

# KIC 010464078

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
010464078-01	OBS	0743.01	19.403984	133.674836	10036.9	12.123	320.9	320.1	0.68	5043	7.67	17.73
010464078-02	OBS	No	19.404046	145.510083	1168.9	11.331	41.1	43.6	0.68	5043	2.60	17.73

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
010464078-01	OBS	FP	0.00	0	1	0	0	MOD_SEC_DV—HAS_SEC_TCE
010464078-02	OBS	FP	0.00	1	1	0	0	IS_SEC_TCE

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

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

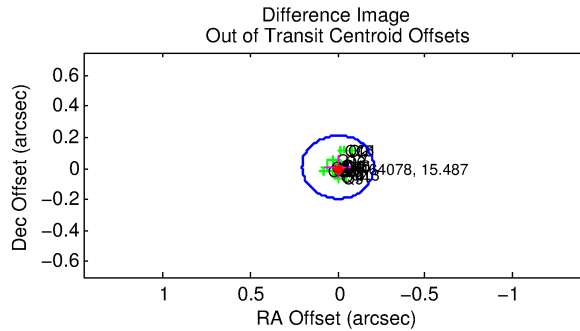
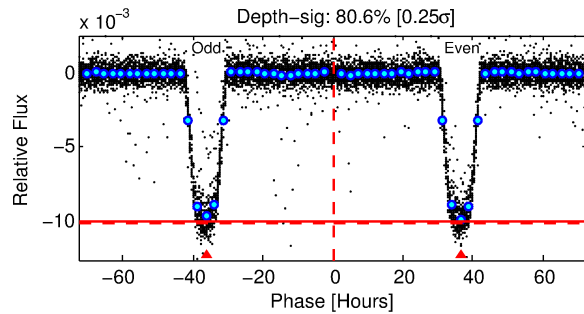
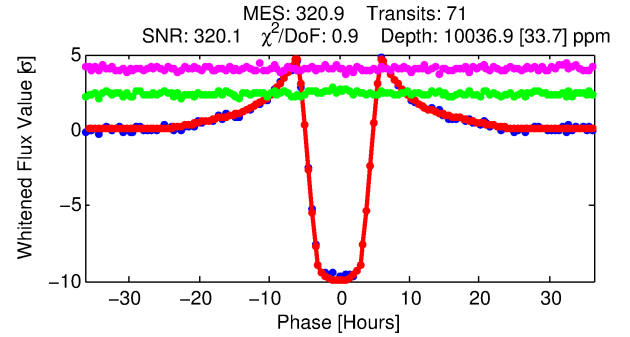
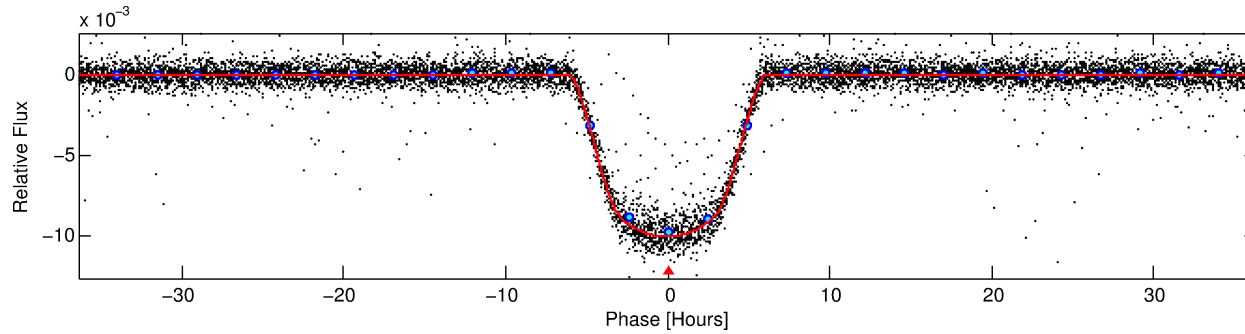
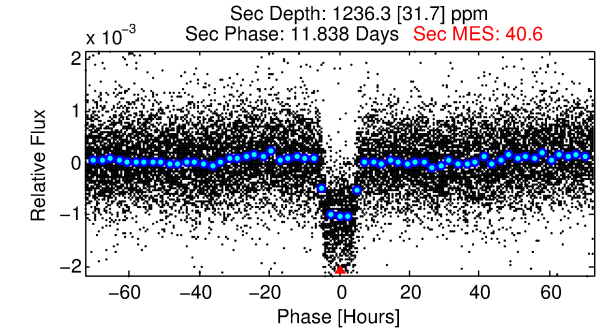
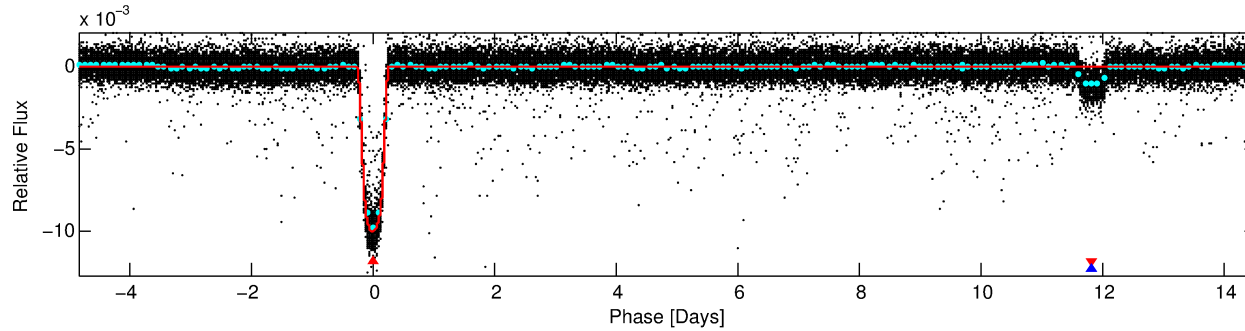
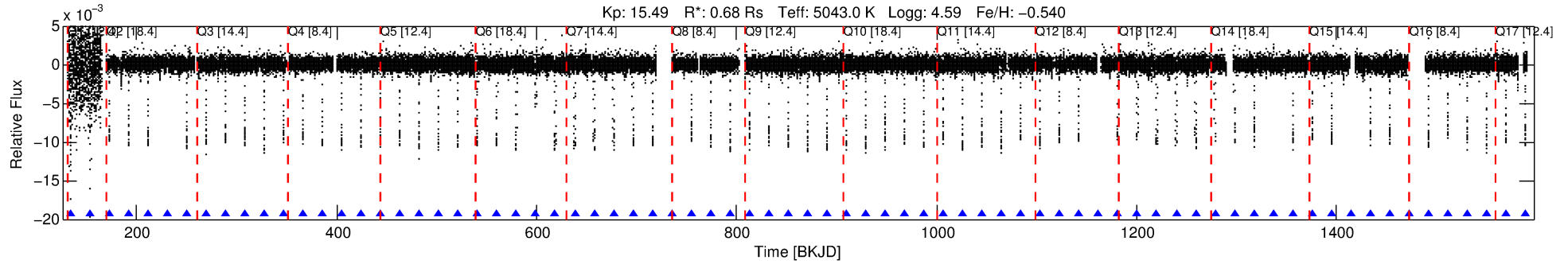
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 010464078-01

No Significant Match Found

# DV One-Page Summary

KIC: 10464078 Candidate: 1 of 2 Period: 19.404 d  
KOI: K00743.01 Corr: 0.897



## DV Fit Results:

Period = 19.40398 [0.00001] d  
Epoch = 133.6748 [0.0006] BKJD  
Rp/R\* = 0.1034 [0.0003]  
a/R\* = 9.22 [0.05]  
b = 0.81 [0.00]  
Seff = 17.73 [3.15]  
Teq = 523 [23] K  
Rp = 7.67 [0.81] Re  
a = 0.1229 [0.0110] AU  
**Ag = 174.69 [23.36] [7.43 $\sigma$ ]**  
**Teffp = 2941 [90] K [25.97 $\sigma$ ]**

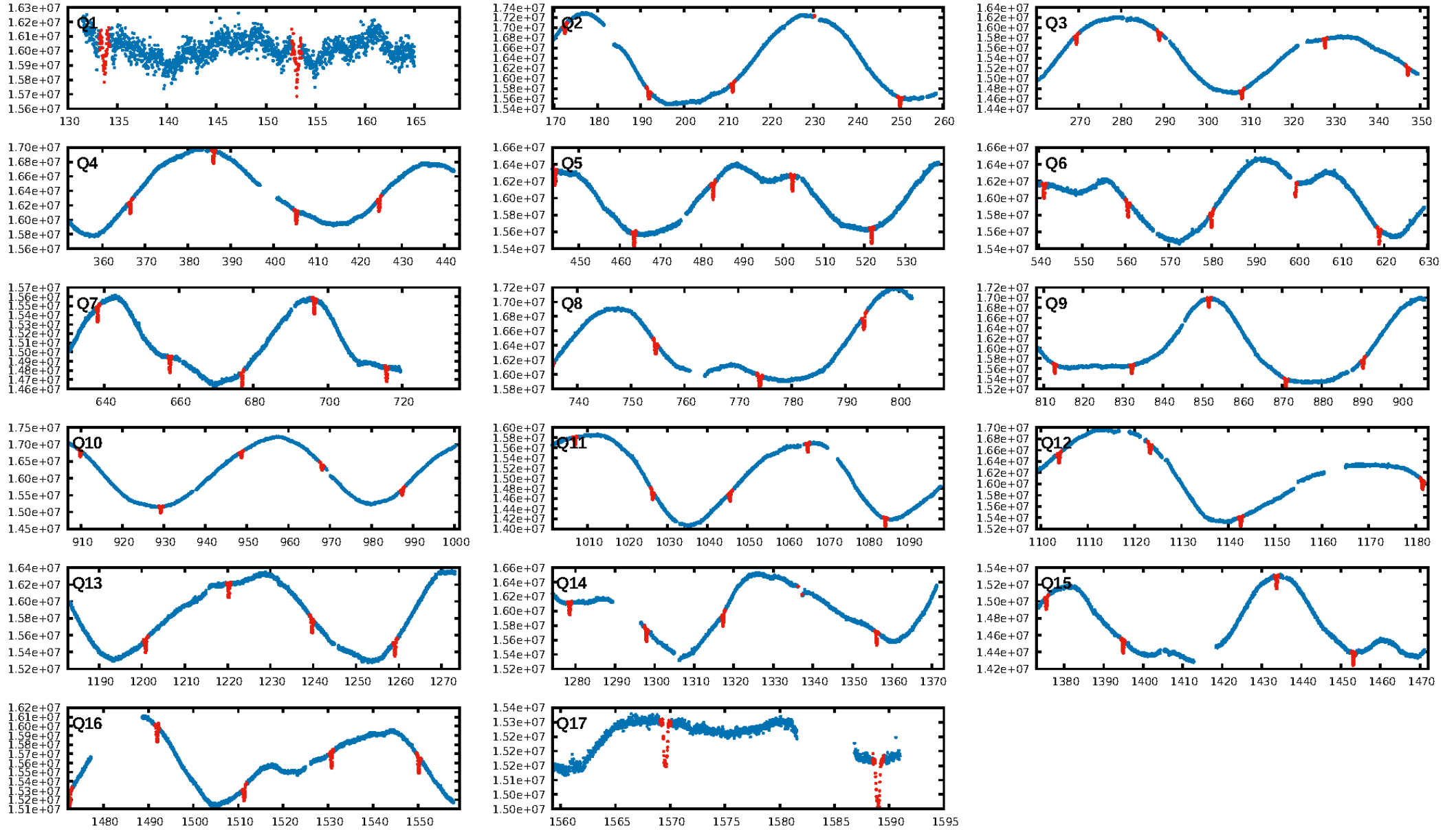
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
**LongPeriod-sig: 0.0% [0.00 $\sigma$ ]**  
**ModelChiSquare2-sig: 0.0%**  
ModelChiSquareGof-sig: 100.0%  
Bootstrap-pfa: 0.00e+00  
RollingBand-fgt: 1.00 [67/67]  
GhostDiagnostic-chr: 2.307  
Centroid-sig: 4.8%  
Centroid-so: 0.038 arcsec [1.63 $\sigma$ ]  
OotOffset-rm: 0.009 arcsec [0.14 $\sigma$ ]  
KicOffset-rm: 0.152 arcsec [2.23 $\sigma$ ]  
OotOffset-st: 4/4/4/5 [17]  
KicOffset-st: 4/4/4/5 [17]  
DiffImageQuality-fgm: 1.00 [17/17]  
DiffImageOverlap-fno: 1.00 [17/17]

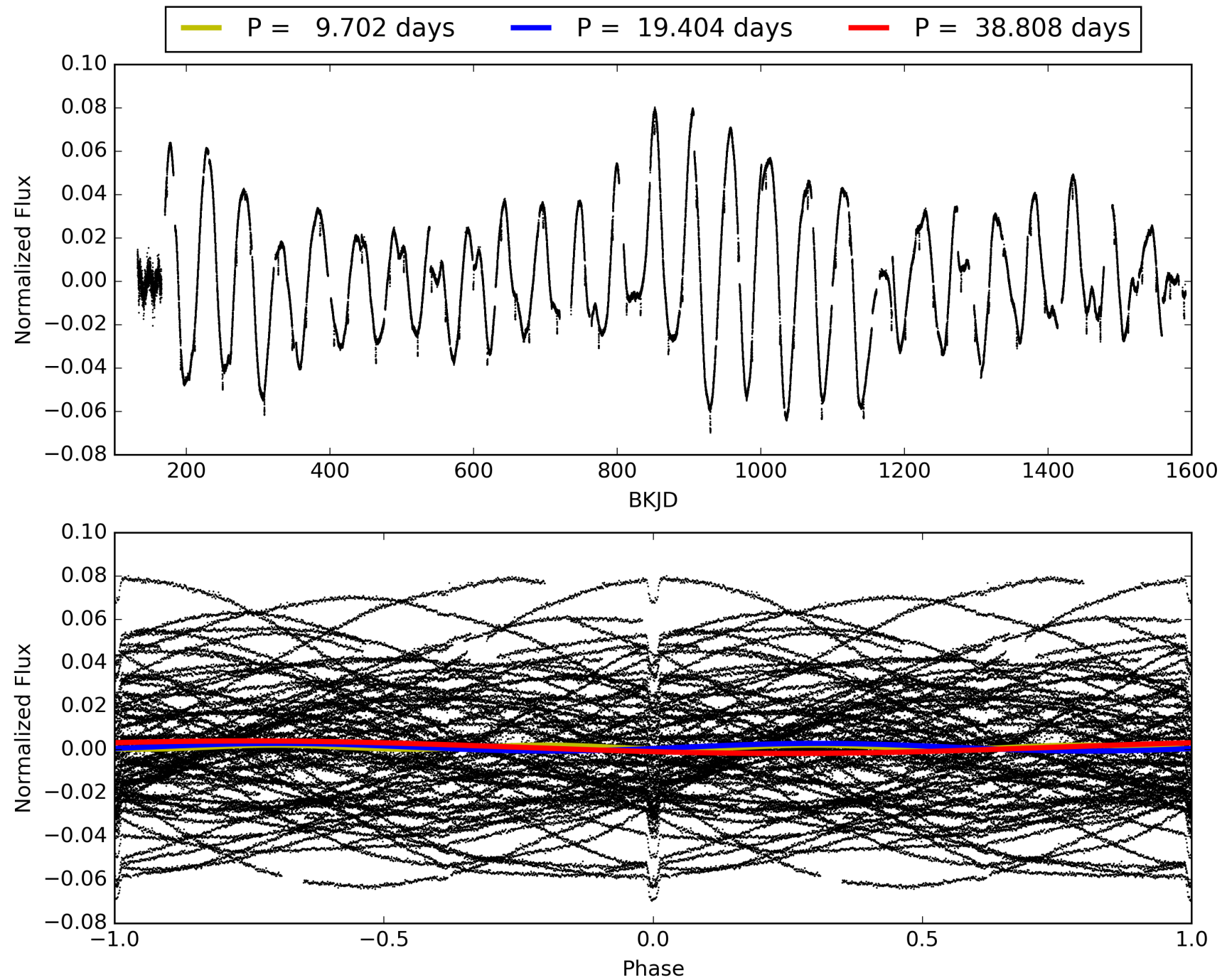
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 29-Jan-2016 14:04:06 Z

