

# KIC 010404582

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
010404582-01	OBS	2147.01	37.865947	134.361102	388.5	5.160	22.9	23.6	1.02	5757	2.39	20.65
010404582-02	OBS	2147.02	10.327378	139.373514	123.6	2.037	8.9	9.8	1.02	5757	1.37	116.75

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
010404582-01	OBS	PC	1.00	0	0	0	0	NO_COMMENT
010404582-02	OBS	PC	0.85	0	0	0	0	NO_COMMENT

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

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

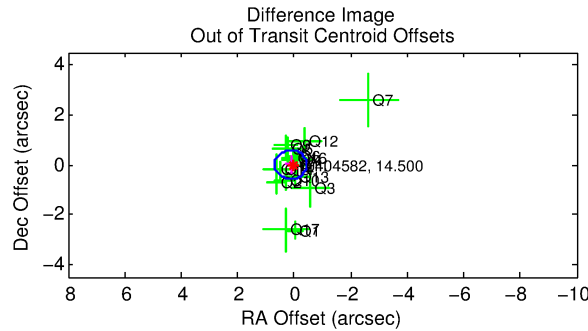
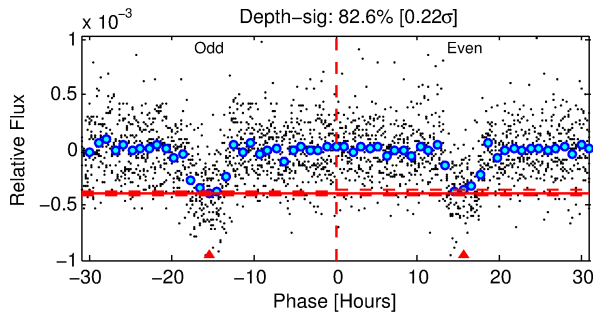
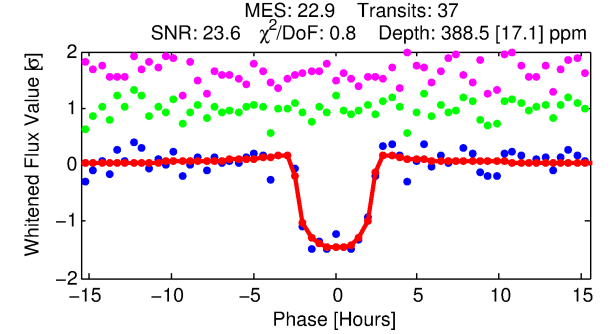
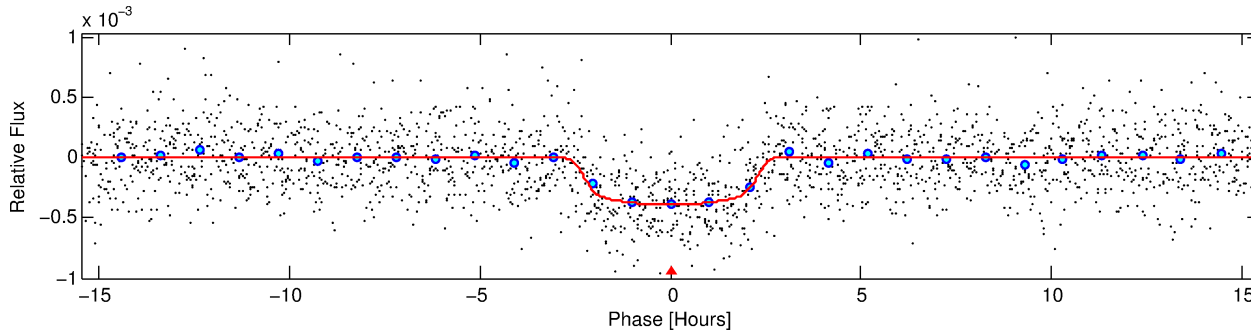
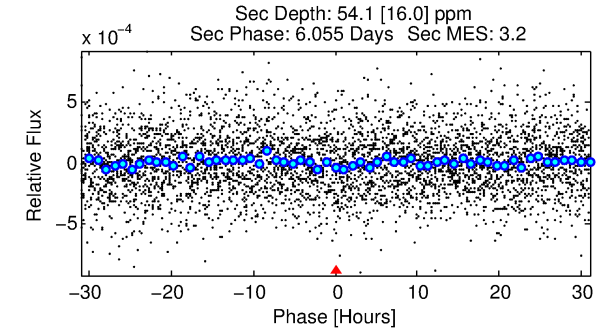
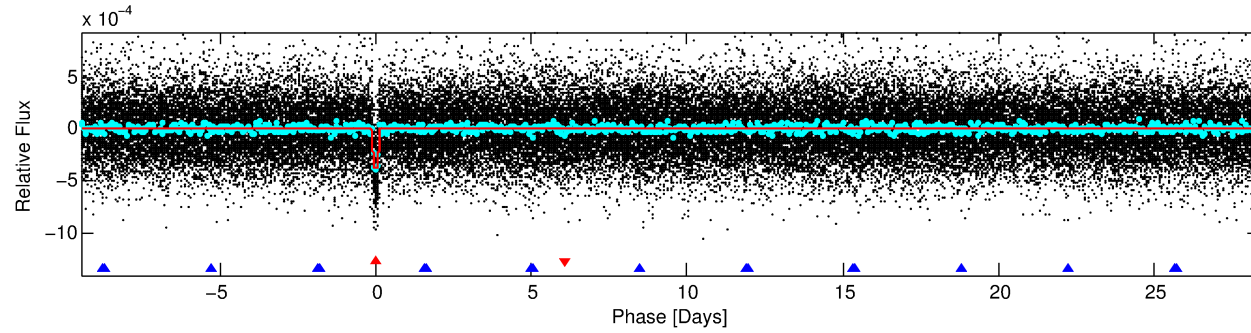
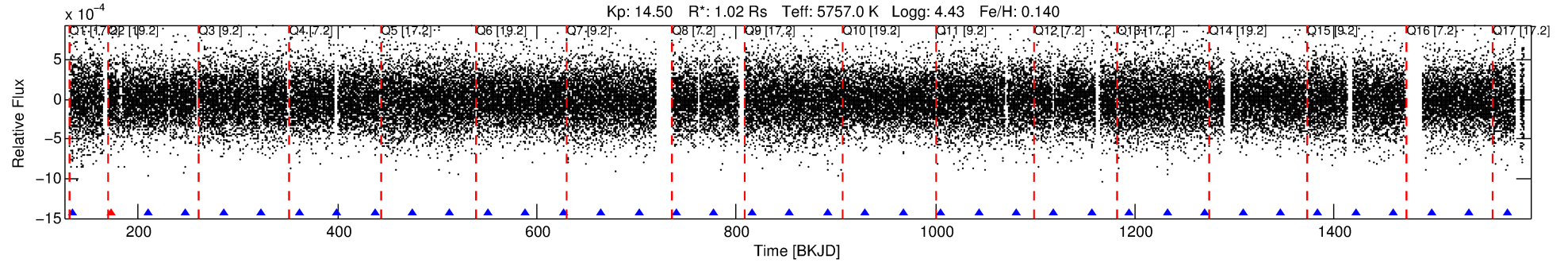
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 010404582-01

No Significant Match Found

# DV One-Page Summary

KIC: 10404582 Candidate: 1 of 2 Period: 37.866 d  
KOI: K02147.01 Name: Kepler-362c Corr: 0.978



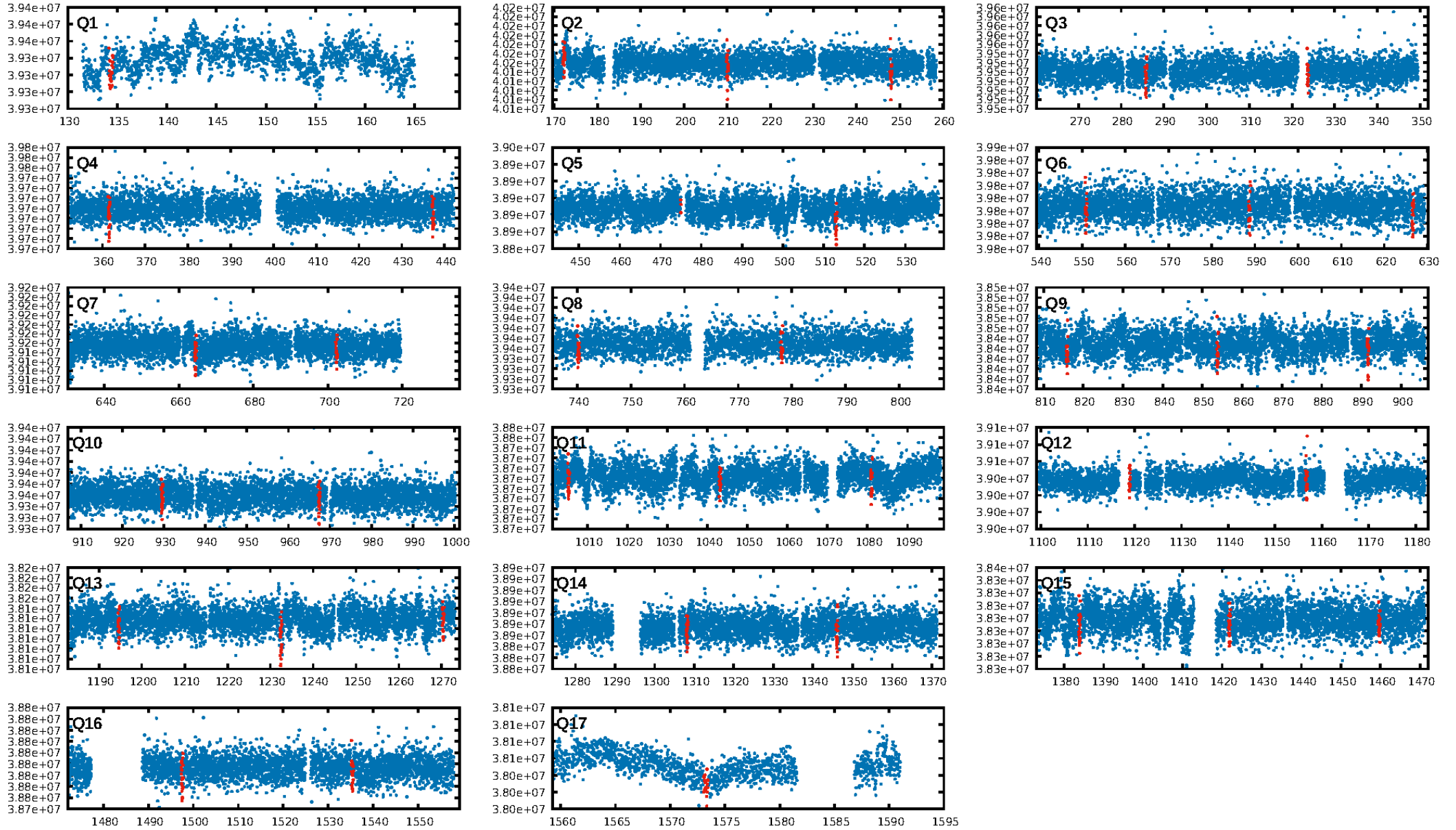
## DV Fit Results:

Period = 37.86595 [0.00020] d  
Epoch = 134.3611 [0.0047] BKJD  
Rp/R\* = 0.0215 [0.0021]  
a/R\* = 27.04 [11.31]  
b = 0.90 [0.09]  
Seff = 20.65 [4.71]  
Teq = 544 [31] K  
Rp = 2.39 [0.44] Re  
a = 0.2220 [0.0318] AU  
Ag = 256.94 [106.54] [2.40 $\sigma$ ]  
Teffp = 3365 [300] K [9.36 $\sigma$ ]

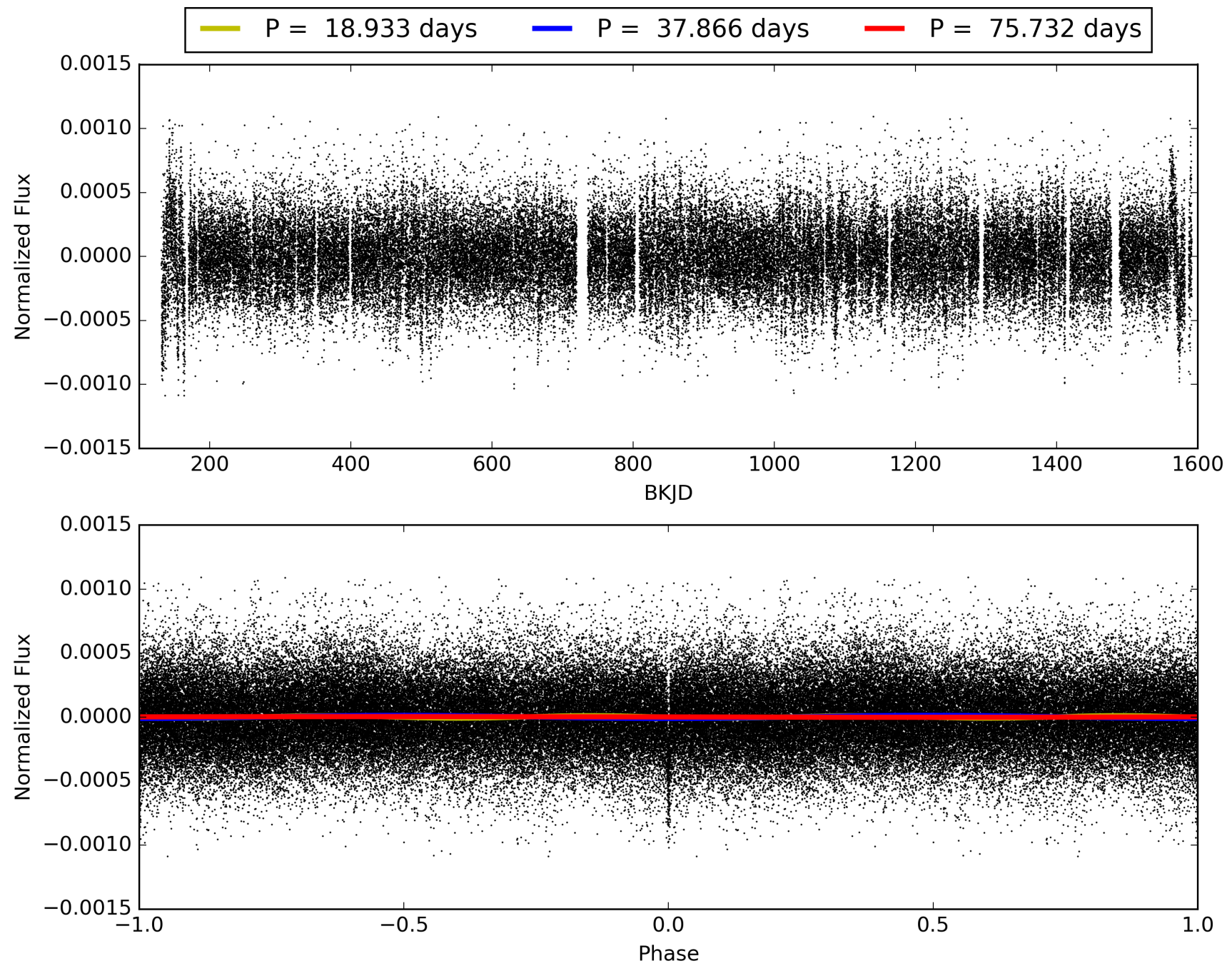
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [119.14 $\sigma$ ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: 39.8%  
ModelChiSquareGof-sig: 100.0%  
Bootstrap-pfa: 1.26e-103  
RollingBand-fgt: 0.97 [34/35]  
GhostDiagnostic-chr: 15.12  
Centroid-sig: 60.4%  
Centroid-so: 0.411 arcsec [0.63 $\sigma$ ]  
OotOffset-rm: 0.121 arcsec [0.64 $\sigma$ ]  
KicOffset-rm: 0.121 arcsec [0.40 $\sigma$ ]  
OotOffset-st: 4/4/3/5 [16]  
KicOffset-st: 4/4/3/5 [16]  
DiffImageQuality-fgm: 0.94 [15/16]  
DiffImageOverlap-fno: 1.00 [17/17]

