

# KIC 009892816

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
009892816-01	OBS	1955.01	15.170230	132.667566	228.4	4.327	32.2	35.4	1.37	6297	2.50	158.63
009892816-02	OBS	1955.02	39.457264	136.479121	229.6	9.419	24.0	25.0	1.37	6297	2.68	44.35
009892816-03	OBS	1955.03	1.644212	131.754609	43.8	2.816	17.5	18.4	1.37	6297	1.06	3069.64
009892816-04	OBS	1955.04	26.235229	141.974221	181.8	3.069	15.0	16.4	1.37	6297	2.33	76.42

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009892816-01	OBS	PC	1.00	0	0	0	0	NO_COMMENT
009892816-02	OBS	PC	0.60	0	0	0	0	NO_COMMENT
009892816-03	OBS	PC	1.00	0	0	0	0	NO_COMMENT
009892816-04	OBS	PC	0.99	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.

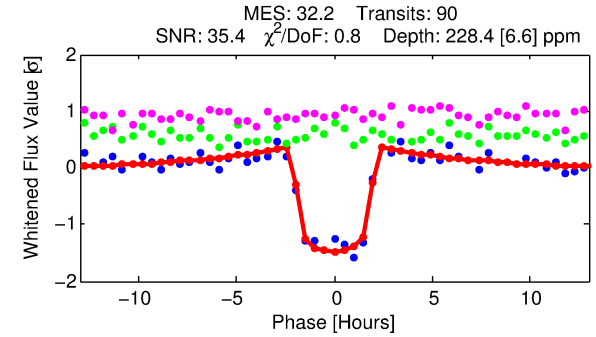
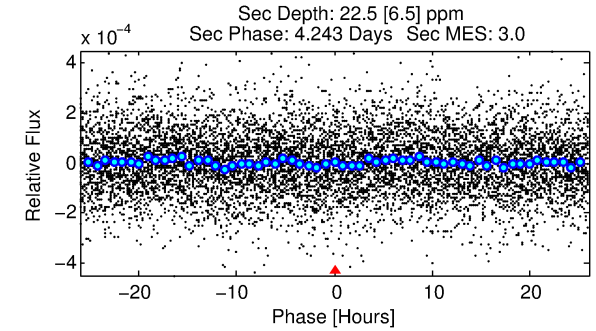
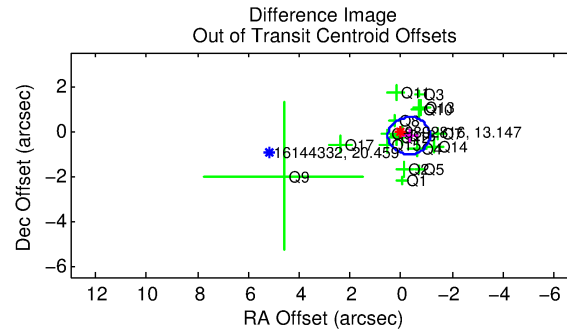
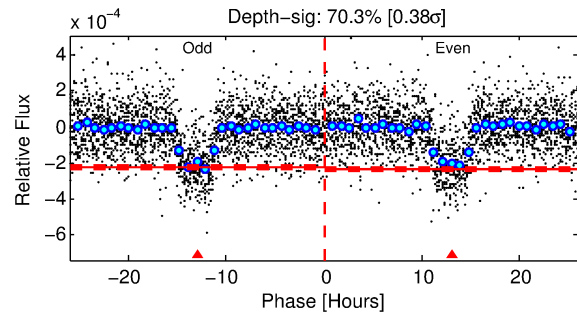
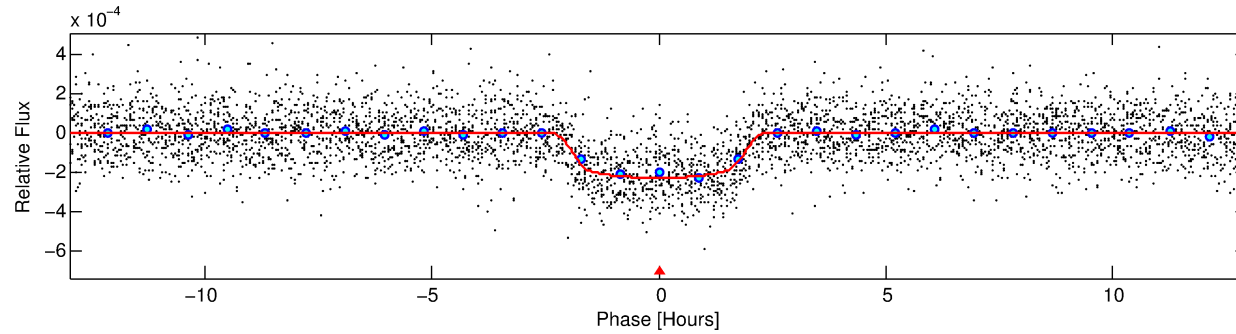
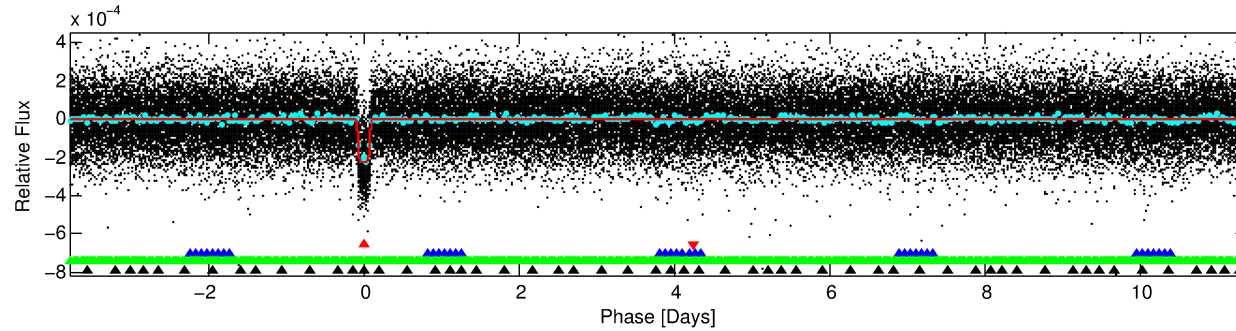
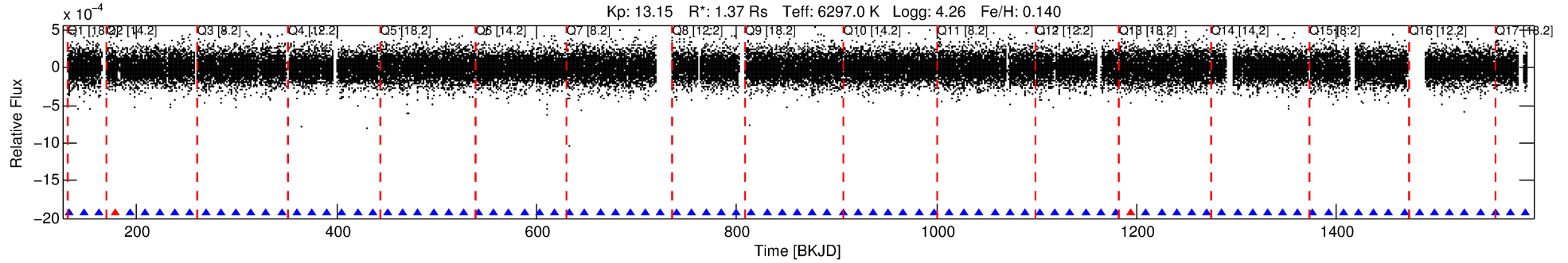
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 009892816-01

No Significant Match Found

# DV One-Page Summary

KIC: 9892816 Candidate: 1 of 4 Period: 15.170 d  
KOI: K01955.01 Name: Kepler-342b Corr: 0.961



## DV Fit Results:

Period = 15.17023 [0.00004] d  
Epoch = 132.6676 [0.0022] BKJD  
Rp/R\* = 0.0167 [0.0008]  
a/R\* = 11.29 [2.76]  
b = 0.93 [0.04]  
Seff = 158.63 [34.48]  
Teq = 905 [49] K  
Rp = 2.50 [0.43] Re  
a = 0.1290 [0.0180] AU  
Ag = 33.07 [12.07] [2.66 $\sigma$ ]  
Teffp = 3355 [264] K [9.13 $\sigma$ ]

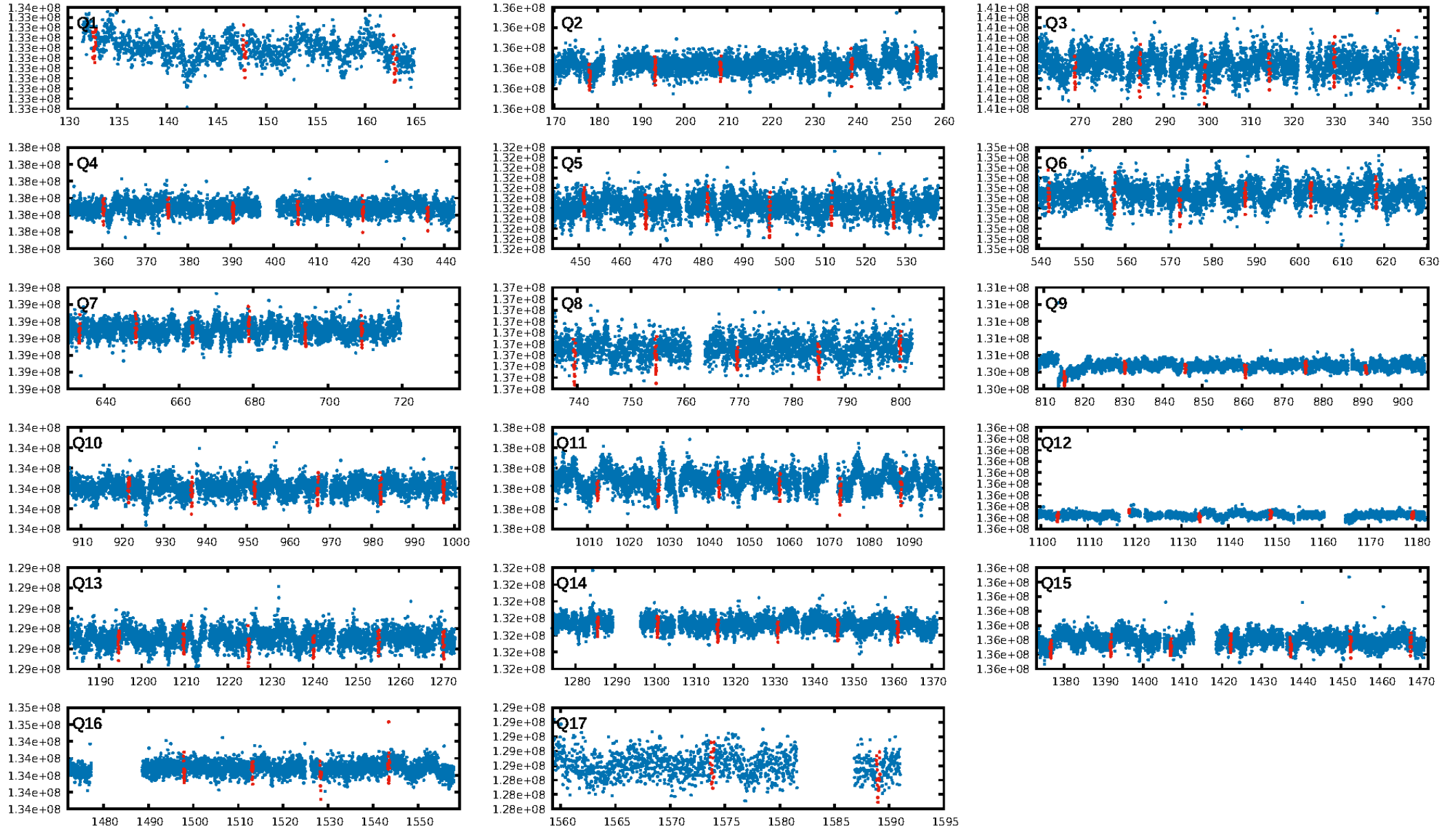
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [62.88 $\sigma$ ]  
LongPeriod-sig: 100.0% [50.06 $\sigma$ ]  
ModelChiSquare2-sig: 100.0%  
ModelChiSquareGof-sig: 100.0%  
Bootstrap-pfa: 6.34e-209  
RollingBand-fgt: 0.98 [83/85]  
GhostDiagnostic-chr: 10.71  
Centroid-sig: 30.1%  
Centroid-so: 0.290 arcsec [0.97 $\sigma$ ]  
OotOffset-rm: 0.375 arcsec [1.37 $\sigma$ ]  
KicOffset-rm: 0.393 arcsec [1.47 $\sigma$ ]  
OotOffset-st: 4/4/4/5 [17]  
KicOffset-st: 4/4/4/5 [17]  
DiffImageQuality-fgm: 0.88 [15/17]  
DiffImageOverlap-fno: 0.94 [16/17]

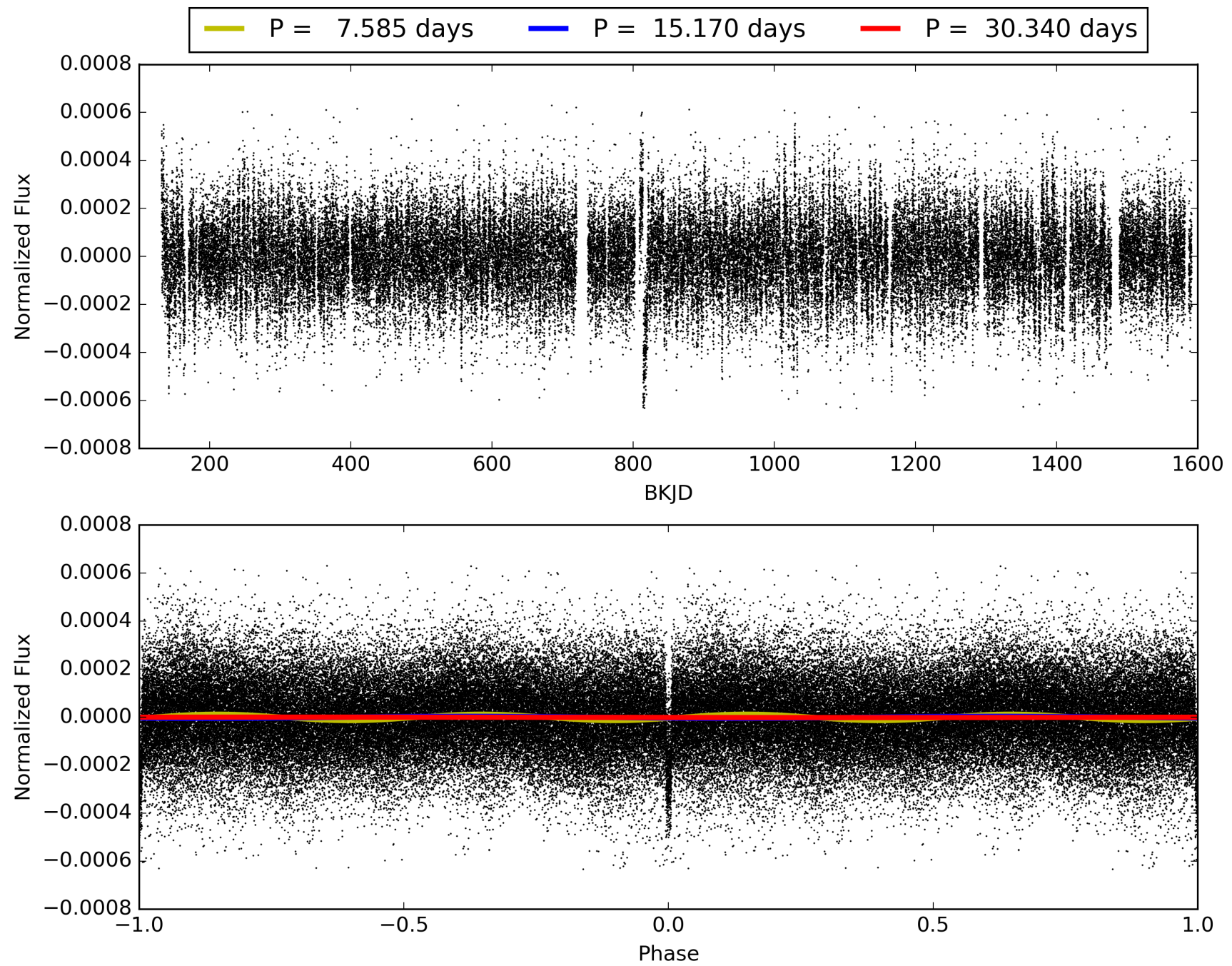
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This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

# TCE 009892816-01, PDC Light Curves



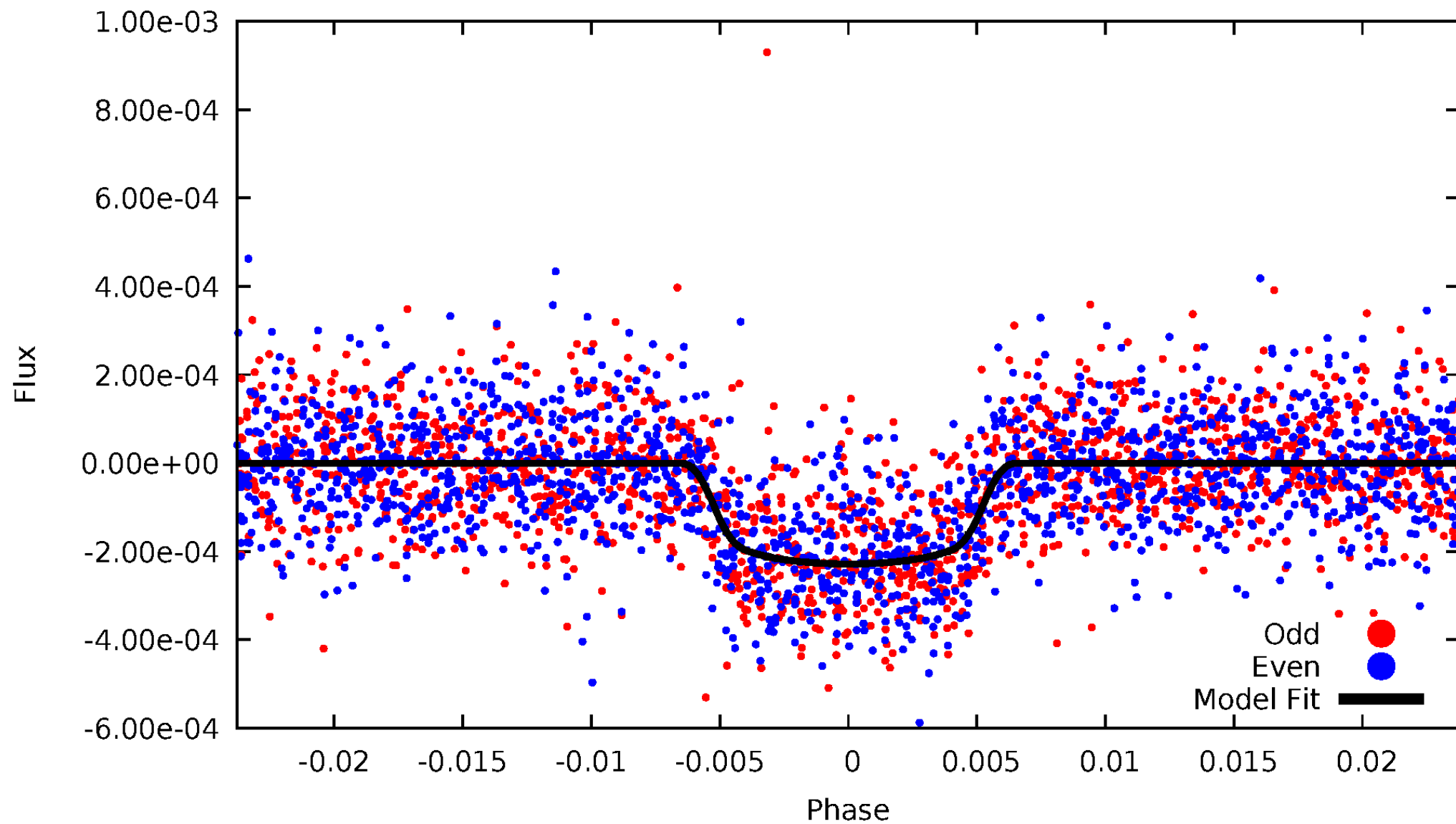
TCE 009892816-01





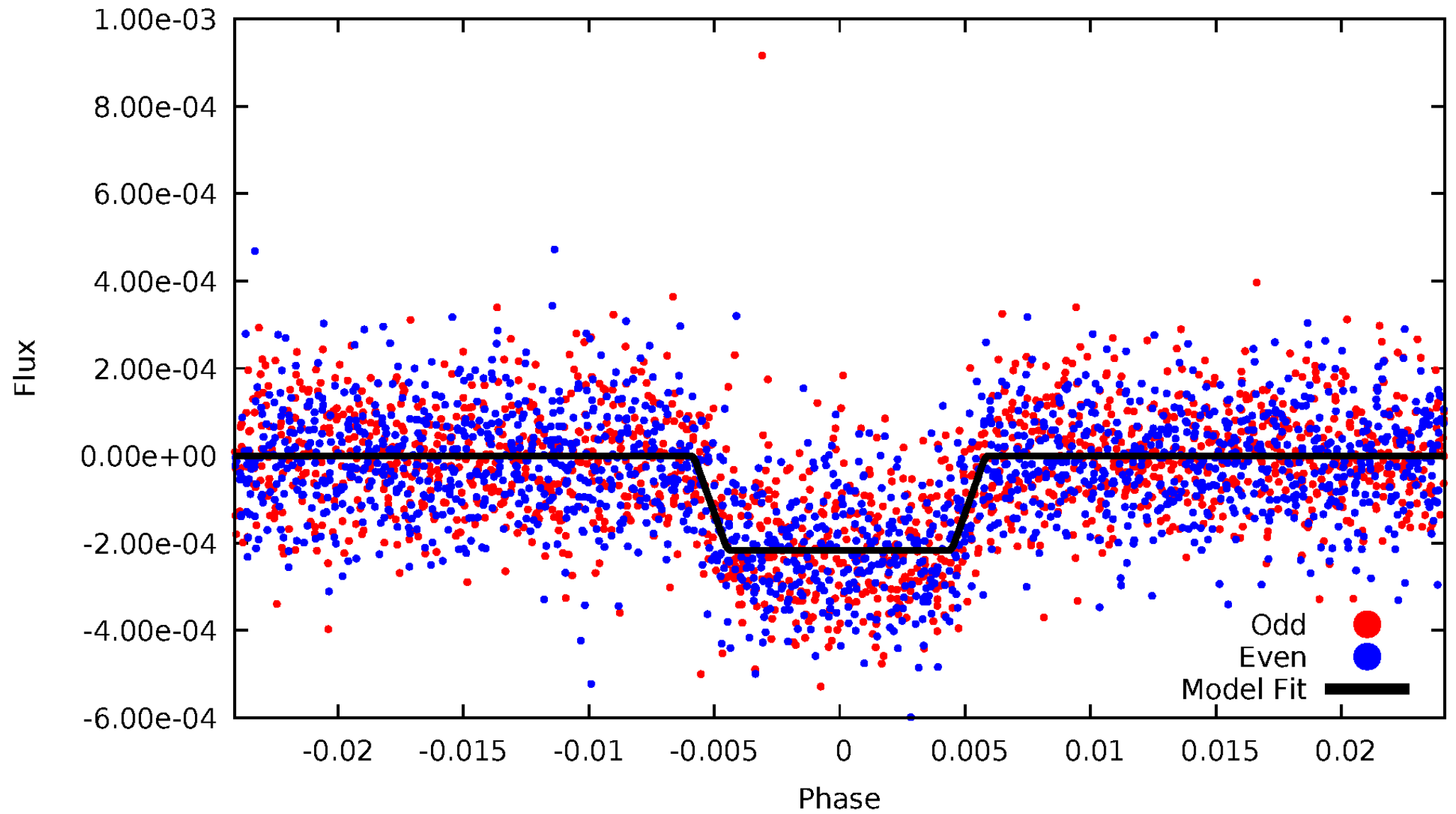
# DV Odd/Even

TCE 009892816-01



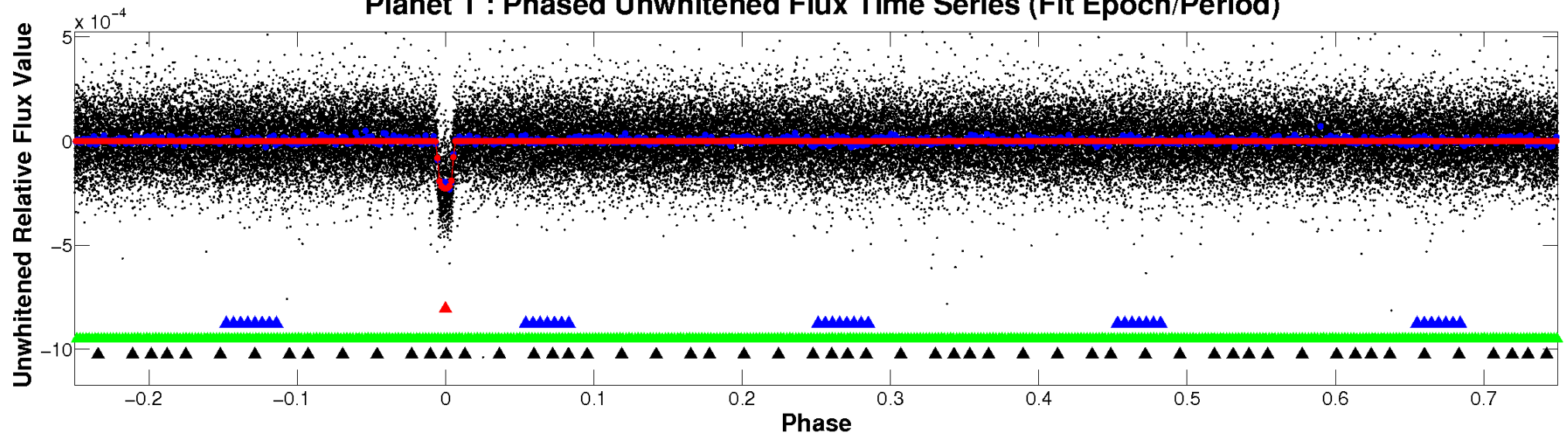
# ALT Odd/Even

TCE 009892816-01

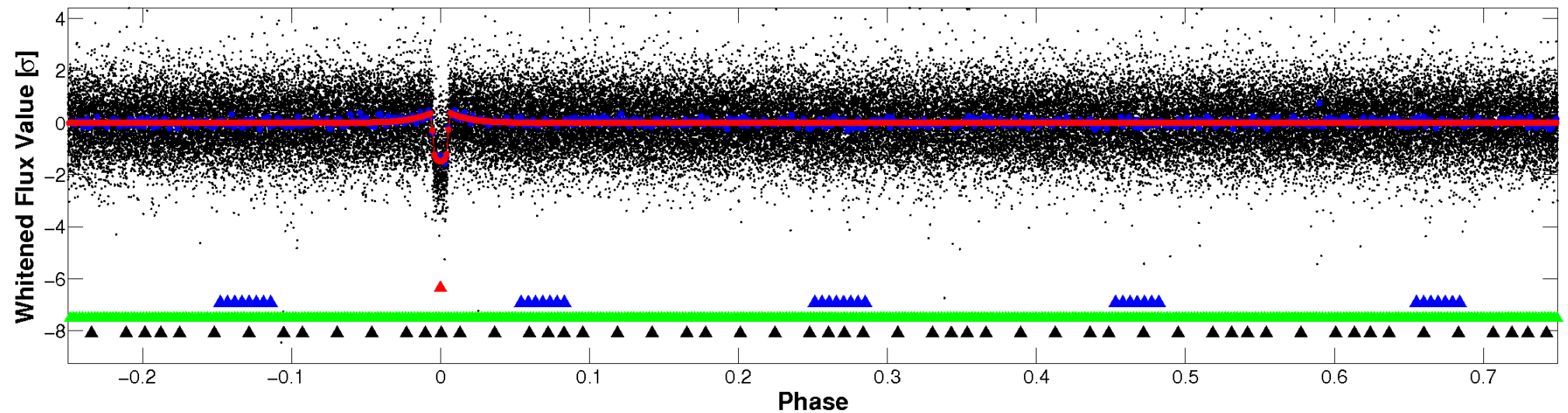


# Non-Whitened Vs. Whitened Light Curve

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

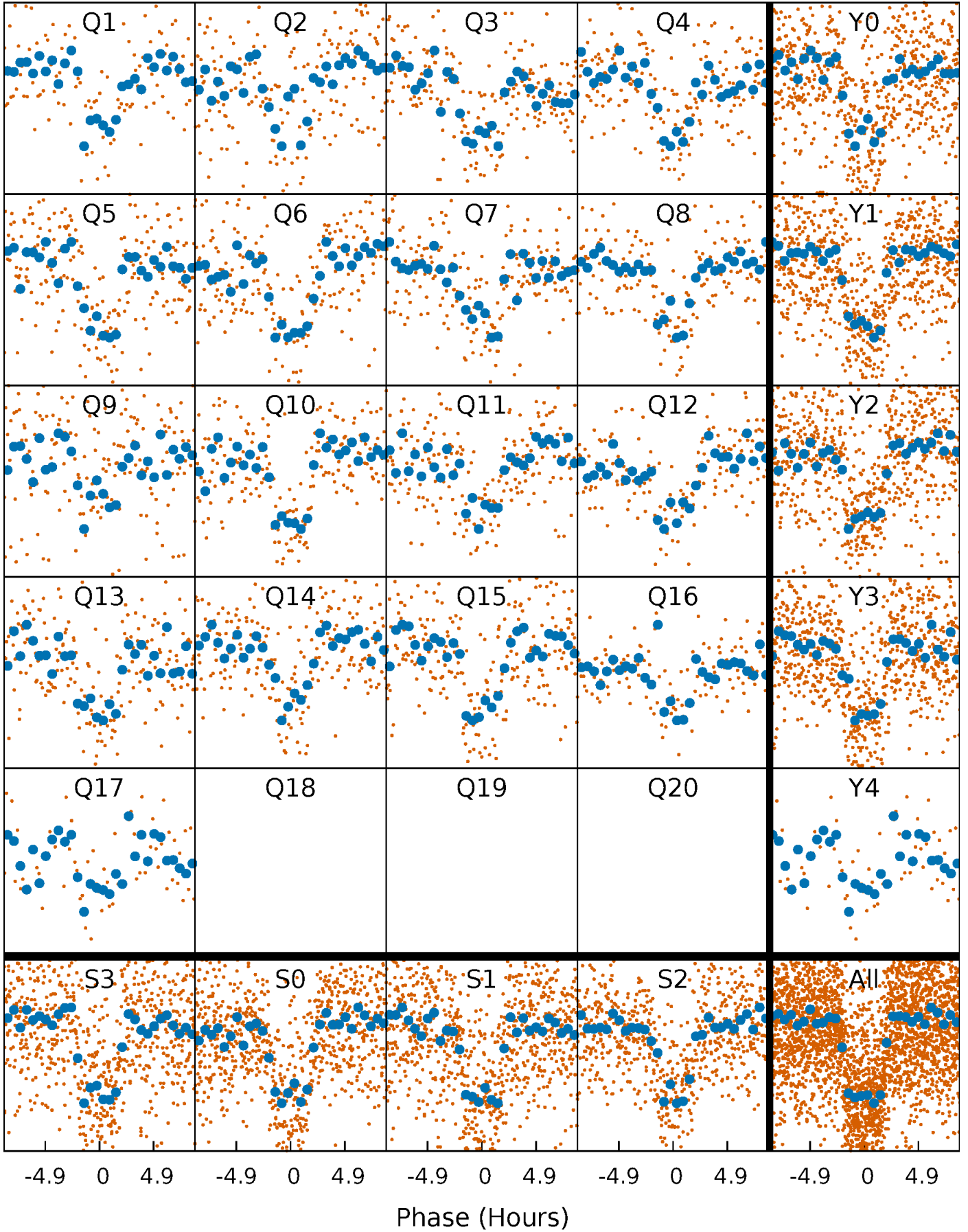


## Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)



# PDC Quarter-Phased Transit Curves

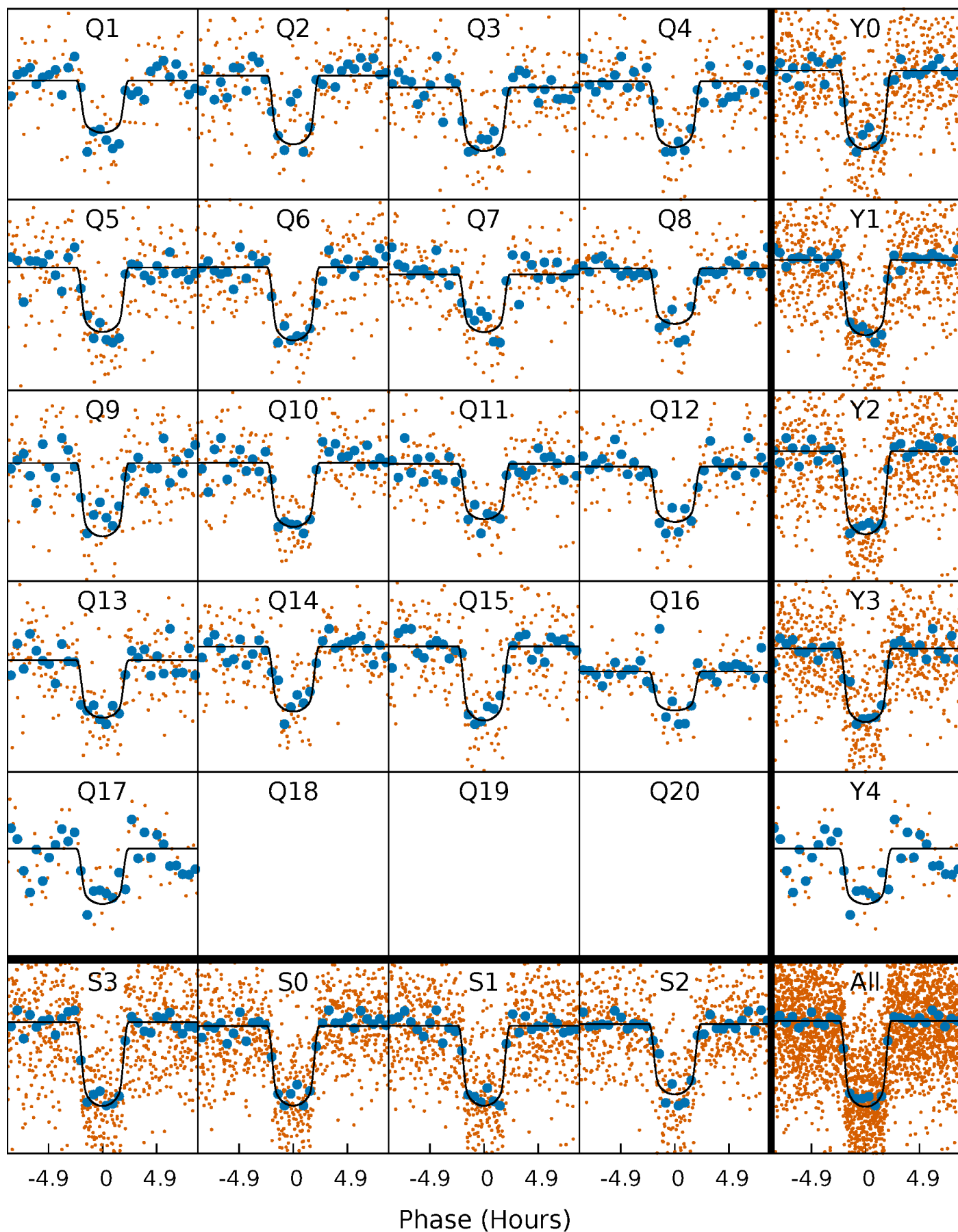
TCE 009892816-01 P= 15.170230 Days  $T_0=132.667566$  (BKJD)





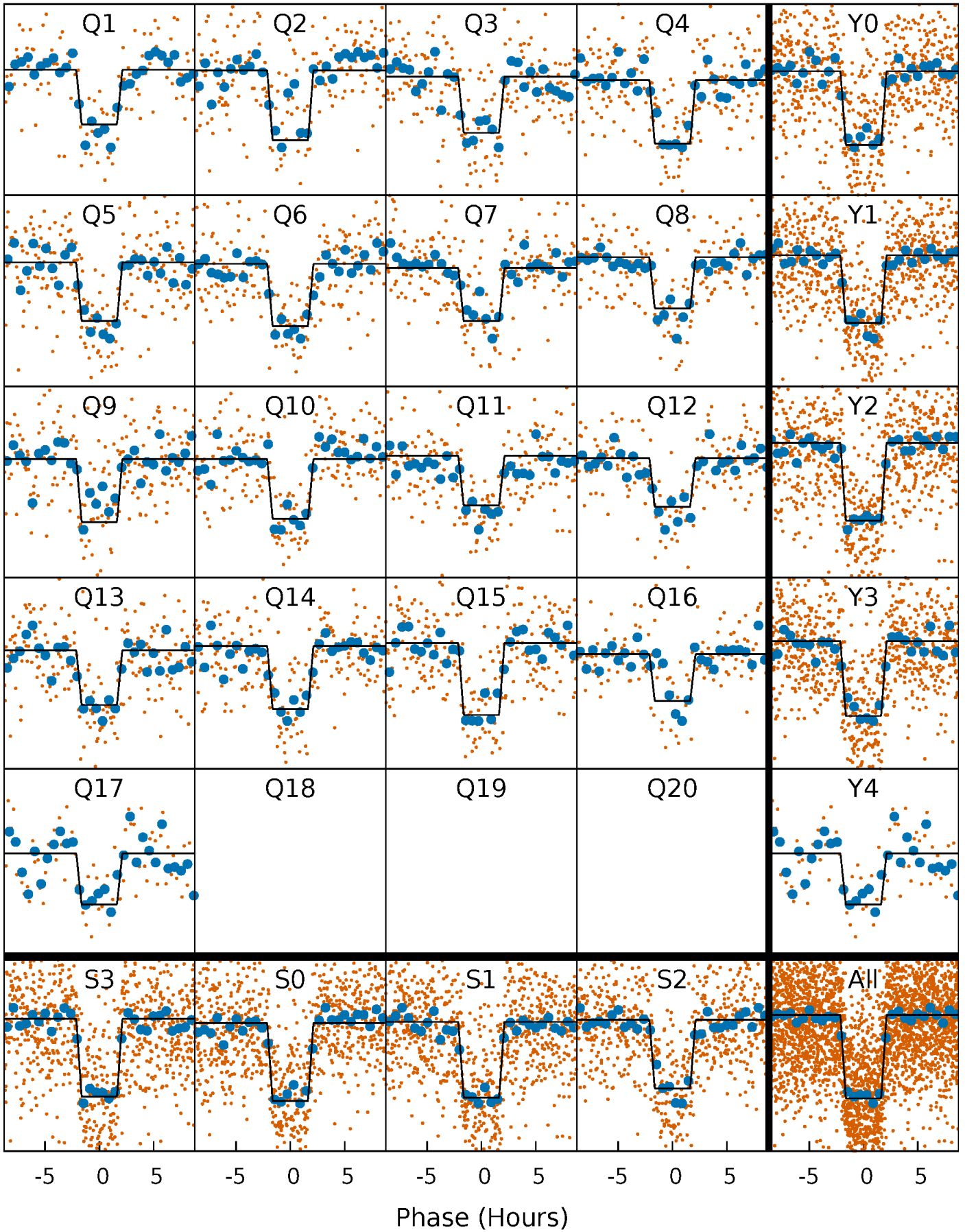
# DV Quarter-Phased Transit Curves

TCE 009892816-01 P= 15.170230 Days  $T_0=132.667566$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

