

# KIC 009892856

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
009892856-01	OBS	3906.01	2.406529	133.749294	346.9	2.139	28.5	29.7	1.11	6167	2.44	1139.64
009892856-02	OBS	No	2.406513	132.553757	165.0	1.446	12.8	12.3	1.11	6167	1.69	1139.65

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009892856-01	OBS	FP	0.00	0	1	1	0	MOD_SEC_DV—MOD_SEC_ALT—HAS_SEC_TCE—CENT_RESOLVED_OFFSET
009892856-02	OBS	FP	0.00	1	1	1	0	IS_SEC_TCE—CENT_RESOLVED_OFFSET—HALO_GHOST

**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.

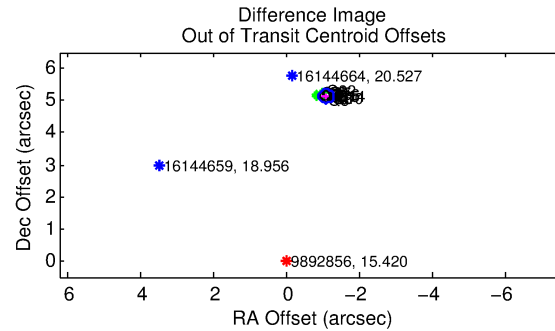
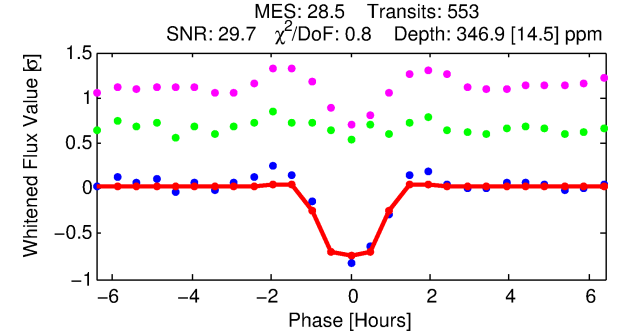
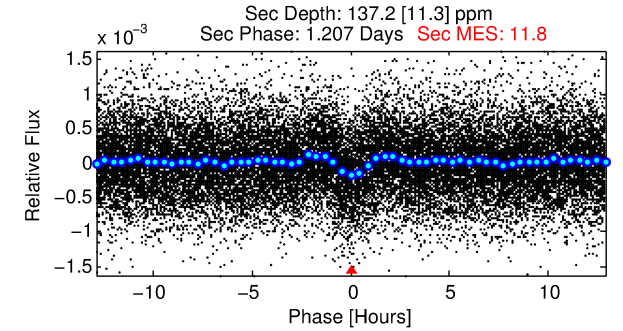
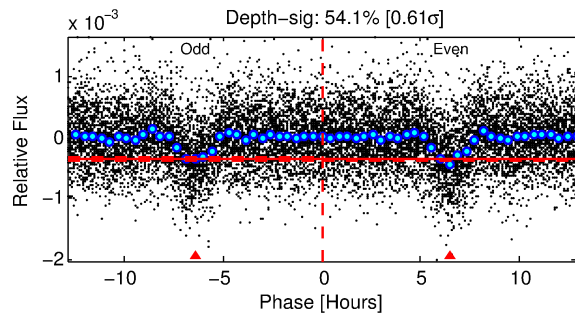
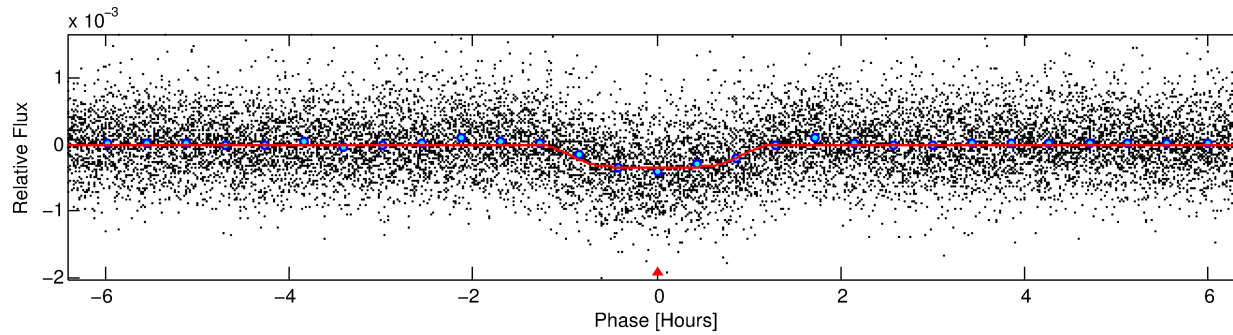
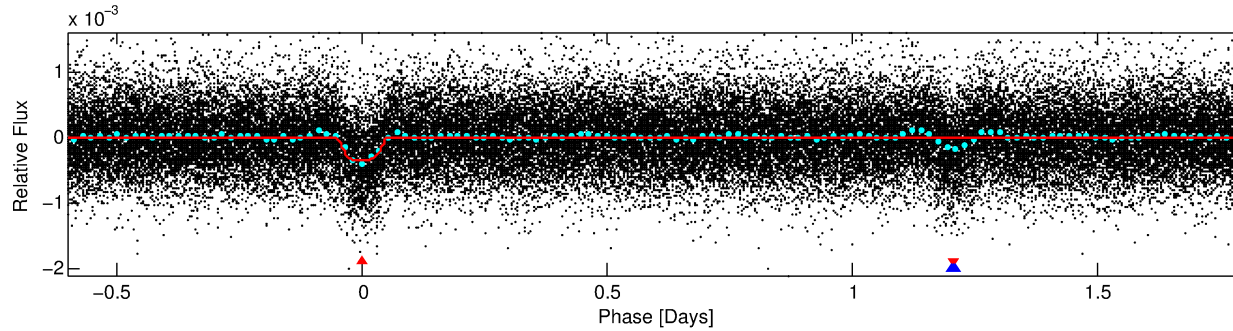
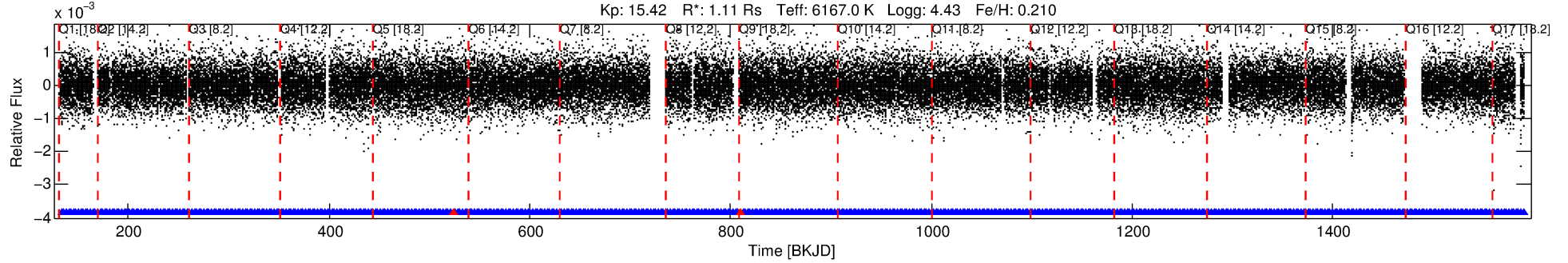
## Ephemeris Match Information For 009892856-01

No Significant Match Found

# DV One-Page Summary

KIC: 9892856 Candidate: 1 of 2 Period: 2.407 d  
KOI: K03906.01 Corr: 0.799

Kp: 15.42 R\*: 1.11 Rs Teff: 6167.0 K Logg: 4.43 Fe/H: 0.210



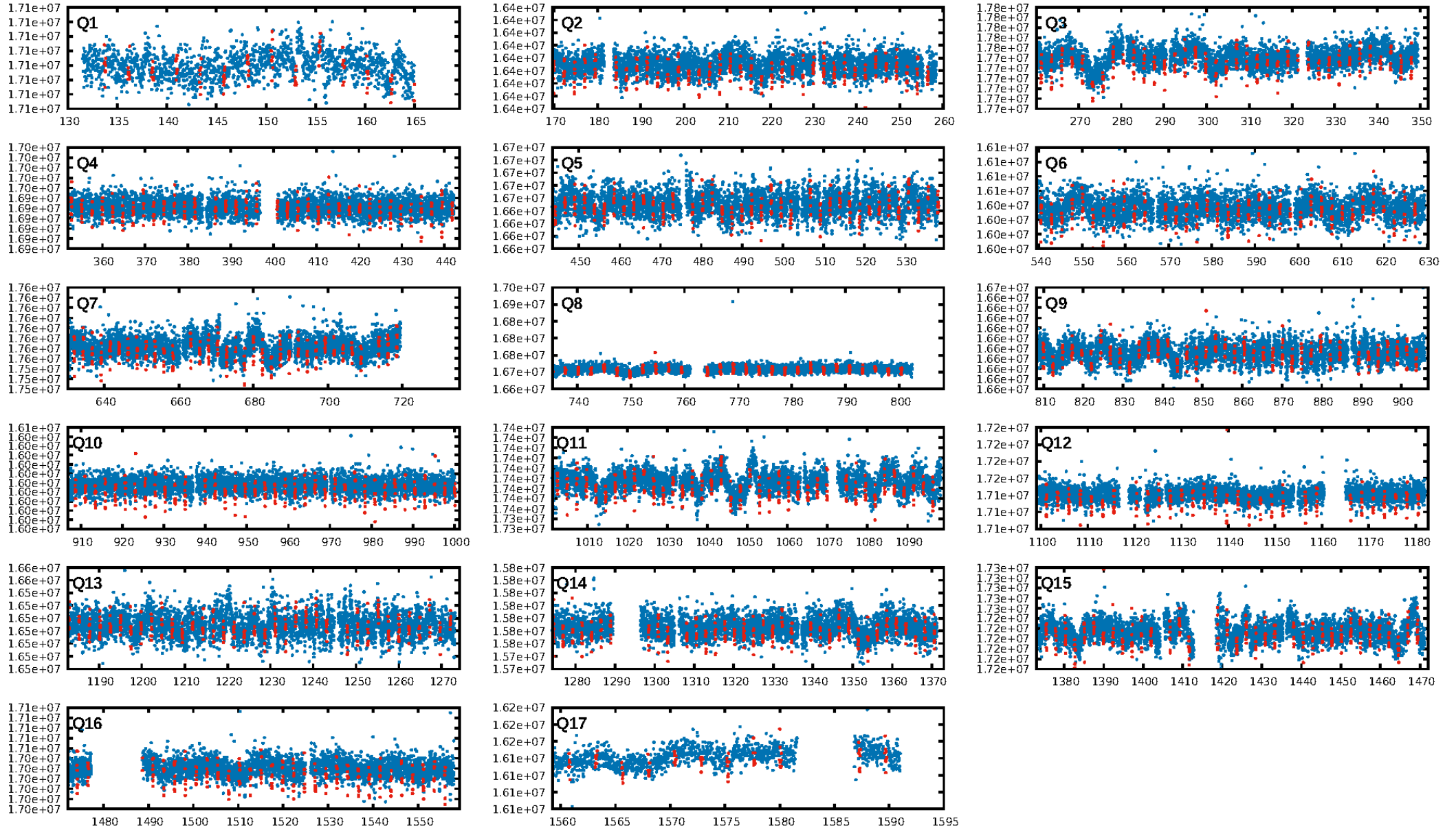
## DV Fit Results:

Period = 2.40653 [0.00001] d  
Epoch = 133.7493 [0.0011] BKJD  
Rp/R\* = 0.0202 [0.0033]  
a/R\* = 4.22 [3.29]  
b = 0.90 [0.18]  
Seff = 1139.64 [474.43]  
Teq = 1482 [154] K  
Rp = 2.44 [0.87] Re  
a = 0.0373 [0.0099] AU  
Ag = 17.68 [9.04] [1.85σ]  
Teff = 4697 [442] K [6.87σ]

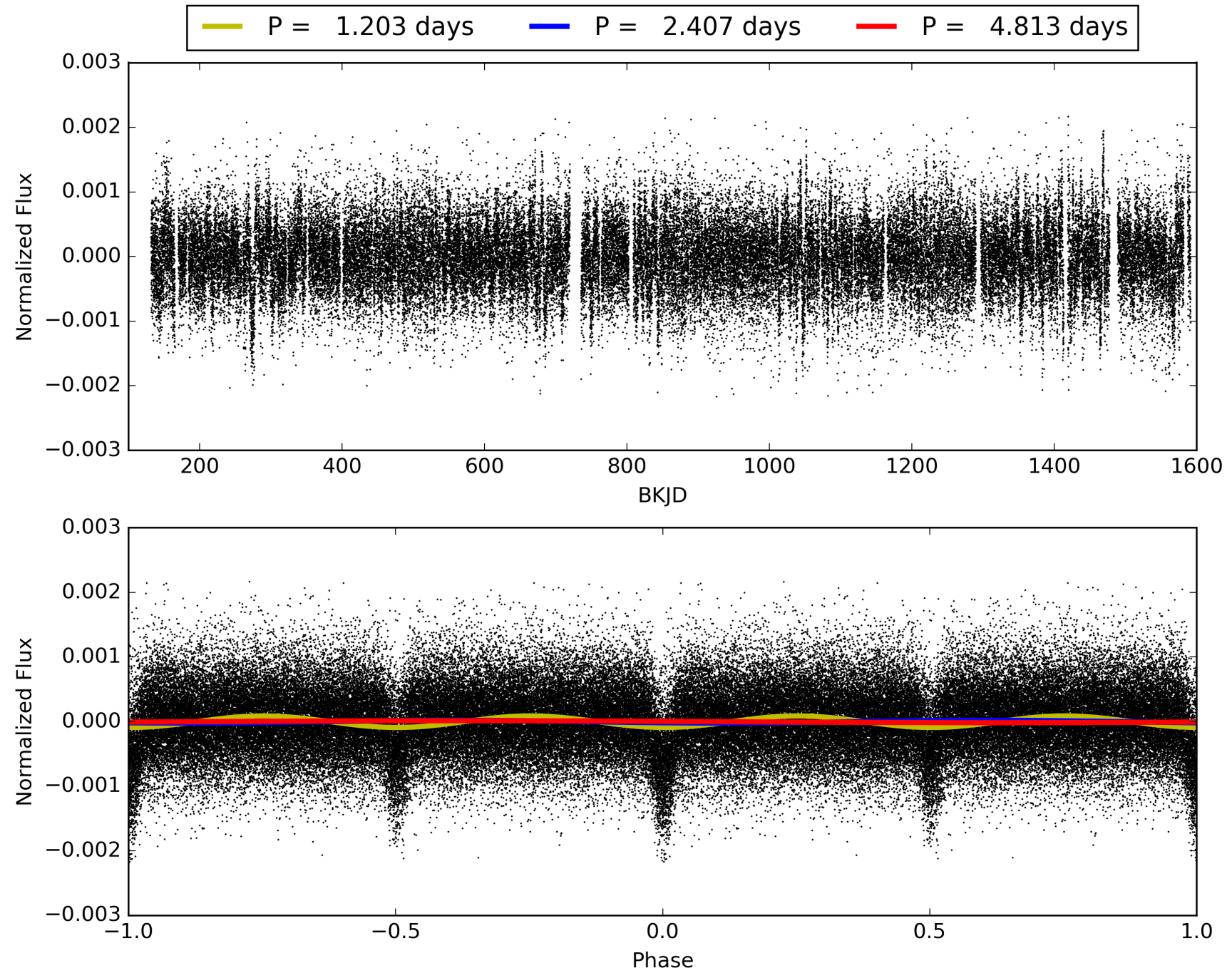
## DV Diagnostic Results:

ShortPeriod-sig: 0.0% [0.00σ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: 1.58e-173  
RollingBand-fgt: 1.00 [526/528]  
GhostDiagnostic-chr: -0.268  
Centroid-sig: 0.0%  
Centroid-so: 36.072 arcsec [72.32σ]  
OotOffset-rm: 5.248 arcsec [74.27σ]  
KicOffset-rm: 5.322 arcsec [77.67σ]  
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 009892856-01, PDC Light Curves

