

# KIC 003852116

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
003852116-01	OBS	No	366.484469	408.259534	2193.0	6.588	15.0	7.4	0.66	4555	2.98	0.22
003852116-02	OBS	No	185.278116	165.565284	2156.9	3.292	12.8	8.1	0.66	4555	3.14	0.56
003852116-03	OBS	No	517.860719	456.491183	2713.1	5.758	11.9	7.6	0.66	4555	3.46	0.14
003852116-04	OBS	No	370.155848	222.268762	2471.9	3.085	13.5	7.8	0.66	4555	3.17	0.22
003852116-05	OBS	No	465.573161	434.163541	3119.6	2.940	11.8	8.6	0.66	4555	3.68	0.16
003852116-06	OBS	No	421.057650	471.703520	2540.7	12.843	10.7	5.6	0.66	4555	3.20	0.19

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
003852116-01	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_SKYE—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS
003852116-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—TRANS_GAPPED—LPP_DV—ALL_TRANS_CHASES—INCONSISTENT_TRANS—CENT_FEW_DIFFS
003852116-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—ALL_TRANS_CHASES—MOD_POS_DV—CENT_FEW_DIFFS
003852116-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS
003852116-05	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—ALL_TRANS_CHASES—MOD_POS_DV—CENT_FEW_DIFFS
003852116-06	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—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.

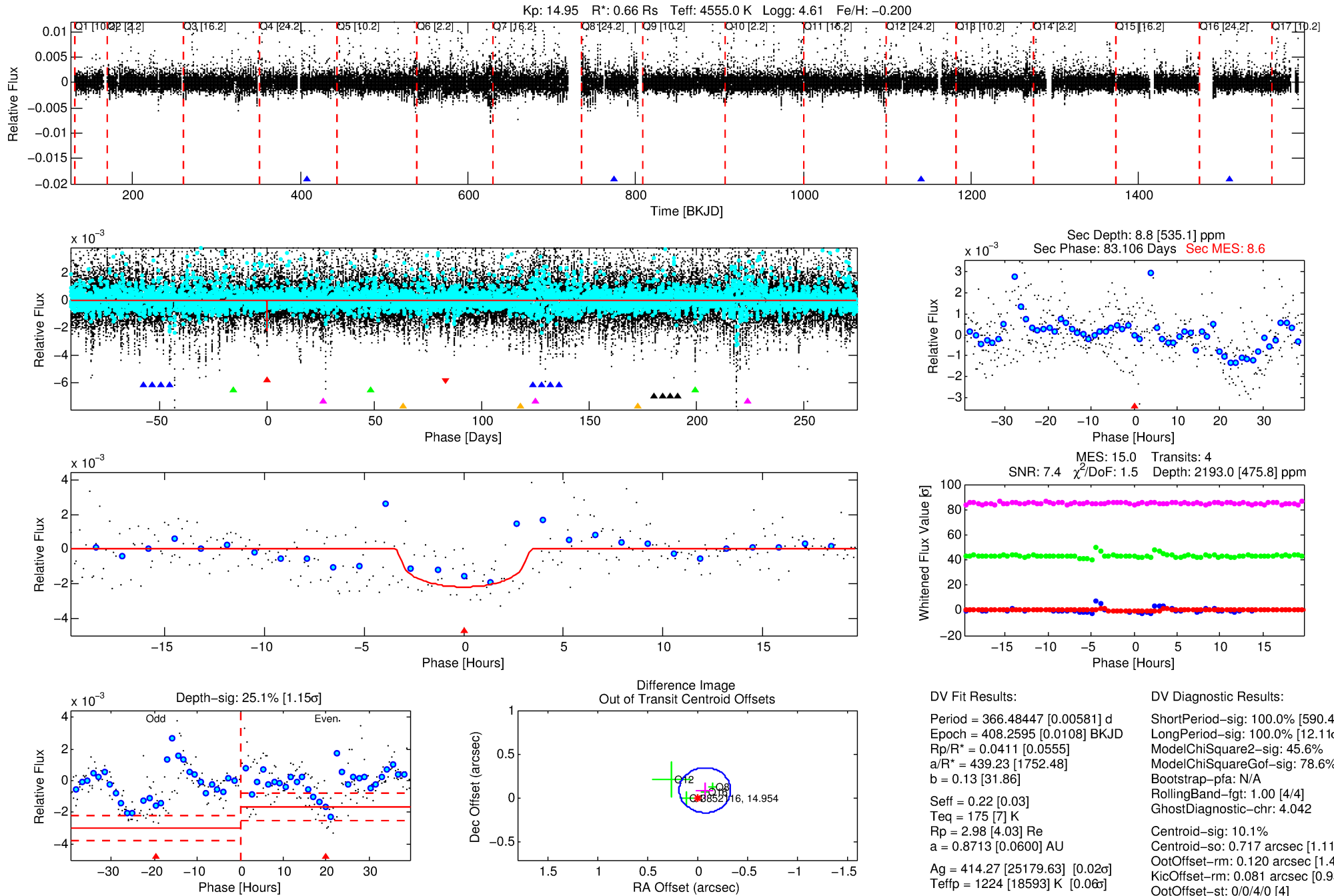
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 003852116-01

No Significant Match Found

# DV One-Page Summary

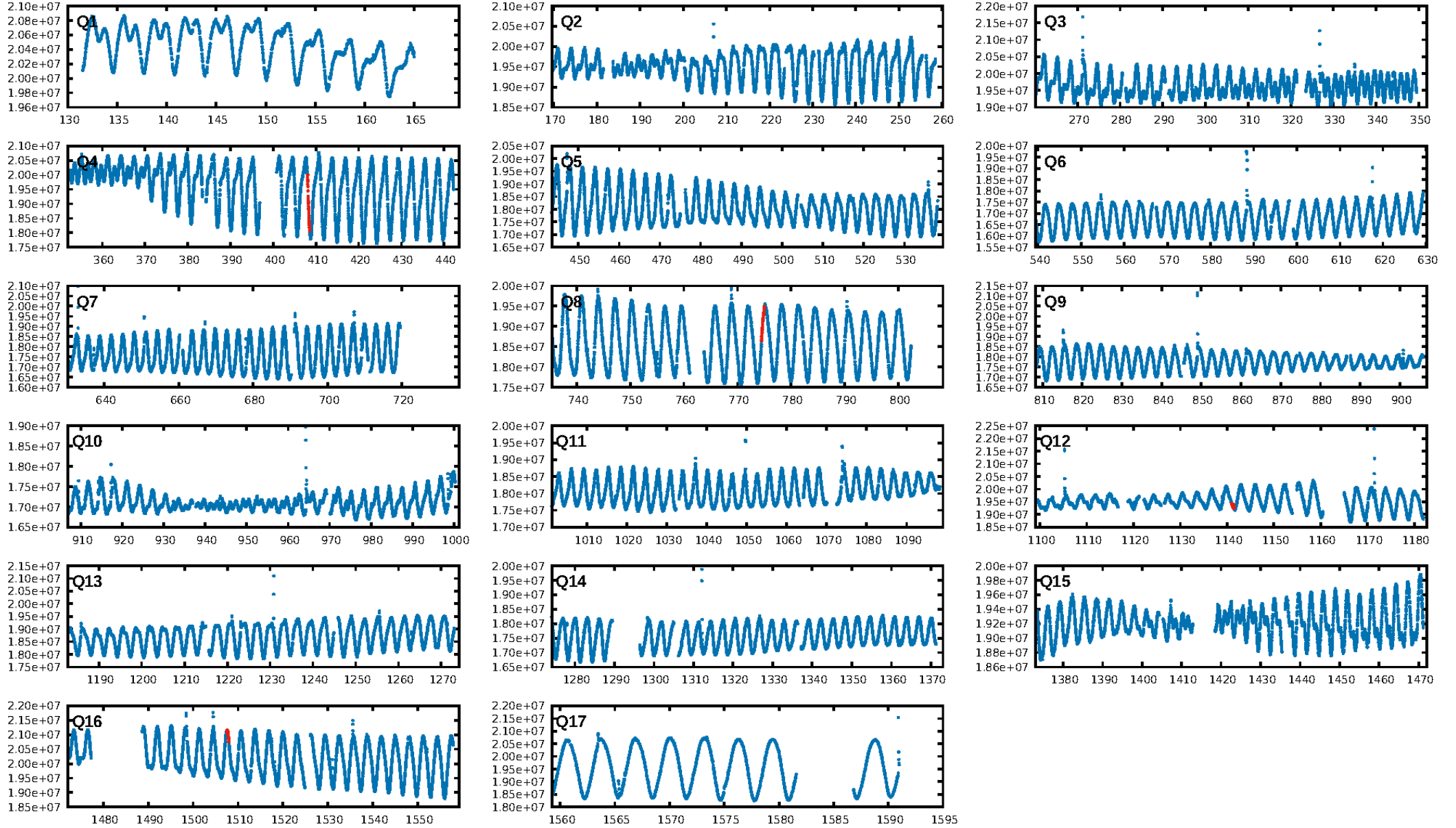
KIC: 3852116 Candidate: 1 of 6 Period: 366.484 d



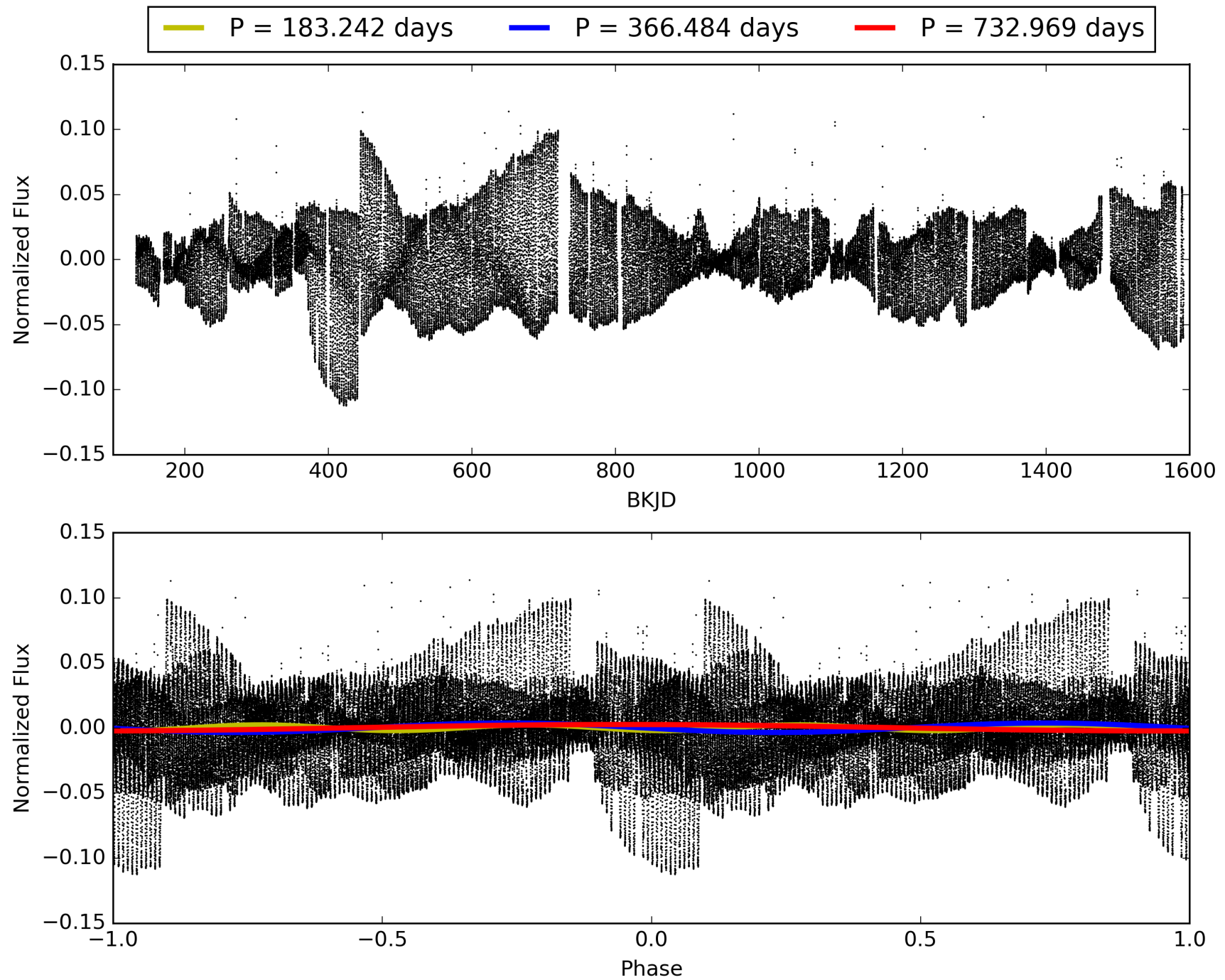
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 01-Feb-2016 05:44:08 Z

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

# TCE 003852116-01, PDC Light Curves



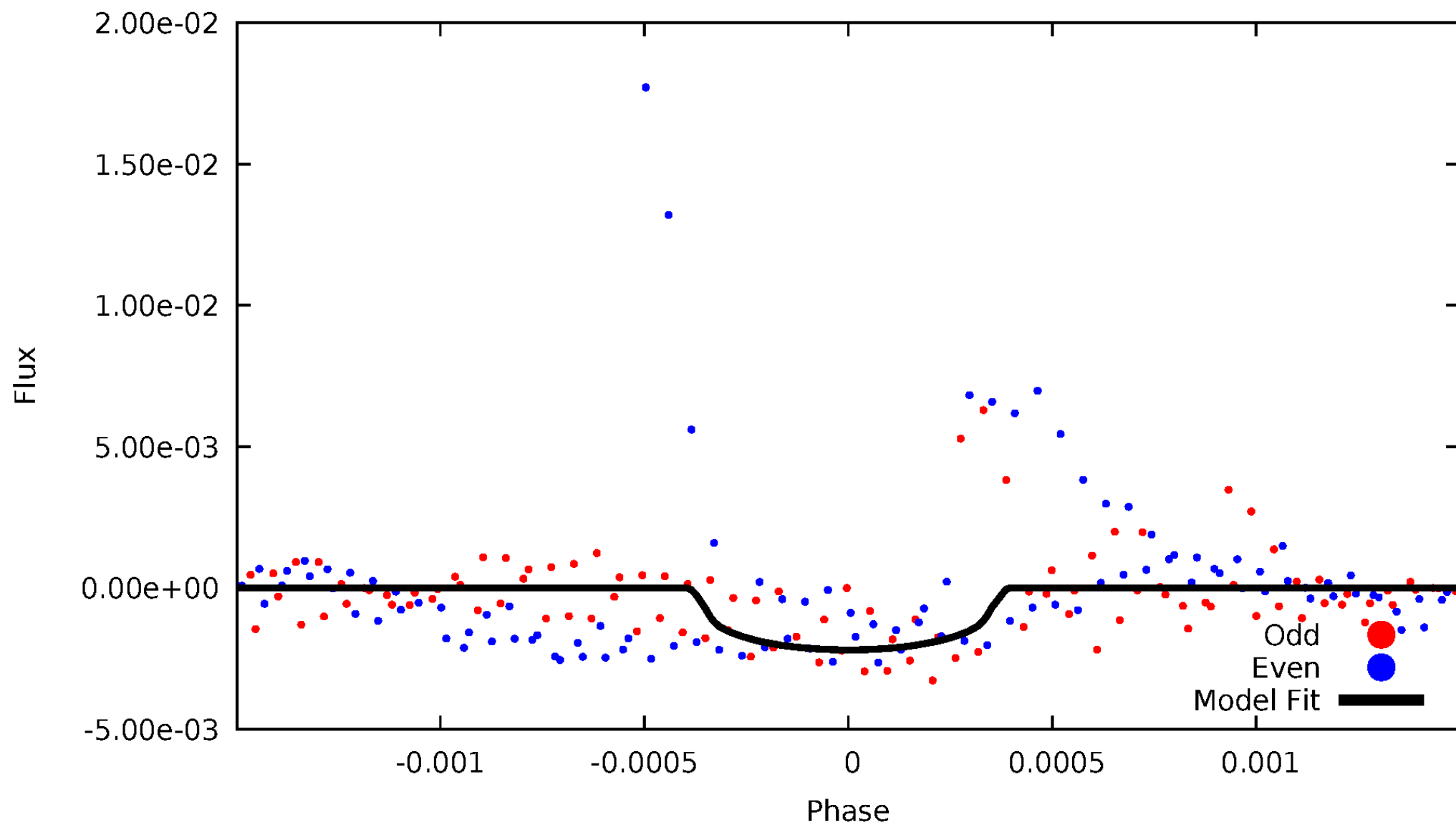
TCE 003852116-01





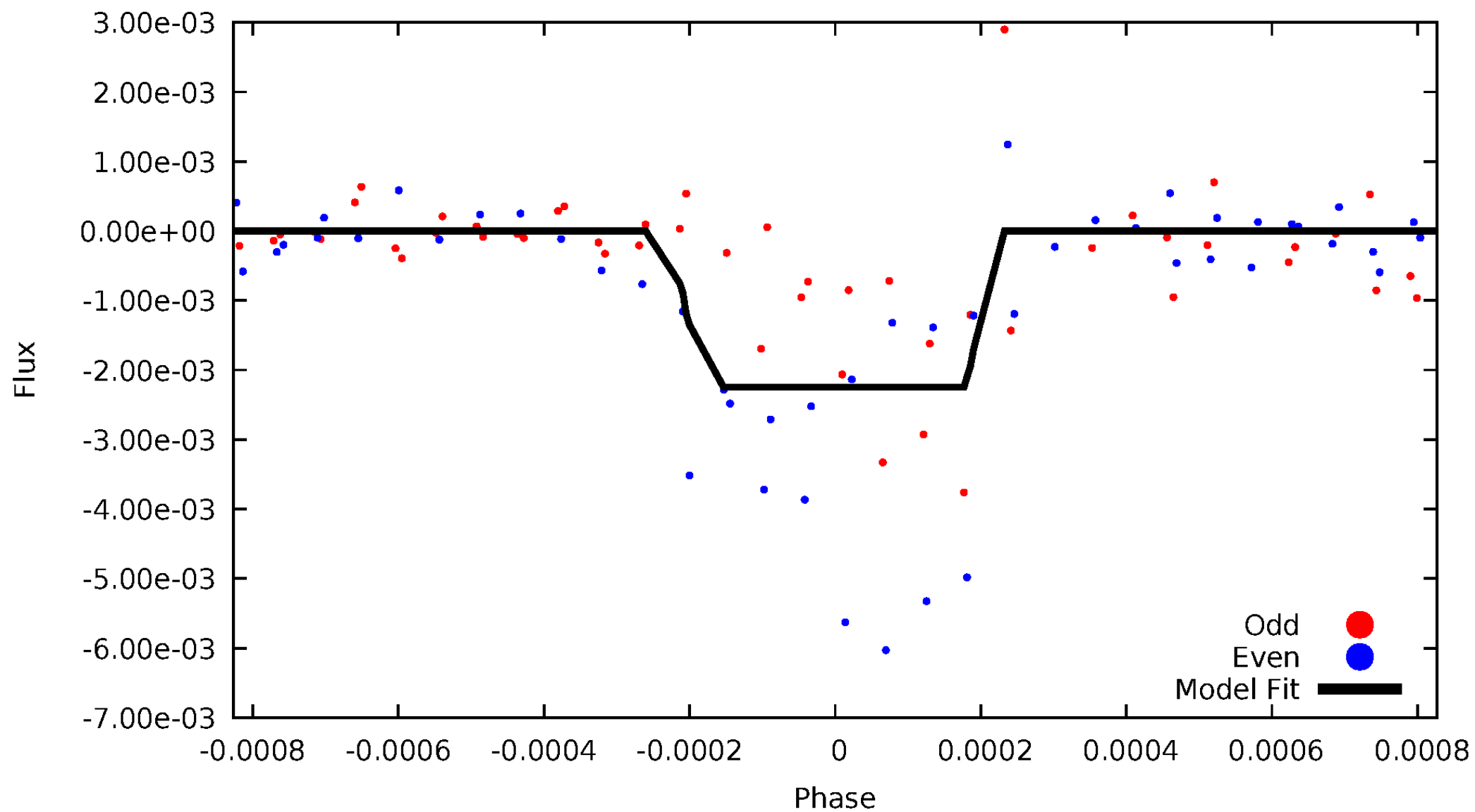
# DV Odd/Even

TCE 003852116-01



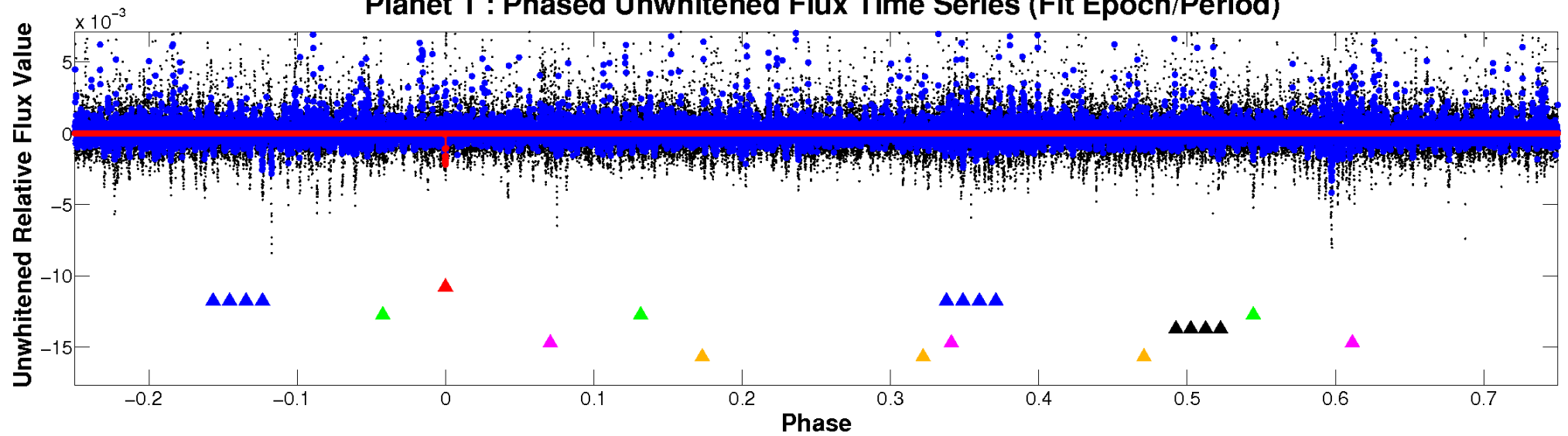
# ALT Odd/Even

TCE 003852116-01

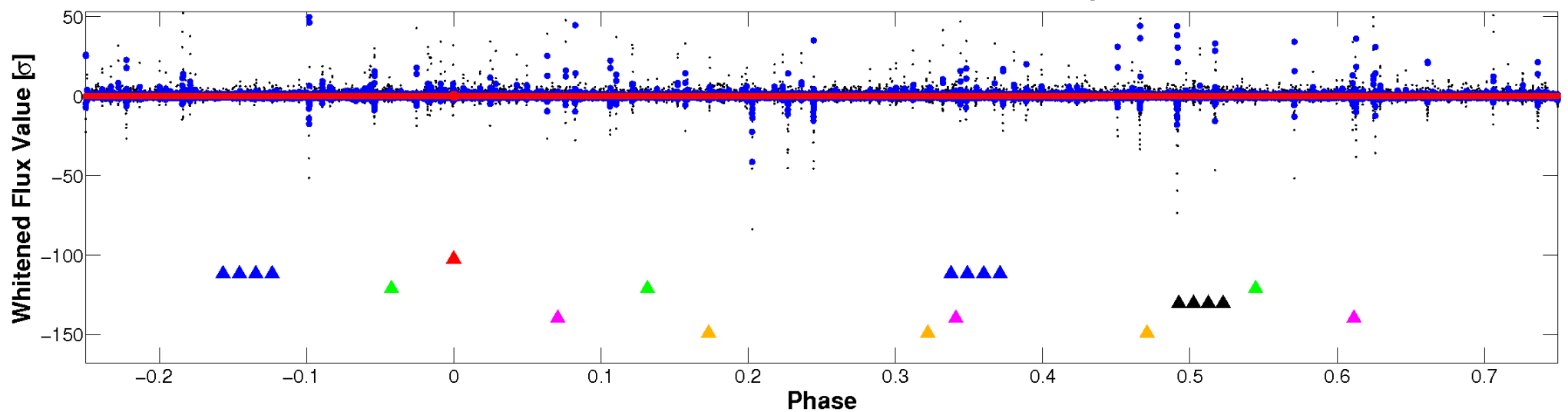


# Non-Whitened Vs. Whitened Light Curve

**Planet 1 : Phased Unwhitened Flux Time Series (Fit Epoch/Period)**

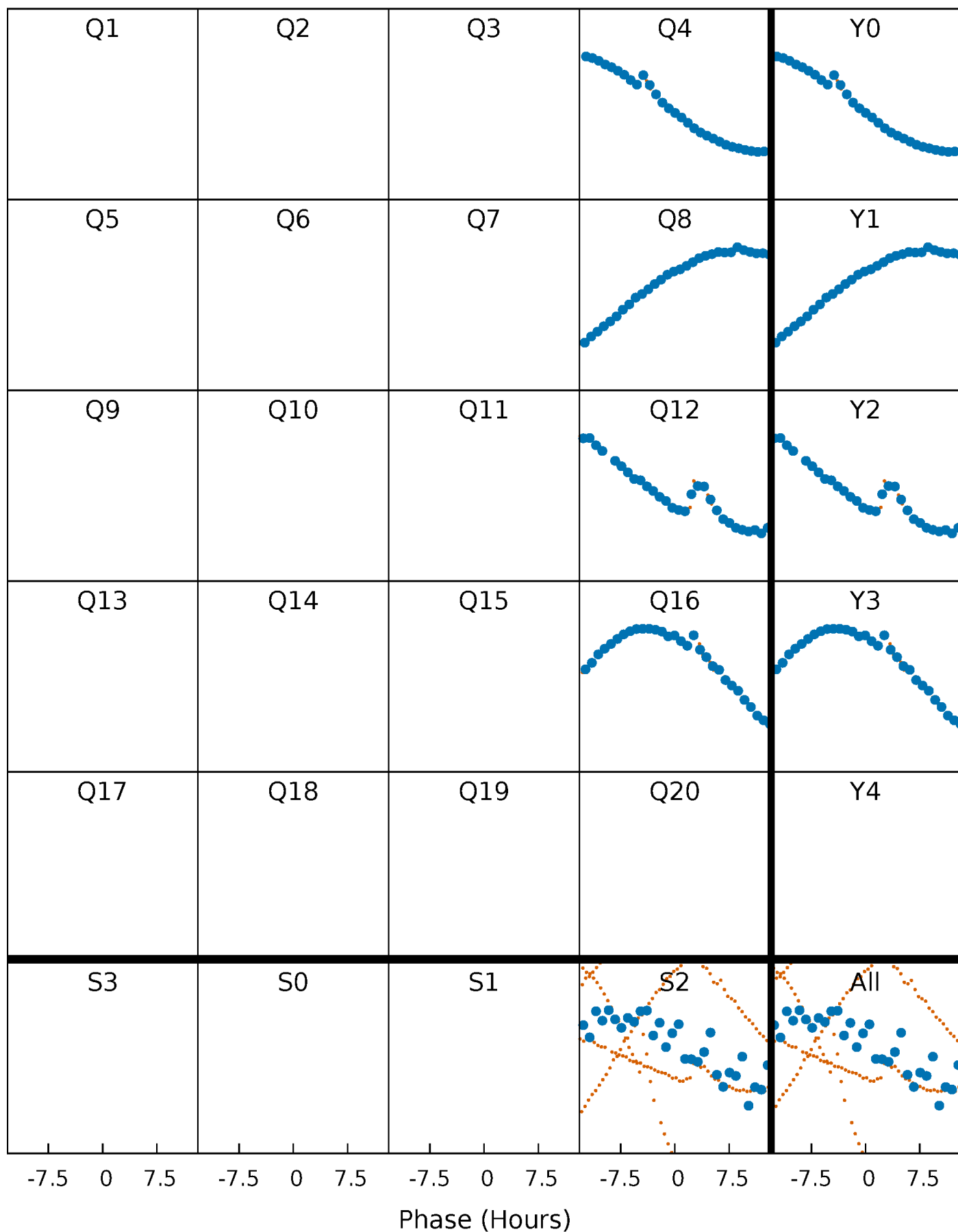


**Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)**



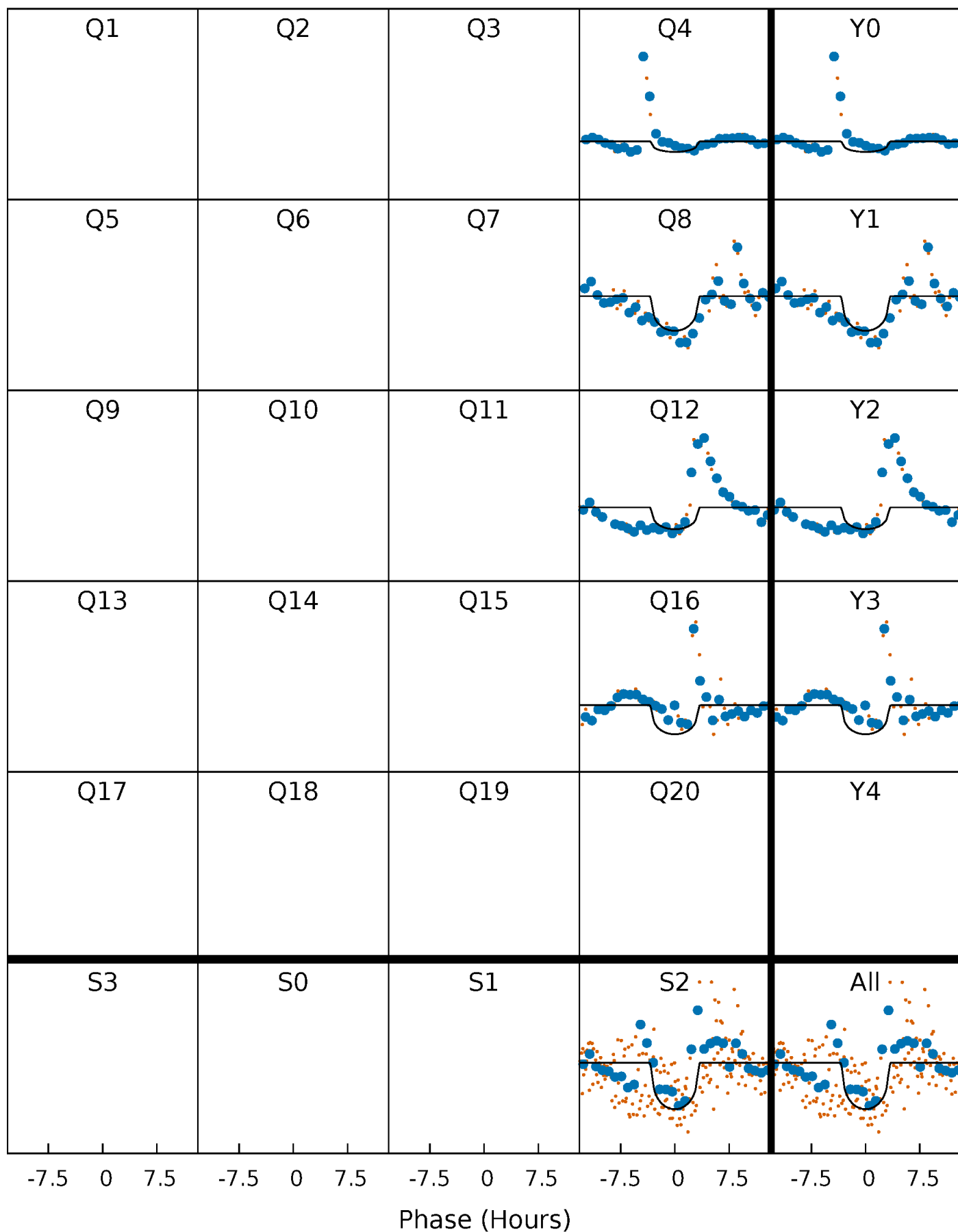
# PDC Quarter-Phased Transit Curves

TCE 003852116-01 P=366.484469 Days  $T_0=408.259534$  (BKJD)



# DV Quarter-Phased Transit Curves

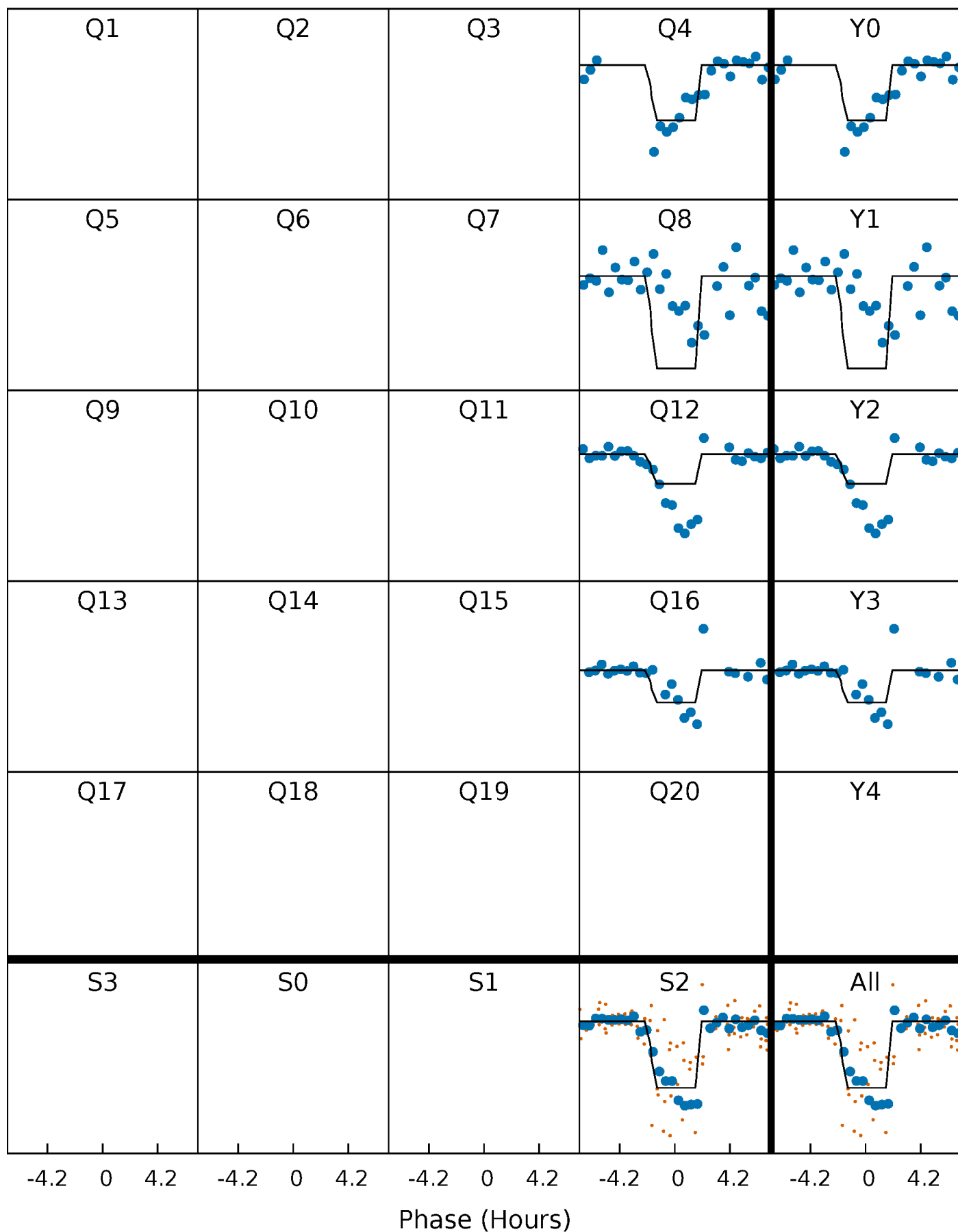
TCE 003852116-01 P=366.484469 Days  $T_0=408.259534$  (BKJD)





# Alt. Detrend Quarter-Phased Transit Curves

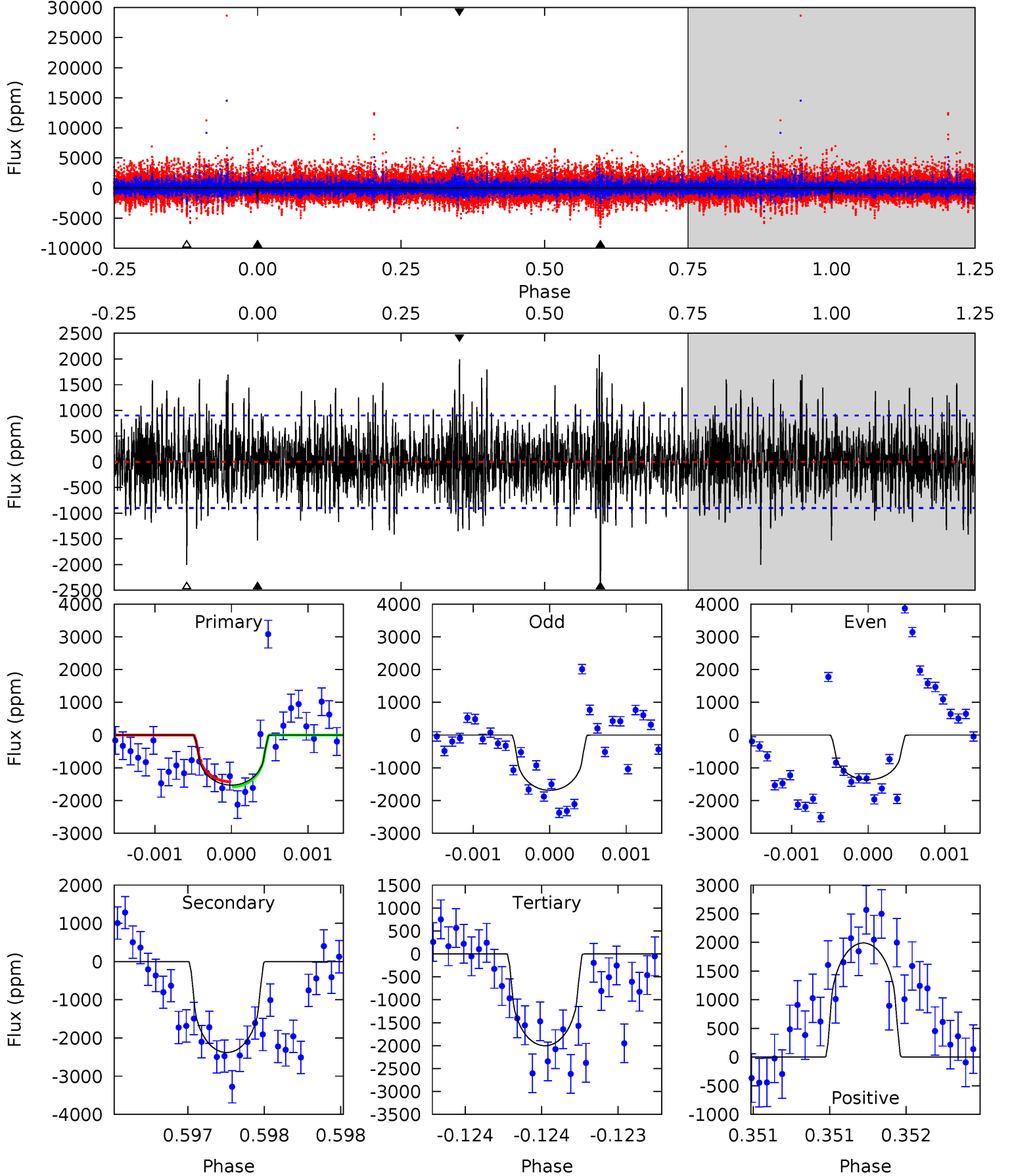
TCE 003852116-01 P=366.478187 Days  $T_0=408.294070$  (BKJD)



# DV Model-Shift Uniqueness Test

003852116-01, P = 366.484469 Days, E = 41.775065 Days

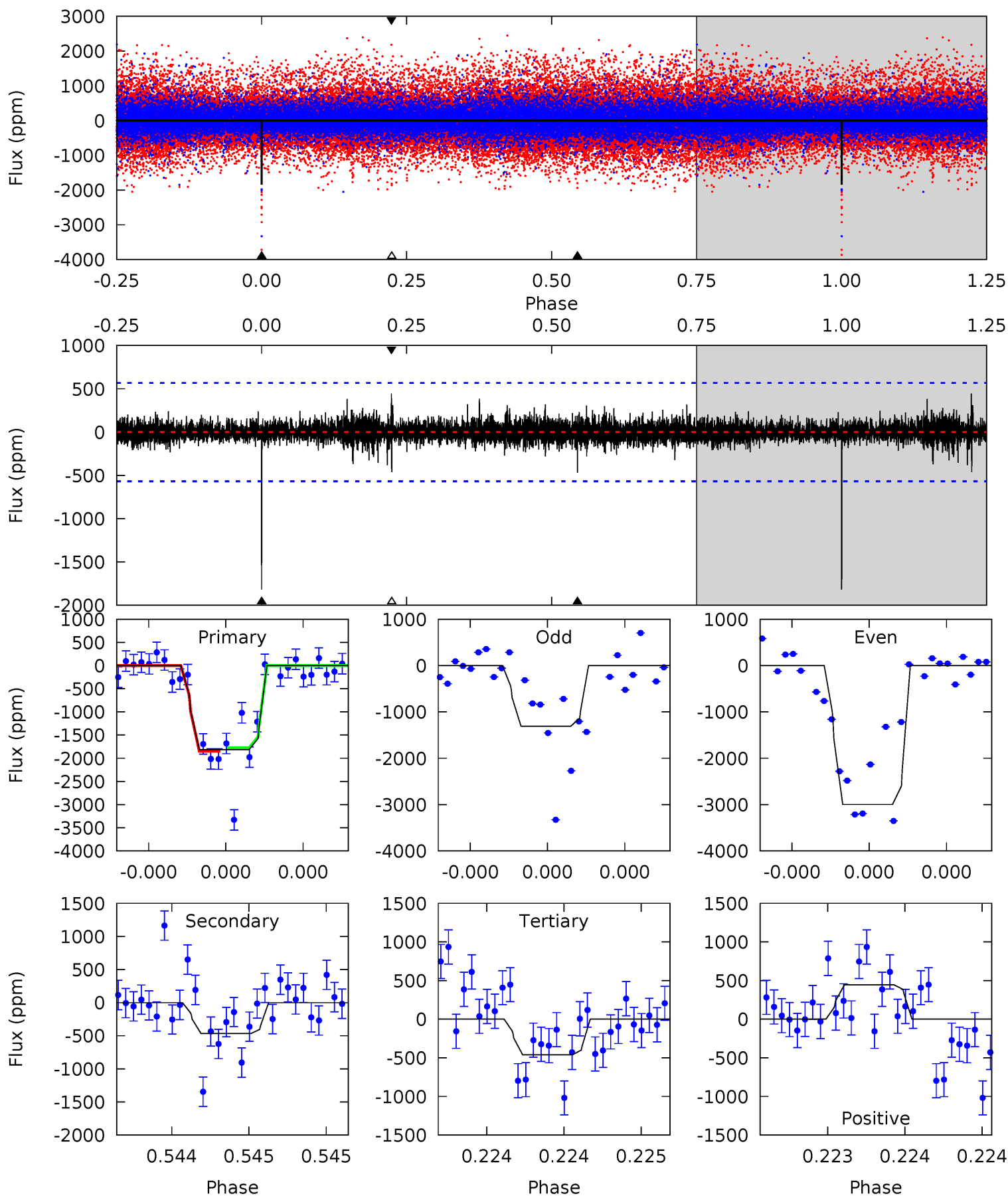
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
9.32	14.5	12.2	12.1	5.49	3.35	2.80	-2.88	-2.81	2.31	2.38	0.74	1.13	0.47	0.47



# Alt Model-Shift Uniqueness Test

003852116-01, P = 366.478187 Days, E = 41.815883 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
17.9	4.60	4.54	4.37	5.59	3.51	0.70	13.3	13.5	0.06	0.23	8.51	1.06	0.20	0.38



### Stellar Parameters For KIC 003852116

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (g \cdot \text{cm}^{-3})$
	$4555^{+136}_{-136}$	$4.611^{+0.048}_{-0.028}$	$-0.200^{+0.300}_{-0.300}$	$0.664^{+0.052}_{-0.058}$	$0.656^{+0.071}_{-0.051}$	$3.163^{+0.733}_{-0.411}$
	+3%/-3%	+1%/-1%	+150%/-150%	+8%/-9%	+11%/-8%	+23%/-13%
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 003852116-01 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-2381 \pm 164$	$4.12^{+3.41}_{-2.69}$	$244^{+9}_{-9}$	$4255^{+2661}_{-771}$	$57579^{+431857}_{-39678}$
Alt.	$-467 \pm 101$	$4.48^{+3.63}_{-2.82}$	$244^{+8}_{-8}$	$3187^{+1328}_{-503}$	$9752^{+64028}_{-6930}$

$T_{max}$  = 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

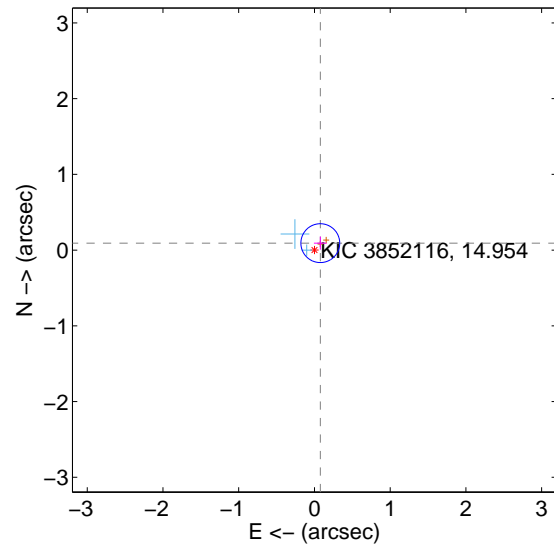
Supplemental centroid analysis for 003852116-01. Kepler magnitude: 14.95. Transit SNR 7.41

There are 2 quarters with good PRF difference image offsets

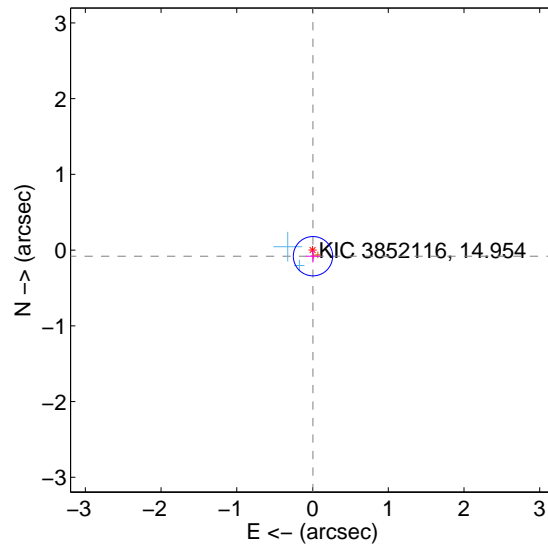
The direct PRF centroid is offset from the target star catalog position by about 0.17 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.120 \pm 0.085$	1.40	$-0.077 \pm 0.085$	$0.092 \pm 0.086$
PRF-fit source offset from KIC position	$0.081 \pm 0.086$	0.93	$-0.006 \pm 0.093$	$-0.080 \pm 0.084$
photometric centroid source offset	$0.72 \pm 0.65$	1.11	$0.54 \pm 0.59$	$0.47 \pm 0.72$

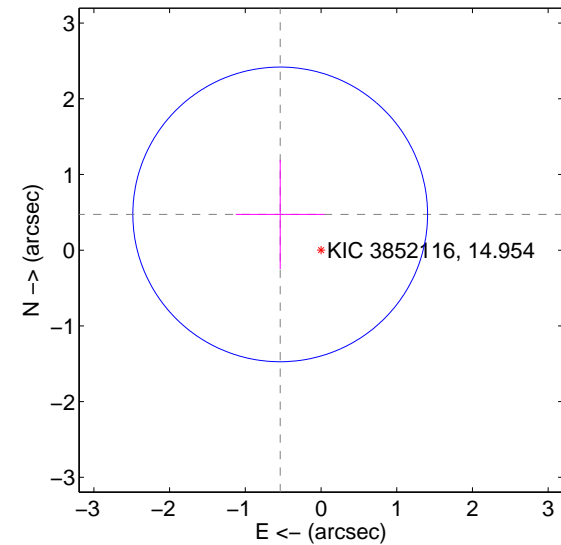
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position



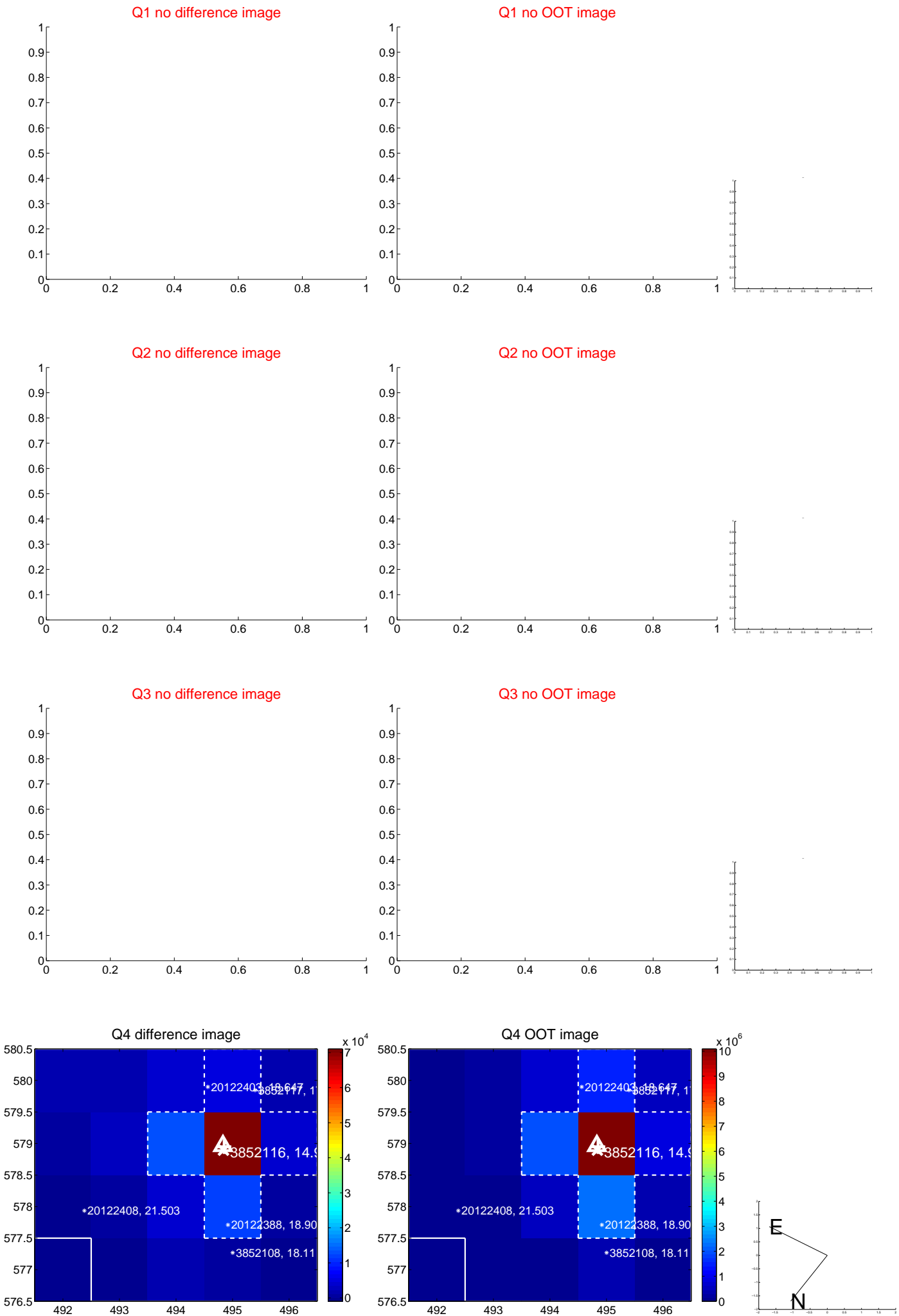
offset from photometric centroids



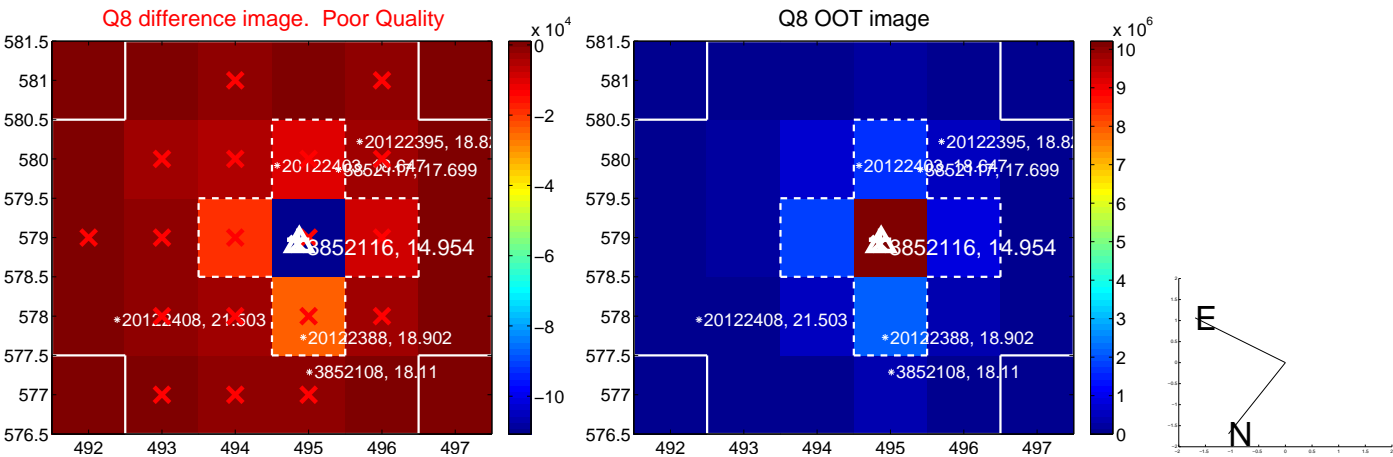
Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three- $\sigma$ . 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.



