

# KIC 009596187

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
009596187-01	OBS	7198.01	0.953290	131.704325	1348.1	1.361	213.0	212.6	1.02	6183	4.42	3870.72
009596187-02	OBS	No	0.953294	132.178344	167.2	0.670	11.4	21.9	1.02	6183	1.59	3870.69

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009596187-01	OBS	PC	0.67	0	1	0	0	MOD_SEC_DV—PLANET_OCCULT_DV—MOD_SEC_ALT—HAS_SEC_TCE
009596187-02	OBS	FP	0.00	1	1	0	0	IS_SEC_TCE

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

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

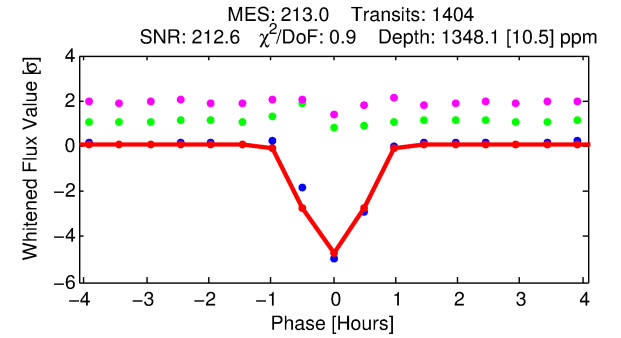
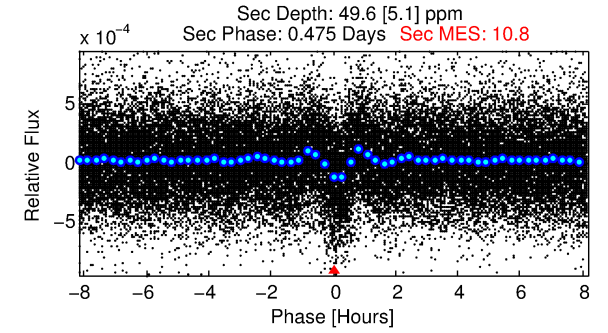
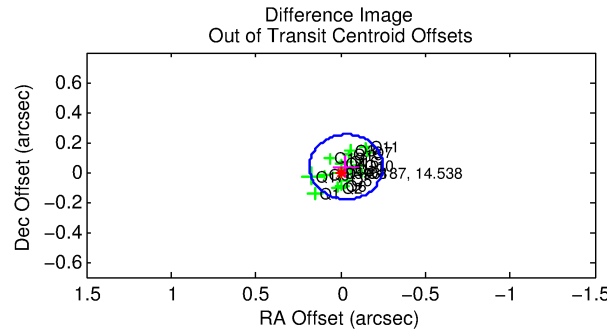
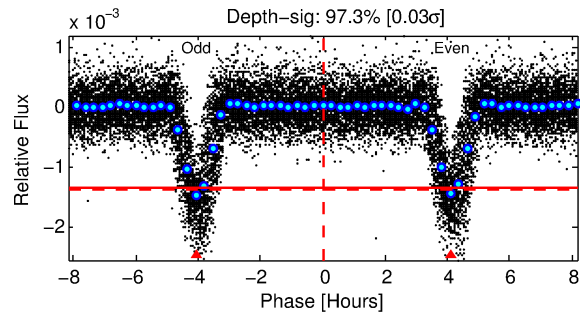
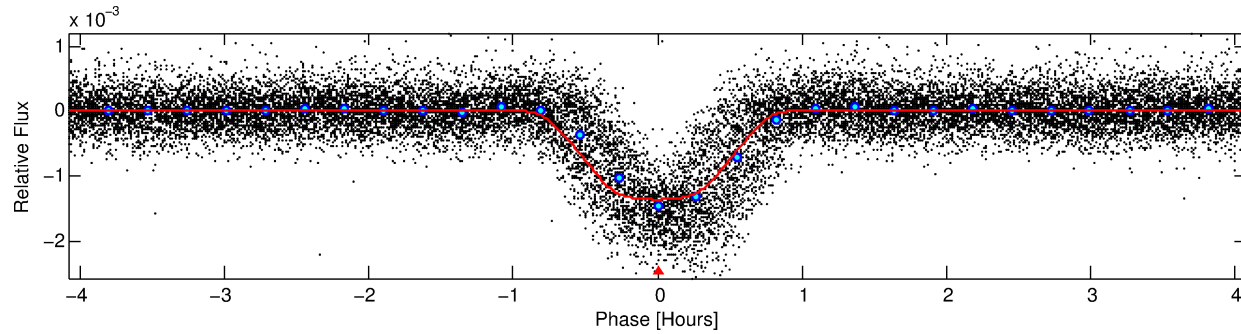
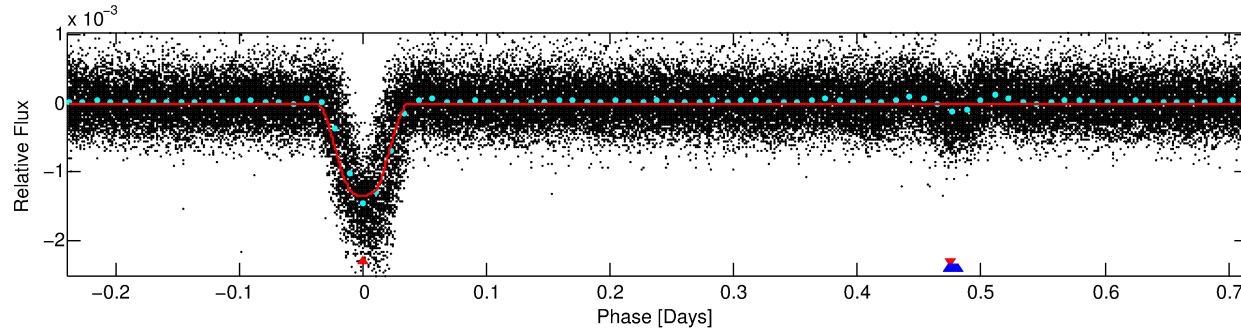
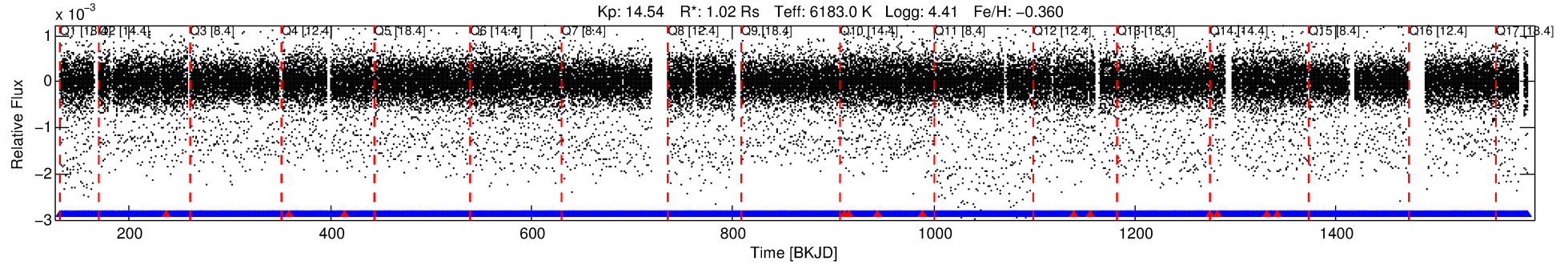
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 009596187-01

No Significant Match Found

# DV One-Page Summary

KIC: 9596187 Candidate: 1 of 2 Period: 0.953 d  
KOI: K07198.01 Corr: 0.890



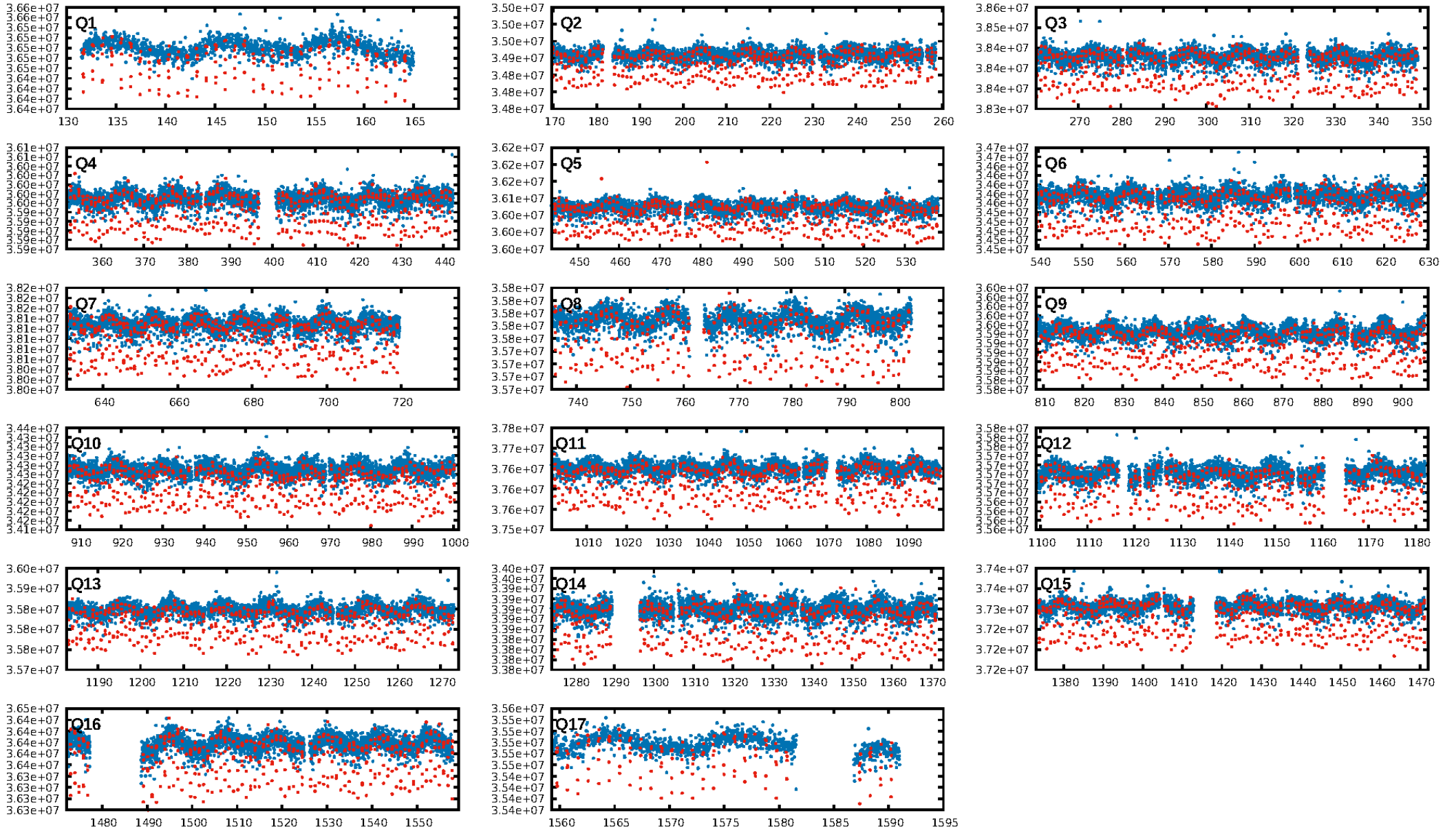
## DV Fit Results:

Period = 0.95329 [0.00000] d  
Epoch = 131.7043 [0.0001] BKJD  
Rp/R\* = 0.0397 [0.0007]  
a/R\* = 2.94 [0.20]  
b = 0.90 [0.02]  
Seff = 3870.72 [1476.74]  
Teq = 2011 [192] K  
Rp = 4.42 [1.30] Re  
a = 0.0188 [0.0046] AU  
Ag = 0.49 [0.18] [-2.77 $\sigma$ ]  
Teffp = 2603 [112] K [2.67 $\sigma$ ]

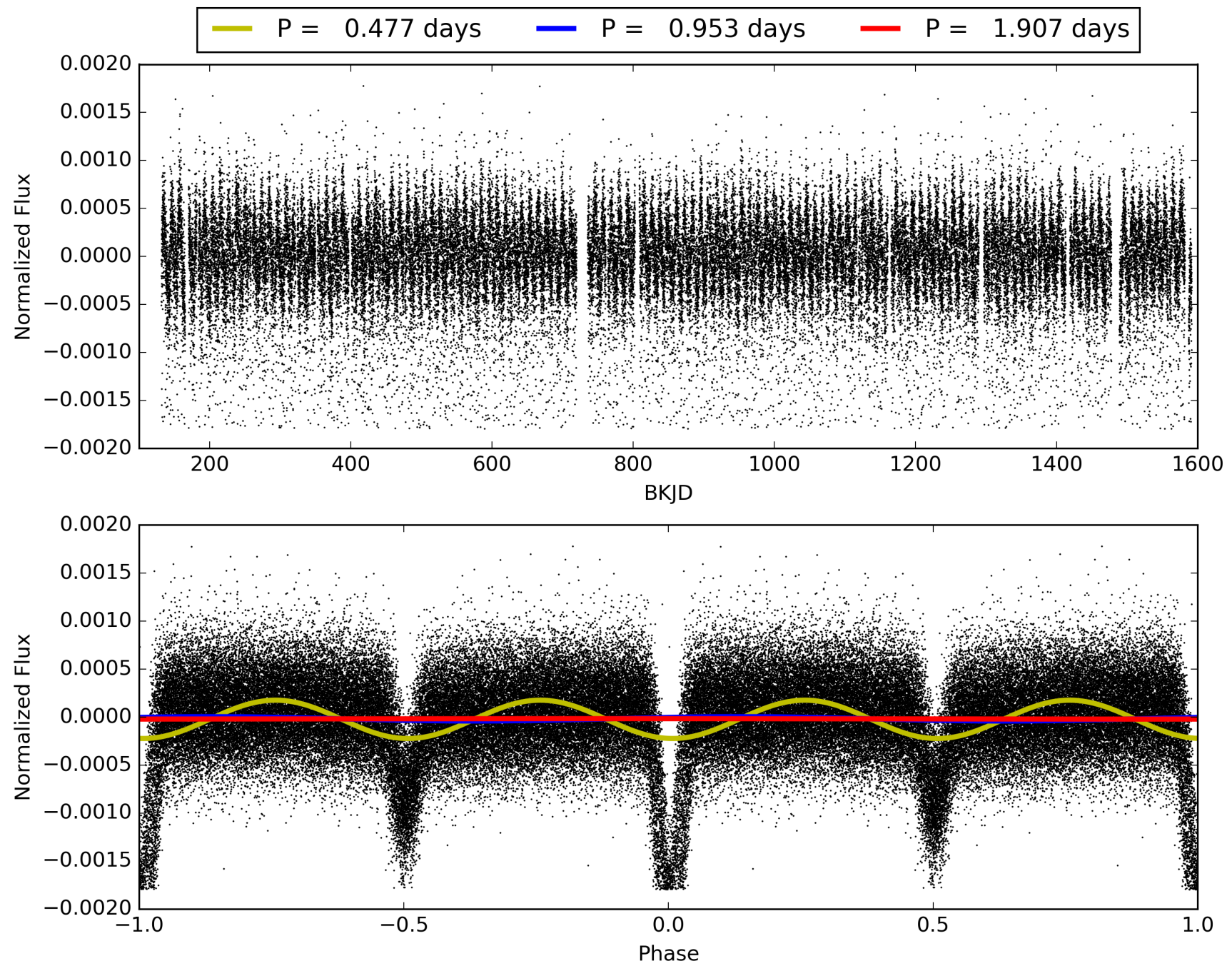
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
**LongPeriod-sig: 0.0% [0.00 $\sigma$ ]**  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: 0.00e+00  
RollingBand-fgt: 0.99 [1329/1342]  
GhostDiagnostic-chr: 5.159  
**Centroid-sig: 0.0%**  
**Centroid-so: 0.227 arcsec [3.98 $\sigma$ ]**  
OotOffset-rm: 0.048 arcsec [0.67 $\sigma$ ]  
KicOffset-rm: 0.133 arcsec [1.92 $\sigma$ ]  
OotOffset-st: 4/4/4/5 [17]  
KicOffset-st: 4/4/4/5 [17]  
DiffImageQuality-fgm: 1.00 [17/17]  
DiffImageOverlap-fno: 1.00 [17/17]

