

# KIC 009345924

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
009345924-01	OBS	No	1.045851	131.989923	23.3	6.757	7.6	8.4	0.87	6046	0.45	2295.20
009345924-02	OBS	No	50.315451	134.007633	310.0	2.659	9.8	6.0	0.87	6046	1.76	13.12
009345924-03	OBS	No	58.990893	137.266430	378.8	3.447	8.4	8.3	0.87	6046	1.88	10.61
009345924-04	OBS	No	91.226941	183.599746	586.2	2.086	8.3	9.3	0.87	6046	2.45	5.93

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009345924-01	OBS	FP	0.00	1	0	0	1	LPP_DV—LPP_ALT—EPHEM_MATCH
009345924-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_NONUNIQ_ALT—CENT_FEW_DIFFS
009345924-03	OBS	FP	0.00	1	0	1	0	INDIV_TRANS_RUBBLE_SKYE—TRANS_GAPPED—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—CENT_FEW_DIFFS—HALO_GHOST
009345924-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_POS_ALT—CENT_FEW_DIFFS

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

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

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

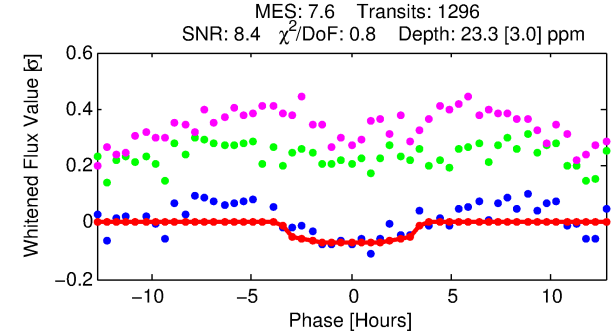
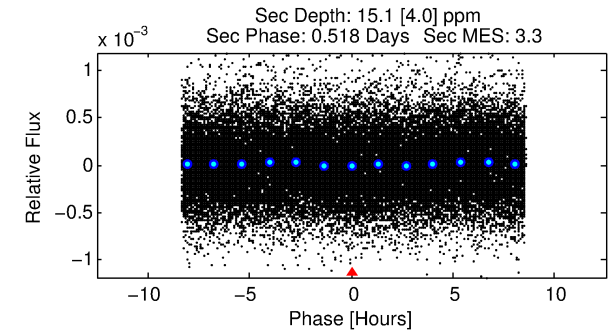
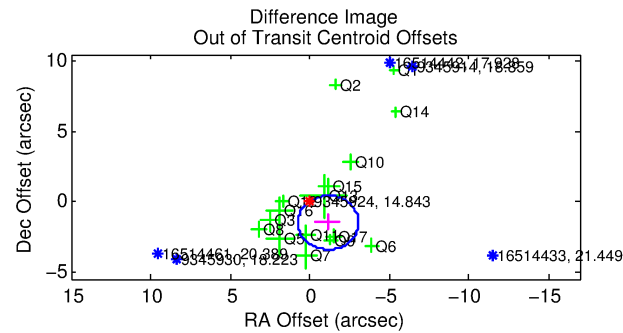
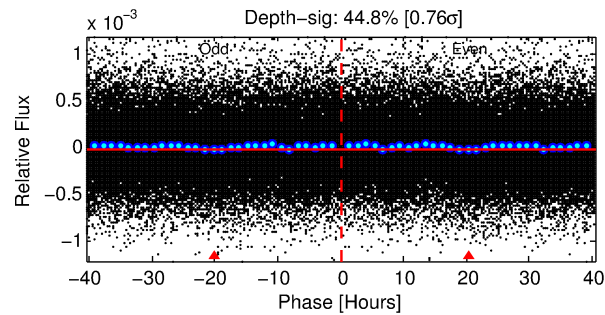
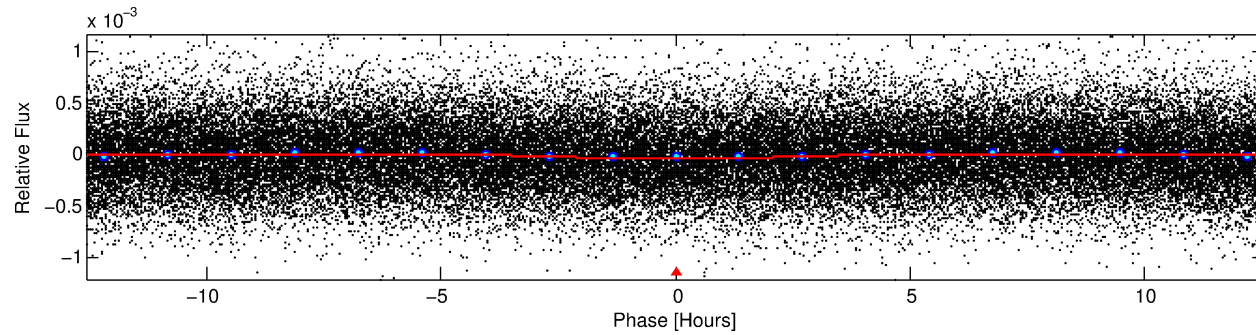
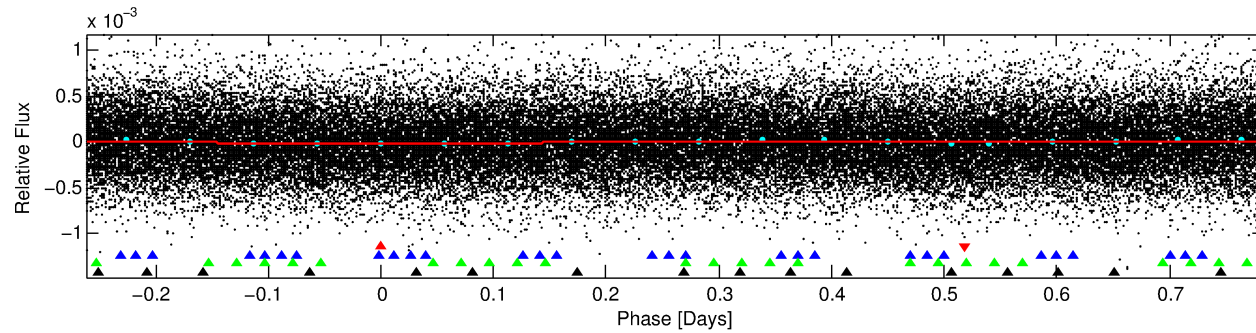
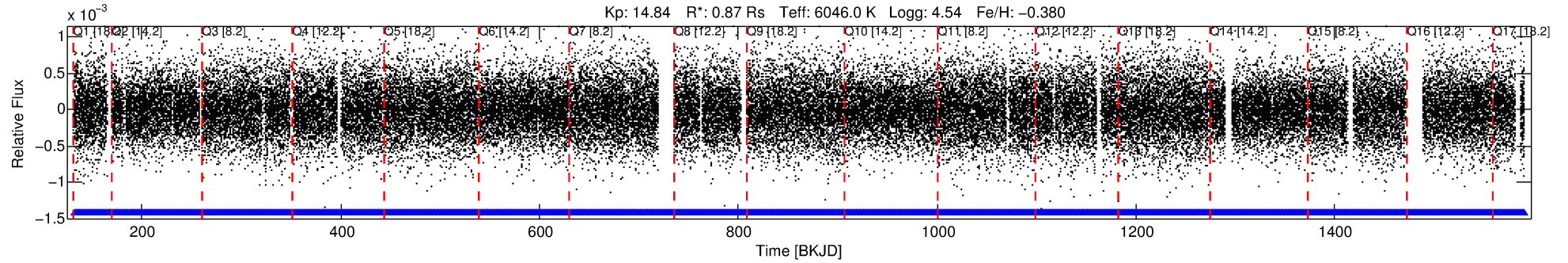
## Ephemeris Match Information For 009345924-01

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	$\sigma_P$	$\sigma_T$
009345924-01	9345924	009345838-pri	9345838	1:1	88.0	22	4	12.38	14.84	10274.00	Direct-PRF	0	2.00	0.05

**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: 9345924 Candidate: 1 of 4 Period: 1.046 d



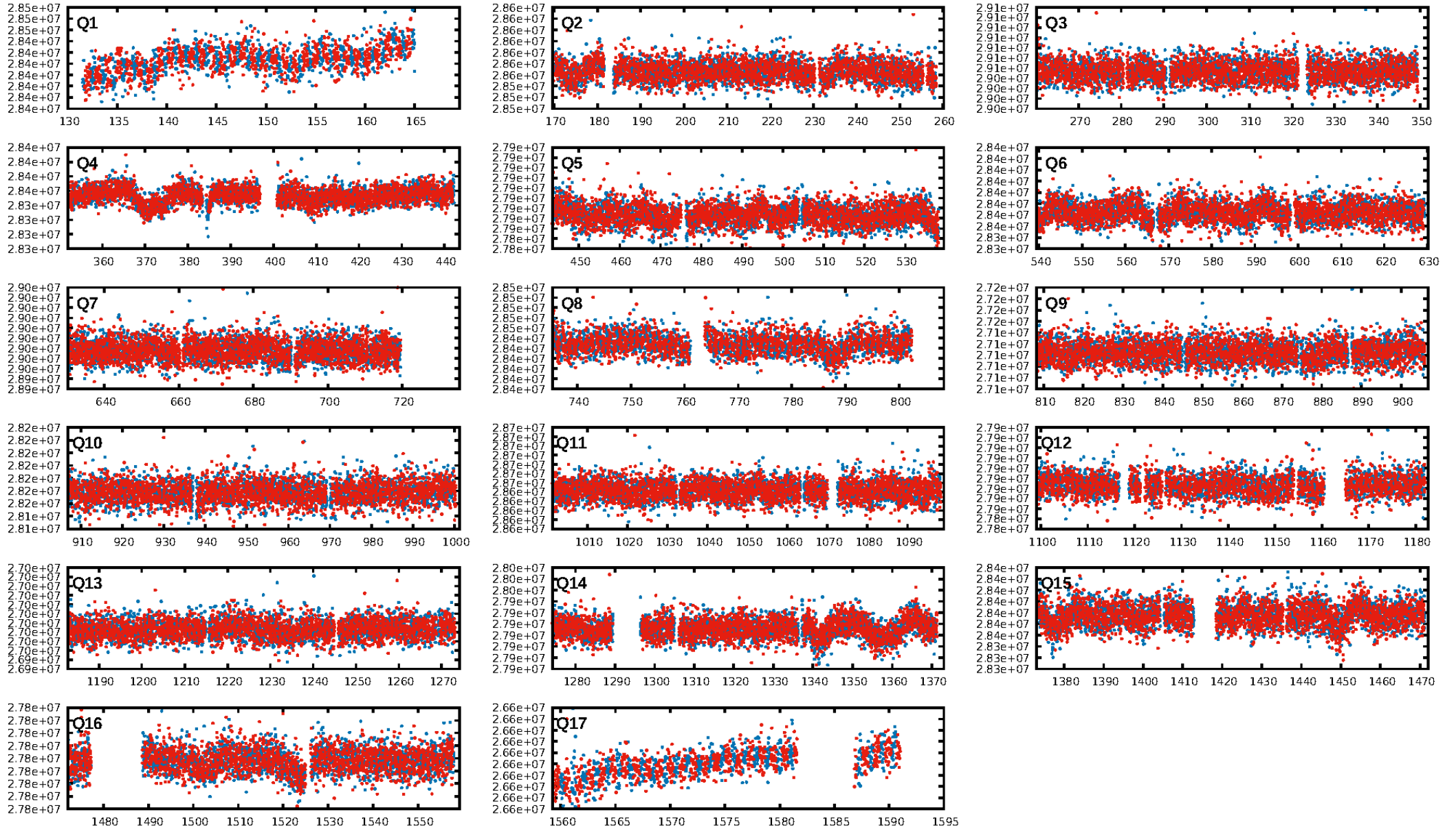
## DV Fit Results:

Period = 1.04585 [0.00002] d  
Epoch = 131.9899 [0.0087] BKJD  
Rp/R\* = 0.0048 [0.0043]  
a/R\* = 1.18 [1.52]  
b = 0.73 [3.03]  
Seff = 2295.20 [898.57]  
Teq = 1765 [173] K  
Rp = 0.45 [0.43] Re  
a = 0.0198 [0.0051] AU  
Ag = 15.99 [29.91] [0.50σ]  
Teffp = 5457 [2506] K [1.47σ]

## DV Diagnostic Results:

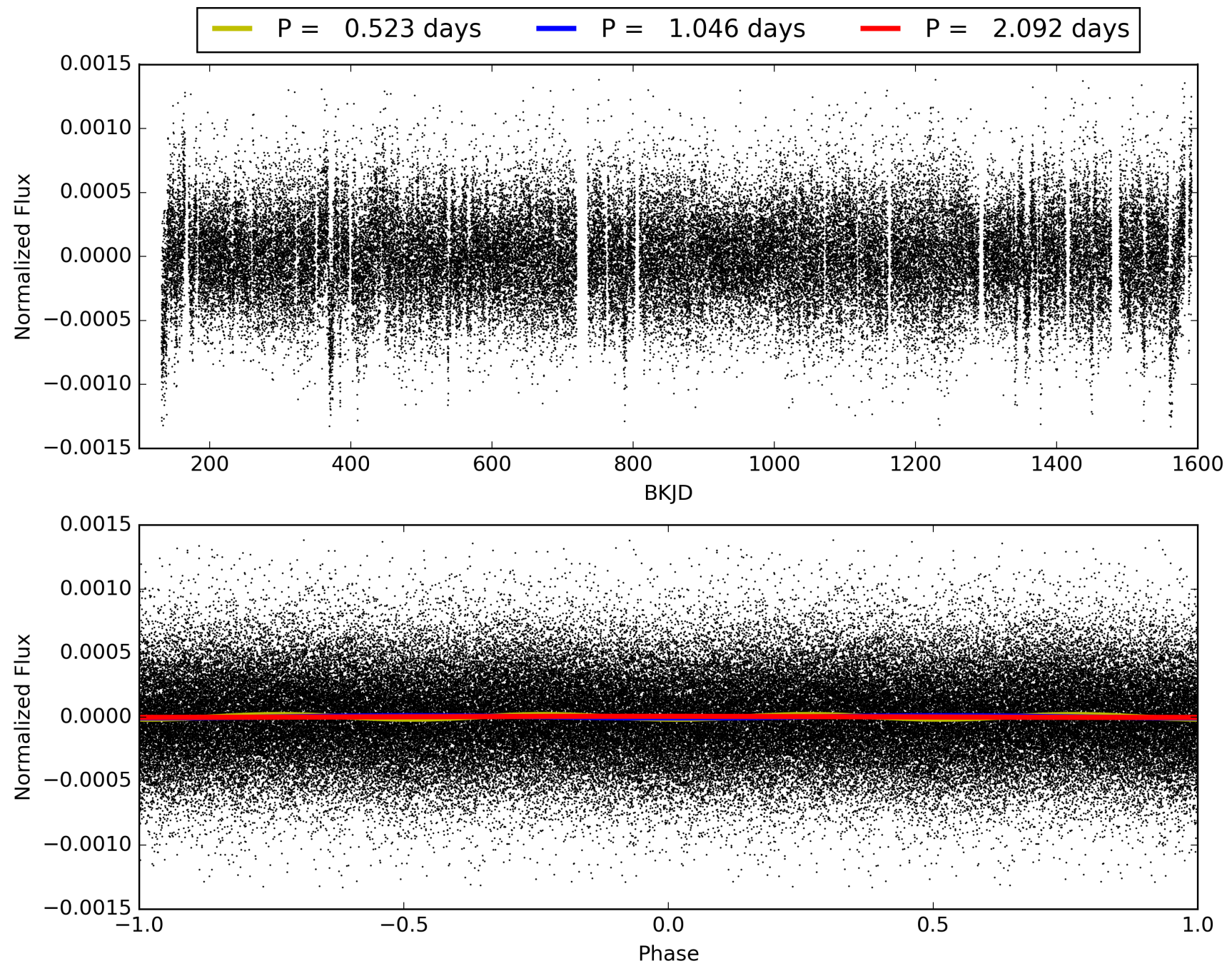
ShortPeriod-sig: N/A  
LongPeriod-sig: 100.0% [162.85σ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: 4.71e-10  
RollingBand-fgt: 1.00 [1237/1237]  
GhostDiagnostic-chr: 0.287  
Centroid-sig: 4.6%  
Centroid-so: 2.347 arcsec [1.44σ]  
OotOffset-rm: 1.890 arcsec [2.96σ]  
KicOffset-rm: 1.744 arcsec [2.55σ]  
OotOffset-st: 4/4/3/5 [16]  
KicOffset-st: 4/4/3/5 [16]  
DiffImageQuality-fgm: 0.12 [2/16]  
DiffImageOverlap-fno: 1.00 [17/17]

# TCE 009345924-01, PDC Light Curves





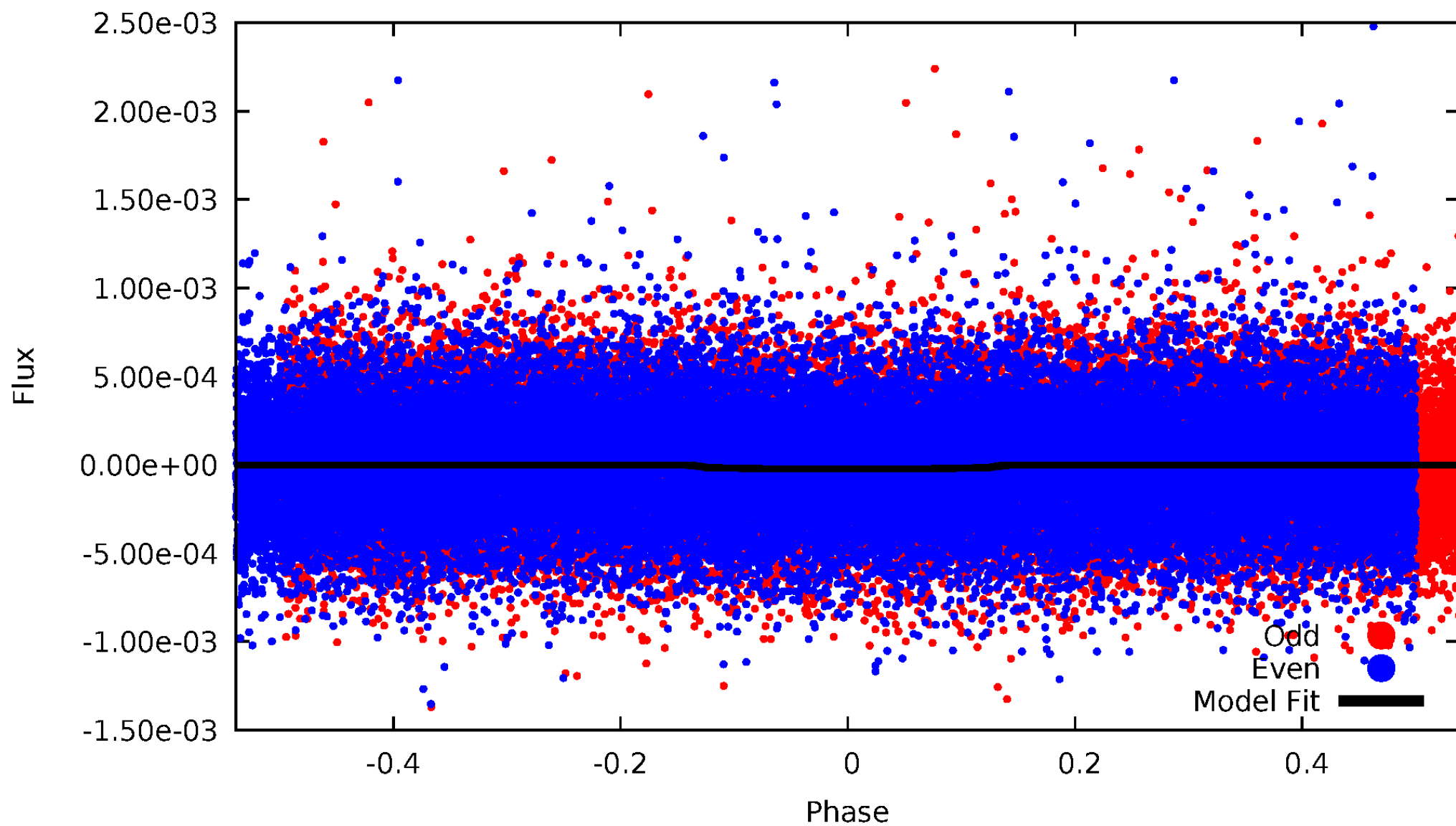
TCE 009345924-01





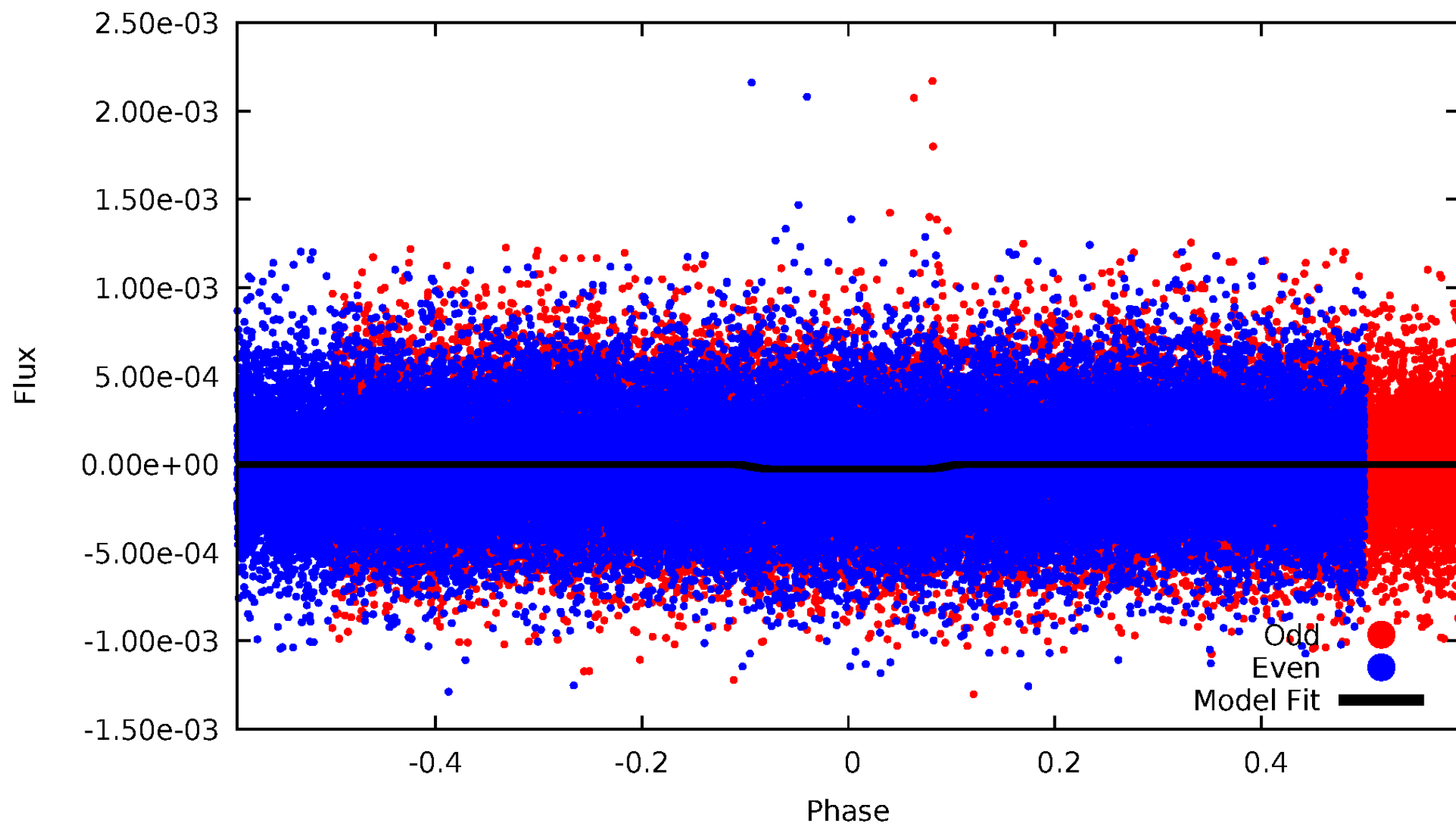
# DV Odd/Even

TCE 009345924-01

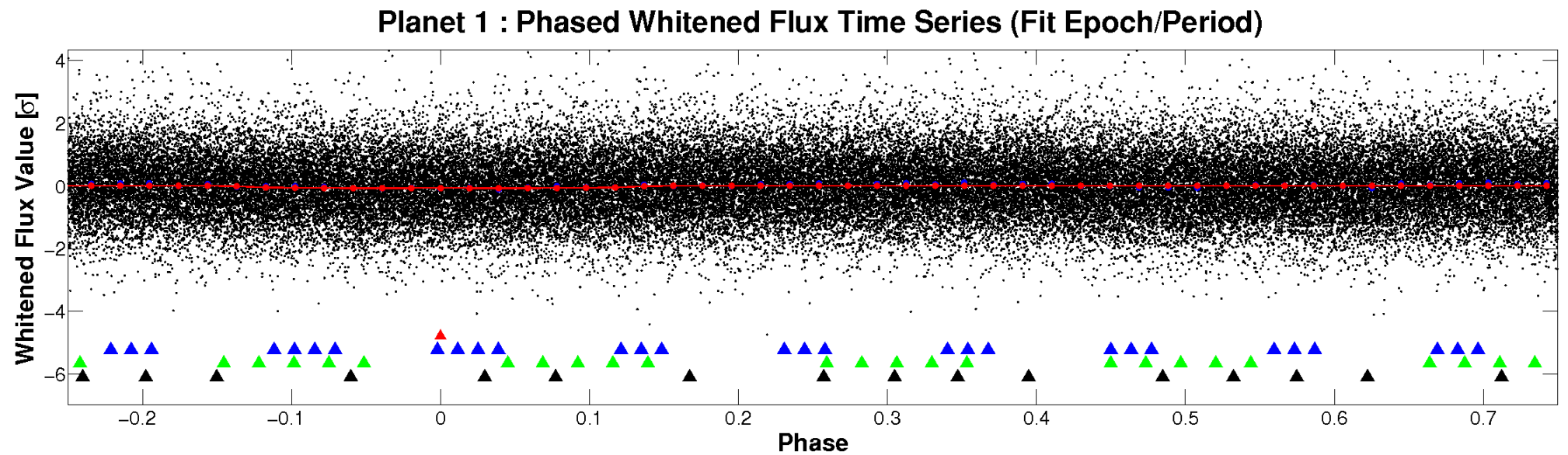
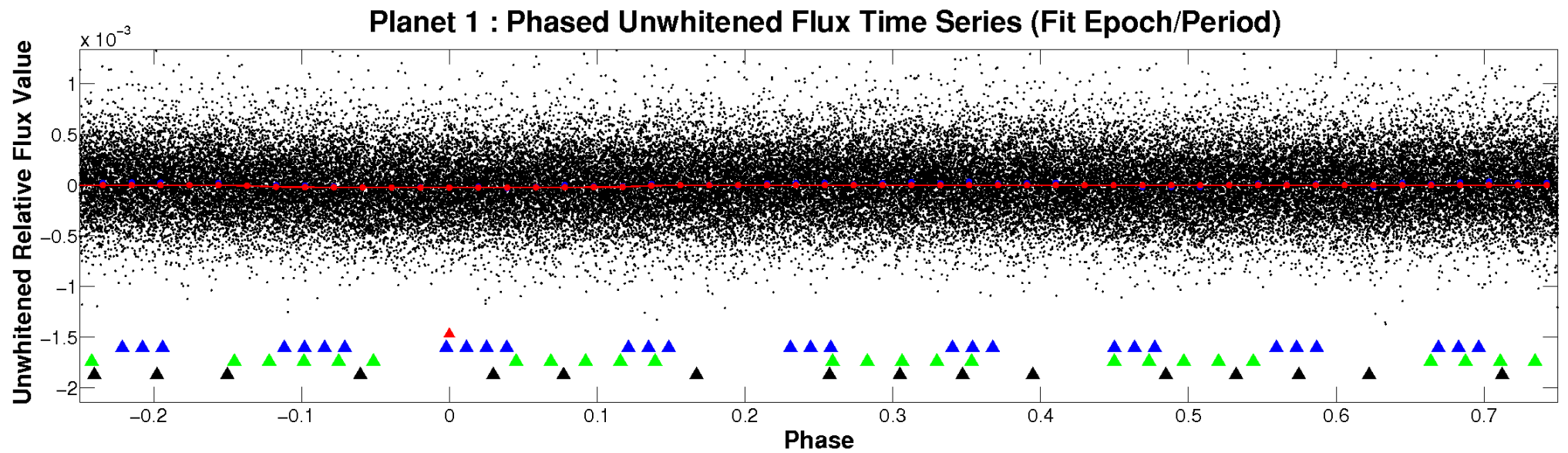


# ALT Odd/Even

TCE 009345924-01



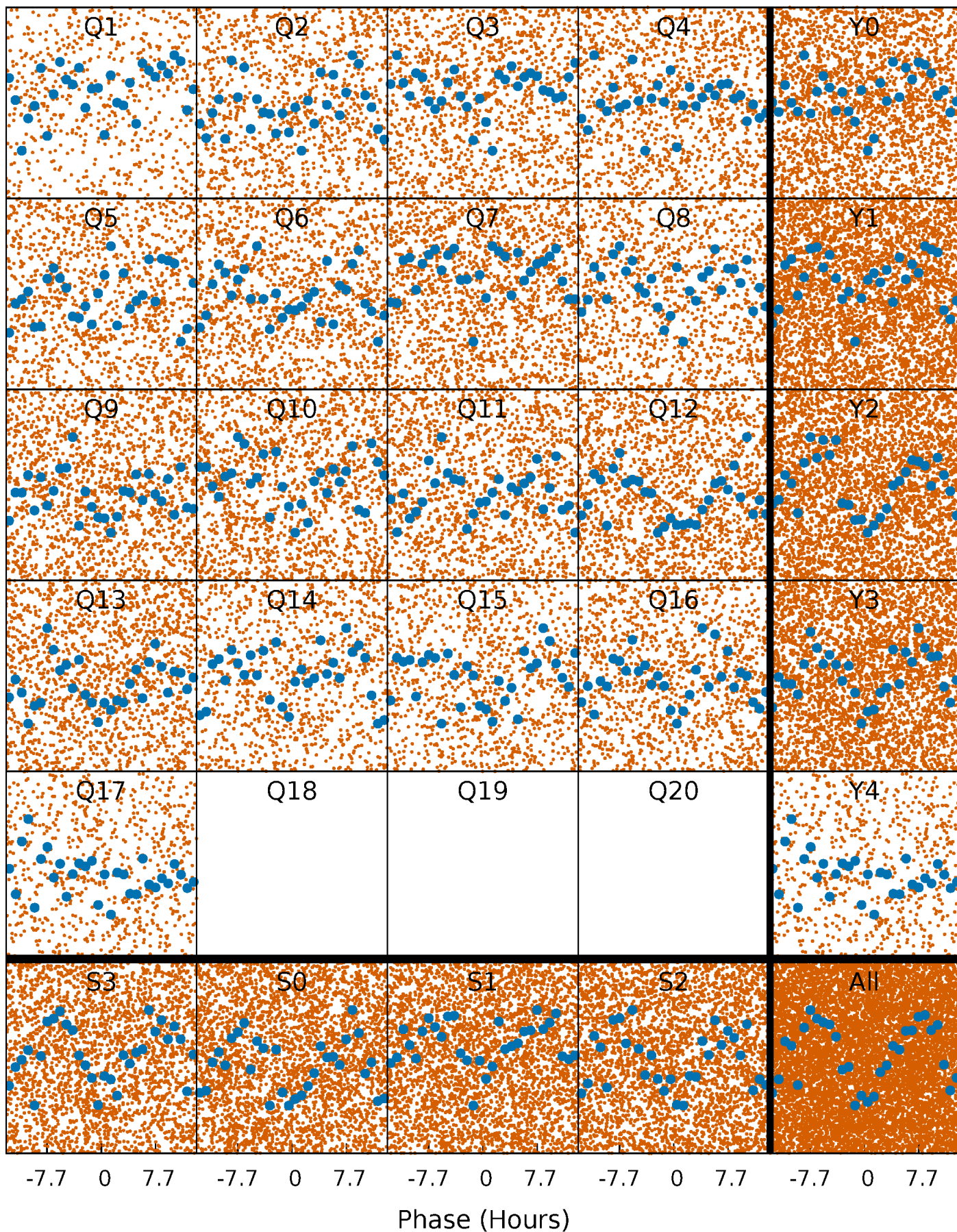
# Non-Whitened Vs. Whitened Light Curve





# PDC Quarter-Phased Transit Curves

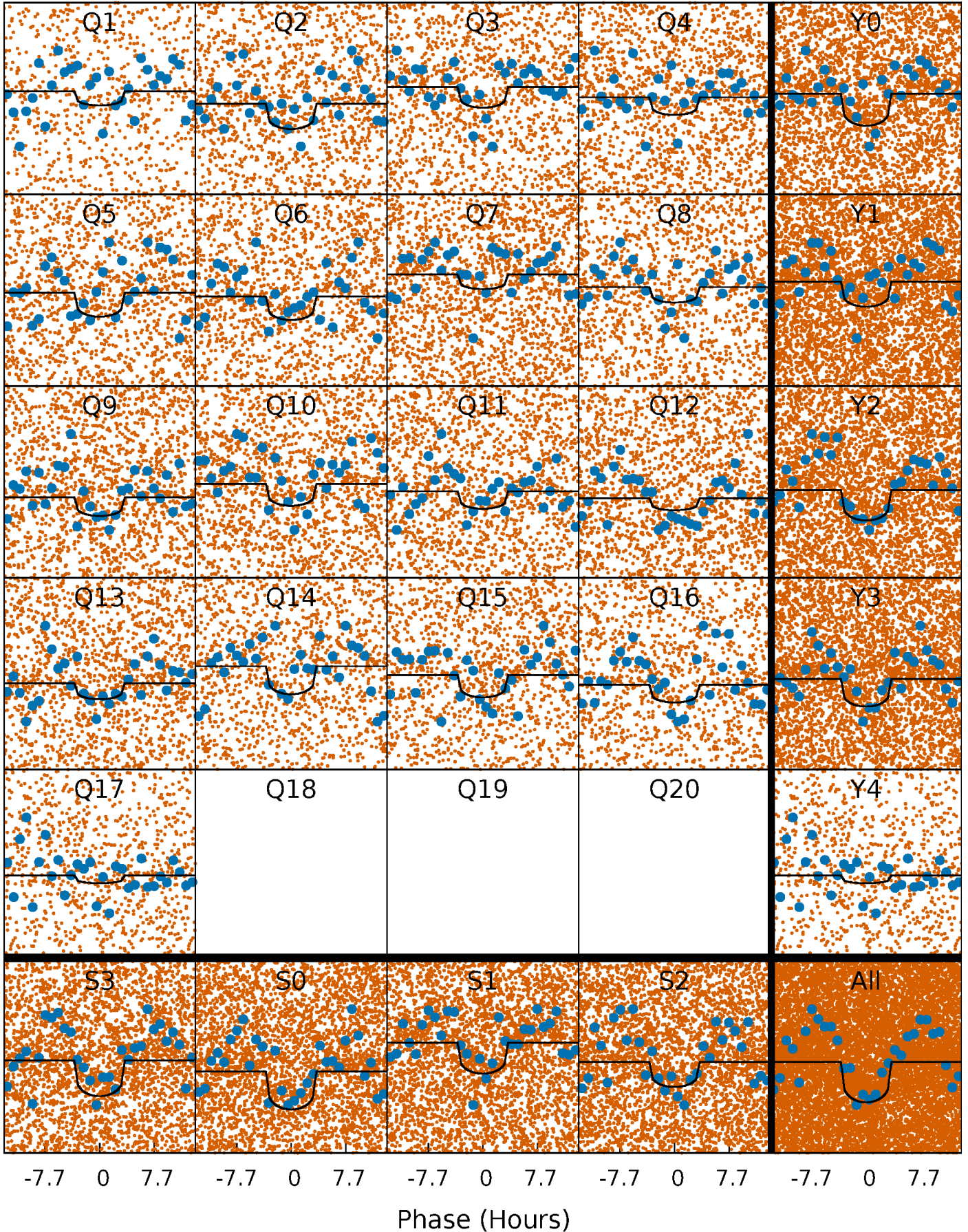
TCE 009345924-01 P= 1.045851 Days  $T_0=131.989923$  (BKJD)





# DV Quarter-Phased Transit Curves

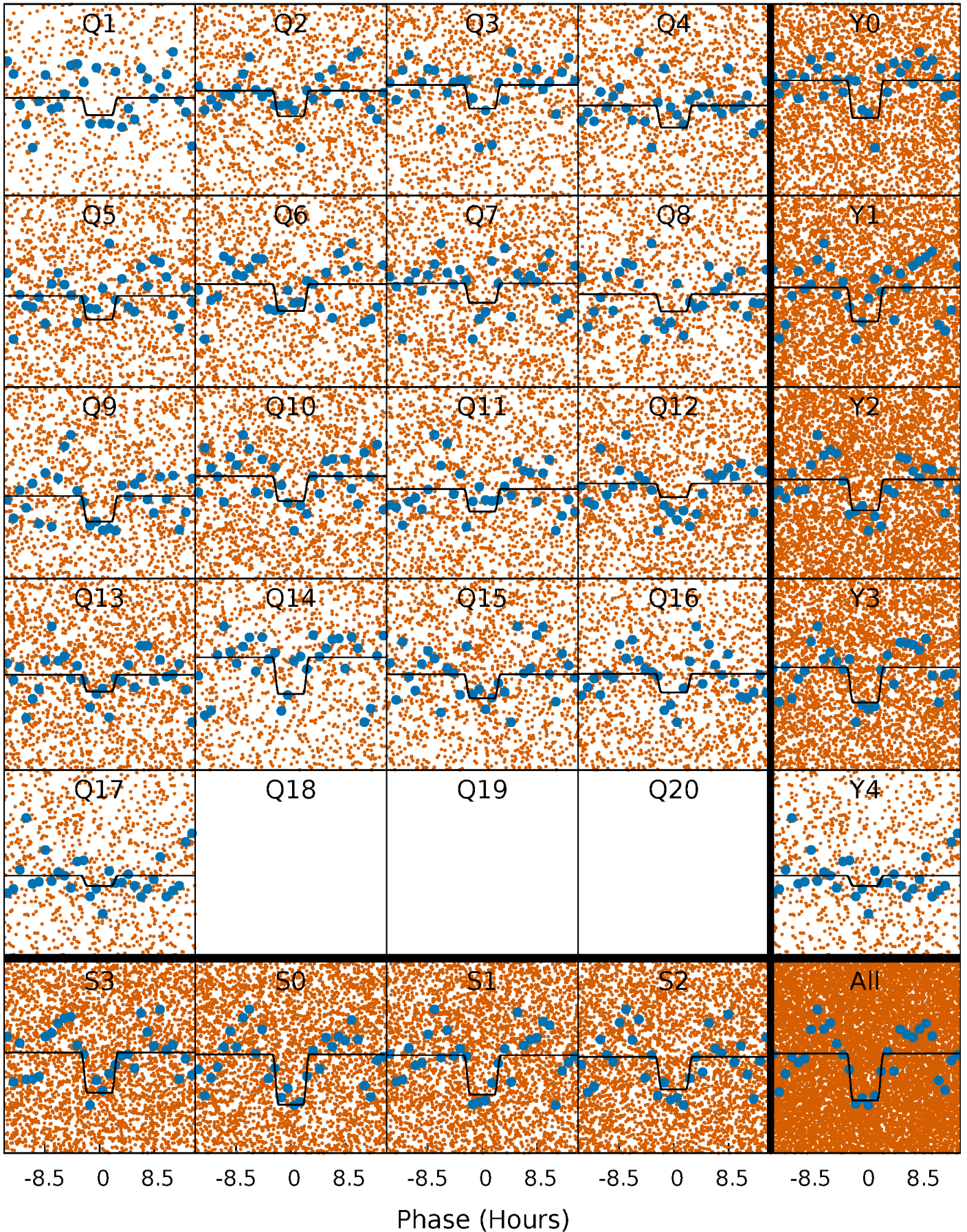
TCE 009345924-01   P= 1.045851 Days    $T_0=131.989923$  (BKJD)