# TCE 010404582-01, PDC Light Curves

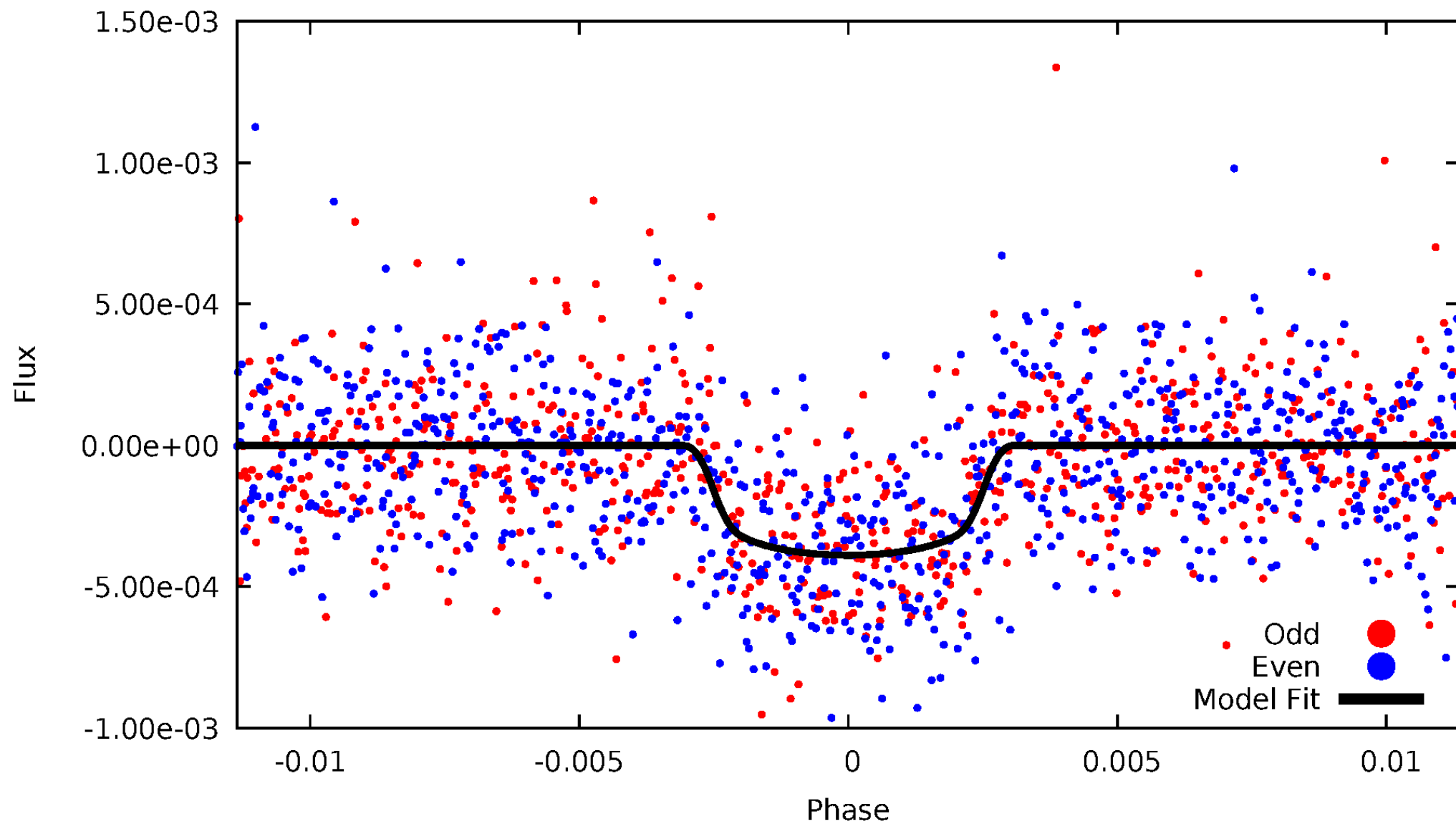


TCE 010404582-01



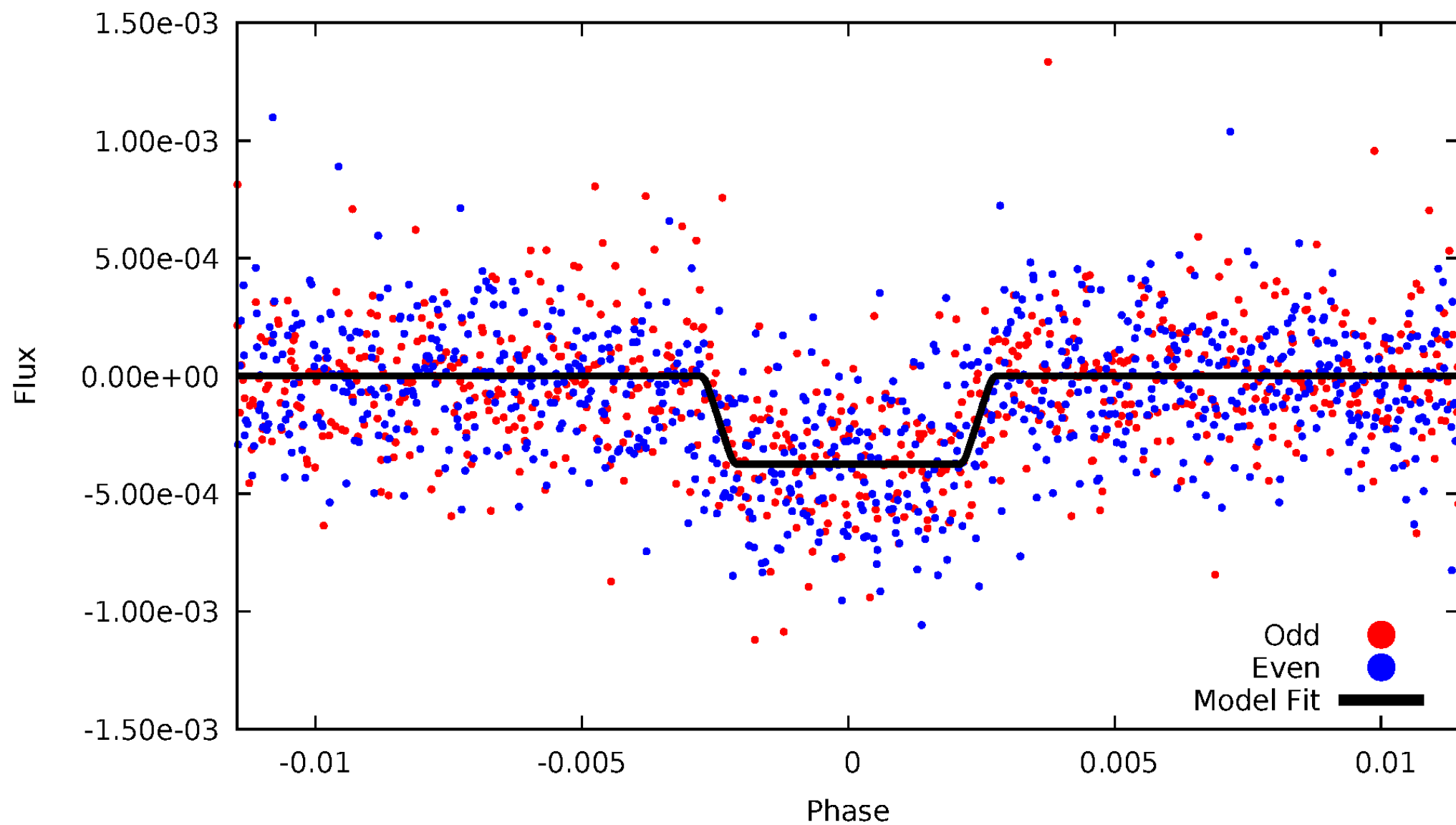
# DV Odd/Even

TCE 010404582-01



# ALT Odd/Even

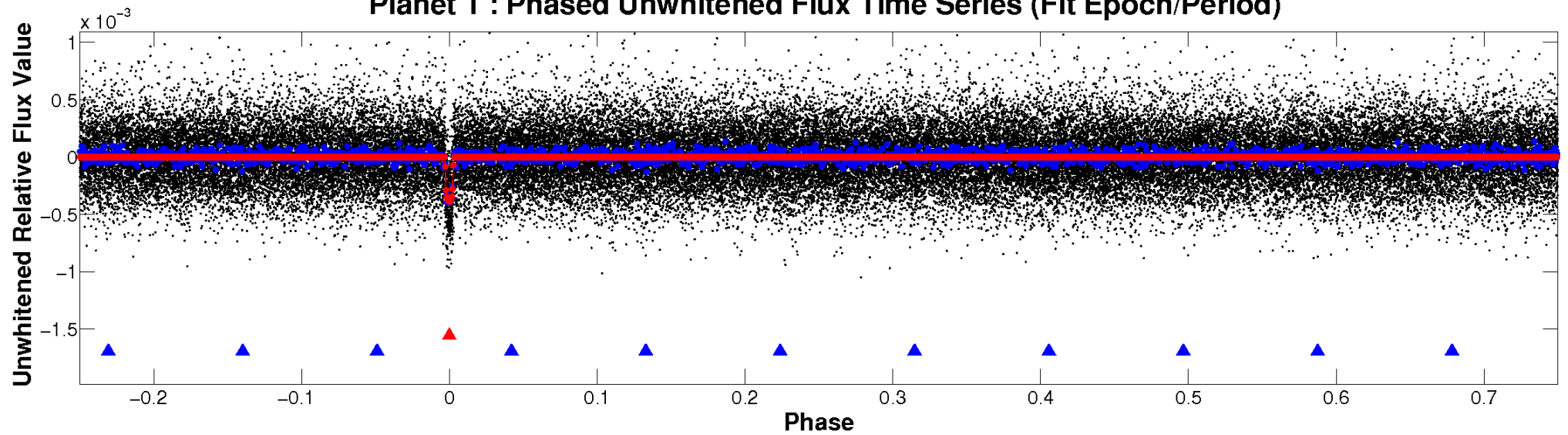
TCE 010404582-01



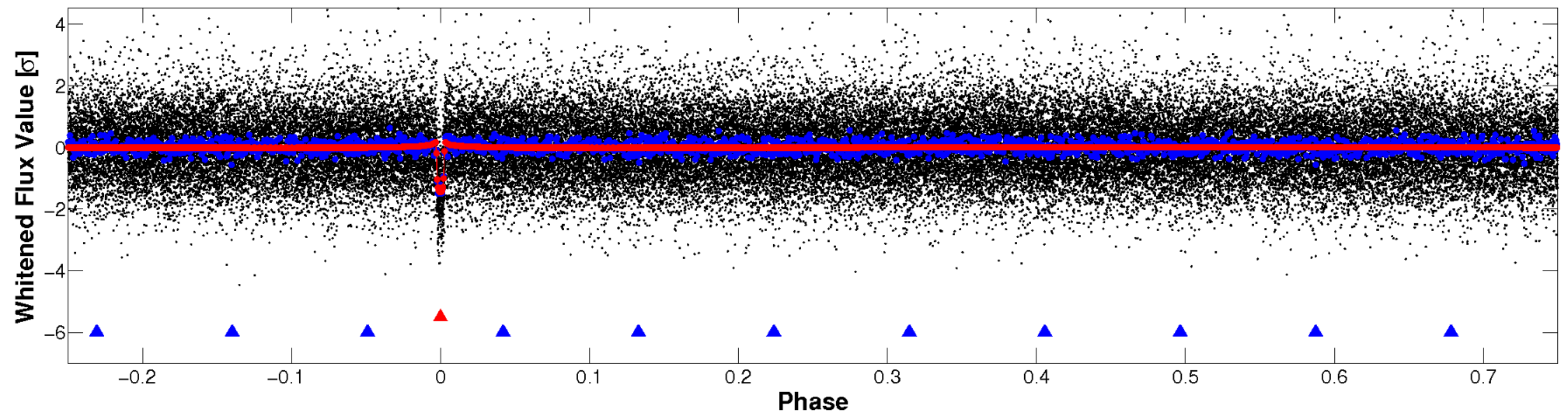


# Non-Whitened Vs. Whitened Light Curve

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

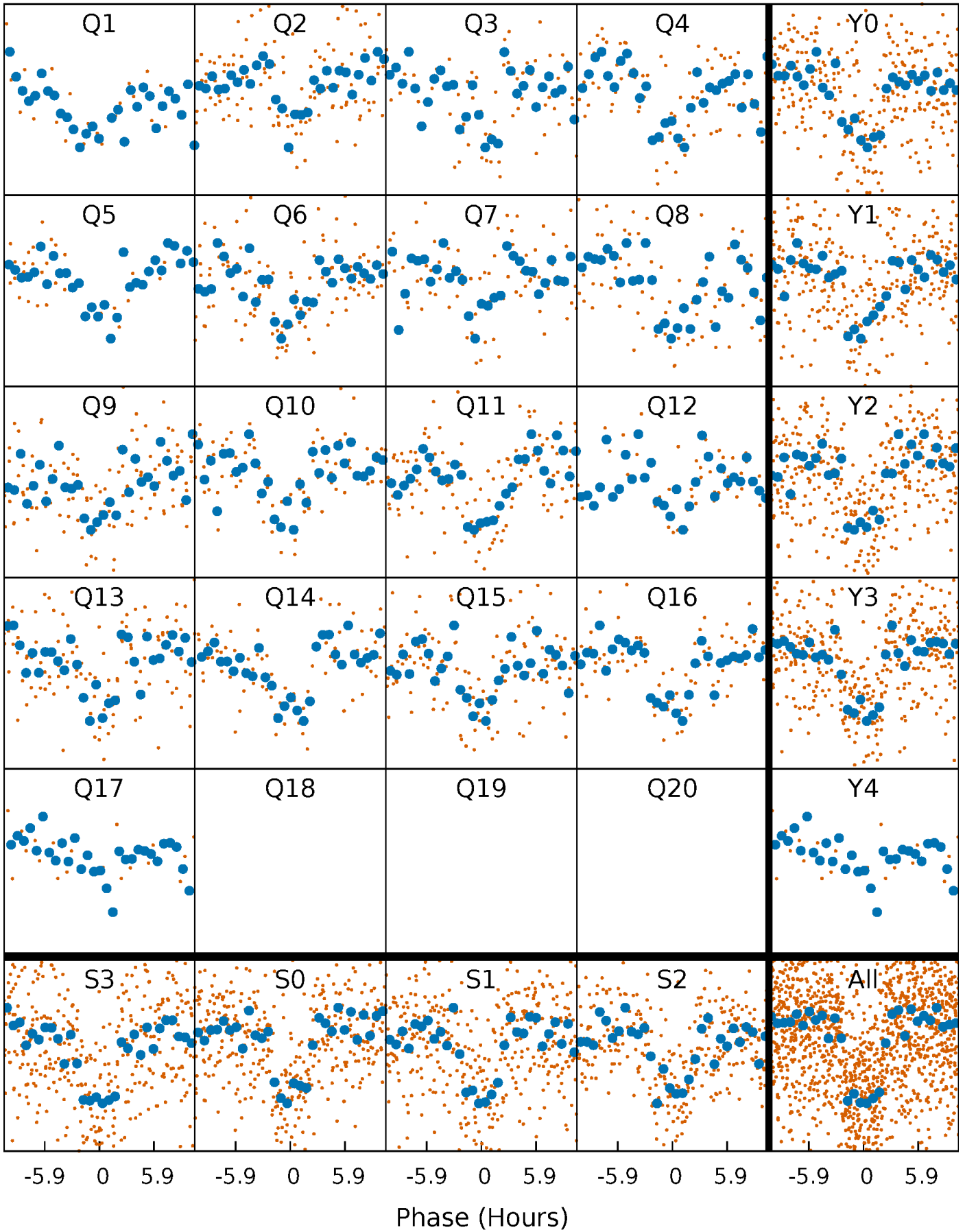


**Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)**



# PDC Quarter-Phased Transit Curves

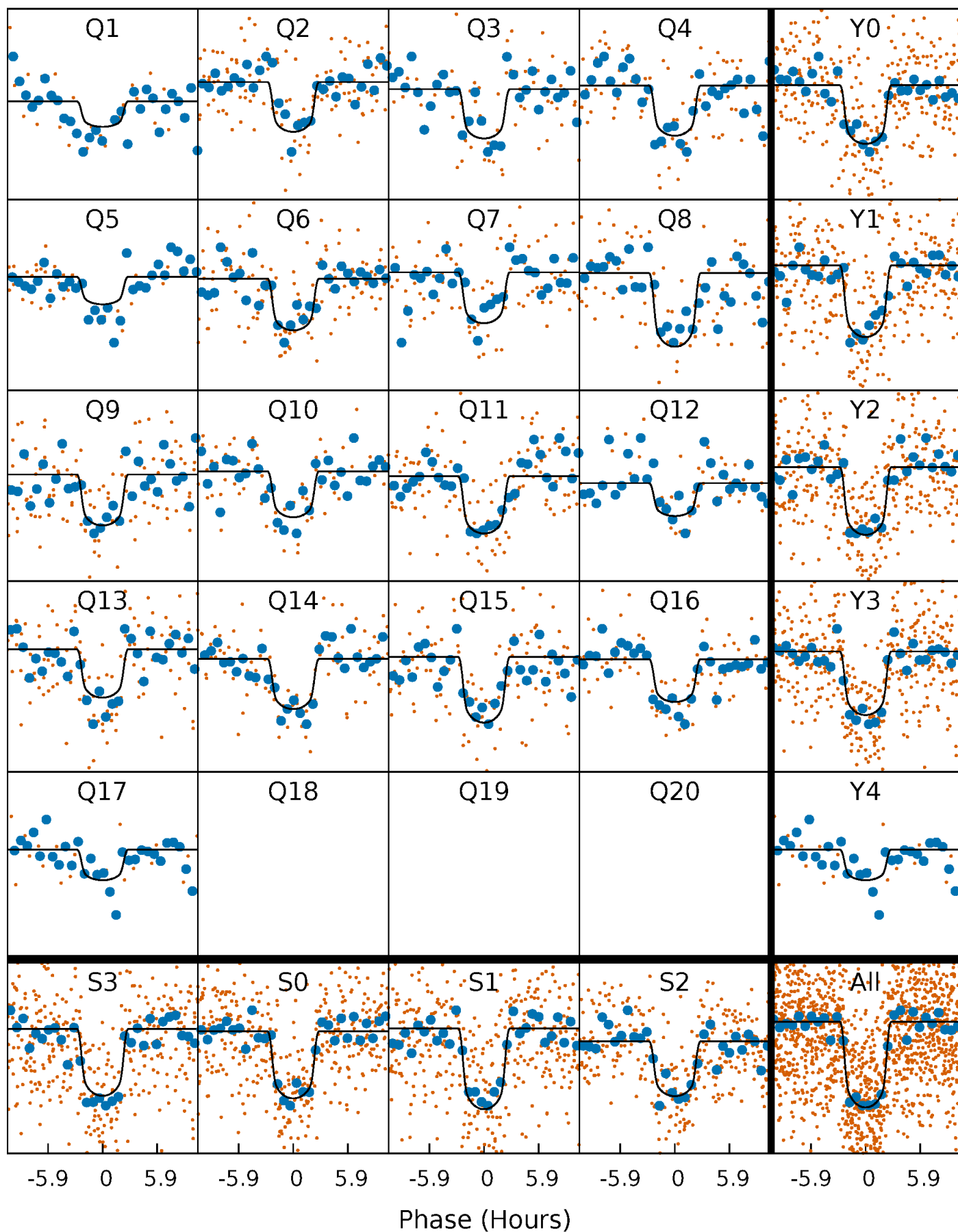
TCE 010404582-01 P= 37.865947 Days  $T_0=134.361102$  (BKJD)





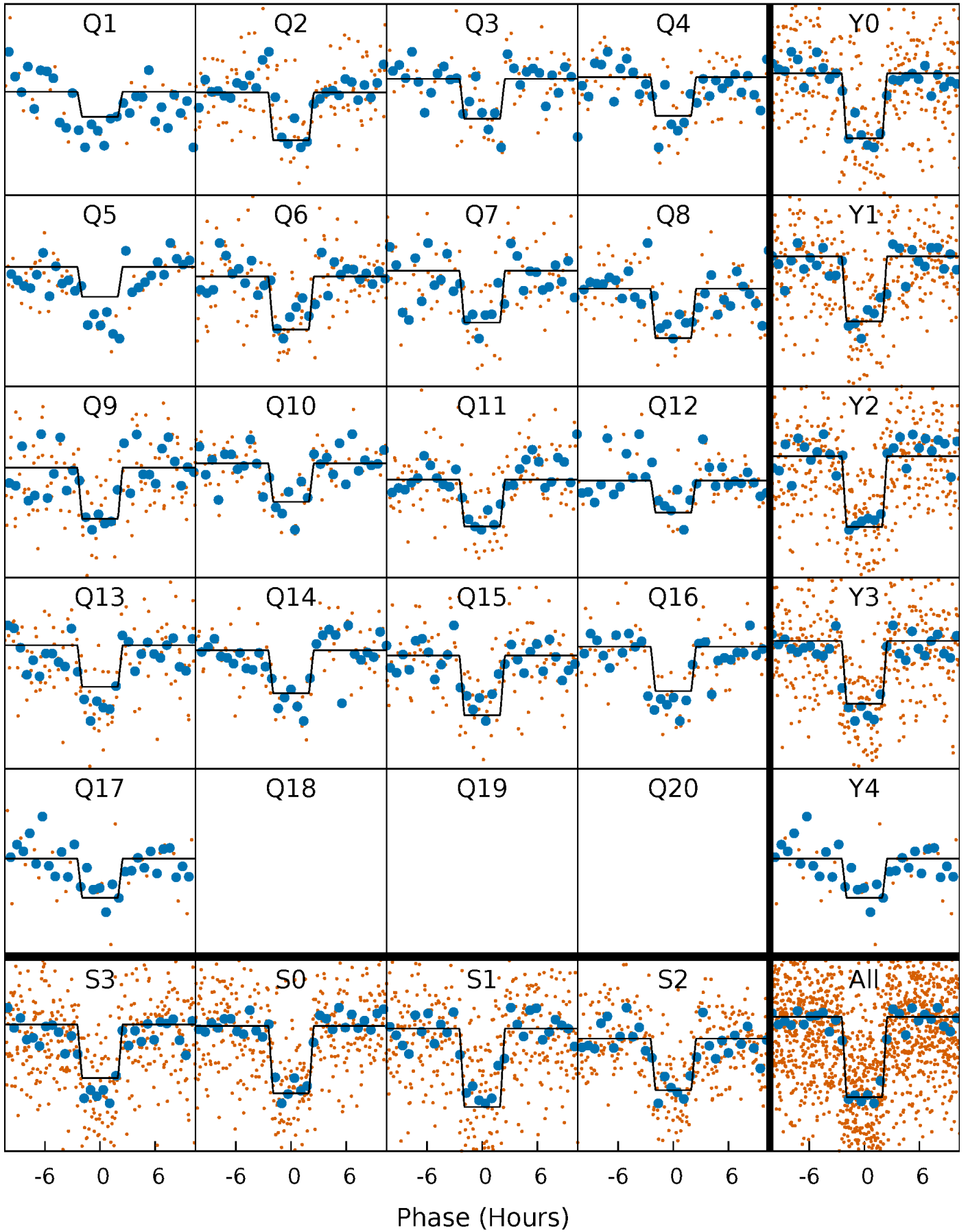
# DV Quarter-Phased Transit Curves

TCE 010404582-01 P= 37.865947 Days  $T_0=134.361102$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

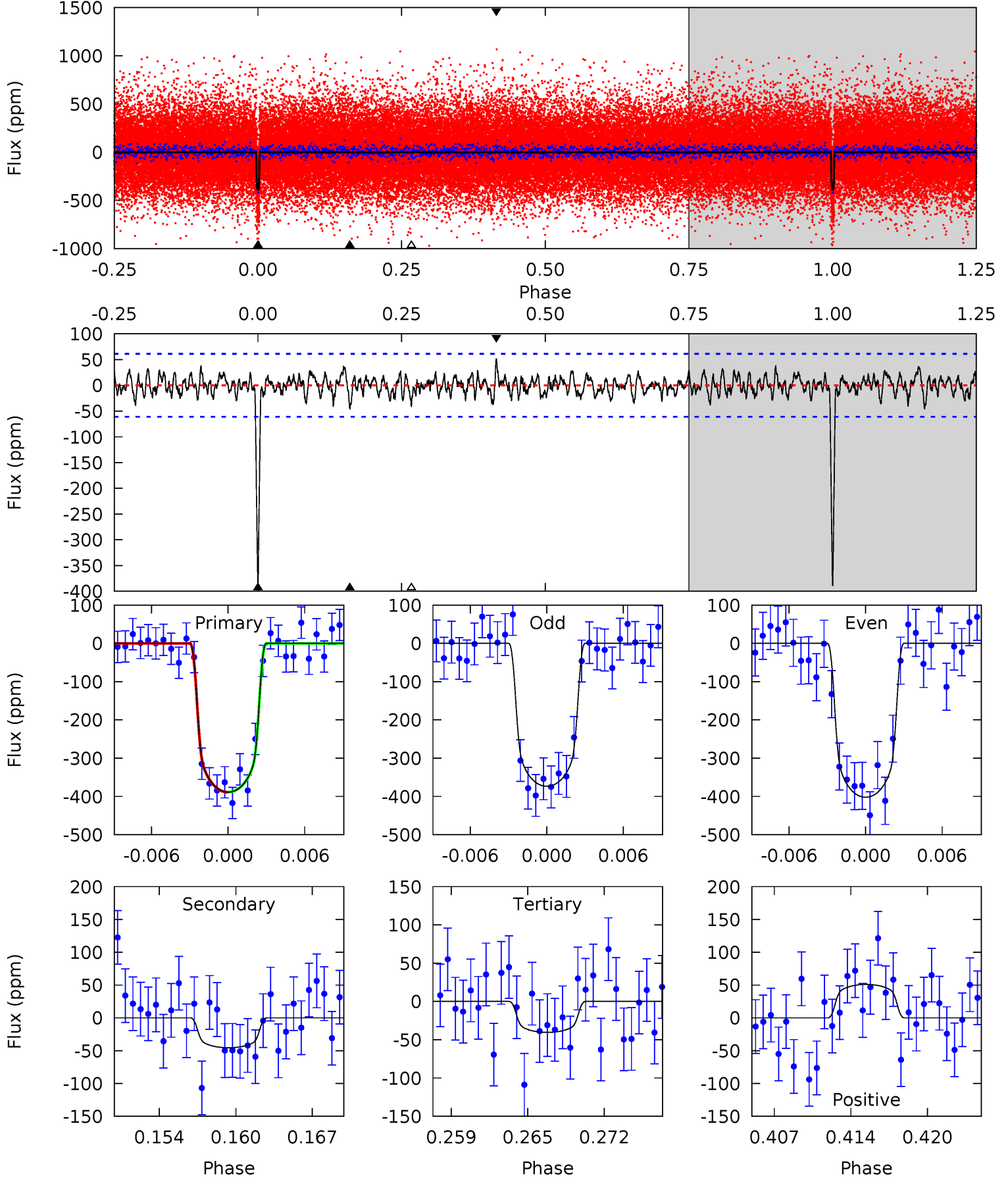
TCE 010404582-01 P= 37.866417 Days  $T_0=134.352808$  (BKJD)



# DV Model-Shift Uniqueness Test

010404582-01, P = 37.865947 Days, E = 96.495155 Days

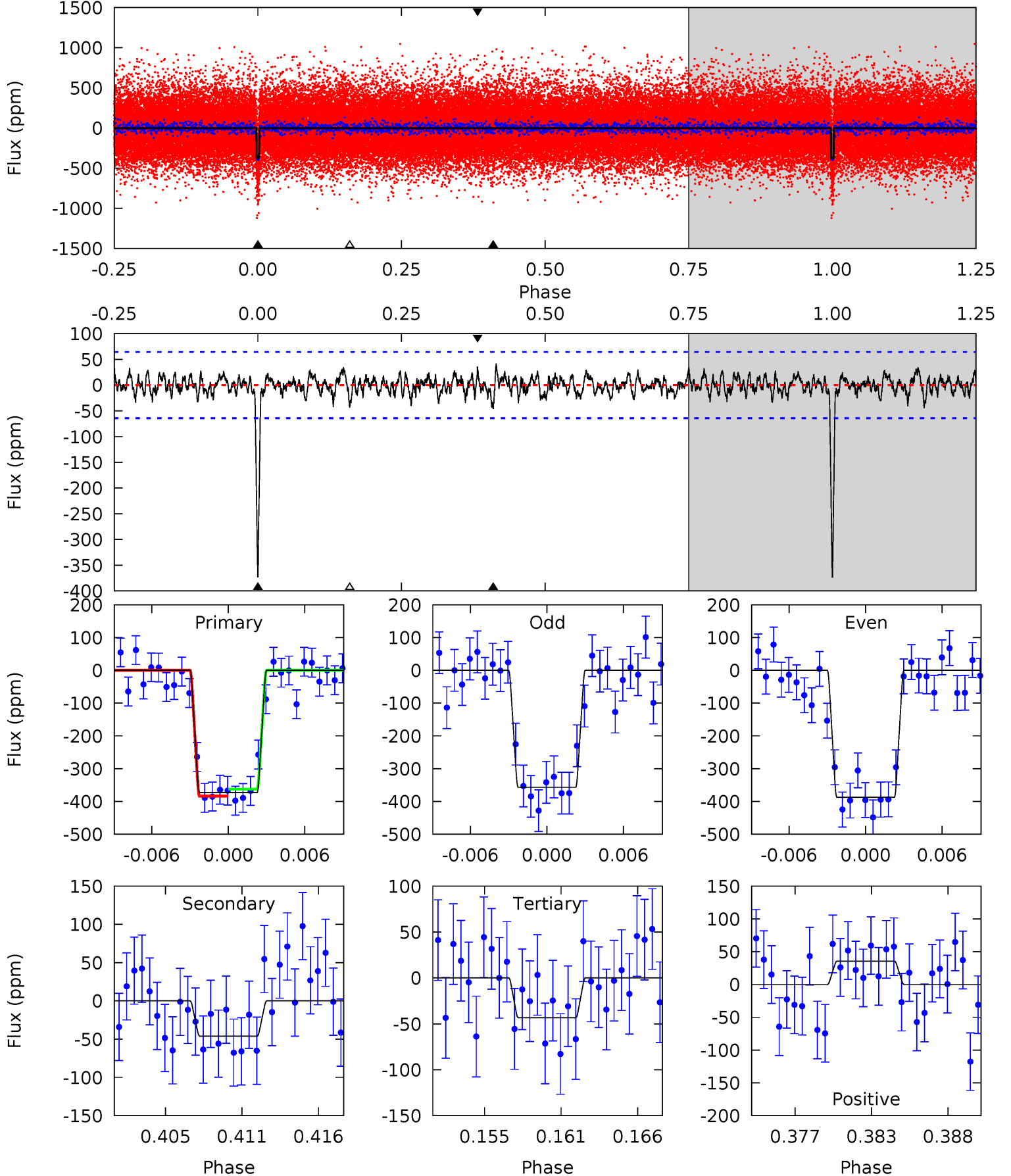
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
32.5	3.81	3.38	4.26	5.12	2.74	1.17	29.1	28.2	0.43	-0.45	1.21	1.00	0.12	0.02



