

# KIC 004544572

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
004544572-01	OBS	3950.01	2.189047	132.098339	439.1	2.145	28.3	28.5	0.97	6106	2.42	1036.49
004544572-02	OBS	No	2.189053	133.521907	167.2	1.543	11.9	9.7	0.97	6106	1.48	1036.49
004544572-03	OBS	No	2.189090	133.668527	158.7	1.623	9.1	9.8	0.97	6106	1.22	1036.46

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
004544572-01	OBS	FP	0.00	1	0	1	1	LPP_DV—CENT_RESOLVED_OFFSET—HALO_GHOST—EPHEM_MATCH
004544572-02	OBS	FP	0.00	1	0	1	1	LPP_DV—SAME_NTL_PERIOD—CENT_RESOLVED_OFFSET—HALO_GHOST—EPHEM_MATCH
004544572-03	OBS	FP	0.00	1	0	0	1	LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—SAME_NTL_PERIOD—CENT_FEW_DIFFS—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.

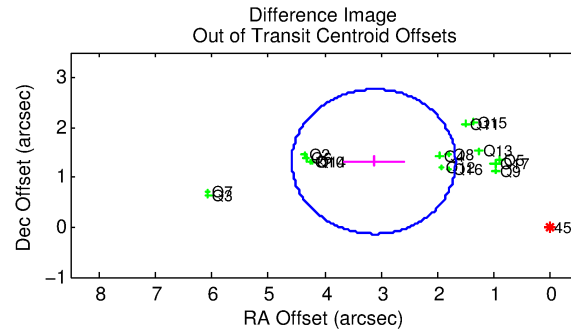
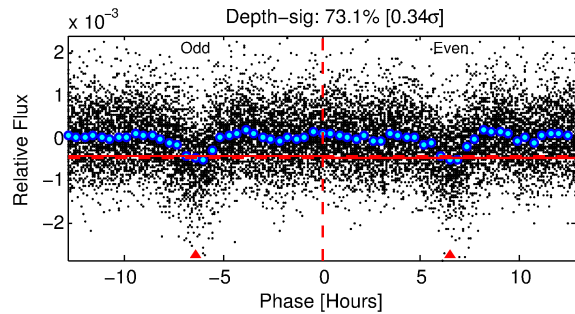
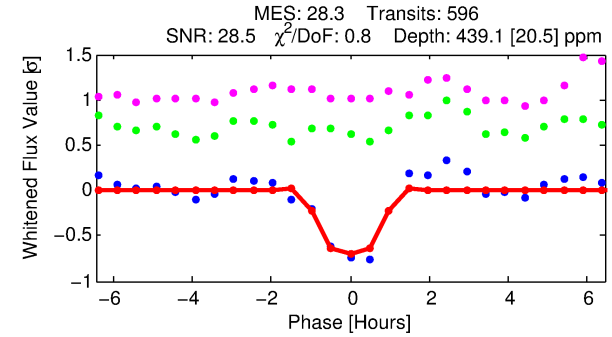
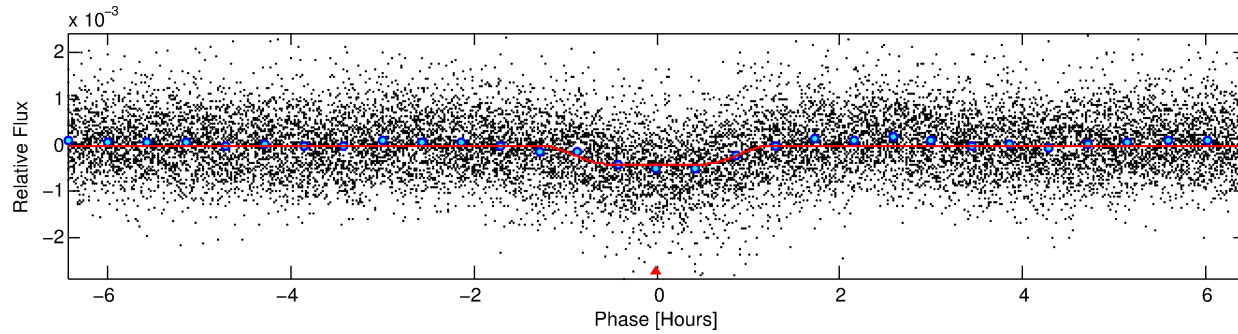
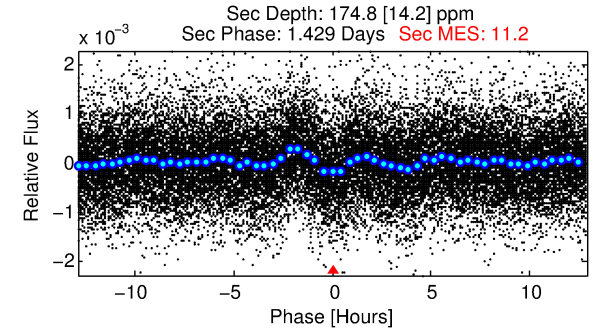
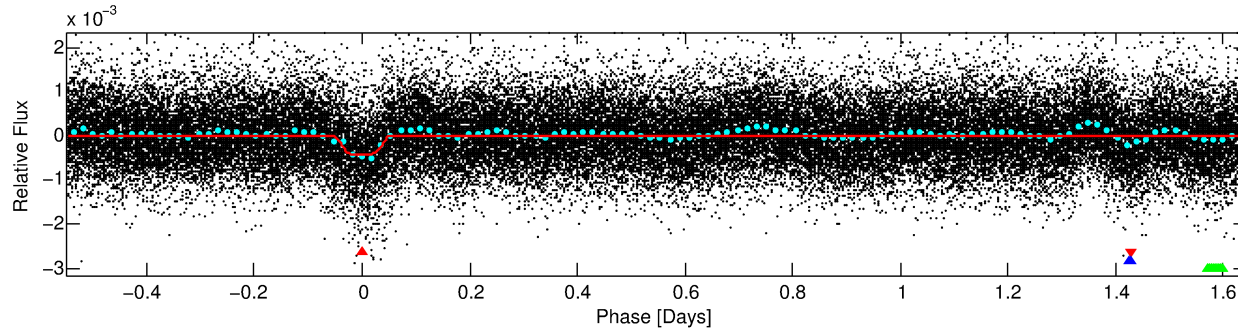
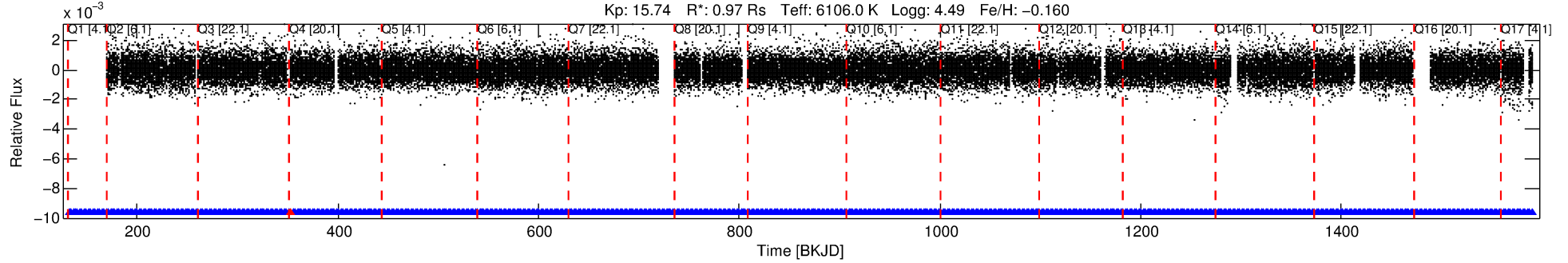
## Ephemeris Match Information For 004544572-01

TCE (1)	KIC	Parent (2)	Parent KIC	P <sub>1</sub> :P <sub>2</sub>	Dist ( $''$ )	$\Delta$ Row	$\Delta$ Col	m <sub>2</sub>	m <sub>1</sub>	D <sub>2</sub> /D <sub>1</sub>	Mechanism	Flag	$\sigma_P$	$\sigma_T$
004544572-01	4544572	004544587-pri	4544587	1:1	36.6	1	-9	10.80	15.74	1020.30	Direct-PRF	0	1.58	0.95

**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: 4544572 Candidate: 1 of 3 Period: 2.189 d  
KOI: K03950 Corr: No Ephemeris Match



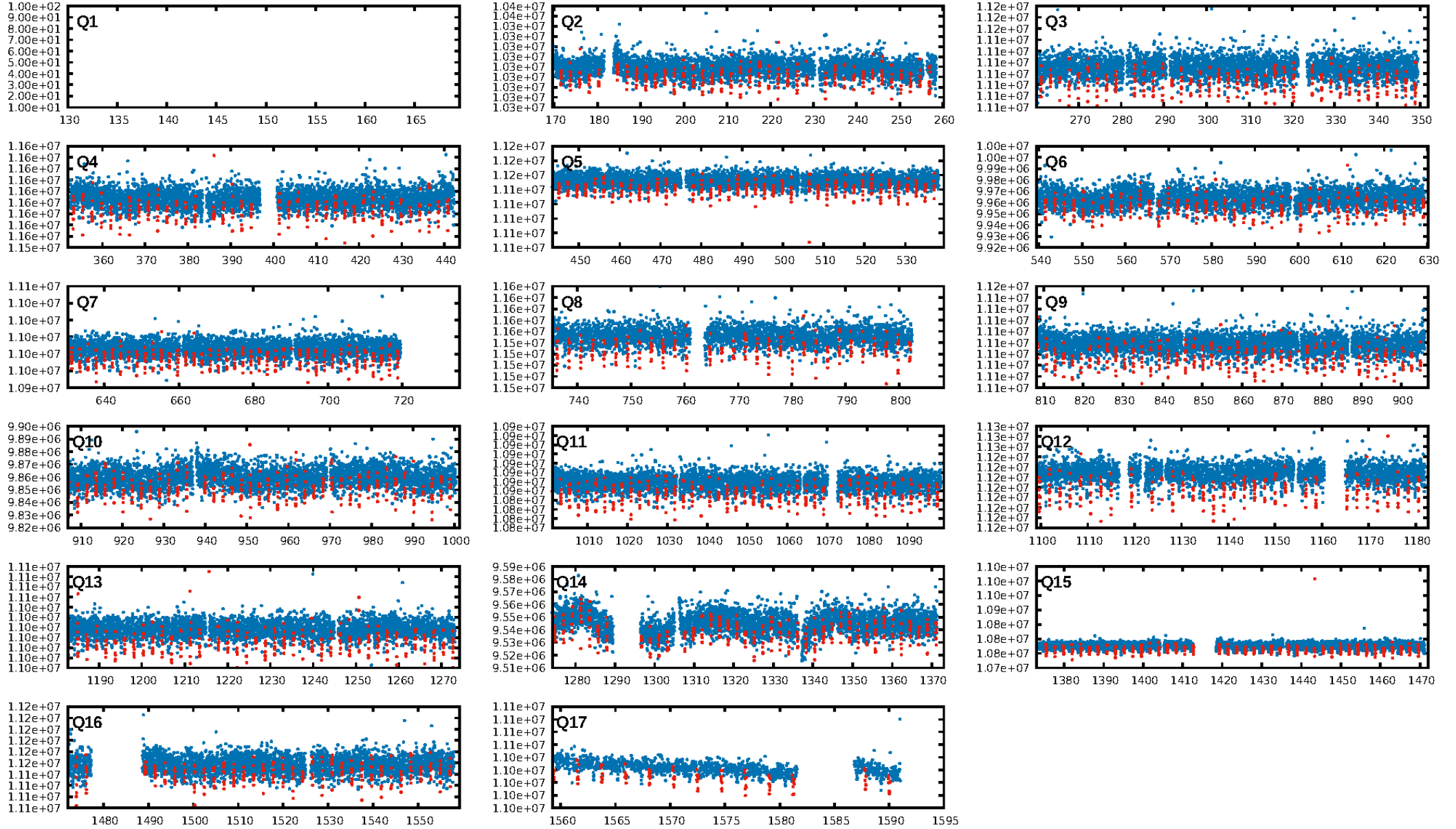
## DV Fit Results:

Period = 2.18905 [0.00001] d  
Epoch = 132.0983 [0.0012] BKJD  
Rp/R\* = 0.0230 [0.0028]  
a/R\* = 3.69 [2.14]  
b = 0.91 [0.11]  
Seff = 1036.49 [423.79]  
Teq = 1447 [148] K  
Rp = 2.42 [0.79] Re  
a = 0.0335 [0.0087] AU  
Ag = 18.39 [8.52] [2.04σ]  
**Teffp = 4633 [343] K [8.53σ]**

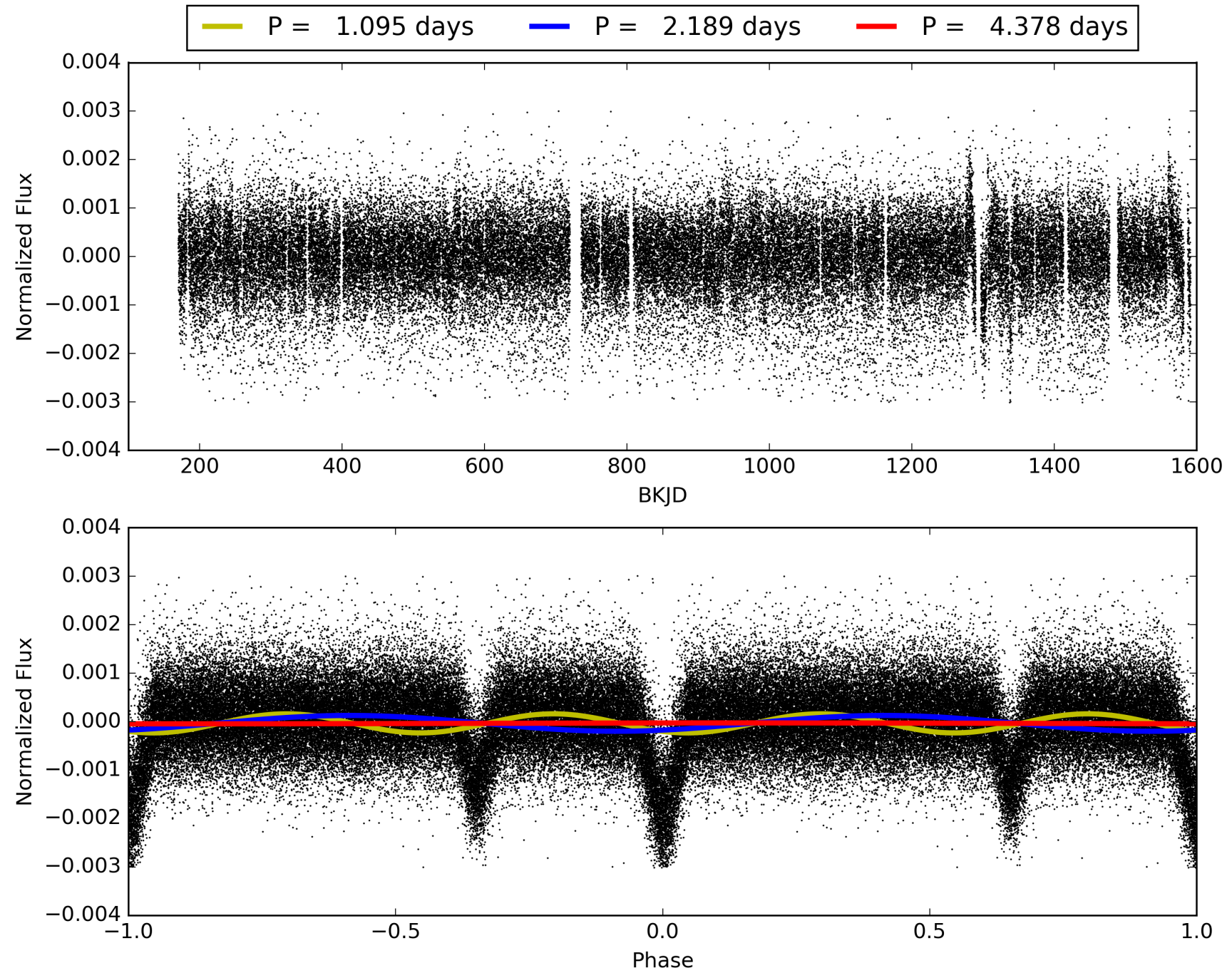
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
**LongPeriod-sig: 0.0% [0.00σ]**  
ModelChiSquare2-sig: N/A  
ModelChiSquareGo-sig: N/A  
Bootstrap-pfa: 3.62e-166  
RollingBand-fgt: 1.00 [582/583]  
**GhostDiagnostic-chr: -0.1067**  
Centroid-sig: 0.0%  
Centroid-so: 8.089 arcsec [15.92σ]  
**OotOffset-rm: 3.393 arcsec [7.02σ]**  
**KicOffset-rm: 3.142 arcsec [6.40σ]**  
OotOffset-st: 4/4/4/4 [16]  
KicOffset-st: 4/4/4/4 [16]  
DiffImageQuality-fgm: 0.06 [1/16]  
DiffImageOverlap-fno: 1.00 [16/16]

# TCE 004544572-01, PDC Light Curves



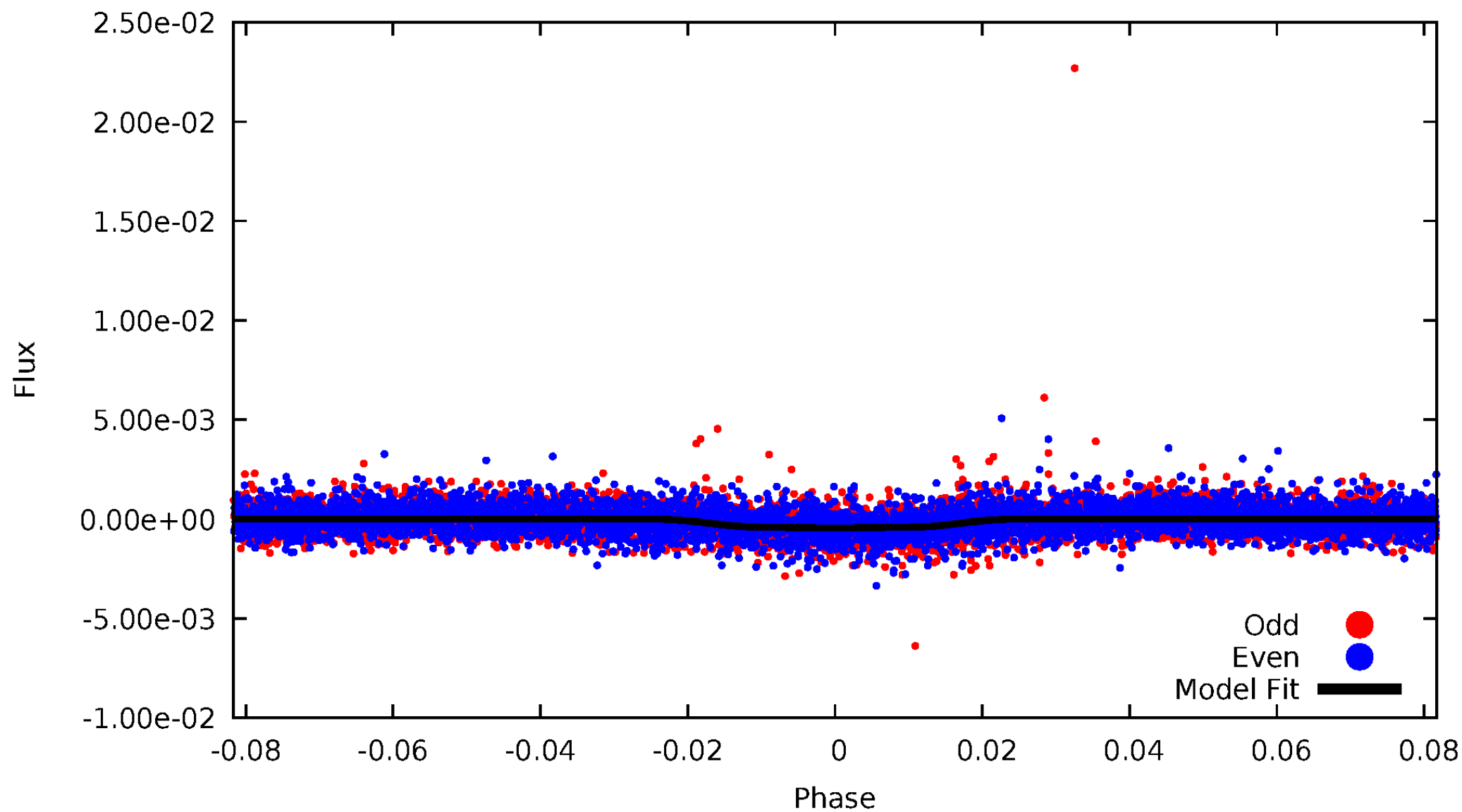
TCE 004544572-01





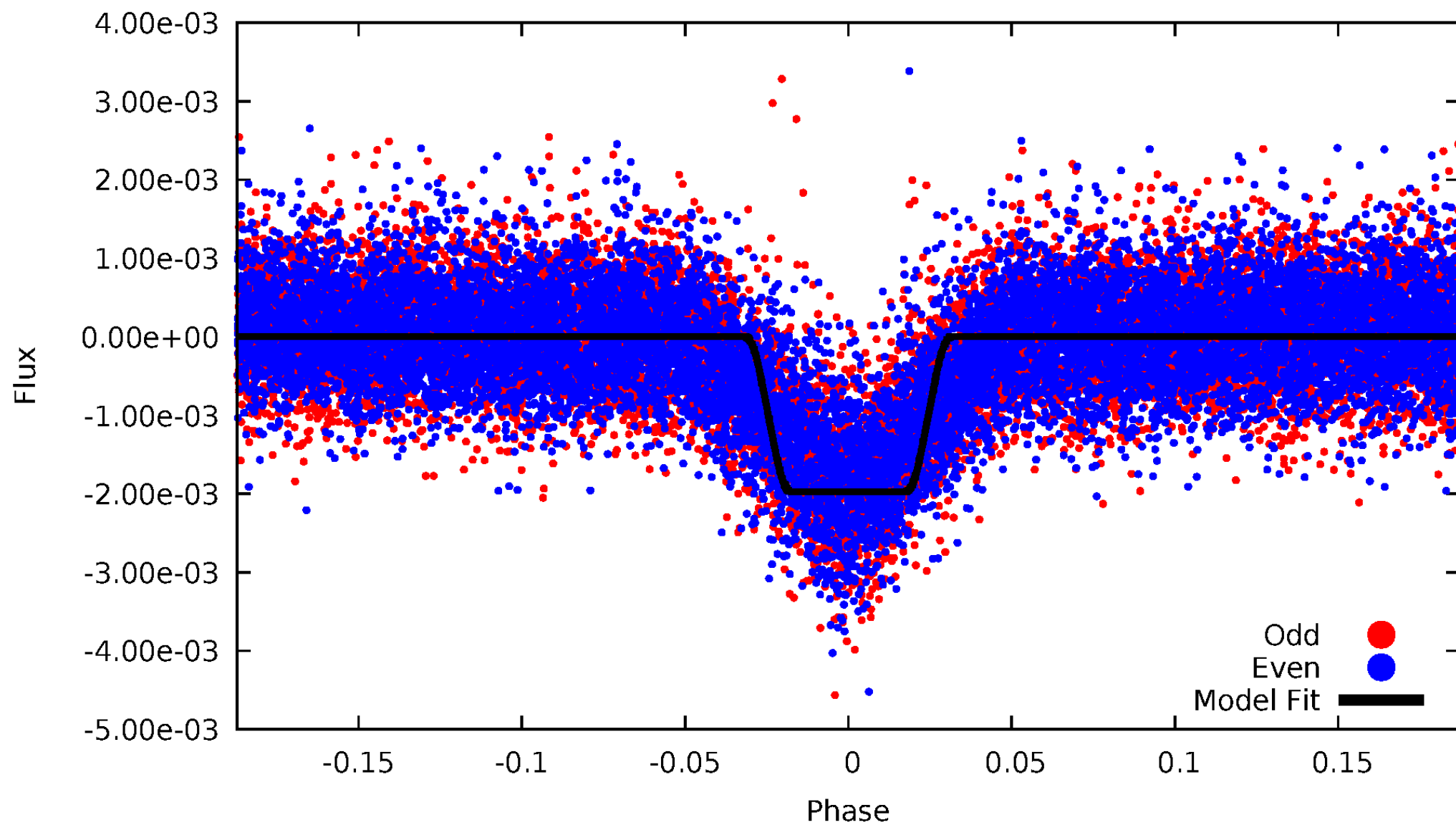
# DV Odd/Even

TCE 004544572-01

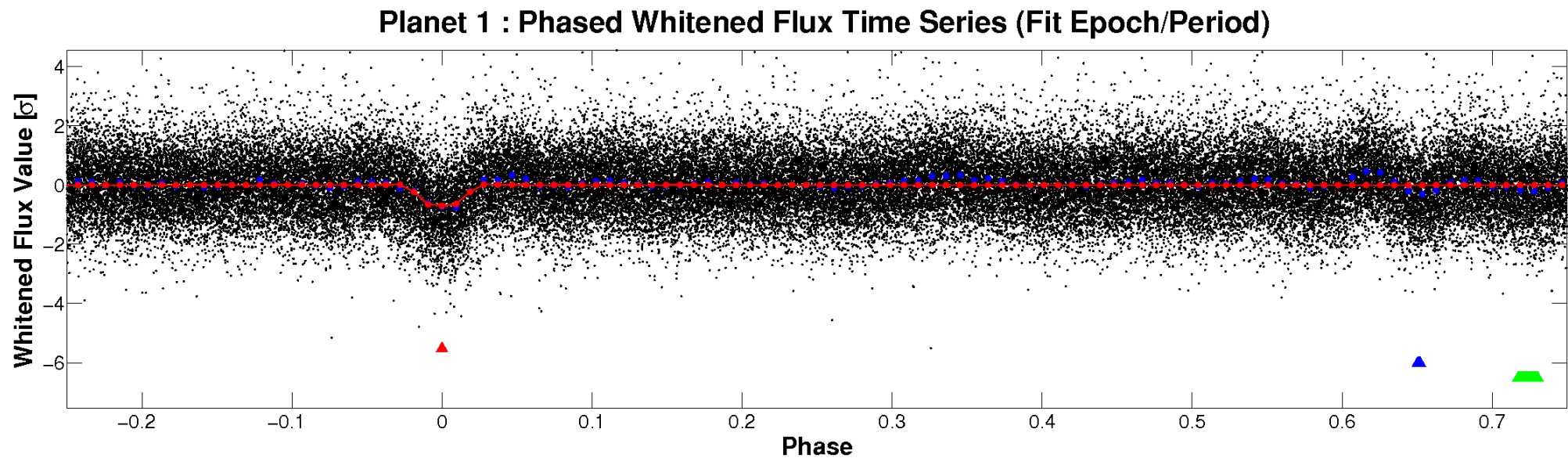
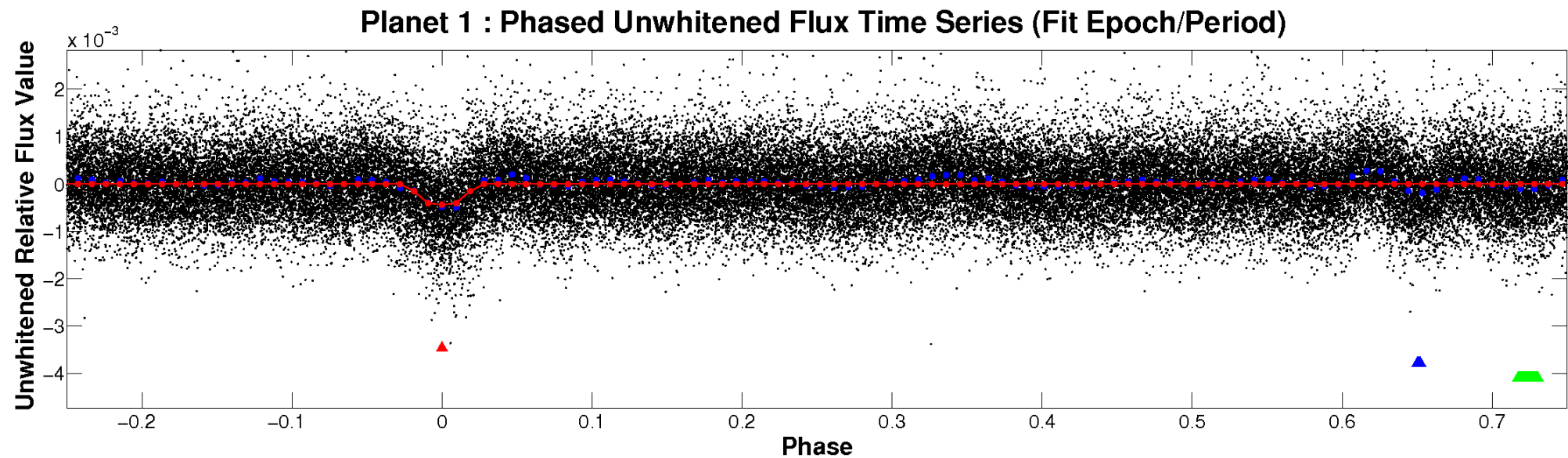


