

# KIC 007023872

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
007023872-01	OBS	No	0.772815	131.725386	48.6	2.746	11.7	12.4	1.11	6007	0.92	5032.50
007023872-02	OBS	No	0.772737	132.198597	12.8	5.396	8.4	4.8	1.11	6007	0.45	5033.18

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
007023872-01	OBS	FP	0.00	1	0	0	1	LPP_DV—EPHEM_MATCH
007023872-02	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—SAME_NTL_PERIOD—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.

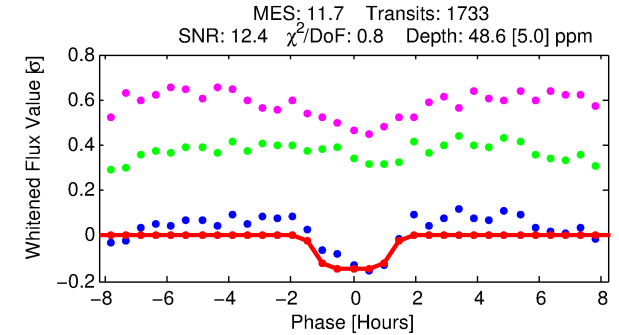
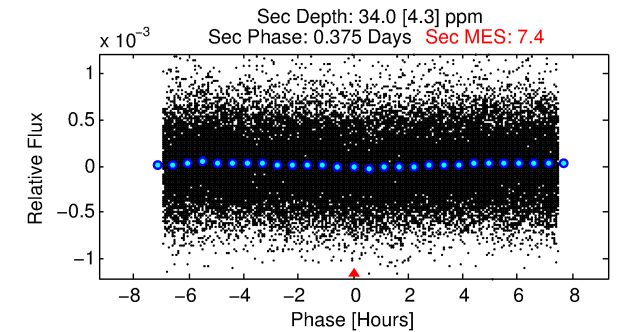
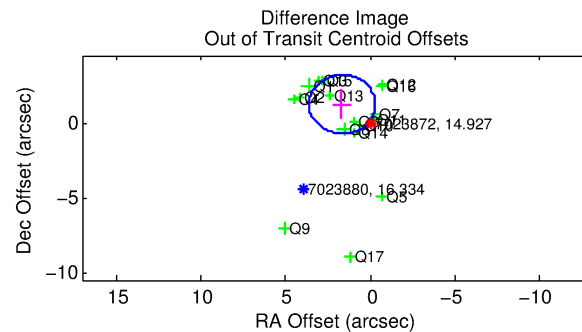
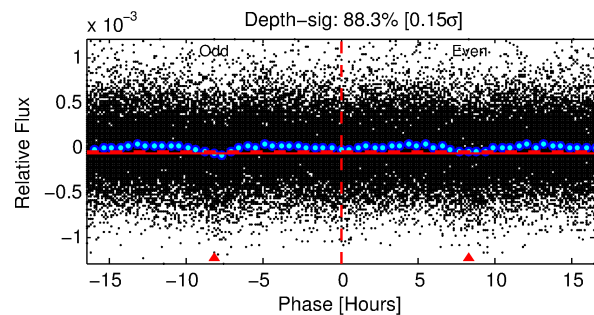
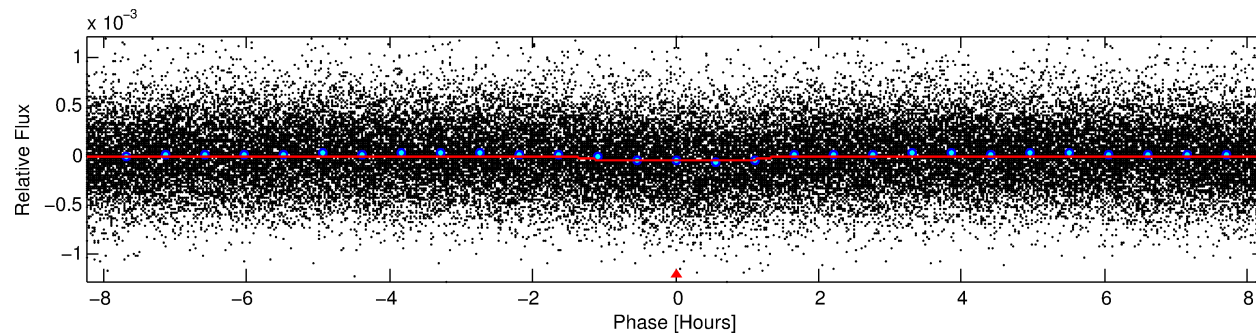
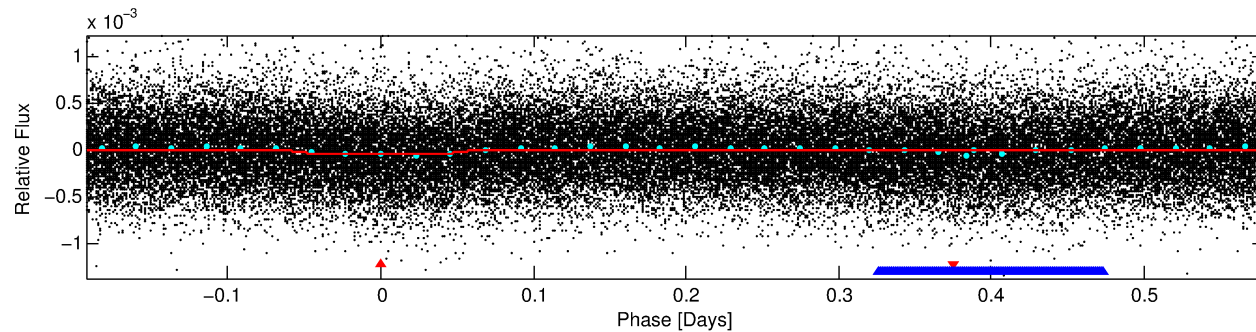
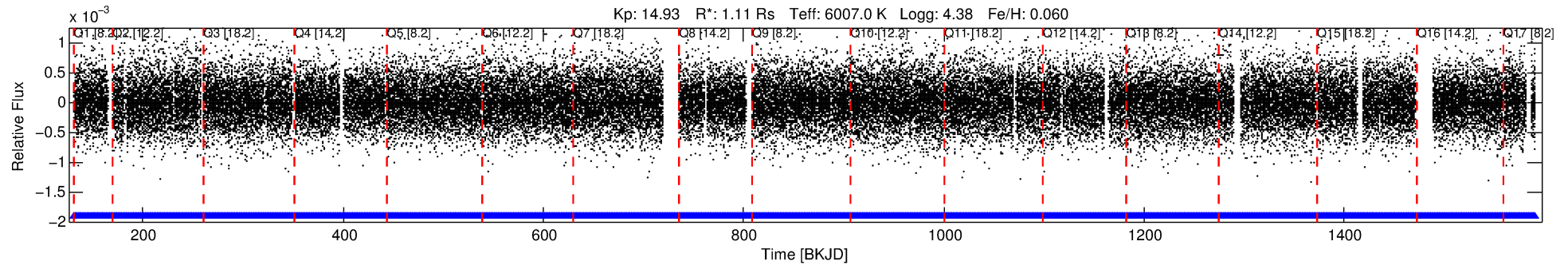
## Ephemeris Match Information For 007023872-01

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	$\sigma_P$	$\sigma_T$
007023872-01	7023872	007023917-pri	7023917	1:1	52.0	5	12	10.12	14.93	1500.00	Direct-PRF	0	3.55	1.38

**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: 7023872 Candidate: 1 of 2 Period: 0.773 d



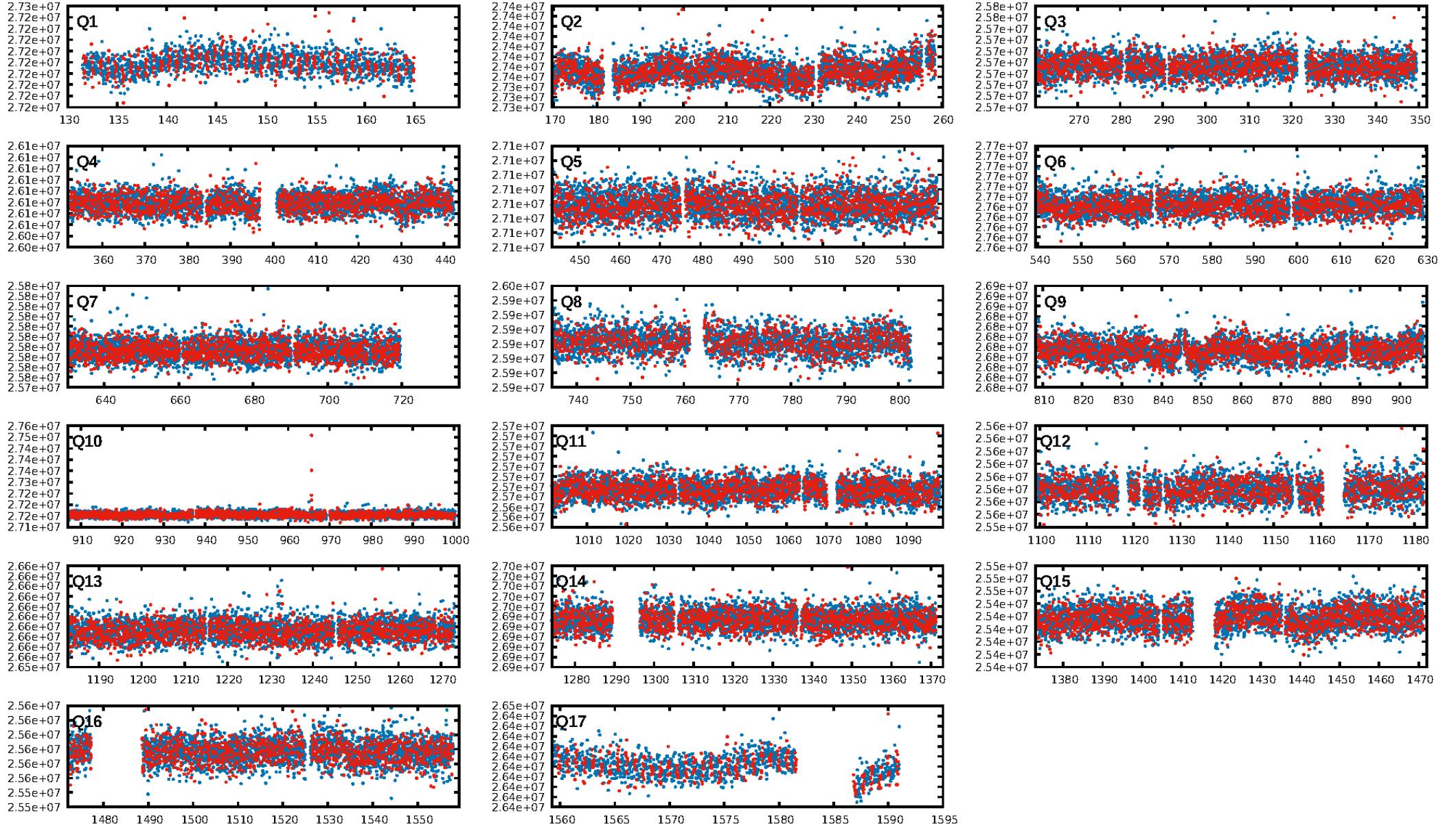
## DV Fit Results:

Period = 0.77282 [0.00001] d  
Epoch = 131.7254 [0.0029] BKJD  
Rp/R\* = 0.0076 [0.0044]  
a/R\* = 1.35 [1.81]  
b = 0.90 [0.63]  
Seff = 5032.50 [2079.09]  
Teff = 2148 [222] K  
Rp = 0.92 [0.61] Re  
a = 0.0169 [0.0045] AU  
Ag = 6.36 [7.91] [0.68 $\sigma$ ]  
Teffp = 5274 [1570] K [1.97 $\sigma$ ]

## DV Diagnostic Results:

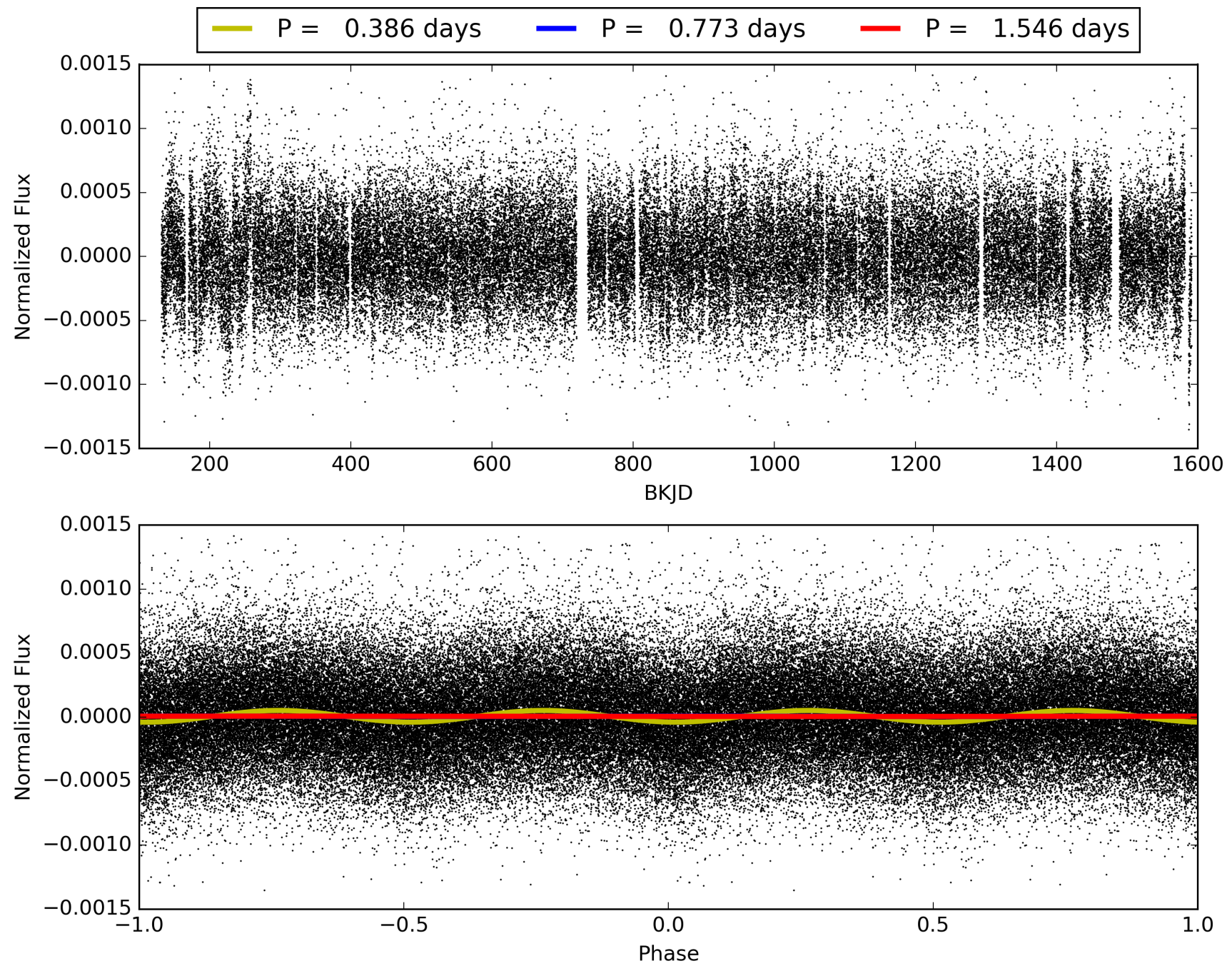
ShortPeriod-sig: 0.0% [0.00 $\sigma$ ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: N/A  
RollingBand-fgt: 1.00 [1654/1654]  
GhostDiagnostic-chr: 0.3509  
Centroid-sig: 0.2%  
Centroid-so: 1.045 arcsec [1.07 $\sigma$ ]  
OotOffset-rm: 2.079 arcsec [3.17 $\sigma$ ]  
KicOffset-rm: 1.950 arcsec [3.43 $\sigma$ ]  
OotOffset-st: 4/4/4/5 [17]  
KicOffset-st: 4/4/4/5 [17]  
DiffImageQuality-fgm: 0.06 [1/17]  
DiffImageOverlap-fno: 0.00 [0/17]