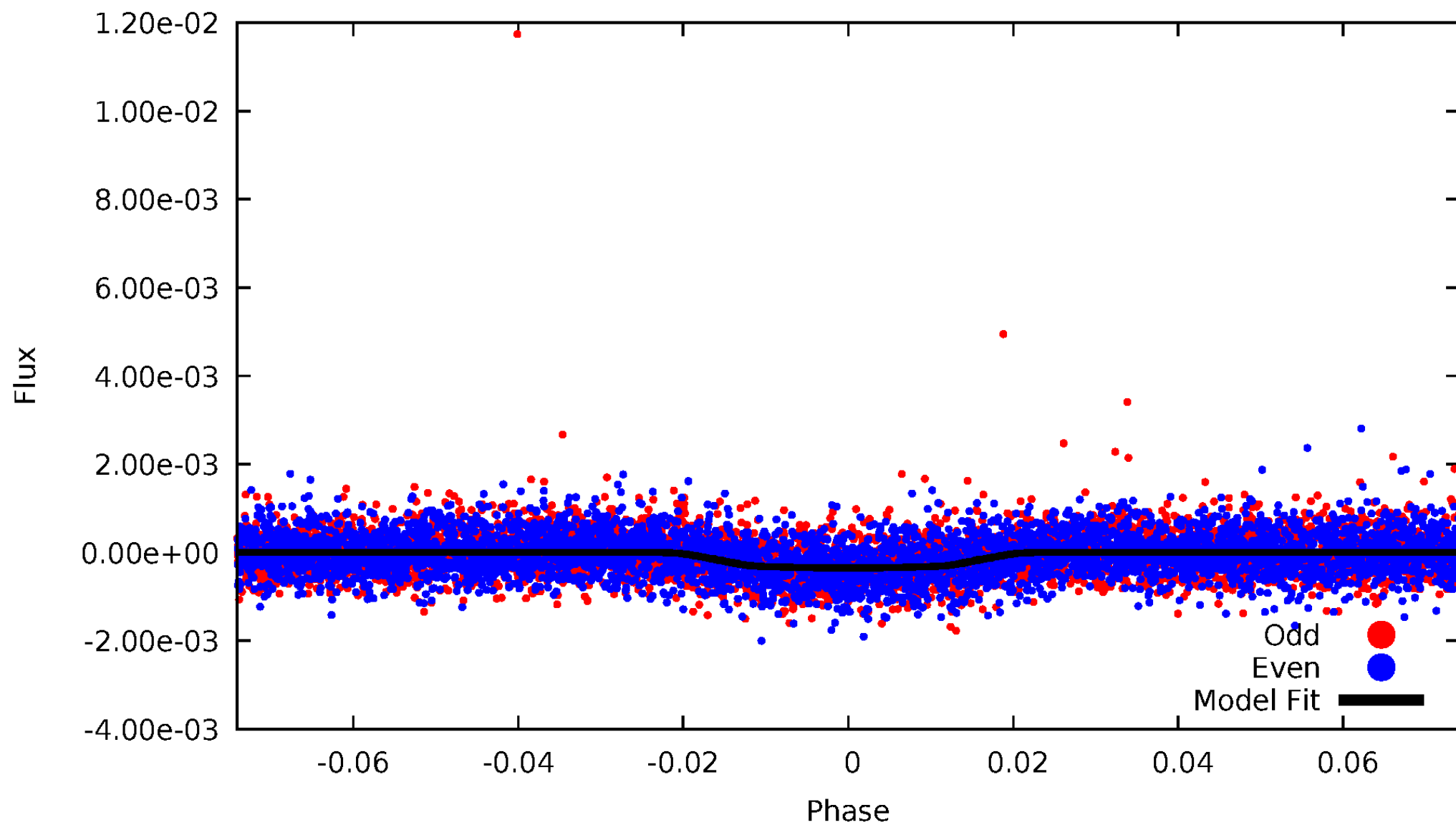


TCE 009892856-01



# DV Odd/Even

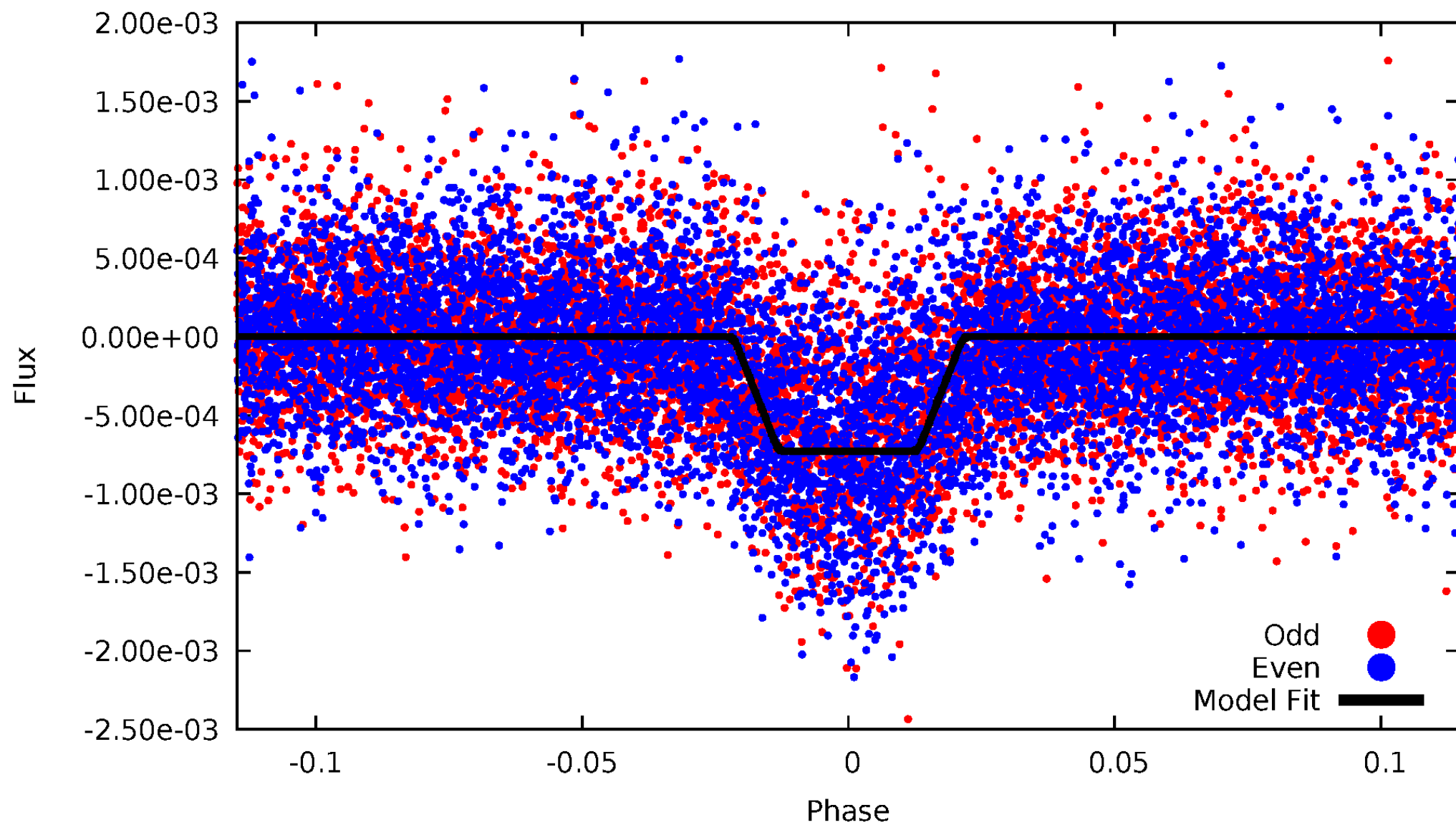
TCE 009892856-01





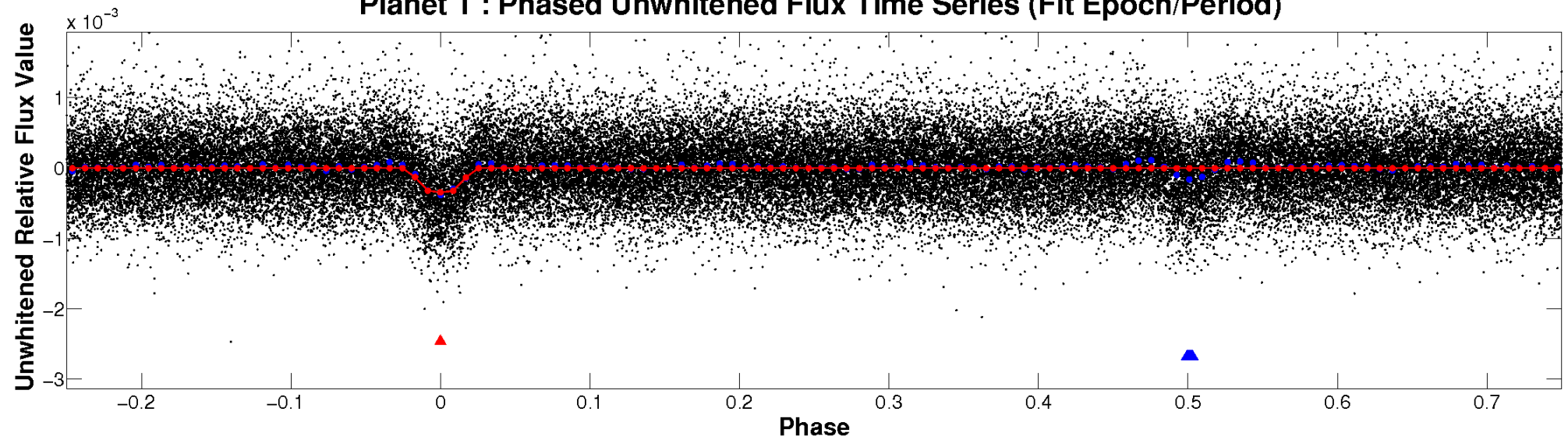
# ALT Odd/Even

TCE 009892856-01

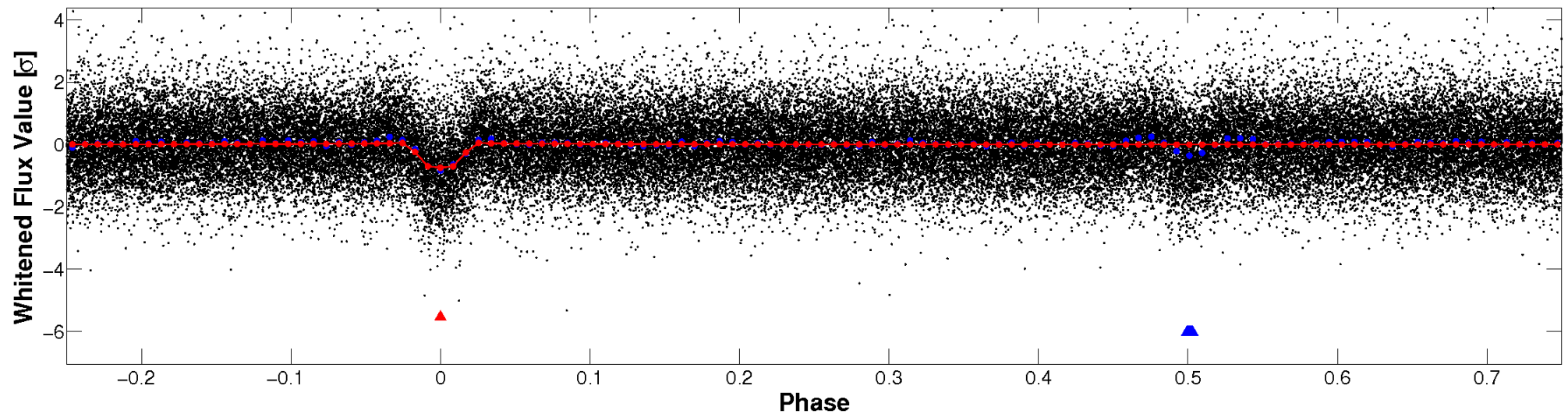


# Non-Whitened Vs. Whitened Light Curve

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

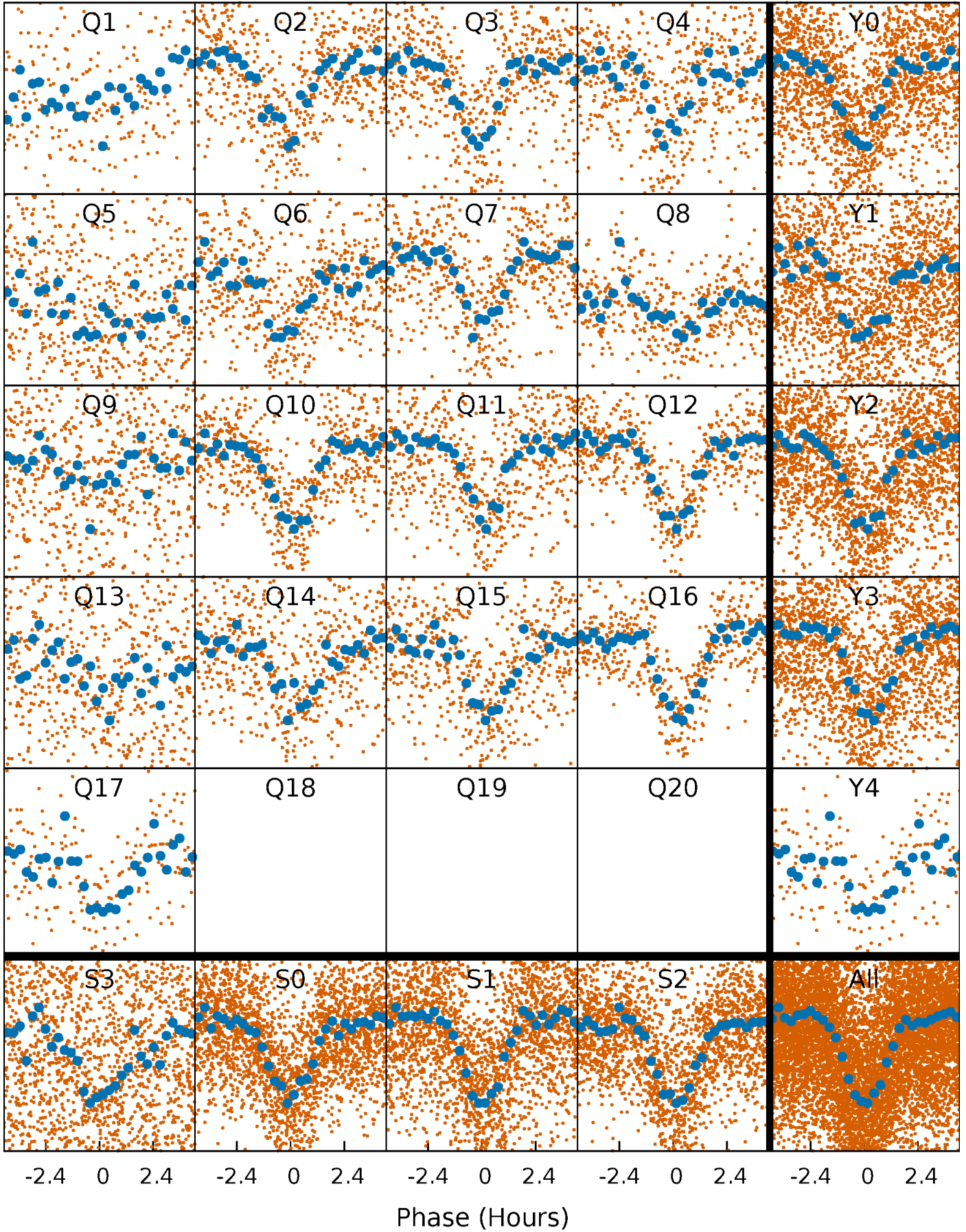


## Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)



# PDC Quarter-Phased Transit Curves

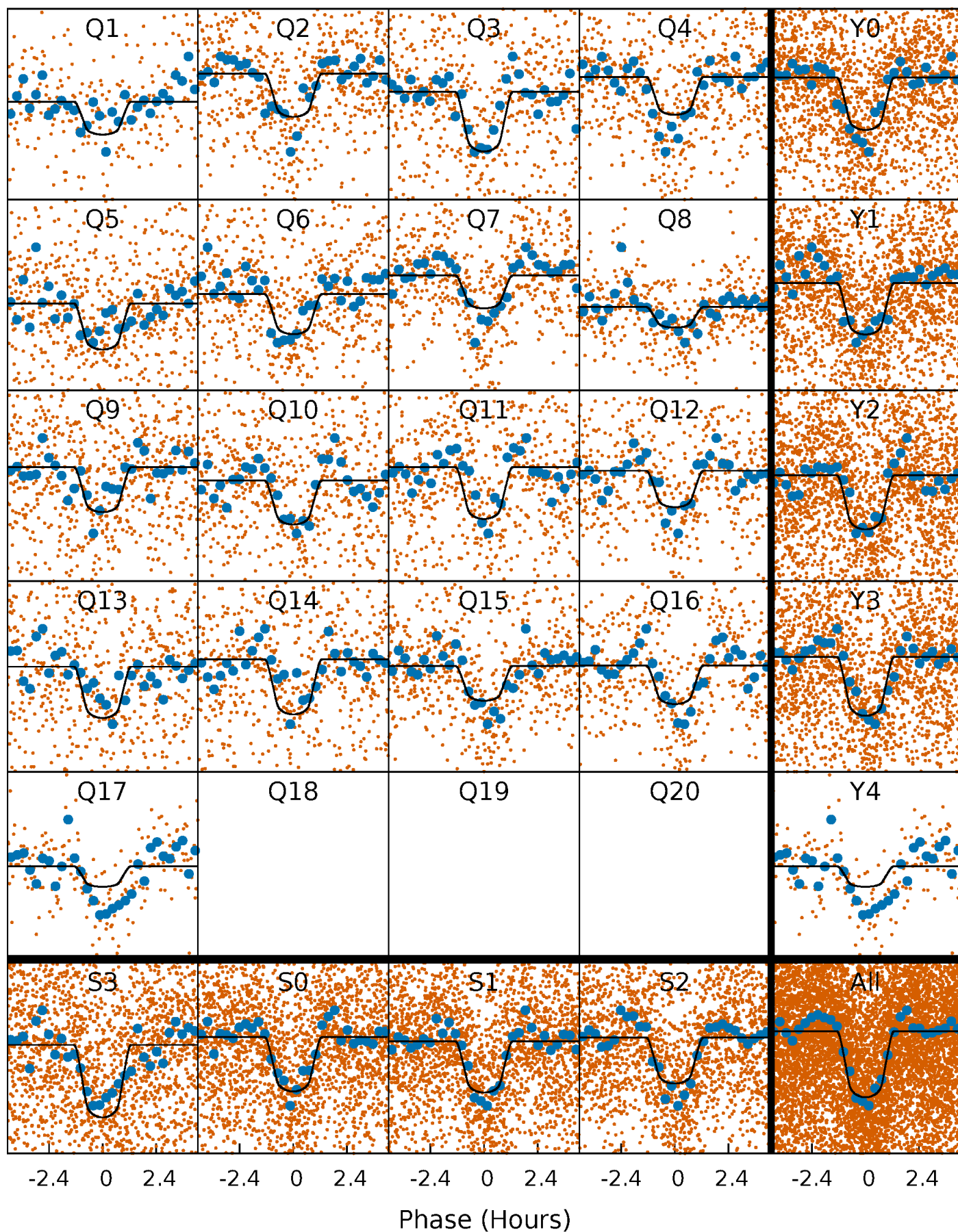
TCE 009892856-01   P= 2.406529 Days    $T_0=133.749294$  (BKJD)





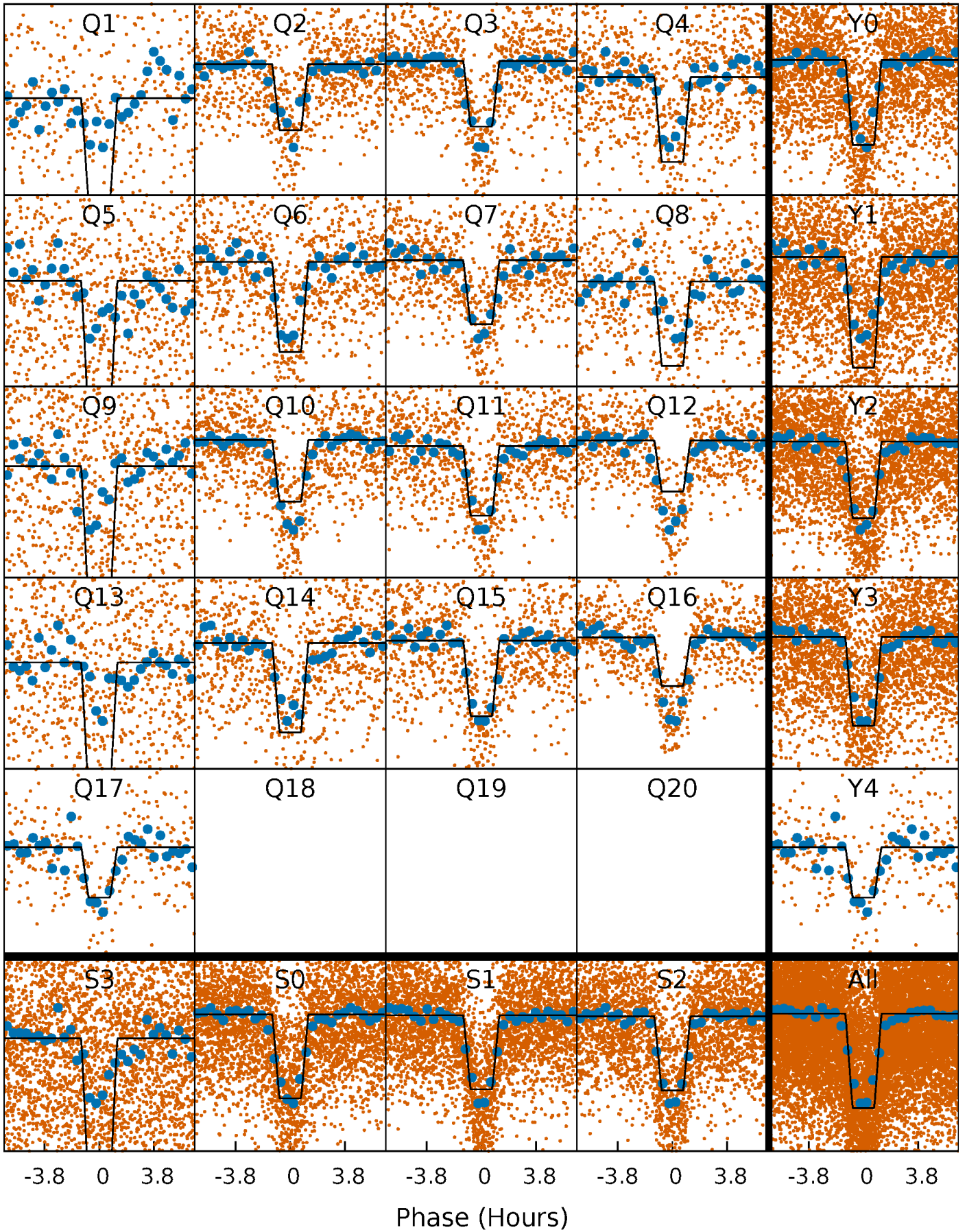
# DV Quarter-Phased Transit Curves

TCE 009892856-01   P= 2.406529 Days    $T_0=133.749294$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