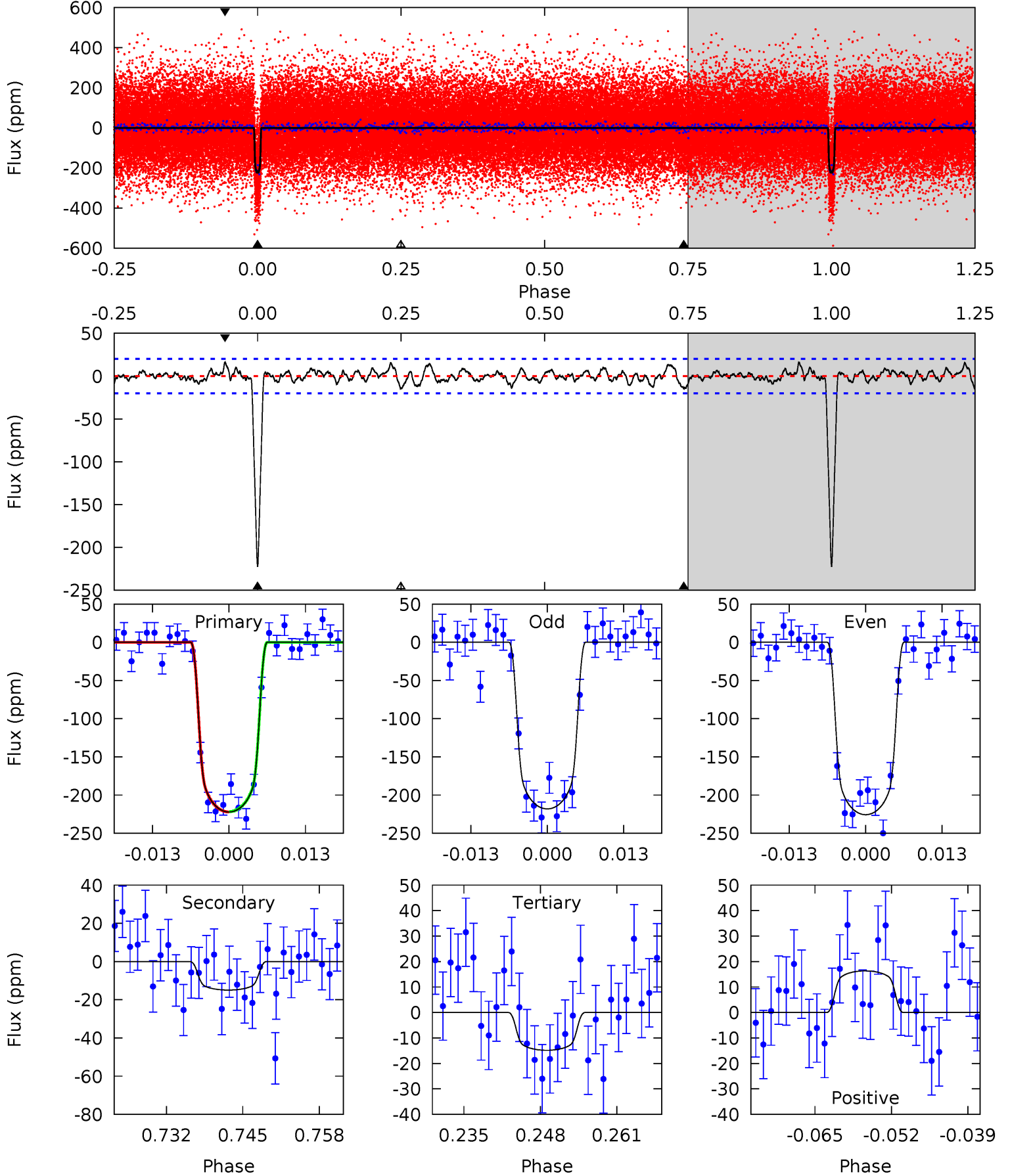
TCE 009892816-01 P= 15.170219 Days  $T_0=132.667529$  (BKJD)



# DV Model-Shift Uniqueness Test

009892816-01, P = 15.170230 Days, E = 117.497336 Days

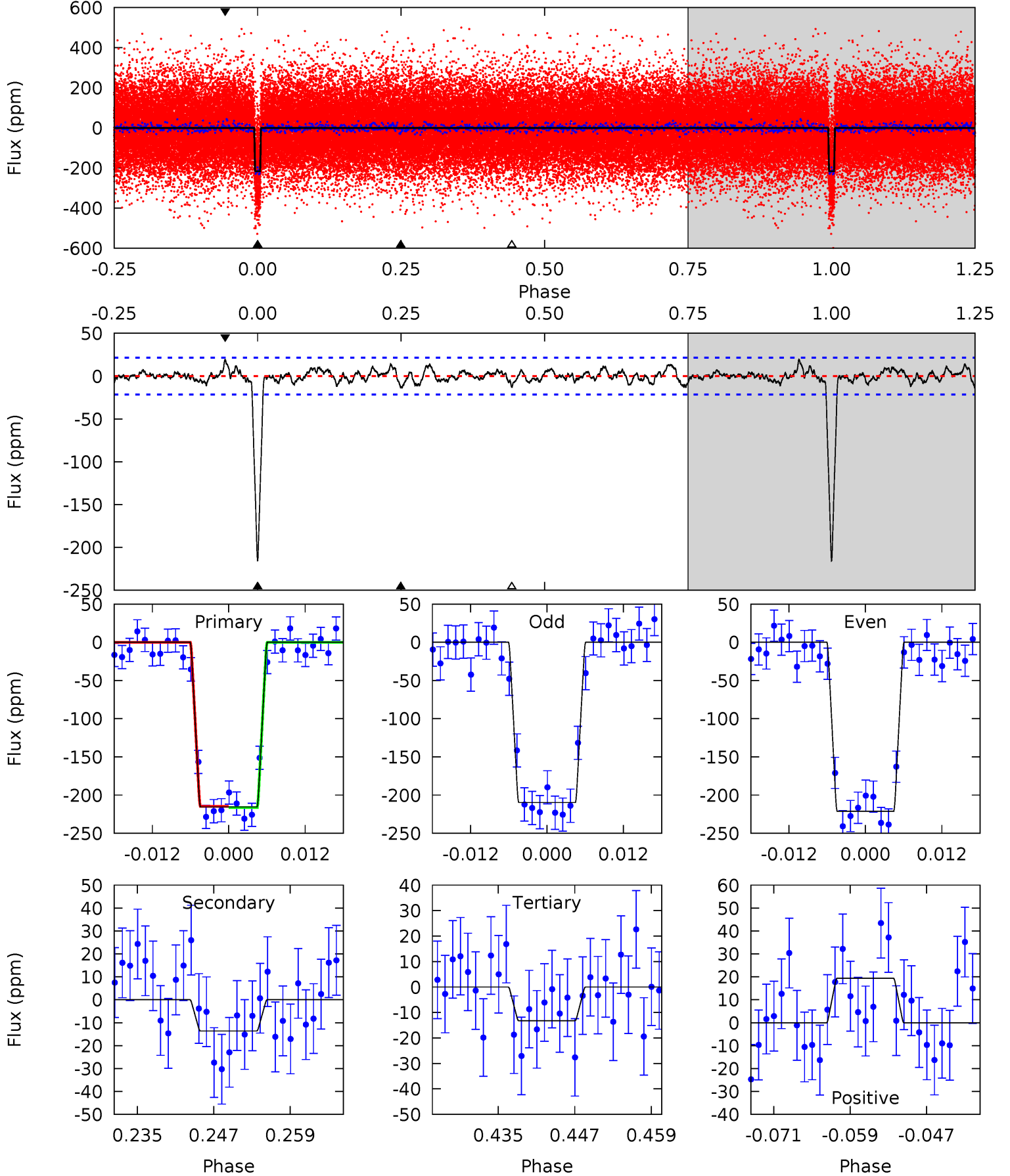
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
54.9	3.69	3.66	4.04	4.97	2.48	1.31	51.2	50.9	0.02	-0.35	0.94	0.98	0.07	0.06



# Alt Model-Shift Uniqueness Test

009892816-01,  $P = 15.170219$  Days,  $E = 117.497310$  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
49.9	3.15	3.05	4.48	5.00	2.52	1.24	46.9	45.4	0.10	-1.33	1.32	0.99	0.08	0.17





### Stellar Parameters For KIC 009892816

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$6297^{+113}_{-126}$	$4.260^{+0.090}_{-0.110}$	$0.140^{+0.150}_{-0.200}$	$1.369^{+0.228}_{-0.187}$	$1.247^{+0.091}_{-0.111}$	$0.684^{+0.278}_{-0.233}$
	+2%/-2%	+2%/-3%	+107%/-143%	+17%/-14%	+7%/-9%	+41%/-34%
Source	SPE59	SPE59	SPE59	DSEP		

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

### Secondary Eclipse Parameters for KIC 009892816-01 / KOI 1955.01

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$-15 \pm 4$	$2.50^{+0.27}_{-0.24}$	$1265^{+62}_{-51}$	$3492^{+156}_{-174}$	$21^{+7}_{-7}$
Alt.	$-14 \pm 4$	$2.20^{+0.23}_{-0.18}$	$1270^{+53}_{-52}$	$3586^{+196}_{-231}$	$25^{+10}_{-9}$

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

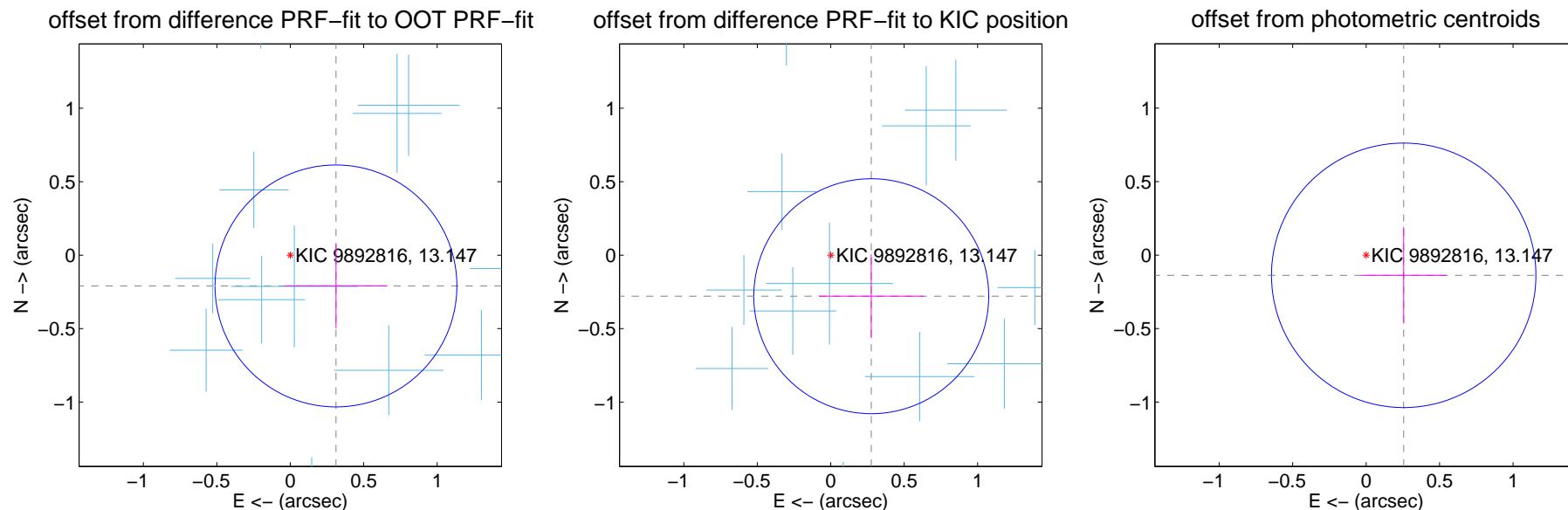
## DV Centroid Data

Supplemental centroid analysis for 009892816-01. Kepler magnitude: 13.15. Transit SNR 35.37

There are 15 quarters with good PRF difference image offsets

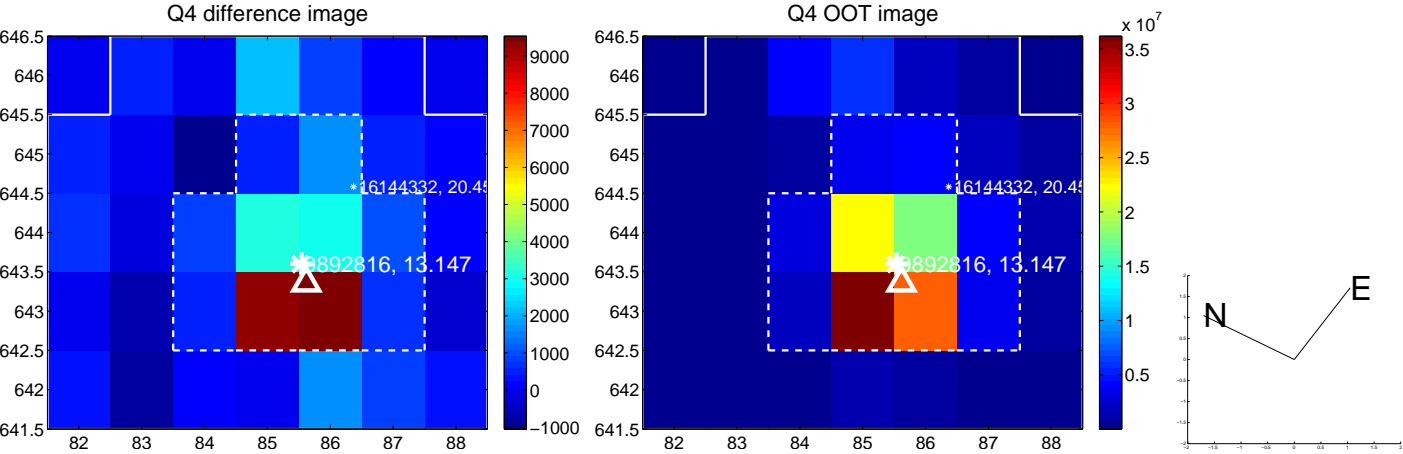
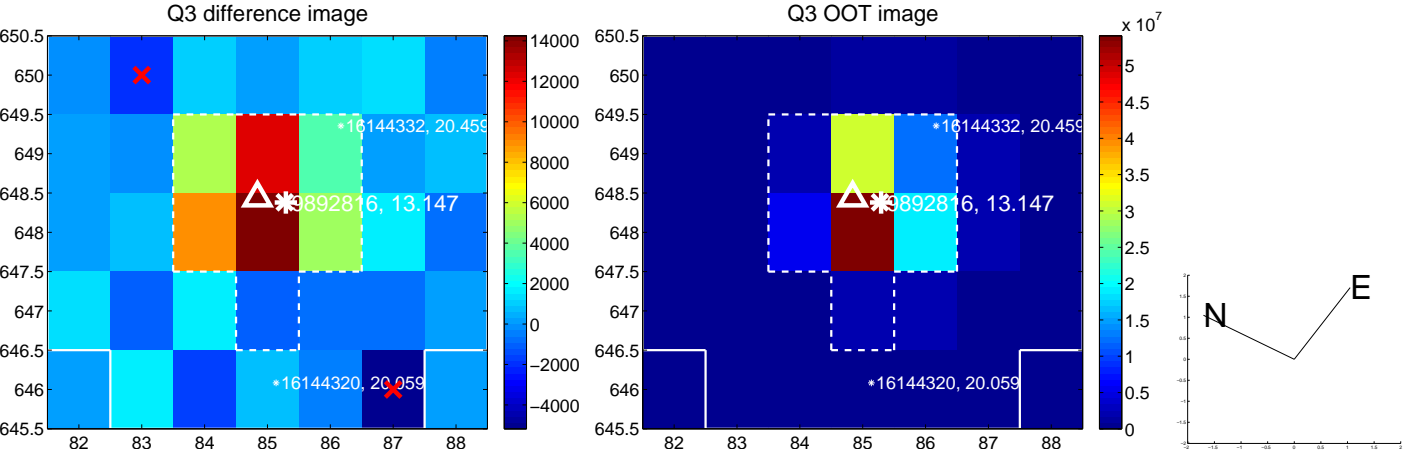
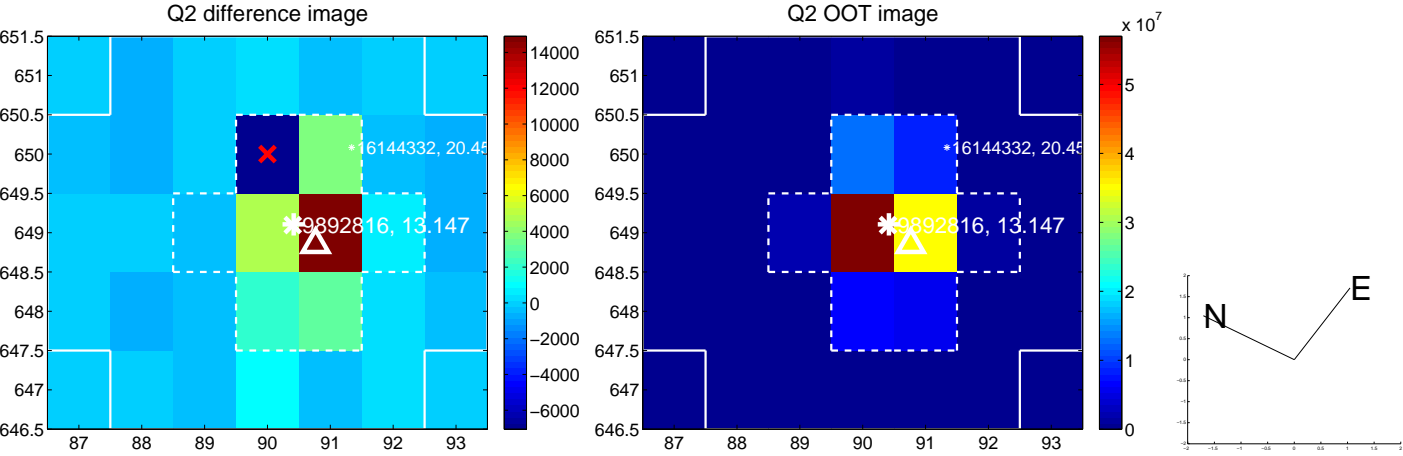
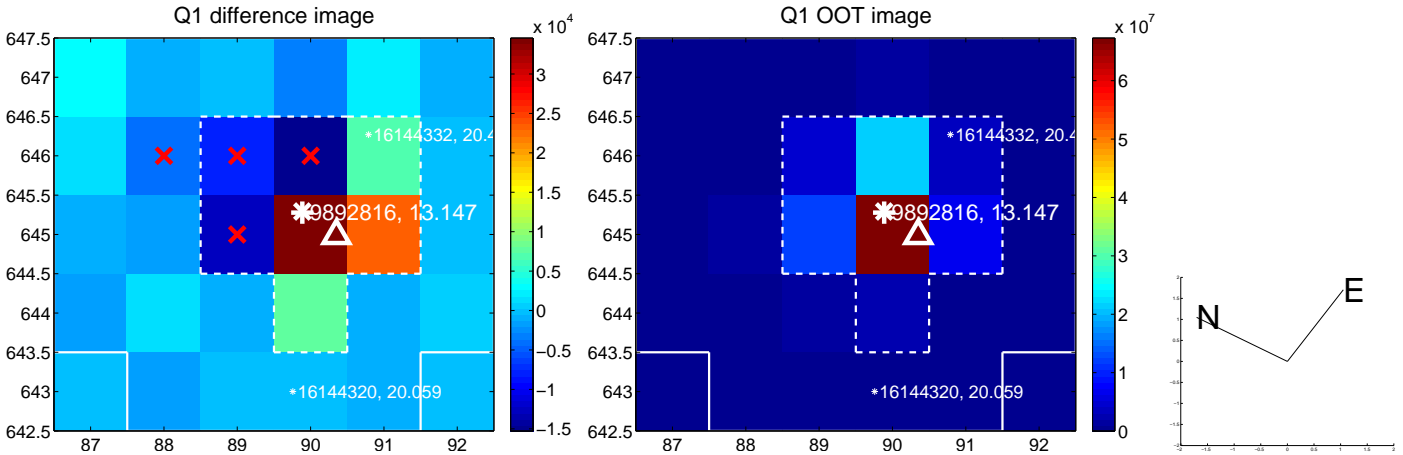
The direct PRF centroid is offset from the target star catalog position by about 0.06 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.375 \pm 0.274$	1.37	$-0.311 \pm 0.350$	$-0.209 \pm 0.288$
PRF-fit source offset from KIC position	$0.393 \pm 0.266$	1.47	$-0.276 \pm 0.356$	$-0.279 \pm 0.285$
photometric centroid source offset	$0.29 \pm 0.30$	0.97	$-0.26 \pm 0.29$	$-0.14 \pm 0.33$

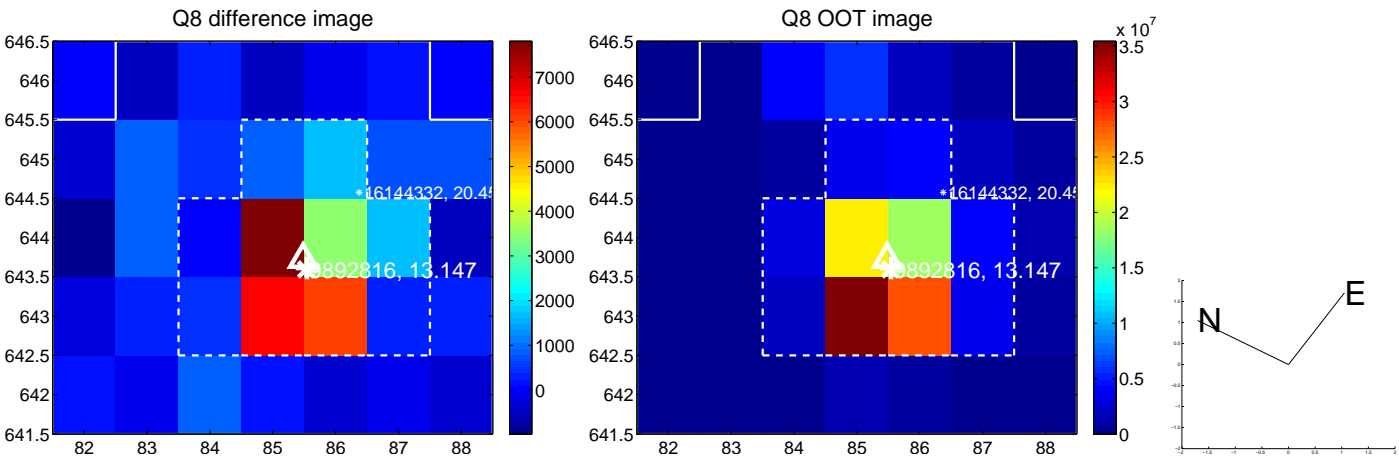
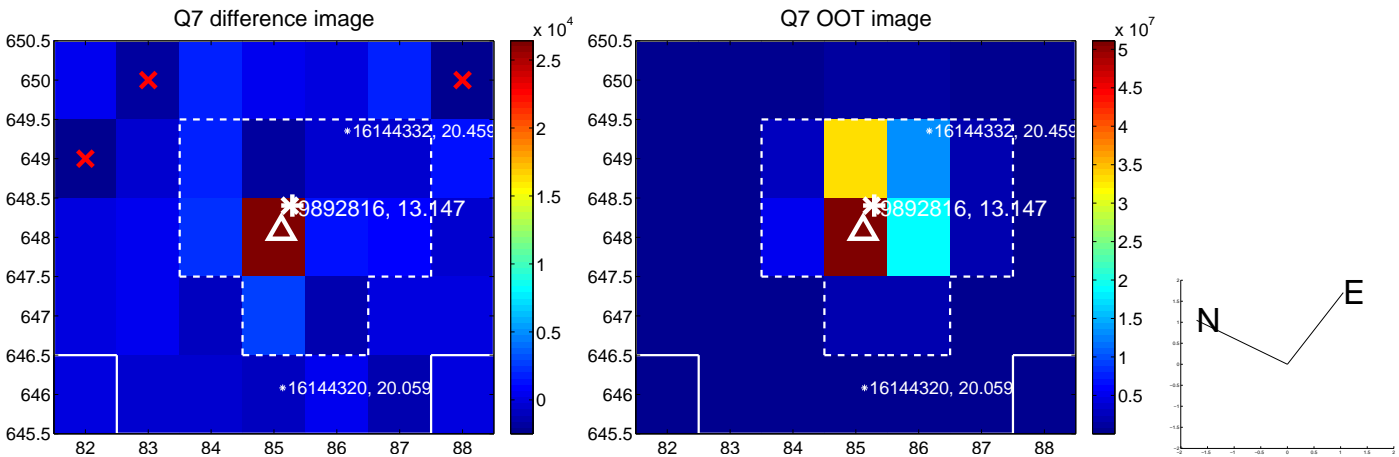
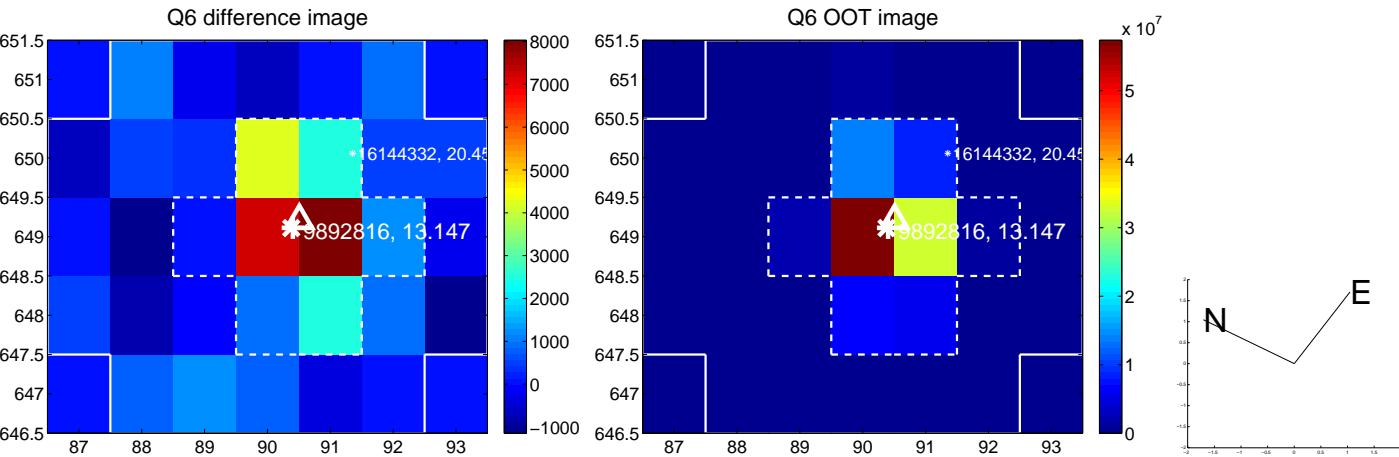
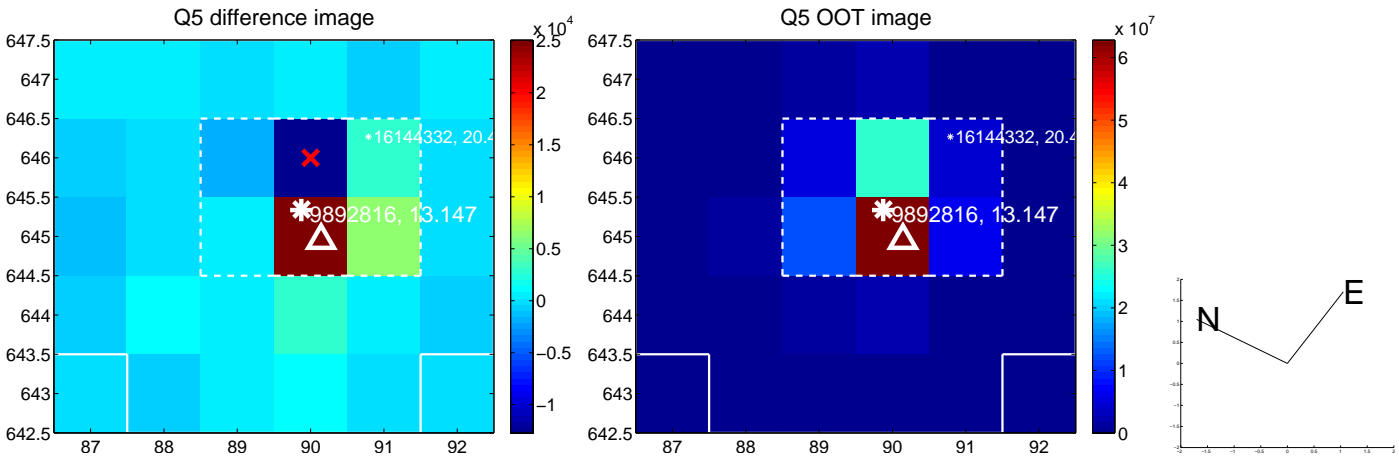


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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

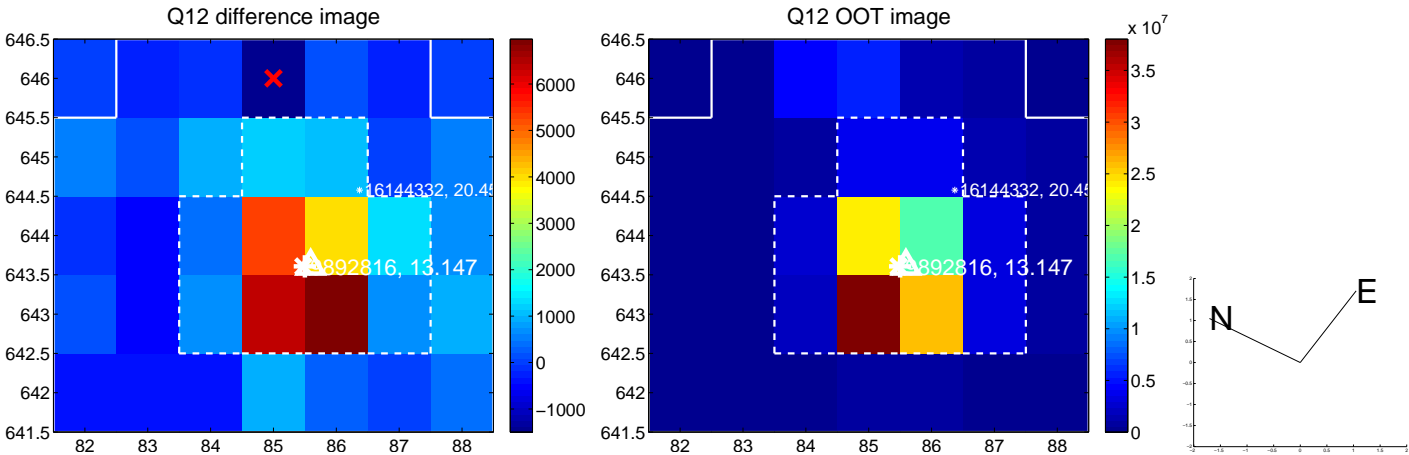
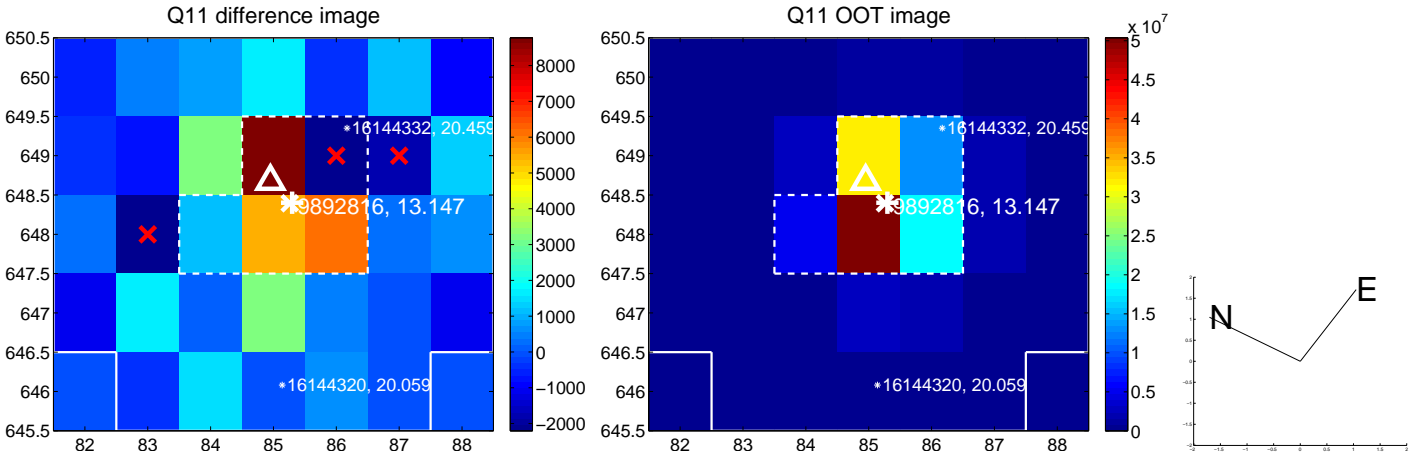
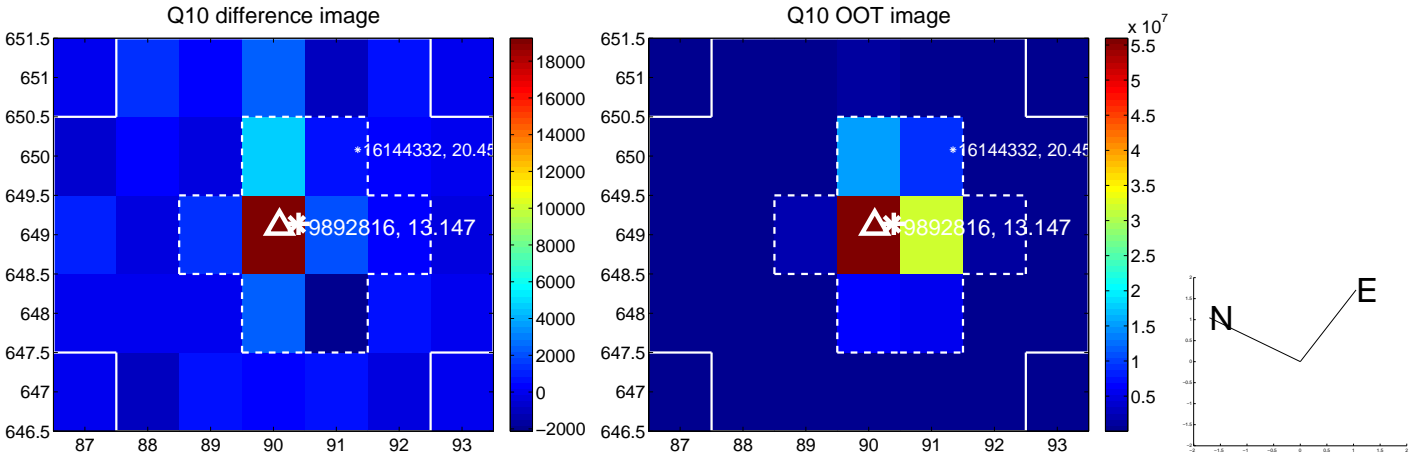
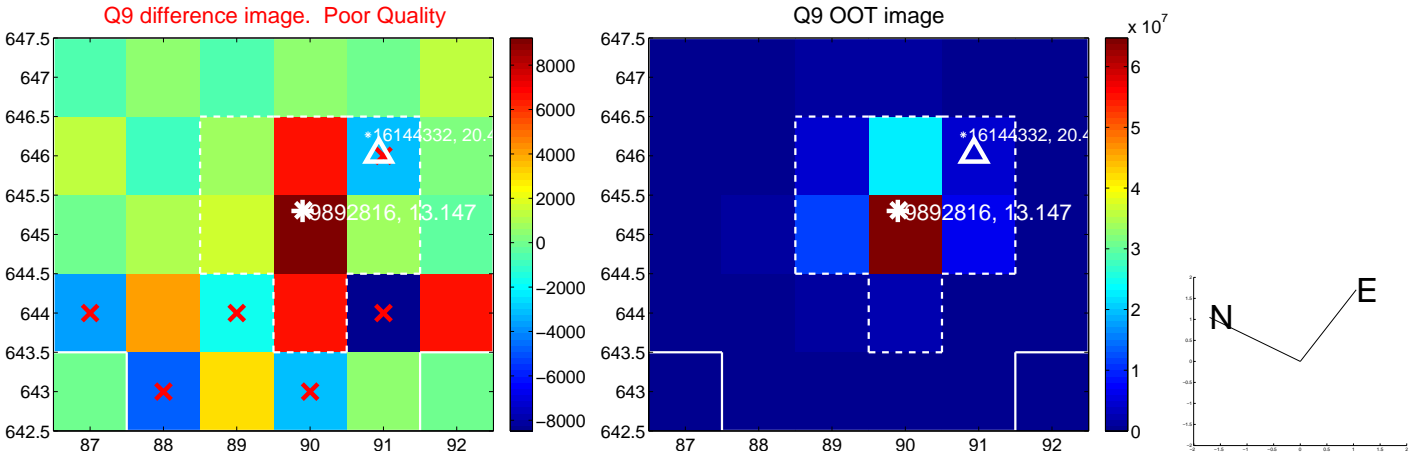