# TCE 007023872-01, PDC Light Curves



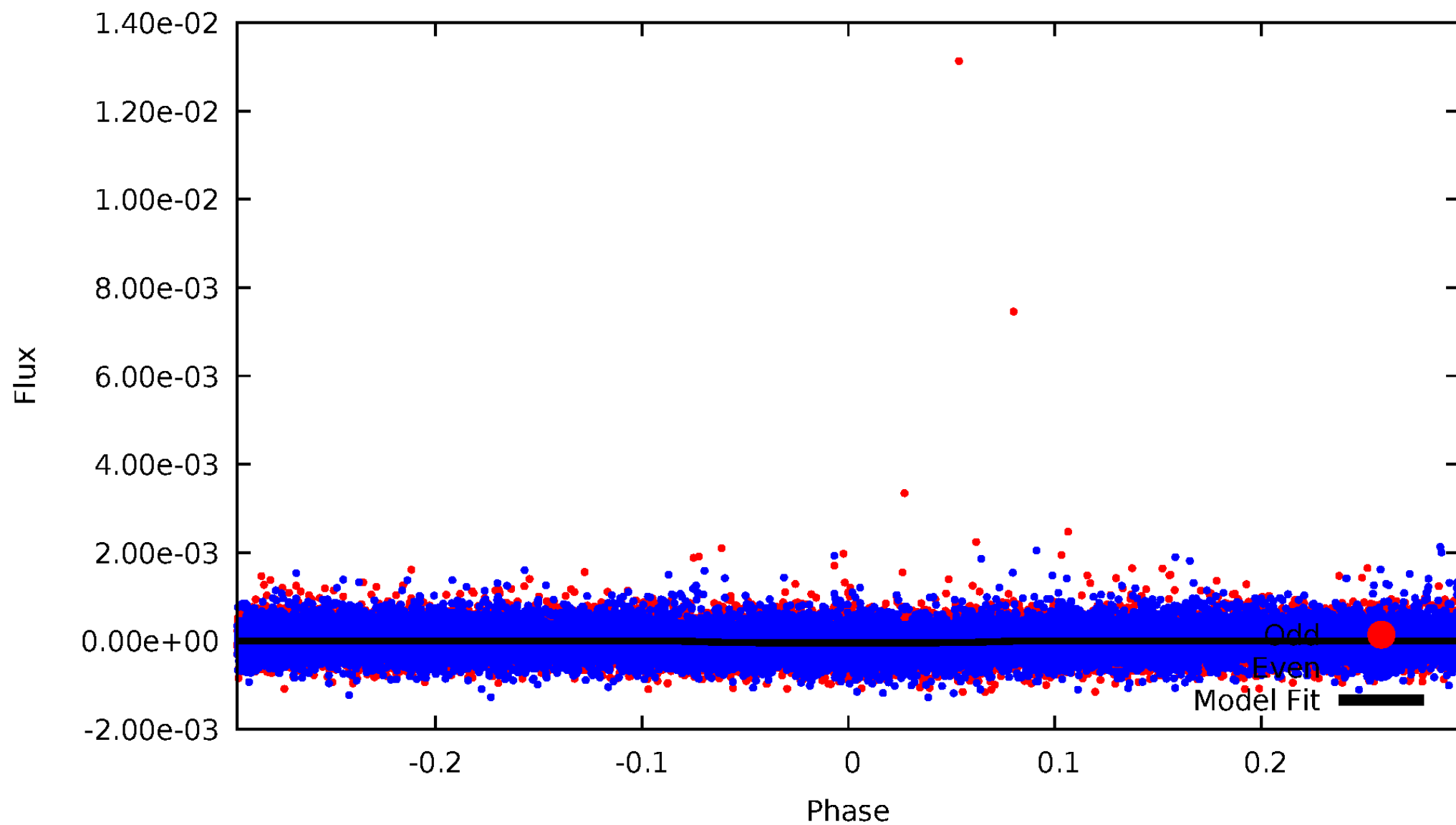


TCE 007023872-01



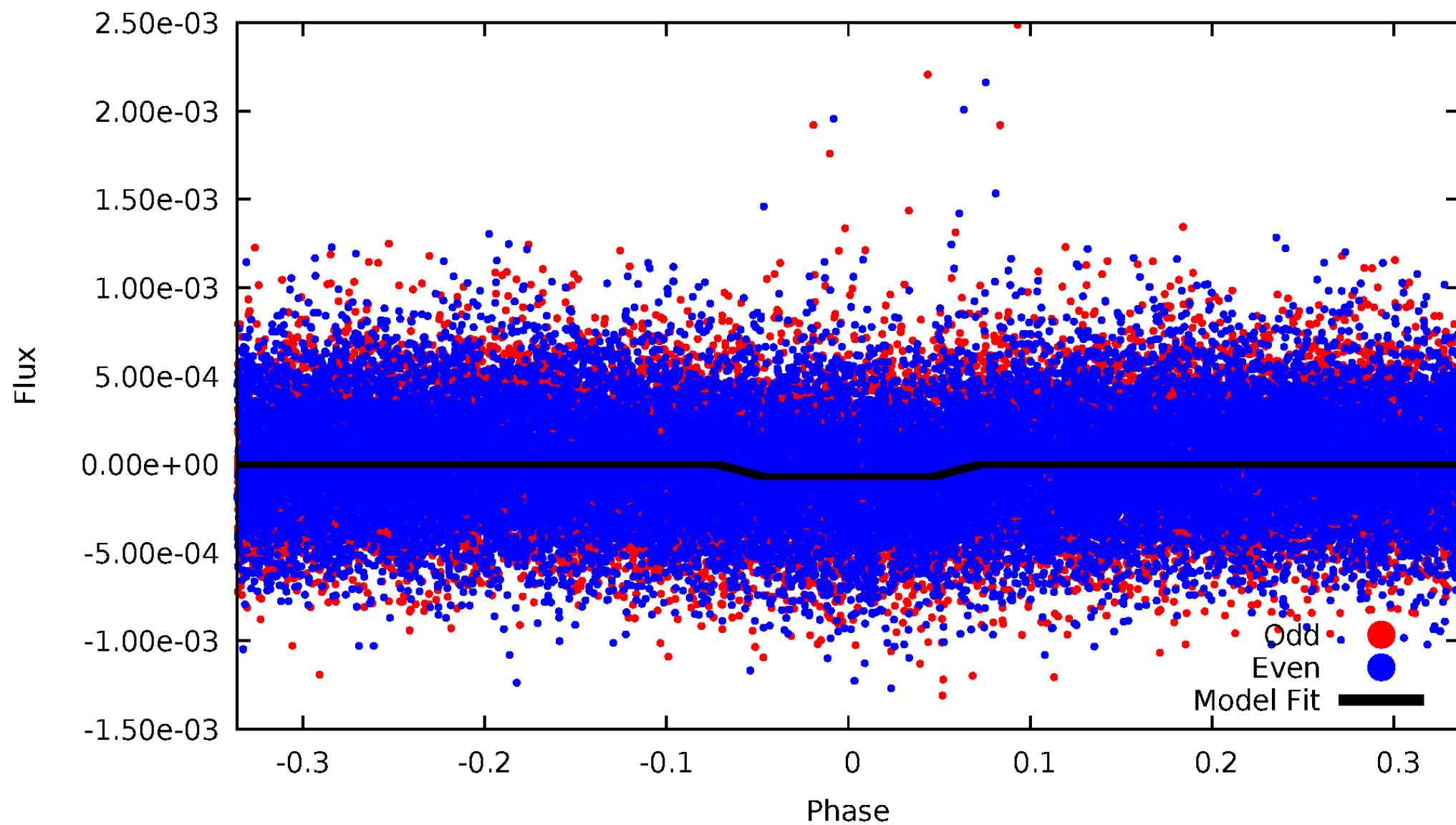
# DV Odd/Even

TCE 007023872-01



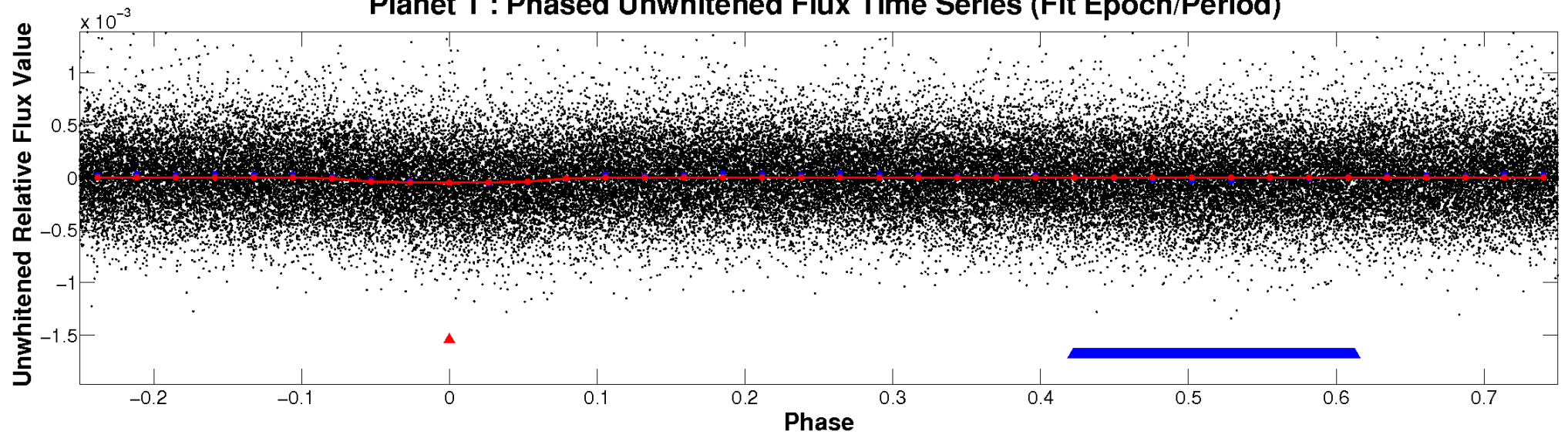
# ALT Odd/Even

TCE 007023872-01

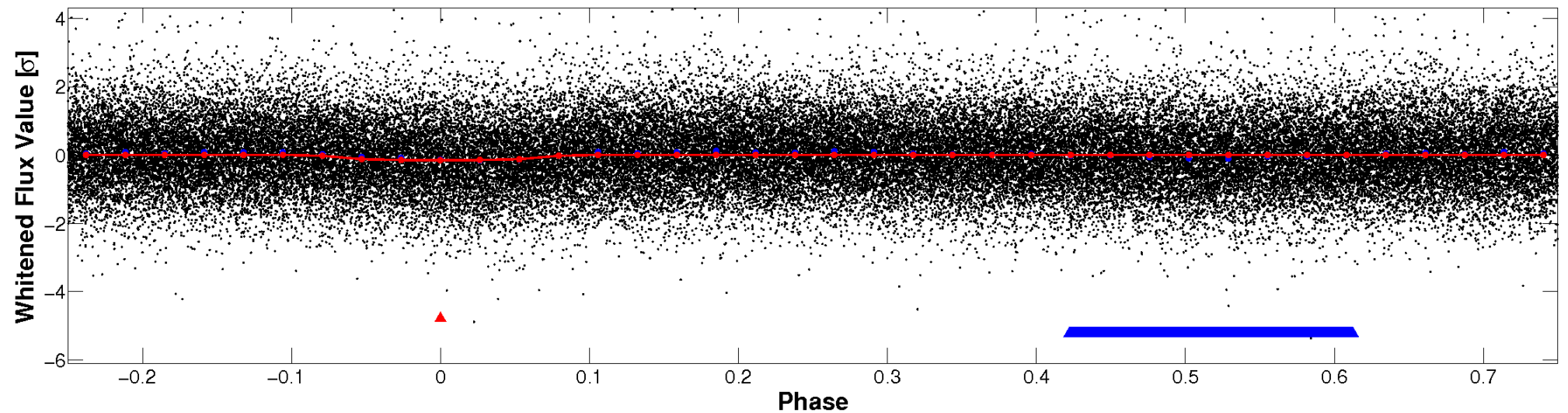


# Non-Whitened Vs. Whitened Light Curve

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



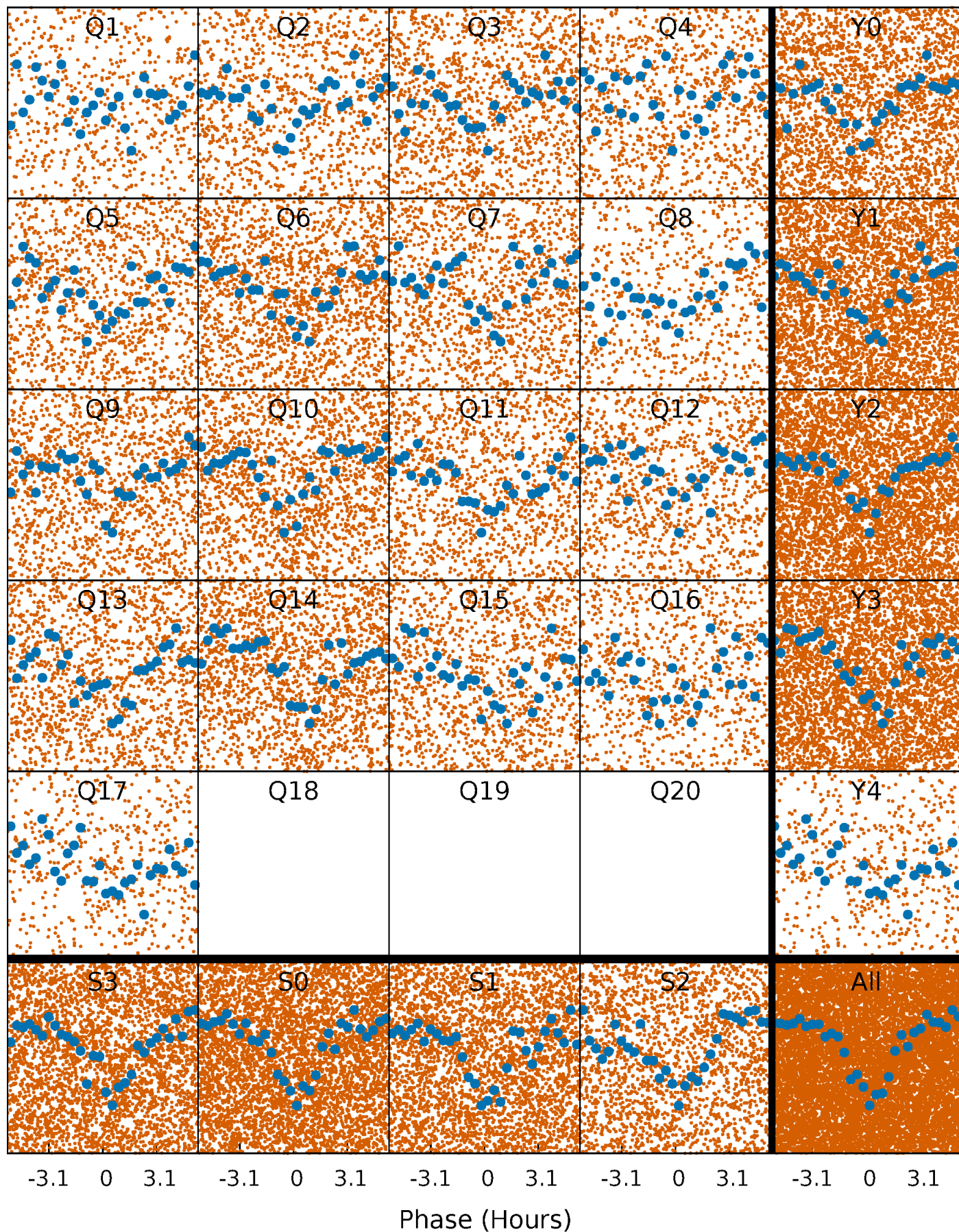
**Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)**





# PDC Quarter-Phased Transit Curves

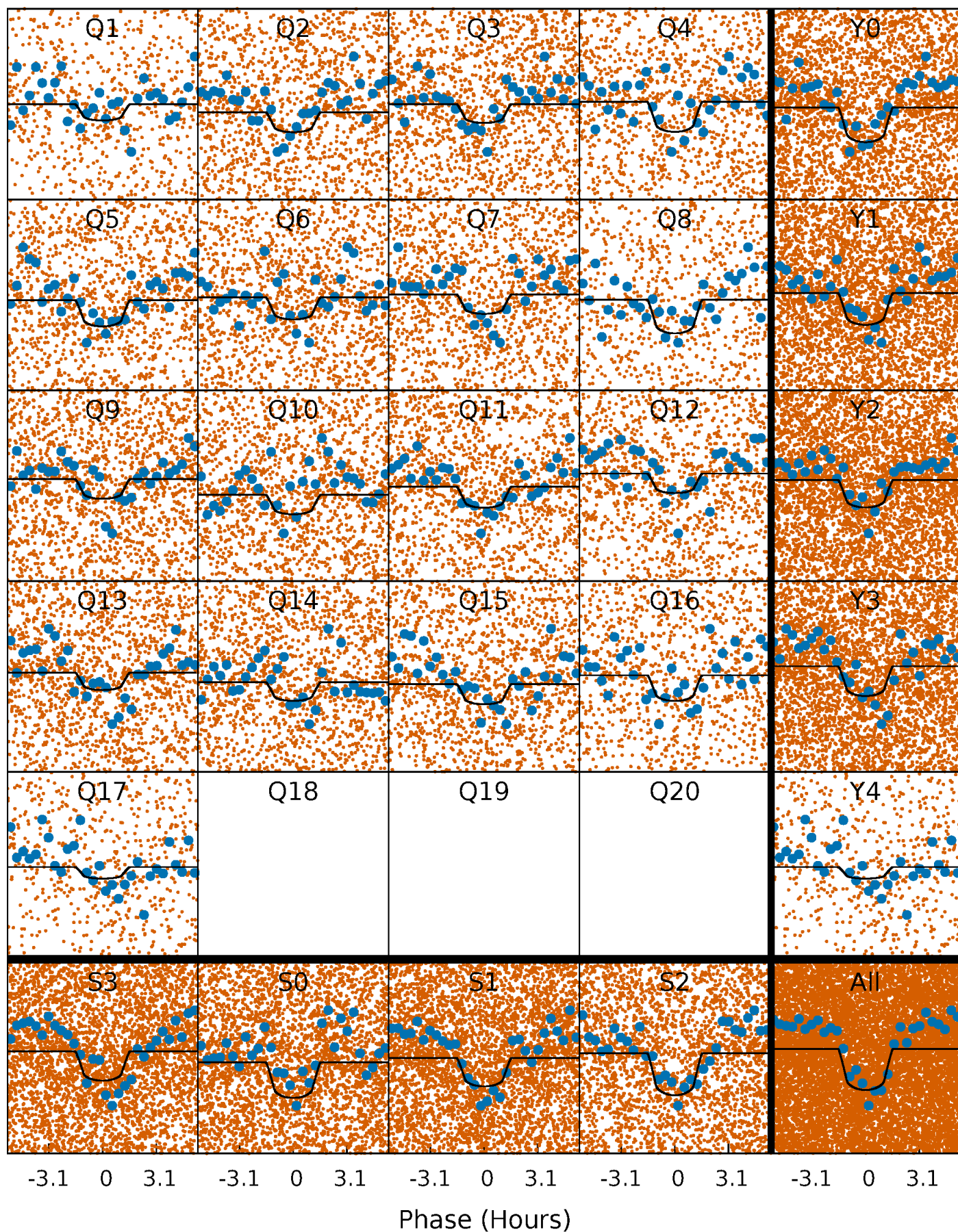
TCE 007023872-01 P= 0.772815 Days  $T_0=131.725386$  (BKJD)





# DV Quarter-Phased Transit Curves

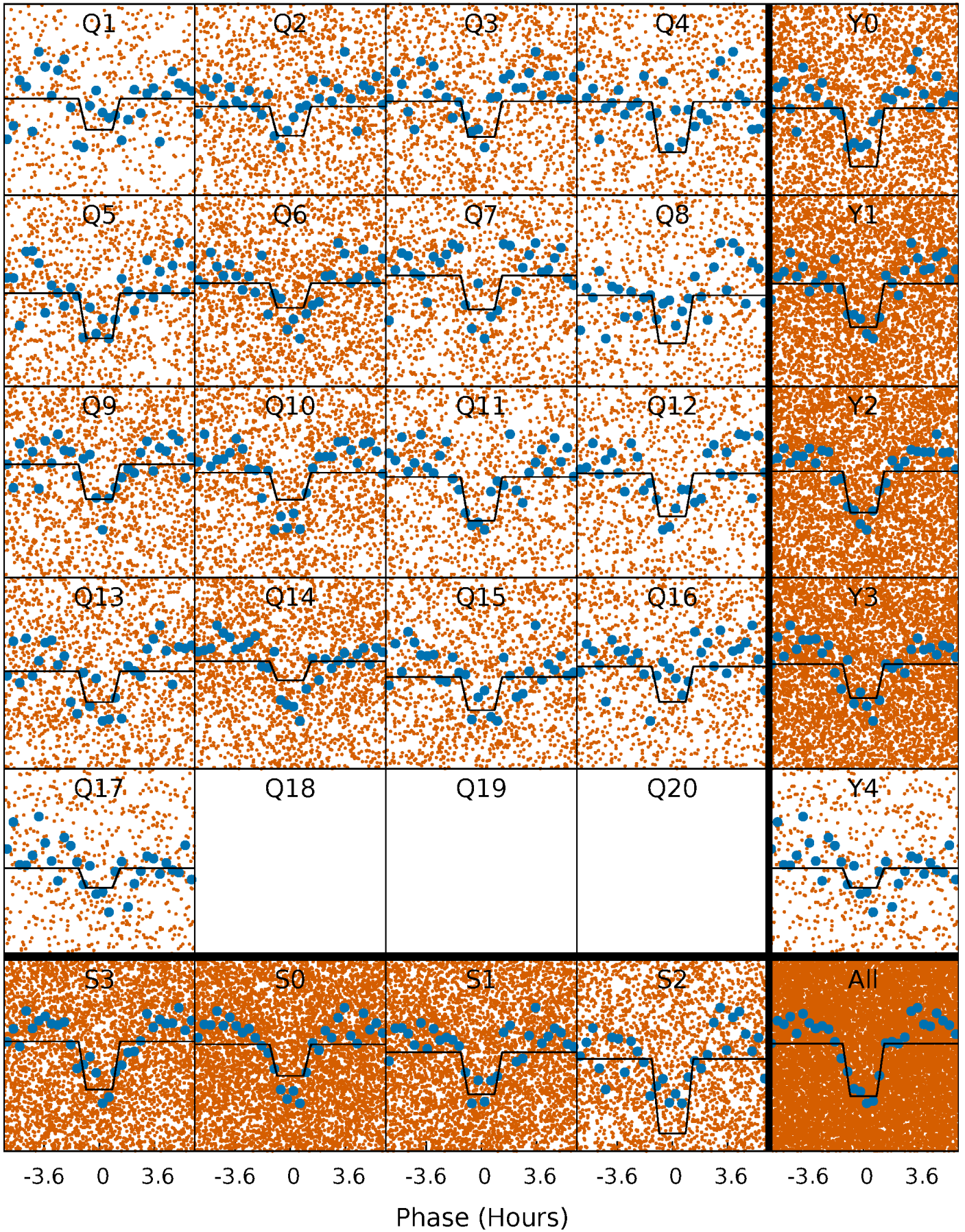
TCE 007023872-01 P= 0.772815 Days  $T_0=131.725386$  (BKJD)





# Alt. Detrend Quarter-Phased Transit Curves

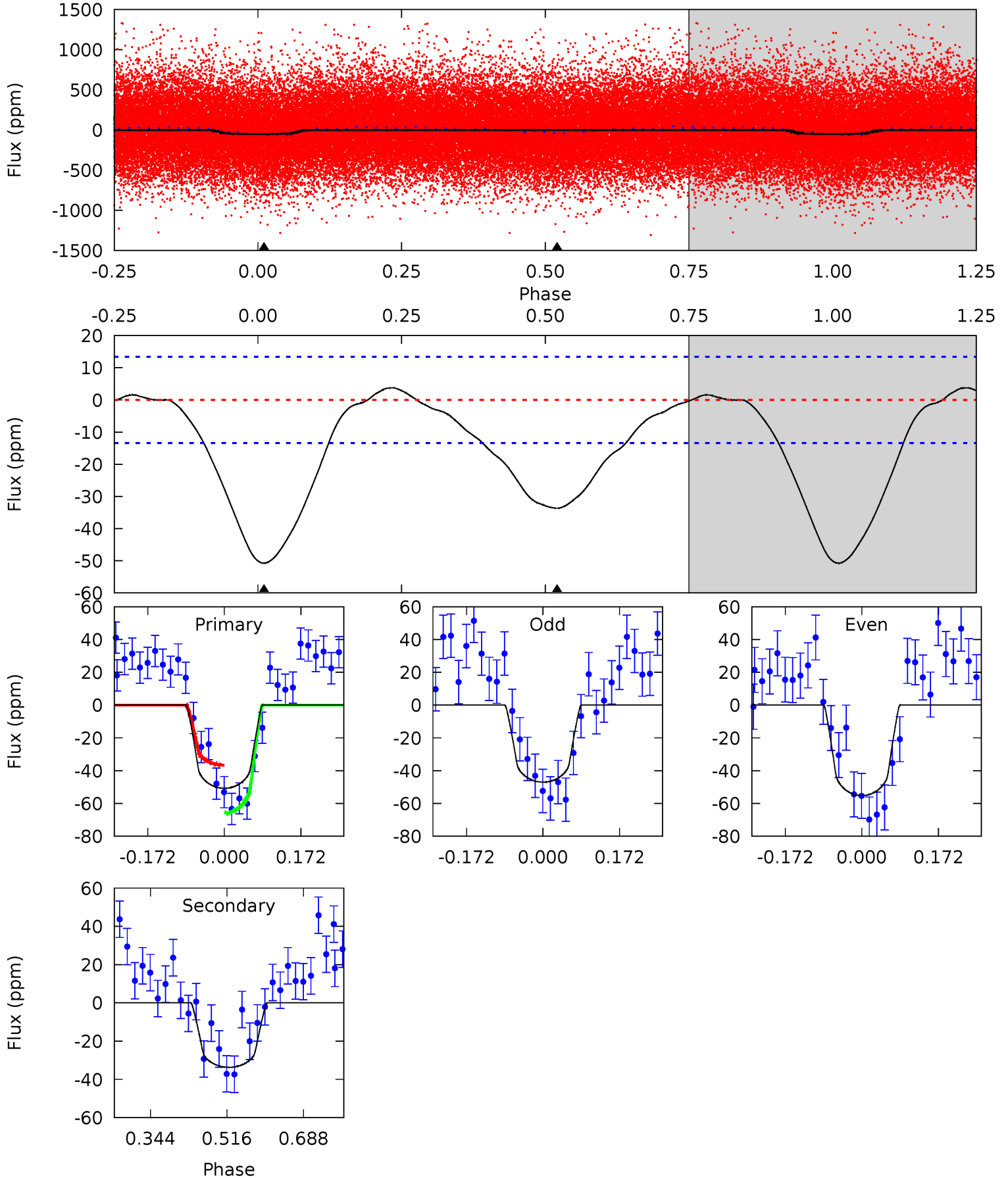
TCE 007023872-01 P= 0.772825 Days  $T_0=131.725251$  (BKJD)



# DV Model-Shift Uniqueness Test

007023872-01, P = 0.772815 Days, E = 130.952571 Days

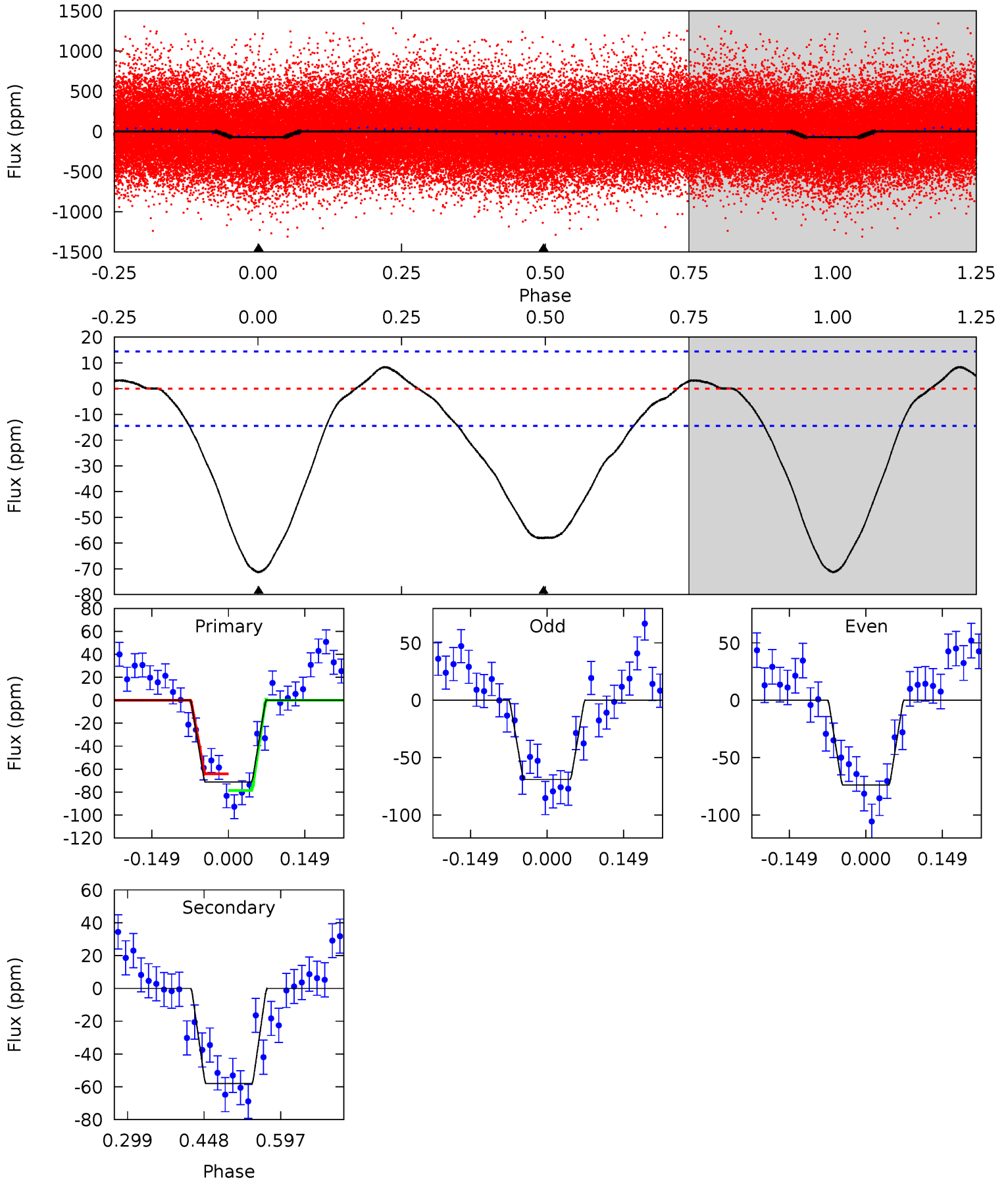
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
16.9	11.2	0	0	4.45	1.37	0.85	16.9	16.9	11.2	11.2	1.36	0.93	0.07	4.84



