

# KIC 005130023

## Q1-17 DR25 TCE Parameters

TCE	Run Type	KOI?	Period (Days)	Epoch (BKJD)	Depth (ppm)	Duration (Hours)	MES	SNR	$R_{\star}$ ( $R_{\odot}$ )	$T_{\star}$ (K)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
005130023-01	OBS	No	3.186113	133.894623	38.2	13.329	8.0	6.3	0.85	5476	0.56	388.74
005130023-02	OBS	No	155.378502	233.732349	425.2	16.013	21.0	7.1	0.85	5476	1.81	2.18
005130023-03	OBS	No	535.544266	285.297649	498.3	6.531	8.3	6.5	0.85	5476	2.08	0.42
005130023-04	OBS	No	270.709339	377.898817	490.8	4.800	7.4	7.6	0.85	5476	2.37	1.04

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
005130023-01	OBS	FP	0.00	1	0	1	0	LPP_DV—CENT_RESOLVED_OFFSET
005130023-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_MARSHALL—TRANS_GAPPED—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS
005130023-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_CHASES_MARSHALL—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS
005130023-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_MARSHALL_SKYE—ALL_TRANS_CHASES—MOD_NONUNIQ_ALT—CENT_FEW_DIFFS

**Notes:** OBS = Observed. INJ = Injected. INV = Inverted. SCR = Scrambled.

N = Not Transit-Like. S = Stellar Eclipse. C = Centroid Offset. E = Ephemeris Match.

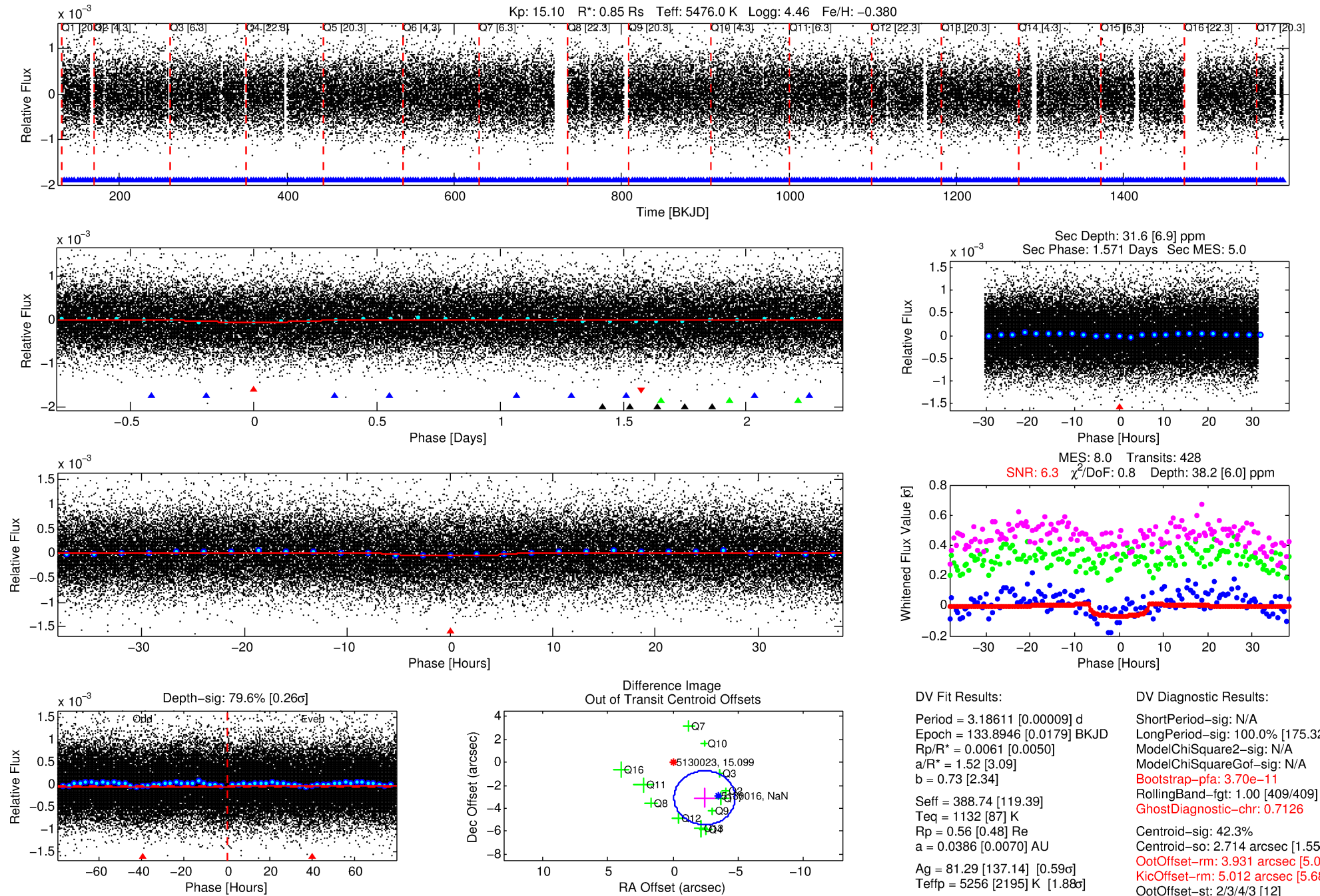
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 005130023-01

No Significant Match Found

# DV One-Page Summary

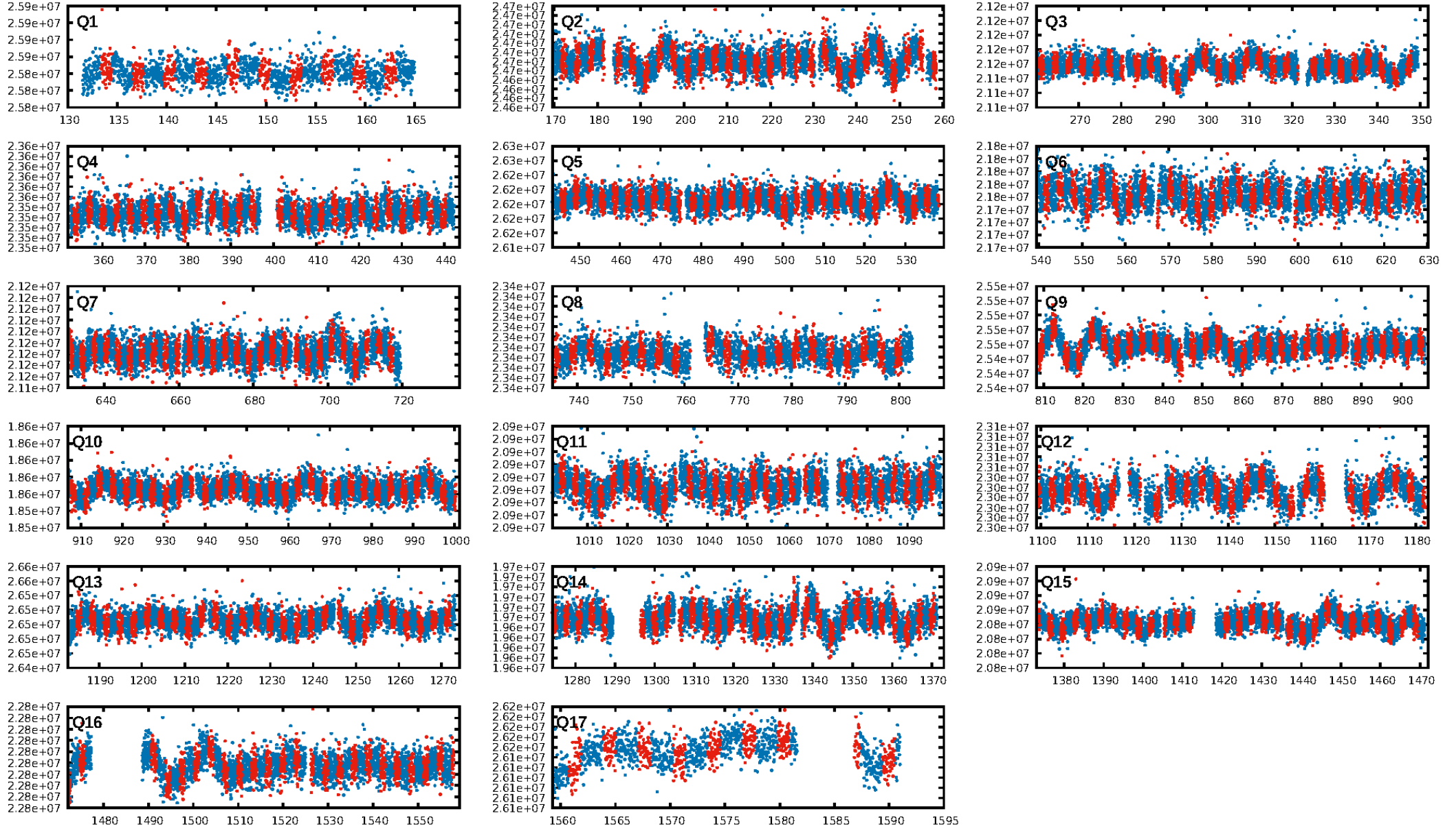
KIC: 5130023 Candidate: 1 of 4 Period: 3.186 d



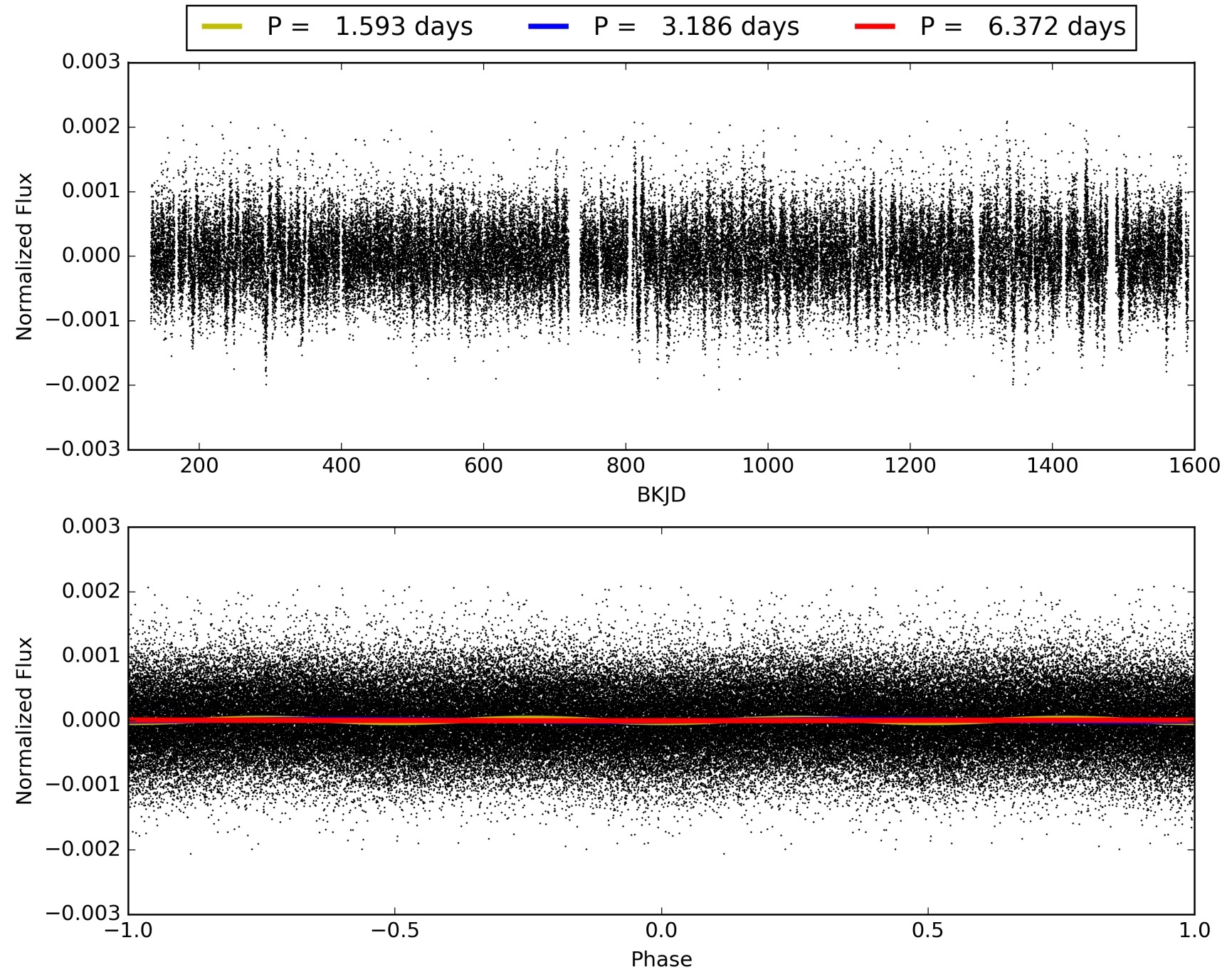
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 29-Jan-2016 16:37:56 Z

This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

# TCE 005130023-01, PDC Light Curves



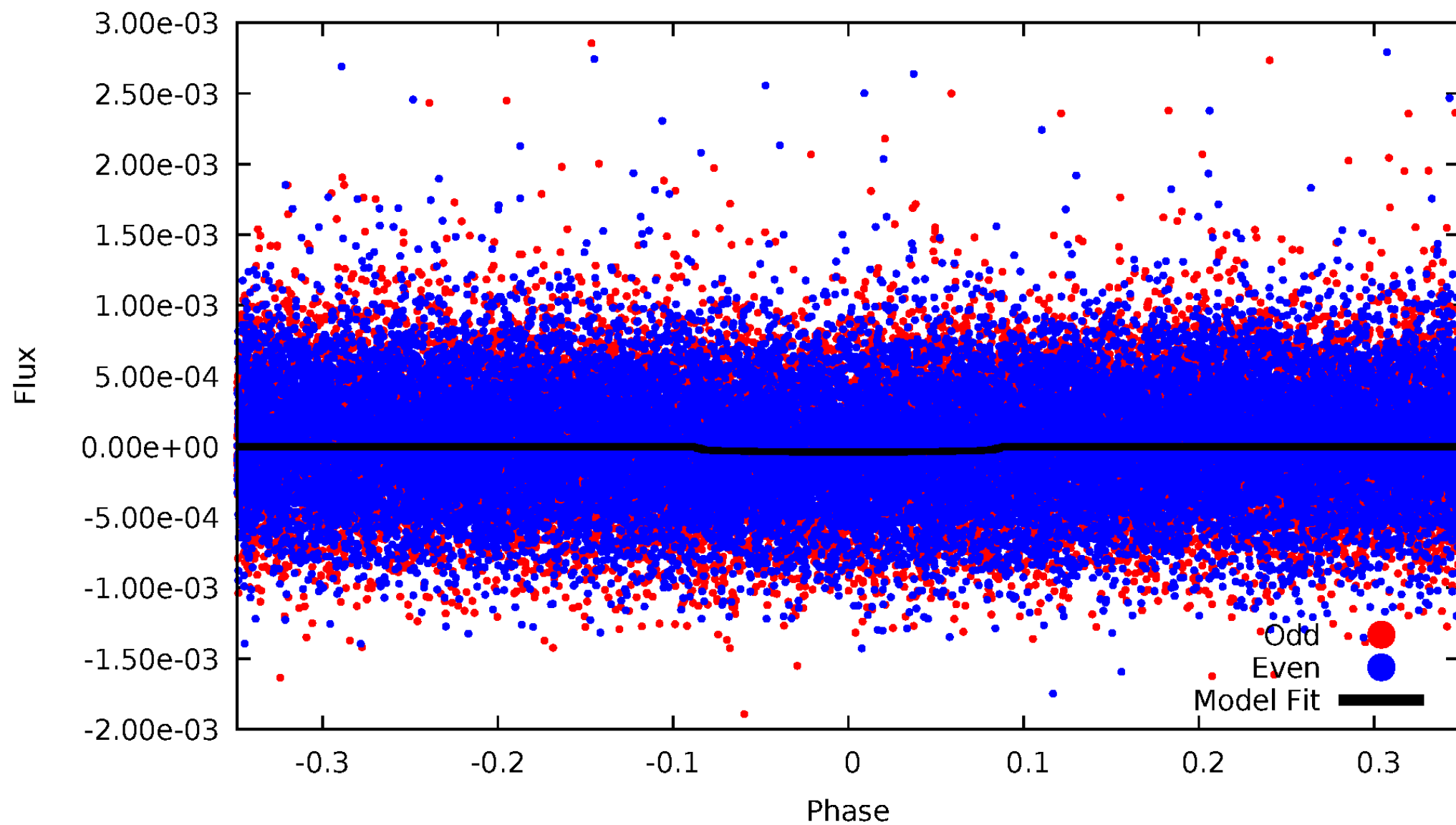
# TCE 005130023-01





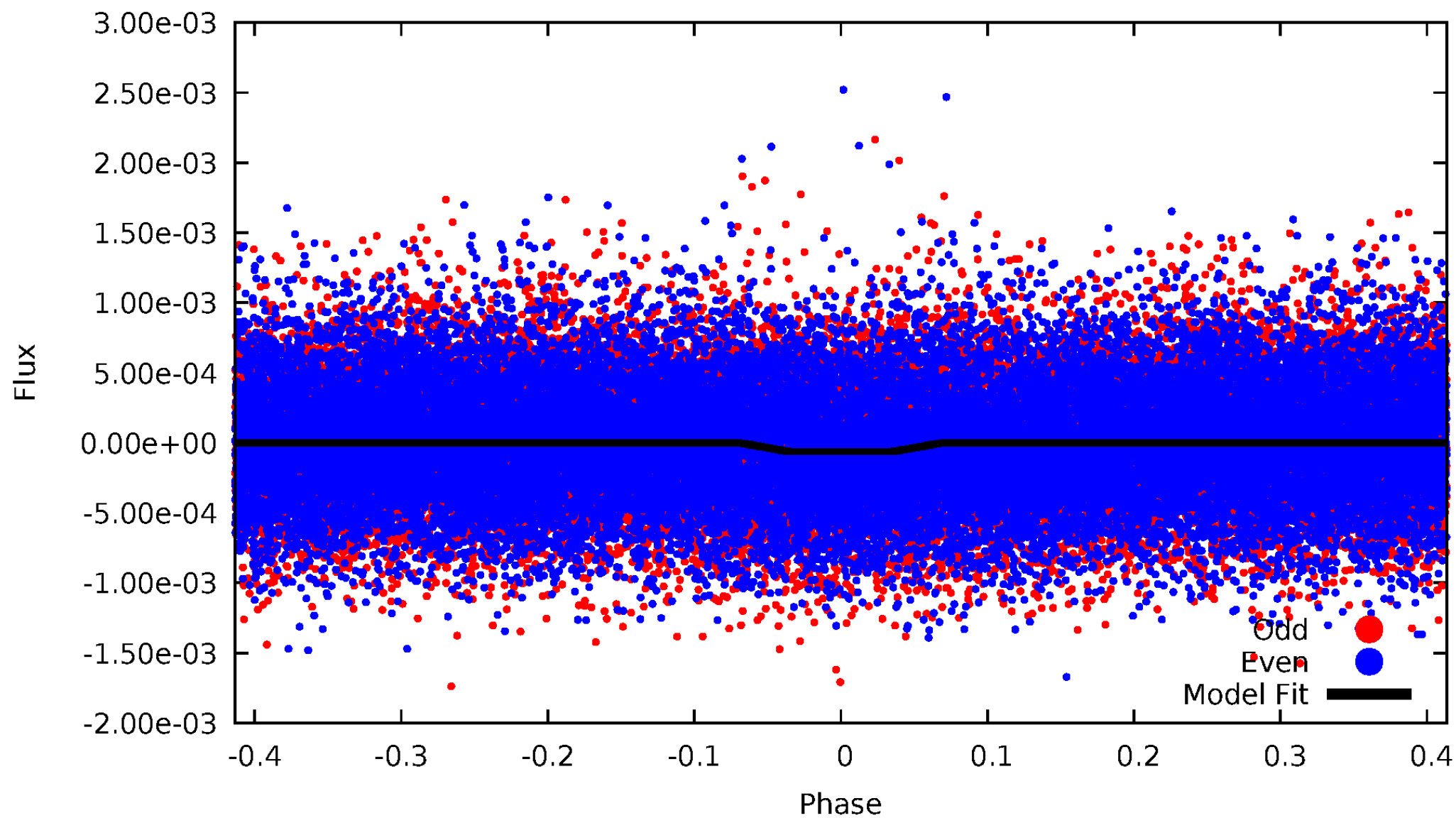
# DV Odd/Even

TCE 005130023-01

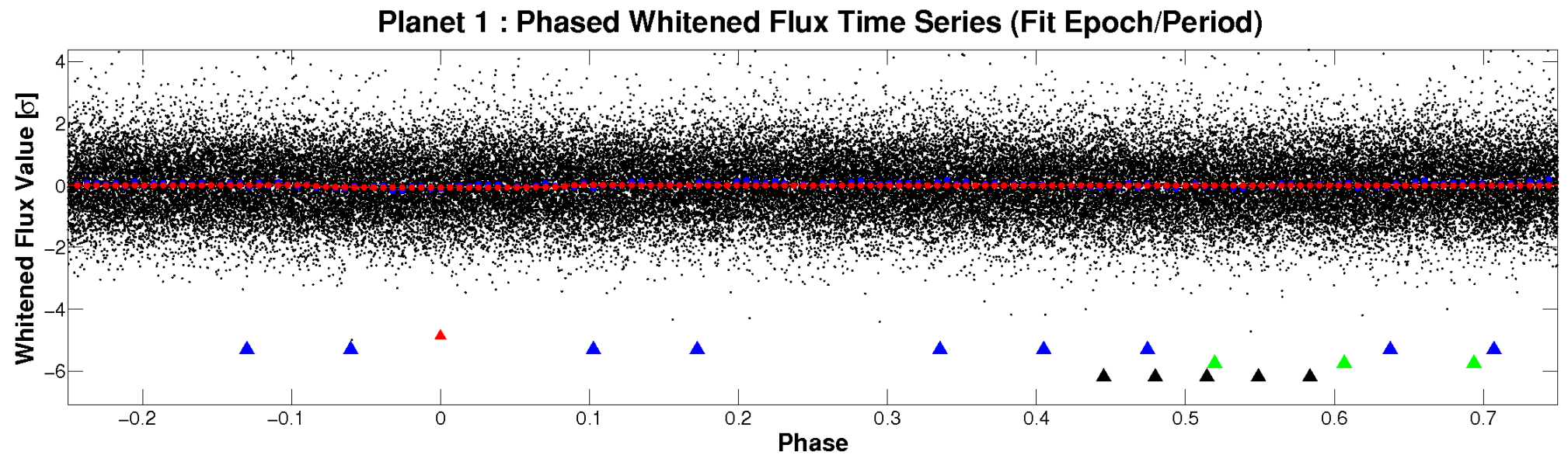
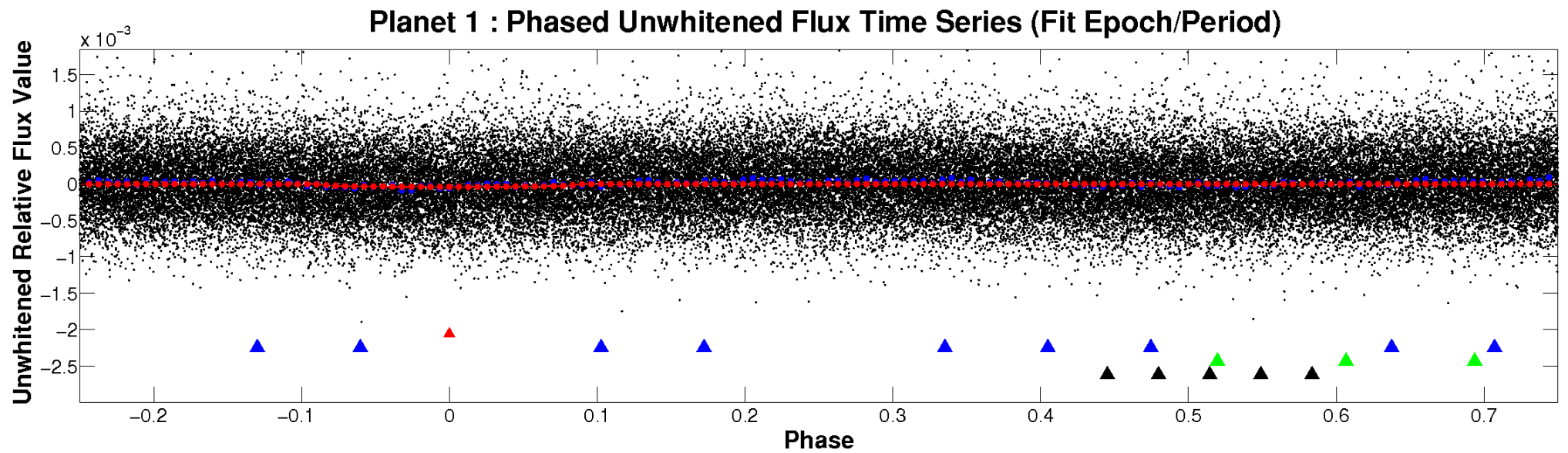


# ALT Odd/Even

TCE 005130023-01

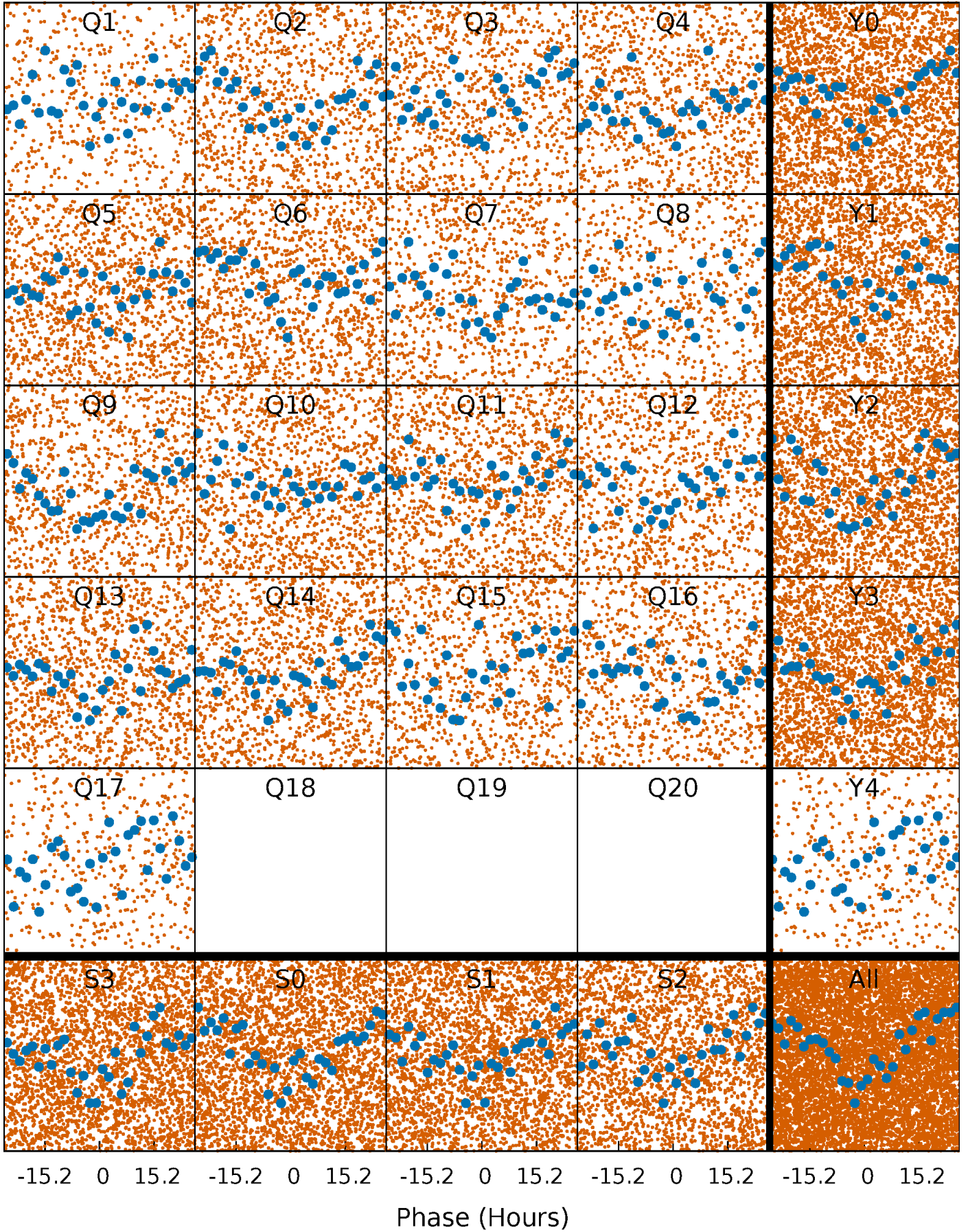


# Non-Whitened Vs. Whitened Light Curve



# PDC Quarter-Phased Transit Curves

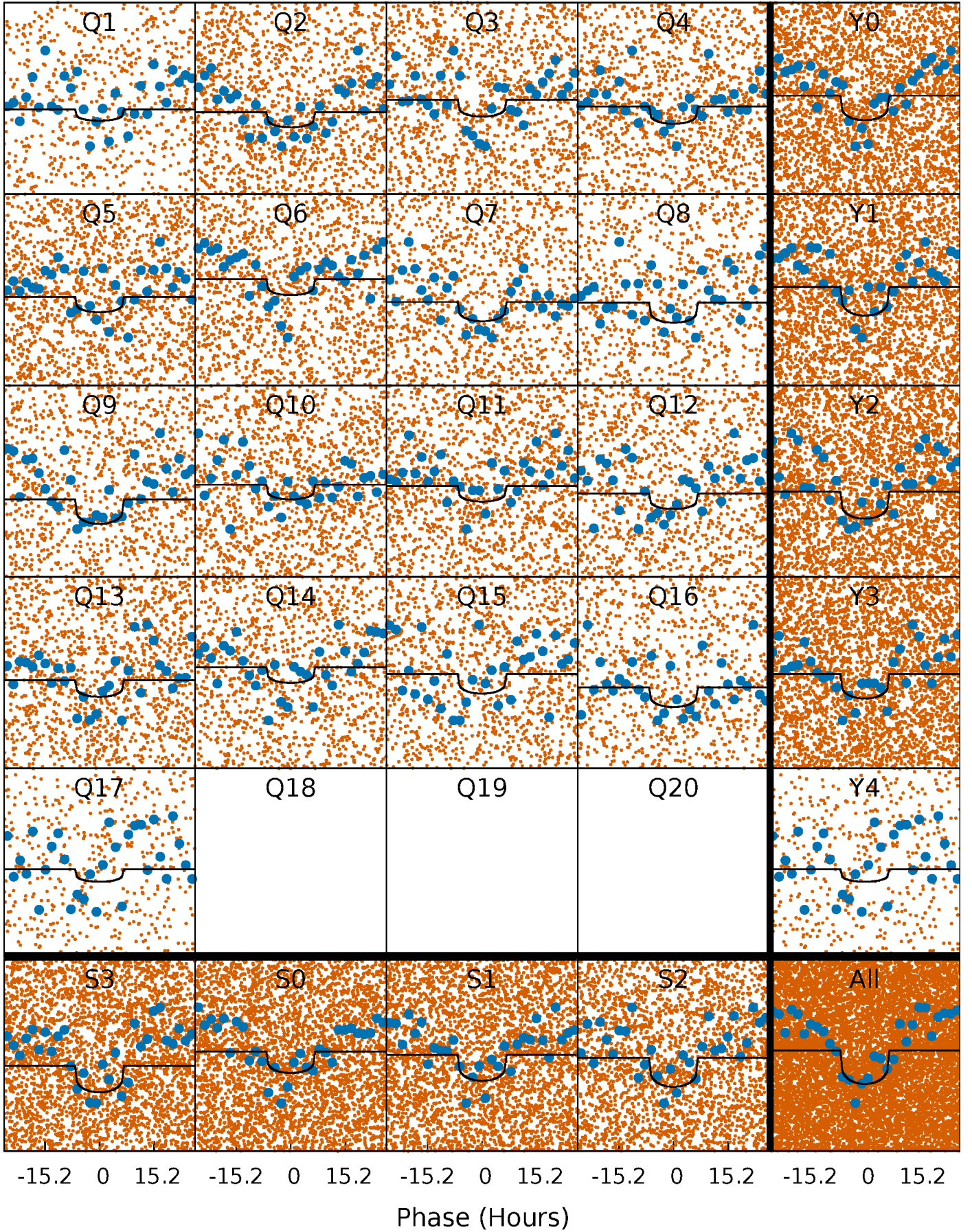
TCE 005130023-01 P= 3.186113 Days  $T_0=133.894623$  (BKJD)





# DV Quarter-Phased Transit Curves

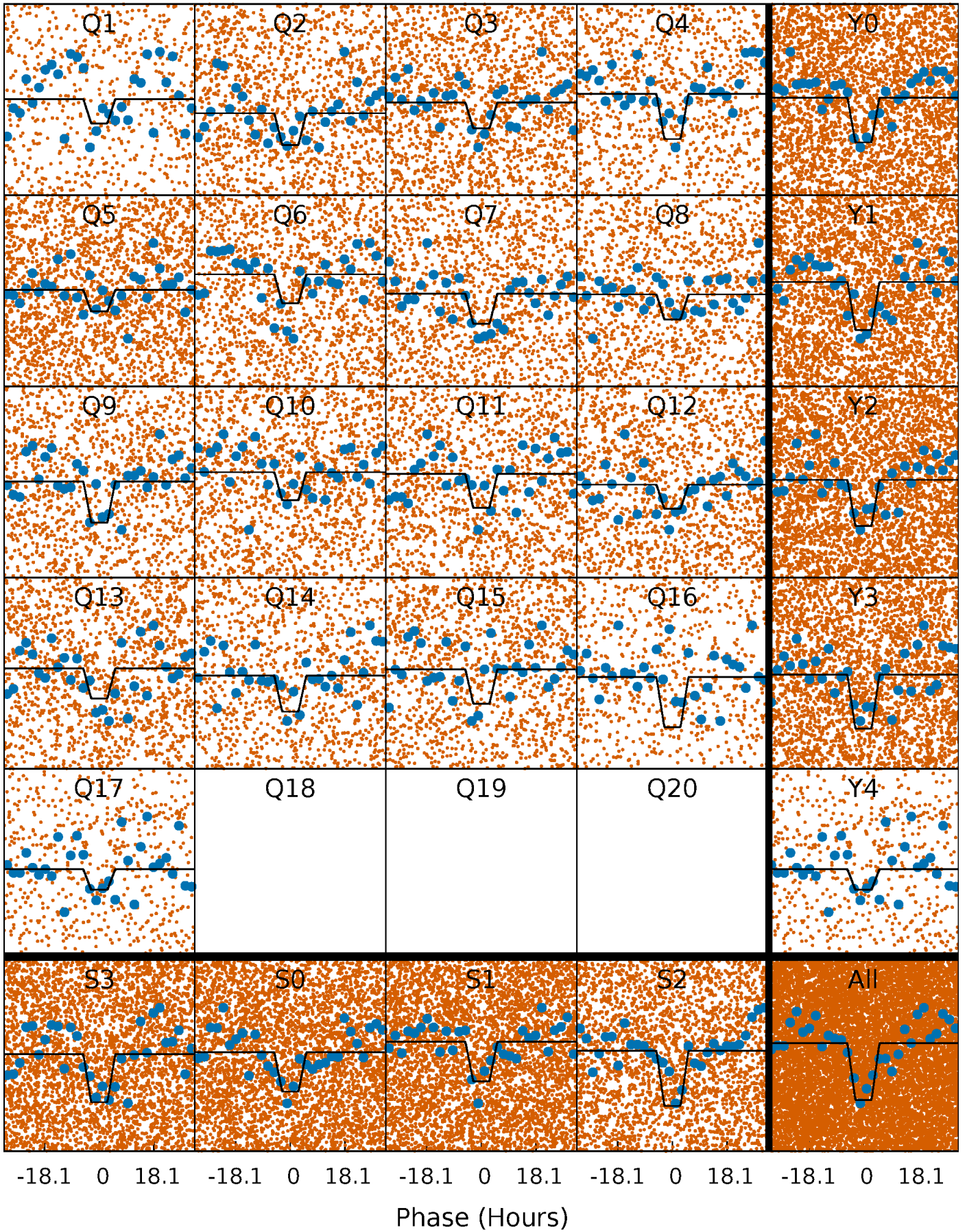
TCE 005130023-01 P= 3.186113 Days  $T_0=133.894623$  (BKJD)





# Alt. Detrend Quarter-Phased Transit Curves

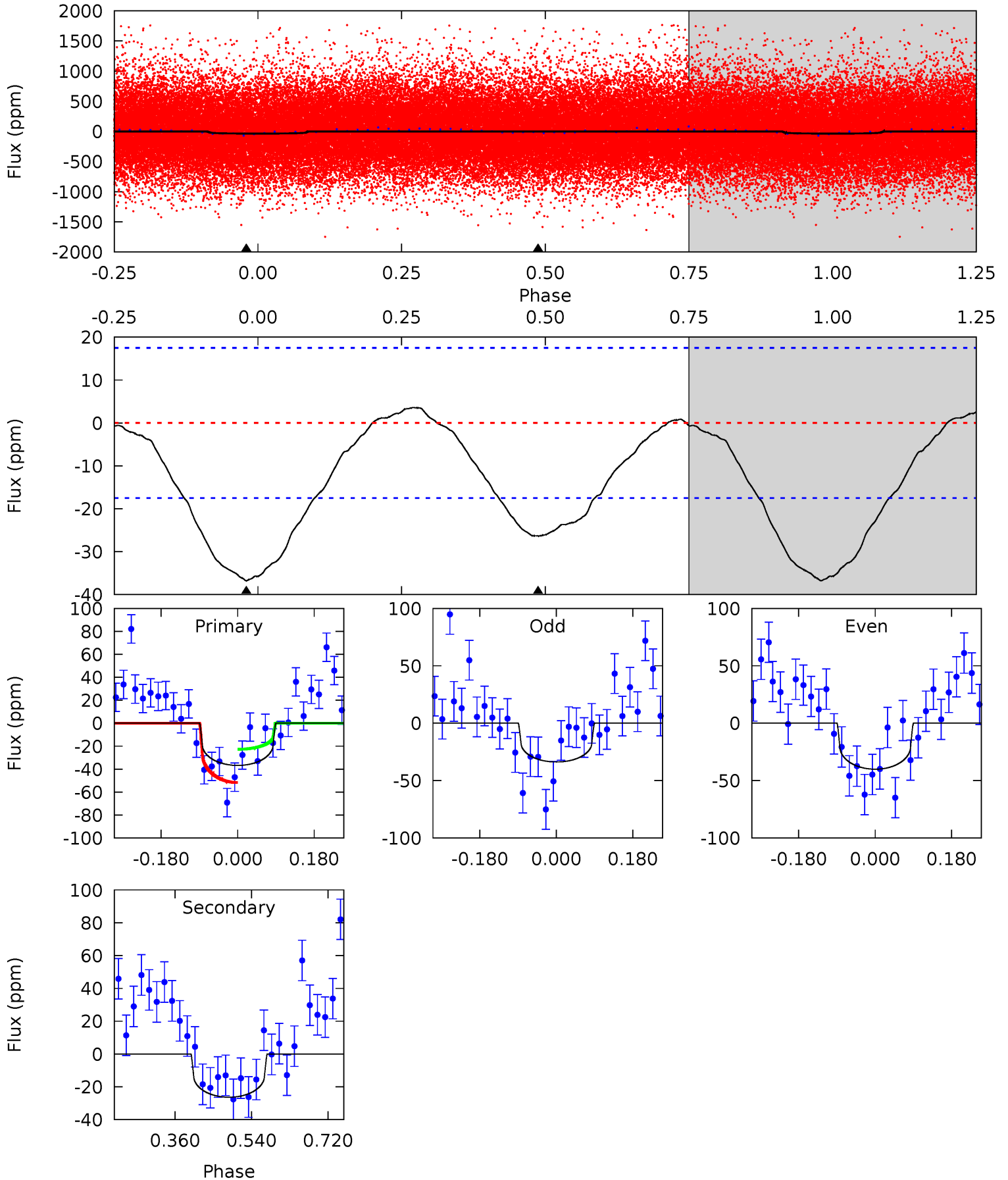
TCE 005130023-01 P= 3.185624 Days  $T_0=133.898091$  (BKJD)