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

# TCE 010464078-01, PDC Light Curves

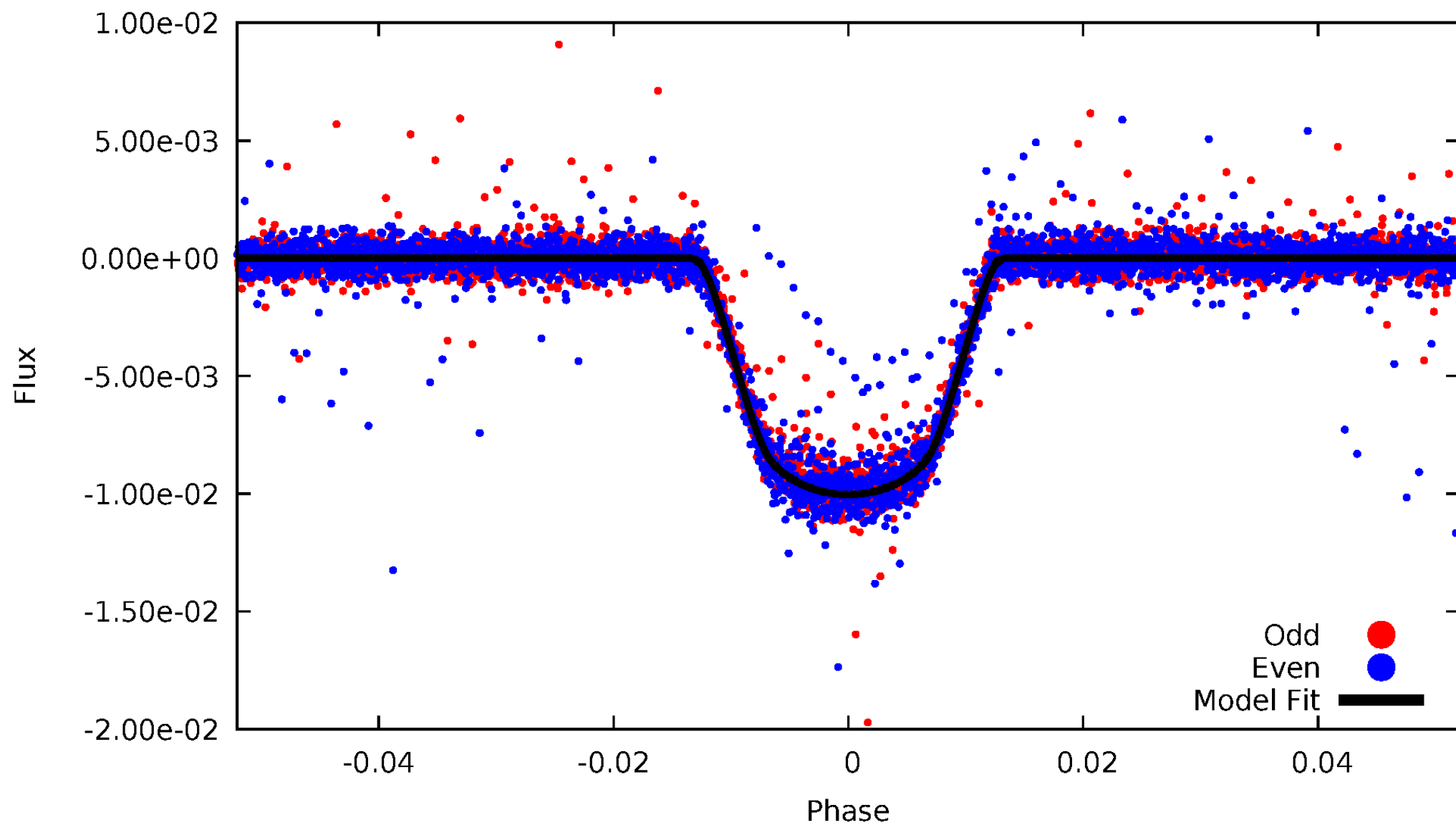


# TCE 010464078-01



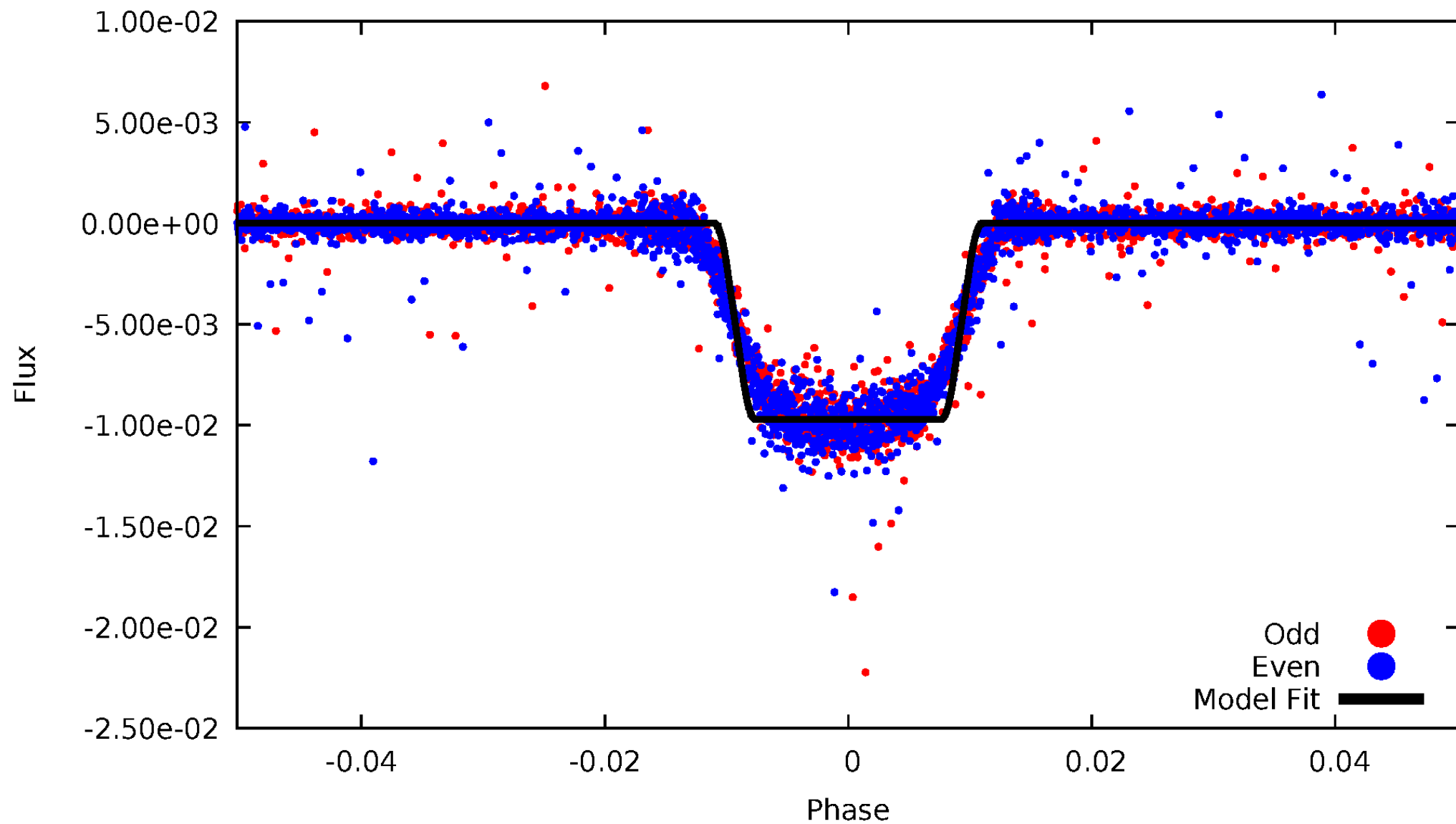
# DV Odd/Even

TCE 010464078-01



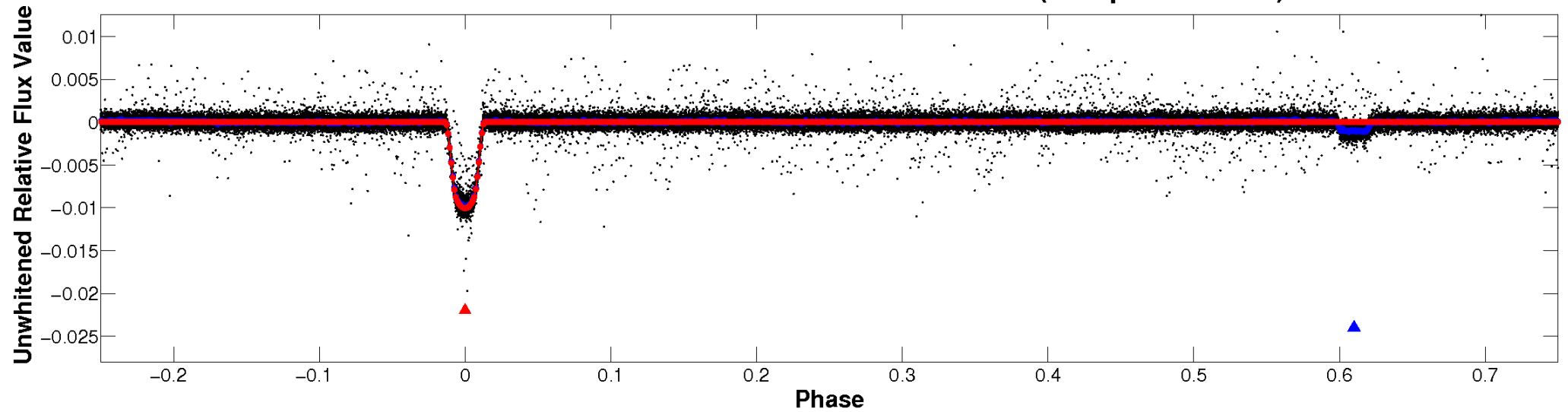
# ALT Odd/Even

TCE 010464078-01

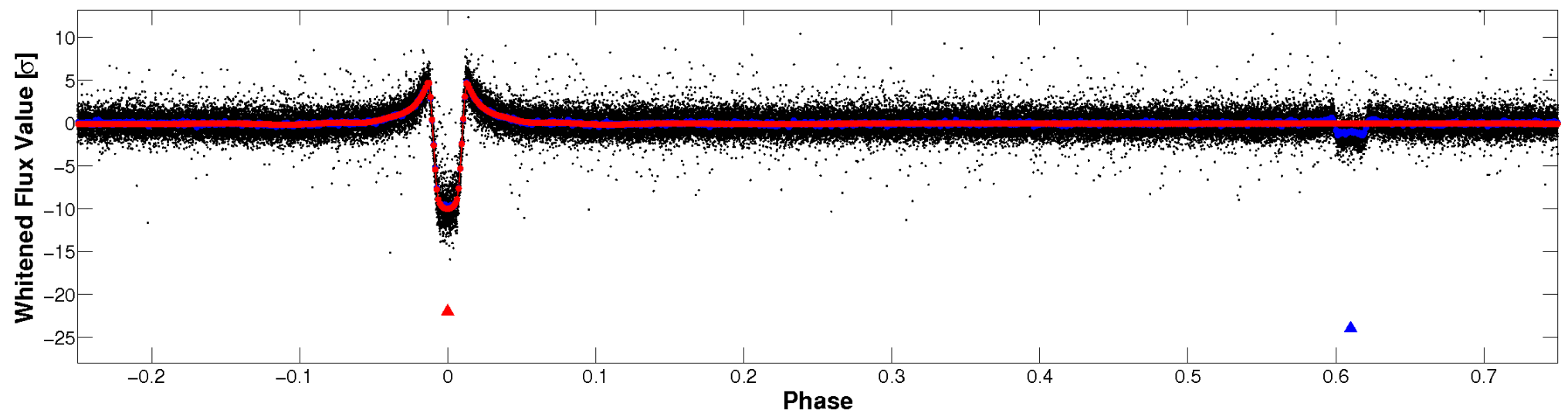


# Non-Whitened Vs. Whitened Light Curve

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



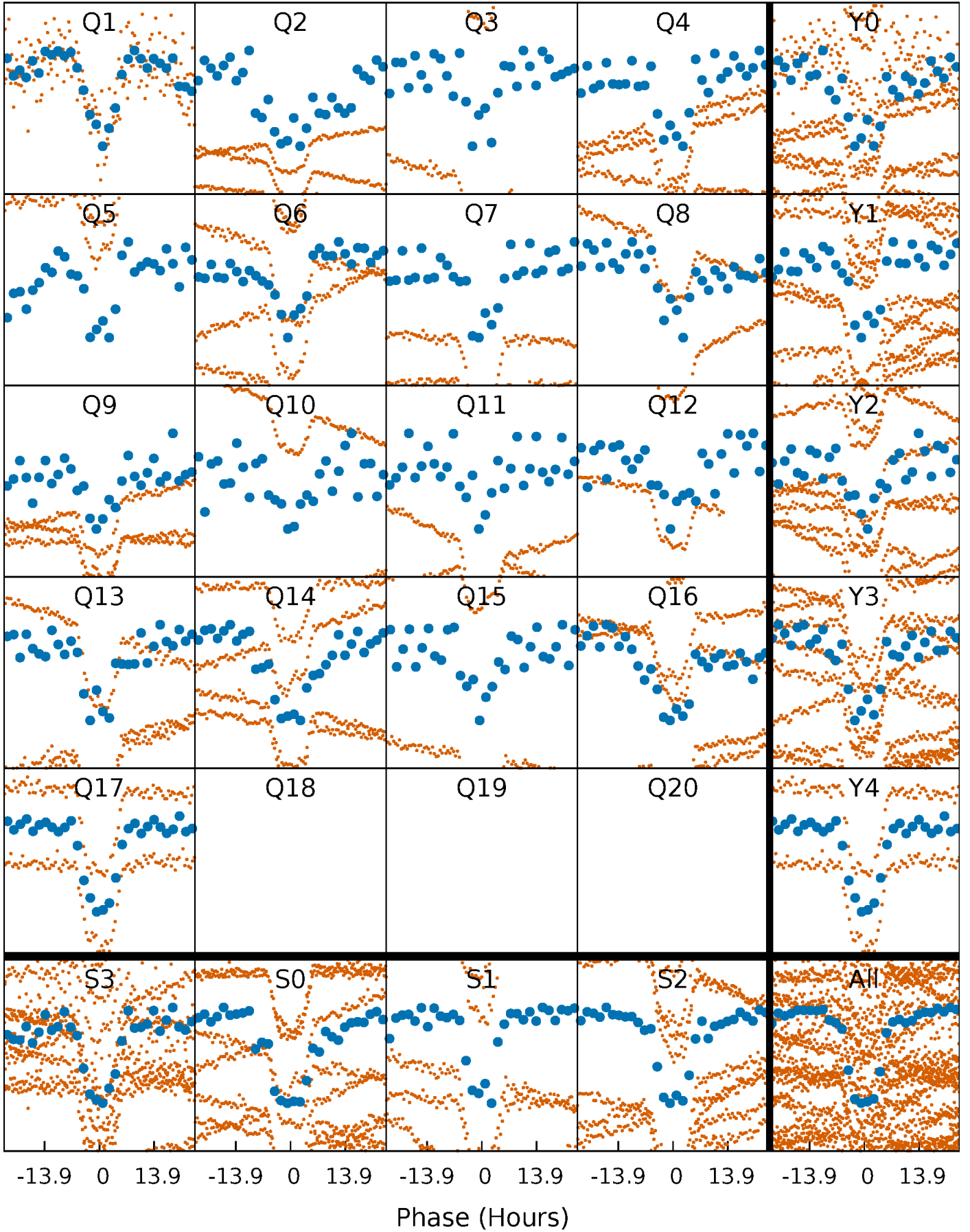
Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)





# PDC Quarter-Phased Transit Curves

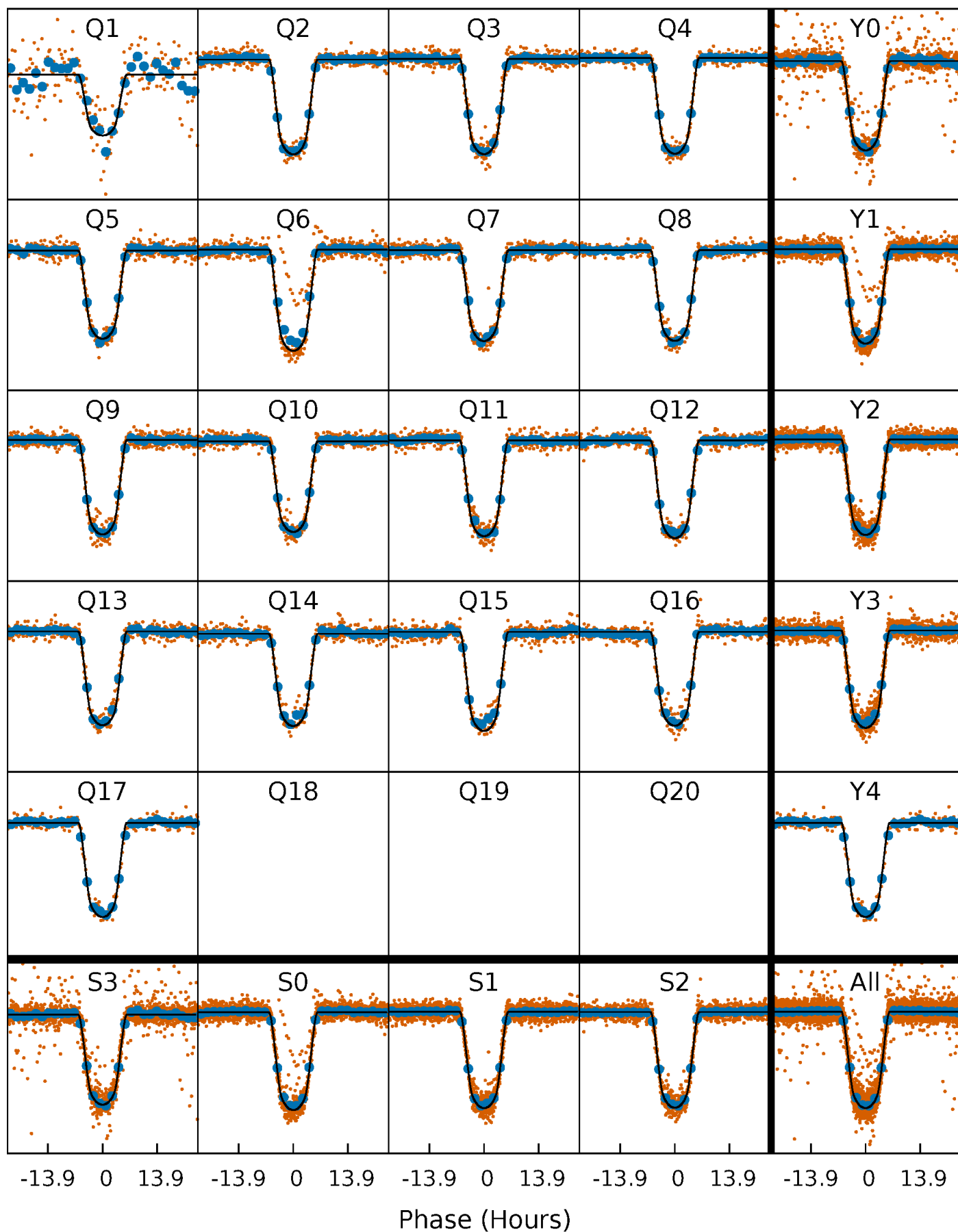
TCE 010464078-01 P= 19.403984 Days  $T_0=133.674836$  (BKJD)





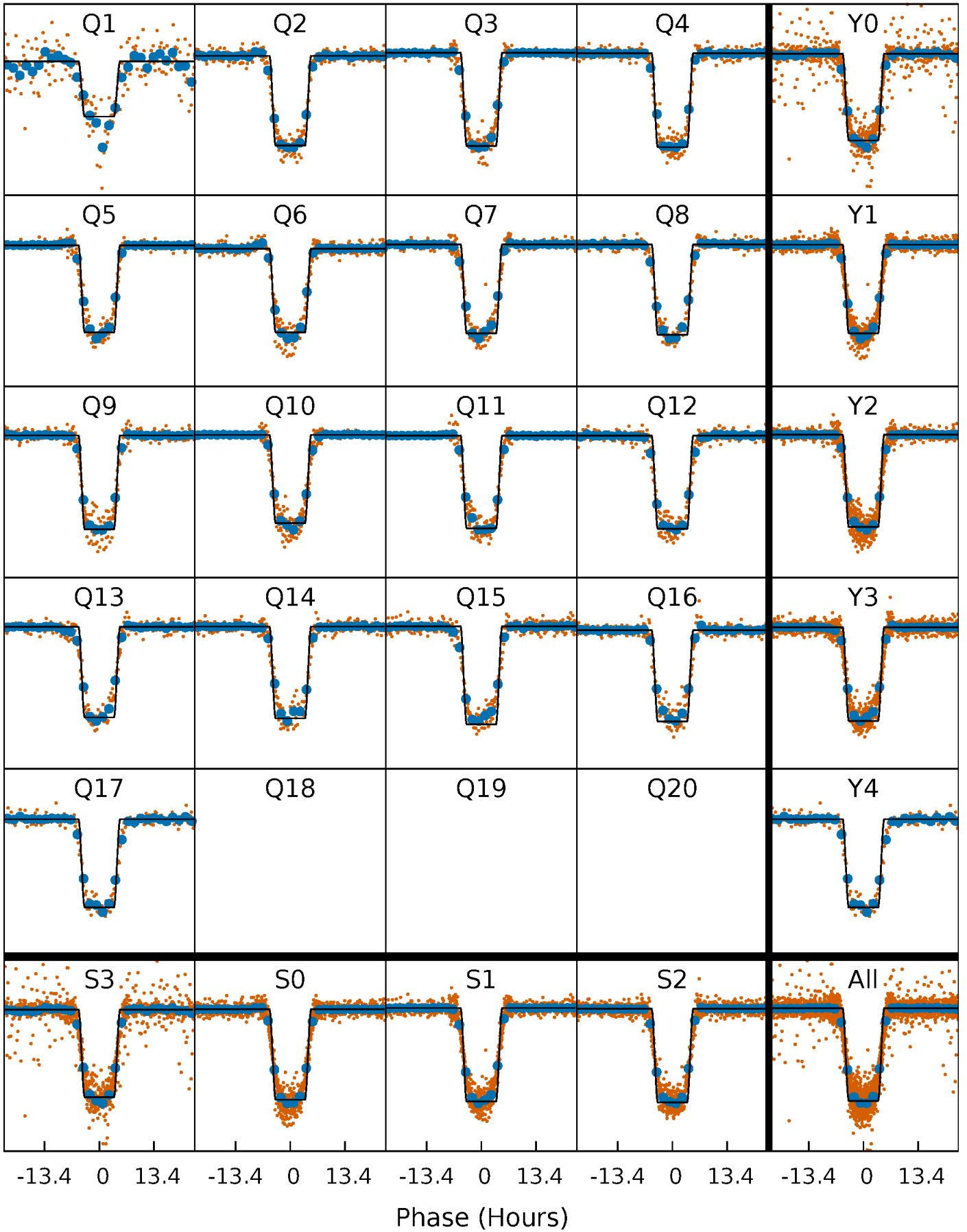
# DV Quarter-Phased Transit Curves

TCE 010464078-01 P= 19.403984 Days  $T_0=133.674836$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

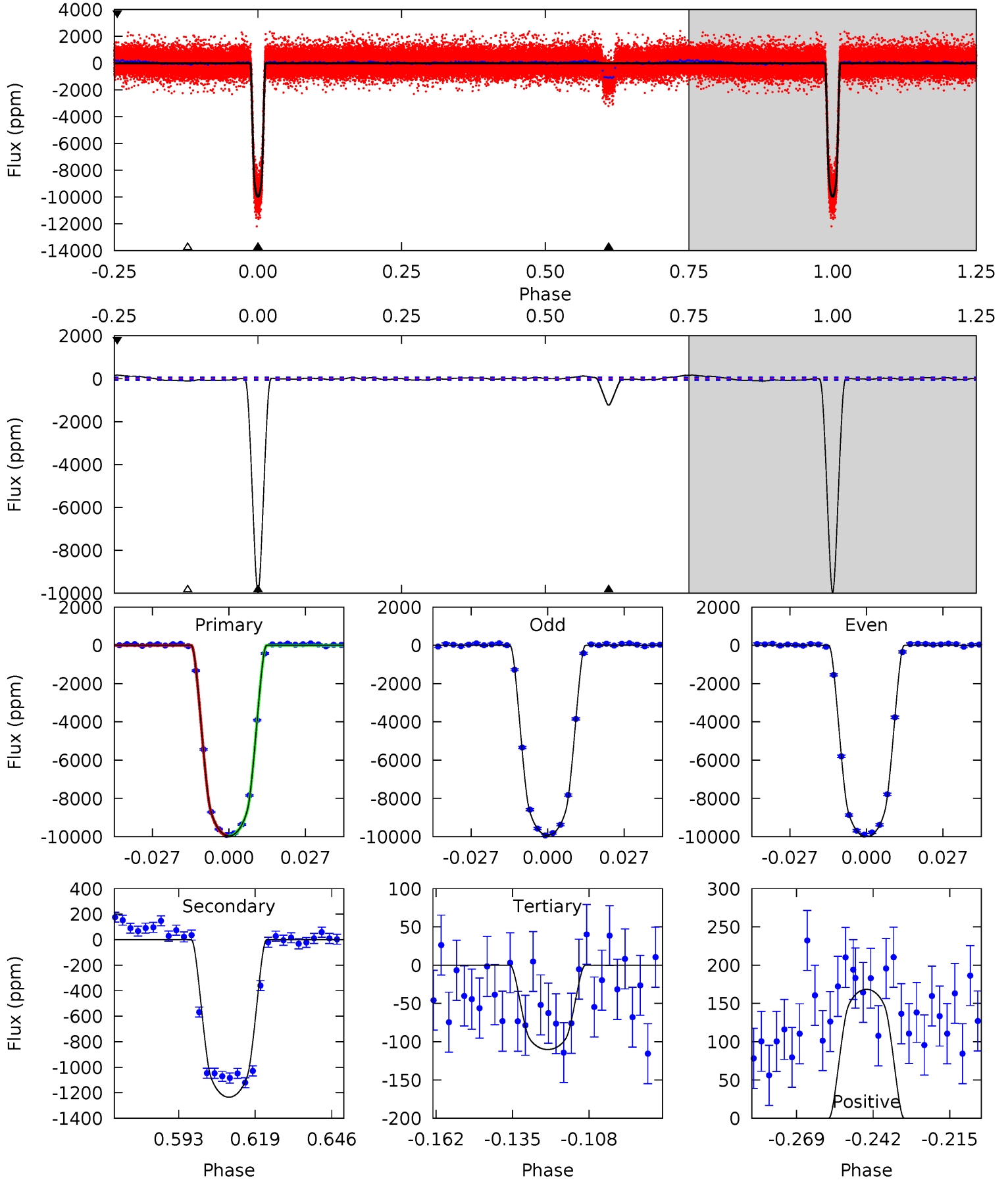
TCE 010464078-01 P= 19.403859 Days  $T_0=133.679918$  (BKJD)



