

# KIC 004150624

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
004150624-01	OBS	1334.01	8.653136	134.299795	634.2	4.163	28.9	32.4	0.85	5421	4.08	84.19
004150624-02	OBS	No	8.653063	136.661062	640.5	3.913	29.8	33.2	0.85	5421	4.21	84.19
004150624-03	OBS	1334.02	94.227104	196.136845	571.4	26.764	15.9	20.9	0.85	5421	2.51	3.49

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
004150624-01	OBS	FP	0.00	0	1	1	1	MOD_SEC_DV—MOD_SEC_ALT—HAS_SEC_TCE—CENT_FEW_DIFFS—HALO_GHOST—EPHEM_MATCH
004150624-02	OBS	FP	0.00	1	1	1	1	IS_SEC_TCE—CENT_RESOLVED_OFFSET—HALO_GHOST—EPHEM_MATCH
004150624-03	OBS	FP	0.00	1	0	1	1	INDIV_TRANS_RUBBLE_SKYE_ZUMA—CENT_FEW_DIFFS—HALO_GHOST—EPHEM_MATCH

**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.

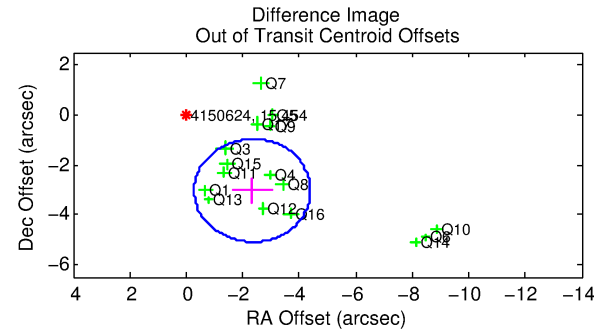
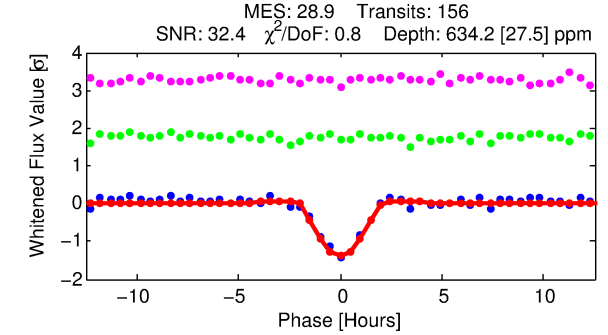
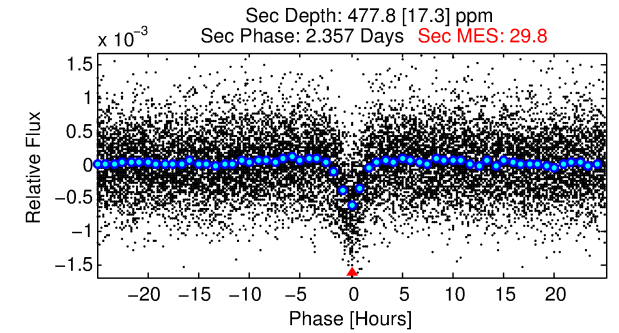
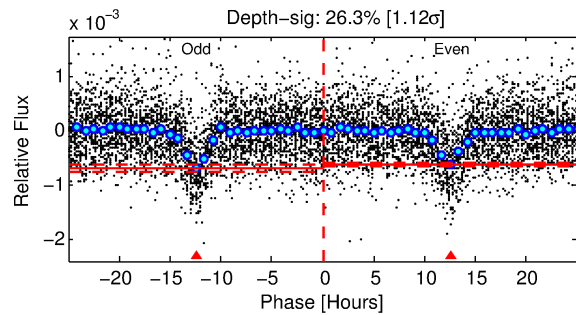
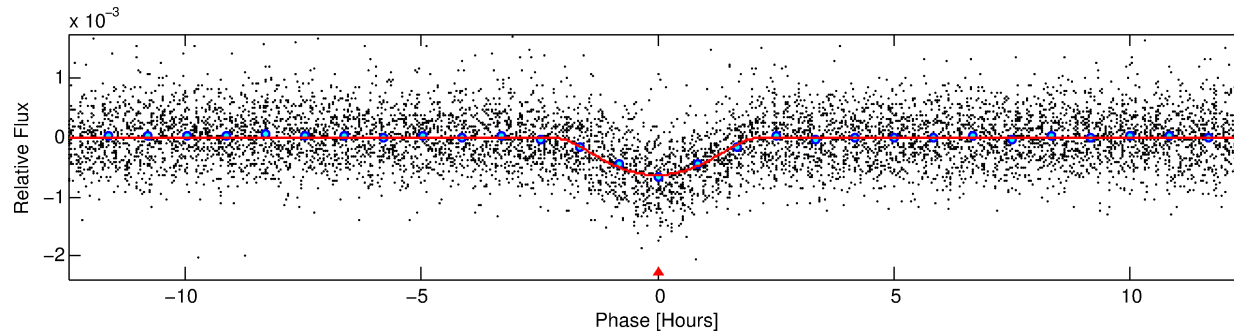
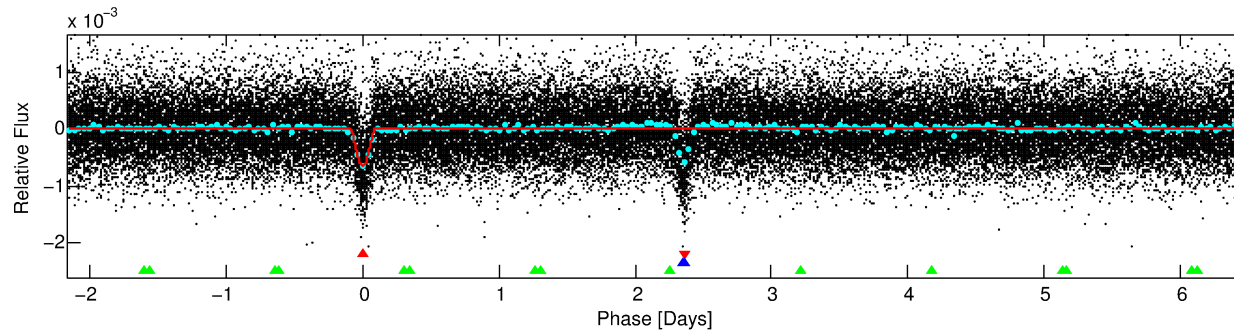
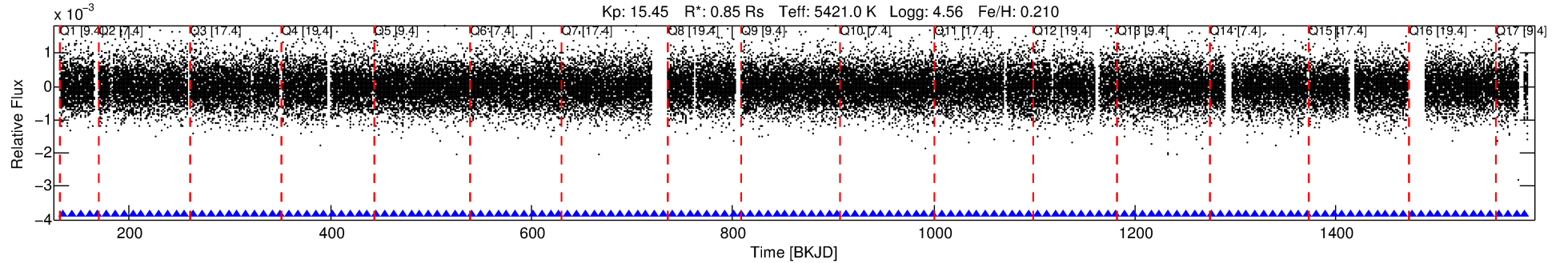
## Ephemeris Match Information For 004150624-01

TCE (1)	KIC	Parent (2)	Parent KIC	$P_1:P_2$	Dist ( $''$ )	$\Delta$ Row	$\Delta$ Col	$m_2$	$m_1$	$D_2/D_1$	Mechanism	Flag	$\sigma_P$	$\sigma_T$
004150624-01	4150624	004150611-02	4150611	1:1	69.4	14	11	7.90	15.46	85.40	Direct-PRF	0	0.12	0.09

**Notes:**  $P_1:P_2$  is the period ratio. Dist is the distance in arcseconds.  $\Delta$ Row and  $\Delta$ Col are the number of pixels apart in row and column.  $m_2$  and  $m_1$  are the magnitudes of the parent and child.  $D_2/D_1$  is the parent's transit depth divided by the child's.  $\sigma_P$  and  $\sigma_T$  are the significance of the match in period and epoch. For a match to be considered significant  $\sigma_P < 5.0$  and  $\sigma_T < 5.0$ . Matches which have  $\sigma_P$  and  $\sigma_T$  very close to this cutoff should receive extra scrutiny, especially if the period ratio is very large.

# DV One-Page Summary

KIC: 4150624 Candidate: 1 of 3 Period: 8.653 d  
KOI: K01334.01 Corr: 0.989



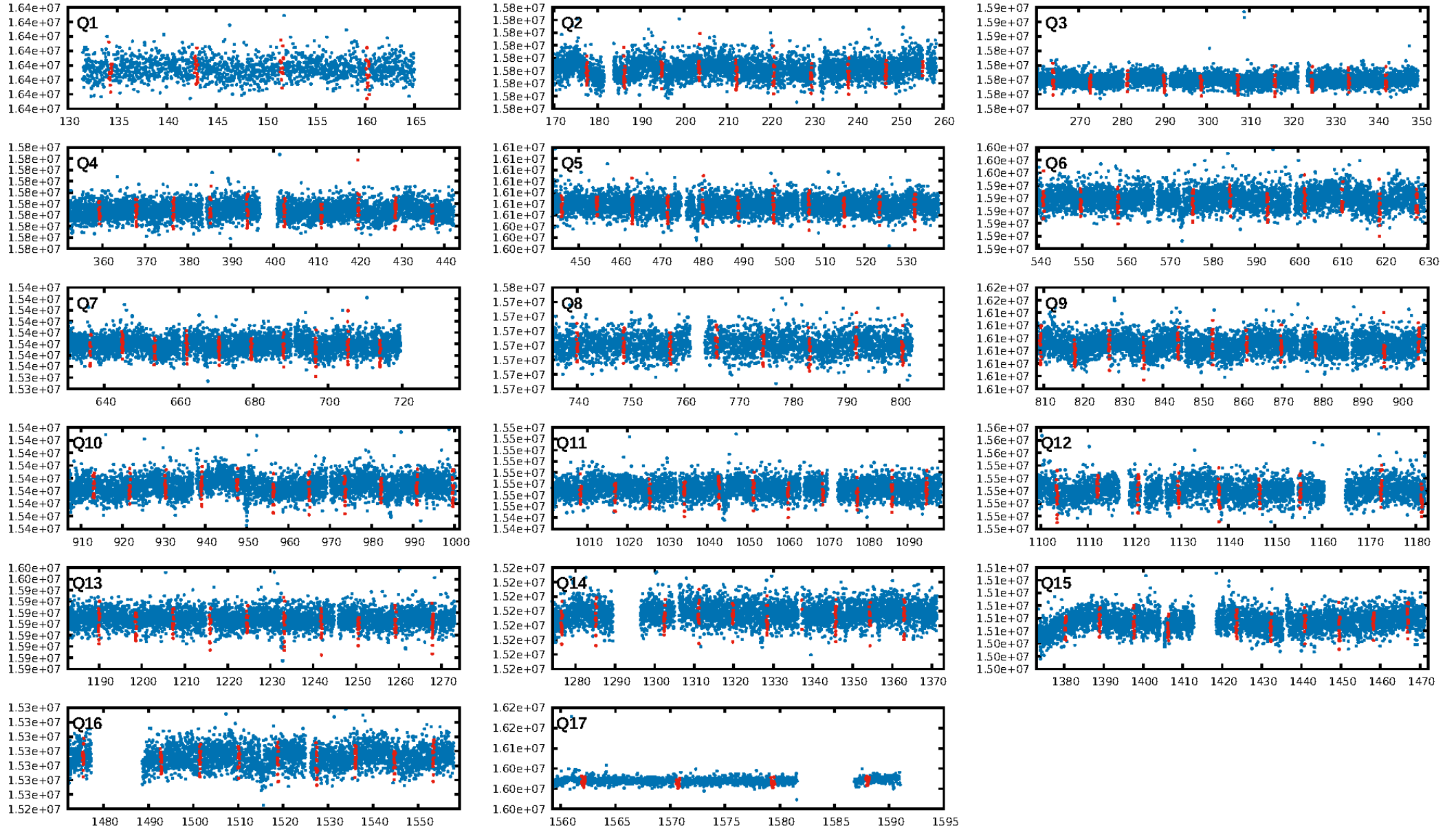
## DV Fit Results:

Period = 8.65314 [0.00003] d  
Epoch = 134.2998 [0.0029] BKJD  
Rp/R\* = 0.0439 [0.0454]  
a/R\* = 5.10 [1.35]  
b = 1.00 [0.07]  
Seff = 84.19 [27.61]  
Teq = 772 [63] K  
Rp = 4.08 [4.33] Re  
a = 0.0817 [0.0166] AU  
Ag = 105.40 [220.74] [0.47 $\sigma$ ]  
Teffp = 3826 [1985] K [1.54 $\sigma$ ]

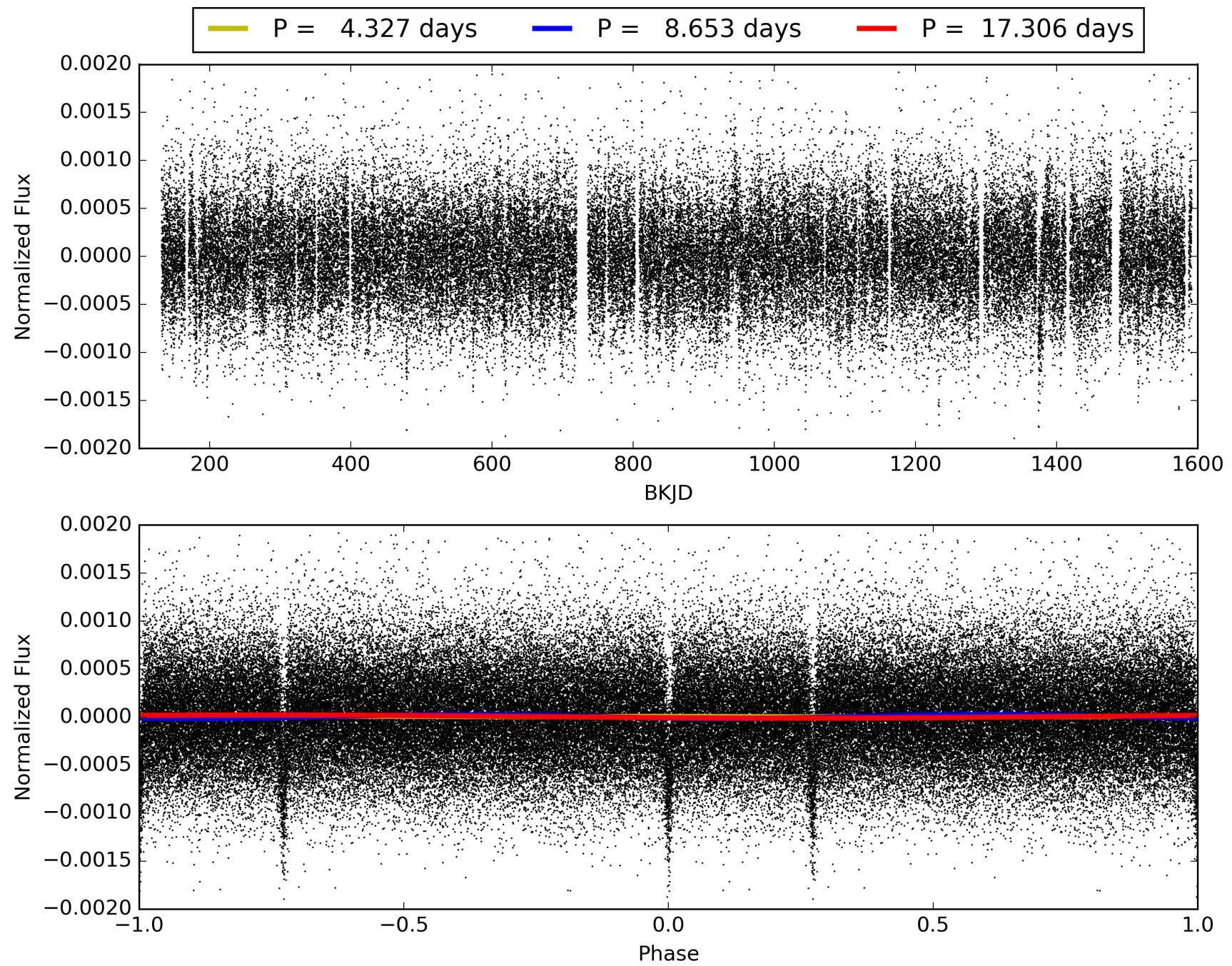
## DV Diagnostic Results:

ShortPeriod-sig: 0.0% [0.00 $\sigma$ ]  
LongPeriod-sig: 100.0% [75.83 $\sigma$ ]  
ModelChiSquare2-sig: 90.5%  
ModelChiSquareGof-sig: 100.0%  
Bootstrap-pfa: 8.80e-180  
RollingBand-fgt: 1.00 [148/148]  
GhostDiagnostic-chr: 0.09742  
Centroid-sig: 0.0%  
Centroid-so: 1.455 arcsec [3.24 $\sigma$ ]  
OotOffset-rm: 3.835 arcsec [5.59 $\sigma$ ]  
KicOffset-rm: 3.894 arcsec [6.64 $\sigma$ ]  
OotOffset-st: 3/4/4/5 [16]  
KicOffset-st: 3/4/4/5 [16]  
DiffImageQuality-fgm: 0.00 [0/16]  
DiffImageOverlap-fno: 1.00 [17/17]

# TCE 004150624-01, PDC Light Curves



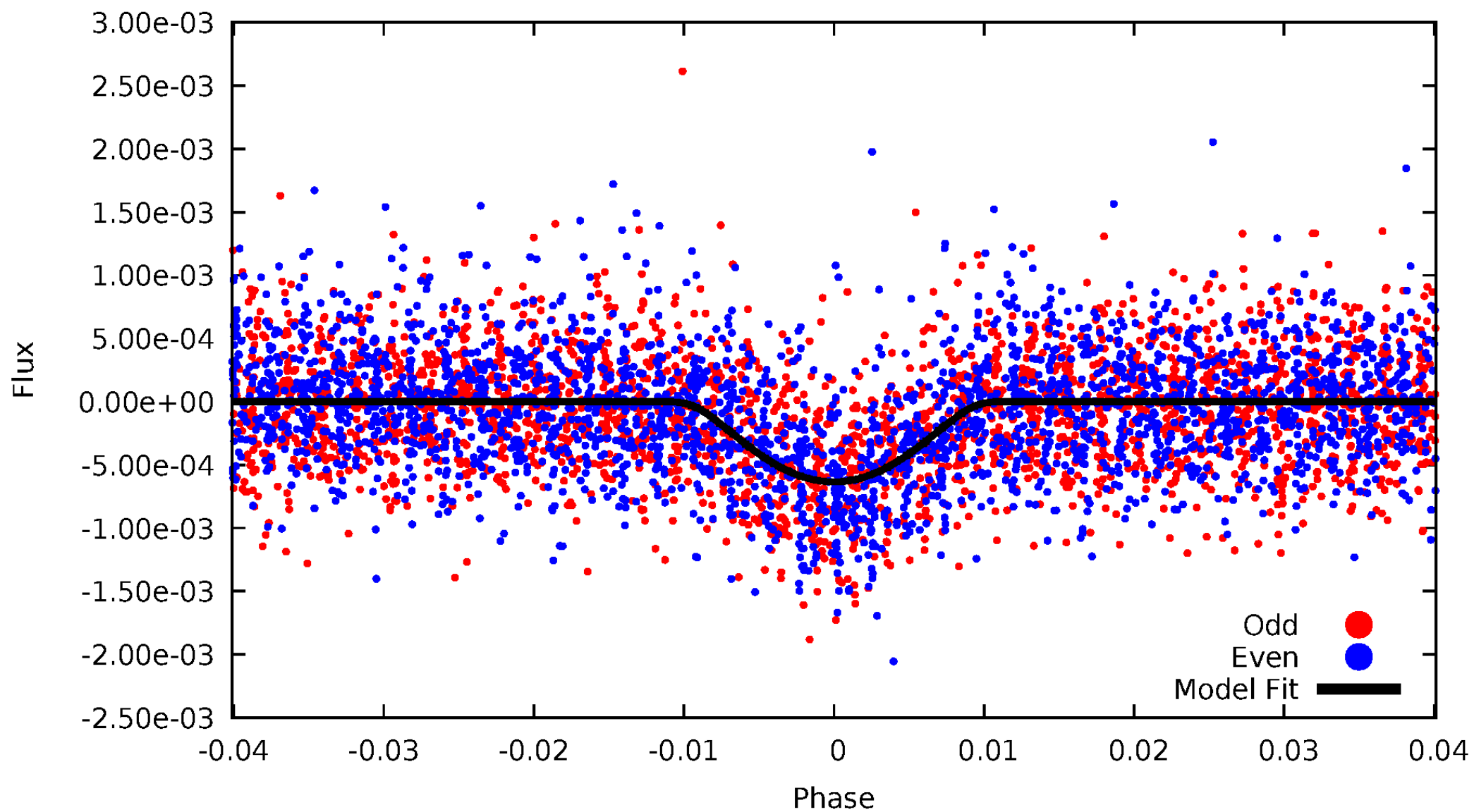
TCE 004150624-01





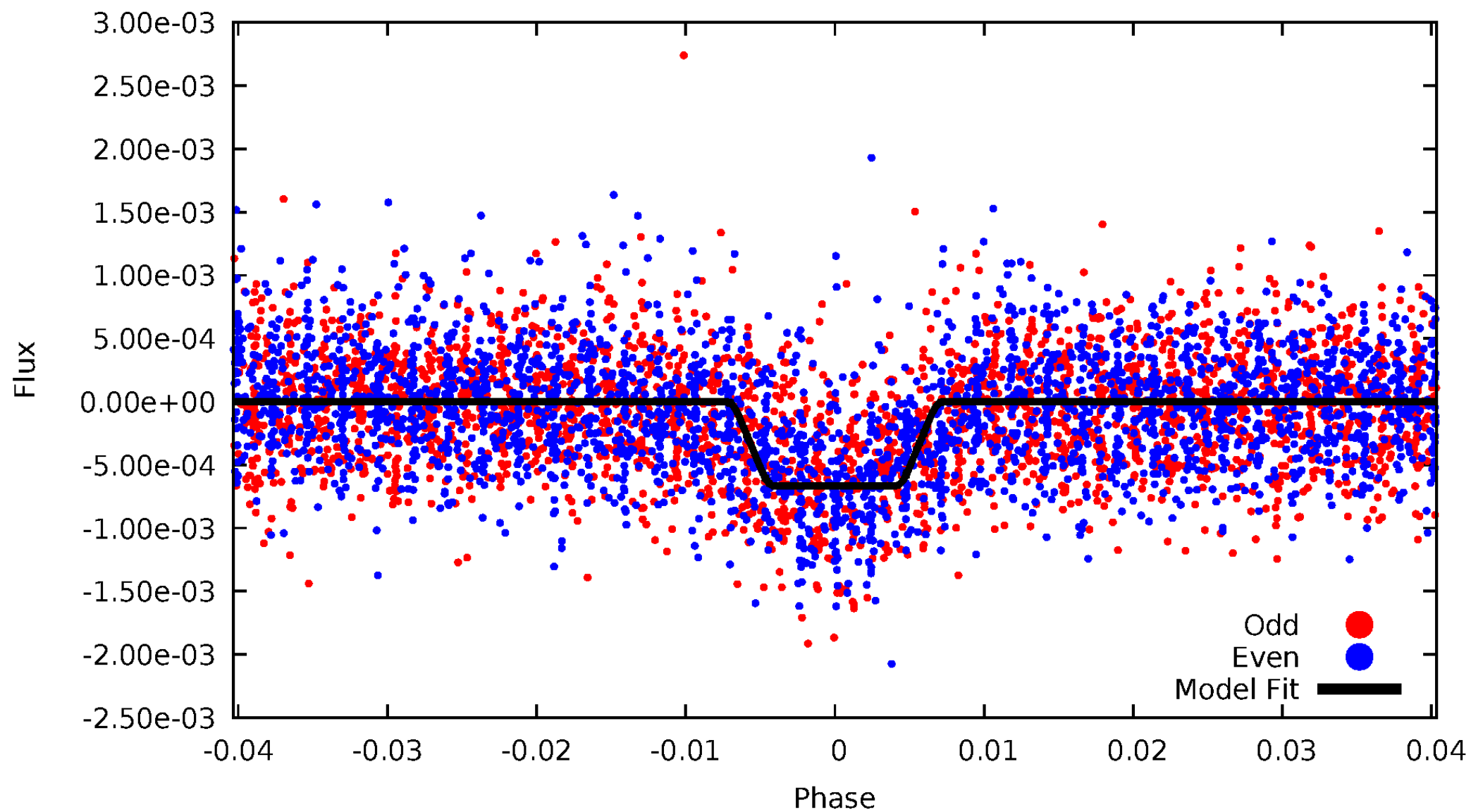
# DV Odd/Even

TCE 004150624-01

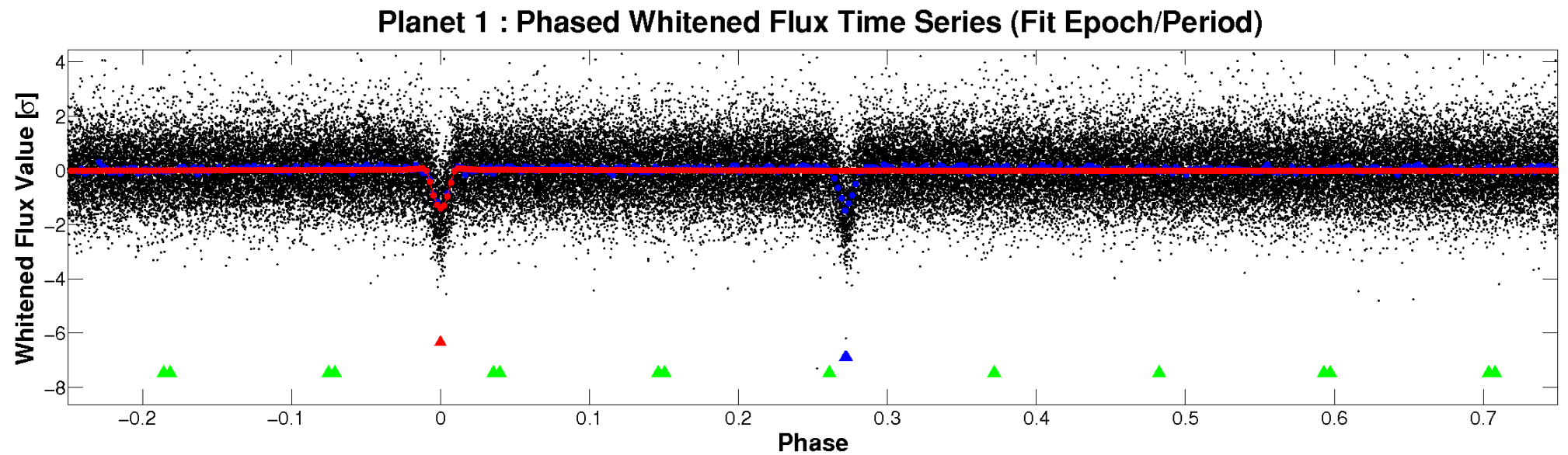
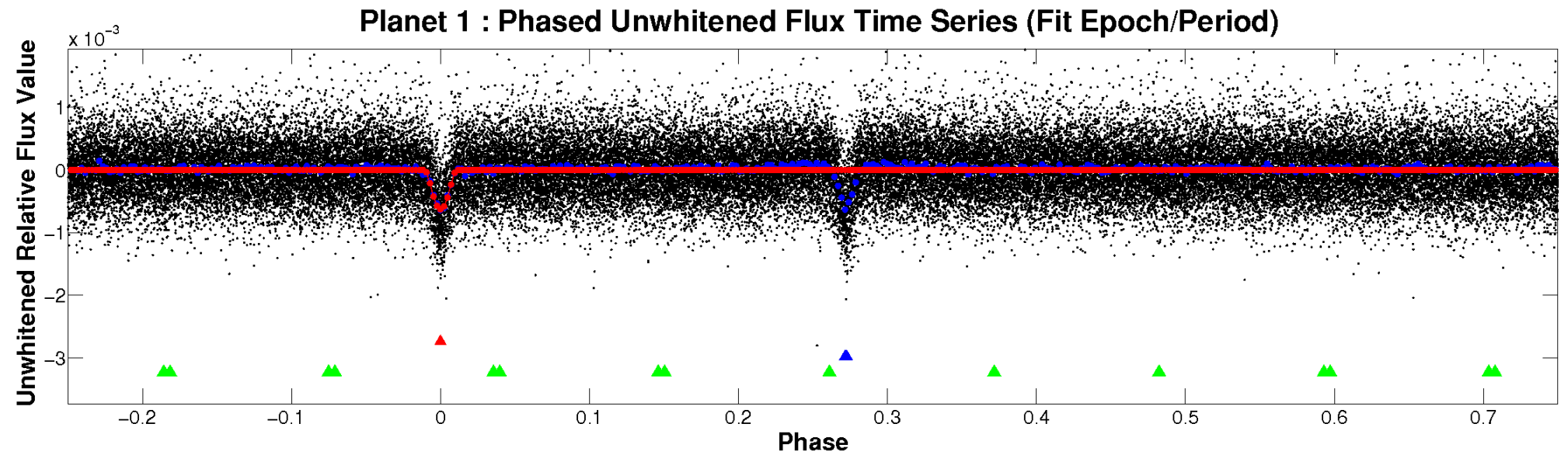


# ALT Odd/Even

TCE 004150624-01

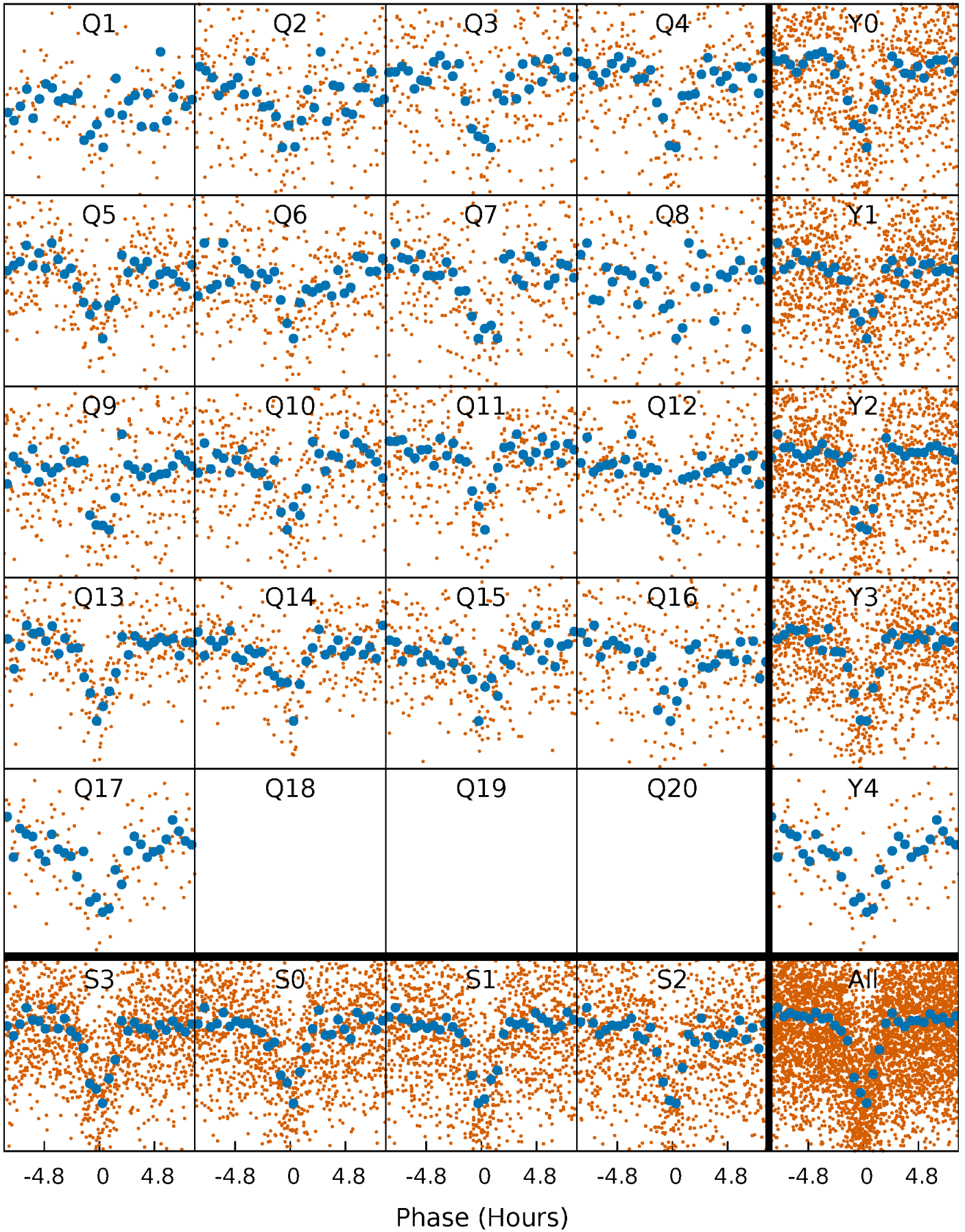


# Non-Whitened Vs. Whitened Light Curve



# PDC Quarter-Phased Transit Curves

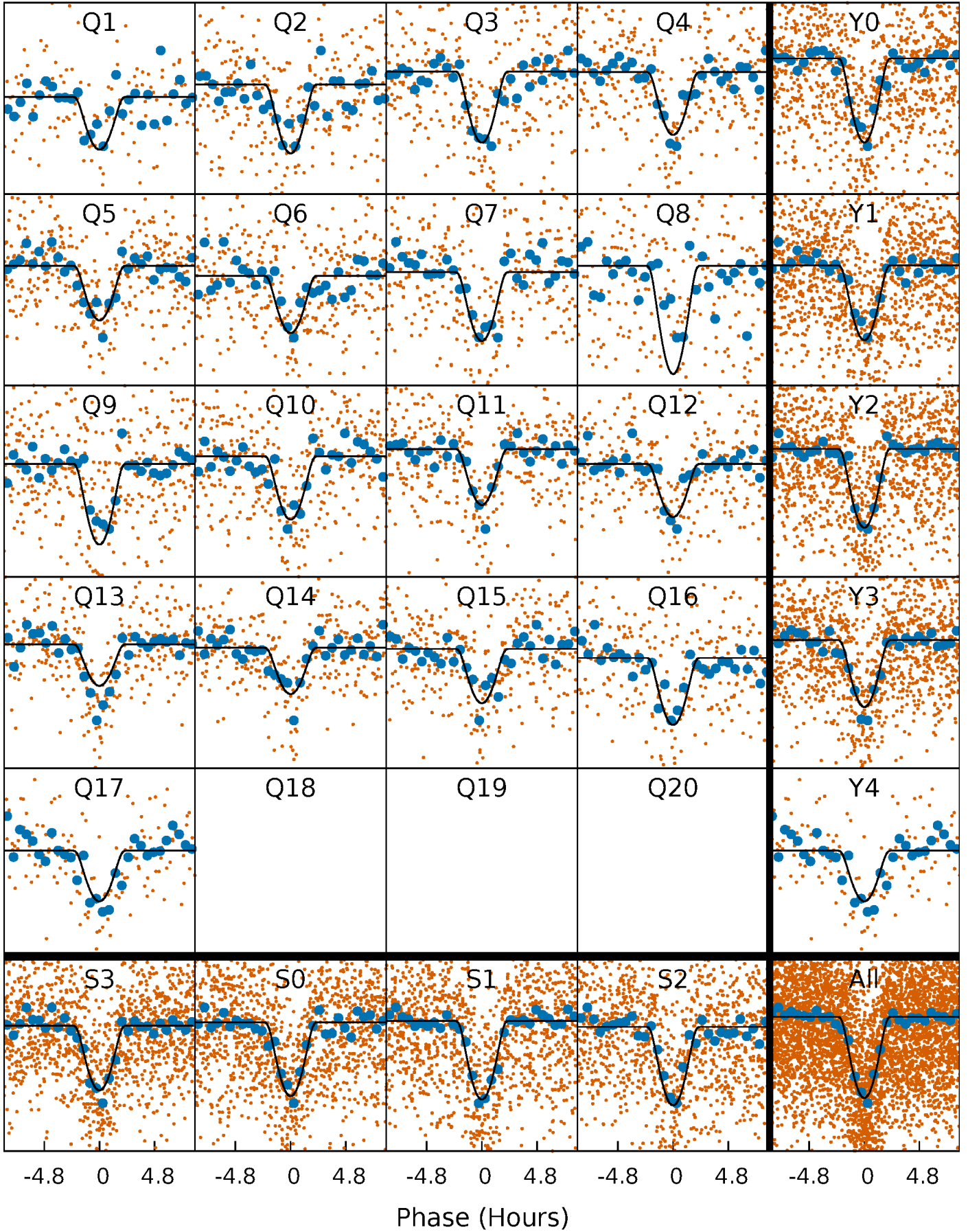
TCE 004150624-01 P= 8.653136 Days  $T_0=134.299795$  (BKJD)