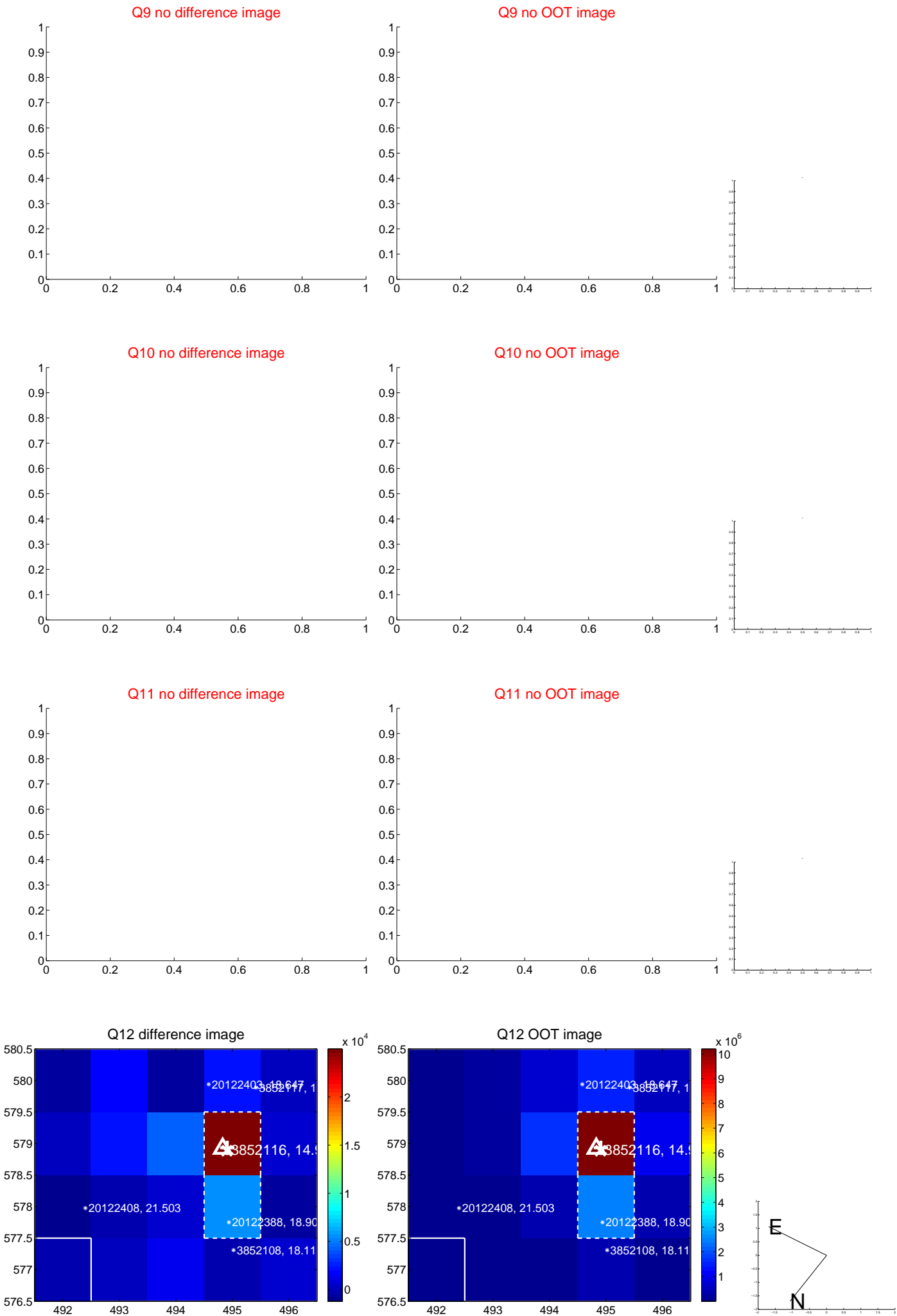
white ×: KIC target position; +: OOT centroid; △: difference centroid. red ✕: large negative pixel value.



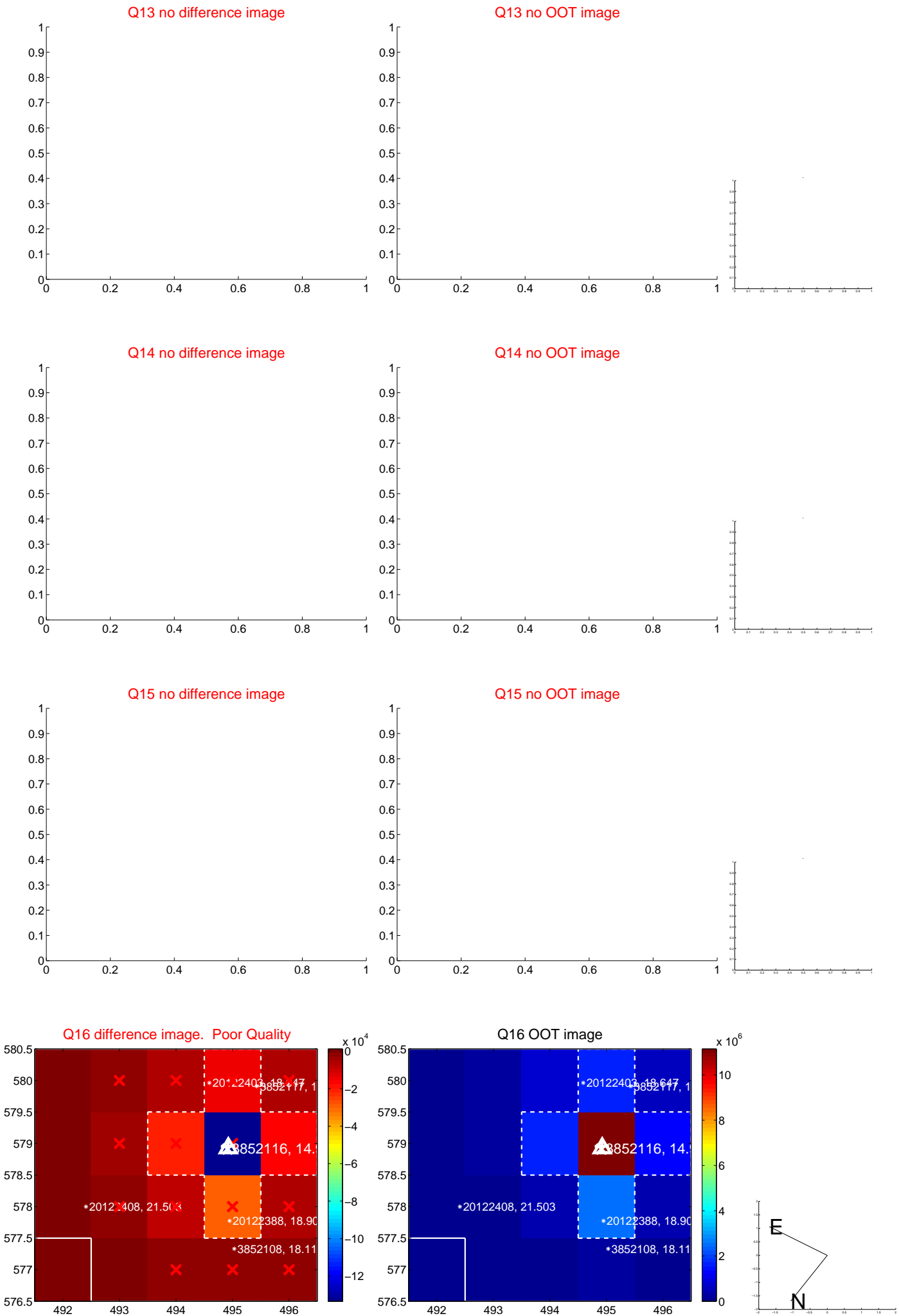
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



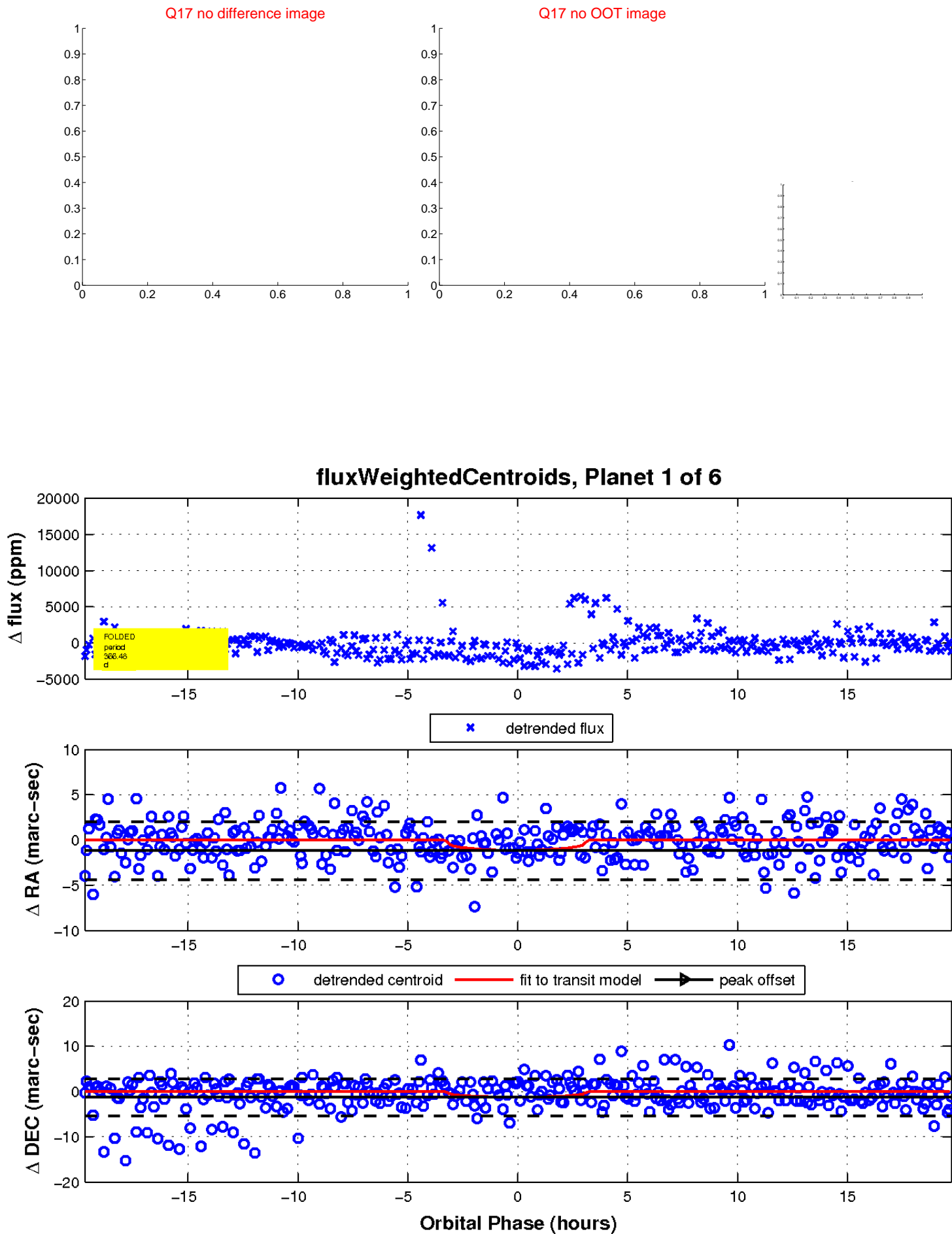
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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



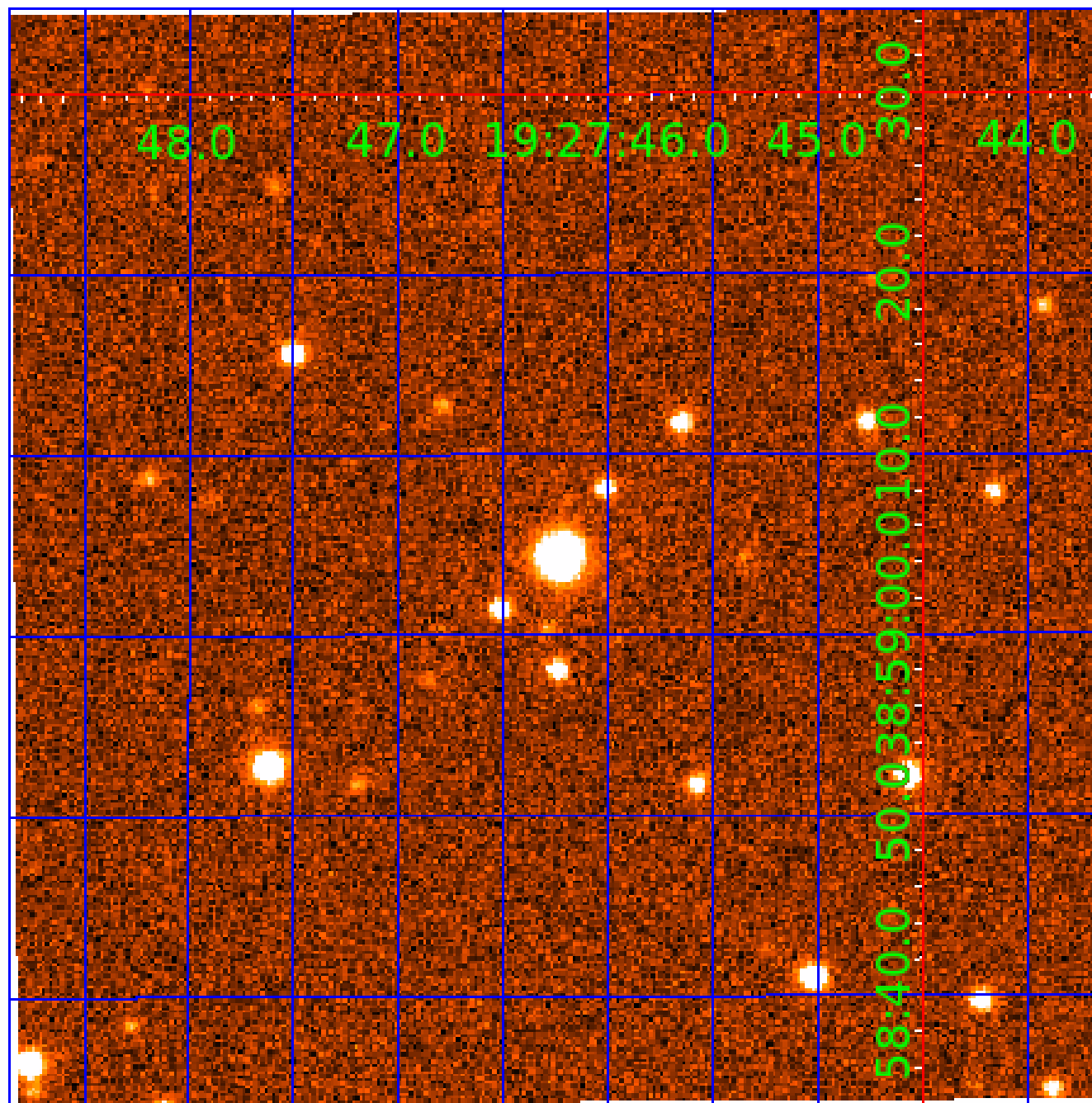
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.





# UKIRT Image

Declination



# KIC 003852116

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
003852116-01	OBS	No	366.484469	408.259534	2193.0	6.588	15.0	7.4	0.66	4555	2.98	0.22
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003852116-06	OBS	No	421.057650	471.703520	2540.7	12.843	10.7	5.6	0.66	4555	3.20	0.19

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
003852116-01	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_SKYE—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS
003852116-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—TRANS_GAPPED—LPP_DV—ALL_TRANS_CHASES—INCONSISTENT_TRANS—CENT_FEW_DIFFS
003852116-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—ALL_TRANS_CHASES—MOD_POS_DV—CENT_FEW_DIFFS
003852116-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS
003852116-05	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—ALL_TRANS_CHASES—MOD_POS_DV—CENT_FEW_DIFFS
003852116-06	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—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.

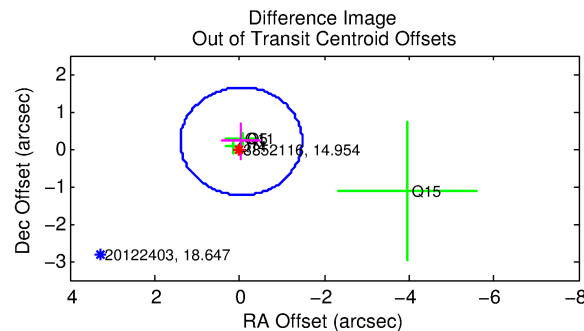
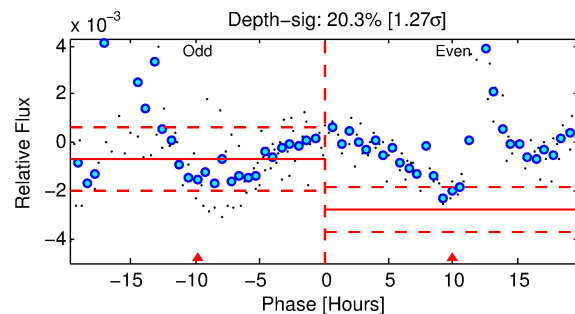
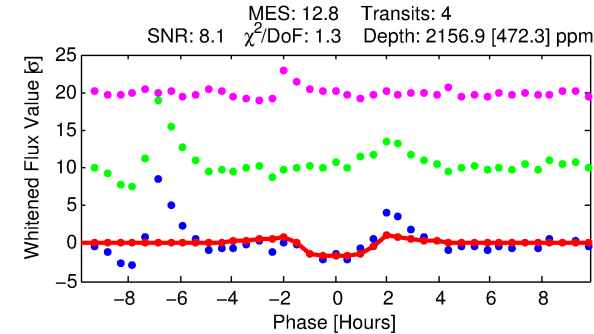
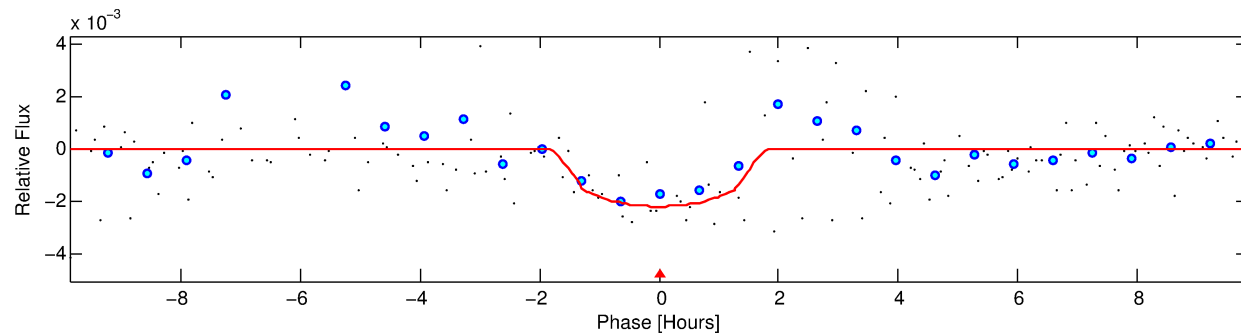
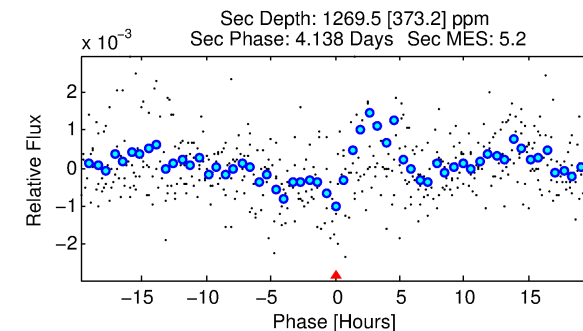
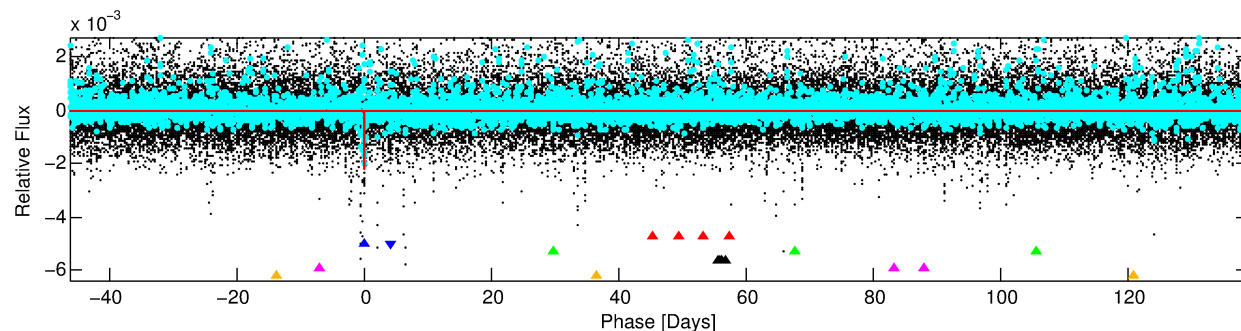
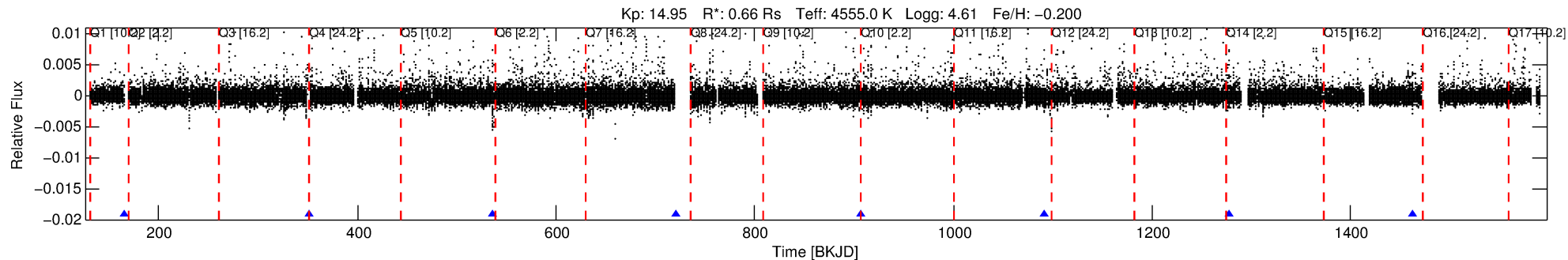
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 003852116-02

No Significant Match Found

# DV One-Page Summary

KIC: 3852116 Candidate: 2 of 6 Period: 185.278 d



## DV Fit Results:

Period = 185.27812 [0.00288] d  
Epoch = 165.5653 [0.0163] BKJD  
Rp/R\* = 0.0434 [0.1097]  
a/R\* = 377.28 [2878.15]  
b = 0.56 [9.48]  
Seff = 0.56 [0.08]  
Teq = 220 [8] K  
Rp = 3.14 [7.95] Re  
a = 0.5530 [0.0381] AU  
Ag = 21607.45 [109434.05] [0.20σ]  
Teffp = 4128 [5227] K [0.75σ]

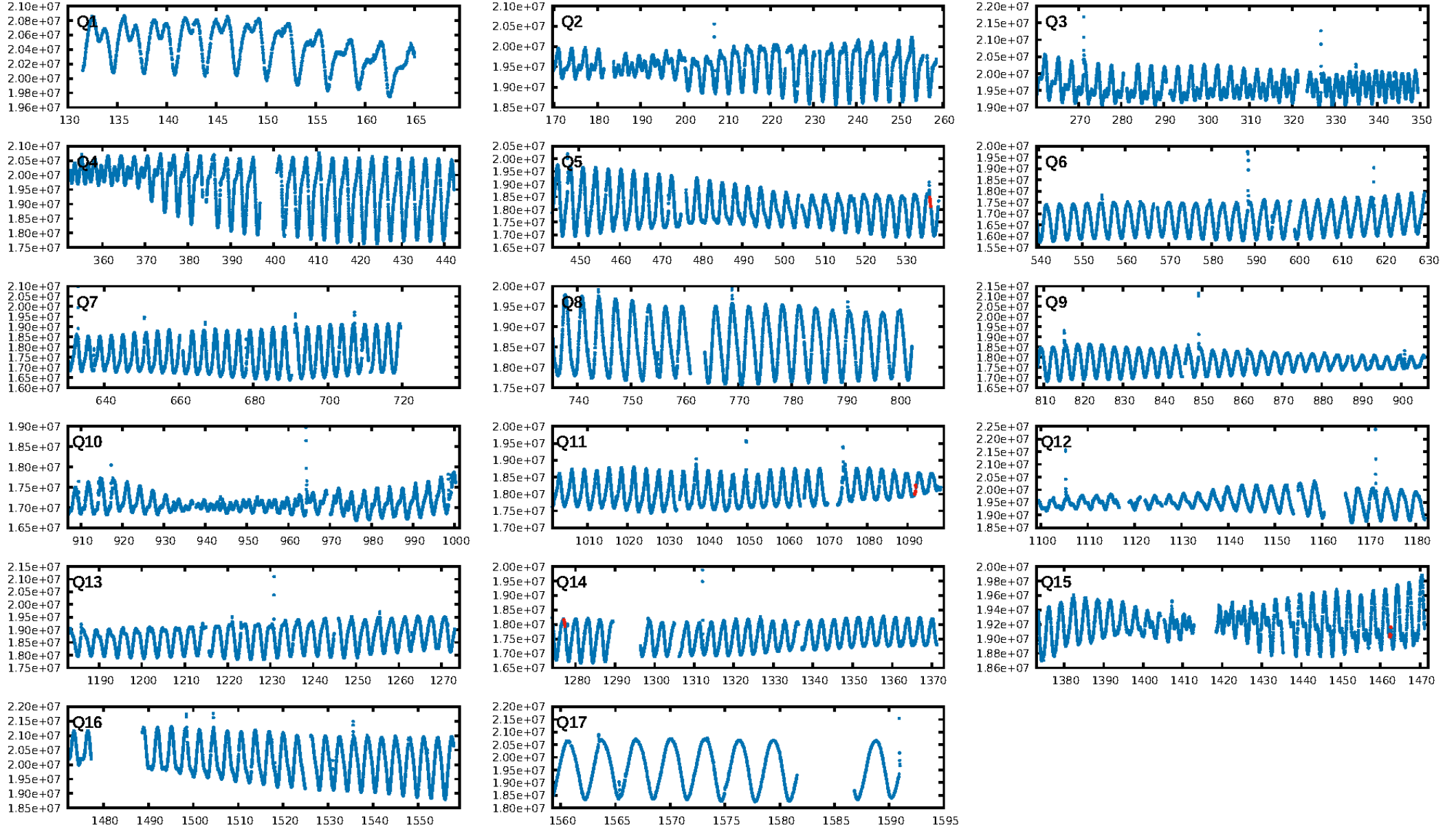
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 100.0% [590.49σ]  
ModelChiSquare2-sig: 24.3%  
ModelChiSquareGof-sig: 99.5%  
Bootstrap-pfa: N/A  
RollingBand-fgt: 1.00 [4/4]  
GhostDiagnostic-chr: 1.191  
Centroid-sig: 70.3%  
Centroid-so: 0.494 arcsec [0.47σ]  
OotOffset-rm: 0.208 arcsec [0.43σ]  
KicOffset-rm: 0.087 arcsec [0.18σ]  
OotOffset-st: 1/2/0/1 [4]  
KicOffset-st: 1/2/0/1 [4]  
DiffImageQuality-fgm: 0.50 [2/4]  
DiffImageOverlap-fno: 1.00 [4/4]

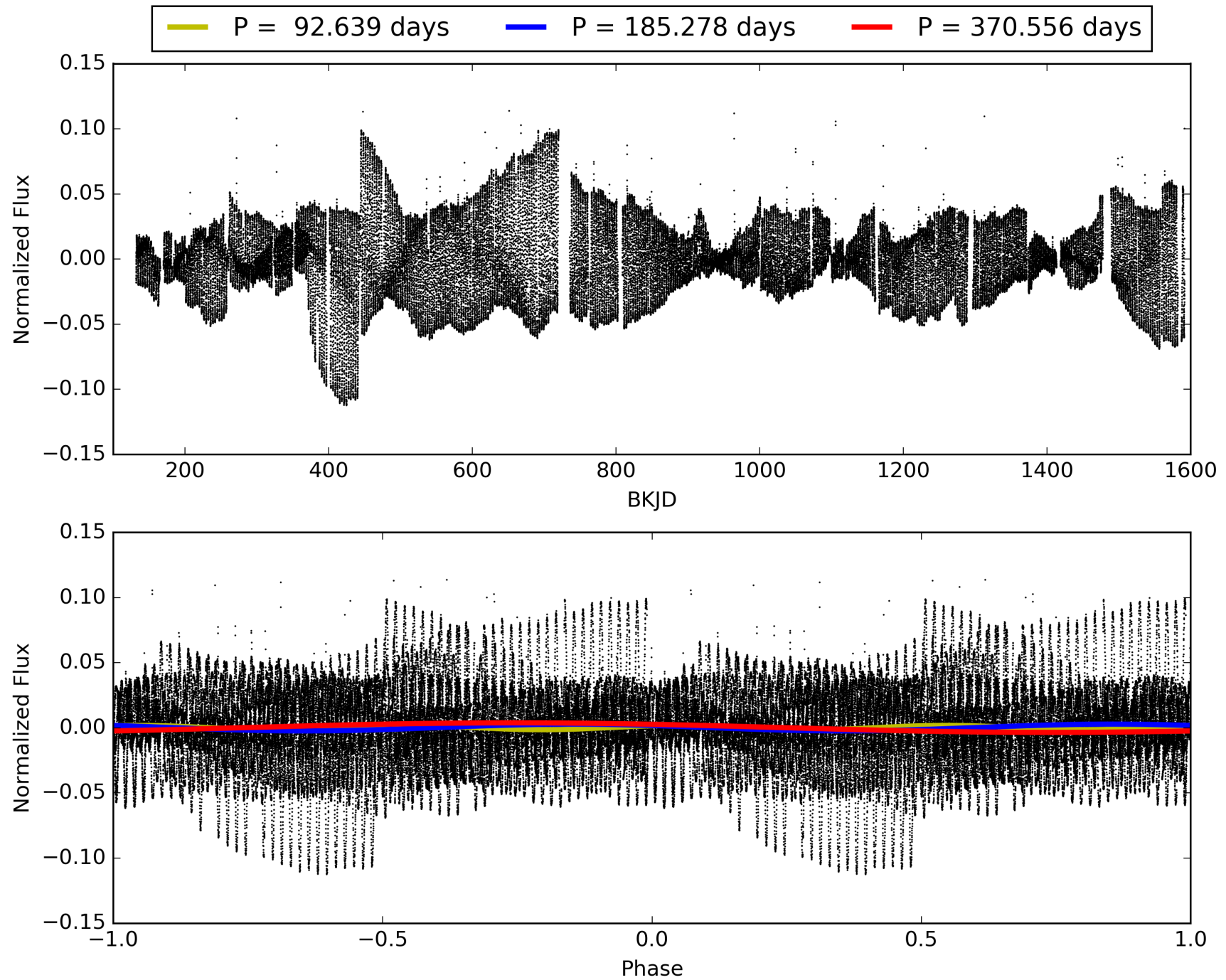
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 01-Feb-2016 05:44:19 Z

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

# TCE 003852116-02, PDC Light Curves



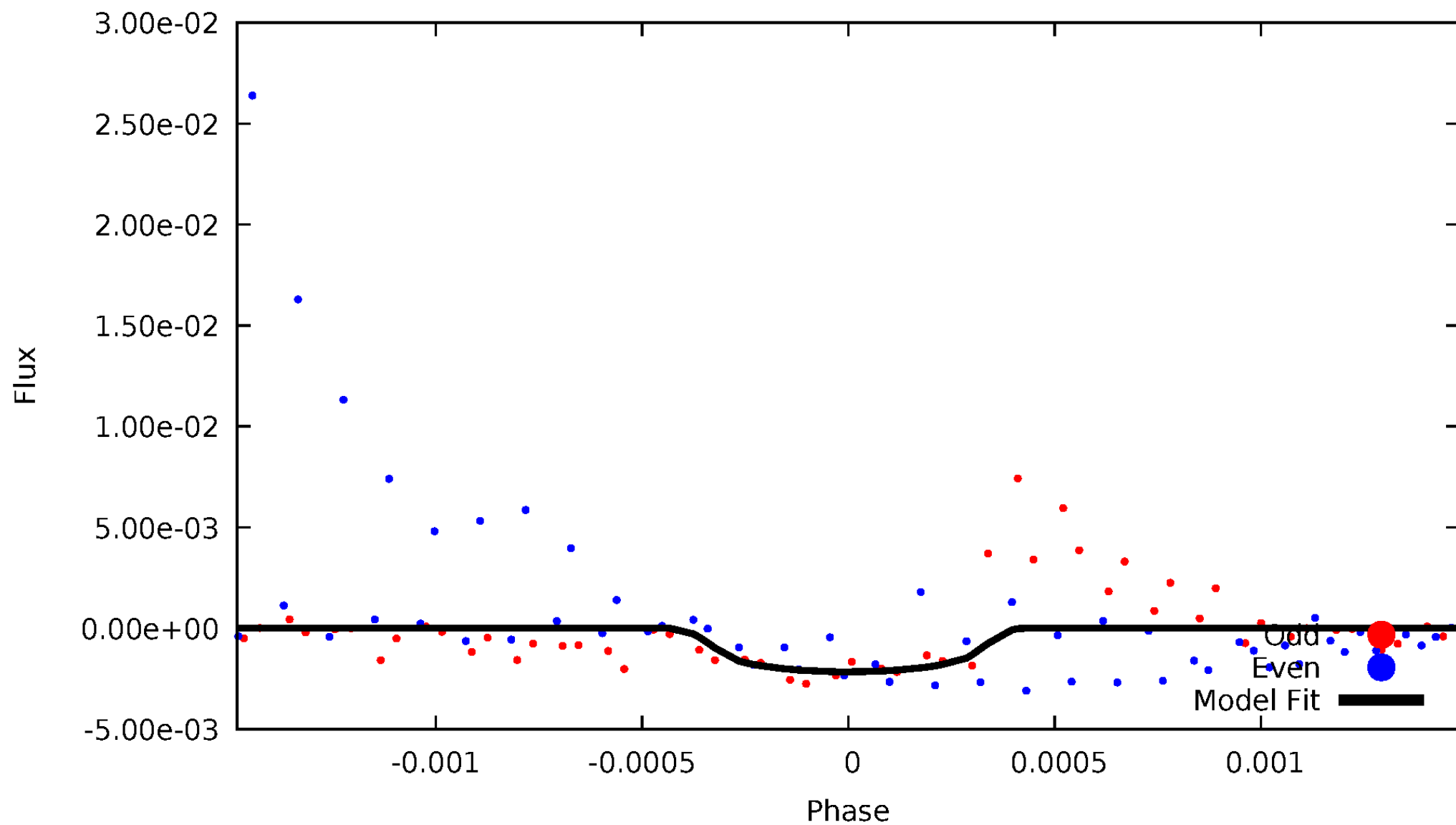
TCE 003852116-02





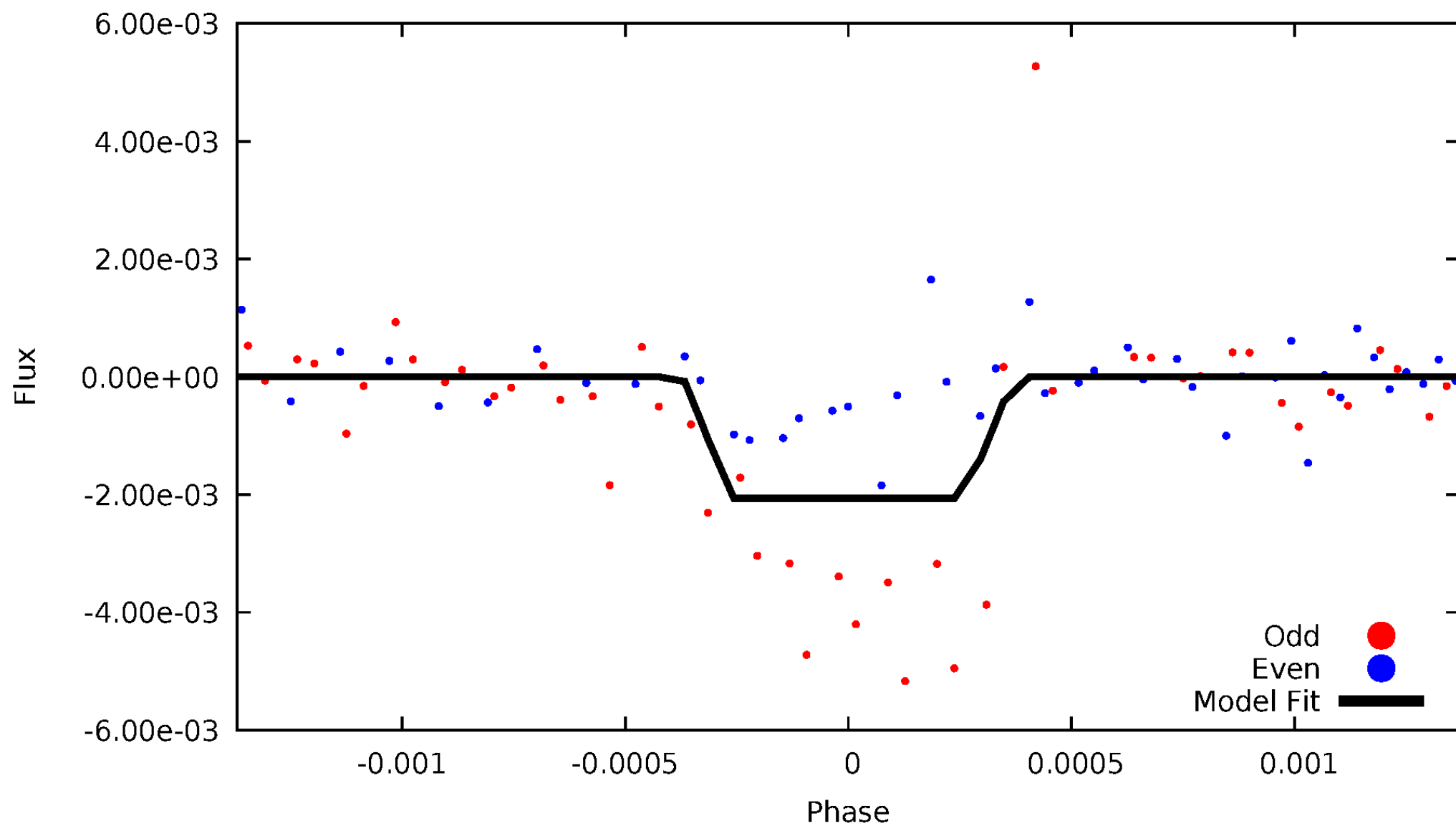
# DV Odd/Even

TCE 003852116-02



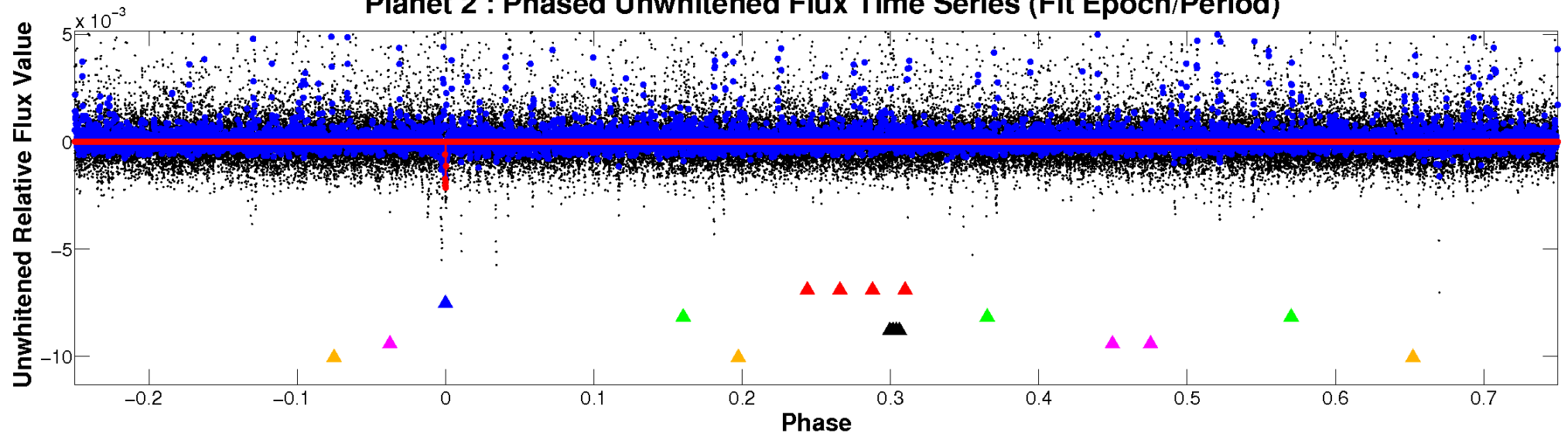
# ALT Odd/Even

TCE 003852116-02

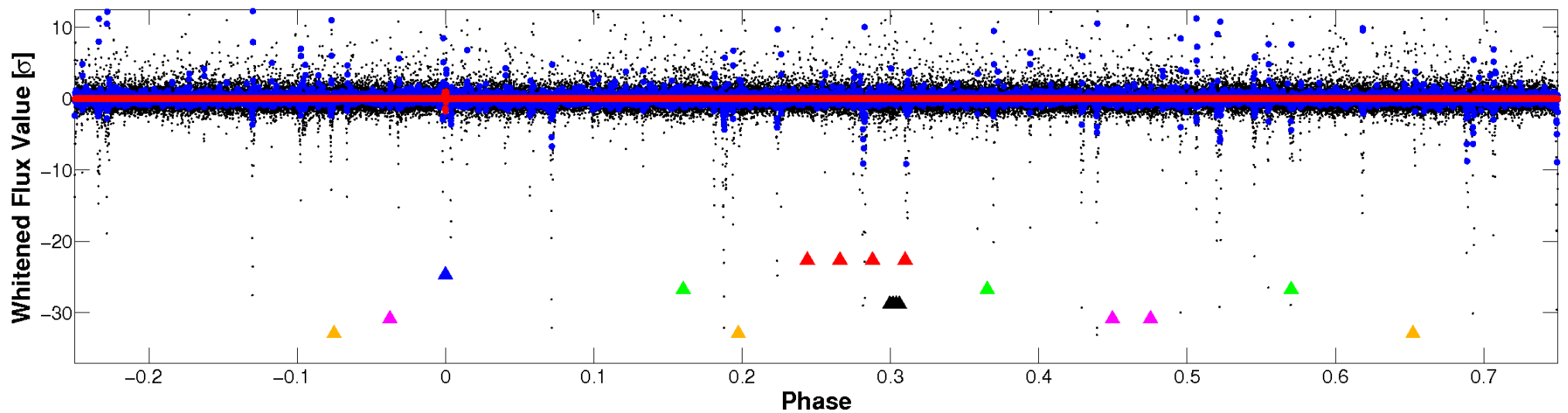


# Non-Whitened Vs. Whitened Light Curve

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

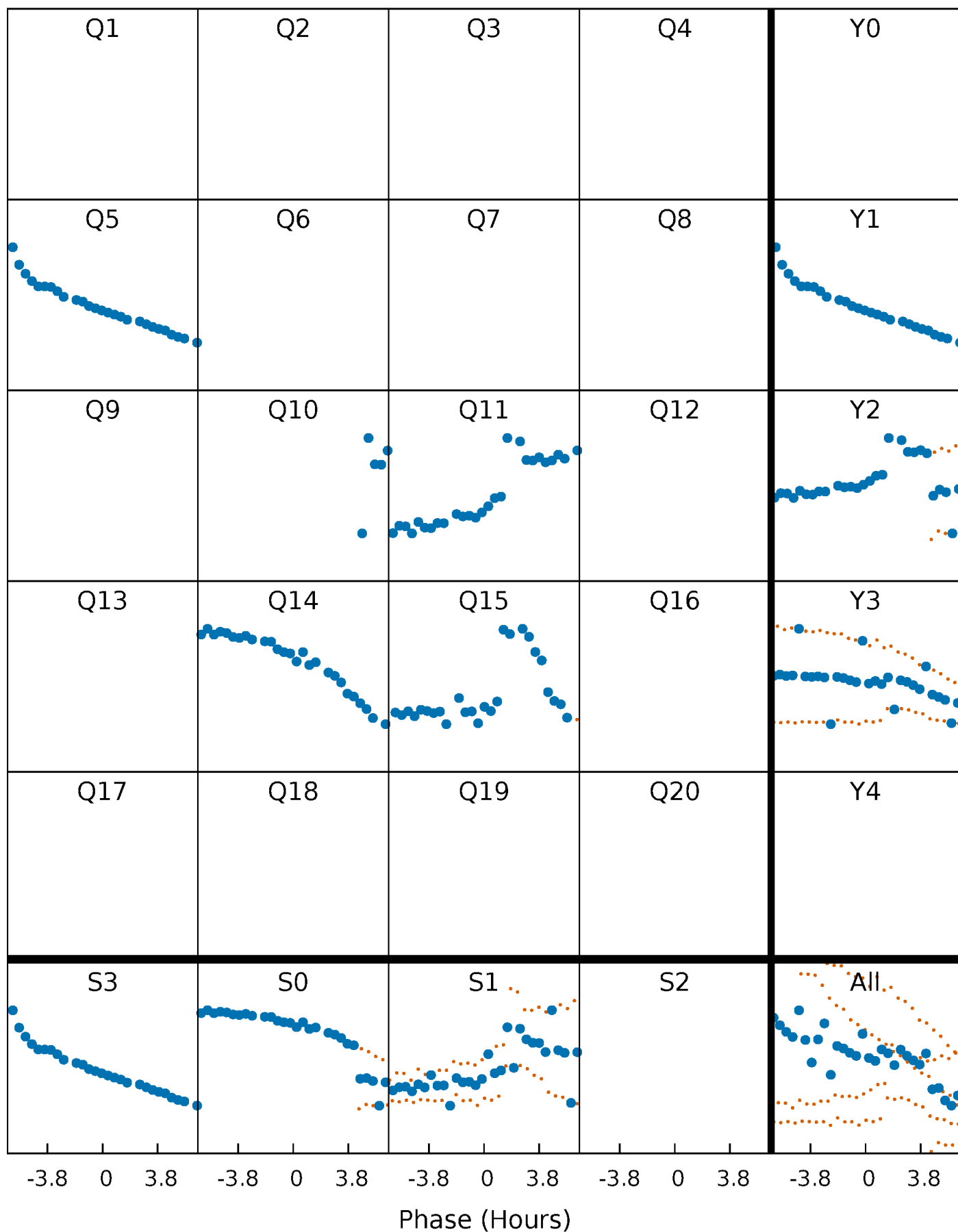


## Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



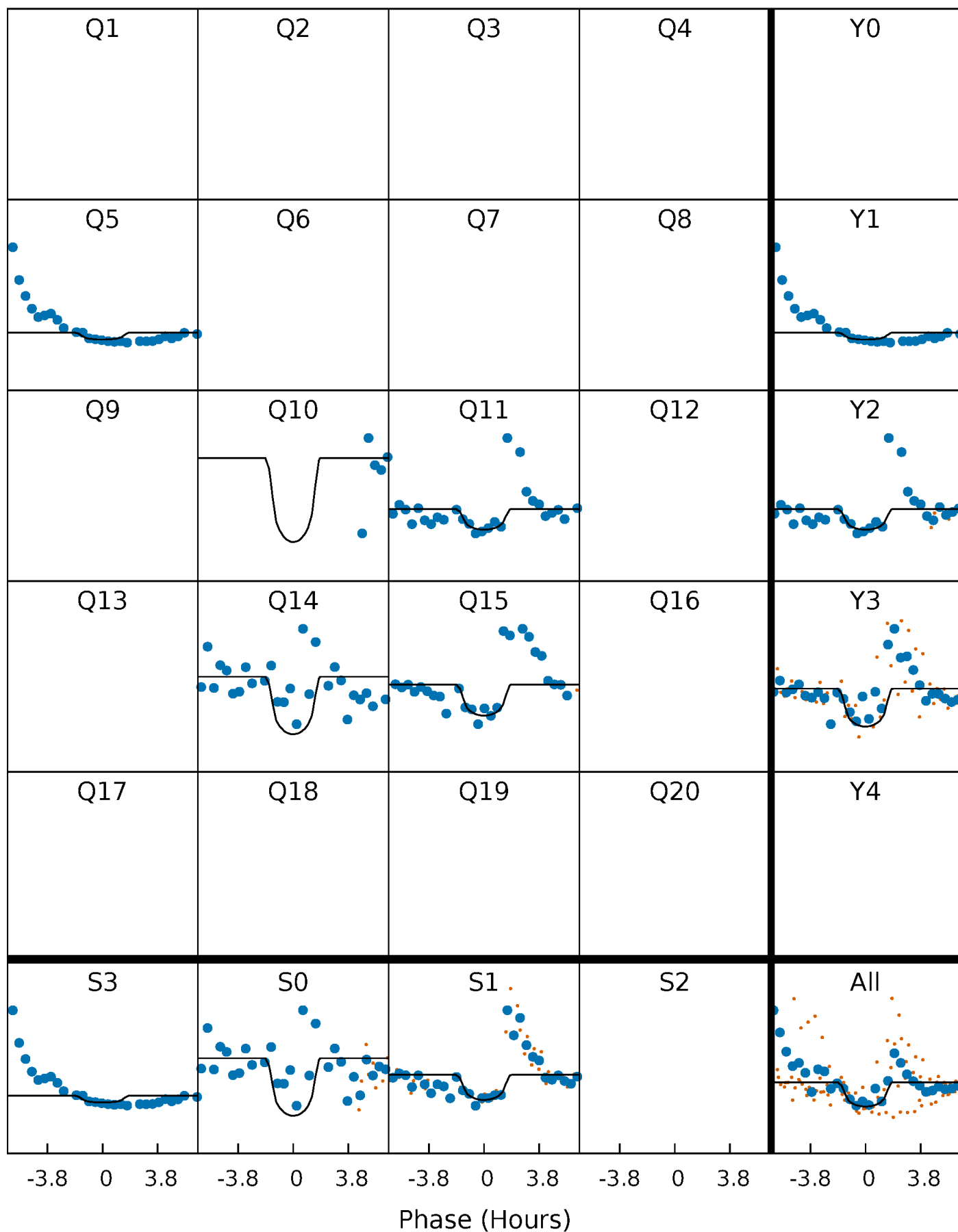
# PDC Quarter-Phased Transit Curves

TCE 003852116-02 P=185.278116 Days  $T_0=165.565284$  (BKJD)



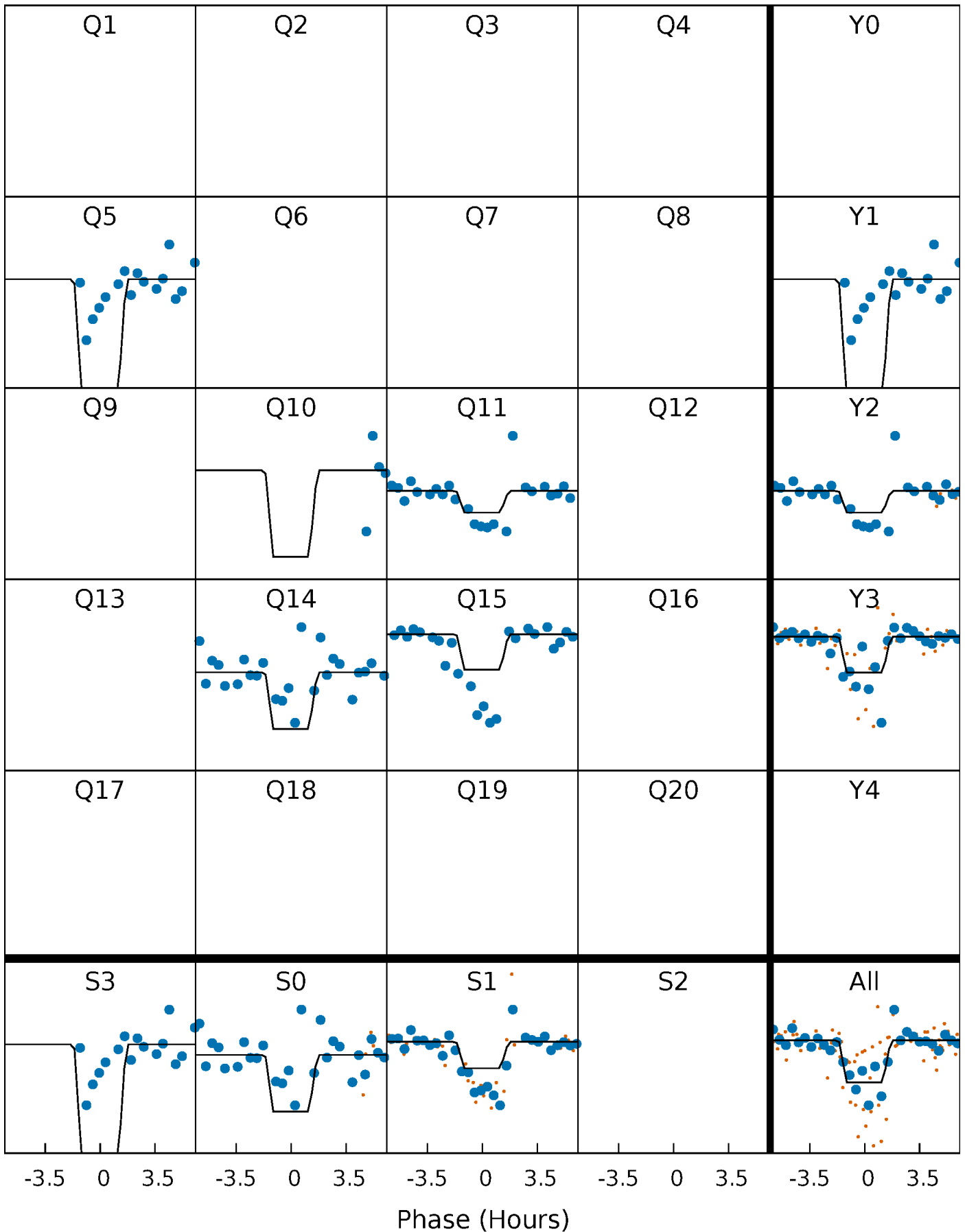
# DV Quarter-Phased Transit Curves

TCE 003852116-02 P=185.278116 Days  $T_0=165.565284$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

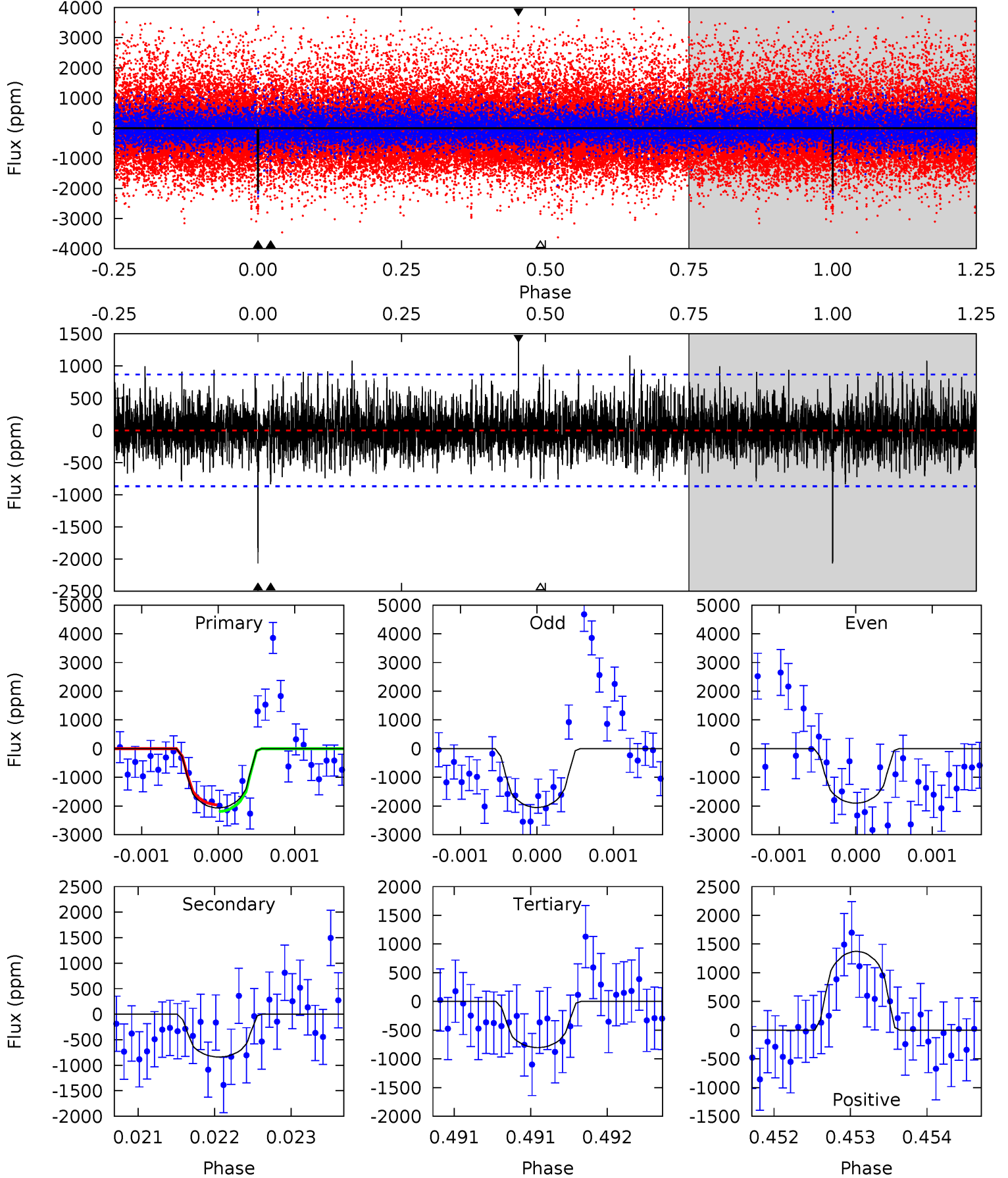
TCE 003852116-02   P=185.278144 Days    $T_0=165.563464$  (BKJD)