# DV Model-Shift Uniqueness Test

005130023-01, P = 3.186113 Days, E = 130.708510 Days

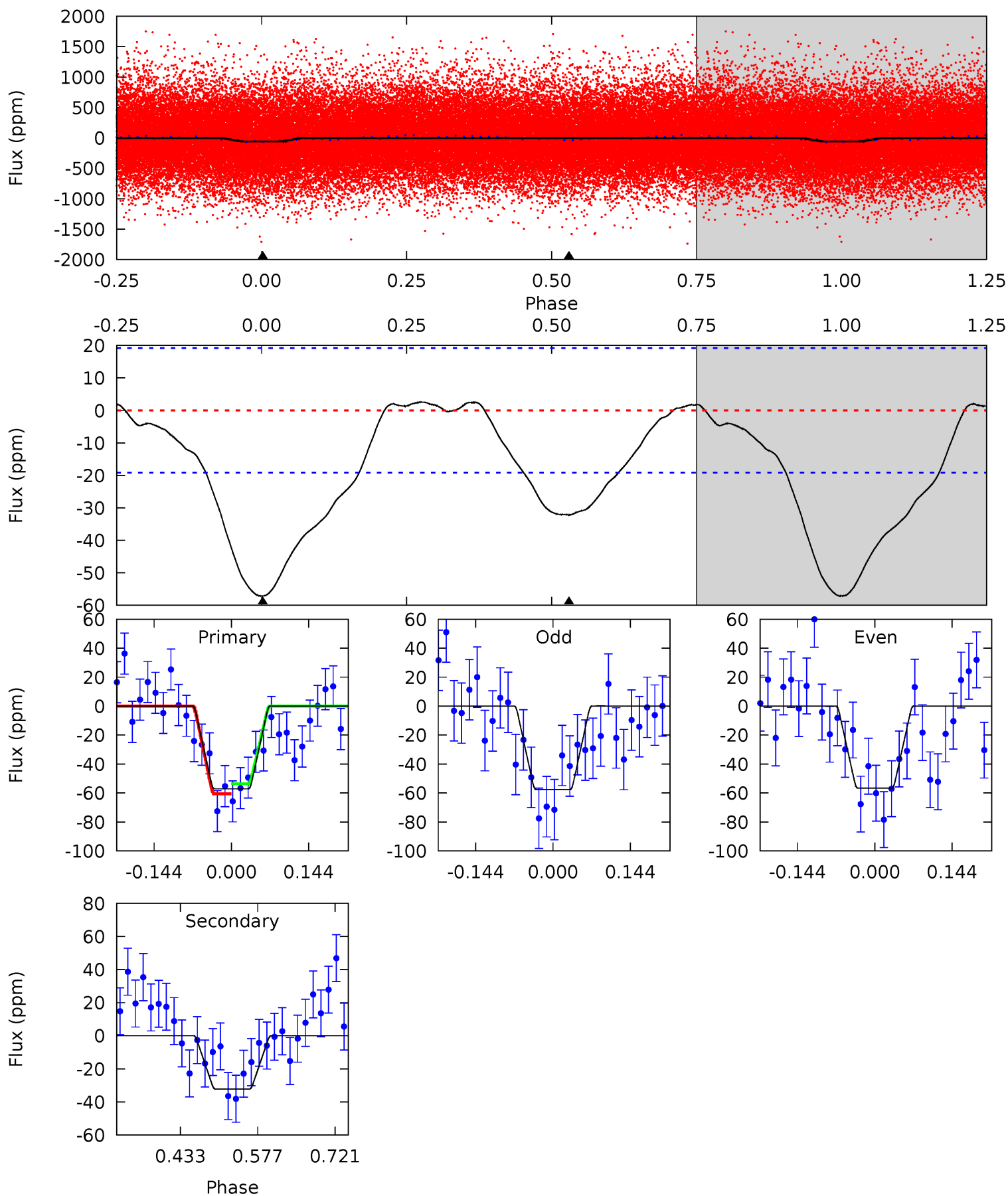
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
9.33	6.68	0	0	4.44	1.34	0.61	9.33	9.33	6.68	6.68	0.80	0.85	0.09	3.68



# Alt Model-Shift Uniqueness Test

005130023-01, P = 3.185624 Days, E = 130.712467 Days

Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
13.3	7.53	0	0	4.49	1.46	1.46	13.3	13.3	7.53	7.53	0.12	0.85	0.04	0.81





### Stellar Parameters For KIC 005130023

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$5476^{+191}_{-172}$	$4.459^{+0.126}_{-0.154}$	$-0.380^{+0.350}_{-0.300}$	$0.847^{+0.175}_{-0.116}$	$0.753^{+0.123}_{-0.053}$	$1.745^{+1.069}_{-0.709}$
	+3%/-3%	+3%/-3%	+92%/-79%	+21%/-14%	+16%/-7%	+61%/-41%
Source	PHO1	KIC0	KIC0	DSEP		

KIC = Kepler Input Catalog; PHO = Photometry; SPE = Spectroscopy; AST = Asteroseismology  
 TRA = Transits; DESP = Dartmouth Models; MULT = Multiple Models

### Secondary Eclipse Parameters for KIC 005130023-01 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-26 \pm 4$	$0.66^{+0.45}_{-0.38}$	$1595^{+103}_{-94}$	$4745^{+2454}_{-792}$	$50^{+219}_{-32}$
Alt.	$-32 \pm 4$	$0.75^{+0.50}_{-0.43}$	$1587^{+92}_{-88}$	$4706^{+2204}_{-839}$	$45^{+210}_{-28}$

$T_{max}$  = Theoretical Maximum Planetary Temperature

$T_{obs}$  = Observed Planetary Temperature (Assuming  $A=0.3$ )

$A_{obs}$  = Observed Albedo (Assuming  $T=0$ )

If a secondary eclipse is present, the system is likely an EB if  $T_{obs} \gg T_{max}$  AND  $A_{obs} \gg 1.0$

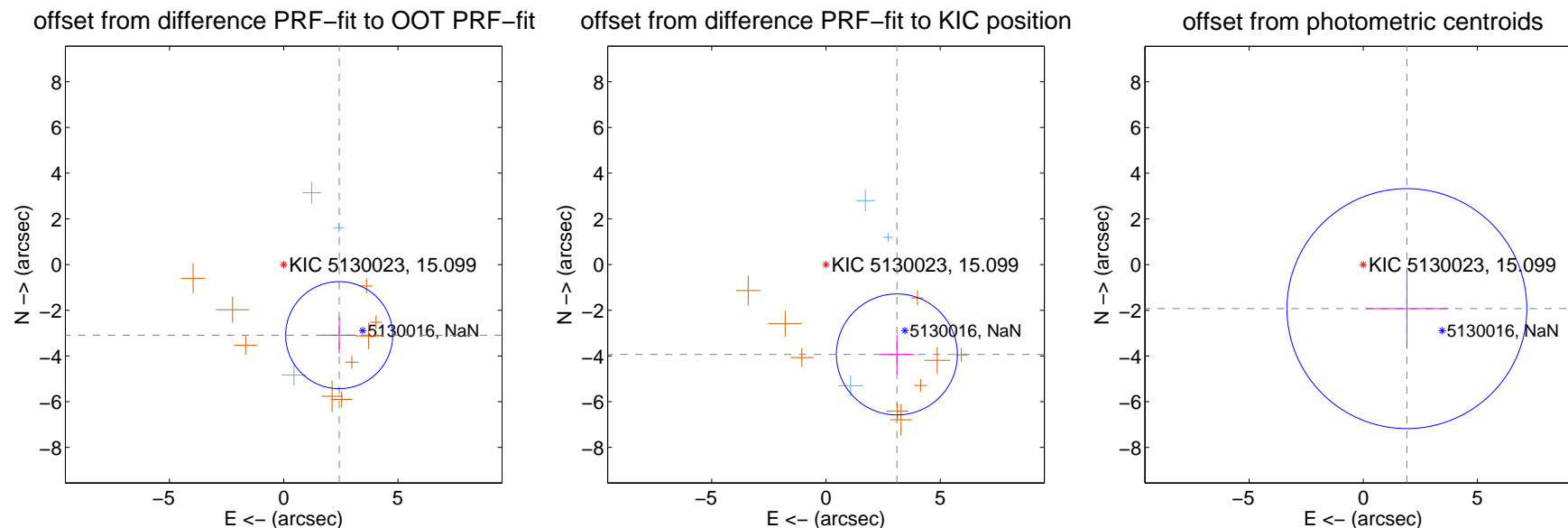
## DV Centroid Data

Supplemental centroid analysis for 005130023-01. Kepler magnitude: 15.10. Transit SNR 6.33

There are 3 quarters with good PRF difference image offsets

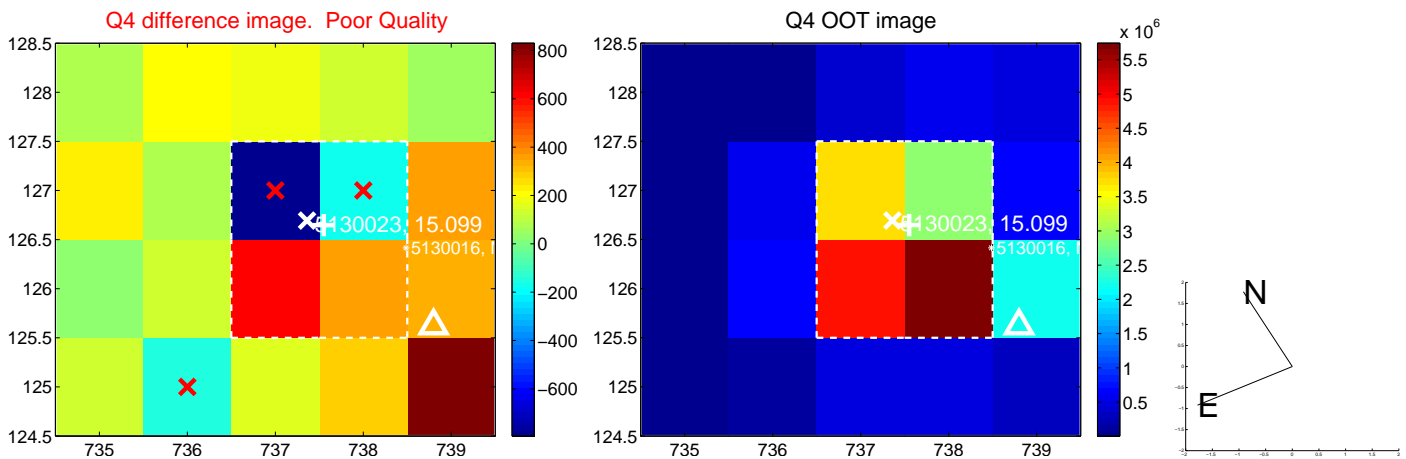
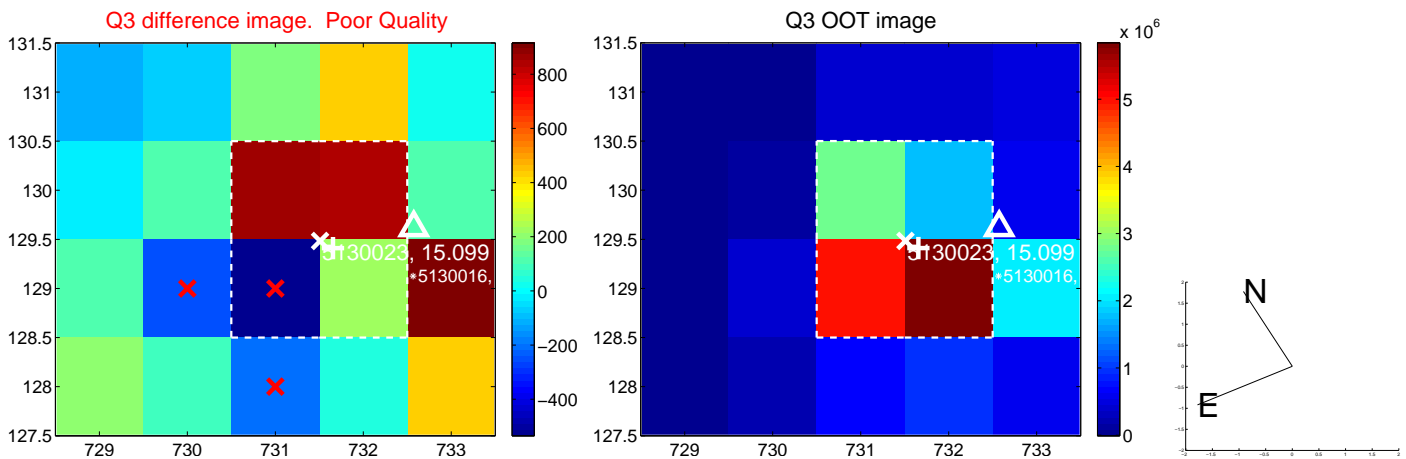
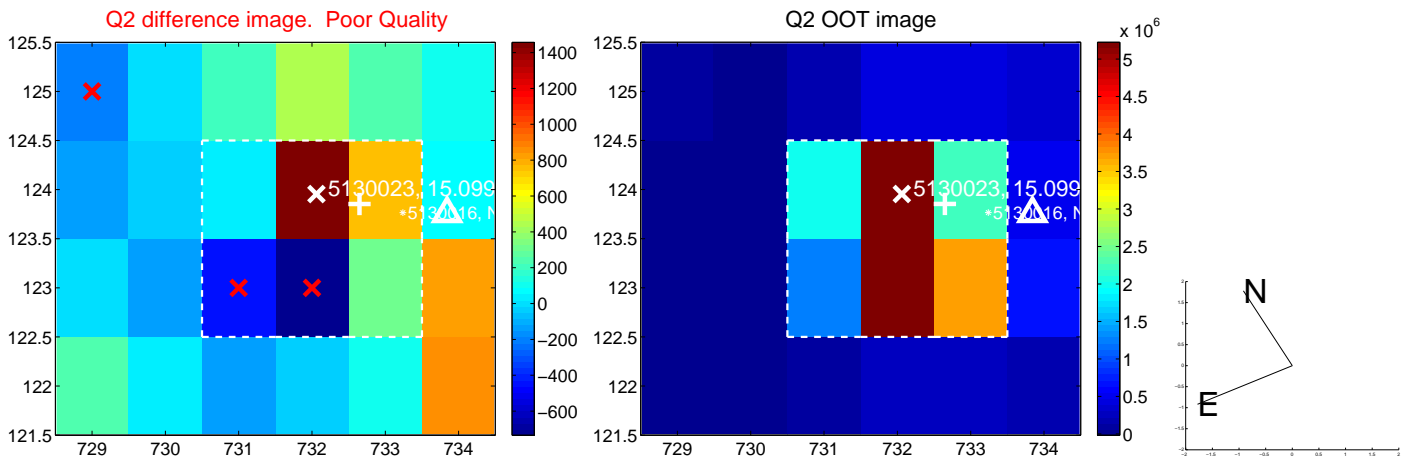
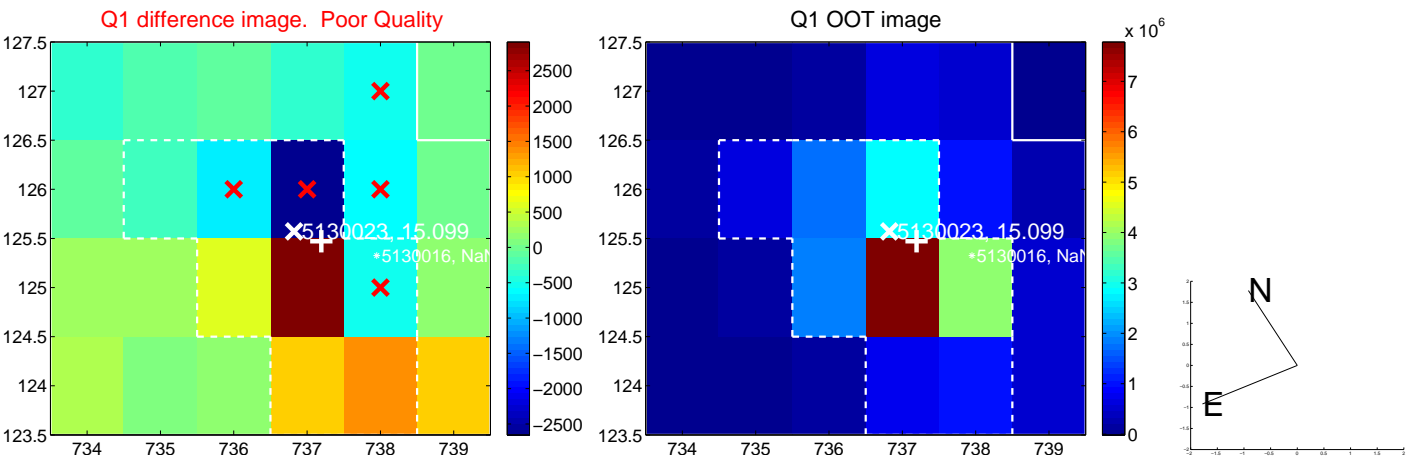
The direct PRF centroid is offset from the target star catalog position by about 1.57 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$3.931 \pm 0.781$	5.03	$-2.430 \pm 0.763$	$-3.090 \pm 0.787$
PRF-fit source offset from KIC position	$5.012 \pm 0.883$	5.68	$-3.105 \pm 0.751$	$-3.934 \pm 0.848$
photometric centroid source offset	$2.71 \pm 1.75$	1.55	$-1.91 \pm 1.82$	$-1.93 \pm 1.68$

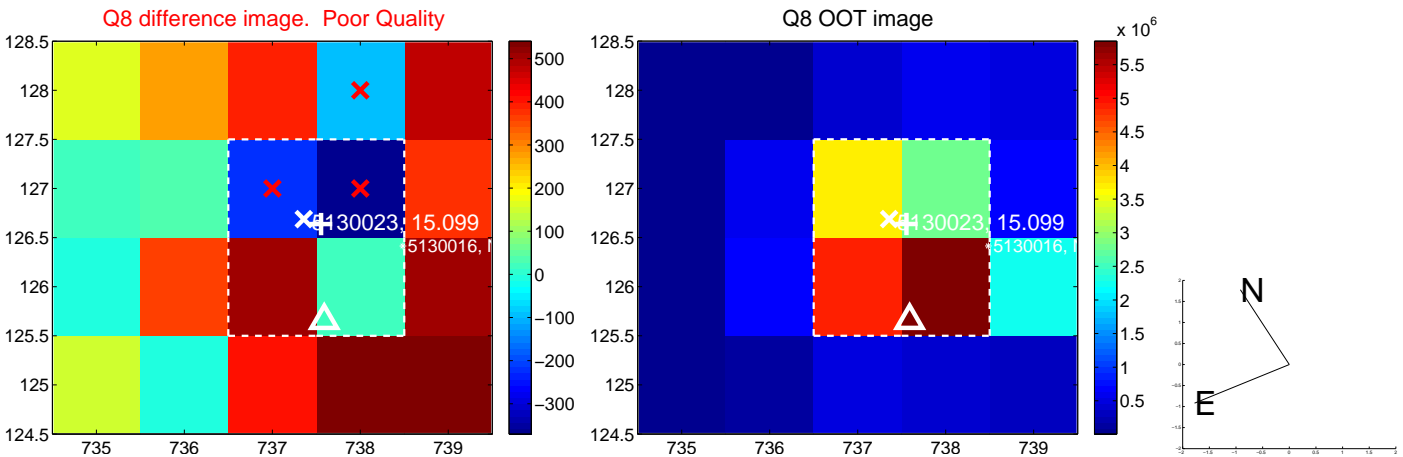
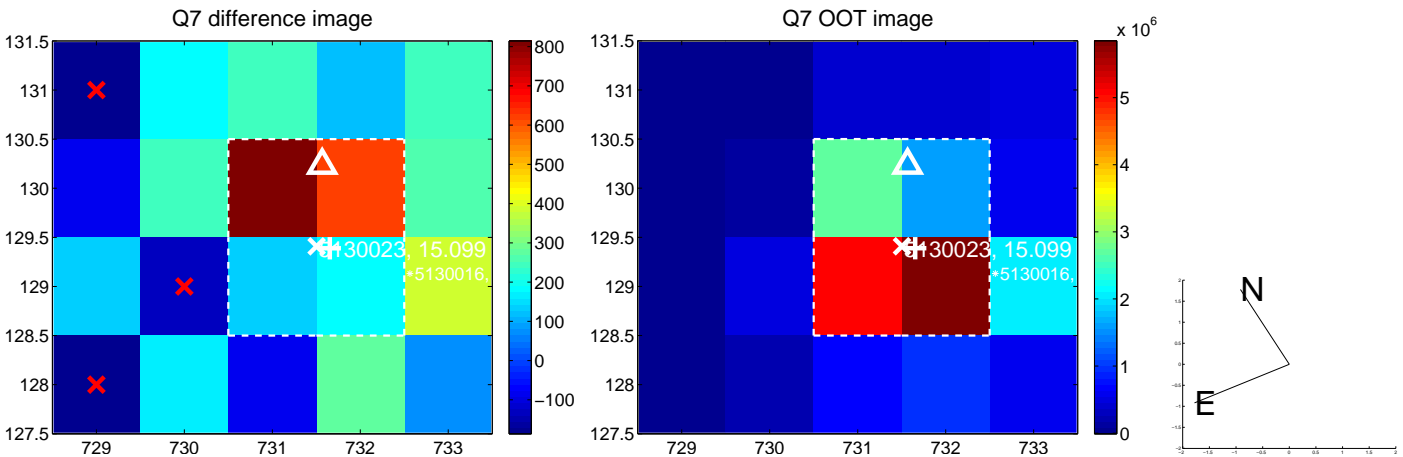
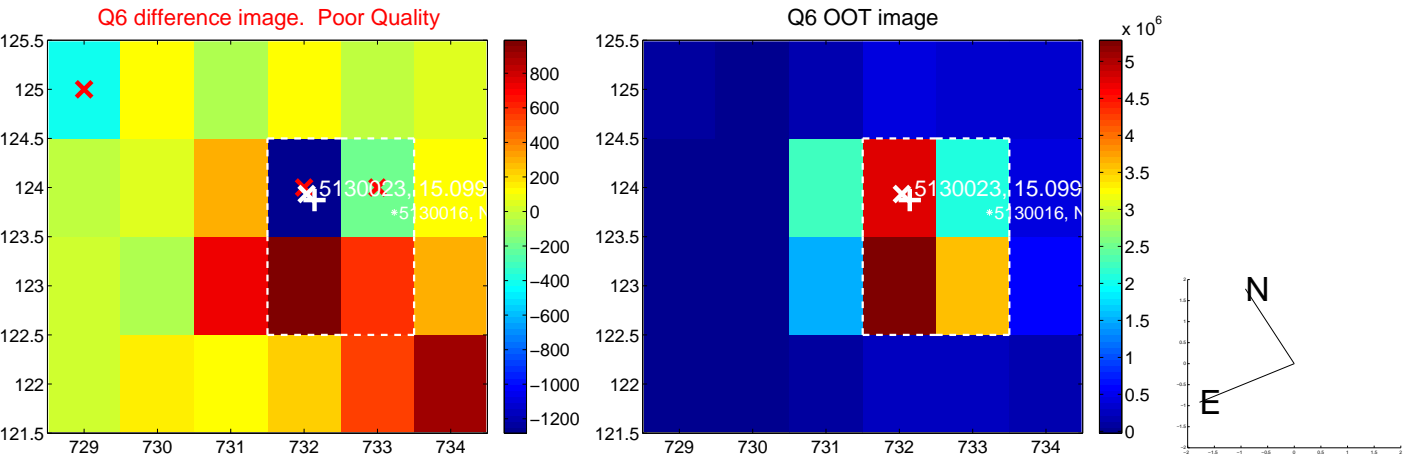
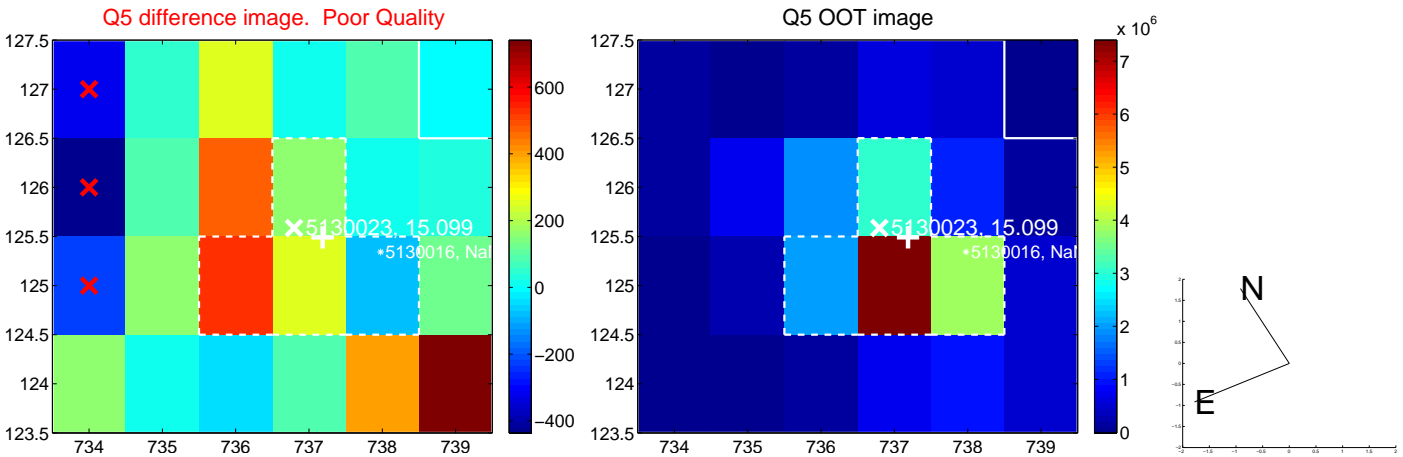


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three- $\sigma$ . Red \*: target star. Blue \*: Other stars. Text next to a star gives its KIC ID and kepmag. KIC IDs > 15,000,000 are from the UKIRT catalog.

white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

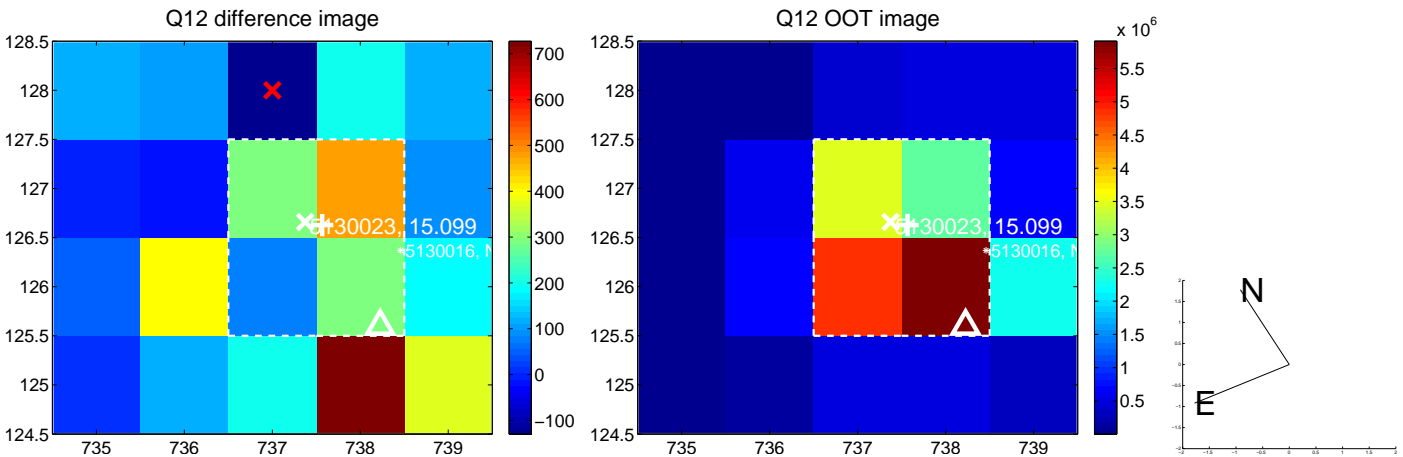
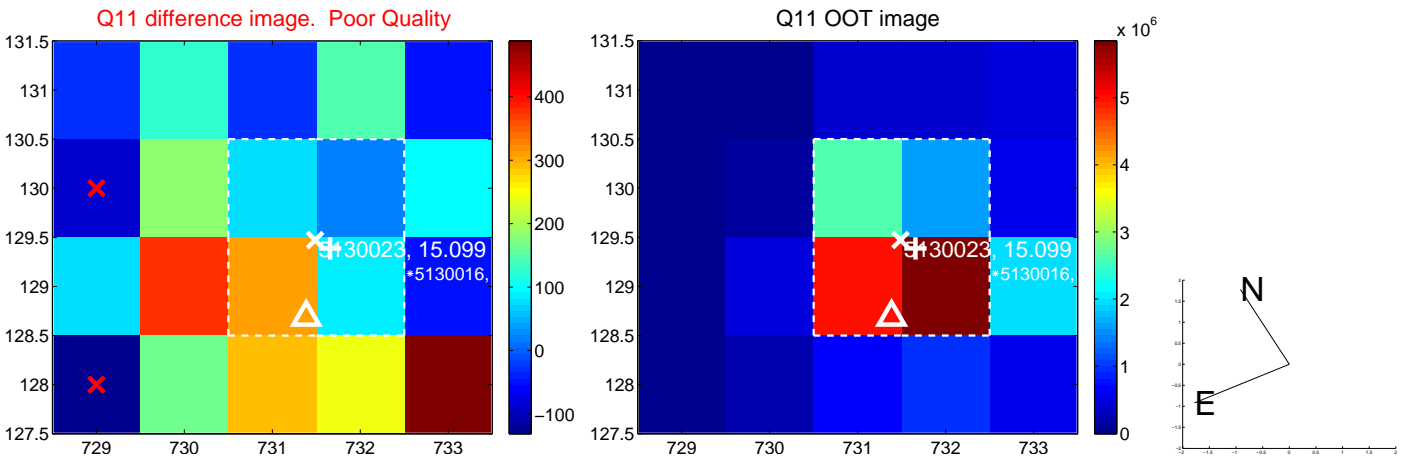
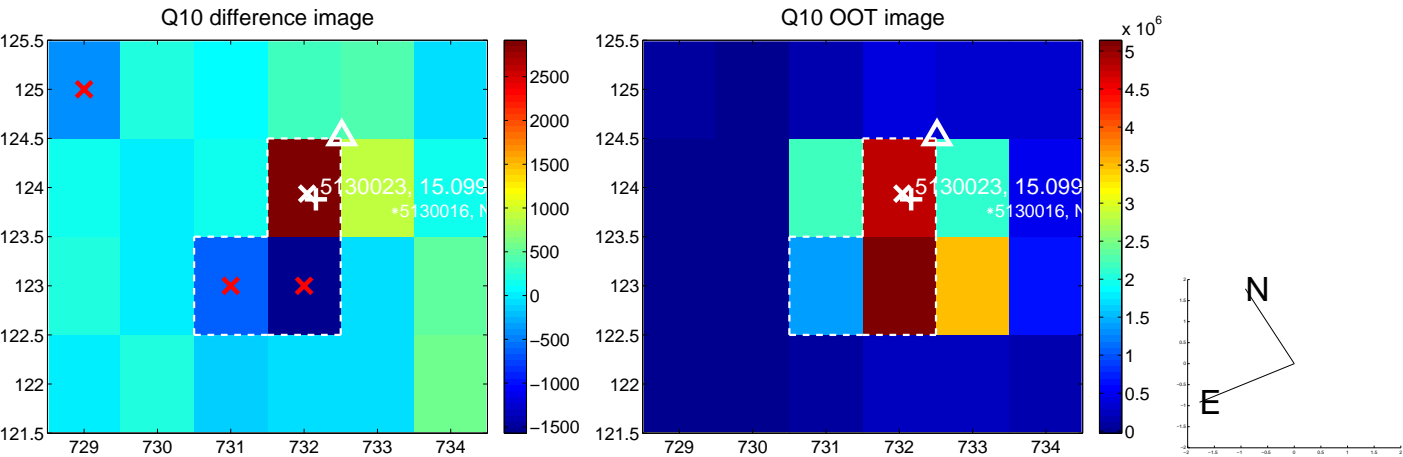
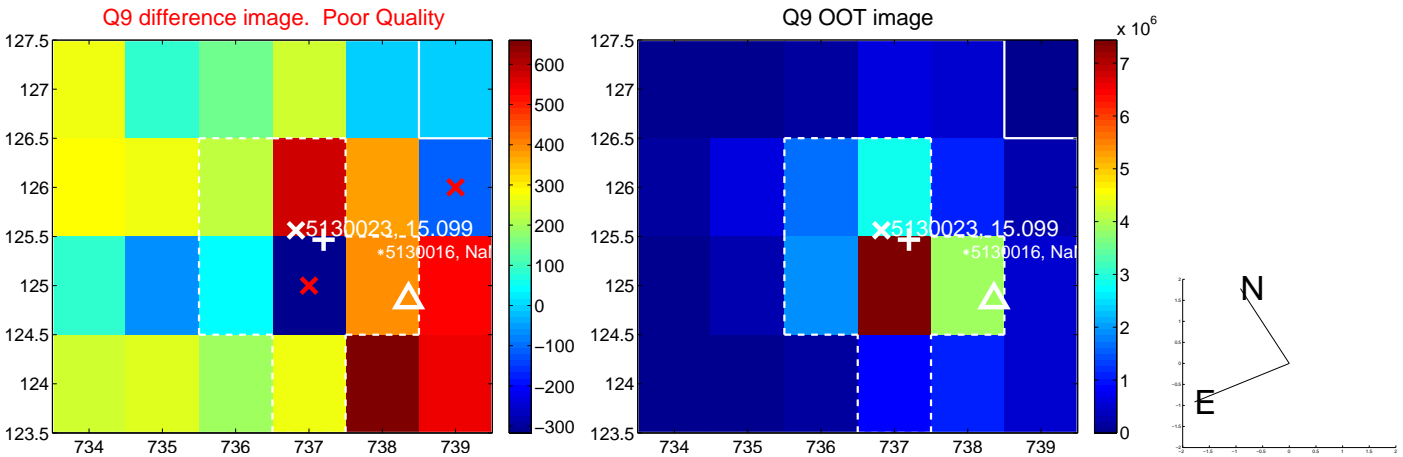


