

# KIC 004173026

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
004173026-01	OBS	2172.01	10.440892	137.969920	762.5	3.592	26.0	29.2	0.98	5738	3.19	111.70
004173026-02	OBS	2172.02	116.584962	246.628520	1259.2	7.066	15.0	16.5	0.98	5738	4.06	4.48

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
004173026-01	OBS	PC	1.00	0	0	0	0	NO_COMMENT
004173026-02	OBS	PC	0.99	0	0	0	0	NO_COMMENT

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

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

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

## Ephemeris Match Information For 004173026-01

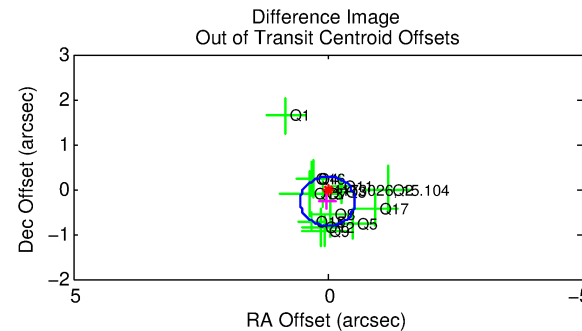
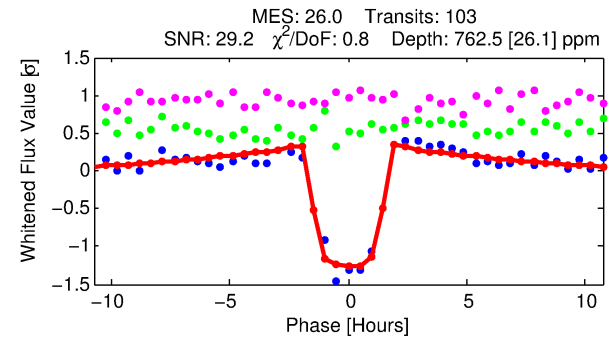
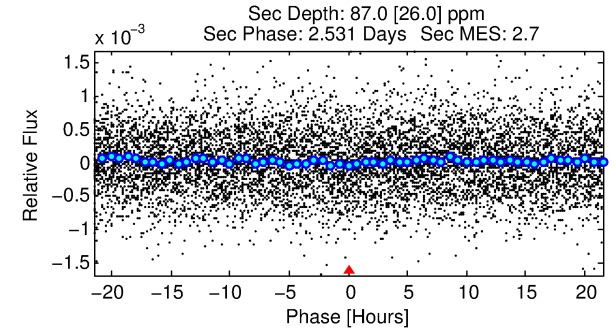
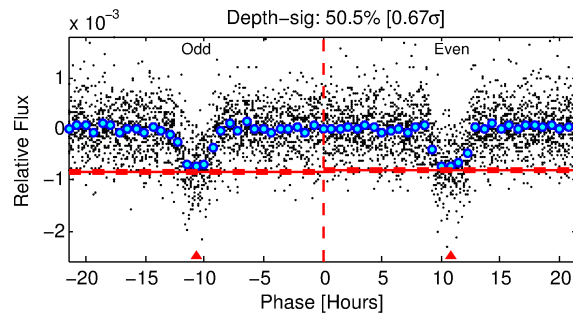
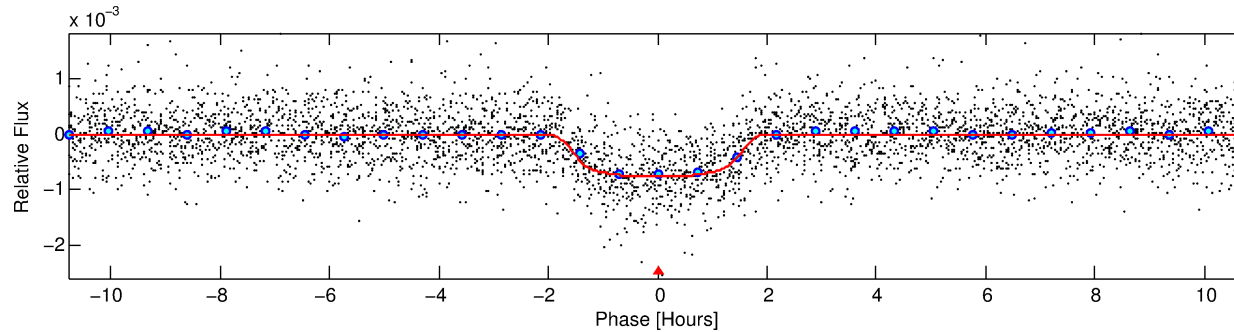
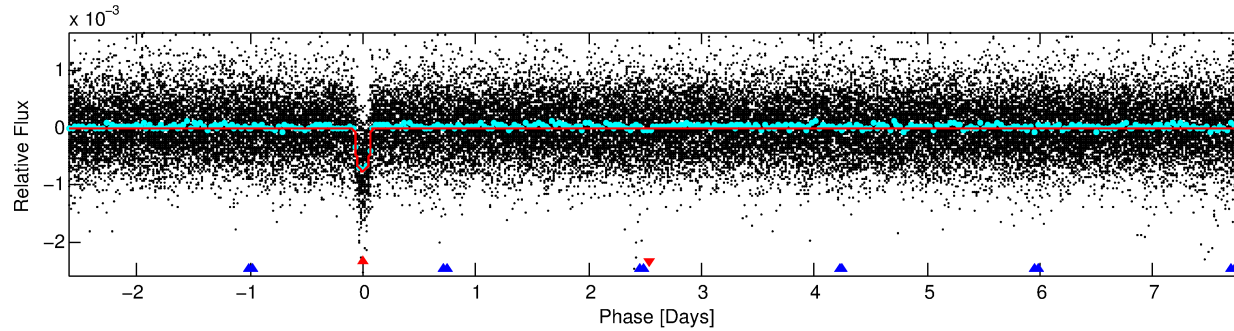
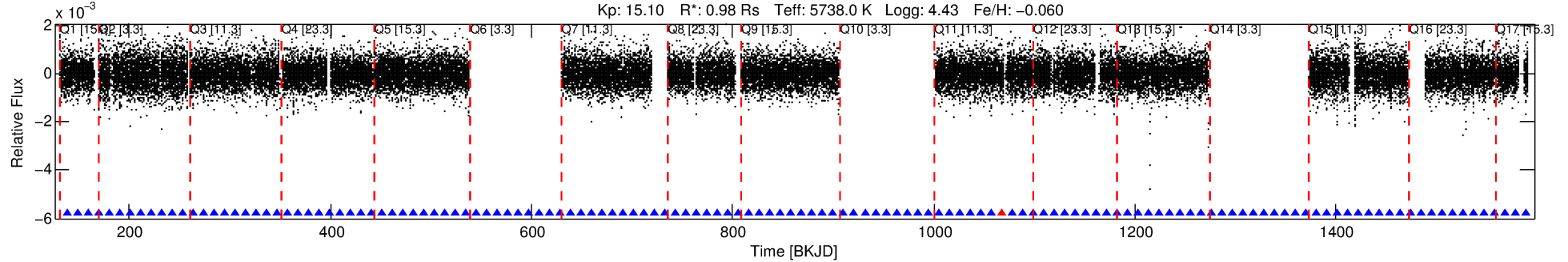
No Significant Match Found

# DV One-Page Summary

KIC: 4173026 Candidate: 1 of 2 Period: 10.441 d

KOI: K02172.01 Corr: 0.980

Kp: 15.10 R\*: 0.98 Rs Teff: 5738.0 K Logg: 4.43 Fe/H: -0.060



## DV Fit Results:

Period = 10.44089 [0.00003] d  
Epoch = 137.9699 [0.0021] BKJD  
Rp/R\* = 0.0298 [0.0021]  
a/R\* = 11.65 [3.57]  
b = 0.89 [0.08]  
Seff = 111.70 [40.94]  
Teq = 829 [76] K  
Rp = 3.19 [0.94] Re  
a = 0.0915 [0.0219] AU  
Ag = 39.49 [18.91] [2.03σ]  
Teffp = 3213 [283] K [8.13σ]

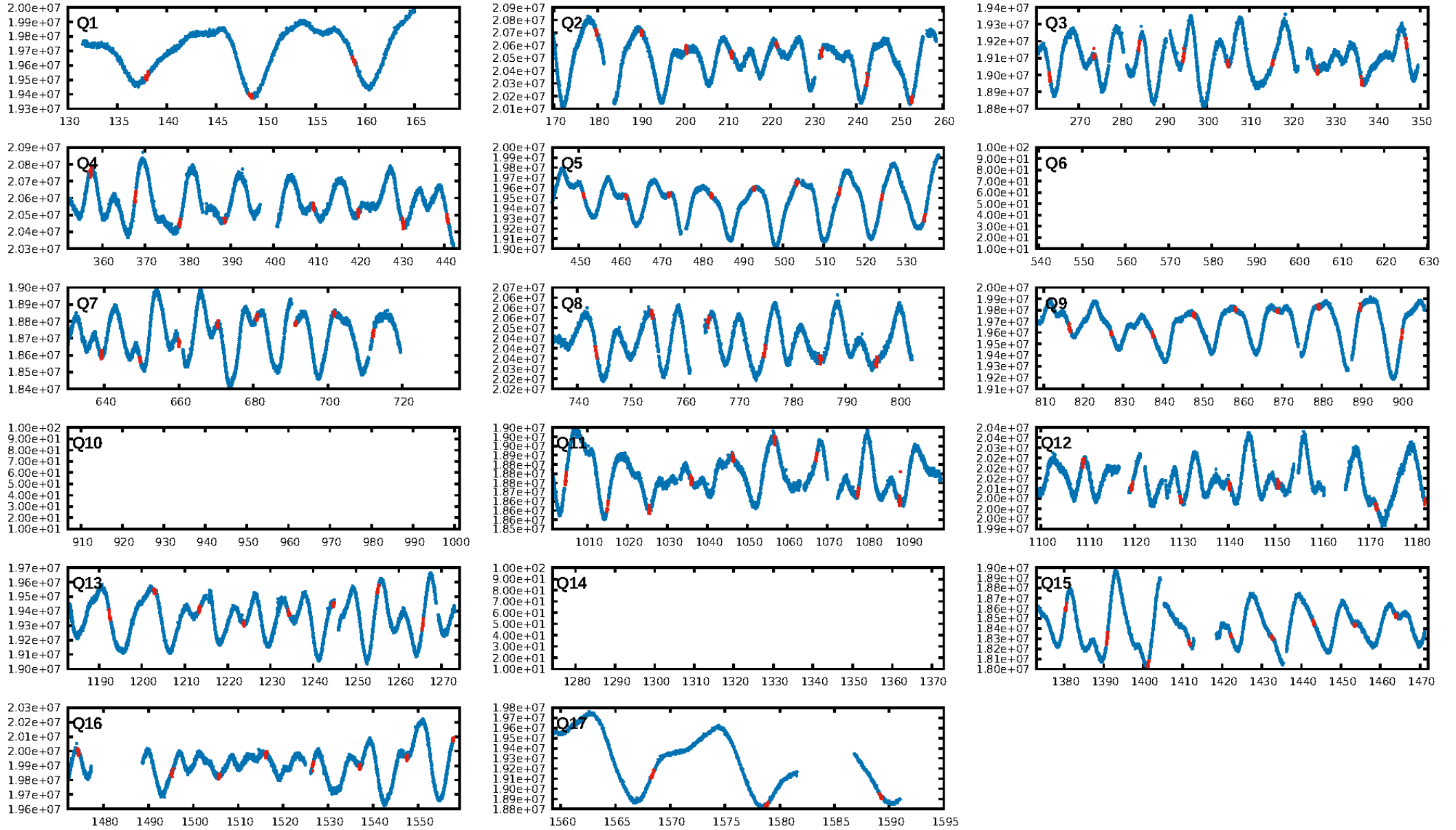
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 100.0% [321.37σ]  
ModelChiSquare2-sig: 99.5%  
ModelChiSquareGof-sig: 100.0%  
Bootstrap-pfa: 1.81e-146  
RollingBand-fgt: 0.99 [96/97]  
GhostDiagnostic-chr: 1.78e+04  
Centroid-sig: 3.7%  
Centroid-so: 0.363 arcsec [0.94σ]  
OotOffset-rm: 0.270 arcsec [1.49σ]  
OotOffset-st: 1/4/4/5 [14]  
KicOffset-rm: 0.250 arcsec [1.48σ]  
KicOffset-st: 1/4/4/5 [14]  
DiffImageQuality-fgm: 1.00 [14/14]  
DiffImageOverlap-fno: 1.00 [14/14]