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



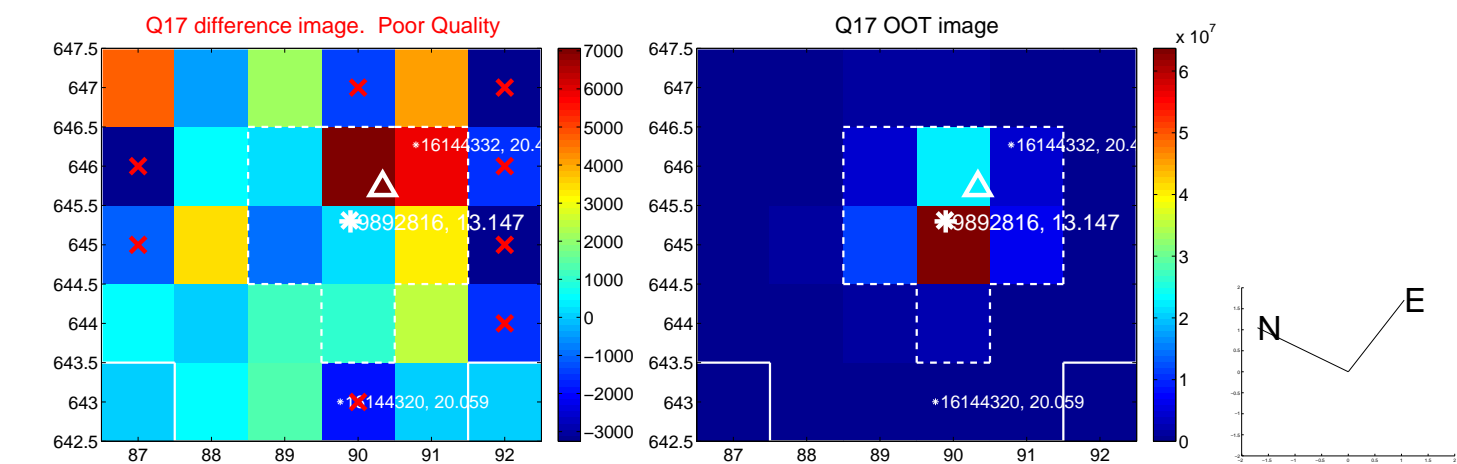


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

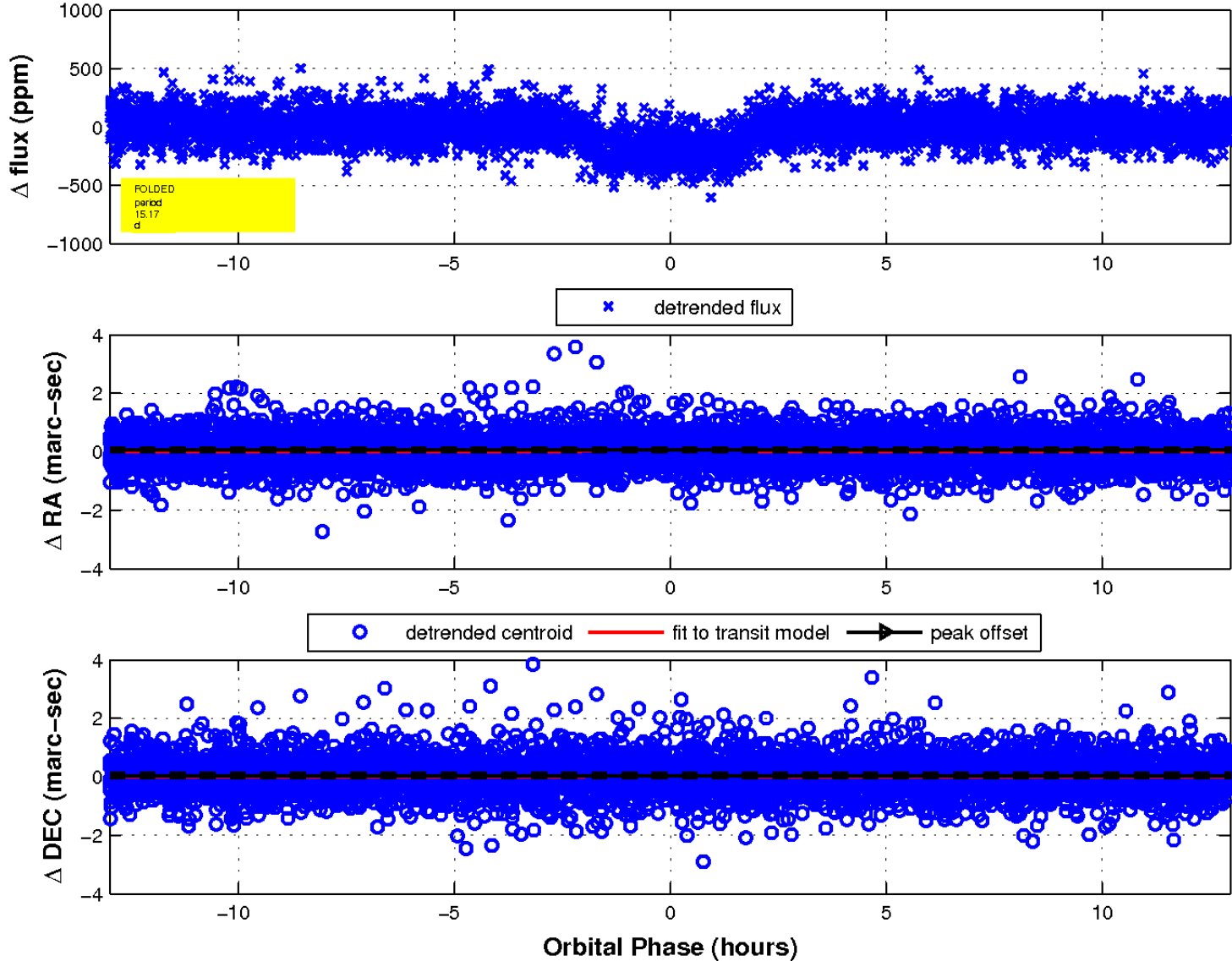




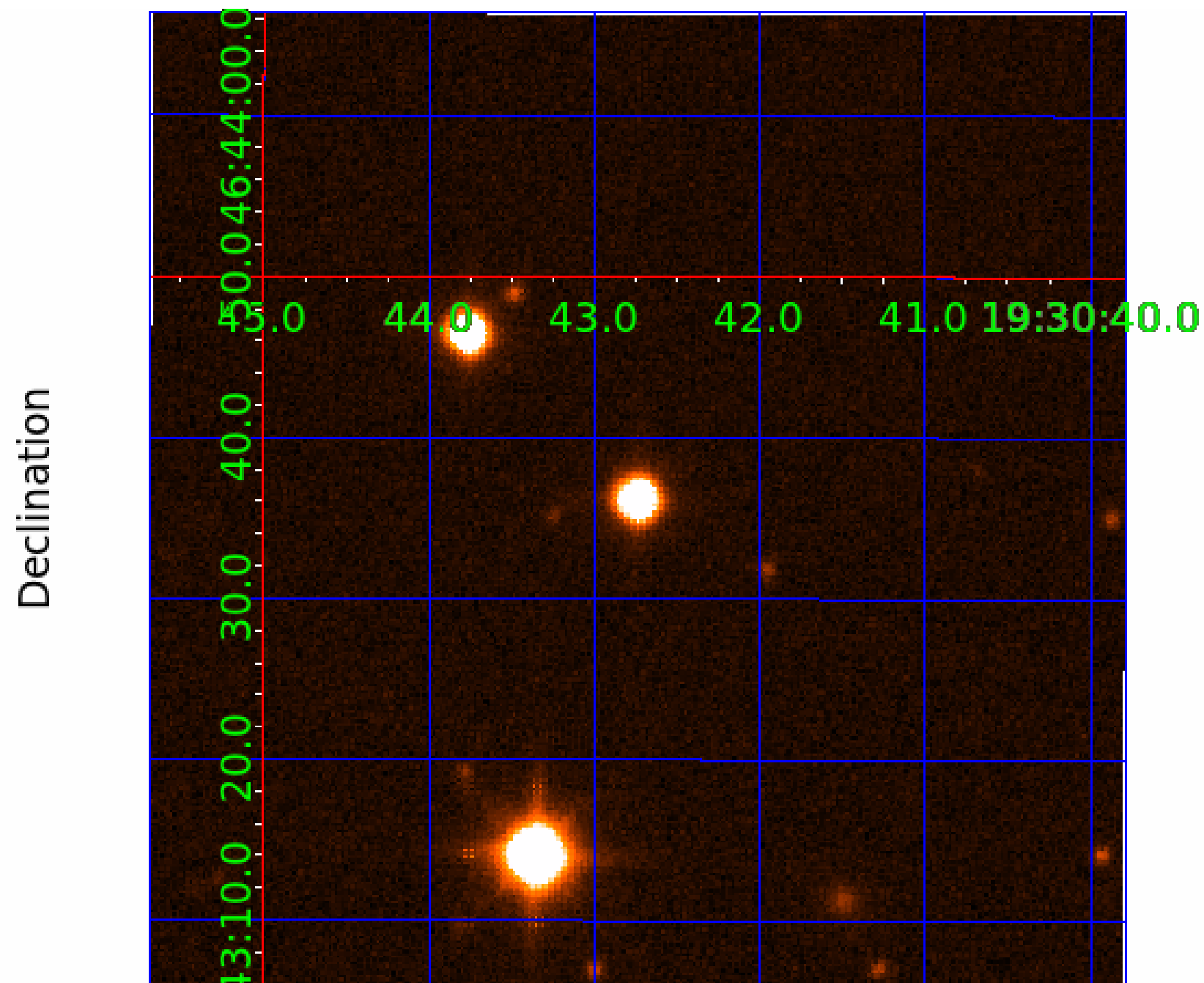
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



fluxWeightedCentroids, Planet 1 of 4



UKIRT Image





# KIC 009892816

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
009892816-01	OBS	1955.01	15.170230	132.667566	228.4	4.327	32.2	35.4	1.37	6297	2.50	158.63
009892816-02	OBS	1955.02	39.457264	136.479121	229.6	9.419	24.0	25.0	1.37	6297	2.68	44.35
009892816-03	OBS	1955.03	1.644212	131.754609	43.8	2.816	17.5	18.4	1.37	6297	1.06	3069.64
009892816-04	OBS	1955.04	26.235229	141.974221	181.8	3.069	15.0	16.4	1.37	6297	2.33	76.42

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009892816-01	OBS	PC	1.00	0	0	0	0	NO_COMMENT
009892816-02	OBS	PC	0.60	0	0	0	0	NO_COMMENT
009892816-03	OBS	PC	1.00	0	0	0	0	NO_COMMENT
009892816-04	OBS	PC	0.99	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.

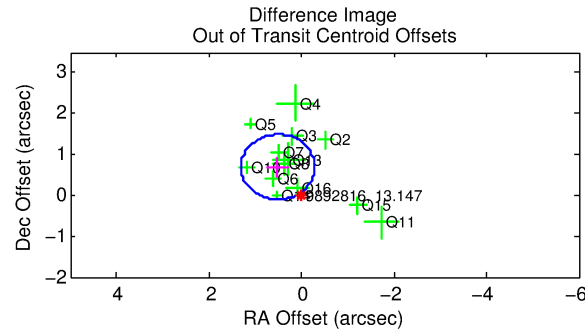
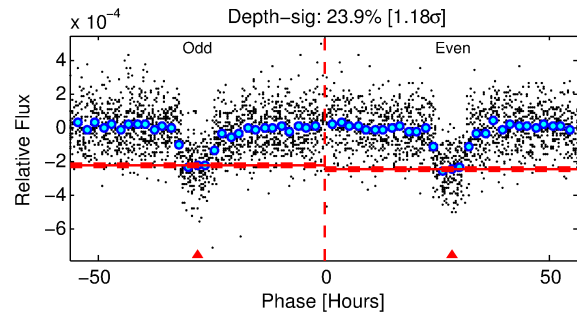
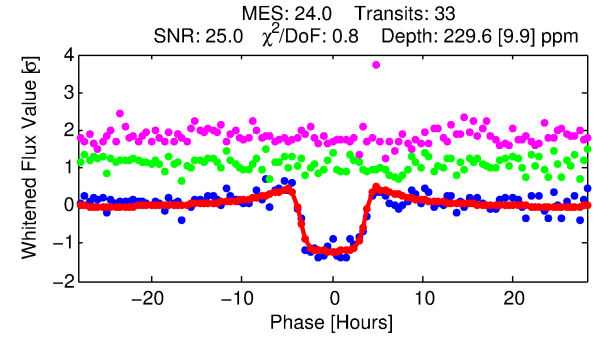
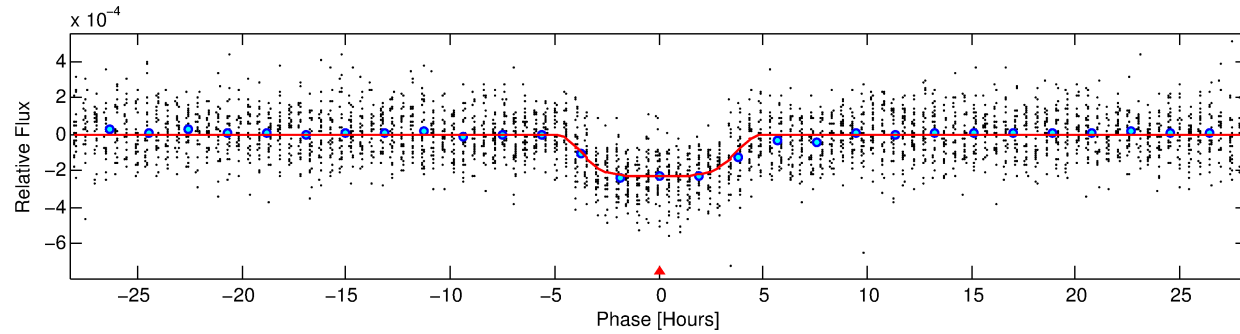
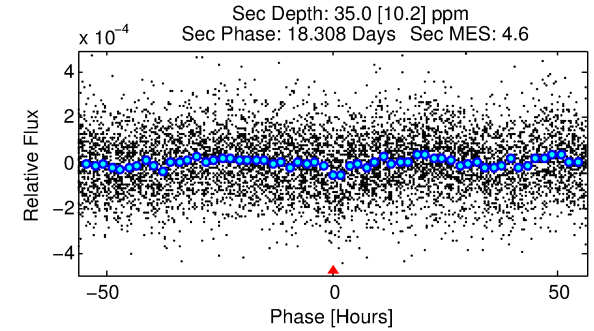
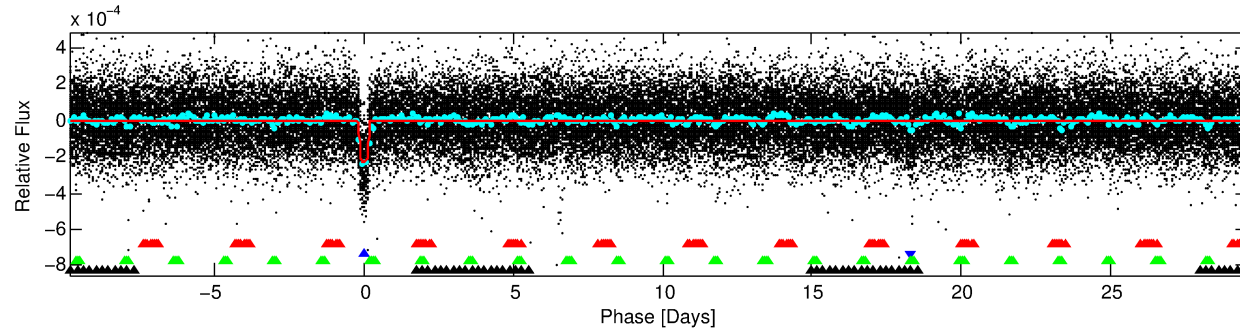
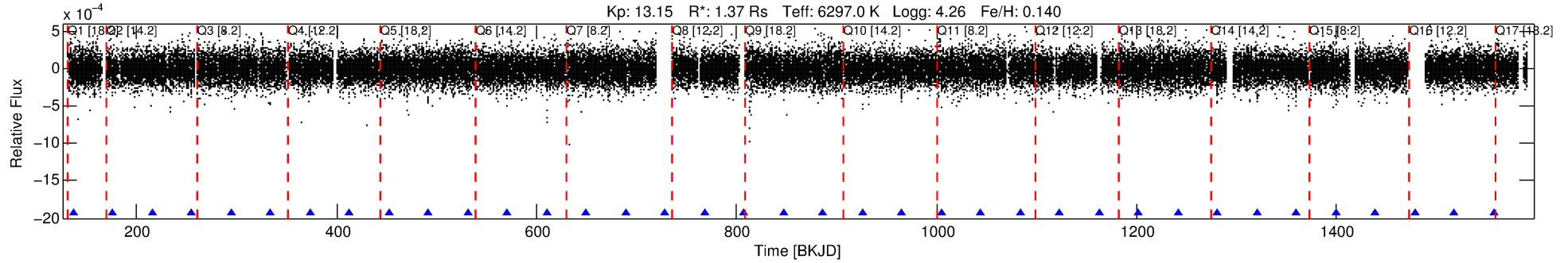
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 009892816-02

No Significant Match Found

# DV One-Page Summary

KIC: 9892816 Candidate: 2 of 4 Period: 39.457 d  
KOI: K01955.02 Name: Kepler-342d Corr: 0.989



## DV Fit Results:

Period = 39.45726 [0.00029] d  
Epoch = 136.4791 [0.0061] BKJD  
Rp/R\* = 0.0179 [0.0005]  
a/R\* = 10.21 [0.82]  
b = 0.97 [0.01]  
Seff = 44.35 [9.64]  
Teq = 658 [36] K  
Rp = 2.68 [0.45] Re  
a = 0.2440 [0.0340] AU  
Ag = 159.49 [57.29] [2.77σ]  
Teffp = 3615 [278] K [10.55σ]

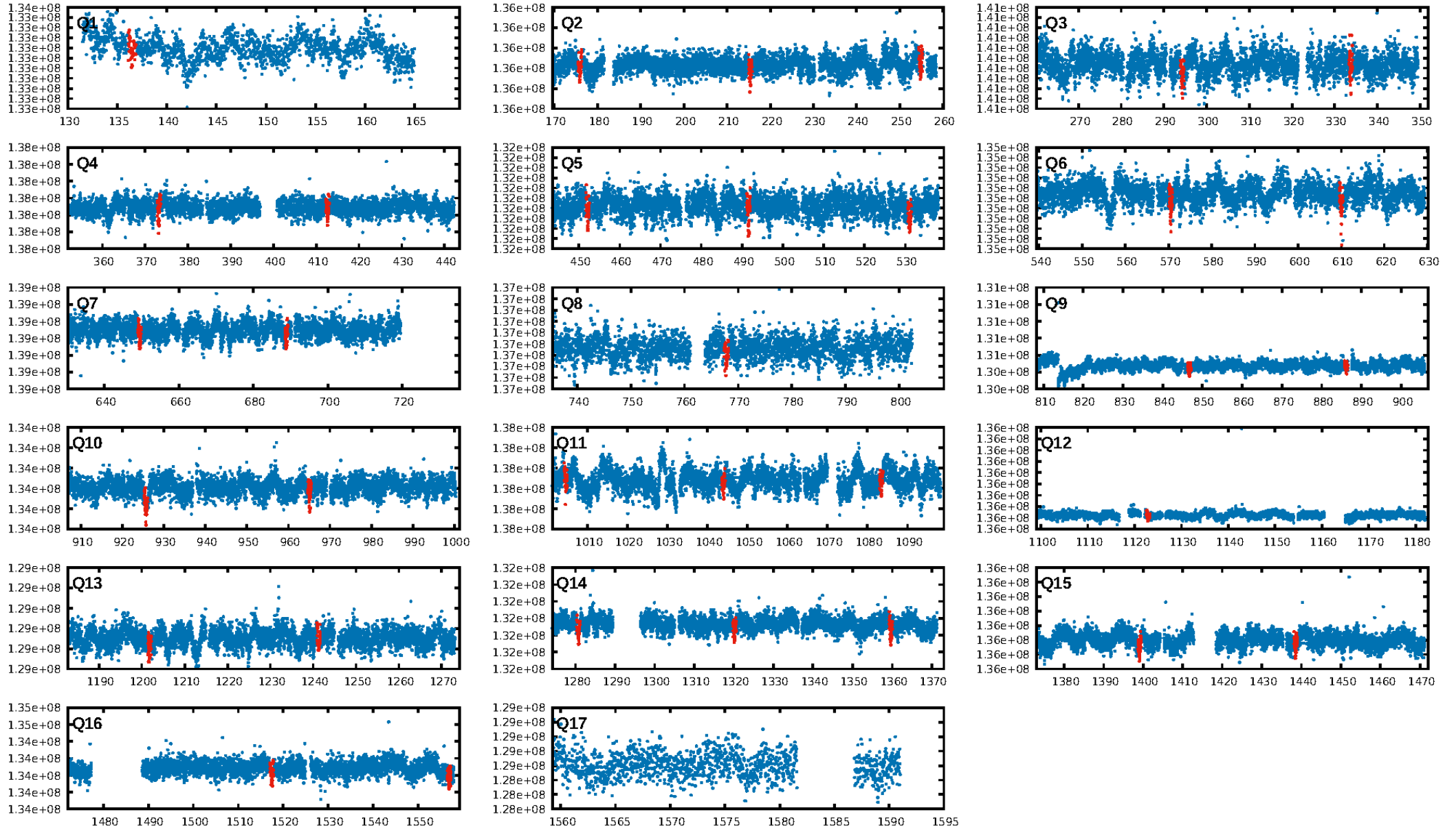
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [32.03σ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: 99.7%  
ModelChiSquareGof-sig: 100.0%  
Bootstrap-pfa: 1.37e-108  
RollingBand-fgt: 1.00 [32/32]  
GhostDiagnostic-chr: 4.455  
Centroid-sig: 5.6%  
Centroid-so: 0.512 arcsec [1.20σ]  
OotOffset-rm: 0.864 arcsec [3.25σ]  
KicOffset-rm: 0.846 arcsec [3.22σ]  
OotOffset-st: 4/4/3/2 [13]  
KicOffset-st: 4/4/3/2 [13]  
DiffImageQuality-fgm: 0.92 [12/13]  
DiffImageOverlap-fno: 0.00 [0/14]

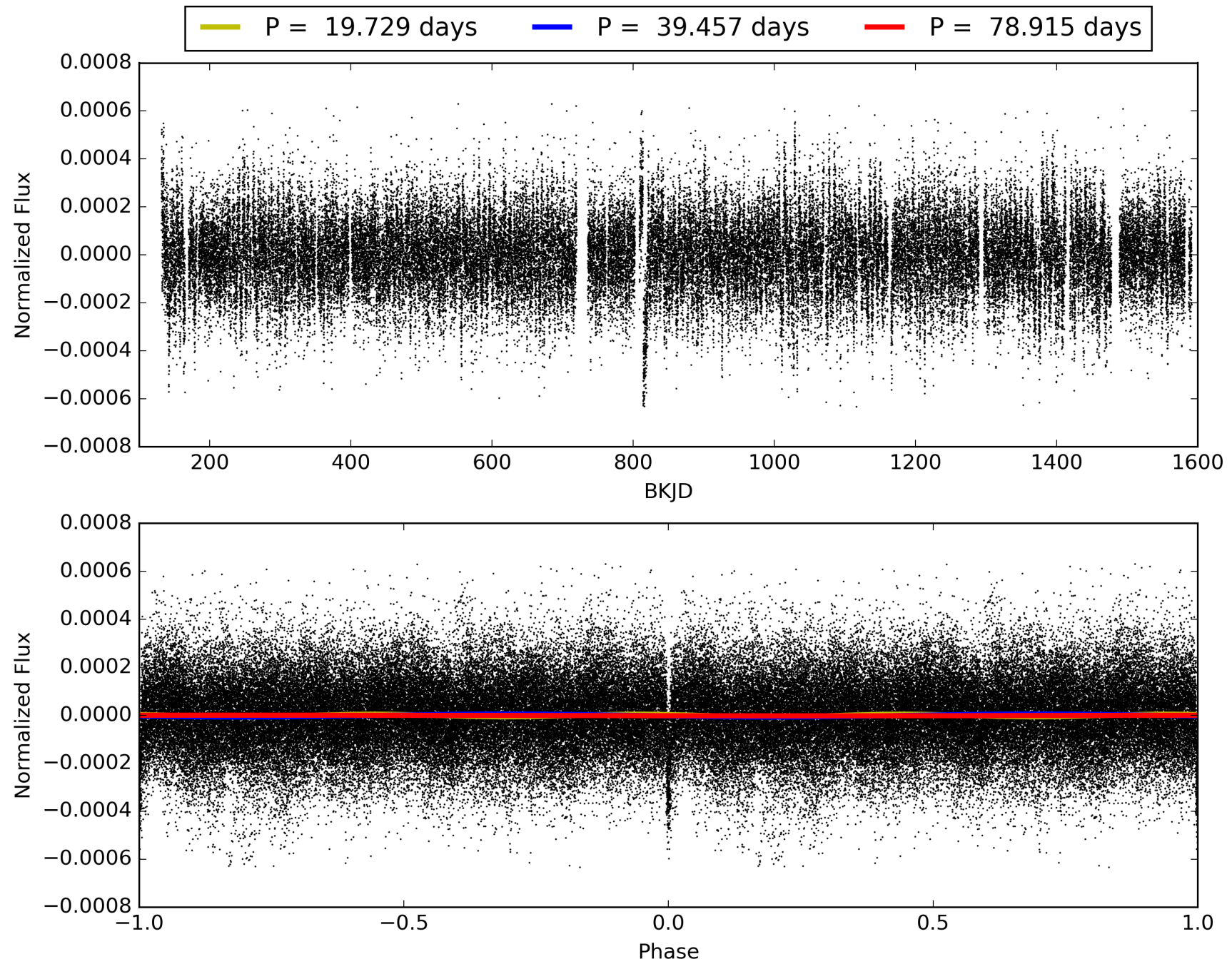
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 31-Jan-2016 04:36:19 Z

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

# TCE 009892816-02, PDC Light Curves

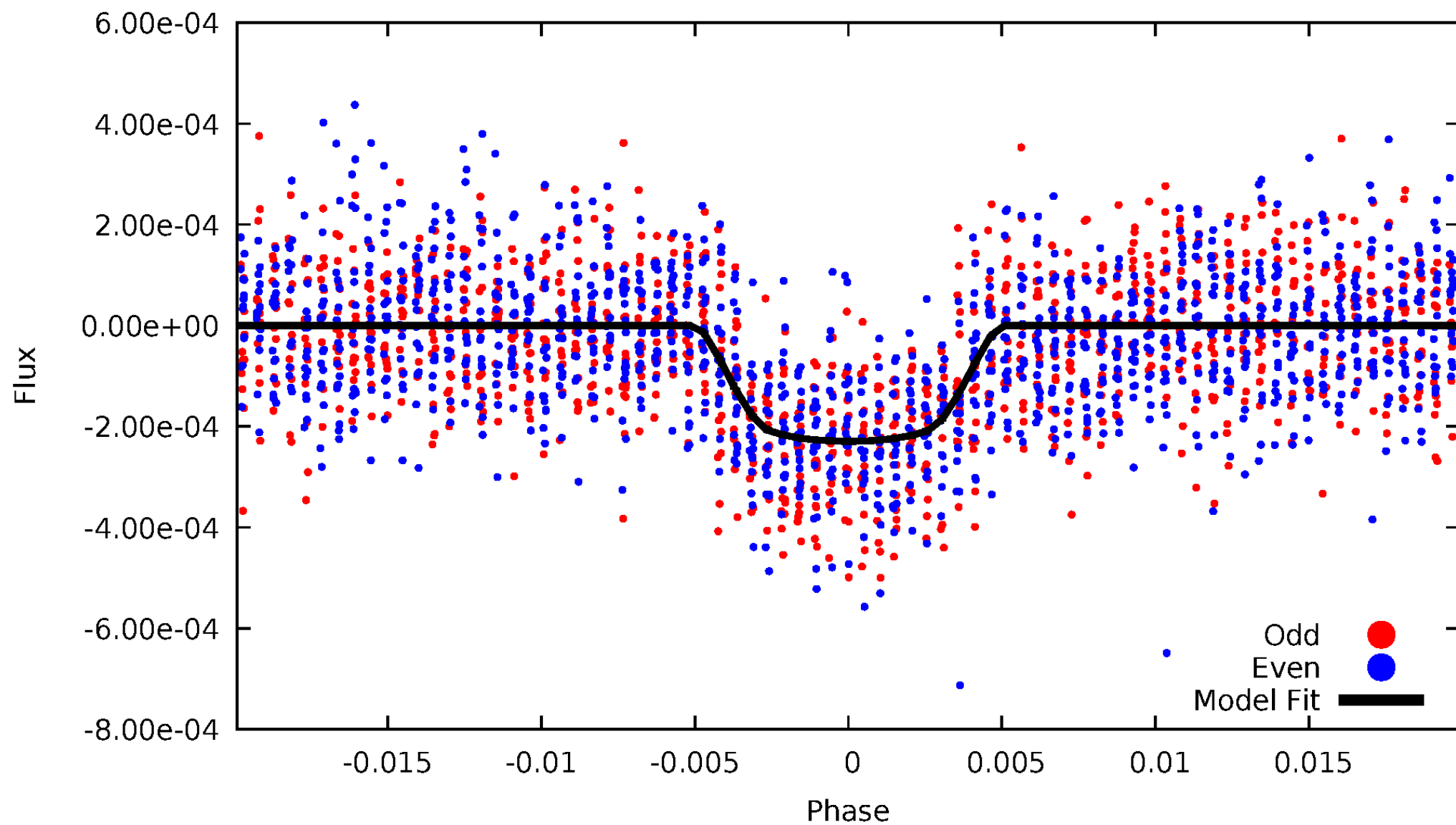


TCE 009892816-02



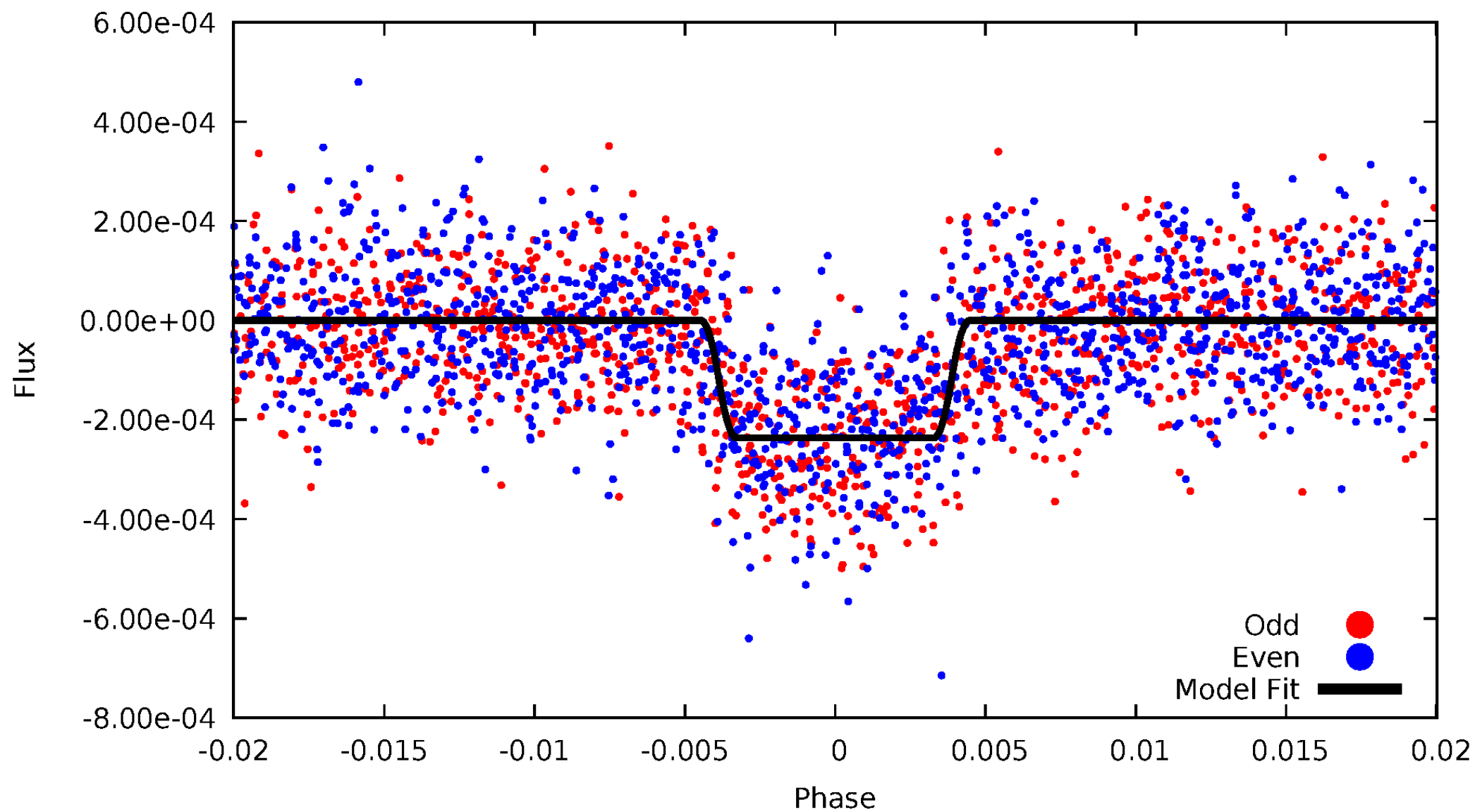
# DV Odd/Even

TCE 009892816-02



# ALT Odd/Even

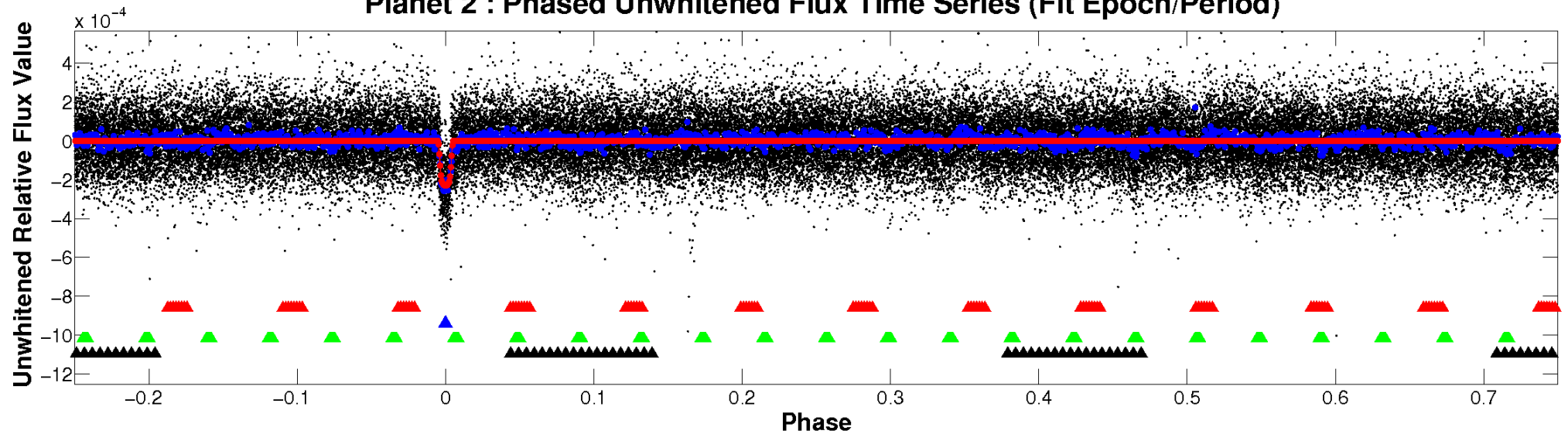
TCE 009892816-02



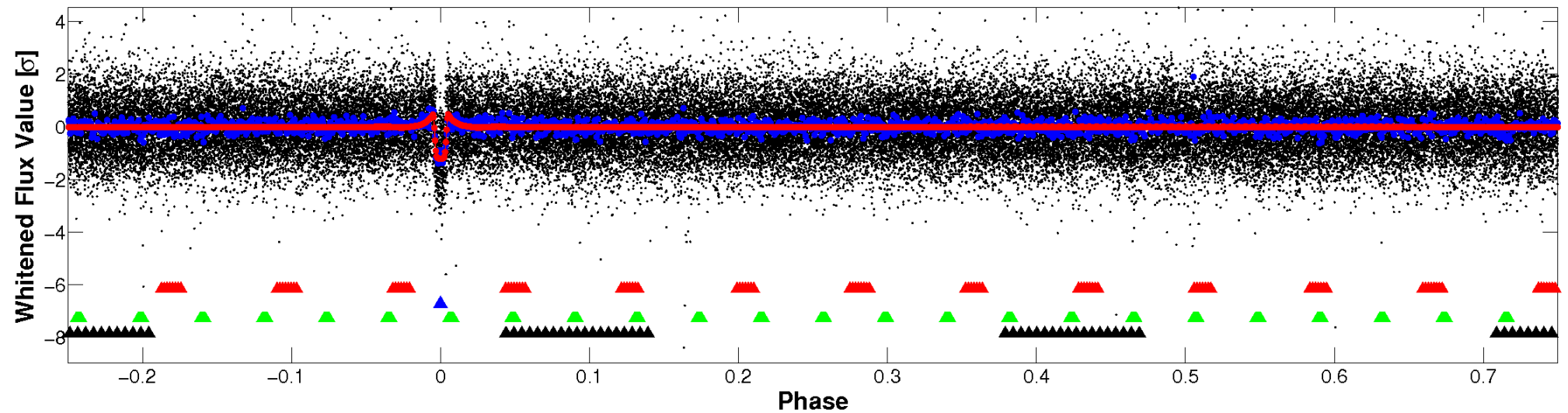


# Non-Whitened Vs. Whitened Light Curve

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



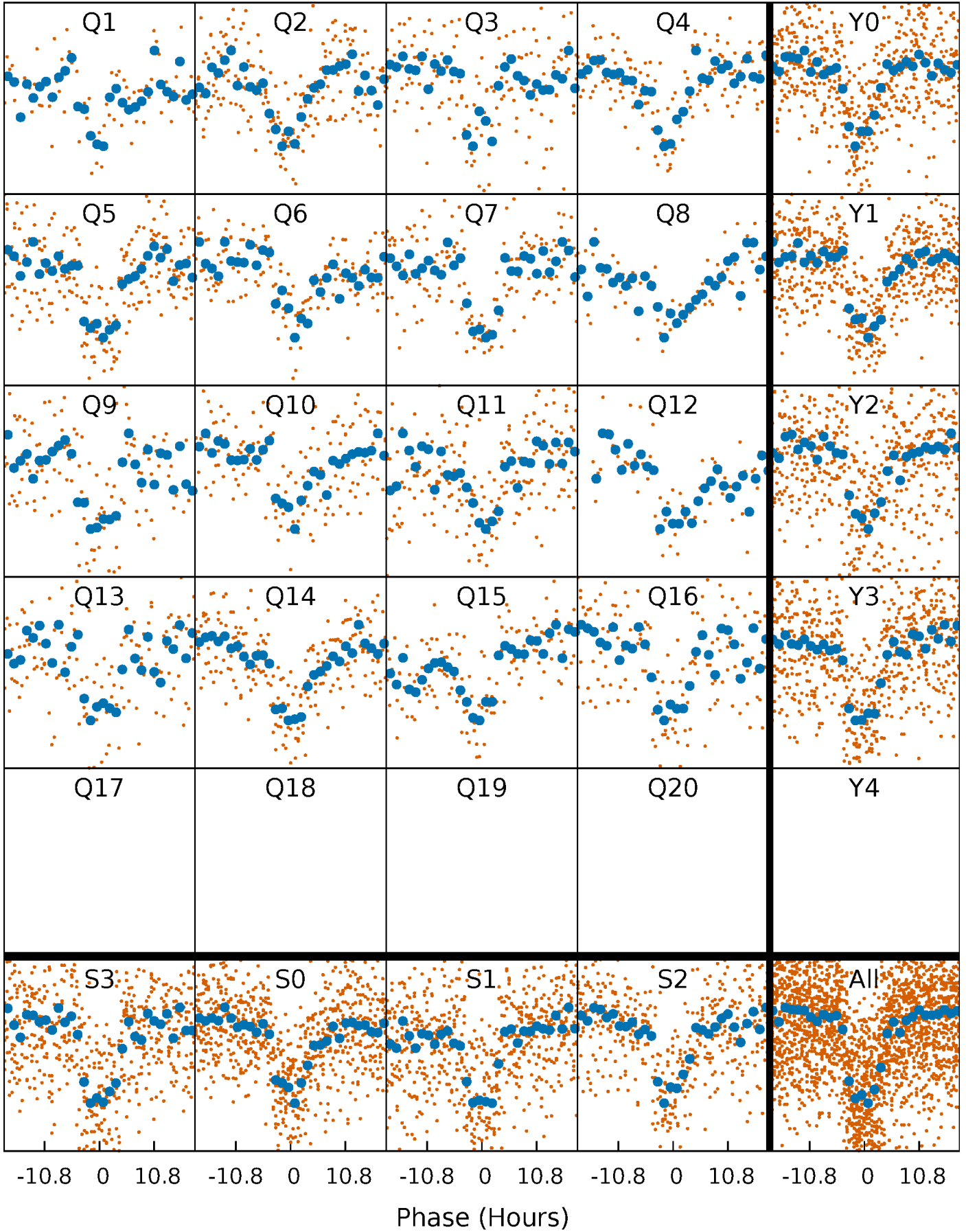
## Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)





