

# KIC 004384398

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
004384398-01	OBS	No	2.306852	132.208805	48.7	6.818	8.9	9.7	1.13	6130	0.94	1392.15
004384398-02	OBS	No	2.306794	133.083165	10.4	21.830	9.2	3.1	1.13	6130	0.38	1392.19

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
004384398-01	OBS	FP	0.00	1	0	0	0	SWEET_NTL—LPP_DV—LPP_ALT—MOD_NONUNIQ_ALT
004384398-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_SKYE_ZUMA—SWEET_NTL—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_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.

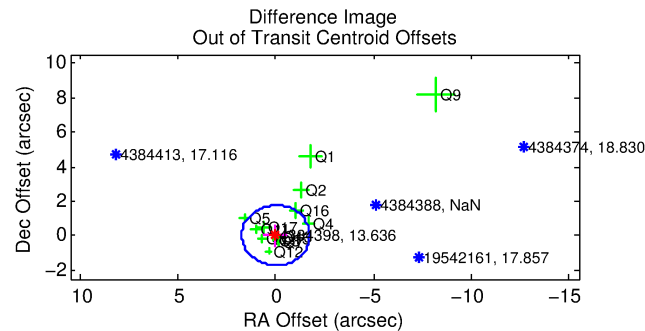
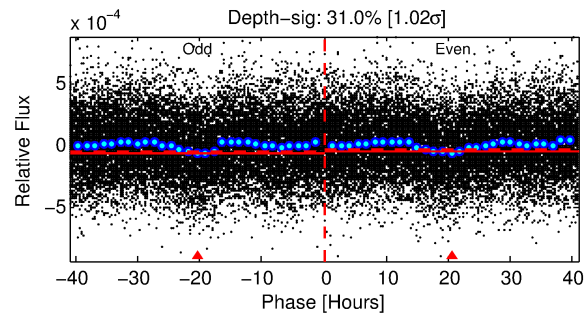
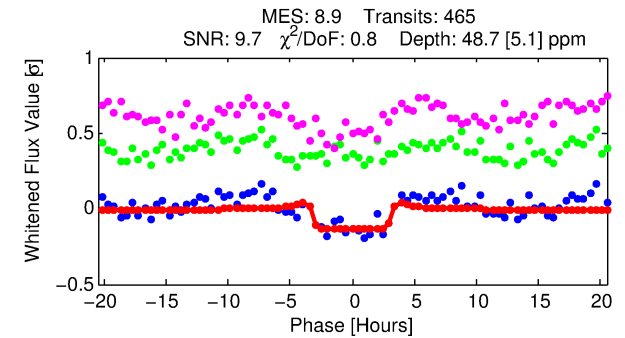
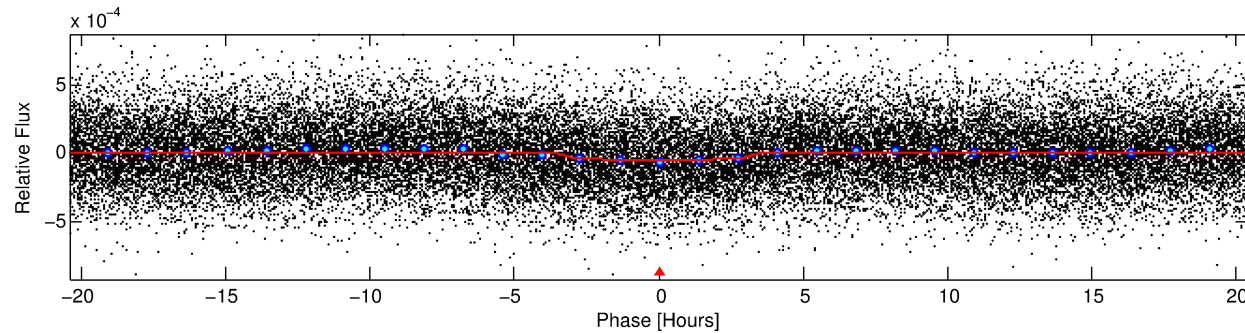
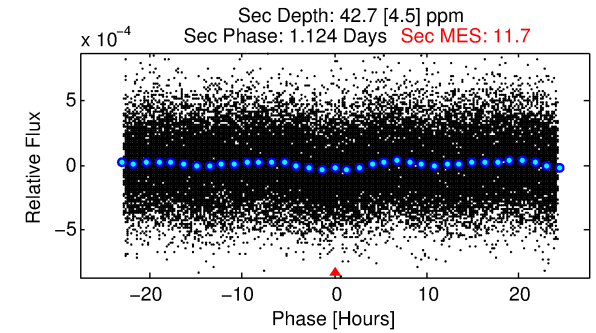
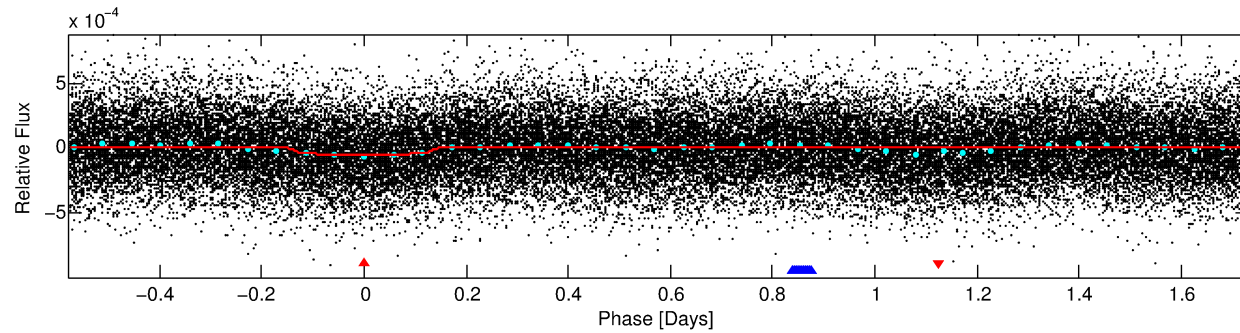
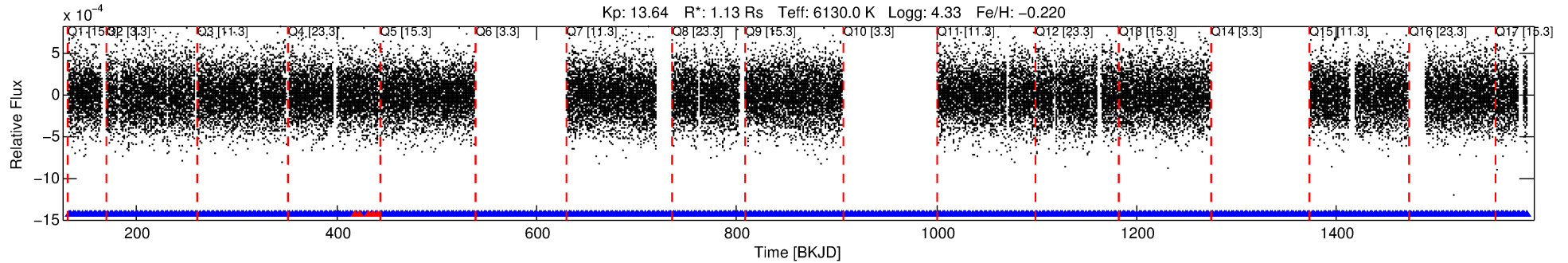
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 004384398-01

No Significant Match Found

# DV One-Page Summary

KIC: 4384398 Candidate: 1 of 2 Period: 2.307 d



## DV Fit Results:

Period = 2.30685 [0.00002] d  
Epoch = 132.2088 [0.0052] BKJD  
Rp/R\* = 0.0076 [0.0016]  
a/R\* = 1.43 [0.83]  
b = 0.92 [0.20]  
Seff = 1392.15 [515.79]  
Teq = 1558 [144] K  
Rp = 0.94 [0.34] Re  
a = 0.0341 [0.0082] AU  
Ag = 30.67 [17.12] [1.73σ]  
Teffp = 5667 [647] K [6.20σ]

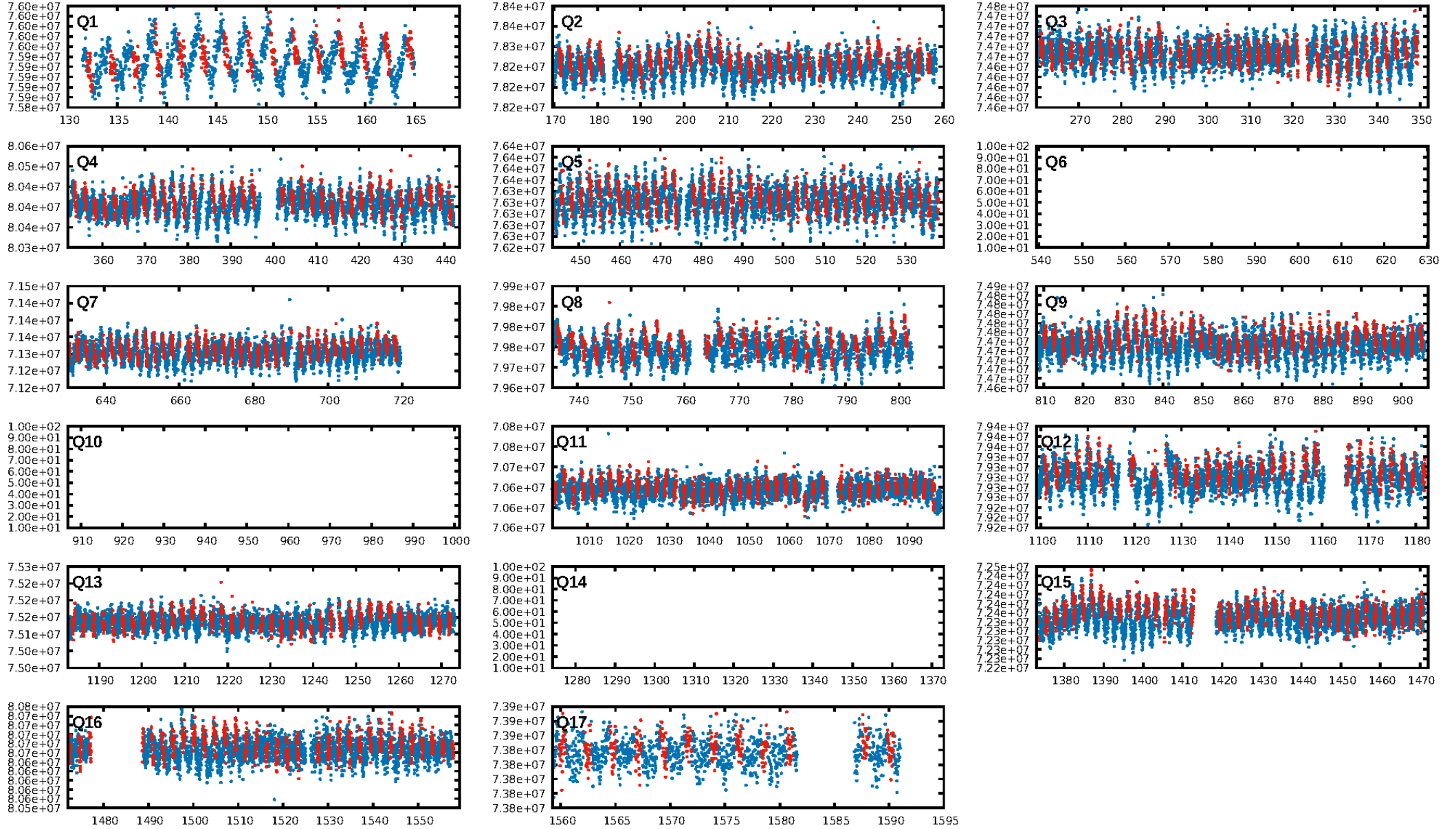
## DV Diagnostic Results:

ShortPeriod-sig: 0.0% [0.00σ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: N/A  
RollingBand-fgt: 0.99 [433/438]  
GhostDiagnostic-chr: 2.009  
Centroid-sig: 40.9%  
Centroid-so: 0.601 arcsec [0.78σ]  
OotOffset-rm: 0.024 arcsec [0.04σ]  
OotOffset-st: 1/4/4/5 [14]  
KicOffset-rm: 0.004 arcsec [0.01σ]  
KicOffset-st: 1/4/4/5 [14]  
DiffImageQuality-fgm: 0.86 [12/14]  
DiffImageOverlap-fno: 0.00 [0/14]

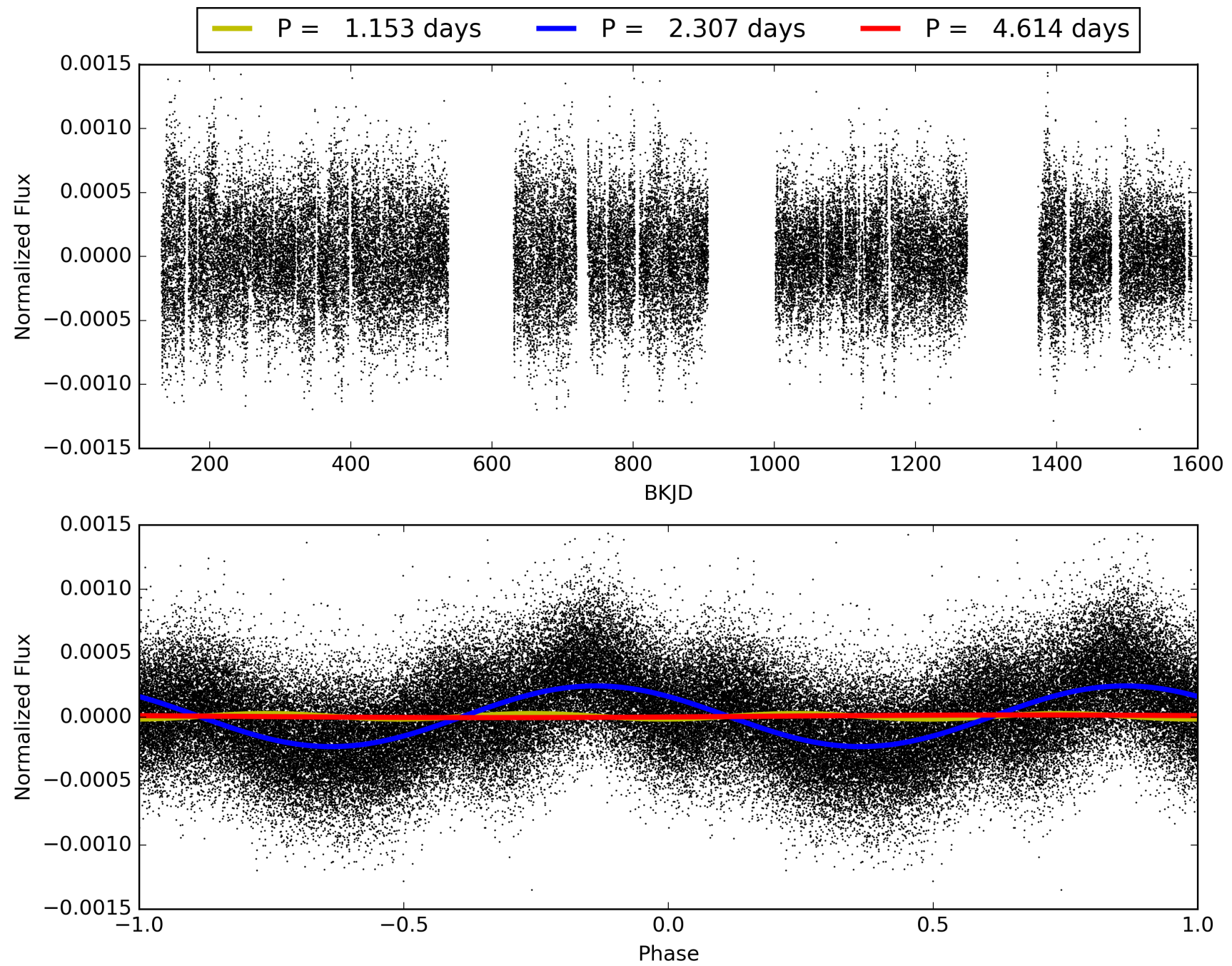
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 30-Jan-2016 02:35:46 Z