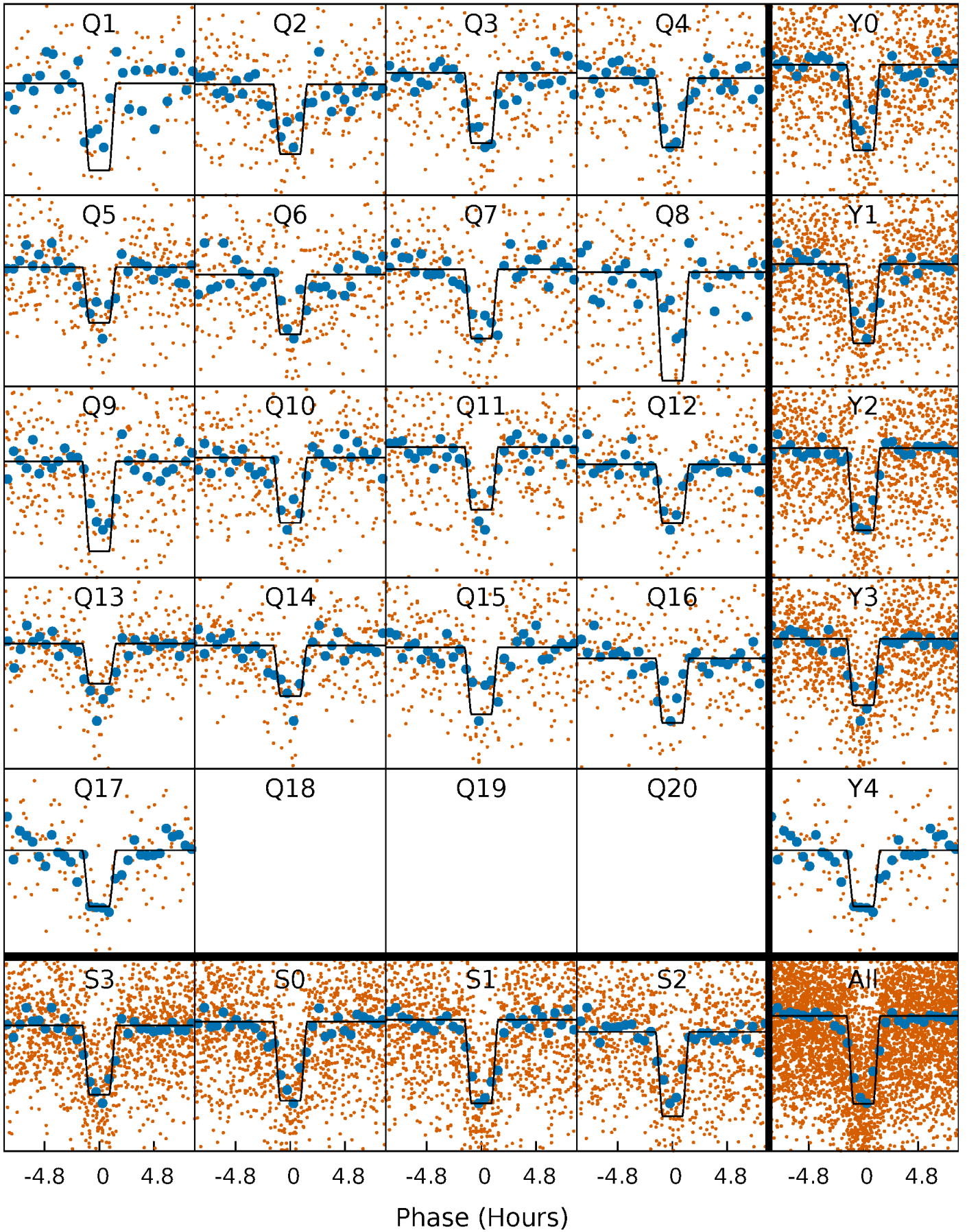
# DV Quarter-Phased Transit Curves

TCE 004150624-01 P= 8.653136 Days  $T_0=134.299795$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

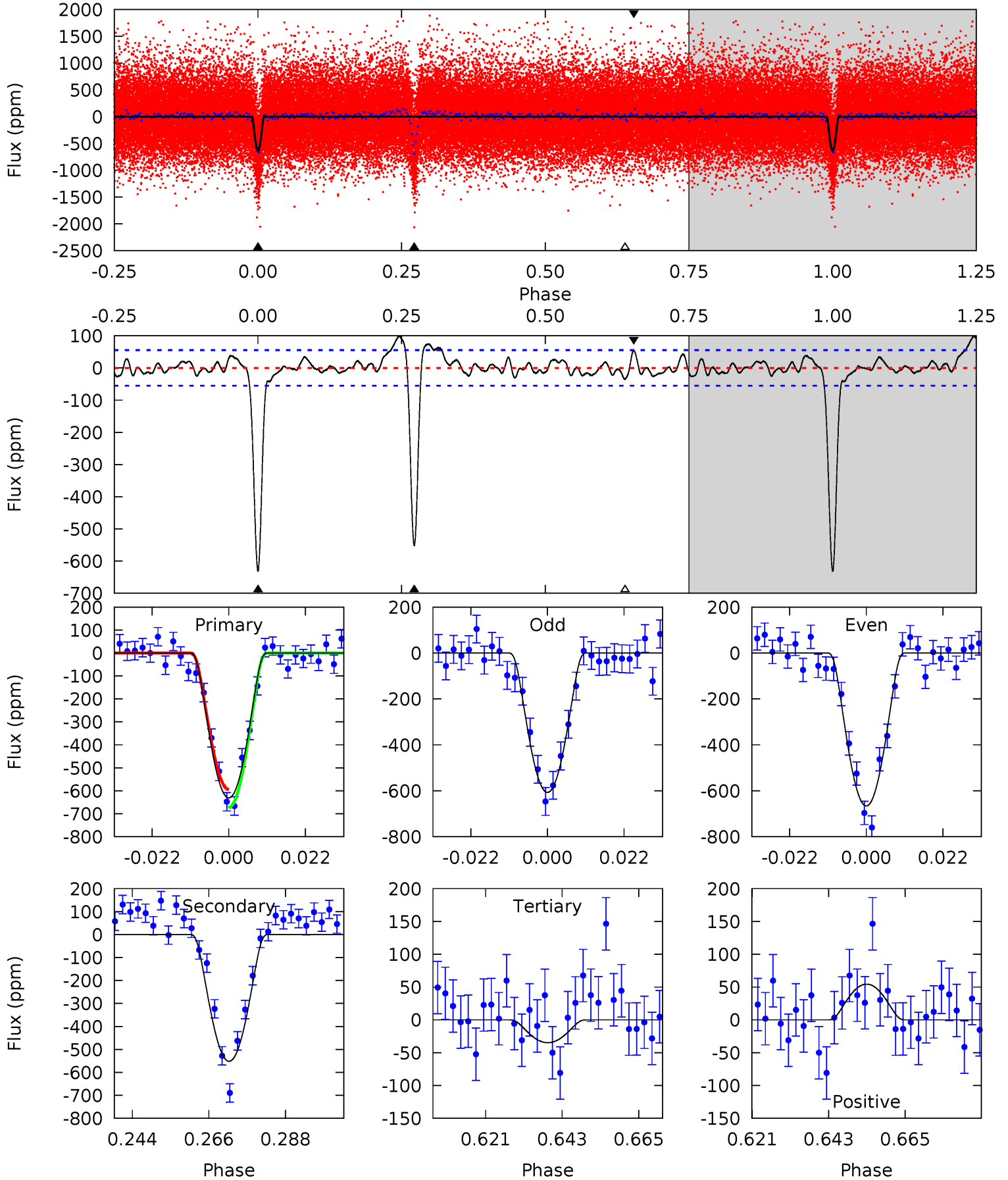
TCE 004150624-01 P= 8.653147 Days  $T_0=134.299819$  (BKJD)



# DV Model-Shift Uniqueness Test

004150624-01, P = 8.653136 Days, E = 125.646659 Days

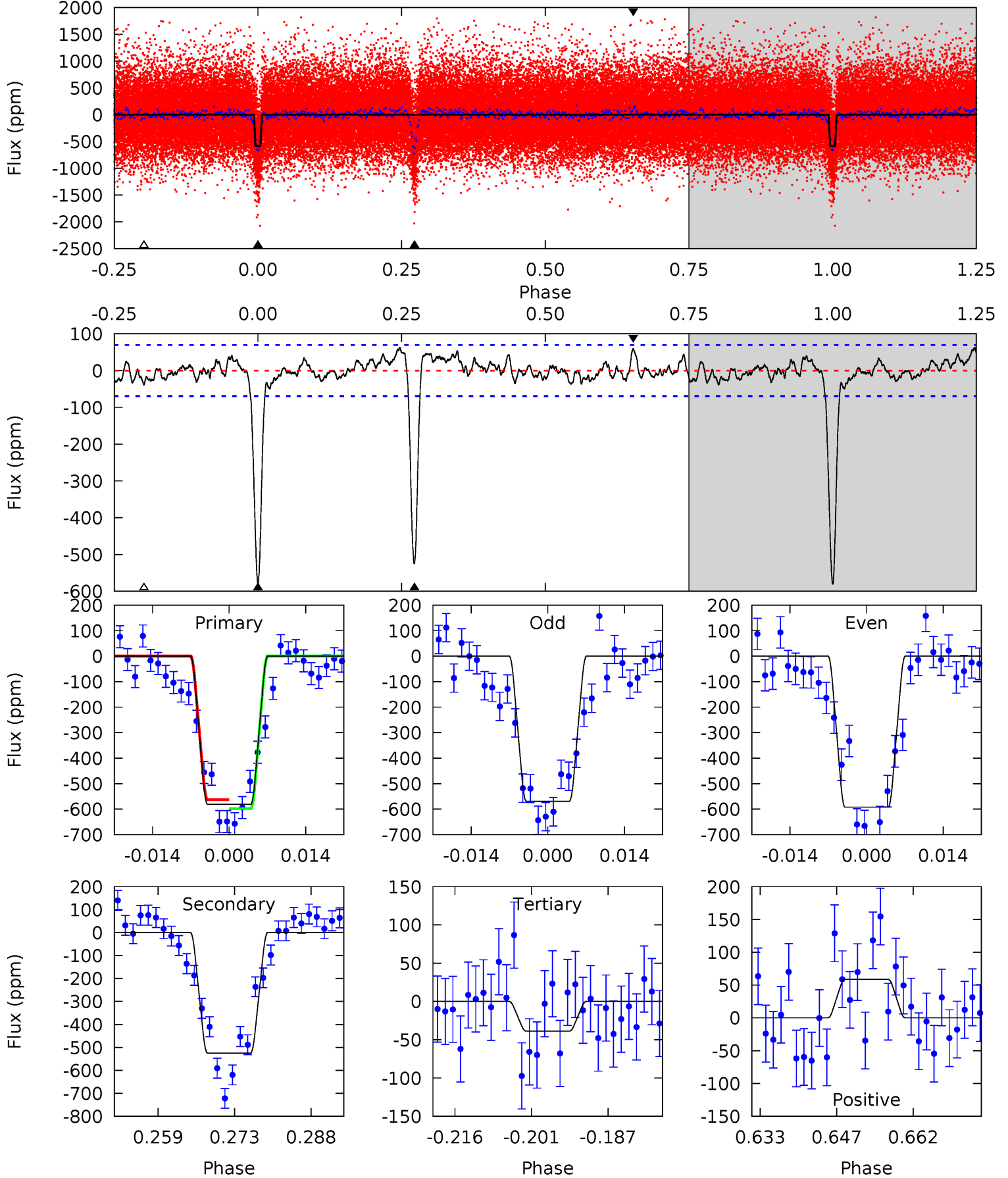
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
55.7	48.7	3.07	4.80	4.87	2.29	2.03	52.6	50.9	45.6	43.9	2.61	0.97	0.14	3.47



# Alt Model-Shift Uniqueness Test

004150624-01, P = 8.653147 Days, E = 125.646672 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
41.5	37.5	2.77	4.19	4.96	2.45	1.51	38.7	37.3	34.7	33.3	0.84	1.00	0.10	1.27





### Stellar Parameters For KIC 004150624

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$5421^{+164}_{-164}$	$4.564^{+0.028}_{-0.171}$	$0.210^{+0.200}_{-0.300}$	$0.852^{+0.198}_{-0.062}$	$0.969^{+0.065}_{-0.106}$	$2.207^{+0.344}_{-0.974}$
	+3%/-3%	+1%/-4%	+95%/-143%	+23%/-7%	+7%/-11%	+16%/-44%
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 004150624-01 / KOI 1334.01

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-552 \pm 11$	$5.08^{+3.69}_{-3.16}$	$1103^{+67}_{-45}$	$3974^{+2050}_{-688}$	$79^{+472}_{-53}$
Alt.	$-525 \pm 14$	$4.20^{+3.65}_{-2.88}$	$1102^{+62}_{-44}$	$4211^{+2895}_{-825}$	$106^{+973}_{-76}$

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

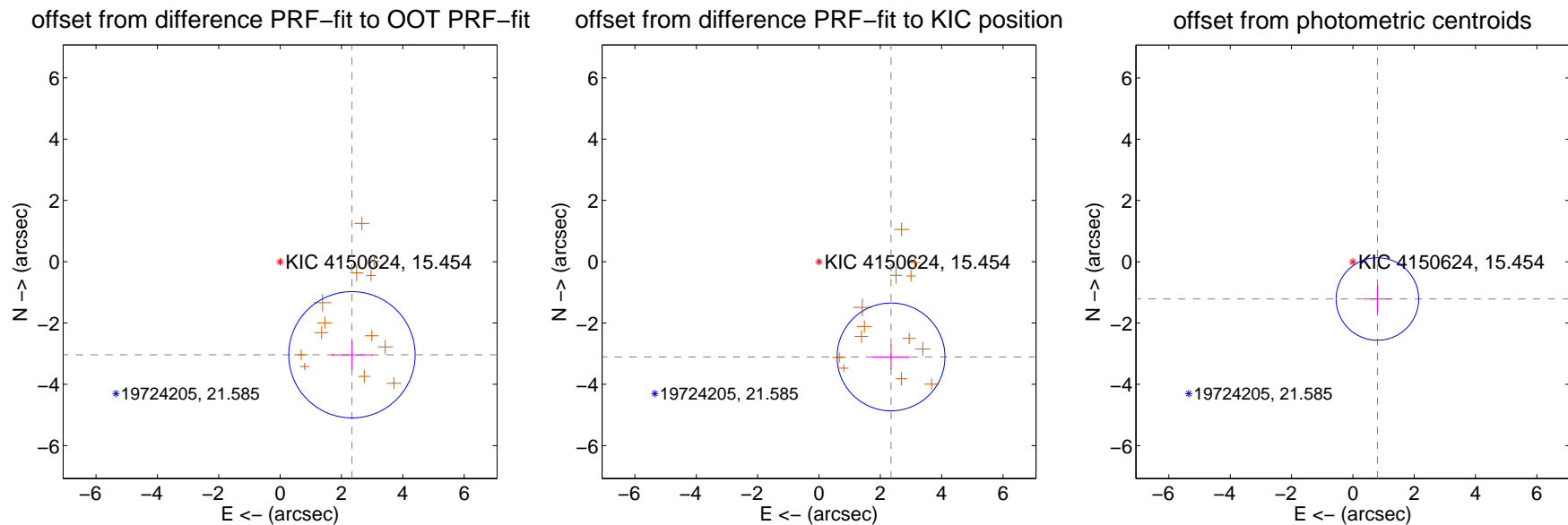
## DV Centroid Data

Supplemental centroid analysis for 004150624-01. Kepler magnitude: 15.45. Transit SNR 32.43

There are 0 quarters with good PRF difference image offsets

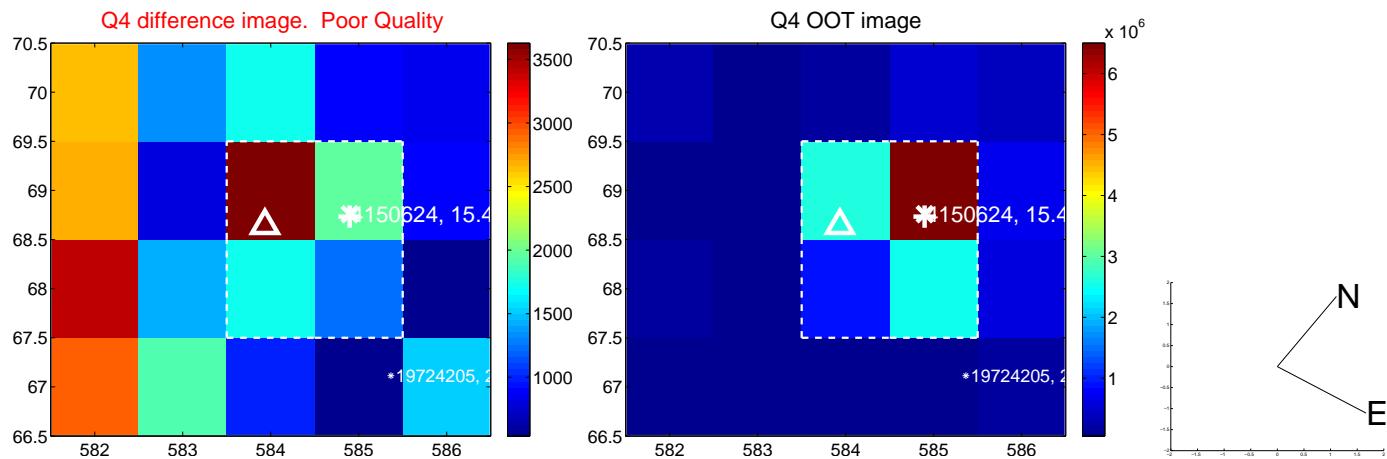
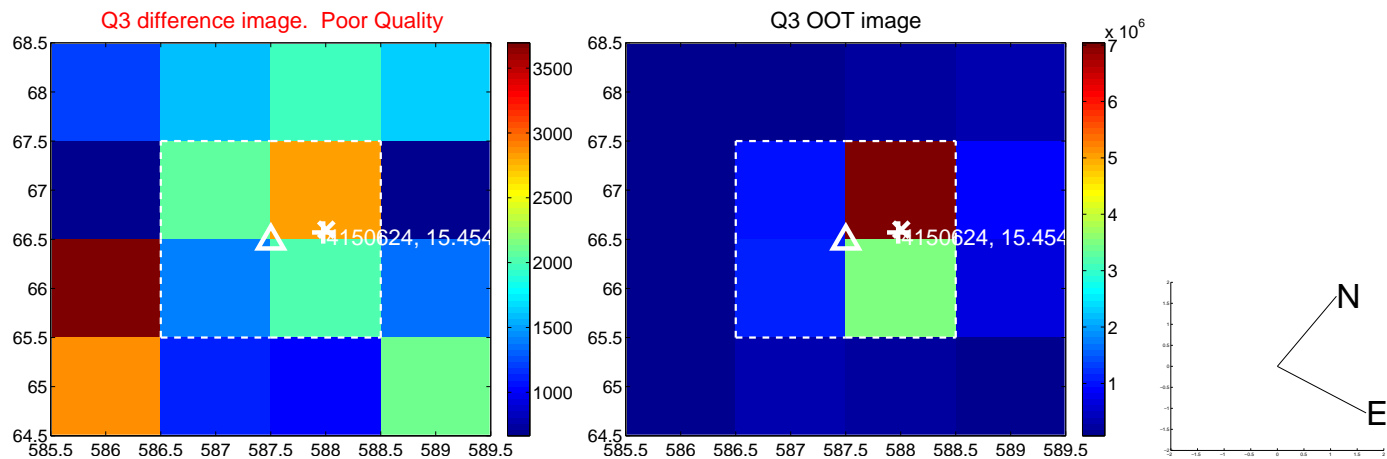
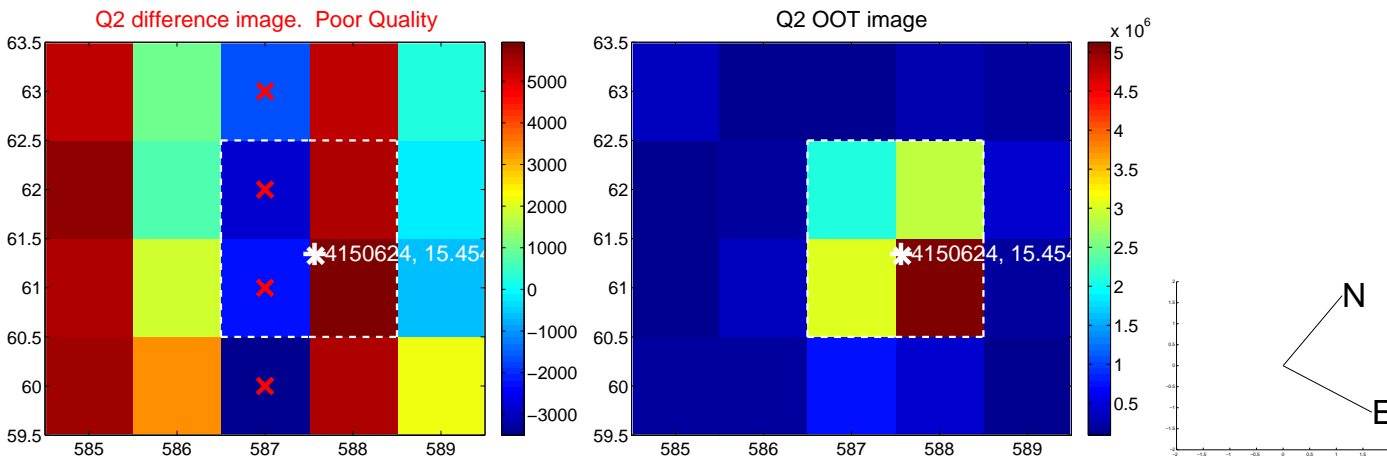
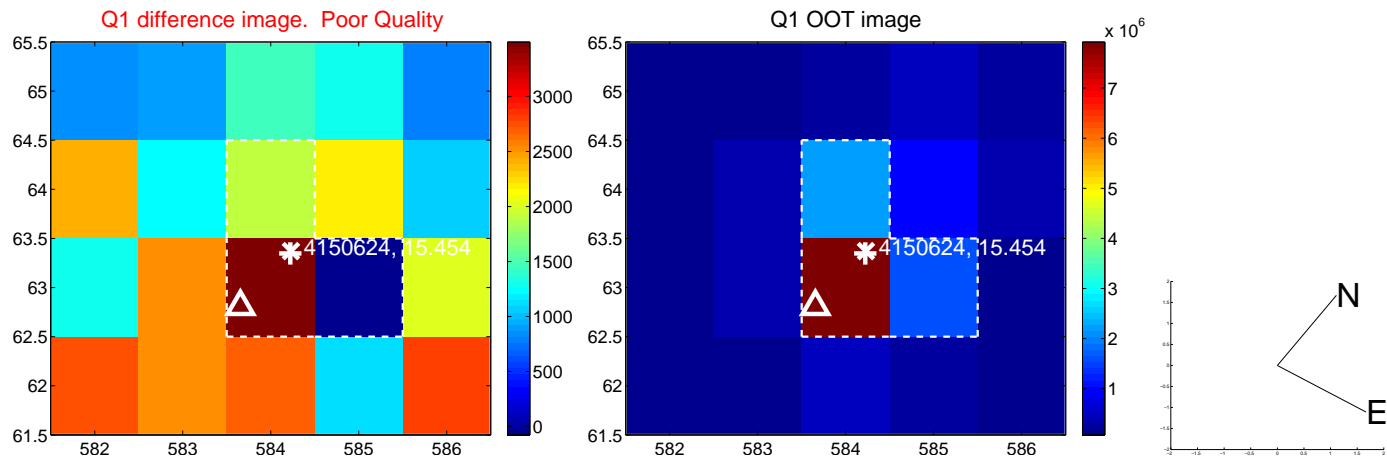
The direct PRF centroid is offset from the target star catalog position by about 0.09 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$3.835 \pm 0.687$	5.59	$-2.342 \pm 0.679$	$-3.037 \pm 0.467$
PRF-fit source offset from KIC position	$3.894 \pm 0.586$	6.64	$-2.348 \pm 0.610$	$-3.107 \pm 0.407$
photometric centroid source offset	$1.45 \pm 0.45$	3.24	$-0.80 \pm 0.46$	$-1.21 \pm 0.44$

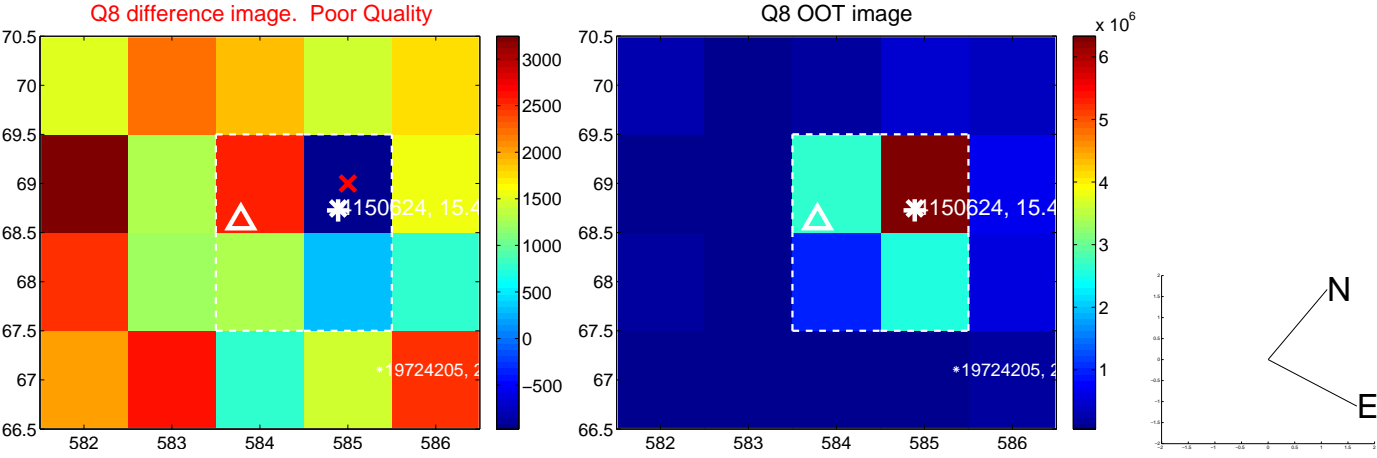
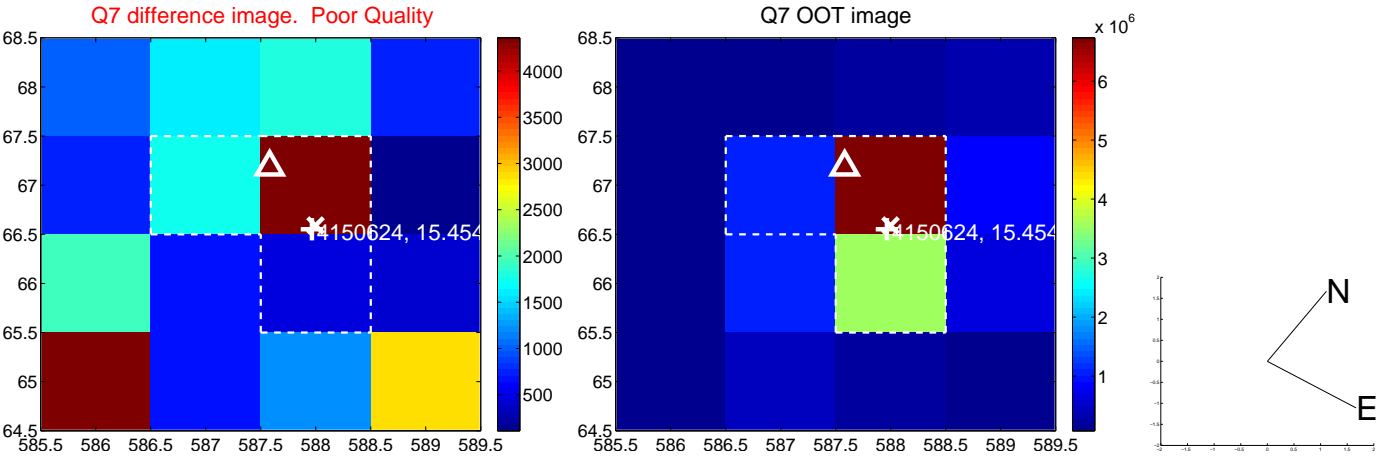
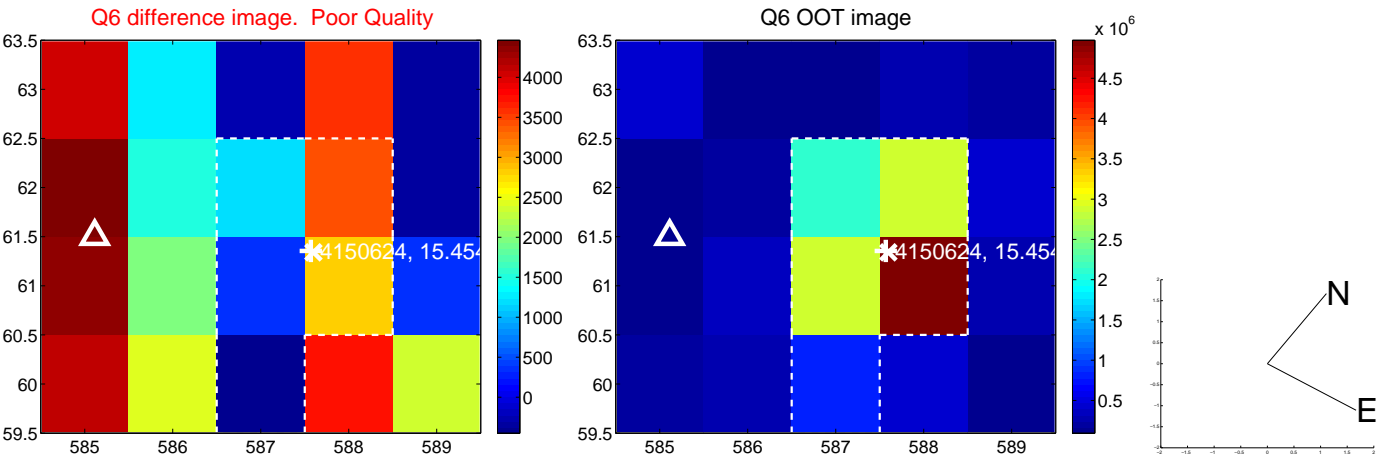
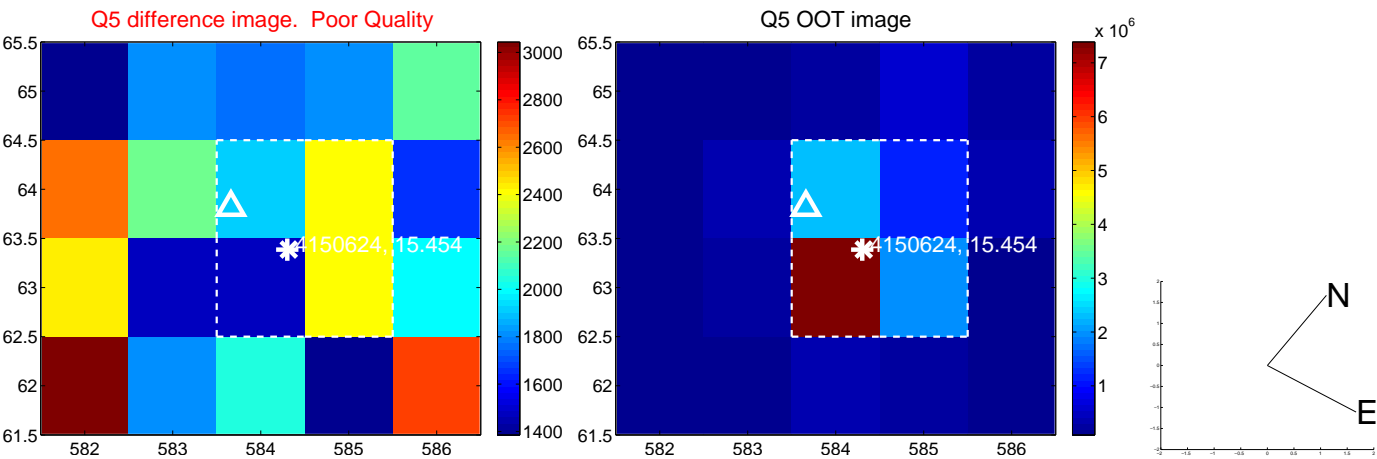