# Alt Model-Shift Uniqueness Test

007023872-01, P = 0.772825 Days, E = 130.952426 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
22.1	18.0	0	0	4.48	1.44	1.78	22.1	22.1	18.0	18.0	0.73	1.01	0.10	2.24





### Stellar Parameters For KIC 007023872

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$6007^{+181}_{-217}$	$4.379^{+0.090}_{-0.210}$	$0.060^{+0.250}_{-0.300}$	$1.108^{+0.356}_{-0.152}$	$1.072^{+0.145}_{-0.145}$	$1.110^{+0.528}_{-0.573}$
	+3%/-4%	+2%/-5%	+417%/-500%	+32%/-14%	+14%/-14%	+48%/-52%
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 007023872-01 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-34 \pm 3$	$0.98^{+0.60}_{-0.51}$	$3036^{+236}_{-167}$	$5158^{+2222}_{-951}$	$5.408^{+18.383}_{-3.270}$
Alt.	$-58 \pm 3$	$1.07^{+0.56}_{-0.52}$	$3047^{+231}_{-181}$	$5611^{+2260}_{-930}$	$7.676^{+21.346}_{-4.264}$

$T_{max}$  = 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

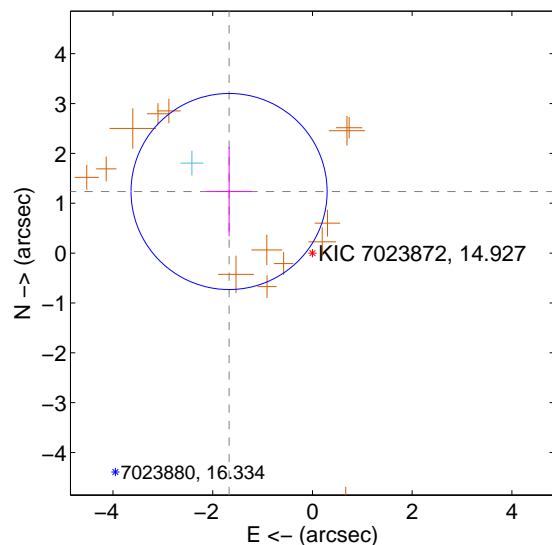
Supplemental centroid analysis for 007023872-01. Kepler magnitude: 14.93. Transit SNR 12.38

There are 1 quarters with good PRF difference image offsets

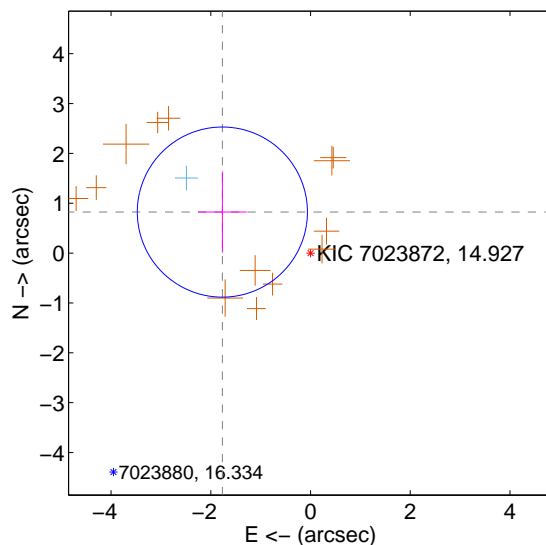
The direct PRF centroid is offset from the target star catalog position by about 0.32 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$2.079 \pm 0.655$	3.17	$1.672 \pm 0.455$	$1.236 \pm 0.897$
PRF-fit source offset from KIC position	$1.950 \pm 0.569$	3.43	$1.768 \pm 0.491$	$0.823 \pm 0.813$
photometric centroid source offset	$1.05 \pm 0.98$	1.07	$-0.77 \pm 0.97$	$0.71 \pm 0.99$

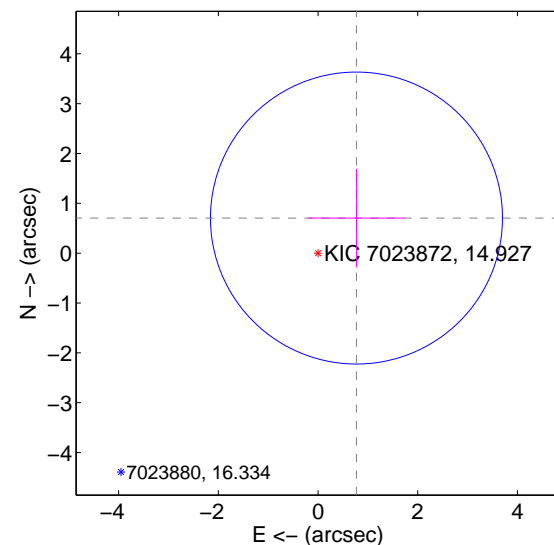
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position

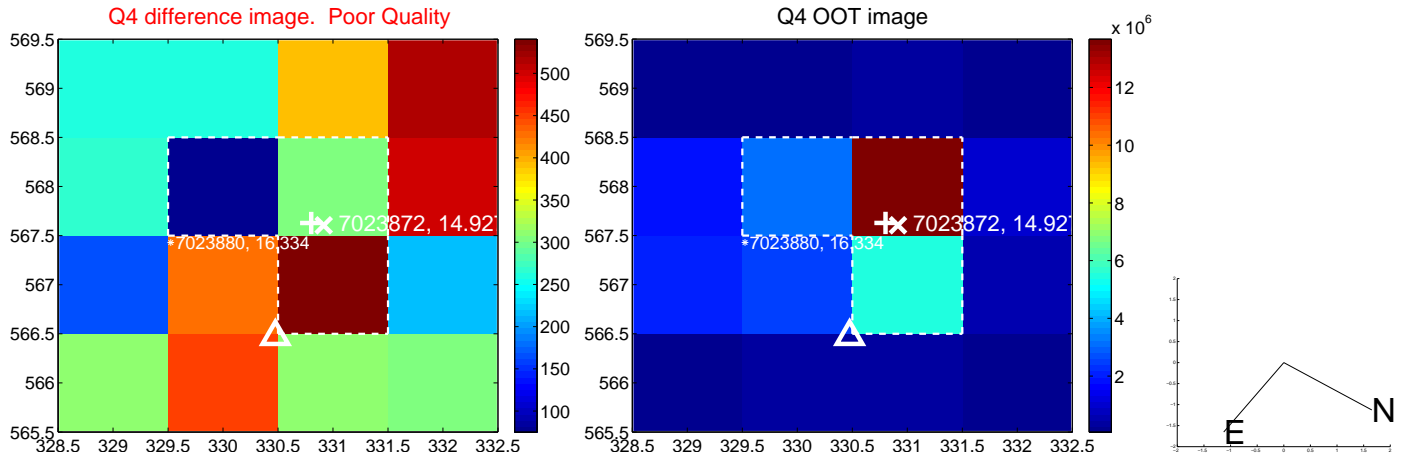
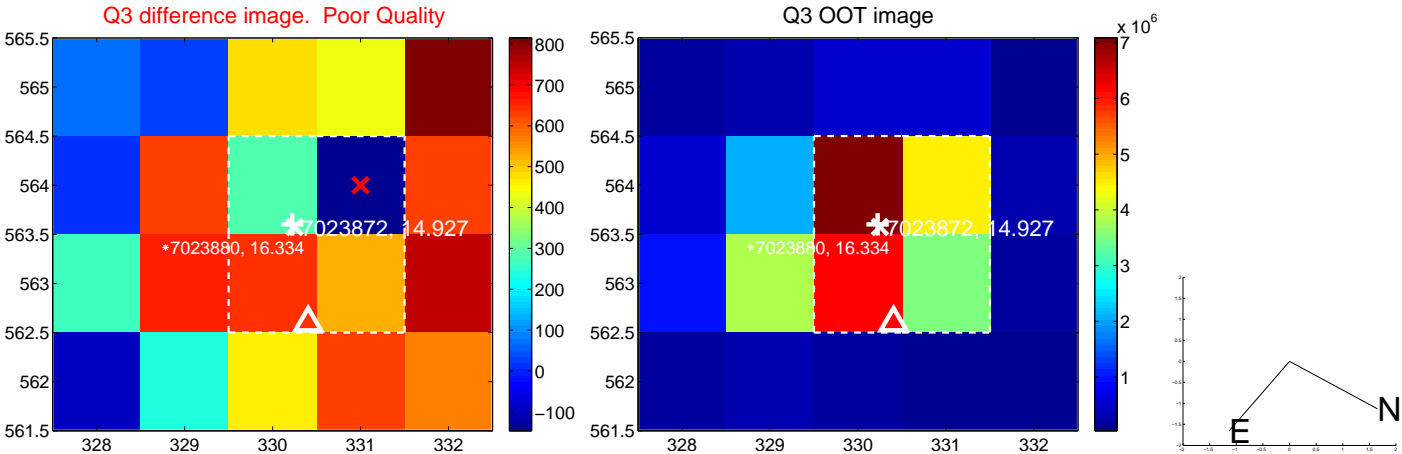
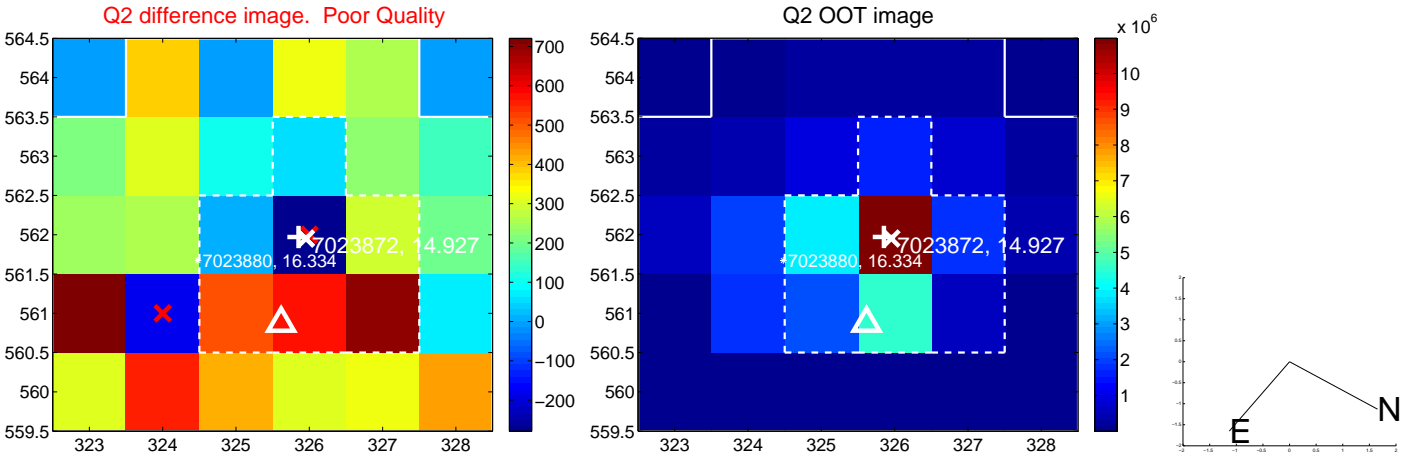
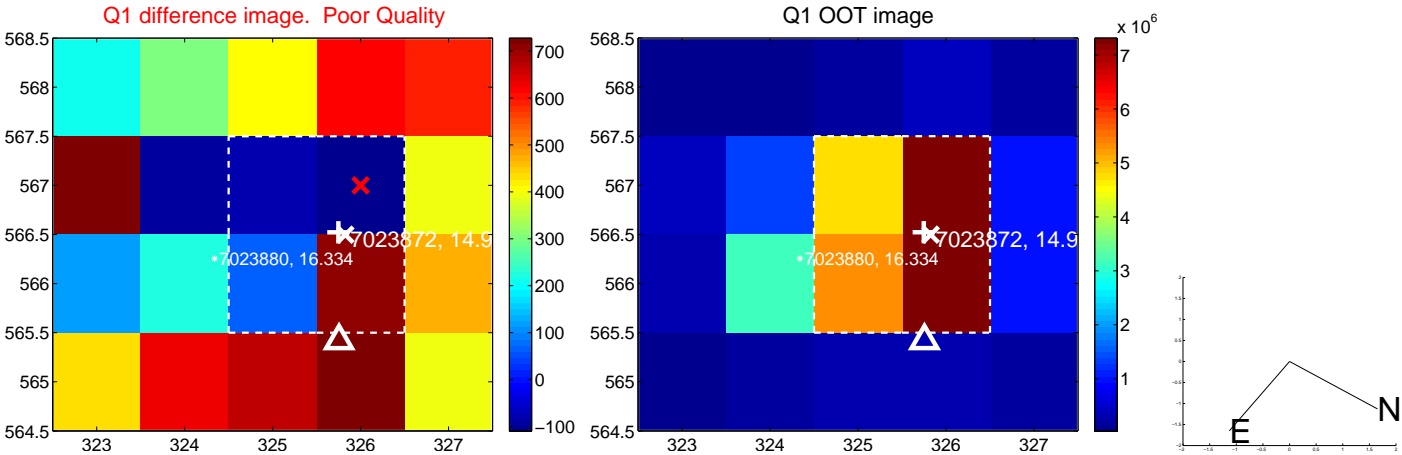


offset from photometric centroids

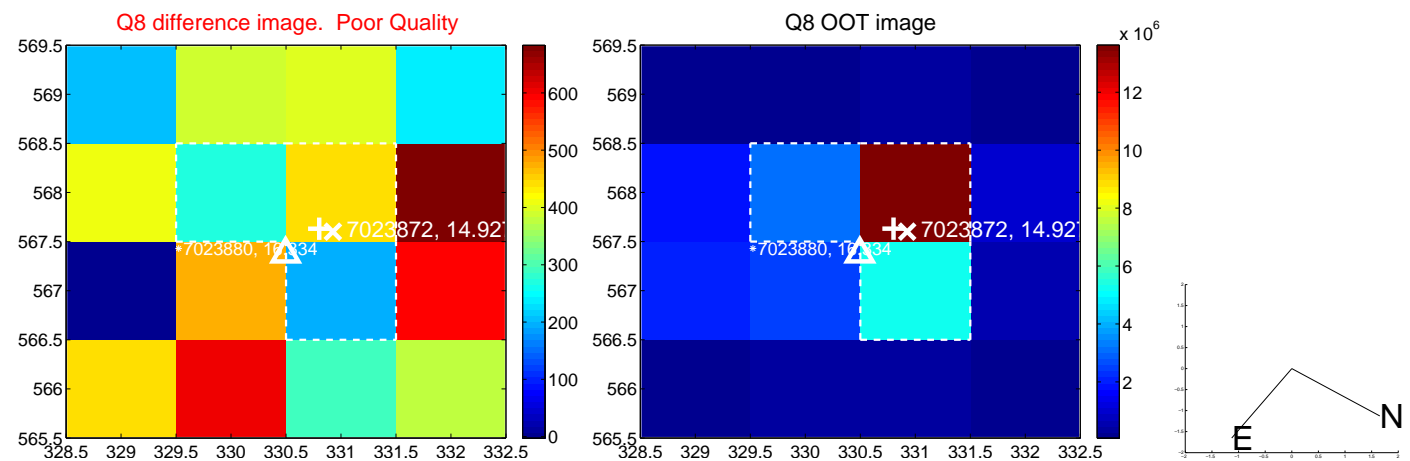
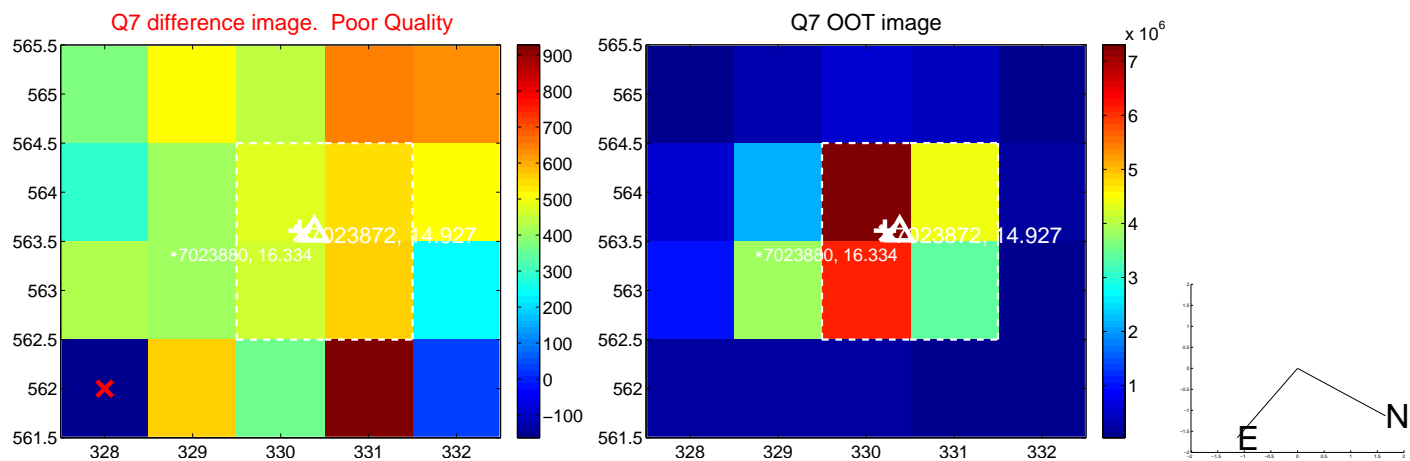
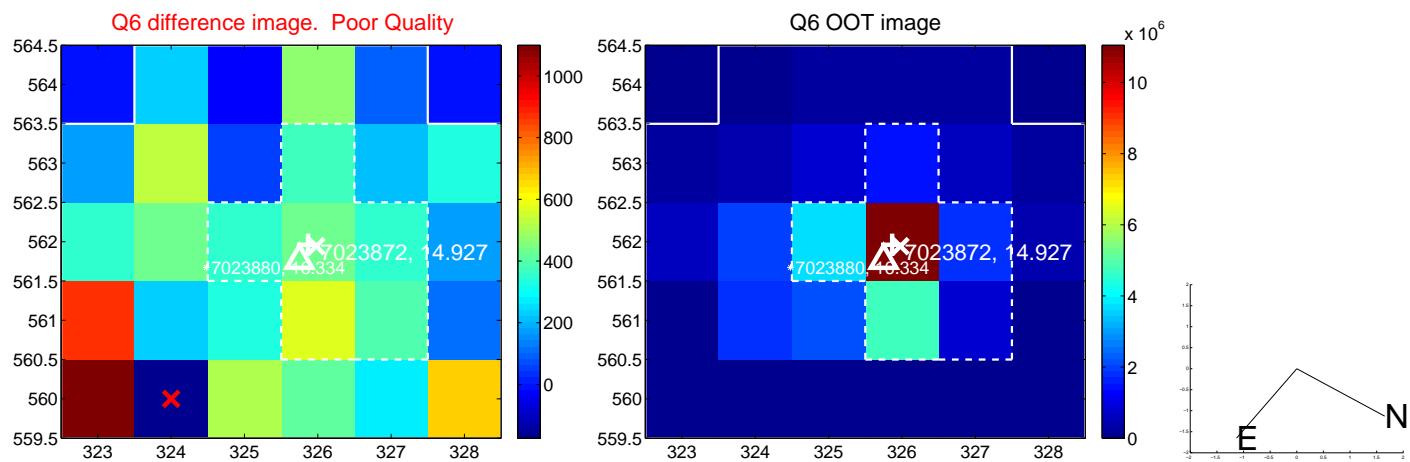
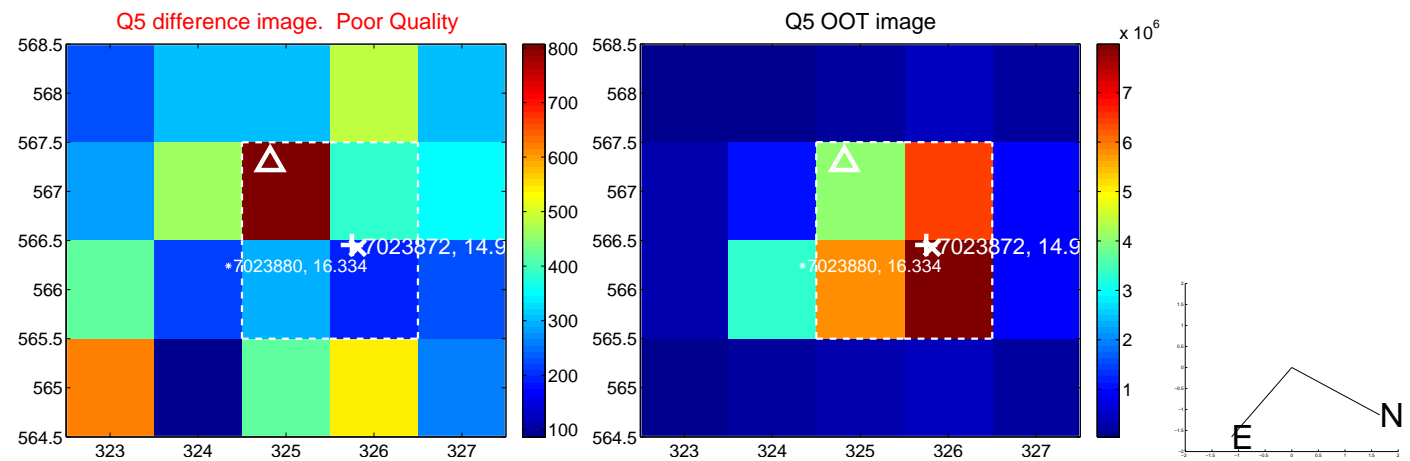


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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