# DV Model-Shift Uniqueness Test

010464078-01, P = 19.403984 Days, E = 114.270852 Days

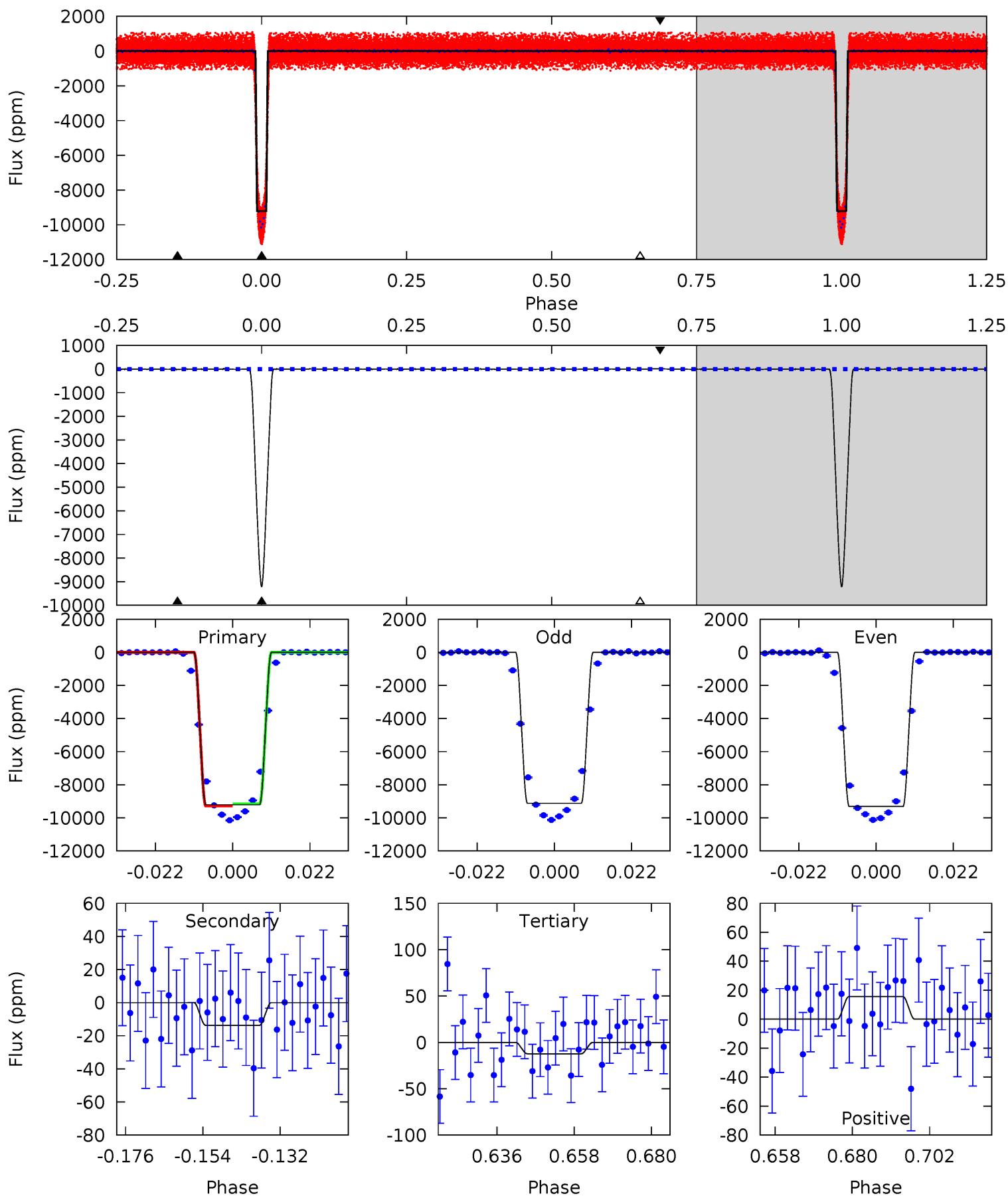
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
772.7	95.8	8.55	13.1	4.83	2.21	4.43	764.2	759.6	87.2	82.7	3.22	0.98	0.02	0.22



# Alt Model-Shift Uniqueness Test

010464078-01, P = 19.403859 Days, E = 114.276059 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
1010	1.50	1.35	1.71	4.87	2.29	0.51	1009	1008	0.15	-0.21	10.8	1.01	0.00	7.47



### Stellar Parameters For KIC 010464078

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R$ ( $R_{\odot}$ )	$M(M_{\odot})$	$p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ )
	$5043^{+151}_{-151}$	$4.591^{+0.072}_{-0.048}$	$-0.540^{+0.350}_{-0.300}$	$0.680^{+0.072}_{-0.065}$	$0.657^{+0.085}_{-0.036}$	$2.945^{+0.852}_{-0.553}$
	+3%/-3%	+2%/-1%	+65%/-56%	+11%/-10%	+13%/-5%	+29%/-19%
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 010464078-01 / KOI 0743.01

Detrend	Depth (ppm)	$R_p$ ( $R_{\oplus}$ )	$T_{max}$ (K)	$T_{obs}$ (K)	$A_{obs}$
DV	$-1235 \pm 13$	$7.65^{+0.46}_{-0.42}$	$728^{+27}_{-28}$	$3413^{+75}_{-74}$	$177^{+20}_{-15}$
Alt.	$-14 \pm 9$	$7.27^{+0.49}_{-0.38}$	$728^{+26}_{-32}$	$1935^{+128}_{-271}$	$2.130^{+1.523}_{-1.495}$

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

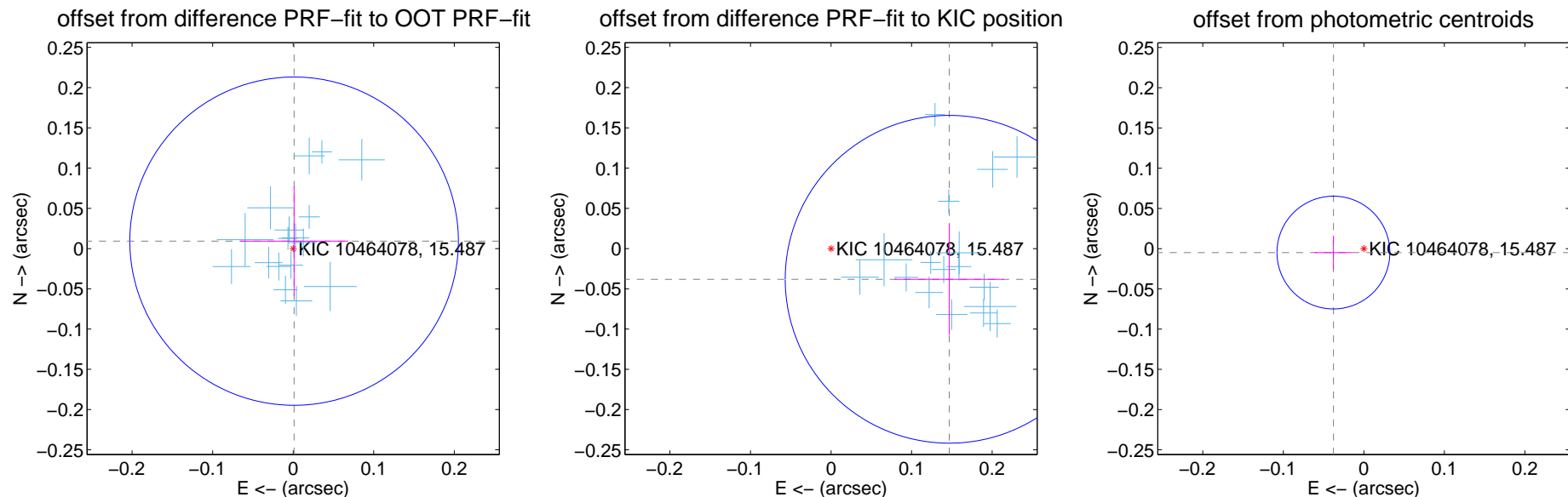
## DV Centroid Data

Supplemental centroid analysis for 010464078-01. Kepler magnitude: 15.49. Transit SNR 320.06

There are 17 quarters with good PRF difference image offsets

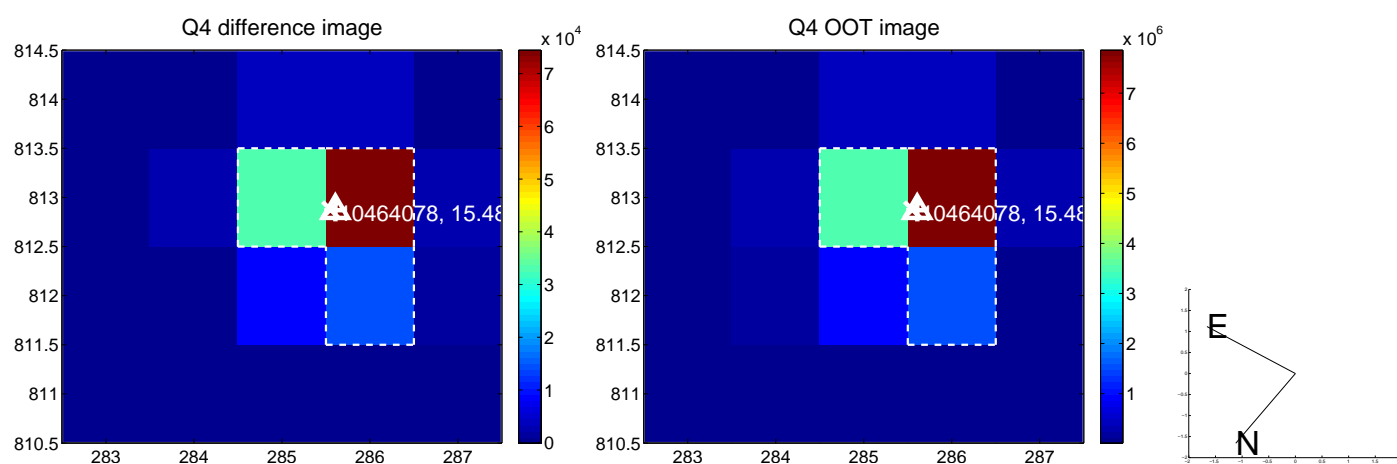
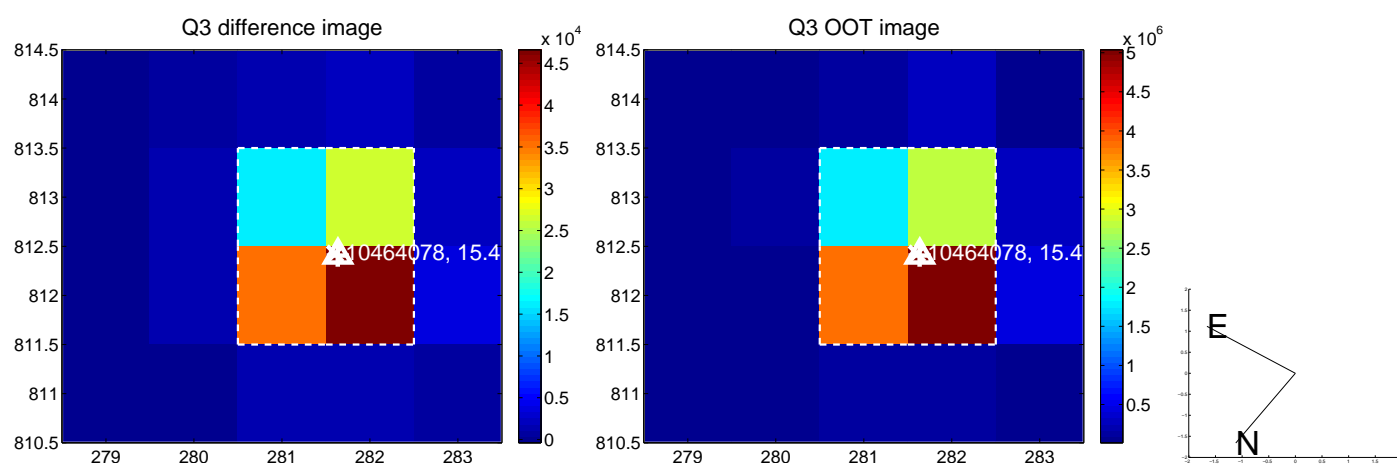
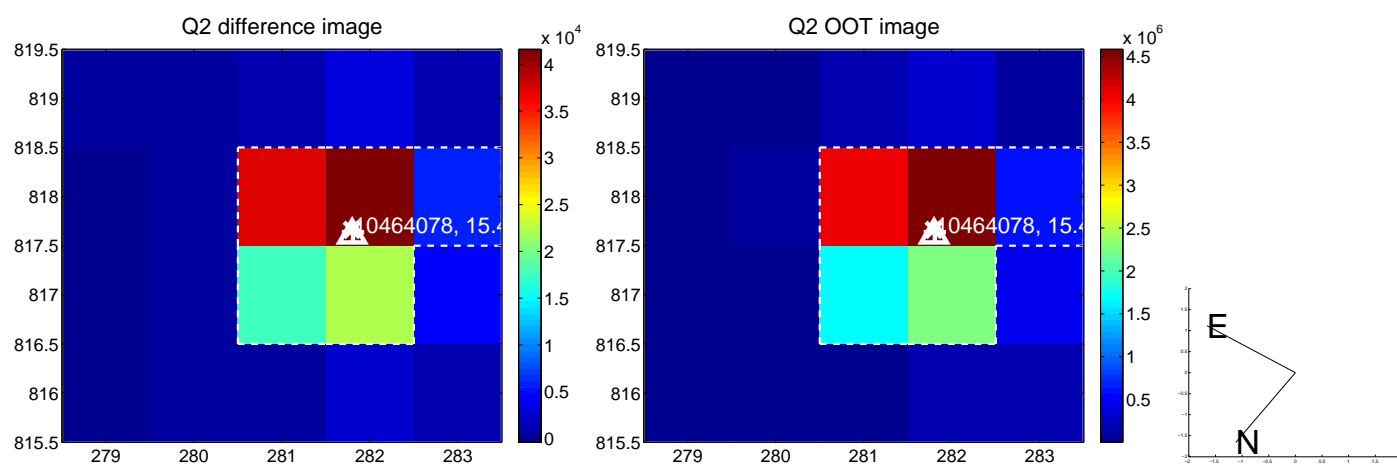
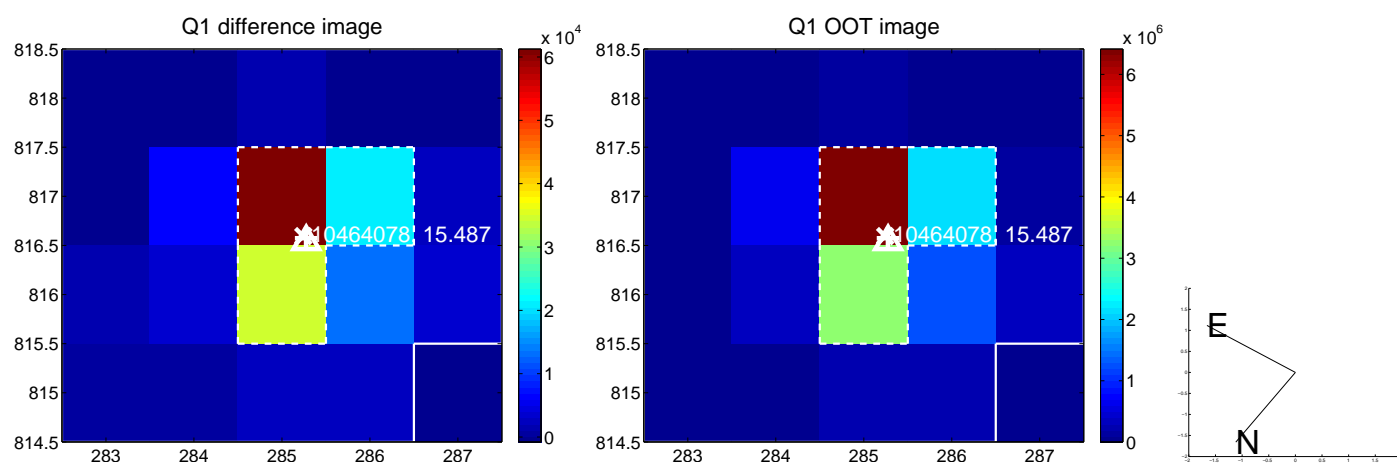
The direct PRF centroid is offset from the target star catalog position by about 0.13 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.009 \pm 0.068$	0.14	$-0.001 \pm 0.067$	$0.009 \pm 0.068$
PRF-fit source offset from KIC position	$0.152 \pm 0.068$	2.23	$-0.147 \pm 0.068$	$-0.038 \pm 0.069$
photometric centroid source offset	$0.04 \pm 0.02$	1.63	$0.04 \pm 0.02$	$-0.00 \pm 0.02$



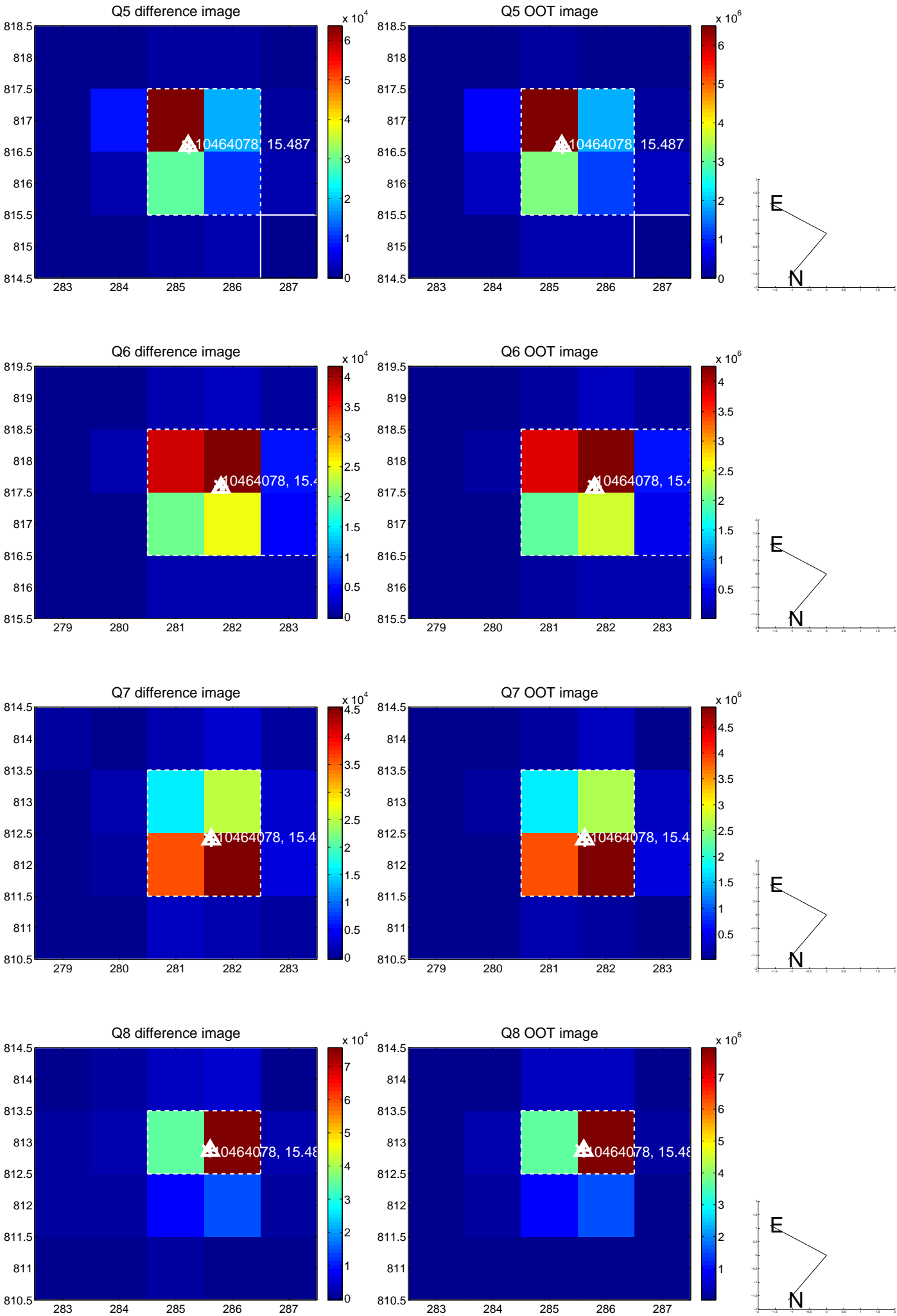
Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses:** good quarterly centroid offsets; **Vermillion crosses:** bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