# Alt. Detrend Quarter-Phased Transit Curves

TCE 009345924-01 P= 1.045894 Days  $T_0=131.960429$  (BKJD)

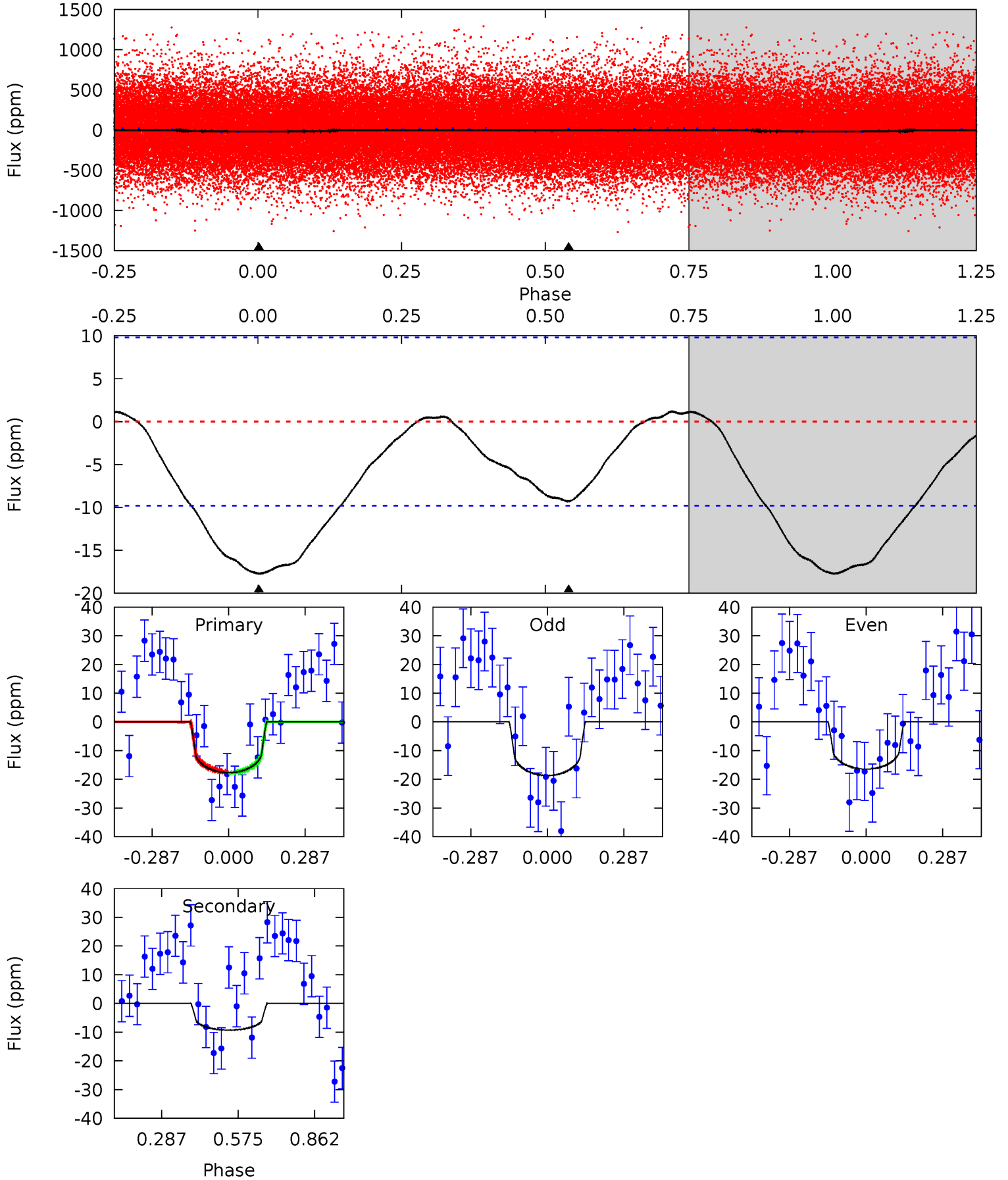




# DV Model-Shift Uniqueness Test

009345924-01, P = 1.045851 Days, E = 130.944072 Days

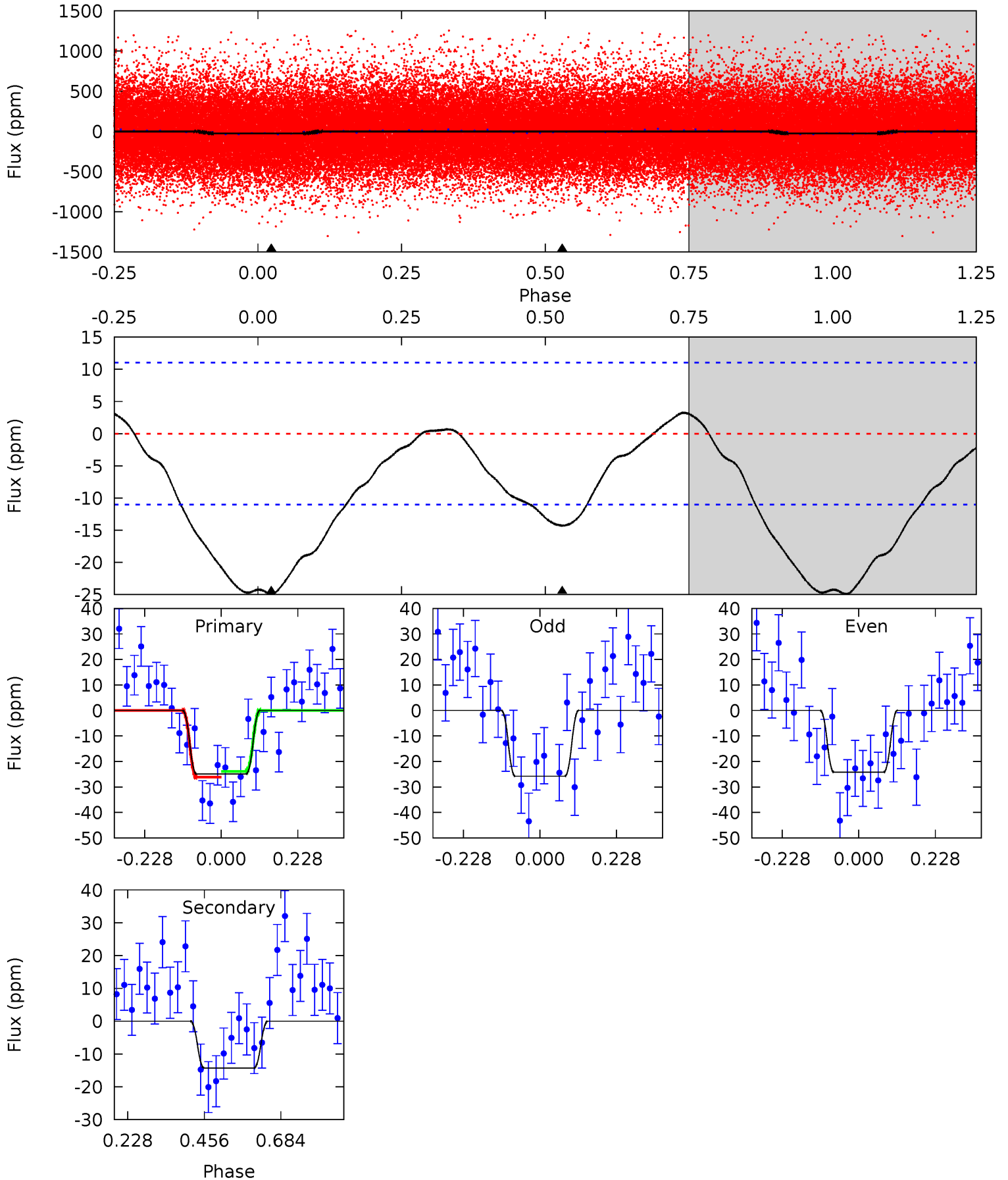
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
7.84	4.12	0	0	4.34	1.06	0.51	7.84	7.84	4.12	4.12	0.50	0.83	0.06	0.09



# Alt Model-Shift Uniqueness Test

009345924-01, P = 1.045894 Days, E = 130.914535 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
9.92	5.69	0	0	4.39	1.21	0.59	9.92	9.92	5.69	5.69	0.31	0.90	0.12	0.43



### Stellar Parameters For KIC 009345924

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$6046^{+164}_{-182}$	$4.539^{+0.036}_{-0.204}$	$-0.380^{+0.300}_{-0.300}$	$0.869^{+0.263}_{-0.066}$	$0.953^{+0.119}_{-0.107}$	$2.043^{+0.395}_{-1.029}$
	+3%/-3%	+1%/-4%	+79%/-79%	+30%/-8%	+12%/-11%	+19%/-50%
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 009345924-01 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-9 \pm 2$	$0.53^{+0.42}_{-0.31}$	$2525^{+183}_{-113}$	$4665^{+2542}_{-942}$	$7.041^{+37.317}_{-4.844}$
Alt.	$-14 \pm 3$	$0.58^{+0.41}_{-0.35}$	$2528^{+178}_{-119}$	$4960^{+2566}_{-997}$	$8.946^{+43.413}_{-5.902}$

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



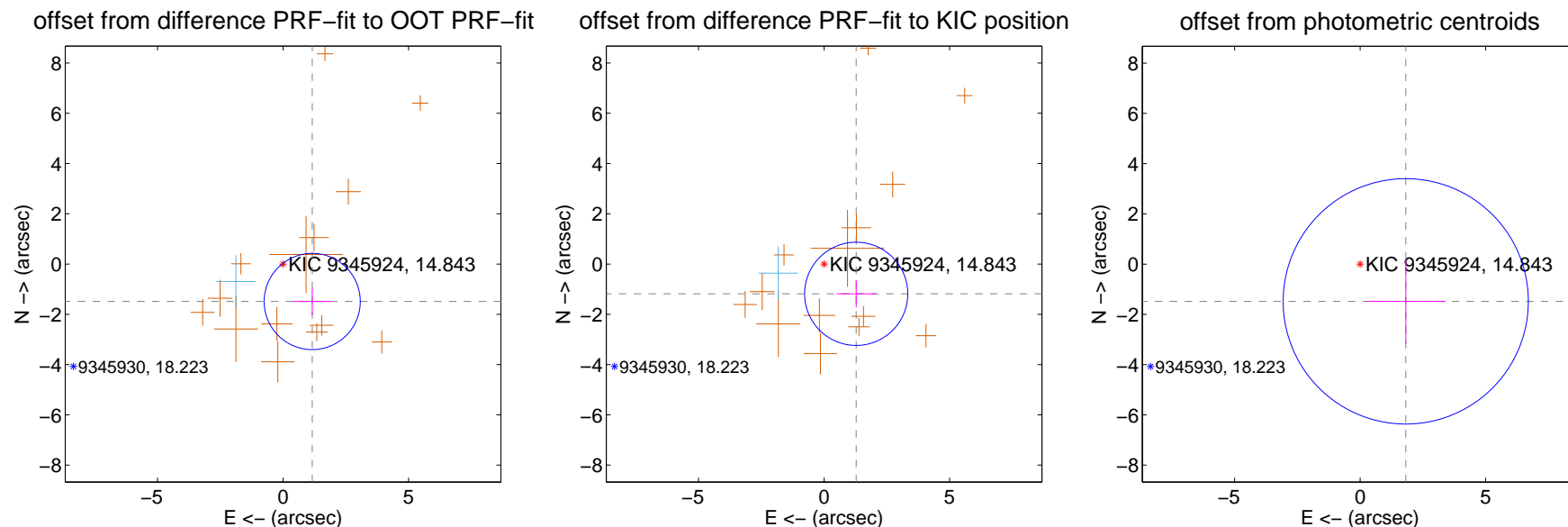
## DV Centroid Data

Supplemental centroid analysis for 009345924-01. Kepler magnitude: 14.84. Transit SNR 8.37

There are 2 quarters with good PRF difference image offsets

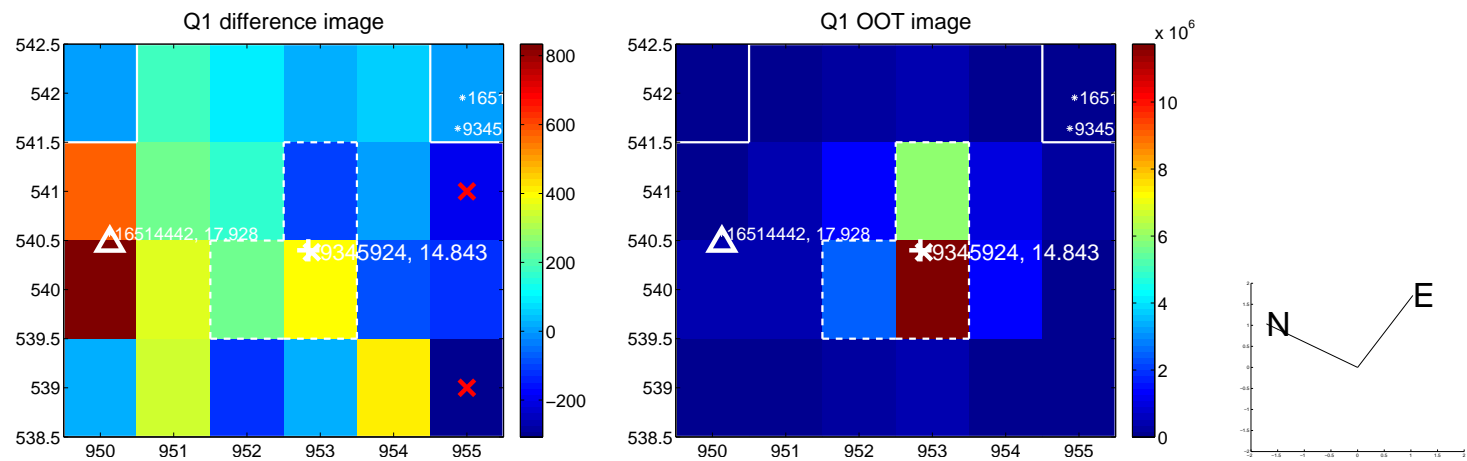
The direct PRF centroid is offset from the target star catalog position by about 0.36 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$1.890 \pm 0.638$	2.96	$-1.162 \pm 0.774$	$-1.490 \pm 0.539$
PRF-fit source offset from KIC position	$1.744 \pm 0.685$	2.55	$-1.279 \pm 0.785$	$-1.185 \pm 0.544$
photometric centroid source offset	$2.35 \pm 1.63$	1.44	$-1.82 \pm 1.59$	$-1.48 \pm 1.68$

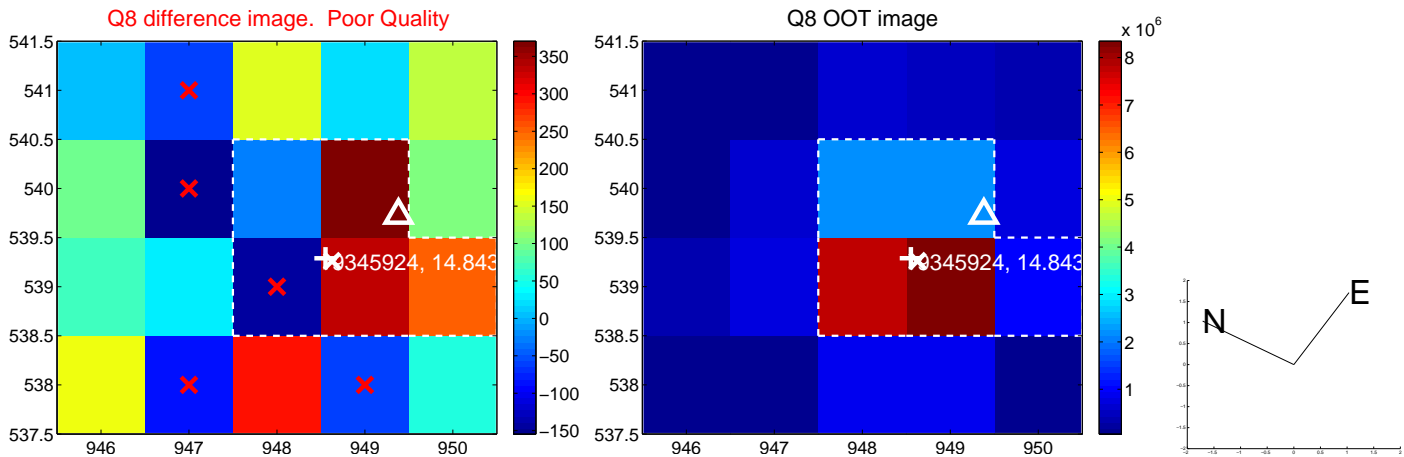
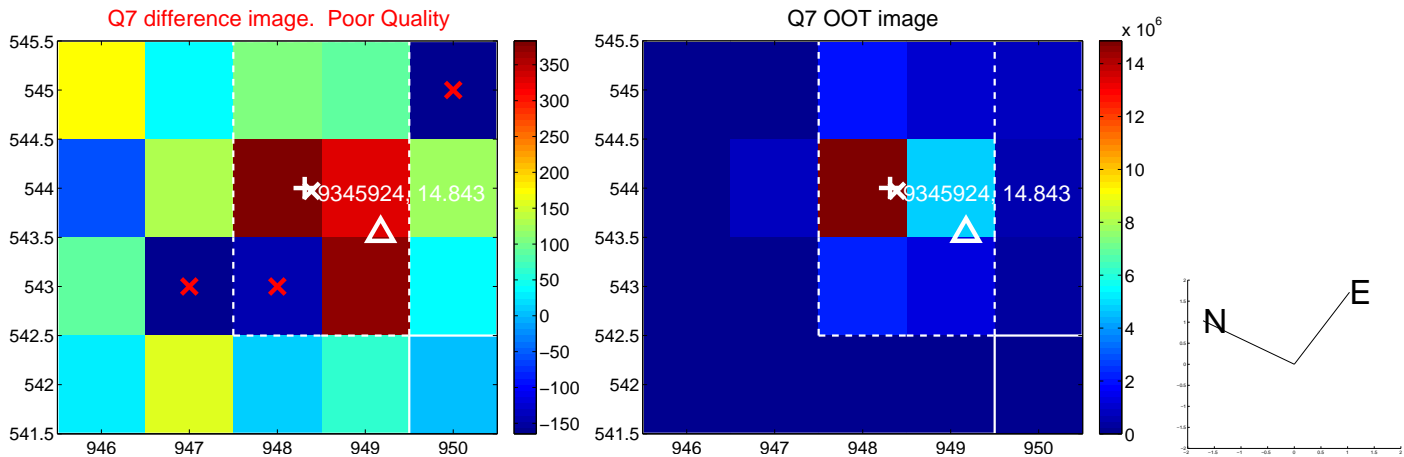
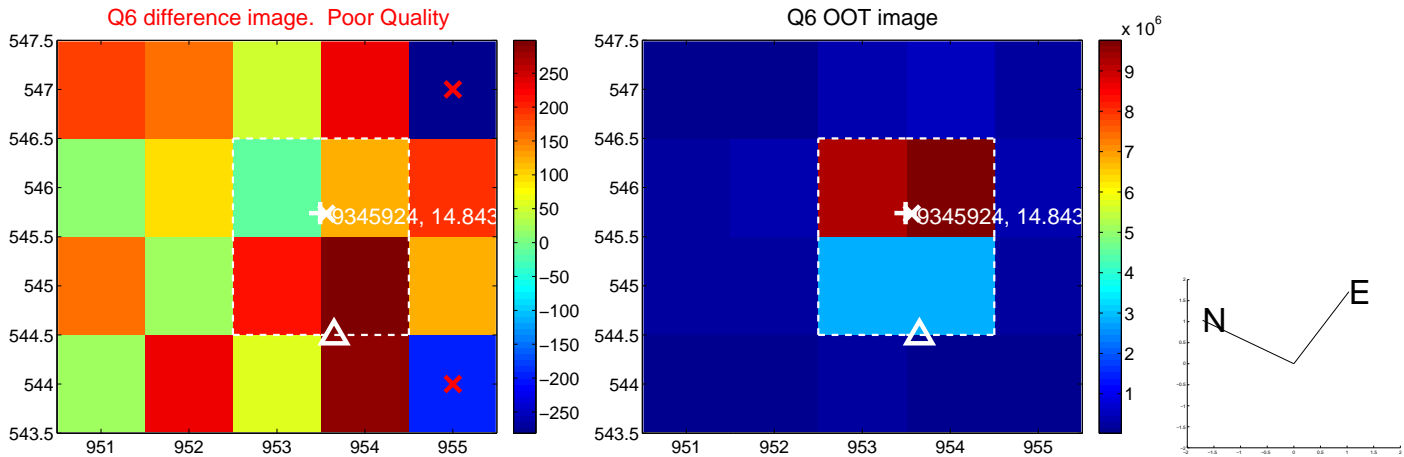
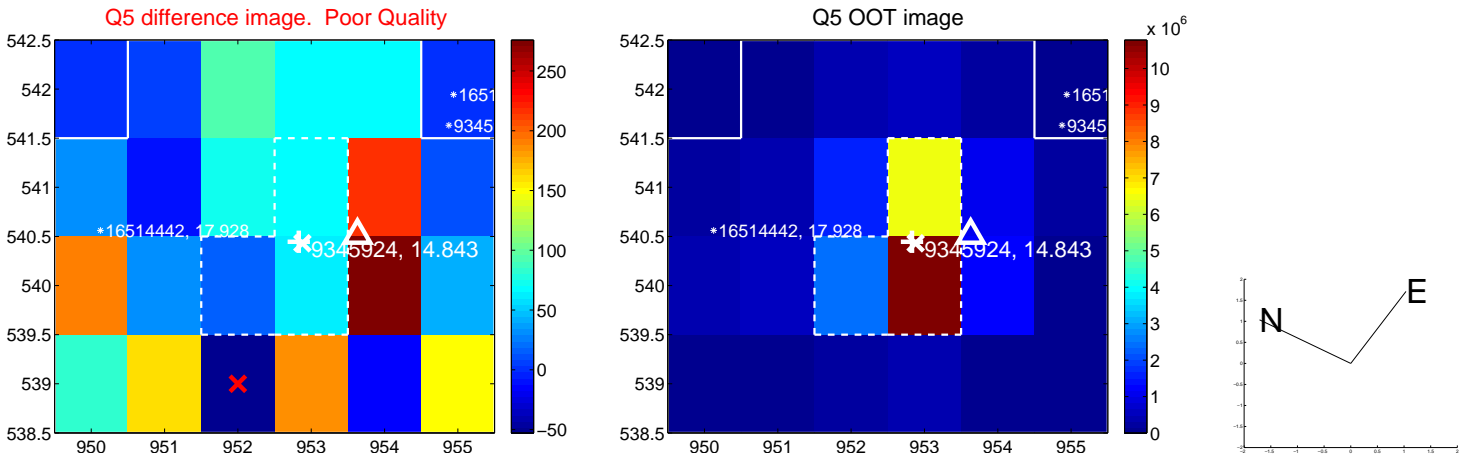


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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

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

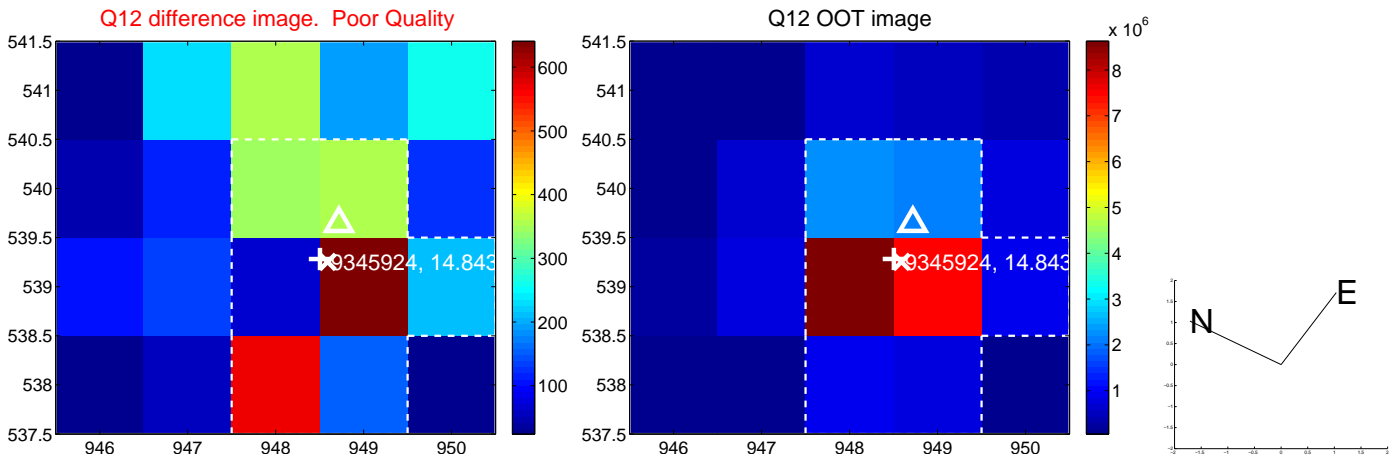
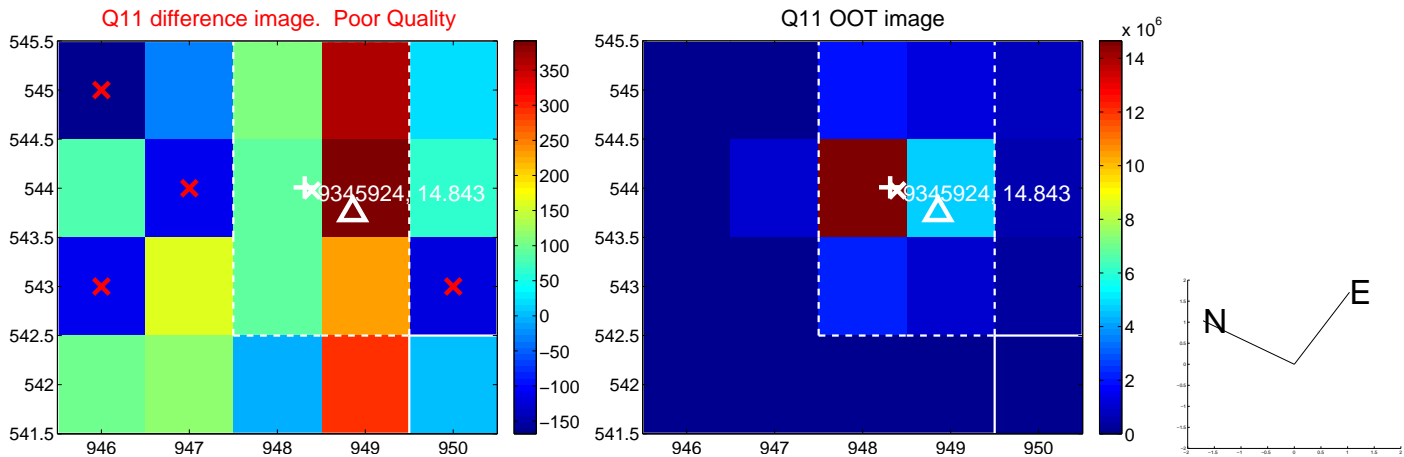
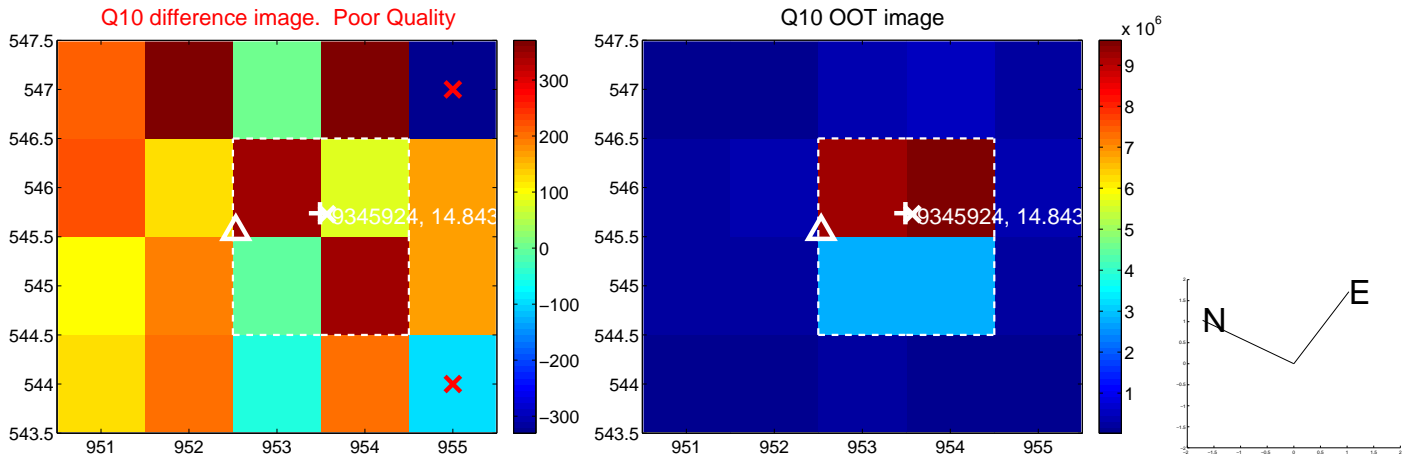
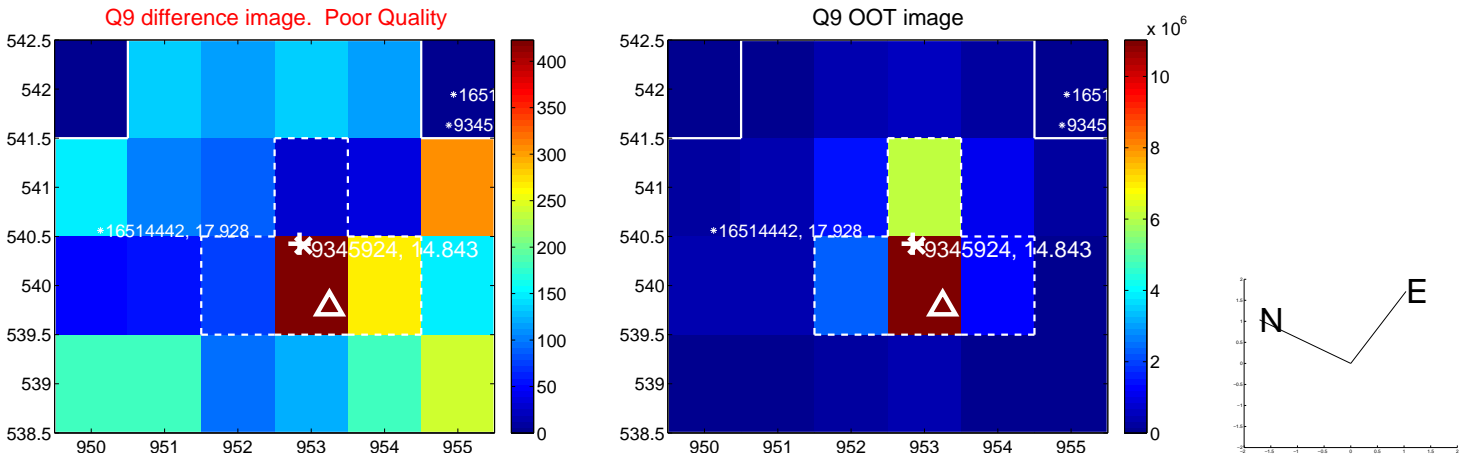


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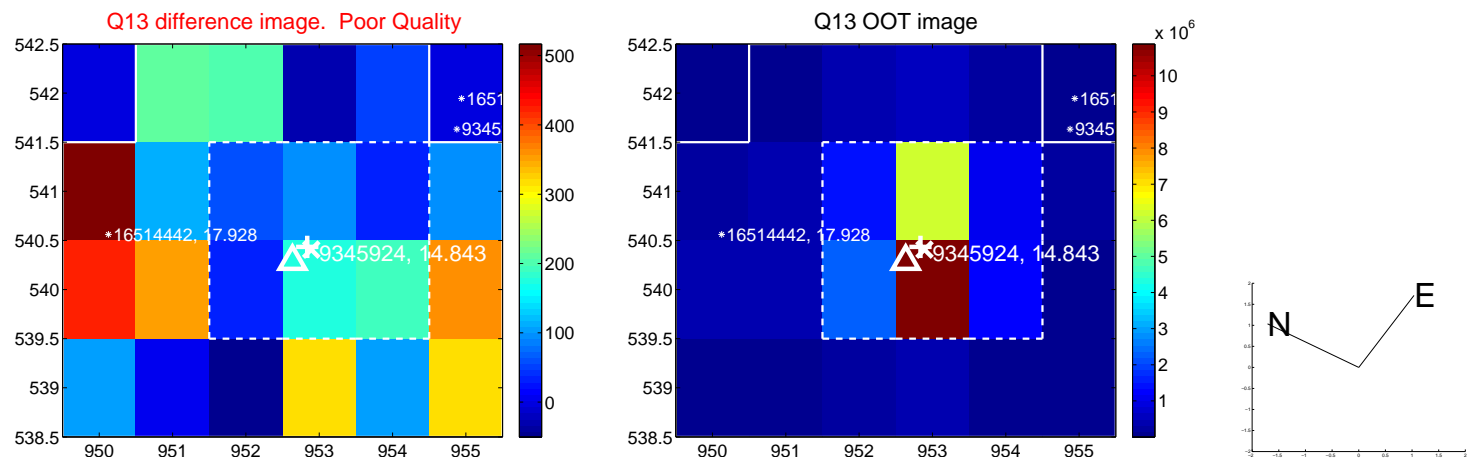




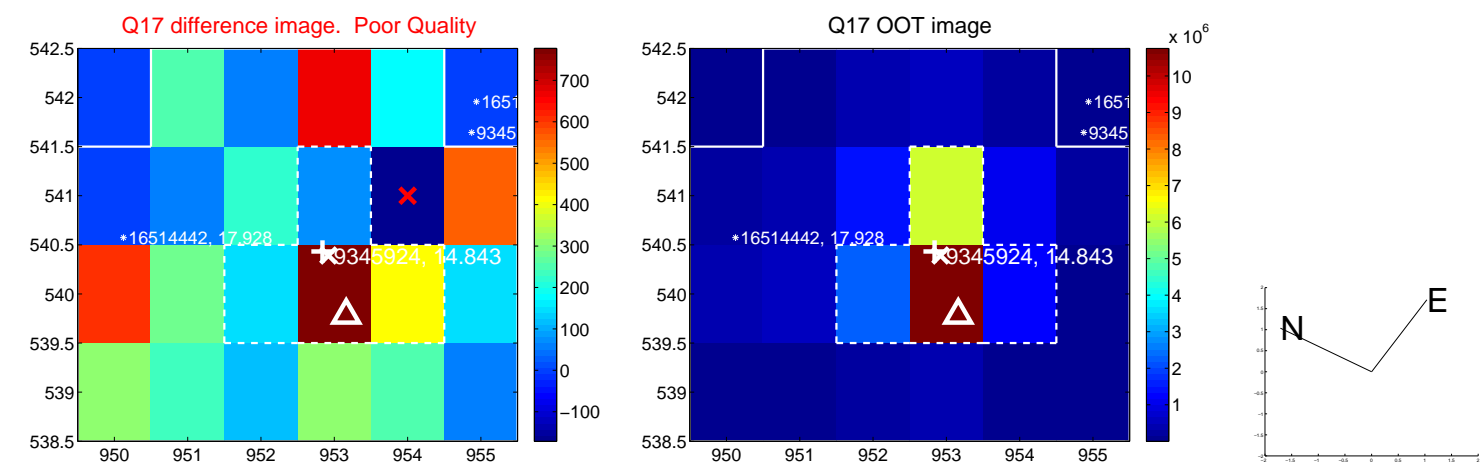
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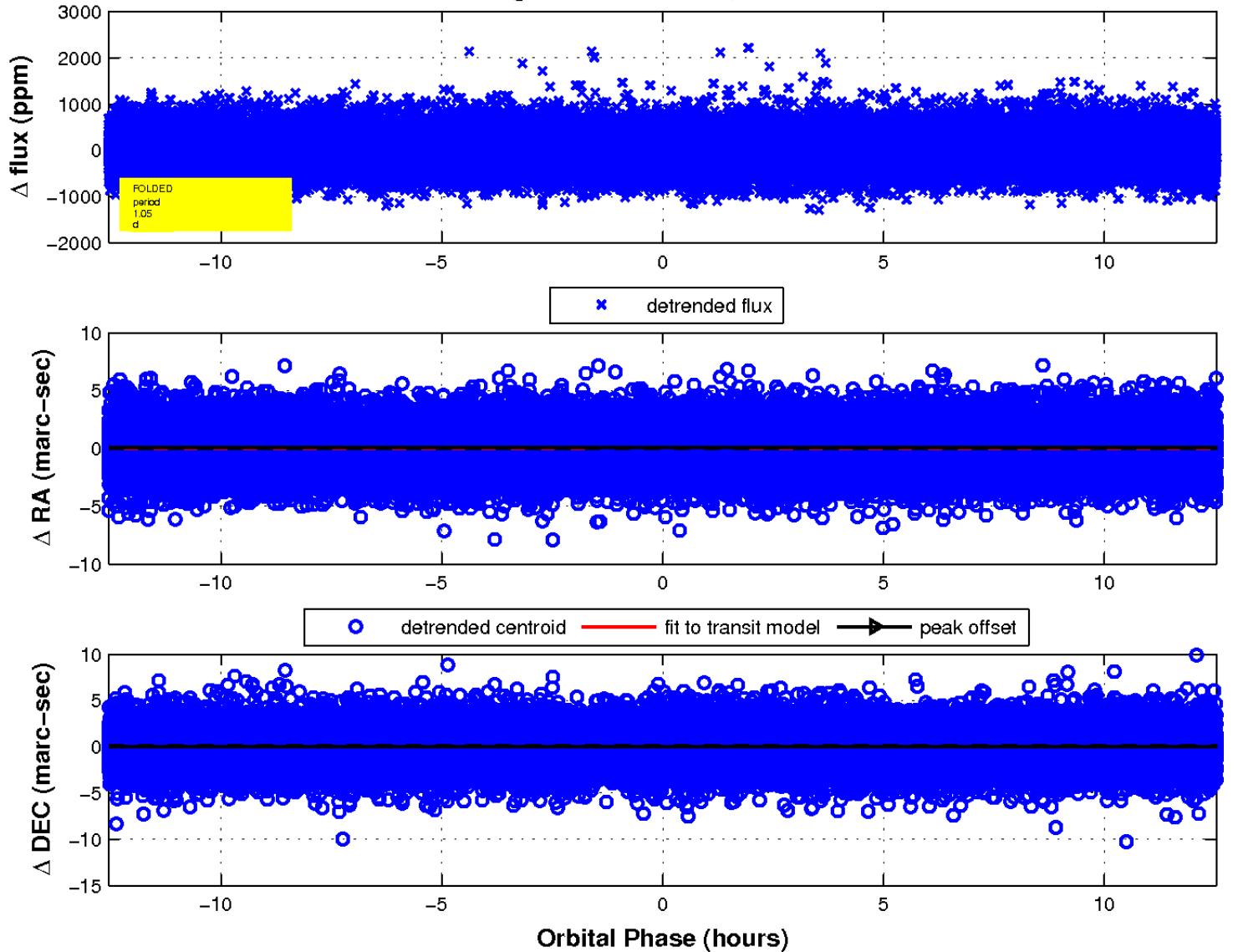
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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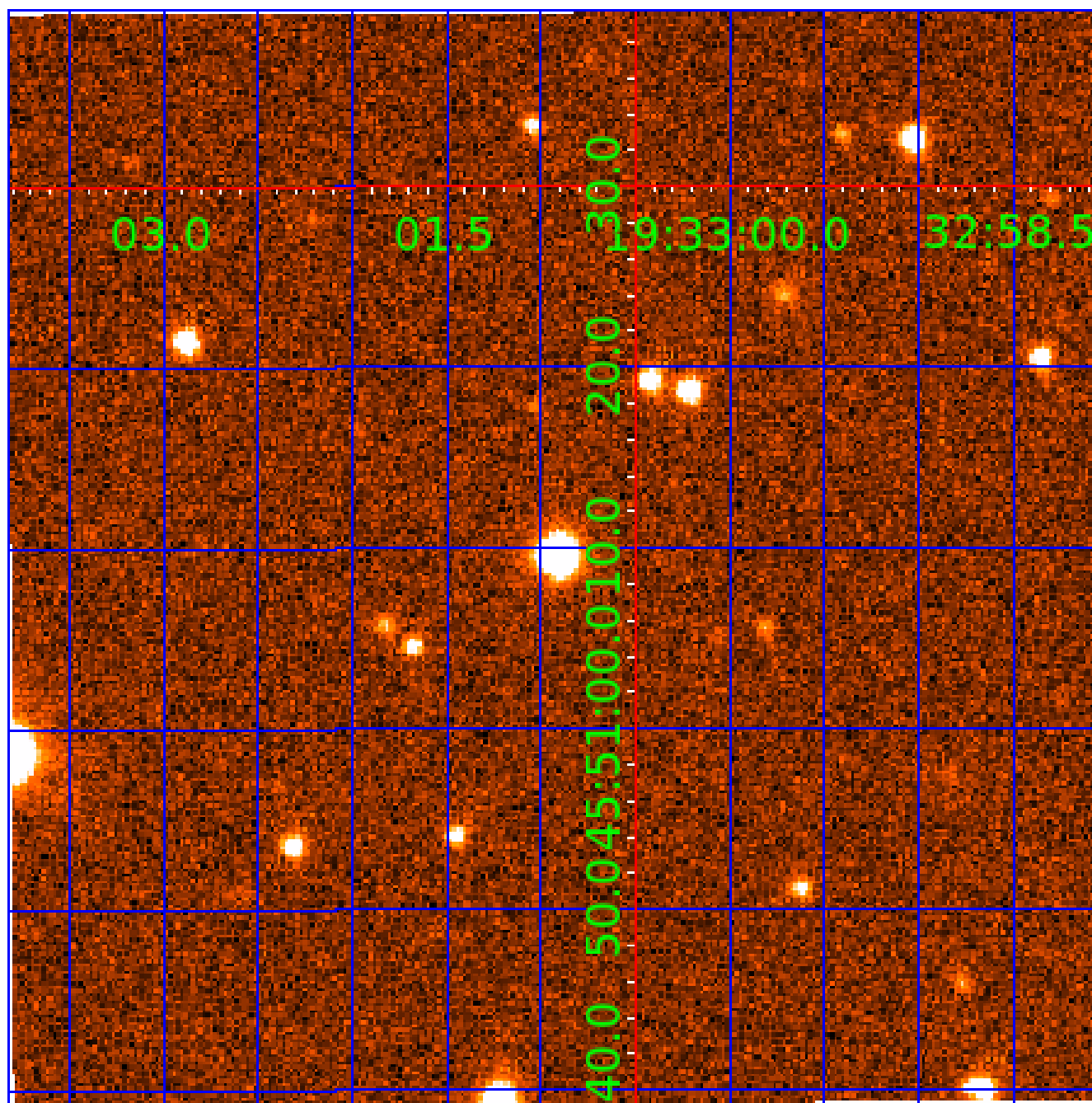


fluxWeightedCentroids, Planet 1 of 4



UKIRT Image

Declination





# KIC 009345924

## 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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## Robovetter Results