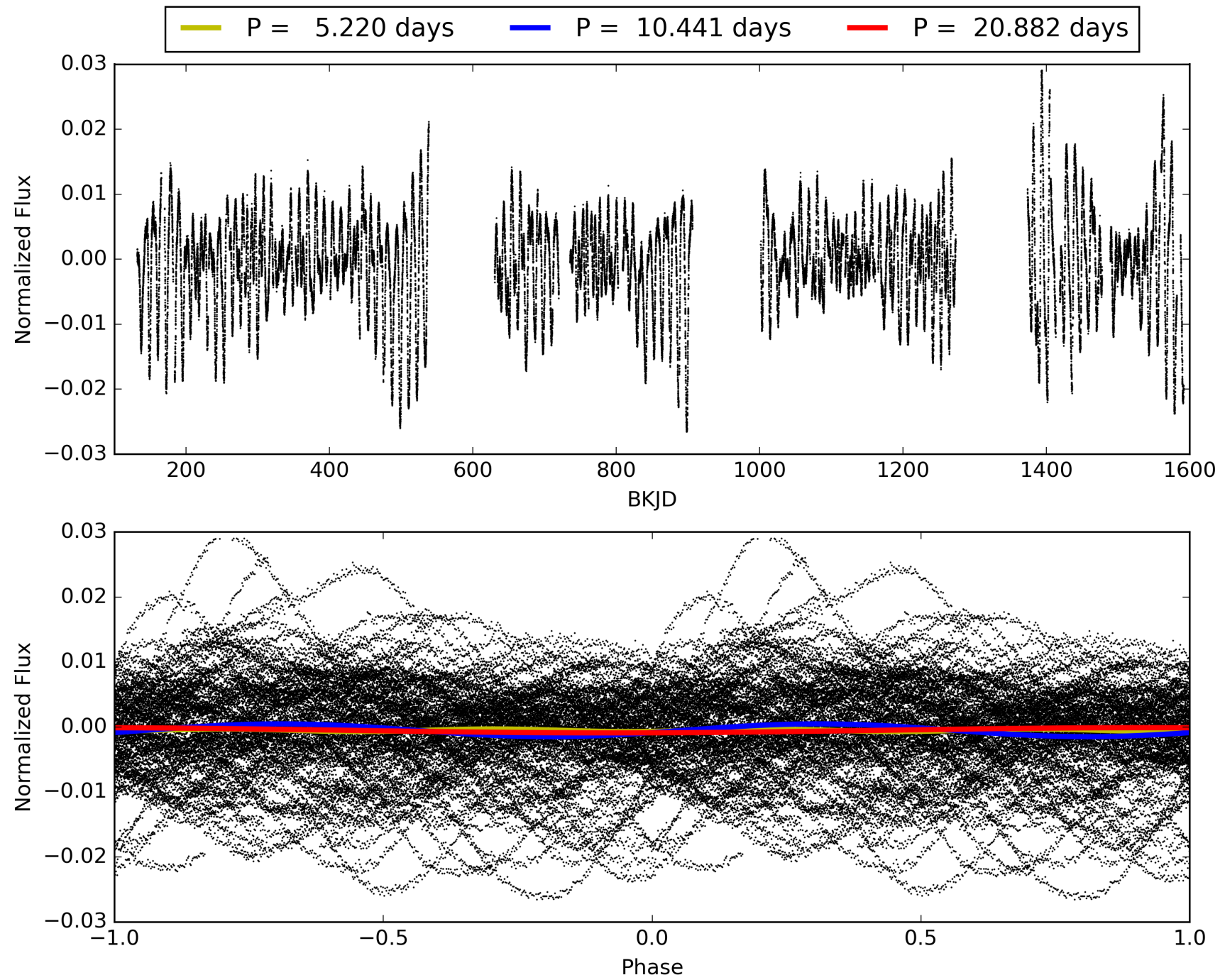
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 30-Jan-2016 00:55:53 Z