# TCE 009596187-01, PDC Light Curves

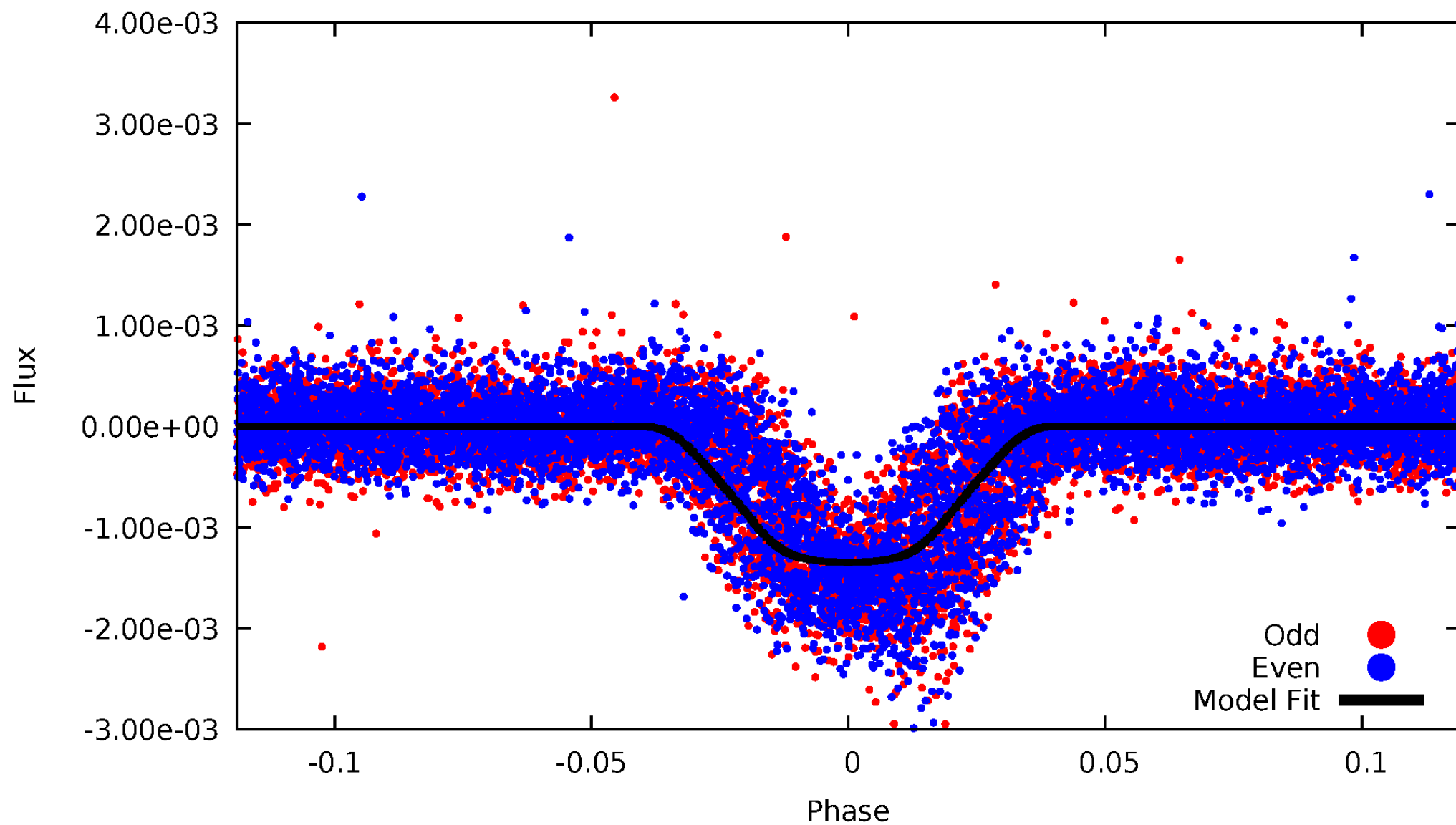


TCE 009596187-01



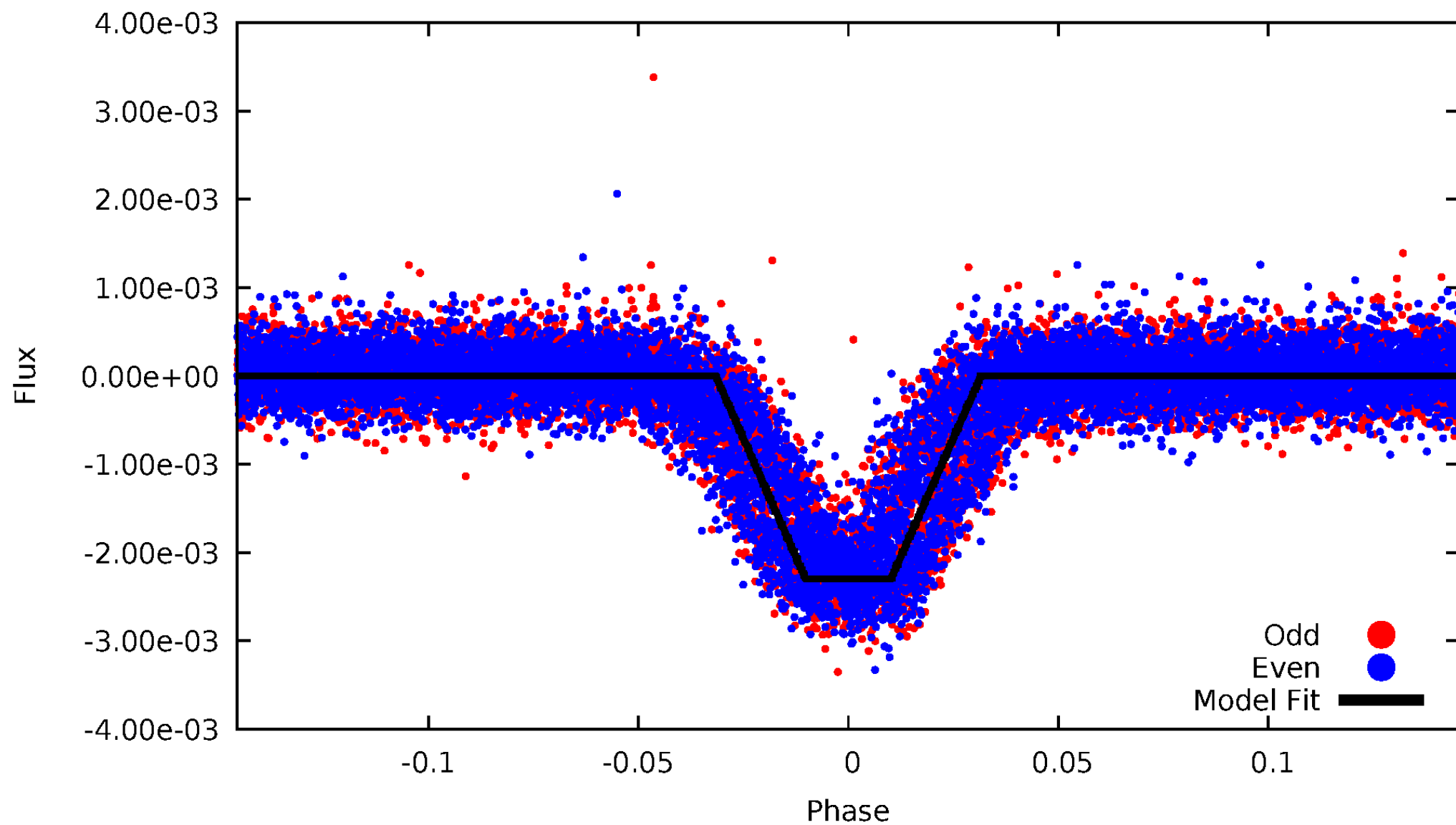
# DV Odd/Even

TCE 009596187-01



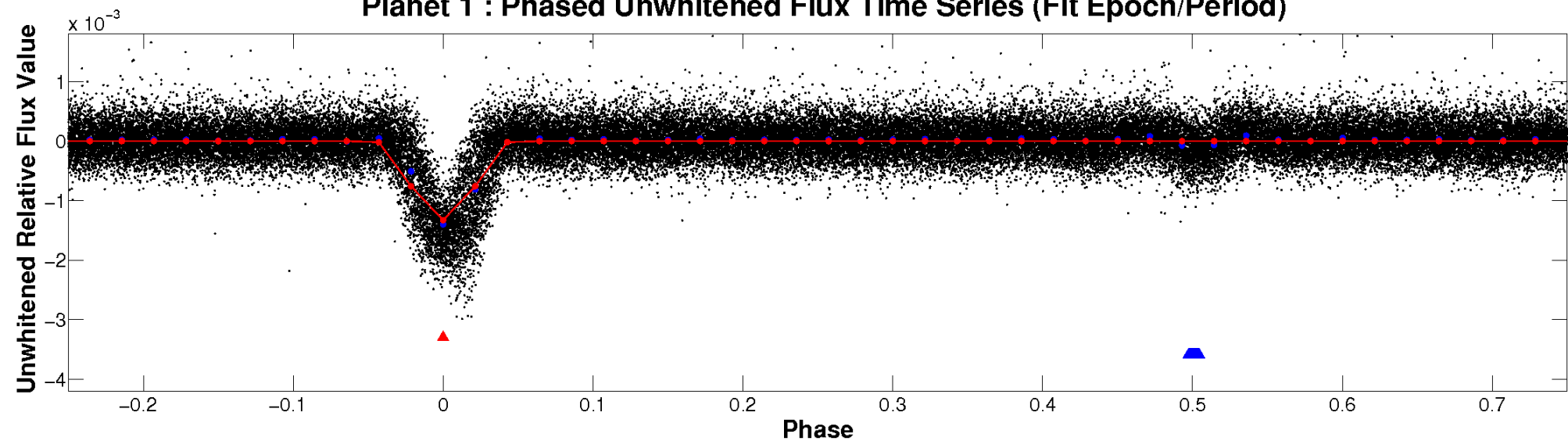
# ALT Odd/Even

TCE 009596187-01

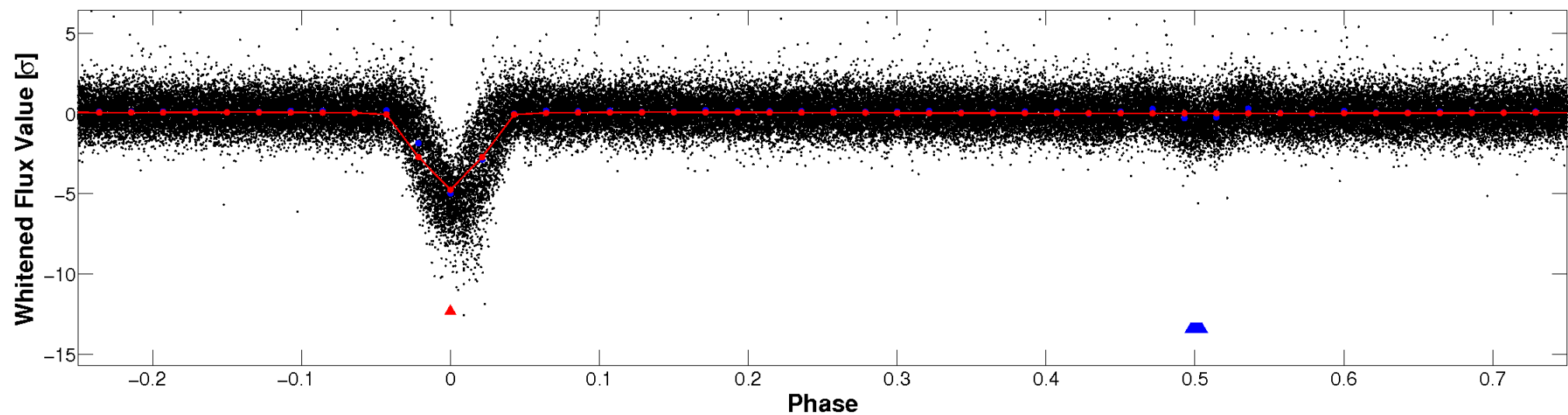


# Non-Whitened Vs. Whitened Light Curve

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

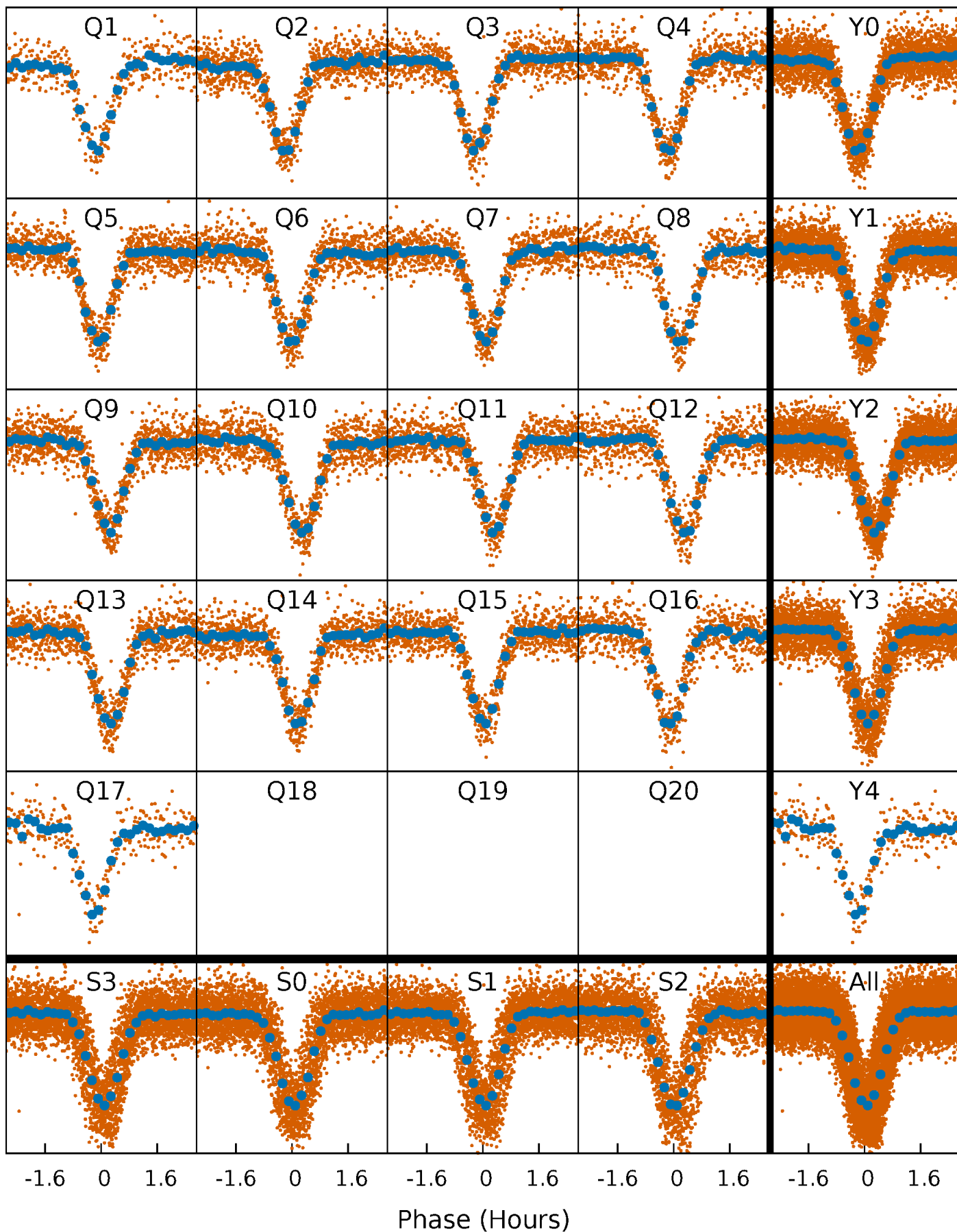


**Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)**



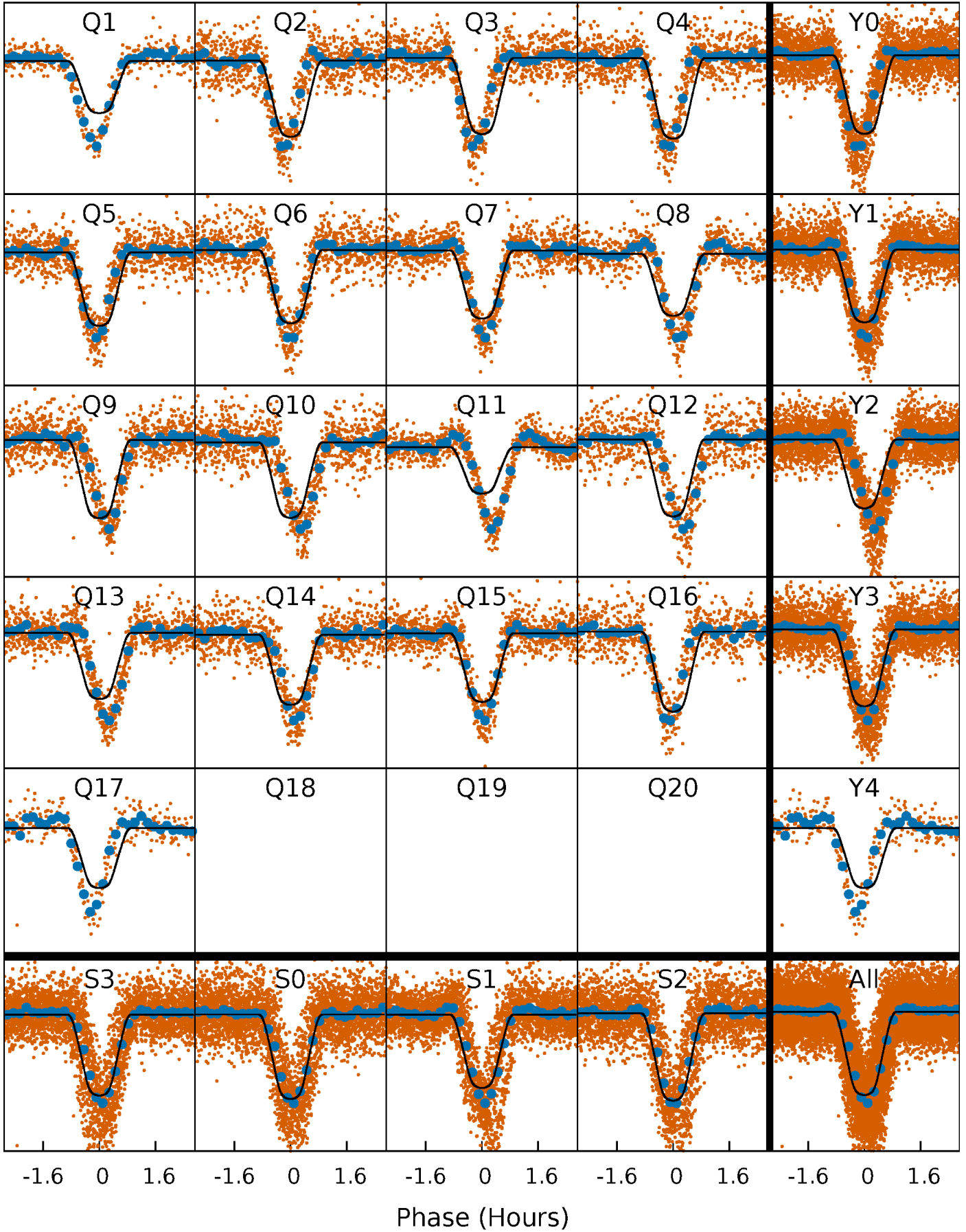
# PDC Quarter-Phased Transit Curves

TCE 009596187-01   P= 0.953290 Days    $T_0=131.704325$  (BKJD)



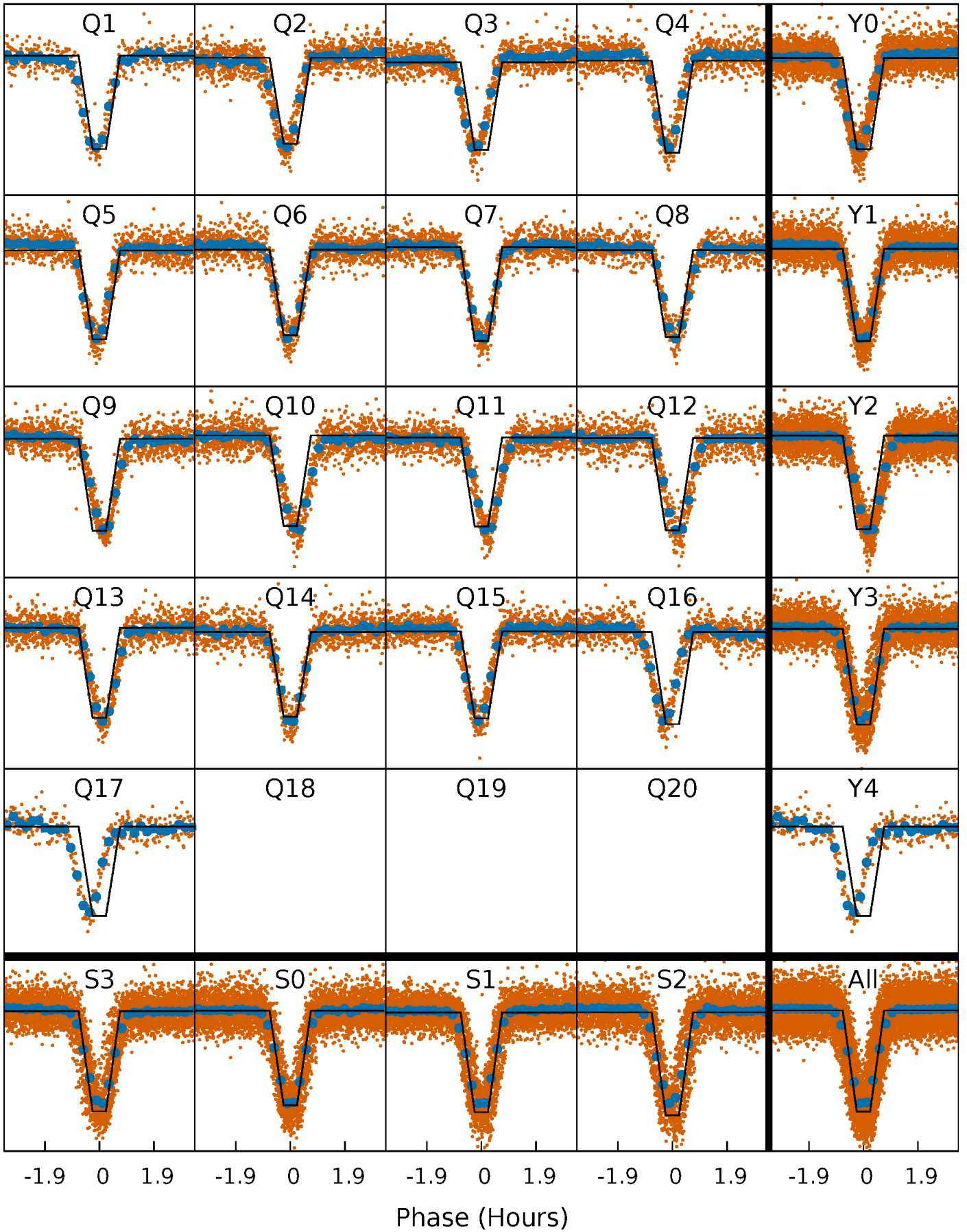
# DV Quarter-Phased Transit Curves

TCE 009596187-01   P= 0.953290 Days    $T_0=131.704325$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

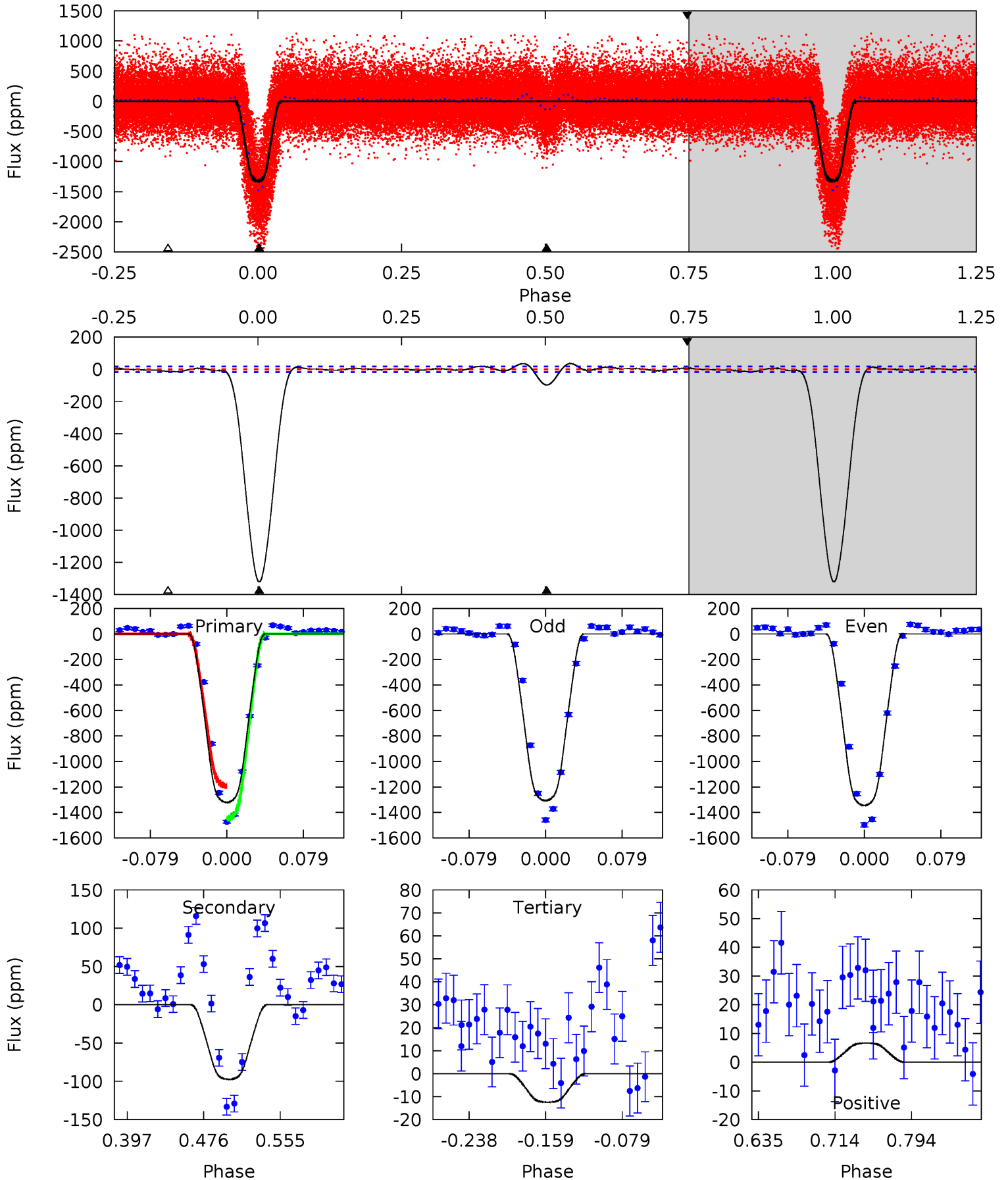
TCE 009596187-01     $P = 0.953295$  Days     $T_0 = 131.703139$  (BKJD)