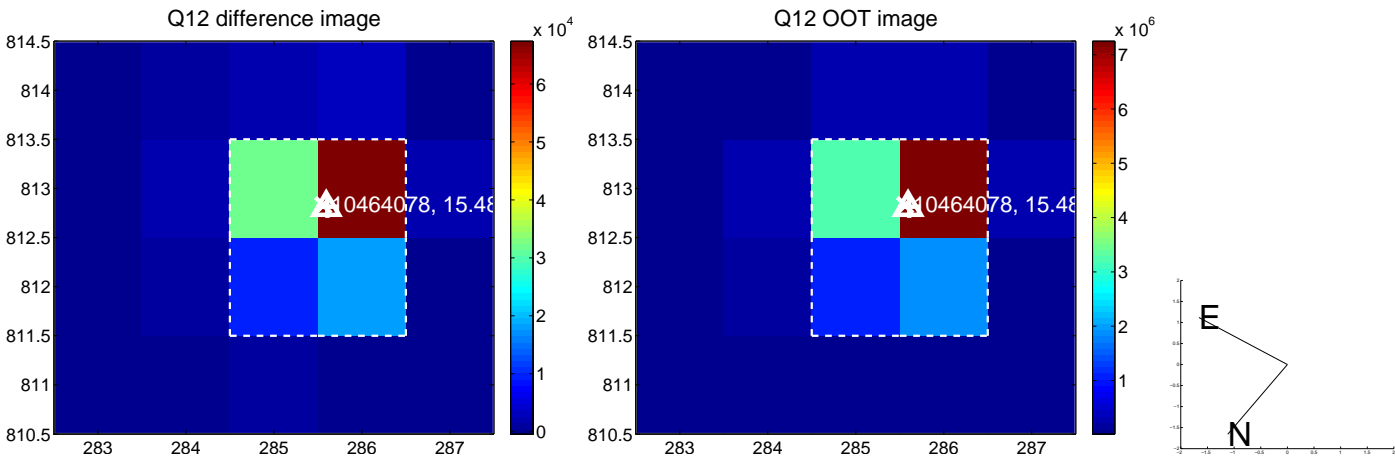
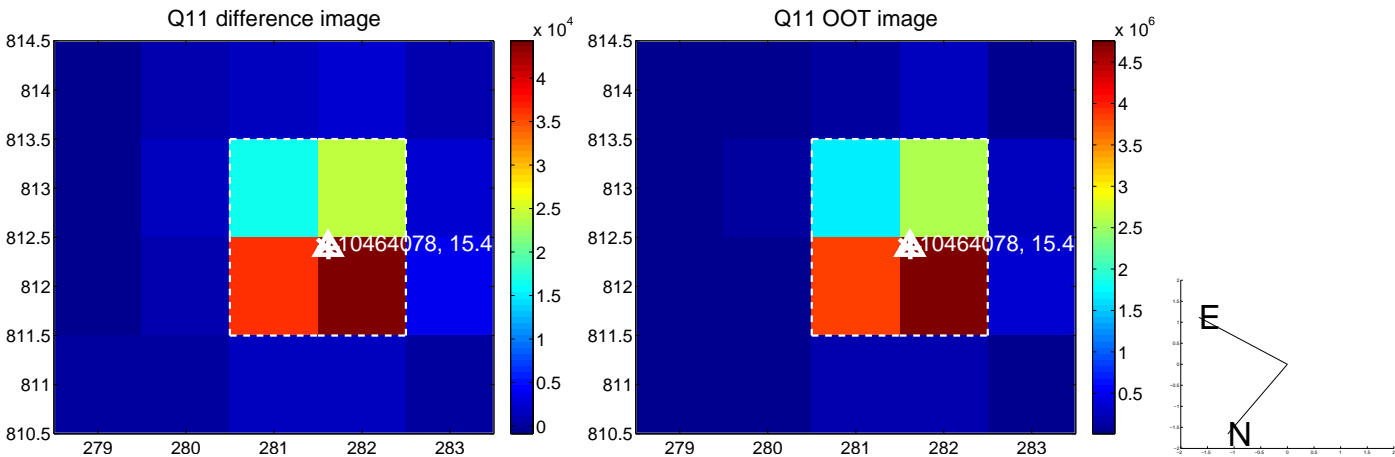
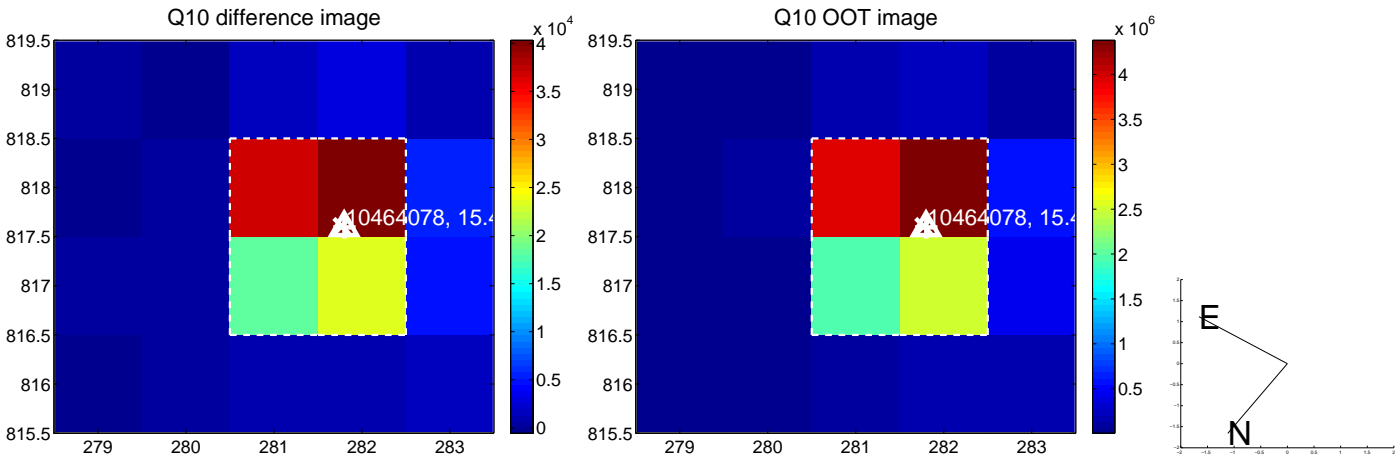
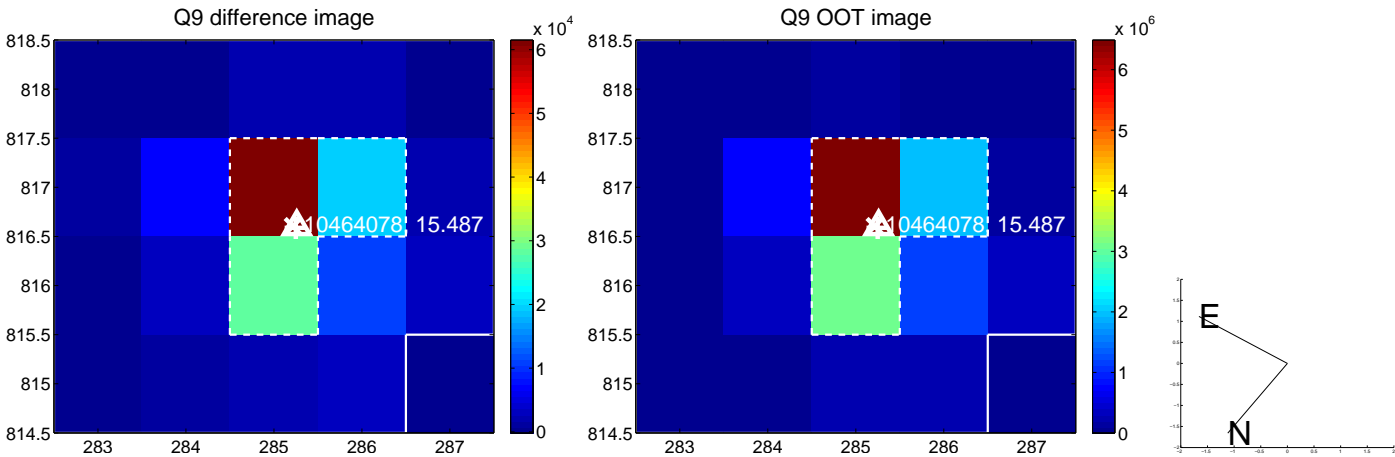




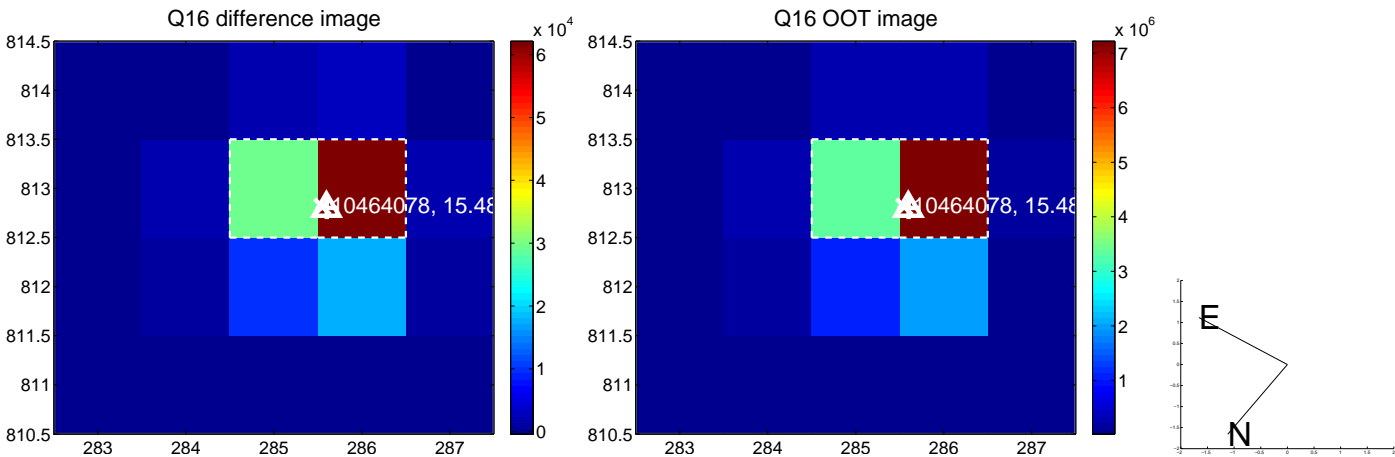
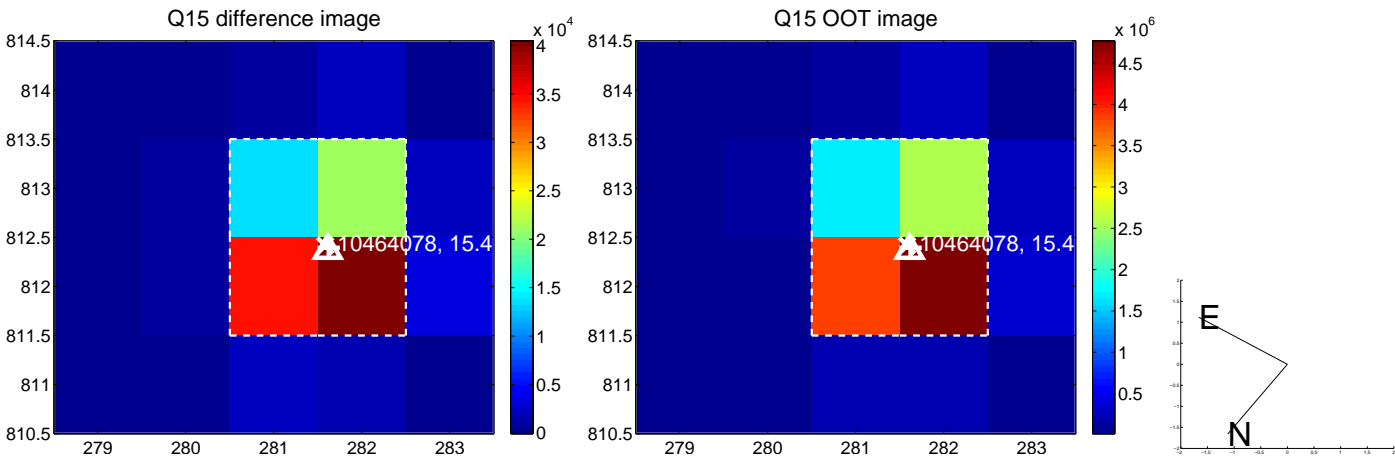
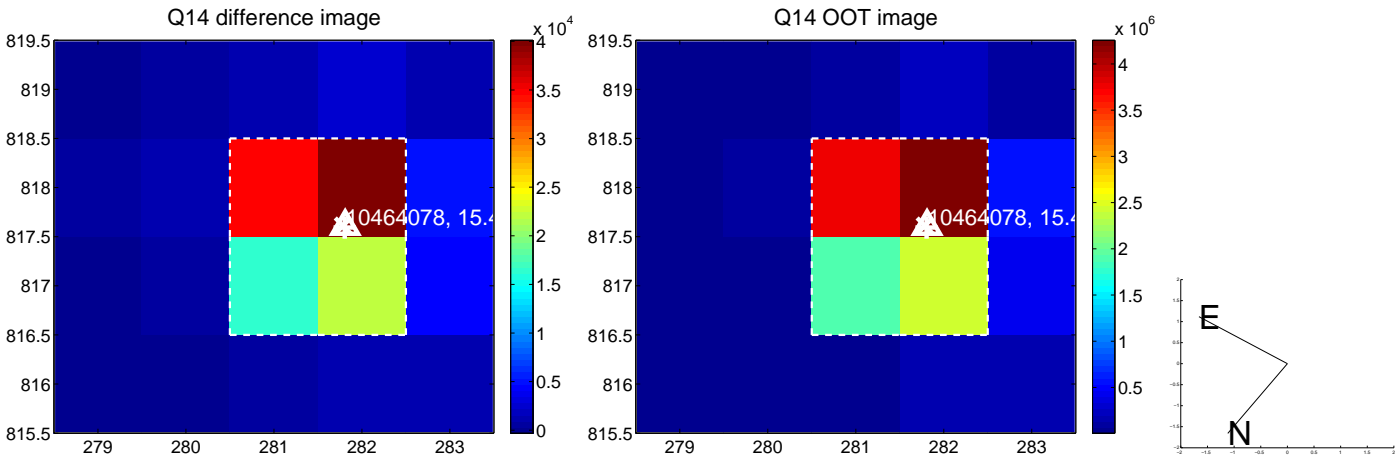
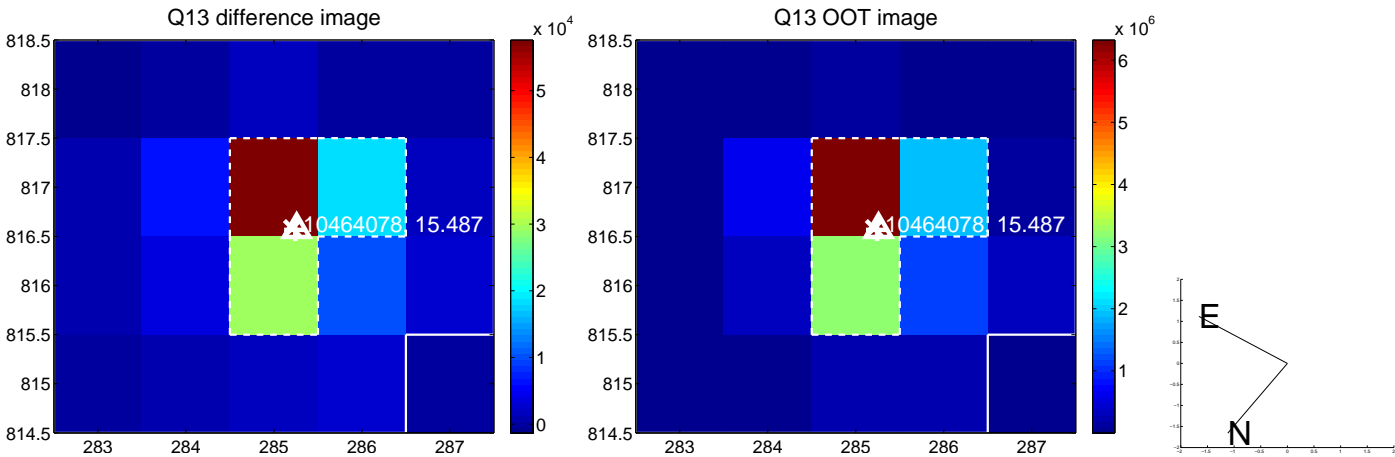
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



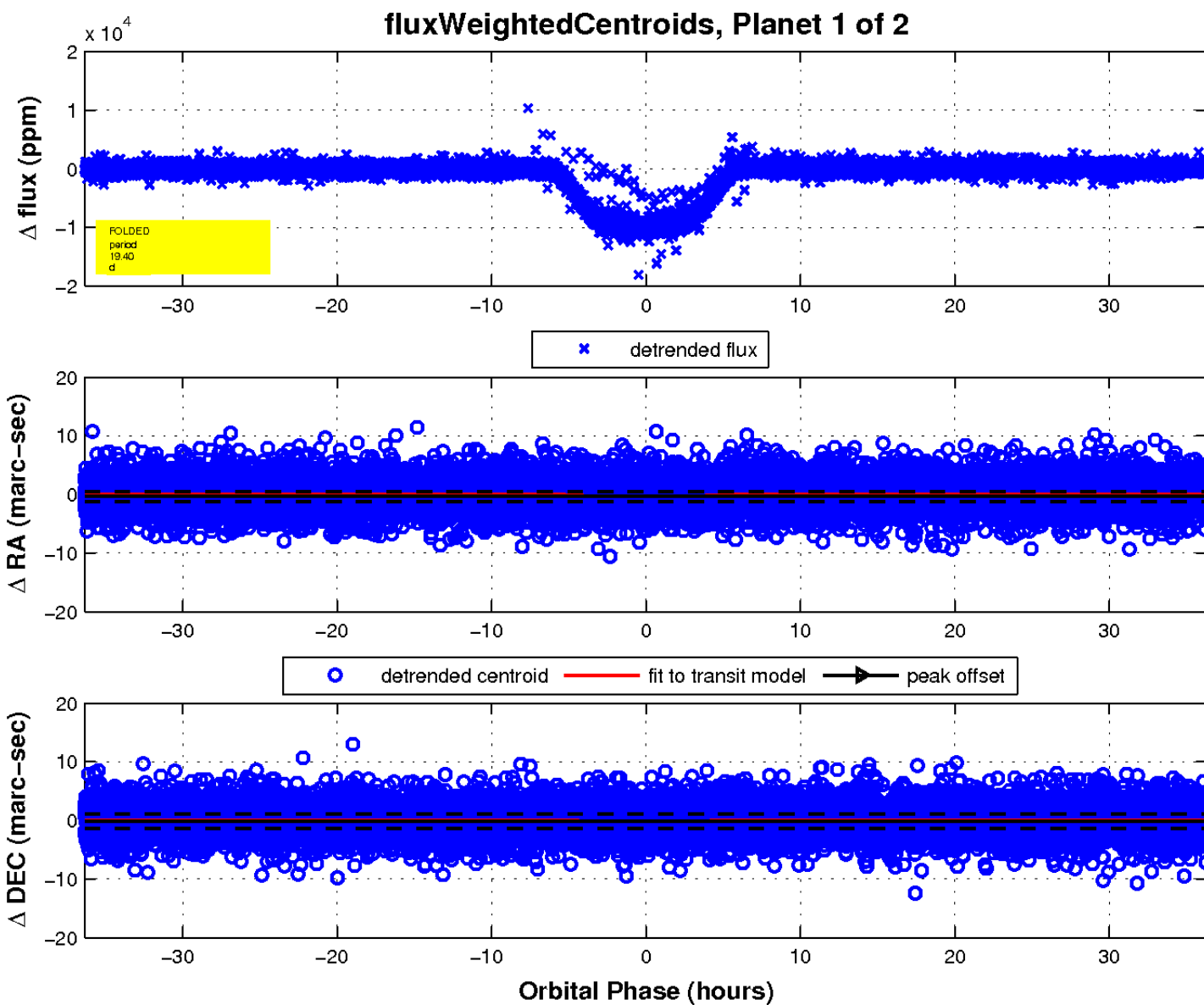
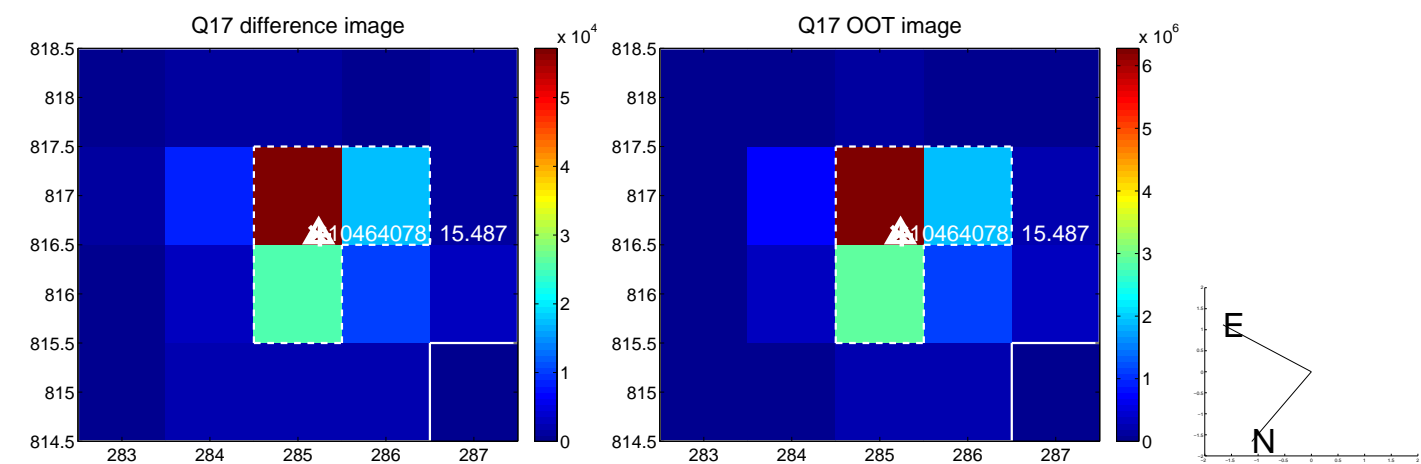
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

