

# KIC 004840513

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
004840513-01	OBS	1541.01	2.379283	133.651248	48605.1	3.182	2697.5	2158.6	1.16	6392	25.82	1442.06
004840513-02	OBS	No	2.379277	132.462958	766.4	3.050	37.5	43.0	1.16	6392	3.78	1442.07
004840513-03	OBS	No	87.703474	200.587777	1199.6	9.041	7.6	5.2	1.16	6392	5.39	11.76
004840513-04	OBS	No	600.749090	198.851996	3627.1	10.292	7.6	7.1	1.16	6392	12.80	0.90
004840513-05	OBS	No	631.697123	201.200422	1783.9	4.642	8.5	6.6	1.16	6392	9.20	0.84

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
004840513-01	OBS	PC	0.76	0	1	0	0	MOD_SEC_DV—PLANET_OCCULT_DV—MOD_SEC_ALT—HAS_SEC_TCE
004840513-02	OBS	FP	0.00	1	1	0	0	IS_SEC_TCE
004840513-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_SKYE—TRANS_GAPPED—LPP_DV—MOD_NONUNIQ_ALT
004840513-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_CHASES—LPP_DV—ALL_TRANS_CHASES—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS
004840513-05	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_CHASES_MARSHALL—LPP_DV—ALL_TRANS_CHASES—MOD_TER_DV—MOD_POS_DV—CENT_FEW_DIFFS

**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.

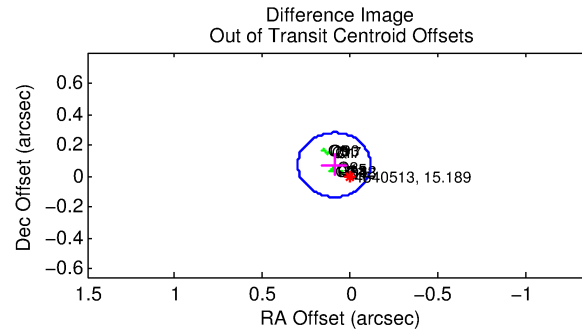
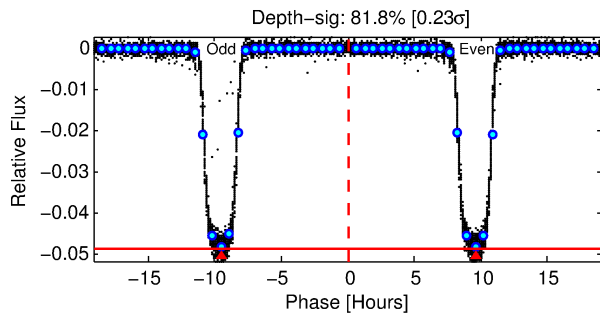
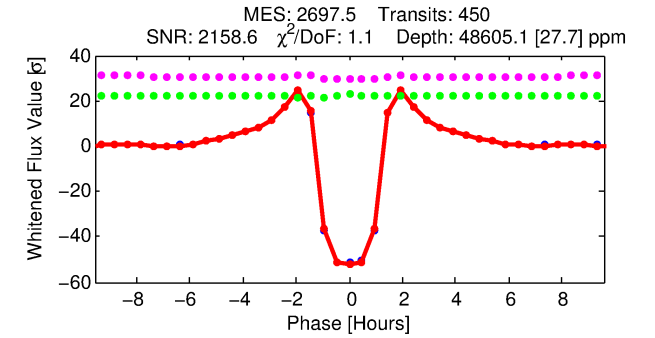
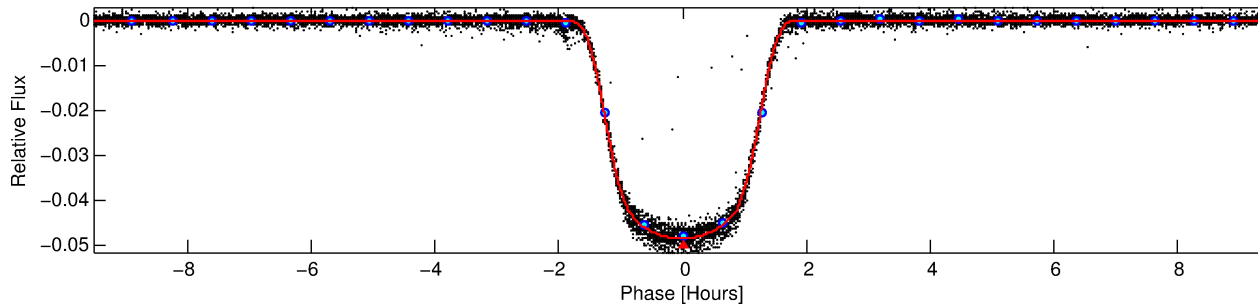
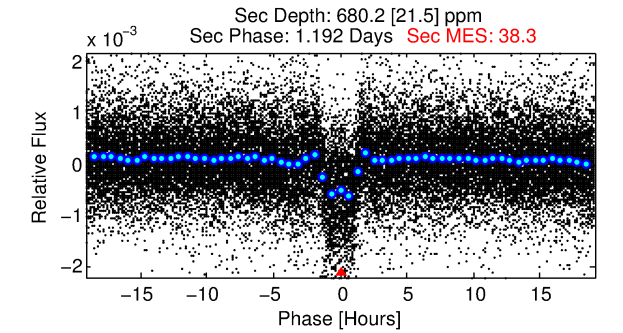
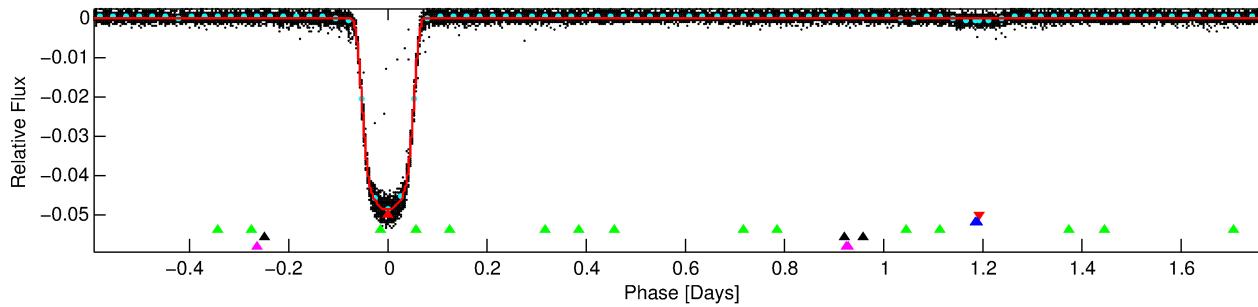
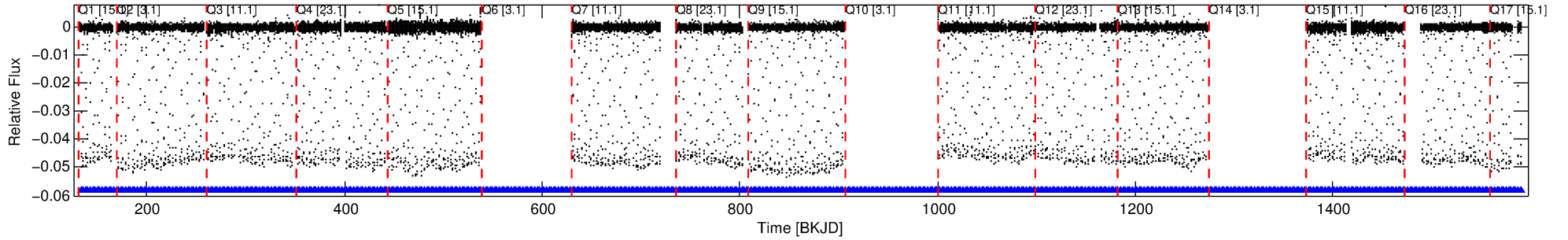
Ephemeris Match Information For 004840513-01

No Significant Match Found

# DV One-Page Summary

KIC: 4840513 Candidate: 1 of 5 Period: 2.379 d  
KOI: K01541.01 Corr: 0.998

Kp: 15.19 R\*: 1.16 Rs Teff: 6392.0 K Logg: 4.40 Fe/H: 0.070



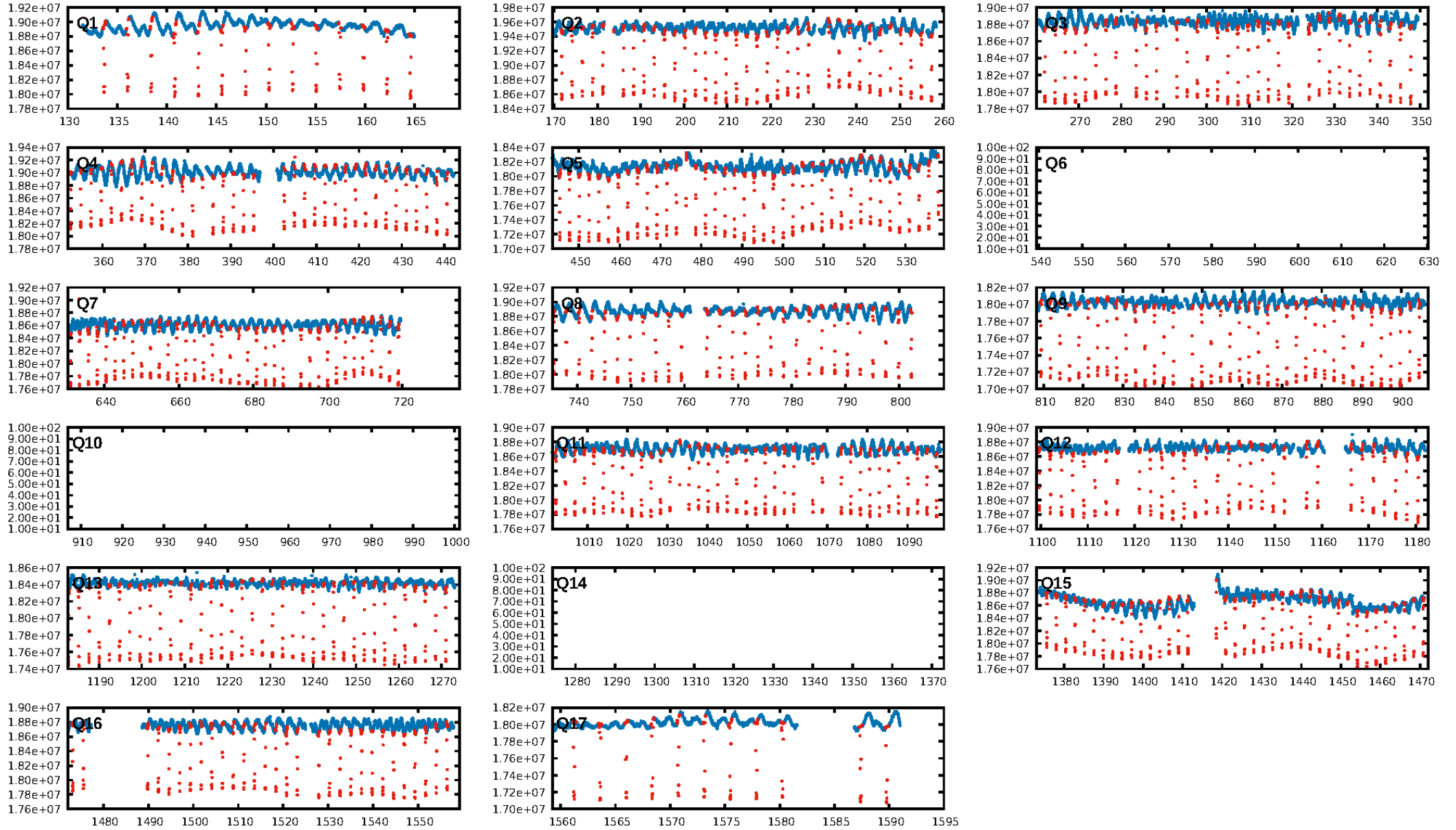
## DV Fit Results:

Period = 2.37928 [0.00000] d  
Epoch = 133.6512 [0.0000] BKJD  
Rp/R\* = 0.2036 [0.0001]  
a/R\* = 6.84 [0.01]  
b = 0.17 [0.01]  
Seff = 1442.06 [604.08]  
Teq = 1571 [165] K  
Rp = 25.81 [8.20] Re  
a = 0.0374 [0.0101] AU  
Ag = 0.79 [0.31] [-0.69σ]  
Teffp = 2288 [84] K [3.88σ]

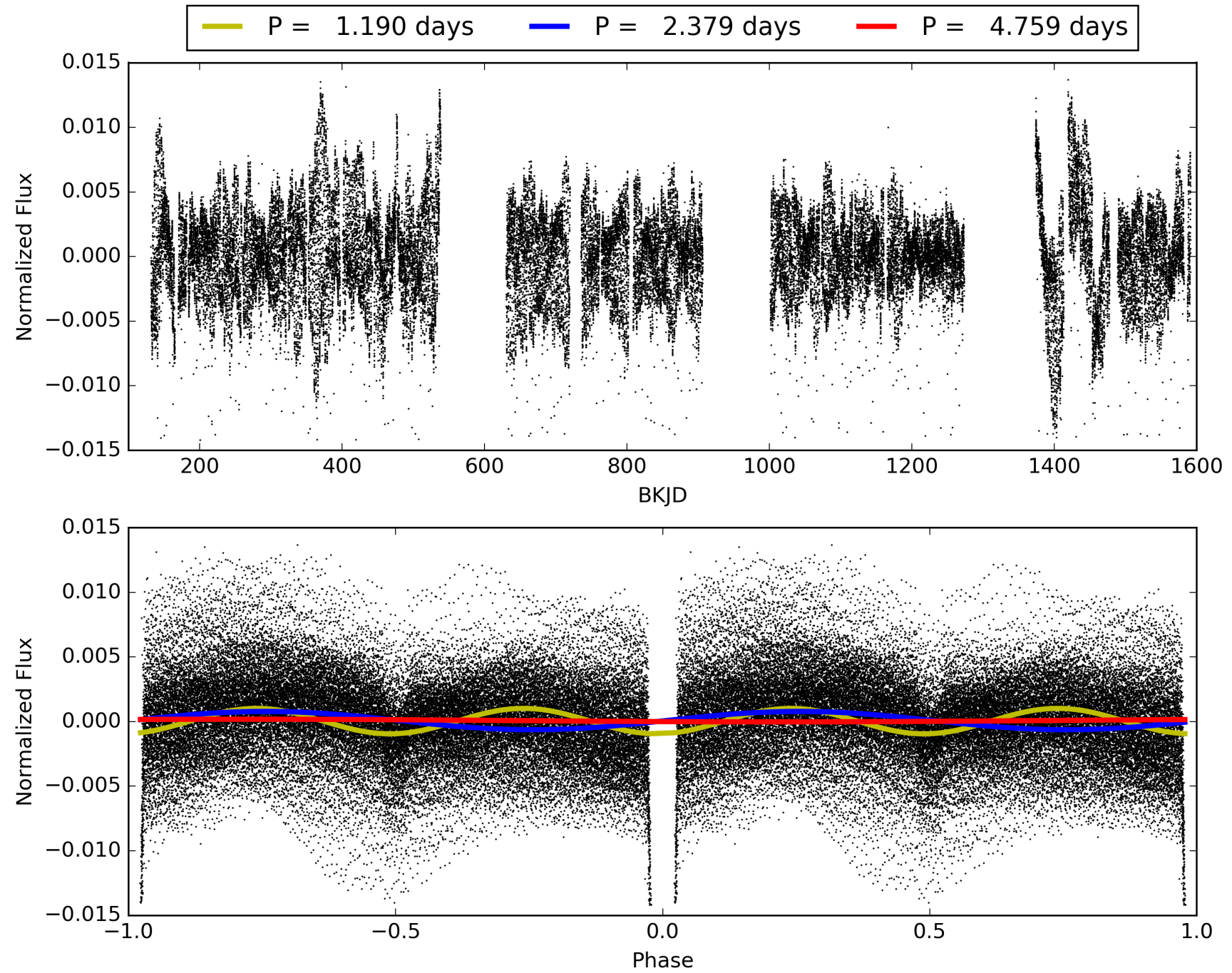
## DV Diagnostic Results:

ShortPeriod-sig: 0.0% [0.00σ]  
LongPeriod-sig: 100.0% [213.66σ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: 0.00e+00  
RollingBand-fgt: 1.00 [425/425]  
GhostDiagnostic-chr: 2.746  
Centroid-sig: 0.0%  
Centroid-so: 0.109 arcsec [34.65σ]  
OotOffset-rm: 0.118 arcsec [1.71σ]  
KicOffset-rm: 0.038 arcsec [0.57σ]  
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]

# TCE 004840513-01, PDC Light Curves



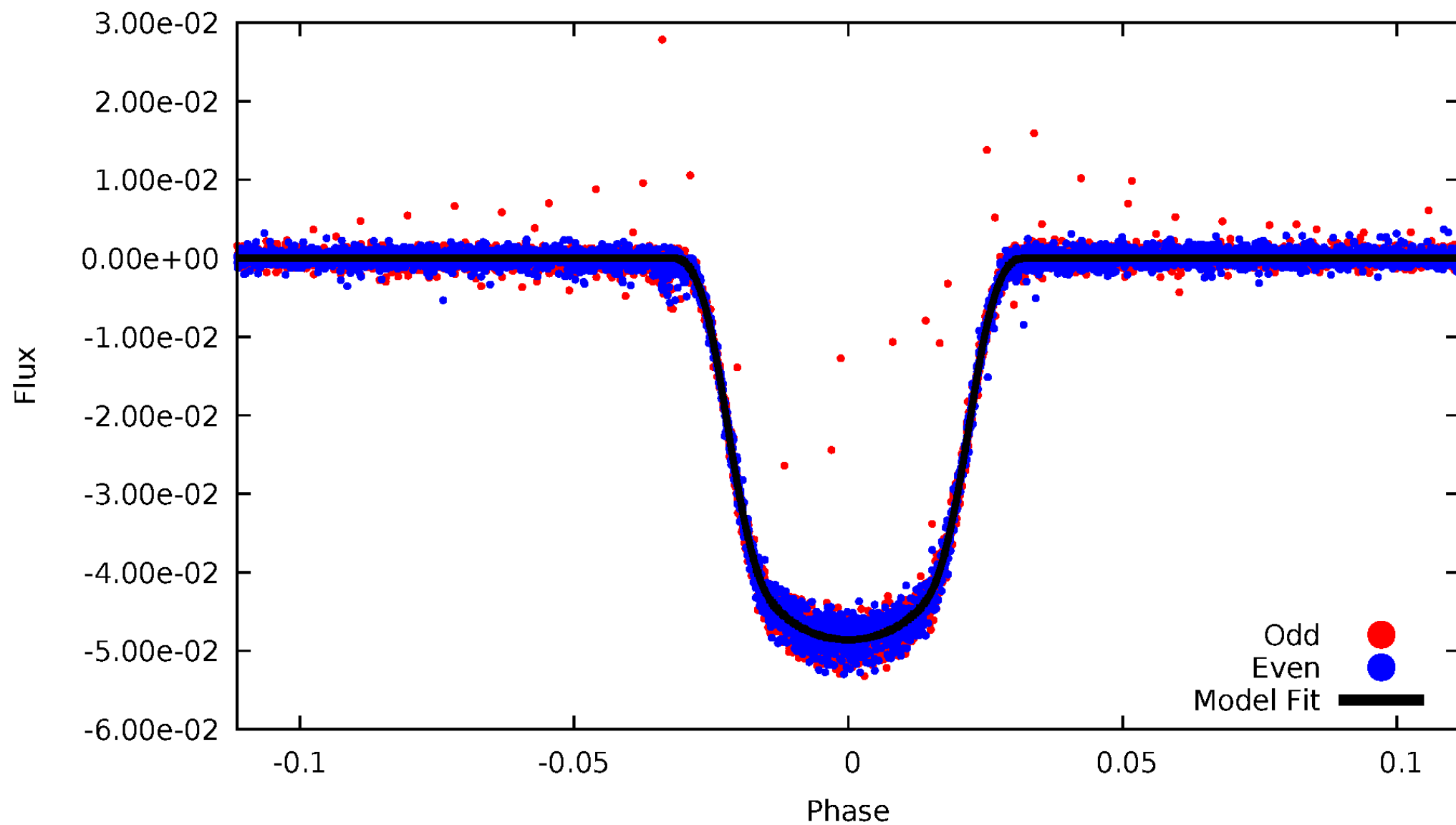
TCE 004840513-01





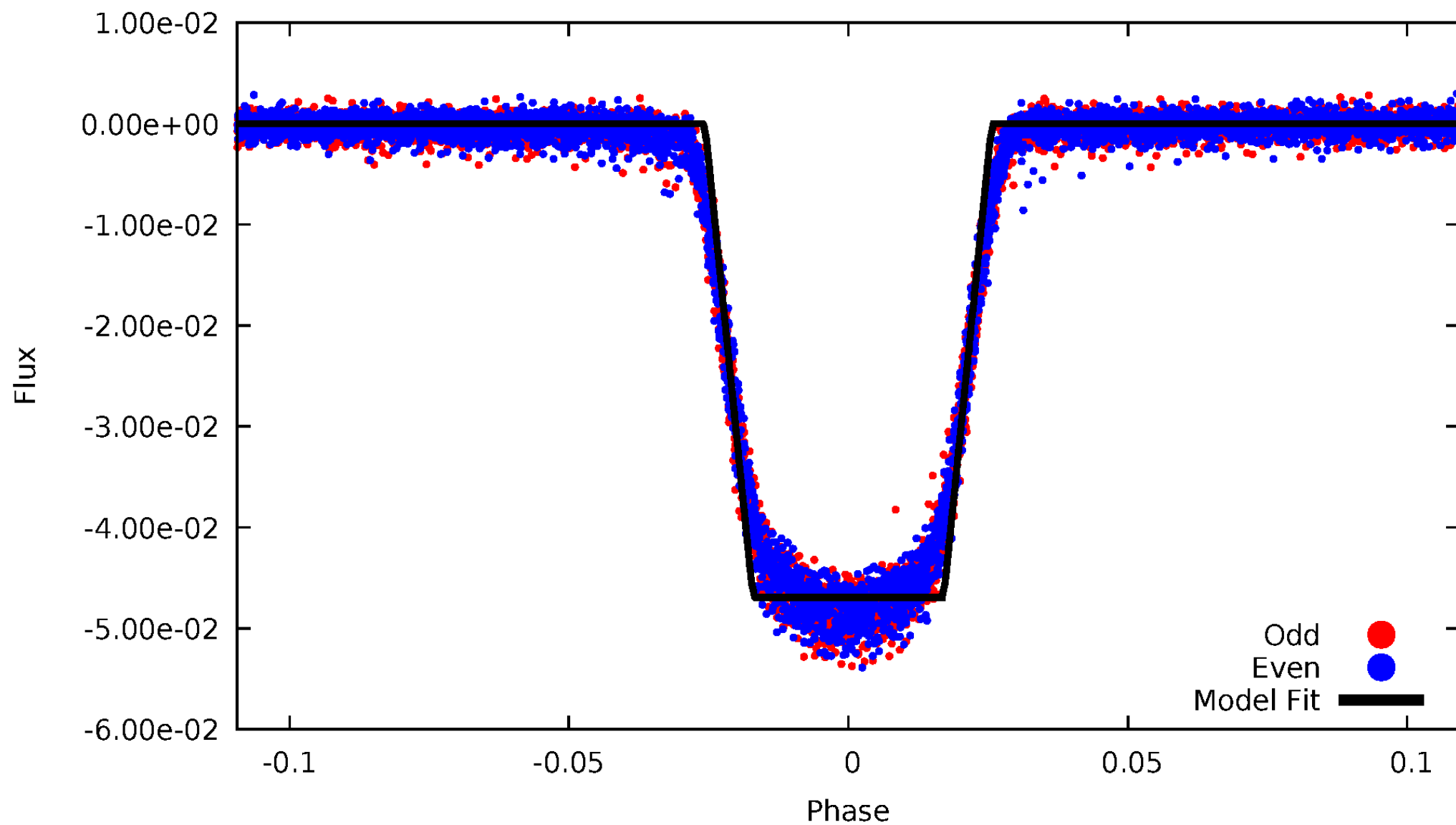
# DV Odd/Even

TCE 004840513-01



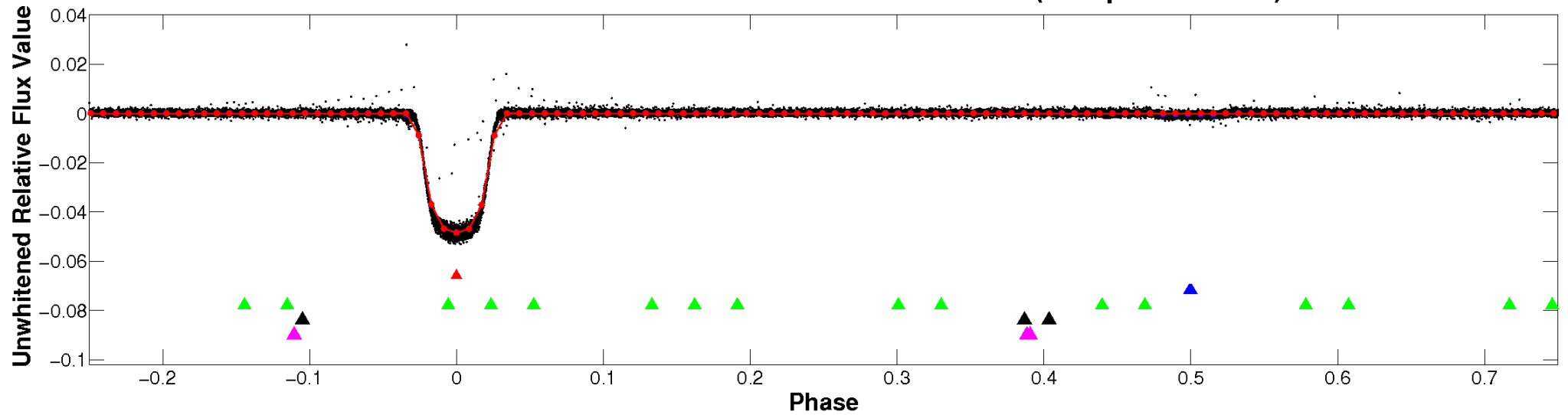
# ALT Odd/Even

TCE 004840513-01

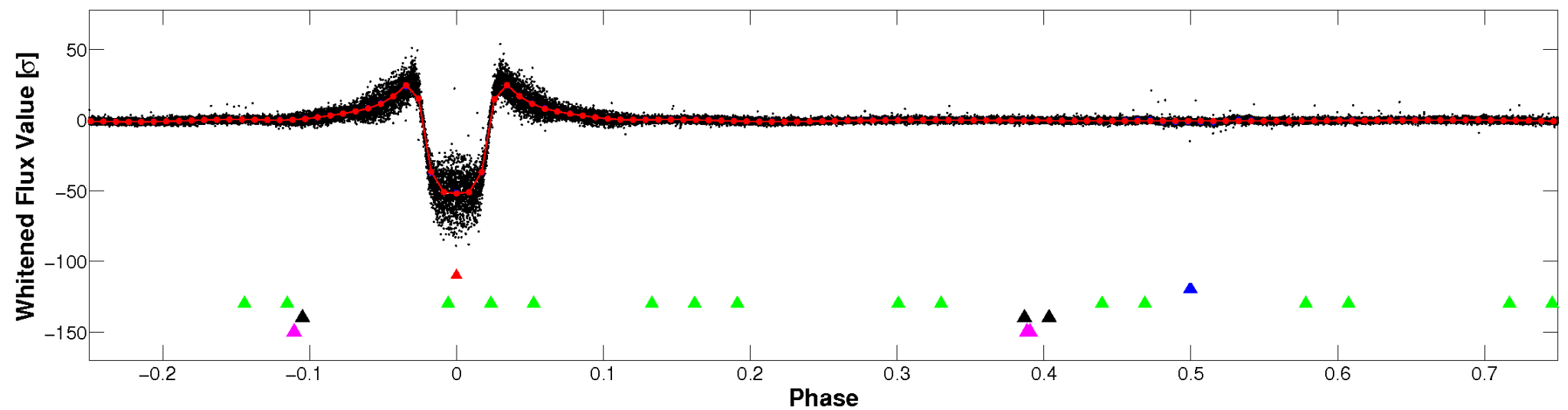


# Non-Whitened Vs. Whitened Light Curve

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

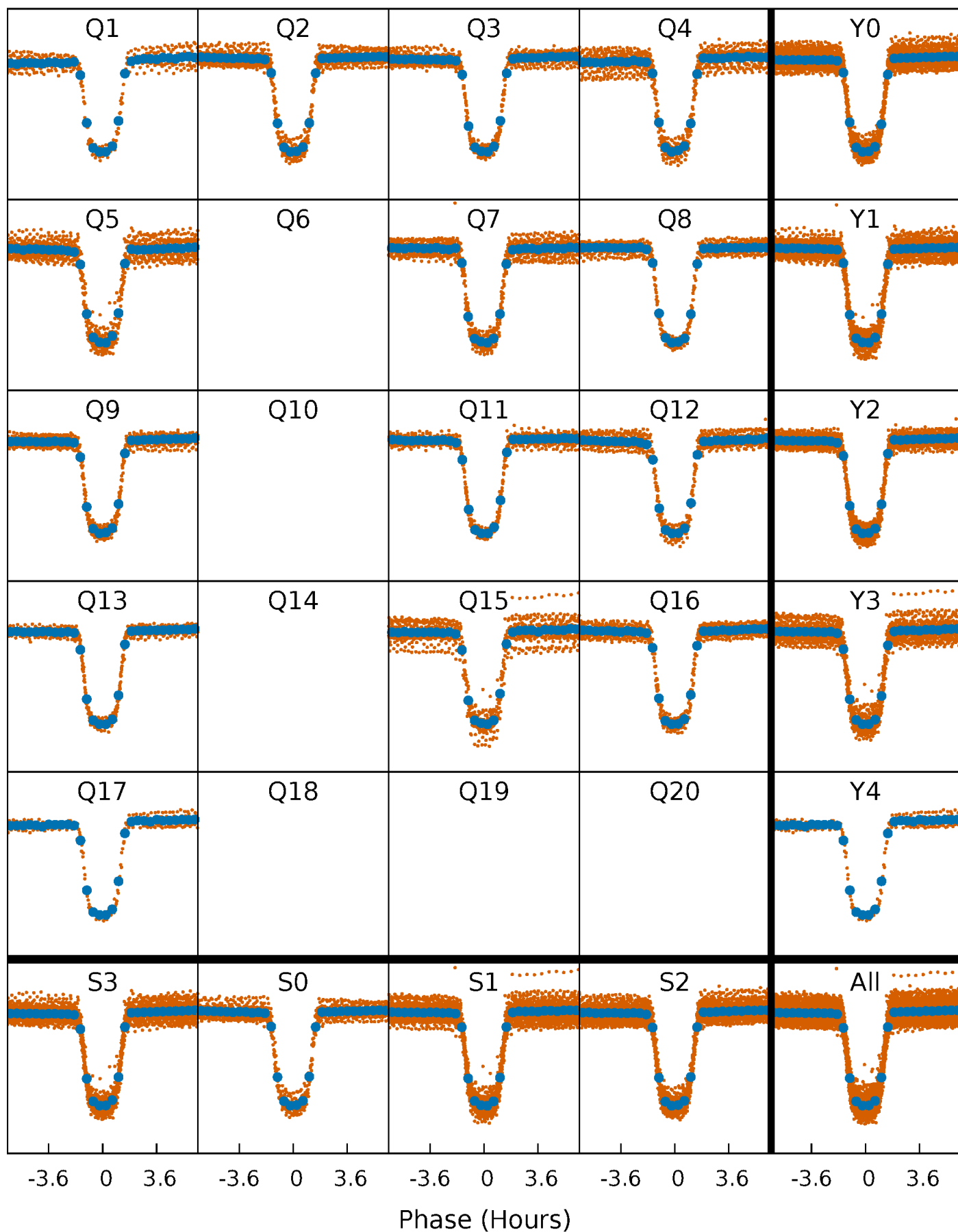


## Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)



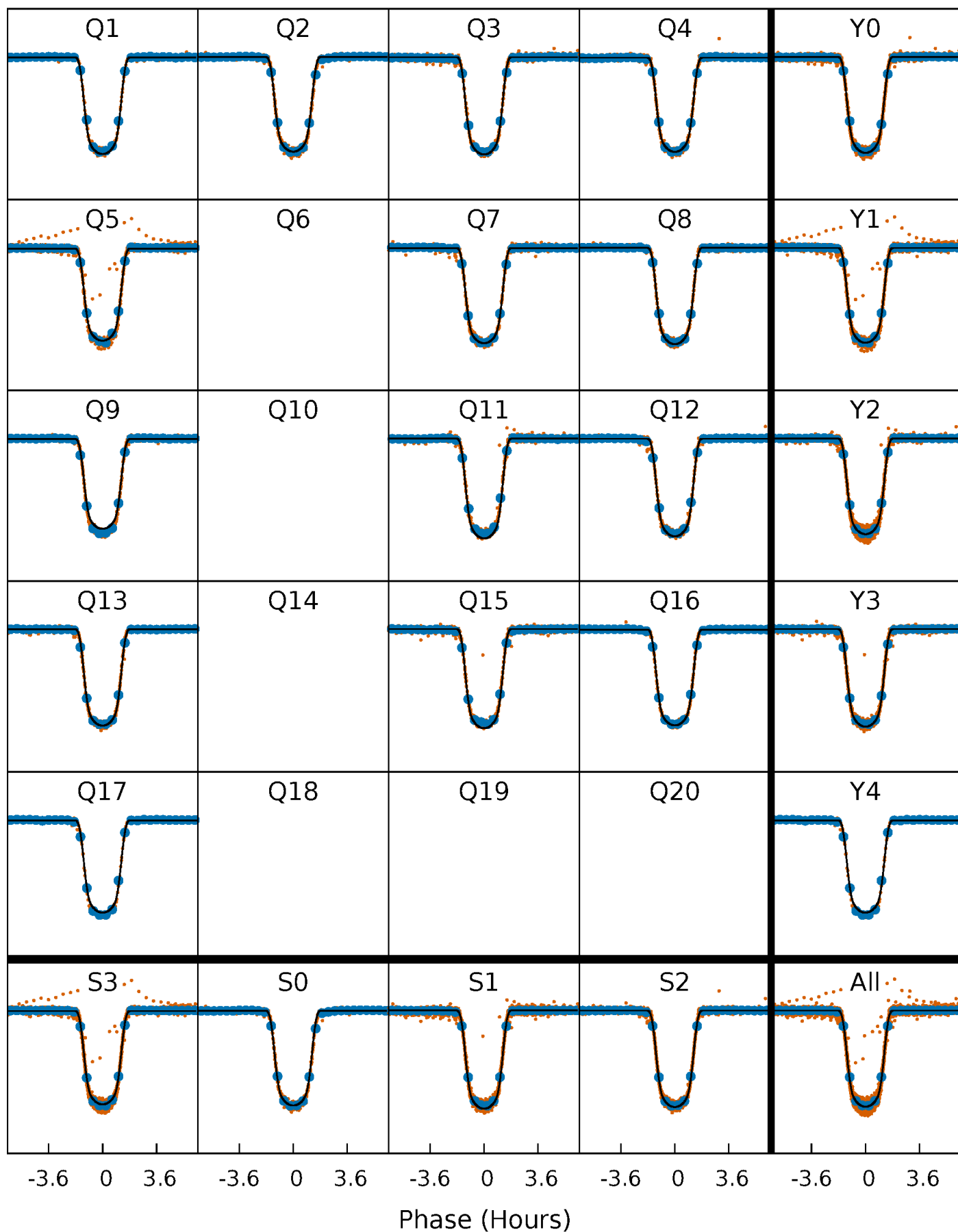
# PDC Quarter-Phased Transit Curves

TCE 004840513-01 P= 2.379283 Days  $T_0=133.651248$  (BKJD)



# DV Quarter-Phased Transit Curves

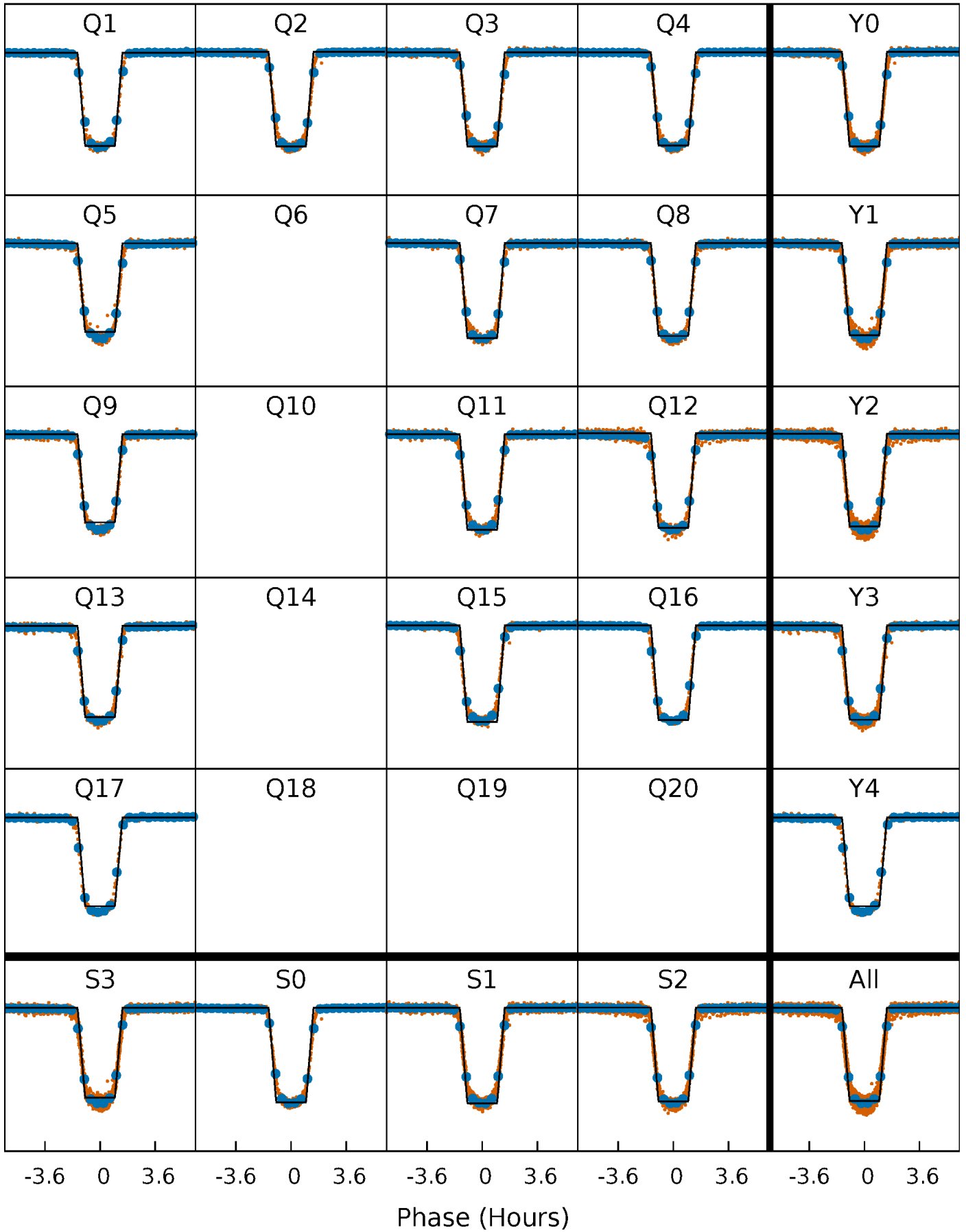
TCE 004840513-01 P= 2.379283 Days  $T_0=133.651248$  (BKJD)





# Alt. Detrend Quarter-Phased Transit Curves

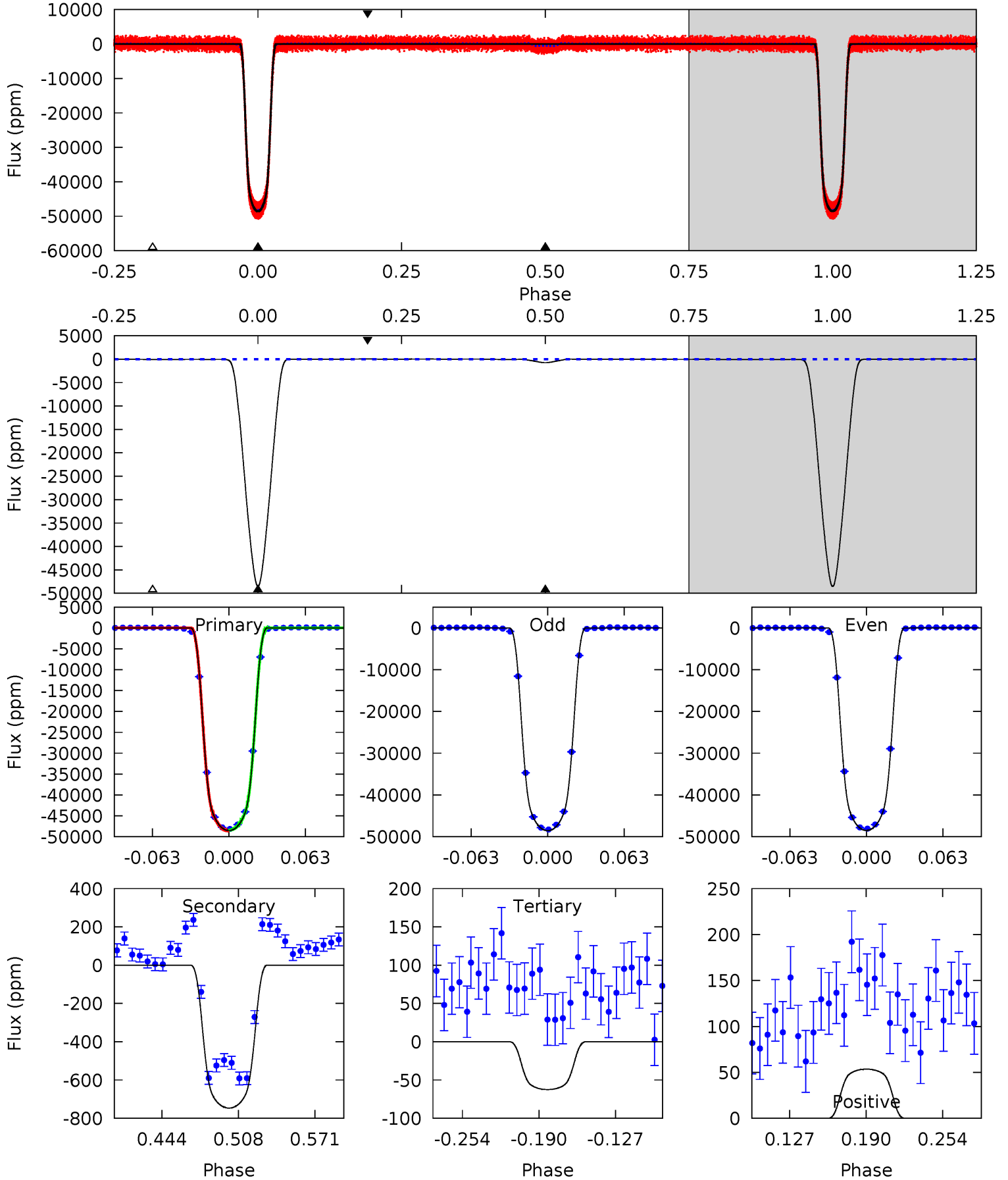
TCE 004840513-01 P= 2.379289 Days  $T_0=133.649521$  (BKJD)



# DV Model-Shift Uniqueness Test

004840513-01, P = 2.379283 Days, E = 131.271965 Days

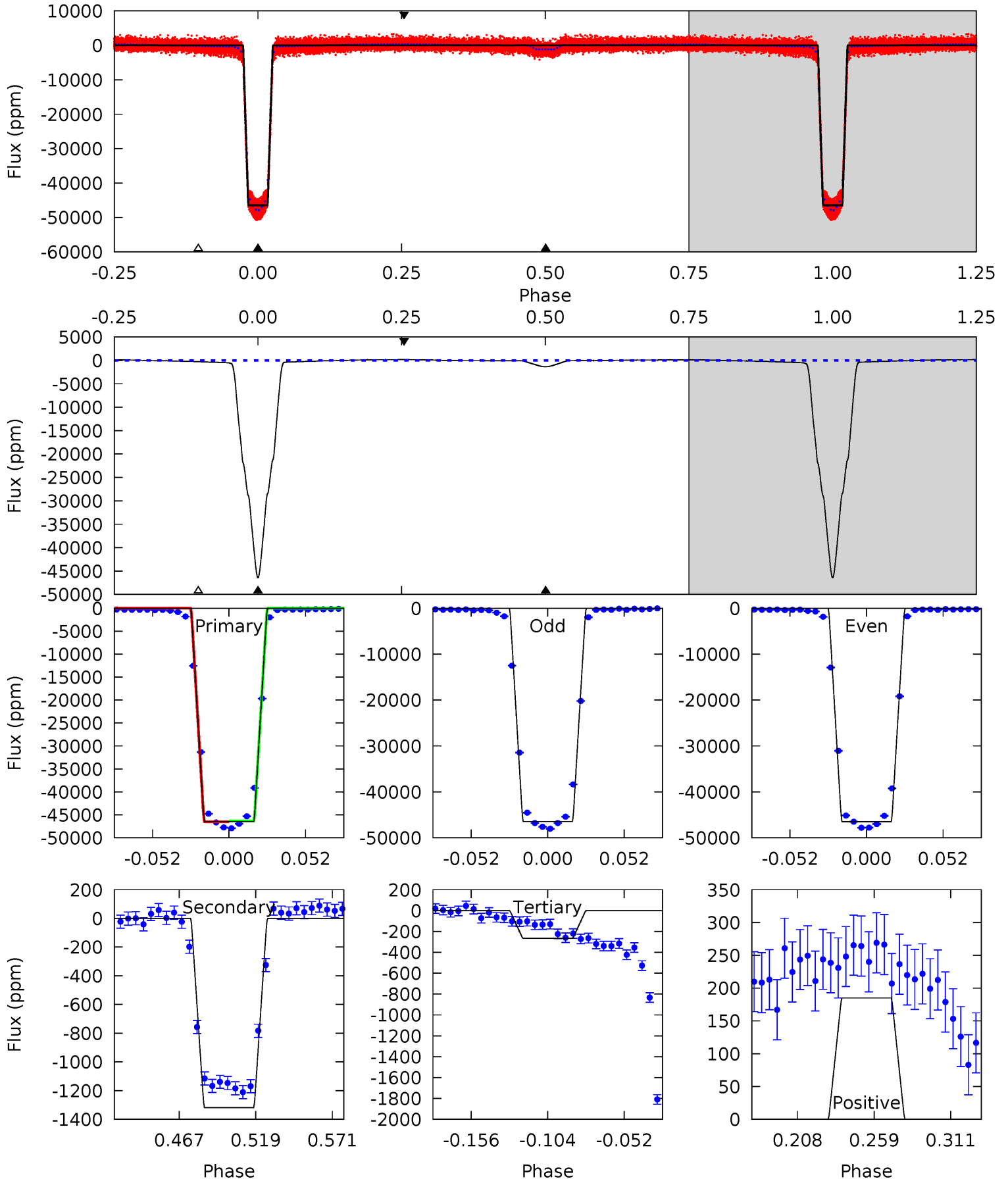
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
4328	66.6	5.57	4.77	4.66	1.86	2.88	4322	4323	61.0	61.8	2.98	1.00	0.00	9.13



# Alt Model-Shift Uniqueness Test

004840513-01, P = 2.379289 Days, E = 131.270232 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
2805	79.6	16.0	11.2	4.70	1.94	9.12	2789	2794	63.6	68.5	1.00	1.00	0.00	5.21



### Stellar Parameters For KIC 004840513

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$6392^{+153}_{-230}$	$4.399^{+0.054}_{-0.216}$	$0.070^{+0.250}_{-0.350}$	$1.162^{+0.369}_{-0.132}$	$1.232^{+0.167}_{-0.184}$	$1.107^{+0.322}_{-0.594}$
	+2%/-4%	+1%/-5%	+357%/-500%	+32%/-11%	+14%/-15%	+29%/-54%
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 004840513-01 / KOI 1541.01

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-747 \pm 11$	$26.52^{+4.49}_{-2.37}$	$2246^{+153}_{-115}$	$2807^{+59}_{-93}$	$0.800^{+0.128}_{-0.192}$
Alt.	$-1319 \pm 17$	$28.51^{+4.54}_{-2.50}$	$2242^{+166}_{-104}$	$3068^{+59}_{-76}$	$1.233^{+0.208}_{-0.303}$

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

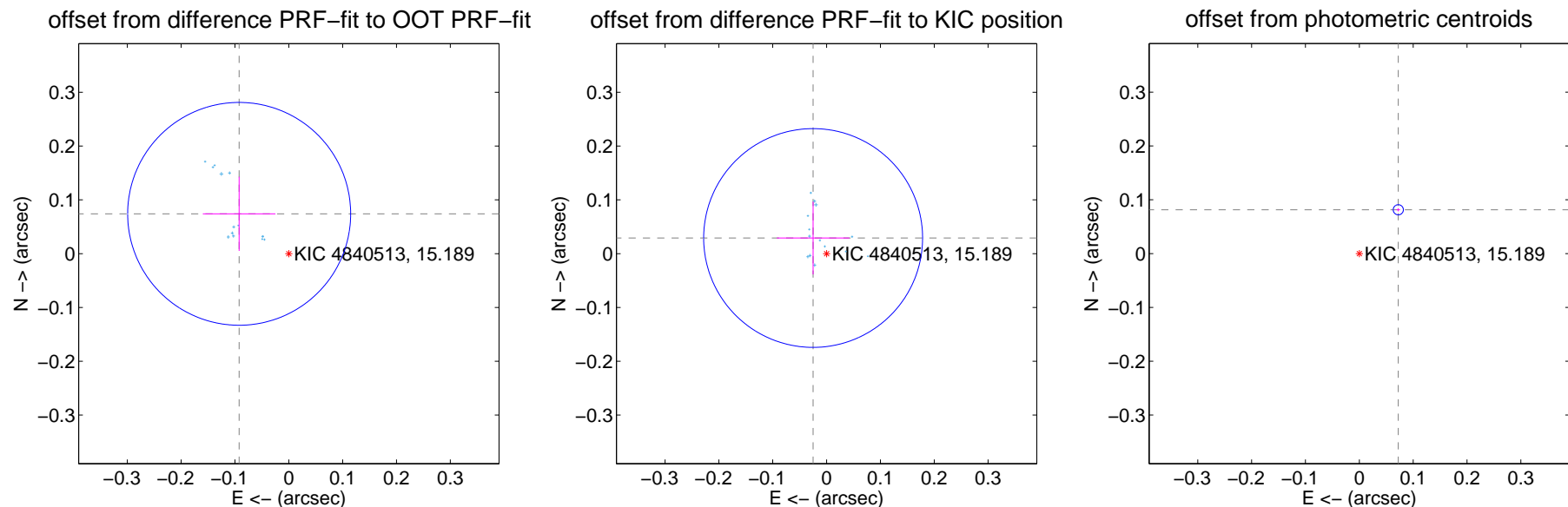
## DV Centroid Data

Supplemental centroid analysis for 004840513-01. Kepler magnitude: 15.19. Transit SNR 2158.63

There are 14 quarters with good PRF difference image offsets

The direct PRF centroid is offset from the target star catalog position by about 0.12 arcsec