# Alt Model-Shift Uniqueness Test

010404582-01, P = 37.866417 Days, E = 96.486391 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
29.8	3.68	3.46	2.83	5.14	2.77	1.06	26.3	26.9	0.22	0.85	1.21	1.08	0.10	0.84



### Stellar Parameters For KIC 010404582

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$5757^{+78}_{-86}$	$4.431^{+0.054}_{-0.126}$	$0.140^{+0.150}_{-0.150}$	$1.017^{+0.161}_{-0.080}$	$1.016^{+0.062}_{-0.062}$	$1.360^{+0.331}_{-0.452}$
	+1%/-1%	+1%/-3%	+107%/-107%	+16%/-8%	+6%/-6%	+24%/-33%
Source	SPE90	SPE90	SPE90	DSEP		

KIC = Kepler Input Catalog; PHO = Photometry; SPE = Spectroscopy; AST = Asteroseismology  
 TRA = Transits; DESP = Dartmouth Models; MULT = Multiple Models

### Secondary Eclipse Parameters for KIC 010404582-01 / KOI 2147.01

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-46 \pm 12$	$2.45^{+0.30}_{-0.30}$	$766^{+34}_{-23}$	$3644^{+198}_{-182}$	$203^{+82}_{-58}$
Alt.	$-46 \pm 13$	$2.18^{+0.32}_{-0.27}$	$765^{+32}_{-23}$	$3780^{+235}_{-225}$	$259^{+107}_{-91}$

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



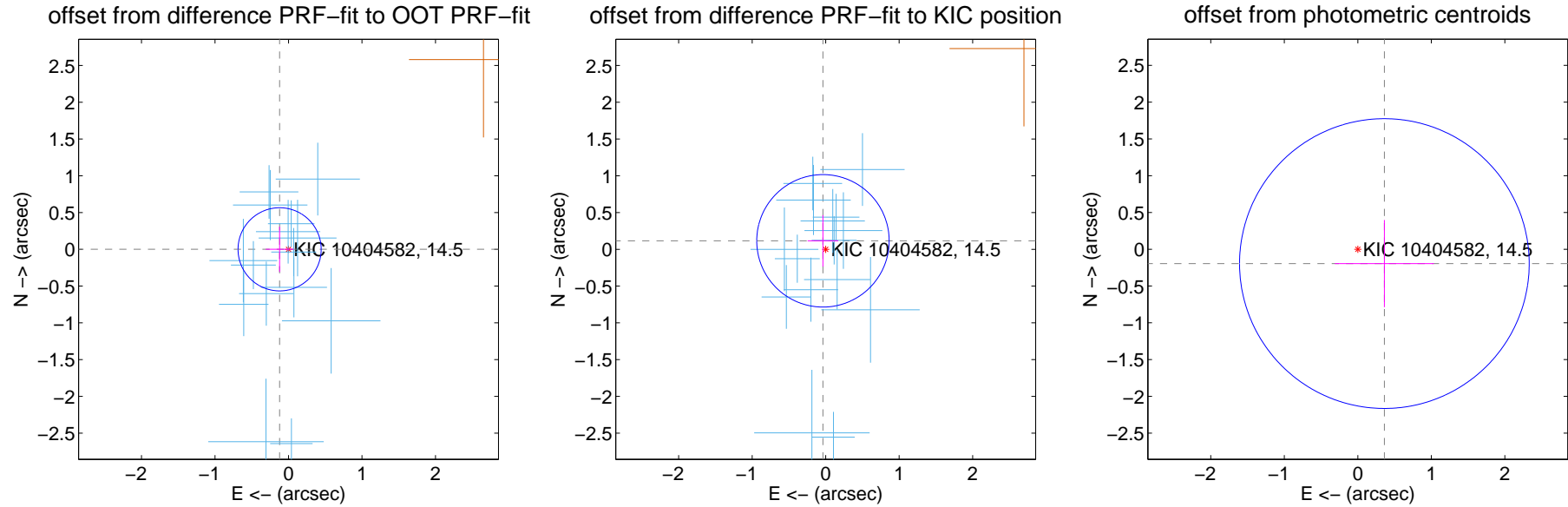
## DV Centroid Data

Supplemental centroid analysis for 010404582-01. Kepler magnitude: 14.50. Transit SNR 23.55

There are 15 quarters with good PRF difference image offsets

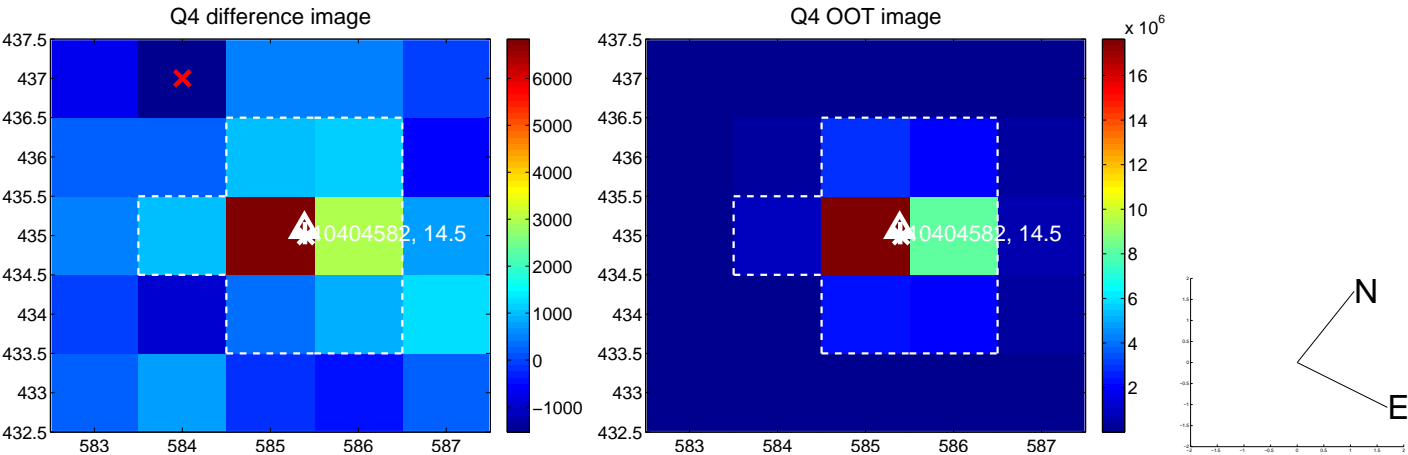
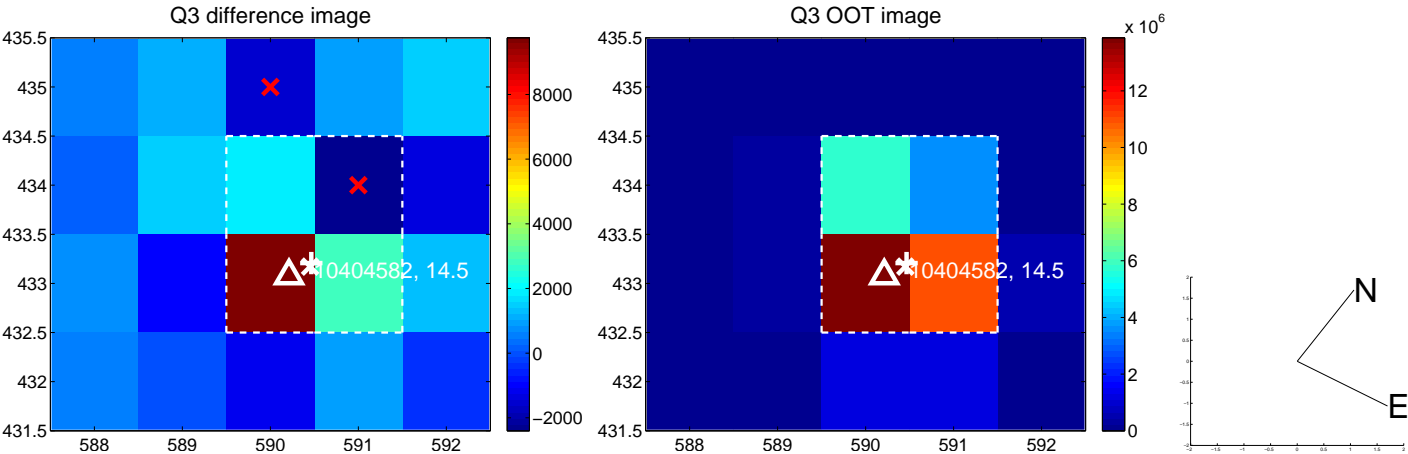
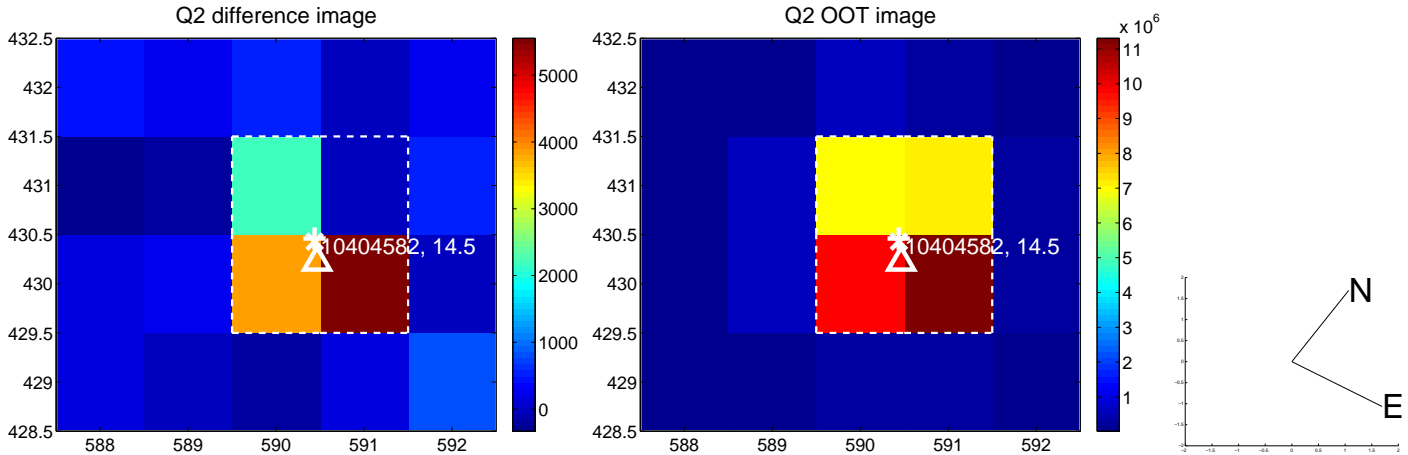
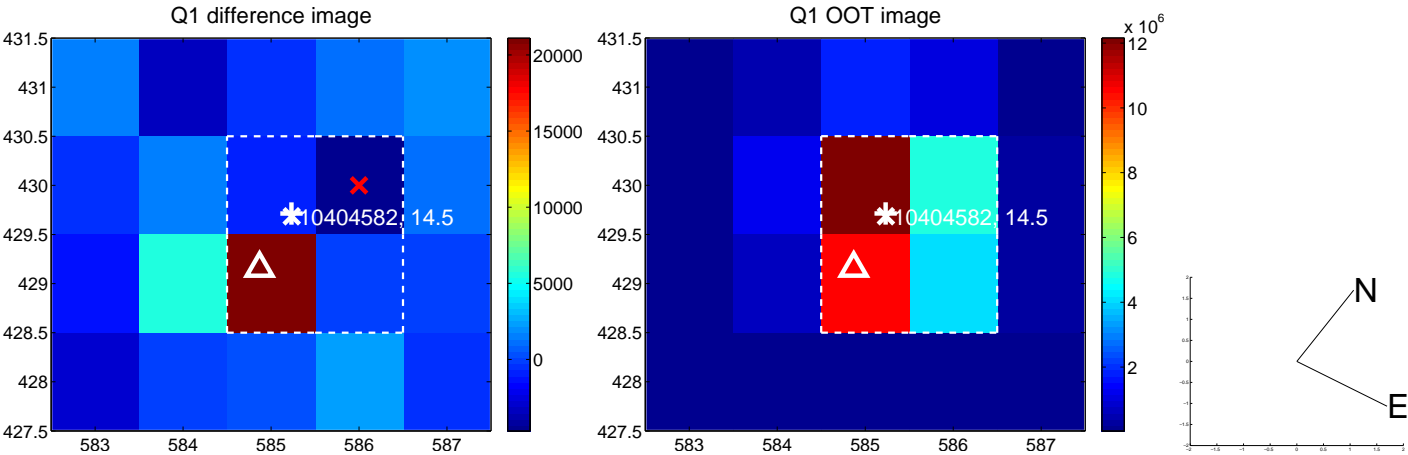
The direct PRF centroid is offset from the target star catalog position by about 0.17 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.121 \pm 0.189$	0.64	$0.121 \pm 0.189$	$0.000 \pm 0.307$
PRF-fit source offset from KIC position	$0.121 \pm 0.300$	0.40	$0.037 \pm 0.209$	$0.115 \pm 0.350$
photometric centroid source offset	$0.41 \pm 0.66$	0.63	$-0.36 \pm 0.67$	$-0.19 \pm 0.59$

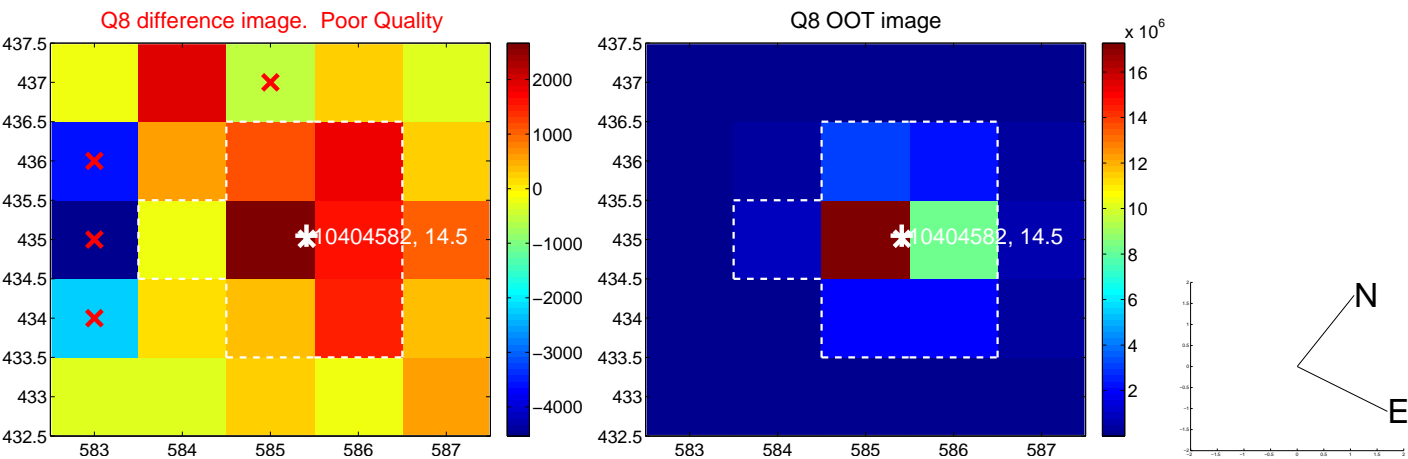
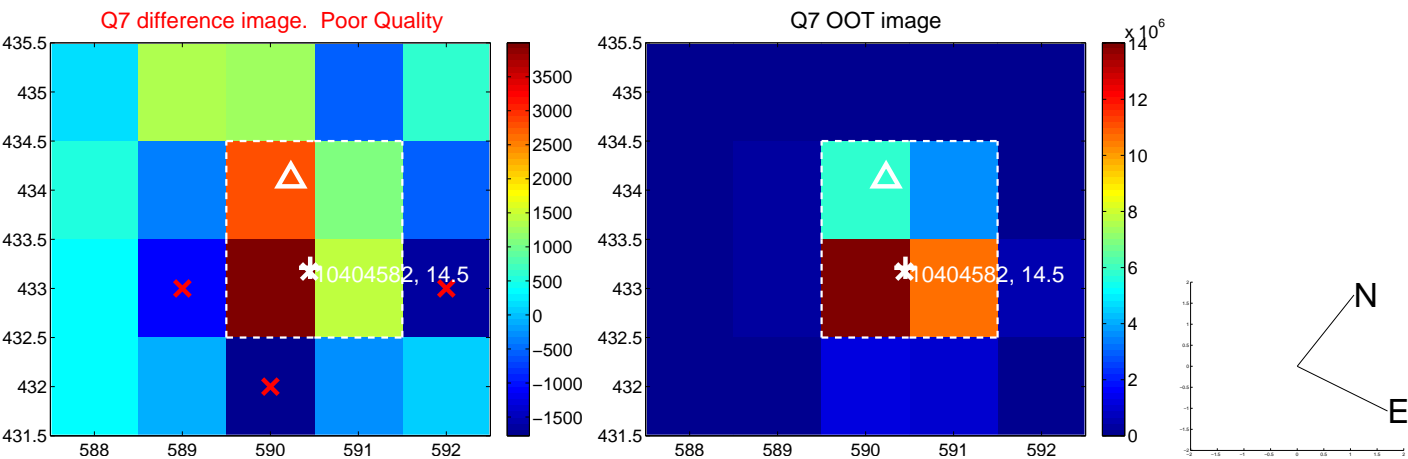
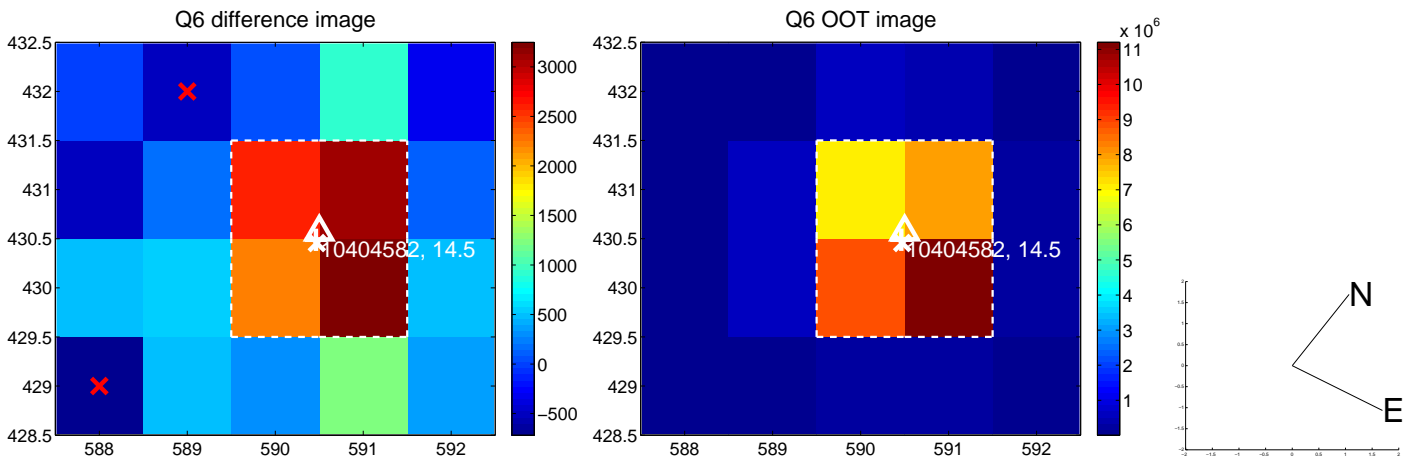
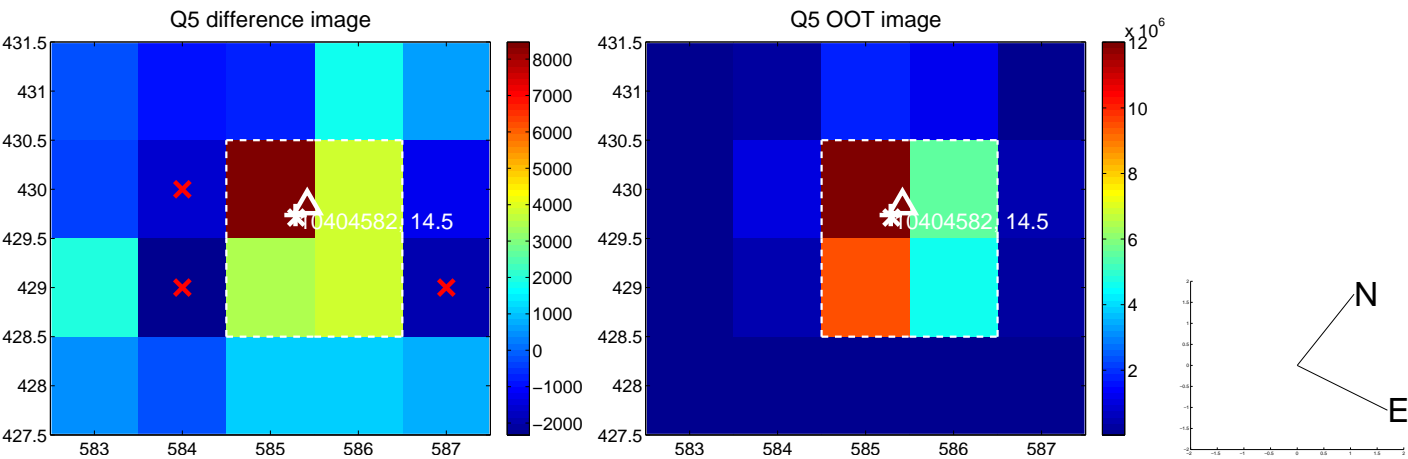


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses:** good quarterly centroid offsets; **Vermillion crosses:** bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