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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

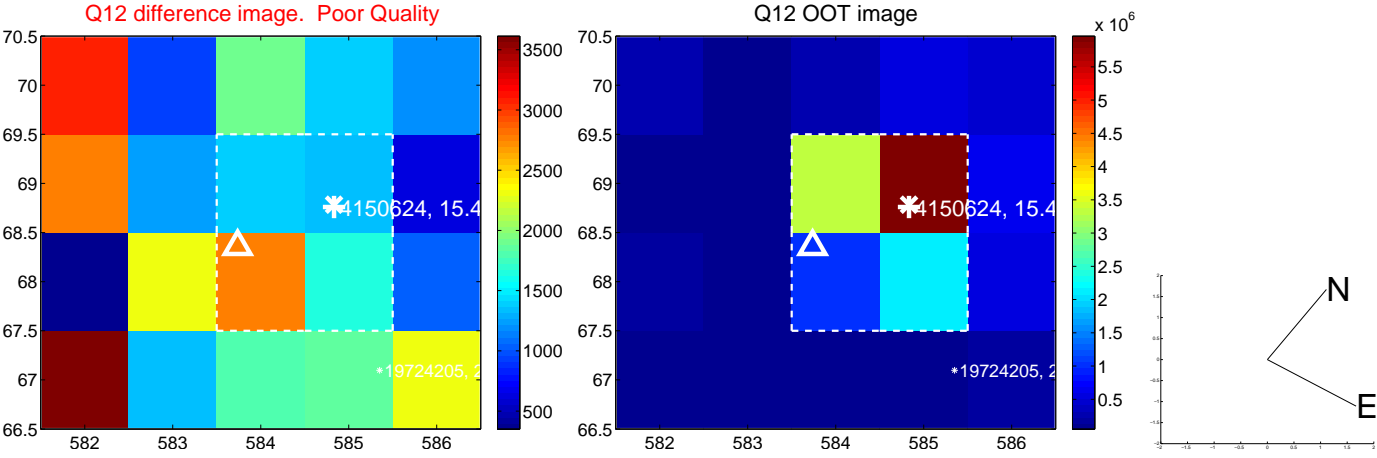
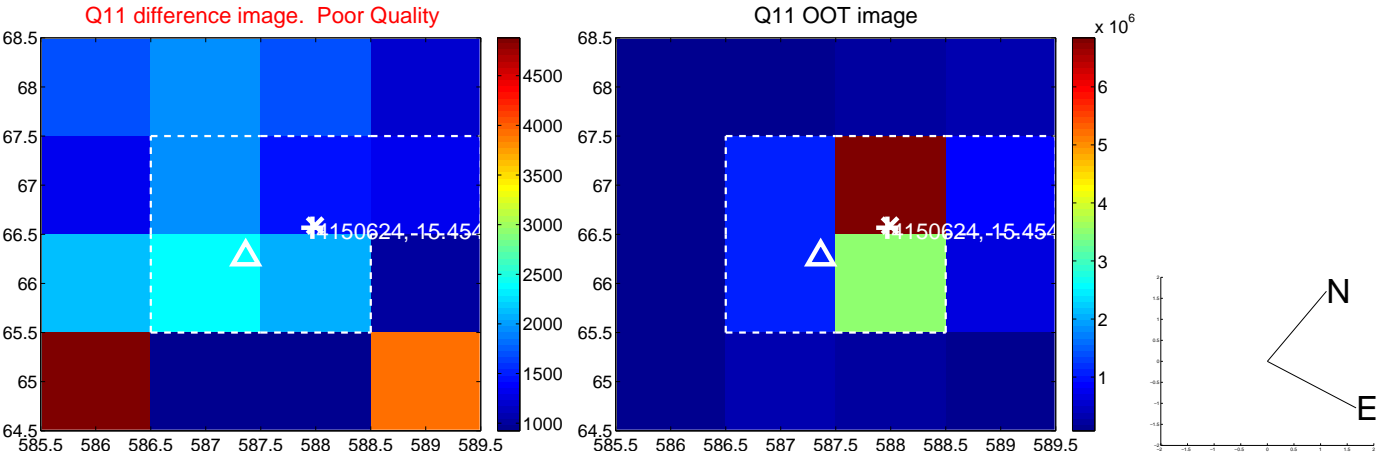
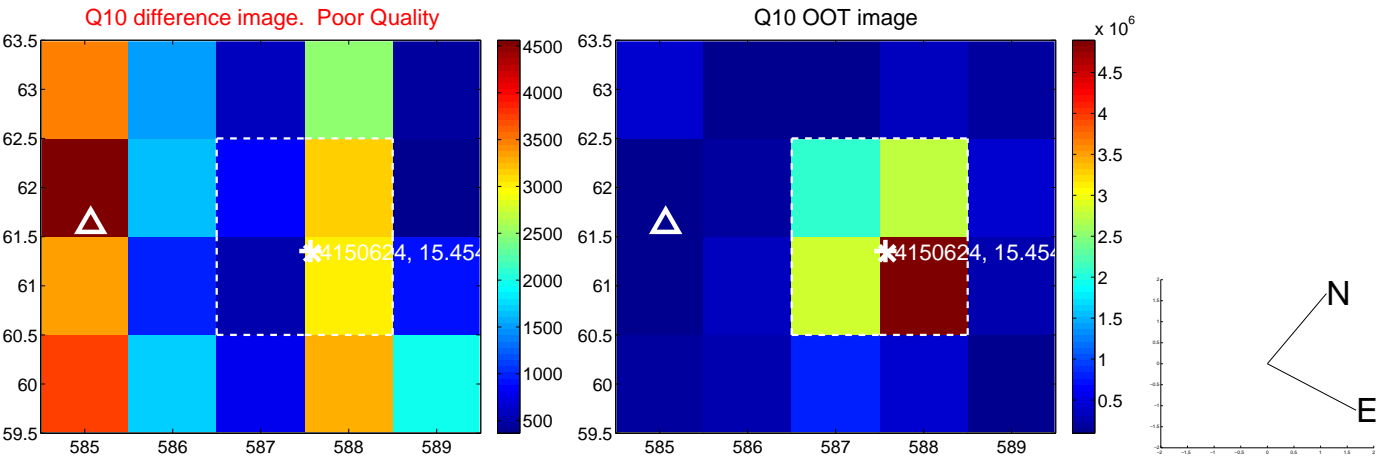
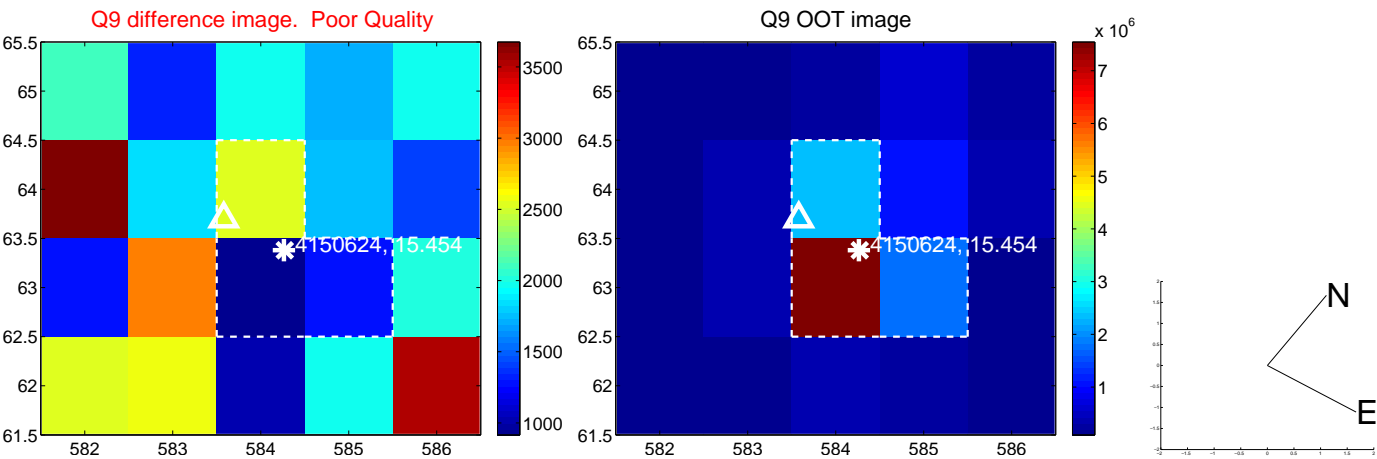


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

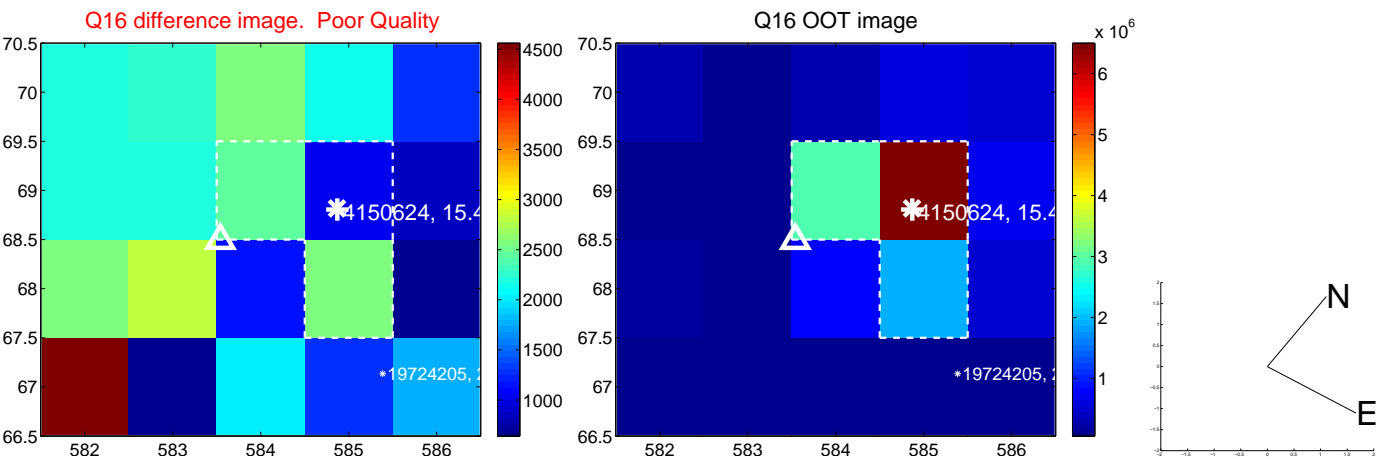
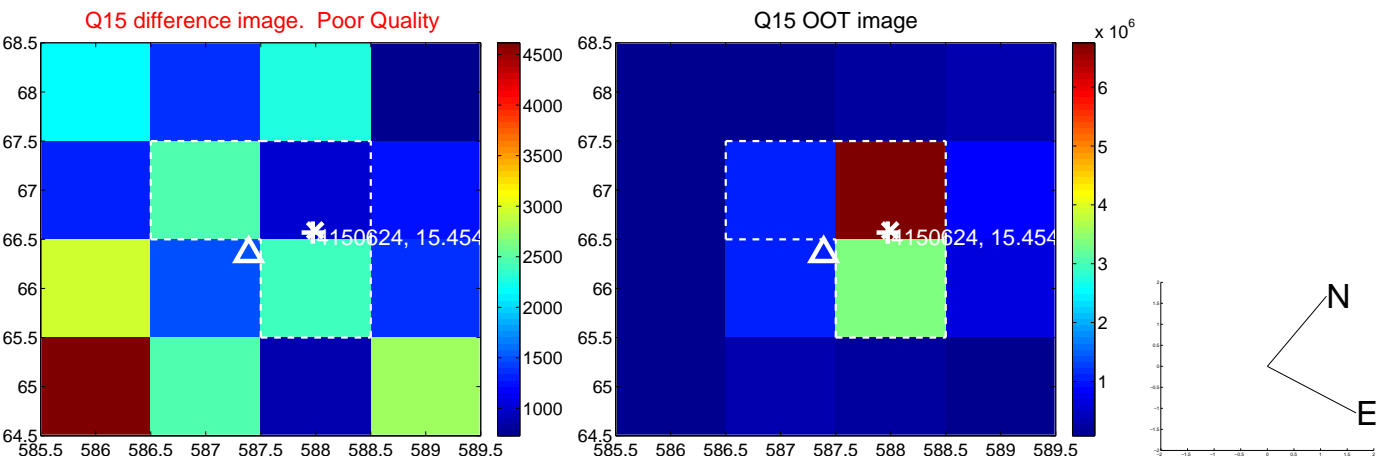
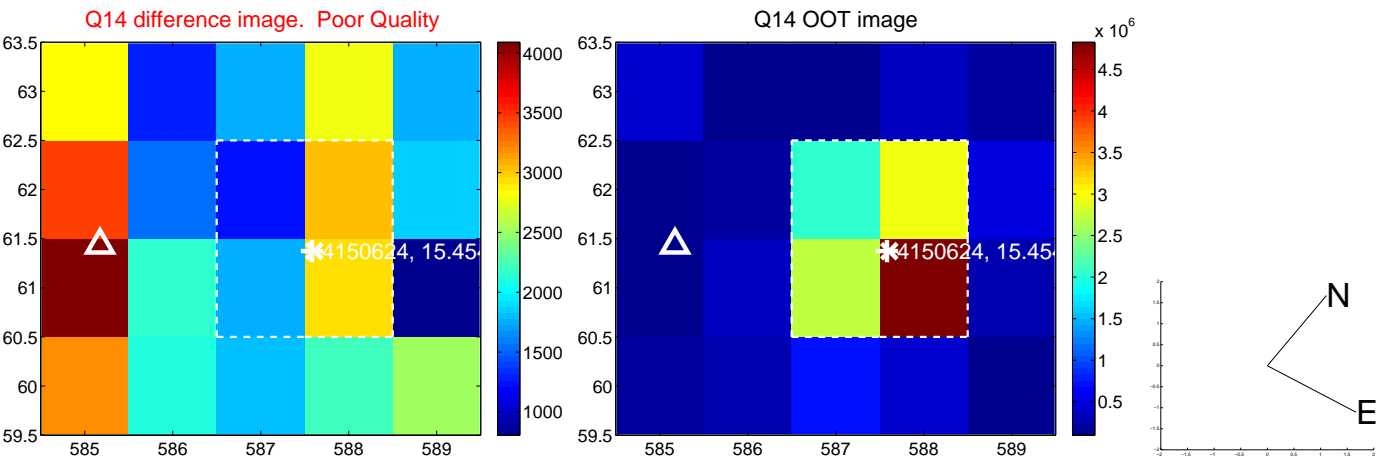
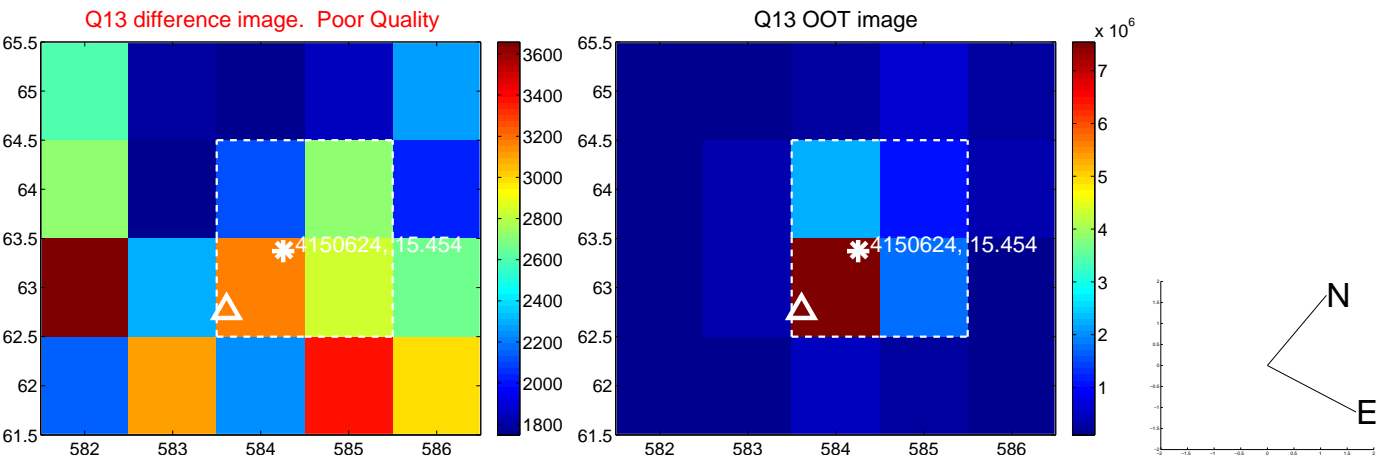




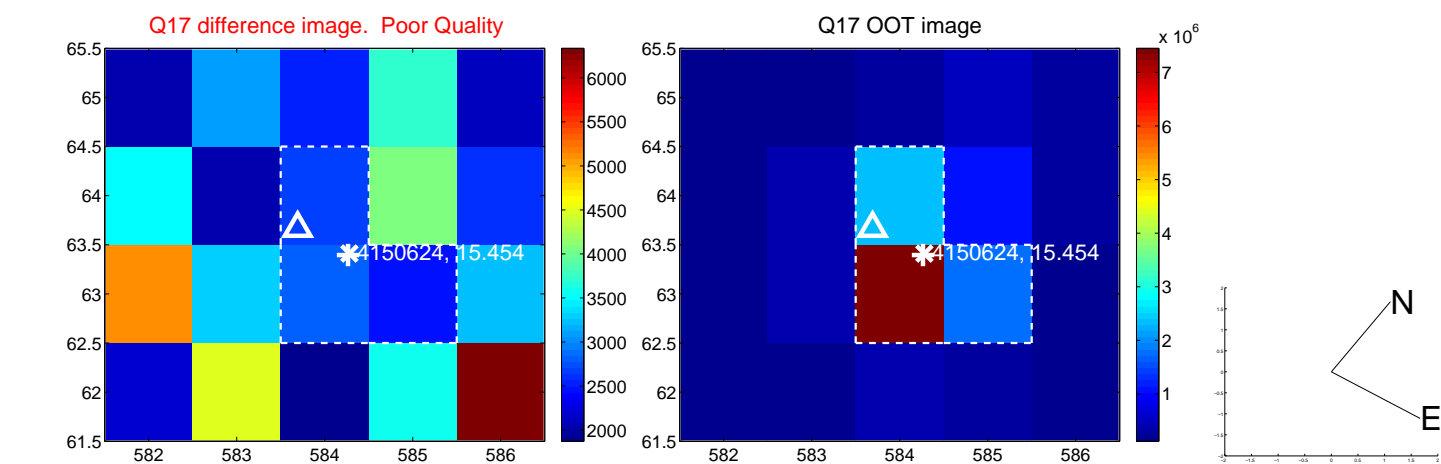
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



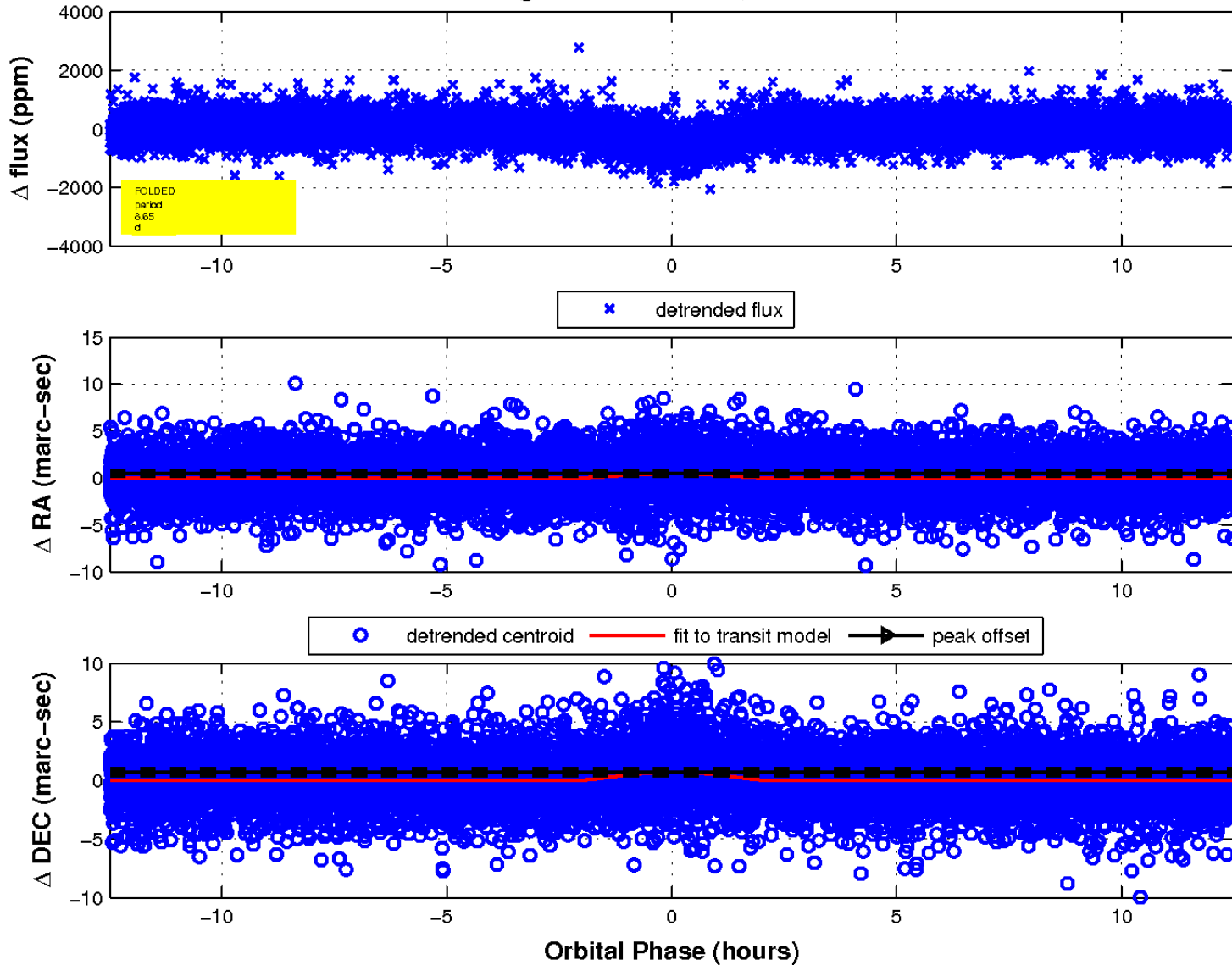
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

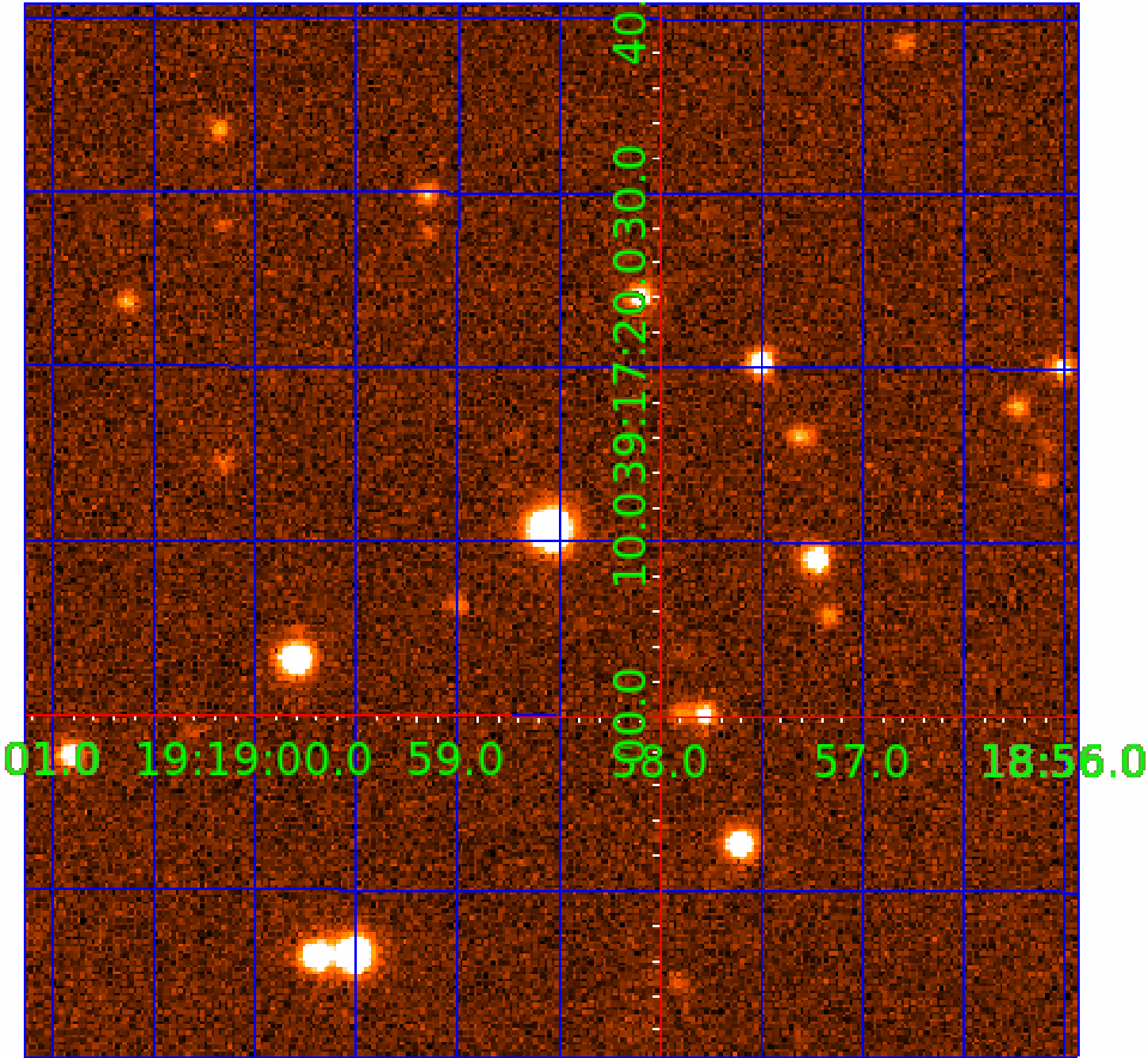


fluxWeightedCentroids, Planet 1 of 3



UKIRT Image

Declination





# KIC 004150624

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
004150624-01	OBS	1334.01	8.653136	134.299795	634.2	4.163	28.9	32.4	0.85	5421	4.08	84.19
004150624-02	OBS	No	8.653063	136.661062	640.5	3.913	29.8	33.2	0.85	5421	4.21	84.19
004150624-03	OBS	1334.02	94.227104	196.136845	571.4	26.764	15.9	20.9	0.85	5421	2.51	3.49

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
004150624-01	OBS	FP	0.00	0	1	1	1	MOD_SEC_DV—MOD_SEC_ALT—HAS_SEC_TCE—CENT_FEW_DIFFS—HALO_GHOST—EPHEM_MATCH
004150624-02	OBS	FP	0.00	1	1	1	1	IS_SEC_TCE—CENT_RESOLVED_OFFSET—HALO_GHOST—EPHEM_MATCH
004150624-03	OBS	FP	0.00	1	0	1	1	INDIV_TRANS_RUBBLE_SKYE_ZUMA—CENT_FEW_DIFFS—HALO_GHOST—EPHEM_MATCH

**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 004150624-02

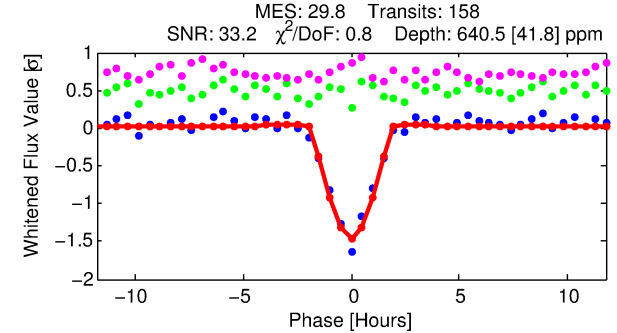
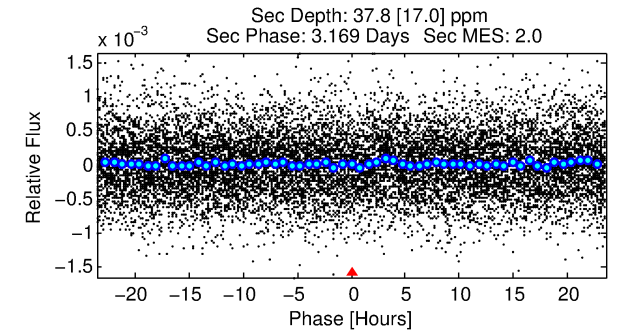
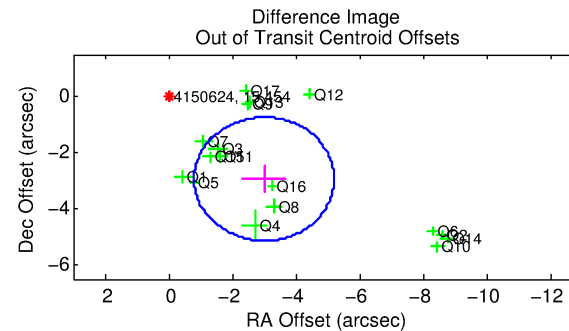
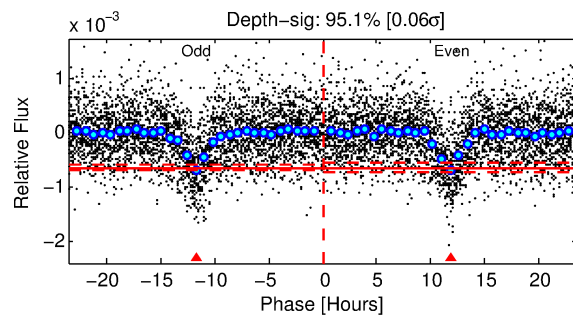
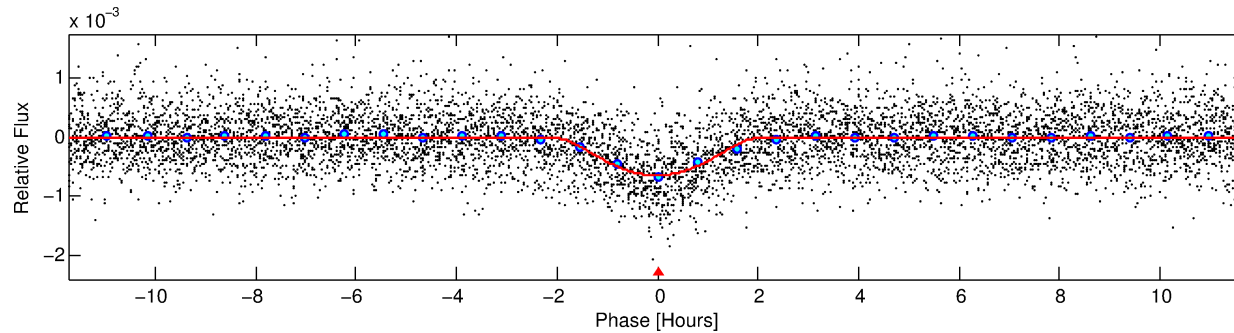
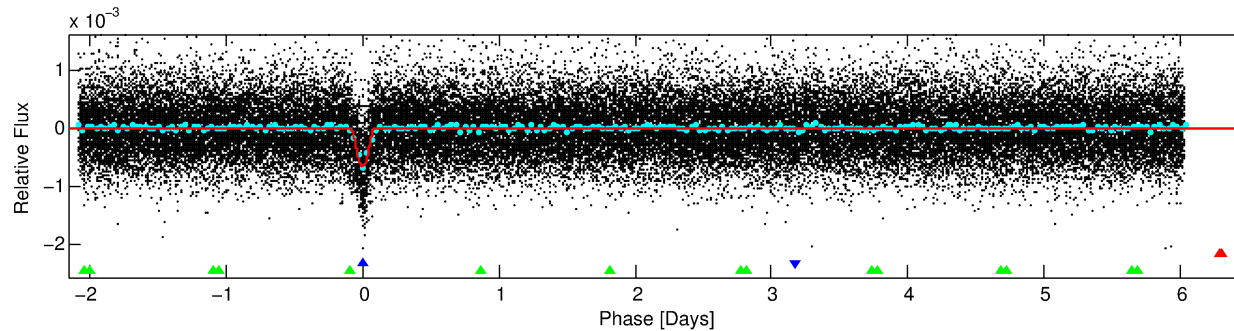
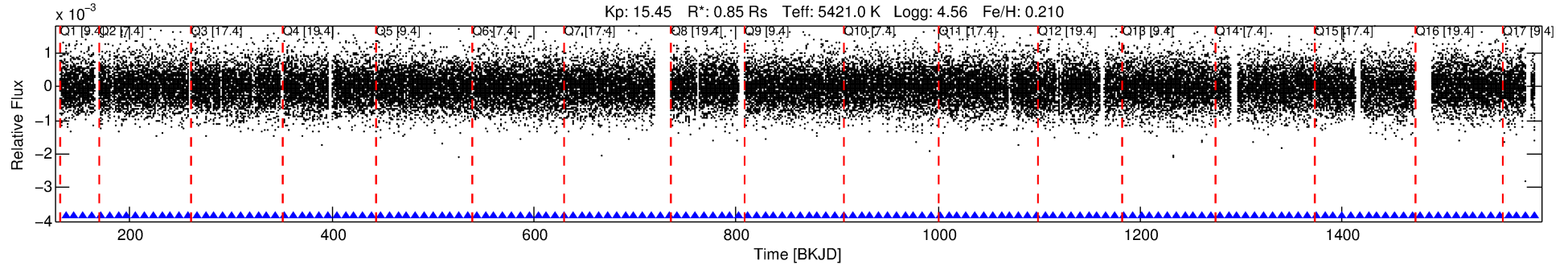
TCE (1)	KIC	Parent (2)	Parent KIC	P <sub>1</sub> :P <sub>2</sub>	Dist ( $\mu$ )	$\Delta$ Row	$\Delta$ Col	m <sub>2</sub>	m <sub>1</sub>	D <sub>2</sub> /D <sub>1</sub>	Mechanism	Flag	$\sigma_P$	$\sigma_T$
004150624-02	4150624	004150611-01	4150611	1:1	69.4	14	11	7.90	15.46	90.60	Direct-PRF	0	0.34	0.19

**Notes:** P<sub>1</sub>:P<sub>2</sub> is the period ratio. Dist is the distance in arcseconds.  $\Delta$ Row and  $\Delta$ Col are the number of pixels apart in row and column. m<sub>2</sub> and m<sub>1</sub> are the magnitudes of the parent and child. D<sub>2</sub>/D<sub>1</sub> is the parent's transit depth divided by the child's.  $\sigma_P$  and  $\sigma_T$  are the significance of the match in period and epoch. For a match to be considered significant  $\sigma_P < 5.0$  and  $\sigma_T < 5.0$ . Matches which have  $\sigma_P$  and  $\sigma_T$  very close to this cutoff should receive extra scrutiny, especially if the period ratio is very large.