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

# TCE 004173026-01, PDC Light Curves

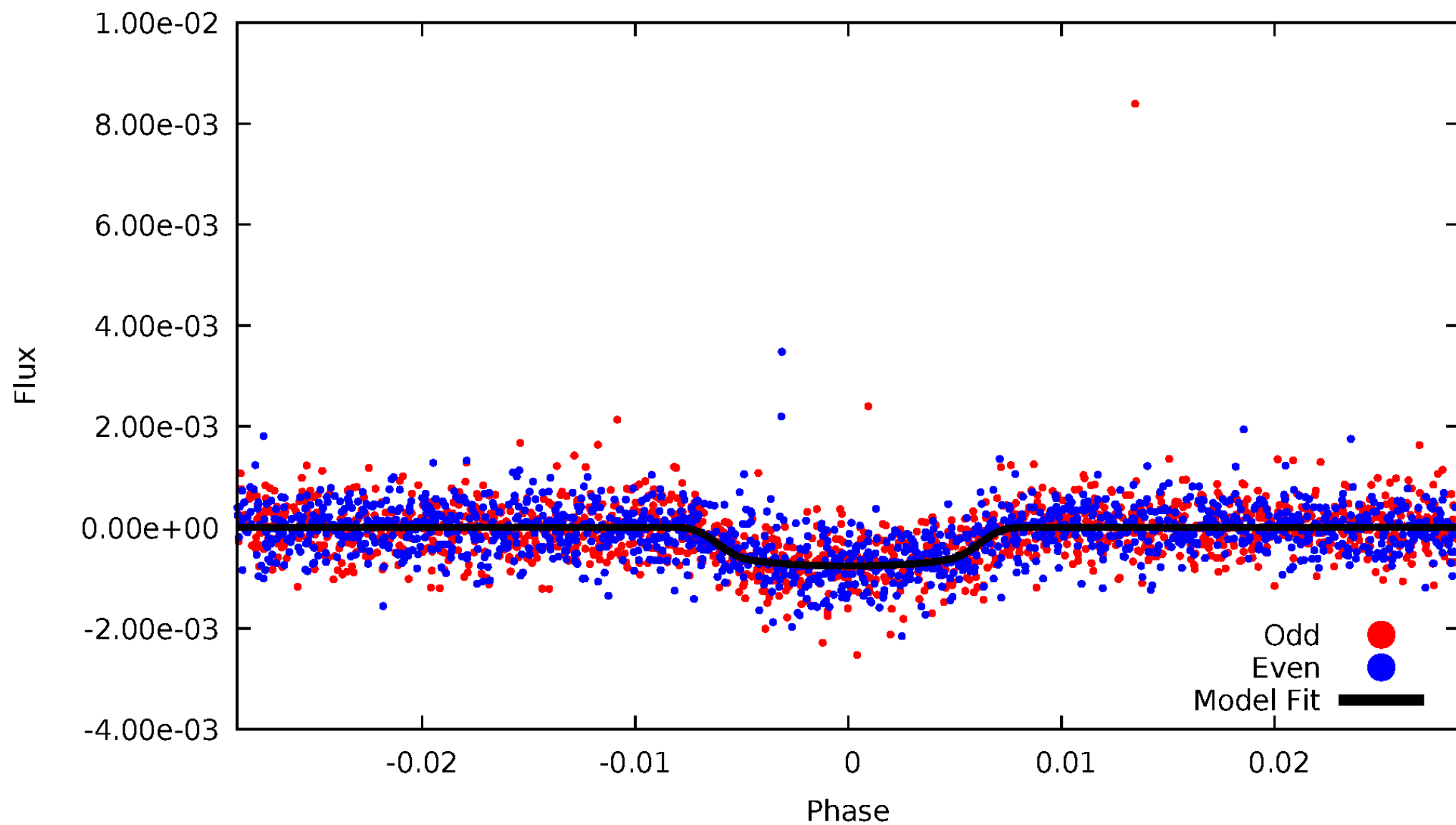


TCE 004173026-01



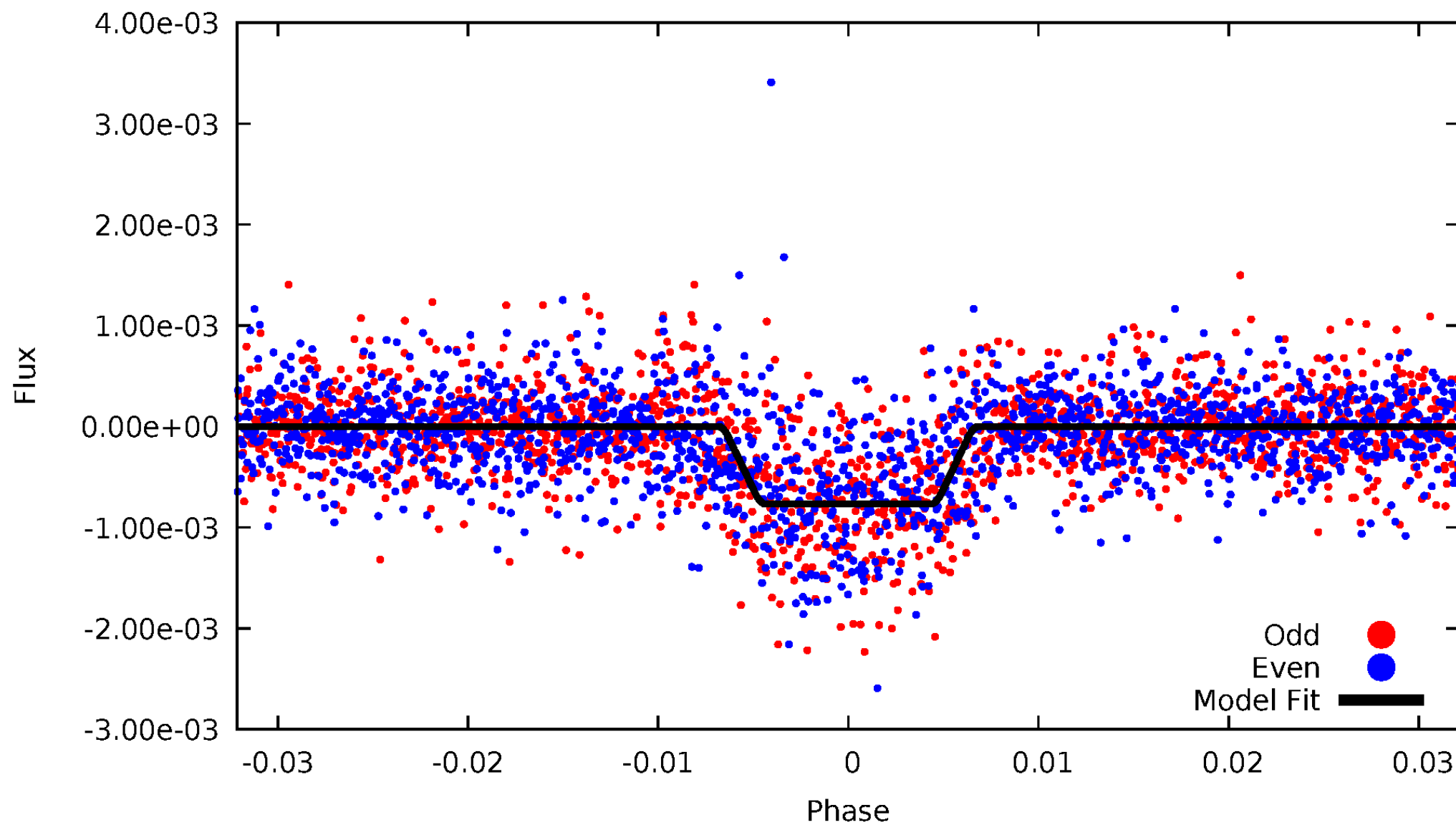
# DV Odd/Even

TCE 004173026-01



# ALT Odd/Even

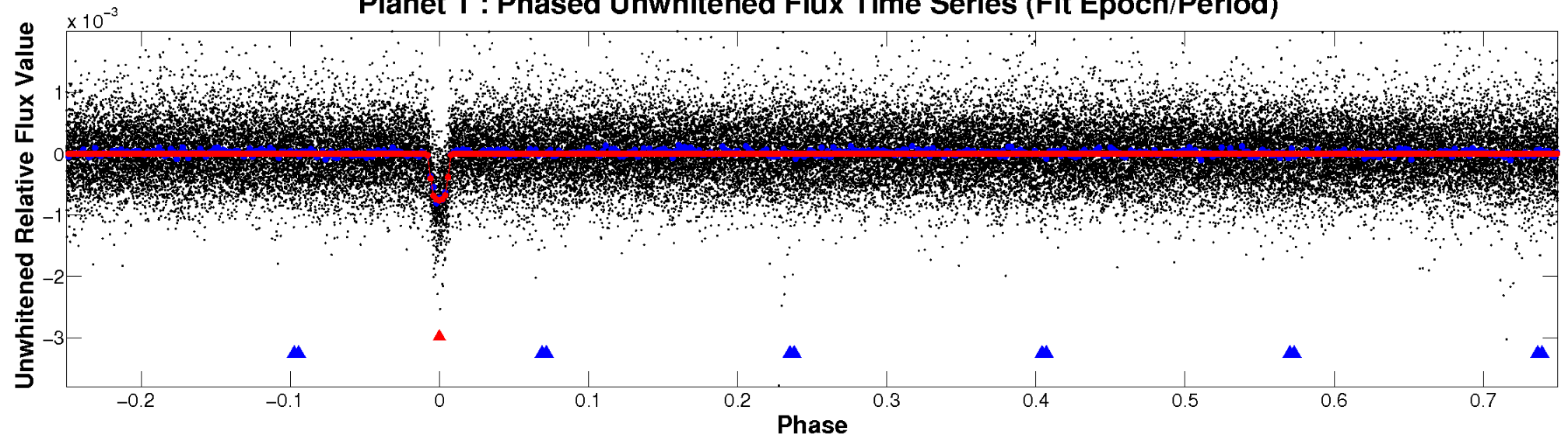
TCE 004173026-01



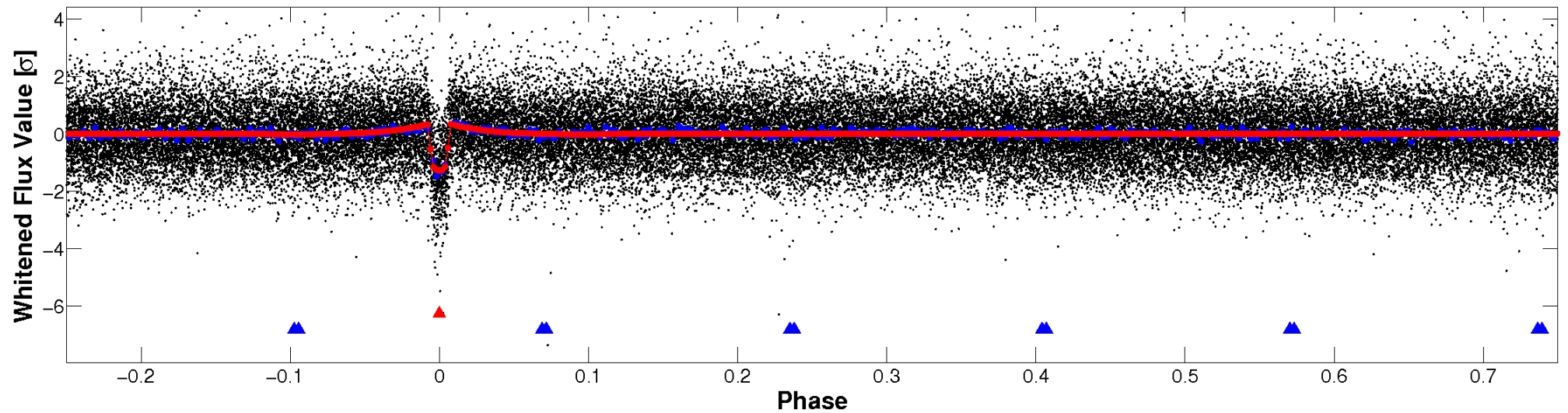


# Non-Whitened Vs. Whitened Light Curve

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

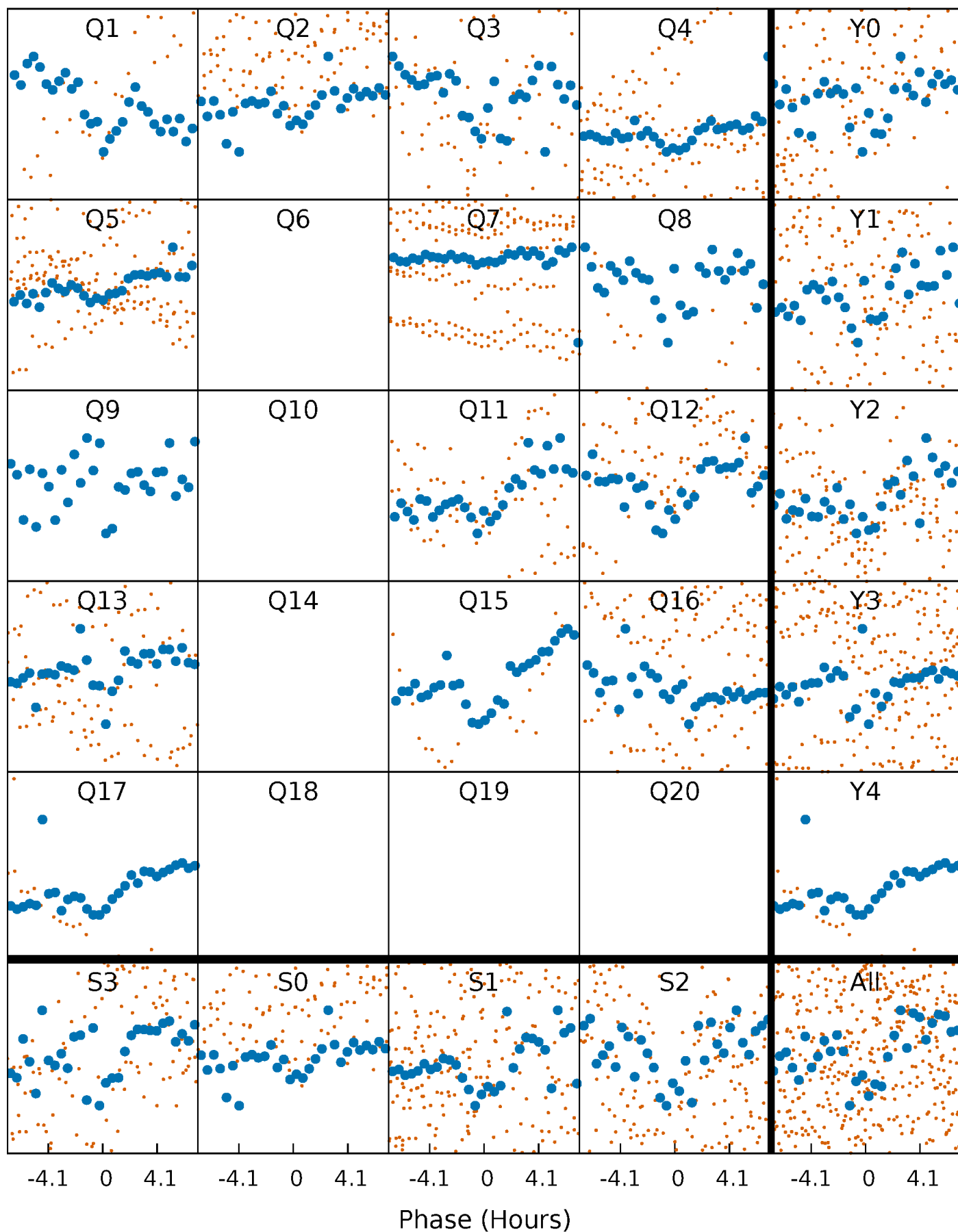


**Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)**



# PDC Quarter-Phased Transit Curves

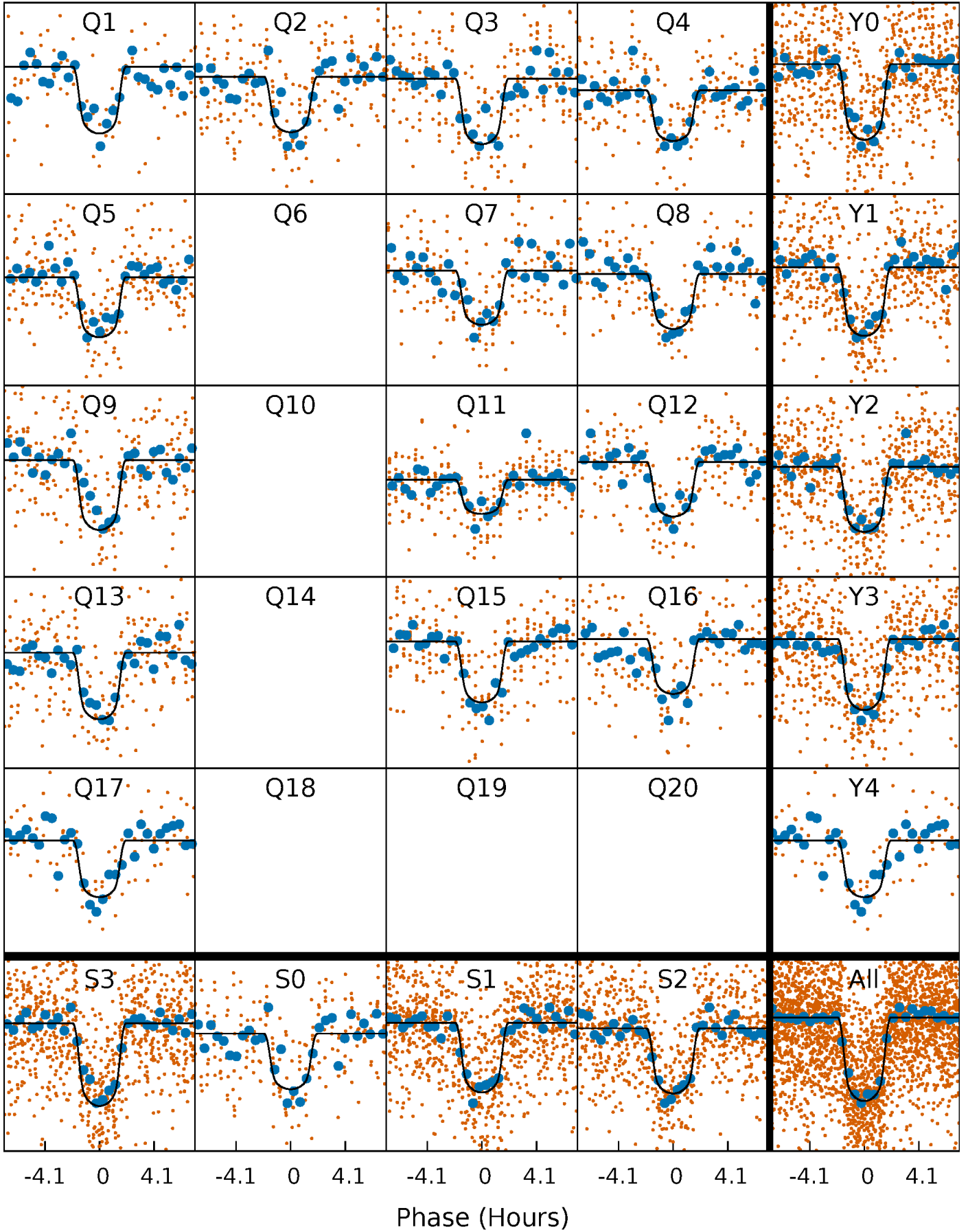
TCE 004173026-01 P= 10.440892 Days  $T_0=137.969920$  (BKJD)