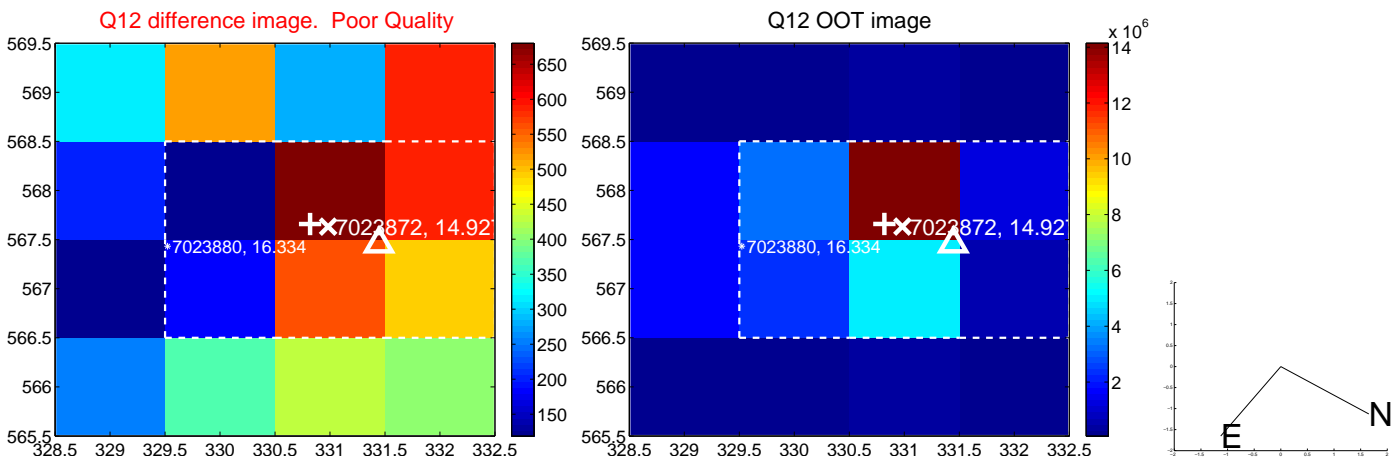
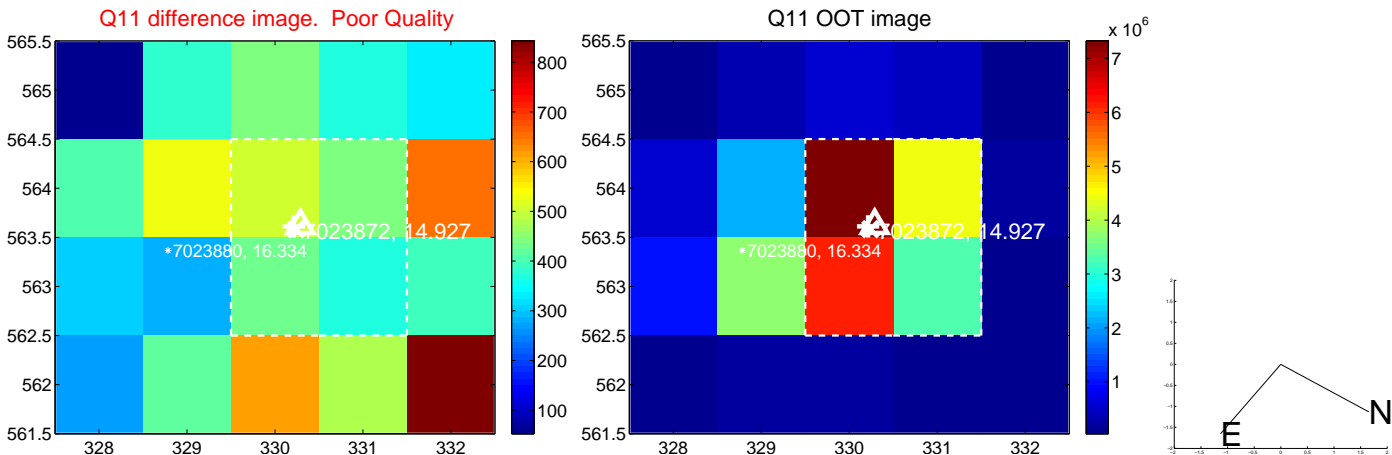
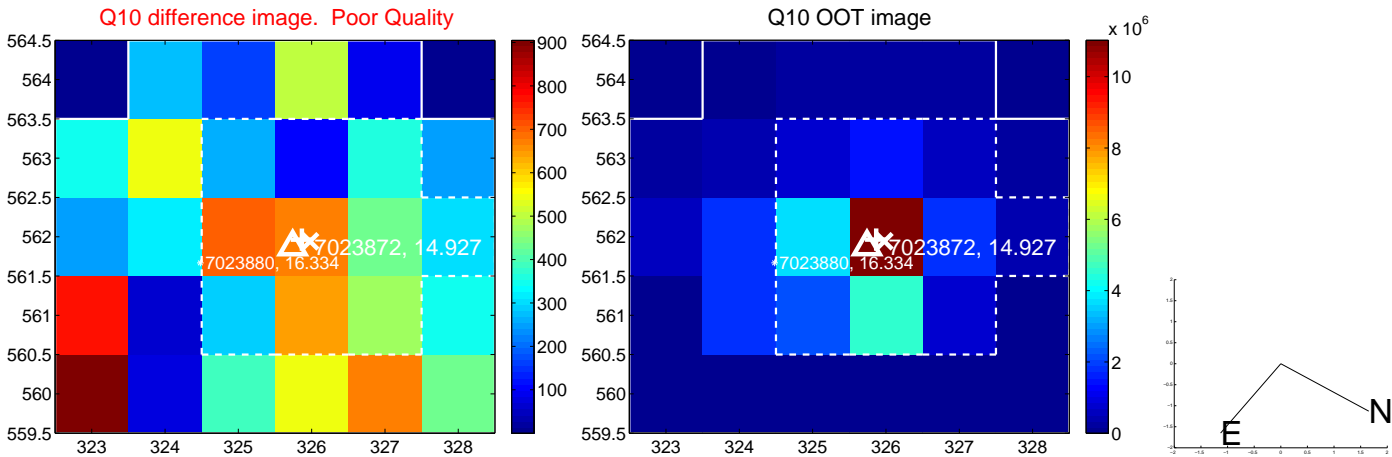
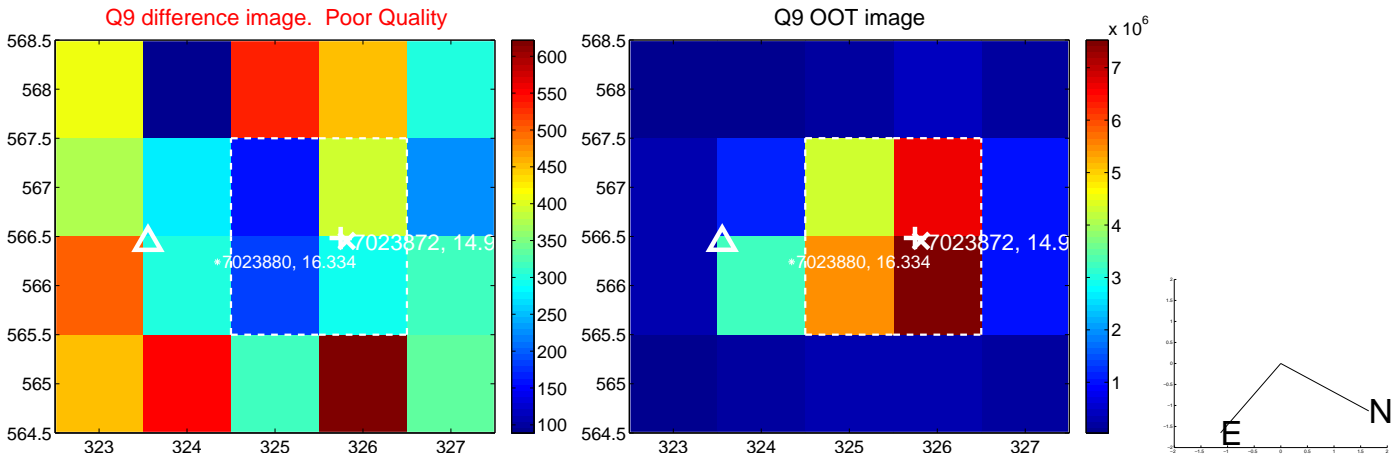


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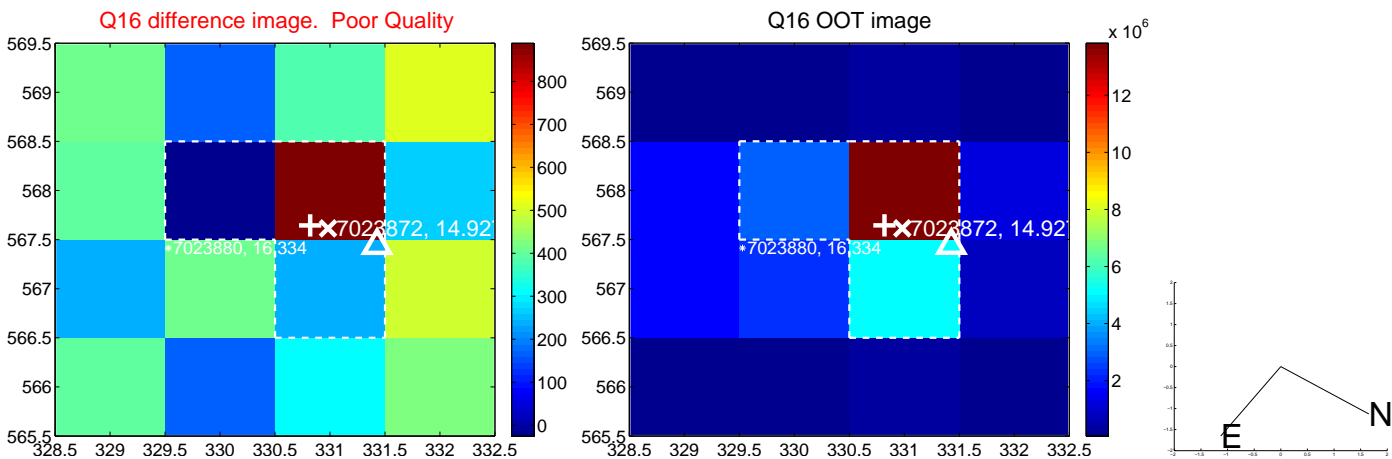
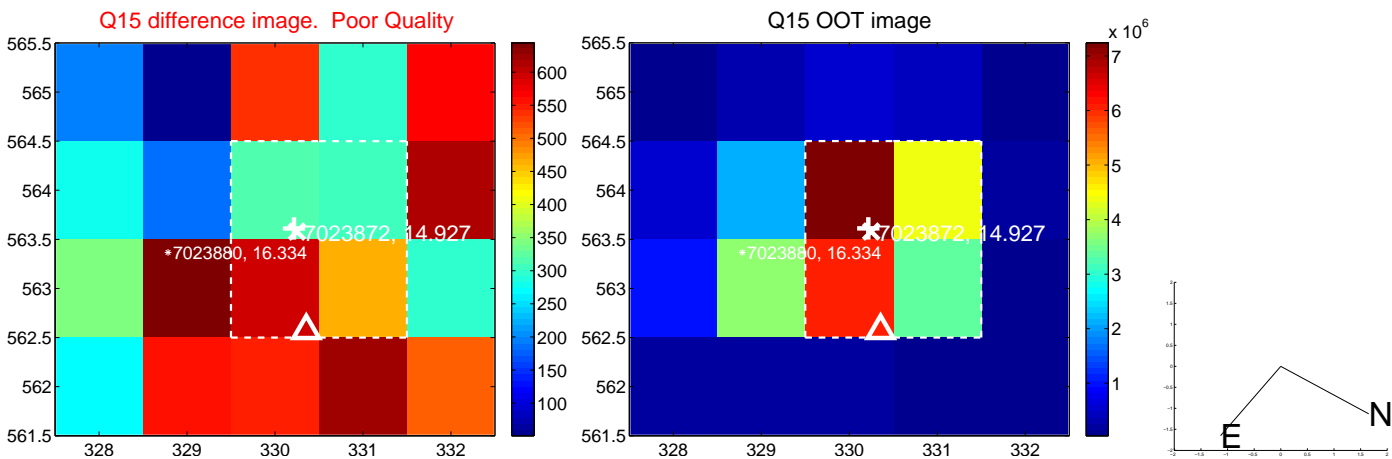
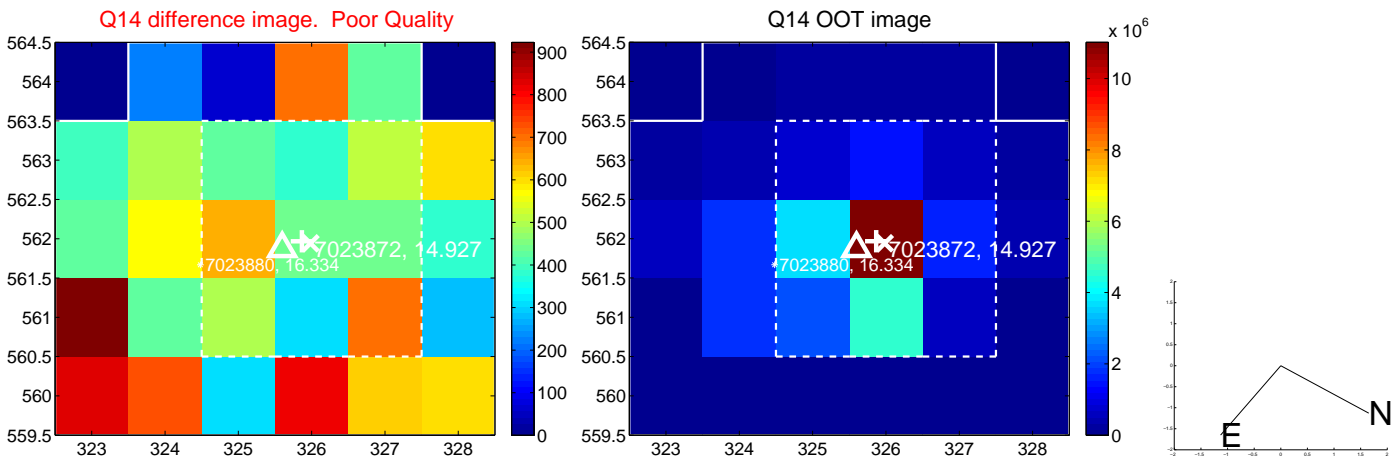
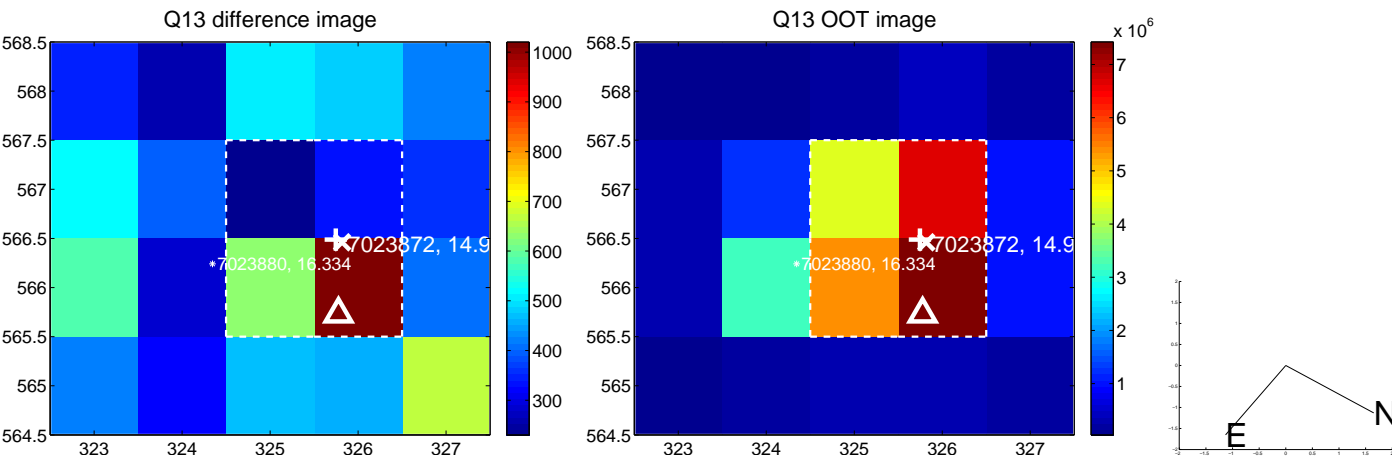




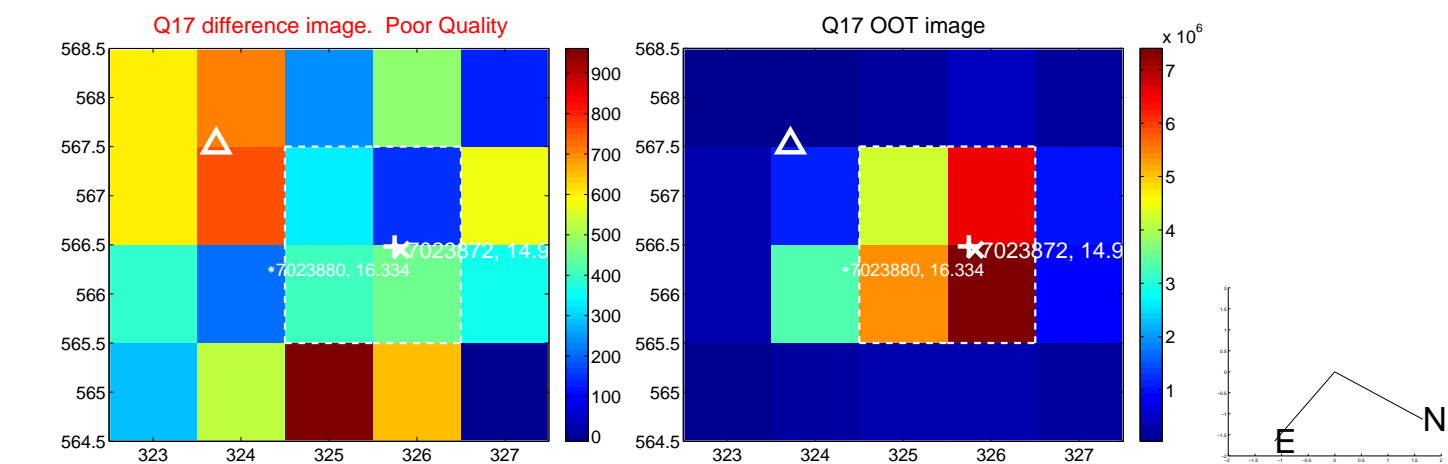
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



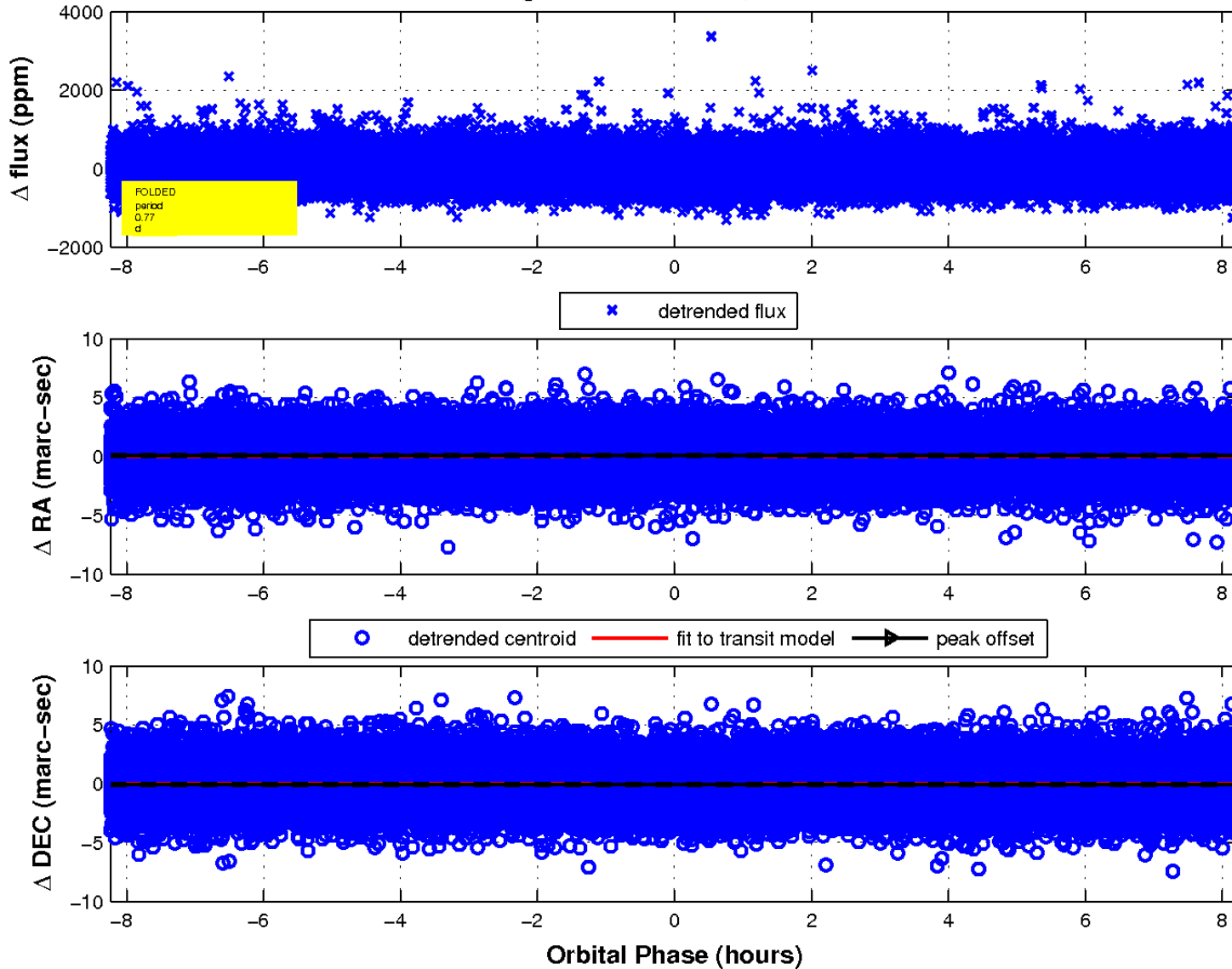
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