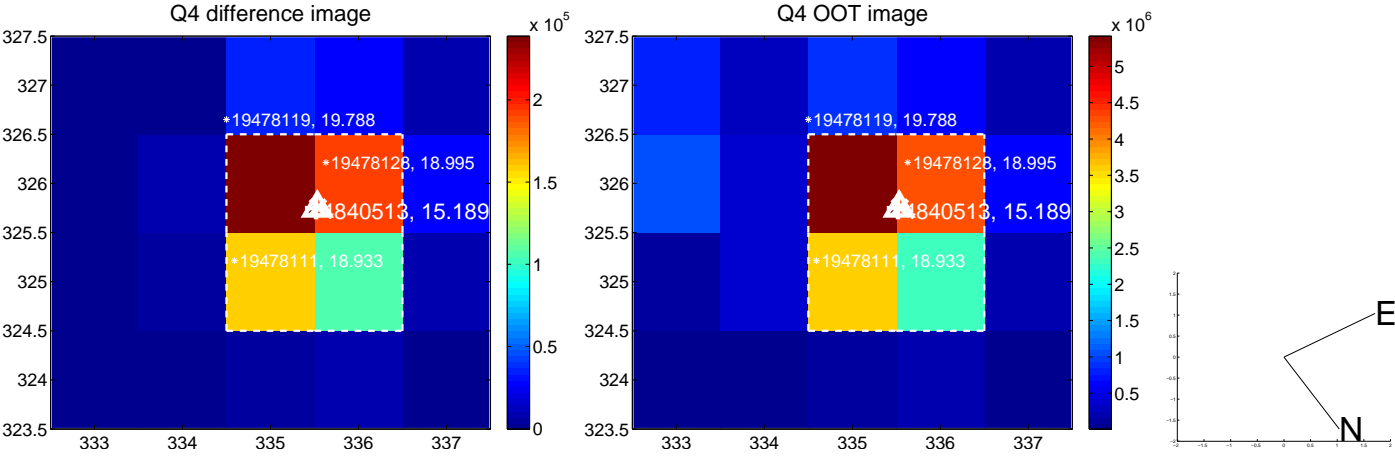
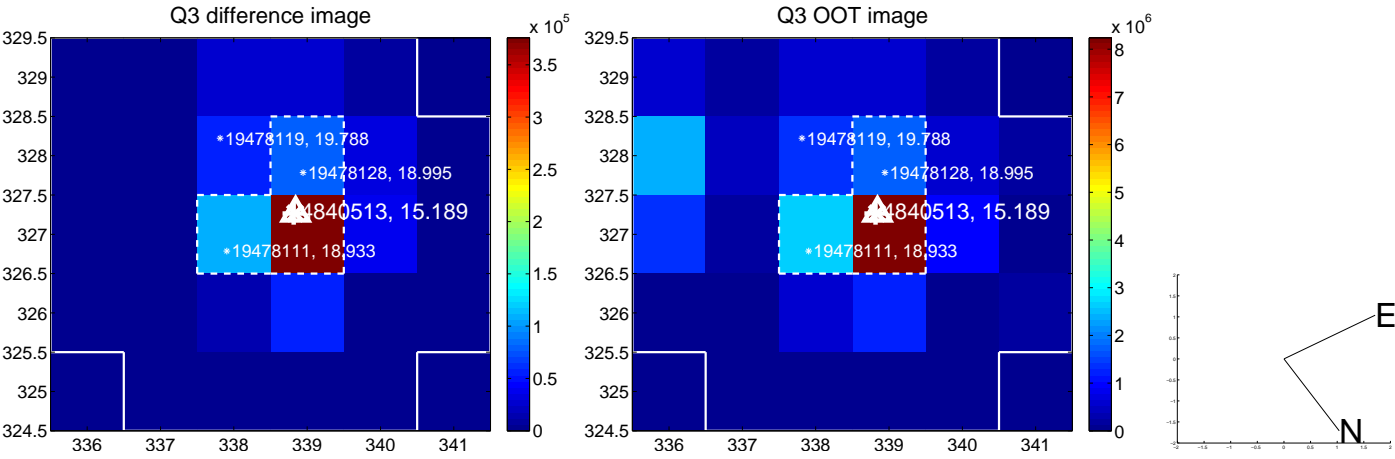
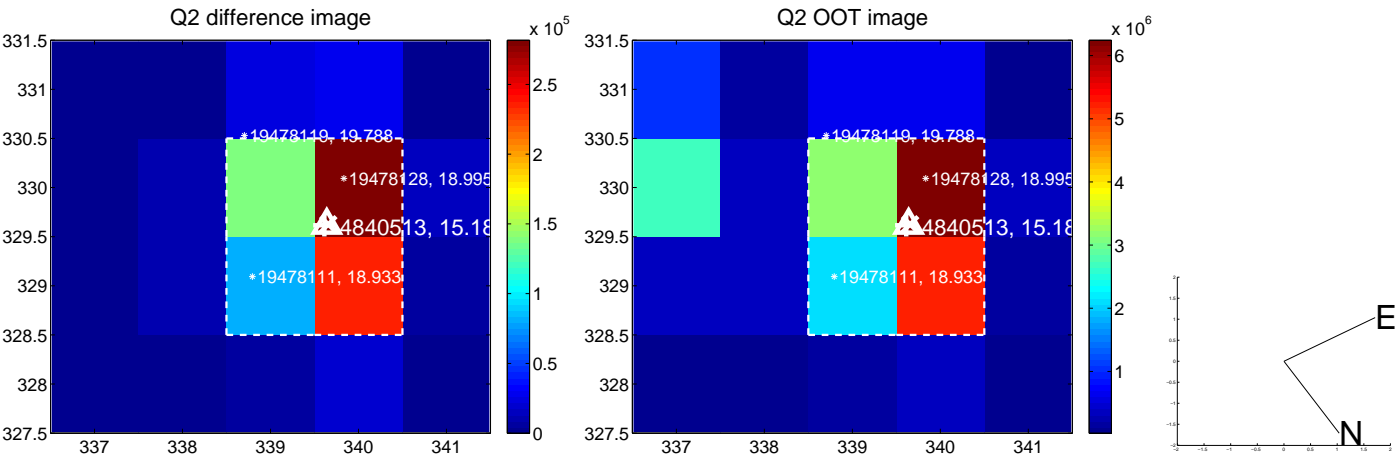
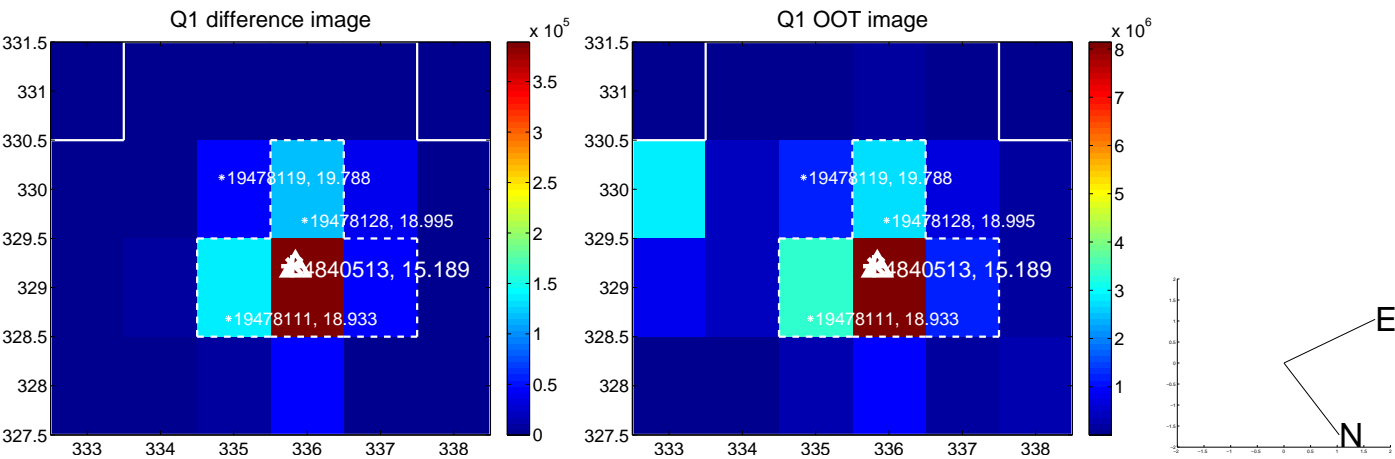
	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.118 \pm 0.069$	1.71	$0.092 \pm 0.067$	$0.074 \pm 0.069$
PRF-fit source offset from KIC position	$0.038 \pm 0.068$	0.57	$0.025 \pm 0.067$	$0.029 \pm 0.068$
photometric centroid source offset	$0.11 \pm 0.00$	34.65	$-0.07 \pm 0.00$	$0.08 \pm 0.00$



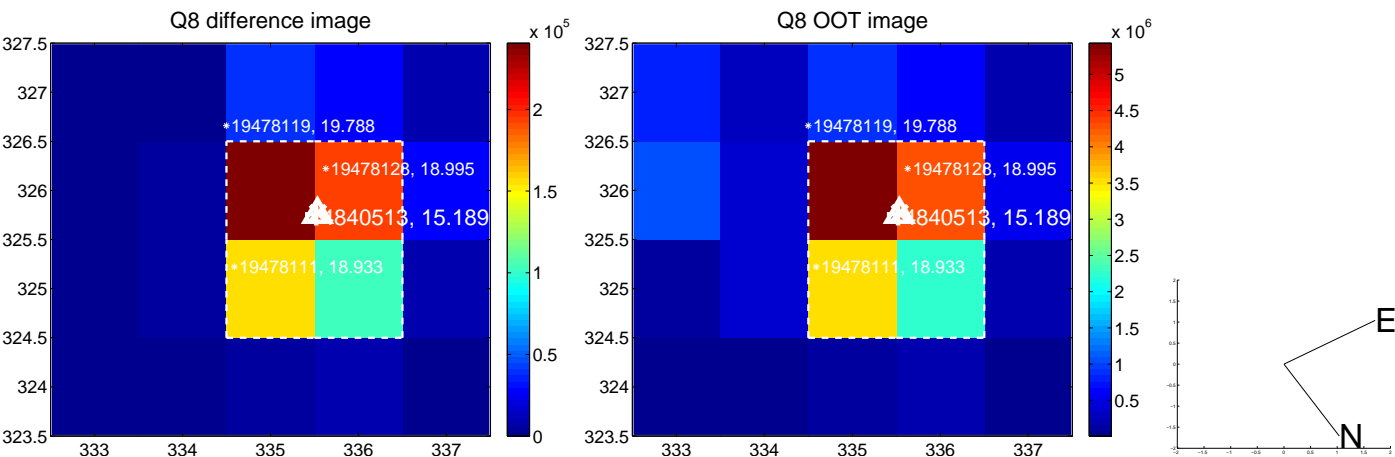
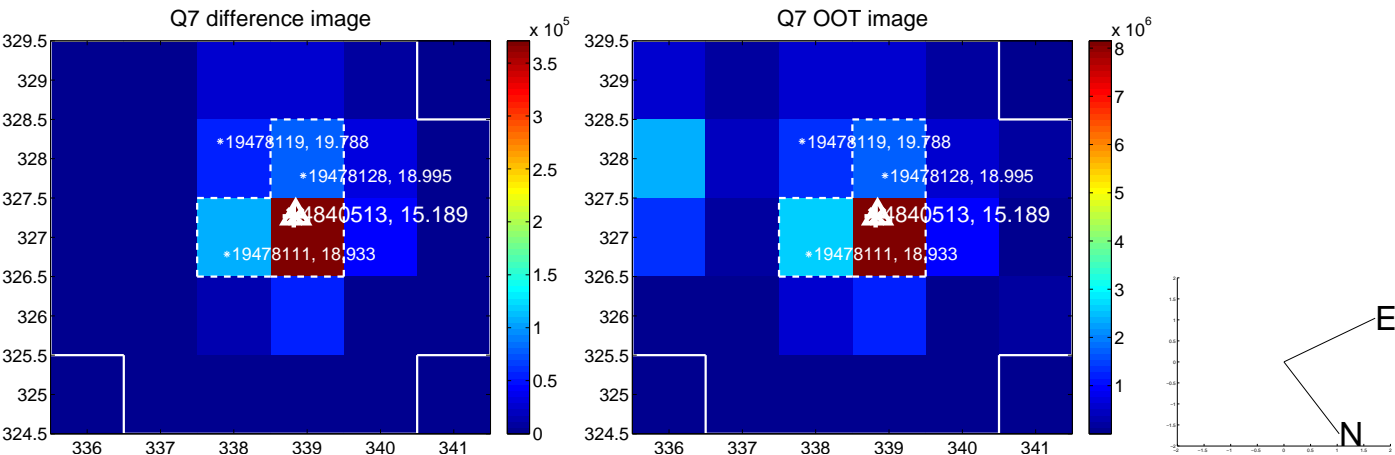
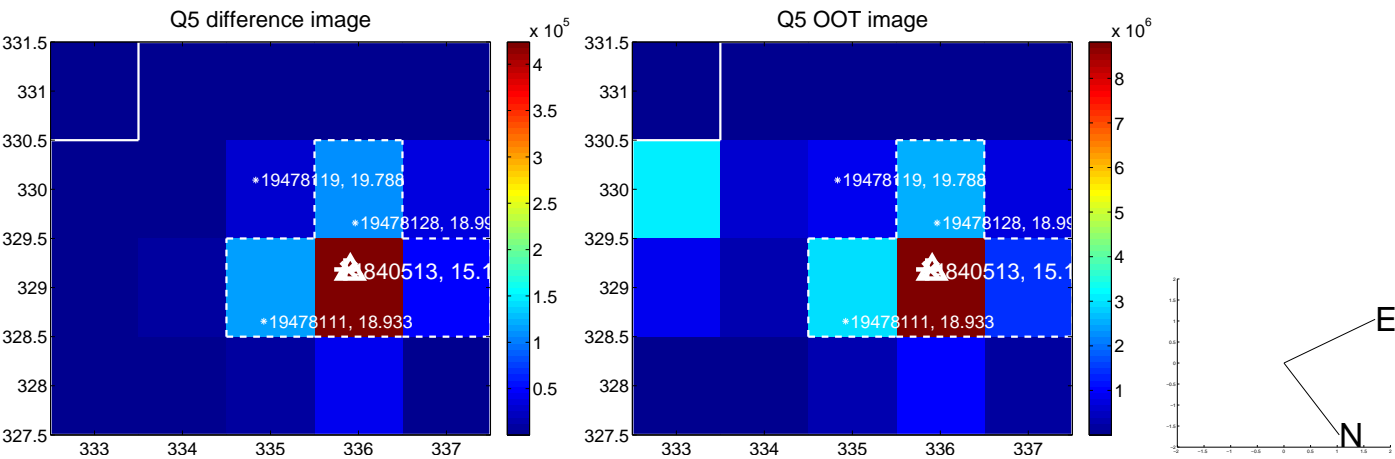
Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses:** good quarterly centroid offsets; **Vermillion crosses:** bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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



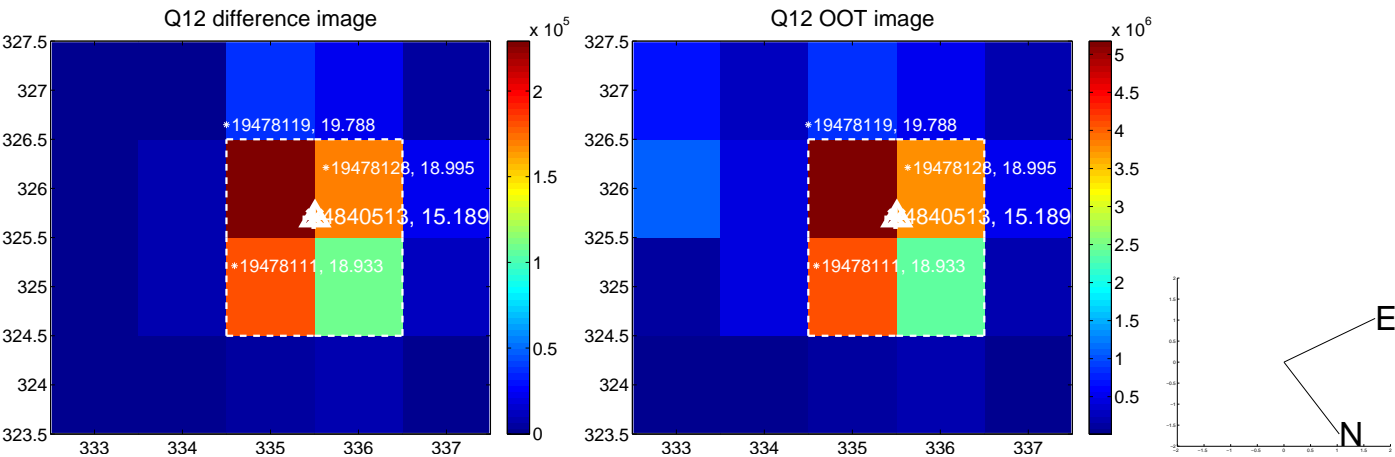
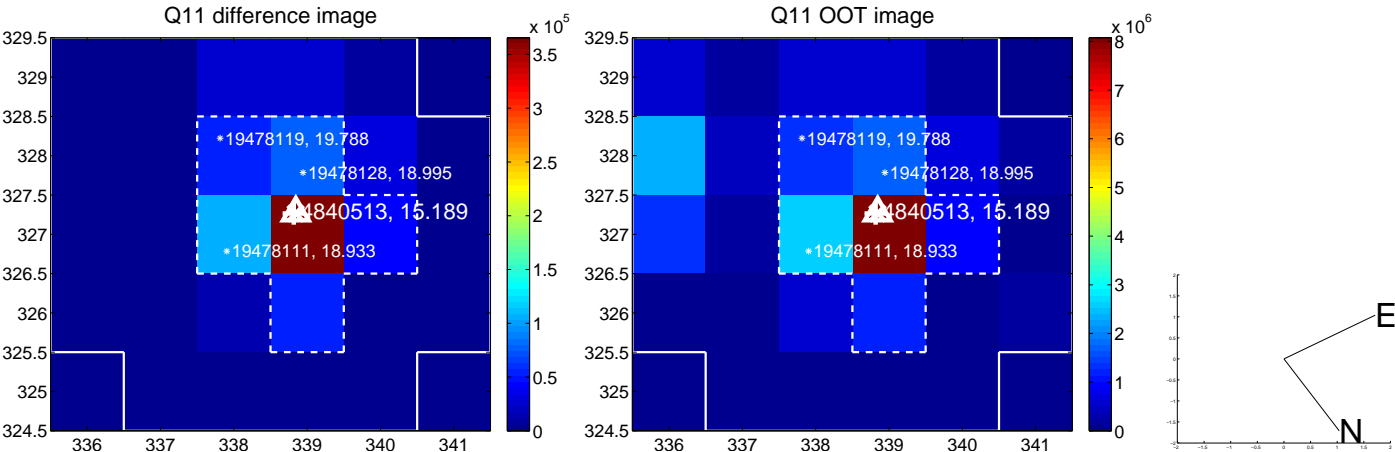
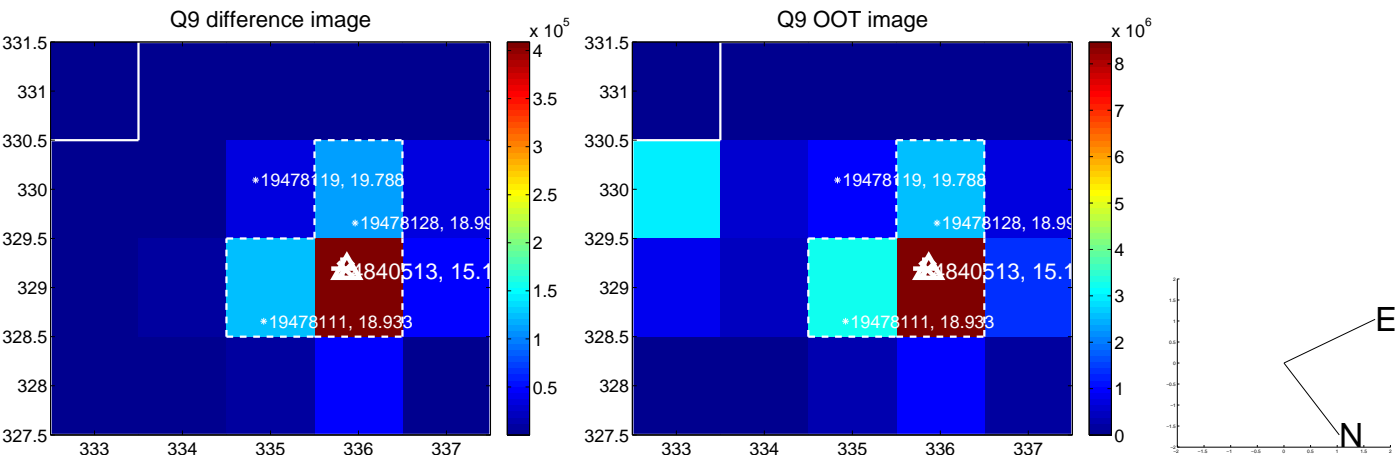
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



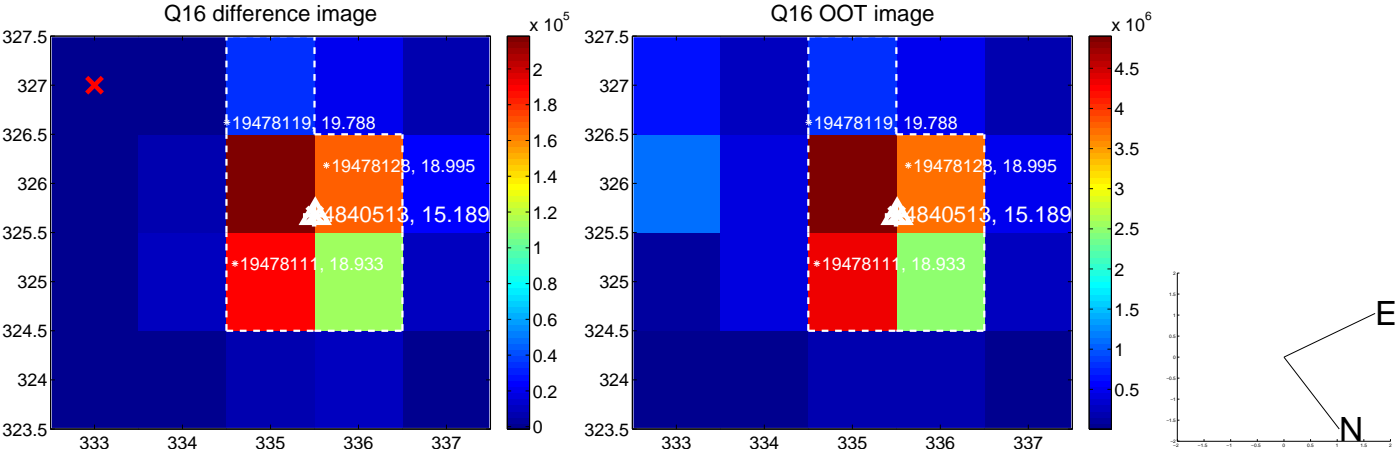
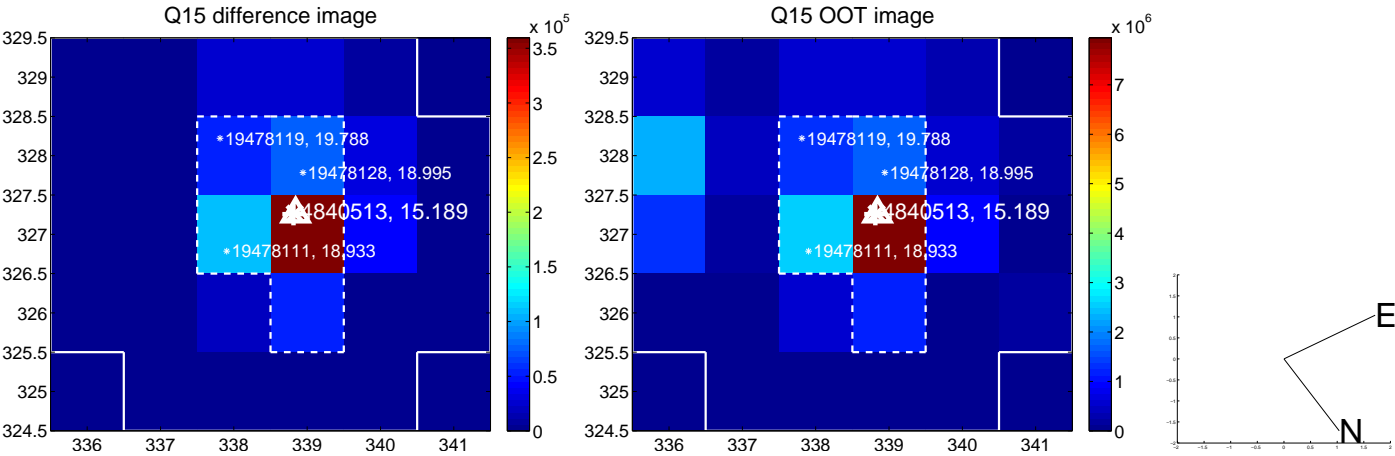
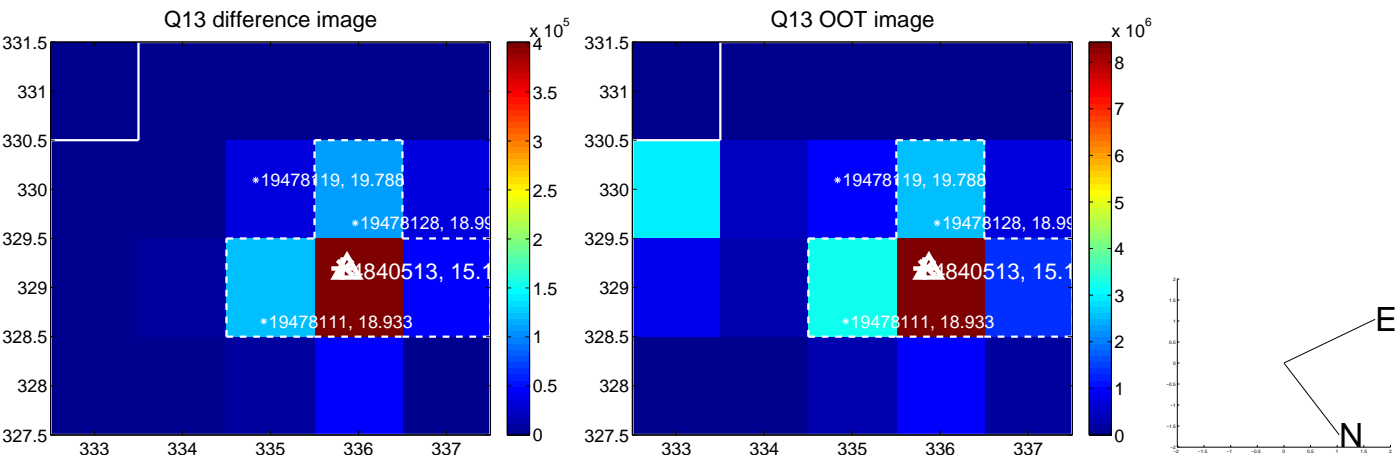
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



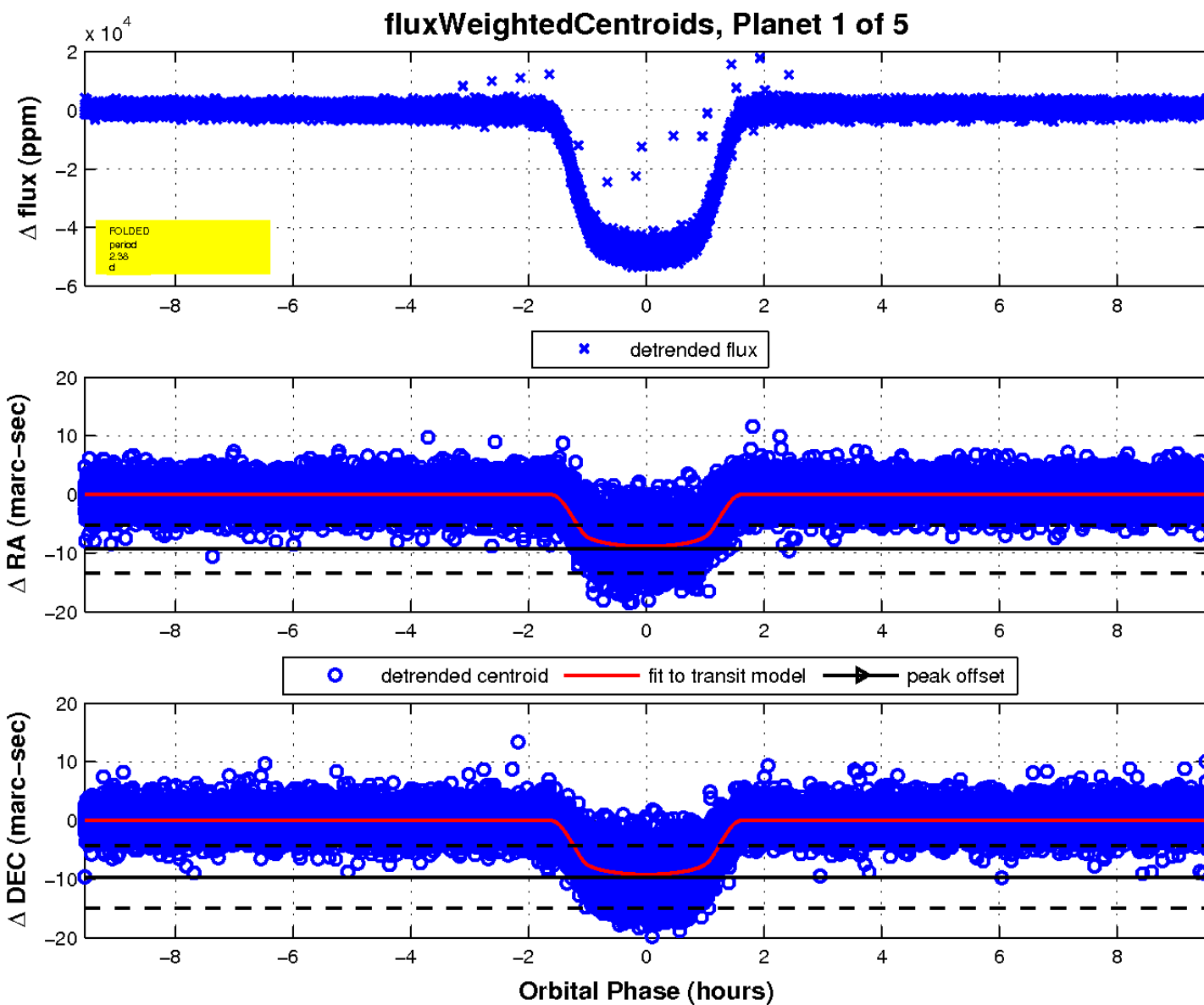
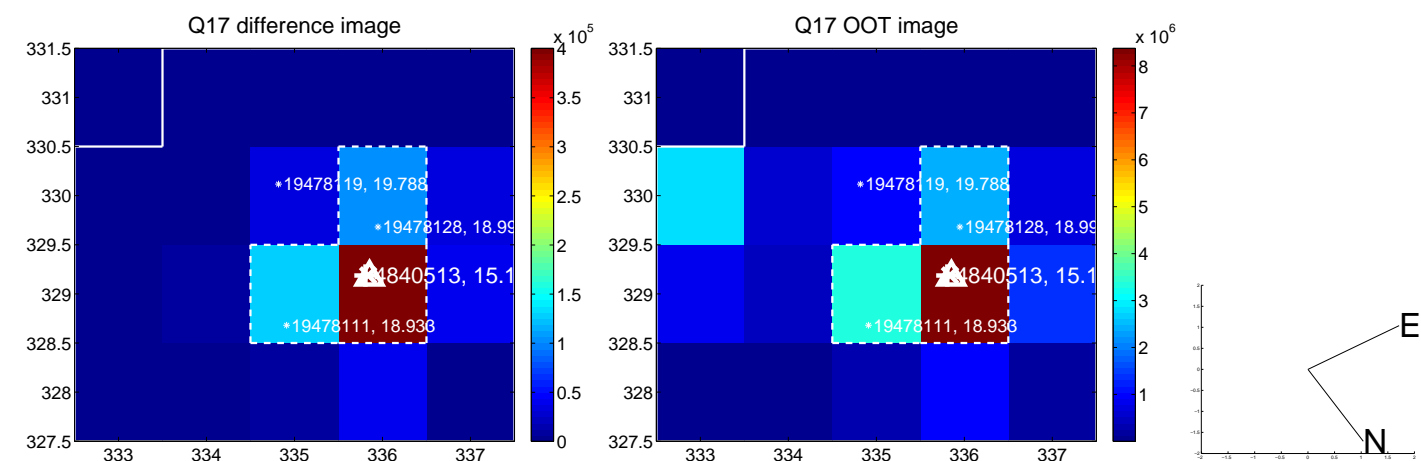
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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



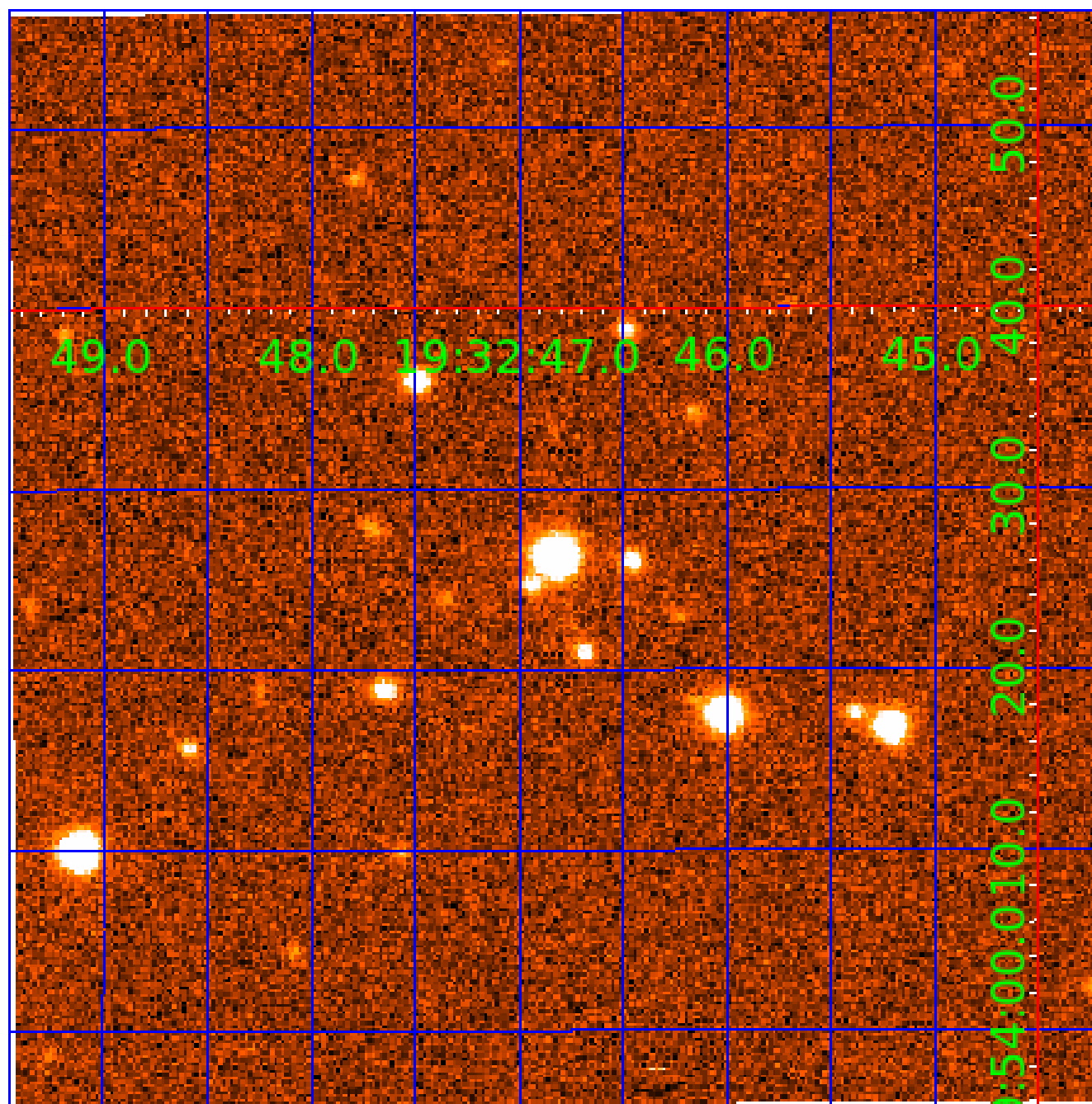
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.





UKIRT Image

Declination



# KIC 004840513

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
004840513-01	OBS	1541.01	2.379283	133.651248	48605.1	3.182	2697.5	2158.6	1.16	6392	25.82	1442.06
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004840513-04	OBS	No	600.749090	198.851996	3627.1	10.292	7.6	7.1	1.16	6392	12.80	0.90
004840513-05	OBS	No	631.697123	201.200422	1783.9	4.642	8.5	6.6	1.16	6392	9.20	0.84

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
004840513-01	OBS	PC	0.76	0	1	0	0	MOD_SEC_DV—PLANET_OCCULT_DV—MOD_SEC_ALT—HAS_SEC_TCE
004840513-02	OBS	FP	0.00	1	1	0	0	IS_SEC_TCE
004840513-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_SKYE—TRANS_GAPPED—LPP_DV—MOD_NONUNIQ_ALT
004840513-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_CHASES—LPP_DV—ALL_TRANS_CHASES—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS
004840513-05	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_CHASES_MARSHALL—LPP_DV—ALL_TRANS_CHASES—MOD_TER_DV—MOD_POS_DV—CENT_FEW_DIFFS

**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.

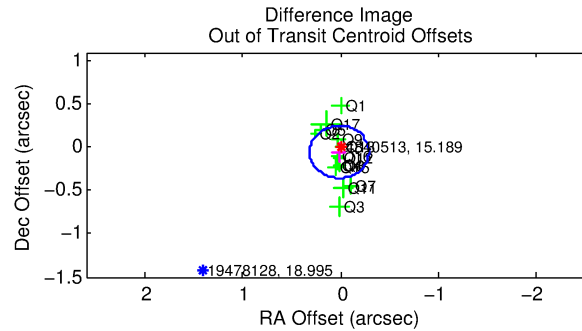
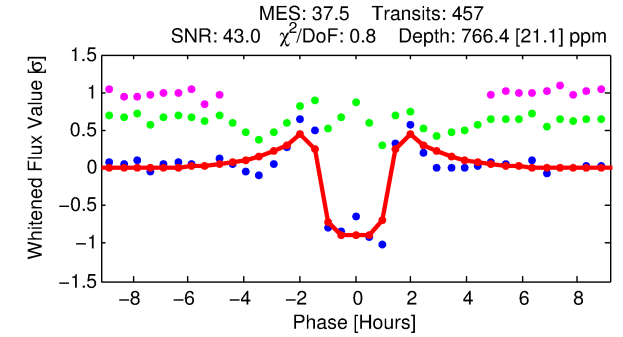
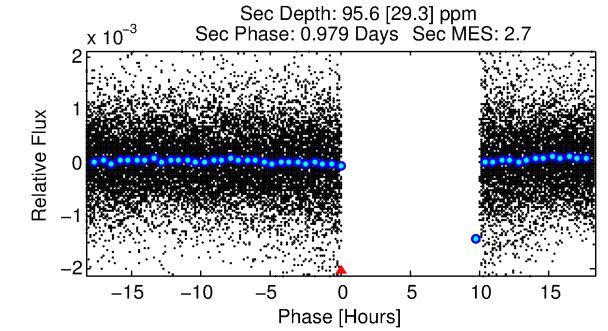
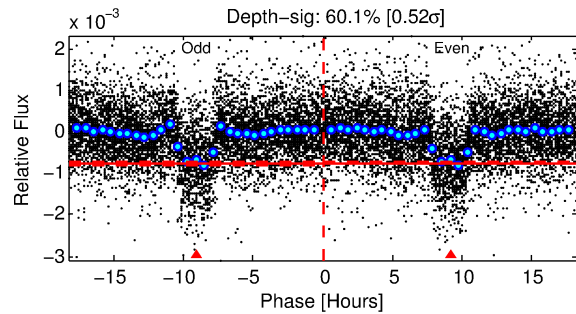
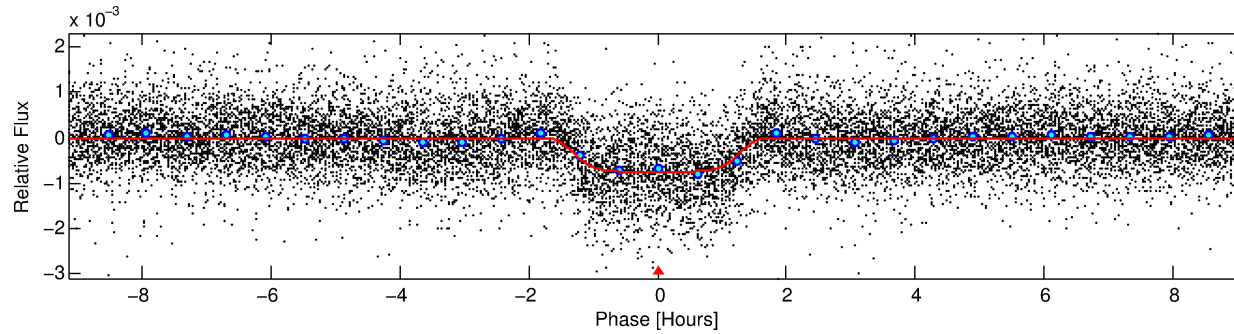
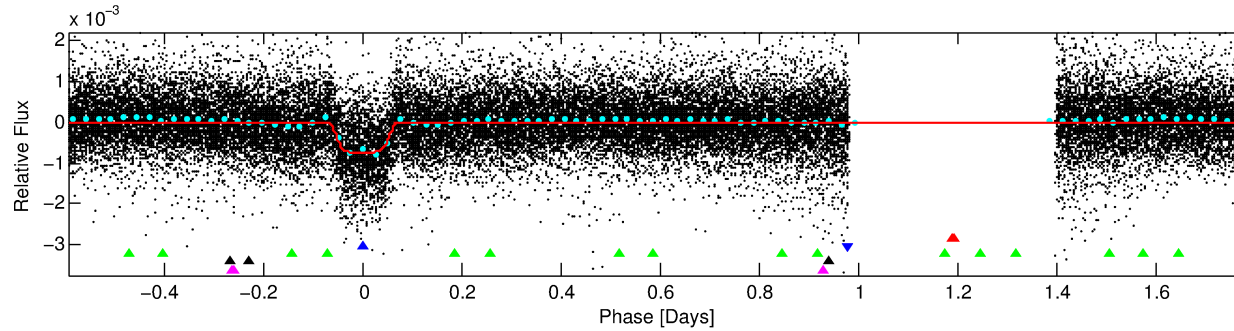
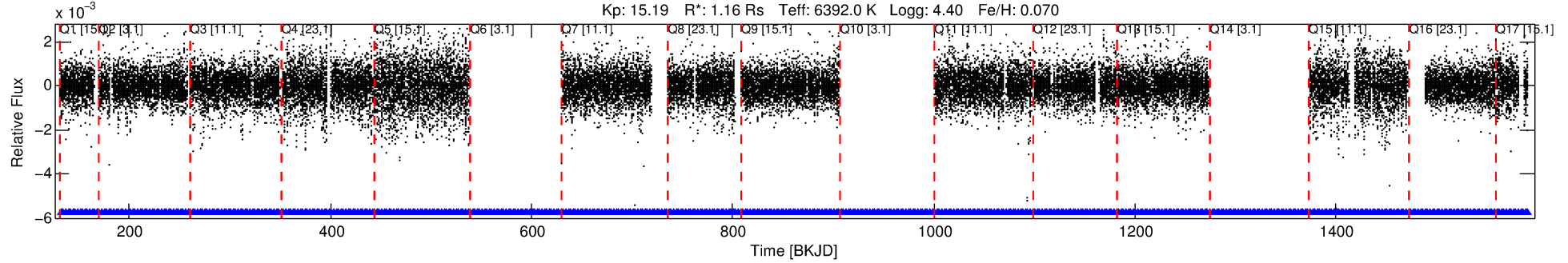
## Ephemeris Match Information For 004840513-02

No Significant Match Found

# DV One-Page Summary

KIC: 4840513 Candidate: 2 of 5 Period: 2.379 d  
KOI: K01541 Corr: No Ephemeris Match

Kp: 15.19 R\*: 1.16 Rs Teff: 6392.0 K Logg: 4.40 Fe/H: 0.070



## DV Fit Results:

Period = 2.37928 [0.00000] d  
Epoch = 132.4630 [0.0007] BKJD  
Rp/R\* = 0.0298 [0.0010]  
a/R\* = 3.13 [0.43]  
b = 0.90 [0.03]  
Seff = 1442.07 [604.08]  
Teq = 1571 [165] K  
Rp = 3.78 [1.21] Re  
a = 0.0374 [0.0101] AU  
Ag = 5.17 [2.60] [1.60σ]  
Teffp = 3663 [316] K [5.86σ]

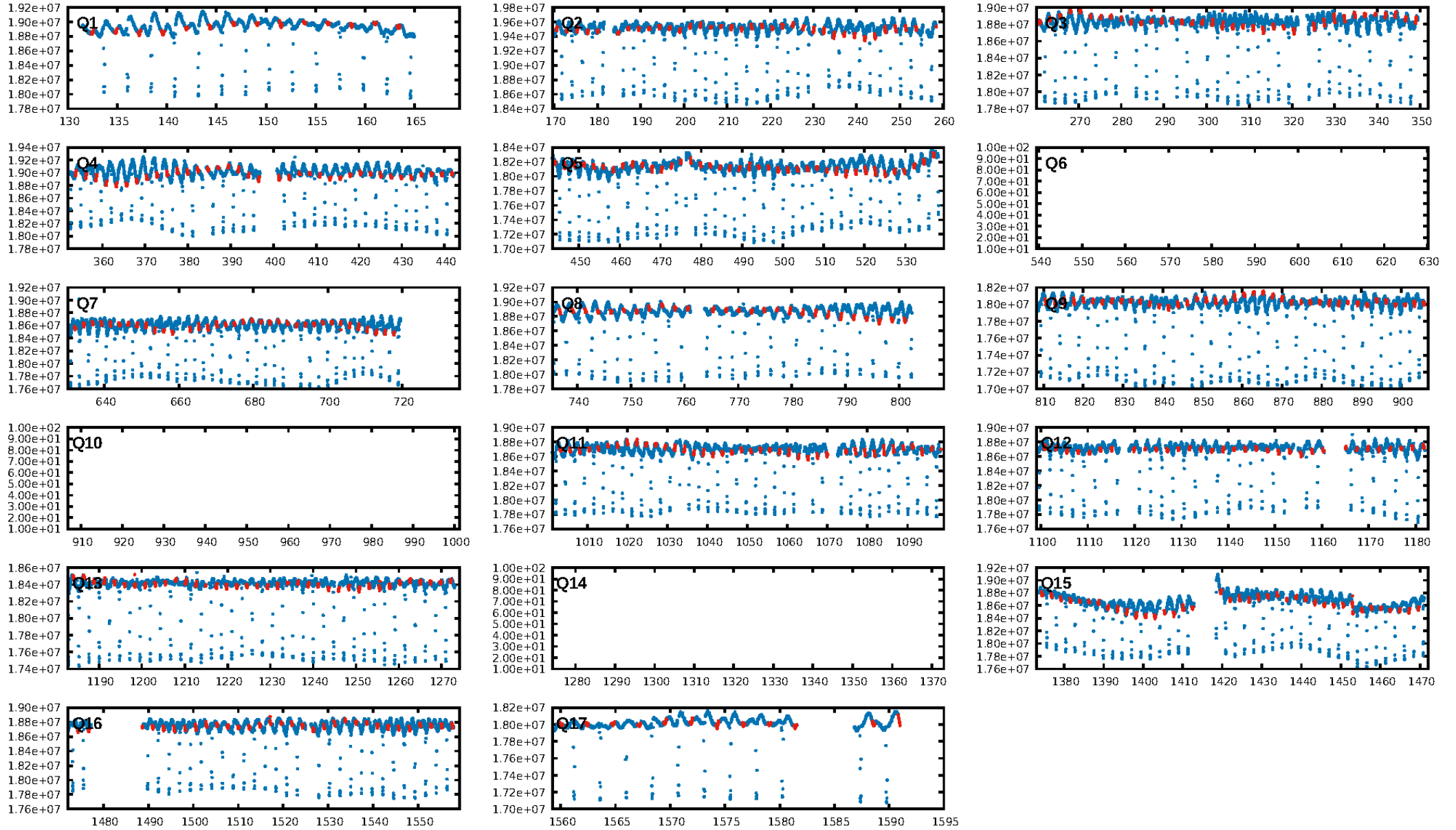
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 0.0% [0.00σ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: 5.61e-283  
RollingBand-fgt: 1.00 [431/431]  
GhostDiagnostic-chr: 2.837  
Centroid-sig: 46.6%  
Centroid-so: 0.208 arcsec [1.10σ]  
OotOffset-rm: 0.055 arcsec [0.54σ]  
KicOffset-rm: 0.109 arcsec [1.09σ]  
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]

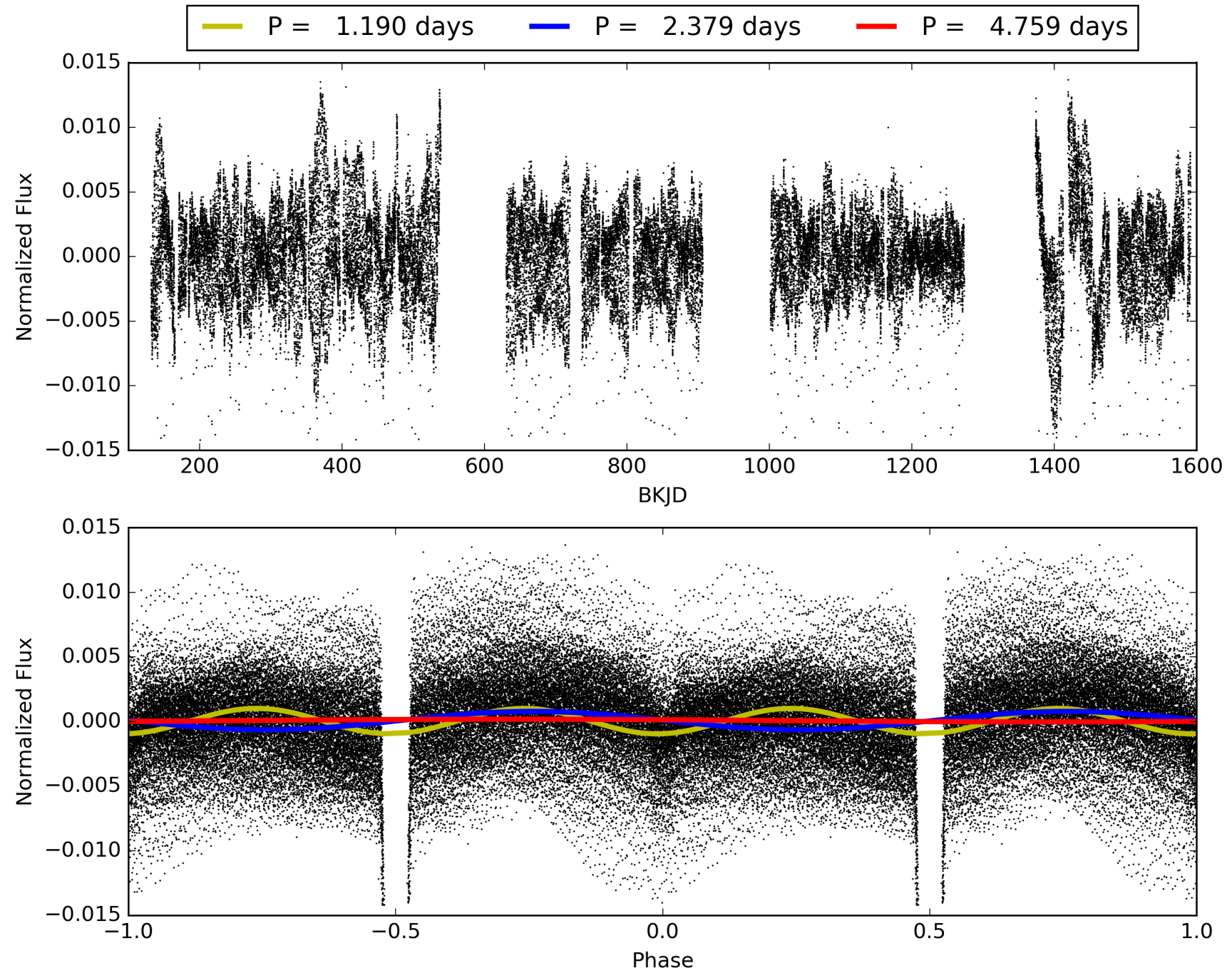
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 01-Feb-2016 11:27:57 Z