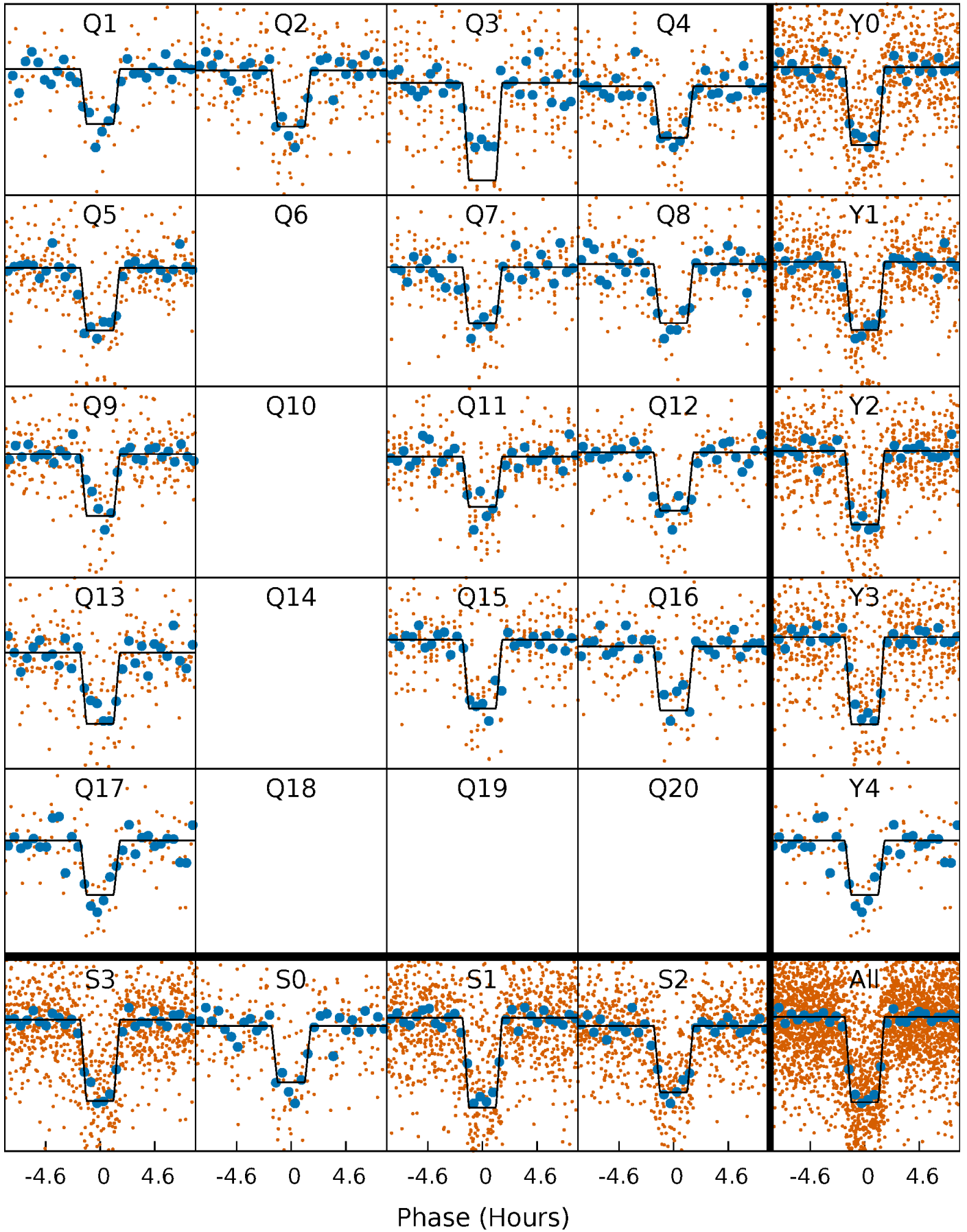
# DV Quarter-Phased Transit Curves

TCE 004173026-01   P= 10.440892 Days    $T_0=137.969920$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

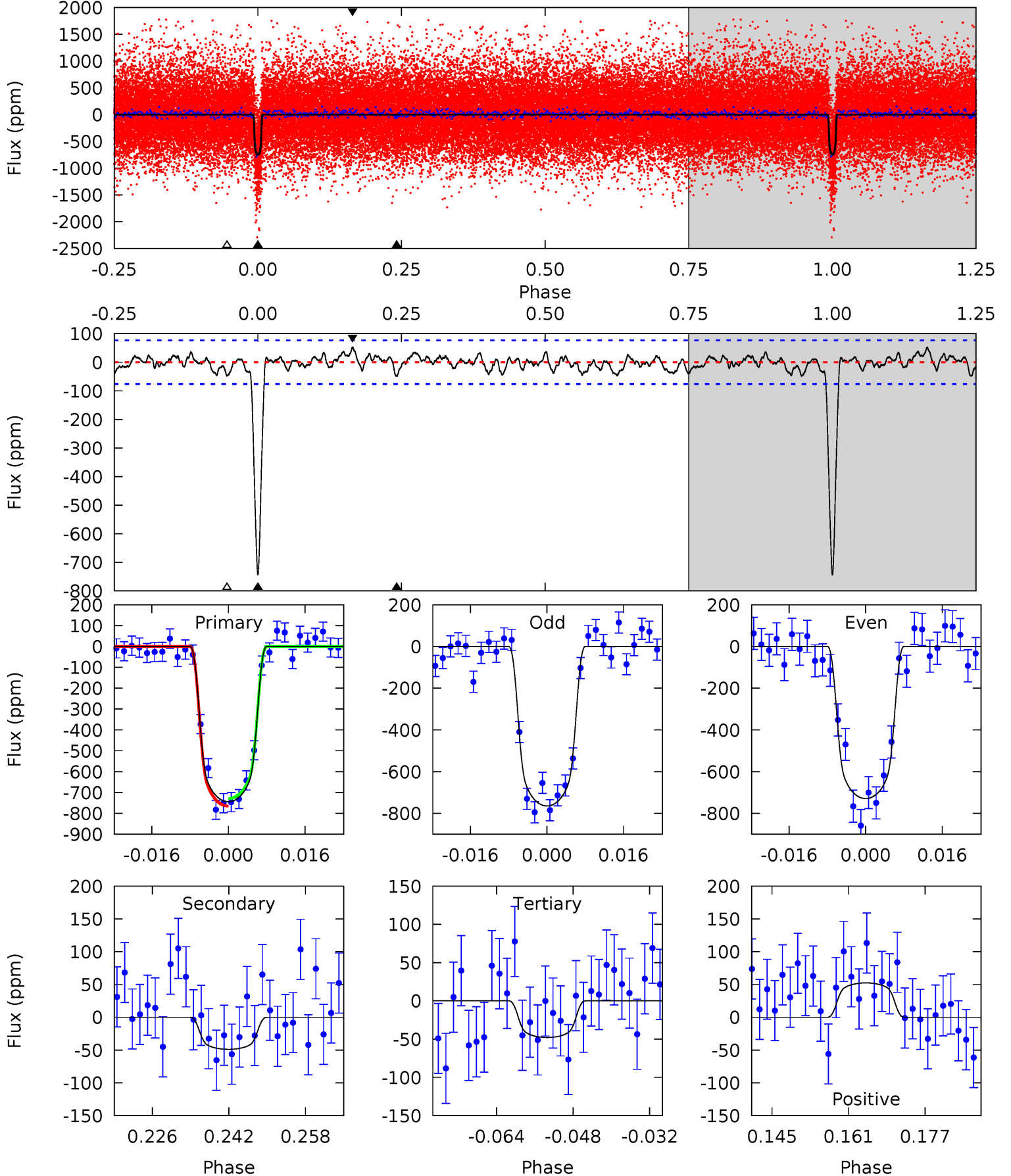
TCE 004173026-01   P= 10.440774 Days    $T_0=137.980942$  (BKJD)



# DV Model-Shift Uniqueness Test

004173026-01,  $P = 10.440892$  Days,  $E = 127.529028$  Days

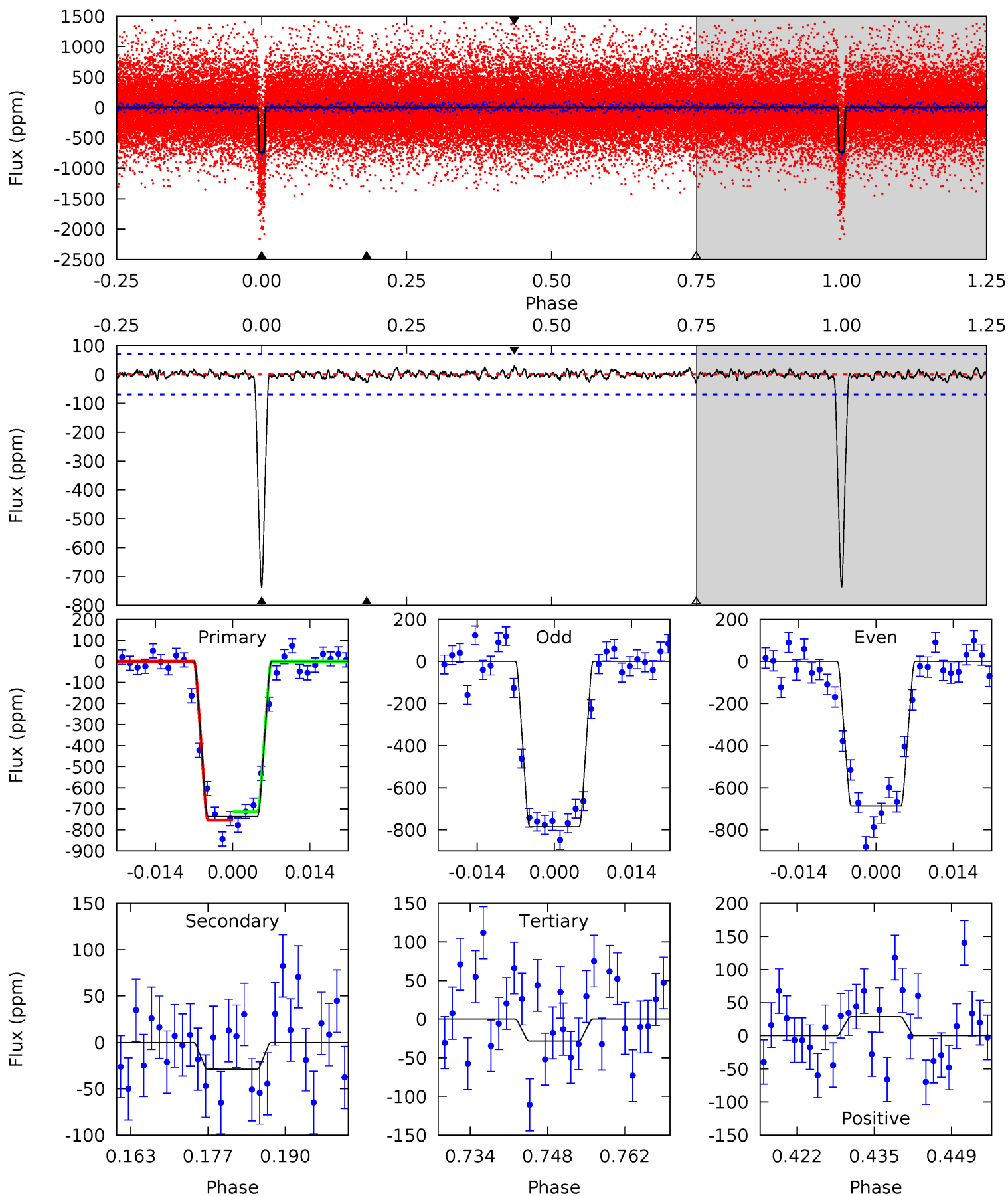
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
48.2	3.17	3.10	3.39	4.93	2.41	1.21	45.1	44.8	0.07	-0.23	1.15	1.00	0.07	1.17