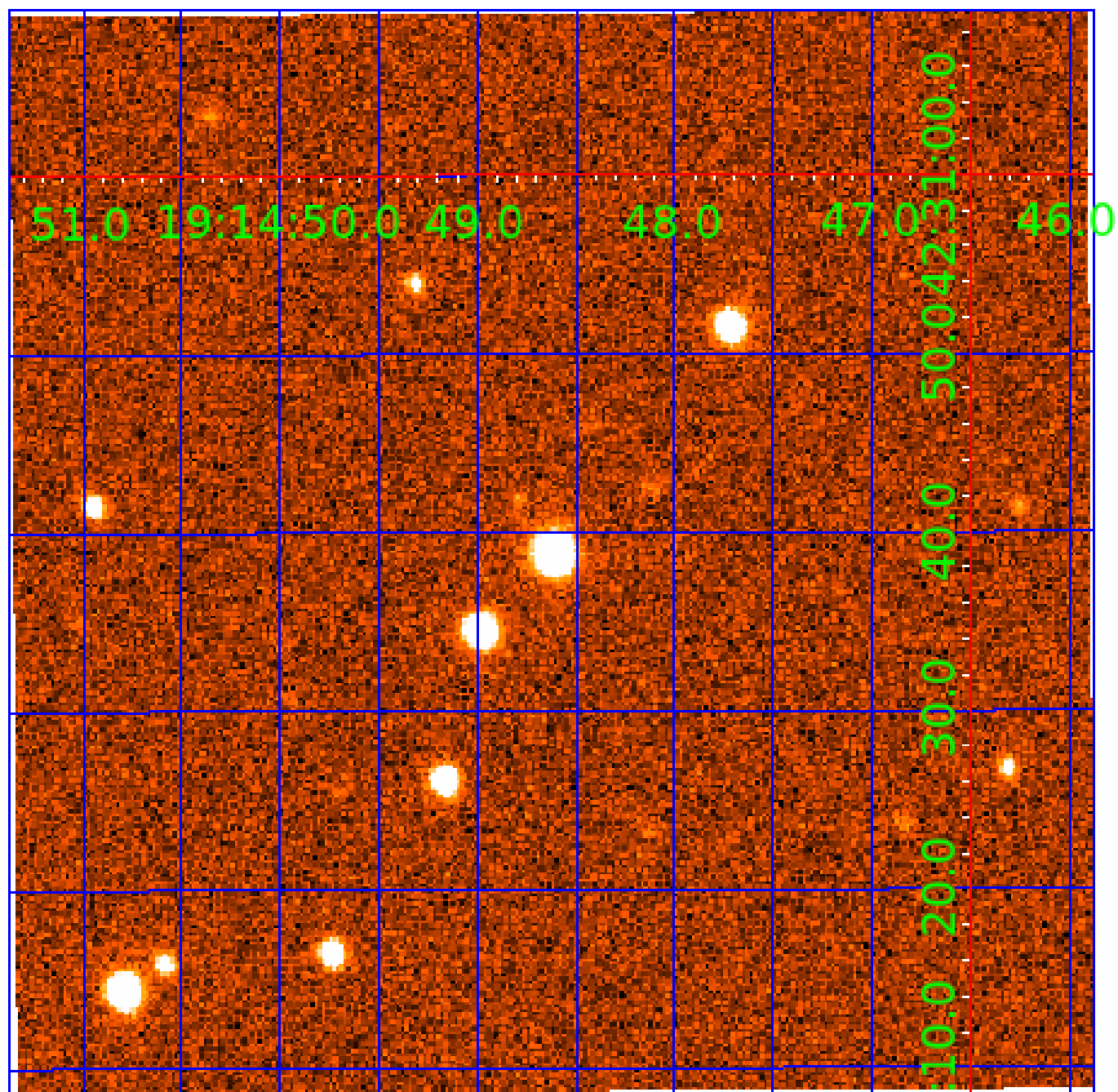


fluxWeightedCentroids, Planet 1 of 2



UKIRT Image

Declination





# KIC 007023872

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
007023872-01	OBS	No	0.772815	131.725386	48.6	2.746	11.7	12.4	1.11	6007	0.92	5032.50
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## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
007023872-01	OBS	FP	0.00	1	0	0	1	LPP_DV—EPHEM_MATCH
007023872-02	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—SAME_NTL_PERIOD—CENT_FEW_DIFS

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

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

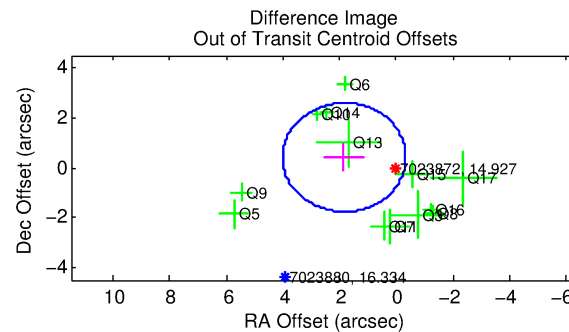
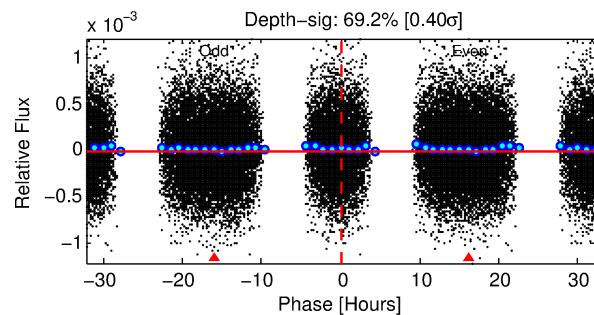
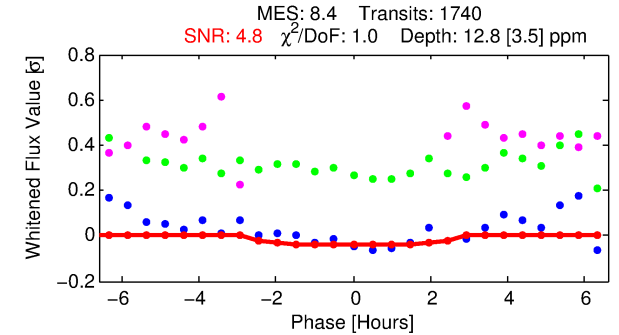
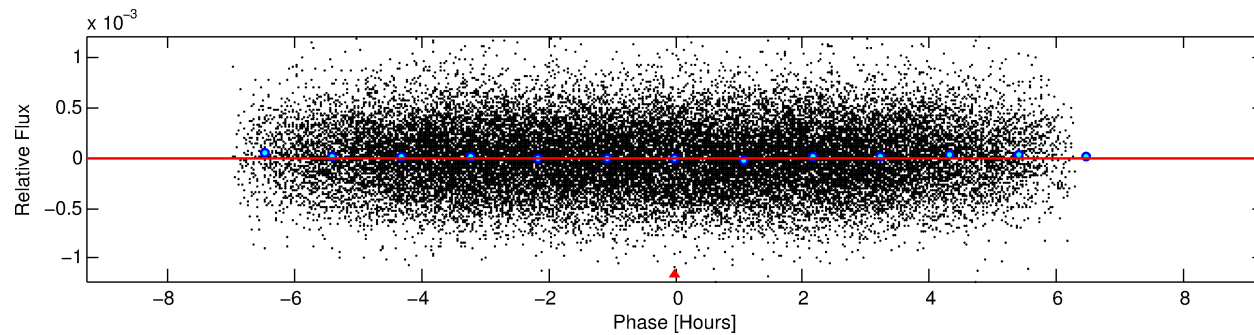
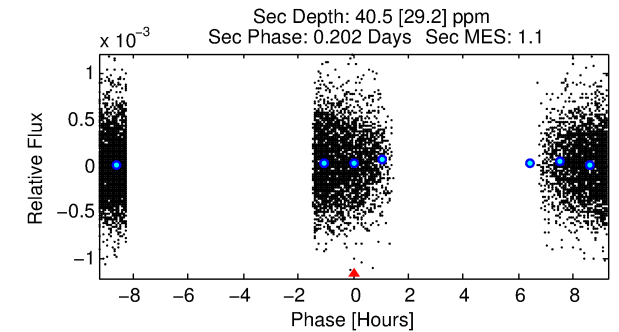
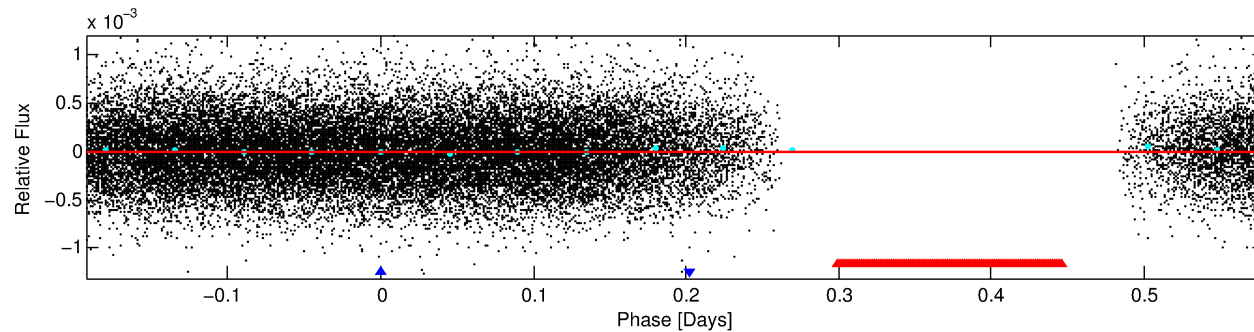
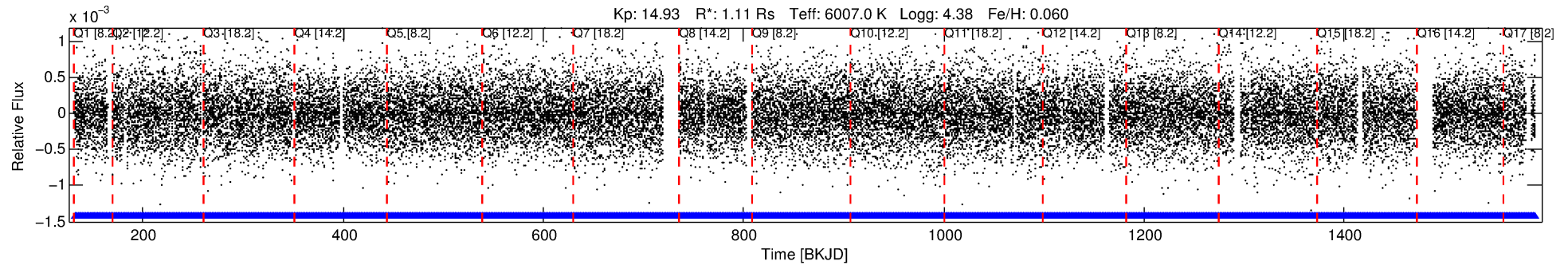
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 007023872-02

No Significant Match Found

# DV One-Page Summary

KIC: 7023872 Candidate: 2 of 2 Period: 0.773 d



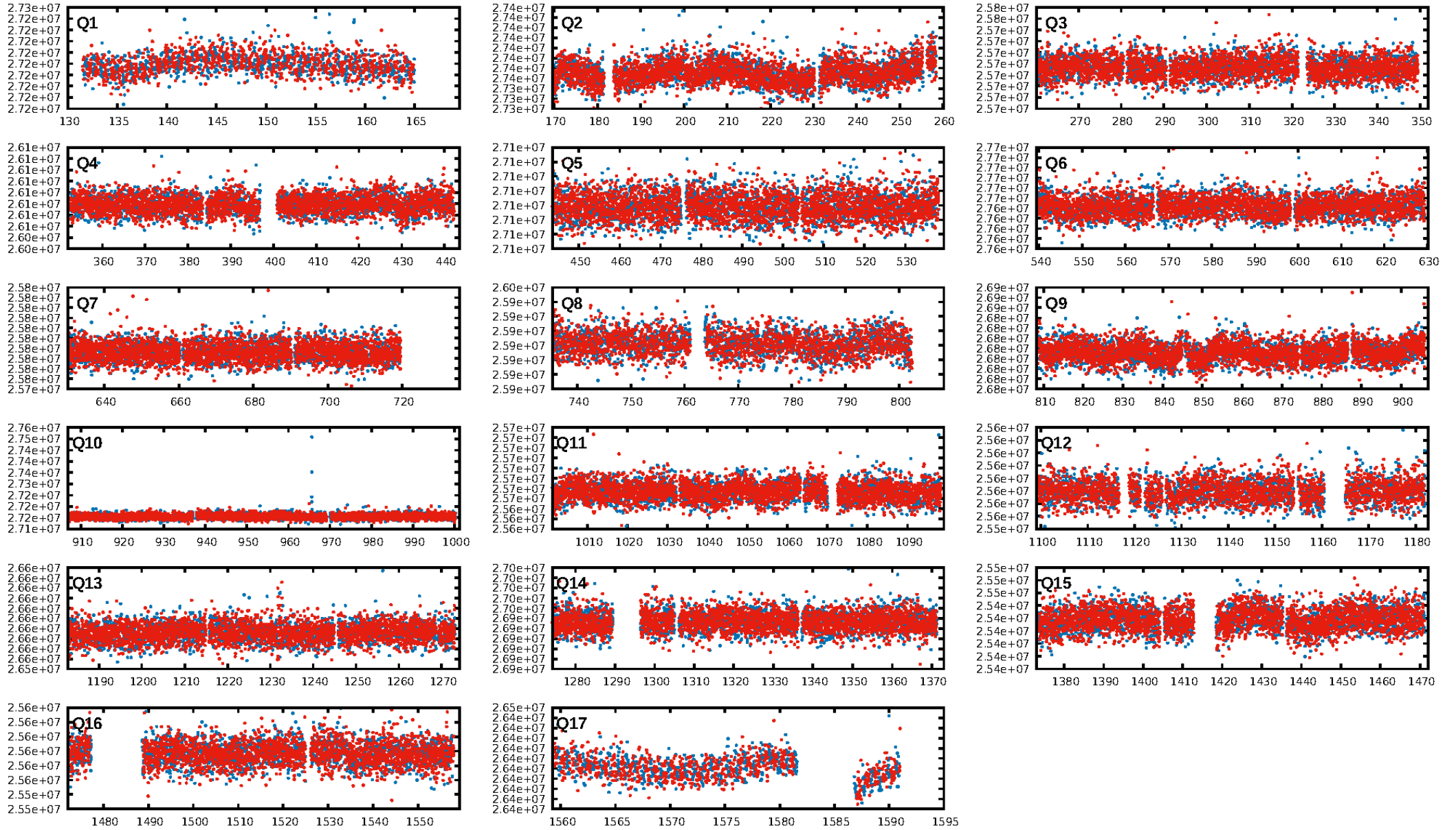
## DV Fit Results:

Period = 0.77274 [0.00003] d  
Epoch = 132.1986 [0.0130] BKJD  
Rp/R\* = 0.0037 [0.0063]  
a/R\* = 1.08 [1.37]  
b = 0.85 [2.80]  
Seff = 5033.18 [2079.37]  
Teff = 2148 [222] K  
Rp = 0.45 [0.78] Re  
a = 0.0169 [0.0045] AU  
Ag = 31.08 [108.46] [0.28 $\sigma$ ]  
Teffp = 7840 [6805] K [0.84 $\sigma$ ]

## DV Diagnostic Results:

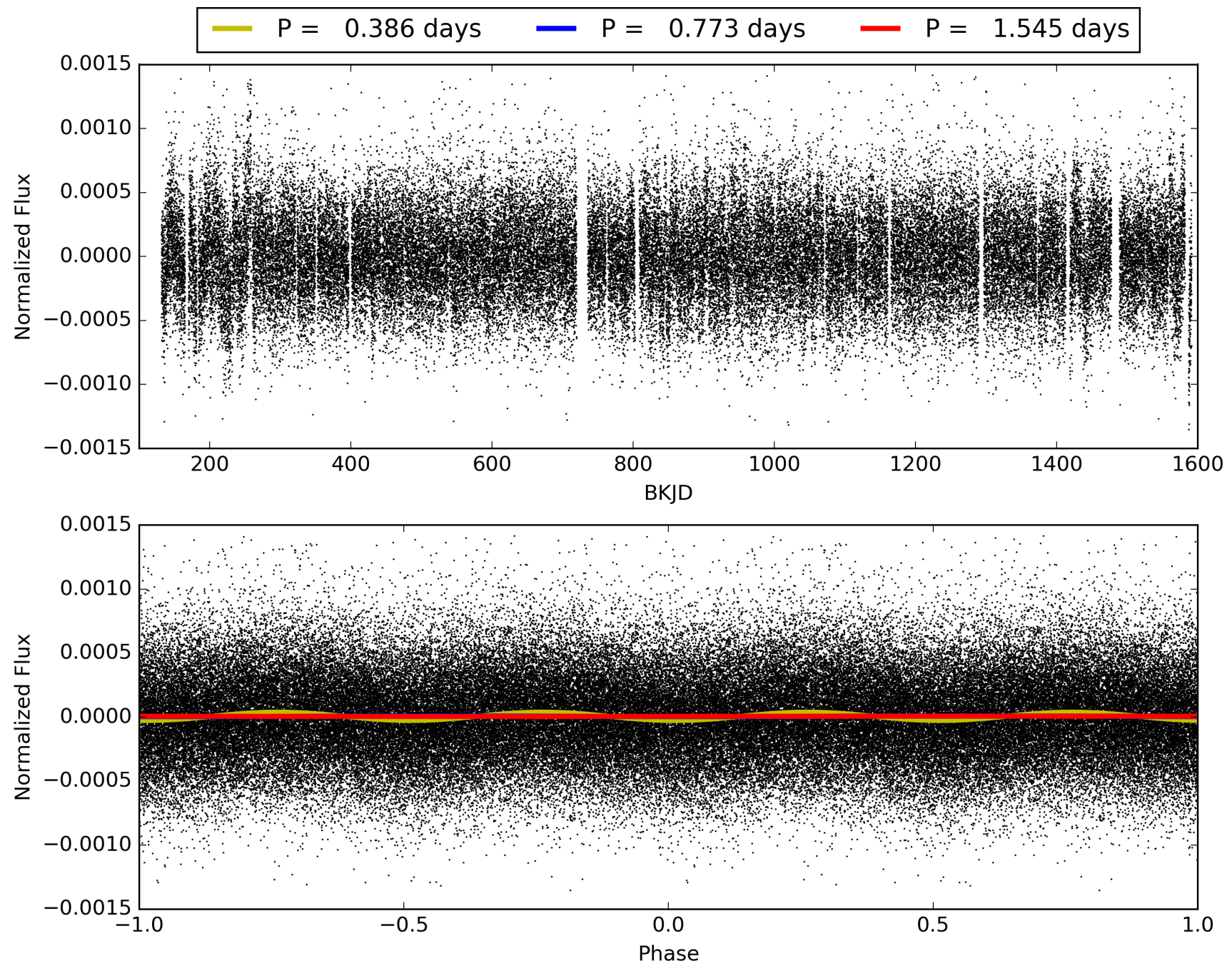
ShortPeriod-sig: N/A  
LongPeriod-sig: 0.0% [0.00 $\sigma$ ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: N/A  
RollingBand-fgt: 1.00 [1662/1662]  
GhostDiagnostic-chr: -8.527  
Centroid-sig: 0.0%  
Centroid-so: 7.400 arcsec [2.81 $\sigma$ ]  
OotOffset-rm: 1.884 arcsec [2.59 $\sigma$ ]  
KicOffset-rm: 1.982 arcsec [2.93 $\sigma$ ]  
OotOffset-st: 3/4/2/4 [13]  
KicOffset-st: 3/4/2/4 [13]  
DiffImageQuality-fgm: 0.38 [5/13]  
DiffImageOverlap-fno: 0.00 [0/17]