# DV One-Page Summary

KIC: 4150624 Candidate: 2 of 3 Period: 8.653 d  
KOI: K01334 Corr: No Ephemeris Match

Kp: 15.45 R\*: 0.85 Rs Teff: 5421.0 K Logg: 4.56 Fe/H: 0.210



## DV Fit Results:

Period = 8.65306 [0.00003] d  
Epoch = 136.6611 [0.0027] BKJD  
Rp/R\* = 0.0453 [0.0542]  
a/R\* = 5.40 [1.59]  
b = 1.00 [0.08]  
Seff = 84.19 [27.61]  
Teq = 772 [63] K  
Rp = 4.21 [5.13] Re  
a = 0.0817 [0.0166] AU  
Ag = 7.81 [19.15] [0.36σ]  
Teffp = 1996 [1216] K [1.01σ]

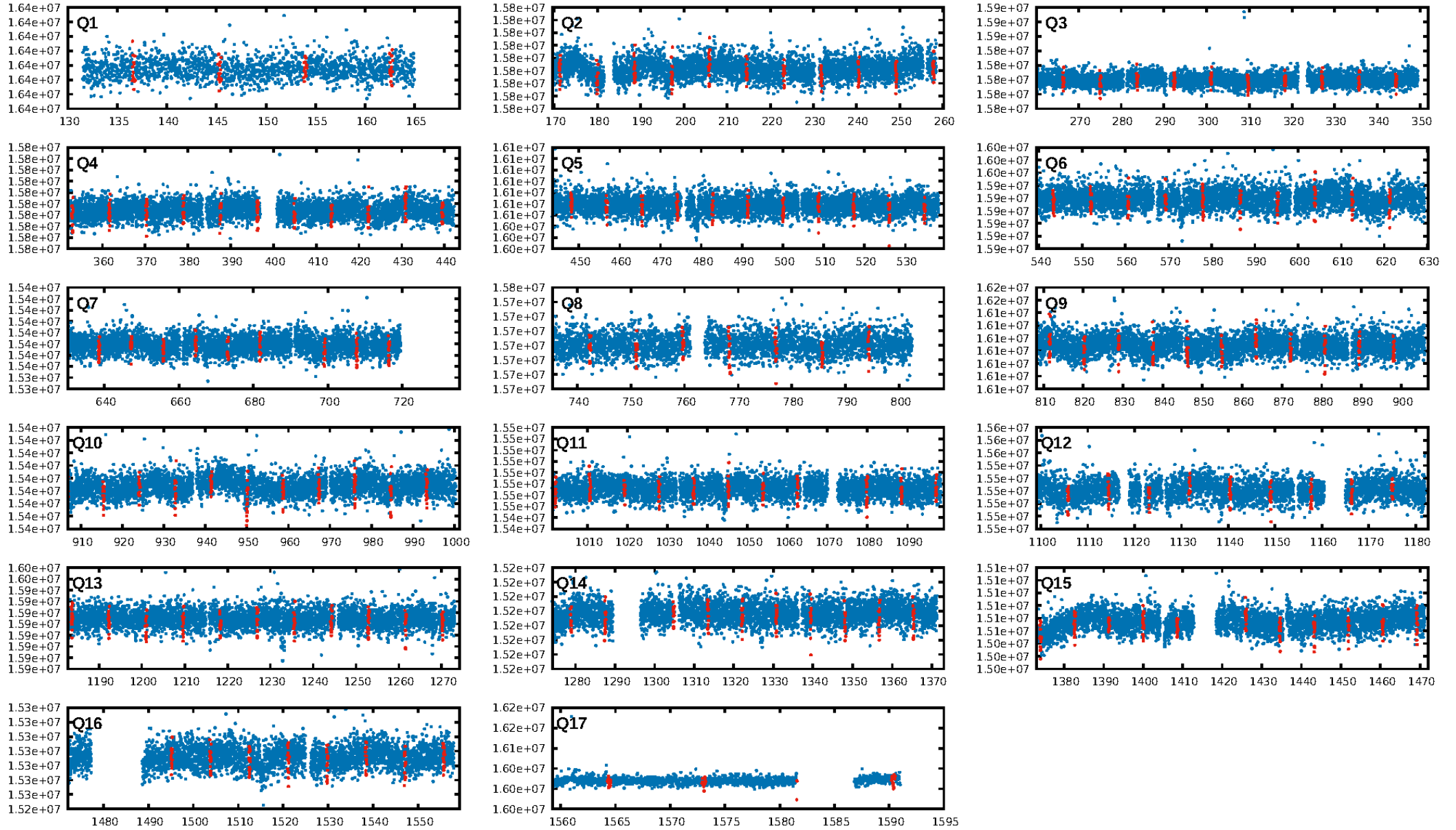
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 0.0% [0.00σ]  
ModelChiSquare2-sig: 83.1%  
ModelChiSquareGof-sig: 100.0%  
Bootstrap-pfa: 4.27e-190  
RollingBand-fgt: 1.00 [151/151]  
GhostDiagnostic-chr: 0.04574  
Centroid-sig: 0.0%  
Centroid-so: 1.599 arcsec [3.53σ]  
OotOffset-rm: 4.204 arcsec [5.73σ]  
KicOffset-rm: 3.788 arcsec [5.11σ]  
OotOffset-st: 4/4/4/5 [17]  
KicOffset-st: 4/4/4/5 [17]  
DiffImageQuality-fgm: 0.00 [0/17]  
DiffImageOverlap-fno: 1.00 [17/17]

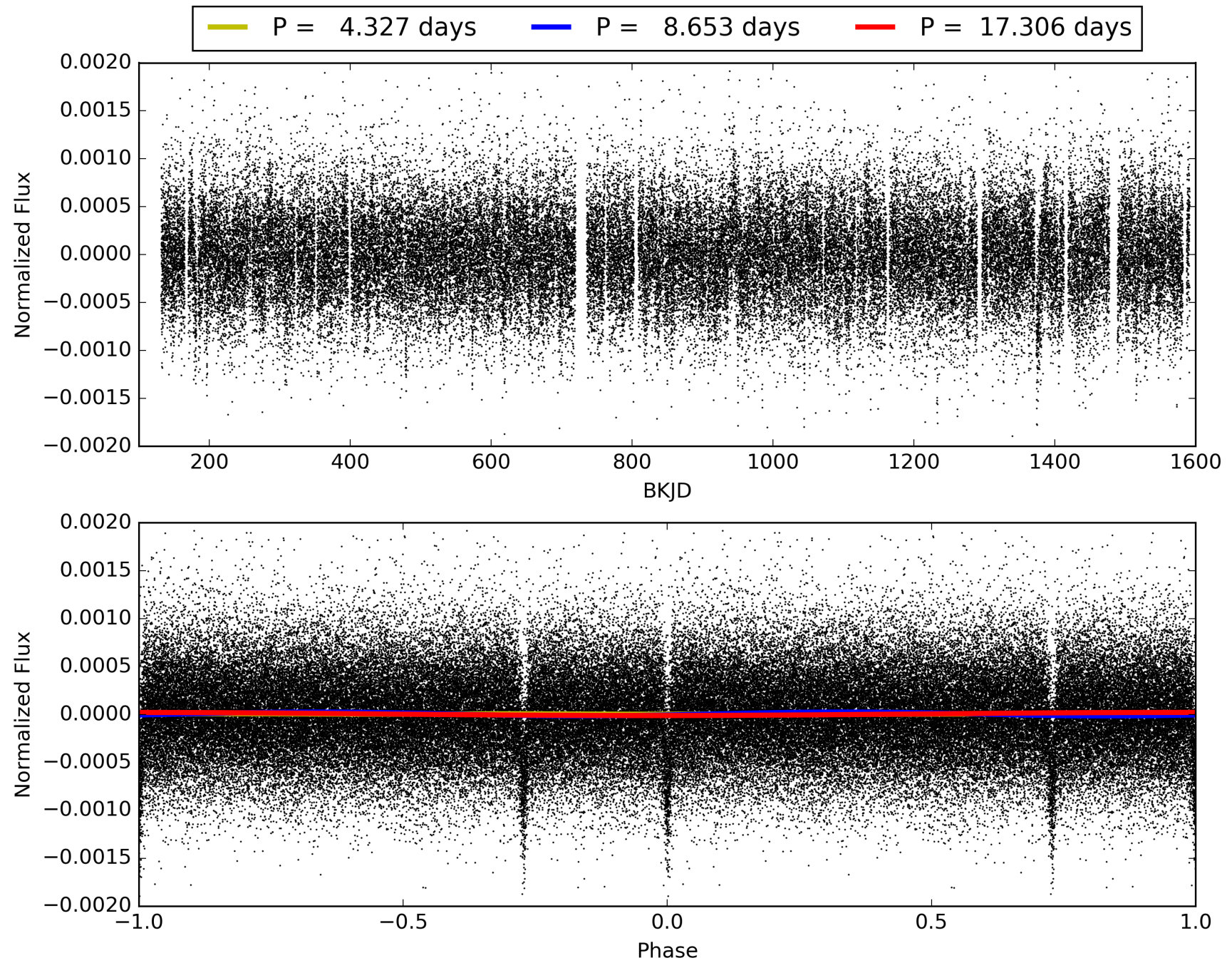
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 01-Feb-2016 03:18:27 Z

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

# TCE 004150624-02, PDC Light Curves



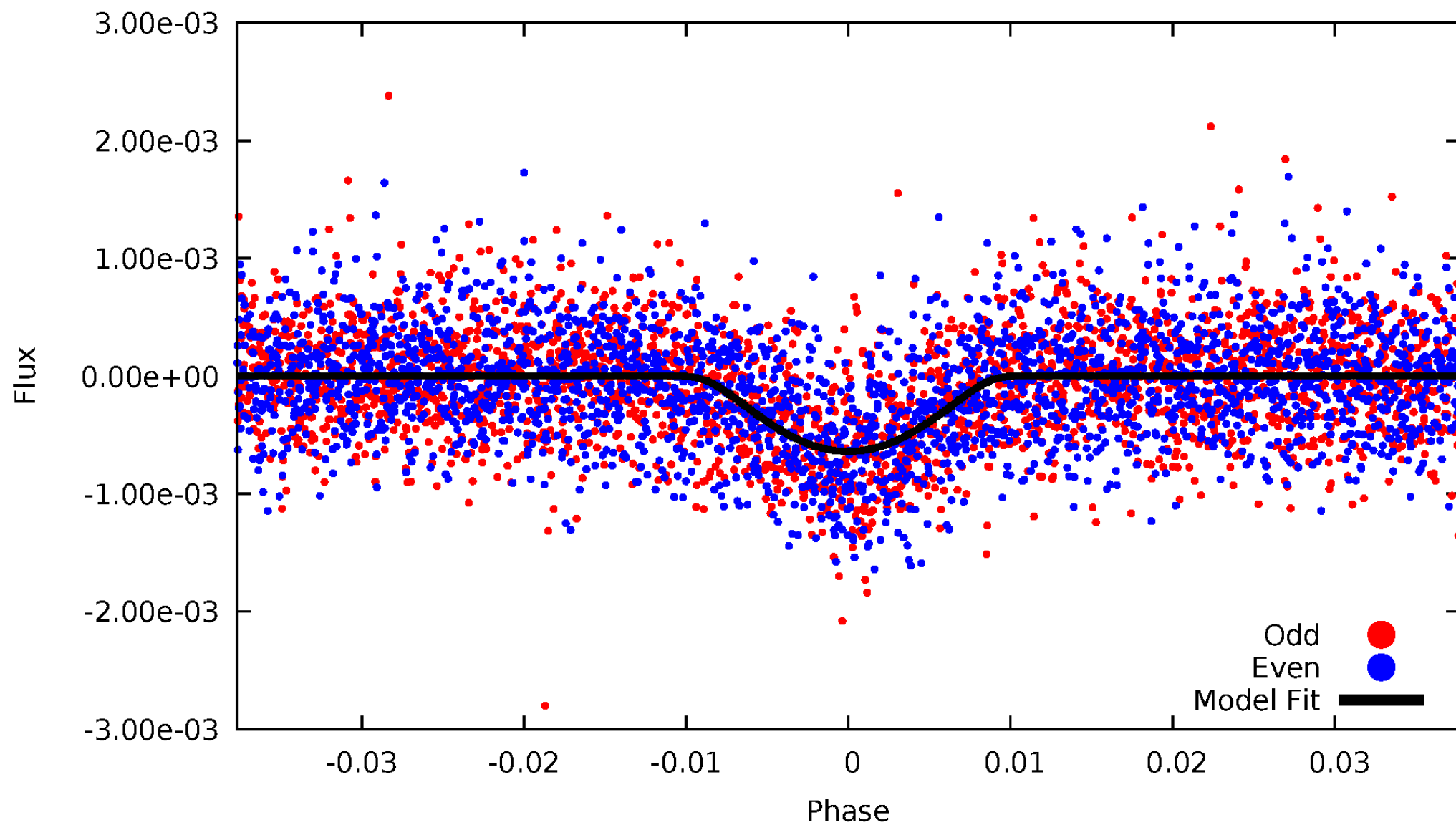
TCE 004150624-02





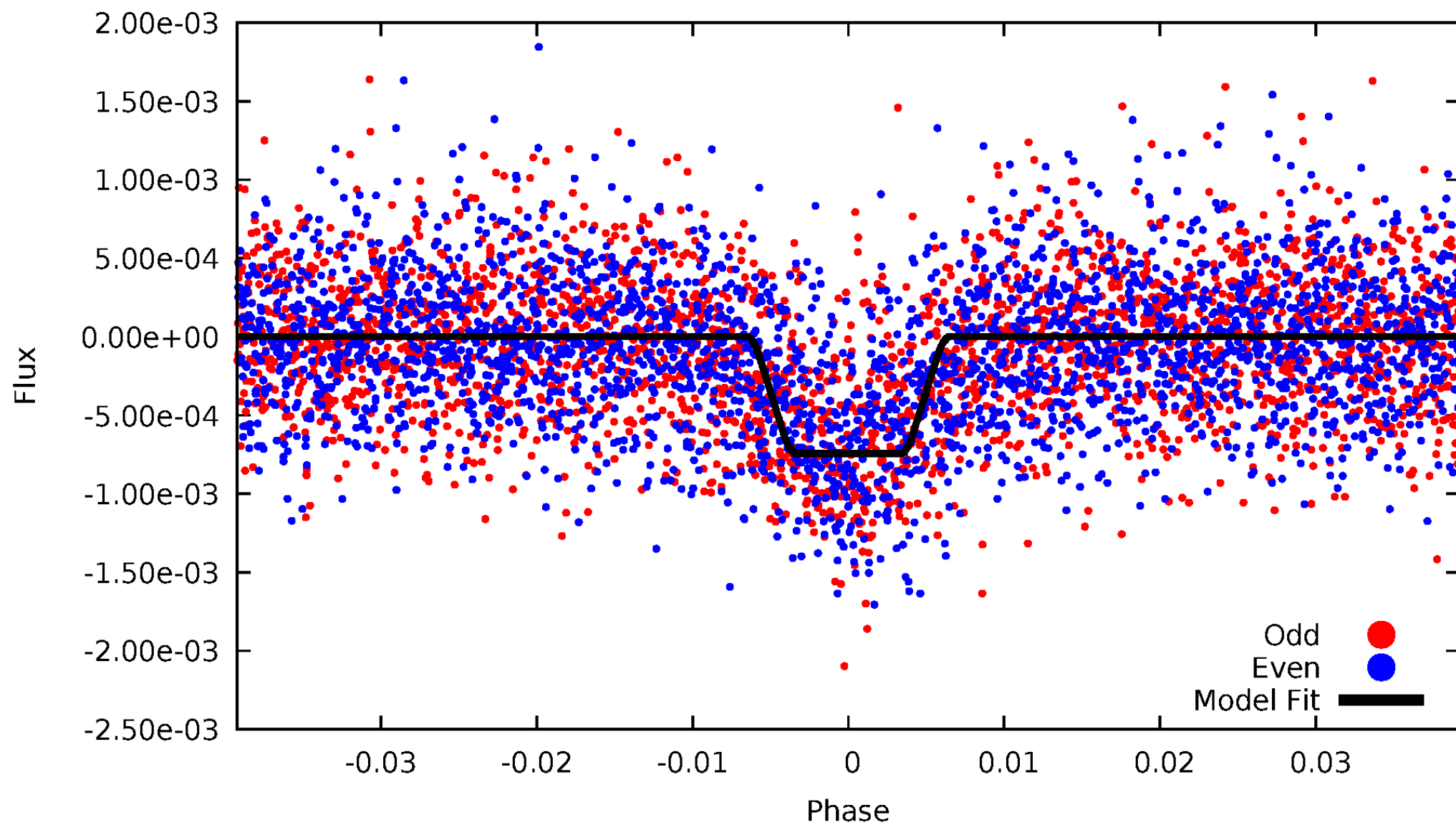
DV Odd/Even

TCE 004150624-02



# ALT Odd/Even

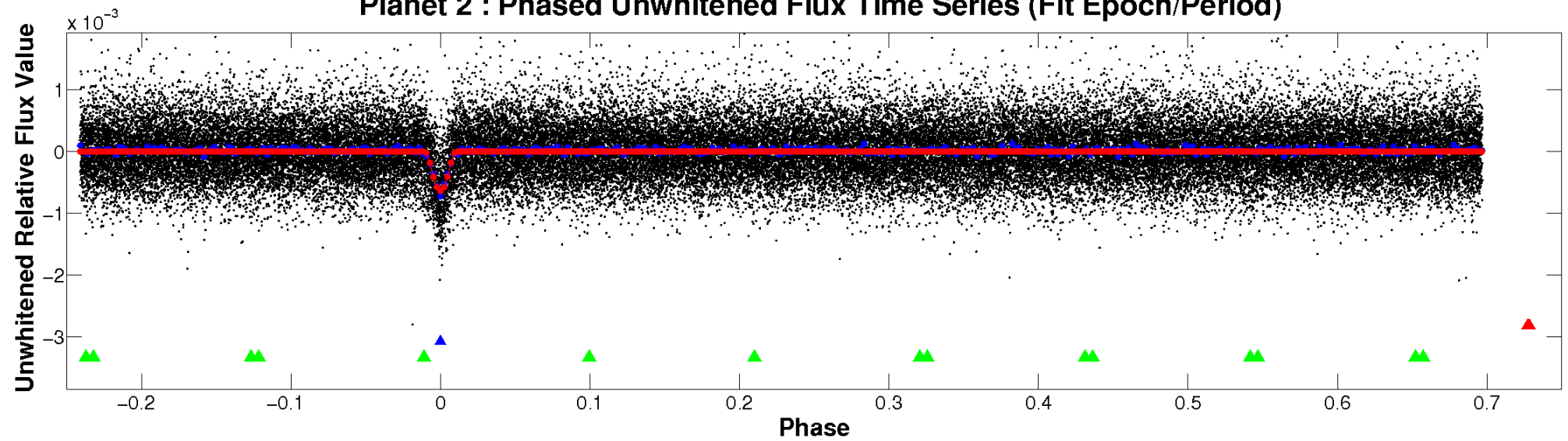
TCE 004150624-02



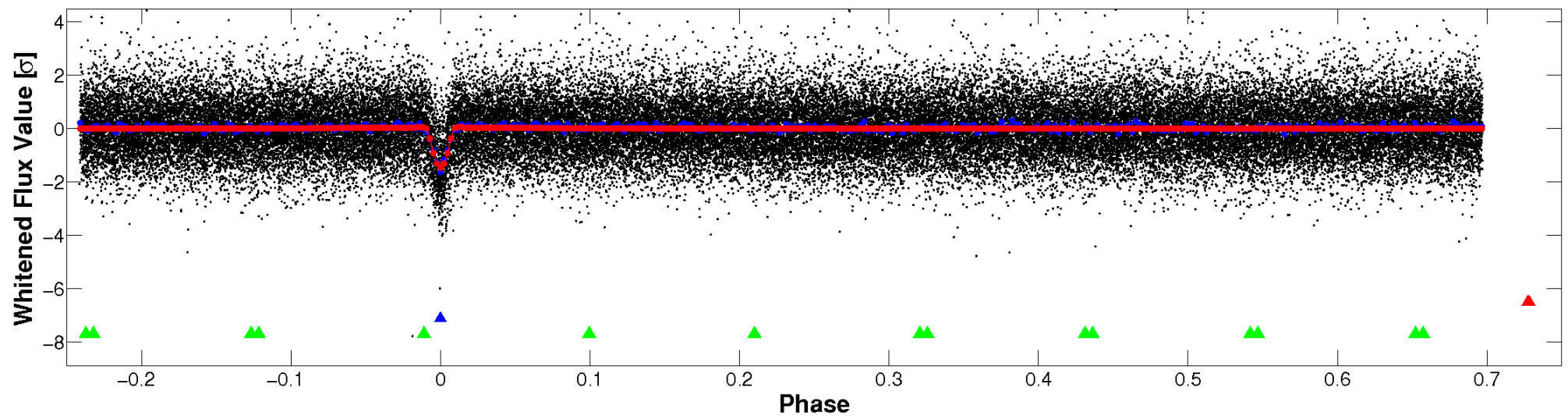


# Non-Whitened Vs. Whitened Light Curve

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

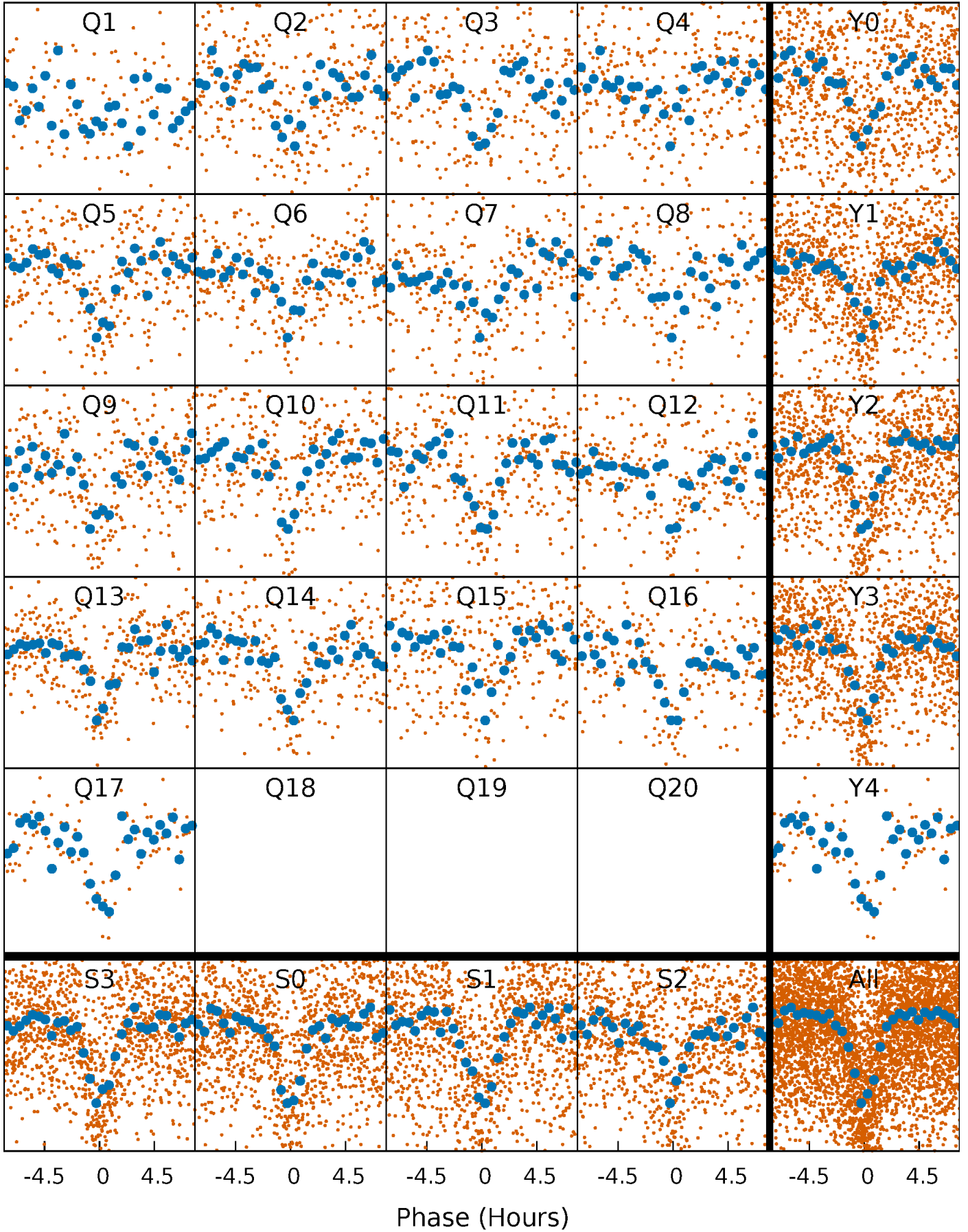


## Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



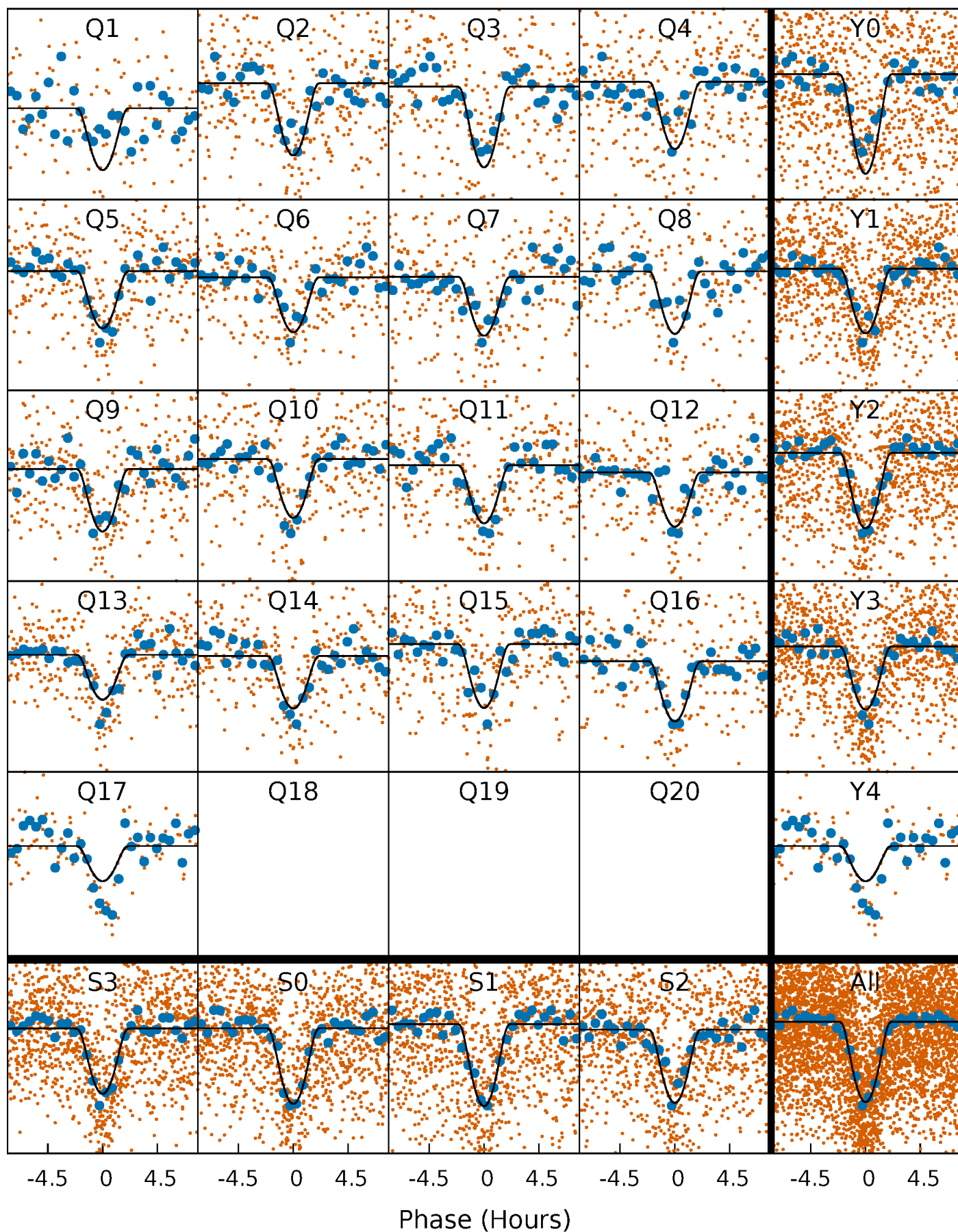
# PDC Quarter-Phased Transit Curves

TCE 004150624-02     $P = 8.653063$  Days     $T_0 = 136.661062$  (BKJD)