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

# TCE 004384398-01, PDC Light Curves



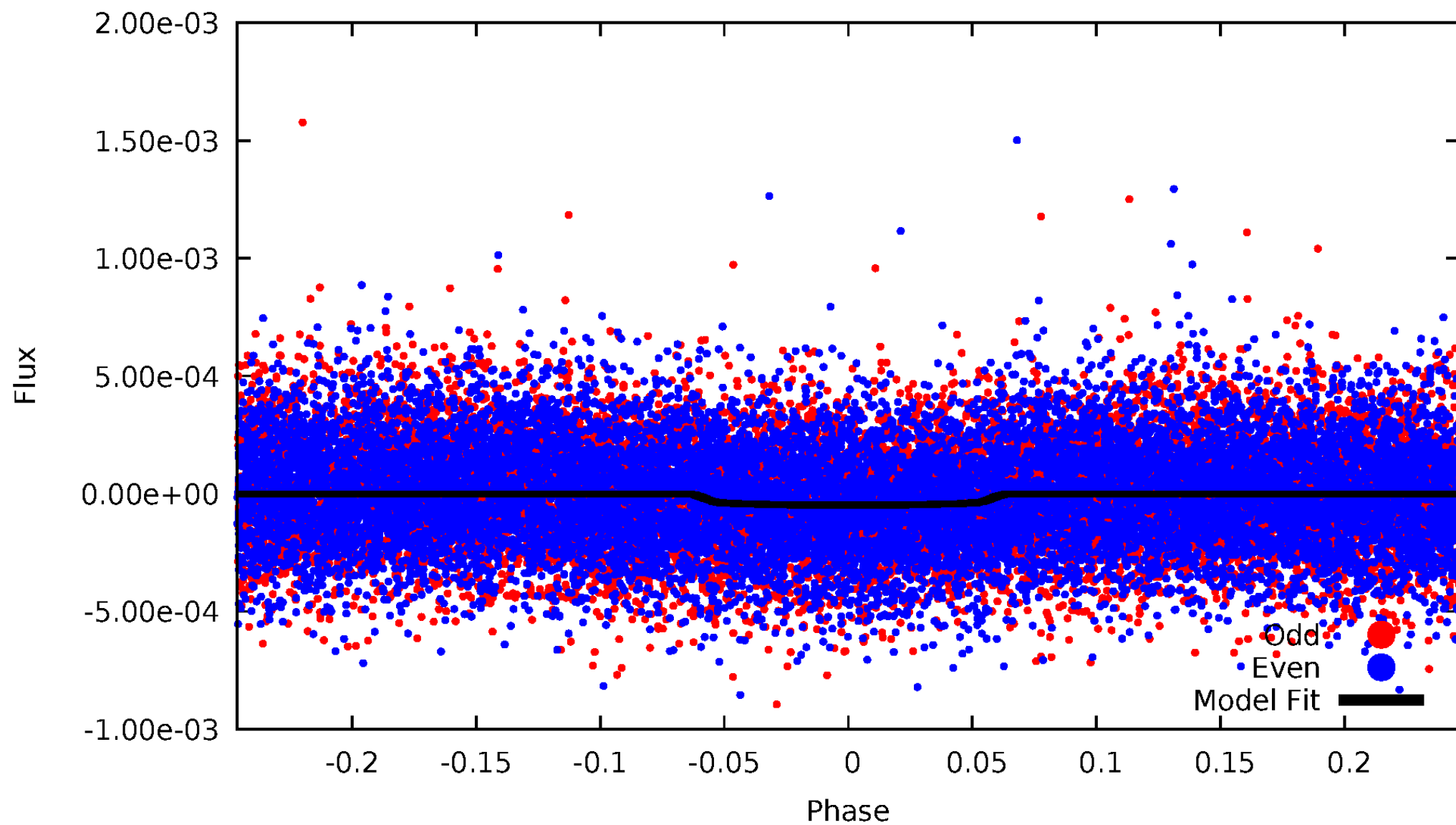
TCE 004384398-01





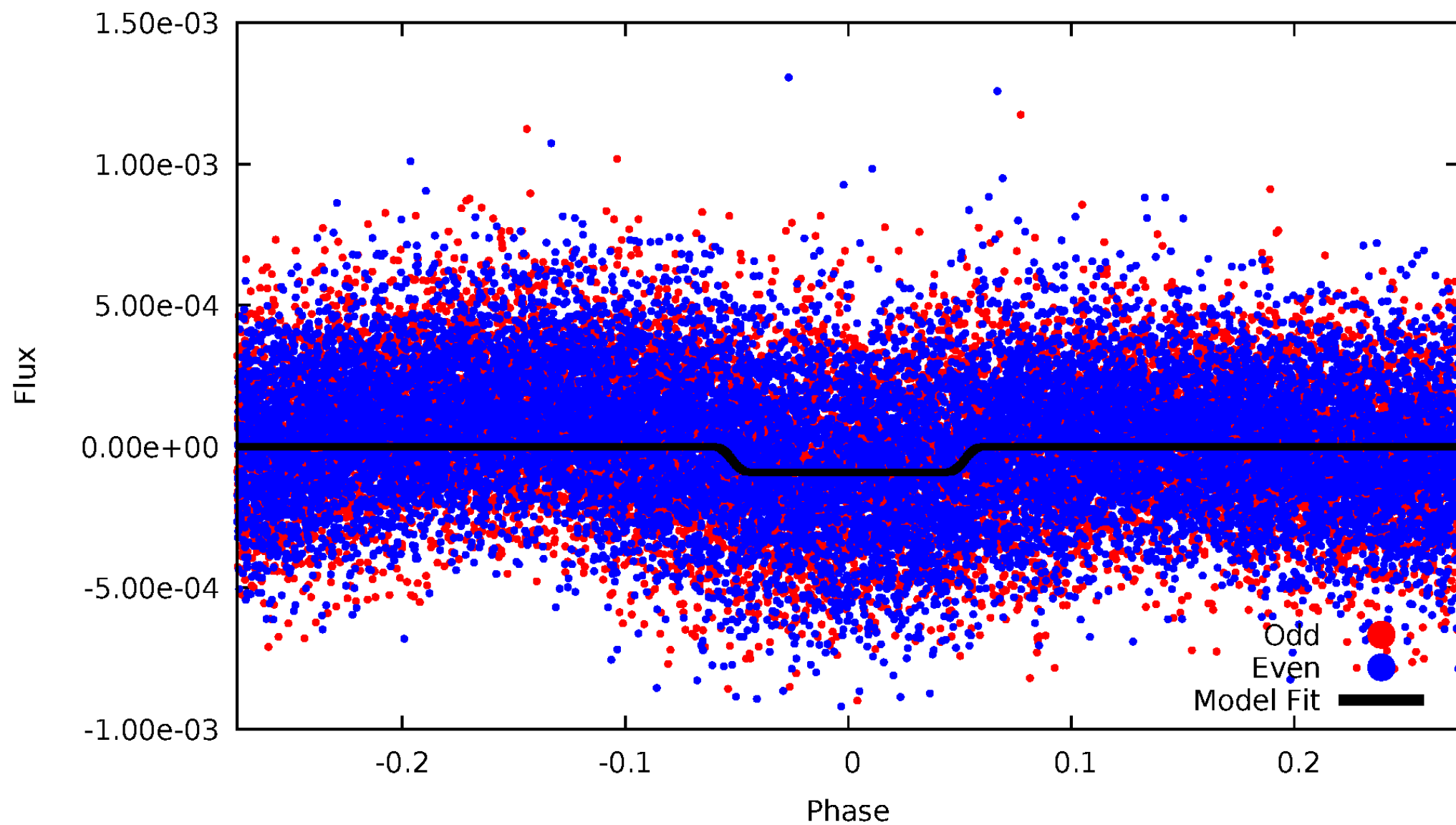
# DV Odd/Even

TCE 004384398-01

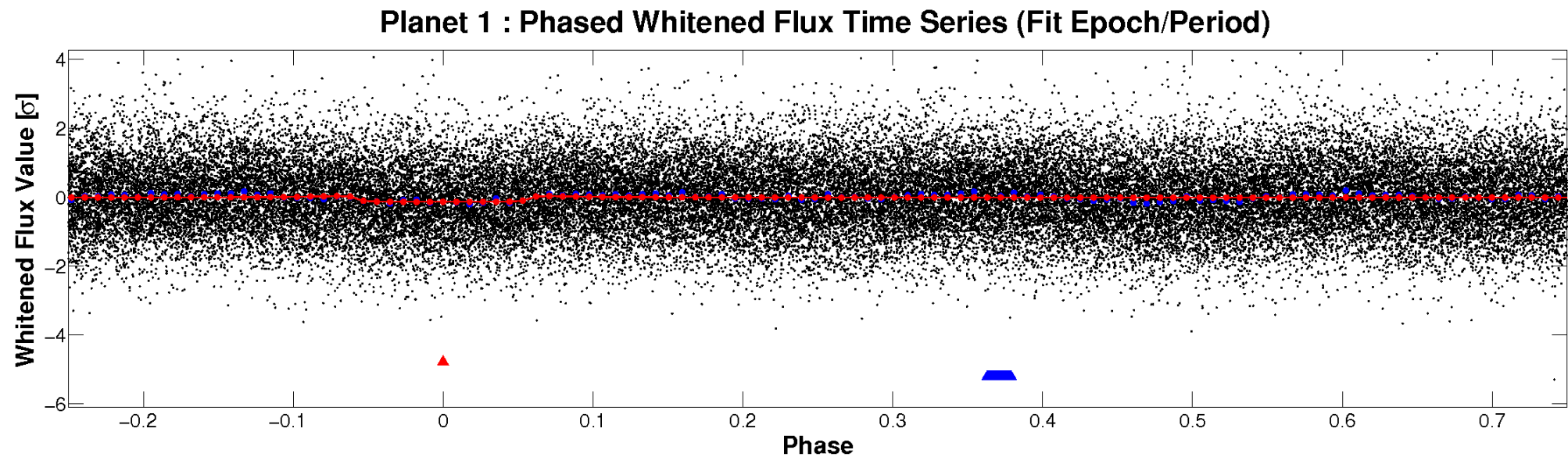
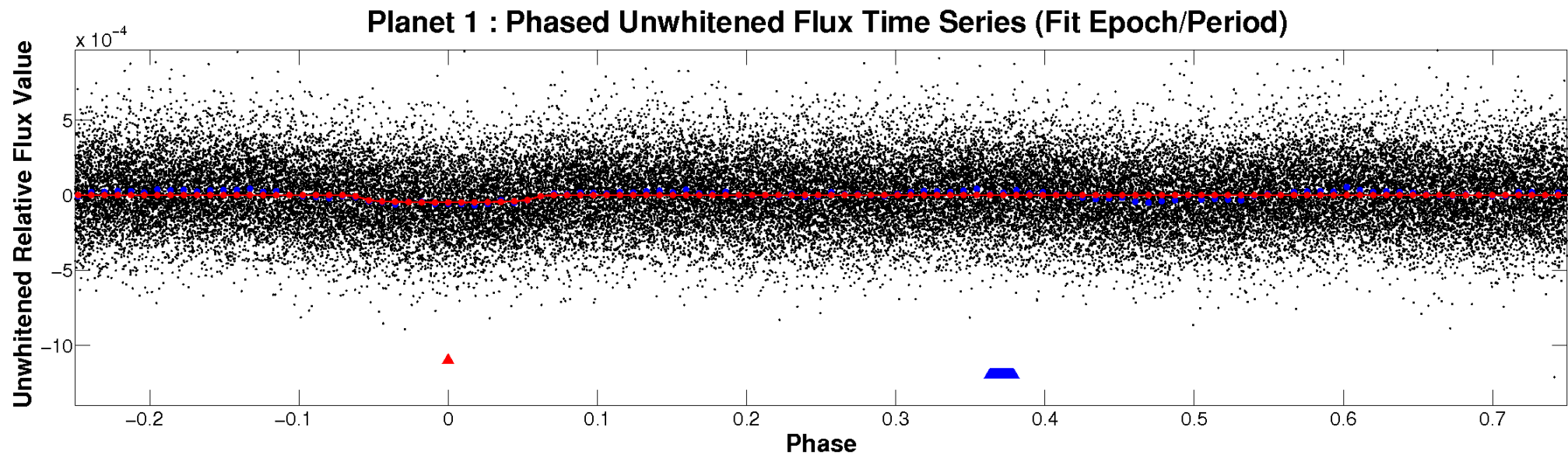


# ALT Odd/Even

TCE 004384398-01

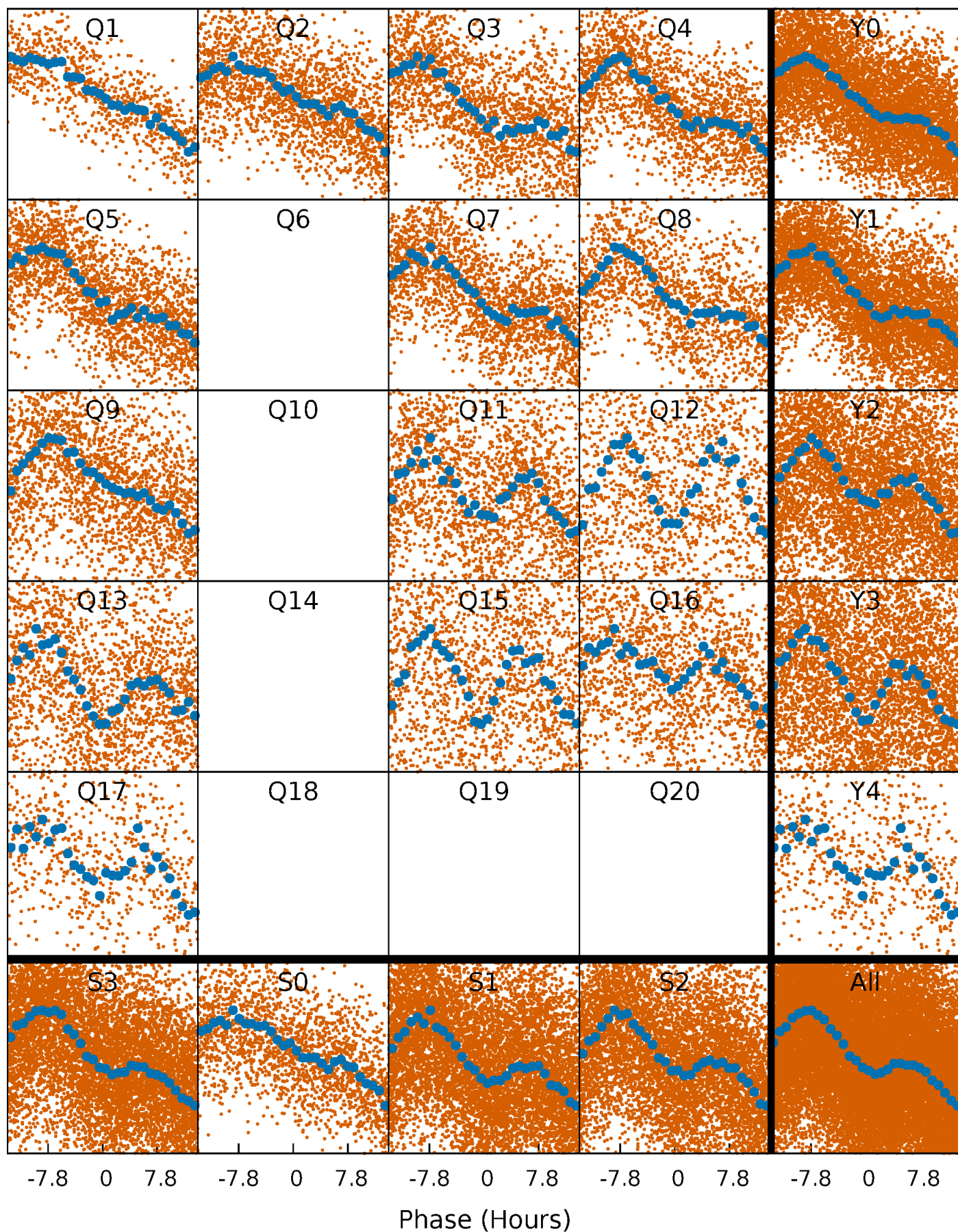


# Non-Whitened Vs. Whitened Light Curve



# PDC Quarter-Phased Transit Curves

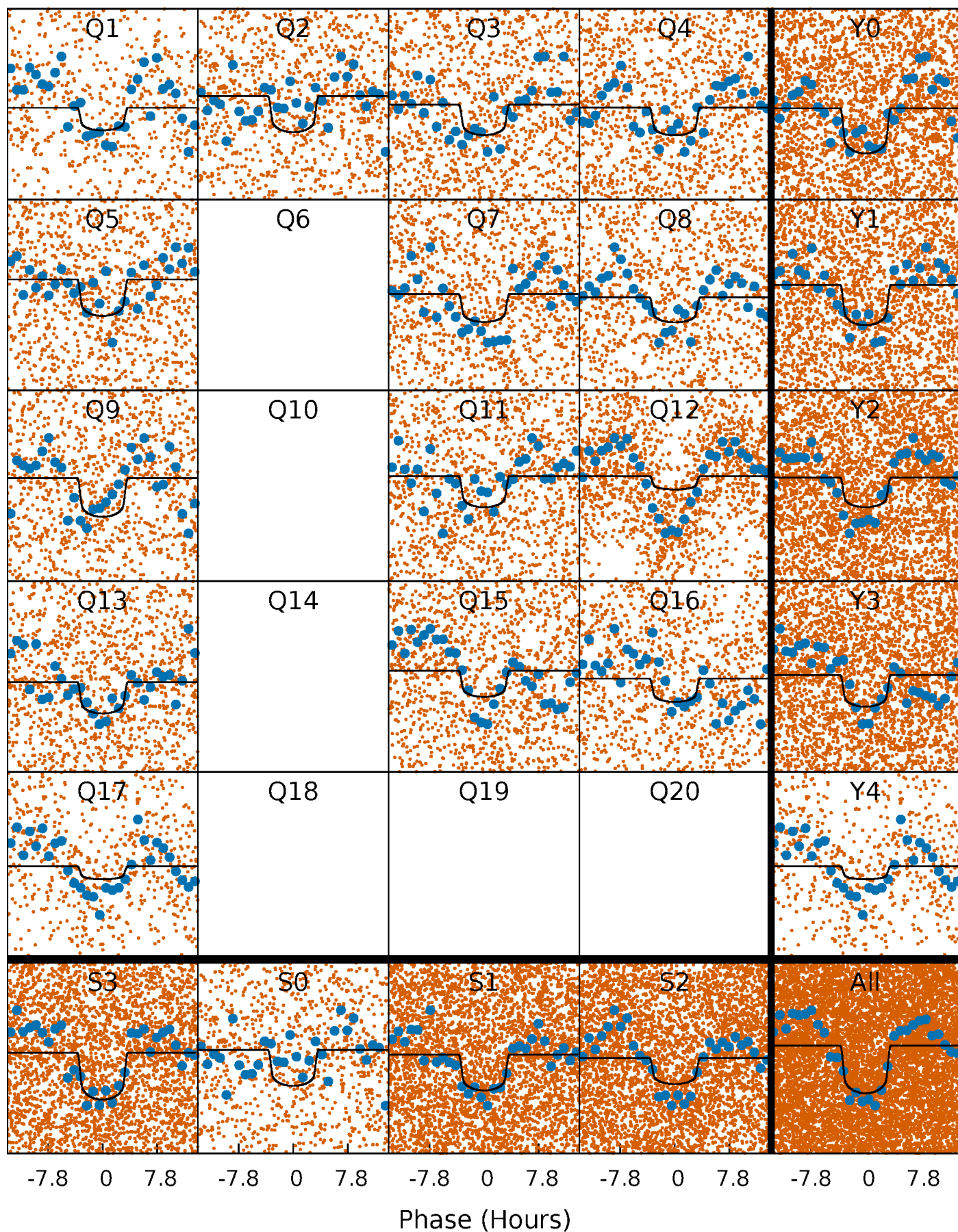
TCE 004384398-01 P= 2.306852 Days  $T_0=132.208805$  (BKJD)





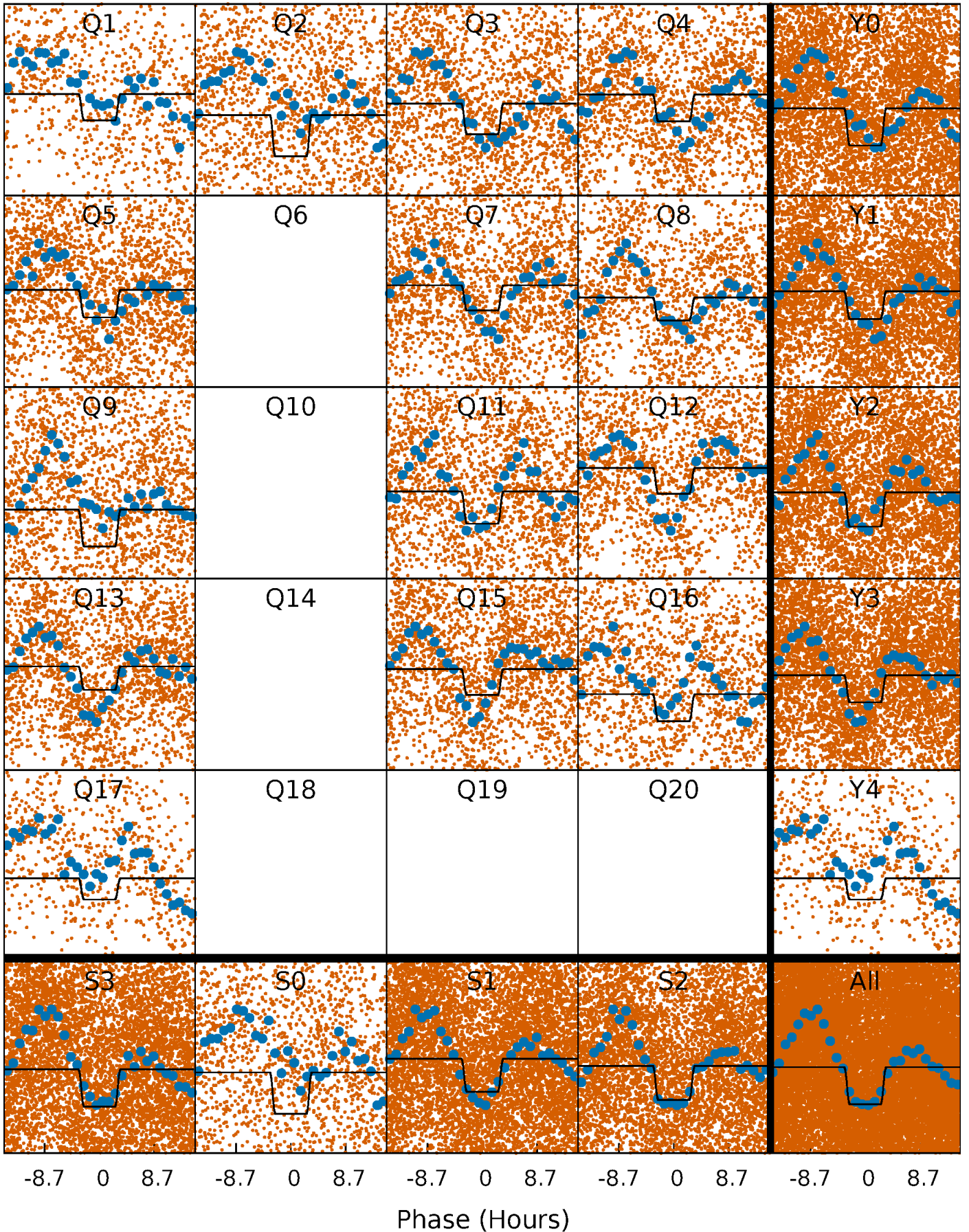
# DV Quarter-Phased Transit Curves

TCE 004384398-01 P= 2.306852 Days  $T_0=132.208805$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

TCE 004384398-01 P= 2.306956 Days  $T_0=132.183741$  (BKJD)