# TCE 007023872-02, PDC Light Curves





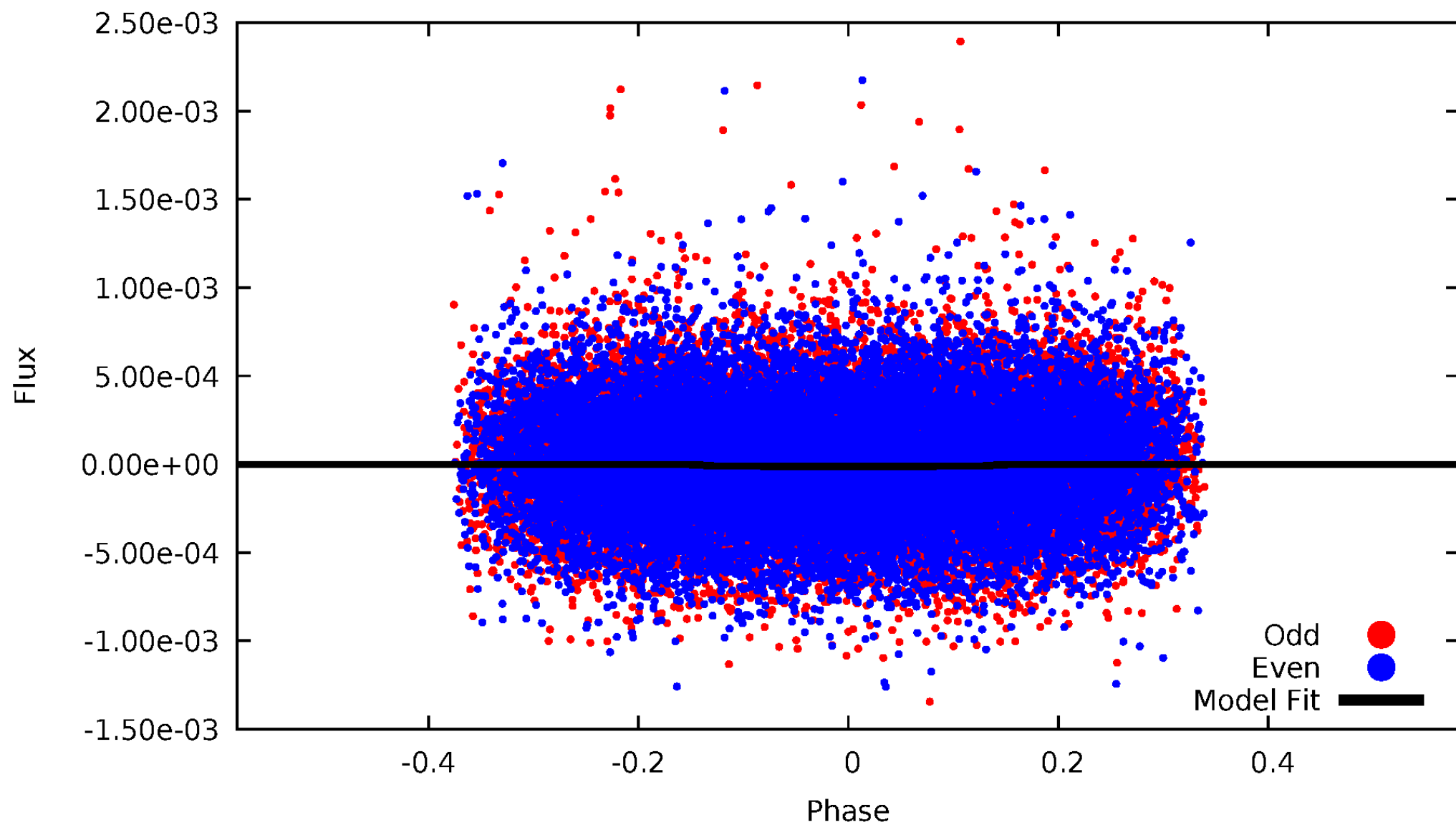
TCE 007023872-02





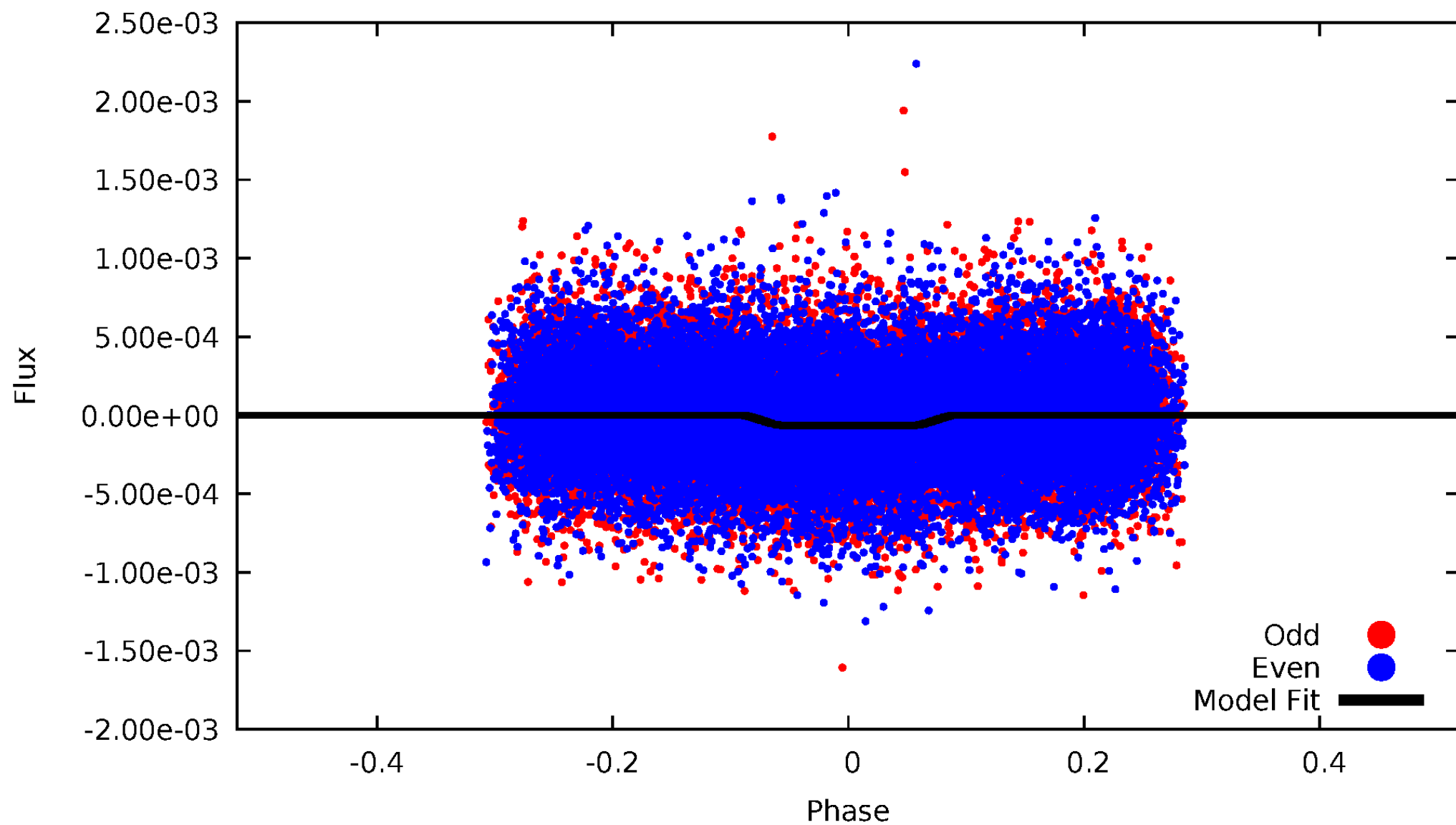
# DV Odd/Even

TCE 007023872-02



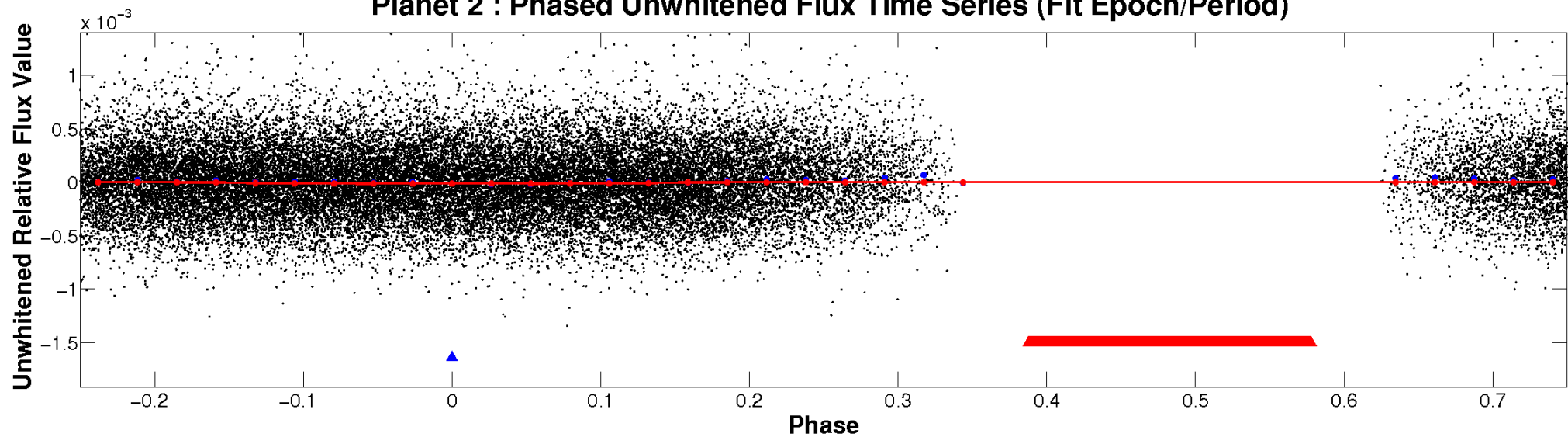
# ALT Odd/Even

TCE 007023872-02

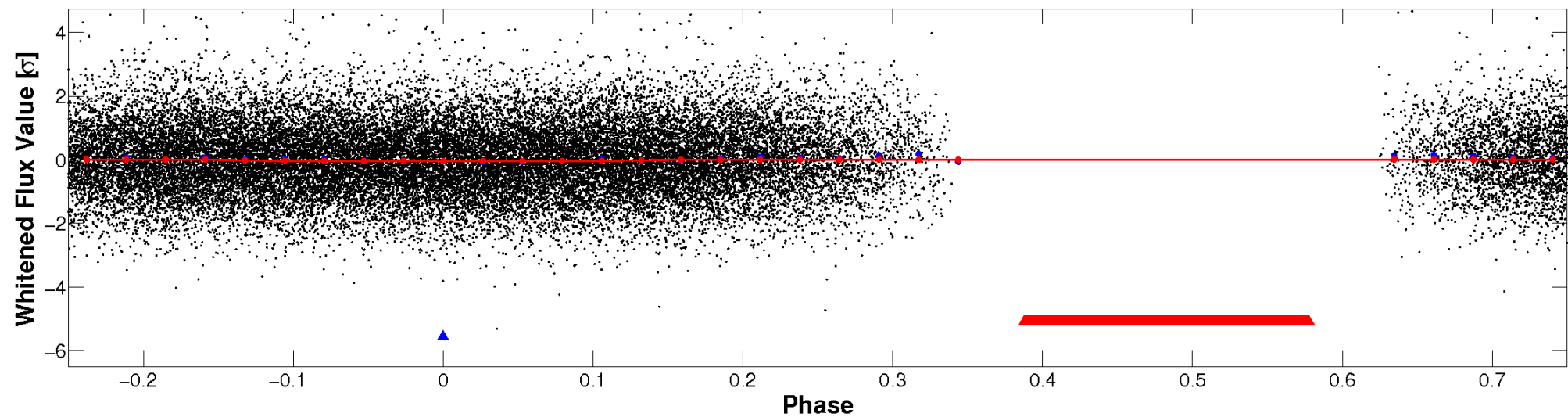


# Non-Whitened Vs. Whitened Light Curve

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

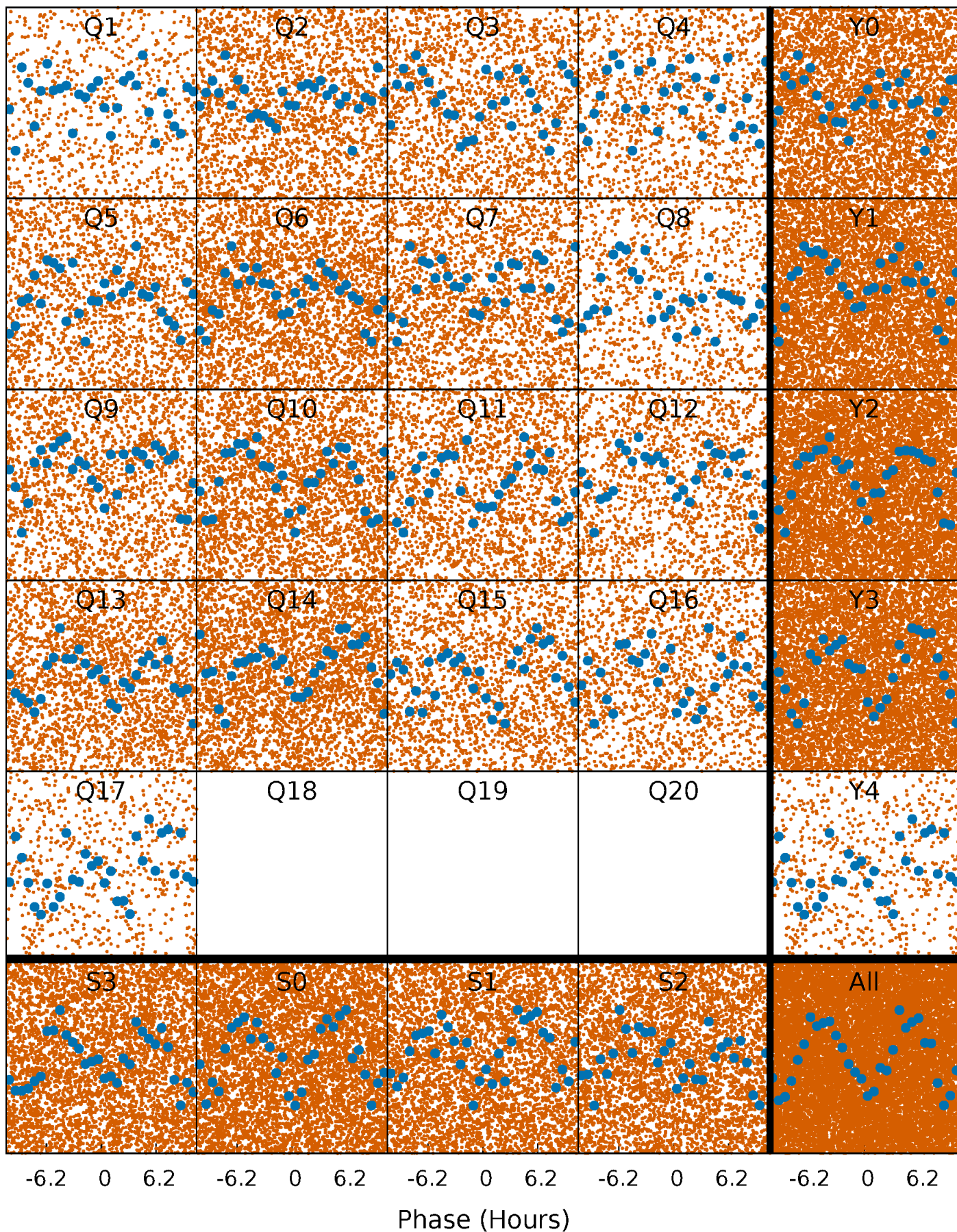


## Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



# PDC Quarter-Phased Transit Curves

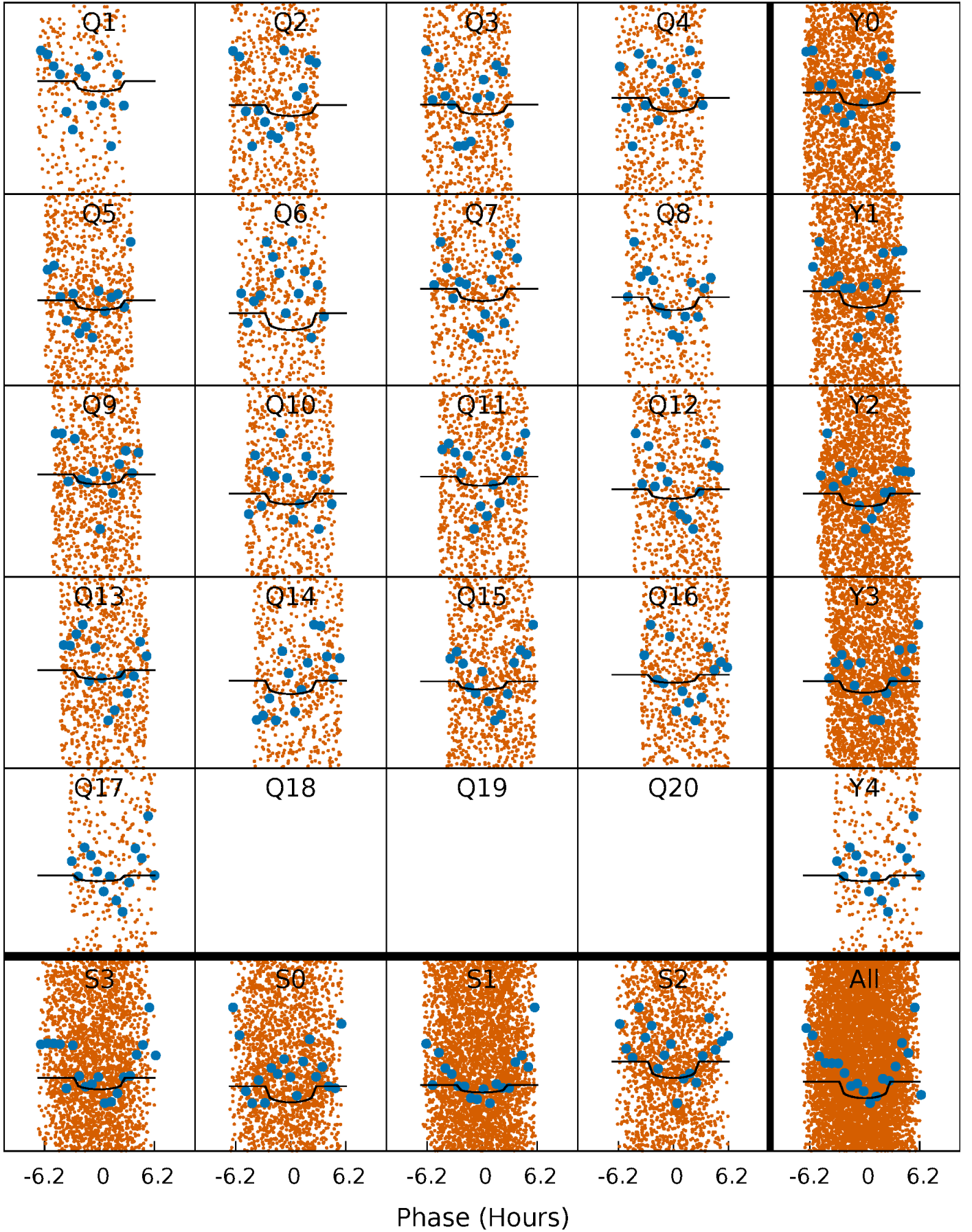
TCE 007023872-02     $P = 0.772737$  Days     $T_0 = 132.198597$  (BKJD)





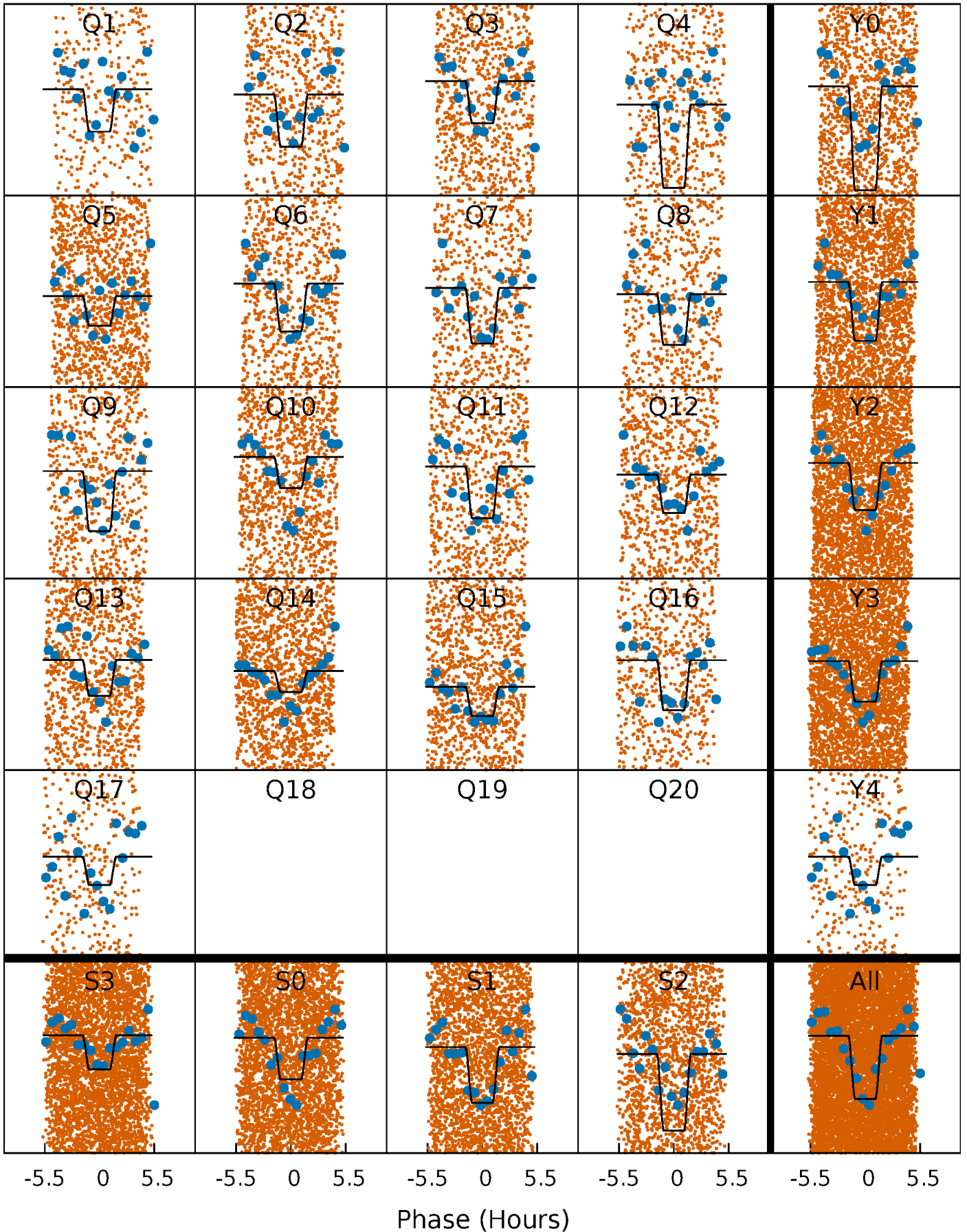
# DV Quarter-Phased Transit Curves

TCE 007023872-02     $P = 0.772737$  Days     $T_0 = 132.198597$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

TCE 007023872-02     $P = 0.772842$  Days     $T_0 = 132.094288$  (BKJD)

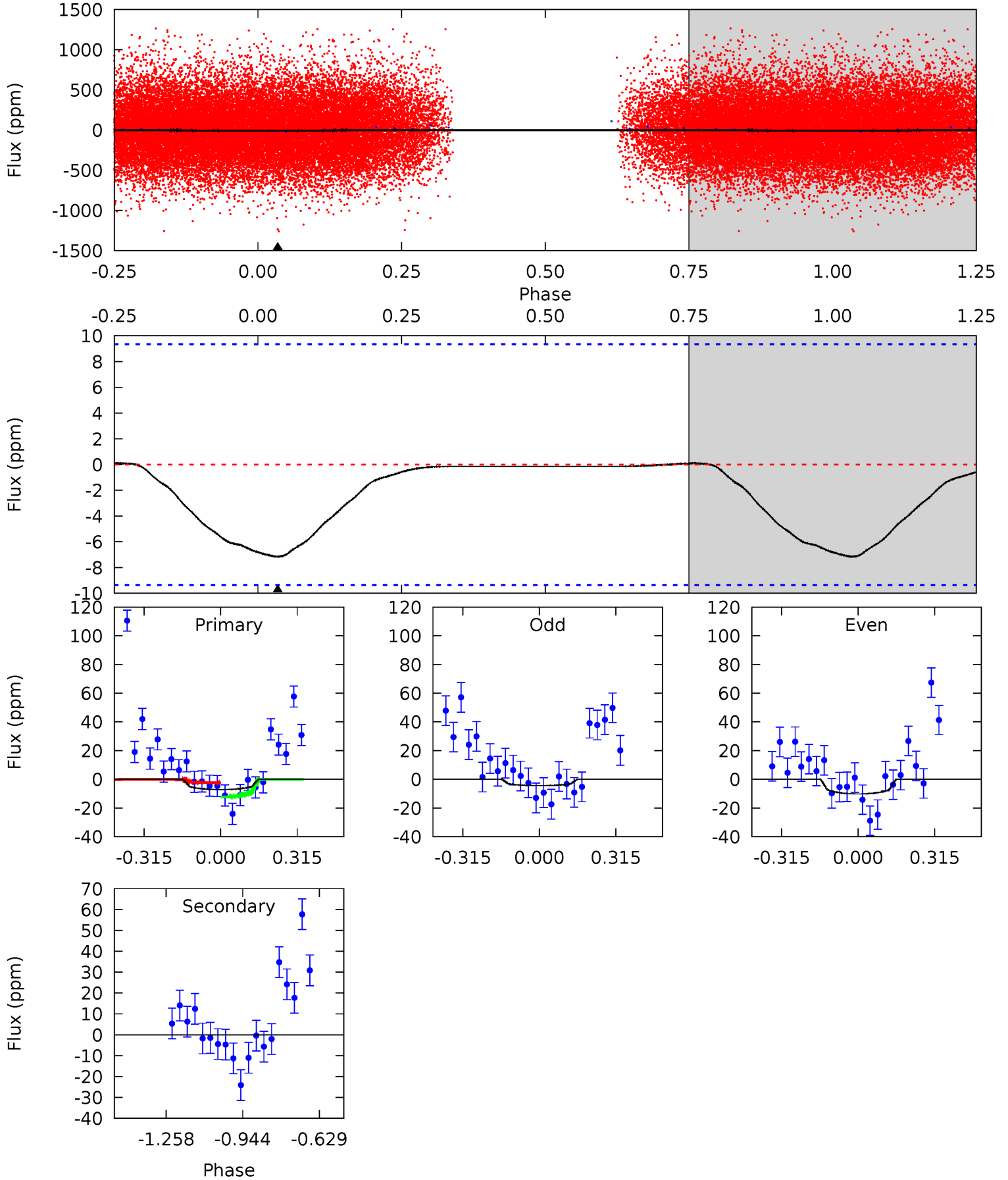




# DV Model-Shift Uniqueness Test

007023872-02, P = 0.772737 Days, E = 131.425860 Days

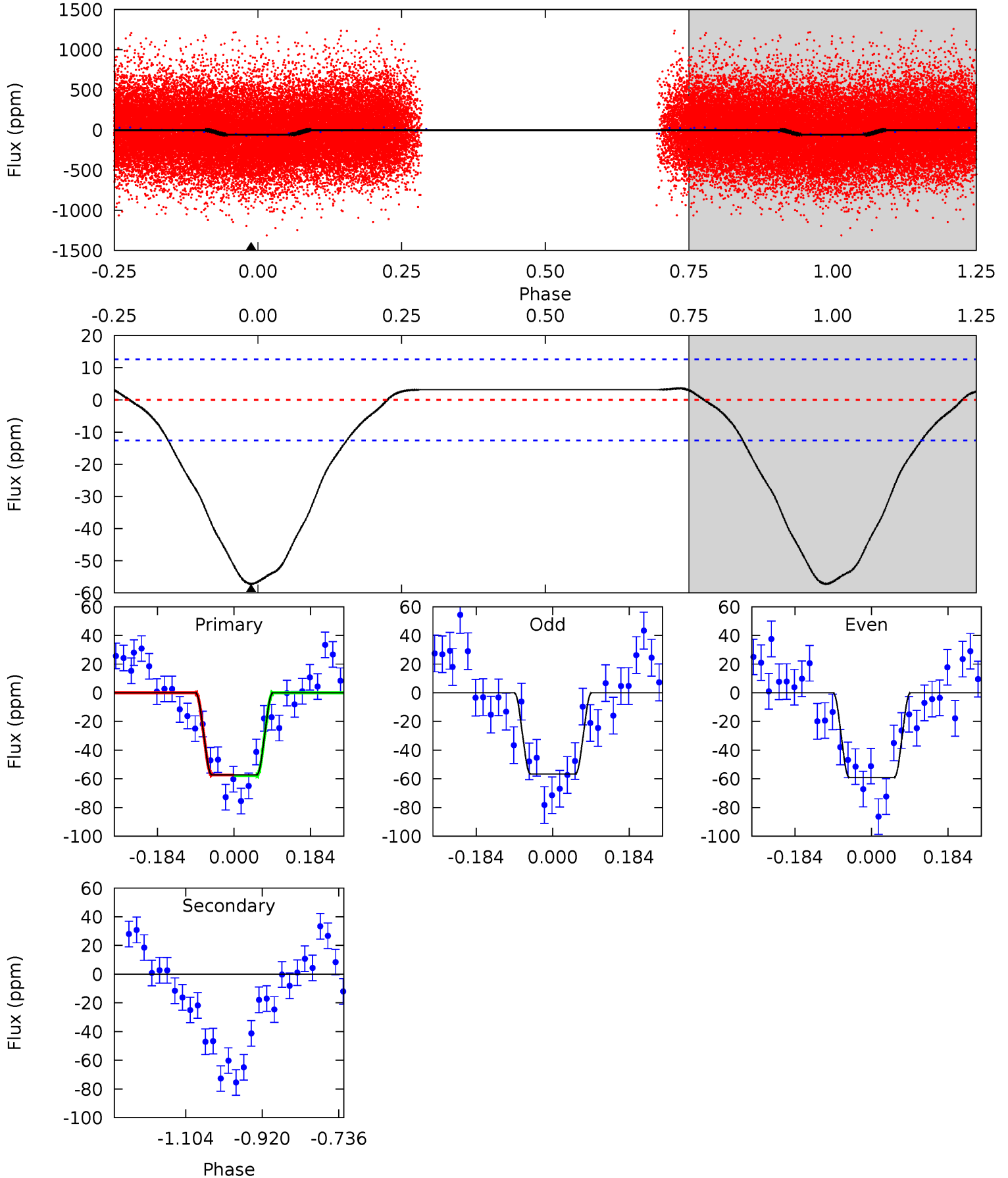
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
3.31	0	0	0	4.32	1.01	0.04	3.31	3.31	0	0	1.34	0.79	0.02	2.21