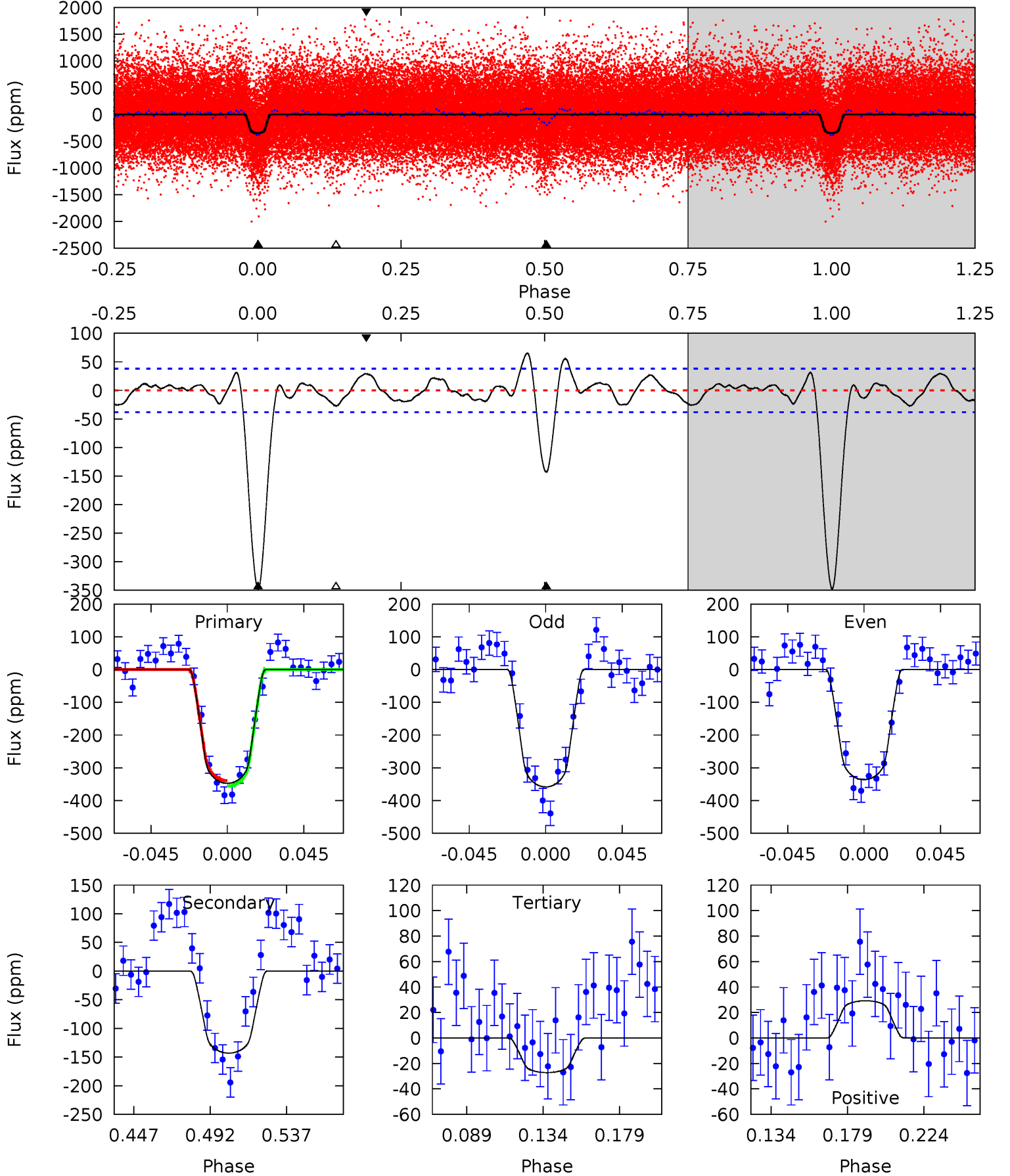
TCE 009892856-01 P= 2.406561 Days  $T_0=133.740833$  (BKJD)



# DV Model-Shift Uniqueness Test

009892856-01, P = 2.406529 Days, E = 131.342765 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
43.1	17.8	3.37	3.63	4.73	2.01	1.71	39.8	39.5	14.4	14.1	1.38	0.97	0.16	1.06

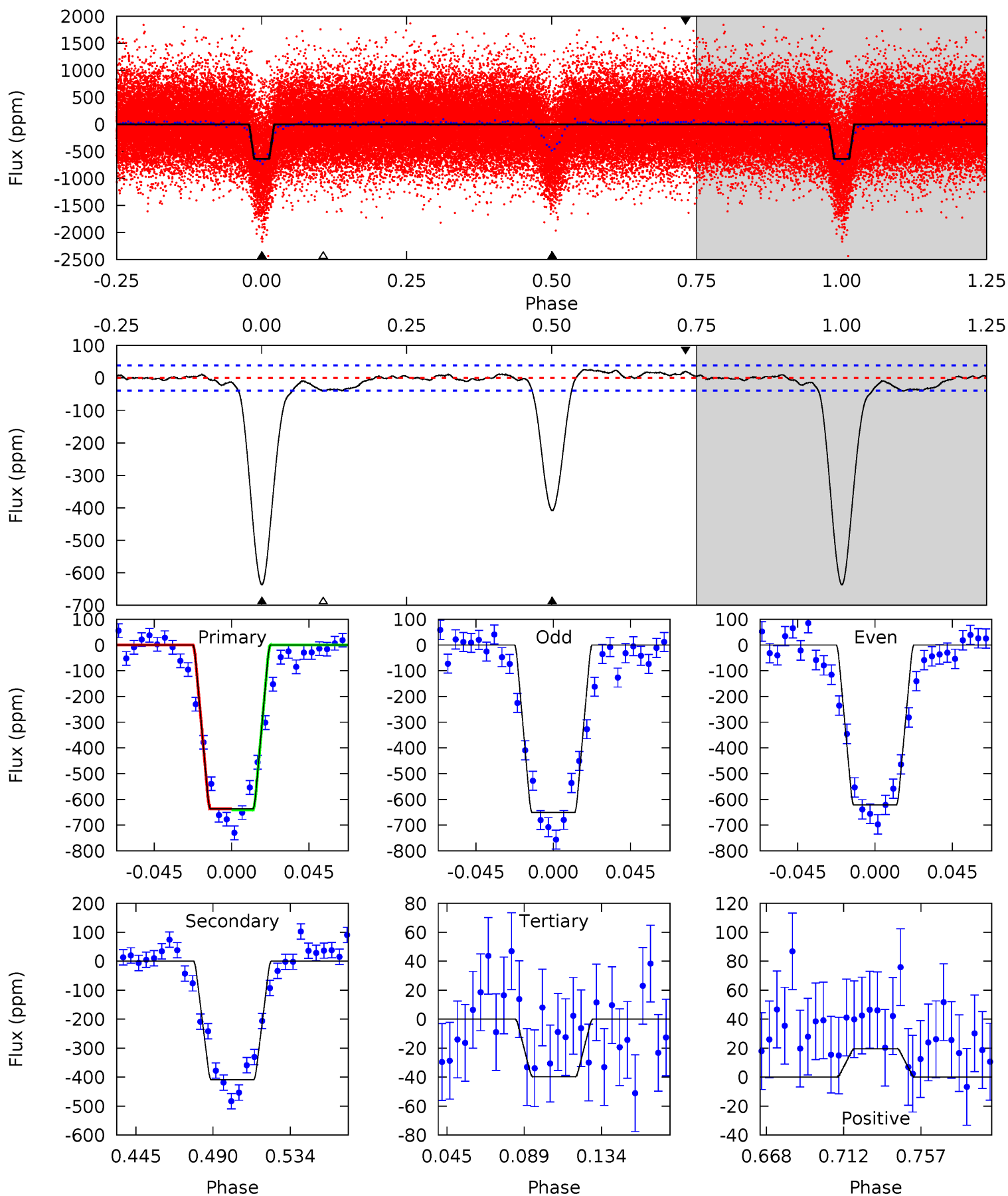




# Alt Model-Shift Uniqueness Test

009892856-01, P = 2.406561 Days, E = 131.334272 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
77.4	49.7	4.83	2.39	4.73	2.01	1.88	72.5	75.0	44.9	47.3	1.76	0.97	0.04	0.19





### Stellar Parameters For KIC 009892856

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R$ ( $R_{\odot}$ )	$M$ ( $M_{\odot}$ )	$p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ )
	$6167^{+169}_{-253}$	$4.428^{+0.052}_{-0.208}$	$0.210^{+0.200}_{-0.350}$	$1.107^{+0.350}_{-0.125}$	$1.200^{+0.147}_{-0.164}$	$1.246^{+0.357}_{-0.658}$
	+3%/-4%	+1%/-5%	+95%/-167%	+32%/-11%	+12%/-14%	+29%/-53%
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 009892856-01 / KOI 3906.01

Detrend	Depth (ppm)	$R_p$ ( $R_{\oplus}$ )	$T_{max}$ (K)	$T_{obs}$ (K)	$A_{obs}$
DV	$-143 \pm 8$	$2.57^{+0.55}_{-0.46}$	$2115^{+166}_{-113}$	$4817^{+404}_{-314}$	$17^{+7}_{-6}$
Alt.	$-409 \pm 8$	$3.41^{+0.66}_{-0.51}$	$2117^{+143}_{-120}$	$5334^{+361}_{-304}$	$26^{+10}_{-7}$

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

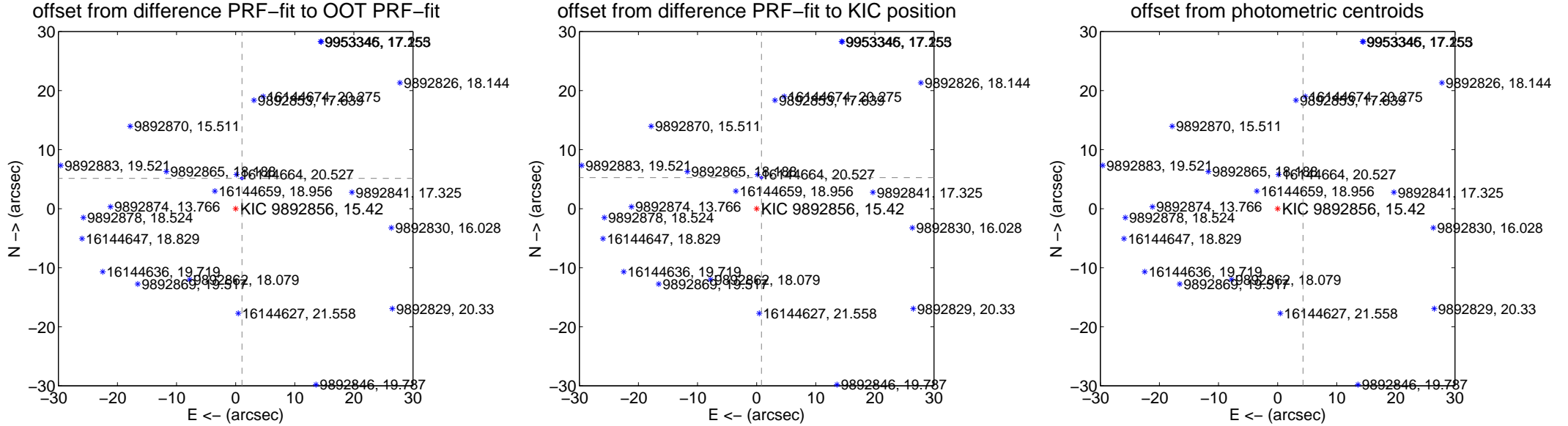
## DV Centroid Data

Supplemental centroid analysis for 009892856-01. Kepler magnitude: 15.42. Transit SNR 29.71

There are 17 quarters with good PRF difference image offsets

The direct PRF centroid is offset from the target star catalog position by about 0.14 arcsec

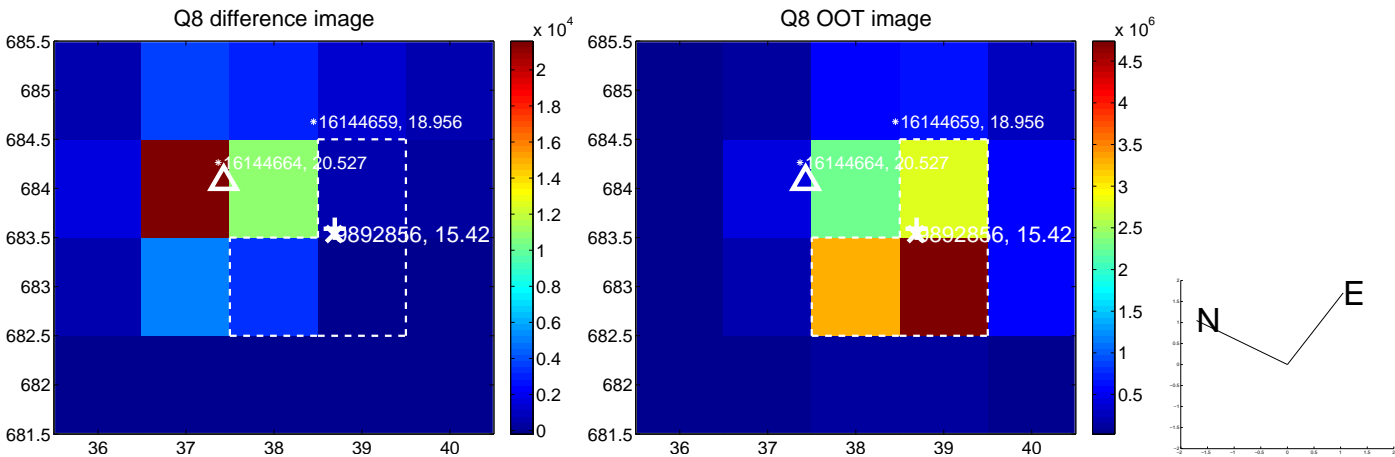
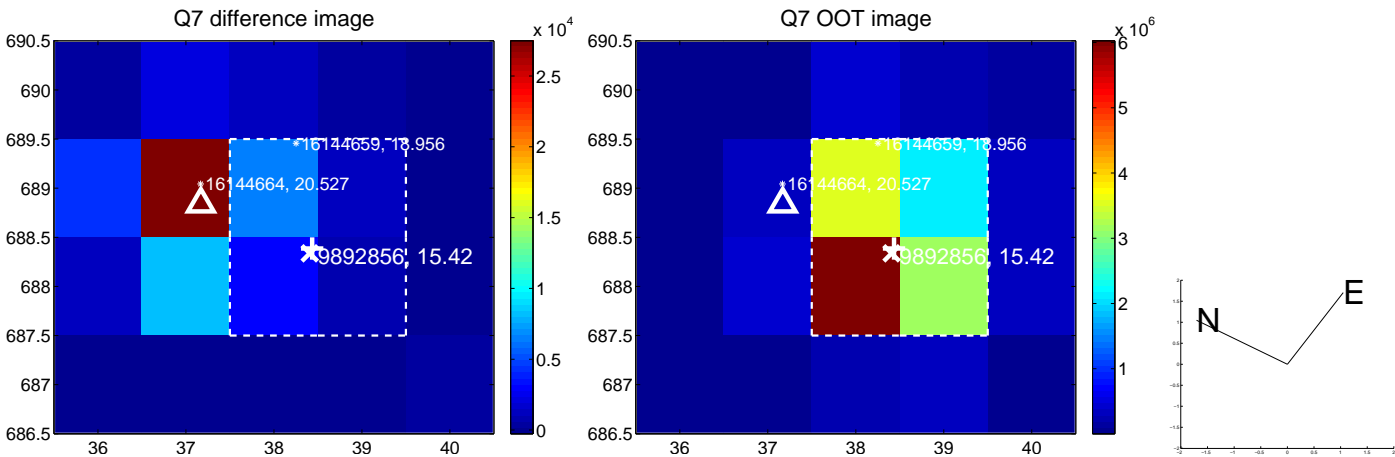
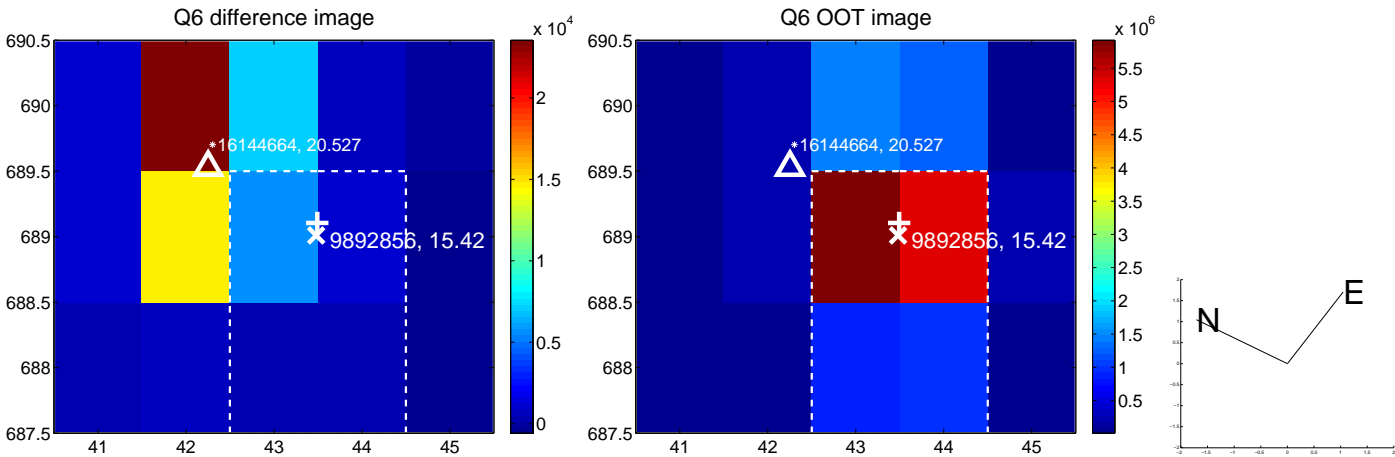
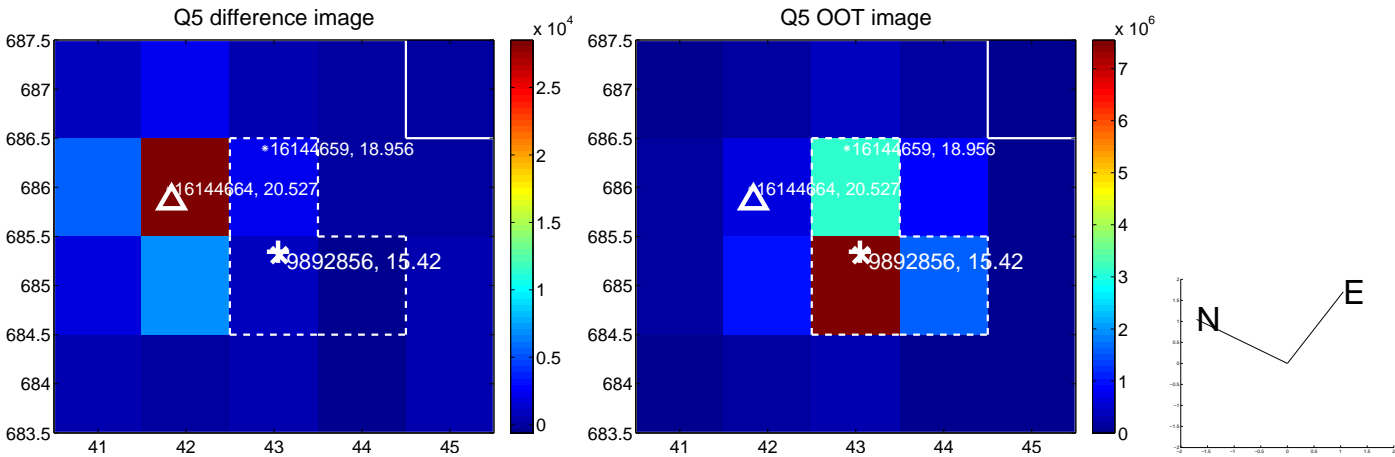
	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$5.248 \pm 0.071$	74.27	$-1.076 \pm 0.075$	$5.136 \pm 0.070$
PRF-fit source offset from KIC position	$5.322 \pm 0.069$	77.67	$-0.816 \pm 0.068$	$5.259 \pm 0.069$
photometric centroid source offset	$36.07 \pm 0.50$	72.32	$-4.30 \pm 0.43$	$35.81 \pm 0.50$