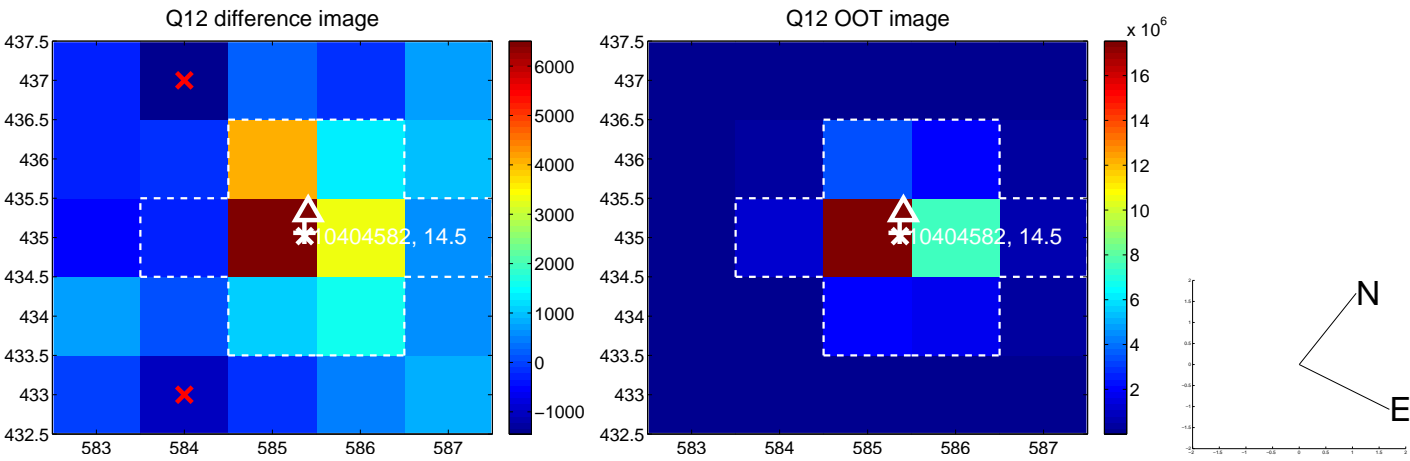
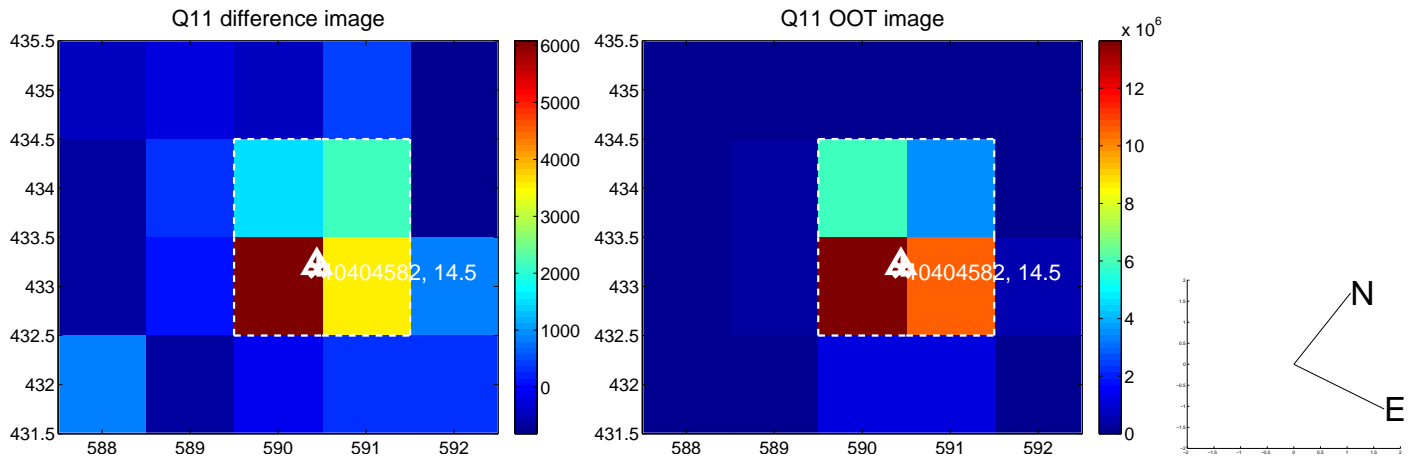
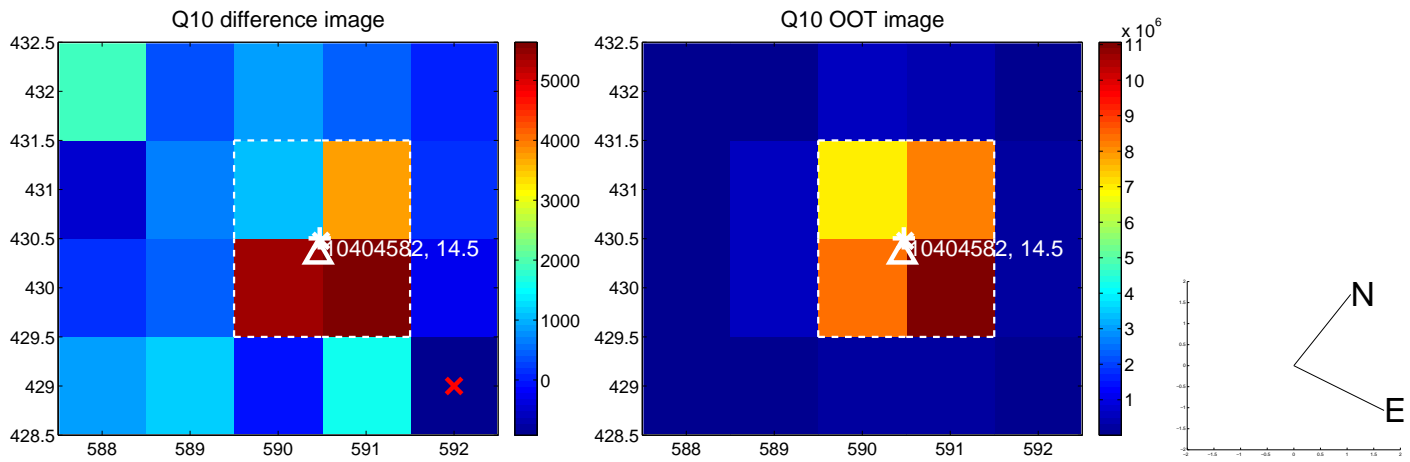
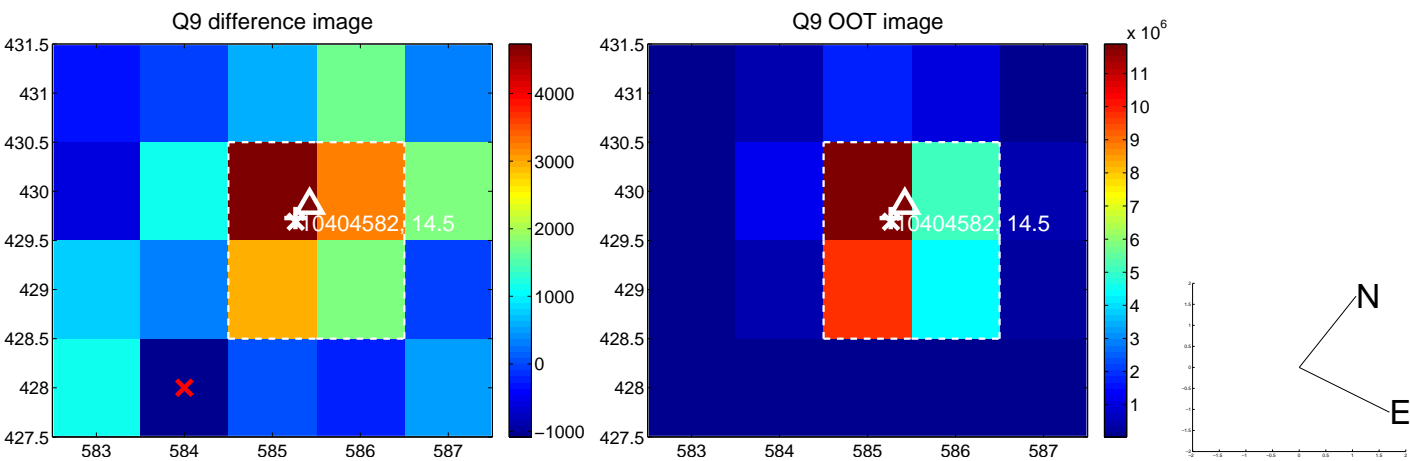
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



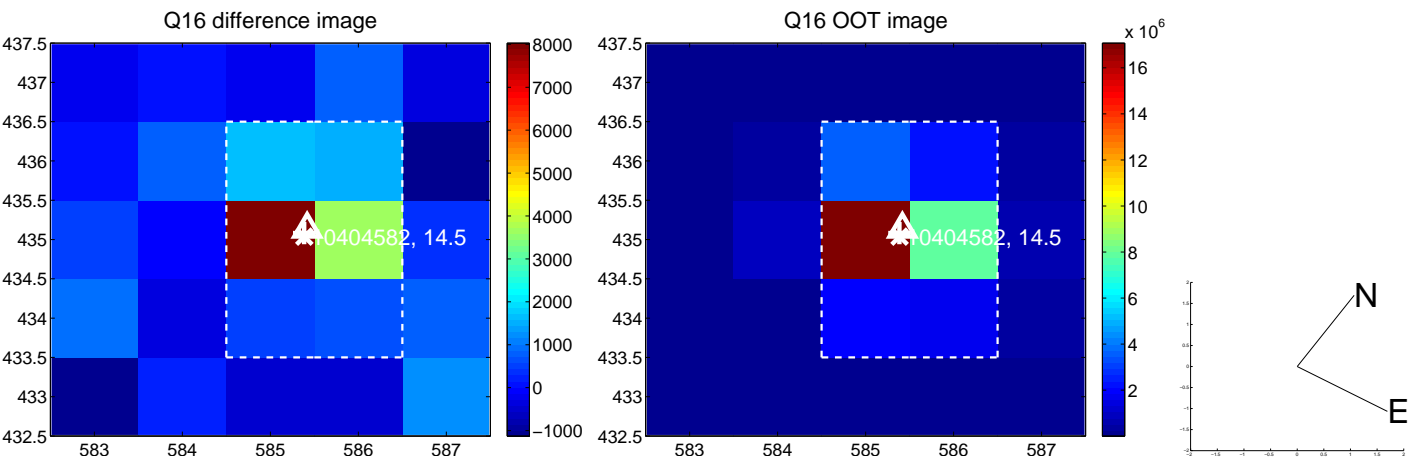
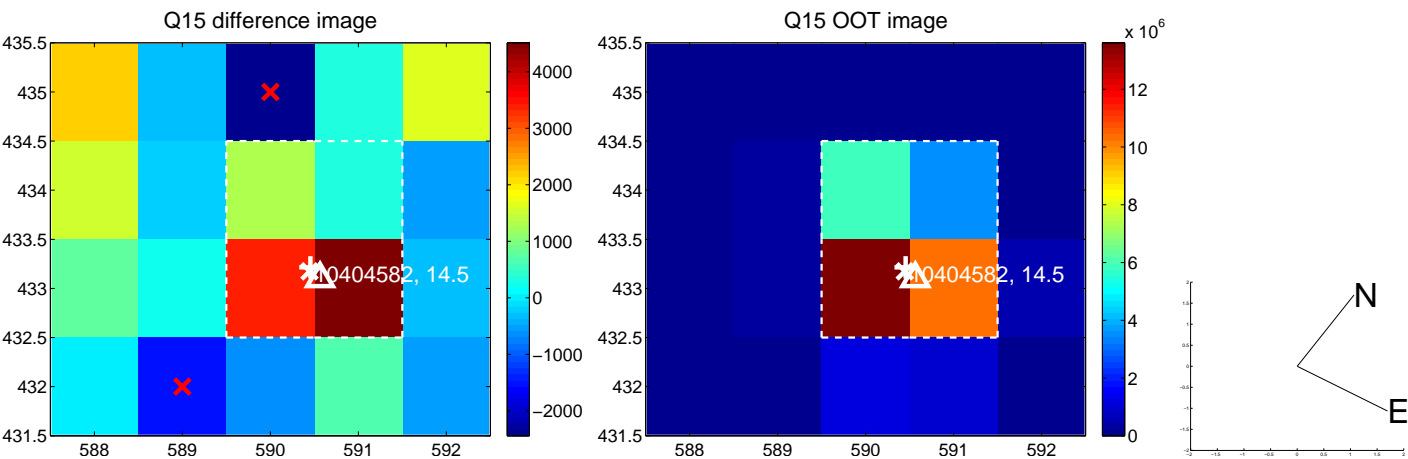
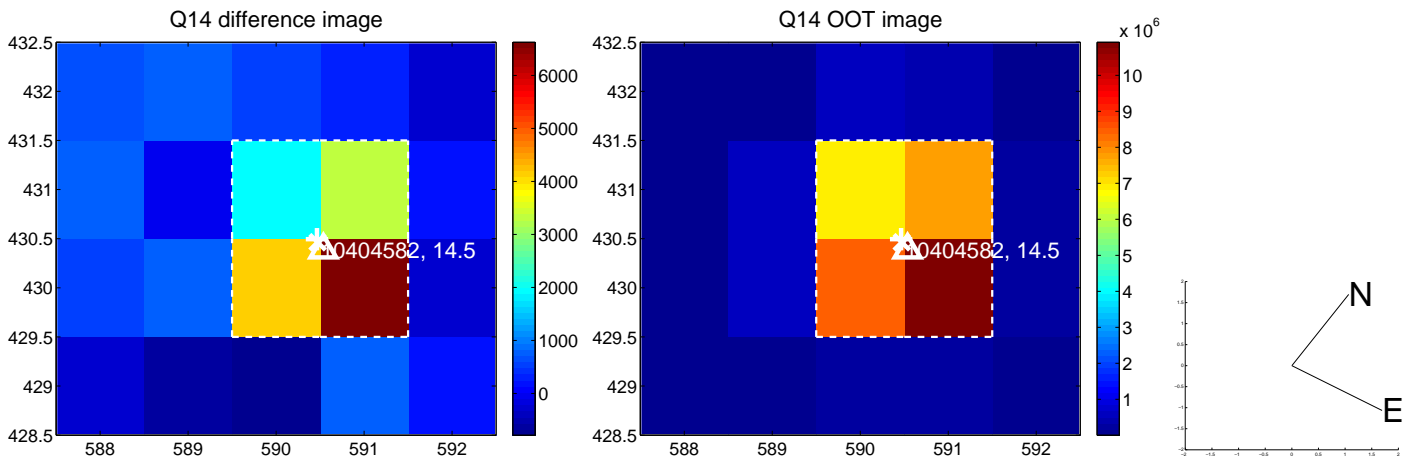
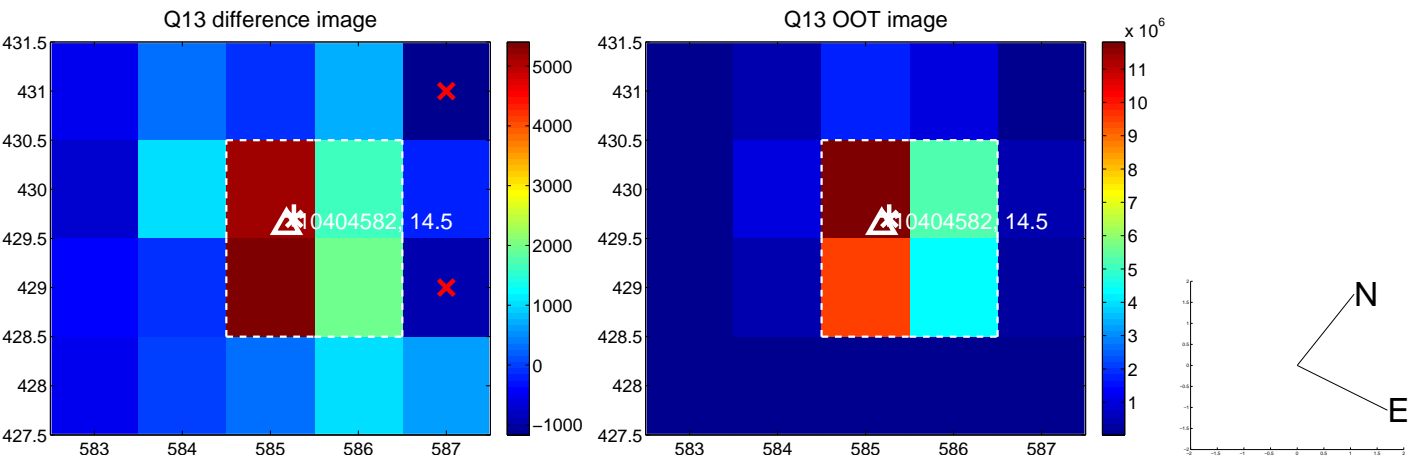
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

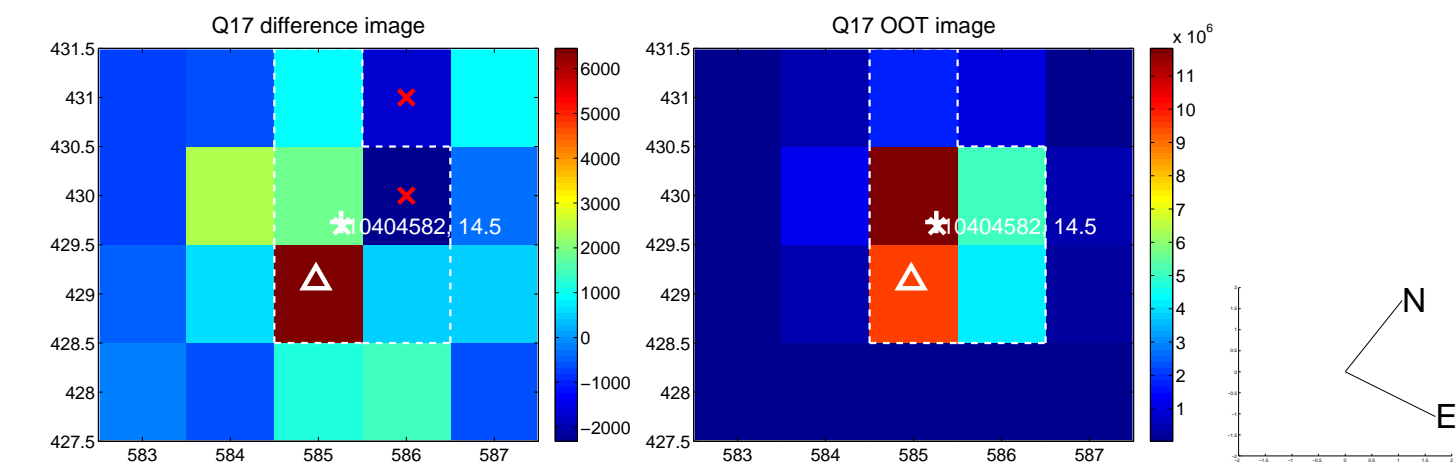


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

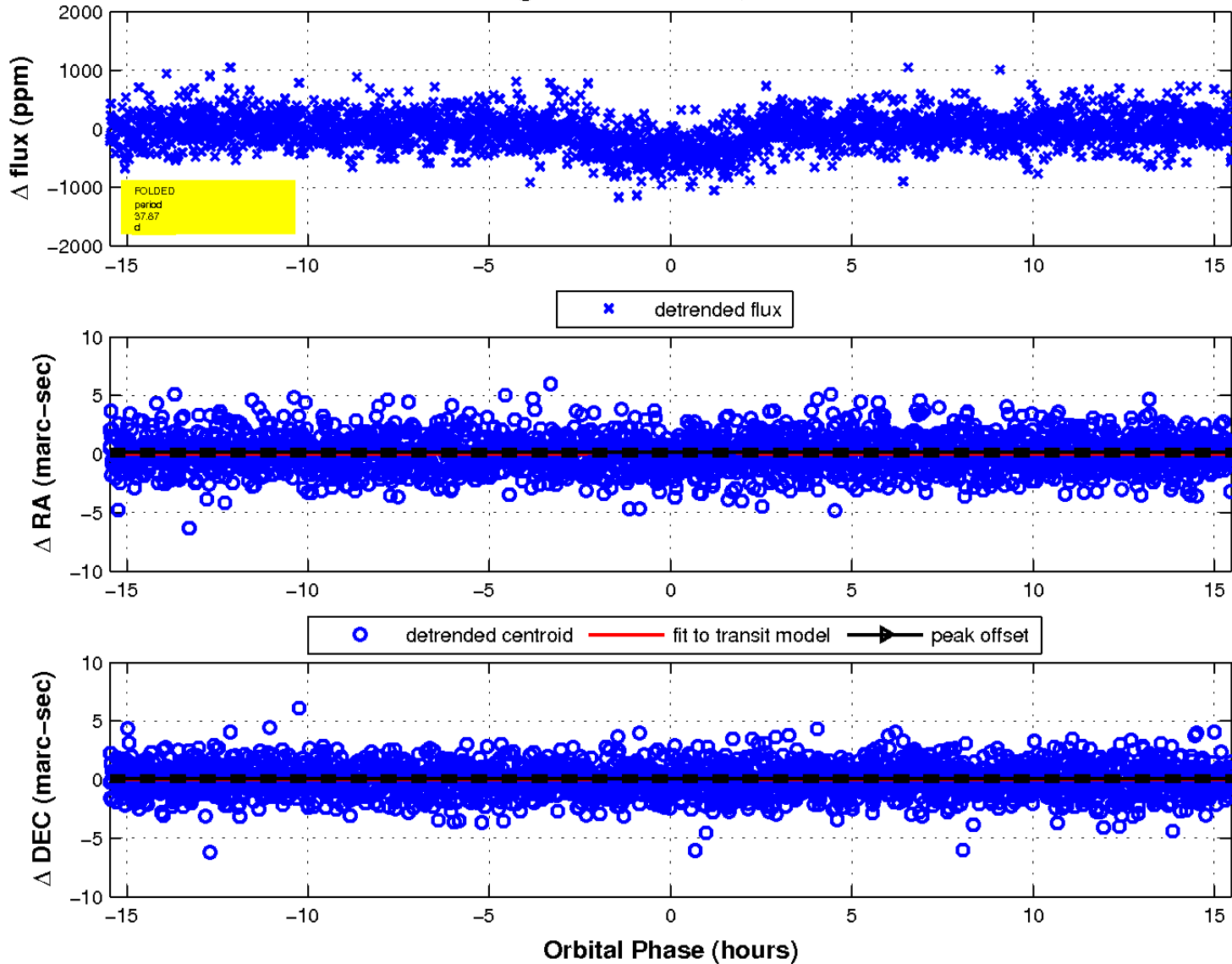




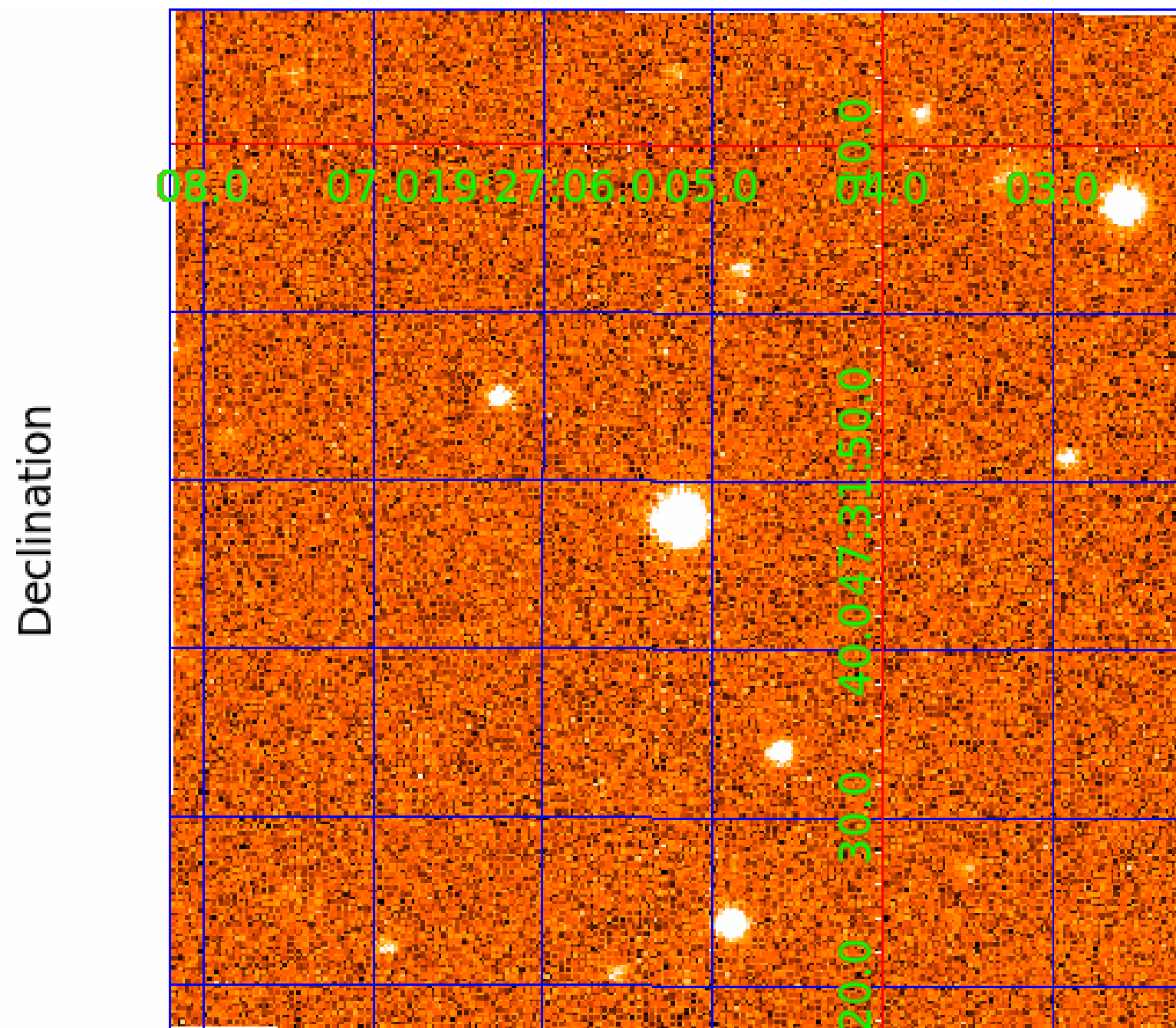
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



fluxWeightedCentroids, Planet 1 of 2



UKIRT Image



# KIC 010404582

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
010404582-01	OBS	2147.01	37.865947	134.361102	388.5	5.160	22.9	23.6	1.02	5757	2.39	20.65
010404582-02	OBS	2147.02	10.327378	139.373514	123.6	2.037	8.9	9.8	1.02	5757	1.37	116.75