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

# TCE 004840513-02, PDC Light Curves



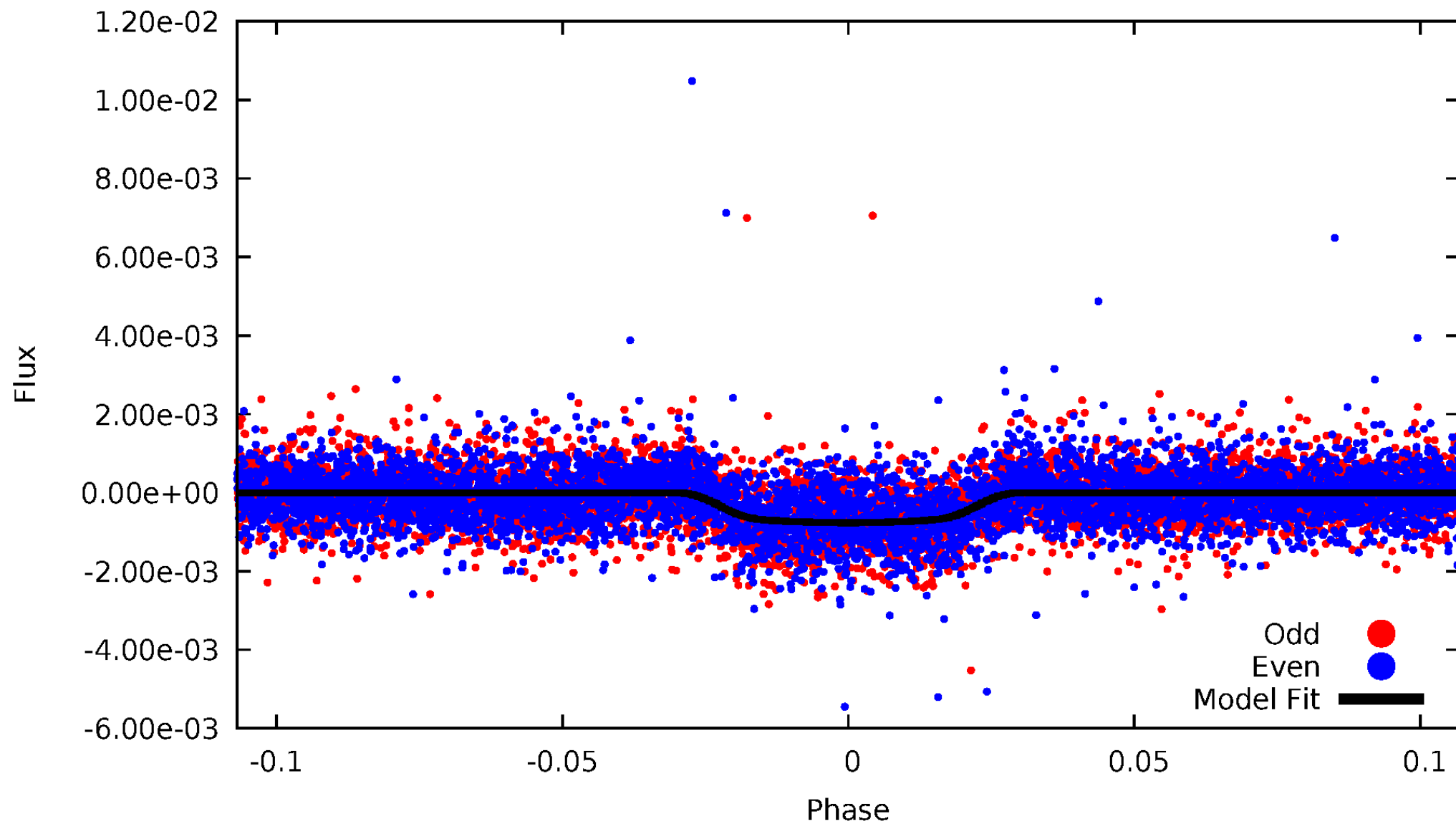
TCE 004840513-02





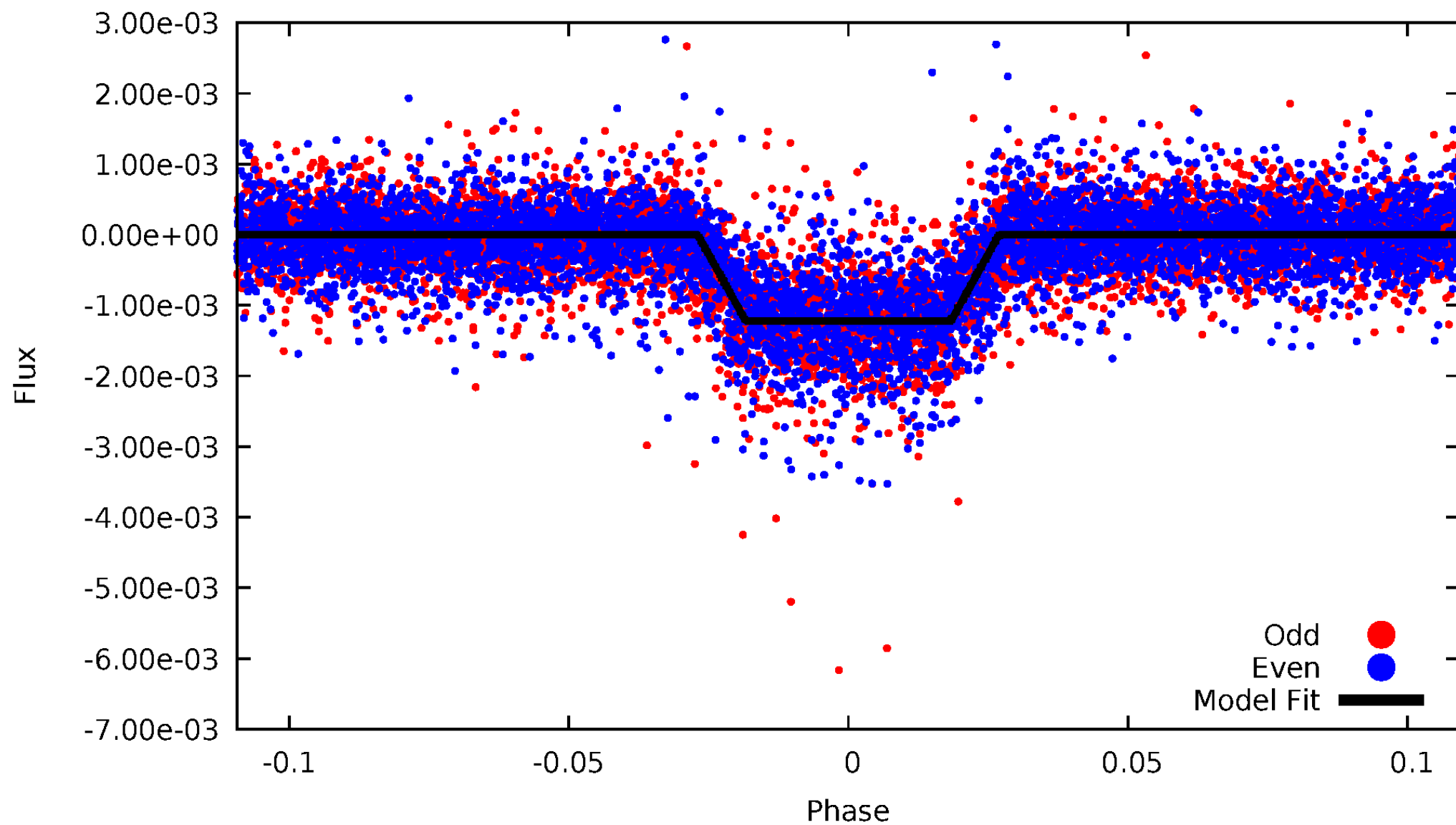
# DV Odd/Even

TCE 004840513-02



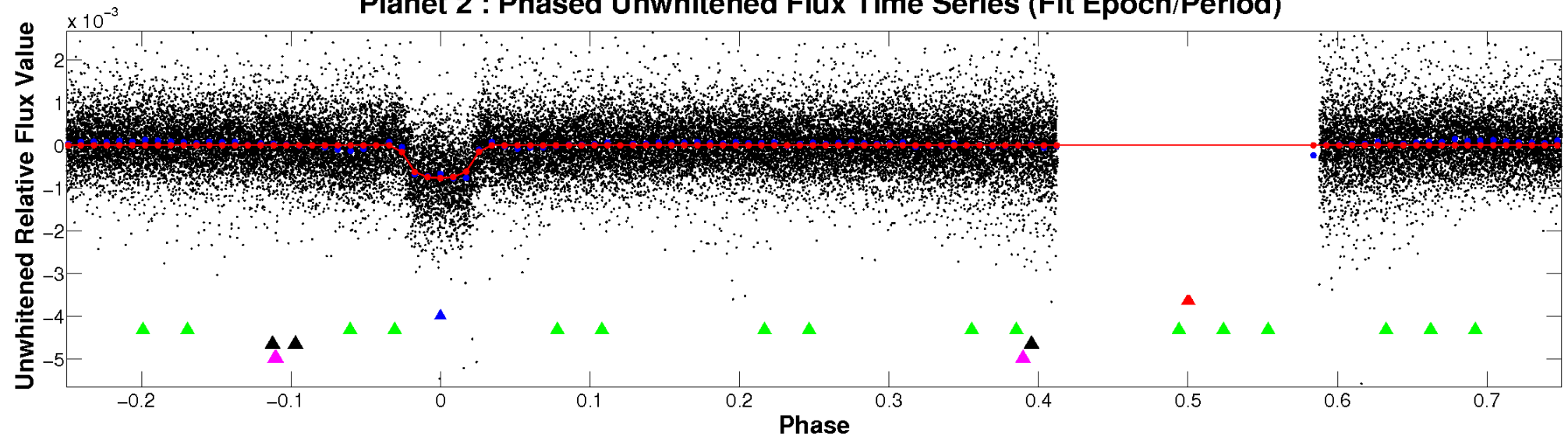
# ALT Odd/Even

TCE 004840513-02

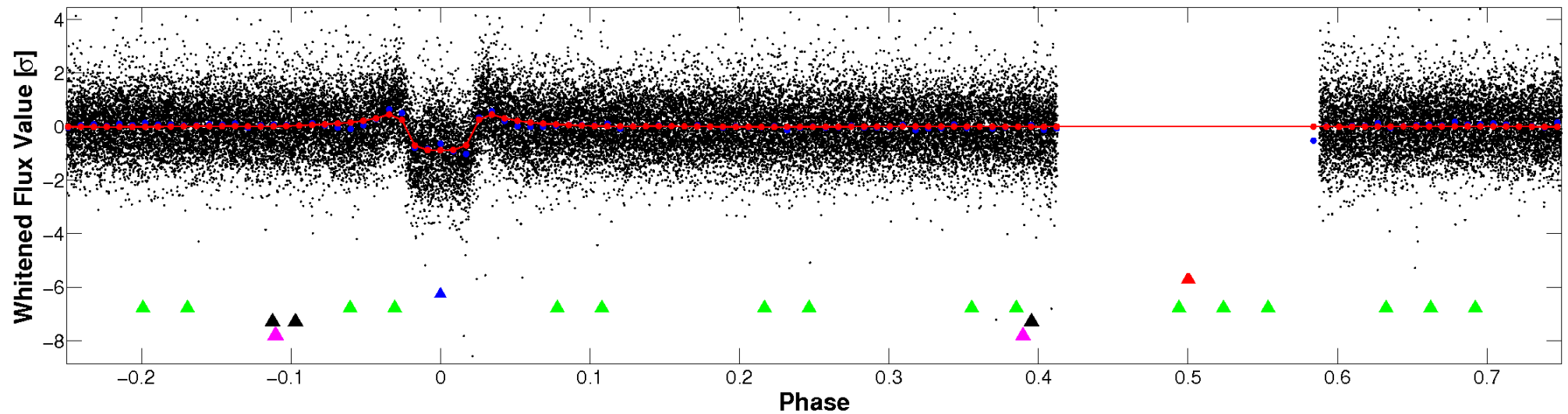


# Non-Whitened Vs. Whitened Light Curve

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

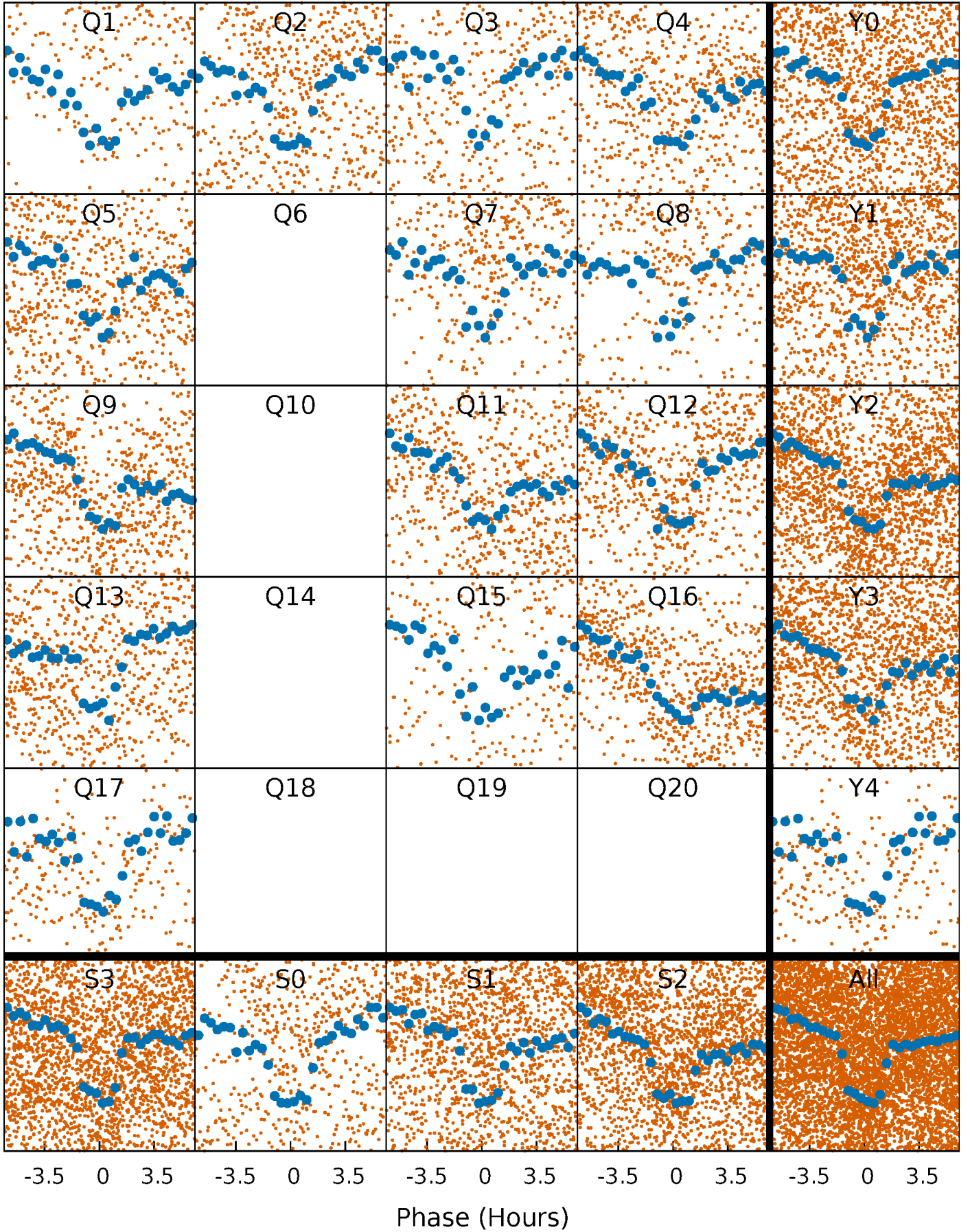


## Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



# PDC Quarter-Phased Transit Curves

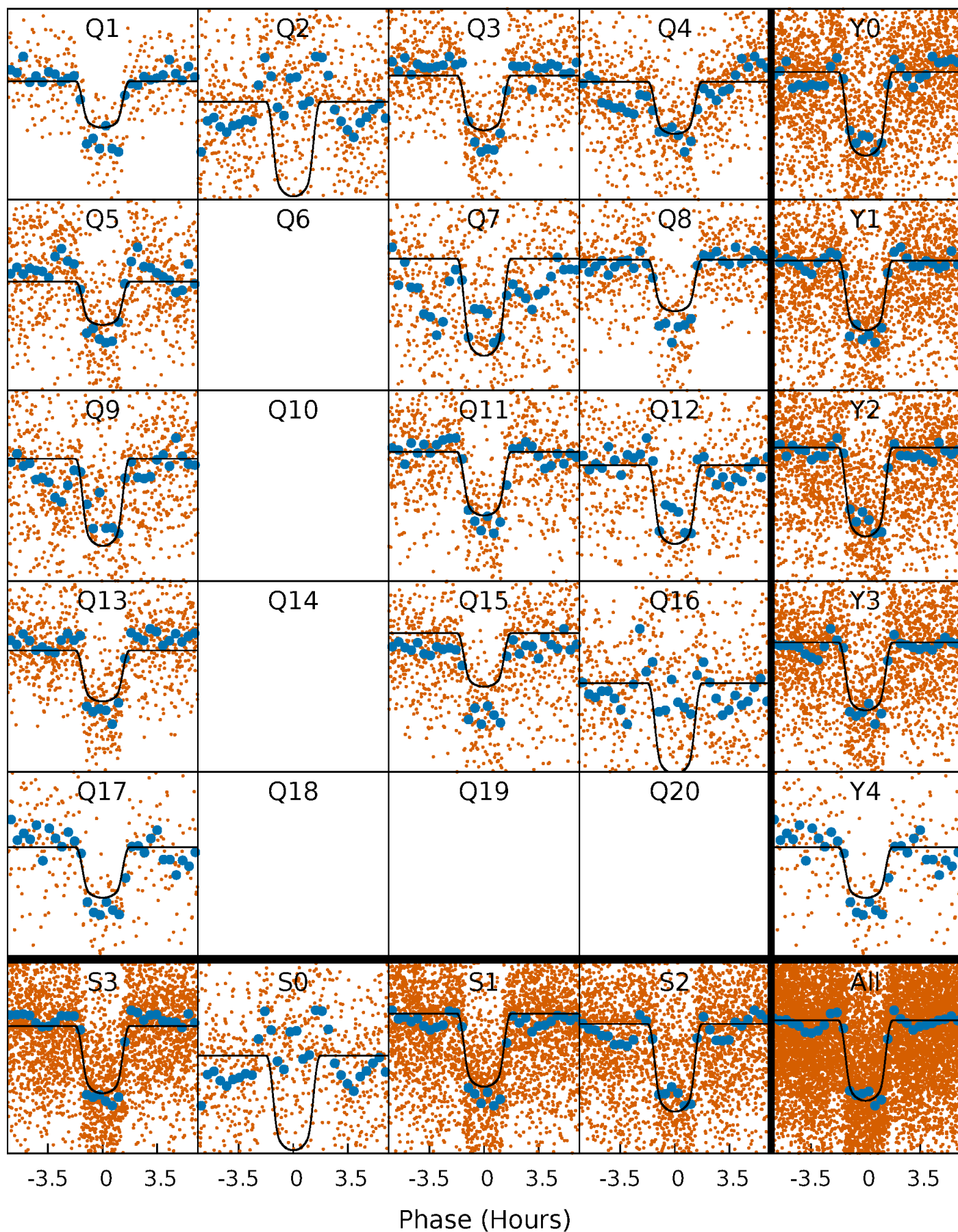
TCE 004840513-02   P= 2.379277 Days    $T_0=132.462959$  (BKJD)





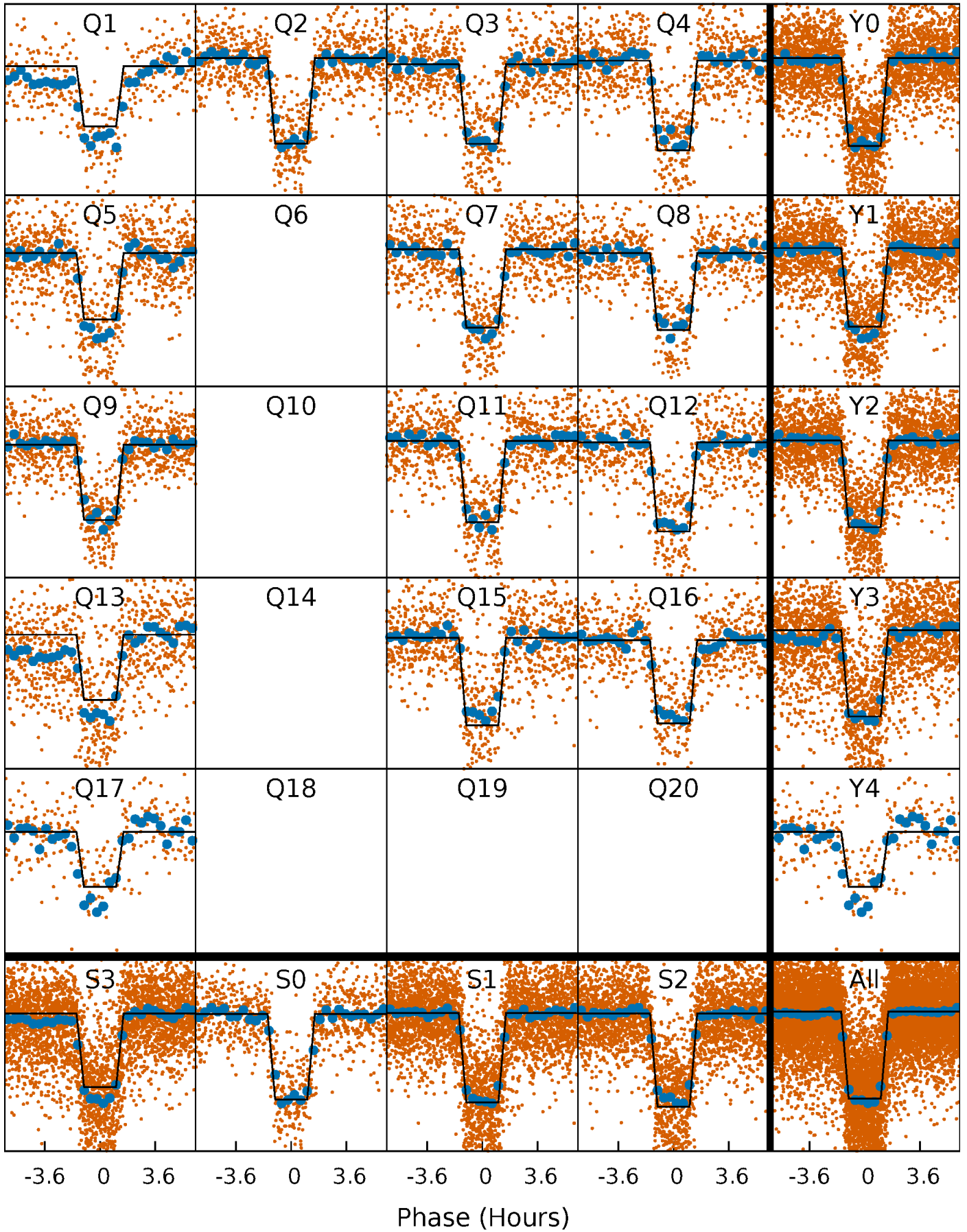
# DV Quarter-Phased Transit Curves

TCE 004840513-02 P= 2.379277 Days  $T_0=132.462959$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

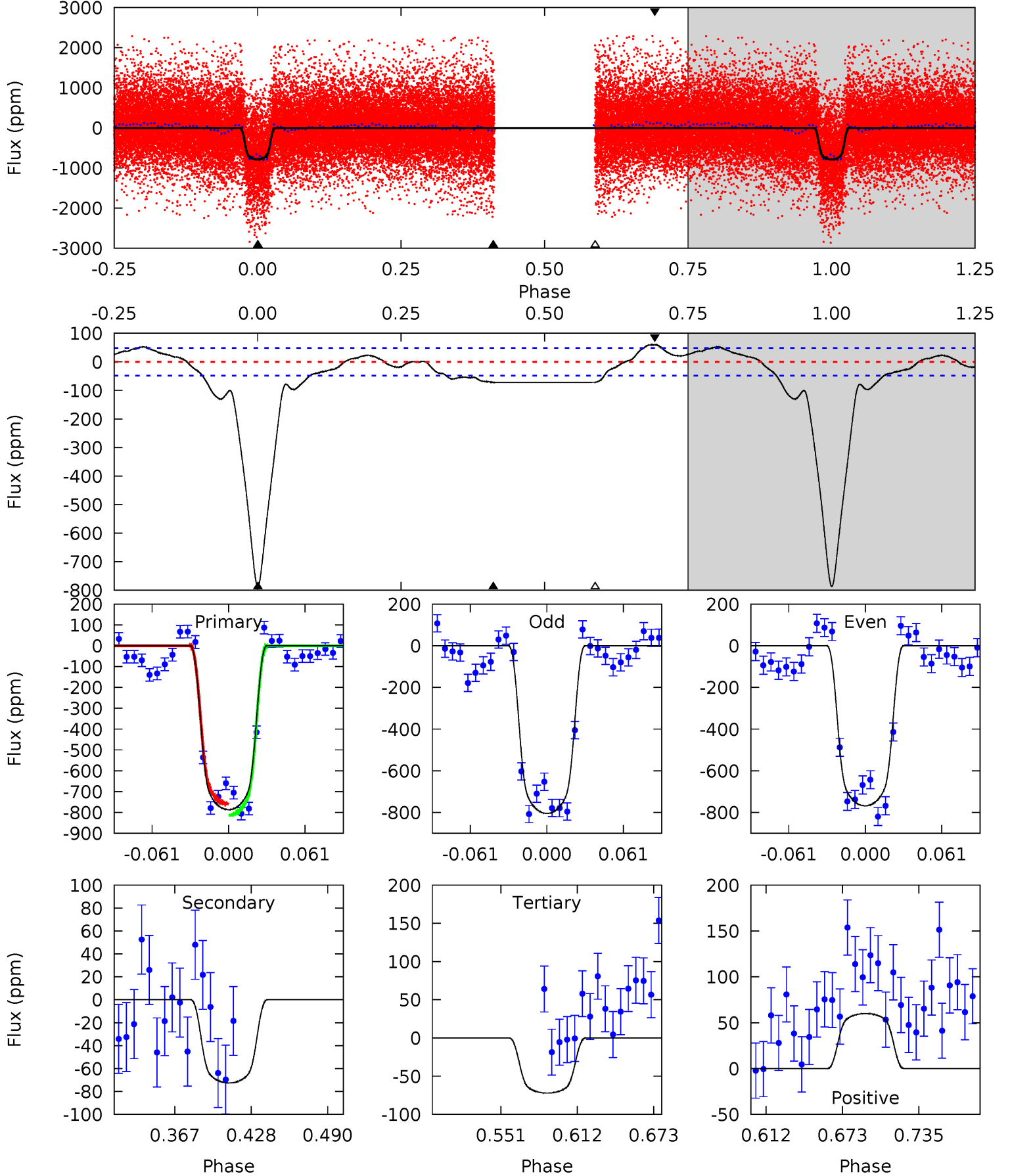
TCE 004840513-02   P= 2.379289 Days    $T_0=132.460109$  (BKJD)



# DV Model-Shift Uniqueness Test

004840513-02, P = 2.379277 Days, E = 130.083682 Days

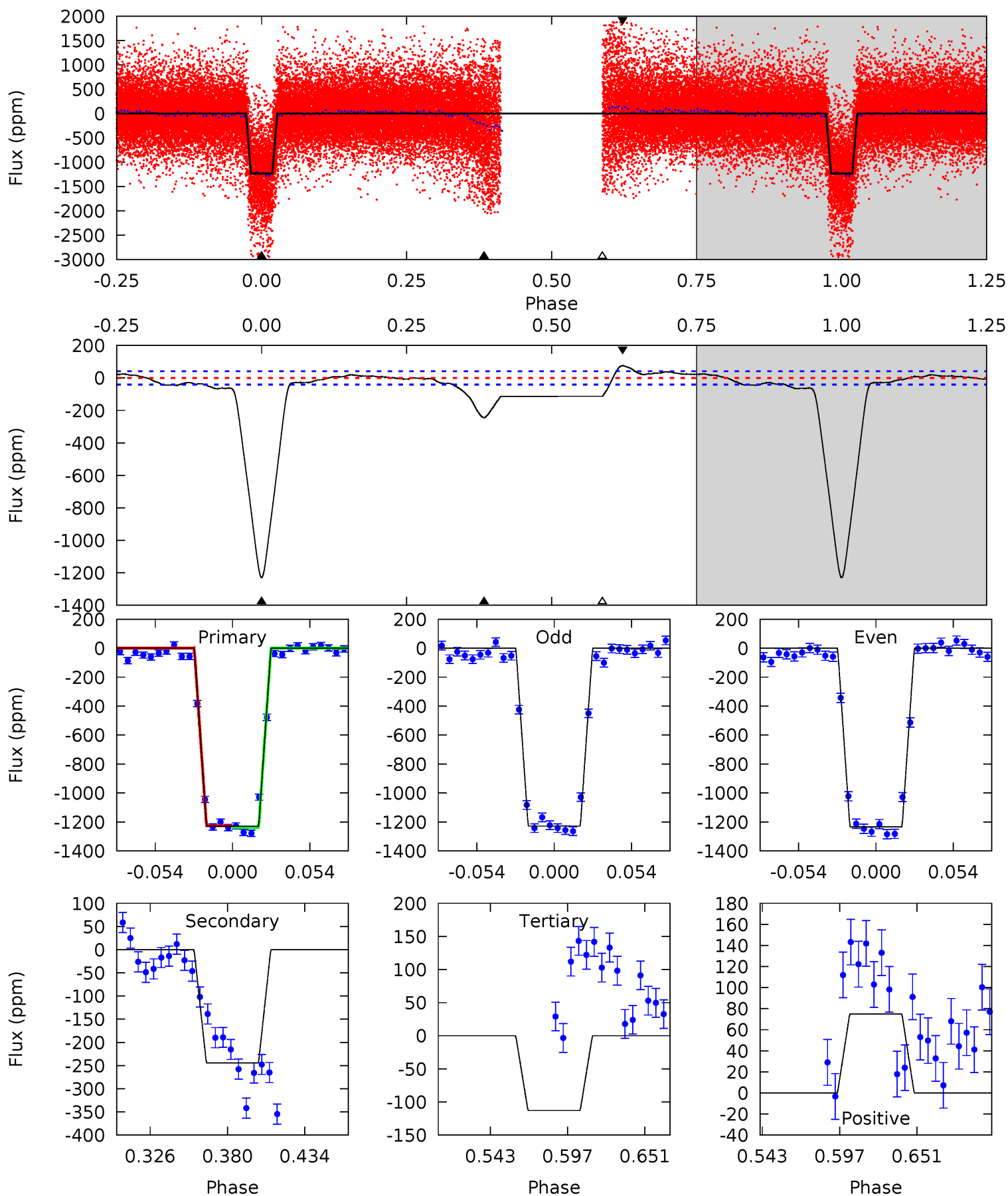
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
75.6	6.98	6.93	5.77	4.67	1.87	4.08	68.7	69.9	0.04	1.21	1.75	1.00	0.07	2.69



# Alt Model-Shift Uniqueness Test

004840513-02, P = 2.379289 Days, E = 130.080820 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
140.4	27.9	12.9	8.56	4.69	1.92	3.63	127.5	131.8	15.0	19.3	0.31	1.04	0.06	0.75





### Stellar Parameters For KIC 004840513

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$6392^{+153}_{-230}$	$4.399^{+0.054}_{-0.216}$	$0.070^{+0.250}_{-0.350}$	$1.162^{+0.369}_{-0.132}$	$1.232^{+0.167}_{-0.184}$	$1.107^{+0.322}_{-0.594}$
	+2%/-4%	+1%/-5%	+357%/-500%	+32%/-11%	+14%/-15%	+29%/-54%
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 004840513-02 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$-73 \pm 10$	$3.89^{+0.71}_{-0.36}$	$2240^{+167}_{-116}$	$3731^{+132}_{-136}$	$3.488^{+0.948}_{-0.921}$
Alt.	$-244 \pm 9$	$4.56^{+0.79}_{-0.40}$	$2240^{+163}_{-107}$	$4417^{+117}_{-113}$	$8.726^{+1.648}_{-2.047}$

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

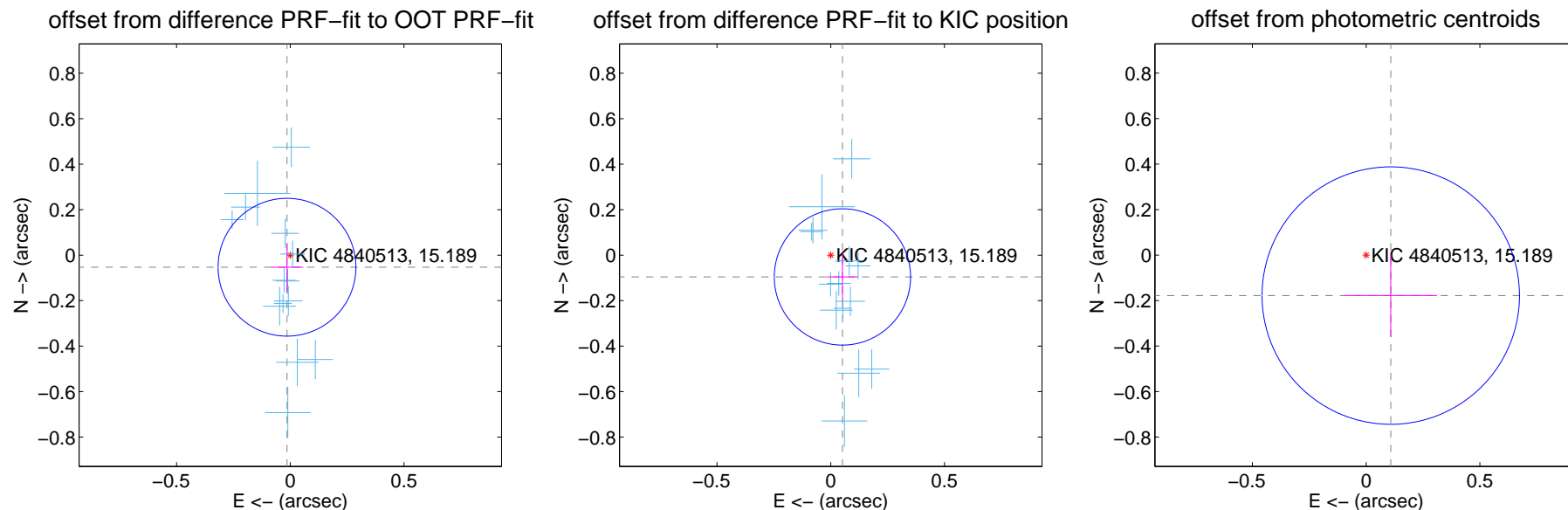
## DV Centroid Data

Supplemental centroid analysis for 004840513-02. Kepler magnitude: 15.19. Transit SNR 43.04

There are 14 quarters with good PRF difference image offsets

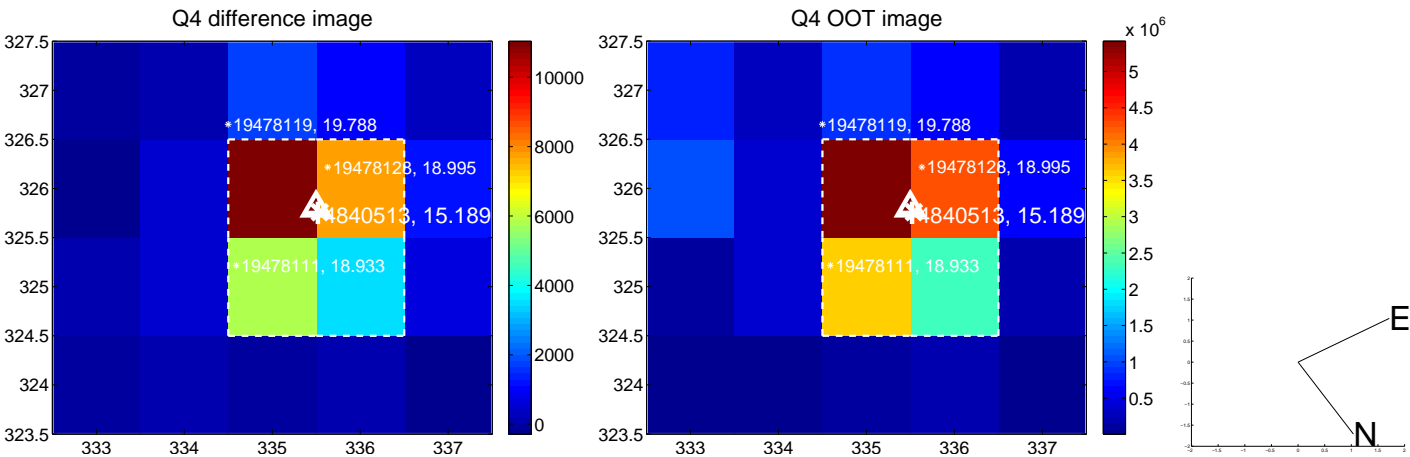
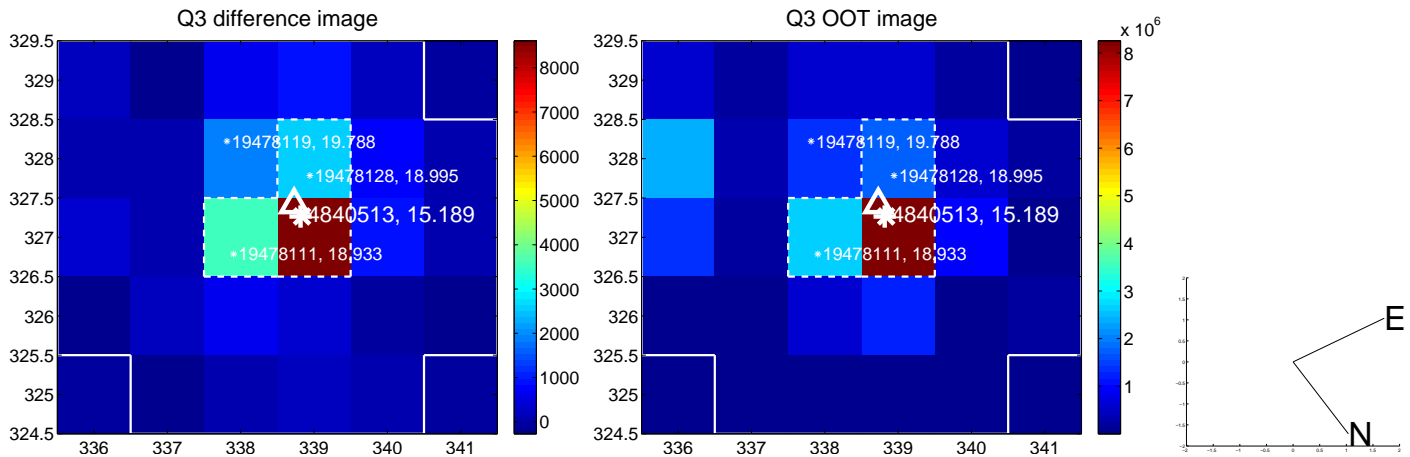
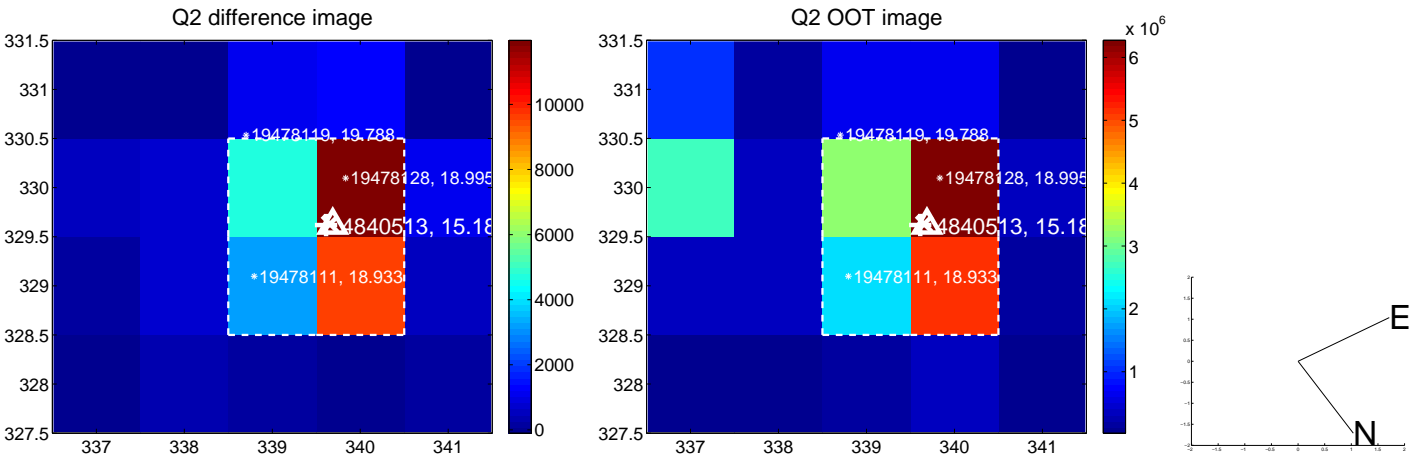
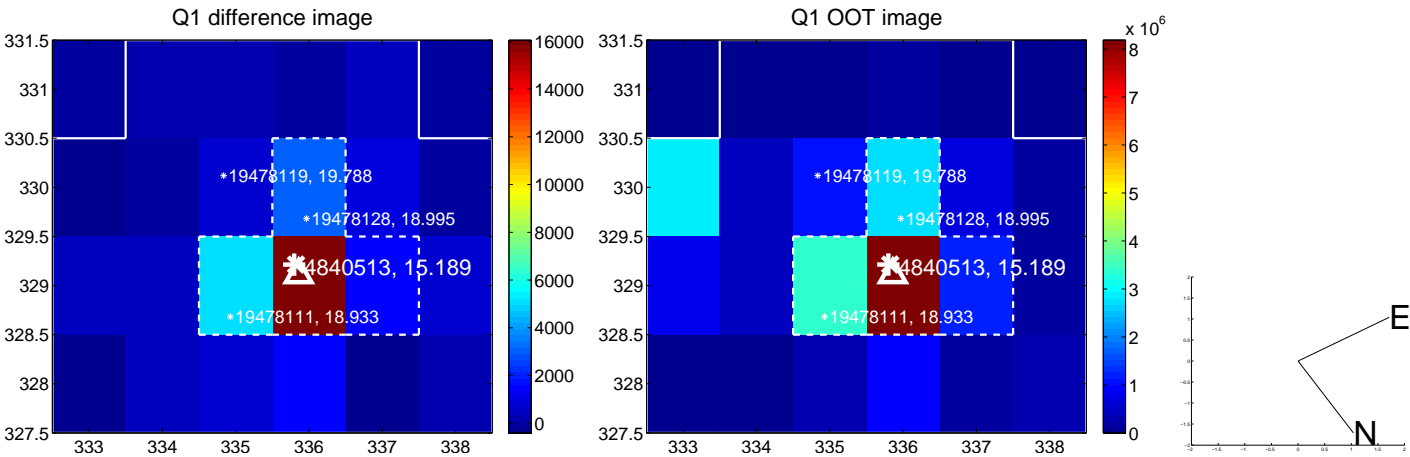
The direct PRF centroid is offset from the target star catalog position by about 0.12 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.055 \pm 0.101$	0.54	$0.014 \pm 0.071$	$-0.053 \pm 0.105$
PRF-fit source offset from KIC position	$0.109 \pm 0.100$	1.09	$-0.051 \pm 0.070$	$-0.096 \pm 0.103$
photometric centroid source offset	$0.21 \pm 0.19$	1.10	$-0.11 \pm 0.20$	$-0.18 \pm 0.18$

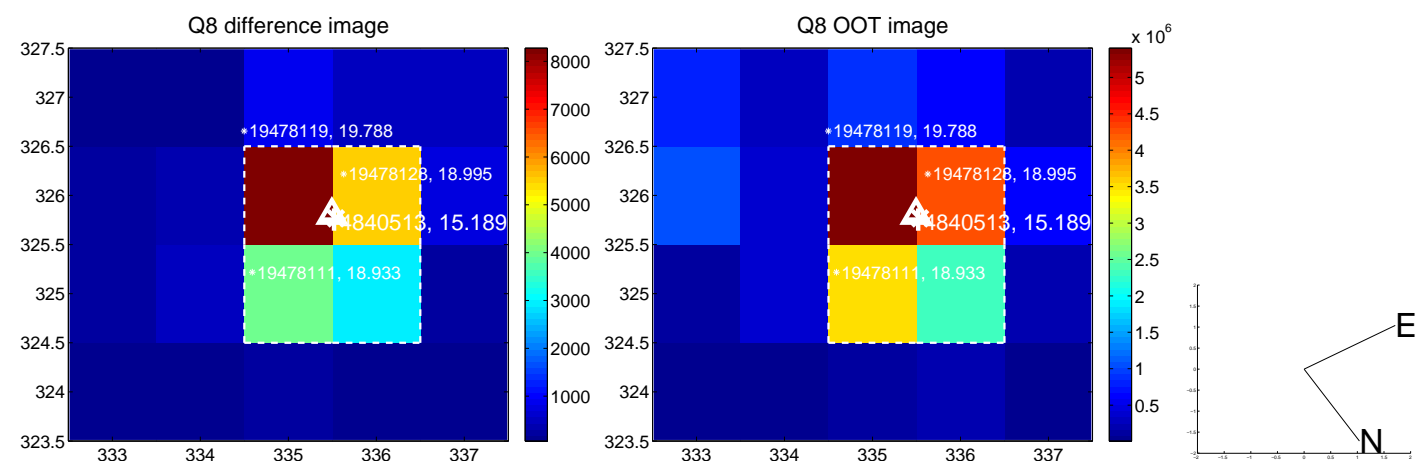
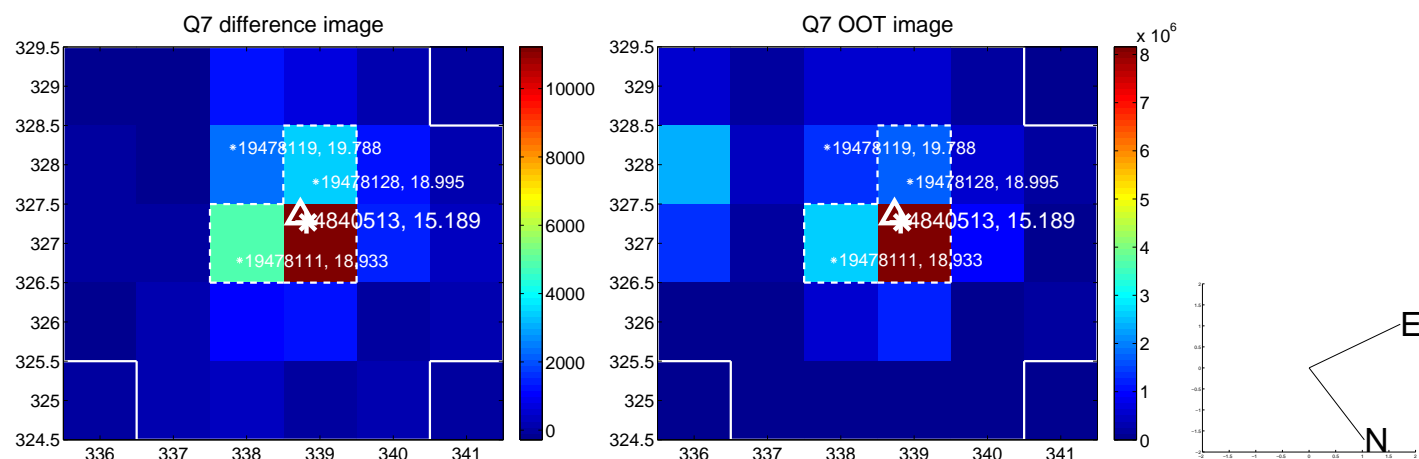
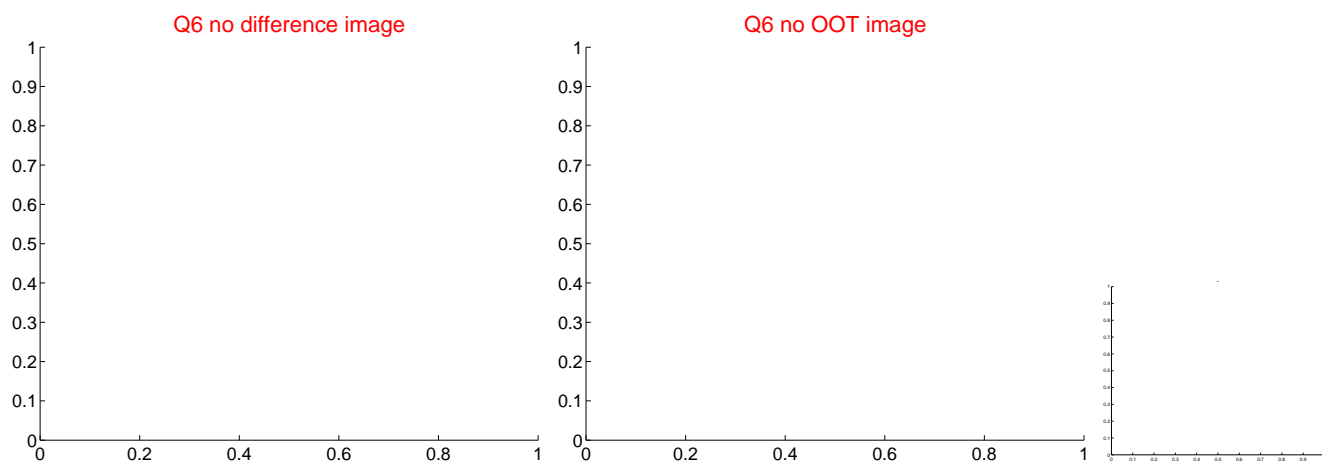
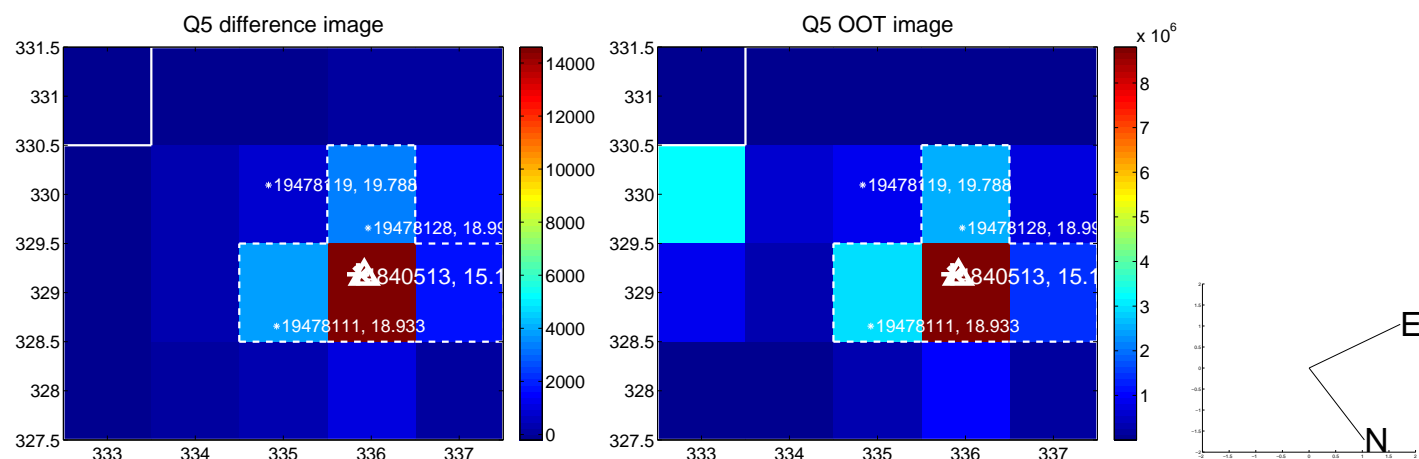


