

# KIC 004940201

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
004940201-01	OBS	6476.01	4.408290	134.285504	20289.0	4.380	1957.8	923.8	0.74	5496	18.68	186.80
004940201-02	OBS	No	493.986053	274.753672	601.6	15.708	9.8	6.6	0.74	5496	2.10	0.35

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
004940201-01	OBS	FP	0.00	0	1	0	0	DEPTH_ODDEVEN_DV—DEPTH_ODDEVEN_ALT—MOD_ODDEVEN_DV—MOD_ODDEVEN_ALT—DEEP_V_SHAPED
004940201-02	OBS	FP	0.00	1	0	1	0	INDIV_TRANS_RUBBLE_MARSHALL—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_POS_ALT— INCONSISTENT_TRANS—CENT_FEW_DIFFS—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.

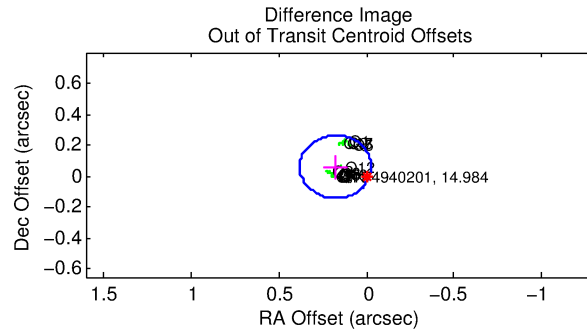
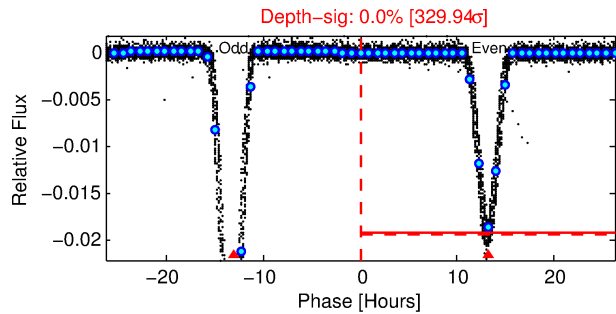
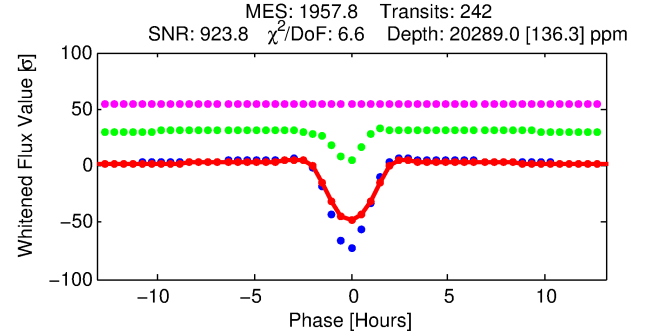
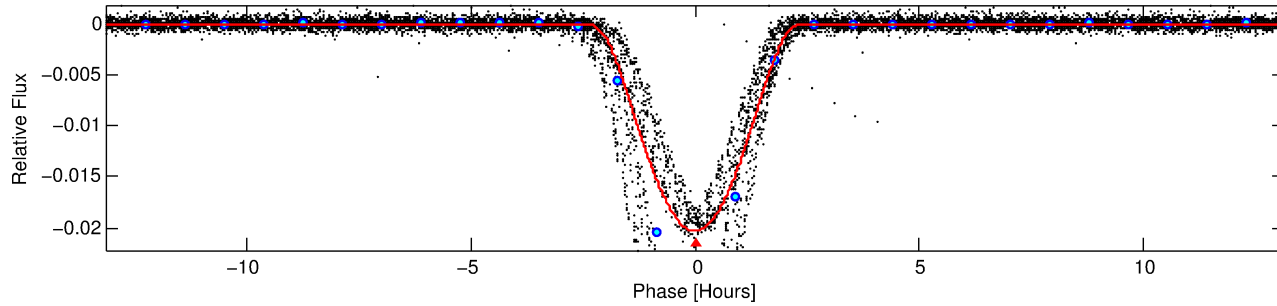
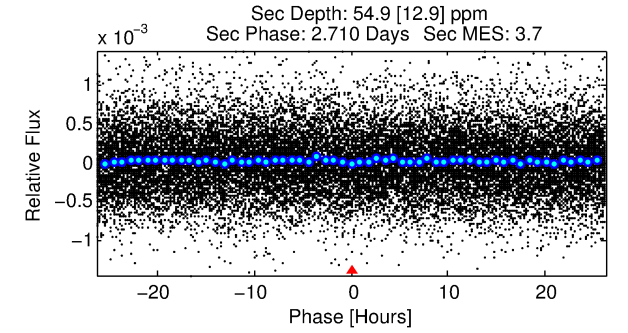
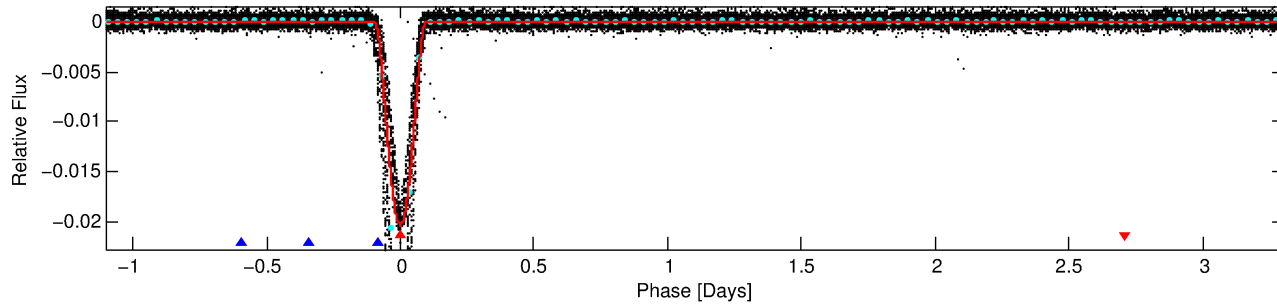
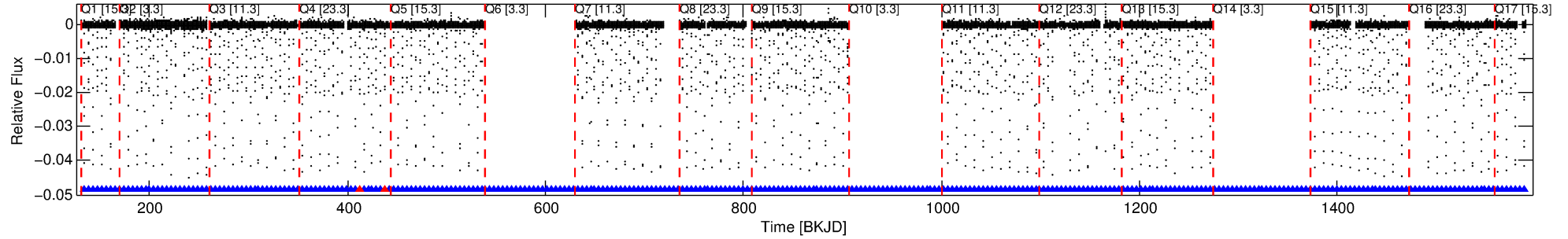
## Ephemeris Match Information For 004940201-01

No Significant Match Found

# DV One-Page Summary

KIC: 4940201 Candidate: 1 of 2 Period: 4.408 d  
KOI: K06476.01 Corr: 0.956

Kp: 14.98 R\*: 0.74 Rs Teff: 5496.0 K Logg: 4.61 Fe/H: -0.380



## DV Fit Results:

Period = 4.40829 [0.00000] d  
Epoch = 134.2855 [0.0002] BKJD  
Rp/R\* = 0.2303 [0.0331]  
a/R\* = 5.64 [0.07]  
b = 1.00 [0.05]  
Seff = 186.80 [49.68]  
Teq = 943 [63] K  
Rp = 18.67 [4.61] Re  
a = 0.0492 [0.0082] AU  
Ag = 0.21 [0.09] [-8.56σ]  
Teff = 986 [96] K [0.37σ]

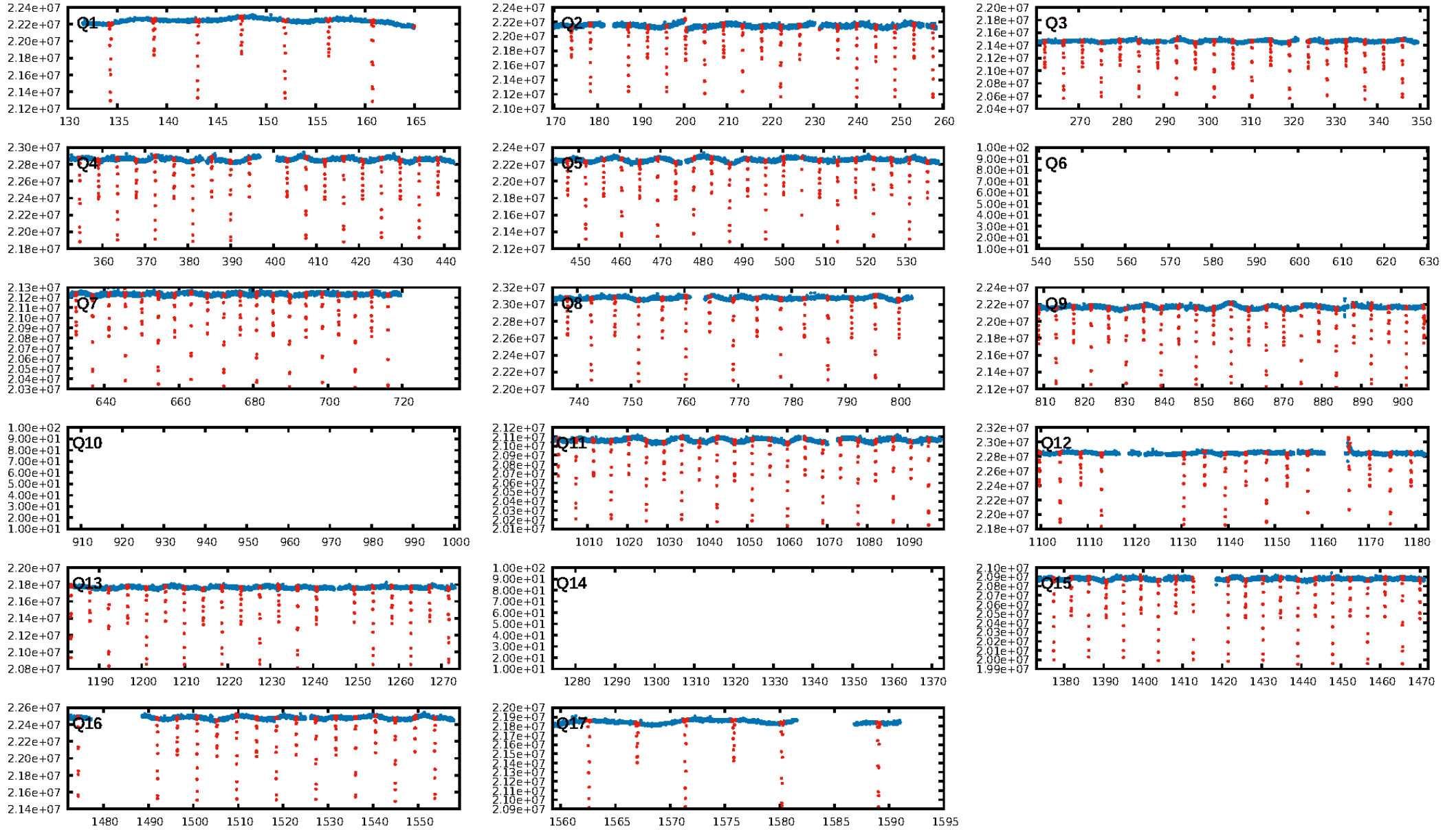
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 100.0% [720.54σ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: 0.00e+00  
RollingBand-fgt: 0.99 [227/229]  
GhostDiagnostic-chr: 2.302  
Centroid-sig: 0.0%  
Centroid-so: 0.136 arcsec [14.64σ]  
OotOffset-rm: 0.187 arcsec [2.77σ]  
KicOffset-rm: 0.082 arcsec [1.16σ]  
OotOffset-st: 1/4/4/5 [14]  
KicOffset-st: 1/4/4/5 [14]  
DiffImageQuality-fgm: 1.00 [14/14]  
DiffImageOverlap-fno: 1.00 [14/14]

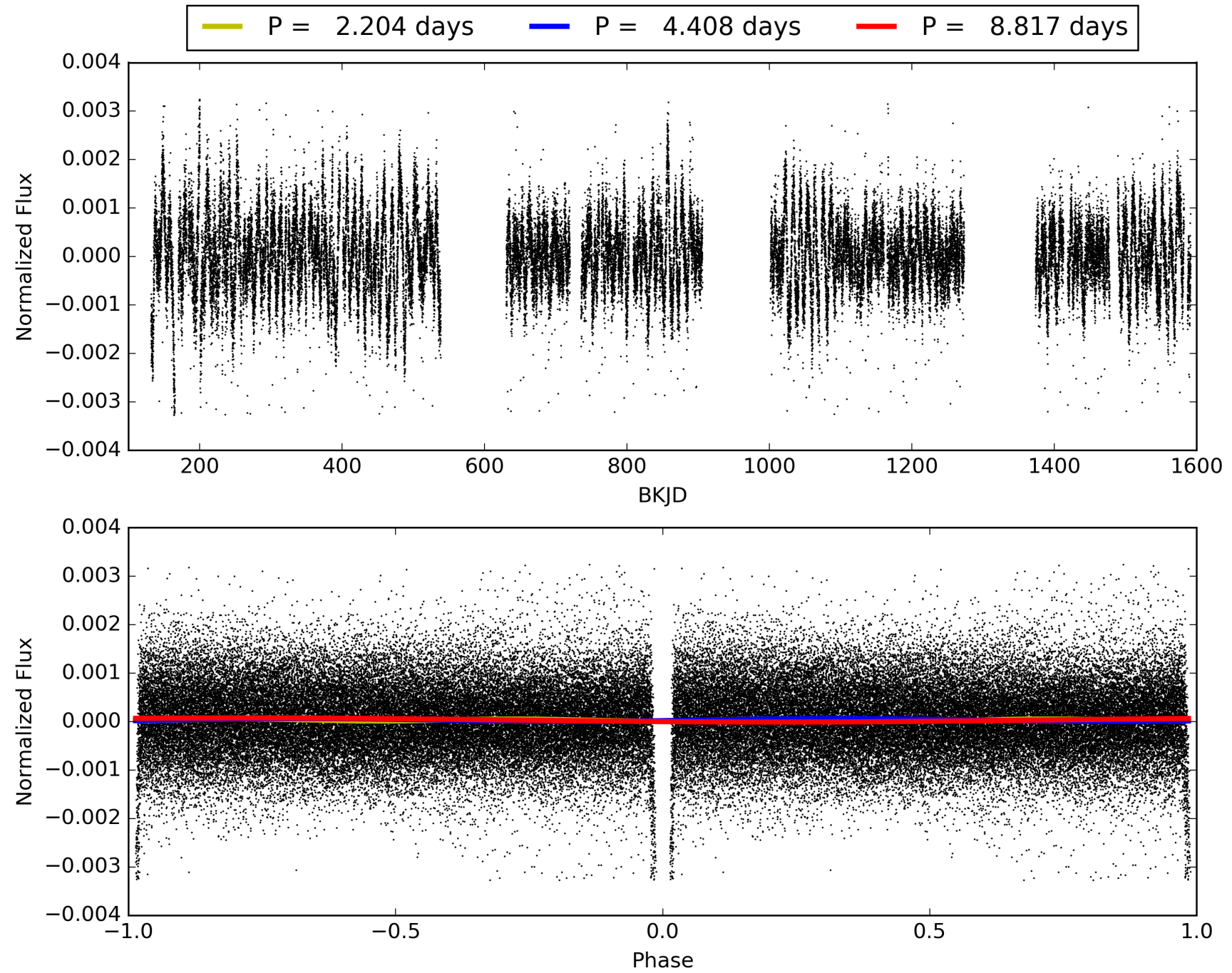
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 30-Jan-2016 17:15:37 Z