# DV Model-Shift Uniqueness Test

003852116-02, P = 185.278116 Days, E = 165.565284 Days

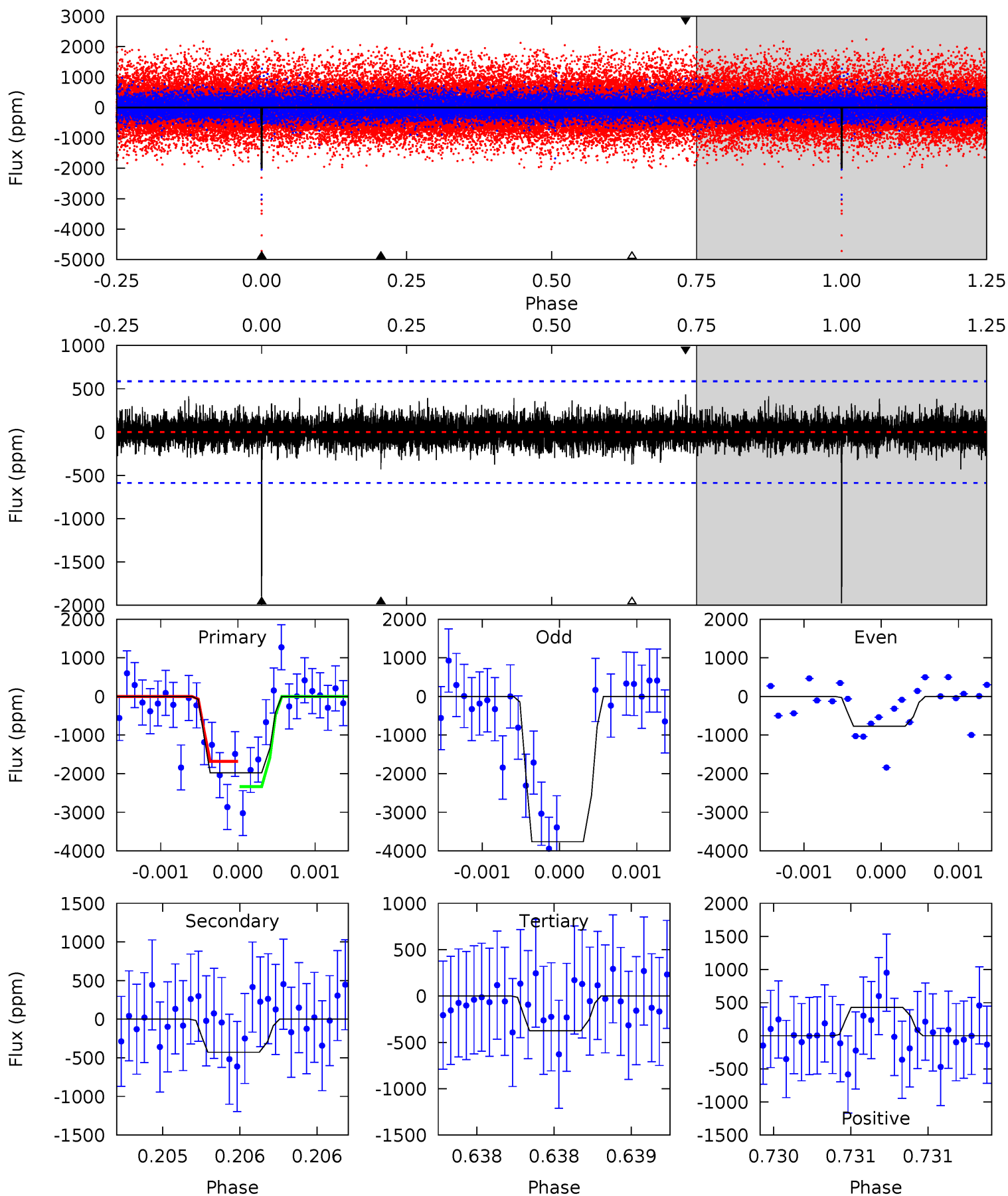
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
13.1	5.31	5.09	8.69	5.49	3.36	1.63	8.00	4.40	0.22	-3.38	0.49	0.88	0.40	0.76



# Alt Model-Shift Uniqueness Test

003852116-02, P = 185.278144 Days, E = 165.563464 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
18.6	4.02	3.51	4.04	5.51	3.38	0.95	15.1	14.5	0.51	-0.02	14.4	1.14	0.18	2.82





### Stellar Parameters For KIC 003852116

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (g \cdot \text{cm}^{-3})$
	$4555^{+136}_{-136}$	$4.611^{+0.048}_{-0.028}$	$-0.200^{+0.300}_{-0.300}$	$0.664^{+0.052}_{-0.058}$	$0.656^{+0.071}_{-0.051}$	$3.163^{+0.733}_{-0.411}$
	+3%/-3%	+1%/-1%	+150%/-150%	+8%/-9%	+11%/-8%	+23%/-13%
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 003852116-02 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-838 \pm 158$	$6.94^{+6.36}_{-4.49}$	$306^{+11}_{-11}$	$3049^{+1224}_{-484}$	$2996^{+19692}_{-2218}$
Alt.	$-428 \pm 106$	$6.45^{+6.61}_{-4.29}$	$306^{+12}_{-10}$	$2841^{+1107}_{-482}$	$1708^{+13795}_{-1301}$

$T_{max}$  = 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  $A_{obs} \gg 1.0$

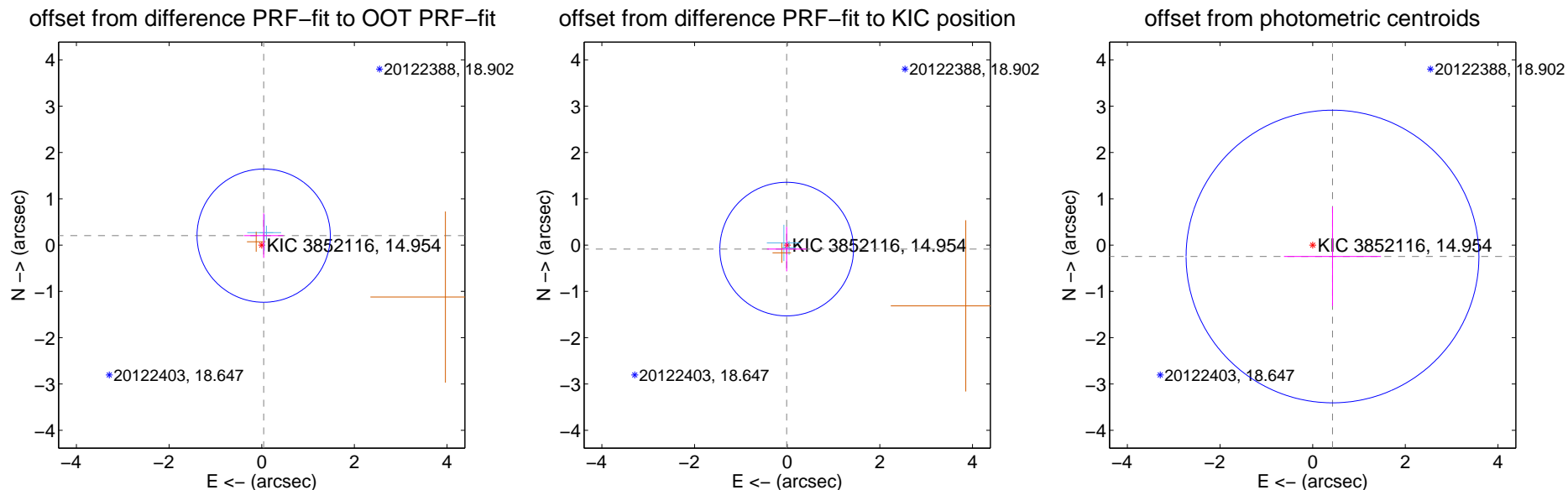
## DV Centroid Data

Supplemental centroid analysis for 003852116-02. Kepler magnitude: 14.95. Transit SNR 8.14

There are 2 quarters with good PRF difference image offsets

The direct PRF centroid is offset from the target star catalog position by about 0.22 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.208 \pm 0.480$	0.43	$-0.042 \pm 0.425$	$0.204 \pm 0.482$
PRF-fit source offset from KIC position	$0.087 \pm 0.481$	0.18	$0.011 \pm 0.425$	$-0.086 \pm 0.482$
photometric centroid source offset	$0.49 \pm 1.05$	0.47	$-0.43 \pm 1.05$	$-0.25 \pm 1.07$

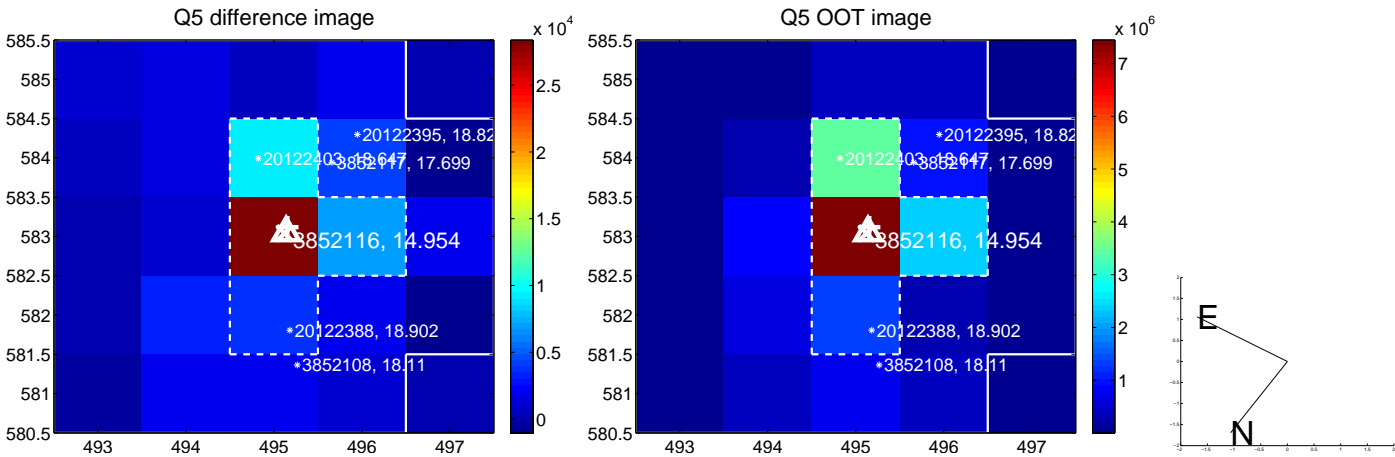


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three- $\sigma$ . 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.

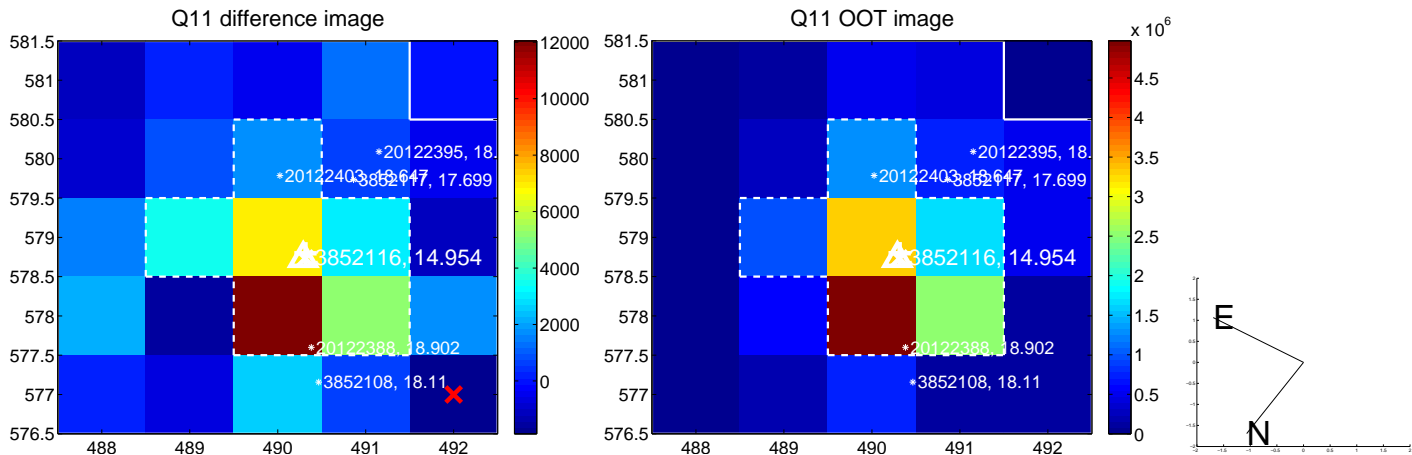
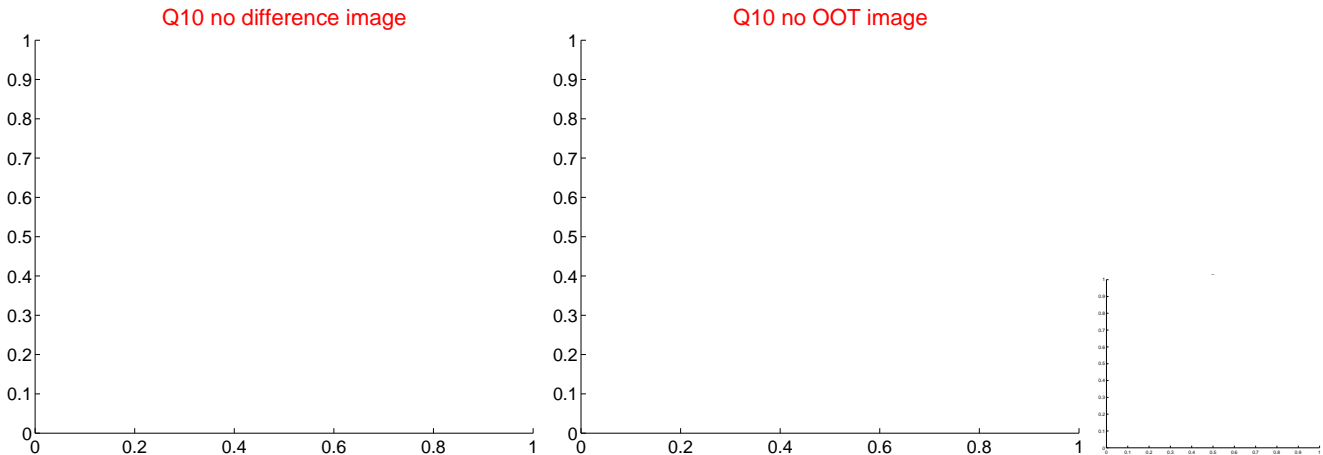
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



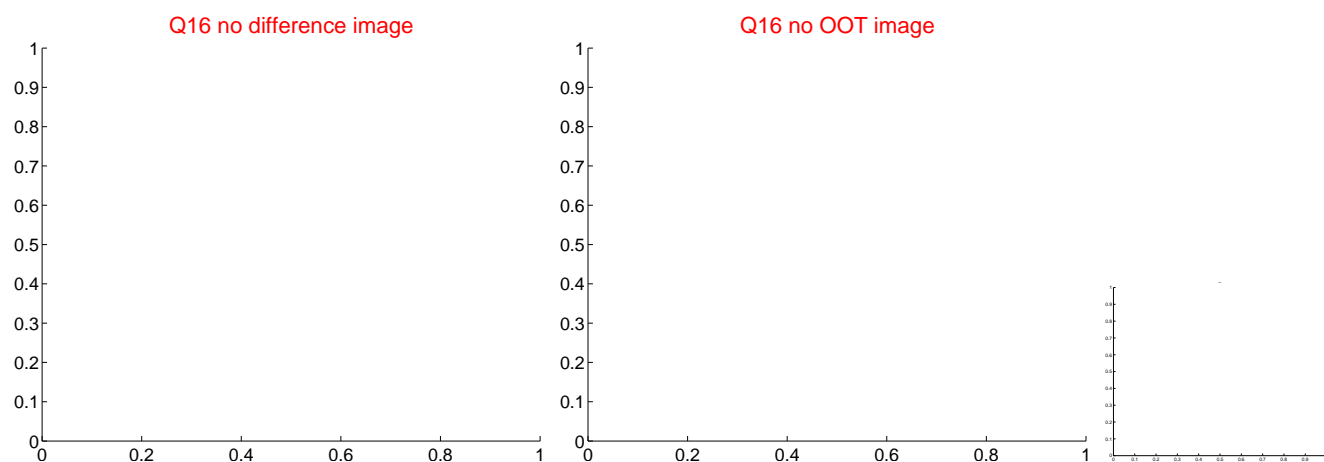
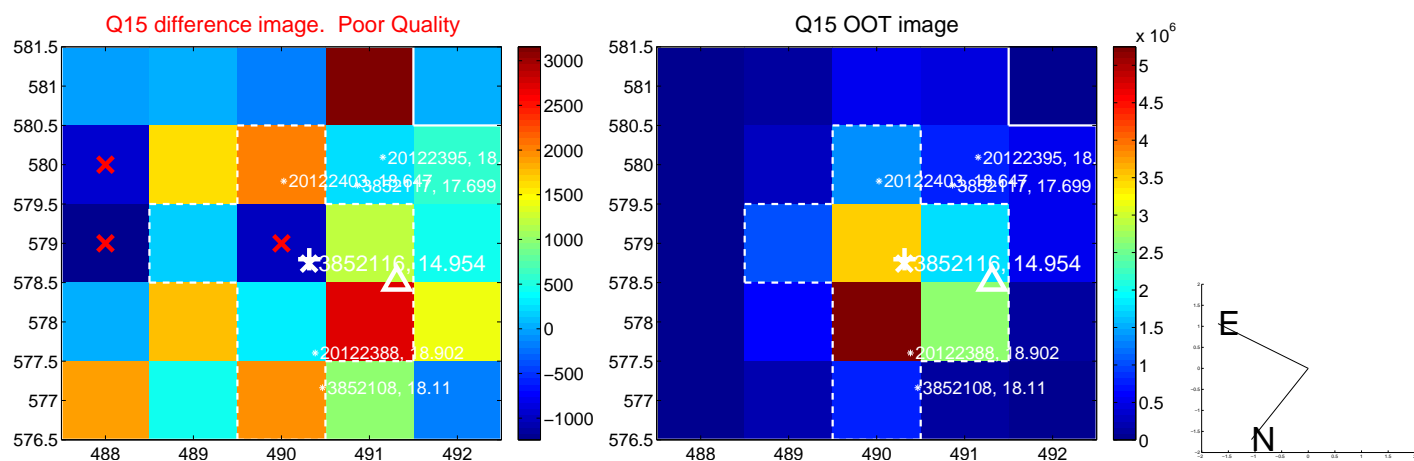
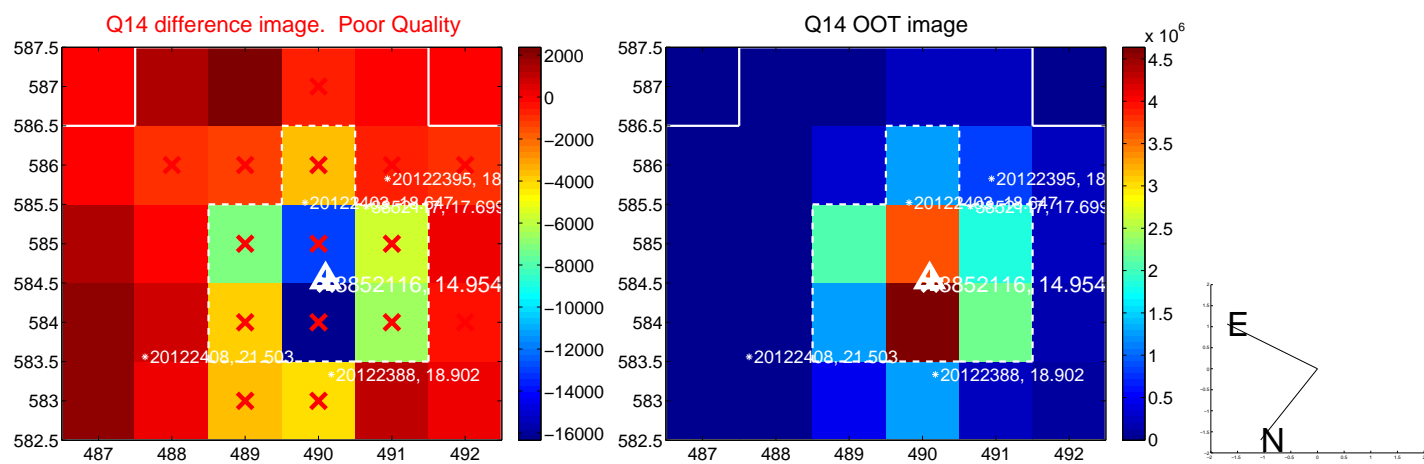
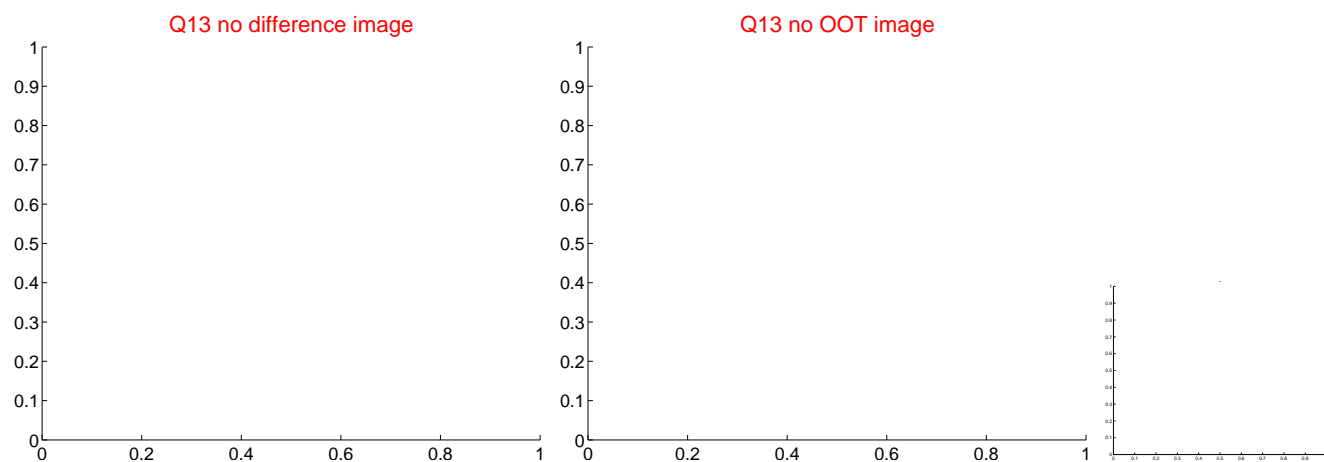
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



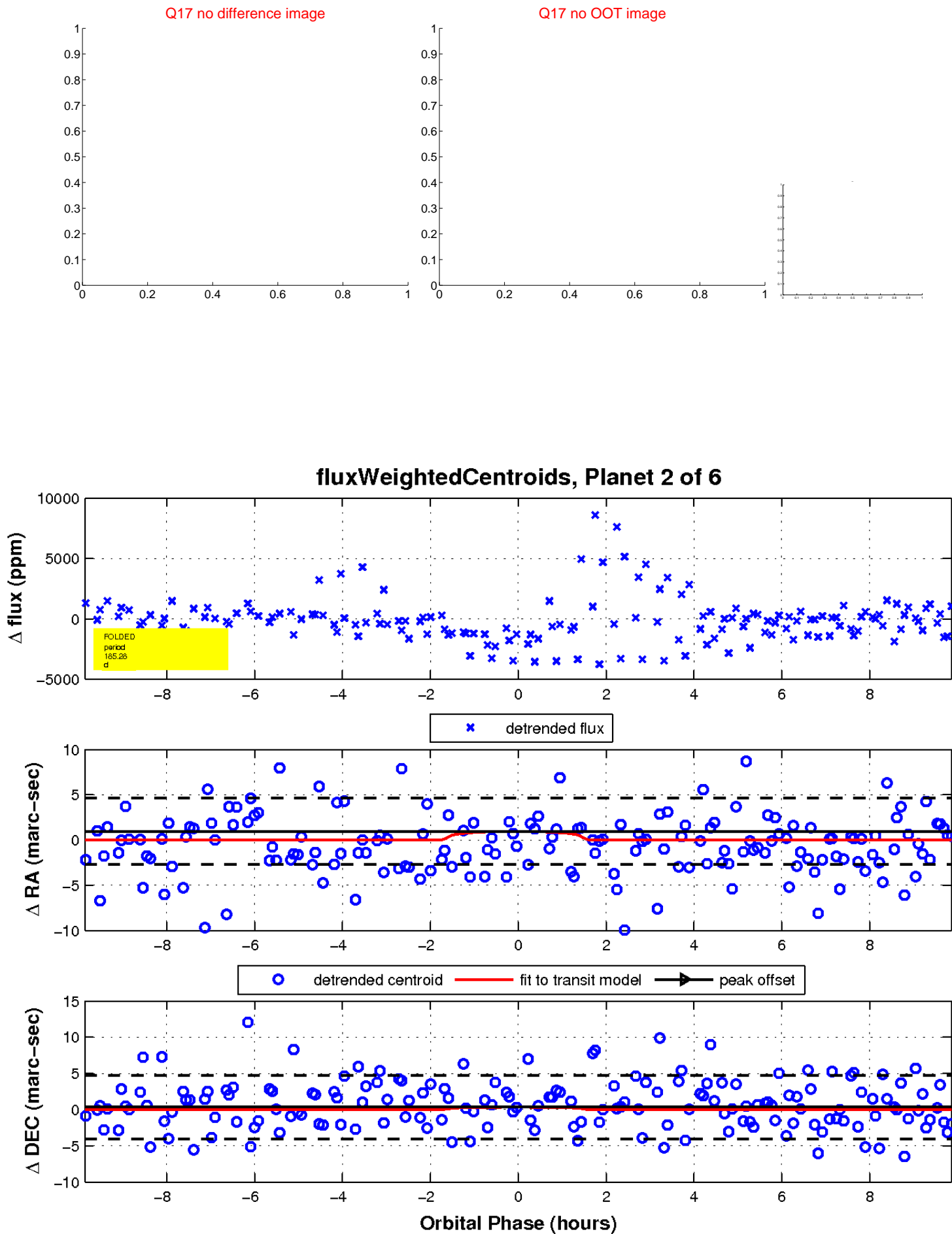
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value



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

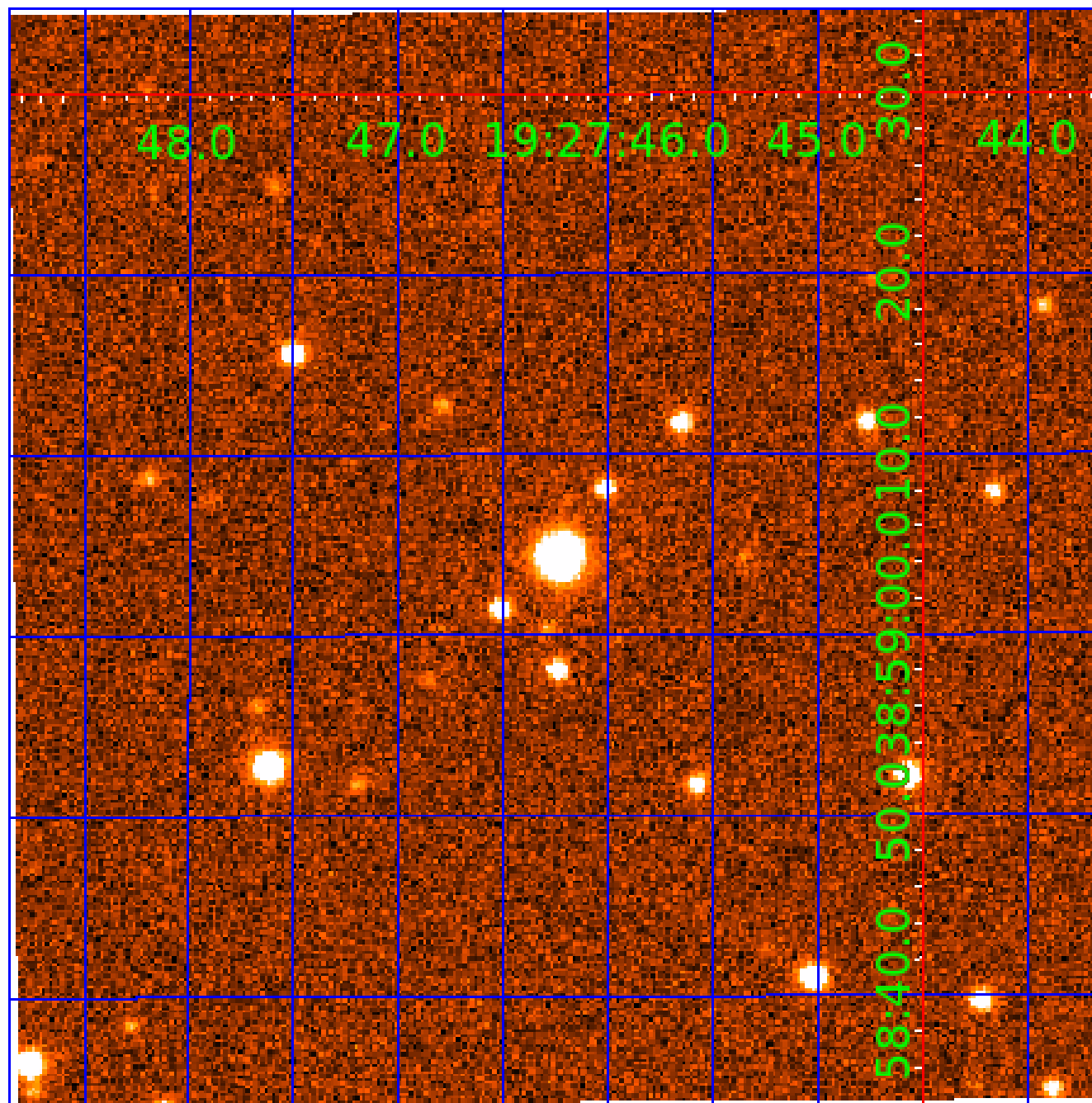


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



# UKIRT Image

Declination





# KIC 003852116

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
003852116-01	OBS	No	366.484469	408.259534	2193.0	6.588	15.0	7.4	0.66	4555	2.98	0.22
003852116-02	OBS	No	185.278116	165.565284	2156.9	3.292	12.8	8.1	0.66	4555	3.14	0.56
003852116-03	OBS	No	517.860719	456.491183	2713.1	5.758	11.9	7.6	0.66	4555	3.46	0.14
003852116-04	OBS	No	370.155848	222.268762	2471.9	3.085	13.5	7.8	0.66	4555	3.17	0.22
003852116-05	OBS	No	465.573161	434.163541	3119.6	2.940	11.8	8.6	0.66	4555	3.68	0.16
003852116-06	OBS	No	421.057650	471.703520	2540.7	12.843	10.7	5.6	0.66	4555	3.20	0.19

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
003852116-01	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_SKYE—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS
003852116-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—TRANS_GAPPED—LPP_DV—ALL_TRANS_CHASES—INCONSISTENT_TRANS—CENT_FEW_DIFFS
003852116-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—ALL_TRANS_CHASES—MOD_POS_DV—CENT_FEW_DIFFS
003852116-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS
003852116-05	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—ALL_TRANS_CHASES—MOD_POS_DV—CENT_FEW_DIFFS
003852116-06	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—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.

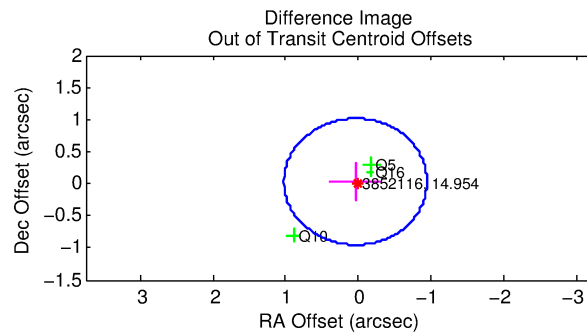
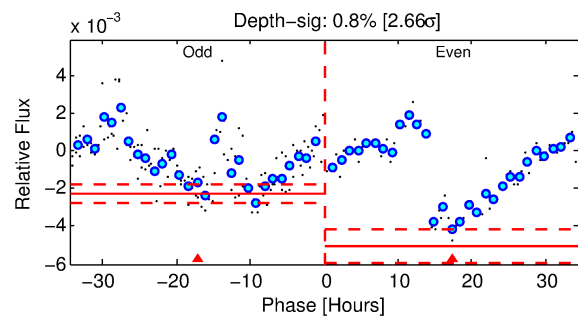
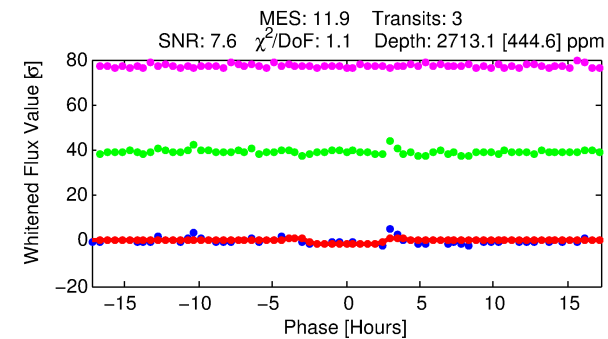
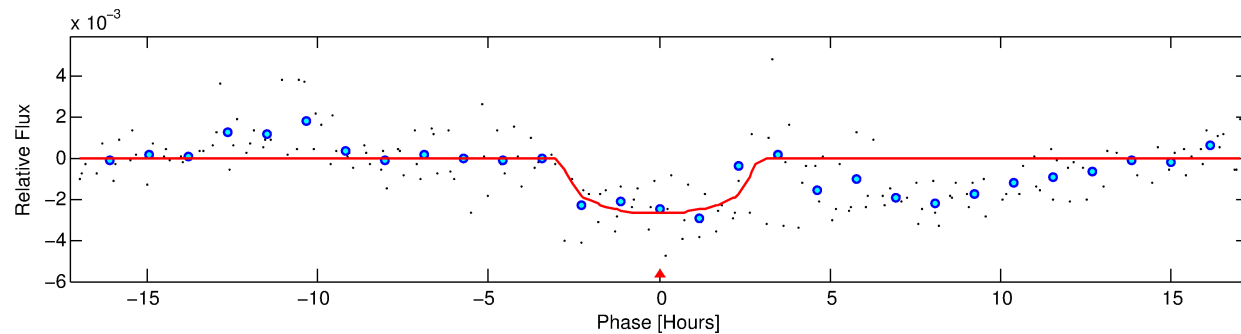
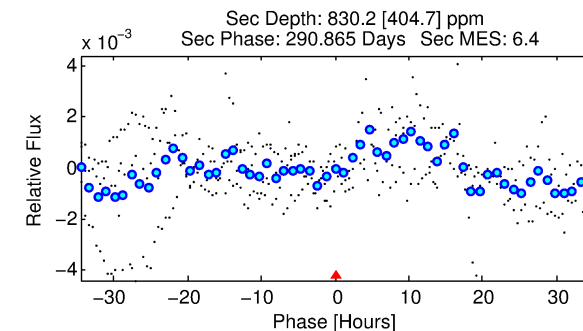
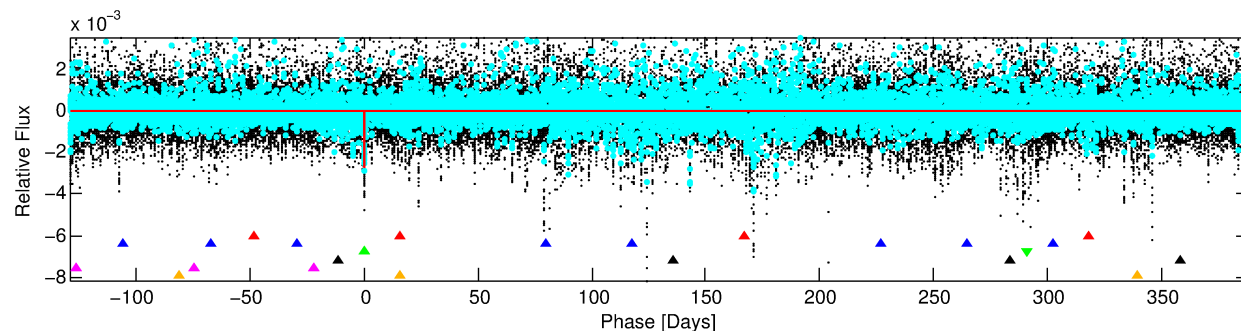
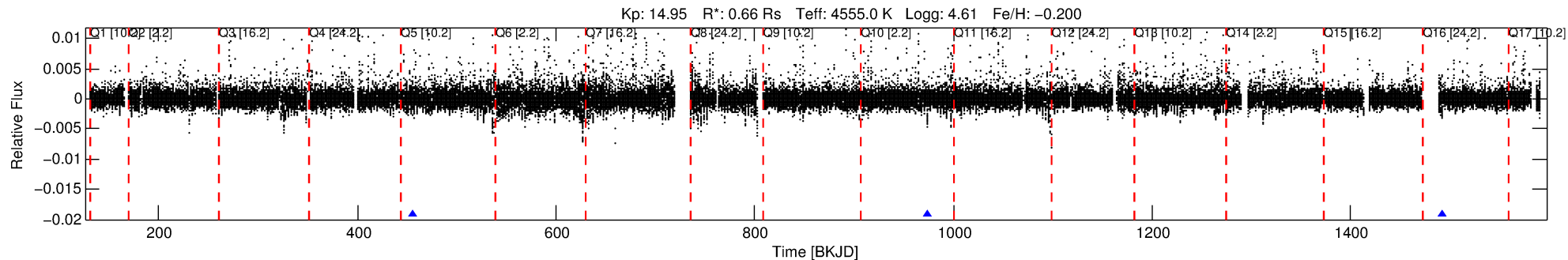
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 003852116-03

No Significant Match Found

# DV One-Page Summary

KIC: 3852116 Candidate: 3 of 6 Period: 517.861 d



## DV Fit Results:

Period = 517.86072 [0.00532] d  
Epoch = 456.4912 [0.0074] BKJD  
Rp/R\* = 0.0477 [0.0572]  
a/R\* = 638.73 [2321.16]  
b = 0.48 [5.90]  
Seff = 0.14 [0.02]  
Teq = 156 [6] K  
Rp = 3.46 [4.16] Re  
a = 1.0972 [0.0756] AU  
Ag = 46015.40 [112676.88] [0.41σ]  
Teff = 3540 [2168] K [1.56σ]

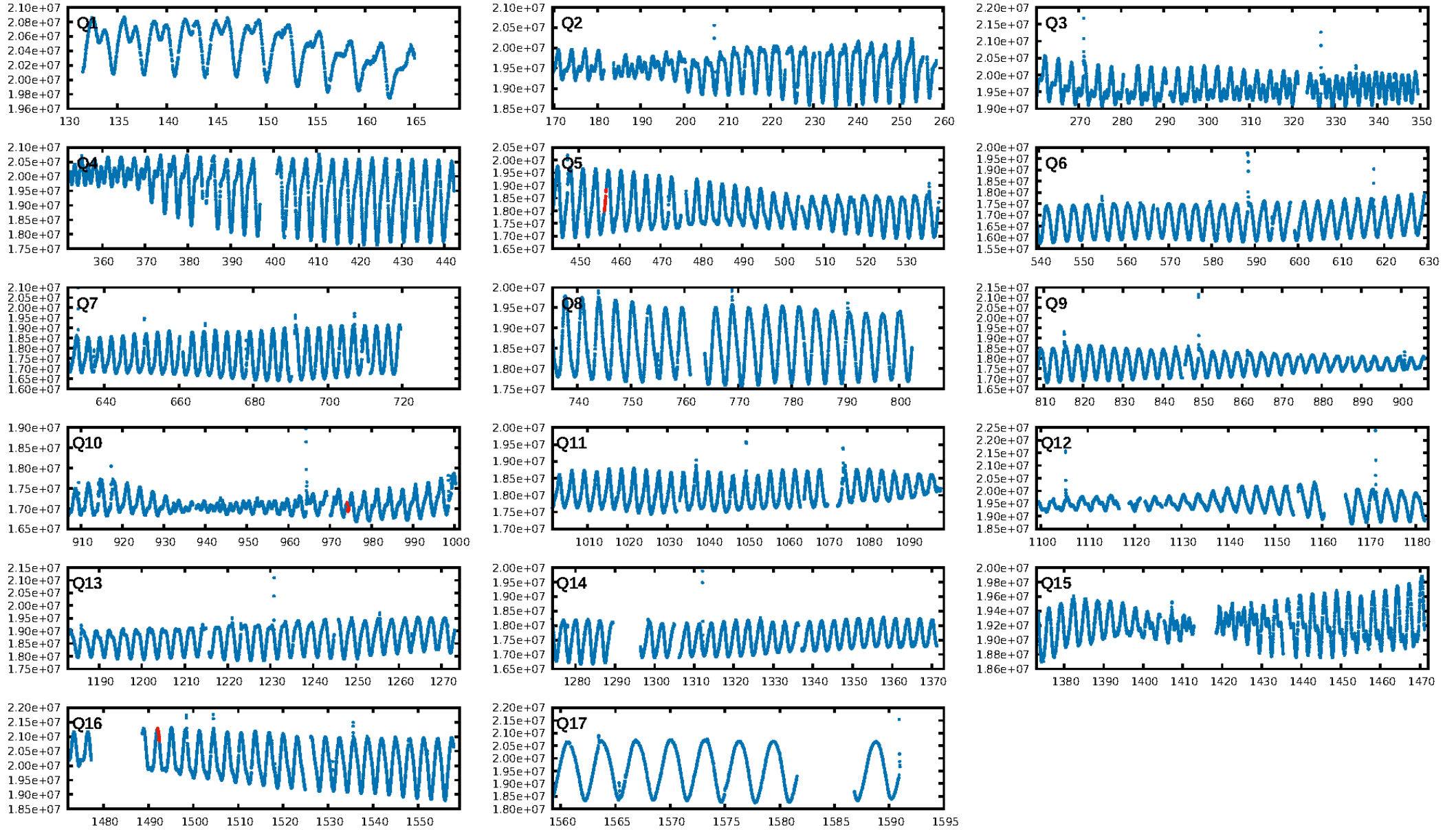
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [194.10σ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: 25.7%  
ModelChiSquareGof-sig: 97.6%  
Bootstrap-pfa: N/A  
RollingBand-fgt: 1.00 [3/3]  
GhostDiagnostic-chr: -10.06  
Centroid-sig: 67.1%  
Centroid-so: 0.247 arcsec [0.36σ]  
OotOffset-rm: 0.051 arcsec [0.15σ]  
OotOffset-st: 1/0/1/1 [3]  
KicOffset-rm: 0.208 arcsec [0.63σ]  
KicOffset-st: 1/0/1/1 [3]  
DiffImageQuality-fgm: 0.67 [2/3]  
DiffImageOverlap-fno: 1.00 [3/3]

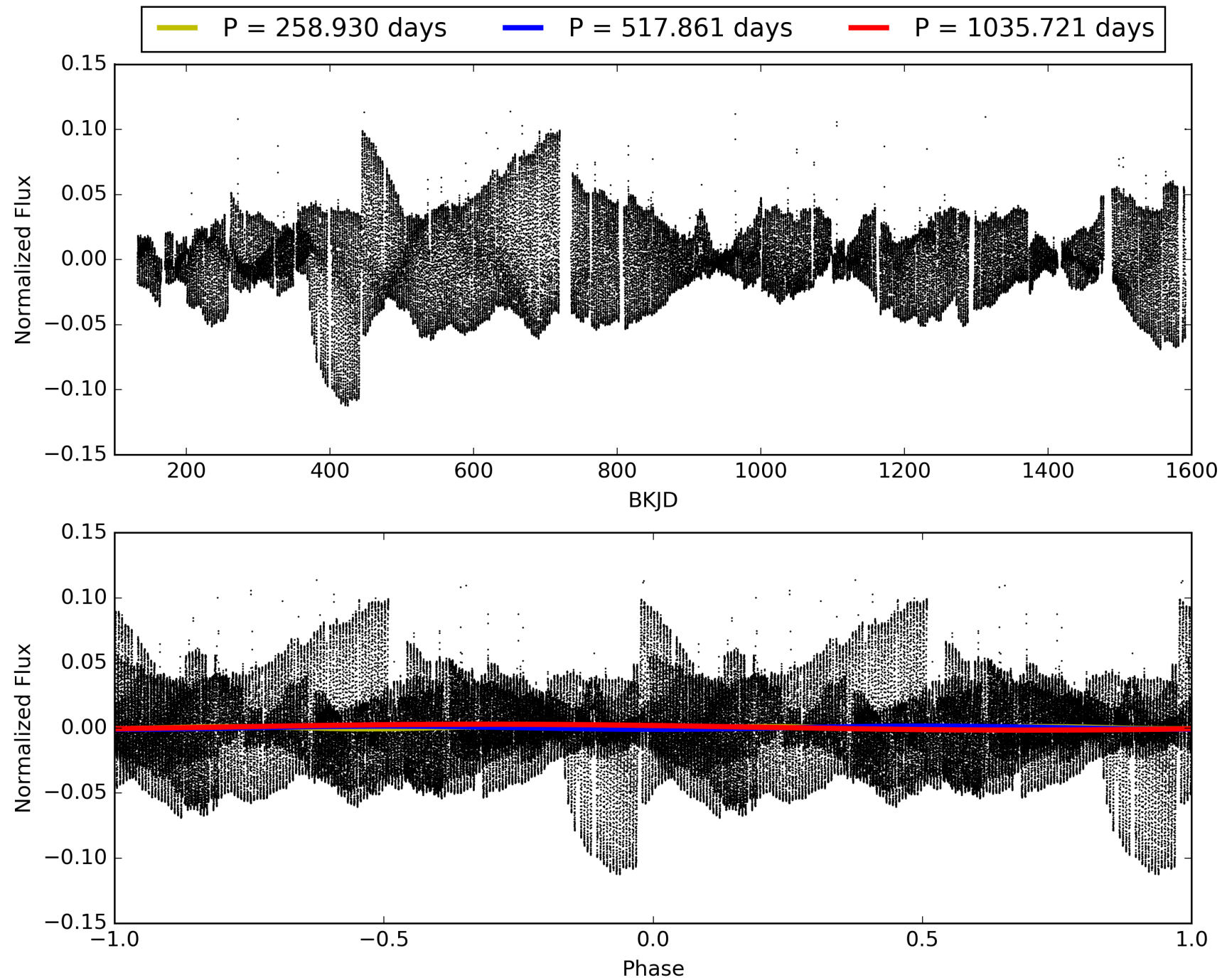
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 01-Feb-2016 05:44:34 Z