# ALT Odd/Even

TCE 004544572-01

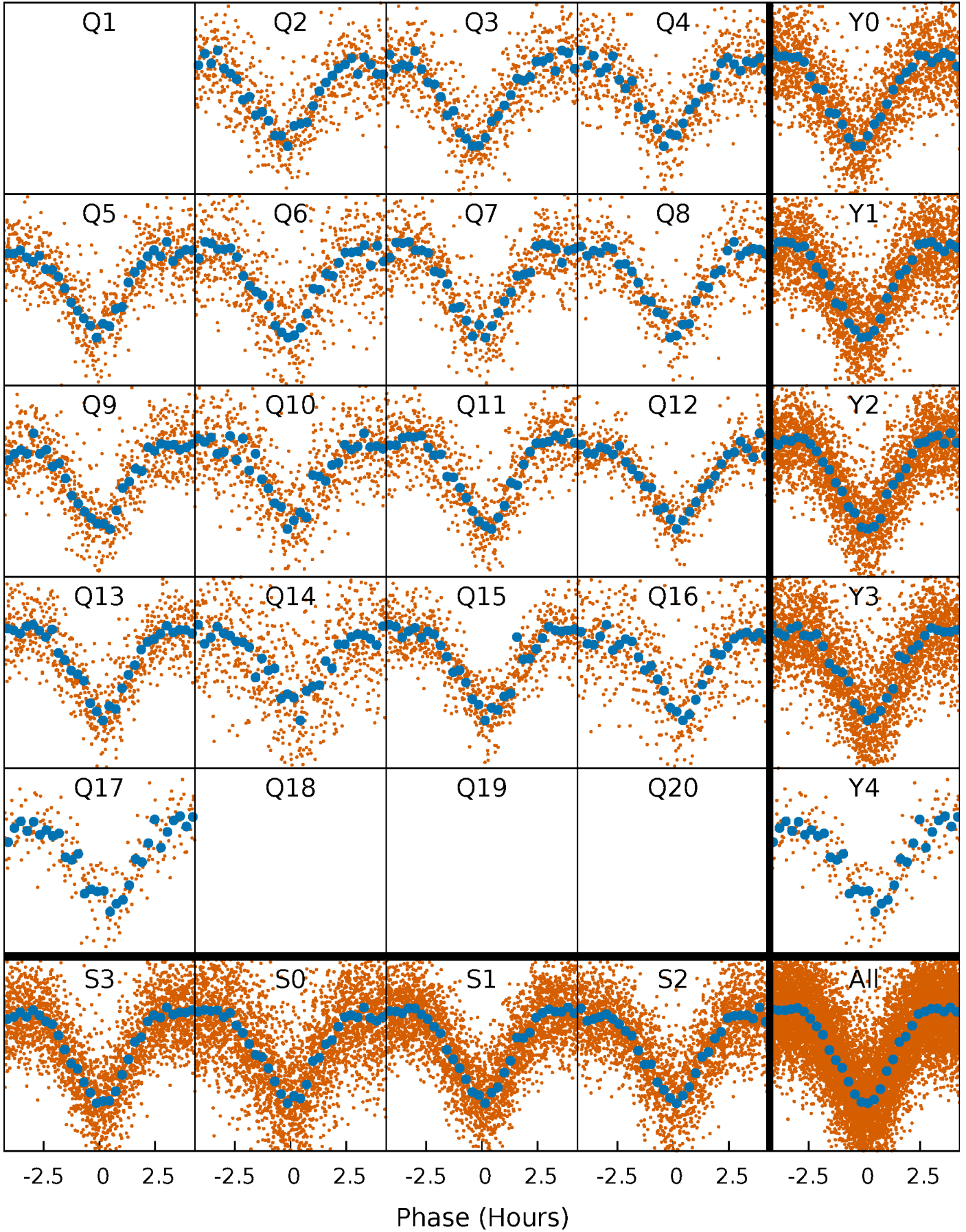


# Non-Whitened Vs. Whitened Light Curve



# PDC Quarter-Phased Transit Curves

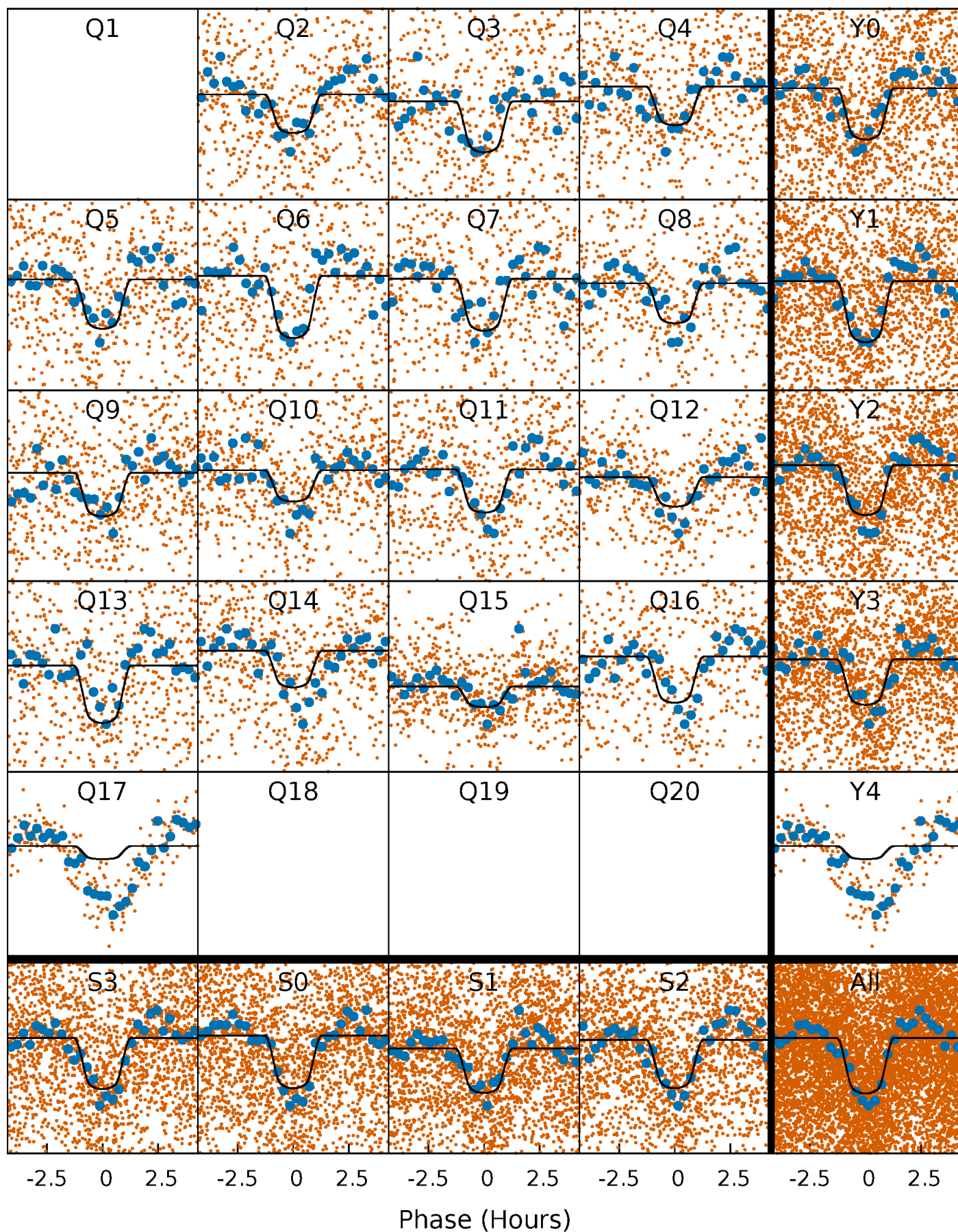
TCE 004544572-01 P= 2.189047 Days  $T_0=132.098339$  (BKJD)





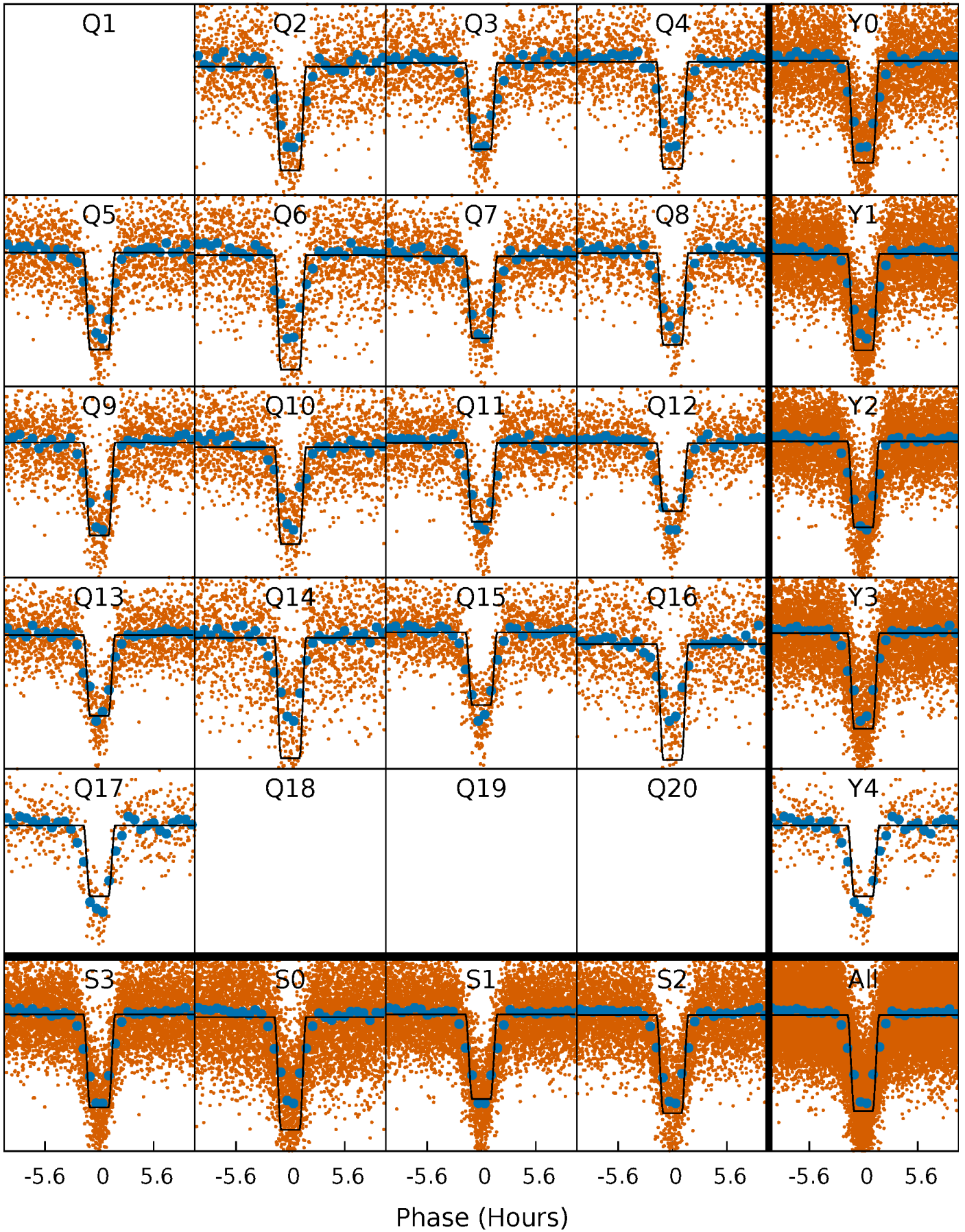
# DV Quarter-Phased Transit Curves

TCE 004544572-01 P= 2.189047 Days  $T_0=132.098339$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

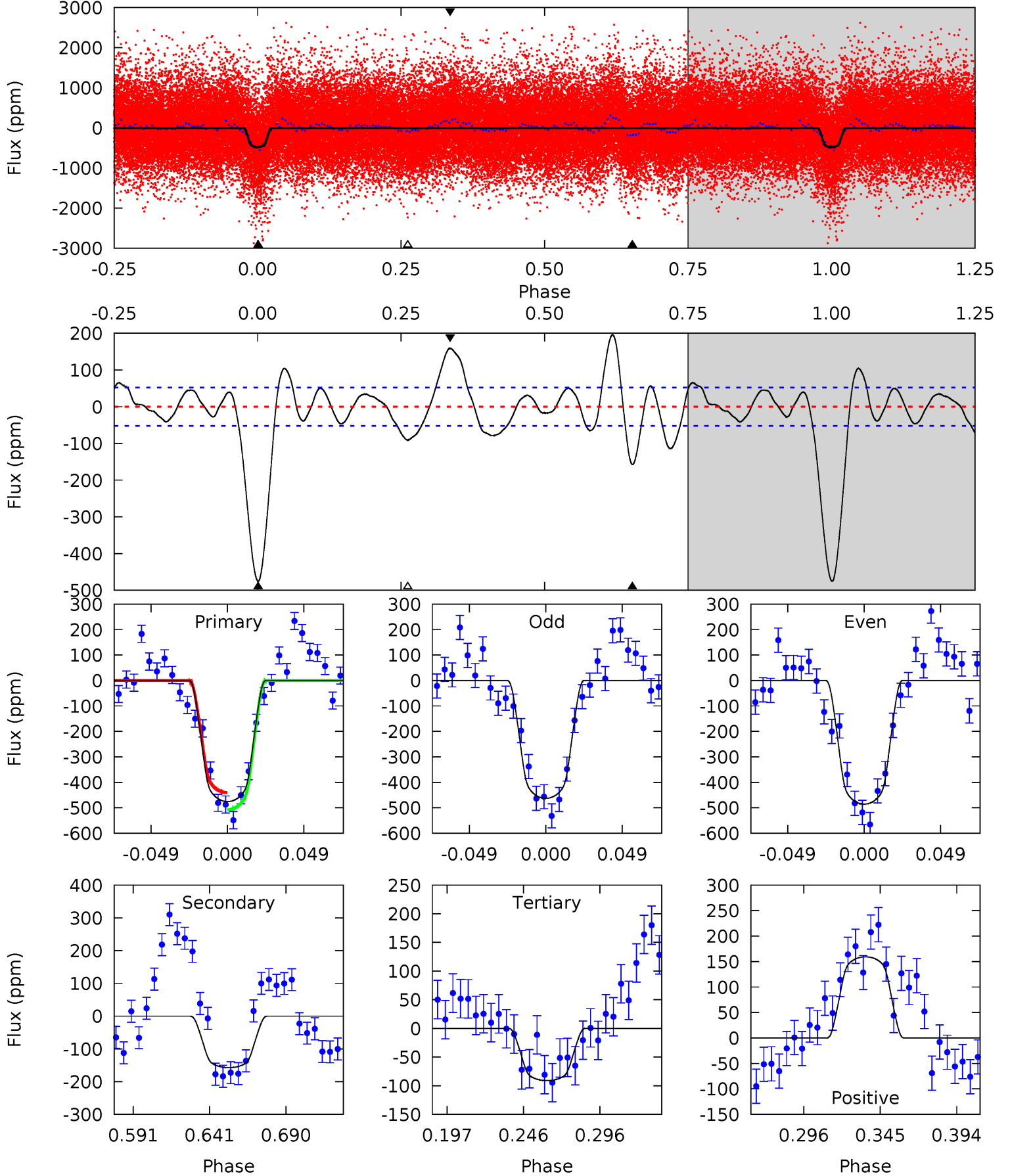
TCE 004544572-01 P= 2.189106 Days  $T_0=132.079111$  (BKJD)



# DV Model-Shift Uniqueness Test

004544572-01, P = 2.189047 Days, E = 132.098339 Days

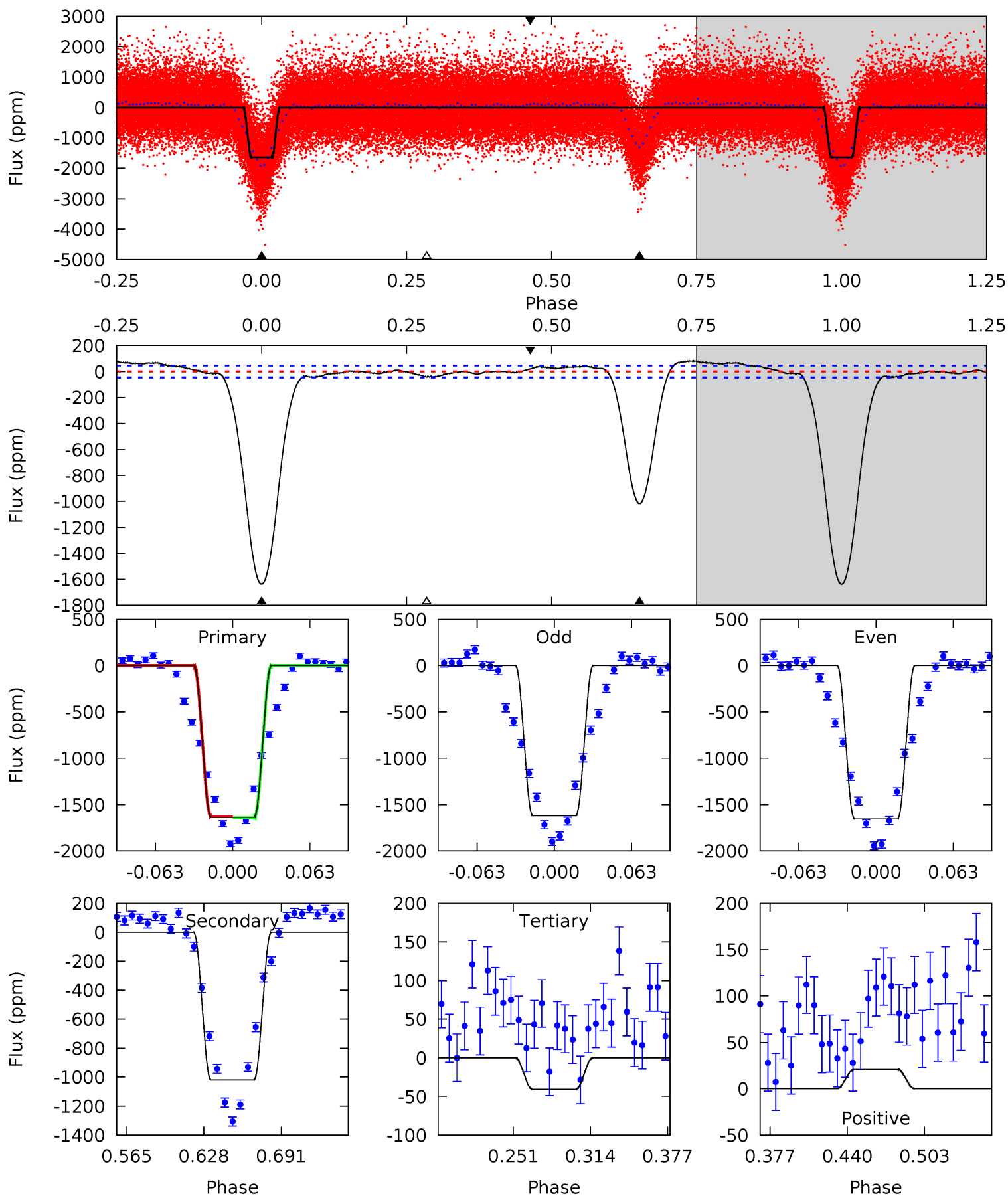
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
42.9	14.2	8.22	14.4	4.71	1.97	4.83	34.7	28.5	6.00	-0.16	1.03	1.02	0.29	3.01



# Alt Model-Shift Uniqueness Test

004544572-01, P = 2.189106 Days, E = 132.079111 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
166.8	103.8	4.16	2.12	4.66	1.86	3.45	162.7	164.7	99.6	101.7	1.77	1.00	0.05	0.51





### Stellar Parameters For KIC 004544572

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$6106^{+181}_{-217}$	$4.487^{+0.050}_{-0.213}$	$-0.160^{+0.250}_{-0.350}$	$0.966^{+0.290}_{-0.097}$	$1.043^{+0.140}_{-0.140}$	$1.631^{+0.443}_{-0.835}$
	+3%/-4%	+1%/-5%	+156%/-219%	+30%/-10%	+13%/-13%	+27%/-51%
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 004544572-01 / KOI 3950.01

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-157 \pm 11$	$2.53^{+0.50}_{-0.39}$	$2072^{+126}_{-103}$	$4647^{+295}_{-252}$	$15^{+6}_{-4}$
Alt.	$-1019 \pm 10$	$4.87^{+0.78}_{-0.52}$	$2075^{+143}_{-111}$	$5201^{+218}_{-200}$	$26^{+6}_{-6}$

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

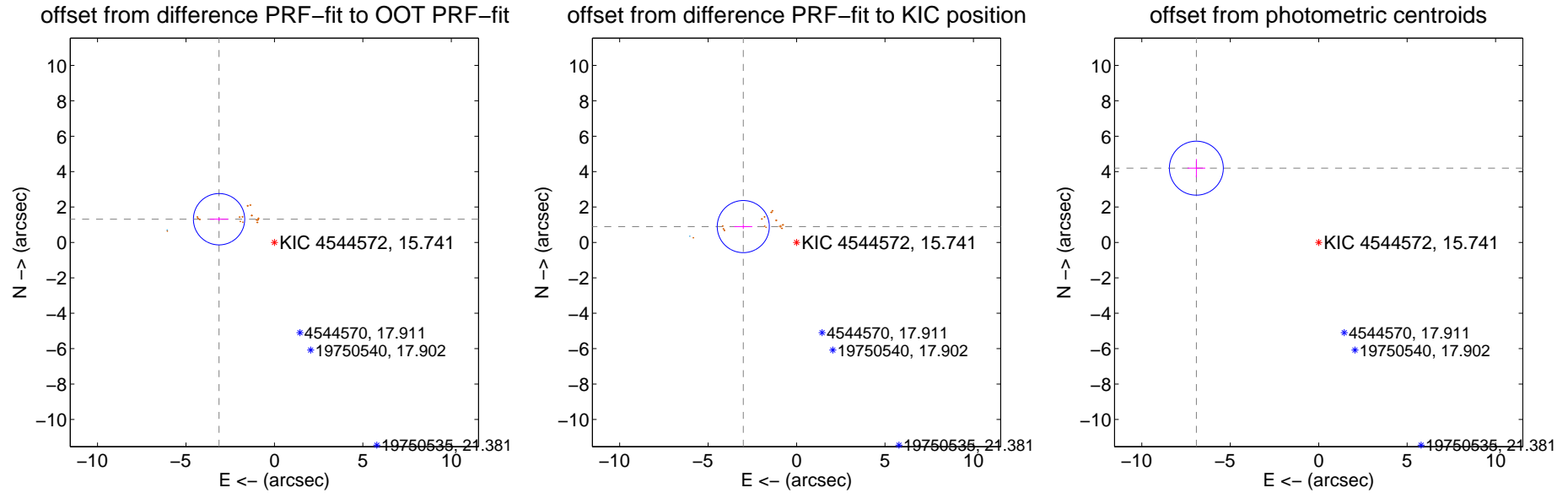
## DV Centroid Data

Supplemental centroid analysis for 004544572-01. Kepler magnitude: 15.74. Transit SNR 28.49

There are 1 quarters with good PRF difference image offsets

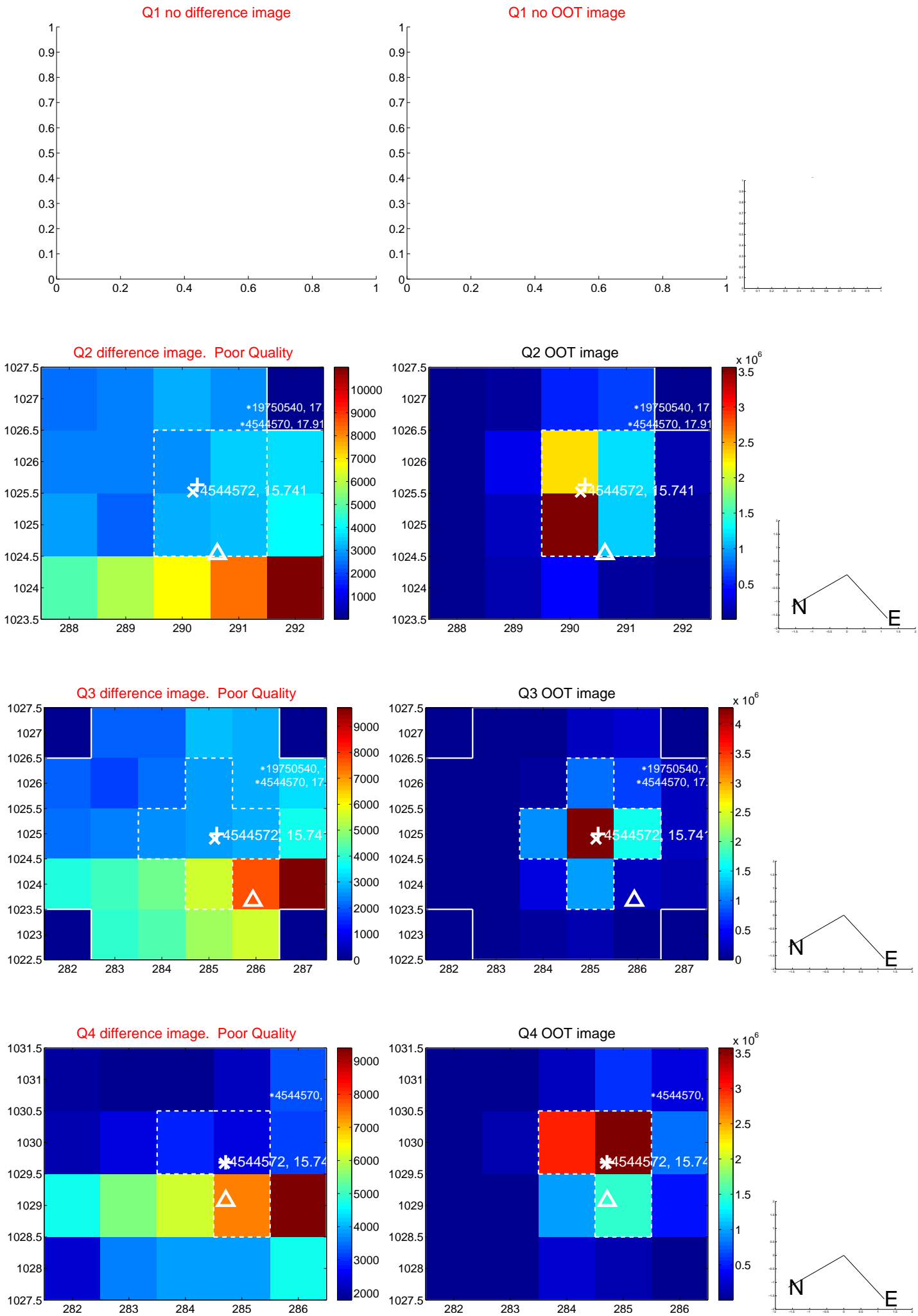
The direct PRF centroid is offset from the target star catalog position by about 0.36 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$3.393 \pm 0.483$	7.02	$3.130 \pm 0.522$	$1.311 \pm 0.097$
PRF-fit source offset from KIC position	$3.142 \pm 0.491$	6.40	$3.012 \pm 0.510$	$0.895 \pm 0.133$
photometric centroid source offset	$8.09 \pm 0.51$	15.92	$6.92 \pm 0.51$	$4.19 \pm 0.52$

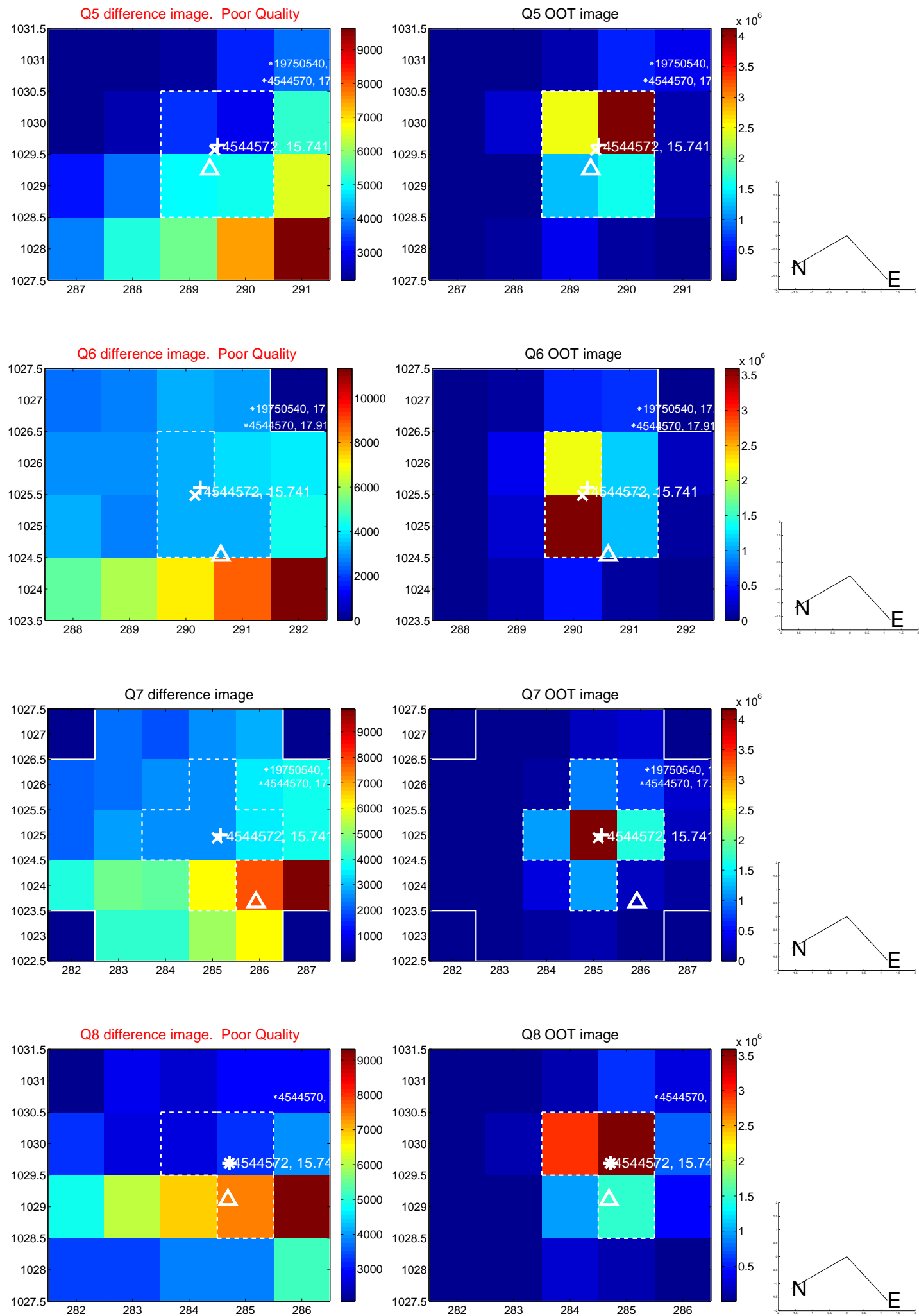


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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

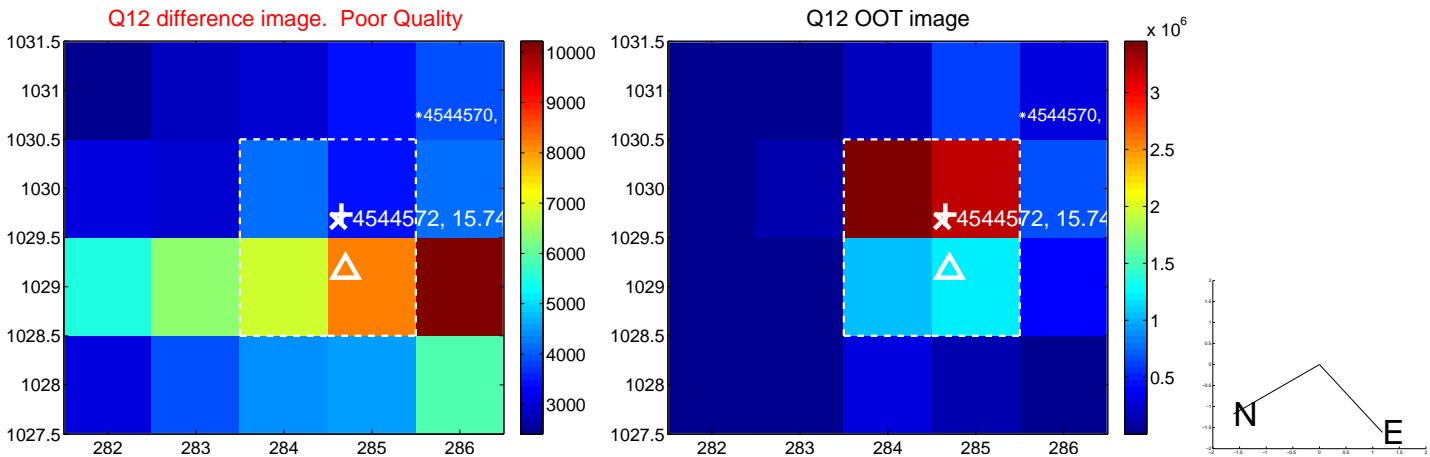
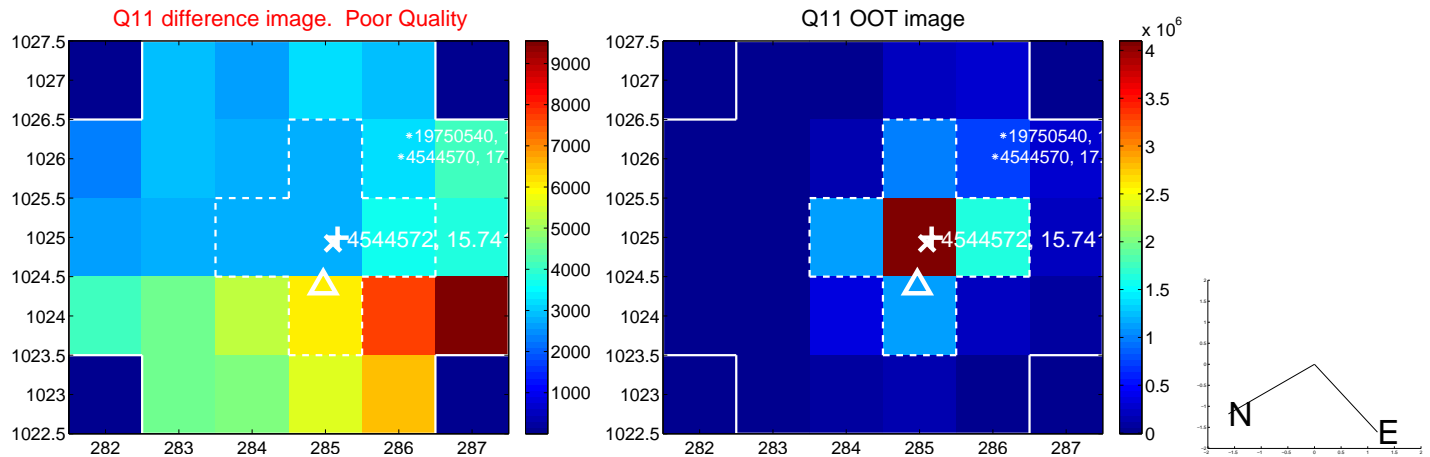
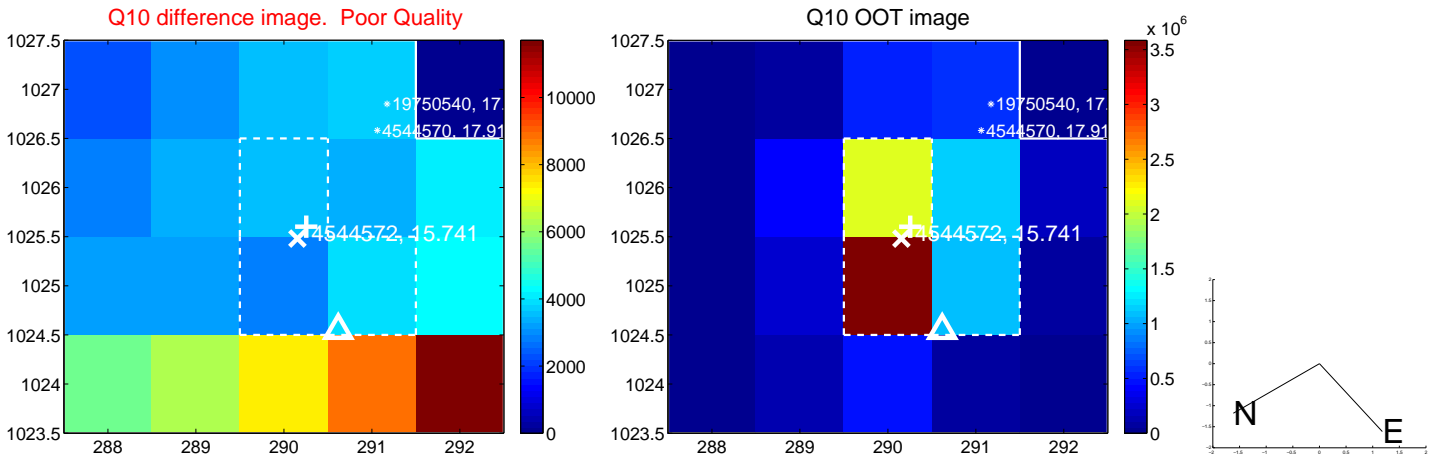
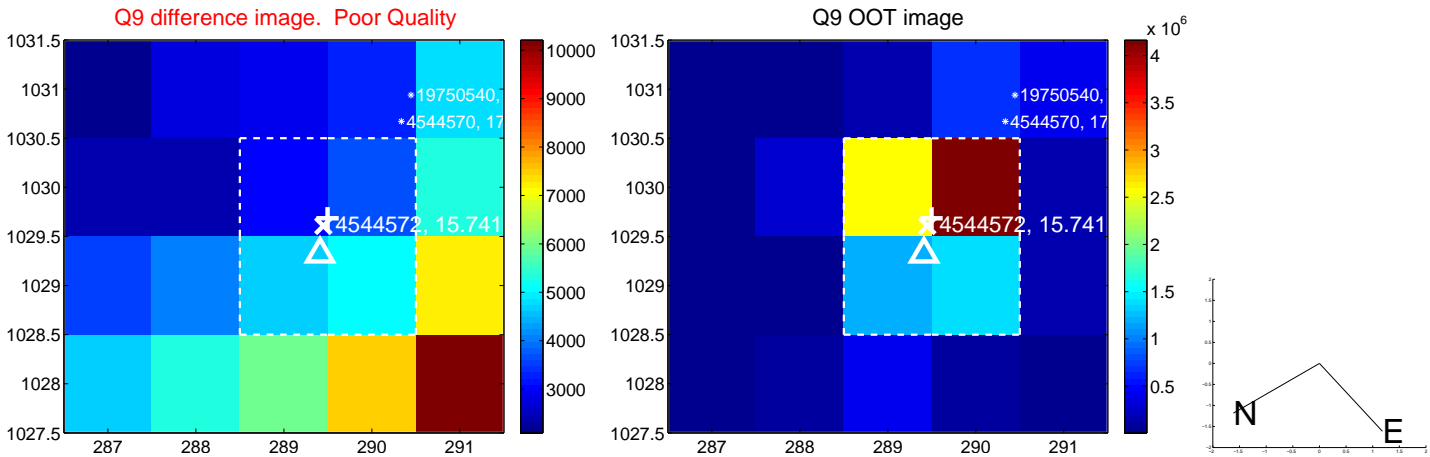