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

# TCE 004940201-01, PDC Light Curves

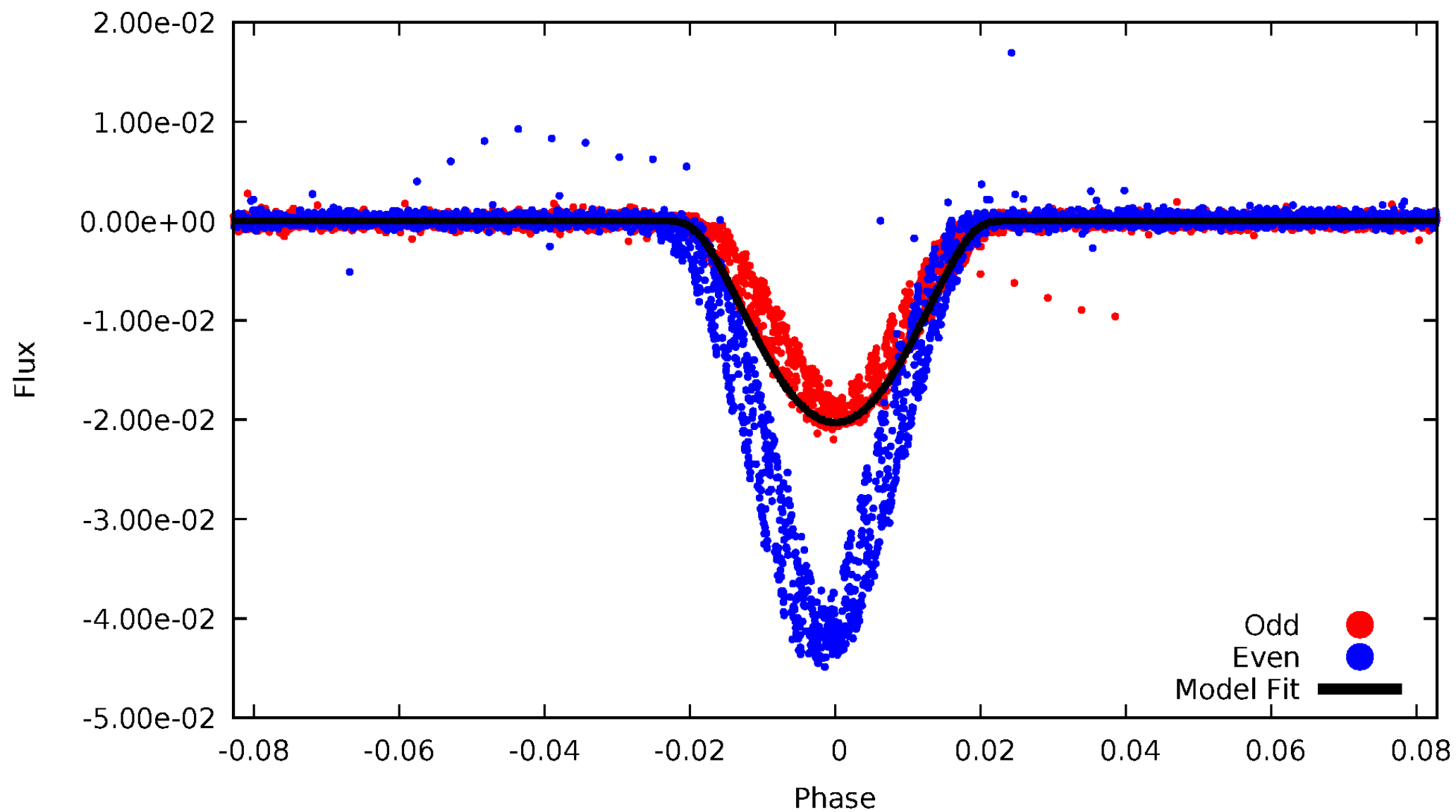


TCE 004940201-01



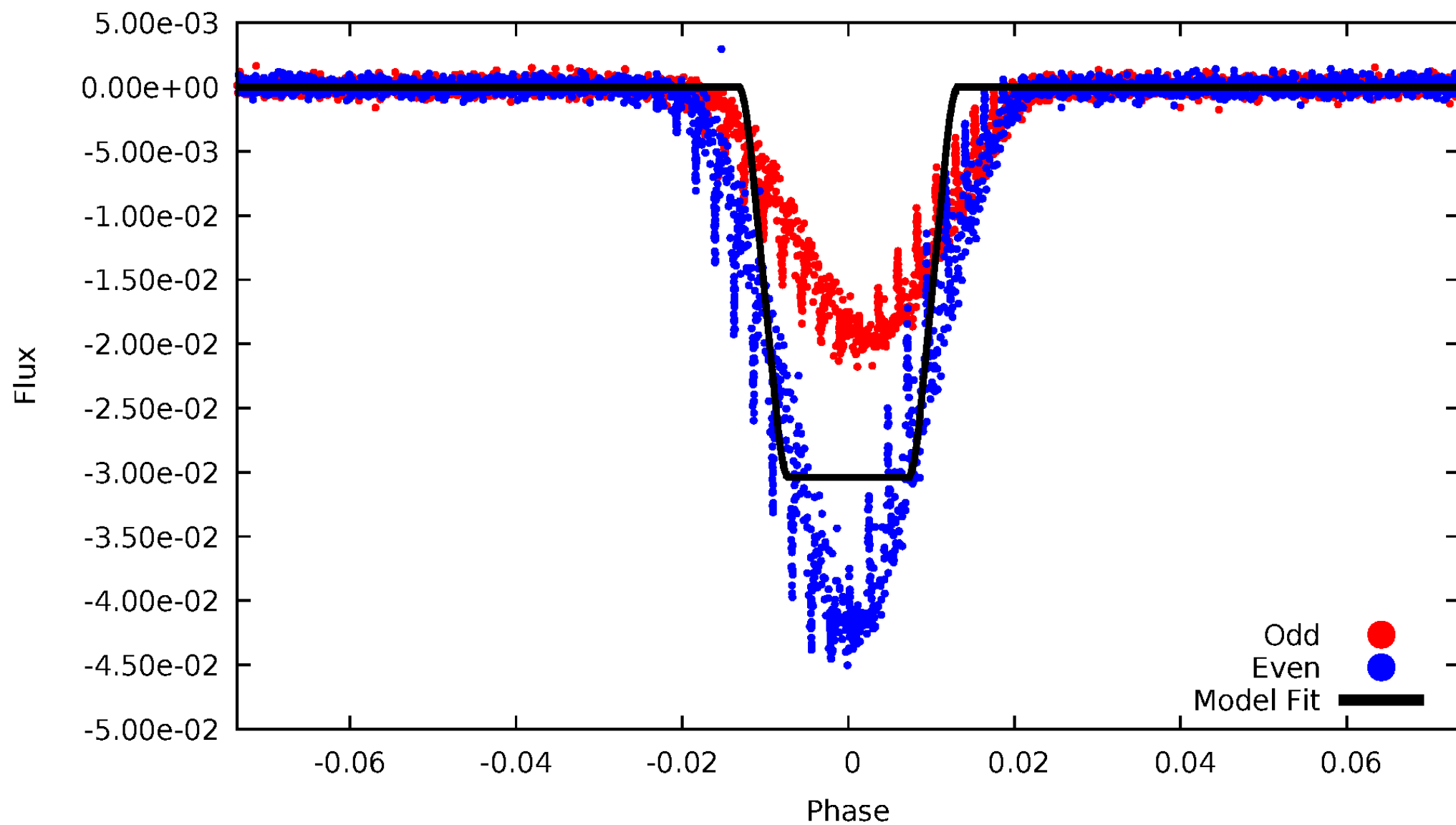
# DV Odd/Even

TCE 004940201-01



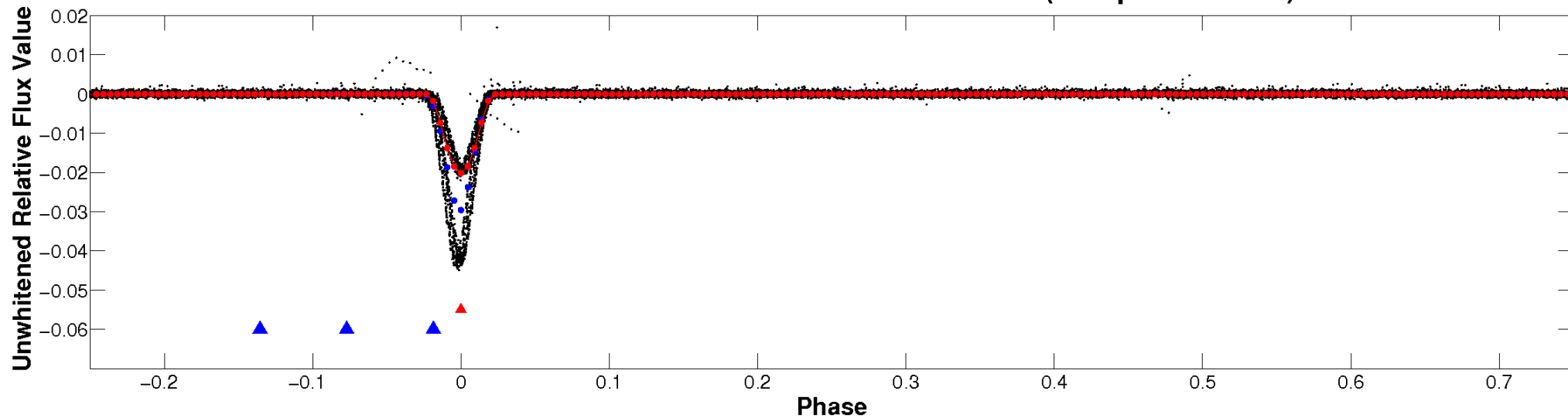
# ALT Odd/Even

TCE 004940201-01

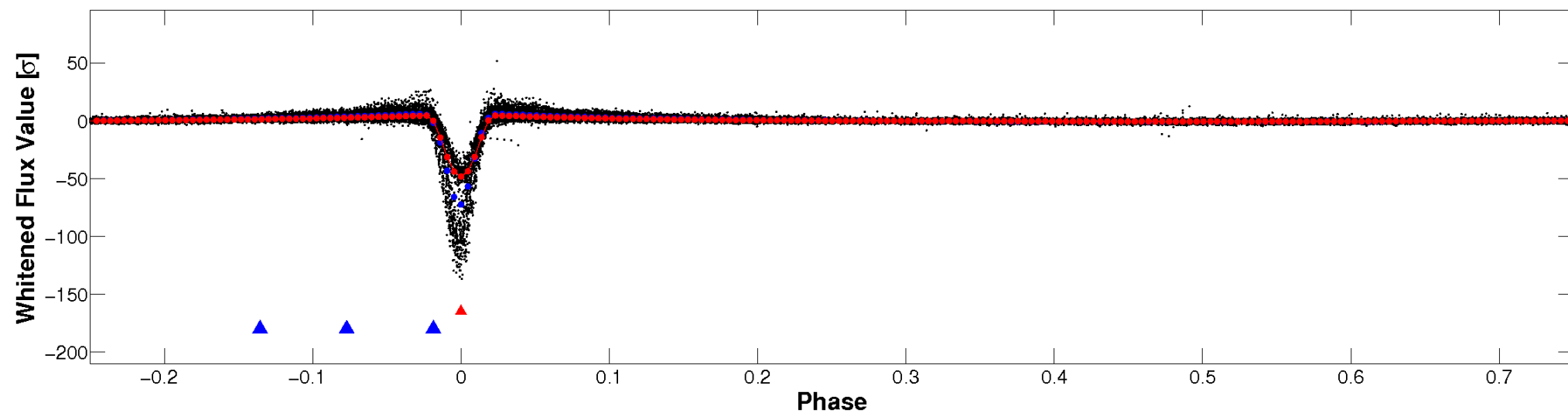


# Non-Whitened Vs. Whitened Light Curve

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

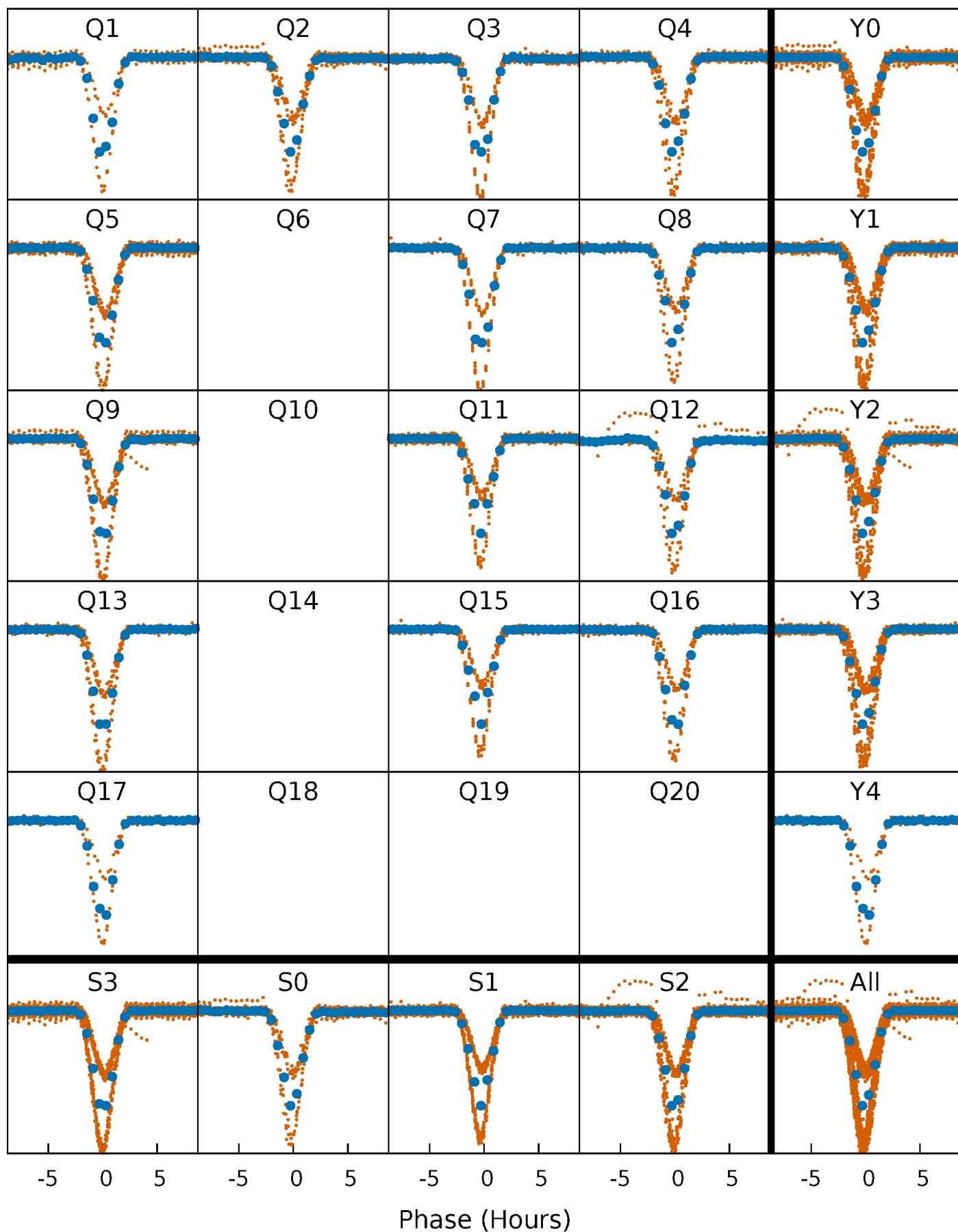


**Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)**



# PDC Quarter-Phased Transit Curves

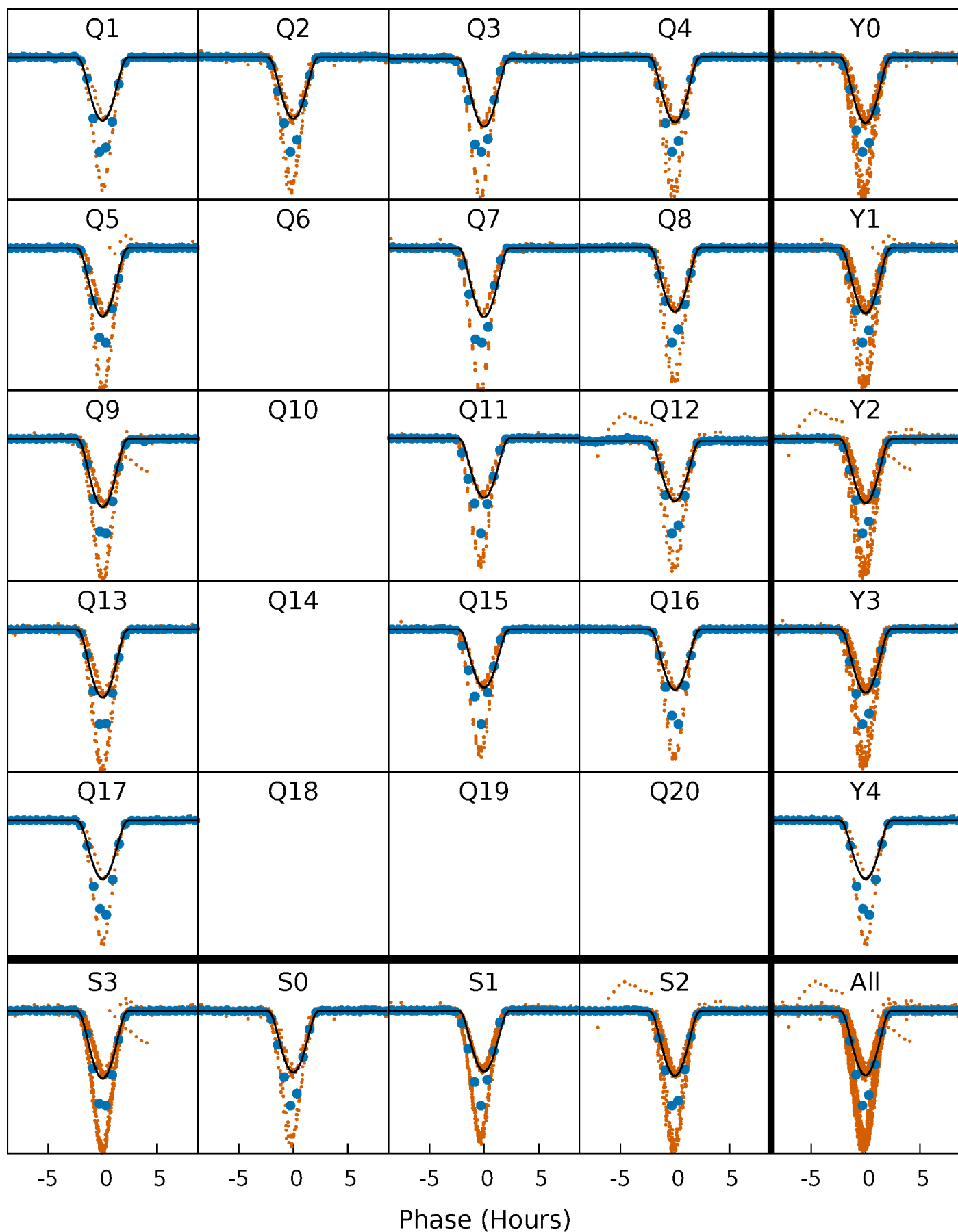
TCE 004940201-01 P= 4.408290 Days  $T_0=134.285504$  (BKJD)