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.

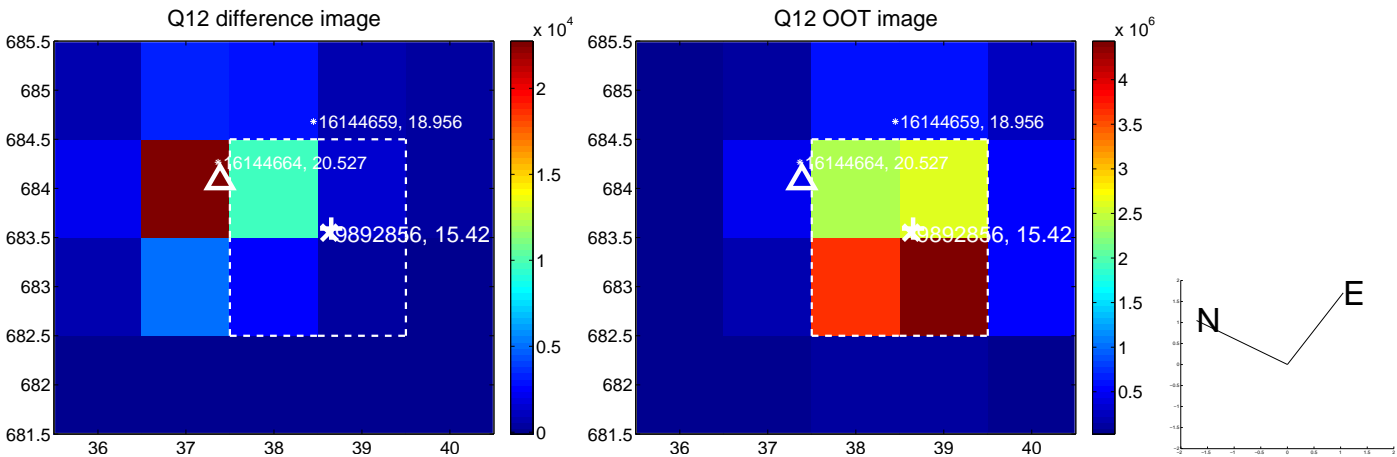
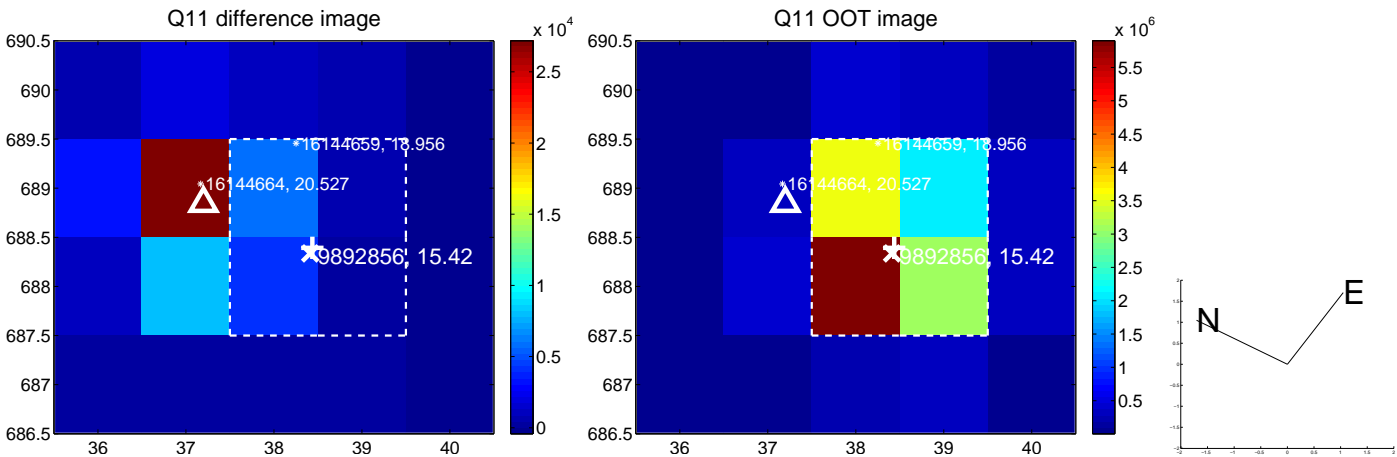
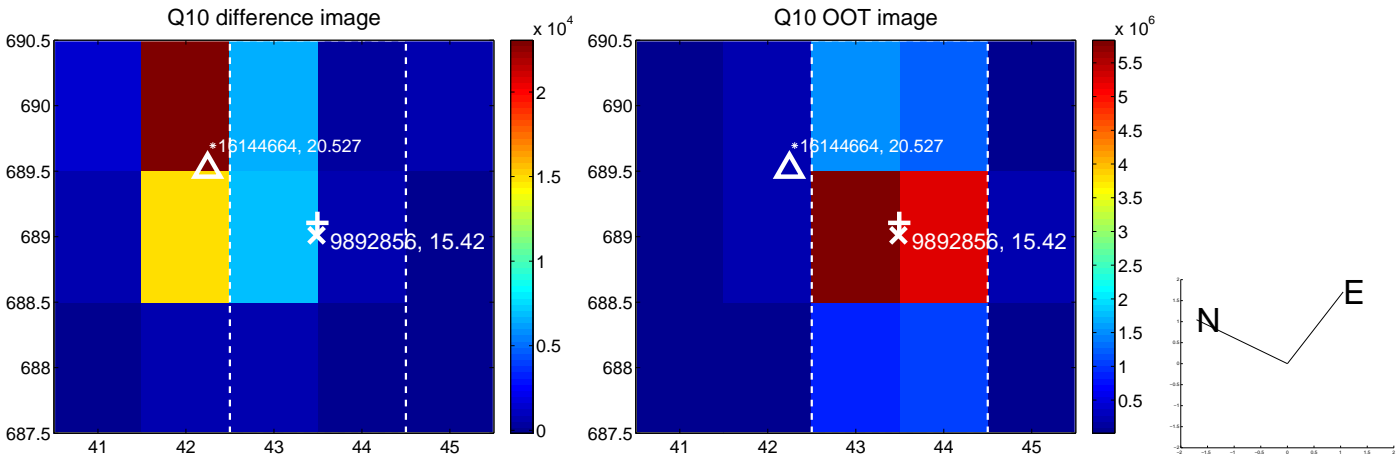
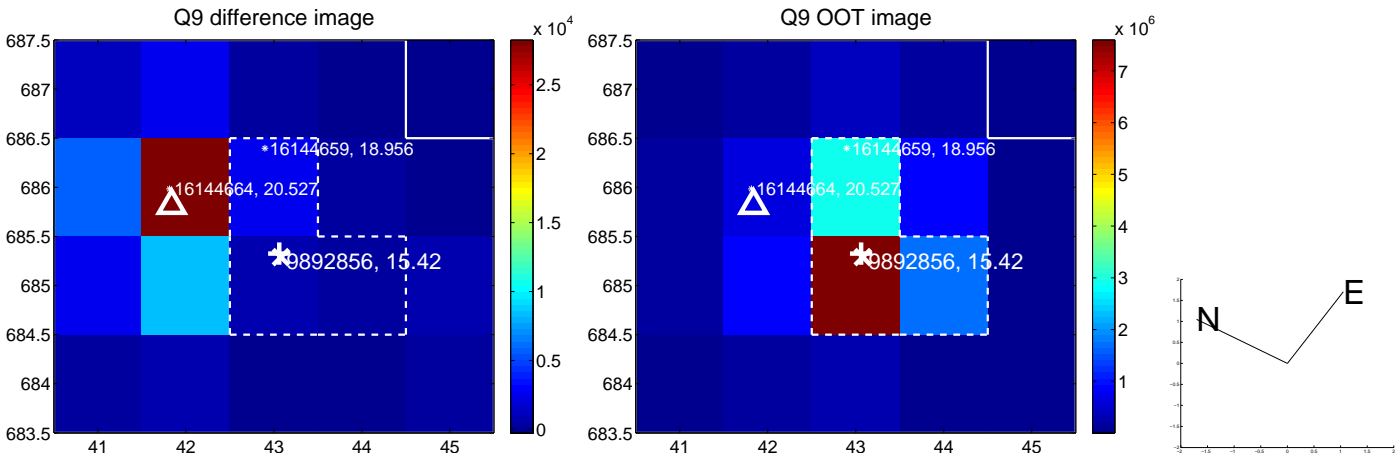


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



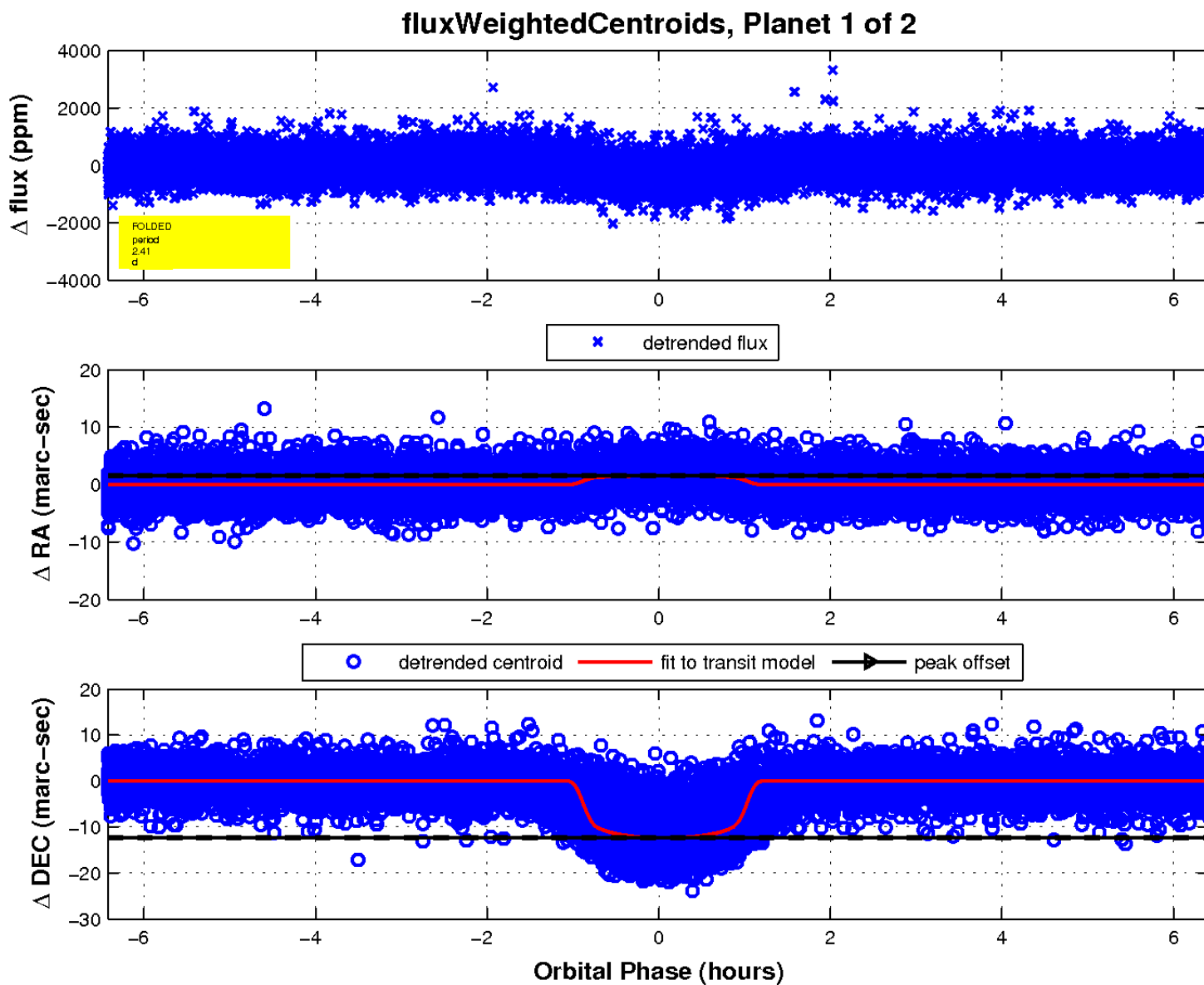
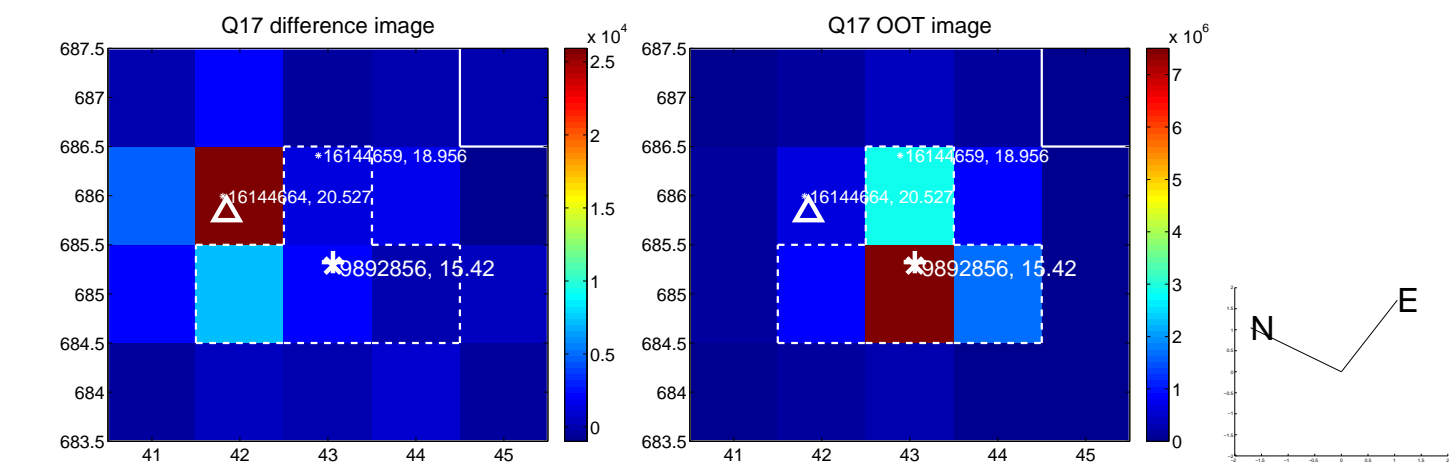