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

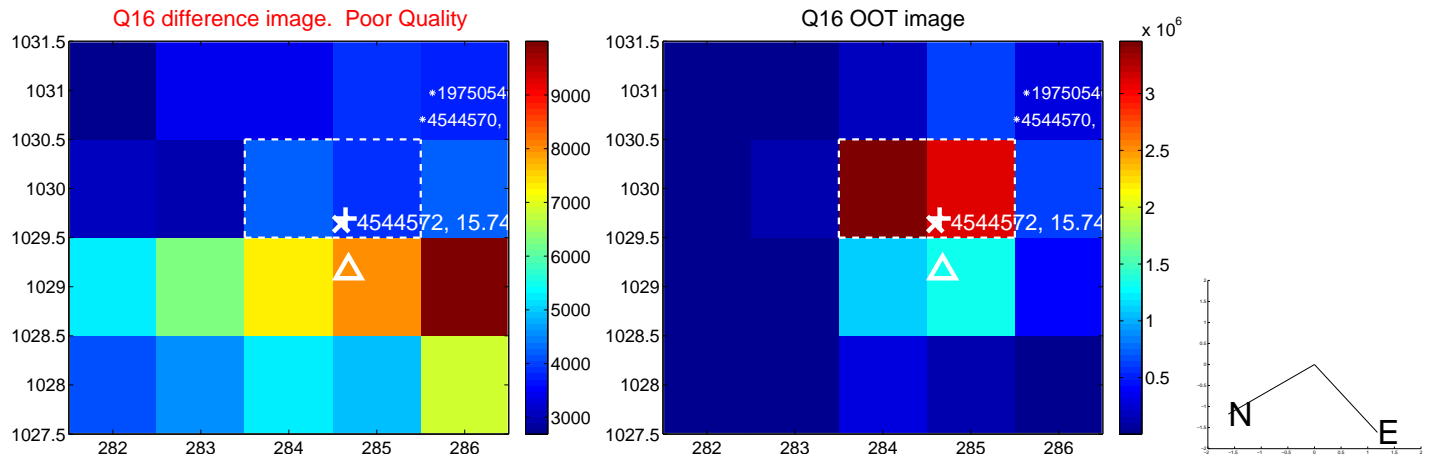
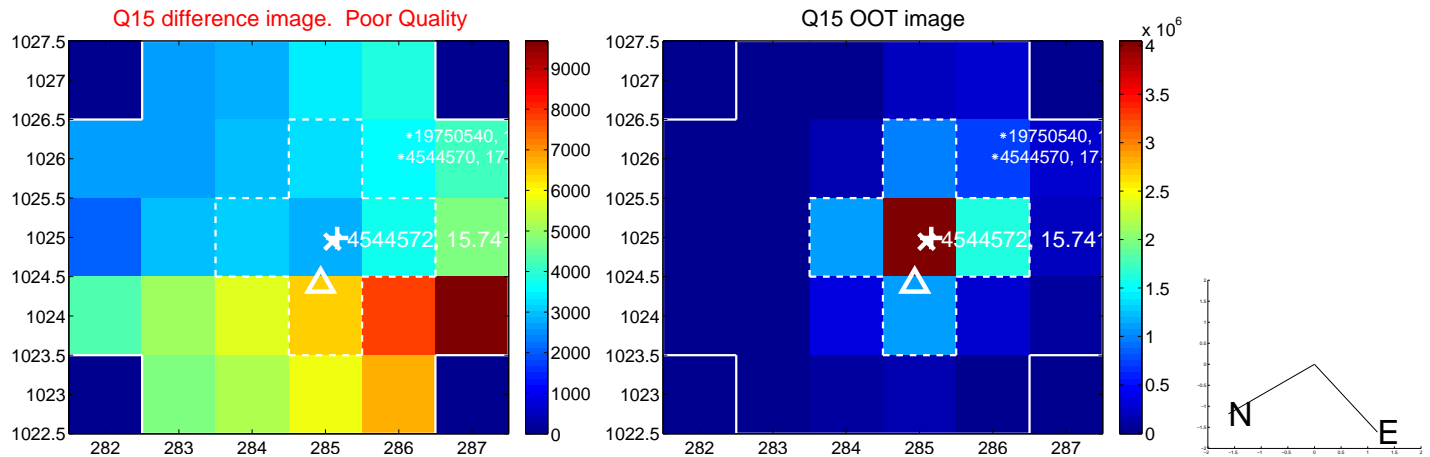
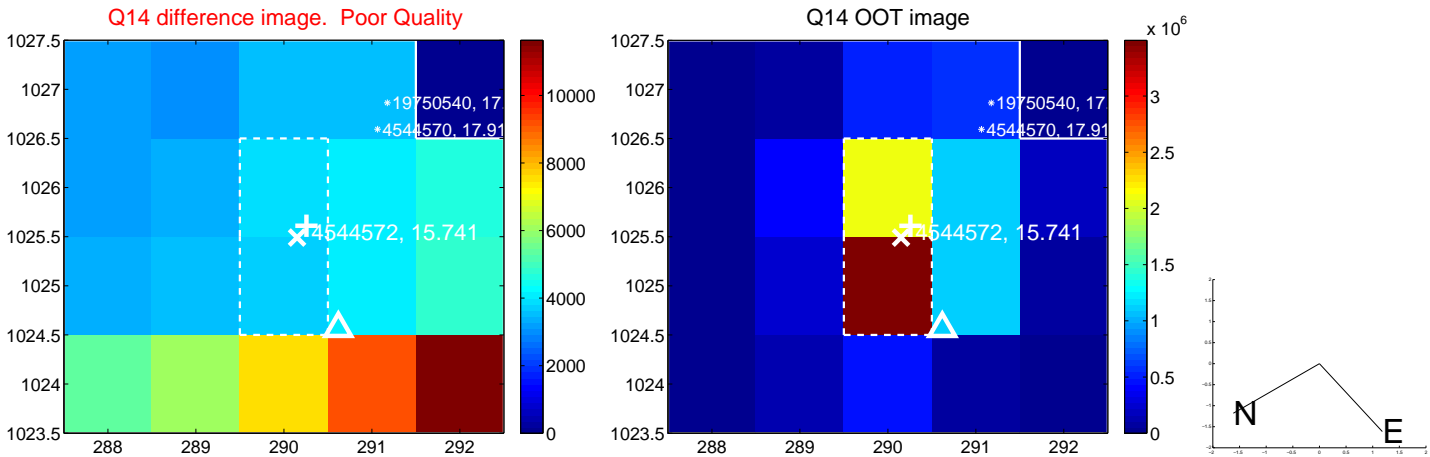
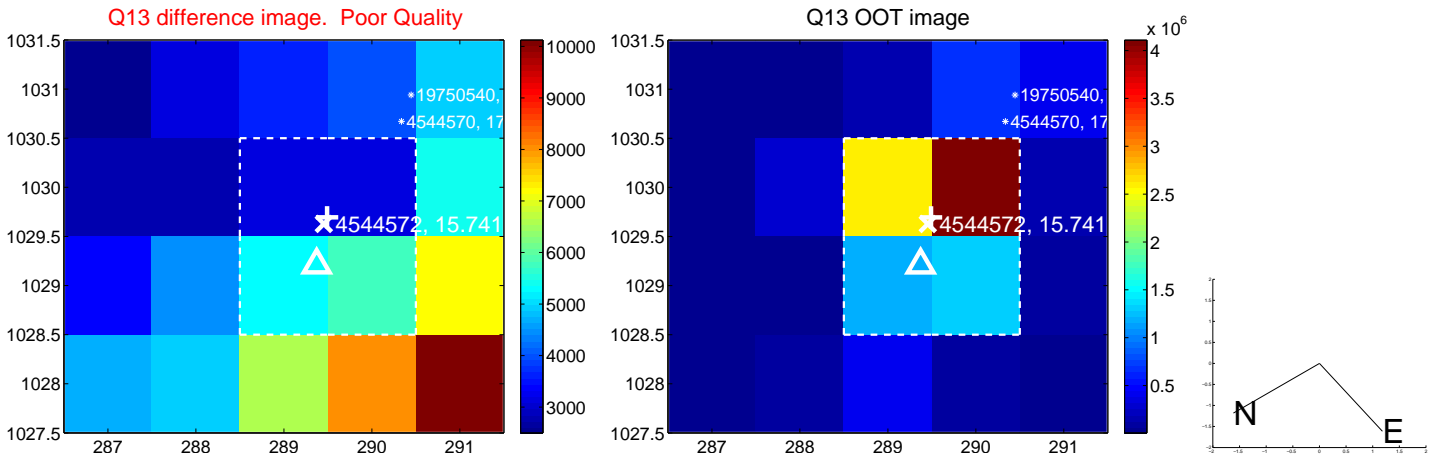




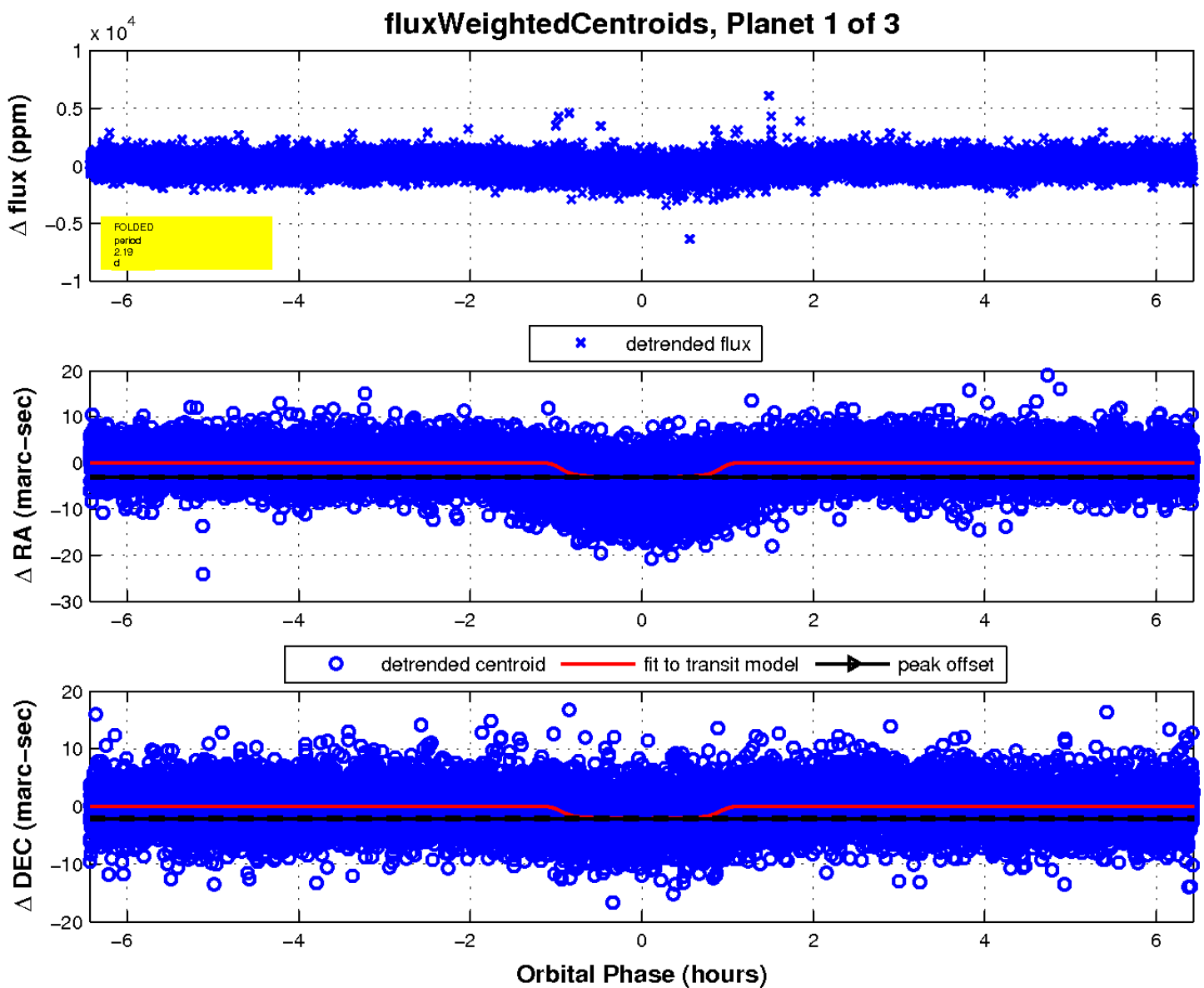
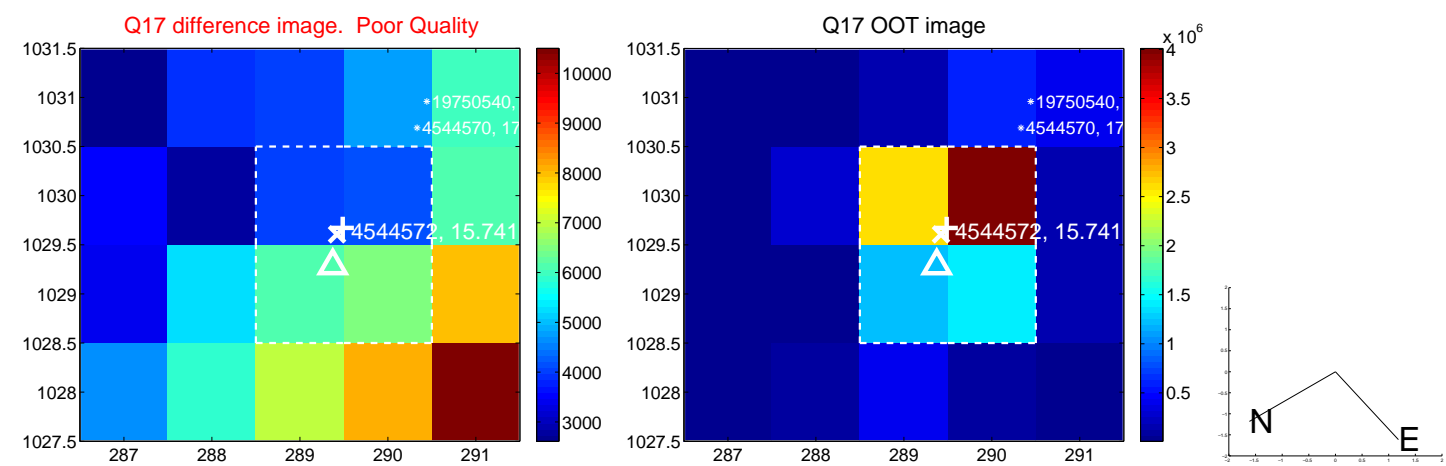
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

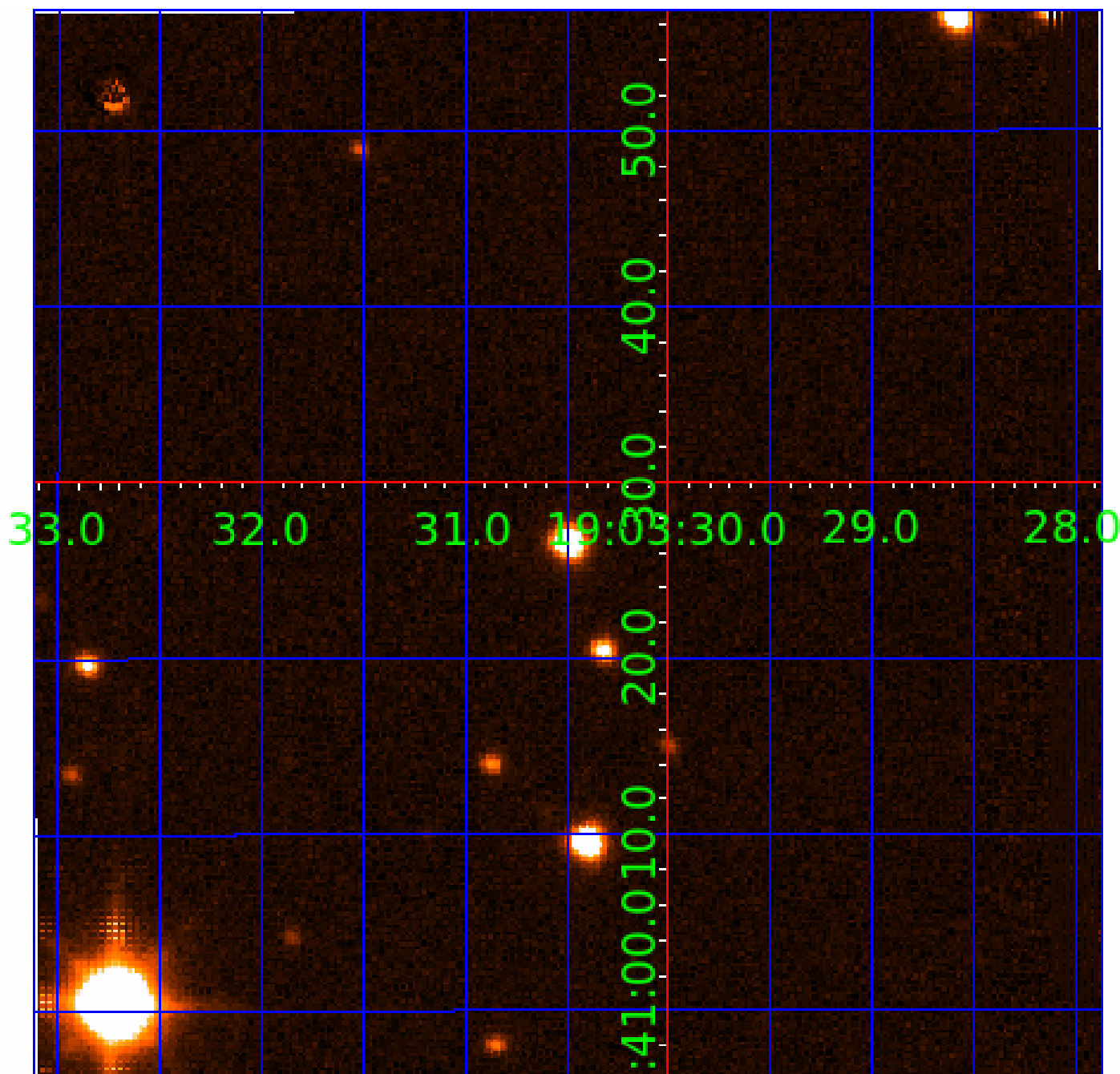


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination





# KIC 004544572

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
004544572-01	OBS	3950.01	2.189047	132.098339	439.1	2.145	28.3	28.5	0.97	6106	2.42	1036.49
004544572-02	OBS	No	2.189053	133.521907	167.2	1.543	11.9	9.7	0.97	6106	1.48	1036.49
004544572-03	OBS	No	2.189090	133.668527	158.7	1.623	9.1	9.8	0.97	6106	1.22	1036.46

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
004544572-01	OBS	FP	0.00	1	0	1	1	LPP_DV—CENT_RESOLVED_OFFSET—HALO_GHOST—EPHEM_MATCH
004544572-02	OBS	FP	0.00	1	0	1	1	LPP_DV—SAME_NTL_PERIOD—CENT_RESOLVED_OFFSET—HALO_GHOST—EPHEM_MATCH
004544572-03	OBS	FP	0.00	1	0	0	1	LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—SAME_NTL_PERIOD—CENT_FEW_DIFFS—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 004544572-02

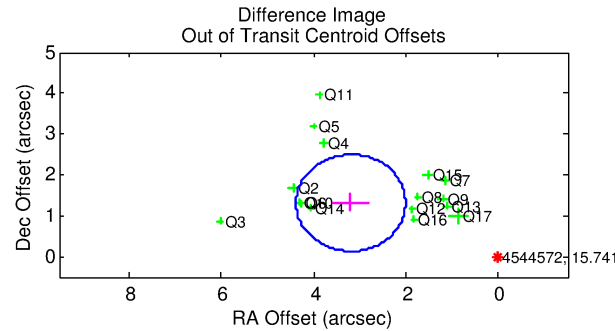
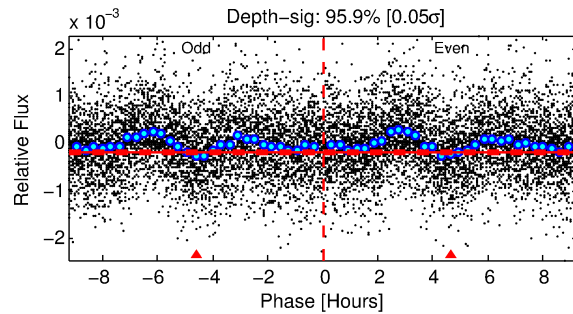
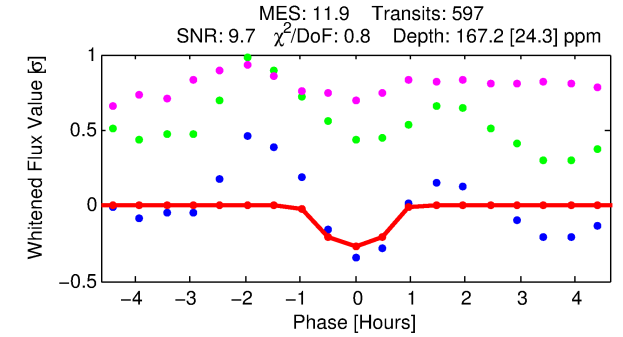
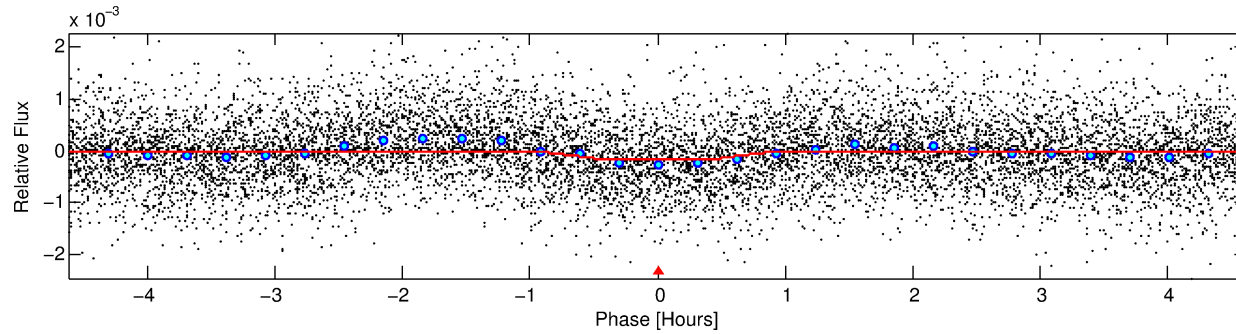
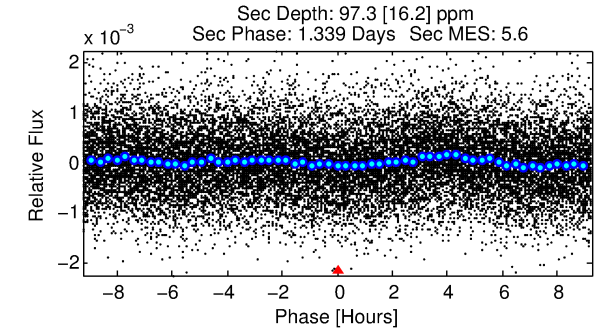
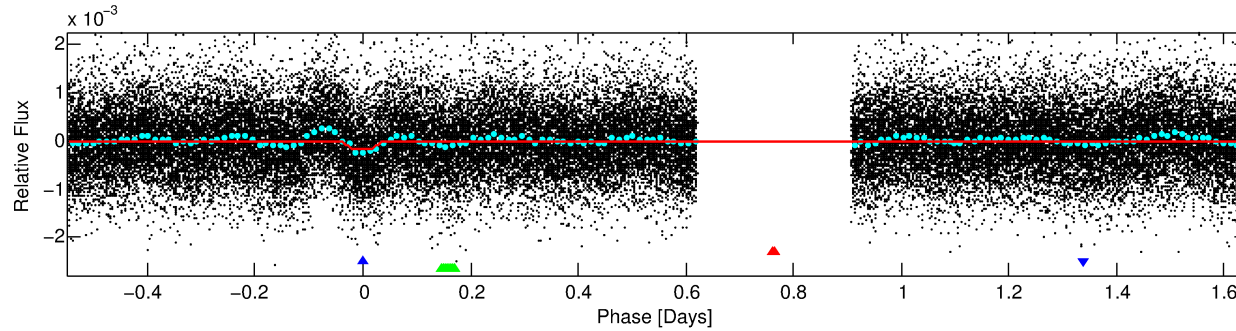
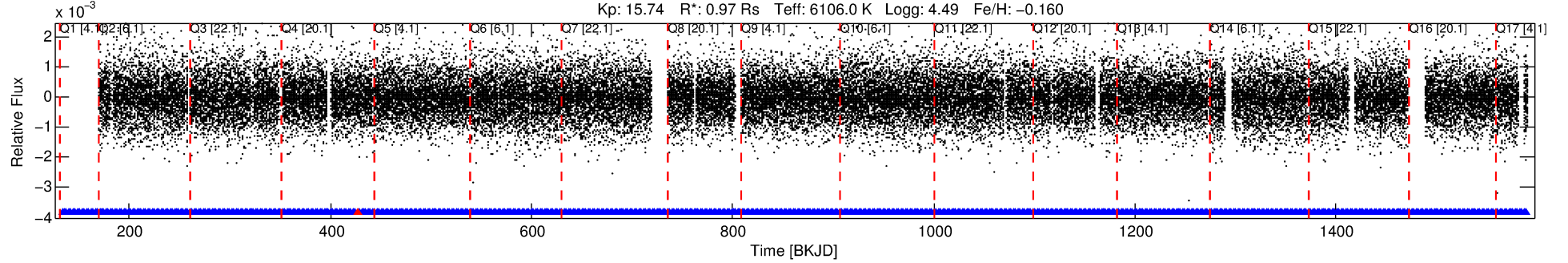
TCE (1)	KIC	Parent (2)	Parent KIC	$P_1:P_2$	Dist ( $\mu$ )	$\Delta$ Row	$\Delta$ Col	$m_2$	$m_1$	$D_2/D_1$	Mechanism	Flag	$\sigma_P$	$\sigma_T$
004544572-02	4544572	004544587-sec	4544587	1:1	36.6	1	-9	10.80	15.74	1940.10	Direct-PRF	0	1.40	0.80

**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: 4544572 Candidate: 2 of 3 Period: 2.189 d  
KOI: K03950 Corr: No Ephemeris Match

Kp: 15.74 R\*: 0.97 Rs Teff: 6106.0 K Logg: 4.49 Fe/H: -0.160



## DV Fit Results:

Period = 2.18905 [0.00001] d  
Epoch = 133.5219 [0.0027] BKJD  
Rp/R\* = 0.0140 [0.0114]  
a/R\* = 5.10 [21.06]  
b = 0.90 [0.90]  
Seff = 1036.49 [423.78]  
Teq = 1447 [148] K  
Rp = 1.48 [1.28] Re  
a = 0.0335 [0.0087] AU  
Ag = 27.50 [46.17] [0.57σ]  
Teffp = 5122 [2101] K [1.75σ]

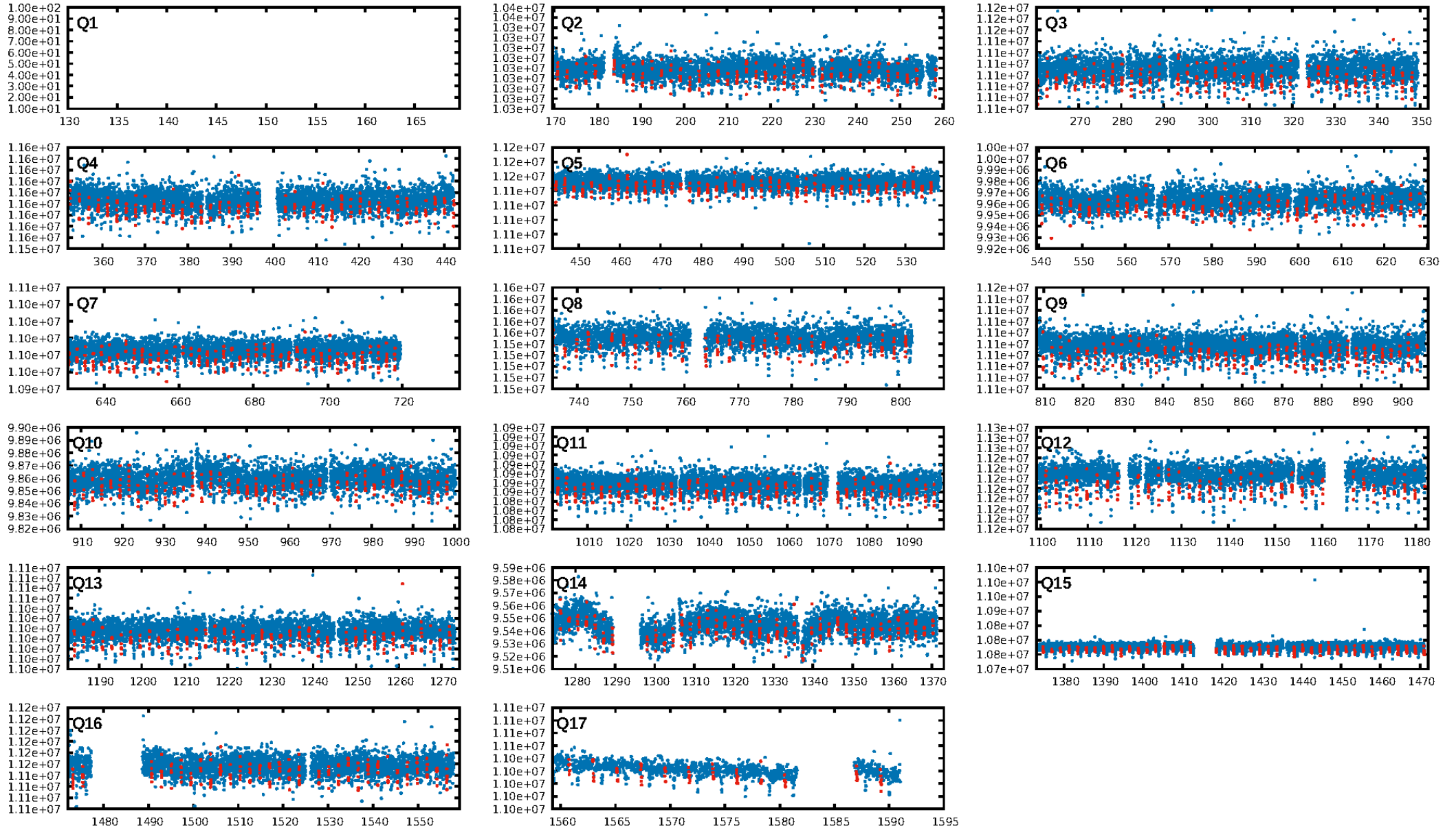
## DV Diagnostic Results:

ShortPeriod-sig: 0.0% [0.00σ]  
LongPeriod-sig: 0.0% [0.00σ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: 8.39e-32  
RollingBand-fgt: 1.00 [584/585]  
GhostDiagnostic-chr: -0.1543  
Centroid-sig: 0.0%  
Centroid-so: 12.015 arcsec [7.88σ]  
OotOffset-rm: 3.455 arcsec [8.76σ]  
KicOffset-rm: 3.252 arcsec [8.25σ]  
OotOffset-st: 4/4/4/4 [16]  
KicOffset-st: 4/4/4/4 [16]  
DiffImageQuality-fgm: 0.06 [1/16]  
DiffImageOverlap-fno: 0.00 [0/16]

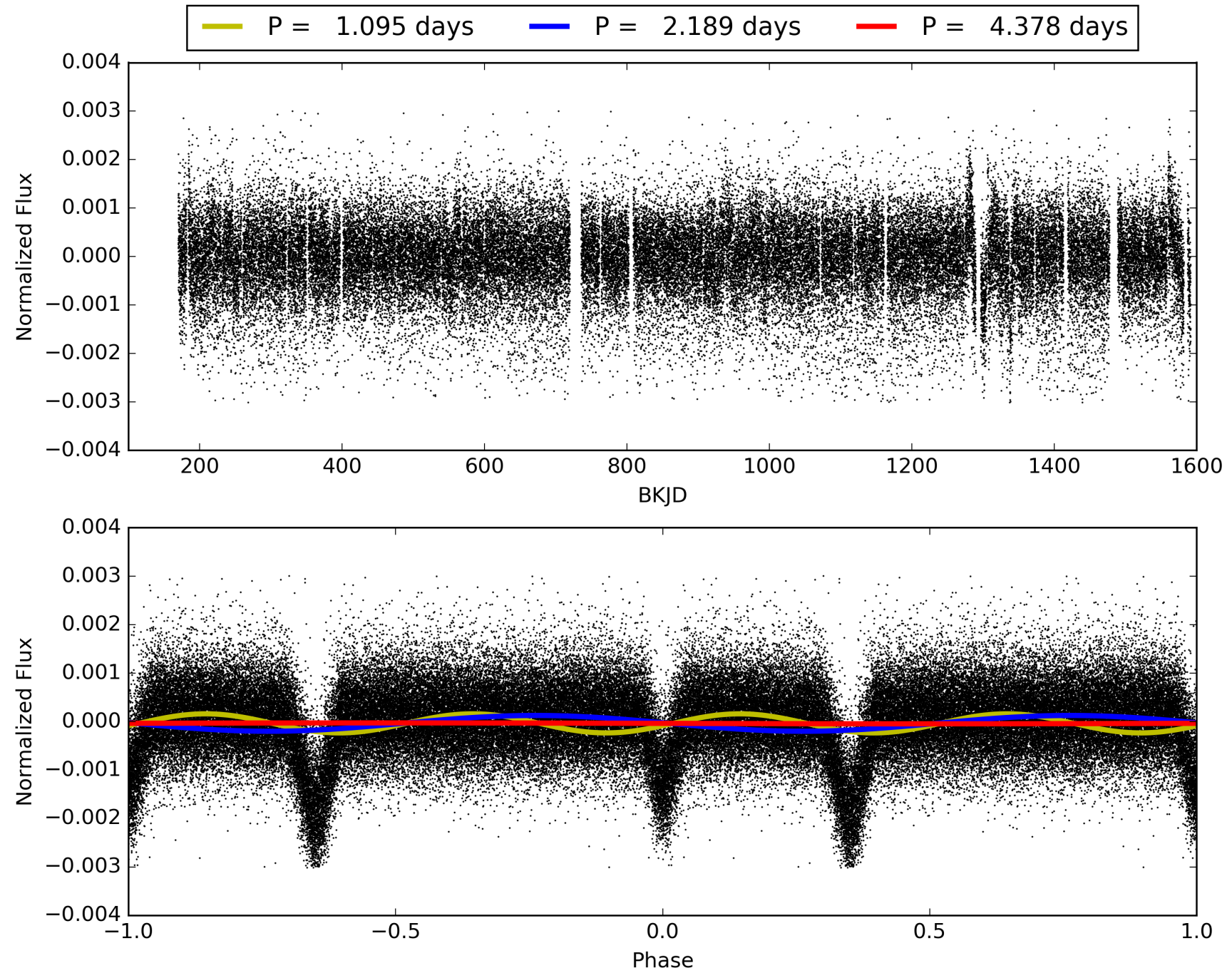
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 01-Feb-2016 16:50:33 Z

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

# TCE 004544572-02, PDC Light Curves



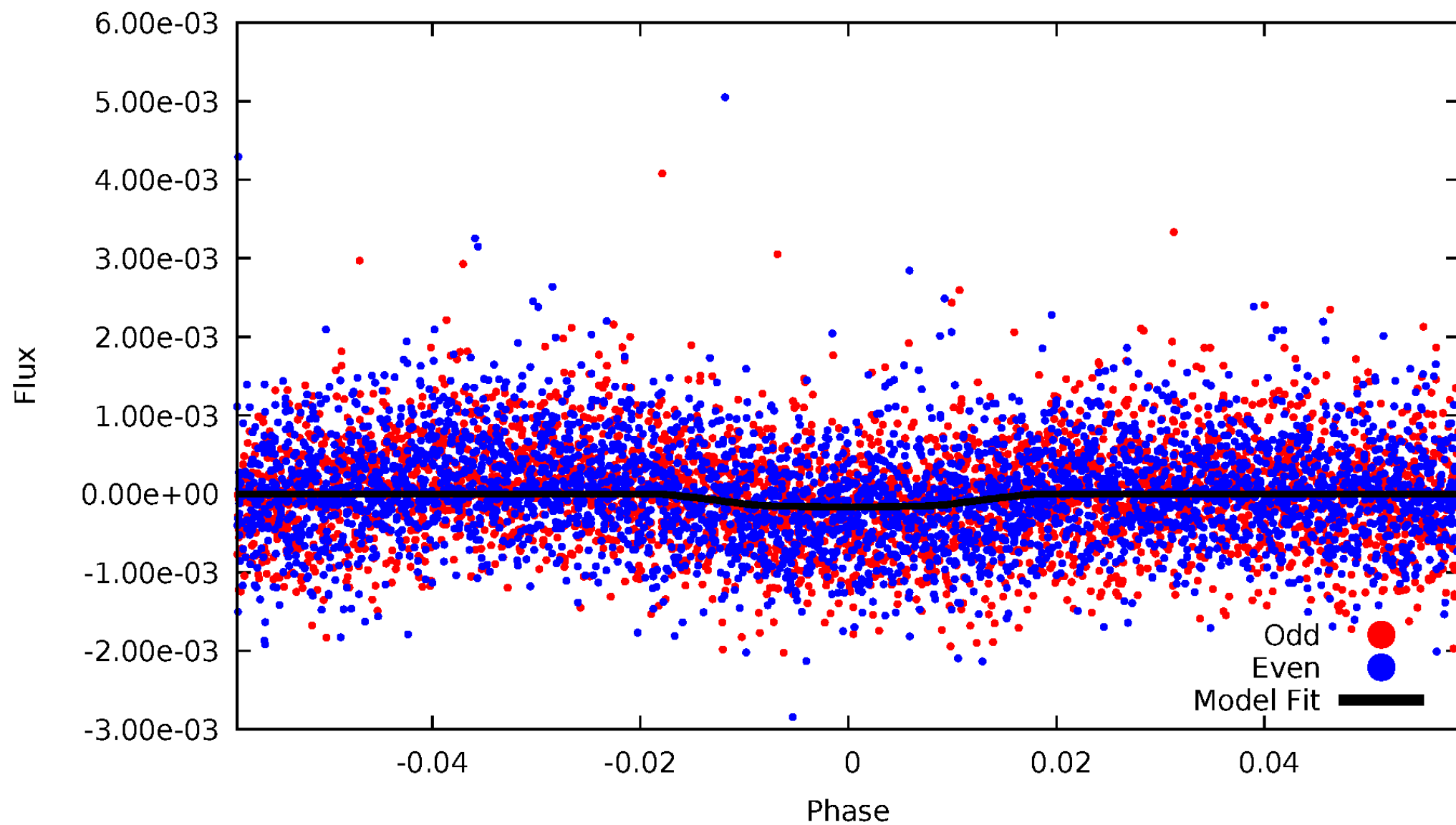
TCE 004544572-02





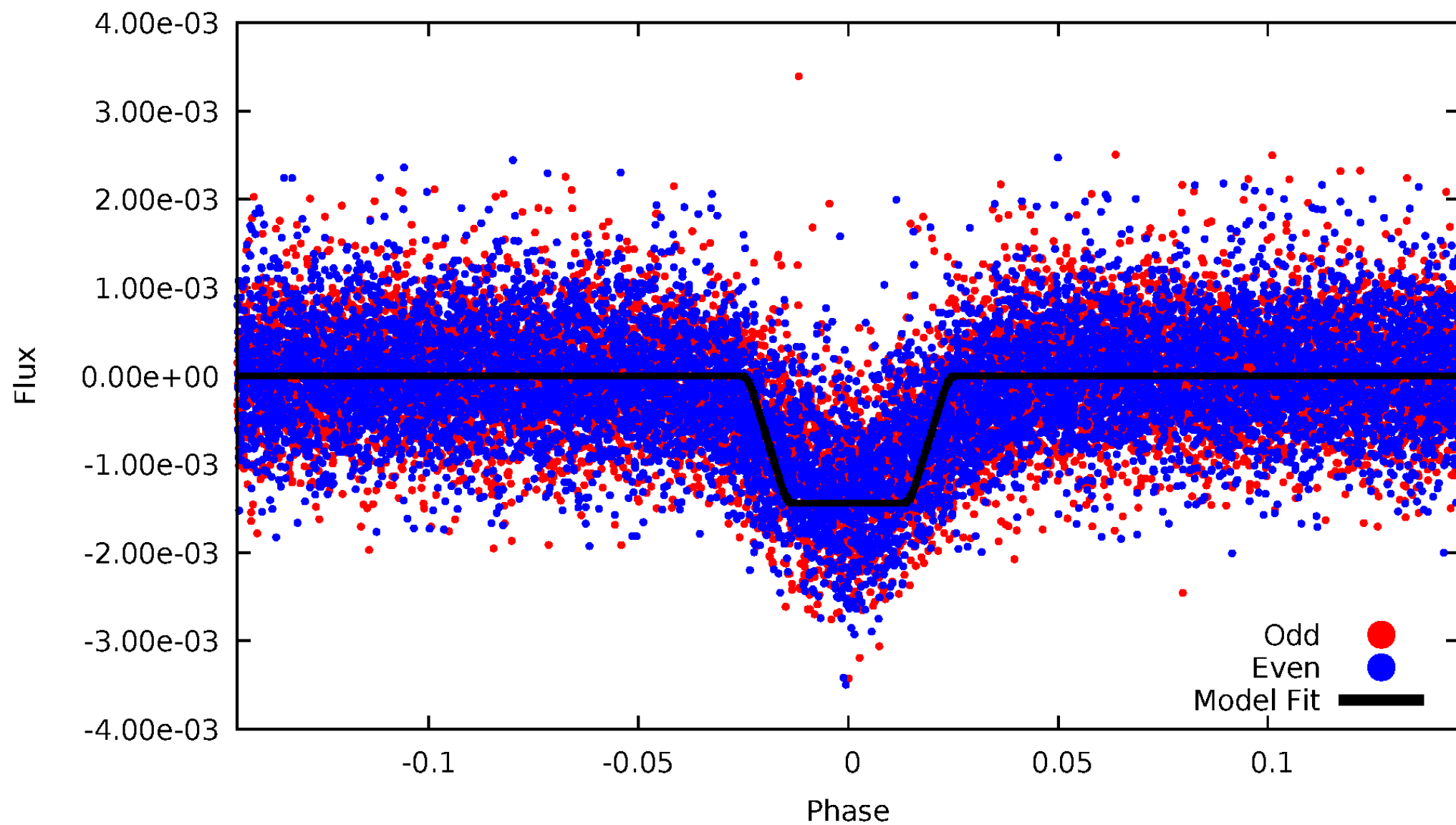
# DV Odd/Even

TCE 004544572-02



# ALT Odd/Even

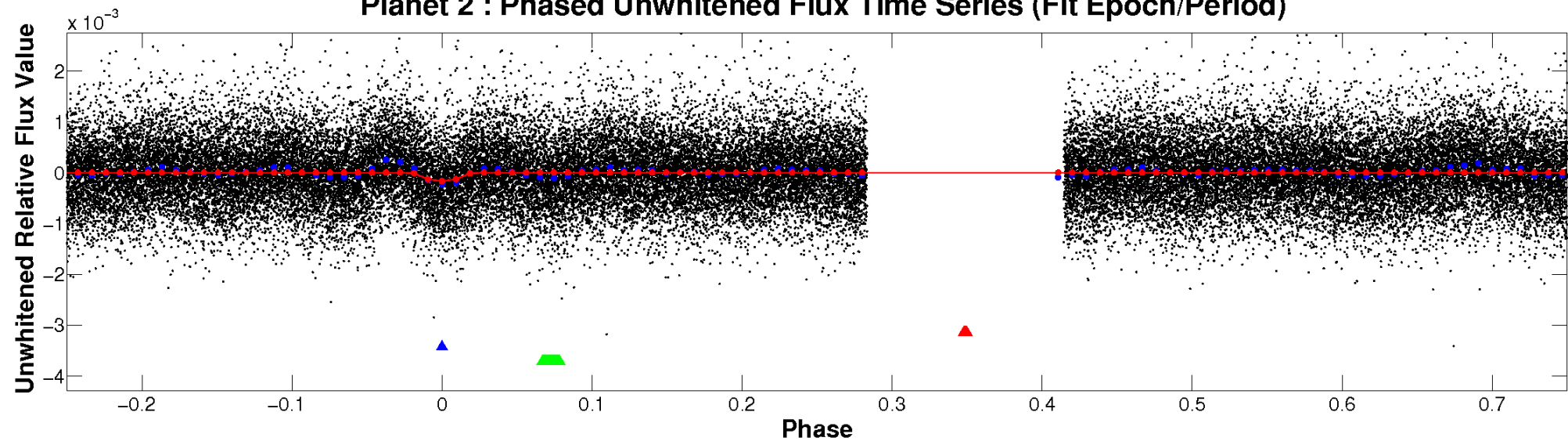
TCE 004544572-02



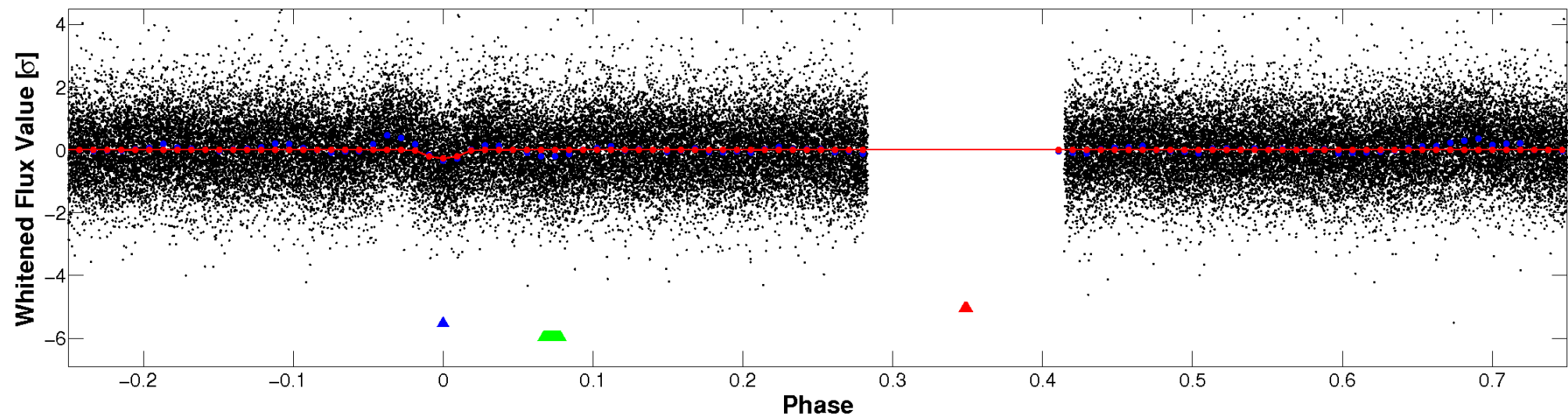


# Non-Whitened Vs. Whitened Light Curve

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

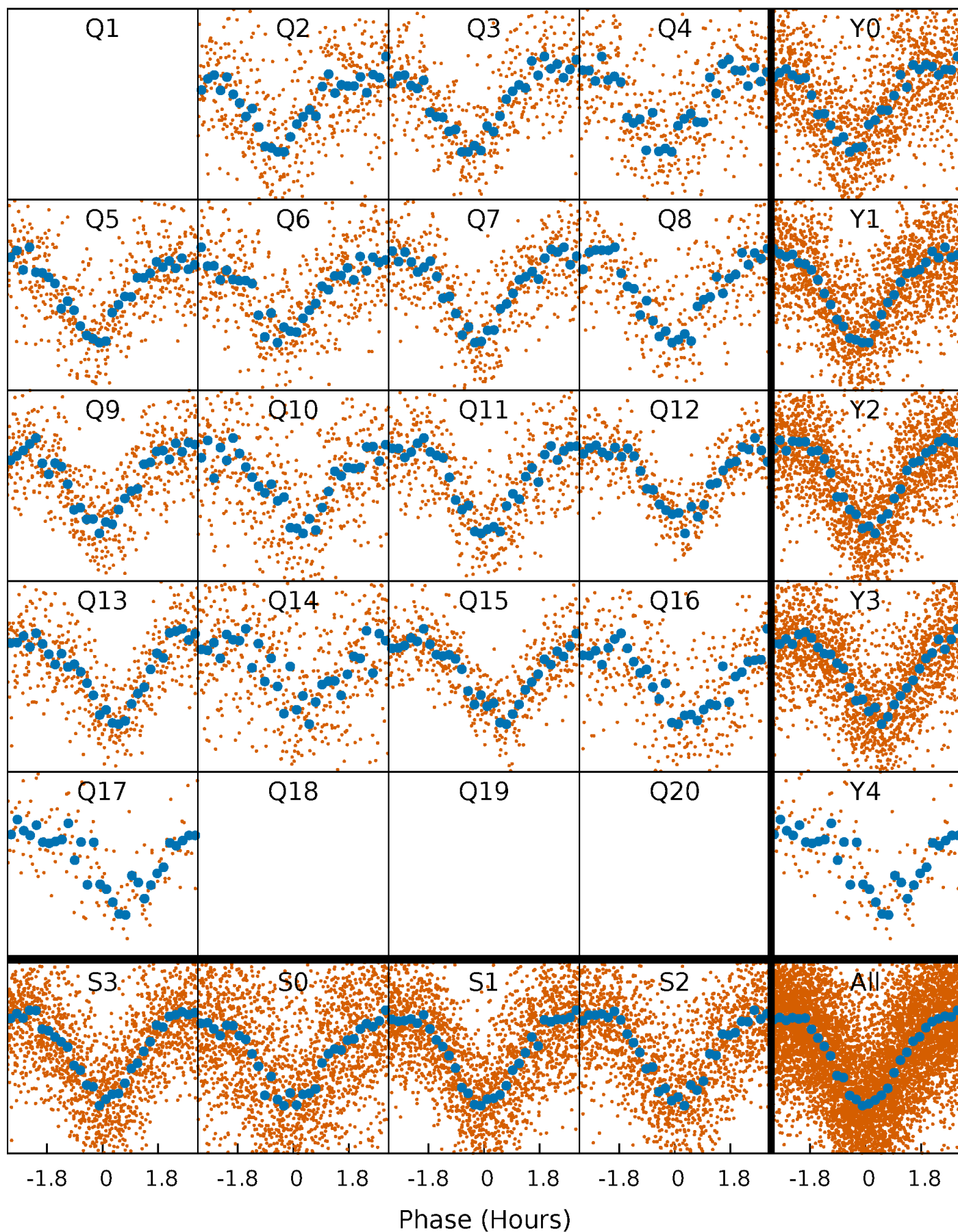


## Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



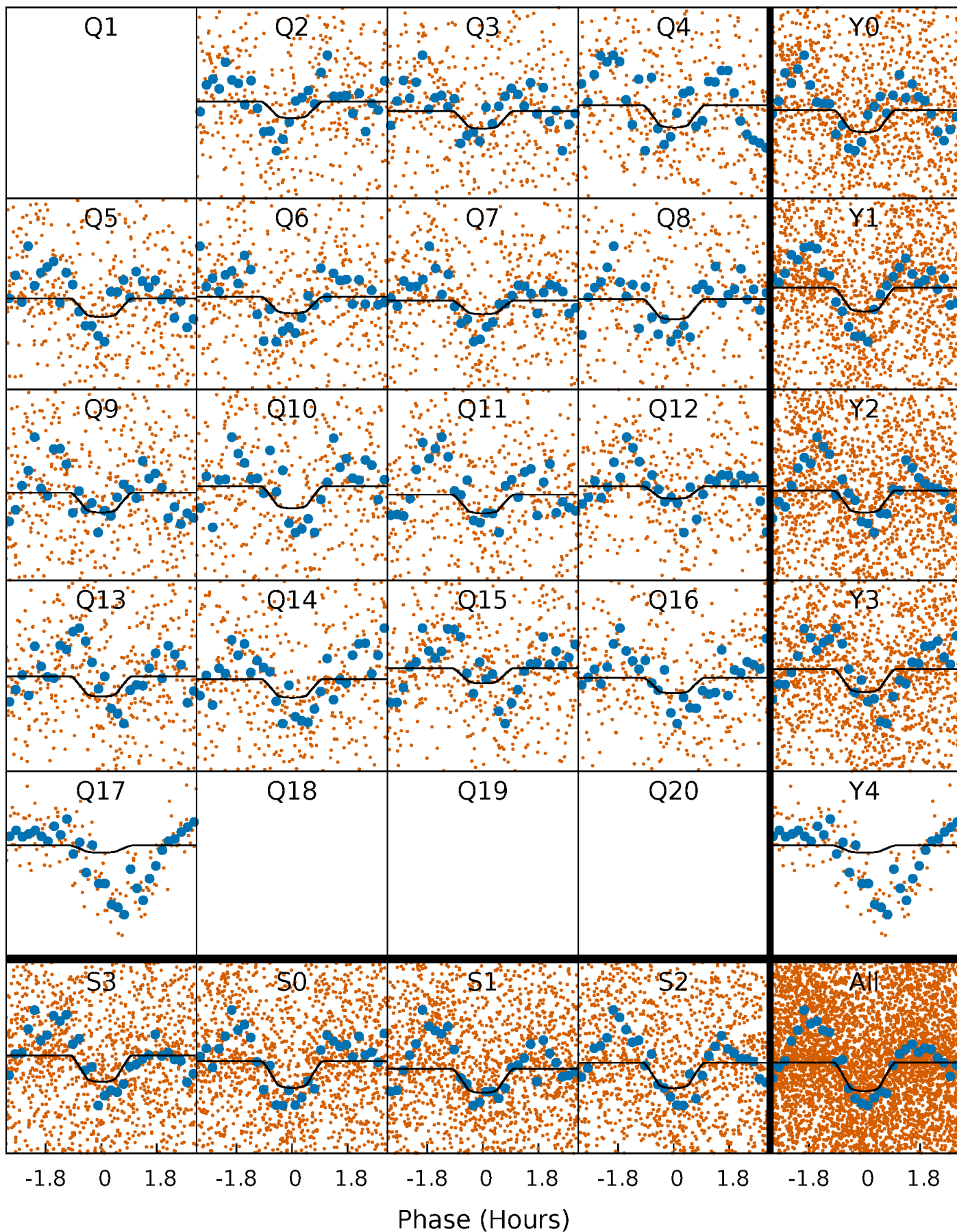
# PDC Quarter-Phased Transit Curves

TCE 004544572-02   P= 2.189053 Days    $T_0=133.521907$  (BKJD)



# DV Quarter-Phased Transit Curves

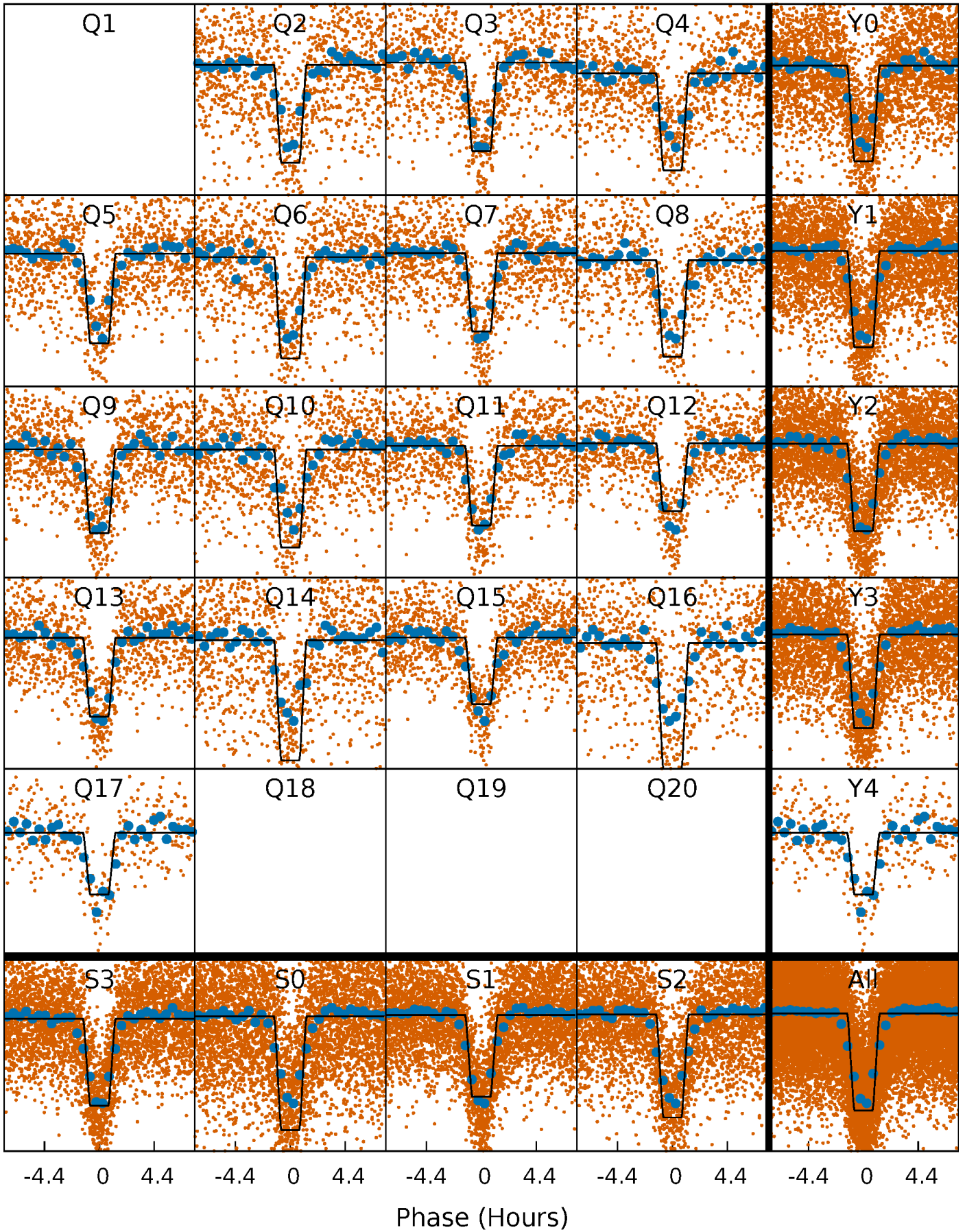
TCE 004544572-02 P= 2.189053 Days  $T_0=133.521907$  (BKJD)





# Alt. Detrend Quarter-Phased Transit Curves

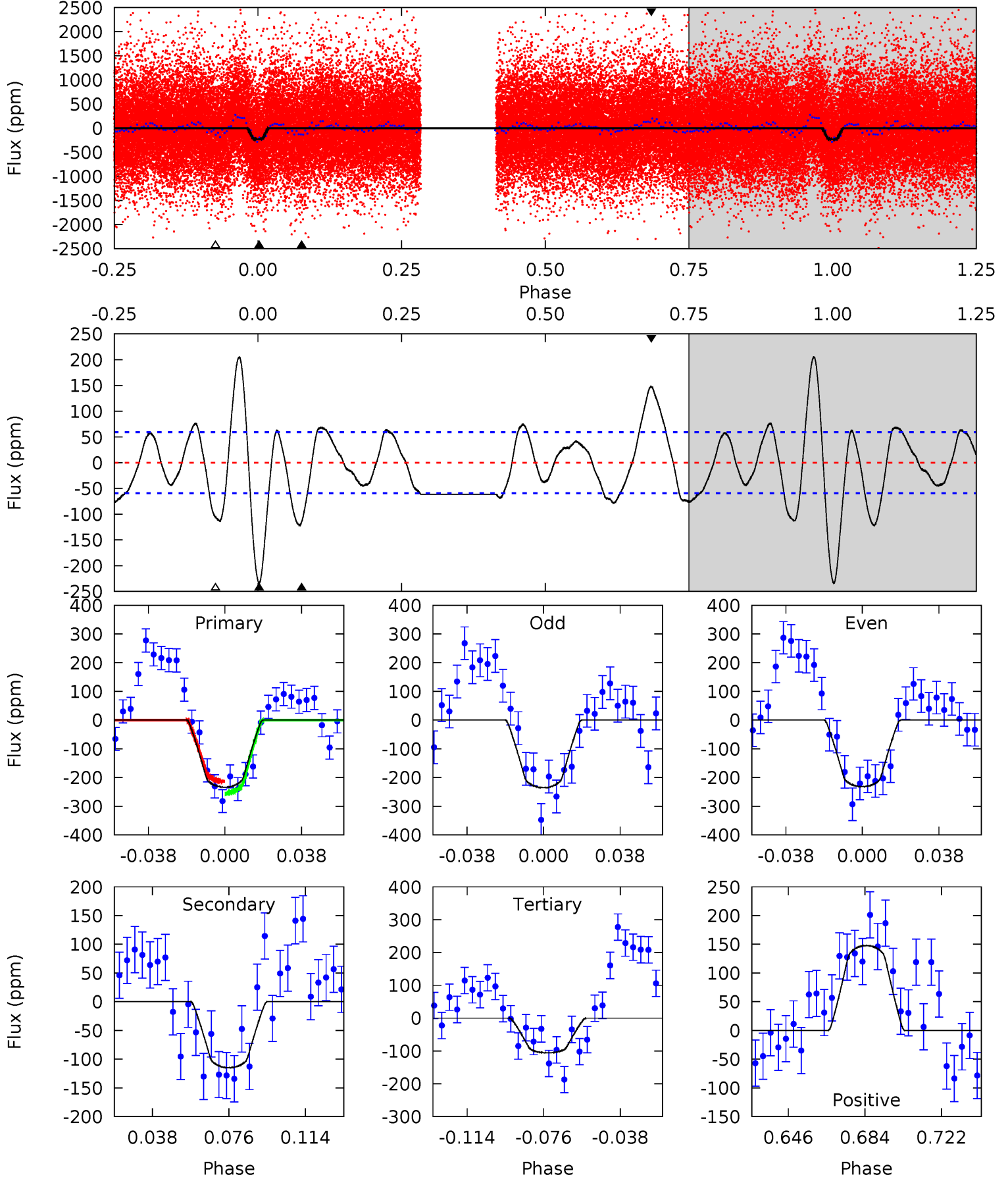
TCE 004544572-02 P= 2.189130 Days  $T_0=133.497118$  (BKJD)