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

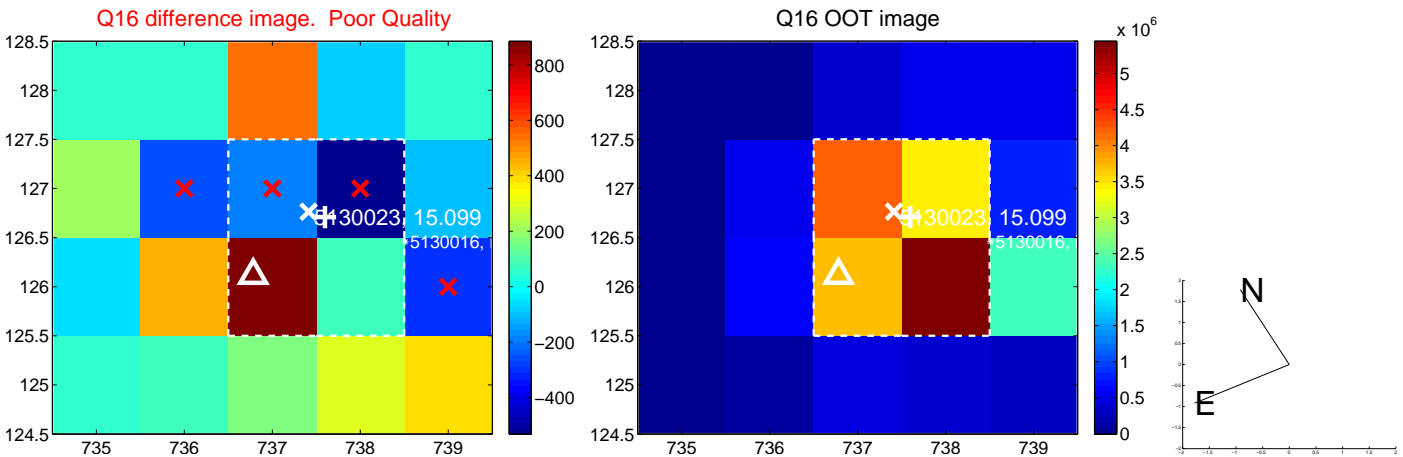
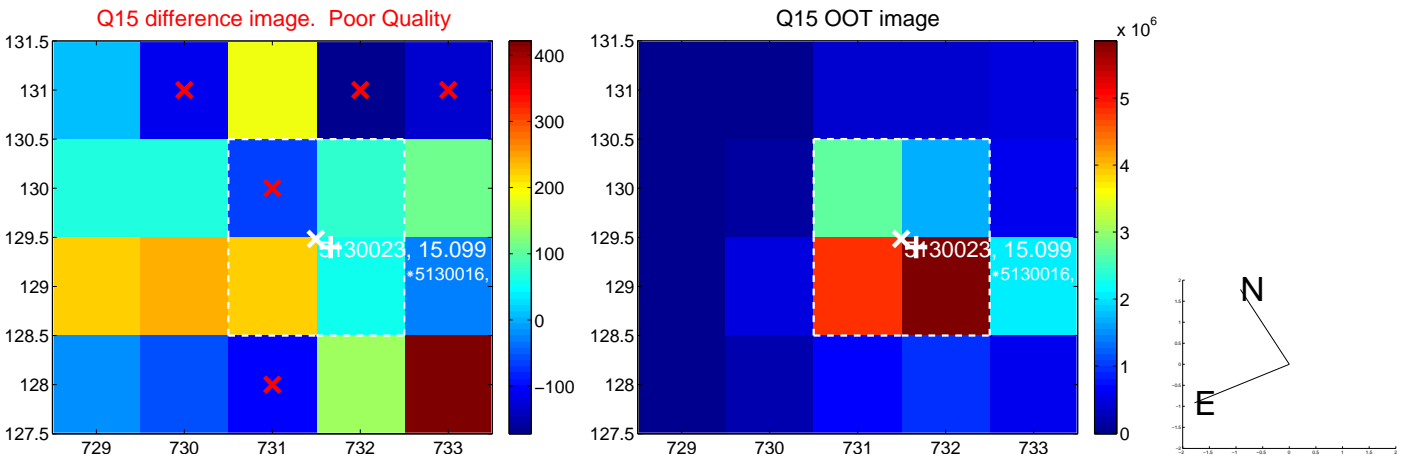
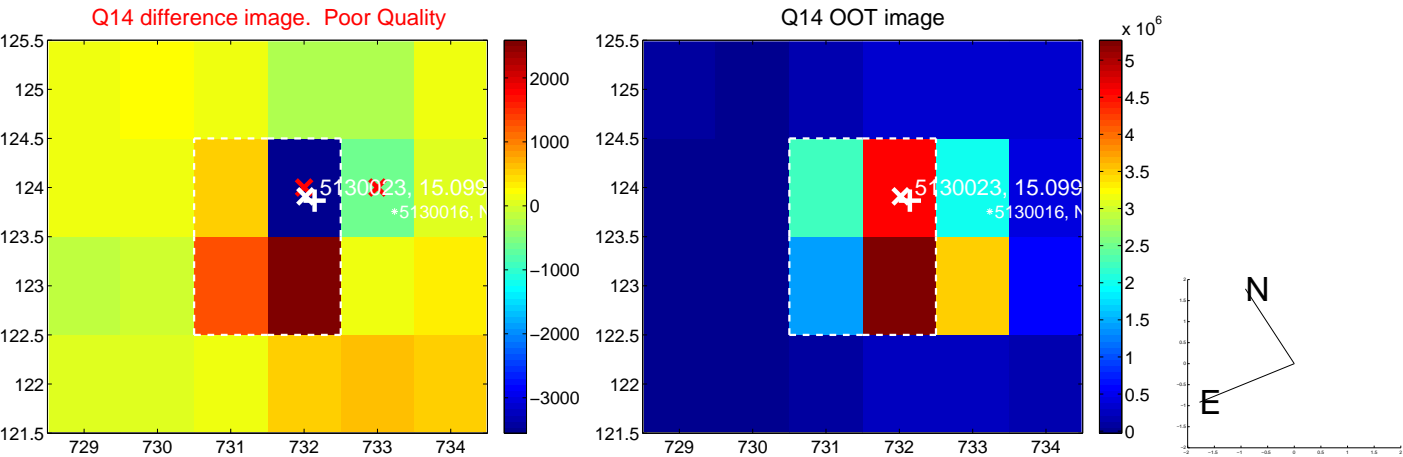
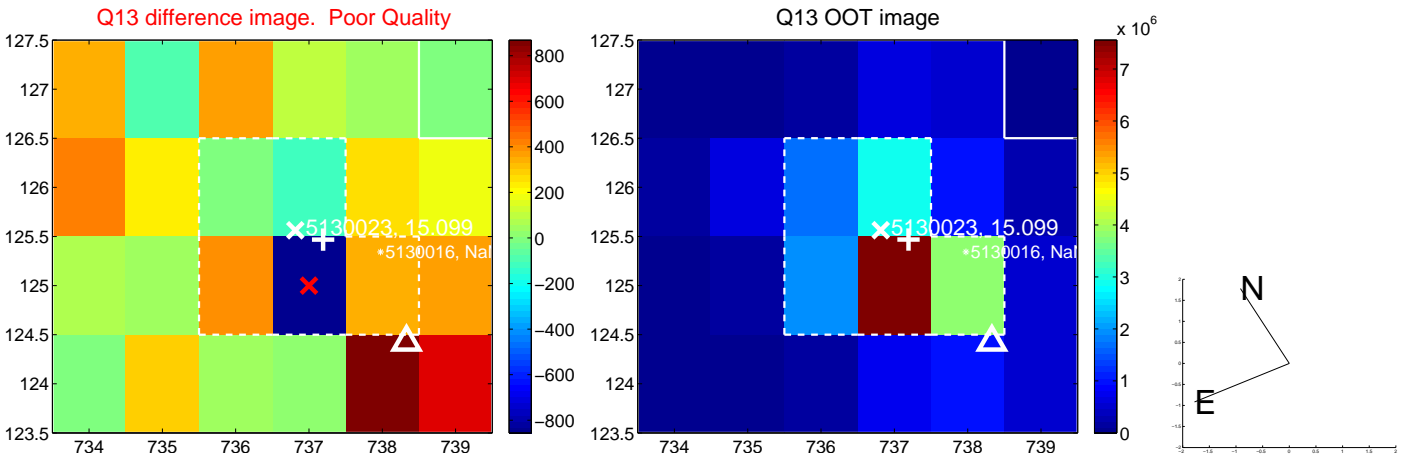




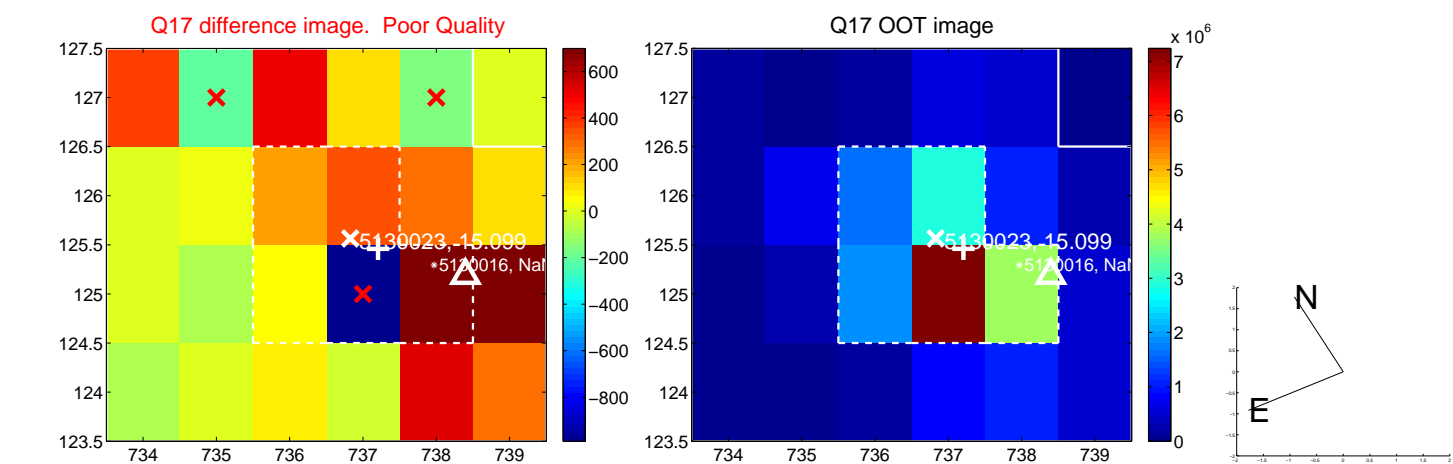
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



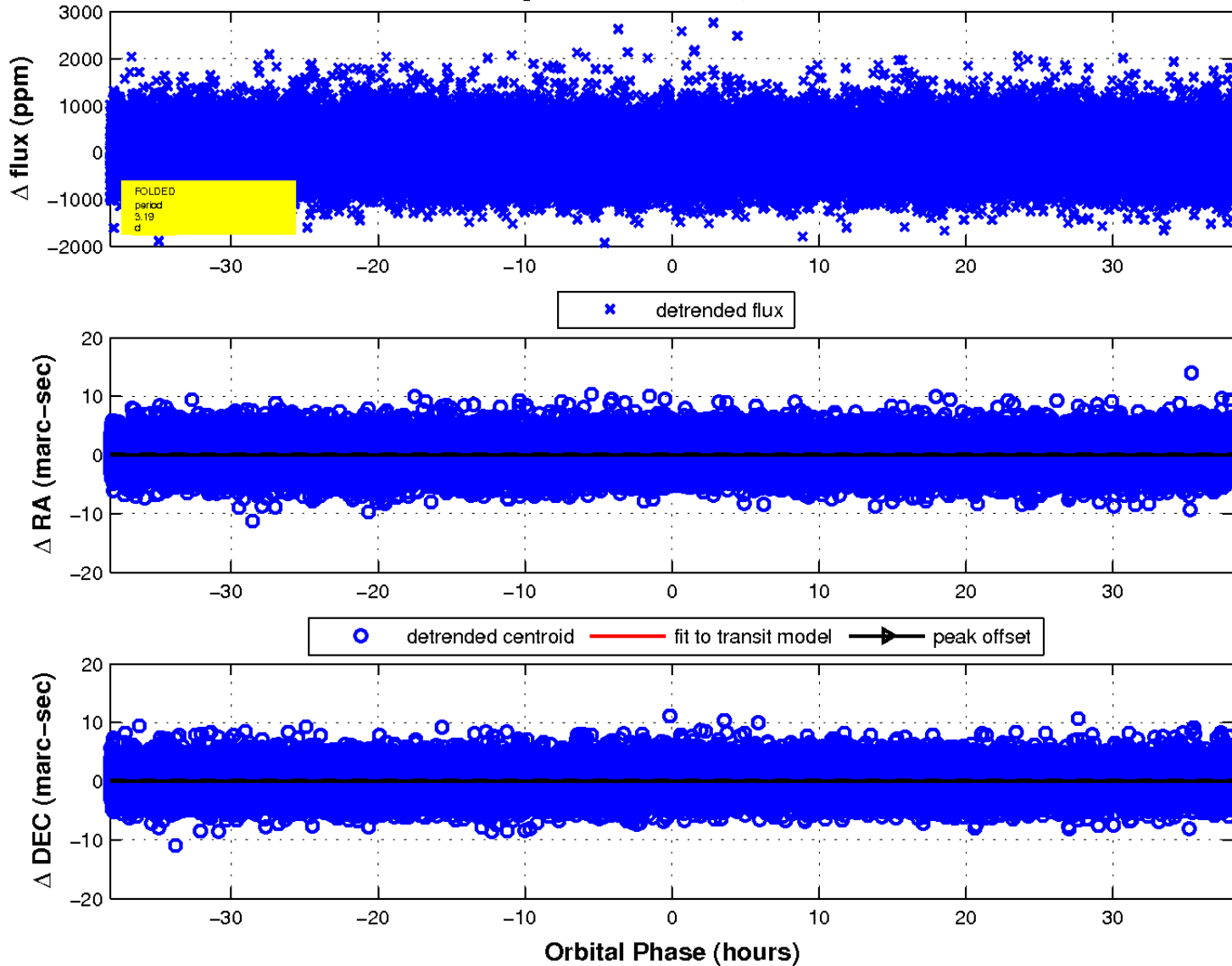
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



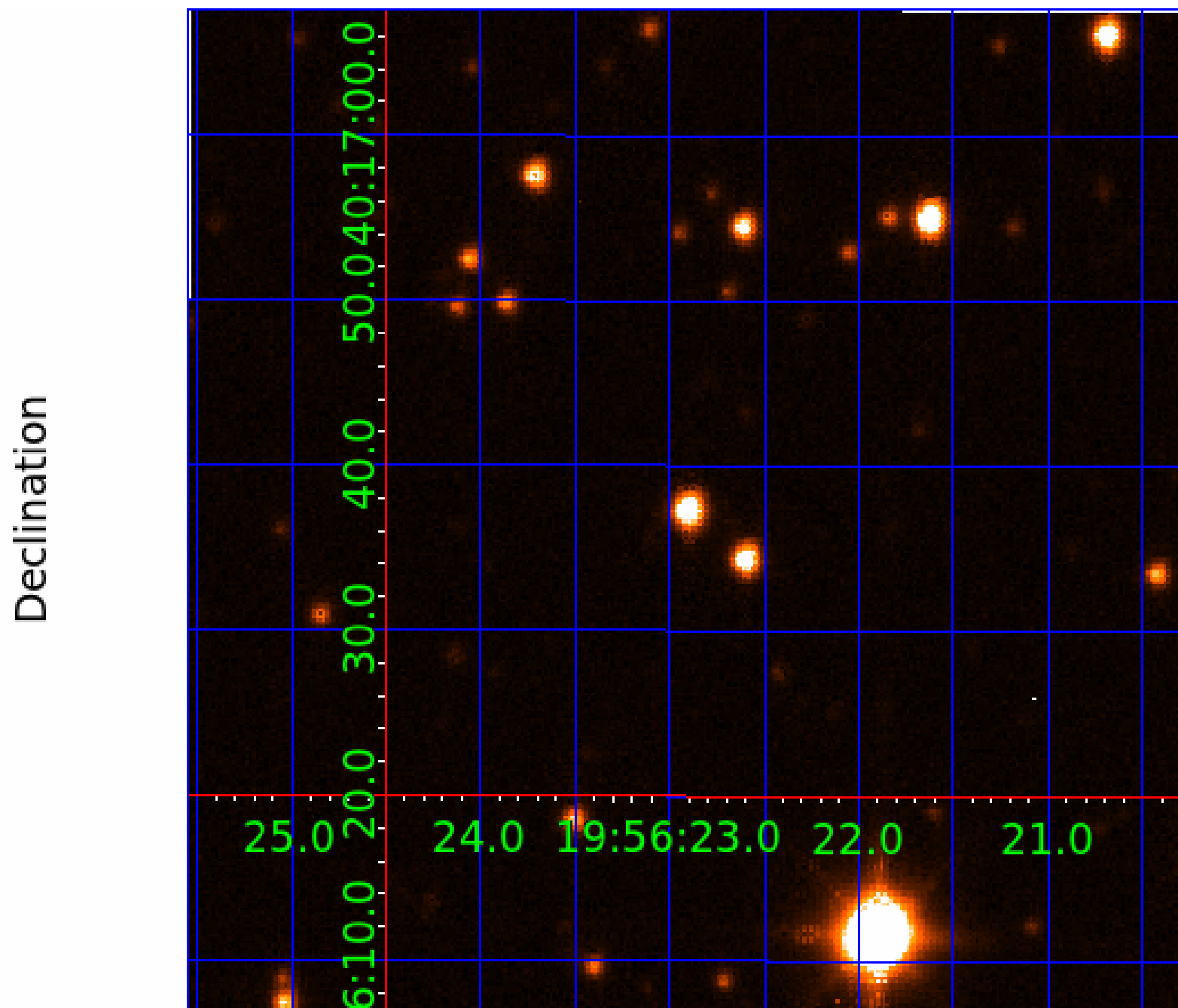
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



fluxWeightedCentroids, Planet 1 of 4



UKIRT Image





# KIC 005130023

## Q1-17 DR25 TCE Parameters

TCE	Run Type	KOI?	Period (Days)	Epoch (BKJD)	Depth (ppm)	Duration (Hours)	MES	SNR	$R_{\star}$ ( $R_{\odot}$ )	$T_{\star}$ (K)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
005130023-01	OBS	No	3.186113	133.894623	38.2	13.329	8.0	6.3	0.85	5476	0.56	388.74
005130023-02	OBS	No	155.378502	233.732349	425.2	16.013	21.0	7.1	0.85	5476	1.81	2.18
005130023-03	OBS	No	535.544266	285.297649	498.3	6.531	8.3	6.5	0.85	5476	2.08	0.42
005130023-04	OBS	No	270.709339	377.898817	490.8	4.800	7.4	7.6	0.85	5476	2.37	1.04

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
005130023-01	OBS	FP	0.00	1	0	1	0	LPP_DV—CENT_RESOLVED_OFFSET
005130023-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_MARSHALL—TRANS_GAPPED—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS
005130023-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_CHASES_MARSHALL—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS
005130023-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_MARSHALL_SKYE—ALL_TRANS_CHASES—MOD_NONUNIQ_ALT—CENT_FEW_DIFFS

**Notes:** OBS = Observed. INJ = Injected. INV = Inverted. SCR = Scrambled.

N = Not Transit-Like. S = Stellar Eclipse. C = Centroid Offset. E = Ephemeris Match.

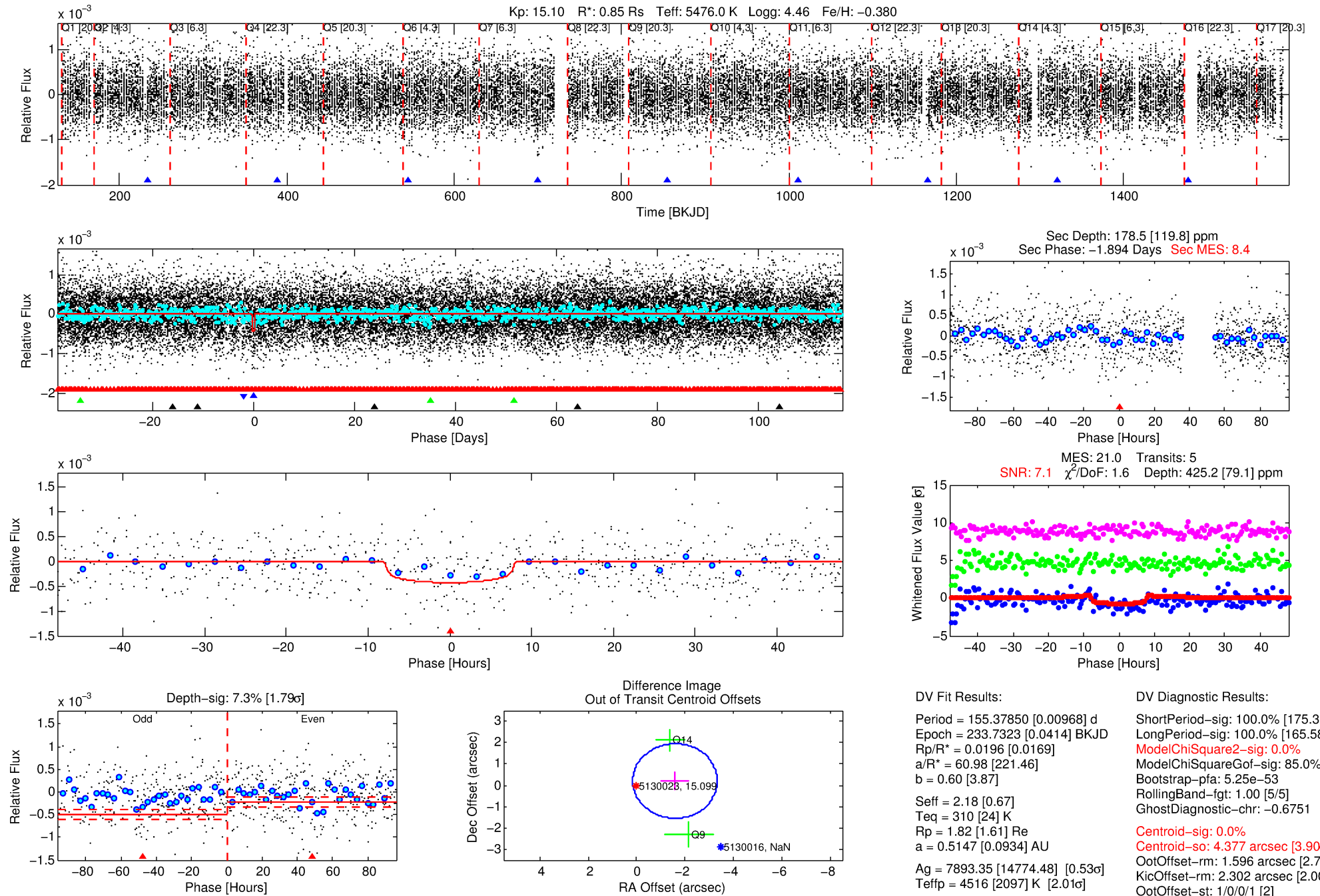
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 005130023-02

No Significant Match Found

# DV One-Page Summary

KIC: 5130023 Candidate: 2 of 4 Period: 155.379 d



## DV Fit Results:

Period = 155.37850 [0.00968] d  
Epoch = 233.7323 [0.0414] BKJD  
Rp/R\* = 0.0196 [0.0169]  
a/R\* = 60.98 [221.46]  
b = 0.60 [3.87]  
Seff = 2.18 [0.67]  
Teq = 310 [24] K  
Rp = 1.82 [1.61] Re  
a = 0.5147 [0.0934] AU  
Ag = 7893.35 [14774.48] [0.53 $\sigma$ ]  
Teffp = 4516 [2097] K [2.01 $\sigma$ ]

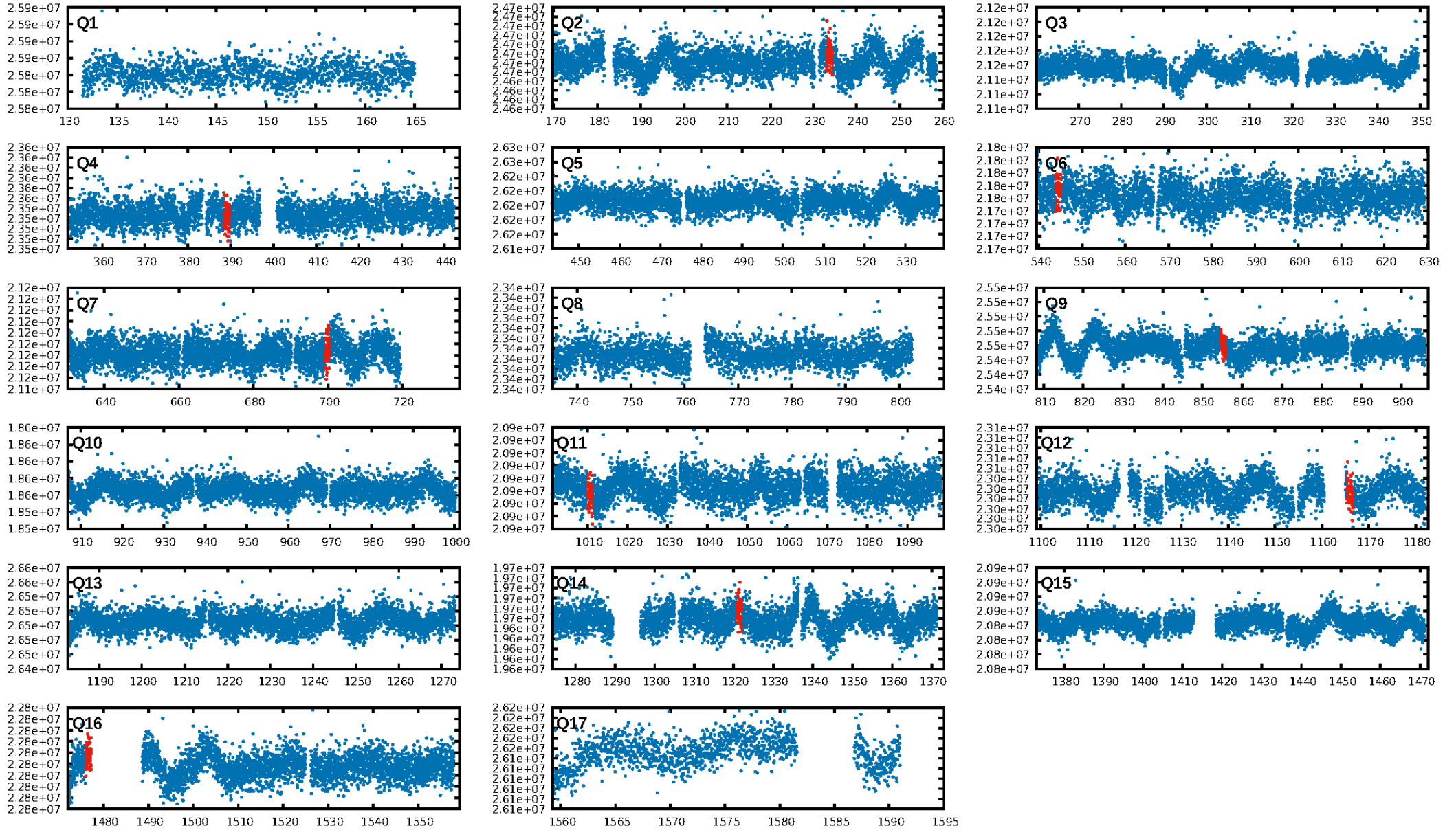
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [175.32 $\sigma$ ]  
LongPeriod-sig: 100.0% [165.58 $\sigma$ ]  
ModelChiSquare2-sig: 0.0%  
ModelChiSquareGof-sig: 85.0%  
Bootstrap-pfa: 5.25e-53  
RollingBand-fgt: 1.00 [5/5]  
GhostDiagnostic-chr: -0.6751  
Centroid-sig: 0.0%  
Centroid-so: 4.377 arcsec [3.90 $\sigma$ ]  
OotOffset-rm: 1.596 arcsec [2.74 $\sigma$ ]  
KicOffset-rm: 2.302 arcsec [2.00 $\sigma$ ]  
OotOffset-st: 1/0/0/1 [2]  
KicOffset-st: 1/0/0/1 [2]  
DiffImageQuality-fgm: 0.50 [1/2]  
DiffImageOverlap-fno: 0.00 [0/7]

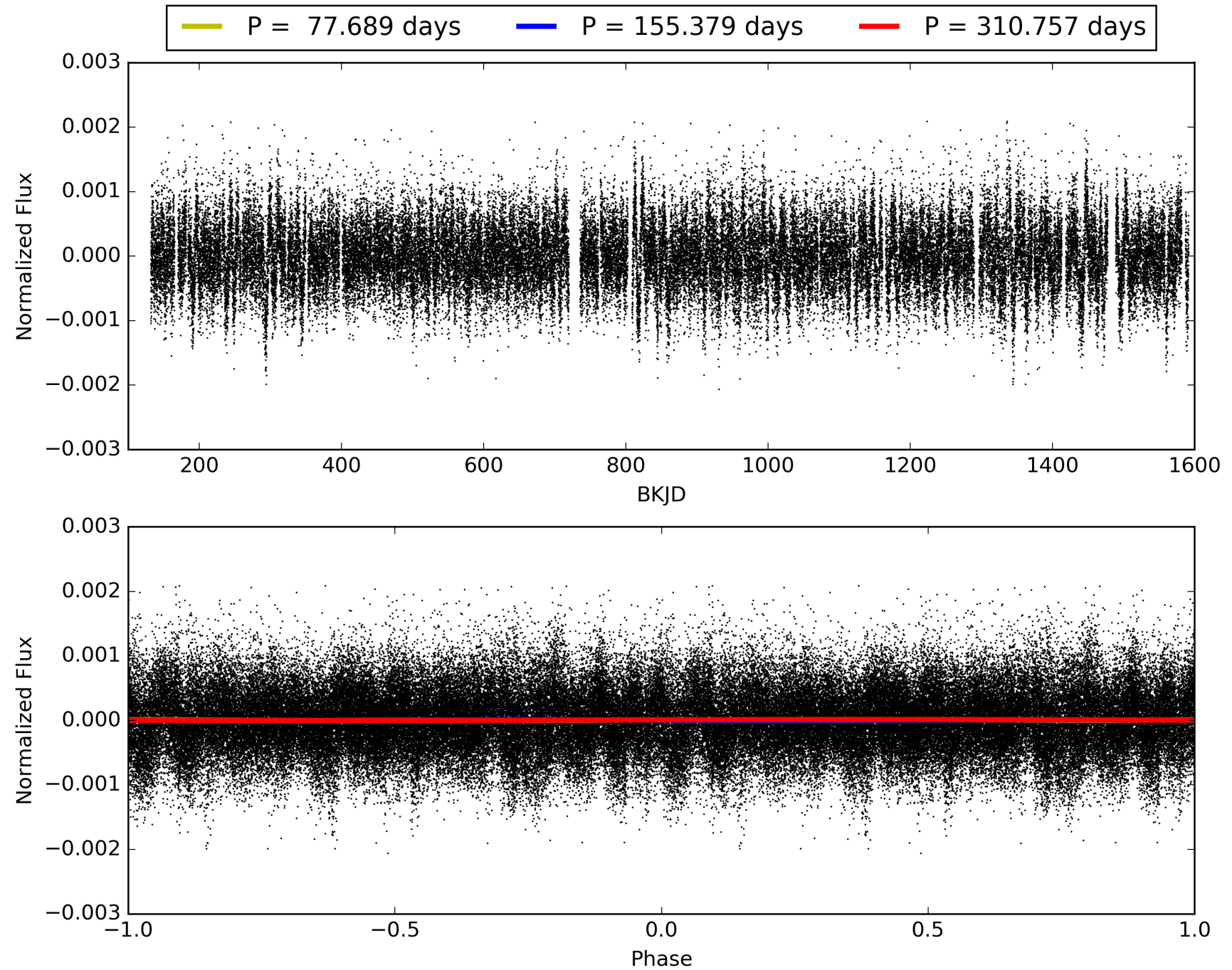
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 29-Jan-2016 16:38:08 Z

