771	9.305	13.419	0.035	2	1	0.32	0.19
3335	5	56094.60386	535802	0.01	13.773	0.021	13.775	0.022	13.69	0.024	26.93	9.38	13.732	0.043	2	-1	0.09	0.228
3335	5	56094.60427	535804	0.015	13.795	0.022	13.752	0.022	13.683	0.024	26.925	9.367	13.89	0.049	2	-1	0.03	0.254

Galactic Longitude [deg]



(Recent tables) ...

- + information_schema
- + mysql
- + performance_schema
- vvv
 - New
 - + b295_lc
 - + b295_plc
 - + b295_tlc
 - + b295_var
 - + b331_lc
 - + b331_plc
 - + b331_tlc
 - + b331_var
 - + b384_lc
 - + b384_plc
 - + b384_tlc
 - + b384_var

Server: localhost:3306 » Database: vvv

Structure SQL Search Query Export Import Operations Privileges Routines Events Triggers

Column:	`b295_var`.`ID`	`b295_var`.`STETSON`	`b295_var`.`PDMFREQ`
Sort:	Ascending	Ascending	Ascending
Show:	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Criteria:	<input type="text"/>	<input type="text"/>	<input type="text"/>
Ins: <input type="checkbox"/> And: <input type="checkbox"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Del: <input type="checkbox"/> Or: <input checked="" type="radio"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Modify:	Or: <input type="radio"/> And: <input checked="" type="radio"/> Ins <input type="checkbox"/> Del <input type="checkbox"/>	Or: <input type="radio"/> And: <input checked="" type="radio"/> Ins <input type="checkbox"/> Del <input type="checkbox"/>	Or: <input type="radio"/> And: <input checked="" type="radio"/> Ins <input type="checkbox"/> Del <input type="checkbox"/>

Add/Delete criteria rows: 0 Add/Delete columns: 0

Use Tables

- b295_lc
- b295_plc
- b295_tlc
- b295_var
- b331_lc
- b331_plc
- b331_tlc

SQL query on database vvv:

Galactic Longitude [deg]



(Recent tables) ...

- + information_schema
- + mysql
- + performance_schema
- vvv
 - + New
 - + b295_lc
 - + b295_plc
 - + b295_tlc
 - + b295_var
 - + b331_lc
 - + b331_plc
 - + b331_tlc
 - + b331_var
 - + b384_lc
 - + b384_plc
 - + b384_tlc
 - + b384_var

Server: localhost:3306 » Database: vvv

Structure SQL Search Query Export Import Operations Privileges Routines Events Triggers

Column:			
Sort:			
Show:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Criteria:			
Ins: <input type="checkbox"/> And: <input type="checkbox"/>			
Del: <input type="checkbox"/> Or: <input checked="" type="radio"/>			
Modify:	Or: <input type="radio"/> And: <input checked="" type="radio"/> Ins <input type="checkbox"/> Del <input type="checkbox"/>	Or: <input type="radio"/> And: <input checked="" type="radio"/> Ins <input type="checkbox"/> Del <input type="checkbox"/>	Or: <input type="radio"/> And: <input checked="" type="radio"/> Ins <input type="checkbox"/> Del <input type="checkbox"/>

Add/Delete criteria rows: 0 Add/Delete columns: 0

Use Tables

- b295_lc
- b295_plc
- b295_tlc
- b295_var
- b331_lc
- b331_plc
- b331_tlc

SQL query on database vvv:

```

SELECT
ID, AP, MEDIAN, JWAV, TAMPL

FROM
b295_var

WHERE
RCRTS>1.5    AND
ABS(GLSPREQ-PDMPREQ) < 20*FREQRES    AND
TAMPL > 0.2    AND
NPT/NTL >= 3
          
```

Galactic Longitude [deg]