# DV Quarter-Phased Transit Curves

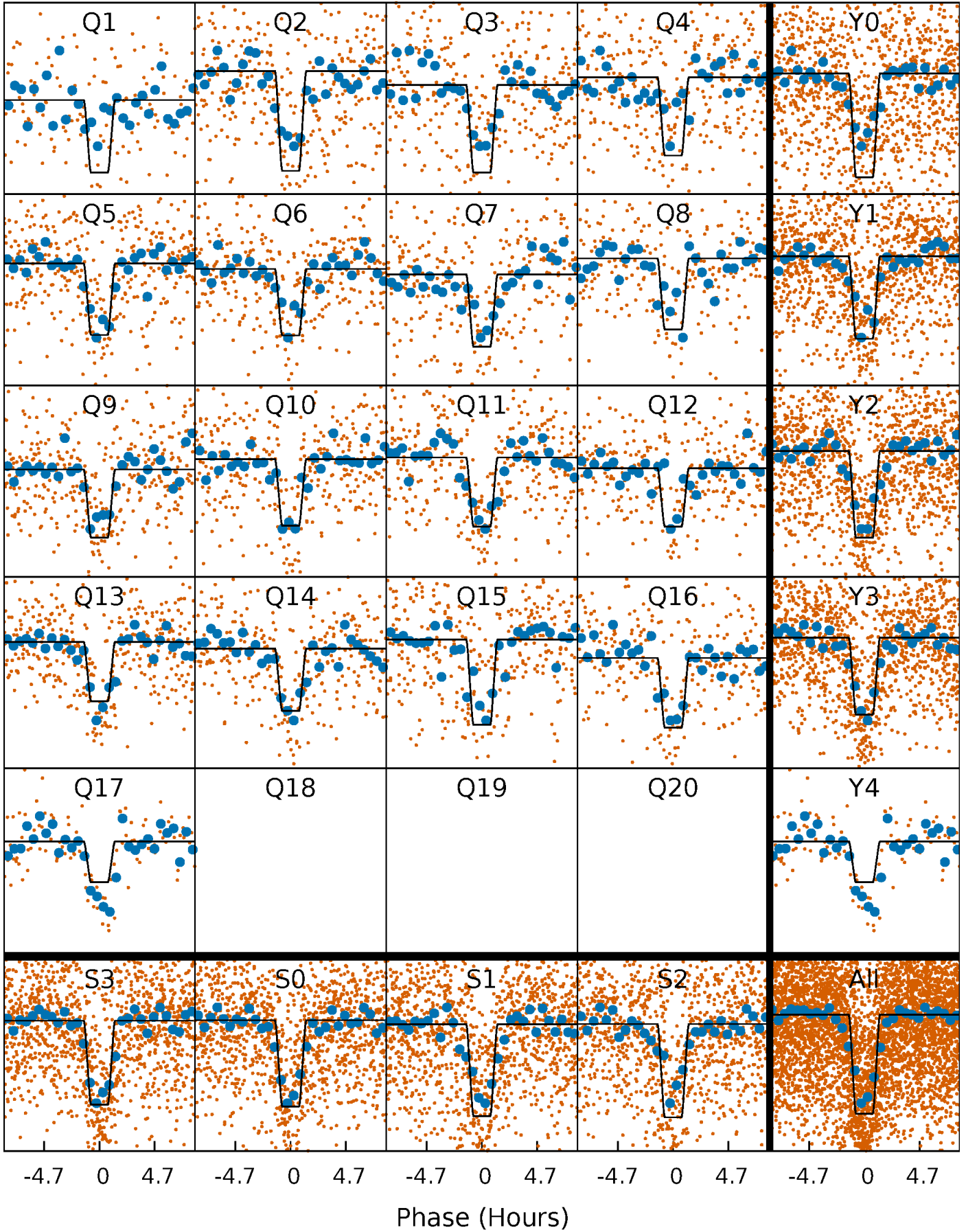
TCE 004150624-02   P= 8.653063 Days    $T_0=136.661062$  (BKJD)





# Alt. Detrend Quarter-Phased Transit Curves

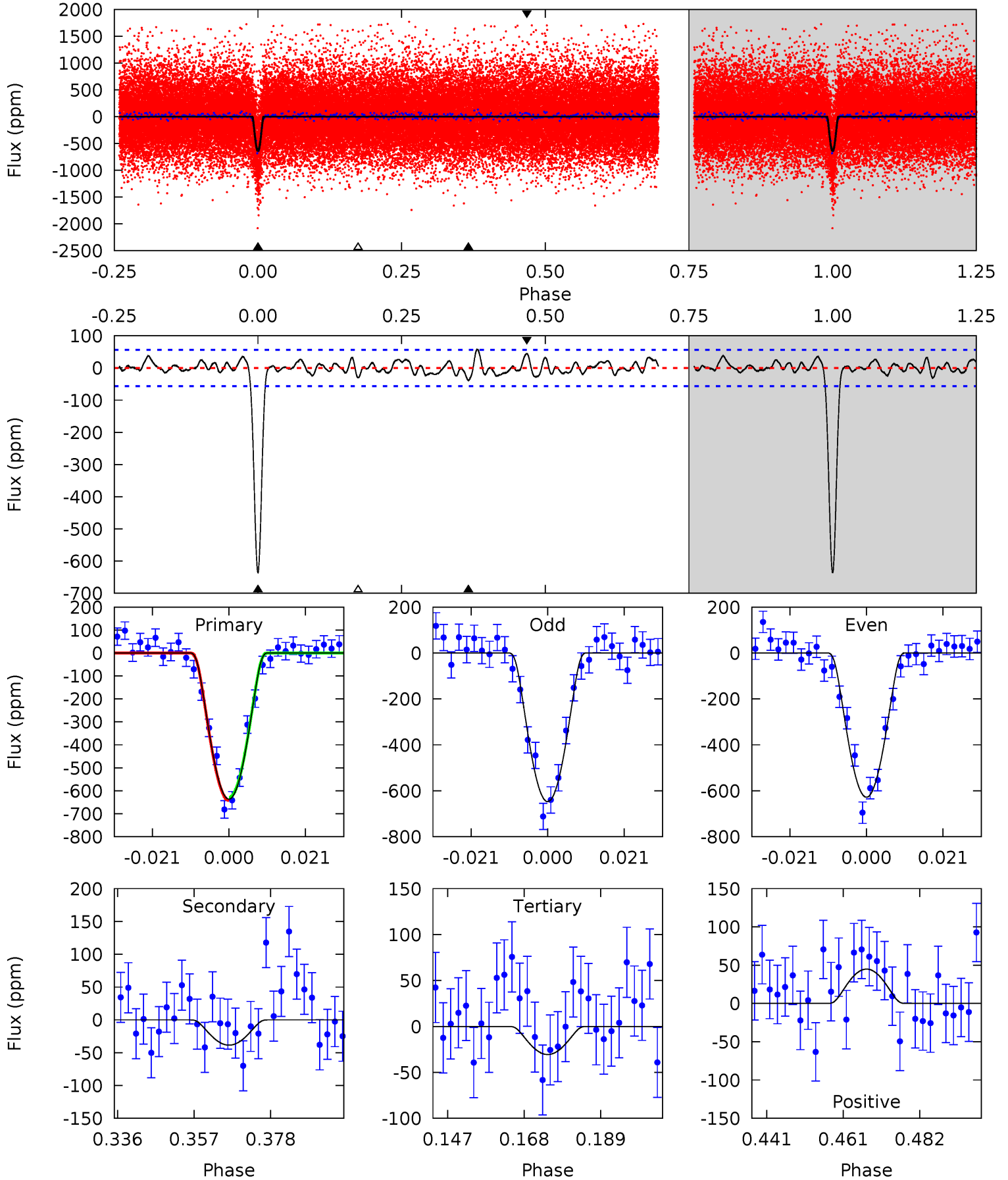
TCE 004150624-02 P= 8.653068 Days  $T_0=136.659783$  (BKJD)



# DV Model-Shift Uniqueness Test

004150624-02, P = 8.653063 Days, E = 128.007999 Days

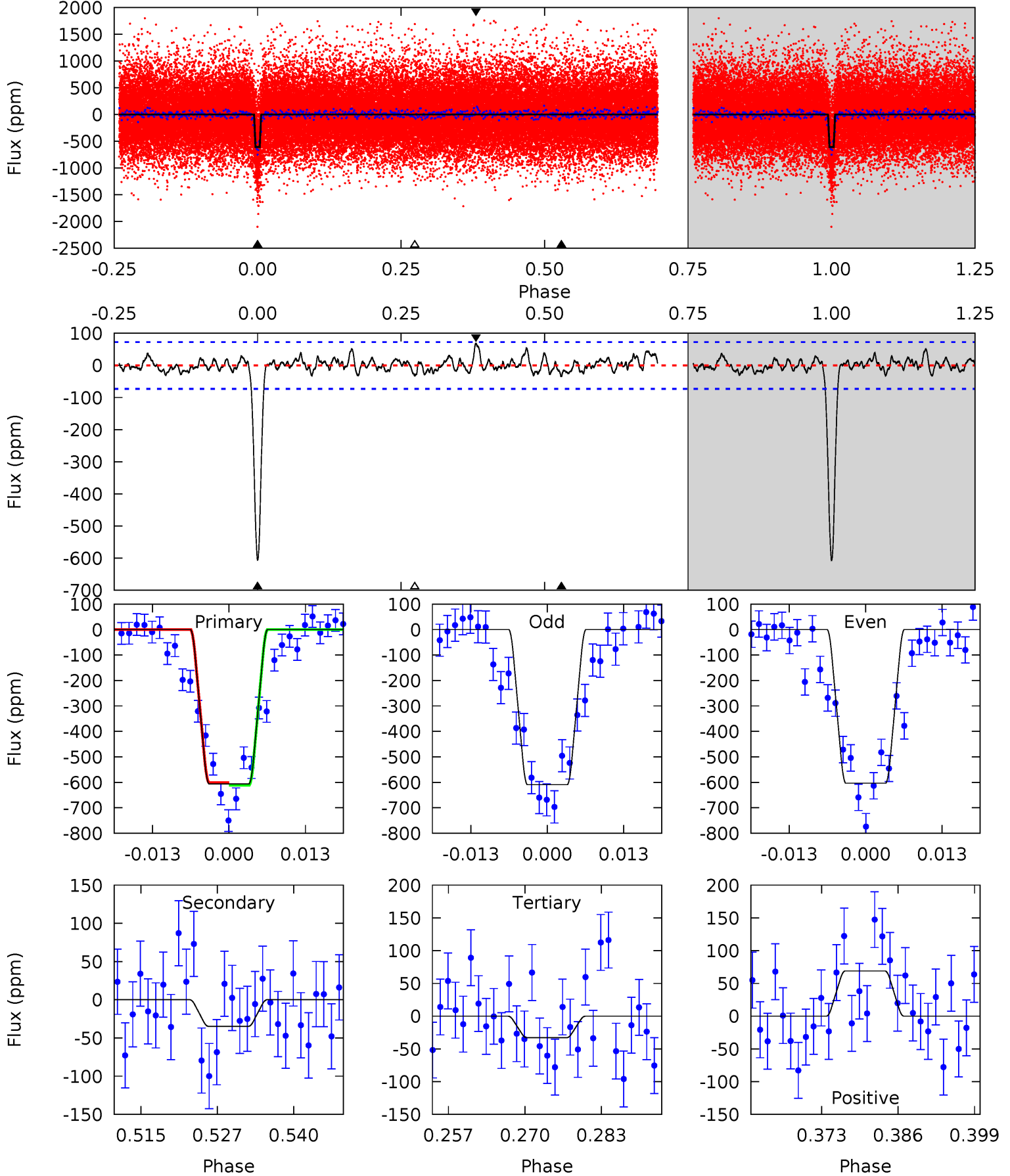
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
55.2	3.34	2.65	3.89	4.88	2.31	1.29	52.5	51.3	0.69	-0.55	0.83	1.02	0.08	0.49



# Alt Model-Shift Uniqueness Test

004150624-02, P = 8.653068 Days, E = 128.006715 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
41.4	2.38	2.25	4.72	4.98	2.49	1.17	39.2	36.7	0.13	-2.33	0.21	0.98	0.10	0.36





### Stellar Parameters For KIC 004150624

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R$ ( $R_{\odot}$ )	$M(M_{\odot})$	$p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ )
	$5421^{+164}_{-164}$	$4.564^{+0.028}_{-0.171}$	$0.210^{+0.200}_{-0.300}$	$0.852^{+0.198}_{-0.062}$	$0.969^{+0.065}_{-0.106}$	$2.207^{+0.344}_{-0.974}$
	+3%/-3%	+1%/-4%	+95%/-143%	+23%/-7%	+7%/-11%	+16%/-44%
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 004150624-02 / KOI

Detrend	Depth (ppm)	$R_p$ ( $R_{\oplus}$ )	$T_{\text{max}}$ (K)	$T_{\text{obs}}$ (K)	$A_{\text{obs}}$
DV	$-39 \pm 12$	$5.61^{+4.67}_{-3.44}$	$1102^{+63}_{-45}$	$2544^{+837}_{-376}$	$4.158^{+24.012}_{-2.923}$
Alt.	$-35 \pm 15$	$4.75^{+4.43}_{-3.23}$	$1104^{+59}_{-46}$	$2627^{+1022}_{-451}$	$5.542^{+42.681}_{-4.230}$

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

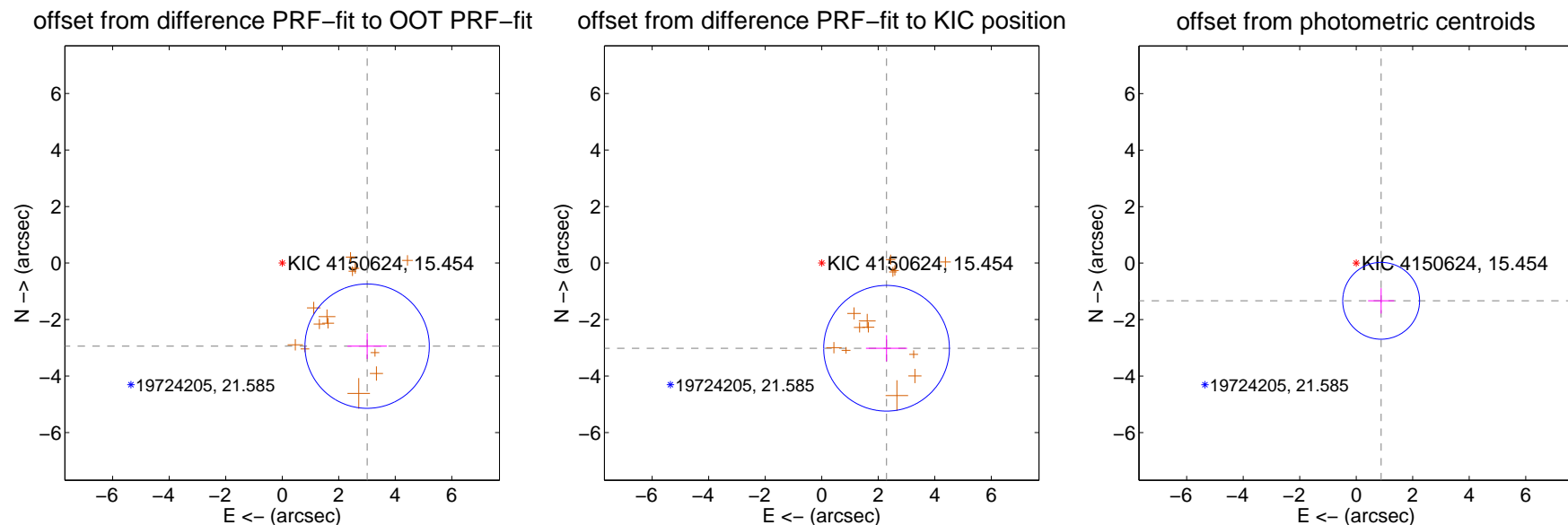
## DV Centroid Data

Supplemental centroid analysis for 004150624-02. Kepler magnitude: 15.45. Transit SNR 33.25

There are 0 quarters with good PRF difference image offsets

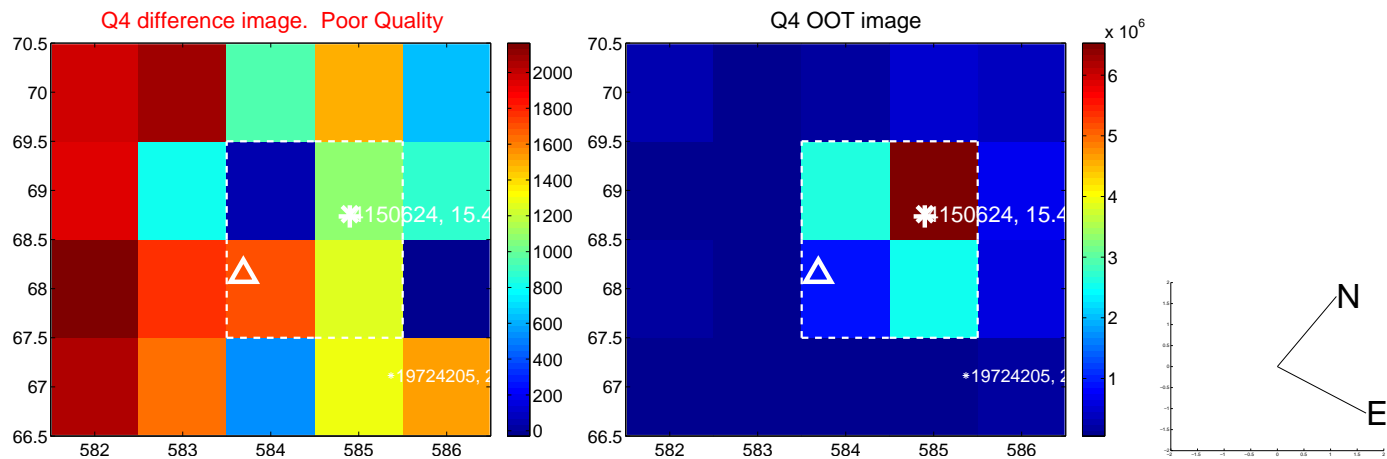
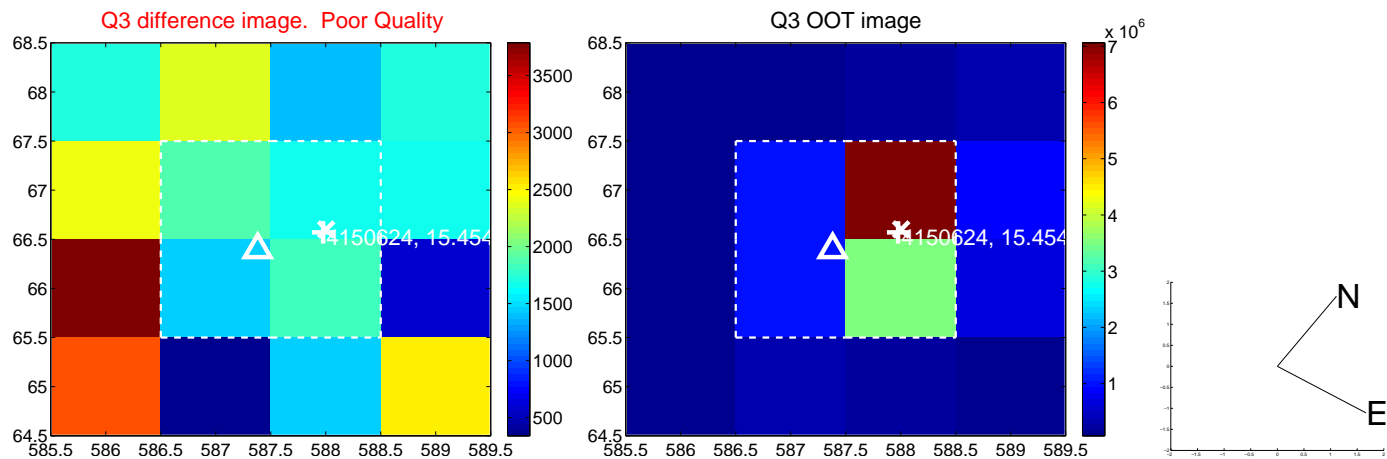
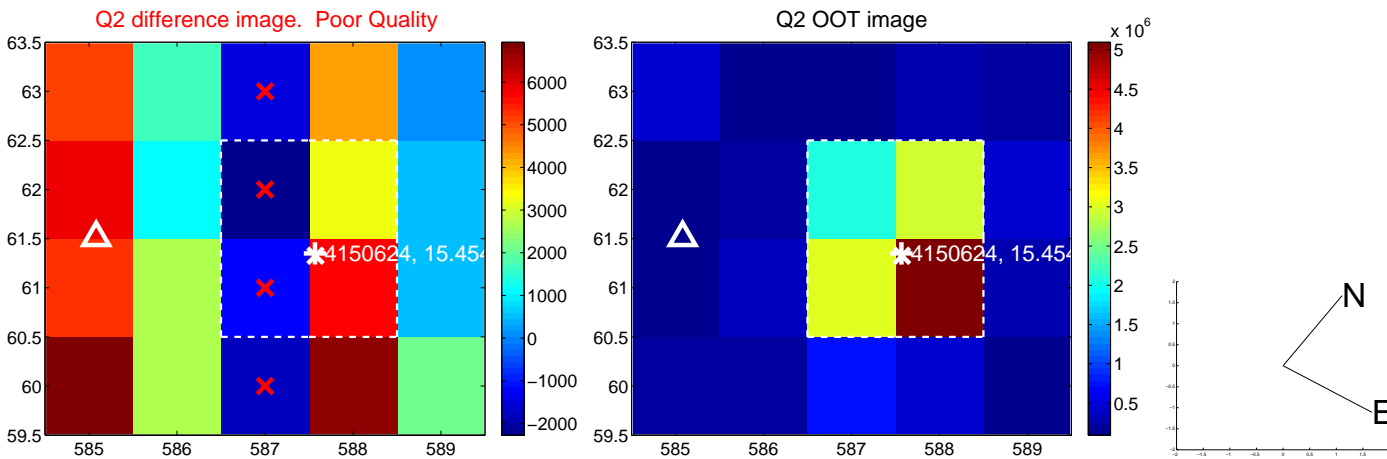
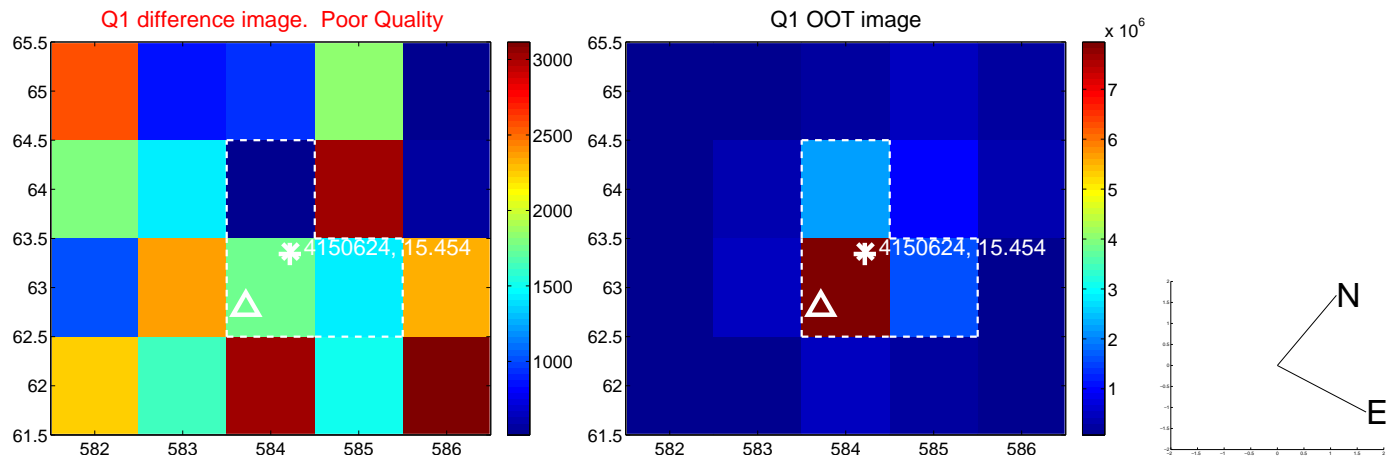
The direct PRF centroid is offset from the target star catalog position by about 0.09 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$4.204 \pm 0.733$	5.73	$-3.004 \pm 0.696$	$-2.941 \pm 0.454$
PRF-fit source offset from KIC position	$3.788 \pm 0.741$	5.11	$-2.293 \pm 0.727$	$-3.015 \pm 0.465$
photometric centroid source offset	$1.60 \pm 0.45$	3.53	$-0.88 \pm 0.46$	$-1.33 \pm 0.45$

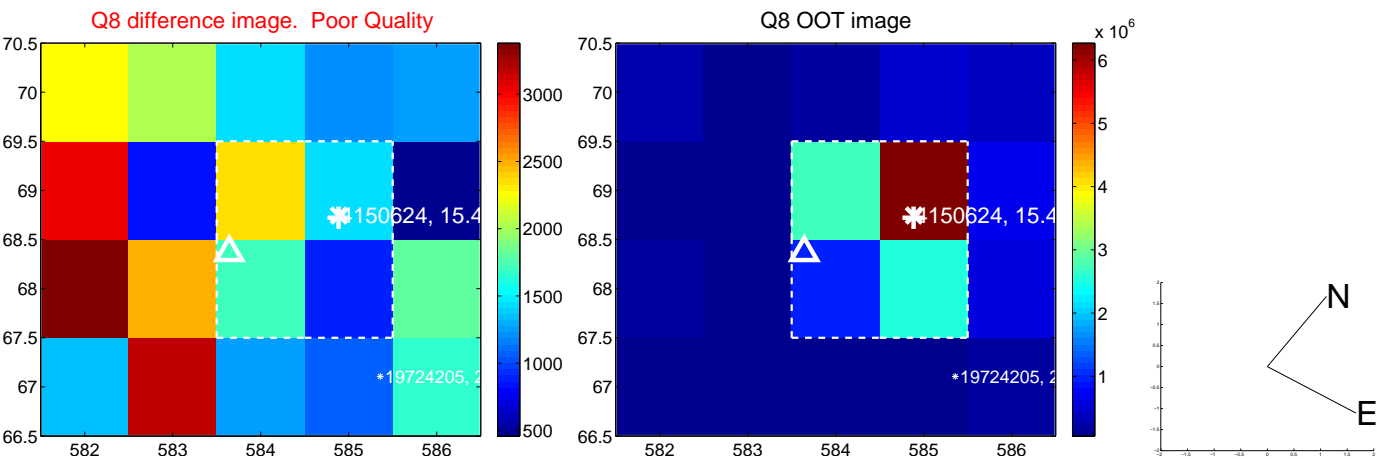
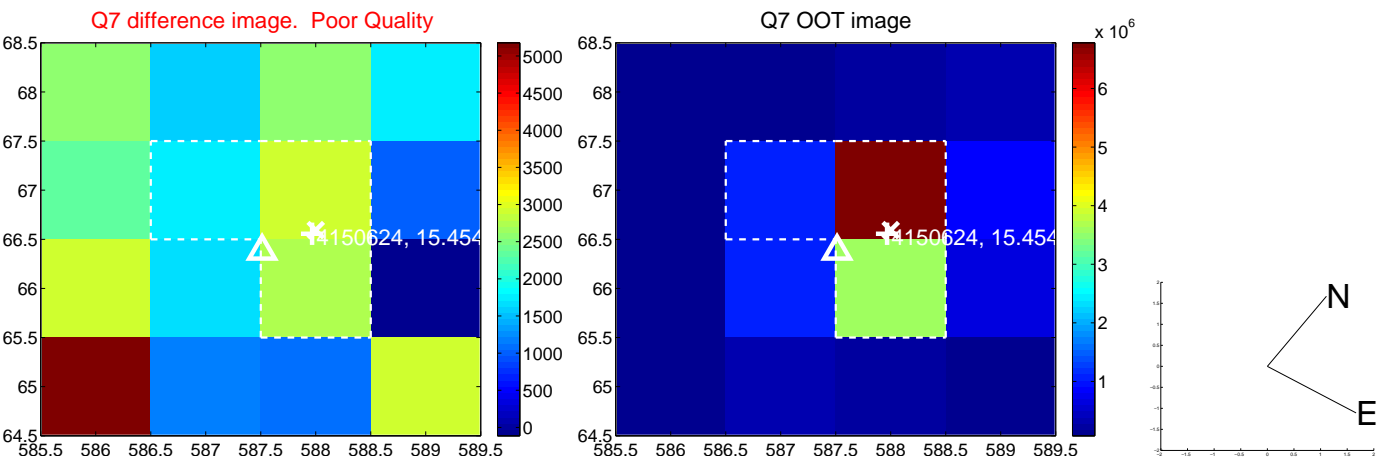
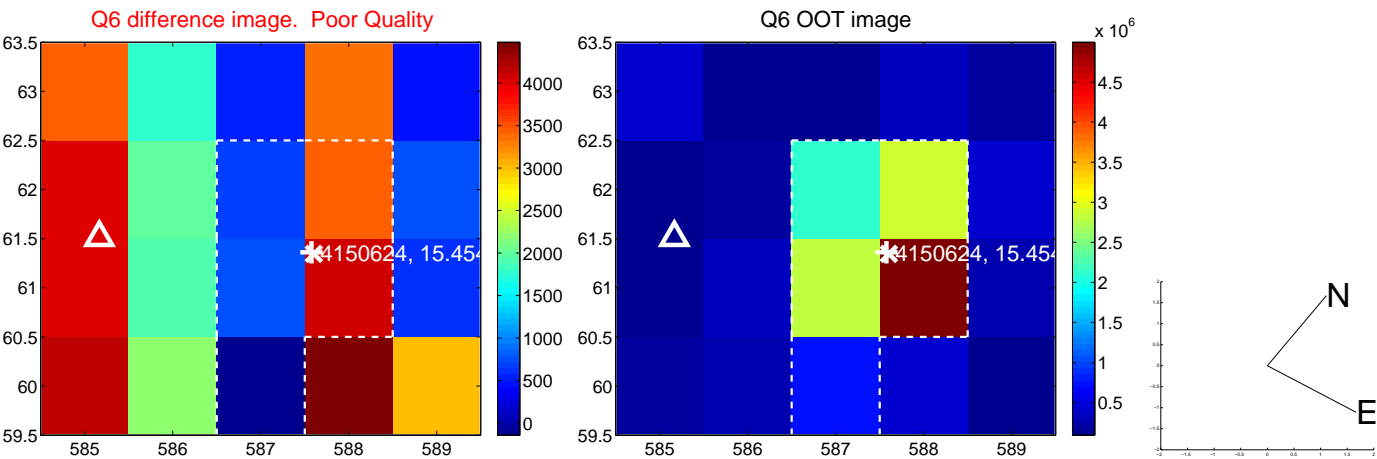
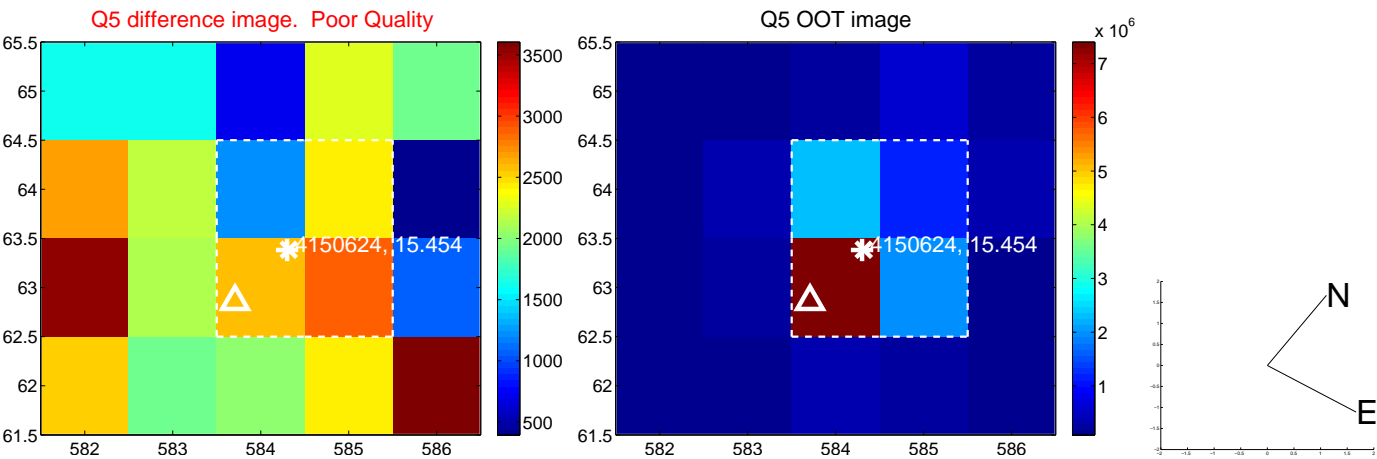


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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