This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

# TCE 005130023-02, PDC Light Curves

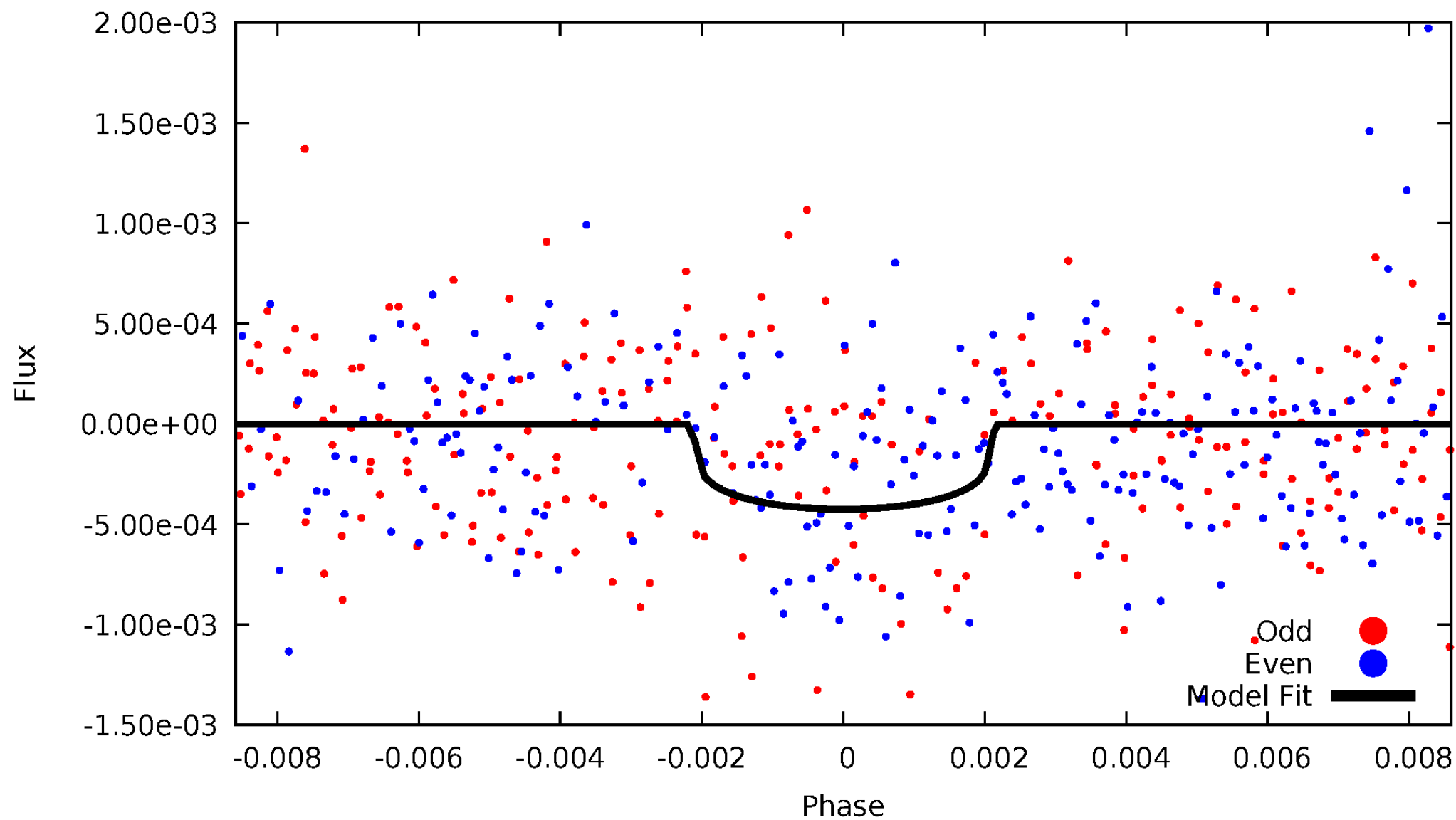


# TCE 005130023-02



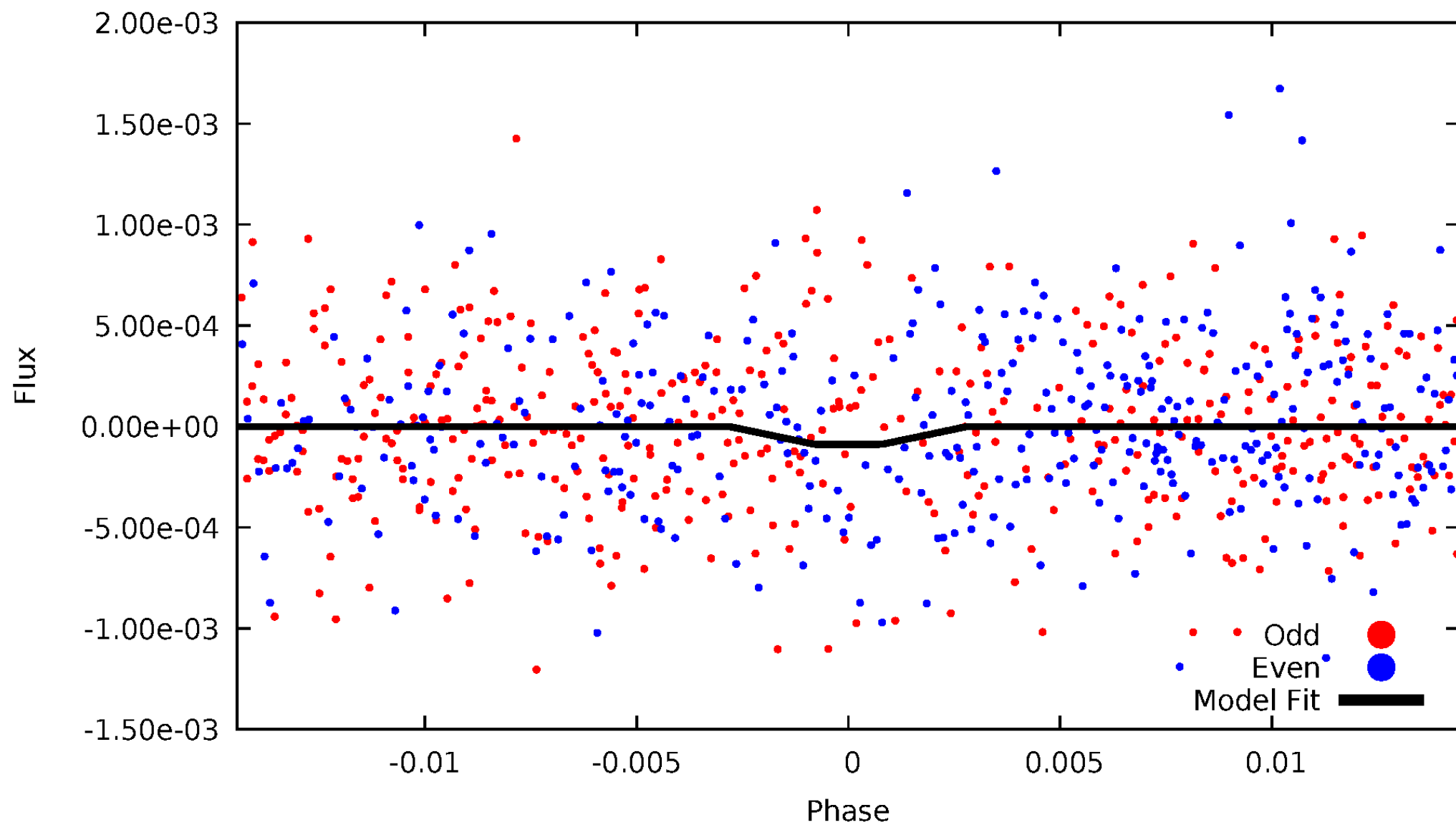
# DV Odd/Even

TCE 005130023-02



# ALT Odd/Even

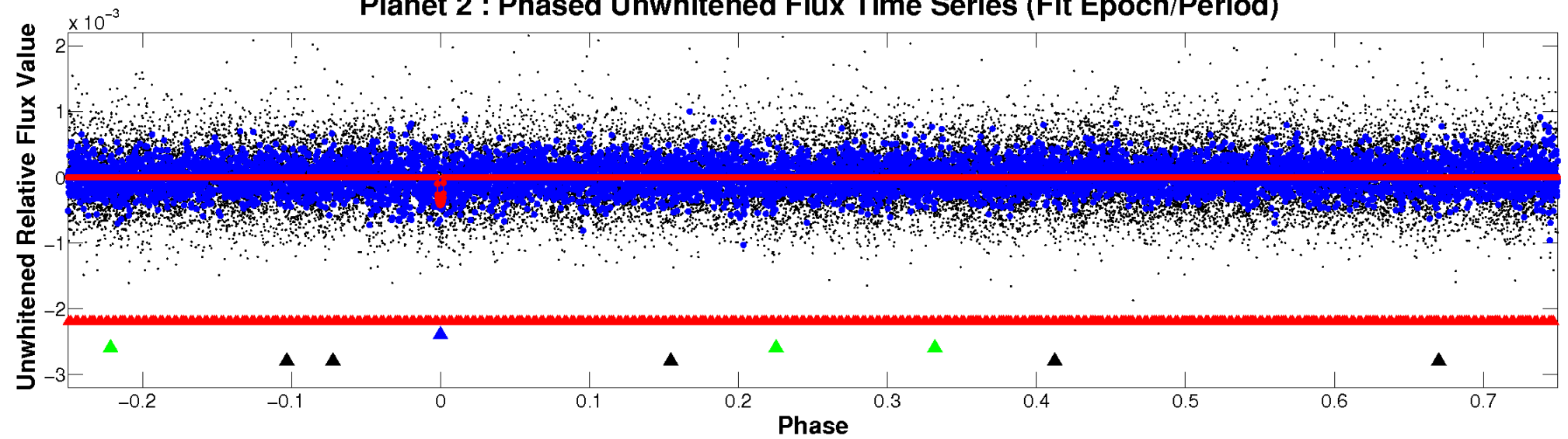
TCE 005130023-02



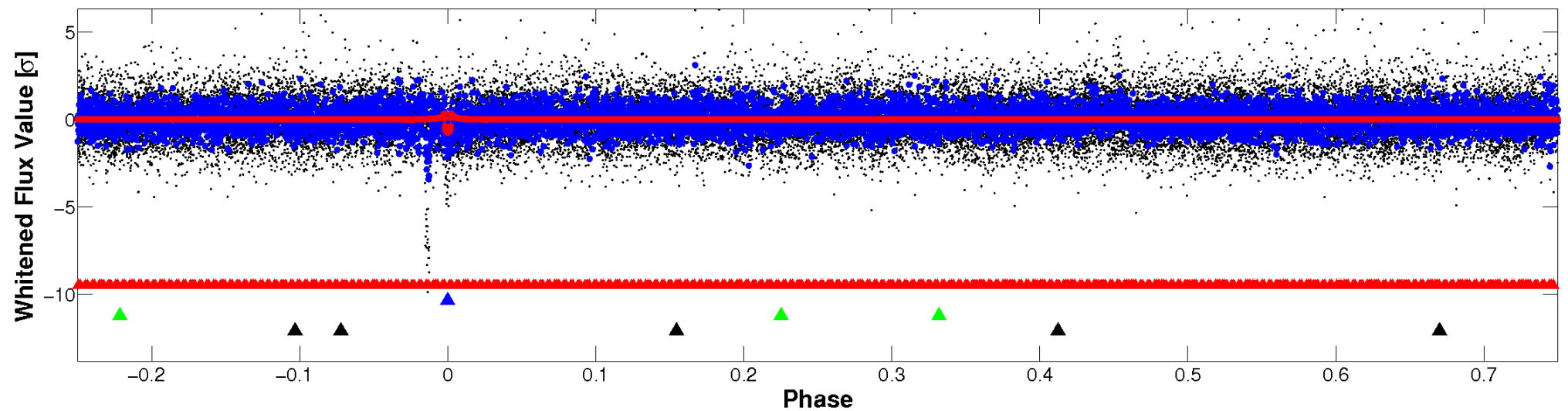


# Non-Whitened Vs. Whitened Light Curve

## Planet 2 : Phased Unwhitened Flux Time Series (Fit Epoch/Period)

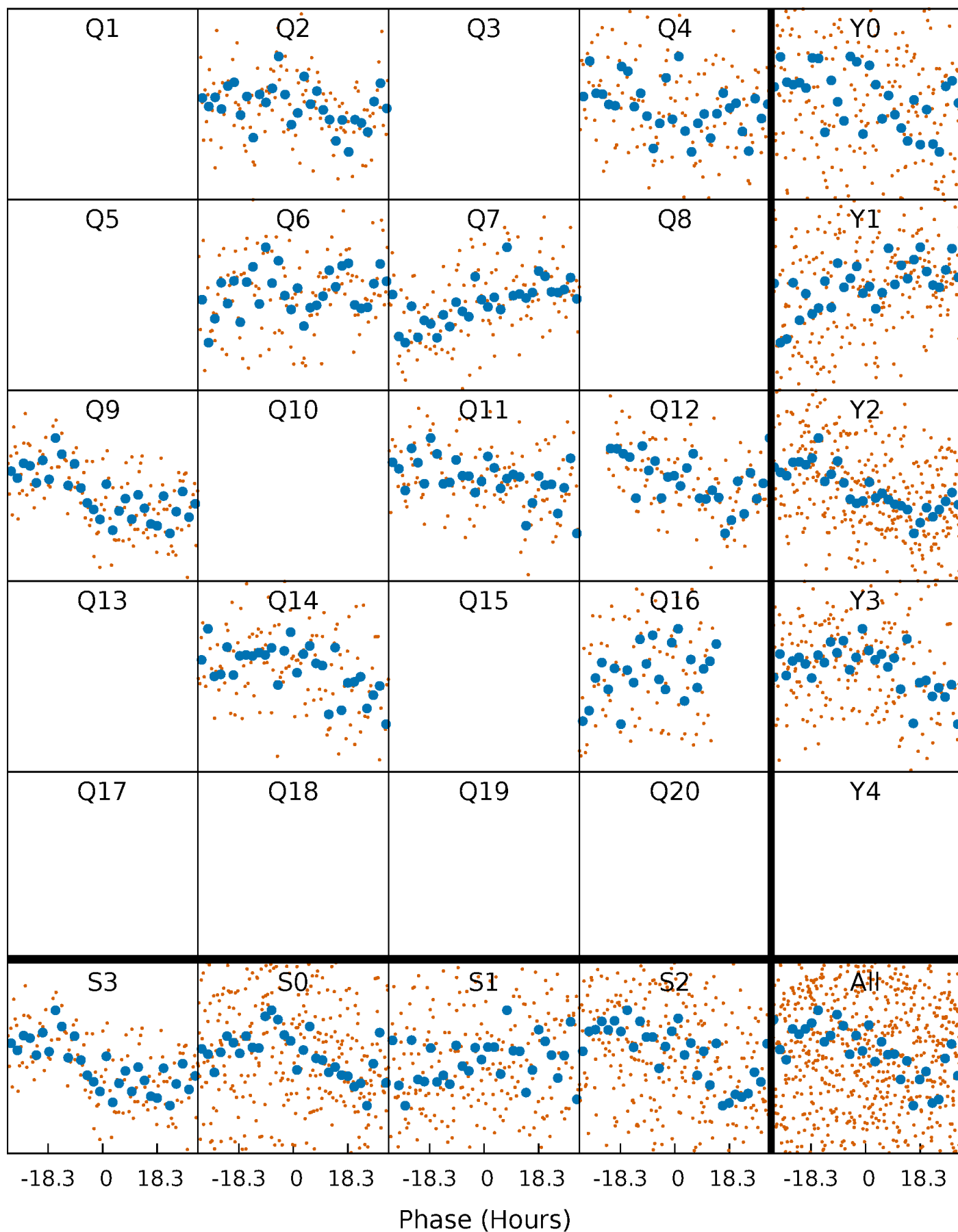


## Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



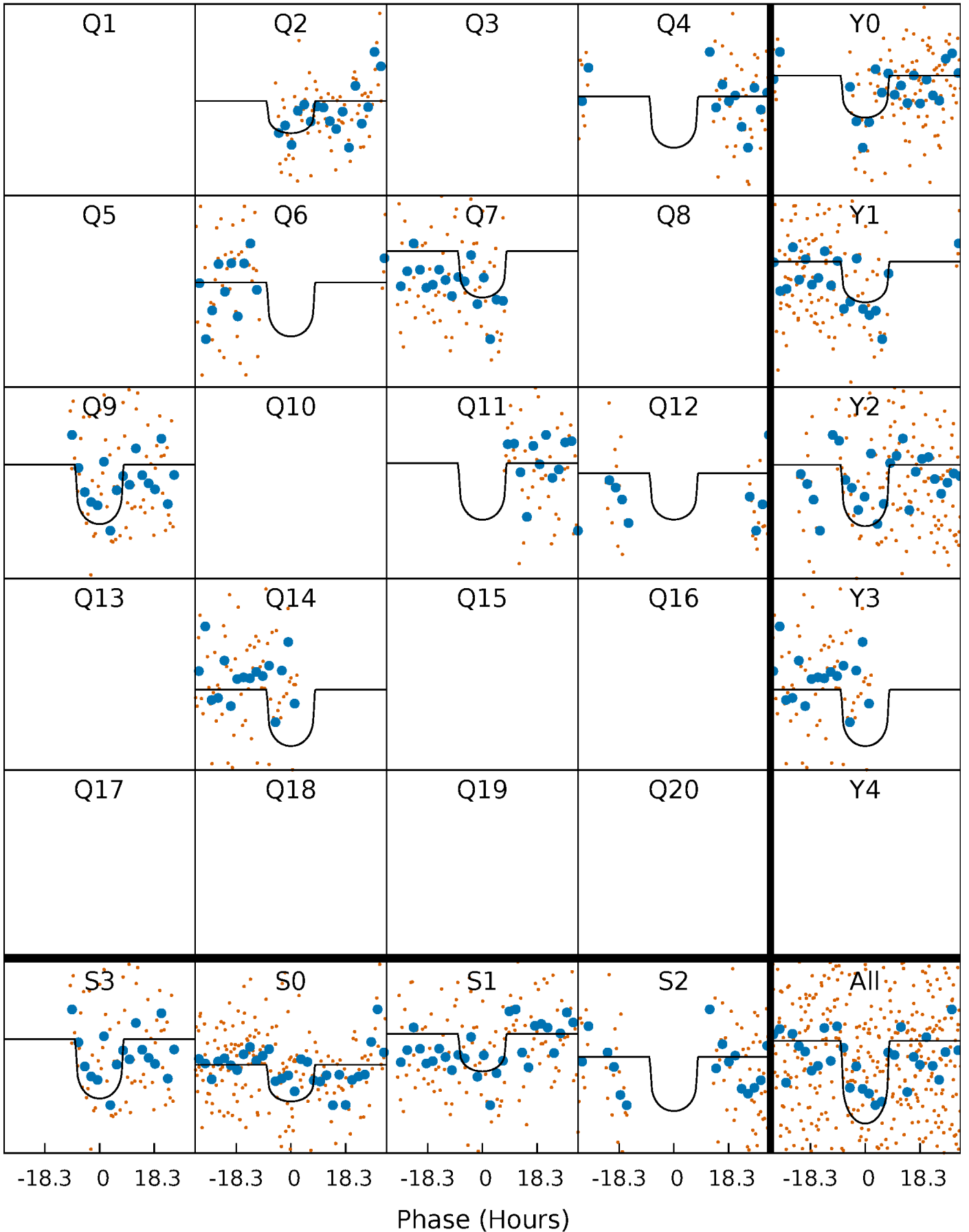
# PDC Quarter-Phased Transit Curves

TCE 005130023-02 P=155.378502 Days  $T_0=233.732349$  (BKJD)



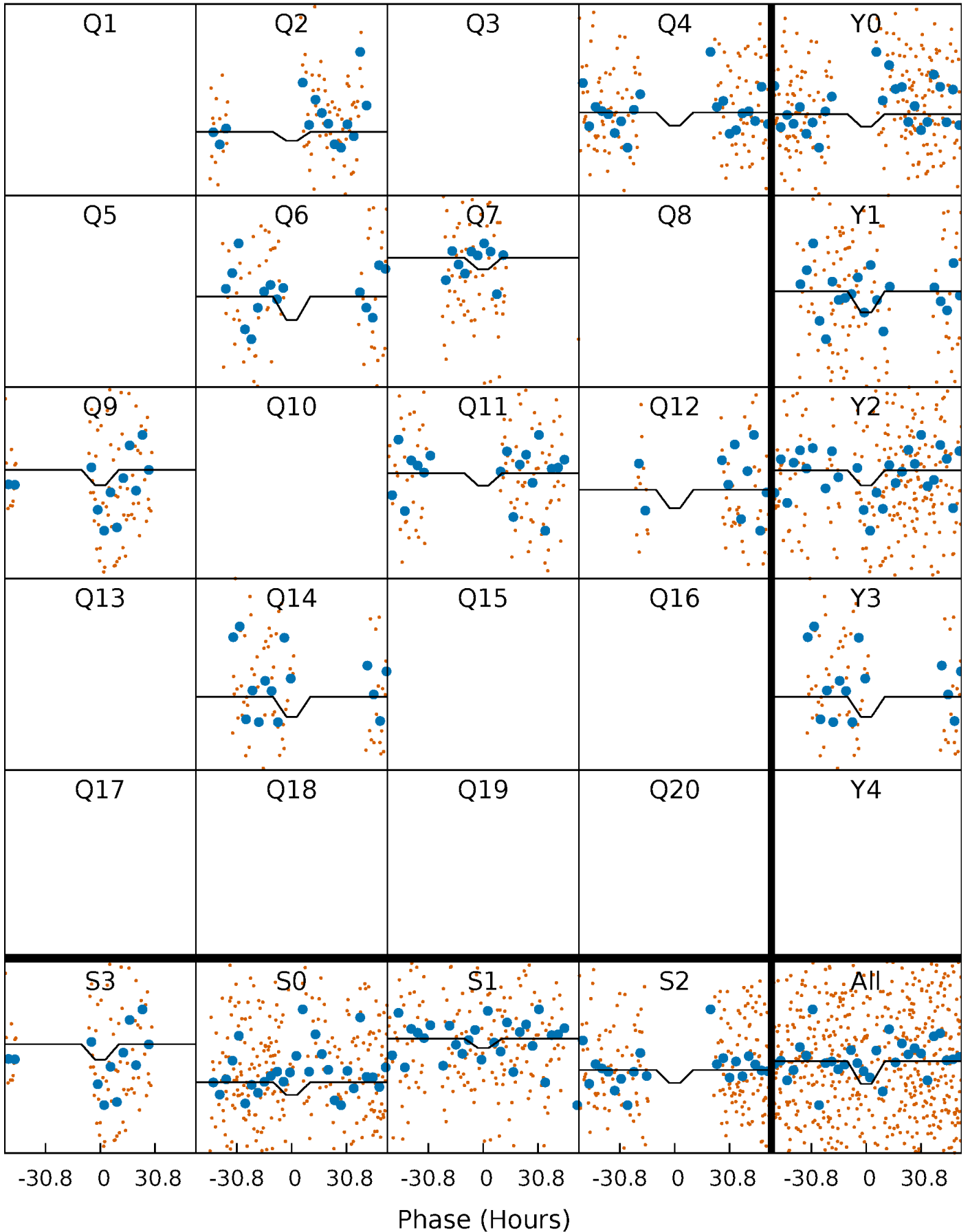
# DV Quarter-Phased Transit Curves

TCE 005130023-02 P=155.378502 Days  $T_0=233.732349$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

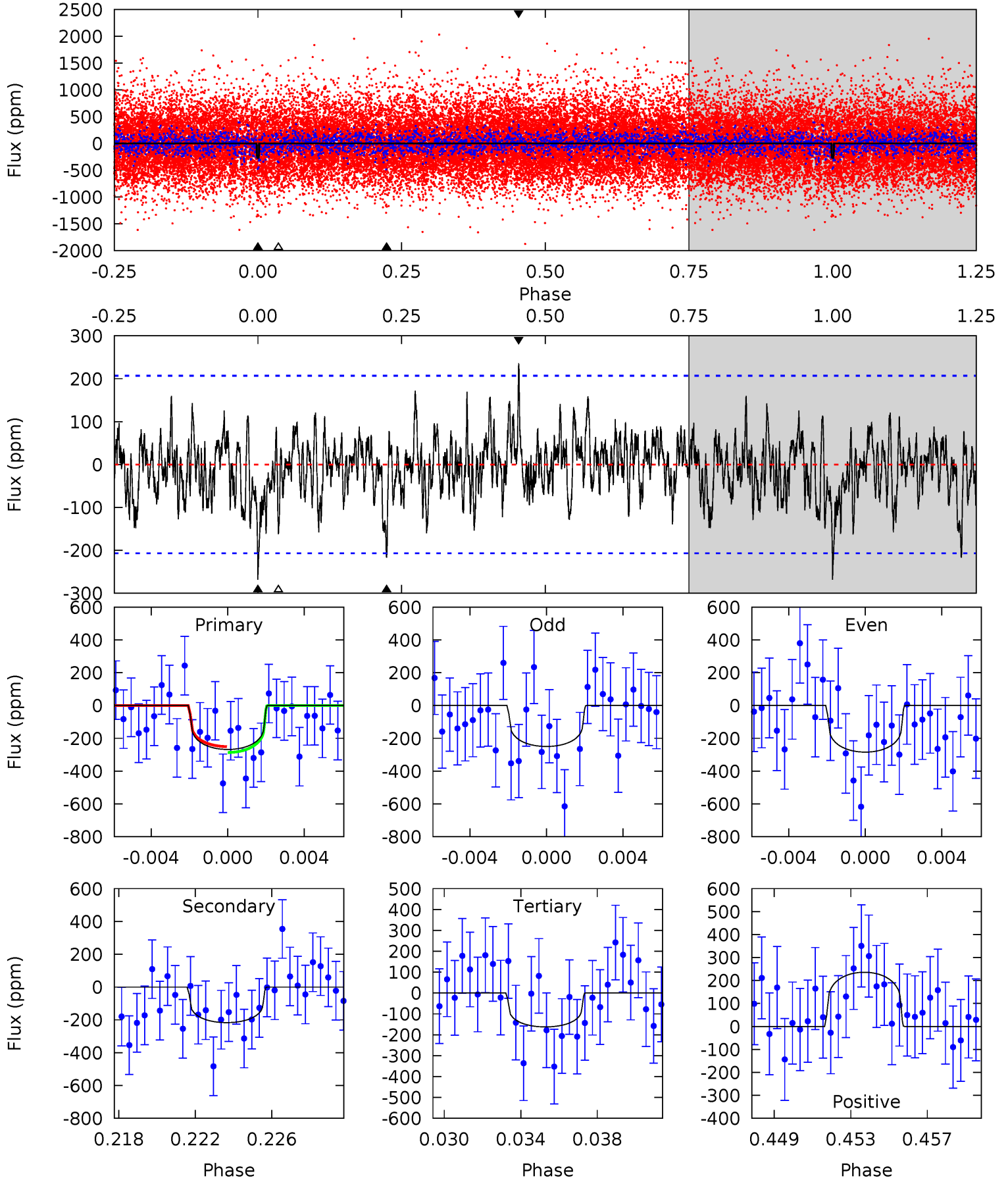
TCE 005130023-02 P=155.444902 Days  $T_0=233.303651$  (BKJD)



# DV Model-Shift Uniqueness Test

005130023-02, P = 155.378502 Days, E = 78.353847 Days

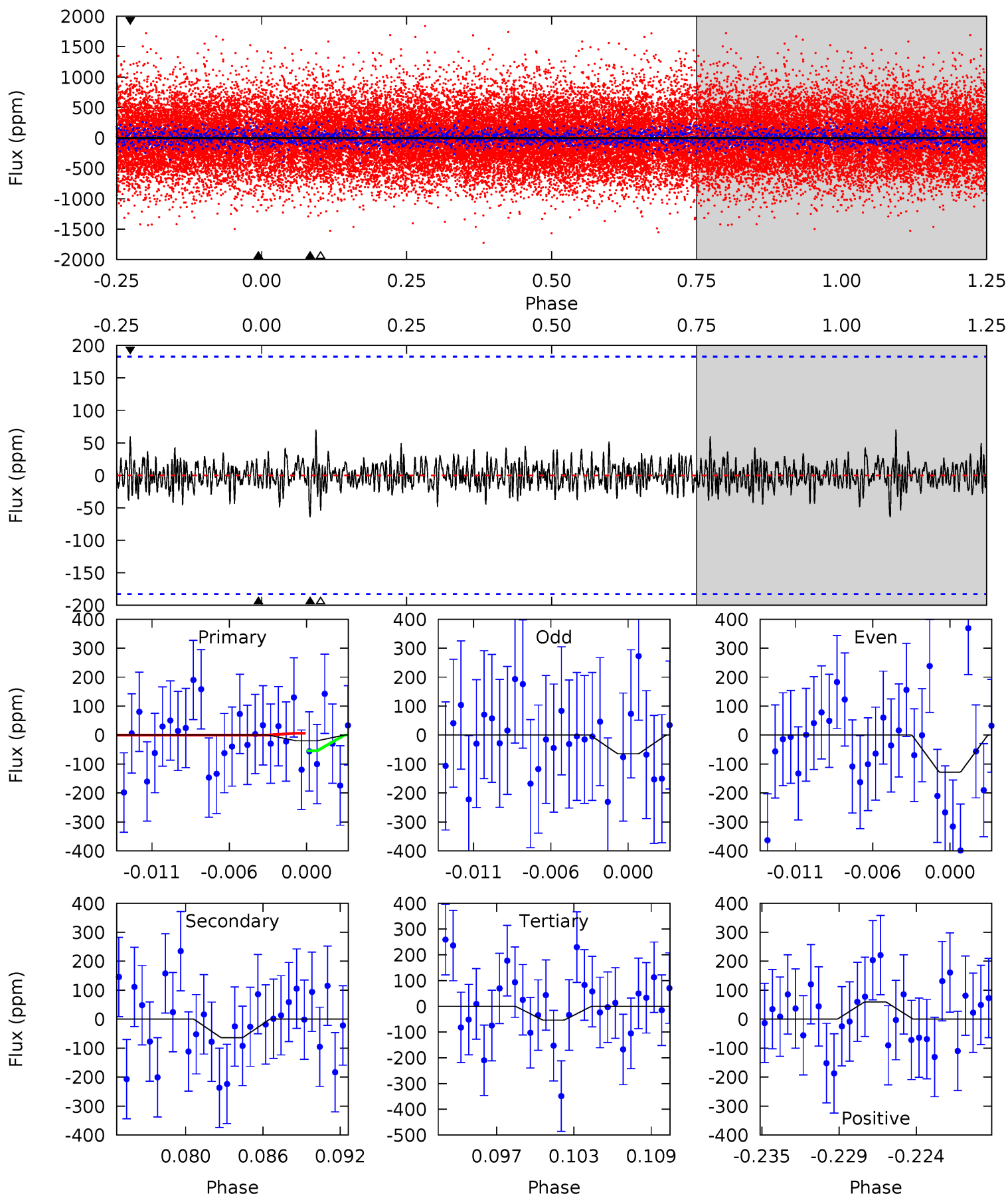
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
6.72	5.44	4.07	5.91	5.19	2.86	1.46	2.65	0.81	1.37	-0.47	0.43	0.92	0.47	0.45



# Alt Model-Shift Uniqueness Test

005130023-02, P = 155.444902 Days, E = 77.858749 Days

Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
0.56	1.80	1.51	1.68	5.13	2.76	0.46	-0.95	-1.12	0.30	0.13	0.90	-44.4	0.52	0.67





### Stellar Parameters For KIC 005130023

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R$ ( $R_{\odot}$ )	$M(M_{\odot})$	$p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ )
	$5476^{+191}_{-172}$	$4.459^{+0.126}_{-0.154}$	$-0.380^{+0.350}_{-0.300}$	$0.847^{+0.175}_{-0.116}$	$0.753^{+0.123}_{-0.053}$	$1.745^{+1.069}_{-0.709}$
	+3%/-3%	+3%/-3%	+92%/-79%	+21%/-14%	+16%/-7%	+61%/-41%
Source	PHO1	KIC0	KIC0	DSEP		

KIC = Kepler Input Catalog; PHO = Photometry; SPE = Spectroscopy; AST = Asteroseismology  
 TRA = Transits; DESP = Dartmouth Models; MULT = Multiple Models

### Secondary Eclipse Parameters for KIC 005130023-02 / KOI

Detrend	Depth (ppm)	$R_p$ ( $R_{\oplus}$ )	$T_{max}$ (K)	$T_{obs}$ (K)	$A_{obs}$
DV	$-217 \pm 40$	$2.17^{+1.56}_{-1.32}$	$434^{+30}_{-22}$	$4535^{+2469}_{-804}$	$6923^{+36609}_{-4687}$
Alt.	$-64 \pm 36$	$1.46^{+1.39}_{-0.97}$	$435^{+29}_{-25}$	$4074^{+2561}_{-944}$	$3886^{+31301}_{-3123}$

$T_{max}$  = Theoretical Maximum Planetary Temperature

$T_{obs}$  = Observed Planetary Temperature (Assuming  $A=0.3$ )

$A_{obs}$  = Observed Albedo (Assuming  $T=0$ )

If a secondary eclipse is present, the system is likely an EB if  $T_{obs} \gg T_{max}$  AND  $A_{obs} \gg 1.0$

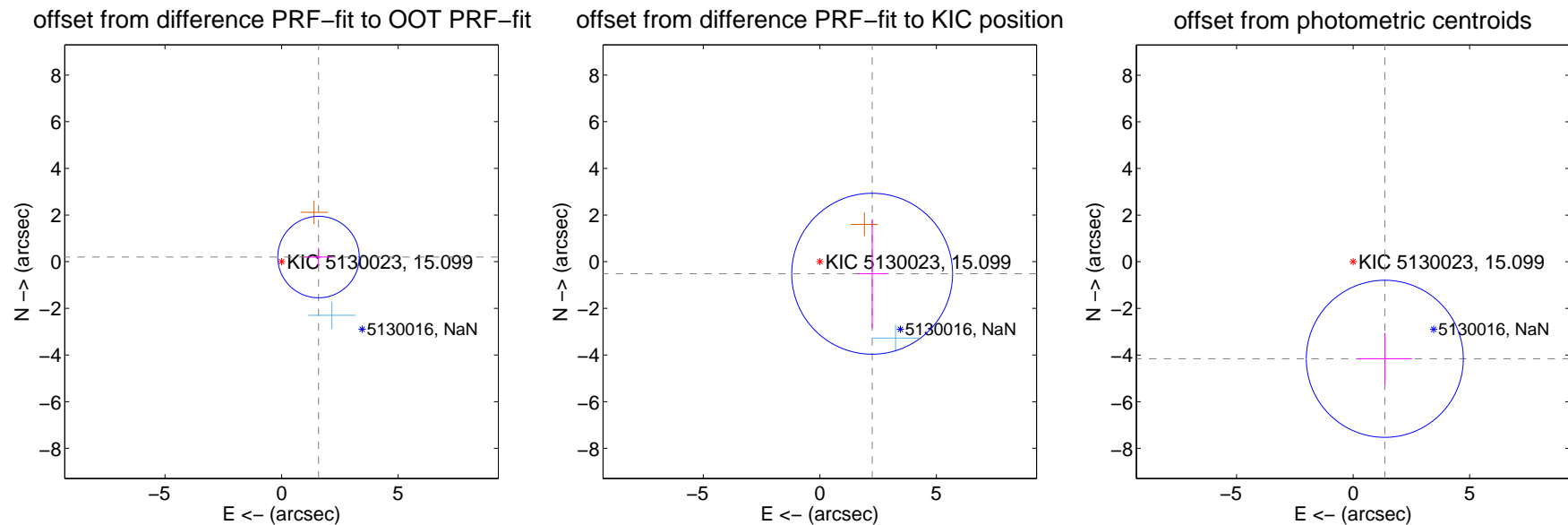
## DV Centroid Data

Supplemental centroid analysis for 005130023-02. Kepler magnitude: 15.10. Transit SNR 7.09

There are 1 quarters with good PRF difference image offsets

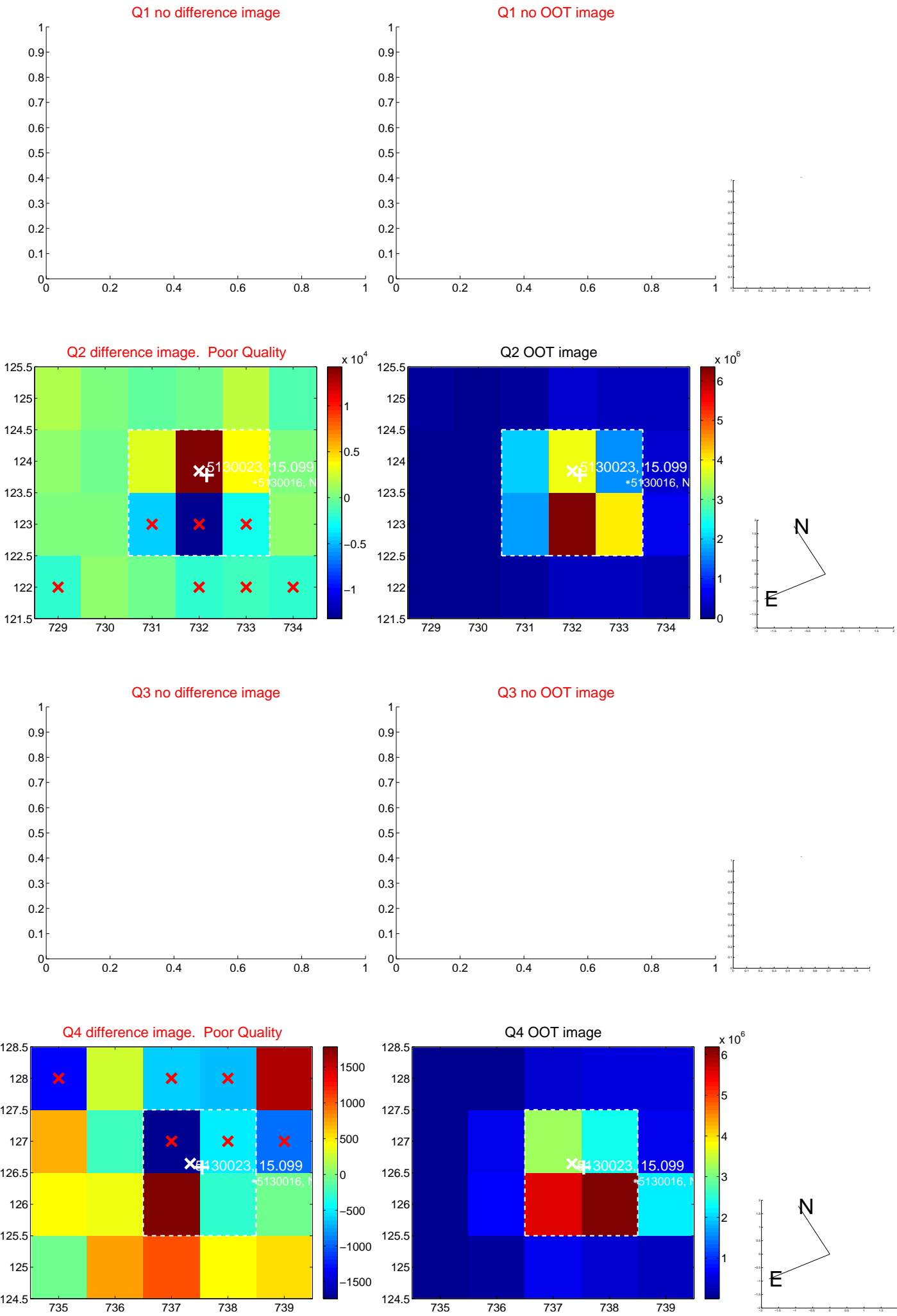
The direct PRF centroid is offset from the target star catalog position by about 0.73 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$1.596 \pm 0.582$	2.74	$-1.584 \pm 0.585$	$0.199 \pm 0.391$
PRF-fit source offset from KIC position	$2.302 \pm 1.150$	2.00	$-2.243 \pm 0.644$	$-0.517 \pm 2.335$
photometric centroid source offset	$4.38 \pm 1.12$	3.90	$-1.36 \pm 1.16$	$-4.16 \pm 1.12$

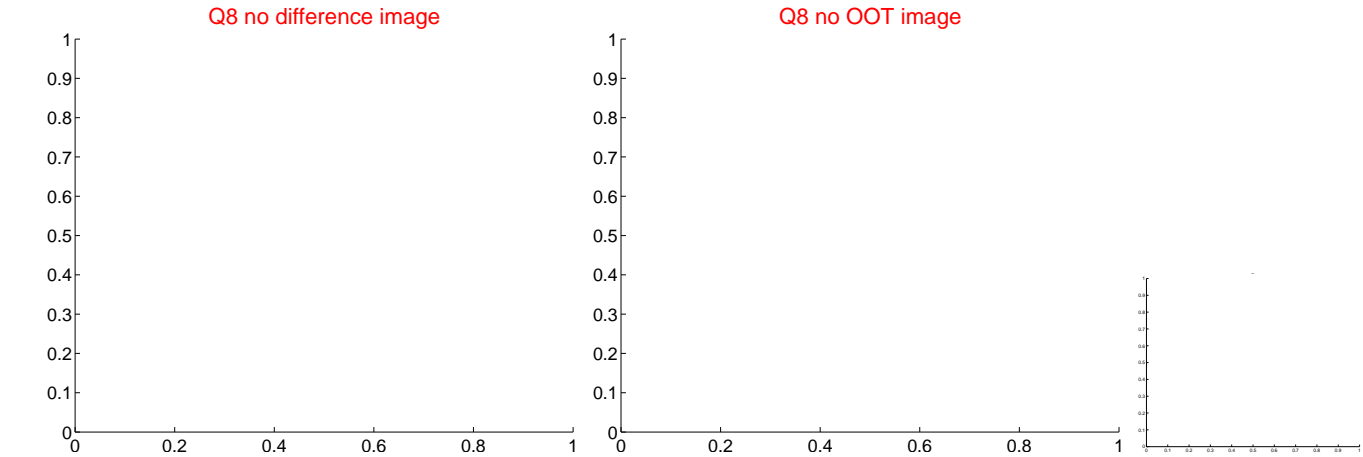
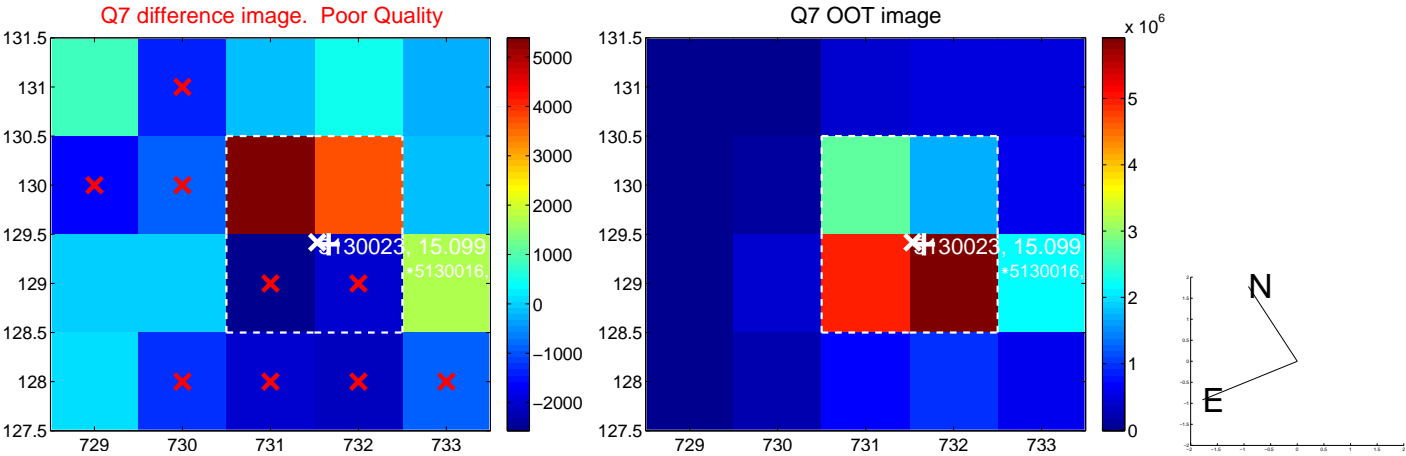
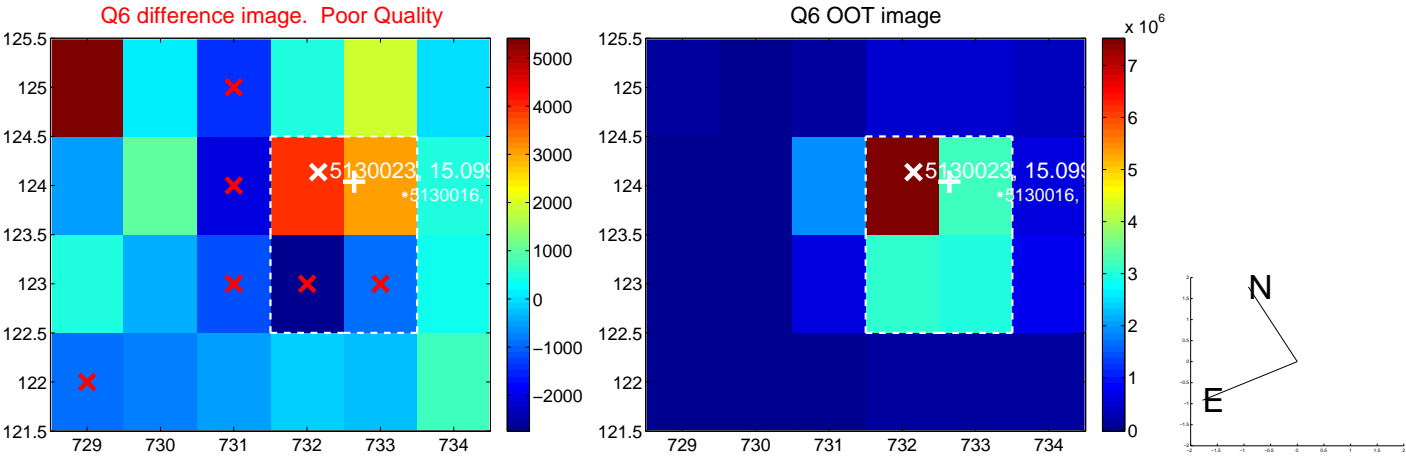
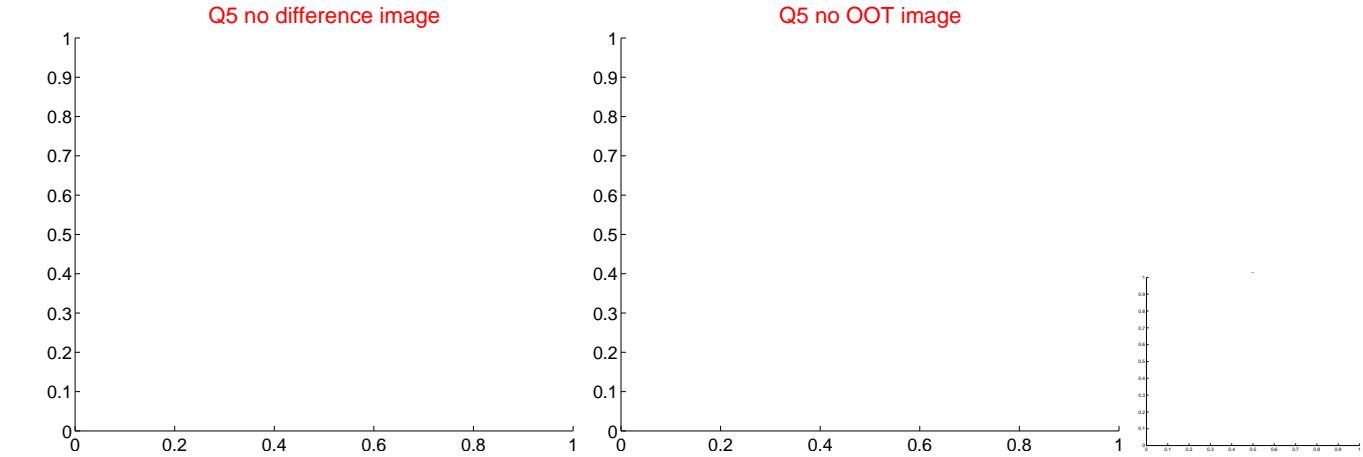


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three- $\sigma$ . Red \*: target star. Blue \*: Other stars. Text next to a star gives its KIC ID and kepmag. KIC IDs > 15,000,000 are from the UKIRT catalog.