# DV Model-Shift Uniqueness Test

009596187-01, P = 0.953290 Days, E = 130.751035 Days

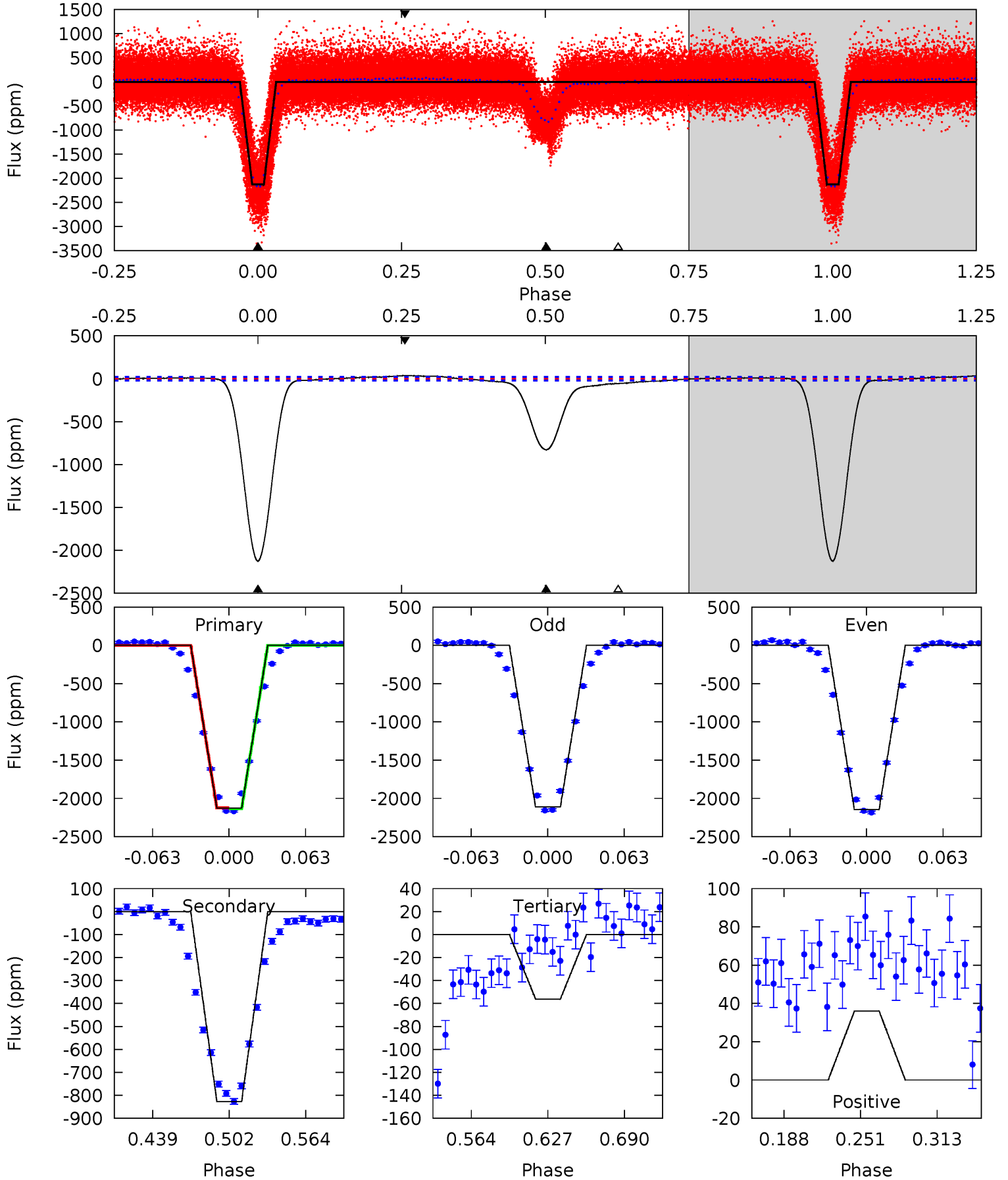
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
353.7	26.1	3.32	1.78	4.61	1.75	1.71	350.4	351.9	22.8	24.3	5.06	1.00	0.03	34.1



# Alt Model-Shift Uniqueness Test

009596187-01, P = 0.953295 Days, E = 130.749844 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
485.4	189.0	12.8	8.22	4.66	1.86	6.72	472.5	477.2	176.1	180.8	3.75	1.00	0.02	1.55



### Stellar Parameters For KIC 009596187

	$T_{\text{eff}} (K)$	$\log(g)$	$[\text{Fe}/\text{H}]$	$R (R_{\odot})$	$M (M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$6183^{+169}_{-206}$	$4.407^{+0.090}_{-0.195}$	$-0.360^{+0.300}_{-0.300}$	$1.020^{+0.299}_{-0.149}$	$0.969^{+0.136}_{-0.111}$	$1.286^{+0.598}_{-0.656}$
	+3%/-3%	+2%/-4%	+83%/-83%	+29%/-15%	+14%/-11%	+46%/-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 009596187-01 / KOI 7198.01

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$-97 \pm 4$	$4.52^{+0.70}_{-0.43}$	$2834^{+217}_{-152}$	$3319^{+85}_{-99}$	$0.920^{+0.181}_{-0.220}$
Alt.	$-827 \pm 4$	$5.43^{+0.92}_{-0.49}$	$2843^{+205}_{-147}$	$4840^{+121}_{-133}$	$5.426^{+0.997}_{-1.357}$

$T_{\text{max}}$  = 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

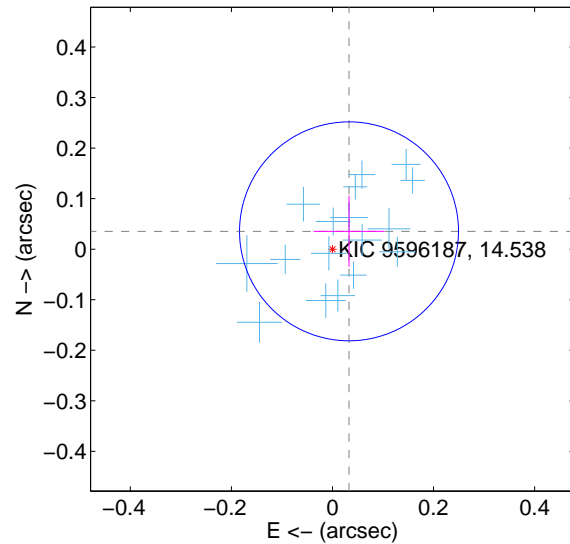
Supplemental centroid analysis for 009596187-01. Kepler magnitude: 14.54. Transit SNR 212.57

There are 17 quarters with good PRF difference image offsets

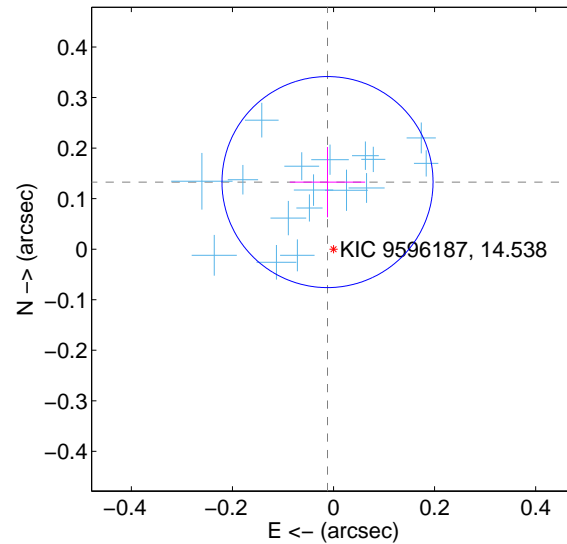
The direct PRF centroid is offset from the target star catalog position by about 0.19 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.048 \pm 0.072$	0.67	$-0.033 \pm 0.070$	$0.035 \pm 0.070$
PRF-fit source offset from KIC position	$0.133 \pm 0.070$	1.92	$0.012 \pm 0.074$	$0.133 \pm 0.070$
photometric centroid source offset	$0.23 \pm 0.06$	3.98	$-0.16 \pm 0.05$	$0.16 \pm 0.06$

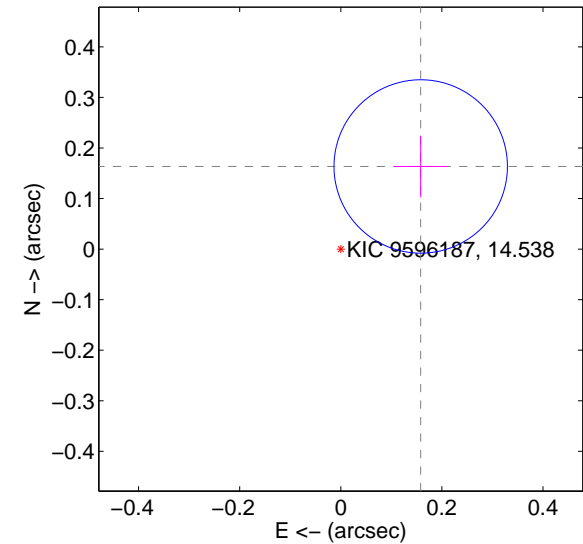
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position

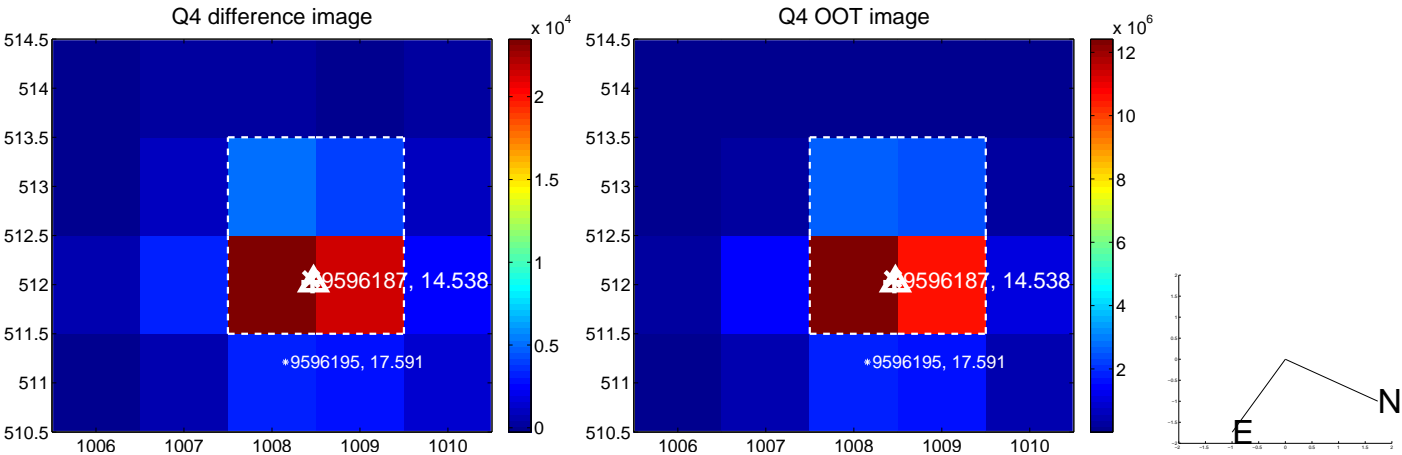
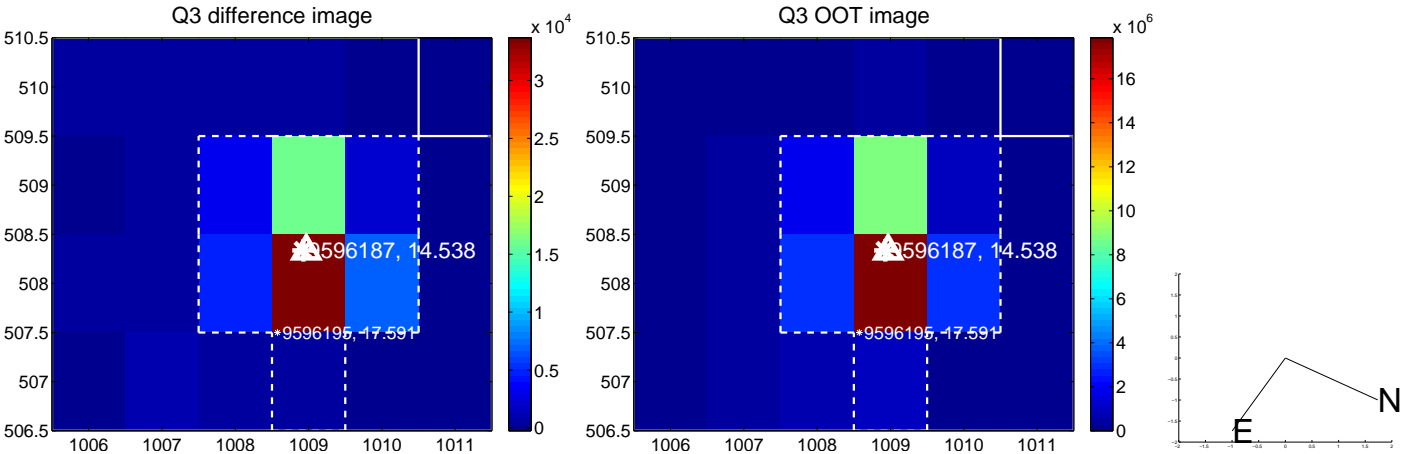
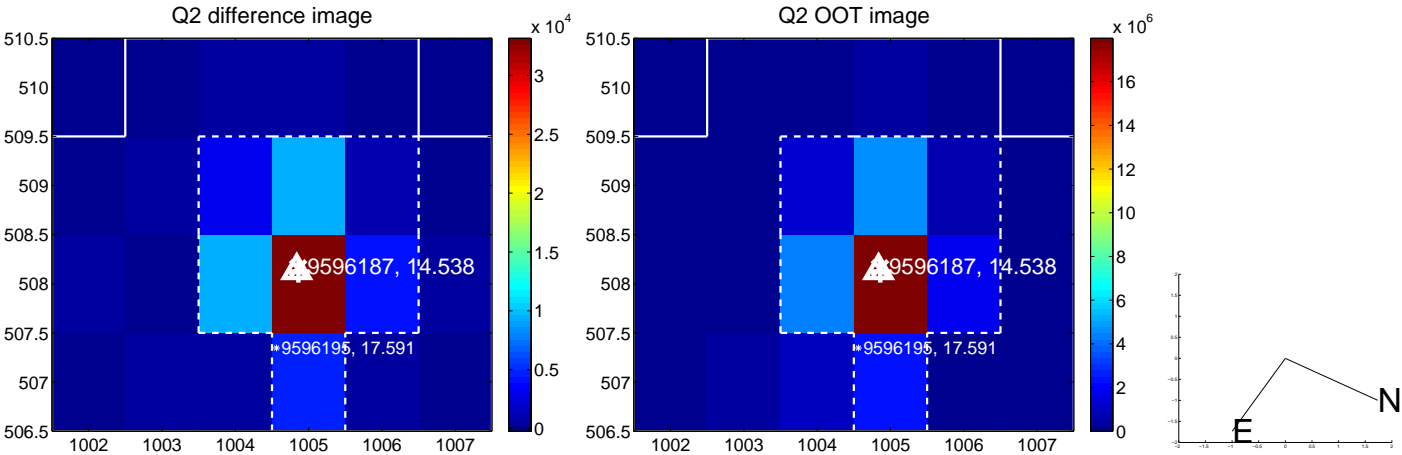
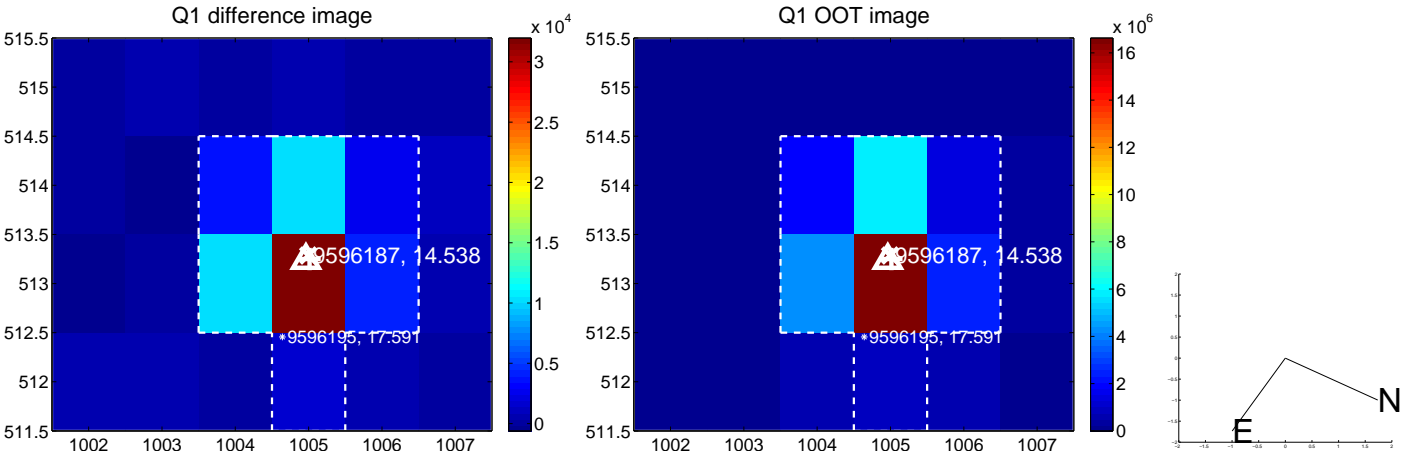


offset from photometric centroids

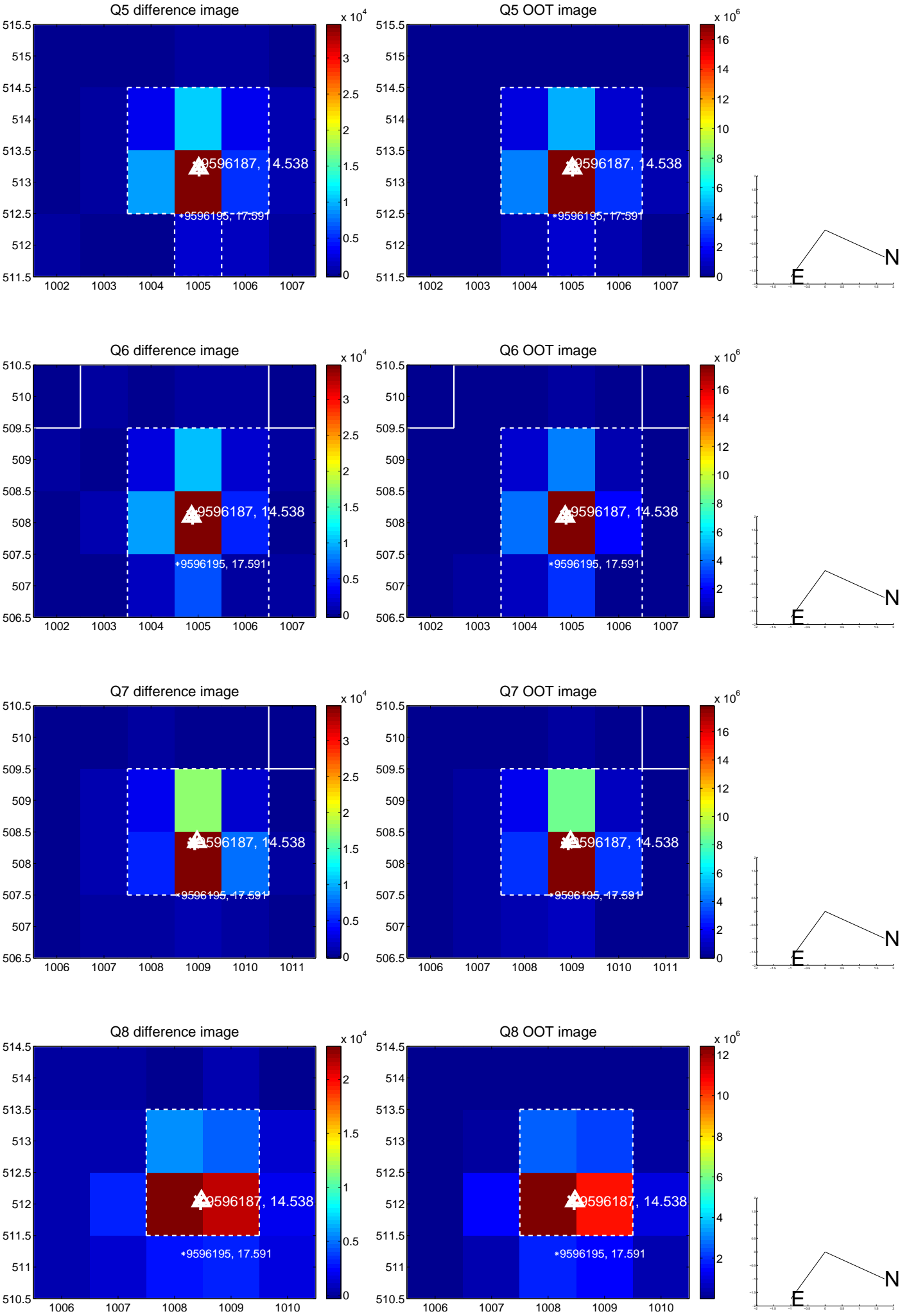


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses:** good quarterly centroid offsets; **Vermillion crosses:** bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