SQL



SELECT

ID, AP, MEDIAN, JWAV, TAMPL

FROM

b295_var

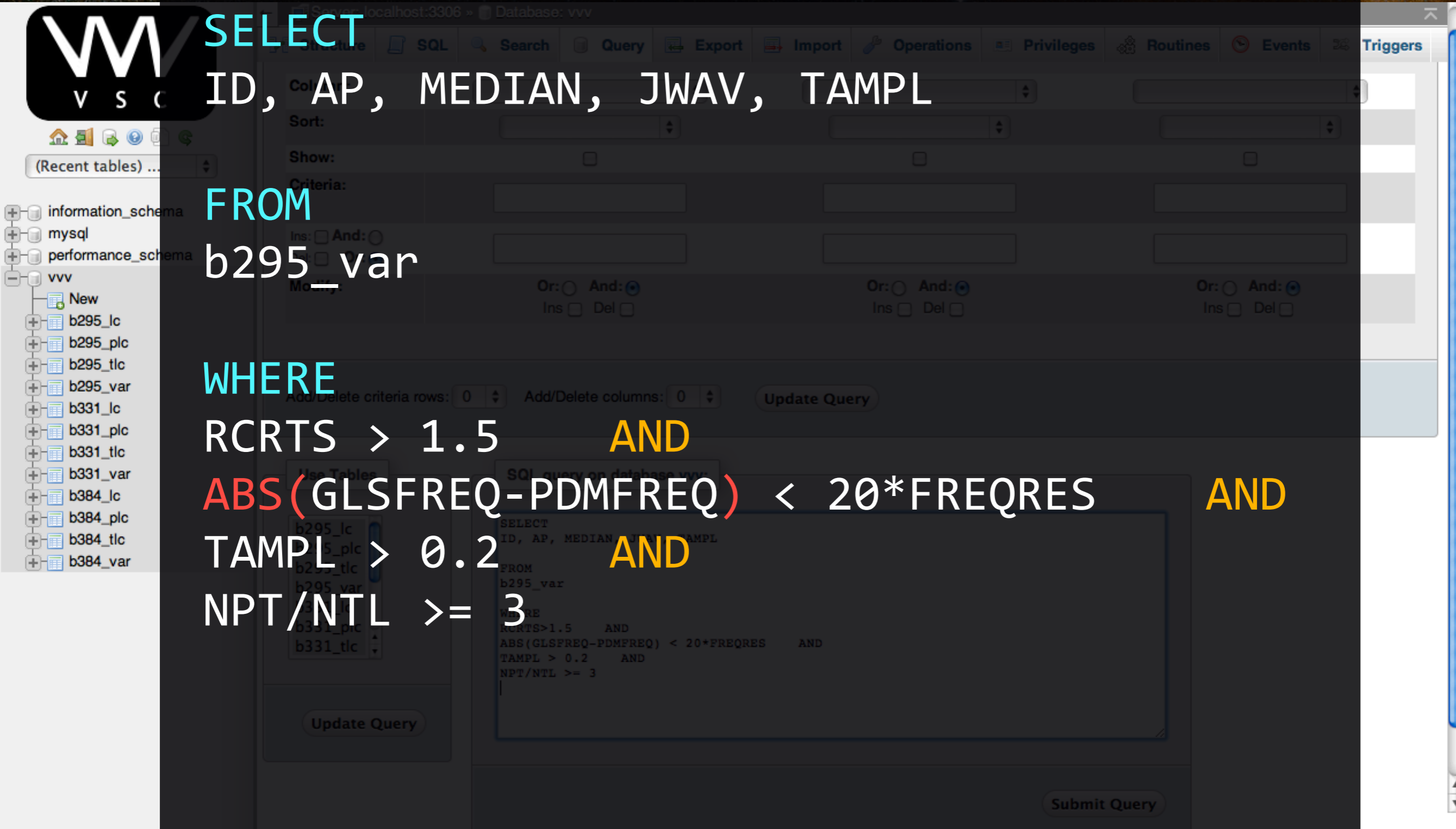
WHERE

RCRTS > 1.5 AND

ABS(GLSFREQ-PDMFREQ) < 20*FREQRES AND

TAMPL > 0.2 AND

NPT/NTL >= 3





(Recent tables) ...