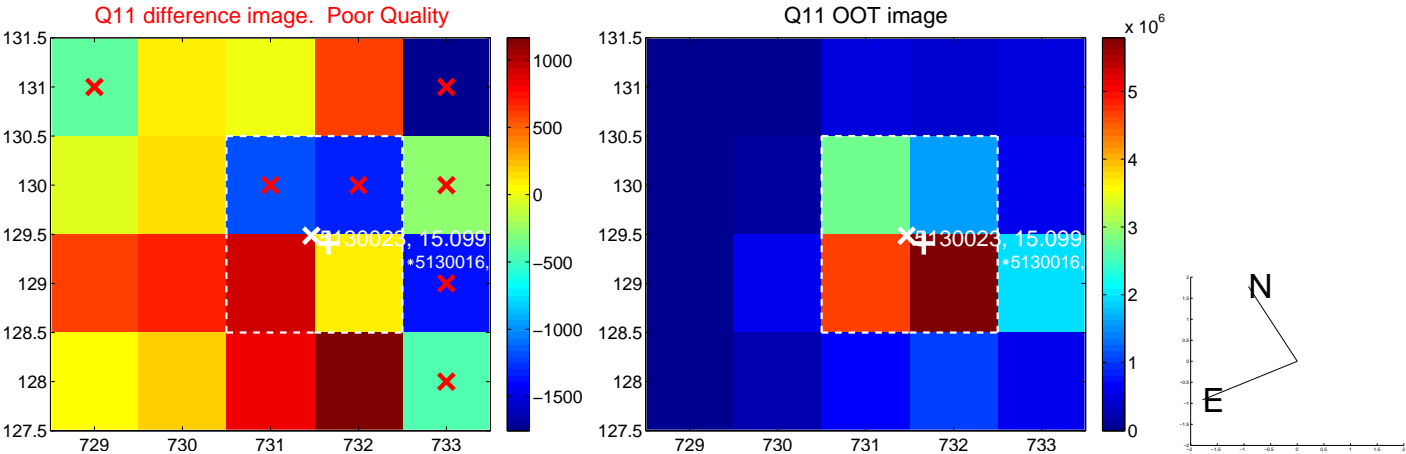
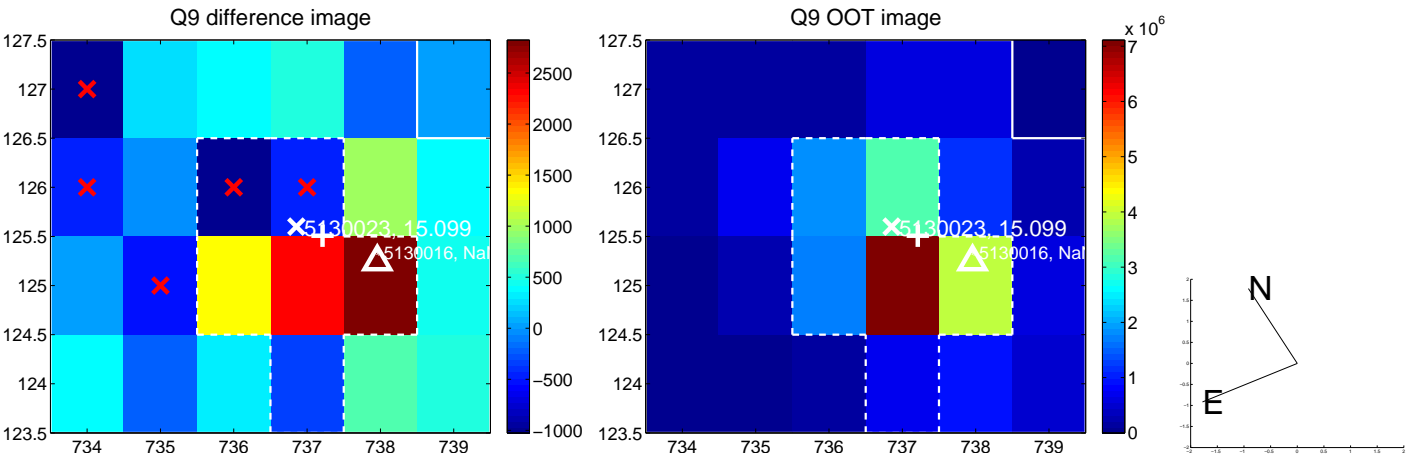
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



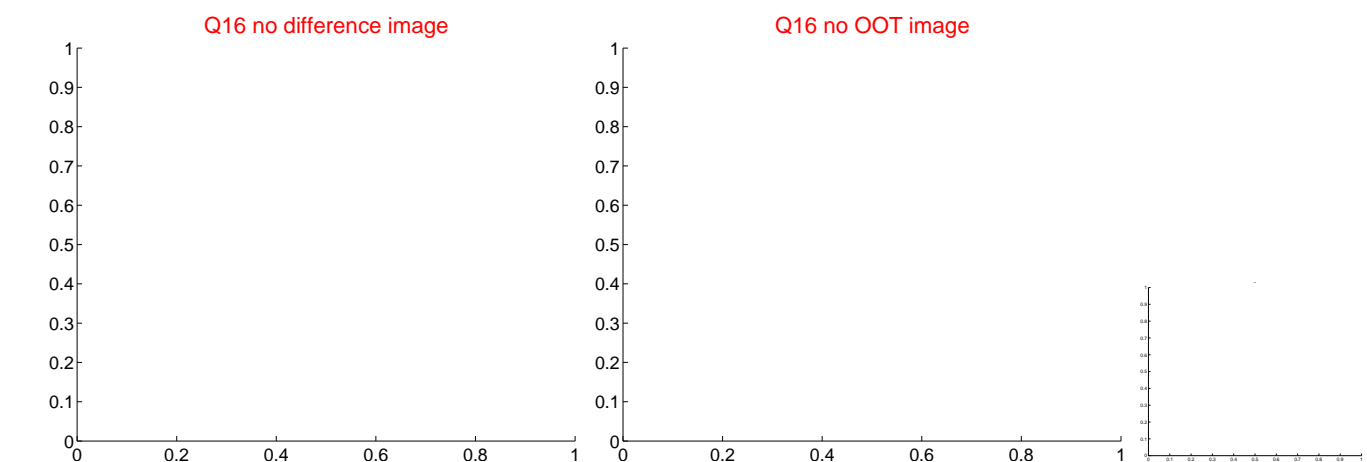
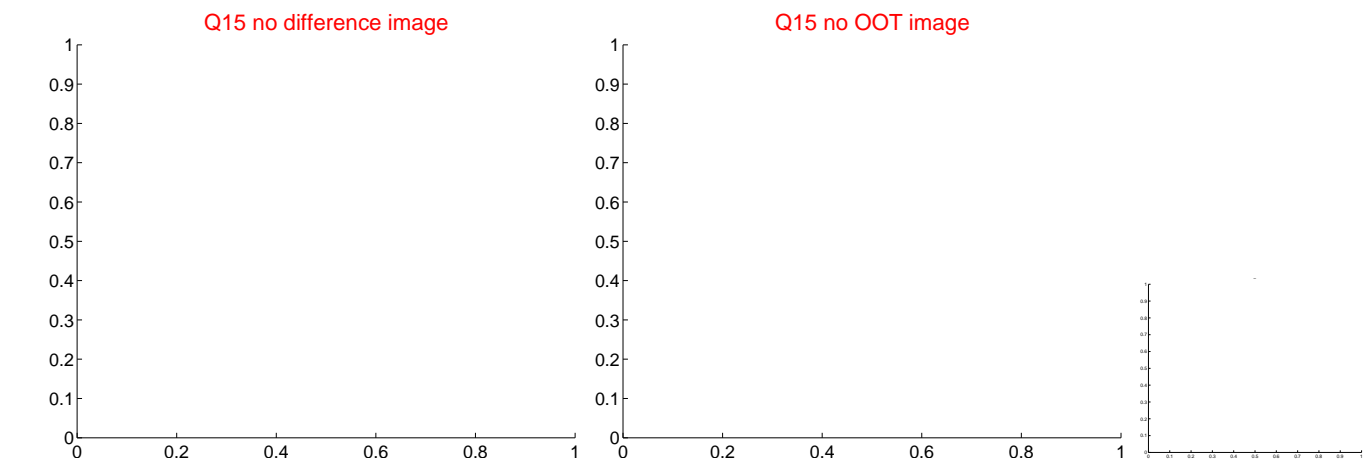
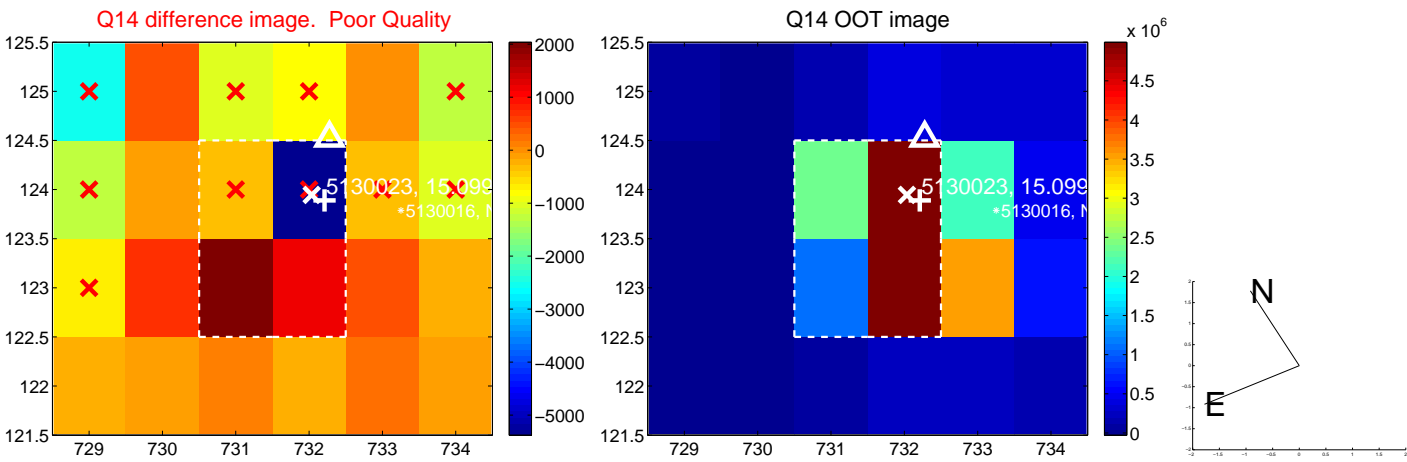
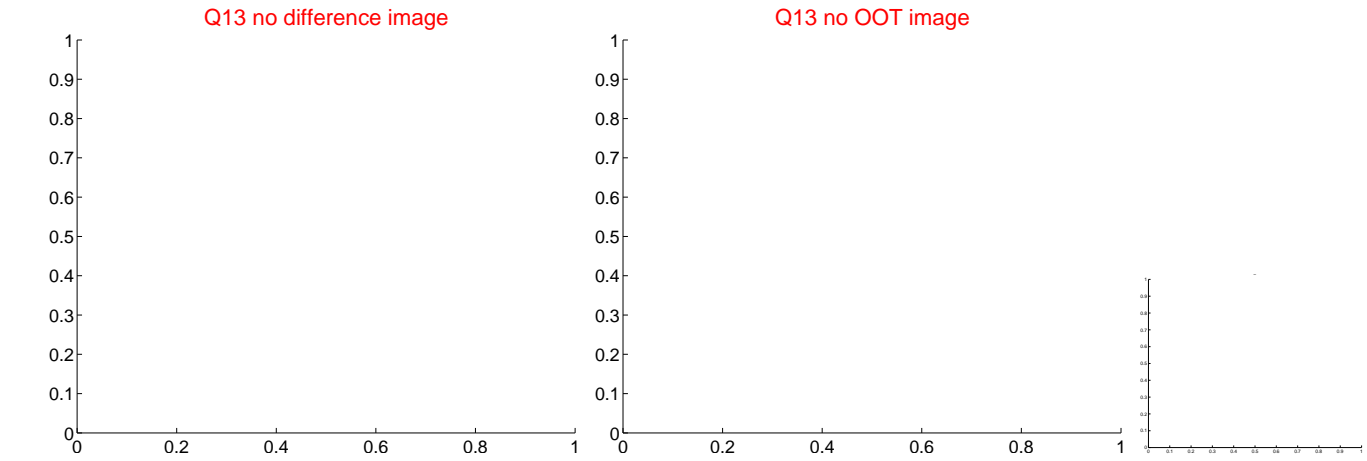
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

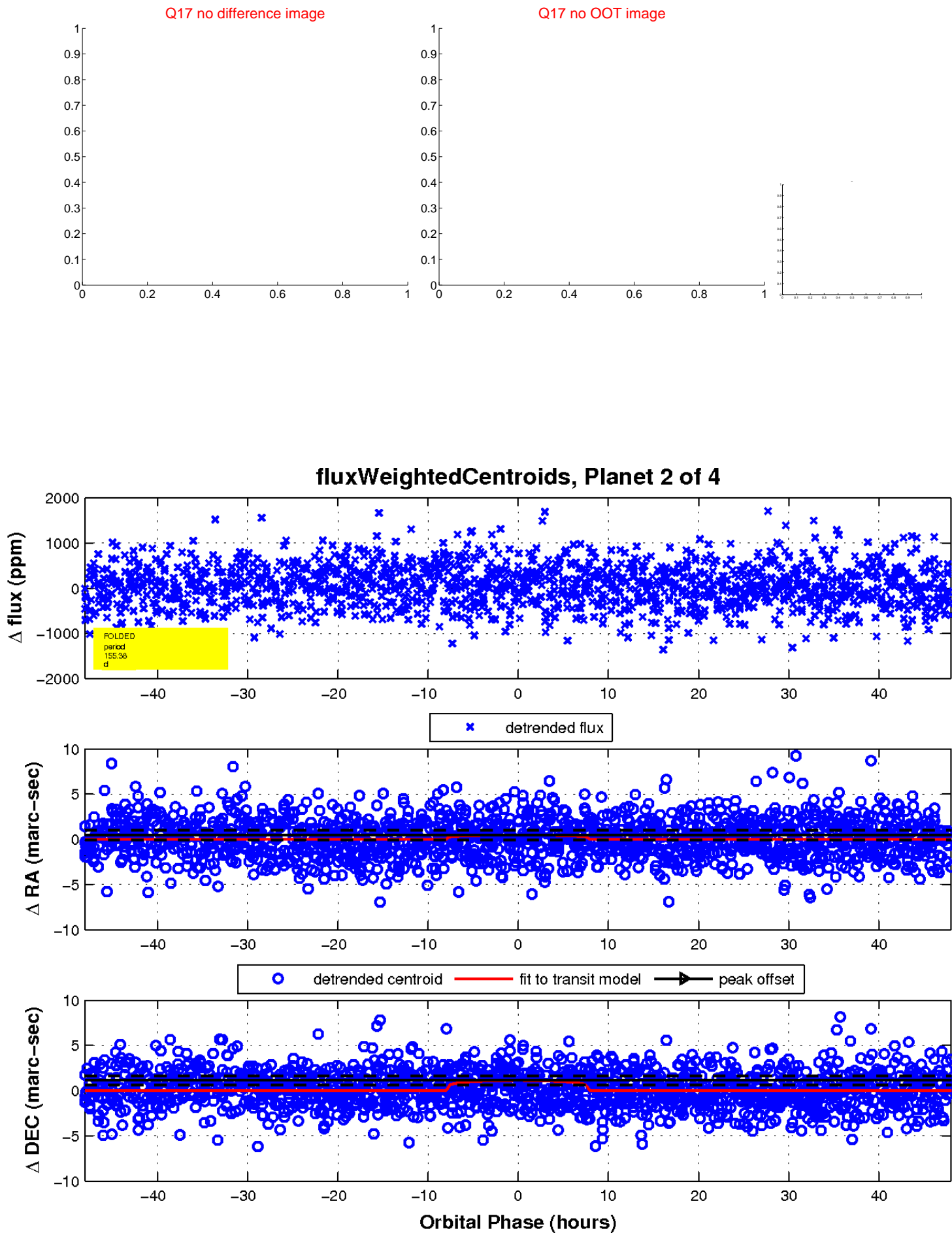


white ×: KIC target position; +: OOT centroid; △: difference centroid. red ✕: large negative pixel value.

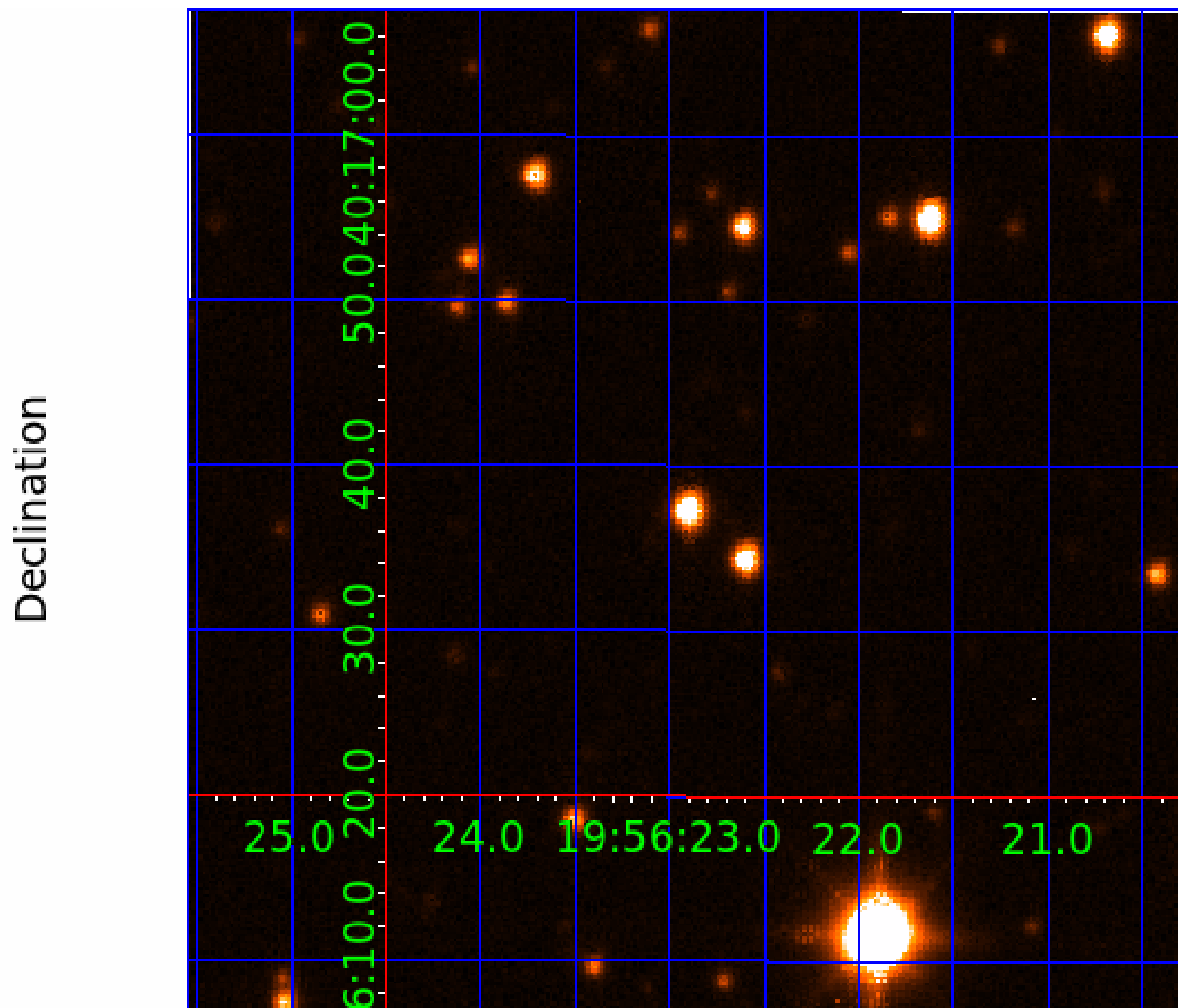




white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image



# KIC 005130023

## Q1-17 DR25 TCE Parameters

TCE	Run Type	KOI?	Period (Days)	Epoch (BKJD)	Depth (ppm)	Duration (Hours)	MES	SNR	$R_{\star}$ ( $R_{\odot}$ )	$T_{\star}$ (K)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
005130023-01	OBS	No	3.186113	133.894623	38.2	13.329	8.0	6.3	0.85	5476	0.56	388.74
005130023-02	OBS	No	155.378502	233.732349	425.2	16.013	21.0	7.1	0.85	5476	1.81	2.18
005130023-03	OBS	No	535.544266	285.297649	498.3	6.531	8.3	6.5	0.85	5476	2.08	0.42
005130023-04	OBS	No	270.709339	377.898817	490.8	4.800	7.4	7.6	0.85	5476	2.37	1.04

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
005130023-01	OBS	FP	0.00	1	0	1	0	LPP_DV—CENT_RESOLVED_OFFSET
005130023-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_MARSHALL—TRANS_GAPPED—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS
005130023-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_CHASES_MARSHALL—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS
005130023-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_MARSHALL_SKYE—ALL_TRANS_CHASES—MOD_NONUNIQ_ALT—CENT_FEW_DIFFS

**Notes:** OBS = Observed. INJ = Injected. INV = Inverted. SCR = Scrambled.

N = Not Transit-Like. S = Stellar Eclipse. C = Centroid Offset. E = Ephemeris Match.

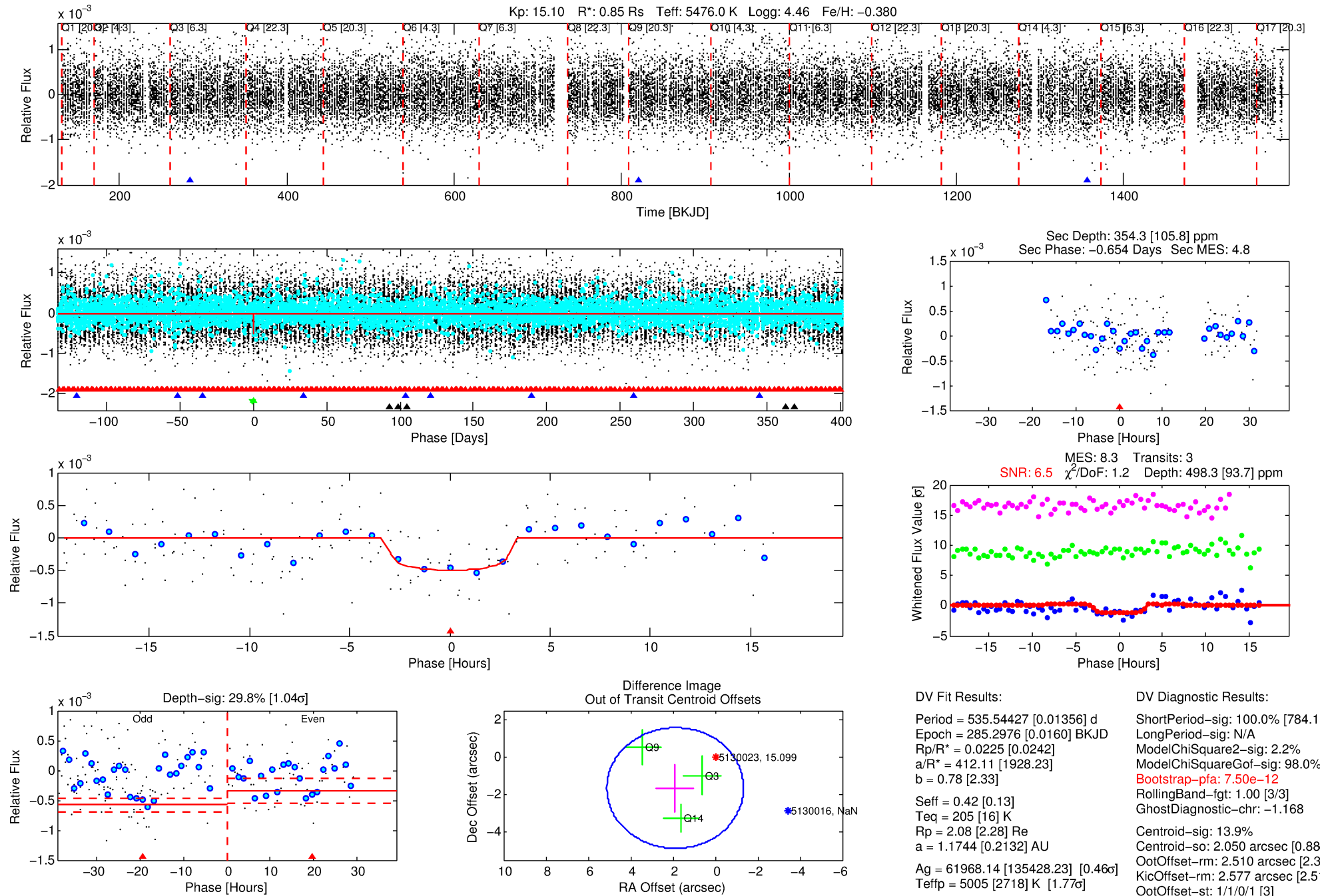
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 005130023-03

No Significant Match Found

# DV One-Page Summary

KIC: 5130023 Candidate: 3 of 4 Period: 535.544 d



## DV Fit Results:

Period = 535.54427 [0.01356] d  
Epoch = 285.2976 [0.0160] BKJD  
Rp/R\* = 0.0225 [0.0242]  
a/R\* = 412.11 [1928.23]  
b = 0.78 [2.33]  
Seff = 0.42 [0.13]  
Teq = 205 [16] K  
Rp = 2.08 [2.28] Re  
a = 1.1744 [0.2132] AU  
Ag = 61968.14 [135428.23] [0.46 $\sigma$ ]  
Teff = 5005 [2718] K [1.77 $\sigma$ ]

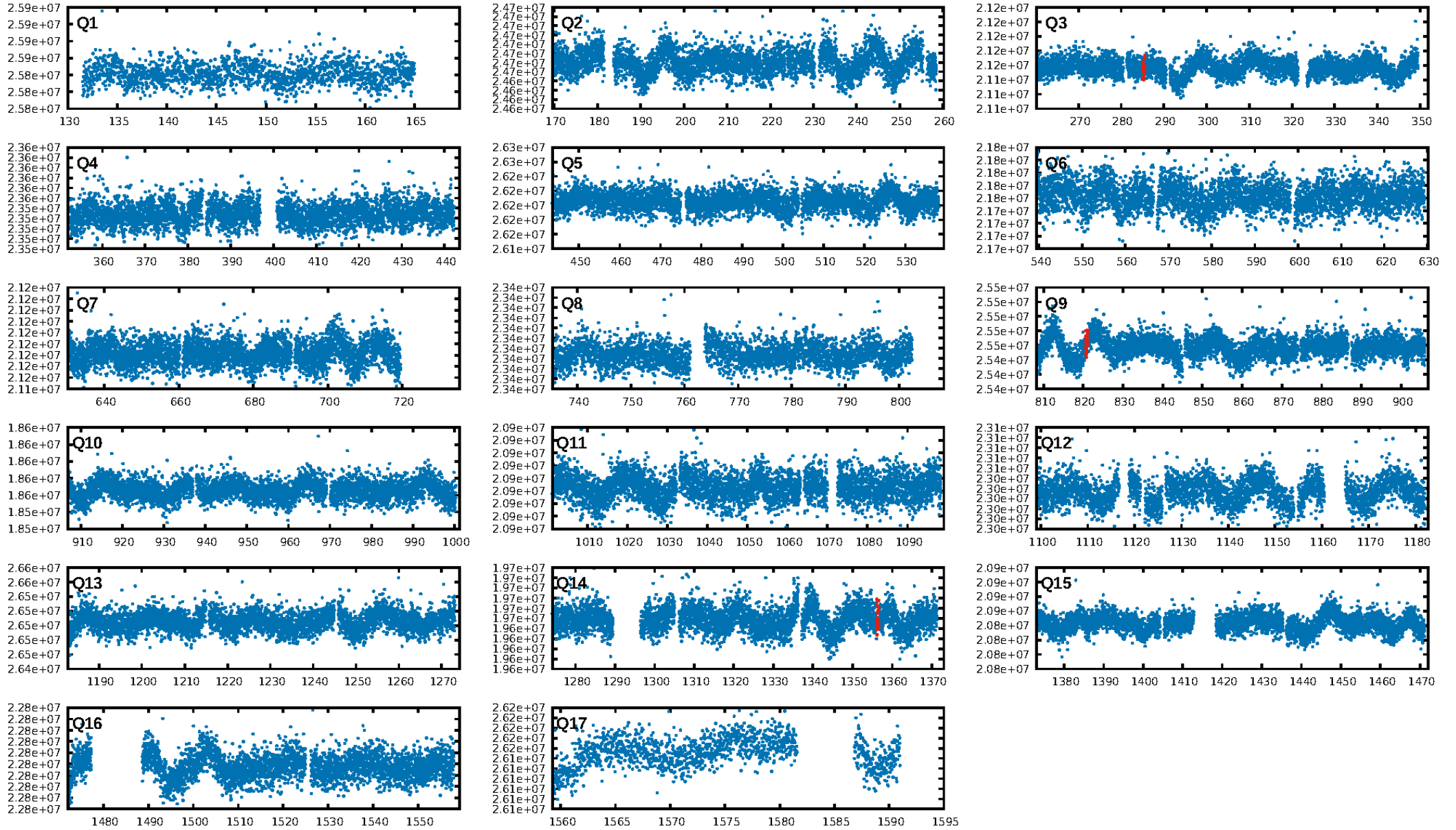
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [784.15 $\sigma$ ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: 2.2%  
ModelChiSquareGof-sig: 98.0%  
**Bootstrap-pfa: 7.50e-12**  
RollingBand-fgt: 1.00 [3/3]  
GhostDiagnostic-chr: -1.168  
Centroid-sig: 13.9%  
Centroid-so: 2.050 arcsec [0.88 $\sigma$ ]  
OotOffset-rm: 2.510 arcsec [2.33 $\sigma$ ]  
KicOffset-rm: 2.577 arcsec [2.51 $\sigma$ ]  
OotOffset-st: 1/1/0/1 [3]  
KicOffset-st: 1/1/0/1 [3]  
DiffImageQuality-fgm: 0.33 [1/3]  
DiffImageOverlap-fno: 1.00 [3/3]

Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 29-Jan-2016 16:38:16 Z

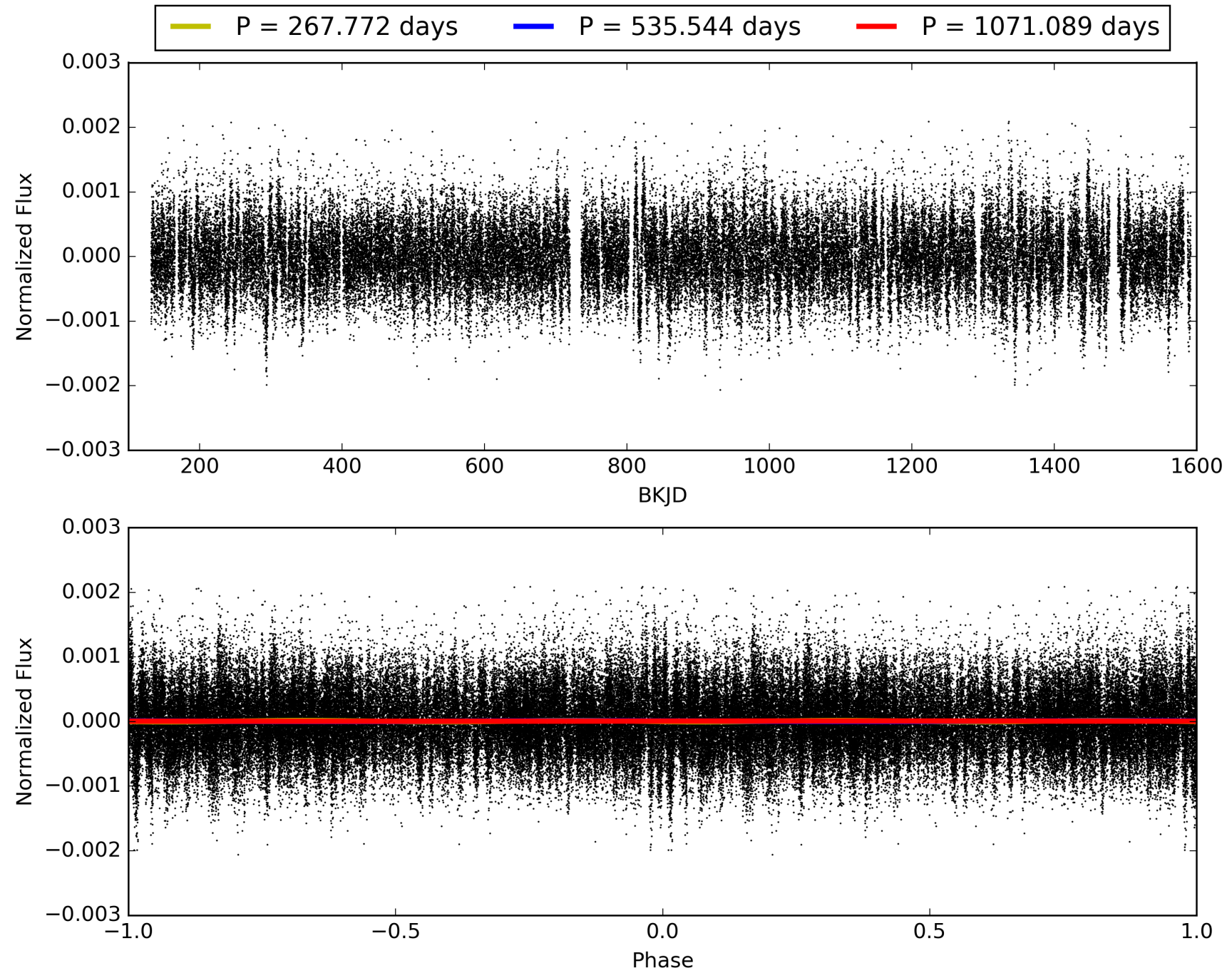
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

# TCE 005130023-03, PDC Light Curves



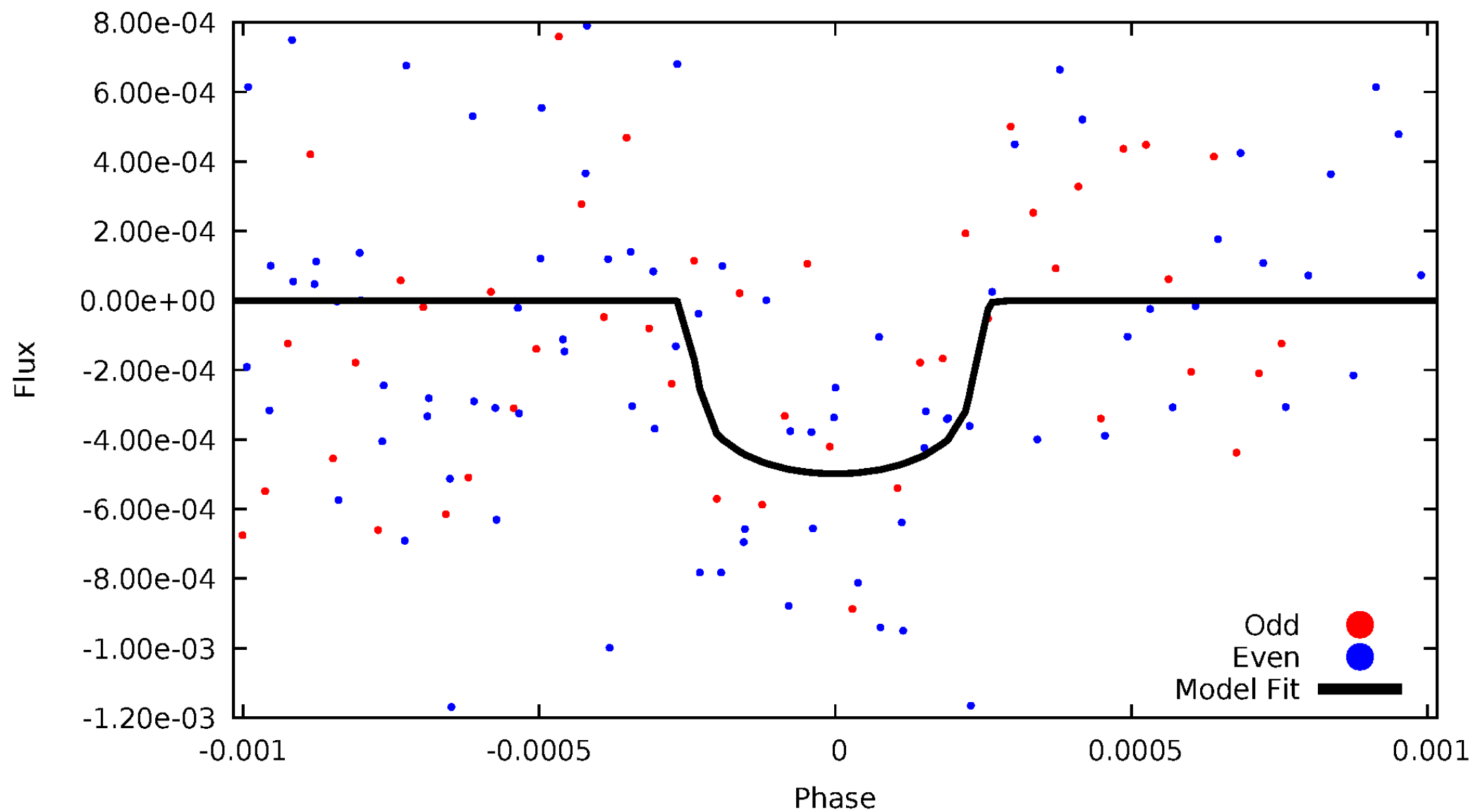


TCE 005130023-03



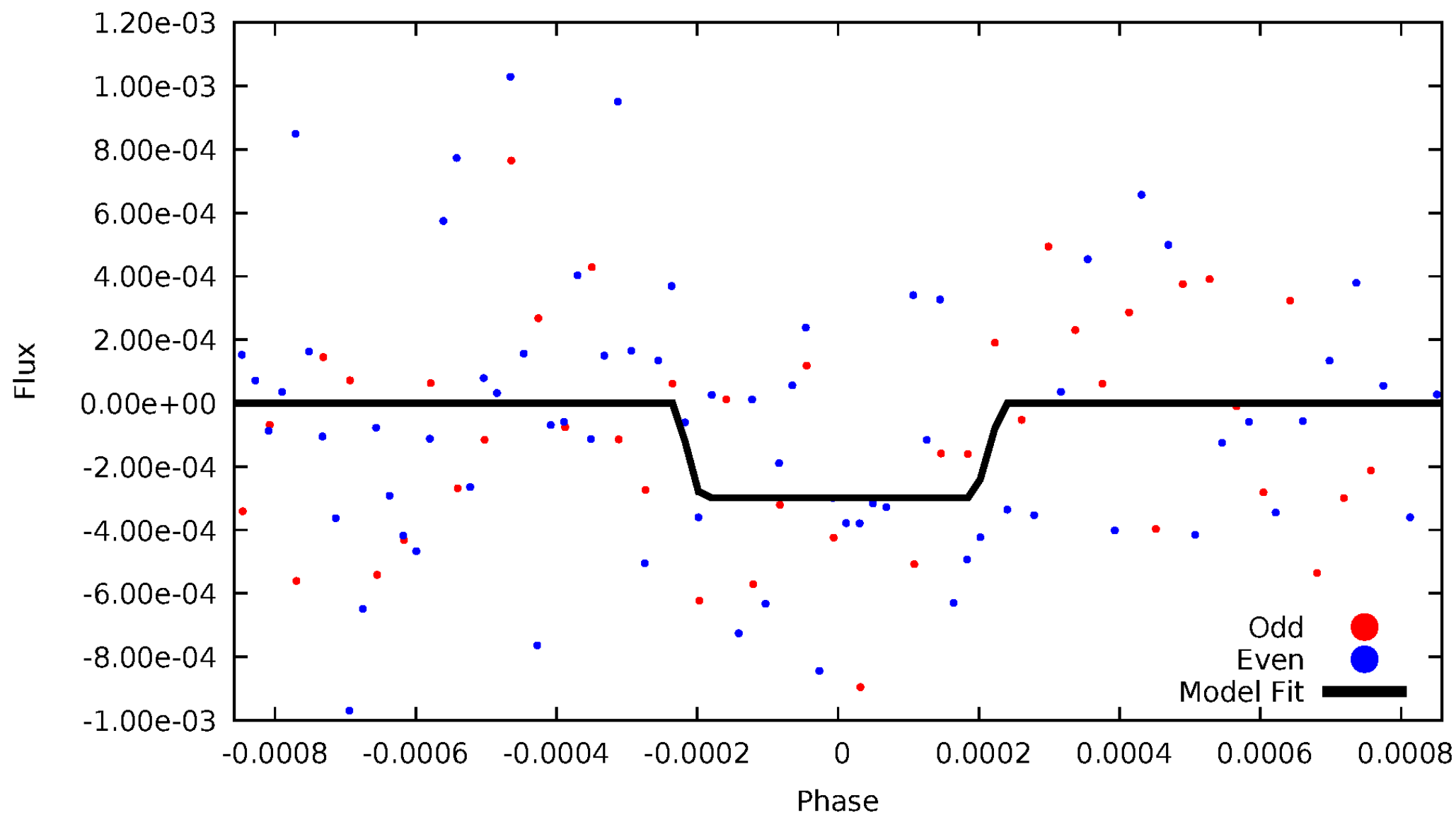
# DV Odd/Even

TCE 005130023-03



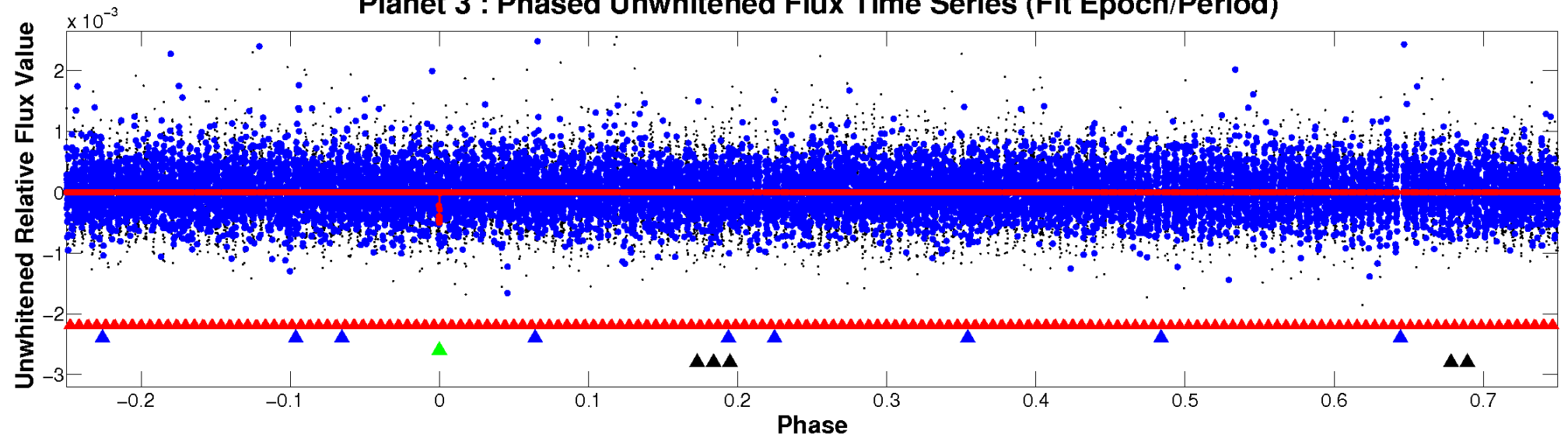
# ALT Odd/Even

TCE 005130023-03

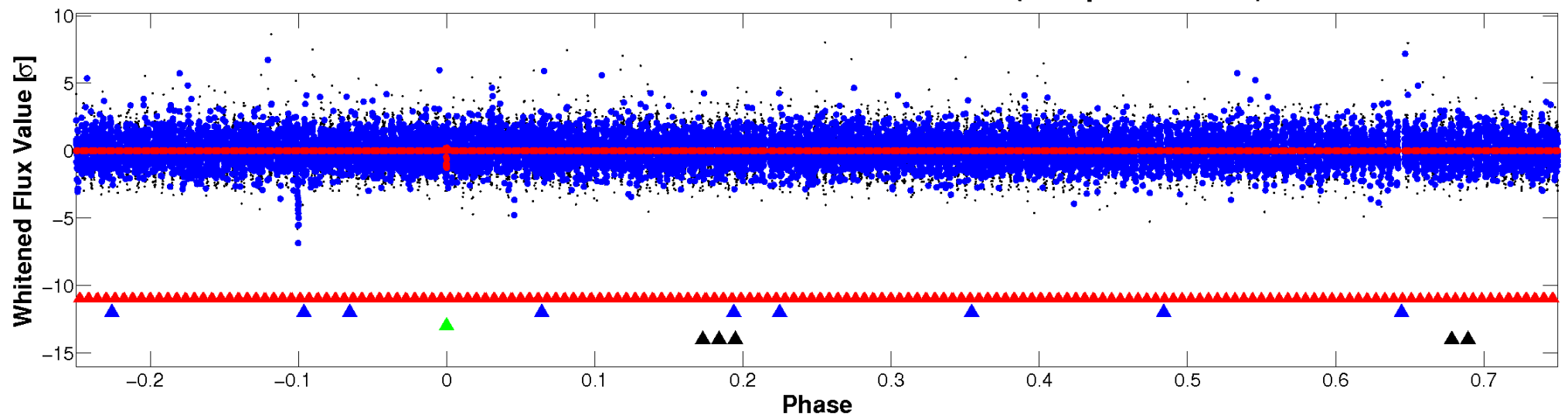


# Non-Whitened Vs. Whitened Light Curve

Planet 3 : Phased Unwhitened Flux Time Series (Fit Epoch/Period)