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
010404582-01	OBS	PC	1.00	0	0	0	0	NO_COMMENT
010404582-02	OBS	PC	0.85	0	0	0	0	NO_COMMENT

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

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

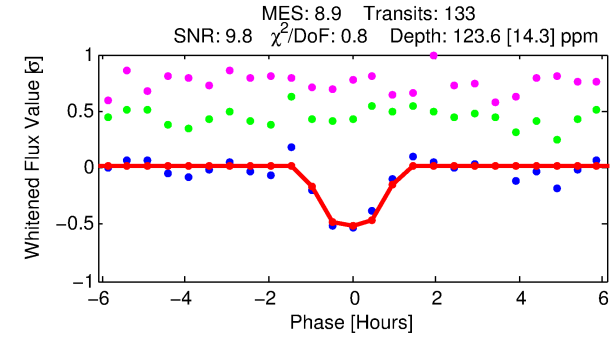
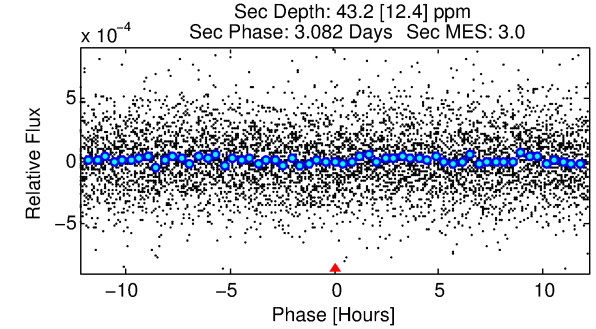
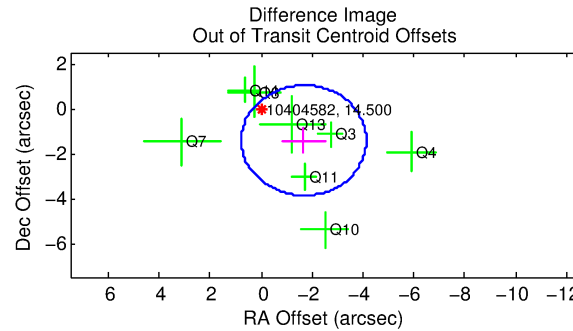
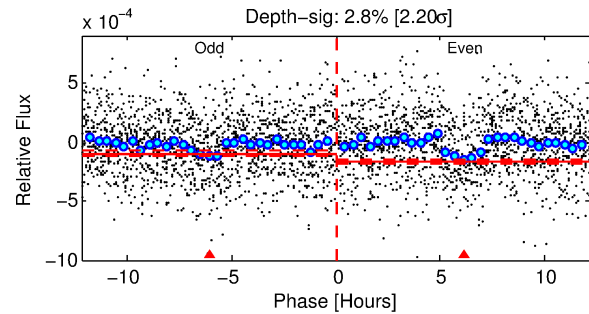
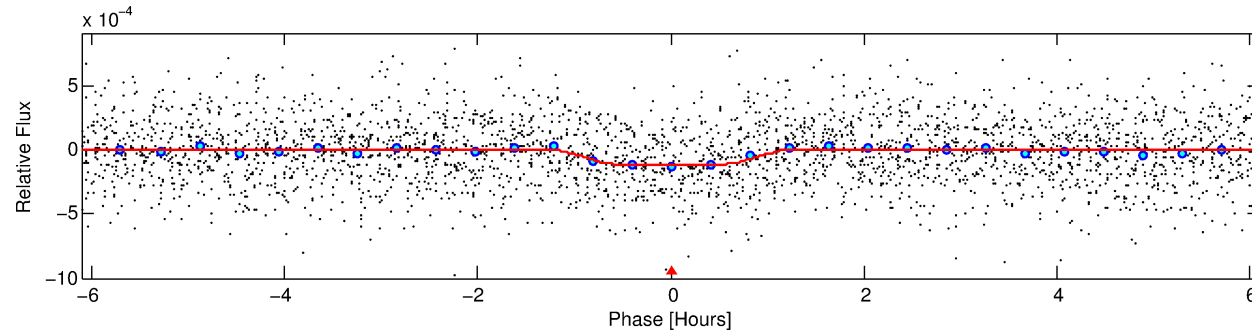
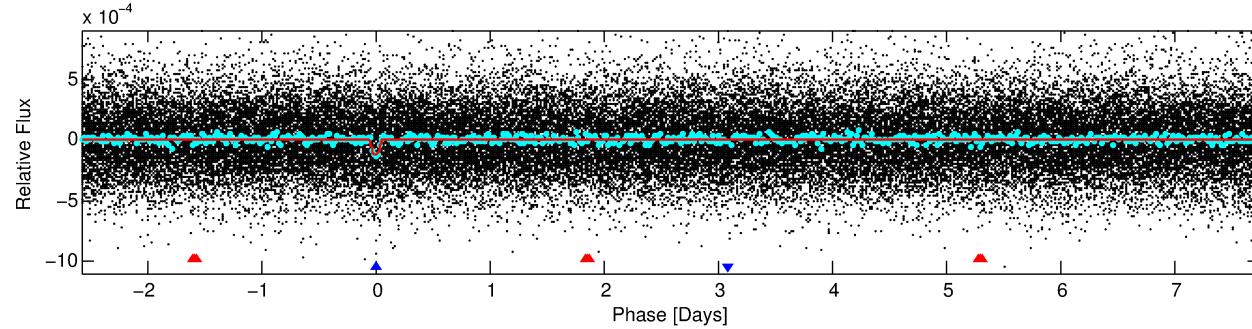
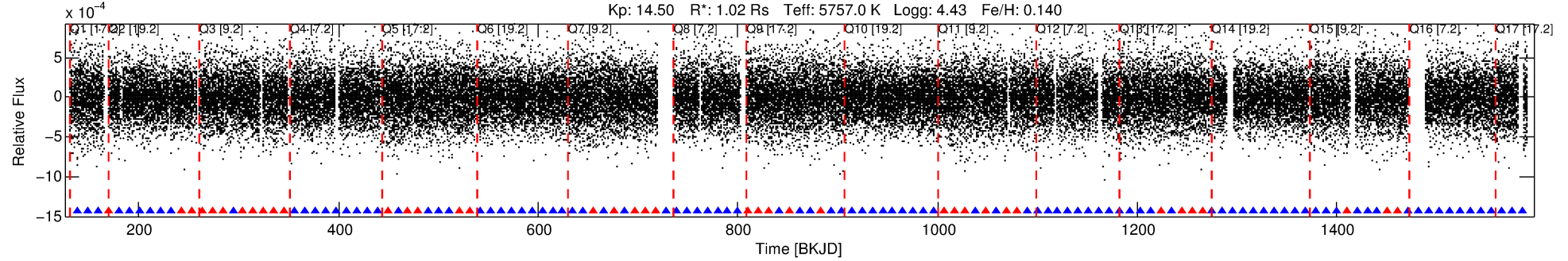
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 010404582-02

No Significant Match Found

# DV One-Page Summary

KIC: 10404582 Candidate: 2 of 2 Period: 10.327 d  
KOI: K02147.02 Name: Kepler-362b Corr: 0.978



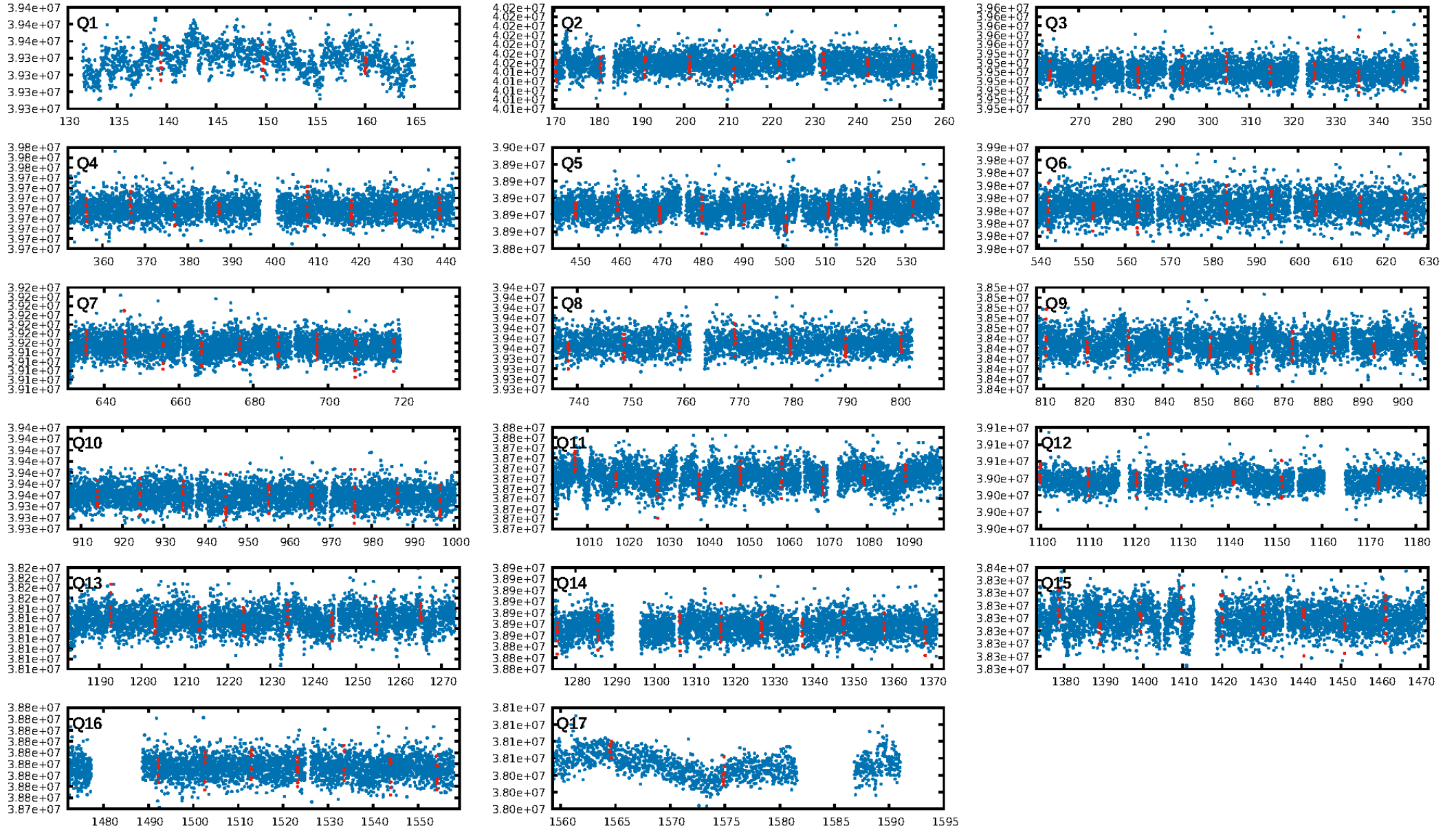
## DV Fit Results:

Period = 10.32738 [0.00007] d  
Epoch = 139.3735 [0.0050] BKJD  
Rp/R\* = 0.0123 [0.0090]  
a/R\* = 16.88 [58.27]  
b = 0.91 [0.64]  
Seff = 116.75 [26.65]  
Teq = 838 [48] K  
Rp = 1.37 [1.02] Re  
a = 0.0934 [0.0134] AU  
Ag = 110.36 [165.24] [0.66 $\sigma$ ]  
Teffp = 4200 [1556] K [2.16 $\sigma$ ]

## DV Diagnostic Results:

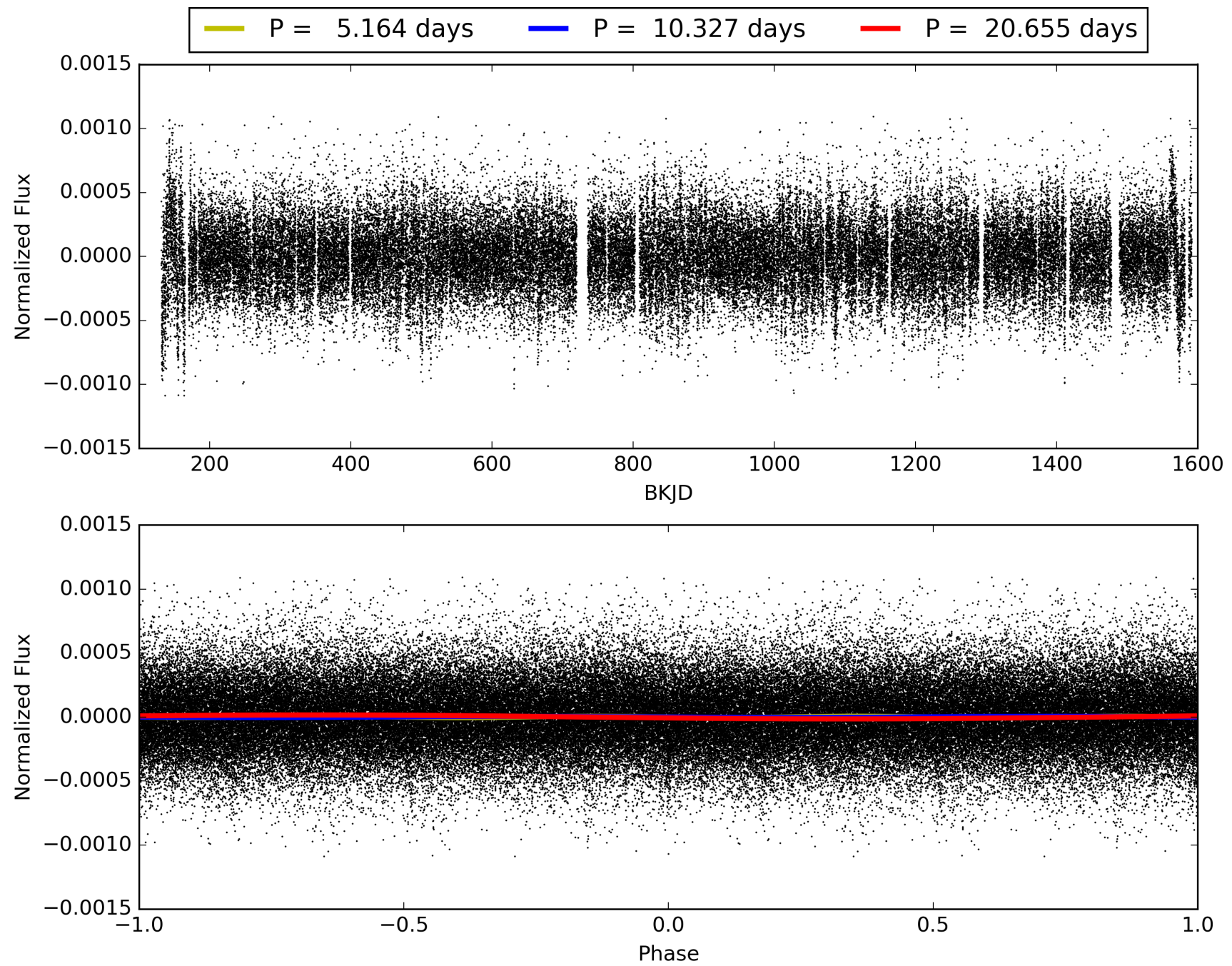
ShortPeriod-sig: N/A  
LongPeriod-sig: 100.0% [119.14 $\sigma$ ]  
ModelChiSquare2-sig: 99.6%  
ModelChiSquareGoF-sig: 100.0%  
Bootstrap-pfa: 4.12e-19  
RollingBand-fgt: 0.70 [89/128]  
GhostDiagnostic-chr: 13.92  
Centroid-sig: 22.2%  
Centroid-so: 2.171 arcsec [1.31 $\sigma$ ]  
OotOffset-rm: 2.201 arcsec [2.69 $\sigma$ ]  
KicOffset-rm: 2.160 arcsec [2.15 $\sigma$ ]  
OotOffset-st: 2/3/2/1 [8]  
KicOffset-st: 2/3/2/1 [8]  
DiffImageQuality-fgm: 0.62 [5/8]  
DiffImageOverlap-fno: 1.00 [17/17]