- + information_schema
- + mysql
- + performance_schema
- vvv
 - New
 - + b295_lc
 - + b295_plc
 - + b295_tlc
 - + b295_var
 - + b331_lc
 - + b331_plc
 - + b331_tlc
 - + b331_var
 - + b384_lc
 - + b384_plc
 - + b384_tlc
 - + b384_var

Server: localhost:3306 » Database: vvv

Structure SQL Search Query Export Import Operations Privileges Routines Events Triggers

Showing rows 0 - 23 (24 total, Query took 0.0076 sec)

```

SELECT ID, AP, MEDIAN, JWAV, TAMPL
FROM b295_var
WHERE RCRTS > 1.5
AND ABS( GLSFREQ - PDMFREQ ) < 20 * FREQRES
AND TAMPL > 0.2
AND NPT / NTL >= 3
LIMIT 0 , 30

```

Profiling [Inline] [Edit] [Explain SQL] [Create PHP Code] [Refresh]

Show : Start row: 0 Number of rows: 30 Headers every 100 rows

+ Options

	ID	AP	MEDIAN	JWAV	TAMPL
<input type="checkbox"/> Edit Copy Delete	299058	2	15.3750	15.937	0.696
<input type="checkbox"/> Edit Copy Delete	299859	1	15.4220	16.276	0.228
<input type="checkbox"/> Edit Copy Delete	451082	1	15.7960	16.114	0.576
<input type="checkbox"/> Edit Copy Delete	453105	1	15.9870	16.458	0.558
<input type="checkbox"/> Edit Copy Delete	454379	2	15.2485	15.909	0.353
<input type="checkbox"/> Edit Copy Delete	454401	2	14.0885	14.579	0.323
<input type="checkbox"/> Edit Copy Delete	454921	2	14.2575	15.245	0.327
<input type="checkbox"/> Edit Copy Delete	455315	2	15.2040	15.726	0.248
<input type="checkbox"/> Edit Copy Delete	457426	1	15.2260	16.071	0.424
<input type="checkbox"/> Edit Copy Delete	608987	2	15.9580	16.767	0.359
<input type="checkbox"/> Edit Copy Delete	610319	3	14.3150	14.819	0.380
<input type="checkbox"/> Edit Copy Delete	758064	1	15.8720	16.490	0.454
<input type="checkbox"/> Edit Copy Delete	758529	3	13.7110	14.805	0.221
<input type="checkbox"/> Edit Copy Delete	759687	3	12.5105	13.594	0.210

Galactic Longitude [deg]



(Recent tables) ...

- + information_schema
- + mysql
- + performance_schema
- vvv
 - New
 - + b295_lc
 - + b295_plc
 - + b295_tlc
 - + b295_var
 - + b331_lc
 - + b331_plc
 - + b331_tlc
 - + b331_var
 - + b384_lc
 - + b384_plc
 - + b384_tlc
 - + b384_var

Server: localhost:3306 » Database: vvv

Structure SQL Search Query Export Import Operations Privileges Routines Events Triggers

Ins: And:
 Del: Or:

Modify: Or: And:
 Ins Del

Add/Delete criteria rows: 0 Add/Delete columns: 0 Update Query

Use Tables

b295_lc
 b295_plc
 b295_tlc
 b295_var
 b331_lc
 b331_plc
 b331_tlc

Update Query

SQL query on database vvv:

```
SELECT
lc.ID, AP, filter, HJD,
aplmag, aplmagErr, ap3mag, ap3magErr,
angSep, chip, PSFclass

FROM
b295_var AS v,
b295_lc AS lc

WHERE
v.ID=lc.ID AND

RCRTS>1.5 AND
ABS(GLSPREQ-PDMFREQ) < 20*PREQRES AND
TAMPL > 0.2 AND
NPT/NTL >= 3 AND
chip<16 AND
filter>=3

ORDER BY
lc.ID, filter|
```

Submit Query

Galactic Longitude [deg]

SQL

```

SELECT
lc.ID, AP, filter, HJD,
ap1mag, ap1magErr, ap3mag, ap3magErr,
angSep, chip, PSFclass
FROM
b295_var AS v,
b295_lc AS lc
WHERE
v.ID=lc.ID AND
RCRTS > 1.5 AND
ABS(GLSFREQ-PDMFREQ) < 20*FREQRES AND
TAMPL > 0.2 AND
NPT/NTL >= 3 AND
chip<16 AND AND
filter>=3 AND
ORDER BY lc.ID, filter

```



(Recent tables) ...