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009345924-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_NONUNIQ_ALT—CENT_FEW_DIFFS
009345924-03	OBS	FP	0.00	1	0	1	0	INDIV_TRANS_RUBBLE_SKYE—TRANS_GAPPED—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—CENT_FEW_DIFFS—HALO_GHOST
009345924-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_POS_ALT—CENT_FEW_DIFFS

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

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

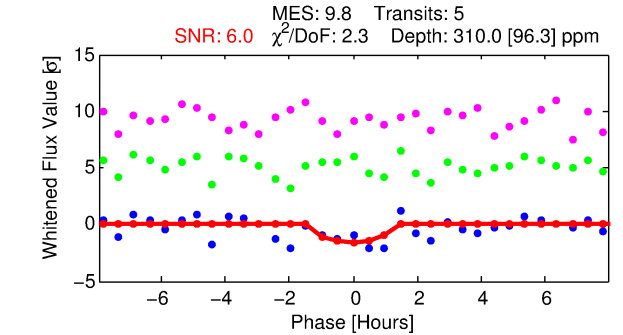
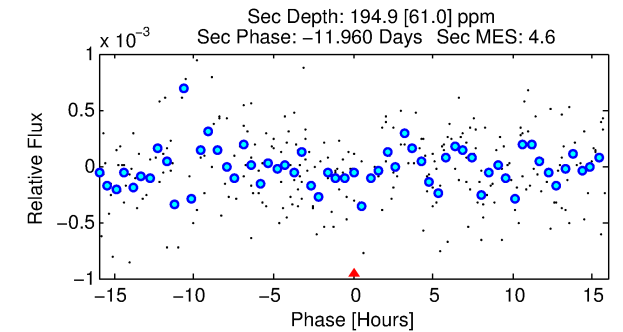
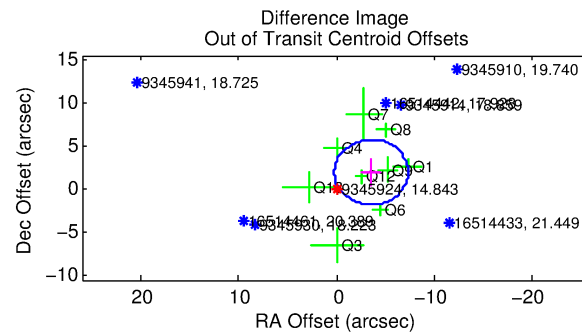
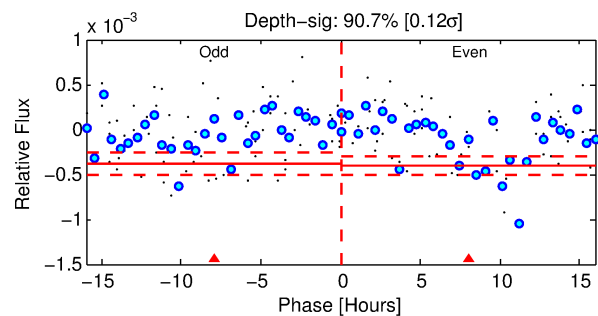
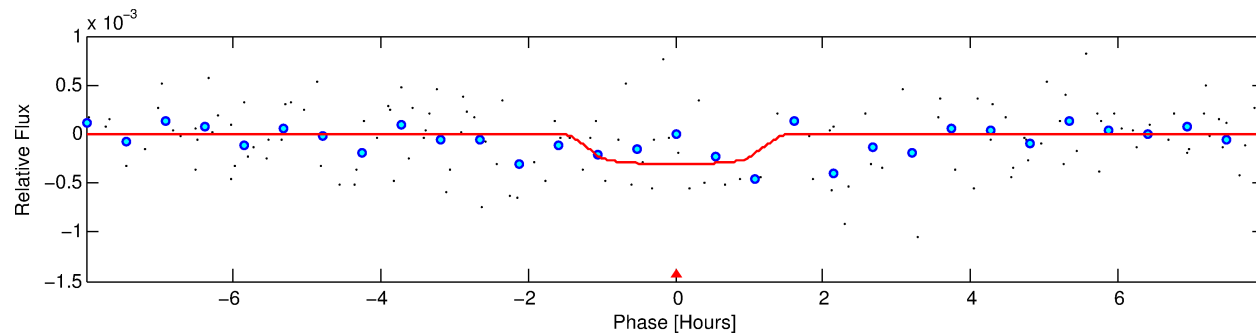
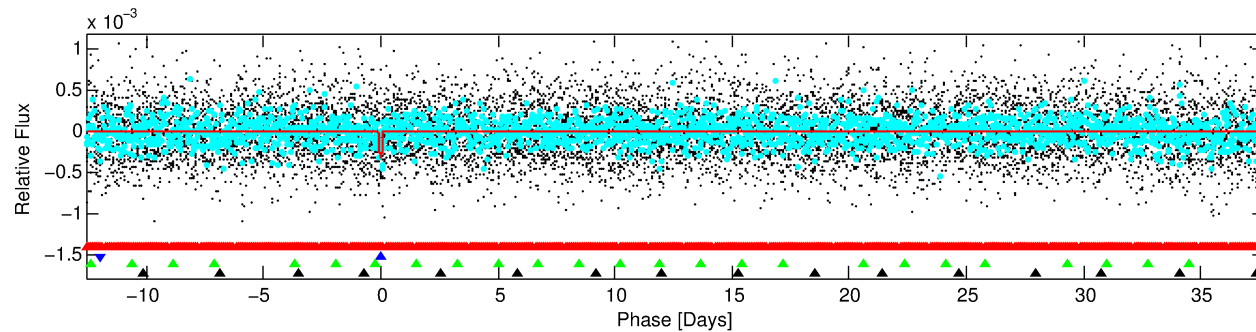
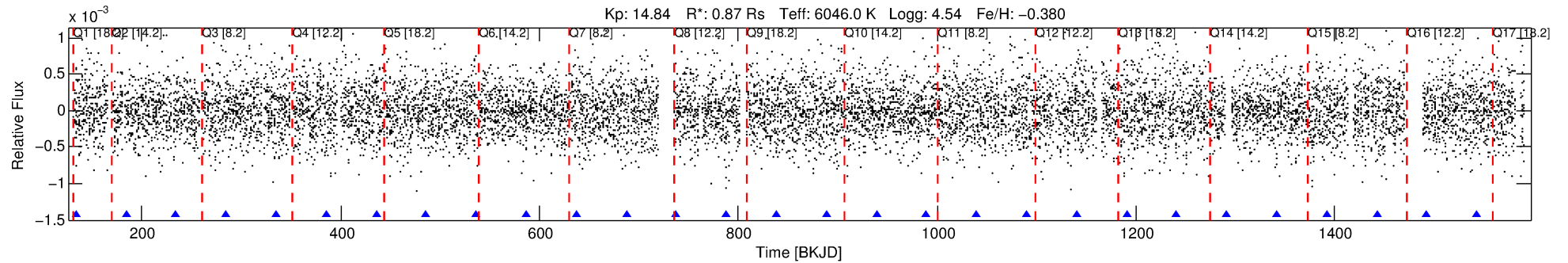
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 009345924-02

No Significant Match Found

# DV One-Page Summary

KIC: 9345924 Candidate: 2 of 4 Period: 50.315 d



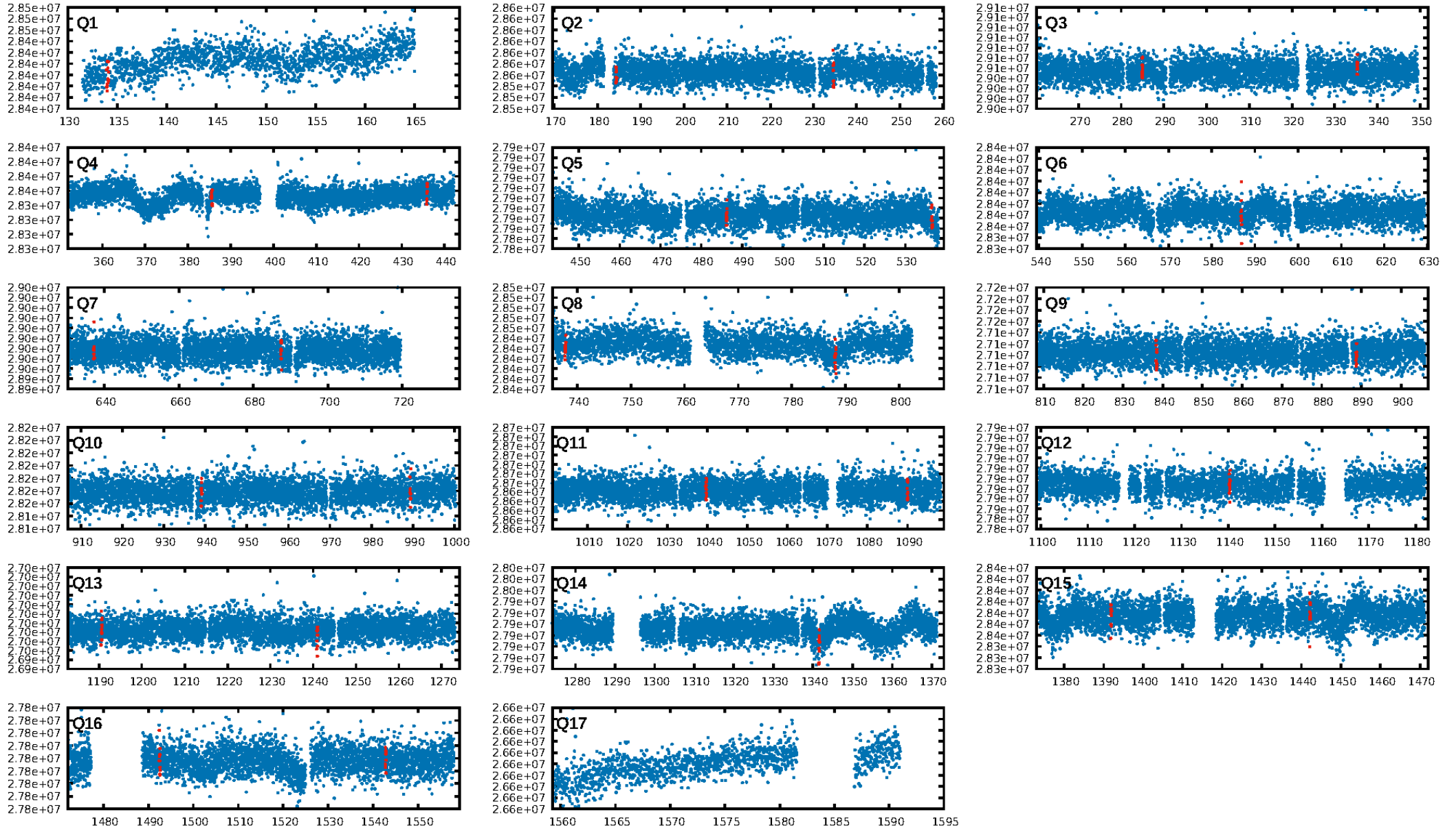
## DV Fit Results:

Period = 50.31545 [0.00163] d  
Epoch = 134.0076 [0.0205] BKJD  
Rp/R\* = 0.0185 [0.0461]  
a/R\* = 76.48 [987.42]  
b = 0.87 [3.67]  
Seff = 13.12 [5.14]  
Teff = 485 [47] K  
Rp = 1.76 [4.40] Re  
a = 0.2625 [0.0670] AU  
Ag = 2388.70 [11931.24] [0.20 $\sigma$ ]  
Teffp = 5245 [6534] K [0.73 $\sigma$ ]

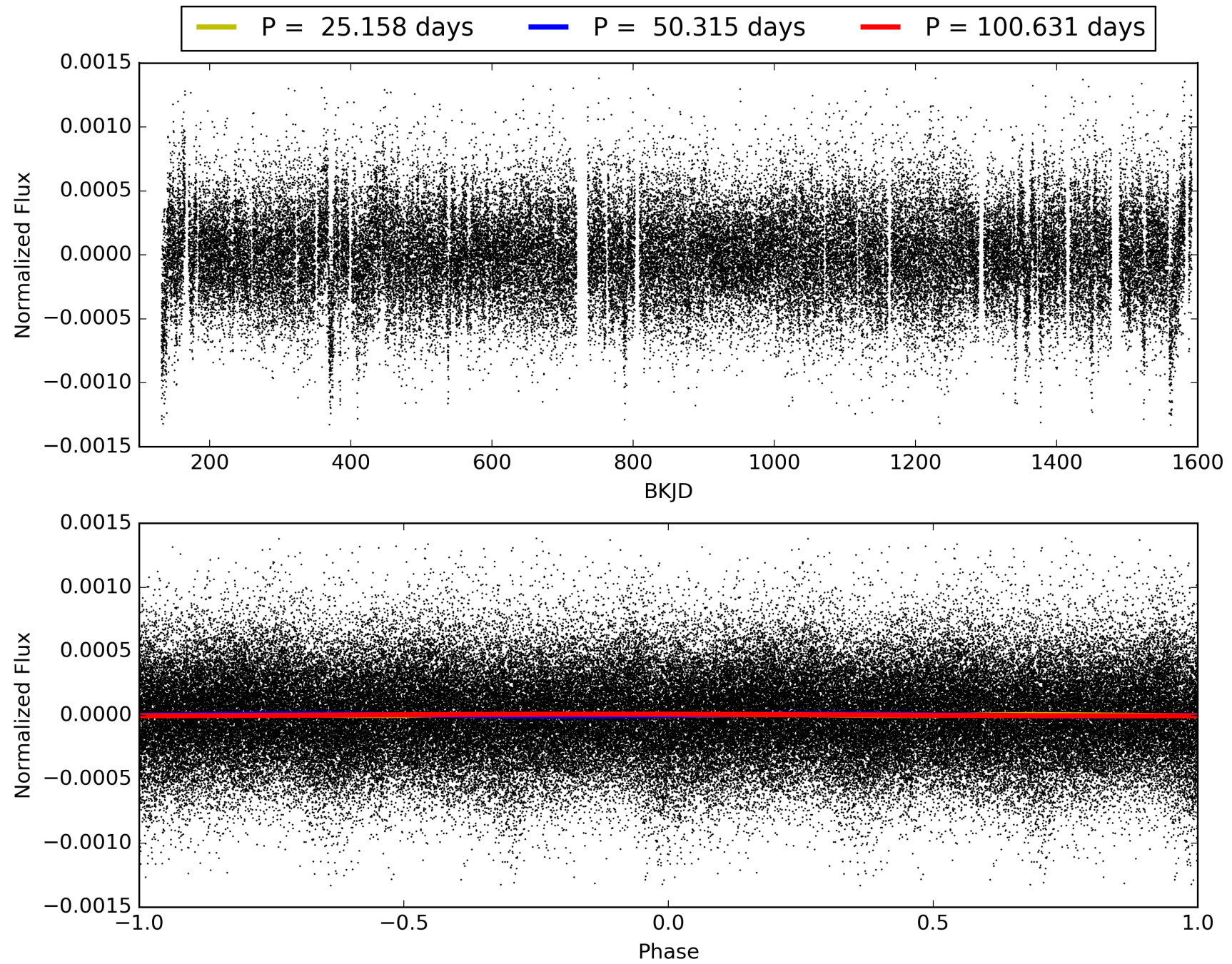
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [162.85 $\sigma$ ]  
LongPeriod-sig: 100.0% [47.83 $\sigma$ ]  
ModelChiSquare2-sig: 5.0%  
ModelChiSquareGof-sig: 73.4%  
Bootstrap-pfa: 1.13e-17  
RollingBand-fgt: 1.00 [5/5]  
GhostDiagnostic-chr: -6.375  
Centroid-sig: 84.8%  
Centroid-so: 0.660 arcsec [0.48 $\sigma$ ]  
OotOffset-rm: 4.061 arcsec [3.23 $\sigma$ ]  
KicOffset-rm: 4.270 arcsec [3.74 $\sigma$ ]  
OotOffset-st: 1/2/3/3 [9]  
KicOffset-st: 1/2/3/3 [9]  
DiffImageQuality-fgm: 0.11 [1/9]  
DiffImageOverlap-fno: 0.19 [3/16]

# TCE 009345924-02, PDC Light Curves



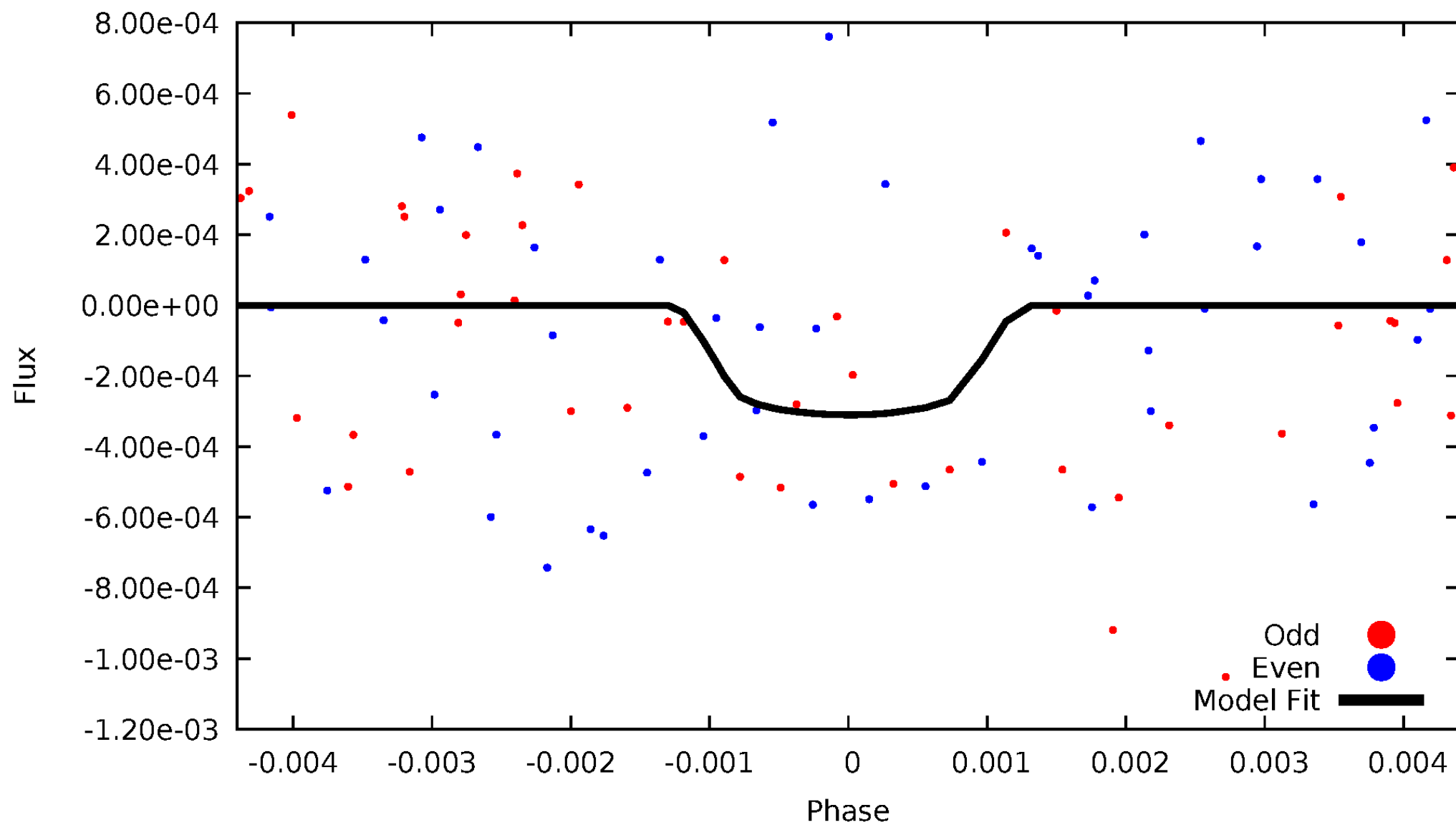
TCE 009345924-02





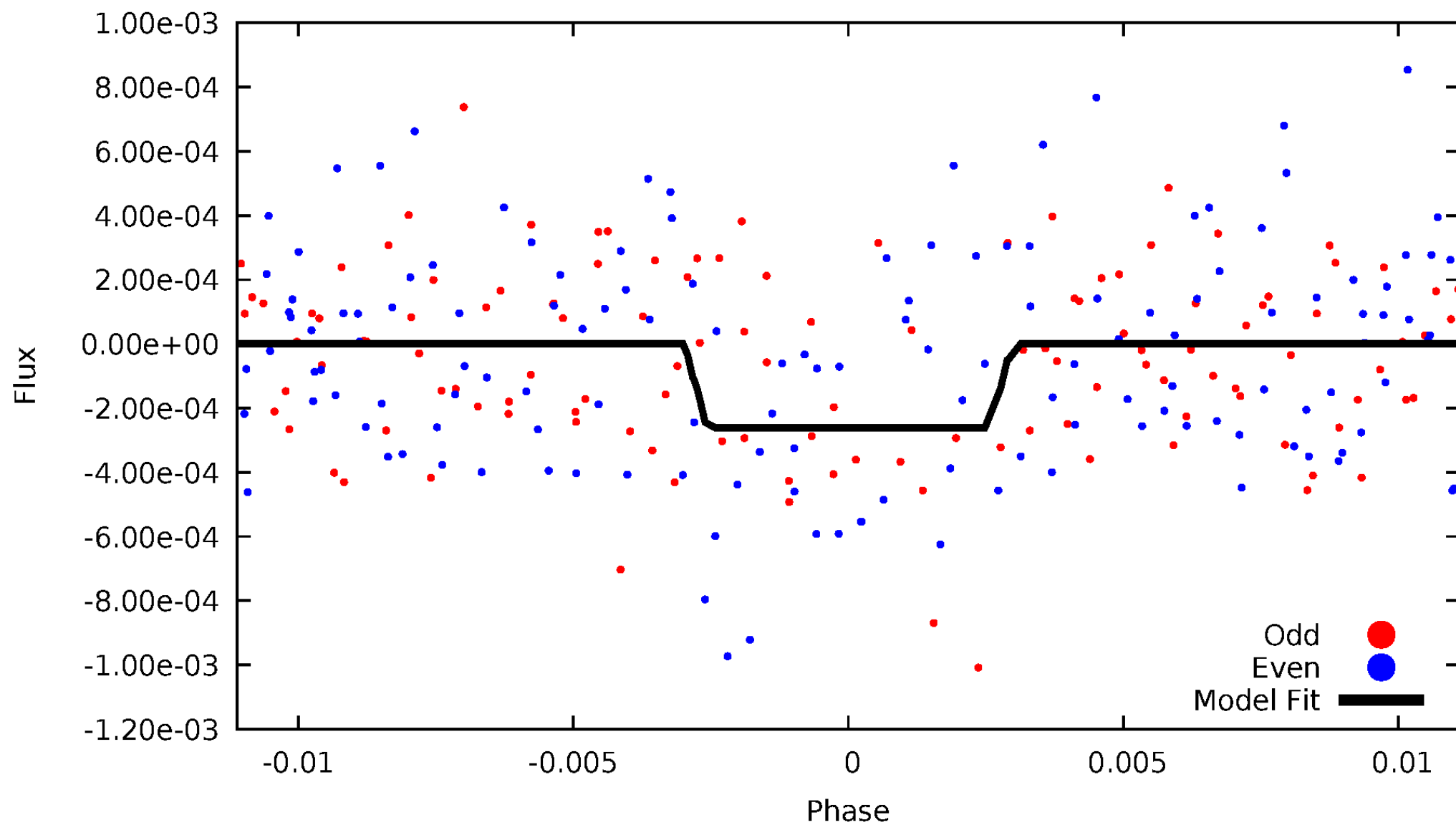
# DV Odd/Even

TCE 009345924-02



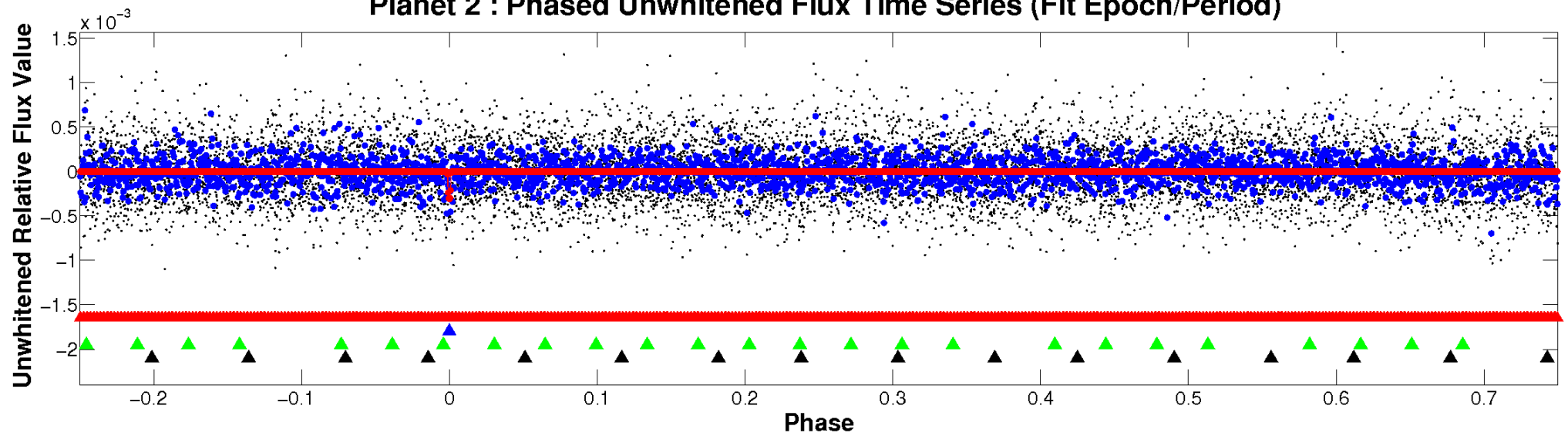
# ALT Odd/Even

TCE 009345924-02

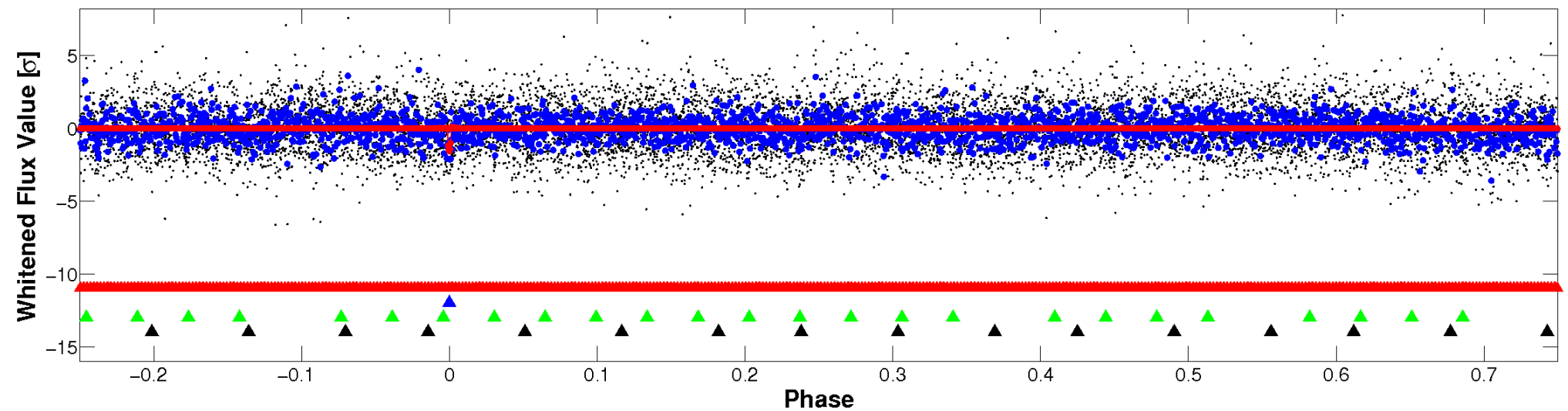


# Non-Whitened Vs. Whitened Light Curve

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

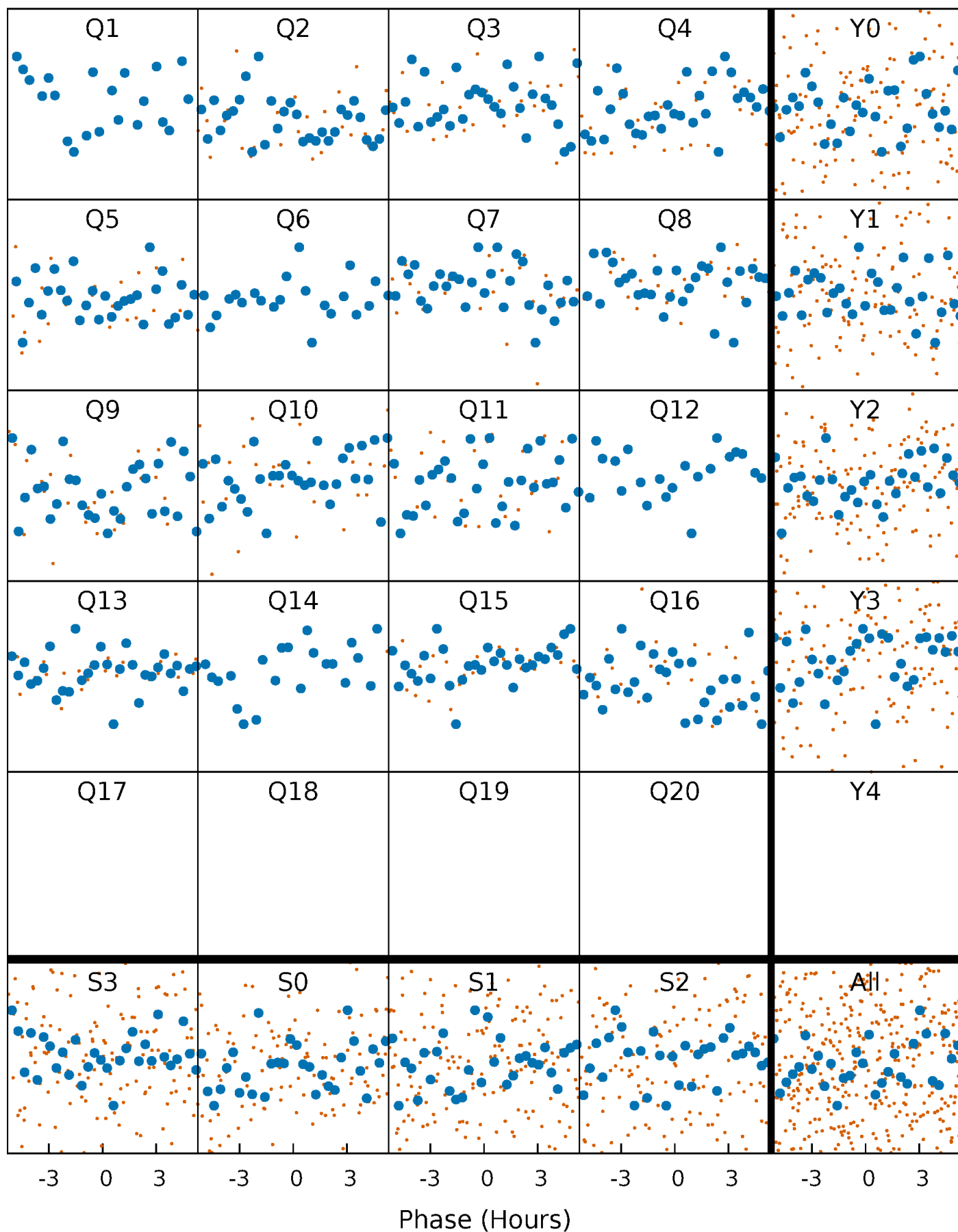


## Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



# PDC Quarter-Phased Transit Curves

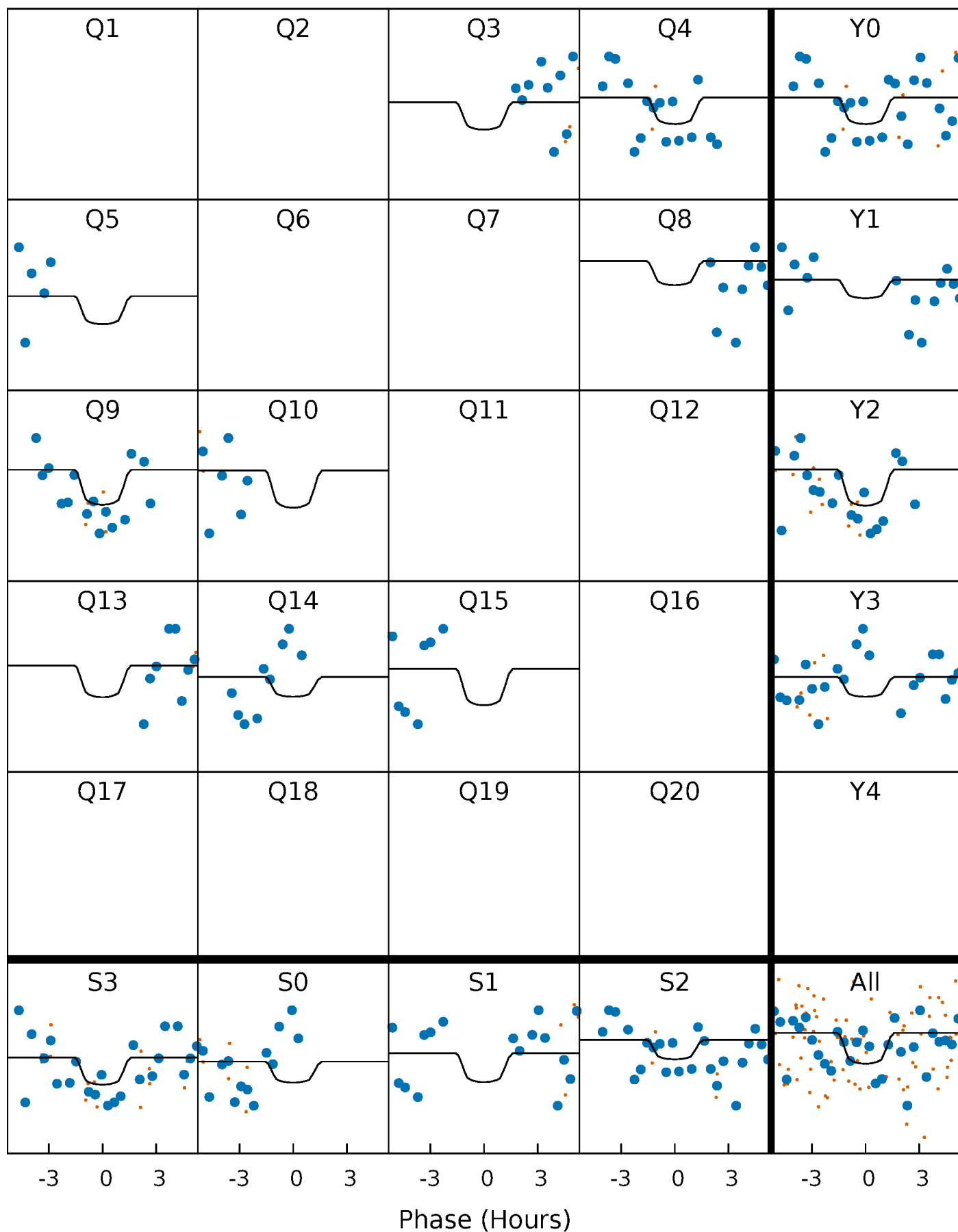
TCE 009345924-02 P= 50.315451 Days  $T_0=134.007633$  (BKJD)