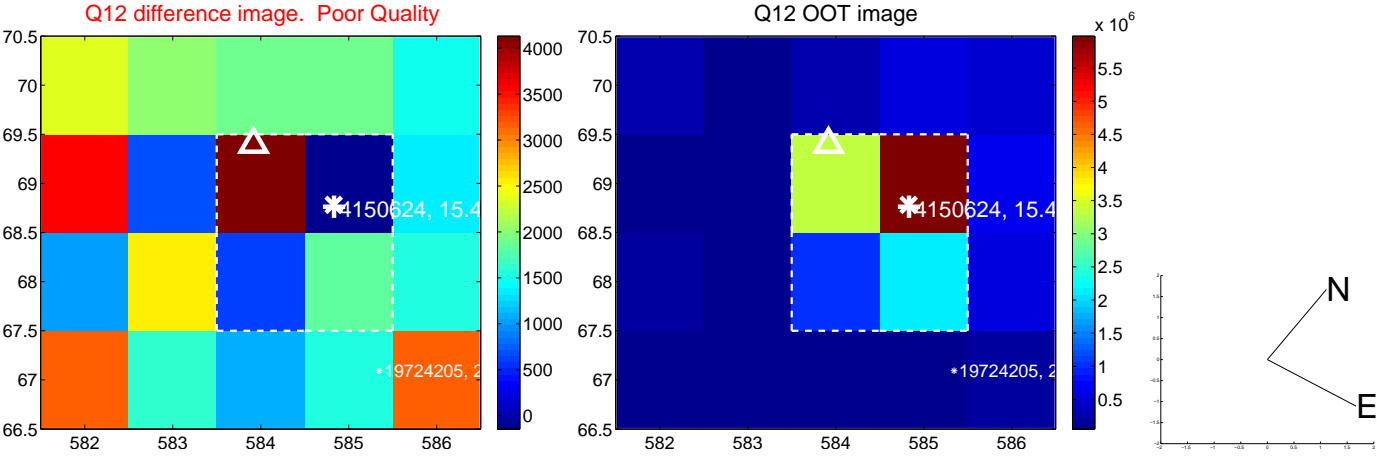
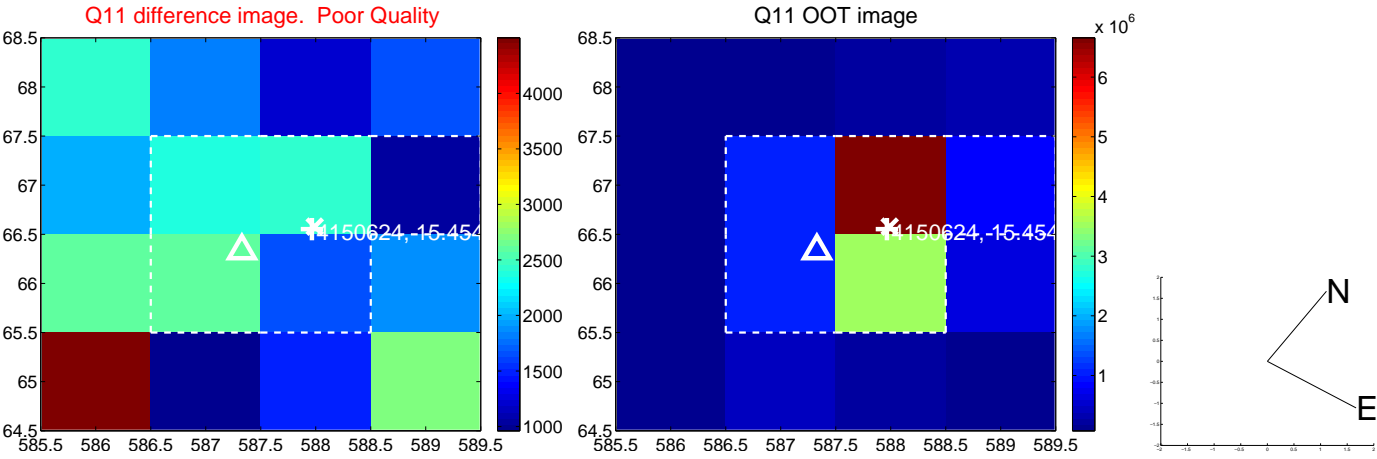
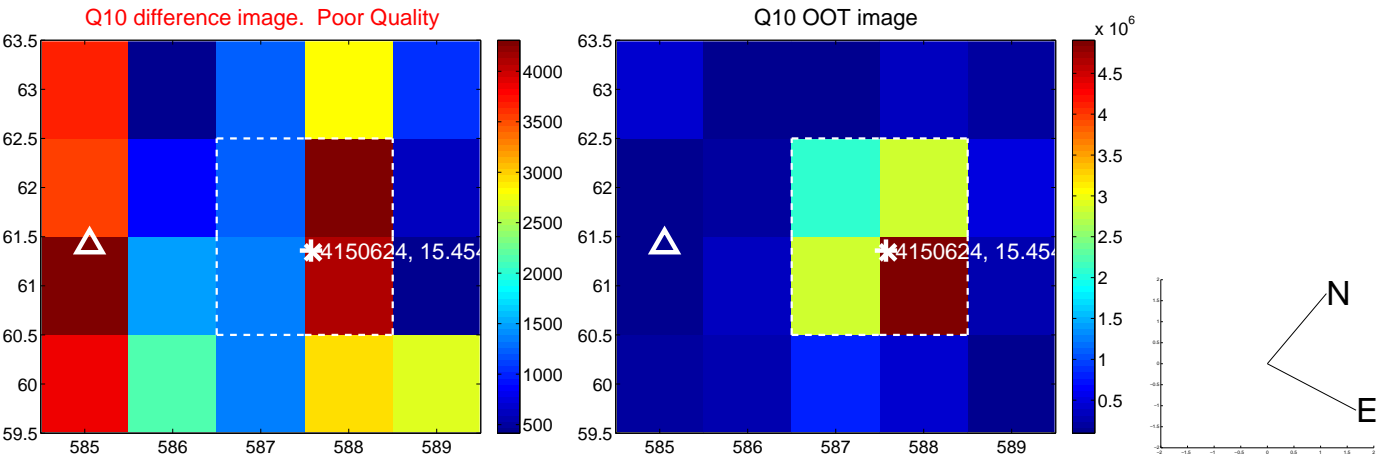
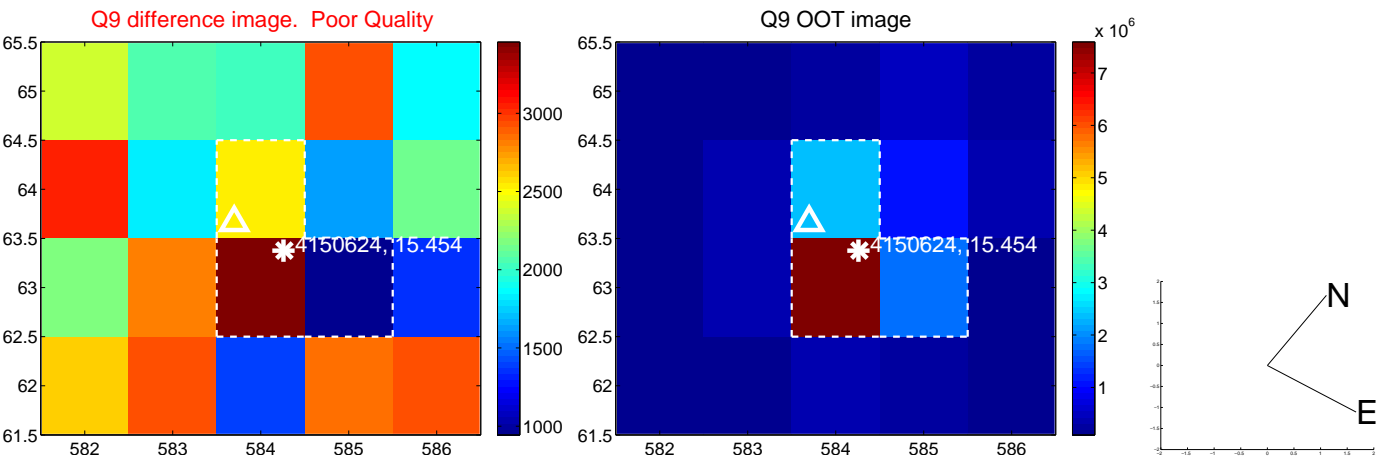
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



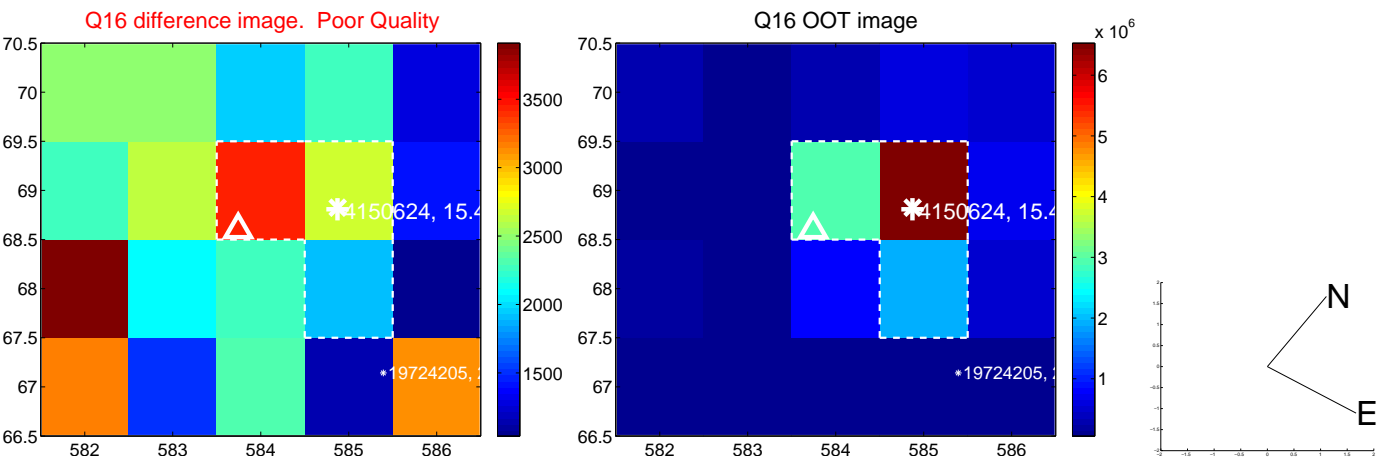
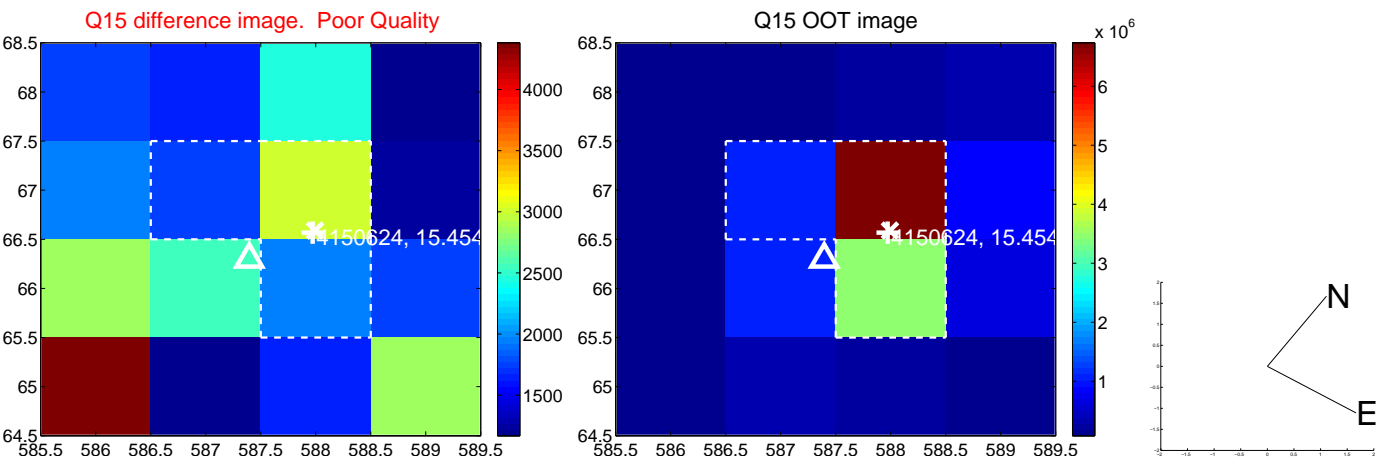
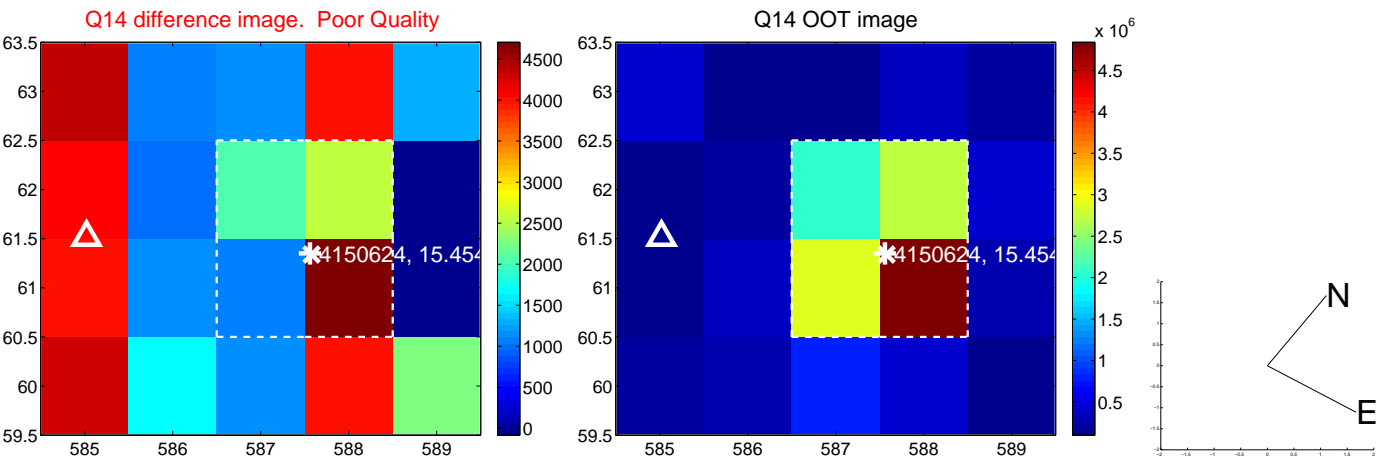
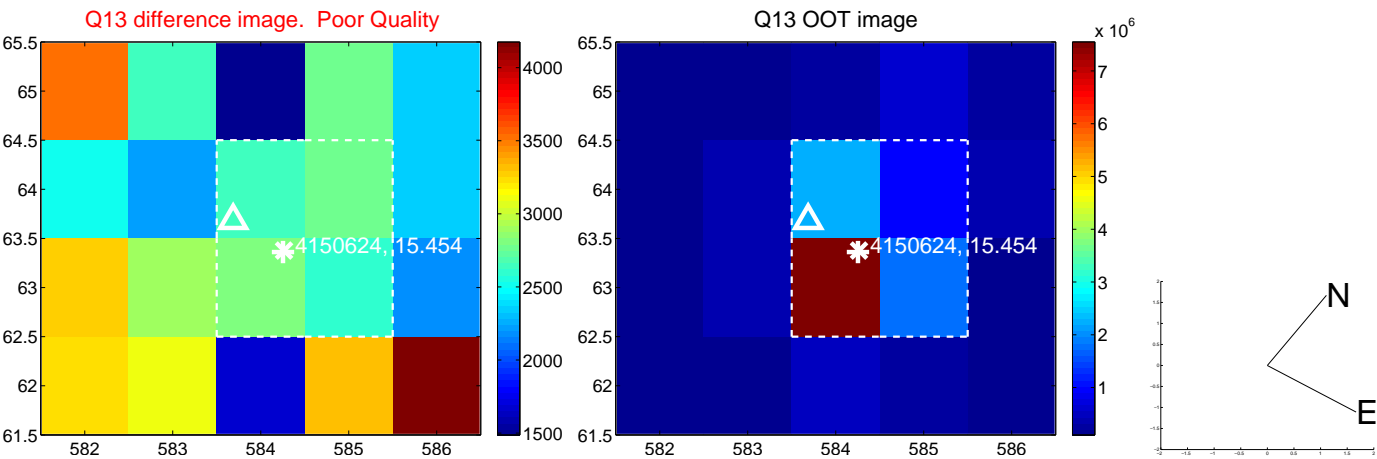
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

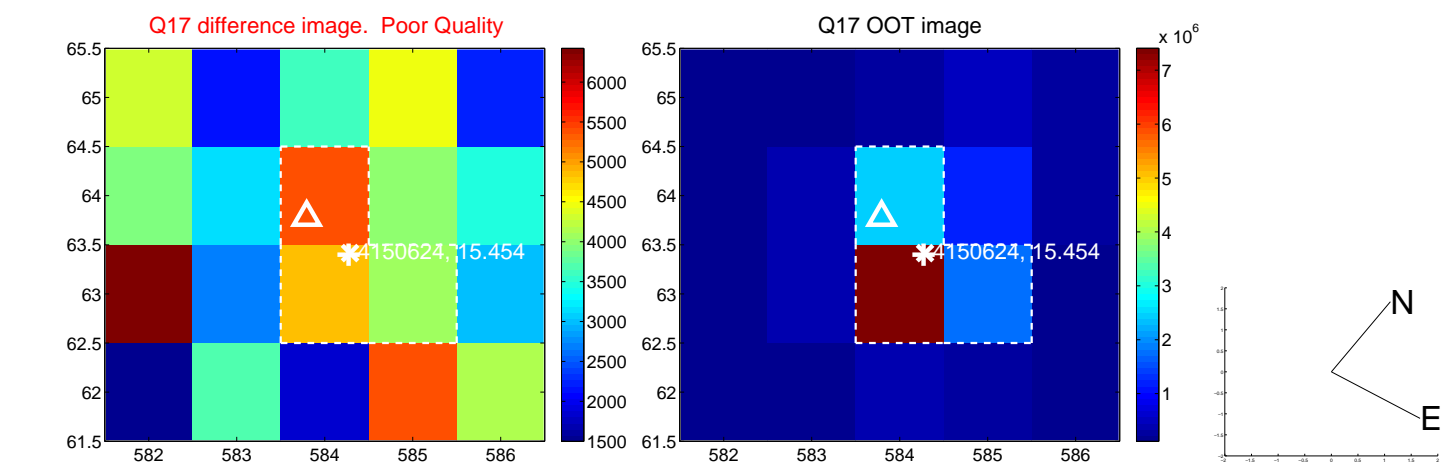


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

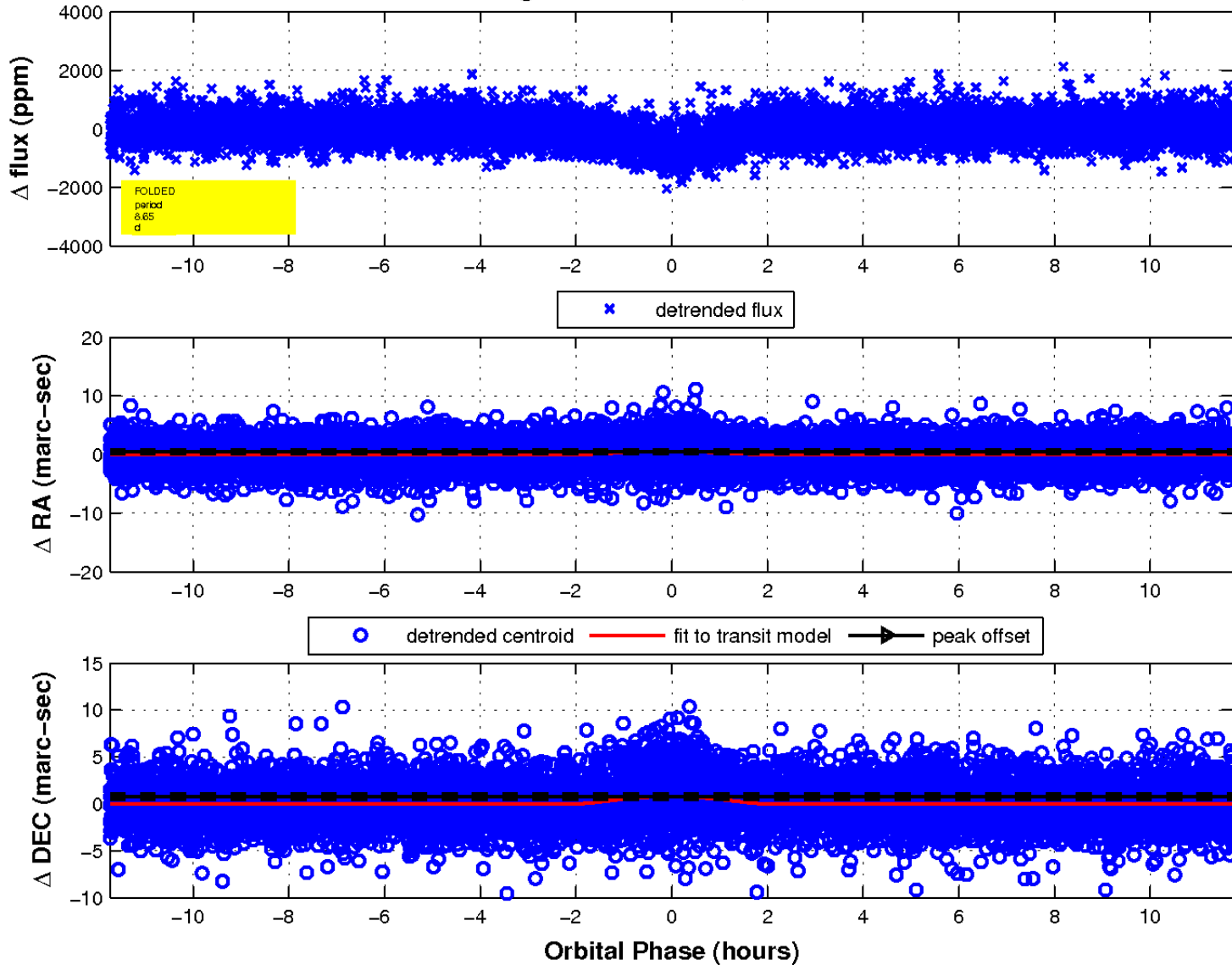




white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

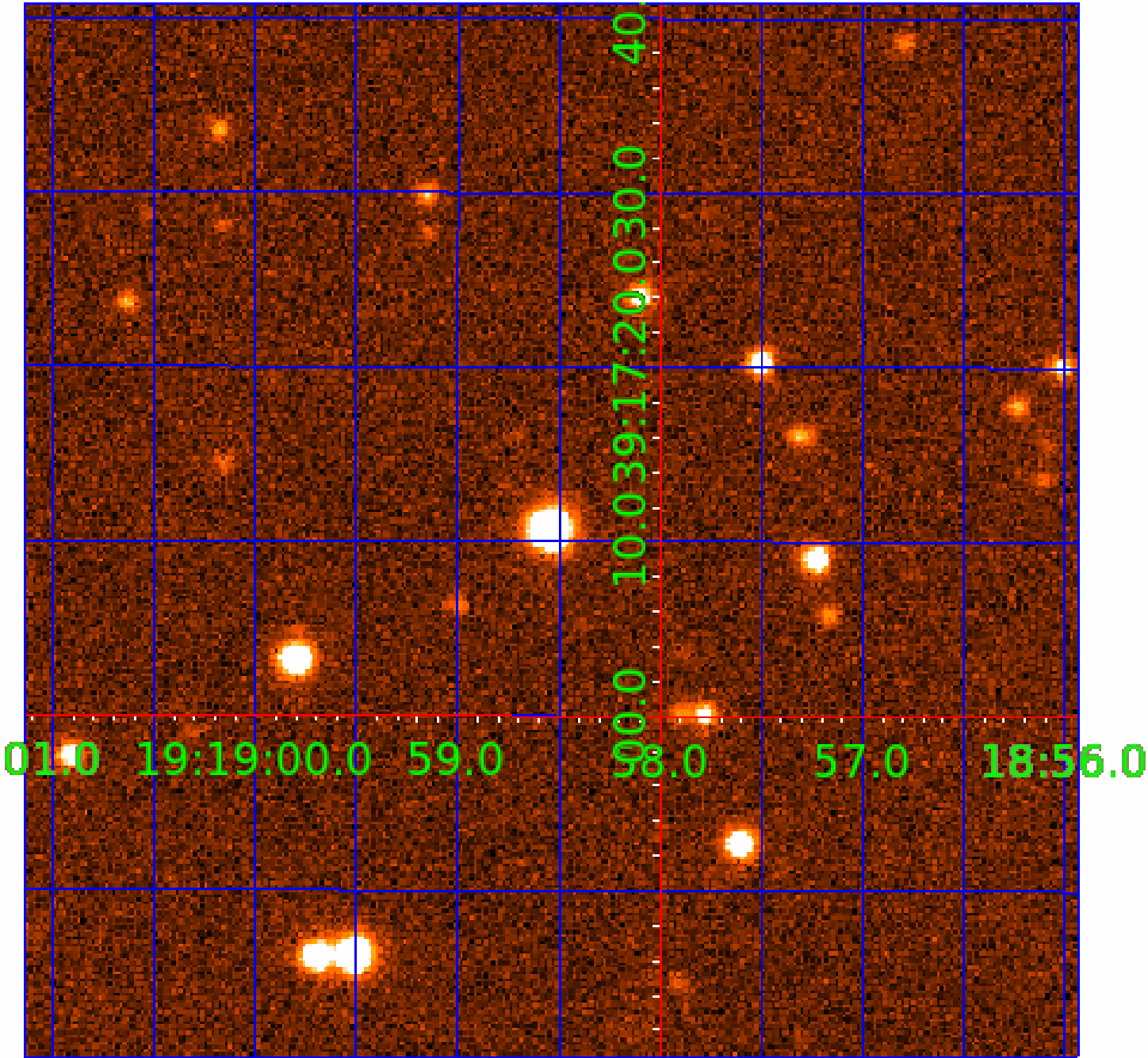


fluxWeightedCentroids, Planet 2 of 3



UKIRT Image

Declination



# KIC 004150624

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
004150624-01	OBS	1334.01	8.653136	134.299795	634.2	4.163	28.9	32.4	0.85	5421	4.08	84.19
004150624-02	OBS	No	8.653063	136.661062	640.5	3.913	29.8	33.2	0.85	5421	4.21	84.19
004150624-03	OBS	1334.02	94.227104	196.136845	571.4	26.764	15.9	20.9	0.85	5421	2.51	3.49

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
004150624-01	OBS	FP	0.00	0	1	1	1	MOD_SEC_DV—MOD_SEC_ALT—HAS_SEC_TCE—CENT_FEW_DIFFS—HALO_GHOST—EPHEM_MATCH
004150624-02	OBS	FP	0.00	1	1	1	1	IS_SEC_TCE—CENT_RESOLVED_OFFSET—HALO_GHOST—EPHEM_MATCH
004150624-03	OBS	FP	0.00	1	0	1	1	INDIV_TRANS_RUBBLE_SKYE_ZUMA—CENT_FEW_DIFFS—HALO_GHOST—EPHEM_MATCH

**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 004150624-03

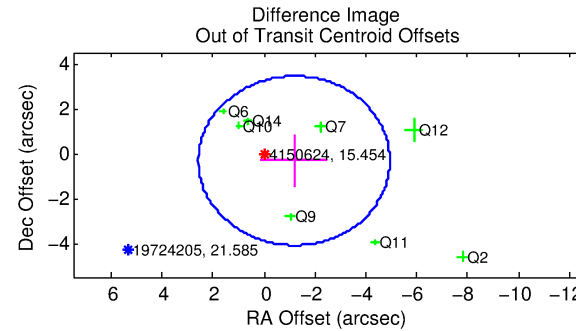
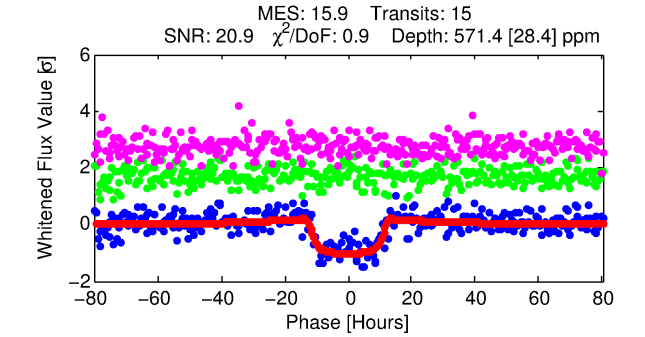
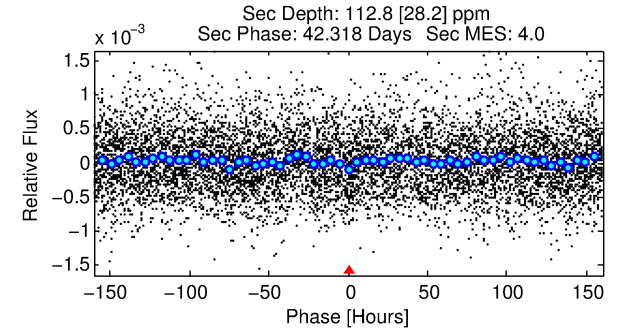
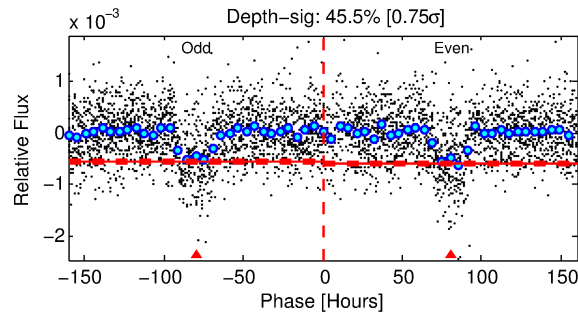
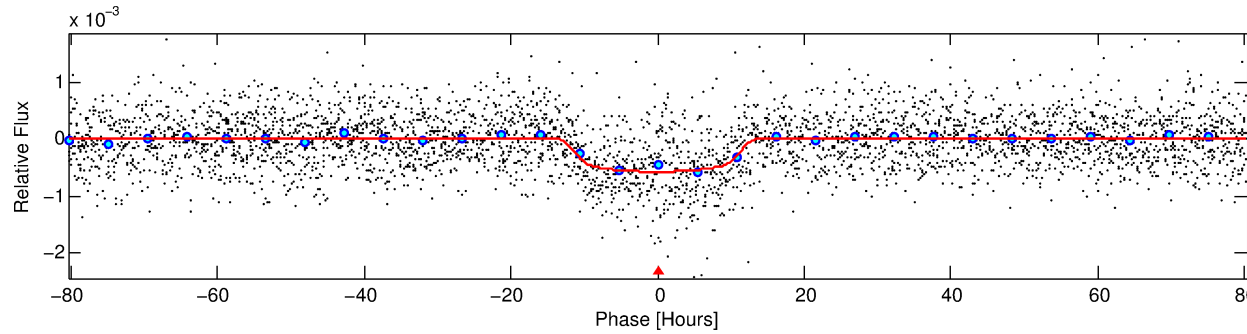
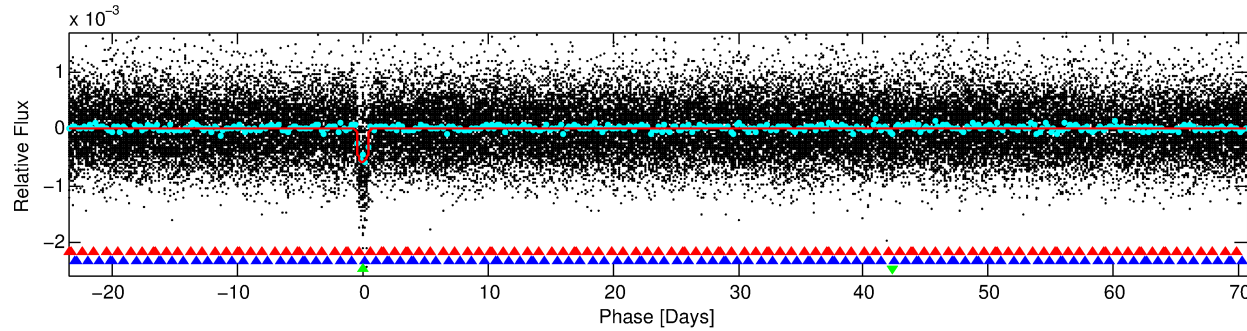
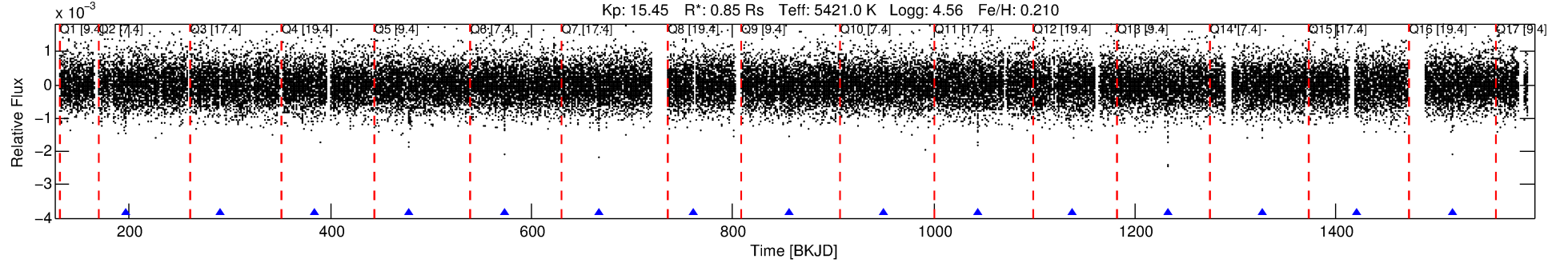
TCE (1)	KIC	Parent (2)	Parent KIC	P <sub>1</sub> :P <sub>2</sub>	Dist ( $\mu$ )	$\Delta$ Row	$\Delta$ Col	m <sub>2</sub>	m <sub>1</sub>	D <sub>2</sub> /D <sub>1</sub>	Mechanism	Flag	$\sigma_P$	$\sigma_T$
004150624-03	4150624	3156.04	4150611	1:1	69.4	14	11	7.90	15.46	85.57	Direct-PRF	0	0.45	0.52

**Notes:** P<sub>1</sub>:P<sub>2</sub> is the period ratio. Dist is the distance in arcseconds.  $\Delta$ Row and  $\Delta$ Col are the number of pixels apart in row and column. m<sub>2</sub> and m<sub>1</sub> are the magnitudes of the parent and child. D<sub>2</sub>/D<sub>1</sub> is the parent's transit depth divided by the child's.  $\sigma_P$  and  $\sigma_T$  are the significance of the match in period and epoch. For a match to be considered significant  $\sigma_P < 5.0$  and  $\sigma_T < 5.0$ . Matches which have  $\sigma_P$  and  $\sigma_T$  very close to this cutoff should receive extra scrutiny, especially if the period ratio is very large.