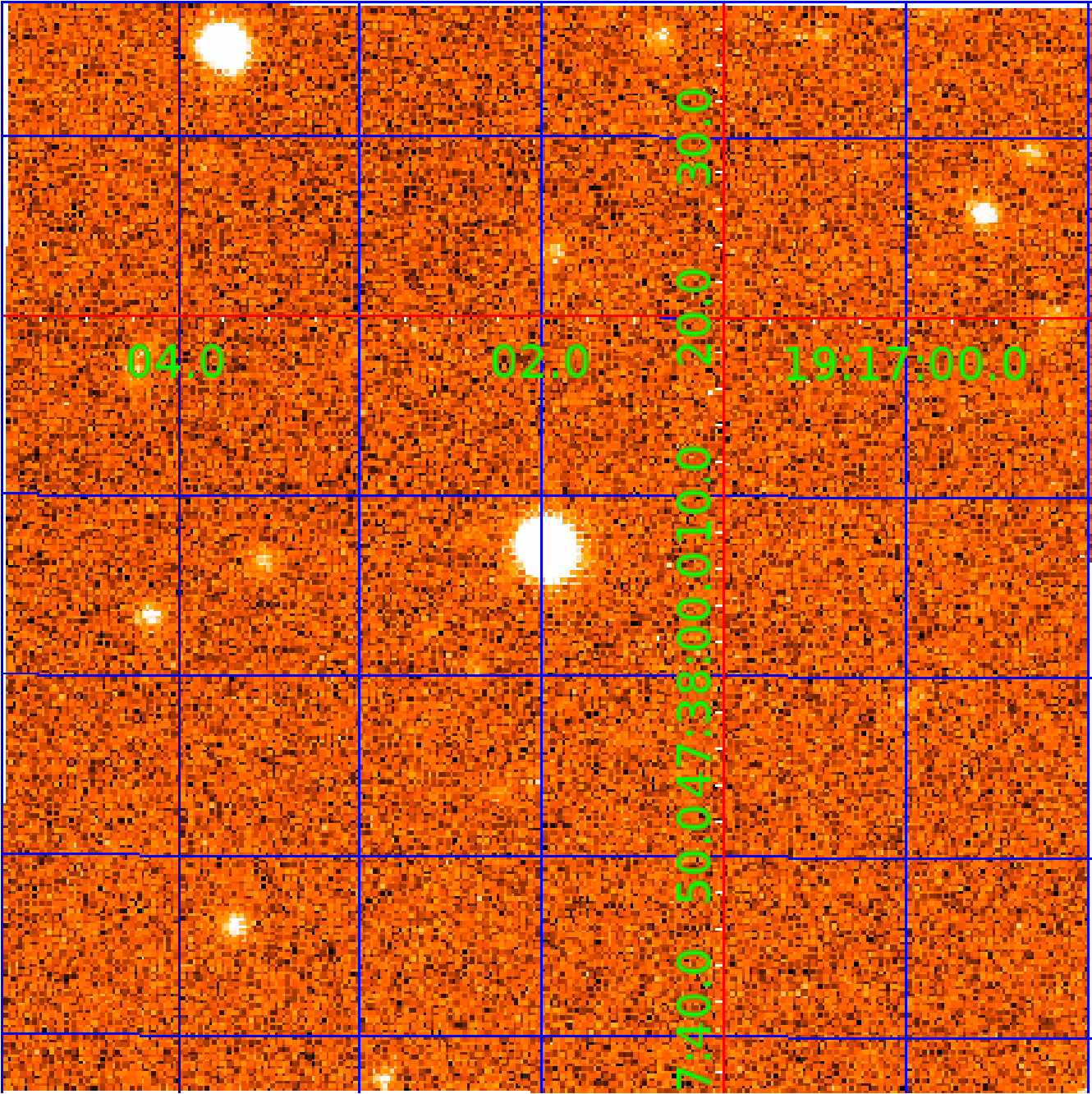


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination



# KIC 010464078

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
010464078-01	OBS	0743.01	19.403984	133.674836	10036.9	12.123	320.9	320.1	0.68	5043	7.67	17.73
010464078-02	OBS	No	19.404046	145.510083	1168.9	11.331	41.1	43.6	0.68	5043	2.60	17.73

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
010464078-01	OBS	FP	0.00	0	1	0	0	MOD_SEC_DV—HAS_SEC_TCE
010464078-02	OBS	FP	0.00	1	1	0	0	IS_SEC_TCE

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

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

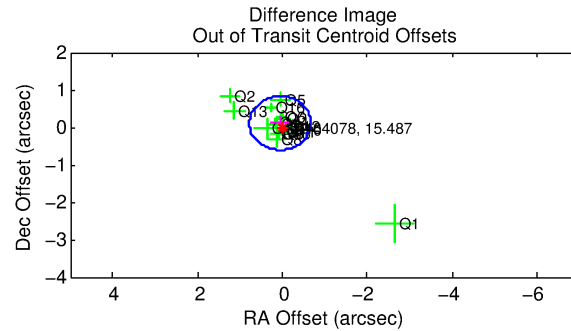
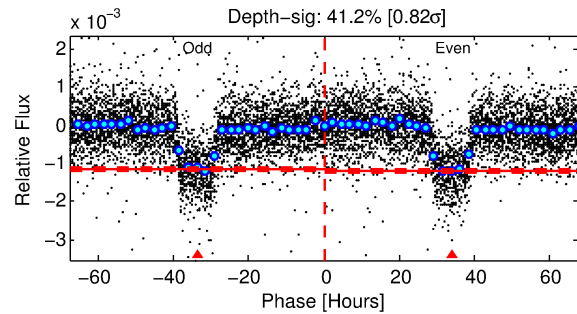
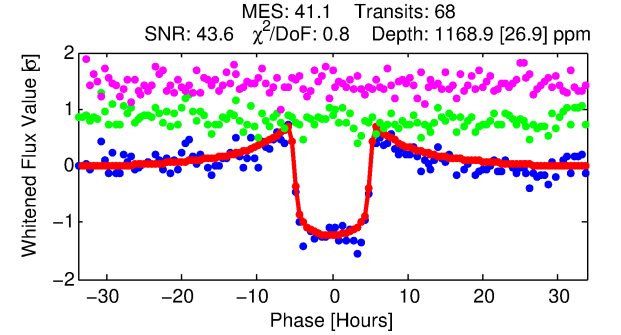
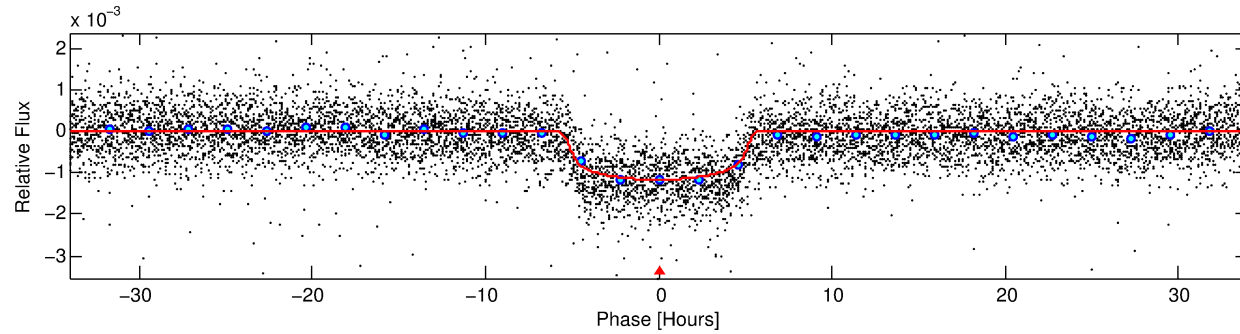
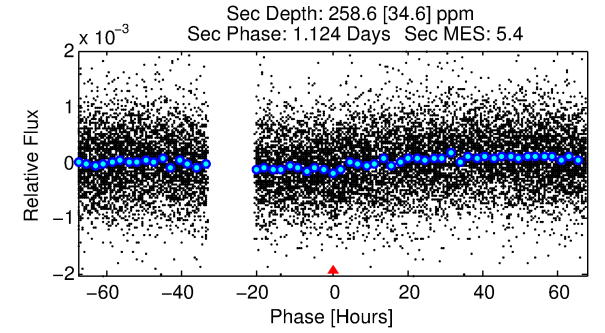
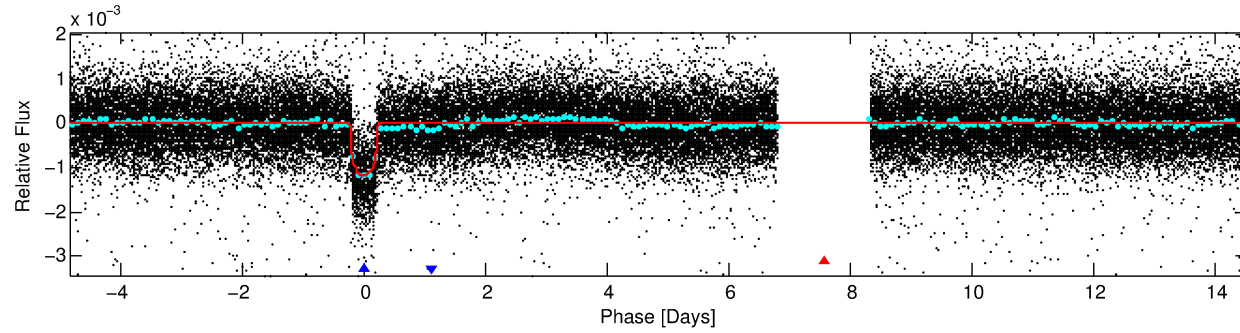
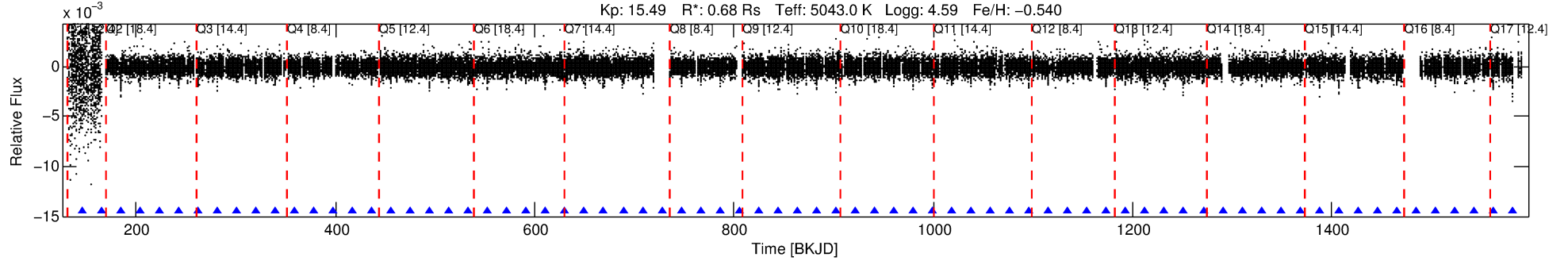
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 010464078-02

No Significant Match Found

# DV One-Page Summary

KIC: 10464078 Candidate: 2 of 2 Period: 19.404 d  
KOI: K00743 Corr: No Ephemeris Match



## DV Fit Results:

Period = 19.40405 [0.00008] d  
Epoch = 145.5101 [0.0034] BKJD  
Rp/R\* = 0.0350 [0.0011]  
a/R\* = 8.59 [0.93]  
b = 0.80 [0.05]  
Seff = 17.73 [3.15]  
Teq = 523 [23] K  
Rp = 2.60 [0.29] Re  
a = 0.1229 [0.0110] AU  
Ag = 318.43 [63.02] [5.04σ]  
Teffp = 3418 [163] K [17.60σ]

## DV Diagnostic Results:

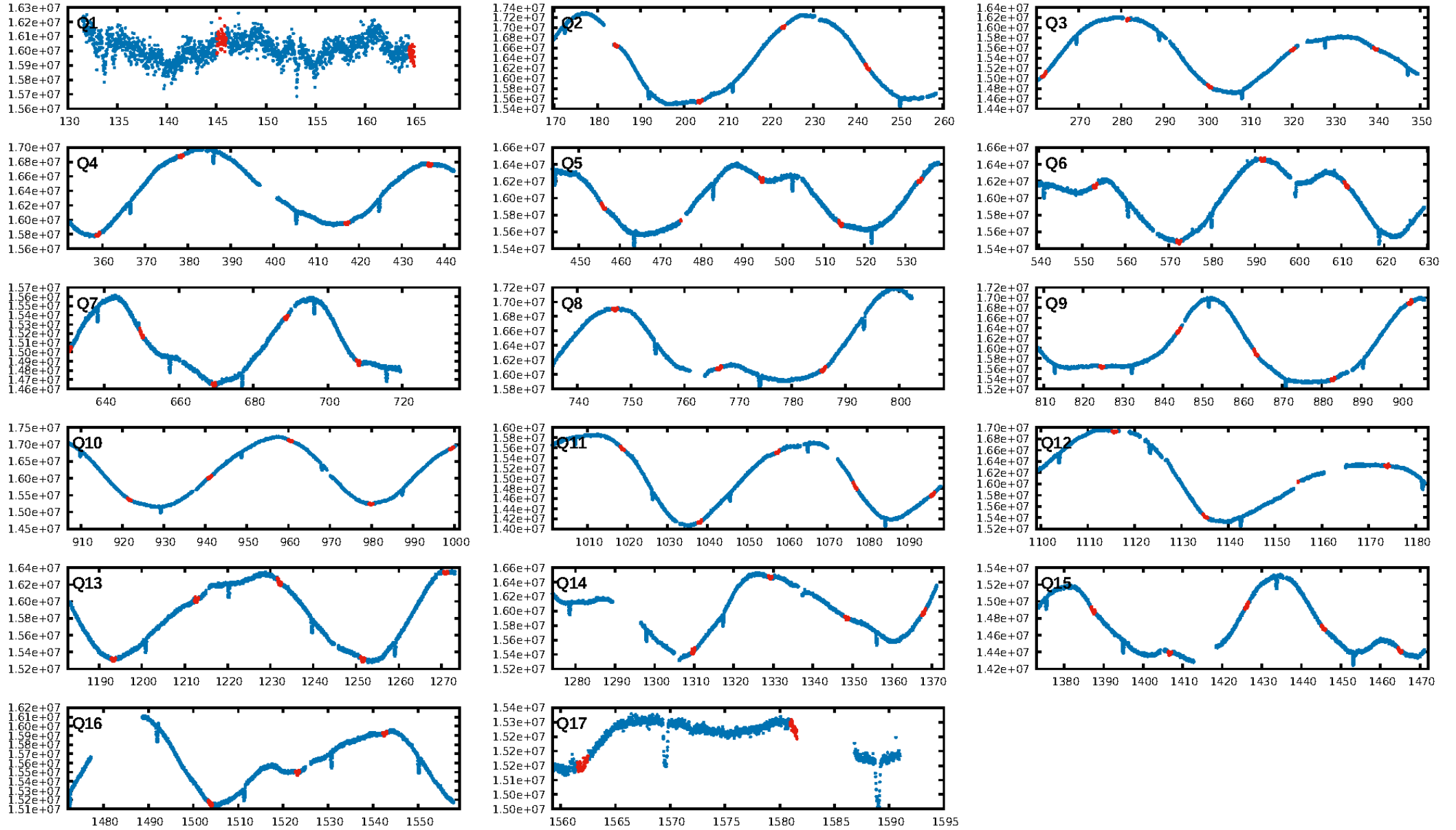
ShortPeriod-sig: 0.0% [0.00σ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: 78.9%  
ModelChiSquareGof-sig: 100.0%  
Bootstrap-pfa: 4.18e-264  
RollingBand-fgt: 1.00 [64/64]  
GhostDiagnostic-chr: 1.56  
Centroid-sig: 13.3%  
Centroid-so: 0.179 arcsec [1.02σ]  
OotOffset-rm: 0.122 arcsec [0.51σ]  
KicOffset-rm: 0.138 arcsec [1.45σ]  
OotOffset-st: 4/4/4/5 [17]  
KicOffset-st: 4/4/4/5 [17]  
DiffImageQuality-fgm: 1.00 [17/17]  
DiffImageOverlap-fno: 1.00 [17/17]

Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 29-Jan-2016 14:04:13 Z

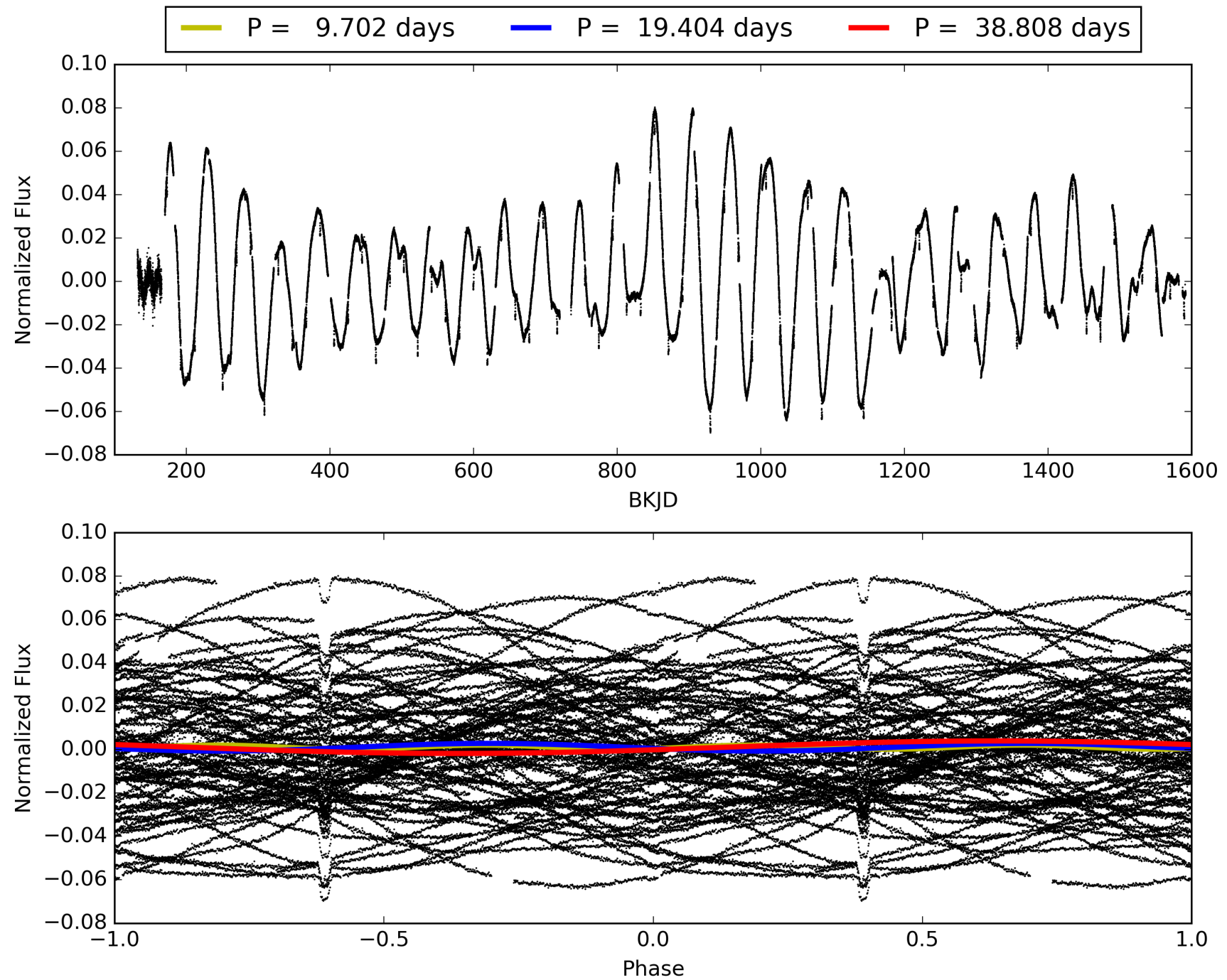
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center