# Alt Model-Shift Uniqueness Test

004173026-01, P = 10.440774 Days, E = 127.540168 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
52.4	2.07	2.01	2.04	4.97	2.47	0.63	50.3	50.3	0.05	0.03	3.55	1.06	0.04	1.43



### Stellar Parameters For KIC 004173026

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$5738^{+156}_{-173}$	$4.426^{+0.101}_{-0.188}$	$-0.060^{+0.300}_{-0.300}$	$0.981^{+0.281}_{-0.141}$	$0.936^{+0.114}_{-0.093}$	$1.397^{+0.624}_{-0.700}$
	+3%/-3%	+2%/-4%	+500%/-500%	+29%/-14%	+12%/-10%	+45%/-50%
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 004173026-01 / KOI 2172.01

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-49 \pm 15$	$3.24^{+0.47}_{-0.41}$	$1164^{+81}_{-61}$	$3311^{+187}_{-210}$	$20^{+10}_{-7}$
Alt.	$-29 \pm 14$	$3.04^{+0.48}_{-0.37}$	$1171^{+80}_{-61}$	$3145^{+208}_{-273}$	$15^{+8}_{-7}$

$T_{max}$  = Theoretical Maximum Planetary Temperature

$T_{obs}$  = Observed Planetary Temperature (Assuming  $A=0.3$ )

$A_{obs}$  = Observed Albedo (Assuming  $T=0$ )

If a secondary eclipse is present, the system is likely an EB if  $T_{obs} \gg T_{max}$  AND  $A_{obs} \gg 1.0$

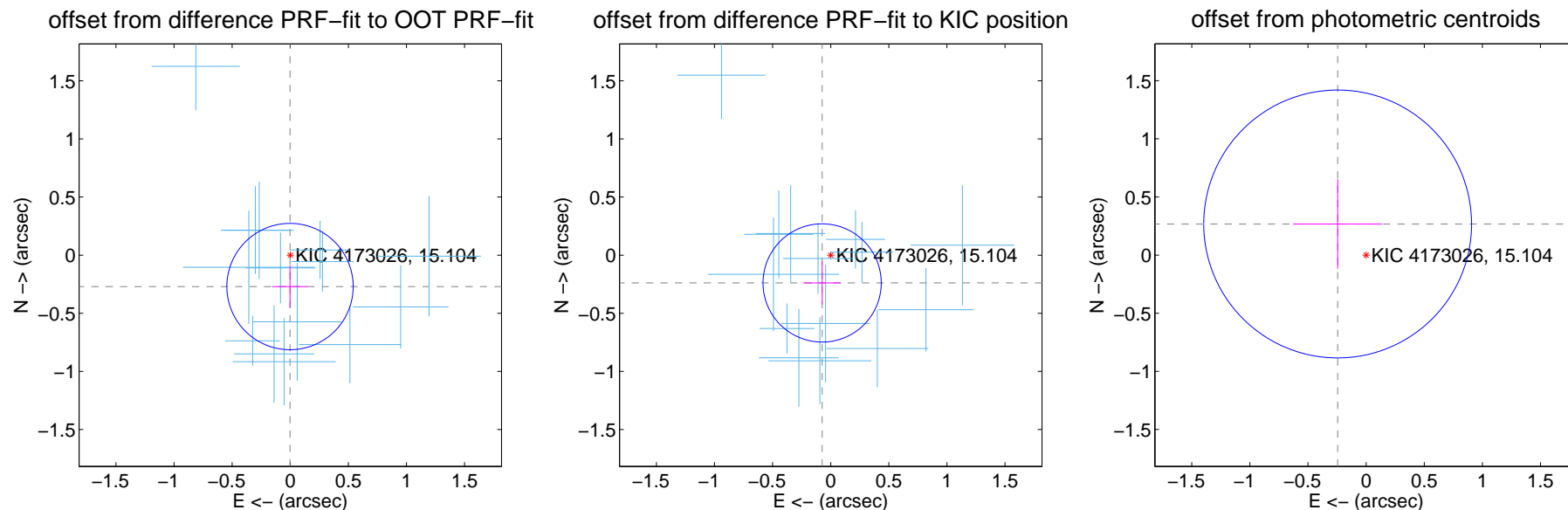
## DV Centroid Data

Supplemental centroid analysis for 004173026-01. Kepler magnitude: 15.10. Transit SNR 29.16

There are 14 quarters with good PRF difference image offsets

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

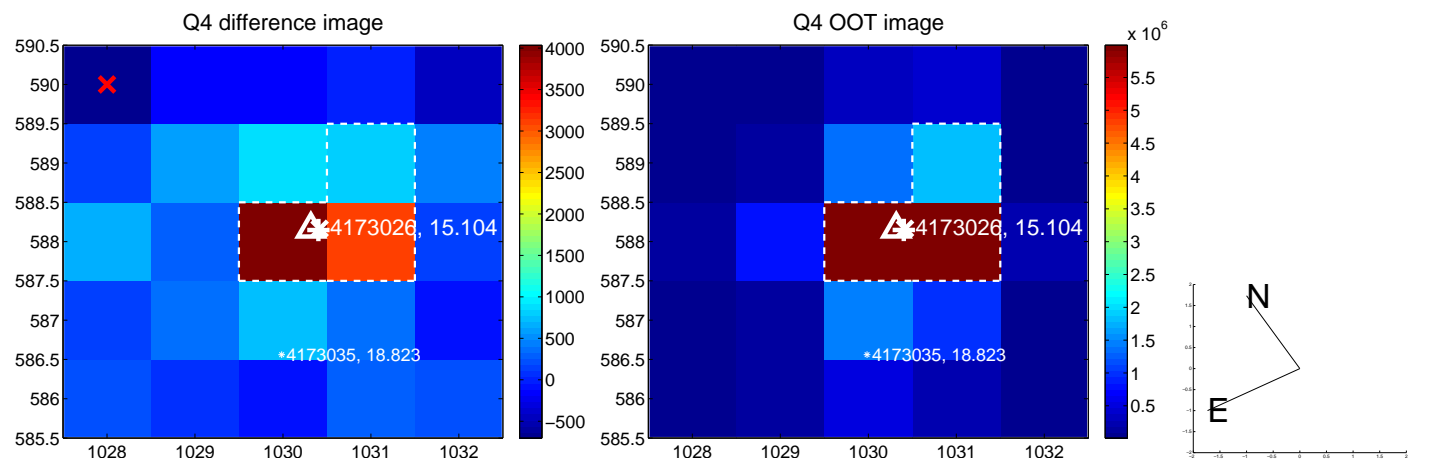
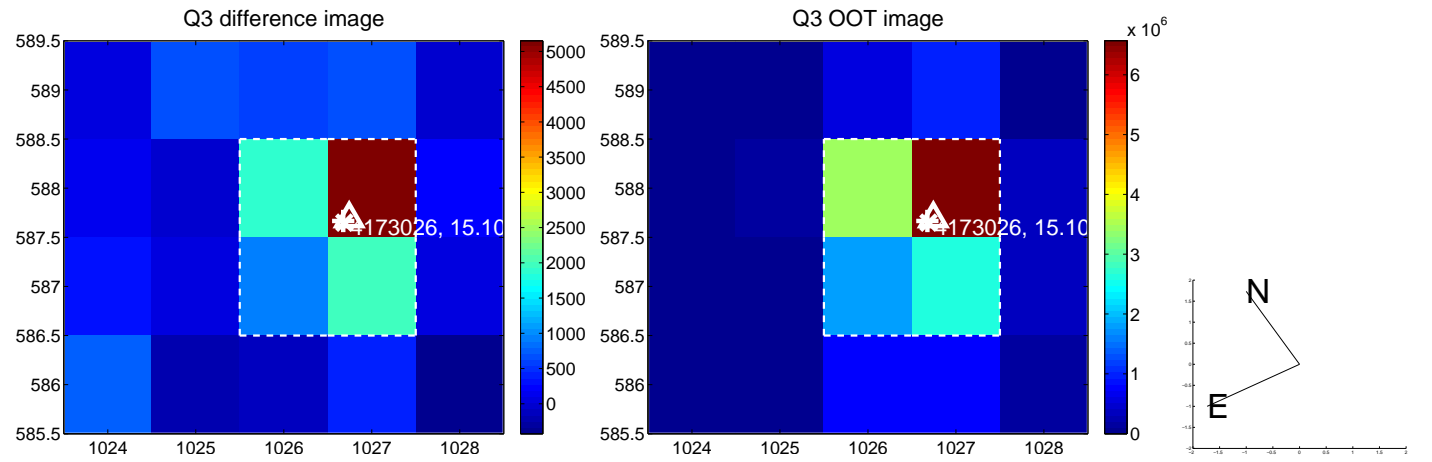
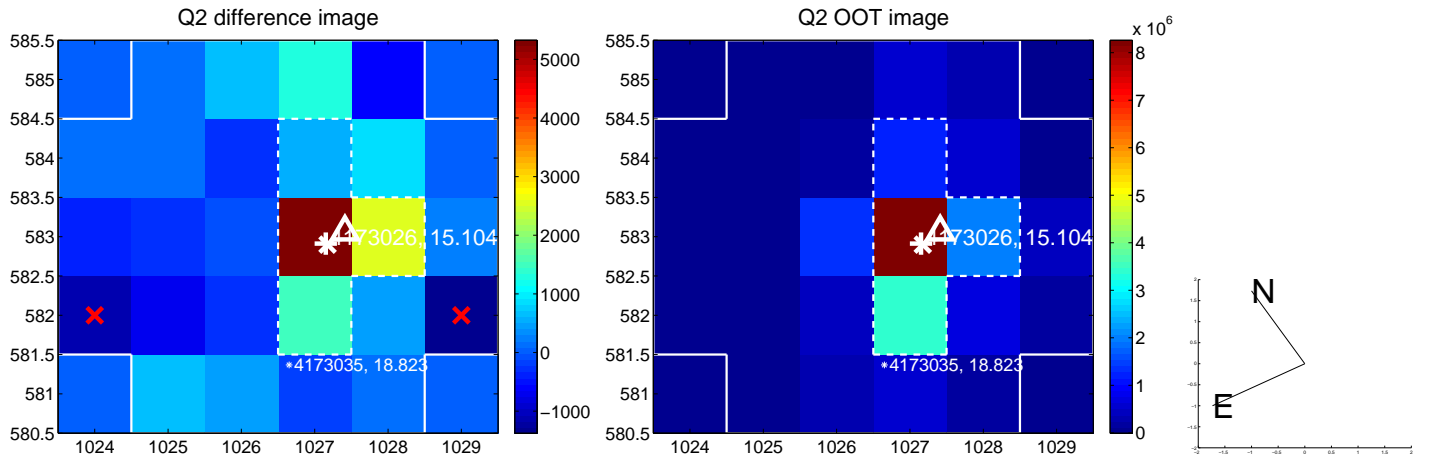
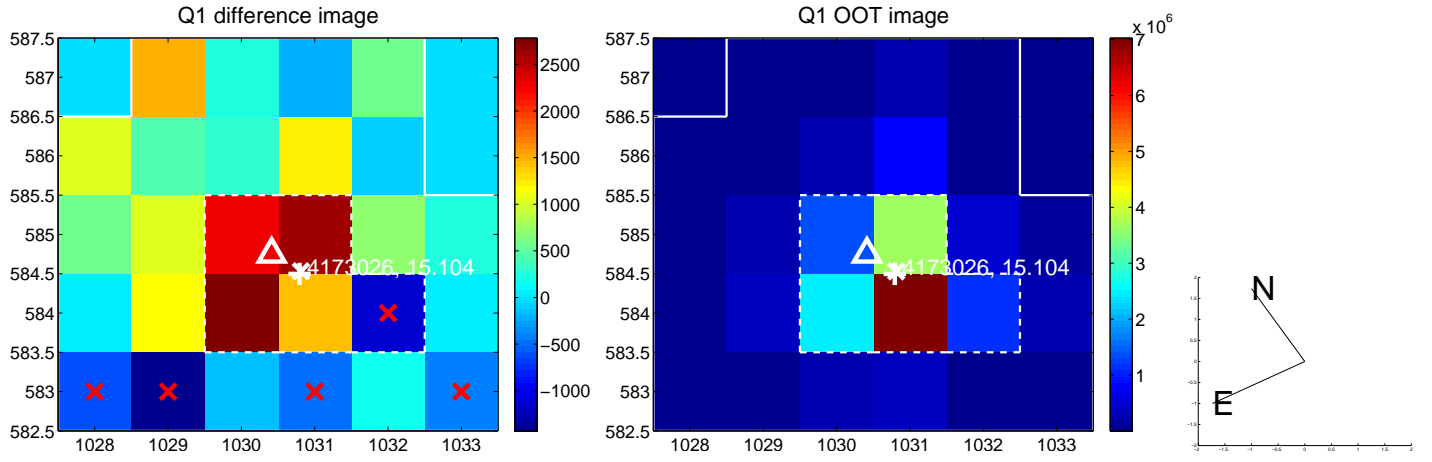
	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.270 \pm 0.181$	1.49	$0.002 \pm 0.153$	$-0.270 \pm 0.182$
PRF-fit source offset from KIC position	$0.250 \pm 0.170$	1.48	$0.074 \pm 0.162$	$-0.239 \pm 0.185$
photometric centroid source offset	$0.36 \pm 0.38$	0.94	$0.25 \pm 0.38$	$0.27 \pm 0.38$