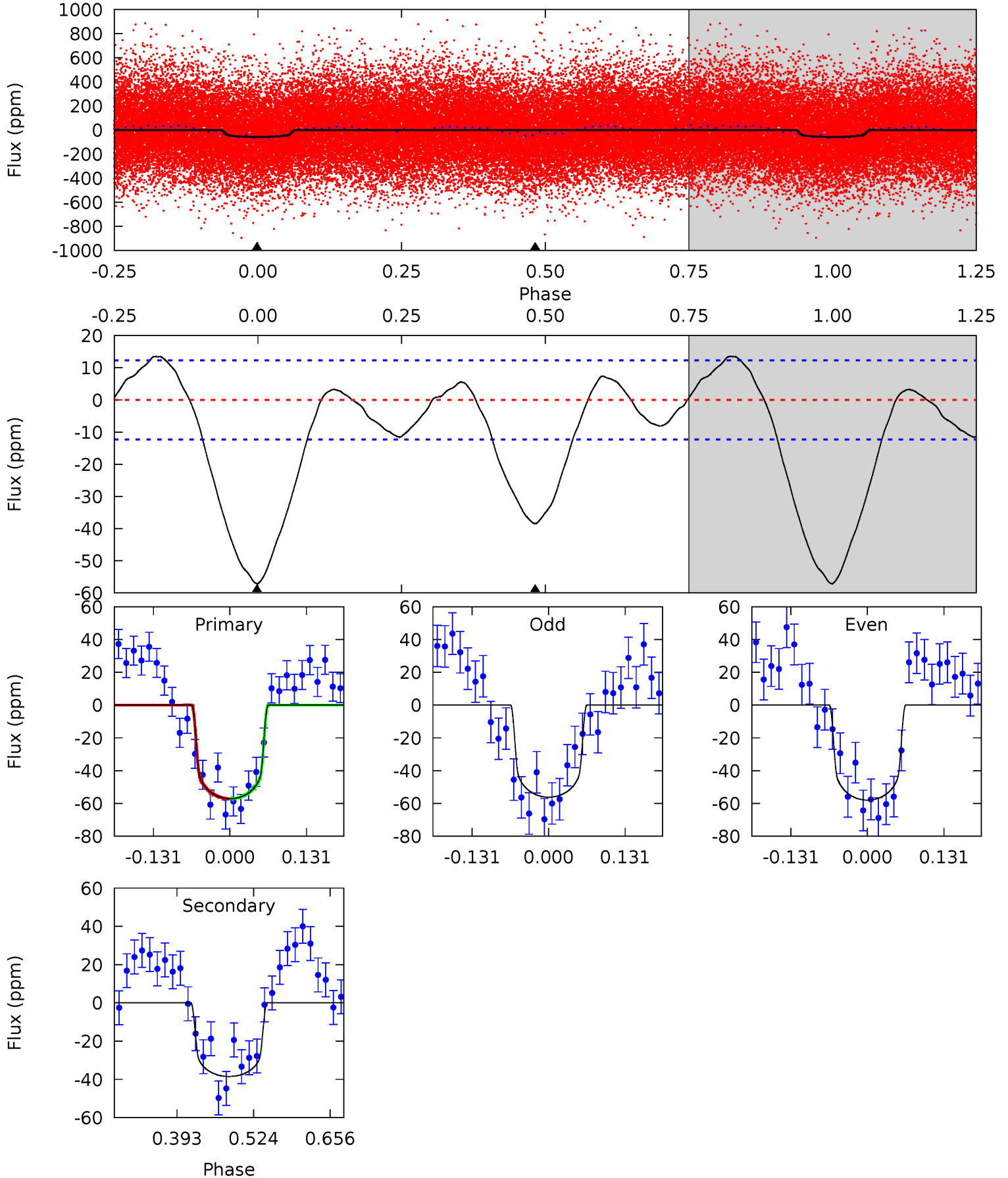




# DV Model-Shift Uniqueness Test

004384398-01, P = 2.306852 Days, E = 129.901953 Days

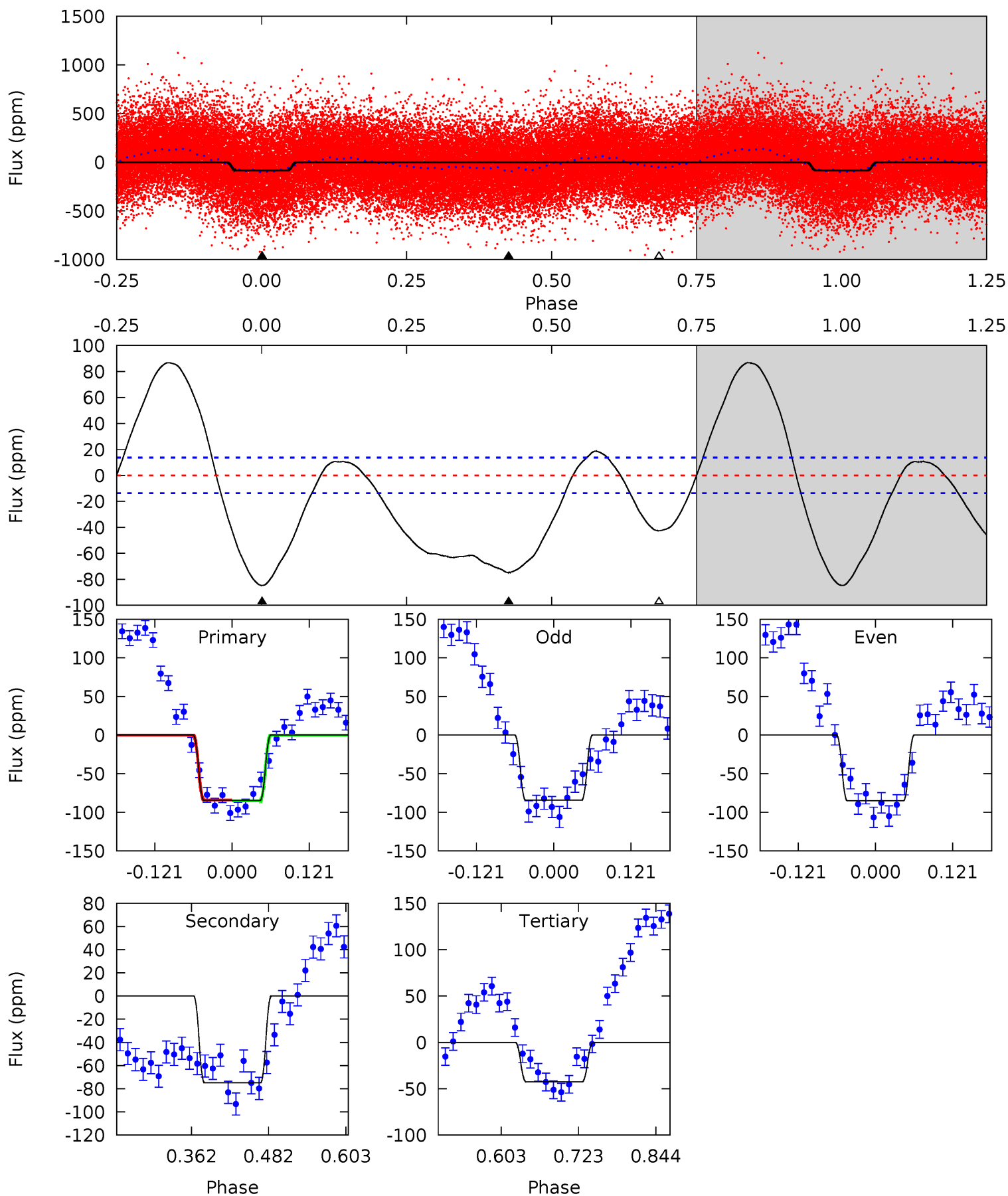
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
21.0	14.1	0	0	4.51	1.51	2.55	21.0	21.0	14.1	14.1	0.32	0.92	0.19	0.01



# Alt Model-Shift Uniqueness Test

004384398-01, P = 2.306956 Days, E = 129.876785 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
28.1	24.8	14.1	0	4.53	1.55	14.0	14.0	28.1	10.7	24.8	0.12	1.03	0.51	0.20





### Stellar Parameters For KIC 004384398

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R$ ( $R_{\odot}$ )	$M(M_{\odot})$	$p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ )
	$6130^{+164}_{-200}$	$4.328^{+0.136}_{-0.187}$	$-0.220^{+0.300}_{-0.300}$	$1.131^{+0.330}_{-0.192}$	$0.991^{+0.166}_{-0.111}$	$0.964^{+0.629}_{-0.483}$
	+3%/-3%	+3%/-4%	+136%/-136%	+29%/-17%	+17%/-11%	+65%/-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 004384398-01 / KOI

Detrend	Depth (ppm)	$R_p$ ( $R_{\oplus}$ )	$T_{max}$ (K)	$T_{obs}$ (K)	$A_{obs}$
DV	$-38 \pm 3$	$0.95^{+0.23}_{-0.23}$	$2181^{+154}_{-134}$	$5566^{+639}_{-482}$	$28^{+19}_{-10}$
Alt.	$-75 \pm 3$	$1.18^{+0.30}_{-0.20}$	$2181^{+155}_{-131}$	$5798^{+593}_{-439}$	$34^{+16}_{-11}$

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

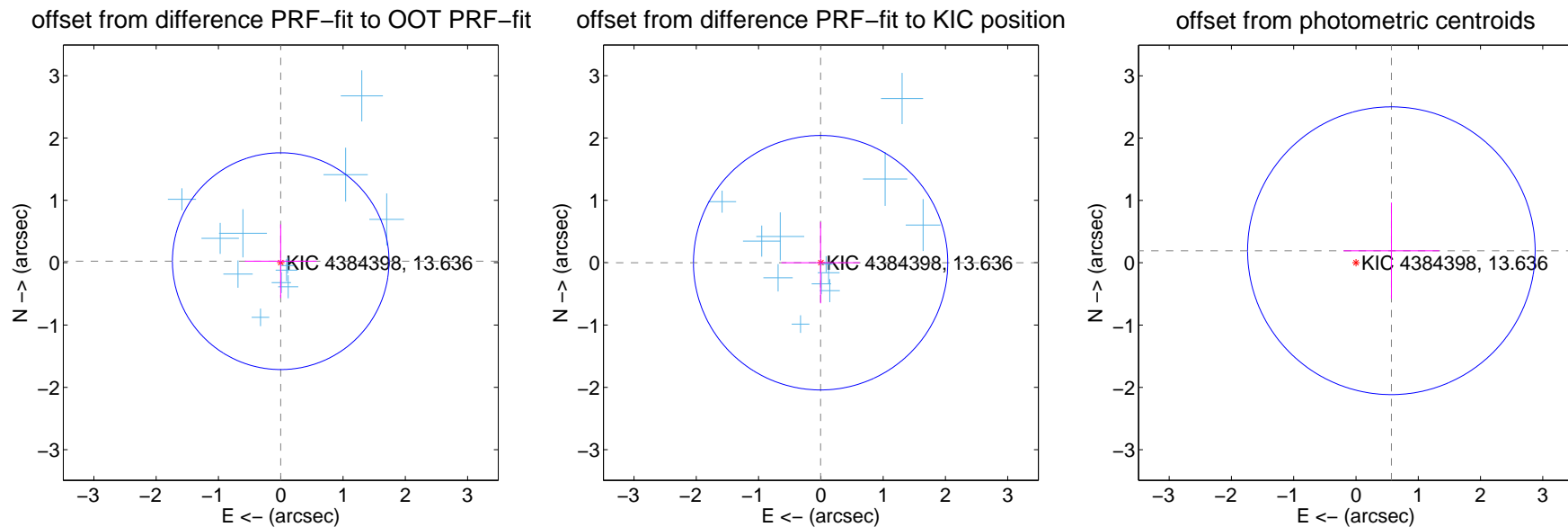
## DV Centroid Data

Supplemental centroid analysis for 004384398-01. Kepler magnitude: 13.64. Transit SNR 9.72

There are 12 quarters with good PRF difference image offsets

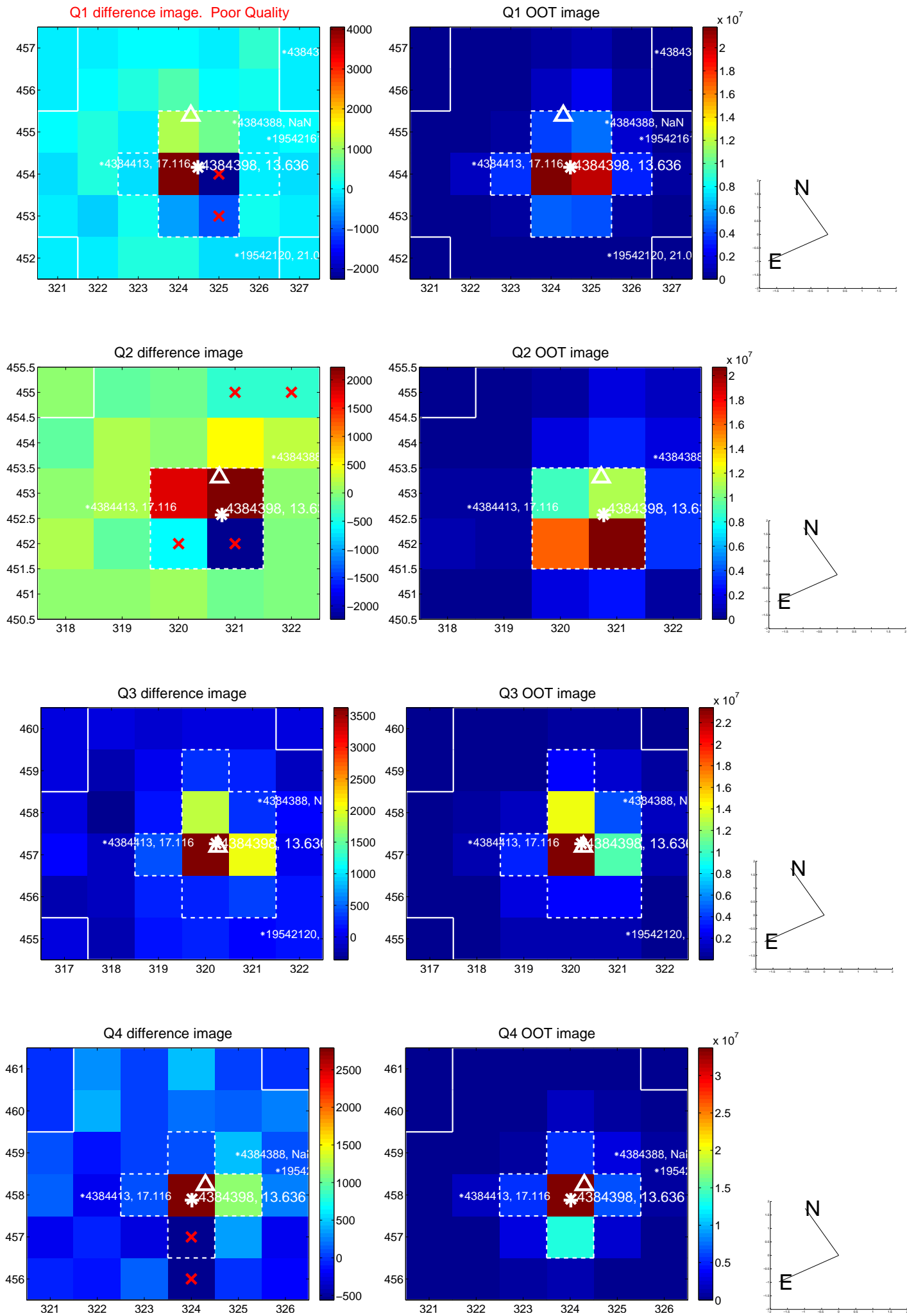
The direct PRF centroid is offset from the target star catalog position by about 0.07 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.024 \pm 0.580$	0.04	$0.001 \pm 0.576$	$0.024 \pm 0.590$
PRF-fit source offset from KIC position	$0.004 \pm 0.681$	0.01	$0.004 \pm 0.629$	$-0.000 \pm 0.652$
photometric centroid source offset	$0.60 \pm 0.77$	0.78	$-0.57 \pm 0.77$	$0.19 \pm 0.77$

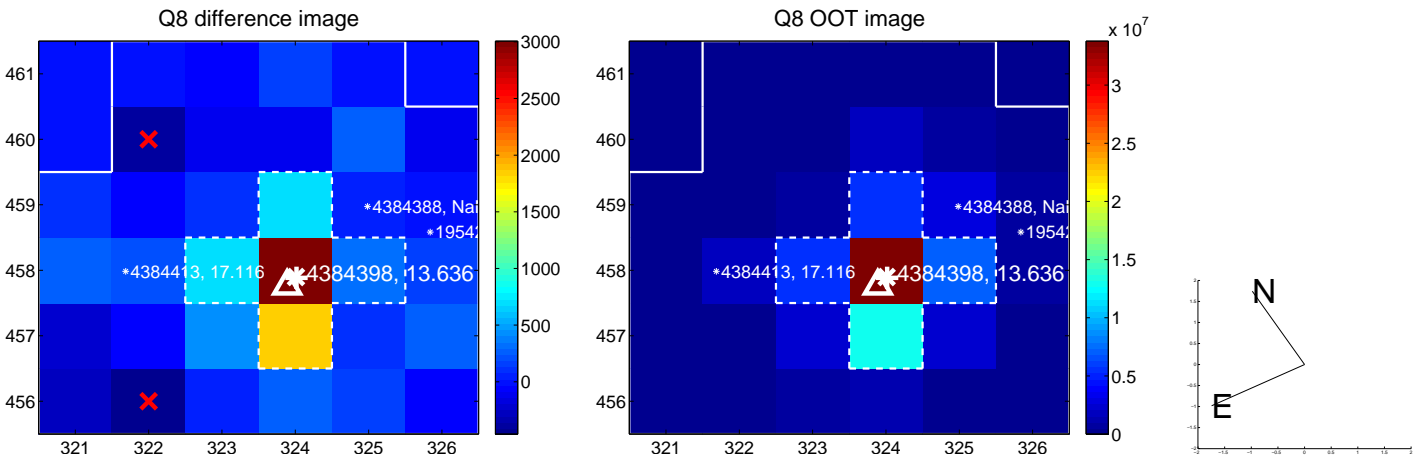
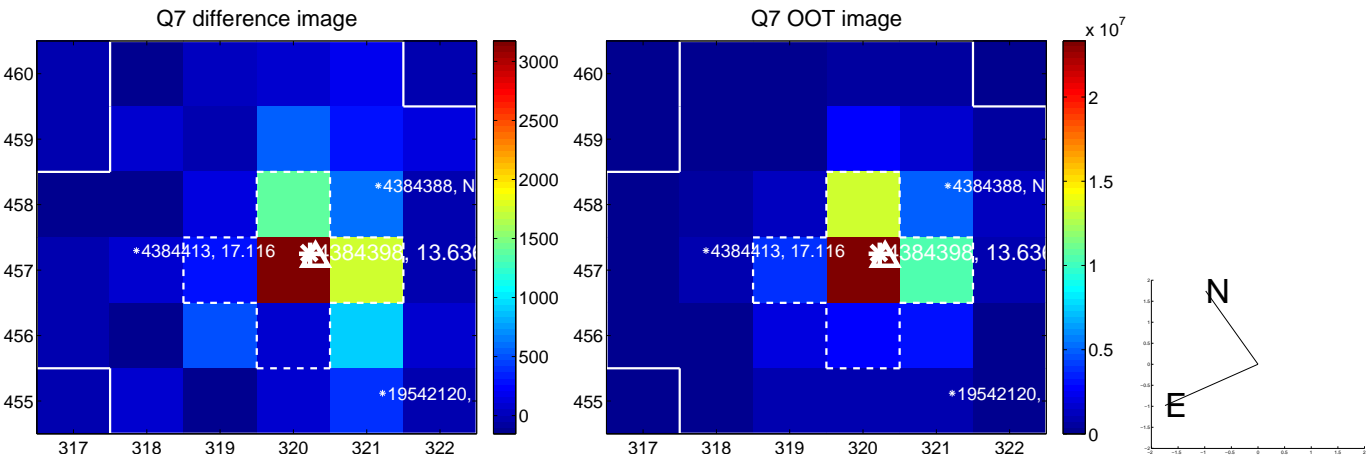
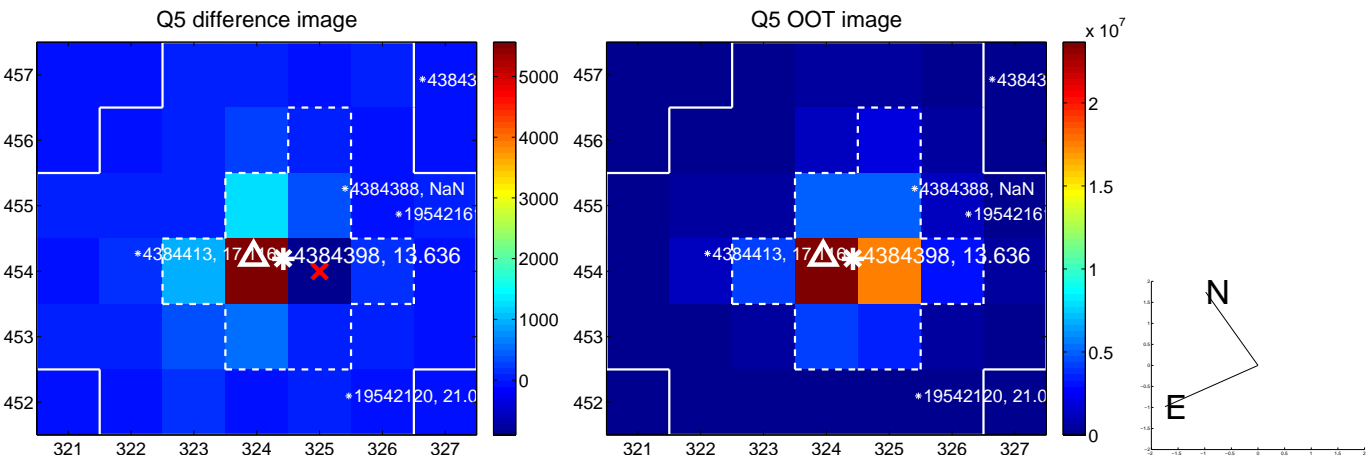