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

# TCE 003852116-03, PDC Light Curves

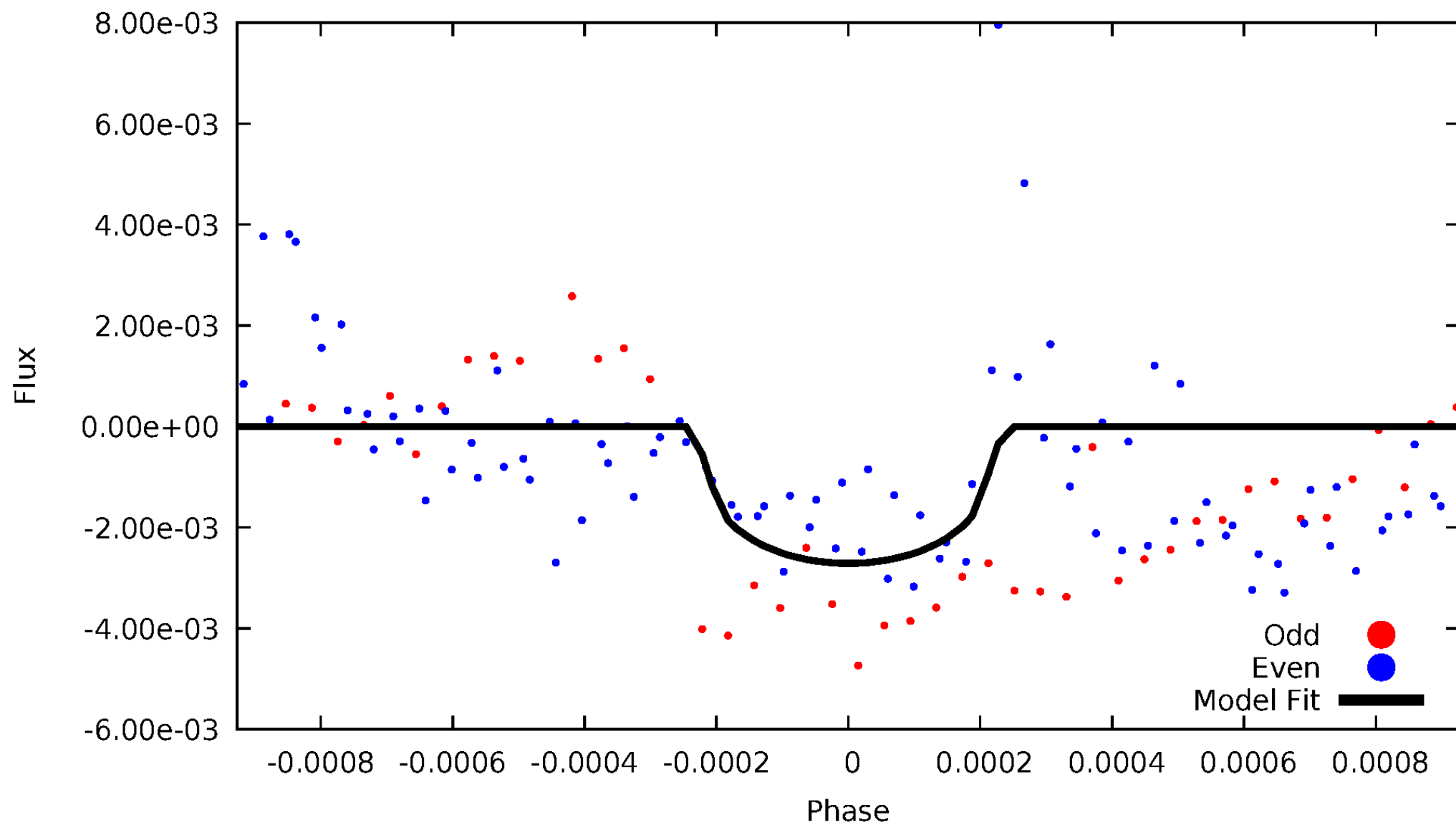


TCE 003852116-03



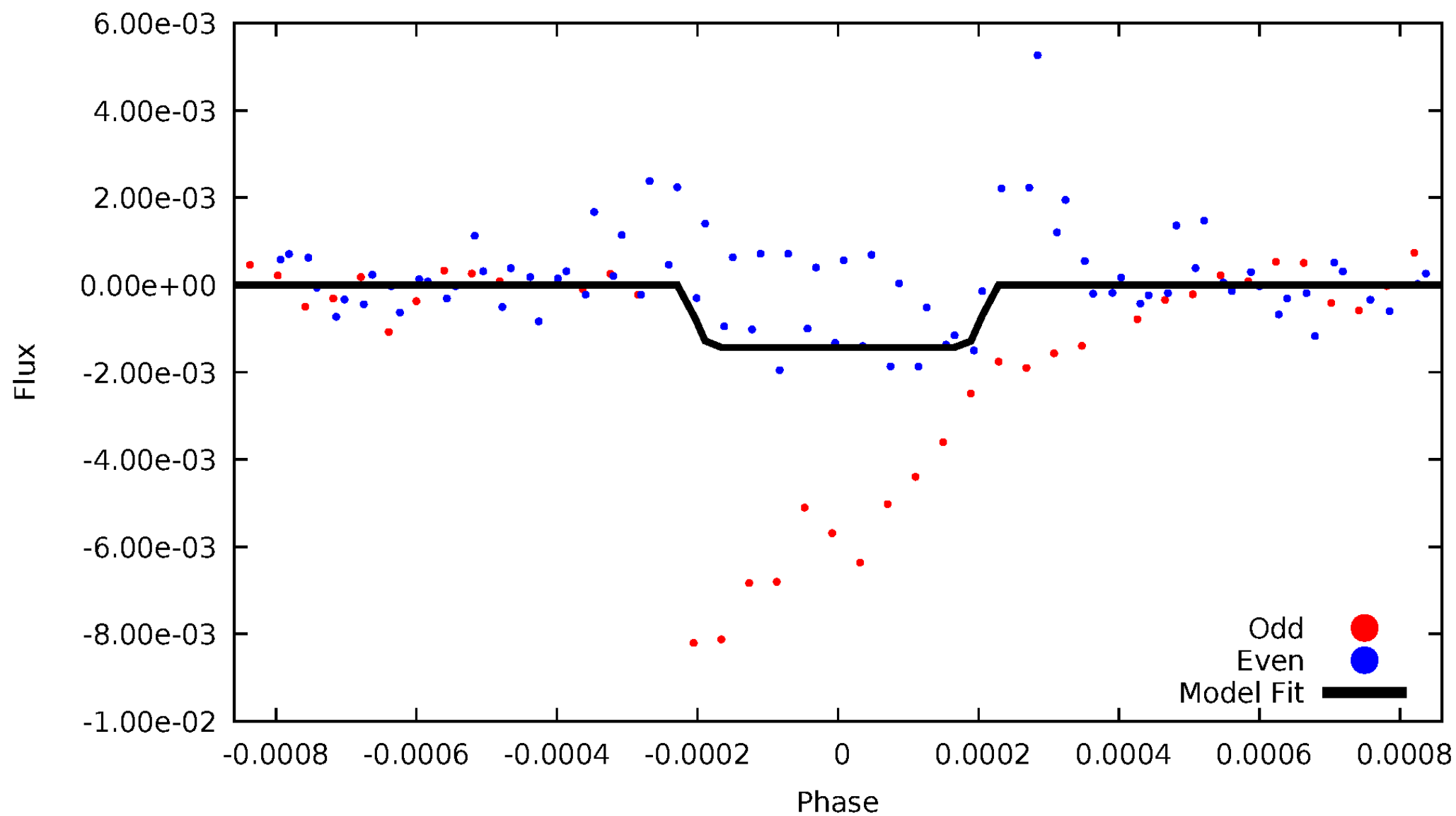
# DV Odd/Even

TCE 003852116-03



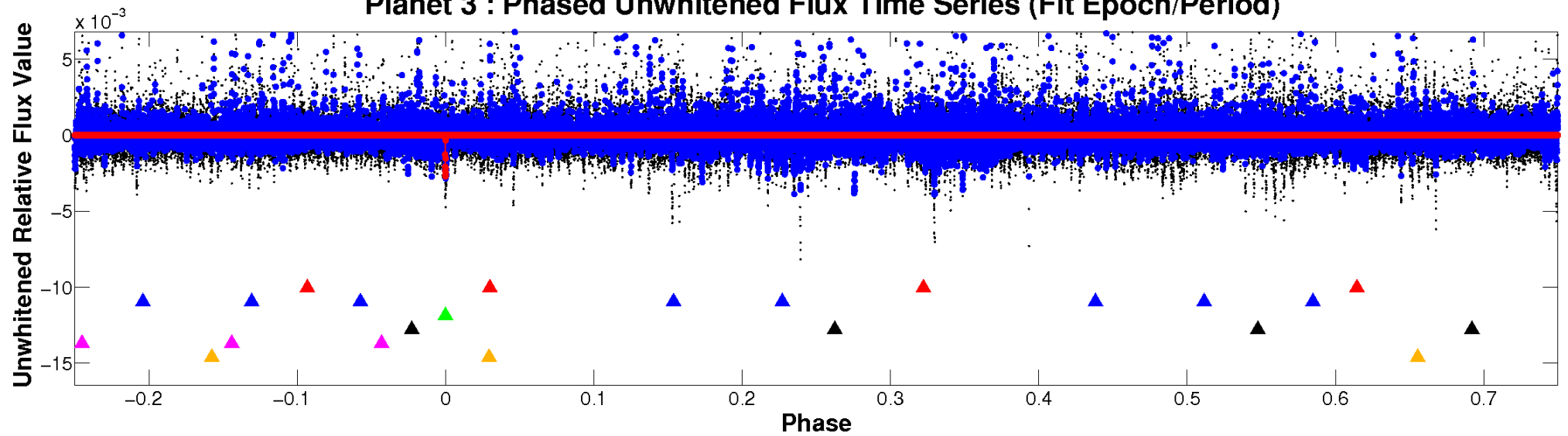
# ALT Odd/Even

TCE 003852116-03

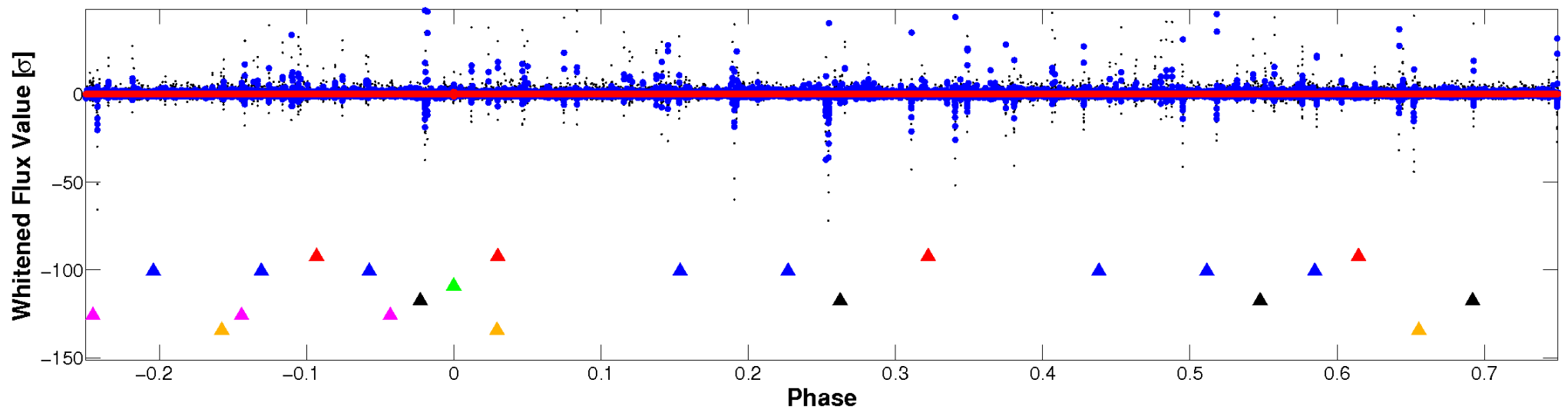


# Non-Whitened Vs. Whitened Light Curve

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

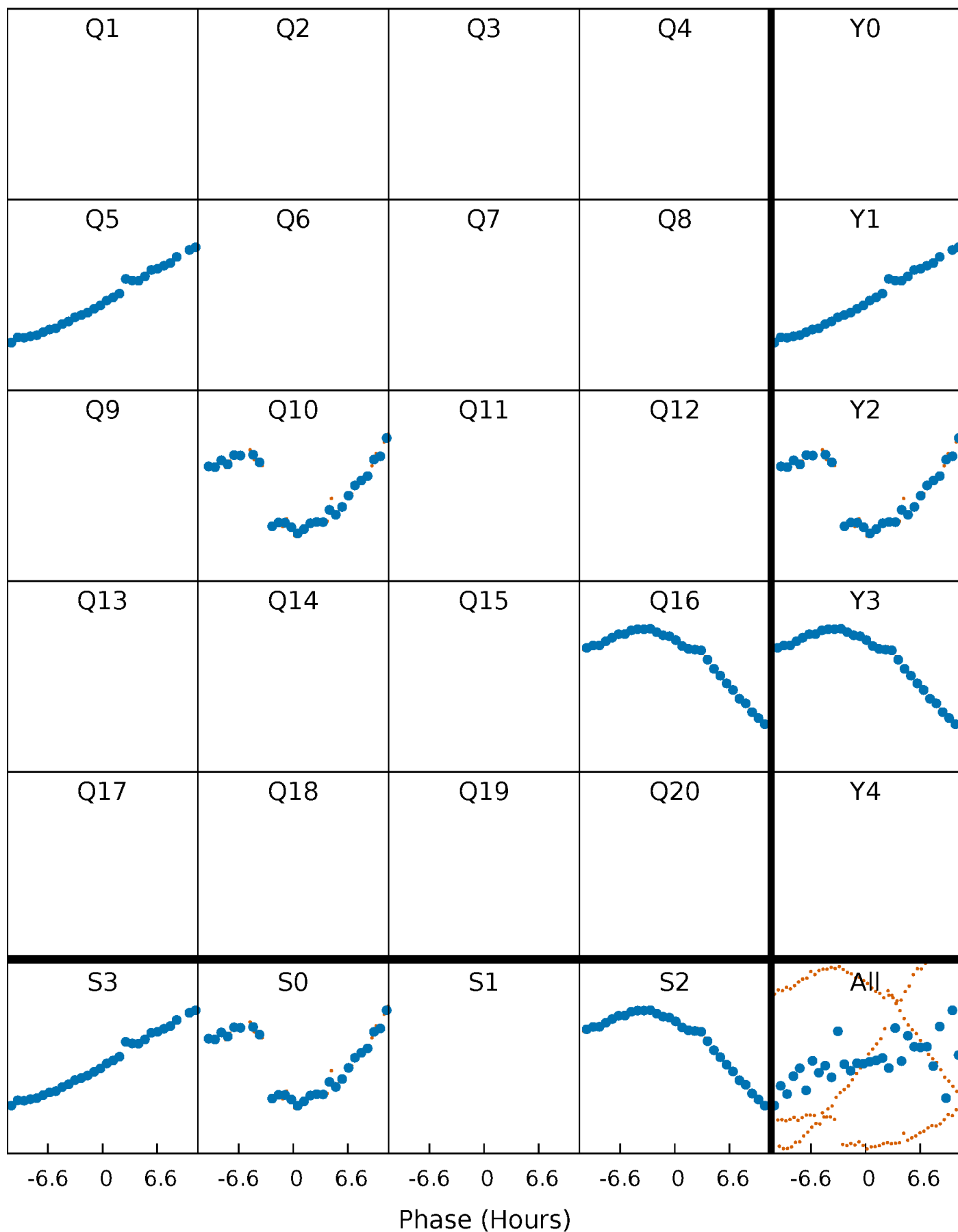


Planet 3 : Phased Whitened Flux Time Series (Fit Epoch/Period)



# PDC Quarter-Phased Transit Curves

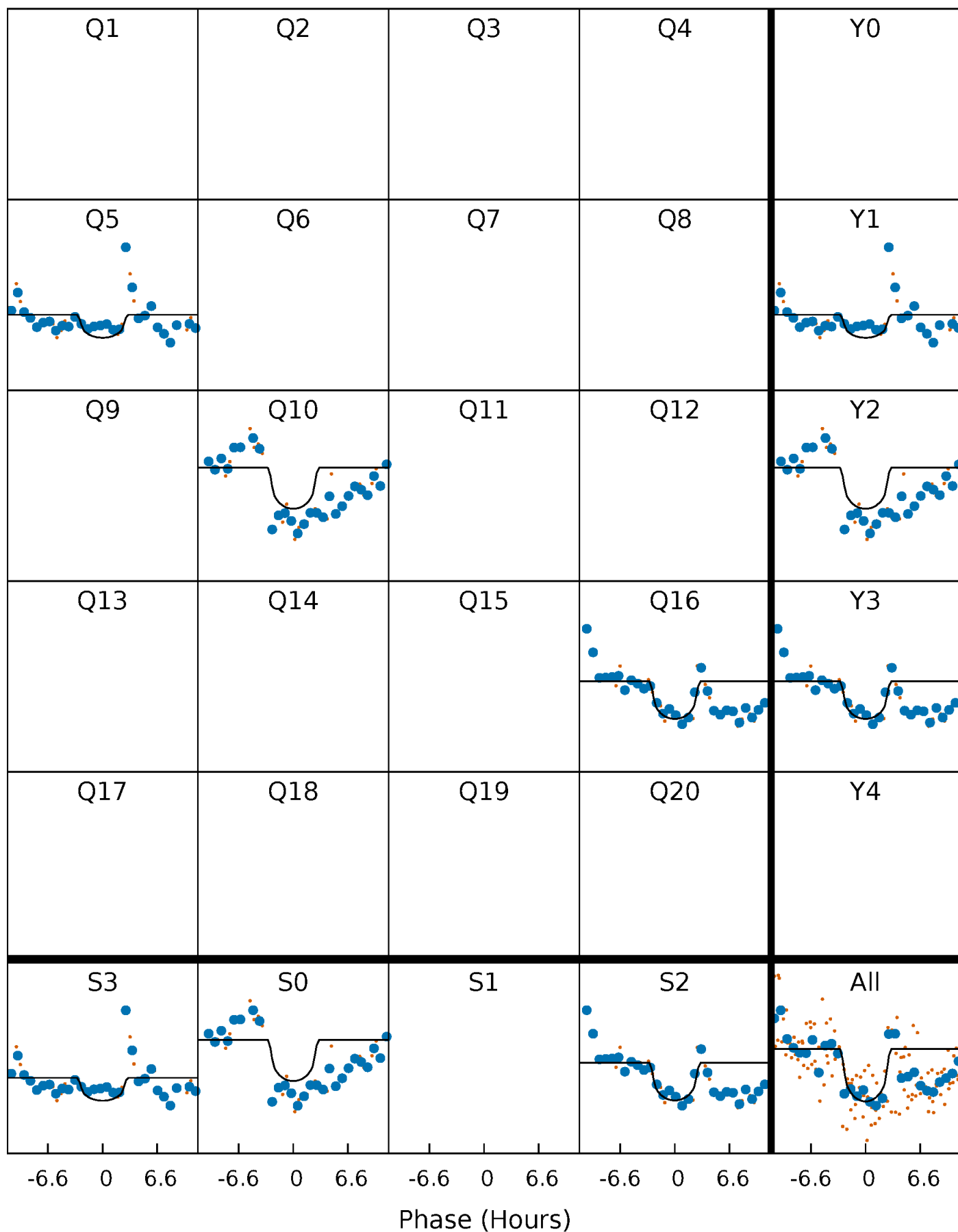
TCE 003852116-03 P=517.860719 Days  $T_0=456.491183$  (BKJD)





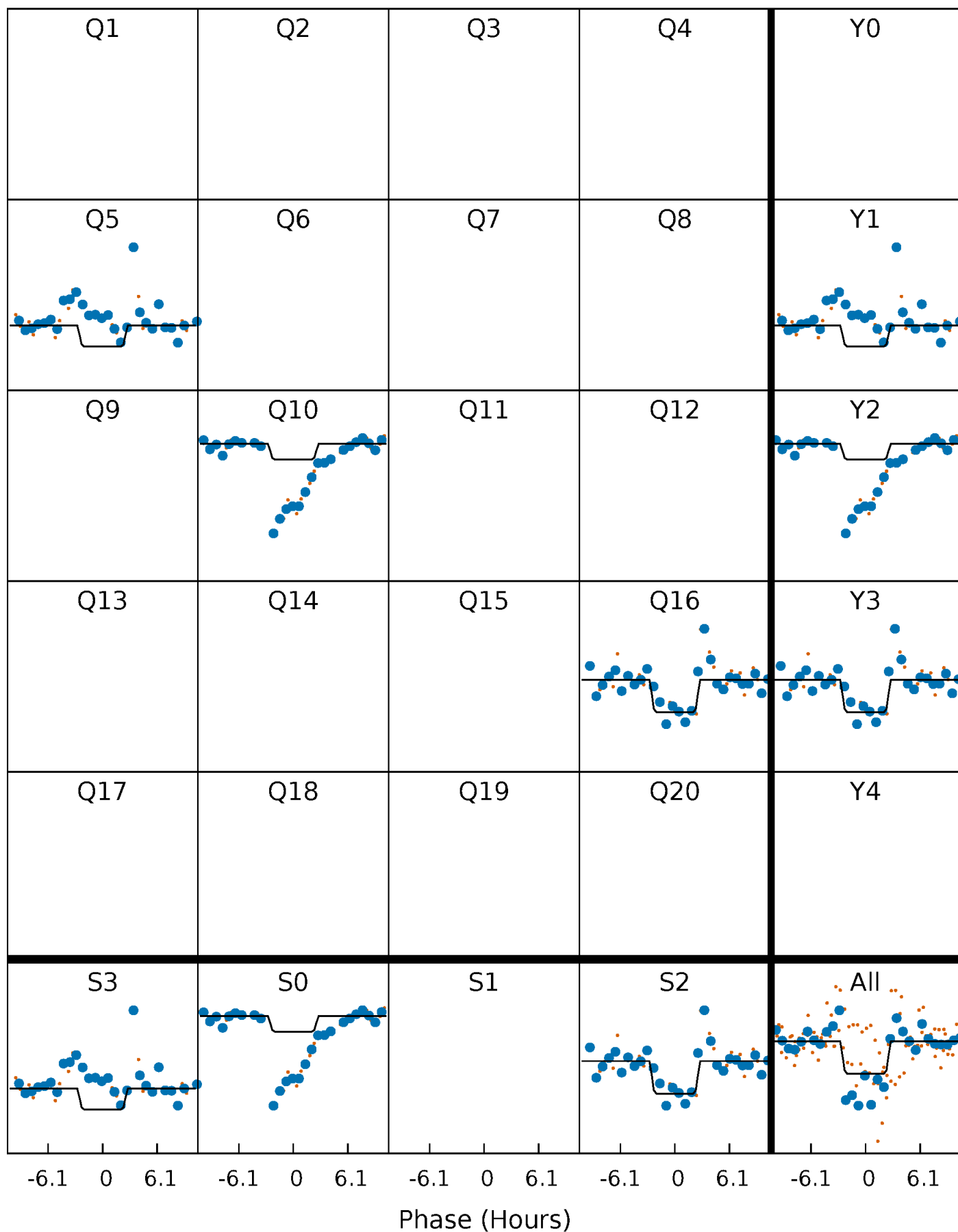
# DV Quarter-Phased Transit Curves

TCE 003852116-03     $P=517.860719$  Days     $T_0=456.491183$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

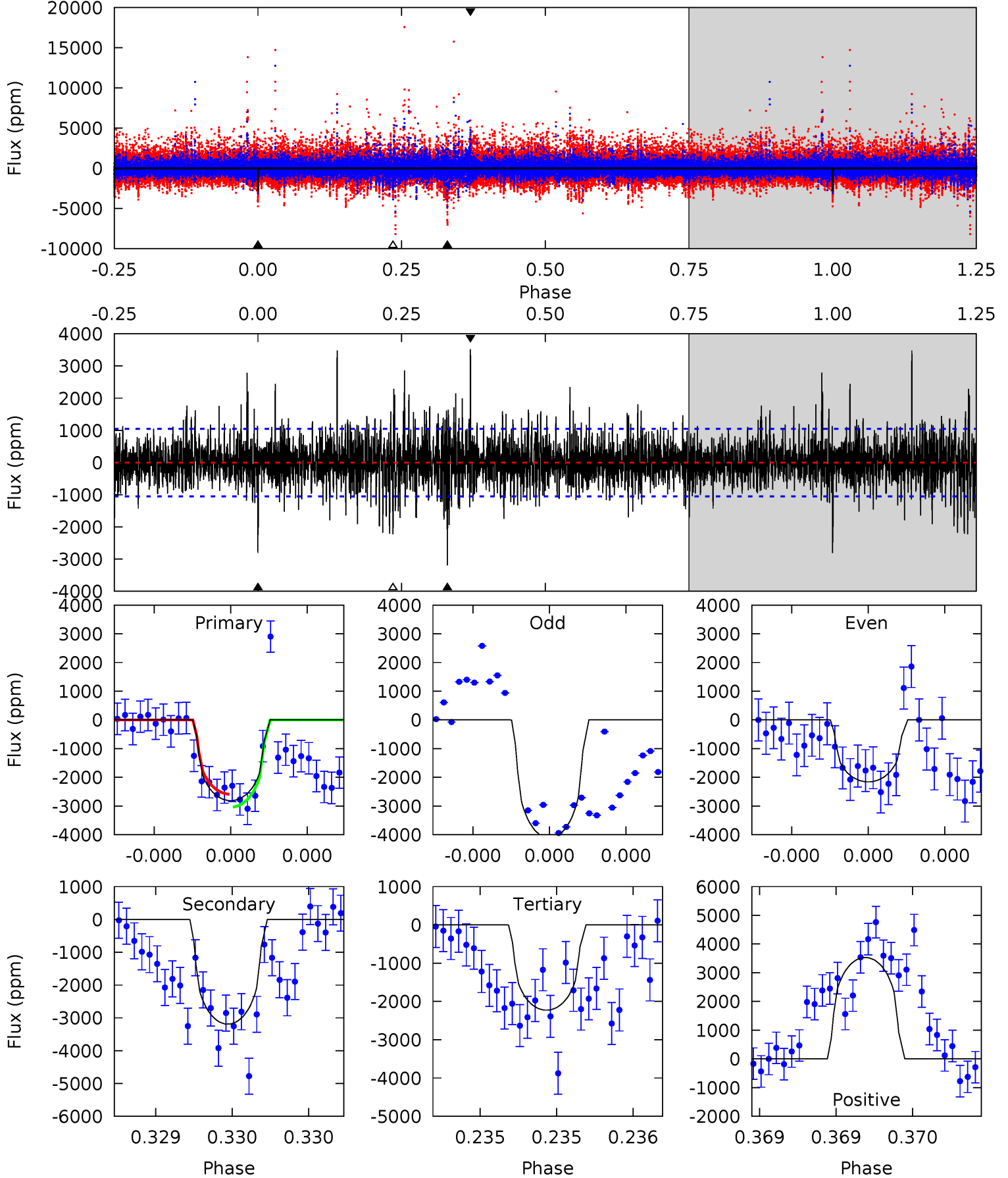
TCE 003852116-03 P=517.861333 Days  $T_0=456.482175$  (BKJD)



# DV Model-Shift Uniqueness Test

003852116-03, P = 517.860719 Days, E = 456.491183 Days

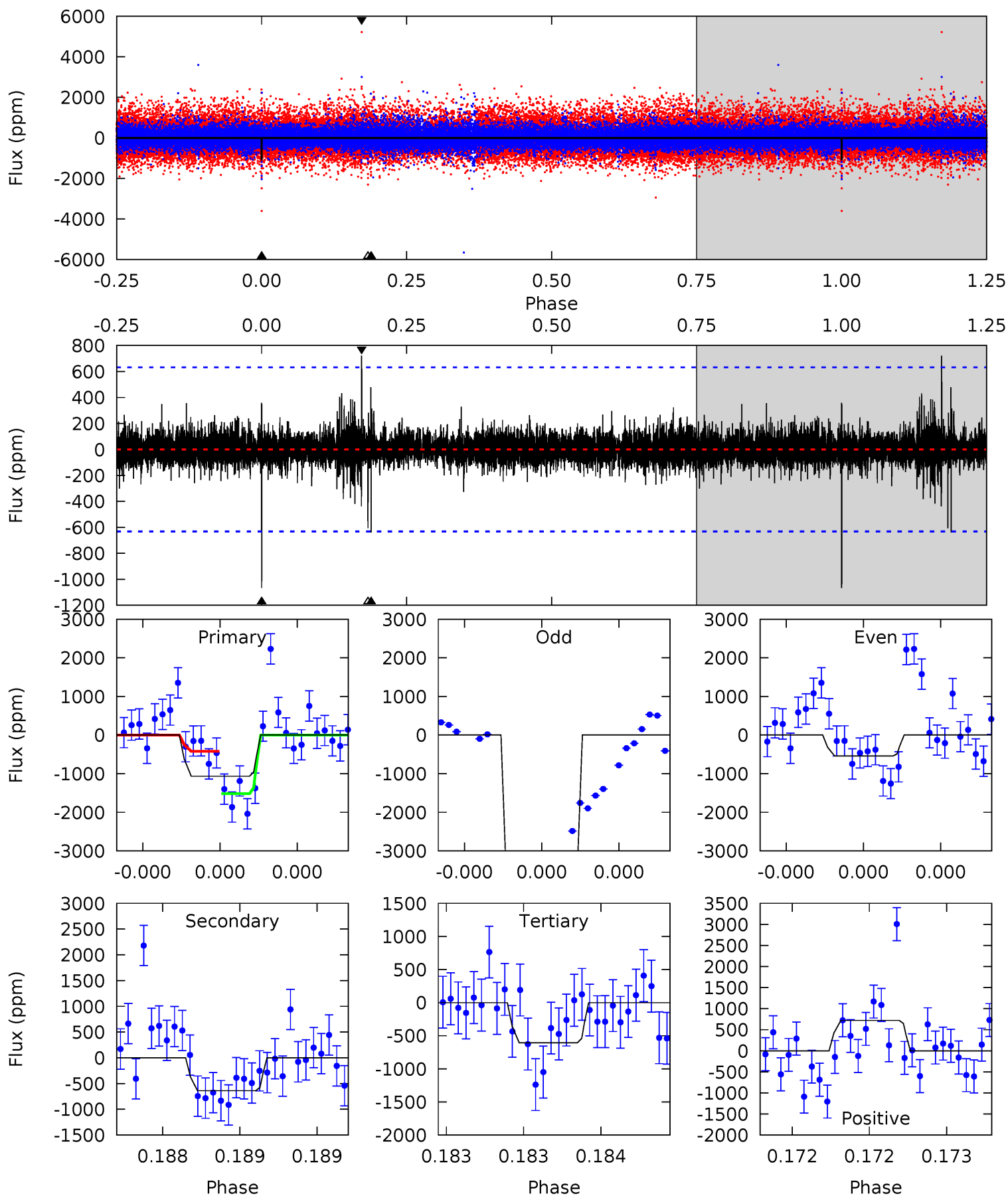
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
14.9	16.9	11.8	18.7	5.57	3.48	2.90	3.11	-3.81	5.12	-1.80	2.50	1.03	0.53	1.19



# Alt Model-Shift Uniqueness Test

003852116-03, P = 517.861333 Days, E = 456.482175 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
9.43	5.64	5.35	6.38	5.60	3.52	0.65	4.08	3.05	0.29	-0.74	26.0	1.62	0.40	4.99



### Stellar Parameters For KIC 003852116

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (g \cdot \text{cm}^{-3})$
	$4555^{+136}_{-136}$	$4.611^{+0.048}_{-0.028}$	$-0.200^{+0.300}_{-0.300}$	$0.664^{+0.052}_{-0.058}$	$0.656^{+0.071}_{-0.051}$	$3.163^{+0.733}_{-0.411}$
	+3%/-3%	+1%/-1%	+150%/-150%	+8%/-9%	+11%/-8%	+23%/-13%
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 003852116-03 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-3189 \pm 188$	$4.65^{+3.63}_{-3.13}$	$218^{+8}_{-7}$	$4350^{+2948}_{-796}$	$97602^{+858245}_{-66766}$
Alt.	$-637 \pm 113$	$4.31^{+3.47}_{-2.95}$	$217^{+7}_{-7}$	$3398^{+1723}_{-555}$	$24020^{+205245}_{-17187}$

$T_{max}$  = 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  $A_{obs} \gg 1.0$

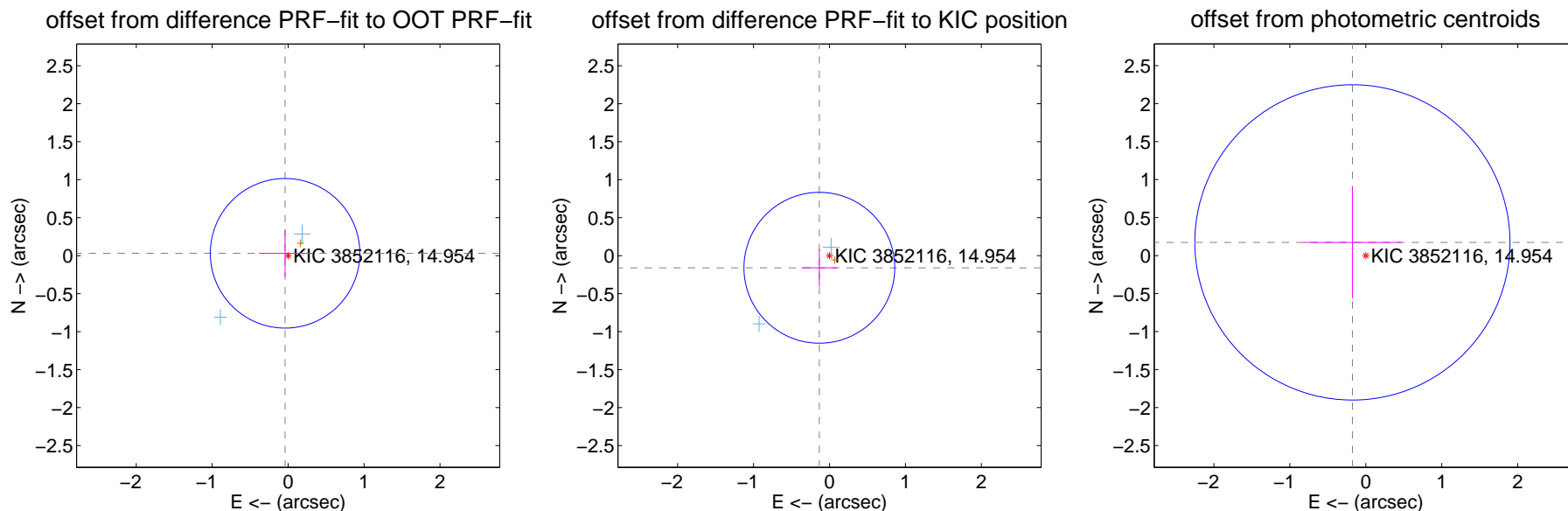
## DV Centroid Data

Supplemental centroid analysis for 003852116-03. Kepler magnitude: 14.95. Transit SNR 7.60

There are 2 quarters with good PRF difference image offsets

The direct PRF centroid is offset from the target star catalog position by about 0.24 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.051 \pm 0.328$	0.15	$0.040 \pm 0.341$	$0.031 \pm 0.305$
PRF-fit source offset from KIC position	$0.208 \pm 0.331$	0.63	$0.133 \pm 0.234$	$-0.160 \pm 0.246$
photometric centroid source offset	$0.25 \pm 0.69$	0.36	$0.18 \pm 0.65$	$0.17 \pm 0.73$

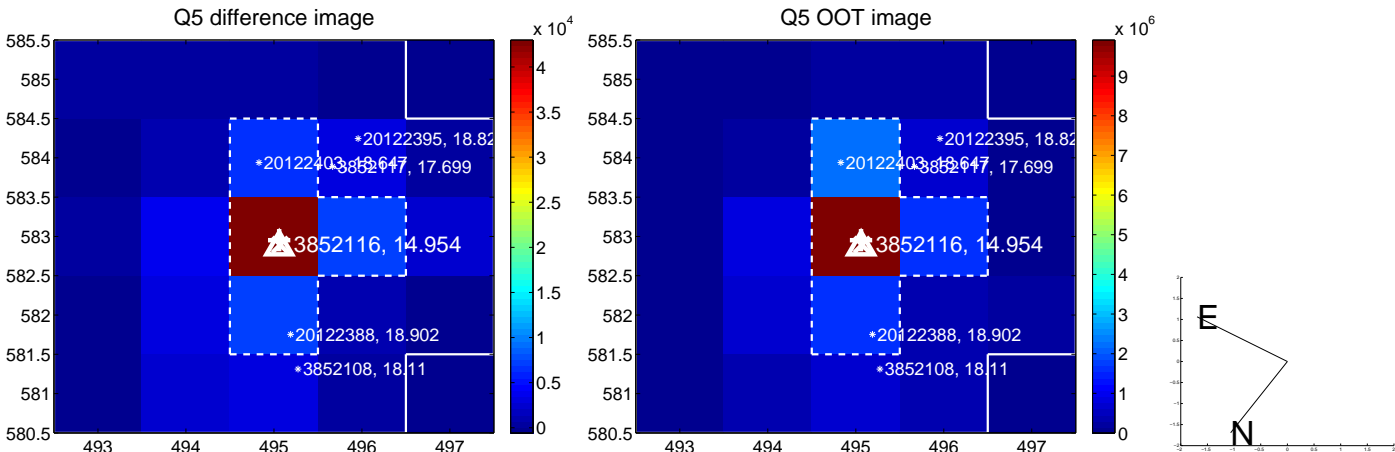


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three- $\sigma$ . 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.



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

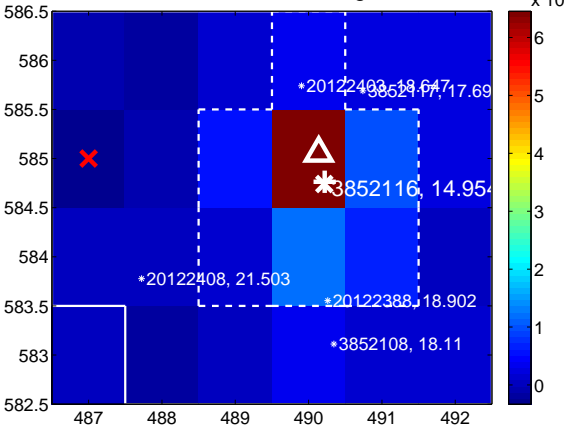
Q9 no difference image



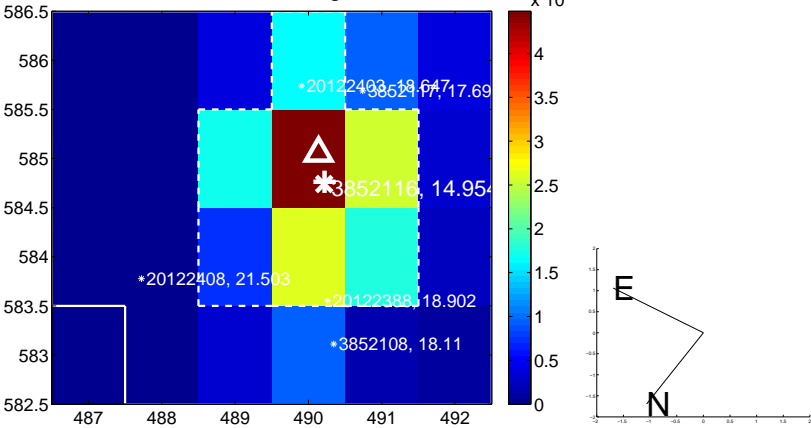
Q9 no OOT image



Q10 difference image



Q10 OOT image



Q11 no difference image



Q11 no OOT image



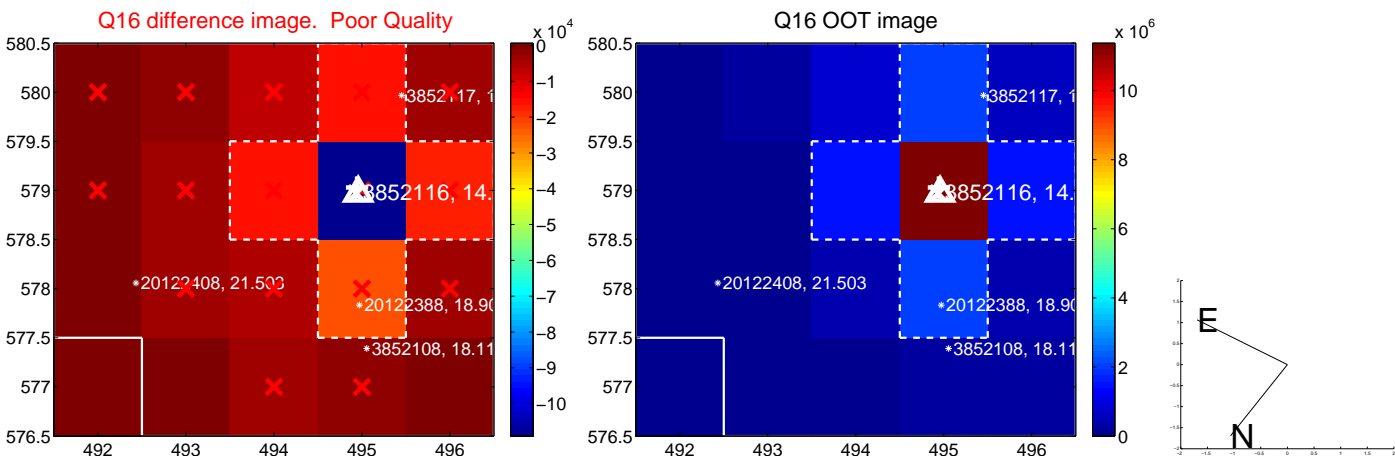
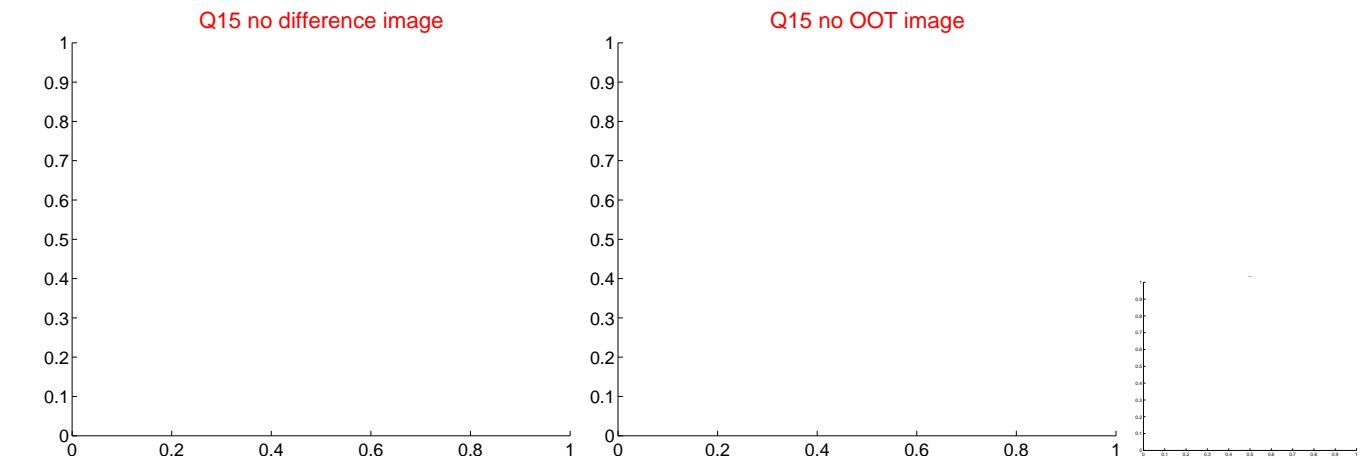
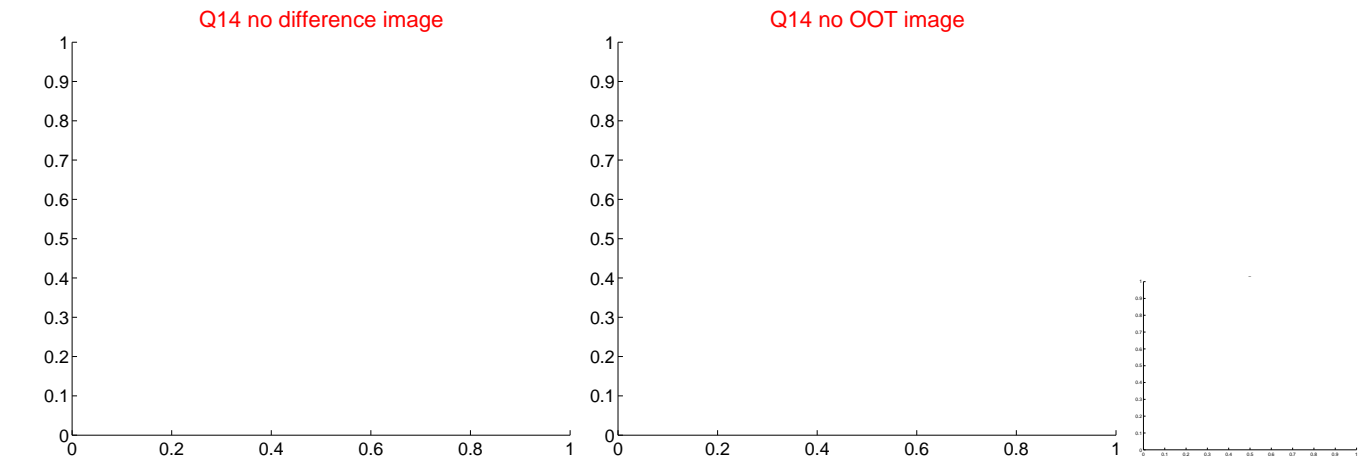
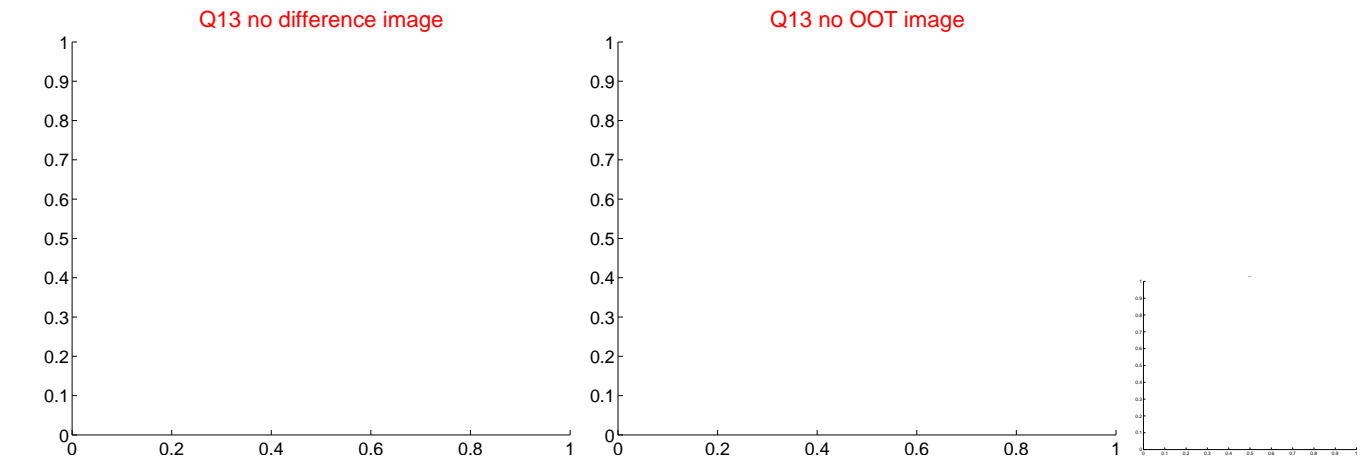
Q12 no difference image



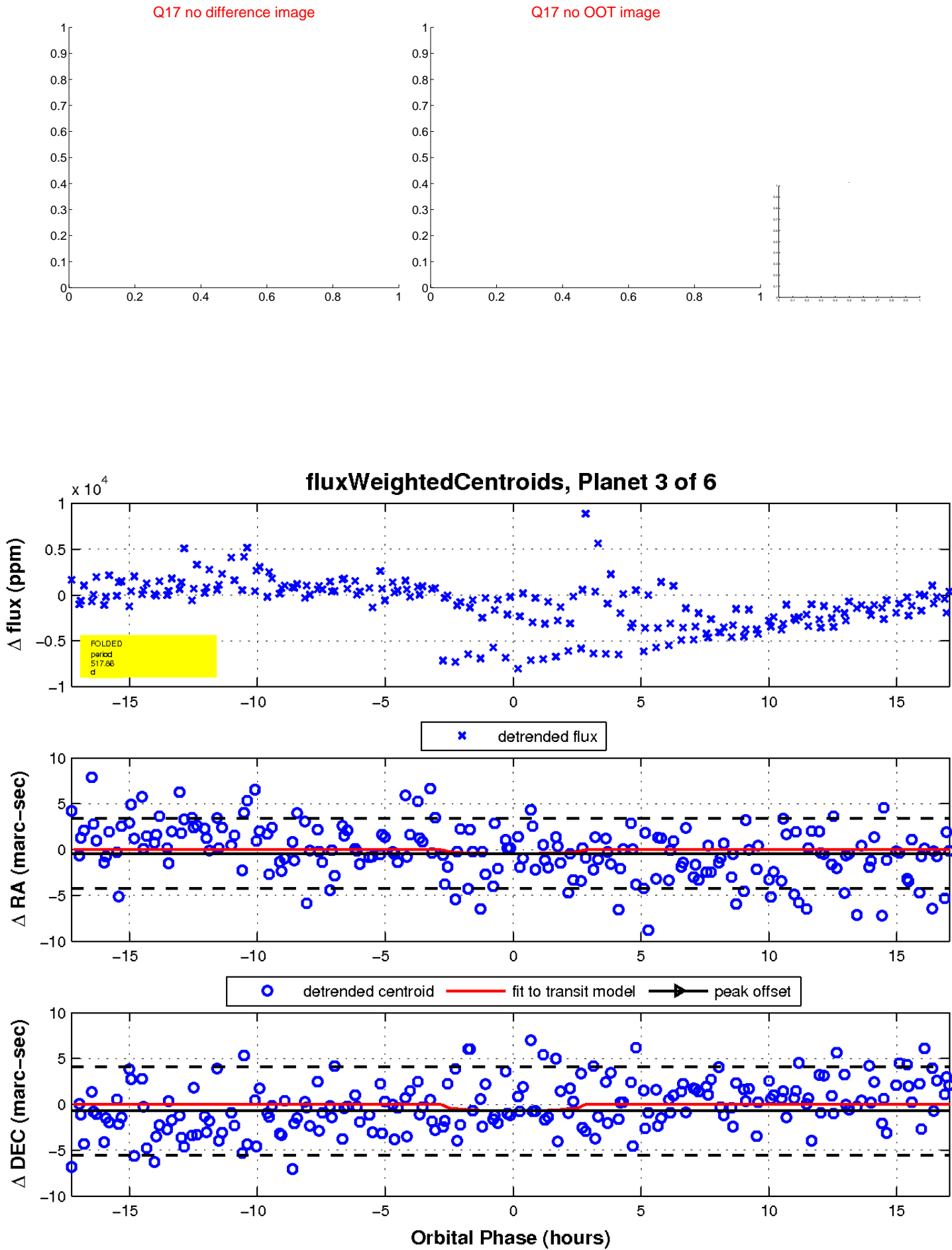
Q12 no OOT image



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

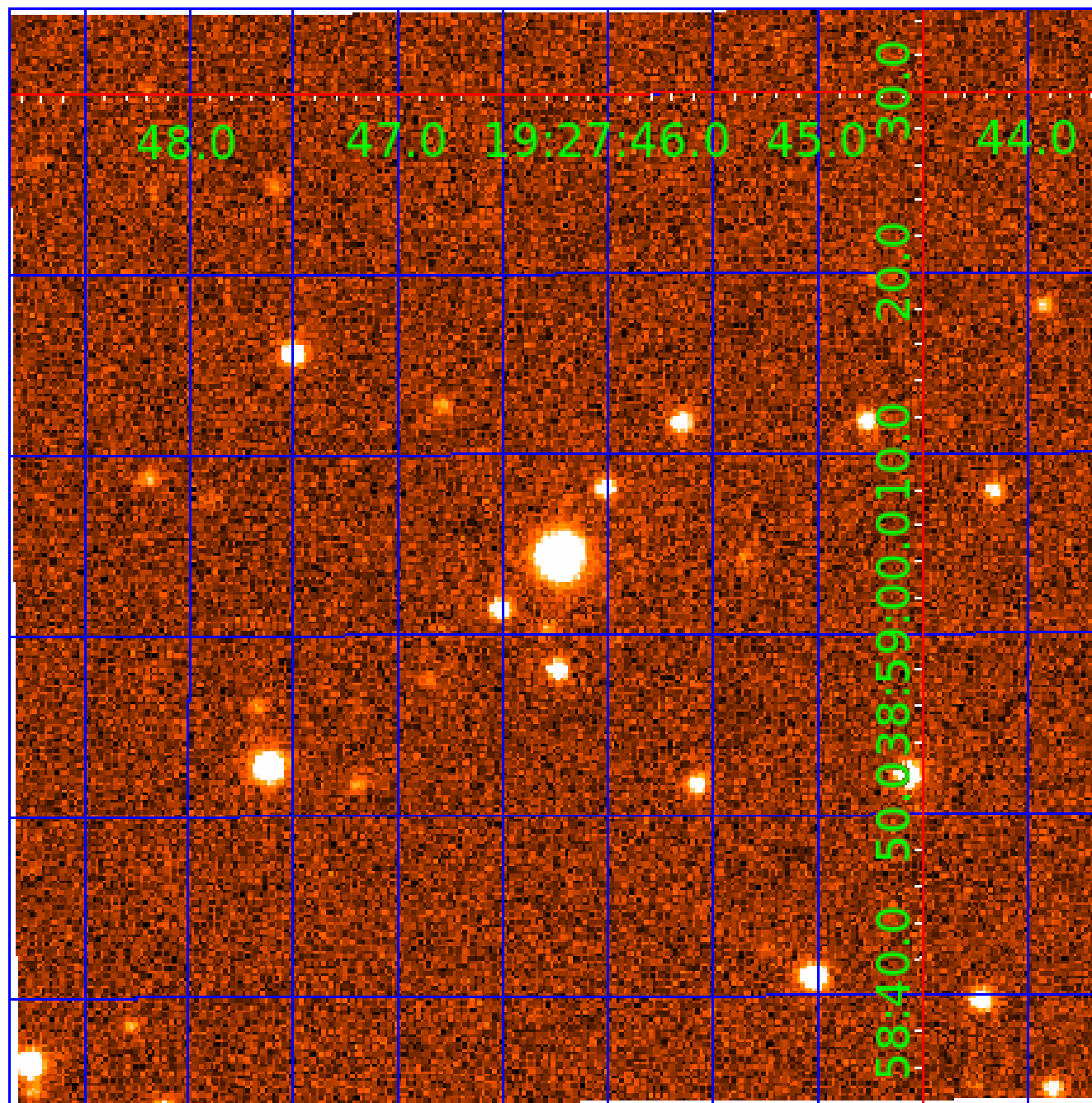


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



# UKIRT Image

Declination



# KIC 003852116

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
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003852116-04	OBS	No	370.155848	222.268762	2471.9	3.085	13.5	7.8	0.66	4555	3.17	0.22
003852116-05	OBS	No	465.573161	434.163541	3119.6	2.940	11.8	8.6	0.66	4555	3.68	0.16
003852116-06	OBS	No	421.057650	471.703520	2540.7	12.843	10.7	5.6	0.66	4555	3.20	0.19

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
003852116-01	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_SKYE—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS
003852116-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—TRANS_GAPPED—LPP_DV—ALL_TRANS_CHASES—INCONSISTENT_TRANS—CENT_FEW_DIFFS
003852116-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—ALL_TRANS_CHASES—MOD_POS_DV—CENT_FEW_DIFFS
003852116-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS
003852116-05	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—ALL_TRANS_CHASES—MOD_POS_DV—CENT_FEW_DIFFS
003852116-06	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—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.