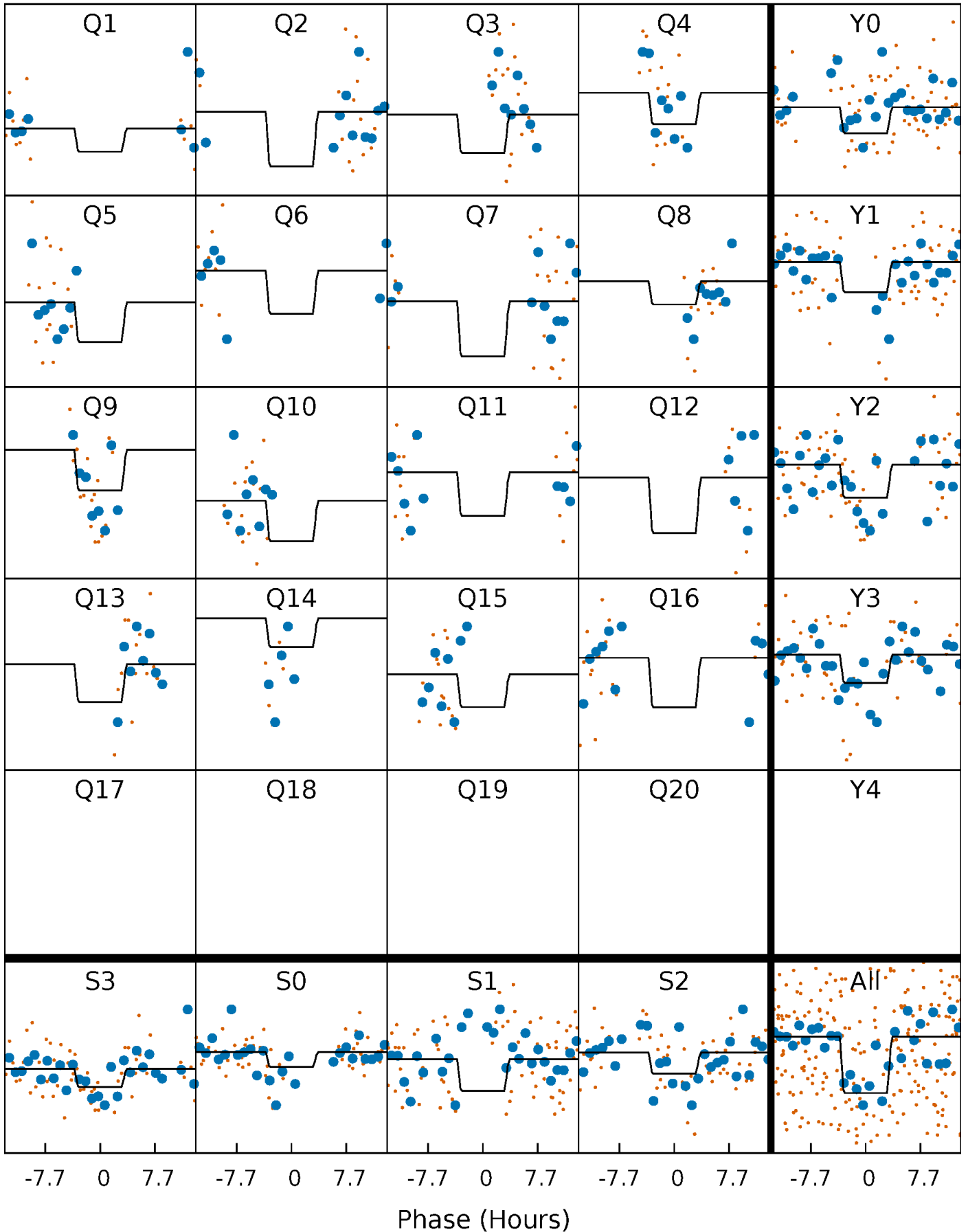
# DV Quarter-Phased Transit Curves

TCE 009345924-02 P= 50.315451 Days  $T_0=134.007633$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

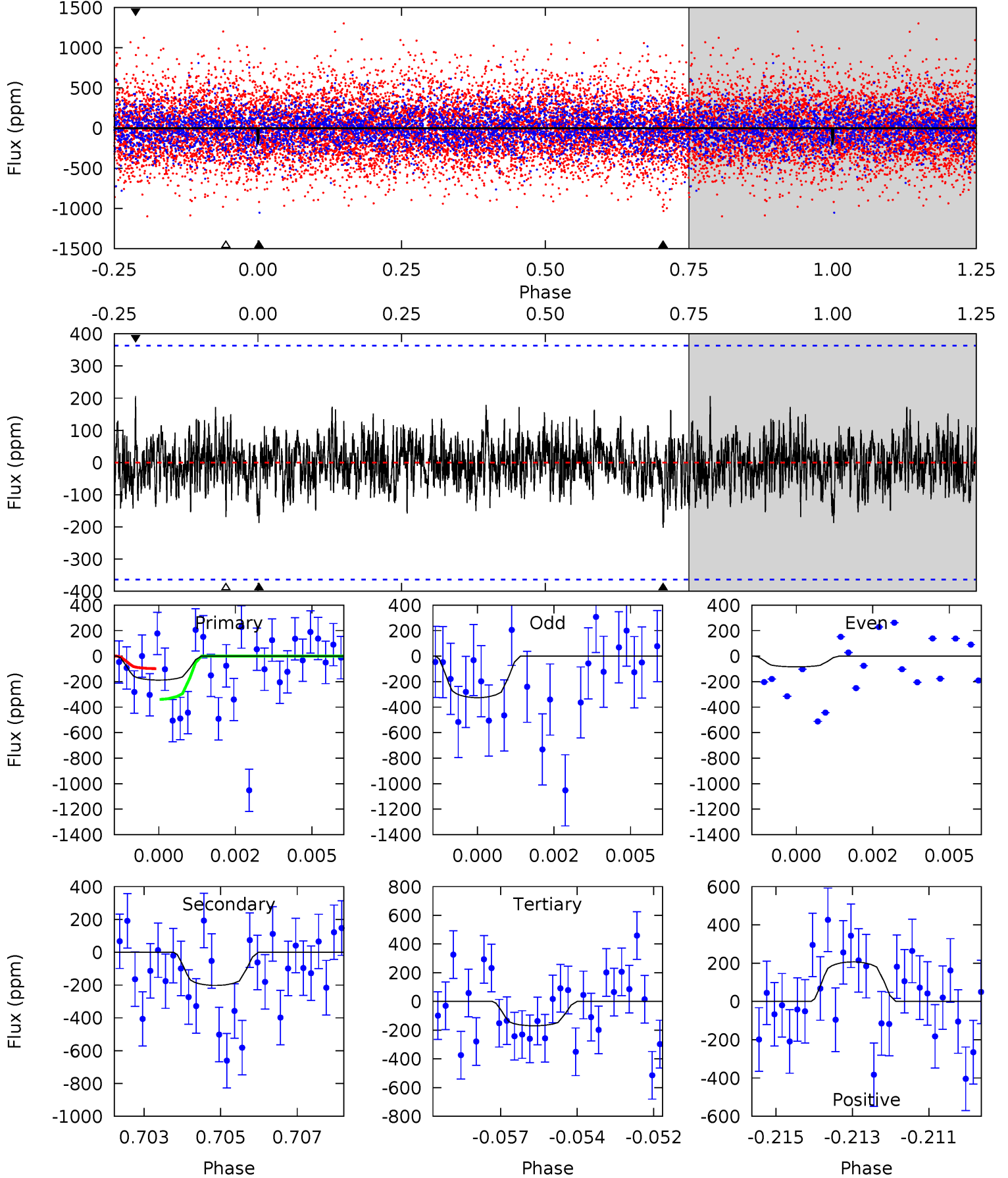
TCE 009345924-02     $P = 50.313946$  Days     $T_0 = 134.045084$  (BKJD)



# DV Model-Shift Uniqueness Test

009345924-02, P = 50.315451 Days, E = 83.692182 Days

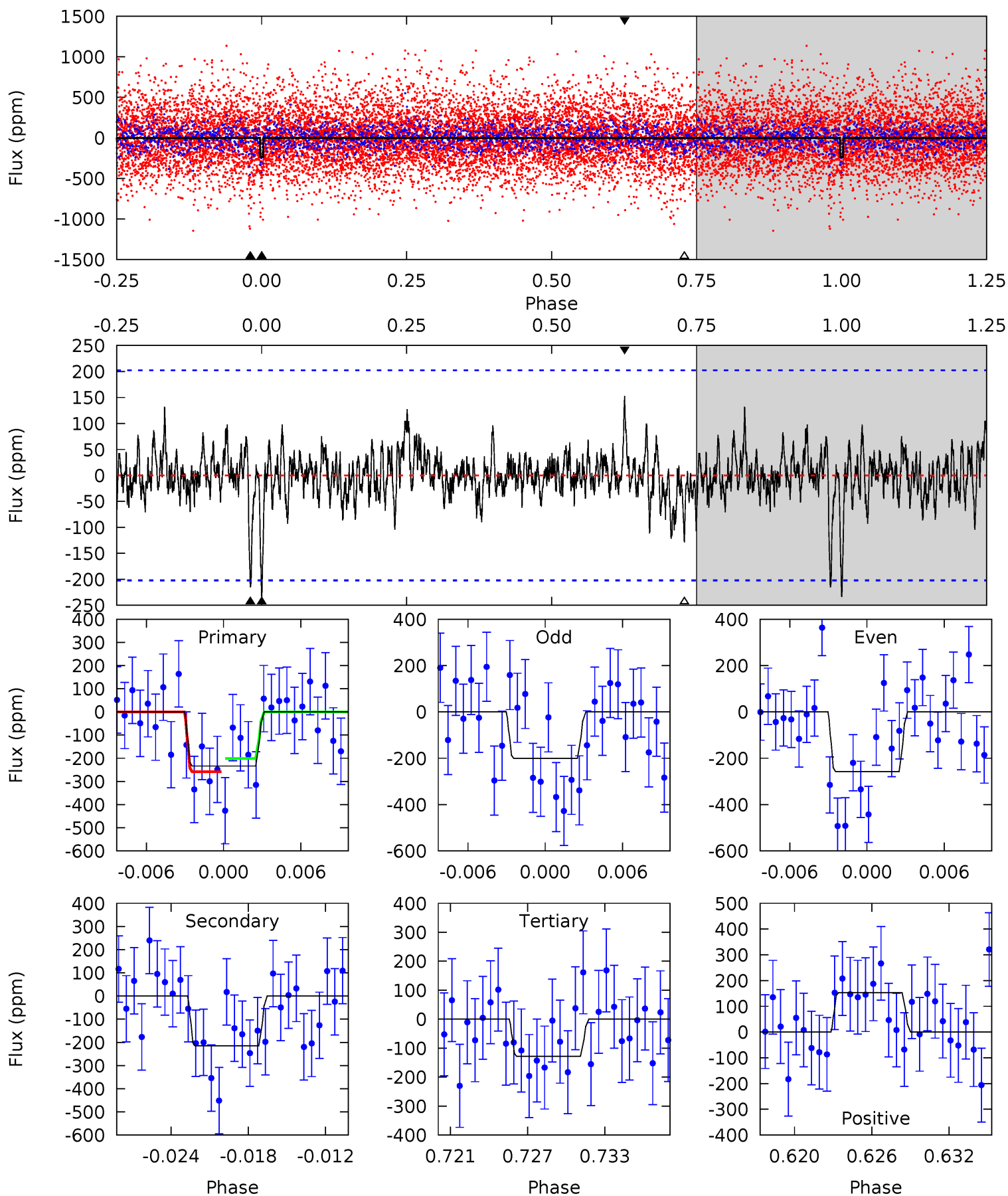
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
2.74	2.94	2.46	3.01	5.30	3.04	0.83	0.27	-0.28	0.48	-0.07	1.77	0.50	0.51	1.73



# Alt Model-Shift Uniqueness Test

009345924-02, P = 50.313946 Days, E = 83.731138 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
5.93	5.46	3.25	3.87	5.12	2.75	0.92	2.67	2.06	2.20	1.59	0.72	0.71	0.39	0.73





### Stellar Parameters For KIC 009345924

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$\rho_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$6046^{+164}_{-182}$	$4.539^{+0.036}_{-0.204}$	$-0.380^{+0.300}_{-0.300}$	$0.869^{+0.263}_{-0.066}$	$0.953^{+0.119}_{-0.107}$	$2.043^{+0.395}_{-1.029}$
	+3%/-3%	+1%/-4%	+79%/-79%	+30%/-8%	+12%/-11%	+19%/-50%
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 009345924-02 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-202 \pm 69$	$3.89^{+3.87}_{-2.57}$	$695^{+48}_{-32}$	$3948^{+2245}_{-782}$	$473^{+3779}_{-355}$
Alt.	$-215 \pm 39$	$3.82^{+4.12}_{-2.50}$	$698^{+45}_{-33}$	$4034^{+2304}_{-833}$	$544^{+3762}_{-420}$

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

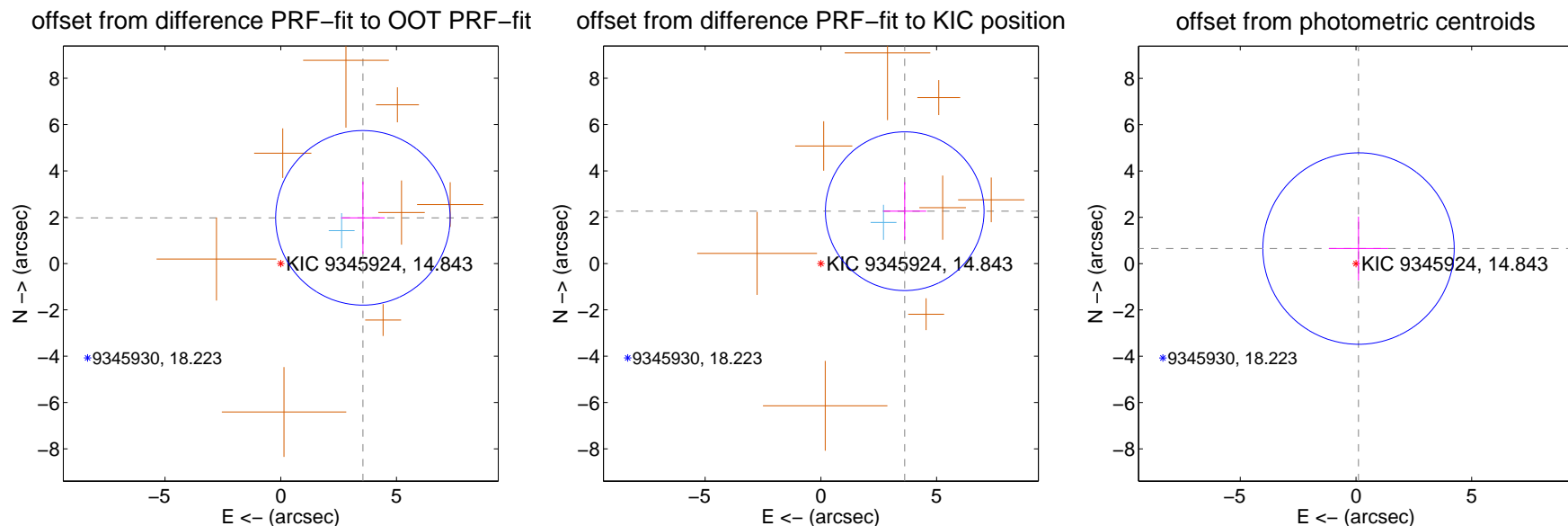
## DV Centroid Data

Supplemental centroid analysis for 009345924-02. Kepler magnitude: 14.84. Transit SNR 5.97

There are 1 quarters with good PRF difference image offsets

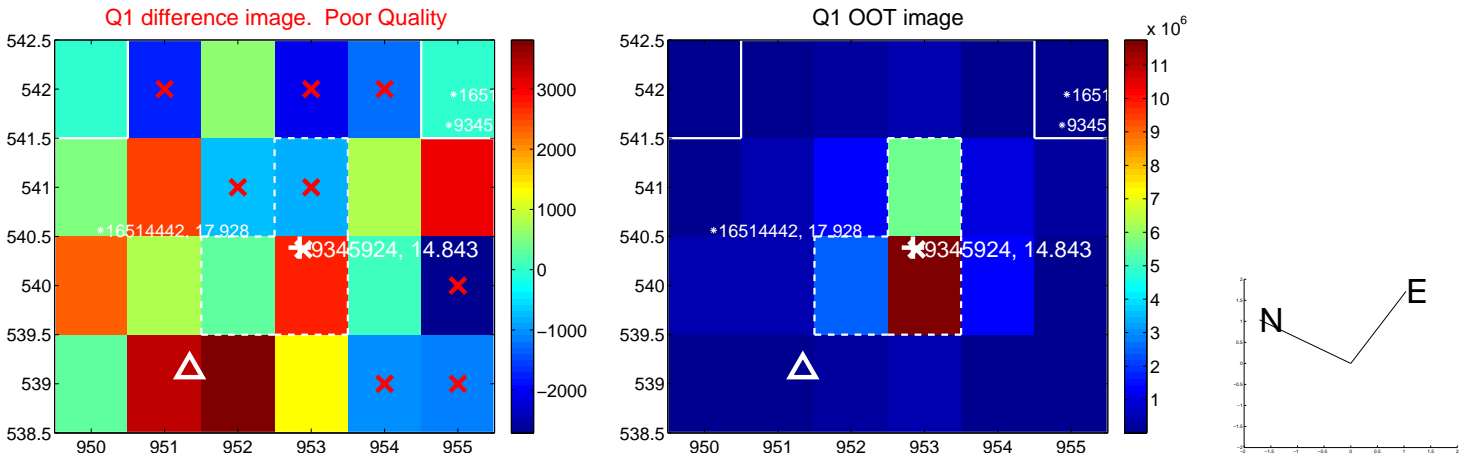
The direct PRF centroid is offset from the target star catalog position by about 0.25 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$4.061 \pm 1.256$	3.23	$-3.550 \pm 0.944$	$1.973 \pm 1.566$
PRF-fit source offset from KIC position	$4.270 \pm 1.142$	3.74	$-3.623 \pm 0.930$	$2.260 \pm 1.250$
photometric centroid source offset	$0.66 \pm 1.38$	0.48	$-0.11 \pm 1.28$	$0.65 \pm 1.38$

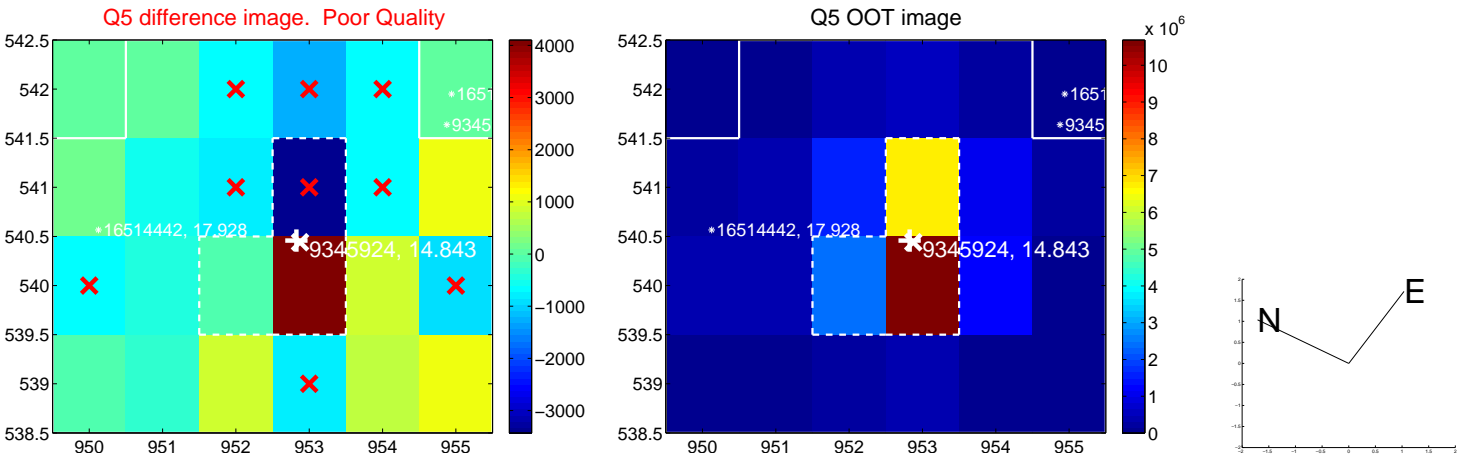


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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

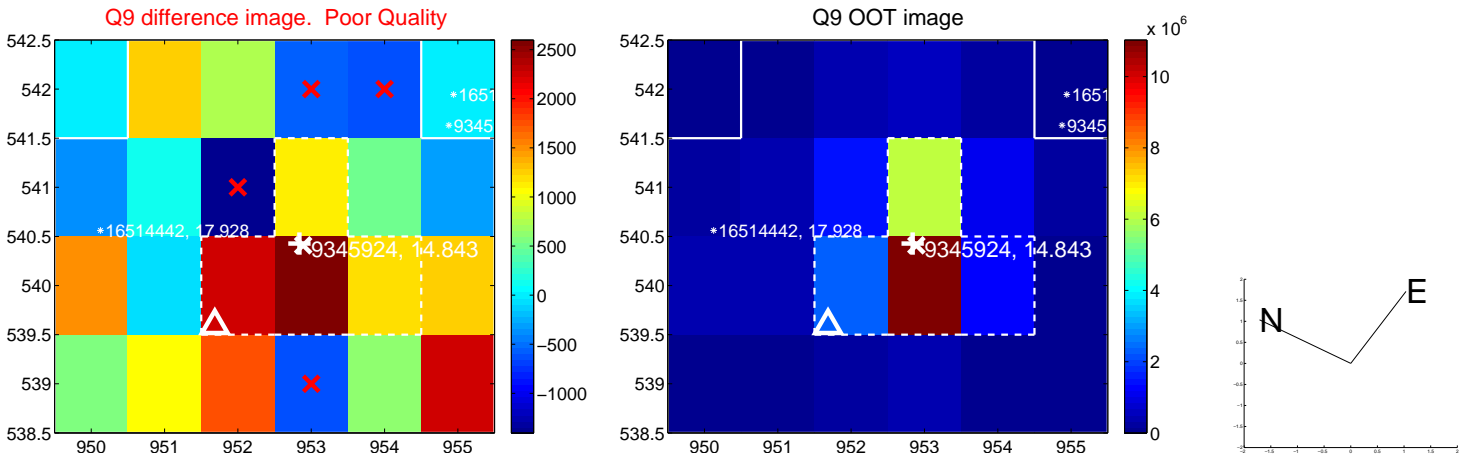
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

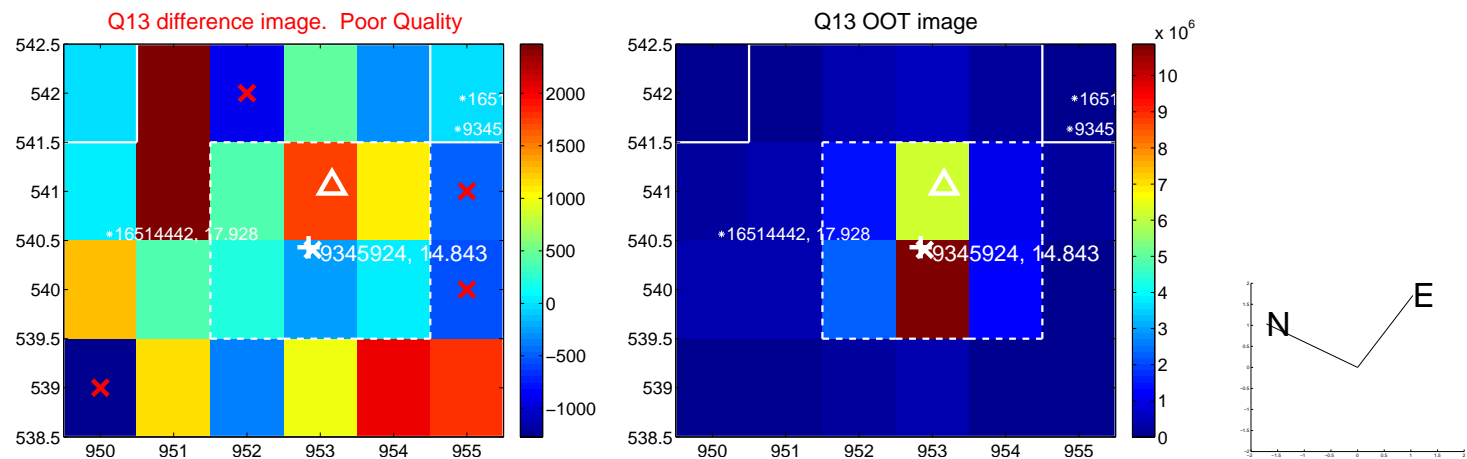


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

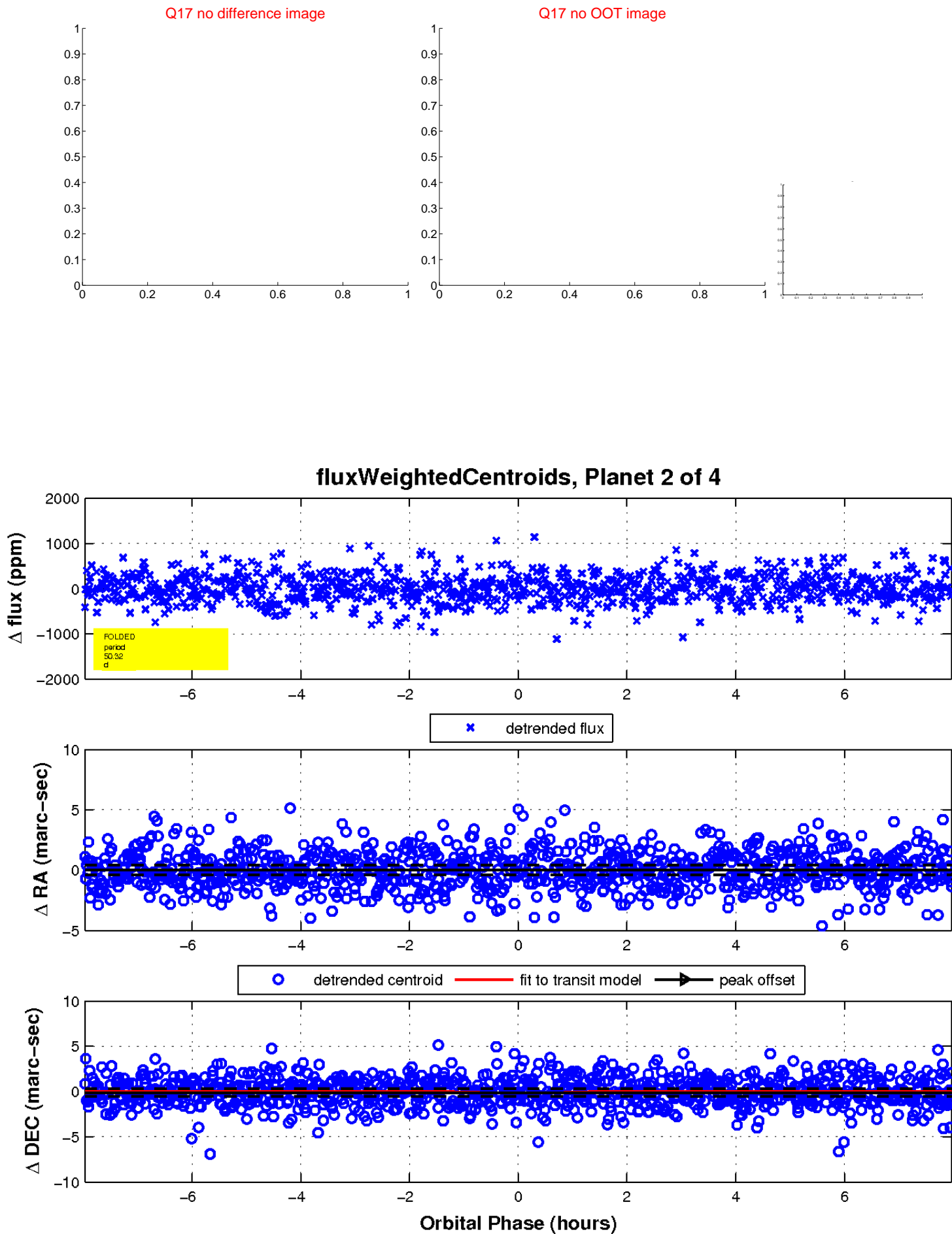




white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

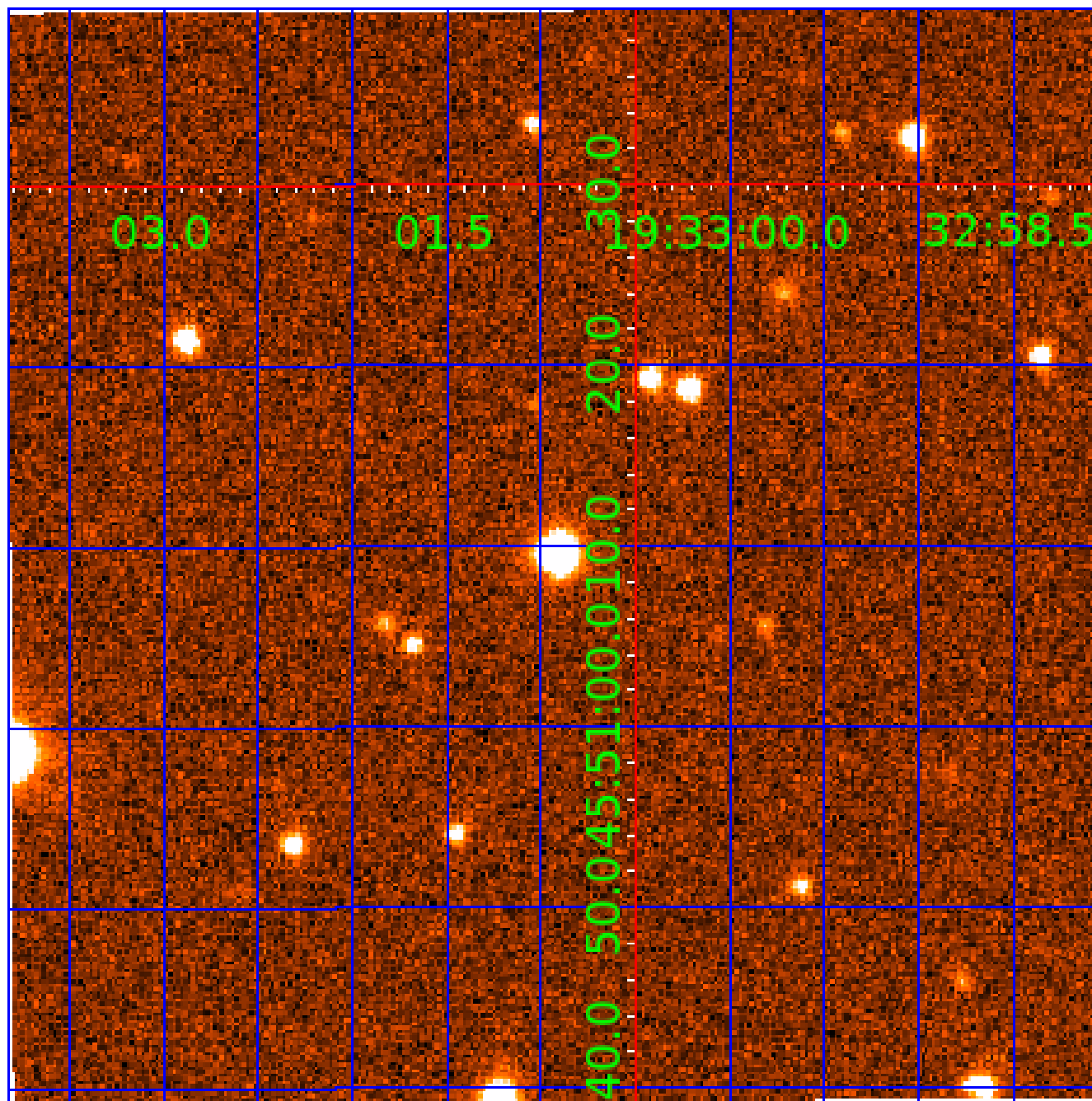


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination



# KIC 009345924

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
009345924-01	OBS	No	1.045851	131.989923	23.3	6.757	7.6	8.4	0.87	6046	0.45	2295.20
009345924-02	OBS	No	50.315451	134.007633	310.0	2.659	9.8	6.0	0.87	6046	1.76	13.12
009345924-03	OBS	No	58.990893	137.266430	378.8	3.447	8.4	8.3	0.87	6046	1.88	10.61
009345924-04	OBS	No	91.226941	183.599746	586.2	2.086	8.3	9.3	0.87	6046	2.45	5.93

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009345924-01	OBS	FP	0.00	1	0	0	1	LPP_DV—LPP_ALT—EPHEM_MATCH
009345924-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_NONUNIQ_ALT—CENT_FEW_DIFFS
009345924-03	OBS	FP	0.00	1	0	1	0	INDIV_TRANS_RUBBLE_SKYE—TRANS_GAPPED—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—CENT_FEW_DIFFS—HALO_GHOST
009345924-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_POS_ALT—CENT_FEW_DIFFS

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

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

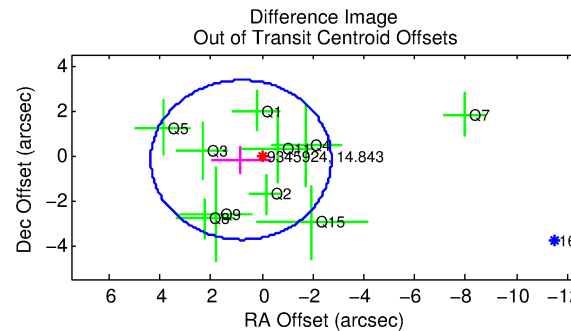
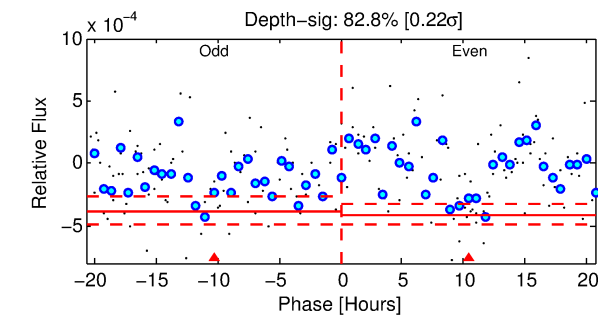
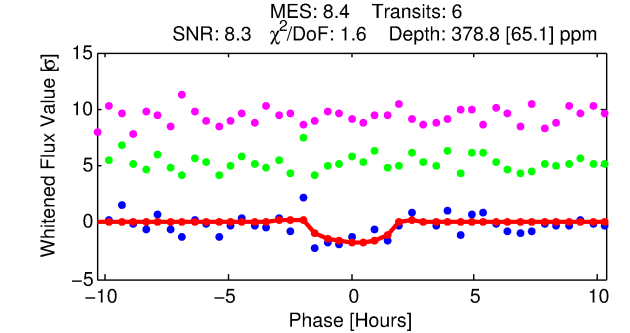
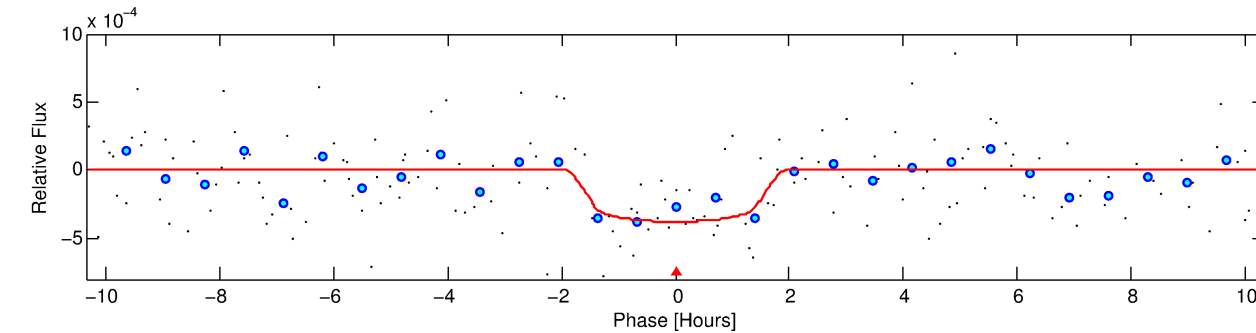
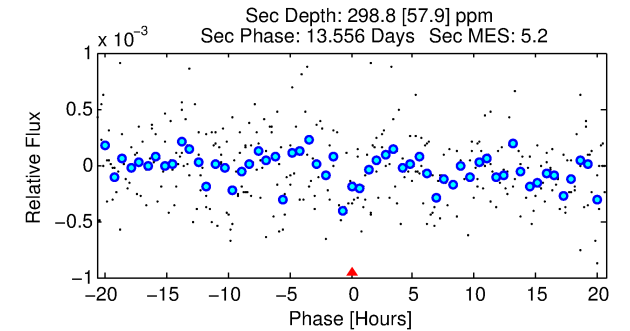
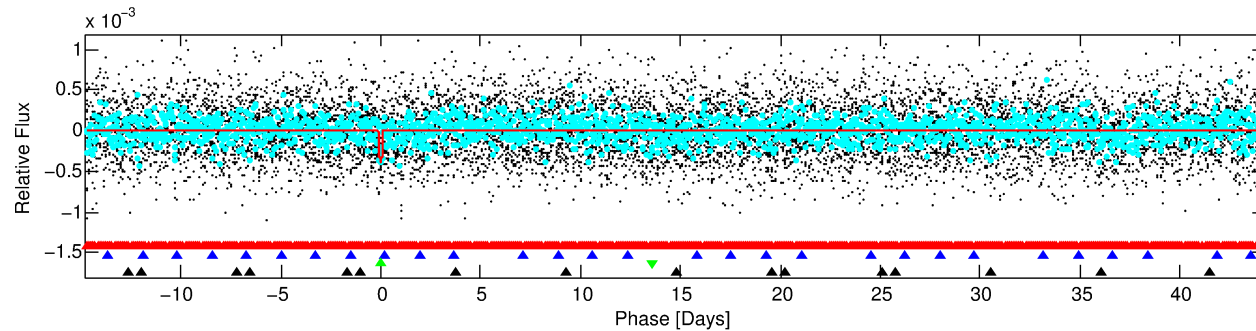
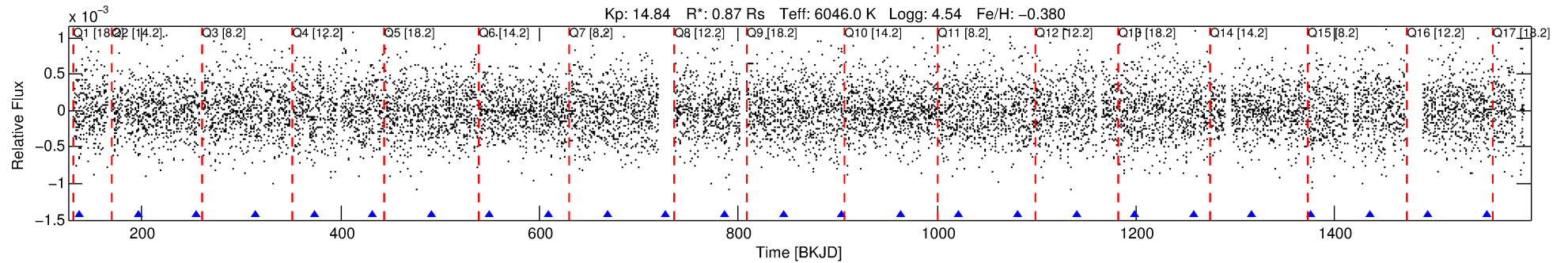
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 009345924-03