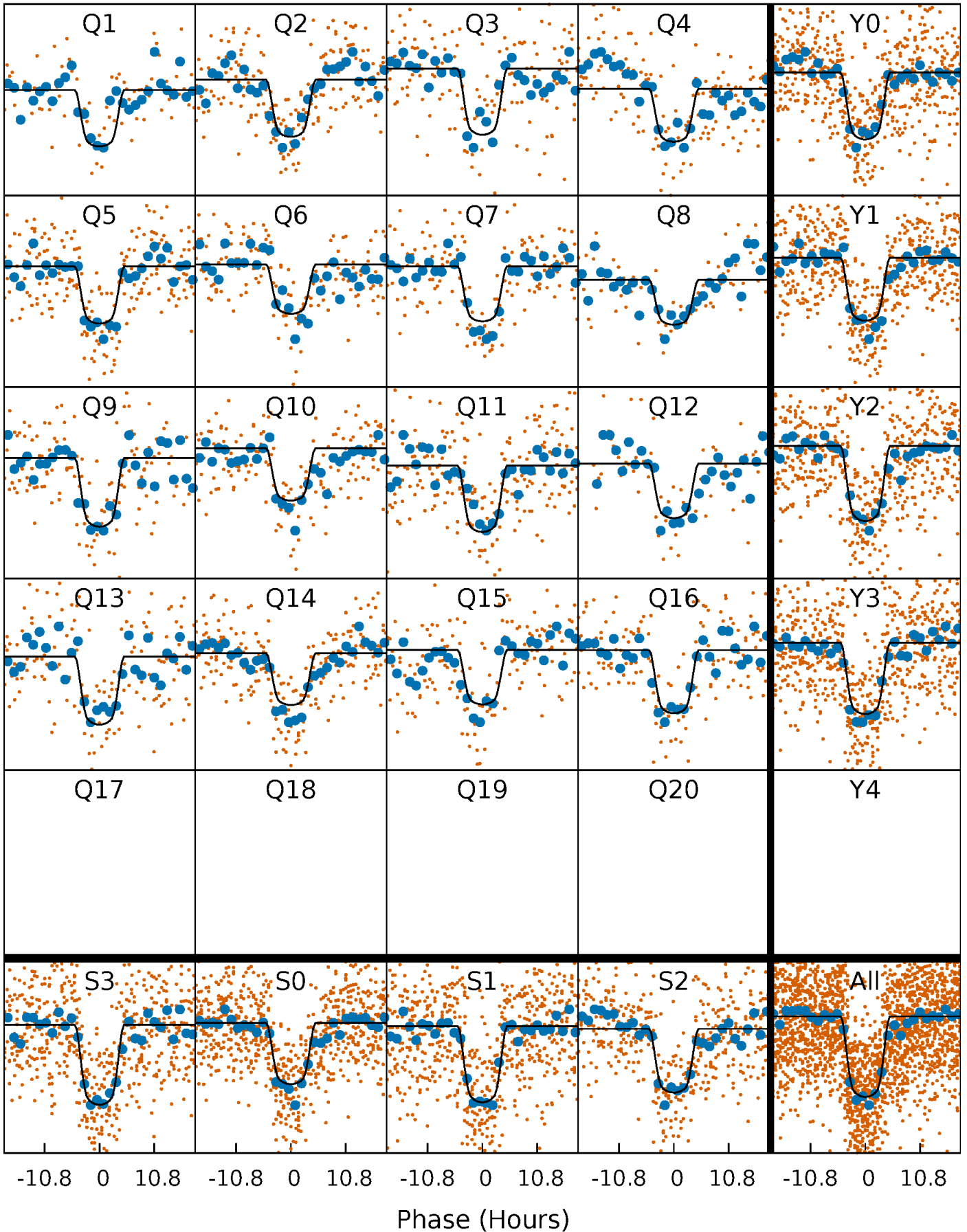
# PDC Quarter-Phased Transit Curves

TCE 009892816-02     $P = 39.457264$  Days     $T_0 = 136.479121$  (BKJD)



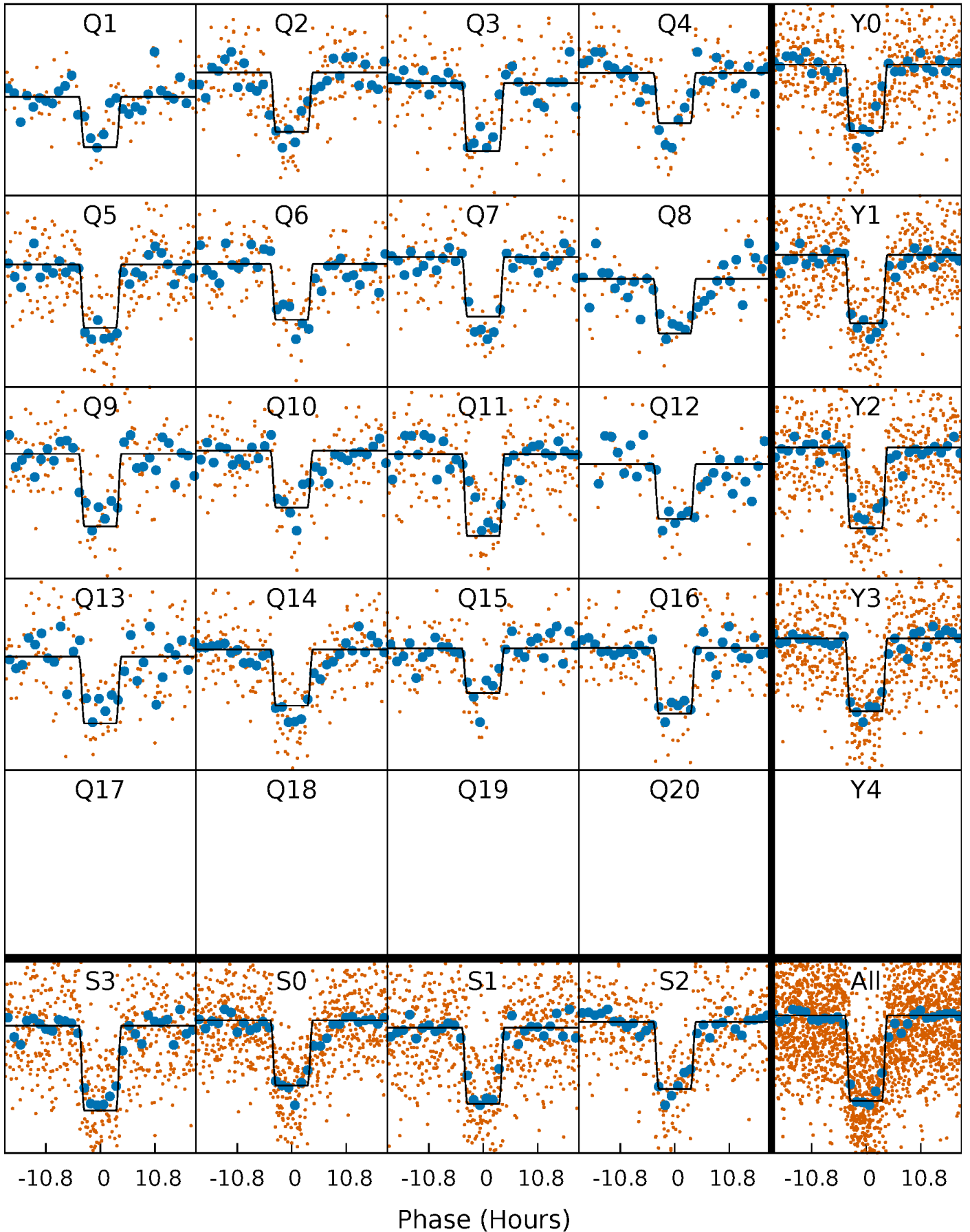
# DV Quarter-Phased Transit Curves

TCE 009892816-02   P= 39.457264 Days    $T_0=136.479121$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

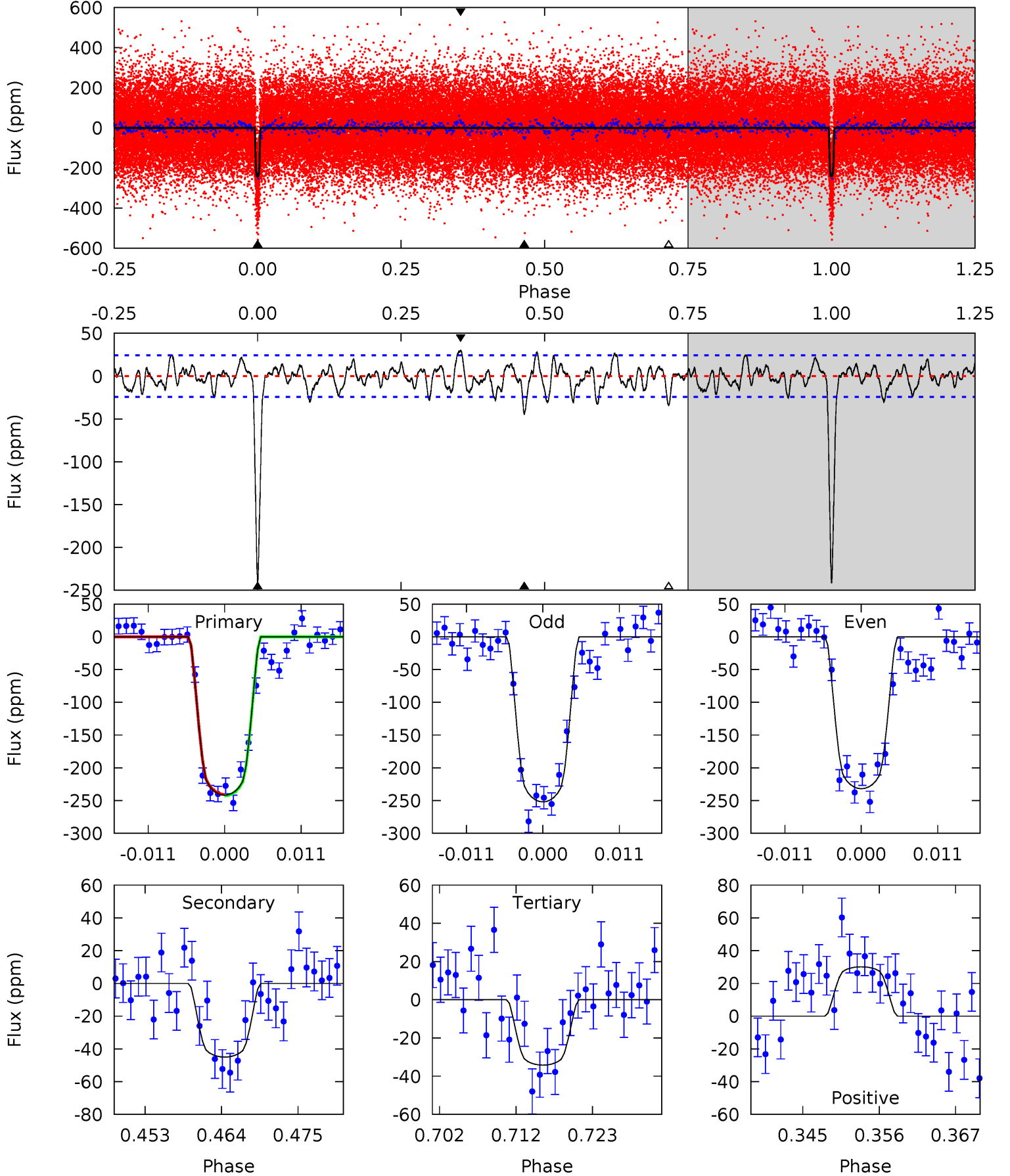
TCE 009892816-02 P= 39.456666 Days  $T_0=136.489992$  (BKJD)



# DV Model-Shift Uniqueness Test

009892816-02, P = 39.457264 Days, E = 97.021857 Days

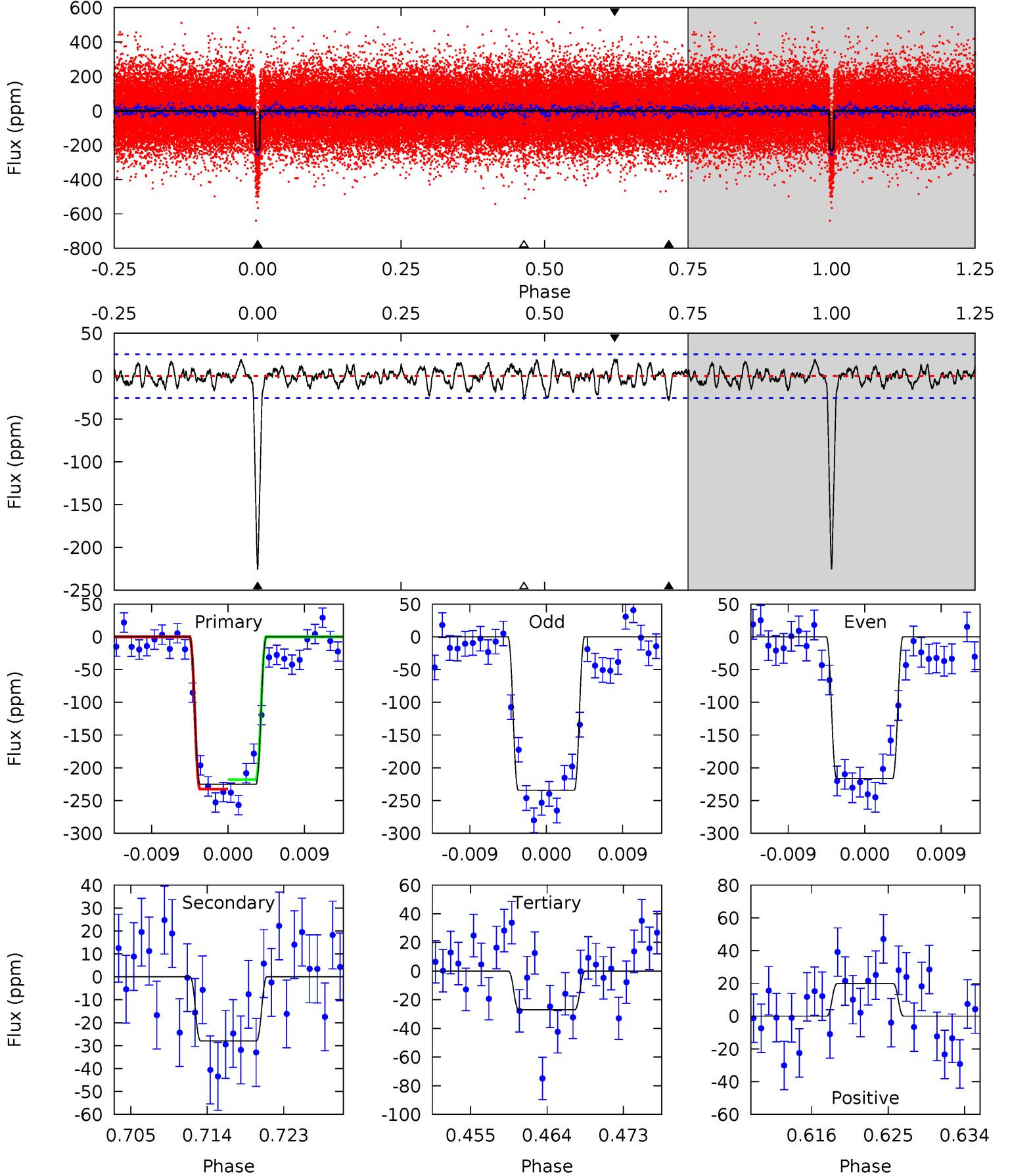
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
49.8	9.27	7.05	6.21	5.01	2.55	2.37	42.8	43.6	2.22	3.06	2.08	1.04	0.11	0.20



# Alt Model-Shift Uniqueness Test

009892816-02, P = 39.456666 Days, E = 97.033326 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
44.7	5.55	5.36	3.95	5.05	2.61	1.63	39.4	40.8	0.19	1.60	1.79	1.00	0.08	1.45



### Stellar Parameters For KIC 009892816

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$6297^{+113}_{-126}$	$4.260^{+0.090}_{-0.110}$	$0.140^{+0.150}_{-0.200}$	$1.369^{+0.228}_{-0.187}$	$1.247^{+0.091}_{-0.111}$	$0.684^{+0.278}_{-0.233}$
	+2%/-2%	+2%/-3%	+107%/-143%	+17%/-14%	+7%/-9%	+41%/-34%
Source	SPE59	SPE59	SPE59	DSEP		

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

### Secondary Eclipse Parameters for KIC 009892816-02 / KOI 1955.02

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$-45 \pm 5$	$2.69^{+0.24}_{-0.22}$	$923^{+39}_{-37}$	$4127^{+109}_{-106}$	$203^{+40}_{-38}$
Alt.	$-28 \pm 5$	$2.31^{+0.23}_{-0.17}$	$922^{+40}_{-37}$	$3998^{+144}_{-146}$	$170^{+39}_{-38}$

$T_{\text{max}}$  = 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

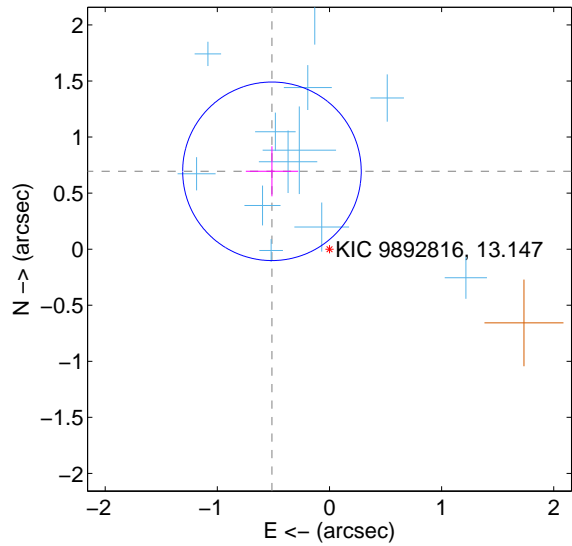
Supplemental centroid analysis for 009892816-02. Kepler magnitude: 13.15. Transit SNR 24.99

There are 12 quarters with good PRF difference image offsets

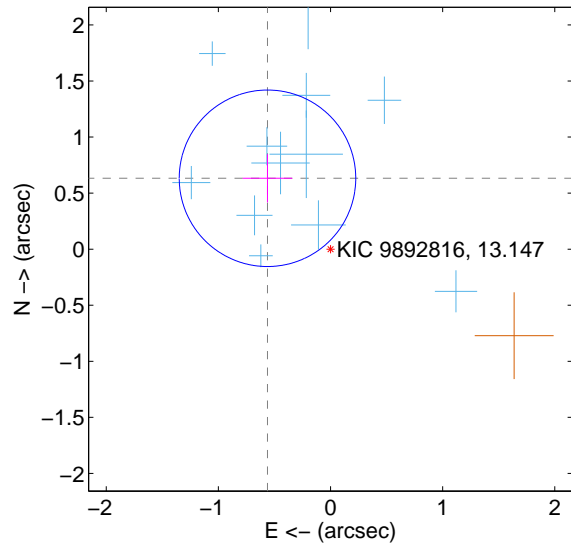
The direct PRF centroid is offset from the target star catalog position by about 0.04 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	<b>0.864 <math>\pm</math> 0.265</b>	<b>3.25</b>	0.513 $\pm$ 0.233	0.695 $\pm$ 0.223
PRF-fit source offset from KIC position	<b>0.846 <math>\pm</math> 0.262</b>	<b>3.22</b>	0.562 $\pm$ 0.222	0.632 $\pm$ 0.215
photometric centroid source offset	0.51 $\pm$ 0.43	1.20	-0.05 $\pm$ 0.39	-0.51 $\pm$ 0.43

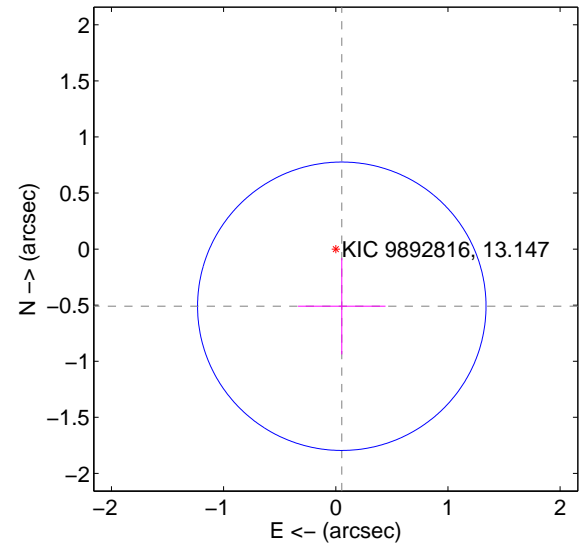
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position



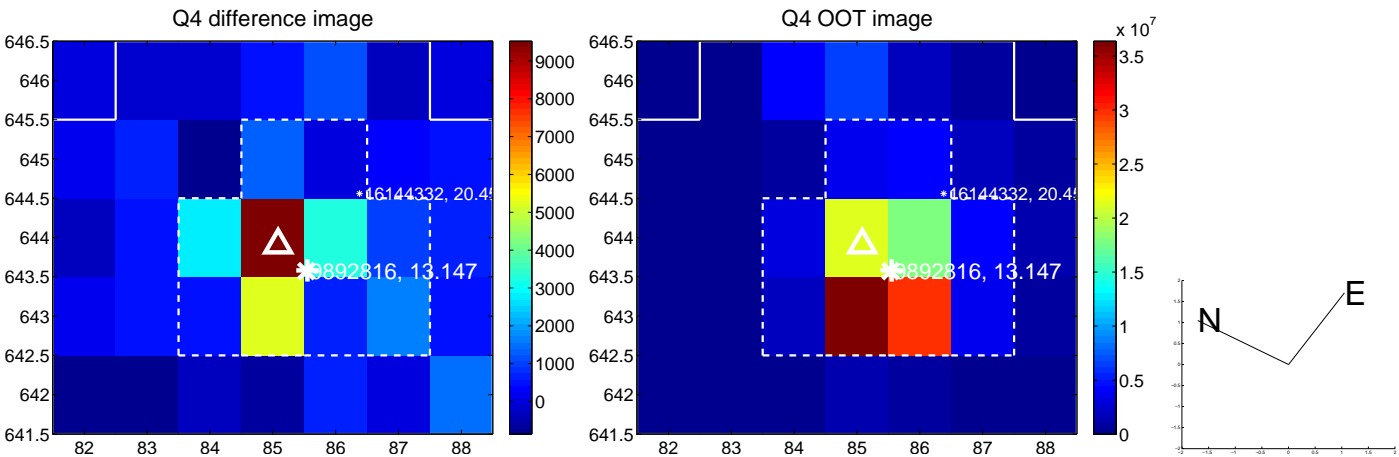
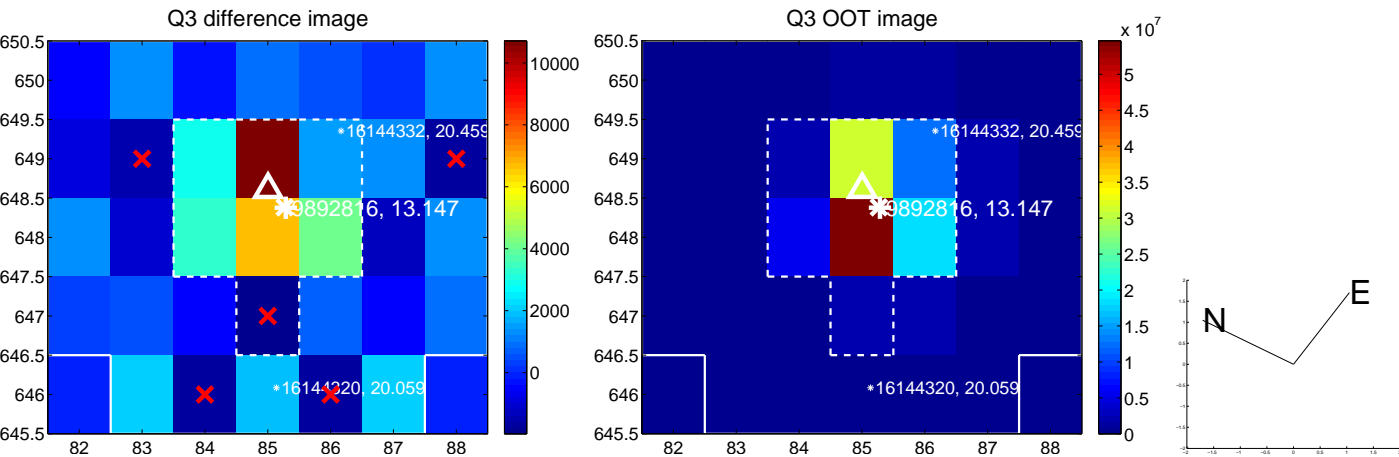
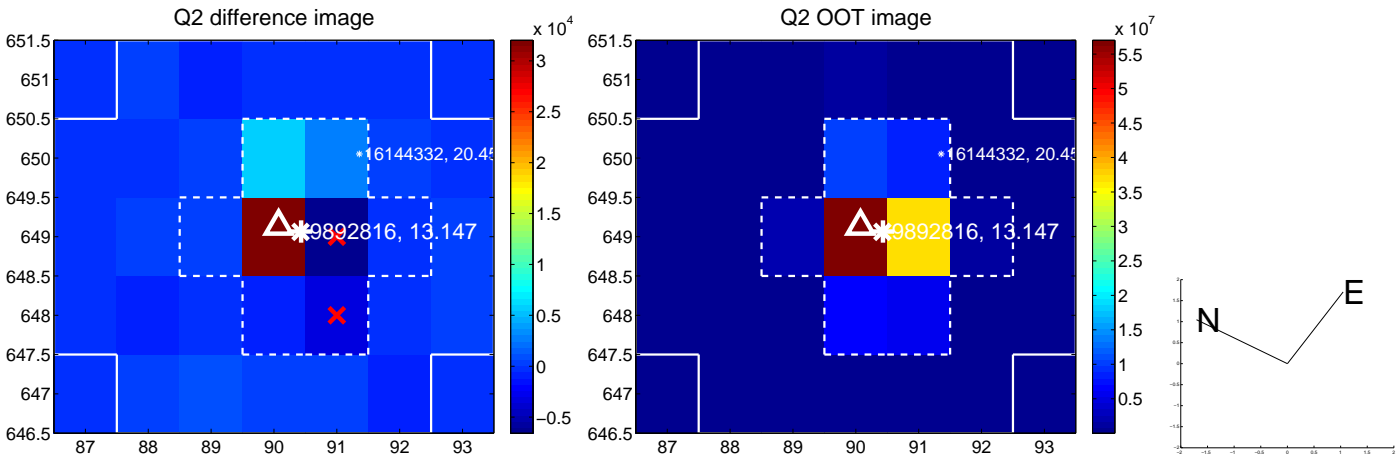
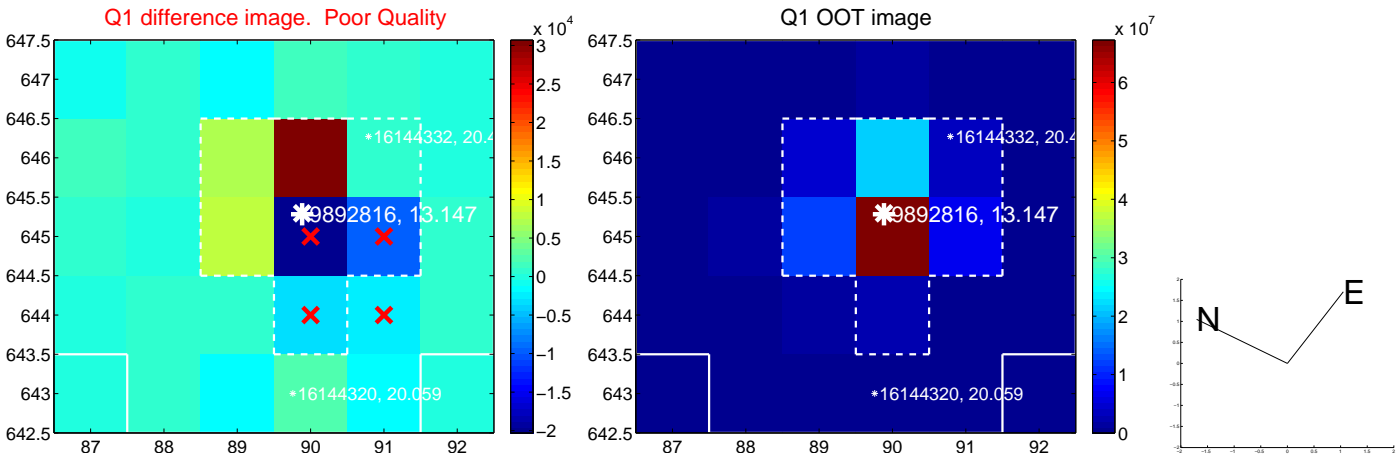
offset from photometric centroids



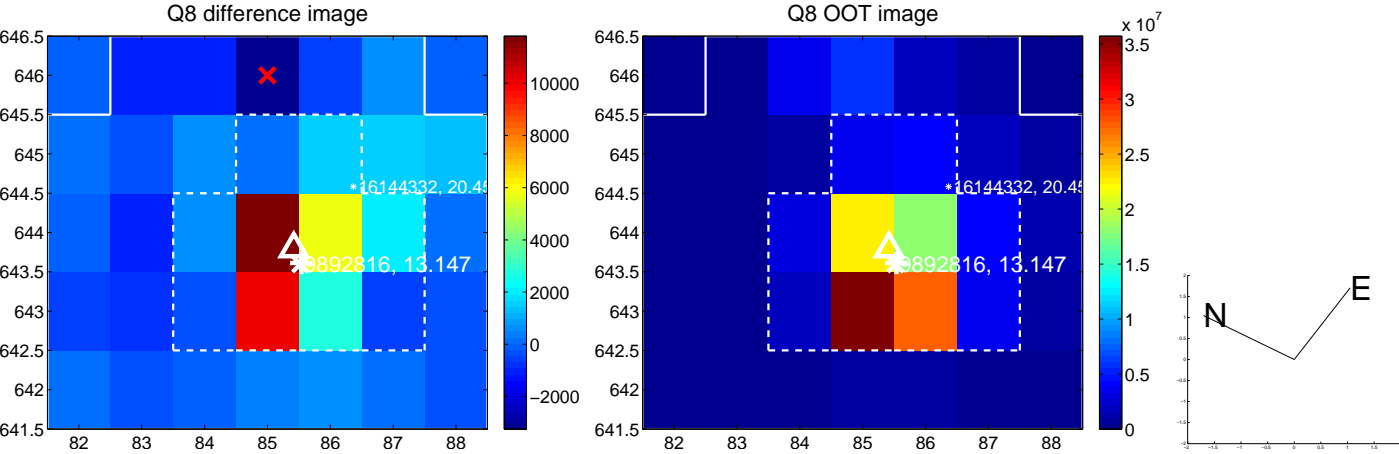
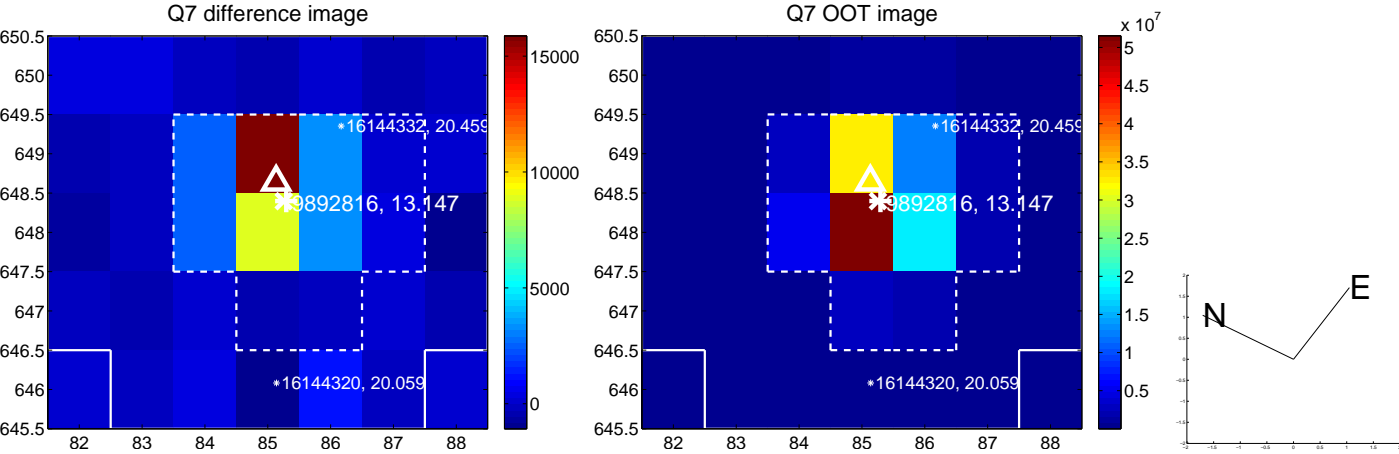
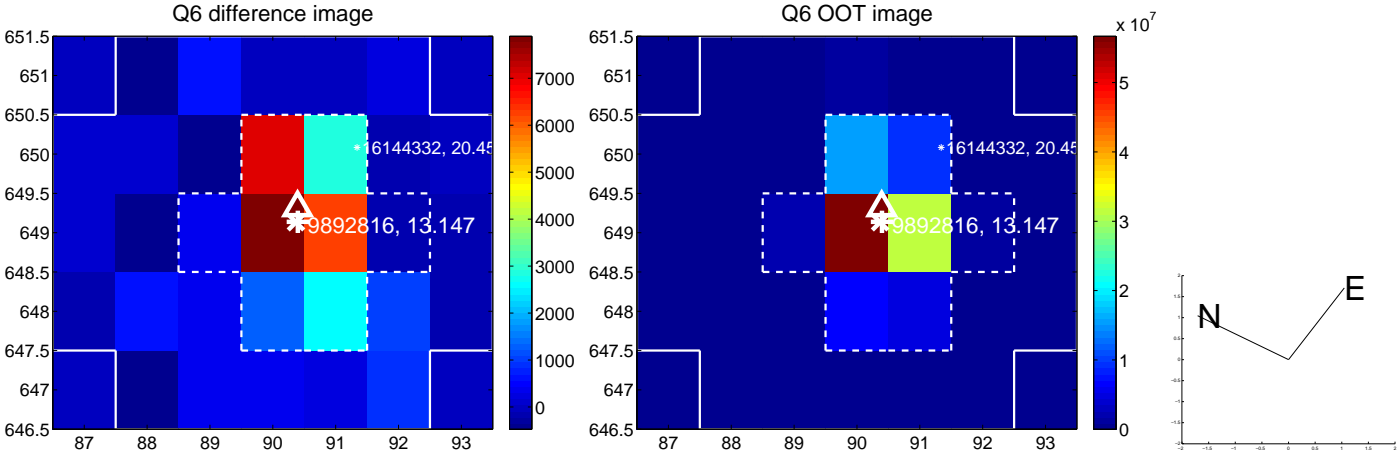
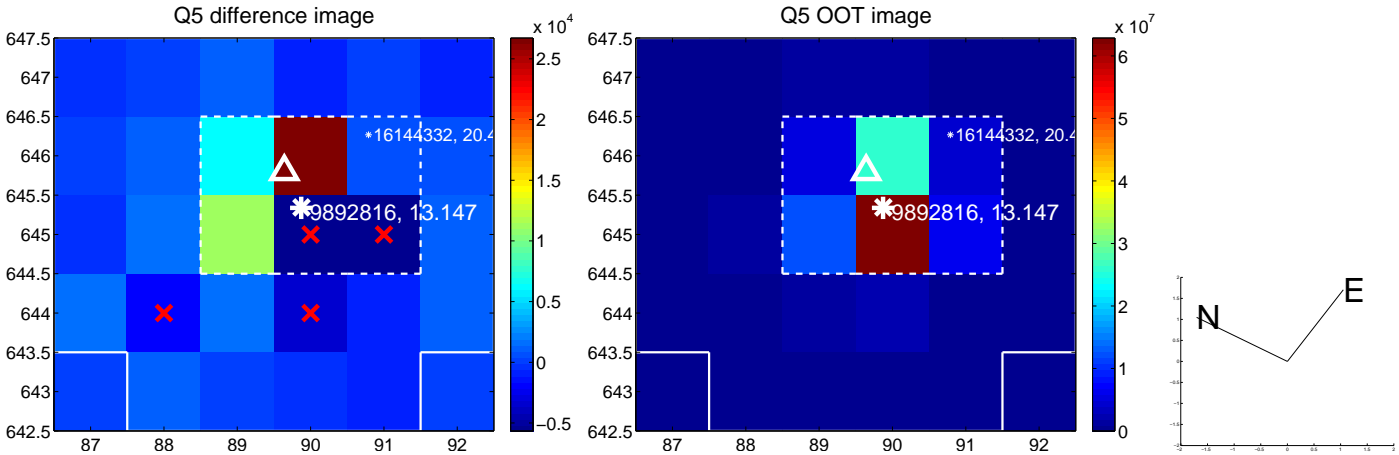
Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets**; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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



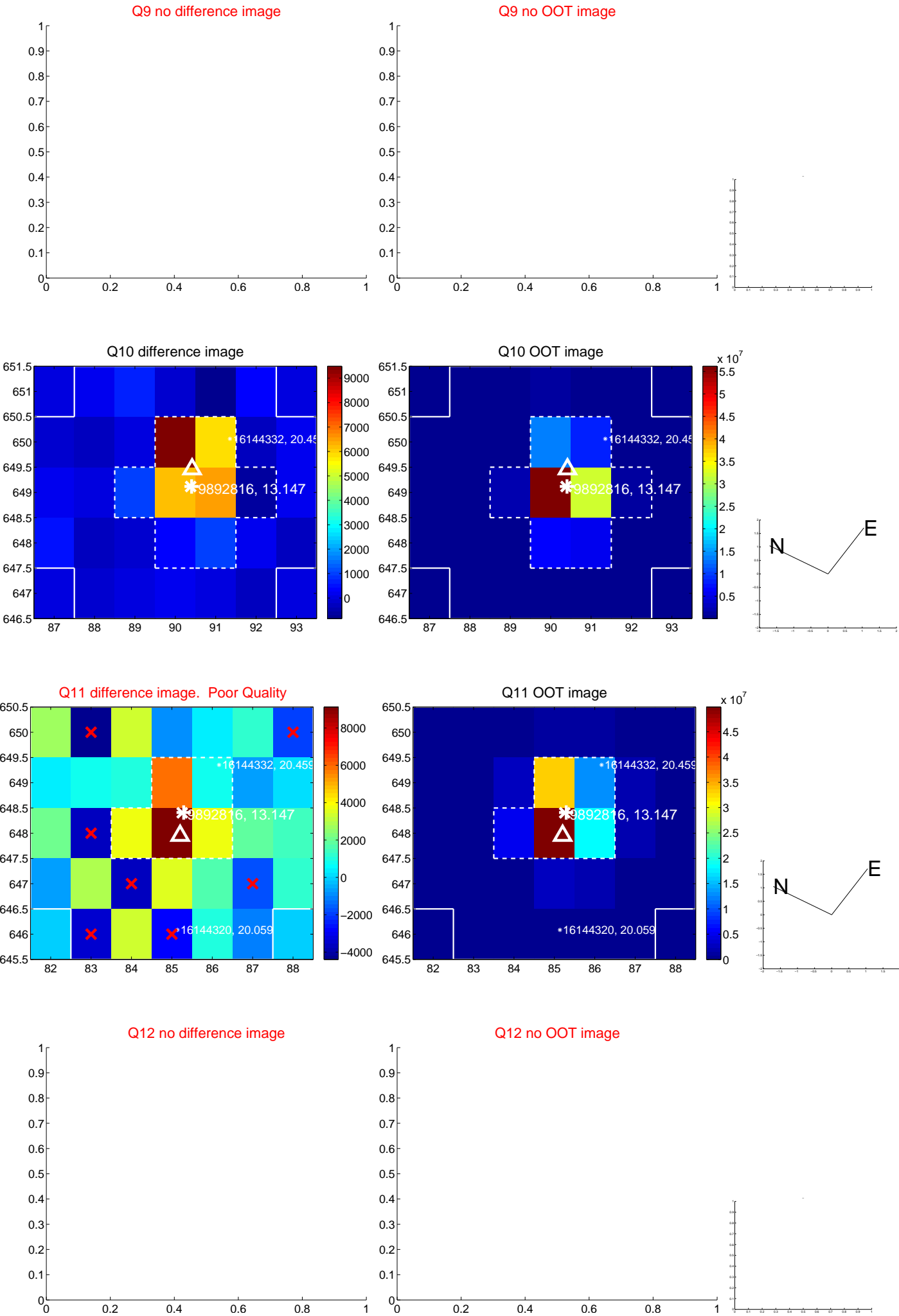
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