# TCE 010404582-02, PDC Light Curves



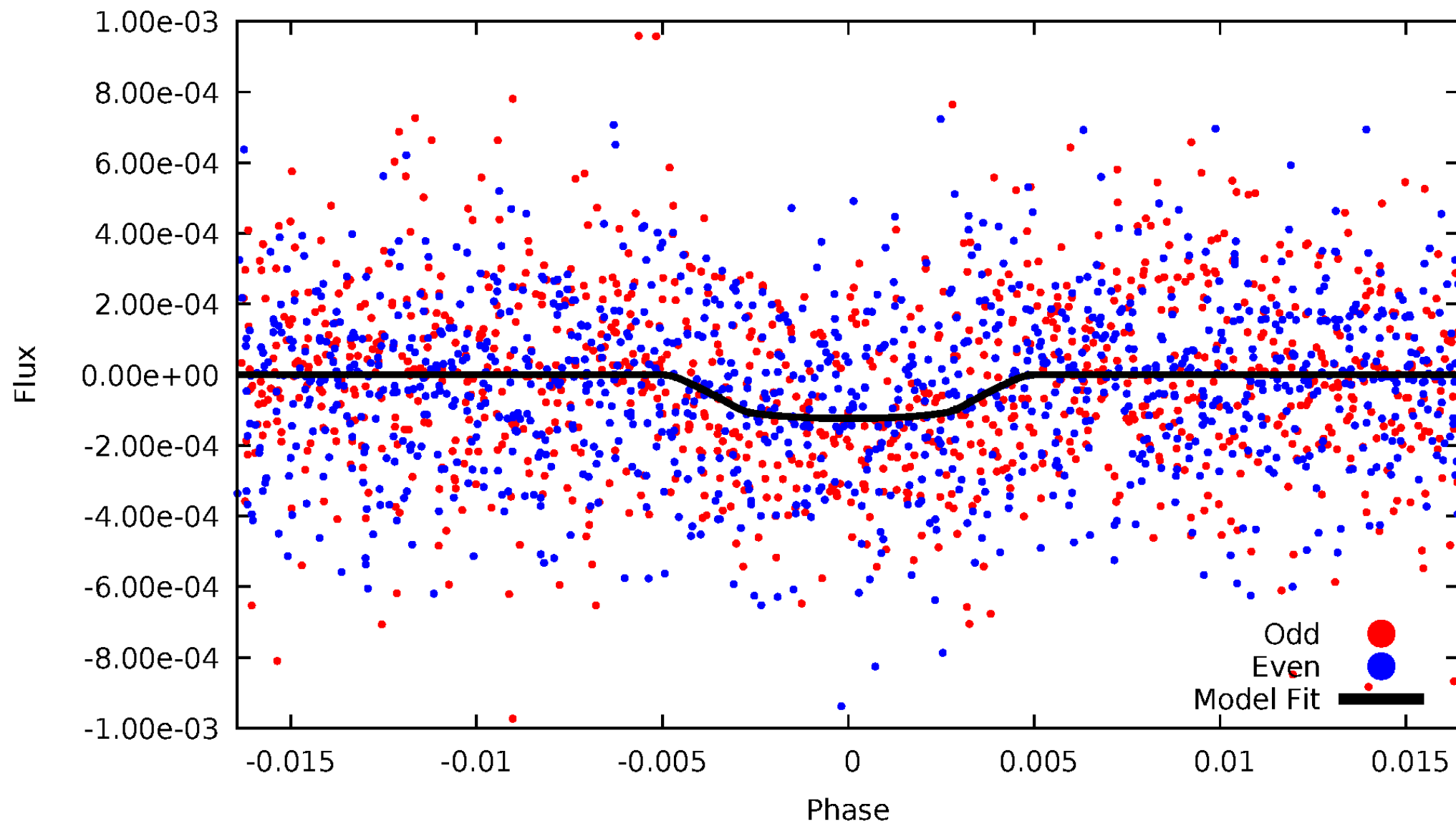


TCE 010404582-02



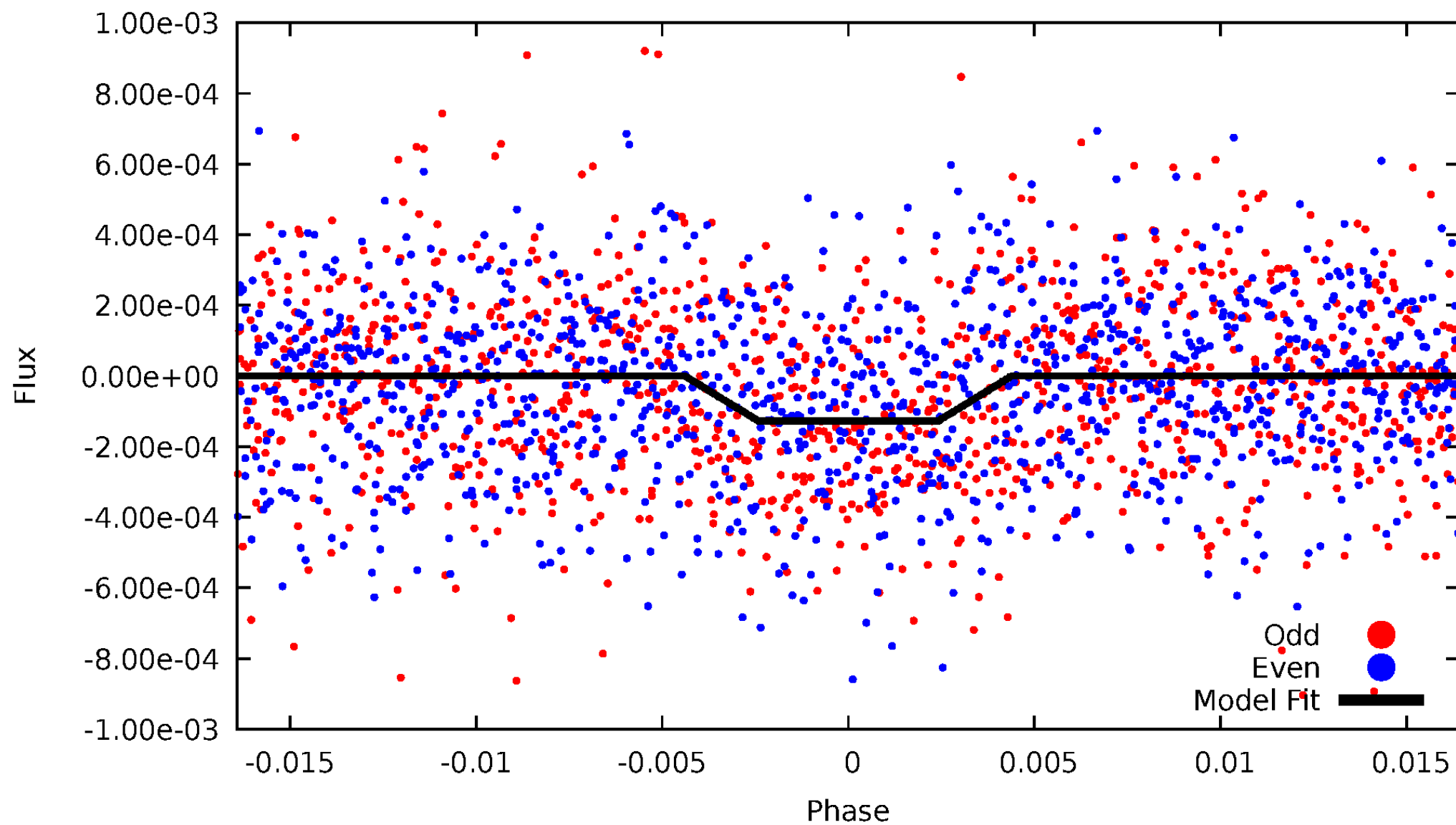
# DV Odd/Even

TCE 010404582-02



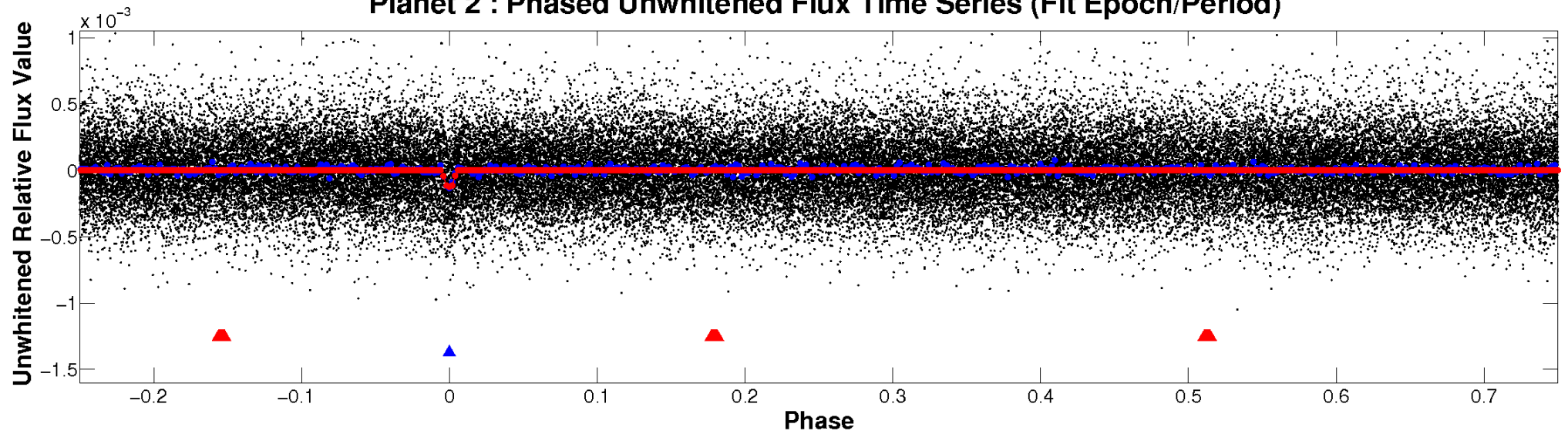
# ALT Odd/Even

TCE 010404582-02

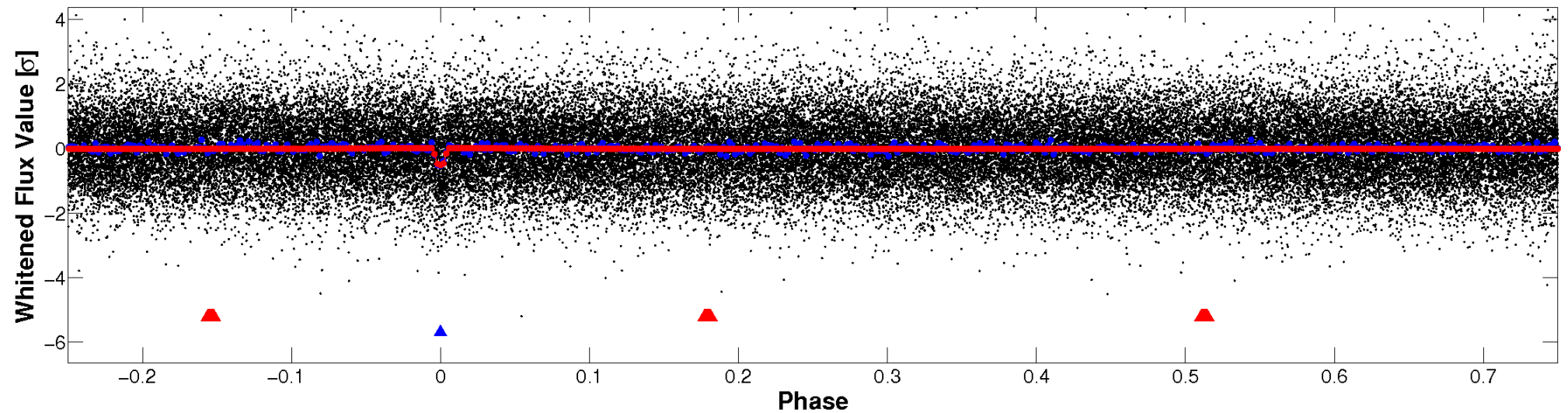


# Non-Whitened Vs. Whitened Light Curve

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

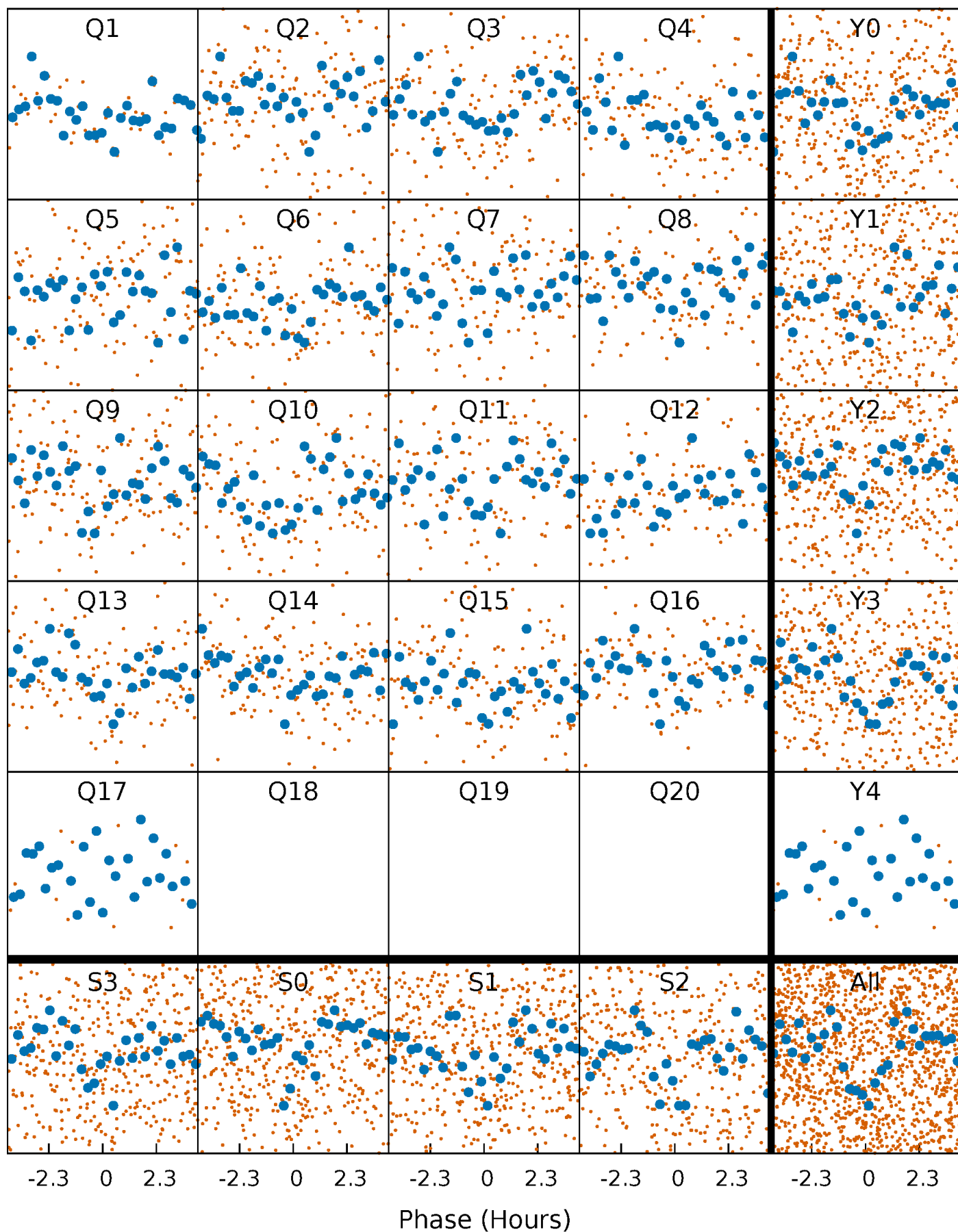


**Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)**



# PDC Quarter-Phased Transit Curves

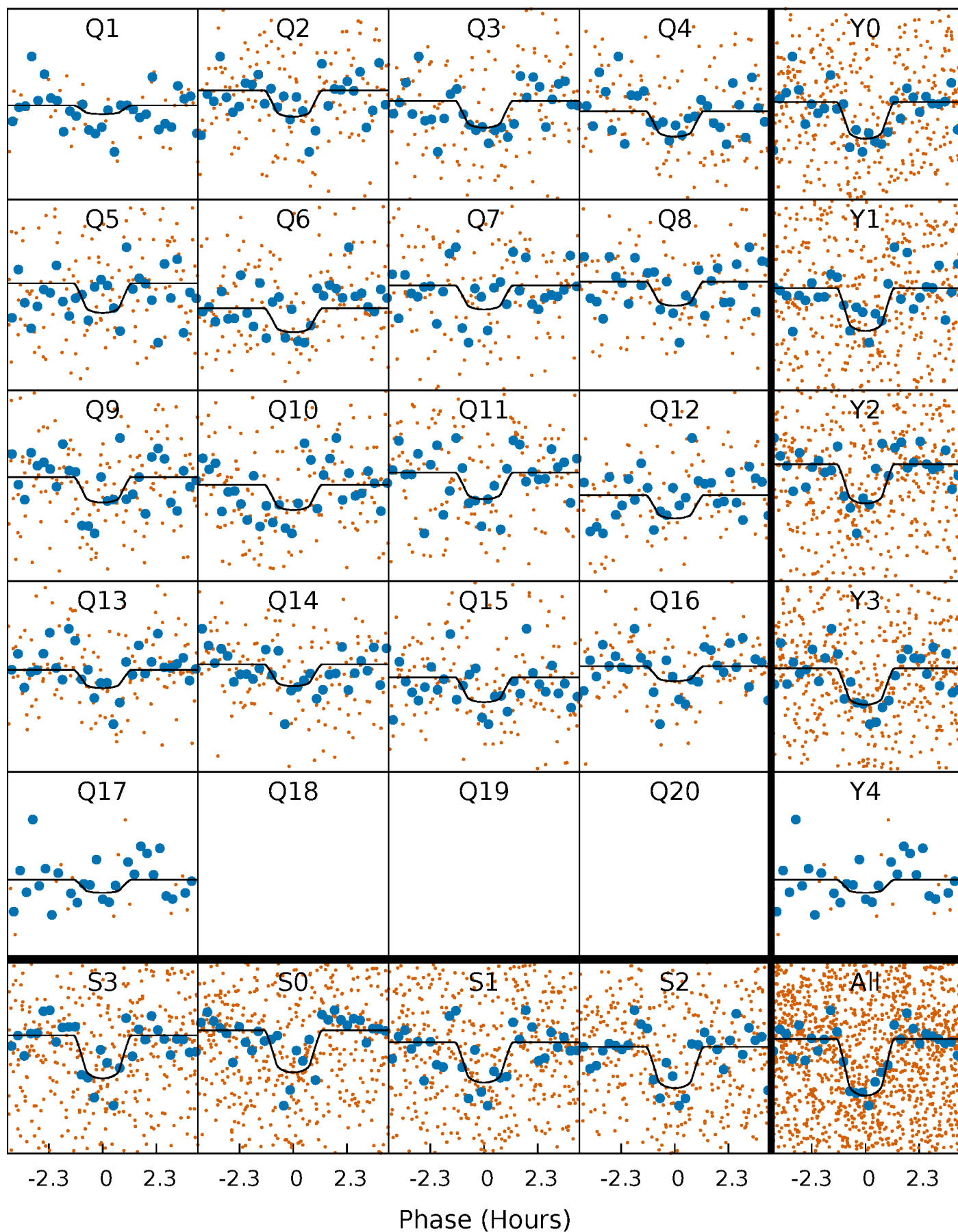
TCE 010404582-02 P= 10.327378 Days  $T_0=139.373514$  (BKJD)





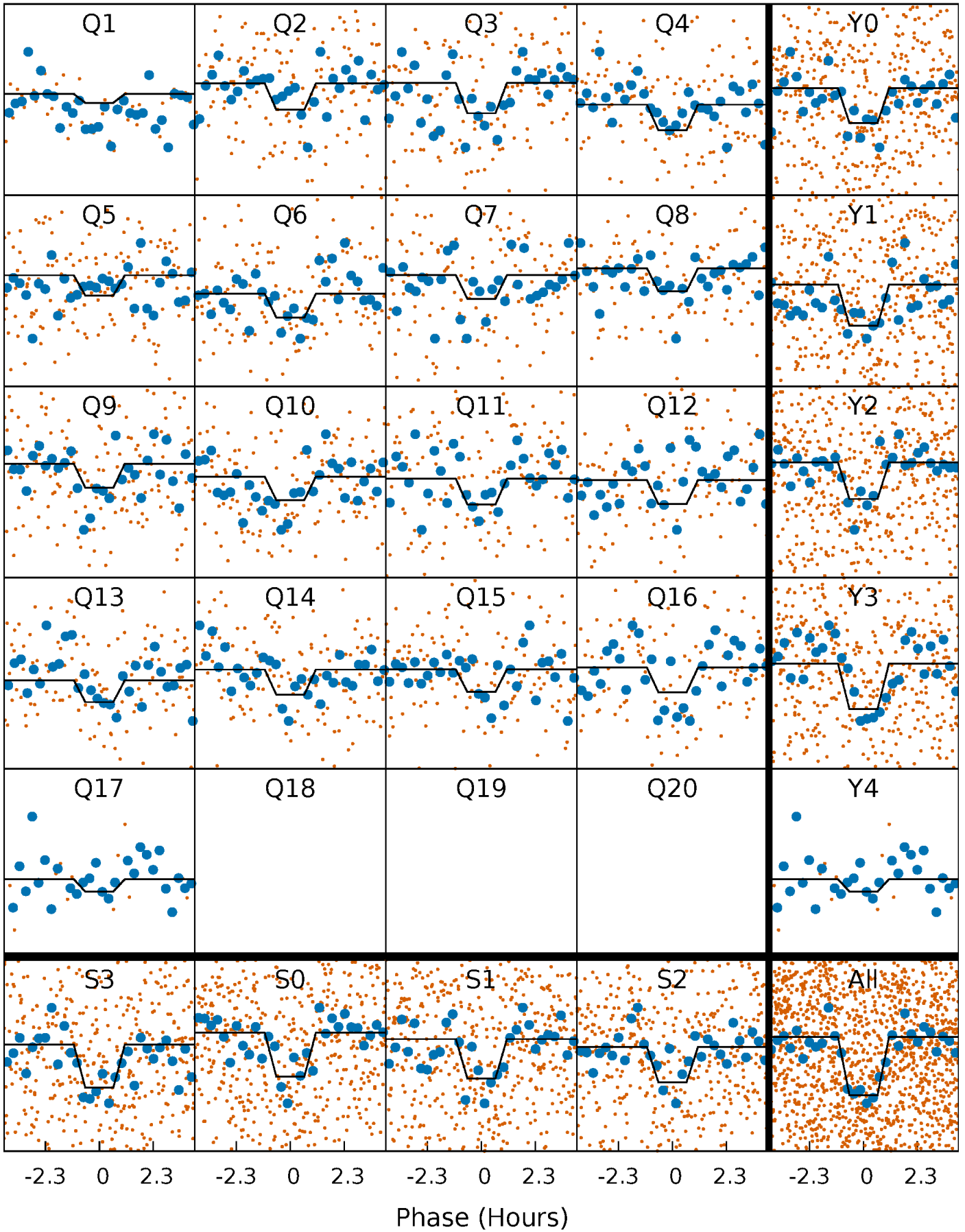
# DV Quarter-Phased Transit Curves

TCE 010404582-02   P= 10.327378 Days    $T_0=139.373514$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

TCE 010404582-02   P= 10.327340 Days    $T_0=139.373581$  (BKJD)

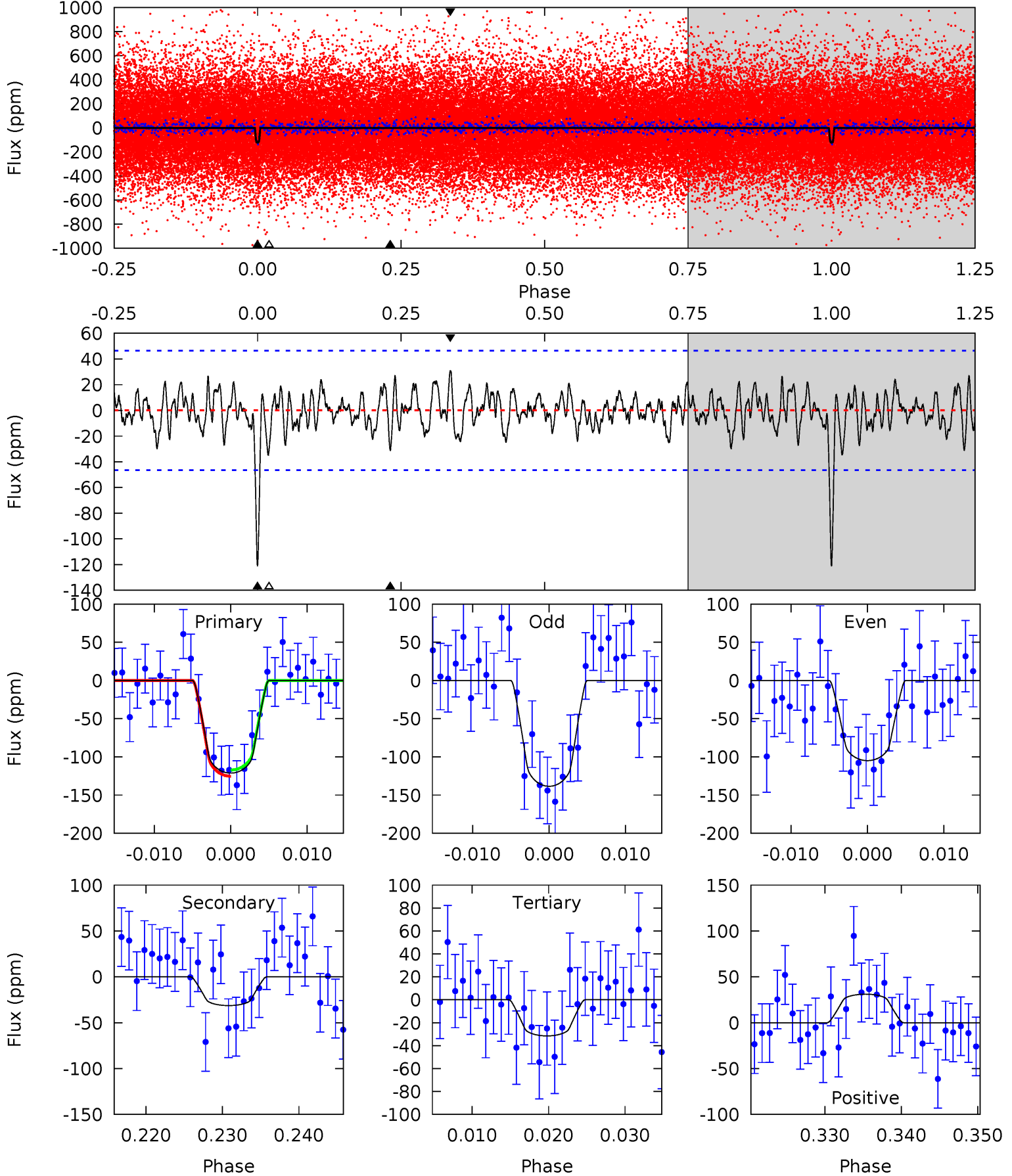




# DV Model-Shift Uniqueness Test

010404582-02, P = 10.327378 Days, E = 129.046136 Days

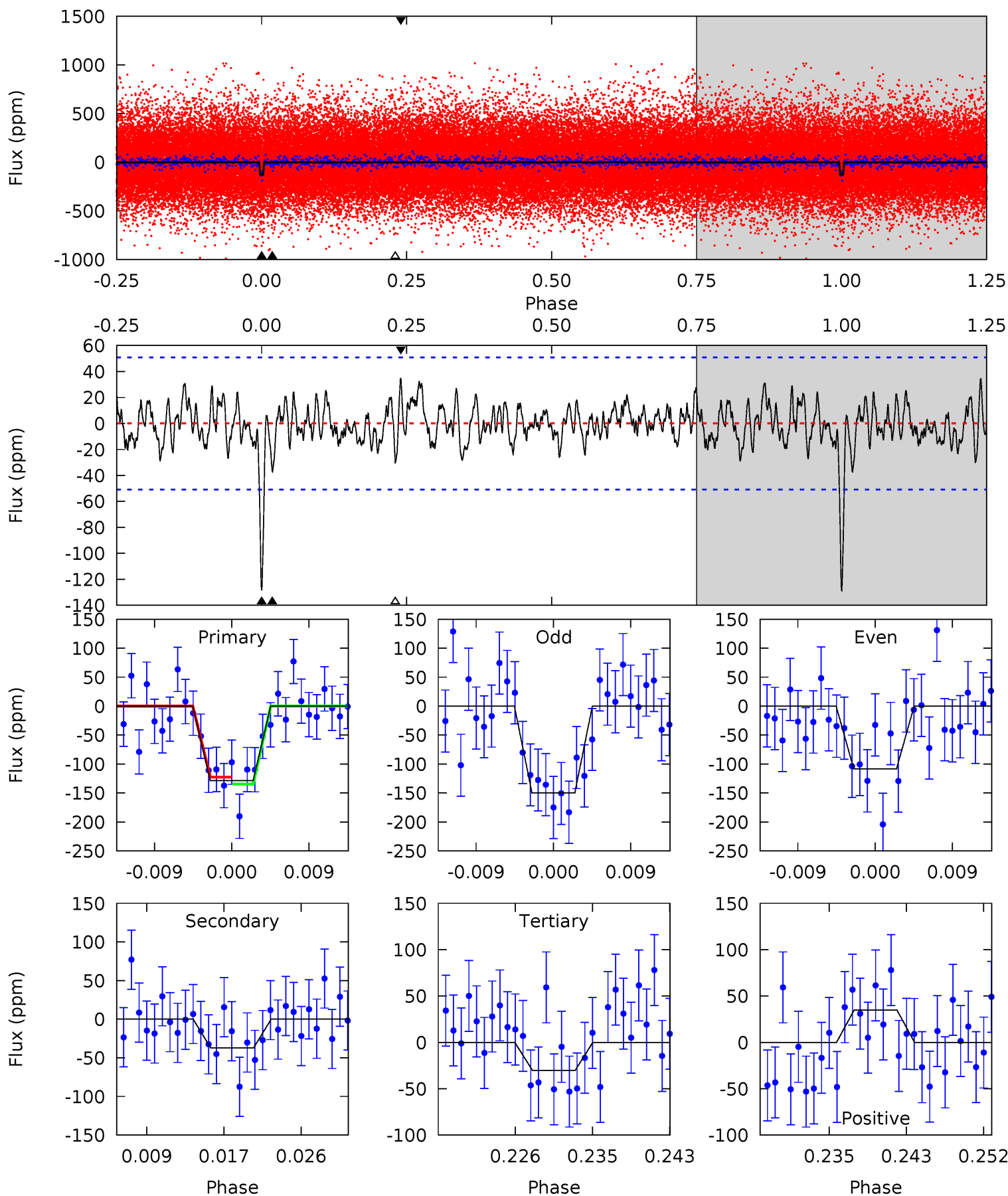
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
13.1	3.39	3.41	3.36	5.03	2.58	1.21	9.70	9.75	-0.02	0.03	1.82	1.01	0.20	0.44