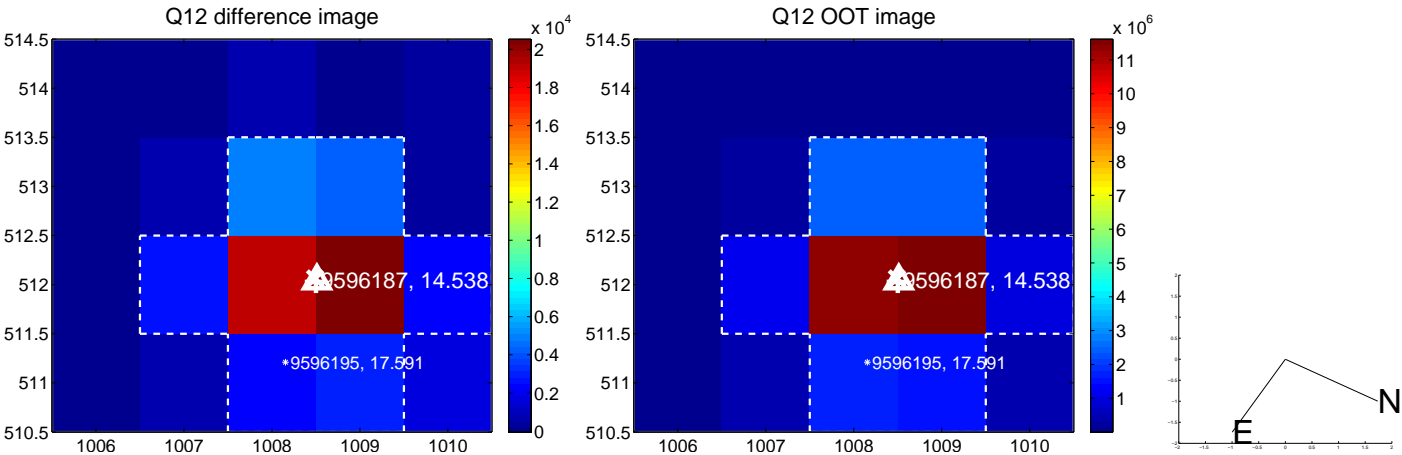
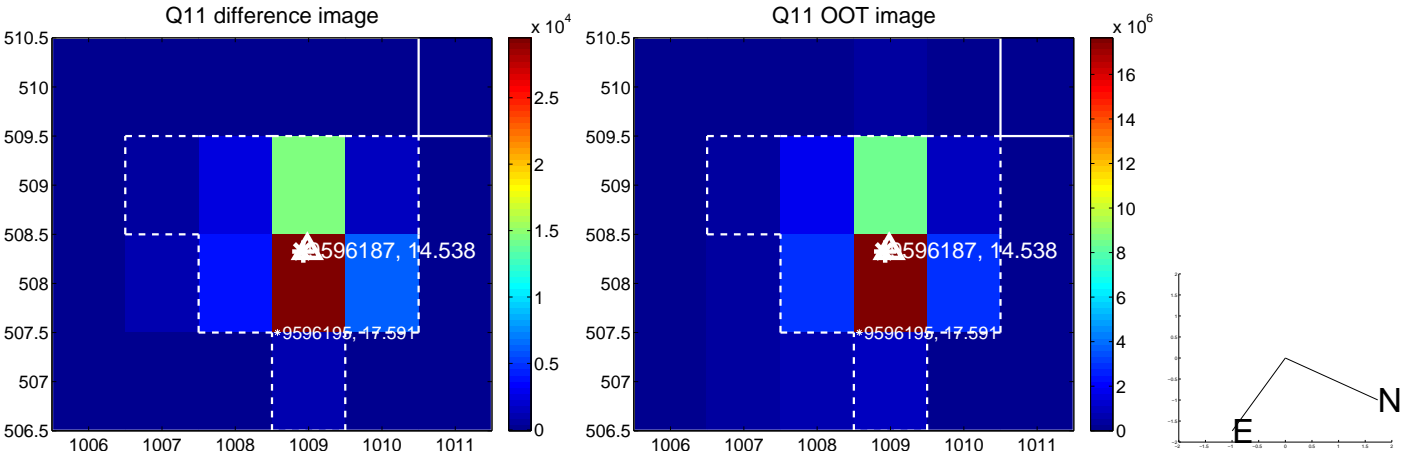
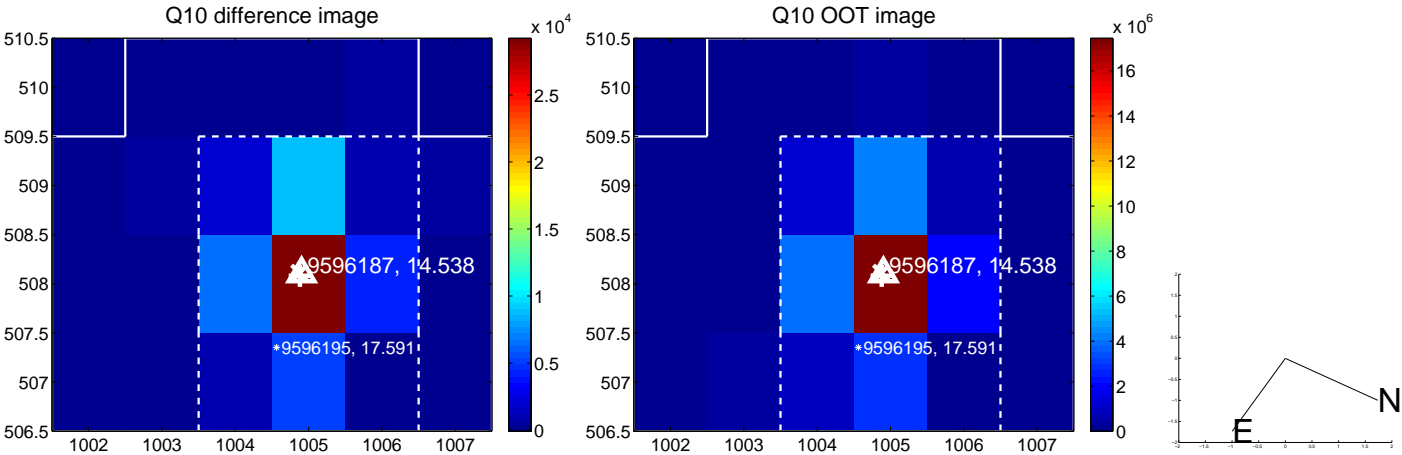
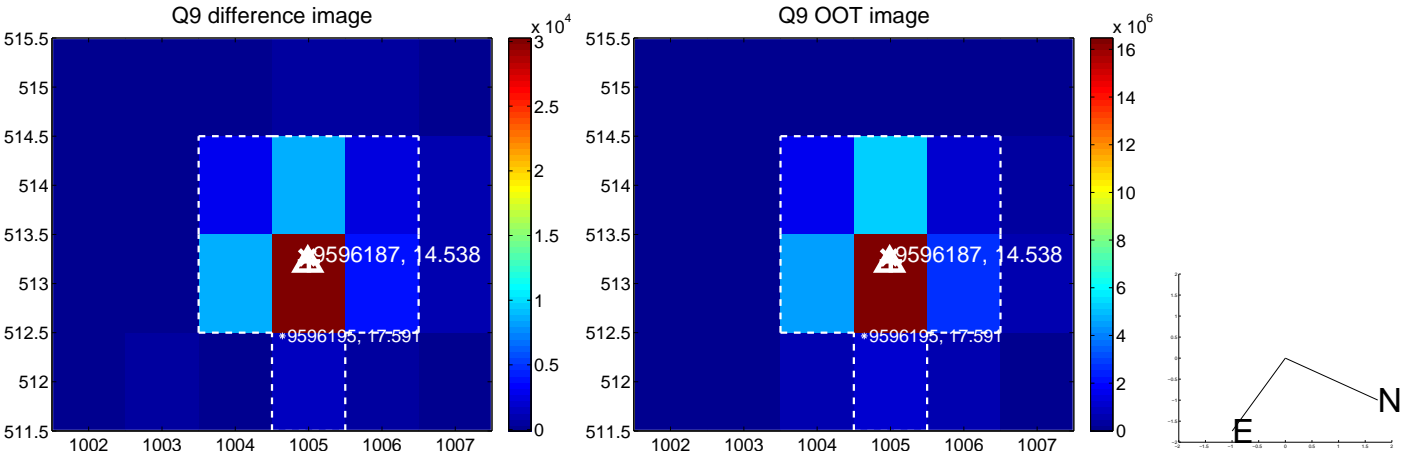
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



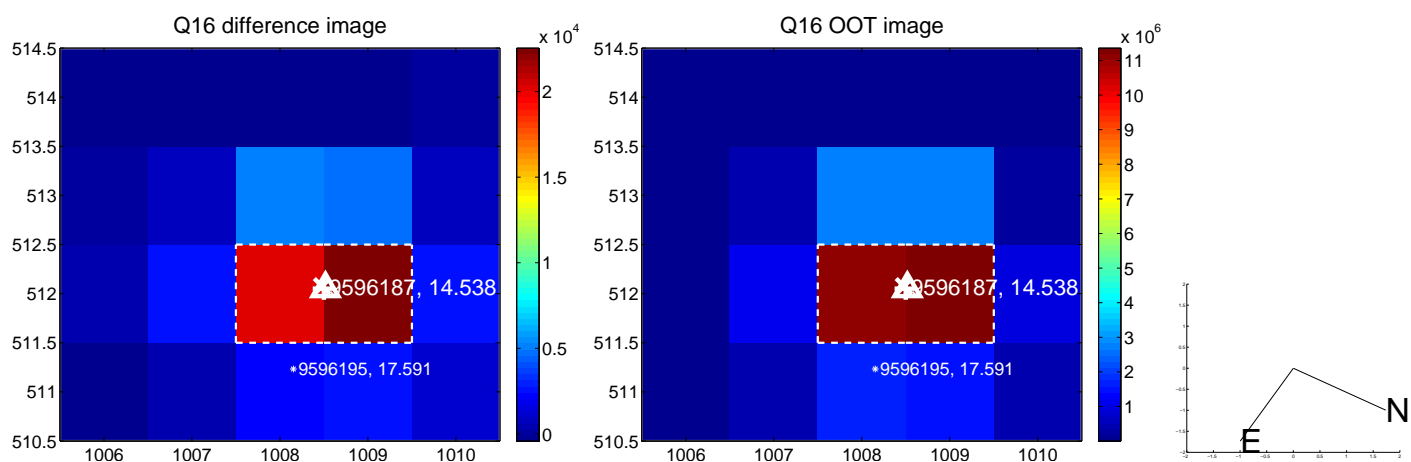
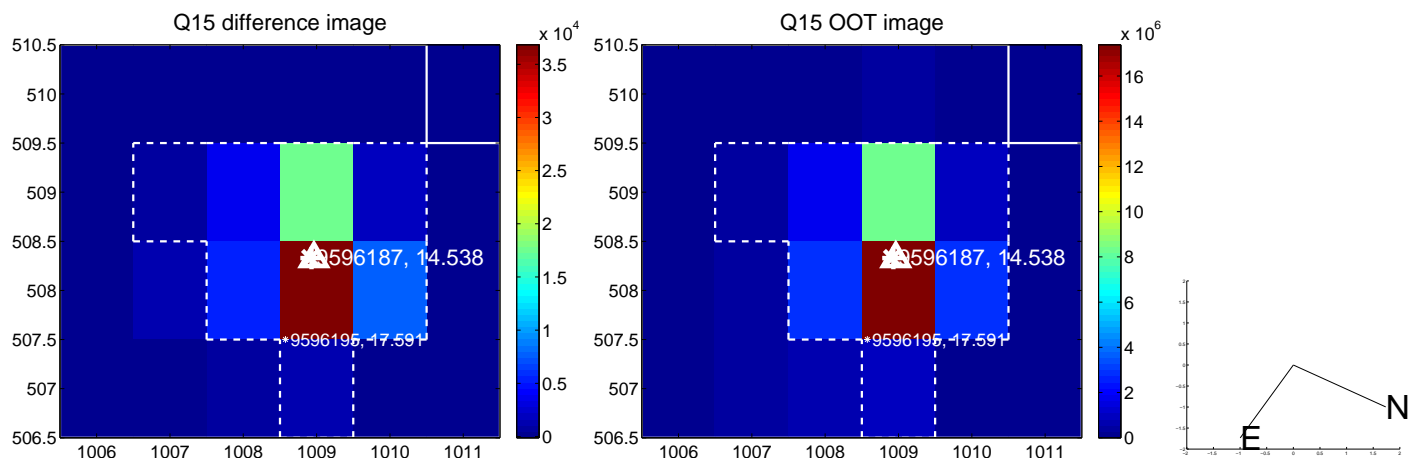
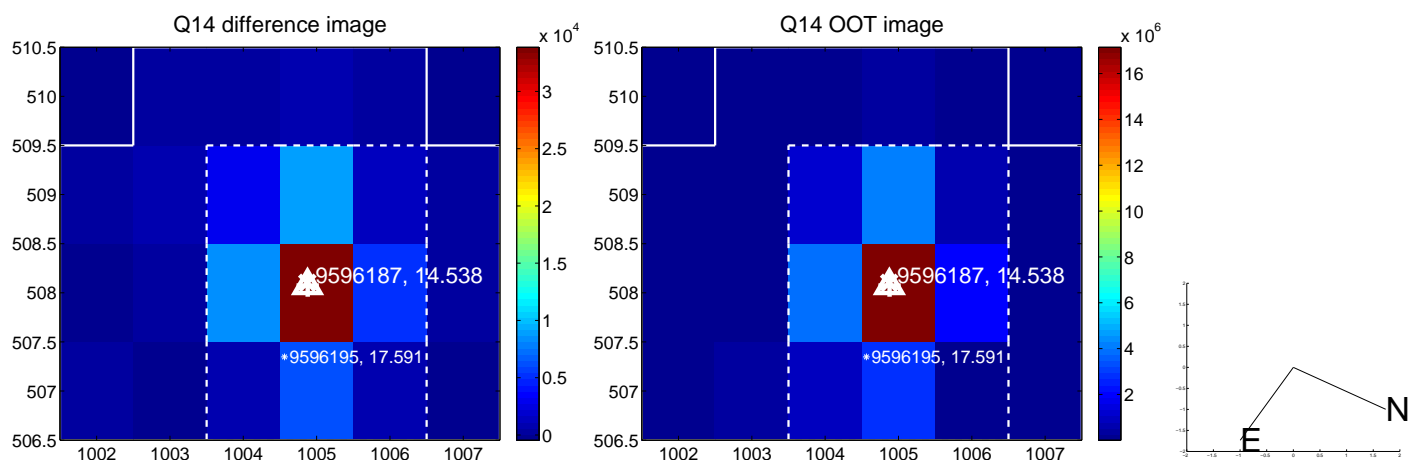
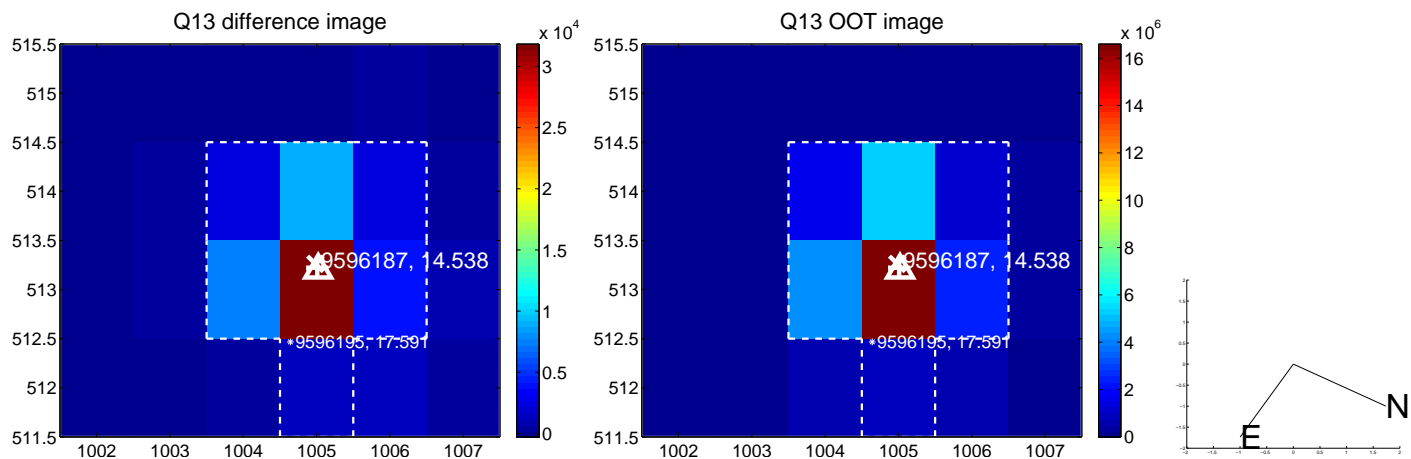
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



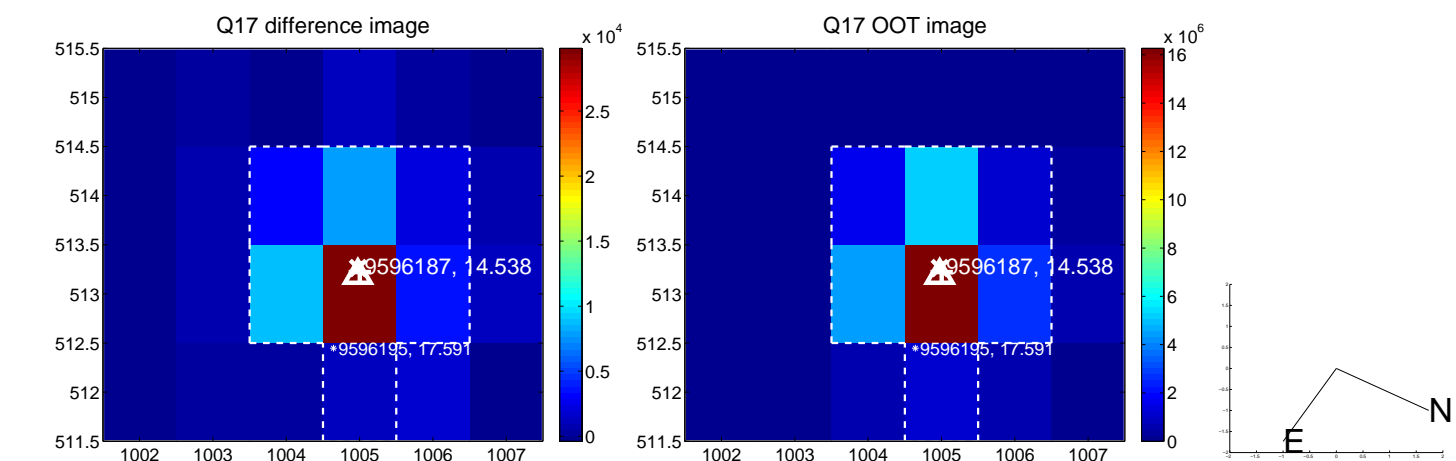
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