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses:** good quarterly centroid offsets; **Vermillion crosses:** bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

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

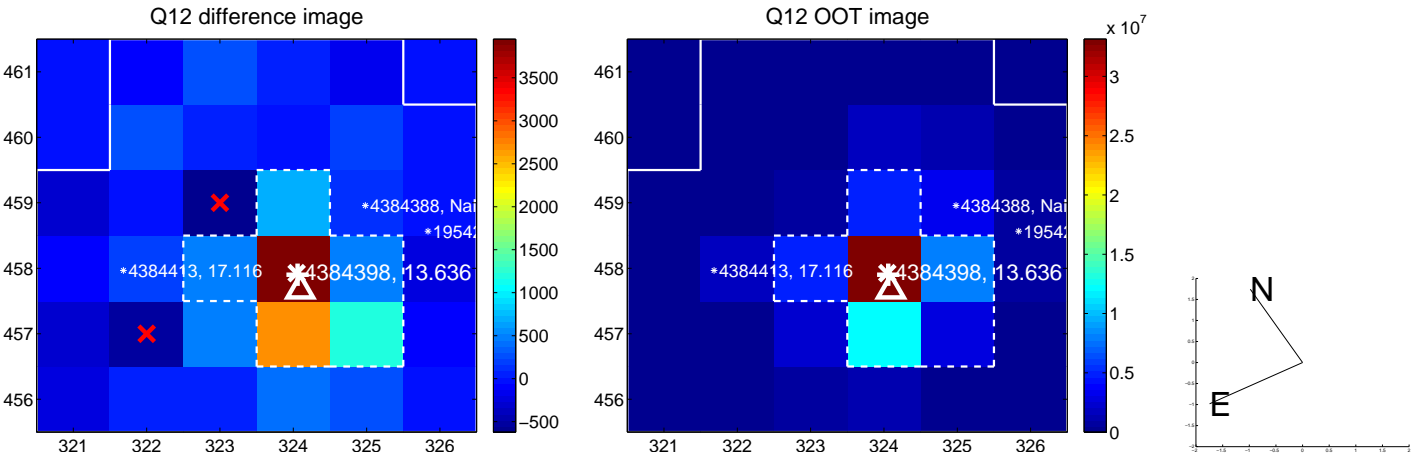
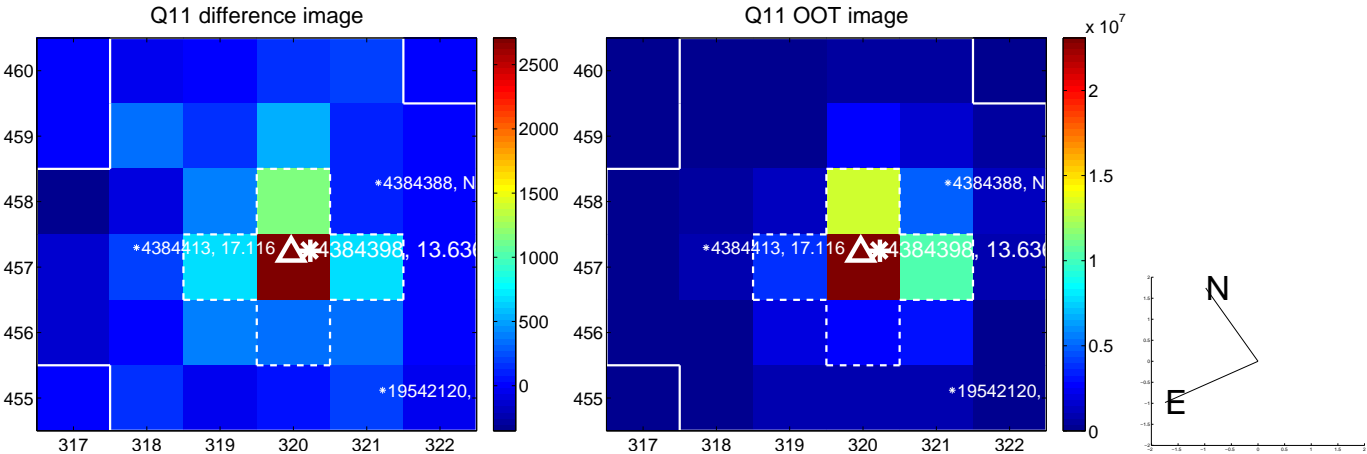
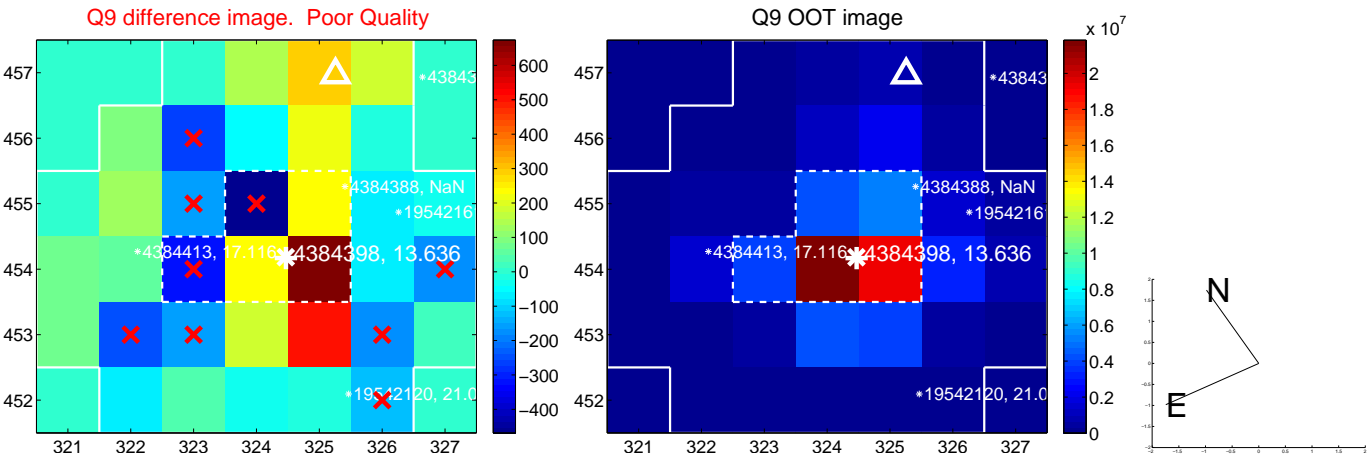


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

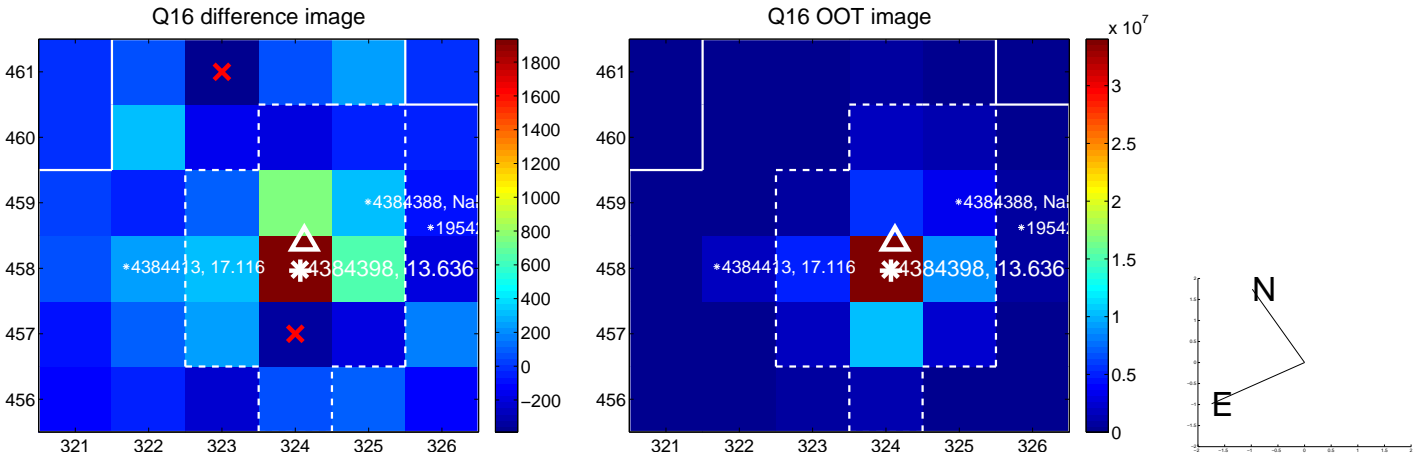
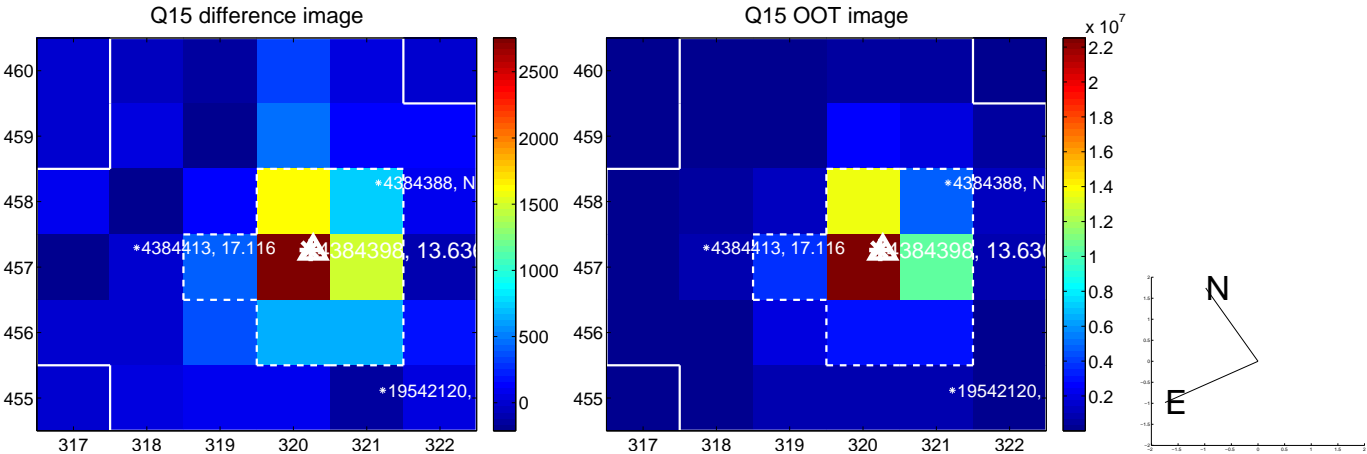
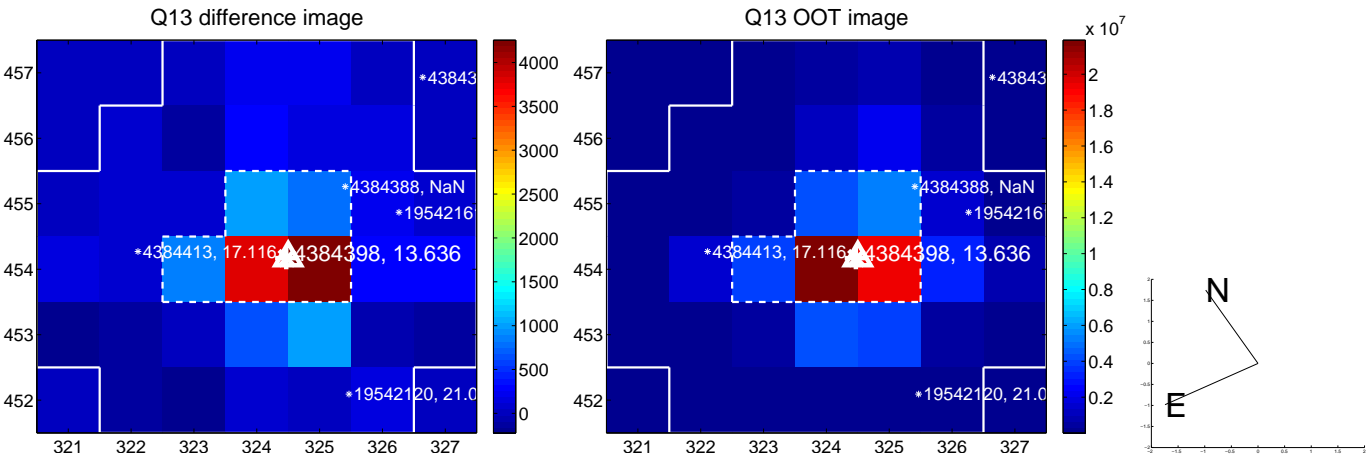




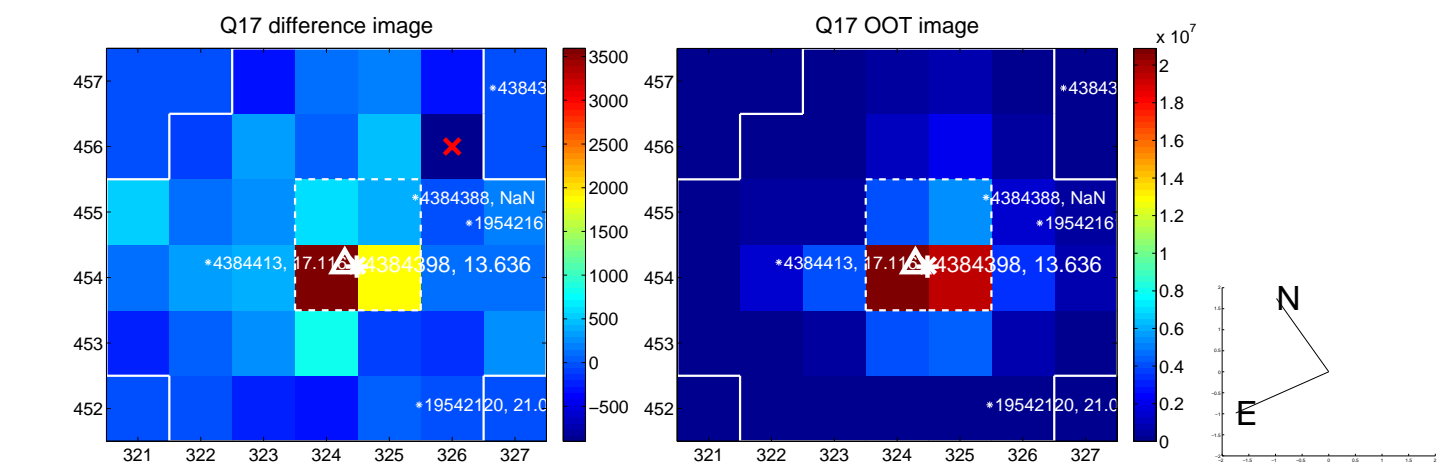
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



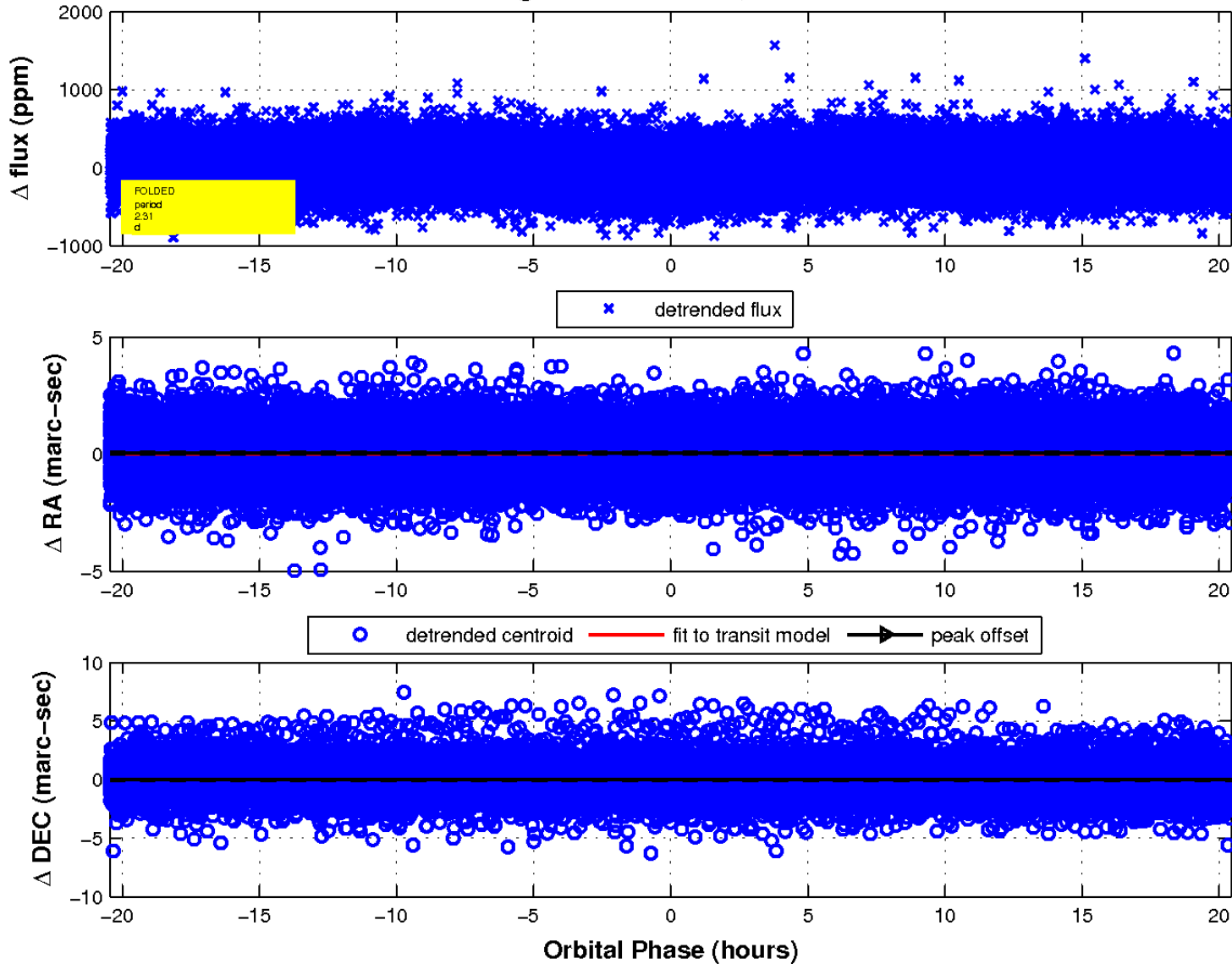
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