# DV One-Page Summary

KIC: 4150624 Candidate: 3 of 3 Period: 94.227 d  
KOI: K01334 Corr: No Ephemeris Match

Kp: 15.45 R\*: 0.85 Rs Teff: 5421.0 K Logg: 4.56 Fe/H: 0.210



## DV Fit Results:

Period = 94.22710 [0.00306] d  
Epoch = 196.1368 [0.0265] BKJD  
Rp/R\* = 0.0270 [0.0014]  
a/R\* = 12.36 [2.18]  
b = 0.92 [0.03]  
Seff = 3.49 [1.14]  
Teq = 348 [29] K  
Rp = 2.51 [0.60] Re  
a = 0.4013 [0.0815] AU  
Ag = 1585.29 [645.41] [2.45σ]  
Teffp = 3400 [251] K [12.06σ]

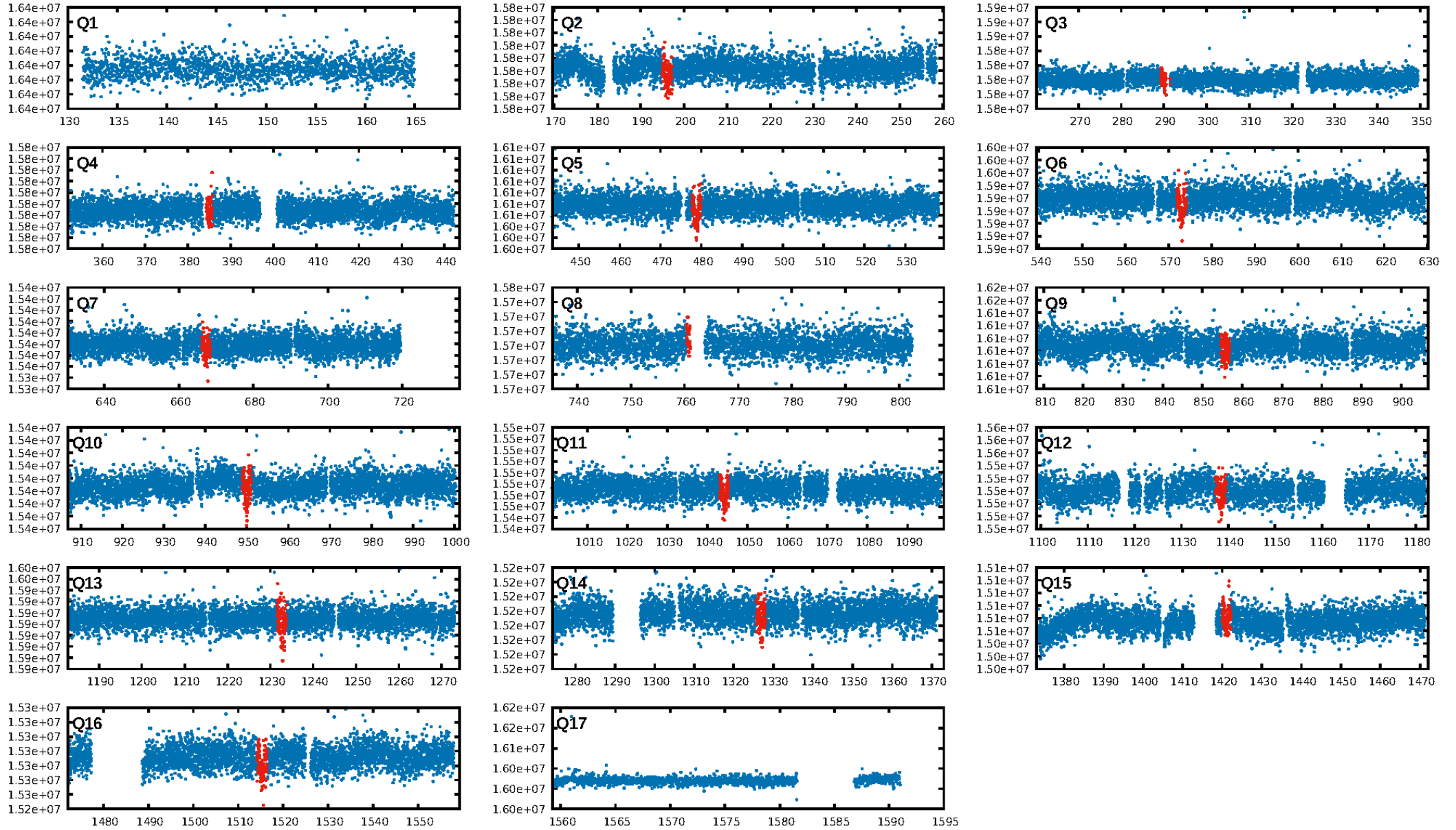
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [75.83σ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: 0.0%  
ModelChiSquareGof-sig: 100.0%  
Bootstrap-pfa: 2.30e-61  
RollingBand-fgt: 1.00 [15/15]  
GhostDiagnostic-chr: -0.07986  
Centroid-sig: 0.3%  
Centroid-so: 1.417 arcsec [2.51σ]  
OotOffset-rm: 1.232 arcsec [0.98σ]  
KicOffset-rm: 1.318 arcsec [1.06σ]  
OotOffset-st: 4/2/1/1 [8]  
KicOffset-st: 4/2/1/1 [8]  
DiffImageQuality-fgm: 0.12 [1/8]  
DiffImageOverlap-fno: 0.25 [2/8]

Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 01-Feb-2016 03:18:35 Z

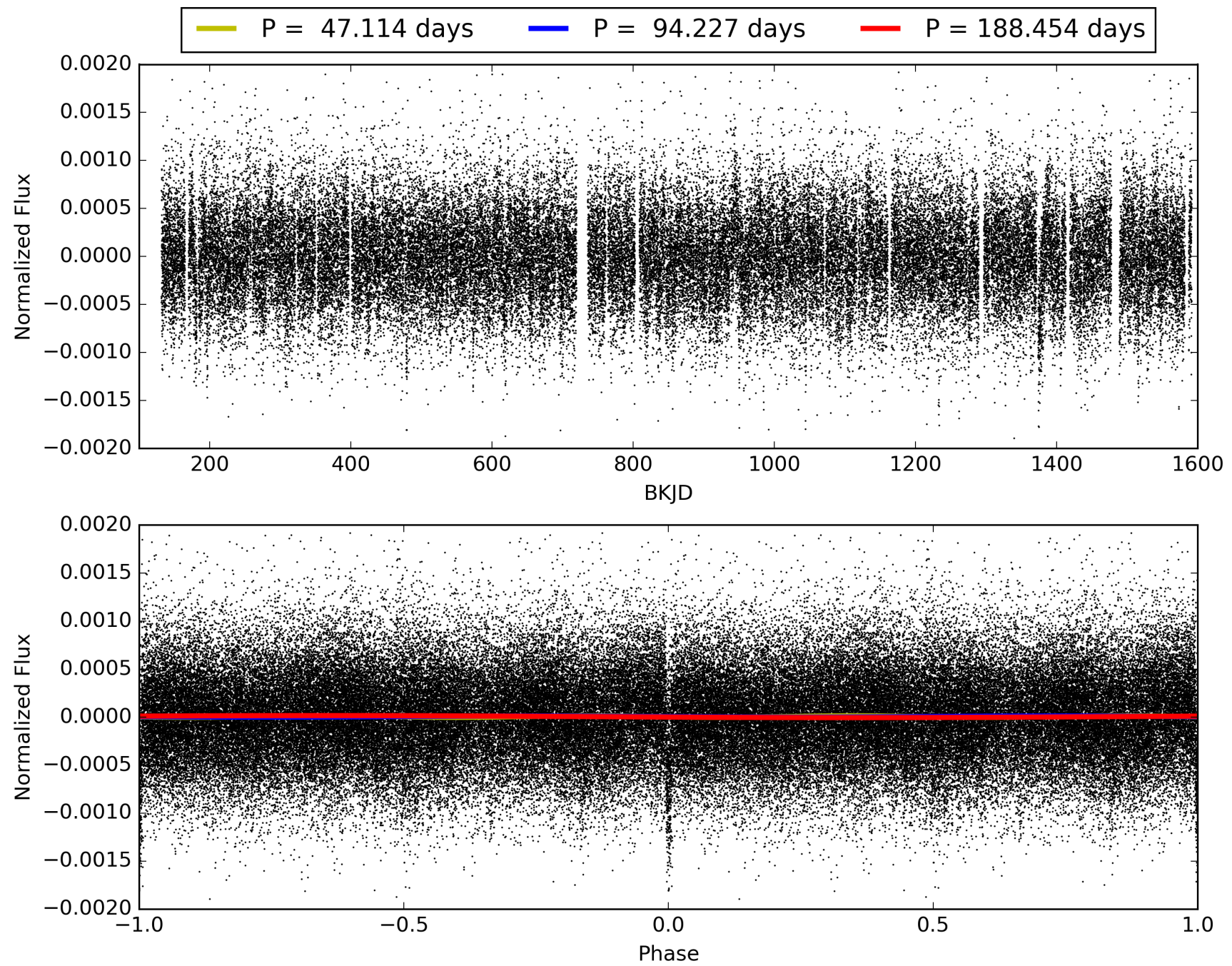
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

# TCE 004150624-03, PDC Light Curves





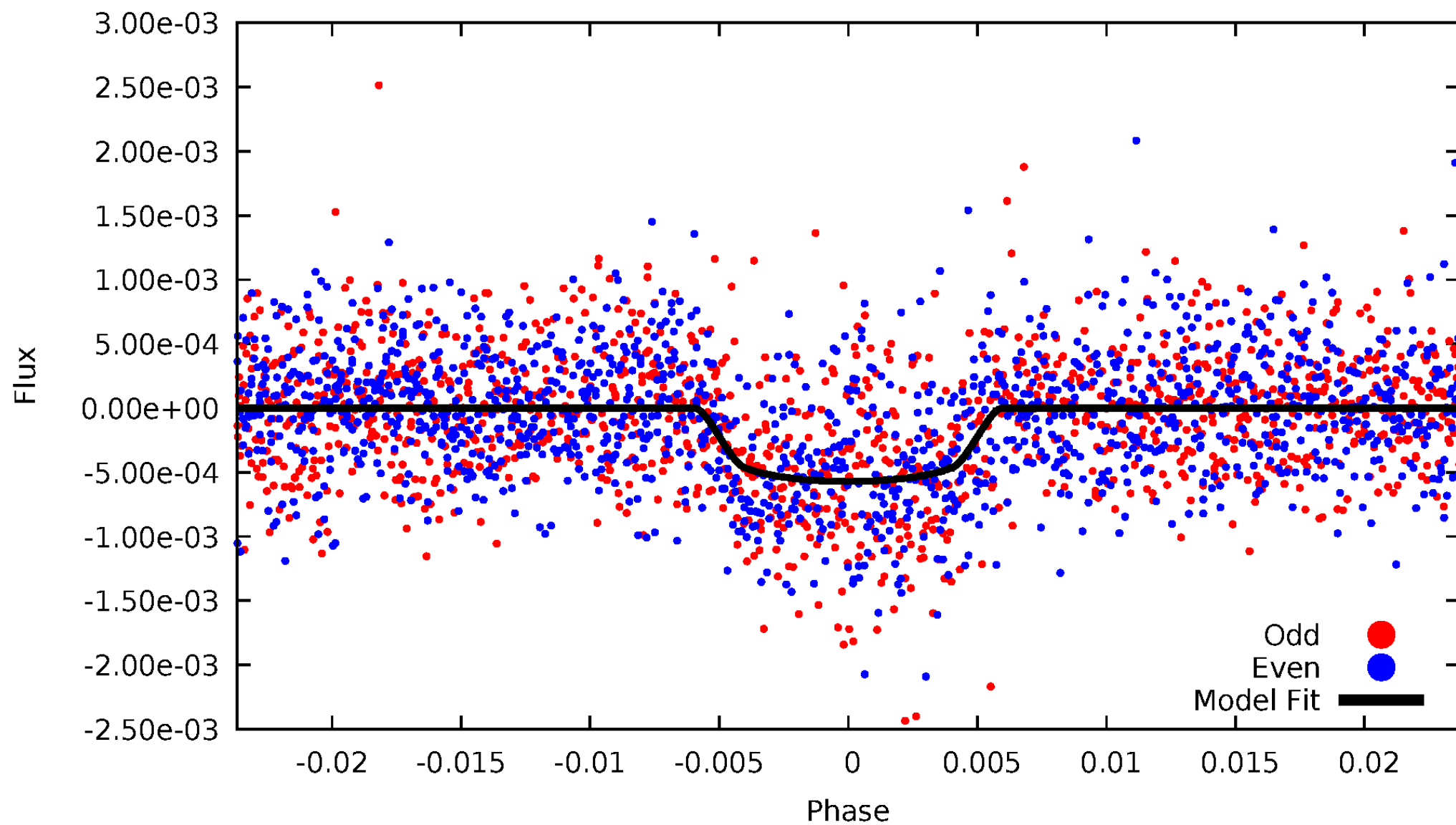
TCE 004150624-03





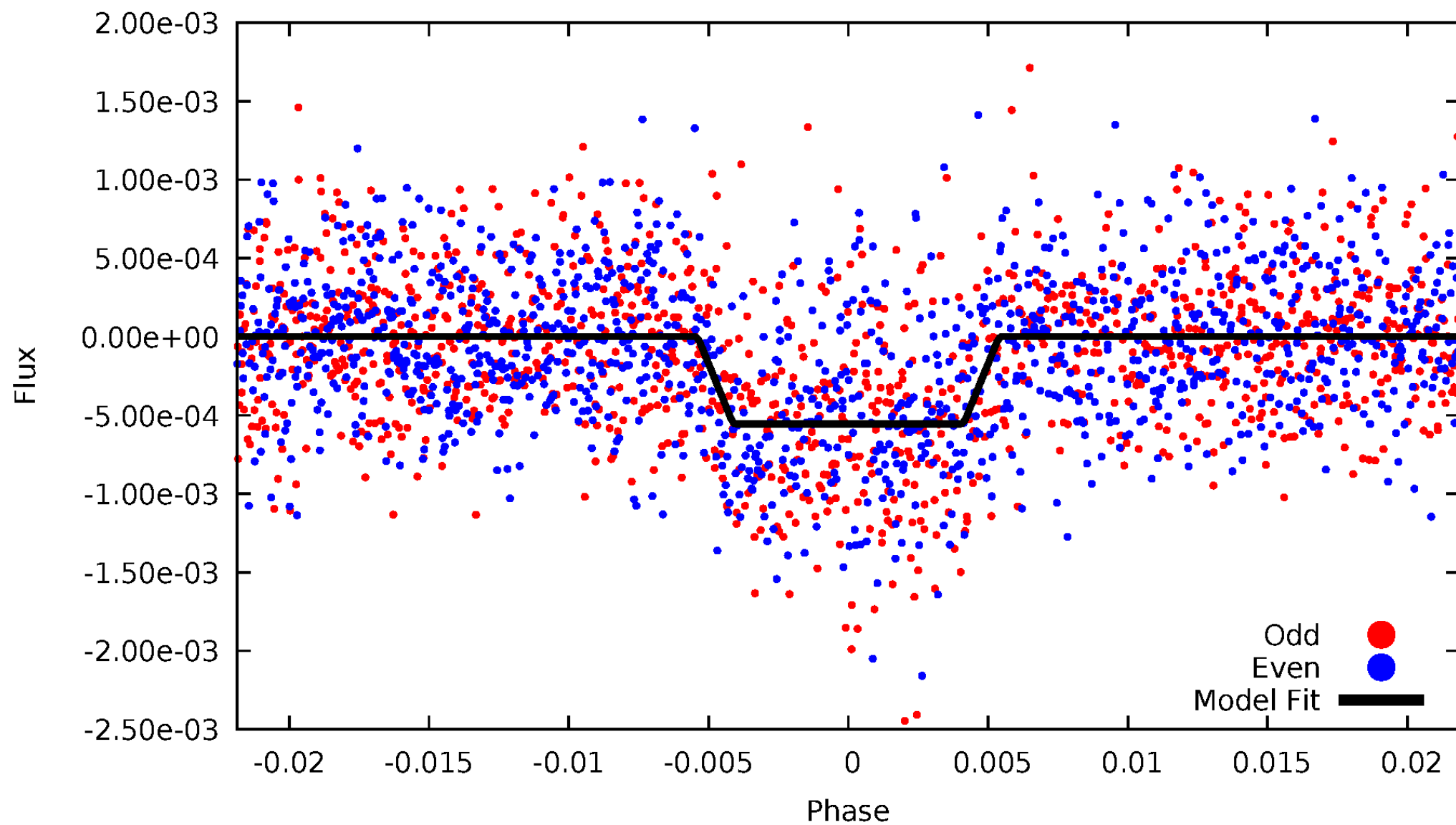
DV Odd/Even

TCE 004150624-03



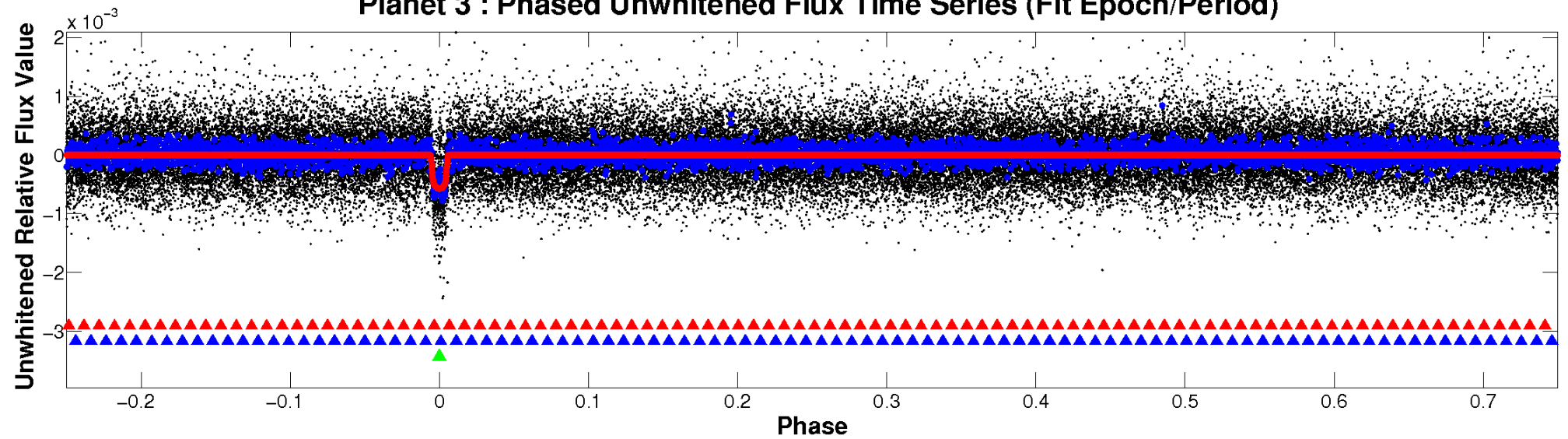
# ALT Odd/Even

TCE 004150624-03

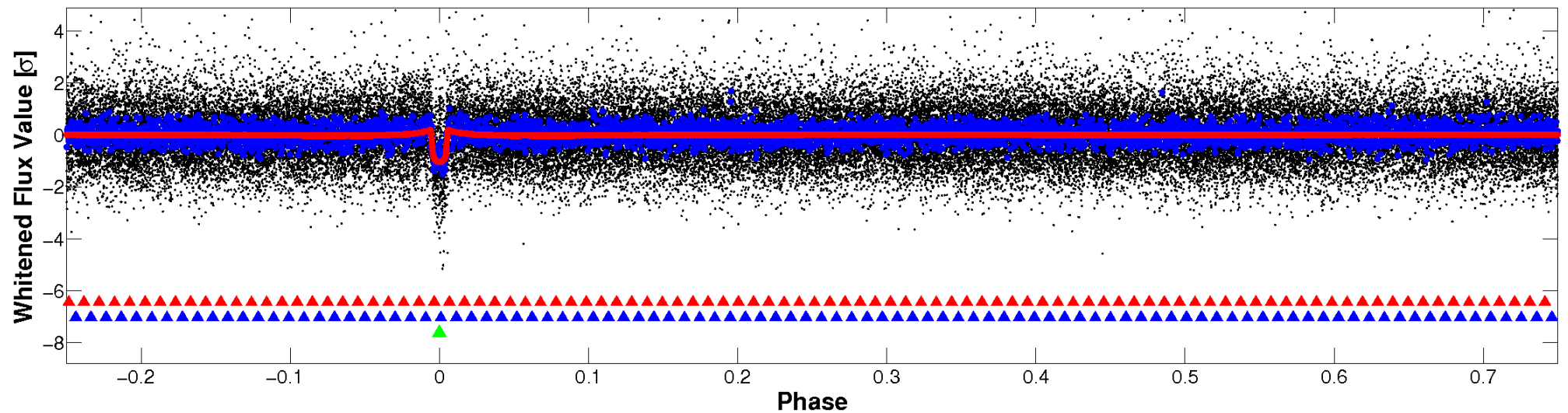


# Non-Whitened Vs. Whitened Light Curve

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

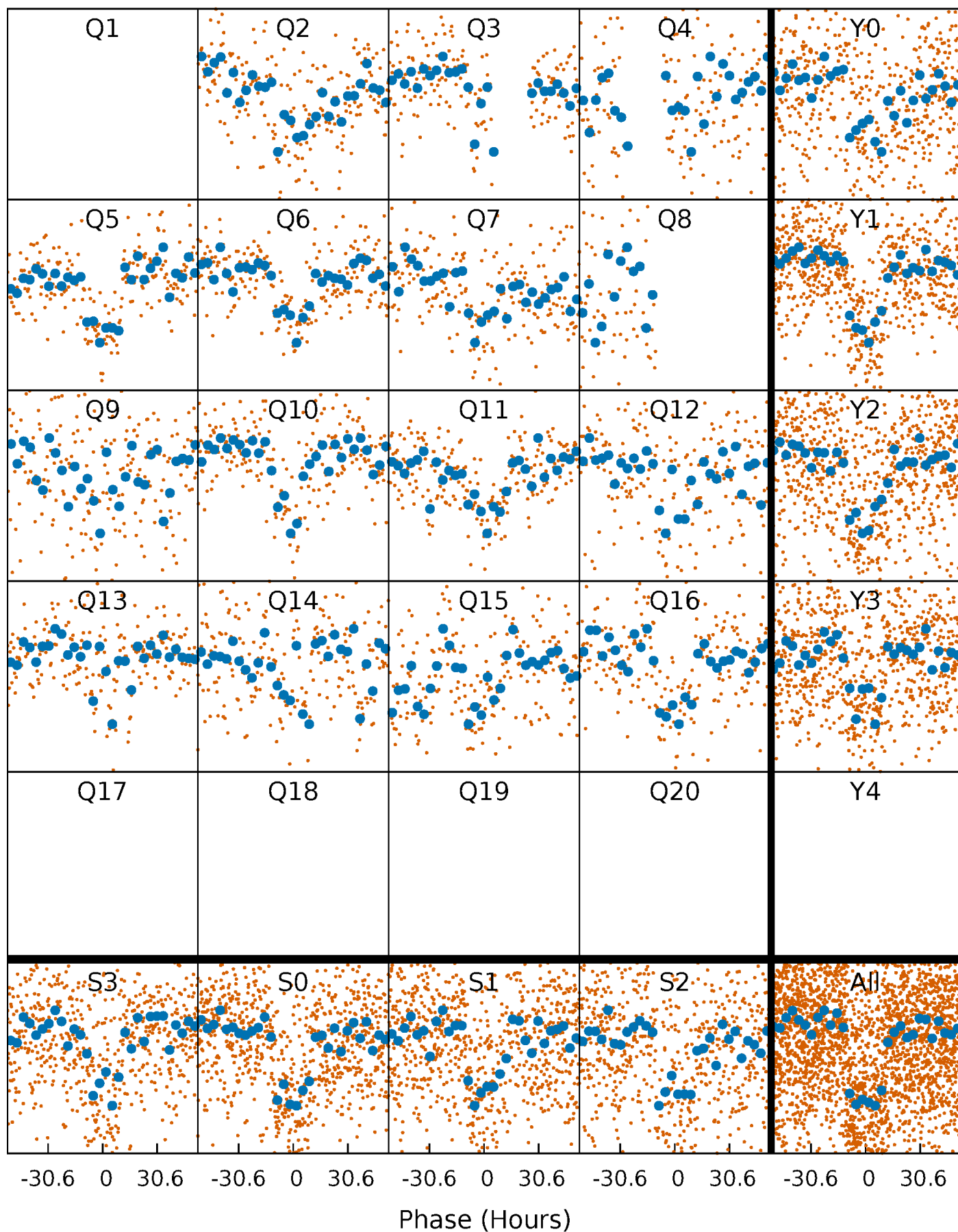


Planet 3 : Phased Whitened Flux Time Series (Fit Epoch/Period)



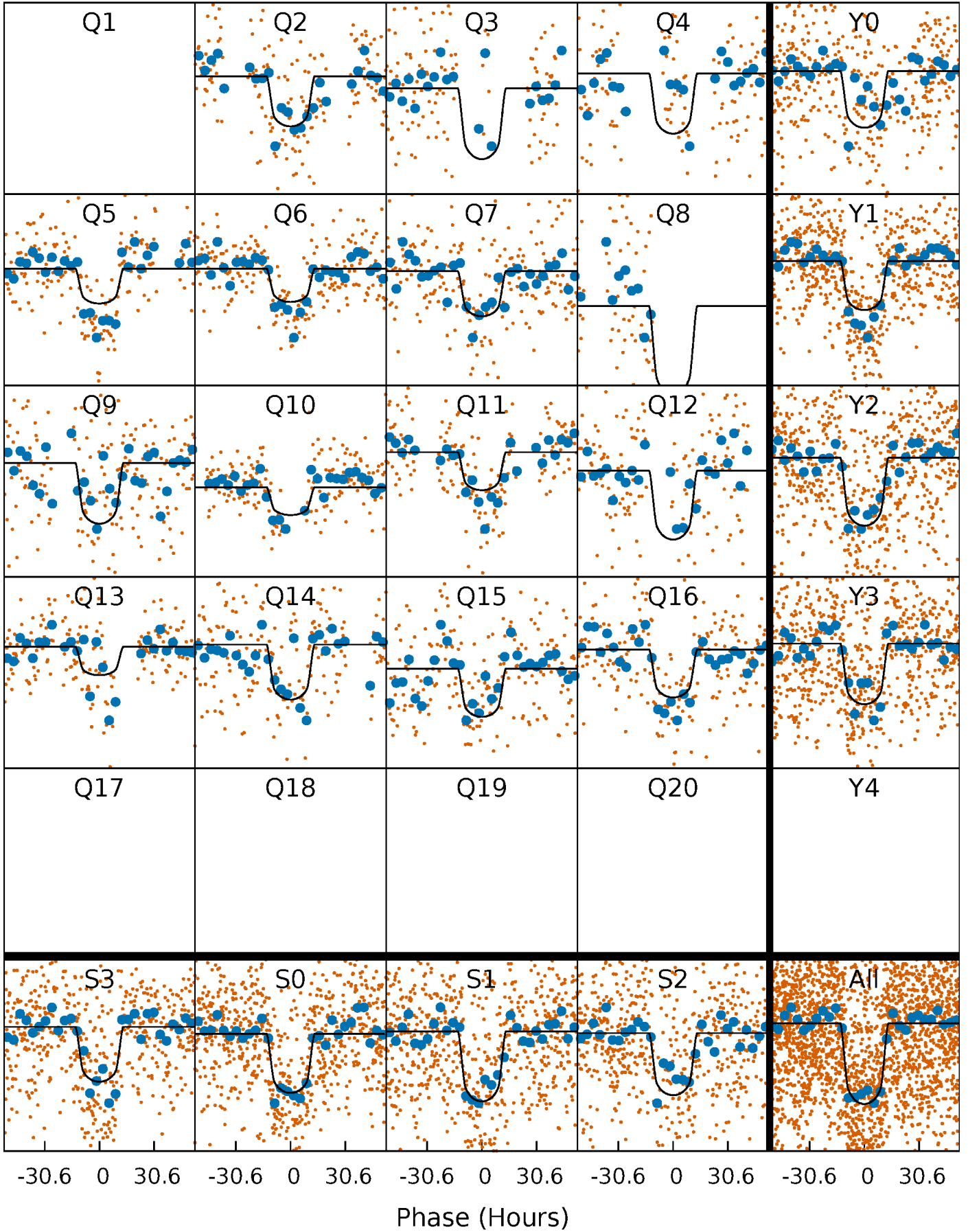
# PDC Quarter-Phased Transit Curves

TCE 004150624-03 P= 94.227104 Days  $T_0=196.136845$  (BKJD)



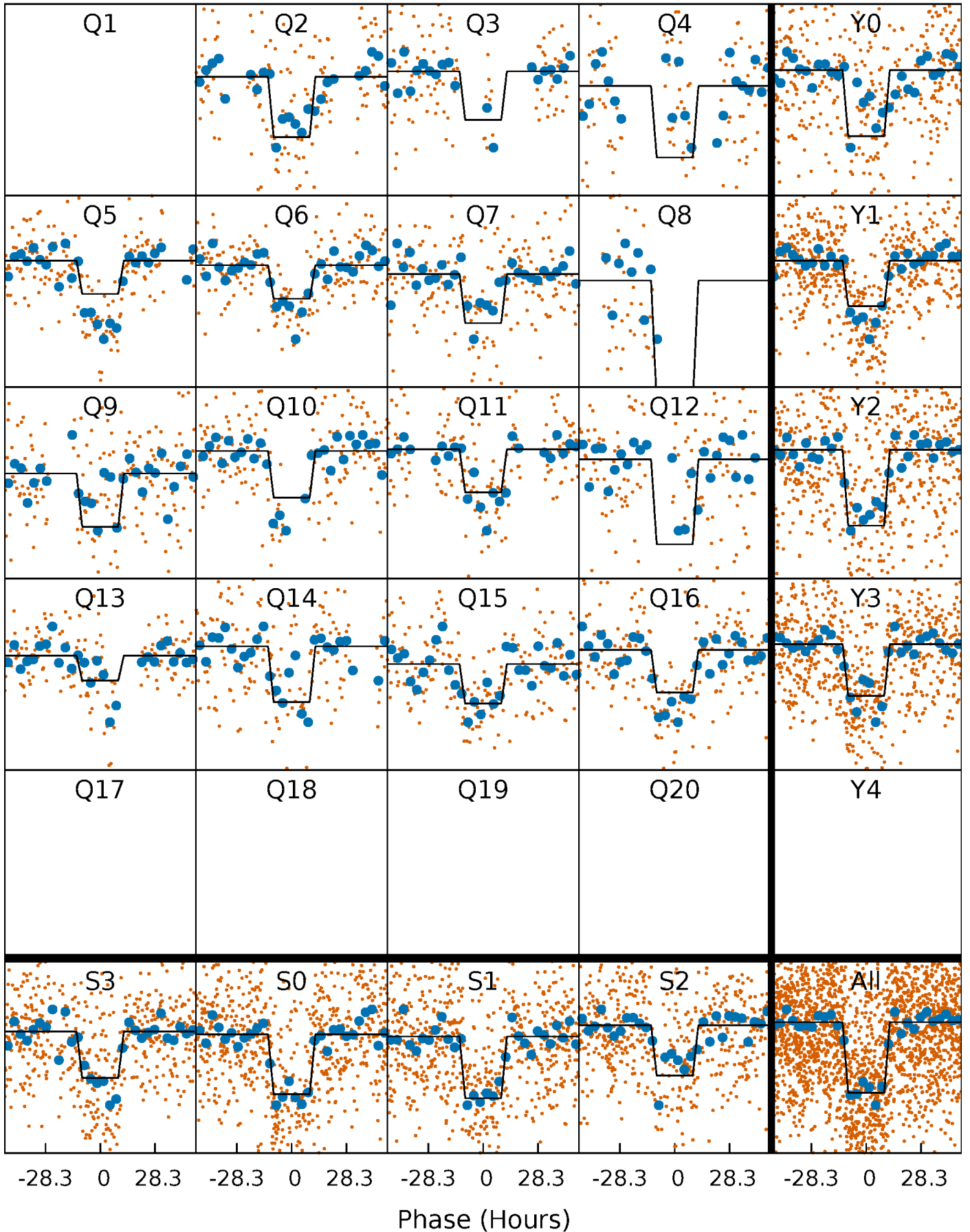
# DV Quarter-Phased Transit Curves

TCE 004150624-03   P= 94.227104 Days    $T_0=196.136845$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

TCE 004150624-03 P= 94.232768 Days  $T_0=196.091791$  (BKJD)

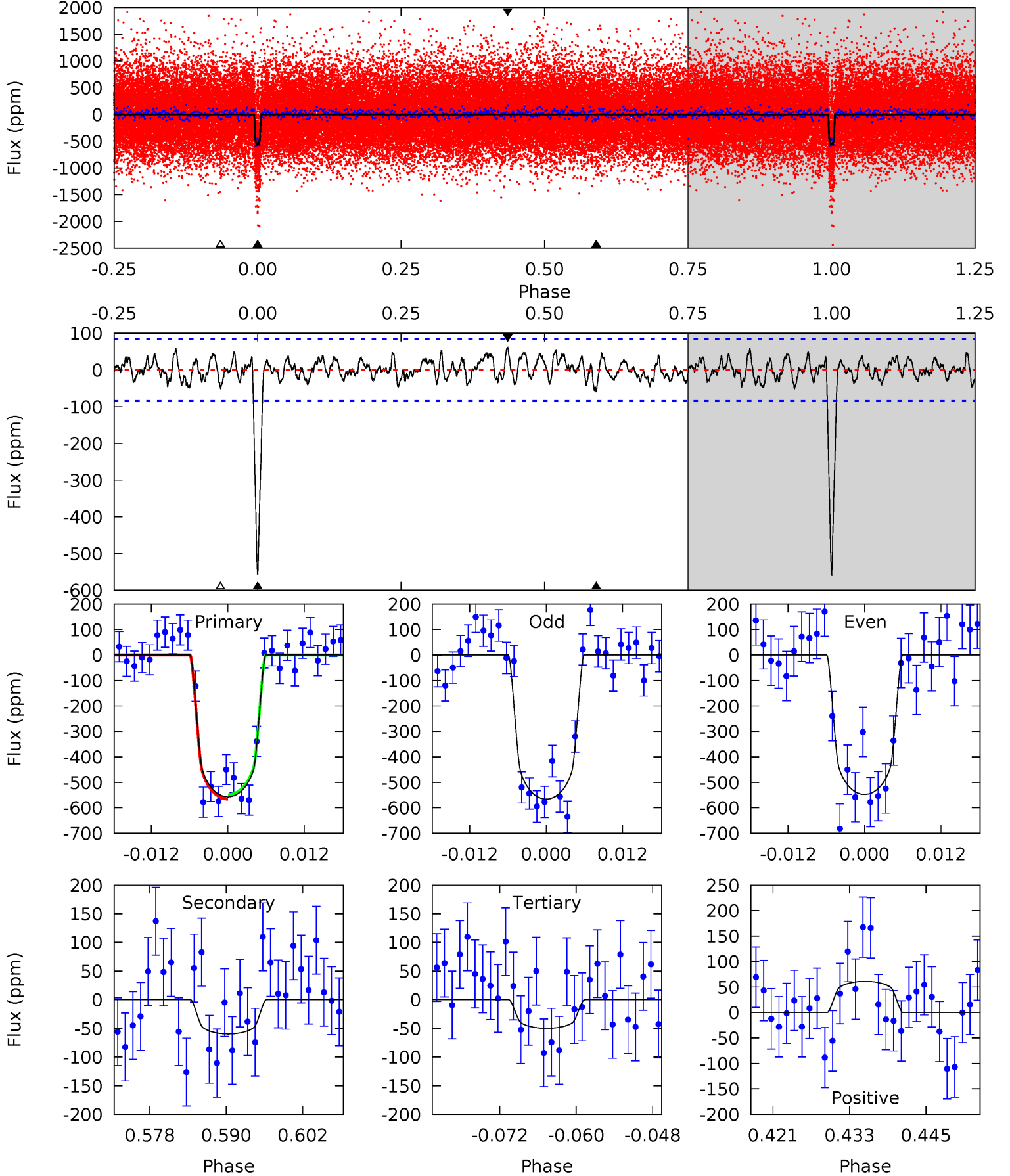




# DV Model-Shift Uniqueness Test

004150624-03, P = 94.227104 Days, E = 101.909741 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
32.8	3.51	2.93	3.60	4.99	2.51	1.33	29.8	29.2	0.58	-0.09	0.55	0.95	0.10	0.50