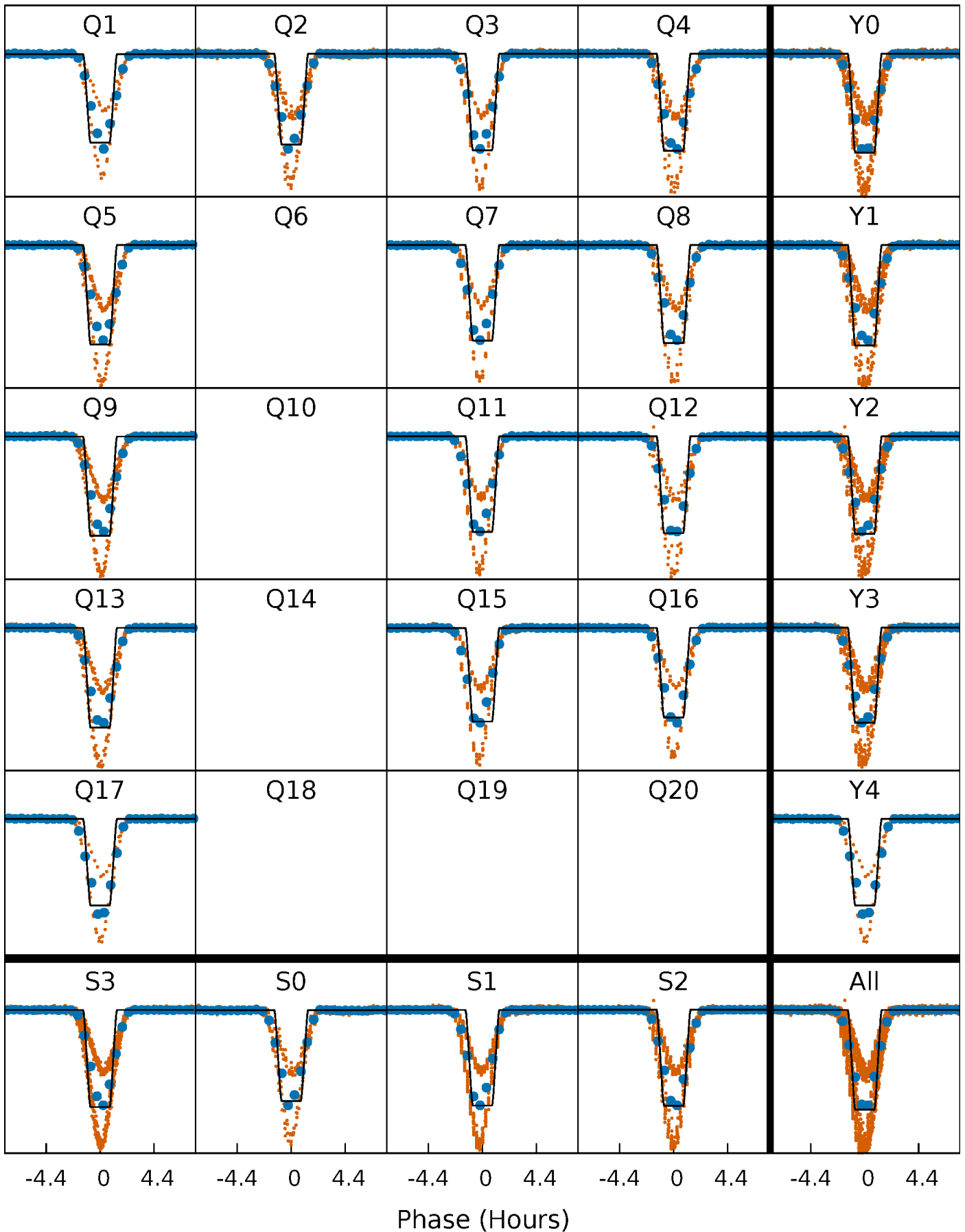
# DV Quarter-Phased Transit Curves

TCE 004940201-01 P= 4.408290 Days  $T_0=134.285504$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

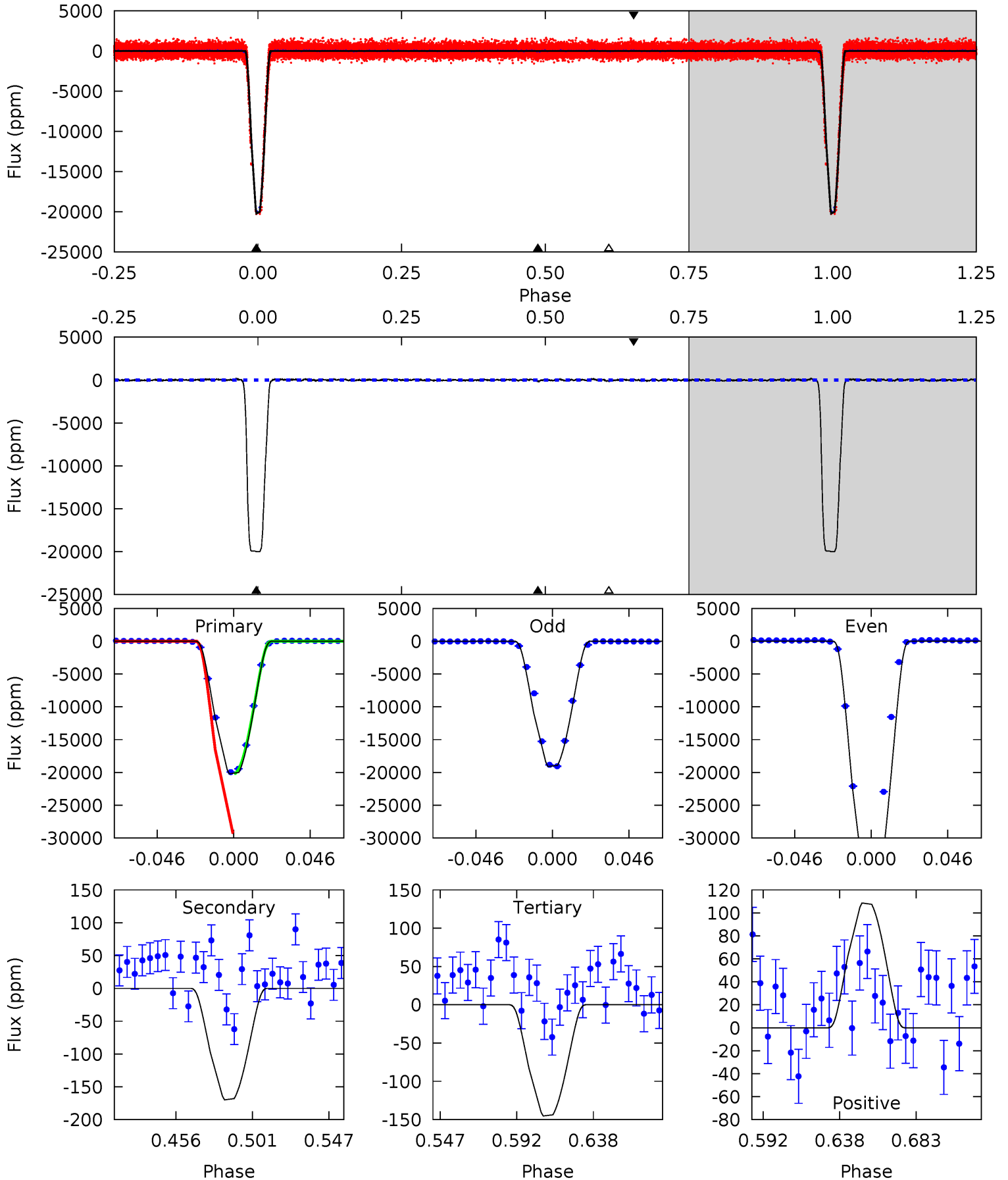
TCE 004940201-01 P= 4.408306 Days  $T_0=134.279386$  (BKJD)



# DV Model-Shift Uniqueness Test

004940201-01, P = 4.408290 Days, E = 129.877214 Days

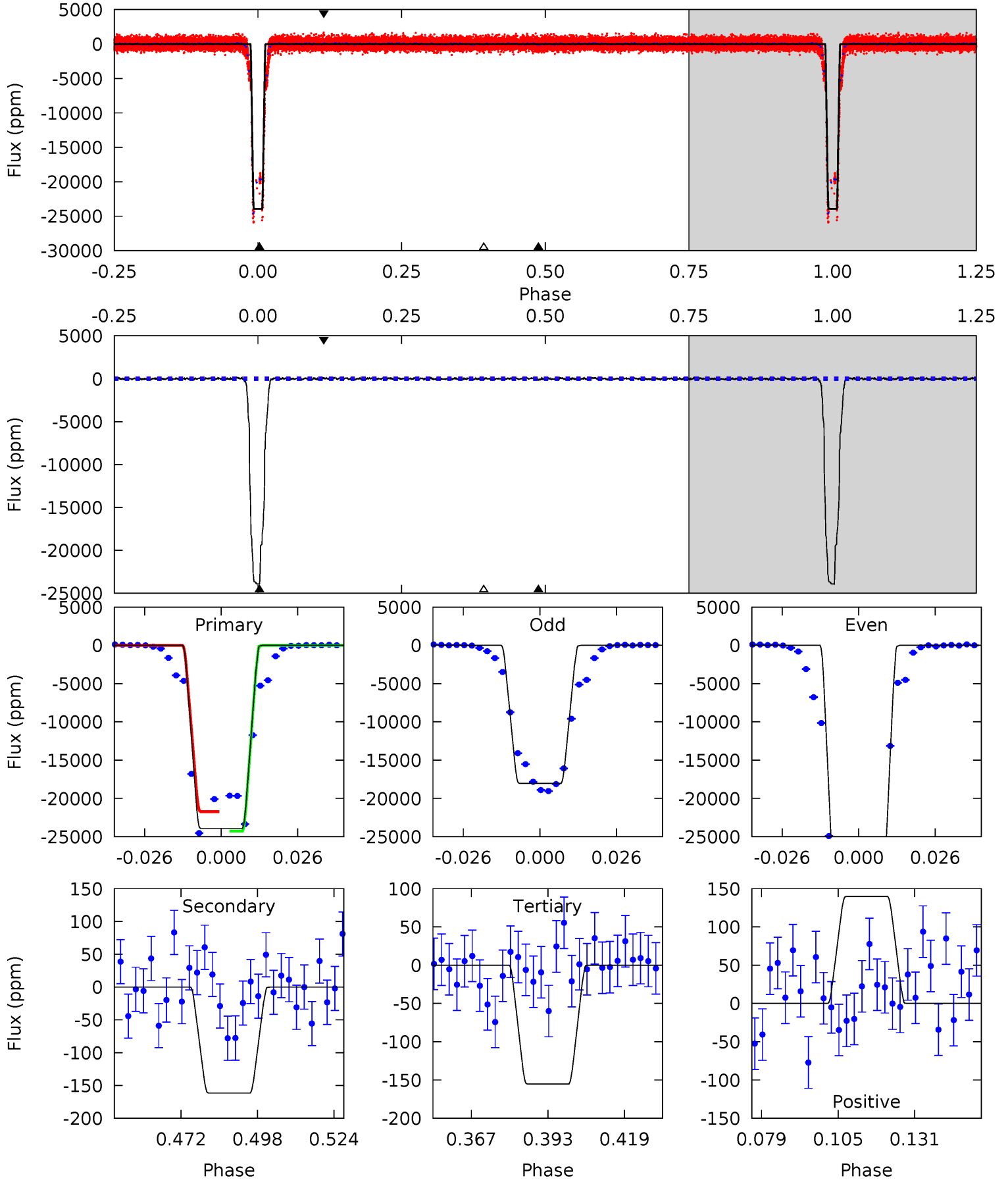
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
1428	12.0	10.3	7.67	4.73	2.00	2.98	1417	1420	1.73	4.32	817.7	1.04	0.01	0



# Alt Model-Shift Uniqueness Test

004940201-01, P = 4.408306 Days, E = 129.871080 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
776.0	5.24	5.03	4.53	4.84	2.22	1.53	770.9	771.4	0.21	0.71	559.2	0.86	0.01	0



### Stellar Parameters For KIC 004940201

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$5496^{+164}_{-148}$	$4.607^{+0.032}_{-0.128}$	$-0.380^{+0.350}_{-0.300}$	$0.743^{+0.149}_{-0.064}$	$0.825^{+0.088}_{-0.088}$	$2.831^{+0.480}_{-1.064}$
	+3%/-3%	+1%/-3%	+92%/-79%	+20%/-9%	+11%/-11%	+17%/-38%
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 004940201-01 / KOI 6476.01

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$-168 \pm 14$	$19.53^{+3.46}_{-3.14}$	$1342^{+67}_{-52}$	$2063^{+131}_{-157}$	$0.573^{+0.243}_{-0.147}$
Alt.	$-162 \pm 31$	$14.85^{+3.29}_{-2.96}$	$1344^{+68}_{-53}$	$2276^{+154}_{-157}$	$0.976^{+0.522}_{-0.341}$

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

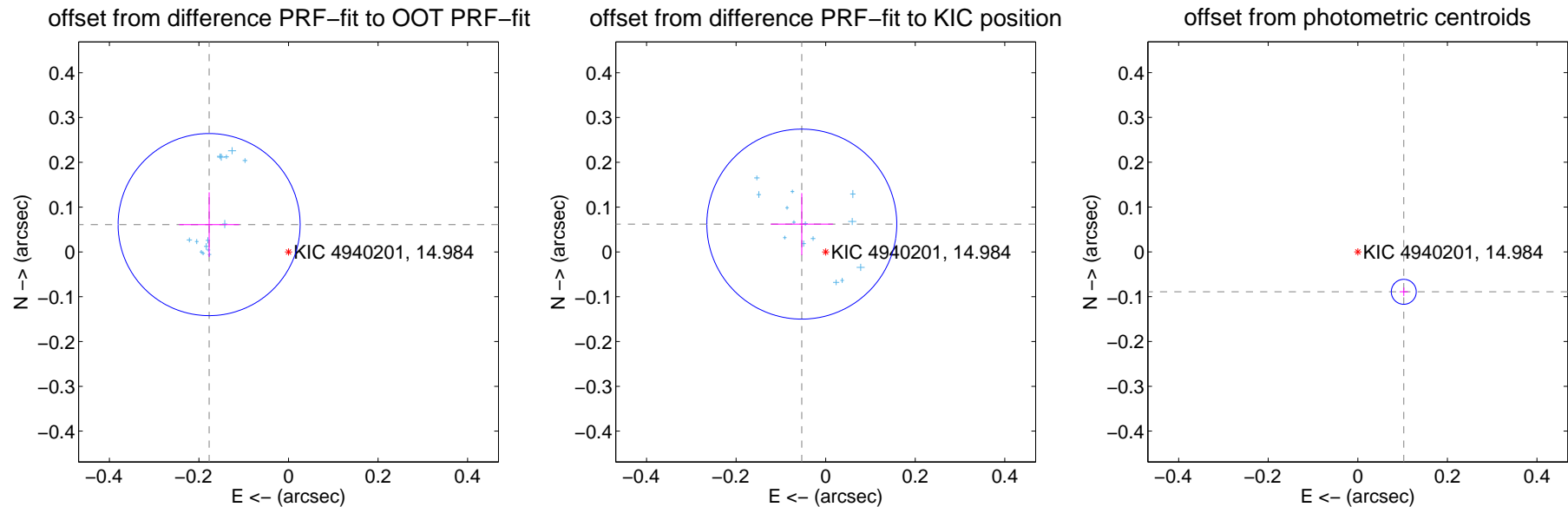
## DV Centroid Data

Supplemental centroid analysis for 004940201-01. Kepler magnitude: 14.98. Transit SNR 923.80

There are 14 quarters with good PRF difference image offsets

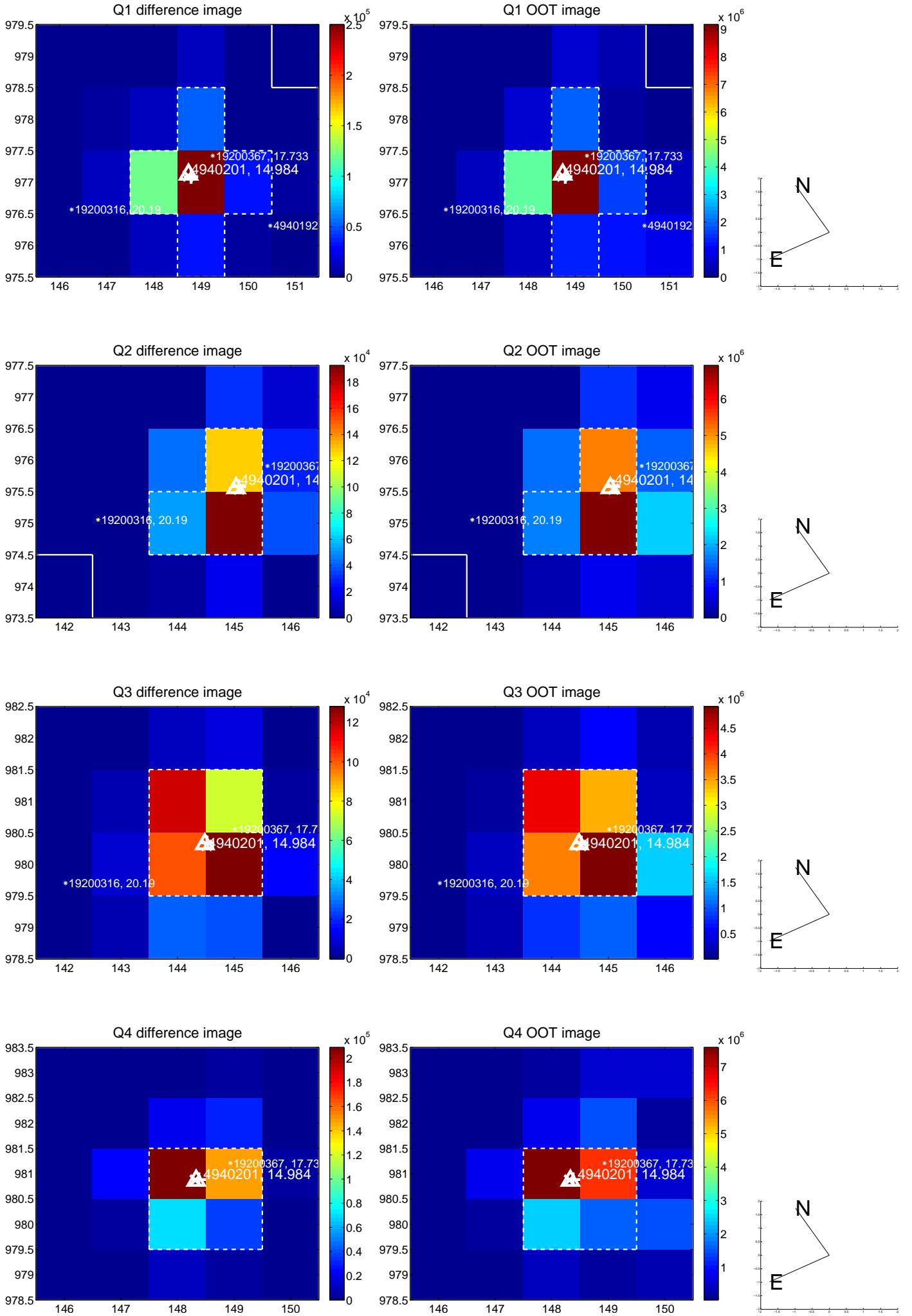
The direct PRF centroid is offset from the target star catalog position by about 0.34 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.187 \pm 0.068$	2.77	$0.177 \pm 0.067$	$0.061 \pm 0.072$
PRF-fit source offset from KIC position	$0.082 \pm 0.071$	1.16	$0.053 \pm 0.069$	$0.062 \pm 0.069$
photometric centroid source offset	$0.14 \pm 0.01$	14.64	$-0.10 \pm 0.01$	$-0.09 \pm 0.01$