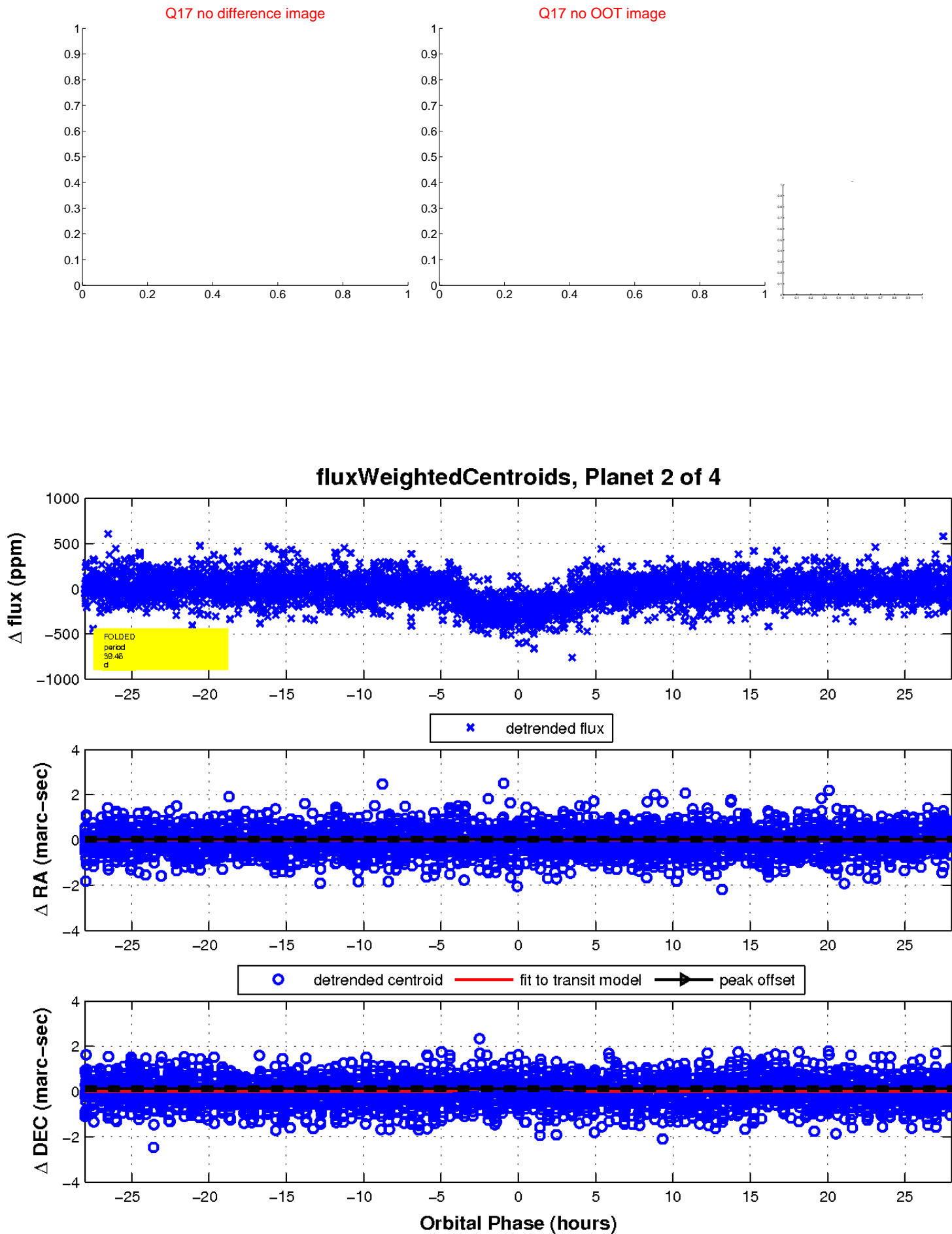


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

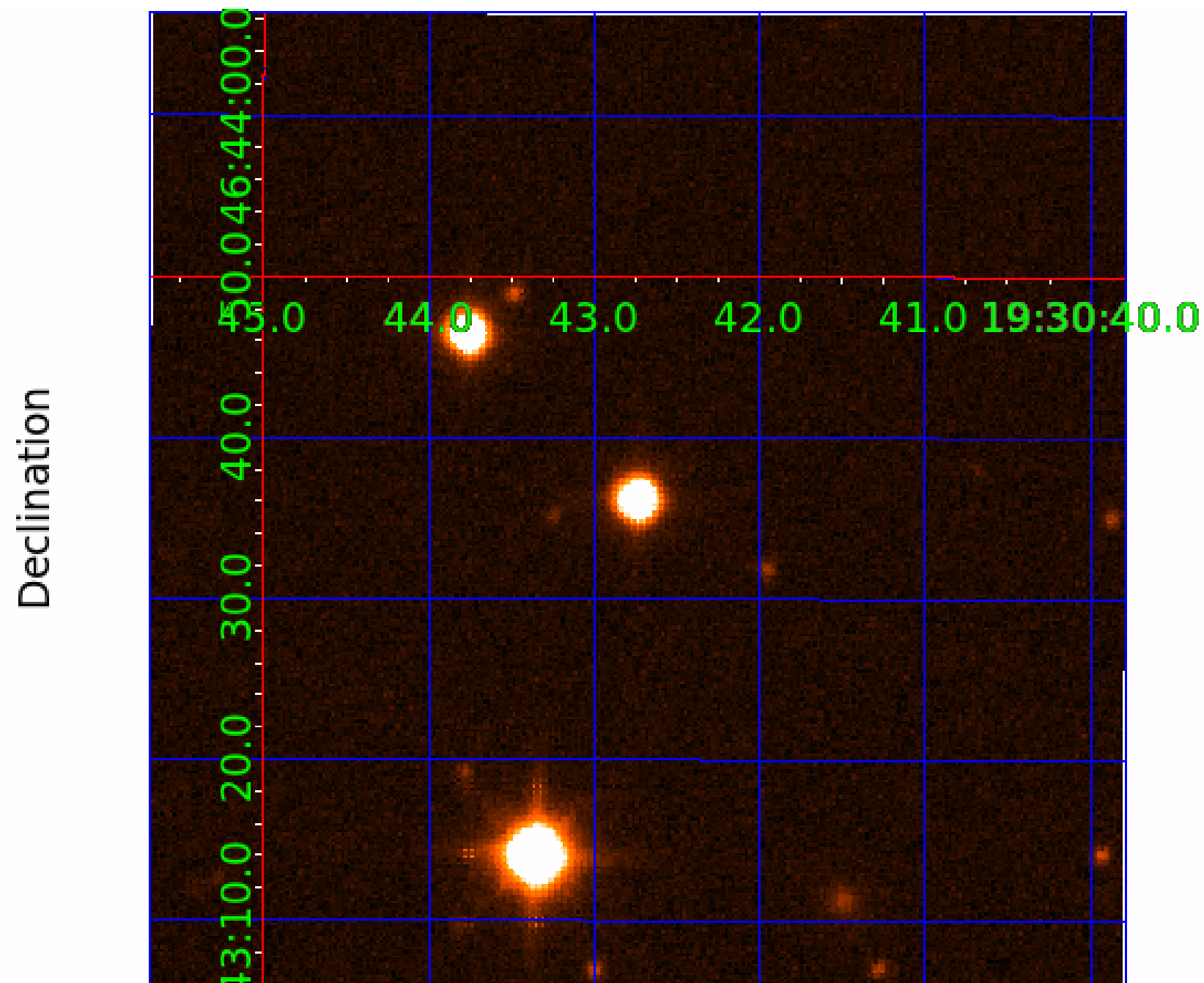




white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image



# KIC 009892816

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
009892816-01	OBS	1955.01	15.170230	132.667566	228.4	4.327	32.2	35.4	1.37	6297	2.50	158.63
009892816-02	OBS	1955.02	39.457264	136.479121	229.6	9.419	24.0	25.0	1.37	6297	2.68	44.35
009892816-03	OBS	1955.03	1.644212	131.754609	43.8	2.816	17.5	18.4	1.37	6297	1.06	3069.64
009892816-04	OBS	1955.04	26.235229	141.974221	181.8	3.069	15.0	16.4	1.37	6297	2.33	76.42

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009892816-01	OBS	PC	1.00	0	0	0	0	NO_COMMENT
009892816-02	OBS	PC	0.60	0	0	0	0	NO_COMMENT
009892816-03	OBS	PC	1.00	0	0	0	0	NO_COMMENT
009892816-04	OBS	PC	0.99	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.

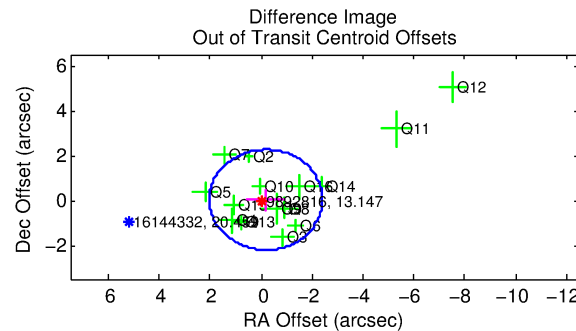
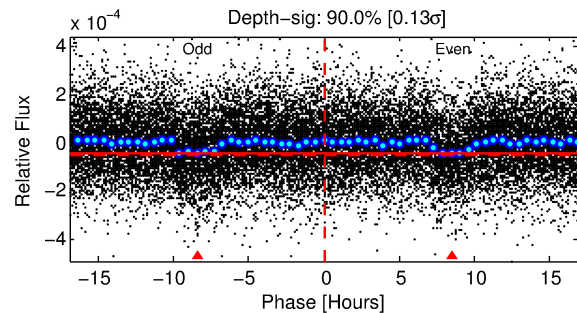
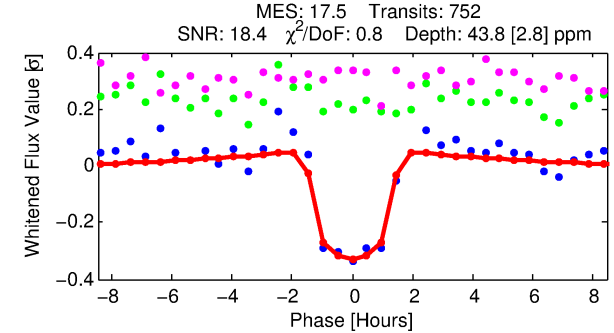
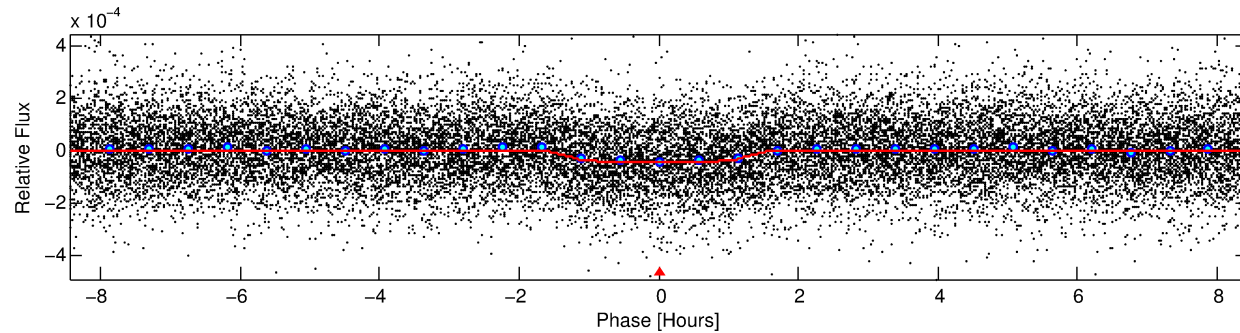
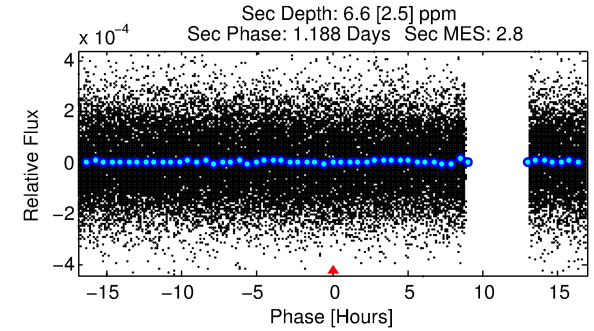
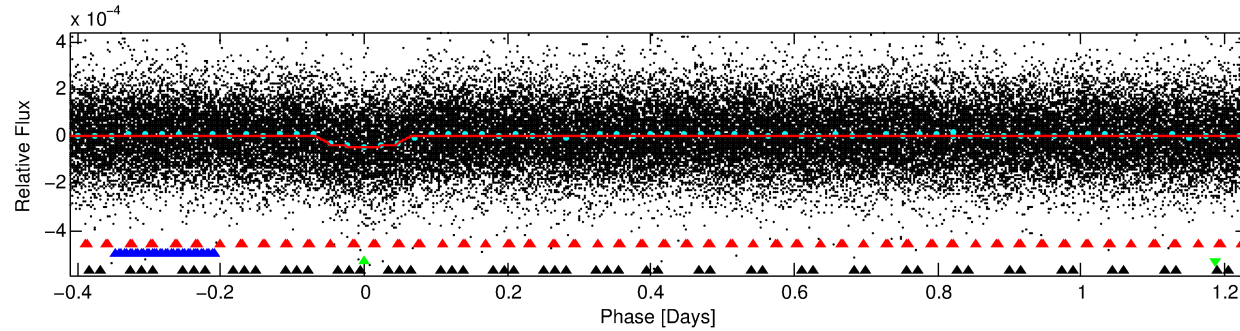
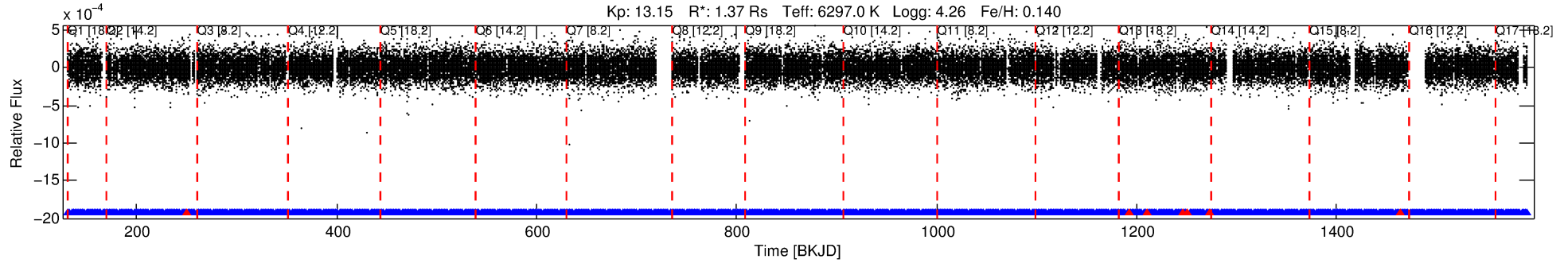
Ephemeris Match Information For 009892816-03

No Significant Match Found



# DV One-Page Summary

KIC: 9892816 Candidate: 3 of 4 Period: 1.644 d  
KOI: K01955.03 Corr: 0.972



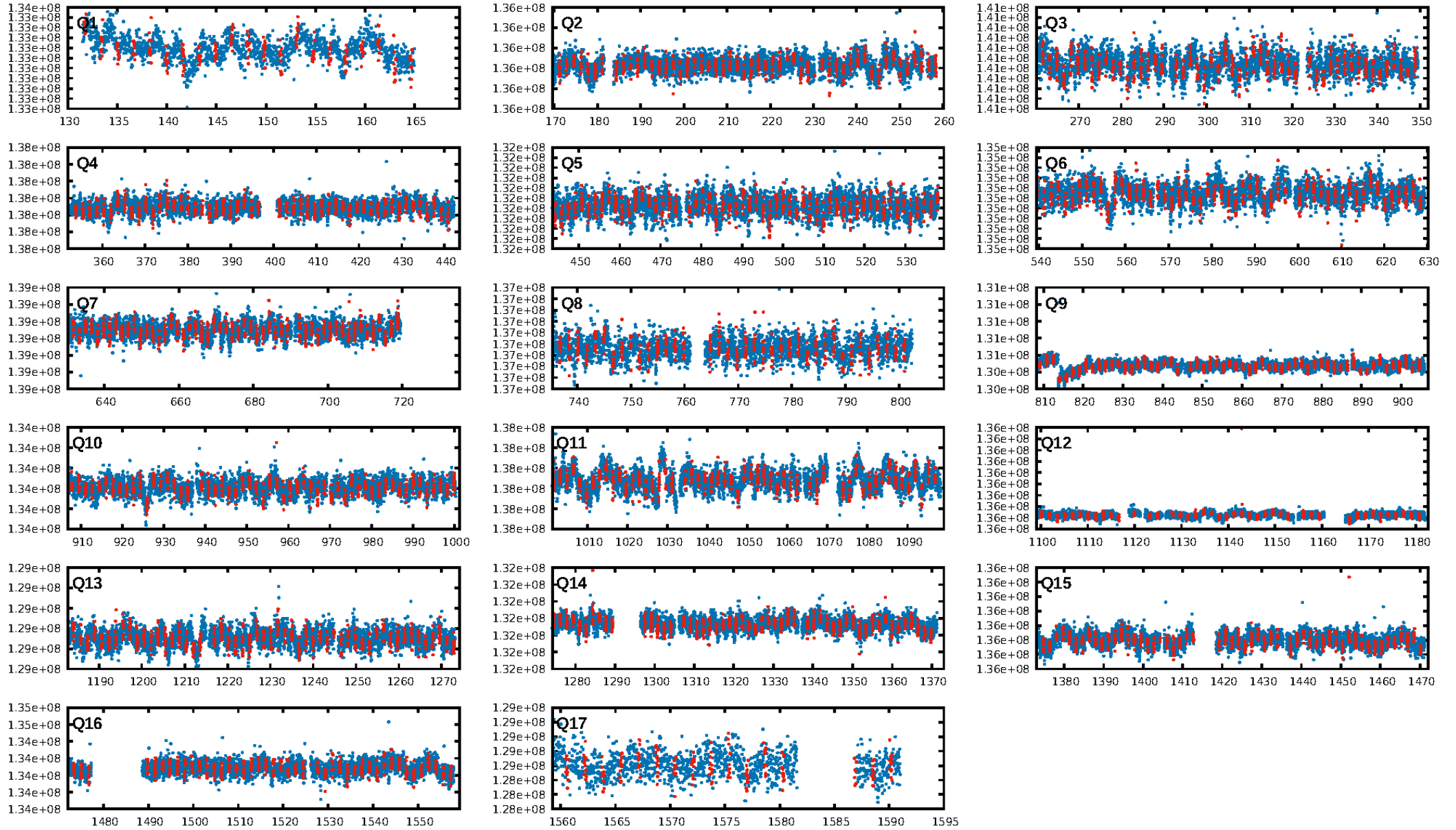
## DV Fit Results:

Period = 1.64421 [0.00001] d  
Epoch = 131.7546 [0.0019] BKJD  
Rp/R\* = 0.0071 [0.0020]  
a/R\* = 2.22 [2.65]  
b = 0.90 [0.32]  
Seff = 3069.64 [667.22]  
Teq = 1898 [103] K  
Rp = 1.07 [0.34] Re  
a = 0.0293 [0.0041] AU  
Ag = 2.74 [1.92] [0.91σ]  
Teffp = 3777 [635] K [2.92σ]

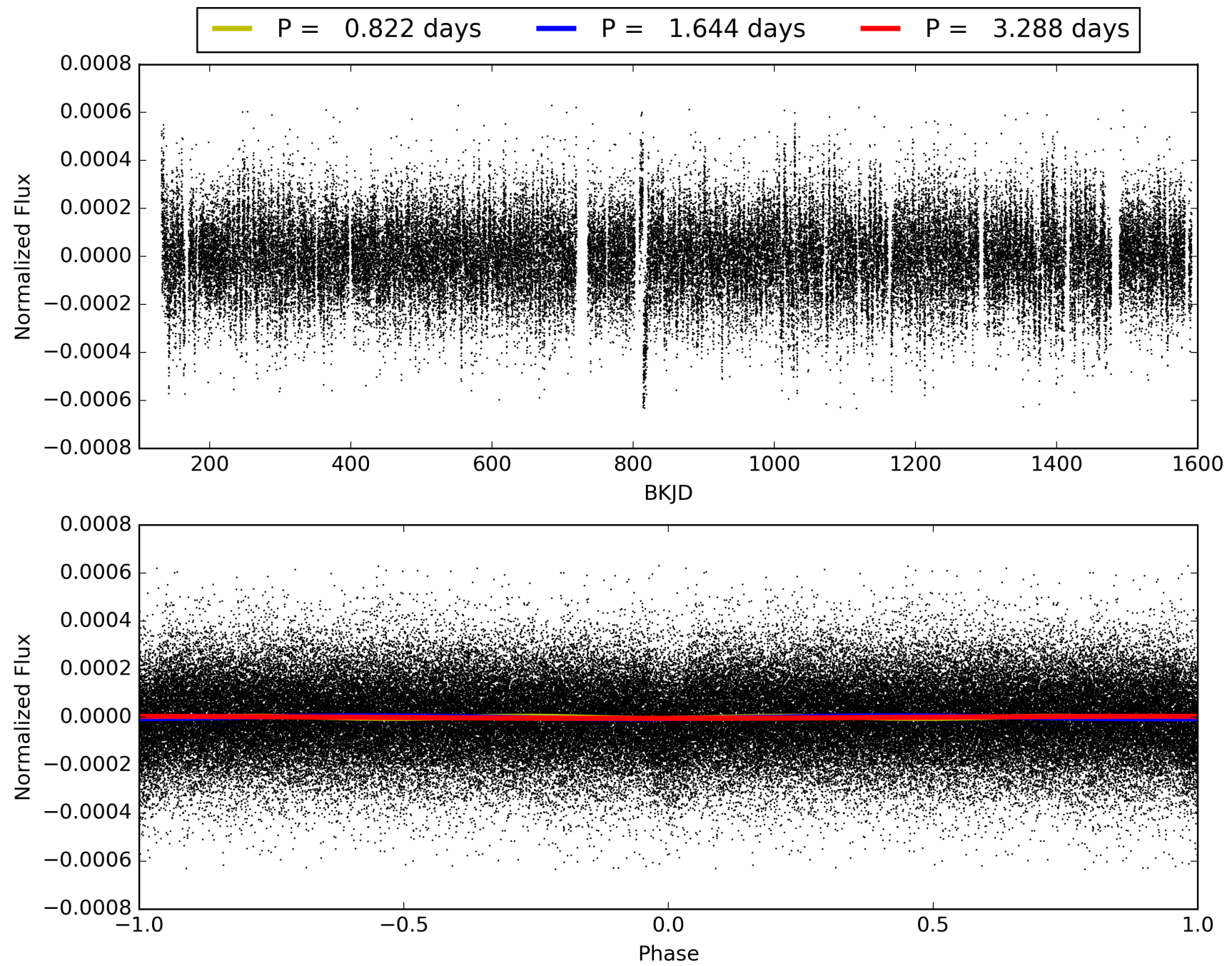
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 100.0% [62.88σ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: 9.92e-65  
RollingBand-fgt: 0.99 [711/718]  
GhostDiagnostic-chr: 4.803  
Centroid-sig: 0.1%  
Centroid-so: 1.756 arcsec [3.04σ]  
OotOffset-rm: 0.186 arcsec [0.25σ]  
KicOffset-rm: 0.159 arcsec [0.30σ]  
OotOffset-st: 4/4/4/3 [15]  
KicOffset-st: 4/4/4/3 [15]  
DiffImageQuality-fgm: 0.87 [13/15]  
DiffImageOverlap-fno: 1.00 [17/17]

# TCE 009892816-03, PDC Light Curves

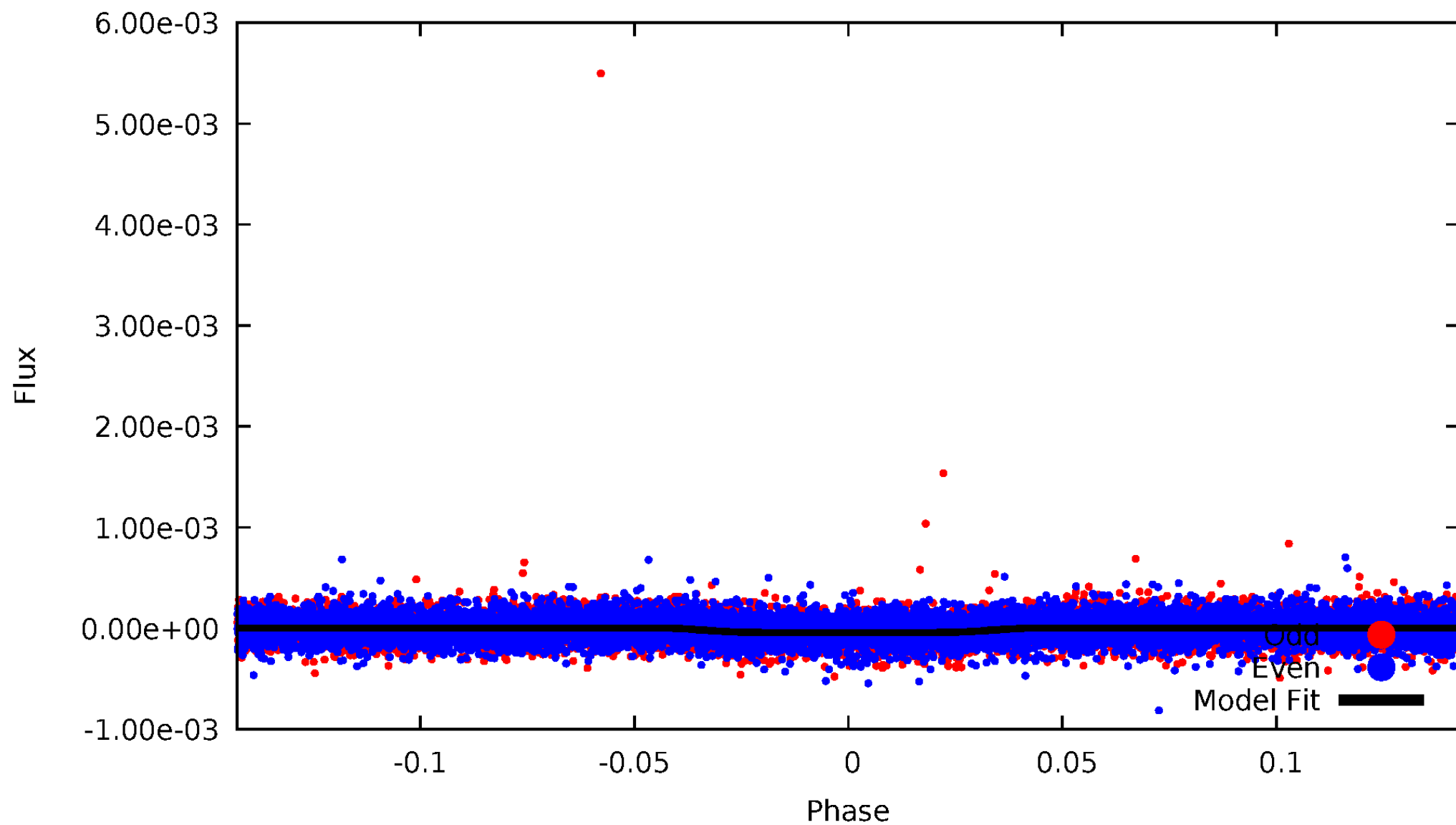


TCE 009892816-03



# DV Odd/Even

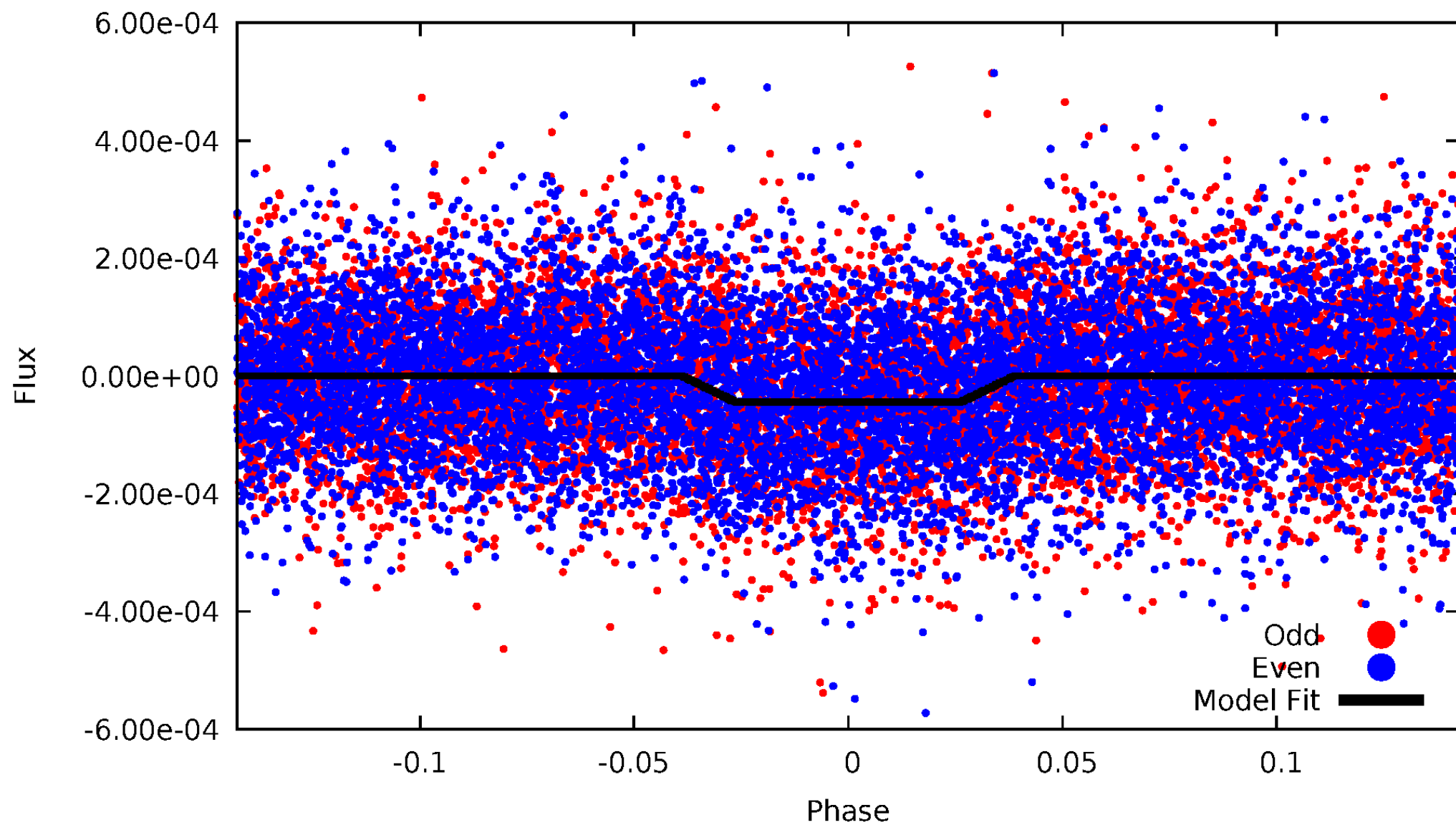
TCE 009892816-03



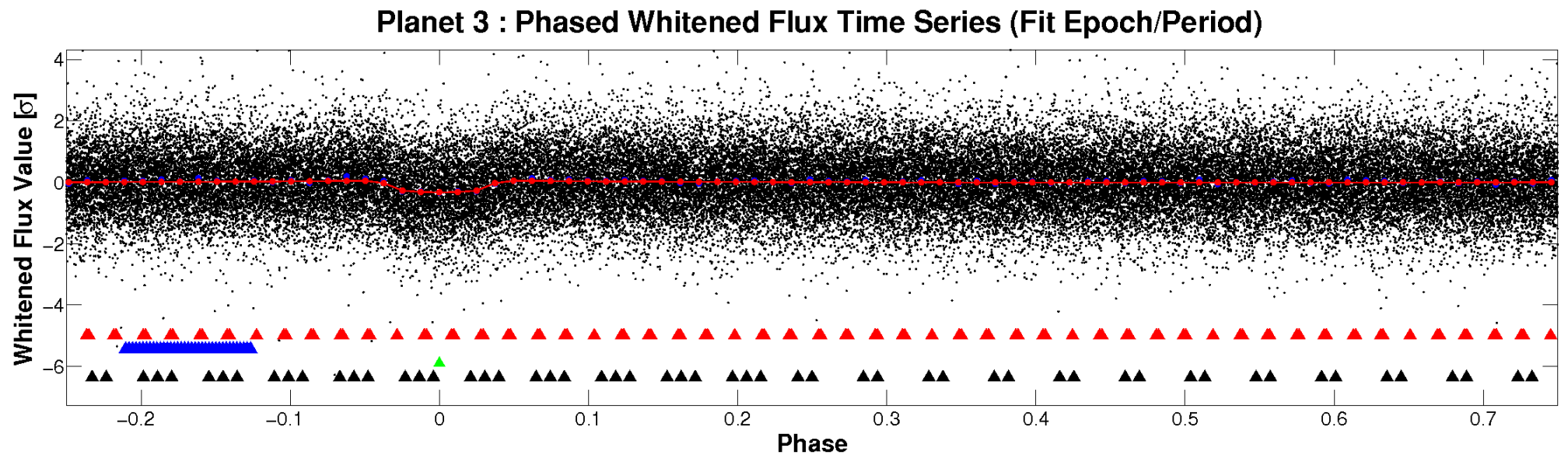
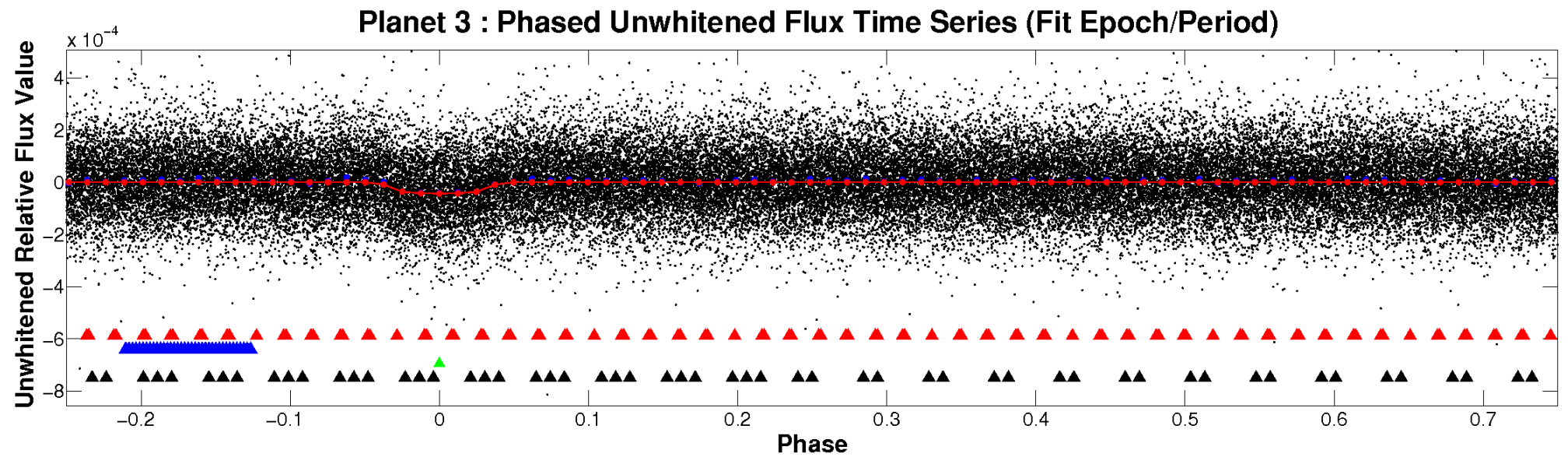


# ALT Odd/Even

TCE 009892816-03

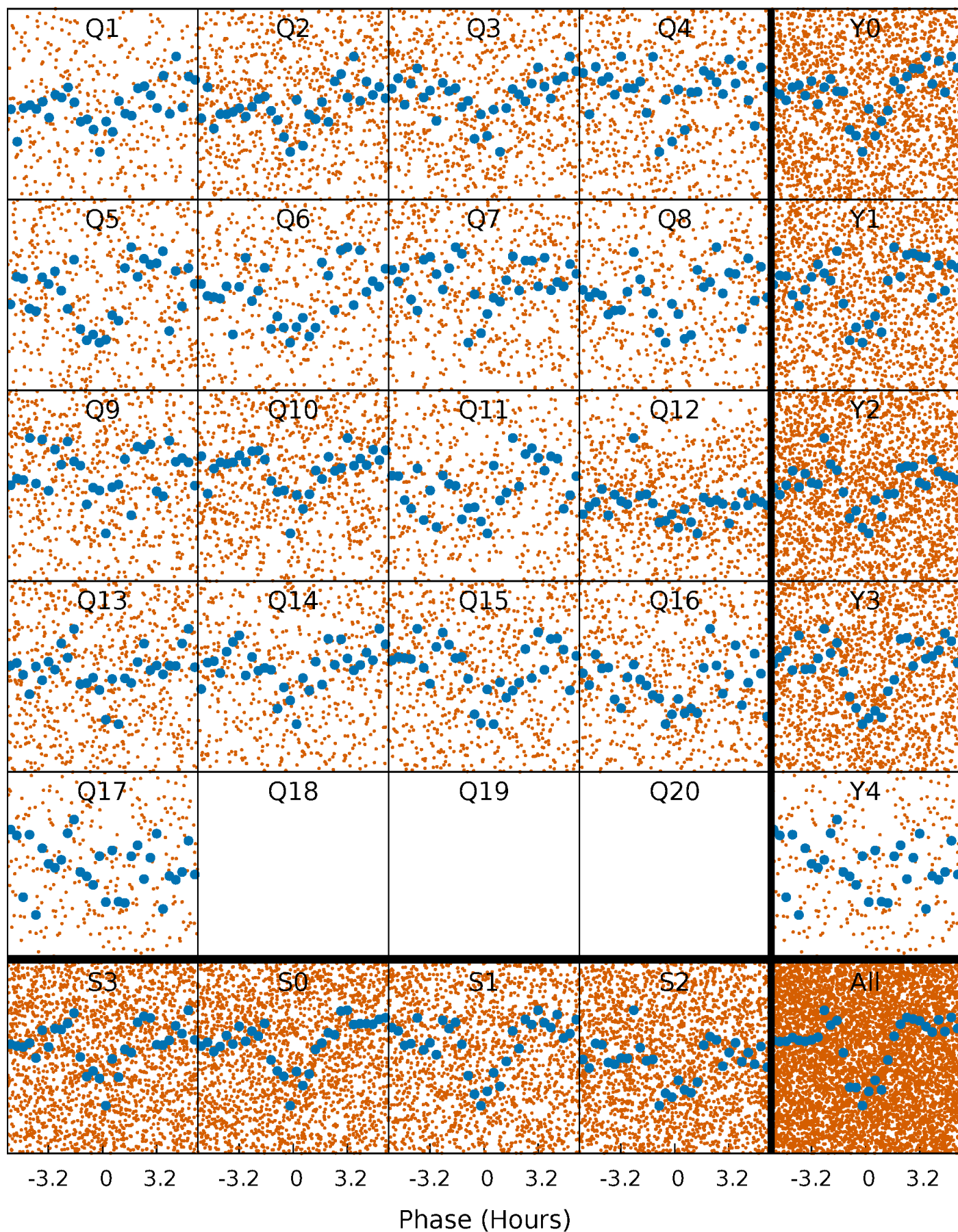


# Non-Whitened Vs. Whitened Light Curve



# PDC Quarter-Phased Transit Curves

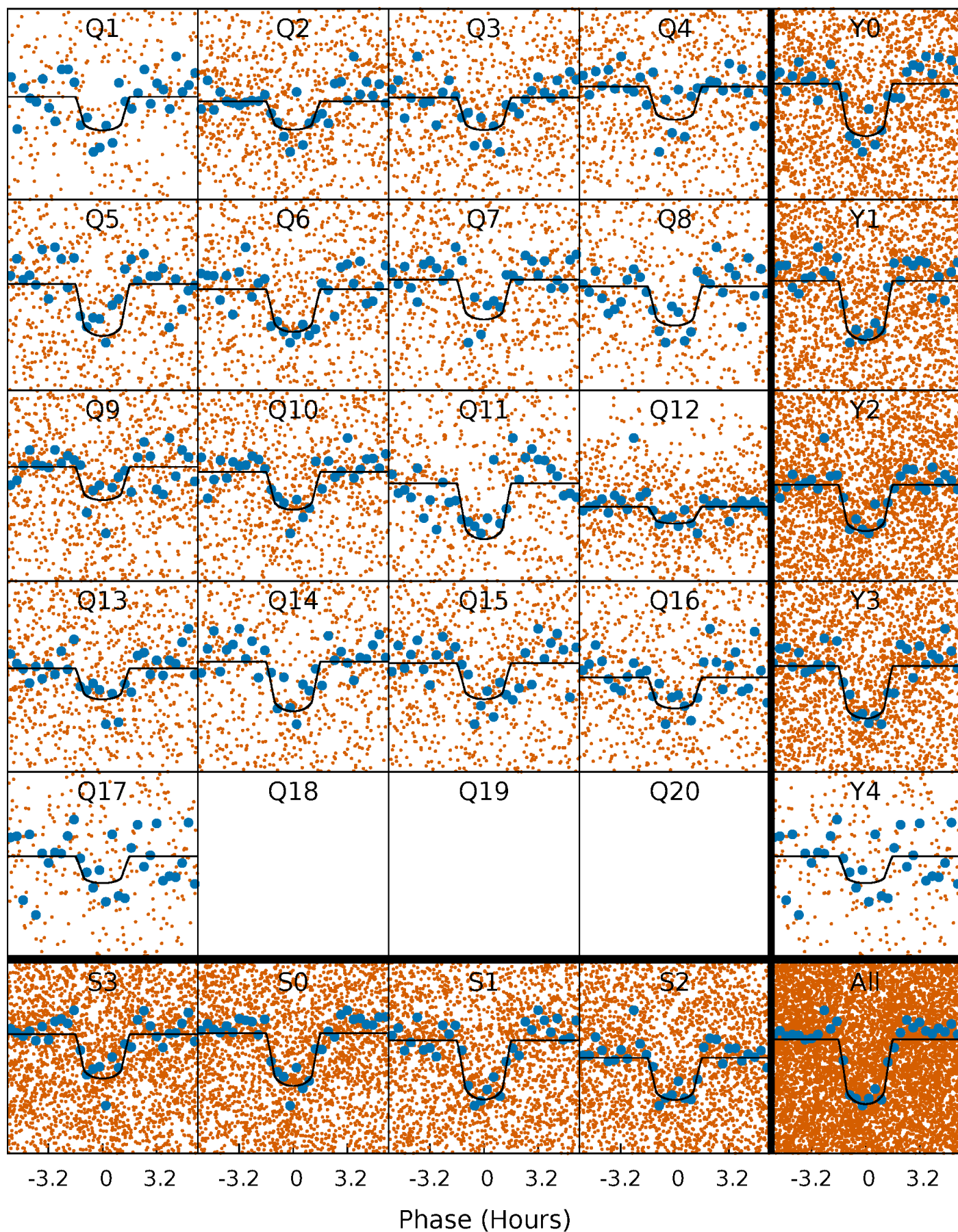
TCE 009892816-03 P= 1.644212 Days  $T_0=131.754609$  (BKJD)