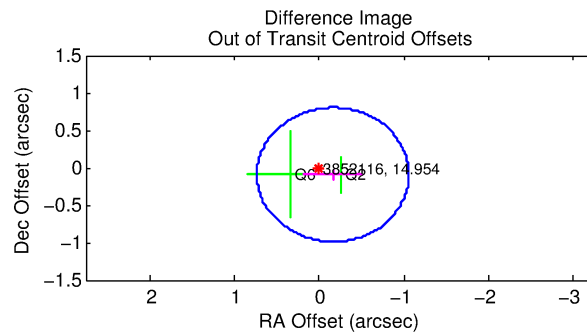
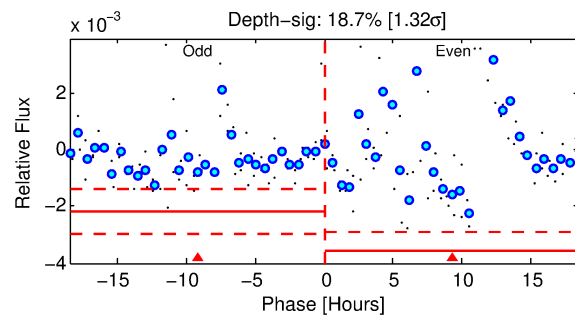
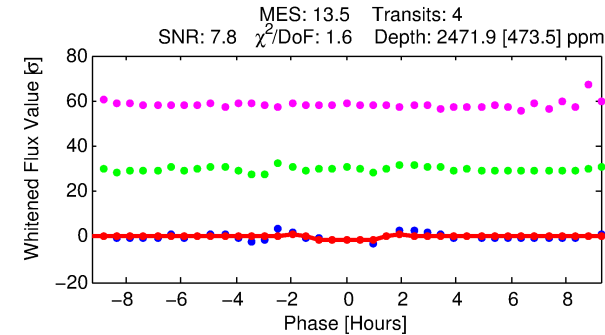
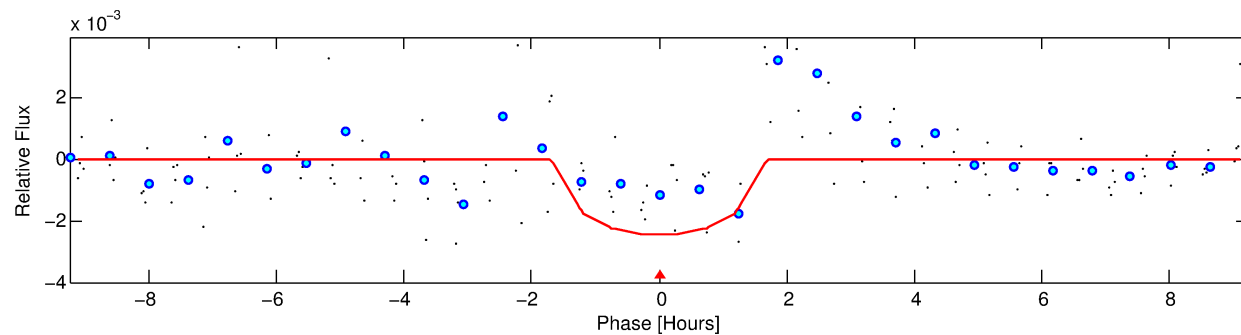
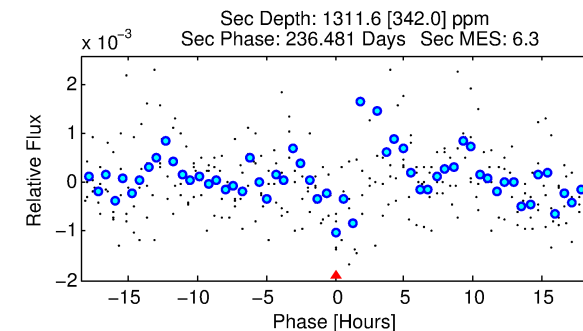
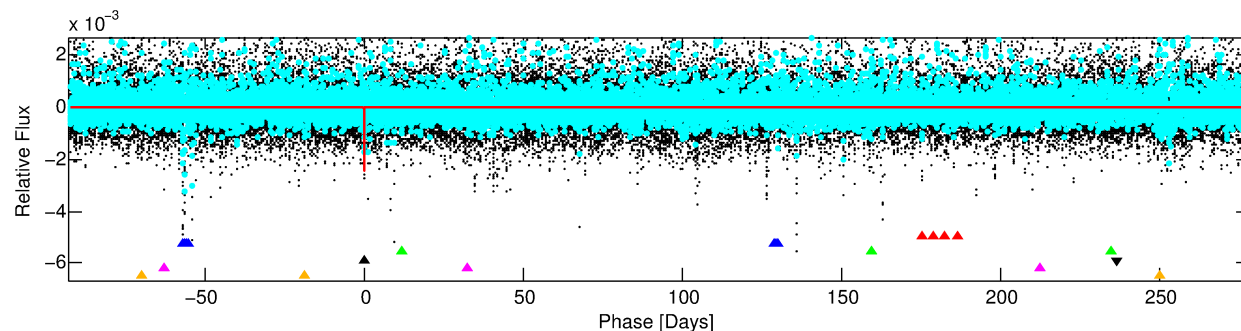
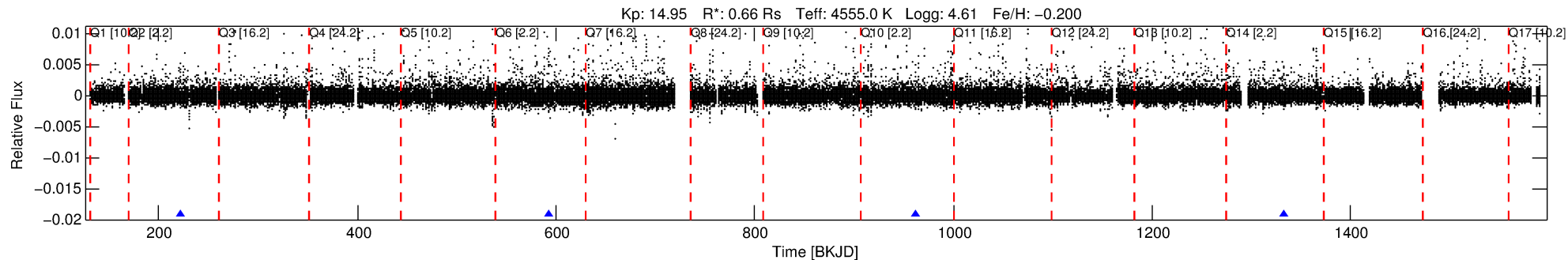
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 003852116-04

No Significant Match Found

# DV One-Page Summary

KIC: 3852116 Candidate: 4 of 6 Period: 370.156 d



## DV Fit Results:

Period = 370.15585 [0.00502] d  
Epoch = 222.2688 [0.0088] BKJD  
Rp/R\* = 0.0438 [0.1195]  
a/R\* = 954.39 [7627.21]  
b = 0.07 [110.58]  
Seff = 0.22 [0.03]  
Teq = 175 [7] K  
Rp = 3.17 [8.66] Re  
a = 0.8771 [0.0604] AU  
Ag = 55139.93 [301235.42] [0.18σ]  
Teff = 4142 [5658] K [0.70σ]

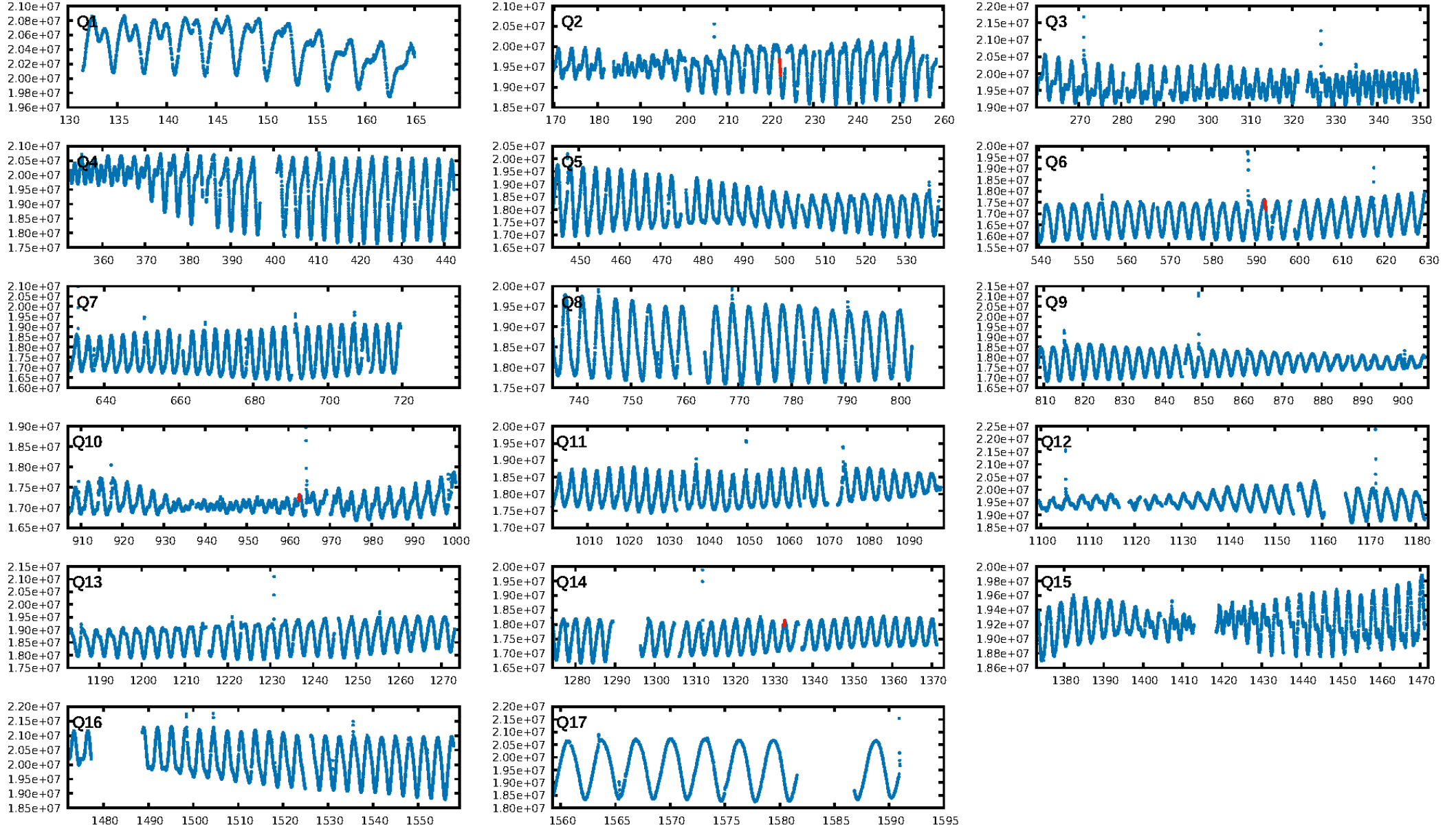
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [12.11σ]  
LongPeriod-sig: 100.0% [92.49σ]  
ModelChiSquare2-sig: 0.3%  
ModelChiSquareGof-sig: 24.5%  
Bootstrap-pfa: N/A  
RollingBand-fgt: 1.00 [4/4]  
GhostDiagnostic-chr: 1.024  
Centroid-sig: 2.6%  
Centroid-so: 1.518 arcsec [1.64σ]  
OotOffset-rm: 0.189 arcsec [0.63σ]  
KicOffset-rm: 0.260 arcsec [0.84σ]  
OotOffset-st: 2/0/0/0 [2]  
KicOffset-st: 2/0/0/0 [2]  
DiffImageQuality-fgm: 0.00 [0/2]  
DiffImageOverlap-fno: 1.00 [4/4]

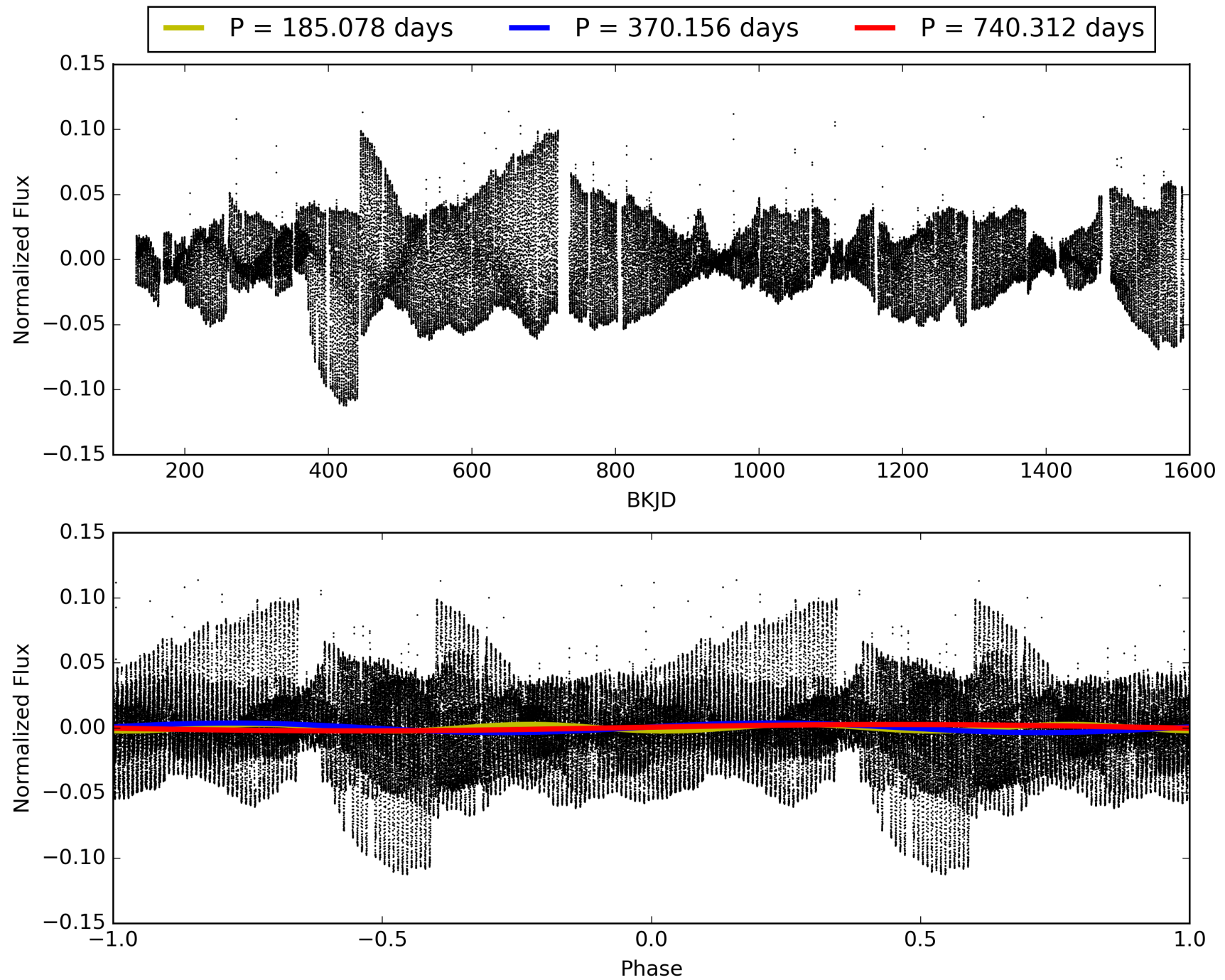
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 01-Feb-2016 05:44:51 Z

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

# TCE 003852116-04, PDC Light Curves



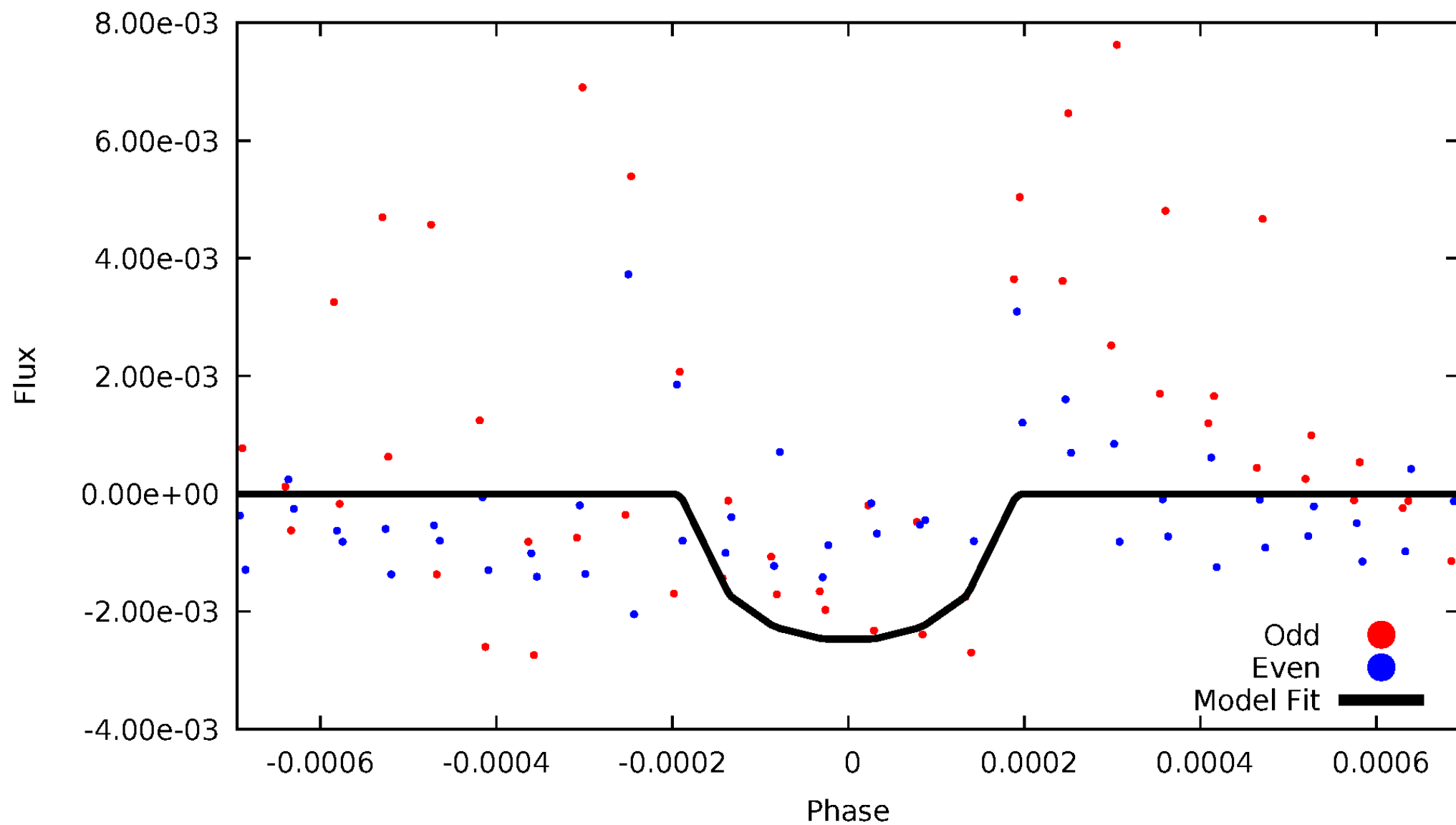
TCE 003852116-04





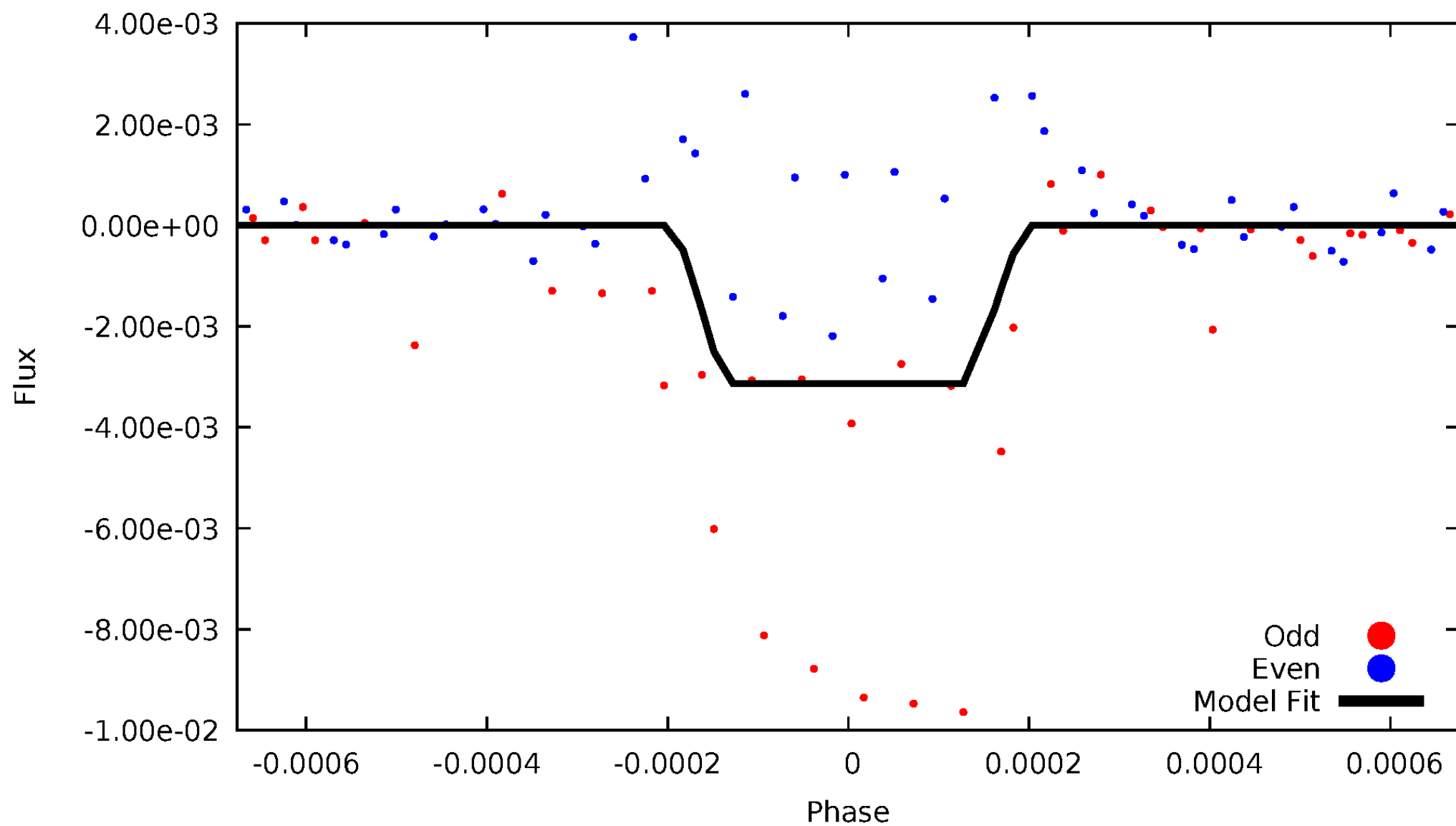
# DV Odd/Even

TCE 003852116-04



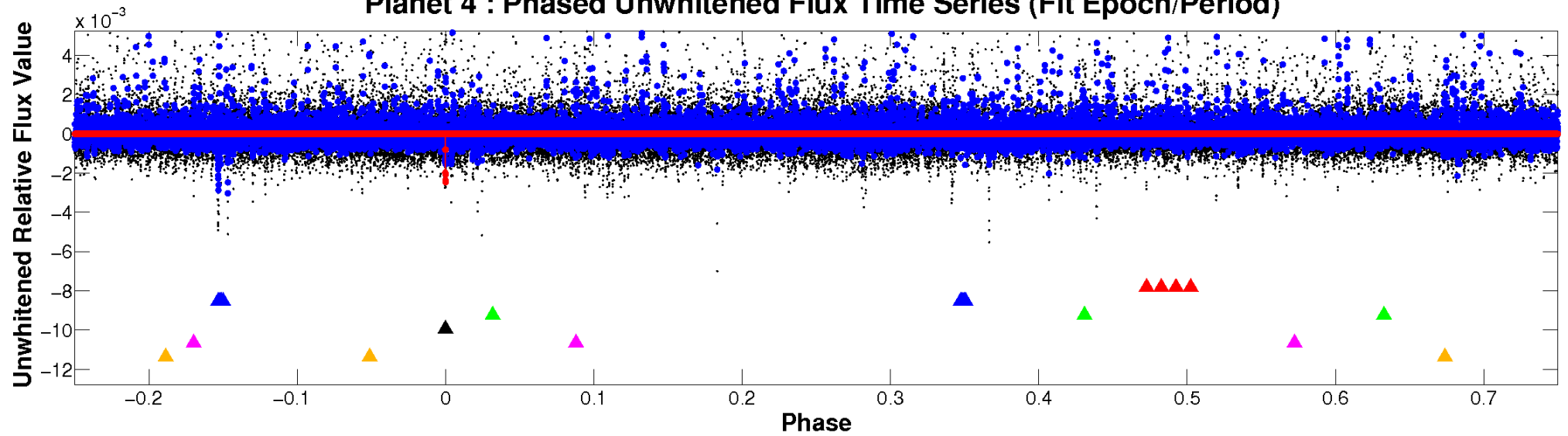
# ALT Odd/Even

TCE 003852116-04

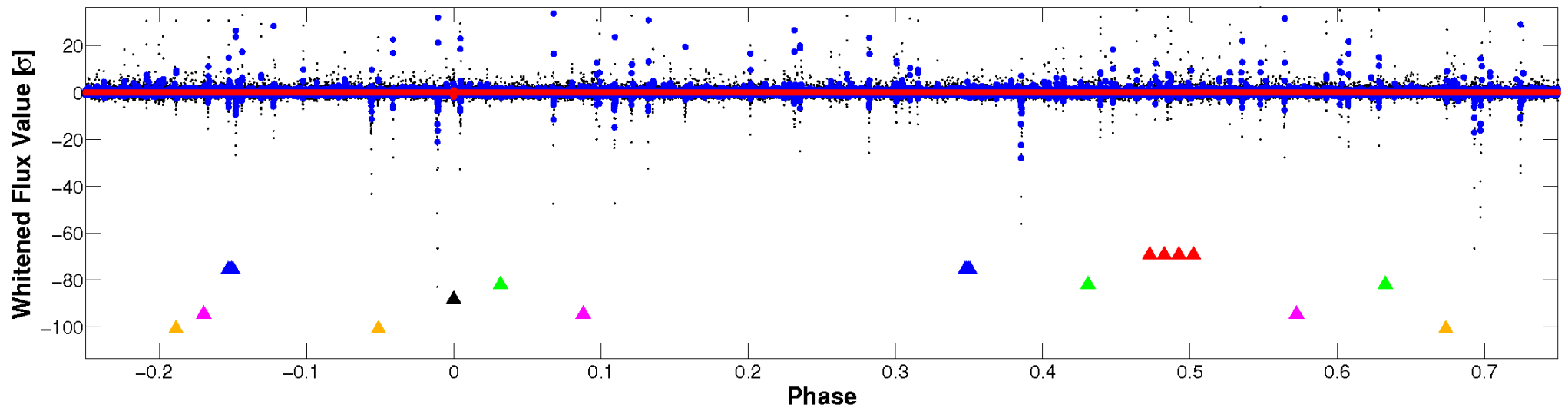


# Non-Whitened Vs. Whitened Light Curve

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

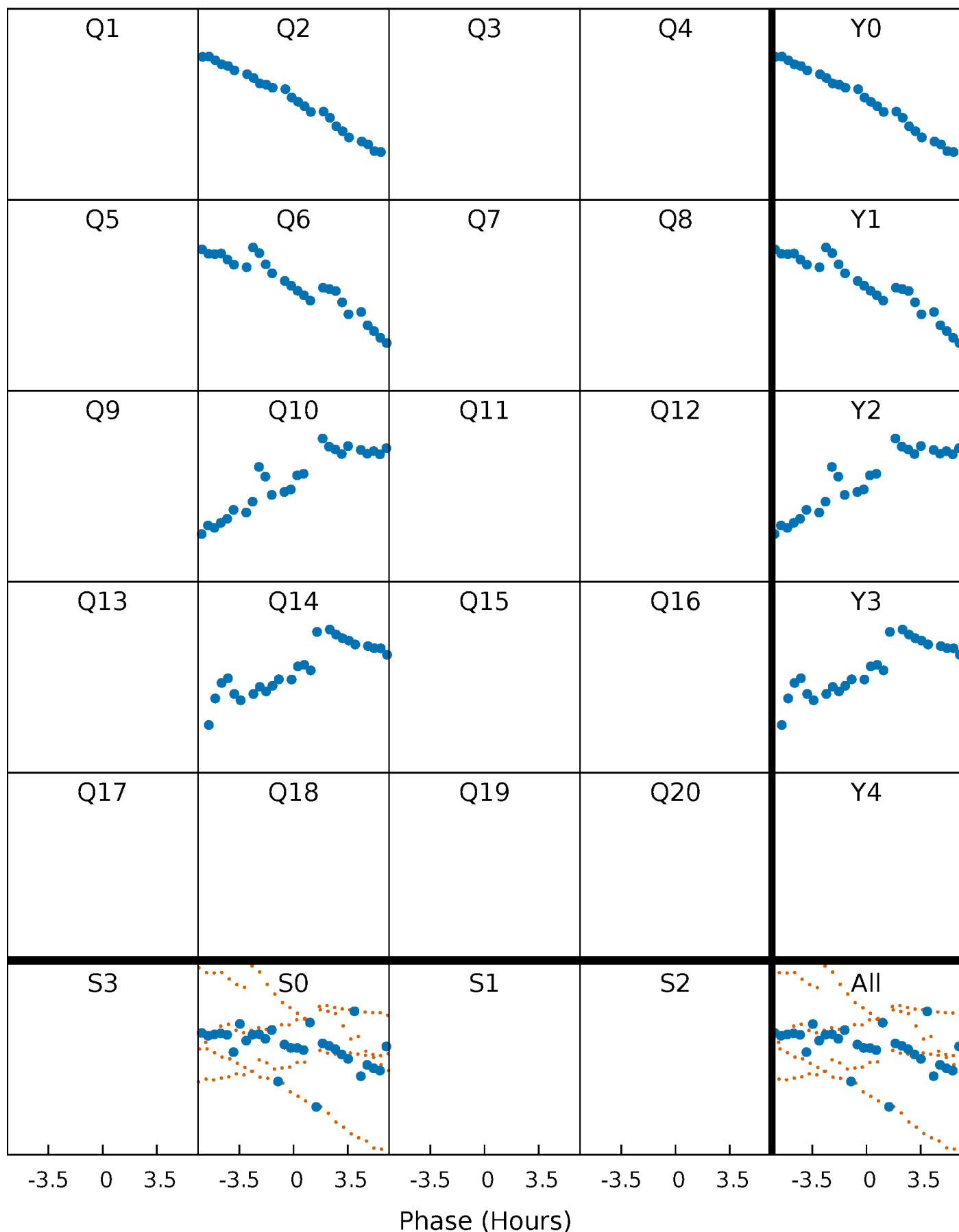


## Planet 4 : Phased Whitened Flux Time Series (Fit Epoch/Period)



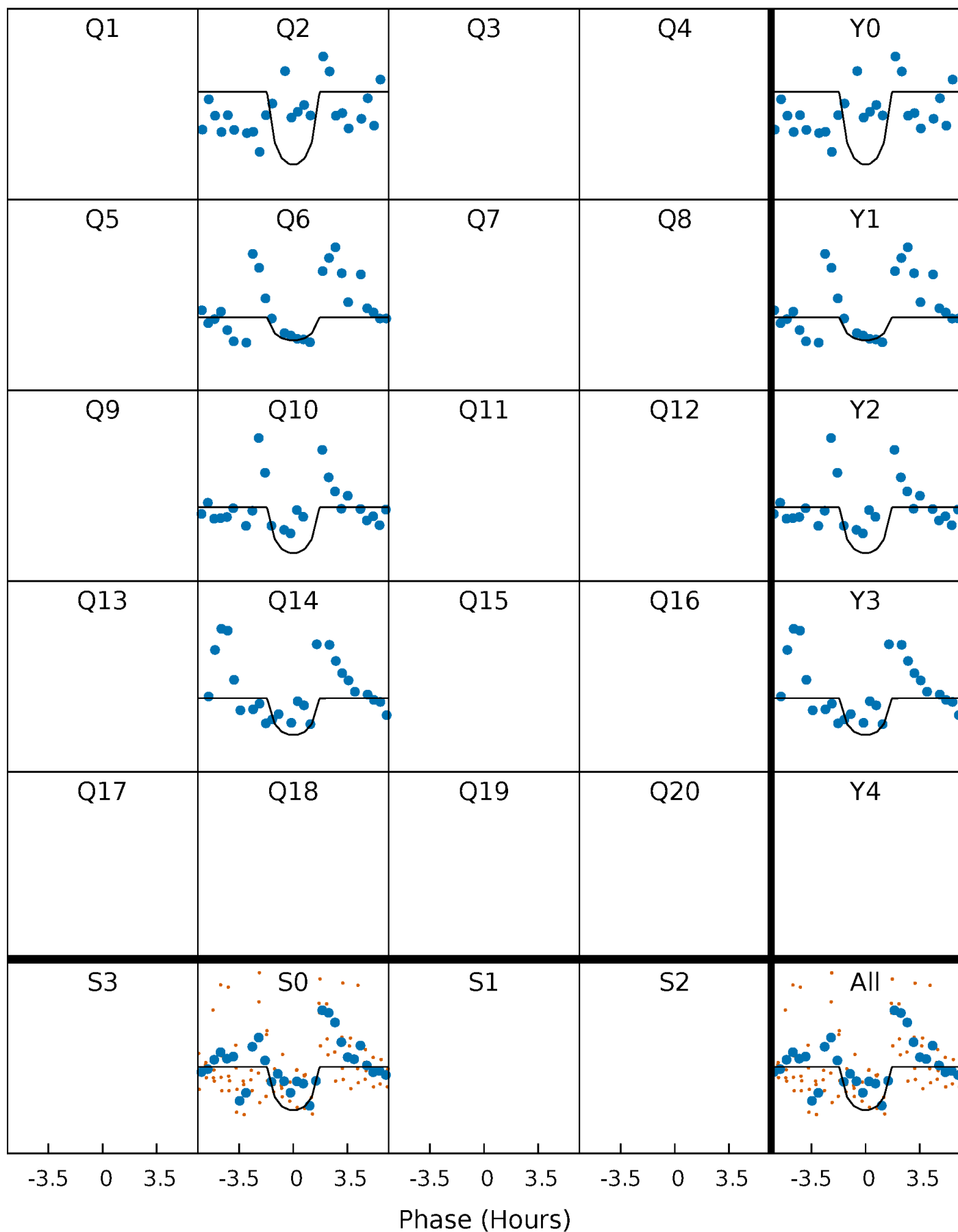
# PDC Quarter-Phased Transit Curves

TCE 003852116-04 P=370.155848 Days  $T_0=222.268762$  (BKJD)



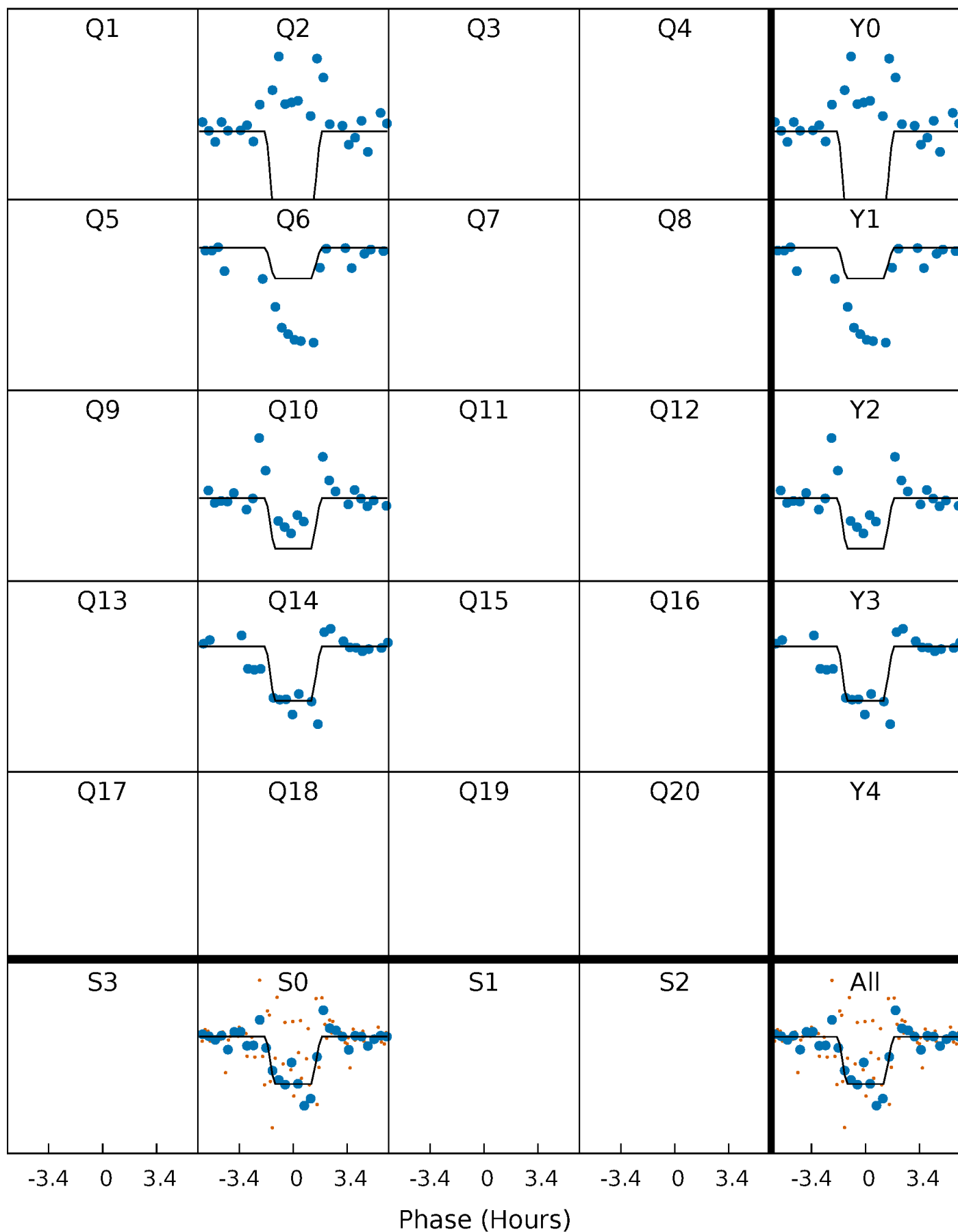
# DV Quarter-Phased Transit Curves

TCE 003852116-04 P=370.155848 Days  $T_0=222.268762$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

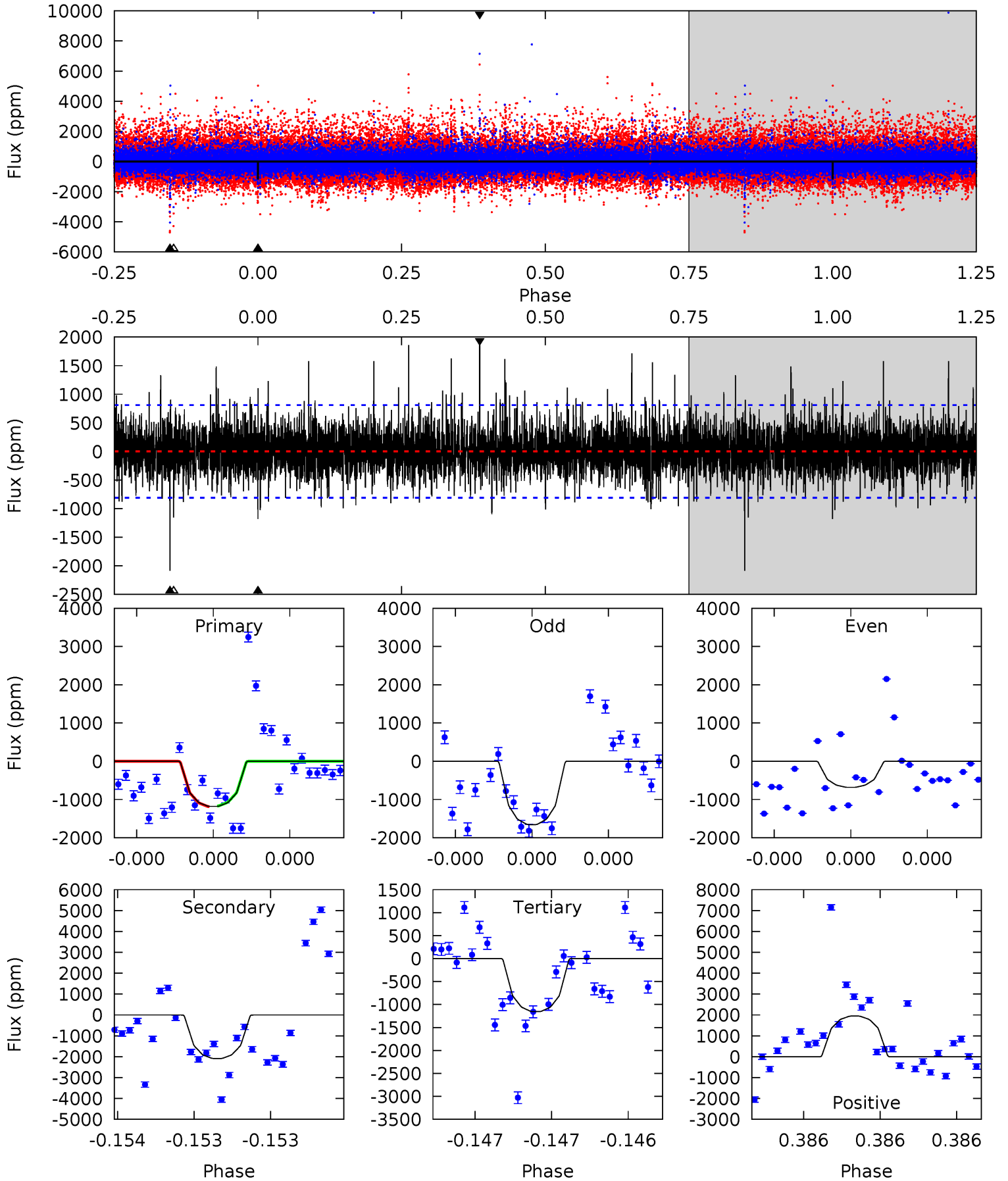
TCE 003852116-04 P=370.146938 Days  $T_0=222.282194$  (BKJD)



# DV Model-Shift Uniqueness Test

003852116-04, P = 370.155848 Days, E = 222.268762 Days

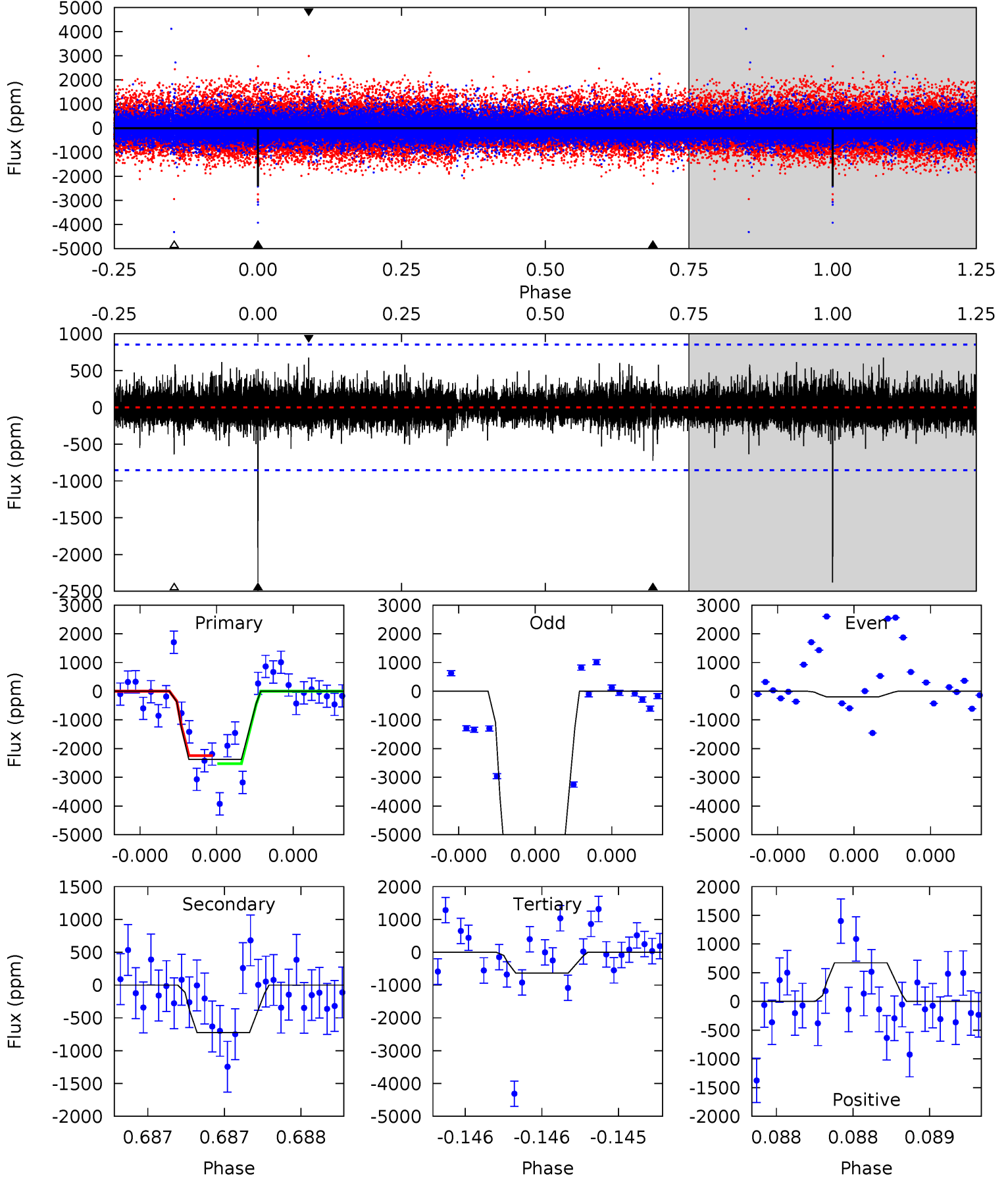
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
8.15	14.4	7.97	13.5	5.59	3.51	2.06	0.18	-5.30	6.45	0.97	2.58	1.13	0.48	0.06



# Alt Model-Shift Uniqueness Test

003852116-04, P = 370.146938 Days, E = 222.282194 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
15.7	4.77	4.20	4.45	5.63	3.57	0.83	11.5	11.2	0.58	0.33	30.3	1.23	0.22	0





### Stellar Parameters For KIC 003852116

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (g \cdot \text{cm}^{-3})$
	$4555^{+136}_{-136}$	$4.611^{+0.048}_{-0.028}$	$-0.200^{+0.300}_{-0.300}$	$0.664^{+0.052}_{-0.058}$	$0.656^{+0.071}_{-0.051}$	$3.163^{+0.733}_{-0.411}$
	+3%/-3%	+1%/-1%	+150%/-150%	+8%/-9%	+11%/-8%	+23%/-13%
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 003852116-04 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-2087 \pm 145$	$7.17^{+7.62}_{-4.85}$	$243^{+8}_{-8}$	$3469^{+1743}_{-662}$	$17794^{+137611}_{-13659}$
Alt.	$-724 \pm 152$	$7.42^{+6.99}_{-5.10}$	$243^{+8}_{-8}$	$2919^{+1435}_{-454}$	$5630^{+57645}_{-4188}$

$T_{max}$  = 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  $A_{obs} \gg 1.0$

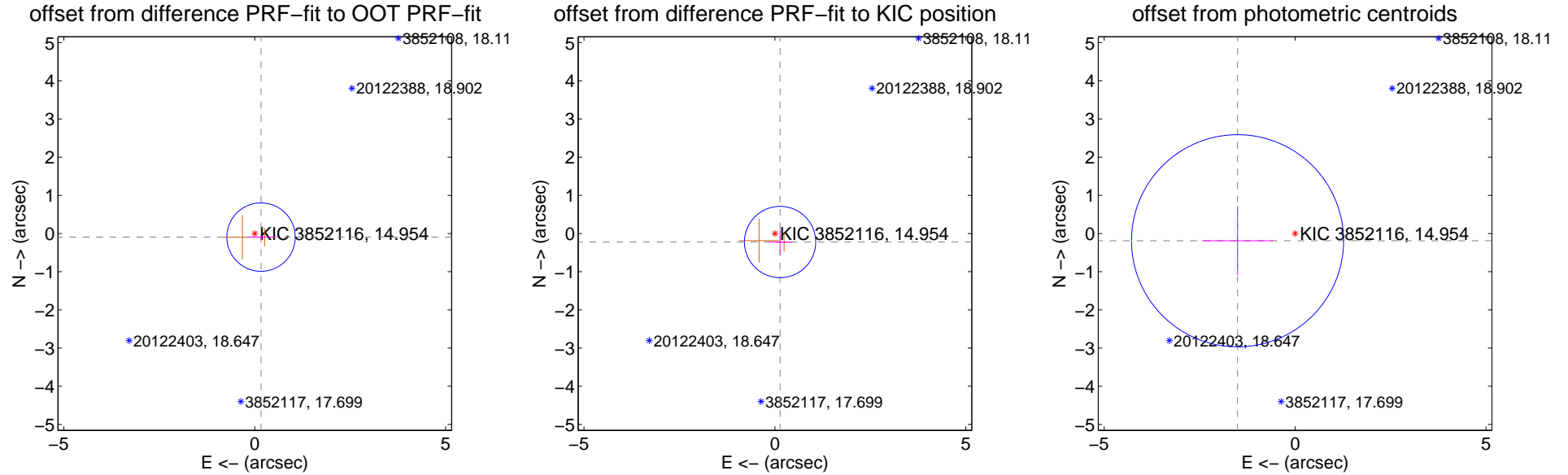
## DV Centroid Data

Supplemental centroid analysis for 003852116-04. Kepler magnitude: 14.95. Transit SNR 7.79

There are 0 quarters with good PRF difference image offsets

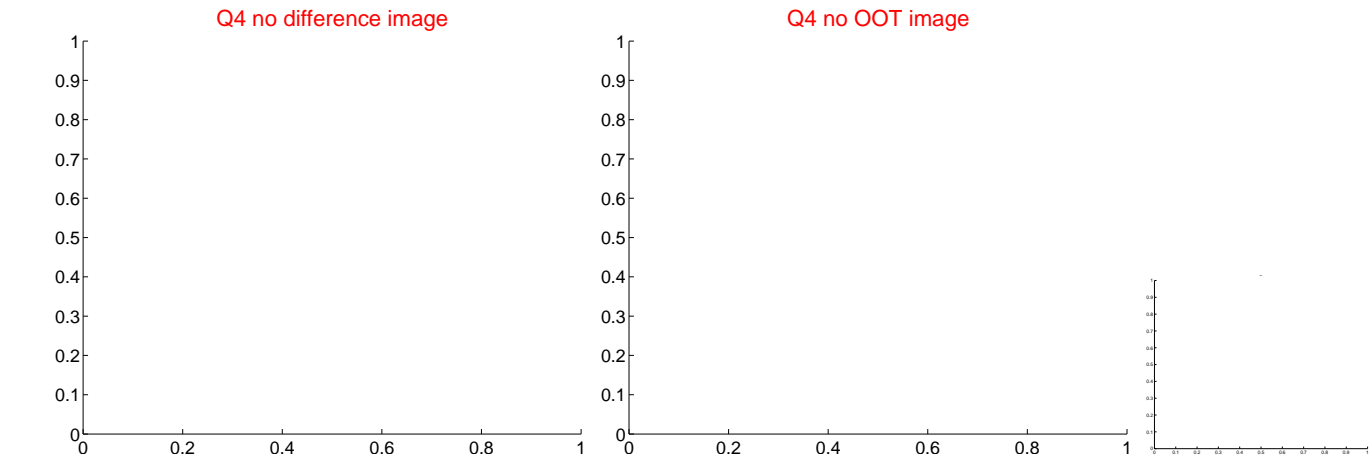
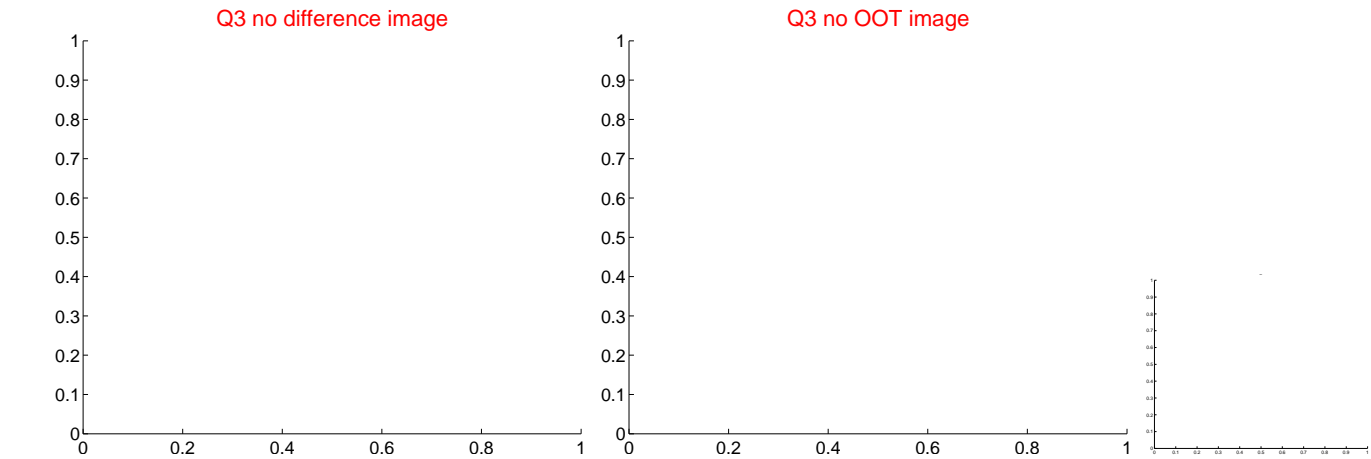
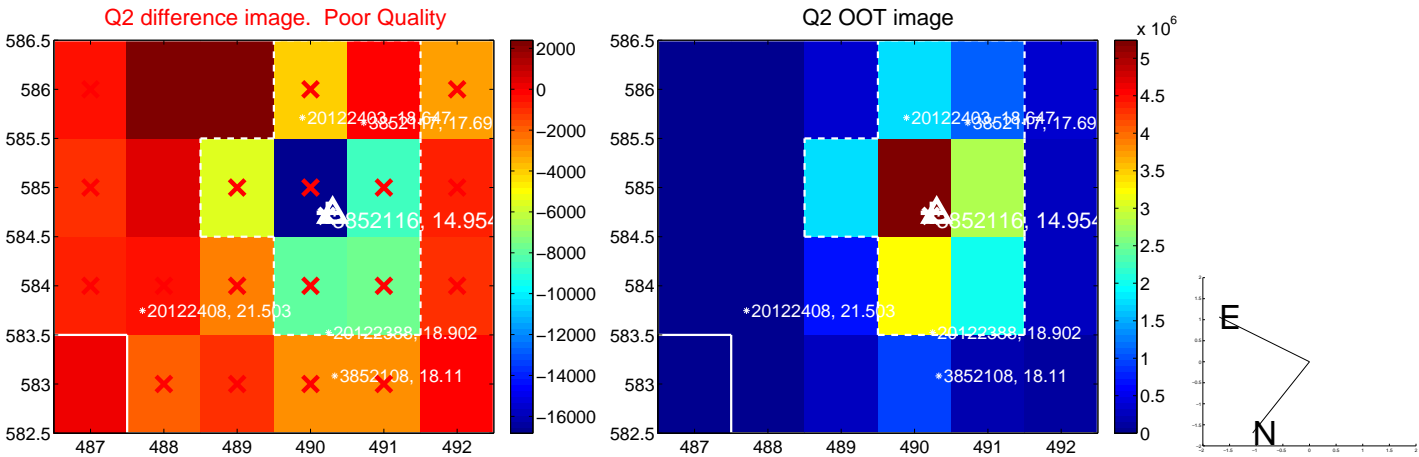
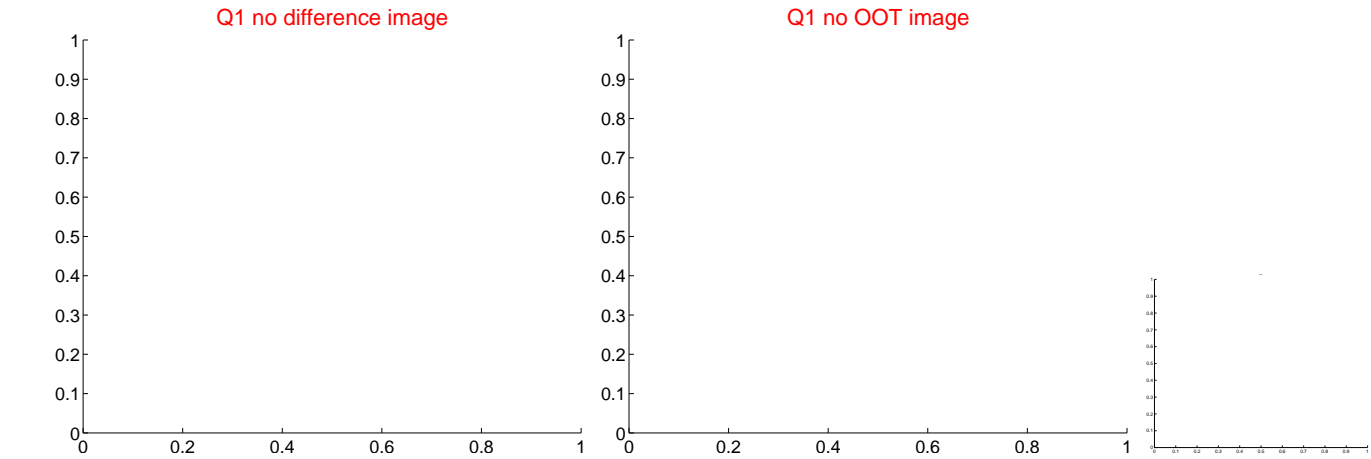
The direct PRF centroid is offset from the target star catalog position by about 0.13 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.189 \pm 0.298$	0.63	$-0.164 \pm 0.343$	$-0.094 \pm 0.067$
PRF-fit source offset from KIC position	$0.260 \pm 0.311$	0.84	$-0.135 \pm 0.291$	$-0.223 \pm 0.318$
photometric centroid source offset	$1.52 \pm 0.93$	1.64	$1.51 \pm 0.93$	$-0.19 \pm 0.90$

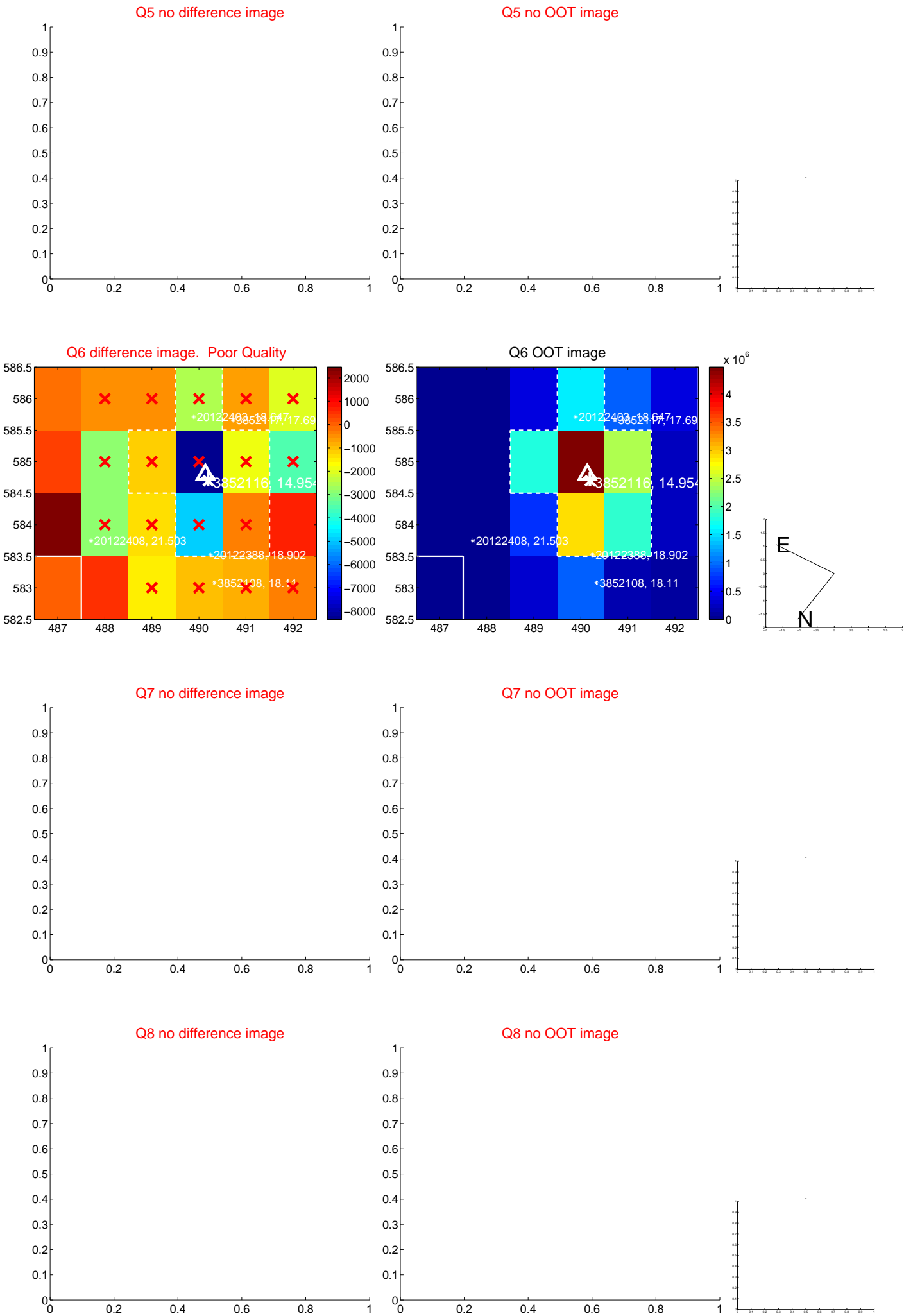


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three- $\sigma$ . 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.