No Significant Match Found

# DV One-Page Summary

KIC: 9345924 Candidate: 3 of 4 Period: 58.991 d



## DV Fit Results:

Period = 58.99089 [0.00090] d  
Epoch = 137.2664 [0.0147] BKJD  
Rp/R\* = 0.0199 [0.0460]  
a/R\* = 80.12 [962.31]  
b = 0.82 [4.99]  
Seff = 10.61 [4.15]  
Teq = 460 [45] K  
Rp = 1.88 [4.40] Re  
a = 0.2919 [0.0745] AU  
Ag = 3944.20 [18318.17] [0.22 $\sigma$ ]  
Teffp = 5639 [6528] K [0.79 $\sigma$ ]

## DV Diagnostic Results:

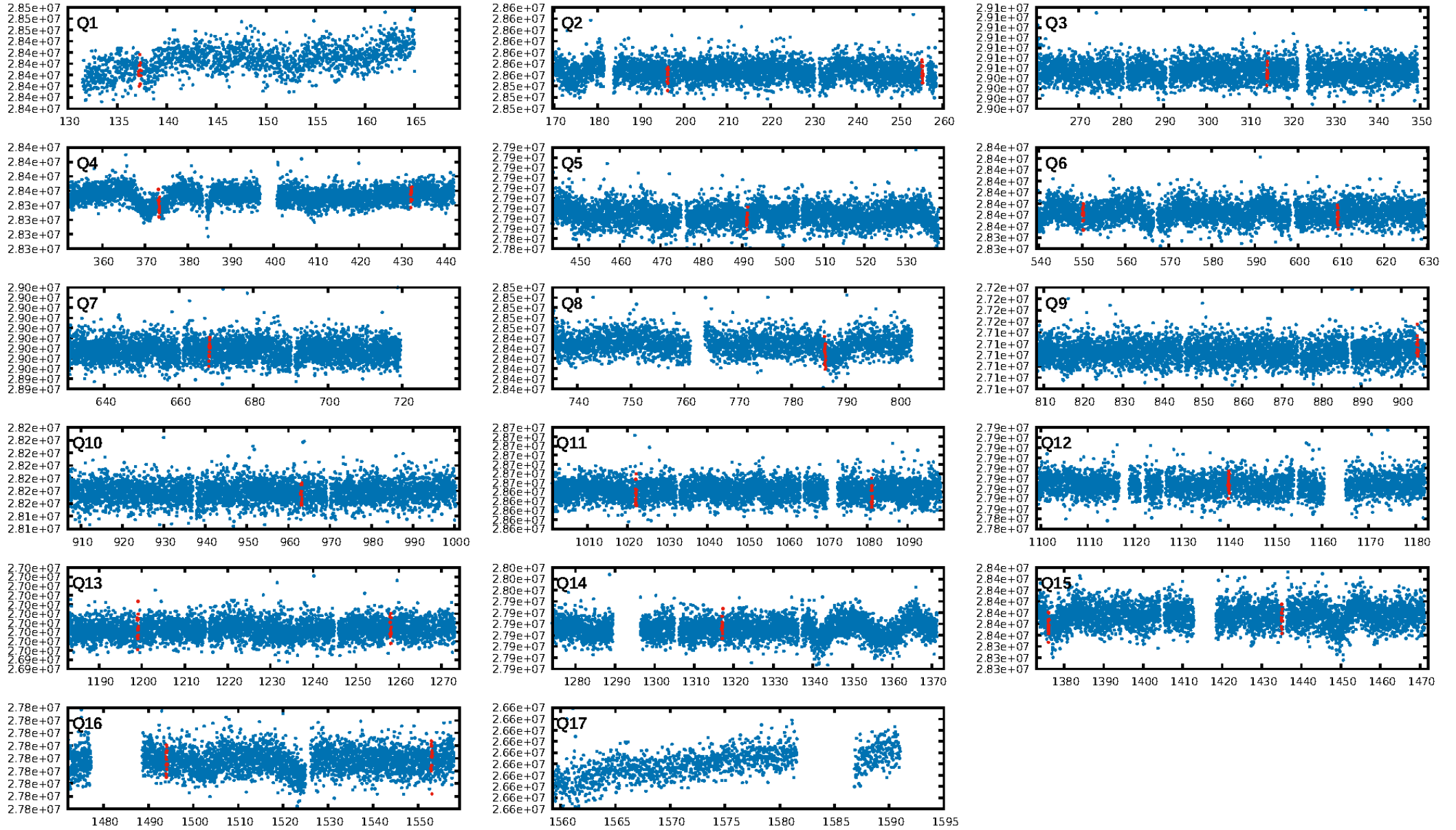
ShortPeriod-sig: 100.0% [47.83 $\sigma$ ]  
LongPeriod-sig: 100.0% [192.03 $\sigma$ ]  
ModelChiSquare2-sig: 62.0%  
ModelChiSquareGof-sig: 96.7%  
**Bootstrap-pfa: 9.48e-10**  
RollingBand-fgt: 1.00 [6/6]  
**GhostDiagnostic-chr: -0.1696**  
Centroid-sig: 49.4%  
Centroid-so: 0.885 arcsec [0.81 $\sigma$ ]  
OotOffset-rm: 0.836 arcsec [0.71 $\sigma$ ]  
KicOffset-rm: 0.759 arcsec [0.82 $\sigma$ ]  
OotOffset-st: 1/4/2/3 [10]  
KicOffset-st: 1/4/2/3 [10]  
DiffImageQuality-fgm: 0.20 [2/10]  
DiffImageOverlap-fno: 0.19 [3/16]

Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 31-Jan-2016 00:38:44 Z

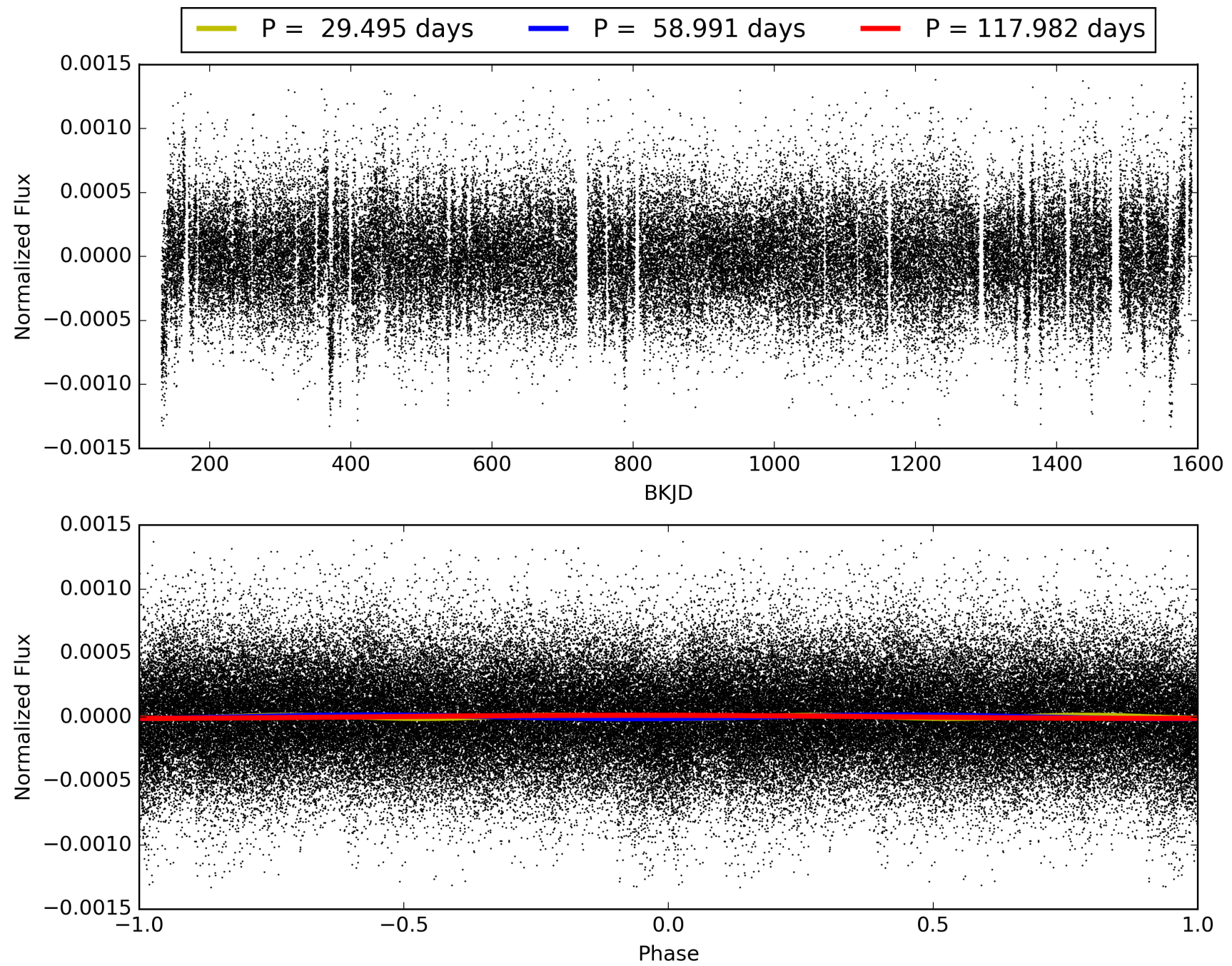
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center



# TCE 009345924-03, PDC Light Curves

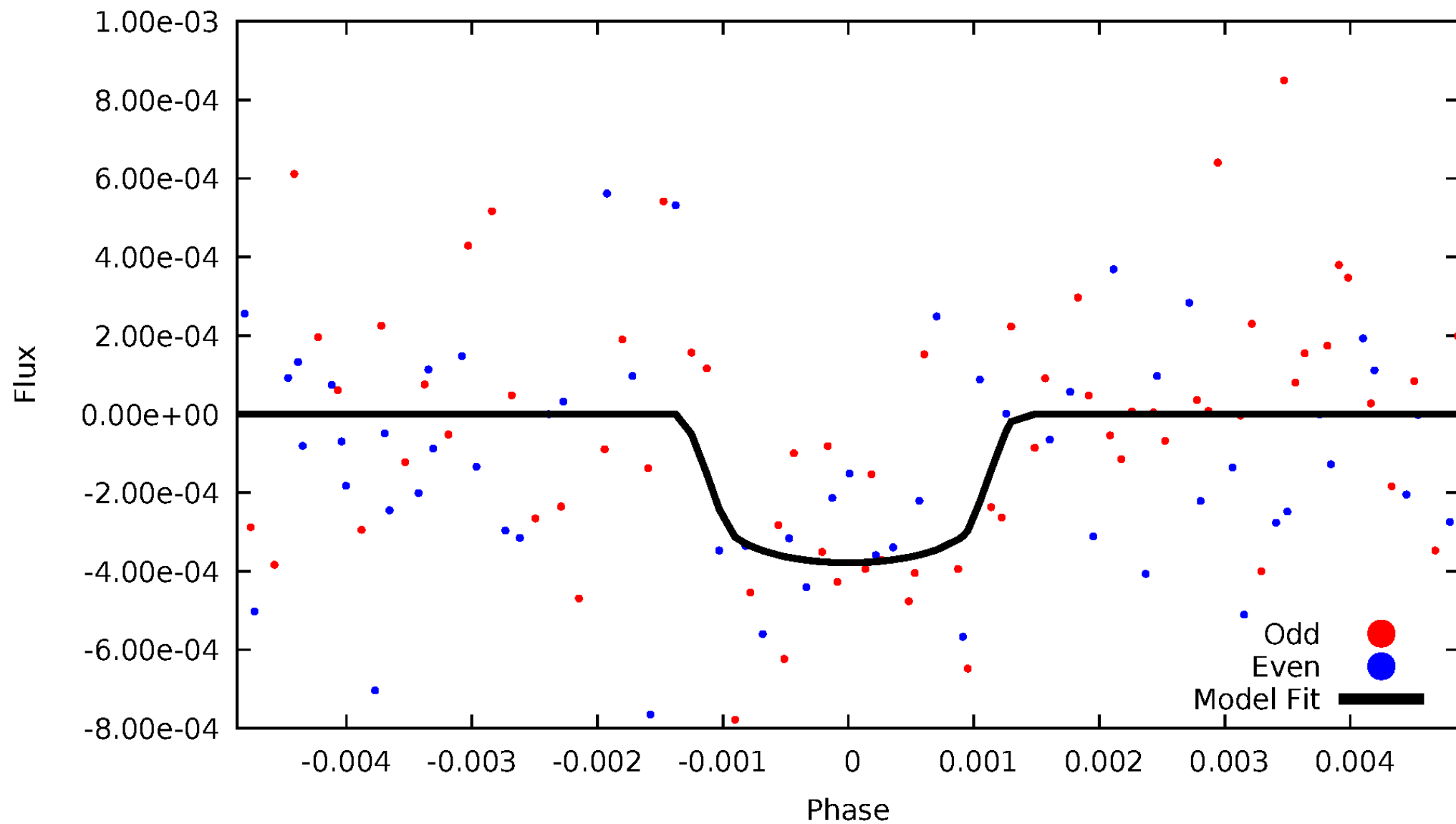


TCE 009345924-03



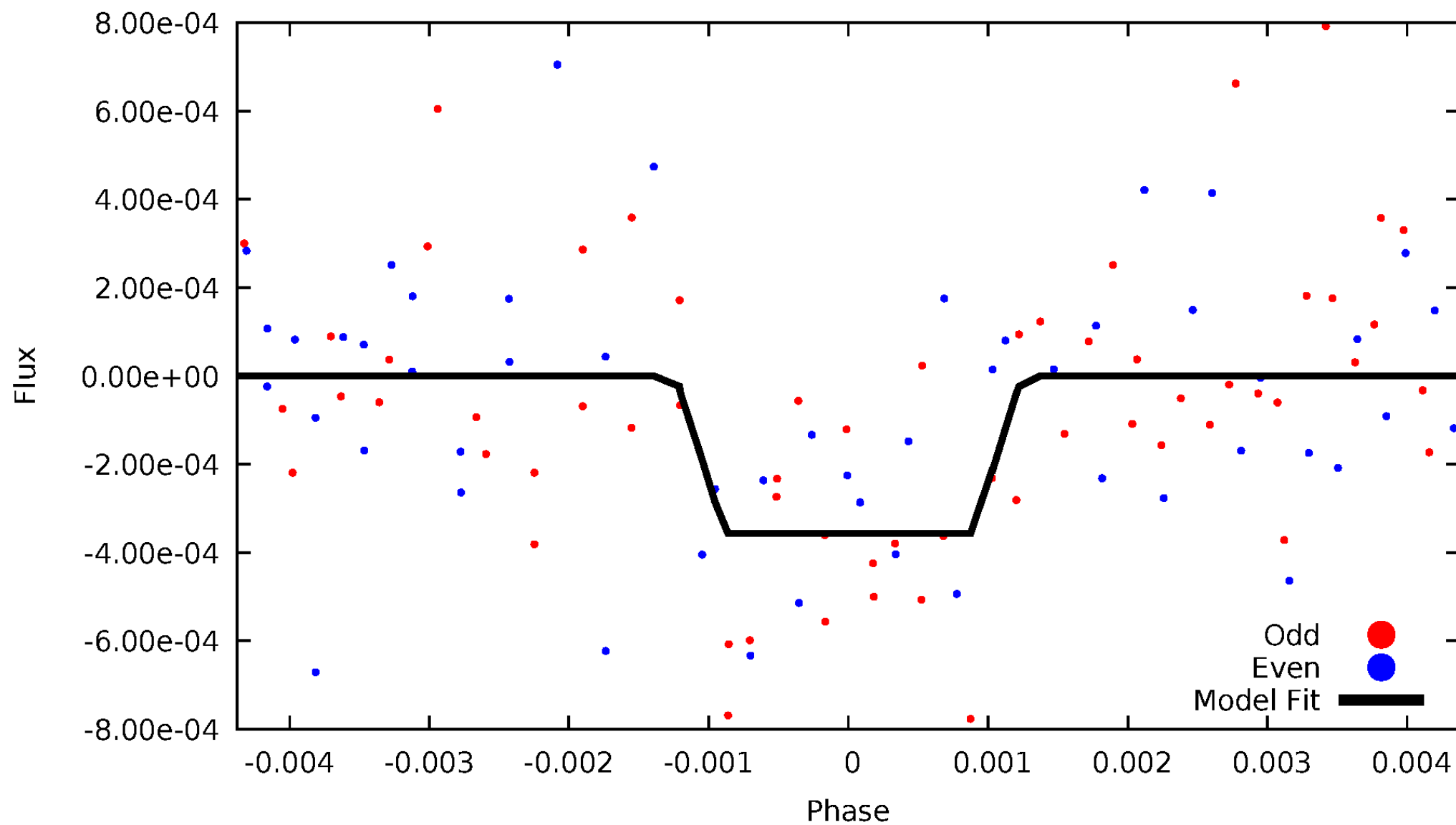
# DV Odd/Even

TCE 009345924-03



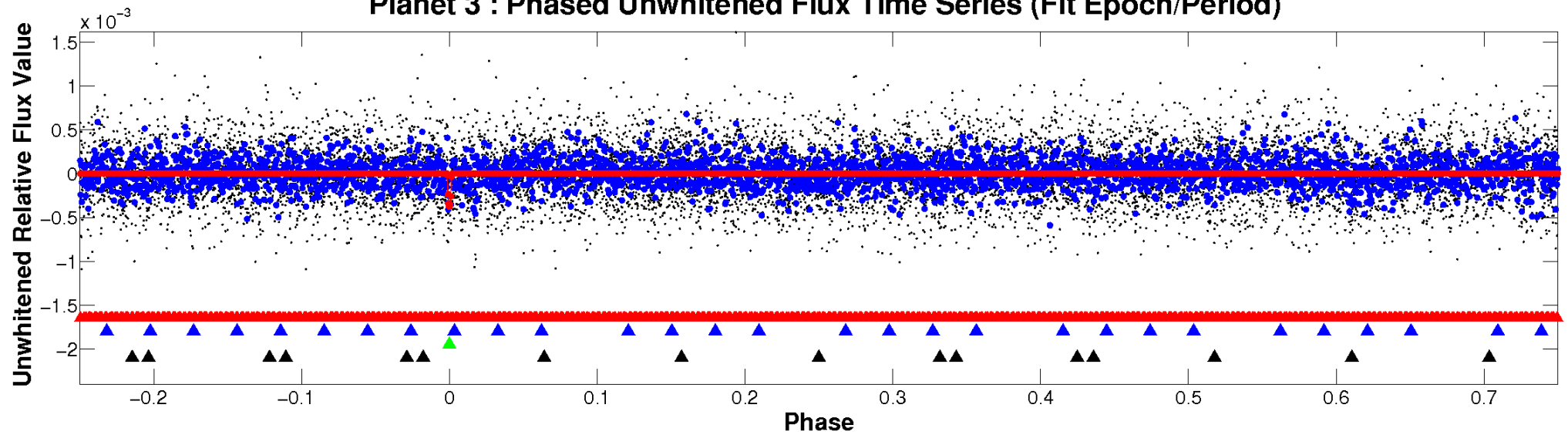
# ALT Odd/Even

TCE 009345924-03

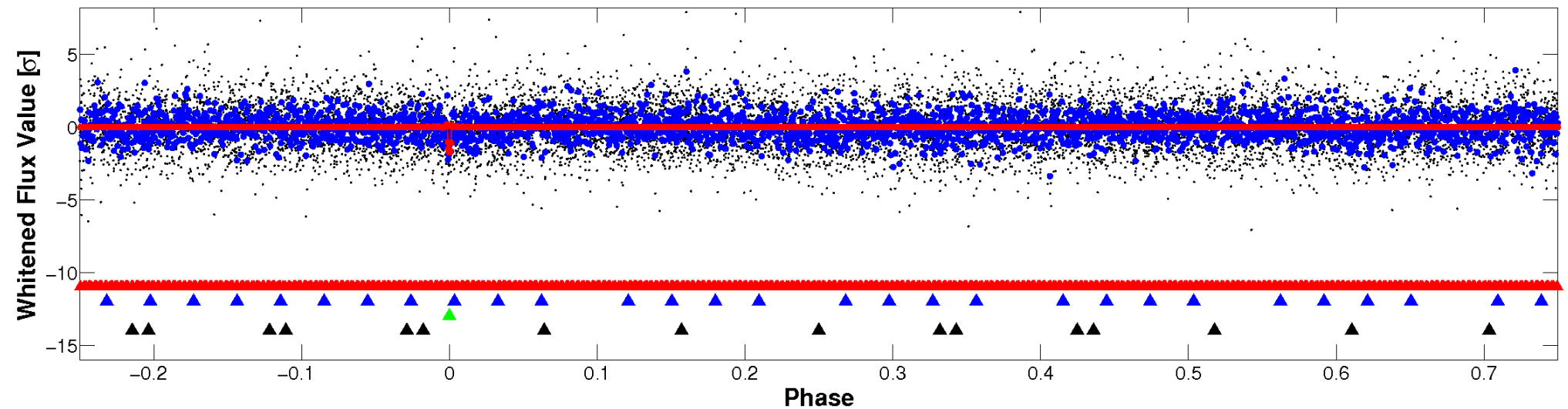


# Non-Whitened Vs. Whitened Light Curve

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



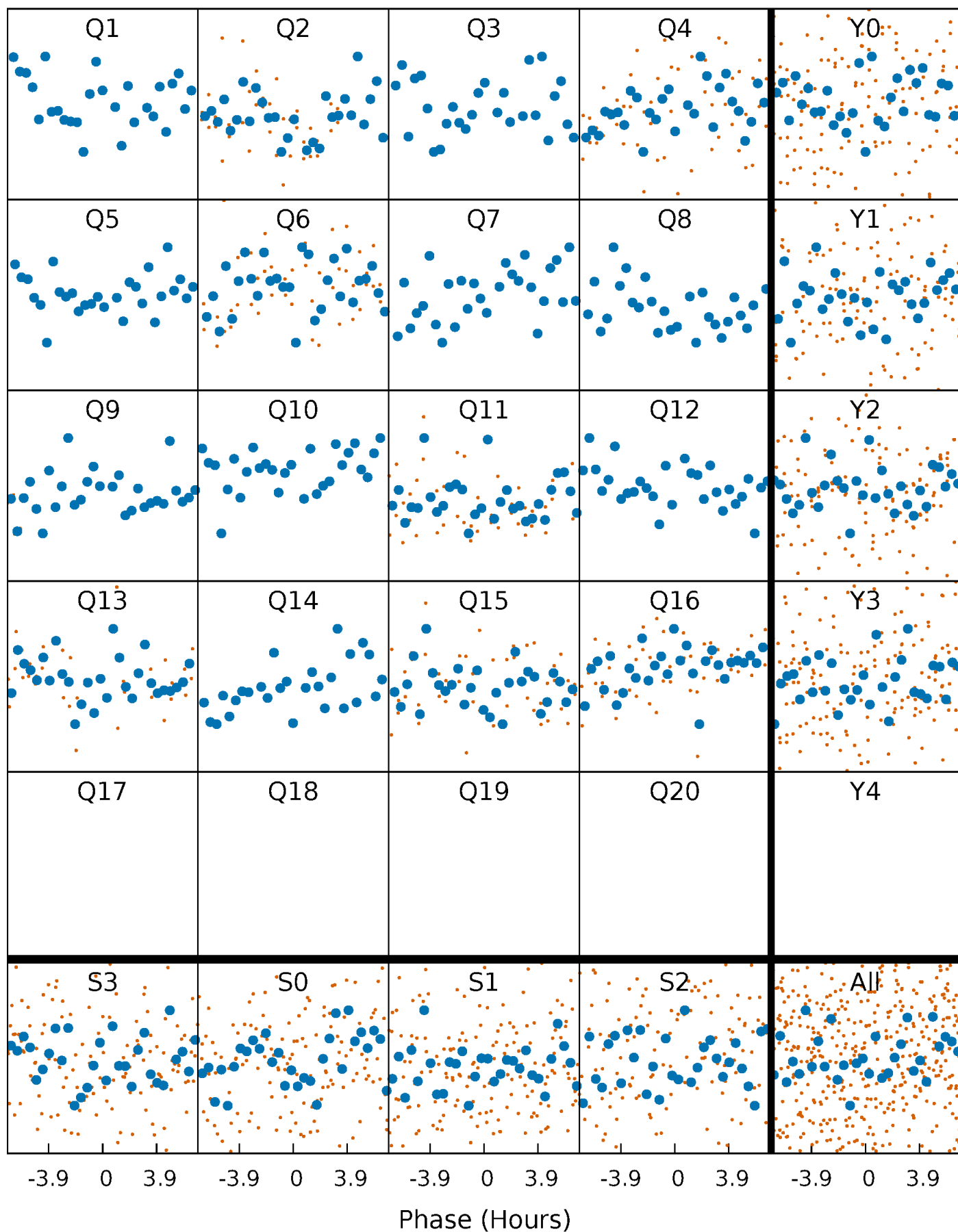
Planet 3 : Phased Whitened Flux Time Series (Fit Epoch/Period)





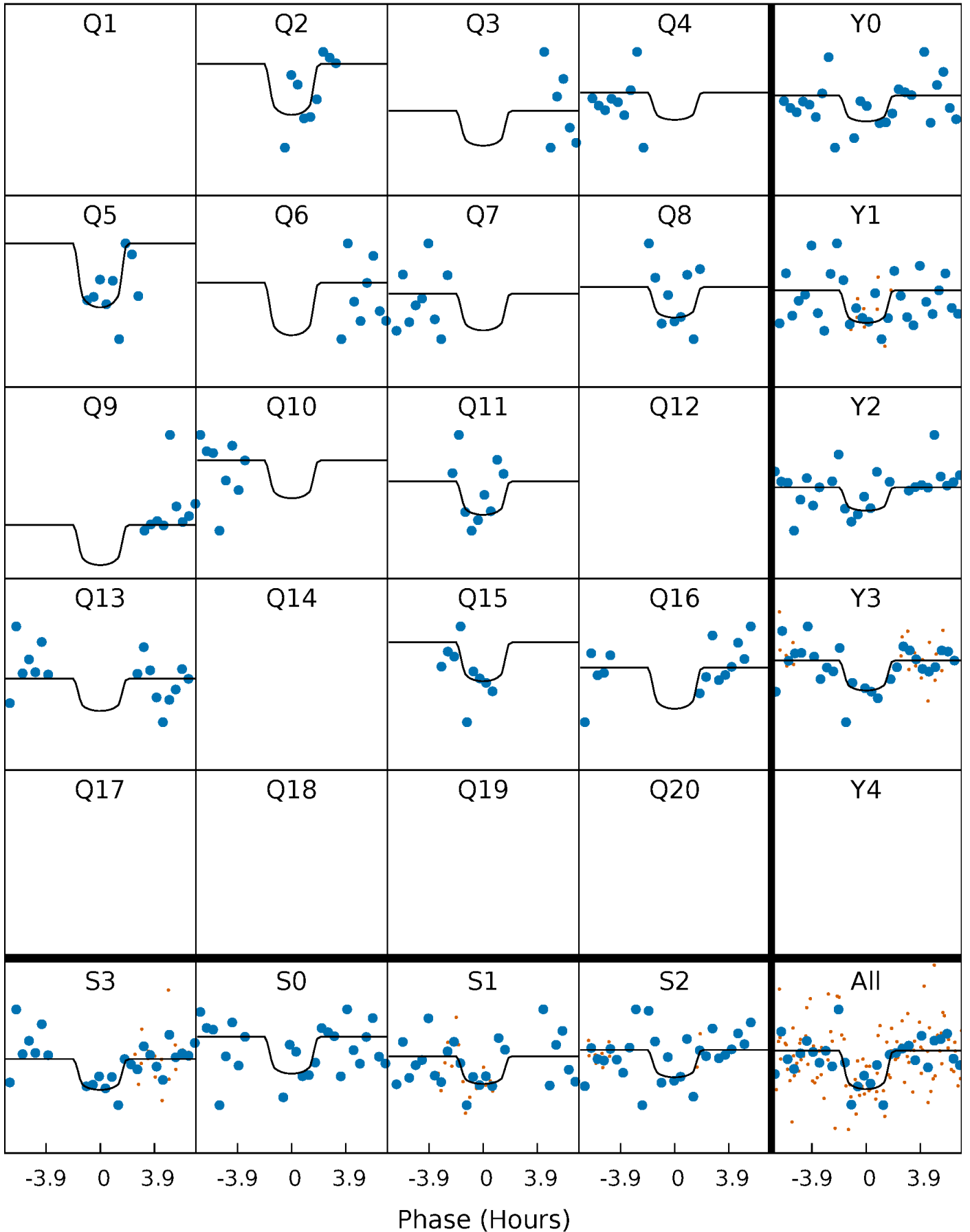
# PDC Quarter-Phased Transit Curves

TCE 009345924-03   P= 58.990893 Days    $T_0=137.266430$  (BKJD)



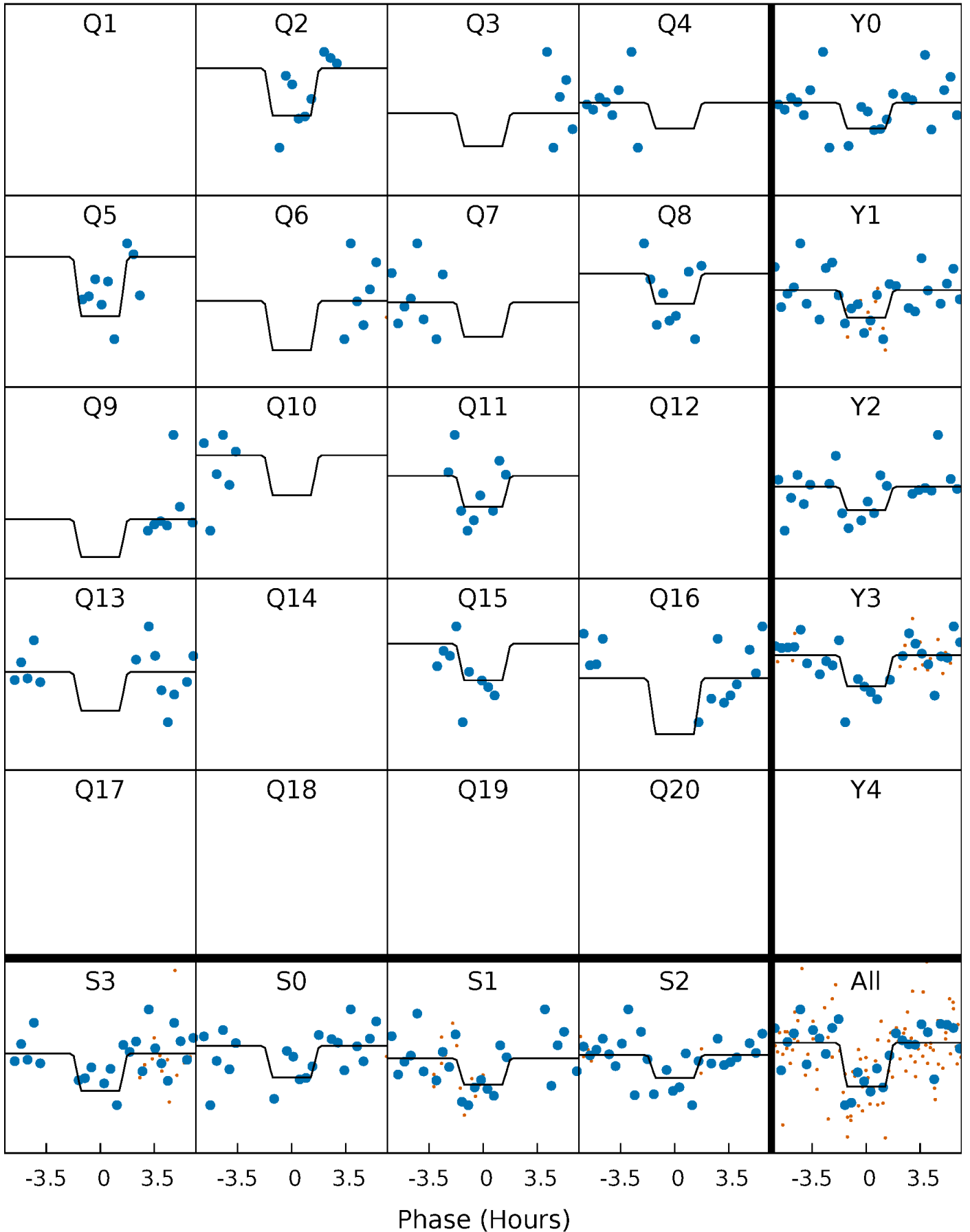
# DV Quarter-Phased Transit Curves

TCE 009345924-03     $P = 58.990893$  Days     $T_0 = 137.266430$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

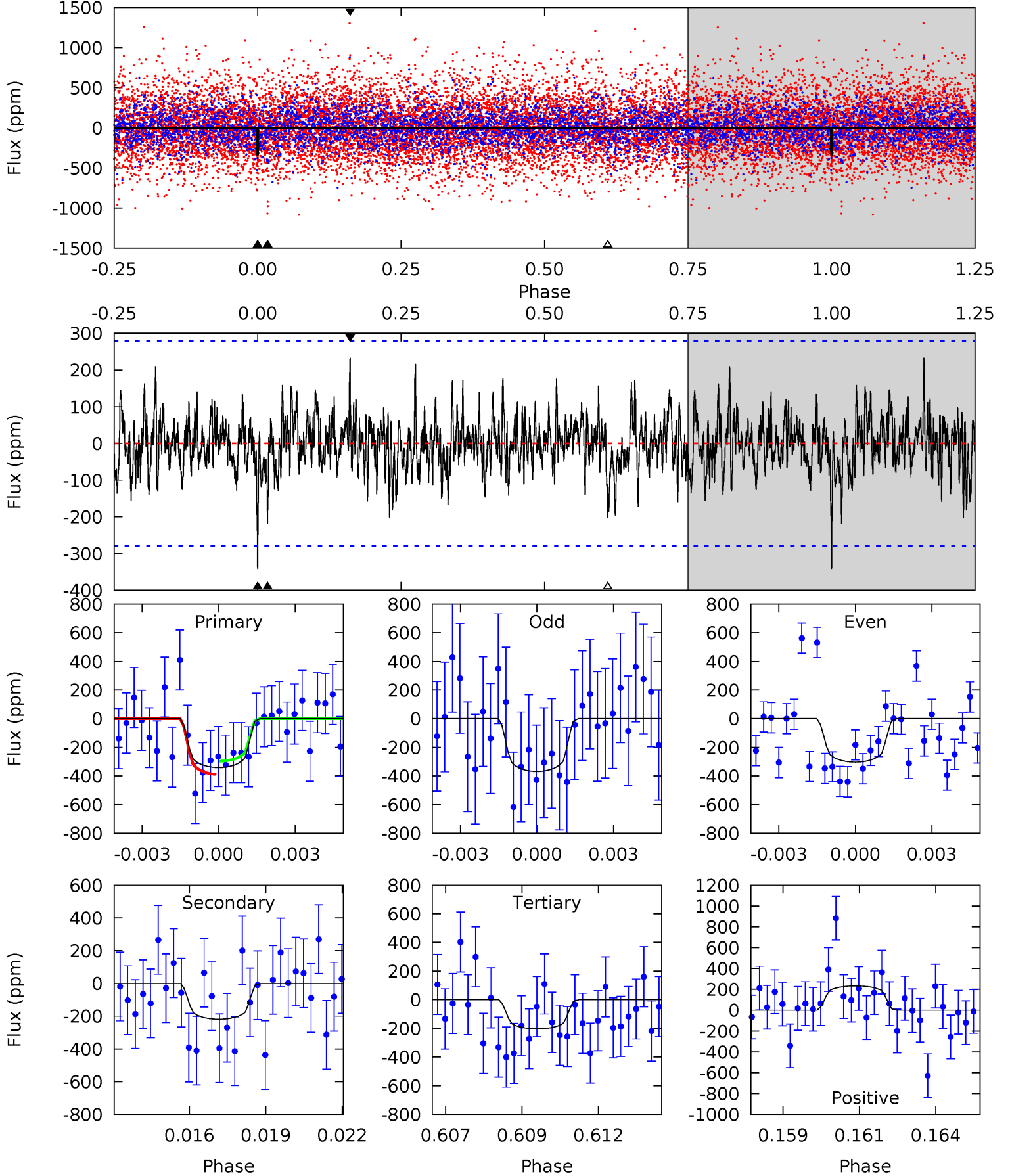
TCE 009345924-03   P= 58.990198 Days    $T_0=137.278578$  (BKJD)



# DV Model-Shift Uniqueness Test

009345924-03, P = 58.990893 Days, E = 78.275537 Days

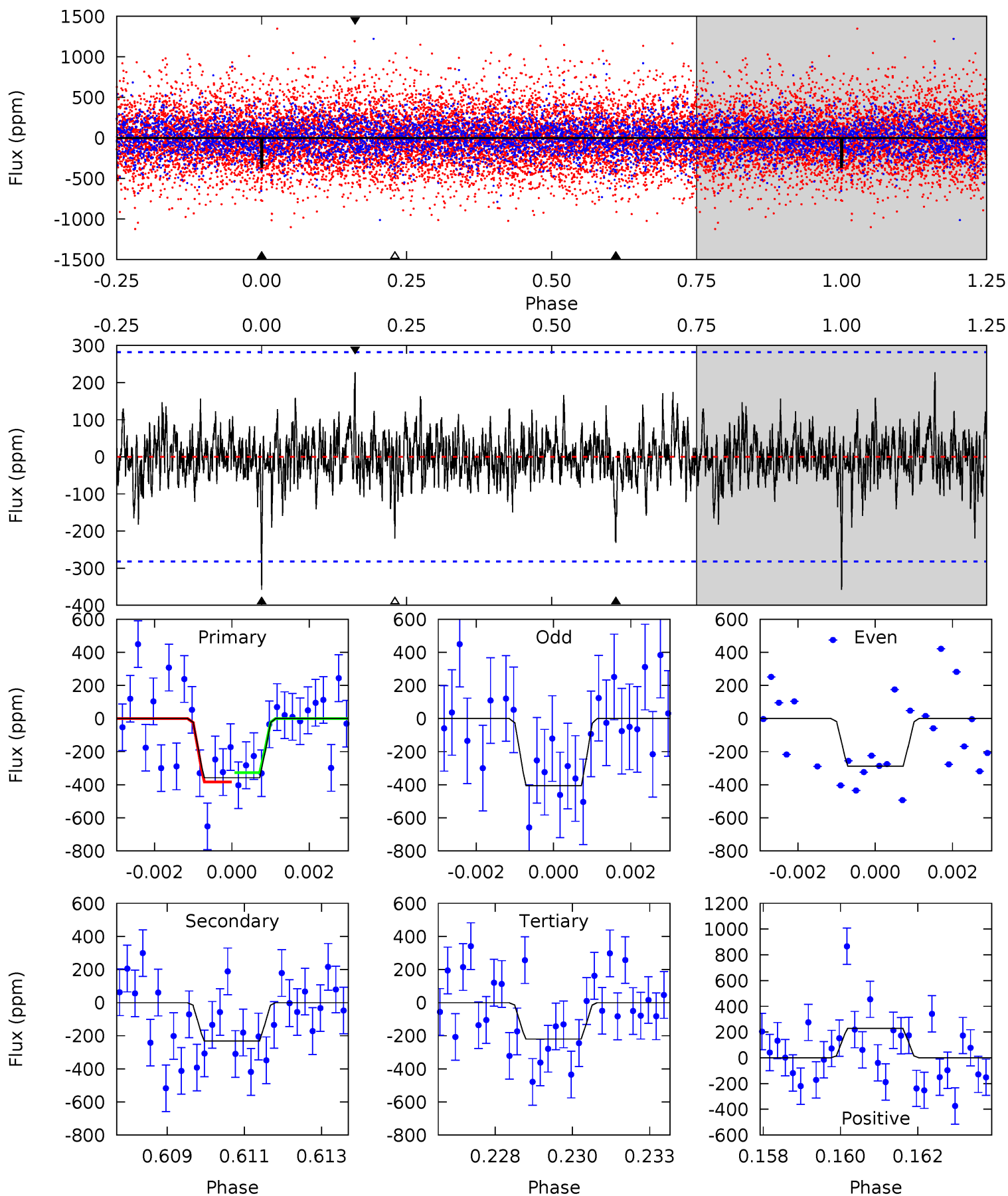
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
6.46	4.14	3.83	4.40	5.27	3.00	1.18	2.63	2.06	0.30	-0.26	0.61	0.98	0.41	0.87