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



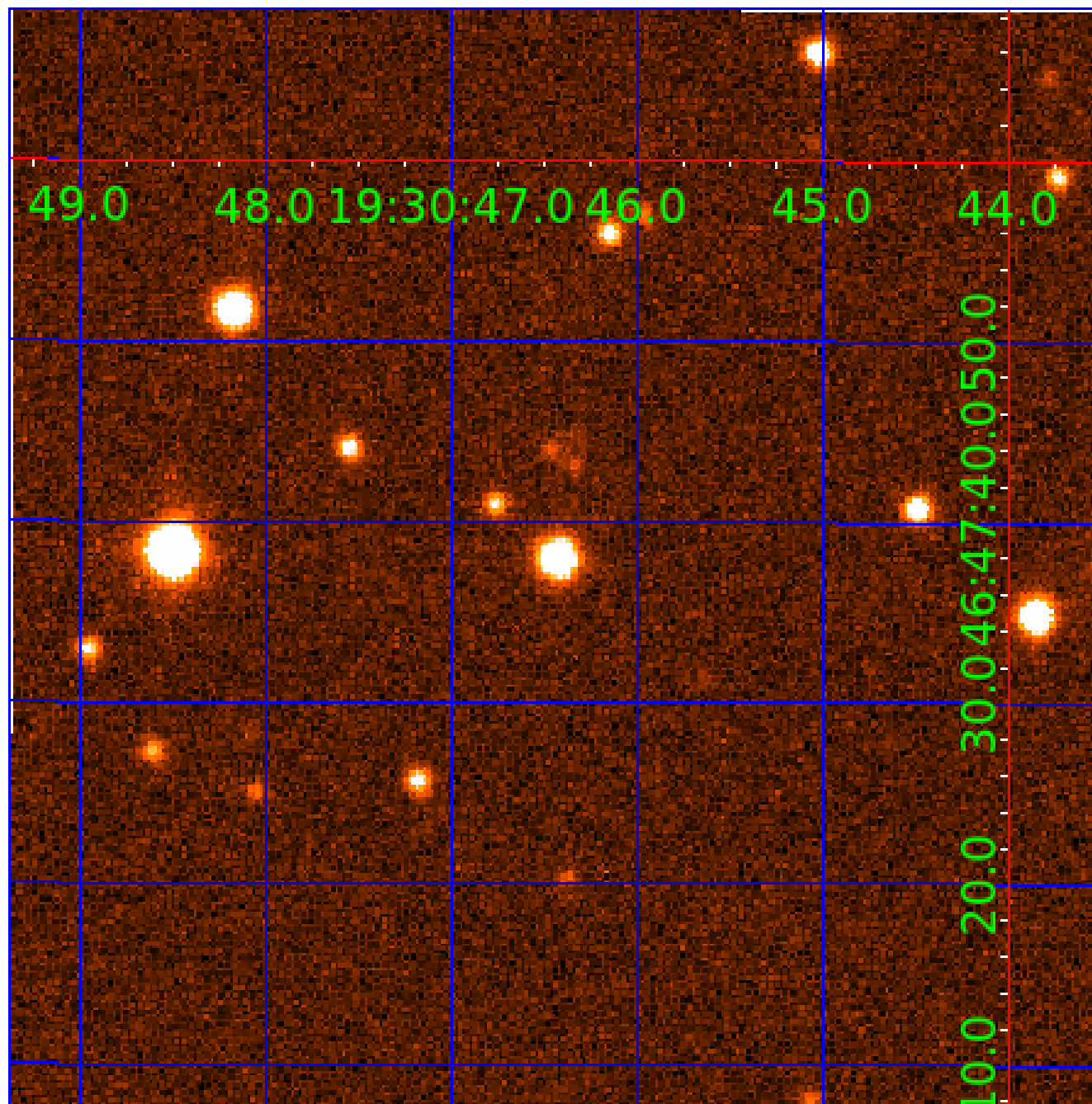


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination





# KIC 009892856

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
009892856-01	OBS	3906.01	2.406529	133.749294	346.9	2.139	28.5	29.7	1.11	6167	2.44	1139.64
009892856-02	OBS	No	2.406513	132.553757	165.0	1.446	12.8	12.3	1.11	6167	1.69	1139.65

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009892856-01	OBS	FP	0.00	0	1	1	0	MOD_SEC_DV—MOD_SEC_ALT—HAS_SEC_TCE—CENT_RESOLVED_OFFSET
009892856-02	OBS	FP	0.00	1	1	1	0	IS_SEC_TCE—CENT_RESOLVED_OFFSET—HALO_GHOST

**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.

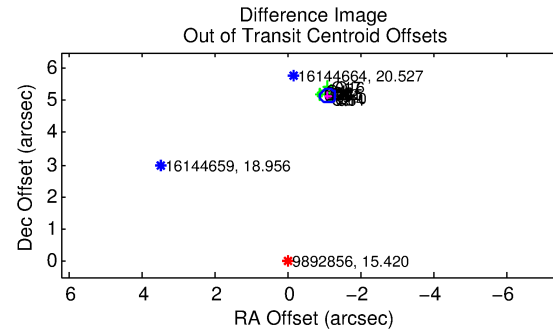
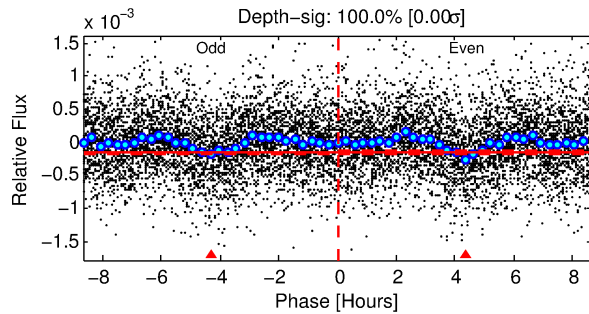
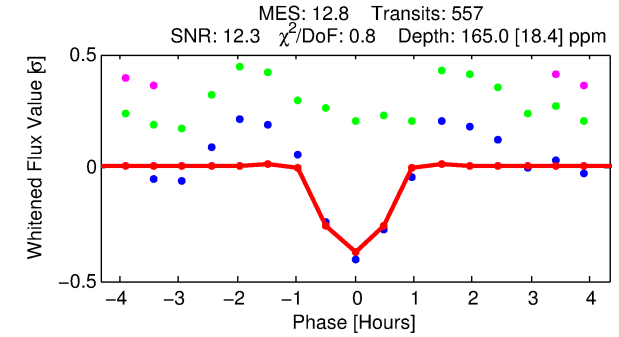
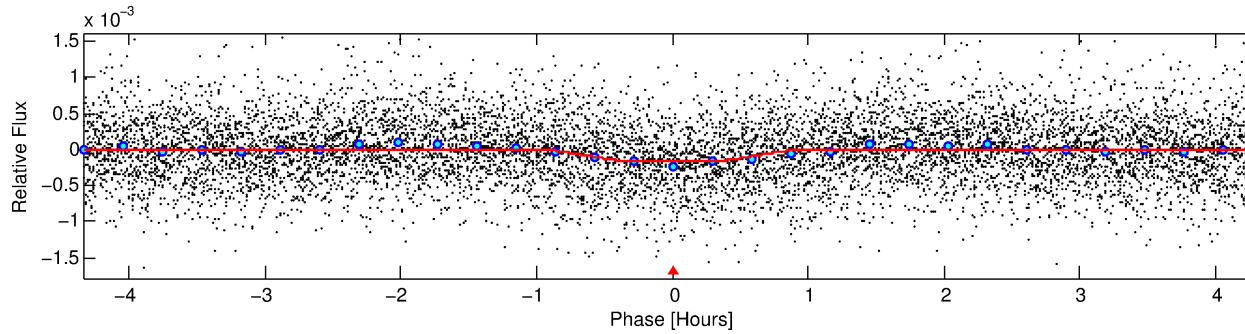
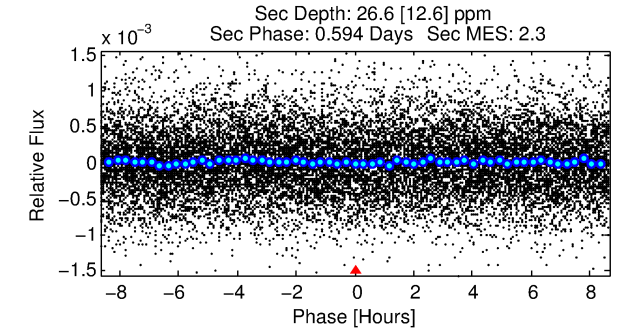
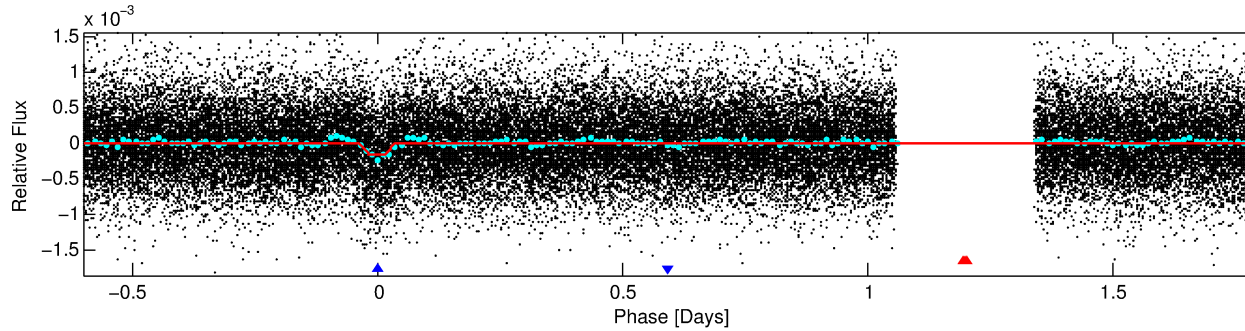
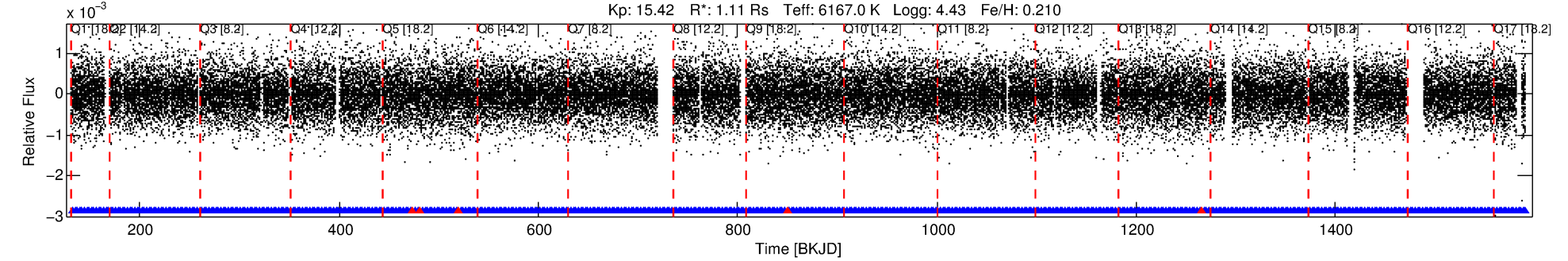
## Ephemeris Match Information For 009892856-02

No Significant Match Found

# DV One-Page Summary

KIC: 9892856 Candidate: 2 of 2 Period: 2.407 d  
KOI: K03906 Corr: No Ephemeris Match

Kp: 15.42 R\*: 1.11 Rs Teff: 6167.0 K Logg: 4.43 Fe/H: 0.210



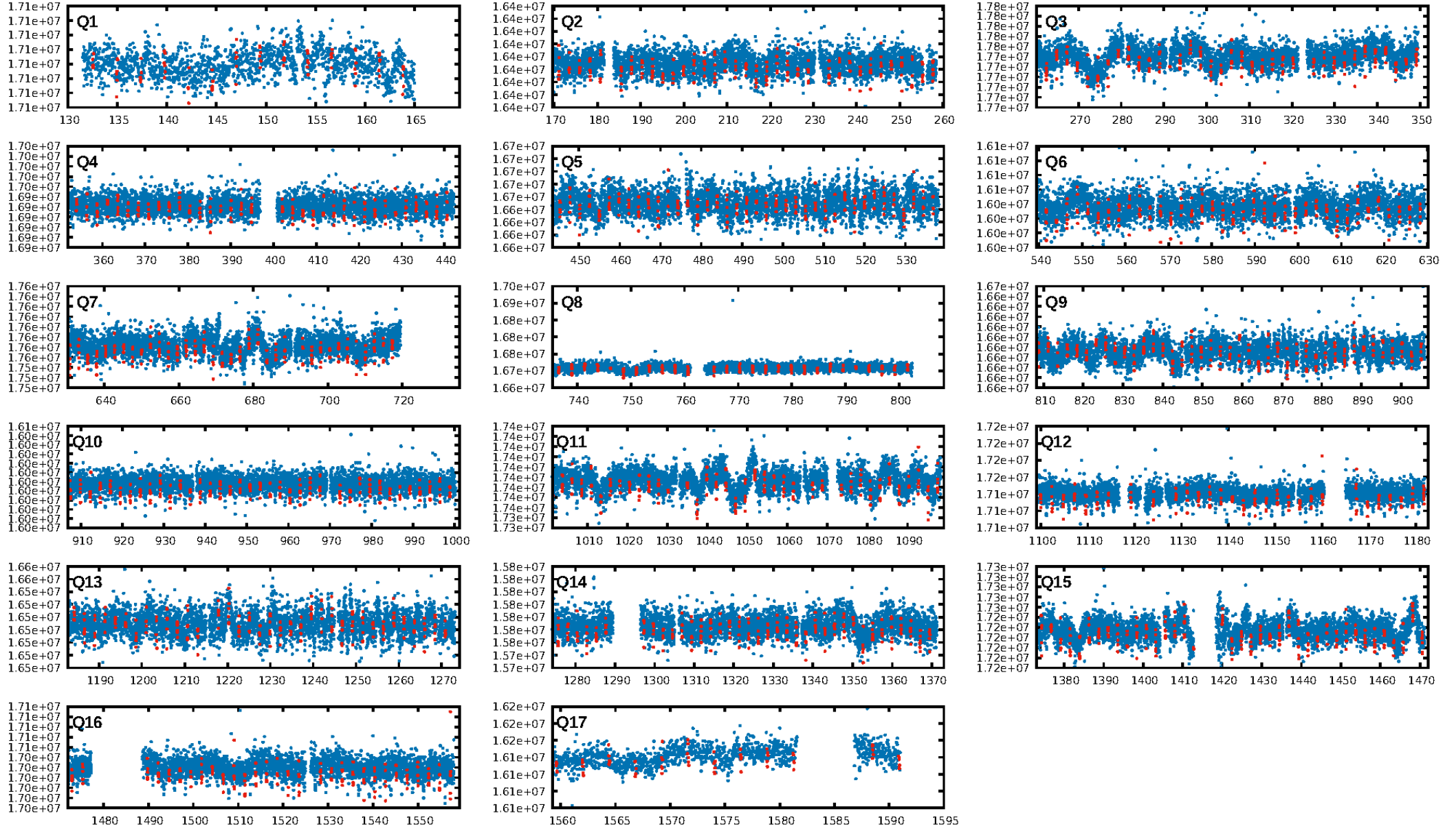
## DV Fit Results:

Period = 2.40651 [0.00001] d  
Epoch = 132.5538 [0.0020] BKJD  
Rp/R\* = 0.0139 [0.0084]  
a/R\* = 6.01 [18.12]  
b = 0.90 [0.67]  
Seff = 1139.65 [474.43]  
Teq = 1482 [154] K  
Rp = 1.68 [1.15] Re  
a = 0.0373 [0.0099] AU  
Ag = 7.17 [9.73] [0.63σ]  
Teffp = 3749 [1229] K [1.83σ]

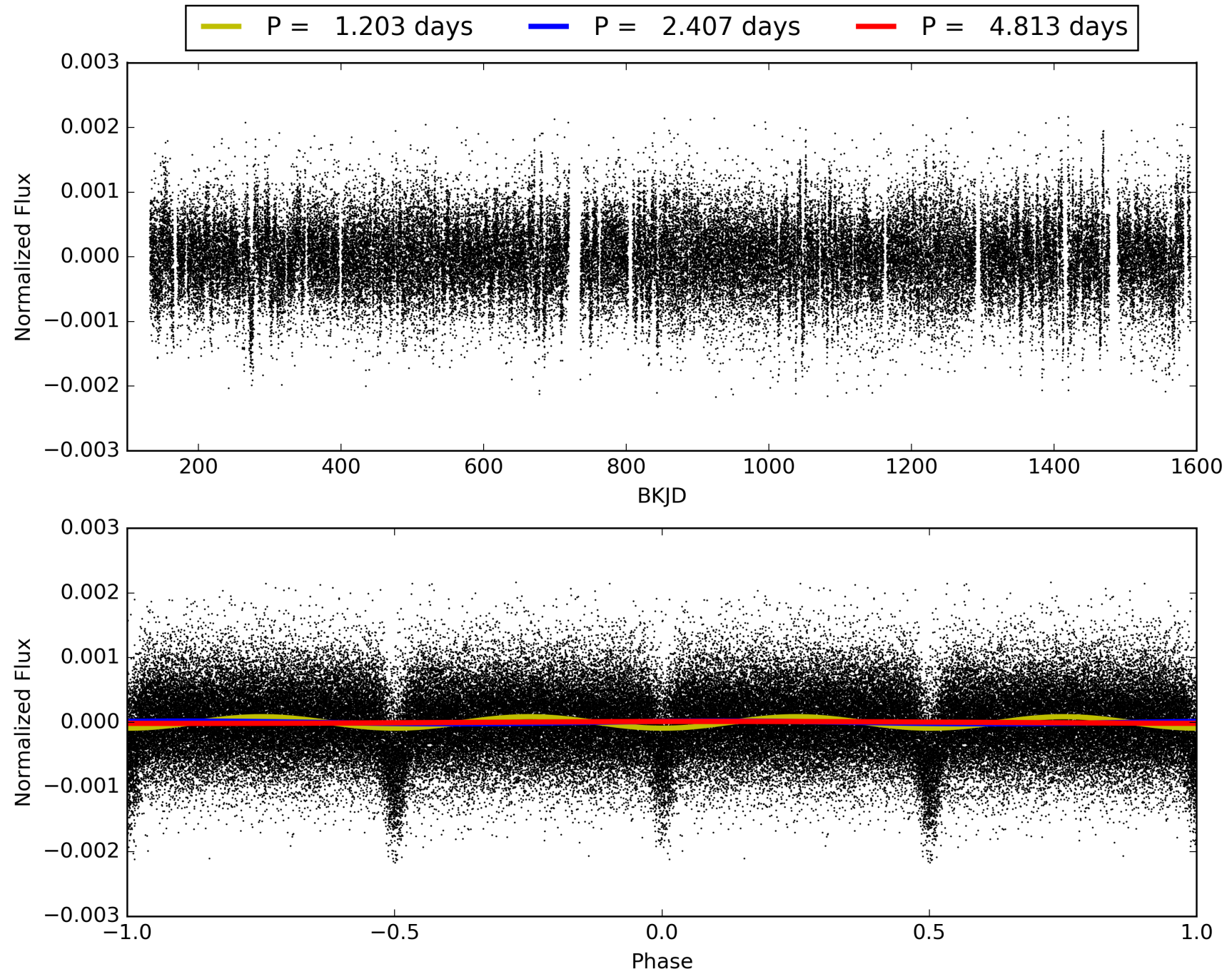
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 0.0% [0.00σ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: 9.32e-37  
RollingBand-fgt: 0.99 [526/531]  
GhostDiagnostic-chr: -0.1777  
Centroid-sig: 0.0%  
Centroid-so: 67.040 arcsec [55.21σ]  
OotOffset-rm: 5.261 arcsec [71.80σ]  
KicOffset-rm: 5.320 arcsec [74.70σ]  
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 009892856-02, PDC Light Curves