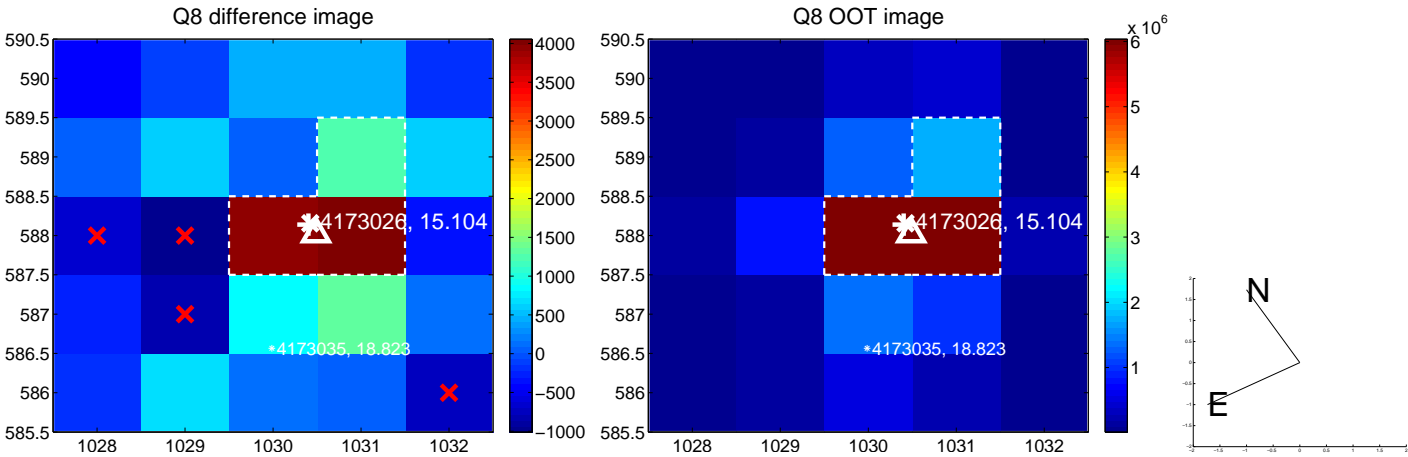
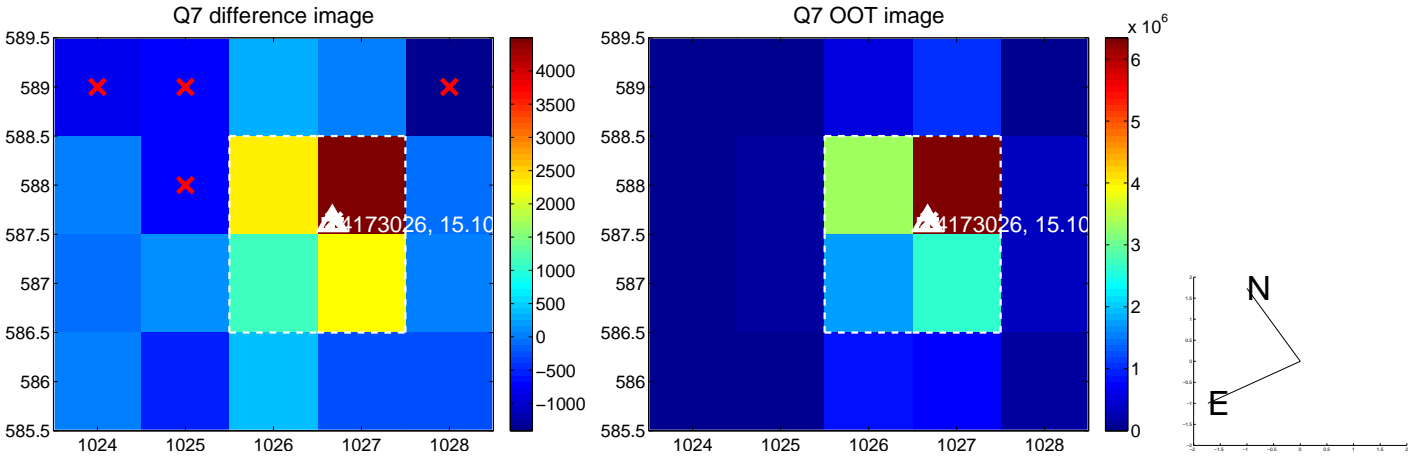
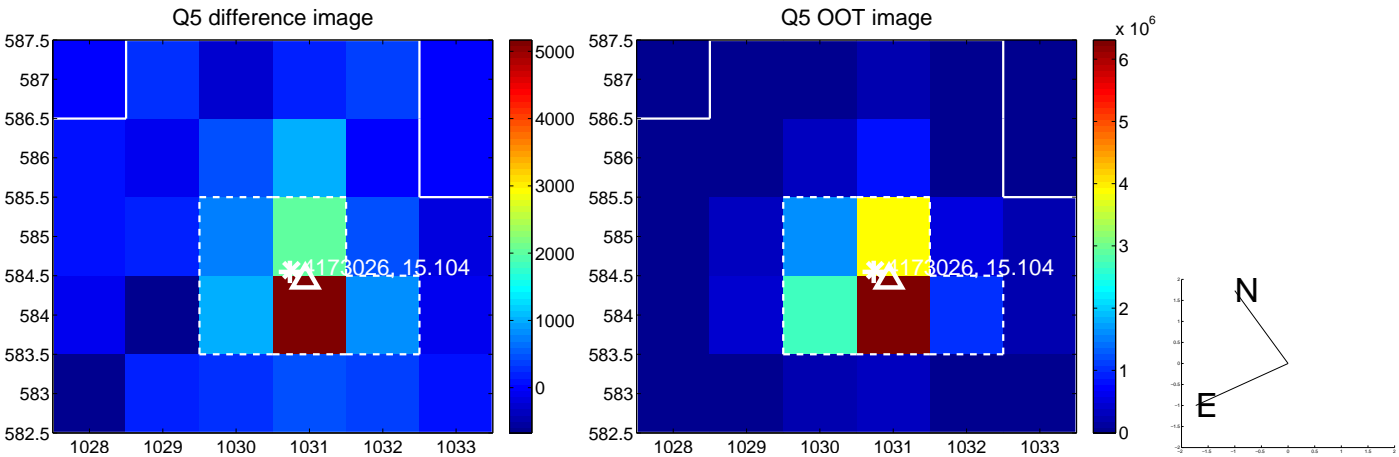
Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses:** good quarterly centroid offsets; **Vermillion crosses:** bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three- $\sigma$ . Red \*: target star. Blue \*: Other stars. Text next to a star gives its KIC ID and kepmag. KIC IDs > 15,000,000 are from the UKIRT catalog.



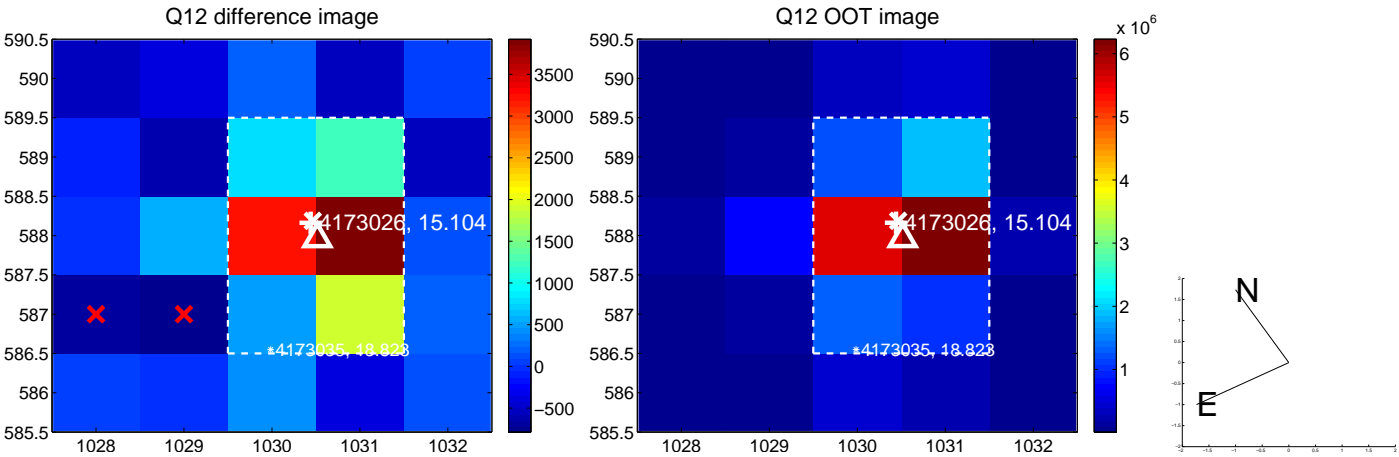
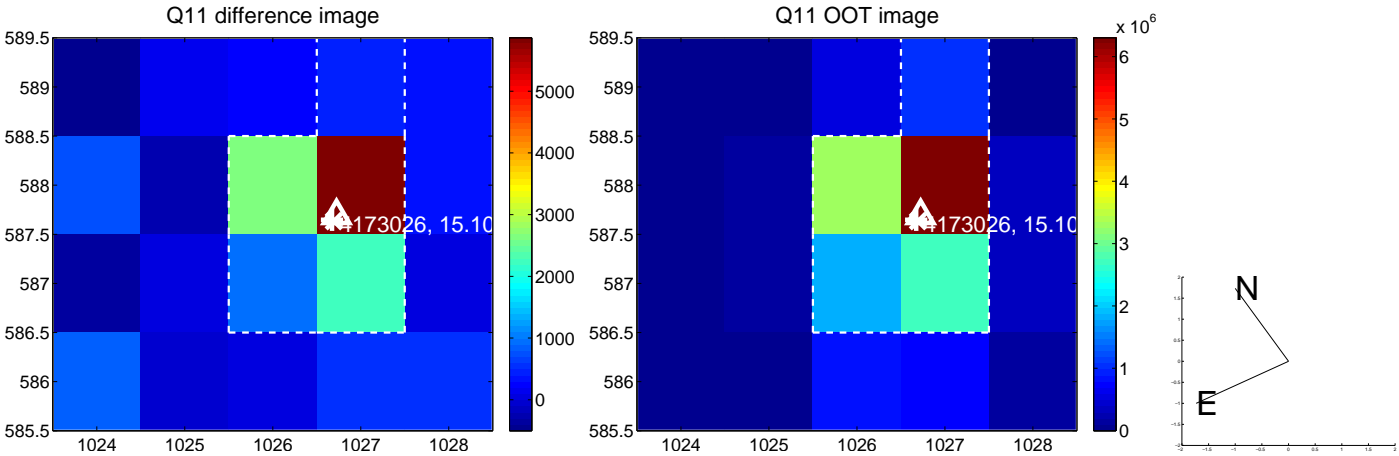
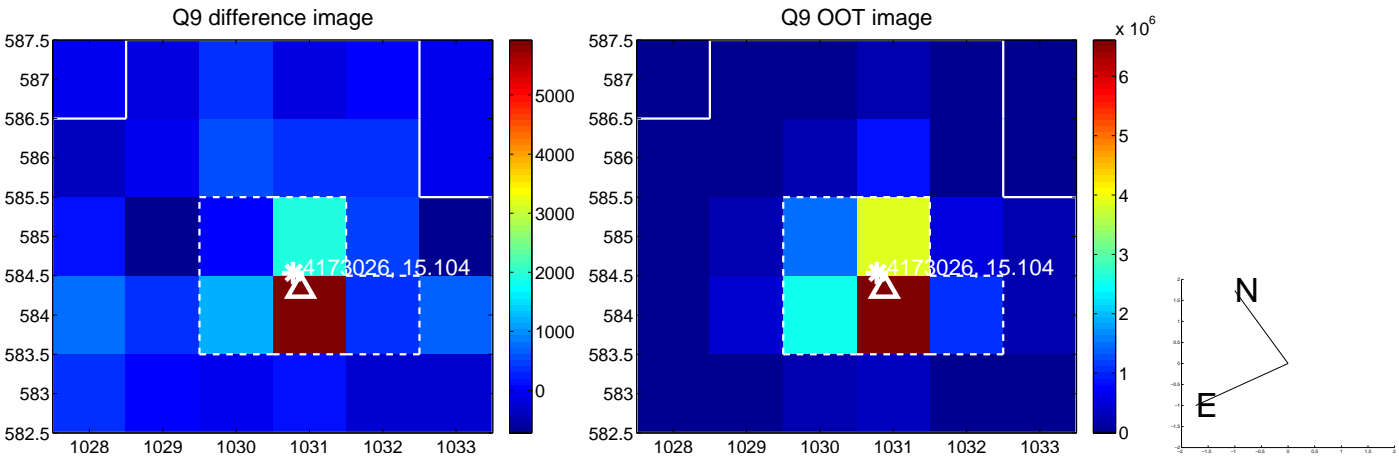
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