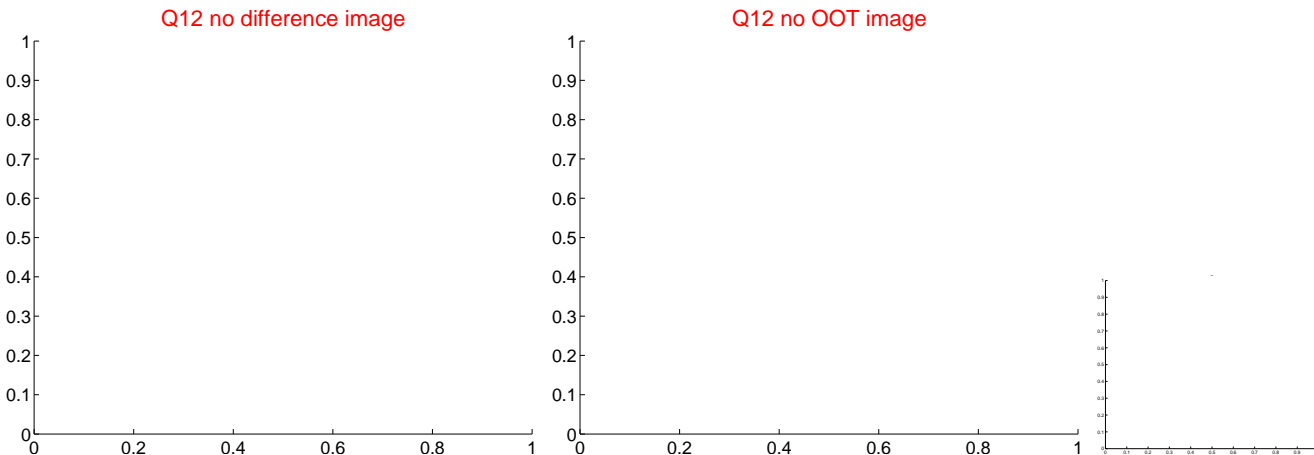
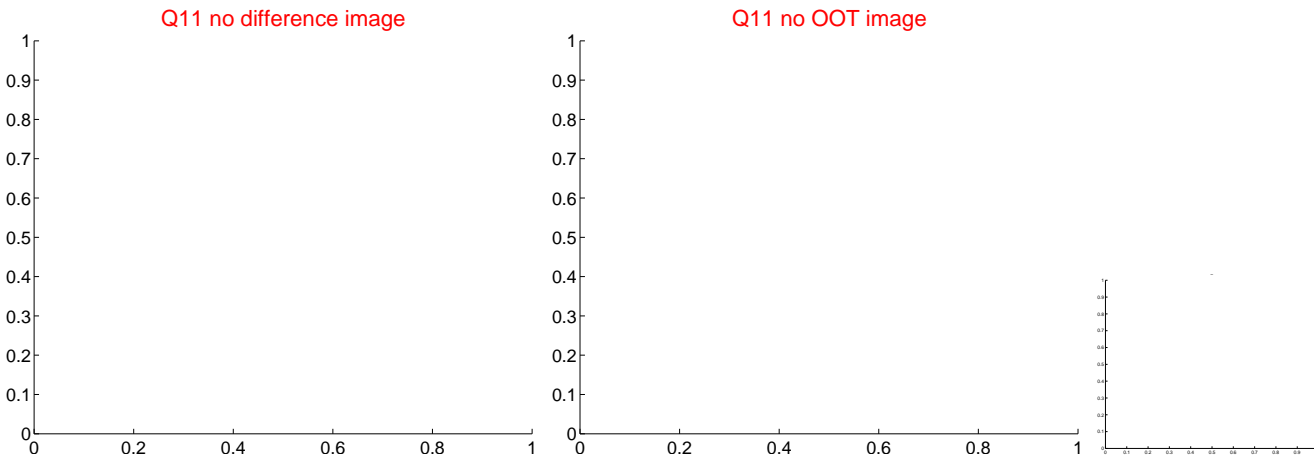
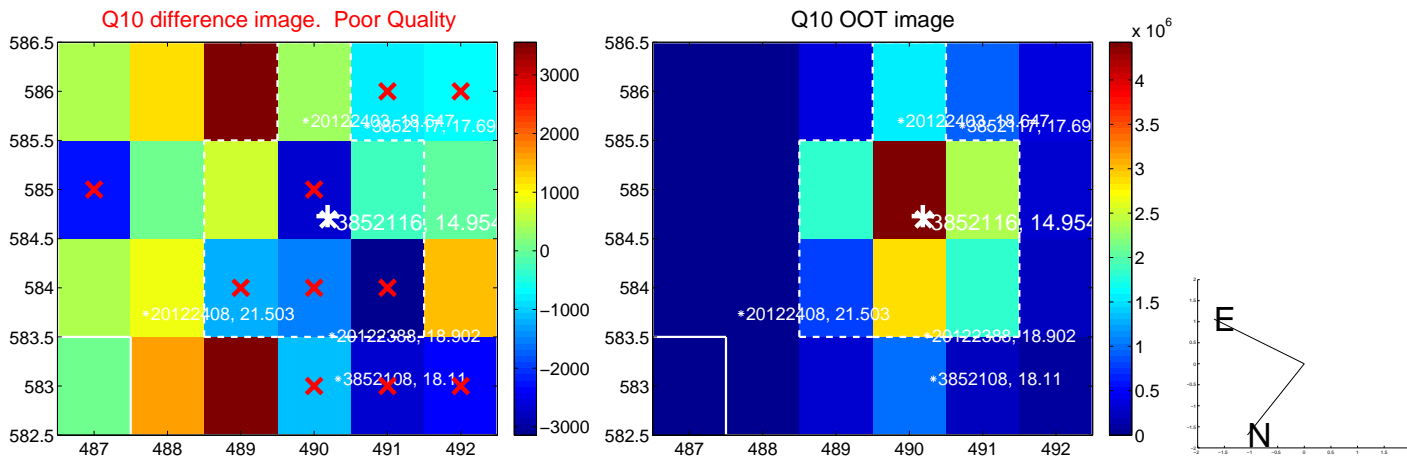
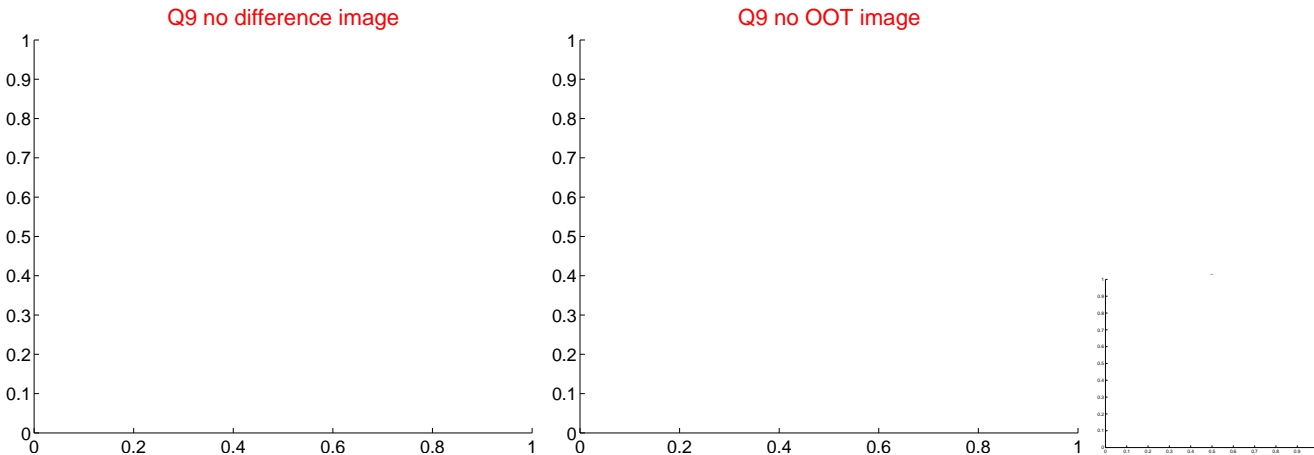
white ×: KIC target position; +: OOT centroid; △: difference centroid. red ×: large negative pixel value.



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



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.

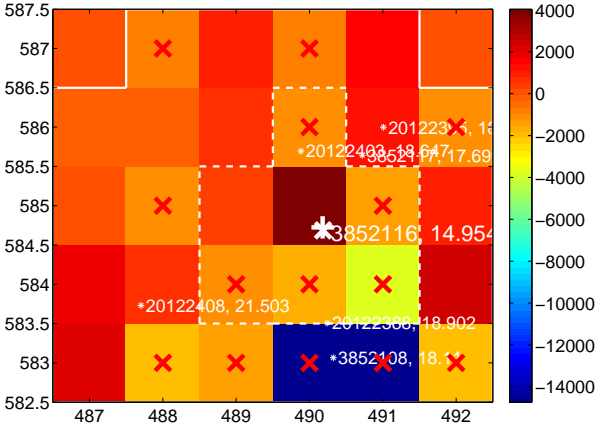
Q13 no difference image



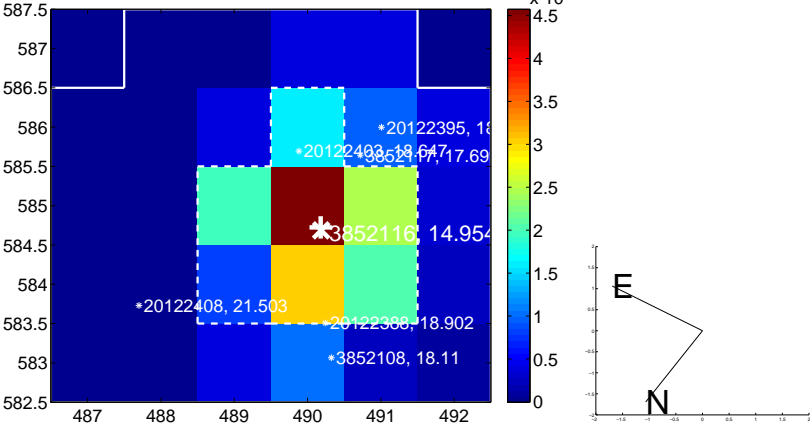
Q13 no OOT image



Q14 difference image. Poor Quality



Q14 OOT image



Q15 no difference image



Q15 no OOT image



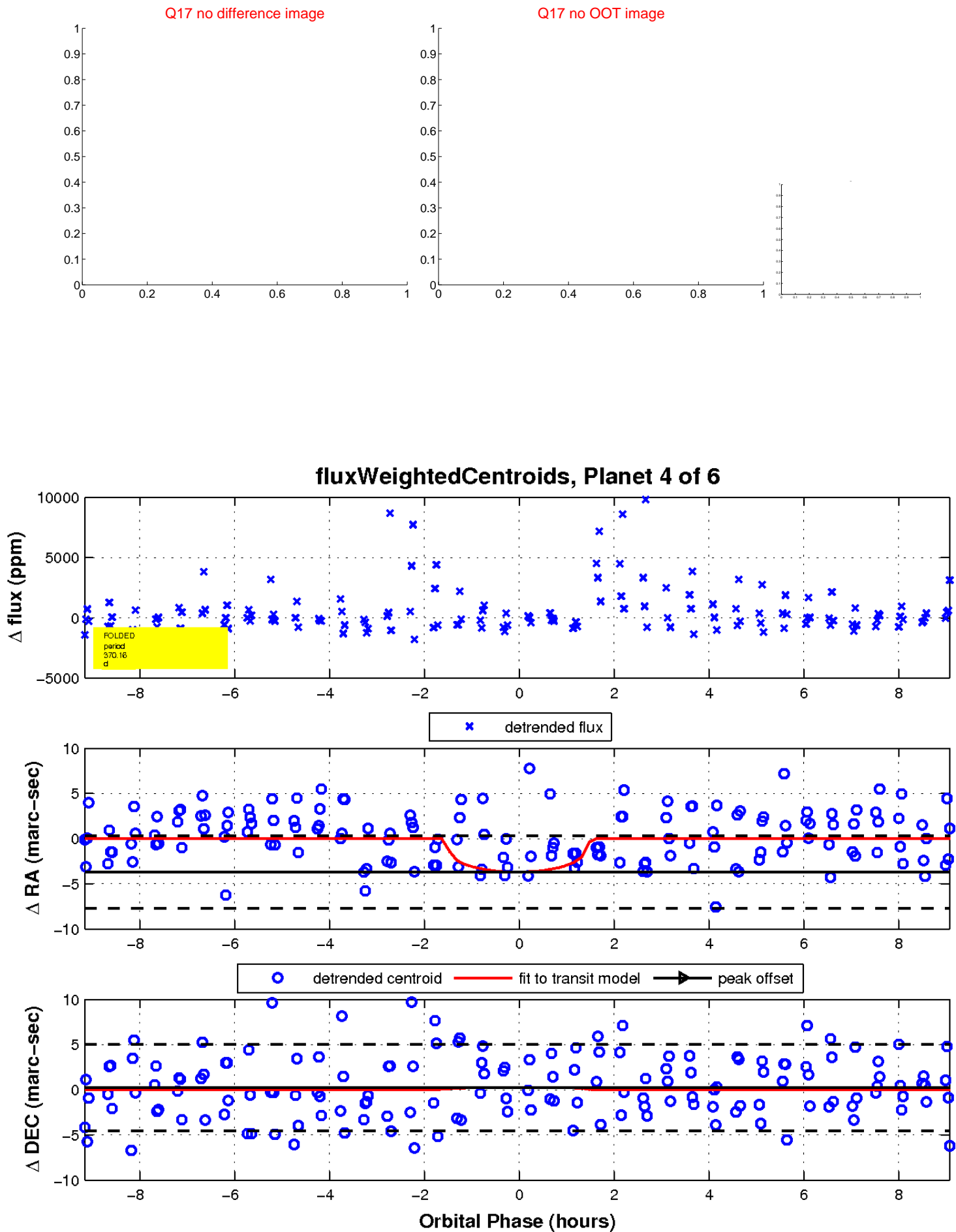
Q16 no difference image



Q16 no OOT image

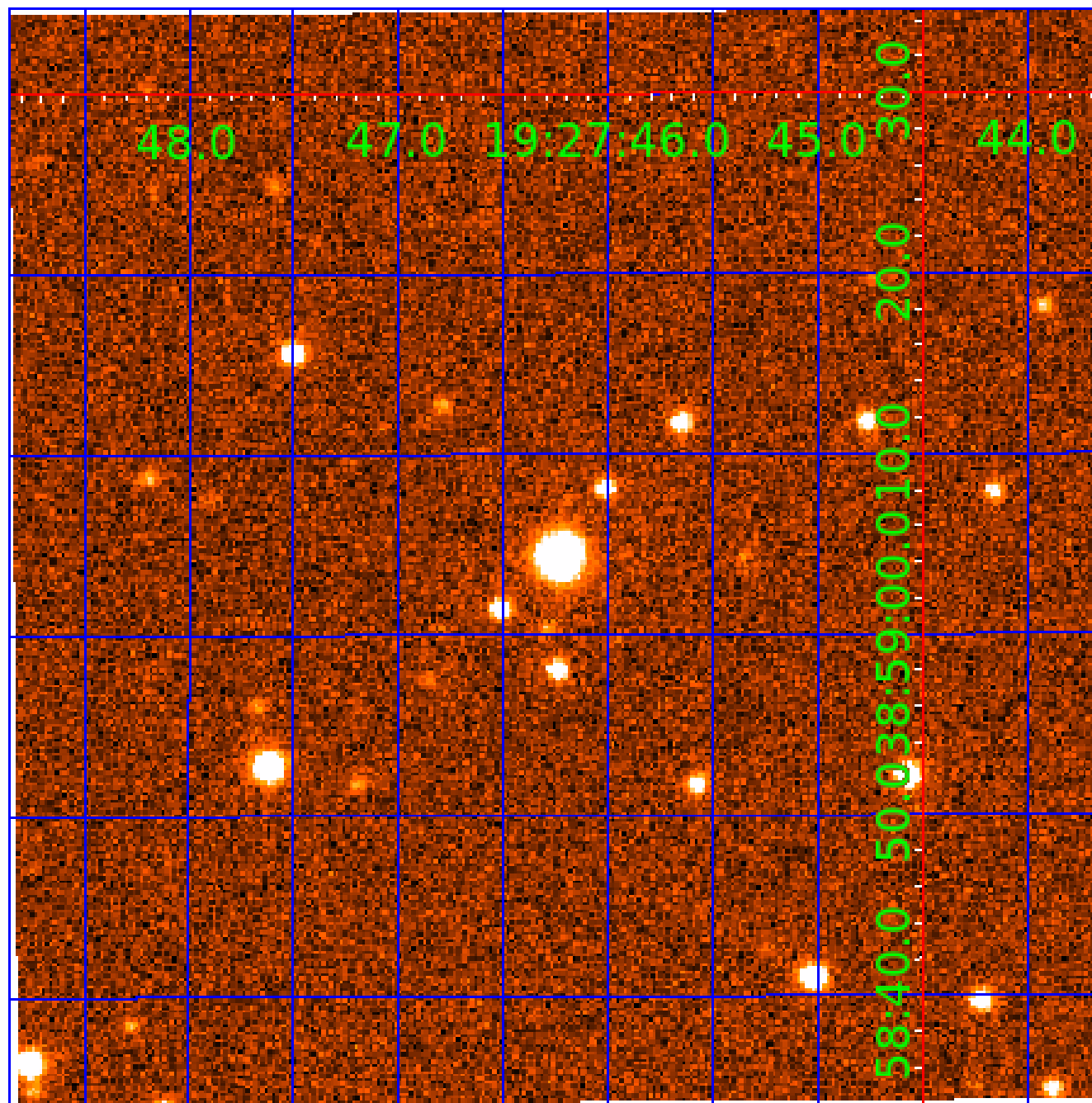


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



# UKIRT Image

Declination





# KIC 003852116

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
003852116-01	OBS	No	366.484469	408.259534	2193.0	6.588	15.0	7.4	0.66	4555	2.98	0.22
003852116-02	OBS	No	185.278116	165.565284	2156.9	3.292	12.8	8.1	0.66	4555	3.14	0.56
003852116-03	OBS	No	517.860719	456.491183	2713.1	5.758	11.9	7.6	0.66	4555	3.46	0.14
003852116-04	OBS	No	370.155848	222.268762	2471.9	3.085	13.5	7.8	0.66	4555	3.17	0.22
003852116-05	OBS	No	465.573161	434.163541	3119.6	2.940	11.8	8.6	0.66	4555	3.68	0.16
003852116-06	OBS	No	421.057650	471.703520	2540.7	12.843	10.7	5.6	0.66	4555	3.20	0.19

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
003852116-01	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_SKYE—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS
003852116-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—TRANS_GAPPED—LPP_DV—ALL_TRANS_CHASES—INCONSISTENT_TRANS—CENT_FEW_DIFFS
003852116-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—ALL_TRANS_CHASES—MOD_POS_DV—CENT_FEW_DIFFS
003852116-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS
003852116-05	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—ALL_TRANS_CHASES—MOD_POS_DV—CENT_FEW_DIFFS
003852116-06	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—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.

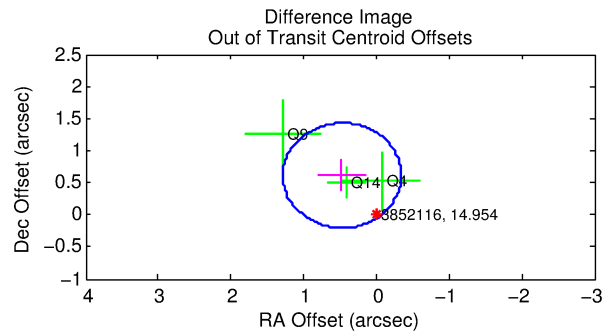
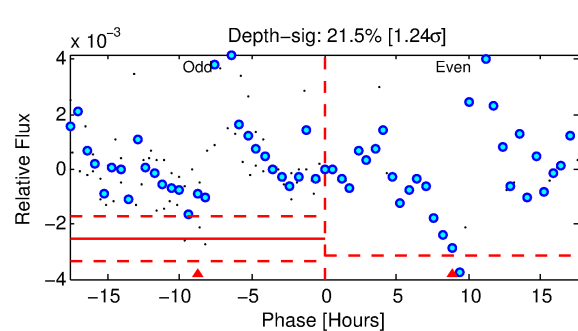
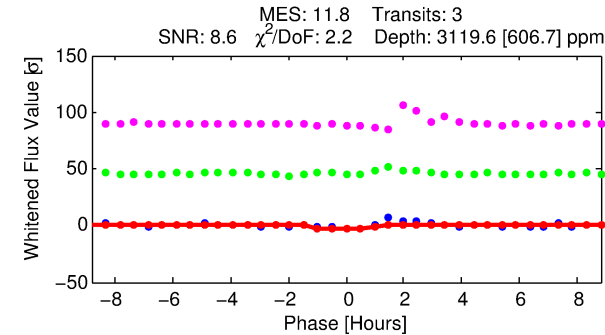
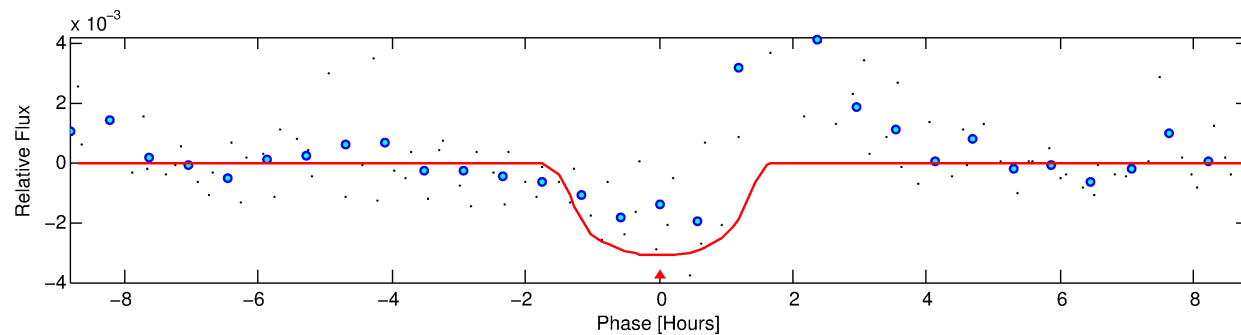
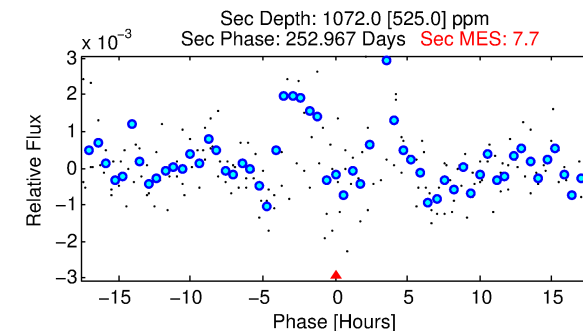
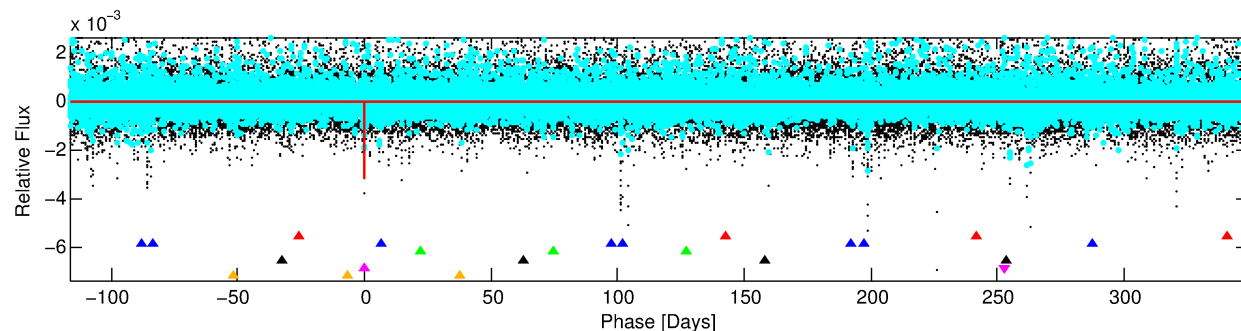
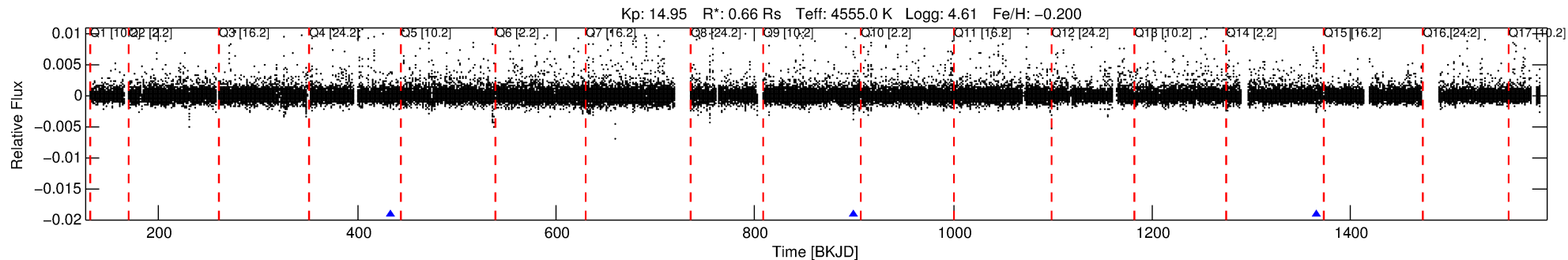
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 003852116-05

No Significant Match Found

# DV One-Page Summary

KIC: 3852116 Candidate: 5 of 6 Period: 465.573 d



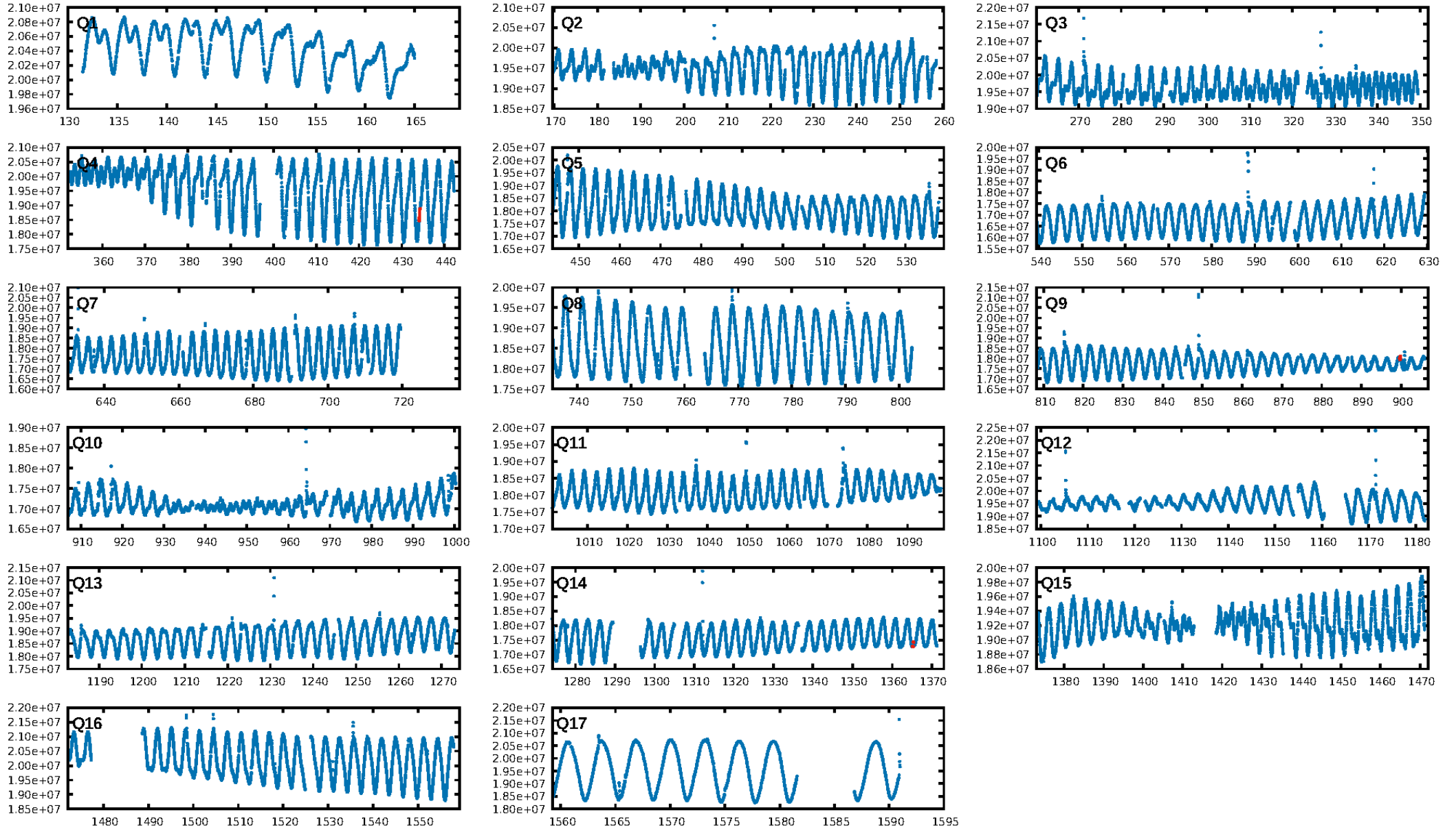
## DV Fit Results:

Period = 465.57316 [0.00578] d  
Epoch = 434.1635 [0.0066] BKJD  
Rp/R\* = 0.0508 [0.1195]  
a/R\* = 1153.99 [8051.54]  
b = 0.44 [13.07]  
Seff = 0.16 [0.02]  
Teq = 162 [6] K  
Rp = 3.68 [8.66] Re  
a = 1.0220 [0.0704] AU  
Ag = 45478.55 [215163.30] [0.21σ]  
Teff = 3657 [4326] K [0.81σ]

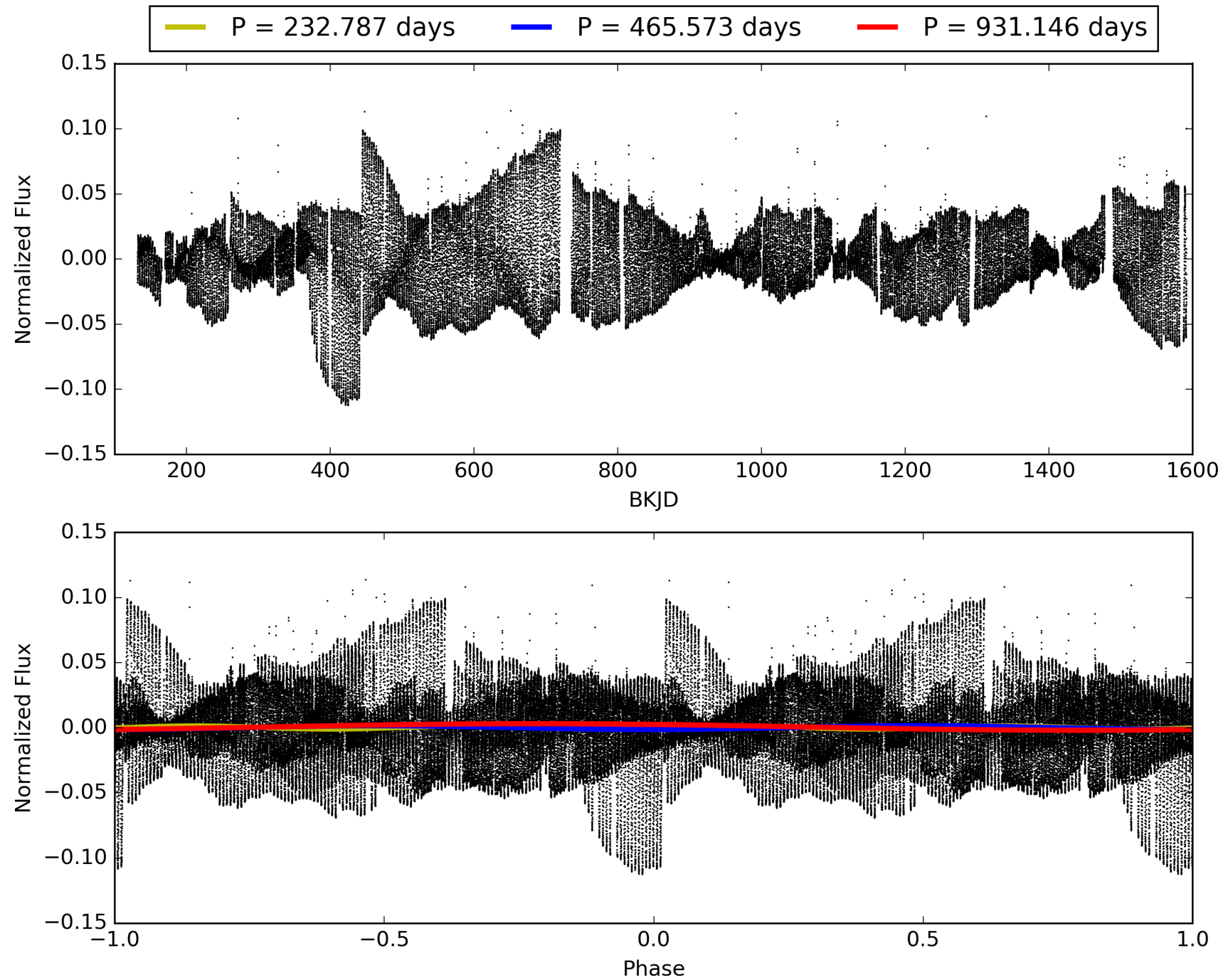
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [81.09σ]  
LongPeriod-sig: 100.0% [194.10σ]  
ModelChiSquare2-sig: 0.6%  
ModelChiSquareGof-sig: 13.7%  
Bootstrap-pfa: N/A  
RollingBand-fgt: 1.00 [3/3]  
GhostDiagnostic-chr: 4.67  
Centroid-sig: 43.9%  
Centroid-so: 0.504 arcsec [0.66σ]  
OotOffset-rm: 0.774 arcsec [2.85σ]  
KicOffset-rm: 0.649 arcsec [2.31σ]  
OotOffset-st: 1/0/1/1 [3]  
KicOffset-st: 1/0/1/1 [3]  
DiffImageQuality-fgm: 0.67 [2/3]  
DiffImageOverlap-fno: 1.00 [3/3]

# TCE 003852116-05, PDC Light Curves

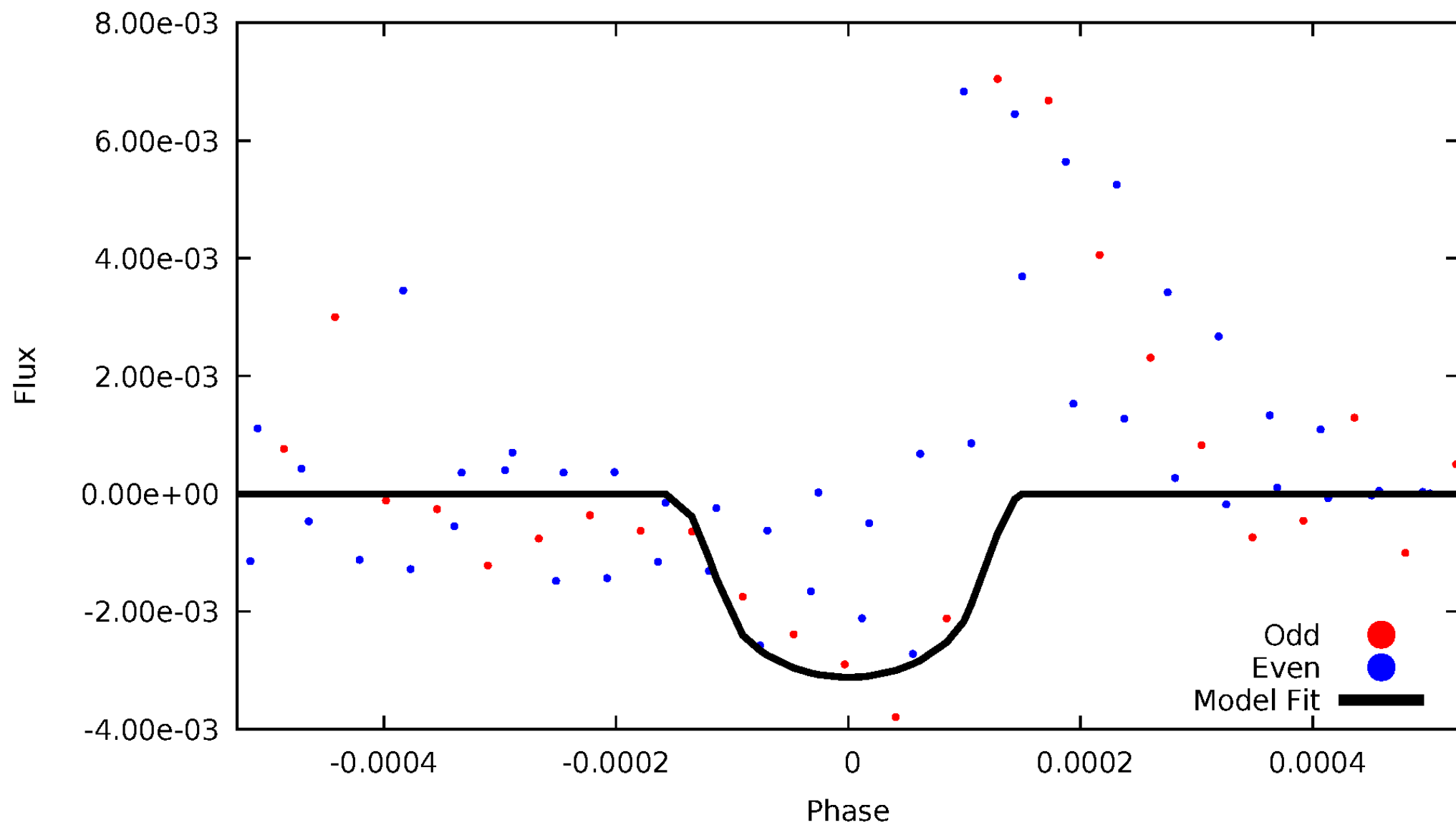


TCE 003852116-05



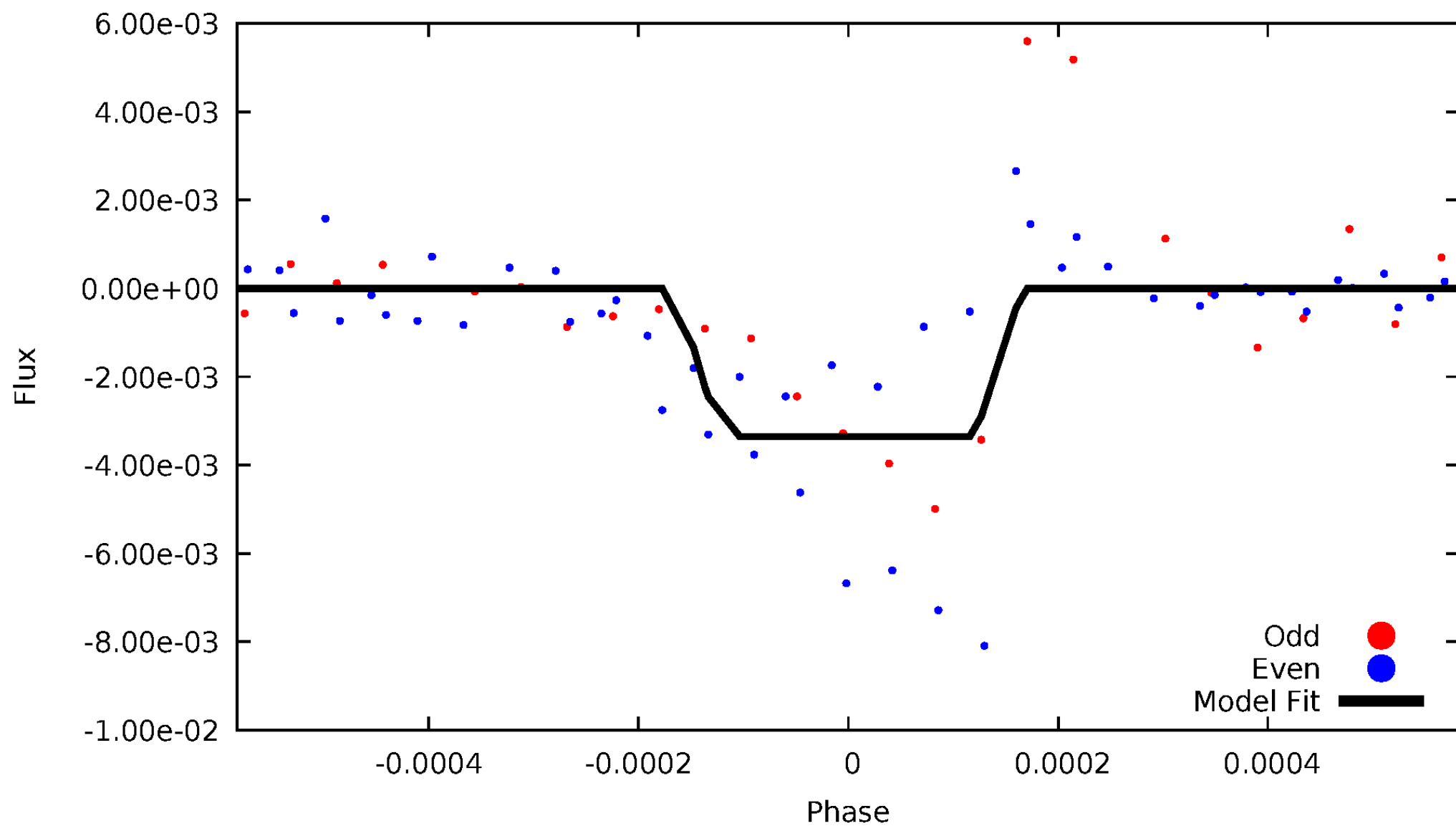
# DV Odd/Even

TCE 003852116-05



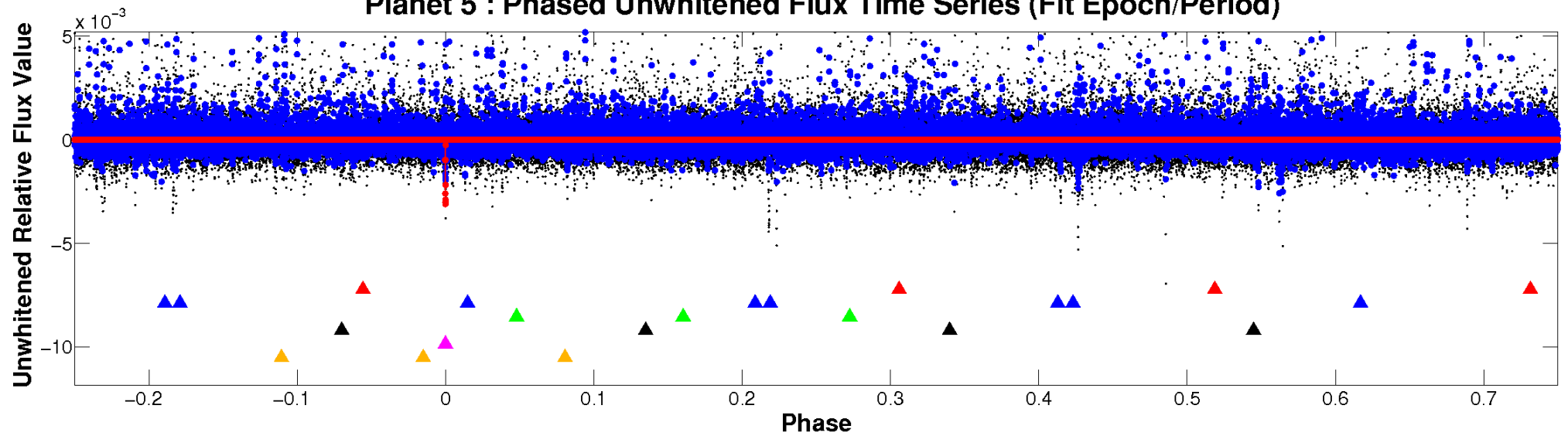
# ALT Odd/Even

TCE 003852116-05

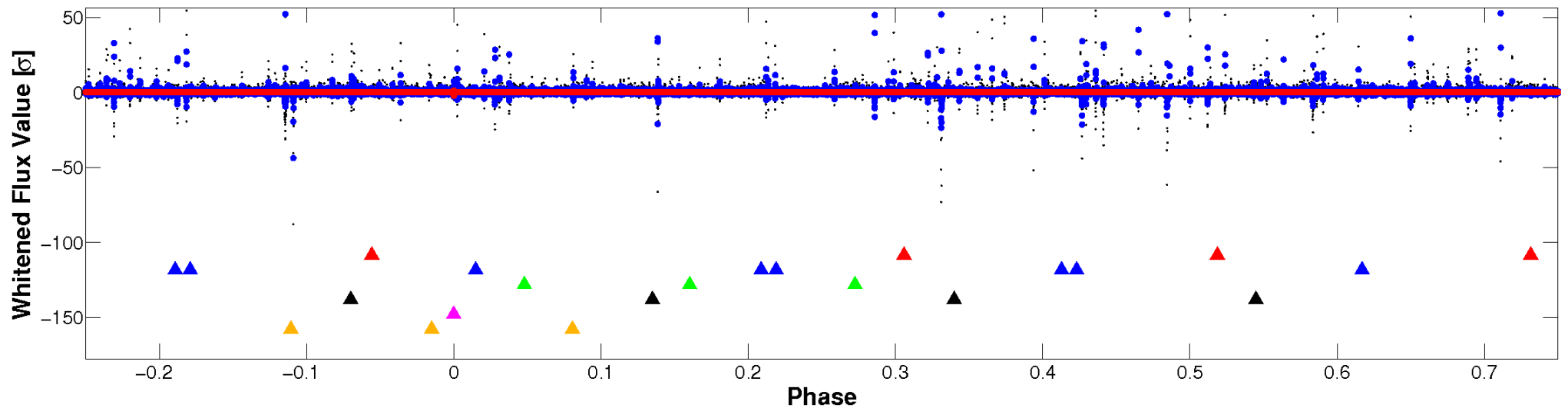


# Non-Whitened Vs. Whitened Light Curve

## Planet 5 : Phased Unwhitened Flux Time Series (Fit Epoch/Period)

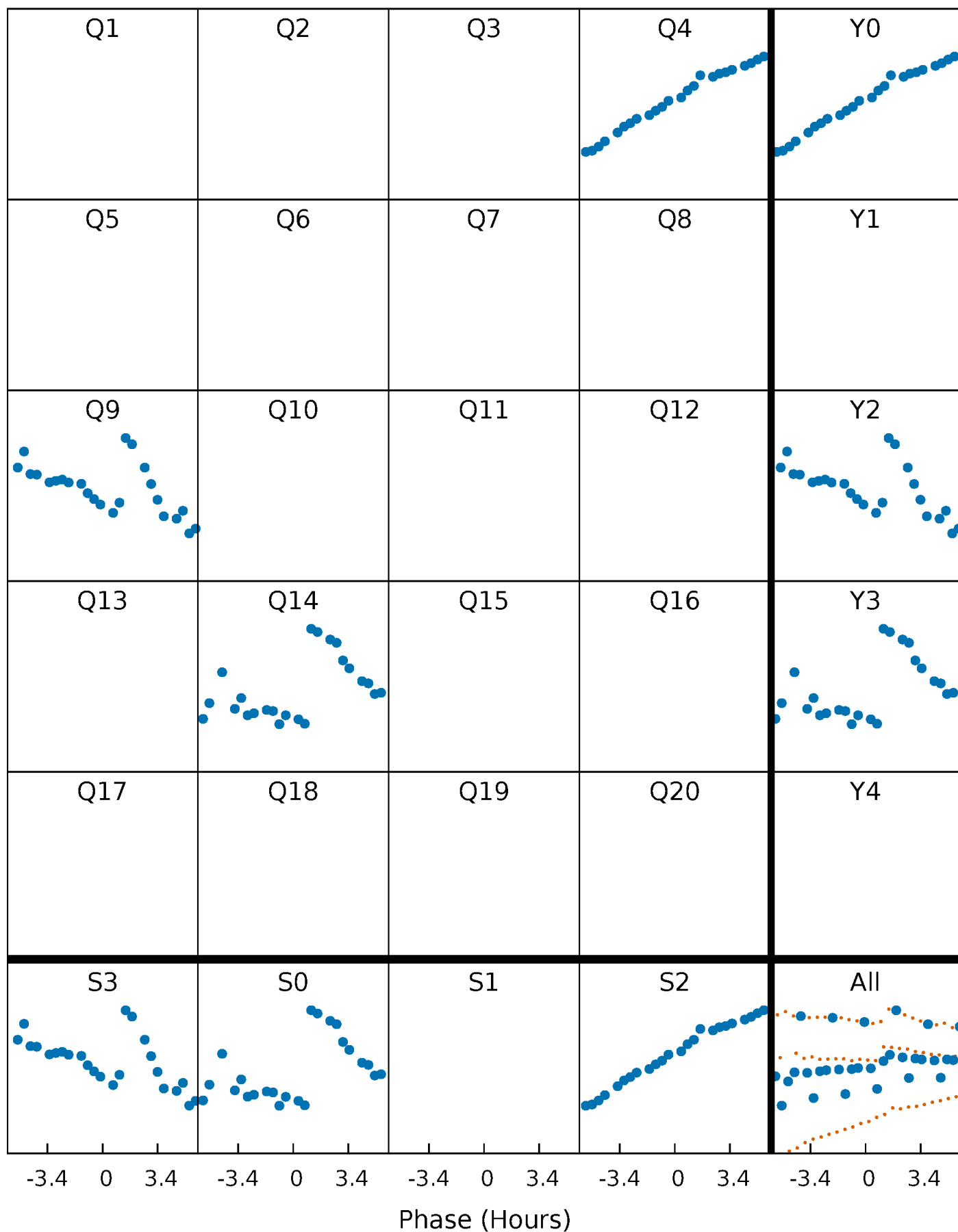


## Planet 5 : Phased Whitened Flux Time Series (Fit Epoch/Period)



# PDC Quarter-Phased Transit Curves

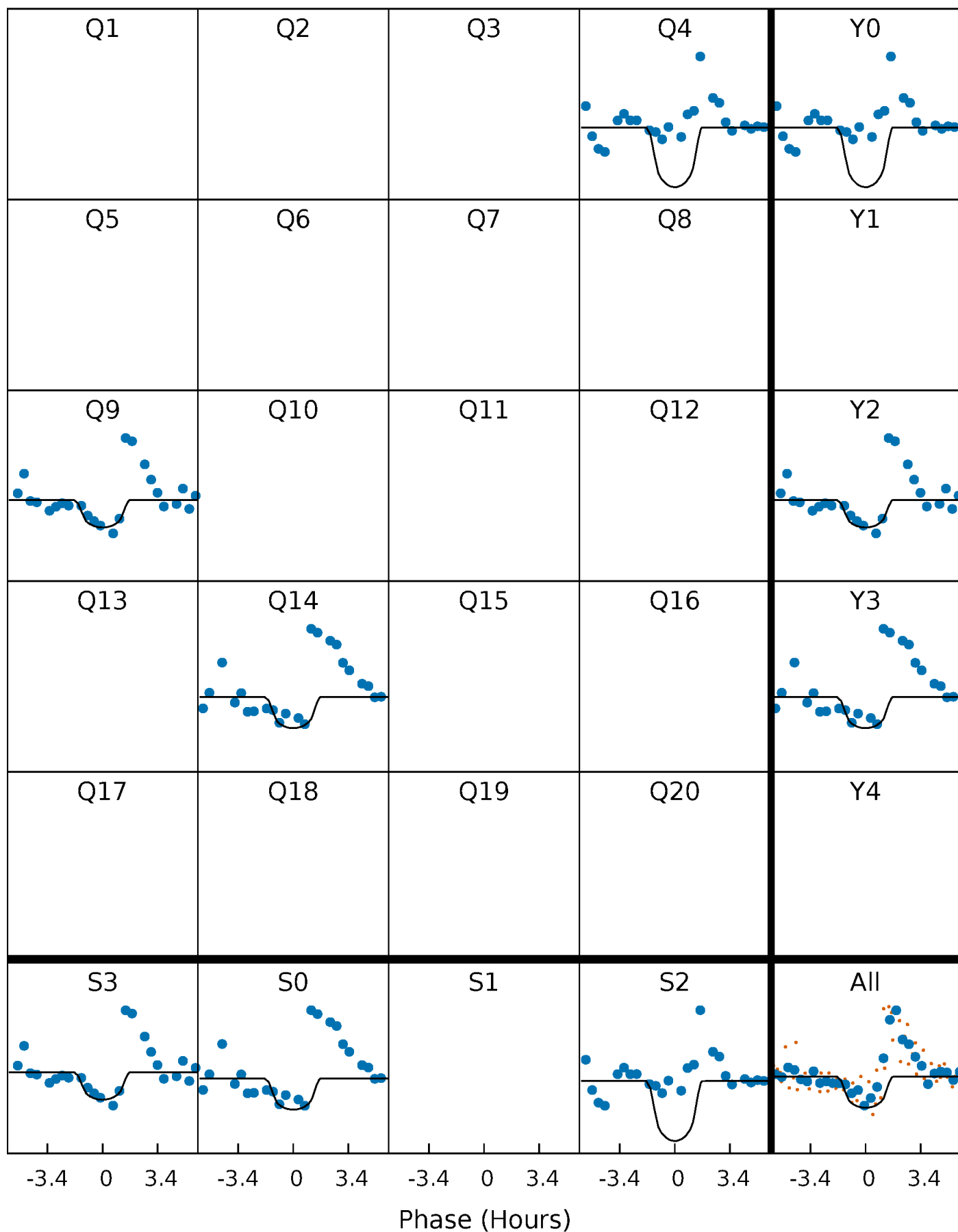
TCE 003852116-05     $P=465.573162$  Days     $T_0=434.163541$  (BKJD)