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses:** good quarterly centroid offsets; **Vermillion crosses:** bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

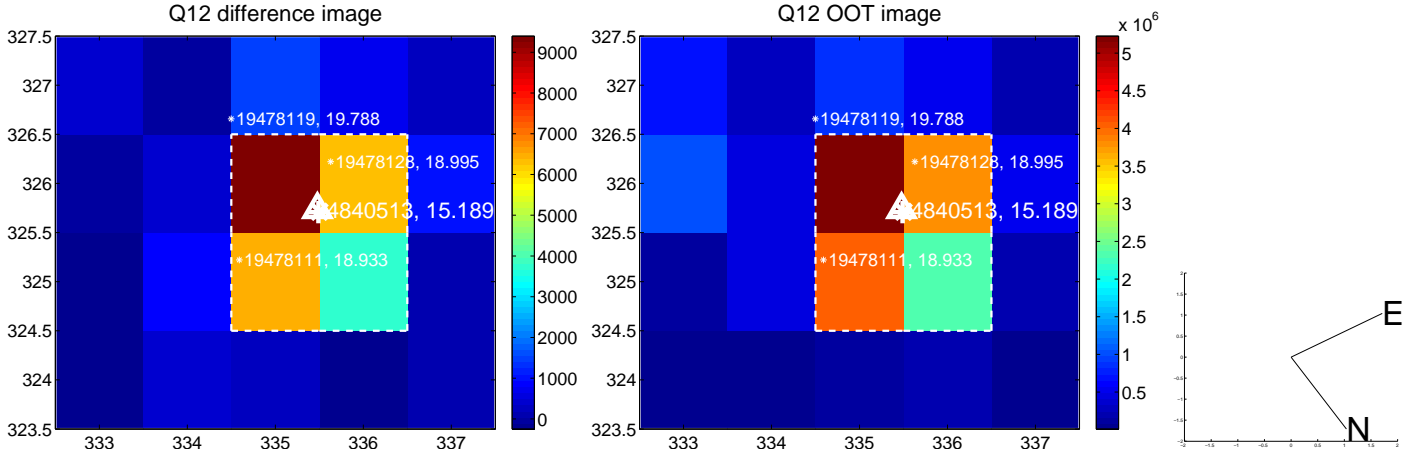
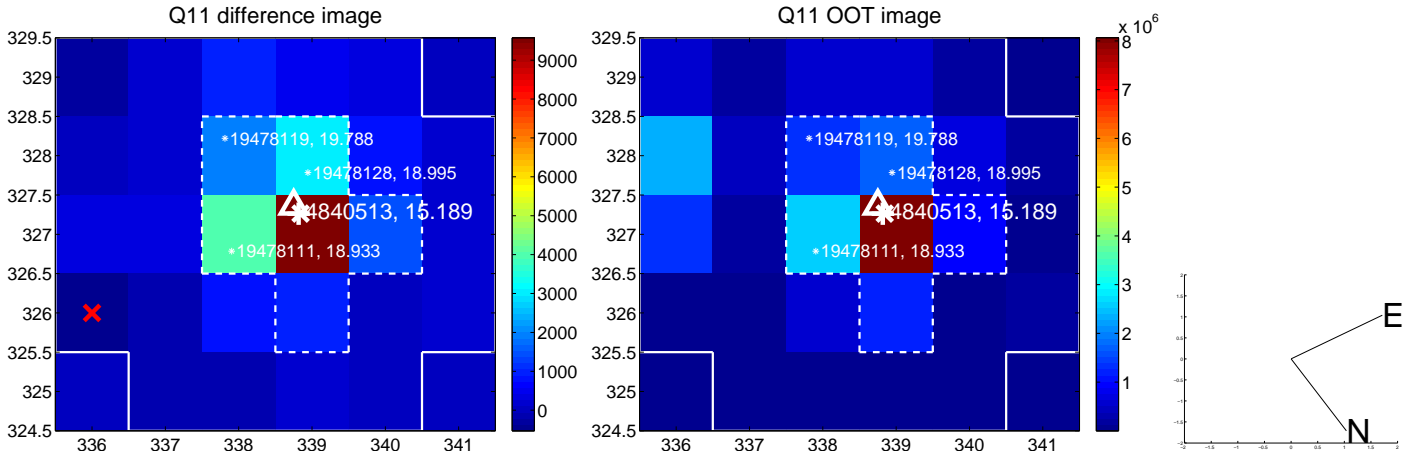
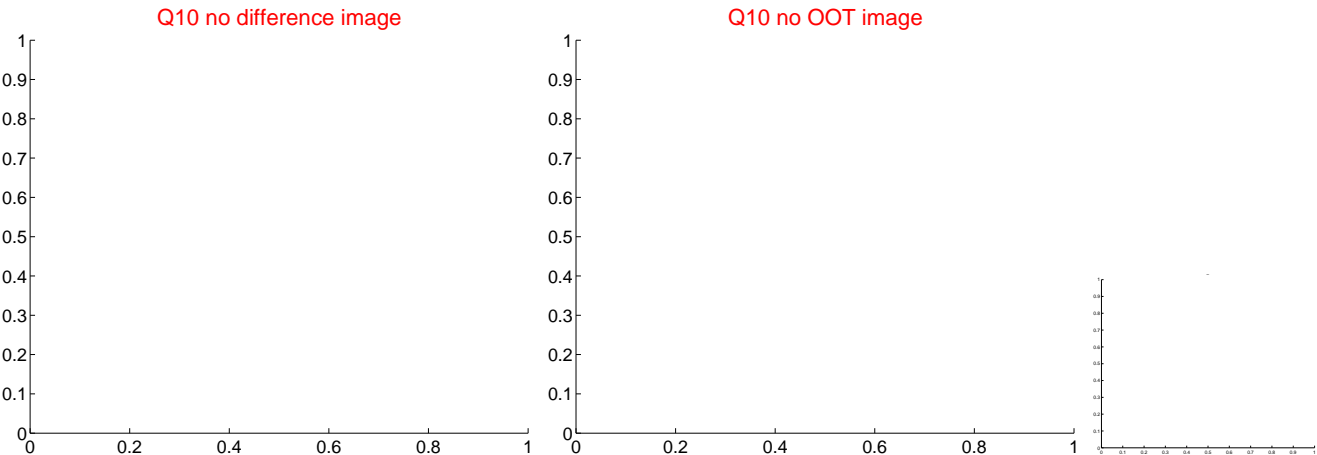
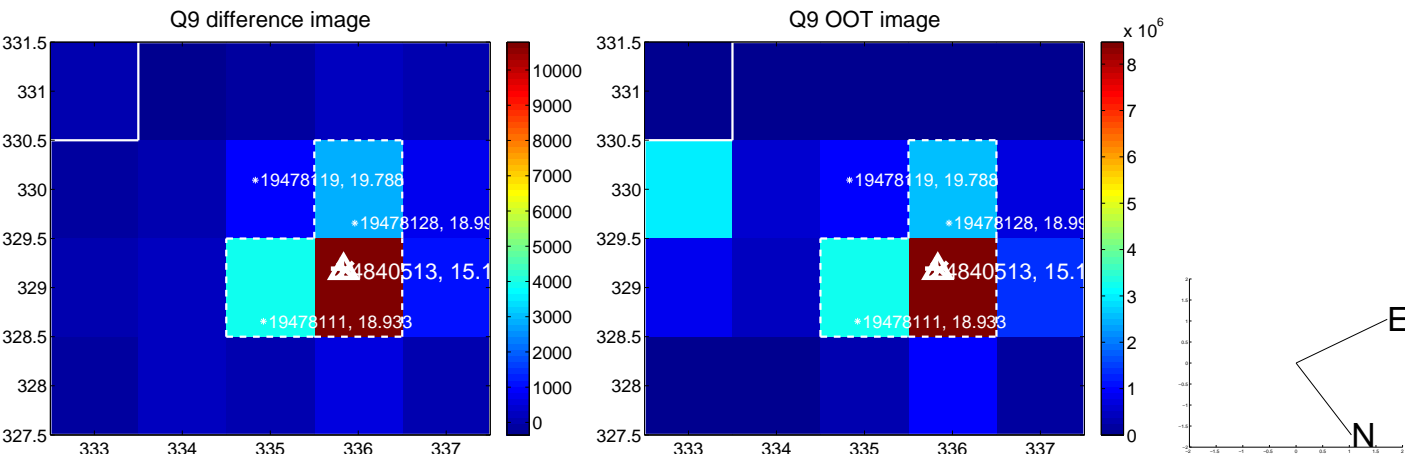
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



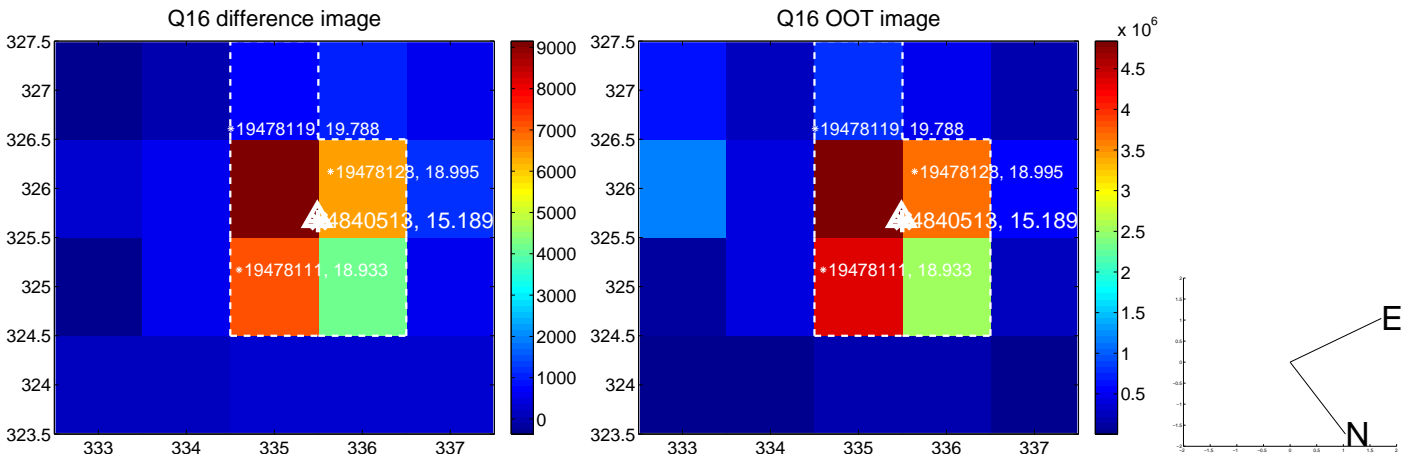
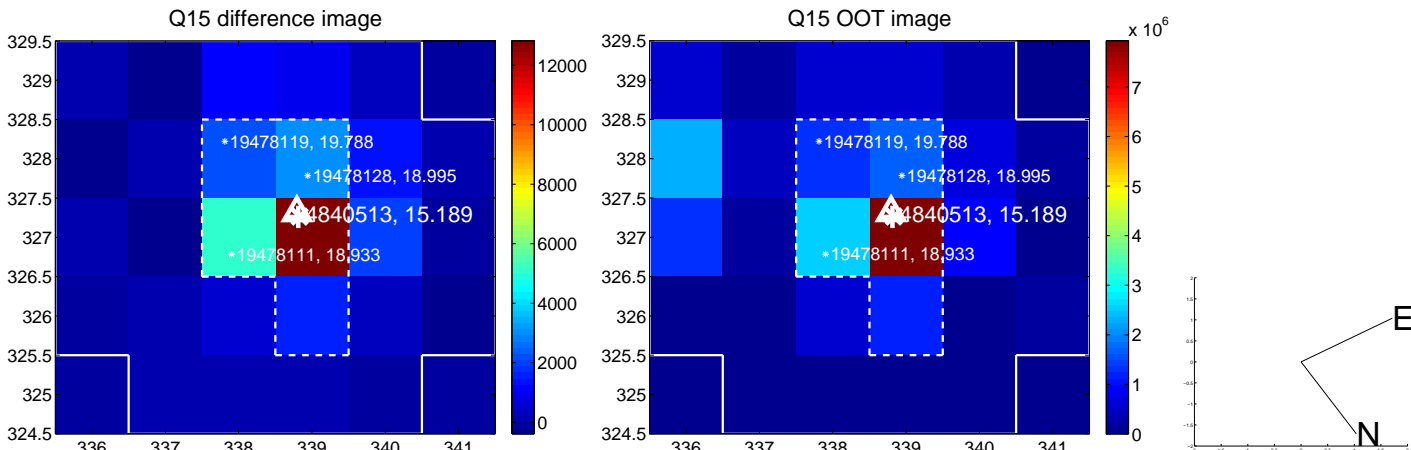
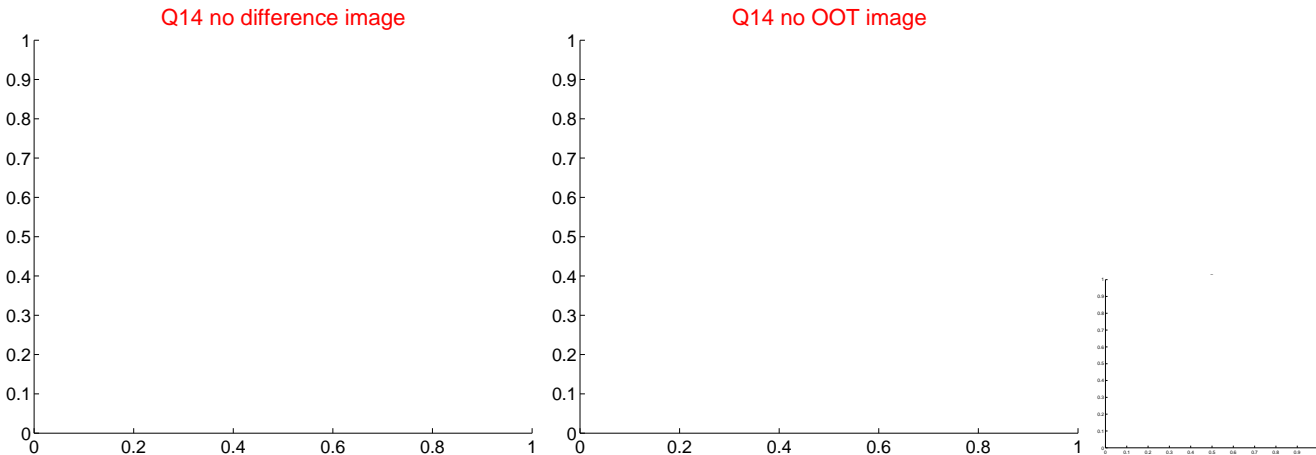
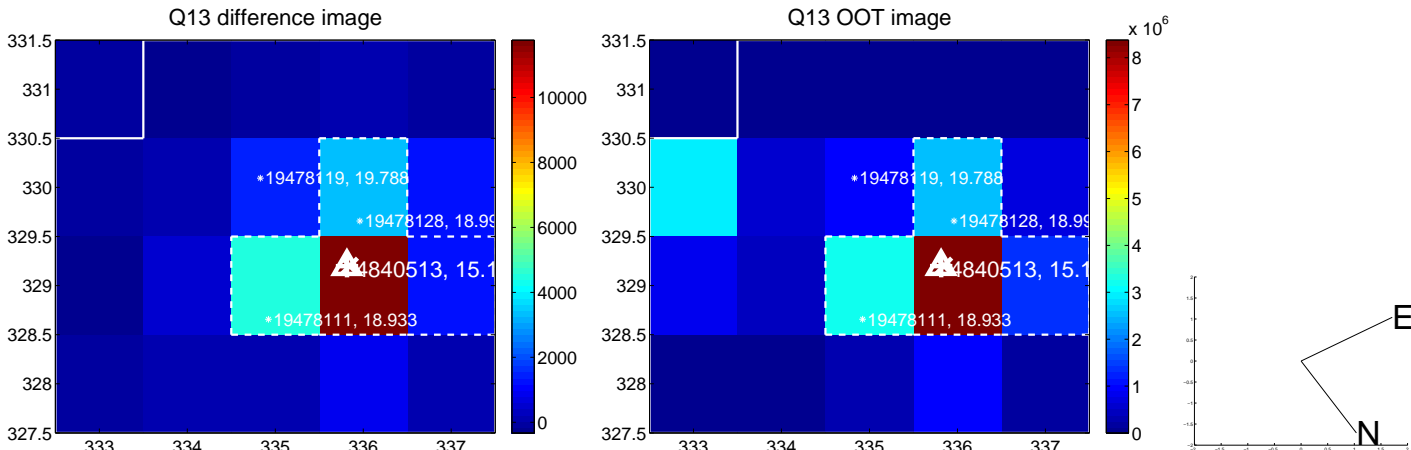
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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



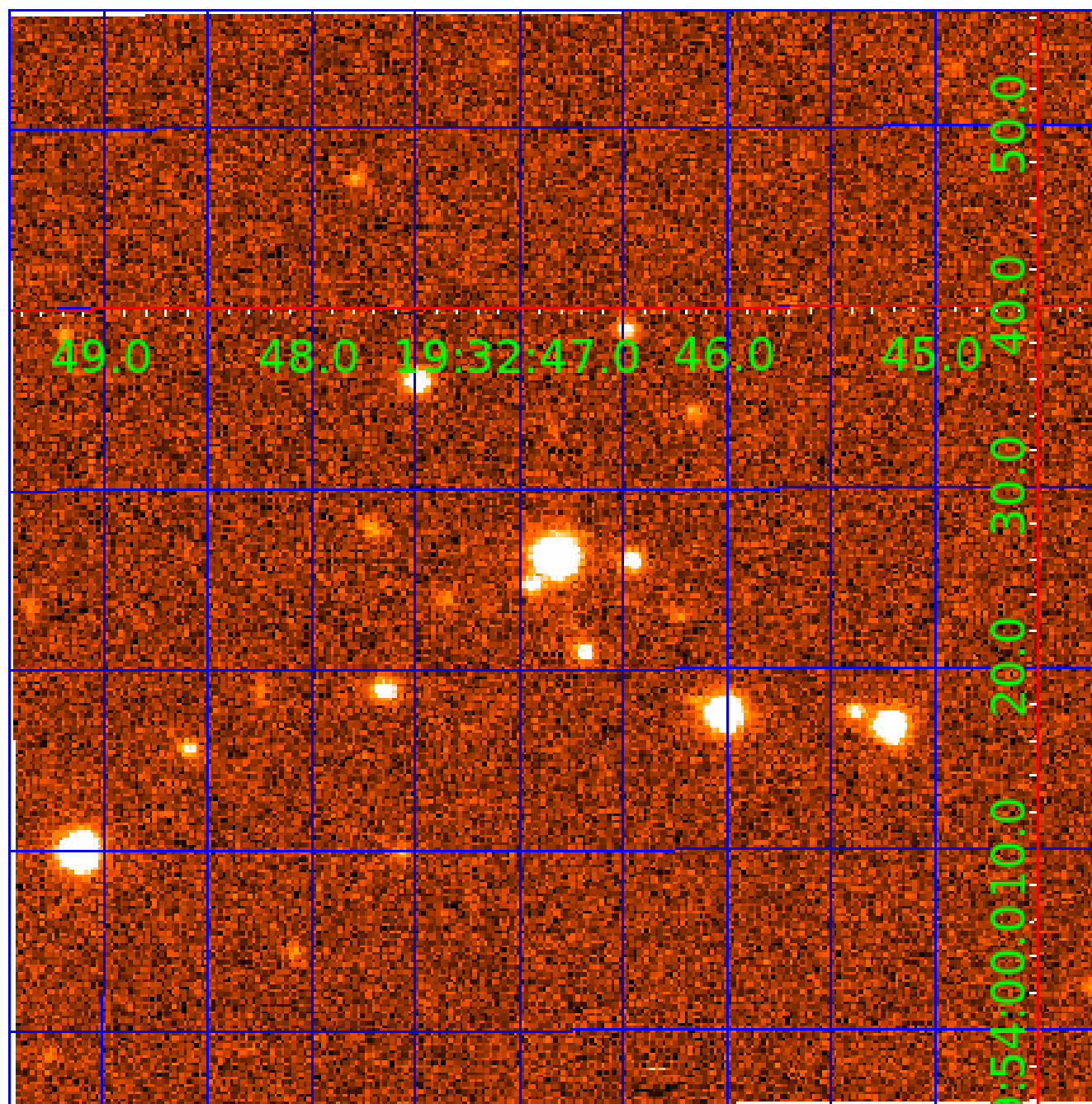
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value





UKIRT Image

Declination





# KIC 004840513

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
004840513-01	OBS	1541.01	2.379283	133.651248	48605.1	3.182	2697.5	2158.6	1.16	6392	25.82	1442.06
004840513-02	OBS	No	2.379277	132.462958	766.4	3.050	37.5	43.0	1.16	6392	3.78	1442.07
004840513-03	OBS	No	87.703474	200.587777	1199.6	9.041	7.6	5.2	1.16	6392	5.39	11.76
004840513-04	OBS	No	600.749090	198.851996	3627.1	10.292	7.6	7.1	1.16	6392	12.80	0.90
004840513-05	OBS	No	631.697123	201.200422	1783.9	4.642	8.5	6.6	1.16	6392	9.20	0.84

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
004840513-01	OBS	PC	0.76	0	1	0	0	MOD_SEC_DV—PLANET_OCCULT_DV—MOD_SEC_ALT—HAS_SEC_TCE
004840513-02	OBS	FP	0.00	1	1	0	0	IS_SEC_TCE
004840513-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_SKYE—TRANS_GAPPED—LPP_DV—MOD_NONUNIQ_ALT
004840513-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_CHASES—LPP_DV—ALL_TRANS_CHASES—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS
004840513-05	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_CHASES_MARSHALL—LPP_DV—ALL_TRANS_CHASES—MOD_TER_DV—MOD_POS_DV—CENT_FEW_DIFFS

**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.

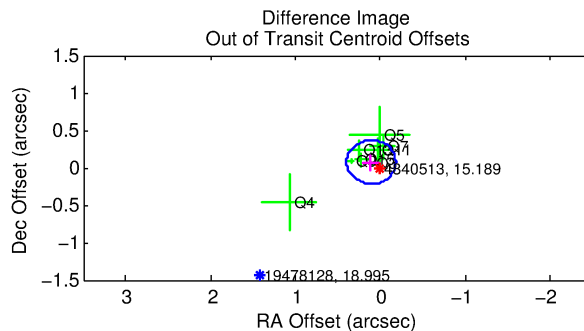
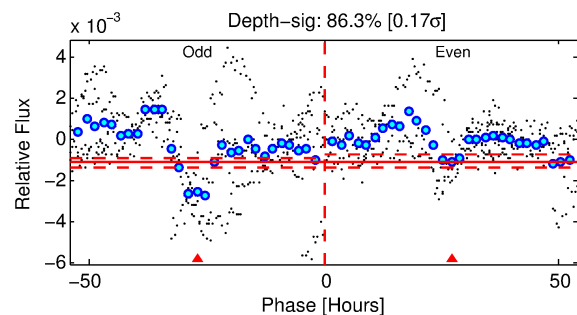
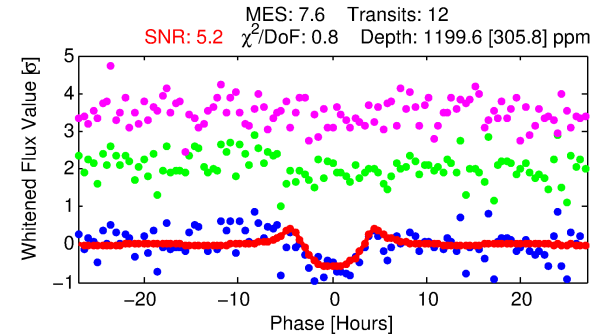
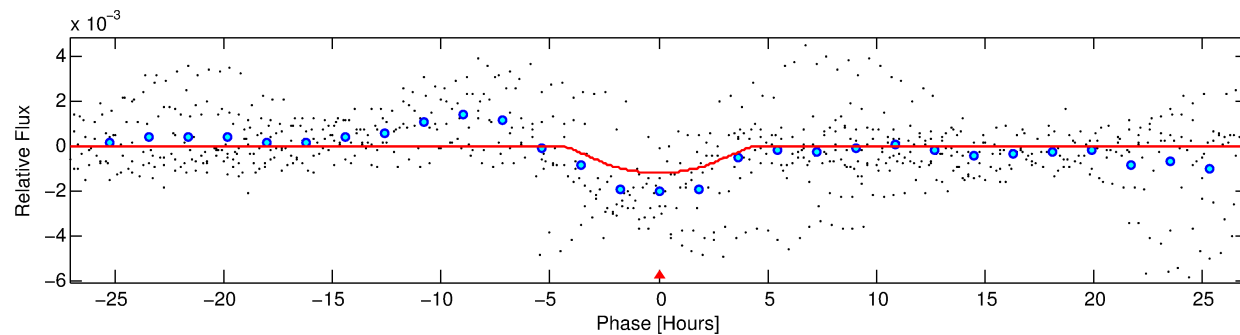
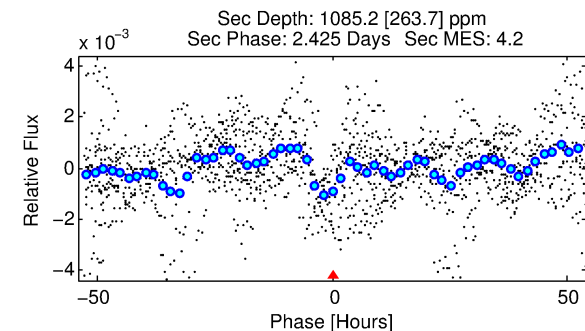
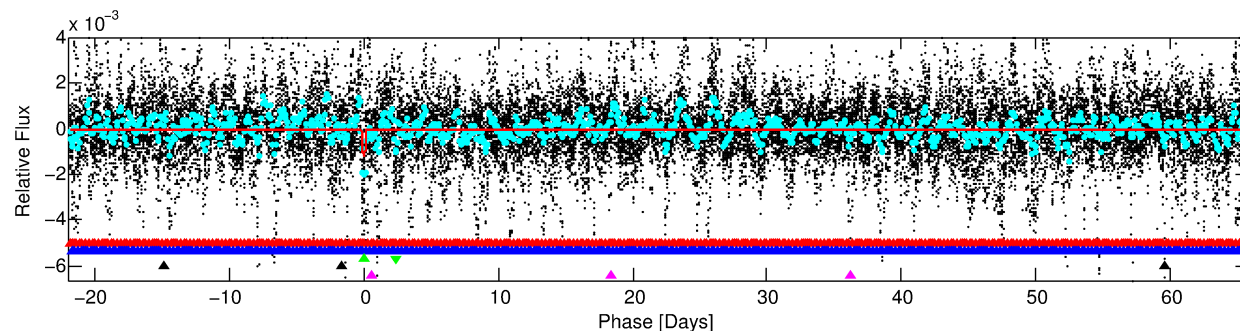
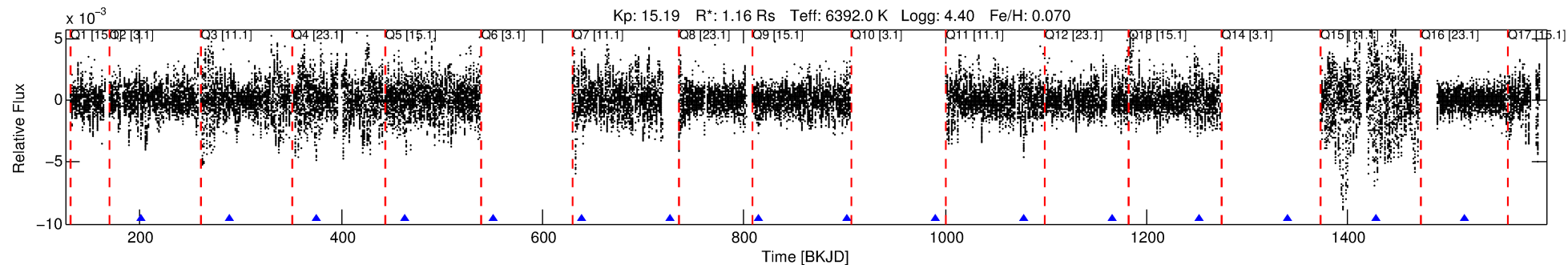
## Ephemeris Match Information For 004840513-03

No Significant Match Found

# DV One-Page Summary

KIC: 4840513 Candidate: 3 of 5 Period: 87.703 d  
KOI: K01541 Corr: No Ephemeris Match

Kp: 15.19 R\*: 1.16 Rs Teff: 6392.0 K Logg: 4.40 Fe/H: 0.070



## DV Fit Results:

Period = 87.70347 [0.00239] d  
Epoch = 200.5878 [0.0224] BKJD  
Rp/R\* = 0.0425 [0.0158]  
a/R\* = 28.80 [6.15]  
b = 0.97 [0.04]  
Seff = 11.76 [4.92]  
Teq = 472 [49] K  
Rp = 5.39 [2.63] Re  
a = 0.4145 [0.1115] AU  
Ag = 3525.15 [3080.47] [1.14σ]  
Teffp = 5625 [1116] K [4.61σ]

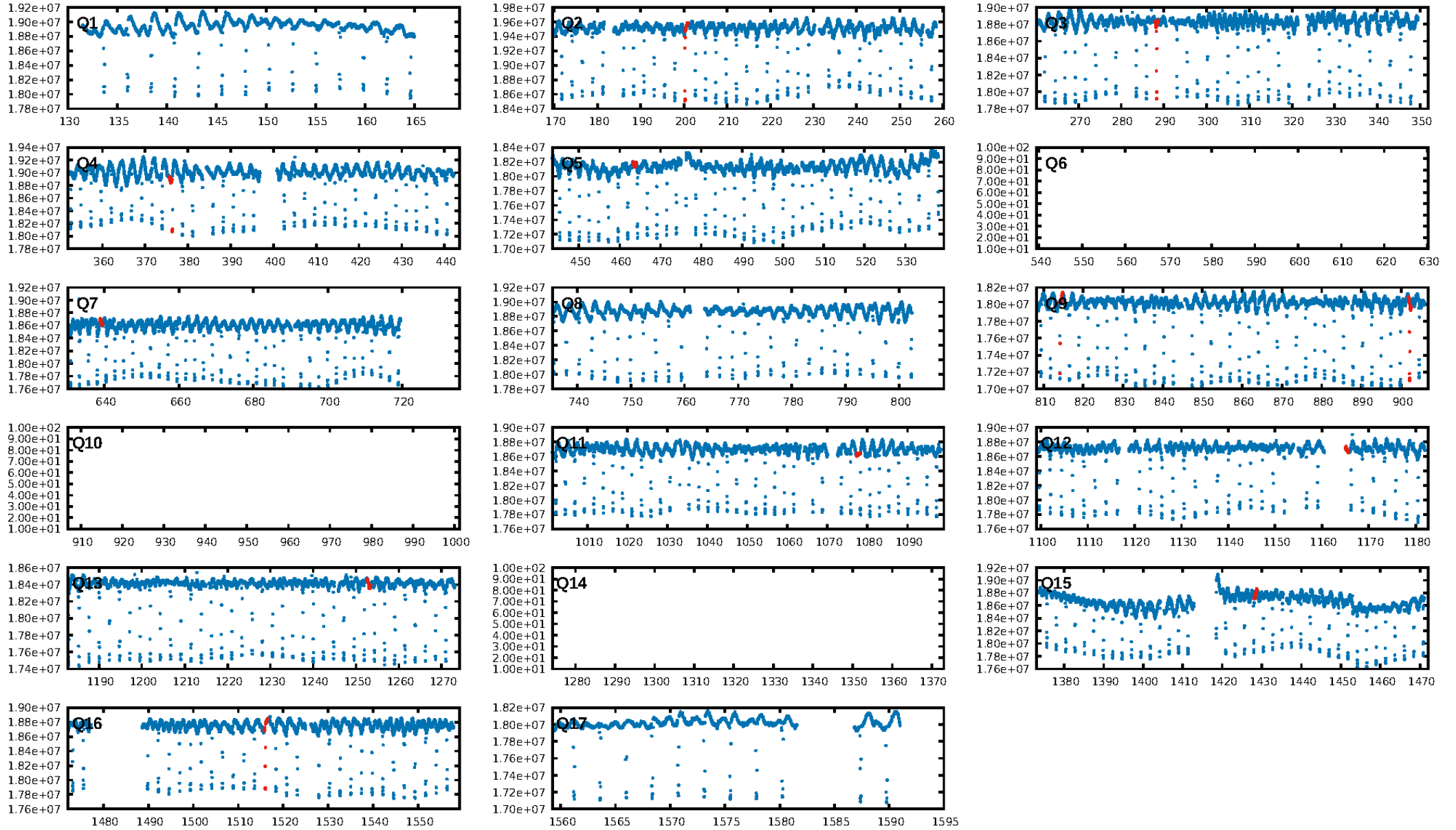
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [213.66σ]  
LongPeriod-sig: 100.0% [898.84σ]  
ModelChiSquare2-sig: 15.6%  
ModelChiSquareGof-sig: 100.0%  
**Bootstrap-pfa: 3.24e-11**  
RollingBand-fgt: 1.00 [12/12]  
**GhostDiagnostic-chr: -3.128**  
Centroid-sig: 1.2%  
Centroid-so: 0.985 arcsec [1.51σ]  
OotOffset-rm: 0.129 arcsec [1.33σ]  
KicOffset-rm: 0.043 arcsec [0.31σ]  
OotOffset-st: 0/4/1/3 [8]  
KicOffset-st: 0/4/1/3 [8]  
DiffImageQuality-fgm: 0.50 [4/8]  
DiffImageOverlap-fno: 0.00 [0/8]

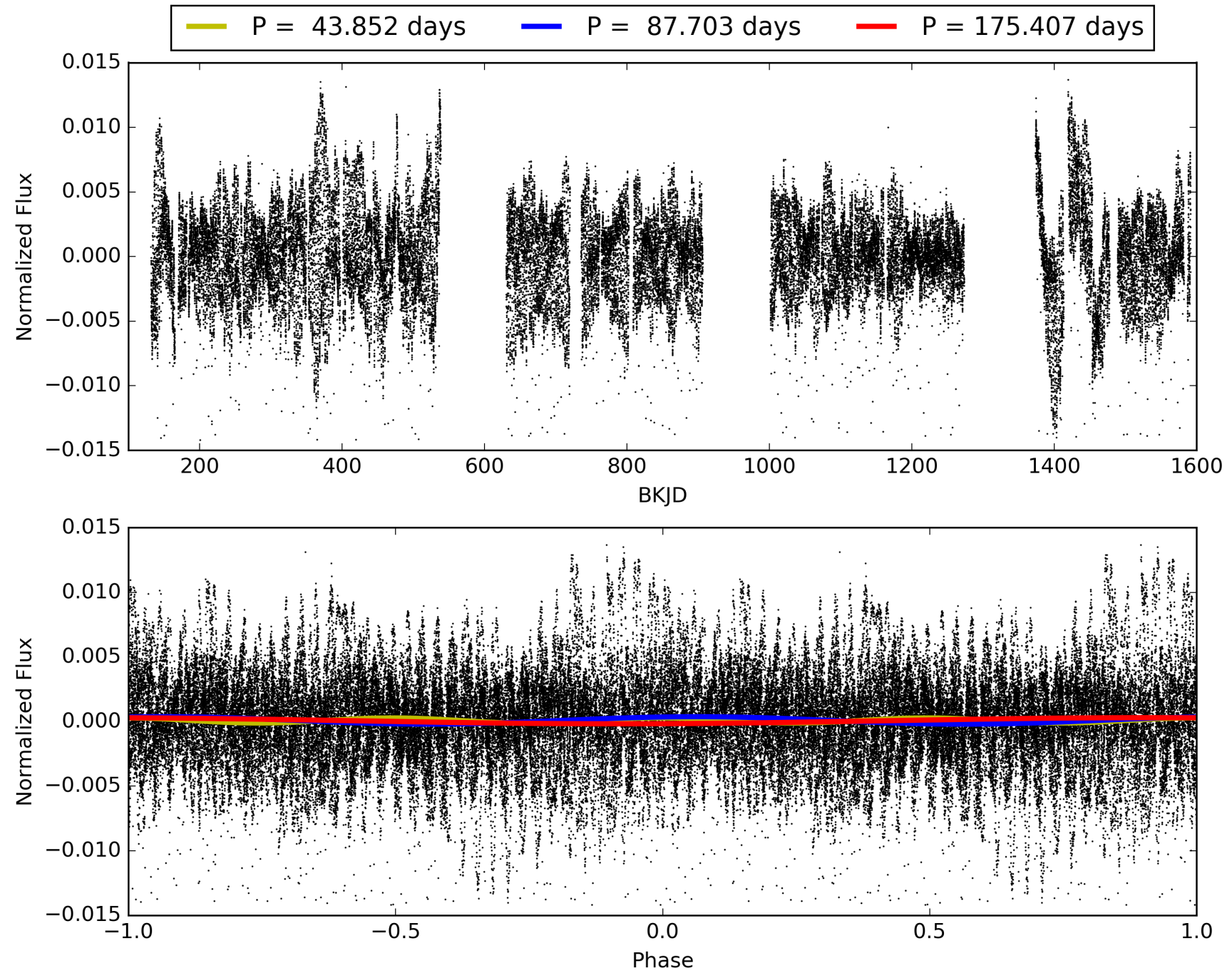
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 01-Feb-2016 11:28:04 Z

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

# TCE 004840513-03, PDC Light Curves

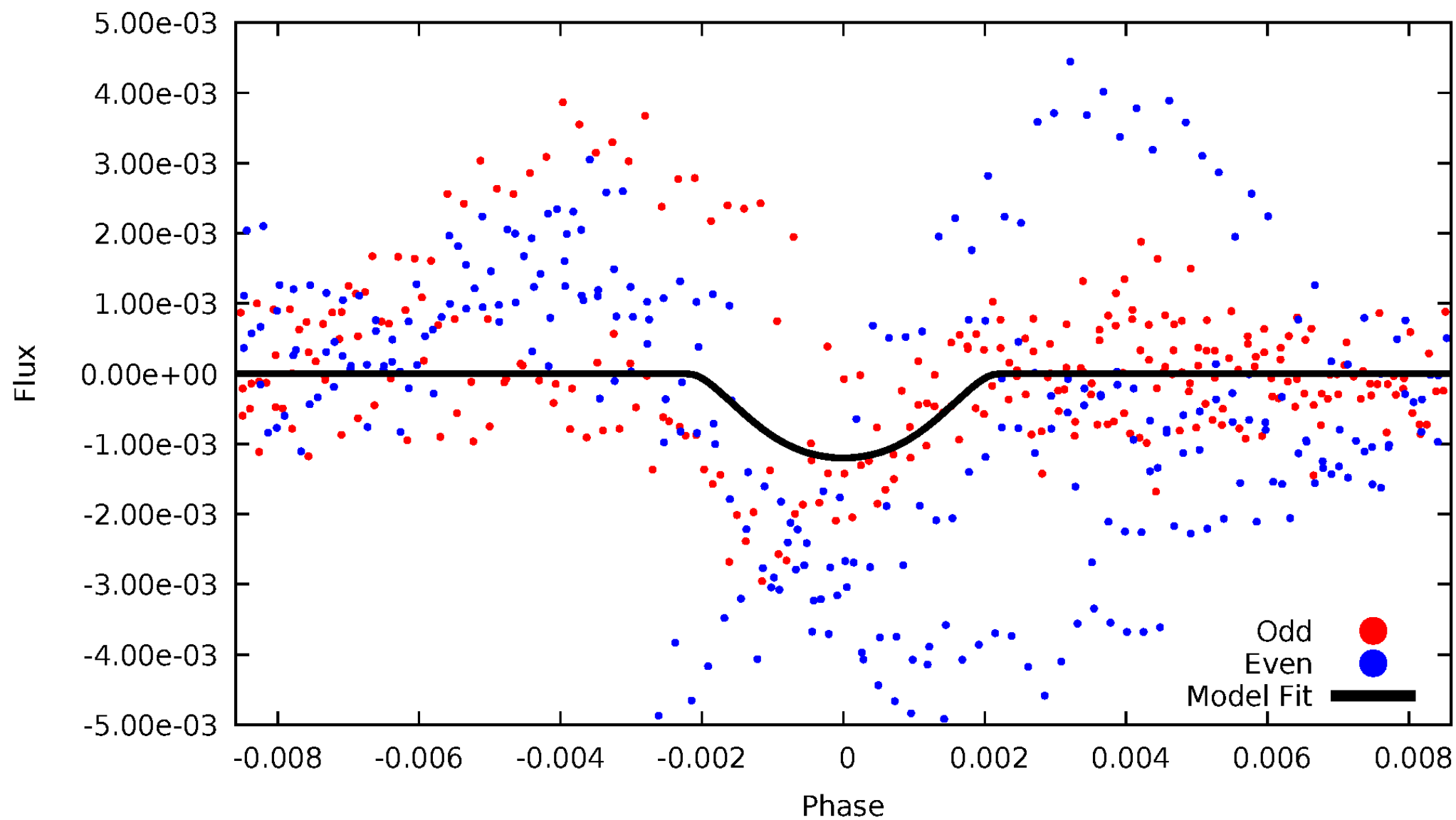


# TCE 004840513-03



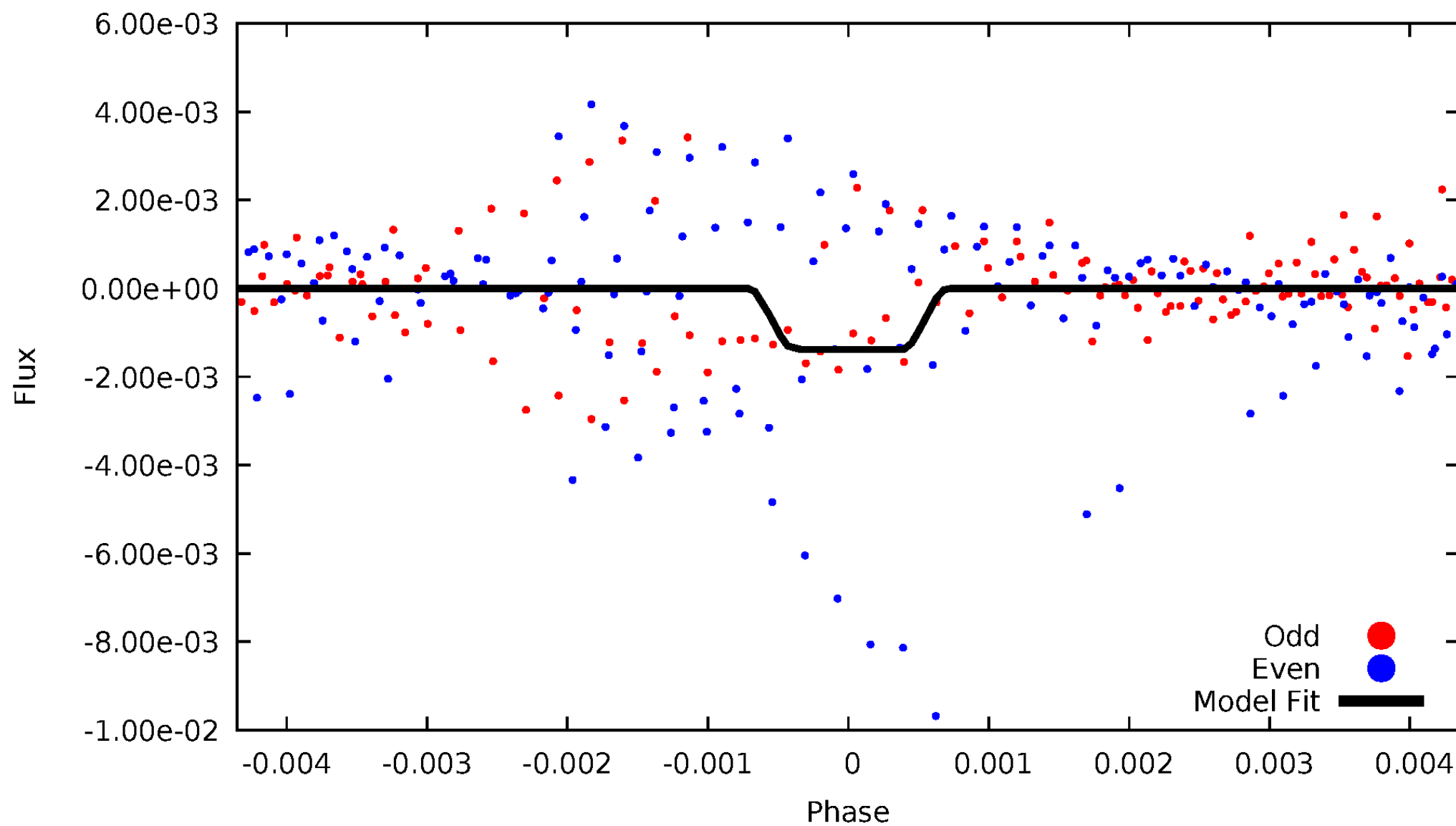
# DV Odd/Even

TCE 004840513-03



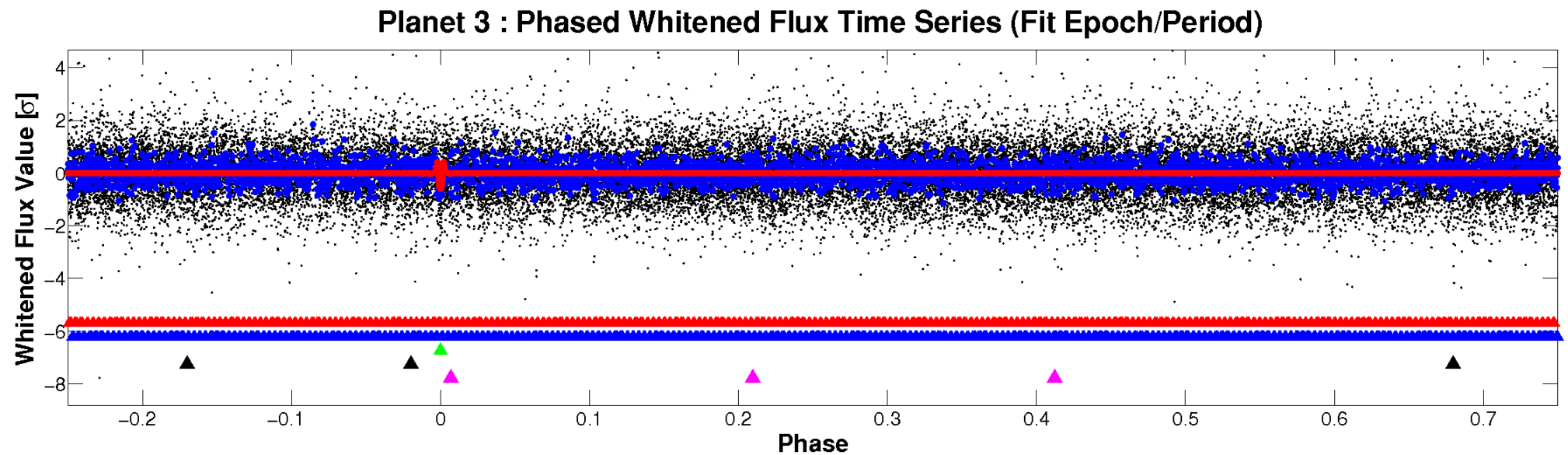
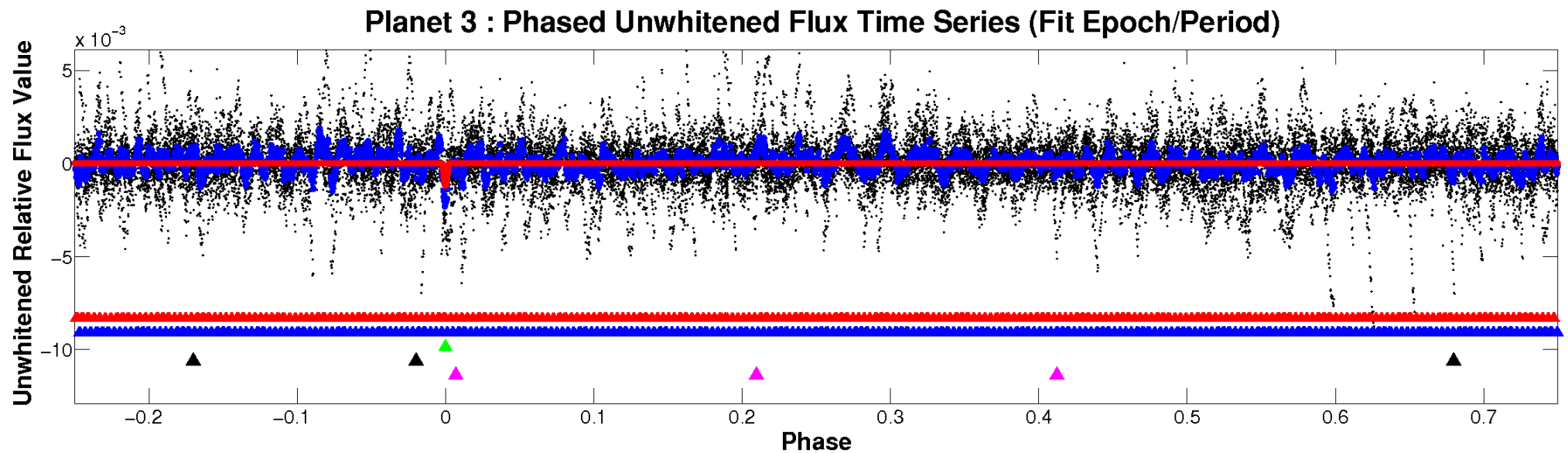
# ALT Odd/Even