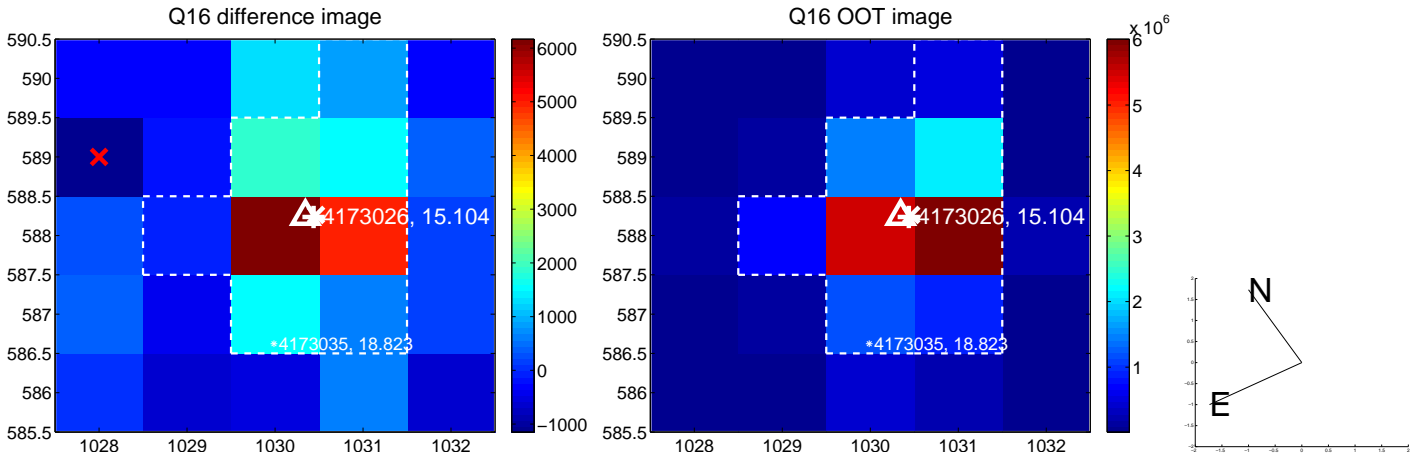
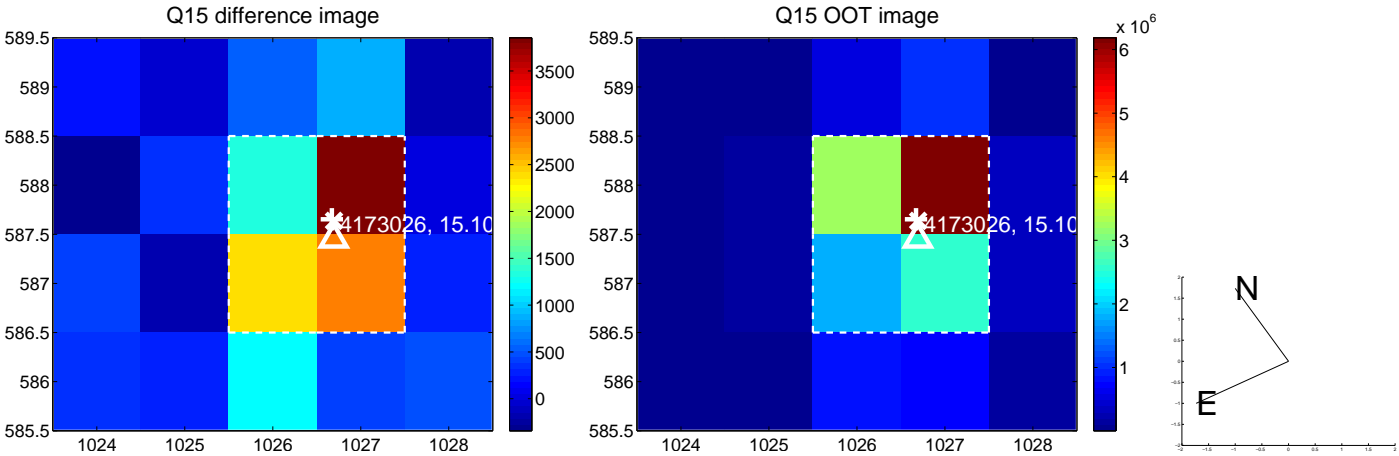
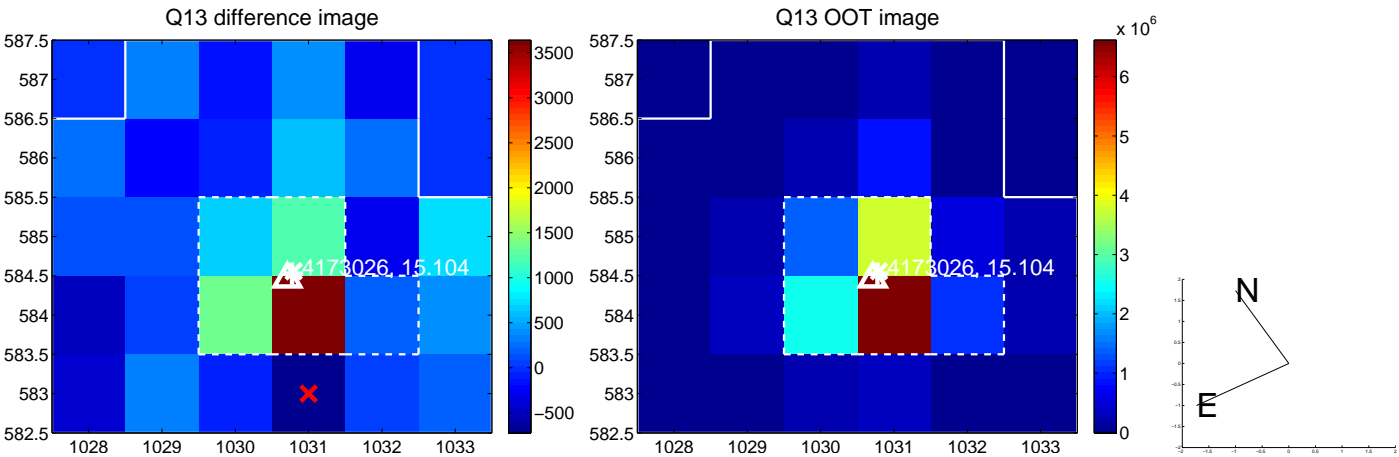
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



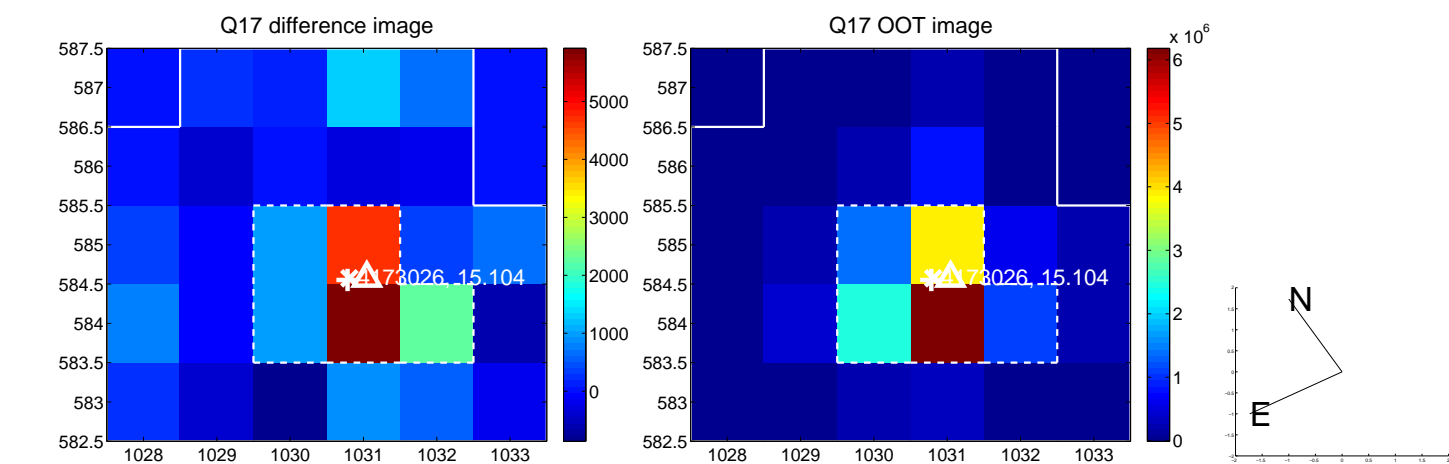
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