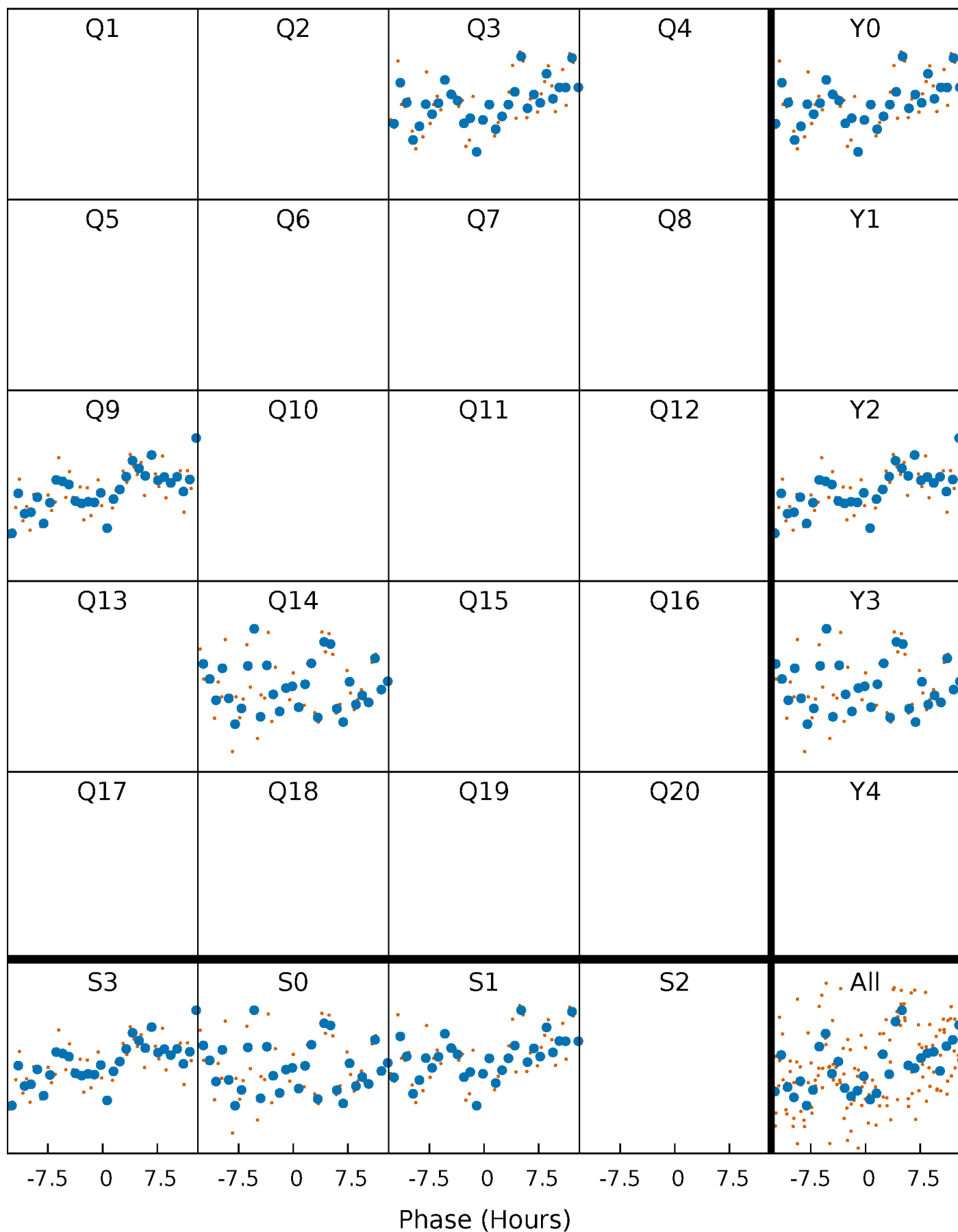


Planet 3 : Phased Whitened Flux Time Series (Fit Epoch/Period)



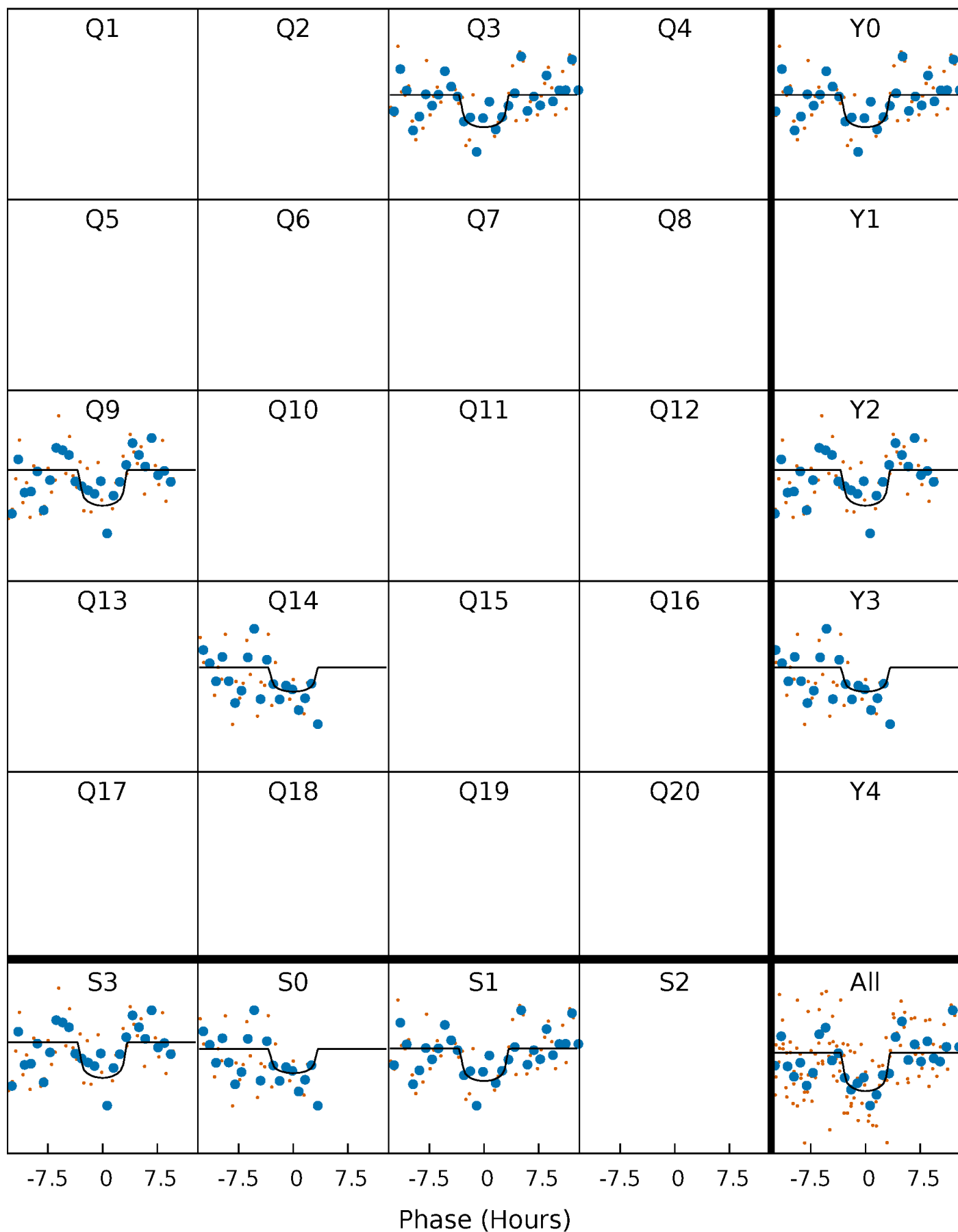
# PDC Quarter-Phased Transit Curves

TCE 005130023-03 P=535.544266 Days  $T_0=285.297649$  (BKJD)



# DV Quarter-Phased Transit Curves

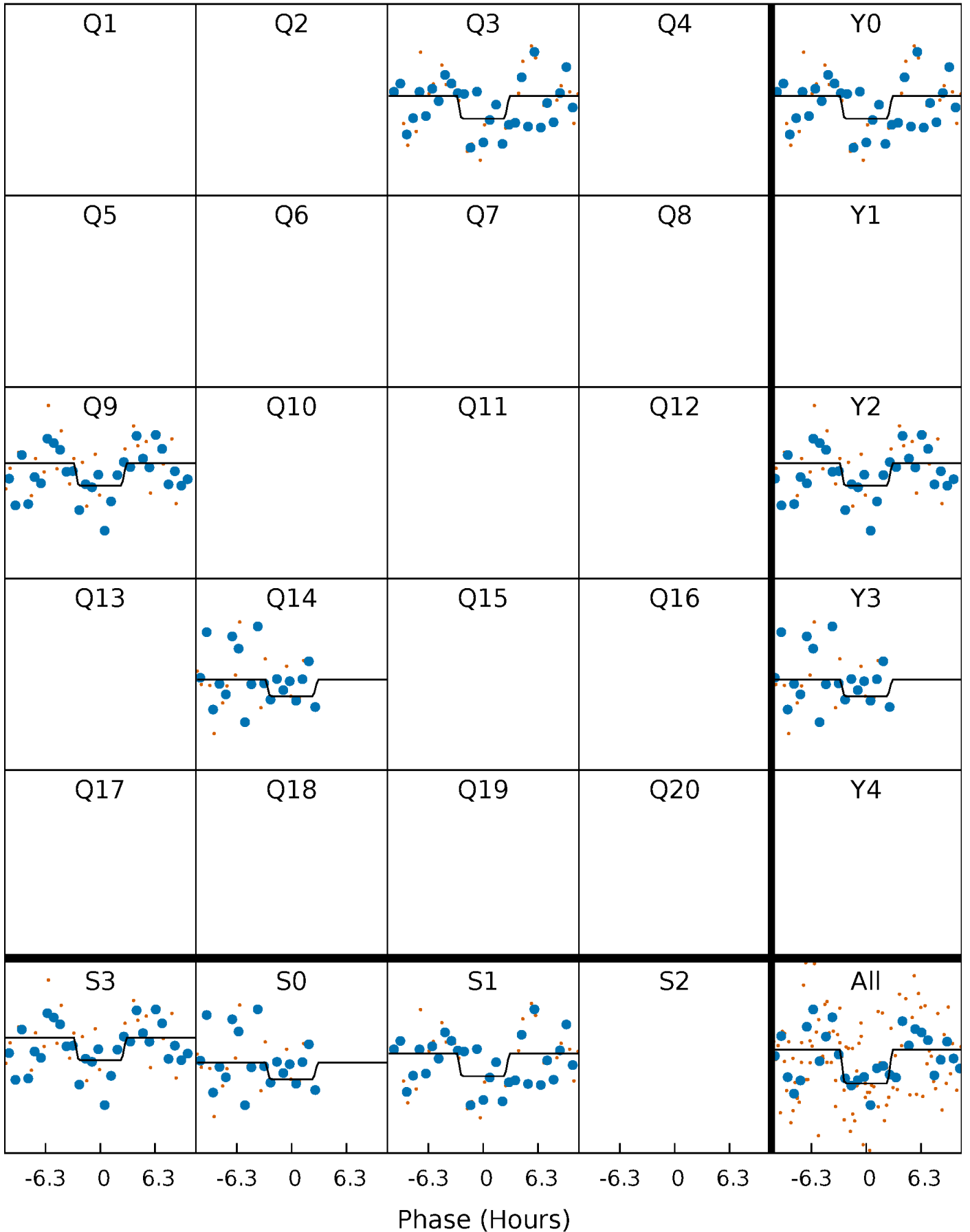
TCE 005130023-03 P=535.544266 Days  $T_0=285.297649$  (BKJD)





# Alt. Detrend Quarter-Phased Transit Curves

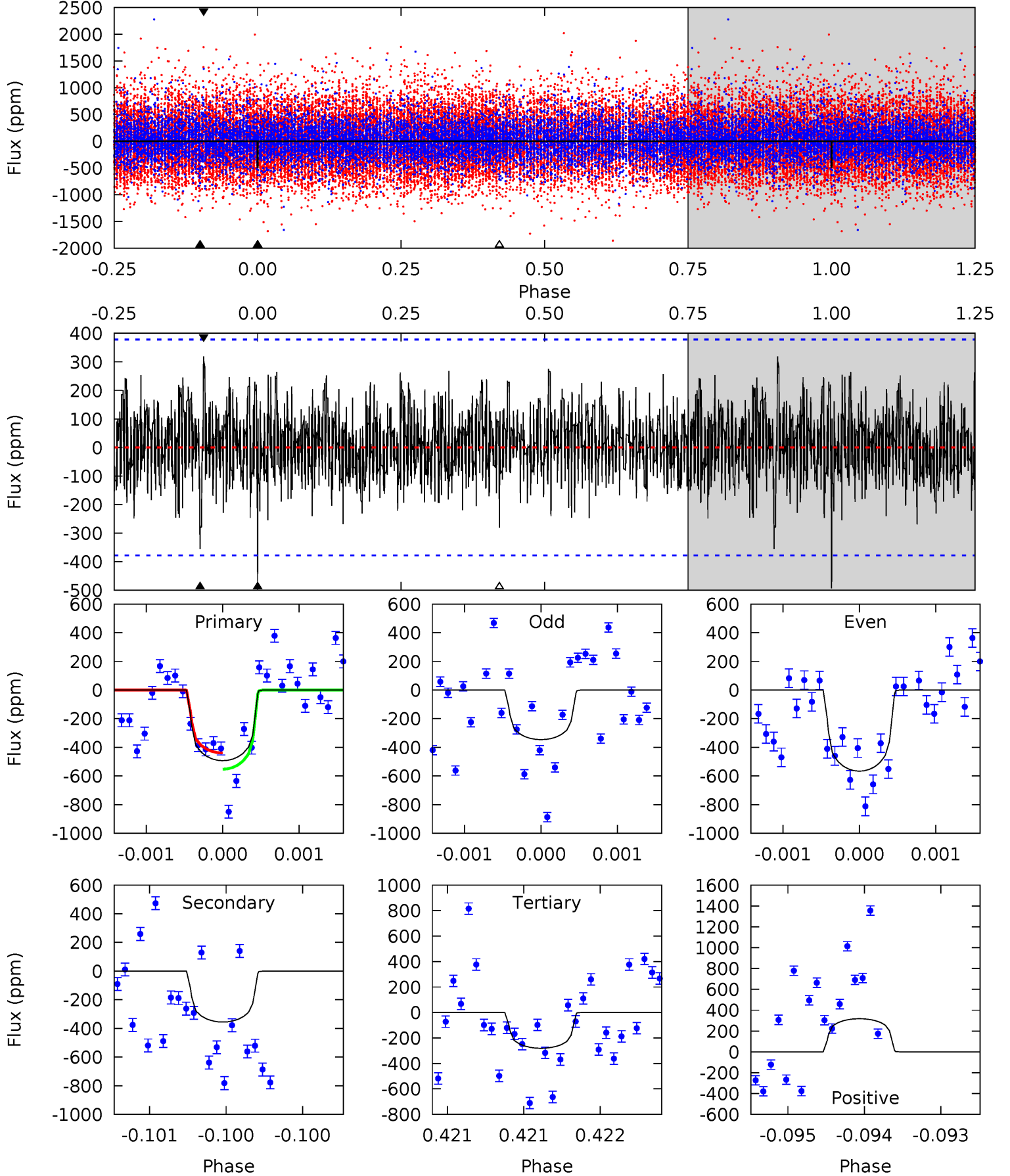
TCE 005130023-03 P=535.570419 Days  $T_0=285.269973$  (BKJD)



# DV Model-Shift Uniqueness Test

005130023-03, P = 535.544266 Days, E = 285.297649 Days

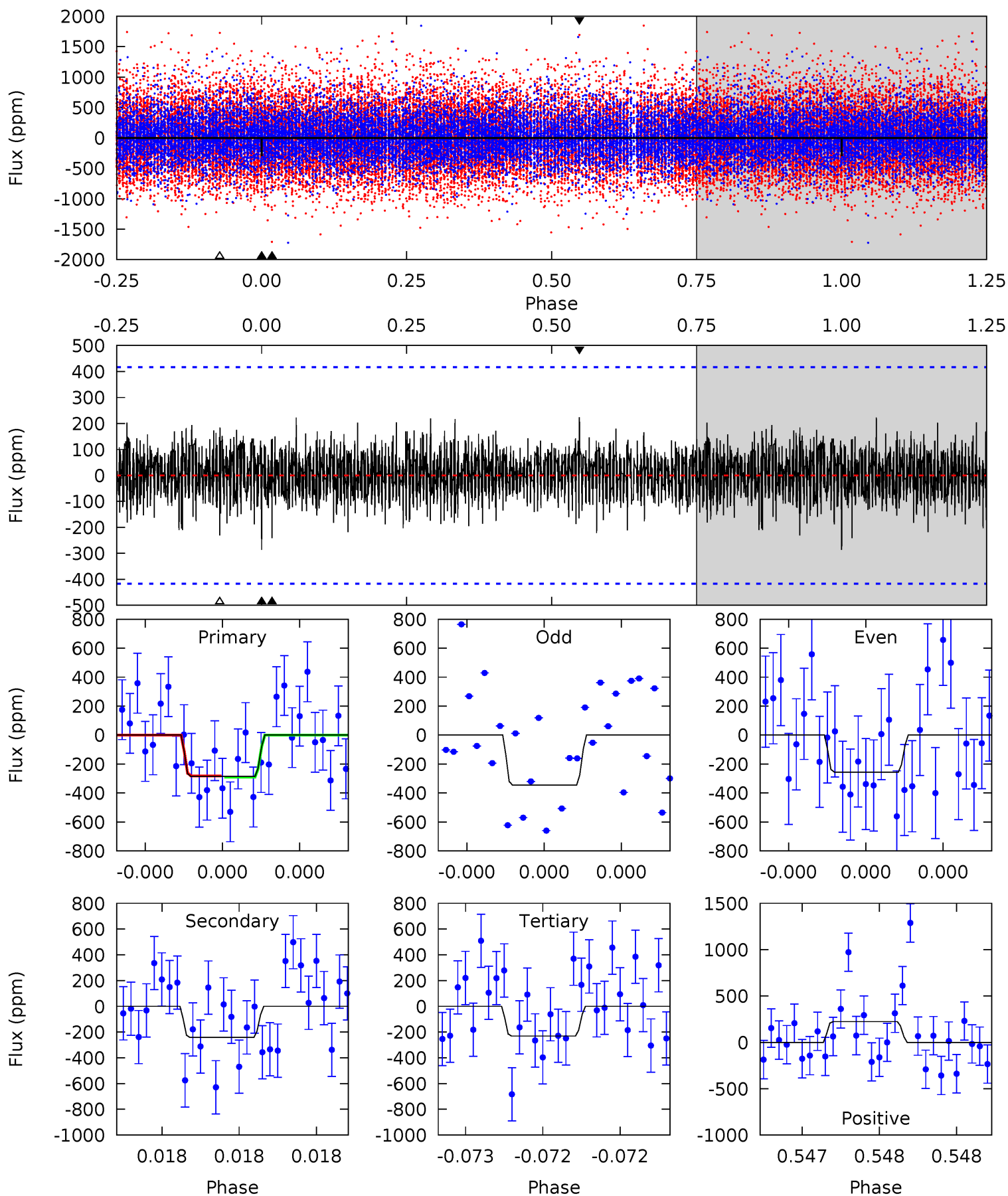
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
7.25	5.23	4.13	4.68	5.55	3.45	1.24	3.12	2.57	1.10	0.55	1.53	1.02	0.39	0.83



# Alt Model-Shift Uniqueness Test

005130023-03, P = 535.570419 Days, E = 285.269973 Days

Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
3.84	3.24	3.10	3.00	5.60	3.52	0.81	0.74	0.84	0.14	0.24	0.59	0.83	0.44	0.06



### Stellar Parameters For KIC 005130023

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R$ ( $R_{\odot}$ )	$M(M_{\odot})$	$p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ )
	$5476^{+191}_{-172}$	$4.459^{+0.126}_{-0.154}$	$-0.380^{+0.350}_{-0.300}$	$0.847^{+0.175}_{-0.116}$	$0.753^{+0.123}_{-0.053}$	$1.745^{+1.069}_{-0.709}$
	+3%/-3%	+3%/-3%	+92%/-79%	+21%/-14%	+16%/-7%	+61%/-41%
Source	PHO1	KIC0	KIC0	DSEP		

KIC = Kepler Input Catalog; PHO = Photometry; SPE = Spectroscopy; AST = Asteroseismology  
 TRA = Transits; DESP = Dartmouth Models; MULT = Multiple Models

### Secondary Eclipse Parameters for KIC 005130023-03 / KOI

Detrend	Depth (ppm)	$R_p$ ( $R_{\oplus}$ )	$T_{\text{max}}$ (K)	$T_{\text{obs}}$ (K)	$A_{\text{obs}}$
DV	$-356 \pm 68$	$2.60^{+2.18}_{-1.68}$	$289^{+17}_{-15}$	$4628^{+3084}_{-885}$	$39200^{+282185}_{-27463}$
Alt.	$-242 \pm 74$	$2.30^{+1.99}_{-1.53}$	$287^{+20}_{-16}$	$4558^{+2947}_{-971}$	$34830^{+273377}_{-25126}$

$T_{\text{max}}$  = Theoretical Maximum Planetary Temperature

$T_{\text{obs}}$  = Observed Planetary Temperature (Assuming  $A=0.3$ )

$A_{\text{obs}}$  = Observed Albedo (Assuming  $T=0$ )

If a secondary eclipse is present, the system is likely an EB if  $T_{\text{obs}} \gg T_{\text{max}}$  AND  $A_{\text{obs}} \gg 1.0$

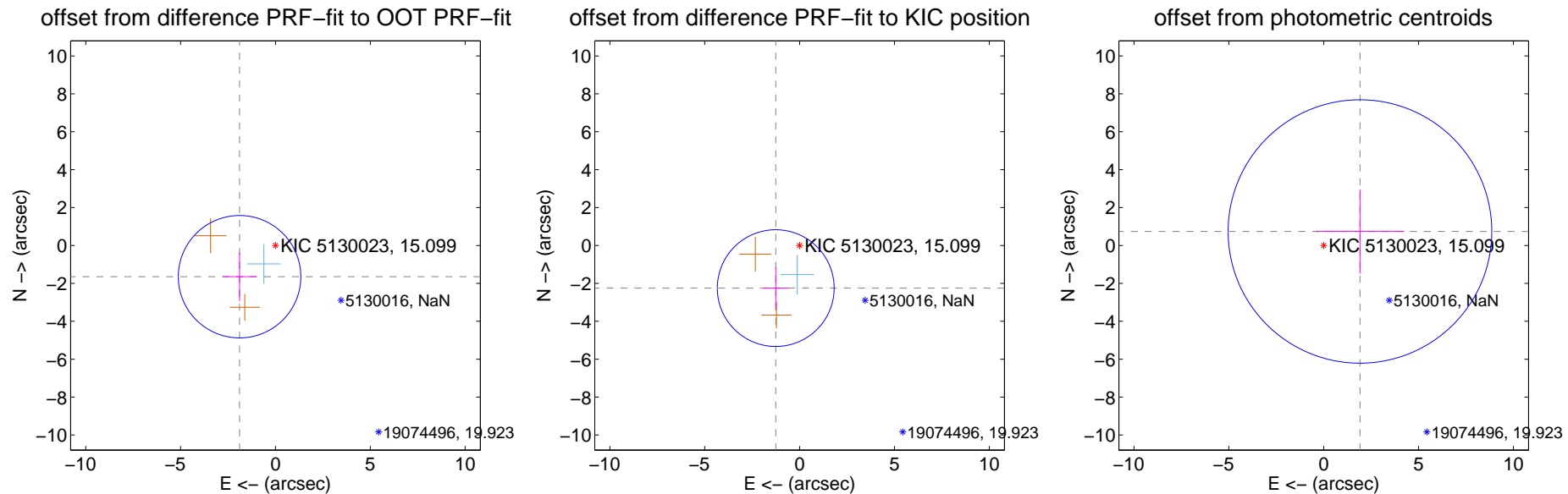
## DV Centroid Data

Supplemental centroid analysis for 005130023-03. Kepler magnitude: 15.10. Transit SNR 6.52

There are 1 quarters with good PRF difference image offsets

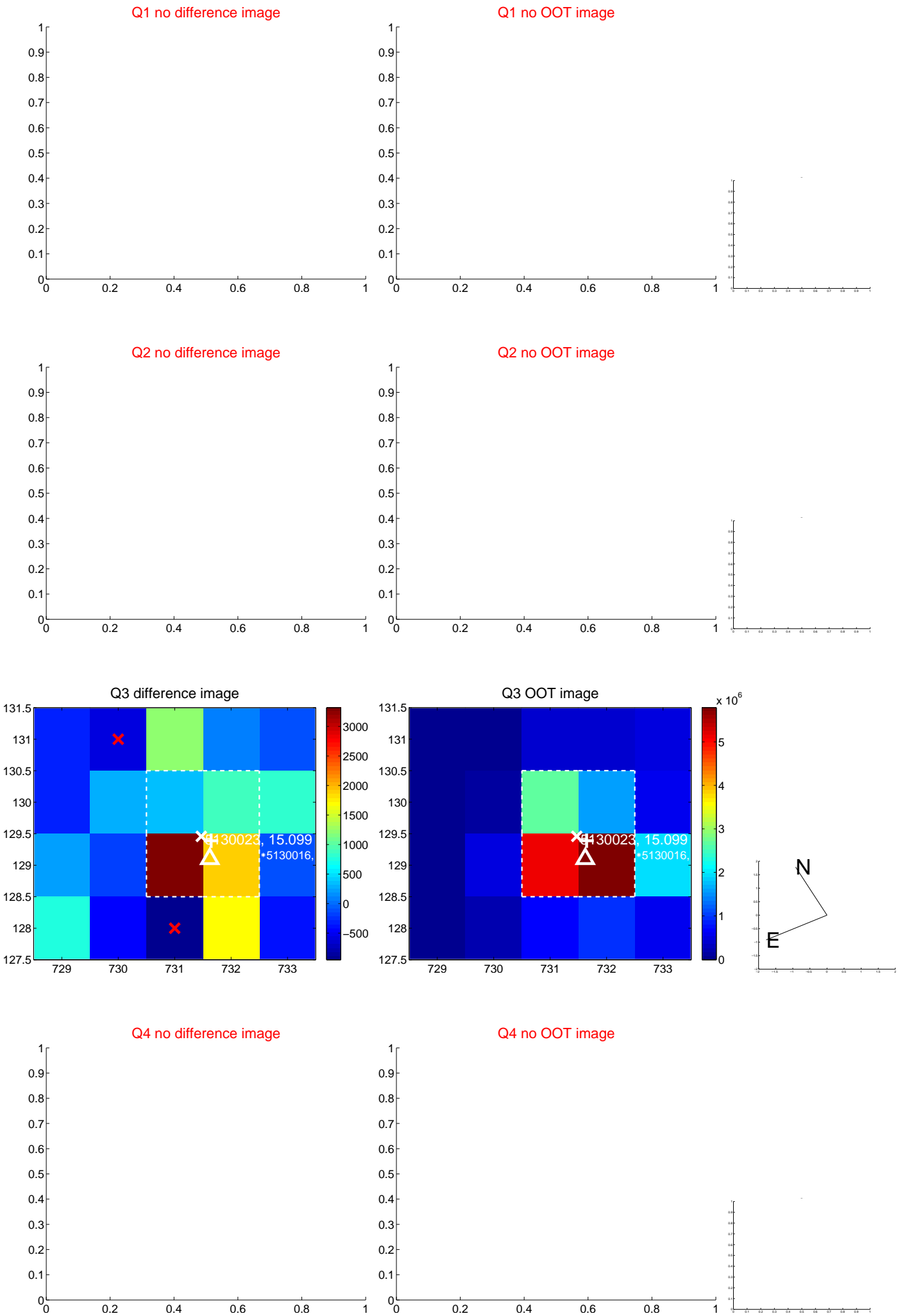
The direct PRF centroid is offset from the target star catalog position by about 0.57 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$2.510 \pm 1.076$	2.33	$1.893 \pm 0.892$	$-1.649 \pm 1.279$
PRF-fit source offset from KIC position	$2.577 \pm 1.027$	2.51	$1.256 \pm 0.674$	$-2.251 \pm 1.114$
photometric centroid source offset	$2.05 \pm 2.32$	0.88	$-1.91 \pm 2.33$	$0.74 \pm 2.22$



Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three- $\sigma$ . Red \*: target star. Blue \*: Other stars. Text next to a star gives its KIC ID and kepmag. KIC IDs > 15,000,000 are from the UKIRT catalog.

white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

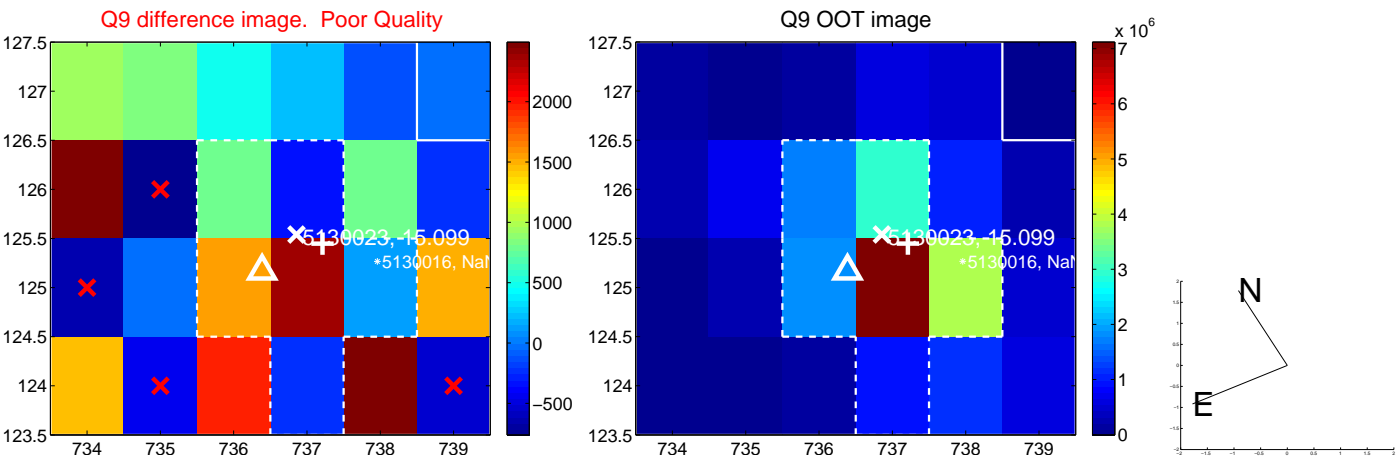




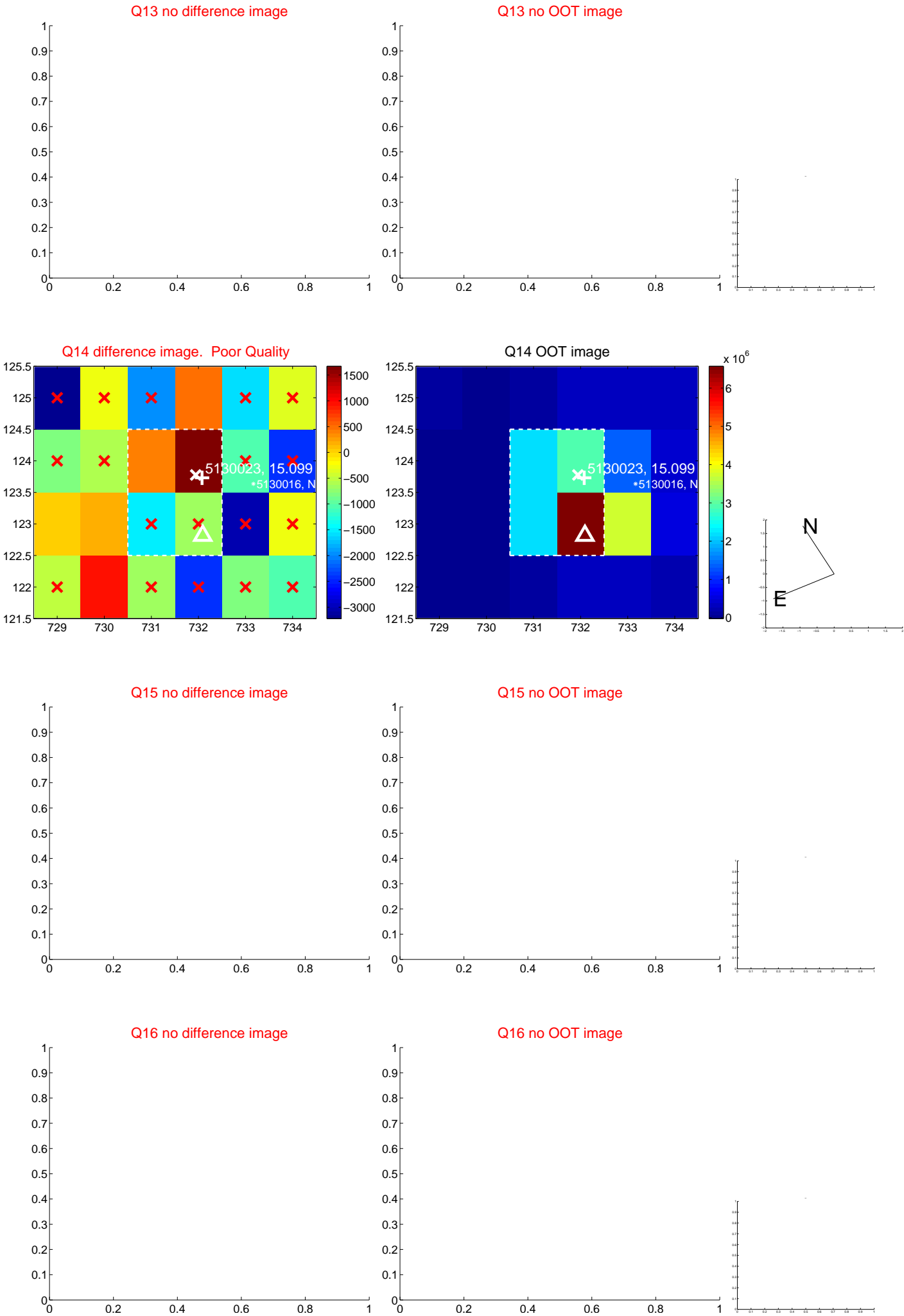
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