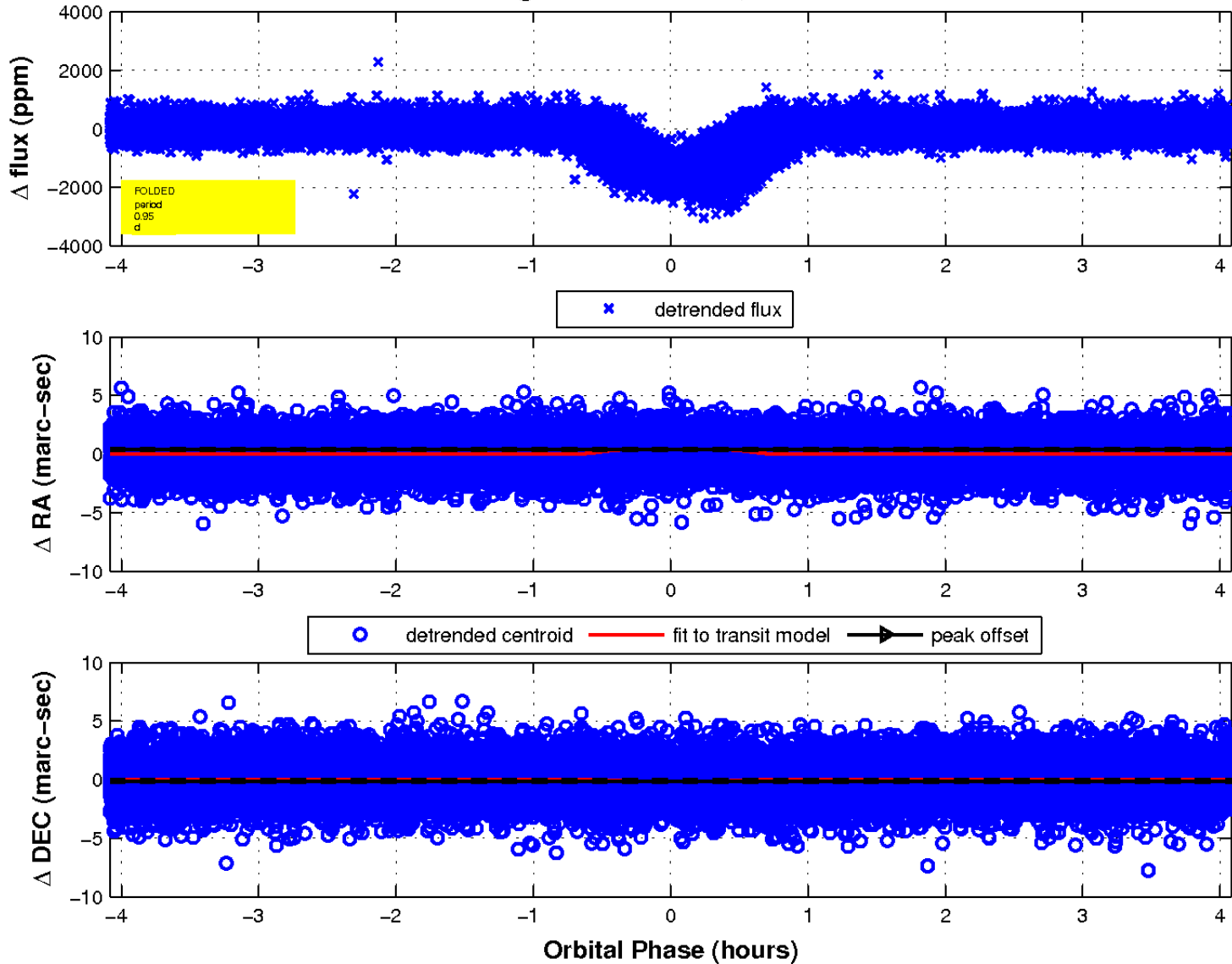
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

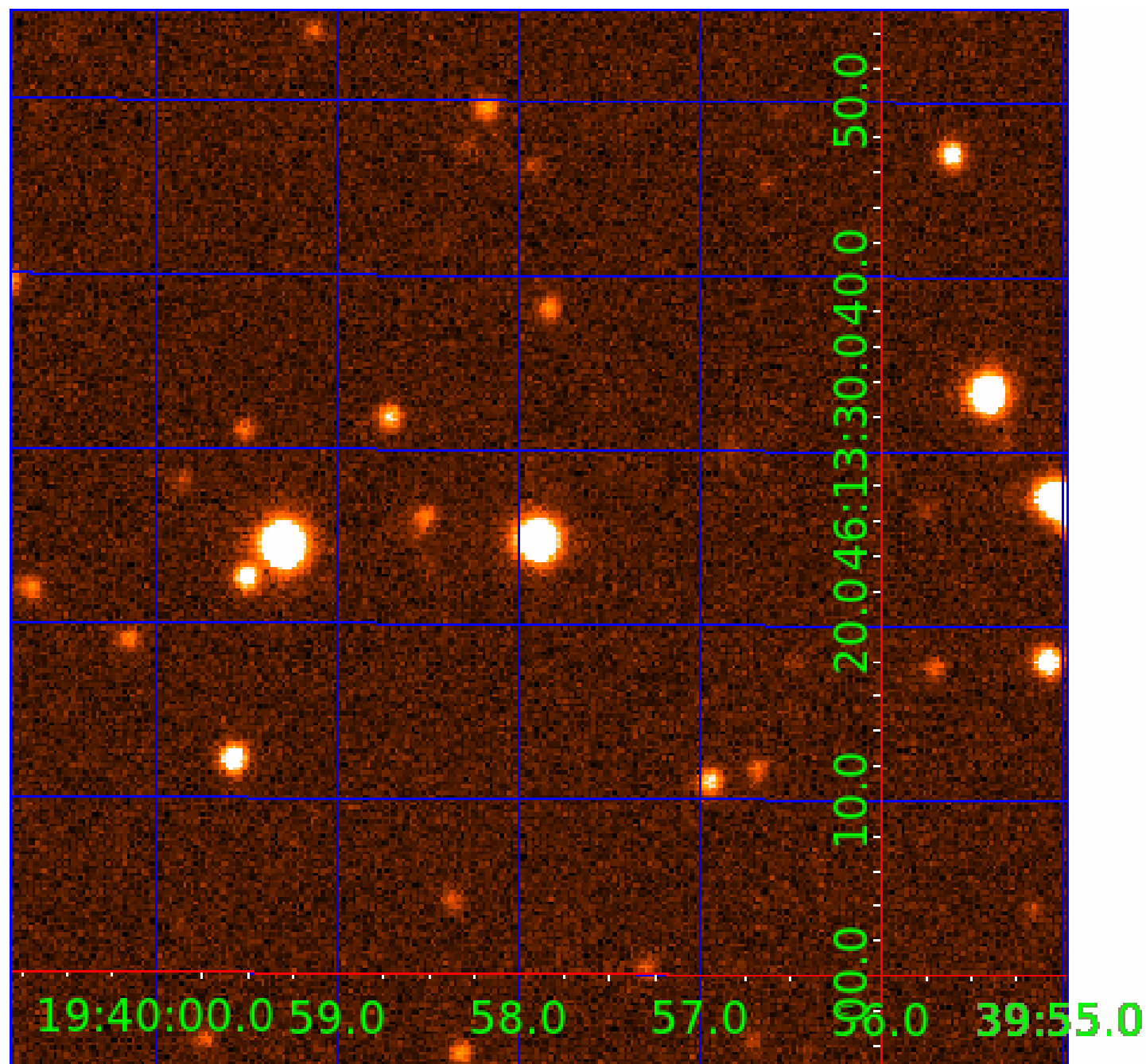


fluxWeightedCentroids, Planet 1 of 2



UKIRT Image

Declination



# KIC 009596187

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
009596187-01	OBS	7198.01	0.953290	131.704325	1348.1	1.361	213.0	212.6	1.02	6183	4.42	3870.72
009596187-02	OBS	No	0.953294	132.178344	167.2	0.670	11.4	21.9	1.02	6183	1.59	3870.69

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009596187-01	OBS	PC	0.67	0	1	0	0	MOD_SEC_DV—PLANET_OCCULT_DV—MOD_SEC_ALT—HAS_SEC_TCE
009596187-02	OBS	FP	0.00	1	1	0	0	IS_SEC_TCE

**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 009596187-02

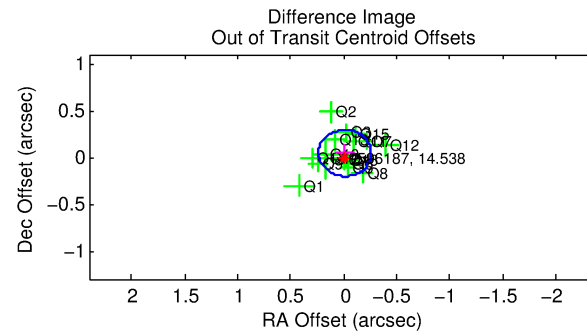
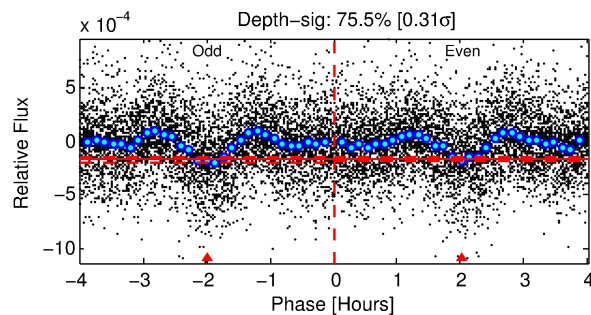
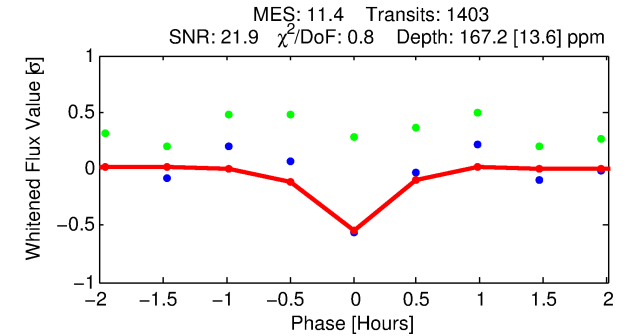
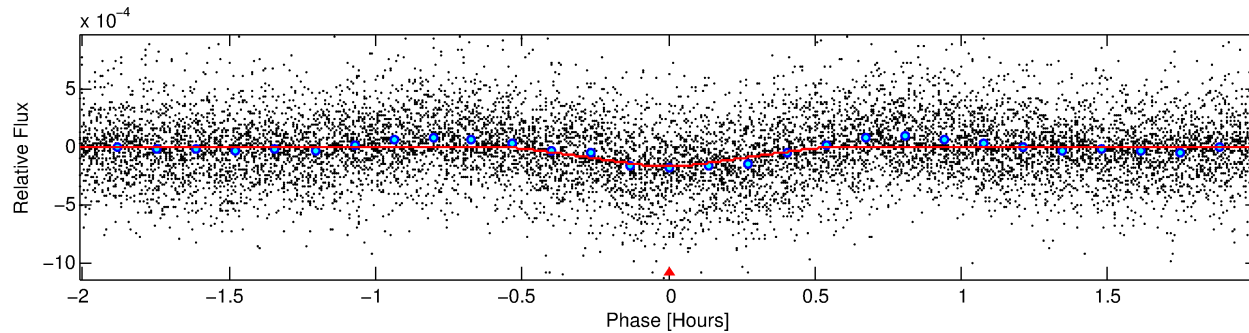
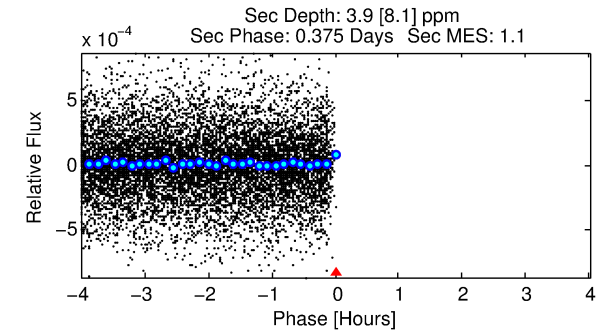
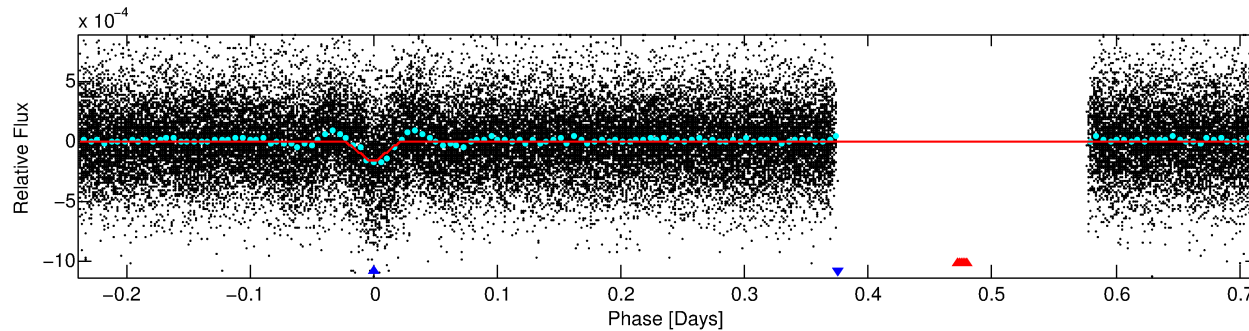
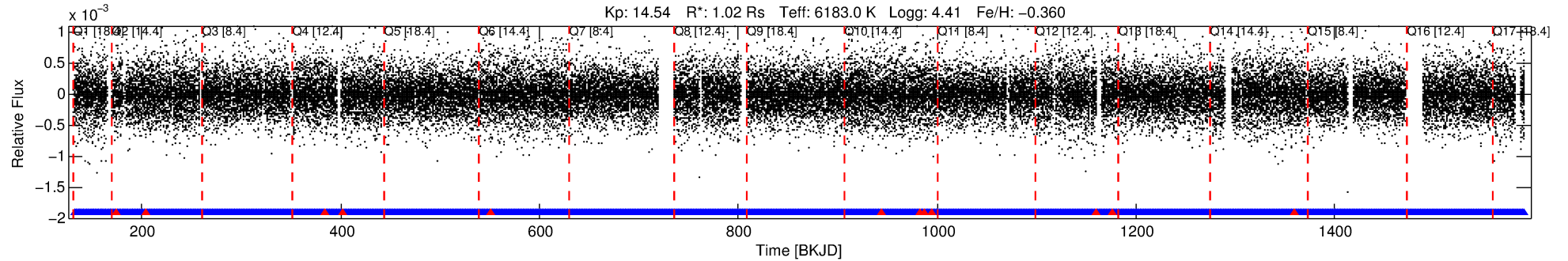
No Significant Match Found

# DV One-Page Summary

KIC: 9596187 Candidate: 2 of 2 Period: 0.953 d

KOI: K07198 Corr: No Ephemeris Match

Kp: 14.54 R\*: 1.02 Rs Teff: 6183.0 K Logg: 4.41 Fe/H: -0.360



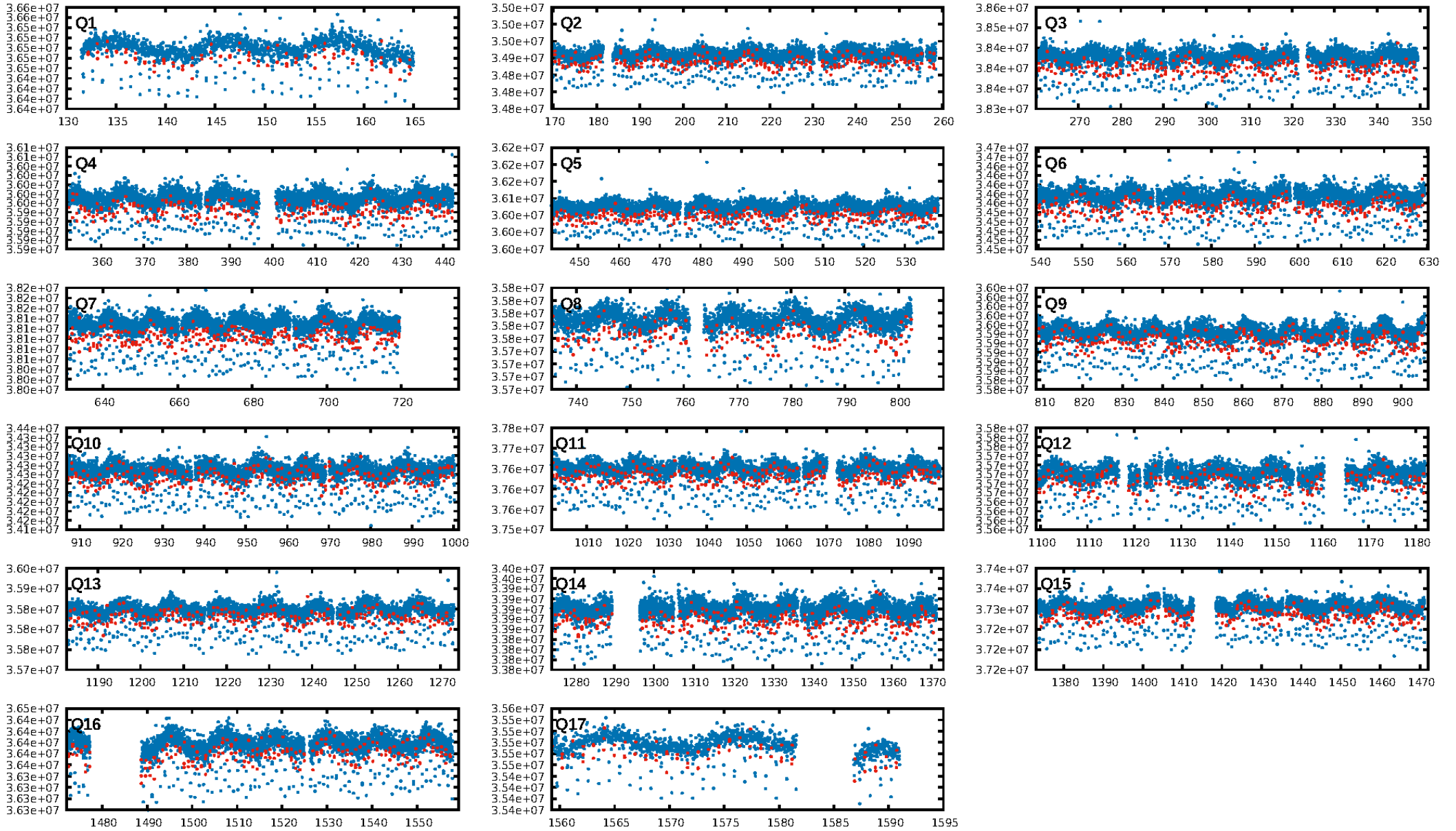
## DV Fit Results:

Period = 0.95329 [0.00000] d  
Epoch = 132.1783 [0.0006] BKJD  
Rp/R\* = 0.0143 [0.0025]  
a/R\* = 5.07 [4.48]  
b = 0.90 [0.19]  
Seff = 3870.69 [1476.73]  
Teff = 2011 [192] K  
Rp = 1.59 [0.54] Re  
a = 0.0188 [0.0046] AU  
Ag = 0.30 [0.64] [-1.10σ]  
Teffp = 2304 [1204] K [0.24σ]

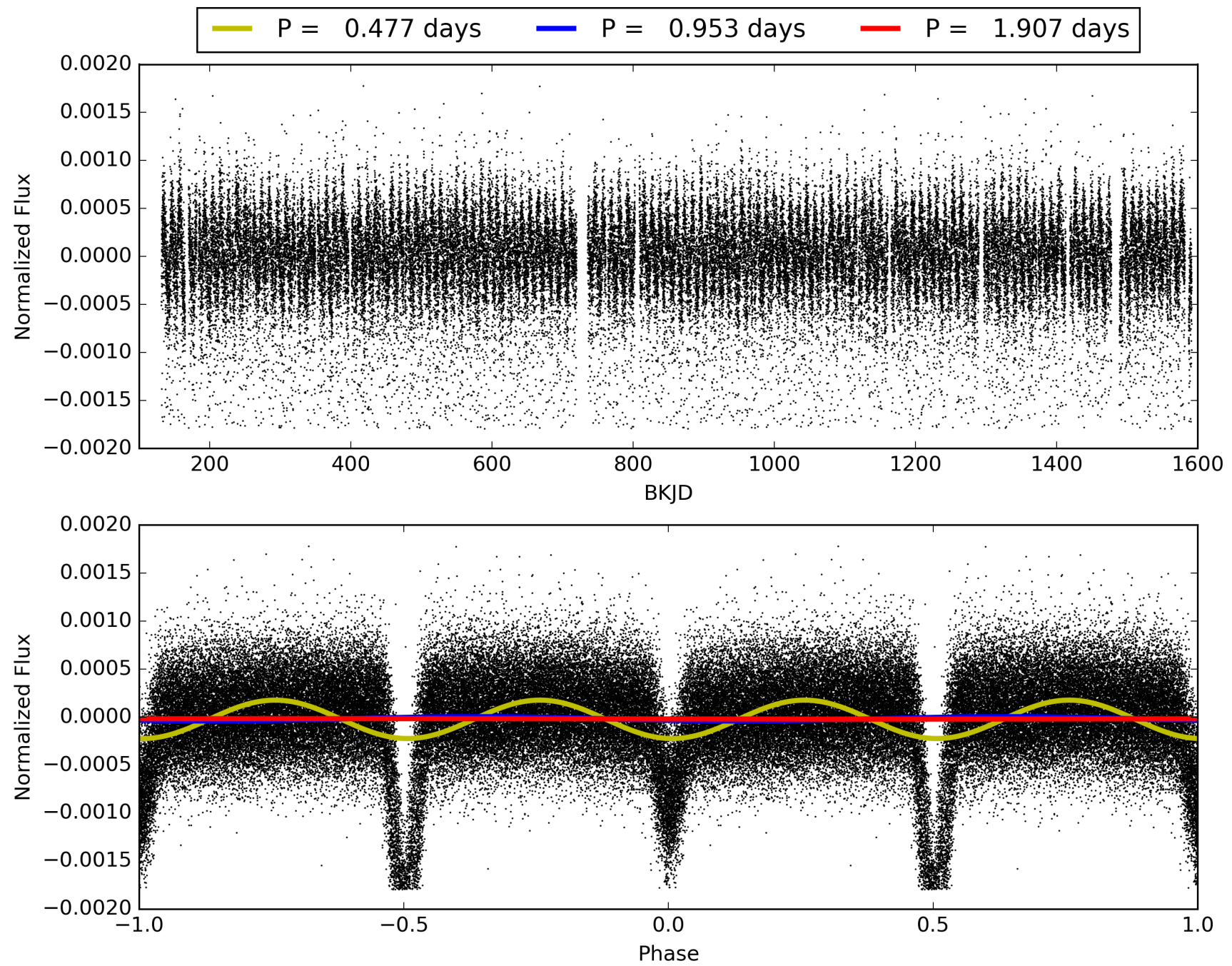
## DV Diagnostic Results:

ShortPeriod-sig: 0.0% [0.00σ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: 2.46e-30  
RollingBand-fgt: 0.99 [1327/1339]  
GhostDiagnostic-chr: 1.983  
Centroid-sig: 0.0%  
Centroid-so: 2.380 arcsec [3.70σ]  
OotOffset-rm: 0.046 arcsec [0.56σ]  
KicOffset-rm: 0.141 arcsec [1.76σ]  
OotOffset-st: 4/4/4/5 [17]  
KicOffset-st: 4/4/4/5 [17]  
DiffImageQuality-fgm: 1.00 [17/17]  
DiffImageOverlap-fno: 1.00 [17/17]

# TCE 009596187-02, PDC Light Curves

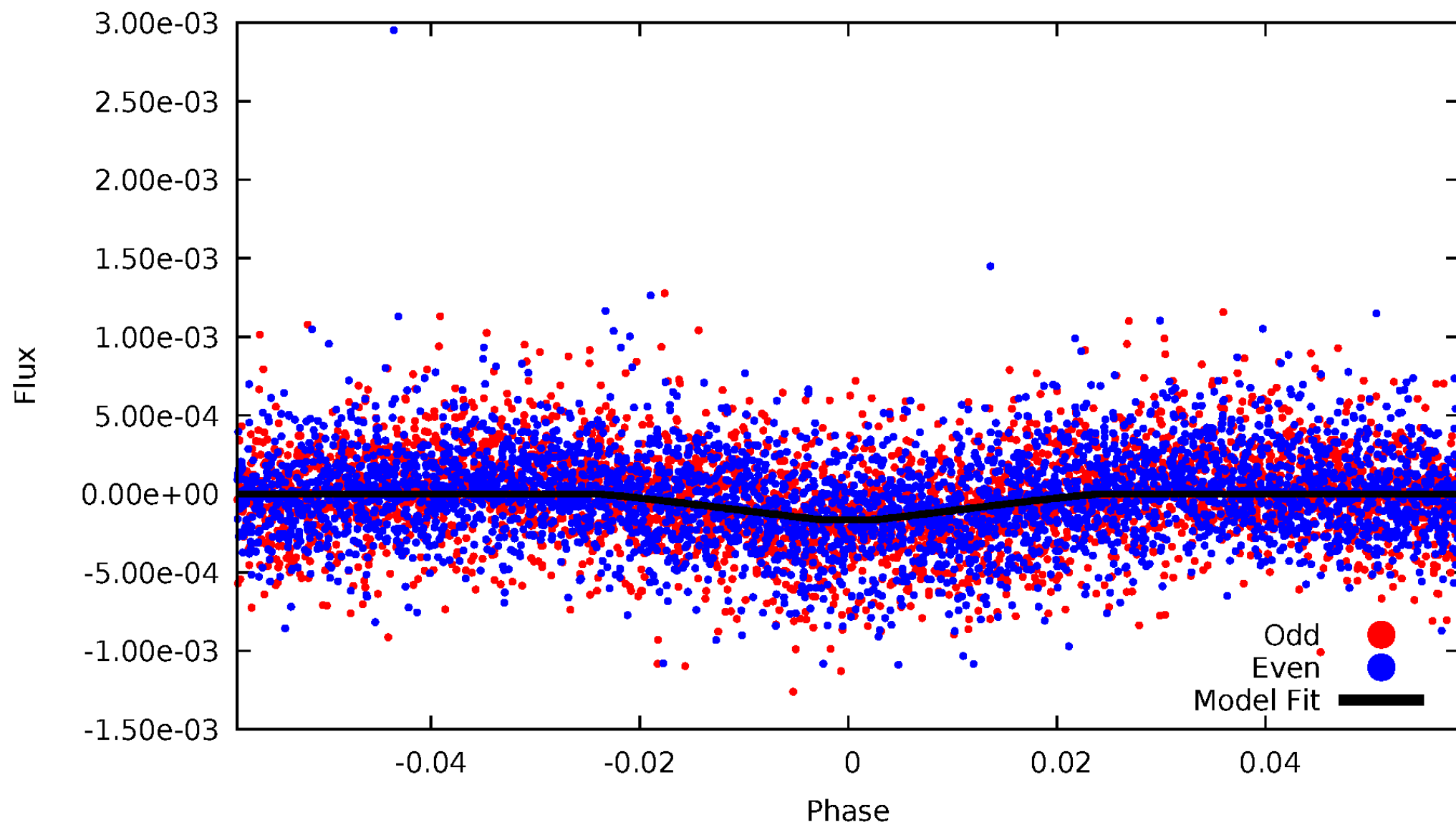


TCE 009596187-02



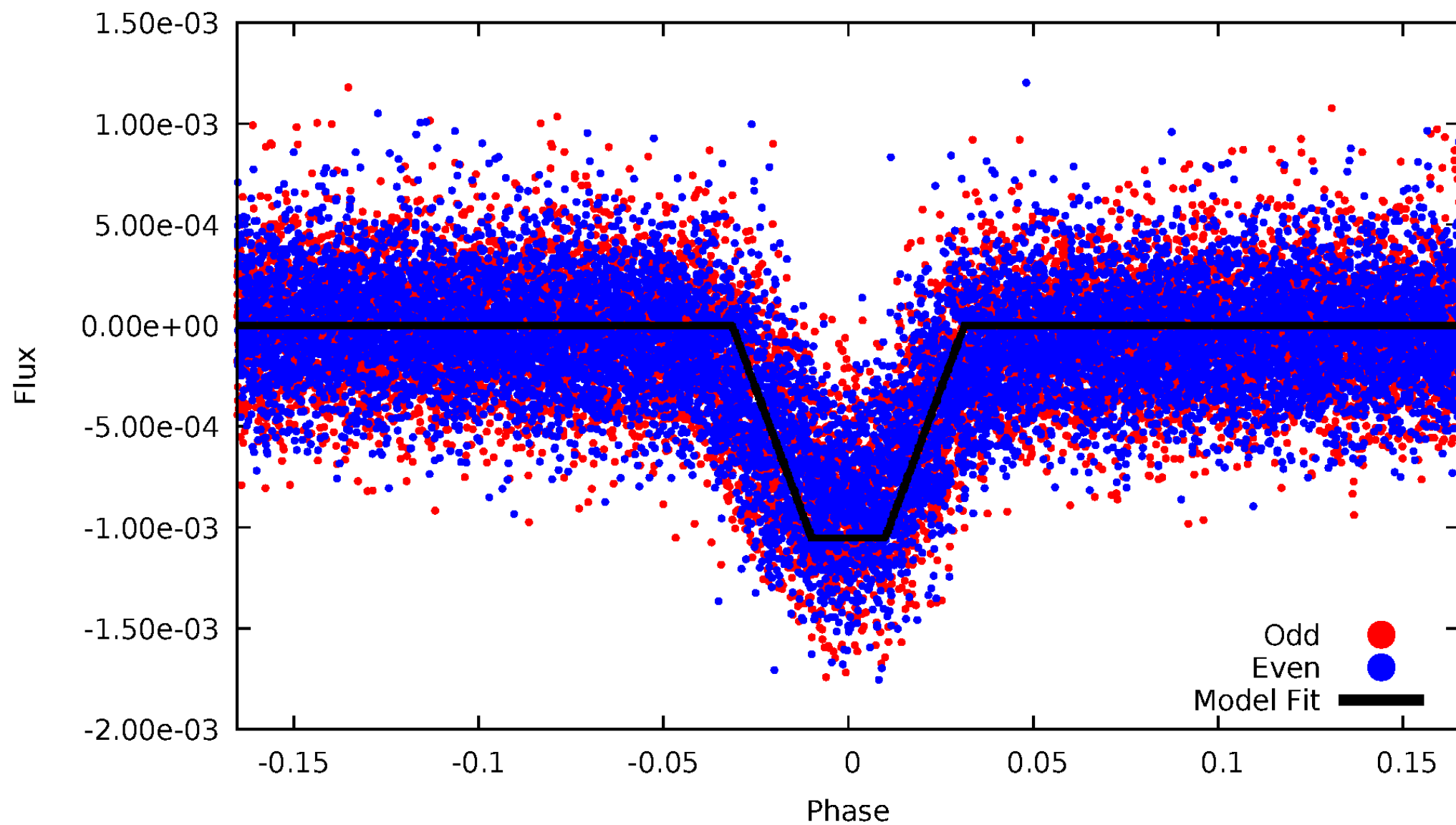
# DV Odd/Even

TCE 009596187-02



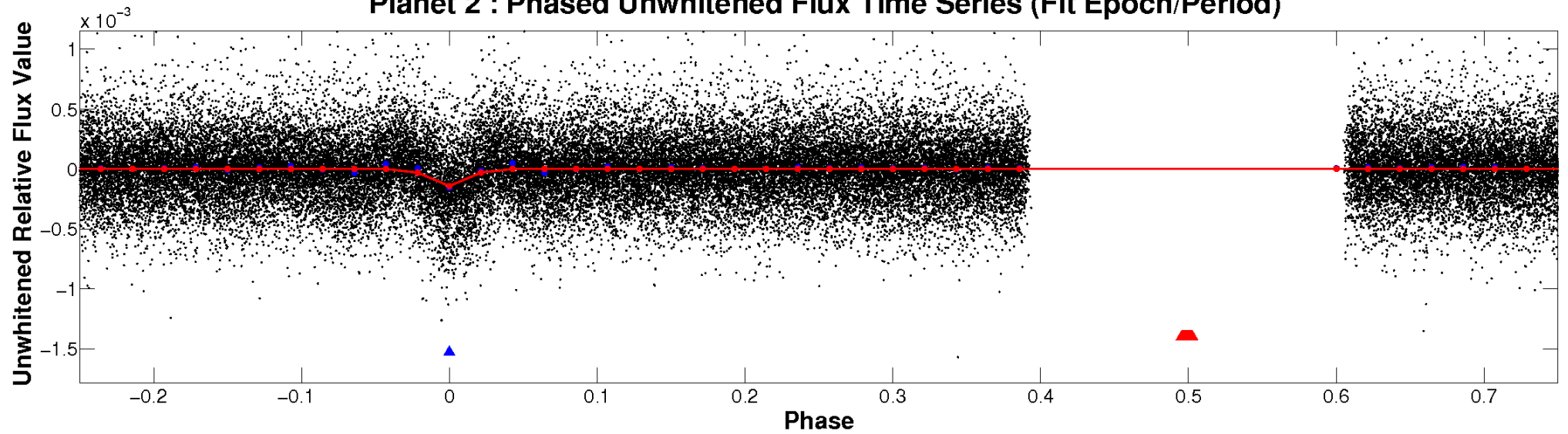
# ALT Odd/Even

TCE 009596187-02

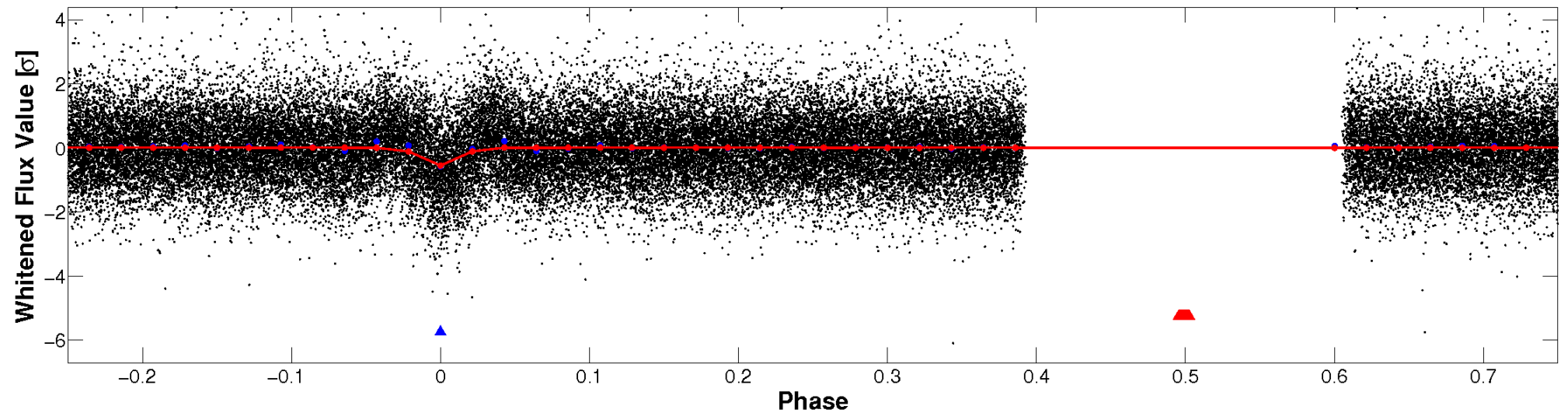


# Non-Whitened Vs. Whitened Light Curve

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

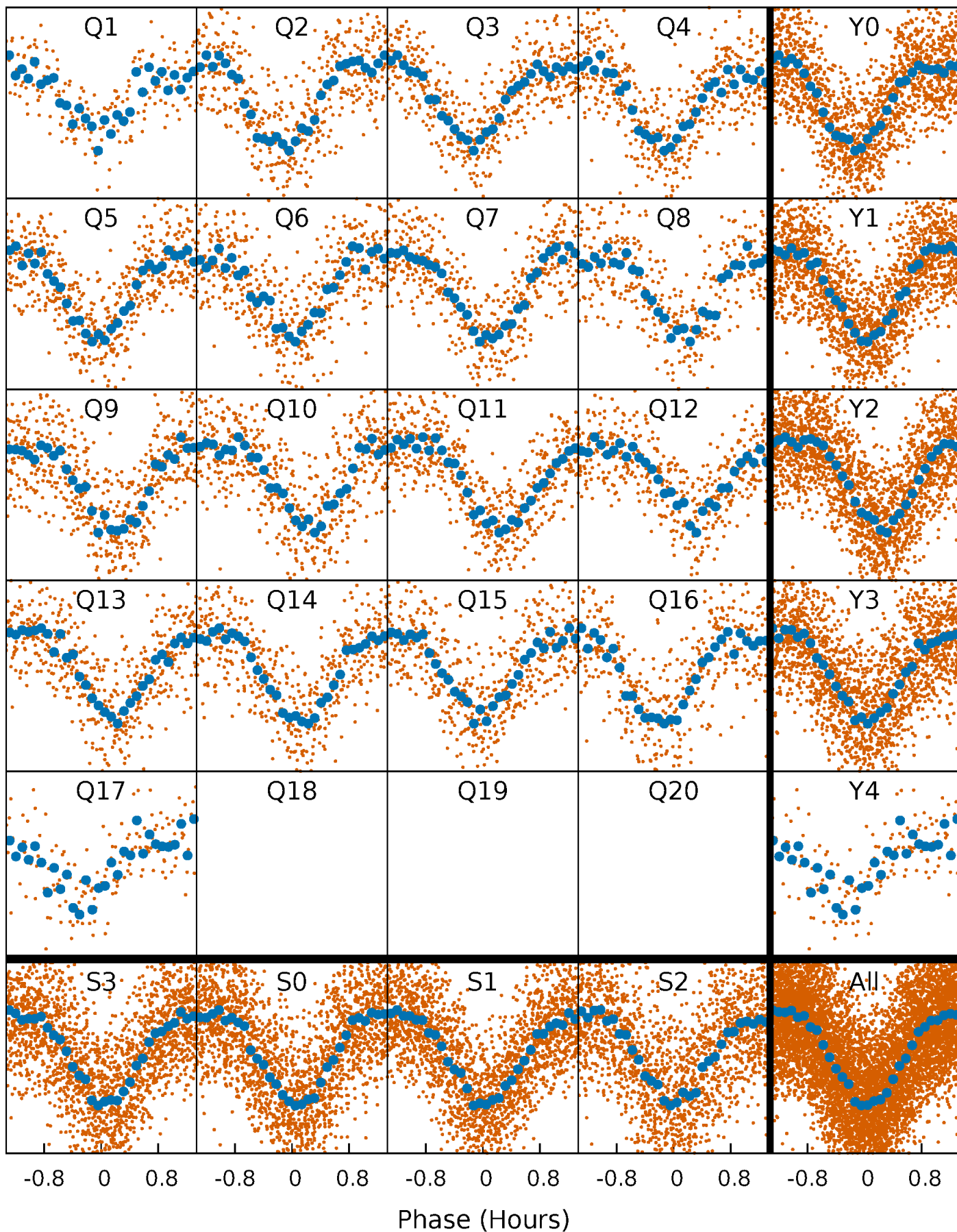


## Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



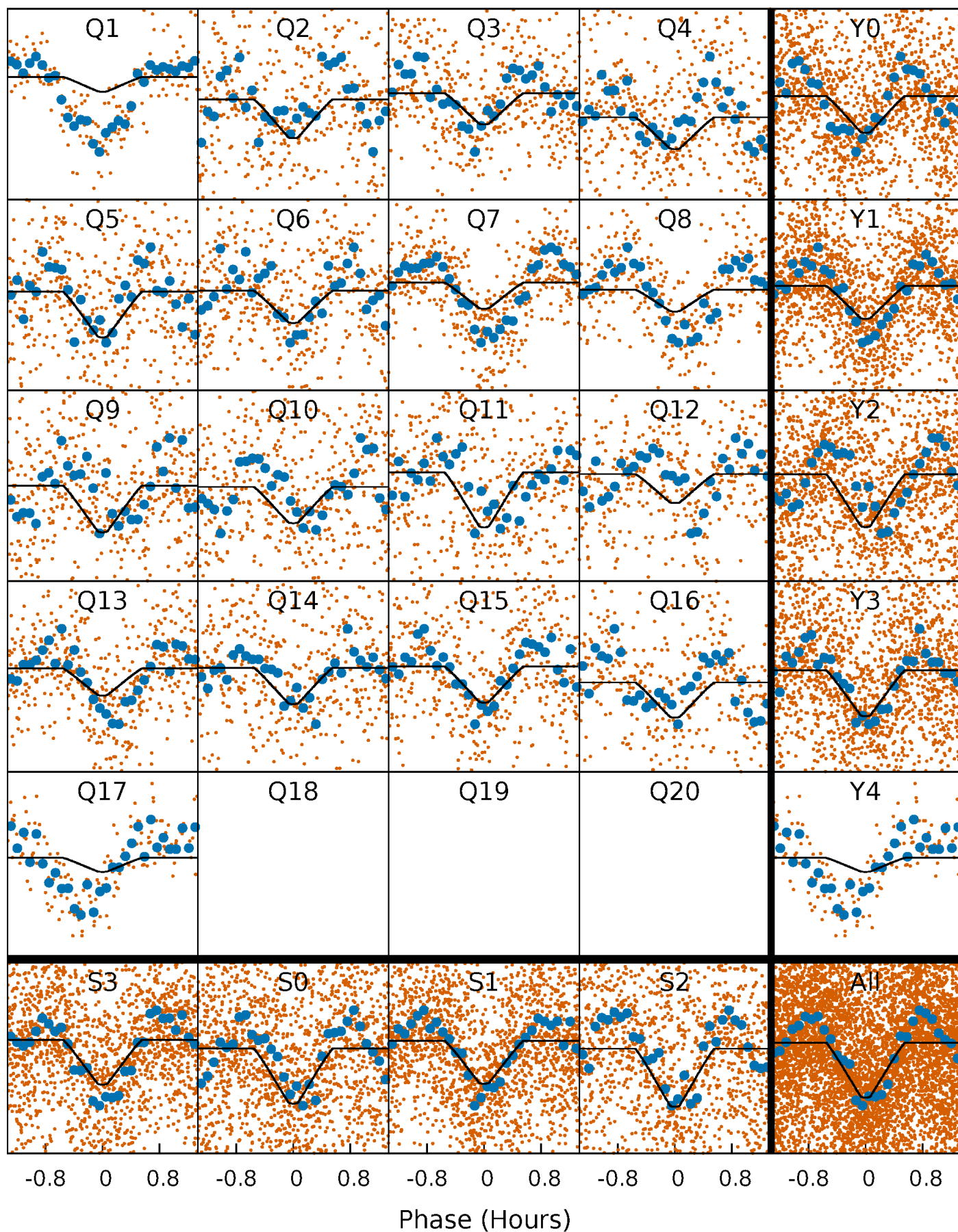
# PDC Quarter-Phased Transit Curves

TCE 009596187-02   P= 0.953294 Days    $T_0=132.178345$  (BKJD)