# Alt Model-Shift Uniqueness Test

007023872-02, P = 0.772842 Days, E = 131.321446 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
20.1	0	0	0	4.44	1.33	1.19	20.1	20.1	0	0	0.45	0.96	0.06	0.08



### Stellar Parameters For KIC 007023872

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$6007^{+181}_{-217}$	$4.379^{+0.090}_{-0.210}$	$0.060^{+0.250}_{-0.300}$	$1.108^{+0.356}_{-0.152}$	$1.072^{+0.145}_{-0.145}$	$1.110^{+0.528}_{-0.573}$
	+3%/-4%	+2%/-5%	+417%/-500%	+32%/-14%	+14%/-14%	+48%/-52%
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 007023872-02 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$0 \pm 2$	$0.76^{+0.66}_{-0.53}$	$3039^{+232}_{-164}$	$-3162^{+6592}_{-849}$	$0.001^{+0.845}_{-1.117}$
Alt.	$0 \pm 3$	$1.08^{+0.78}_{-0.64}$	$3040^{+239}_{-167}$	$-3118^{+6137}_{-604}$	$0.003^{+0.538}_{-0.663}$

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

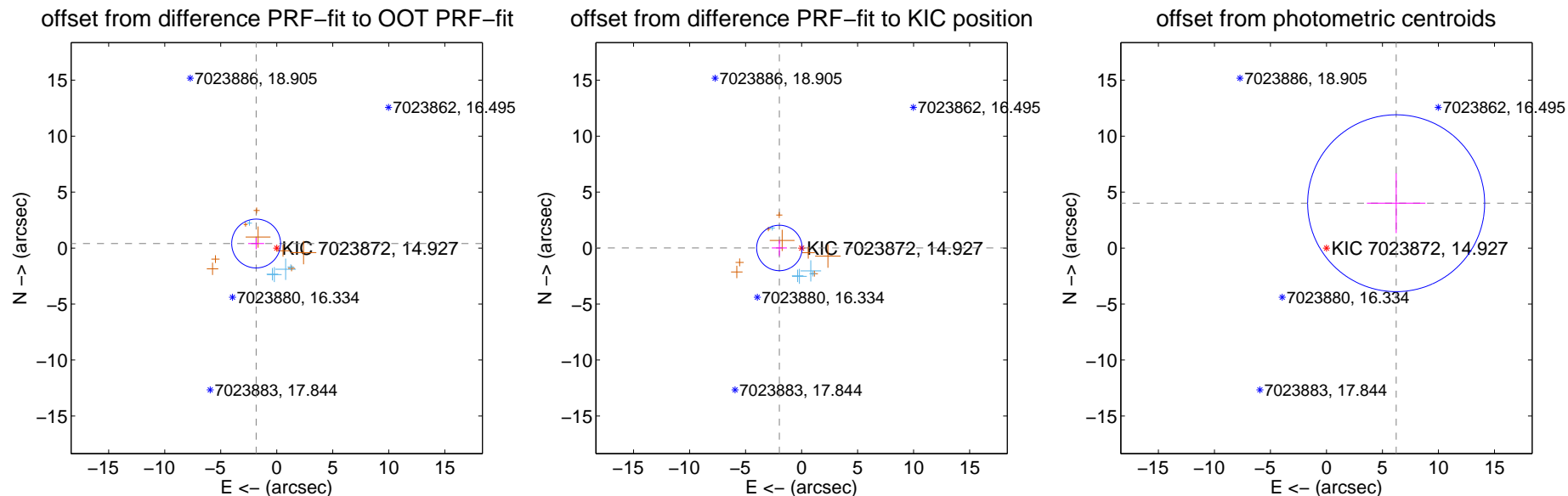
## DV Centroid Data

Supplemental centroid analysis for 007023872-02. Kepler magnitude: 14.93. Transit SNR 4.79

There are 5 quarters with good PRF difference image offsets

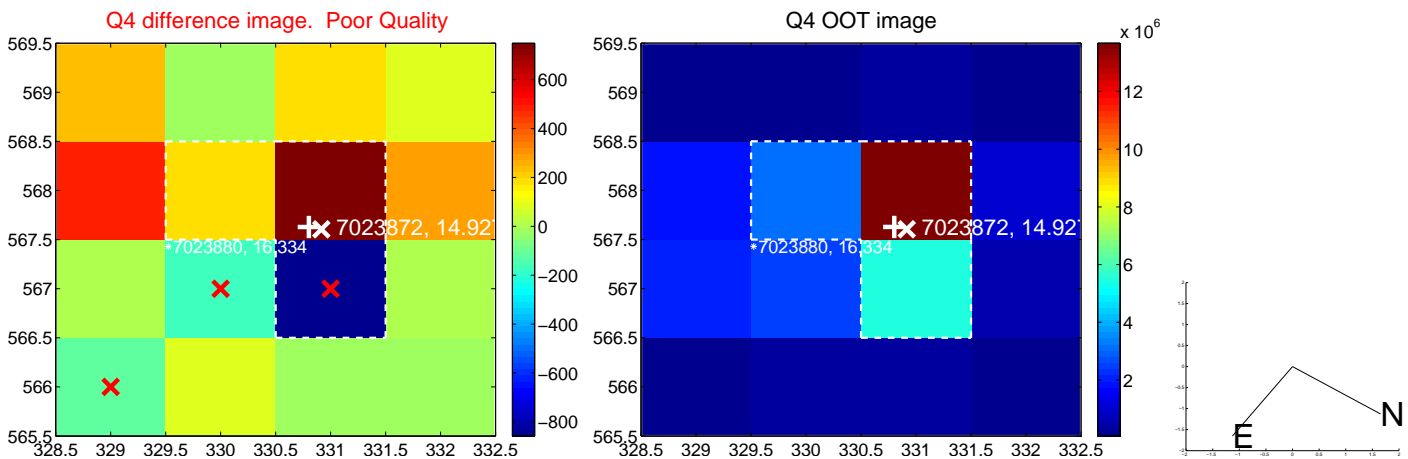
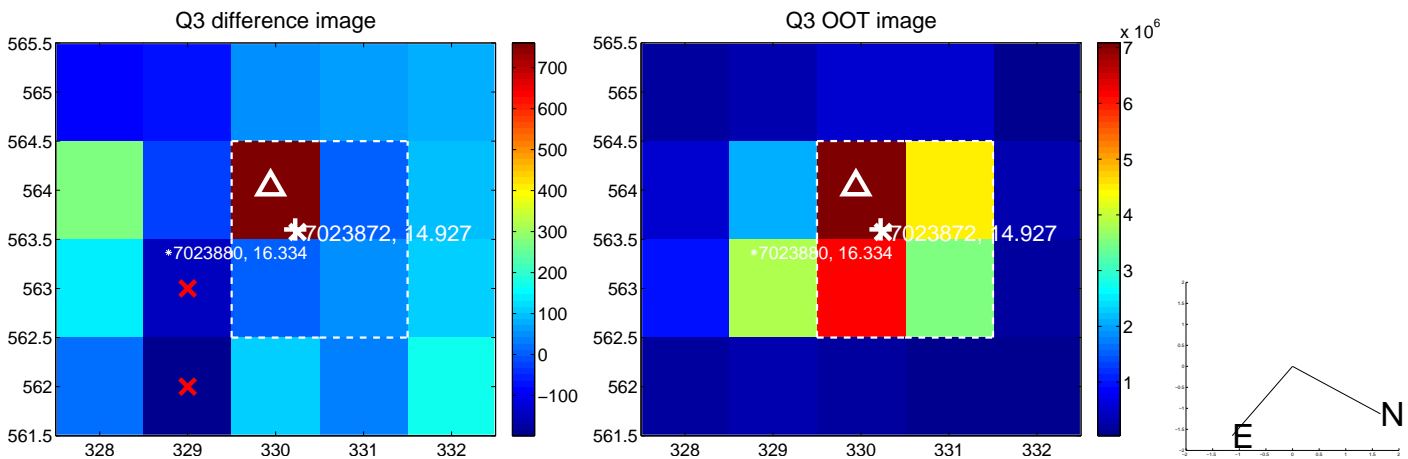
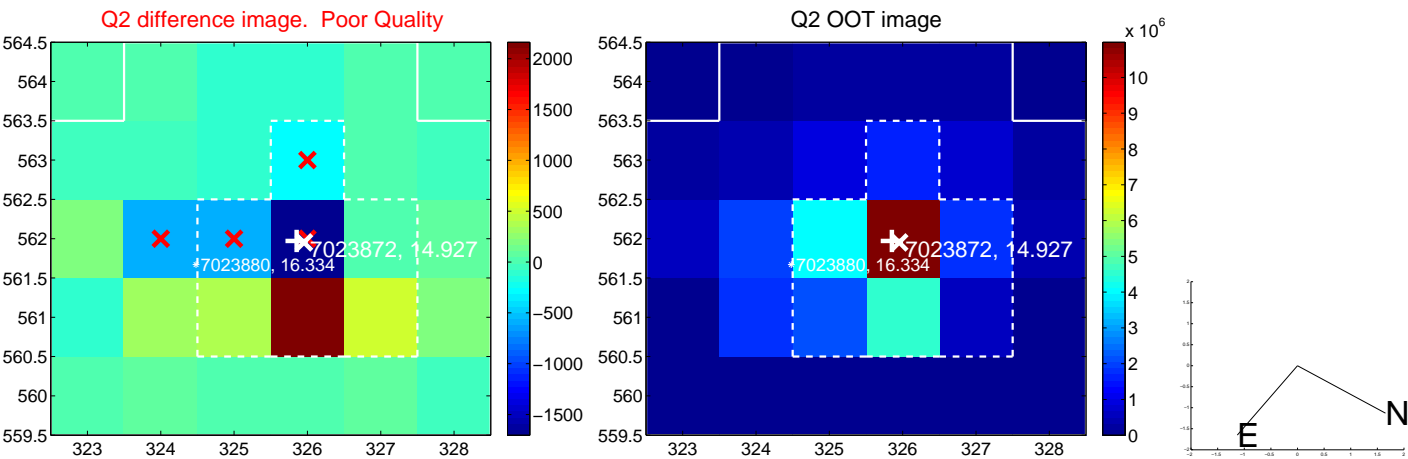
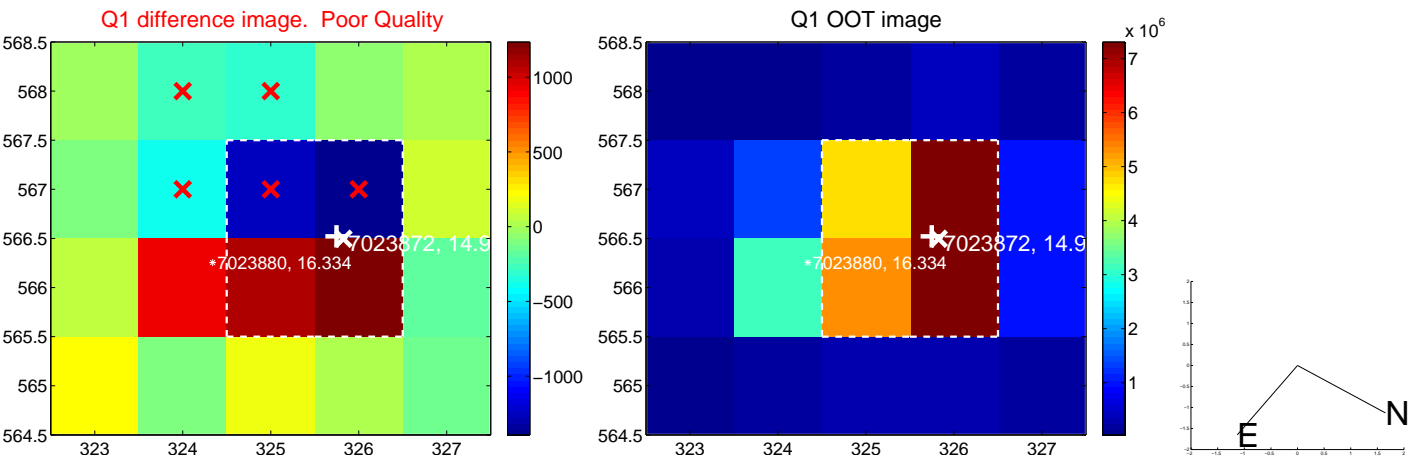
The direct PRF centroid is offset from the target star catalog position by about 0.32 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$1.884 \pm 0.727$	2.59	$1.839 \pm 0.713$	$0.408 \pm 0.507$
PRF-fit source offset from KIC position	$1.982 \pm 0.677$	2.93	$1.982 \pm 0.677$	$0.011 \pm 0.708$
photometric centroid source offset	$7.40 \pm 2.63$	2.81	$-6.22 \pm 2.61$	$4.01 \pm 2.68$

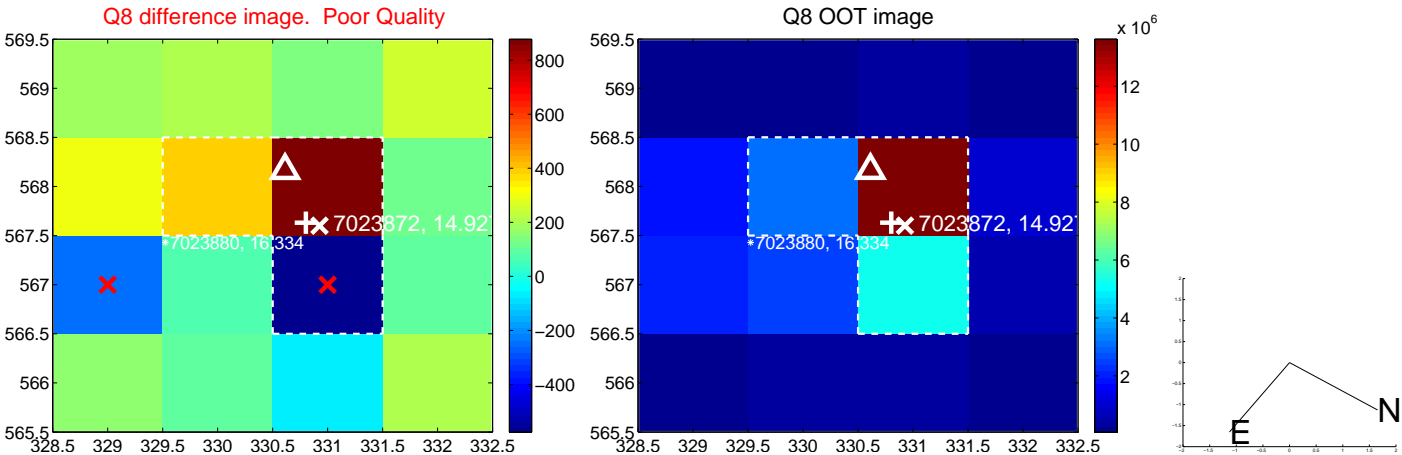
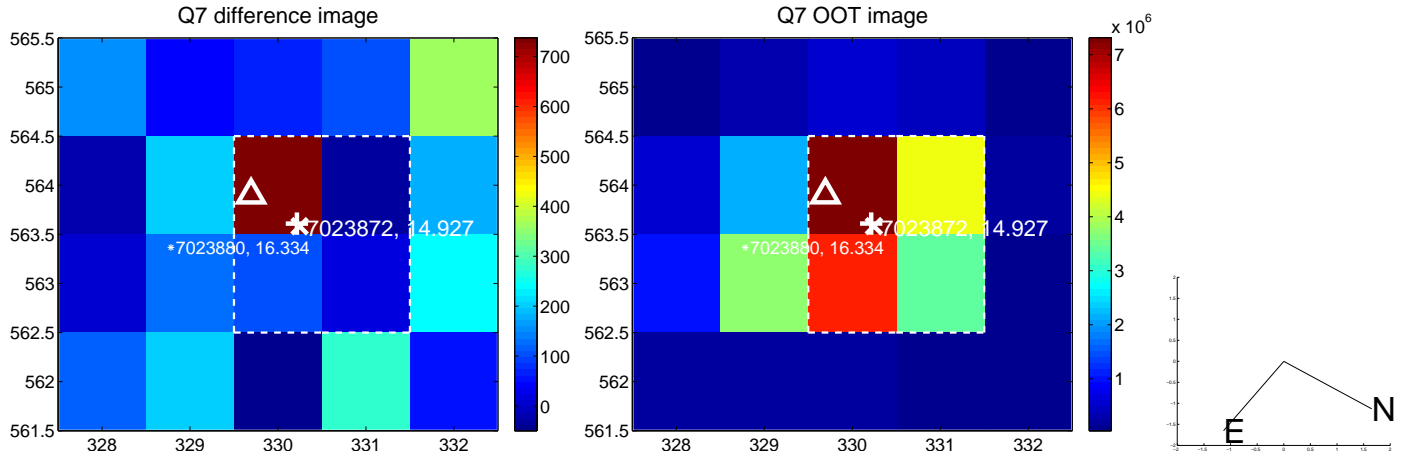
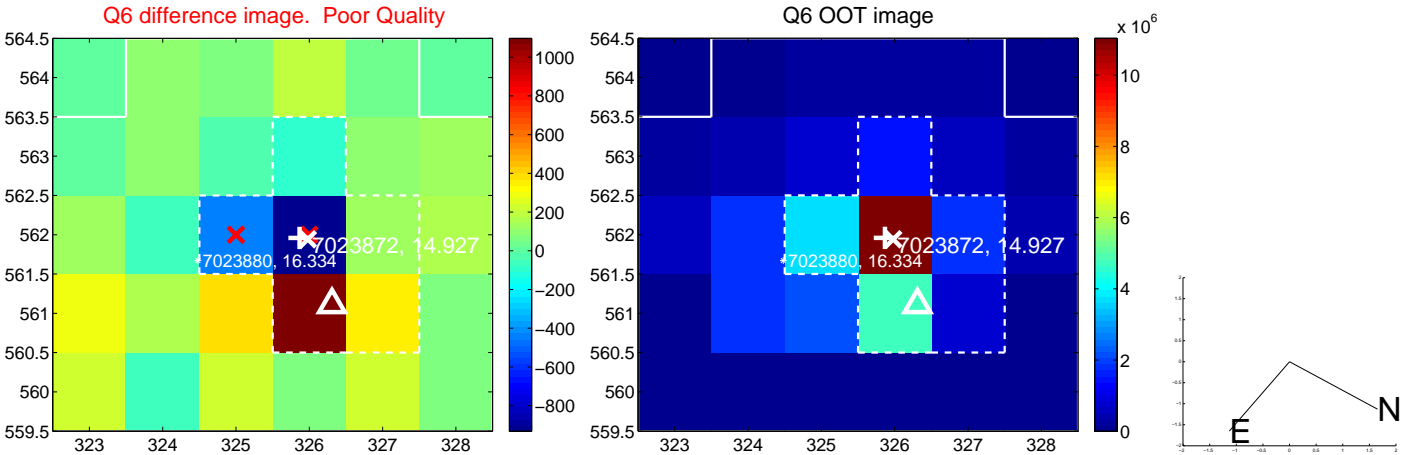
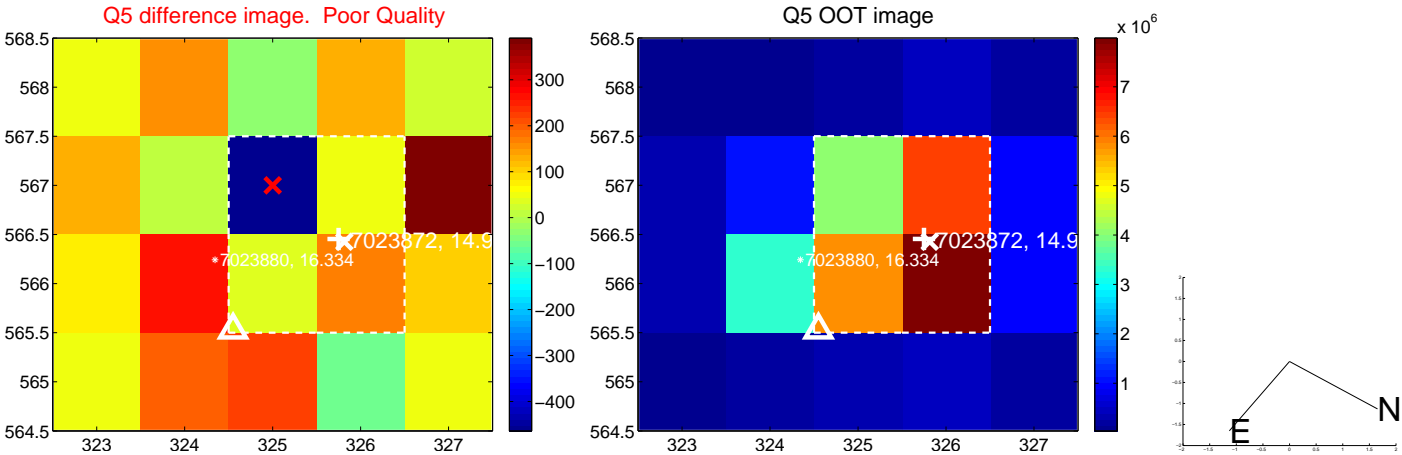