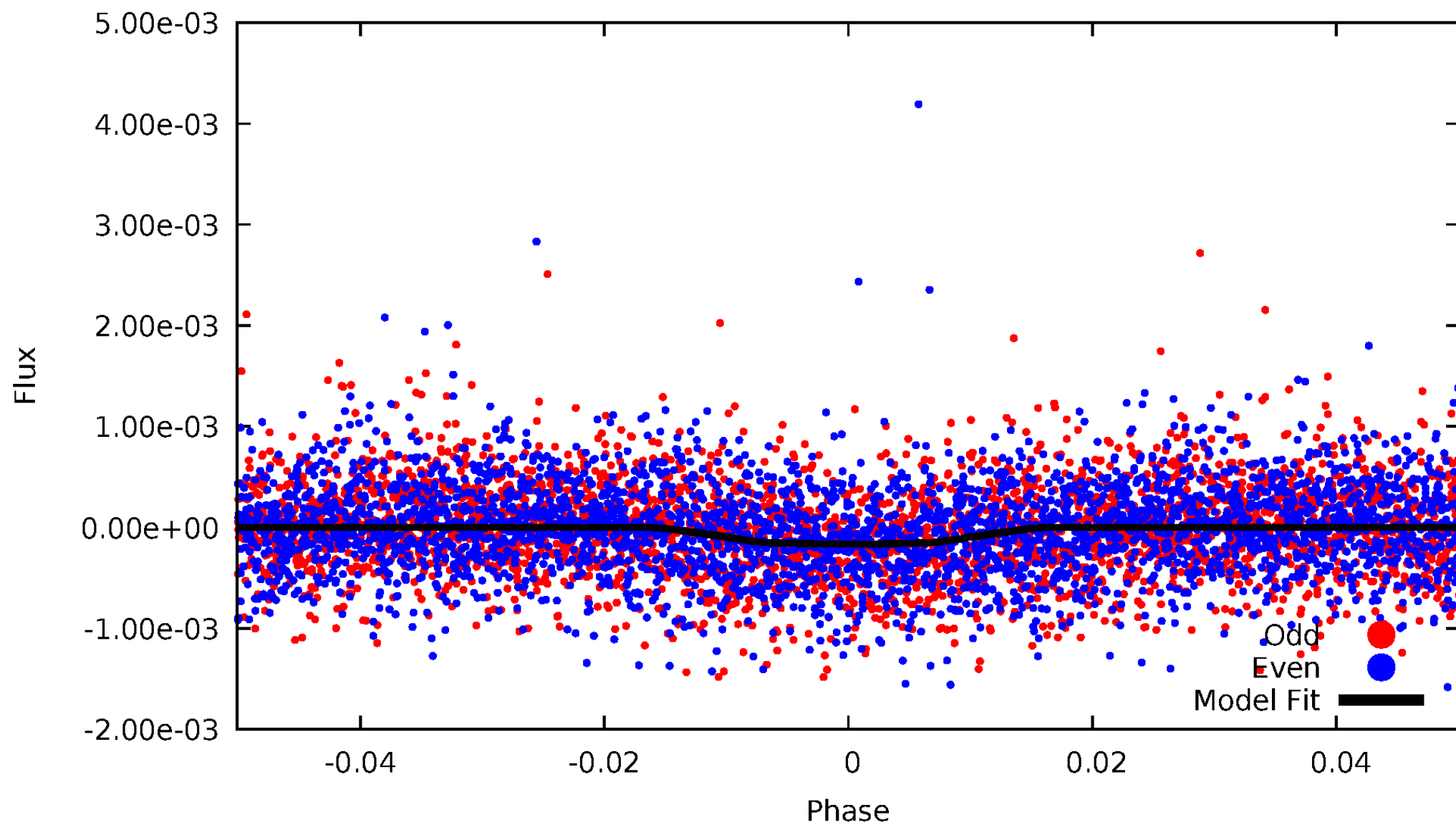
TCE 009892856-02





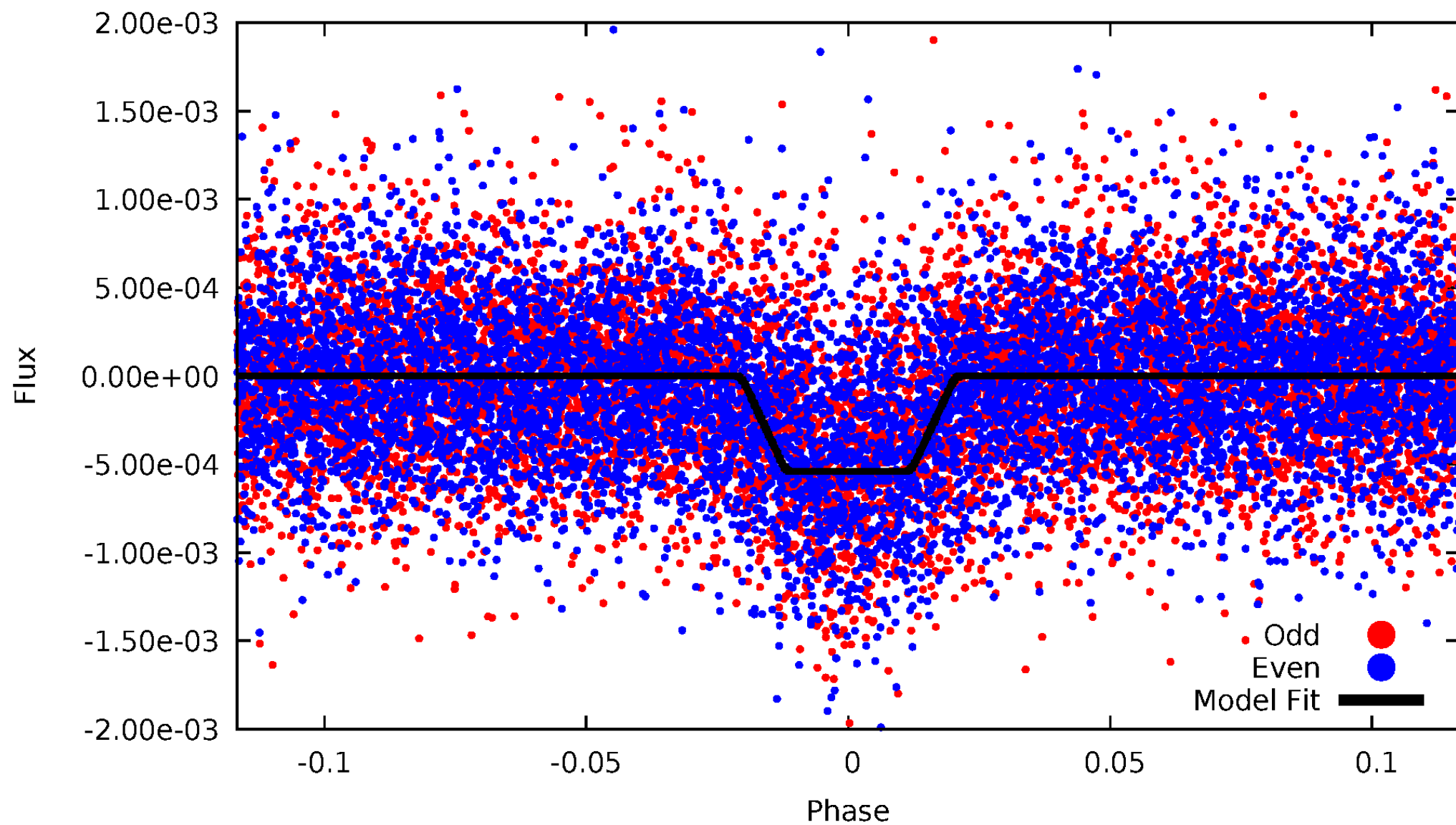
# DV Odd/Even

TCE 009892856-02



# ALT Odd/Even

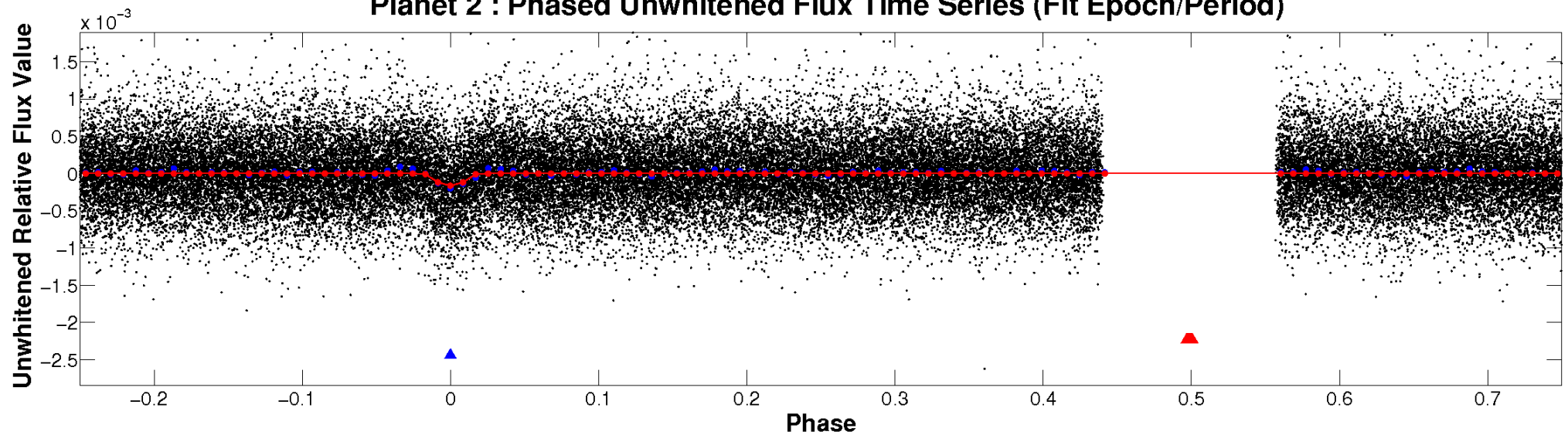
TCE 009892856-02



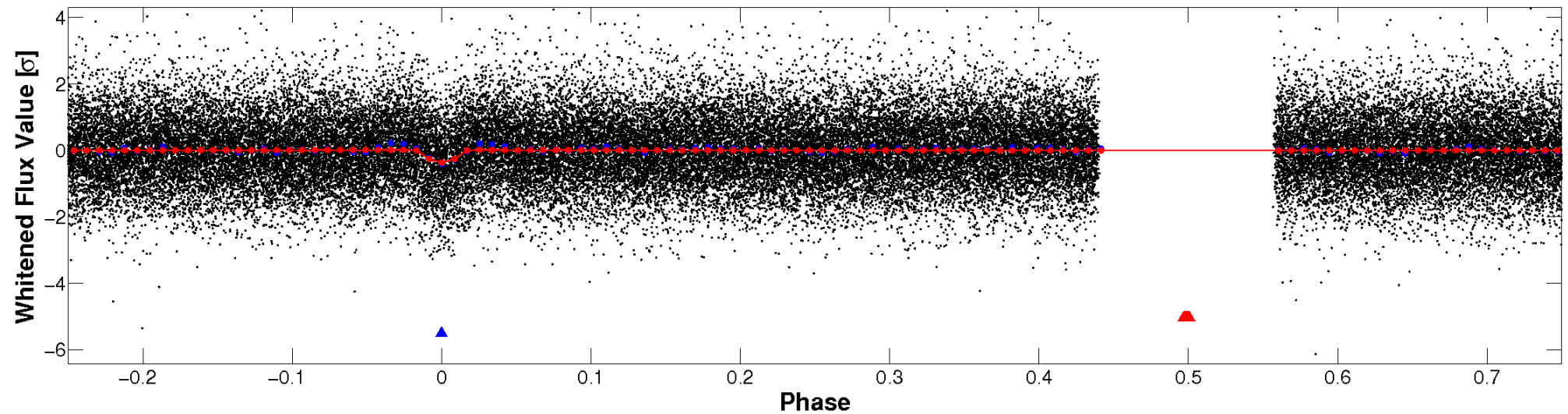


# Non-Whitened Vs. Whitened Light Curve

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

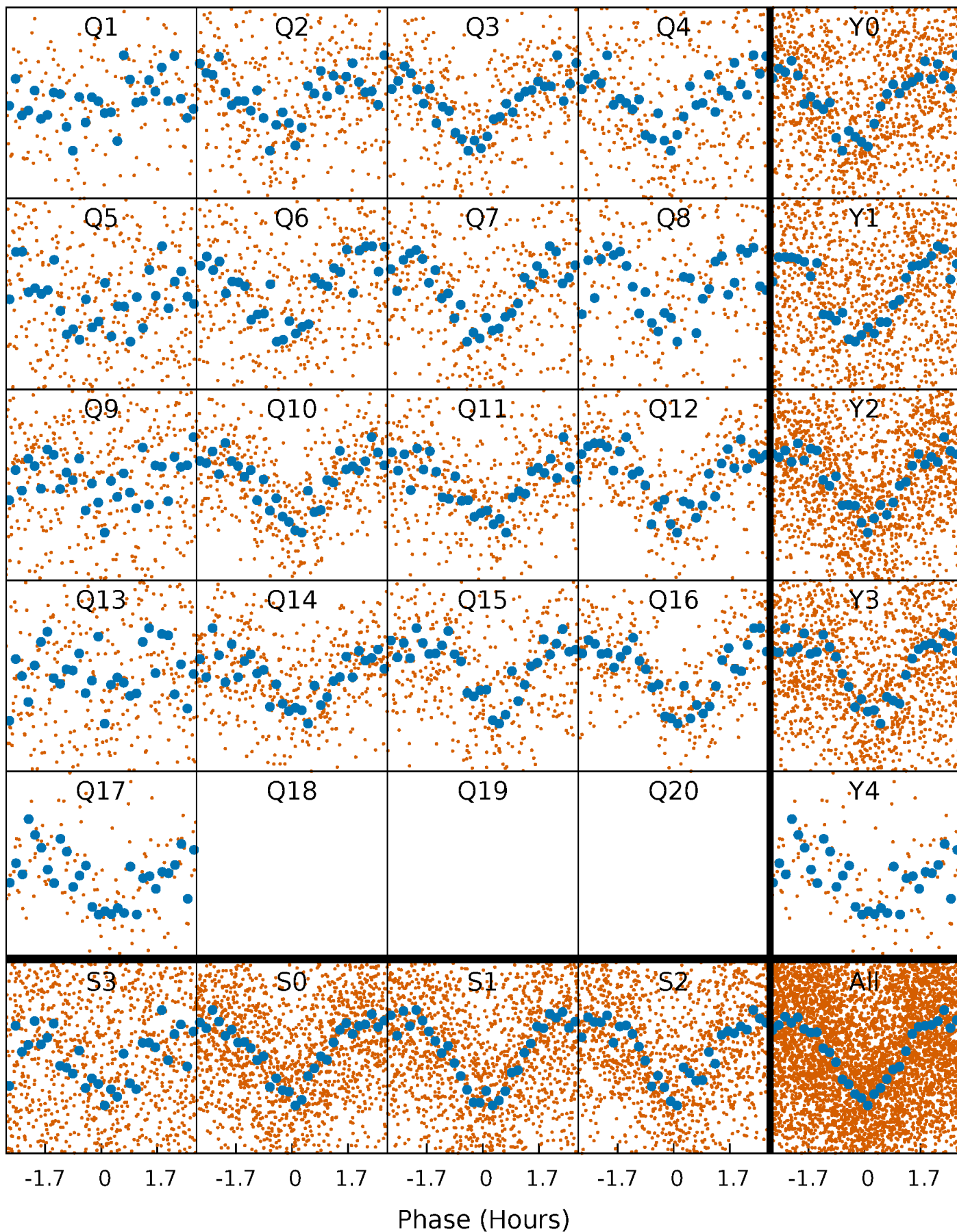


## Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



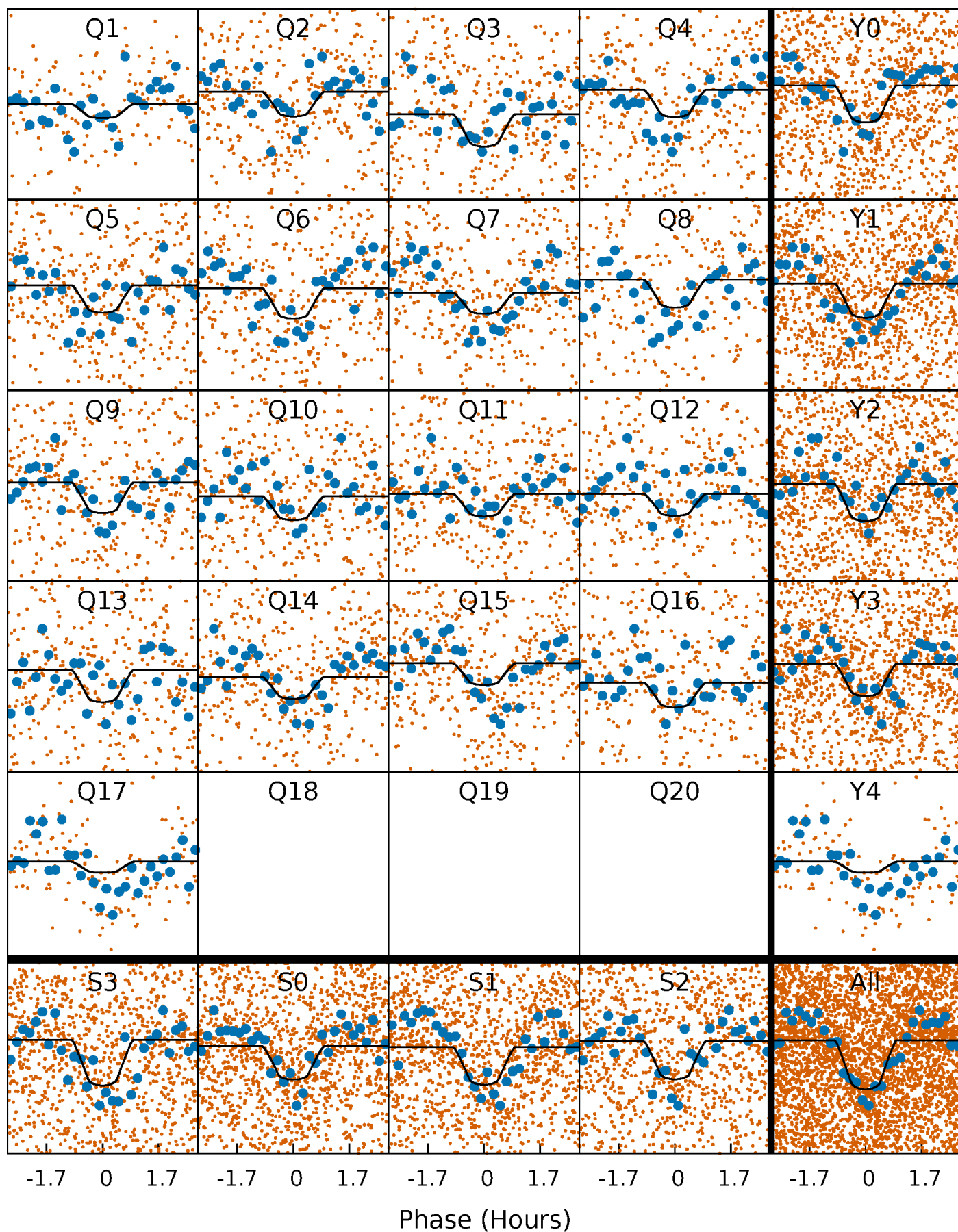
# PDC Quarter-Phased Transit Curves

TCE 009892856-02   P= 2.406513 Days    $T_0=132.553757$  (BKJD)