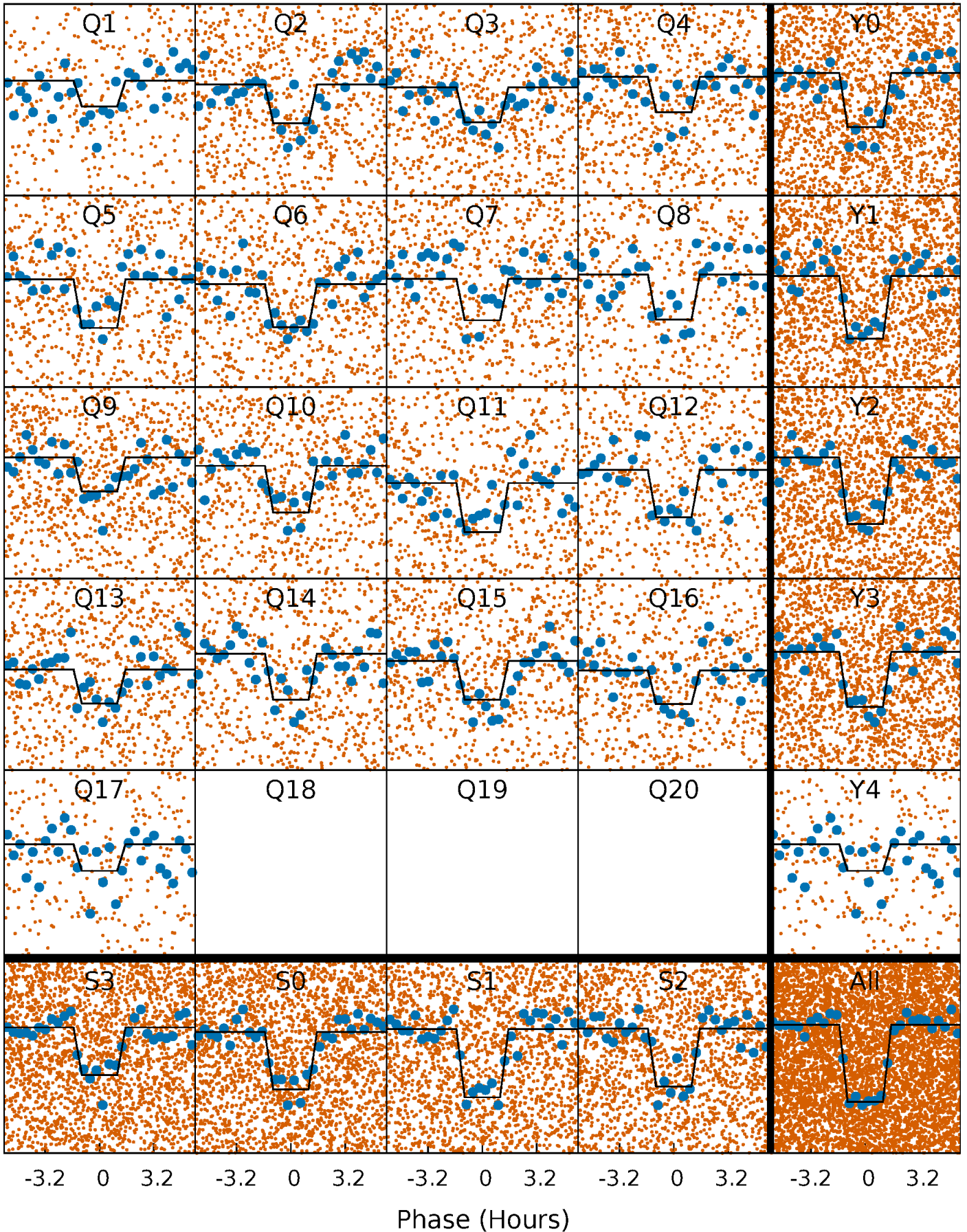
# DV Quarter-Phased Transit Curves

TCE 009892816-03 P= 1.644212 Days  $T_0=131.754609$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

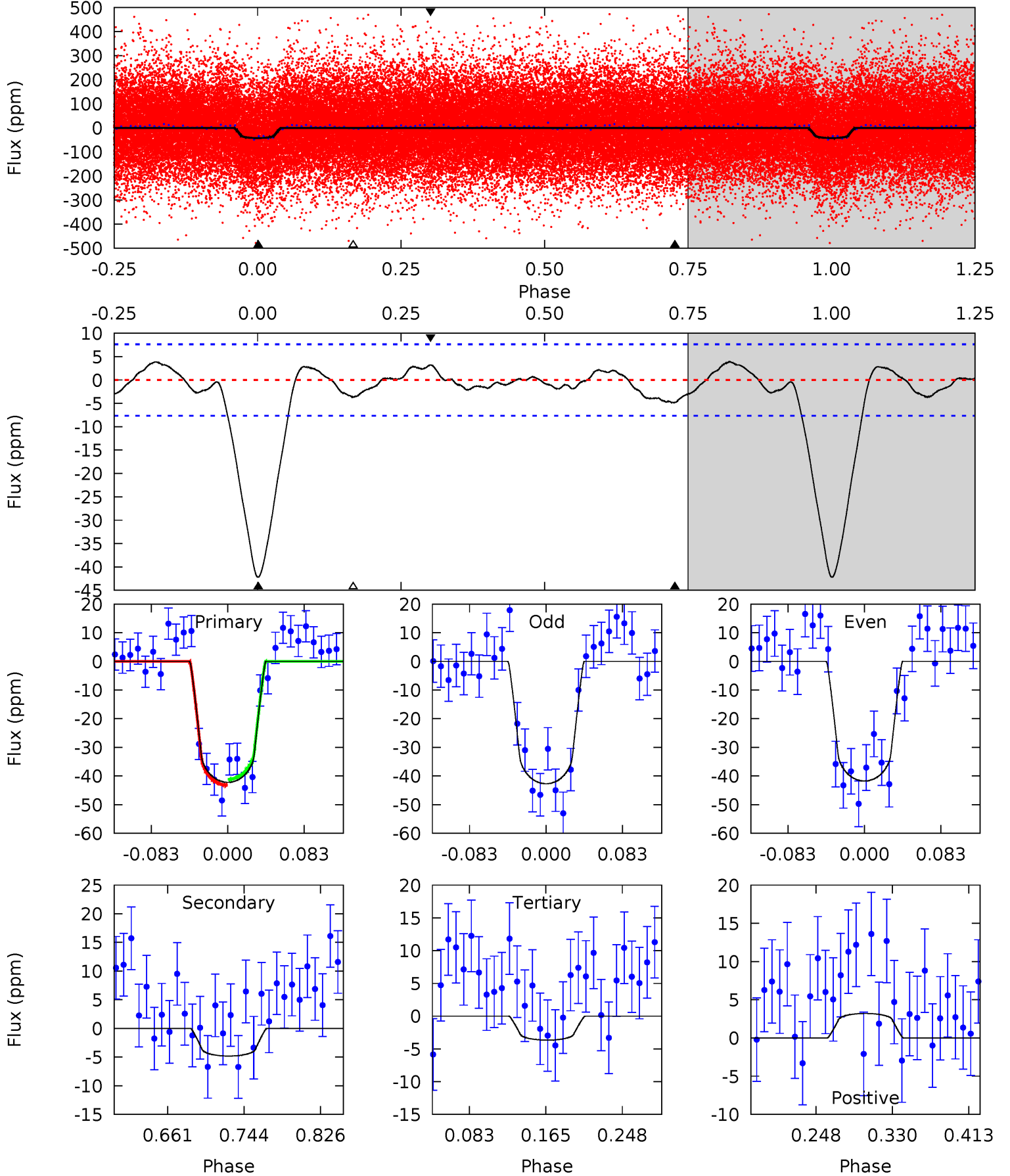
TCE 009892816-03 P= 1.644223 Days  $T_0=131.751328$  (BKJD)



# DV Model-Shift Uniqueness Test

009892816-03, P = 1.644212 Days, E = 130.110397 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
25.4	2.91	2.21	1.93	4.60	1.74	1.10	23.2	23.5	0.70	0.97	0.29	0.98	0.08	0.62

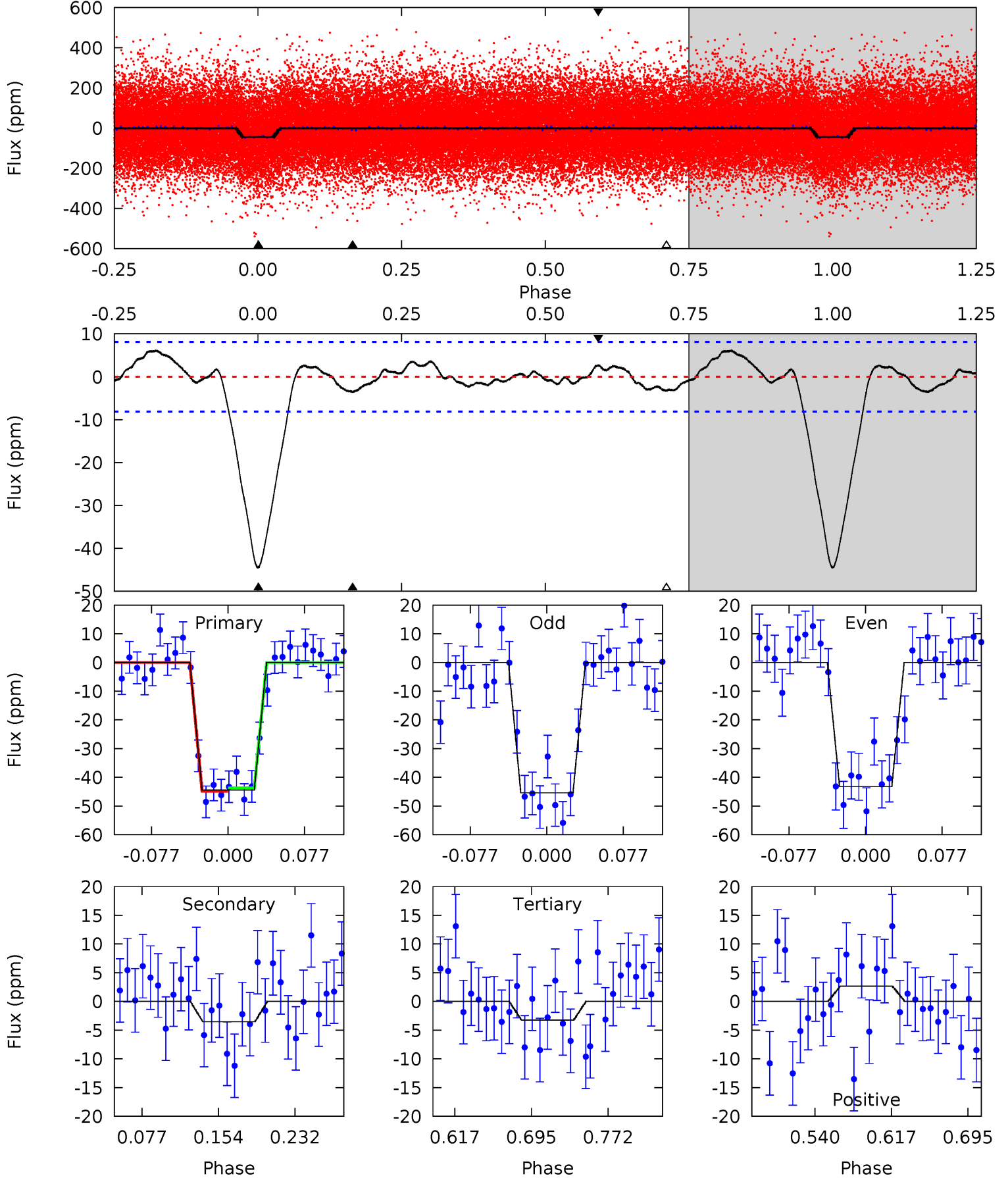




# Alt Model-Shift Uniqueness Test

009892816-03, P = 1.644223 Days, E = 130.107105 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
25.2	2.00	1.85	1.51	4.62	1.77	1.28	23.4	23.7	0.16	0.49	0.62	0.98	0.12	0.35



### Stellar Parameters For KIC 009892816

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$6297^{+113}_{-126}$	$4.260^{+0.090}_{-0.110}$	$0.140^{+0.150}_{-0.200}$	$1.369^{+0.228}_{-0.187}$	$1.247^{+0.091}_{-0.111}$	$0.684^{+0.278}_{-0.233}$
	+2%/-2%	+2%/-3%	+107%/-143%	+17%/-14%	+7%/-9%	+41%/-34%
Source	SPE59	SPE59	SPE59	DSEP		

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

### Secondary Eclipse Parameters for KIC 009892816-03 / KOI 1955.03

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$-5 \pm 2$	$1.05^{+0.33}_{-0.30}$	$2658^{+111}_{-106}$	$3751^{+623}_{-441}$	$1.980^{+2.357}_{-0.903}$
Alt.	$-4 \pm 2$	$0.98^{+0.32}_{-0.29}$	$2659^{+110}_{-107}$	$3602^{+678}_{-627}$	$1.653^{+2.131}_{-0.978}$

$T_{\text{max}}$  = 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

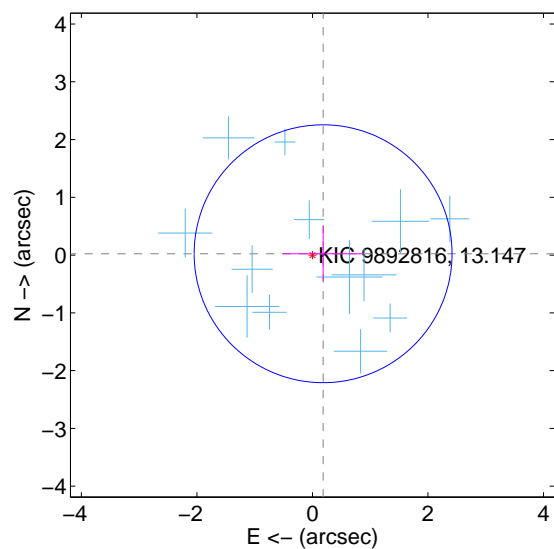
Supplemental centroid analysis for 009892816-03. Kepler magnitude: 13.15. Transit SNR 18.42

There are 13 quarters with good PRF difference image offsets

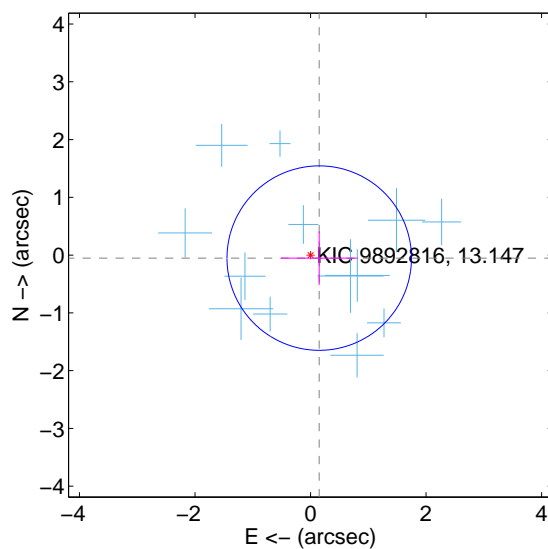
The direct PRF centroid is offset from the target star catalog position by about 0.04 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.186 \pm 0.744$	0.25	$-0.185 \pm 0.707$	$0.023 \pm 0.475$
PRF-fit source offset from KIC position	$0.159 \pm 0.532$	0.30	$-0.151 \pm 0.664$	$-0.052 \pm 0.464$
photometric centroid source offset	$1.76 \pm 0.58$	3.04	$-1.71 \pm 0.57$	$-0.38 \pm 0.65$

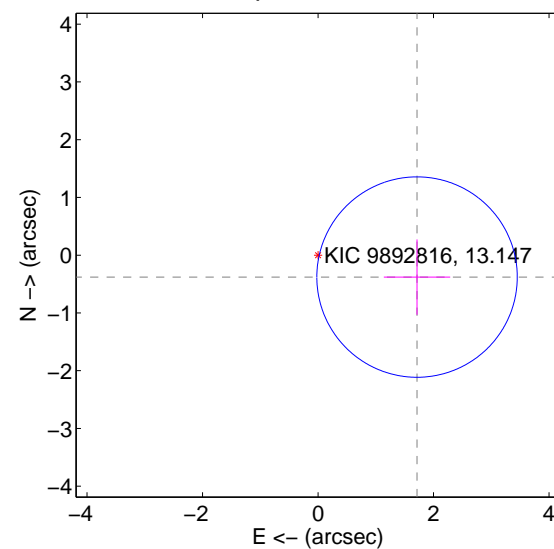
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position



offset from photometric centroids

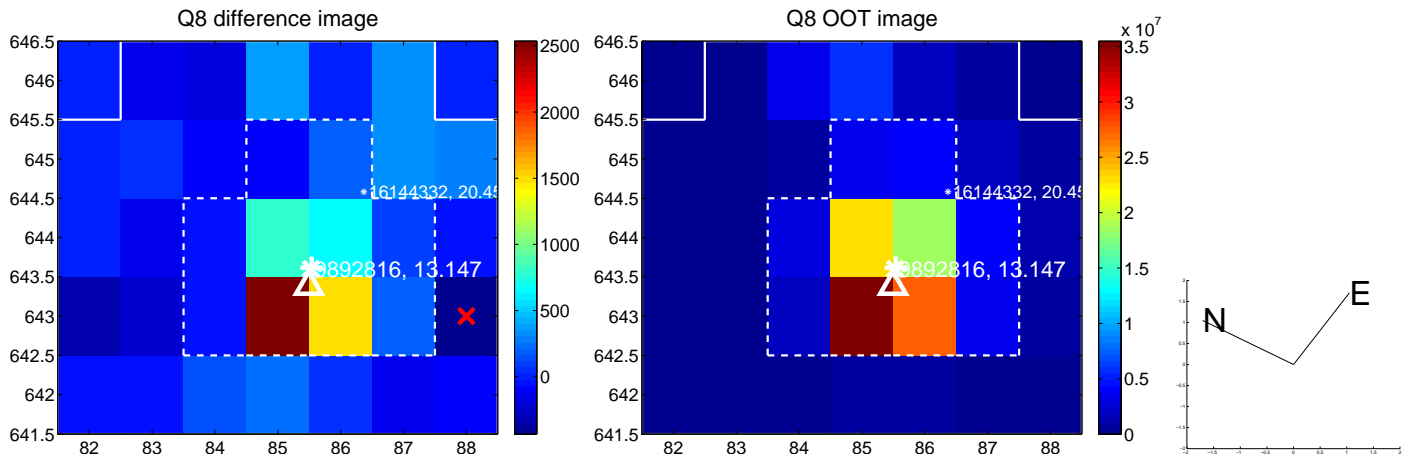
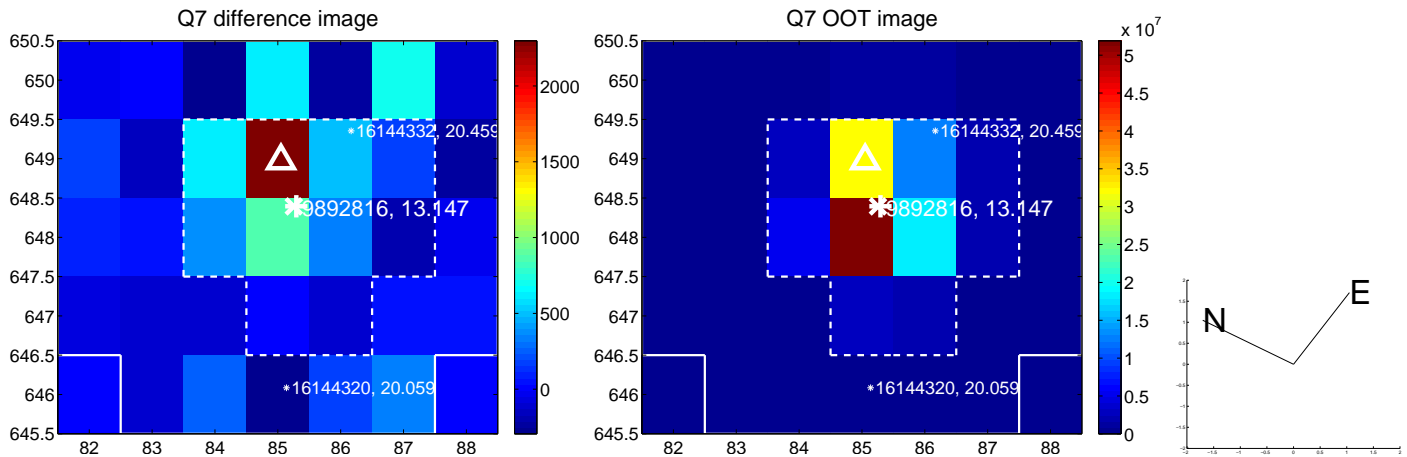
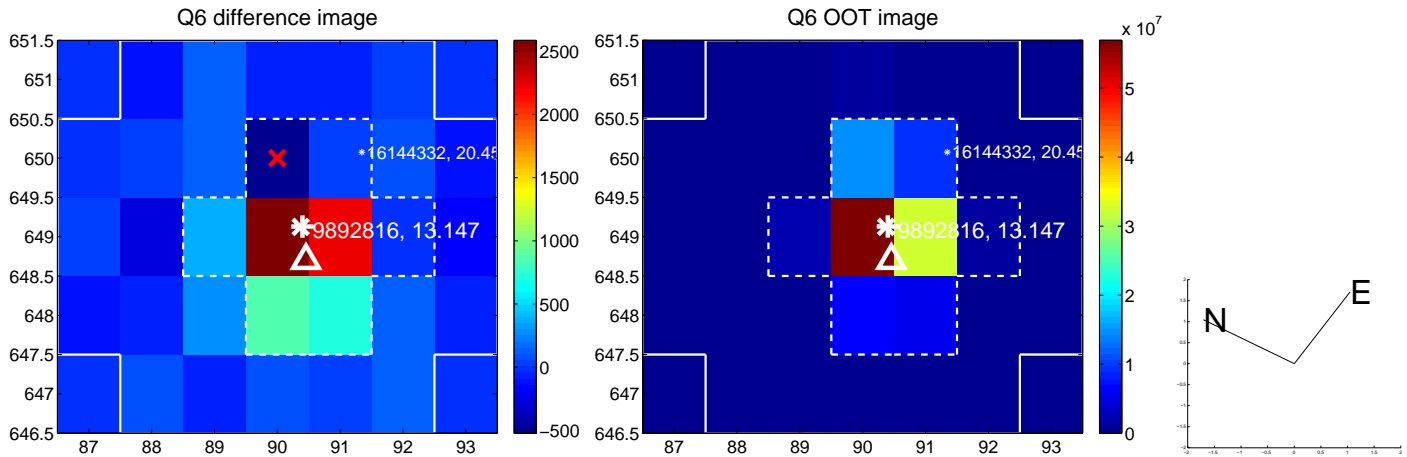
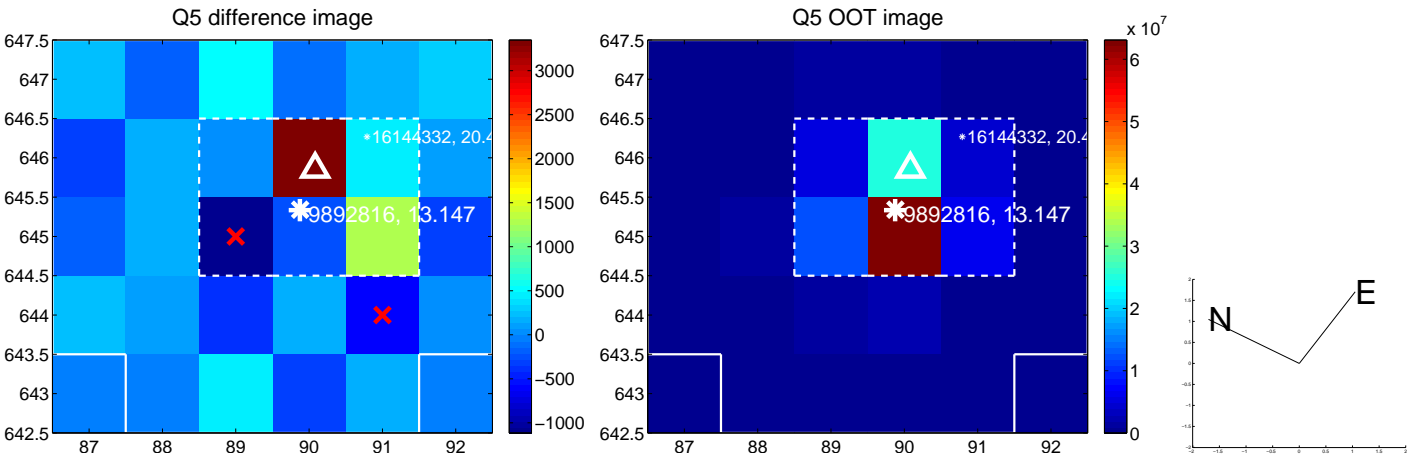


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses:** good quarterly centroid offsets; **Vermillion crosses:** bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

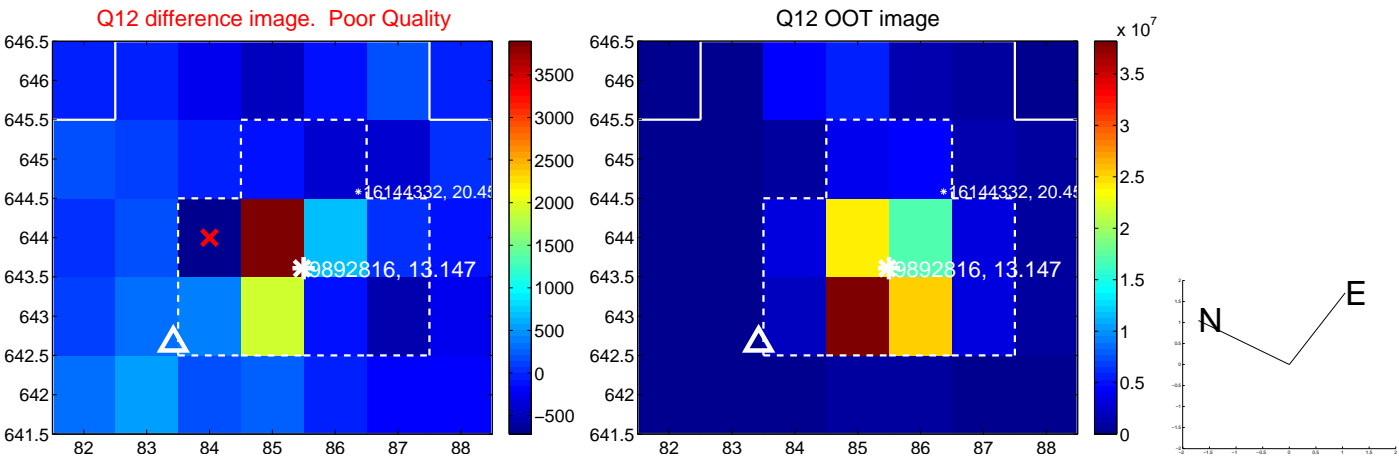
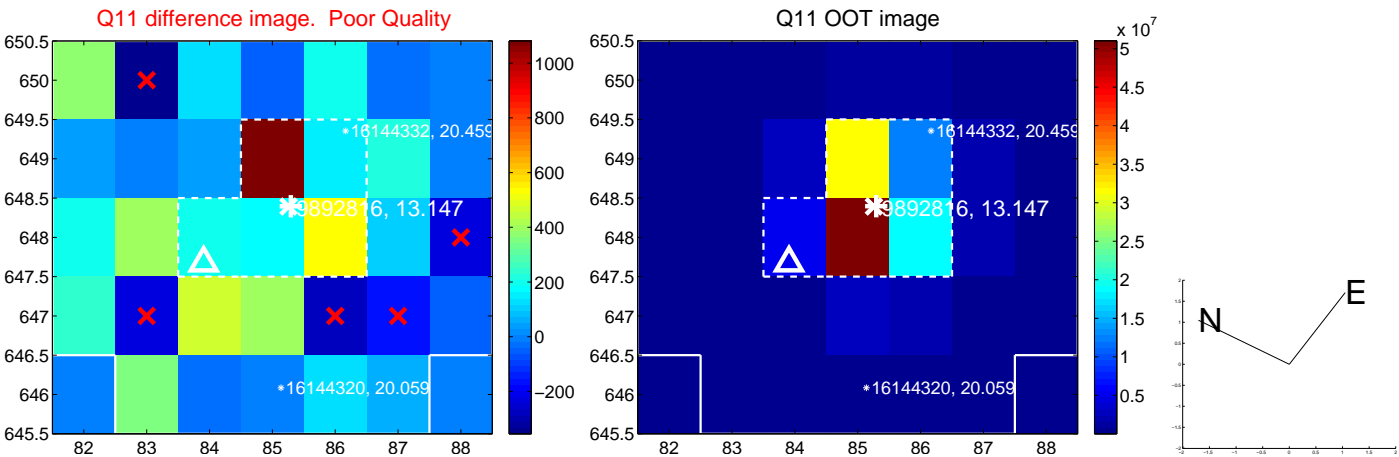
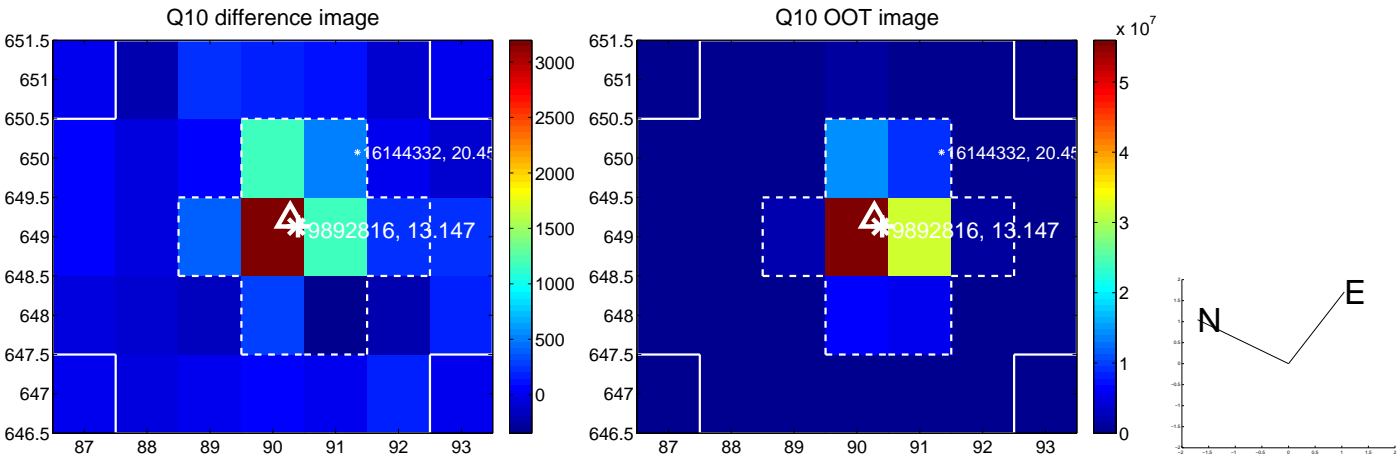
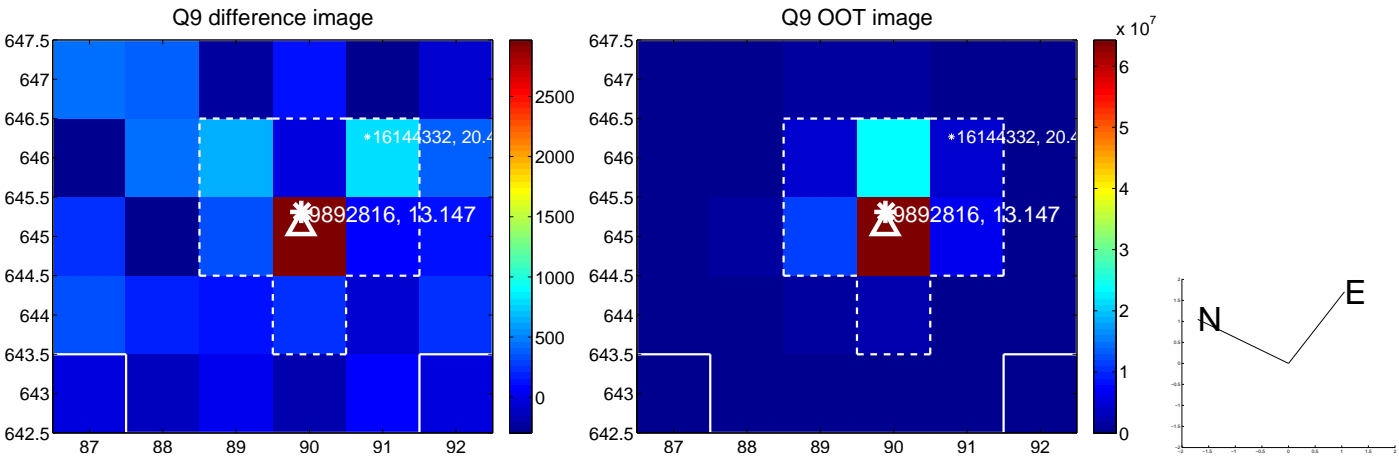




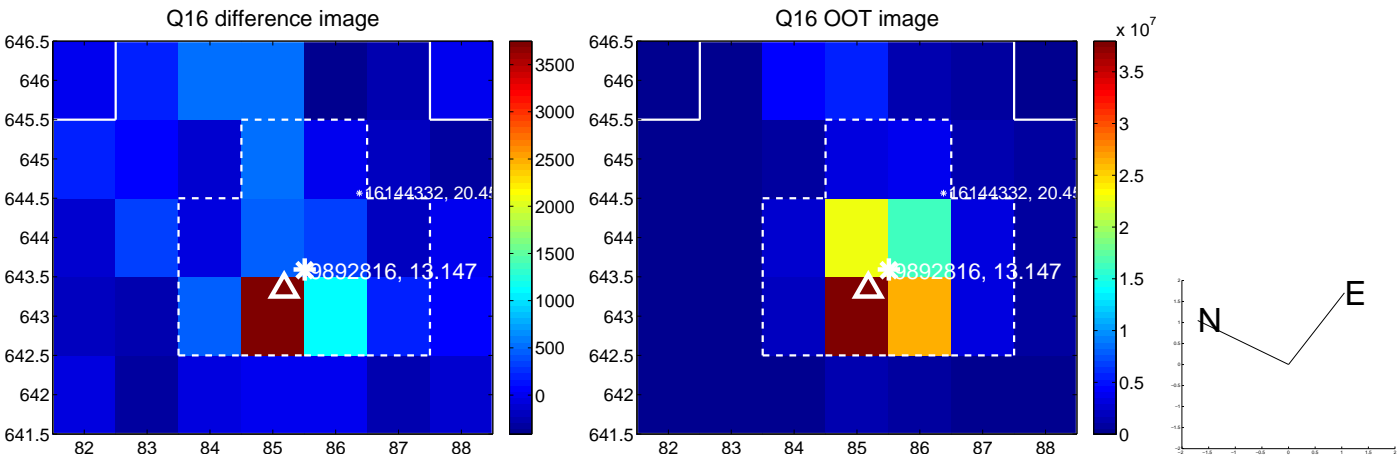
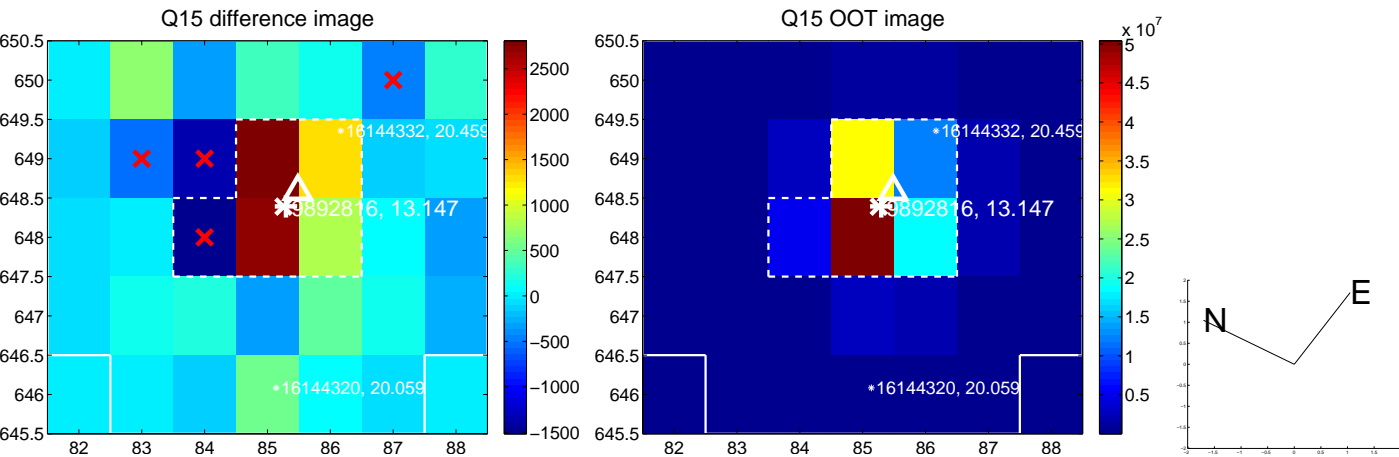
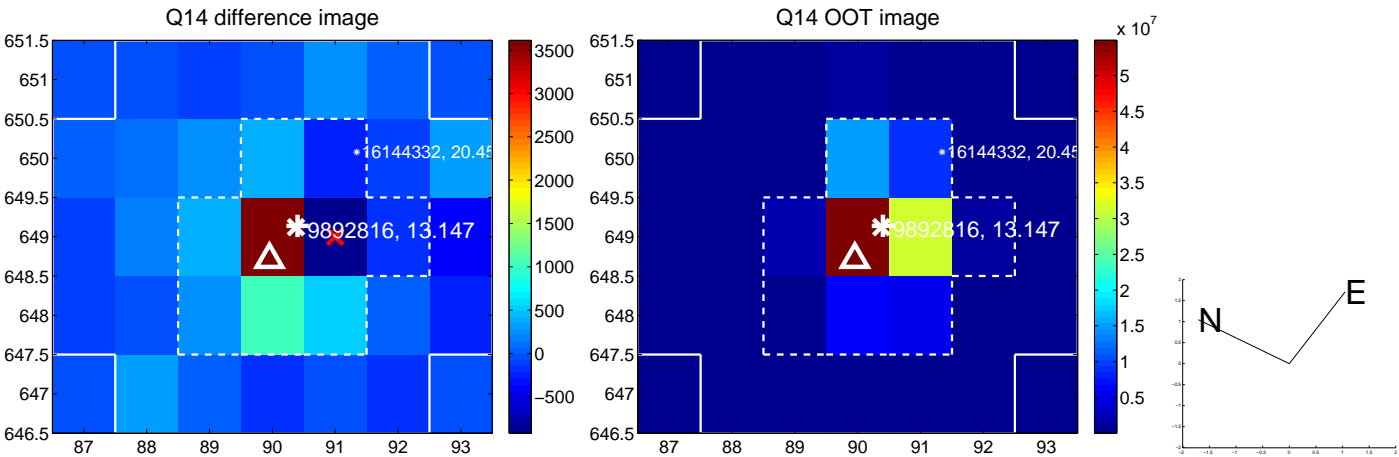
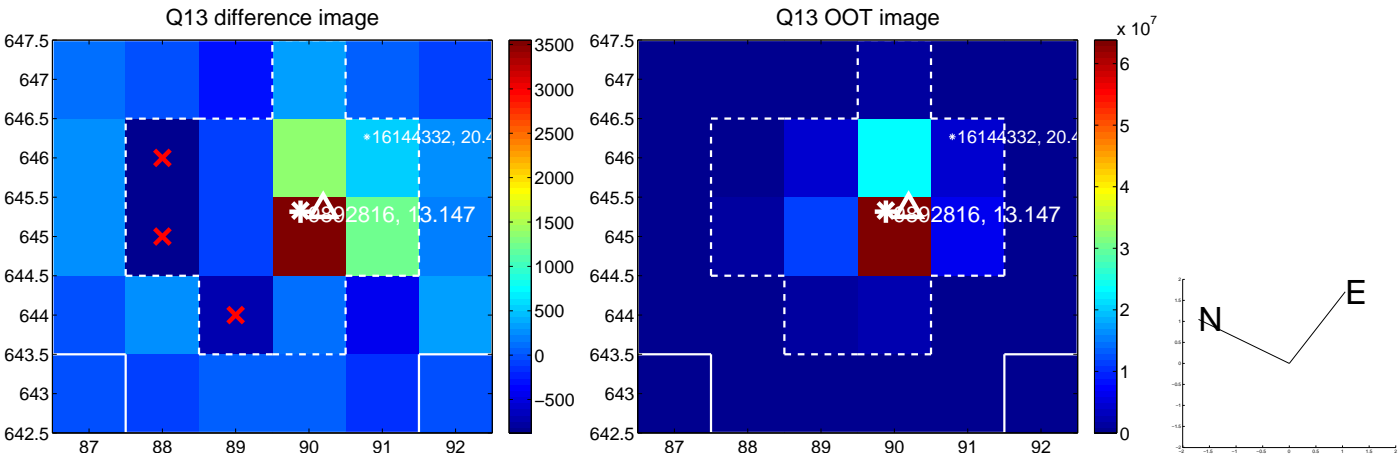
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