# Alt Model-Shift Uniqueness Test

010404582-02, P = 10.327340 Days, E = 129.046241 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
12.8	3.71	3.00	3.46	5.05	2.62	1.19	9.78	9.31	0.71	0.24	2.08	0.98	0.21	0.61



### Stellar Parameters For KIC 010404582

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$5757^{+78}_{-86}$	$4.431^{+0.054}_{-0.126}$	$0.140^{+0.150}_{-0.150}$	$1.017^{+0.161}_{-0.080}$	$1.016^{+0.062}_{-0.062}$	$1.360^{+0.331}_{-0.452}$
	+1%/-1%	+1%/-3%	+107%/-107%	+16%/-8%	+6%/-6%	+24%/-33%
Source	SPE90	SPE90	SPE90	DSEP		

KIC = Kepler Input Catalog; PHO = Photometry; SPE = Spectroscopy; AST = Asteroseismology  
 TRA = Transits; DESP = Dartmouth Models; MULT = Multiple Models

### Secondary Eclipse Parameters for KIC 010404582-02 / KOI 2147.02

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-31 \pm 9$	$1.48^{+0.99}_{-0.83}$	$1181^{+50}_{-33}$	$4030^{+1662}_{-649}$	$66^{+301}_{-43}$
Alt.	$-37 \pm 10$	$1.43^{+0.97}_{-0.89}$	$1184^{+48}_{-39}$	$4189^{+2318}_{-697}$	$80^{+520}_{-52}$

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

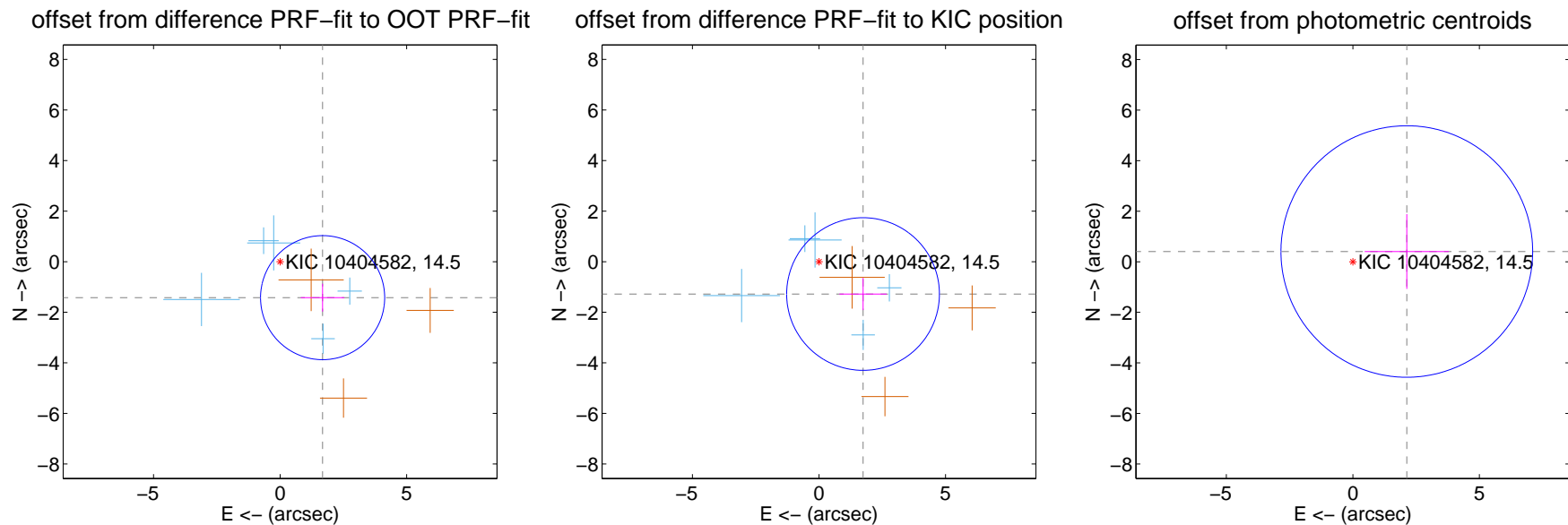
## DV Centroid Data

Supplemental centroid analysis for 010404582-02. Kepler magnitude: 14.50. Transit SNR 9.82

There are 5 quarters with good PRF difference image offsets

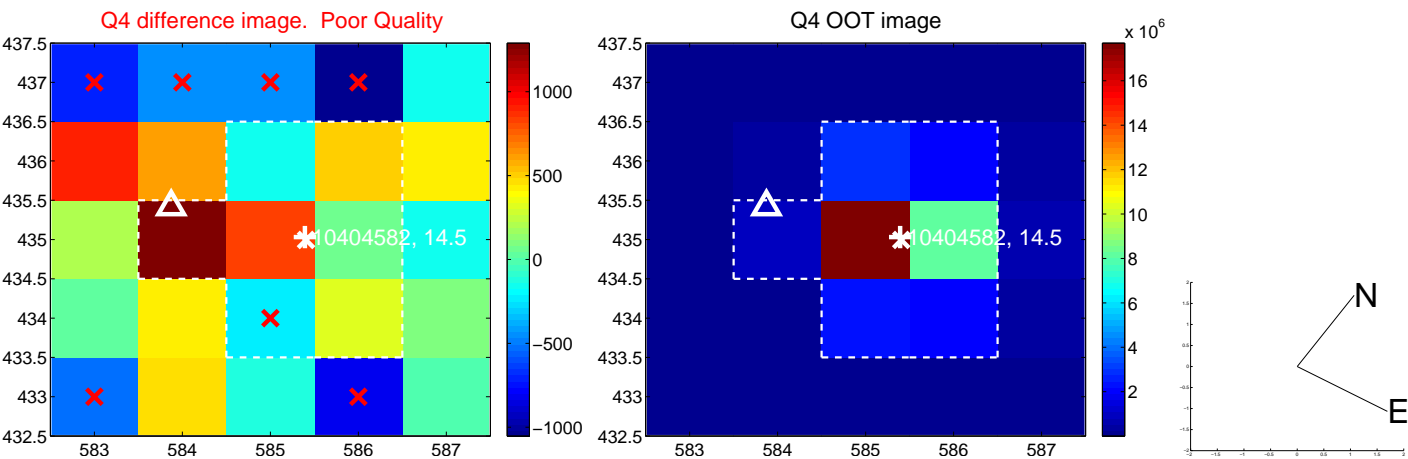
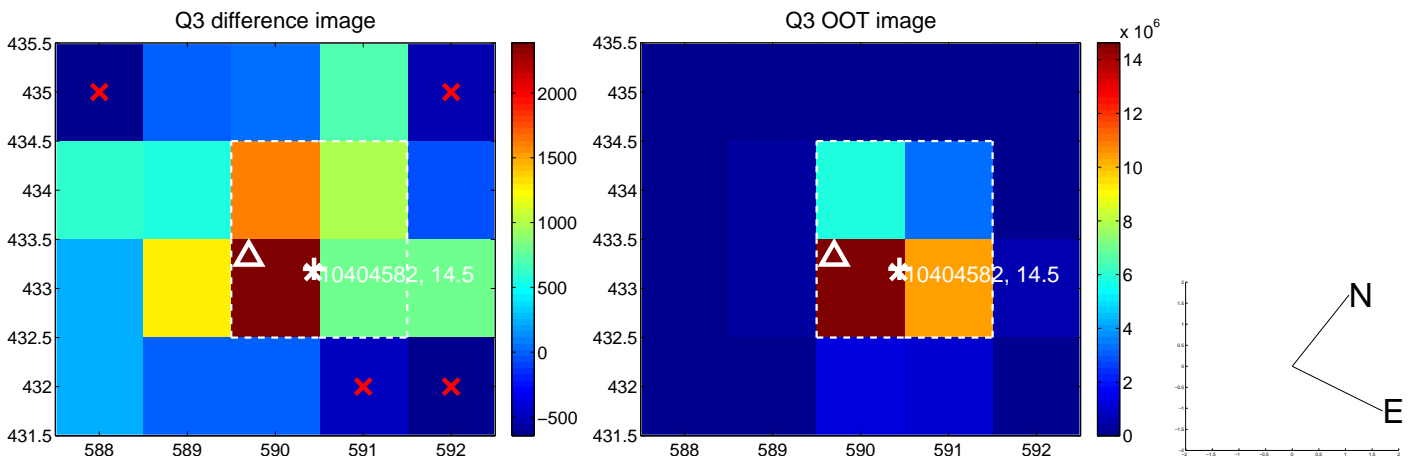
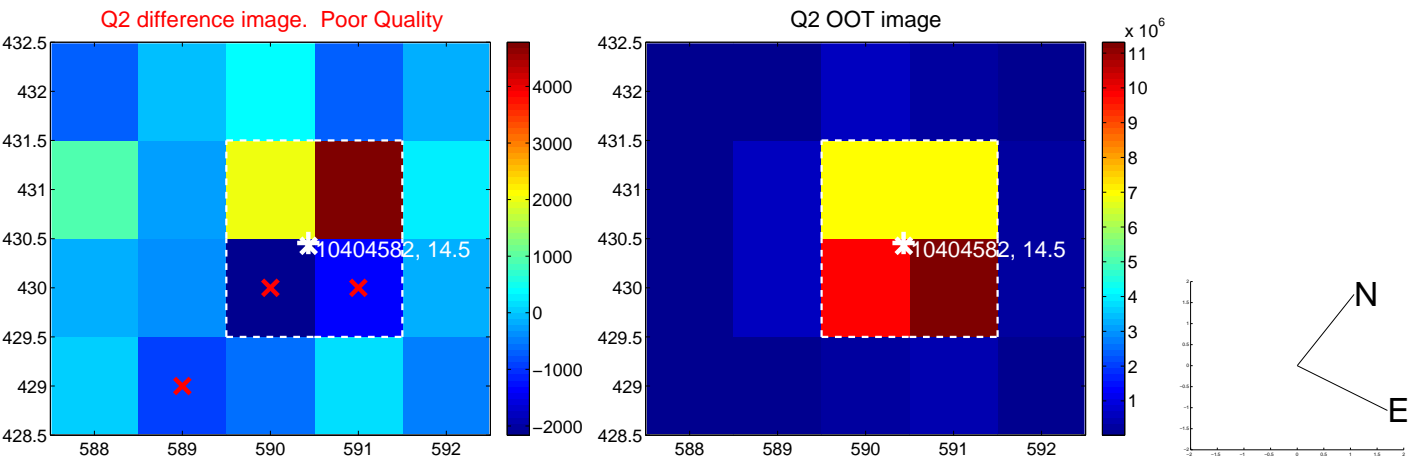
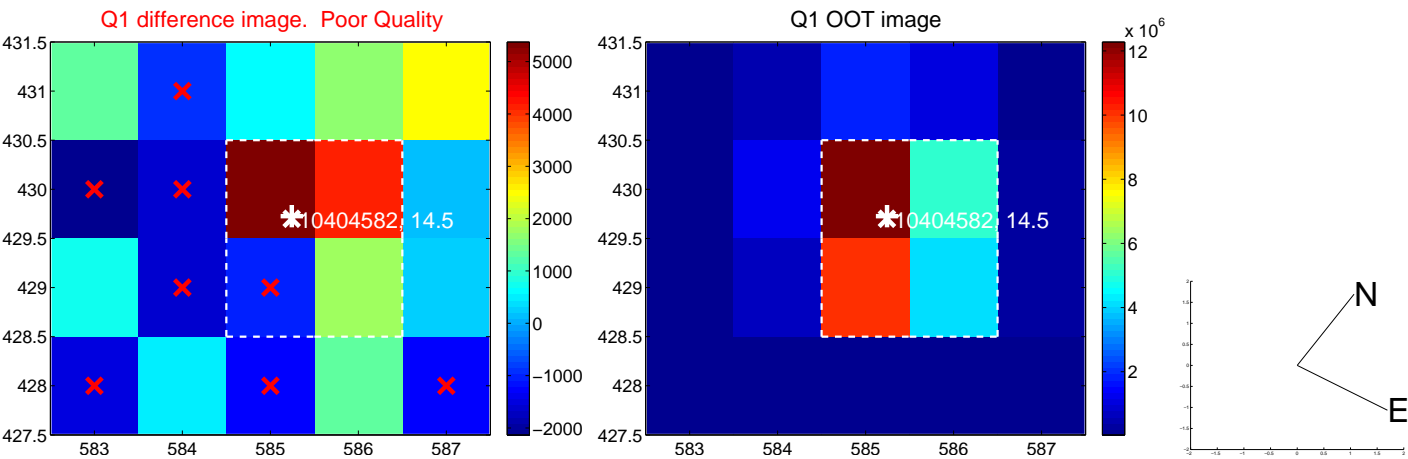
The direct PRF centroid is offset from the target star catalog position by about 0.13 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$2.201 \pm 0.818$	2.69	$-1.680 \pm 0.860$	$-1.422 \pm 0.551$
PRF-fit source offset from KIC position	$2.160 \pm 1.006$	2.15	$-1.741 \pm 0.935$	$-1.279 \pm 0.636$
photometric centroid source offset	$2.17 \pm 1.66$	1.31	$-2.13 \pm 1.66$	$0.41 \pm 1.48$

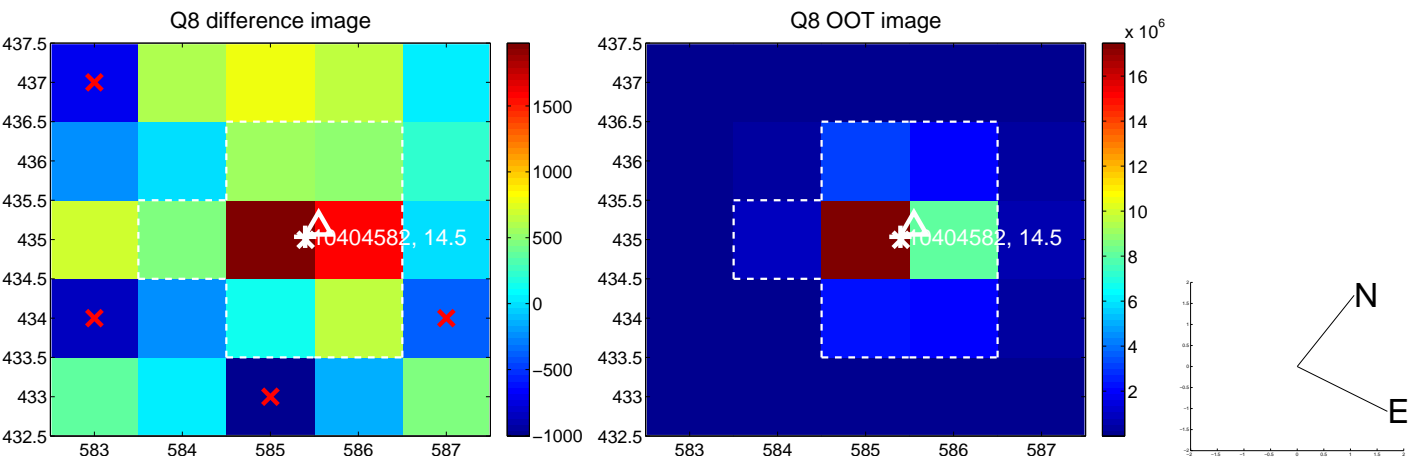
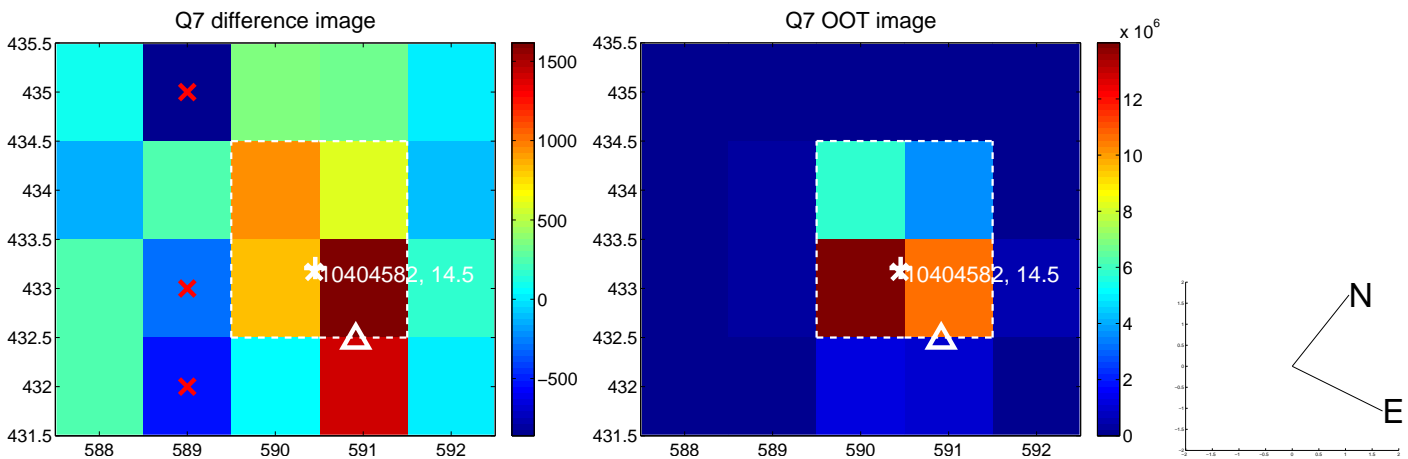
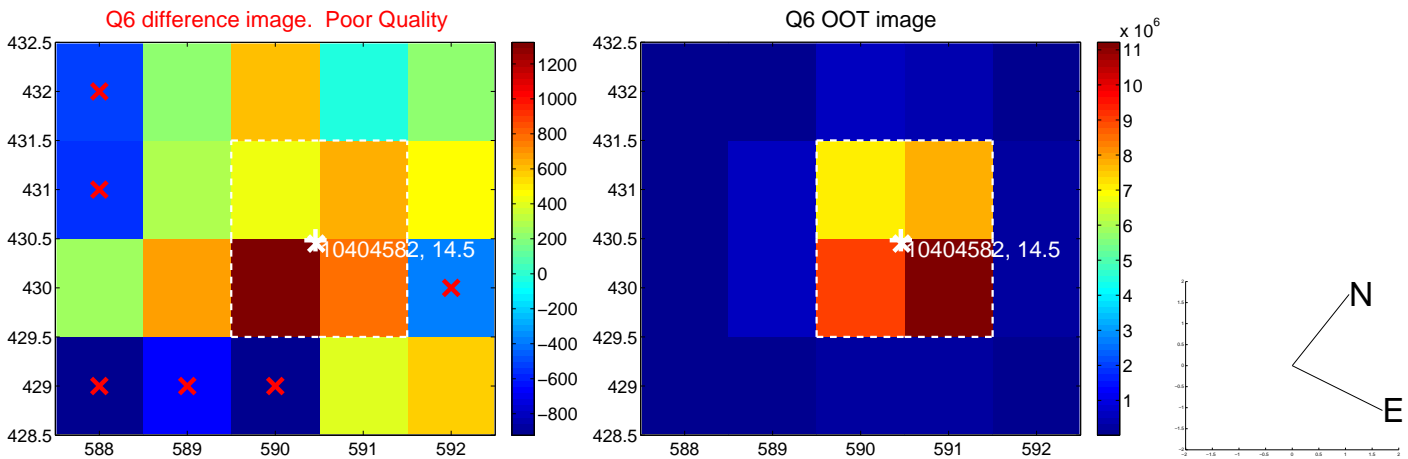
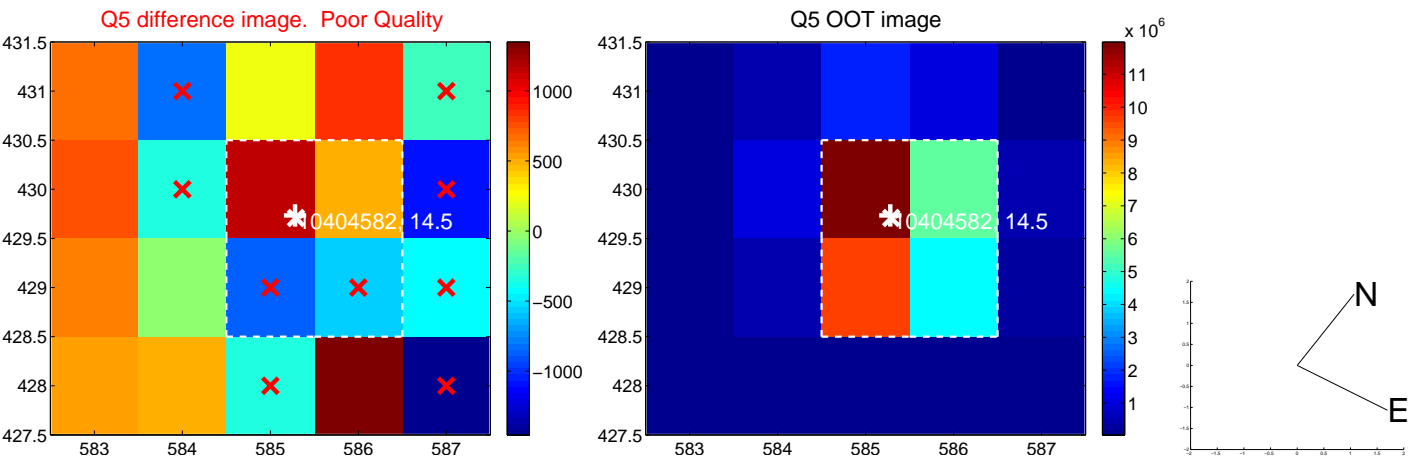