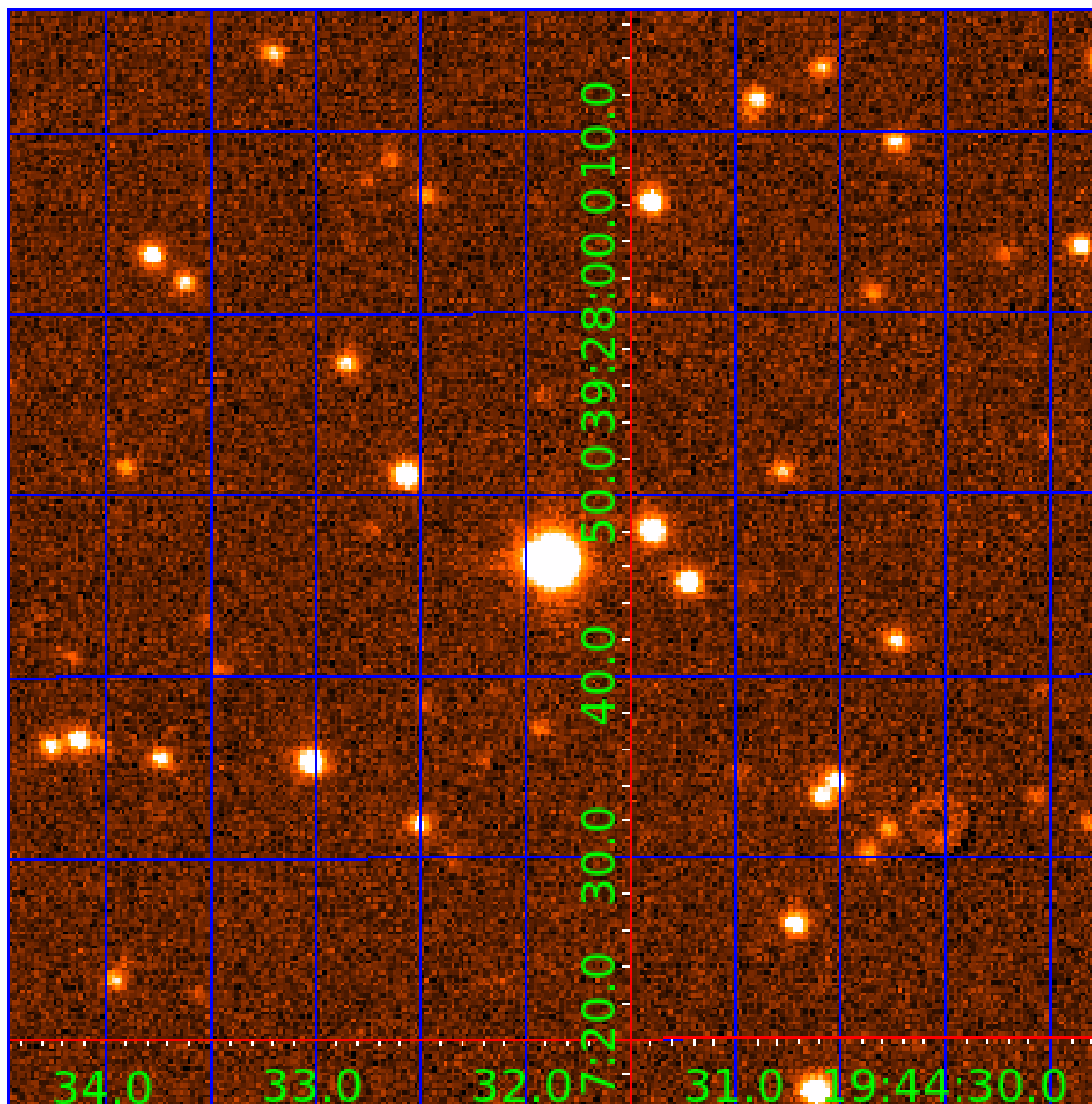


fluxWeightedCentroids, Planet 1 of 2



UKIRT Image

Declination





# KIC 004384398

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
004384398-01	OBS	No	2.306852	132.208805	48.7	6.818	8.9	9.7	1.13	6130	0.94	1392.15
004384398-02	OBS	No	2.306794	133.083165	10.4	21.830	9.2	3.1	1.13	6130	0.38	1392.19

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
004384398-01	OBS	FP	0.00	1	0	0	0	SWEET_NTL—LPP_DV—LPP_ALT—MOD_NONUNIQ_ALT
004384398-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_SKYE_ZUMA—SWEET_NTL—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_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.

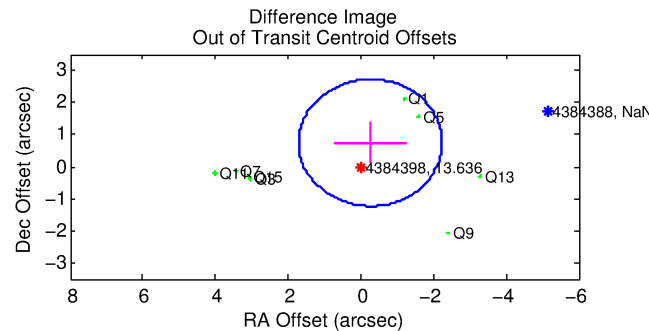
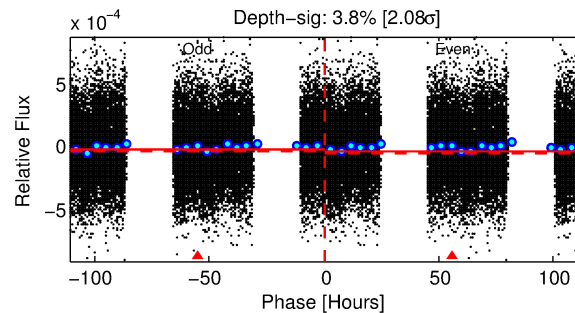
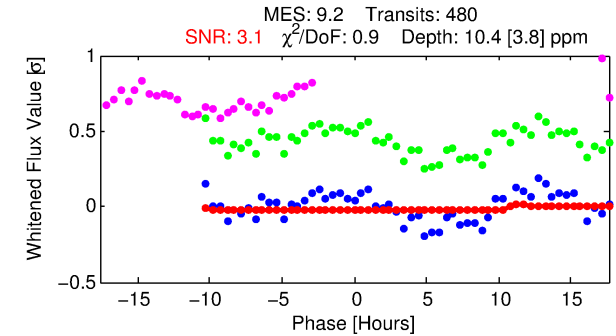
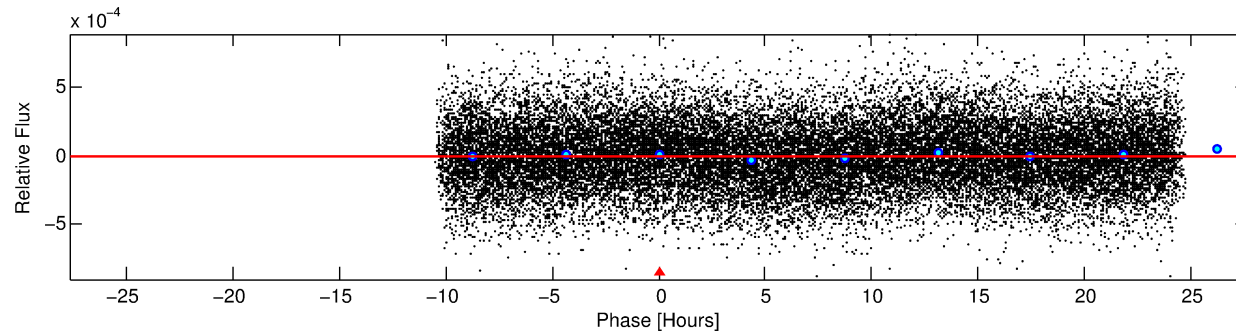
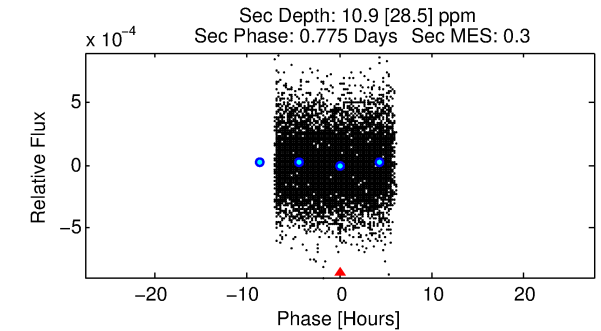
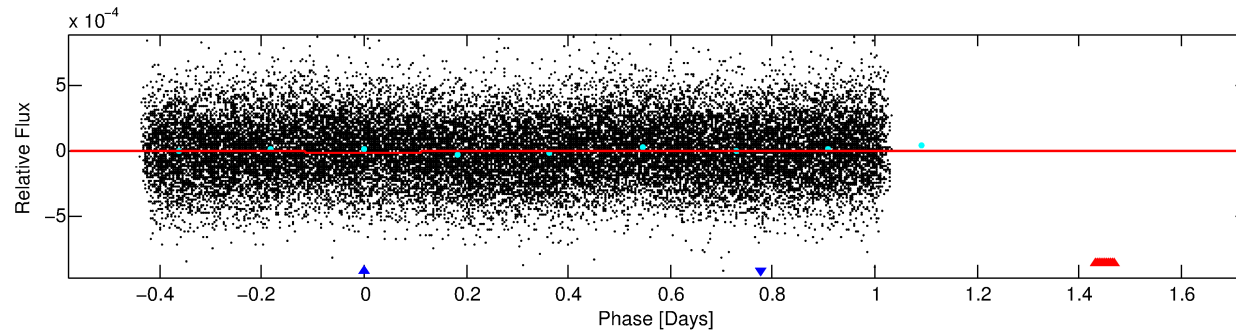
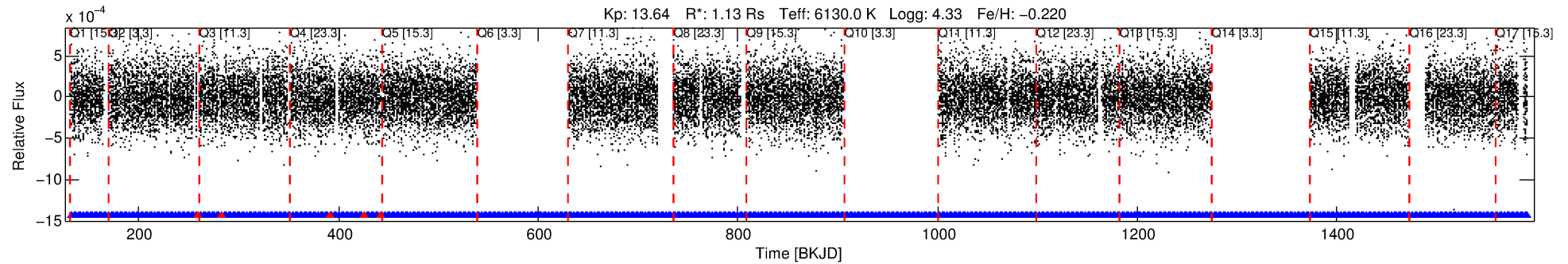
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 004384398-02

No Significant Match Found

# DV One-Page Summary

KIC: 4384398 Candidate: 2 of 2 Period: 2.307 d



## DV Fit Results:

Period = 2.30679 [0.00019] d  
Epoch = 133.0832 [0.1598] BKJD  
Rp/R\* = 0.0030 [0.0068]  
a/R\* = 1.05 [1.04]  
b = 0.50 [17.40]  
Seff = 1392.19 [515.81]  
Teff = 1558 [144] K  
Rp = 0.38 [0.85] Re  
a = 0.0341 [0.0082] AU  
Ag = 49.19 [256.17] [0.19σ]  
Teffp = 6378 [8287] K [0.58σ]

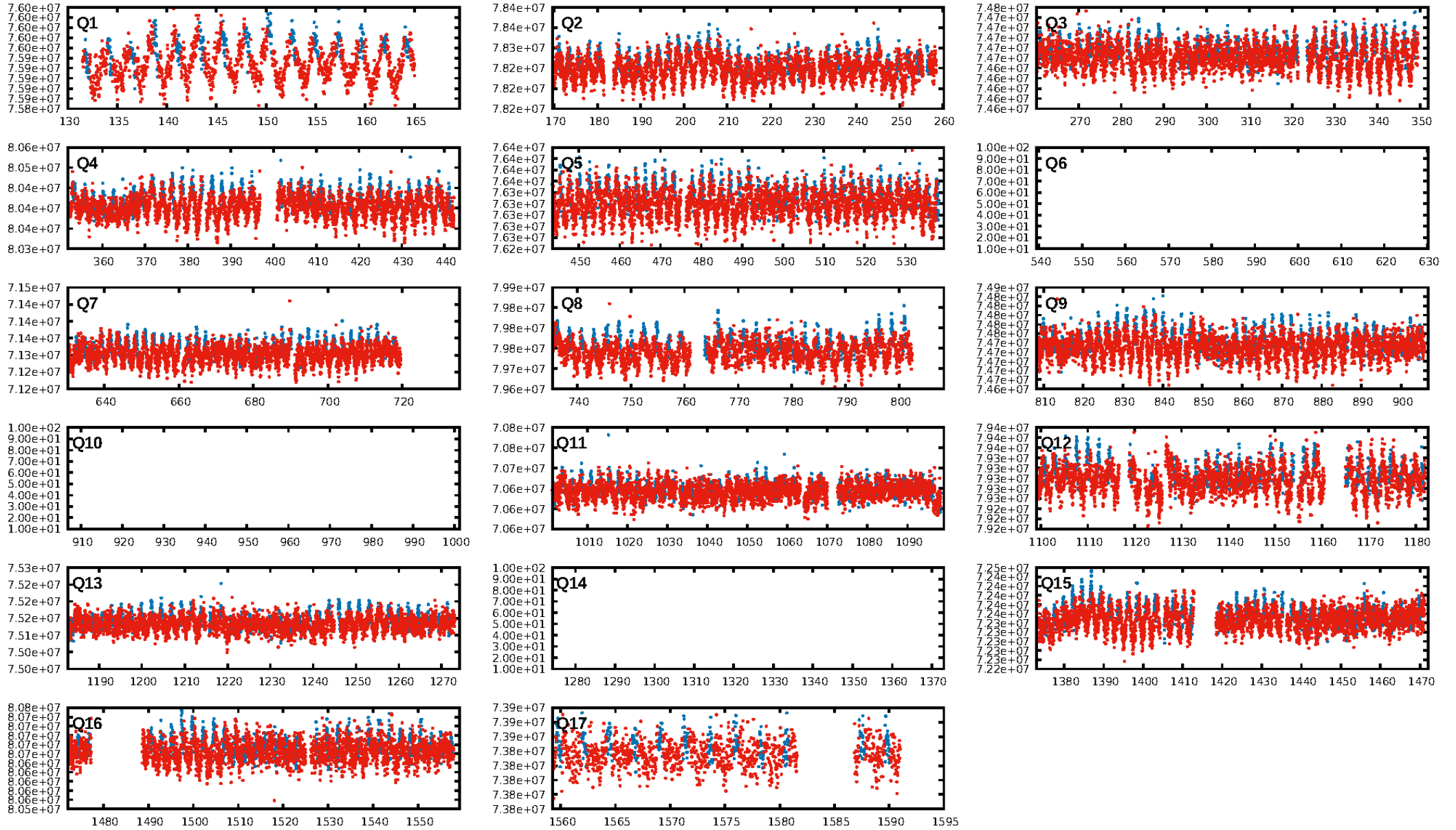
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 0.0% [0.00σ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: N/A  
RollingBand-fgt: 0.99 [448/453]  
GhostDiagnostic-chr: 0.8959  
Centroid-sig: 0.0%  
Centroid-so: 7.902 arcsec [3.57σ]  
OotOffset-rm: 0.788 arcsec [1.20σ]  
OotOffset-st: 0/4/0/4 [8]  
KicOffset-rm: 0.788 arcsec [1.20σ]  
KicOffset-st: 0/4/0/4 [8]  
DiffImageQuality-fgm: 0.00 [0/8]  
DiffImageOverlap-fno: 0.00 [0/14]

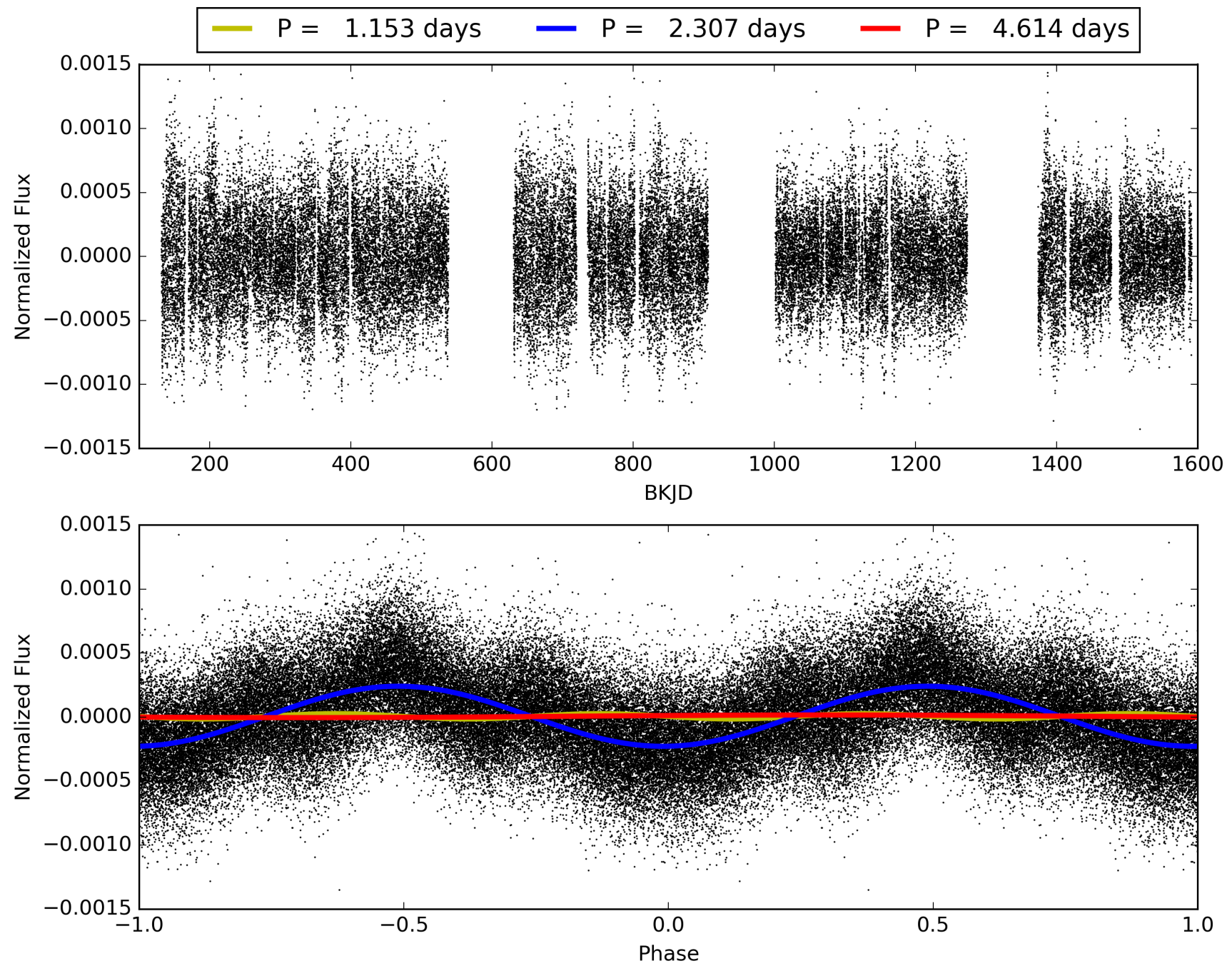
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 30-Jan-2016 02:36:00 Z