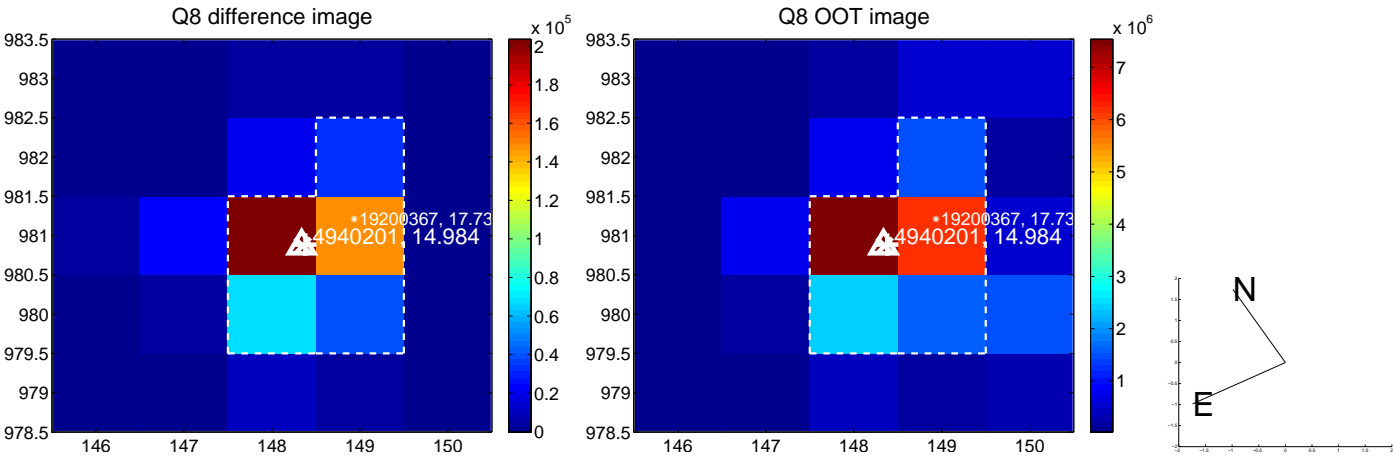
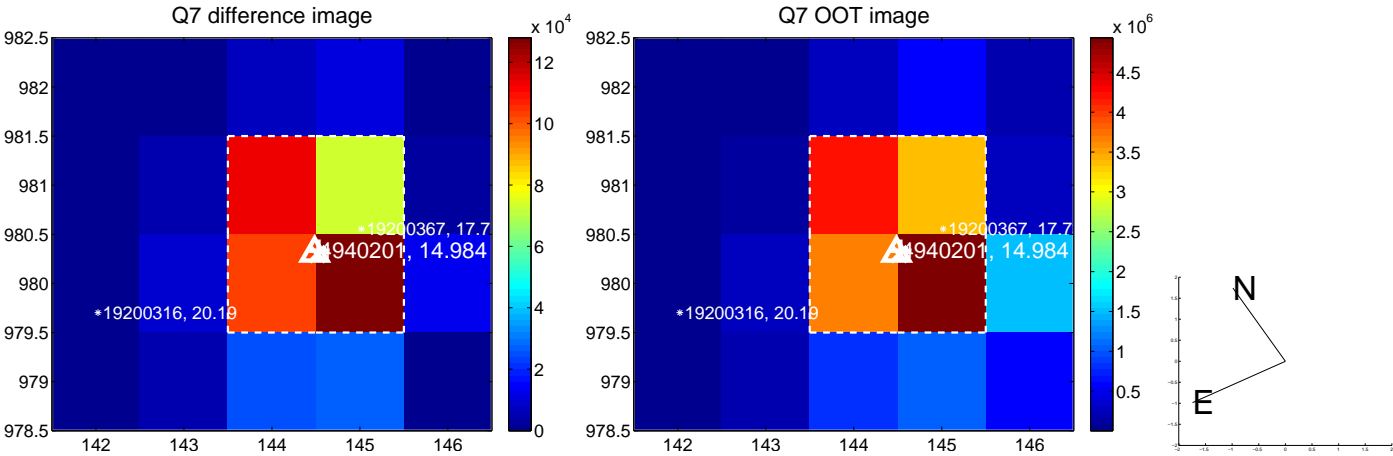
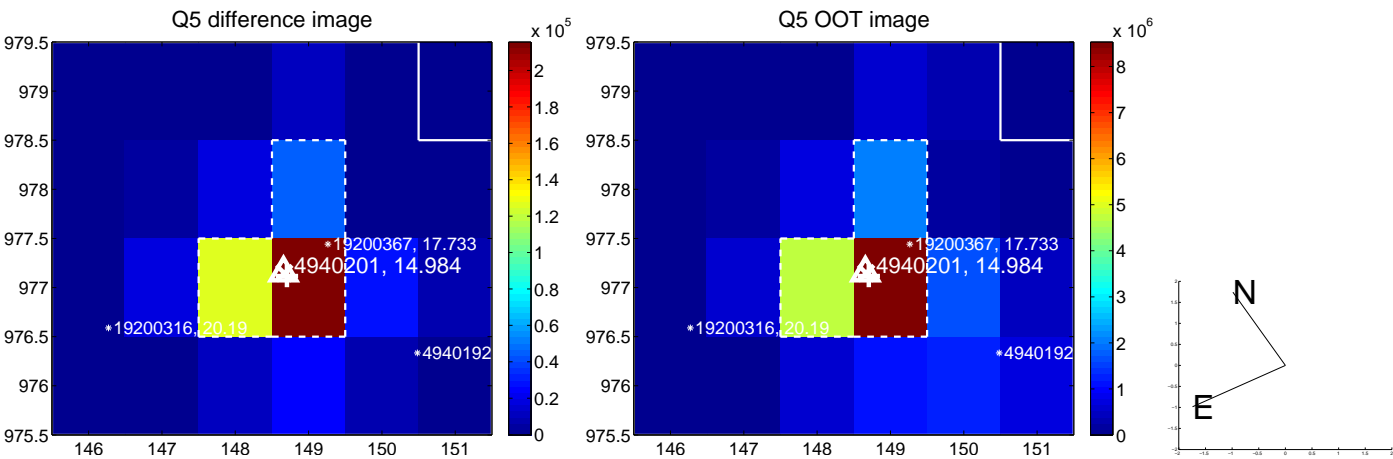


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses:** good quarterly centroid offsets; **Vermillion crosses:** bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

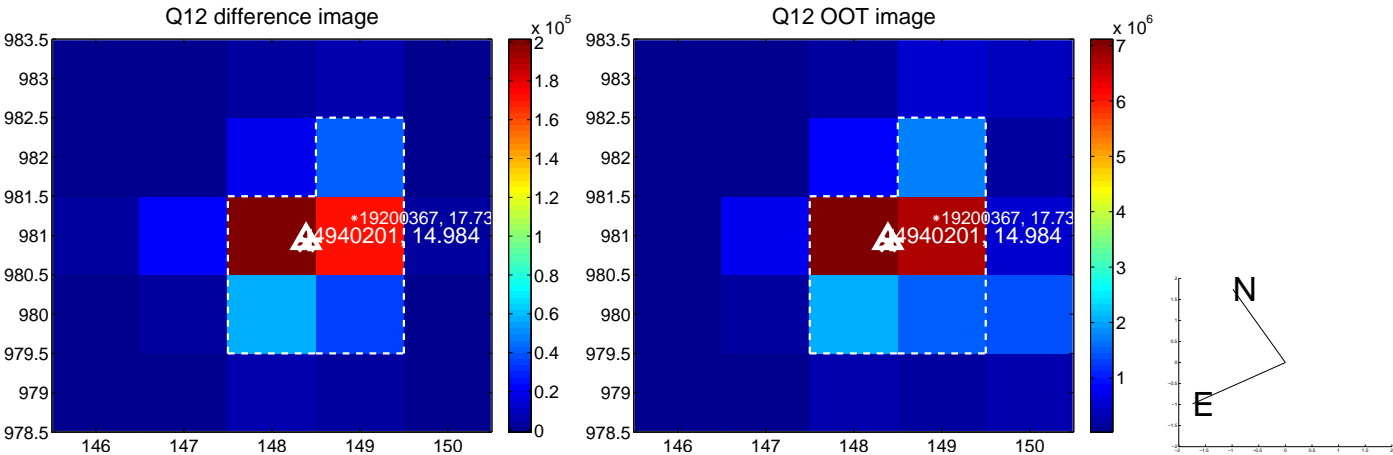
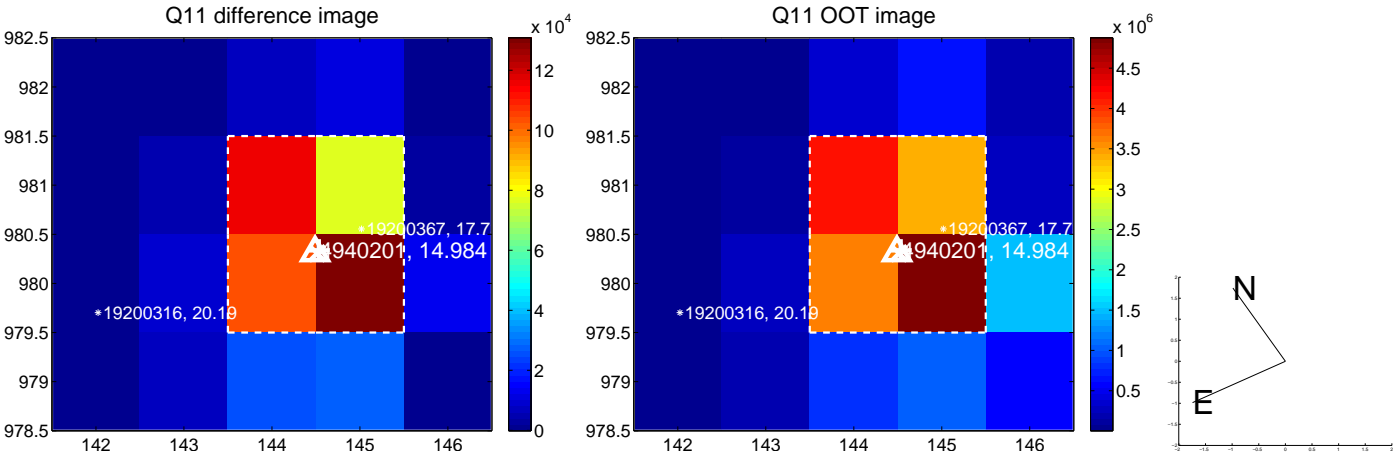
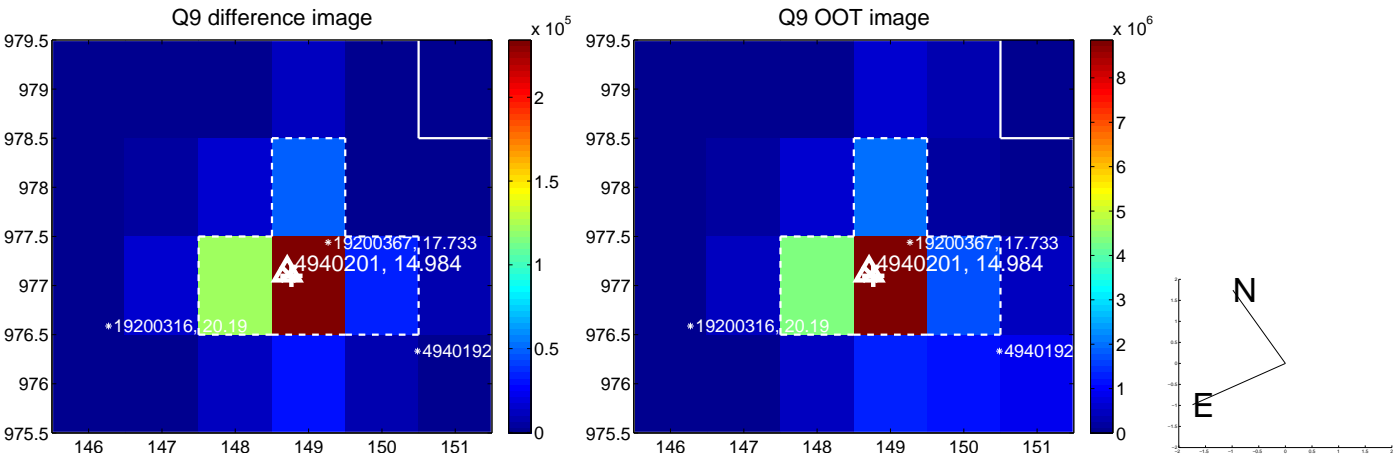


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

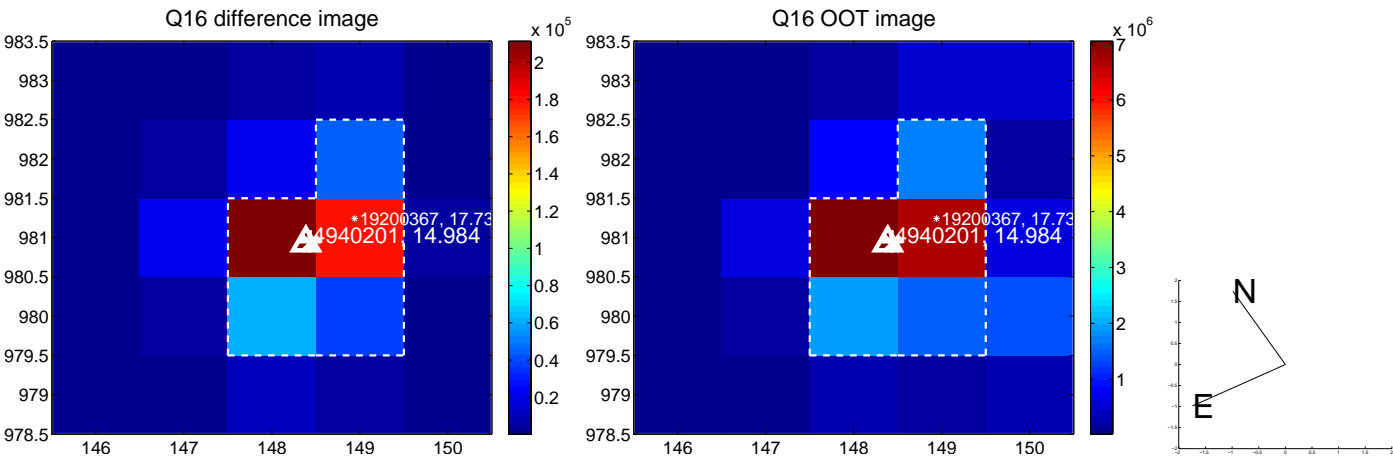
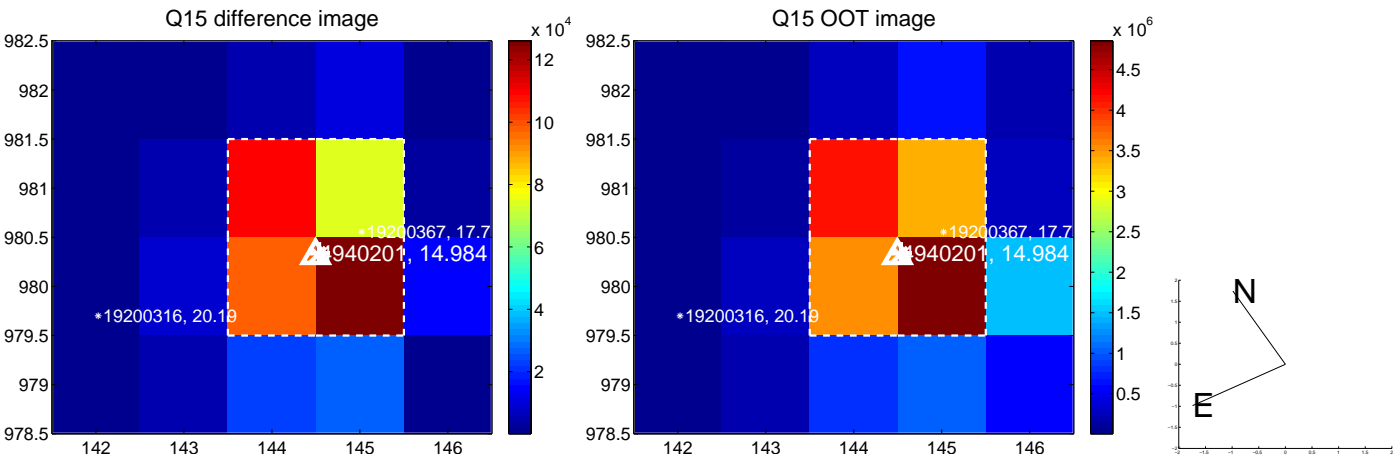
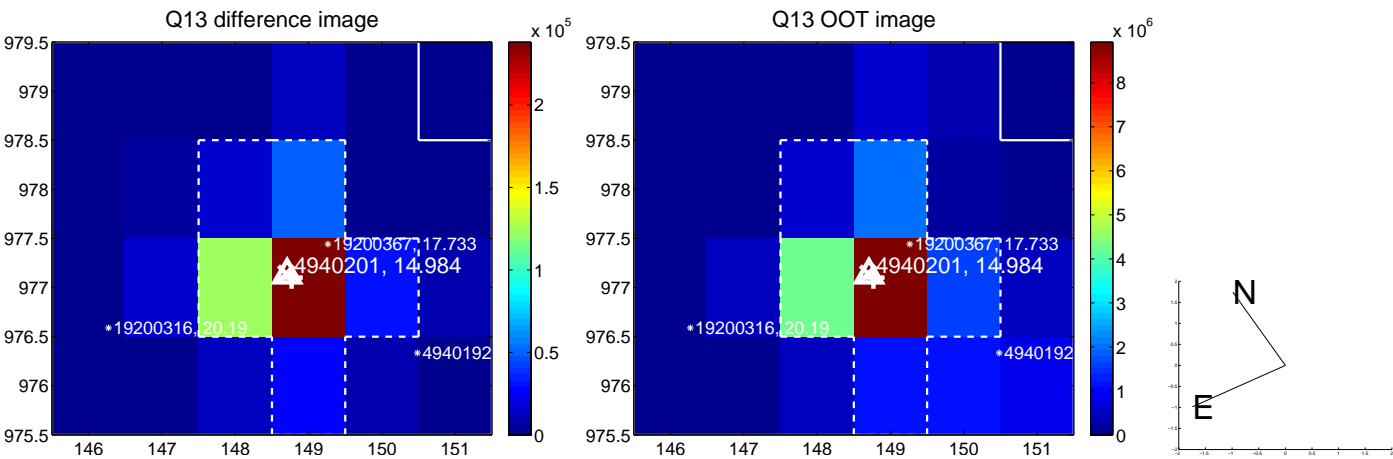