TCE 004840513-03



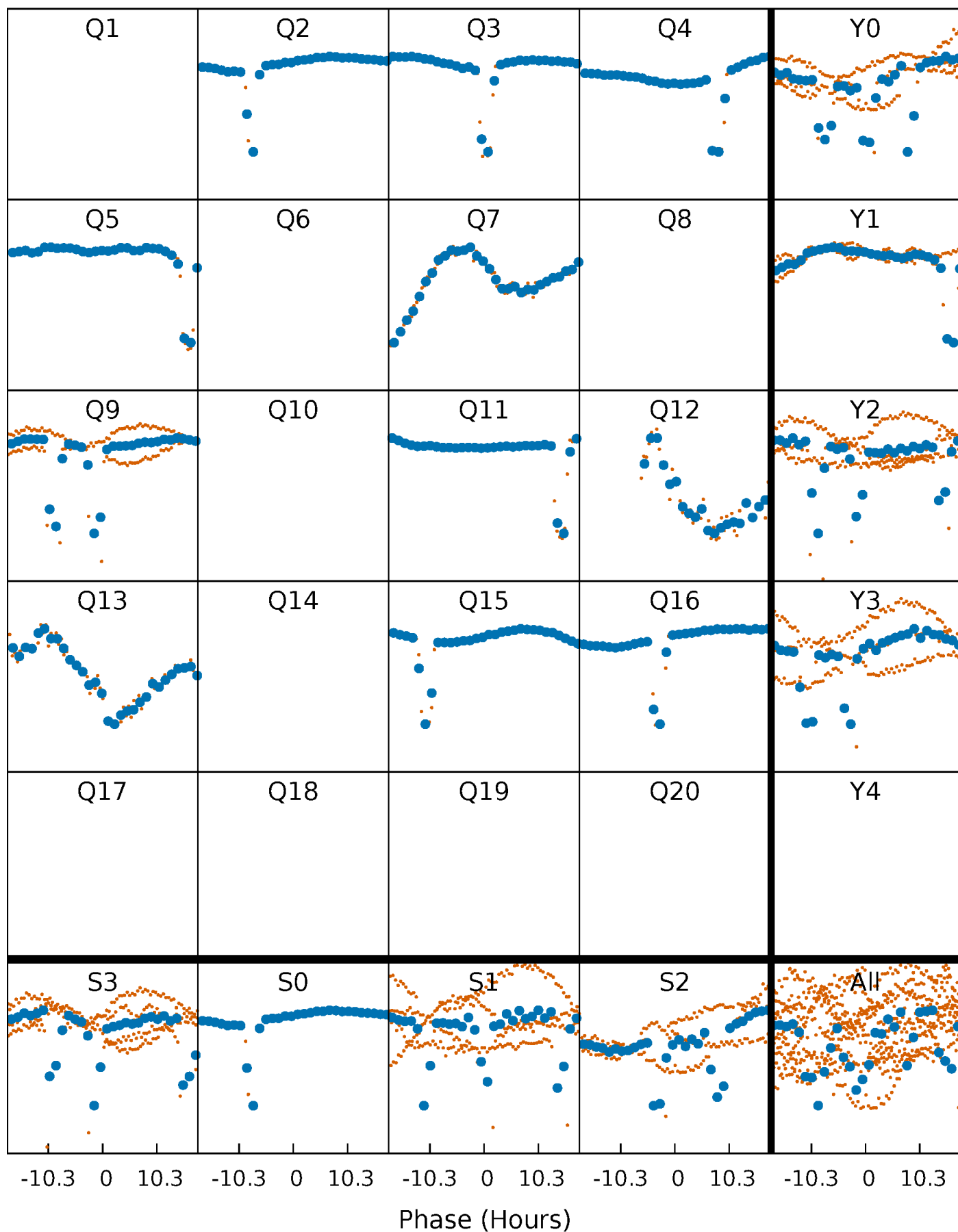


# Non-Whitened Vs. Whitened Light Curve



# PDC Quarter-Phased Transit Curves

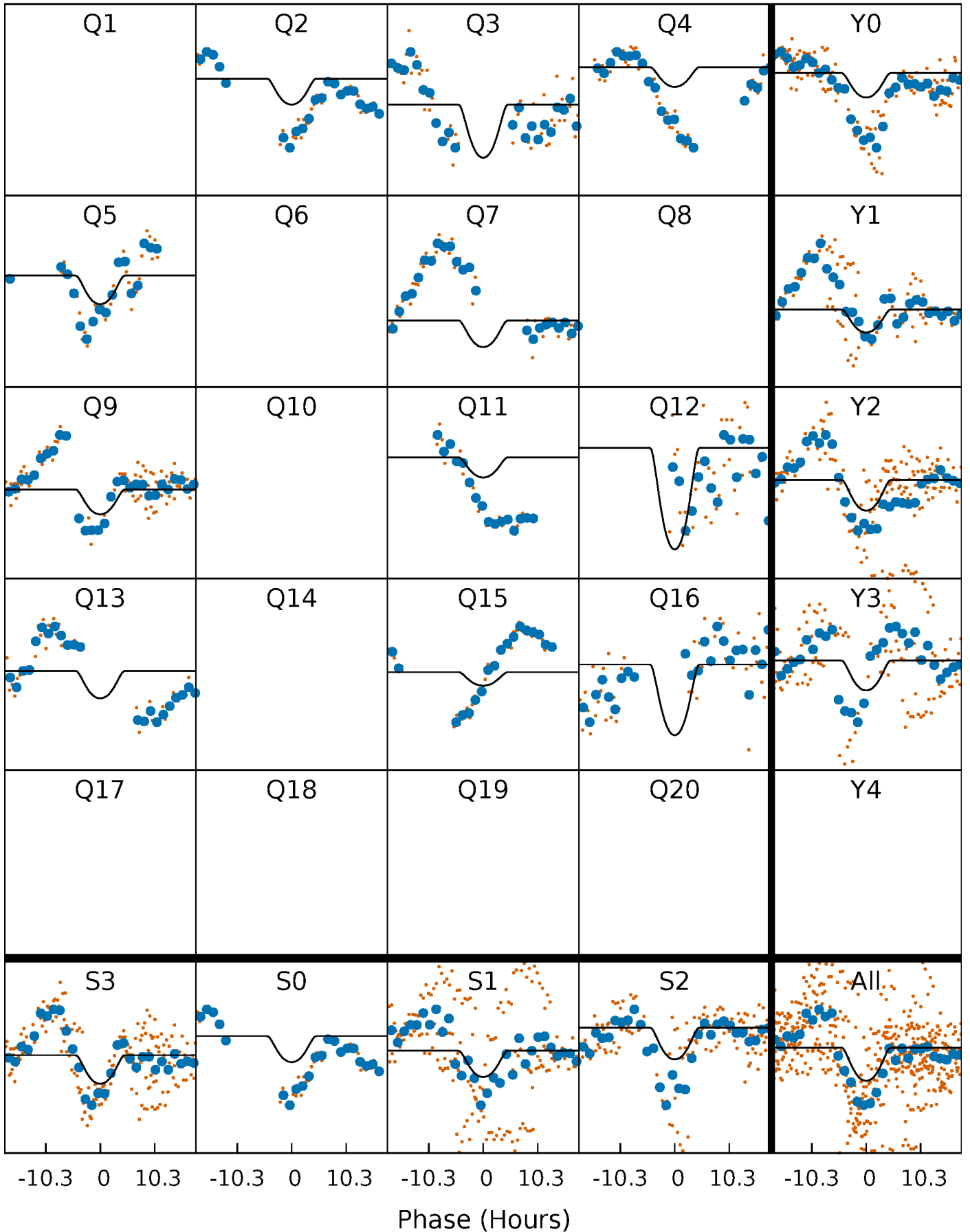
TCE 004840513-03 P= 87.703474 Days  $T_0=200.587777$  (BKJD)





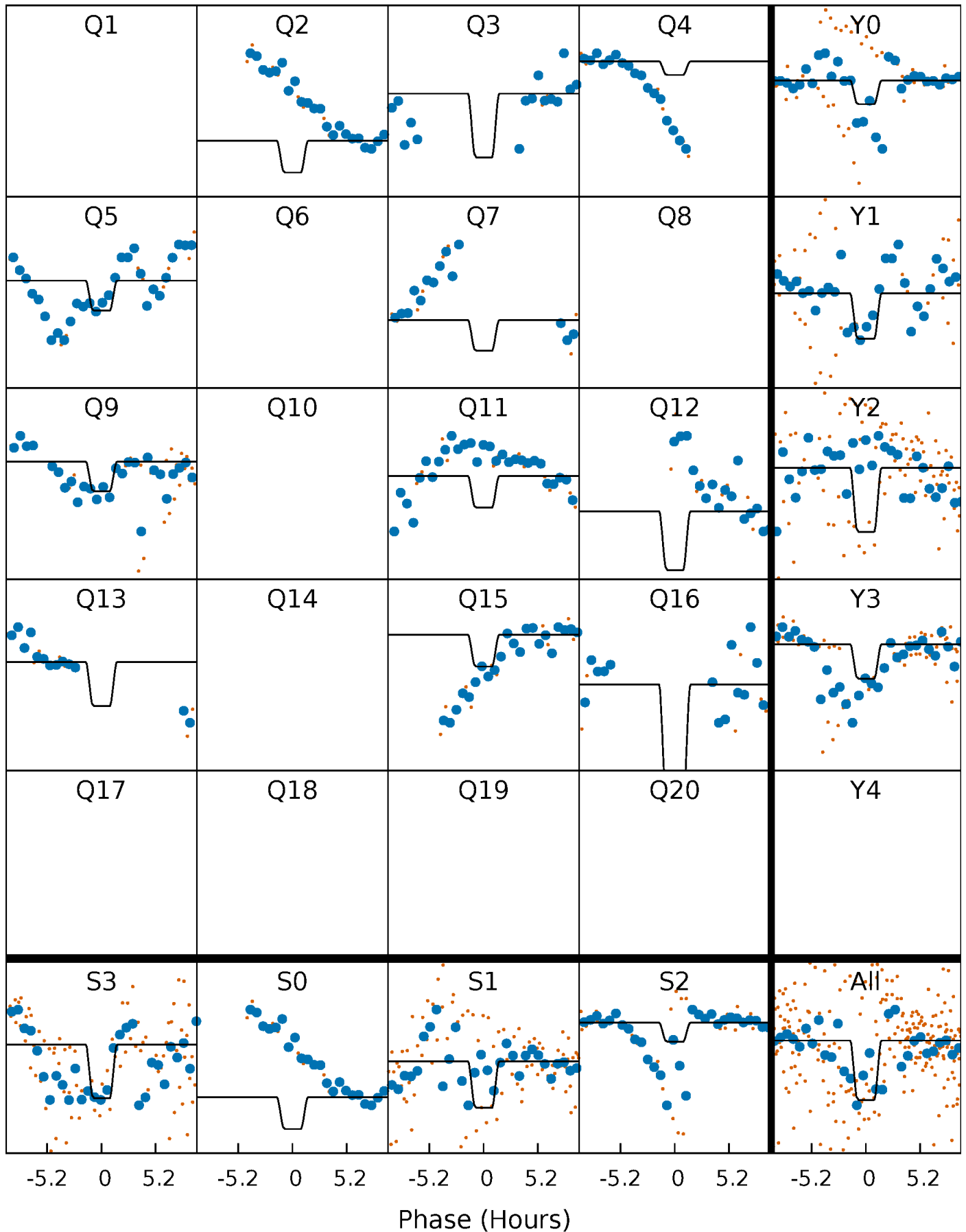
# DV Quarter-Phased Transit Curves

TCE 004840513-03   P= 87.703474 Days    $T_0=200.587777$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

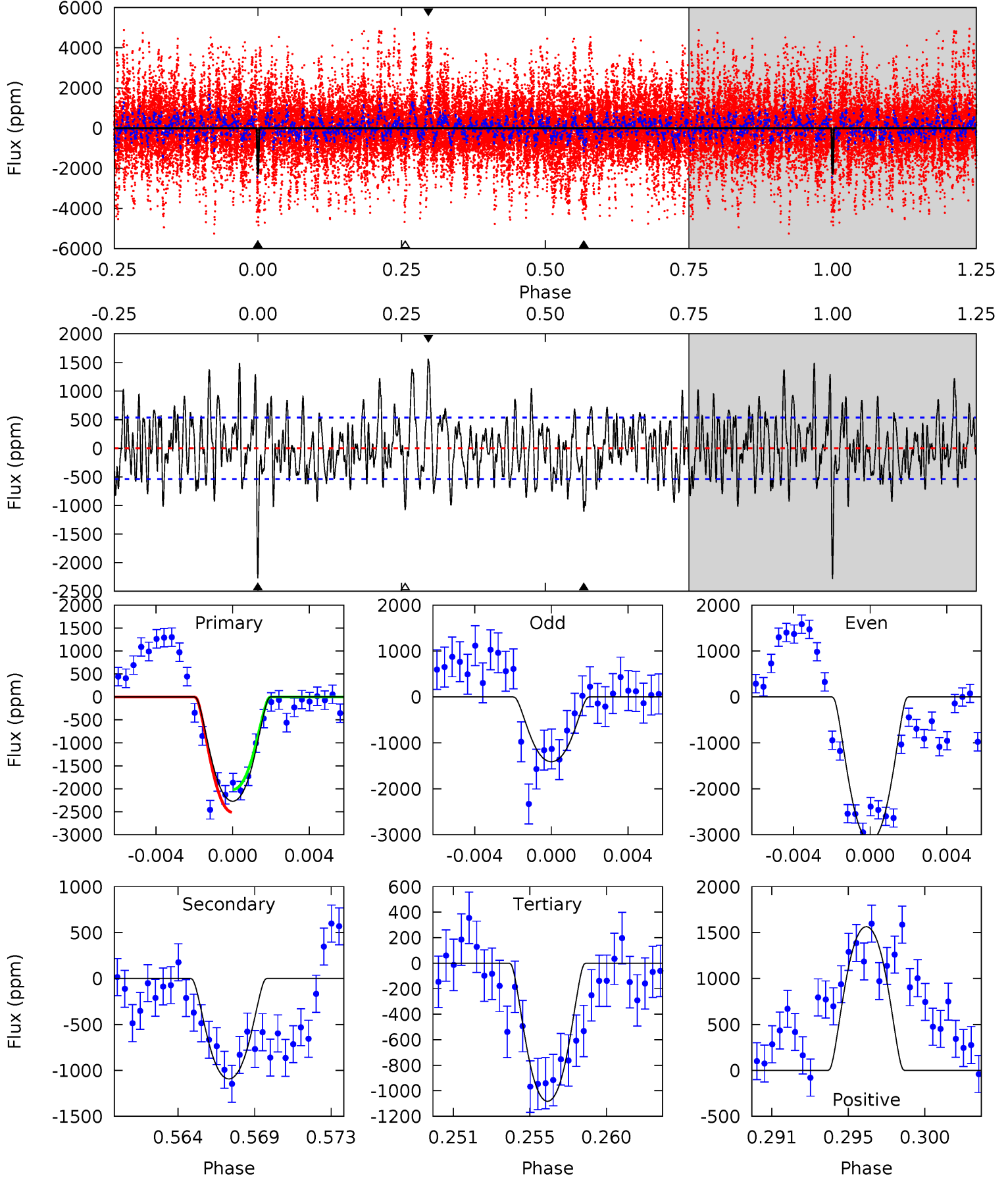
TCE 004840513-03 P= 87.692859 Days  $T_0=200.679331$  (BKJD)



# DV Model-Shift Uniqueness Test

004840513-03, P = 87.703474 Days, E = 112.884303 Days

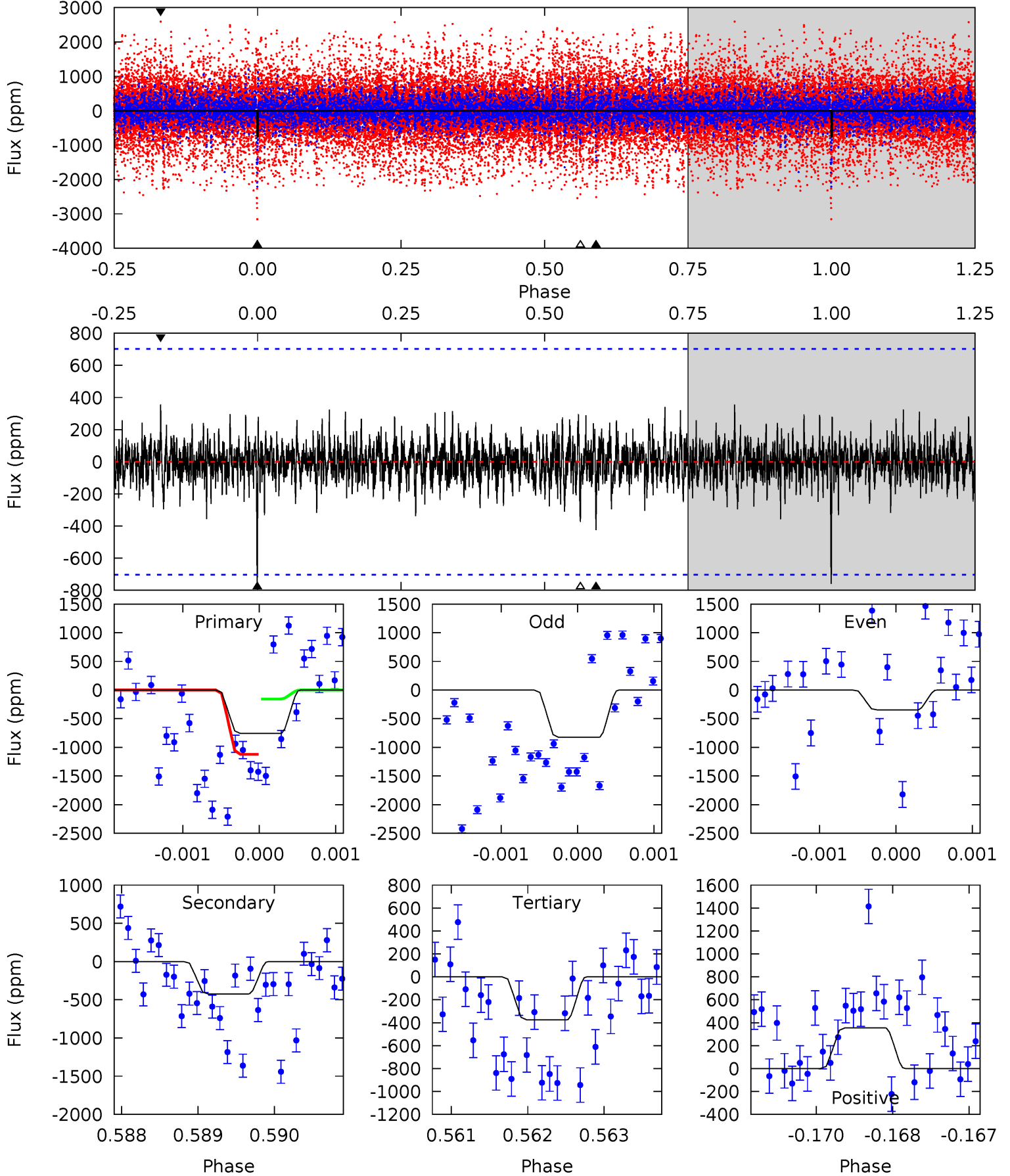
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
21.9	10.5	10.4	15.0	5.18	2.84	4.26	11.4	6.81	0.11	-4.53	8.19	0.40	0.41	2.35



# Alt Model-Shift Uniqueness Test

004840513-03, P = 87.692859 Days, E = 112.986472 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
5.83	3.26	2.88	2.73	5.40	3.21	0.72	2.95	3.10	0.38	0.53	2.02	1.09	0.32	3.77



### Stellar Parameters For KIC 004840513

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$6392^{+153}_{-230}$	$4.399^{+0.054}_{-0.216}$	$0.070^{+0.250}_{-0.350}$	$1.162^{+0.369}_{-0.132}$	$1.232^{+0.167}_{-0.184}$	$1.107^{+0.322}_{-0.594}$
	+2%/-4%	+1%/-5%	+357%/-500%	+32%/-11%	+14%/-15%	+29%/-54%
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 004840513-03 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-1093 \pm 104$	$5.71^{+2.36}_{-2.10}$	$674^{+54}_{-33}$	$5631^{+1468}_{-758}$	$3112^{+4574}_{-1544}$
Alt.	$-424 \pm 130$	$4.97^{+2.19}_{-2.07}$	$674^{+49}_{-32}$	$4812^{+1475}_{-699}$	$1517^{+3397}_{-857}$

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

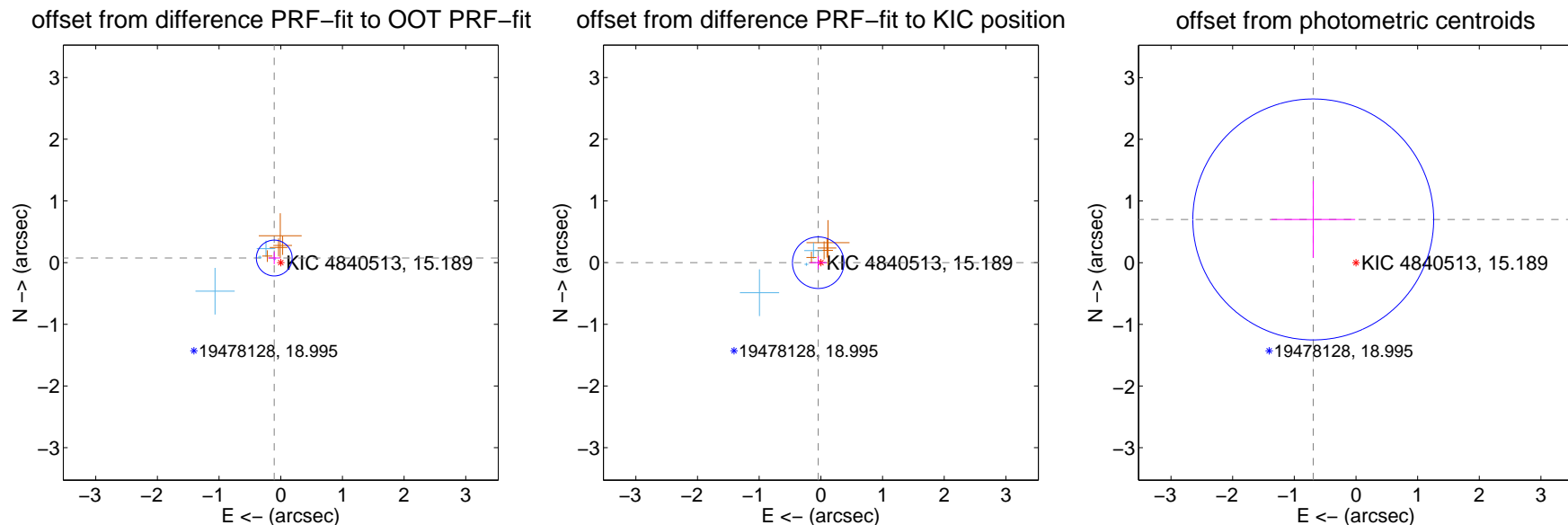
## DV Centroid Data

Supplemental centroid analysis for 004840513-03. Kepler magnitude: 15.19. Transit SNR 5.19

There are 4 quarters with good PRF difference image offsets

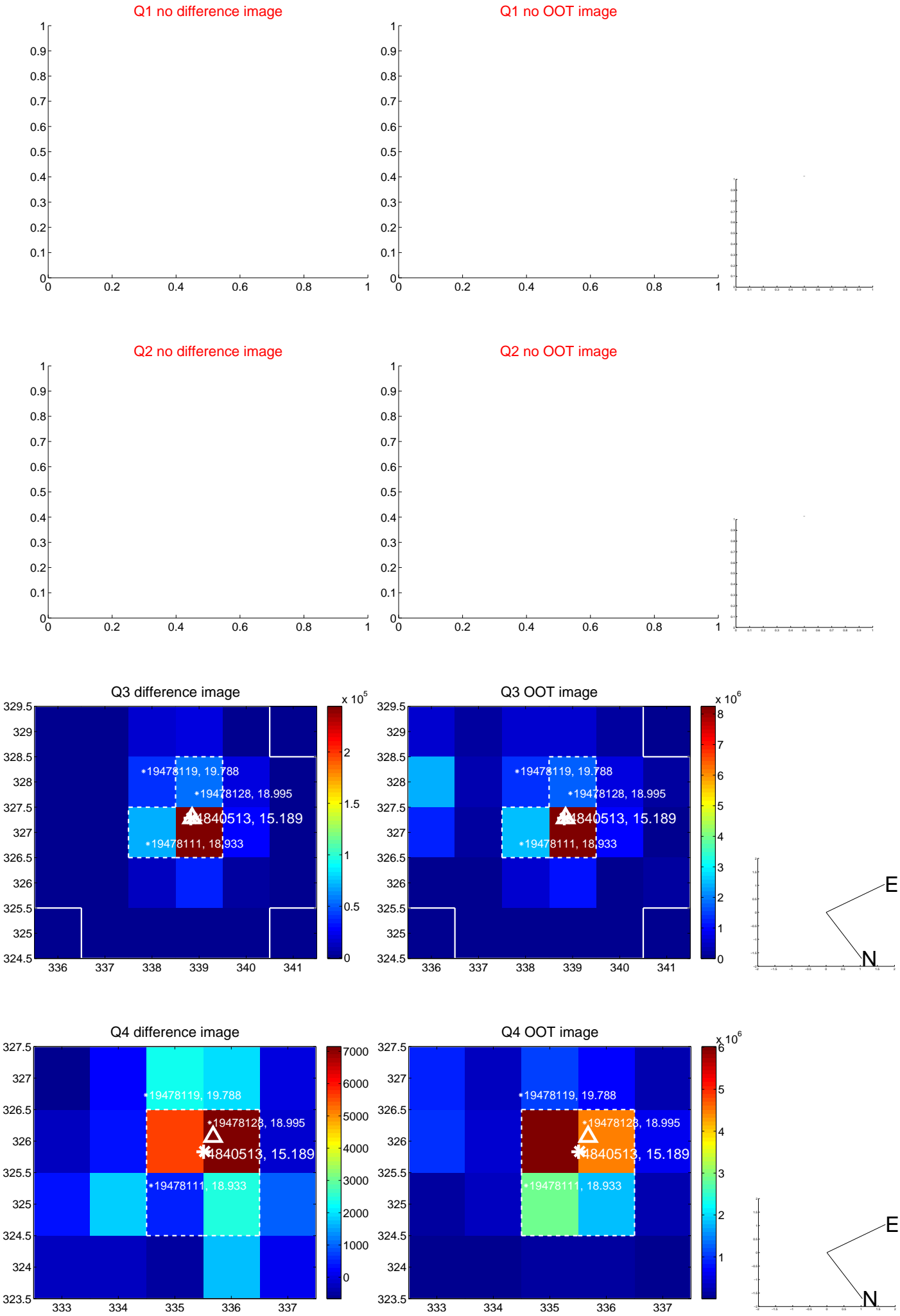
The direct PRF centroid is offset from the target star catalog position by about 0.07 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.129 \pm 0.097$	1.33	$0.105 \pm 0.095$	$0.074 \pm 0.100$
PRF-fit source offset from KIC position	$0.043 \pm 0.139$	0.31	$0.043 \pm 0.137$	$-0.002 \pm 0.105$
photometric centroid source offset	$0.99 \pm 0.65$	1.51	$0.69 \pm 0.68$	$0.70 \pm 0.62$

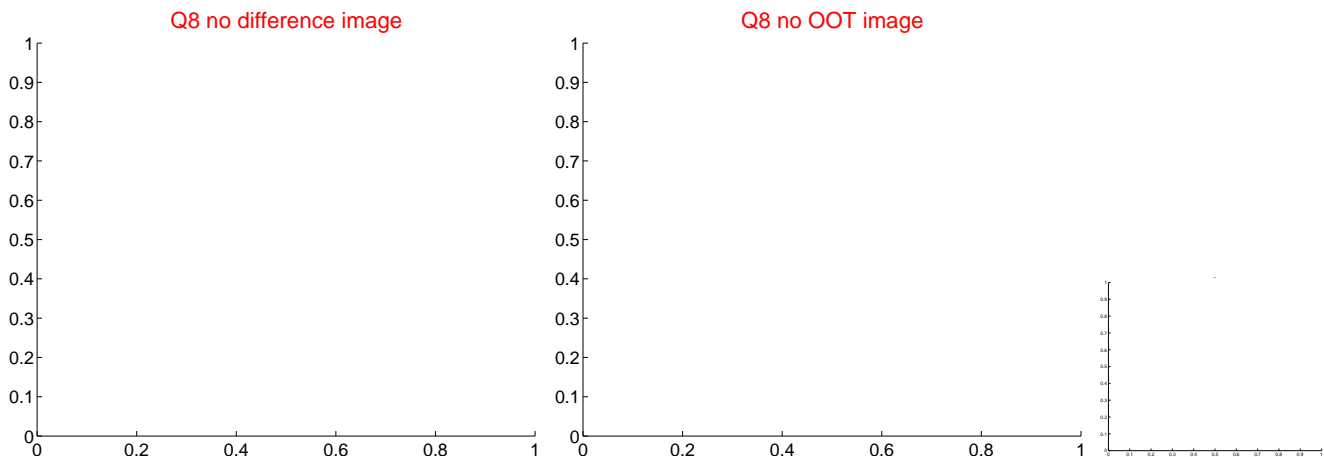
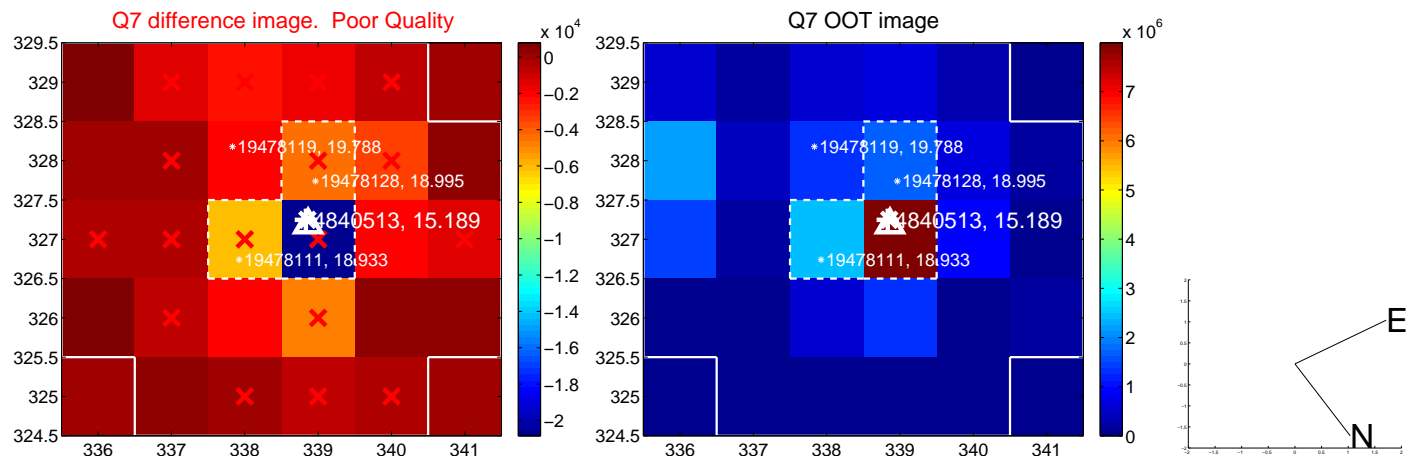
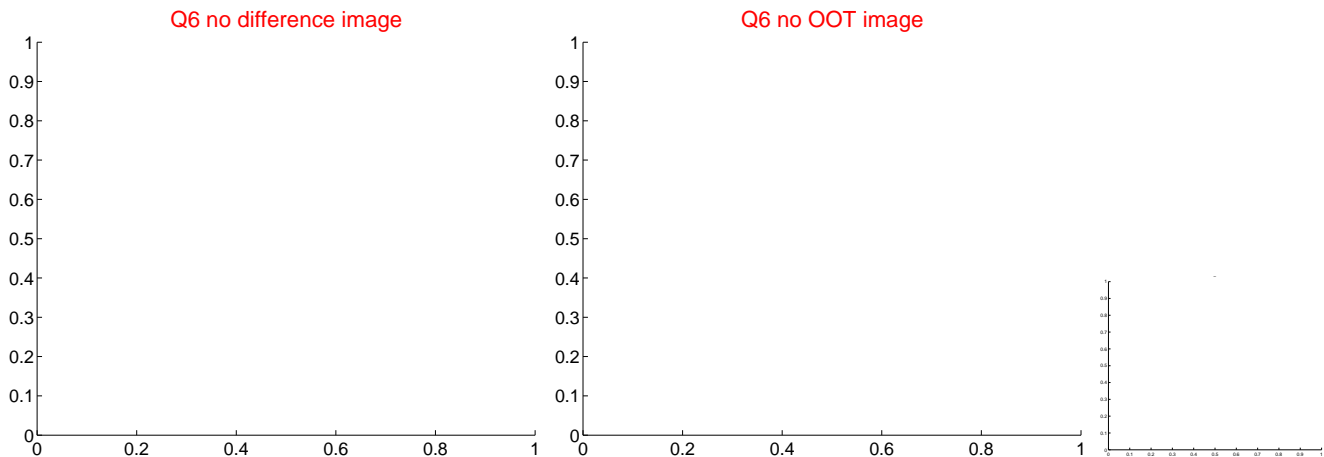
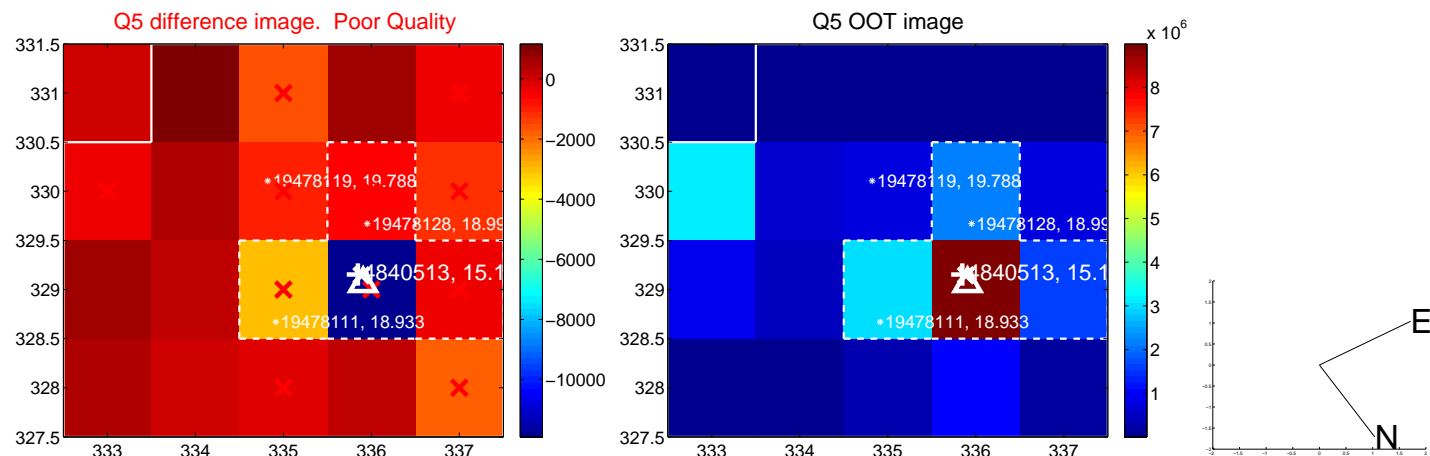


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets**; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

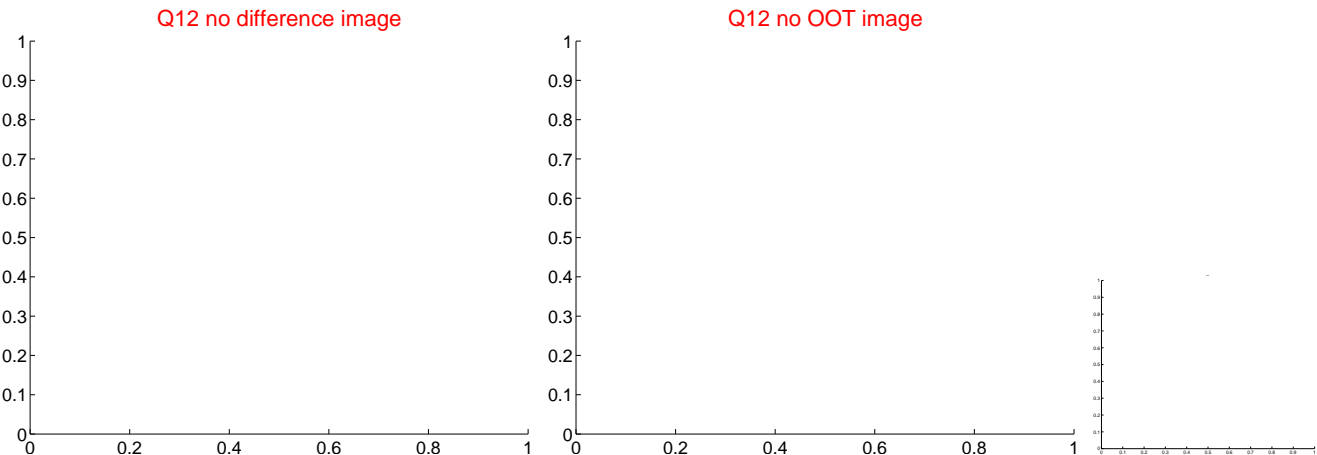
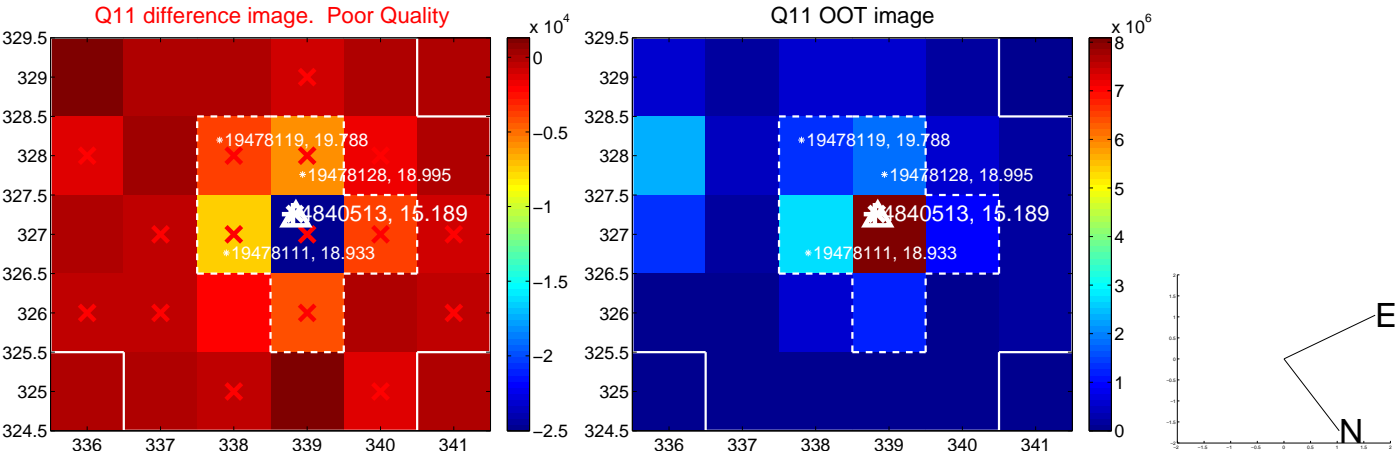
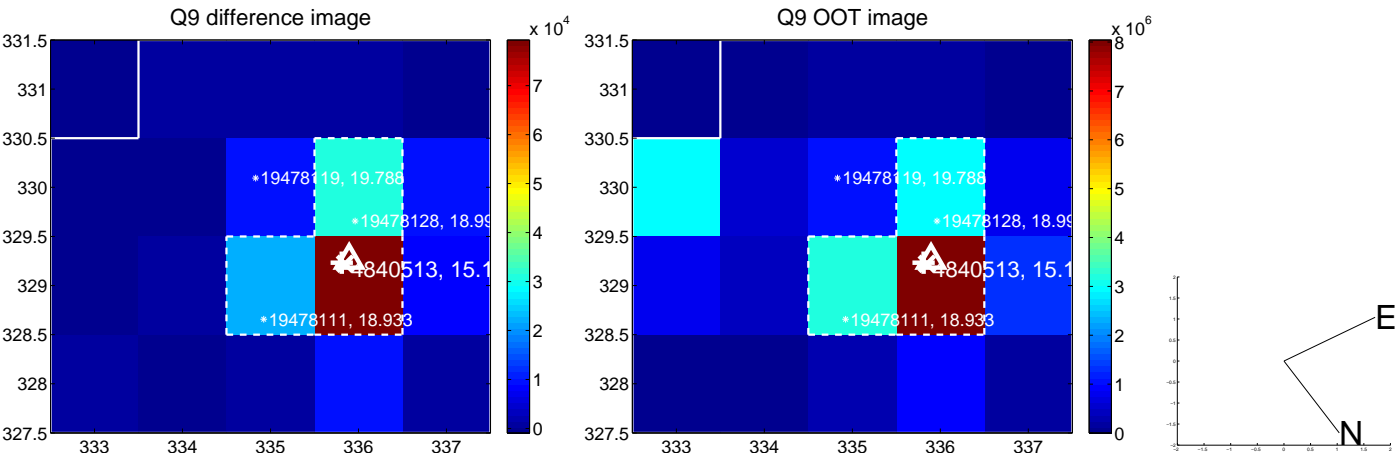


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

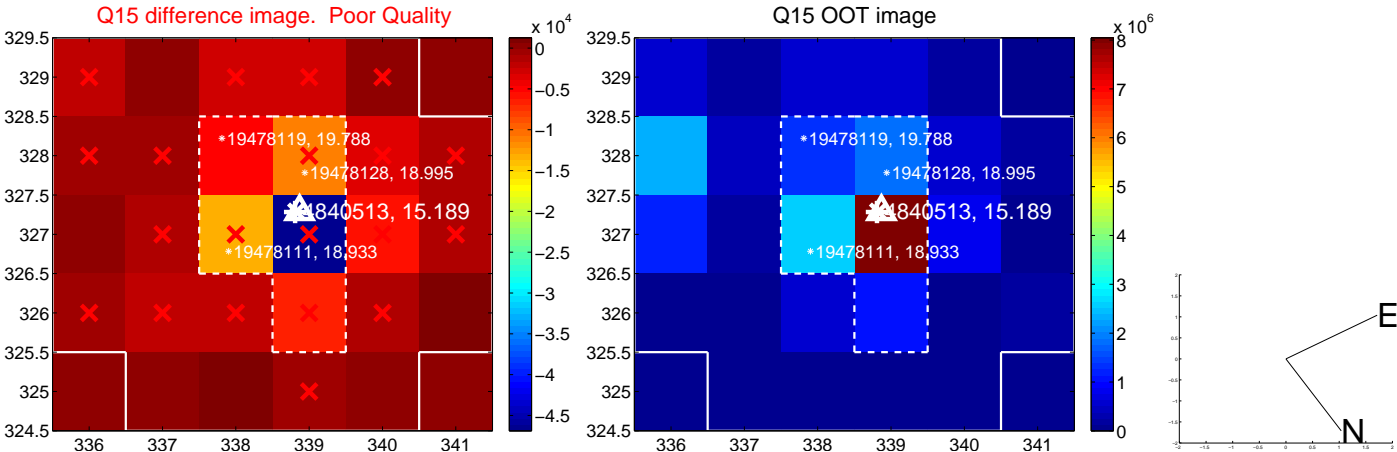
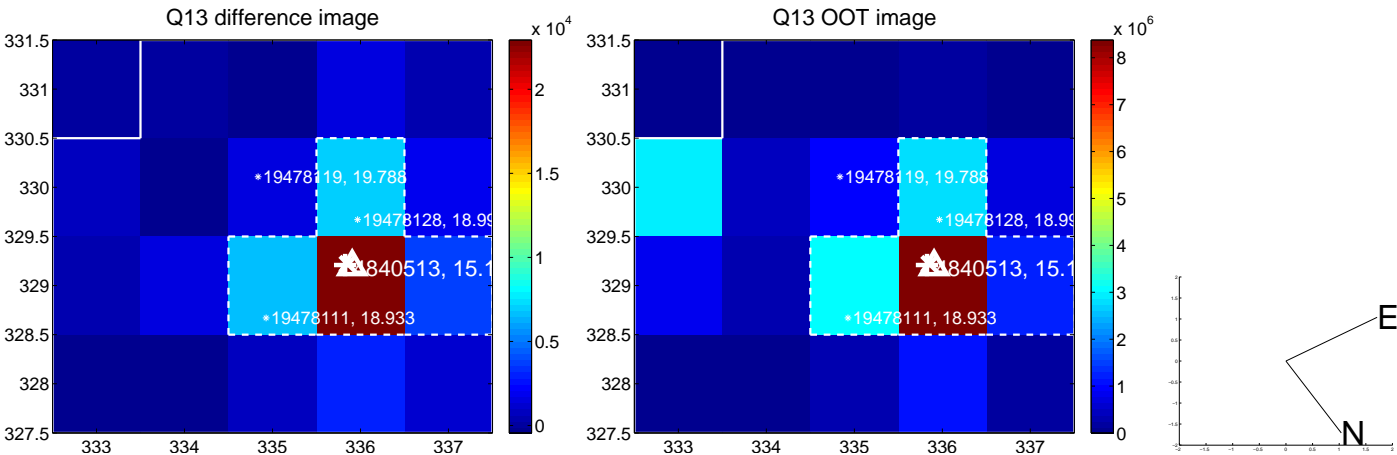




white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



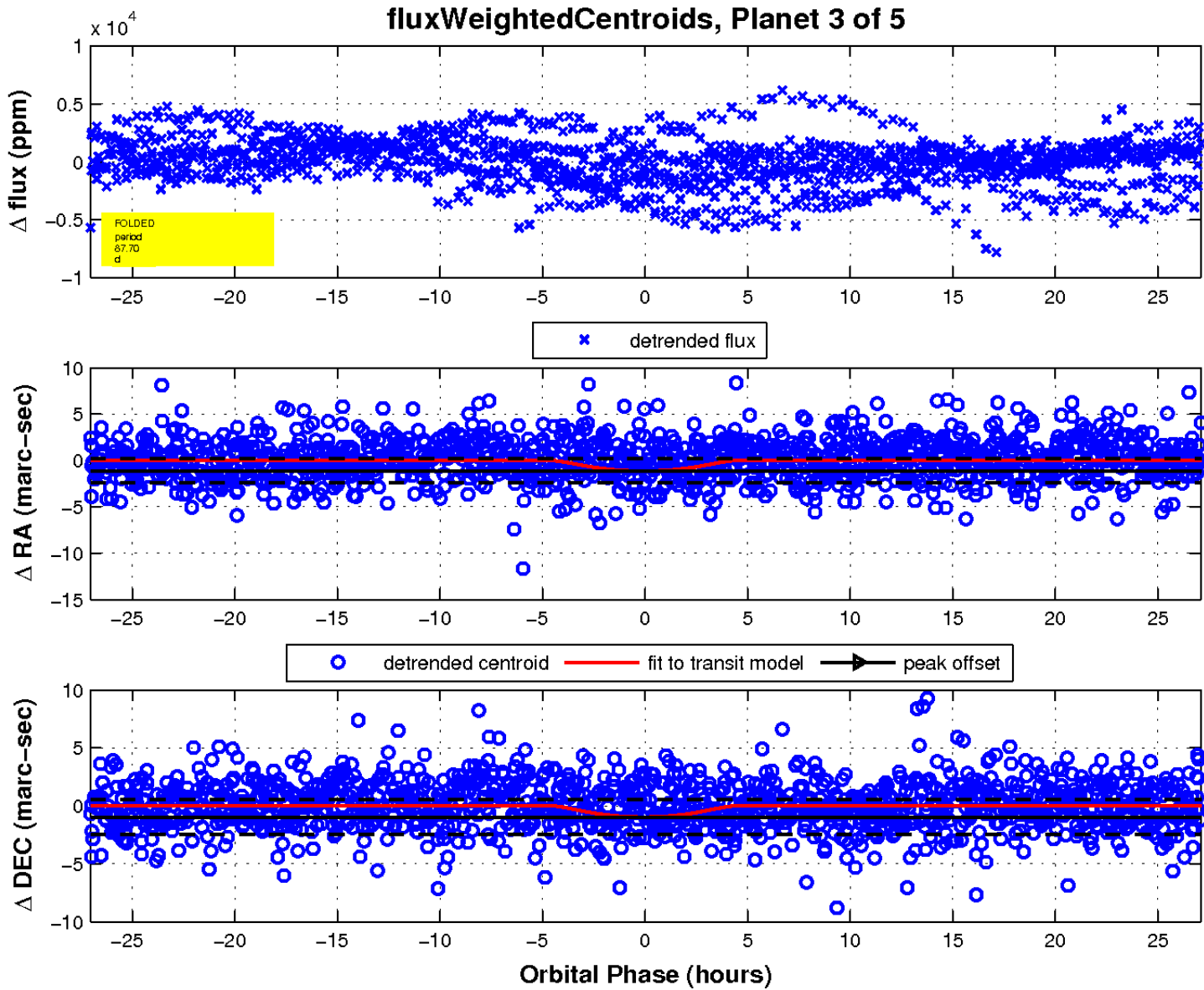
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