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

# TCE 004384398-02, PDC Light Curves



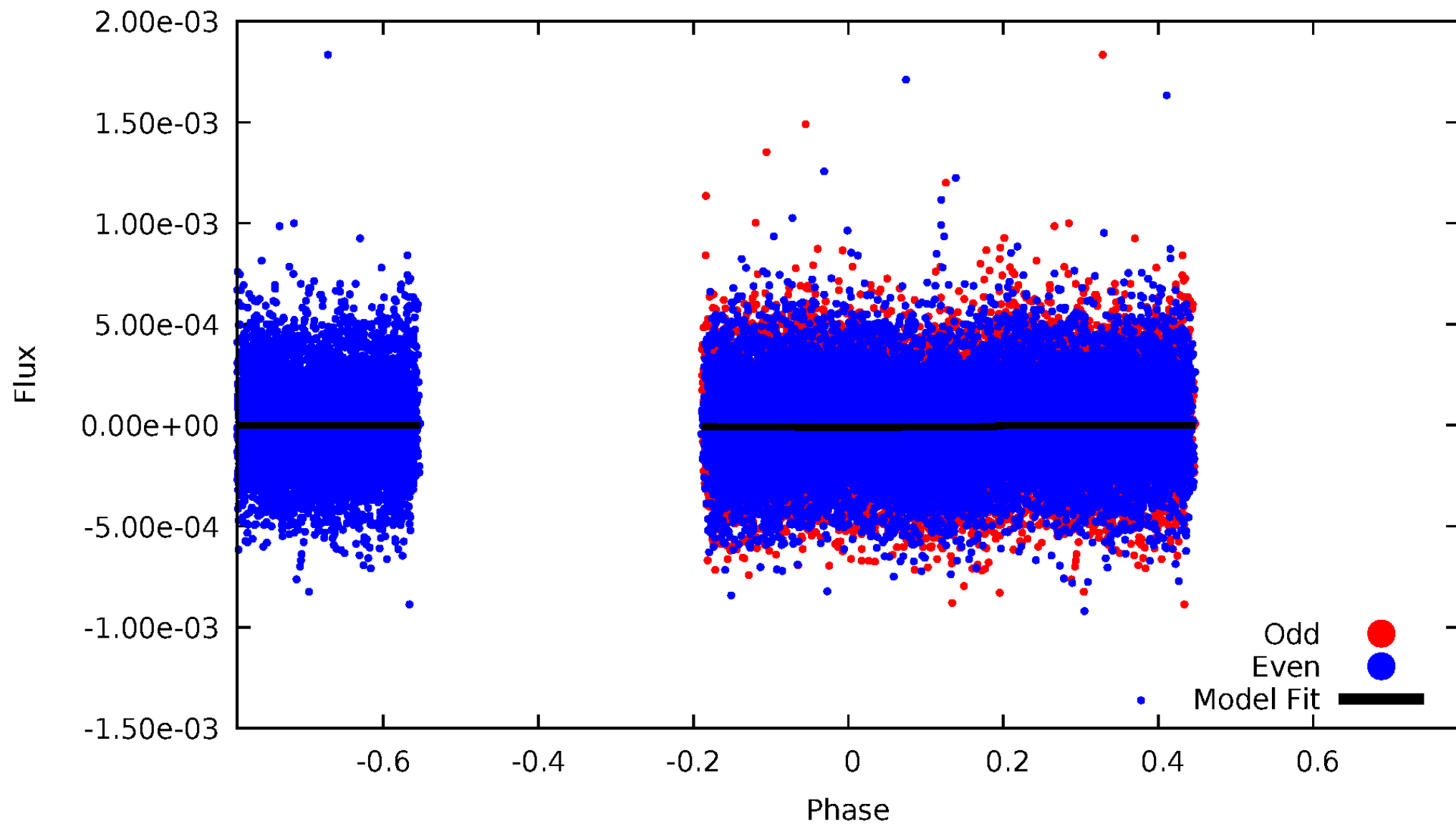
TCE 004384398-02





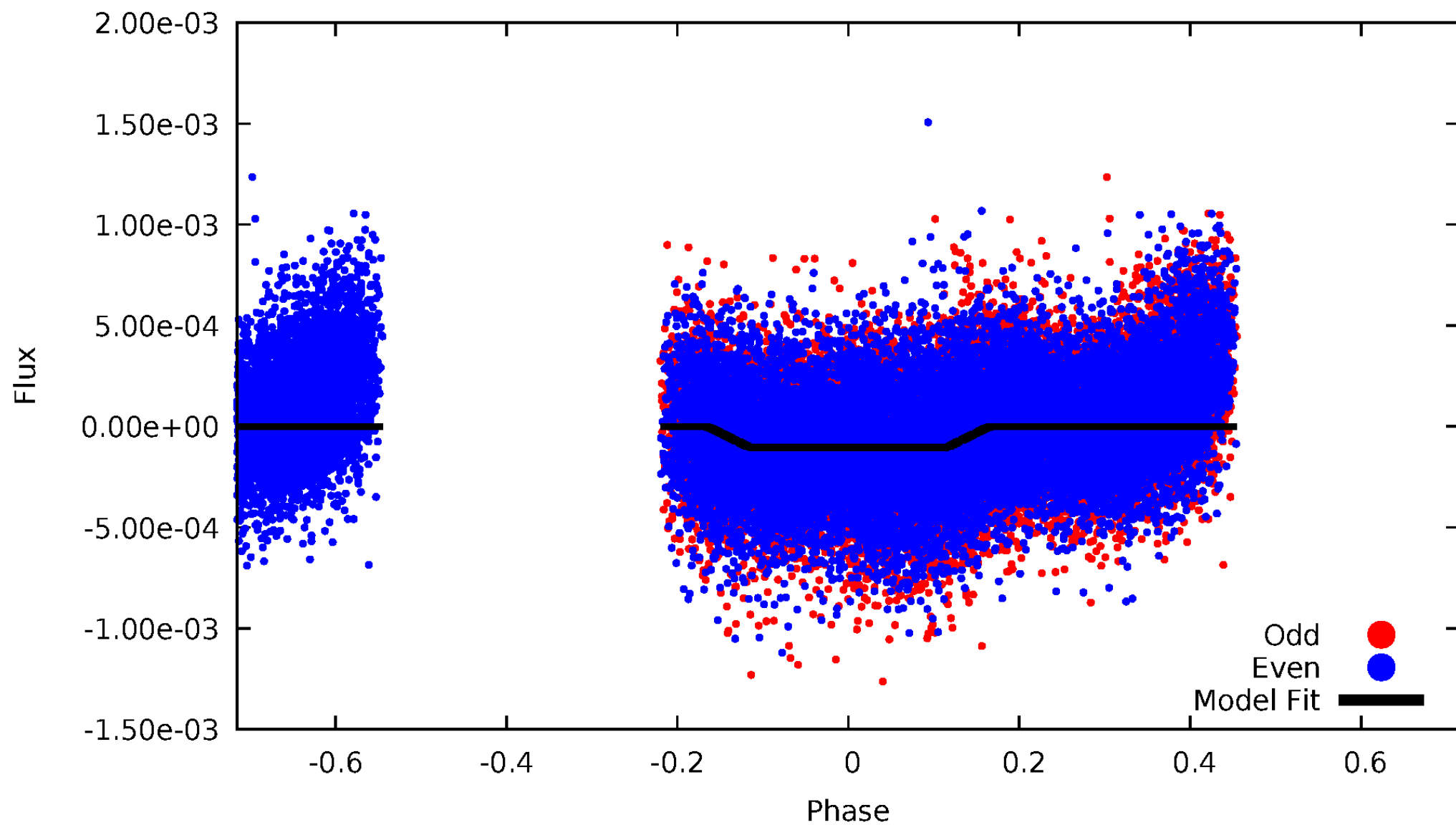
# DV Odd/Even

TCE 004384398-02



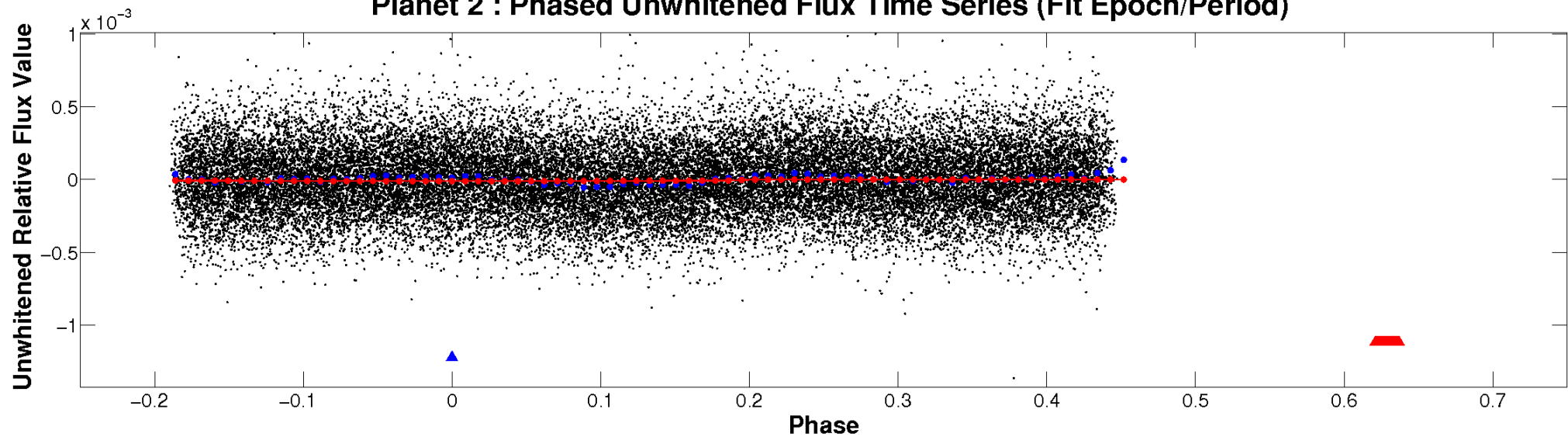
# ALT Odd/Even

TCE 004384398-02

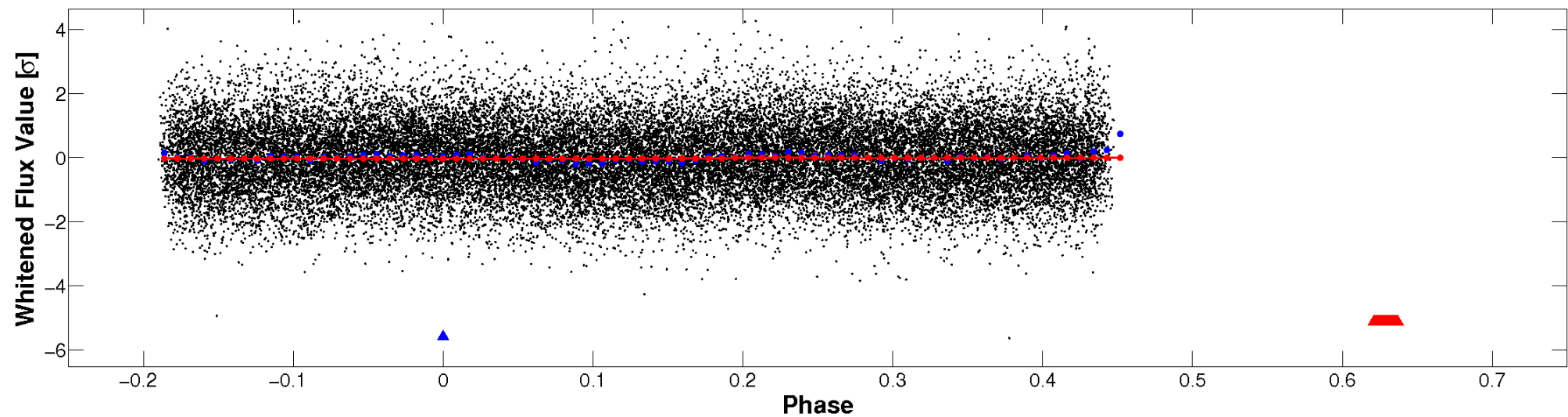


# Non-Whitened Vs. Whitened Light Curve

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

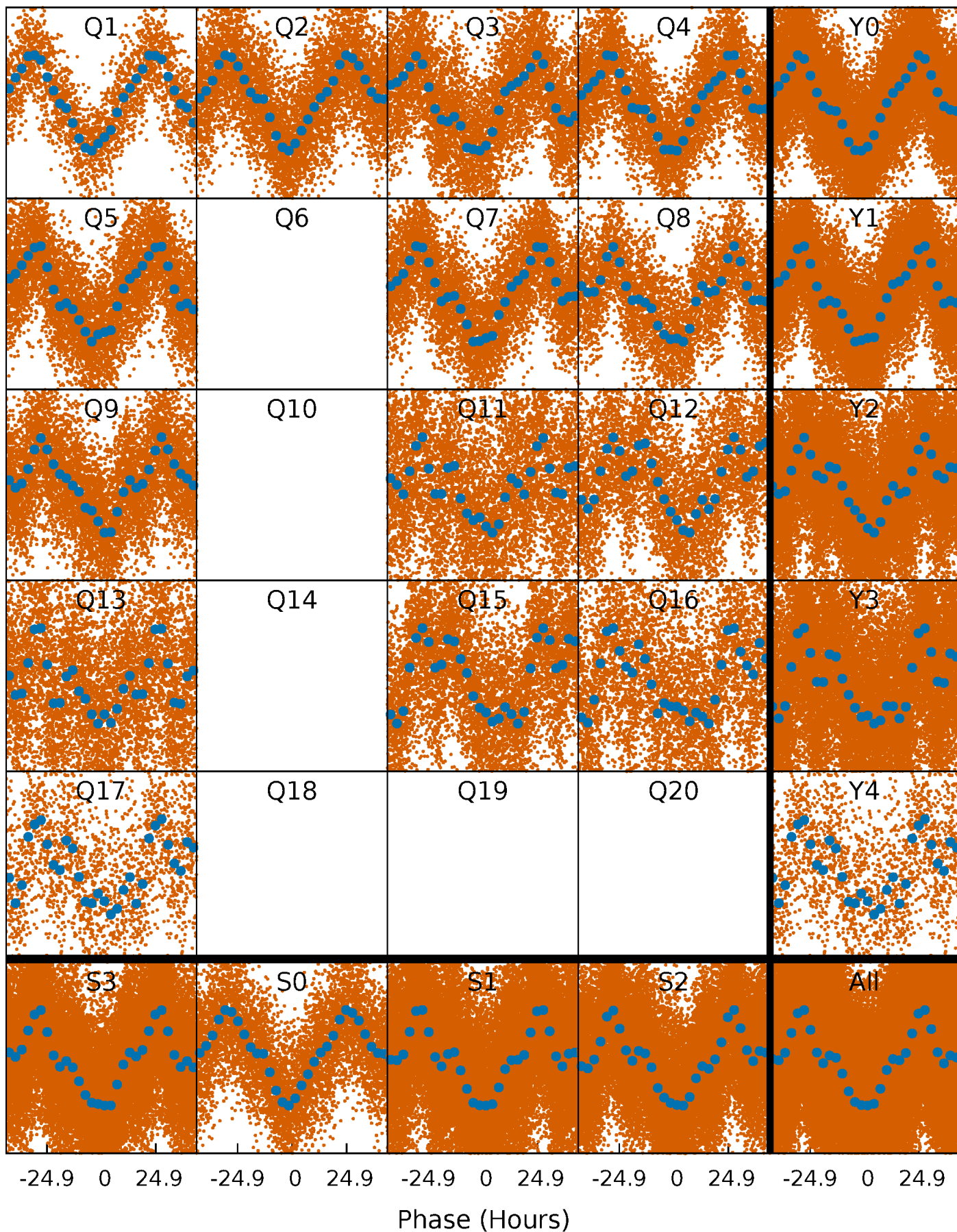


## Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



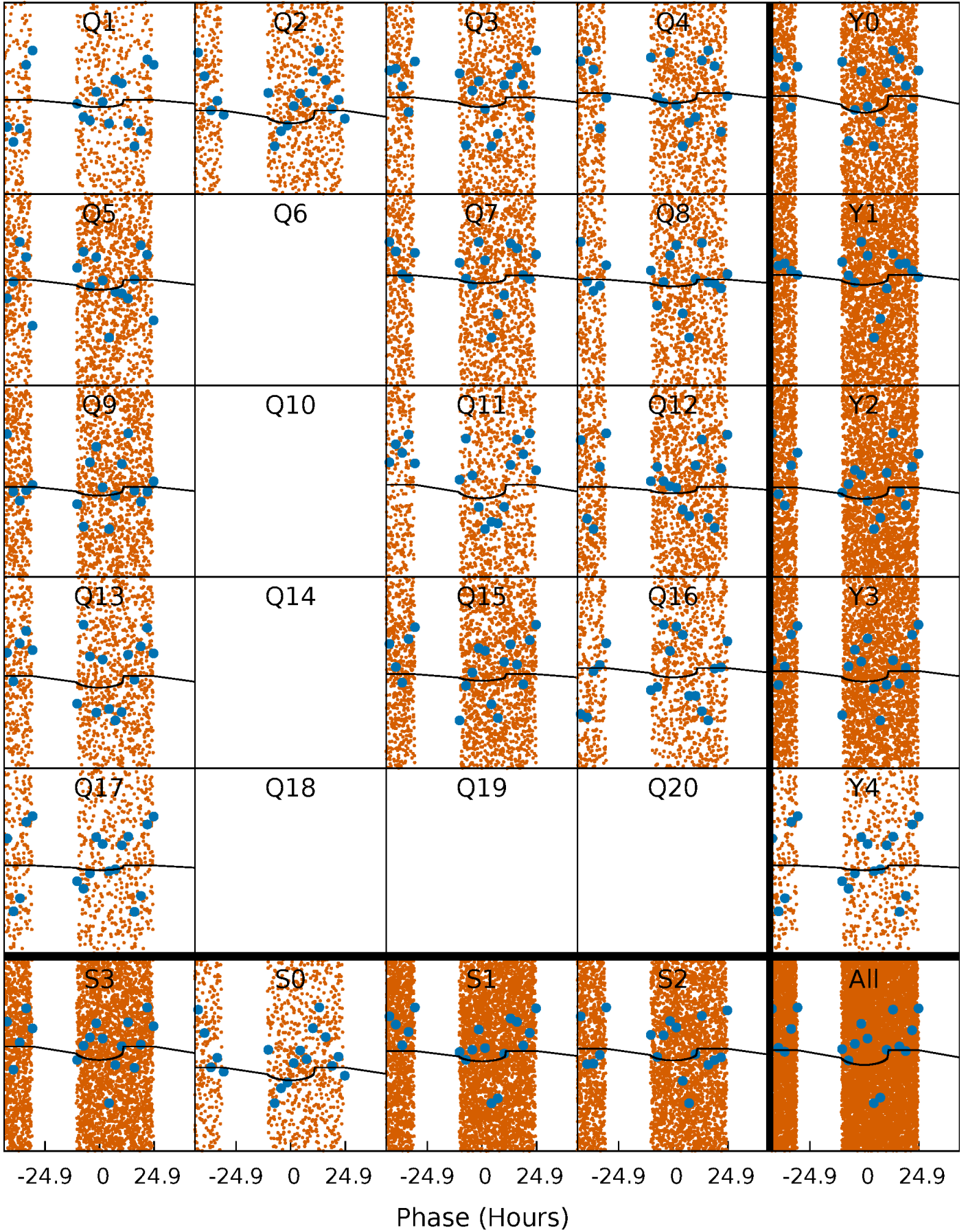
# PDC Quarter-Phased Transit Curves

TCE 004384398-02   P= 2.306794 Days    $T_0=133.083165$  (BKJD)