# DV Model-Shift Uniqueness Test

004544572-02, P = 2.189053 Days, E = 133.521907 Days

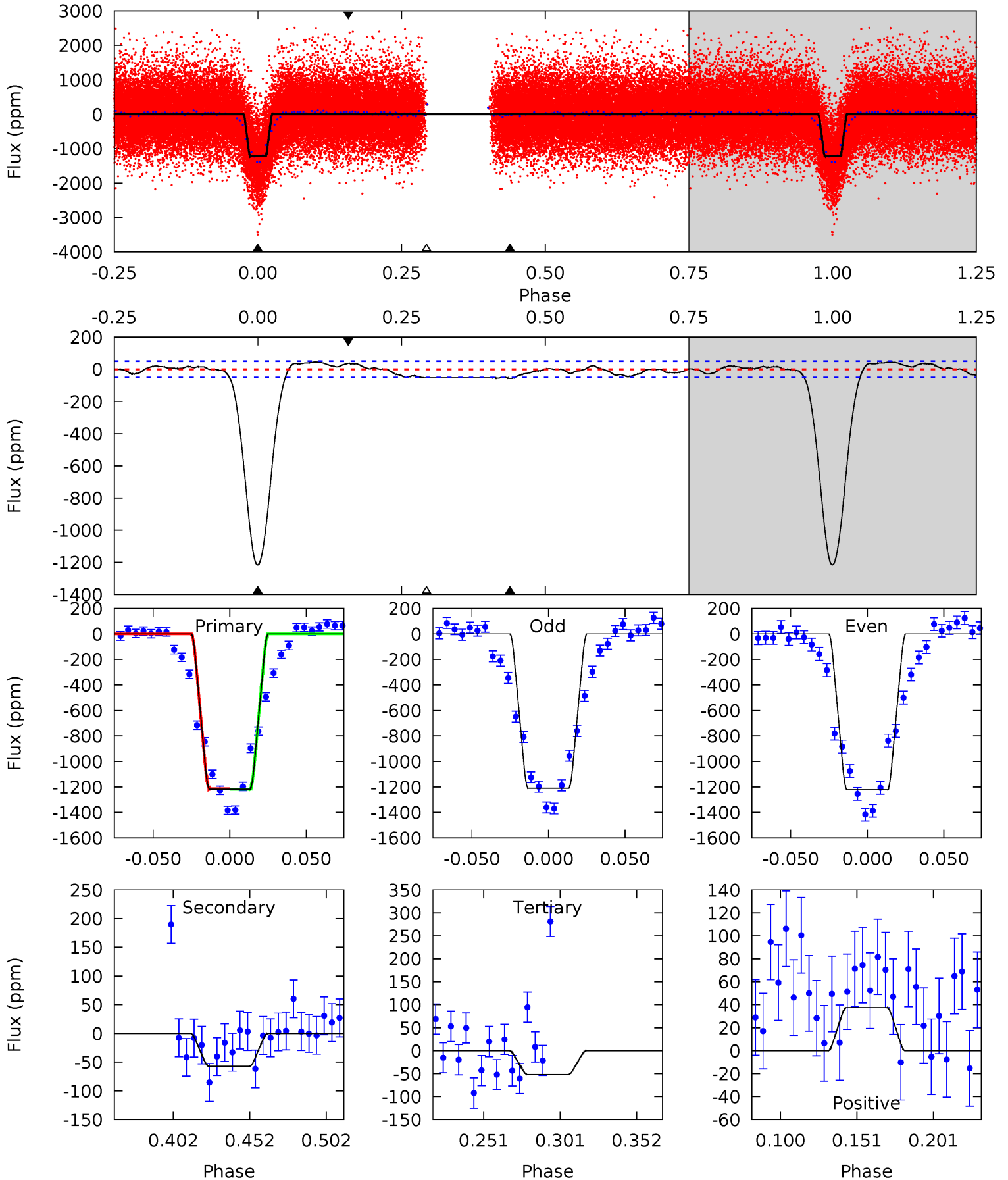
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
18.8	9.24	8.50	11.9	4.76	2.08	4.53	10.3	6.91	0.73	-2.65	0.13	0.96	0.47	1.64



# Alt Model-Shift Uniqueness Test

004544572-02, P = 2.189130 Days, E = 133.497118 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
112.2	5.27	4.81	3.47	4.71	1.96	2.14	107.4	108.7	0.46	1.80	0.55	0.99	0.04	0.17





### Stellar Parameters For KIC 004544572

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$\rho_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$6106^{+181}_{-217}$	$4.487^{+0.050}_{-0.213}$	$-0.160^{+0.250}_{-0.350}$	$0.966^{+0.290}_{-0.097}$	$1.043^{+0.140}_{-0.140}$	$1.631^{+0.443}_{-0.835}$
	+3%/-4%	+1%/-5%	+156%/-219%	+30%/-10%	+13%/-13%	+27%/-51%
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 004544572-02 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-115 \pm 12$	$1.79^{+1.16}_{-1.07}$	$2068^{+155}_{-106}$	$5086^{+2926}_{-970}$	$22^{+115}_{-14}$
Alt.	$-57 \pm 11$	$4.24^{+1.37}_{-1.36}$	$2075^{+146}_{-110}$	$3189^{+464}_{-326}$	$1.926^{+2.294}_{-0.913}$

$T_{max}$  = 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

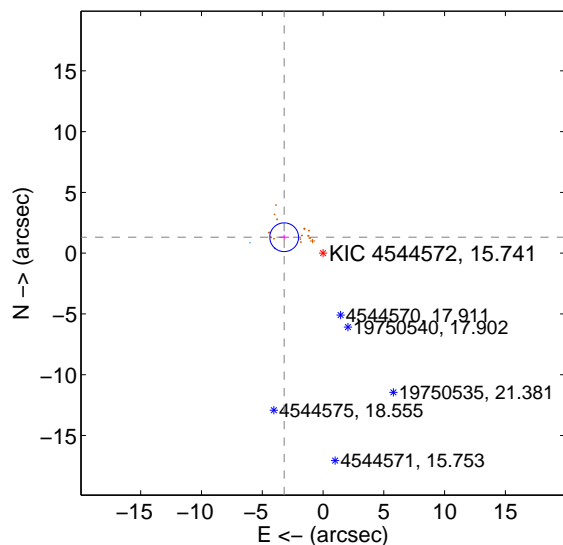
Supplemental centroid analysis for 004544572-02. Kepler magnitude: 15.74. Transit SNR 9.74

There are 1 quarters with good PRF difference image offsets

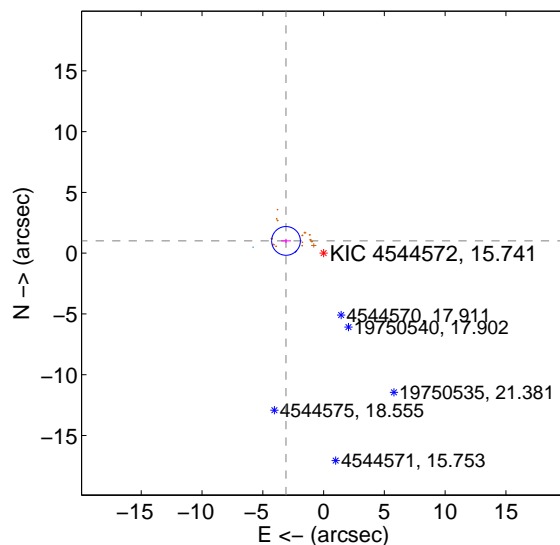
The direct PRF centroid is offset from the target star catalog position by about 0.36 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$3.455 \pm 0.394$	8.76	$3.196 \pm 0.398$	$1.312 \pm 0.208$
PRF-fit source offset from KIC position	$3.252 \pm 0.394$	8.25	$3.091 \pm 0.411$	$1.009 \pm 0.173$
photometric centroid source offset	$12.02 \pm 1.52$	7.88	$8.36 \pm 1.50$	$8.63 \pm 1.55$

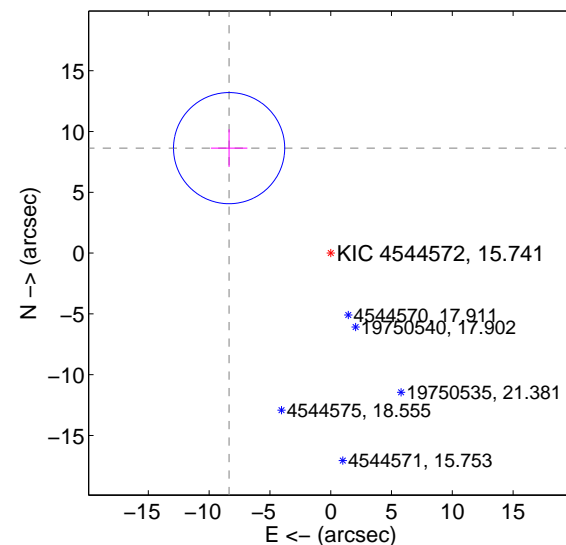
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position

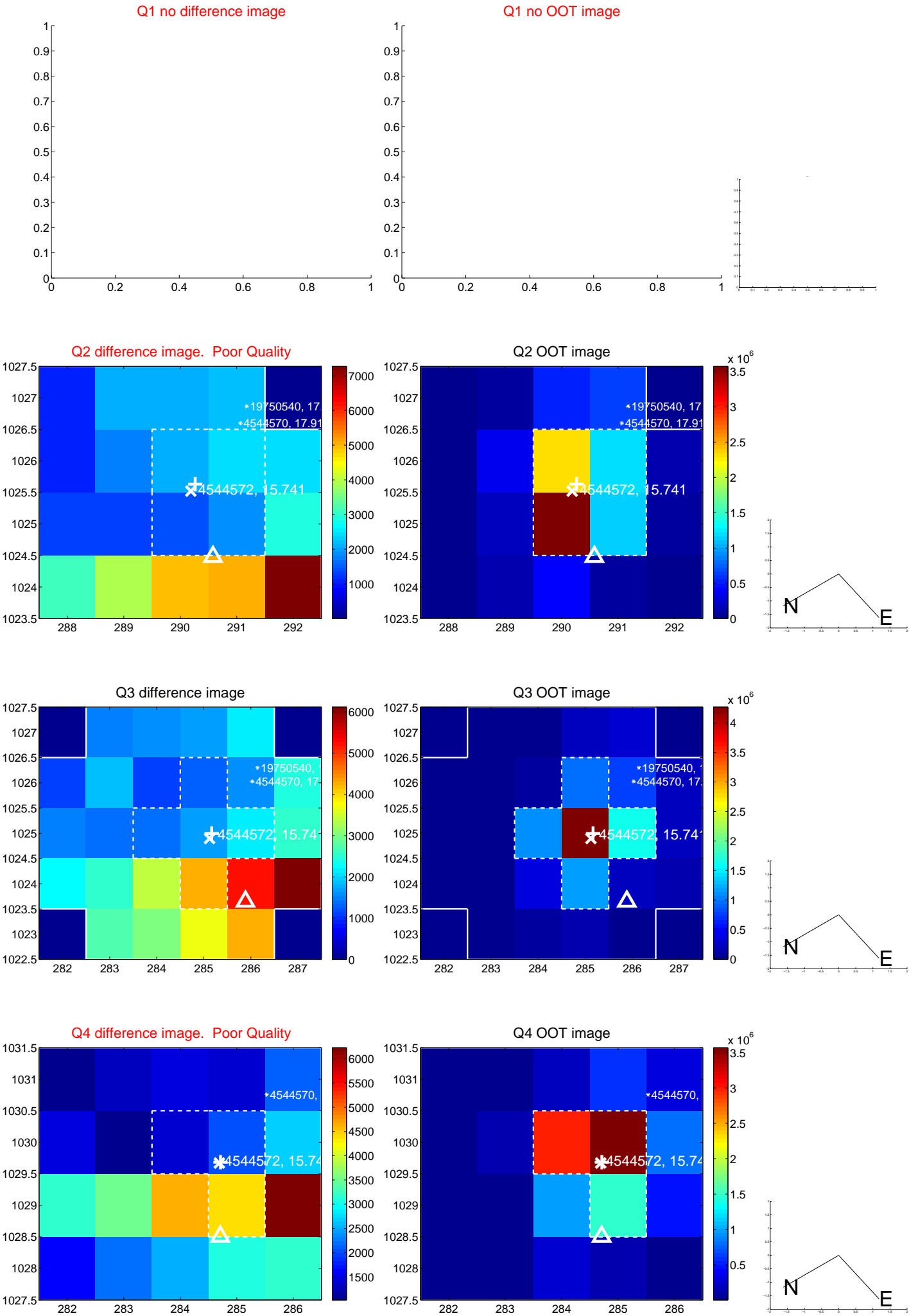


offset from photometric centroids

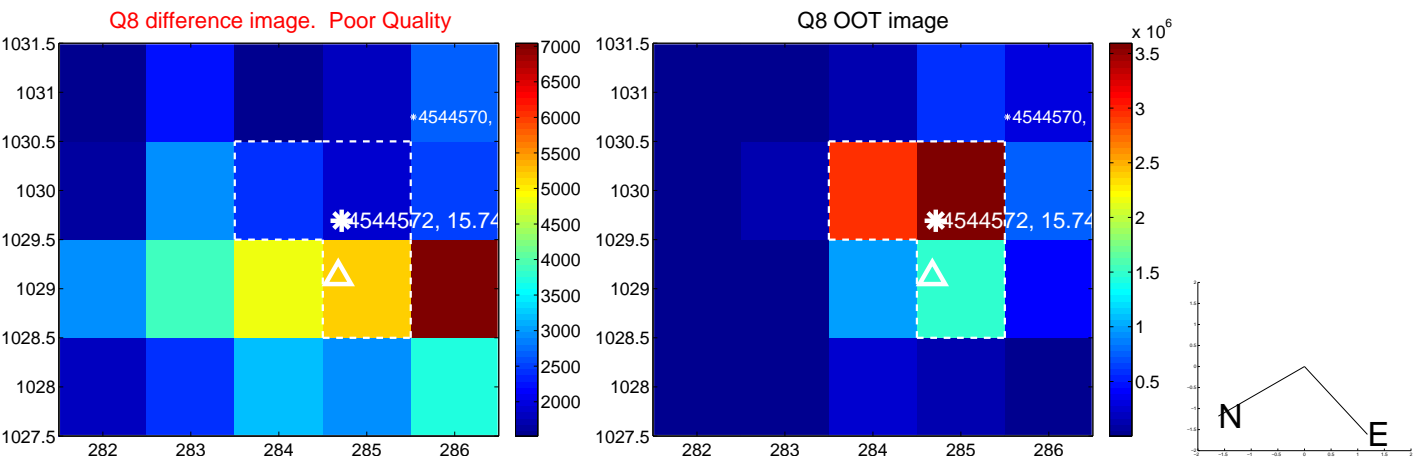
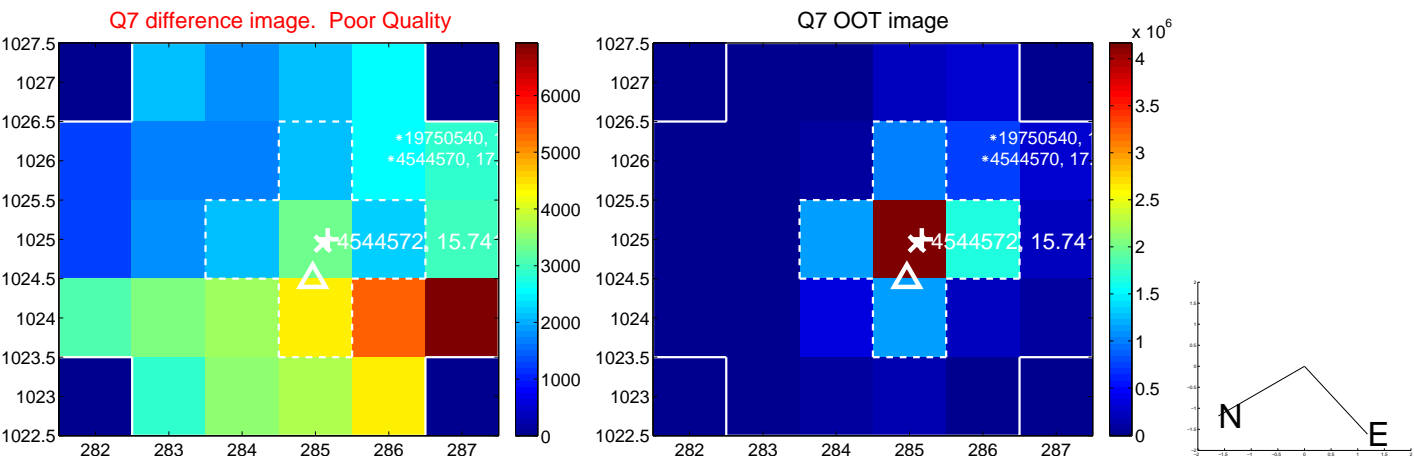
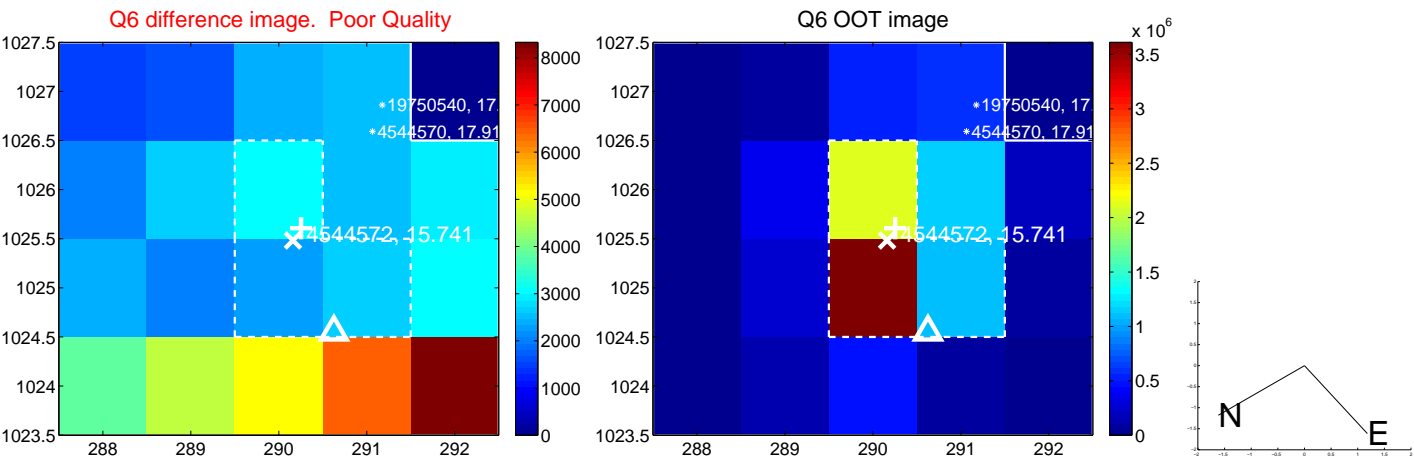
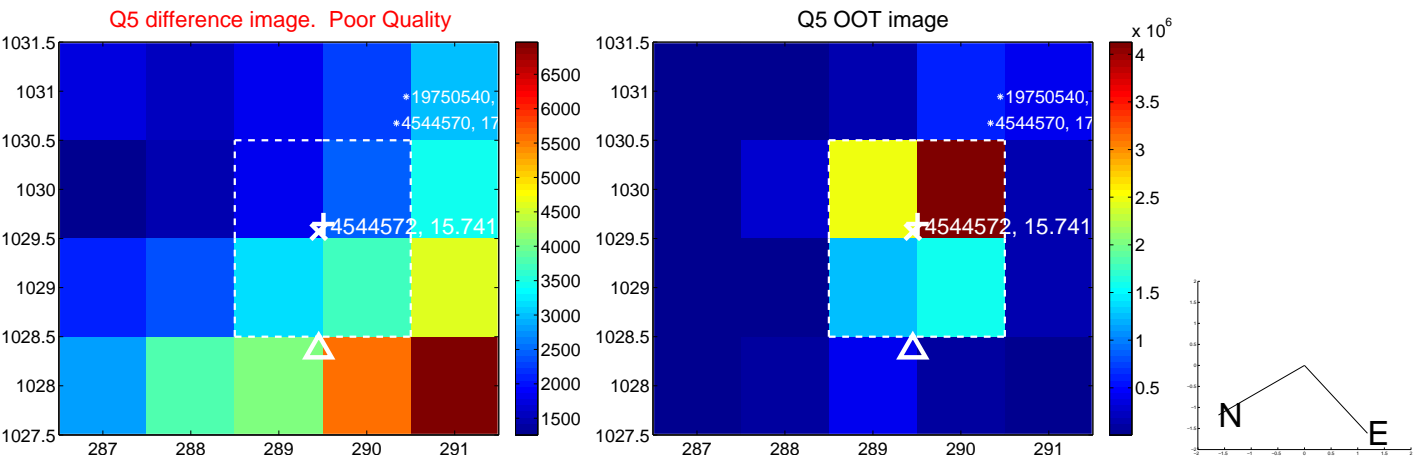


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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

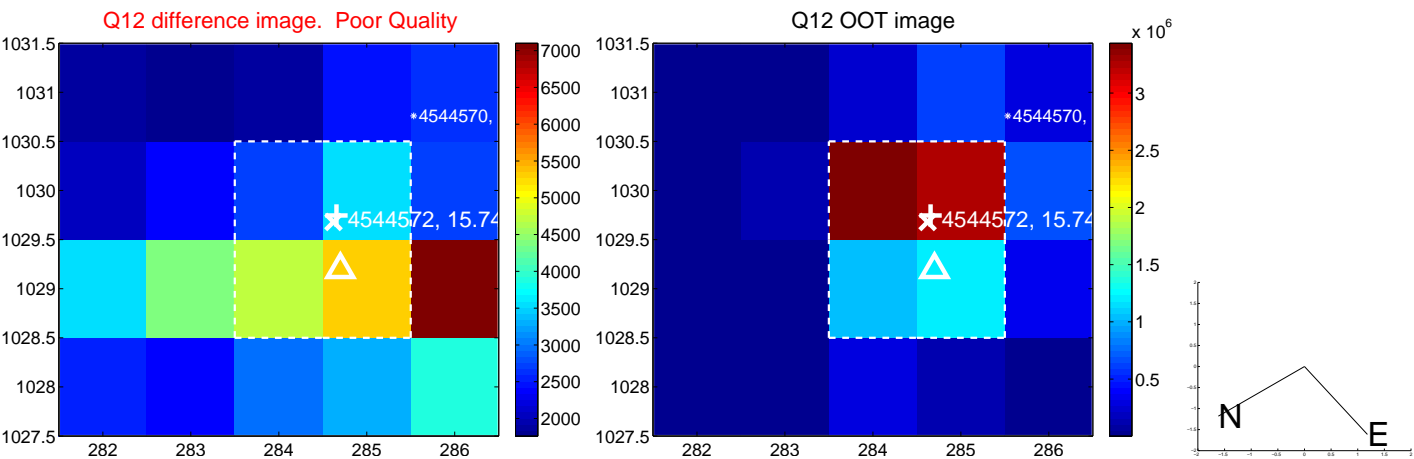
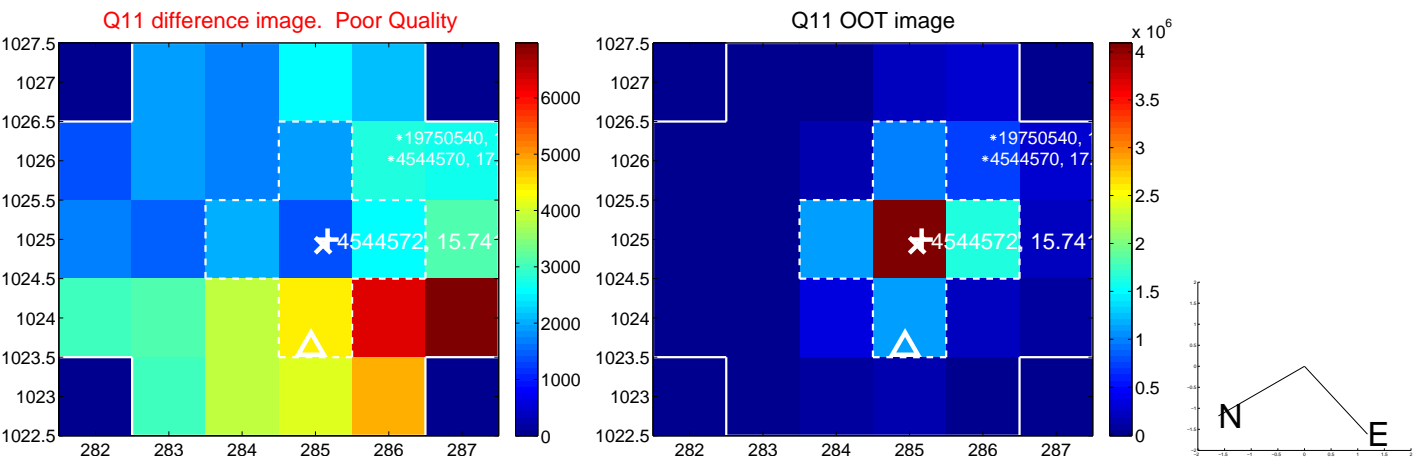
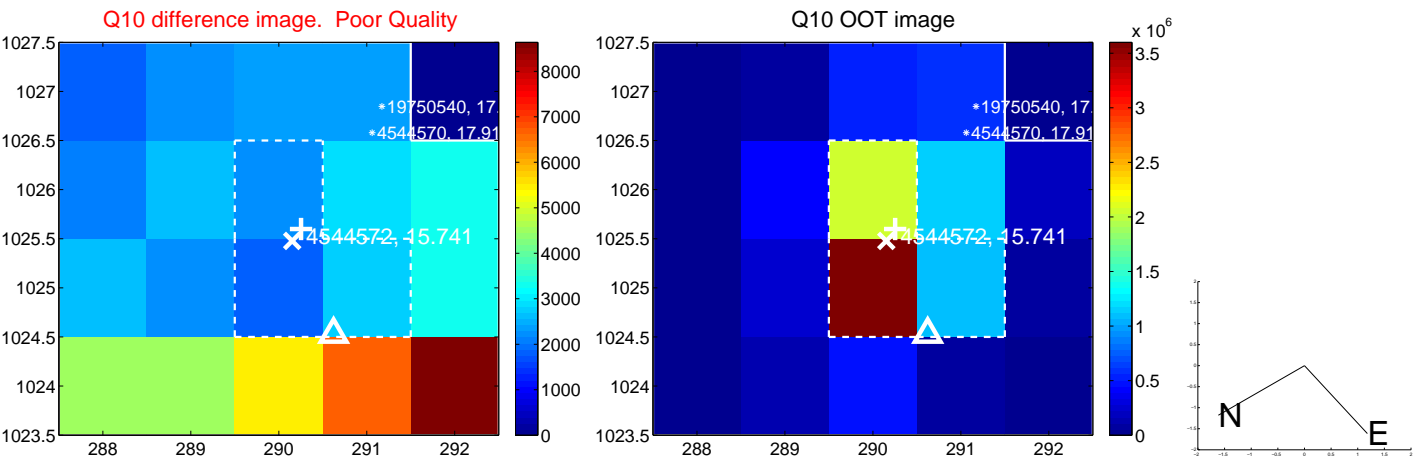
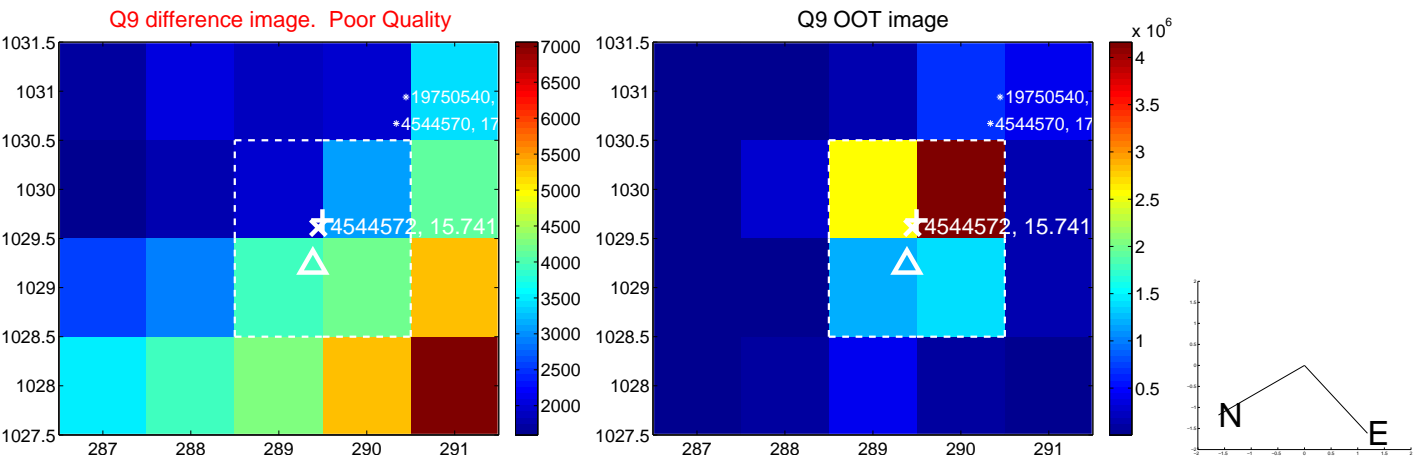
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



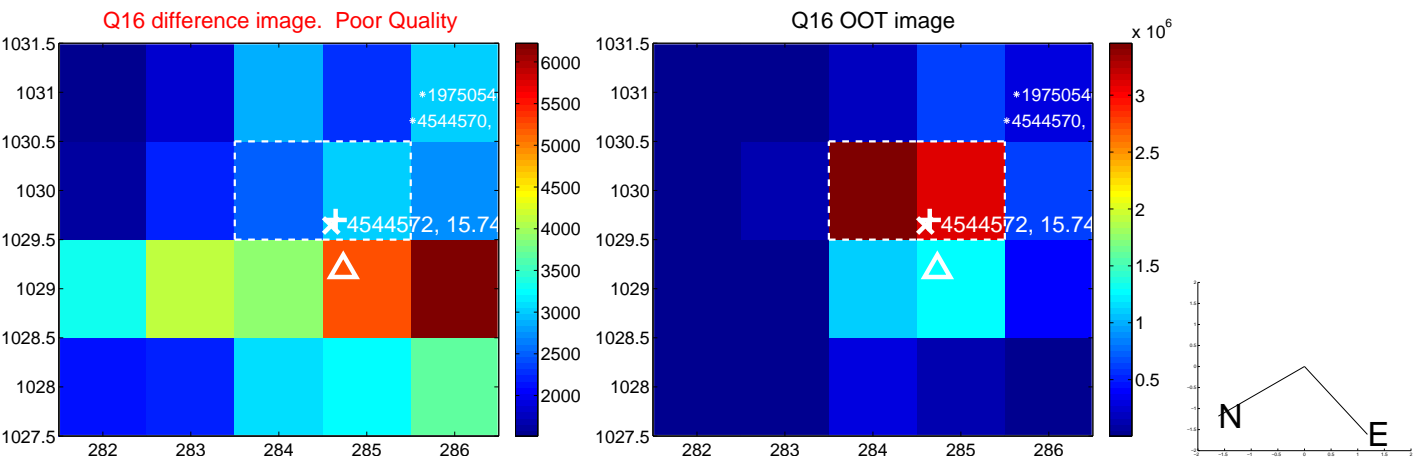
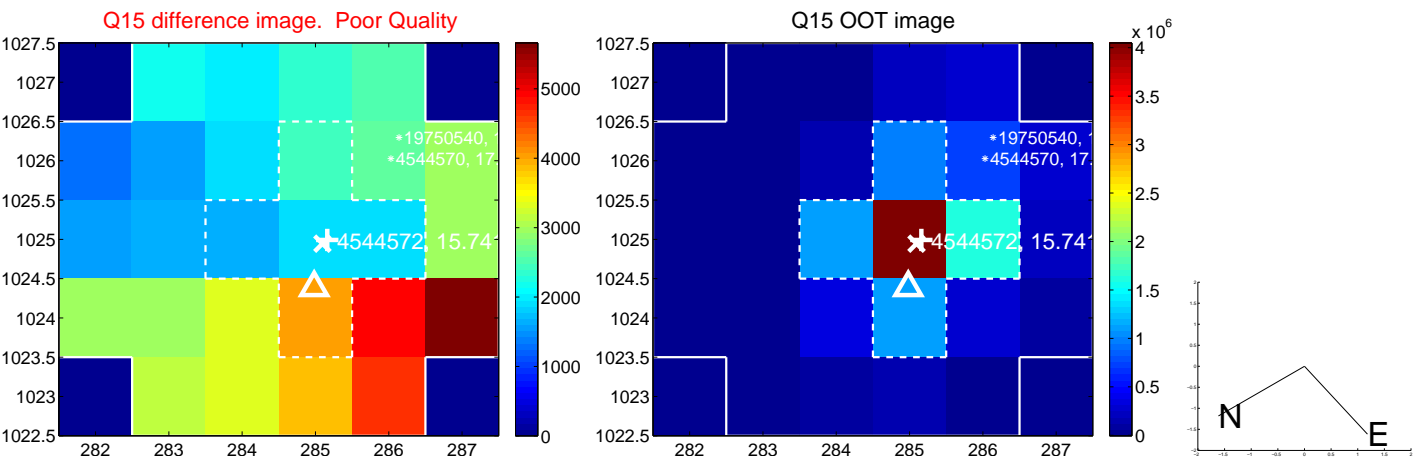
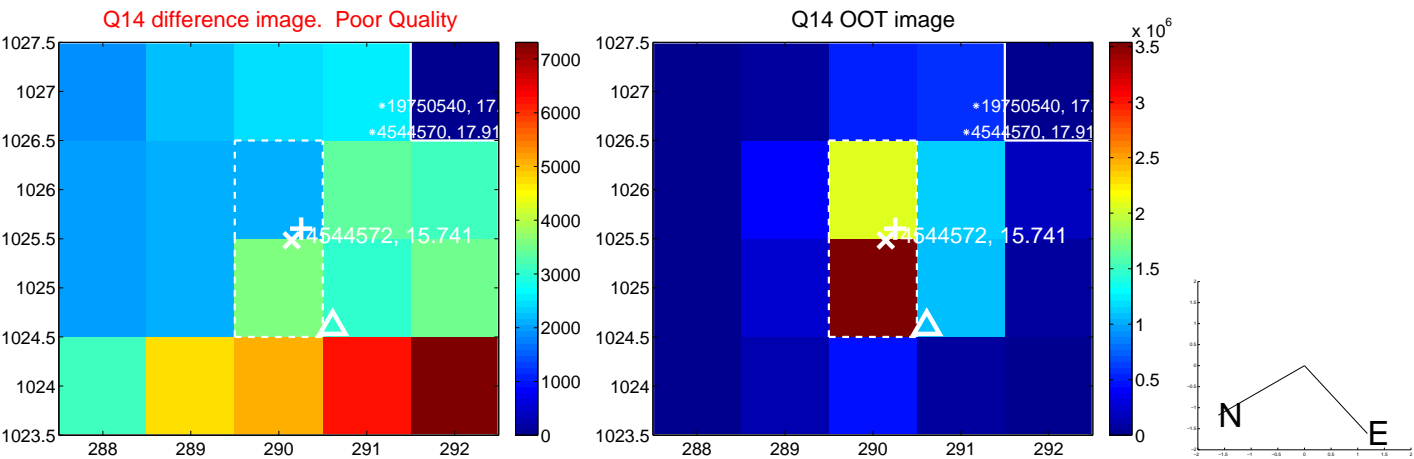
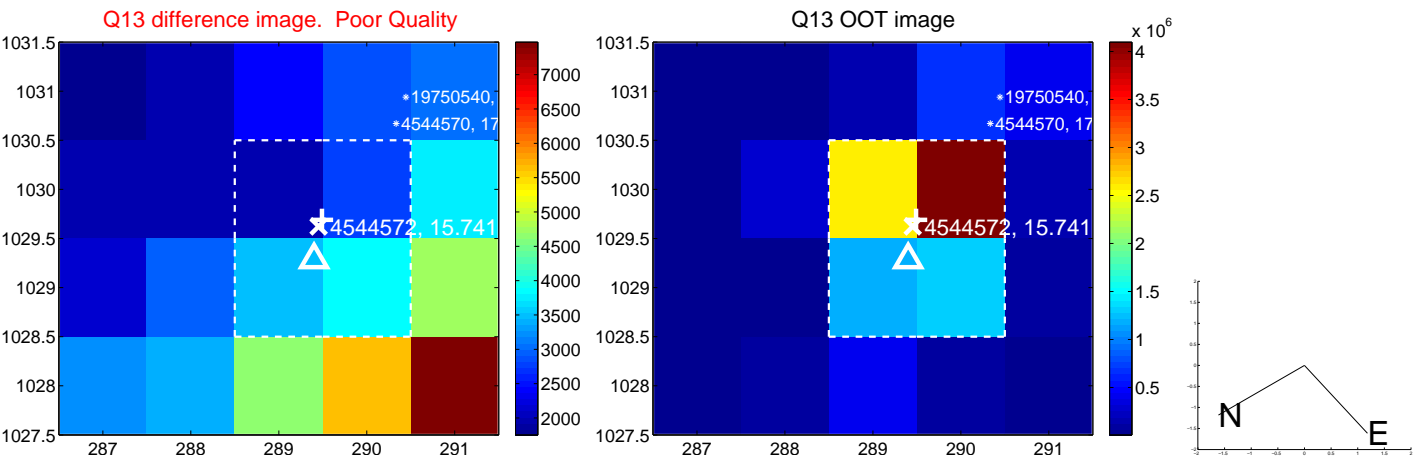
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