# Alt Model-Shift Uniqueness Test

009345924-03, P = 58.990198 Days, E = 78.288380 Days

Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
6.71	4.34	4.12	4.27	5.29	3.03	0.98	2.59	2.44	0.22	0.07	1.10	1.12	0.39	0.53





### Stellar Parameters For KIC 009345924

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$\rho_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$6046^{+164}_{-182}$	$4.539^{+0.036}_{-0.204}$	$-0.380^{+0.300}_{-0.300}$	$0.869^{+0.263}_{-0.066}$	$0.953^{+0.119}_{-0.107}$	$2.043^{+0.395}_{-1.029}$
	+3%/-3%	+1%/-4%	+79%/-79%	+30%/-8%	+12%/-11%	+19%/-50%
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 009345924-03 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-219 \pm 53$	$3.86^{+4.04}_{-2.67}$	$658^{+45}_{-31}$	$3967^{+2827}_{-749}$	$625^{+6411}_{-468}$
Alt.	$-231 \pm 53$	$3.94^{+3.56}_{-2.69}$	$663^{+50}_{-32}$	$4053^{+2496}_{-787}$	$657^{+5687}_{-475}$

$T_{max}$  = 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

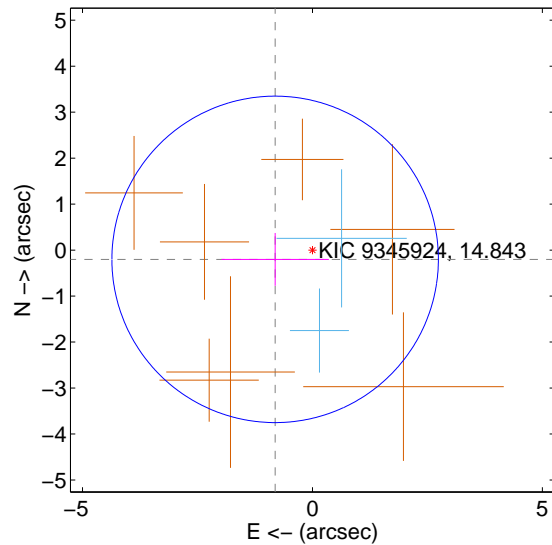
Supplemental centroid analysis for 009345924-03. Kepler magnitude: 14.84. Transit SNR 8.31

There are 2 quarters with good PRF difference image offsets

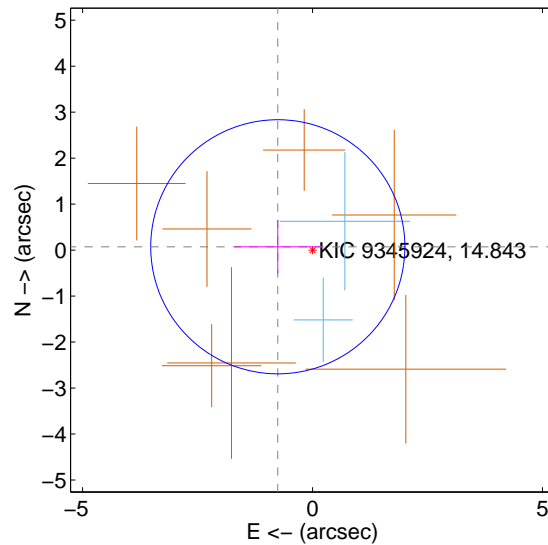
The direct PRF centroid is offset from the target star catalog position by about 0.38 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.836 \pm 1.183$	0.71	$0.811 \pm 1.169$	$-0.202 \pm 0.574$
PRF-fit source offset from KIC position	$0.759 \pm 0.921$	0.82	$0.755 \pm 0.940$	$0.072 \pm 0.583$
photometric centroid source offset	$0.89 \pm 1.09$	0.81	$0.20 \pm 0.99$	$0.86 \pm 1.09$

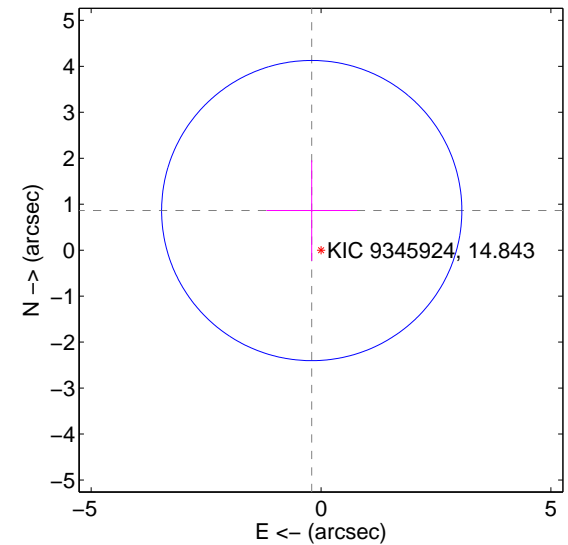
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position

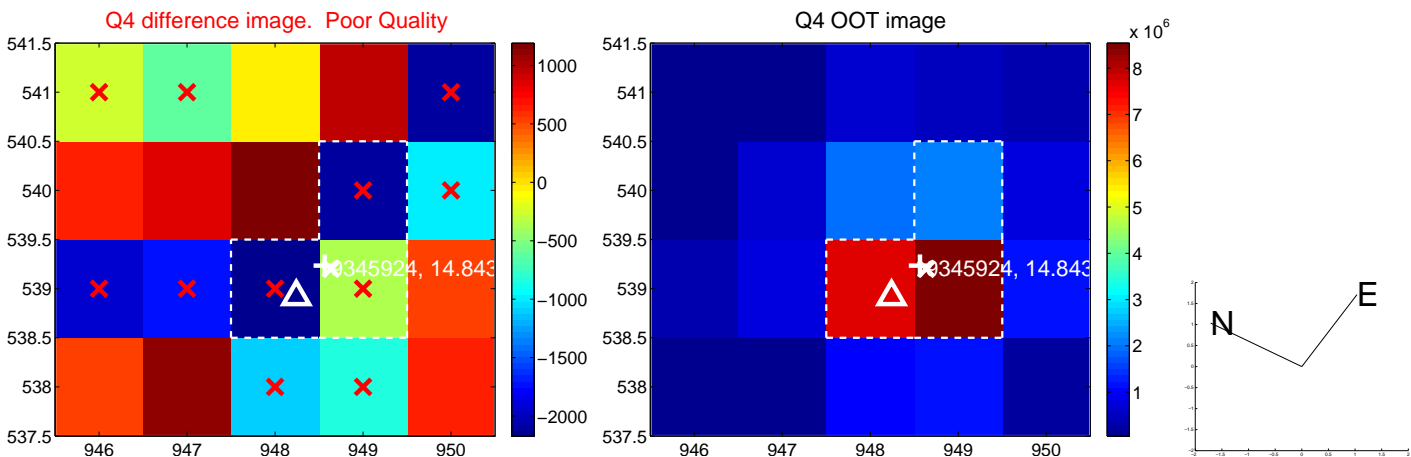
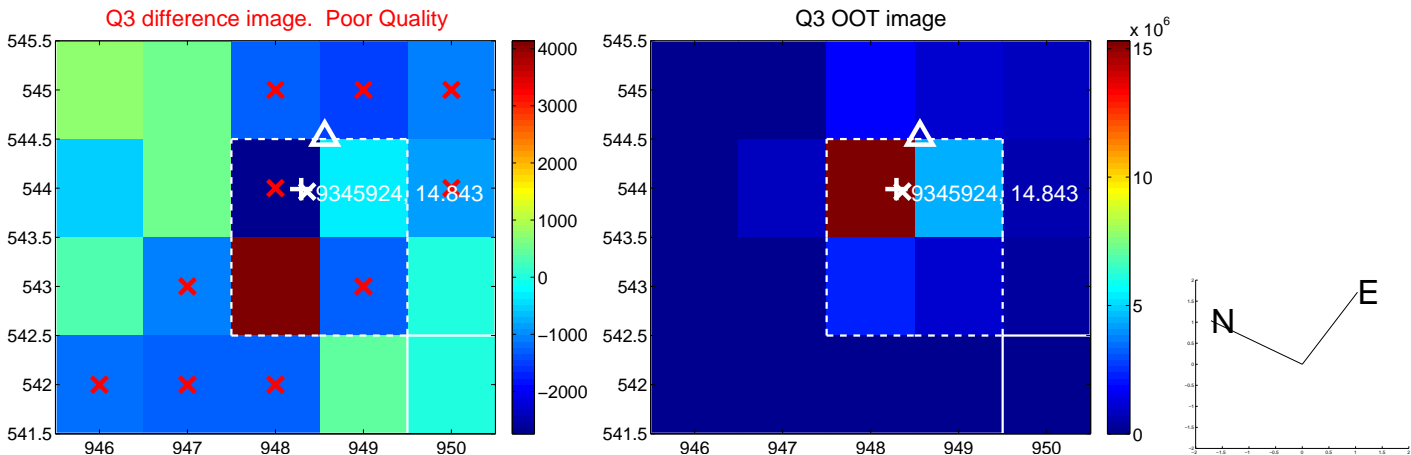
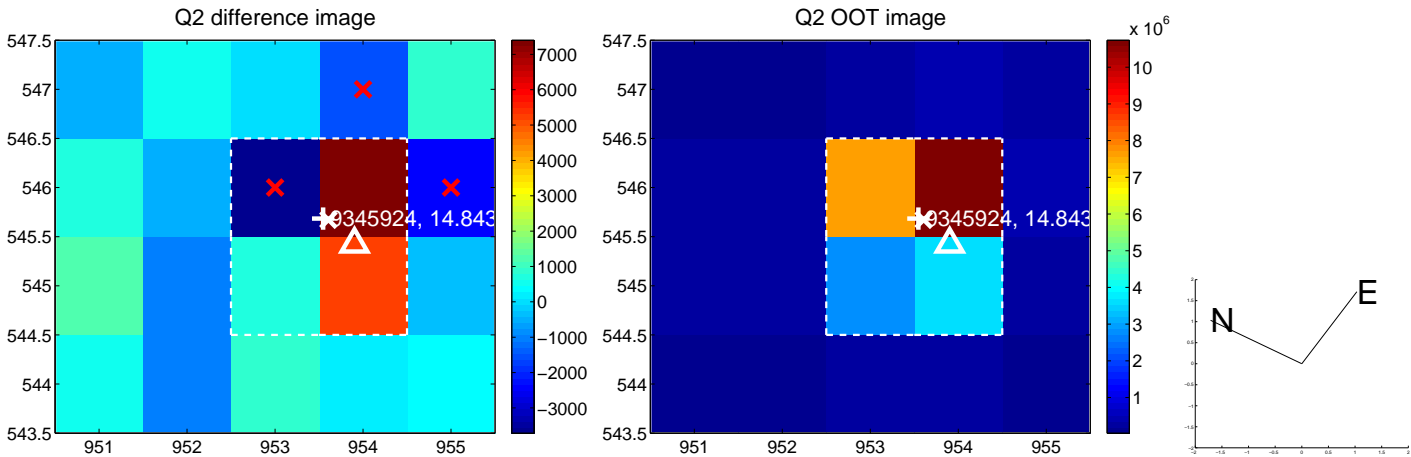
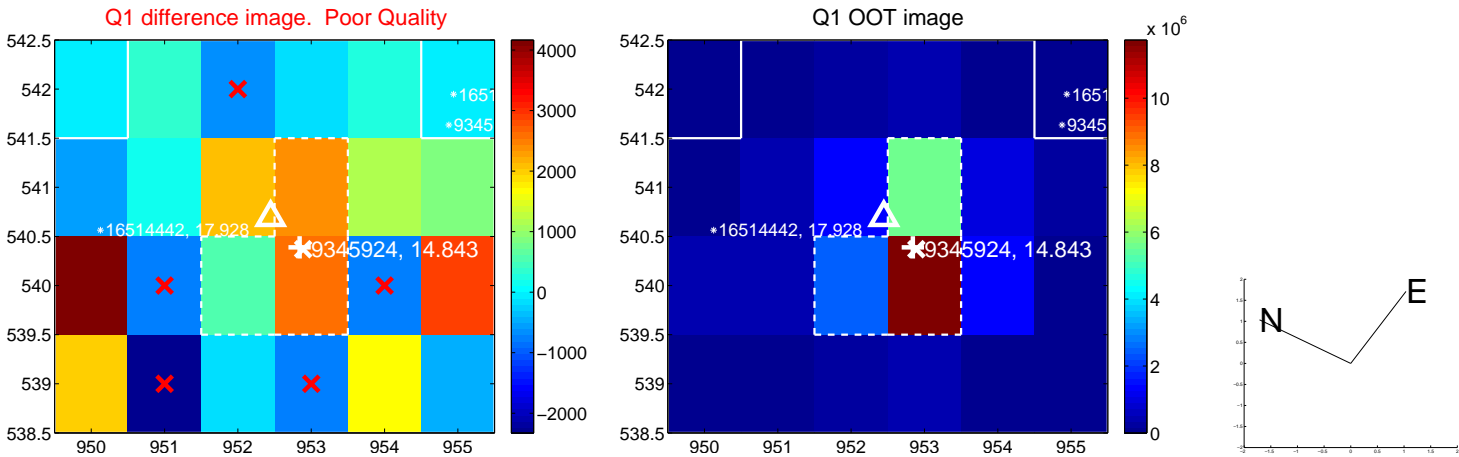


offset from photometric centroids

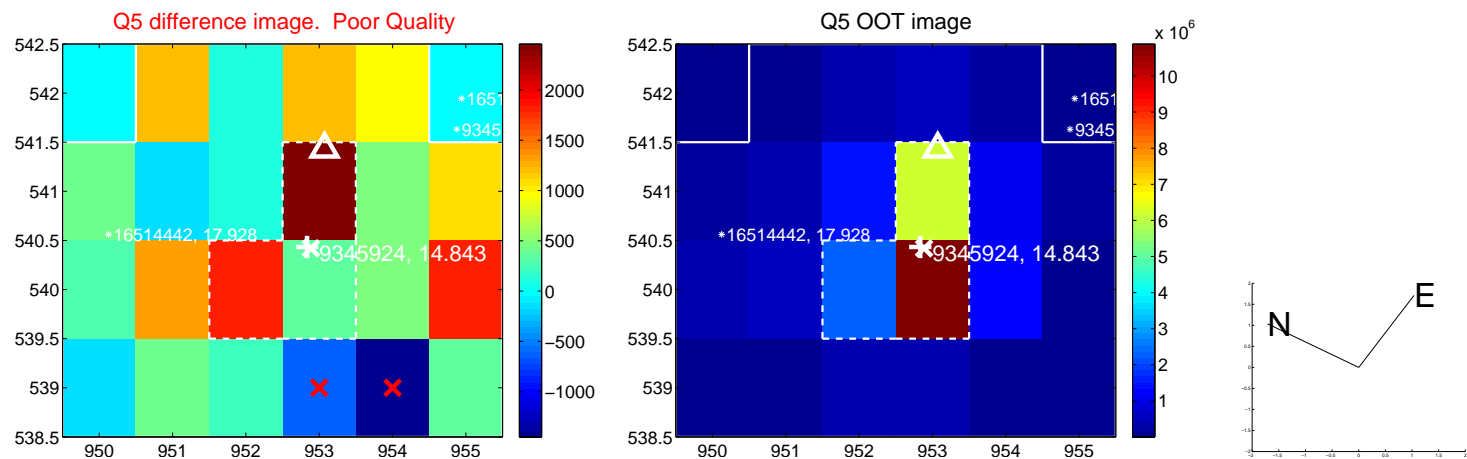


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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

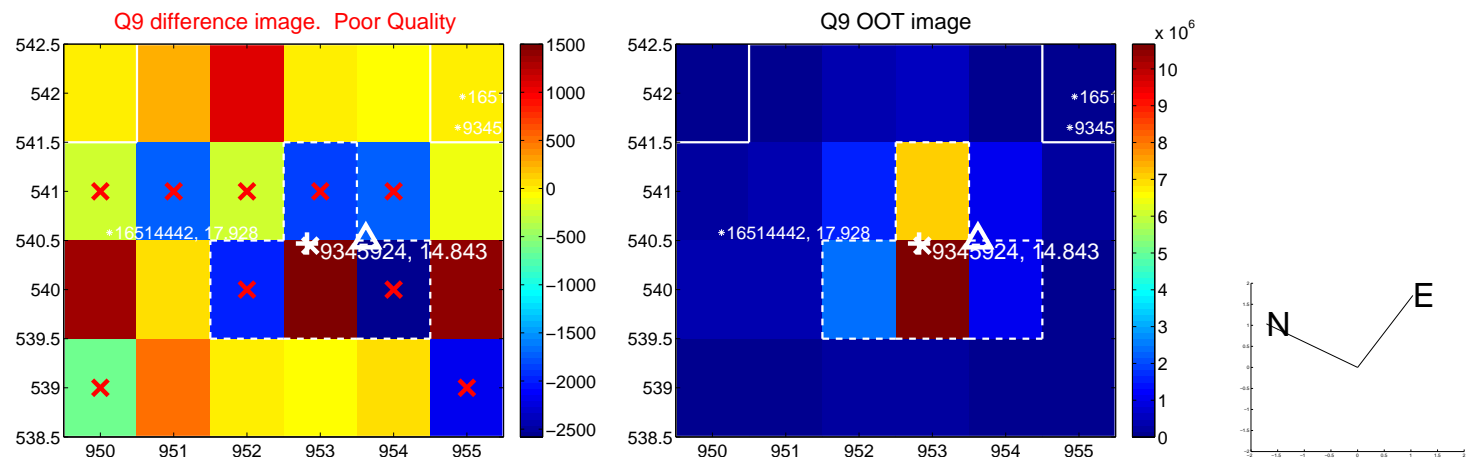
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



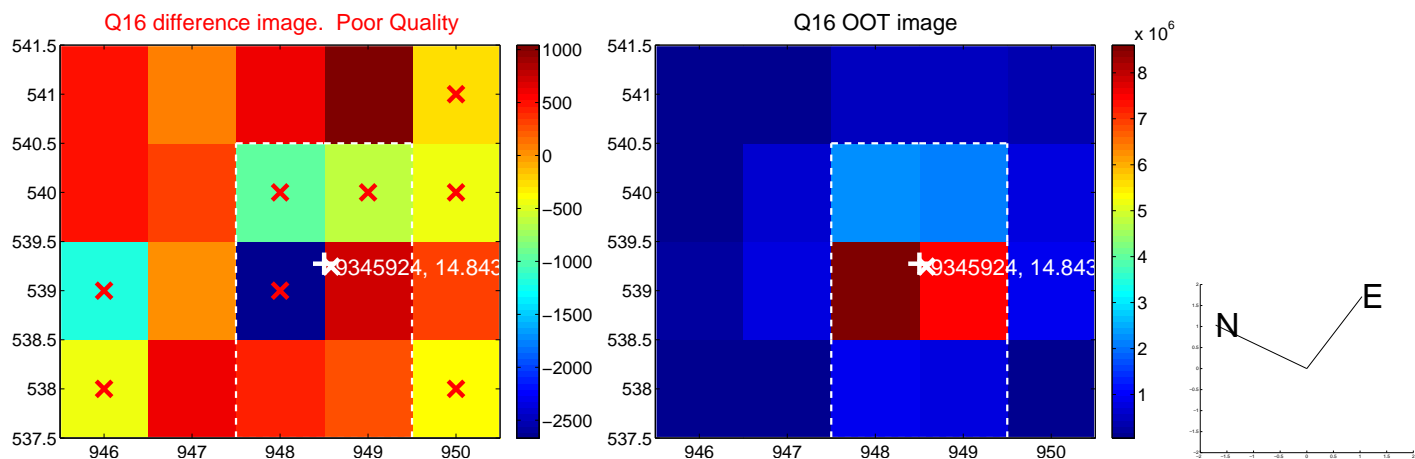
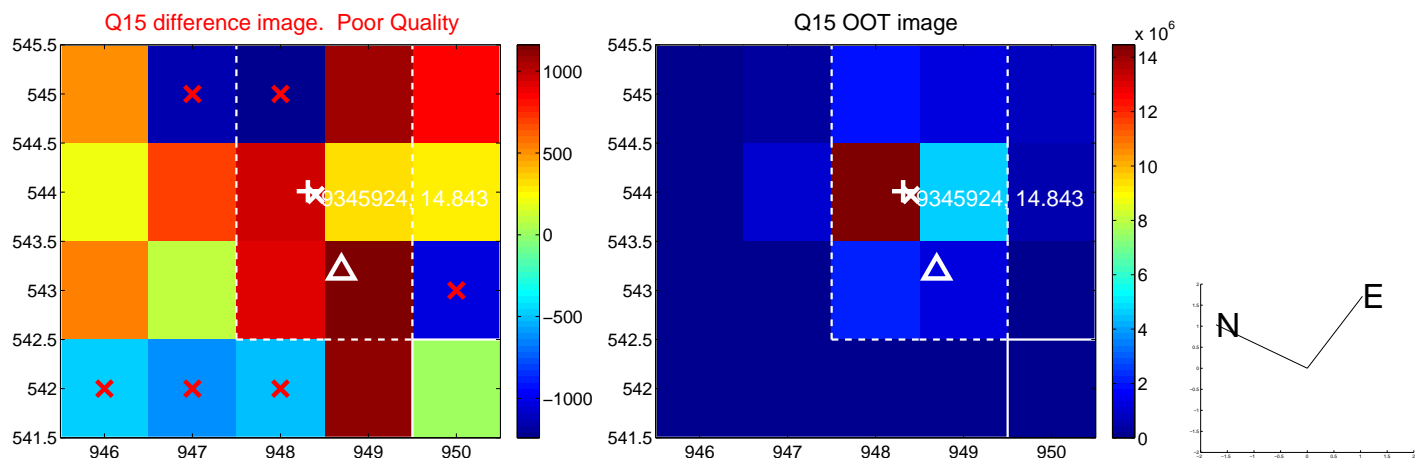
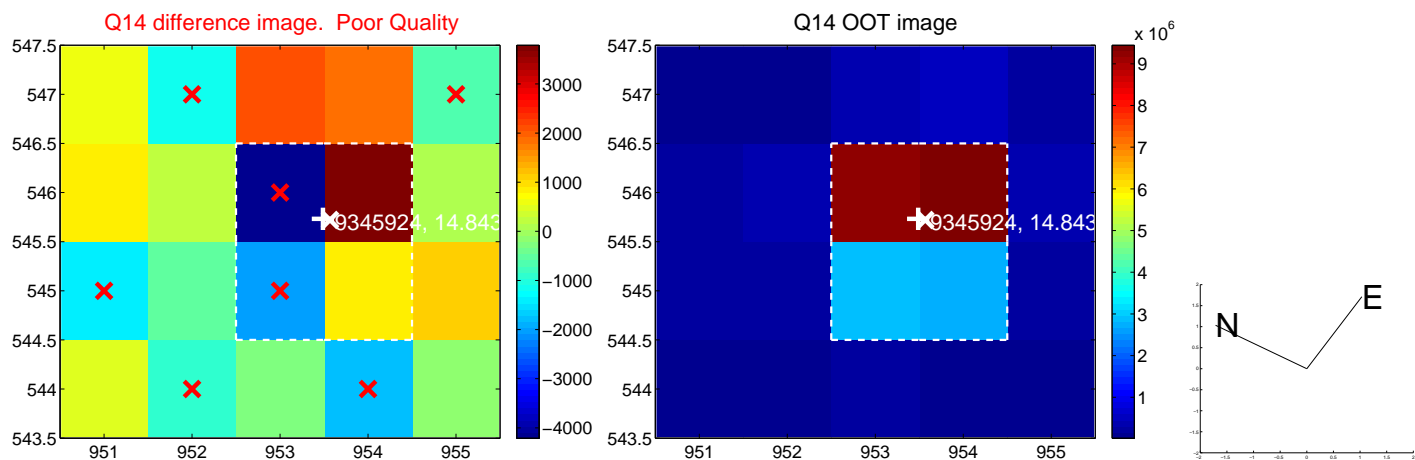
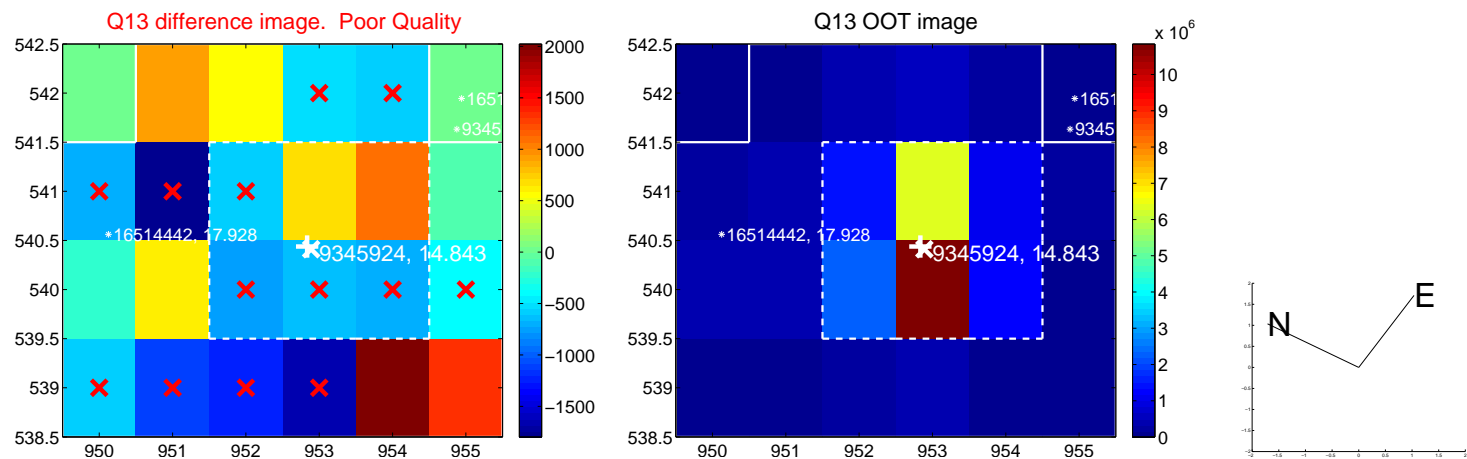
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

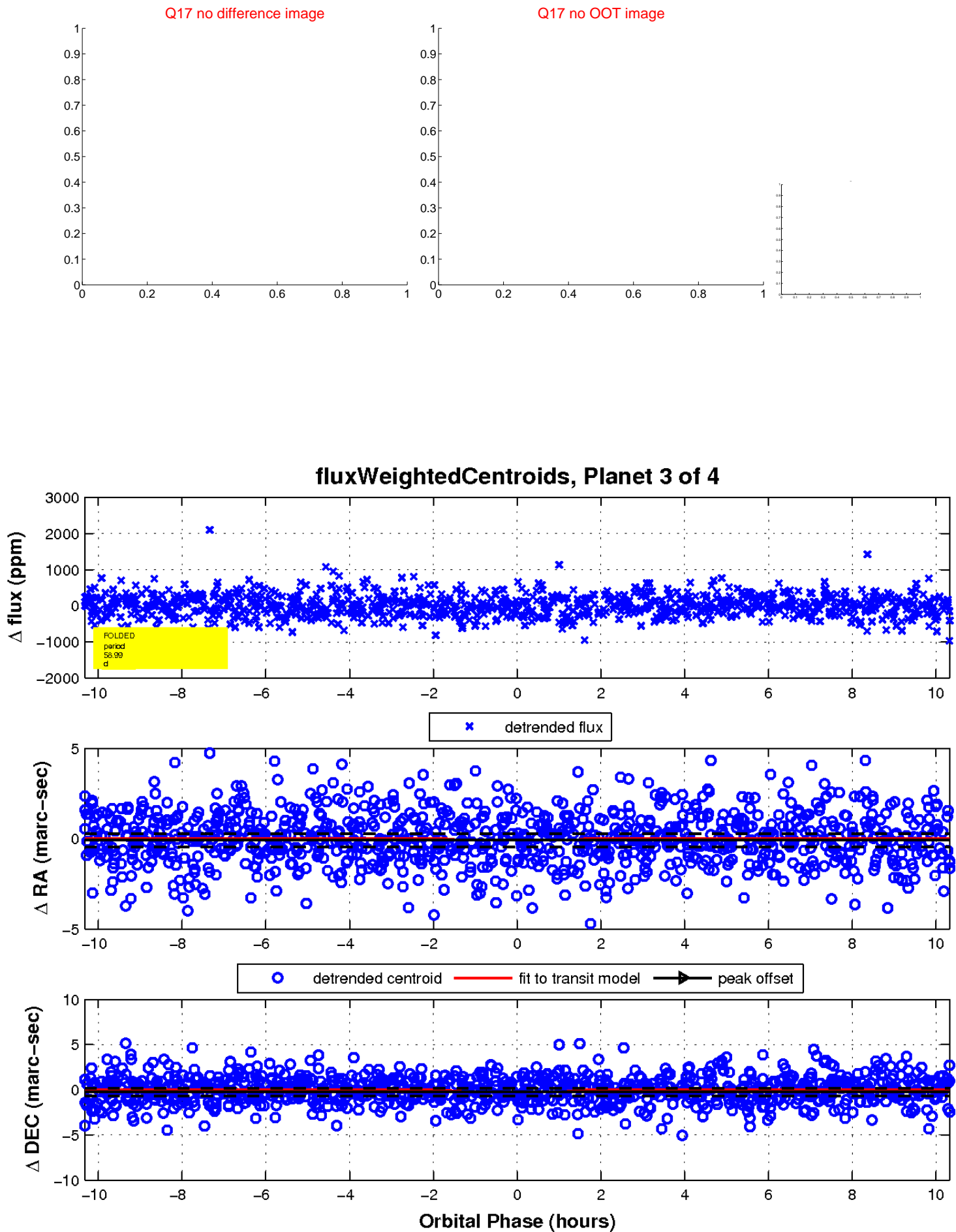


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



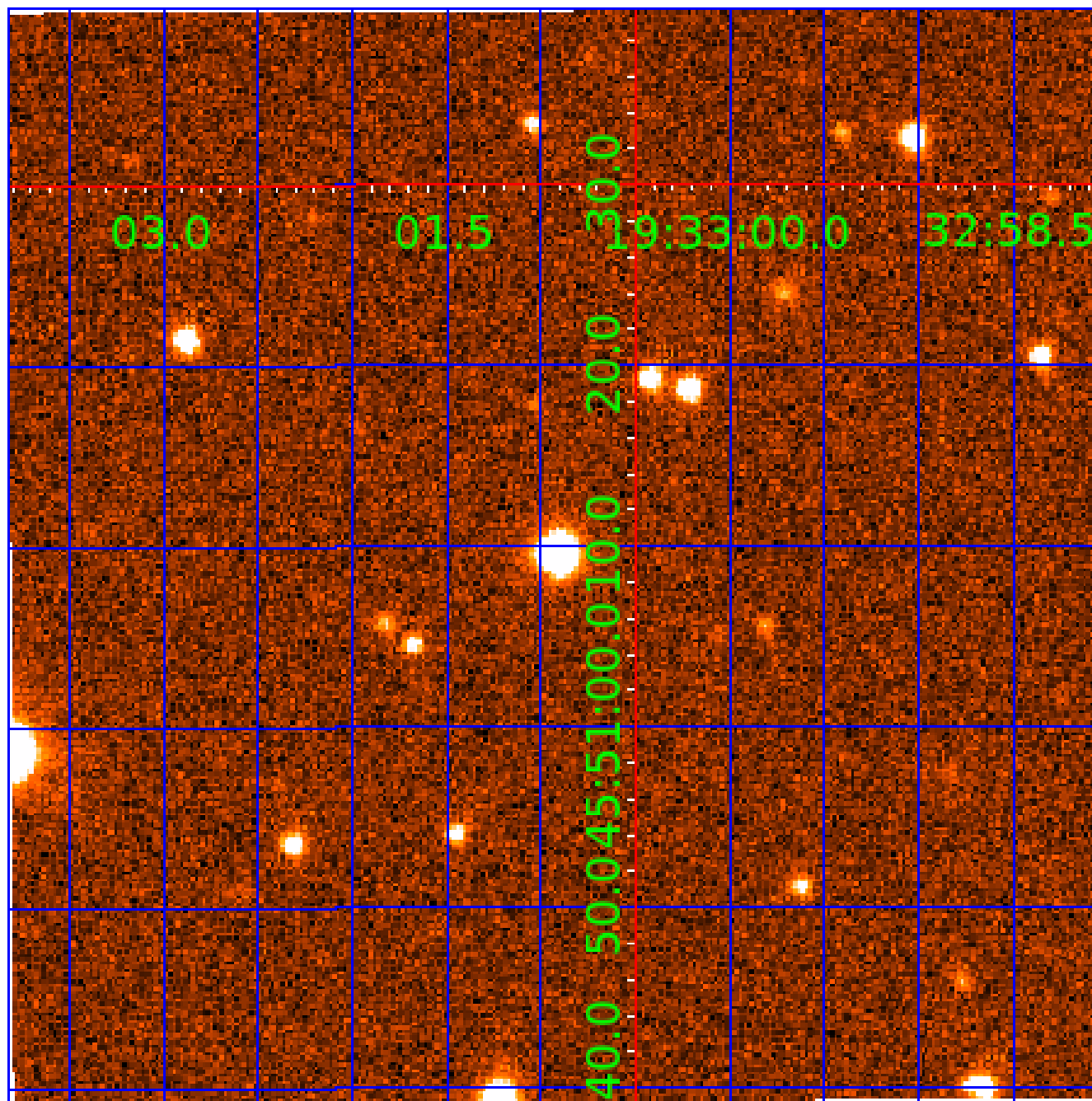


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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# KIC 009345924

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
009345924-01	OBS	No	1.045851	131.989923	23.3	6.757	7.6	8.4	0.87	6046	0.45	2295.20
009345924-02	OBS	No	50.315451	134.007633	310.0	2.659	9.8	6.0	0.87	6046	1.76	13.12
009345924-03	OBS	No	58.990893	137.266430	378.8	3.447	8.4	8.3	0.87	6046	1.88	10.61
009345924-04	OBS	No	91.226941	183.599746	586.2	2.086	8.3	9.3	0.87	6046	2.45	5.93

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009345924-01	OBS	FP	0.00	1	0	0	1	LPP_DV—LPP_ALT—EPHEM_MATCH
009345924-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_NONUNIQ_ALT—CENT_FEW_DIFFS
009345924-03	OBS	FP	0.00	1	0	1	0	INDIV_TRANS_RUBBLE_SKYE—TRANS_GAPPED—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—CENT_FEW_DIFFS—HALO_GHOST
009345924-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_POS_ALT—CENT_FEW_DIFFS

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

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

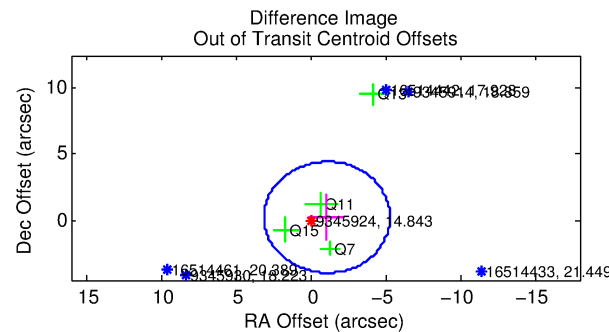
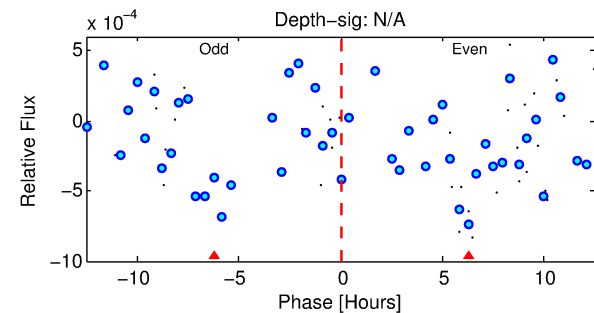
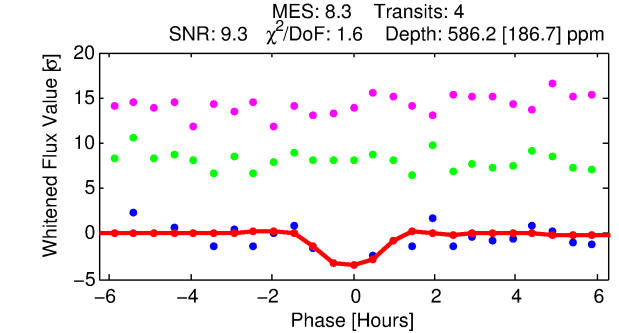
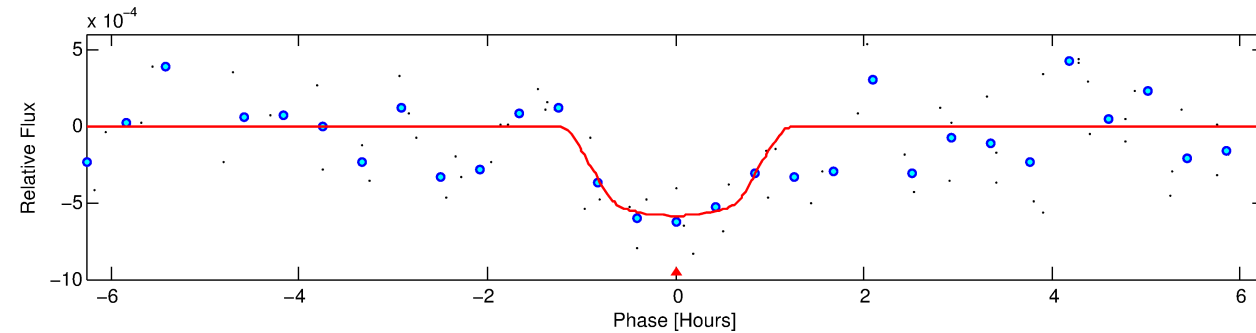
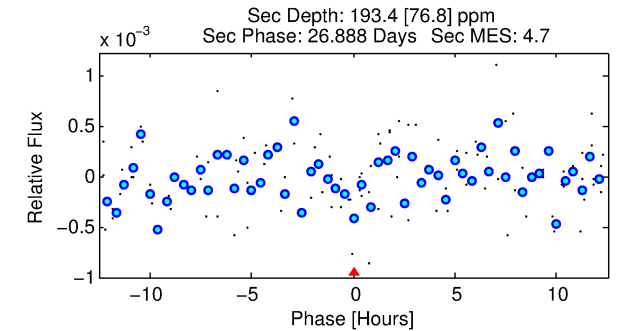
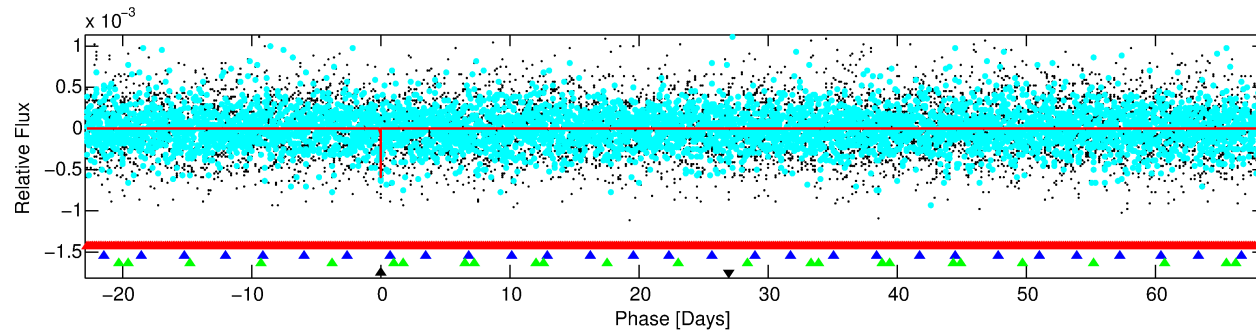
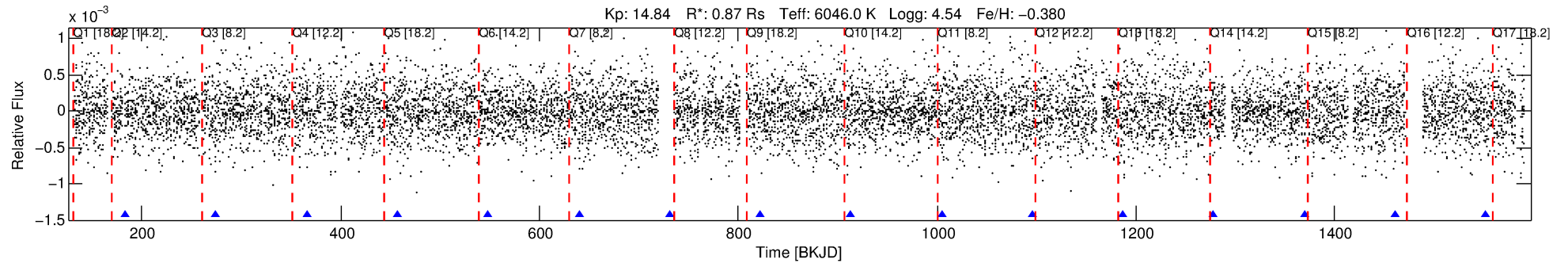
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 009345924-04