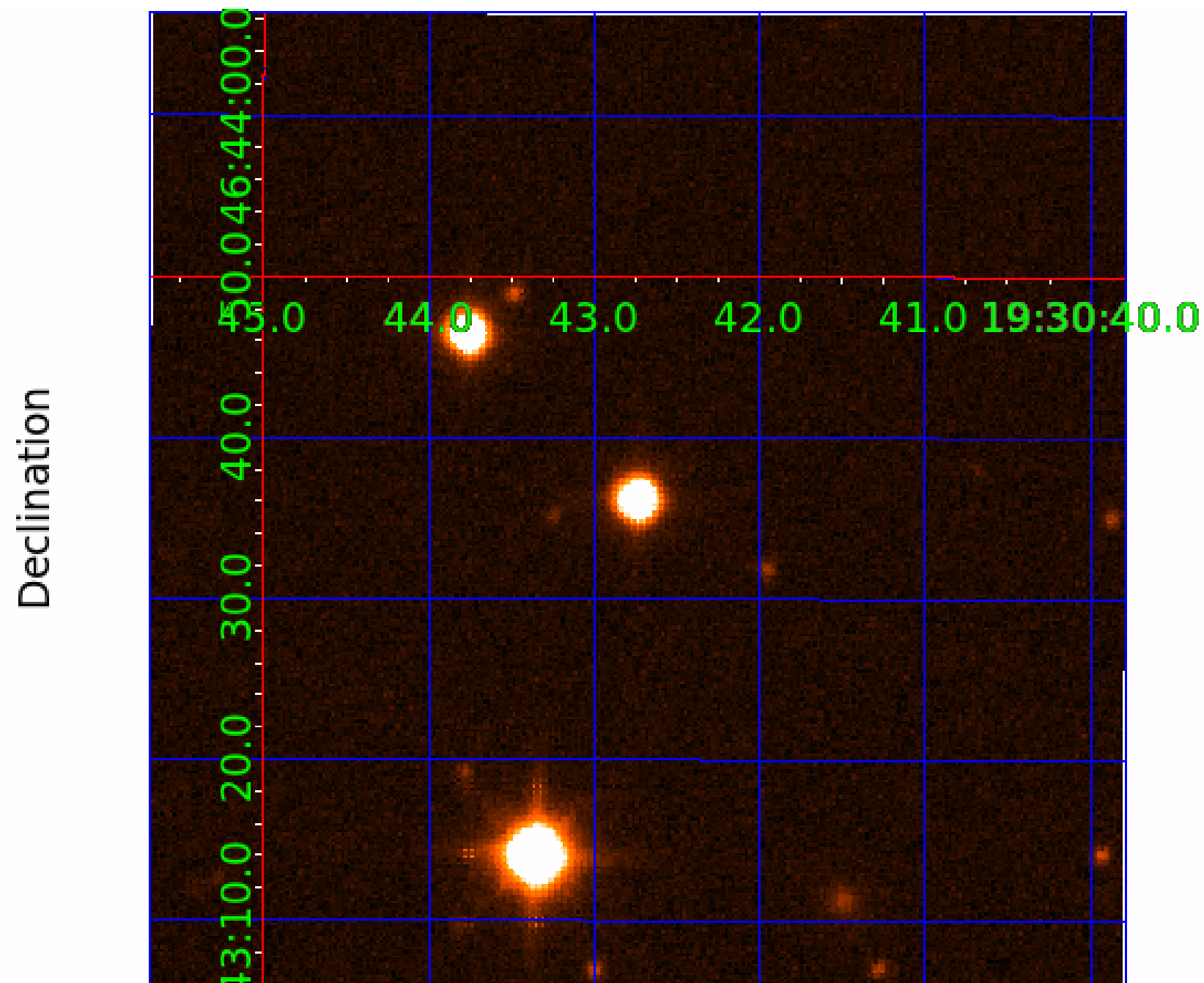


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.





UKIRT Image



# KIC 009892816

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
009892816-01	OBS	1955.01	15.170230	132.667566	228.4	4.327	32.2	35.4	1.37	6297	2.50	158.63
009892816-02	OBS	1955.02	39.457264	136.479121	229.6	9.419	24.0	25.0	1.37	6297	2.68	44.35
009892816-03	OBS	1955.03	1.644212	131.754609	43.8	2.816	17.5	18.4	1.37	6297	1.06	3069.64
009892816-04	OBS	1955.04	26.235229	141.974221	181.8	3.069	15.0	16.4	1.37	6297	2.33	76.42

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009892816-01	OBS	PC	1.00	0	0	0	0	NO_COMMENT
009892816-02	OBS	PC	0.60	0	0	0	0	NO_COMMENT
009892816-03	OBS	PC	1.00	0	0	0	0	NO_COMMENT
009892816-04	OBS	PC	0.99	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.

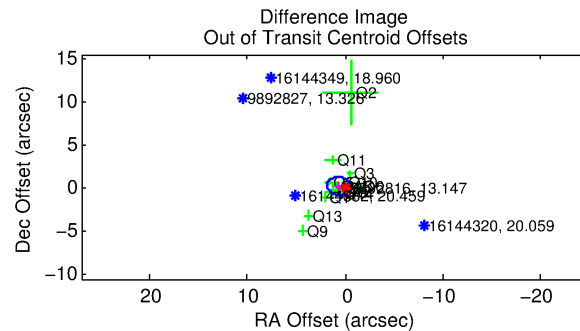
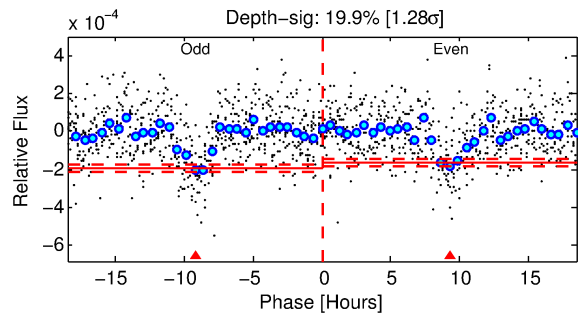
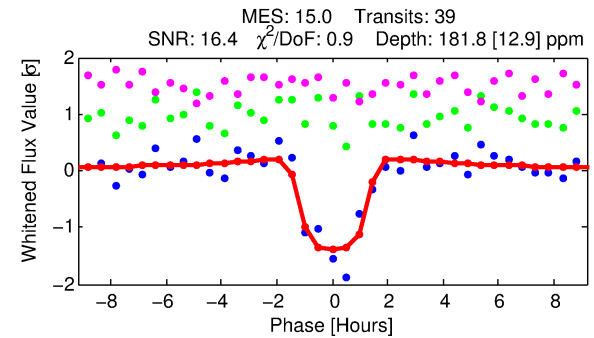
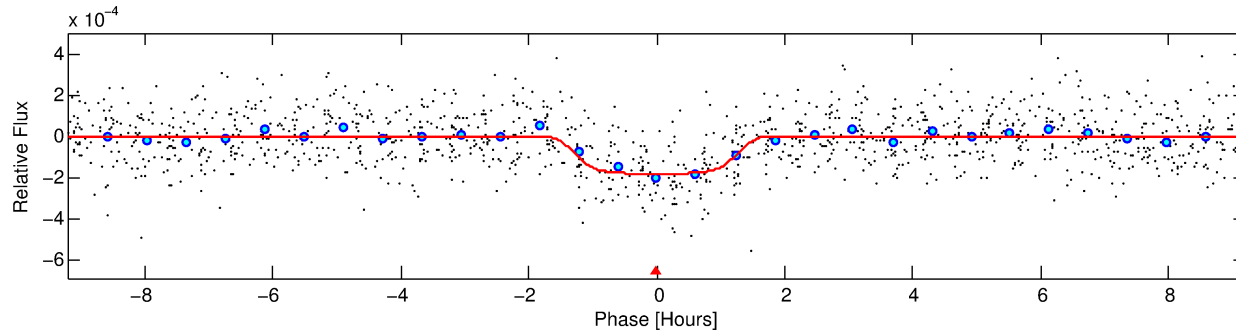
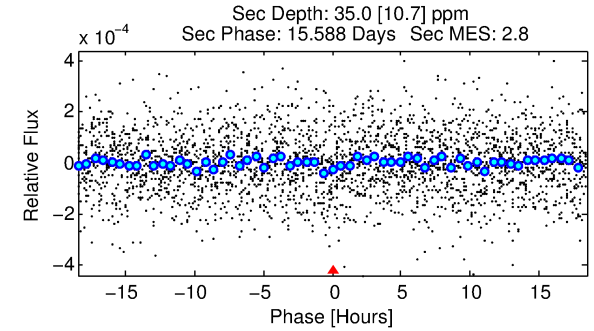
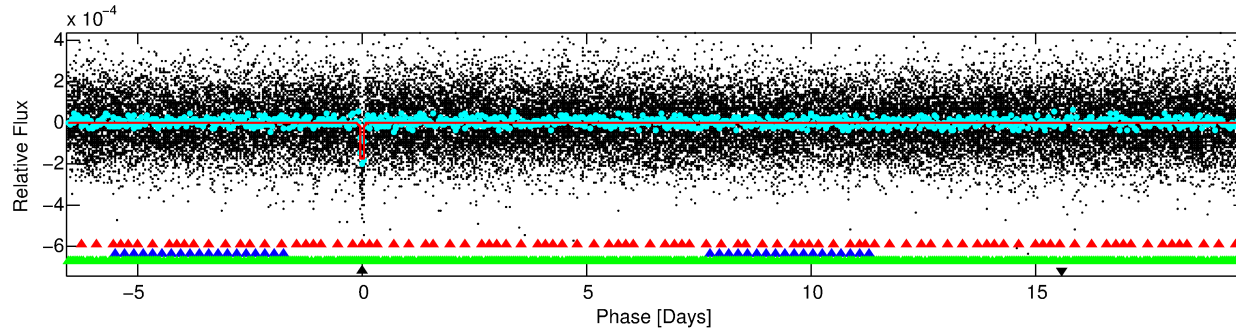
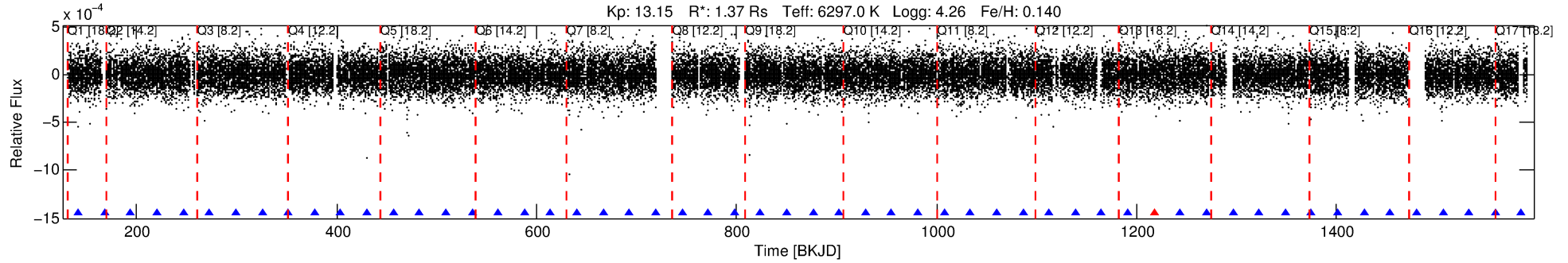
Ephemeris Match Information For 009892816-04

No Significant Match Found



# DV One-Page Summary

KIC: 9892816 Candidate: 4 of 4 Period: 26.235 d  
KOI: K01955.04 Name: Kepler-342c Corr: 0.907



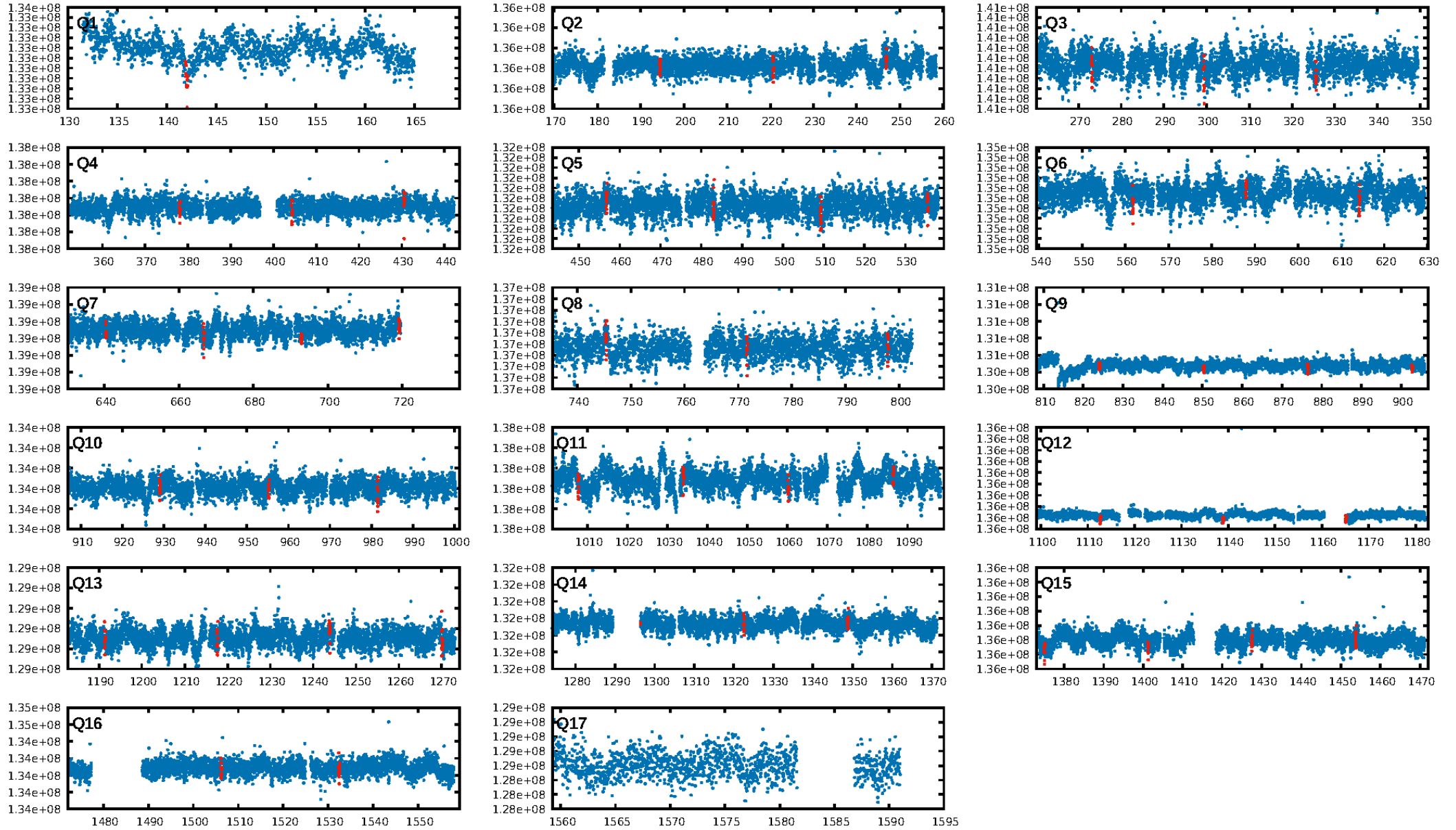
## DV Fit Results:

Period = 26.23523 [0.00016] d  
Epoch = 141.9742 [0.0047] BKJD  
Rp/R\* = 0.0156 [0.0017]  
a/R\* = 22.29 [12.86]  
b = 0.96 [0.05]  
Seff = 76.42 [16.61]  
Teq = 754 [41] K  
Rp = 2.33 [0.47] Re  
a = 0.1859 [0.0259] AU  
Ag = 122.55 [52.55] [2.31σ]  
Teffp = 3878 [375] K [8.29σ]

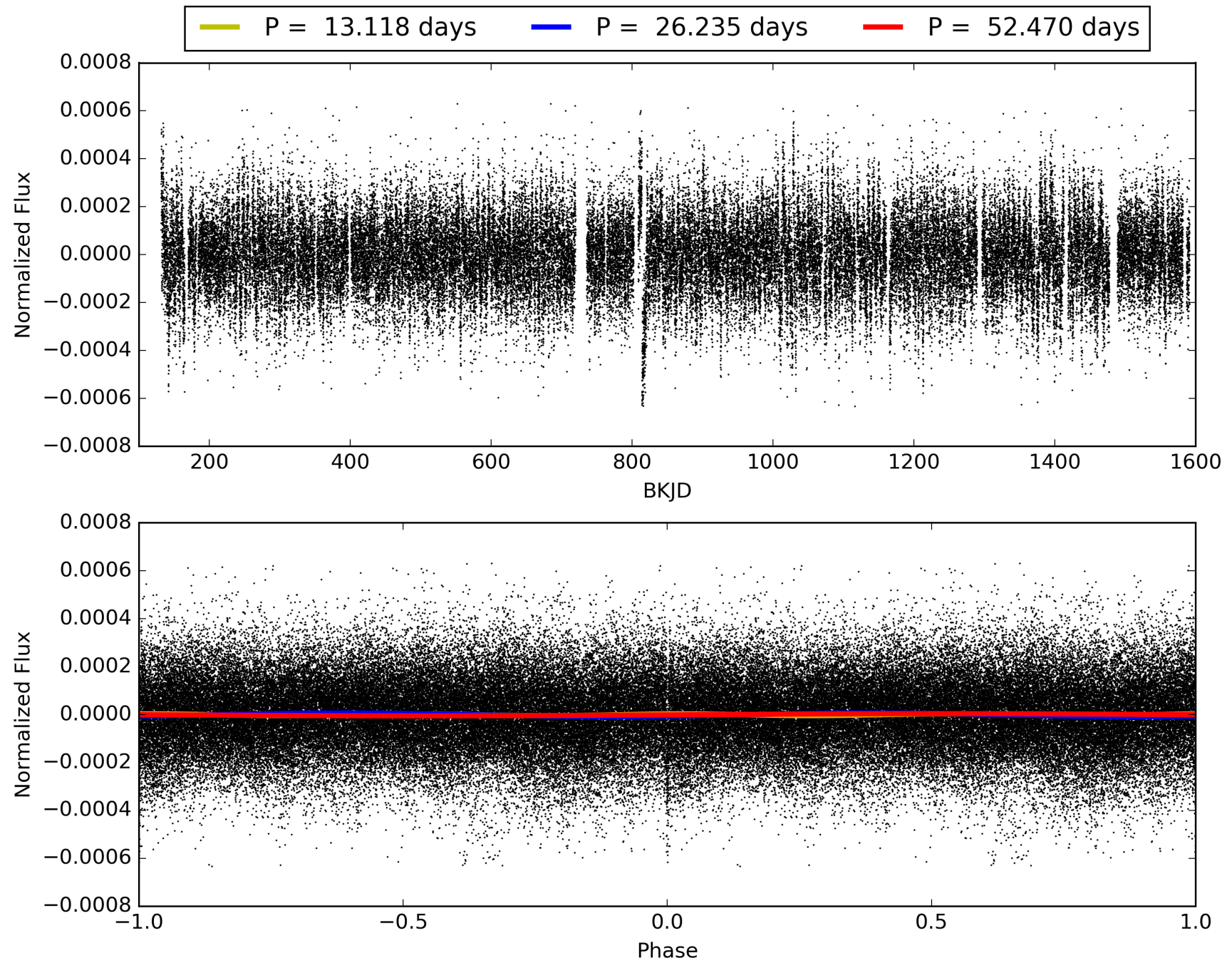
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [50.06σ]  
LongPeriod-sig: 100.0% [32.03σ]  
ModelChiSquare2-sig: 43.9%  
ModelChiSquareGof-sig: 100.0%  
Bootstrap-pfa: 8.02e-48  
RollingBand-fgt: 0.97 [37/38]  
GhostDiagnostic-chr: 12.16  
Centroid-sig: 93.3%  
Centroid-so: 0.097 arcsec [0.15σ]  
OotOffset-rm: 0.827 arcsec [2.31σ]  
KicOffset-rm: 0.856 arcsec [2.45σ]  
OotOffset-st: 4/4/3/4 [15]  
KicOffset-st: 4/4/3/4 [15]  
DiffImageQuality-fgm: 0.67 [10/15]  
DiffImageOverlap-fno: 0.50 [8/16]

# TCE 009892816-04, PDC Light Curves

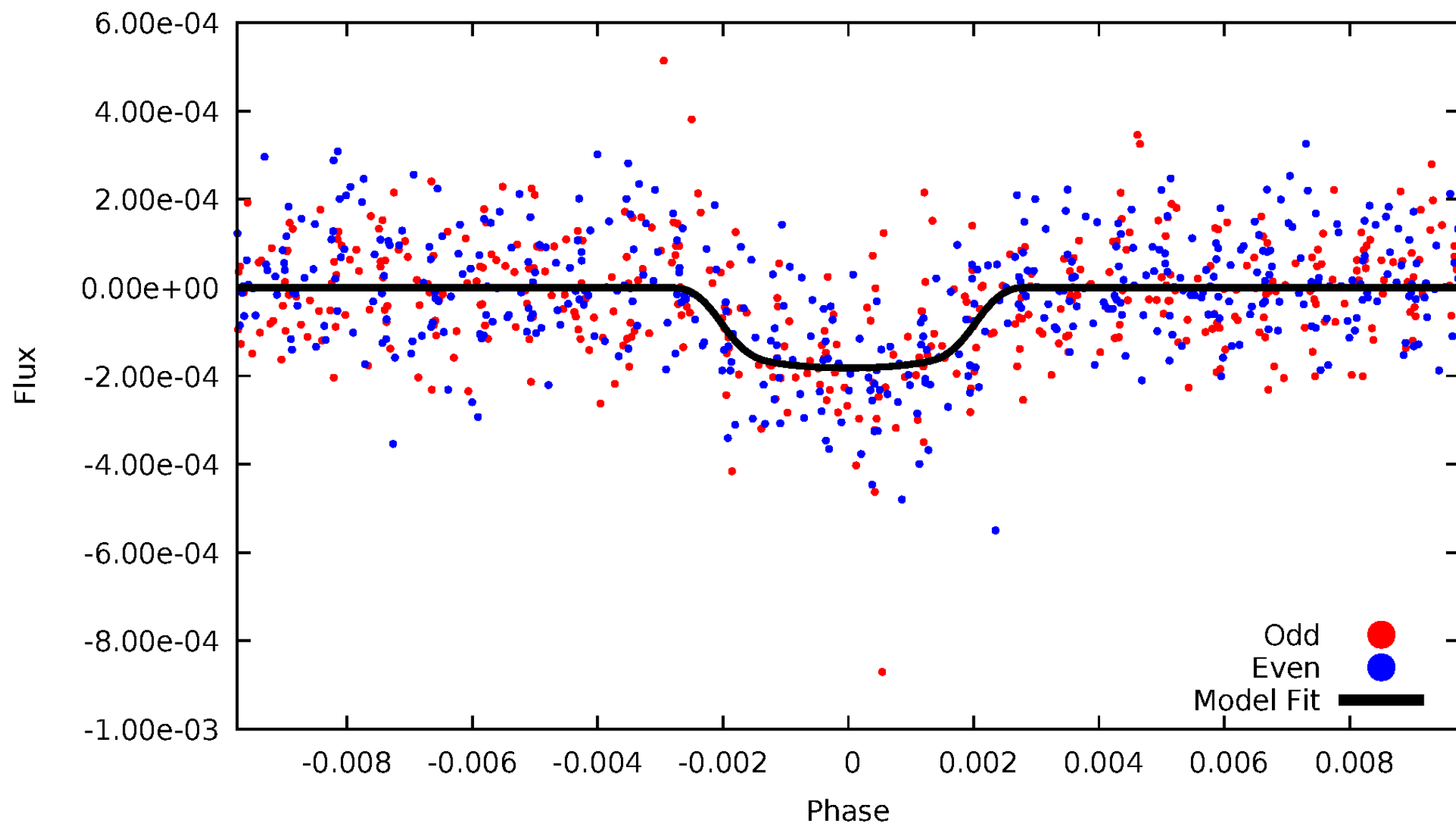


TCE 009892816-04



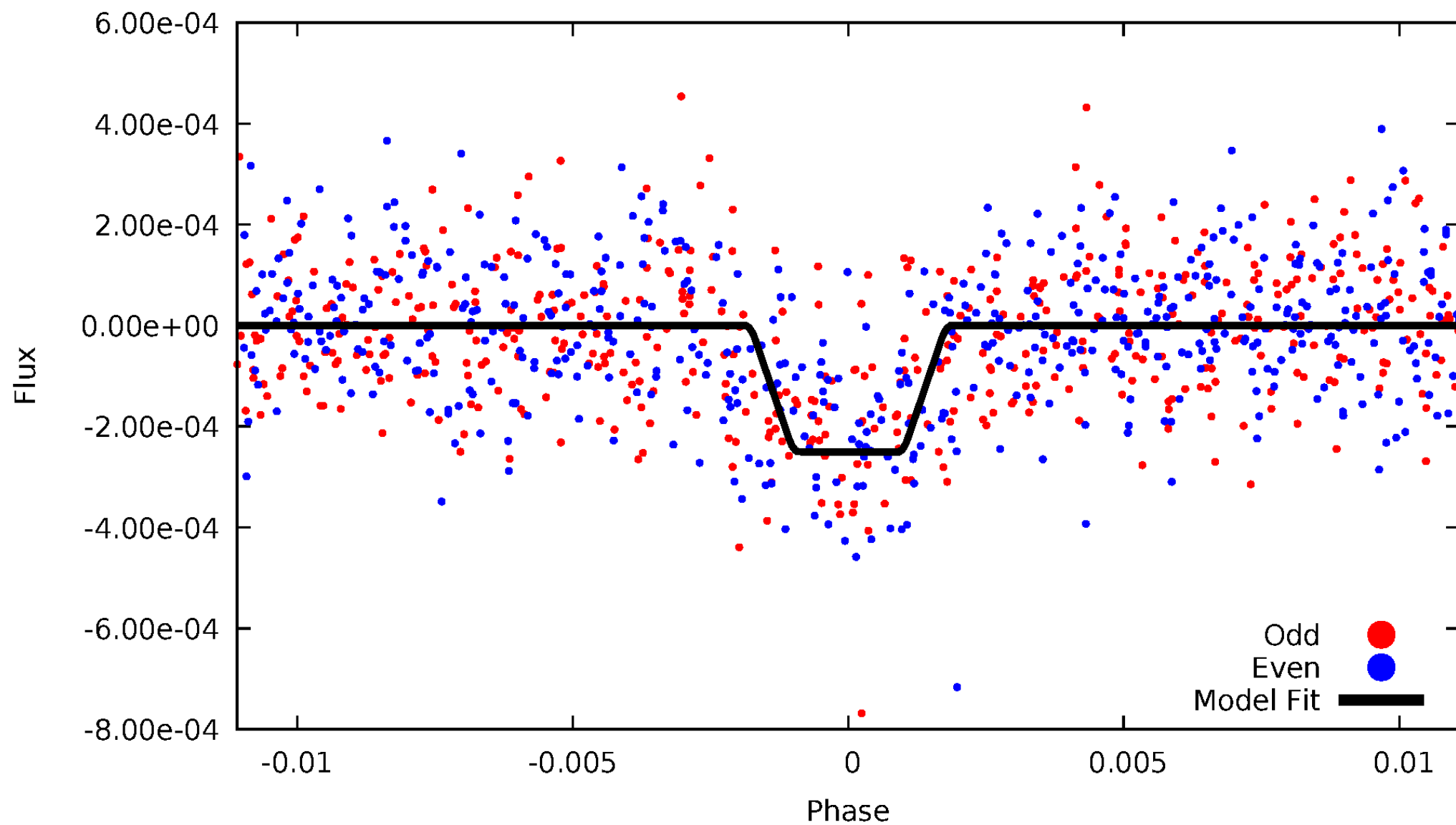
# DV Odd/Even

TCE 009892816-04



# ALT Odd/Even

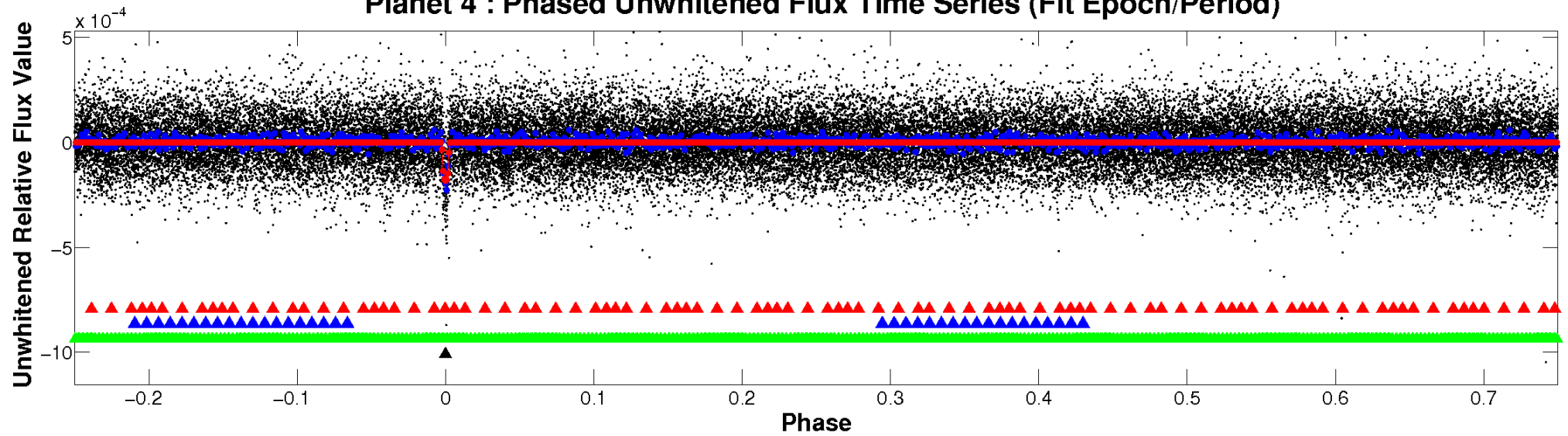
TCE 009892816-04



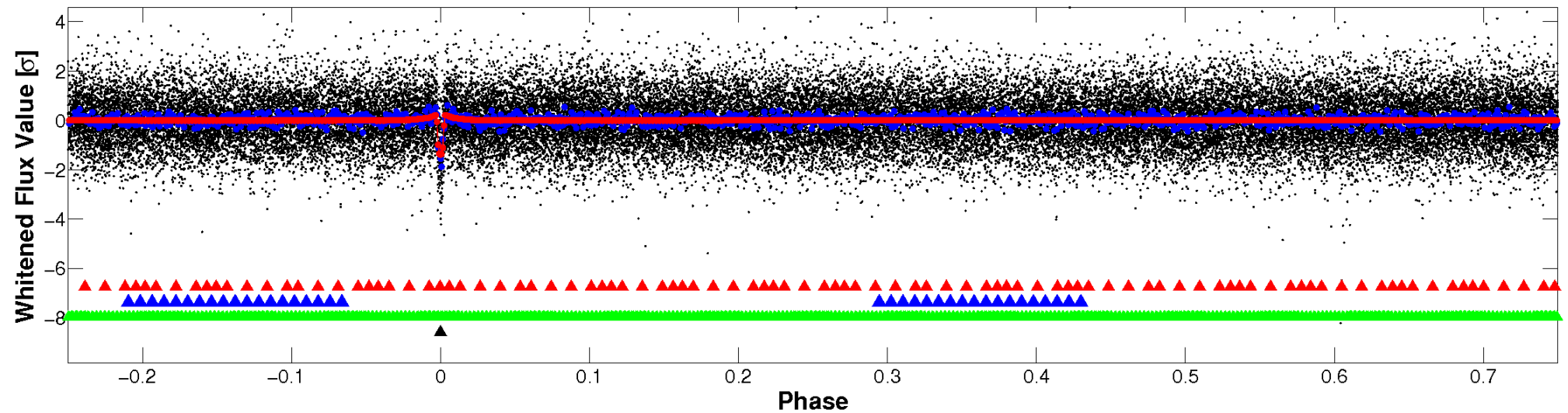


# Non-Whitened Vs. Whitened Light Curve

## Planet 4 : Phased Unwhitened Flux Time Series (Fit Epoch/Period)

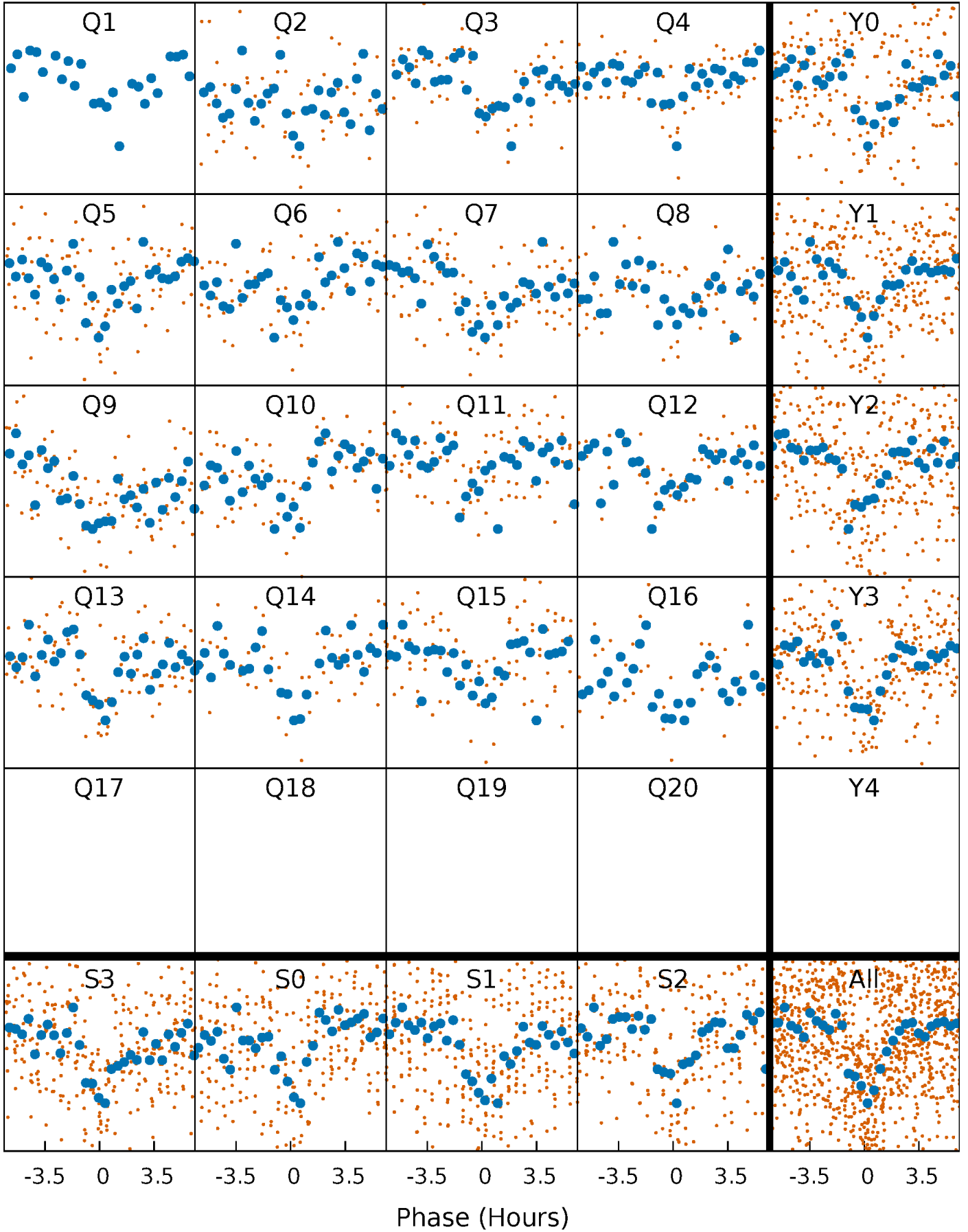


## Planet 4 : Phased Whitened Flux Time Series (Fit Epoch/Period)



# PDC Quarter-Phased Transit Curves

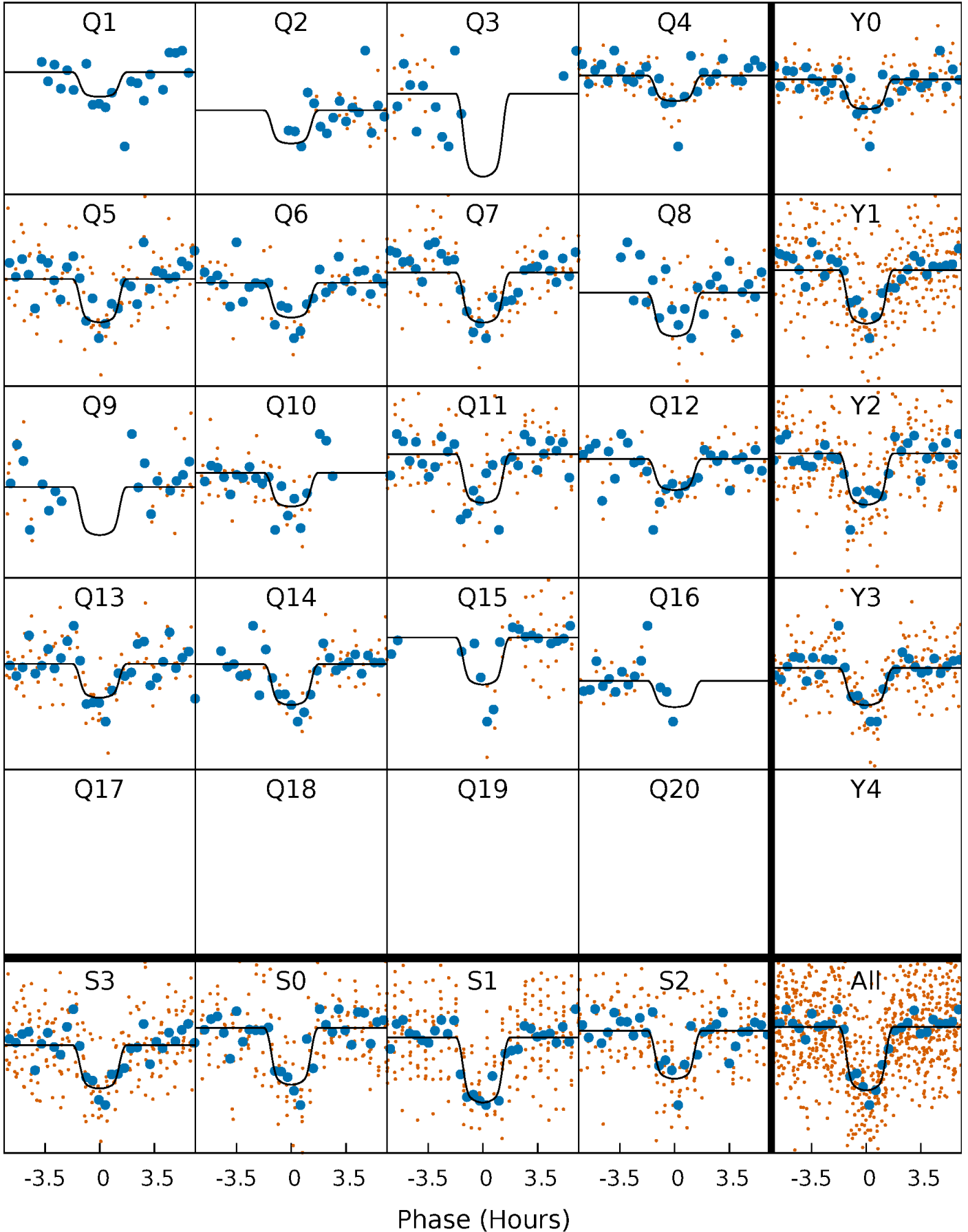
TCE 009892816-04 P= 26.235229 Days  $T_0=141.974221$  (BKJD)