# DV Quarter-Phased Transit Curves

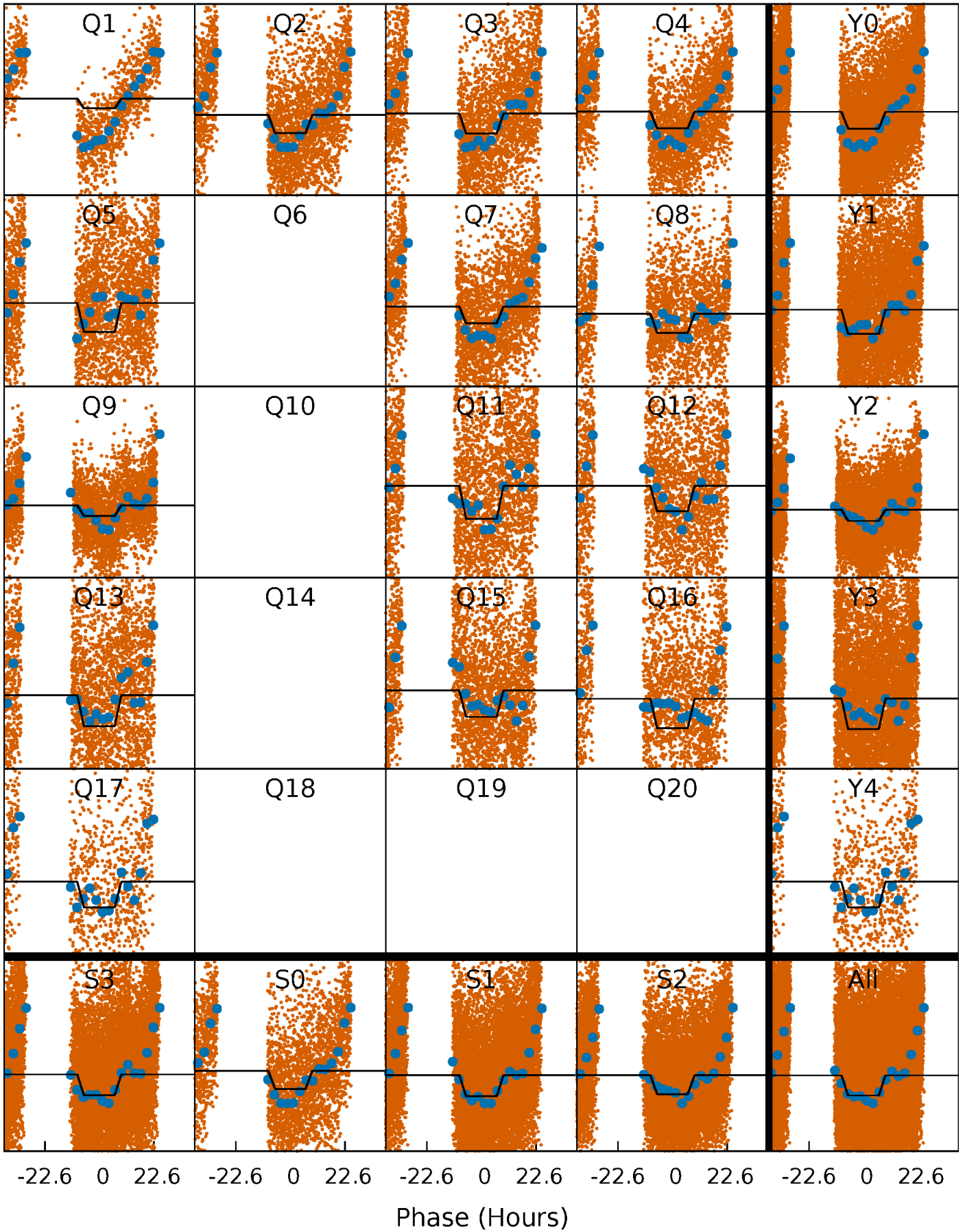
TCE 004384398-02   P= 2.306794 Days    $T_0=133.083165$  (BKJD)





# Alt. Detrend Quarter-Phased Transit Curves

TCE 004384398-02   P= 2.307055 Days    $T_0=133.027437$  (BKJD)

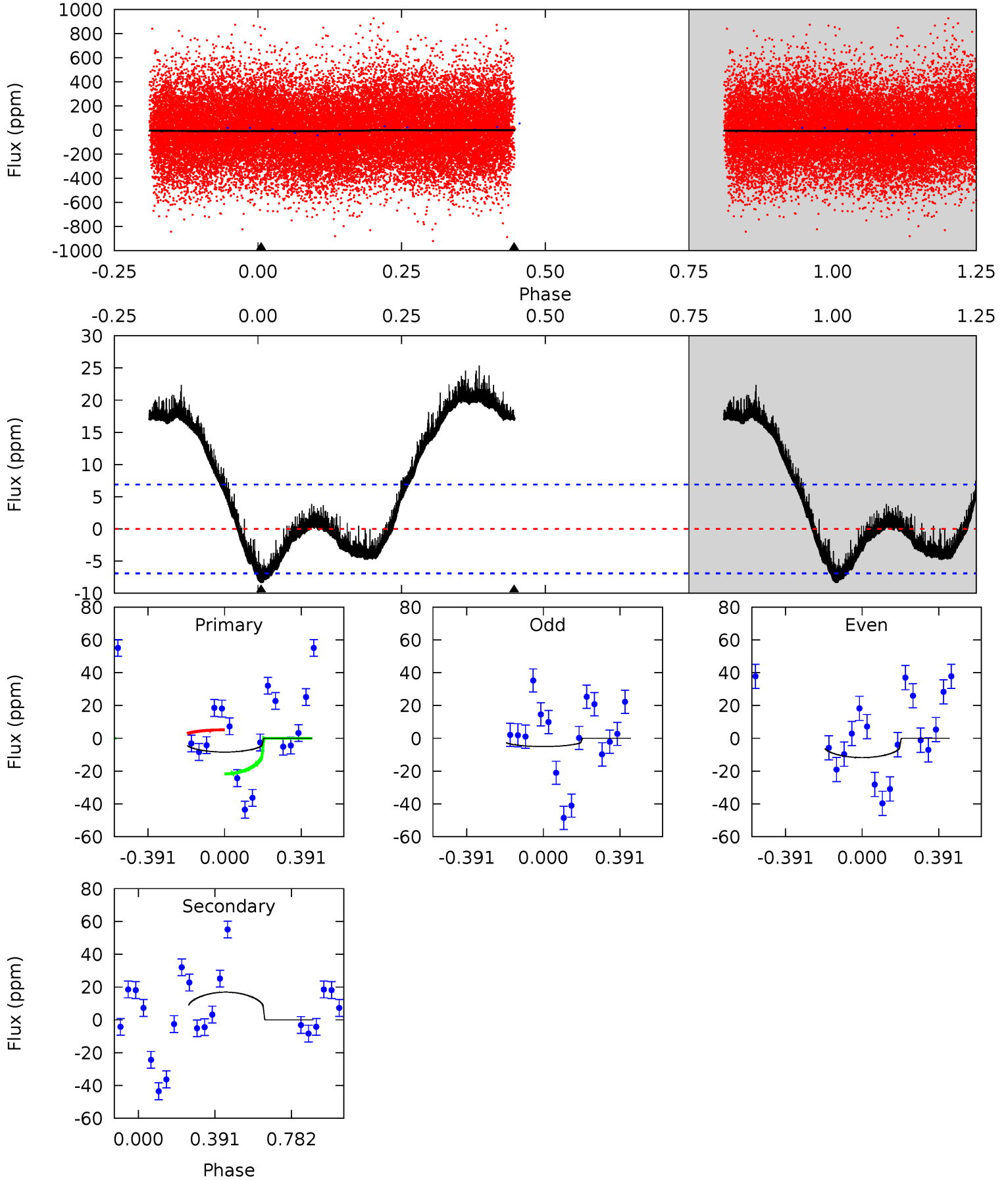




# DV Model-Shift Uniqueness Test

004384398-02, P = 2.306794 Days, E = 130.776371 Days

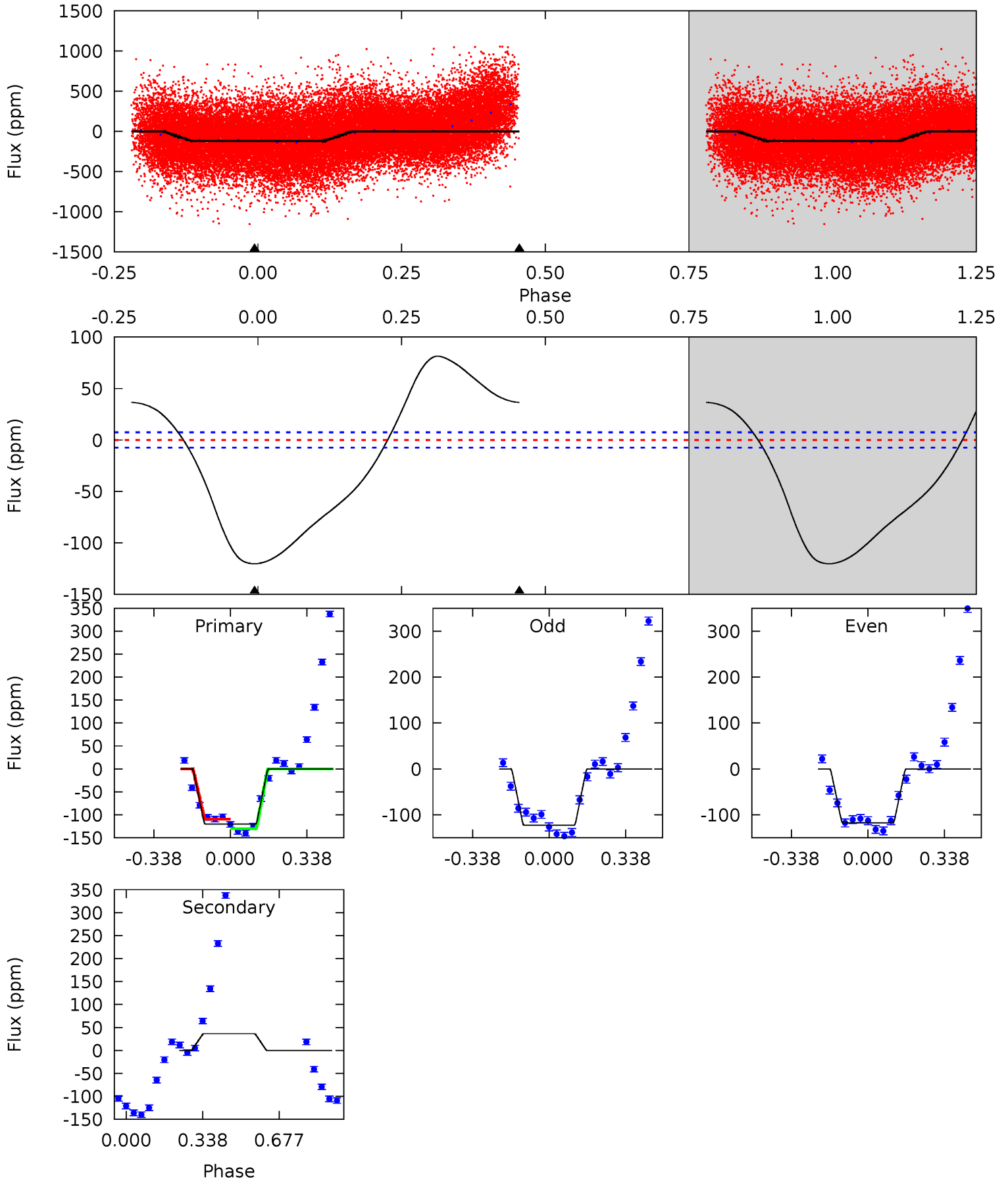
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
5.20	-10.4	0	0	4.27	0.86	3.44	5.20	5.20	-10.4	-10.4	2.10	0.87	0.75	5.18



# Alt Model-Shift Uniqueness Test

004384398-02, P = 2.307055 Days, E = 130.720382 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
69.5	-21.1	0	0	4.30	0.96	11.3	69.5	69.5	-21.1	-21.1	1.40	1.07	0.40	5.95



### Stellar Parameters For KIC 004384398

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R$ ( $R_{\odot}$ )	$M(M_{\odot})$	$p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ )
	$6130^{+164}_{-200}$	$4.328^{+0.136}_{-0.187}$	$-0.220^{+0.300}_{-0.300}$	$1.131^{+0.330}_{-0.192}$	$0.991^{+0.166}_{-0.111}$	$0.964^{+0.629}_{-0.483}$
	+3%/-3%	+3%/-4%	+136%/-136%	+29%/-17%	+17%/-11%	+65%/-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 004384398-02 / KOI

Detrend	Depth (ppm)	$R_p$ ( $R_{\oplus}$ )	$T_{\text{max}}$ (K)	$T_{\text{obs}}$ (K)	$A_{\text{obs}}$
DV	$17 \pm 2$	$0.75^{+0.76}_{-0.51}$	$2171^{+165}_{-119}$	$-5134^{+1152}_{-4262}$	$-19.054^{+14.378}_{-165.313}$
Alt.	$37 \pm 2$	$1.37^{+0.87}_{-0.78}$	$2181^{+164}_{-115}$	$-4764^{+785}_{-2165}$	$-12.816^{+8.048}_{-57.612}$

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

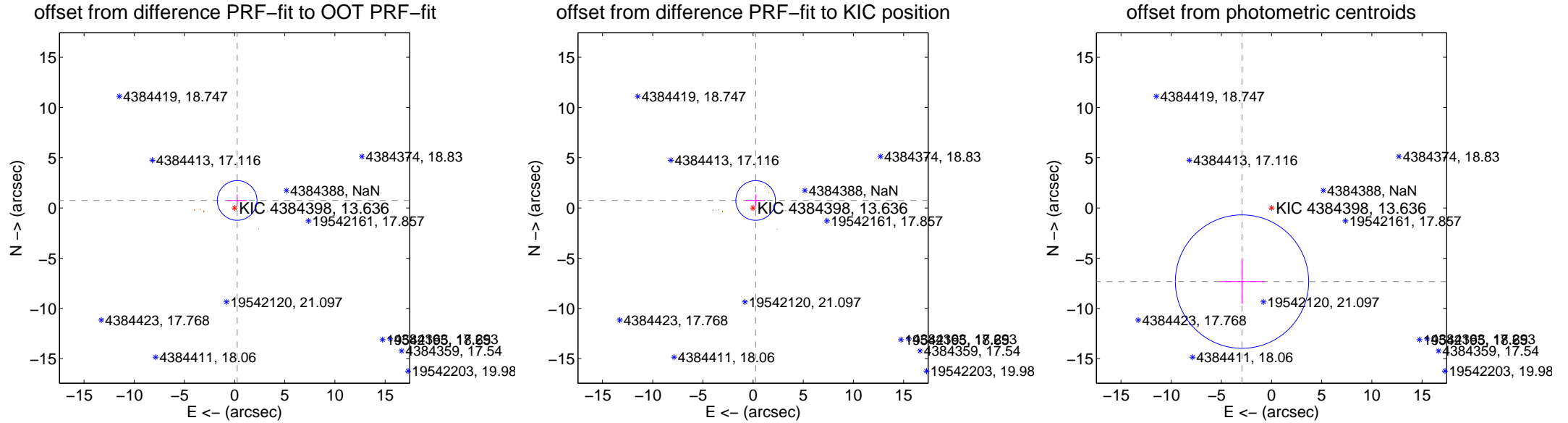
## DV Centroid Data

Supplemental centroid analysis for 004384398-02. Kepler magnitude: 13.64. Transit SNR 3.14

There are 0 quarters with good PRF difference image offsets

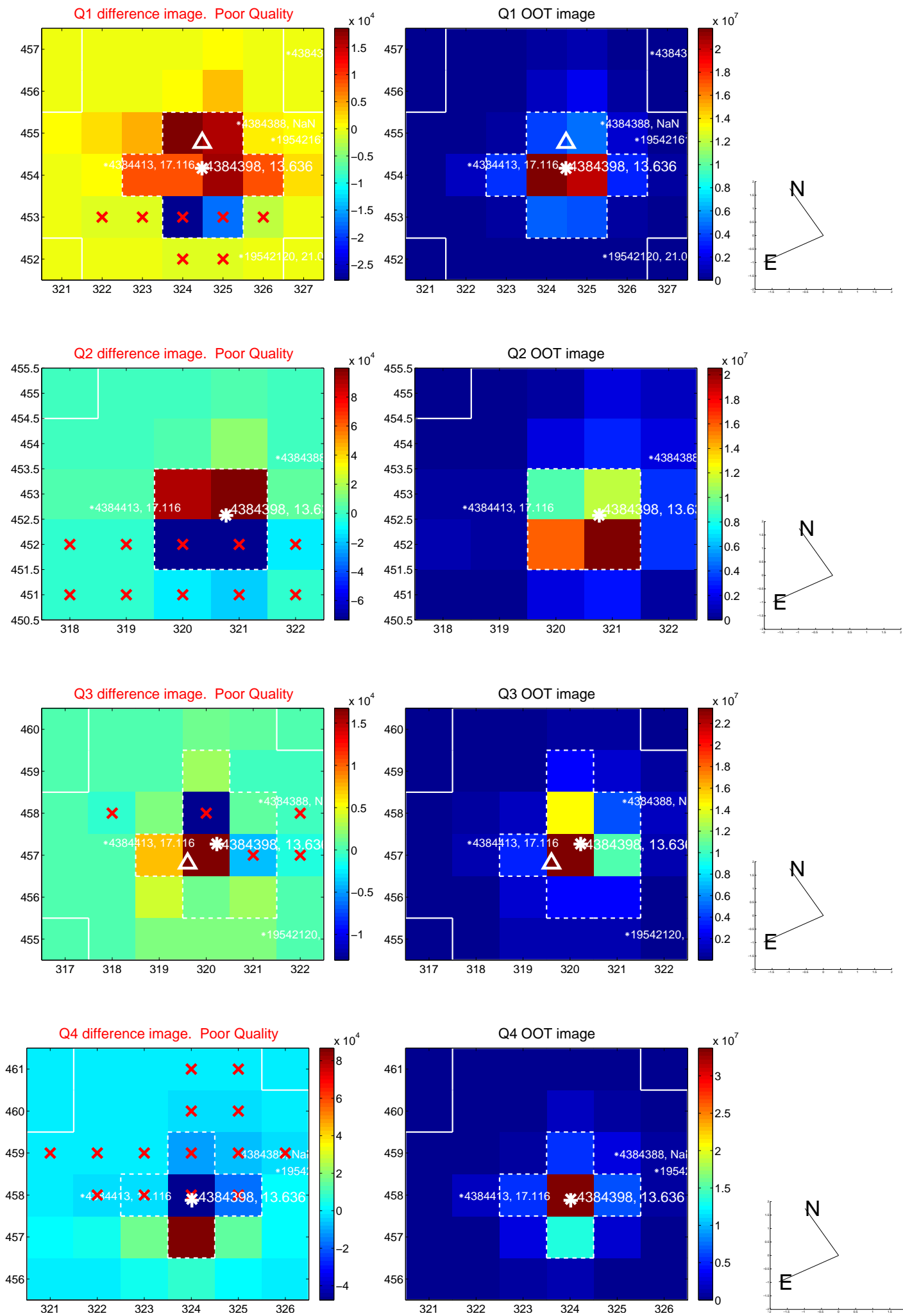
The direct PRF centroid is offset from the target star catalog position by about 0.05 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.788 \pm 0.659$	1.20	$-0.257 \pm 0.986$	$0.745 \pm 0.608$
PRF-fit source offset from KIC position	$0.788 \pm 0.658$	1.20	$-0.256 \pm 0.982$	$0.745 \pm 0.609$
photometric centroid source offset	$7.90 \pm 2.21$	3.57	$2.94 \pm 2.26$	$-7.33 \pm 2.21$