# DV Quarter-Phased Transit Curves

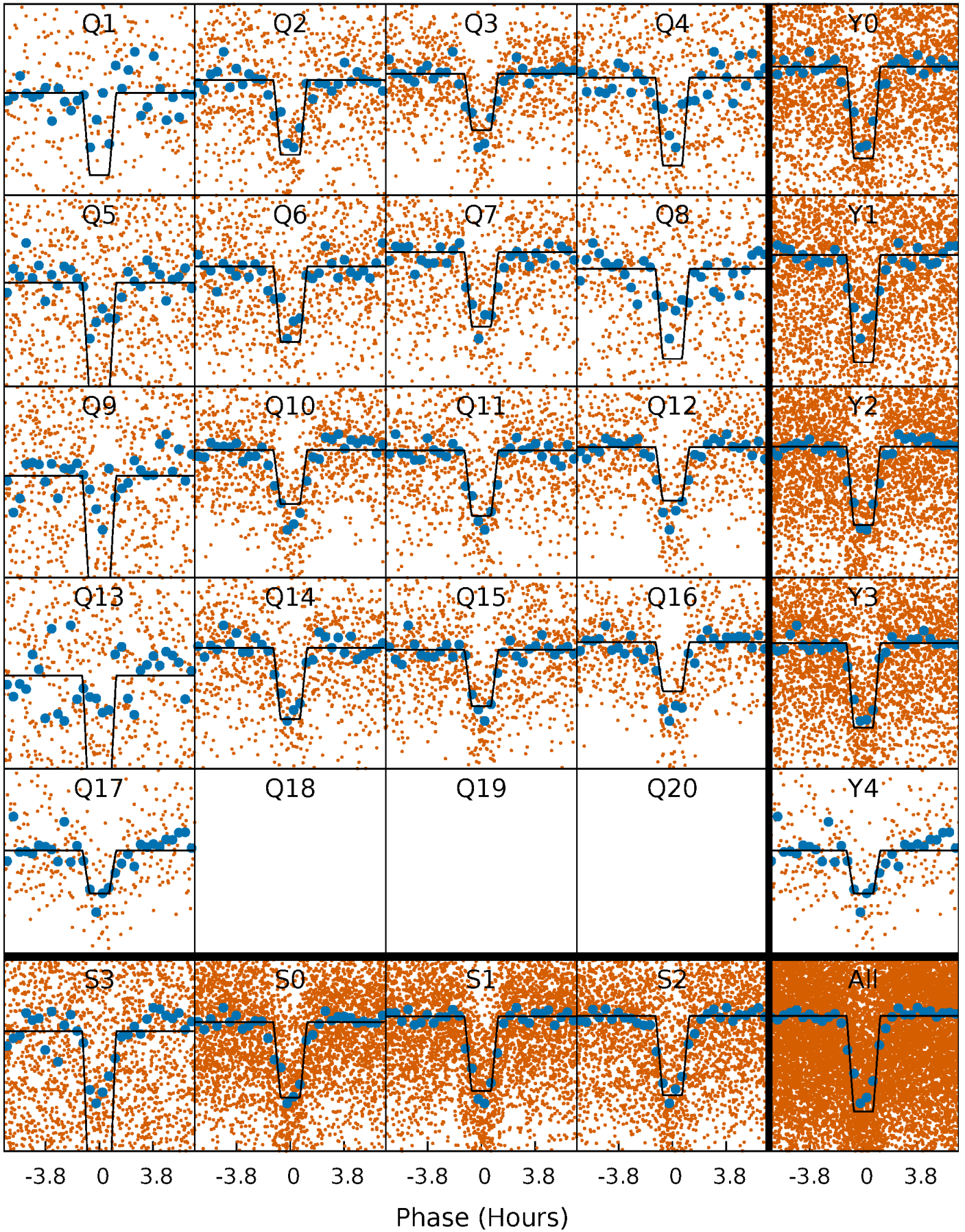
TCE 009892856-02   P= 2.406513 Days    $T_0=132.553757$  (BKJD)





# Alt. Detrend Quarter-Phased Transit Curves

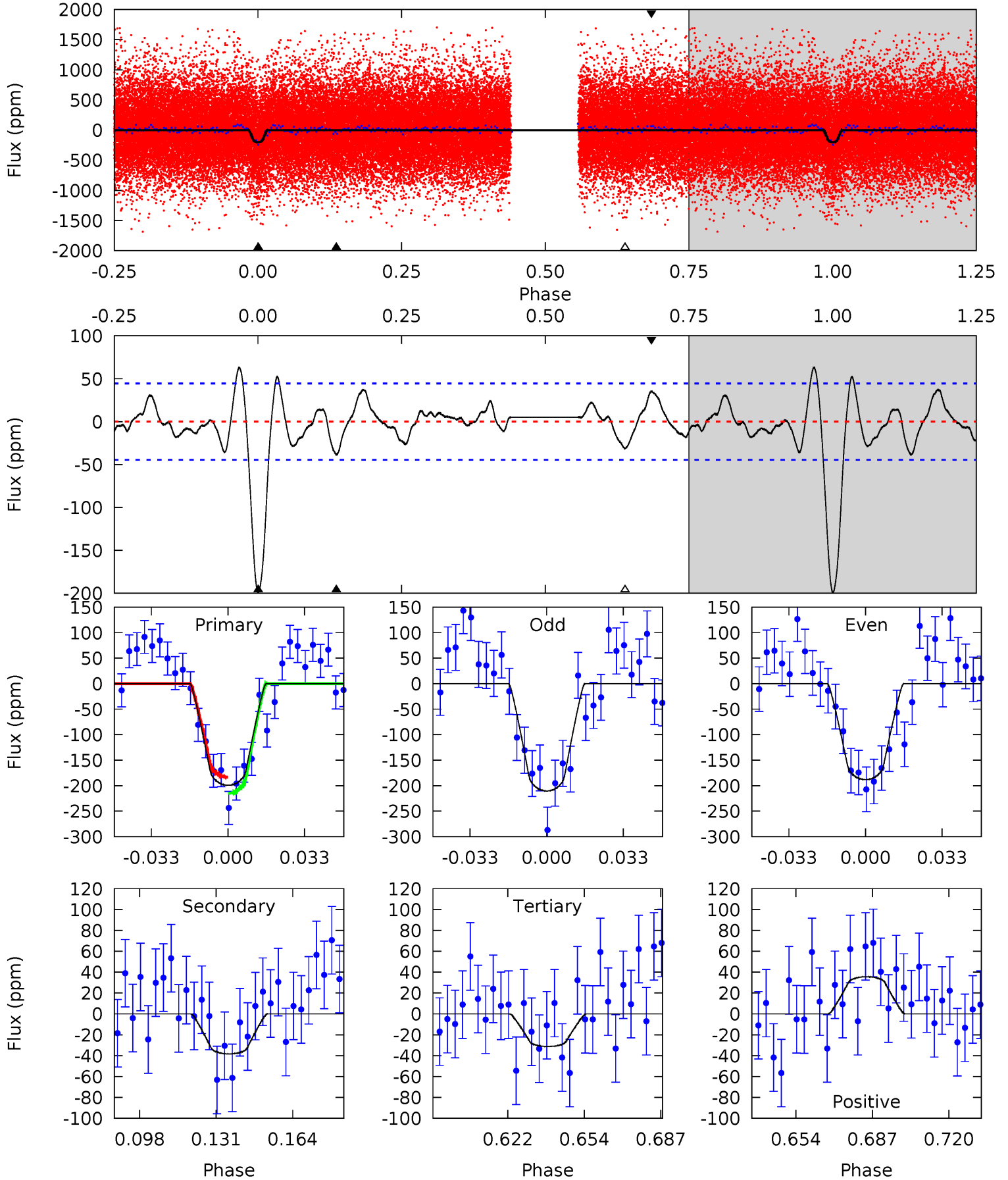
TCE 009892856-02   P= 2.406569 Days    $T_0=132.536548$  (BKJD)



# DV Model-Shift Uniqueness Test

009892856-02, P = 2.406513 Days, E = 130.147244 Days

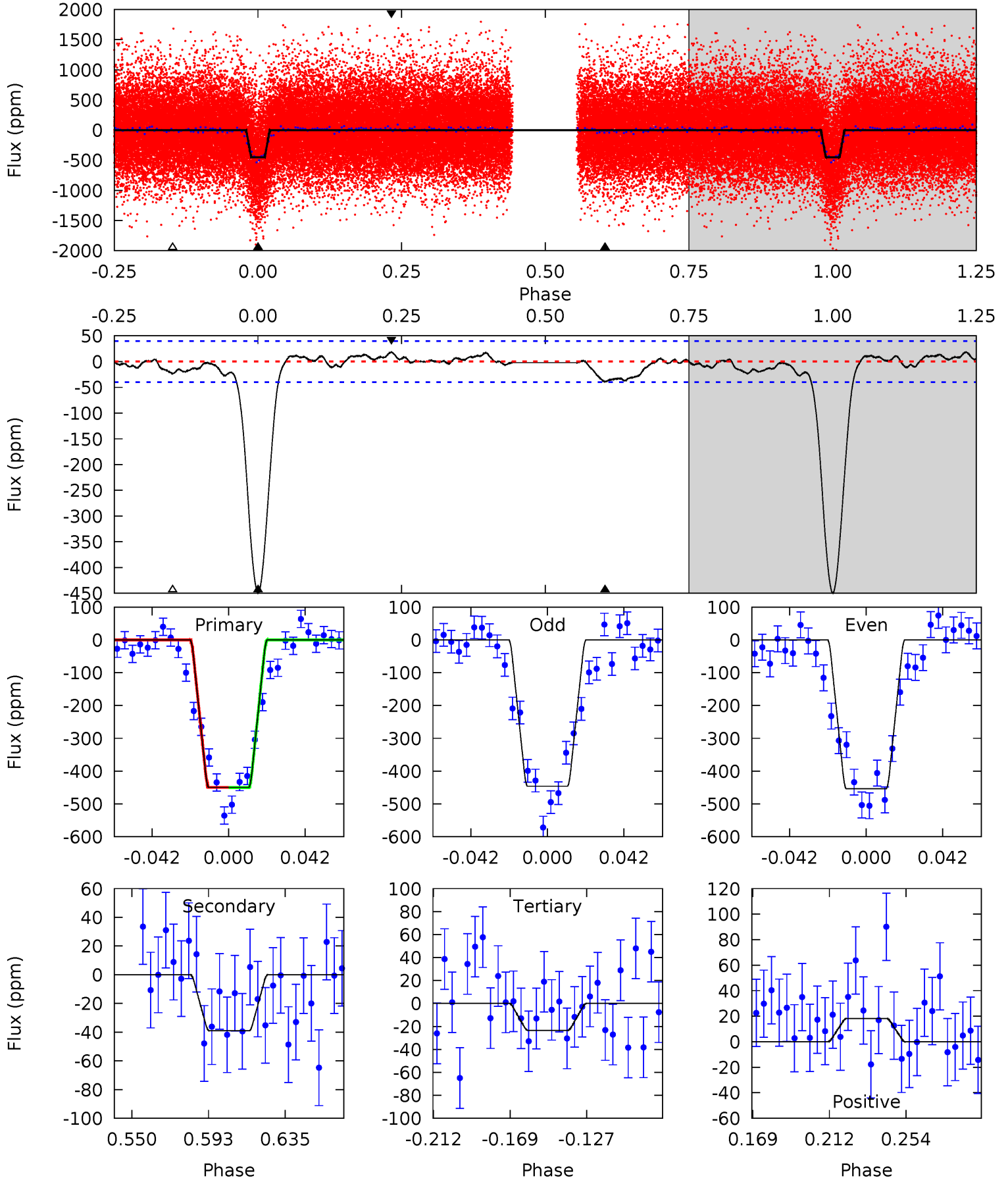
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
21.4	4.13	3.36	3.83	4.79	2.14	1.80	18.1	17.6	0.77	0.30	1.21	1.04	0.24	1.70



# Alt Model-Shift Uniqueness Test

009892856-02, P = 2.406569 Days, E = 130.129979 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
53.4	4.64	2.78	2.17	4.74	2.03	1.27	50.7	51.3	1.86	2.47	0.45	0.98	0.04	0.01





### Stellar Parameters For KIC 009892856

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$6167^{+169}_{-253}$	$4.428^{+0.052}_{-0.208}$	$0.210^{+0.200}_{-0.350}$	$1.107^{+0.350}_{-0.125}$	$1.200^{+0.147}_{-0.164}$	$1.246^{+0.357}_{-0.658}$
	+3%/-4%	+1%/-5%	+95%/-167%	+32%/-11%	+12%/-14%	+29%/-53%
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 009892856-02 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-38 \pm 9$	$1.82^{+1.11}_{-0.99}$	$2113^{+159}_{-121}$	$4274^{+1650}_{-714}$	$8.870^{+33.517}_{-5.712}$
Alt.	$-39 \pm 8$	$2.98^{+1.19}_{-1.14}$	$2113^{+152}_{-109}$	$3552^{+622}_{-425}$	$3.293^{+4.947}_{-1.724}$

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

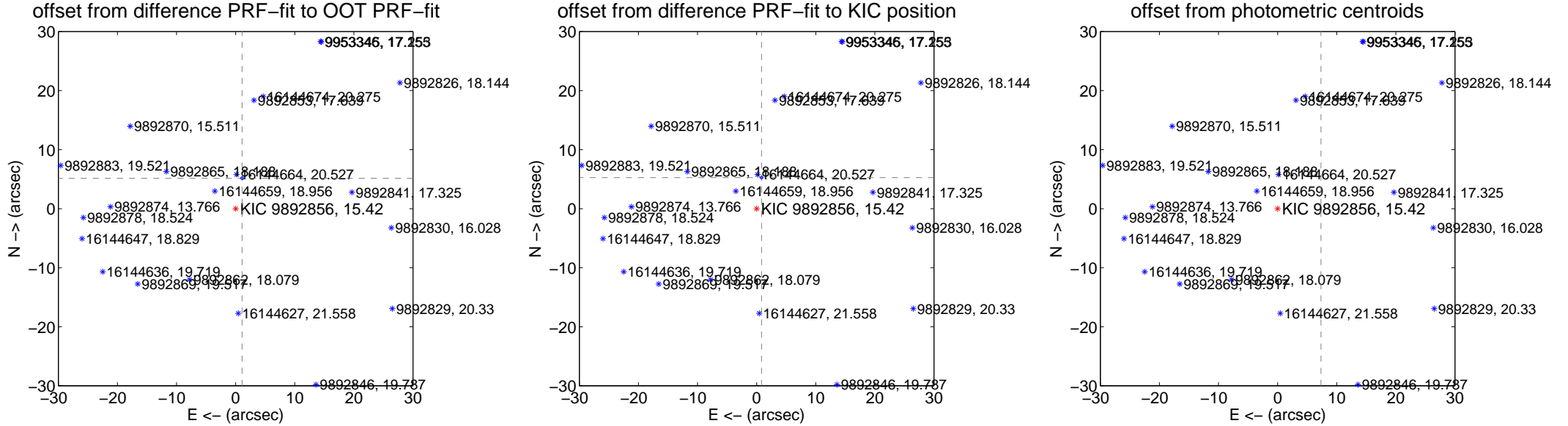
## DV Centroid Data

Supplemental centroid analysis for 009892856-02. Kepler magnitude: 15.42. Transit SNR 12.26

There are 17 quarters with good PRF difference image offsets

The direct PRF centroid is offset from the target star catalog position by about 0.14 arcsec