- + information_schema
- + mysql
- + performance_schema
- vvv
 - New
 - + b295_lc
 - + b295_plc
 - + b295_tlc
 - + b295_var
 - + b331_lc
 - + b331_plc
 - + b331_tlc
 - + b331_var
 - + b384_lc
 - + b384_plc
 - + b384_tlc
 - + b384_var

Server: localhost:3306 » Database: vvv

Structure SQL Search Query Export Import Operations Privileges Routines Events Triggers

1 > >> | Show : Start row: 30 Number of rows: 30 Headers every 100 rows

+ Options

ID	AP	filter	HJD	ap1mag	ap1magErr	ap3mag	ap3magErr	angSep	chip	PSFclass
299058	2	3	55298.83713	16.046	0.05	15.895	0.057	0.287	5	1
299058	2	3	55298.83767	16.13	0.053	15.99	0.061	0.313	5	1
299058	2	4	55298.8323	15.566	0.055	15.289	0.06	0.322	5	-1
299058	2	4	55298.83267	15.574	0.056	15.368	0.065	0.35	5	-1
299058	2	5	55298.83462	15.438	0.075	15.144	0.078	0.064	5	1
299058	2	5	55298.83494	15.498	0.077	15.189	0.082	0.063	5	1
299058	2	5	55778.64251	15.716	0.115	15.068	0.081	0.262	5	1
299058	2	5	55804.60485	15.431	0.081	15.039	0.075	0.085	5	1
299058	2	5	55824.58891	15.348	0.076	15.033	0.075	0.124	5	1
299058	2	5	55824.58932	15.593	0.1	14.854	0.065	0.35	5	1
299058	2	5	55832.57376	15.416	0.106	15.103	0.091	0.097	5	1
299058	2	5	55832.57415	15.362	0.111	15.226	0.104	0.097	5	1
299058	2	5	55832.57456	15.317	0.107	15.253	0.108	0.154	1	1
299058	2	5	55832.57496	15.289	0.113	15.242	0.109	0.33	1	-1
299058	2	5	55842.56718	15.233	0.068	14.846	0.063	0.085	5	1
299058	2	5	55842.56758	15.002	0.057	14.708	0.057	0.349	5	1
299058	2	5	55847.49438	15.393	0.099	15.199	0.09	0.082	5	1
299058	2	5	55847.49478	15.536	0.123	15.308	0.103	0.06	5	1
299058	2	5	55847.49521	15.67	0.156	15.377	0.116	0.183	1	1
299058	2	5	55847.49561	15.449	0.134	15.324	0.113	0.057	1	1
299058	2	5	55857.52129	15.463	0.088	15.192	0.087	0.08	5	1
299058	2	5	55857.52168	15.638	0.102	15.323	0.099	0.039	5	1
299058	2	5	55857.52207	16.021	0.164	15.287	0.095	0.356	1	1
299058	2	5	55857.52243	15.556	0.109	15.312	0.103	0.08	1	1
299058	2	5	56011.83518	15.483	0.079	15.073	0.078	0.017	5	1

Galactic Longitude [deg]



ON-GOING PROJECTS

RR Lyrae search in the bulge

- *map the old population*

Cepheid search in the bulge & disk

- *map the spiral structure*

search for microlenses

- *re-assess the optical depth*

search for novae (and SNe..)

- *survey the 'blind zone'*

Galactic Longitude [deg]



READY FOR (YOUR?) SCIENCE

Galactic Longitude [deg]