No Significant Match Found

# DV One-Page Summary

KIC: 9345924 Candidate: 4 of 4 Period: 91.227 d



## DV Fit Results:

Period = 91.22694 [0.00099] d  
Epoch = 183.5997 [0.0096] BKJD  
Rp/R\* = 0.0259 [0.1121]  
a/R\* = 171.09 [3881.38]  
b = 0.89 [5.46]  
Seff = 5.93 [2.32]  
Teq = 398 [39] K  
Rp = 2.45 [10.65] Re  
a = 0.3904 [0.0997] AU  
Ag = 2691.47 [23350.49] [0.12] $\sigma$   
Teff = 4432 [9604] K [0.42] $\sigma$

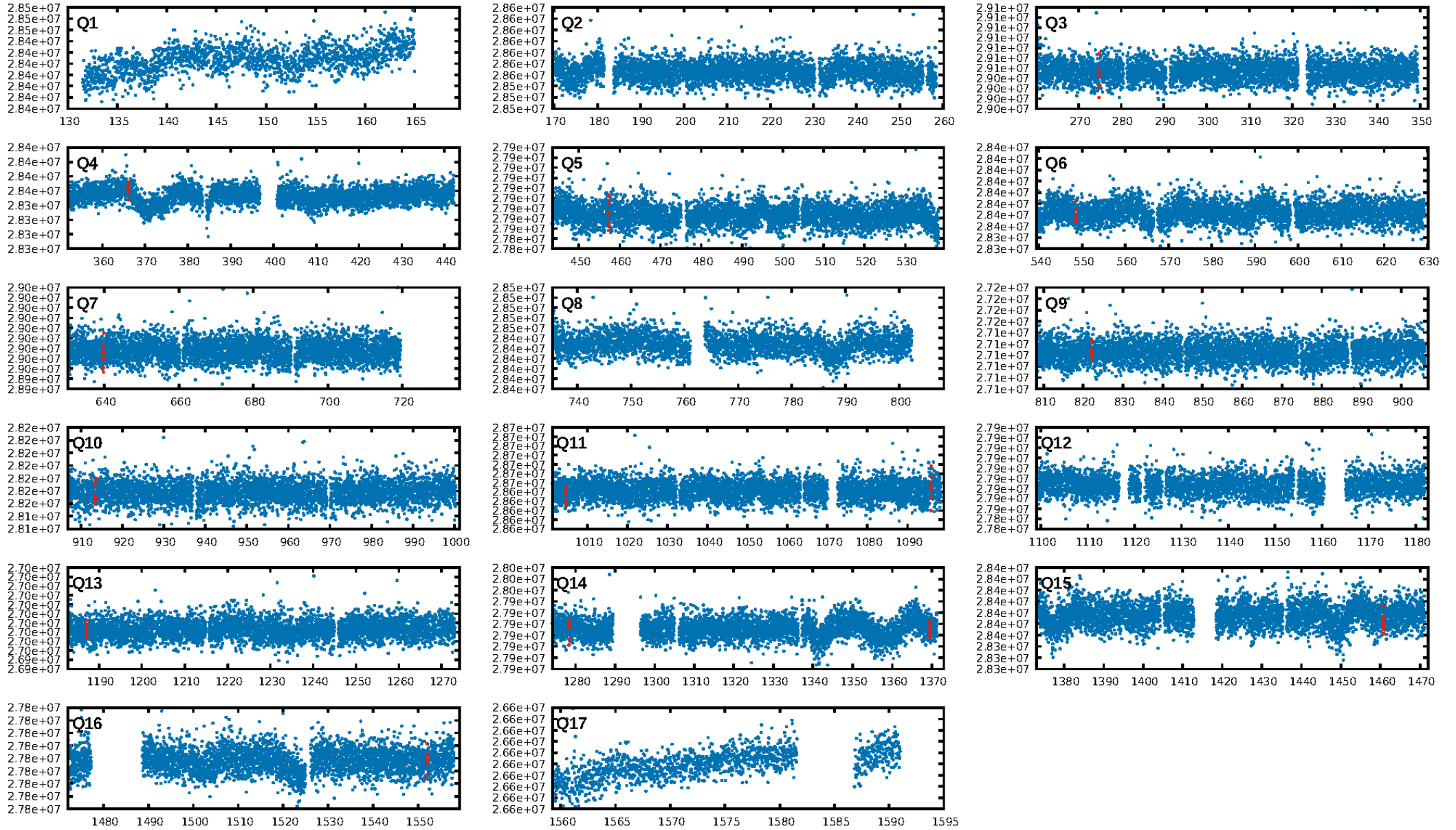
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [192.03] $\sigma$   
LongPeriod-sig: N/A  
ModelChiSquare2-sig: 46.5%  
ModelChiSquareGof-sig: 99.2%  
**Bootstrap-pfa: 4.48e-09**  
RollingBand-fgt: 1.00 [4/4]  
**GhostDiagnostic-chr: 0.8013**  
Centroid-sig: 8.6%  
Centroid-so: 1.651 arcsec [1.51] $\sigma$   
OotOffset-rm: 1.129 arcsec [0.80] $\sigma$   
KicOffset-rm: 1.277 arcsec [0.73] $\sigma$   
OotOffset-st: 0/3/0/1 [4]  
KicOffset-st: 0/3/0/1 [4]  
DiffImageQuality-fgm: 0.00 [0/4]  
DiffImageOverlap-fno: 0.33 [4/12]

Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 31-Jan-2016 00:38:49 Z

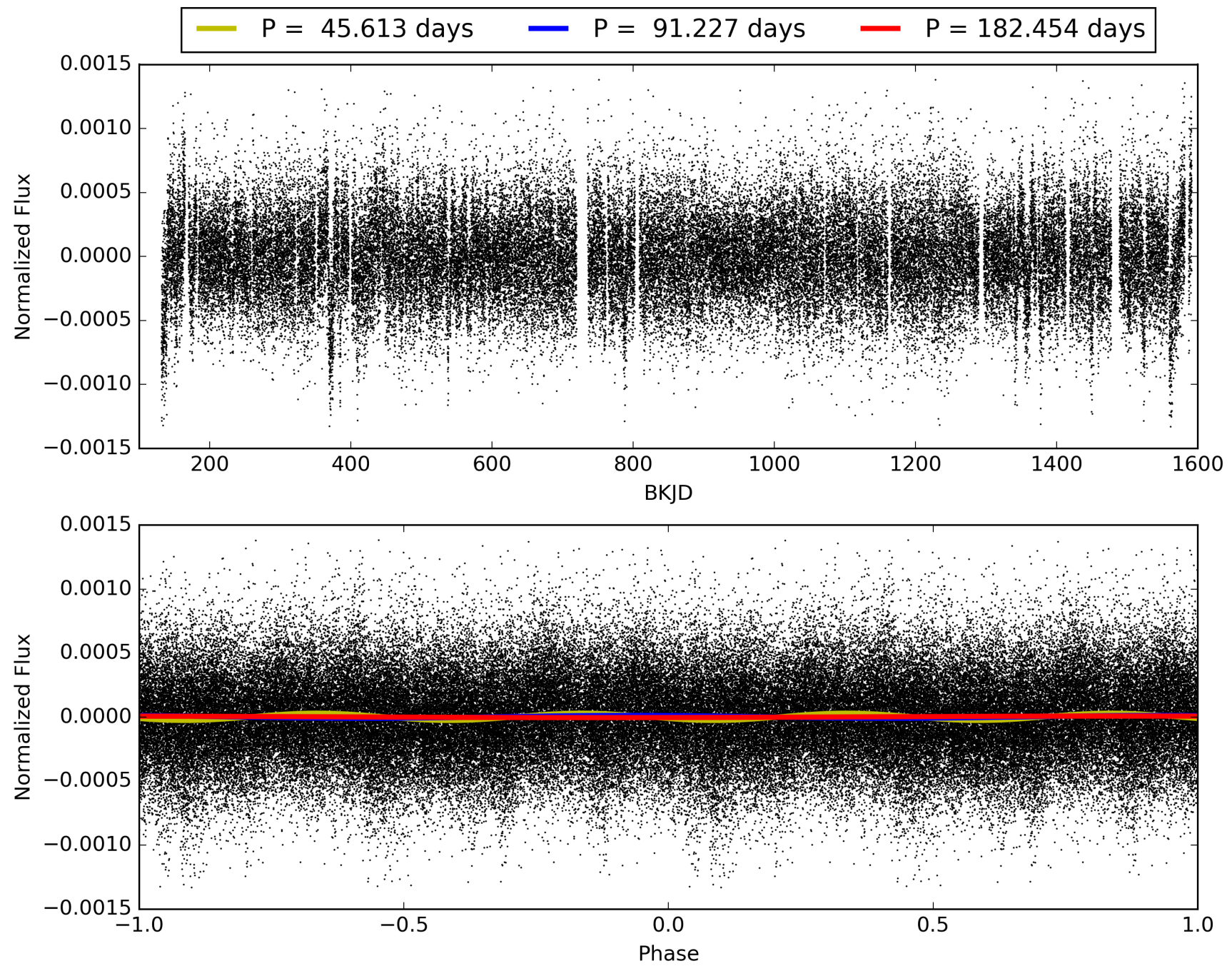
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

# TCE 009345924-04, PDC Light Curves





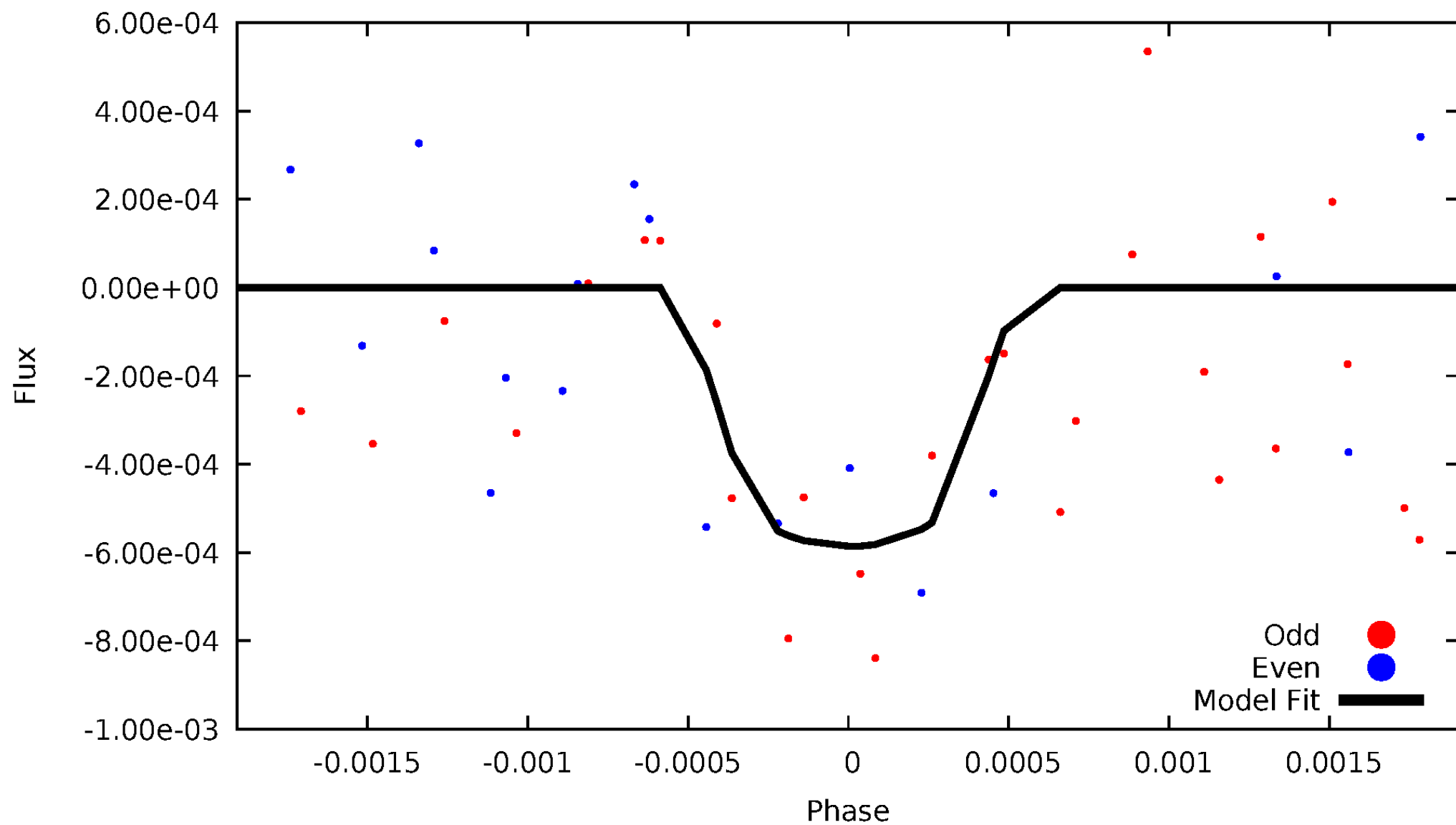
TCE 009345924-04





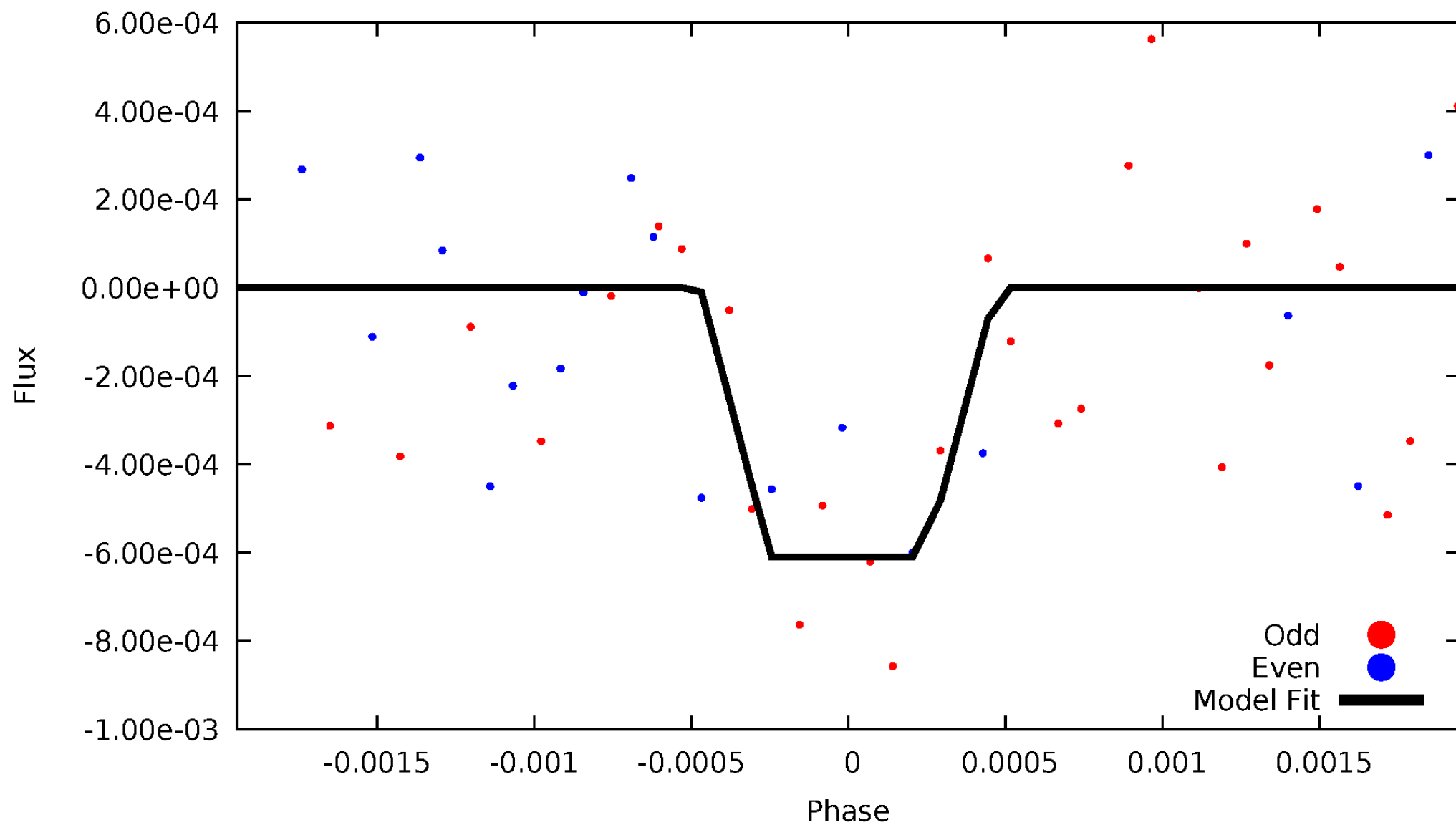
# DV Odd/Even

TCE 009345924-04



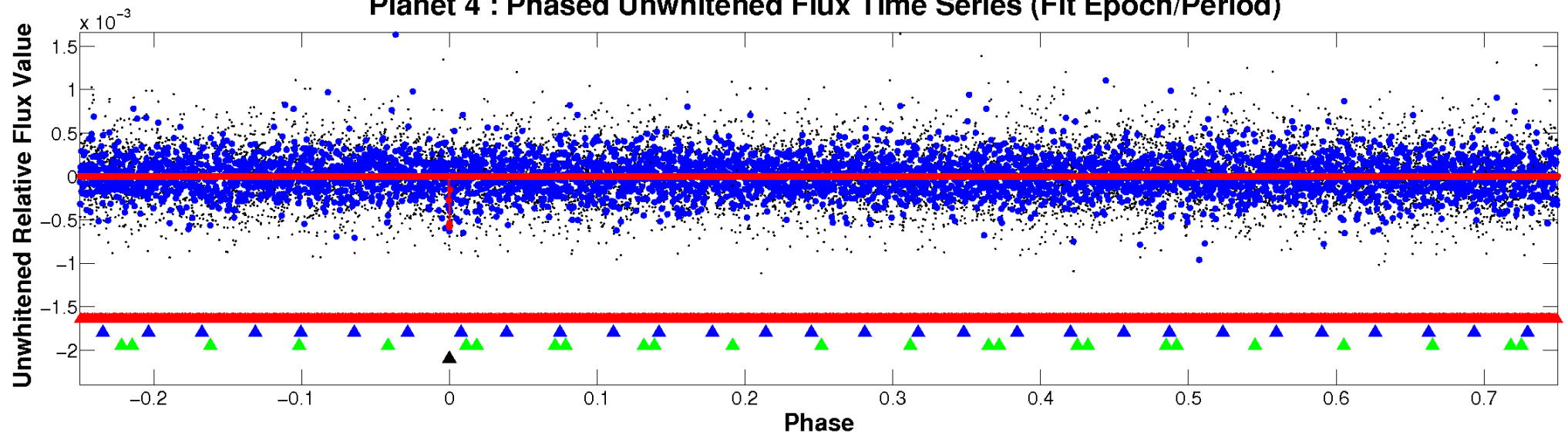
# ALT Odd/Even

TCE 009345924-04

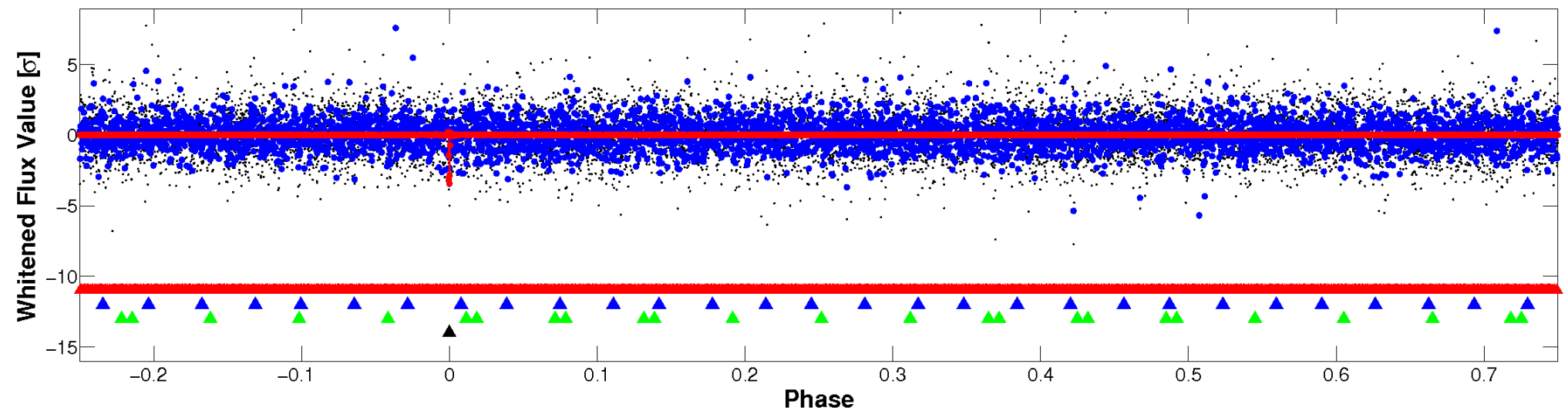


# Non-Whitened Vs. Whitened Light Curve

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

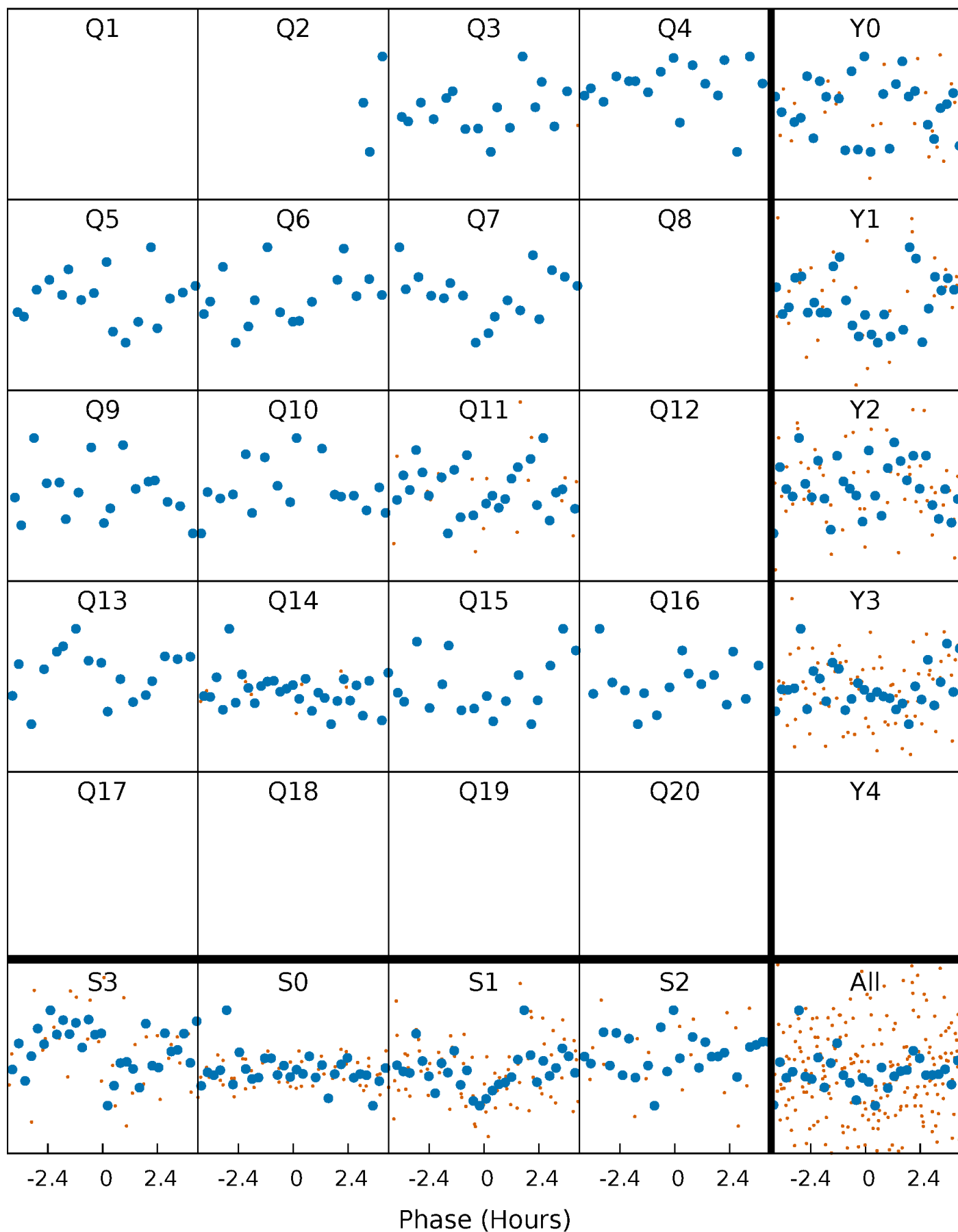


## Planet 4 : Phased Whitened Flux Time Series (Fit Epoch/Period)



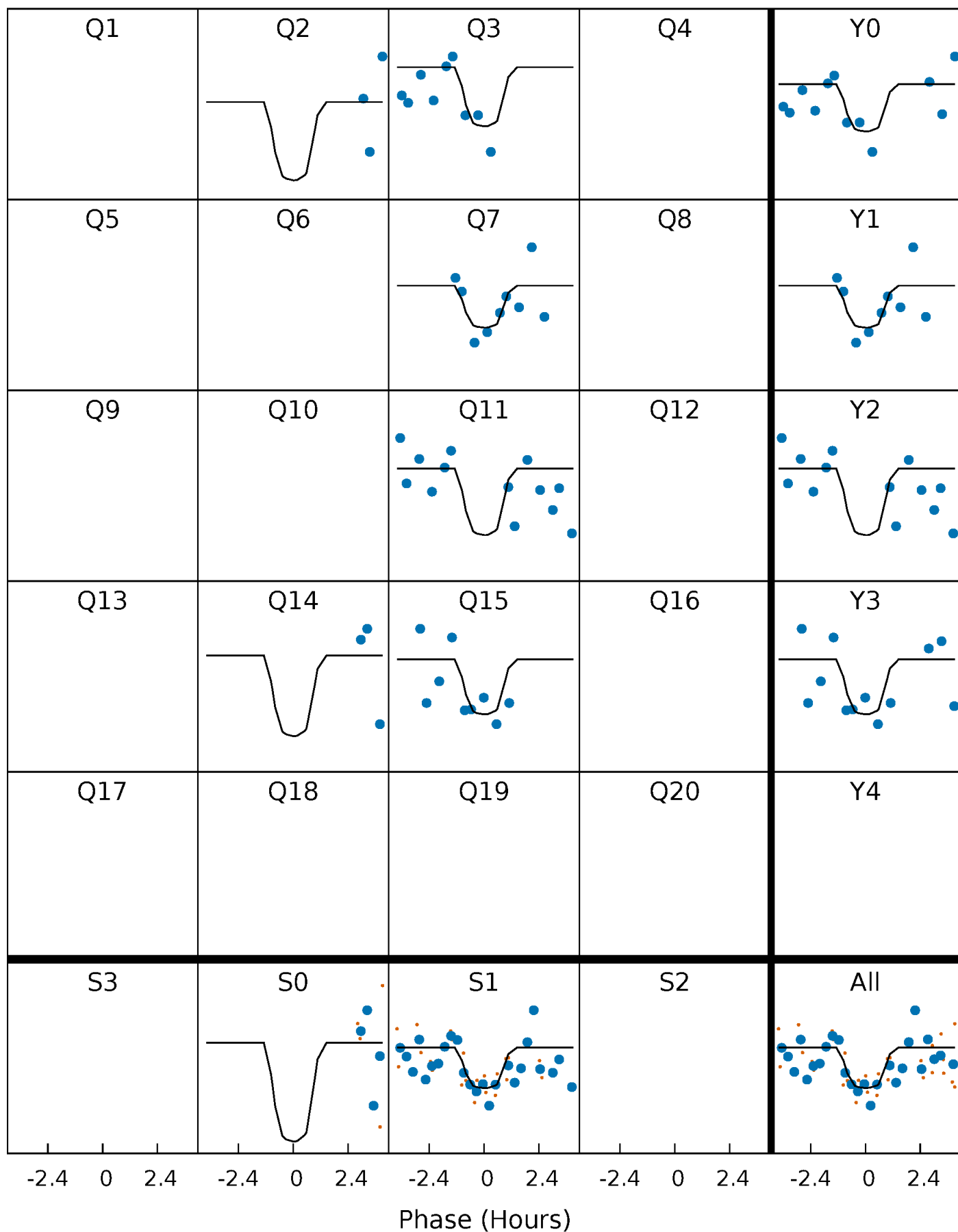
# PDC Quarter-Phased Transit Curves

TCE 009345924-04   P= 91.226941 Days    $T_0=183.599746$  (BKJD)



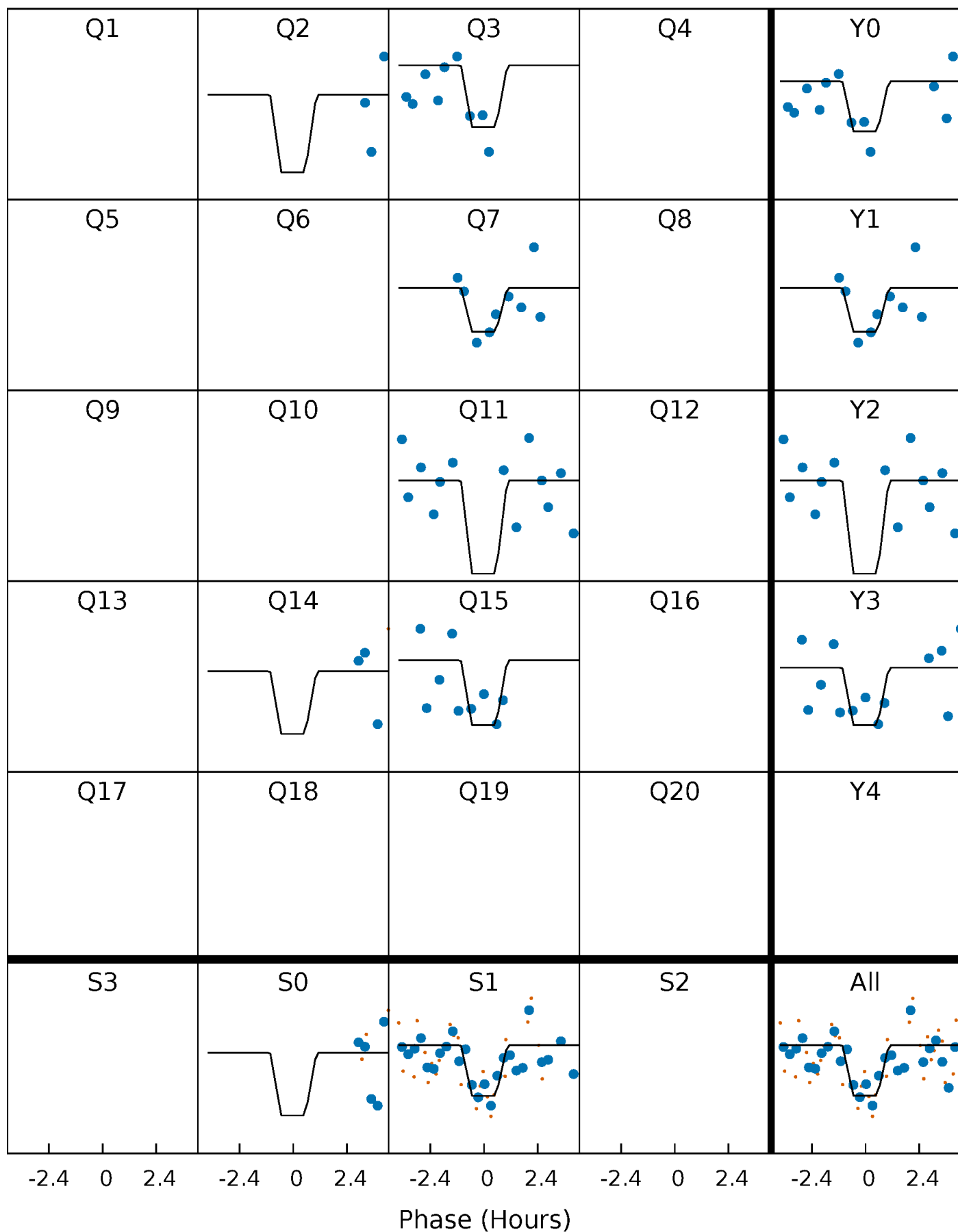
# DV Quarter-Phased Transit Curves

TCE 009345924-04 P= 91.226941 Days  $T_0=183.599746$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

TCE 009345924-04 P= 91.227510 Days  $T_0=183.593990$  (BKJD)

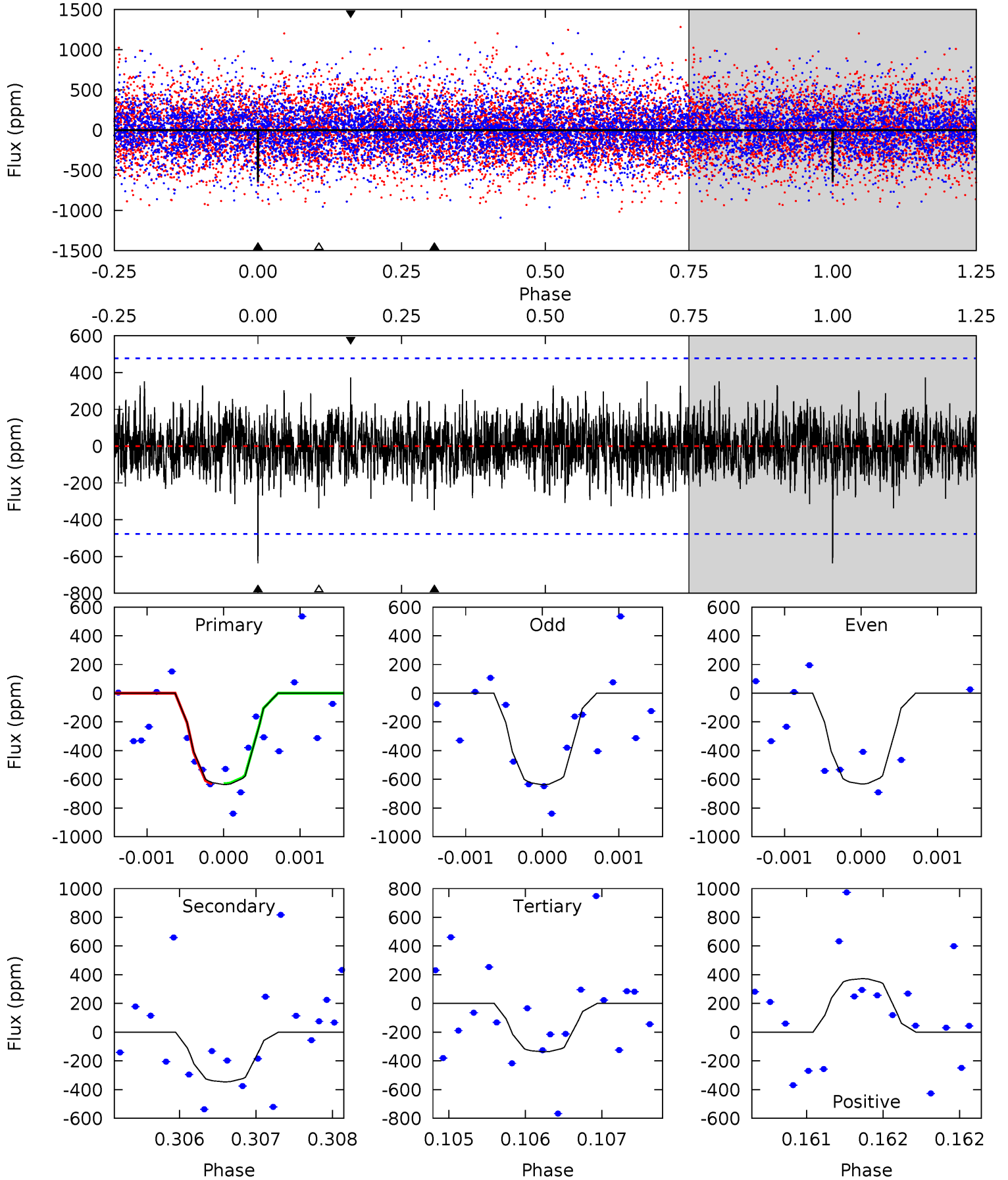




# DV Model-Shift Uniqueness Test

009345924-04, P = 91.226941 Days, E = 92.372805 Days

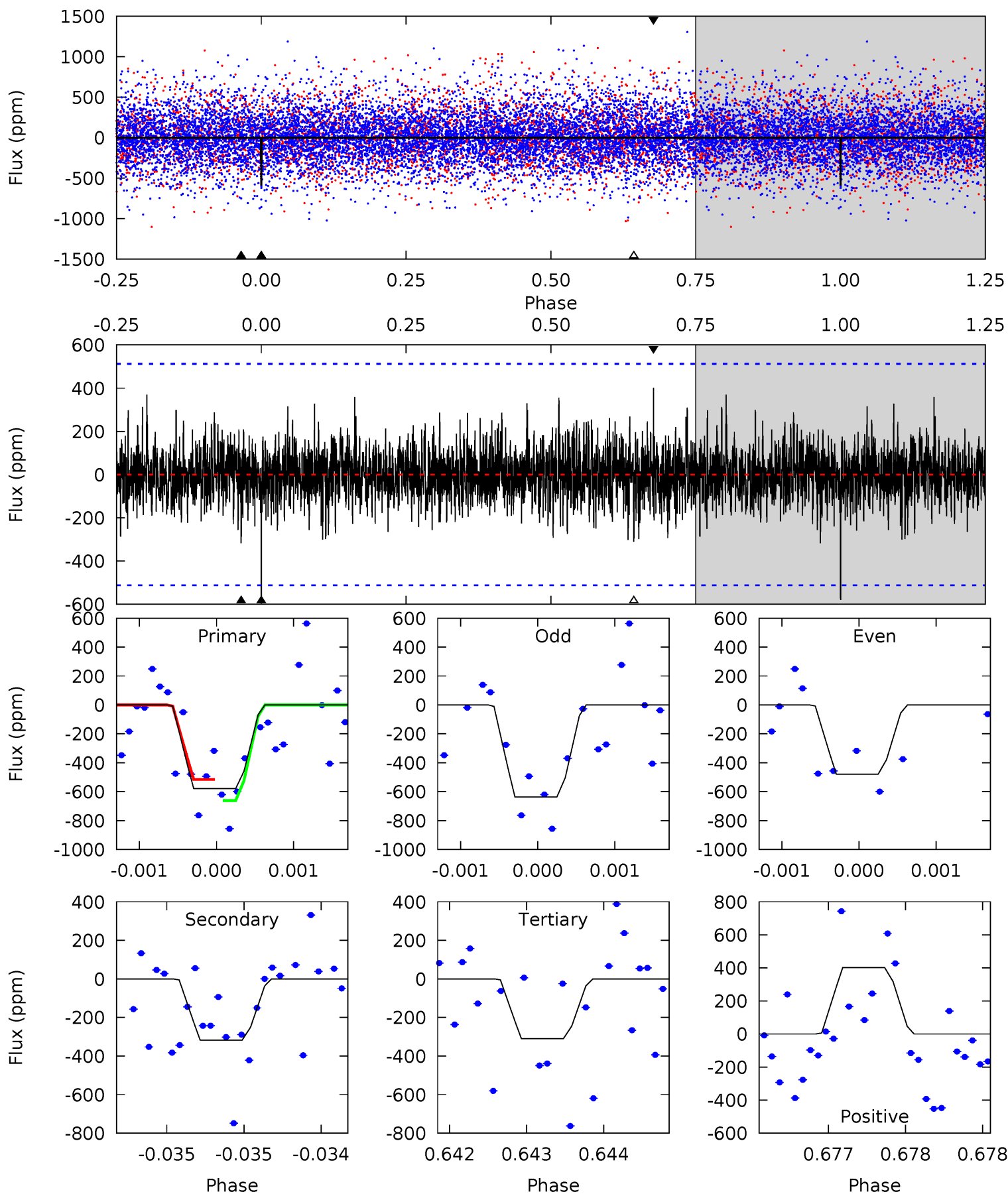
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
7.29	3.96	3.86	4.26	5.46	3.31	1.17	3.43	3.03	0.11	-0.30	0.03	1.01	0.37	0.01