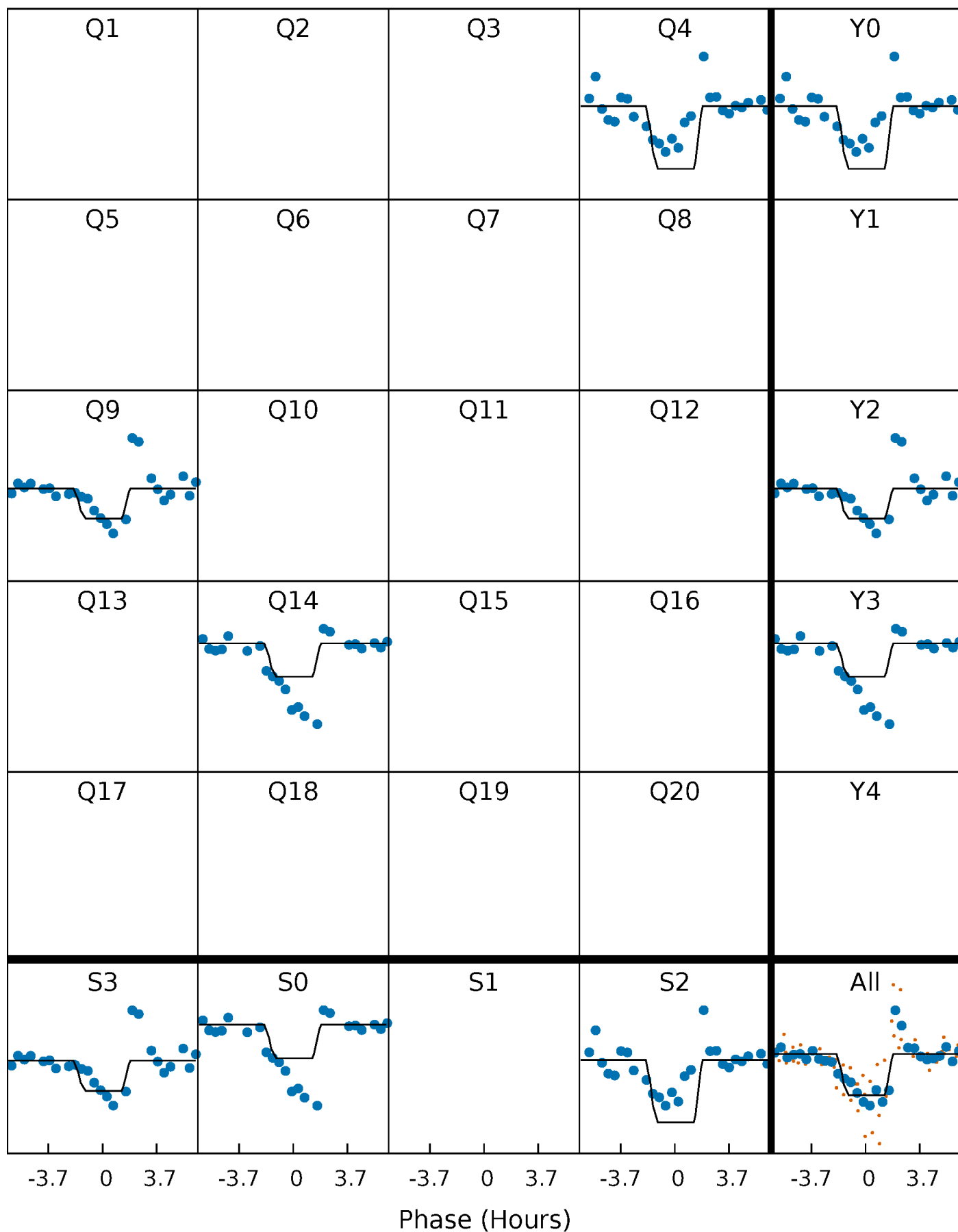
# DV Quarter-Phased Transit Curves

TCE 003852116-05 P=465.573162 Days  $T_0=434.163541$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

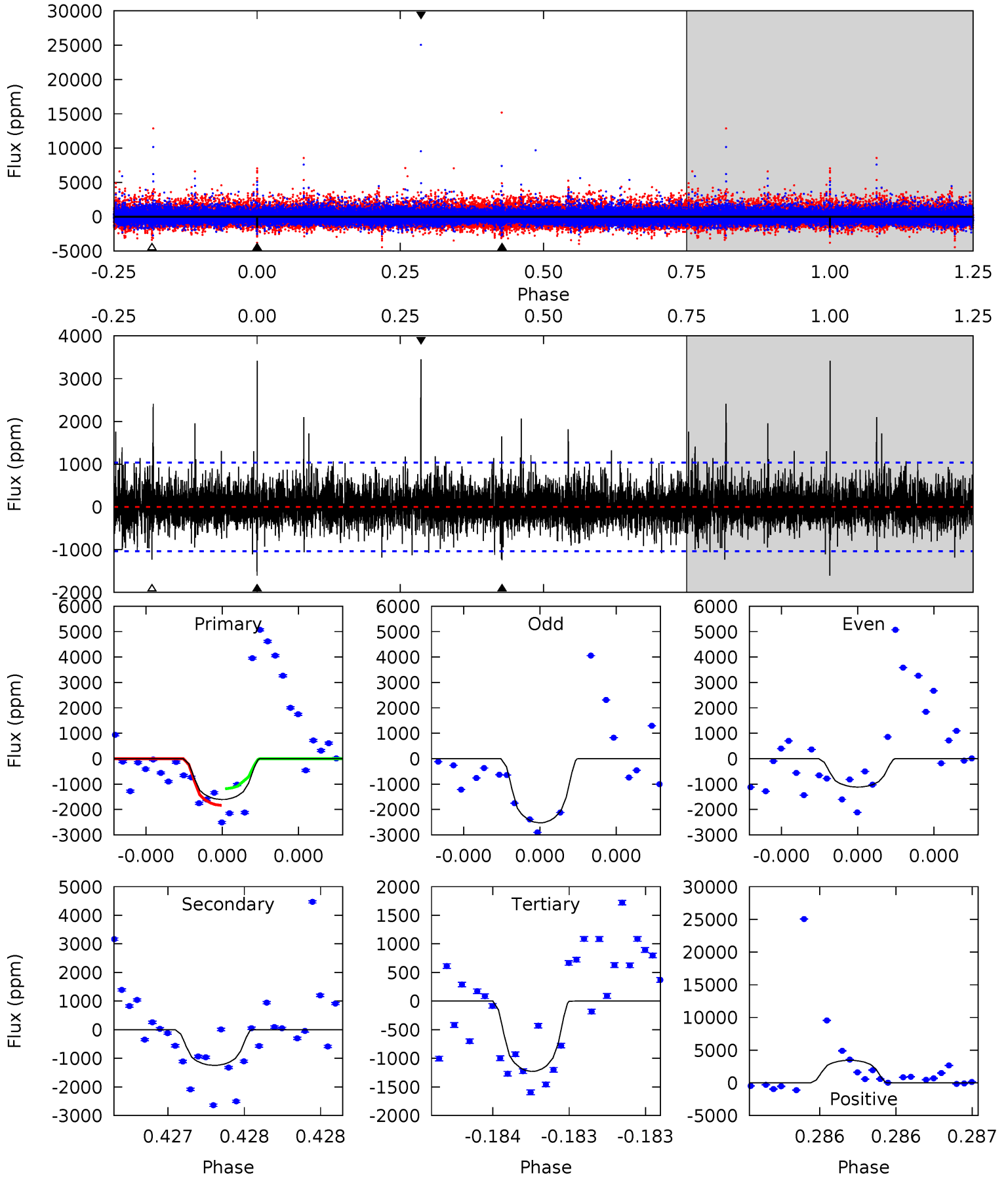
TCE 003852116-05 P=465.558231 Days  $T_0=434.158903$  (BKJD)



# DV Model-Shift Uniqueness Test

003852116-05, P = 465.573162 Days, E = 434.163541 Days

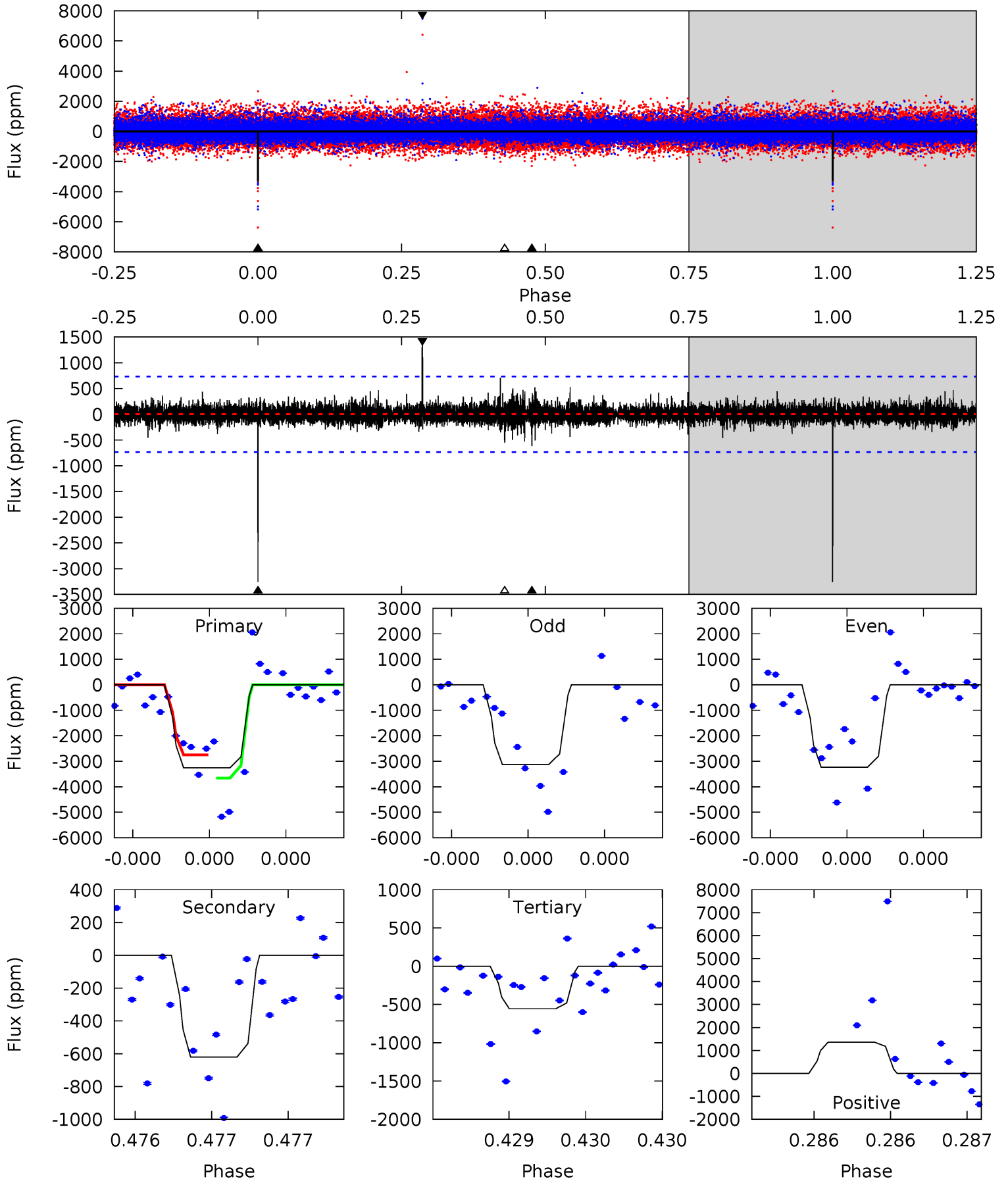
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
8.76	6.79	6.70	18.8	5.66	3.61	1.71	2.06	-10.0	0.09	-12.0	1.59	1.21	0.68	1.74



# Alt Model-Shift Uniqueness Test

003852116-05, P = 465.558231 Days, E = 434.158903 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
25.1	4.78	4.27	10.5	5.66	3.61	0.75	20.8	14.6	0.50	-5.69	0.39	1.16	0.29	0



### Stellar Parameters For KIC 003852116

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (g \cdot \text{cm}^{-3})$
	$4555^{+136}_{-136}$	$4.611^{+0.048}_{-0.028}$	$-0.200^{+0.300}_{-0.300}$	$0.664^{+0.052}_{-0.058}$	$0.656^{+0.071}_{-0.051}$	$3.163^{+0.733}_{-0.411}$
	+3%/-3%	+1%/-1%	+150%/-150%	+8%/-9%	+11%/-8%	+23%/-13%
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 003852116-05 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-1246 \pm 184$	$7.53^{+6.81}_{-5.50}$	$226^{+7}_{-8}$	$3165^{+1799}_{-537}$	$12605^{+155171}_{-9270}$
Alt.	$-620 \pm 130$	$7.92^{+7.46}_{-5.39}$	$225^{+8}_{-7}$	$2808^{+1234}_{-422}$	$5398^{+53343}_{-3904}$

$T_{max}$  = 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  $A_{obs} \gg 1.0$

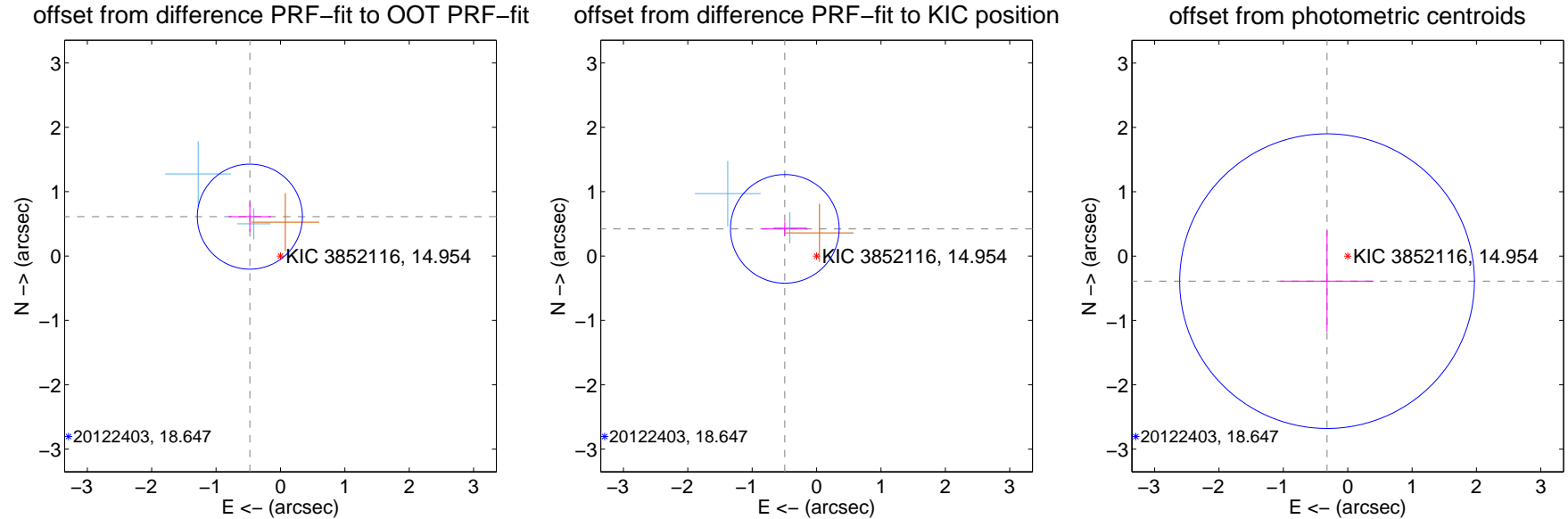
## DV Centroid Data

Supplemental centroid analysis for 003852116-05. Kepler magnitude: 14.95. Transit SNR 8.59

There are 2 quarters with good PRF difference image offsets

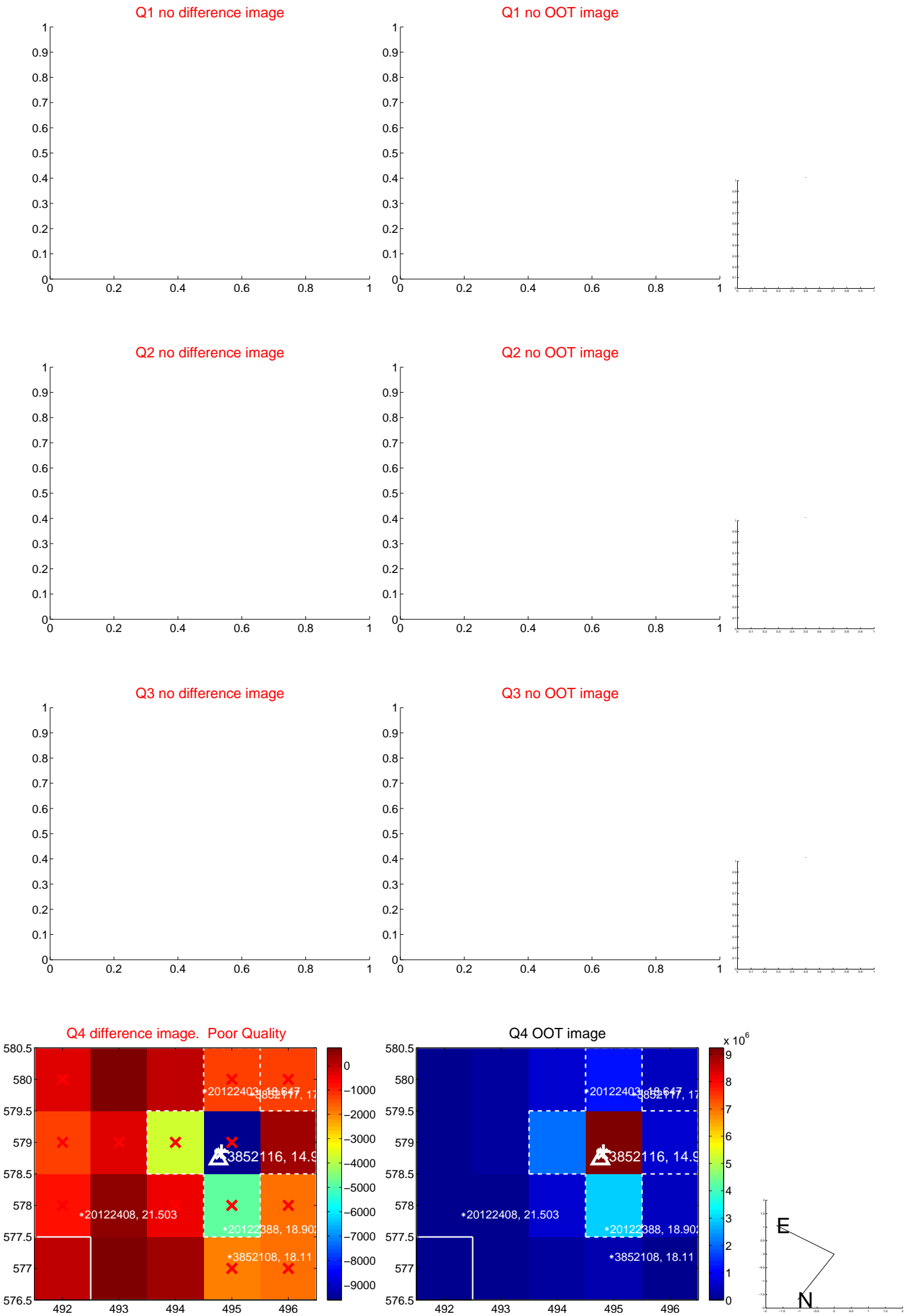
The direct PRF centroid is offset from the target star catalog position by about 0.06 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.774 \pm 0.272$	2.85	$0.475 \pm 0.329$	$0.612 \pm 0.231$
PRF-fit source offset from KIC position	$0.649 \pm 0.281$	2.31	$0.494 \pm 0.359$	$0.422 \pm 0.103$
photometric centroid source offset	$0.50 \pm 0.76$	0.66	$0.32 \pm 0.73$	$-0.39 \pm 0.79$



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.

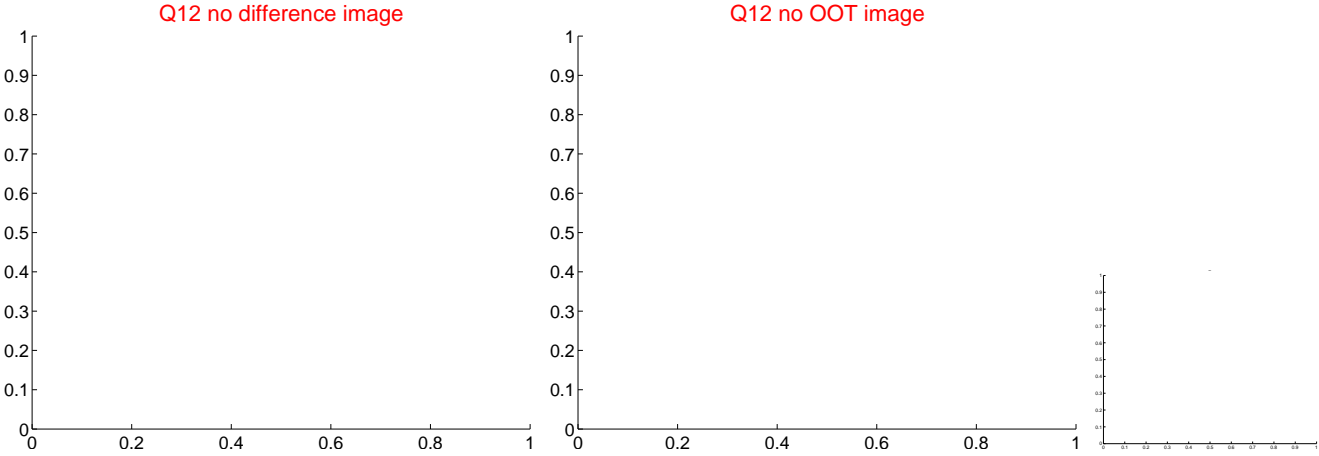
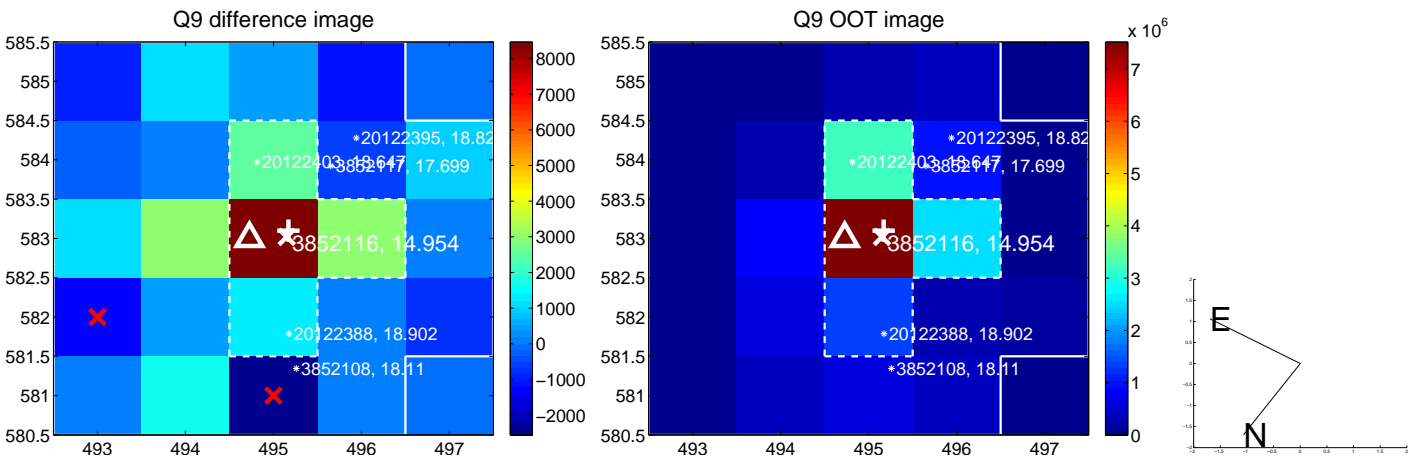


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

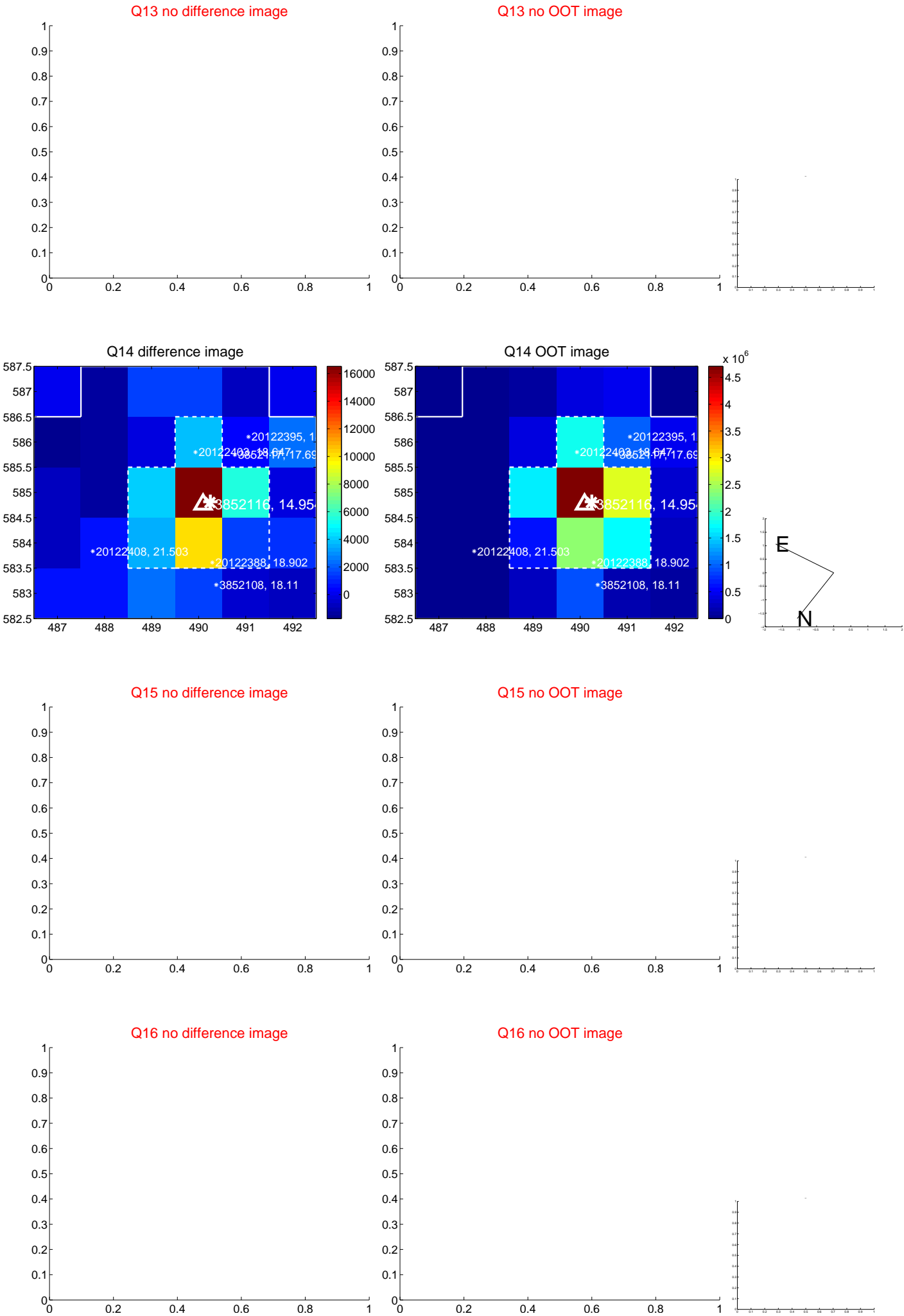




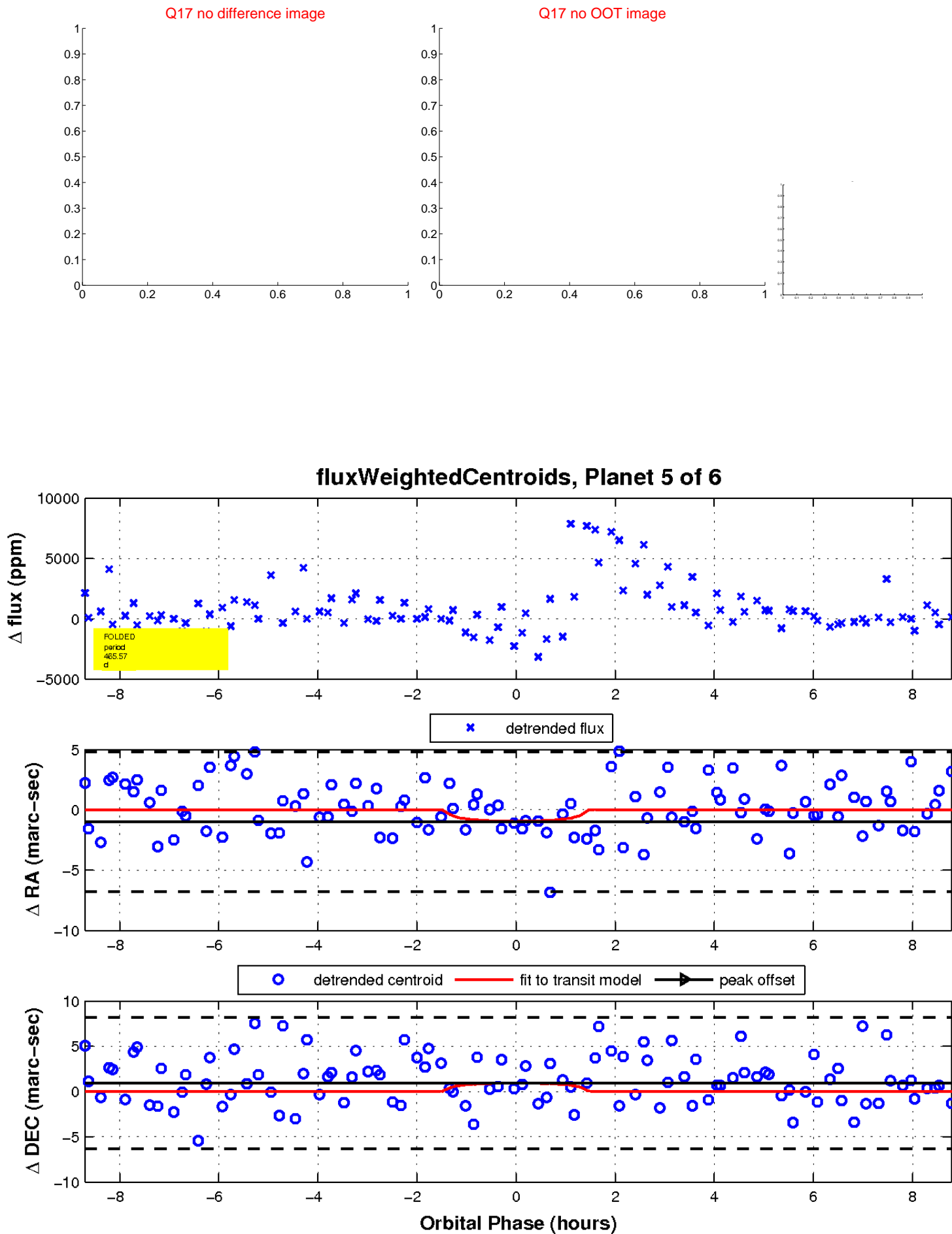
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

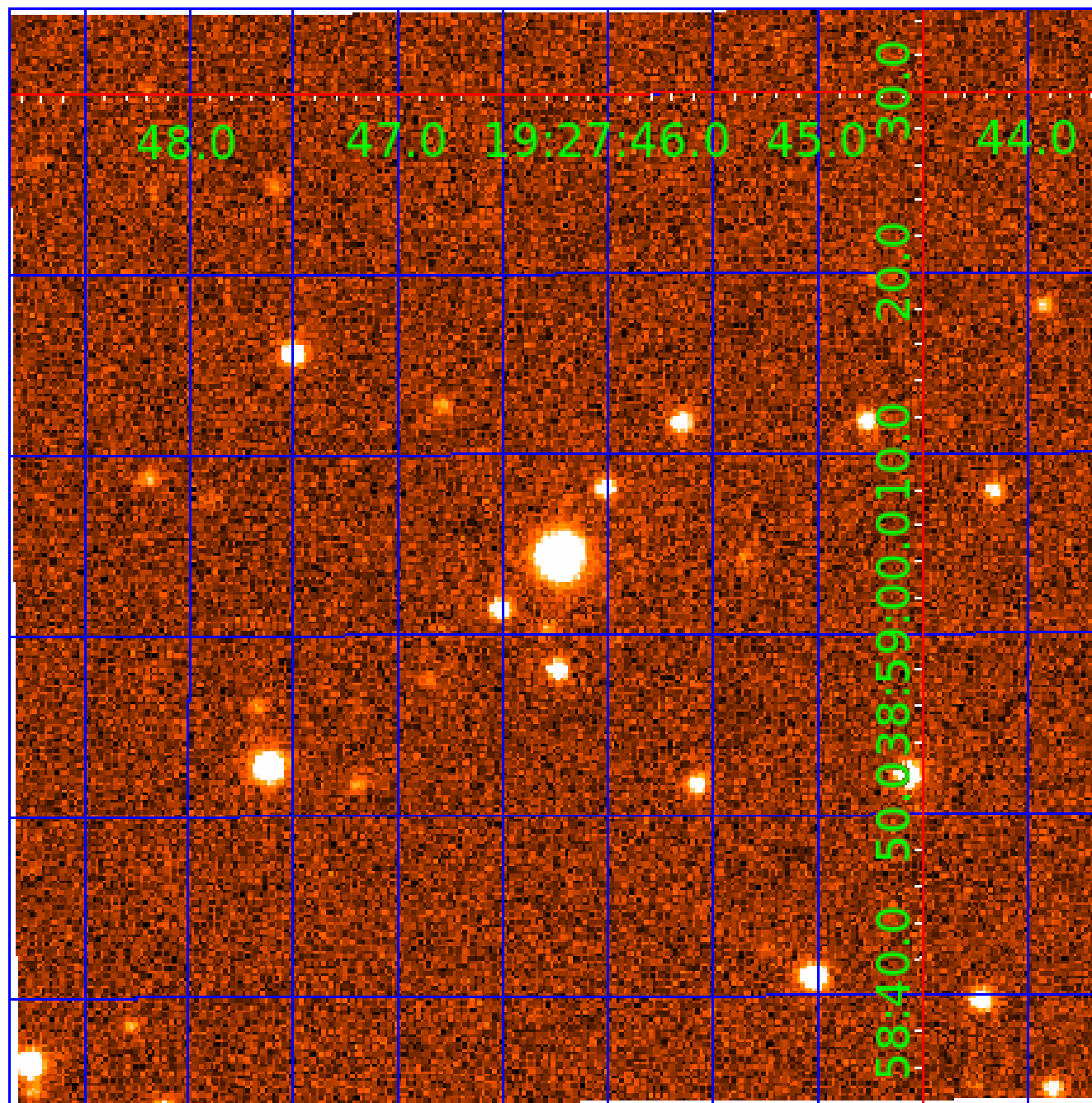


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



# UKIRT Image

Declination



# KIC 003852116

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
003852116-01	OBS	No	366.484469	408.259534	2193.0	6.588	15.0	7.4	0.66	4555	2.98	0.22
003852116-02	OBS	No	185.278116	165.565284	2156.9	3.292	12.8	8.1	0.66	4555	3.14	0.56
003852116-03	OBS	No	517.860719	456.491183	2713.1	5.758	11.9	7.6	0.66	4555	3.46	0.14
003852116-04	OBS	No	370.155848	222.268762	2471.9	3.085	13.5	7.8	0.66	4555	3.17	0.22
003852116-05	OBS	No	465.573161	434.163541	3119.6	2.940	11.8	8.6	0.66	4555	3.68	0.16
003852116-06	OBS	No	421.057650	471.703520	2540.7	12.843	10.7	5.6	0.66	4555	3.20	0.19

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
003852116-01	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_SKYE—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS
003852116-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—TRANS_GAPPED—LPP_DV—ALL_TRANS_CHASES—INCONSISTENT_TRANS—CENT_FEW_DIFFS
003852116-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—ALL_TRANS_CHASES—MOD_POS_DV—CENT_FEW_DIFFS
003852116-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS
003852116-05	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—ALL_TRANS_CHASES—MOD_POS_DV—CENT_FEW_DIFFS
003852116-06	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—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.

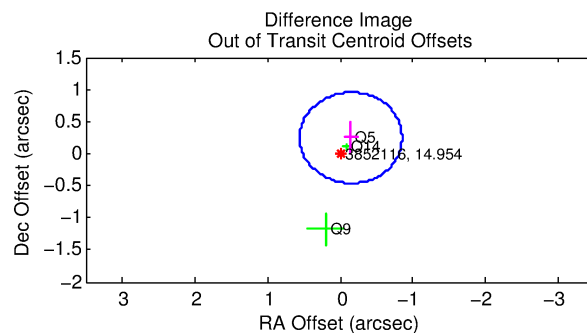
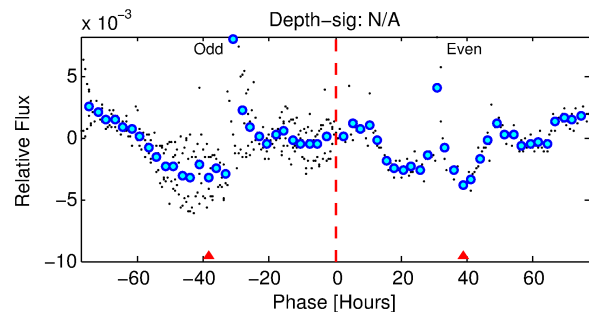
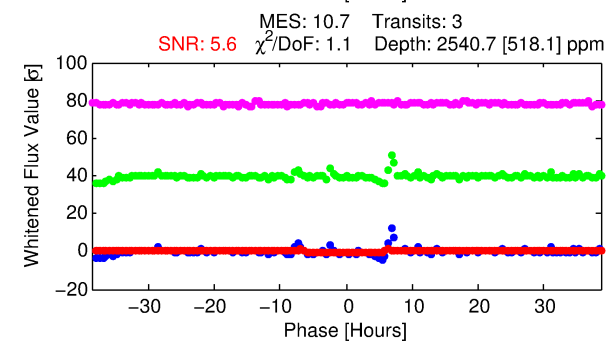
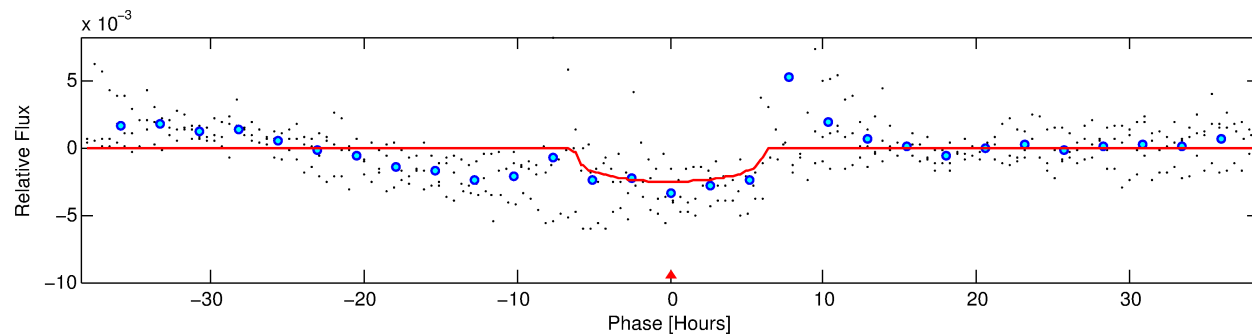
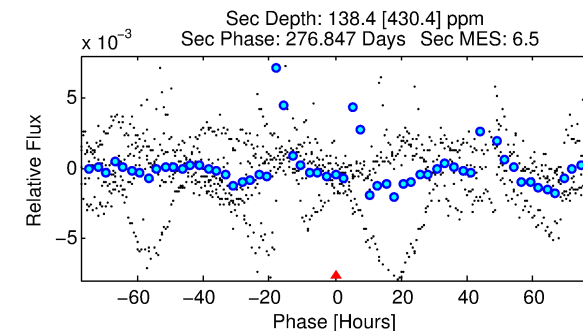
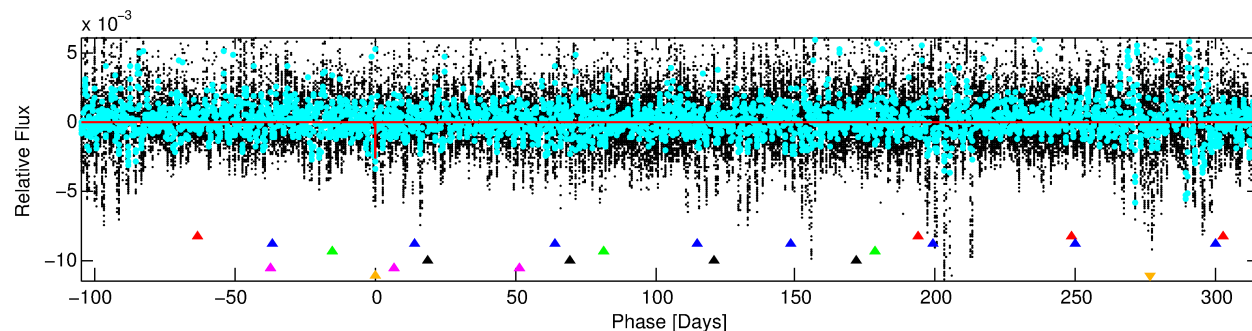
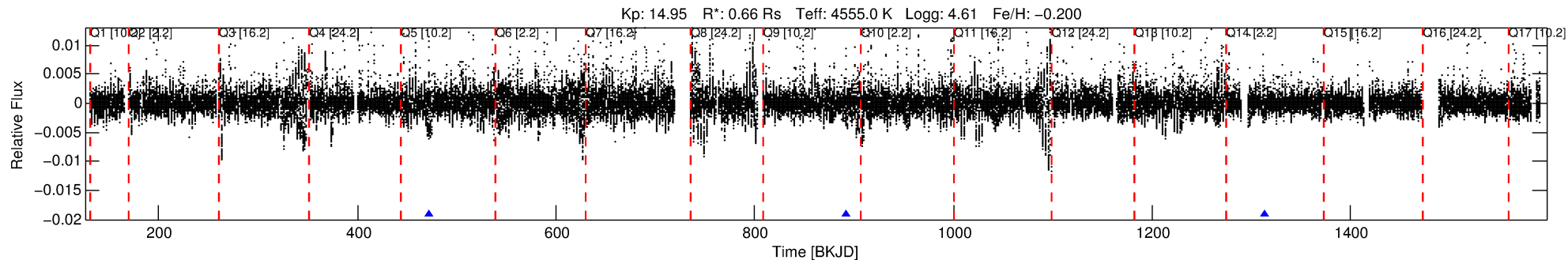
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 003852116-06

No Significant Match Found

# DV One-Page Summary

KIC: 3852116 Candidate: 6 of 6 Period: 421.058 d



## DV Fit Results:

Period = 421.05765 [0.00891] d  
Epoch = 471.7035 [0.0117] BKJD  
Rp/R\* = 0.0442 [0.0254]  
a/R\* = 261.53 [436.55]  
b = 0.00 [1141.16]  
Seff = 0.19 [0.03]  
Teq = 167 [6] K  
Rp = 3.20 [1.86] Re  
a = 0.9558 [0.0659] AU  
Ag = 6797.76 [22540.06] [0.30σ]  
Teff = 2351 [1950] K [1.12σ]

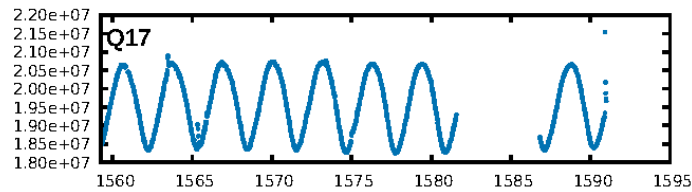
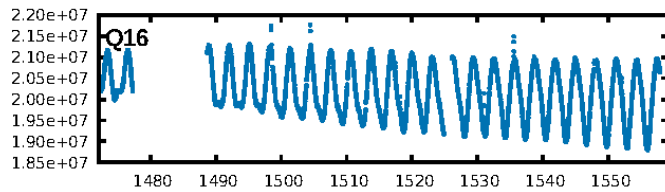
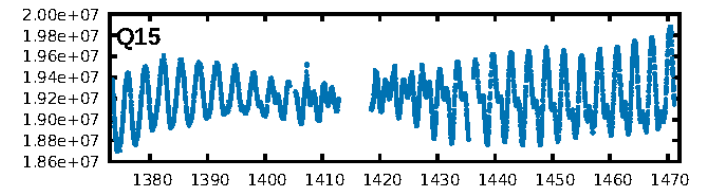
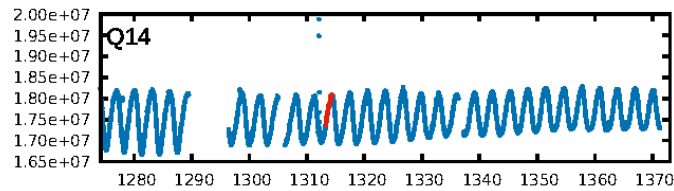
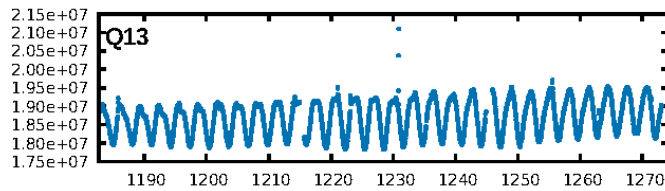
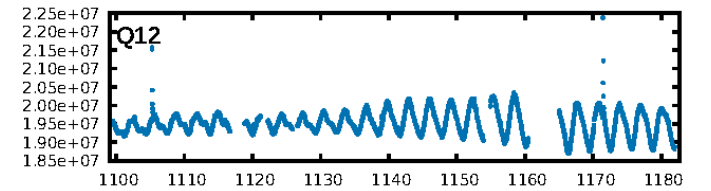
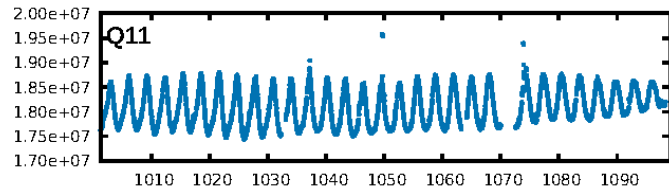
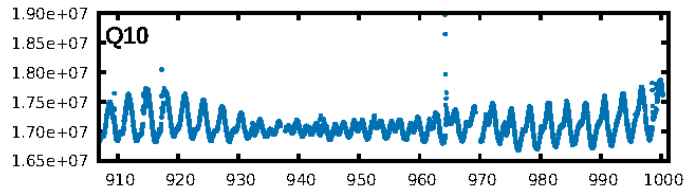
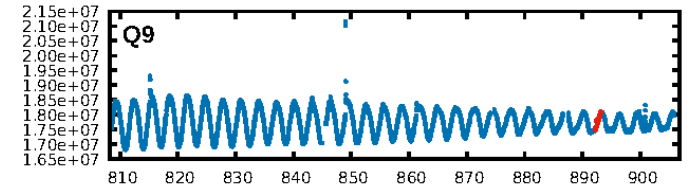
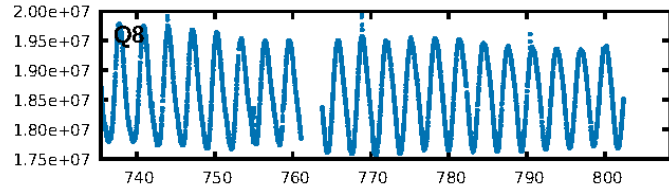
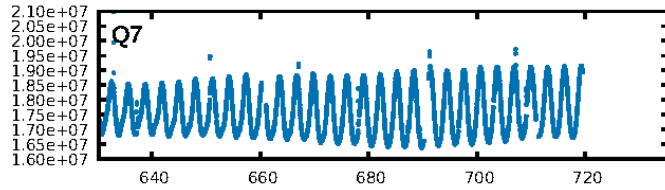
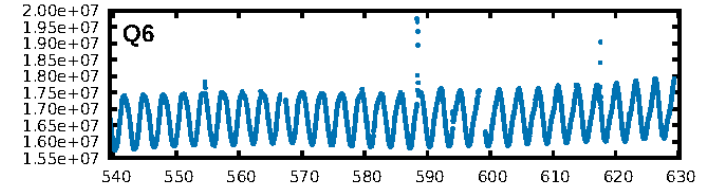
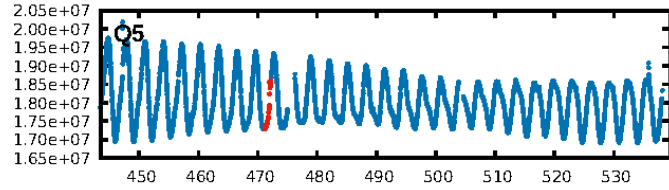
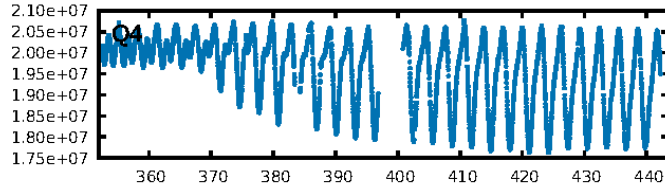
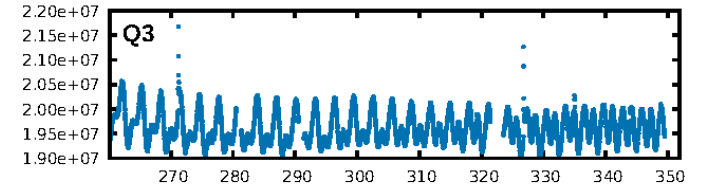
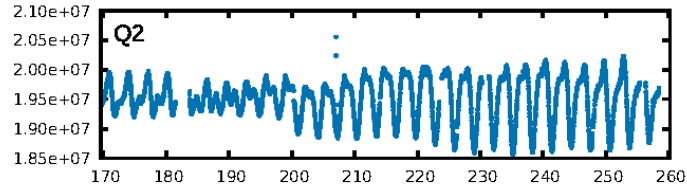
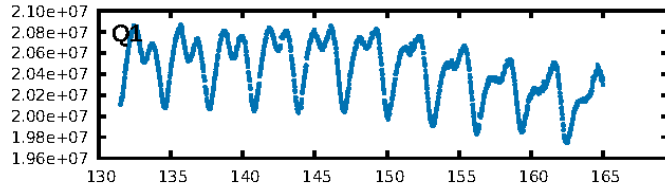
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [92.49σ]  
LongPeriod-sig: 100.0% [81.09σ]  
ModelChiSquare2-sig: 25.8%  
ModelChiSquareGof-sig: 94.9%  
Bootstrap-pfa: N/A  
RollingBand-fgt: 1.00 [3/3]  
GhostDiagnostic-chr: 0.7581  
Centroid-sig: 33.0%  
Centroid-so: 0.447 arcsec [0.66σ]  
OotOffset-rm: 0.286 arcsec [1.21σ]  
OotOffset-st: 1/0/0/2 [3]  
KicOffset-rm: 0.055 arcsec [0.13σ]  
KicOffset-st: 1/0/0/2 [3]  
DiffImageQuality-fgm: 0.33 [1/3]  
DiffImageOverlap-fno: 1.00 [3/3]

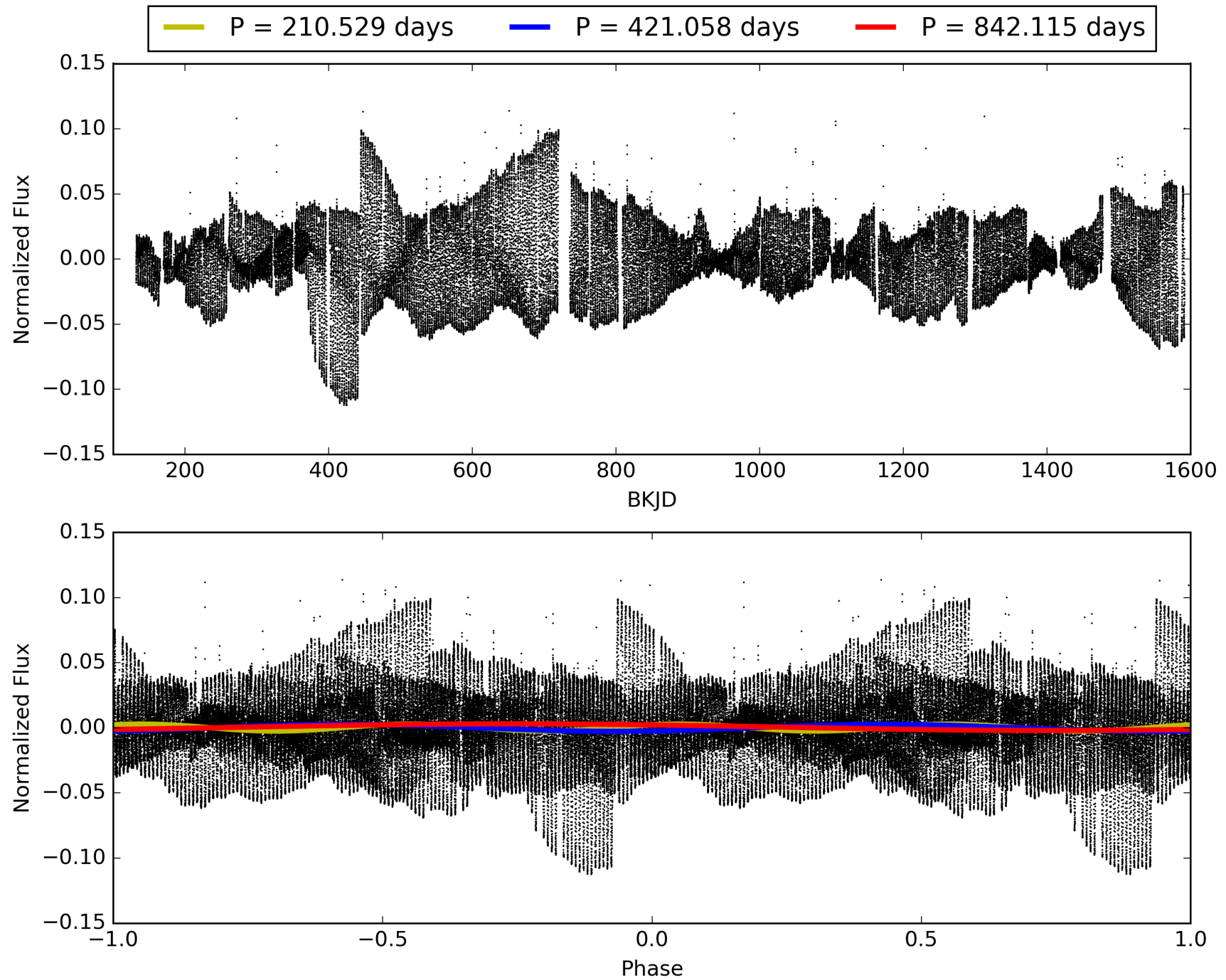
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 01-Feb-2016 05:45:23 Z