white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



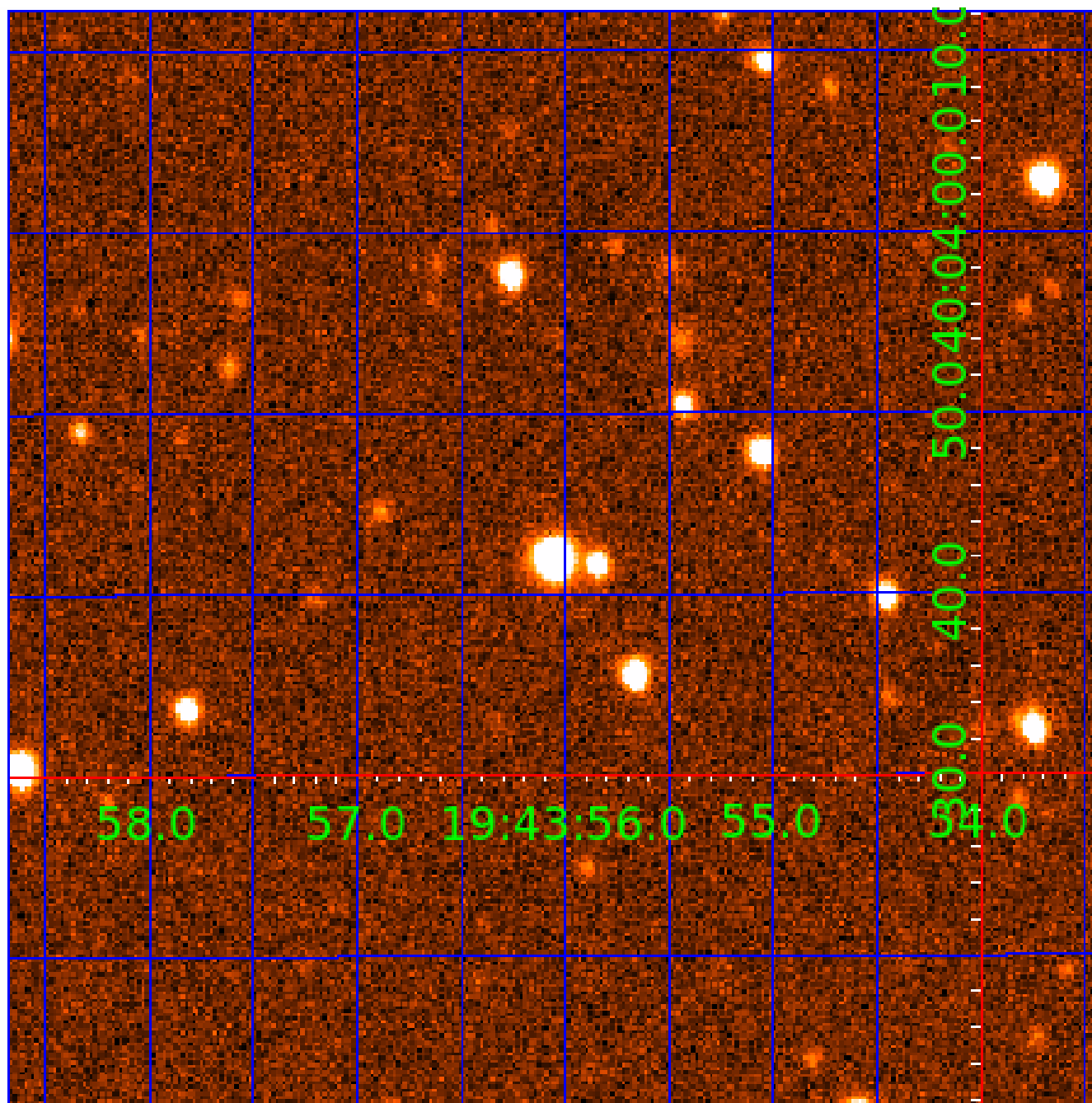
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.





UKIRT Image

Declination



# KIC 004940201

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
004940201-01	OBS	6476.01	4.408290	134.285504	20289.0	4.380	1957.8	923.8	0.74	5496	18.68	186.80
004940201-02	OBS	No	493.986053	274.753672	601.6	15.708	9.8	6.6	0.74	5496	2.10	0.35

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
004940201-01	OBS	FP	0.00	0	1	0	0	DEPTH_ODDEVEN_DV—DEPTH_ODDEVEN_ALT—MOD_ODDEVEN_DV—MOD_ODDEVEN_ALT—DEEP_V_SHAPED
004940201-02	OBS	FP	0.00	1	0	1	0	INDIV_TRANS_RUBBLE_MARSHALL—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS—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.

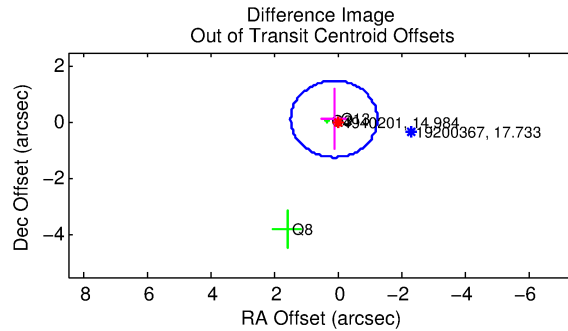
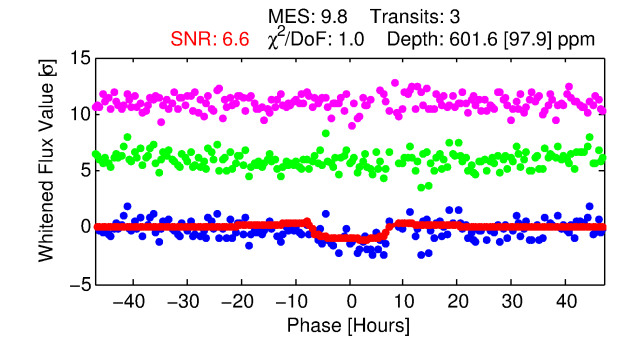
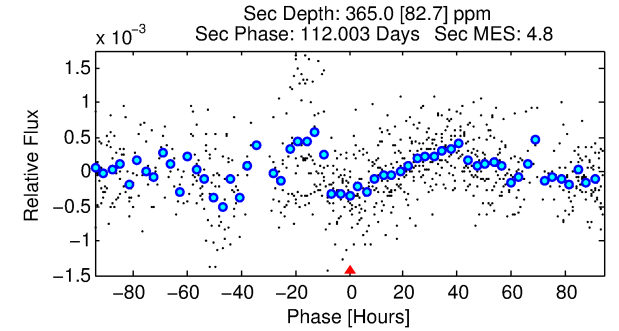
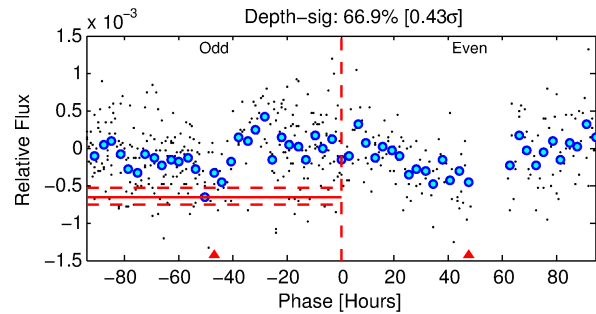
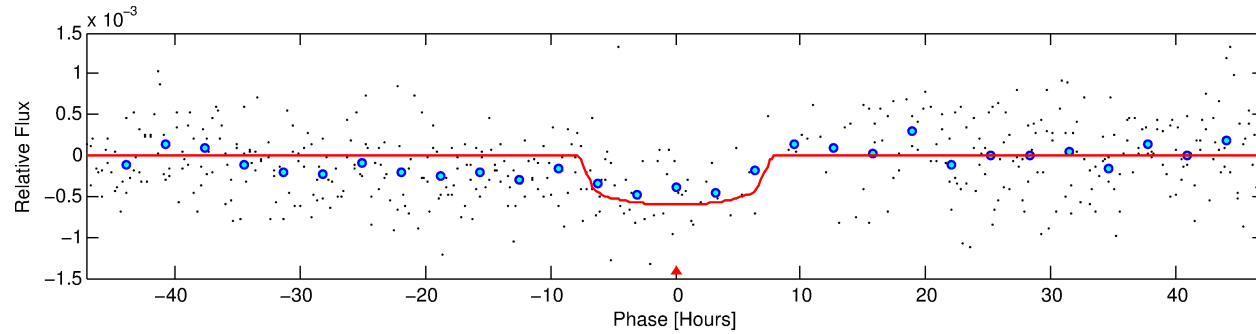
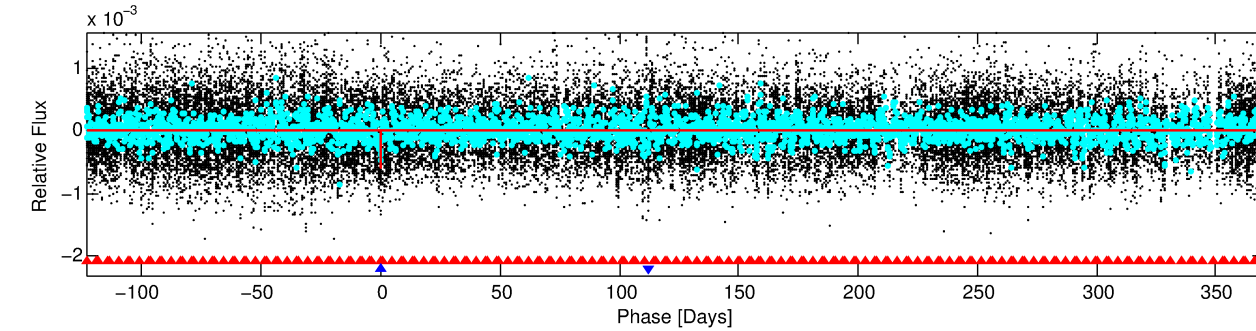
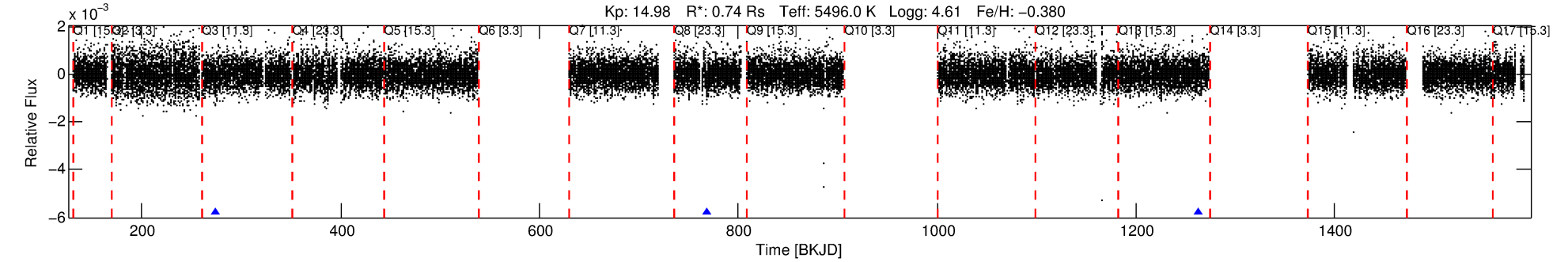
## Ephemeris Match Information For 004940201-02

No Significant Match Found

# DV One-Page Summary

KIC: 4940201 Candidate: 2 of 2 Period: 493.986 d  
KOI: K06476 Corr: No Ephemeris Match

Kp: 14.98 R\*: 0.74 Rs Teff: 5496.0 K Logg: 4.61 Fe/H: -0.380



## DV Fit Results:

Period = 493.98605 [0.02425] d  
Epoch = 274.7537 [0.0238] BKJD  
Rp/R\* = 0.0259 [0.0052]  
a/R\* = 134.91 [105.21]  
b = 0.86 [0.24]  
Seff = 0.35 [0.09]  
Teq = 196 [13] K  
Rp = 2.10 [0.59] Re  
a = 1.1424 [0.1895] AU  
Ag = 59646.25 [30848.07] [1.93σ]  
Teffp = 4725 [561] K [8.08σ]

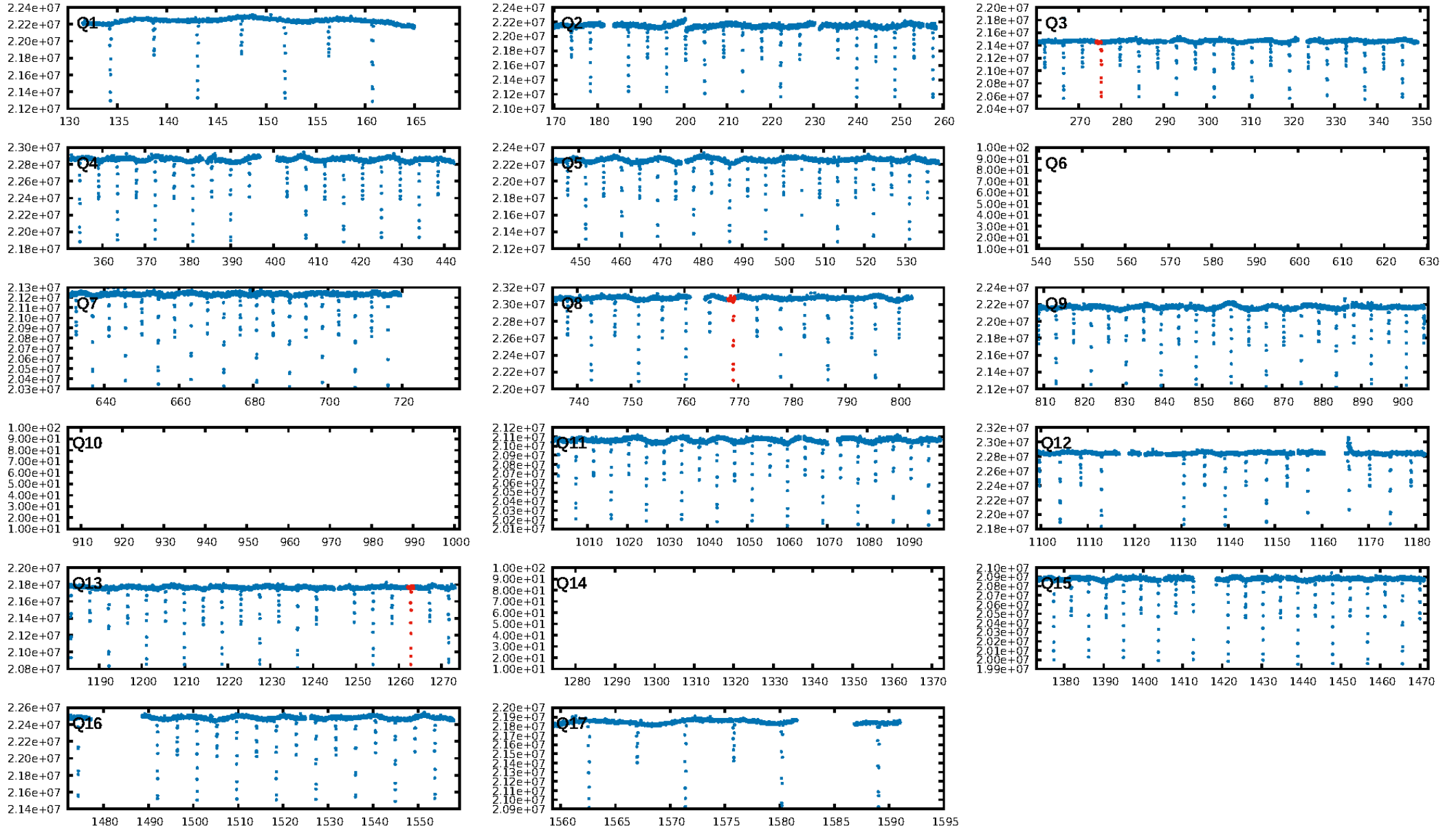
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [720.54σ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: 62.8%  
ModelChiSquareGof-sig: 100.0%  
**Bootstrap-pfa: 9.20e-10**  
RollingBand-fgt: 1.00 [3/3]  
**GhostDiagnostic-chr: 0.01899**  
Centroid-sig: 4.1%  
Centroid-so: 3.199 arcsec [2.51σ]  
OotOffset-rm: 0.186 arcsec [0.41σ]  
KicOffset-rm: 0.105 arcsec [0.63σ]  
OotOffset-st: 0/1/1/1 [3]  
KicOffset-st: 0/1/1/1 [3]  
DiffImageQuality-fgm: 0.33 [1/3]  
DiffImageOverlap-fno: 0.00 [0/3]

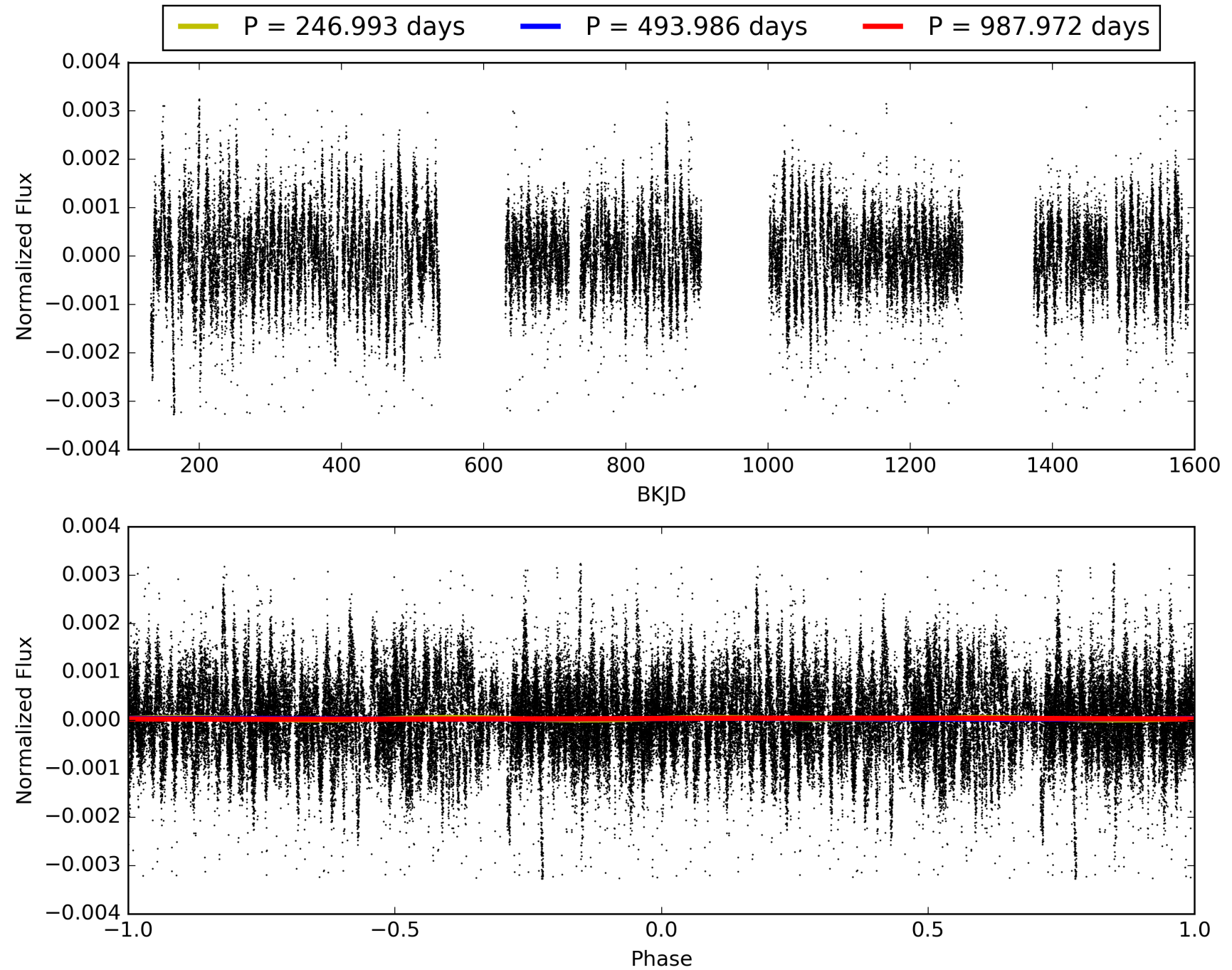
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 30-Jan-2016 17:15:46 Z