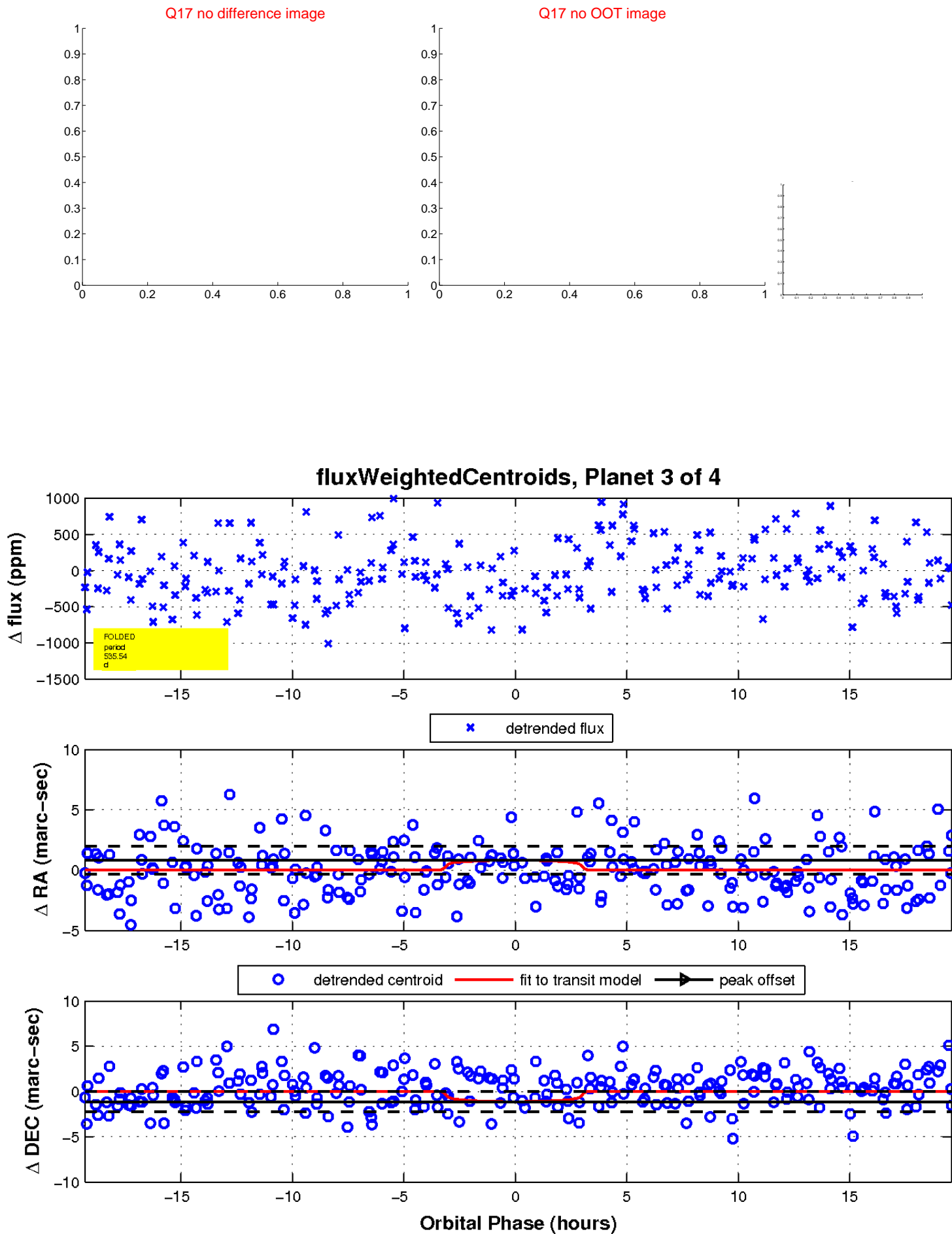
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



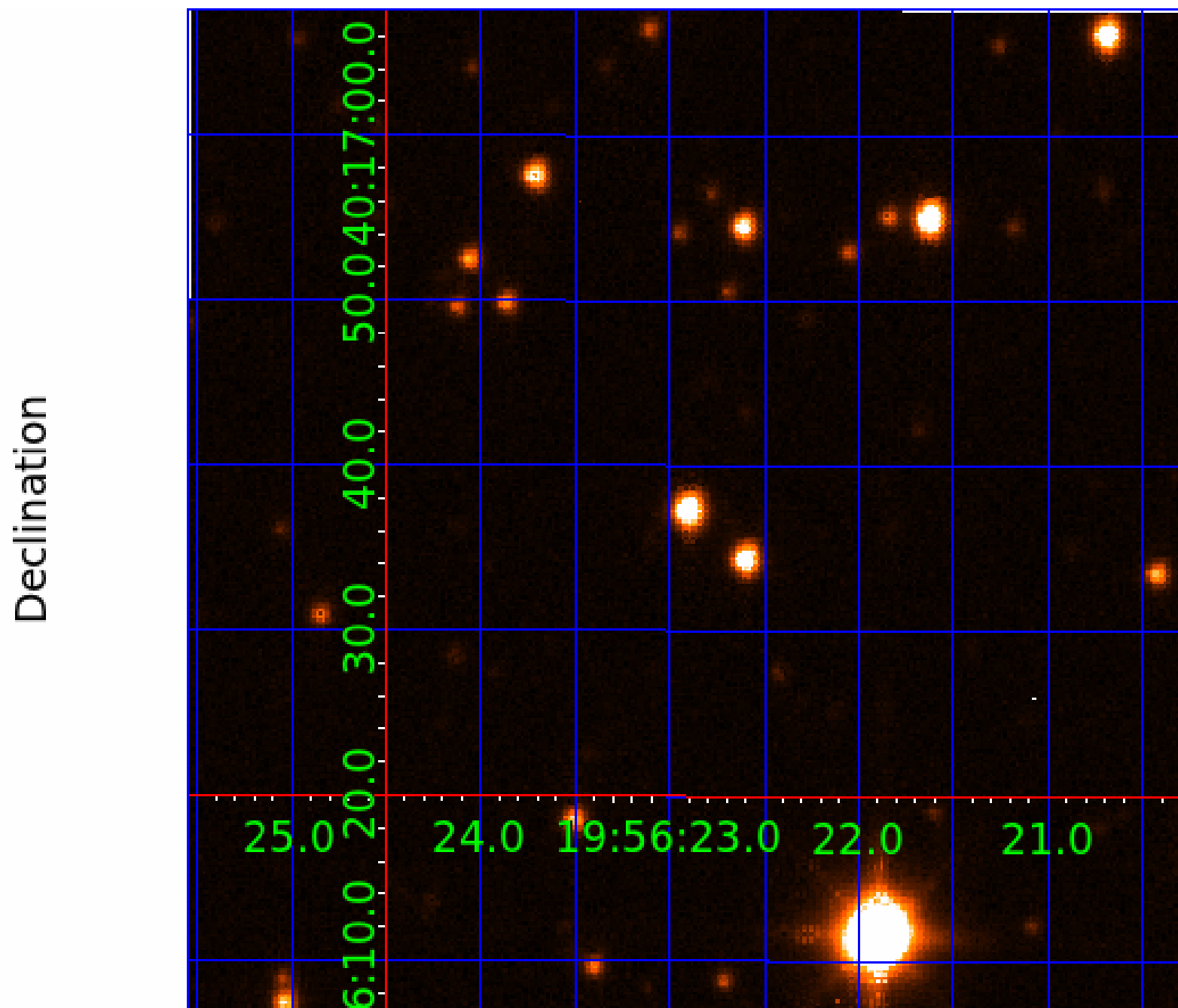
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image



# KIC 005130023

## Q1-17 DR25 TCE Parameters

TCE	Run Type	KOI?	Period (Days)	Epoch (BKJD)	Depth (ppm)	Duration (Hours)	MES	SNR	$R_{\star}$ ( $R_{\odot}$ )	$T_{\star}$ (K)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
005130023-01	OBS	No	3.186113	133.894623	38.2	13.329	8.0	6.3	0.85	5476	0.56	388.74
005130023-02	OBS	No	155.378502	233.732349	425.2	16.013	21.0	7.1	0.85	5476	1.81	2.18
005130023-03	OBS	No	535.544266	285.297649	498.3	6.531	8.3	6.5	0.85	5476	2.08	0.42
005130023-04	OBS	No	270.709339	377.898817	490.8	4.800	7.4	7.6	0.85	5476	2.37	1.04

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
005130023-01	OBS	FP	0.00	1	0	1	0	LPP_DV—CENT_RESOLVED_OFFSET
005130023-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_MARSHALL—TRANS_GAPPED—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS
005130023-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_CHASES_MARSHALL—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS
005130023-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_MARSHALL_SKYE—ALL_TRANS_CHASES—MOD_NONUNIQ_ALT—CENT_FEW_DIFFS

**Notes:** OBS = Observed. INJ = Injected. INV = Inverted. SCR = Scrambled.

N = Not Transit-Like. S = Stellar Eclipse. C = Centroid Offset. E = Ephemeris Match.

See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

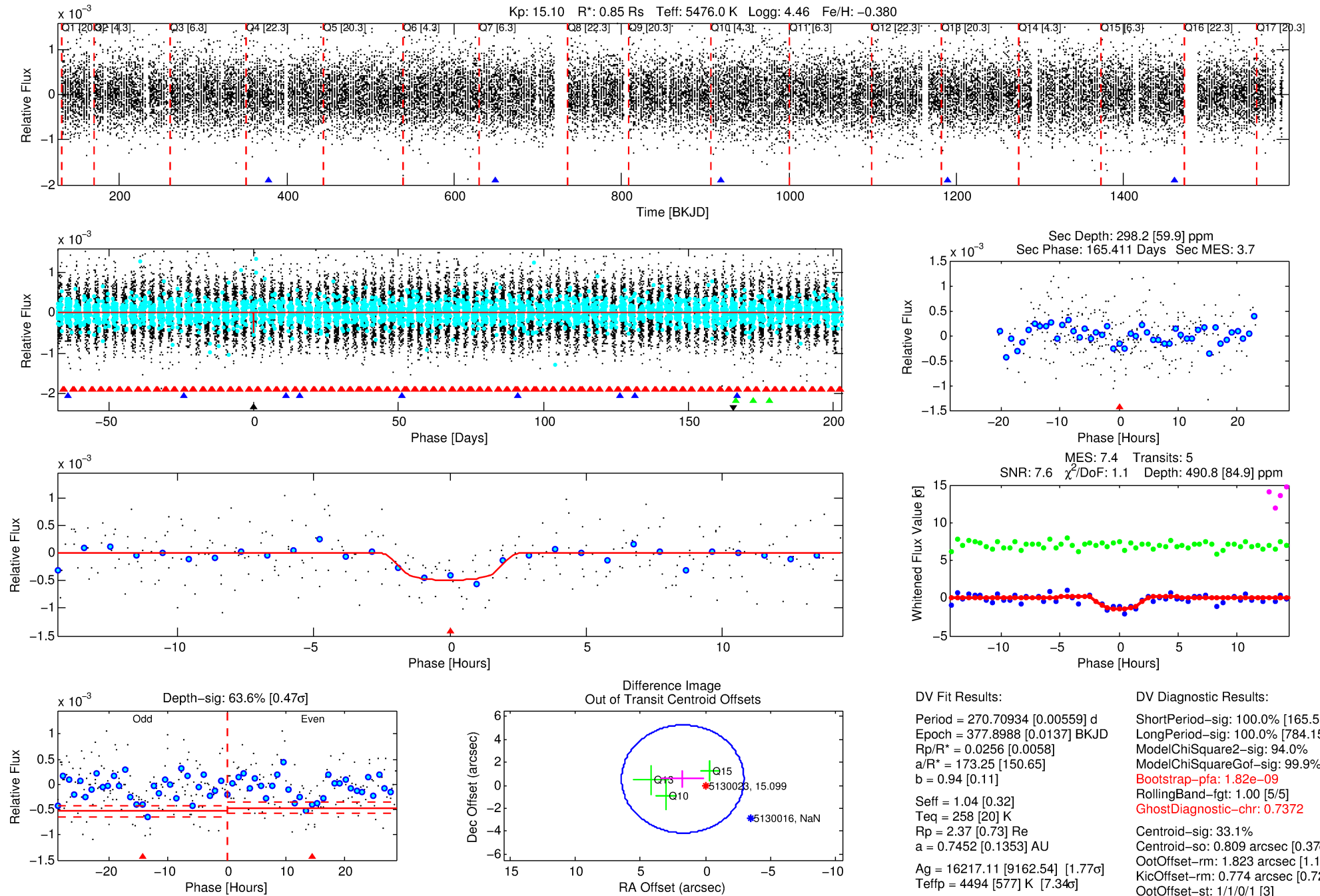
## Ephemeris Match Information For 005130023-04

No Significant Match Found



# DV One-Page Summary

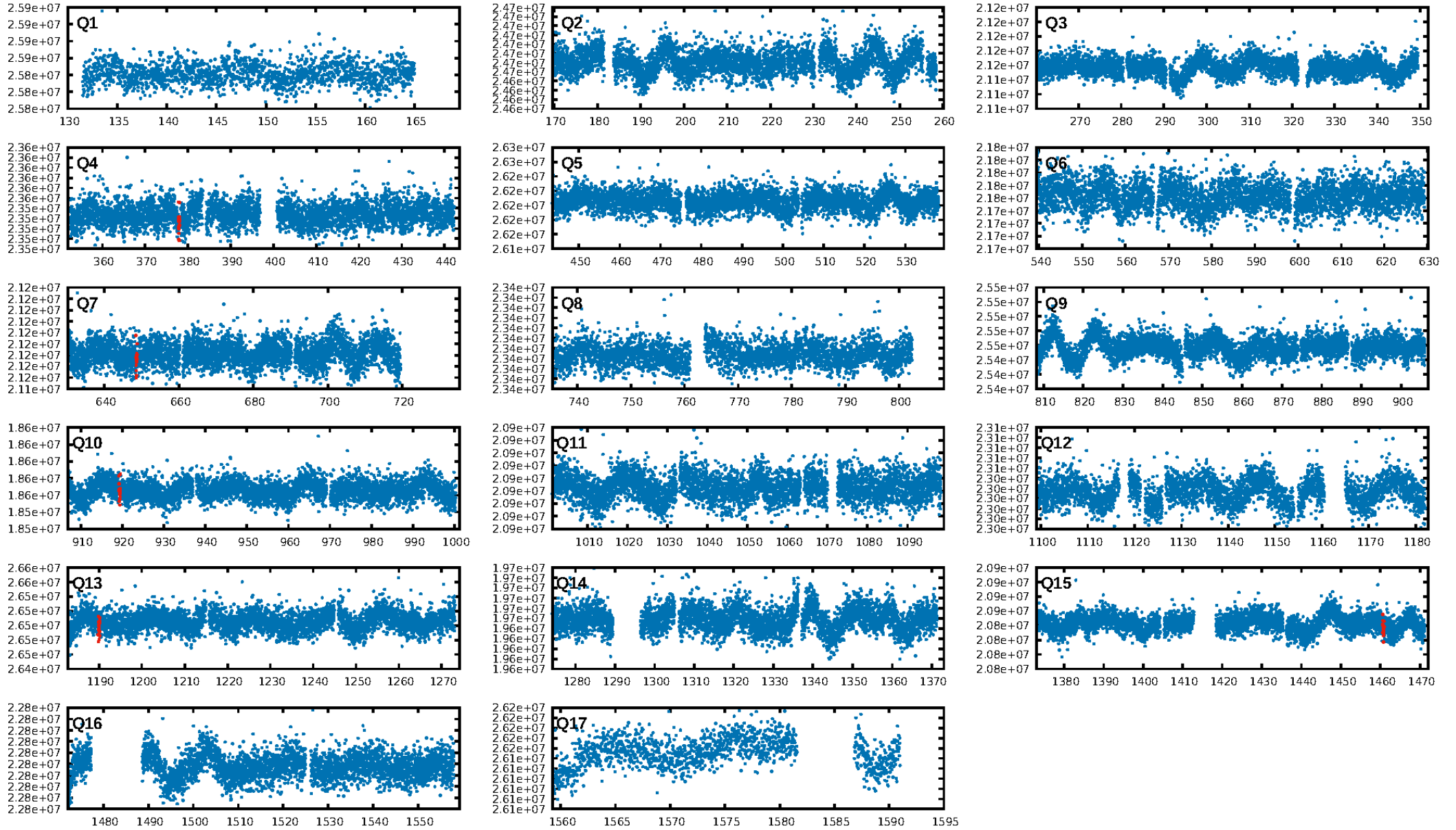
KIC: 5130023 Candidate: 4 of 4 Period: 270.709 d



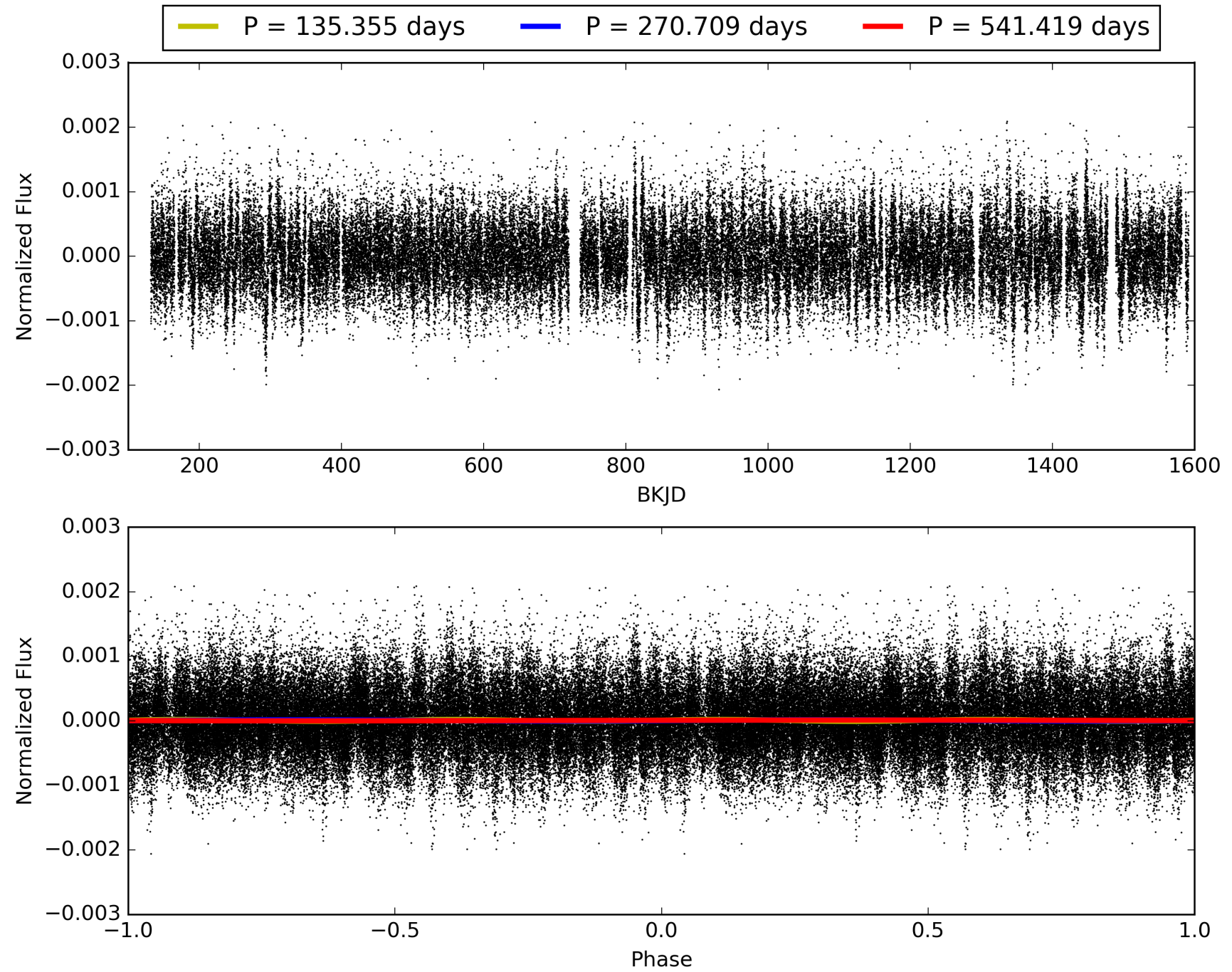
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 29-Jan-2016 16:38:23 Z

This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

# TCE 005130023-04, PDC Light Curves

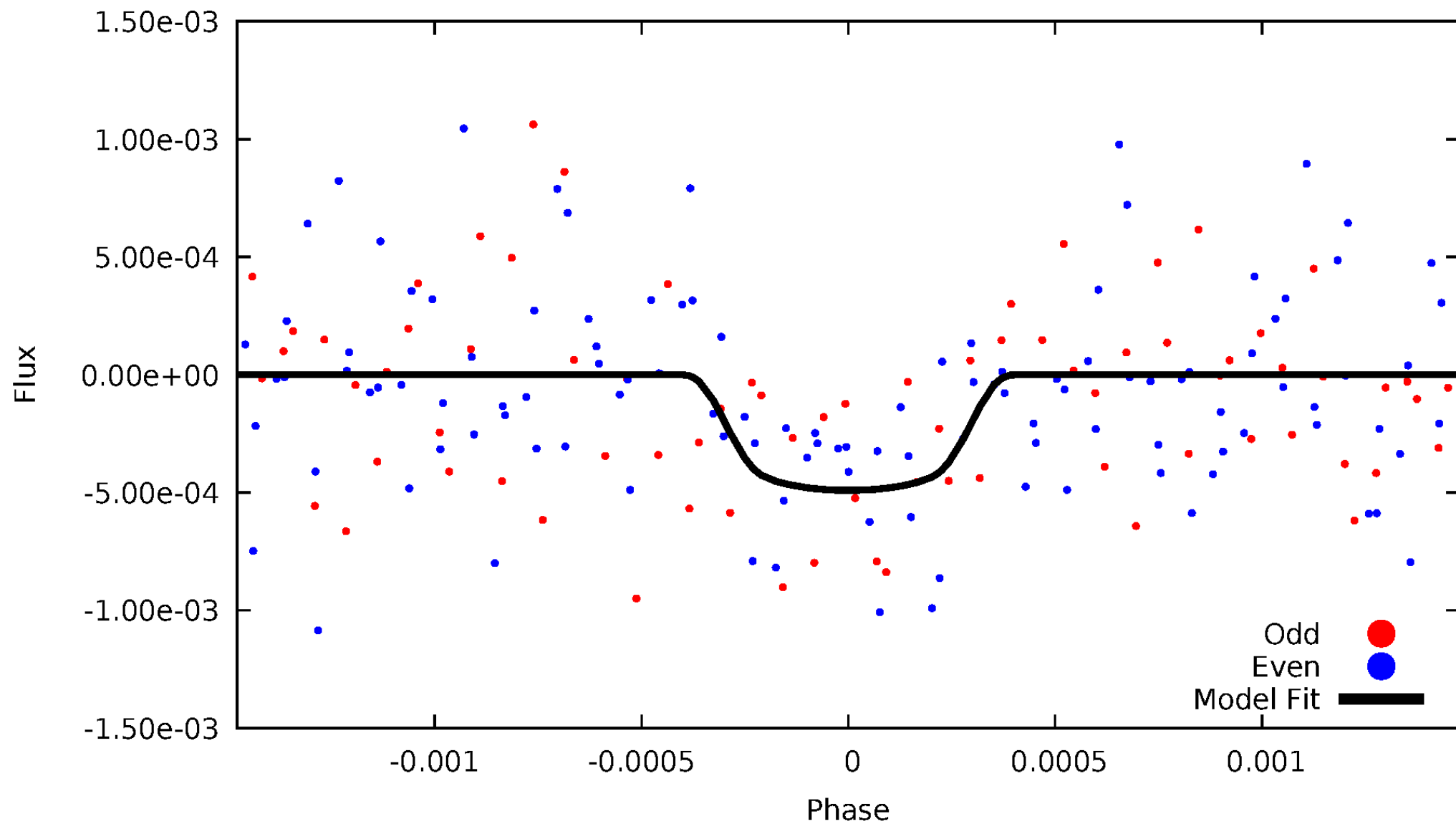


# TCE 005130023-04



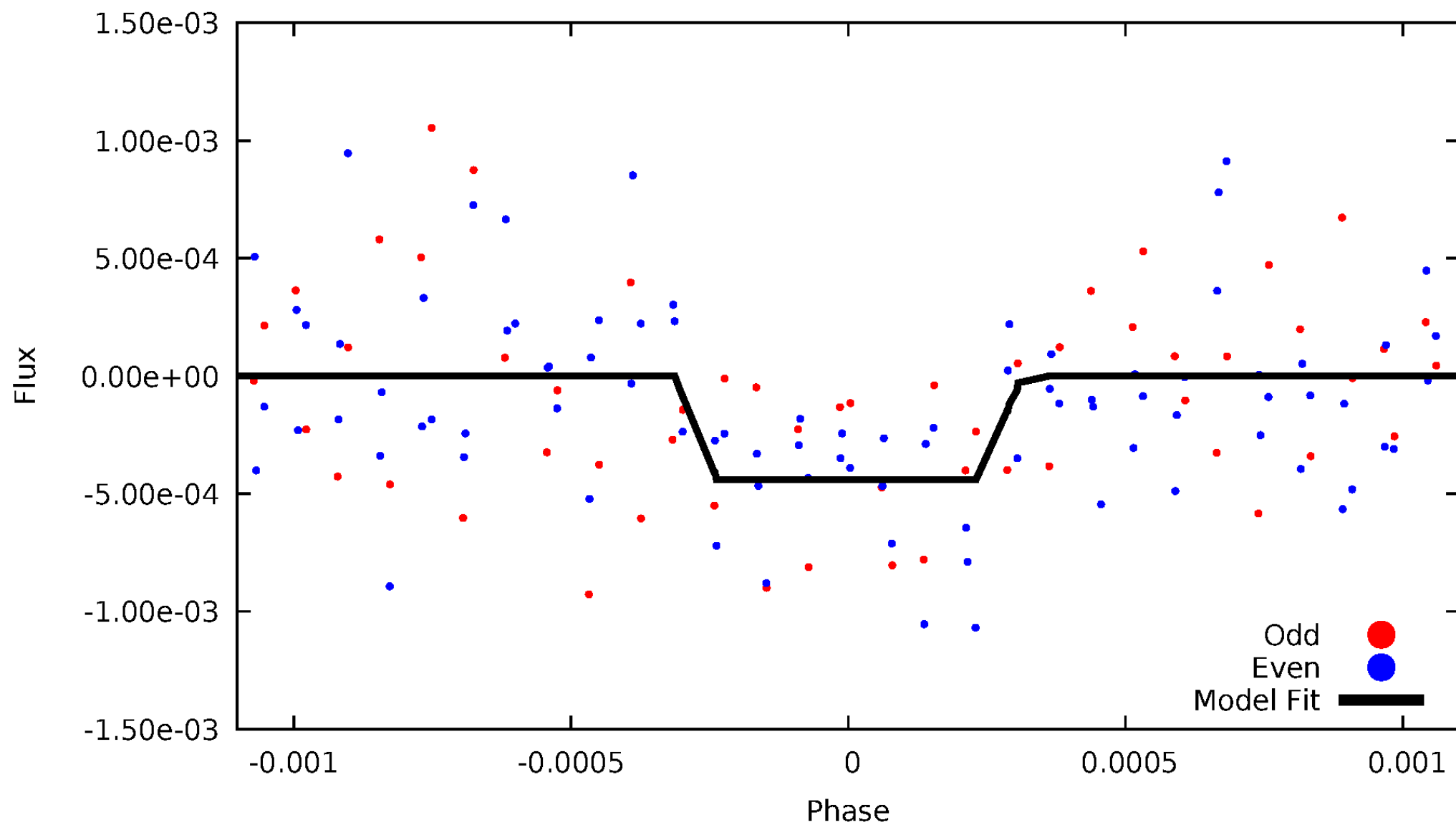
# DV Odd/Even

TCE 005130023-04



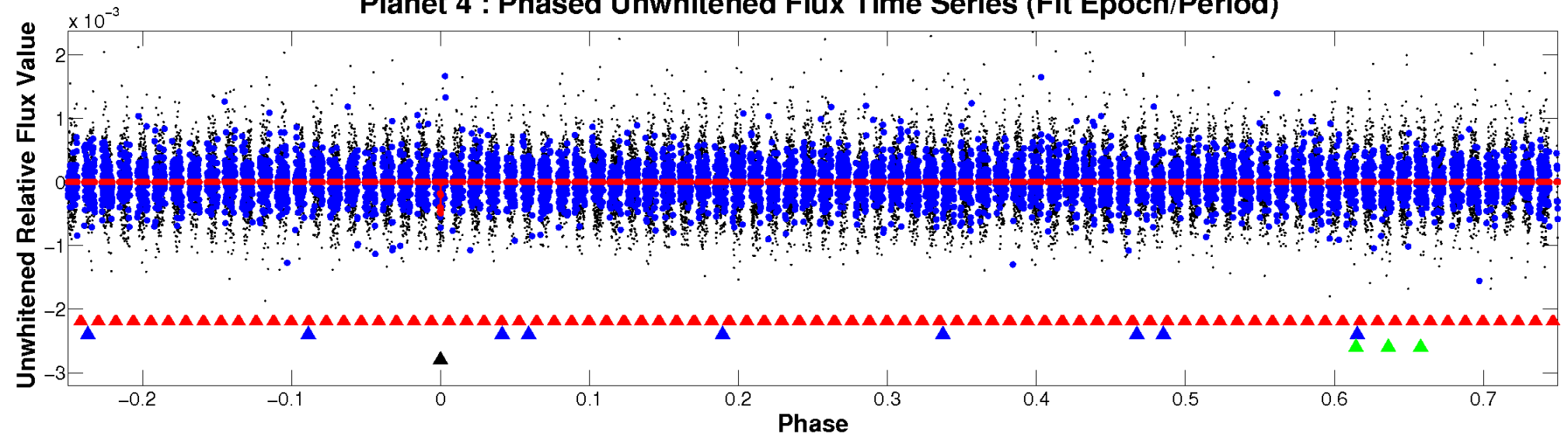
# ALT Odd/Even

TCE 005130023-04

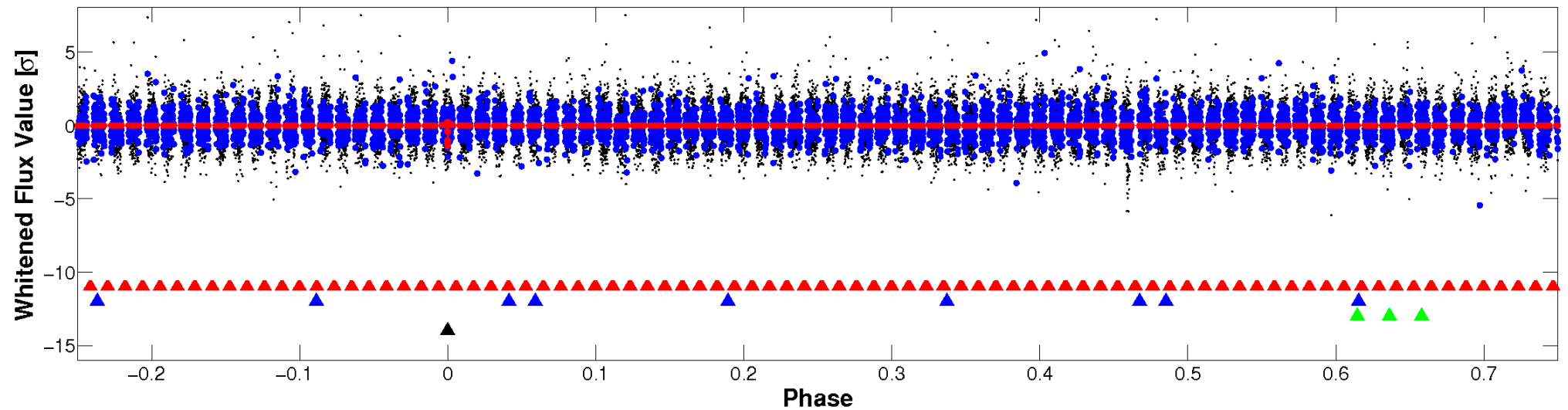


# Non-Whitened Vs. Whitened Light Curve

## Planet 4 : Phased Unwhitened Flux Time Series (Fit Epoch/Period)



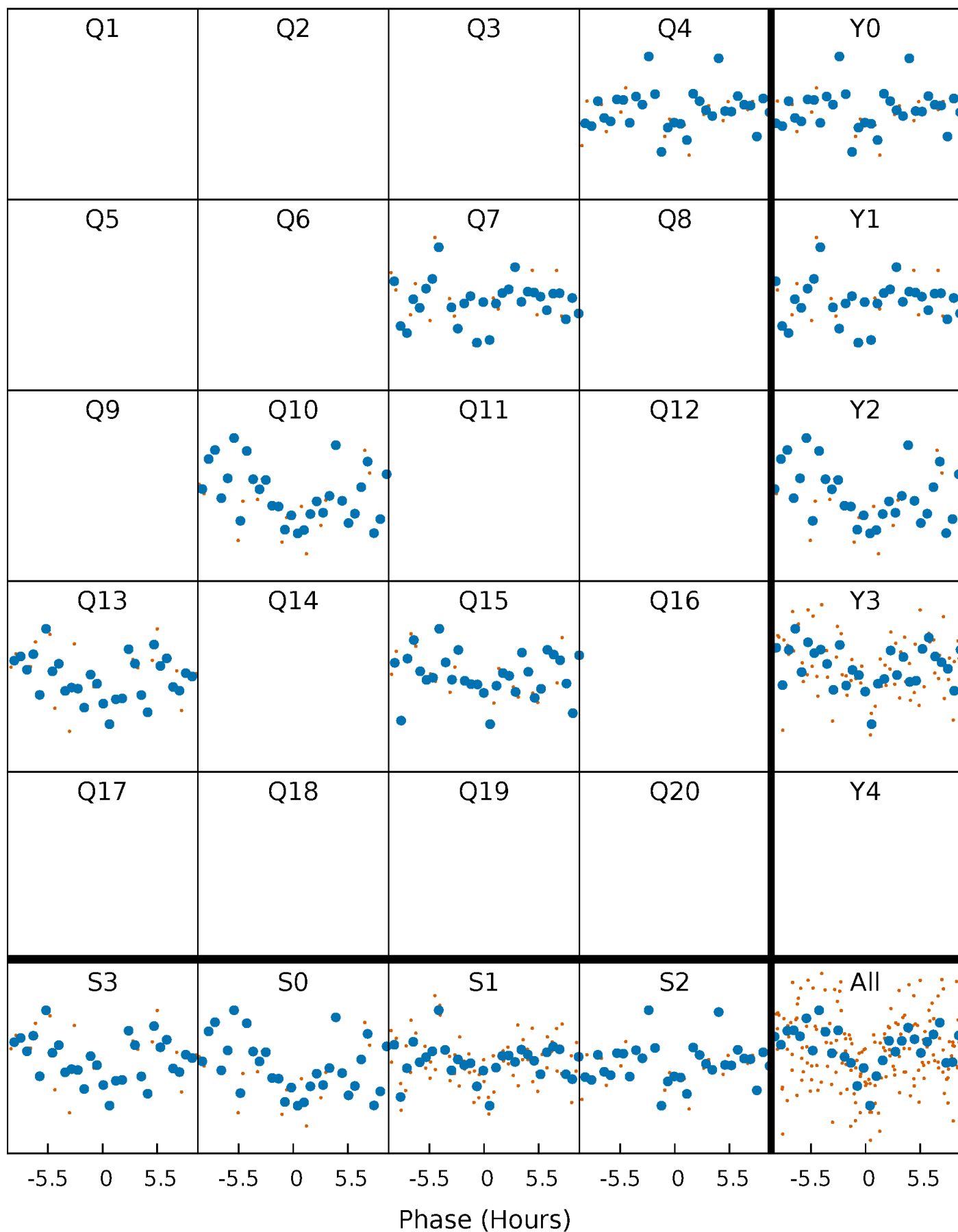
## Planet 4 : Phased Whitened Flux Time Series (Fit Epoch/Period)





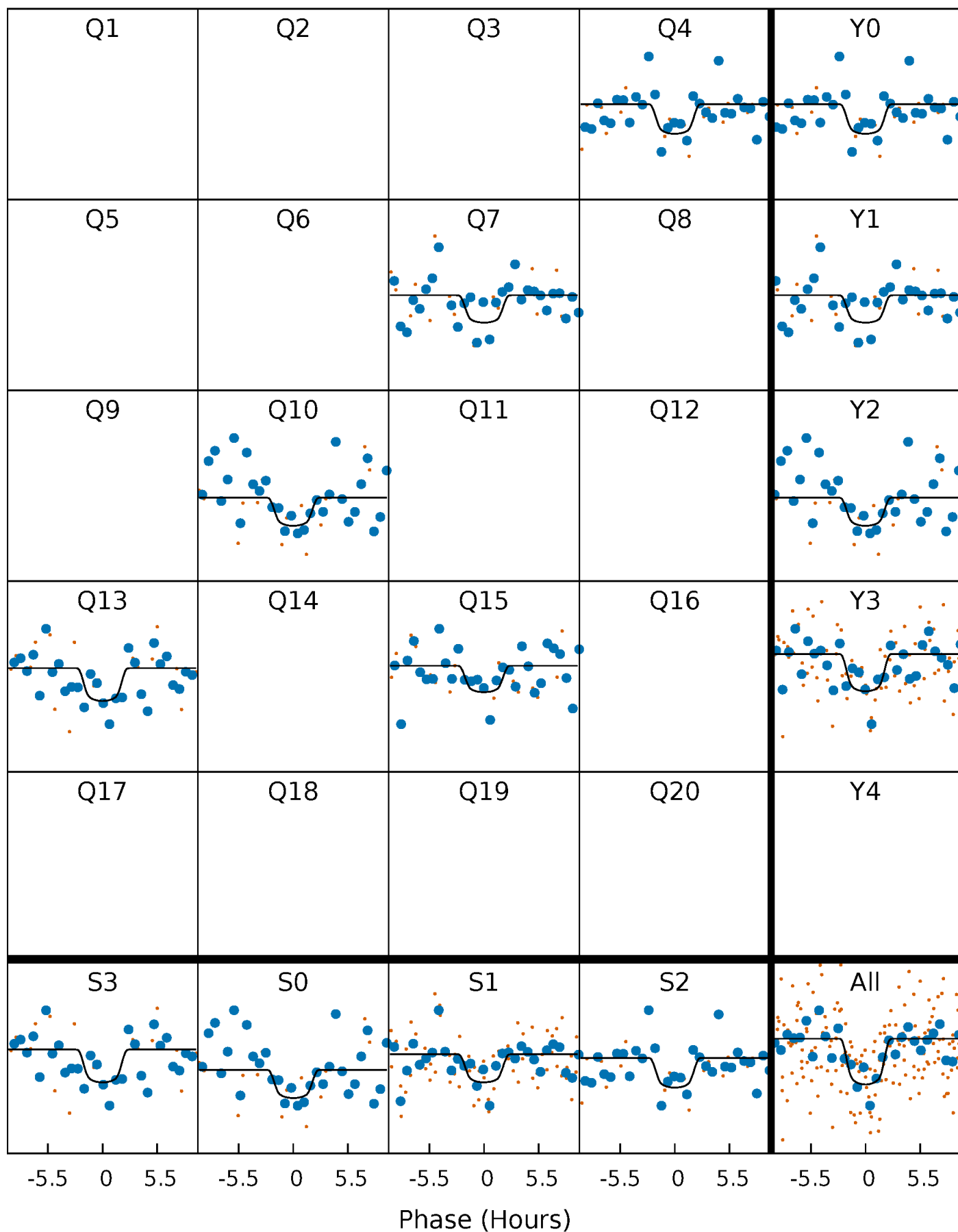
# PDC Quarter-Phased Transit Curves

TCE 005130023-04   P=270.709339 Days    $T_0=377.898818$  (BKJD)