# TCE 010464078-02, PDC Light Curves

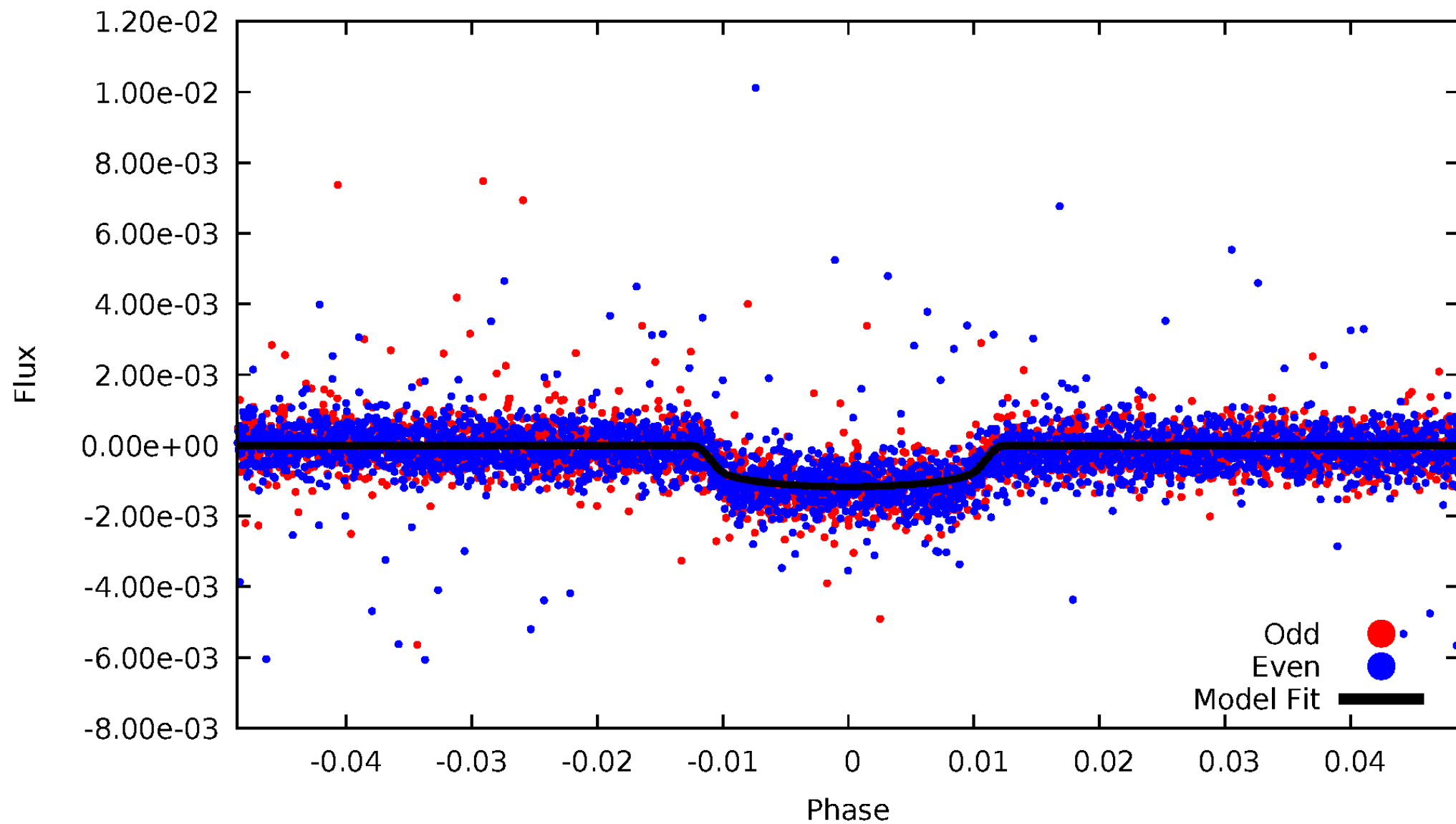


# TCE 010464078-02



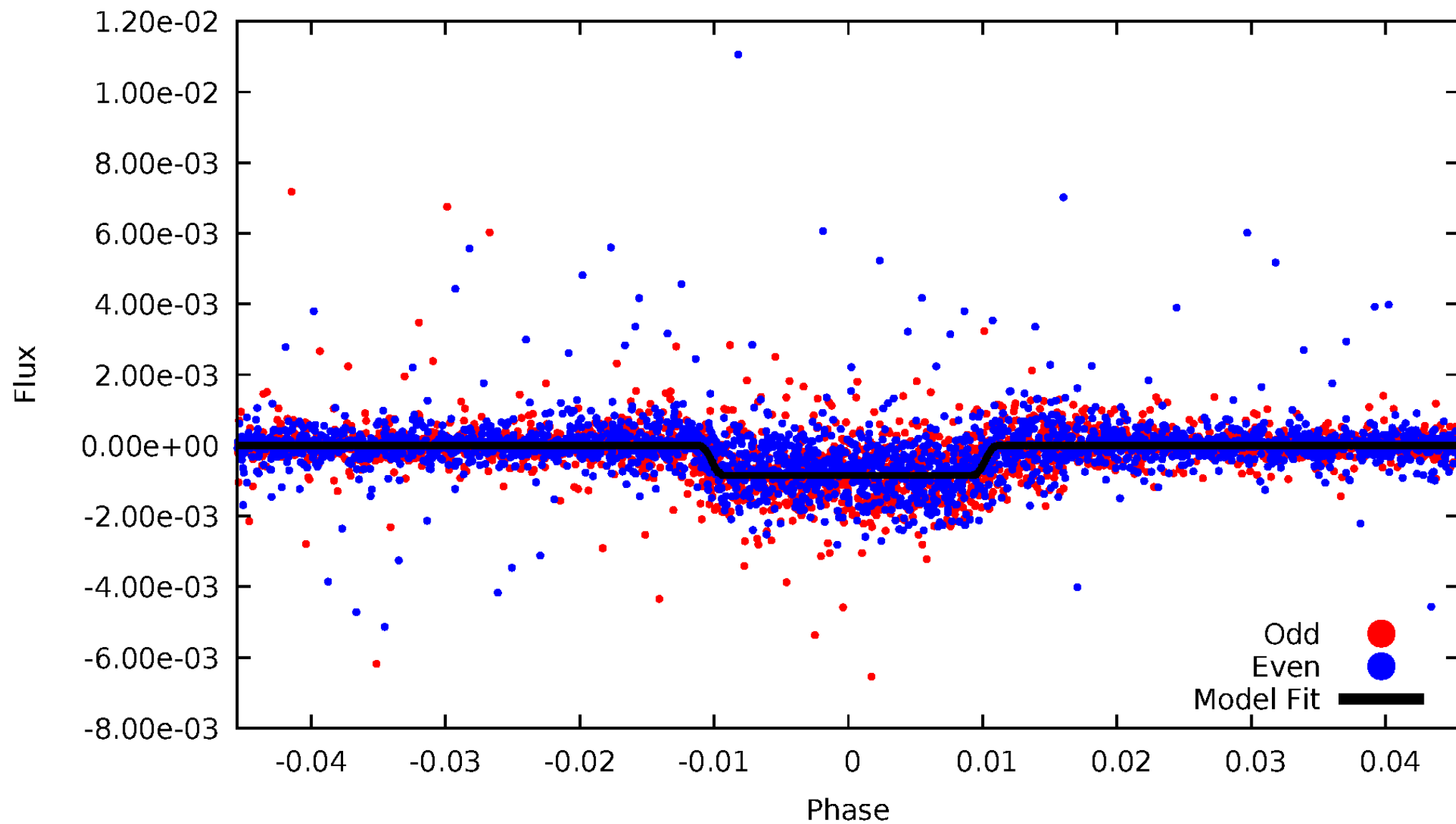
# DV Odd/Even

TCE 010464078-02



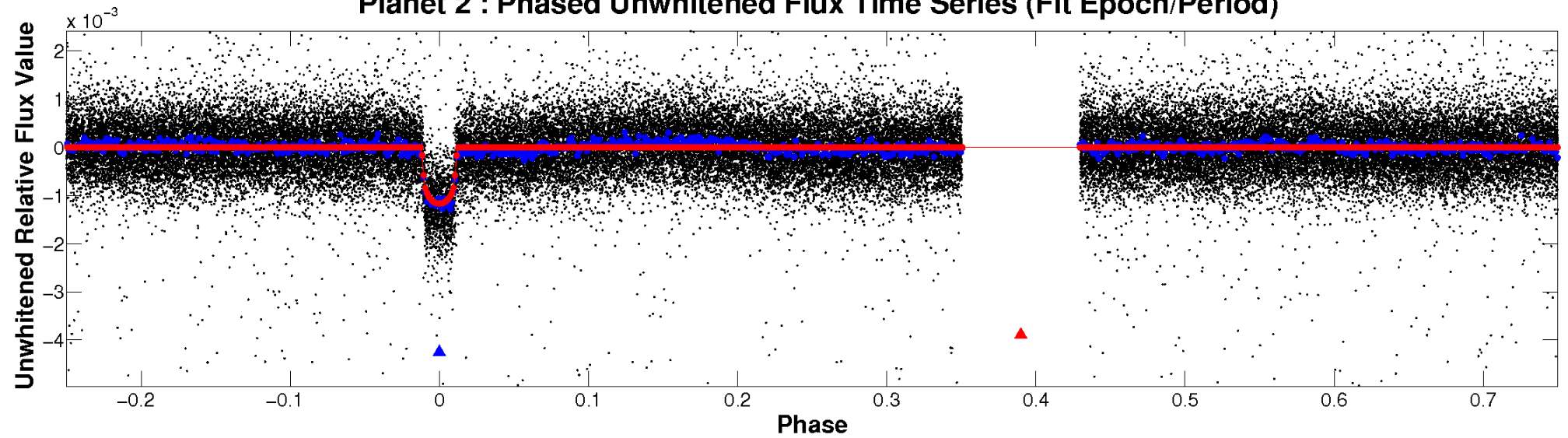
# ALT Odd/Even

TCE 010464078-02

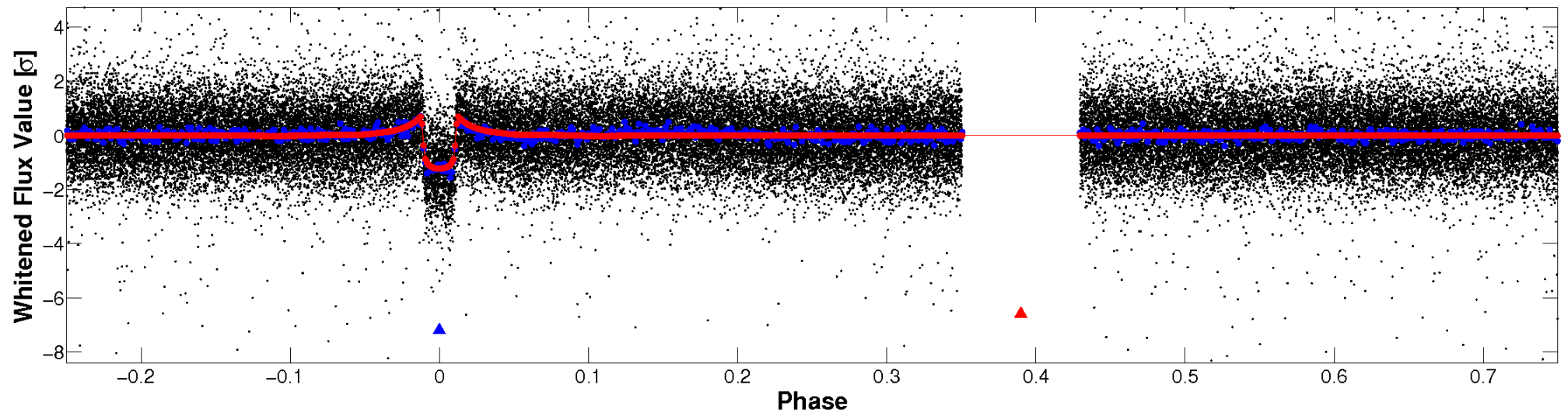


# Non-Whitened Vs. Whitened Light Curve

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

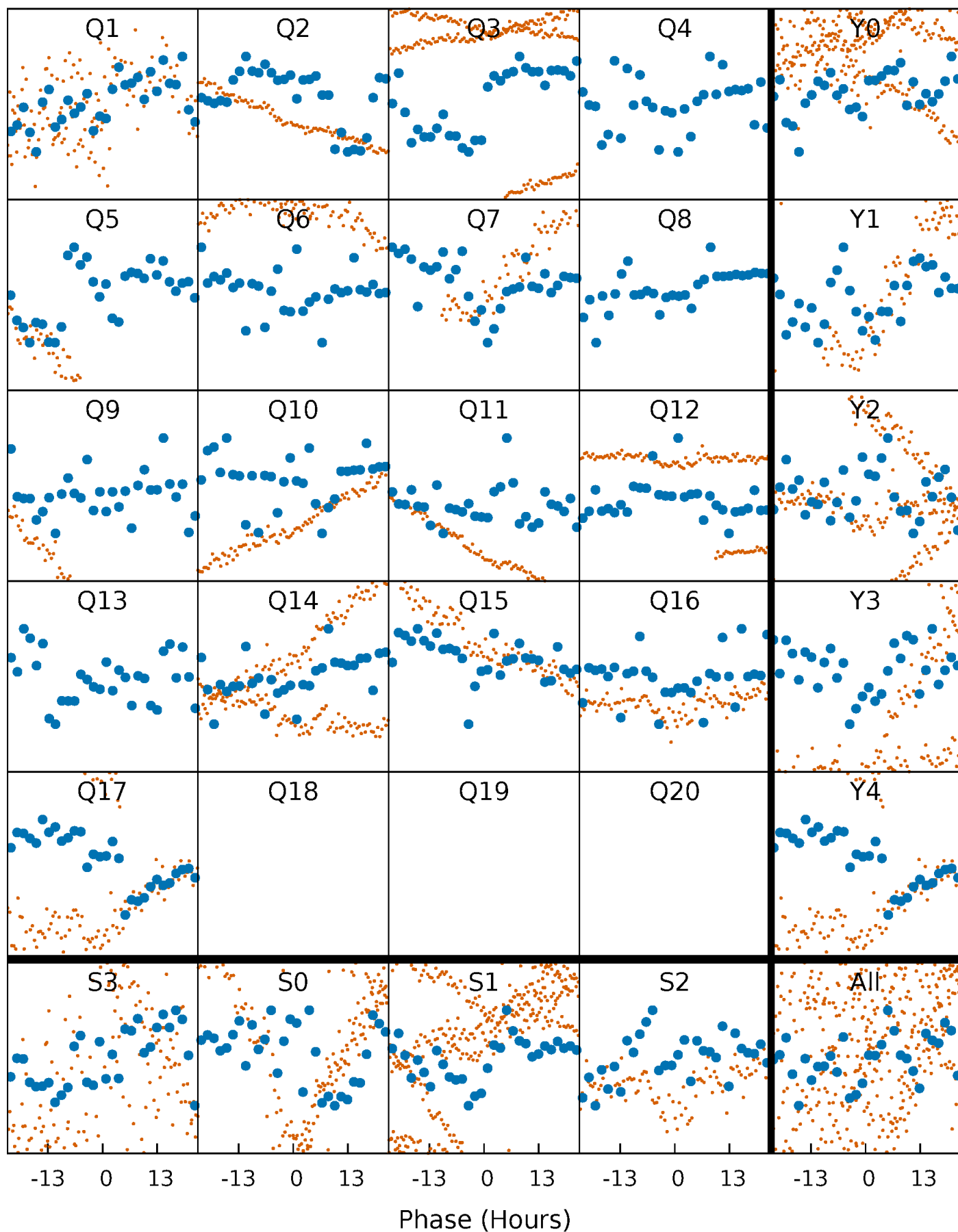


Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



# PDC Quarter-Phased Transit Curves

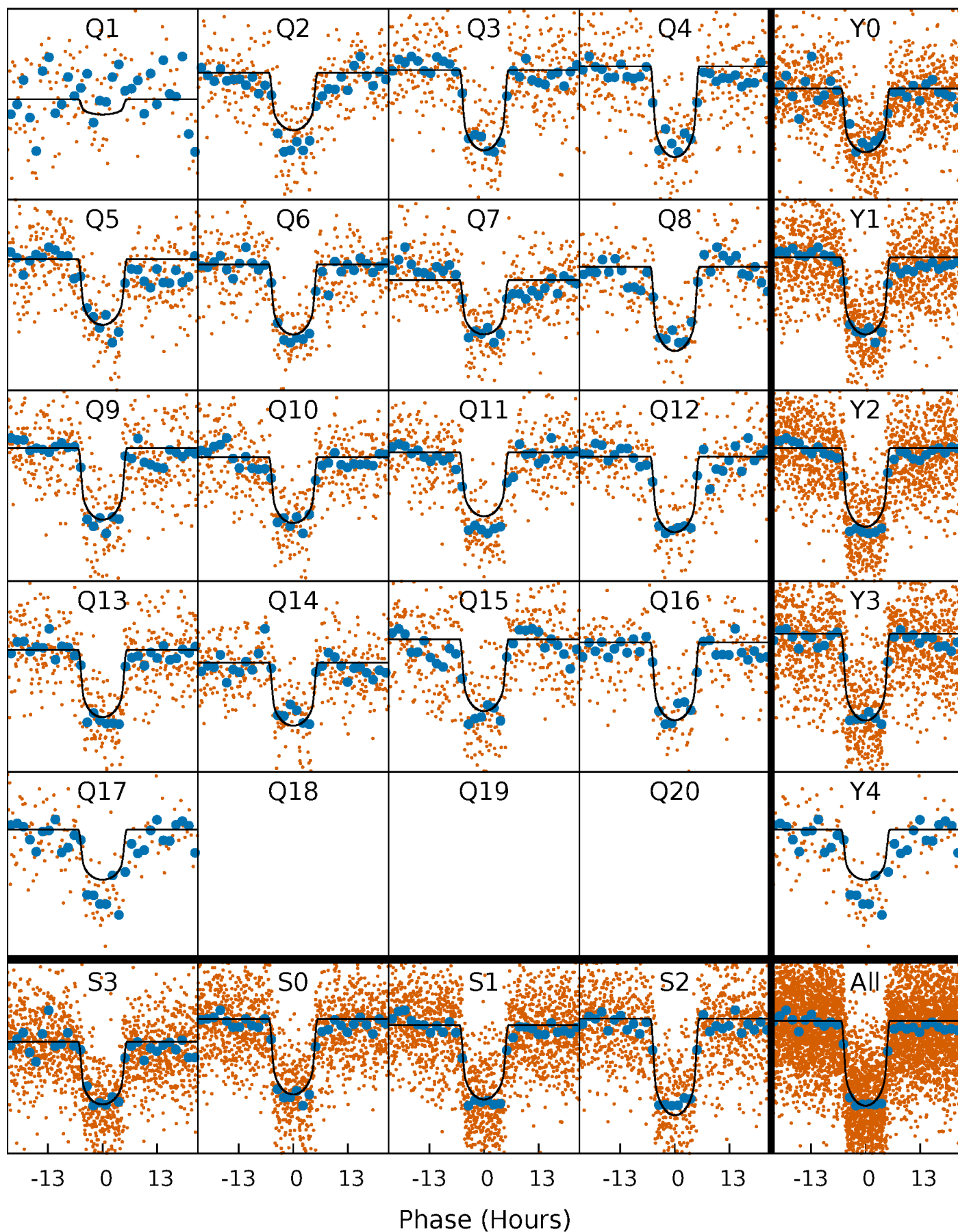
TCE 010464078-02 P= 19.404046 Days  $T_0=145.510083$  (BKJD)





# DV Quarter-Phased Transit Curves

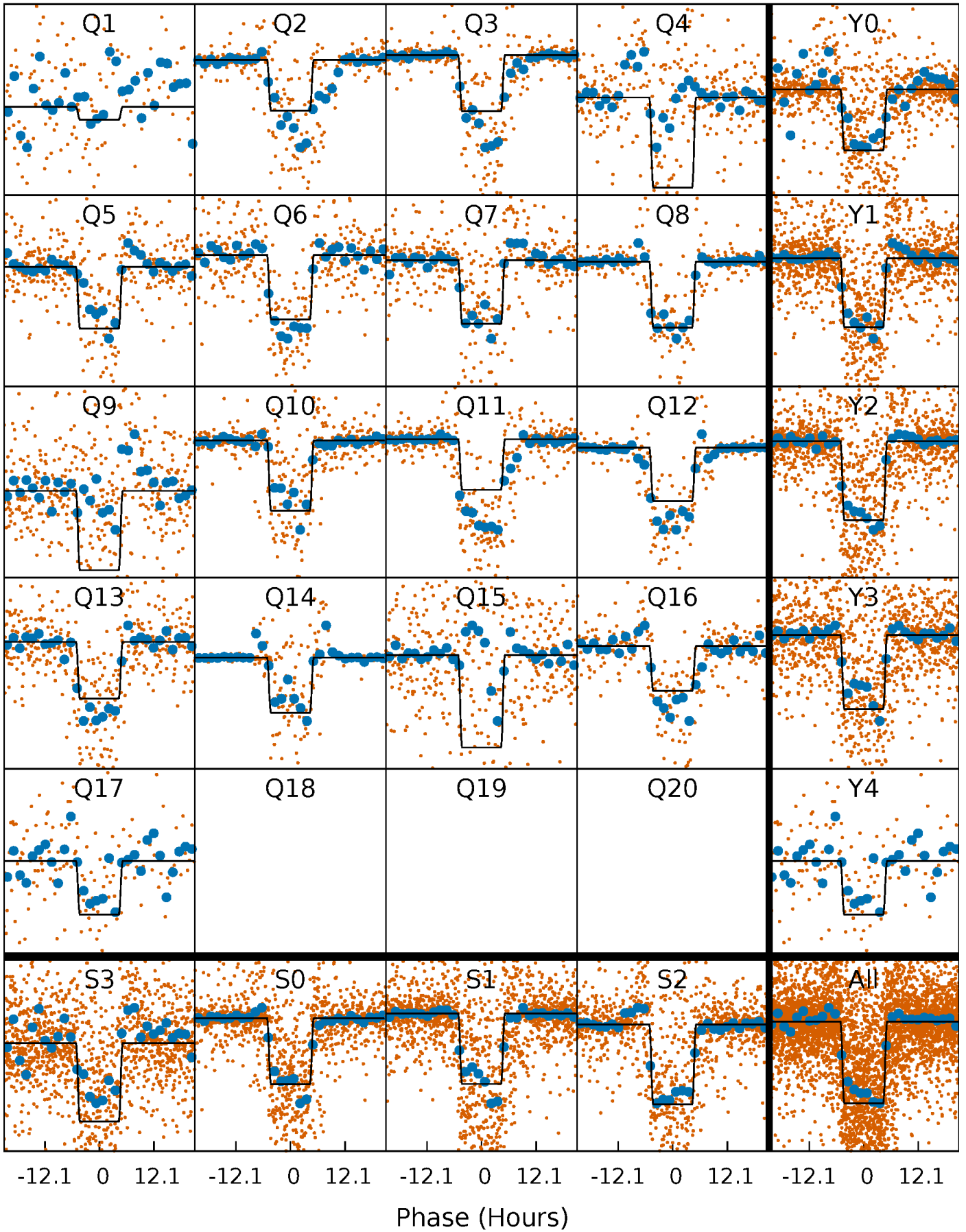
TCE 010464078-02     $P = 19.404046$  Days     $T_0 = 145.510083$  (BKJD)