# Alt Model-Shift Uniqueness Test

009345924-04, P = 91.227510 Days, E = 92.366480 Days

Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
6.21	3.40	3.32	4.30	5.49	3.34	1.02	2.89	1.91	0.08	-0.90	0.84	0.97	0.41	0.79



### Stellar Parameters For KIC 009345924

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$6046^{+164}_{-182}$	$4.539^{+0.036}_{-0.204}$	$-0.380^{+0.300}_{-0.300}$	$0.869^{+0.263}_{-0.066}$	$0.953^{+0.119}_{-0.107}$	$2.043^{+0.395}_{-1.029}$
	+3%/-3%	+1%/-4%	+79%/-79%	+30%/-8%	+12%/-11%	+19%/-50%
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 009345924-04 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-346 \pm 87$	$8.41^{+9.17}_{-5.69}$	$569^{+41}_{-25}$	$3375^{+1697}_{-644}$	$393^{+3476}_{-304}$
Alt.	$-317 \pm 93$	$8.75^{+8.99}_{-6.06}$	$569^{+44}_{-25}$	$3267^{+1695}_{-564}$	$326^{+3150}_{-247}$

$T_{max}$  = 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

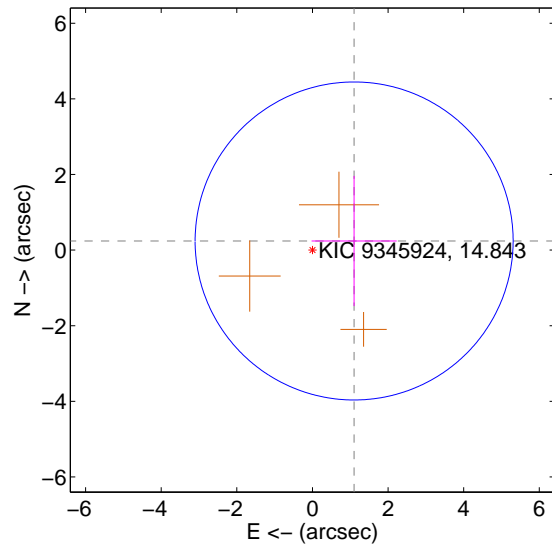
Supplemental centroid analysis for 009345924-04. Kepler magnitude: 14.84. Transit SNR 9.30

There are 0 quarters with good PRF difference image offsets

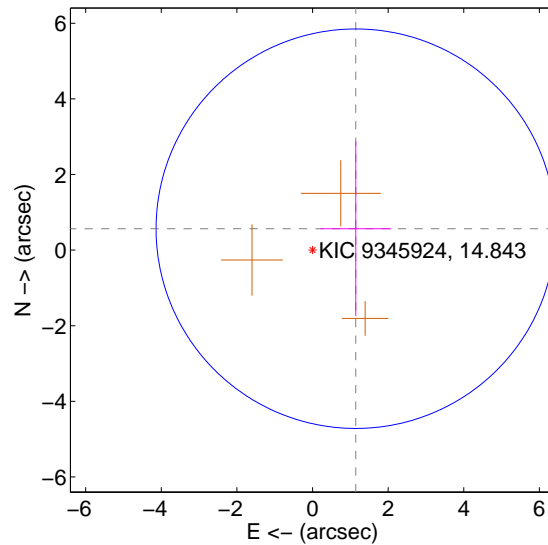
The direct PRF centroid is offset from the target star catalog position by about 0.43 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$1.129 \pm 1.402$	0.80	$-1.103 \pm 1.126$	$0.241 \pm 1.721$
PRF-fit source offset from KIC position	$1.277 \pm 1.761$	0.73	$-1.145 \pm 0.937$	$0.566 \pm 2.312$
photometric centroid source offset	$1.65 \pm 1.09$	1.51	$1.60 \pm 1.08$	$-0.42 \pm 1.18$

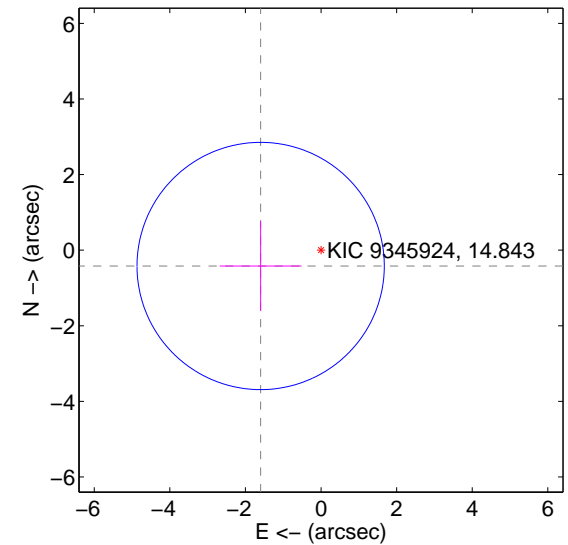
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position

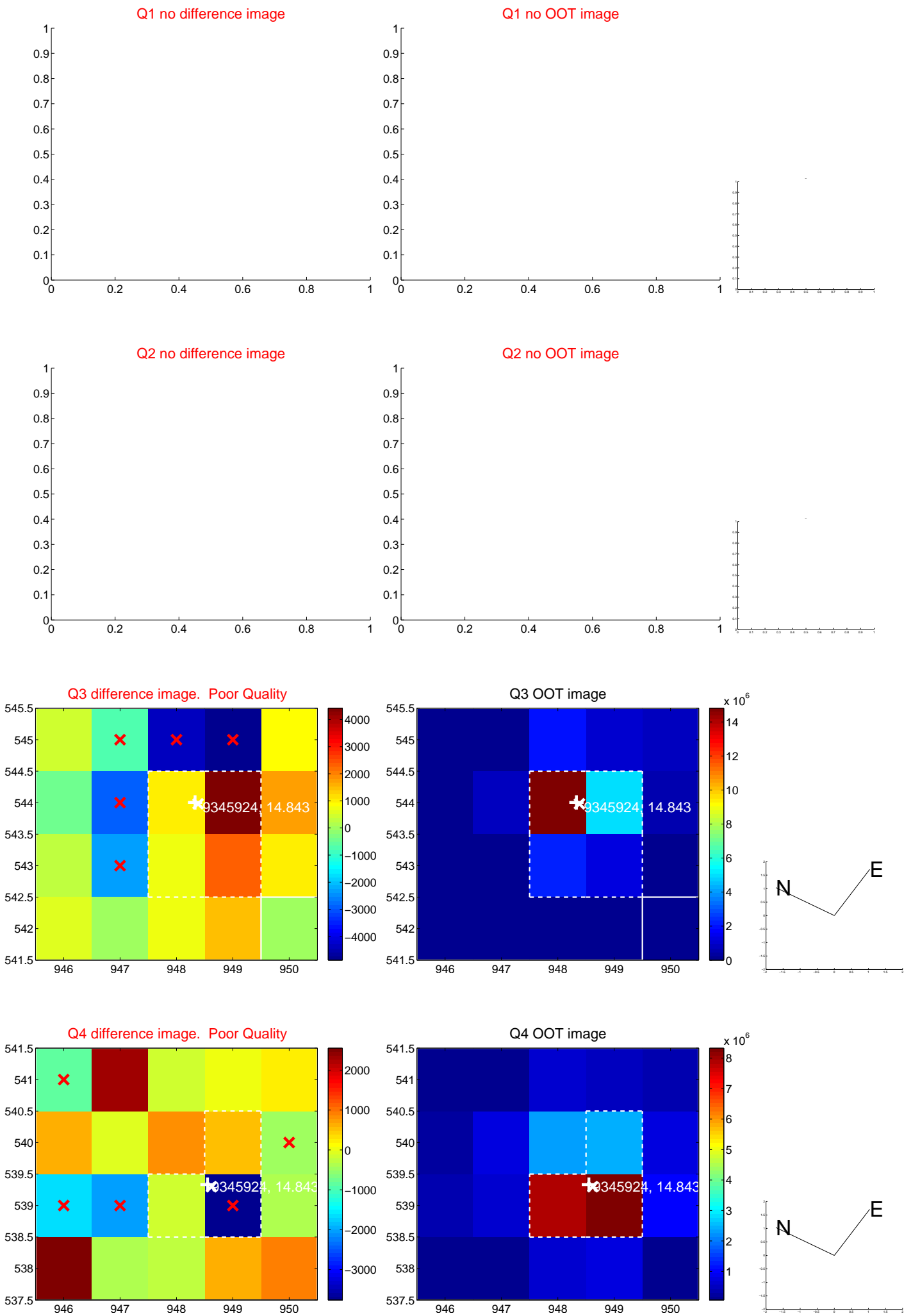


offset from photometric centroids

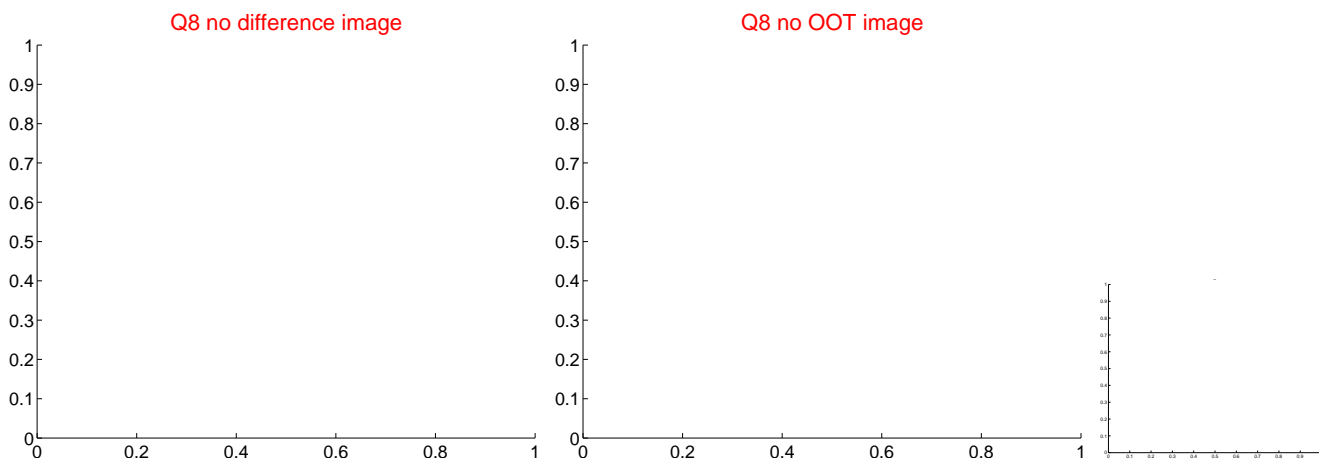
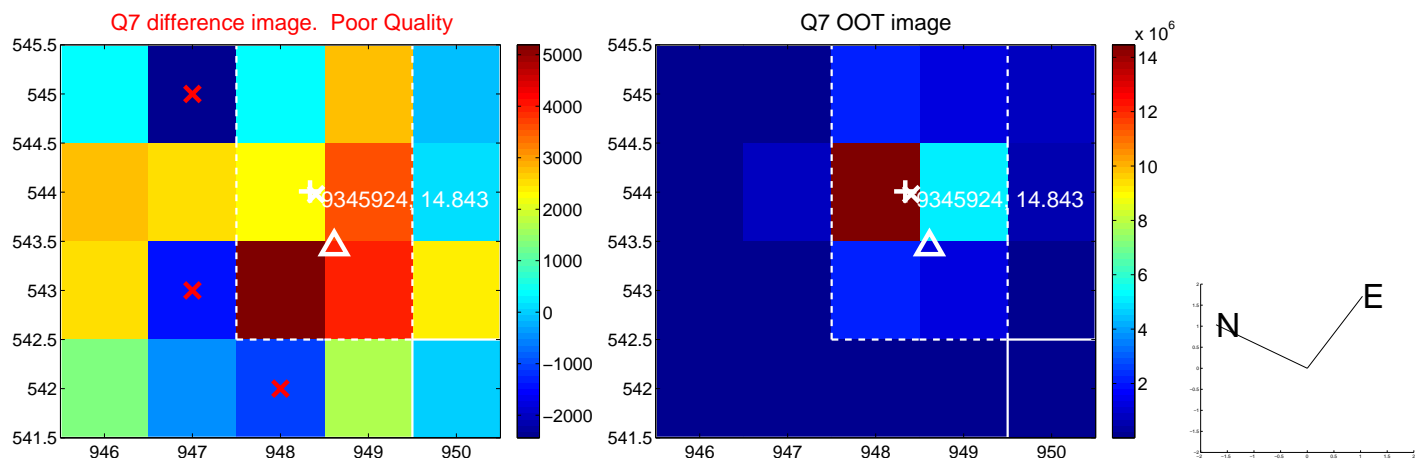
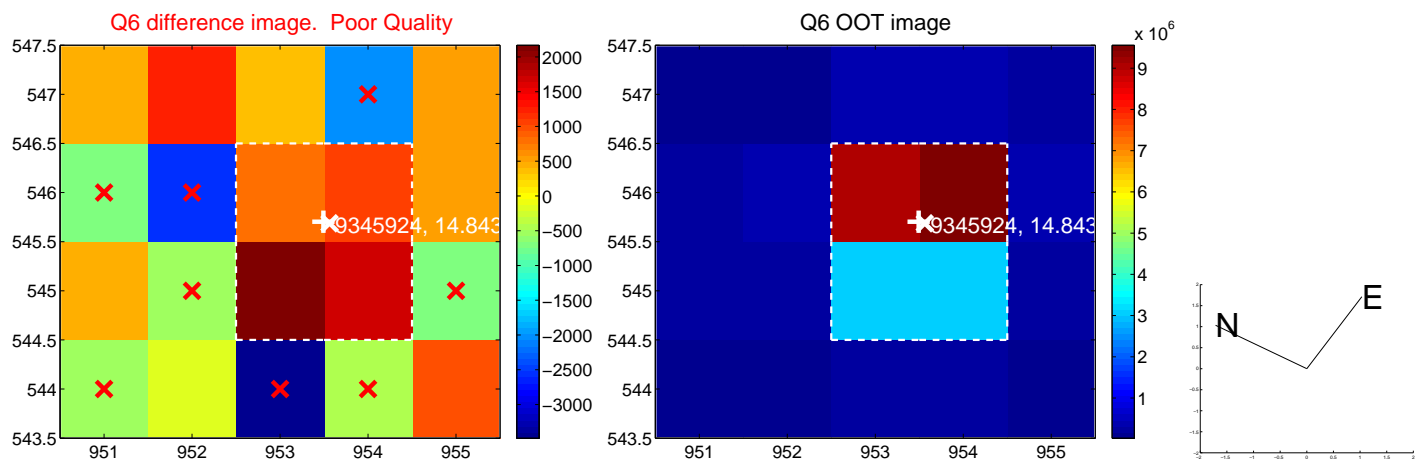
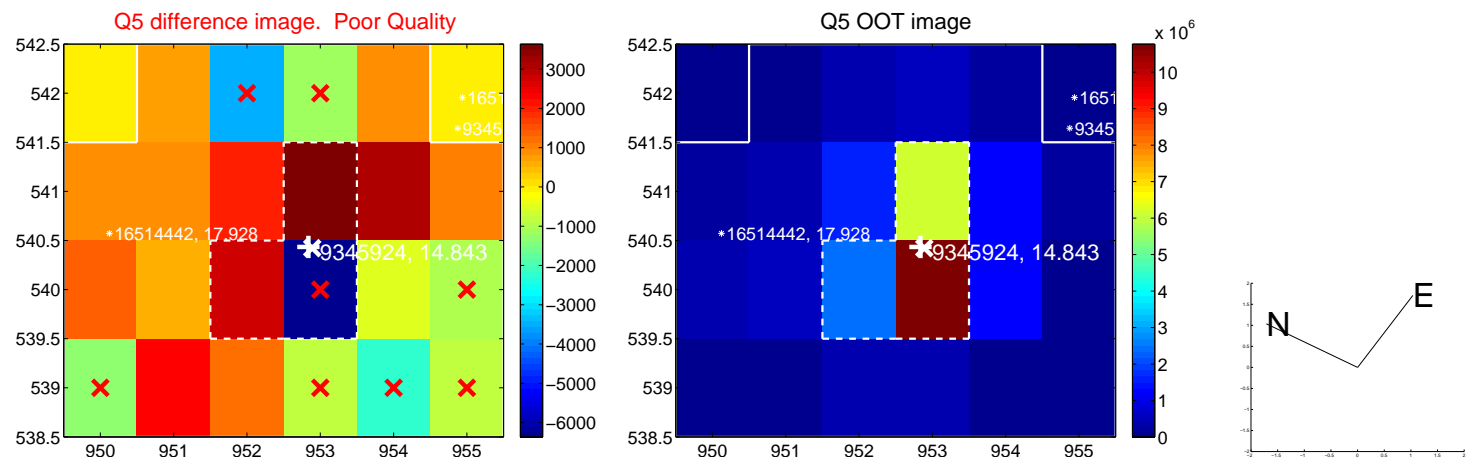


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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

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

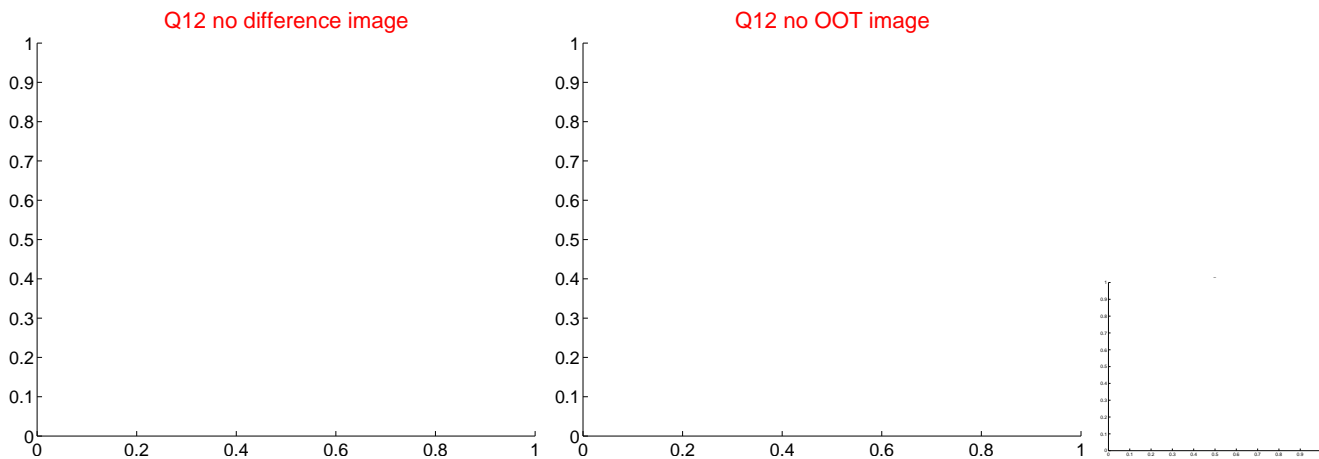
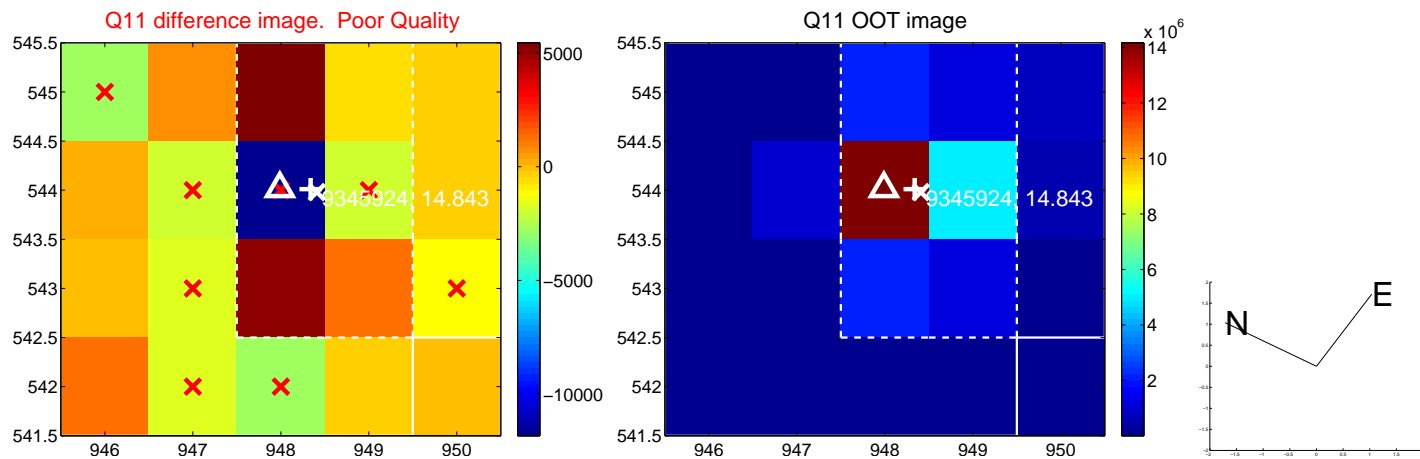
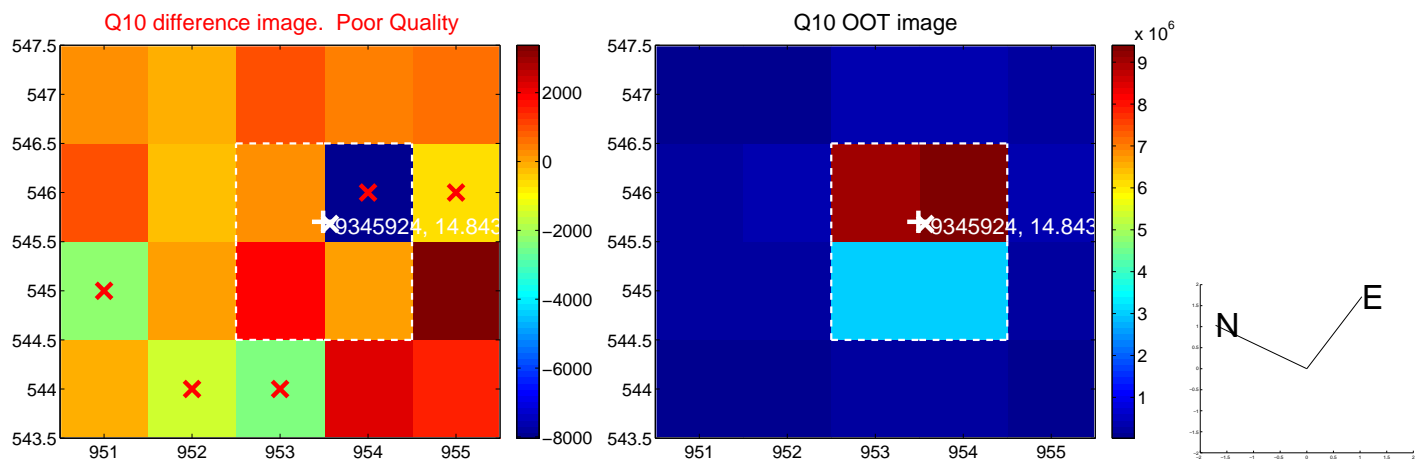
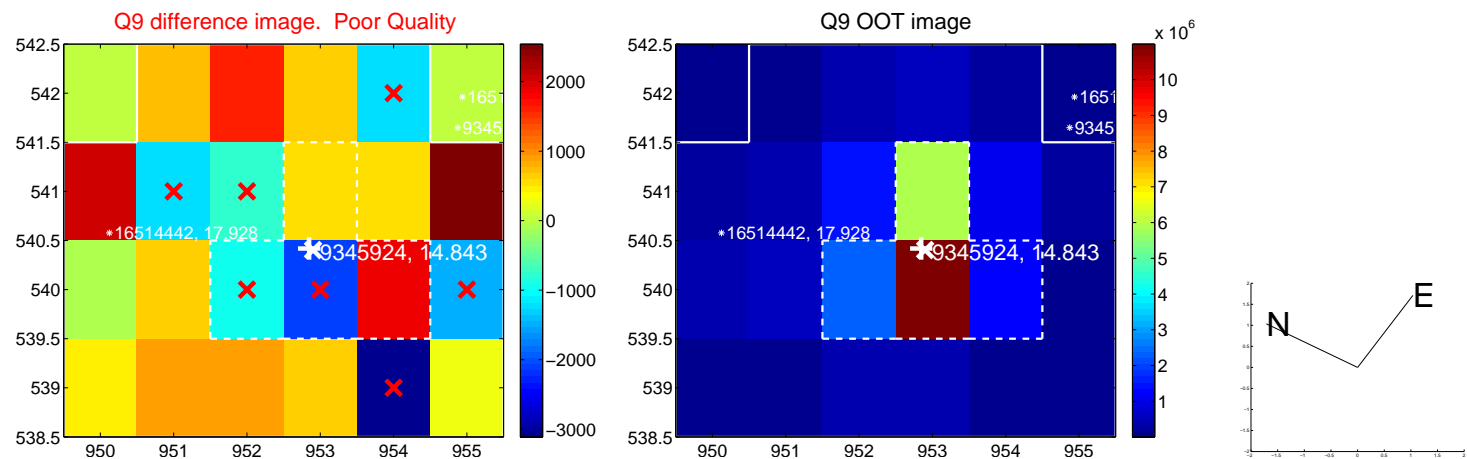


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

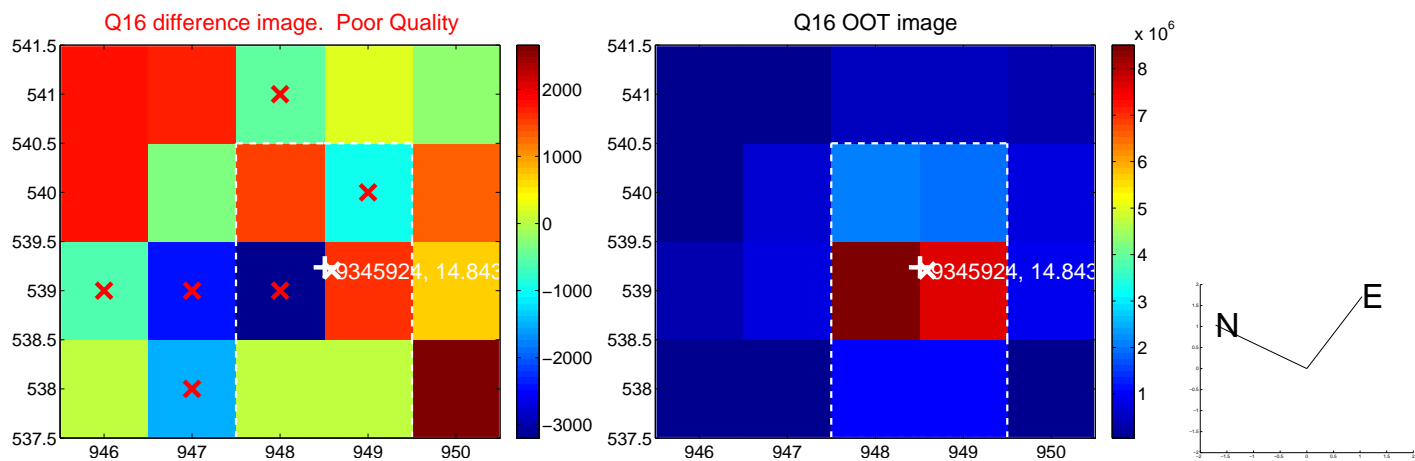
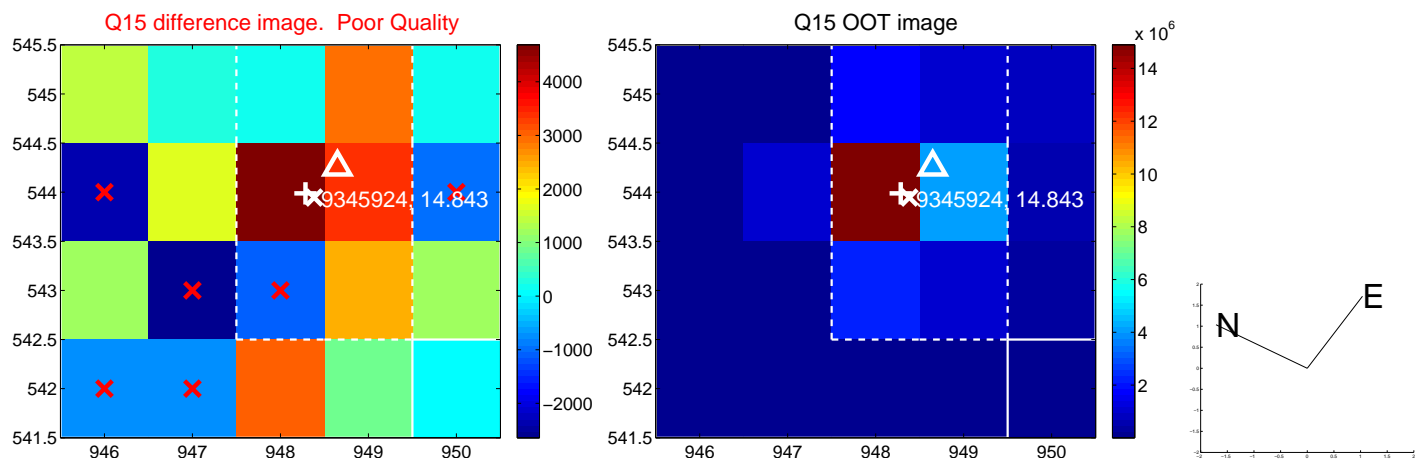
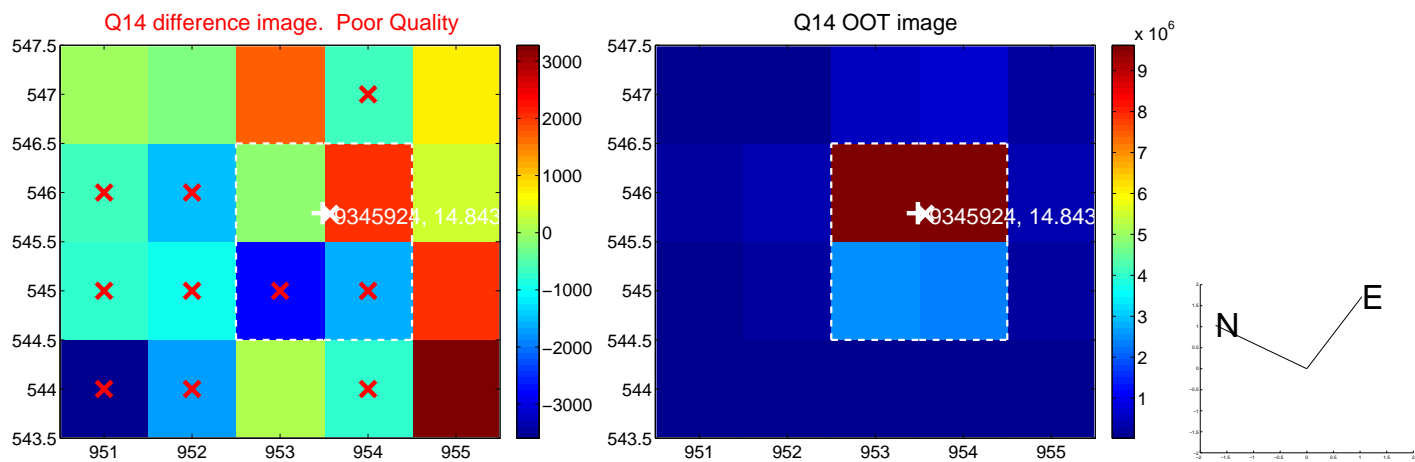
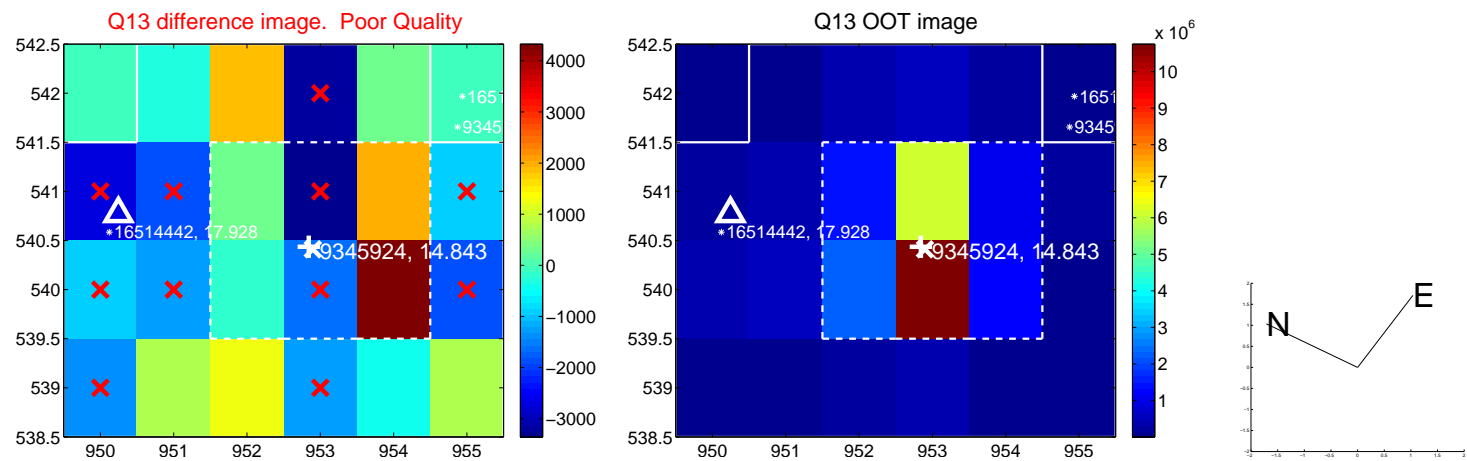




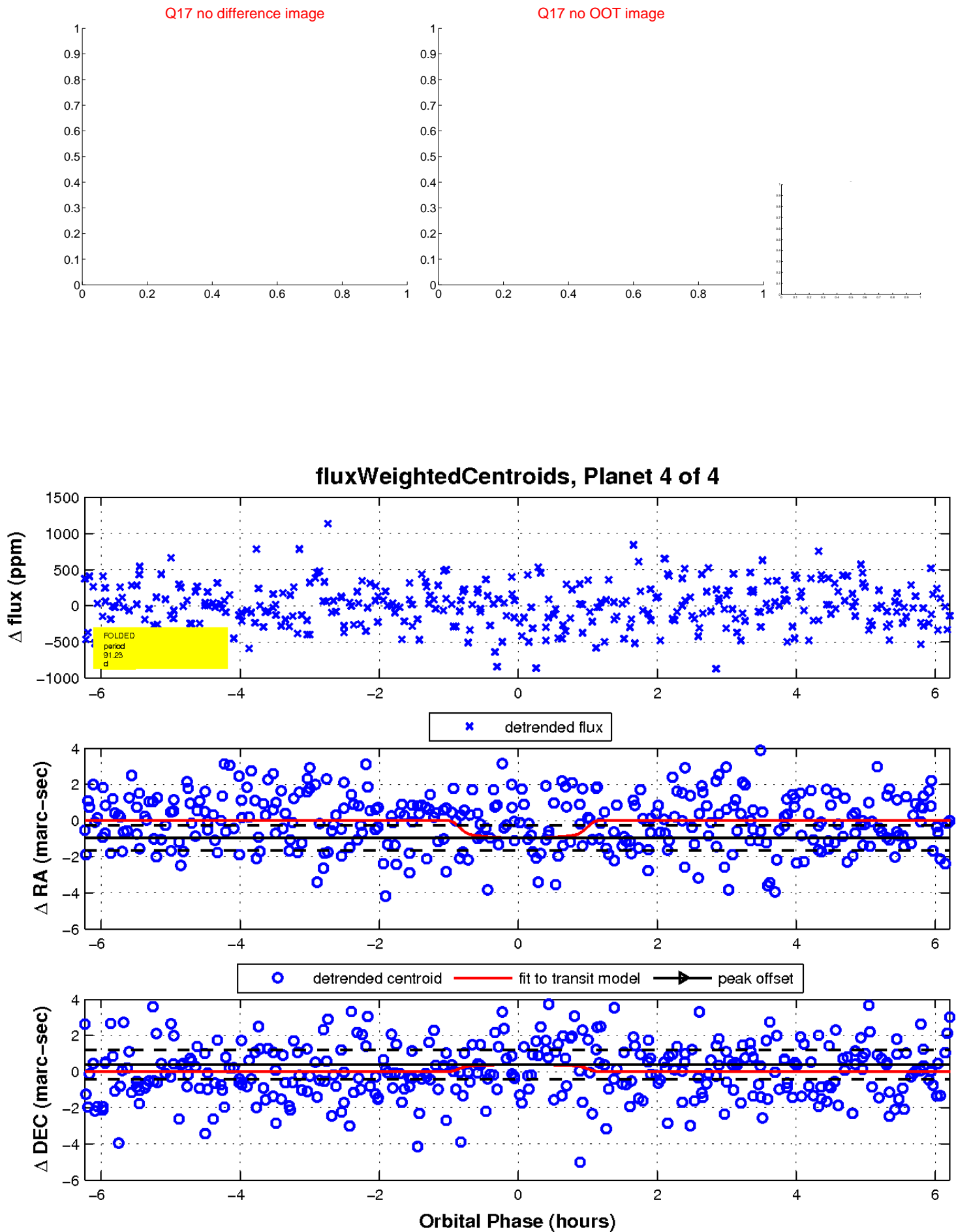
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