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

# TCE 004940201-02, PDC Light Curves



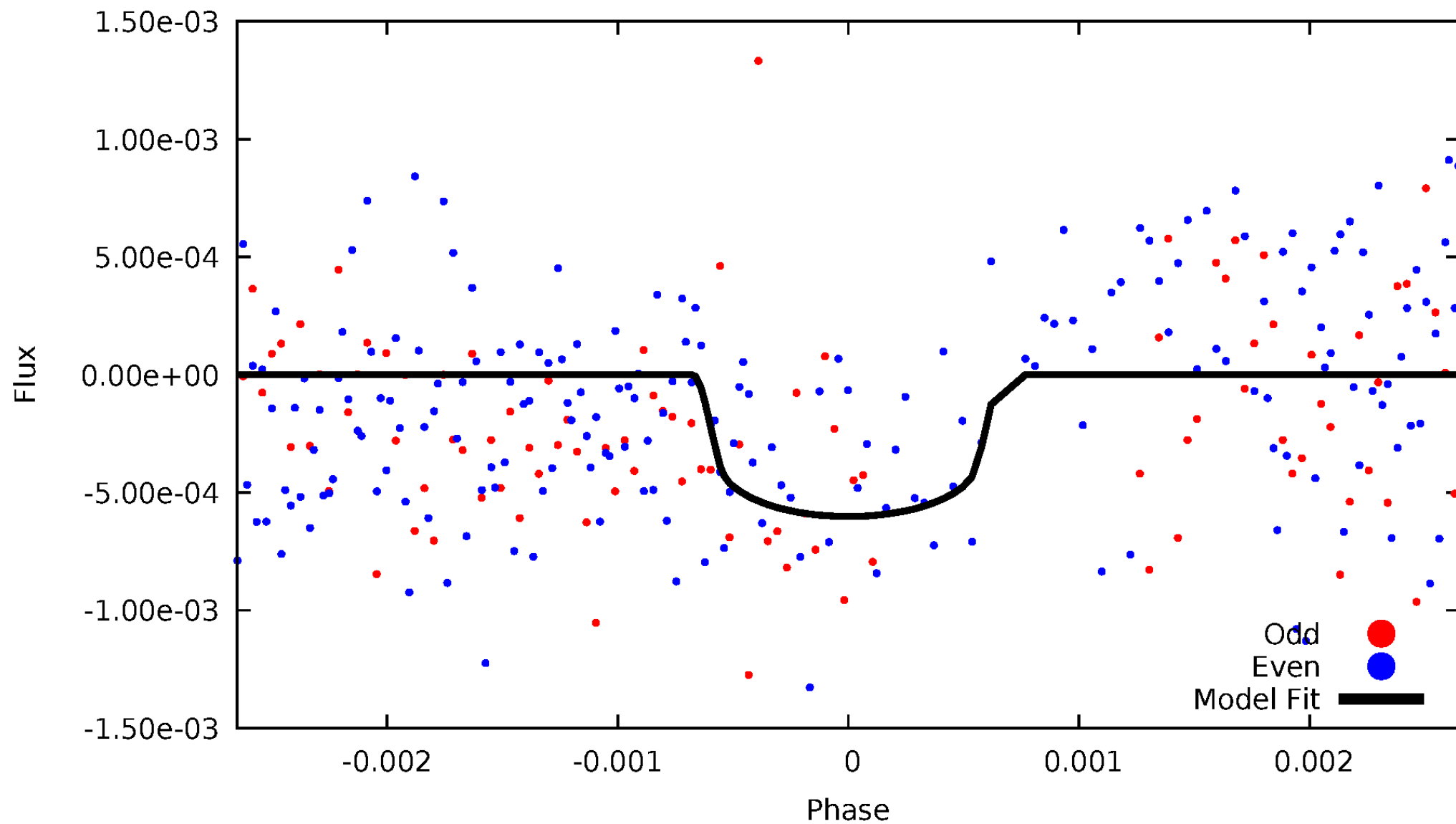
# TCE 004940201-02





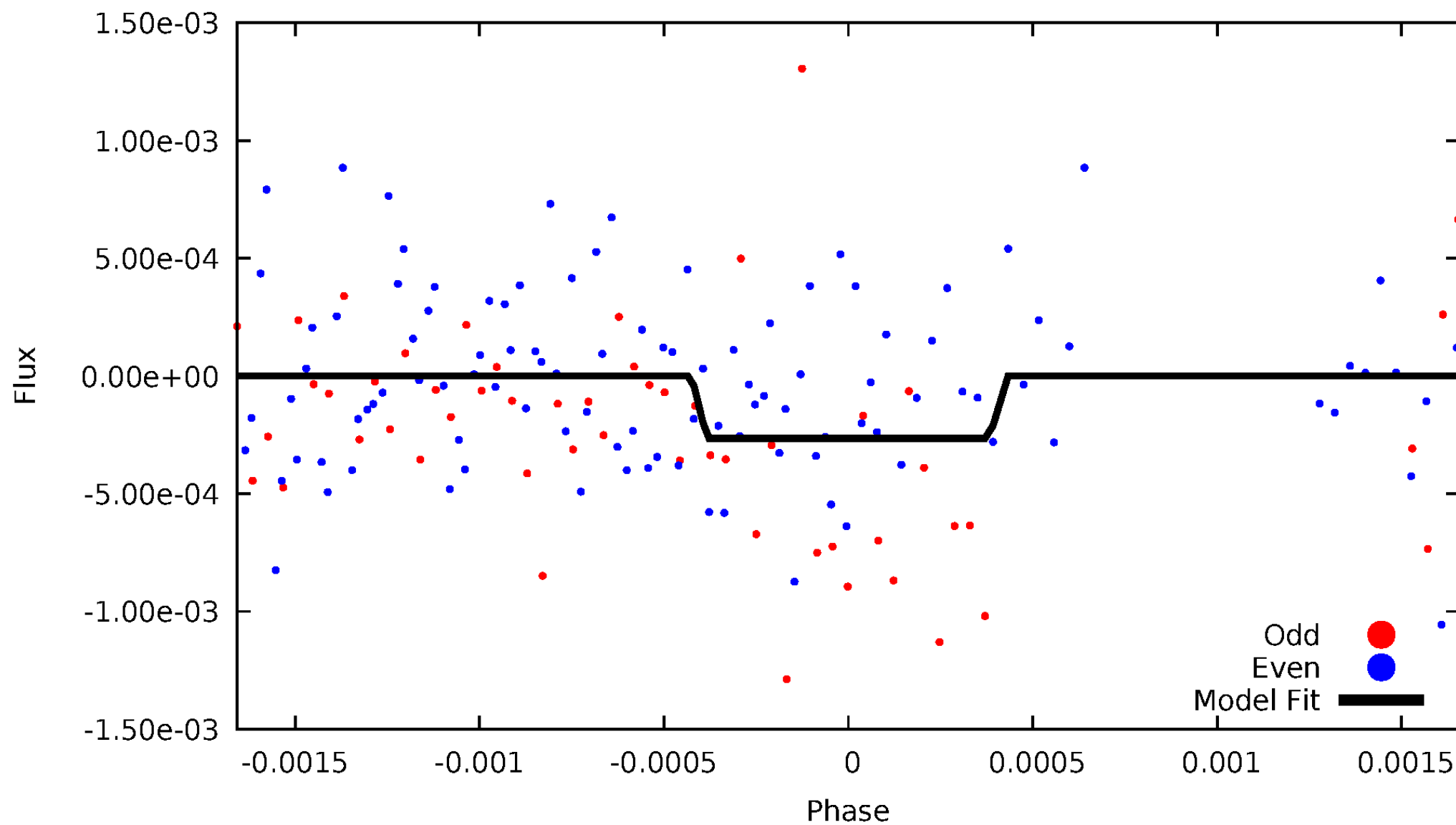
# DV Odd/Even

TCE 004940201-02



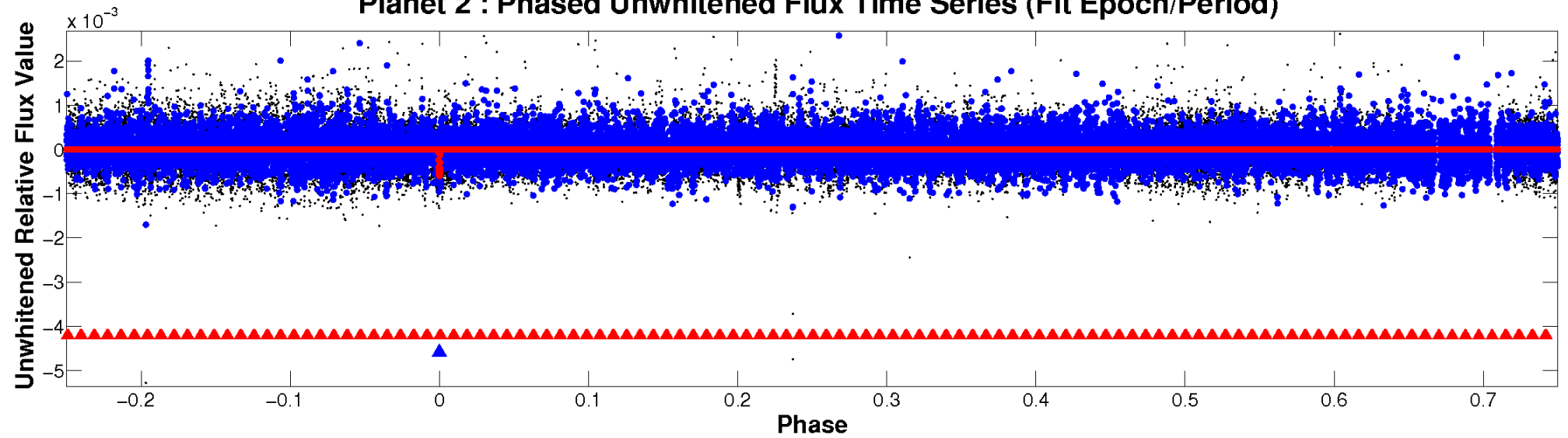
# ALT Odd/Even

TCE 004940201-02

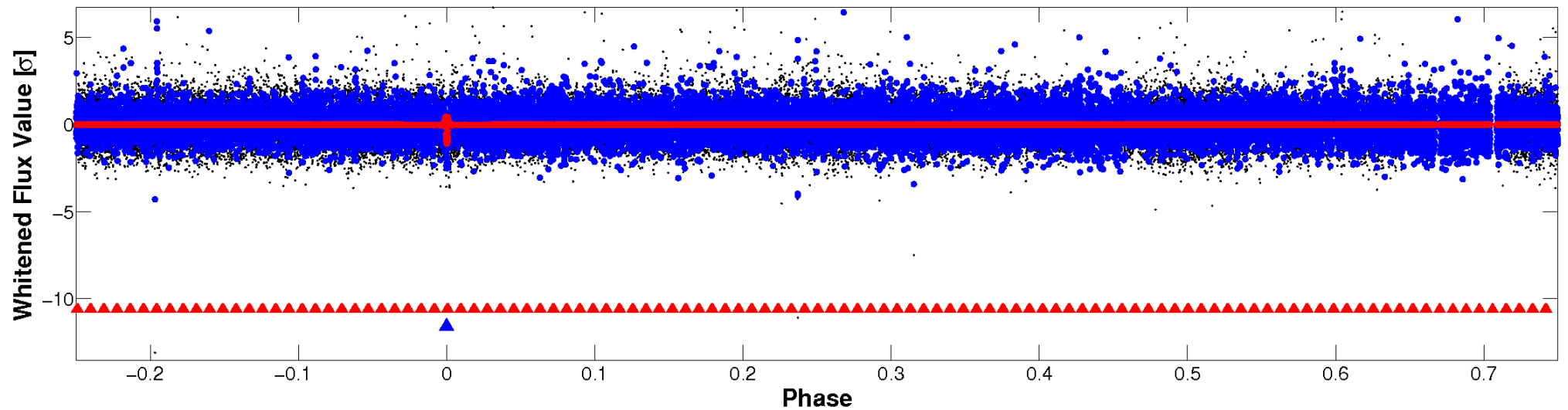


# Non-Whitened Vs. Whitened Light Curve

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

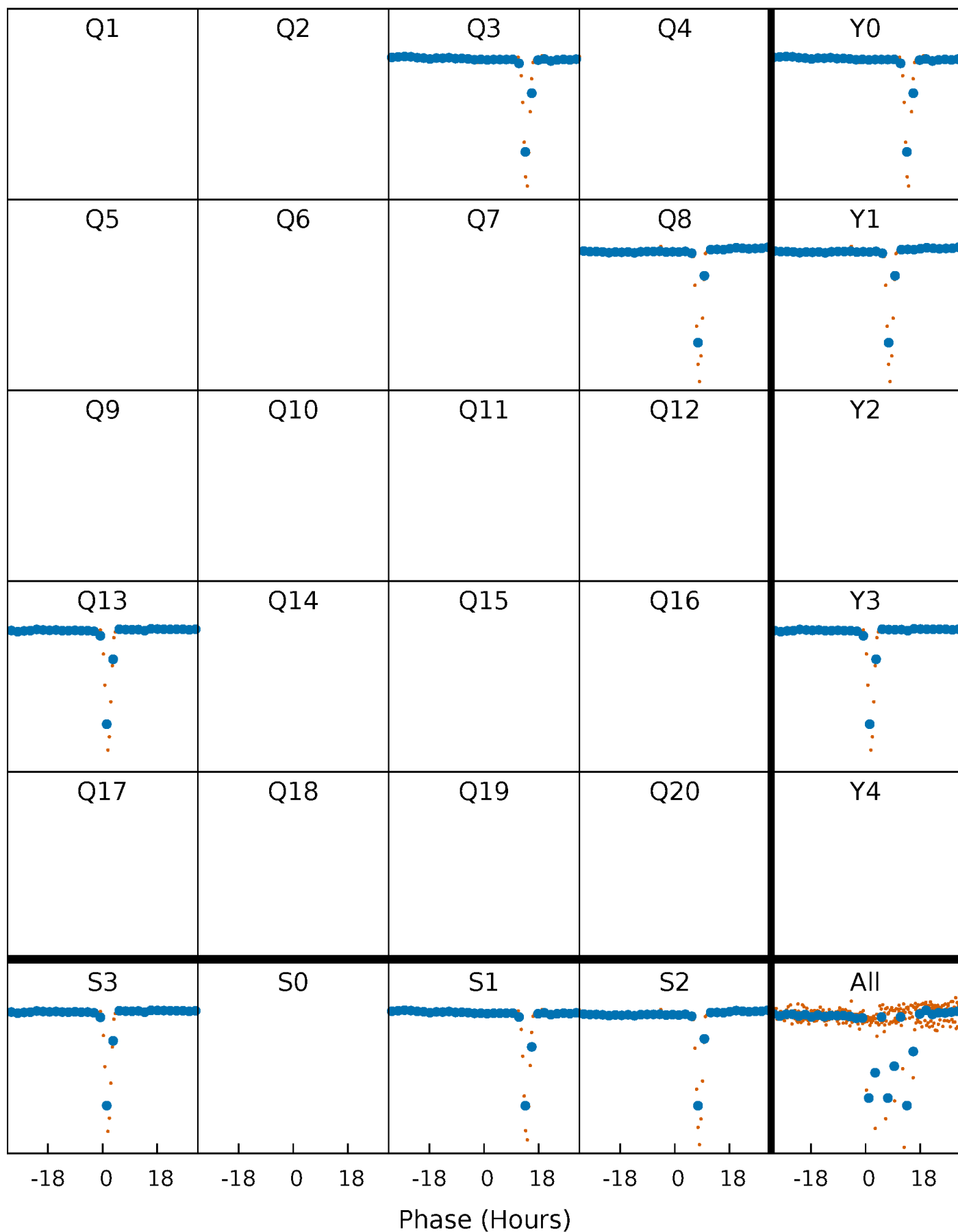


## Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



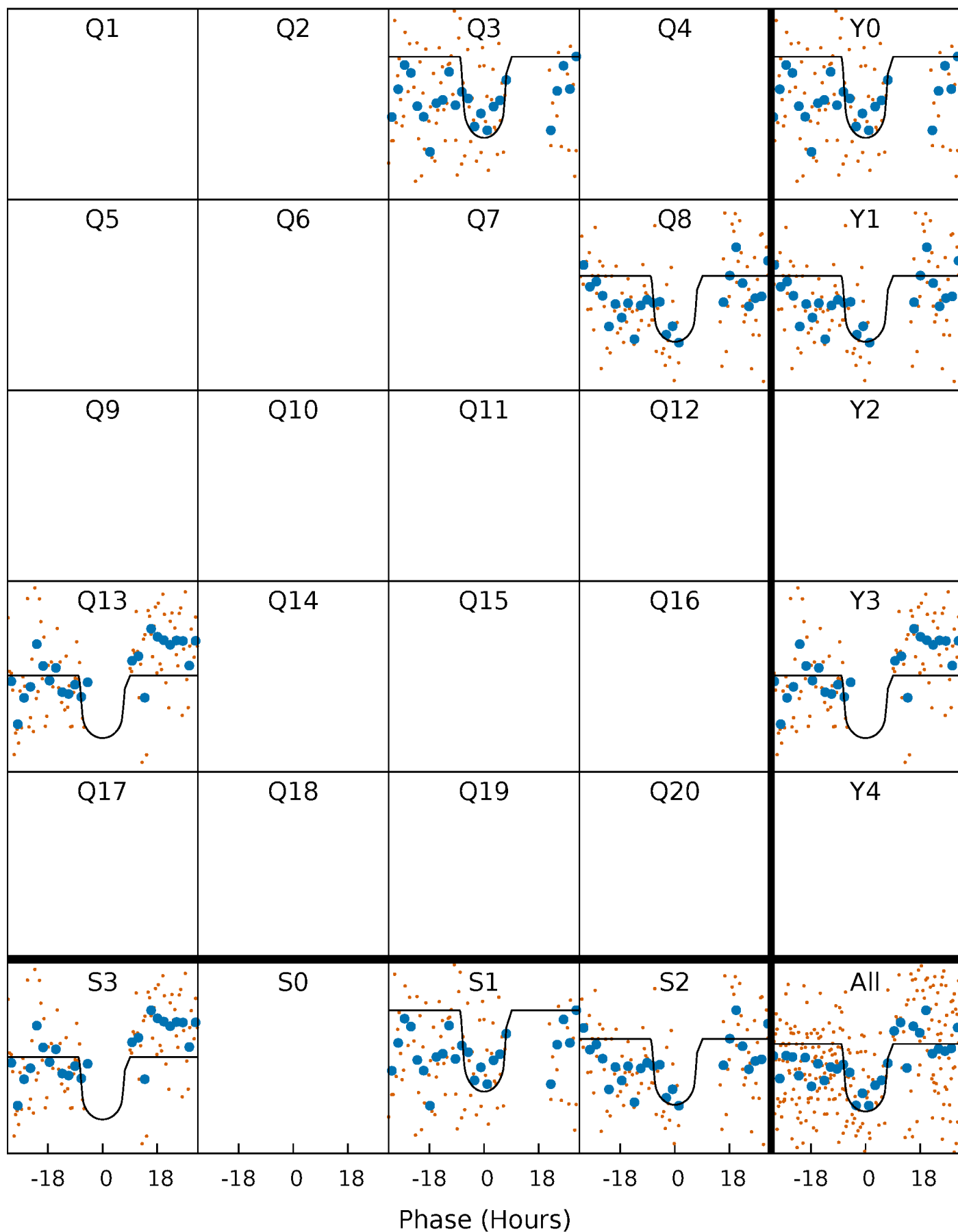
# PDC Quarter-Phased Transit Curves

TCE 004940201-02     $P=493.986053$  Days     $T_0=274.753672$  (BKJD)