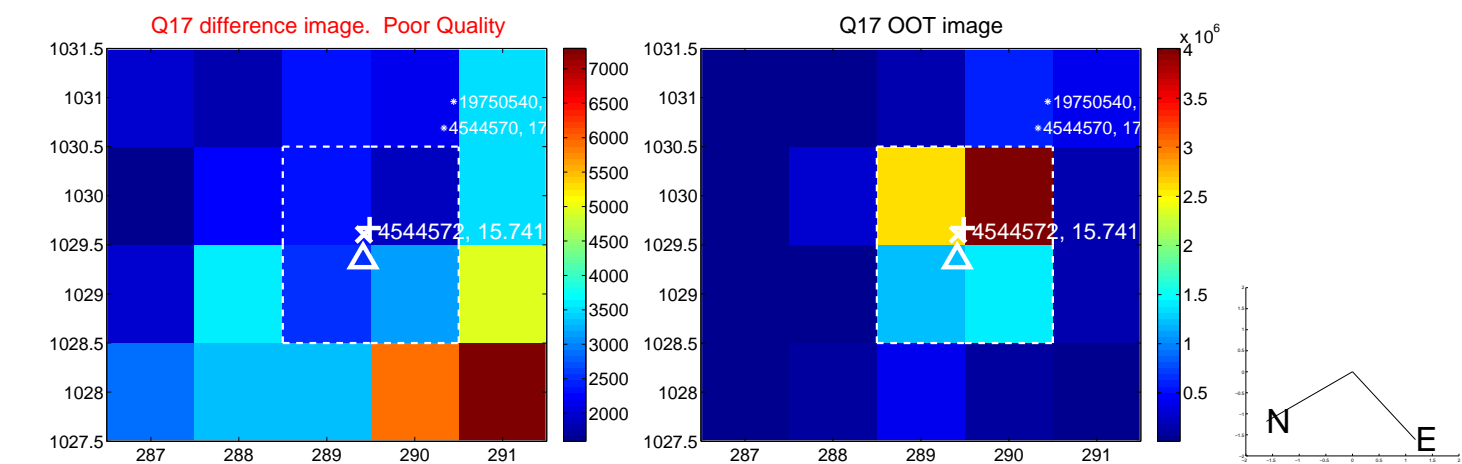


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

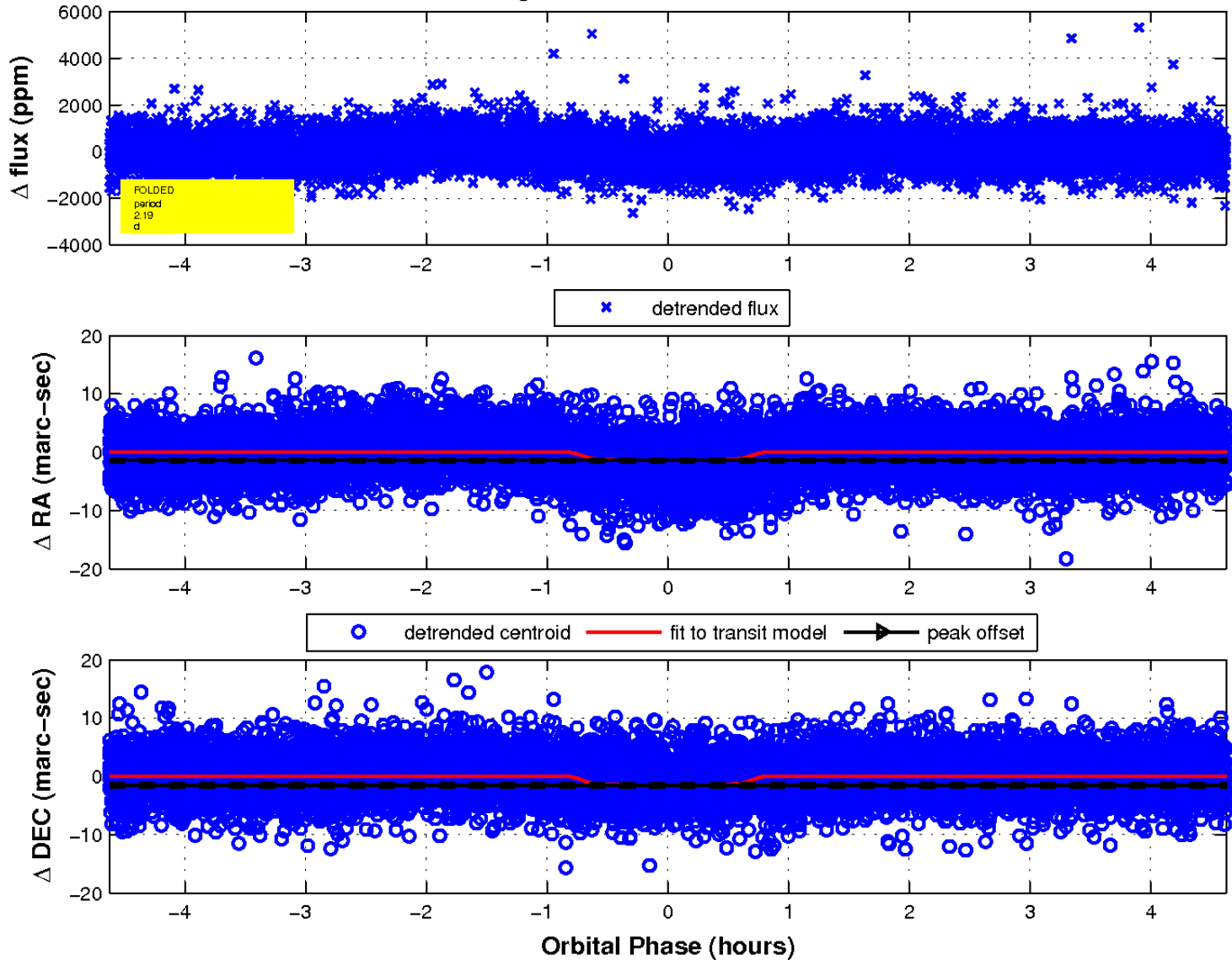




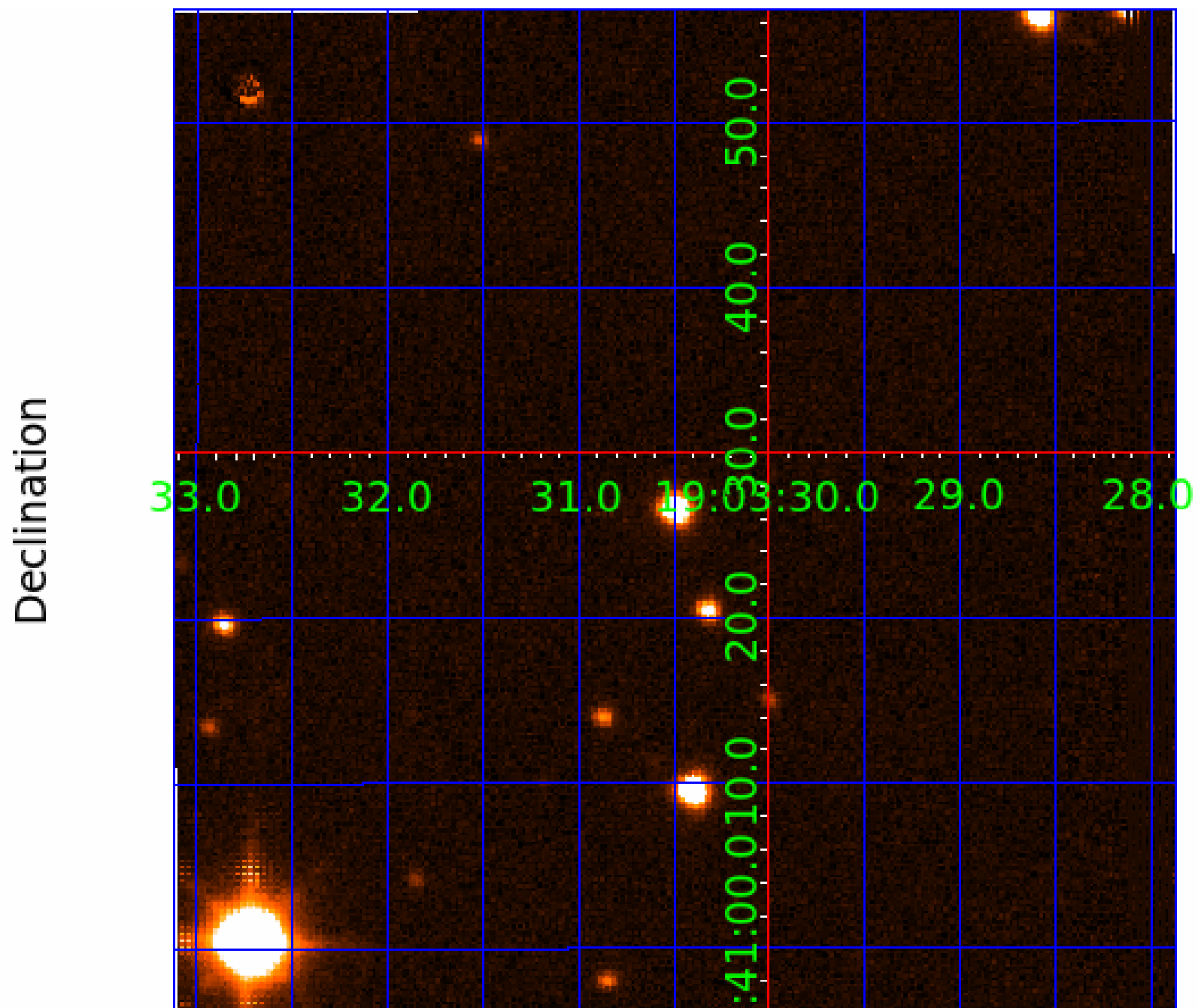
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



fluxWeightedCentroids, Planet 2 of 3



UKIRT Image



# KIC 004544572

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
004544572-01	OBS	3950.01	2.189047	132.098339	439.1	2.145	28.3	28.5	0.97	6106	2.42	1036.49
004544572-02	OBS	No	2.189053	133.521907	167.2	1.543	11.9	9.7	0.97	6106	1.48	1036.49
004544572-03	OBS	No	2.189090	133.668527	158.7	1.623	9.1	9.8	0.97	6106	1.22	1036.46

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
004544572-01	OBS	FP	0.00	1	0	1	1	LPP_DV—CENT_RESOLVED_OFFSET—HALO_GHOST—EPHEM_MATCH
004544572-02	OBS	FP	0.00	1	0	1	1	LPP_DV—SAME_NTL_PERIOD—CENT_RESOLVED_OFFSET—HALO_GHOST—EPHEM_MATCH
004544572-03	OBS	FP	0.00	1	0	0	1	LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—SAME_NTL_PERIOD—CENT_FEW_DIFFS—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 004544572-03

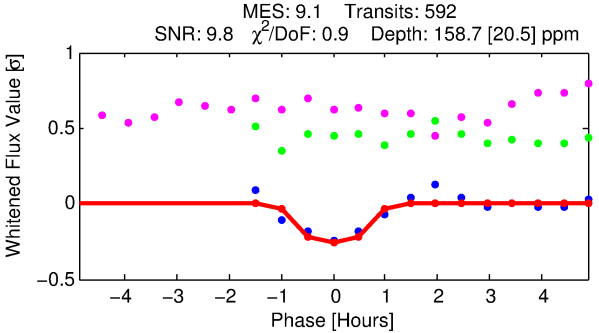
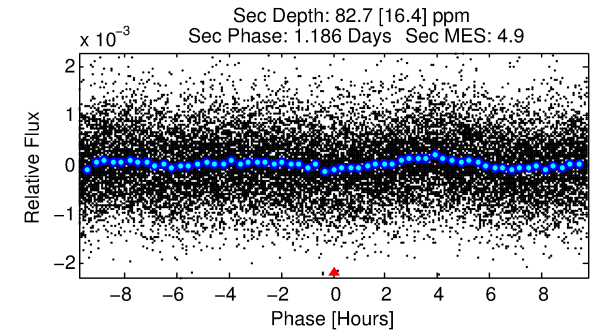
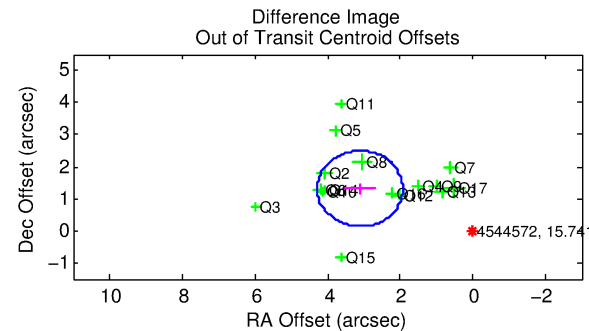
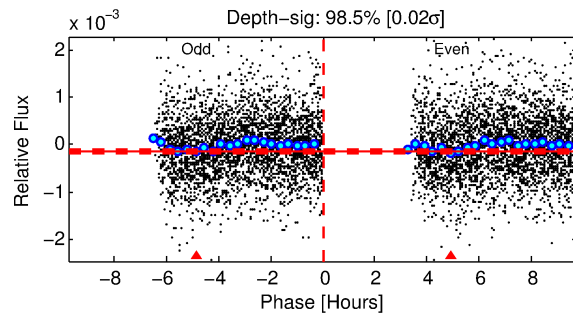
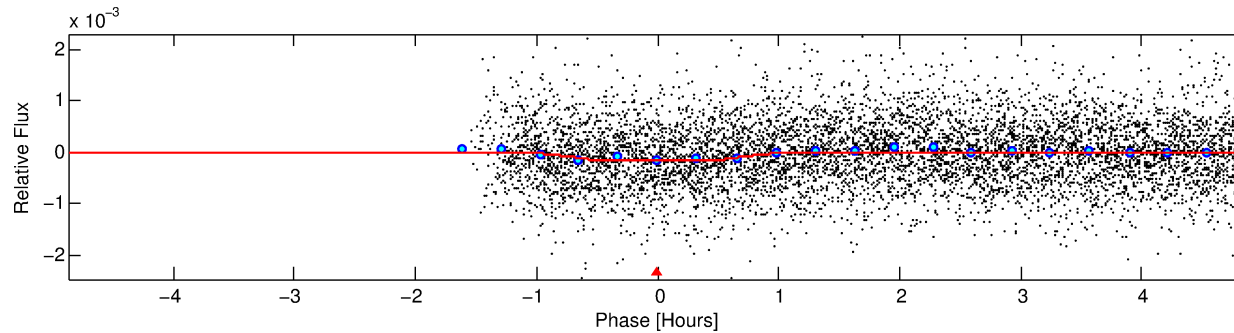
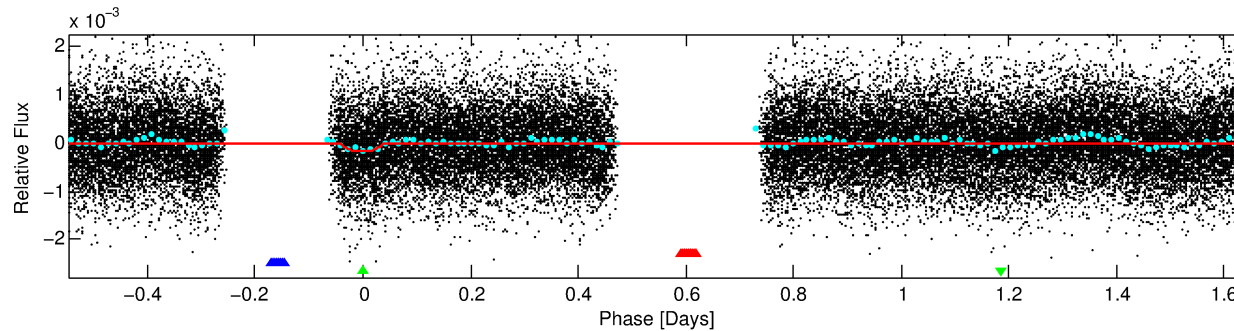
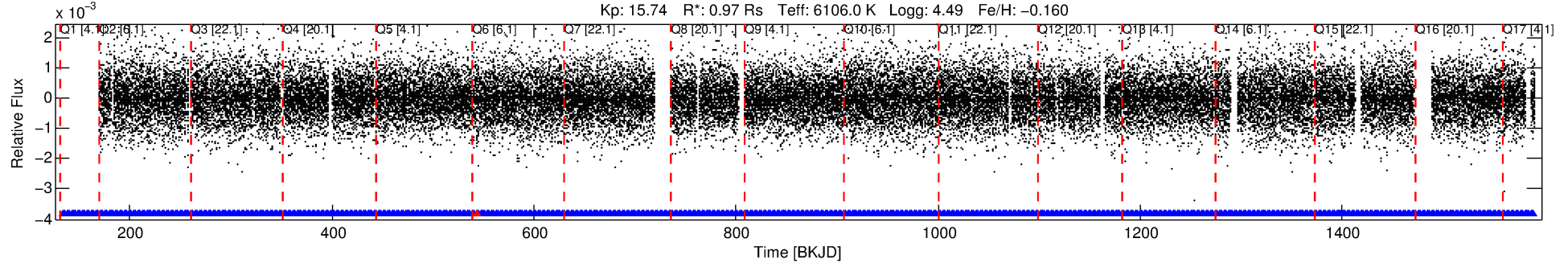
TCE (1)	KIC	Parent (2)	Parent KIC	P <sub>1</sub> :P <sub>2</sub>	Dist ( $''$ )	$\Delta$ Row	$\Delta$ Col	m <sub>2</sub>	m <sub>1</sub>	D <sub>2</sub> /D <sub>1</sub>	Mechanism	Flag	$\sigma_P$	$\sigma_T$
004544572-03	4544572	004544571-03	4544571	1:1	17.1	-3	-4	15.75	15.74	1.03	Direct-PRF	0	3.23	0.33

**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: 4544572 Candidate: 3 of 3 Period: 2.189 d  
KOI: K03950 Corr: No Ephemeris Match

Kp: 15.74 R\*: 0.97 Rs Teff: 6106.0 K Logg: 4.49 Fe/H: -0.160



## DV Fit Results:

Period = 2.18909 [0.00001] d  
Epoch = 133.6685 [0.0030] BKJD  
Rp/R\* = 0.0116 [0.0189]  
a/R\* = 10.44 [82.92]  
b = 0.00 [10797.93]  
Seff = 1036.47 [423.77]  
Teq = 1447 [148] K  
Rp = 1.22 [2.02] Re  
a = 0.0335 [0.0087] AU  
Ag = 34.36 [113.11] [0.29σ]  
Teffp = 5416 [4431] K [0.90σ]

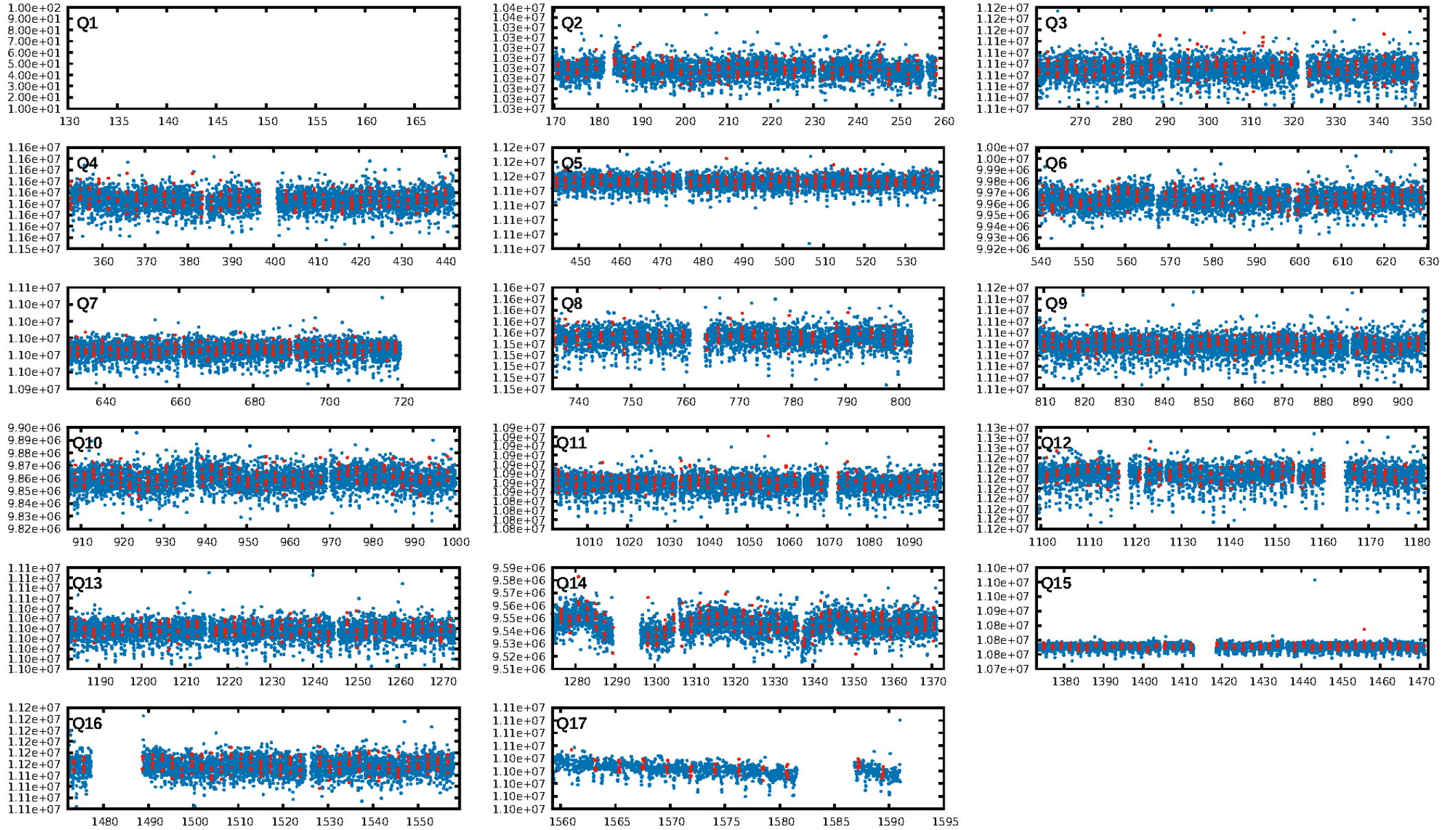
## DV Diagnostic Results:

ShortPeriod-sig: 0.0% [0.00σ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: 9.23e-20  
RollingBand-fgt: 1.00 [579/580]  
GhostDiagnostic-chr: 0.6645  
Centroid-sig: 0.0%  
Centroid-so: 4.186 arcsec [2.71σ]  
OotOffset-rm: 3.375 arcsec [8.59σ]  
KicOffset-rm: 3.152 arcsec [7.92σ]  
OotOffset-st: 4/4/4/4 [16]  
KicOffset-st: 4/4/4/4 [16]  
DiffImageQuality-fgm: 0.00 [0/16]  
DiffImageOverlap-fno: 0.00 [0/16]

Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 01-Feb-2016 16:50:40 Z

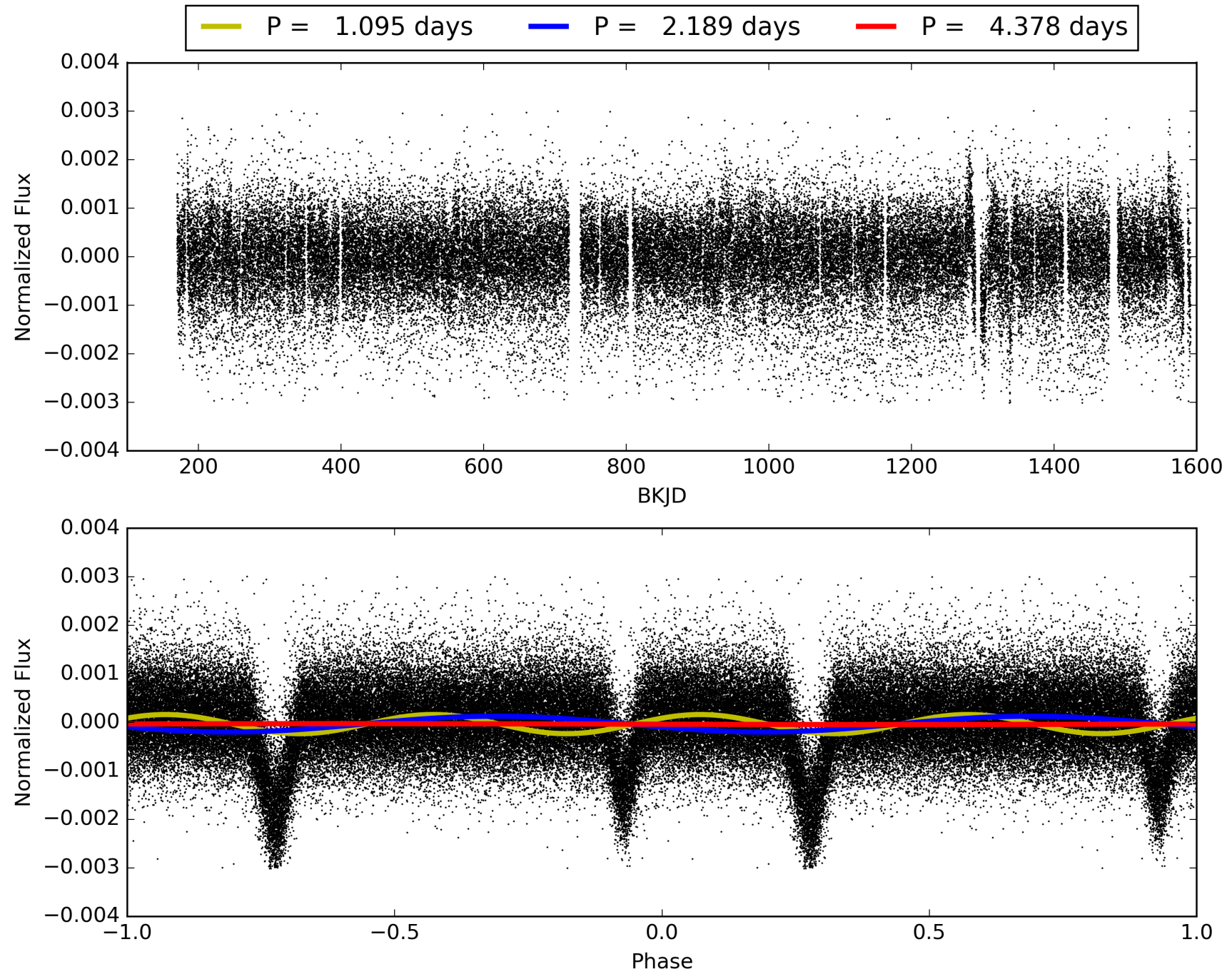
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