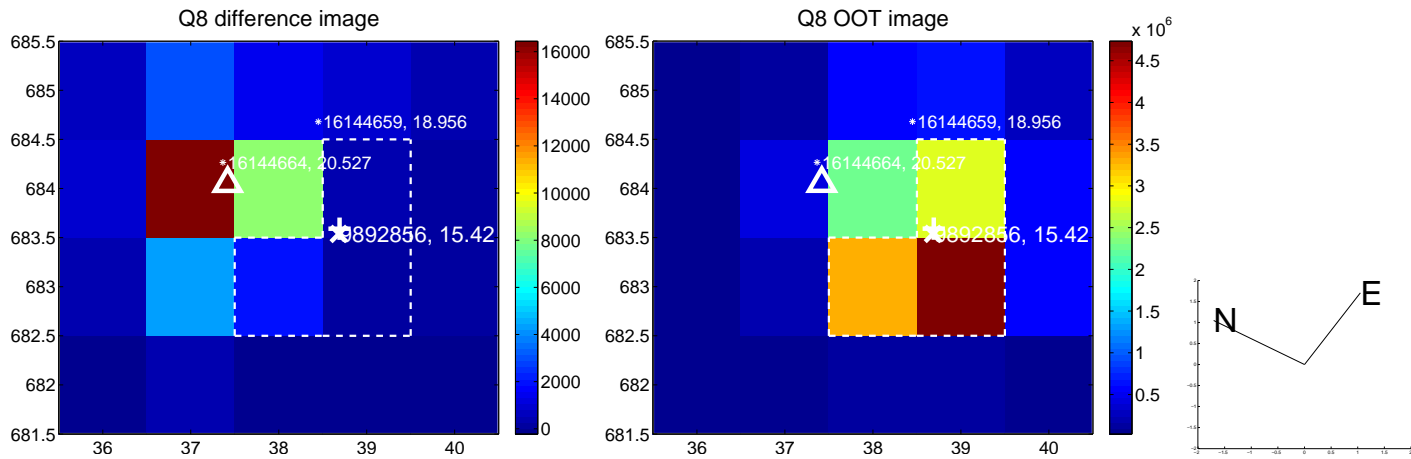
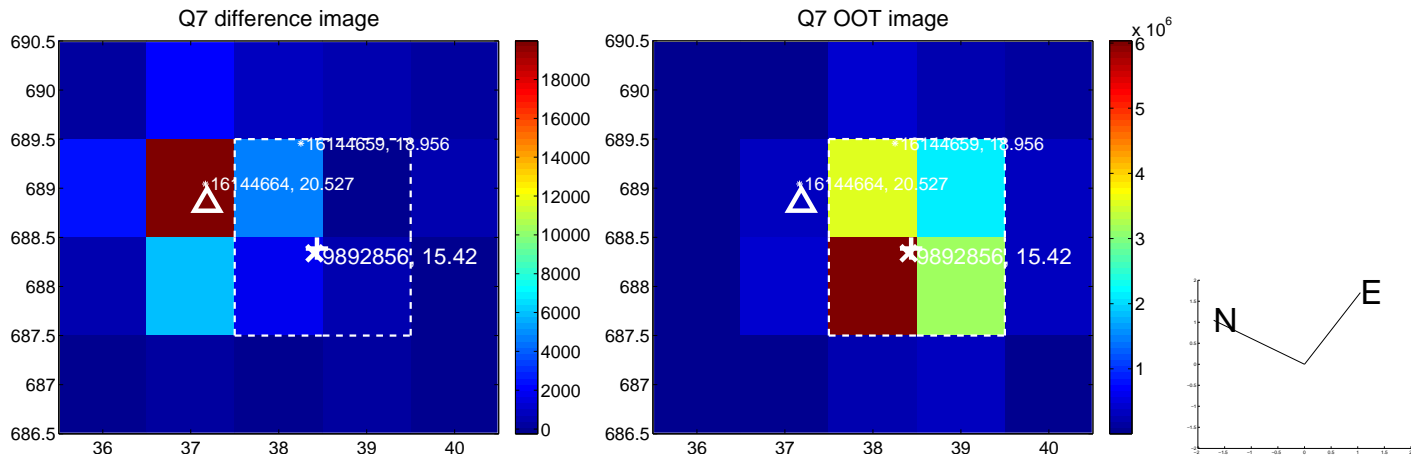
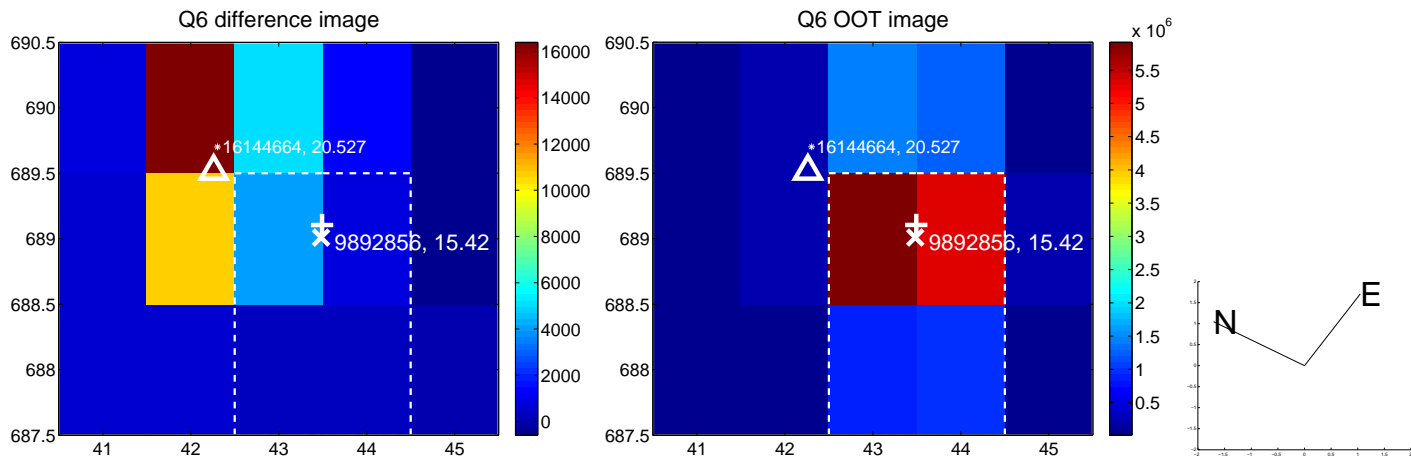
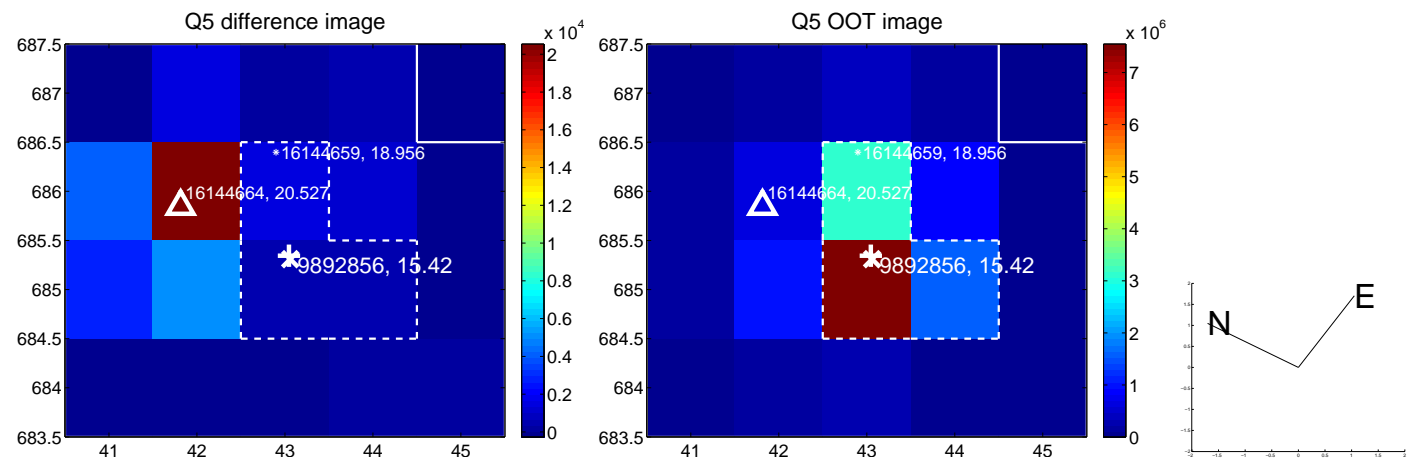
	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$5.261 \pm 0.073$	71.80	$-1.089 \pm 0.074$	$5.147 \pm 0.073$
PRF-fit source offset from KIC position	$5.320 \pm 0.071$	74.70	$-0.828 \pm 0.069$	$5.256 \pm 0.071$
photometric centroid source offset	$67.04 \pm 1.21$	55.21	$-7.33 \pm 1.06$	$66.64 \pm 1.22$



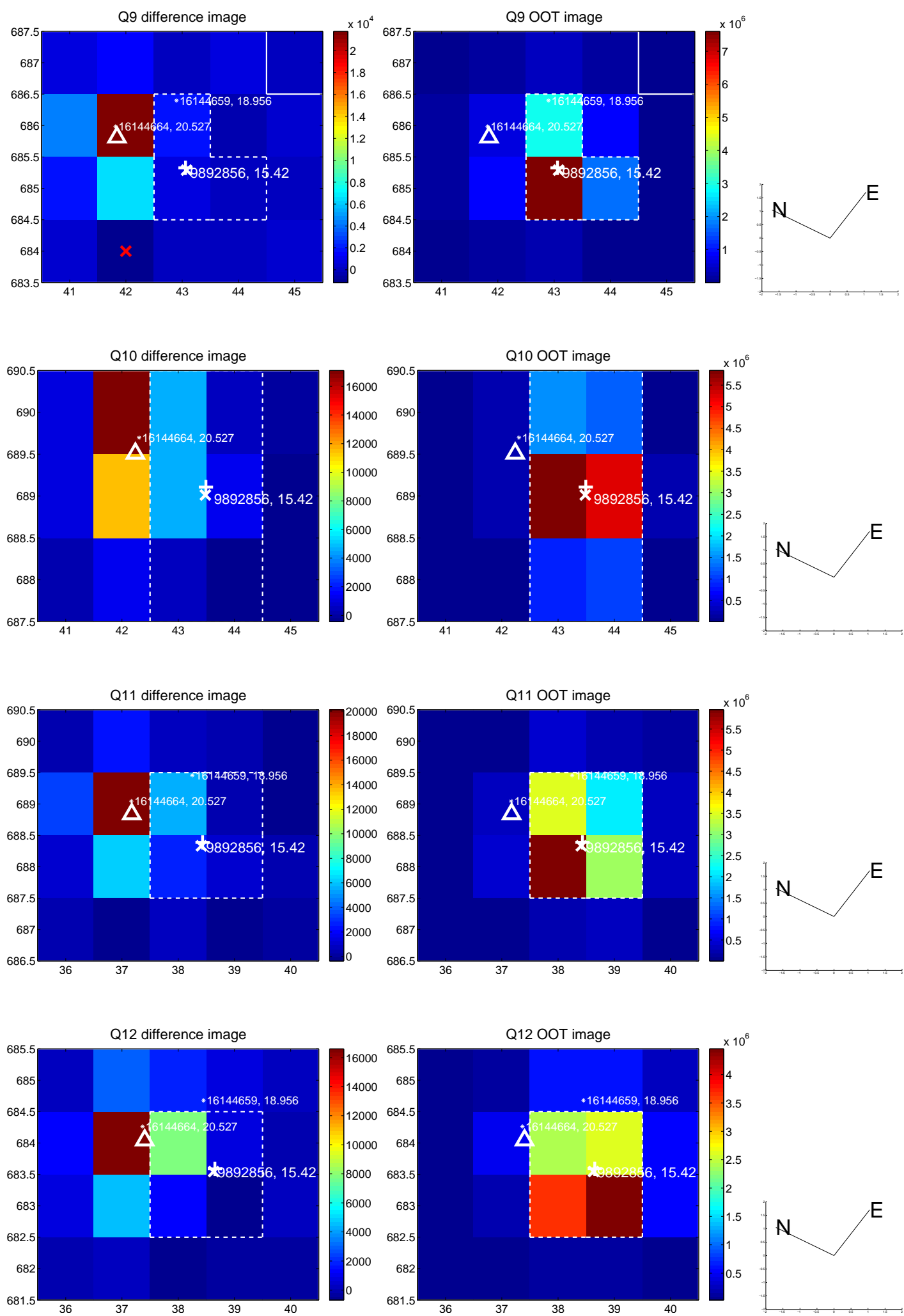
Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets;** magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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



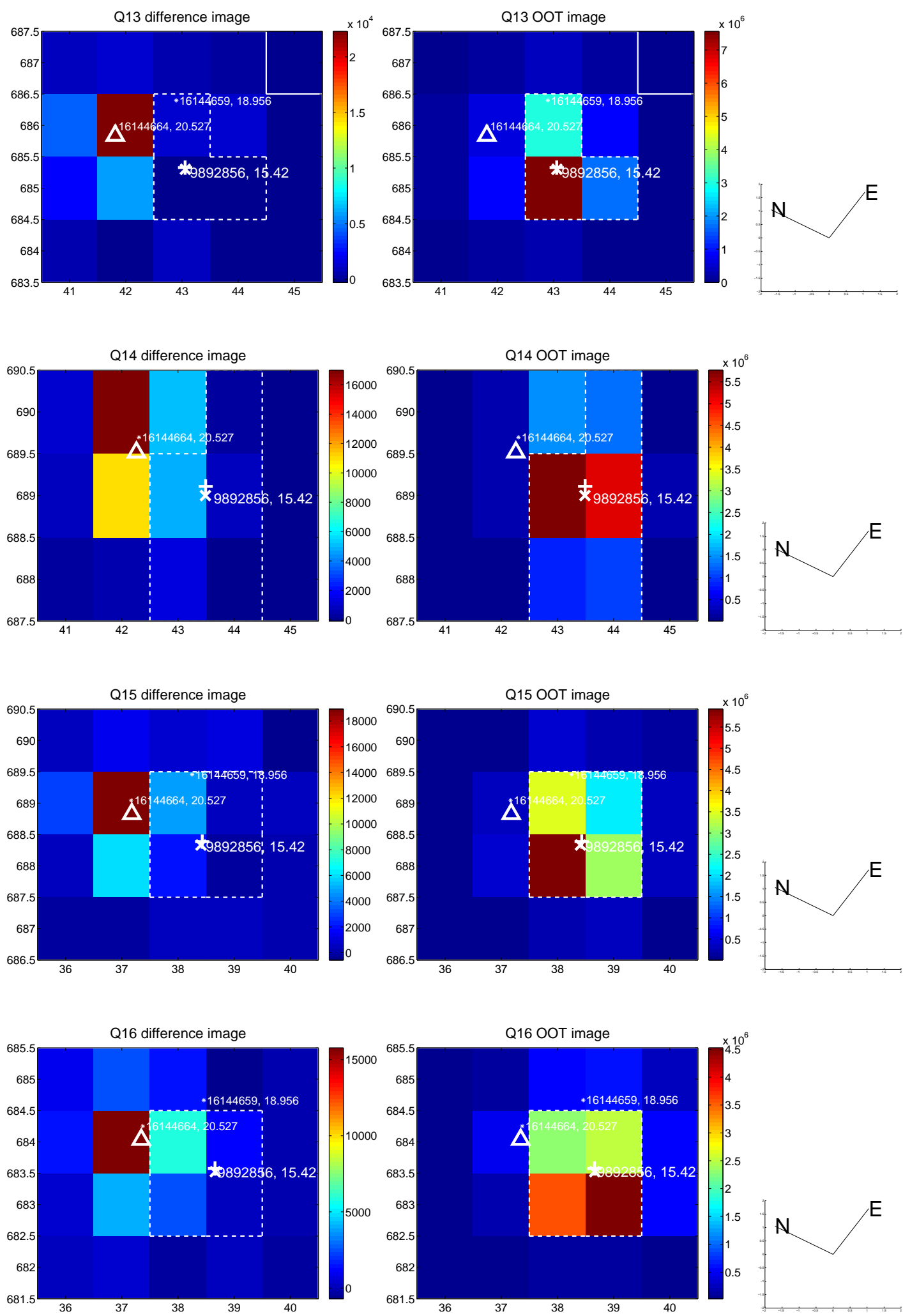
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

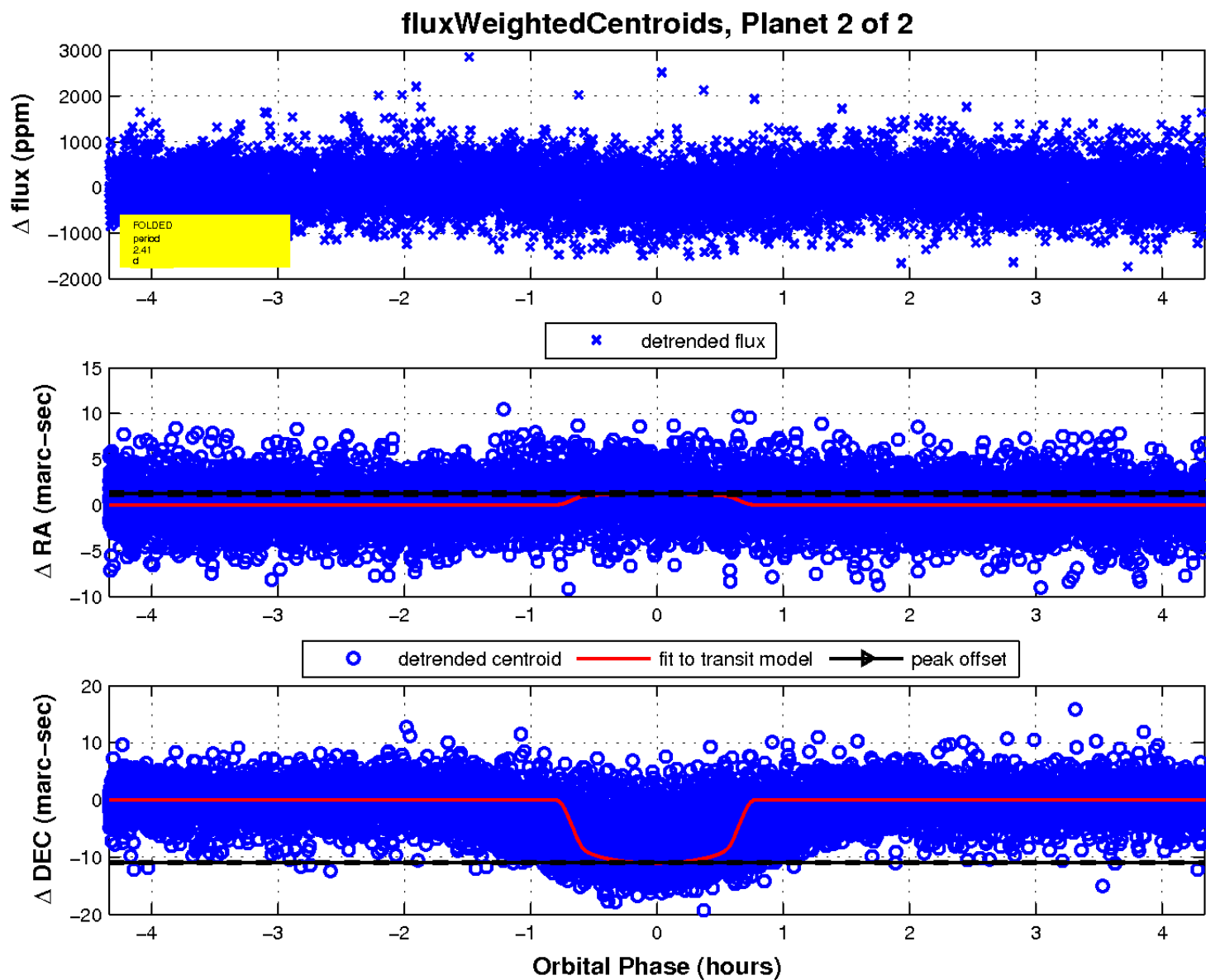
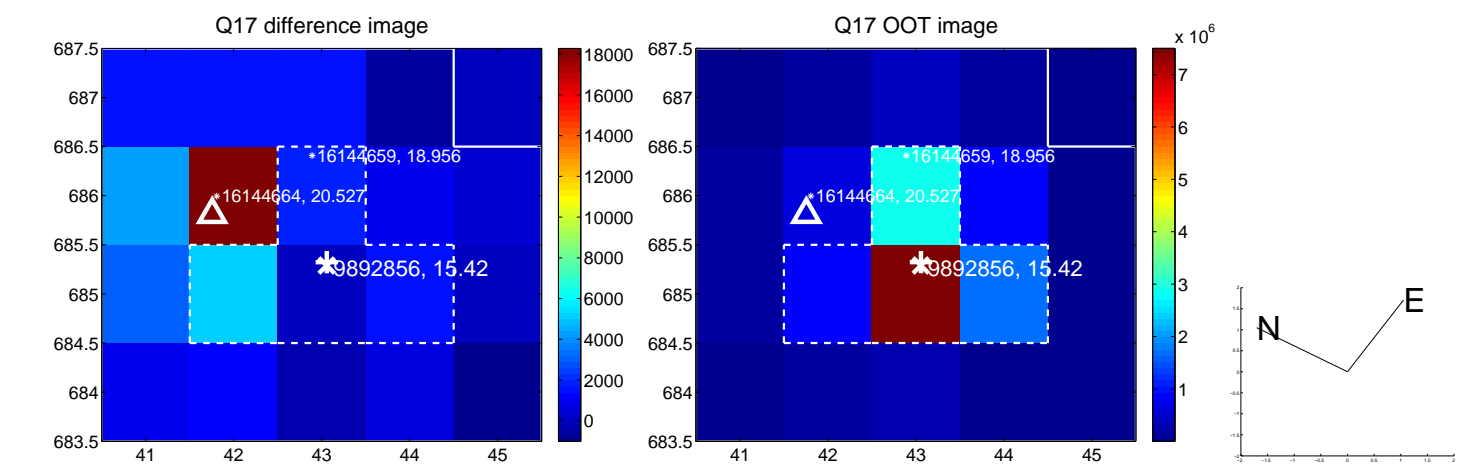


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.





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



UKIRT Image

Declination