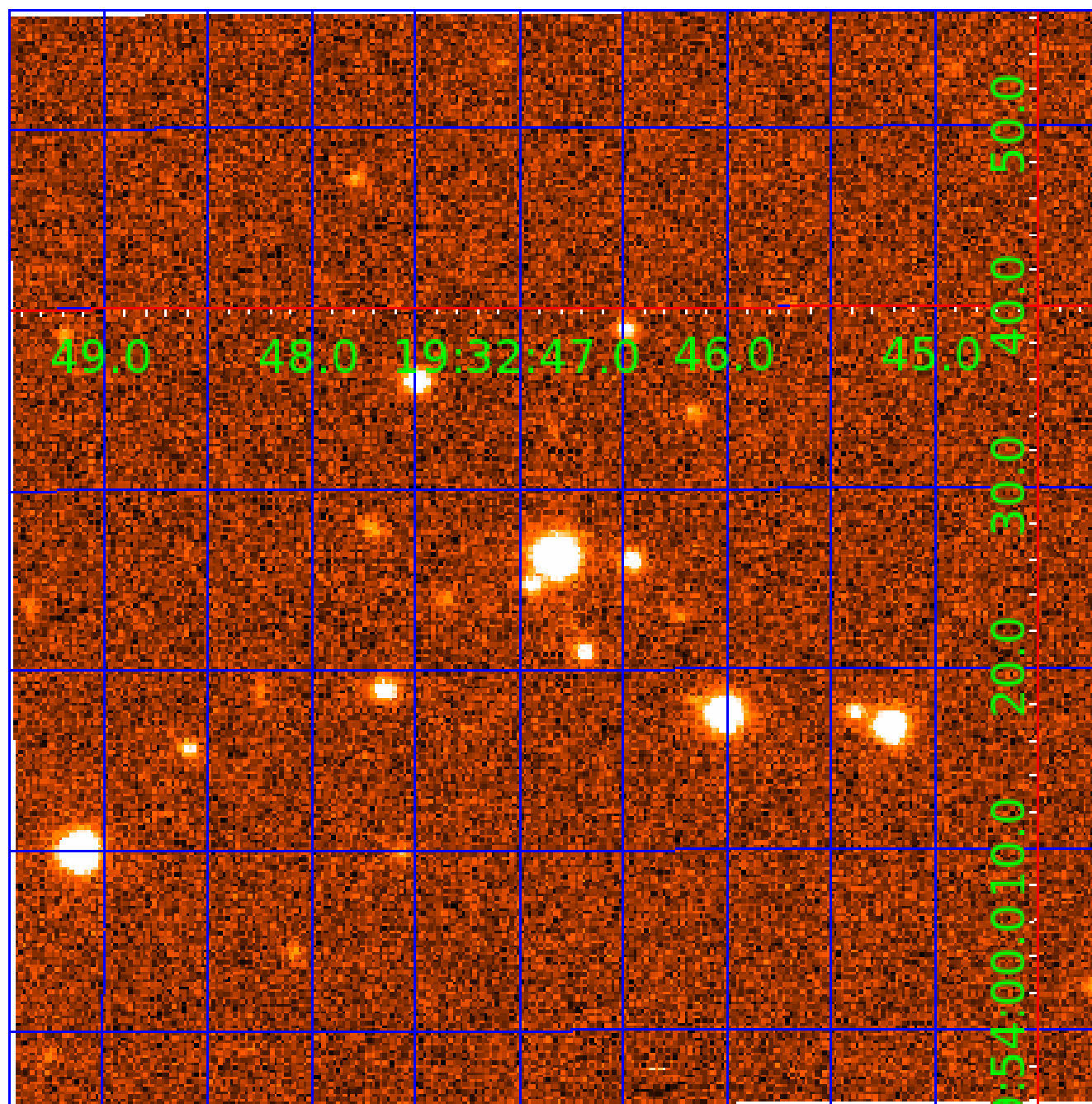
Q17 no difference image

Q17 no OOT image



UKIRT Image

Declination



# KIC 004840513

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
004840513-01	OBS	1541.01	2.379283	133.651248	48605.1	3.182	2697.5	2158.6	1.16	6392	25.82	1442.06
004840513-02	OBS	No	2.379277	132.462958	766.4	3.050	37.5	43.0	1.16	6392	3.78	1442.07
004840513-03	OBS	No	87.703474	200.587777	1199.6	9.041	7.6	5.2	1.16	6392	5.39	11.76
004840513-04	OBS	No	600.749090	198.851996	3627.1	10.292	7.6	7.1	1.16	6392	12.80	0.90
004840513-05	OBS	No	631.697123	201.200422	1783.9	4.642	8.5	6.6	1.16	6392	9.20	0.84

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
004840513-01	OBS	PC	0.76	0	1	0	0	MOD_SEC_DV—PLANET_OCCULT_DV—MOD_SEC_ALT—HAS_SEC_TCE
004840513-02	OBS	FP	0.00	1	1	0	0	IS_SEC_TCE
004840513-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_SKYE—TRANS_GAPPED—LPP_DV—MOD_NONUNIQ_ALT
004840513-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_CHASES—LPP_DV—ALL_TRANS_CHASES—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS
004840513-05	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_CHASES_MARSHALL—LPP_DV—ALL_TRANS_CHASES—MOD_TER_DV—MOD_POS_DV—CENT_FEW_DIFFS

**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 004840513-04

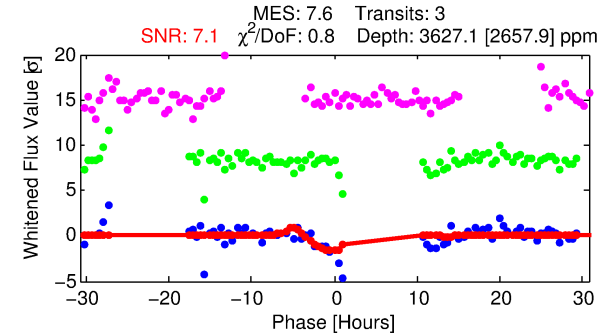
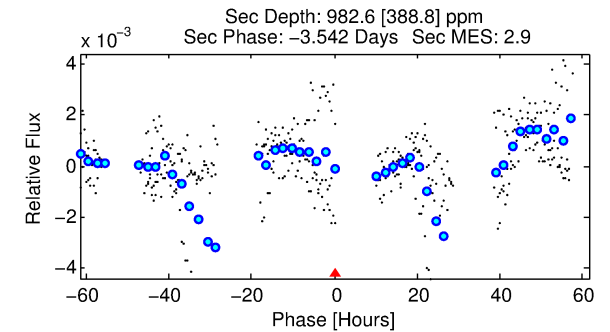
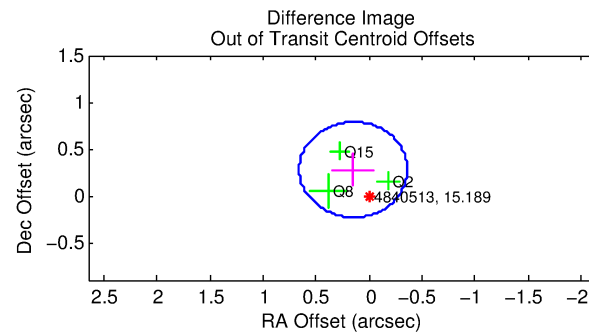
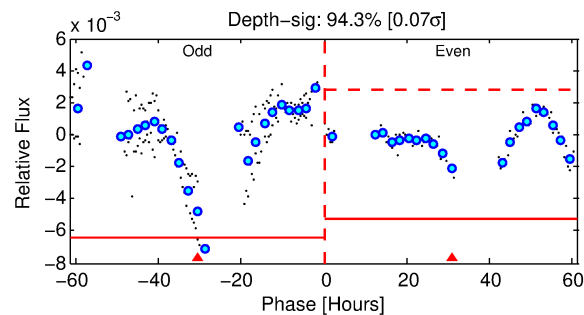
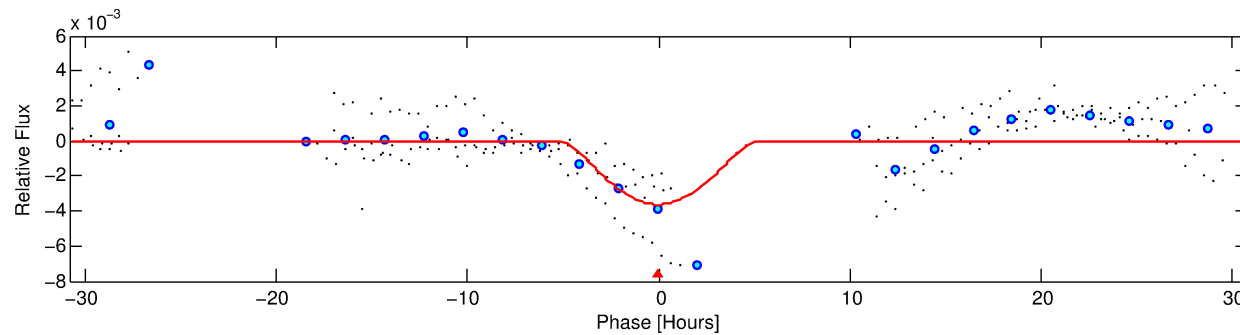
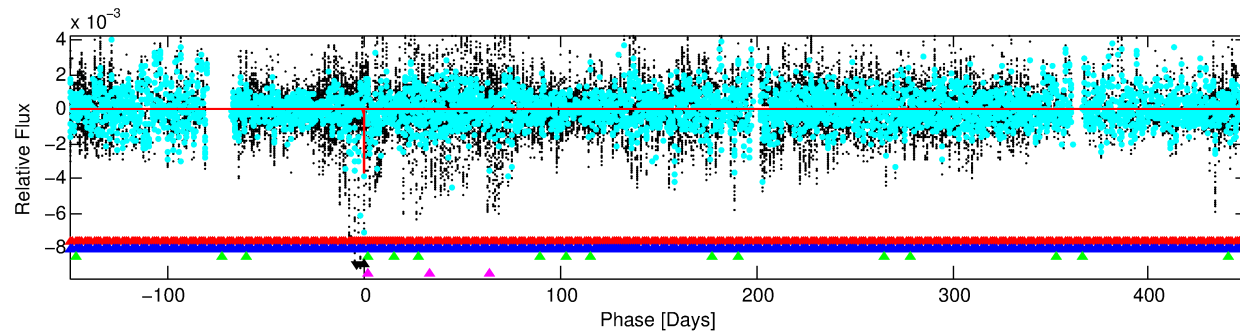
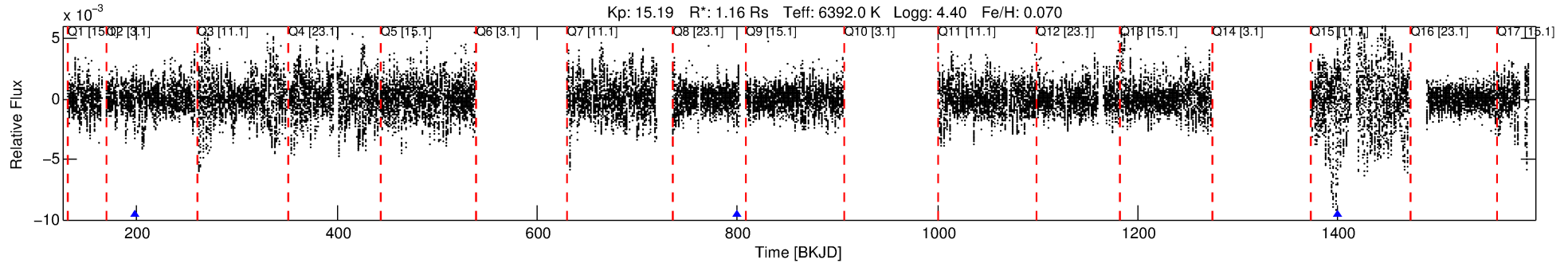
No Significant Match Found

# DV One-Page Summary

KIC: 4840513 Candidate: 4 of 5 Period: 600.749 d

KOI: K01541 Corr: No Ephemeris Match

Kp: 15.19 R\*: 1.16 Rs Teff: 6392.0 K Logg: 4.40 Fe/H: 0.070



## DV Fit Results:

Period = 600.74909 [0.01436] d  
Epoch = 198.8520 [0.0486] BKJD  
Rp/R\* = 0.1010 [0.2150]  
a/R\* = 205.40 [80.83]  
b = 1.00 [0.26]  
Seff = 0.90 [0.38]  
Teq = 249 [26] K  
Rp = 12.80 [27.56] Re  
a = 1.4950 [0.4020] AU  
Ag = 7369.54 [31652.34] [0.23σ]  
Teffp = 3561 [3810] K [0.87σ]

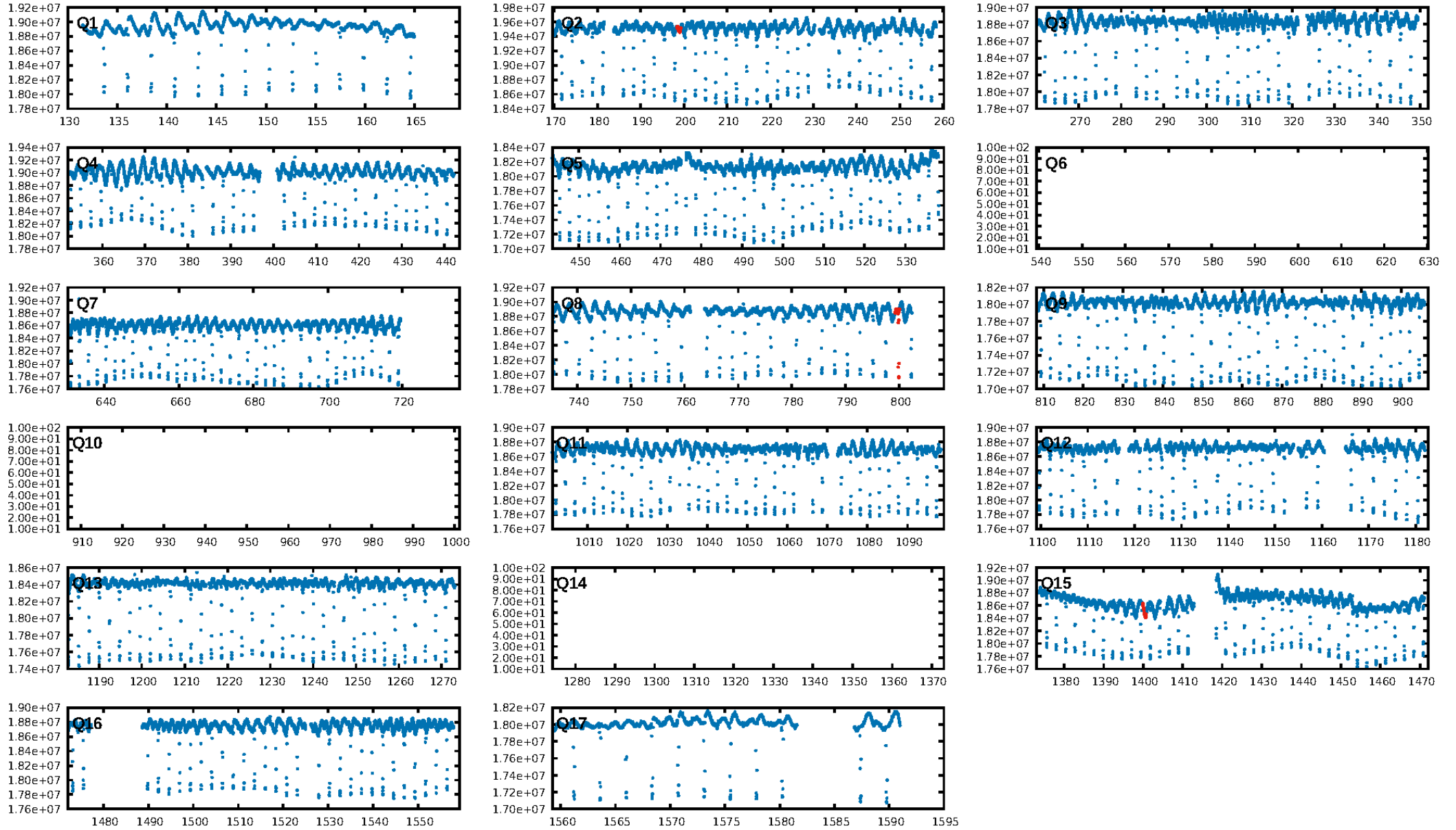
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [898.84σ]  
LongPeriod-sig: 100.0% [65.79σ]  
ModelChiSquare2-sig: 22.8%  
ModelChiSquareGof-sig: 100.0%  
**Bootstrap-pfa: 2.92e-09**  
RollingBand-fgt: 1.00 [3/3]  
GhostDiagnostic-chr: 15.06  
Centroid-sig: 59.2%  
Centroid-so: 0.112 arcsec [0.27σ]  
OotOffset-rm: 0.317 arcsec [1.87σ]  
KicOffset-rm: 0.242 arcsec [1.46σ]  
OotOffset-st: 1/1/1/0 [3]  
KicOffset-st: 1/1/1/0 [3]  
DiffImageQuality-fgm: 0.67 [2/3]  
DiffImageOverlap-fno: 0.00 [0/3]

Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 01-Feb-2016 11:28:12 Z

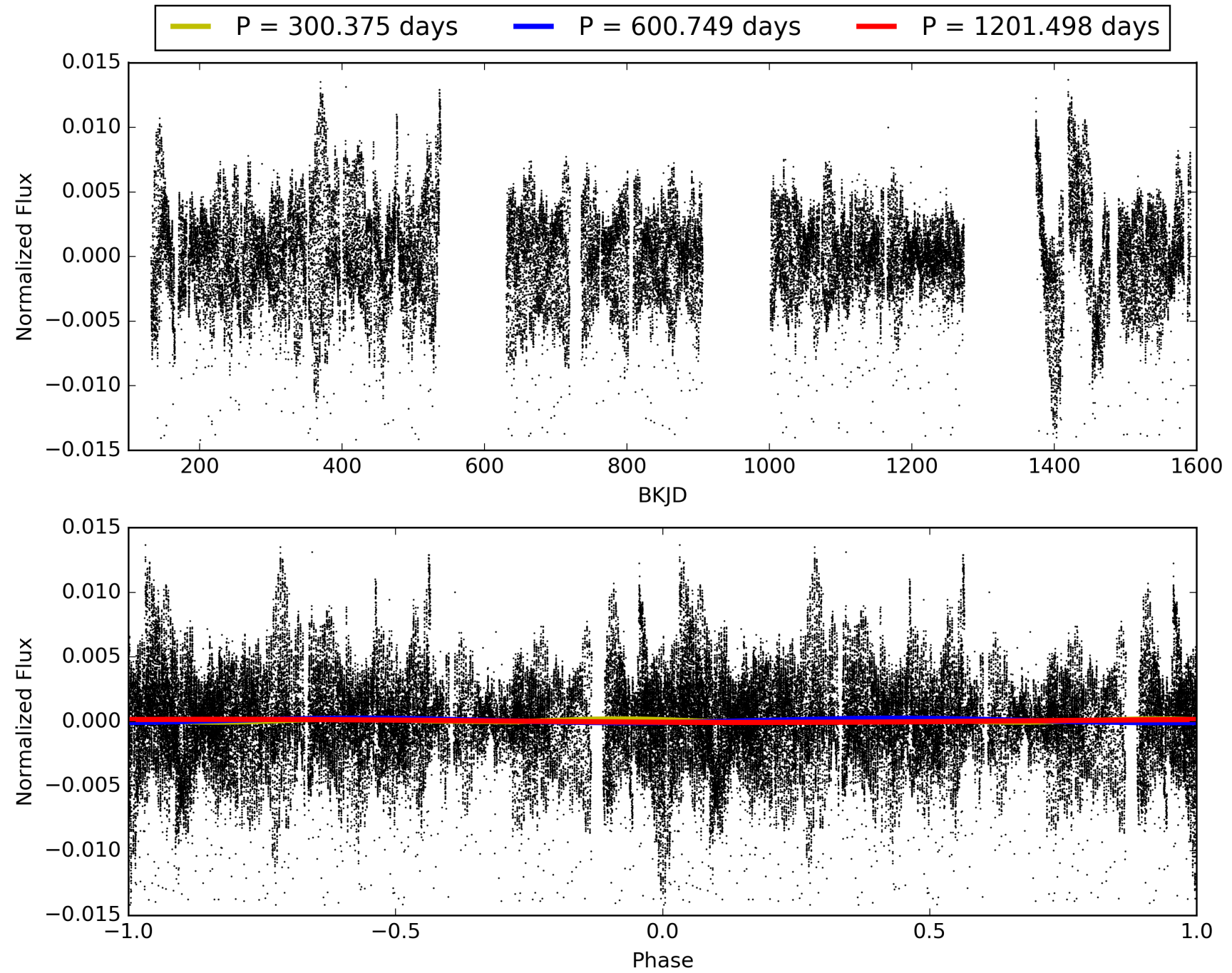
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

# TCE 004840513-04, PDC Light Curves





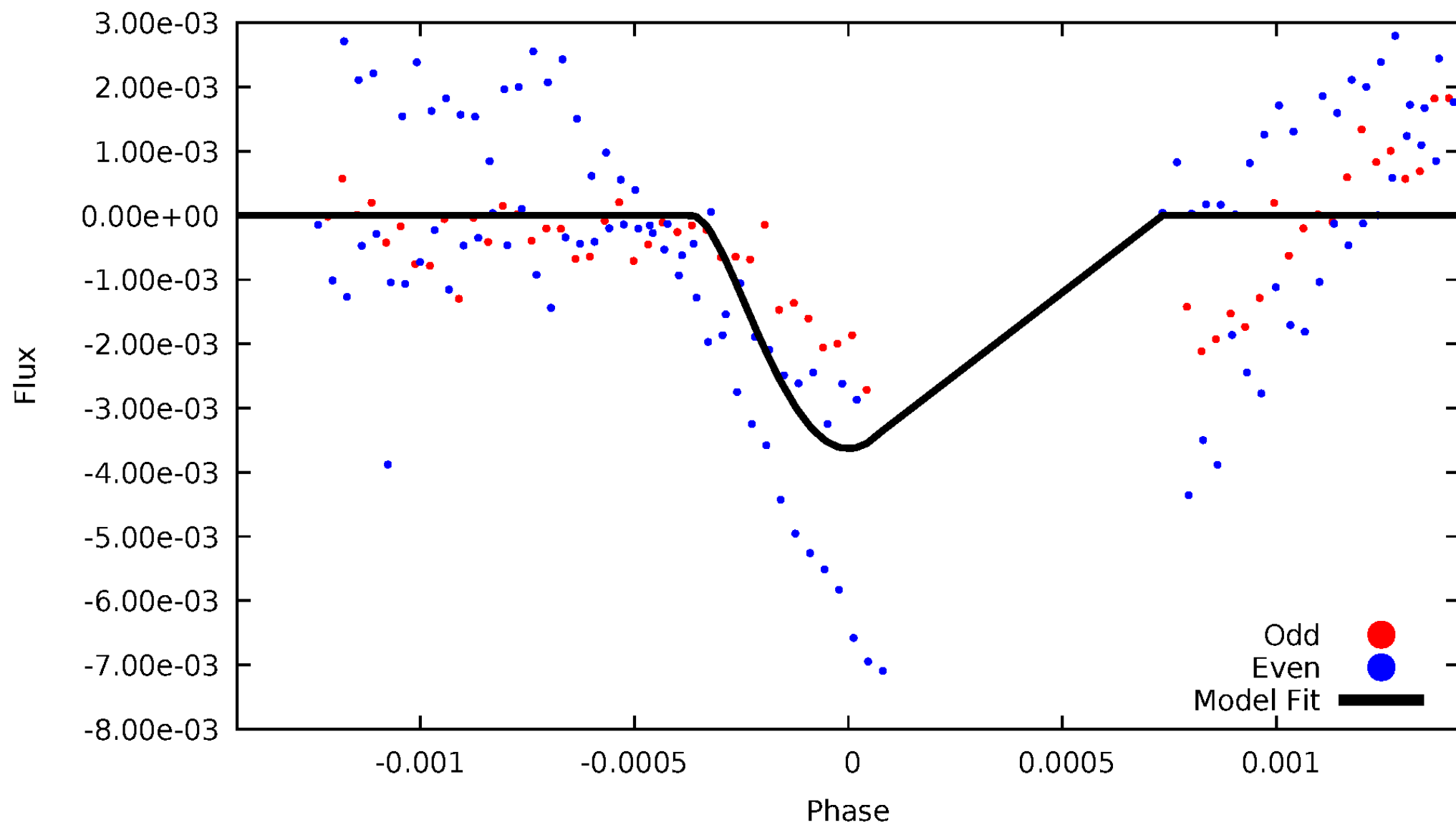
TCE 004840513-04





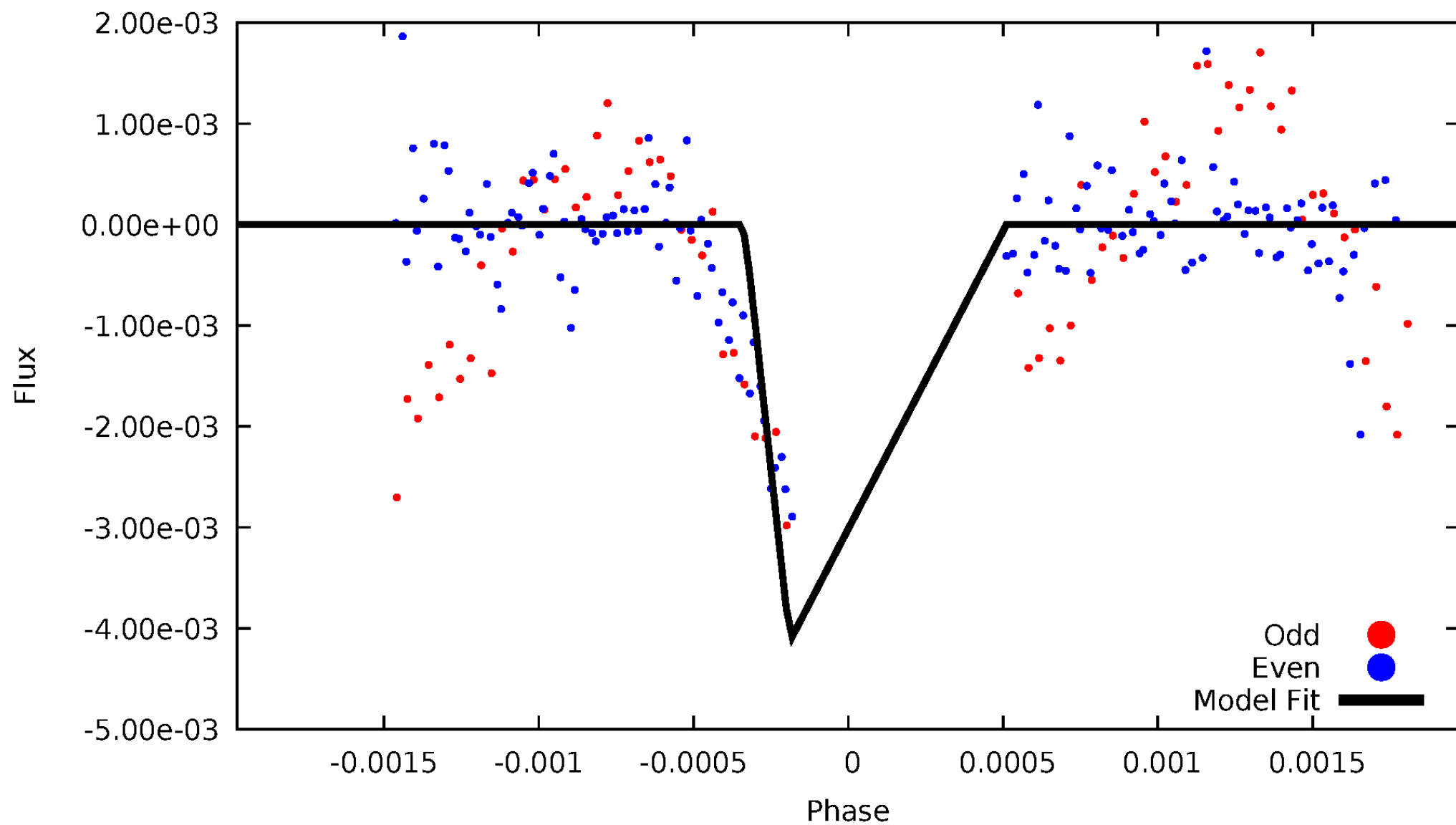
# DV Odd/Even

TCE 004840513-04



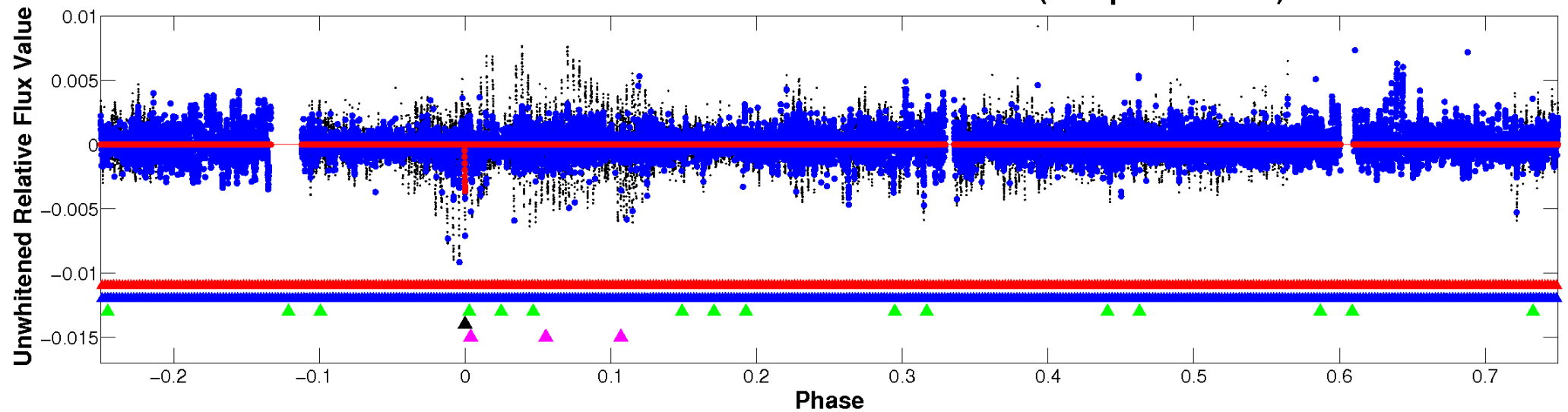
# ALT Odd/Even

TCE 004840513-04

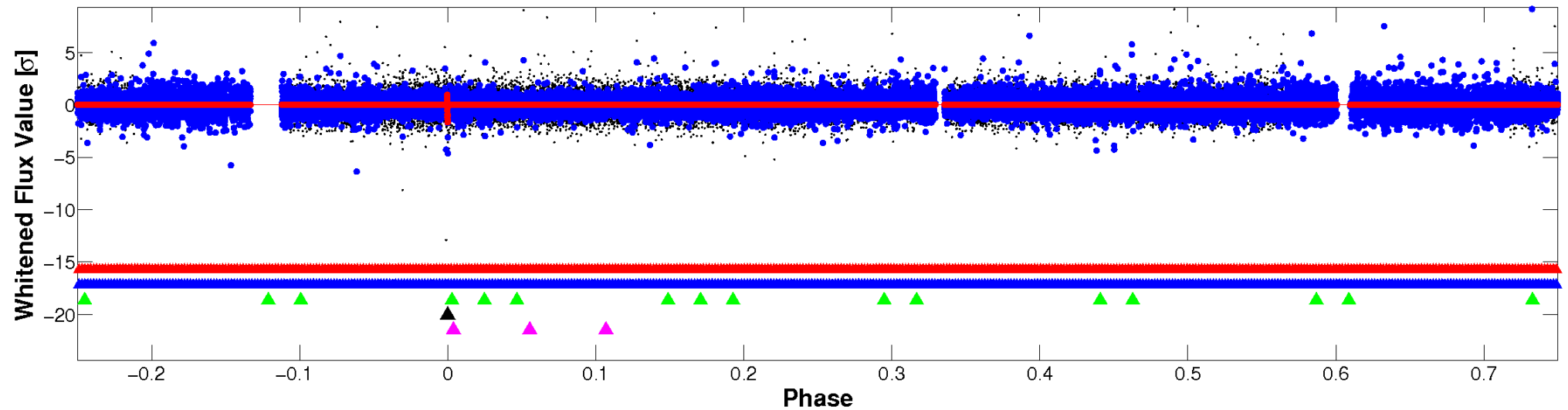


# Non-Whitened Vs. Whitened Light Curve

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

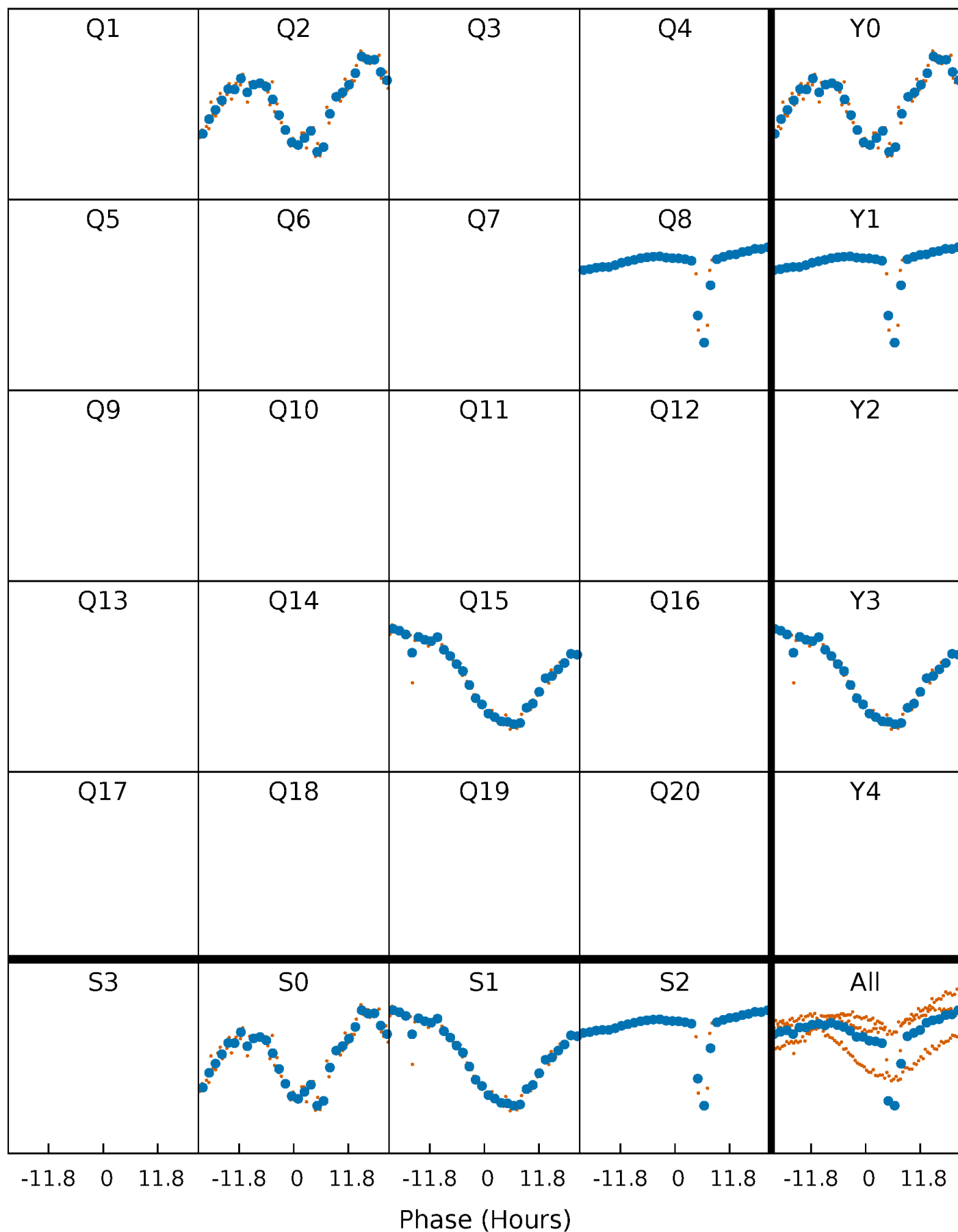


## Planet 4 : Phased Whitened Flux Time Series (Fit Epoch/Period)



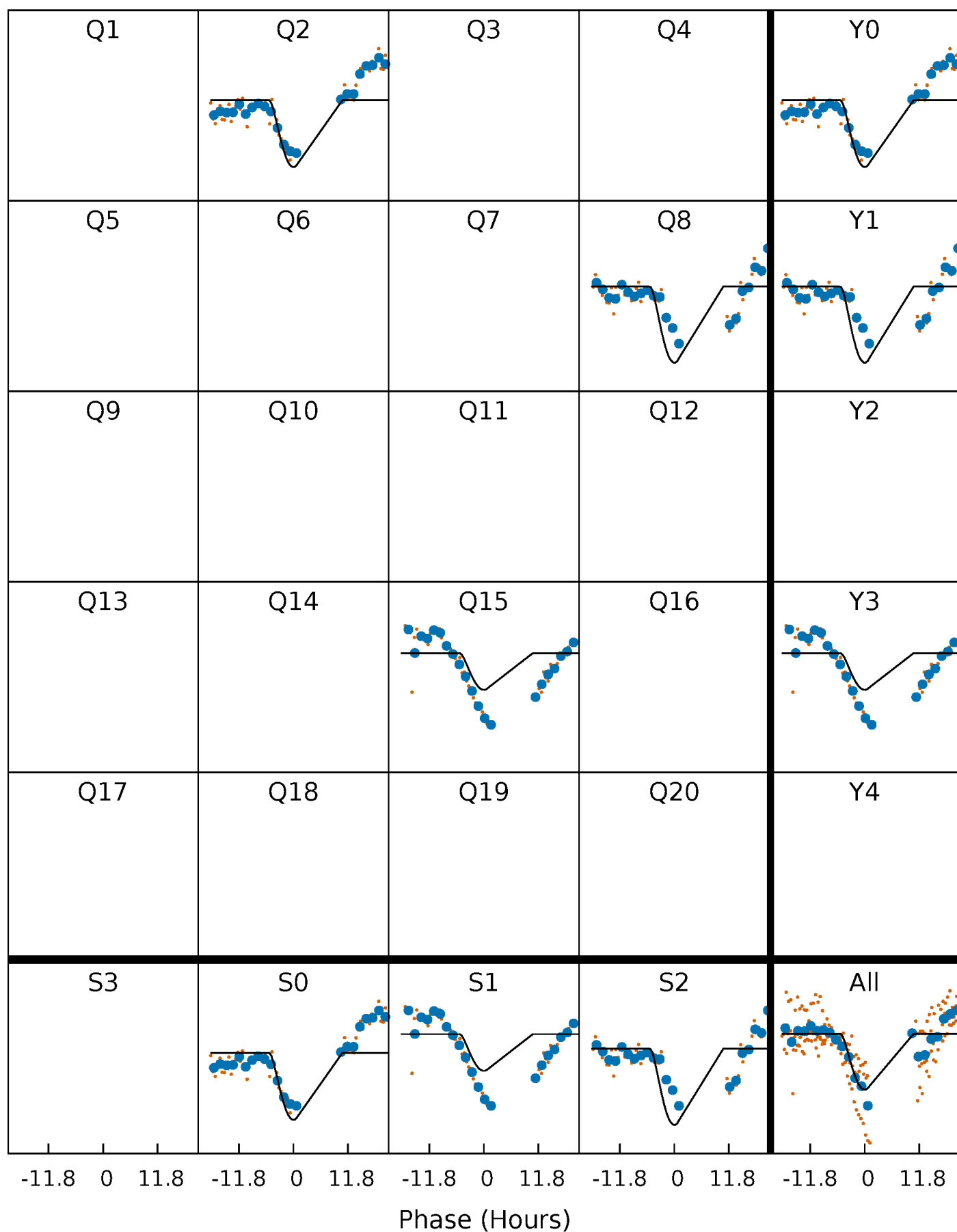
# PDC Quarter-Phased Transit Curves

TCE 004840513-04 P=600.749090 Days  $T_0=198.851997$  (BKJD)



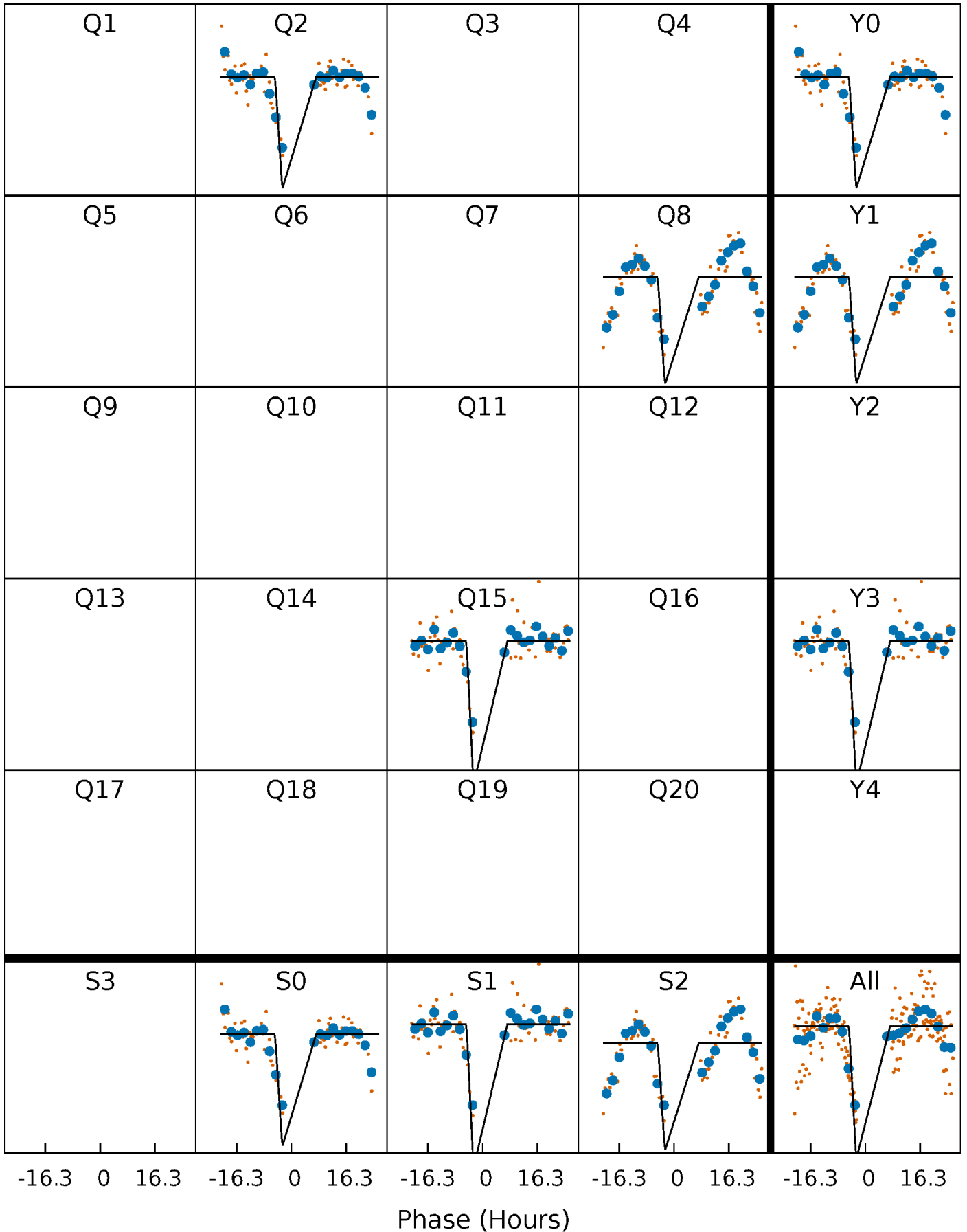
# DV Quarter-Phased Transit Curves

TCE 004840513-04     $P=600.749090$  Days     $T_0=198.851997$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

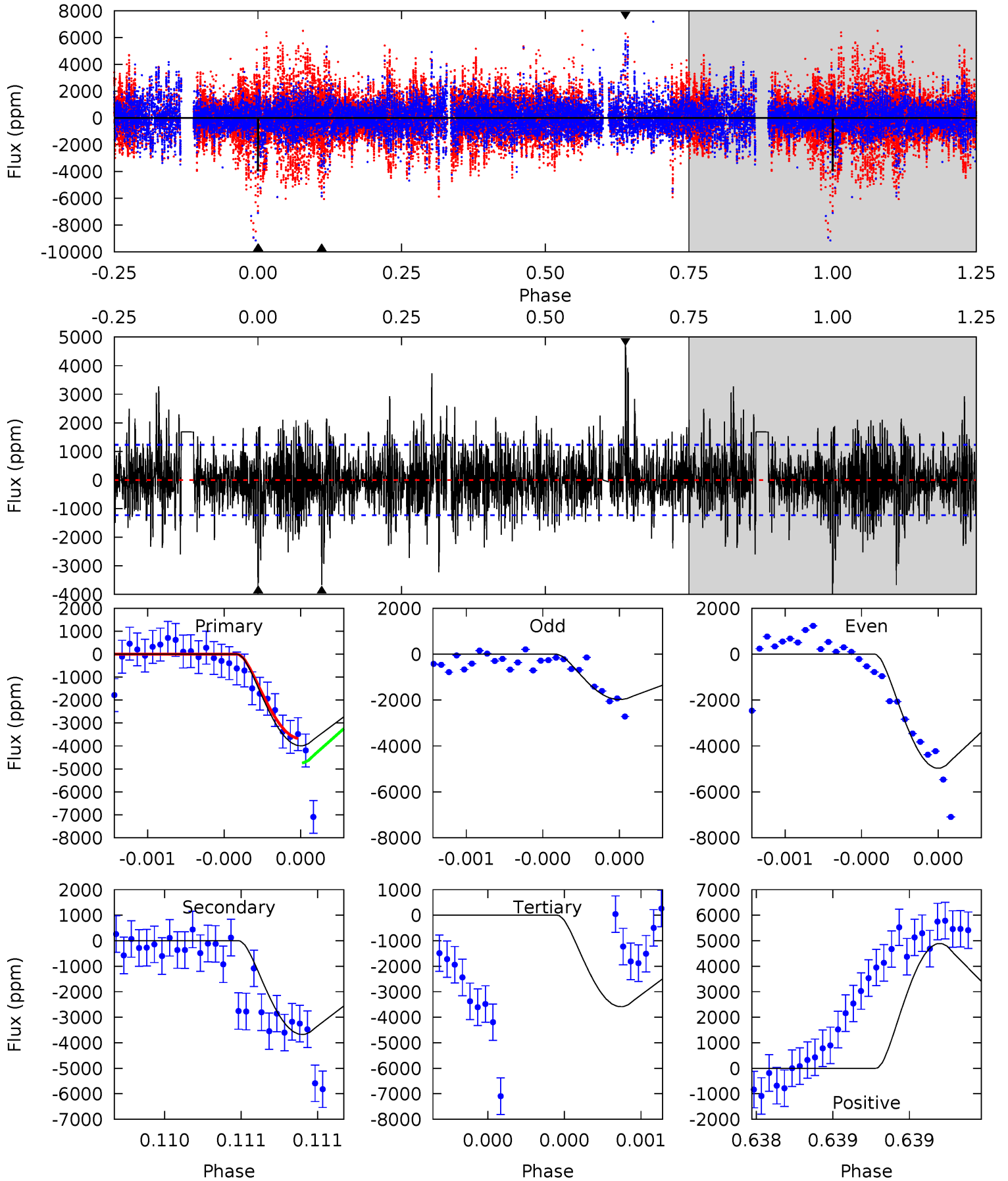
TCE 004840513-04     $P=600.773909$  Days     $T_0=198.972857$  (BKJD)



# DV Model-Shift Uniqueness Test

004840513-04, P = 600.749090 Days, E = 198.851997 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
18.1	16.7	16.3	22.2	5.59	3.51	3.76	1.85	-4.08	0.40	-5.53	6.73	1.25	0.55	1.63

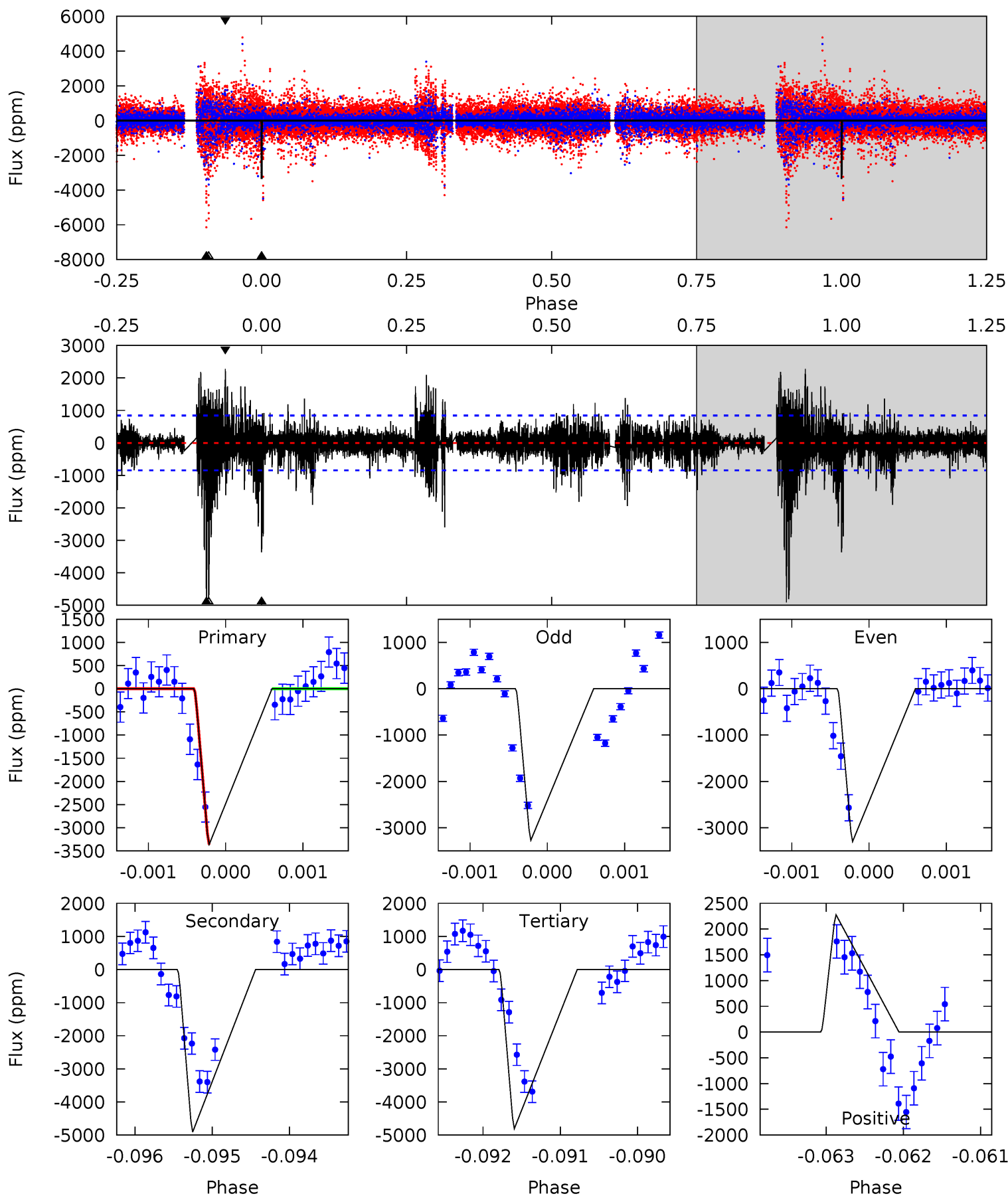




# Alt Model-Shift Uniqueness Test

004840513-04, P = 600.773909 Days, E = 198.972857 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
21.8	31.9	31.2	14.8	5.48	3.34	2.61	-9.40	7.04	0.65	17.1	0.08	0	0.32	0



### Stellar Parameters For KIC 004840513

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$6392^{+153}_{-230}$	$4.399^{+0.054}_{-0.216}$	$0.070^{+0.250}_{-0.350}$	$1.162^{+0.369}_{-0.132}$	$1.232^{+0.167}_{-0.184}$	$1.107^{+0.322}_{-0.594}$
	+2%/-4%	+1%/-5%	+357%/-500%	+32%/-11%	+14%/-15%	+29%/-54%
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 004840513-04 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$-3673 \pm 220$	$25.68^{+23.85}_{-16.93}$	$354^{+24}_{-17}$	$3911^{+2304}_{-731}$	$6780^{+50848}_{-5046}$
Alt.	$-4910 \pm 154$	$23.26^{+21.58}_{-16.17}$	$356^{+25}_{-20}$	$4279^{+3091}_{-856}$	$11029^{+110151}_{-8050}$