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets**; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

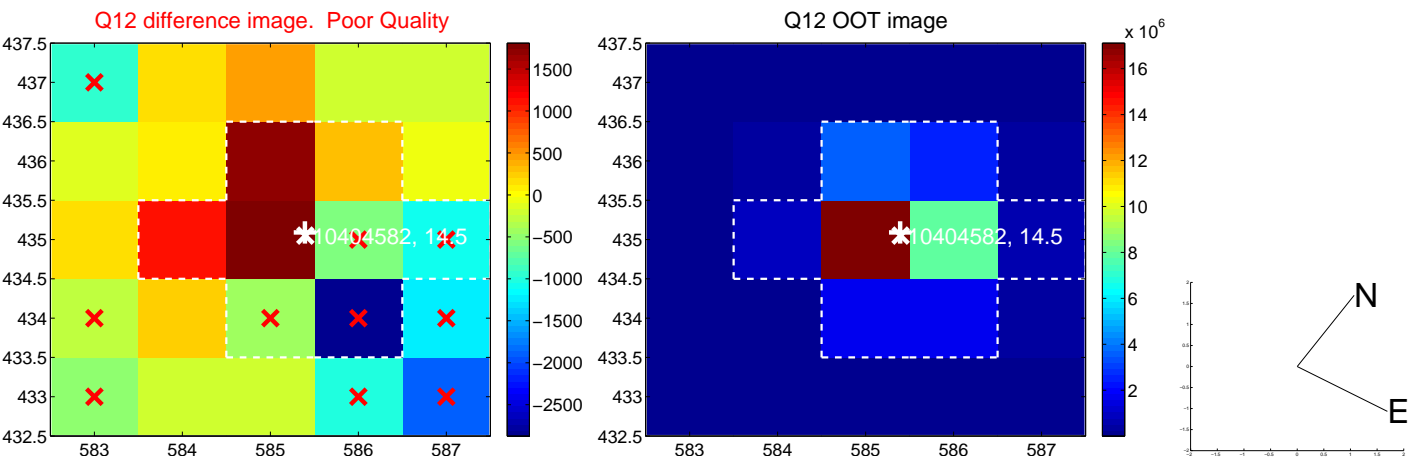
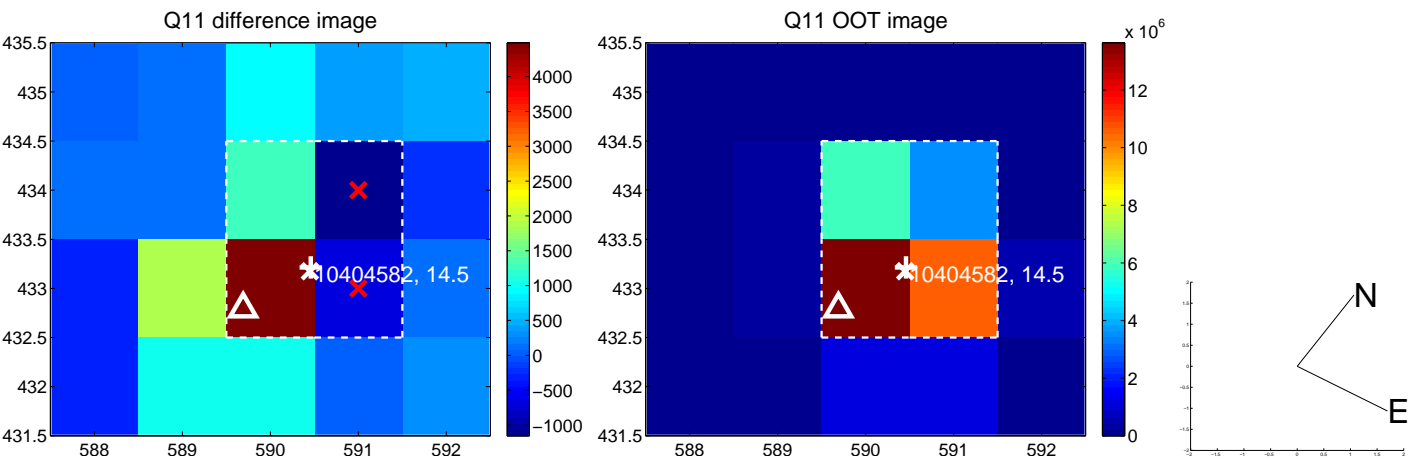
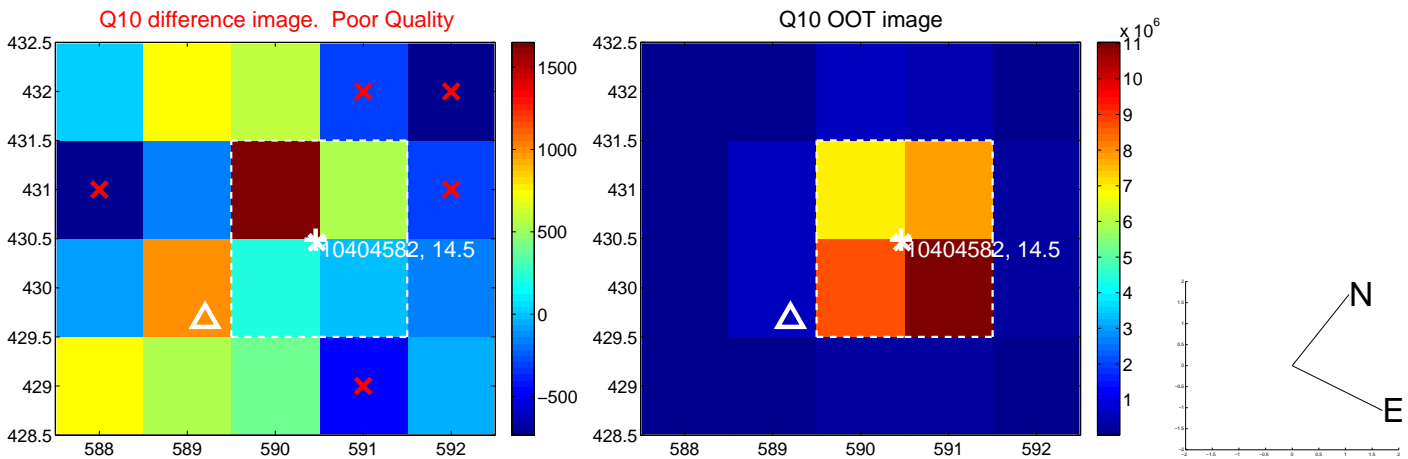
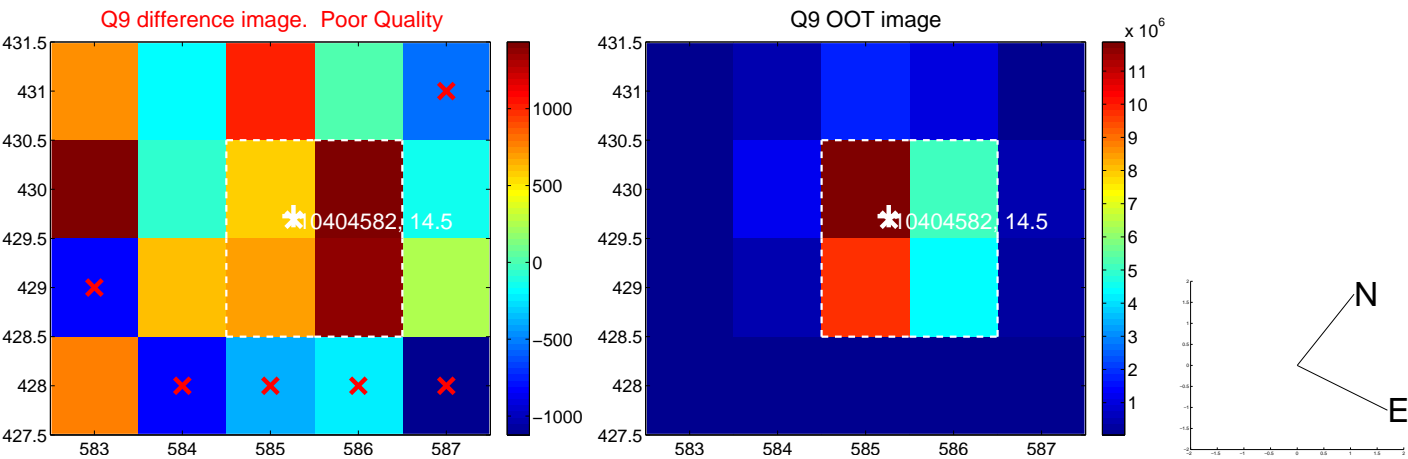
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

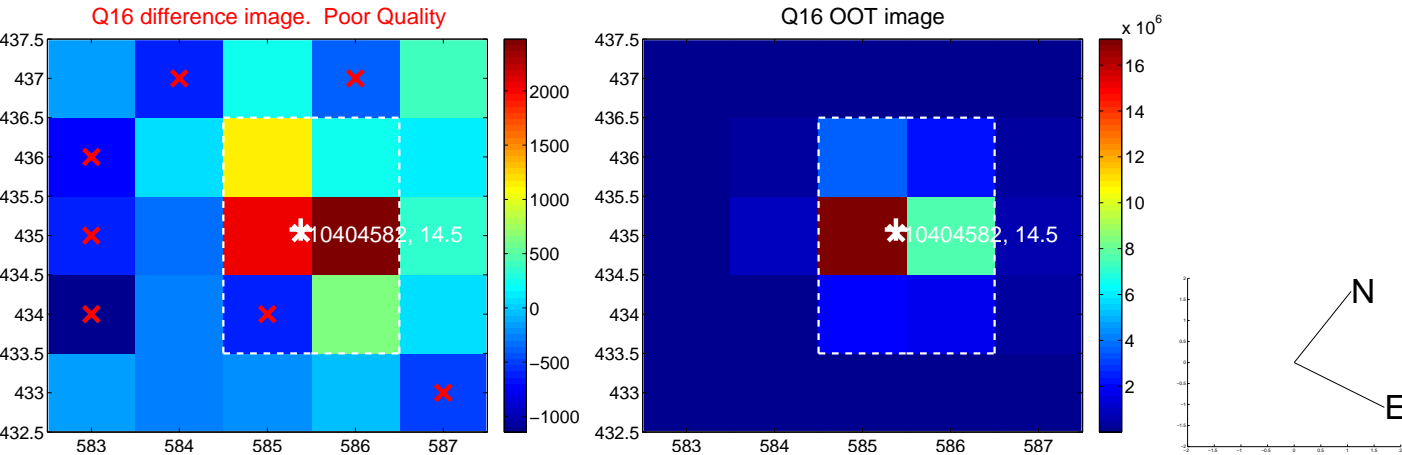
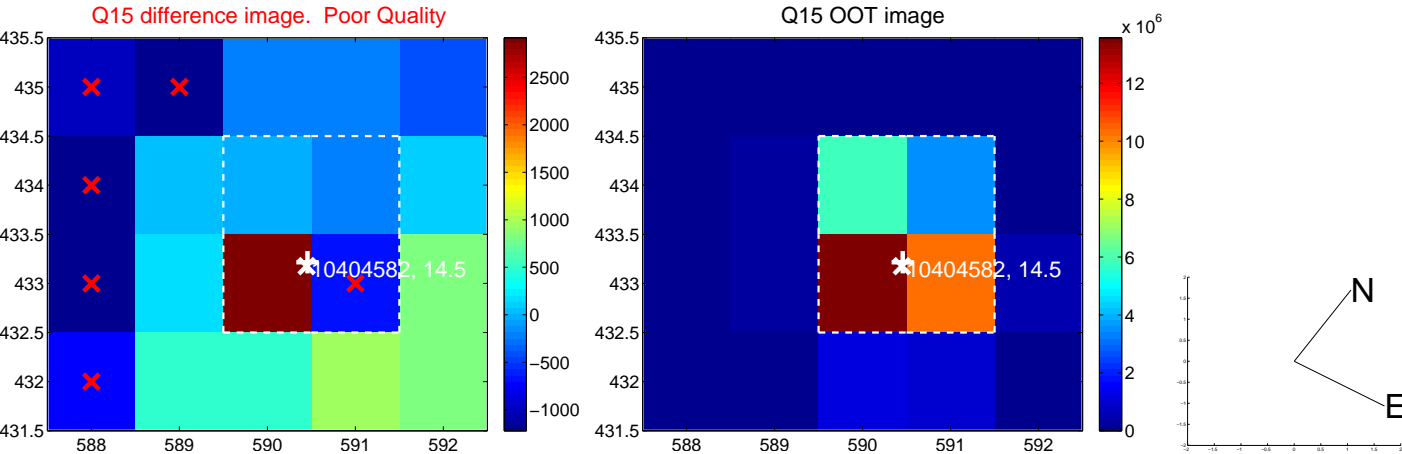
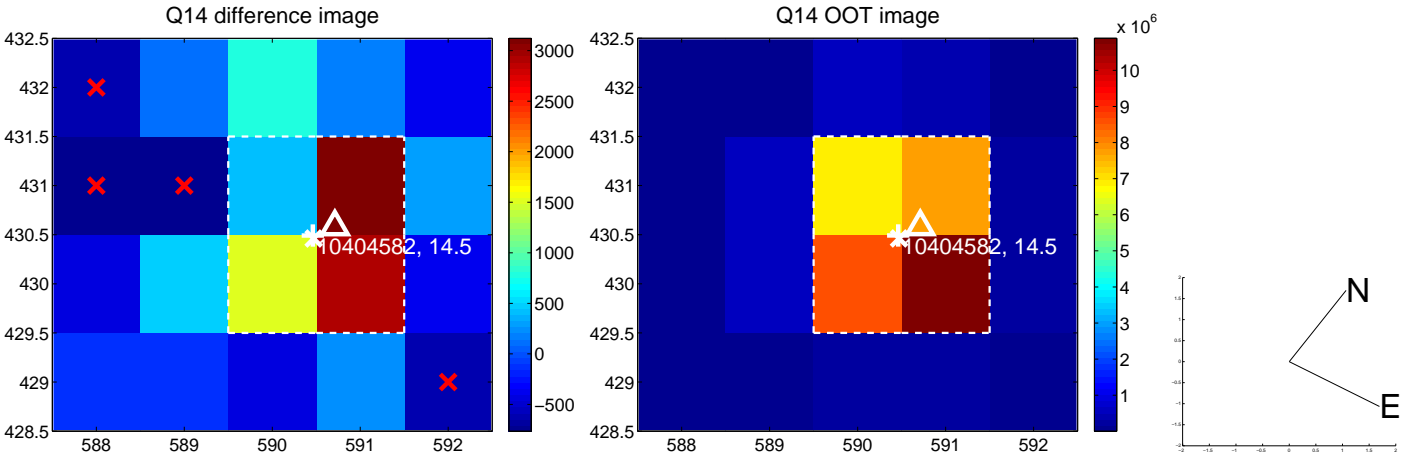
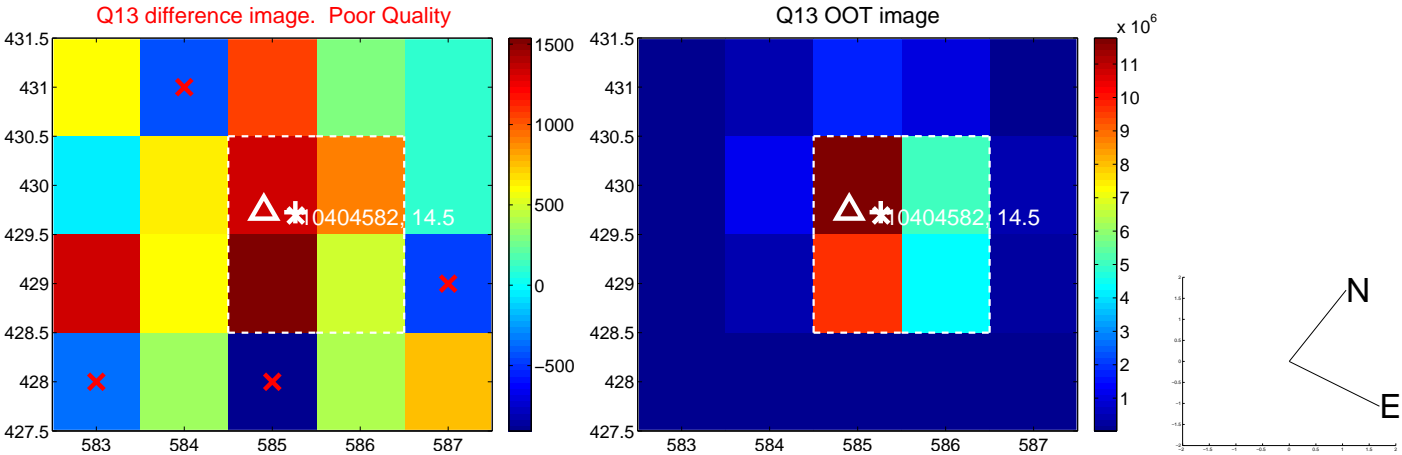


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

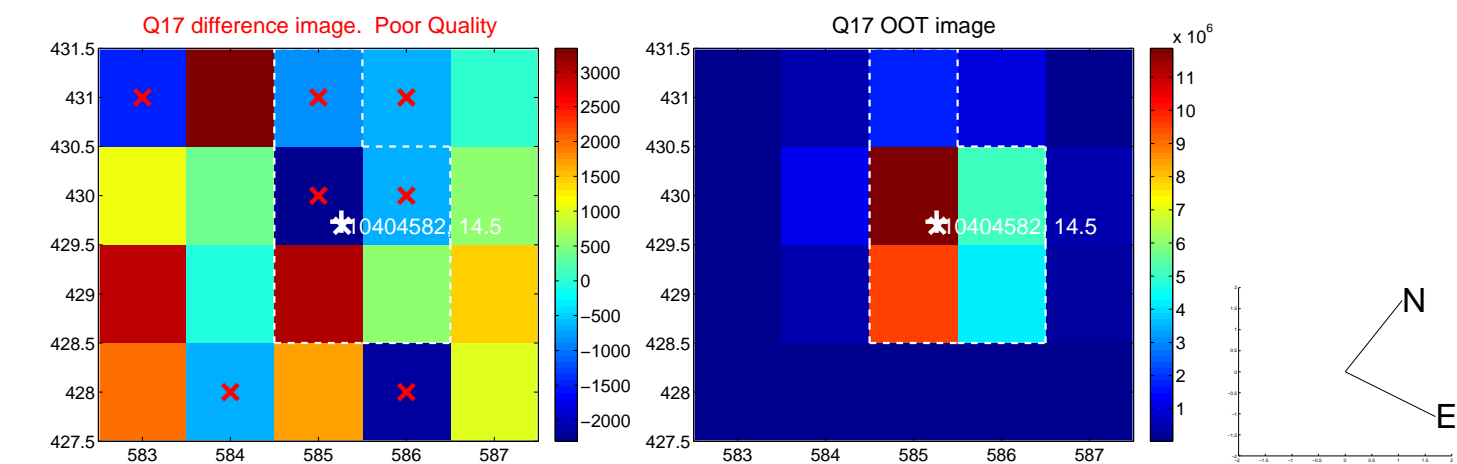




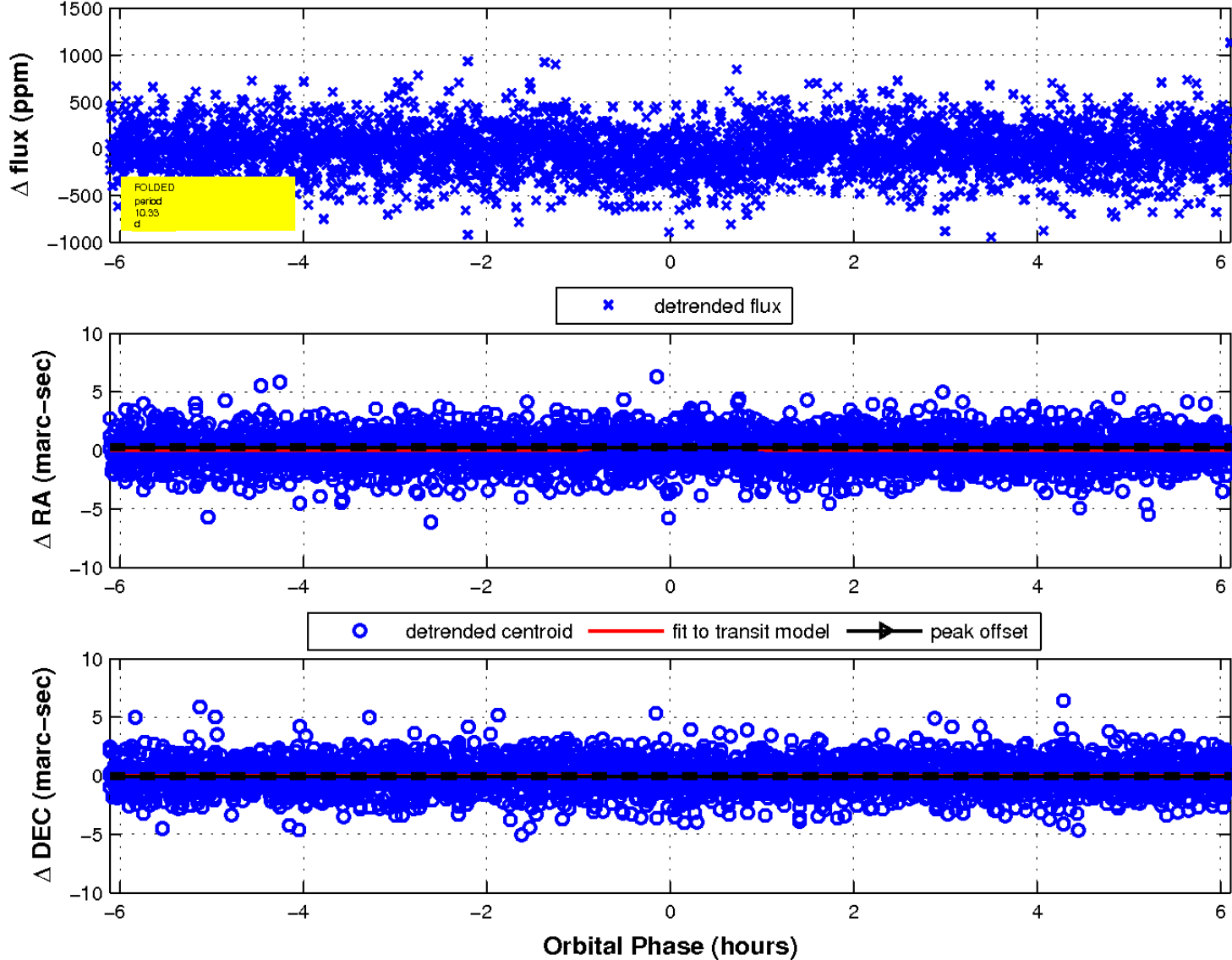
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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



fluxWeightedCentroids, Planet 2 of 2



# UKIRT Image

Declination