# Alt. Detrend Quarter-Phased Transit Curves

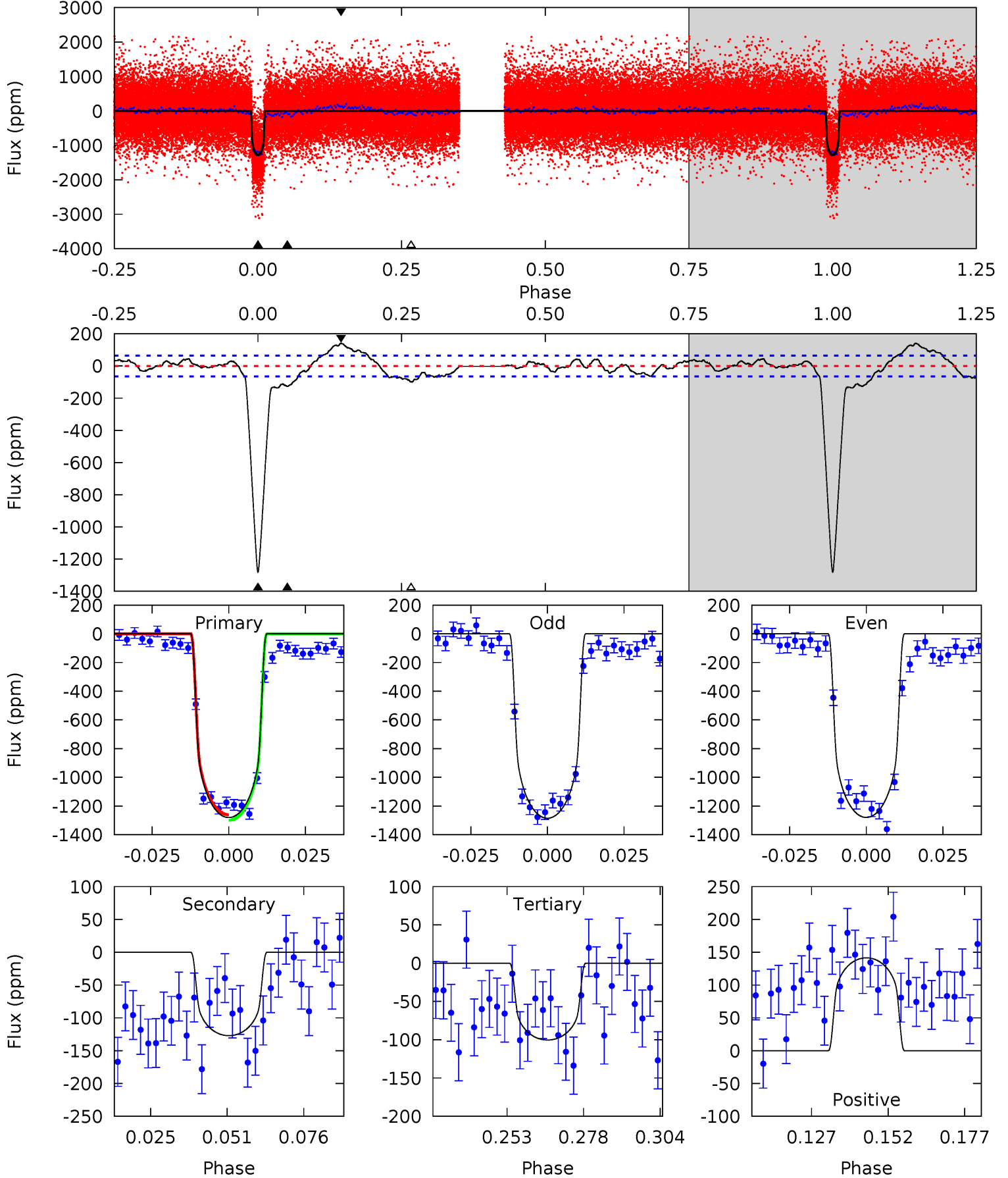
TCE 010464078-02   P= 19.403859 Days    $T_0=145.525849$  (BKJD)



# DV Model-Shift Uniqueness Test

010464078-02, P = 19.404046 Days, E = 126.106037 Days

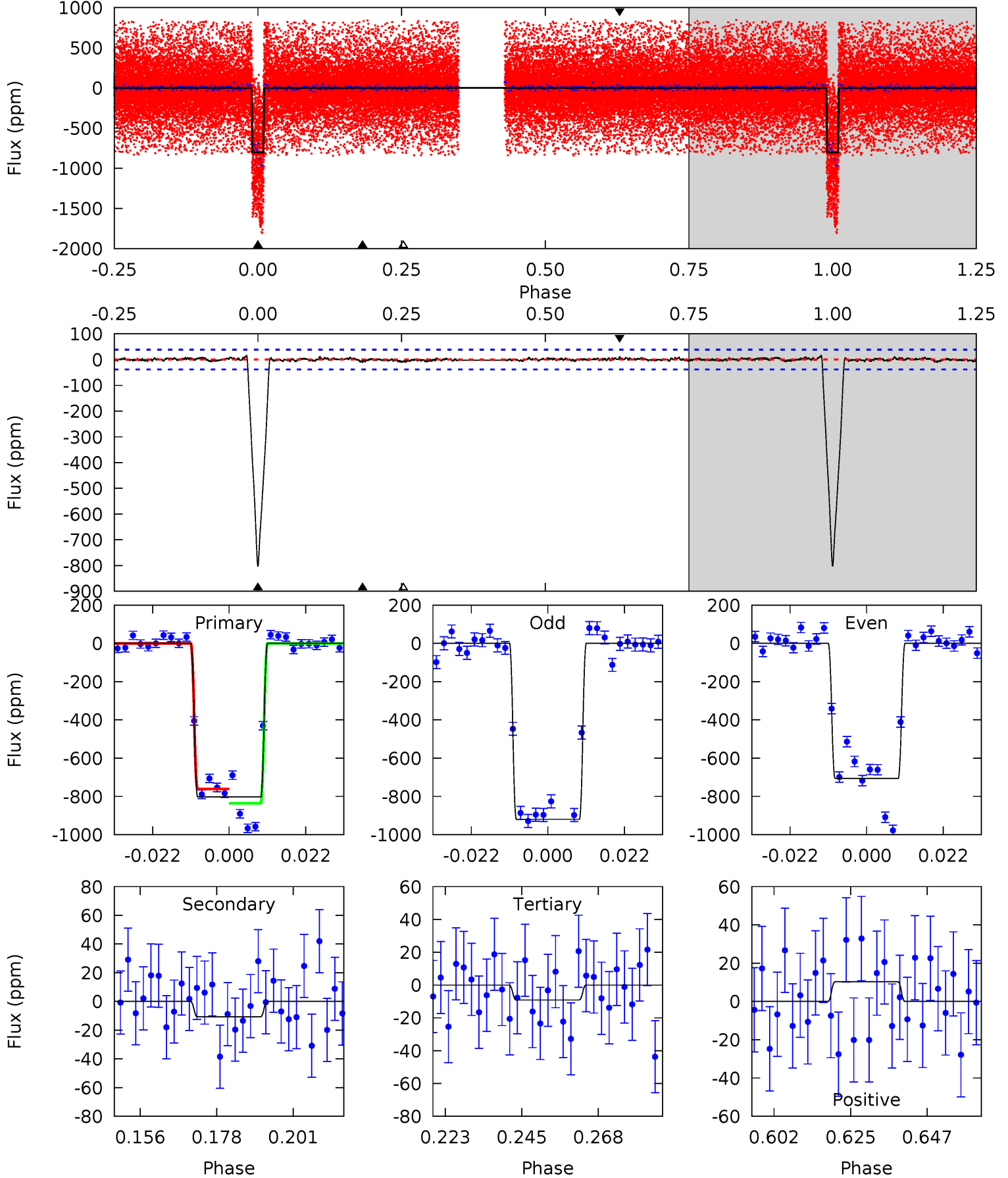
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
95.9	9.52	7.52	10.6	4.85	2.24	3.49	88.4	85.3	2.00	-1.07	0.21	0.97	0.10	1.46



# Alt Model-Shift Uniqueness Test

010464078-02, P = 19.403859 Days, E = 126.121990 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
102.1	1.37	1.16	1.31	4.87	2.29	0.43	100.9	100.8	0.21	0.06	13.8	1.01	0.02	4.74



### Stellar Parameters For KIC 010464078

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R$ ( $R_{\odot}$ )	$M(M_{\odot})$	$p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ )
	$5043^{+151}_{-151}$	$4.591^{+0.072}_{-0.048}$	$-0.540^{+0.350}_{-0.300}$	$0.680^{+0.072}_{-0.065}$	$0.657^{+0.085}_{-0.036}$	$2.945^{+0.852}_{-0.553}$
	+3%/-3%	+2%/-1%	+65%/-56%	+11%/-10%	+13%/-5%	+29%/-19%
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 010464078-02 / KOI

Detrend	Depth (ppm)	$R_p$ ( $R_{\oplus}$ )	$T_{\text{max}}$ (K)	$T_{\text{obs}}$ (K)	$A_{\text{obs}}$
DV	$-127 \pm 13$	$2.59^{+0.18}_{-0.16}$	$729^{+29}_{-30}$	$3348^{+100}_{-102}$	$157^{+28}_{-23}$
Alt.	$-11 \pm 8$	$2.17^{+0.15}_{-0.14}$	$727^{+26}_{-29}$	$2516^{+177}_{-374}$	$20^{+13}_{-15}$

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

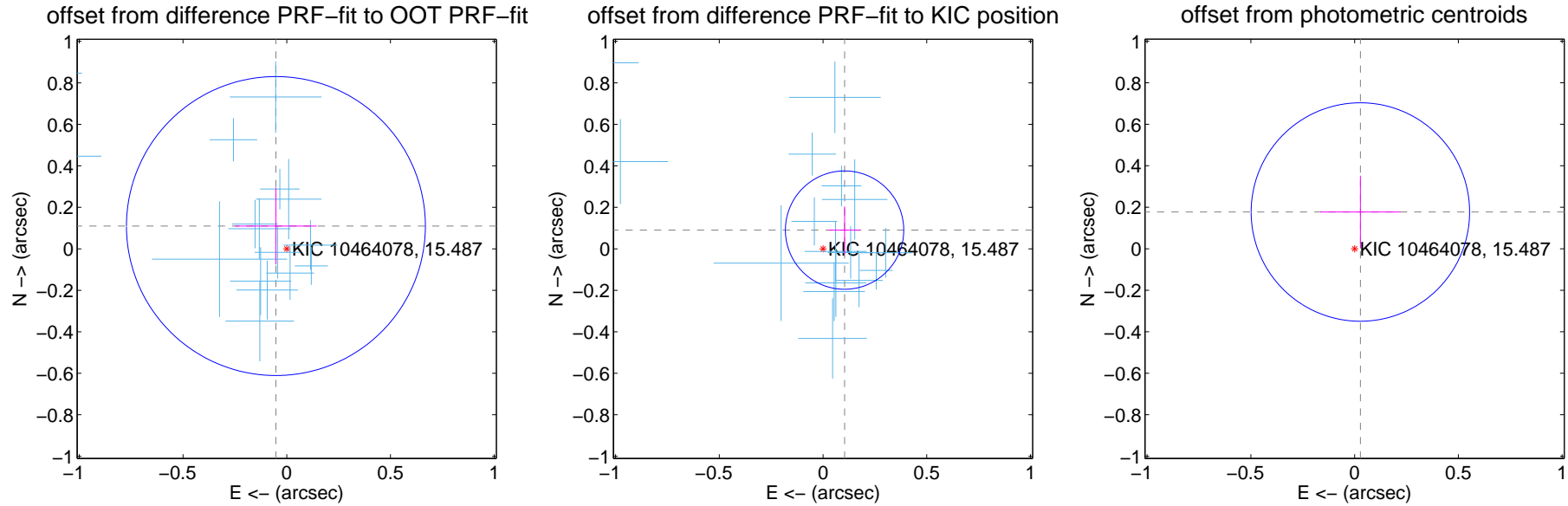
## DV Centroid Data

Supplemental centroid analysis for 010464078-02. Kepler magnitude: 15.49. Transit SNR 43.56

There are 17 quarters with good PRF difference image offsets

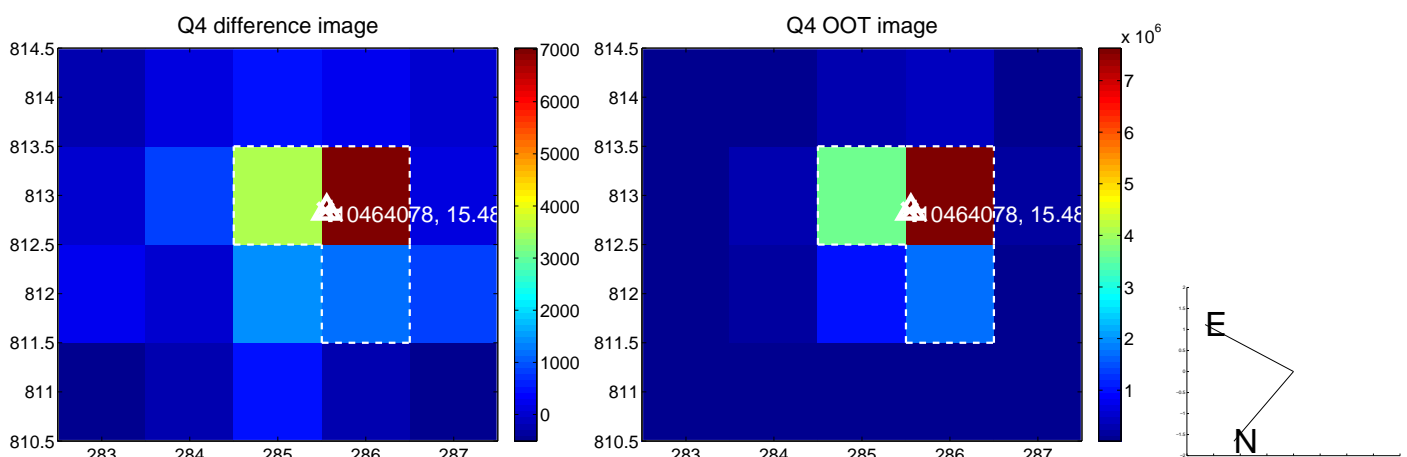
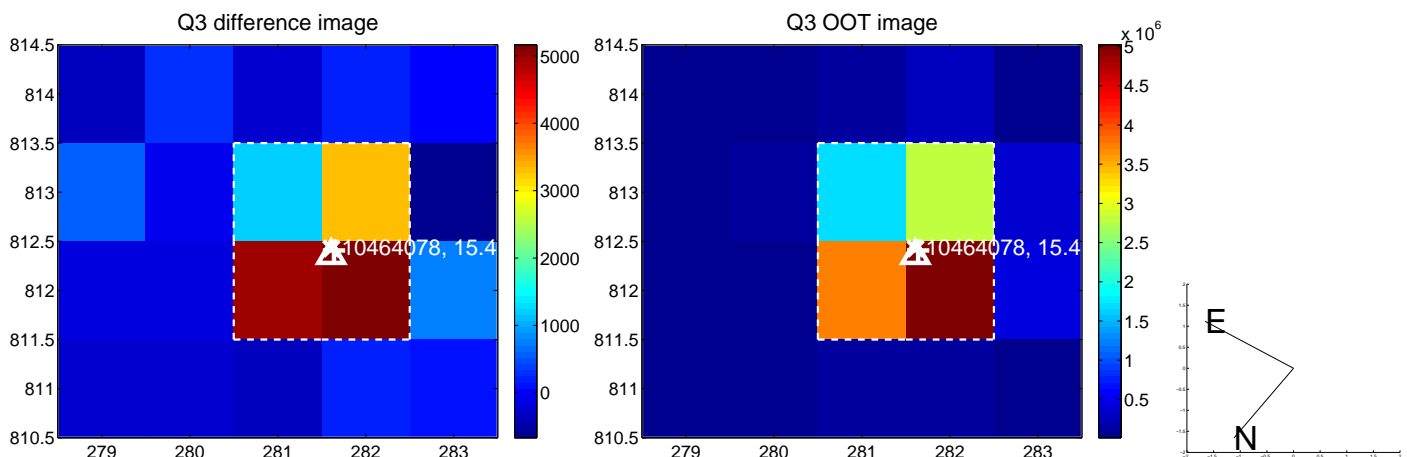
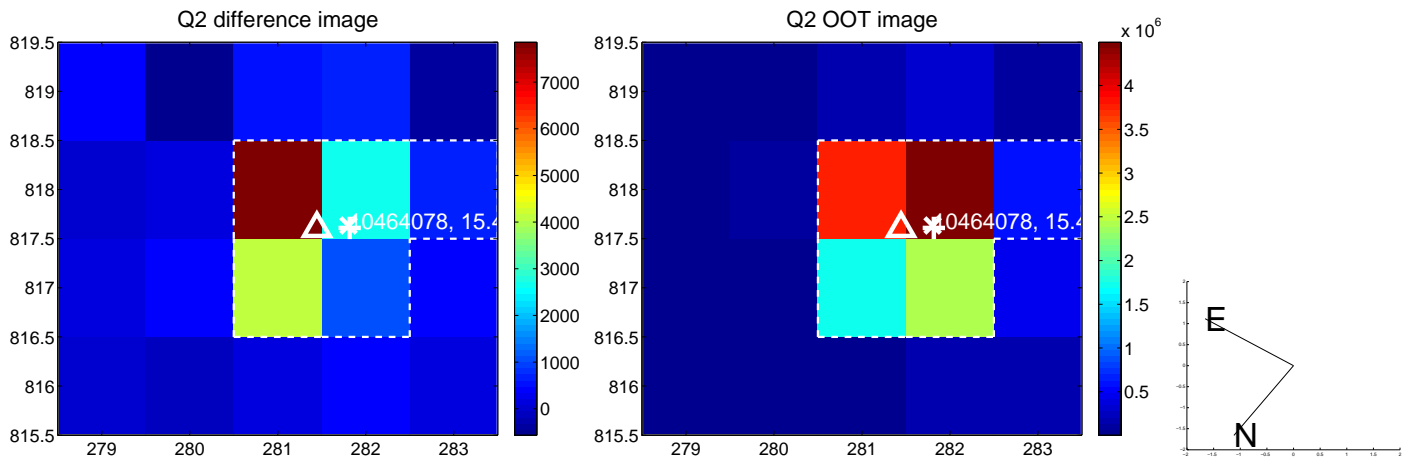
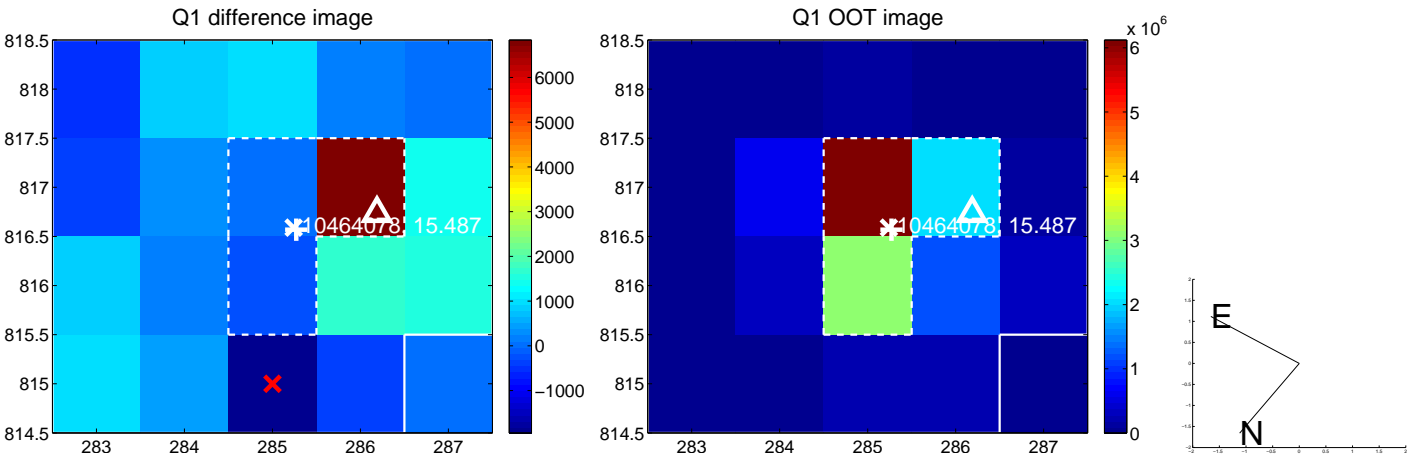
The direct PRF centroid is offset from the target star catalog position by about 0.12 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.122 \pm 0.240$	0.51	$0.052 \pm 0.197$	$0.110 \pm 0.185$
PRF-fit source offset from KIC position	$0.138 \pm 0.095$	1.45	$-0.104 \pm 0.078$	$0.090 \pm 0.114$
photometric centroid source offset	$0.18 \pm 0.18$	1.02	$-0.03 \pm 0.19$	$0.18 \pm 0.18$