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

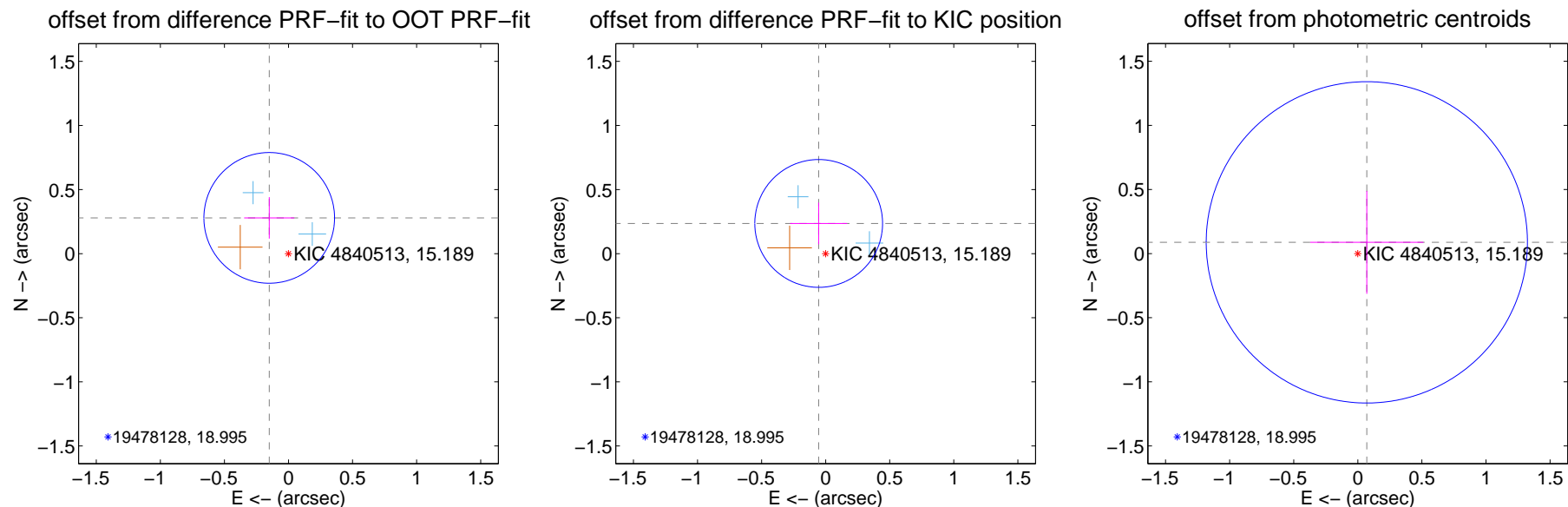
## DV Centroid Data

Supplemental centroid analysis for 004840513-04. Kepler magnitude: 15.19. Transit SNR 7.06

There are 2 quarters with good PRF difference image offsets

The direct PRF centroid is offset from the target star catalog position by about 0.07 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.317 \pm 0.170$	1.87	$0.150 \pm 0.196$	$0.279 \pm 0.162$
PRF-fit source offset from KIC position	$0.242 \pm 0.166$	1.46	$0.054 \pm 0.222$	$0.236 \pm 0.163$
photometric centroid source offset	$0.11 \pm 0.42$	0.27	$-0.07 \pm 0.44$	$0.09 \pm 0.40$



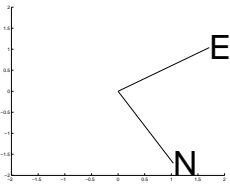
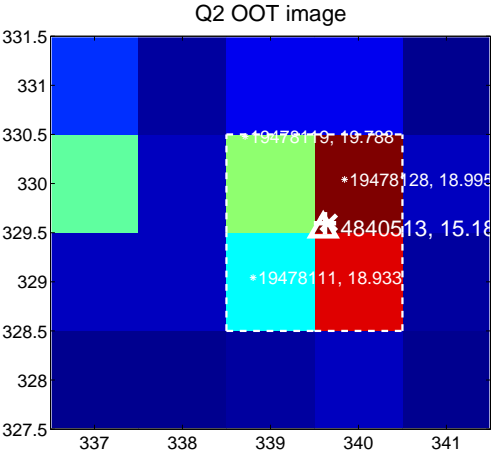
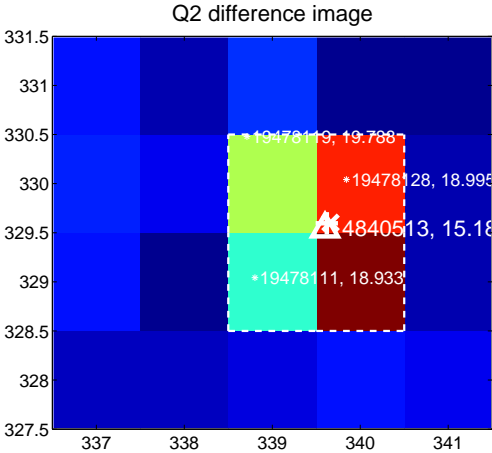
Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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

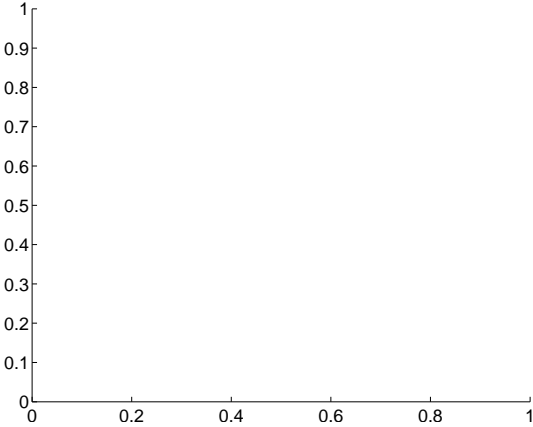
Q1 no difference image



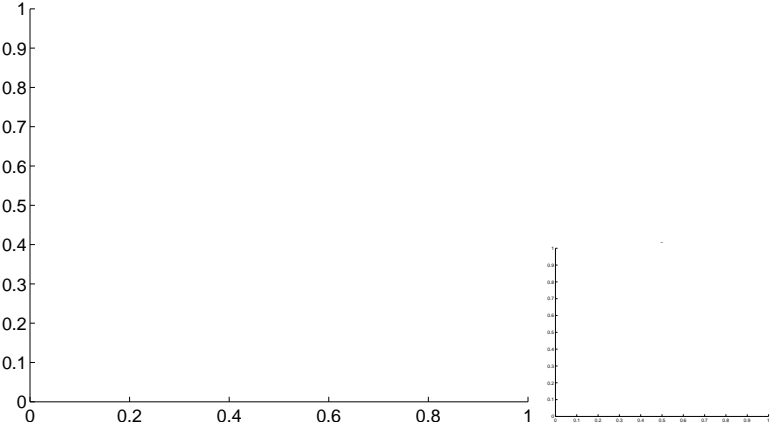
Q1 no OOT image



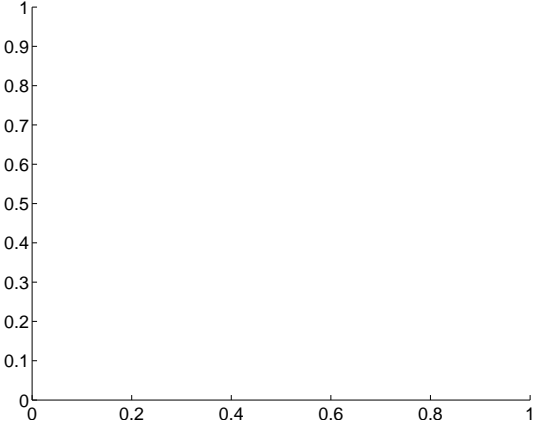
Q3 no difference image



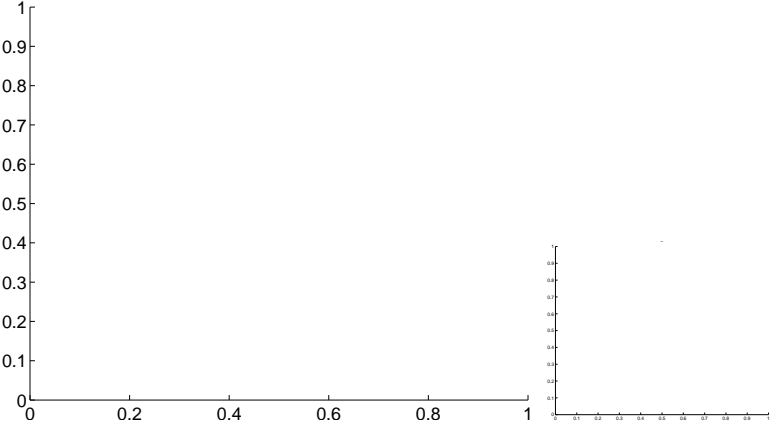
Q3 no OOT image



Q4 no difference image



Q4 no OOT image



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

Q5 no difference image



Q5 no OOT image



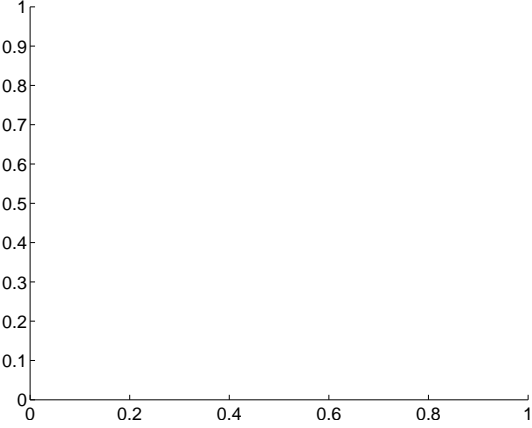
Q6 no difference image



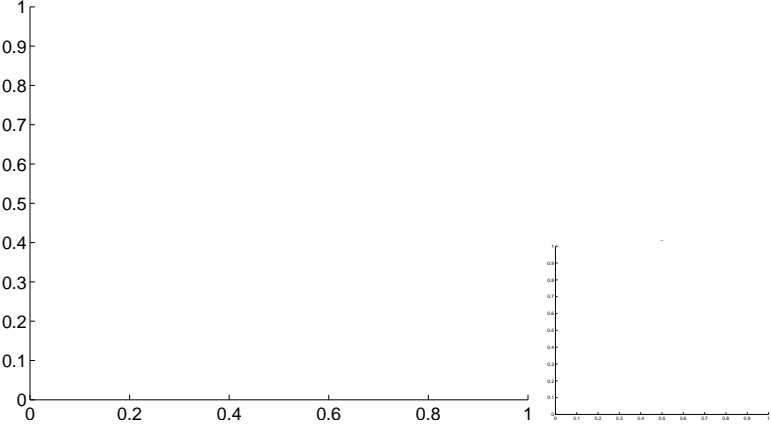
Q6 no OOT image



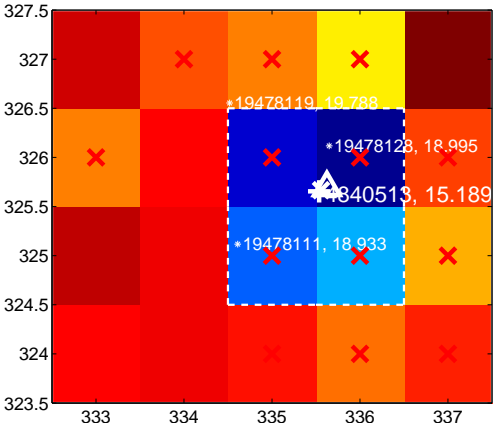
Q7 no difference image



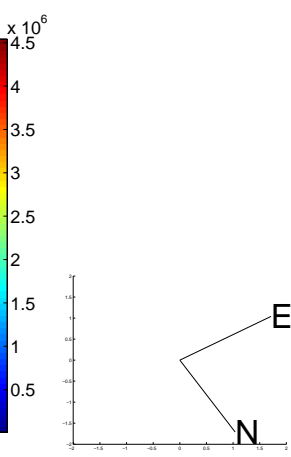
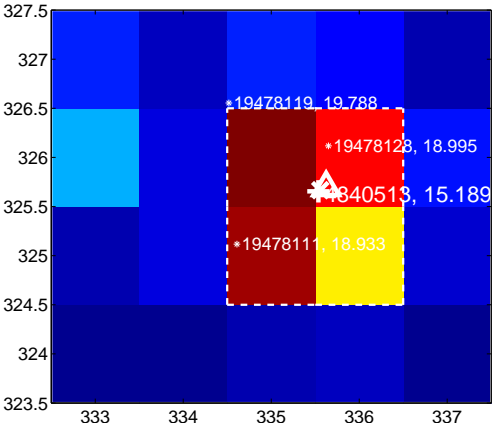
Q7 no OOT image



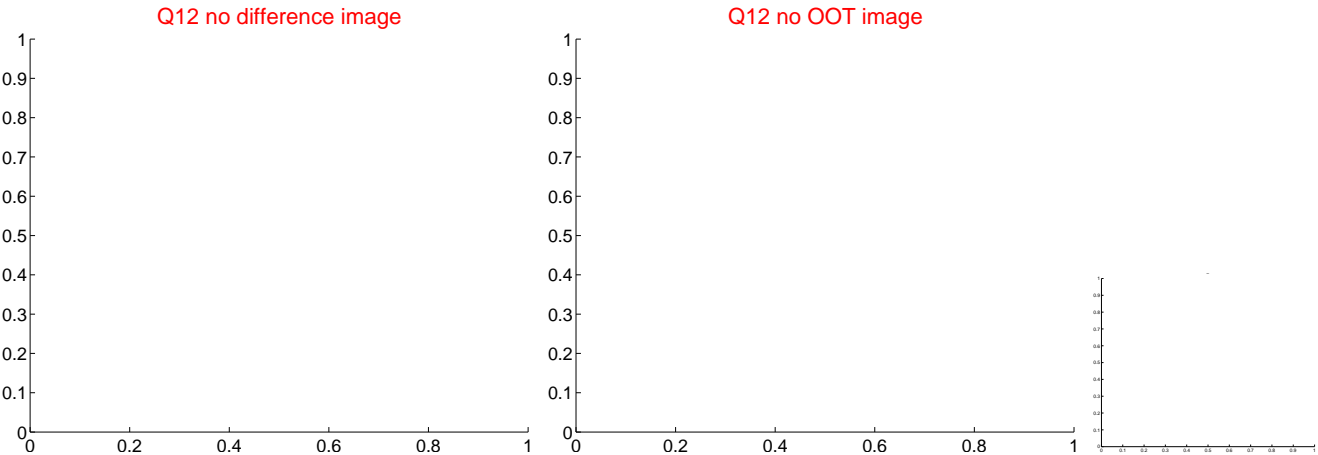
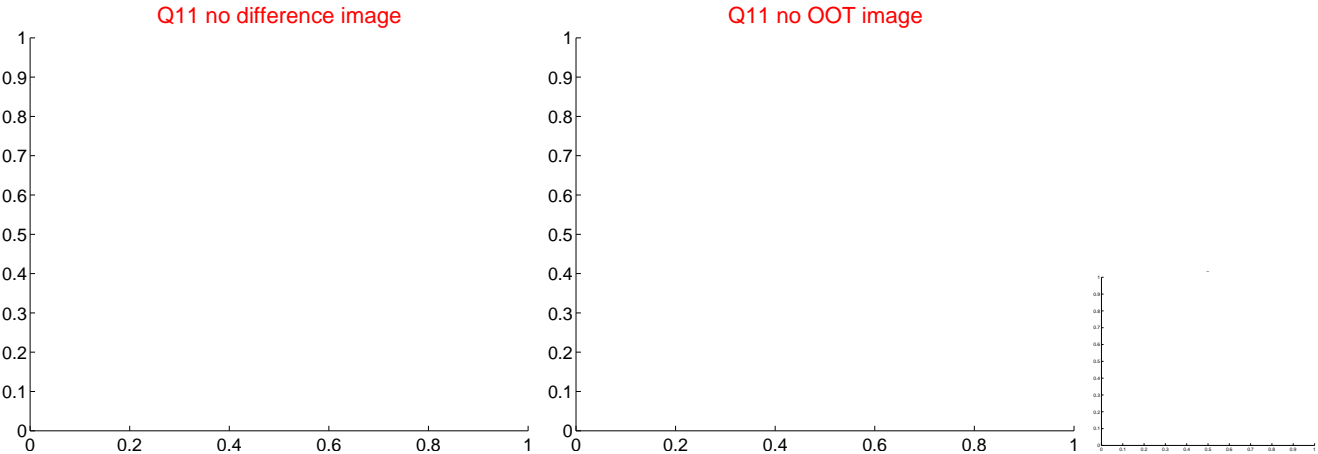
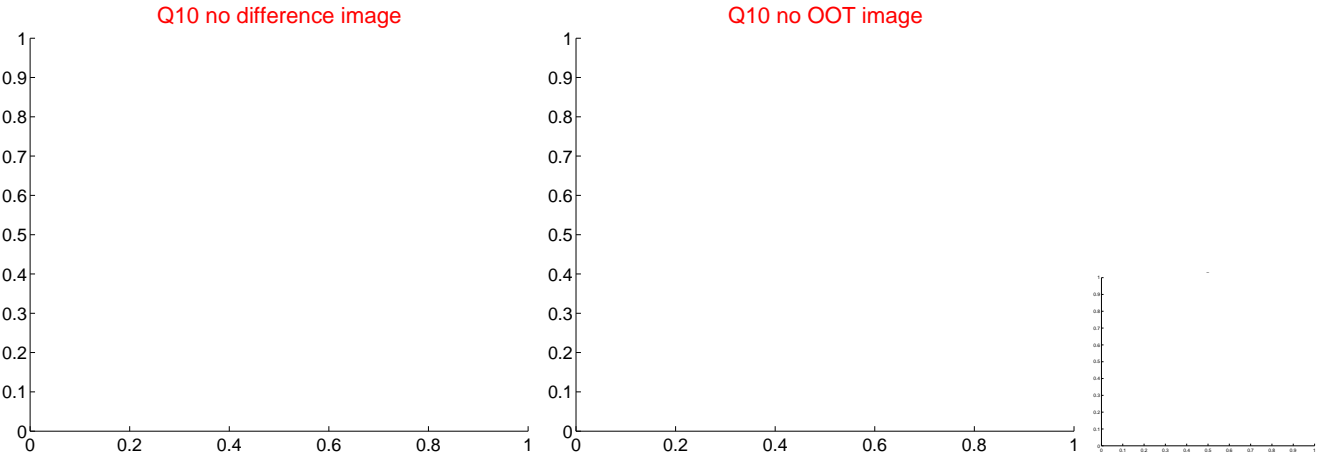
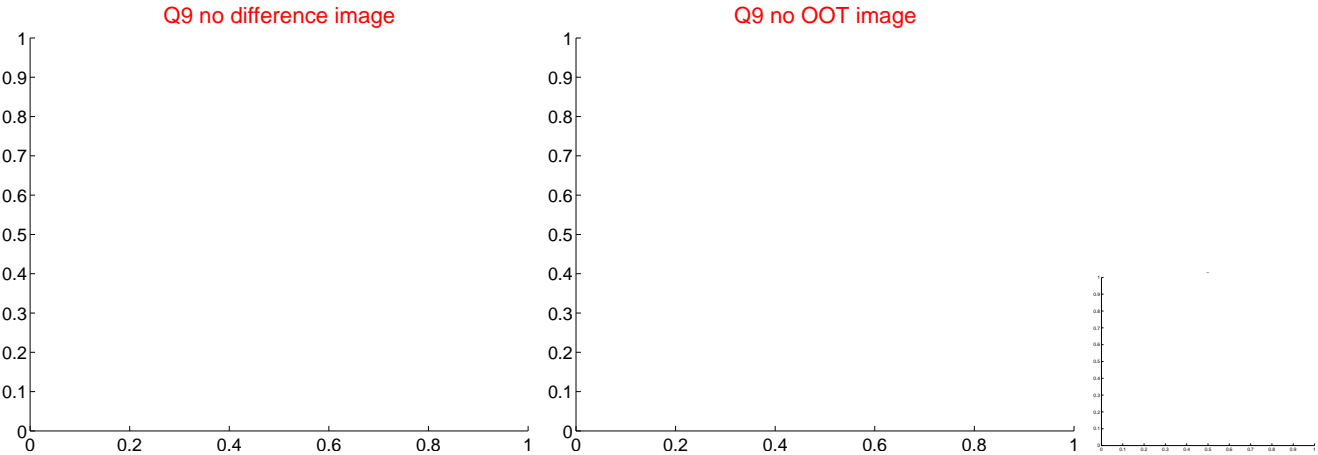
Q8 difference image. Poor Quality



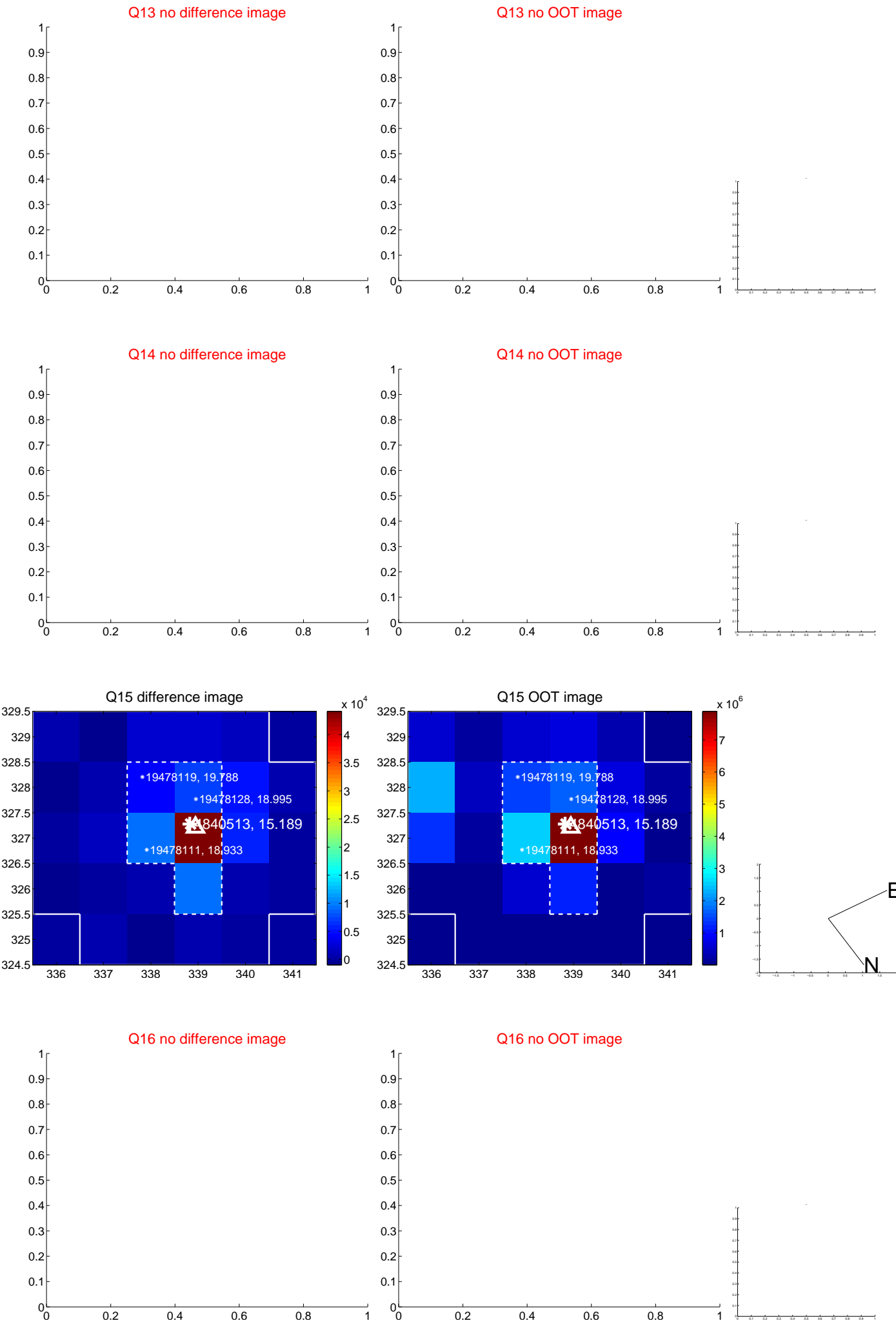
Q8 OOT image



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

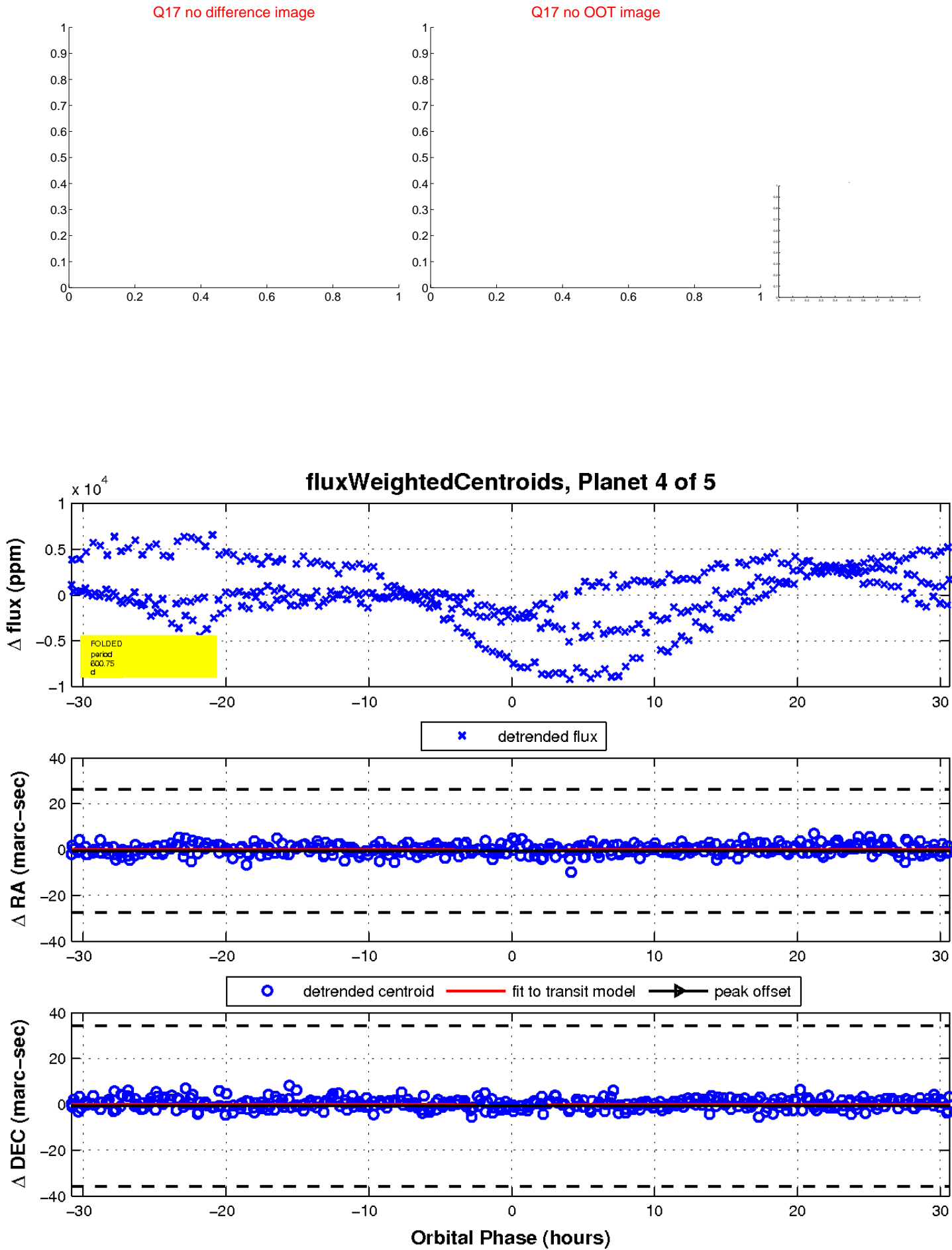


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



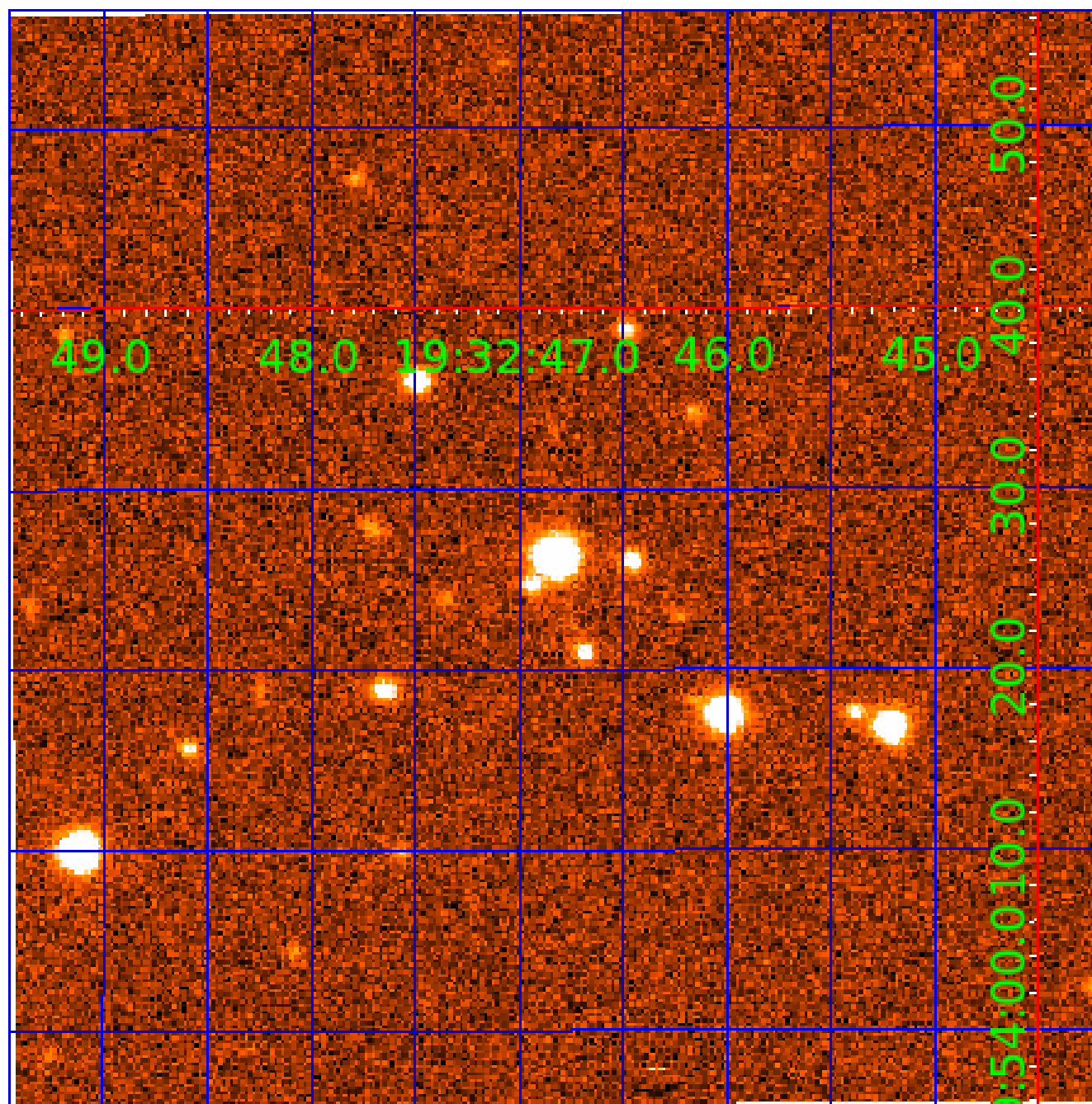


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination



# KIC 004840513

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
004840513-01	OBS	1541.01	2.379283	133.651248	48605.1	3.182	2697.5	2158.6	1.16	6392	25.82	1442.06
004840513-02	OBS	No	2.379277	132.462958	766.4	3.050	37.5	43.0	1.16	6392	3.78	1442.07
004840513-03	OBS	No	87.703474	200.587777	1199.6	9.041	7.6	5.2	1.16	6392	5.39	11.76
004840513-04	OBS	No	600.749090	198.851996	3627.1	10.292	7.6	7.1	1.16	6392	12.80	0.90
004840513-05	OBS	No	631.697123	201.200422	1783.9	4.642	8.5	6.6	1.16	6392	9.20	0.84

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
004840513-01	OBS	PC	0.76	0	1	0	0	MOD_SEC_DV—PLANET_OCCULT_DV—MOD_SEC_ALT—HAS_SEC_TCE
004840513-02	OBS	FP	0.00	1	1	0	0	IS_SEC_TCE
004840513-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_SKYE—TRANS_GAPPED—LPP_DV—MOD_NONUNIQ_ALT
004840513-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_CHASES—LPP_DV—ALL_TRANS_CHASES—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS
004840513-05	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_CHASES_MARSHALL—LPP_DV—ALL_TRANS_CHASES—MOD_TER_DV—MOD_POS_DV—CENT_FEW_DIFFS

**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 004840513-05

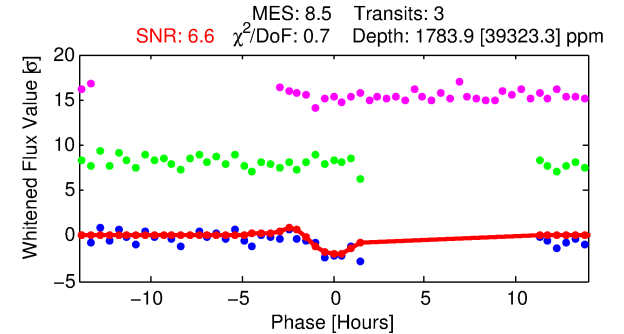
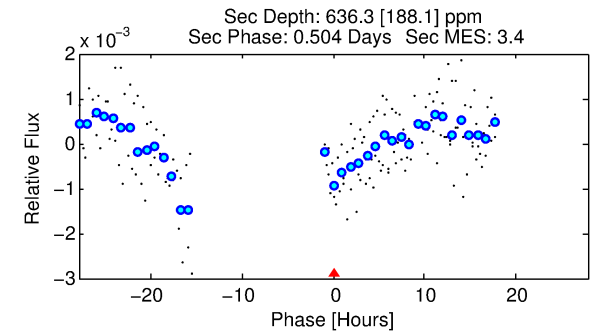
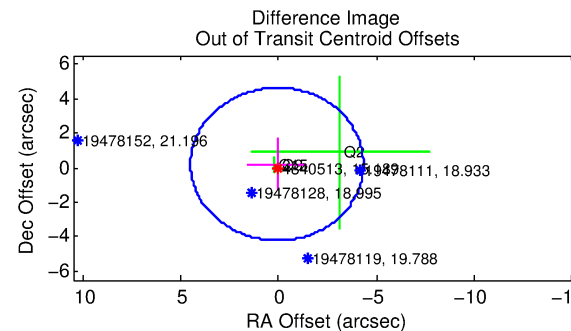
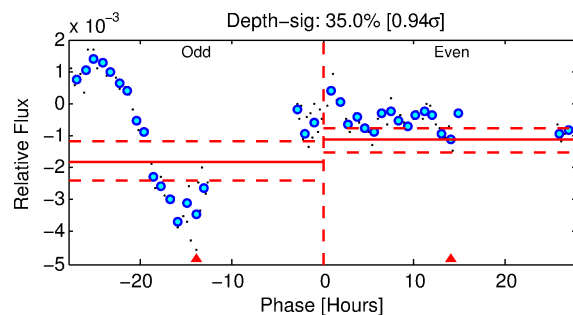
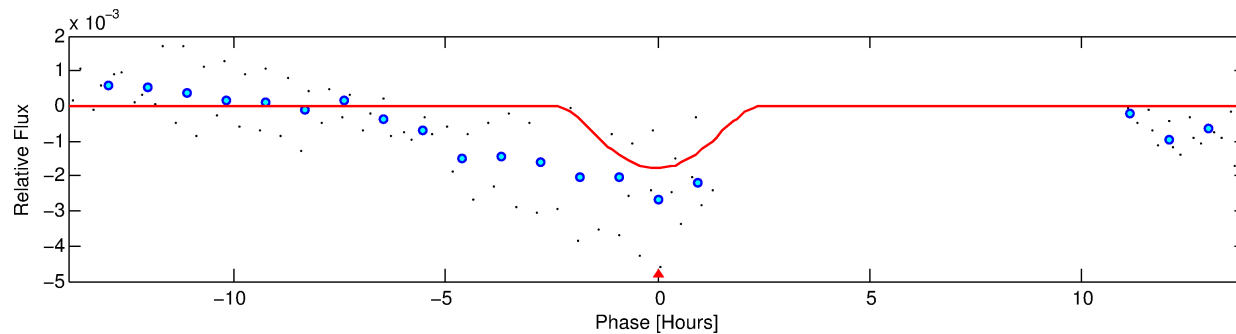
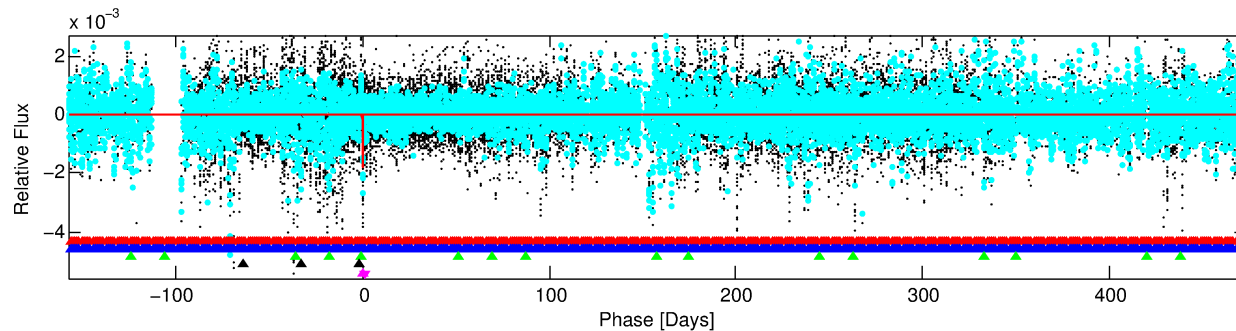
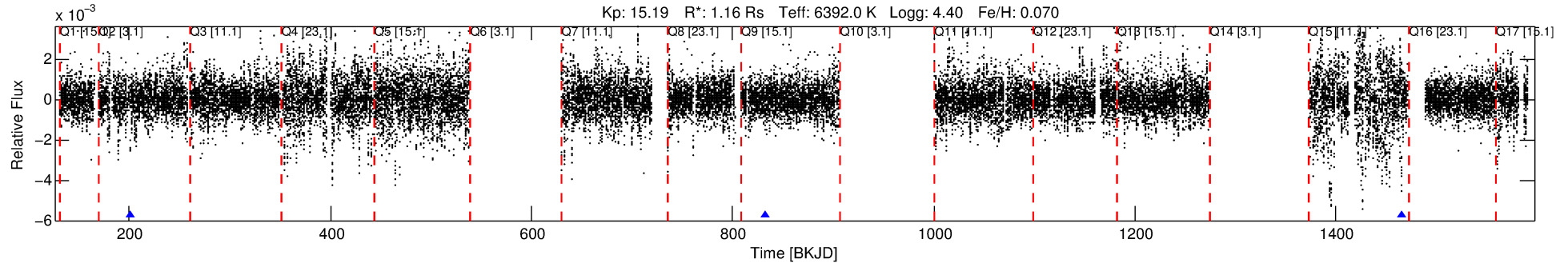
No Significant Match Found

# DV One-Page Summary

KIC: 4840513 Candidate: 5 of 5 Period: 631.697 d

KOI: K01541 Corr: No Ephemeris Match

Kp: 15.19 R\*: 1.16 Rs Teff: 6392.0 K Logg: 4.40 Fe/H: 0.070



## DV Fit Results:

Period = 631.69712 [0.00983] d  
Epoch = 201.2004 [0.0115] BKJD  
Rp/R\* = 0.0725 [0.2792]  
a/R\* = 403.11 [375.45]  
b = 1.00 [0.68]  
Seff = 0.85 [0.35]  
Teq = 244 [26] K  
Rp = 9.20 [35.53] Re  
a = 1.5459 [0.4157] AU  
Ag = 9885.99 [76259.97] [0.13σ]  
Teffp = 3769 [7261] K [0.49σ]

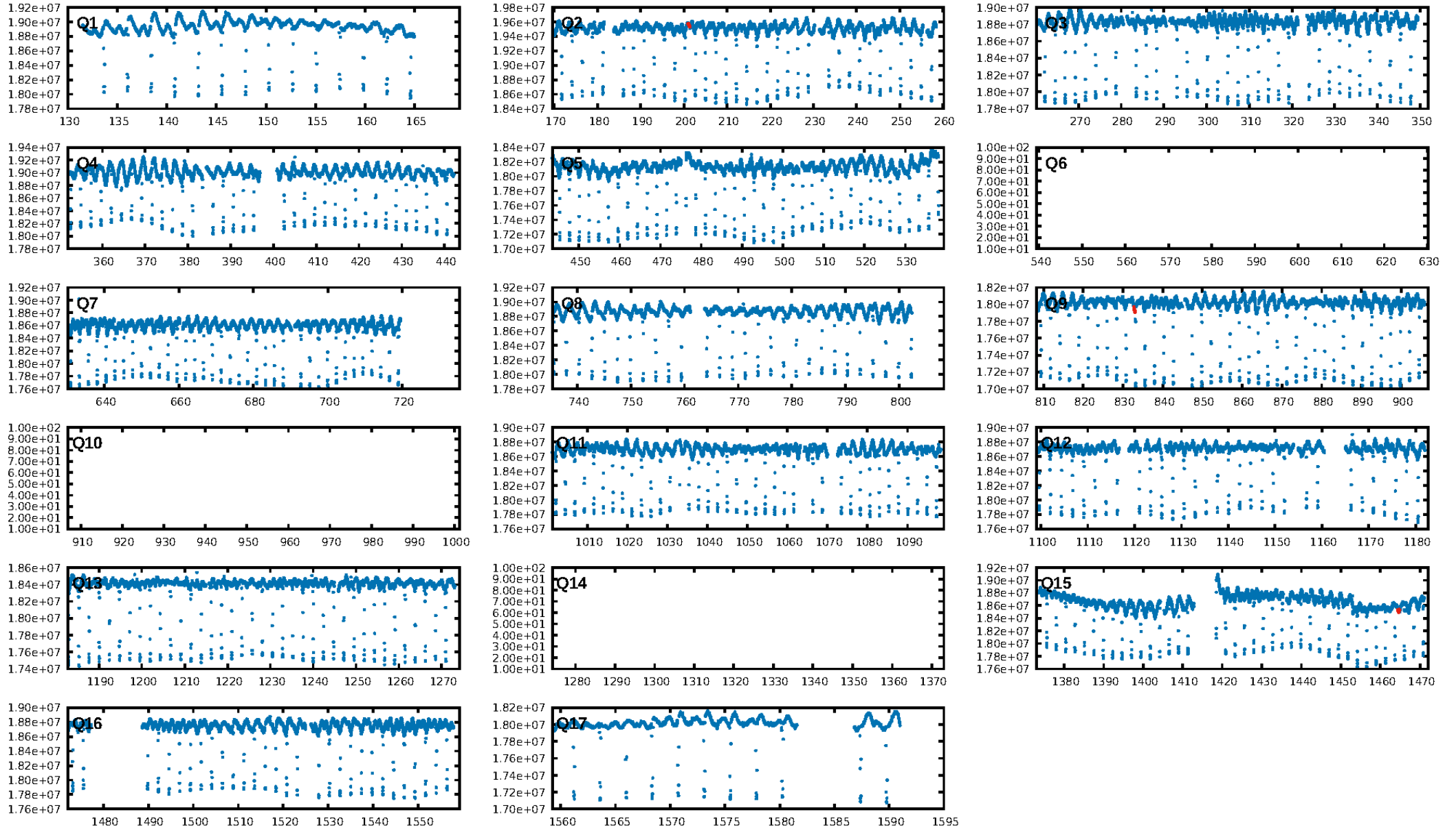
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [65.79σ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: 54.4%  
ModelChiSquareGof-sig: 100.0%  
**Bootstrap-pfa: 1.26e-10**  
RollingBand-fgt: 1.00 [3/3]  
GhostDiagnostic-chr: -1.94  
Centroid-sig: 87.4%  
Centroid-so: 0.415 arcsec [0.36σ]  
OotOffset-rm: 0.215 arcsec [0.15σ]  
KicOffset-rm: 0.079 arcsec [0.05σ]  
OotOffset-st: 1/1/0/1 [3]  
KicOffset-st: 1/1/0/1 [3]  
DiffImageQuality-fgm: 0.33 [1/3]  
DiffImageOverlap-fno: 0.00 [0/3]

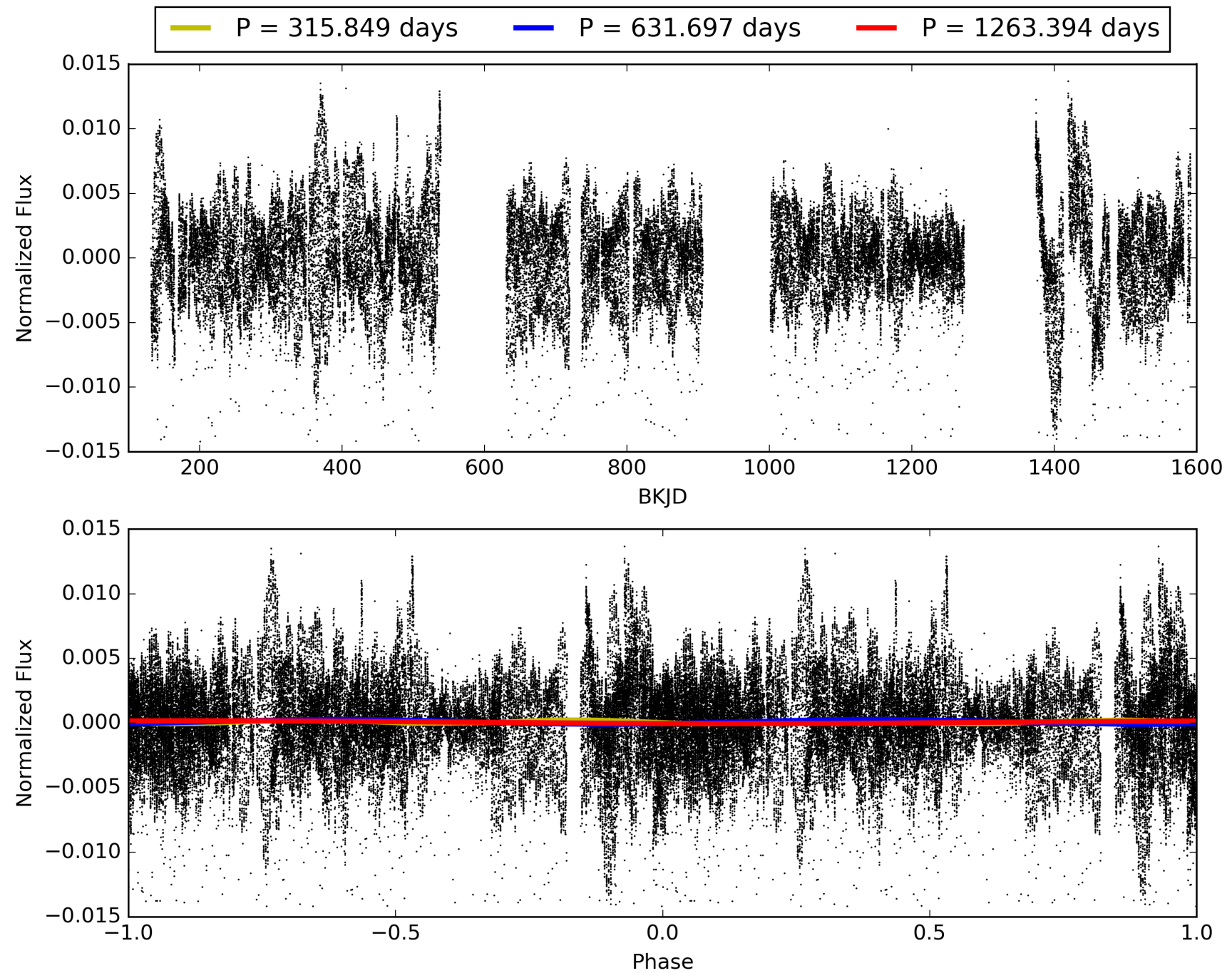
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 01-Feb-2016 11:28:24 Z