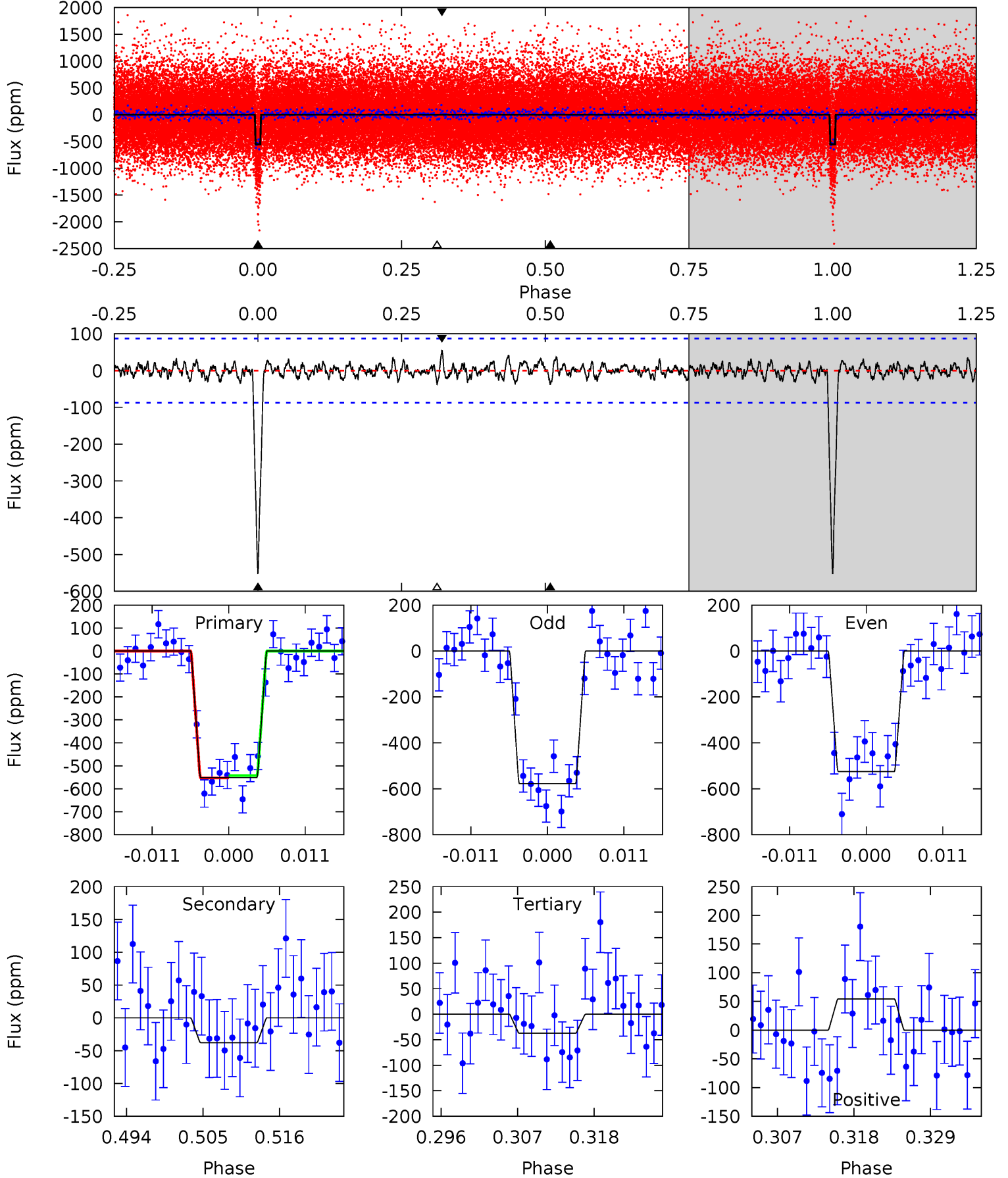




# Alt Model-Shift Uniqueness Test

004150624-03, P = 94.232768 Days, E = 101.859023 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
31.6	2.16	2.14	3.11	5.01	2.54	0.79	29.4	28.5	0.02	-0.95	1.51	0.98	0.09	0.28



### Stellar Parameters For KIC 004150624

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$5421^{+164}_{-164}$	$4.564^{+0.028}_{-0.171}$	$0.210^{+0.200}_{-0.300}$	$0.852^{+0.198}_{-0.062}$	$0.969^{+0.065}_{-0.106}$	$2.207^{+0.344}_{-0.974}$
	+3%/-3%	+1%/-4%	+95%/-143%	+23%/-7%	+7%/-11%	+16%/-44%
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 004150624-03 / KOI 1334.02

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-60 \pm 17$	$2.60^{+0.31}_{-0.22}$	$498^{+28}_{-21}$	$3393^{+181}_{-186}$	$734^{+292}_{-229}$
Alt.	$-38 \pm 17$	$2.27^{+0.28}_{-0.19}$	$498^{+31}_{-23}$	$3293^{+229}_{-324}$	$608^{+336}_{-303}$

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

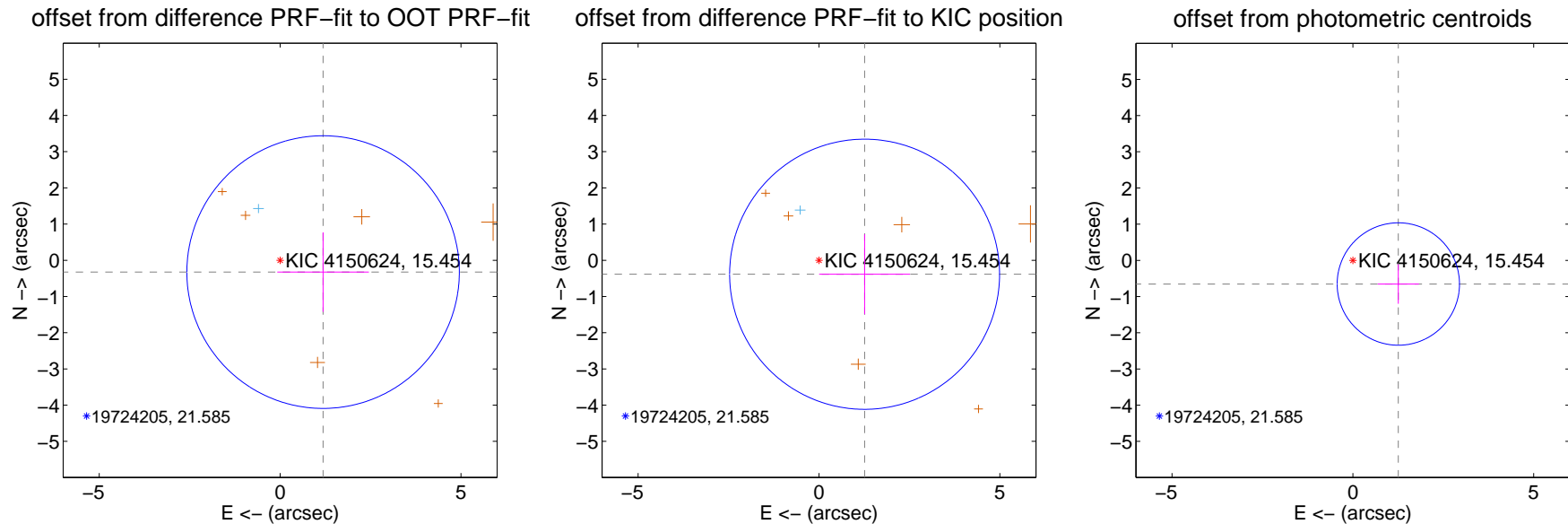
## DV Centroid Data

Supplemental centroid analysis for 004150624-03. Kepler magnitude: 15.45. Transit SNR 20.86

There are 1 quarters with good PRF difference image offsets

The direct PRF centroid is offset from the target star catalog position by about 0.09 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$1.232 \pm 1.255$	0.98	$-1.188 \pm 1.266$	$-0.325 \pm 1.098$
PRF-fit source offset from KIC position	$1.318 \pm 1.243$	1.06	$-1.261 \pm 1.256$	$-0.385 \pm 1.105$
photometric centroid source offset	$1.42 \pm 0.56$	2.51	$-1.26 \pm 0.57$	$-0.65 \pm 0.55$



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.

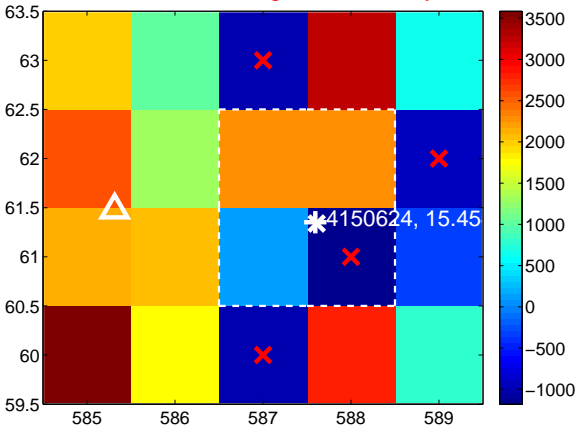
Q1 no difference image



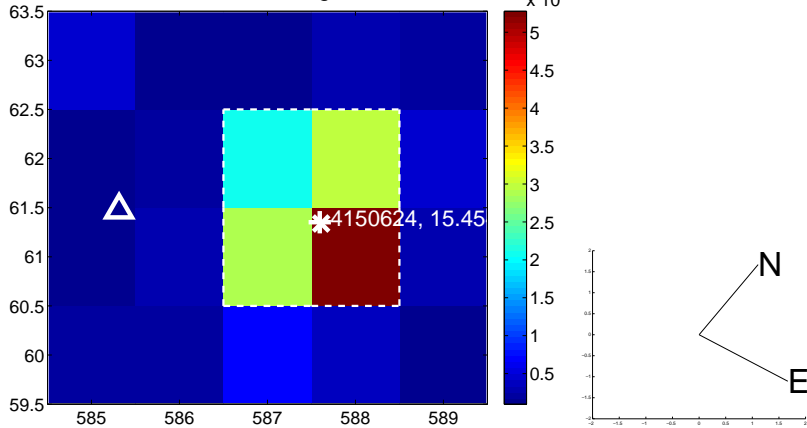
Q1 no OOT image



Q2 difference image. Poor Quality



Q2 OOT image



Q3 no difference image



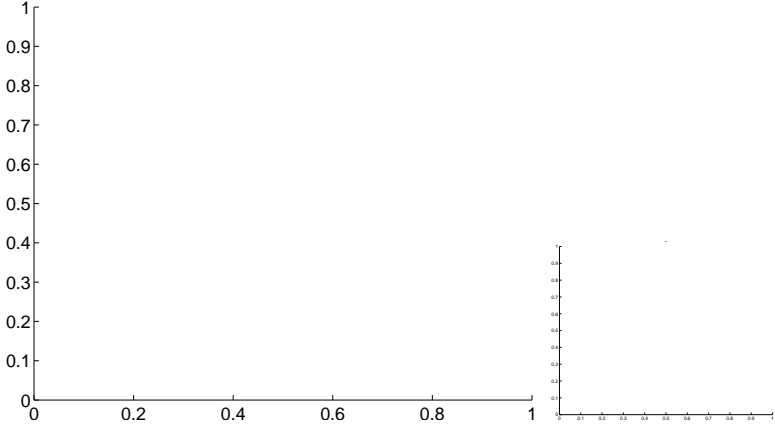
Q3 no OOT image



Q4 no difference image



Q4 no OOT image



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

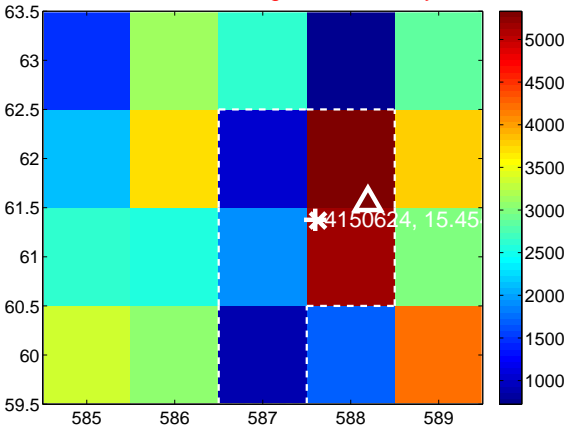
Q5 no difference image



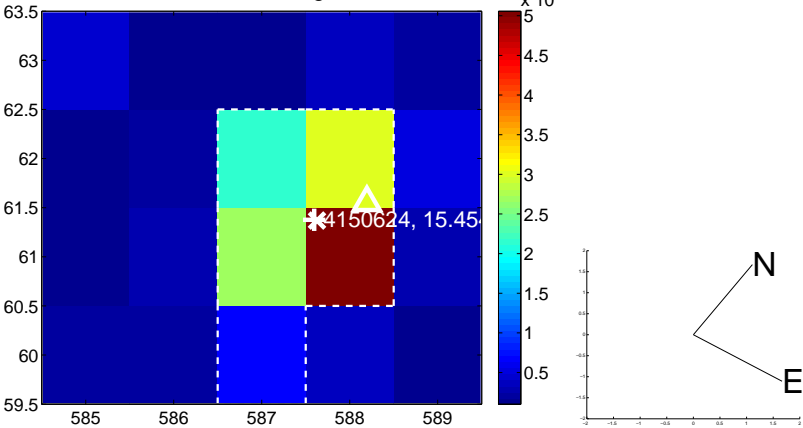
Q5 no OOT image



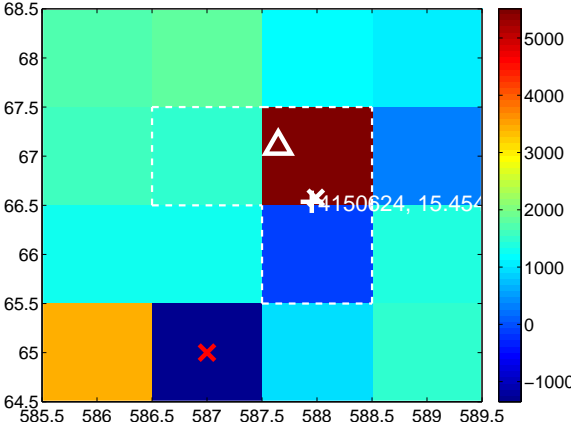
Q6 difference image. Poor Quality



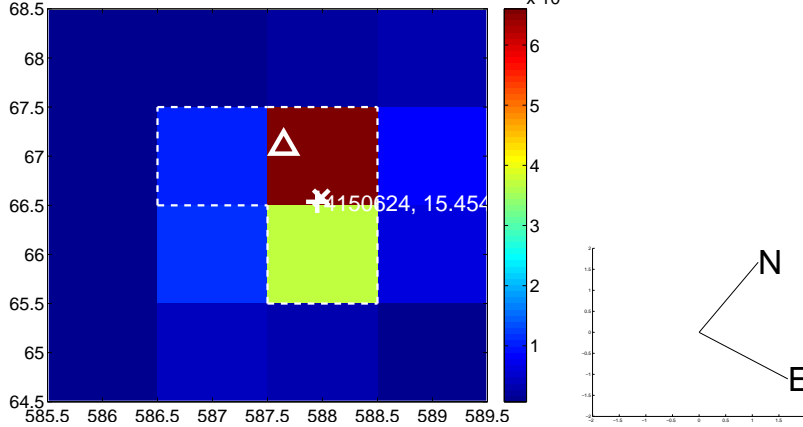
Q6 OOT image



Q7 difference image. Poor Quality



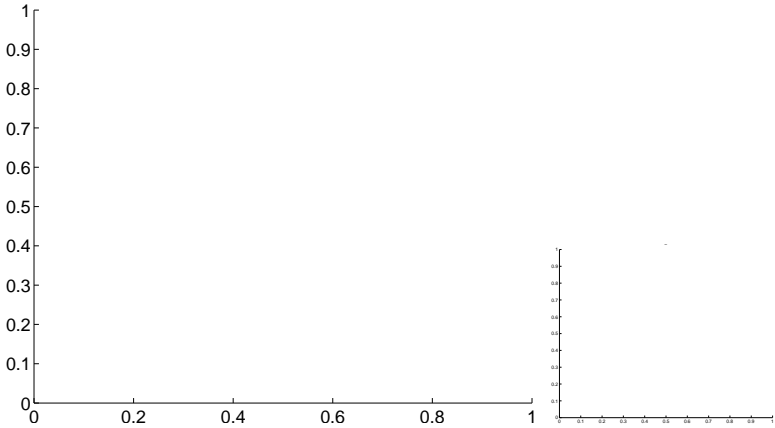
Q7 OOT image



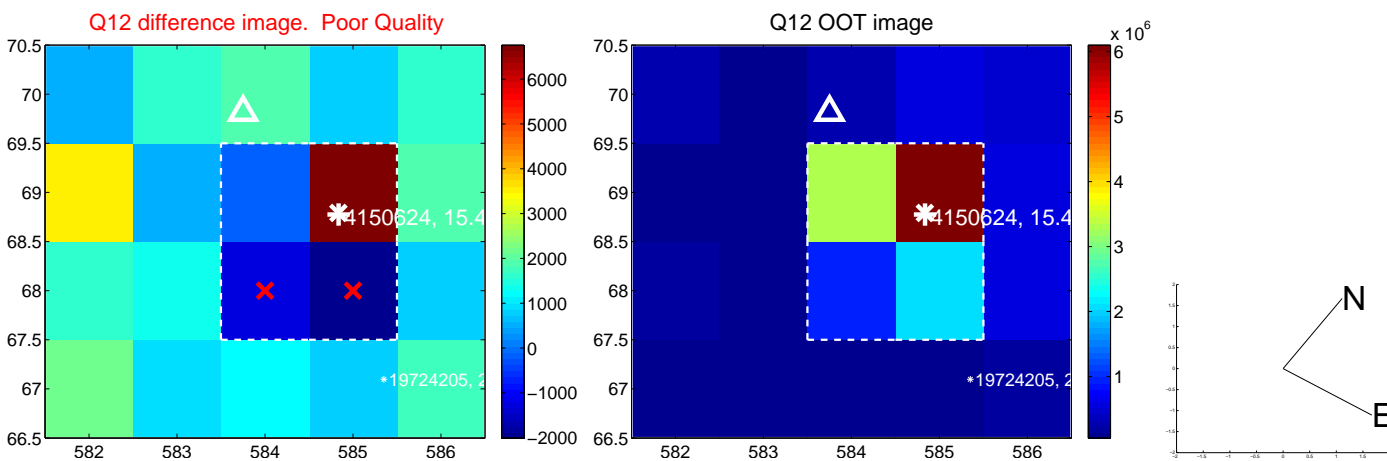
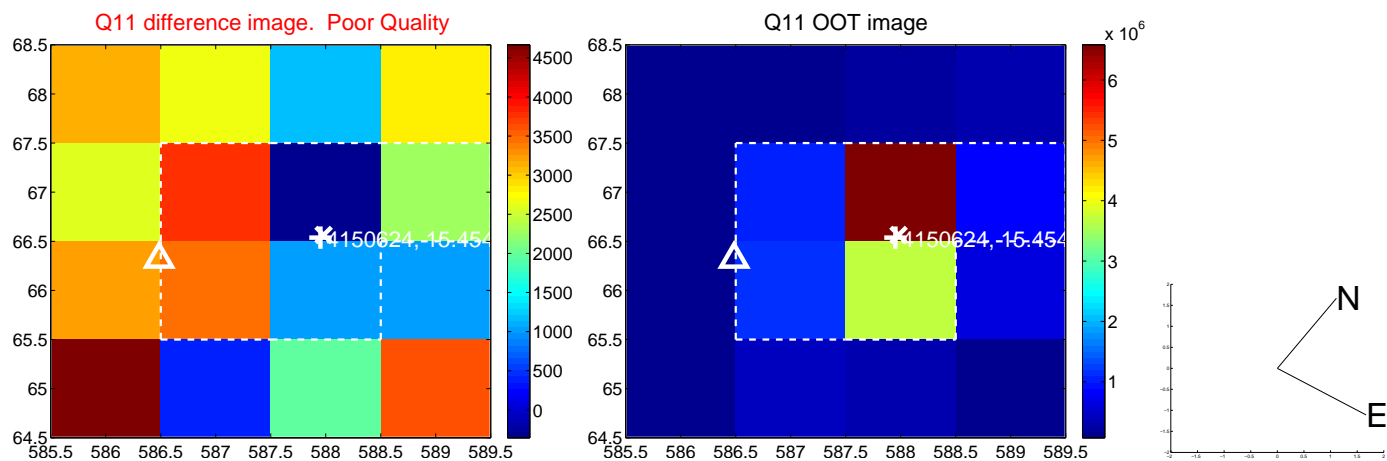
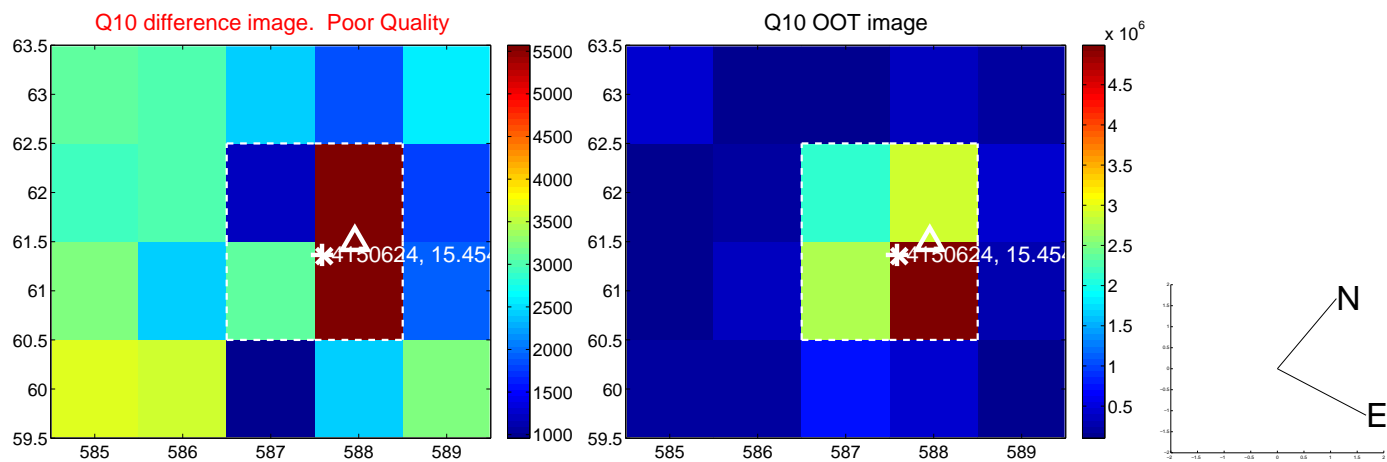
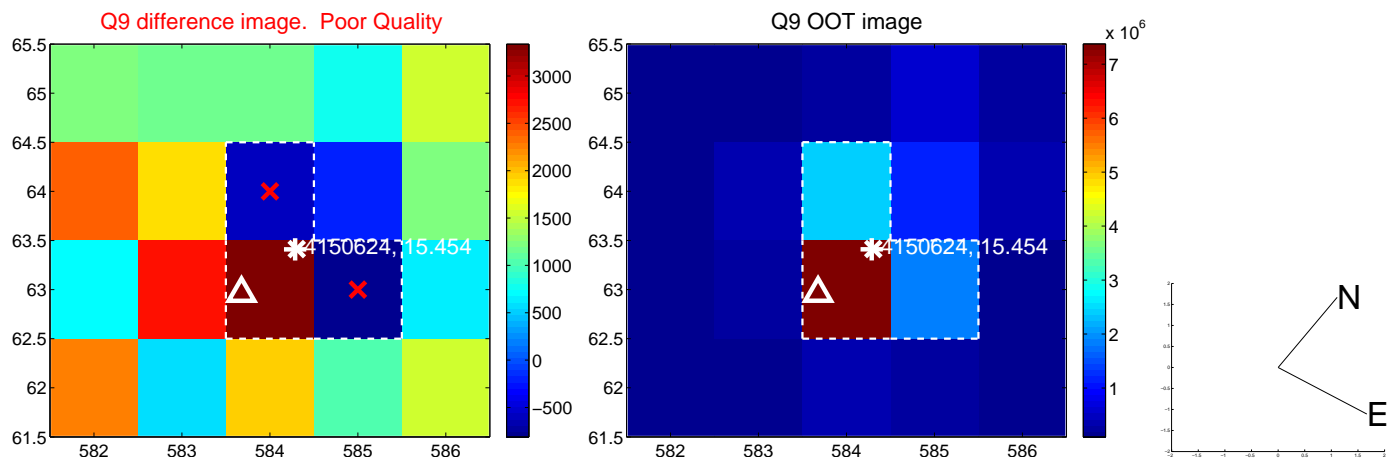
Q8 no difference image



Q8 no OOT image

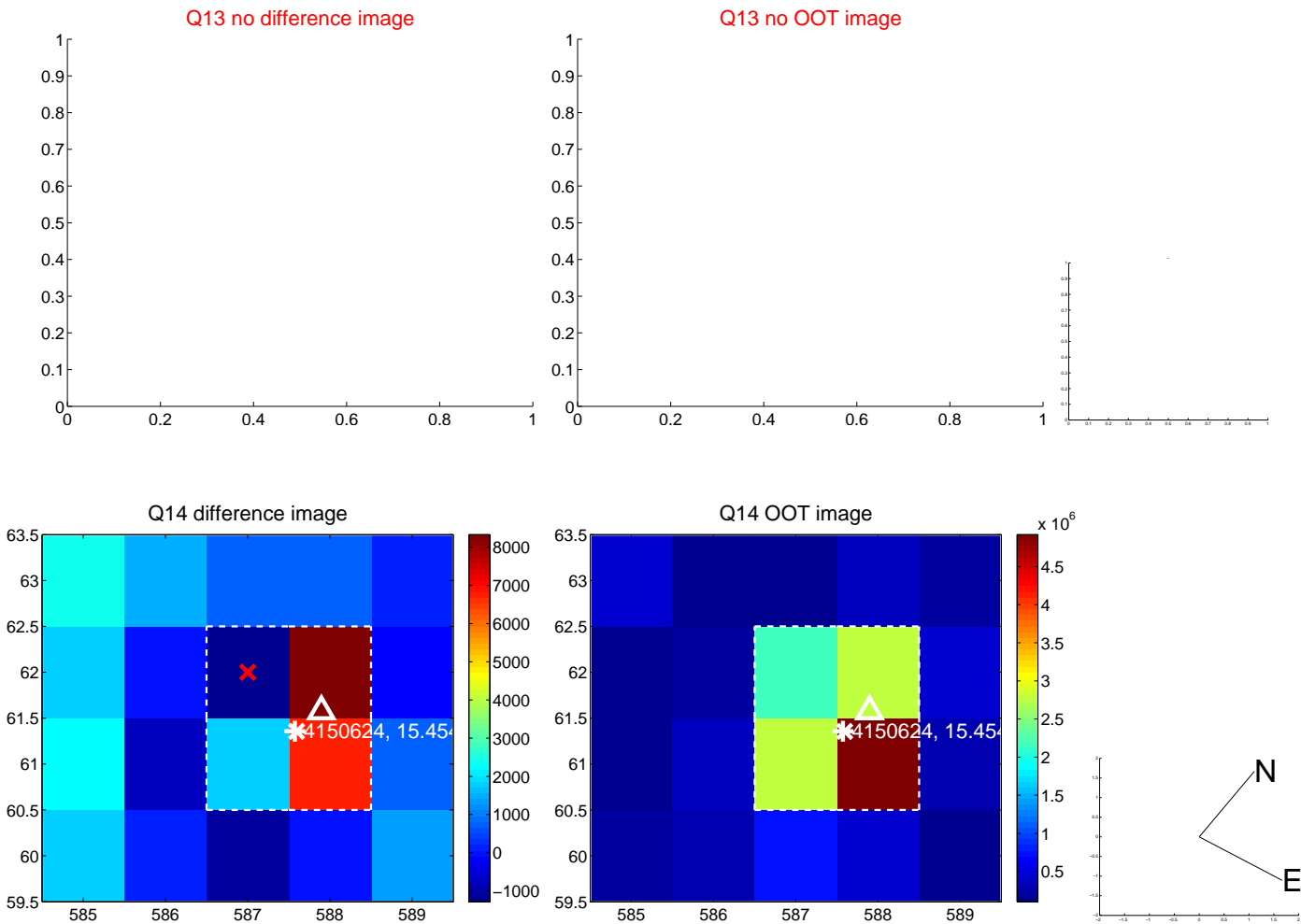


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

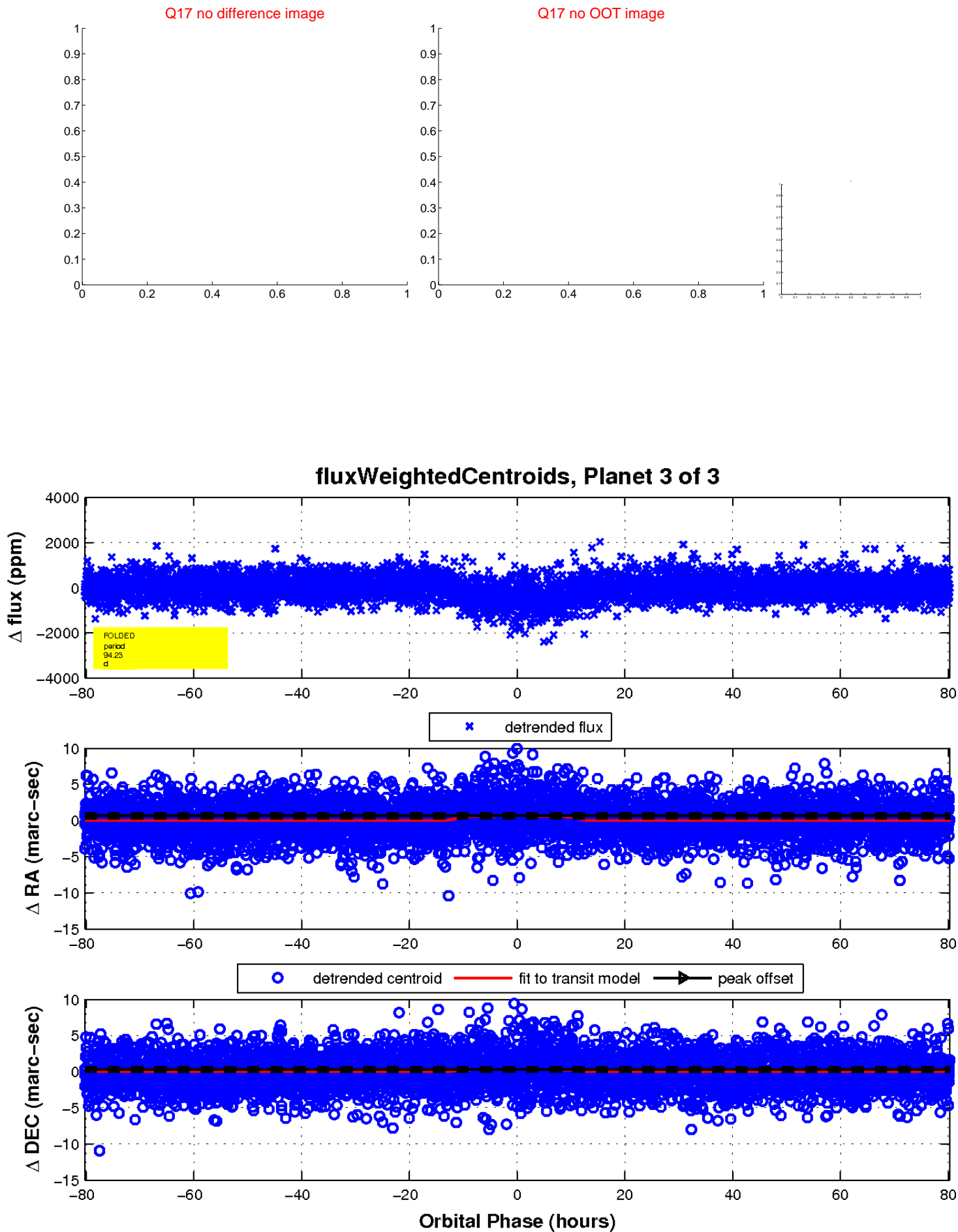




white ×: KIC target position; +: OOT centroid; △: difference centroid. red ✕: large negative pixel value.



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



UKIRT Image

Declination