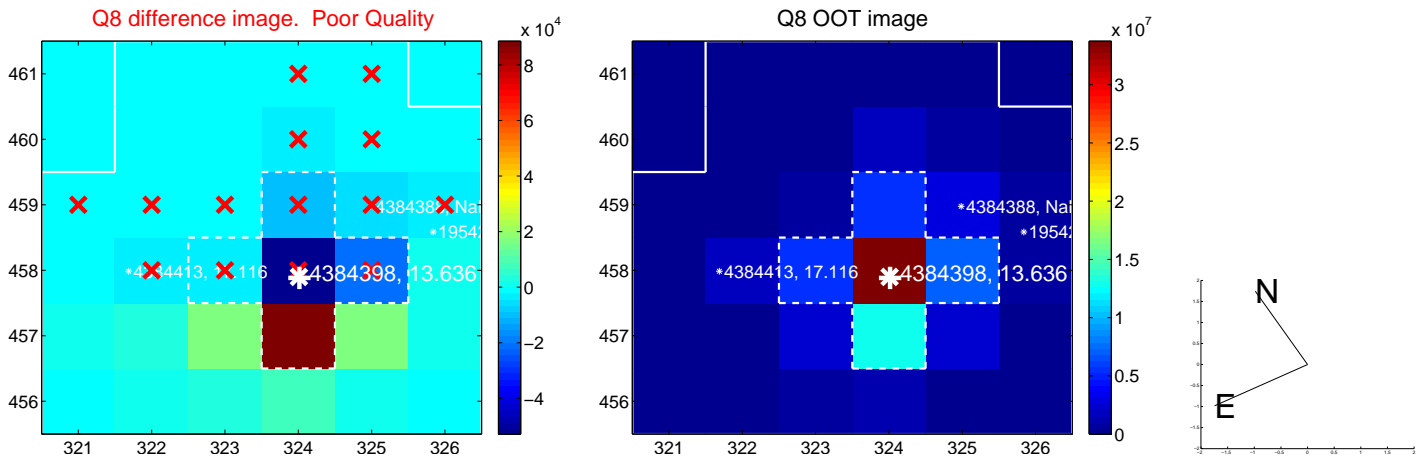
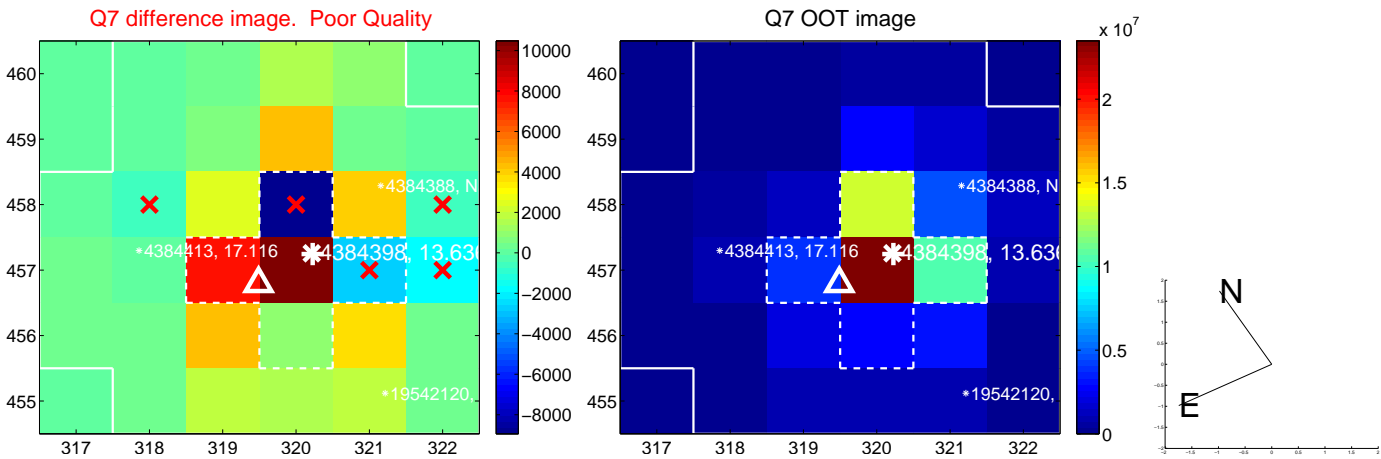
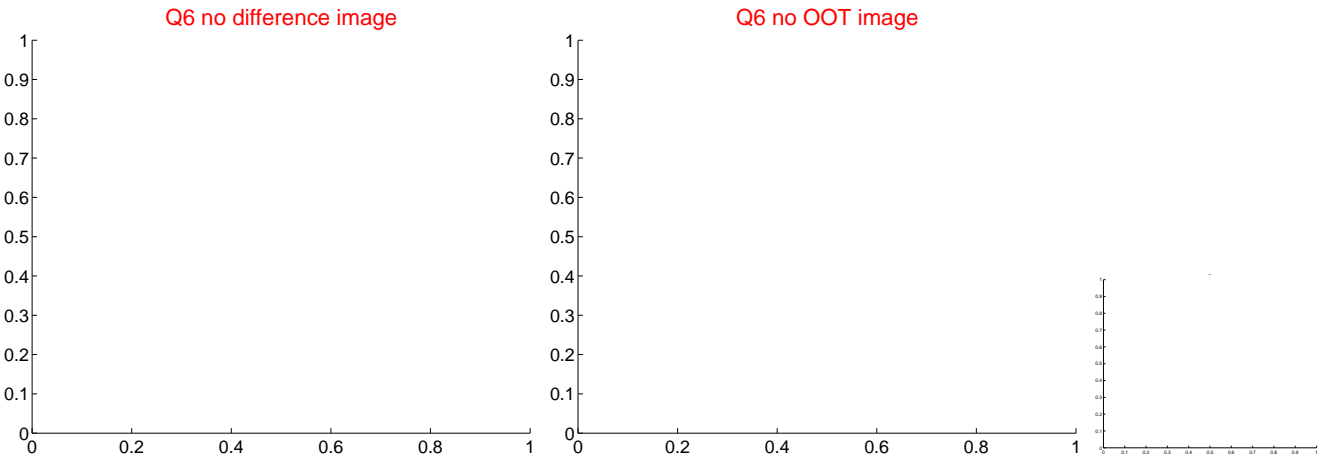
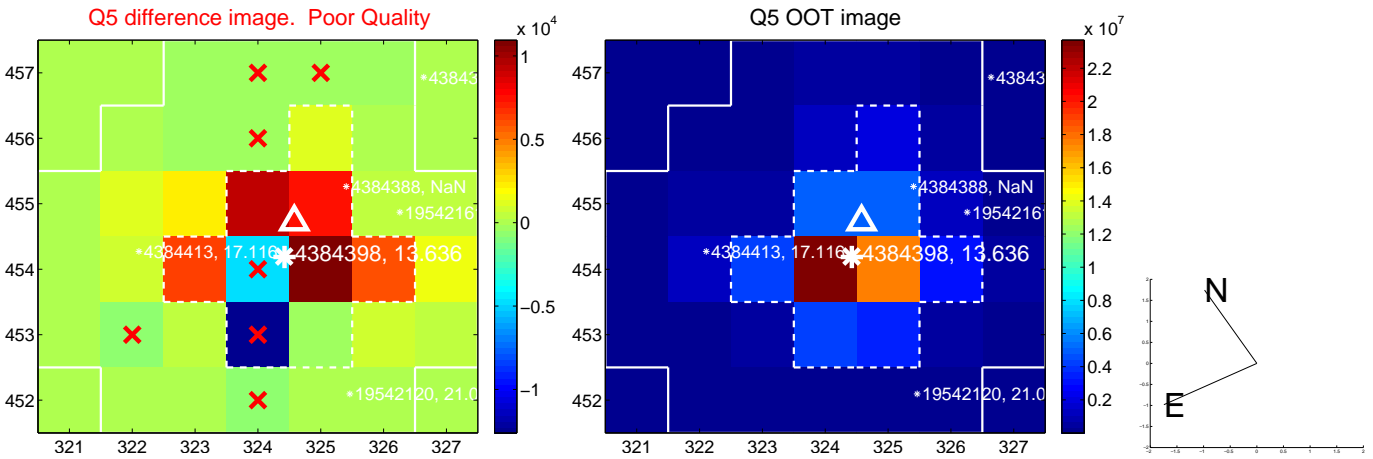


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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

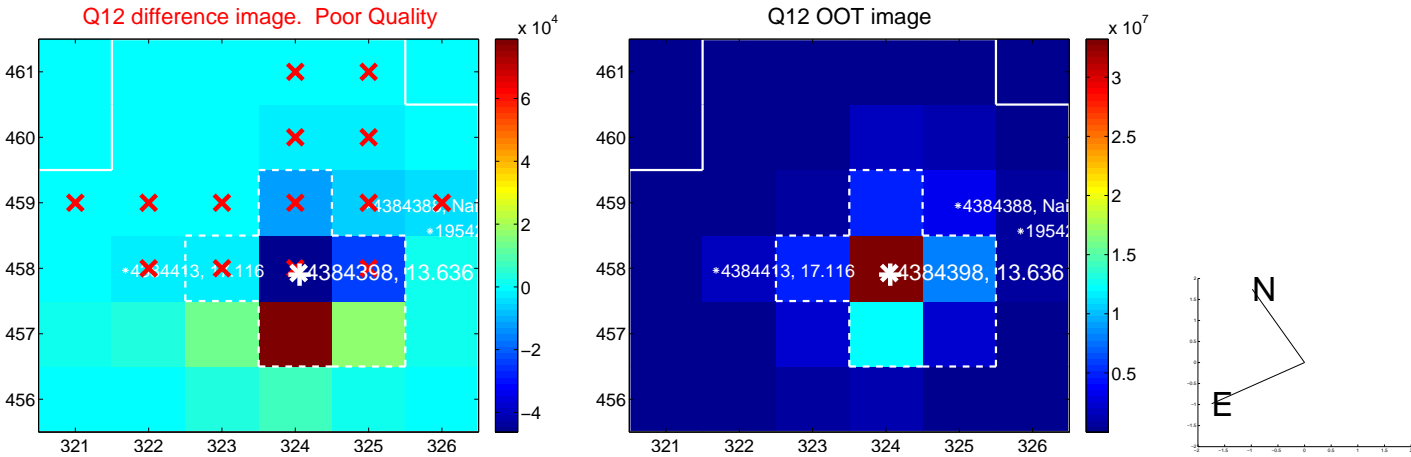
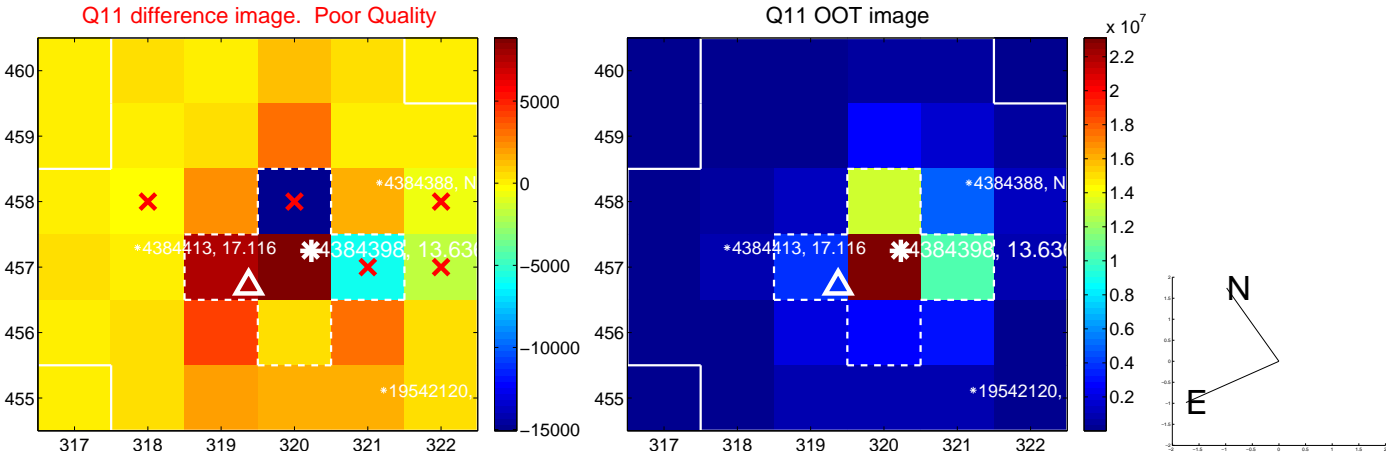
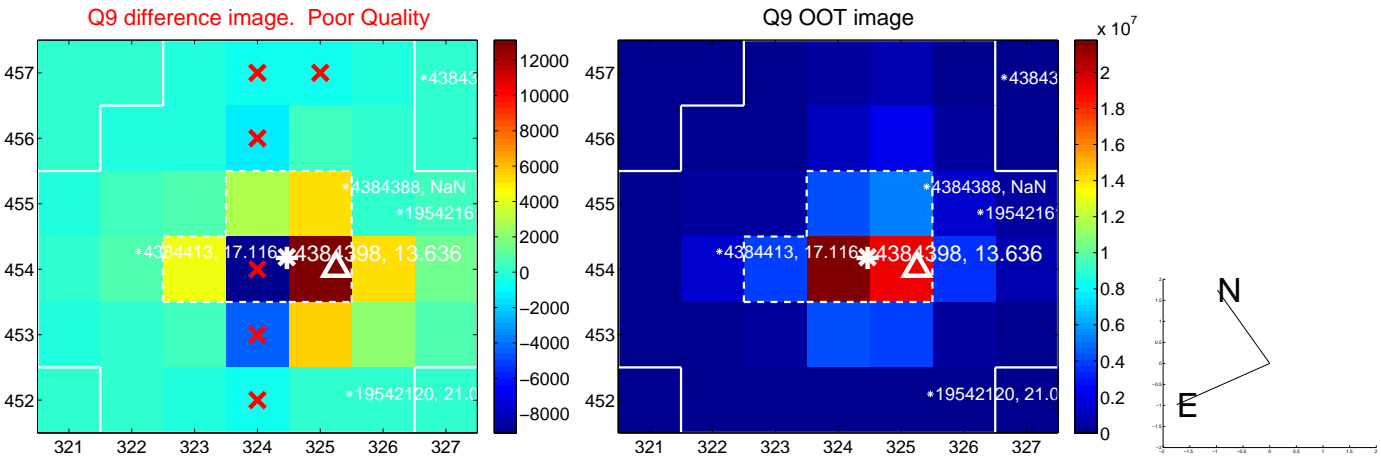


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

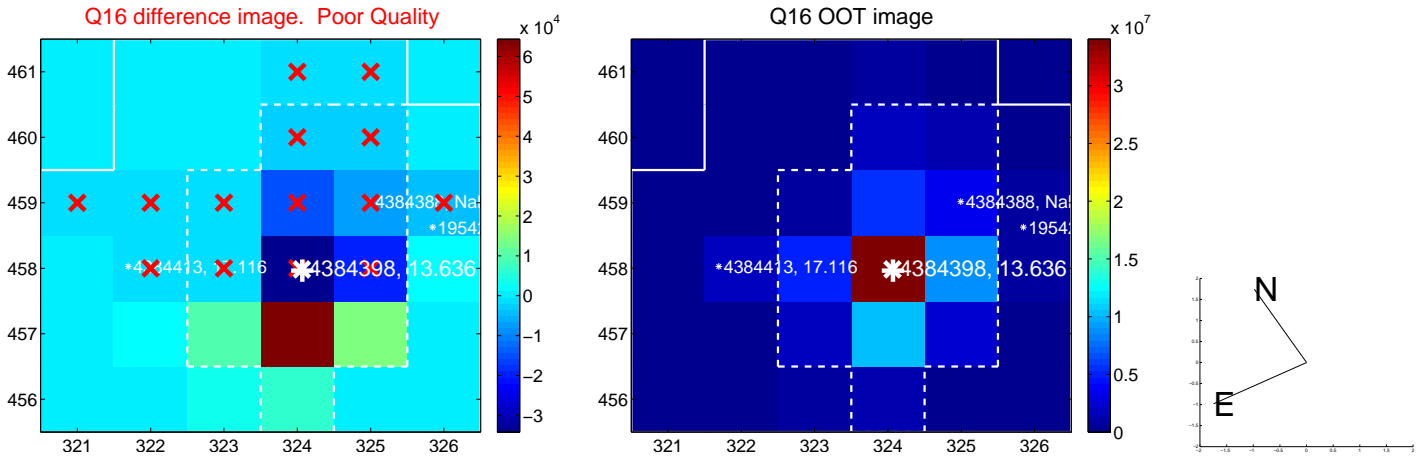
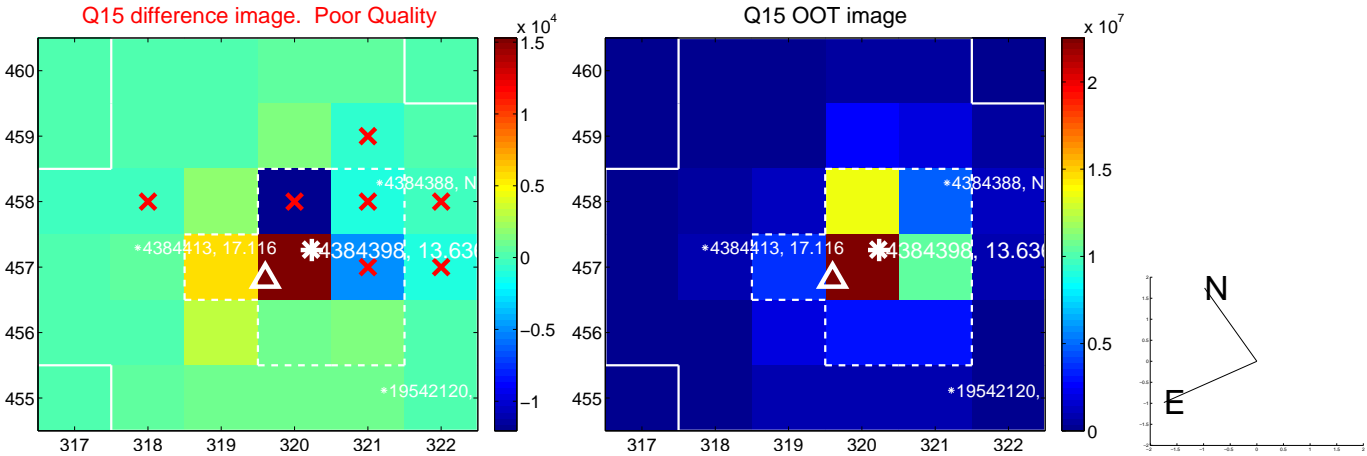
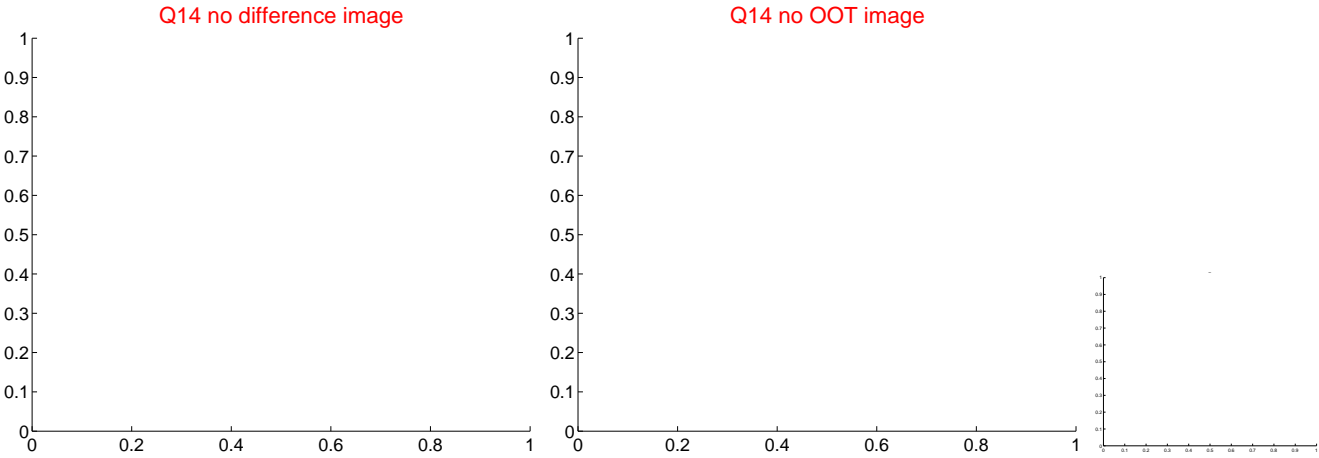
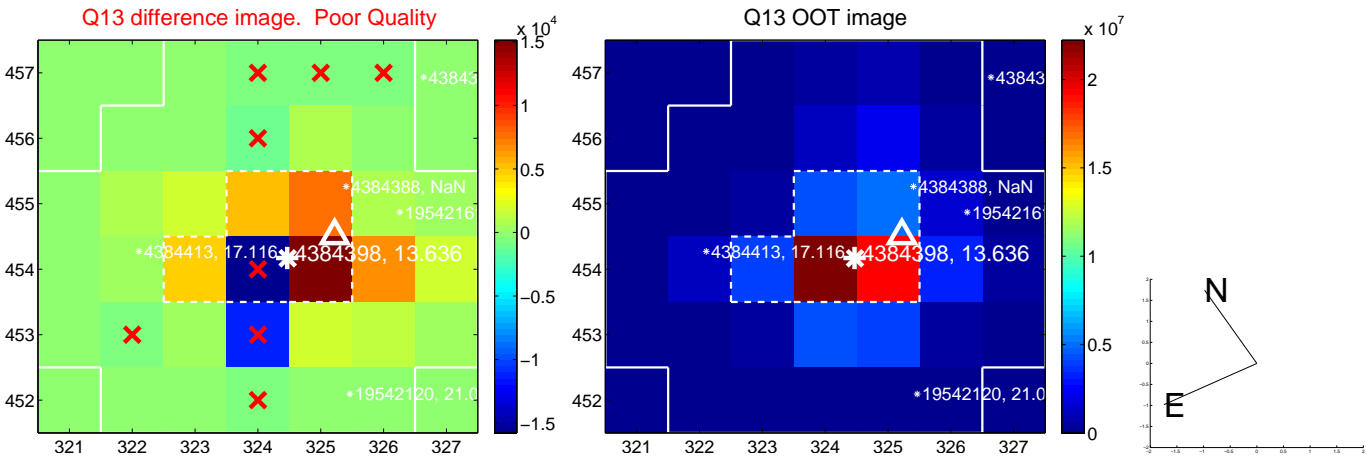




white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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





UKIRT Image

Declination