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

# TCE 004840513-05, PDC Light Curves

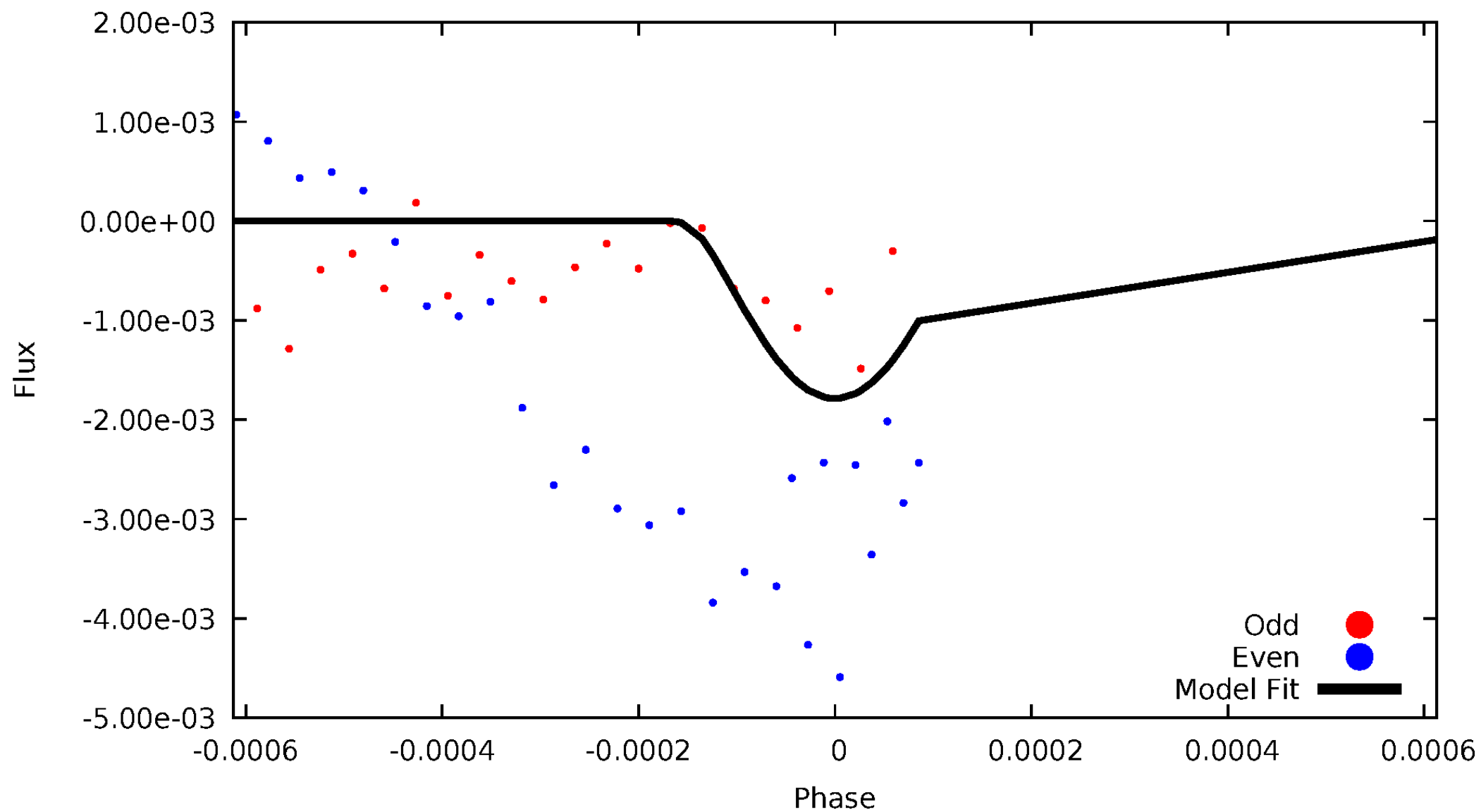


TCE 004840513-05



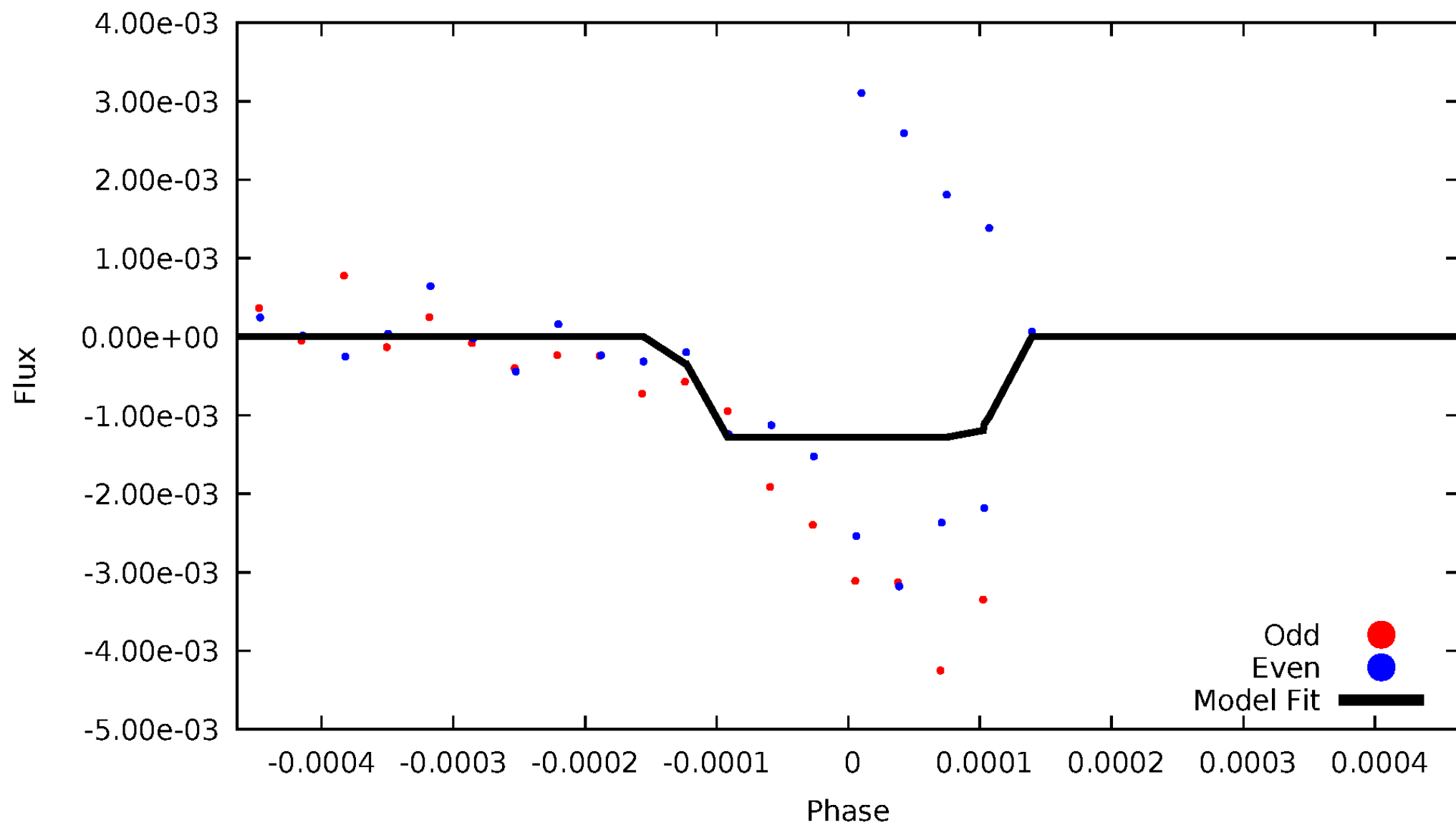
# DV Odd/Even

TCE 004840513-05



# ALT Odd/Even

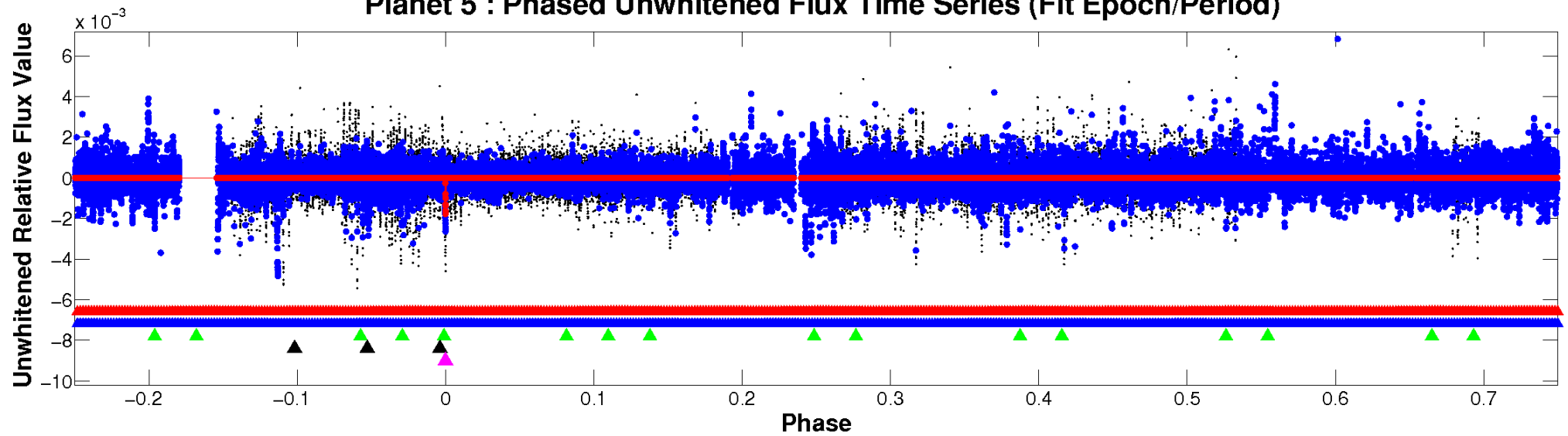
TCE 004840513-05



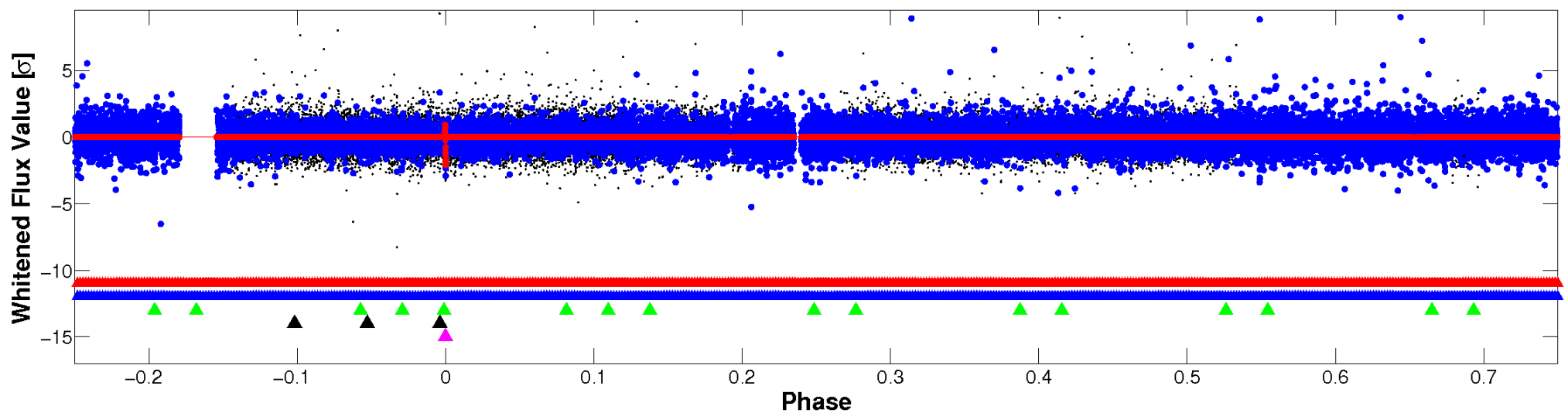


# Non-Whitened Vs. Whitened Light Curve

## Planet 5 : Phased Unwhitened Flux Time Series (Fit Epoch/Period)



## Planet 5 : Phased Whitened Flux Time Series (Fit Epoch/Period)



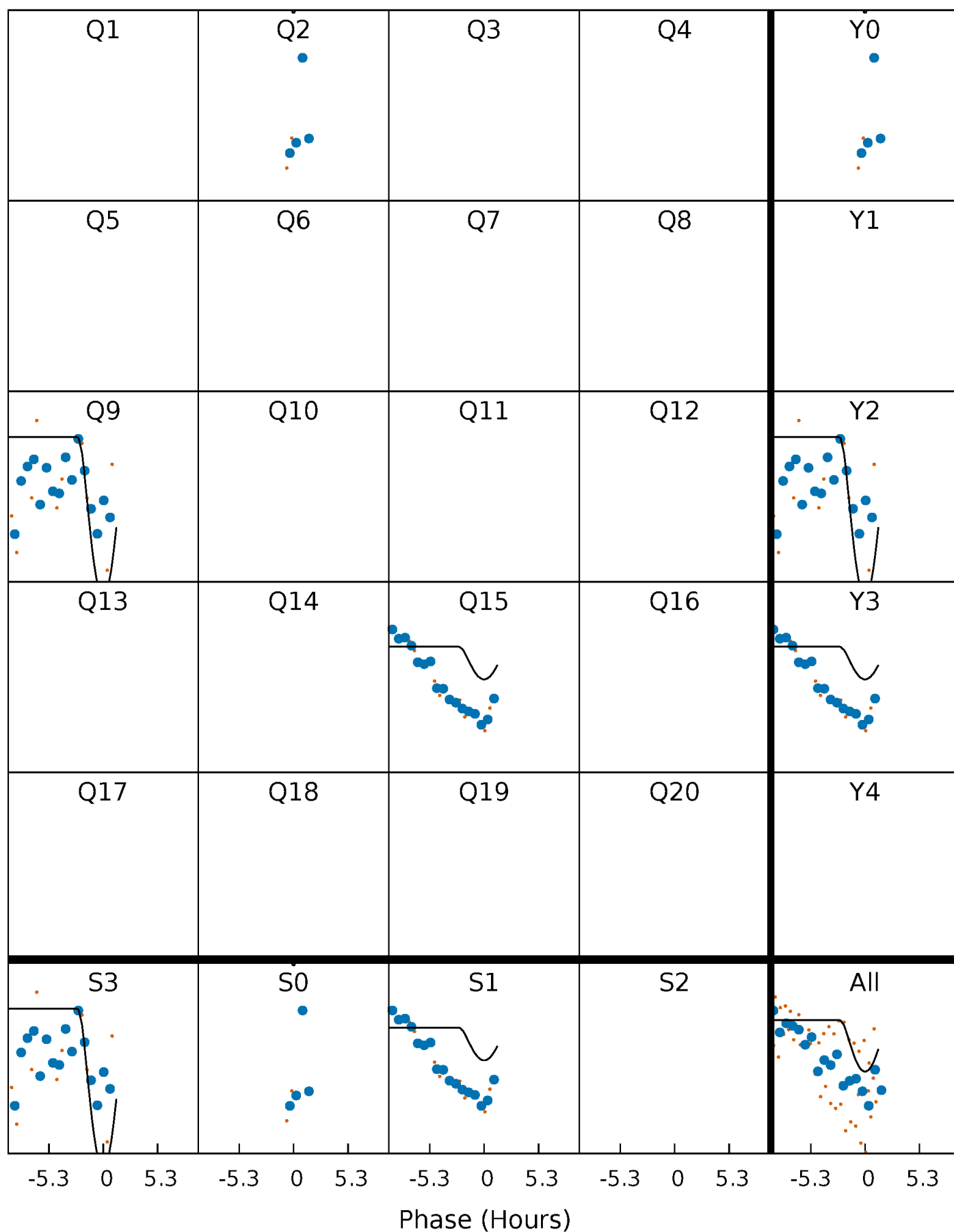
# PDC Quarter-Phased Transit Curves

TCE 004840513-05     $P=631.697123$  Days     $T_0=201.200422$  (BKJD)



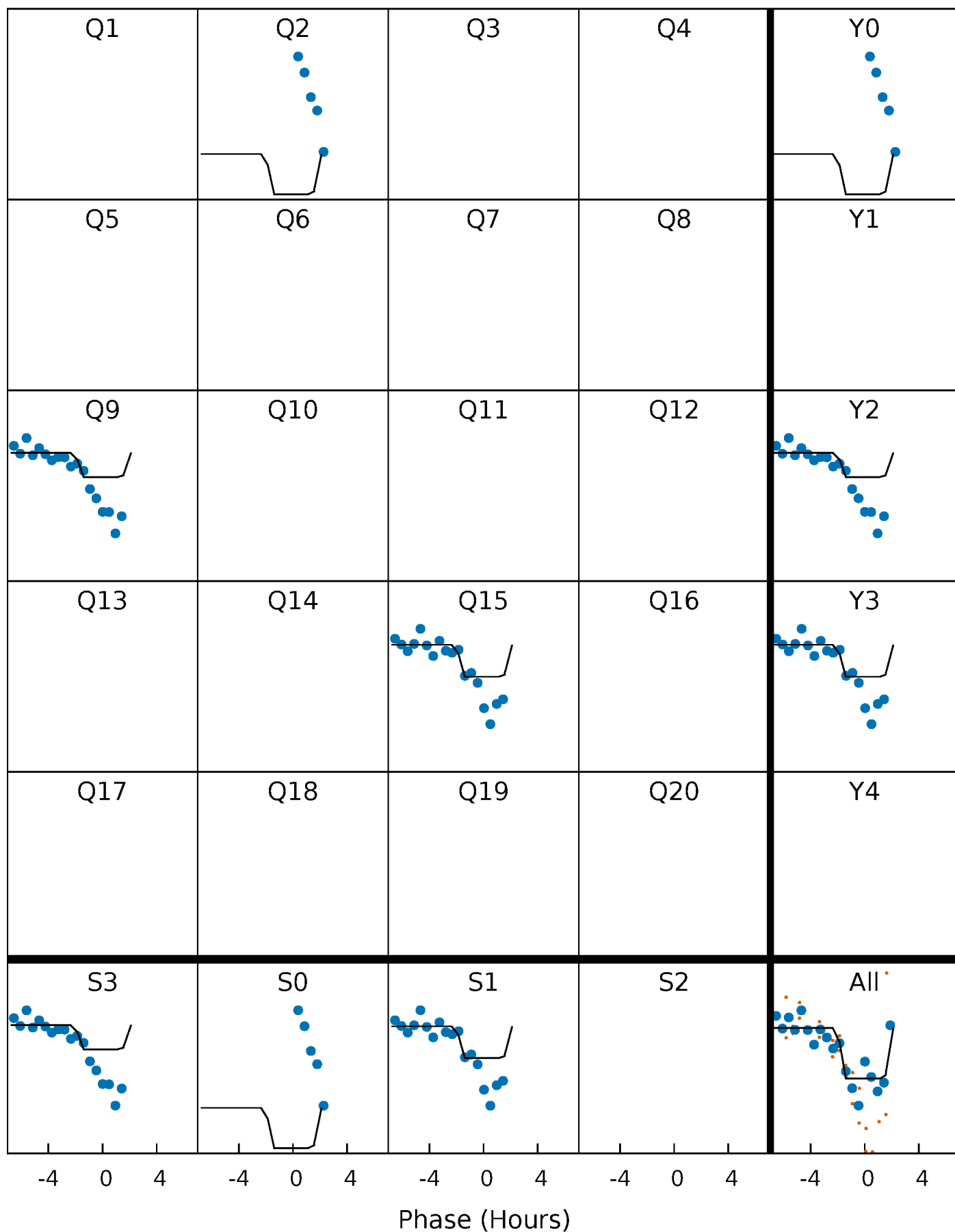
## DV Quarter-Phased Transit Curves

TCE 004840513-05    P=631.697123 Days     $T_0=201.200422$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

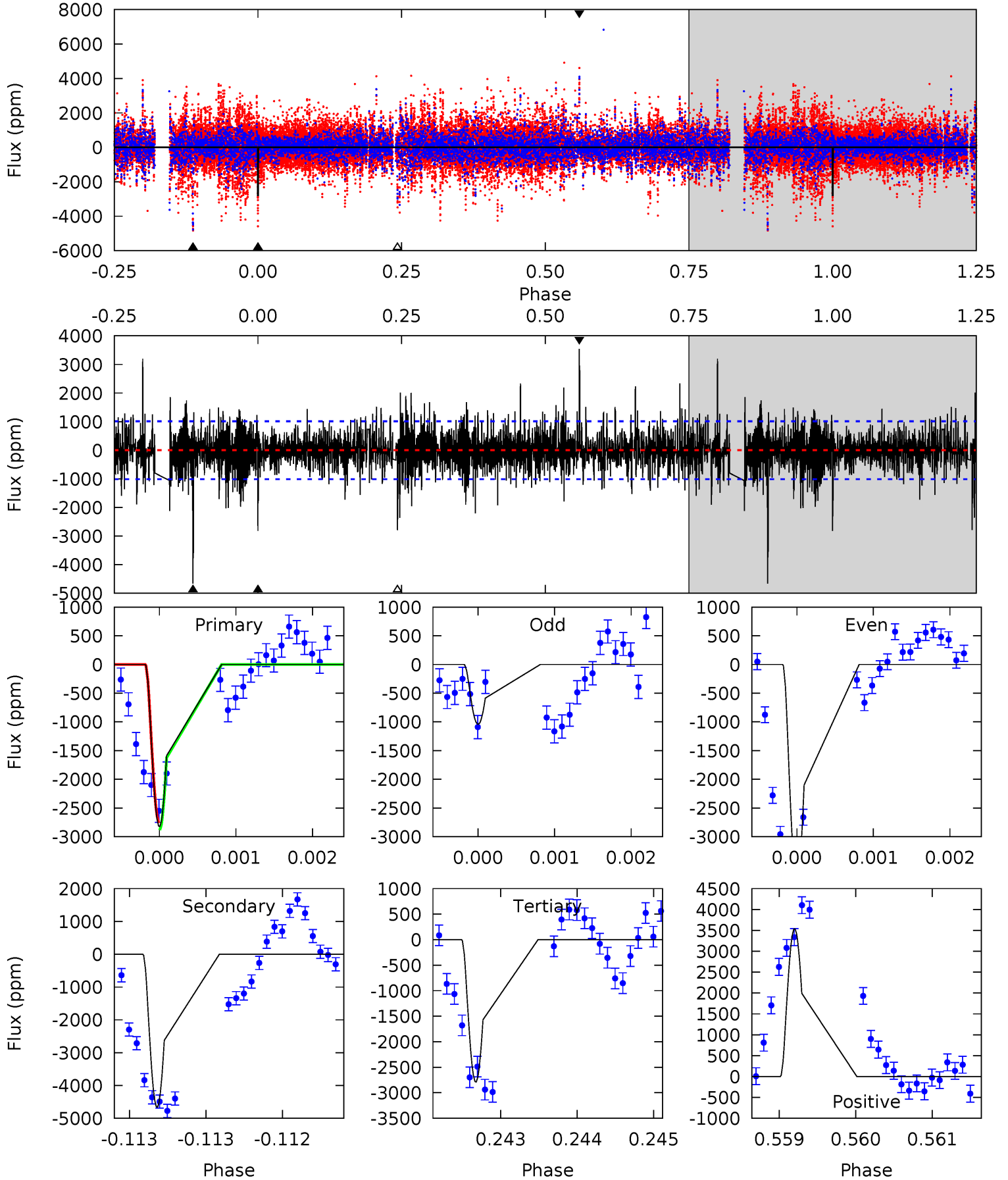
TCE 004840513-05 P=631.703507 Days  $T_0=201.166455$  (BKJD)



# DV Model-Shift Uniqueness Test

004840513-05, P = 631.697123 Days, E = 201.200422 Days

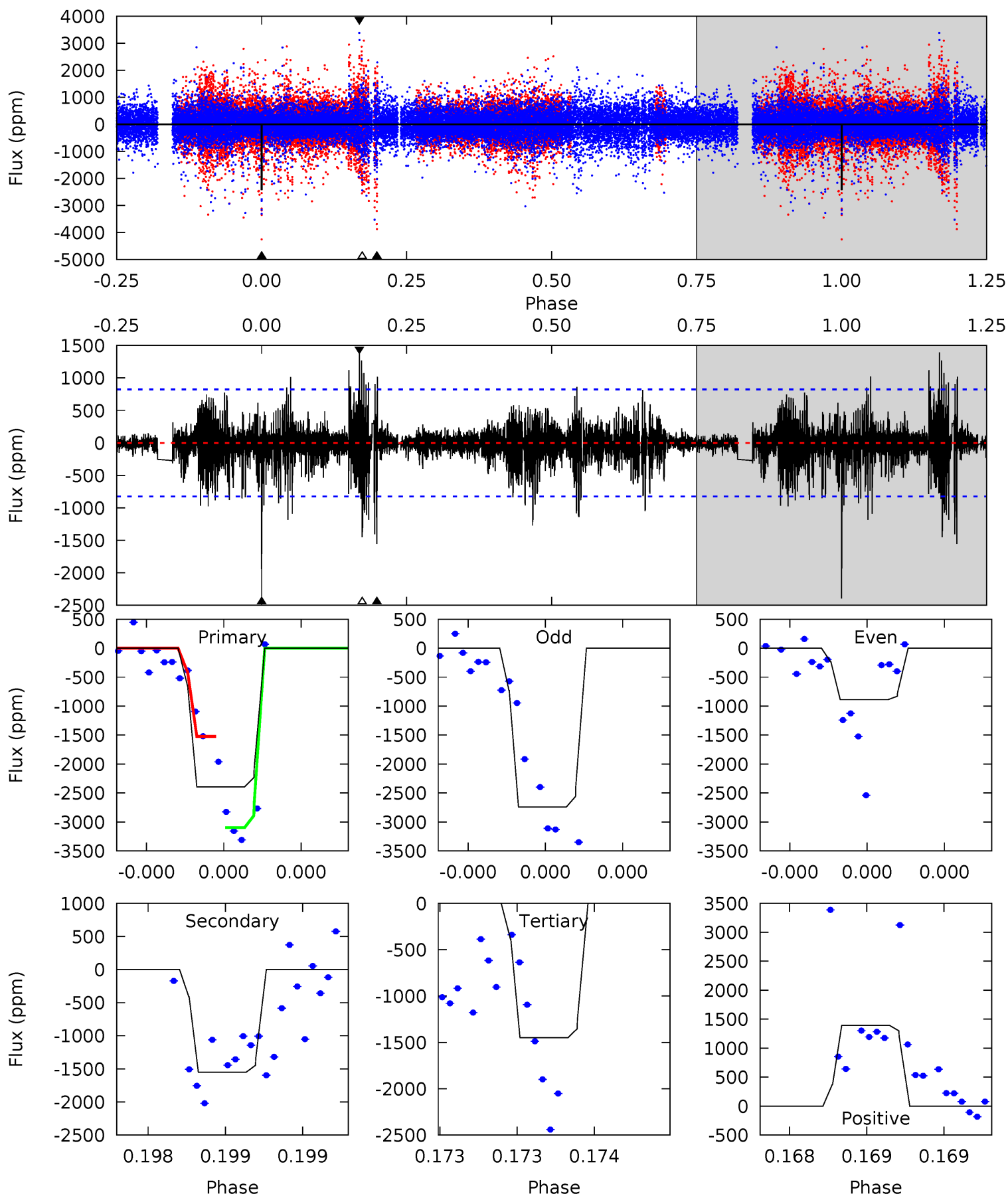
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
15.3	25.2	15.1	19.1	5.47	3.32	2.88	0.19	-3.87	10.1	6.07	7.19	1.03	0.43	0.33



# Alt Model-Shift Uniqueness Test

004840513-05, P = 631.703507 Days, E = 201.166455 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
16.5	10.7	10.0	9.60	5.68	3.65	1.53	6.51	6.92	0.69	1.10	6.91	0.39	0.37	5.35



### Stellar Parameters For KIC 004840513

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$6392^{+153}_{-230}$	$4.399^{+0.054}_{-0.216}$	$0.070^{+0.250}_{-0.350}$	$1.162^{+0.369}_{-0.132}$	$1.232^{+0.167}_{-0.184}$	$1.107^{+0.322}_{-0.594}$
	+2%/-4%	+1%/-5%	+357%/-500%	+32%/-11%	+14%/-15%	+29%/-54%
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 004840513-05 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-4659 \pm 185$	$29.27^{+29.41}_{-20.57}$	$349^{+27}_{-18}$	$3936^{+2686}_{-770}$	$6967^{+77741}_{-5231}$
Alt.	$-1550 \pm 145$	$27.94^{+28.96}_{-19.67}$	$348^{+27}_{-17}$	$3328^{+1832}_{-619}$	$2548^{+26979}_{-1962}$

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

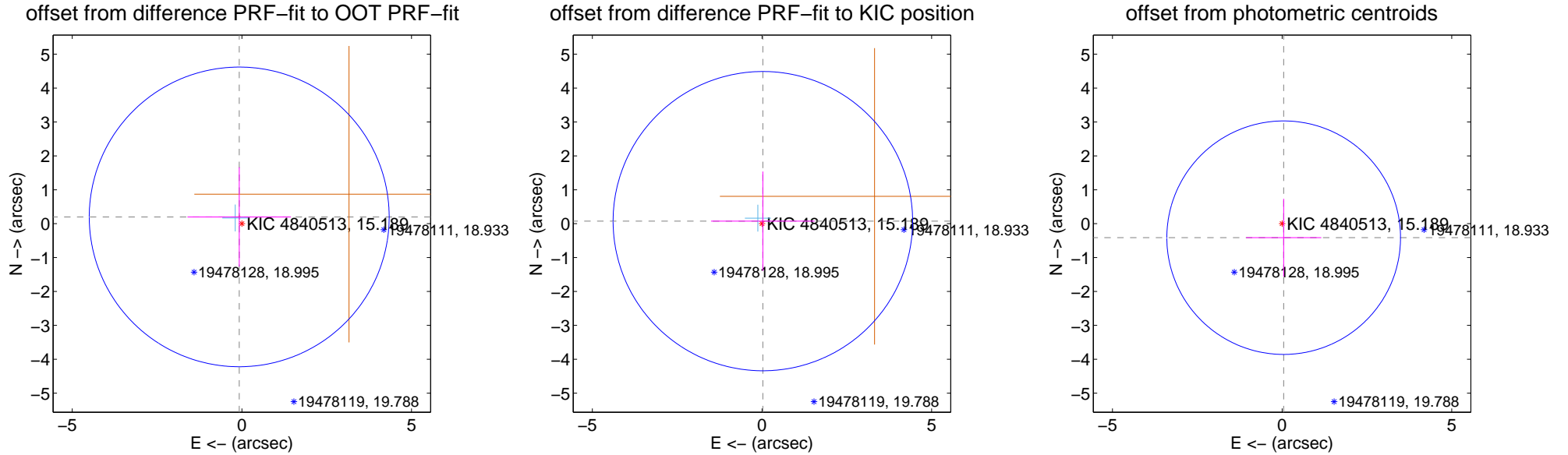
## DV Centroid Data

Supplemental centroid analysis for 004840513-05. Kepler magnitude: 15.19. Transit SNR 6.64

There are 1 quarters with good PRF difference image offsets

The direct PRF centroid is offset from the target star catalog position by about 0.07 arcsec

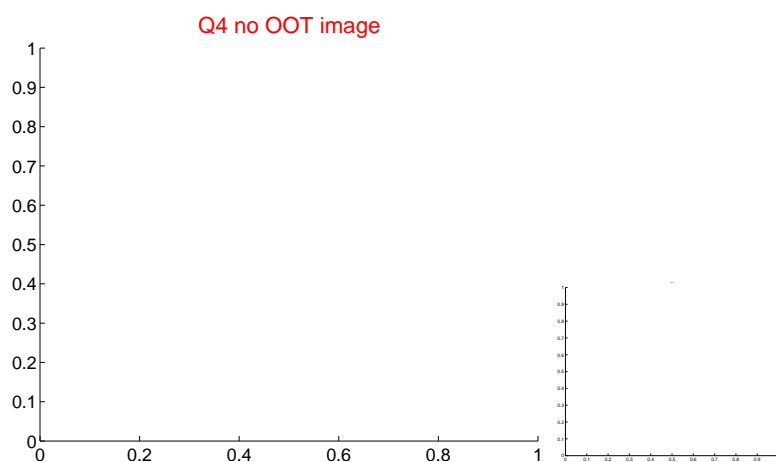
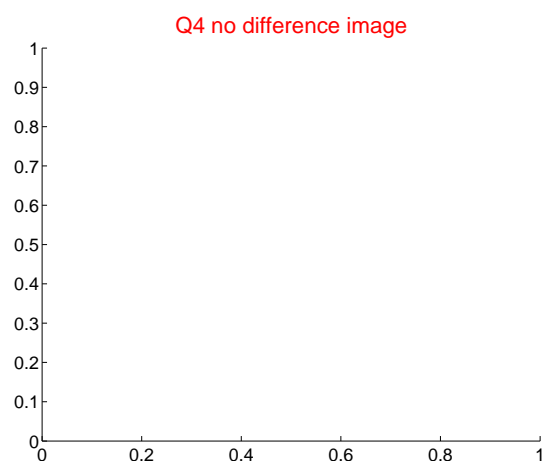
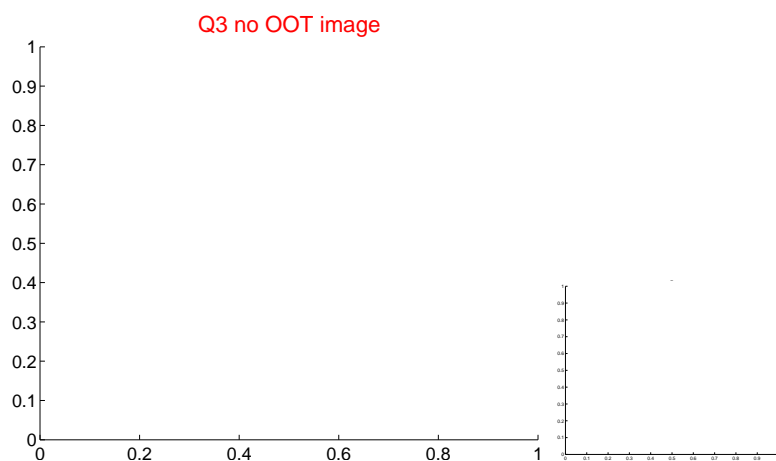
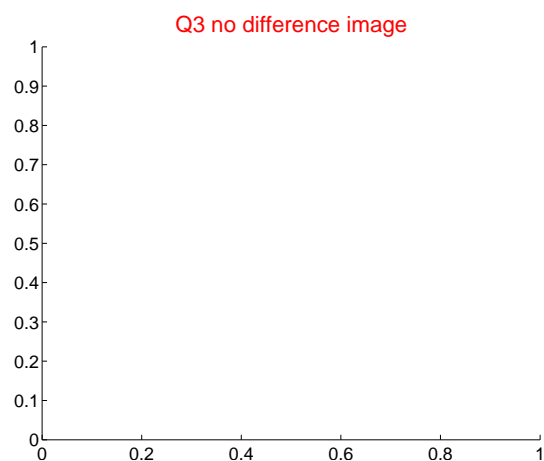
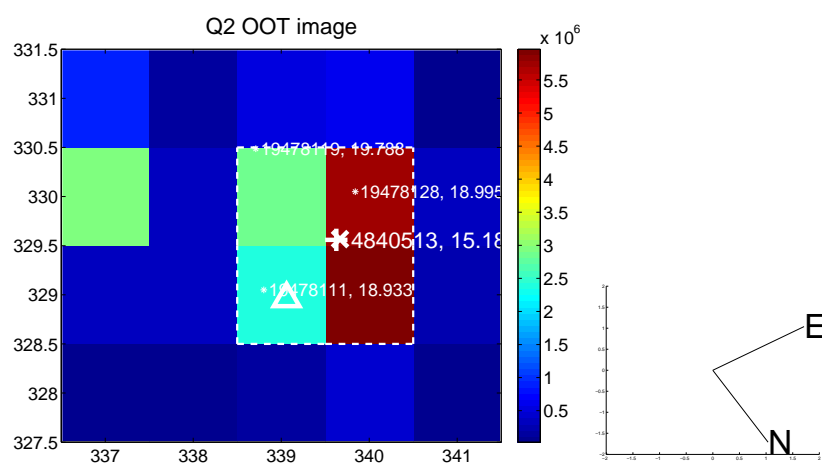
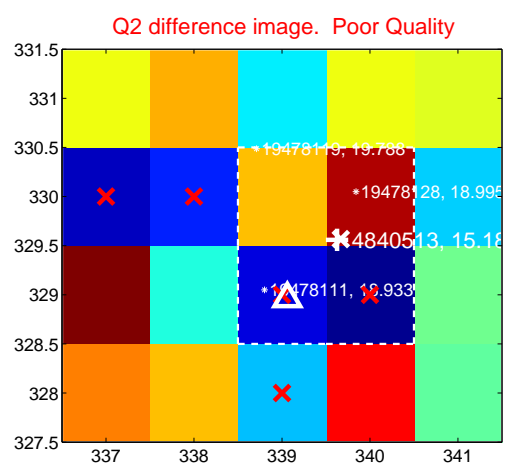
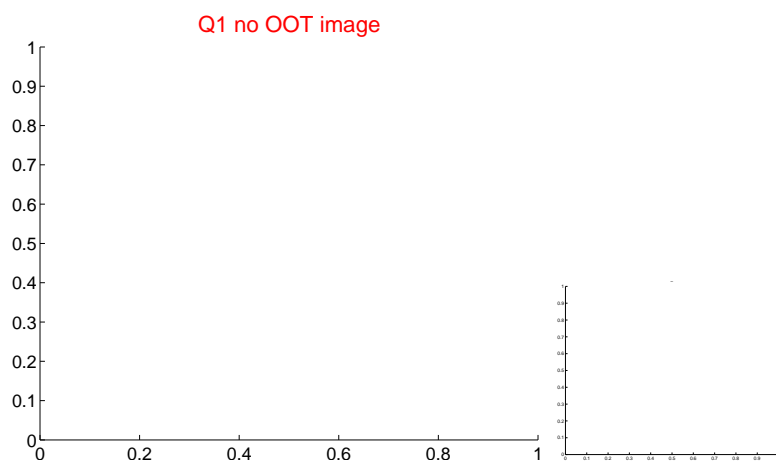
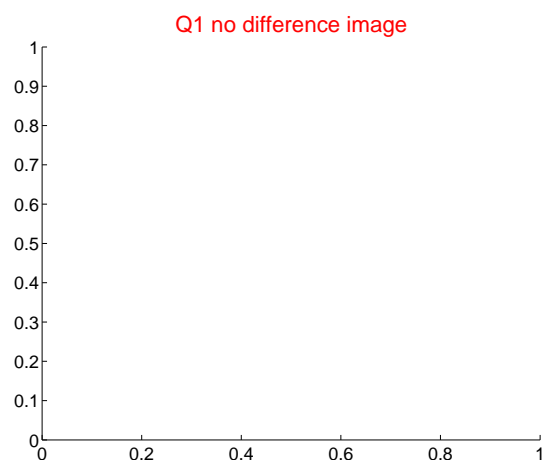
	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.215 \pm 1.473$	0.15	$0.079 \pm 1.526$	$0.200 \pm 1.465$
PRF-fit source offset from KIC position	$0.079 \pm 1.471$	0.05	$-0.025 \pm 1.526$	$0.075 \pm 1.465$
photometric centroid source offset	$0.42 \pm 1.15$	0.36	$-0.05 \pm 1.11$	$-0.41 \pm 1.15$



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.



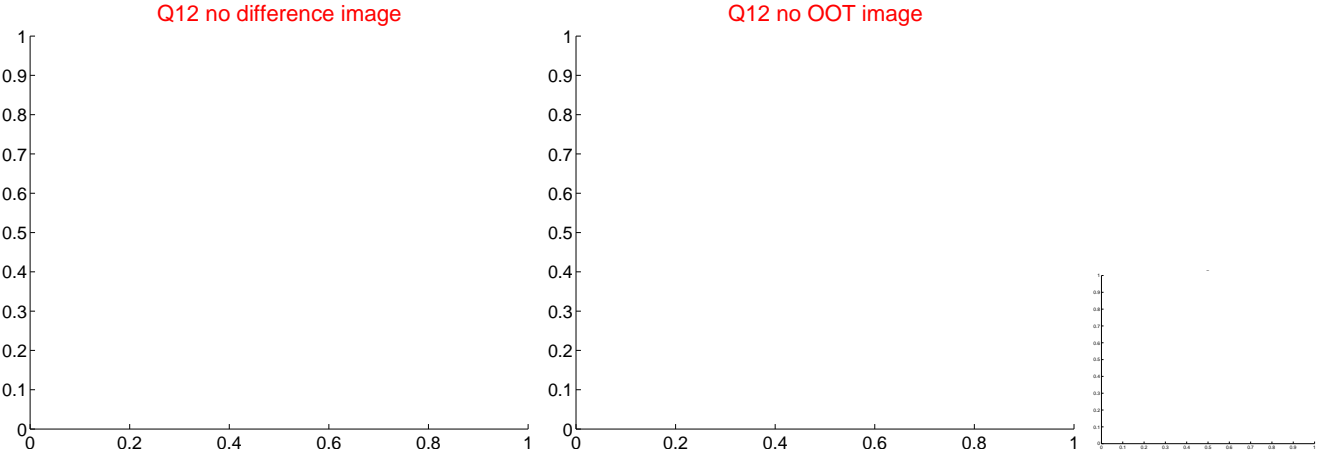
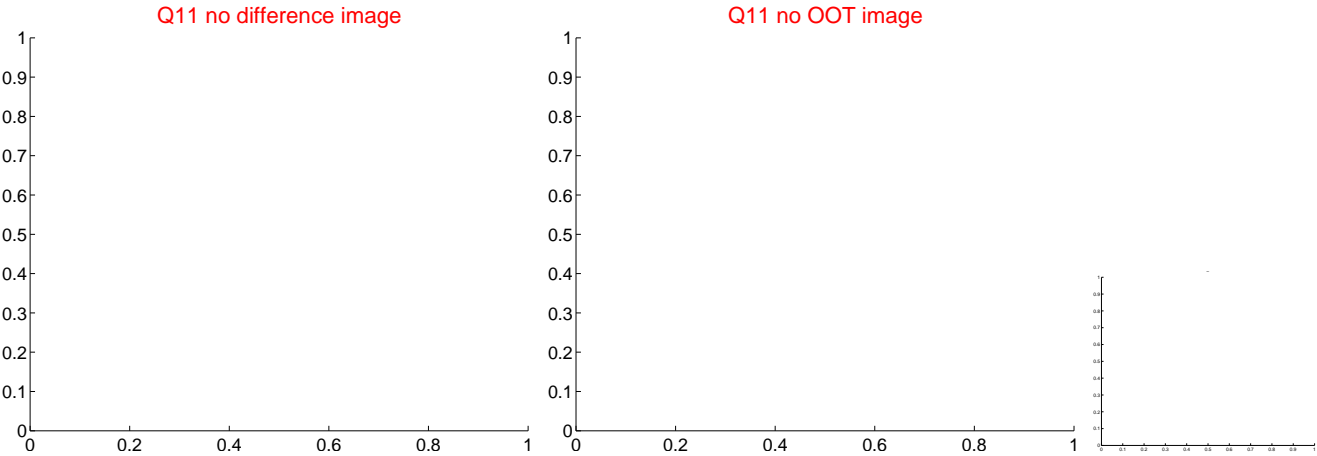
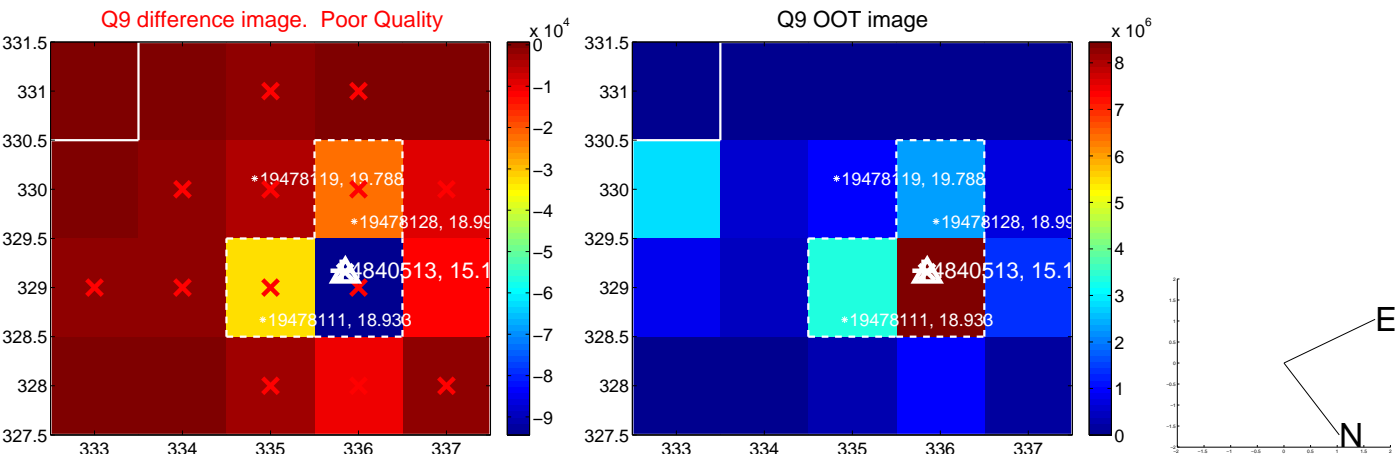
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value



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.

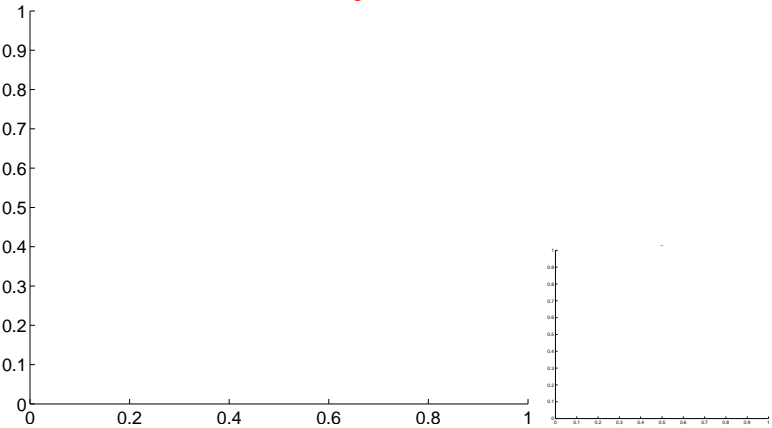


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

Q13 no difference image



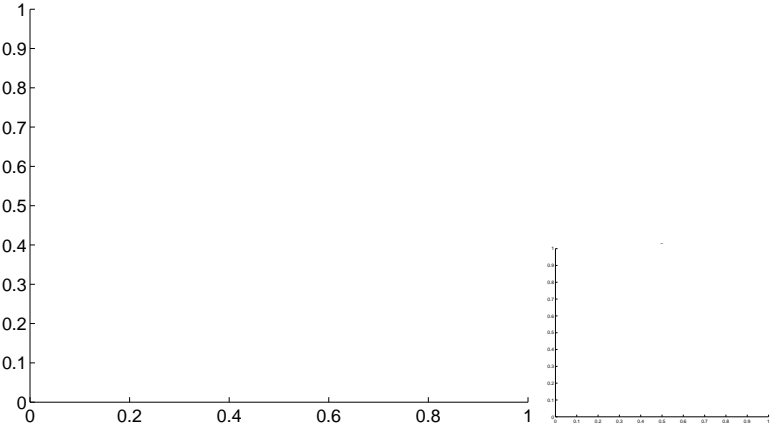
Q13 no OOT image



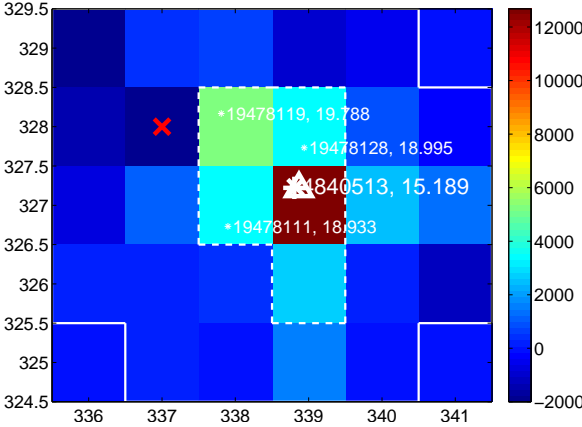
Q14 no difference image



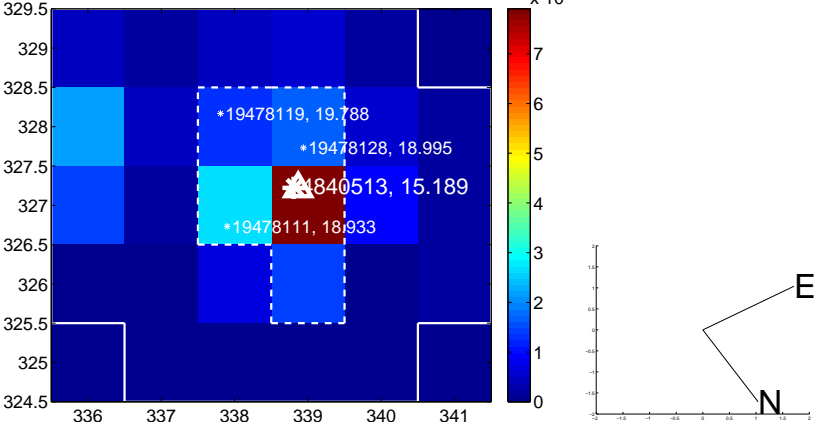
Q14 no OOT image



Q15 difference image



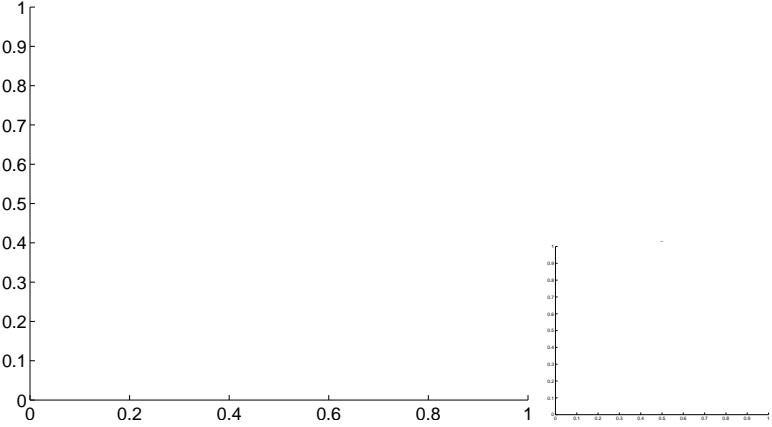
Q15 OOT image



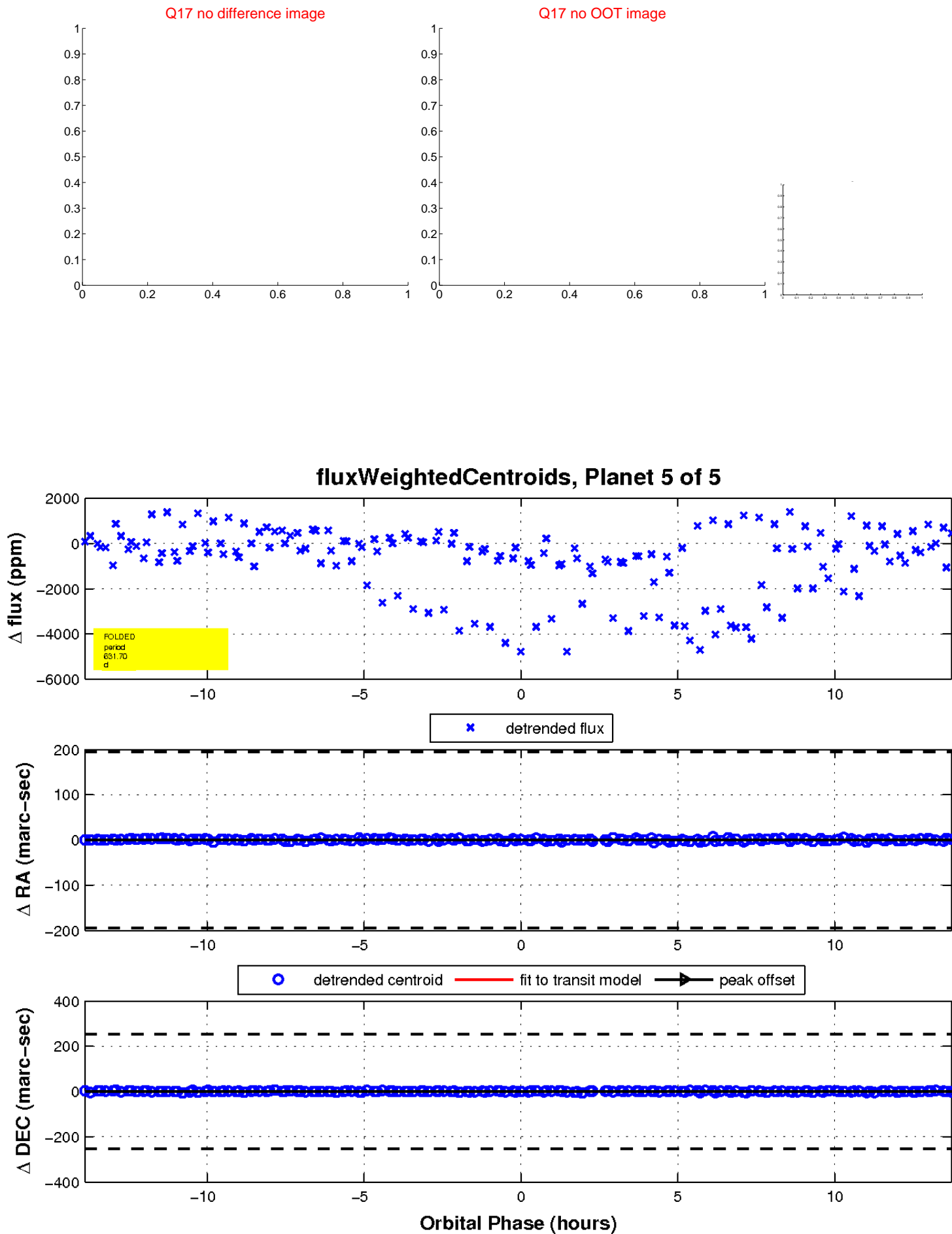
Q16 no difference image



Q16 no OOT image



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



# UKIRT Image

Declination