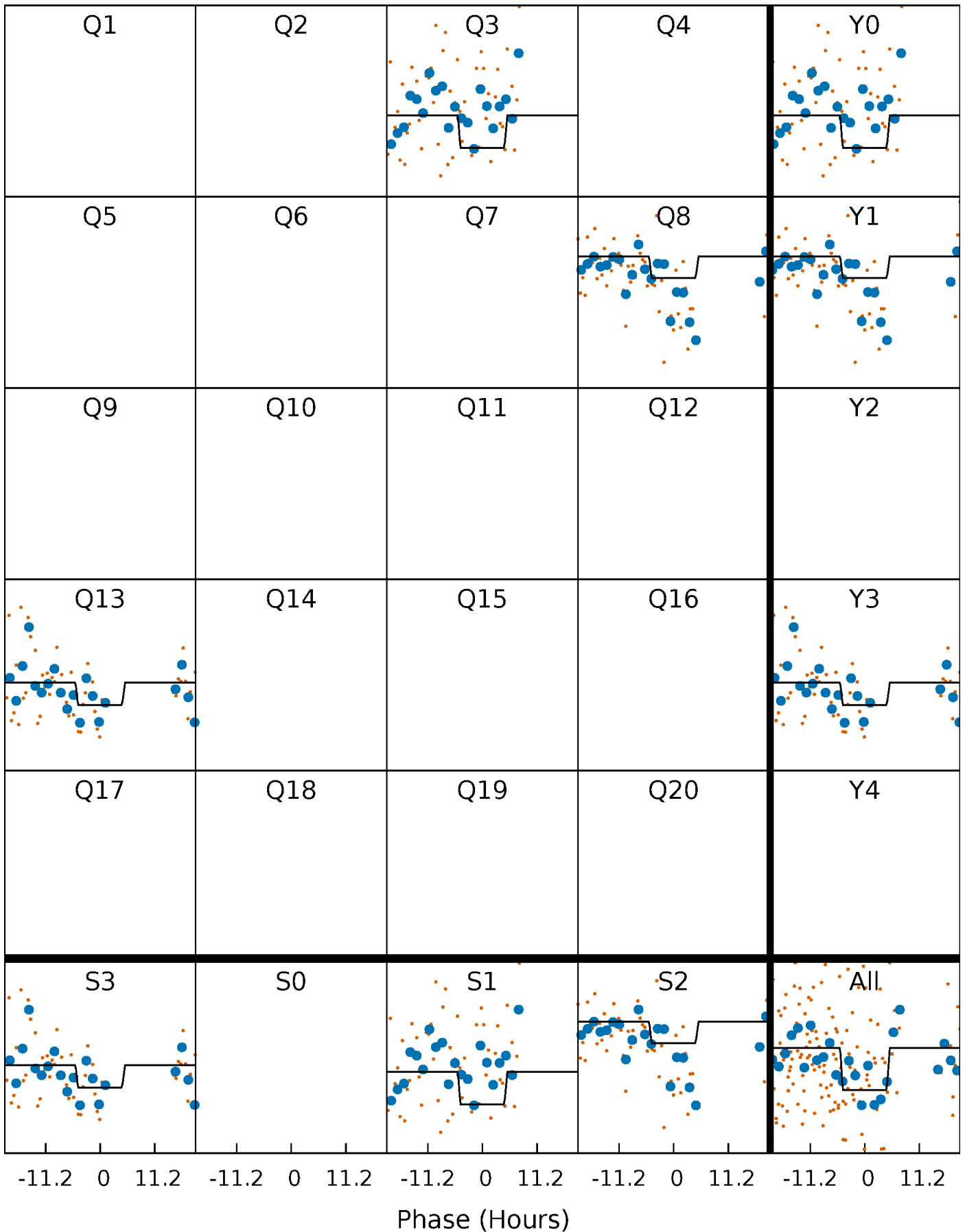
# DV Quarter-Phased Transit Curves

TCE 004940201-02     $P=493.986053$  Days     $T_0=274.753672$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

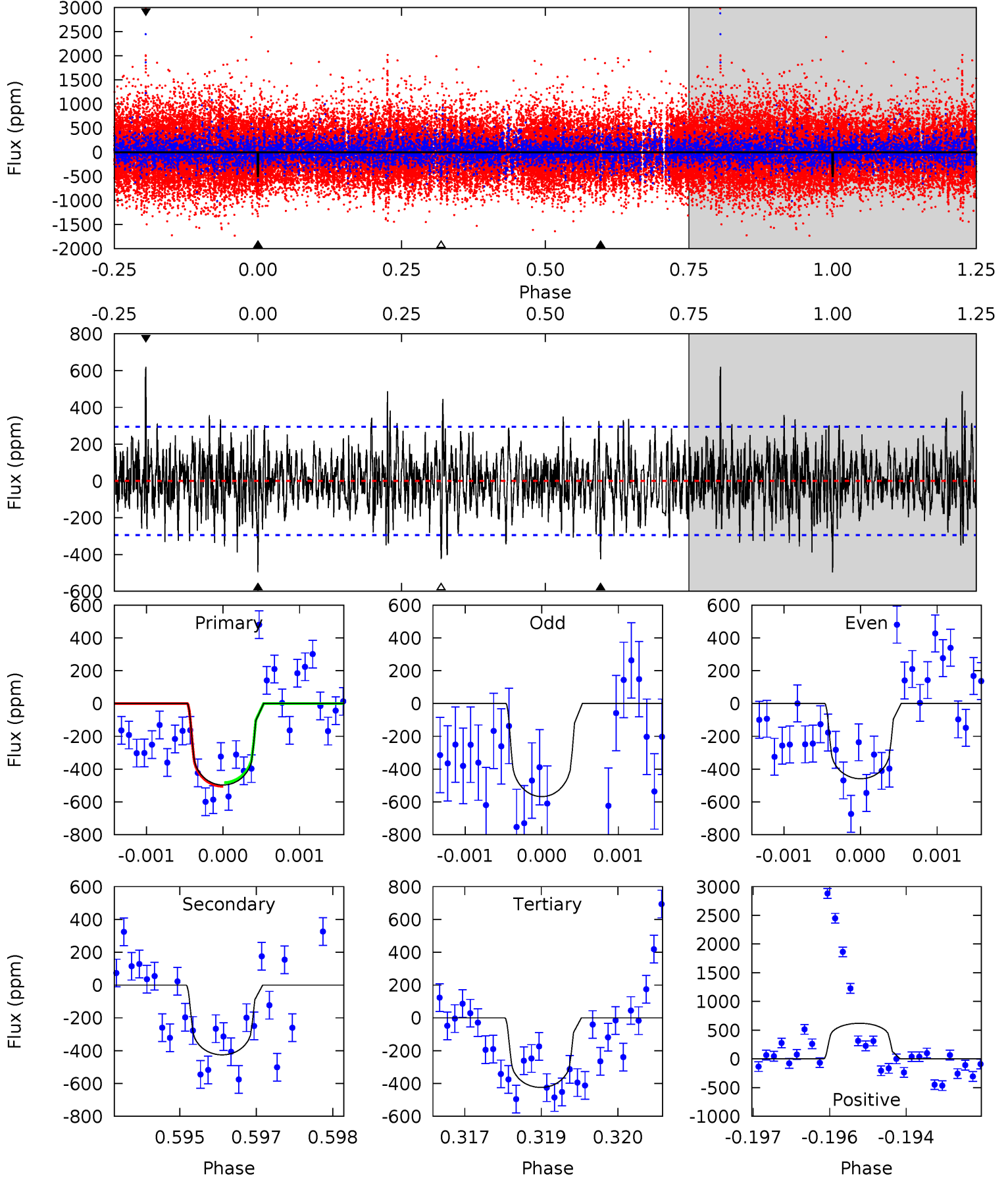
TCE 004940201-02     $P=493.865523$  Days     $T_0=274.743271$  (BKJD)



# DV Model-Shift Uniqueness Test

004940201-02, P = 493.986053 Days, E = 274.753672 Days

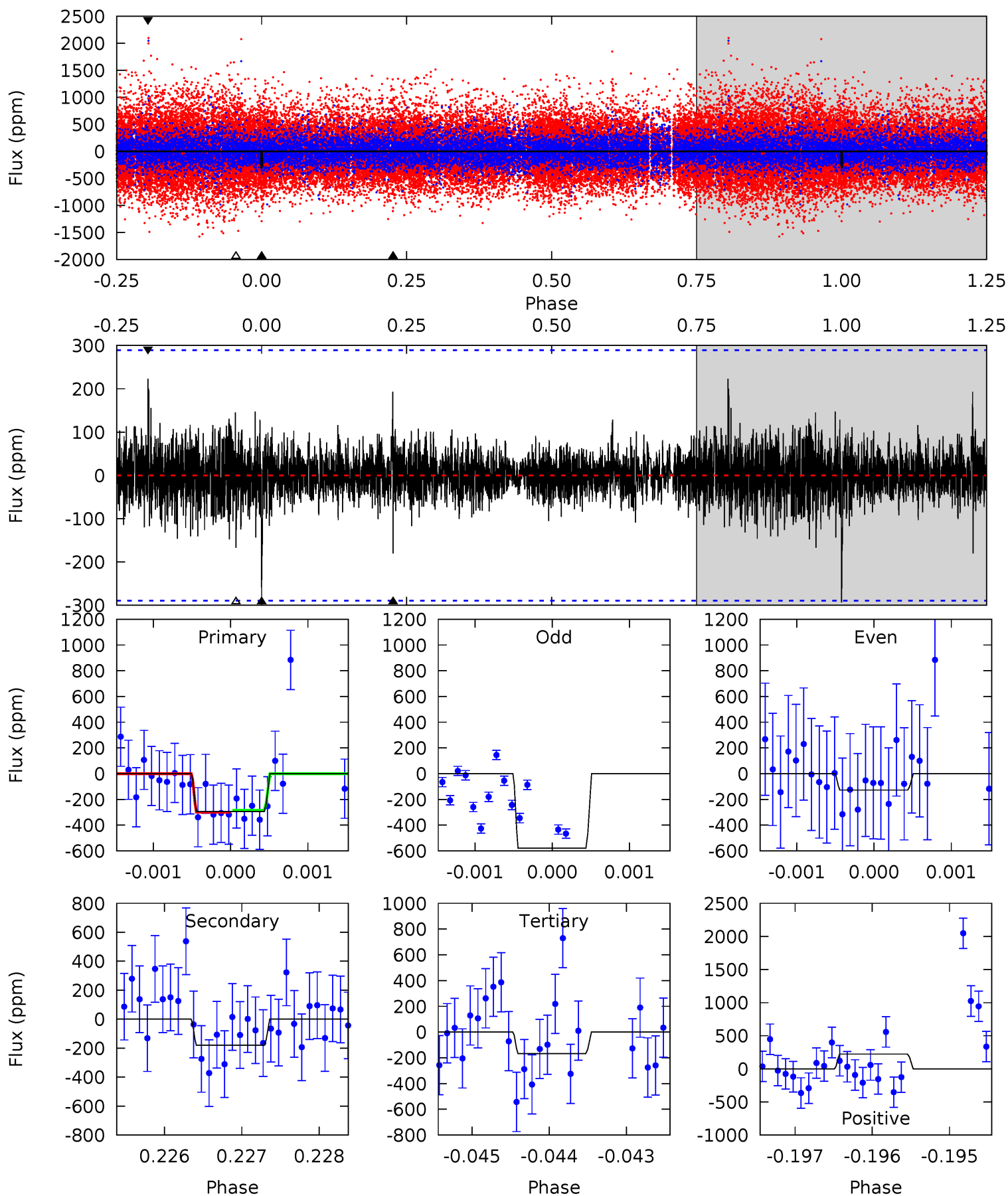
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
9.09	7.78	7.75	11.3	5.39	3.18	2.15	1.33	-2.25	0.03	-3.56	0.96	0.91	0.56	0.19



# Alt Model-Shift Uniqueness Test

004940201-02, P = 493.865523 Days, E = 274.743271 Days

Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
5.55	3.41	3.17	4.23	5.48	3.34	0.71	2.39	1.33	0.24	-0.82	4.26	0.93	0.43	0.16





### Stellar Parameters For KIC 004940201

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$5496^{+164}_{-148}$	$4.607^{+0.032}_{-0.128}$	$-0.380^{+0.350}_{-0.300}$	$0.743^{+0.149}_{-0.064}$	$0.825^{+0.088}_{-0.088}$	$2.831^{+0.480}_{-1.064}$
	+3%/-3%	+1%/-3%	+92%/-79%	+20%/-9%	+11%/-11%	+17%/-38%
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 004940201-02 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$-426 \pm 55$	$2.20^{+0.46}_{-0.47}$	$279^{+14}_{-11}$	$4989^{+545}_{-402}$	$62464^{+41195}_{-20311}$
Alt.	$-180 \pm 53$	$1.39^{+0.46}_{-0.45}$	$279^{+14}_{-11}$	$5008^{+1012}_{-614}$	$66100^{+81214}_{-31090}$

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

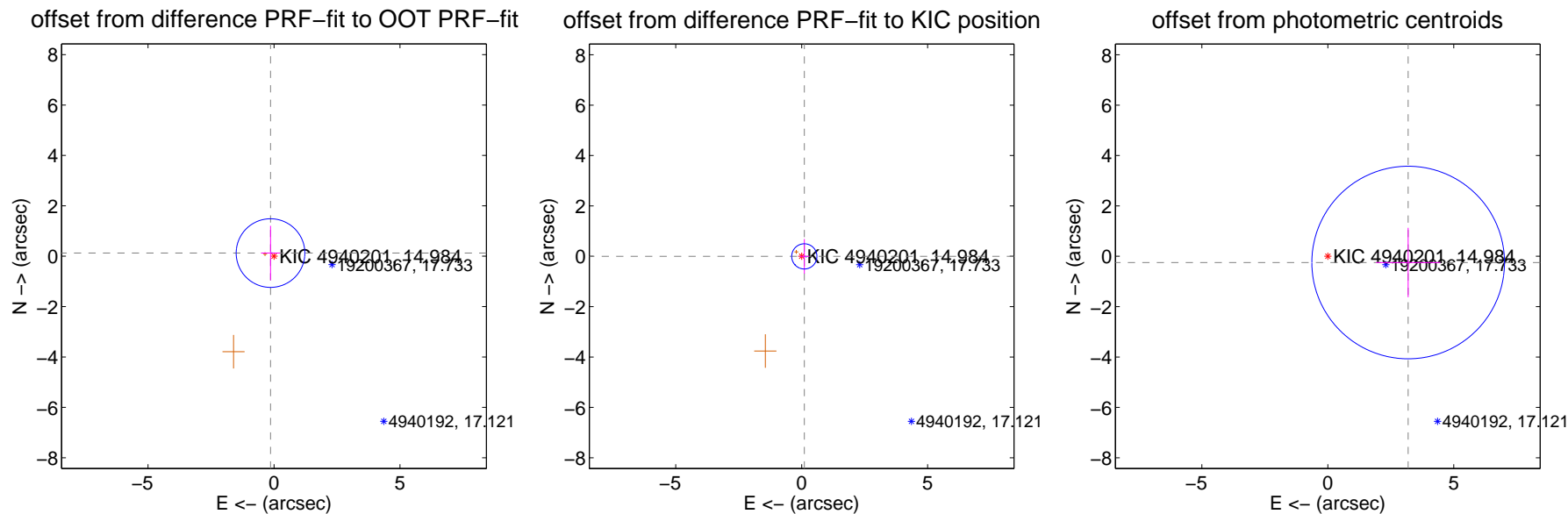
## DV Centroid Data

Supplemental centroid analysis for 004940201-02. Kepler magnitude: 14.98. Transit SNR 6.63