# TCE 004544572-03, PDC Light Curves





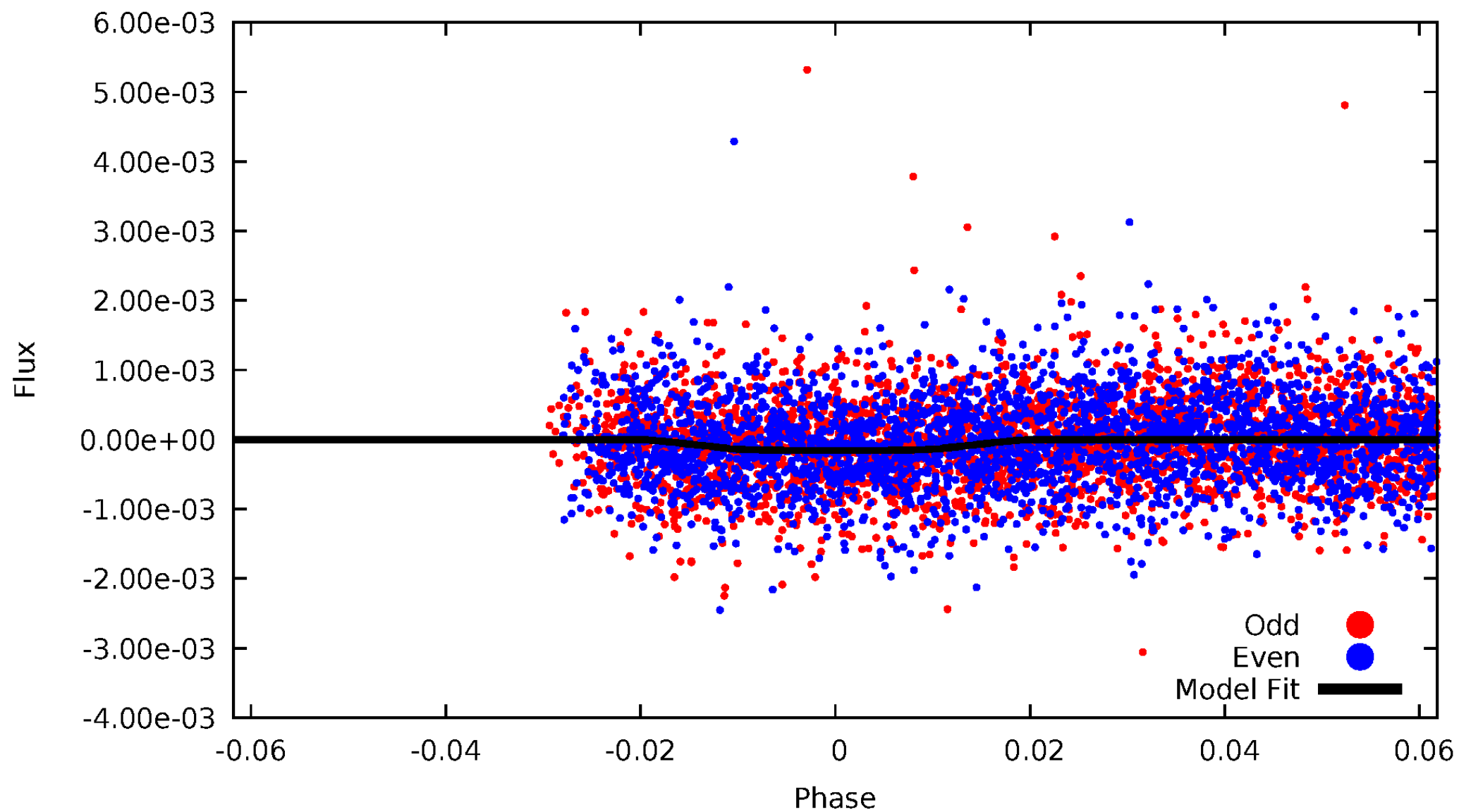
TCE 004544572-03





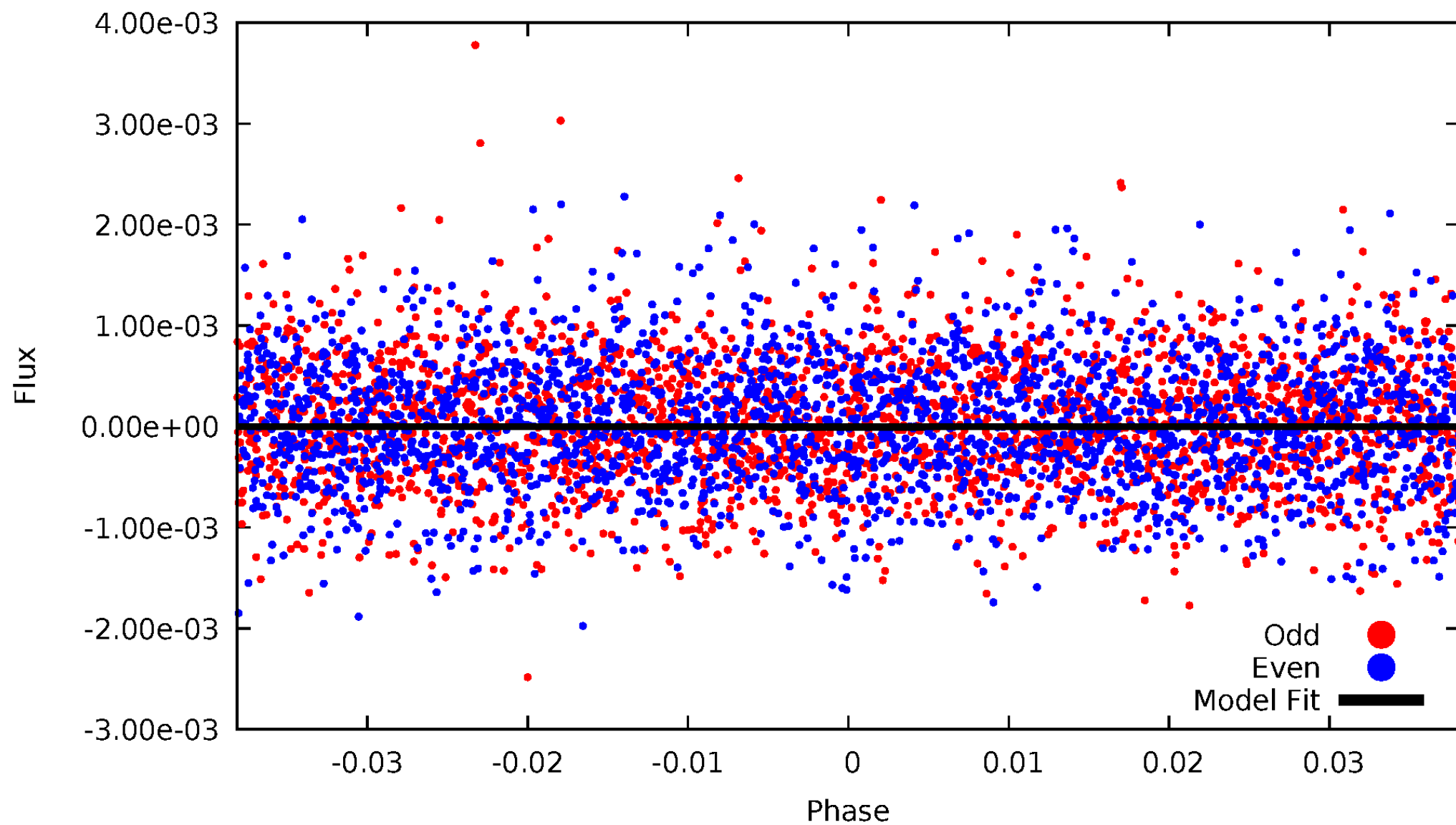
DV Odd/Even

TCE 004544572-03



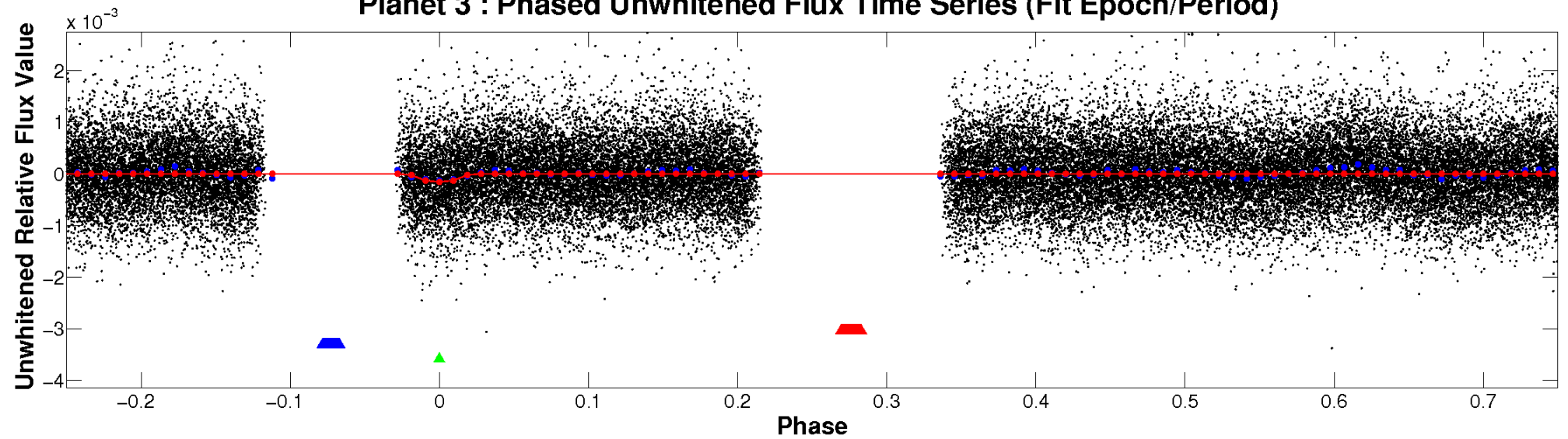
# ALT Odd/Even

TCE 004544572-03

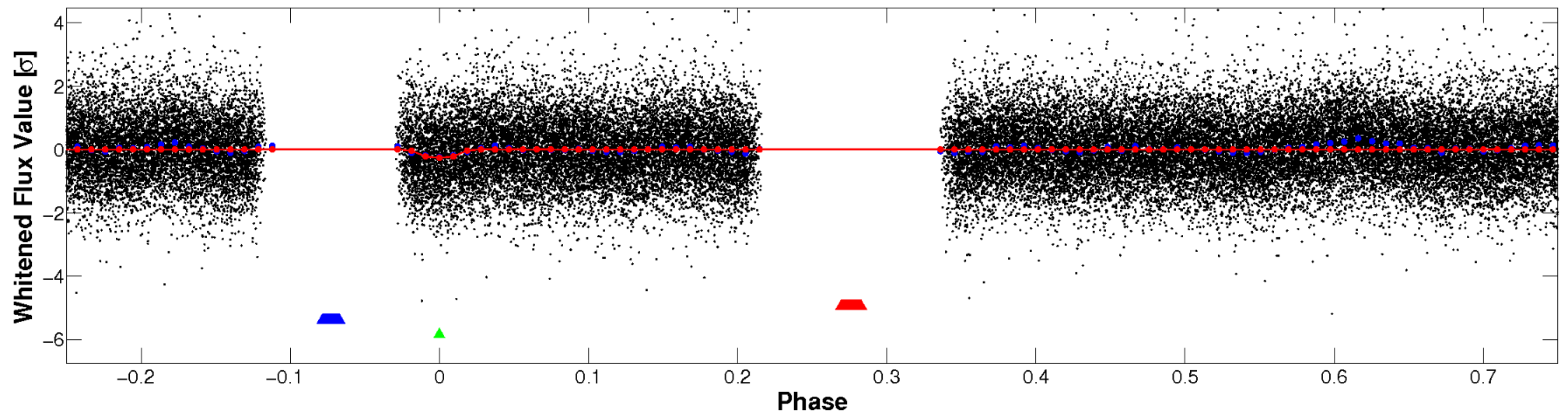


# Non-Whitened Vs. Whitened Light Curve

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

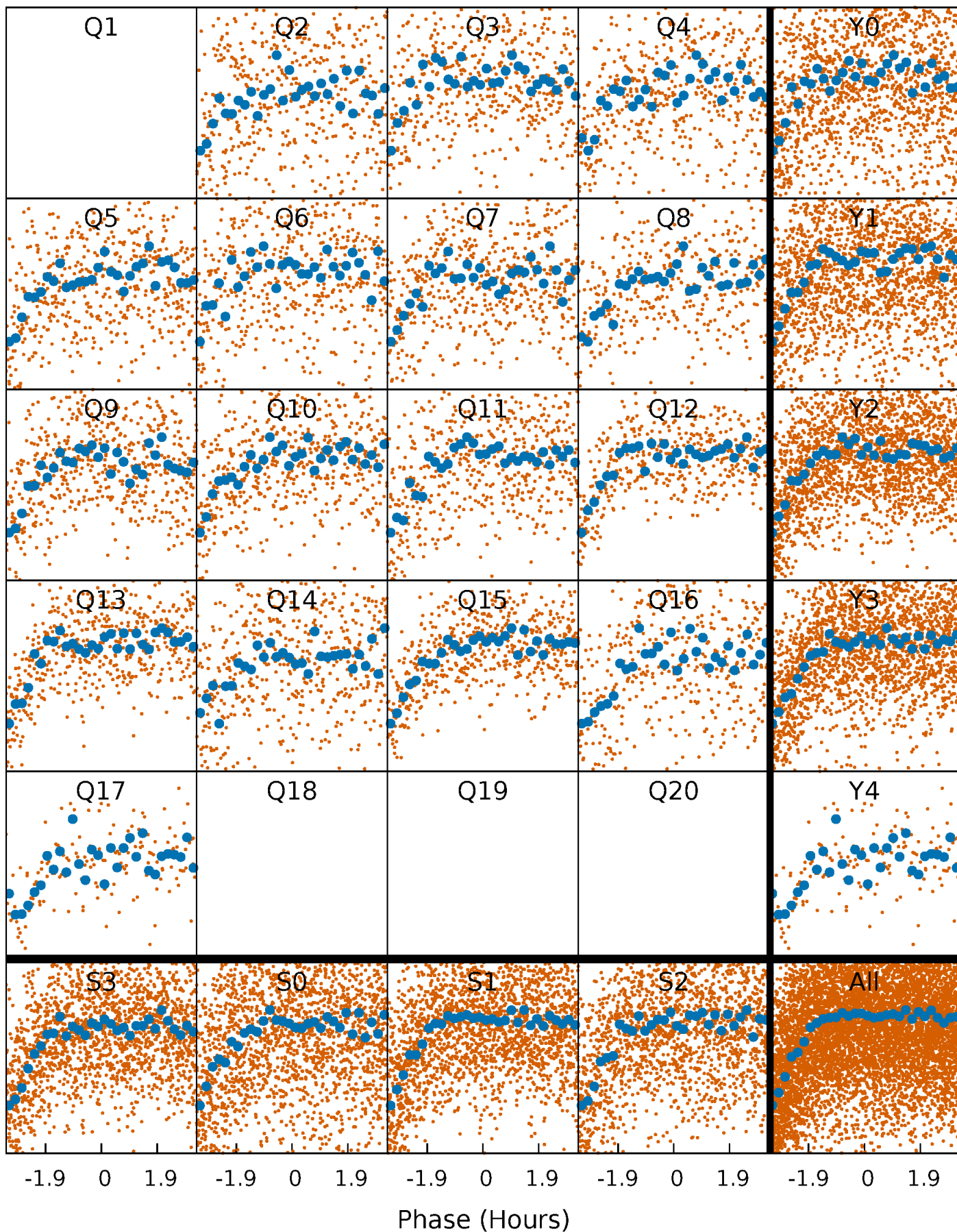


## Planet 3 : Phased Whitened Flux Time Series (Fit Epoch/Period)



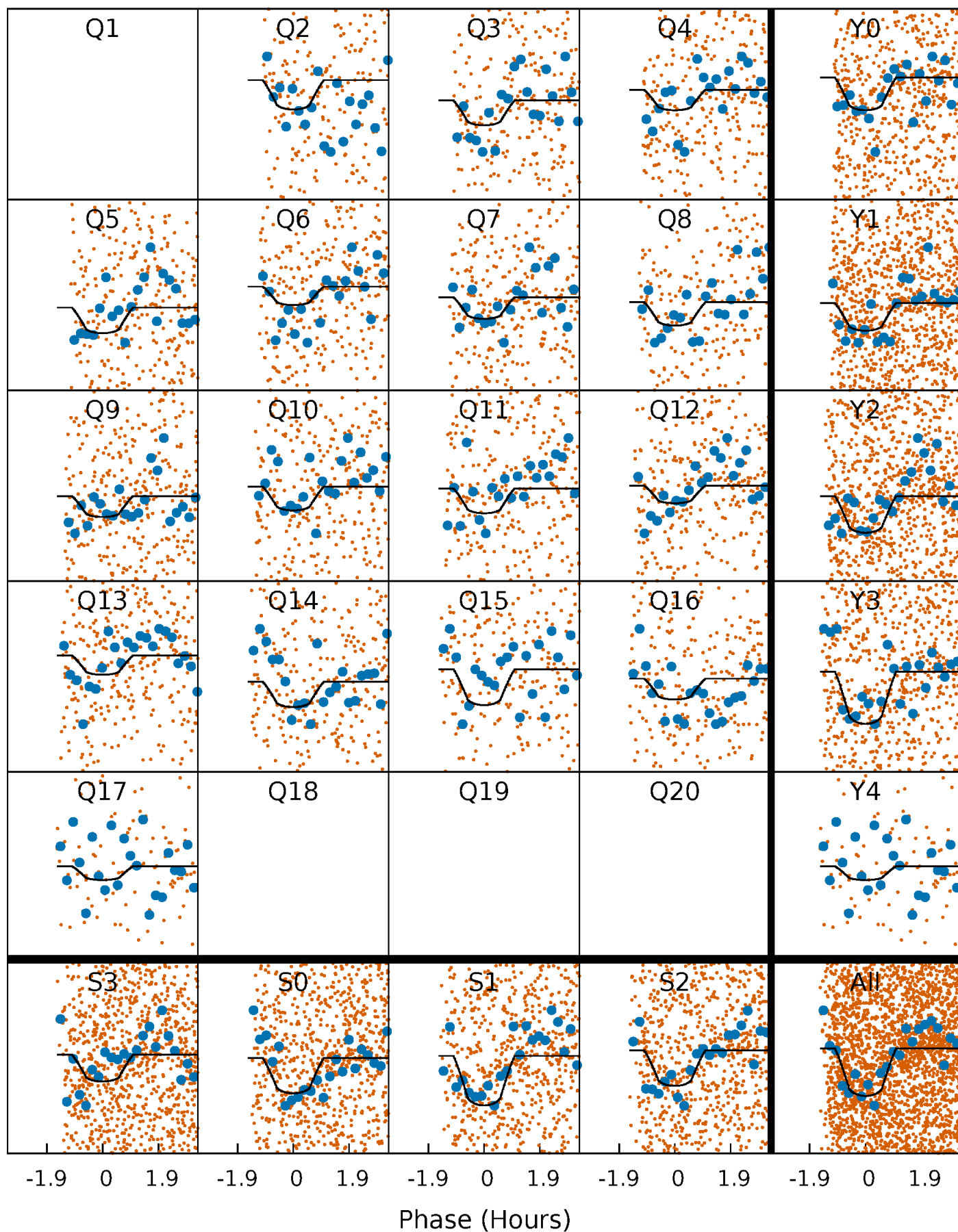
# PDC Quarter-Phased Transit Curves

TCE 004544572-03   P= 2.189090 Days    $T_0=133.668527$  (BKJD)



# DV Quarter-Phased Transit Curves

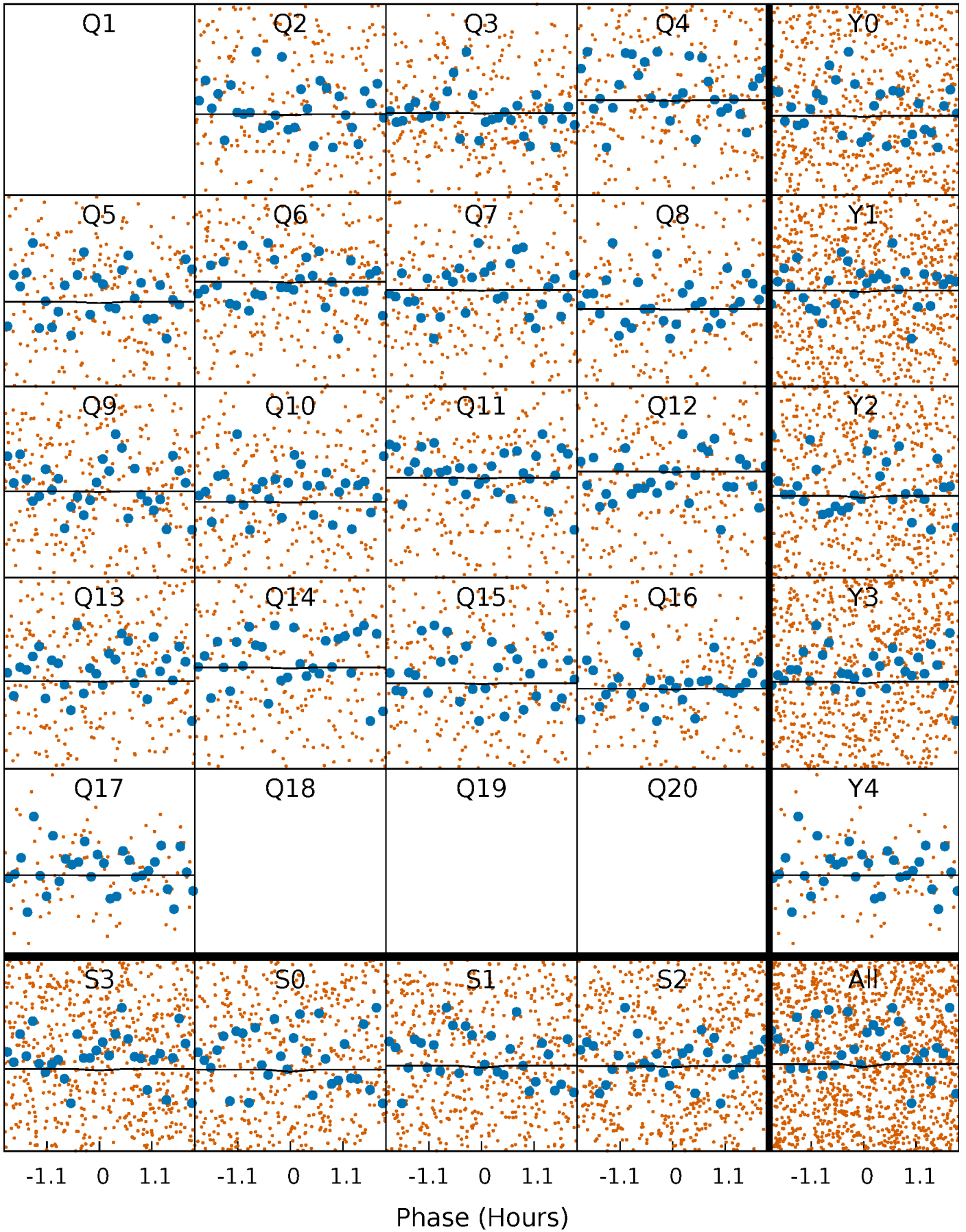
TCE 004544572-03   P= 2.189090 Days    $T_0=133.668527$  (BKJD)





# Alt. Detrend Quarter-Phased Transit Curves

TCE 004544572-03   P= 2.189092 Days    $T_0=133.736342$  (BKJD)

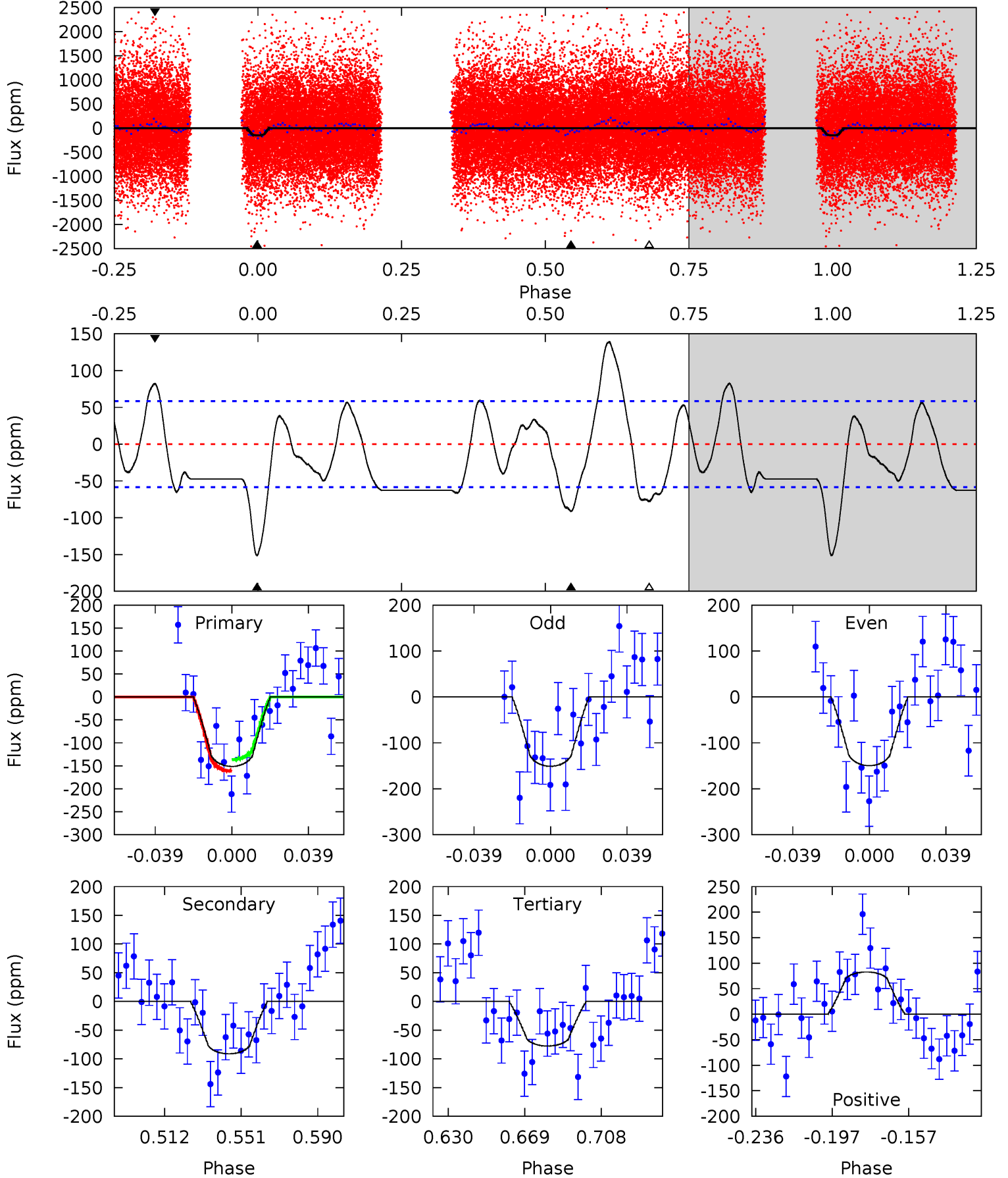




# DV Model-Shift Uniqueness Test

004544572-03, P = 2.189090 Days, E = 133.668527 Days

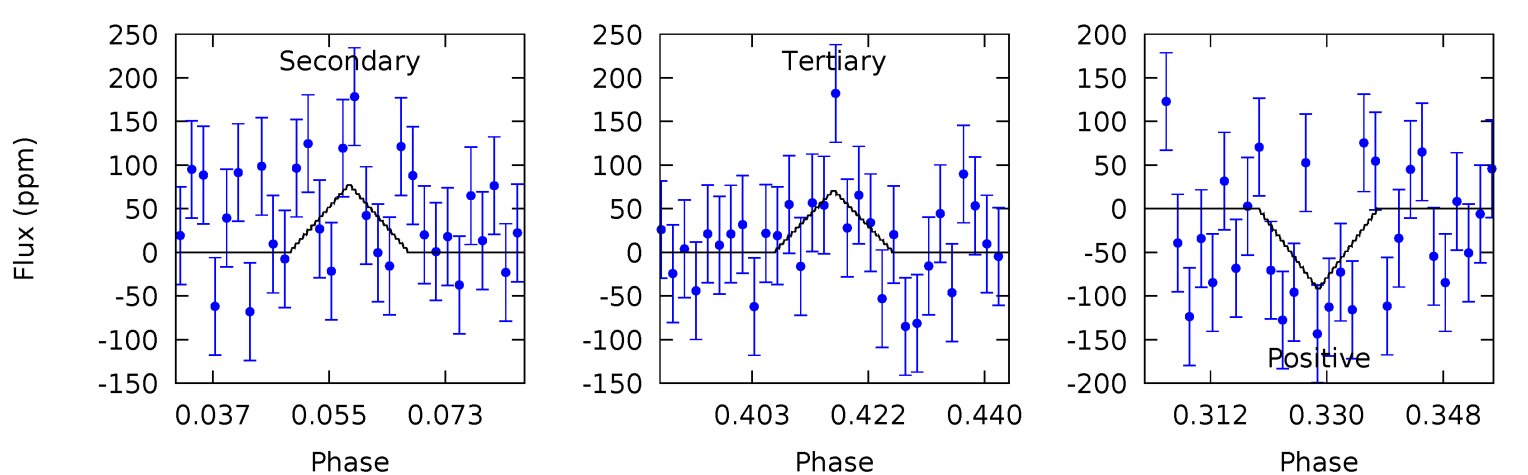
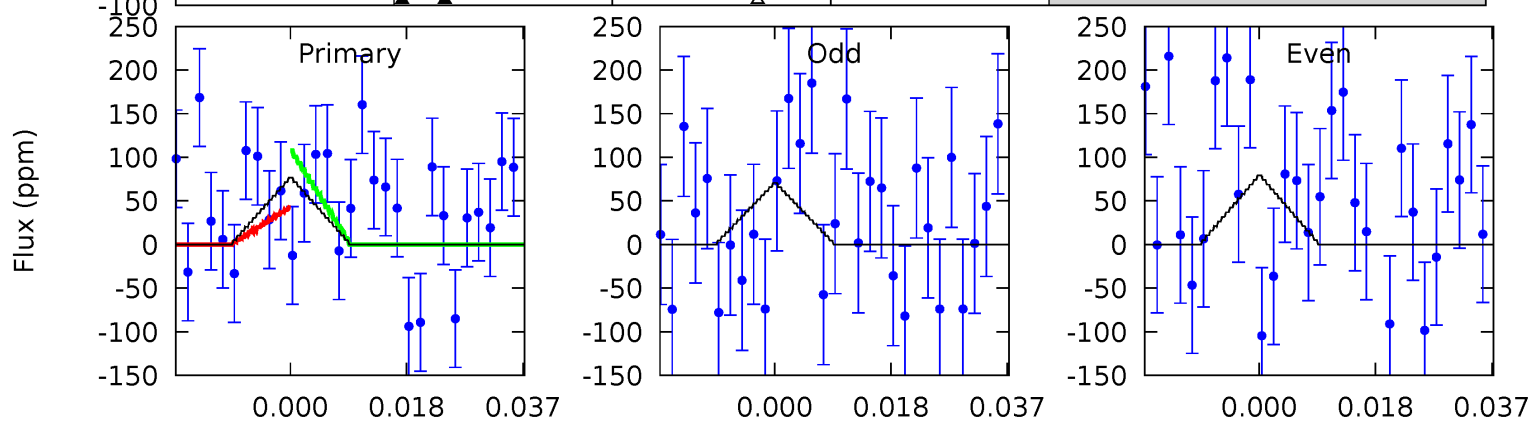
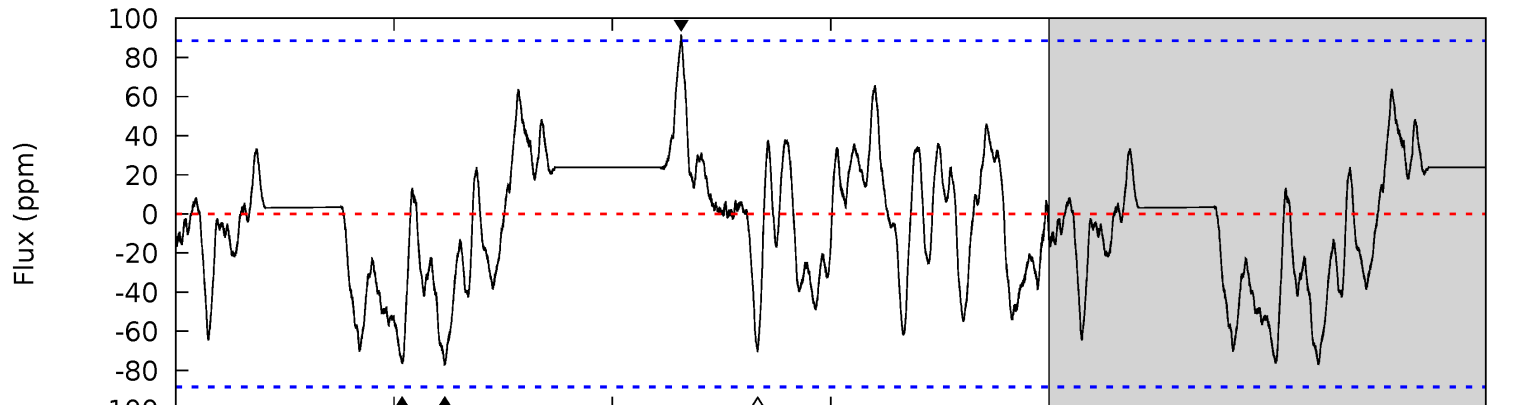
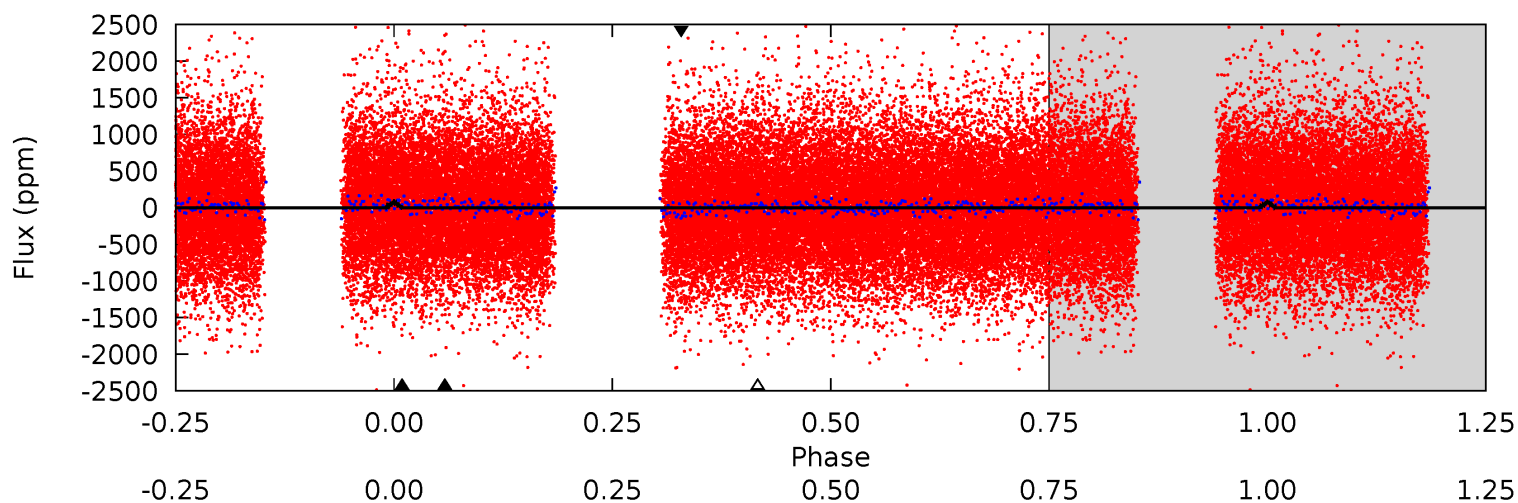
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
12.3	7.42	6.32	6.73	4.76	2.06	4.07	6.00	5.58	1.11	0.69	0.05	0.94	0.48	1.02