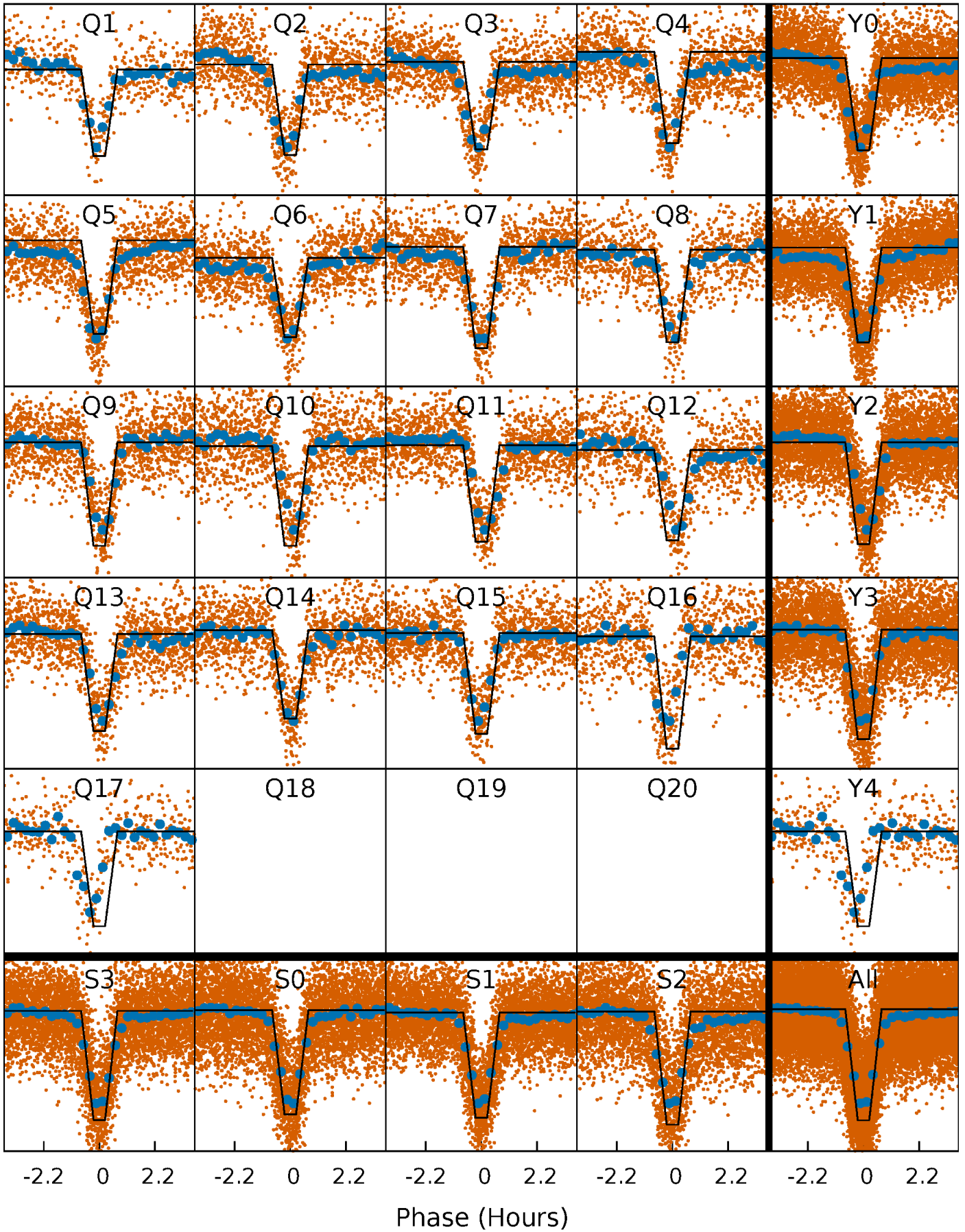
# DV Quarter-Phased Transit Curves

TCE 009596187-02   P= 0.953294 Days    $T_0=132.178345$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

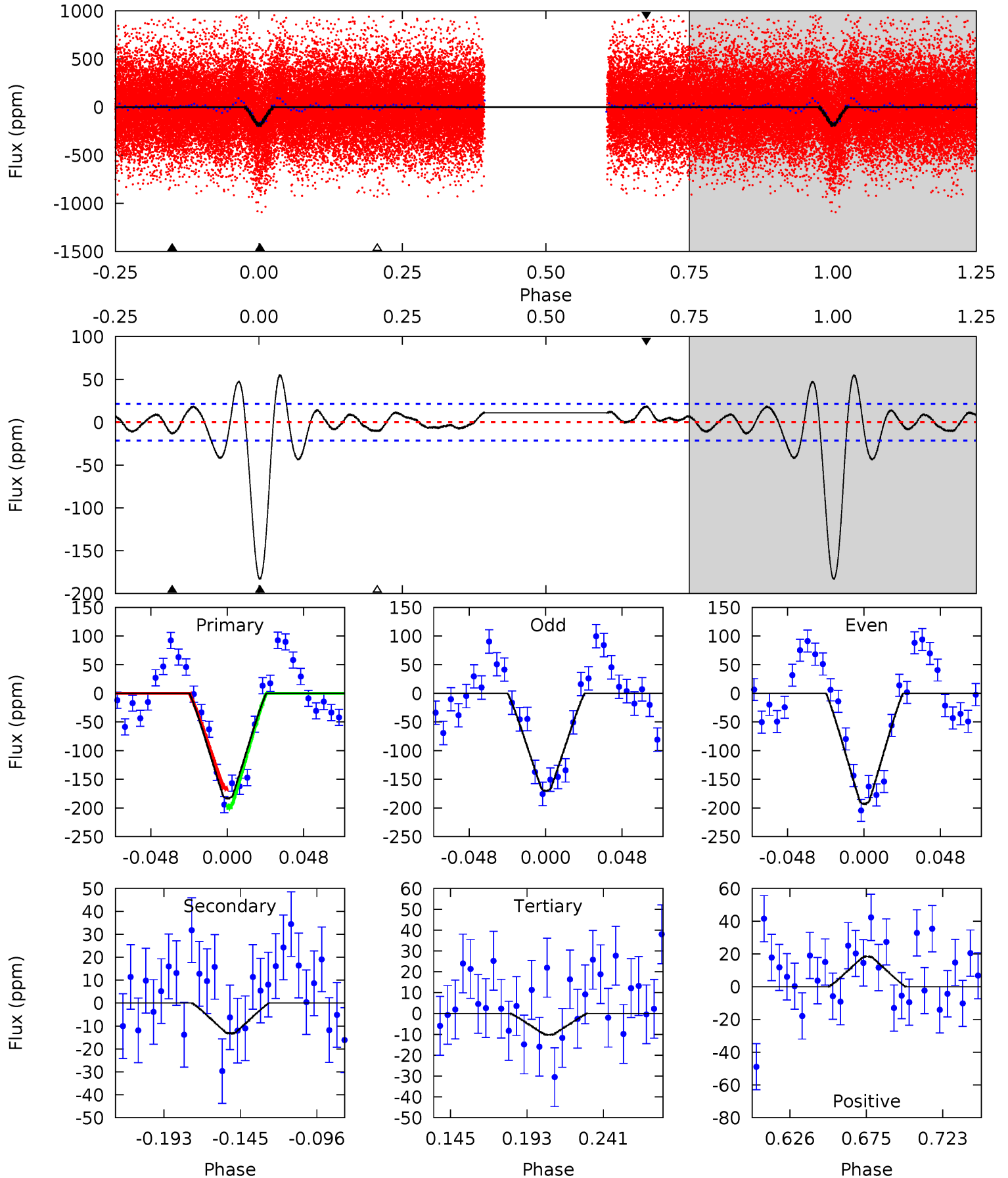
TCE 009596187-02   P= 0.953295 Days    $T_0=132.180210$  (BKJD)



# DV Model-Shift Uniqueness Test

009596187-02, P = 0.953294 Days, E = 131.225051 Days

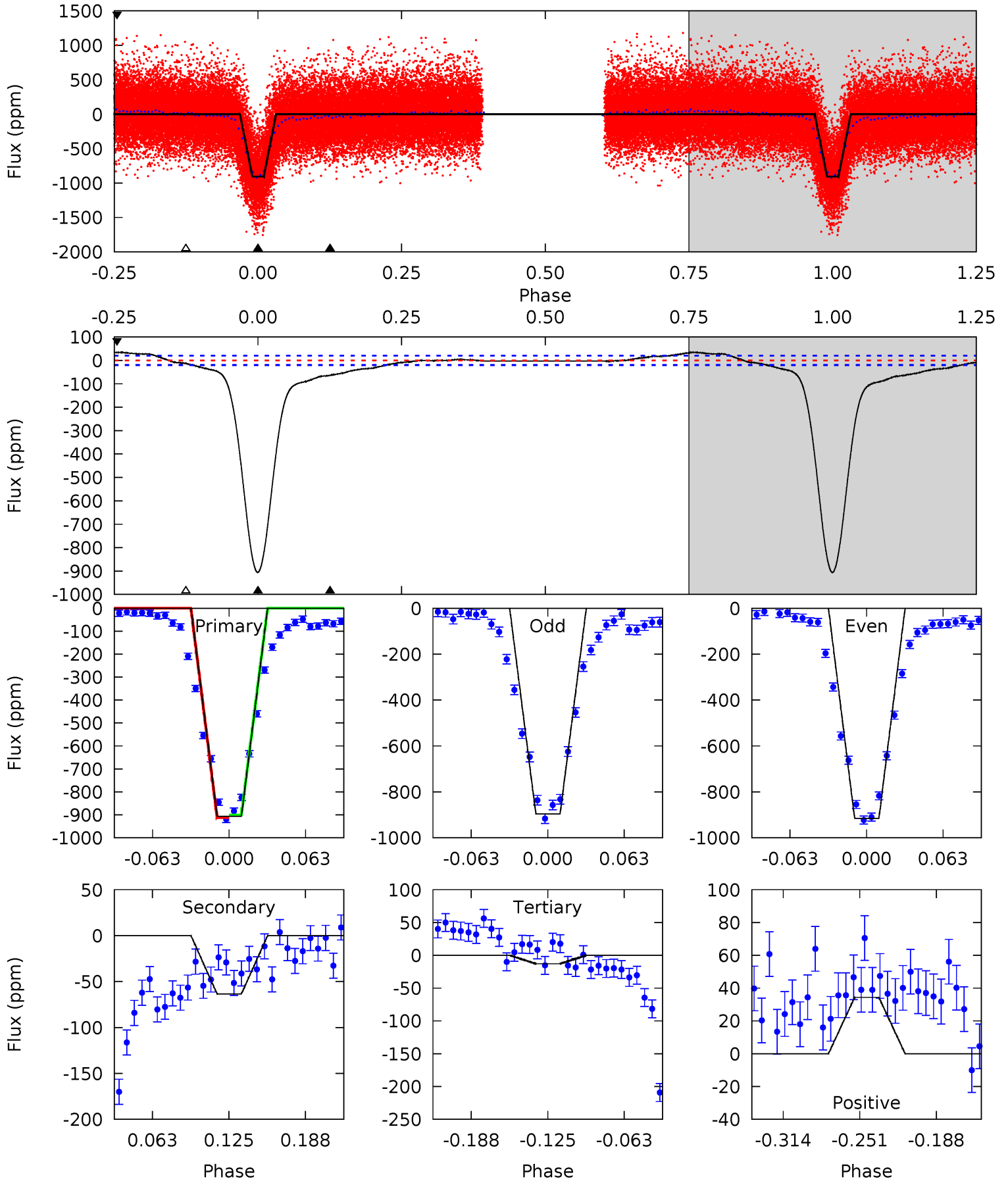
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
40.2	2.91	2.25	4.05	4.72	1.98	2.75	38.0	36.2	0.66	-1.14	2.51	1.06	0.23	3.44



# Alt Model-Shift Uniqueness Test

009596187-02, P = 0.953295 Days, E = 131.226915 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
209.4	14.7	2.97	7.93	4.66	1.86	4.72	206.4	201.5	11.7	6.73	2.27	1.00	0.04	1.28



### Stellar Parameters For KIC 009596187

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$6183^{+169}_{-206}$	$4.407^{+0.090}_{-0.195}$	$-0.360^{+0.300}_{-0.300}$	$1.020^{+0.299}_{-0.149}$	$0.969^{+0.136}_{-0.111}$	$1.286^{+0.598}_{-0.656}$
	+3%/-3%	+2%/-4%	+83%/-83%	+29%/-15%	+14%/-11%	+46%/-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 009596187-02 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$-13 \pm 5$	$1.65^{+0.41}_{-0.34}$	$2855^{+202}_{-157}$	$3353^{+379}_{-450}$	$0.938^{+0.661}_{-0.427}$
Alt.	$-63 \pm 4$	$3.71^{+0.55}_{-0.45}$	$2844^{+209}_{-155}$	$3303^{+150}_{-164}$	$0.881^{+0.252}_{-0.202}$

$T_{\text{max}}$  = 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

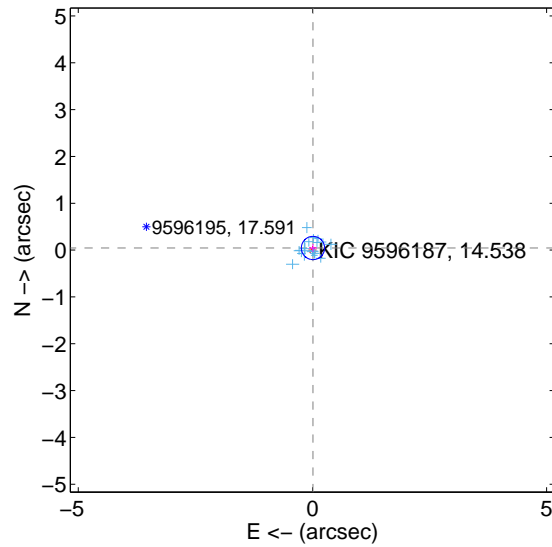
Supplemental centroid analysis for 009596187-02. Kepler magnitude: 14.54. Transit SNR 21.89

There are 17 quarters with good PRF difference image offsets

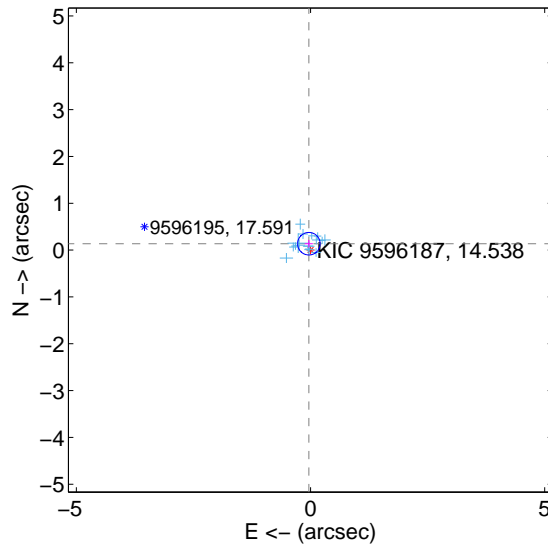
The direct PRF centroid is offset from the target star catalog position by about 0.19 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.046 \pm 0.083$	0.56	$-0.012 \pm 0.082$	$0.045 \pm 0.083$
PRF-fit source offset from KIC position	$0.141 \pm 0.080$	1.76	$0.036 \pm 0.087$	$0.136 \pm 0.080$
photometric centroid source offset	$2.38 \pm 0.64$	3.70	$-1.50 \pm 0.58$	$1.85 \pm 0.68$

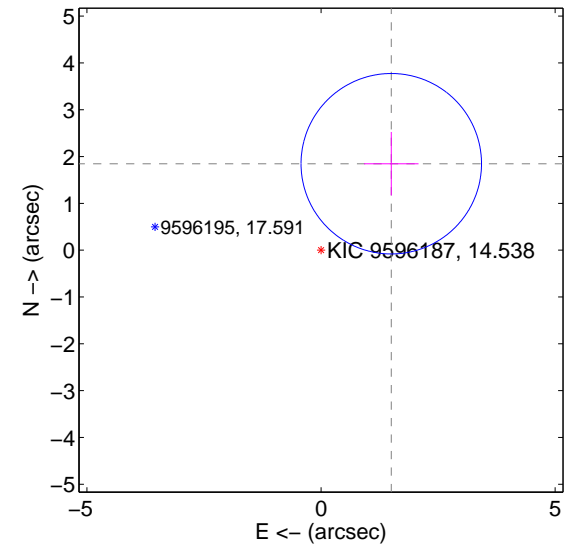
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position

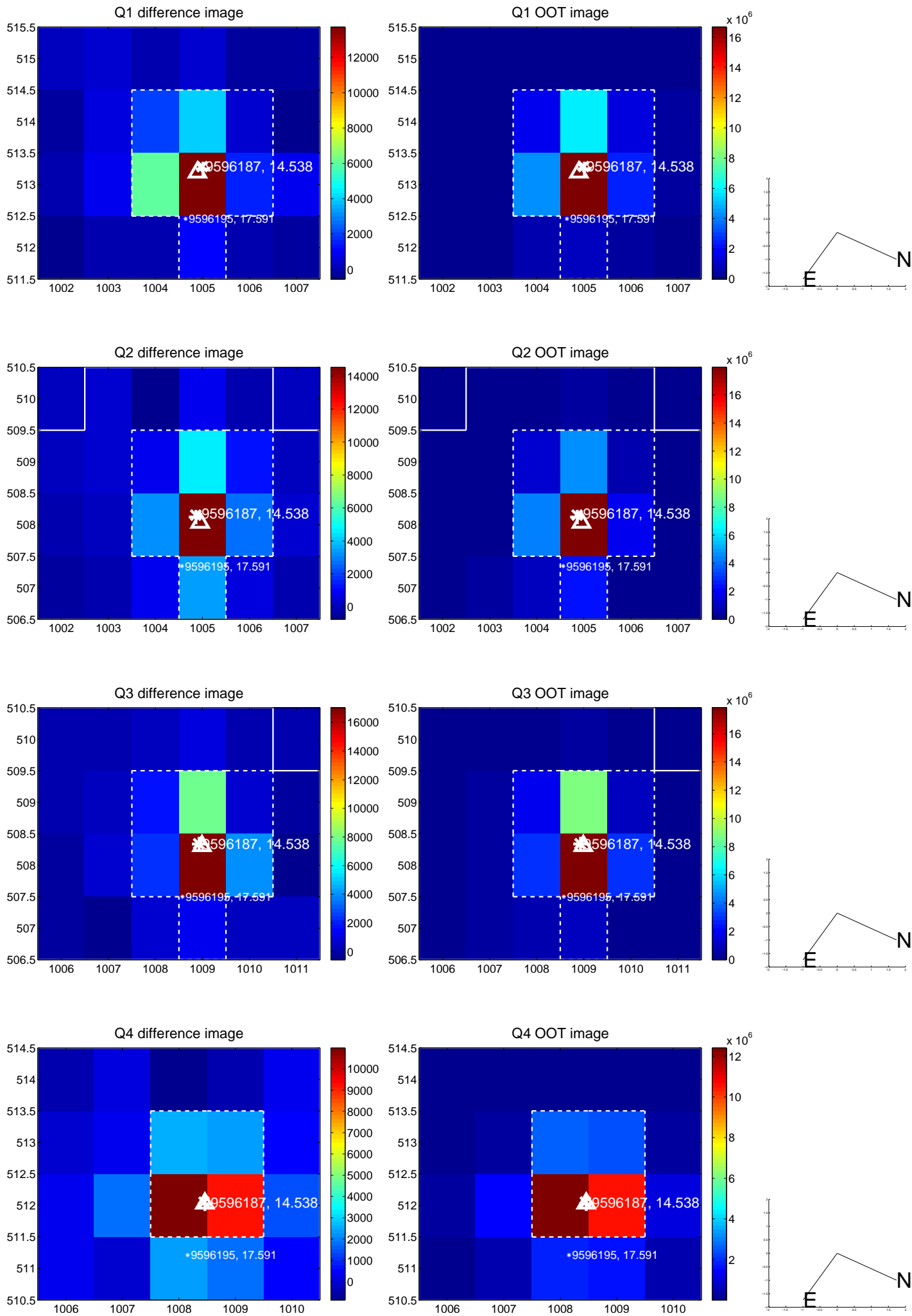


offset from photometric centroids

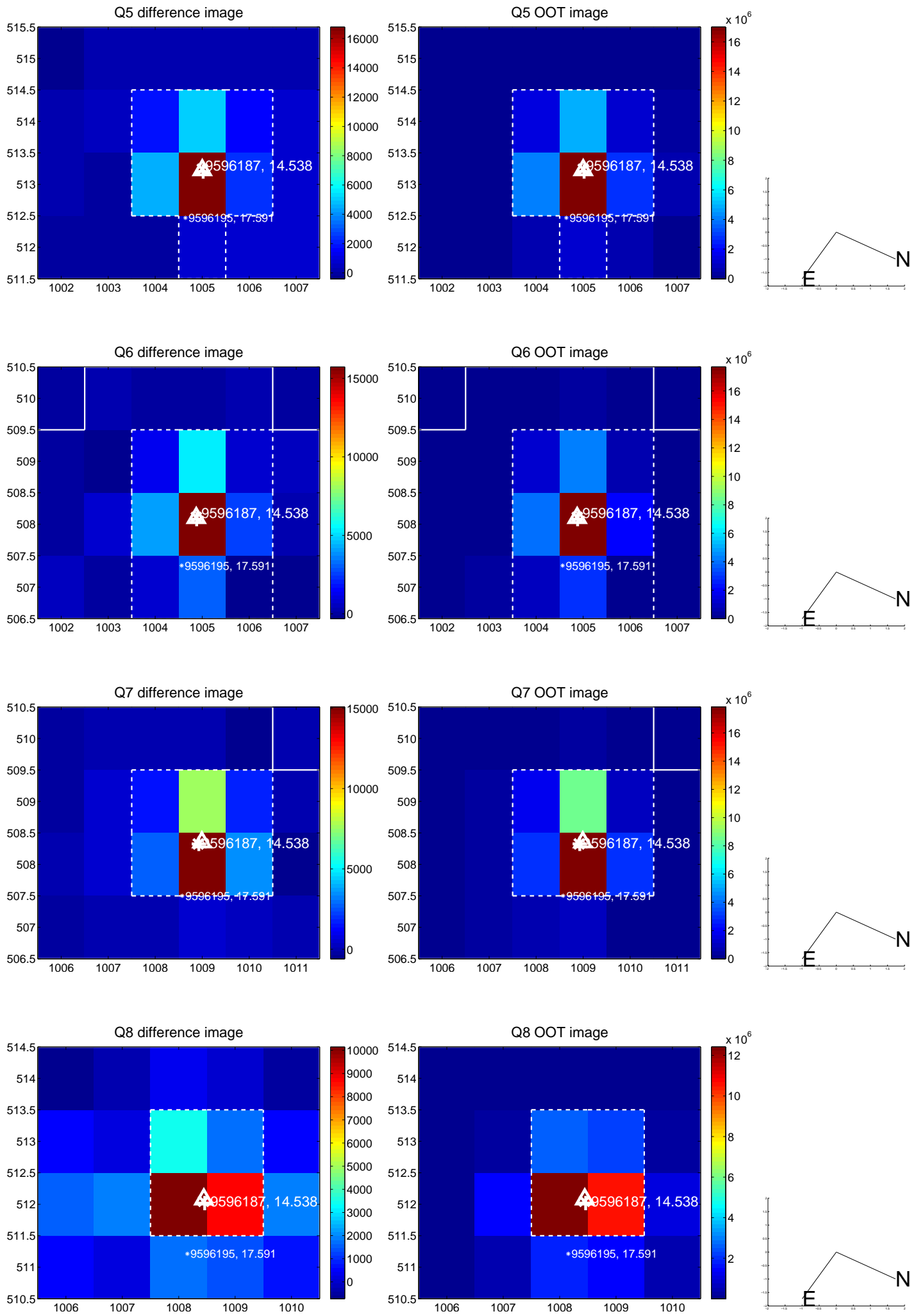


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets**; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