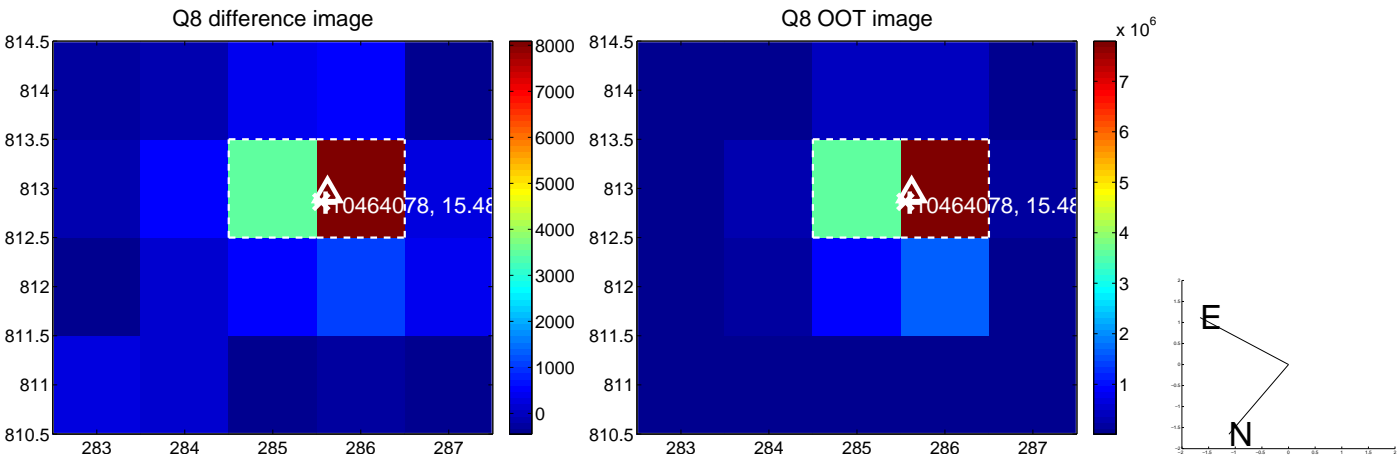
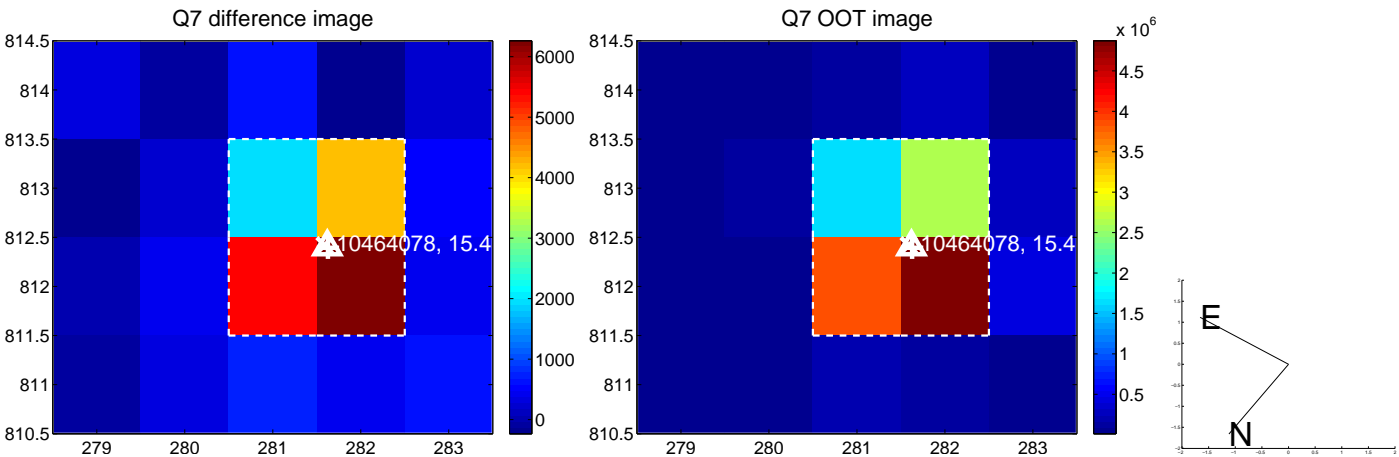
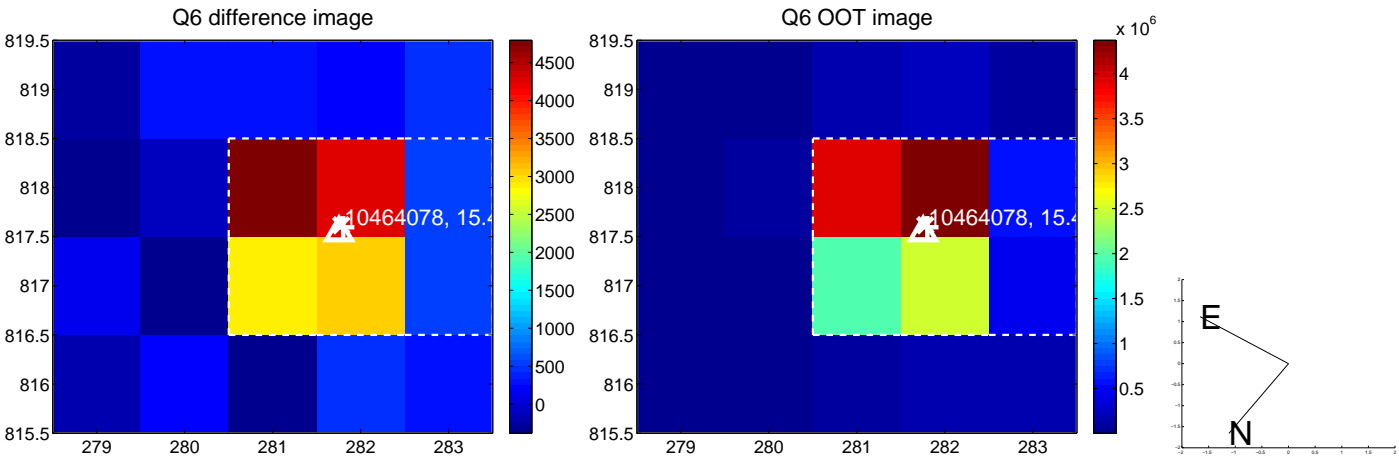
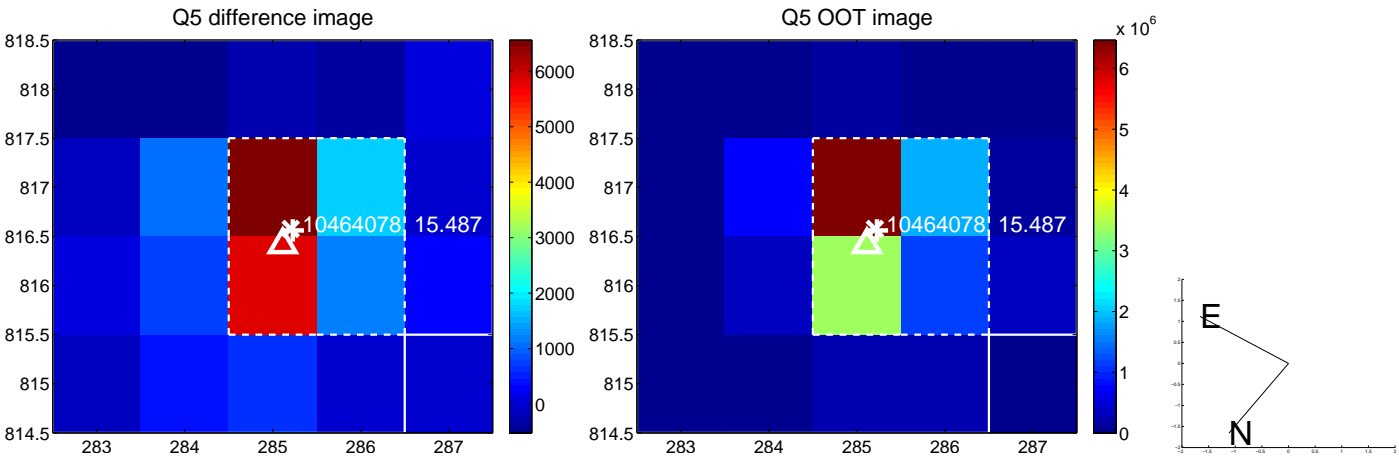


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses:** good quarterly centroid offsets; **Vermillion crosses:** bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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



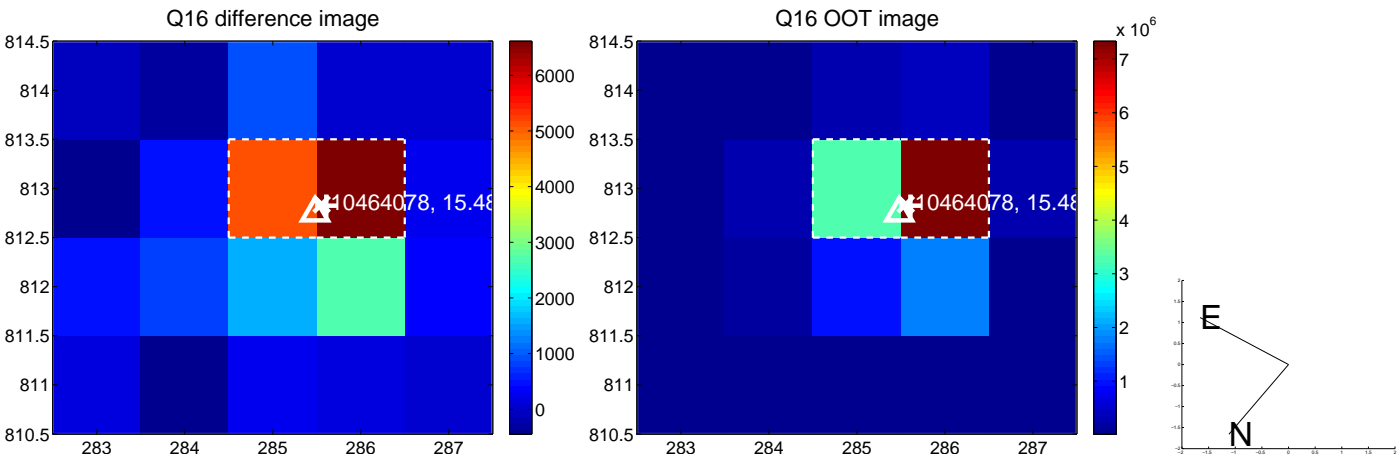
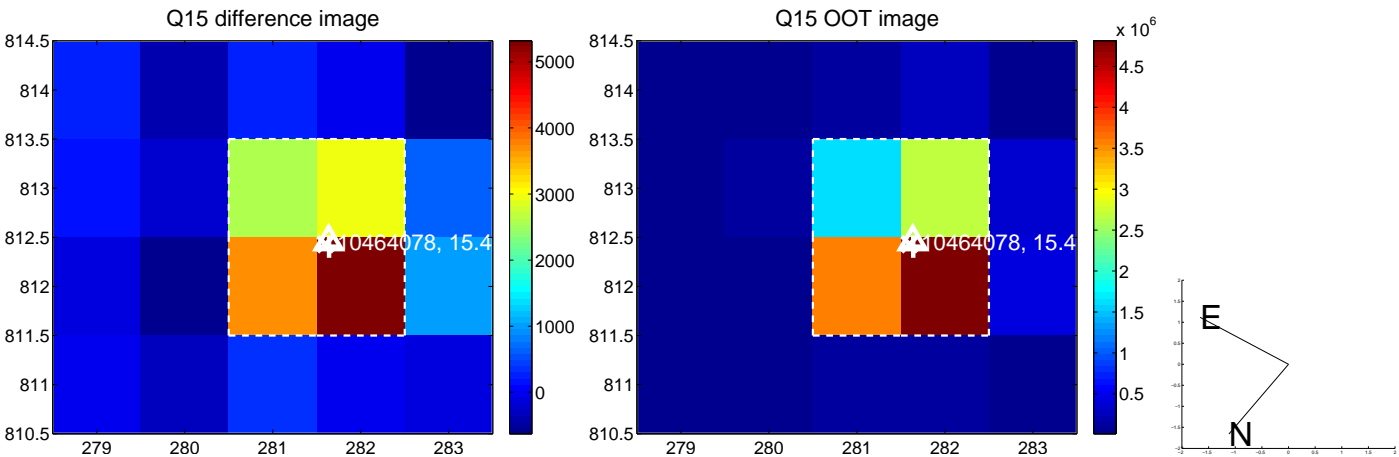
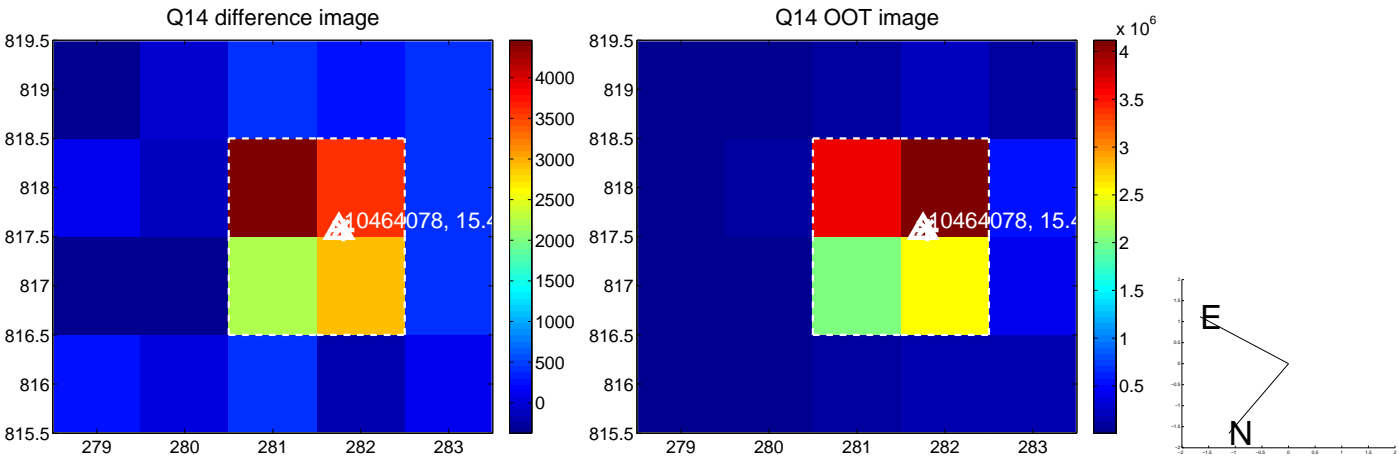
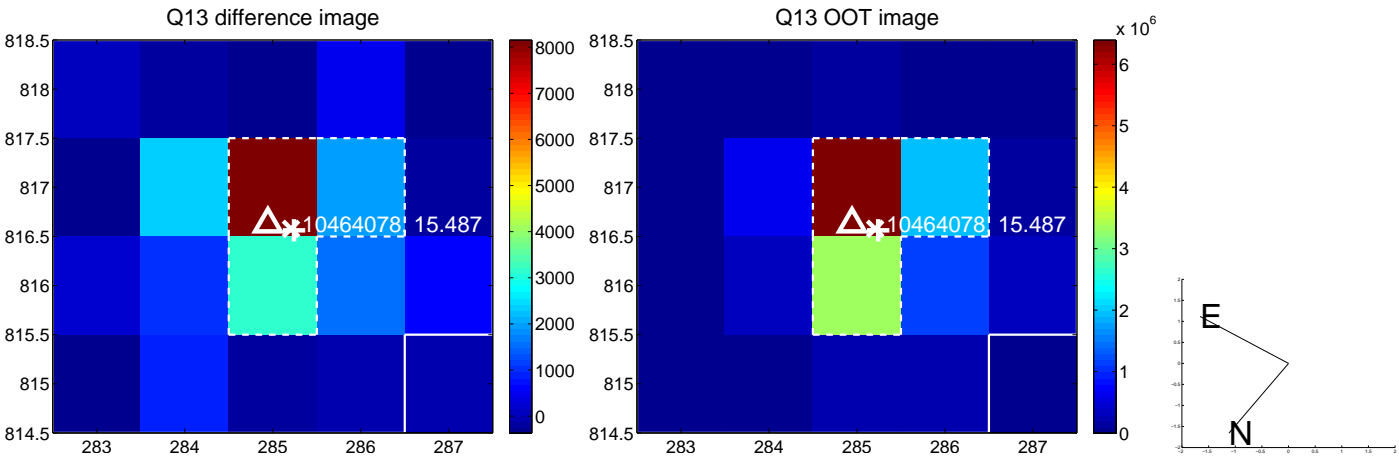
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



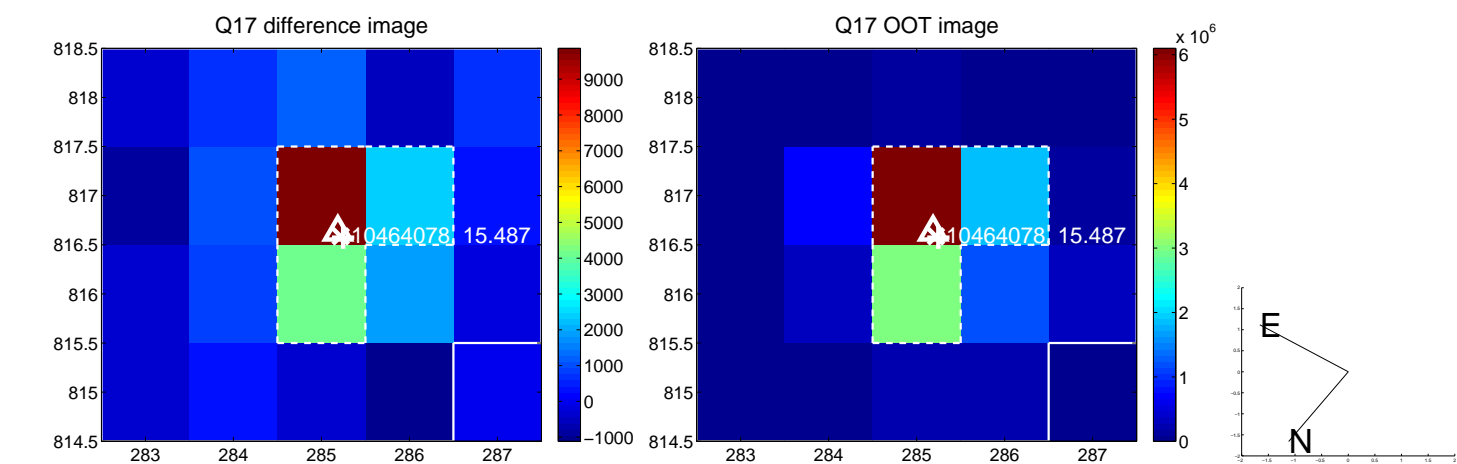




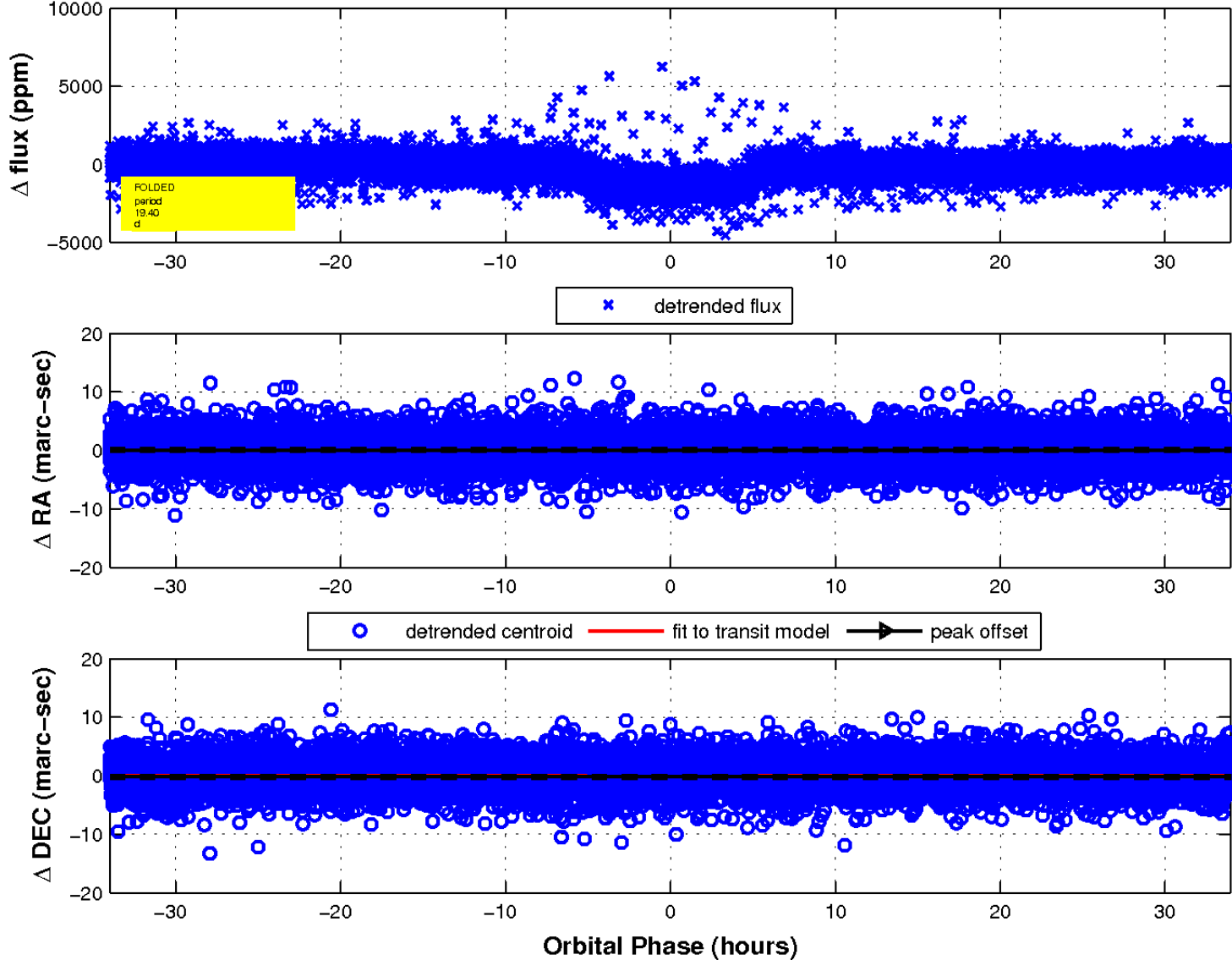
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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



fluxWeightedCentroids, Planet 2 of 2



# UKIRT Image

Declination