# Alt Model-Shift Uniqueness Test

004544572-03, P = 2.189092 Days, E = 133.736342 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
4.25	4.28	3.92	5.08	4.91	2.36	1.73	0.33	-0.83	0.36	-0.80	0.24	0.86	0.54	1.81



### Stellar Parameters For KIC 004544572

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$6106^{+181}_{-217}$	$4.487^{+0.050}_{-0.213}$	$-0.160^{+0.250}_{-0.350}$	$0.966^{+0.290}_{-0.097}$	$1.043^{+0.140}_{-0.140}$	$1.631^{+0.443}_{-0.835}$
	+3%/-4%	+1%/-5%	+156%/-219%	+30%/-10%	+13%/-13%	+27%/-51%
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 004544572-03 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$-91 \pm 12$	$1.89^{+1.88}_{-1.19}$	$2068^{+145}_{-102}$	$4696^{+2944}_{-1069}$	$15^{+101}_{-11}$
Alt.	$-77 \pm 18$	$1.53^{+1.57}_{-1.09}$	$2071^{+135}_{-100}$	$4953^{+4844}_{-1289}$	$19^{+209}_{-15}$

$T_{\text{max}}$  = 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

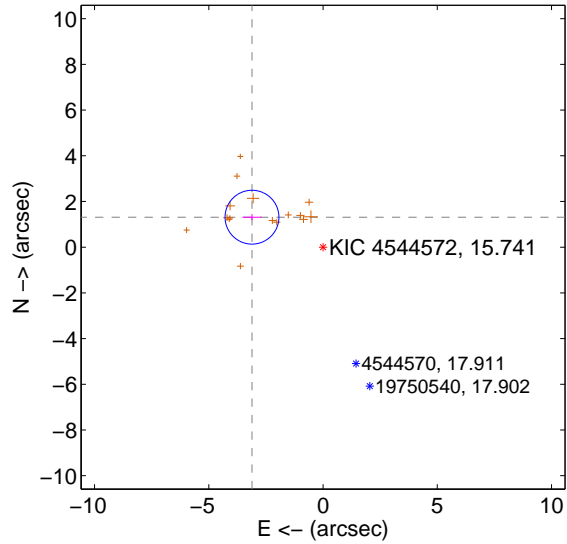
Supplemental centroid analysis for 004544572-03. Kepler magnitude: 15.74. Transit SNR 9.84

There are 0 quarters with good PRF difference image offsets

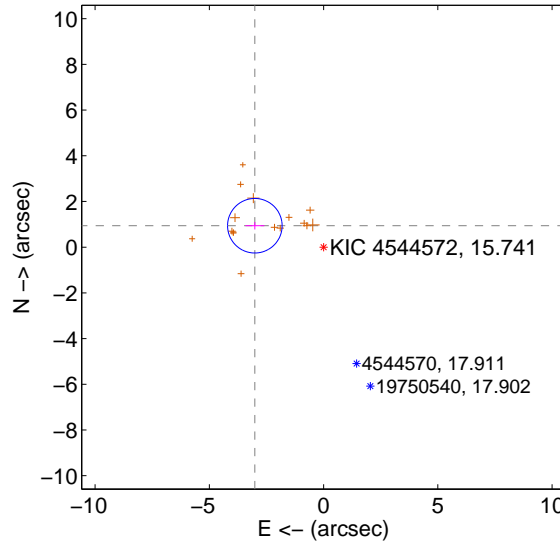
The direct PRF centroid is offset from the target star catalog position by about 0.36 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	<b><math>3.375 \pm 0.393</math></b>	<b>8.59</b>	$3.110 \pm 0.423$	$1.313 \pm 0.134$
PRF-fit source offset from KIC position	<b><math>3.152 \pm 0.398</math></b>	<b>7.92</b>	$3.009 \pm 0.414$	$0.939 \pm 0.164$
photometric centroid source offset	$4.19 \pm 1.55$	2.71	$2.31 \pm 1.52$	$3.49 \pm 1.56$

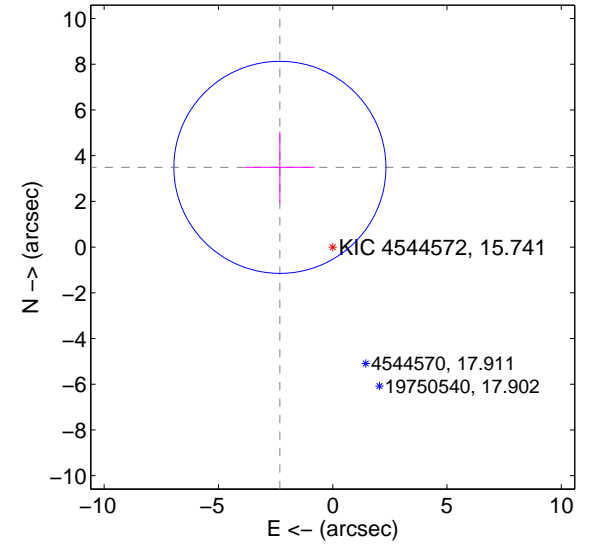
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position

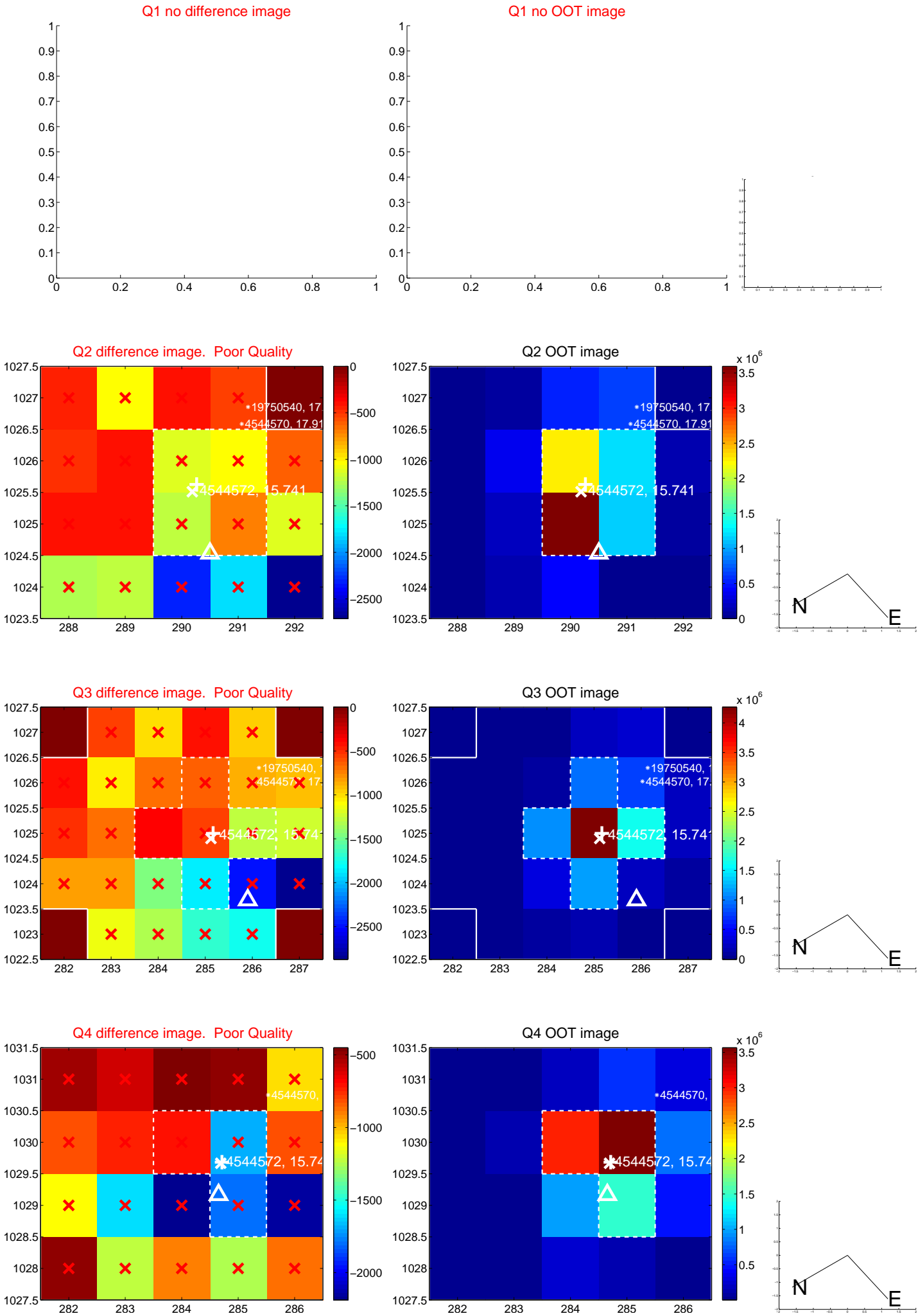


offset from photometric centroids

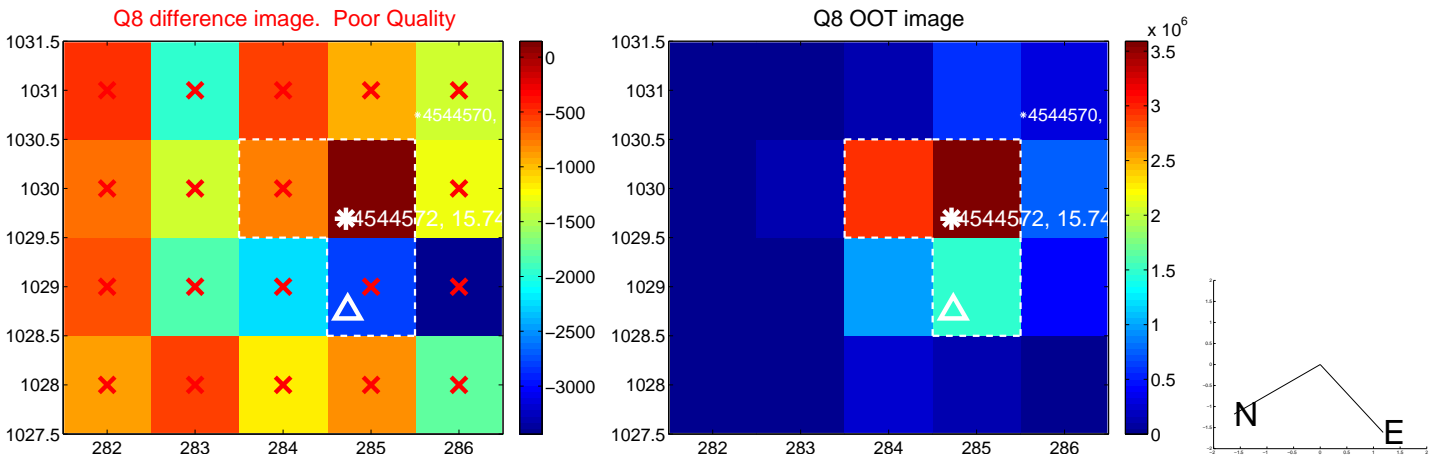
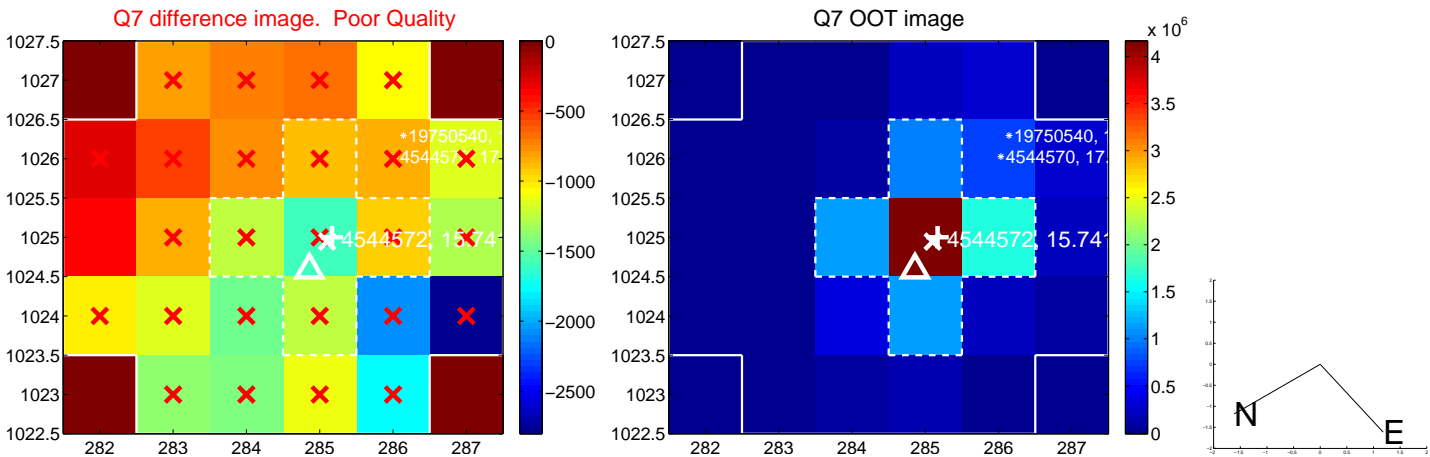
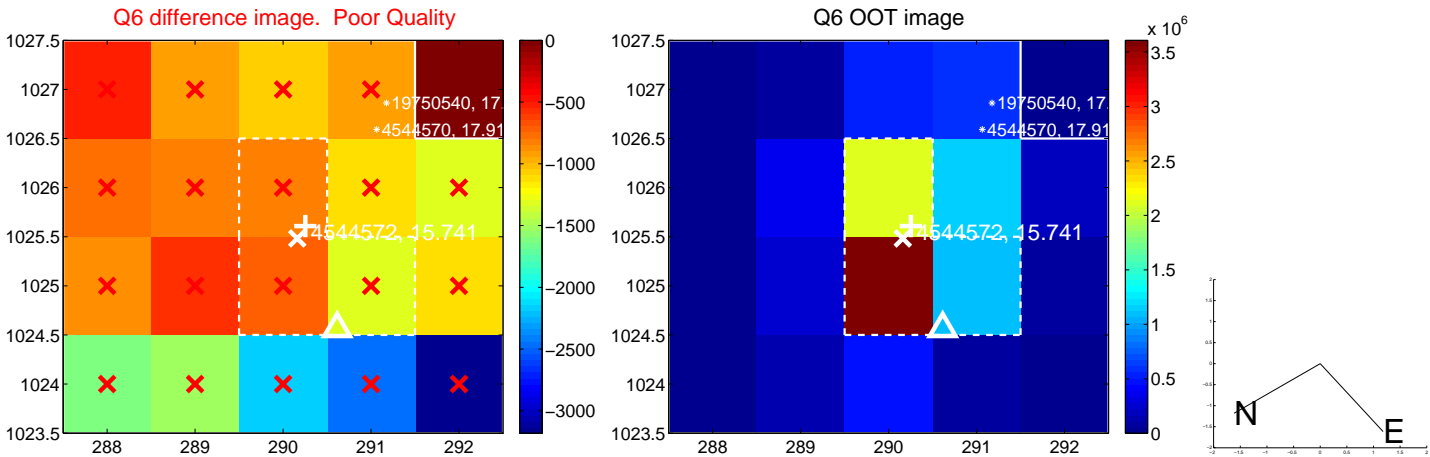
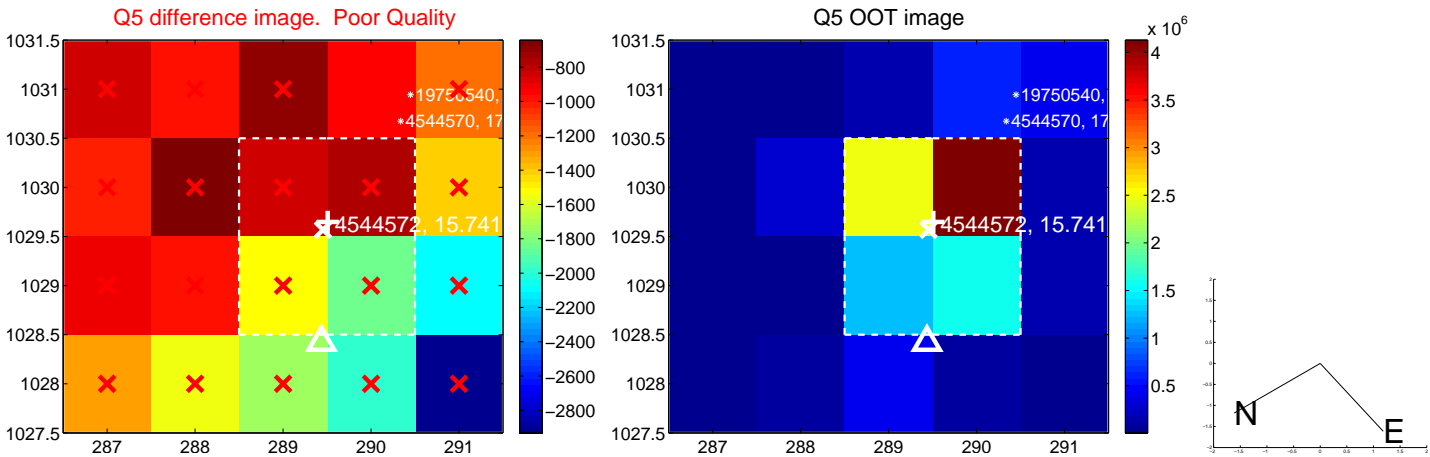


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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

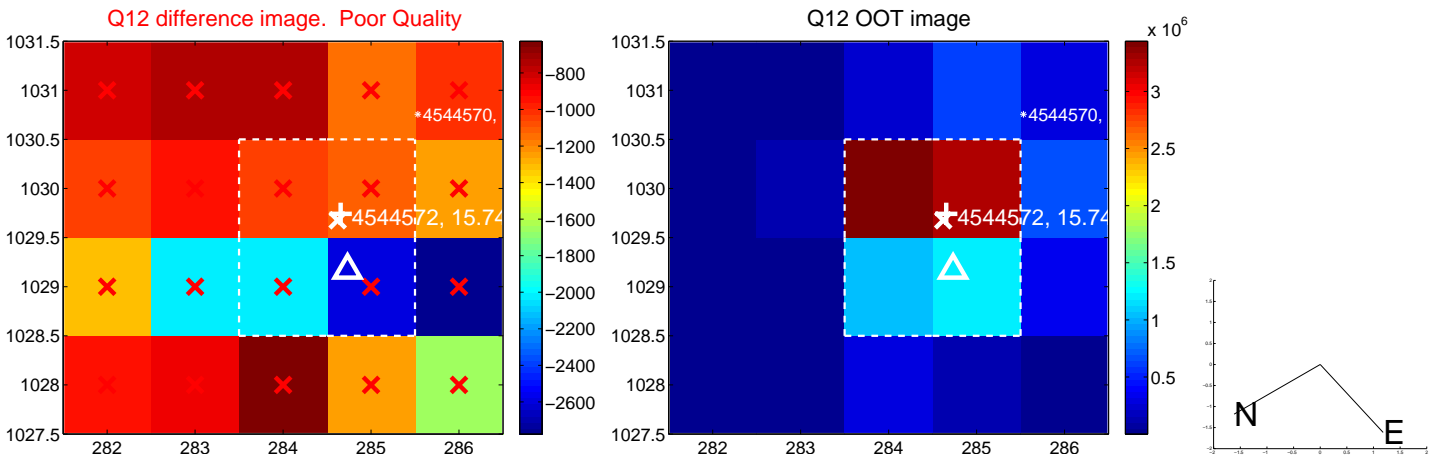
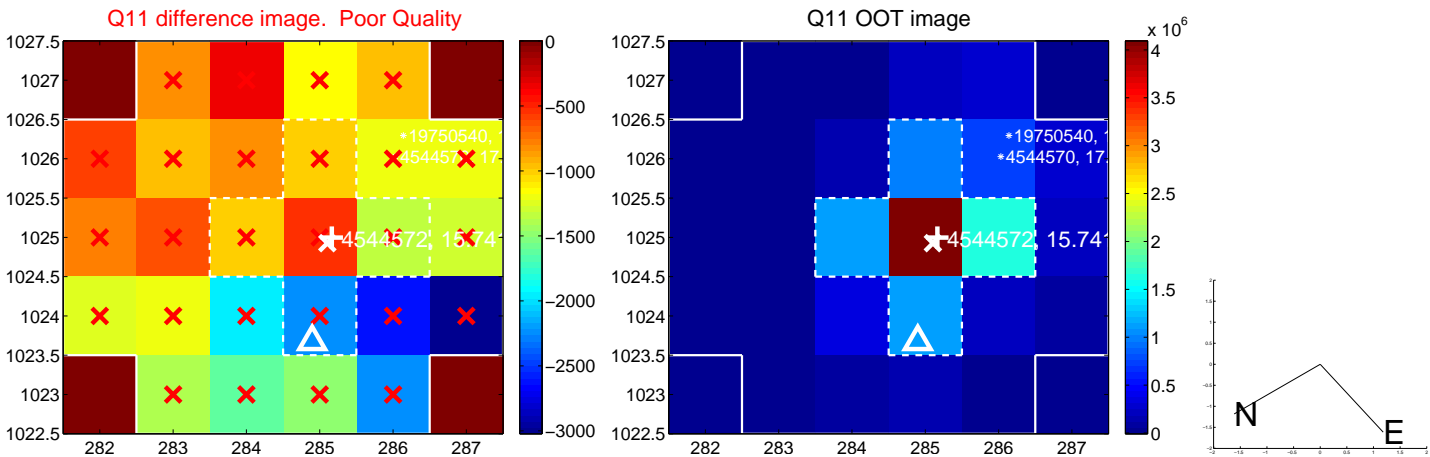
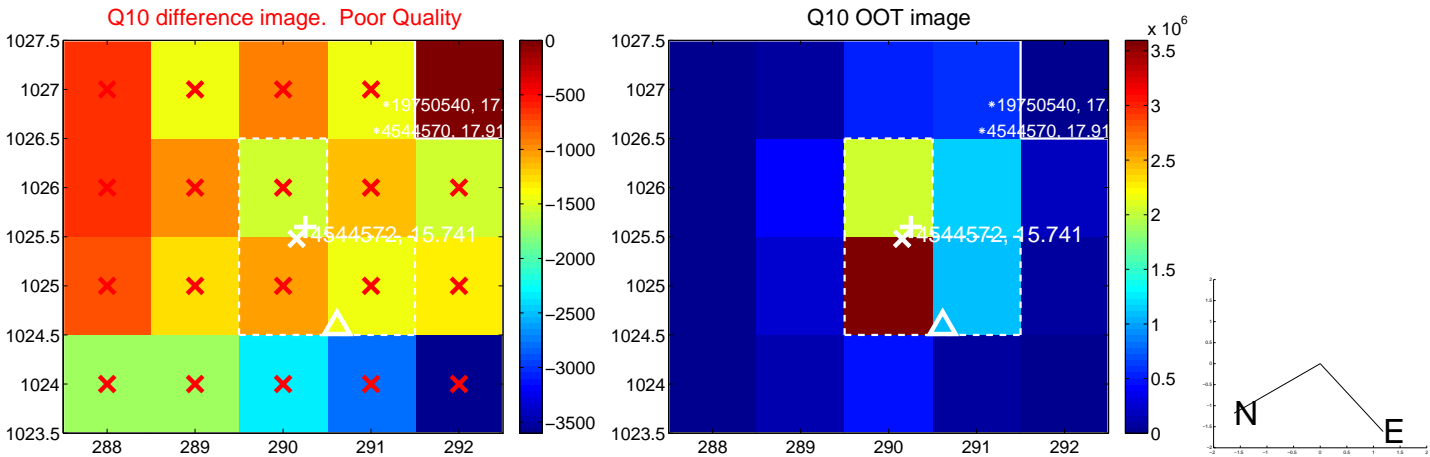
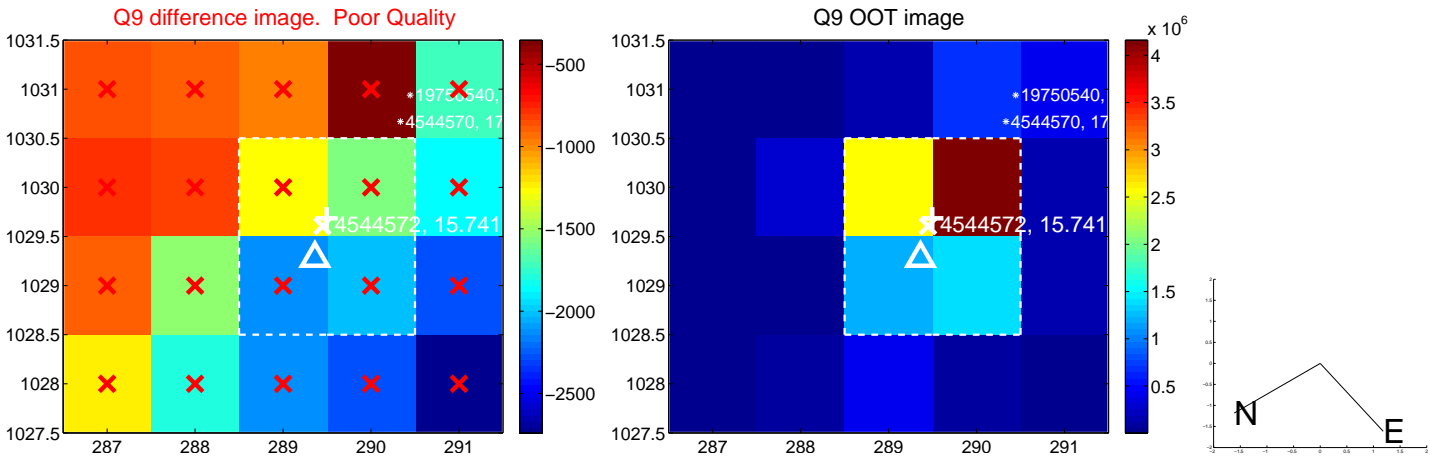


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



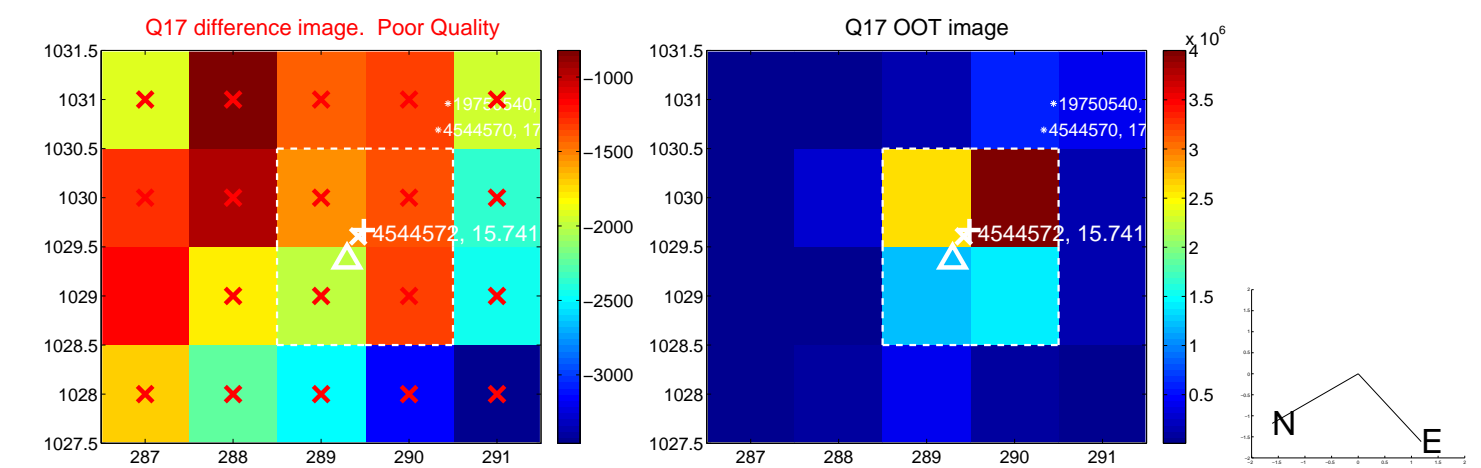


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

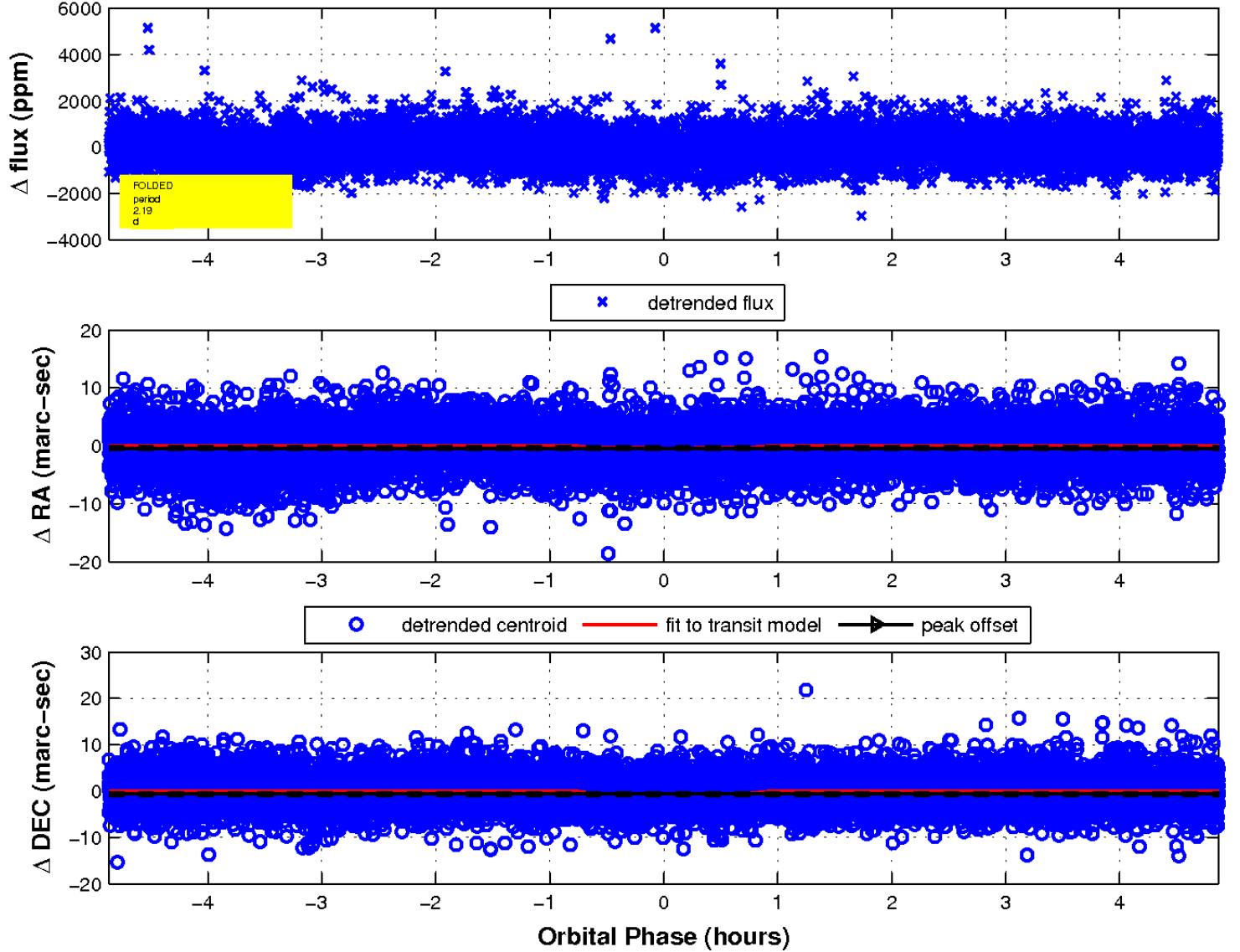




white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



fluxWeightedCentroids, Planet 3 of 3



UKIRT Image

Declination