There are 1 quarters with good PRF difference image offsets

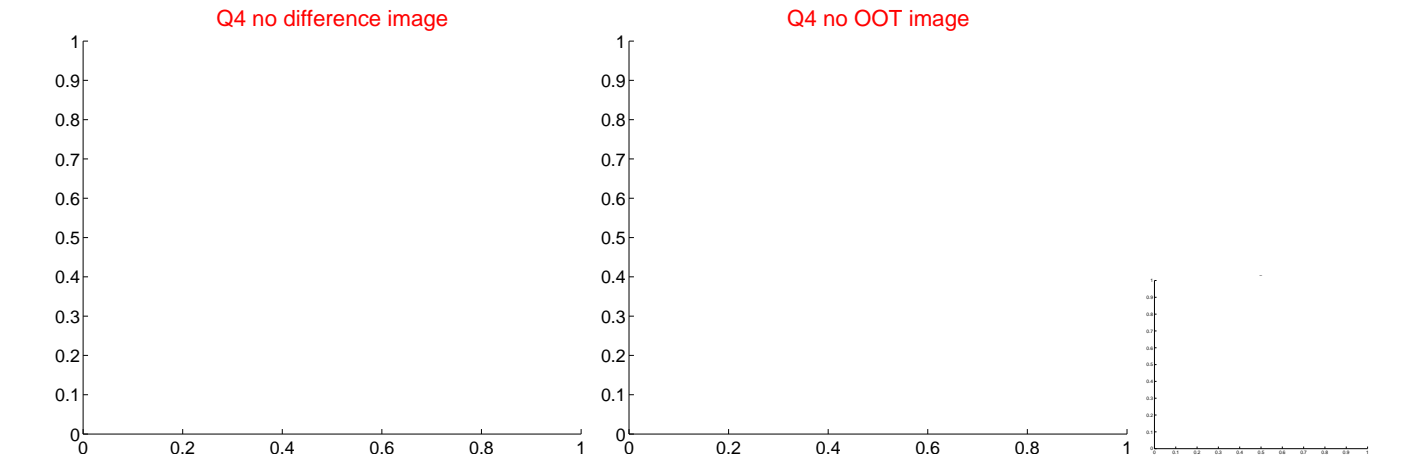
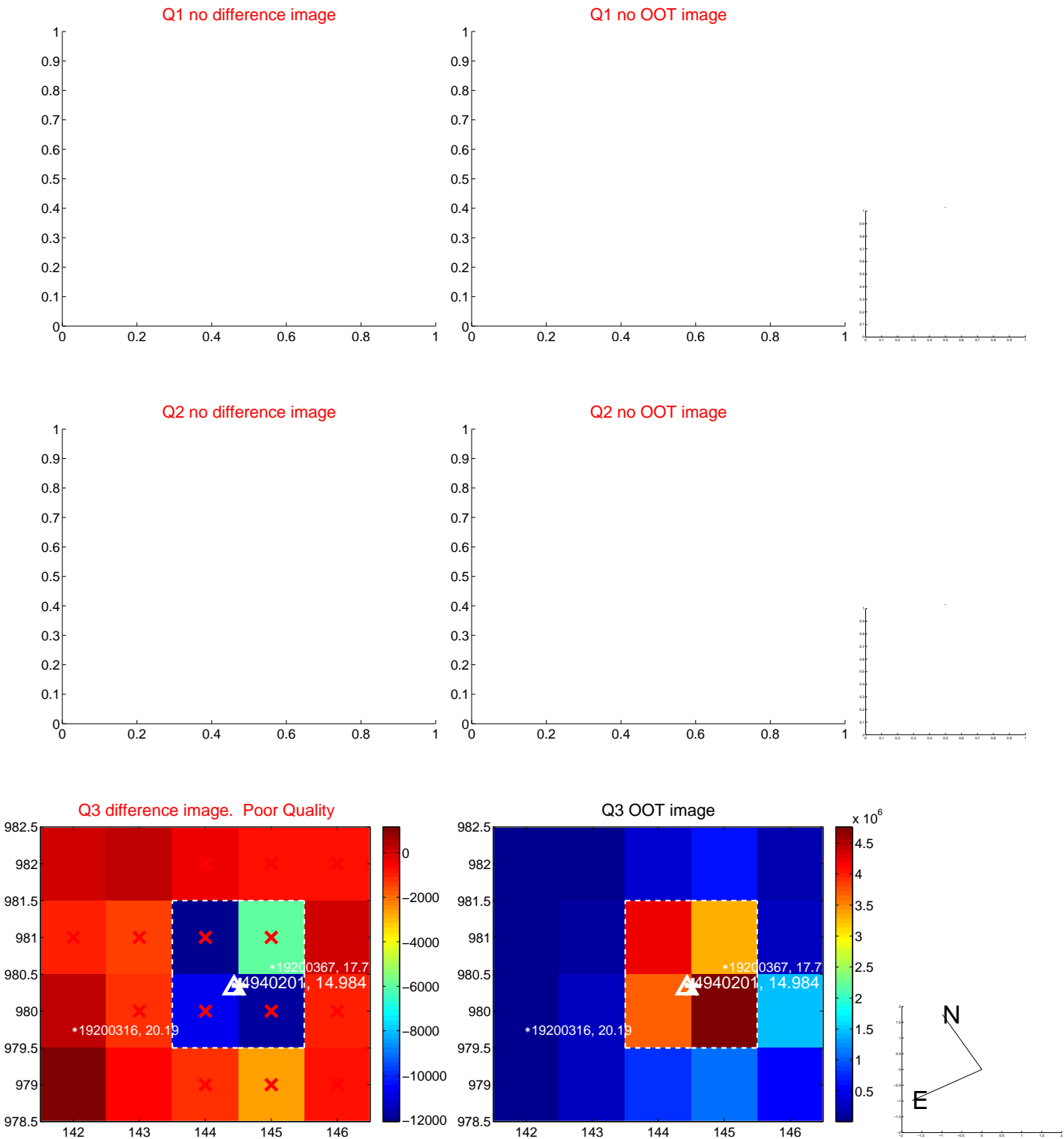
The direct PRF centroid is offset from the target star catalog position by about 0.31 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.186 \pm 0.454$	0.41	$0.139 \pm 0.378$	$0.125 \pm 1.081$
PRF-fit source offset from KIC position	$0.105 \pm 0.167$	0.63	$-0.105 \pm 0.186$	$-0.004 \pm 0.688$
photometric centroid source offset	$3.20 \pm 1.27$	2.51	$-3.19 \pm 1.27$	$-0.25 \pm 1.38$

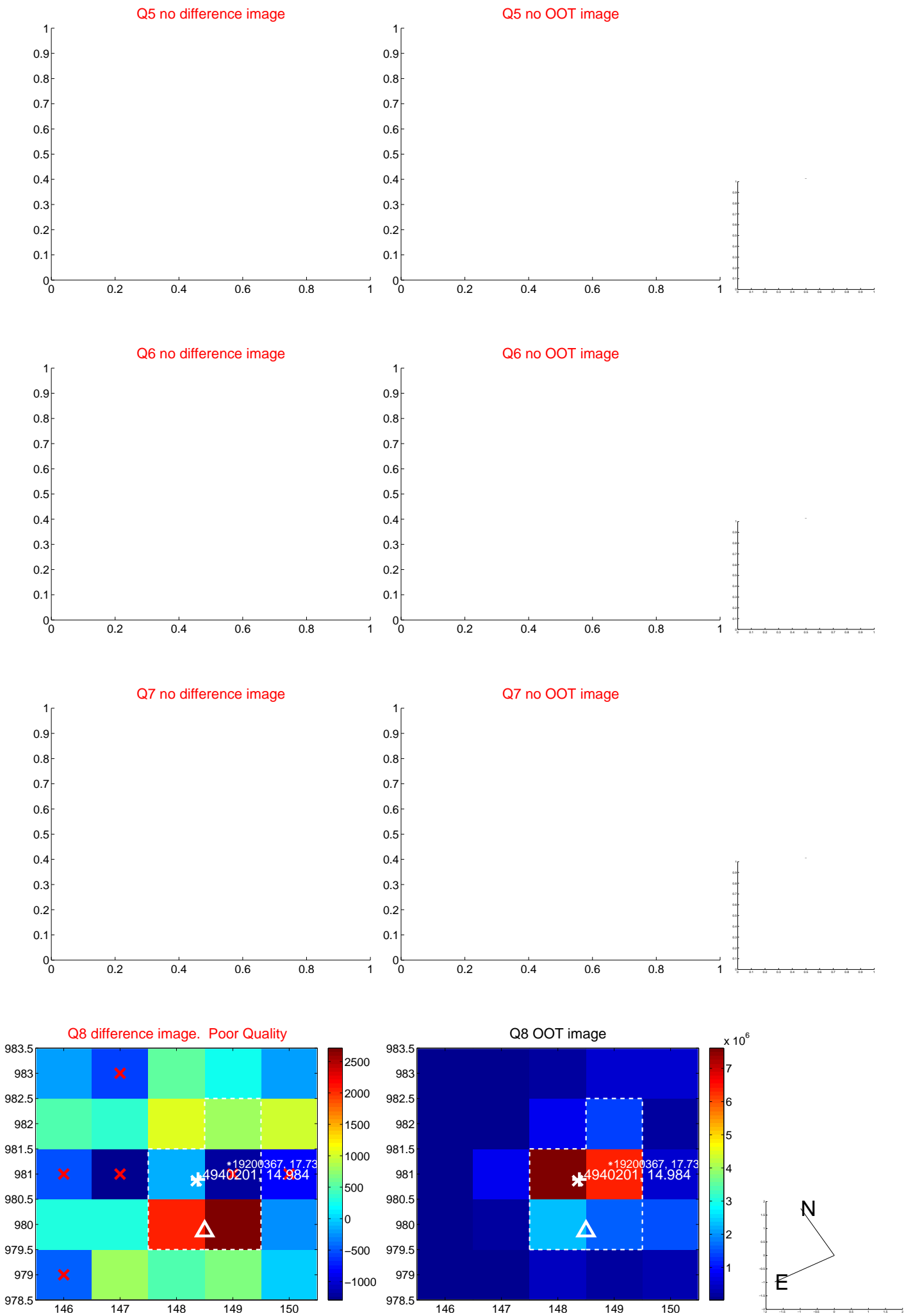


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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

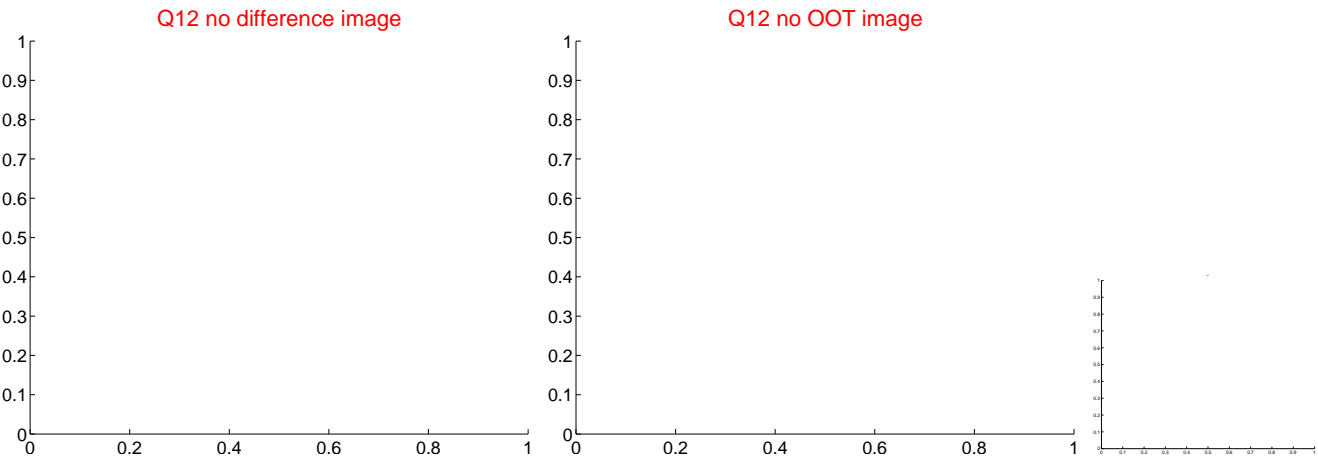
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



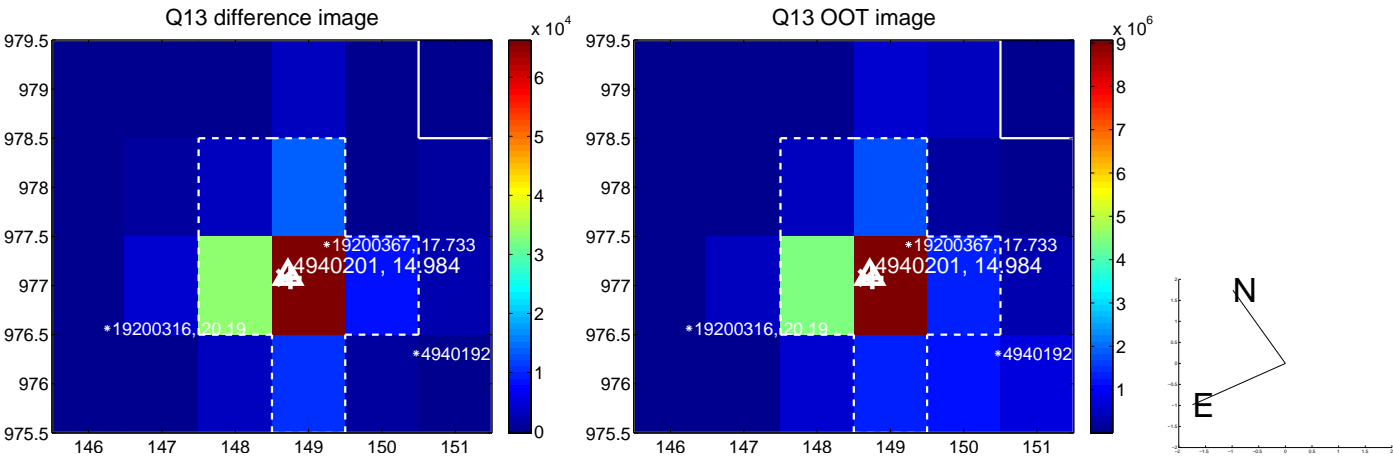
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

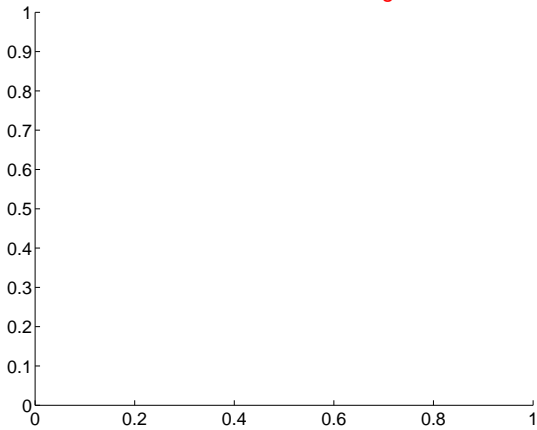


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

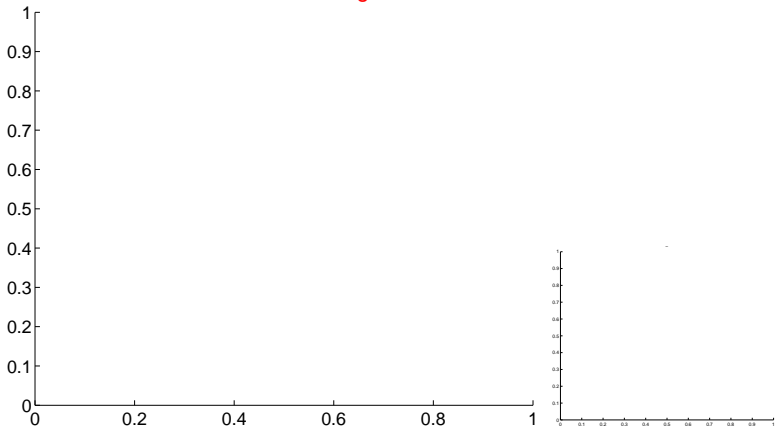


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

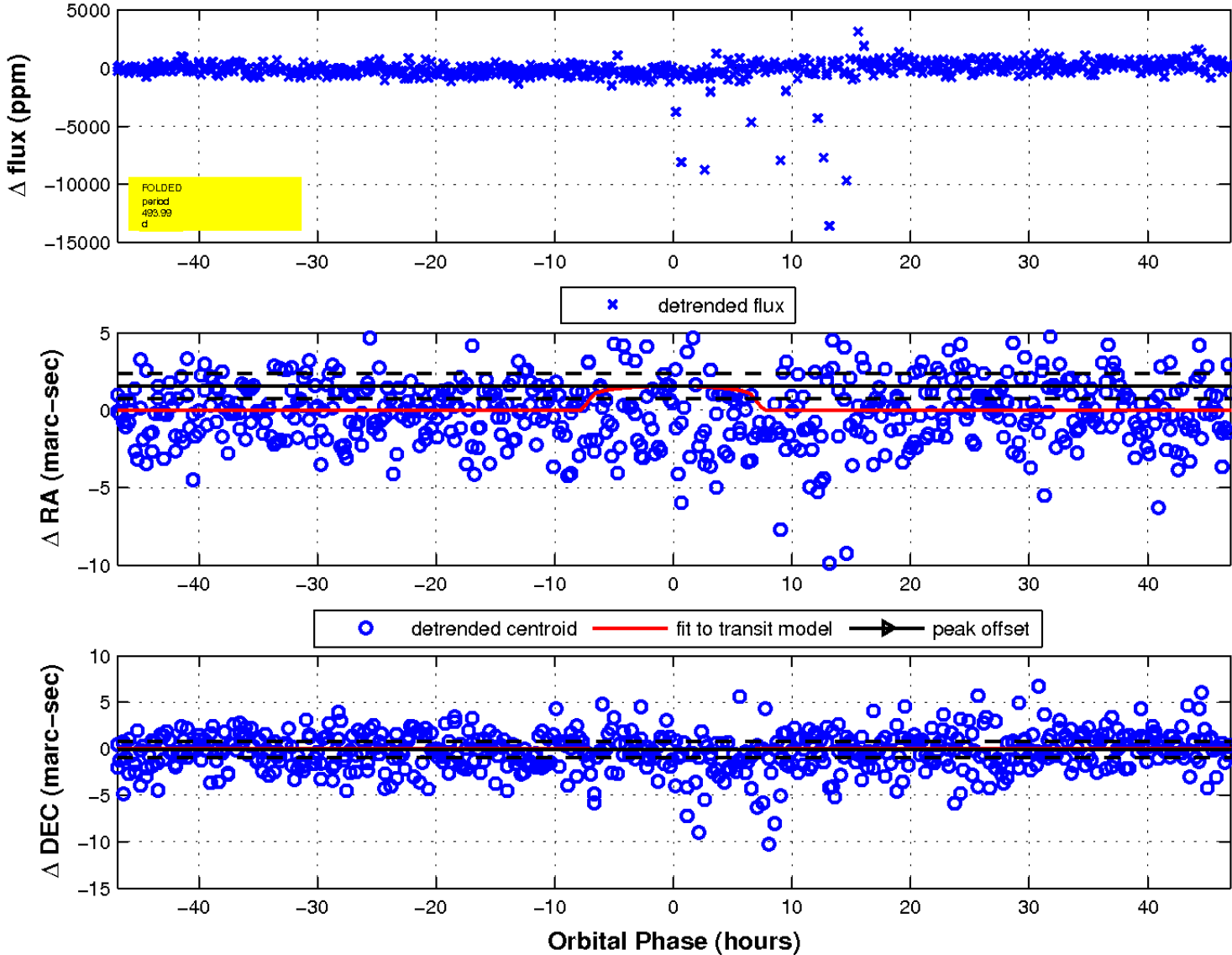
Q17 no difference image



Q17 no OOT image



fluxWeightedCentroids, Planet 2 of 2



UKIRT Image

Declination