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

# TCE 003852116-06, PDC Light Curves



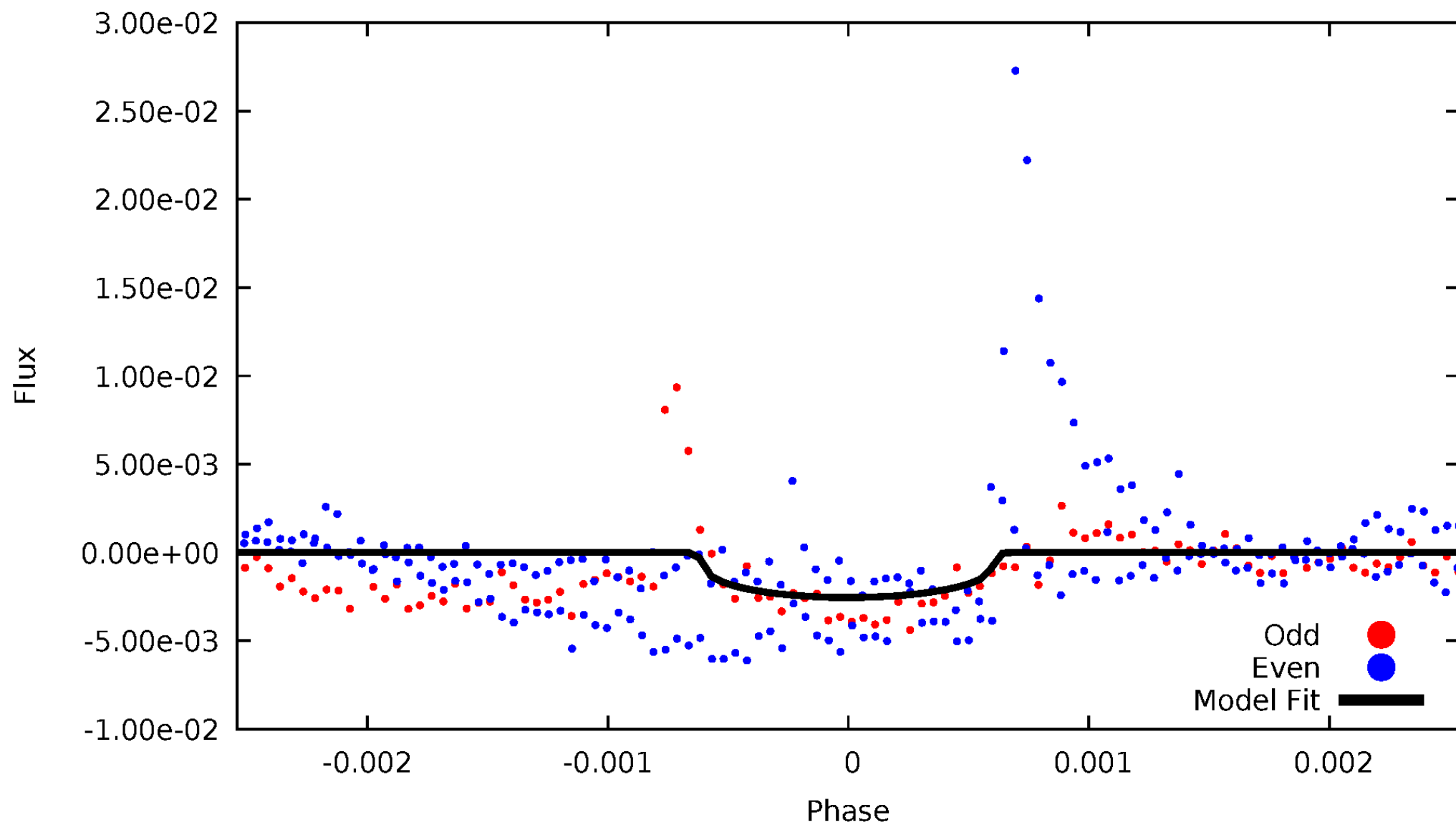
TCE 003852116-06





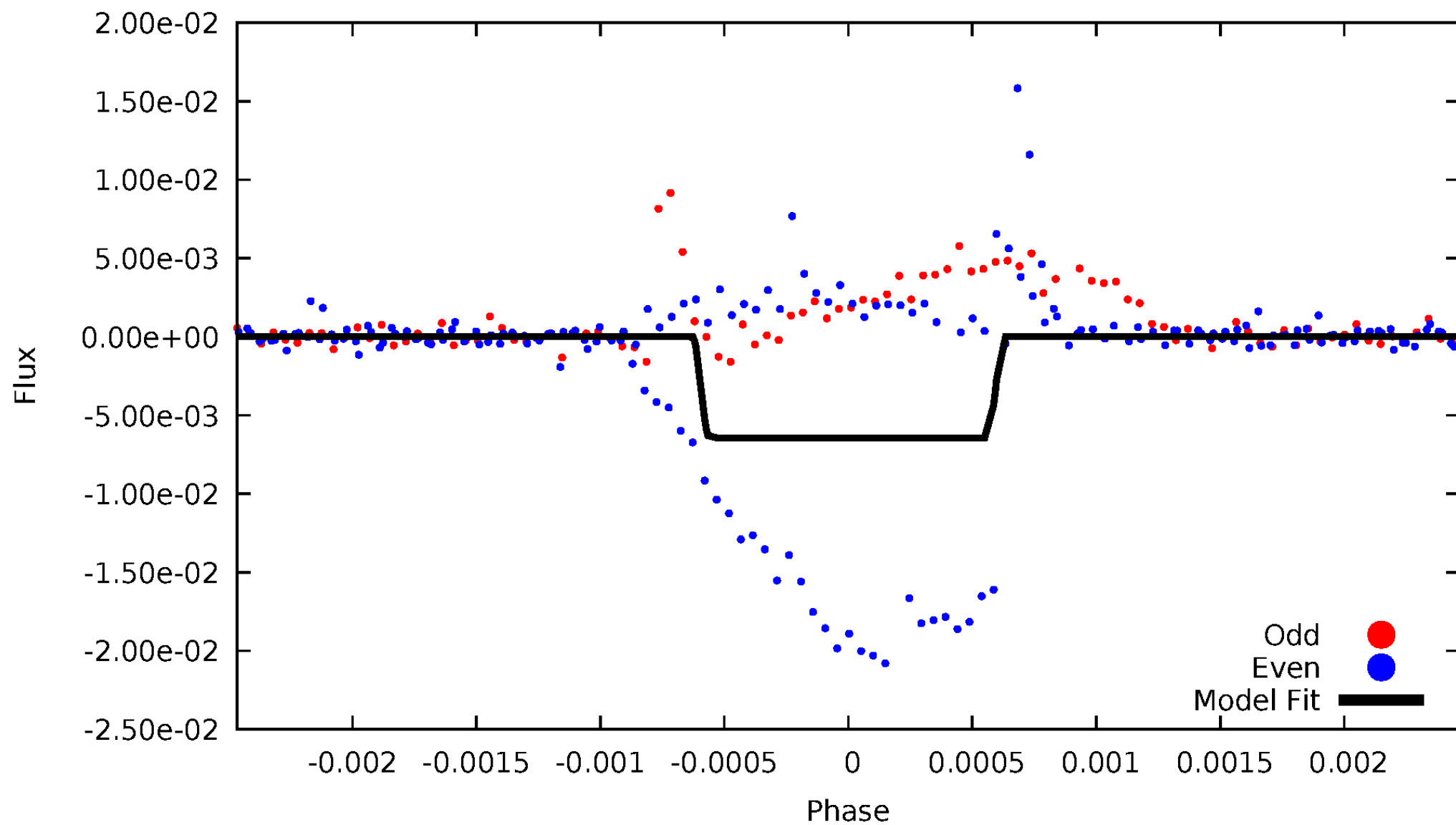
# DV Odd/Even

TCE 003852116-06



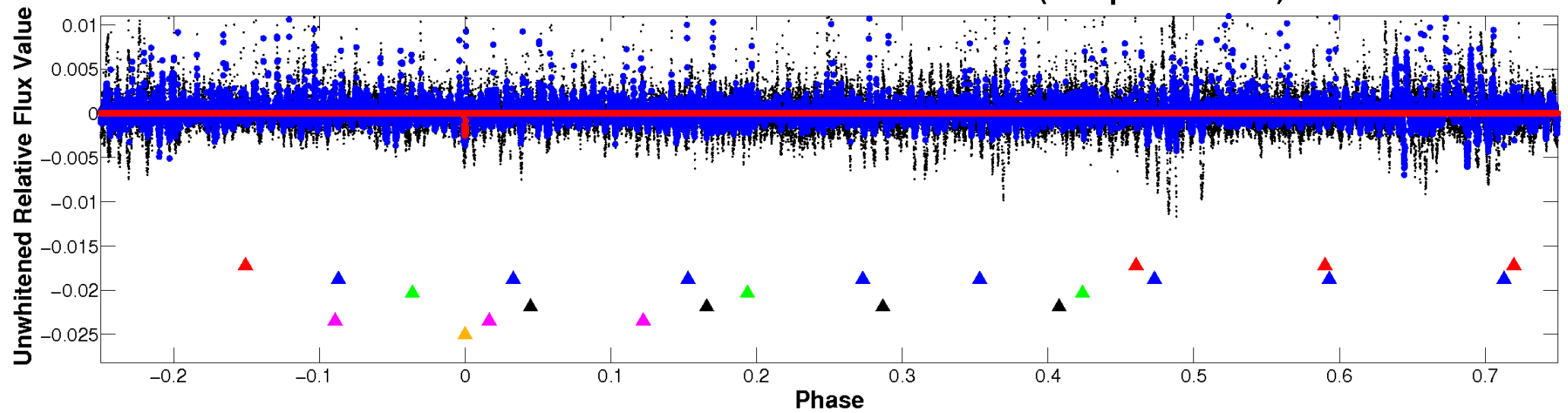
# ALT Odd/Even

TCE 003852116-06

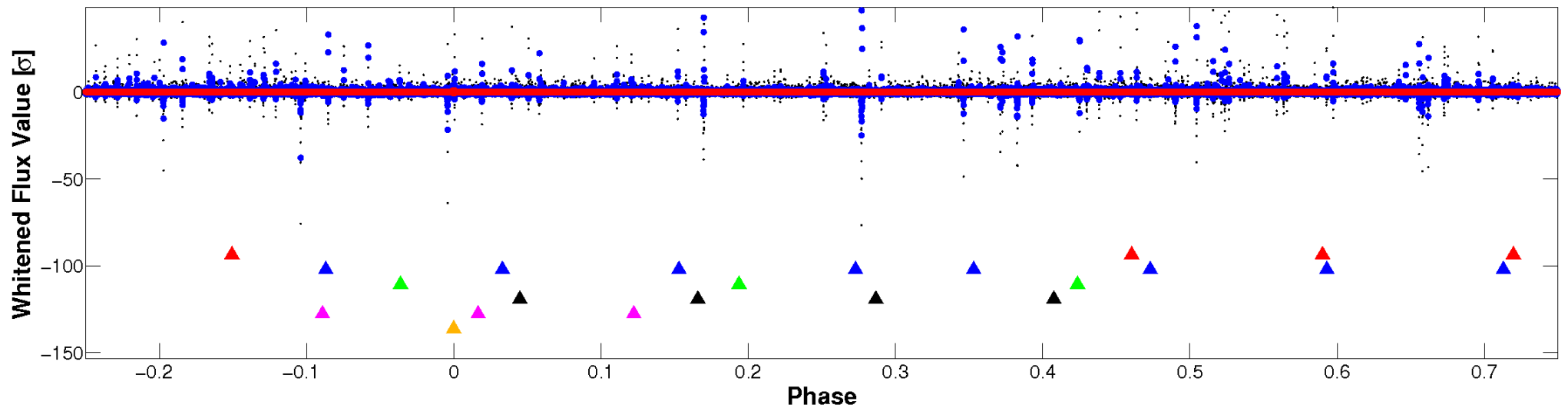


# Non-Whitened Vs. Whitened Light Curve

## Planet 6 : Phased Unwhitened Flux Time Series (Fit Epoch/Period)

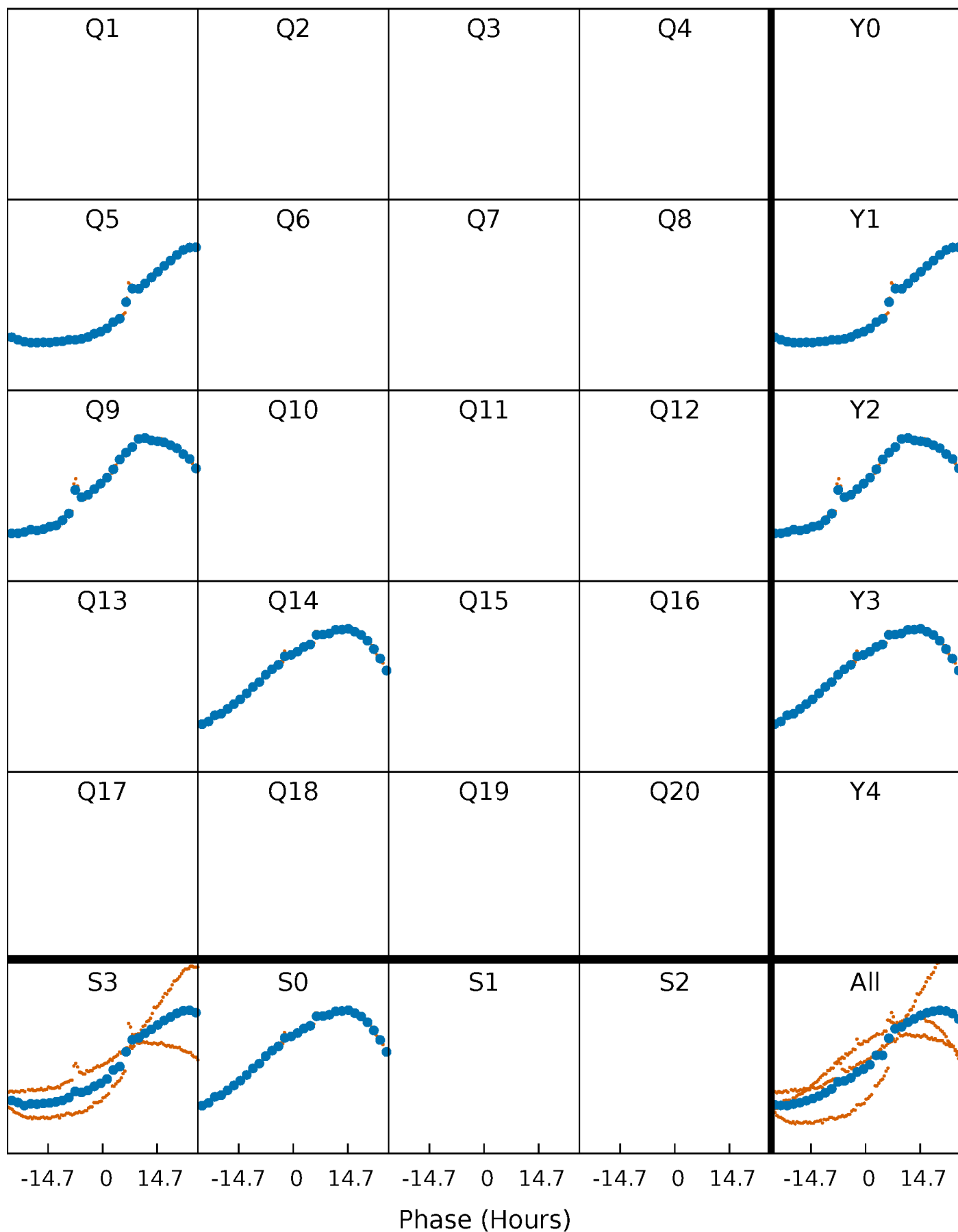


## Planet 6 : Phased Whitened Flux Time Series (Fit Epoch/Period)



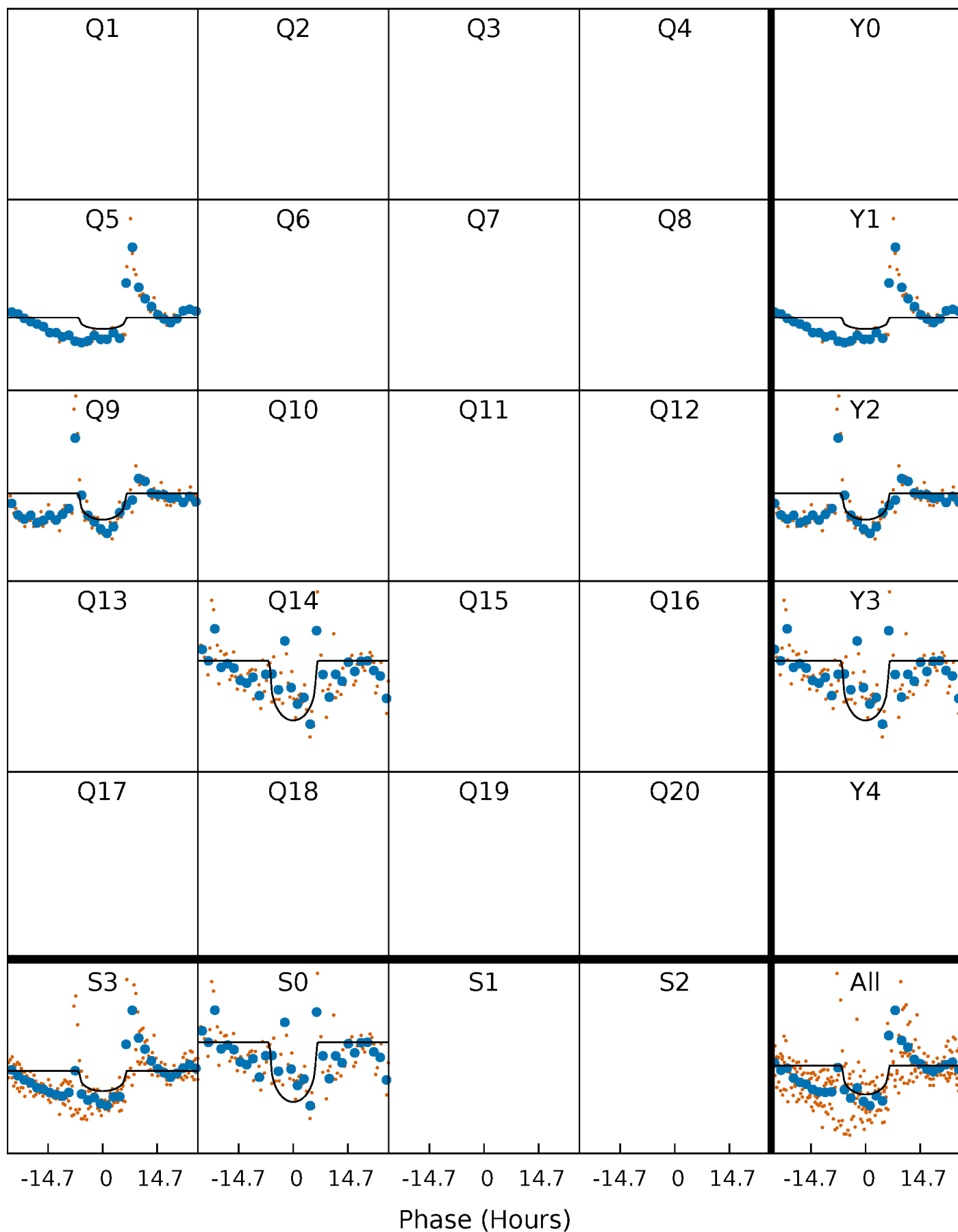
# PDC Quarter-Phased Transit Curves

TCE 003852116-06 P=421.057651 Days  $T_0=471.703520$  (BKJD)



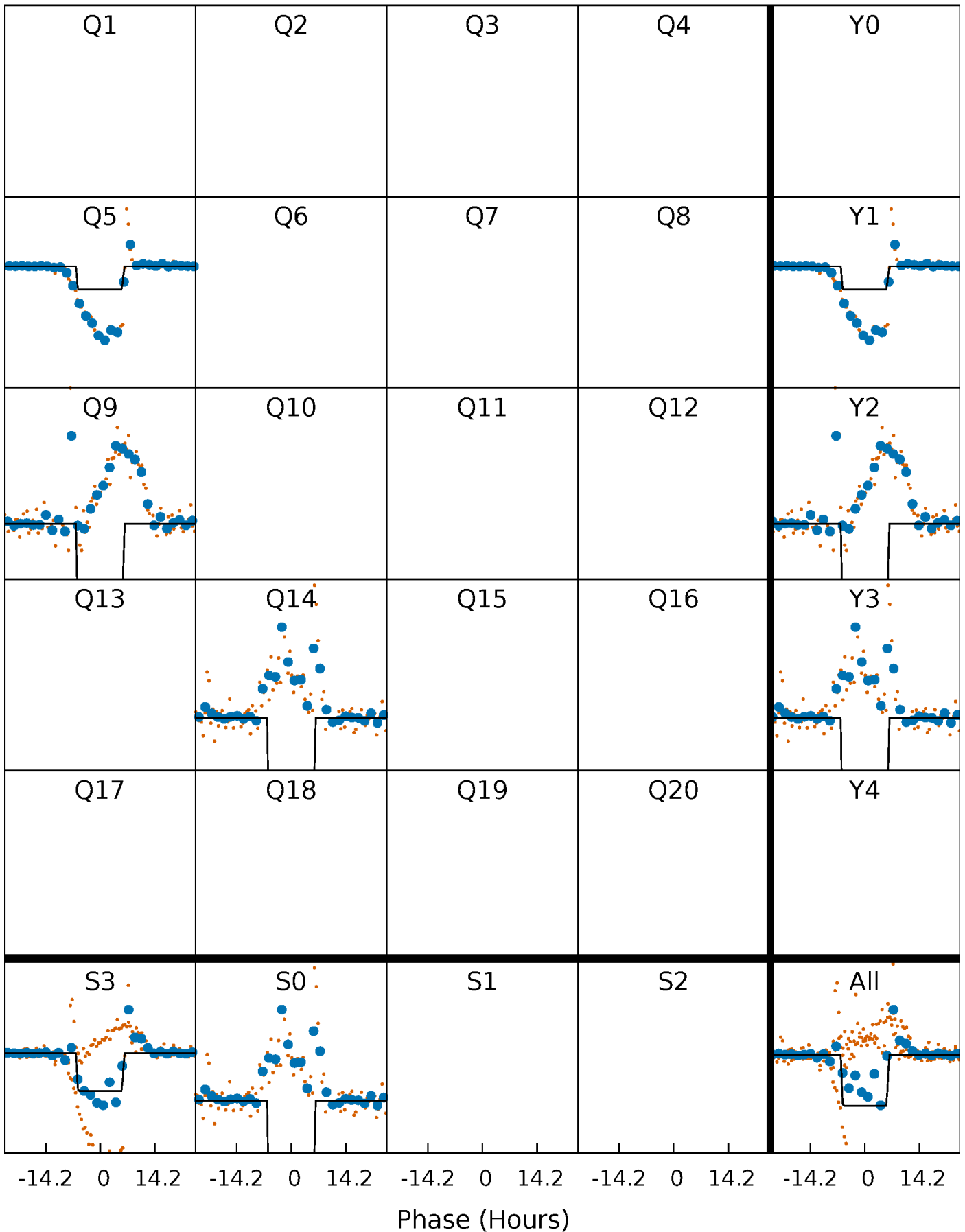
# DV Quarter-Phased Transit Curves

TCE 003852116-06 P=421.057651 Days  $T_0=471.703520$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

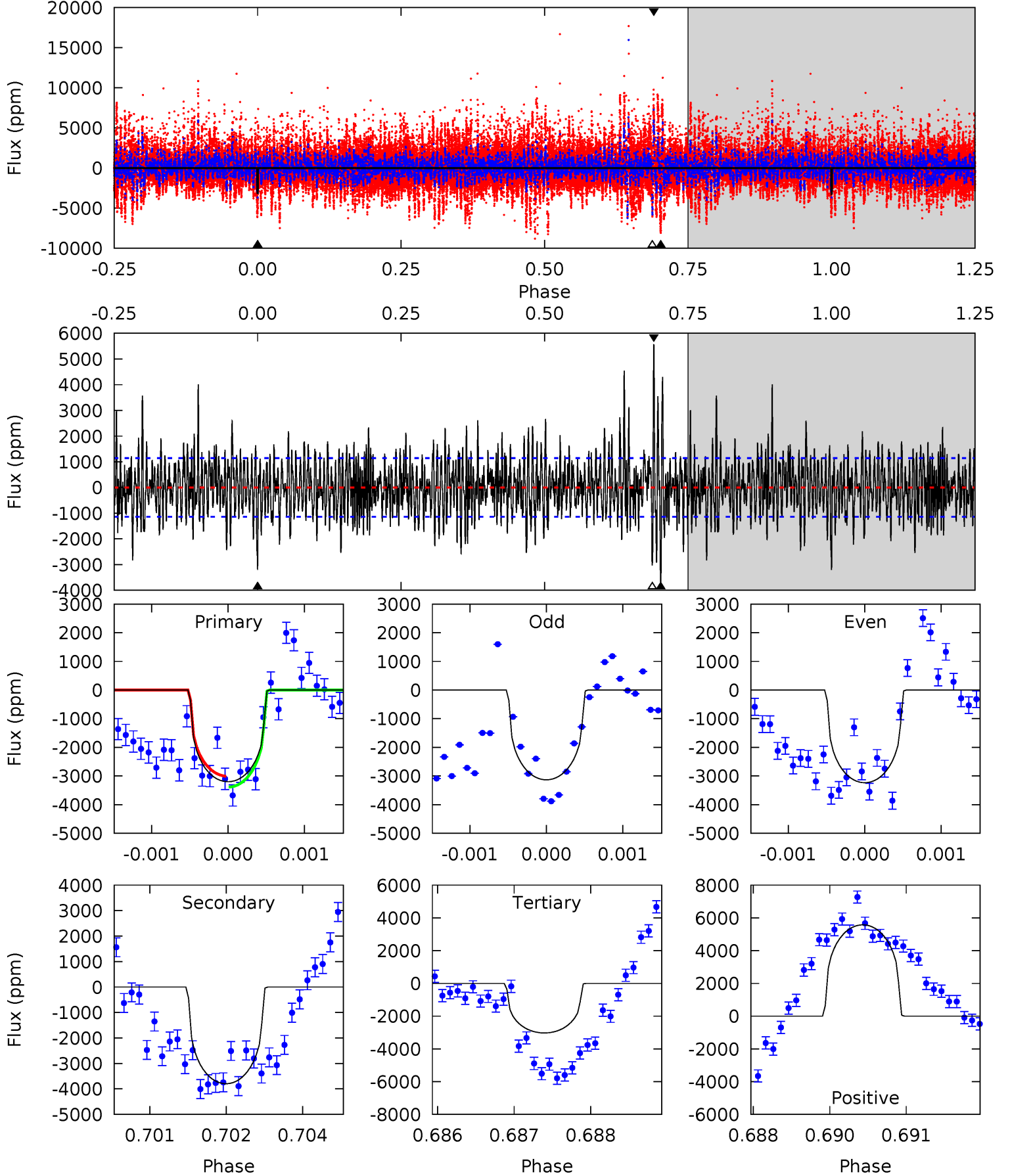
TCE 003852116-06 P=421.053937 Days  $T_0=471.708615$  (BKJD)



# DV Model-Shift Uniqueness Test

003852116-06, P = 421.057651 Days, E = 50.645869 Days

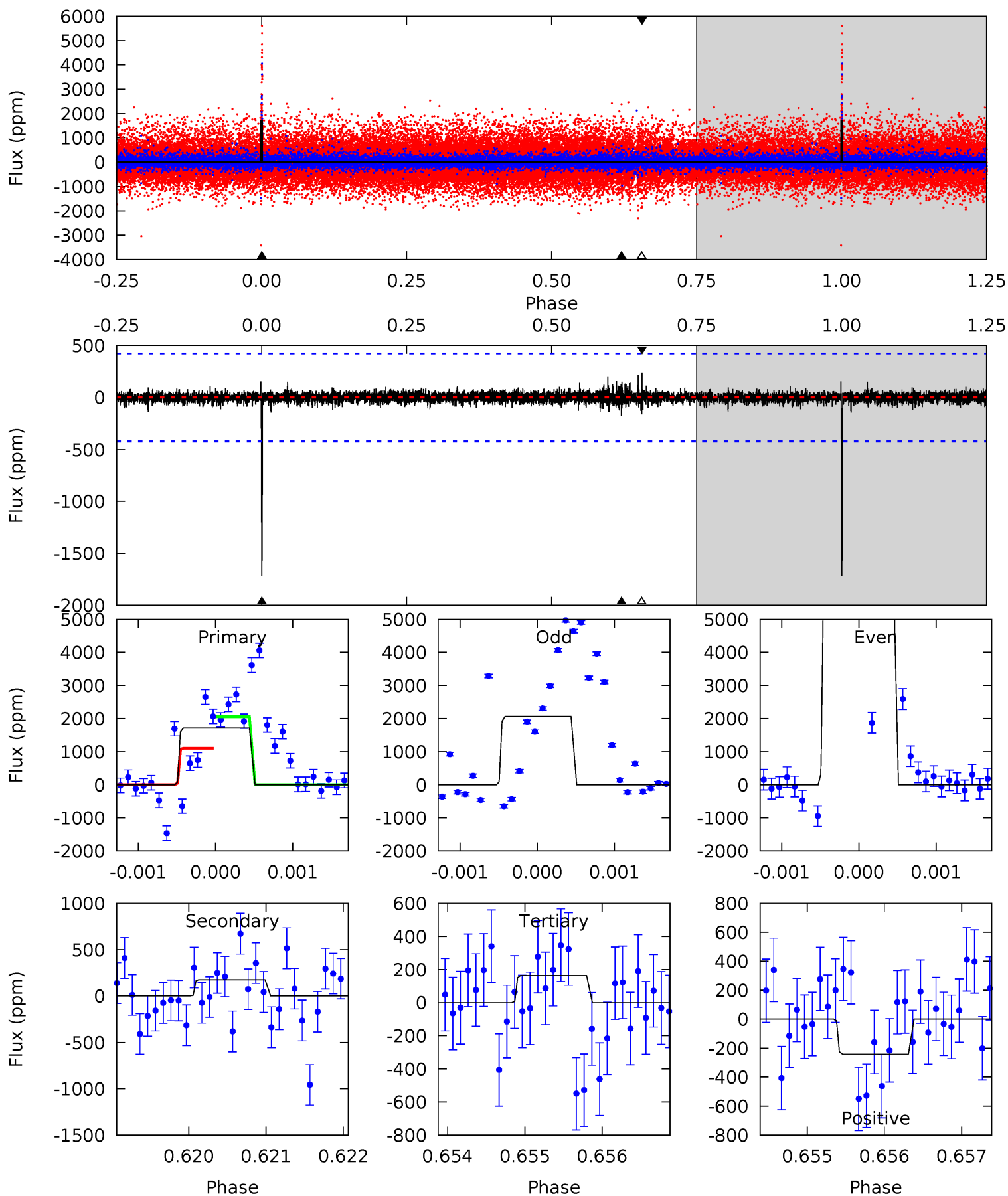
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
15.2	18.0	14.4	26.4	5.41	3.22	4.55	0.82	-11.3	3.64	-8.44	0.16	1.02	0.59	0.90



# Alt Model-Shift Uniqueness Test

003852116-06, P = 421.053937 Days, E = 50.654678 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
21.9	2.26	2.09	3.08	5.41	3.23	0.39	19.8	18.8	0.17	-0.82	38.4	-1.98	0.12	6.09





### Stellar Parameters For KIC 003852116

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R$ ( $R_{\odot}$ )	$M(M_{\odot})$	$p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ )
	$4555^{+136}_{-136}$	$4.611^{+0.048}_{-0.028}$	$-0.200^{+0.300}_{-0.300}$	$0.664^{+0.052}_{-0.058}$	$0.656^{+0.071}_{-0.051}$	$3.163^{+0.733}_{-0.411}$
	+3%/-3%	+1%/-1%	+150%/-150%	+8%/-9%	+11%/-8%	+23%/-13%
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 003852116-06 / KOI

Detrend	Depth (ppm)	$R_p$ ( $R_{\oplus}$ )	$T_{\text{max}}$ (K)	$T_{\text{obs}}$ (K)	$A_{\text{obs}}$
DV	$-3795 \pm 211$	$3.30^{+1.72}_{-1.72}$	$232^{+8}_{-7}$	$5150^{+2272}_{-793}$	$179763^{+619211}_{-103103}$
Alt.	$-176 \pm 78$	$5.74^{+1.80}_{-1.99}$	$233^{+8}_{-8}$	$2593^{+330}_{-253}$	$2585^{+4232}_{-1432}$

$T_{\text{max}}$  = 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

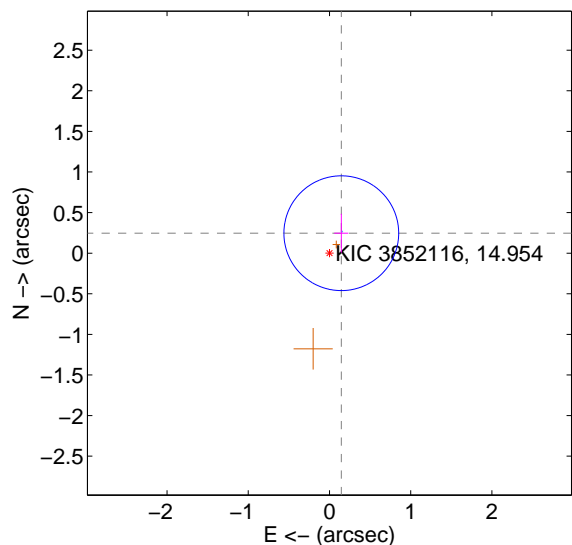
Supplemental centroid analysis for 003852116-06. Kepler magnitude: 14.95. Transit SNR 5.59

There are 1 quarters with good PRF difference image offsets

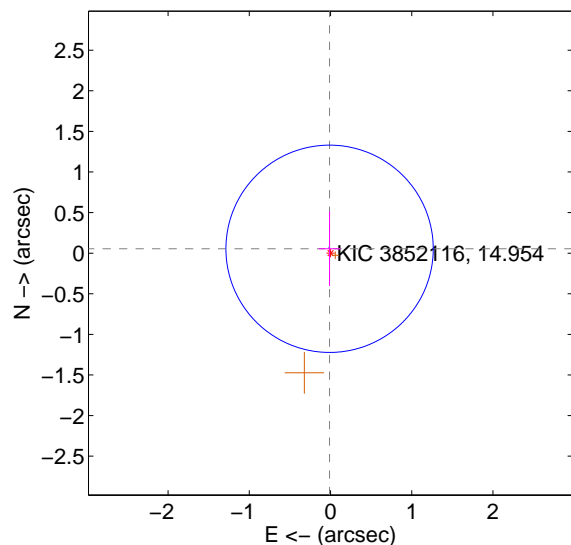
The direct PRF centroid is offset from the target star catalog position by about 0.13 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.286 \pm 0.236$	1.21	$-0.146 \pm 0.087$	$0.246 \pm 0.239$
PRF-fit source offset from KIC position	$0.055 \pm 0.426$	0.13	$0.011 \pm 0.134$	$0.054 \pm 0.458$
photometric centroid source offset	$0.45 \pm 0.68$	0.66	$-0.29 \pm 0.59$	$0.34 \pm 0.74$

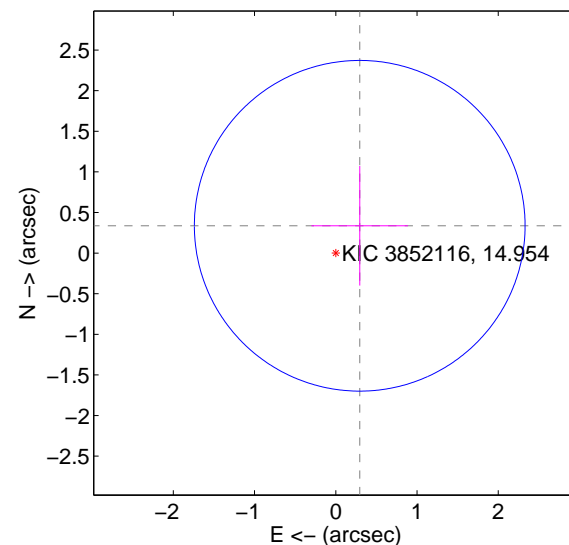
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position



offset from photometric centroids

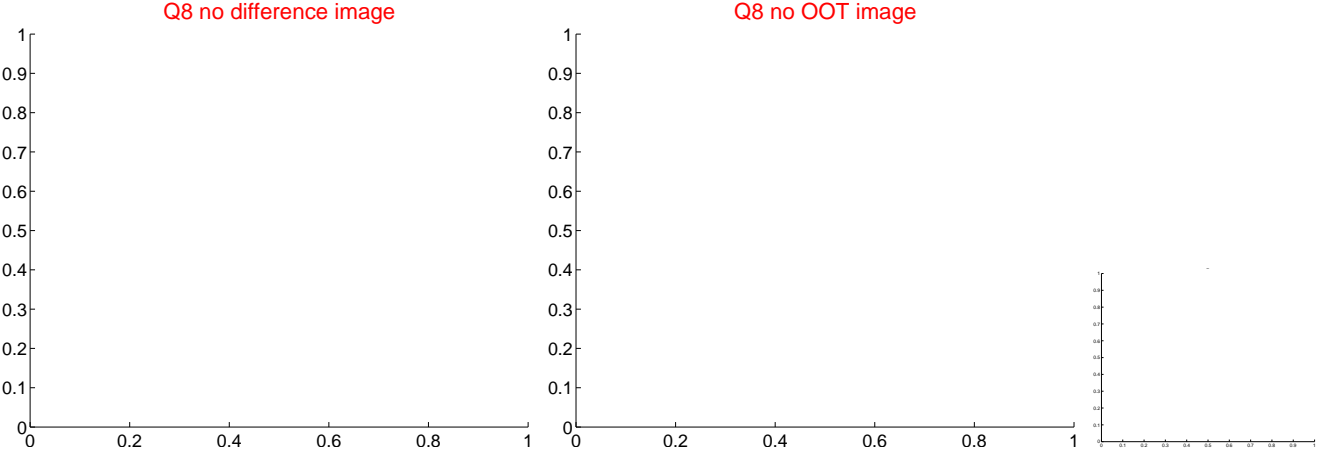
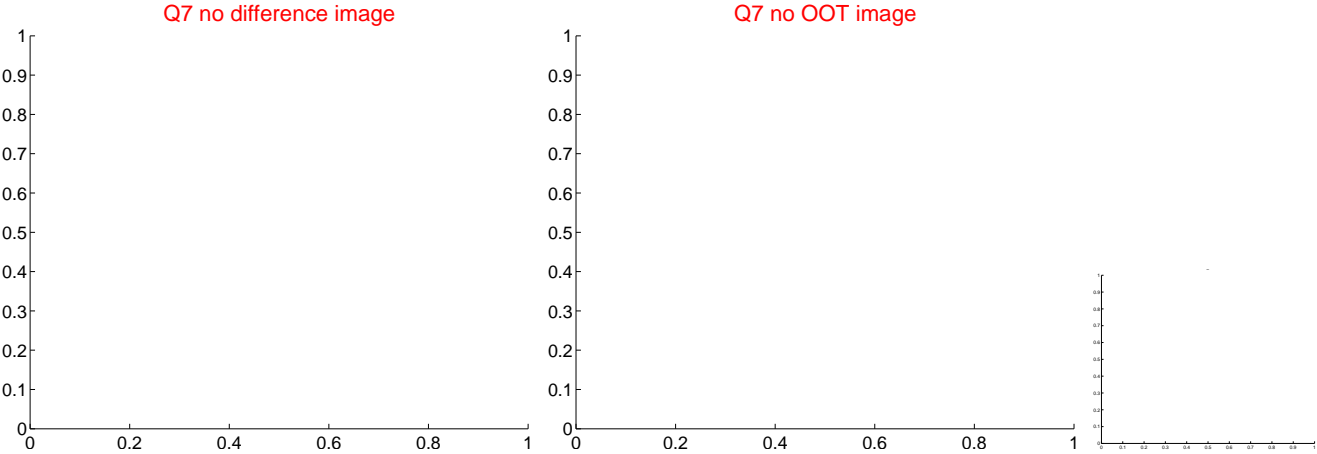
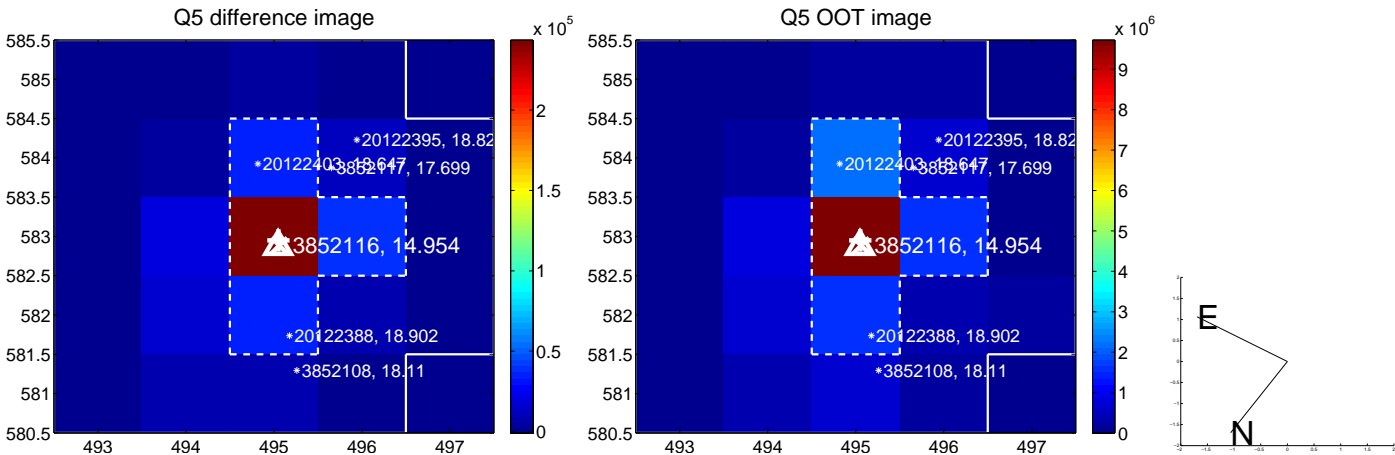


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets**; **Vermillion crosses: bad quarterly centroid offsets**; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: 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.

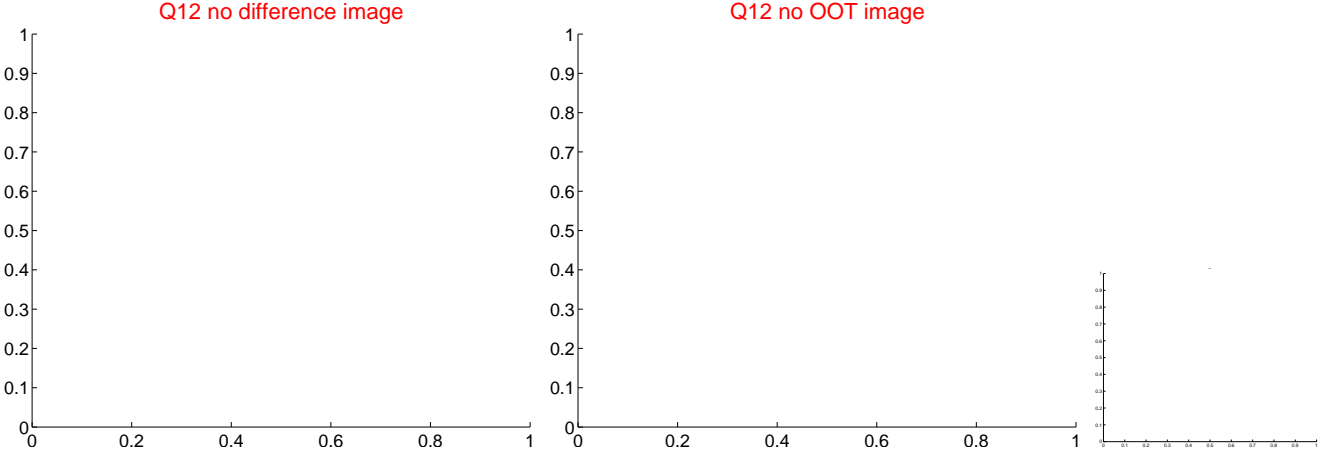
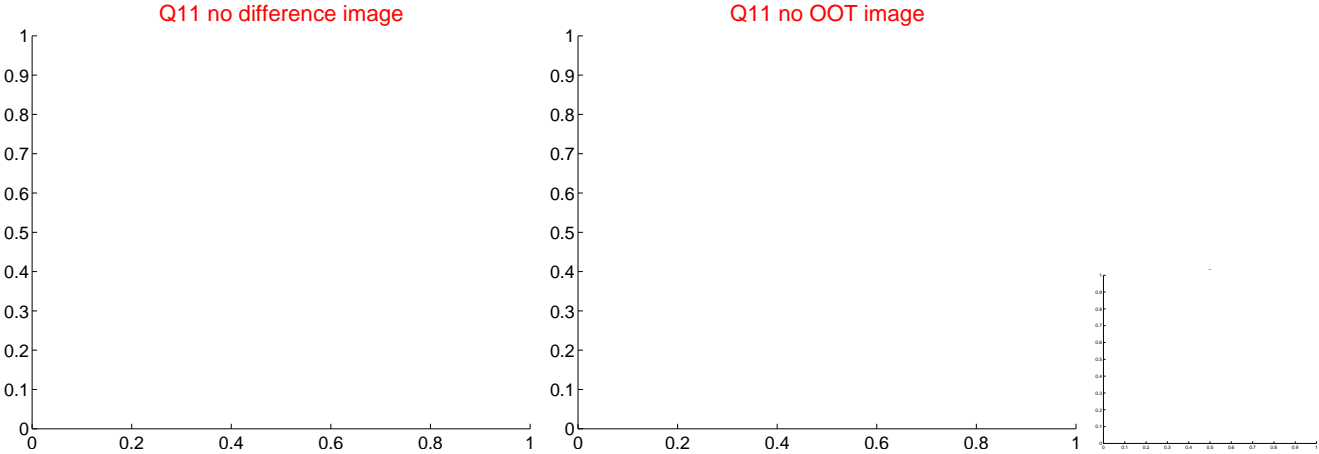
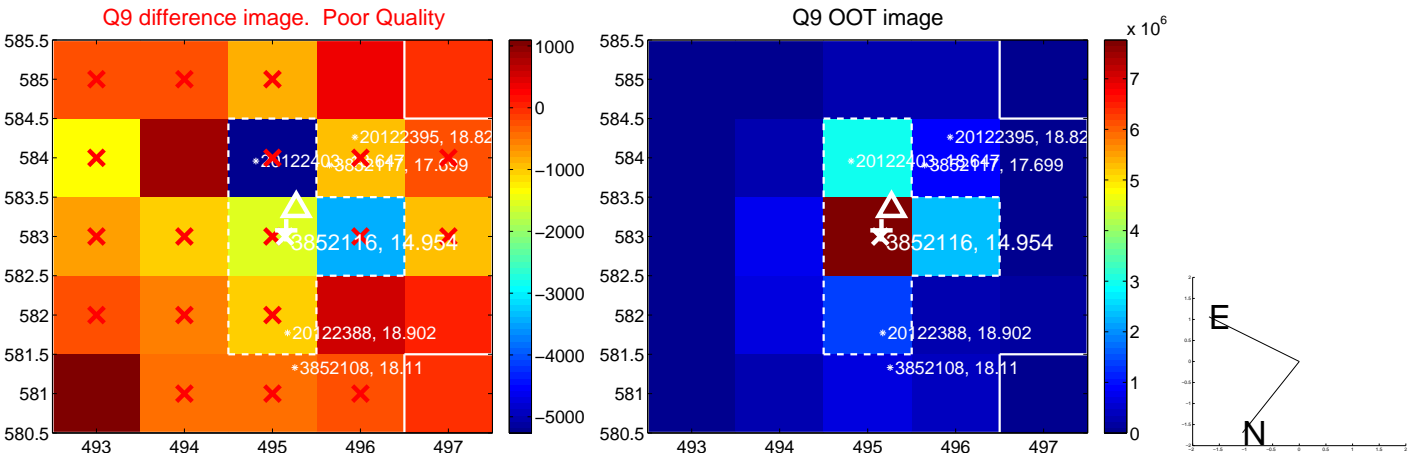
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



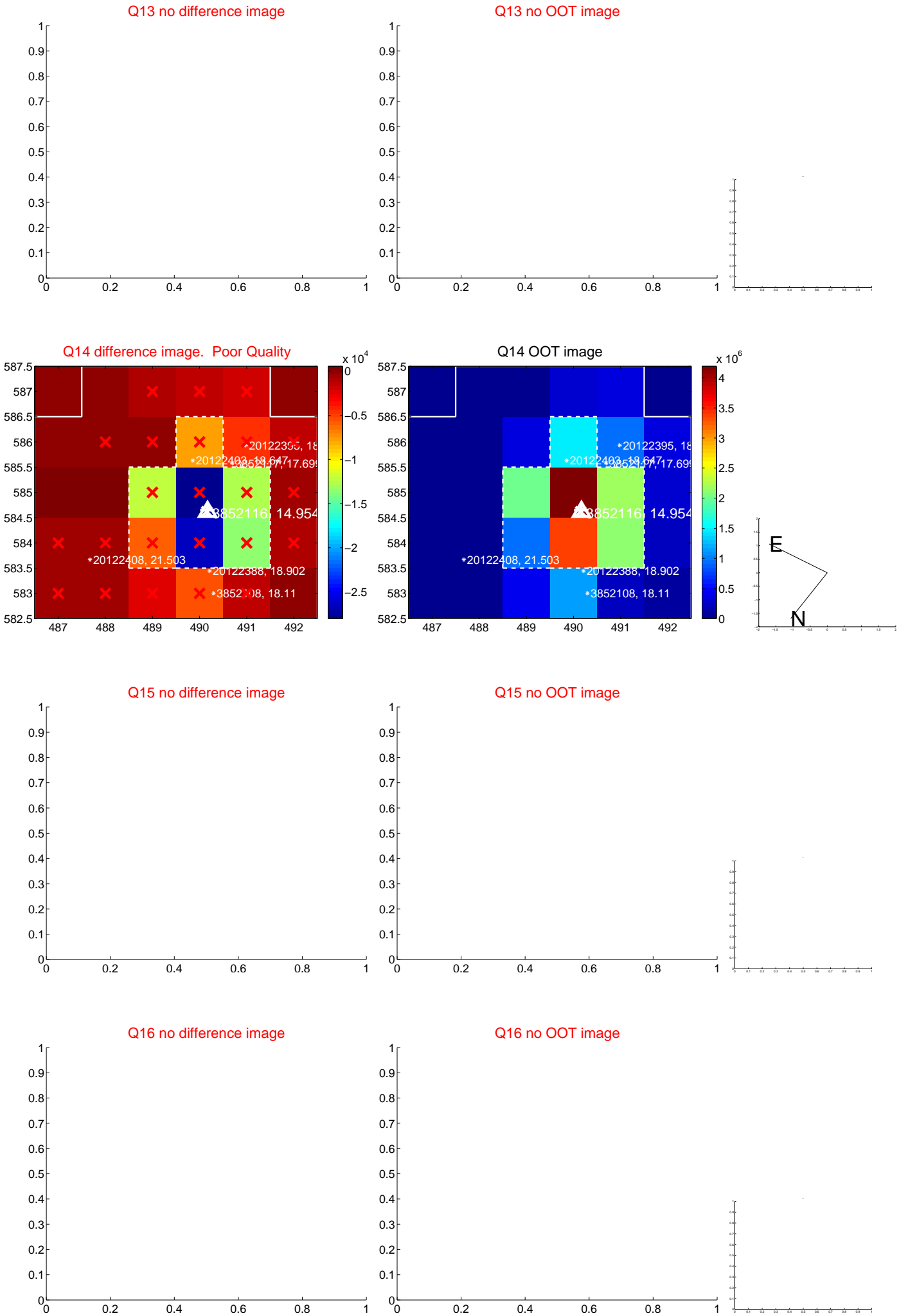
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



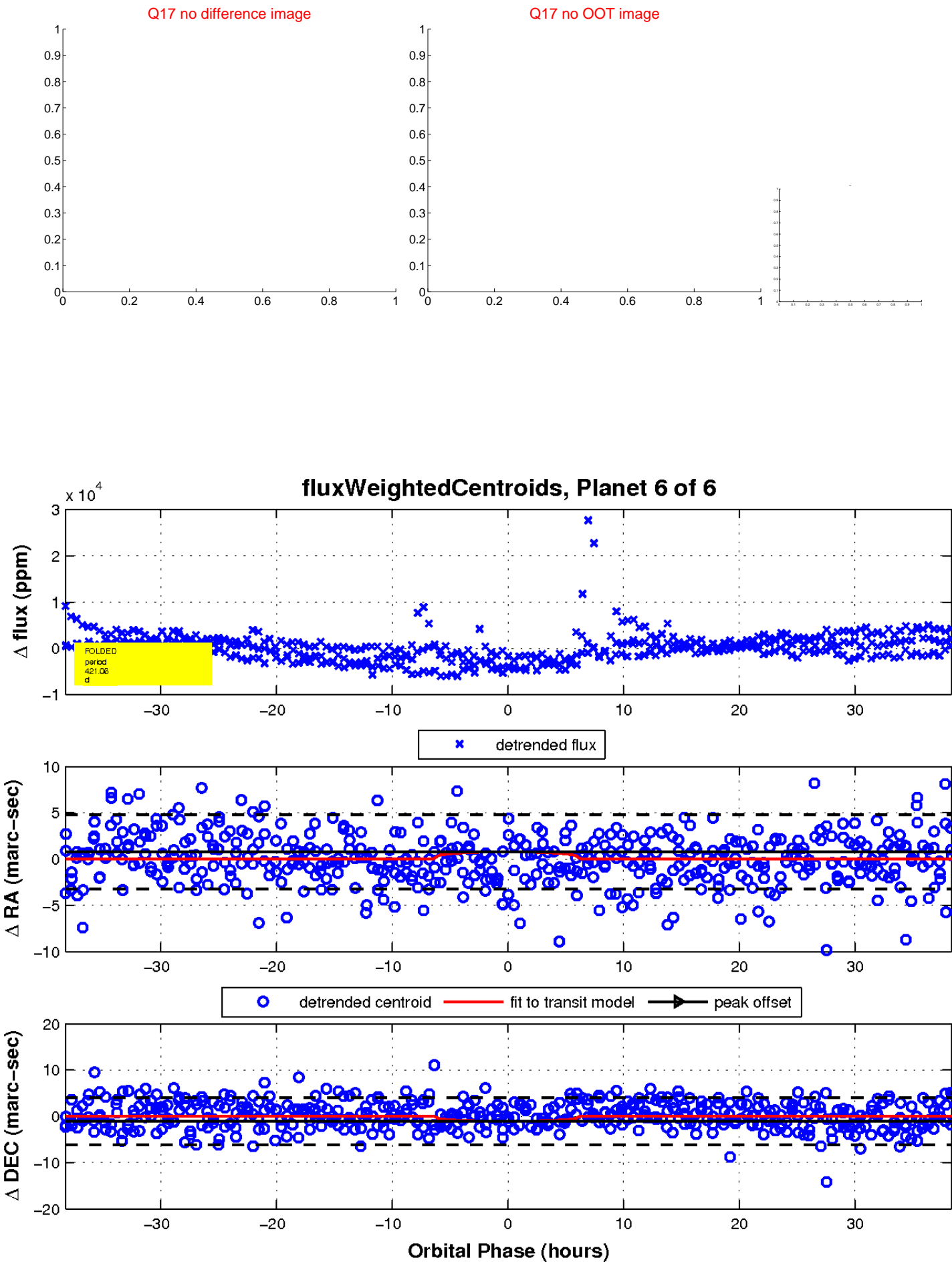
white ×: KIC target position; +: OOT centroid; △: difference centroid. red ×: large negative pixel value.



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



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



# UKIRT Image

Declination