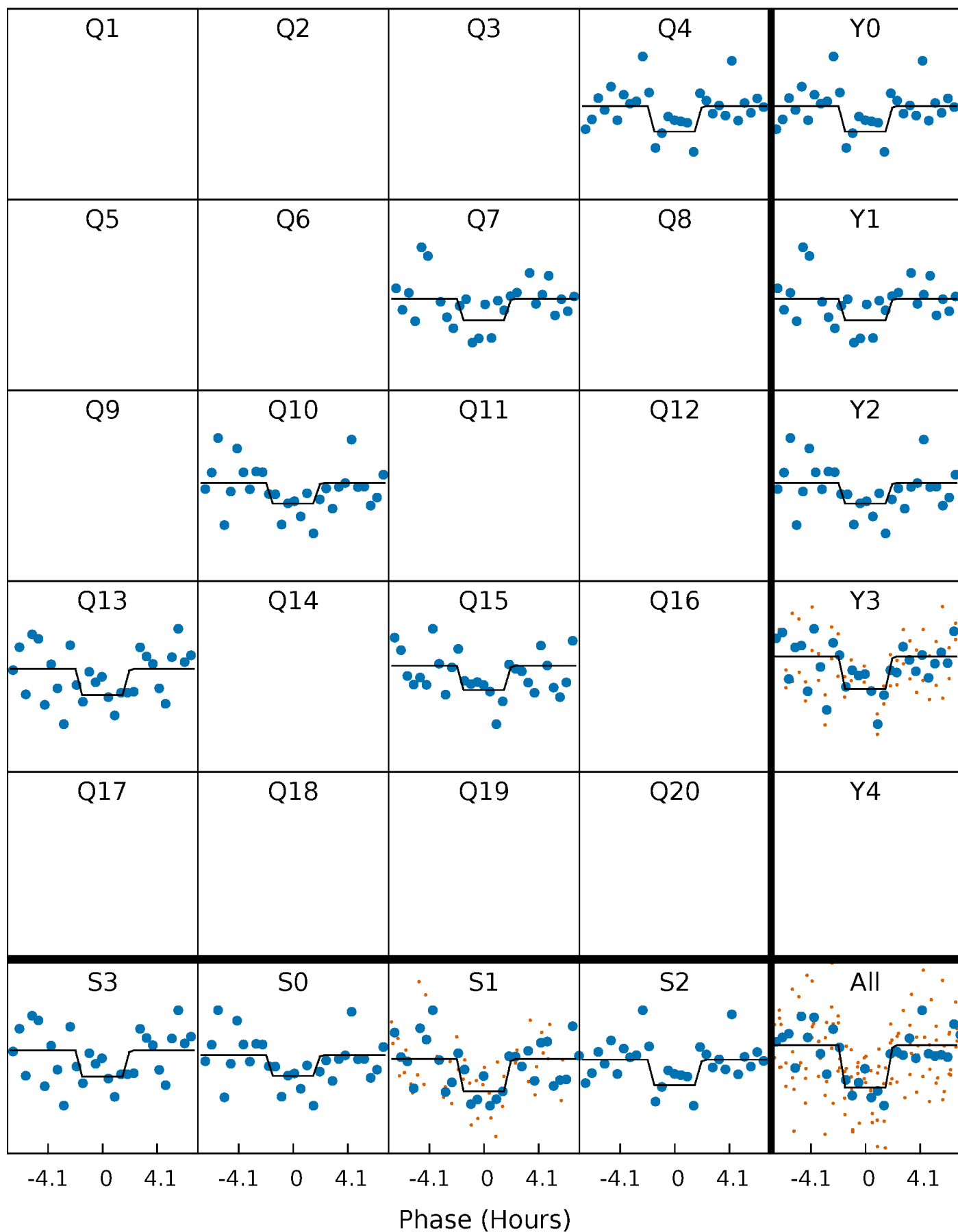
# DV Quarter-Phased Transit Curves

TCE 005130023-04     $P=270.709339$  Days     $T_0=377.898818$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

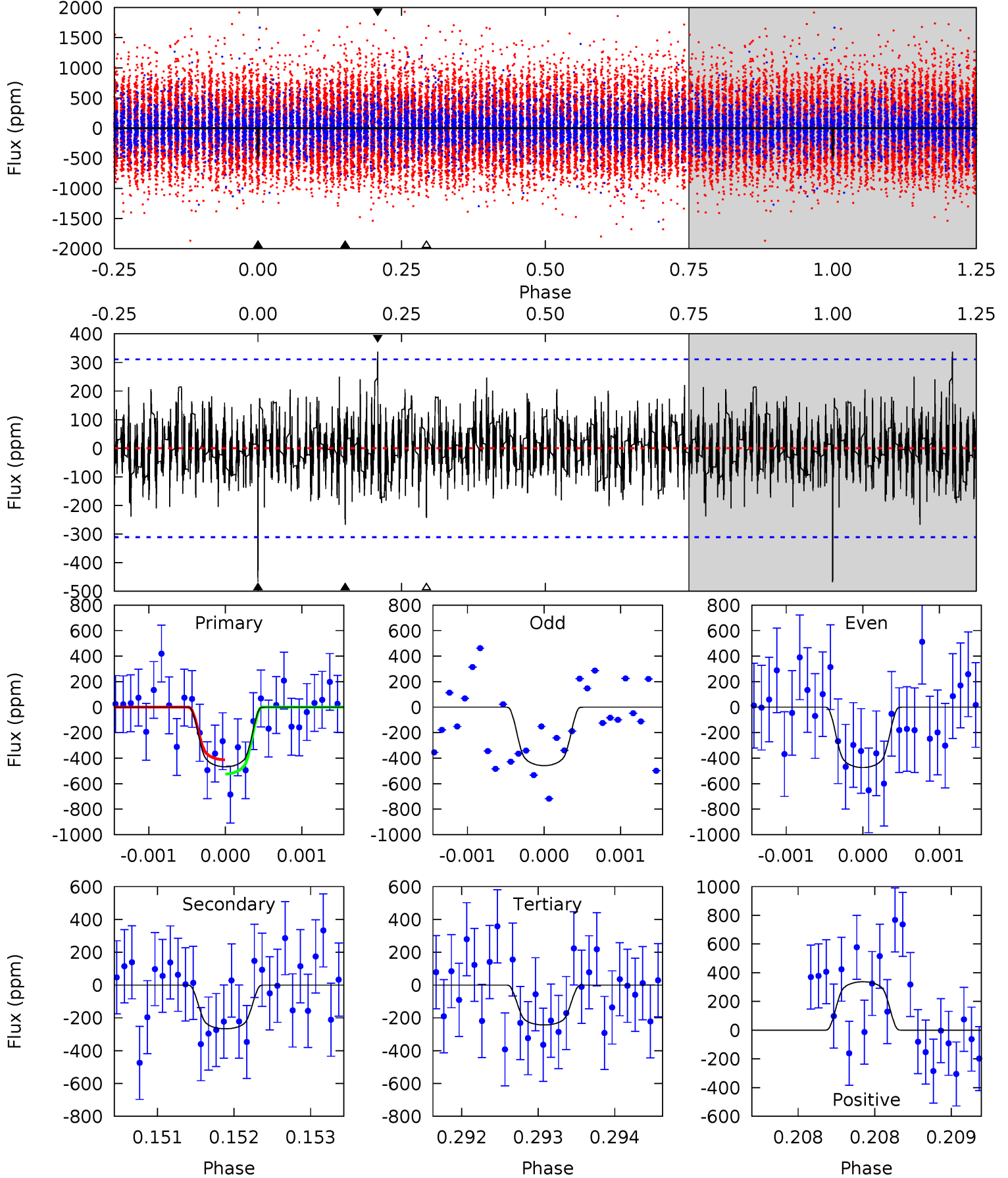
TCE 005130023-04     $P=270.704800$  Days     $T_0=377.900491$  (BKJD)



# DV Model-Shift Uniqueness Test

005130023-04, P = 270.709339 Days, E = 107.189479 Days

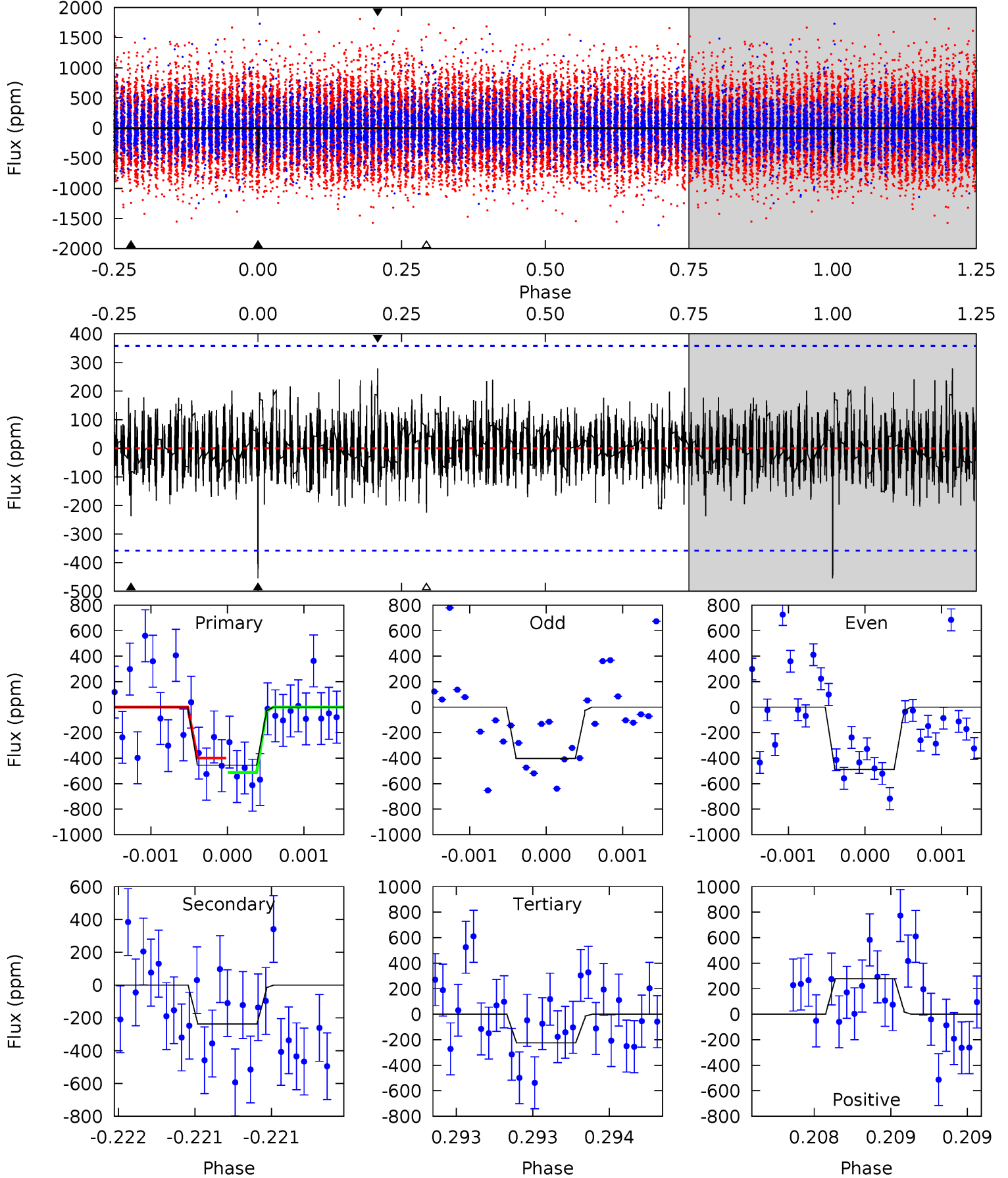
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
8.25	4.71	4.29	5.95	5.48	3.34	1.32	3.96	2.30	0.42	-1.24	0.13	1.02	0.42	0.99



# Alt Model-Shift Uniqueness Test

005130023-04, P = 270.704800 Days, E = 107.195691 Days

Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
7.03	3.66	3.48	4.31	5.54	3.43	1.01	3.55	2.72	0.19	-0.64	0.66	1.09	0.38	0.87



### Stellar Parameters For KIC 005130023

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R$ ( $R_{\odot}$ )	$M(M_{\odot})$	$p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ )
	$5476^{+191}_{-172}$	$4.459^{+0.126}_{-0.154}$	$-0.380^{+0.350}_{-0.300}$	$0.847^{+0.175}_{-0.116}$	$0.753^{+0.123}_{-0.053}$	$1.745^{+1.069}_{-0.709}$
	+3%/-3%	+3%/-3%	+92%/-79%	+21%/-14%	+16%/-7%	+61%/-41%
Source	PHO1	KIC0	KIC0	DSEP		

KIC = Kepler Input Catalog; PHO = Photometry; SPE = Spectroscopy; AST = Asteroseismology  
 TRA = Transits; DESP = Dartmouth Models; MULT = Multiple Models

### Secondary Eclipse Parameters for KIC 005130023-04 / KOI

Detrend	Depth (ppm)	$R_p$ ( $R_{\oplus}$ )	$T_{\text{max}}$ (K)	$T_{\text{obs}}$ (K)	$A_{\text{obs}}$
DV	$-267 \pm 57$	$2.40^{+0.63}_{-0.58}$	$361^{+22}_{-19}$	$4515^{+578}_{-382}$	$14463^{+11079}_{-6012}$
Alt.	$-237 \pm 65$	$1.99^{+0.63}_{-0.58}$	$360^{+24}_{-20}$	$4755^{+864}_{-545}$	$18248^{+21317}_{-8463}$

$T_{\text{max}}$  = Theoretical Maximum Planetary Temperature

$T_{\text{obs}}$  = Observed Planetary Temperature (Assuming  $A=0.3$ )

$A_{\text{obs}}$  = Observed Albedo (Assuming  $T=0$ )

If a secondary eclipse is present, the system is likely an EB if  $T_{\text{obs}} \gg T_{\text{max}}$  AND  $A_{\text{obs}} \gg 1.0$

## DV Centroid Data

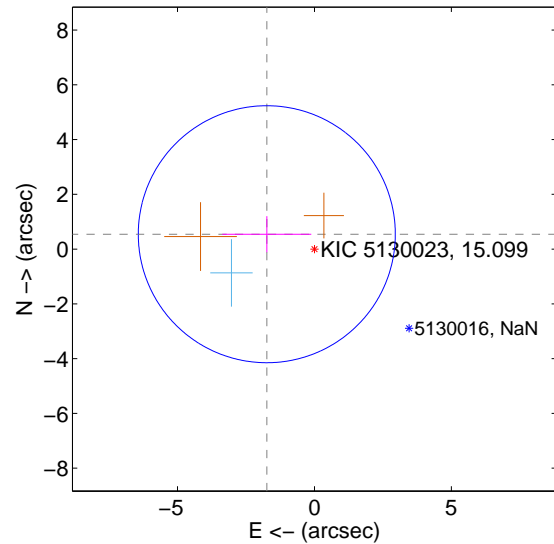
Supplemental centroid analysis for 005130023-04. Kepler magnitude: 15.10. Transit SNR 7.62

There are 1 quarters with good PRF difference image offsets

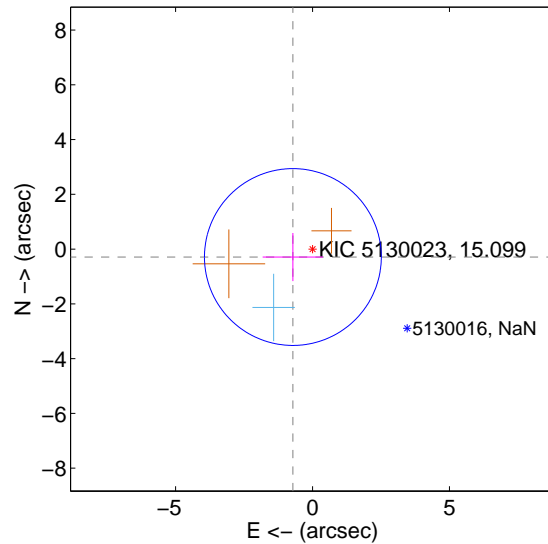
The direct PRF centroid is offset from the target star catalog position by about 0.66 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$1.823 \pm 1.564$	1.17	$1.740 \pm 1.626$	$0.543 \pm 0.657$
PRF-fit source offset from KIC position	$0.774 \pm 1.076$	0.72	$0.717 \pm 1.105$	$-0.290 \pm 0.878$
photometric centroid source offset	$0.81 \pm 2.19$	0.37	$-0.80 \pm 2.19$	$-0.11 \pm 2.03$

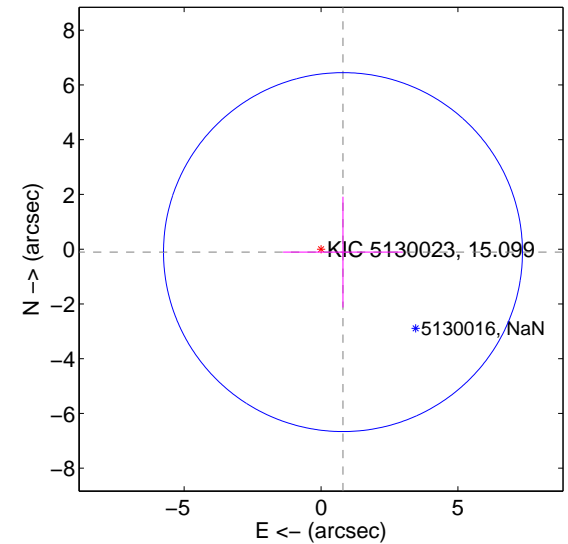
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position



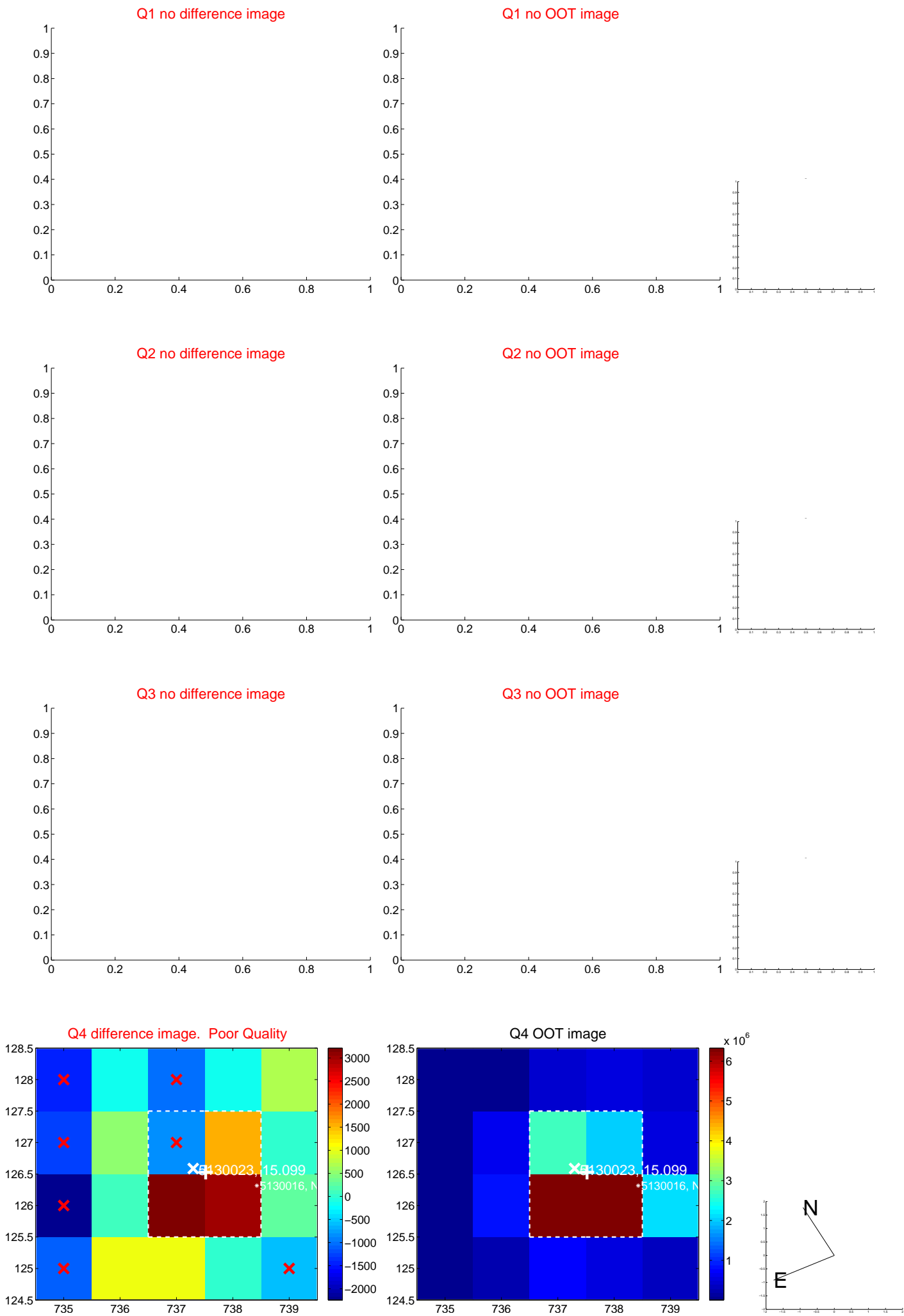
offset from photometric centroids



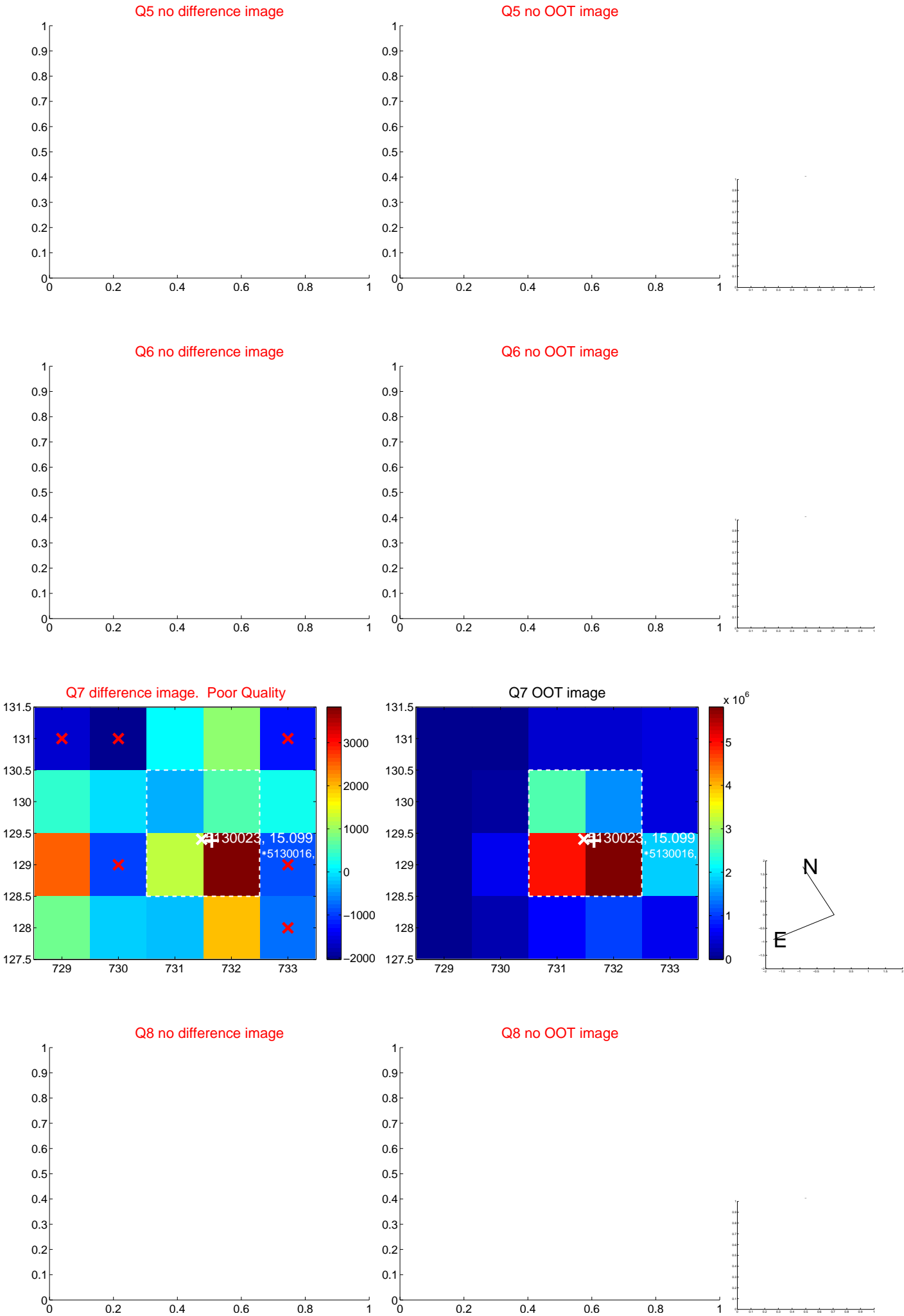
Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three- $\sigma$ . Red \*: target star. Blue \*: Other stars. Text next to a star gives its KIC ID and kepmag. KIC IDs > 15,000,000 are from the UKIRT catalog.



white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

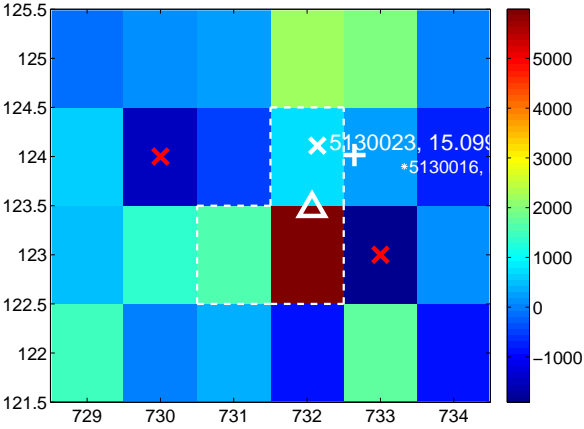
Q9 no difference image



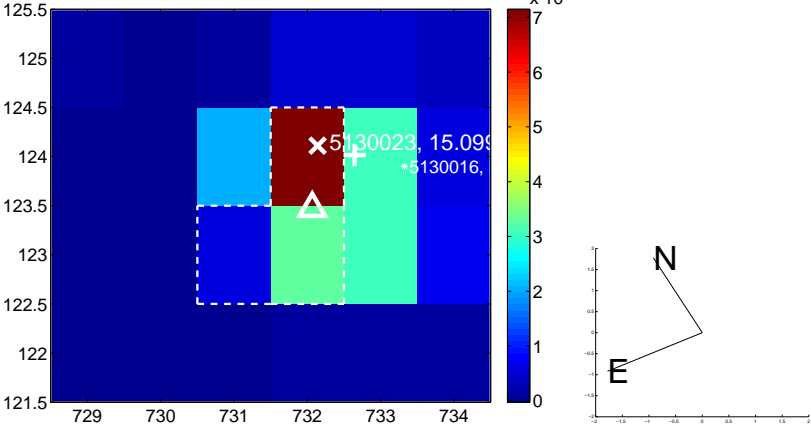
Q9 no OOT image



Q10 difference image



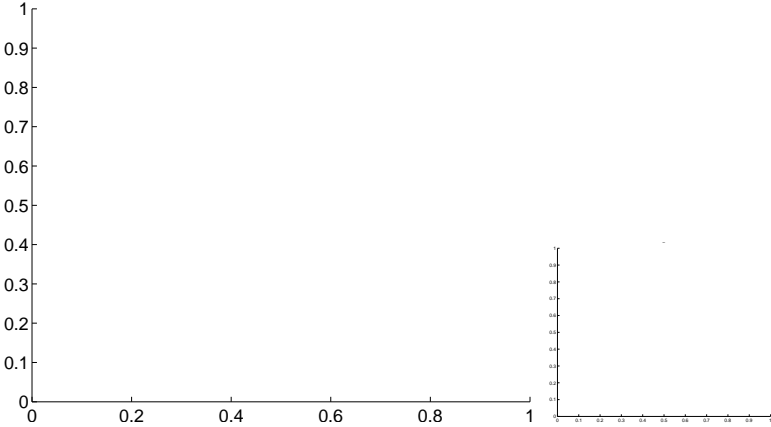
Q10 OOT image



Q11 no difference image



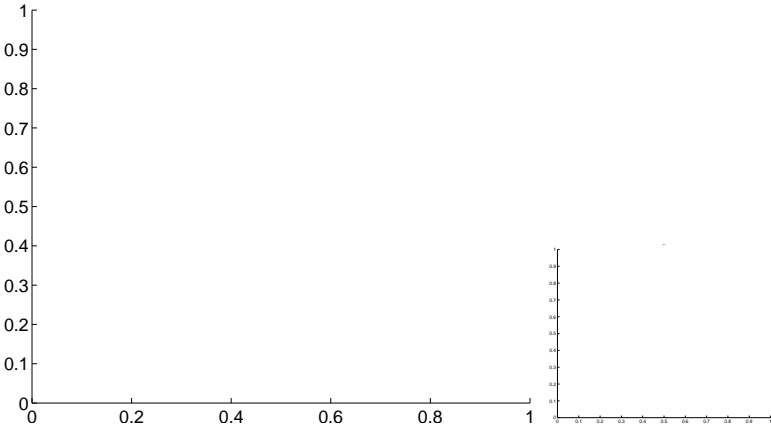
Q11 no OOT image



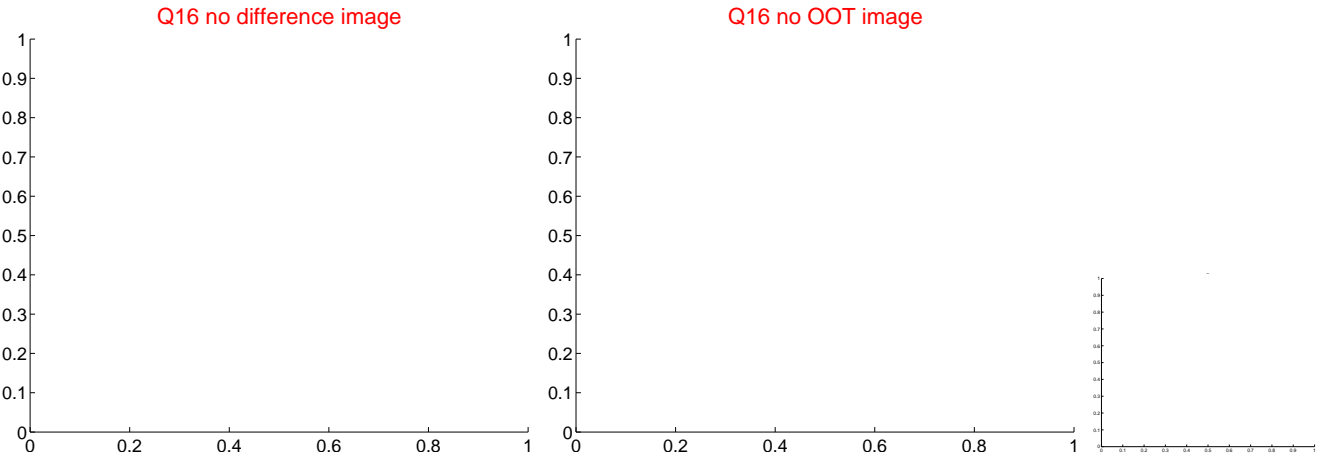
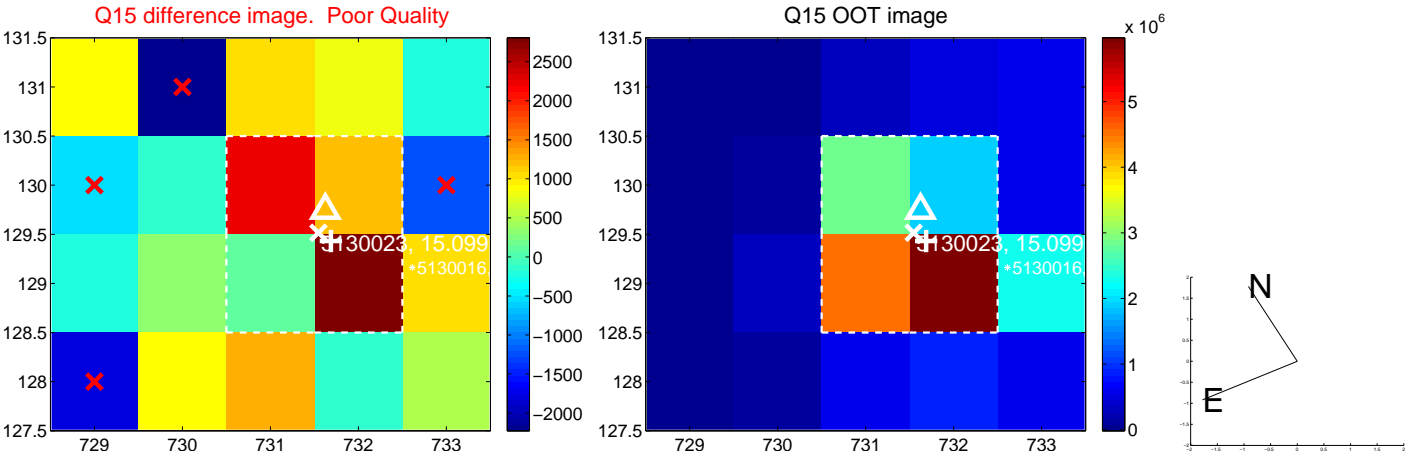
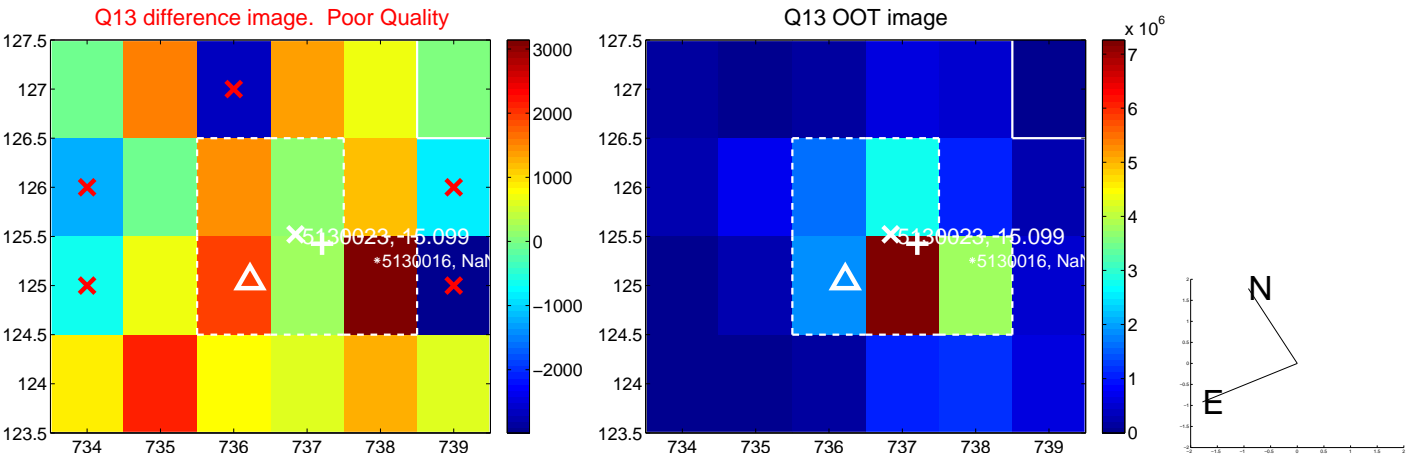
Q12 no difference image



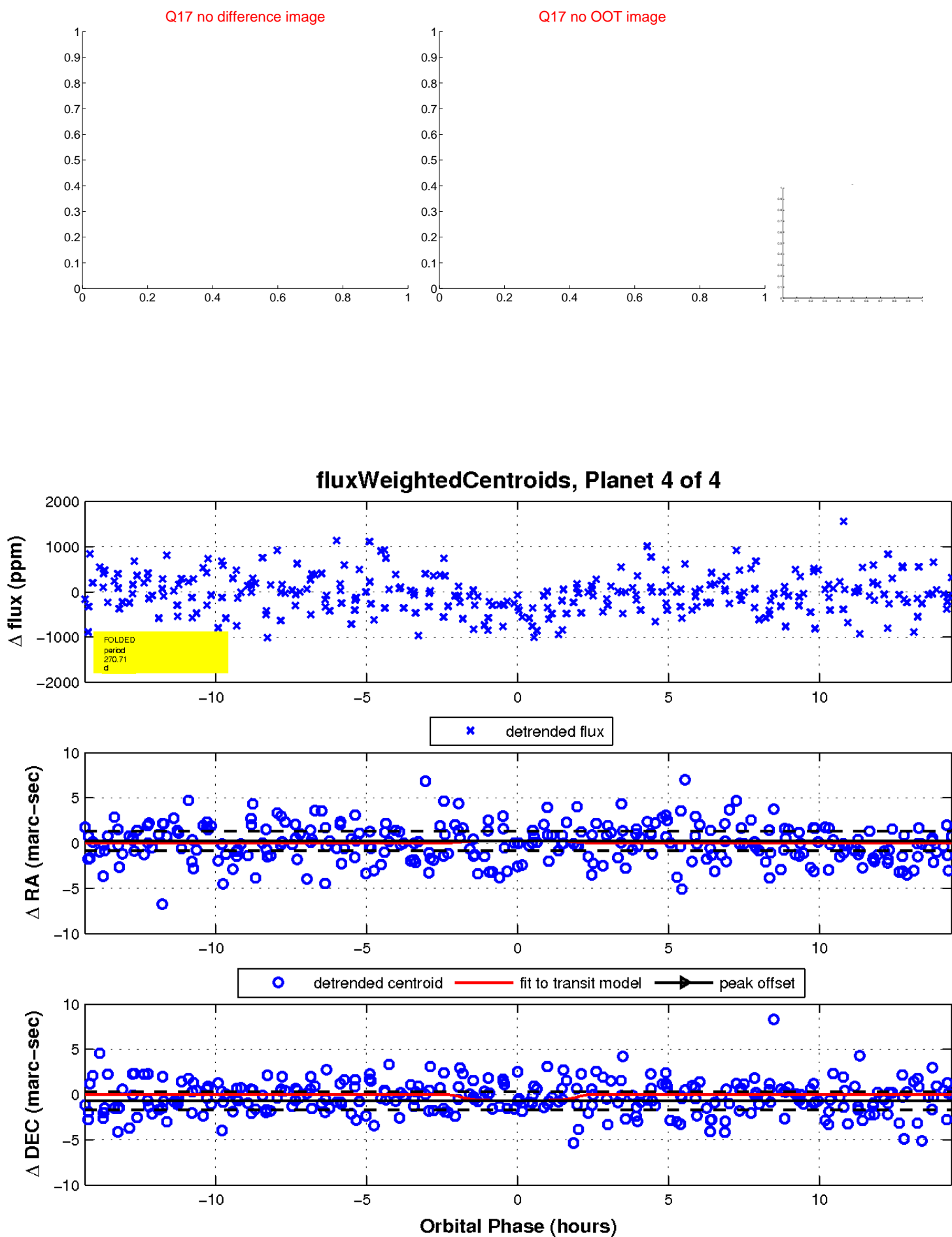
Q12 no OOT image



white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