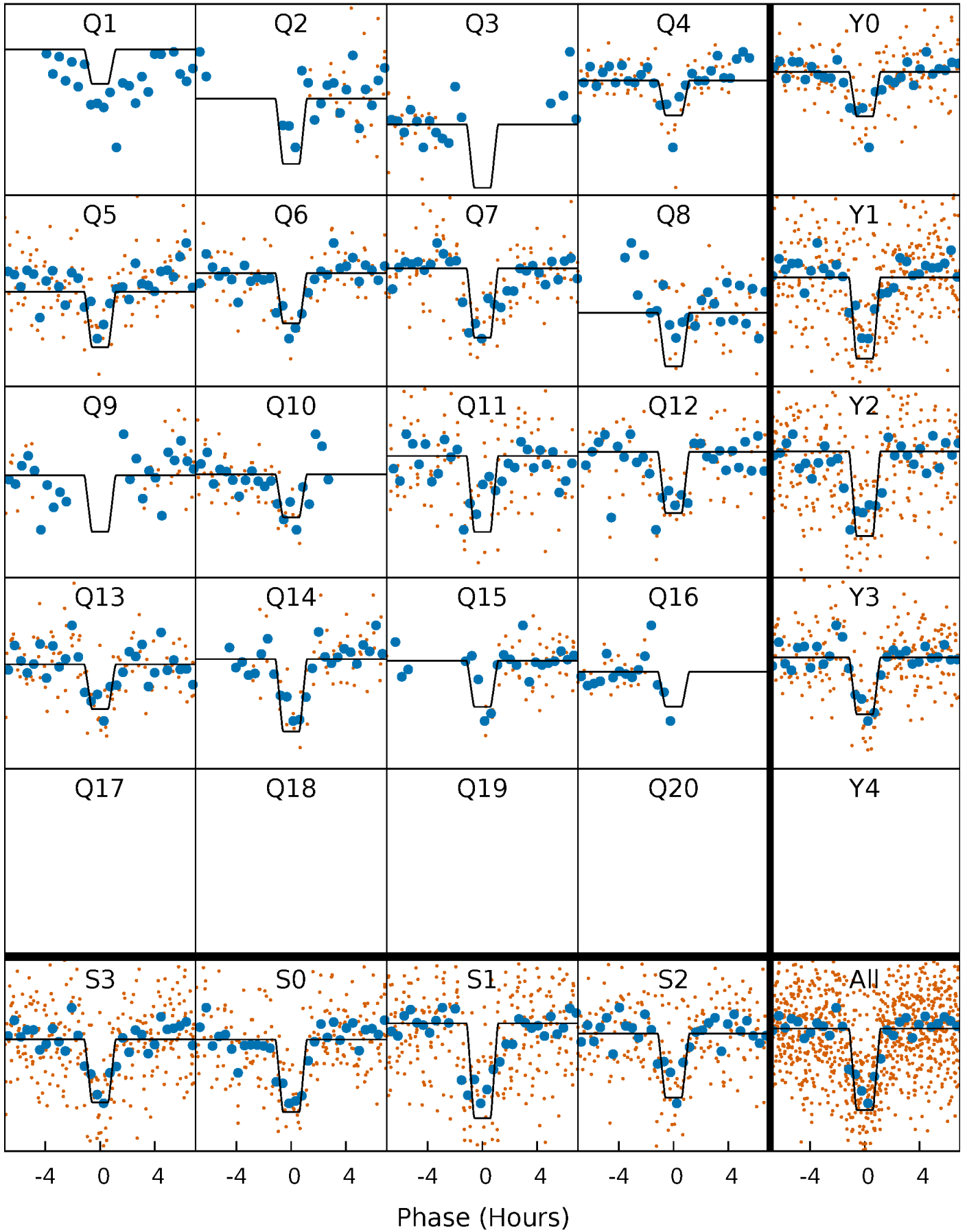
# DV Quarter-Phased Transit Curves

TCE 009892816-04 P= 26.235229 Days  $T_0=141.974221$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

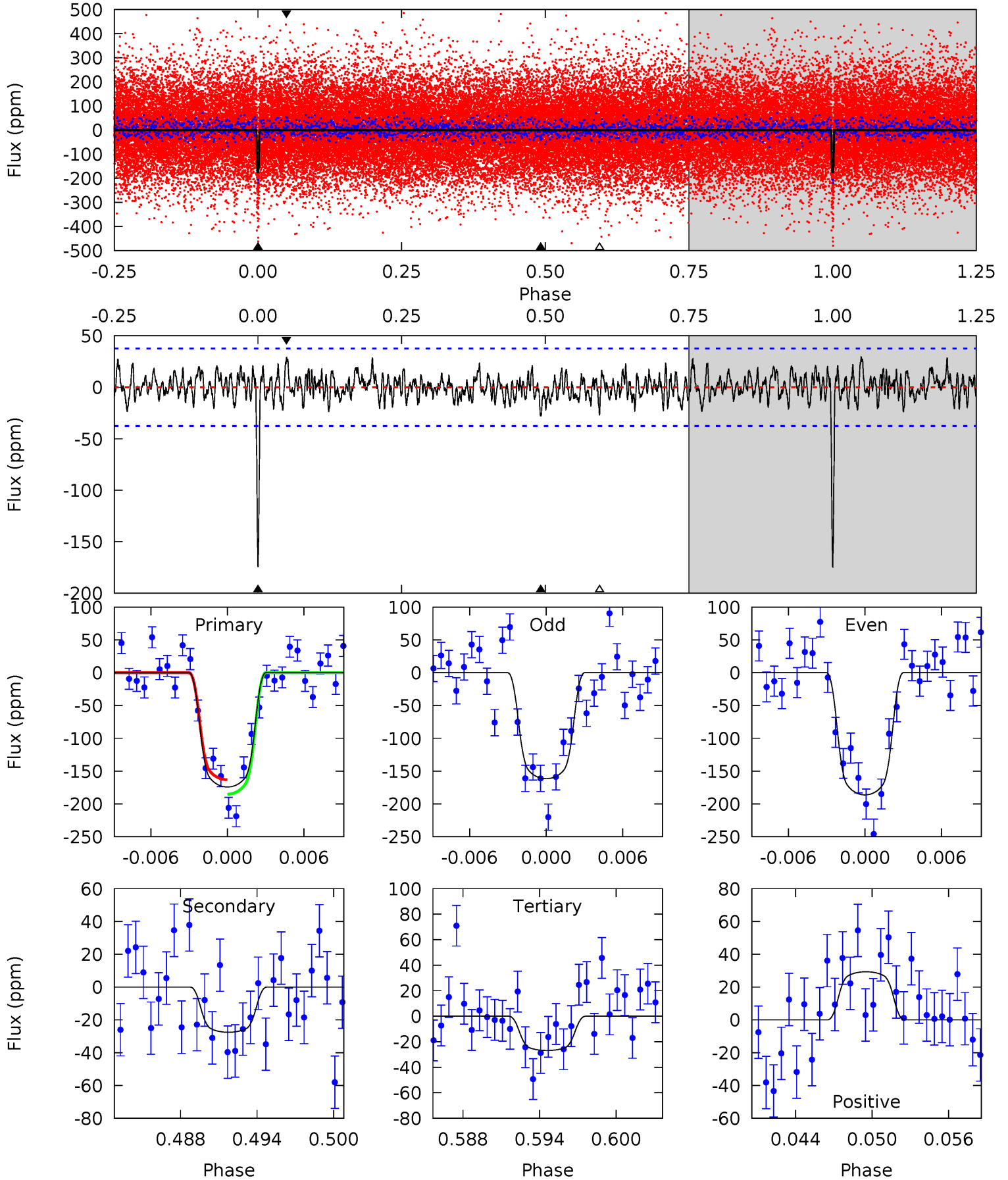
TCE 009892816-04 P= 26.235054 Days  $T_0=141.984022$  (BKJD)



# DV Model-Shift Uniqueness Test

009892816-04,  $P = 26.235229$  Days,  $E = 115.738992$  Days

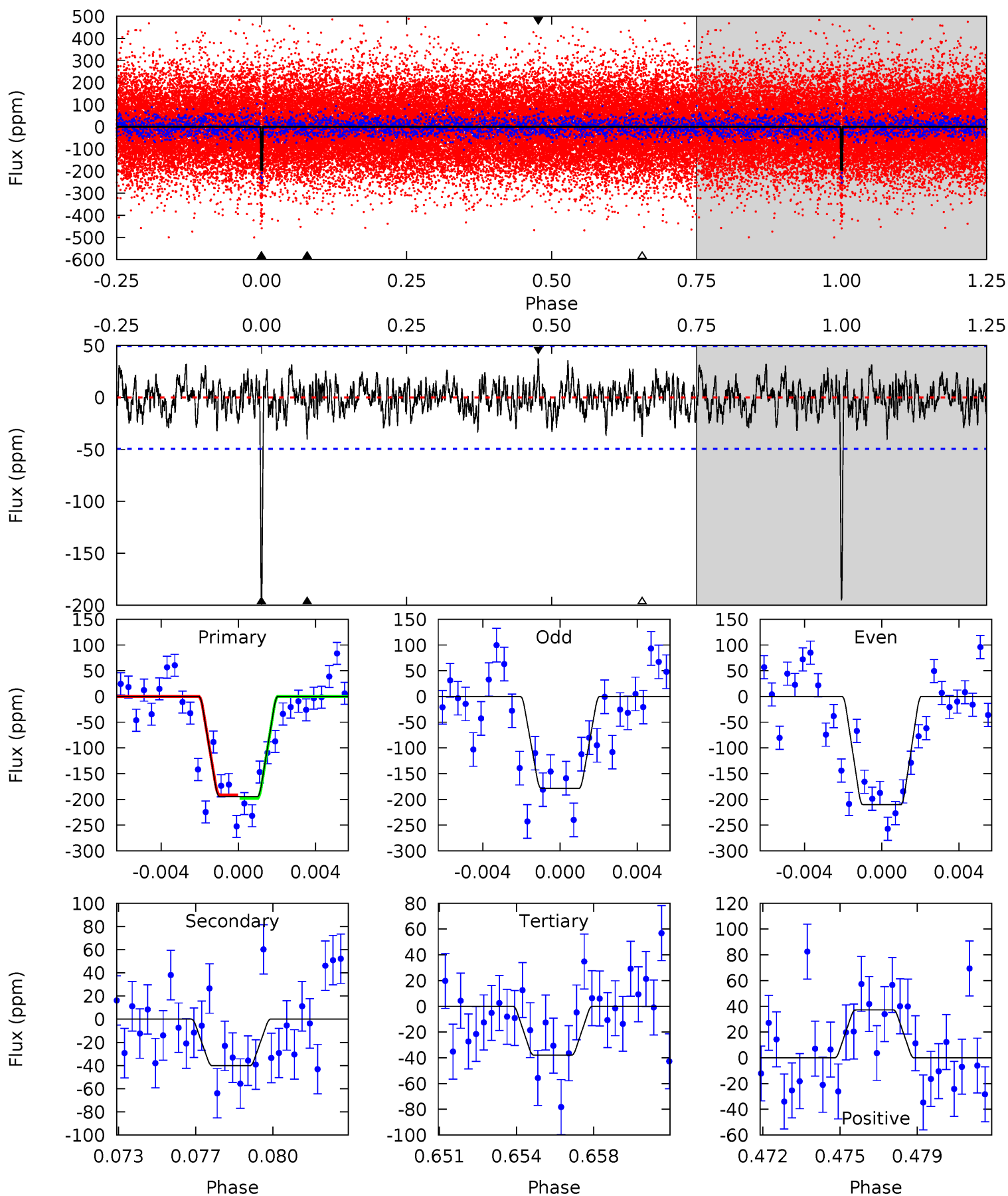
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
23.7	3.76	3.66	4.00	5.14	2.77	1.32	20.1	19.7	0.09	-0.24	1.69	0.94	0.14	1.50



# Alt Model-Shift Uniqueness Test

009892816-04, P = 26.235054 Days, E = 115.748968 Days

Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
20.5	4.23	4.00	3.92	5.22	2.91	1.29	16.5	16.6	0.23	0.31	1.67	0.96	0.16	0.36



### Stellar Parameters For KIC 009892816

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$6297^{+113}_{-126}$	$4.260^{+0.090}_{-0.110}$	$0.140^{+0.150}_{-0.200}$	$1.369^{+0.228}_{-0.187}$	$1.247^{+0.091}_{-0.111}$	$0.684^{+0.278}_{-0.233}$
	+2%/-2%	+2%/-3%	+107%/-143%	+17%/-14%	+7%/-9%	+41%/-34%
Source	SPE59	SPE59	SPE59	DSEP		

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

### Secondary Eclipse Parameters for KIC 009892816-04 / KOI 1955.04

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$-28 \pm 7$	$2.35^{+0.35}_{-0.30}$	$1056^{+49}_{-40}$	$3988^{+246}_{-246}$	$95^{+45}_{-32}$
Alt.	$-40 \pm 9$	$2.36^{+0.32}_{-0.30}$	$1055^{+47}_{-46}$	$4240^{+253}_{-246}$	$136^{+55}_{-39}$

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

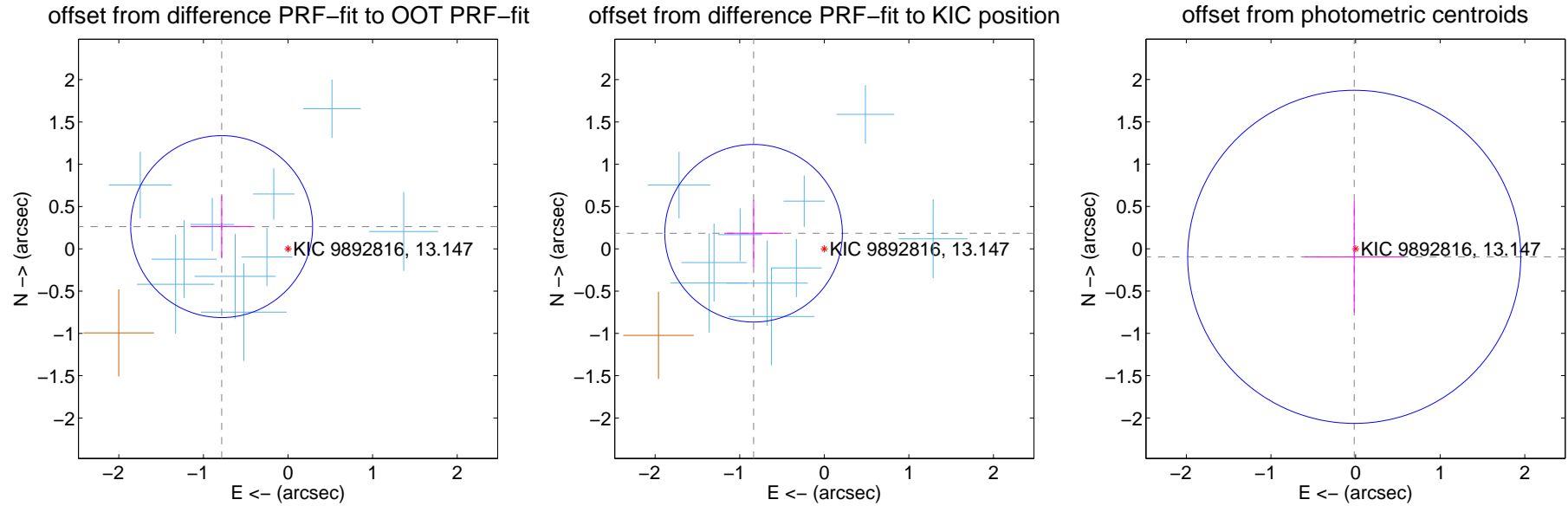
## DV Centroid Data

Supplemental centroid analysis for 009892816-04. Kepler magnitude: 13.15. Transit SNR 16.43

There are 10 quarters with good PRF difference image offsets

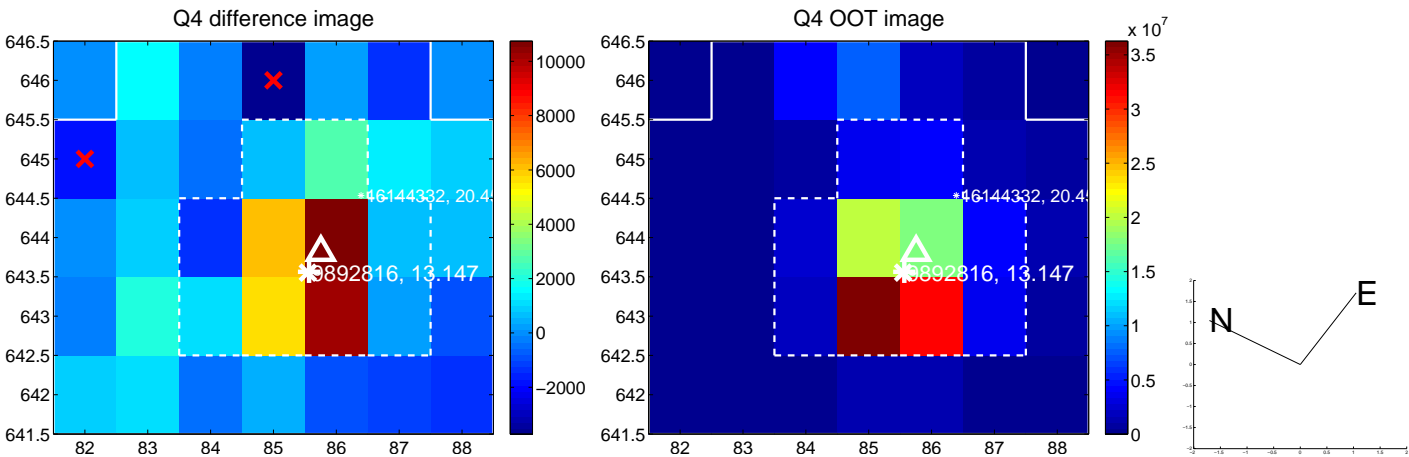
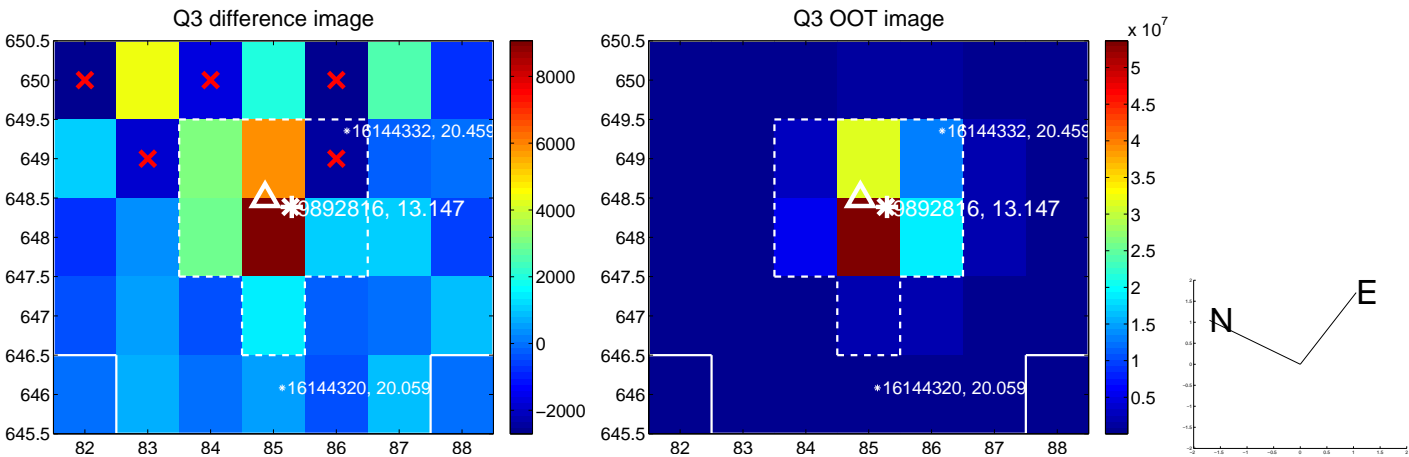
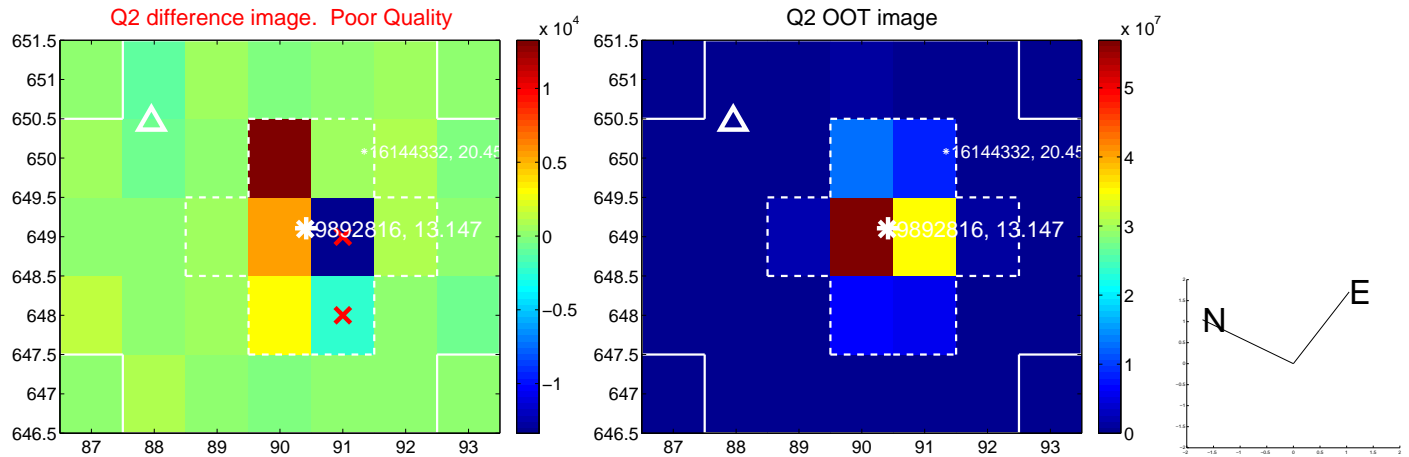
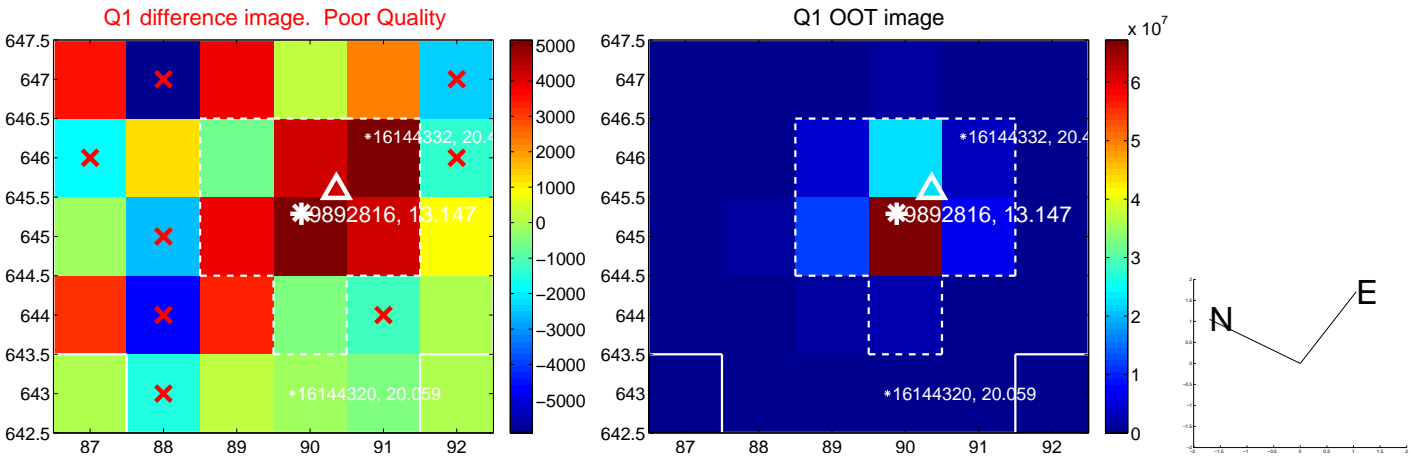
The direct PRF centroid is offset from the target star catalog position by about 0.04 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.827 \pm 0.358$	2.31	$0.785 \pm 0.358$	$0.263 \pm 0.364$
PRF-fit source offset from KIC position	$0.856 \pm 0.350$	2.45	$0.836 \pm 0.348$	$0.184 \pm 0.391$
photometric centroid source offset	$0.10 \pm 0.66$	0.15	$0.02 \pm 0.59$	$-0.10 \pm 0.66$



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.

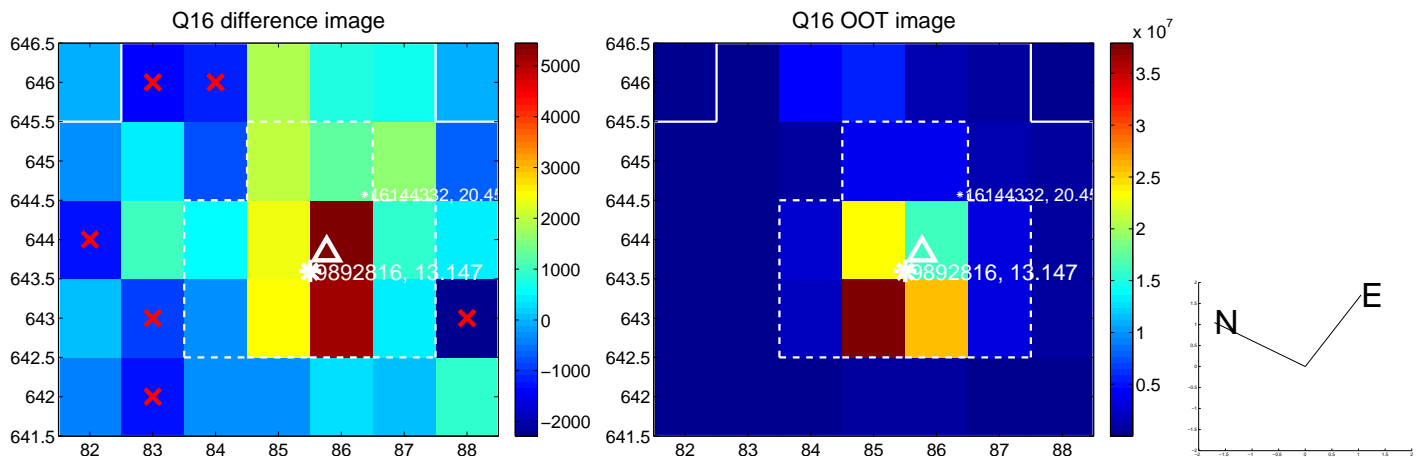
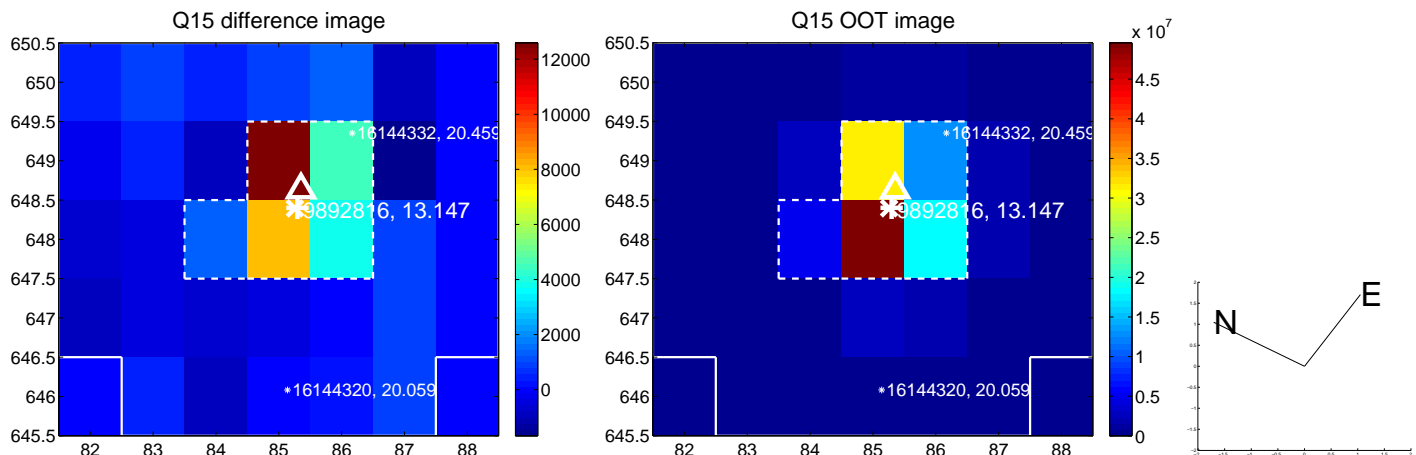
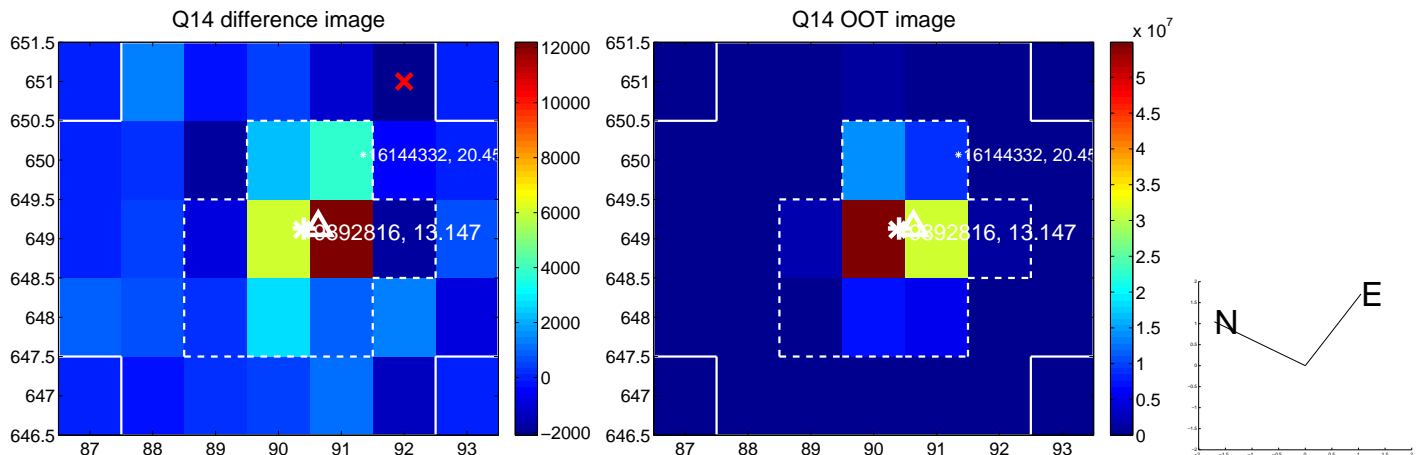
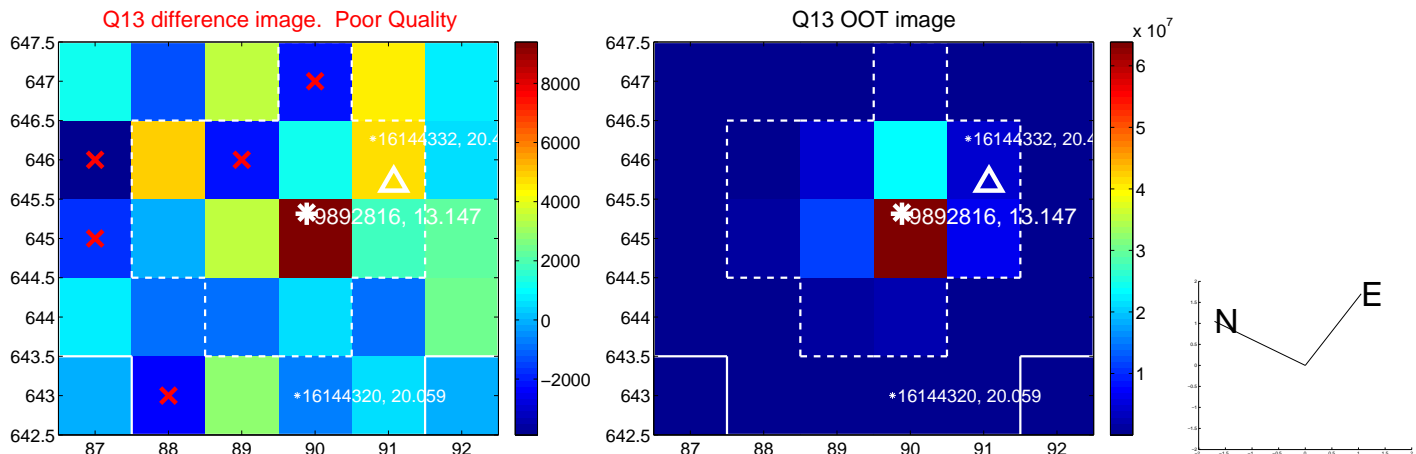




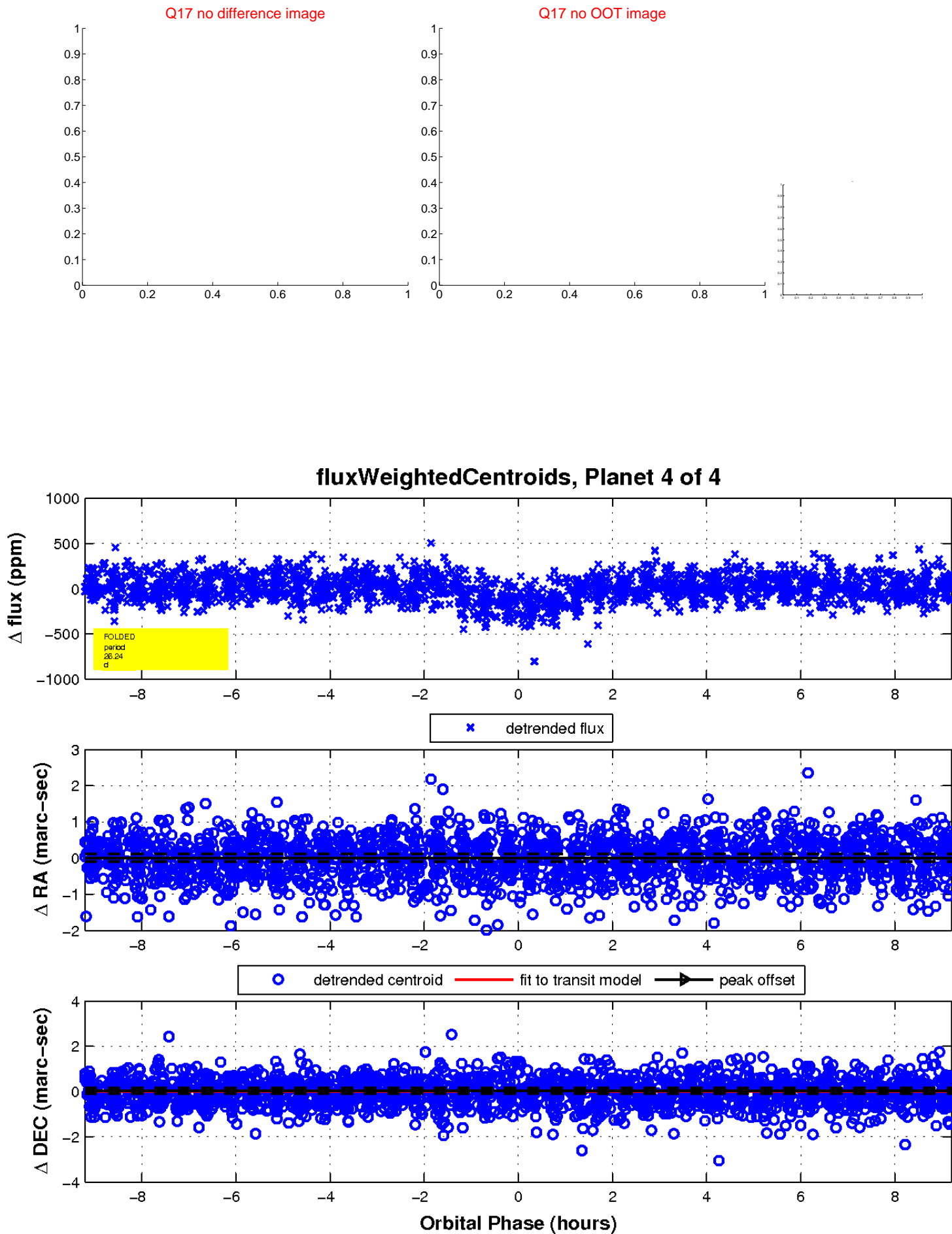




white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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



UKIRT Image