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses:** good quarterly centroid offsets; **Vermillion crosses:** bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

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

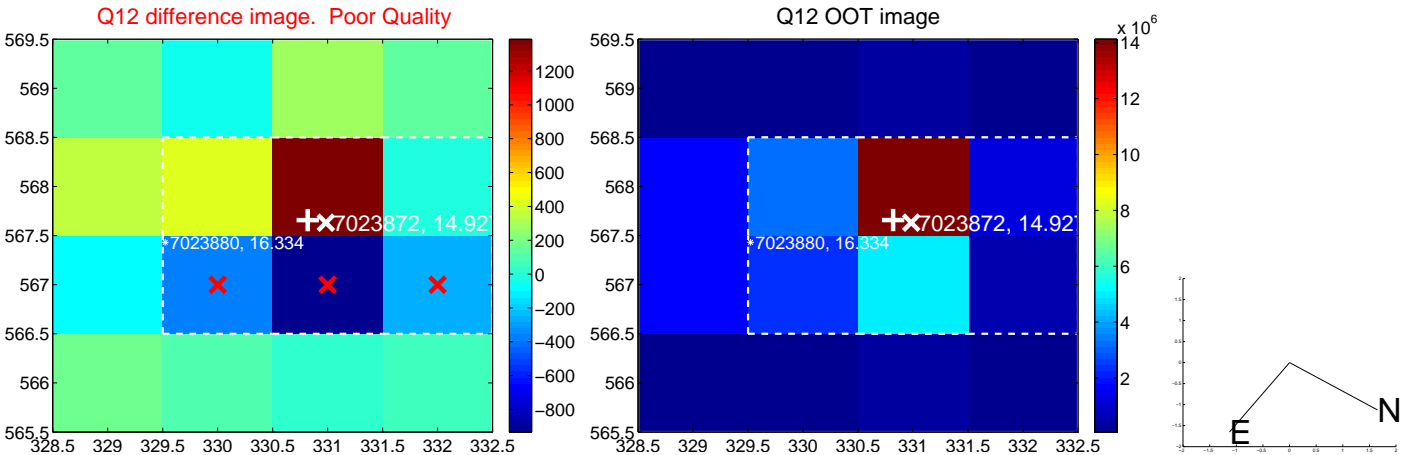
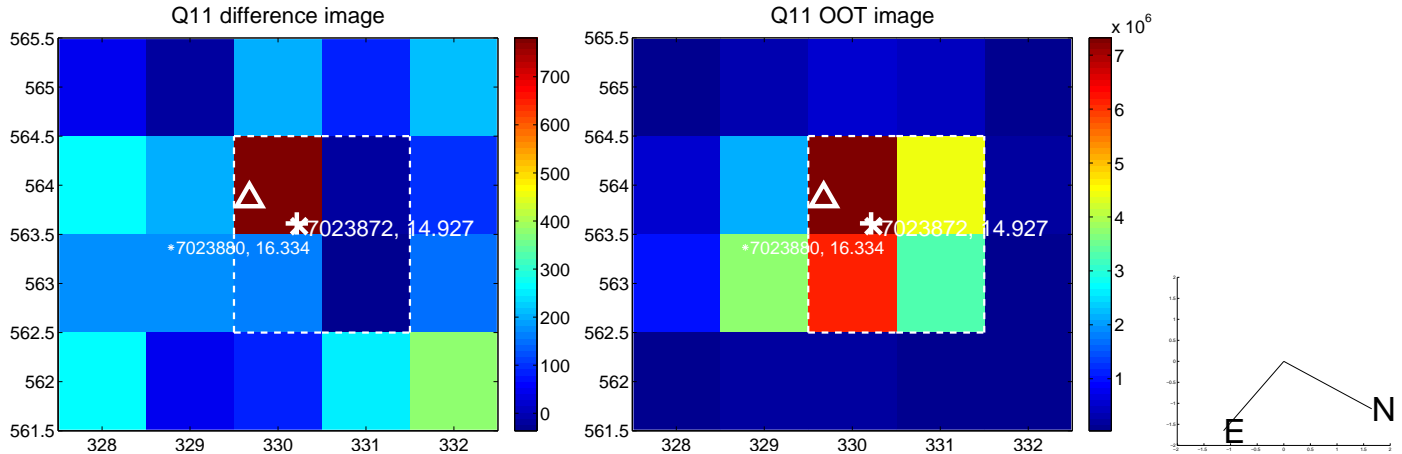
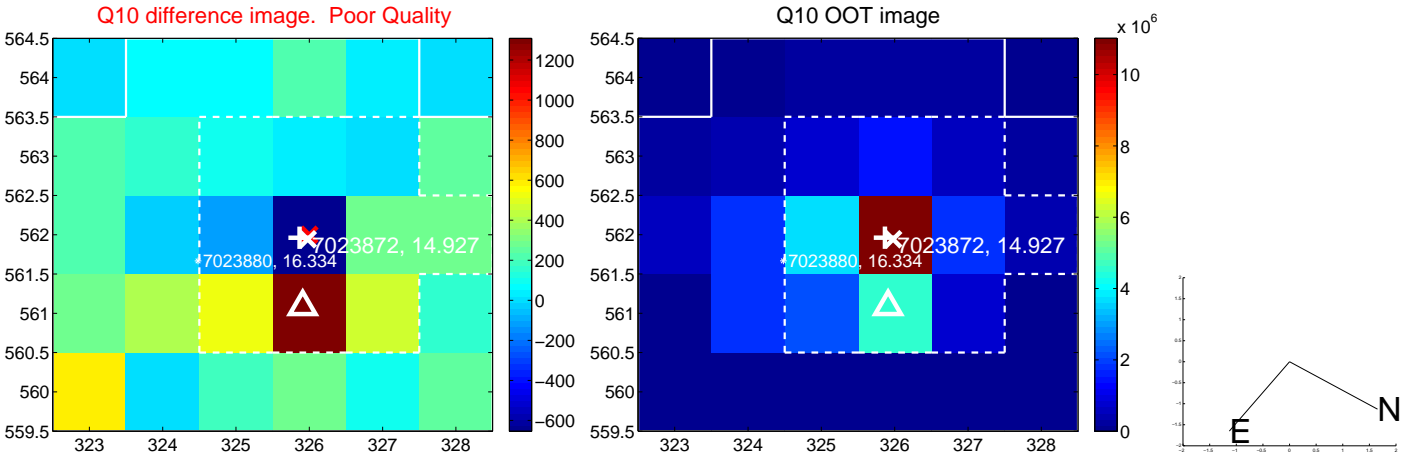
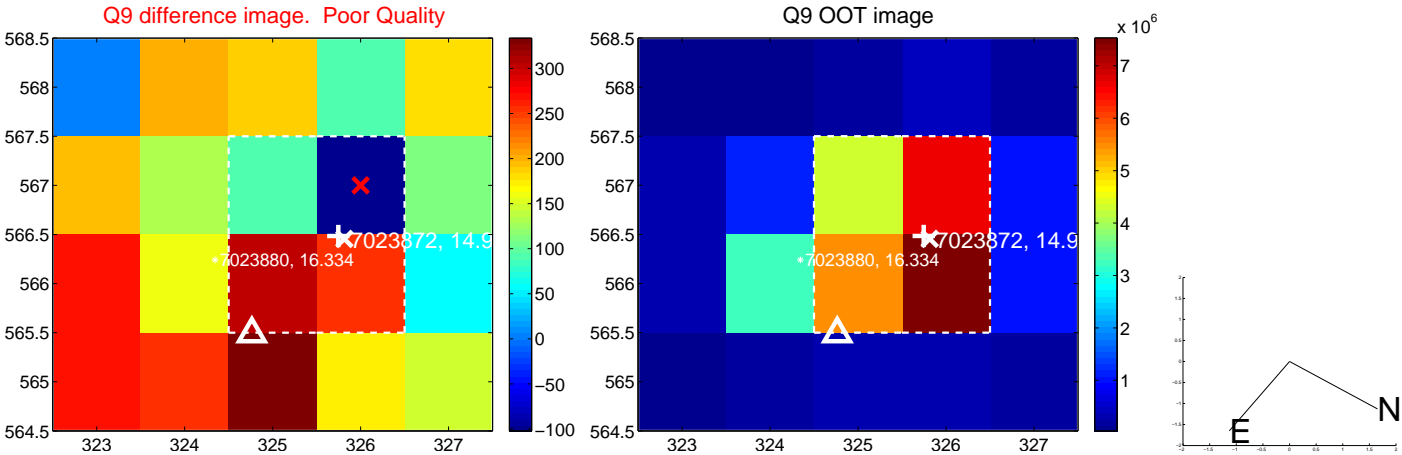


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

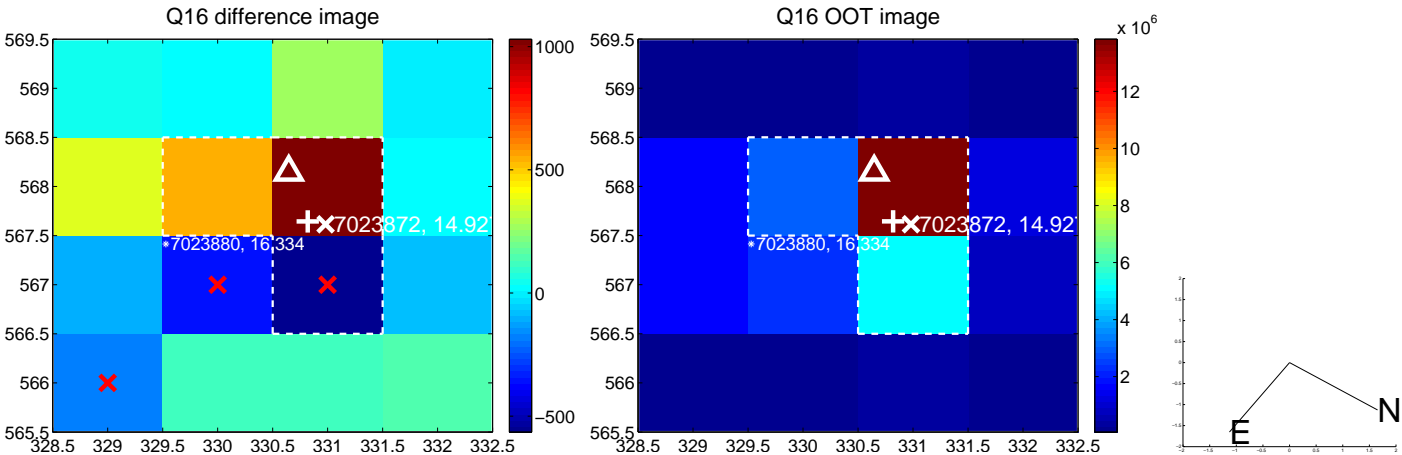
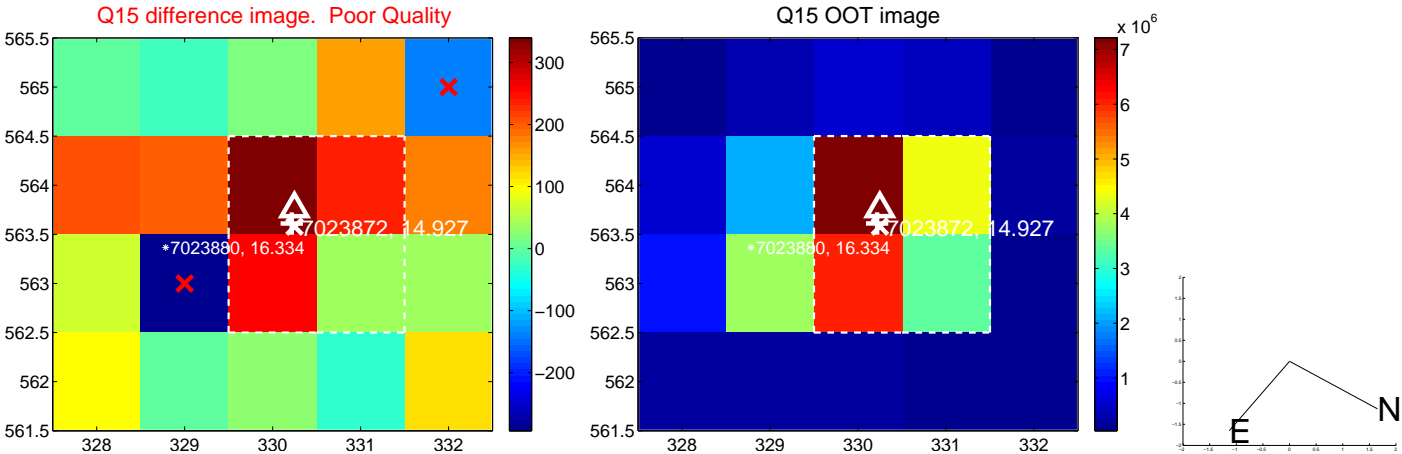
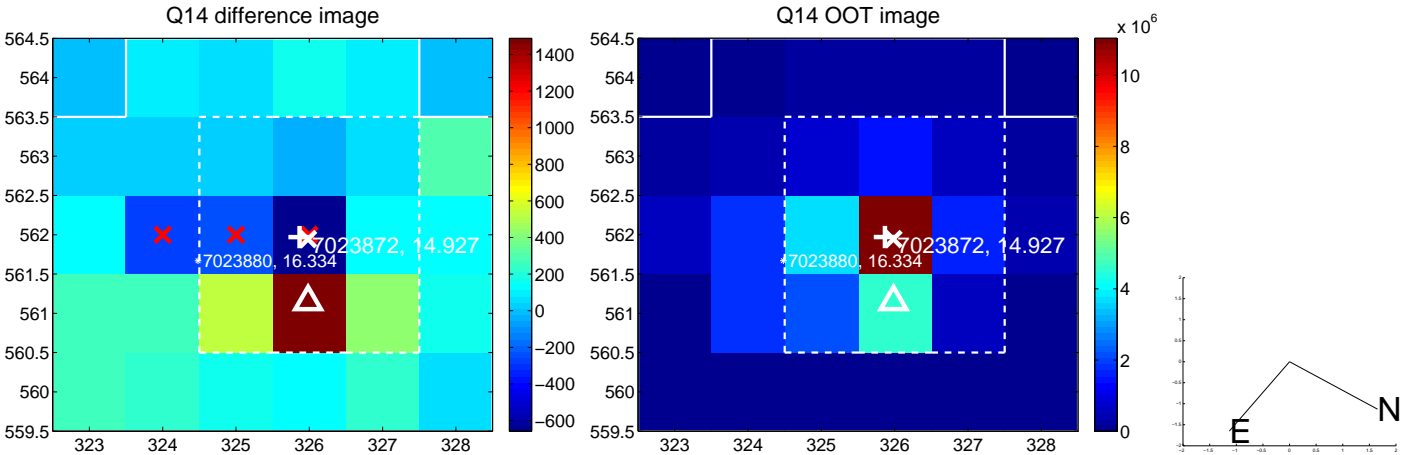
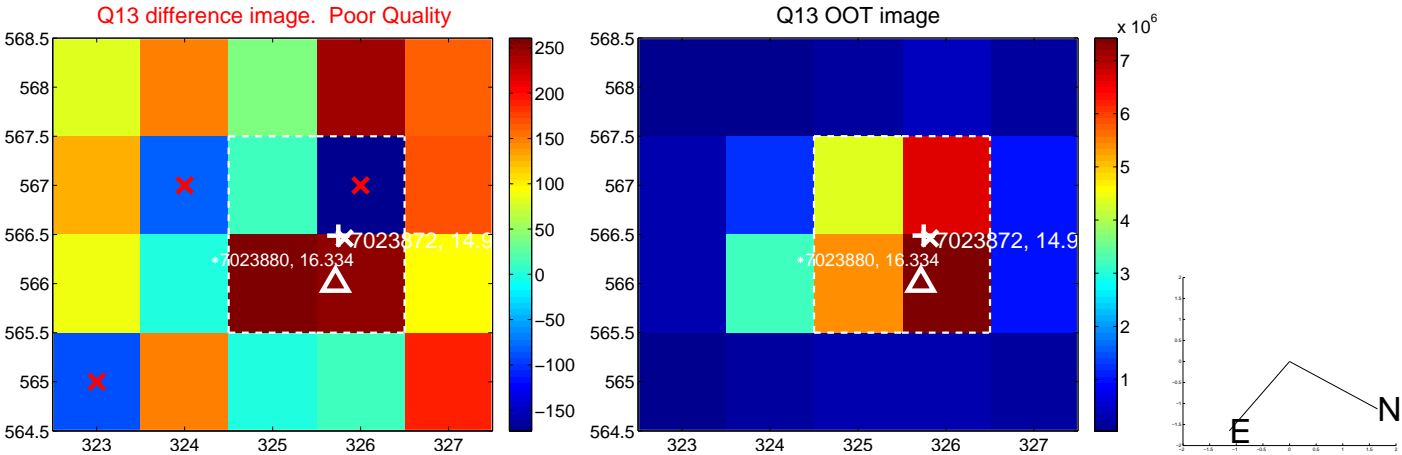




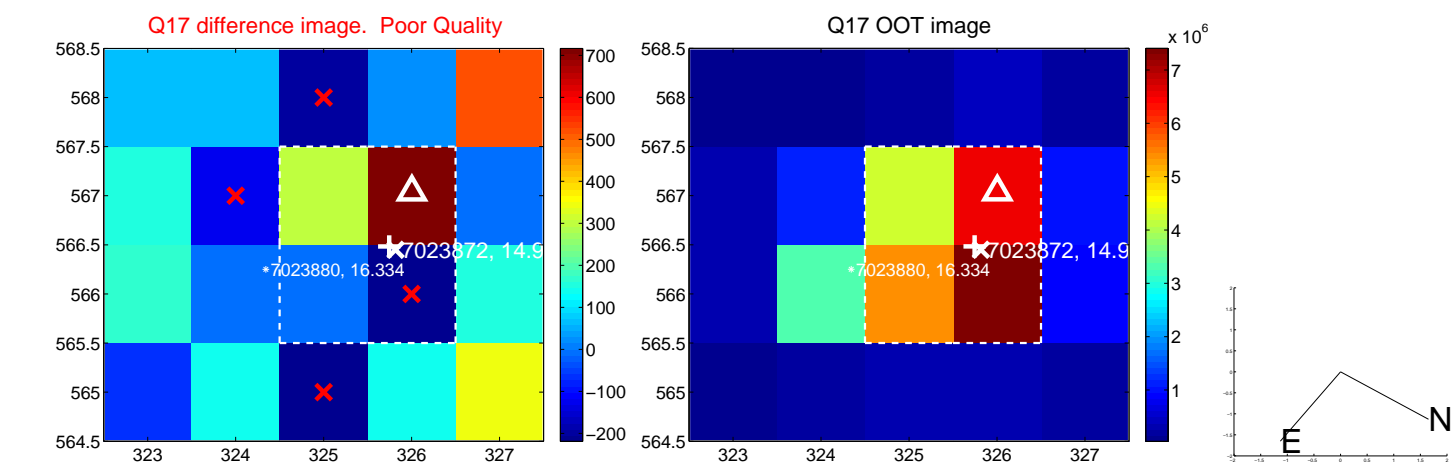
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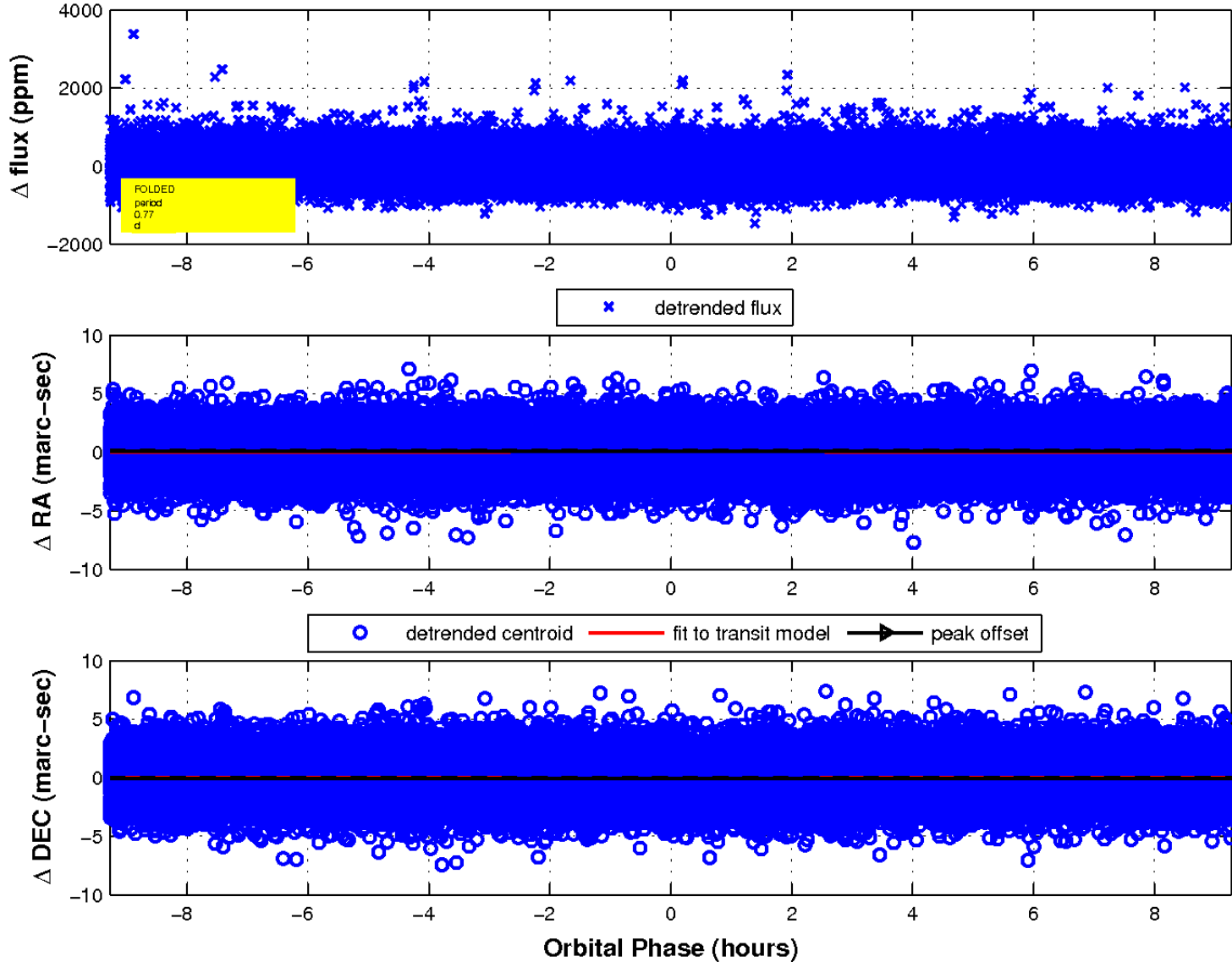
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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



fluxWeightedCentroids, Planet 2 of 2



UKIRT Image

Declination