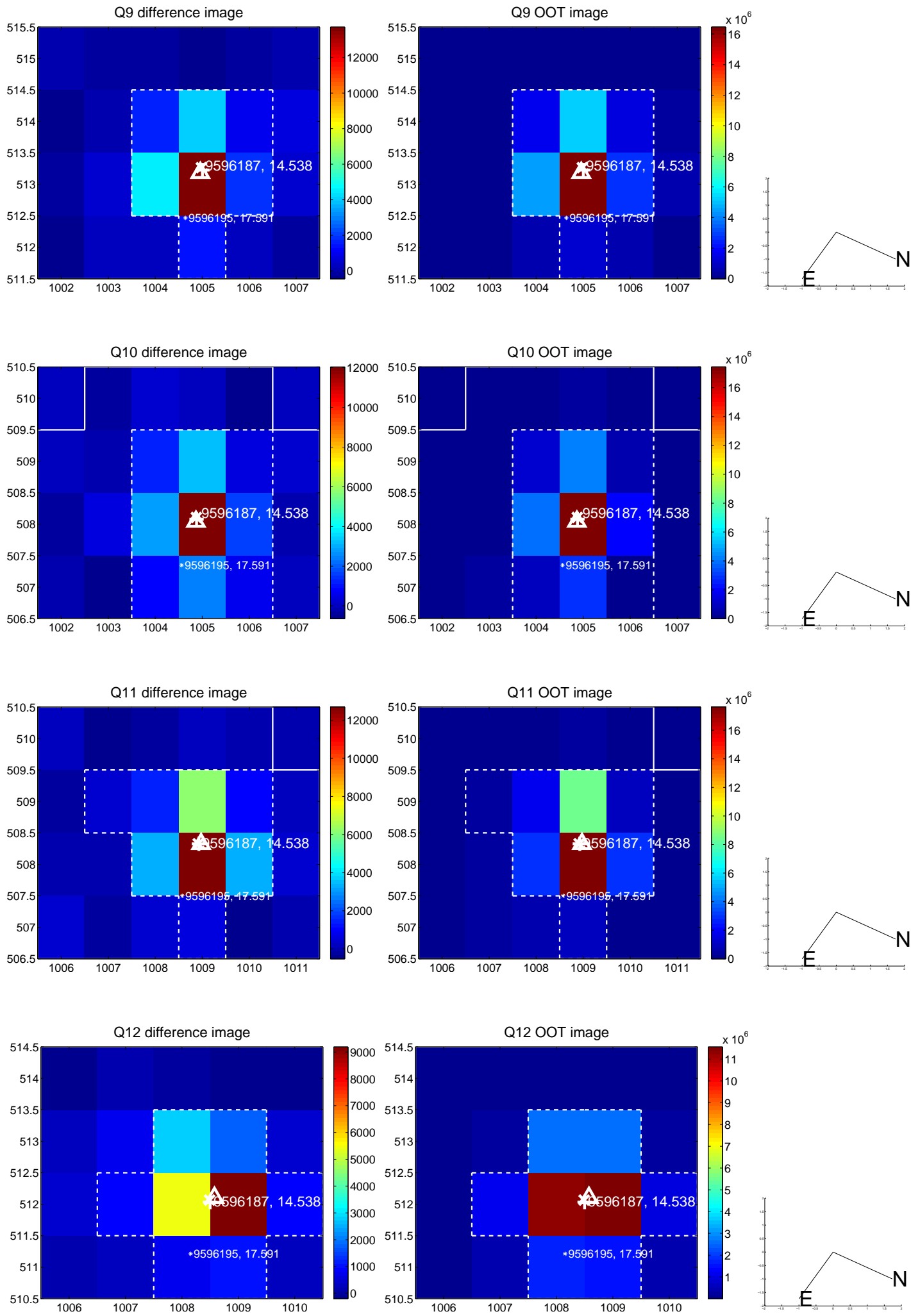
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



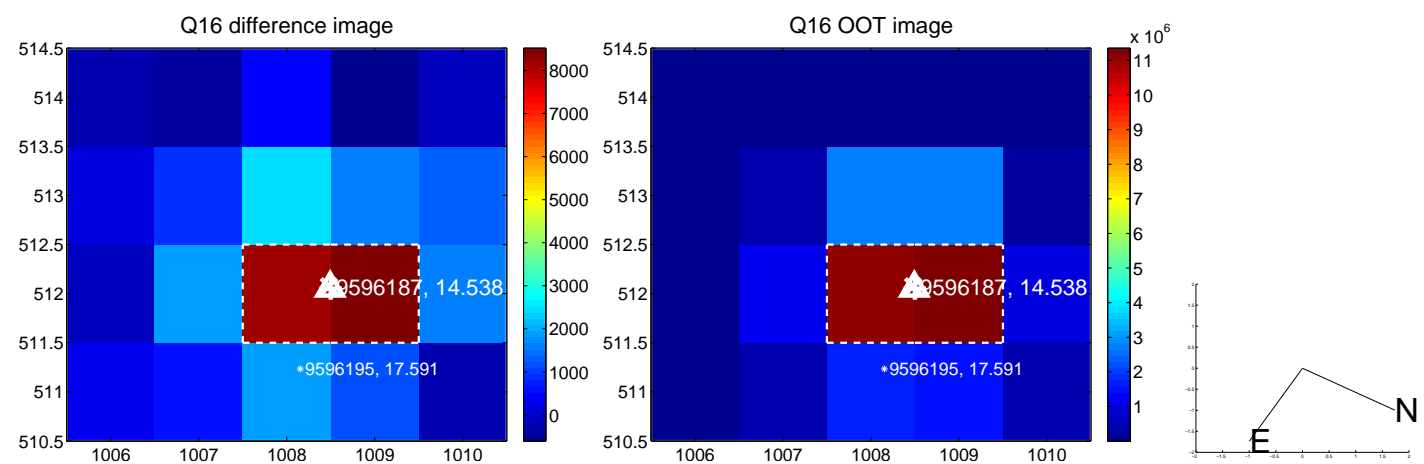
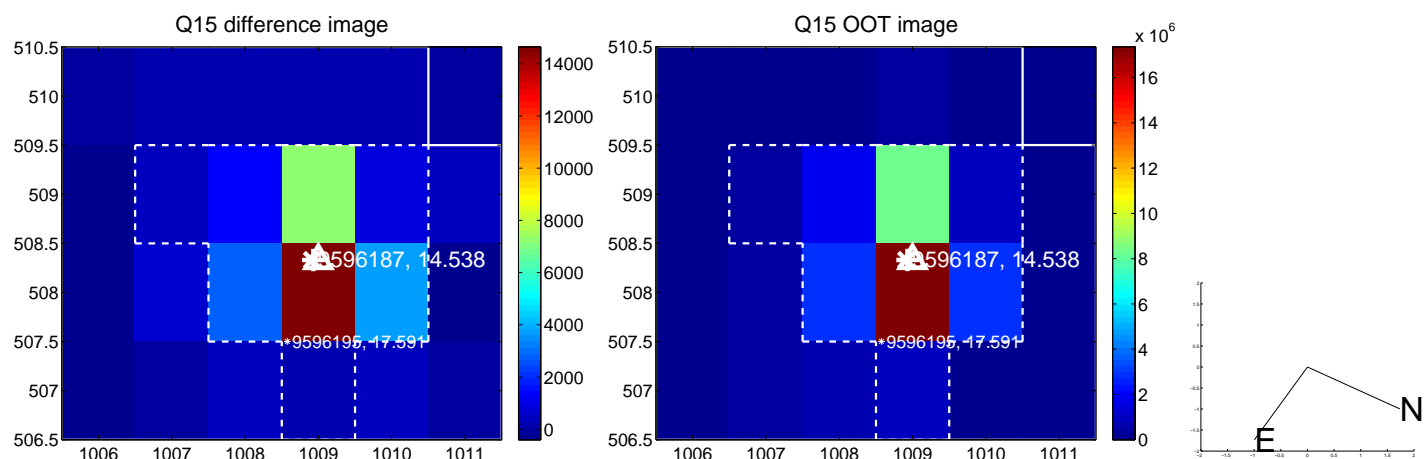
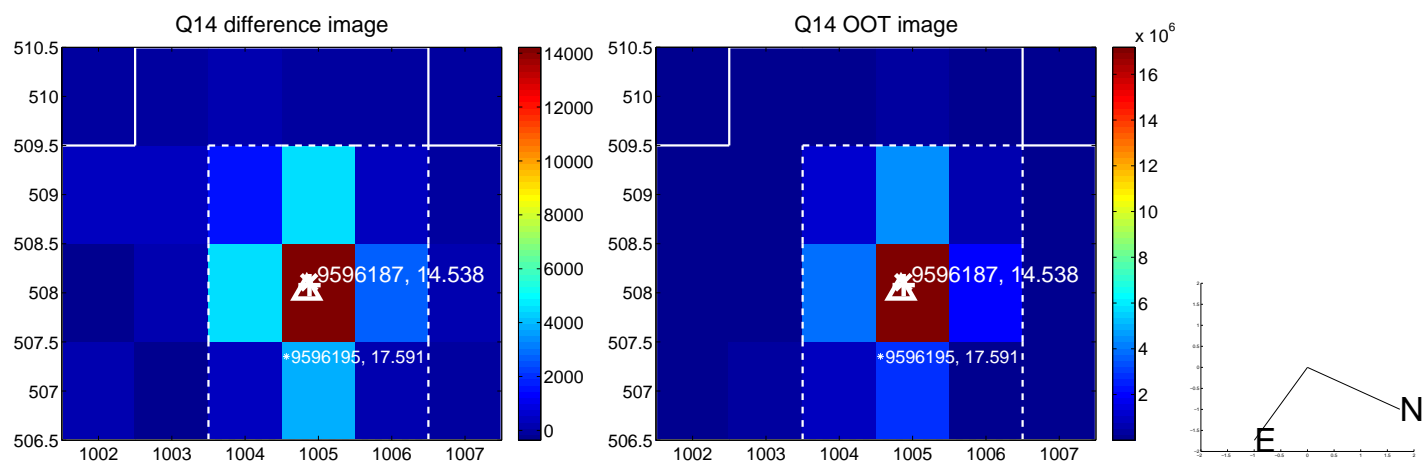
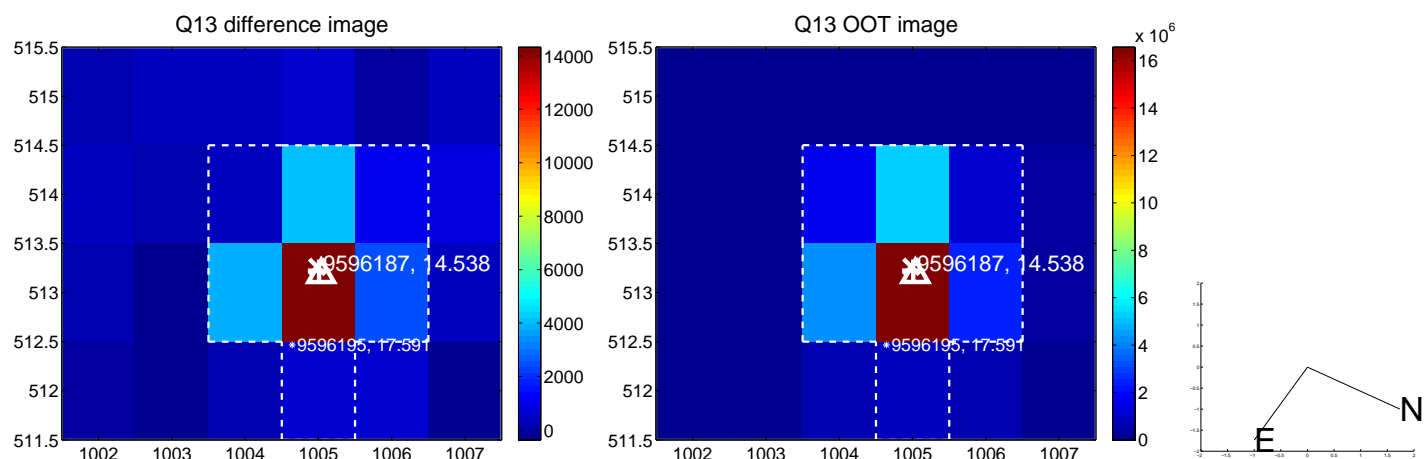
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



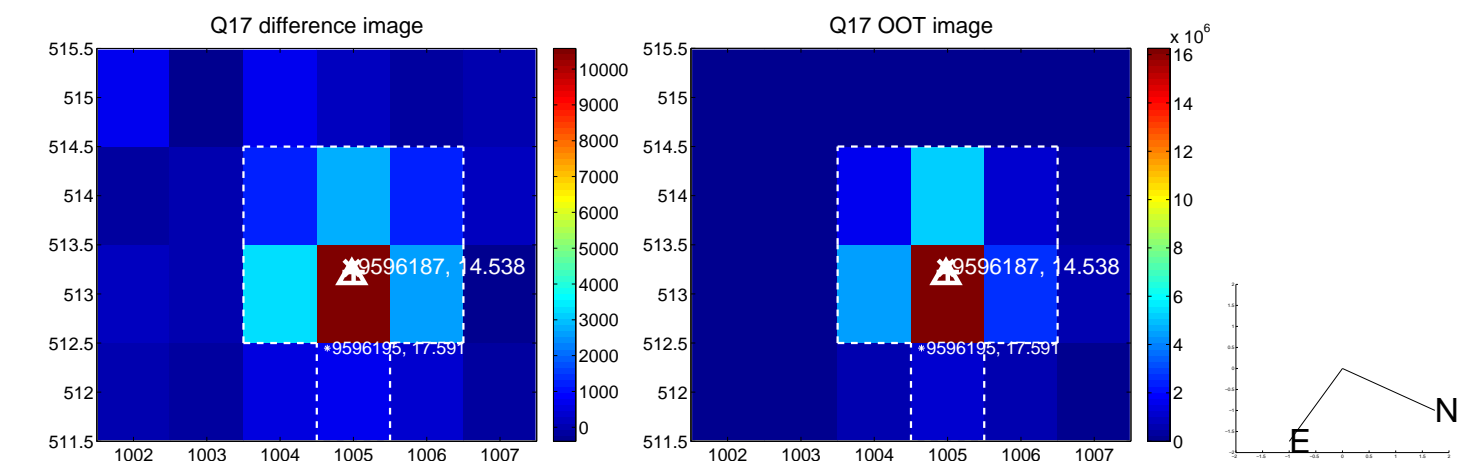
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



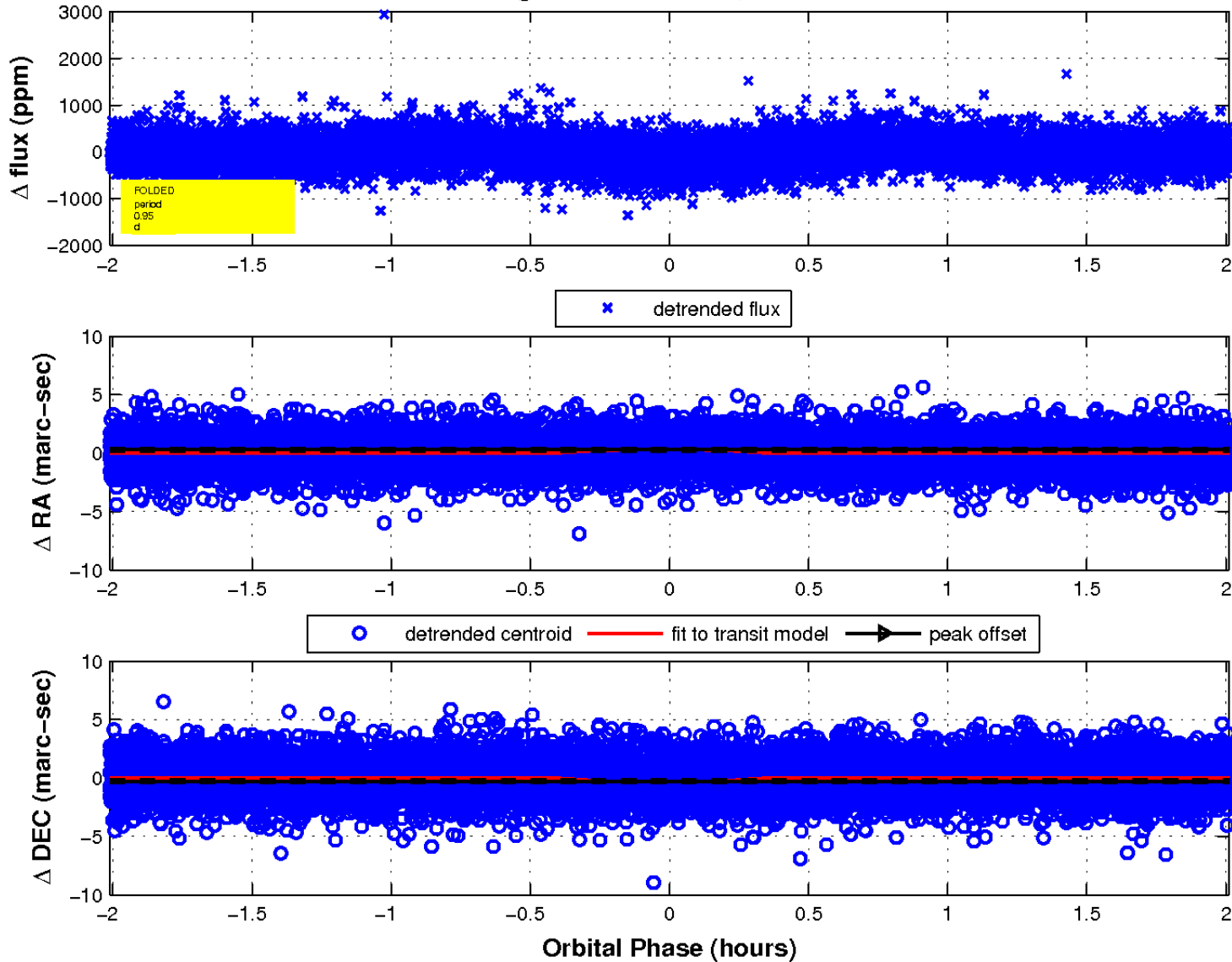
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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



fluxWeightedCentroids, Planet 2 of 2



UKIRT Image

Declination