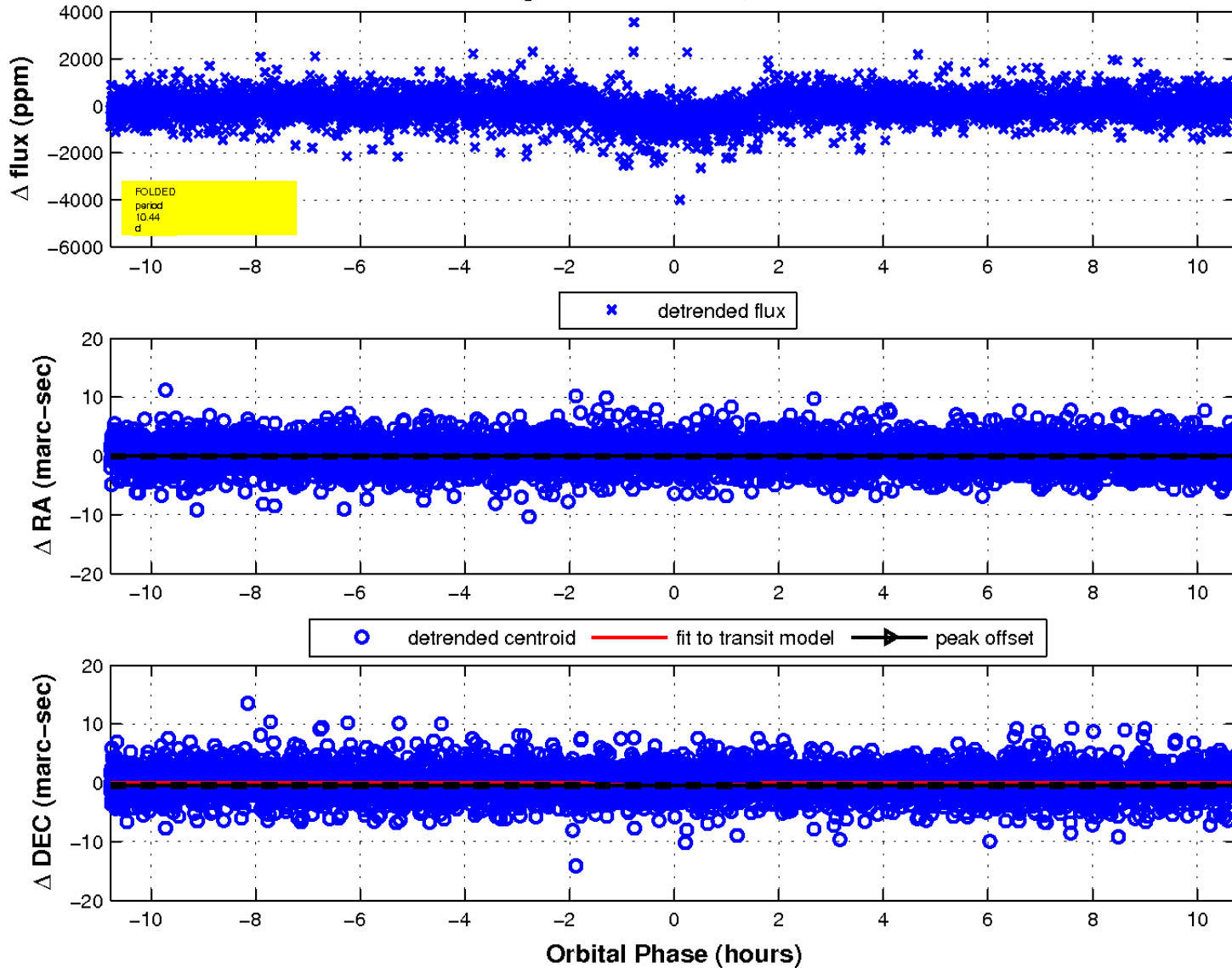
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

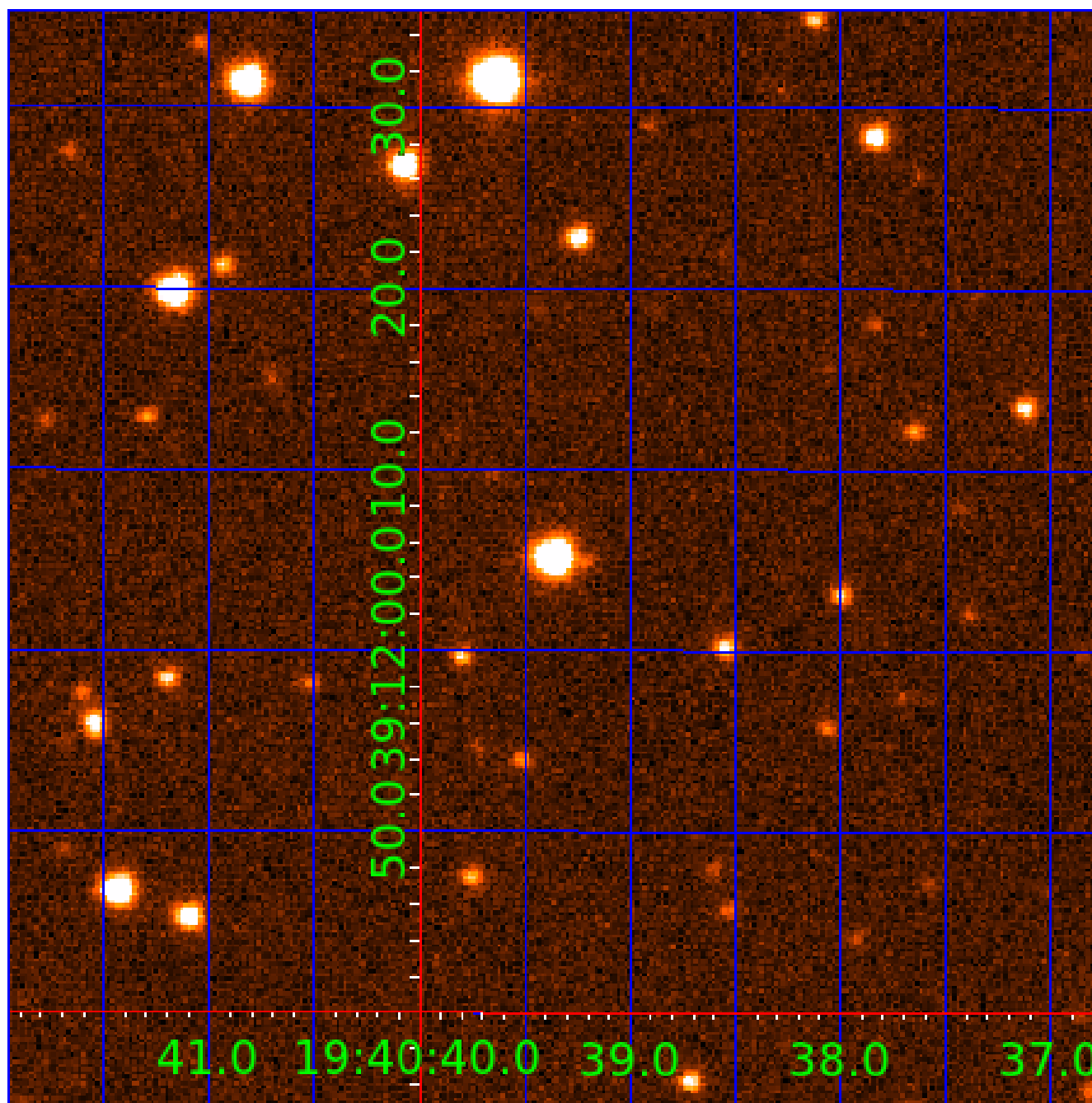


fluxWeightedCentroids, Planet 1 of 2



UKIRT Image

Declination





# KIC 004173026

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
004173026-01	OBS	2172.01	10.440892	137.969920	762.5	3.592	26.0	29.2	0.98	5738	3.19	111.70
004173026-02	OBS	2172.02	116.584962	246.628520	1259.2	7.066	15.0	16.5	0.98	5738	4.06	4.48

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
004173026-01	OBS	PC	1.00	0	0	0	0	NO_COMMENT
004173026-02	OBS	PC	0.99	0	0	0	0	NO_COMMENT

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

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

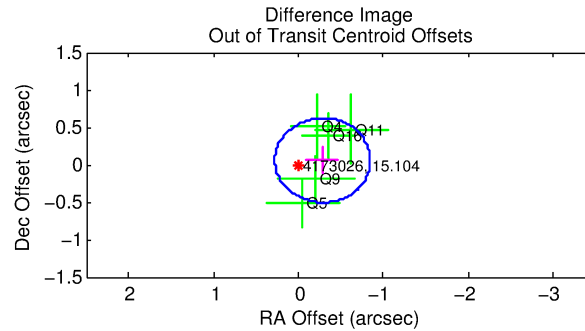
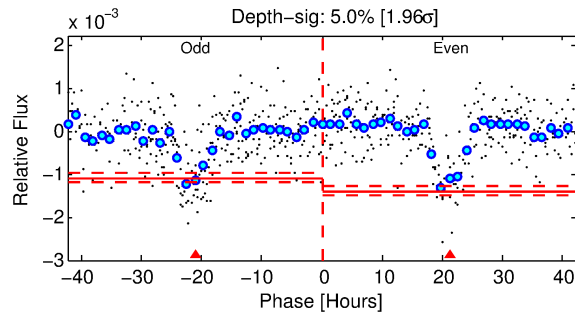
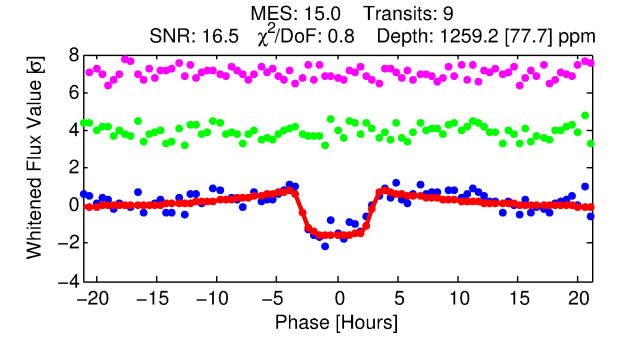
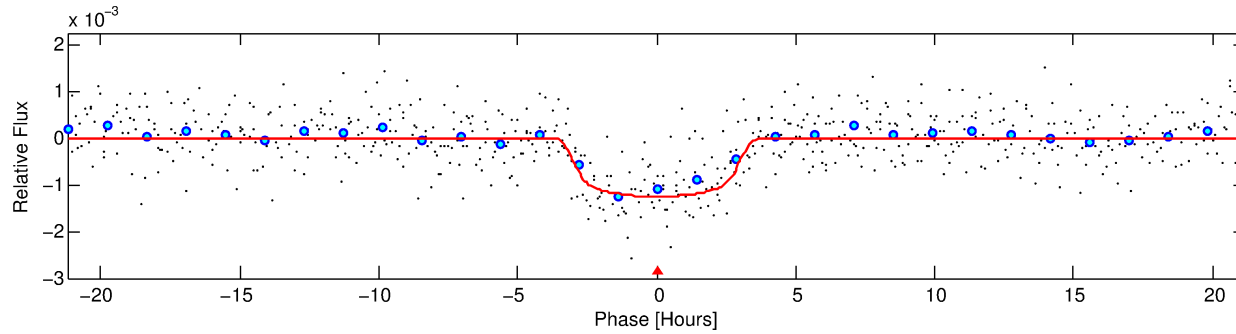
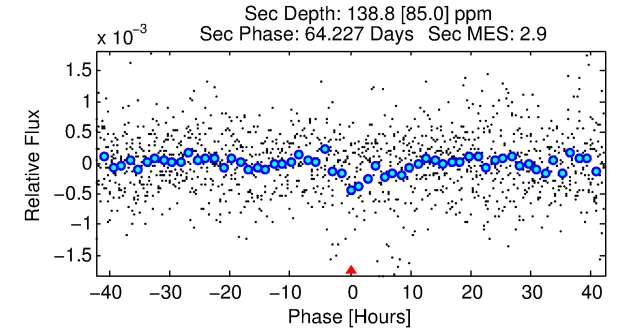
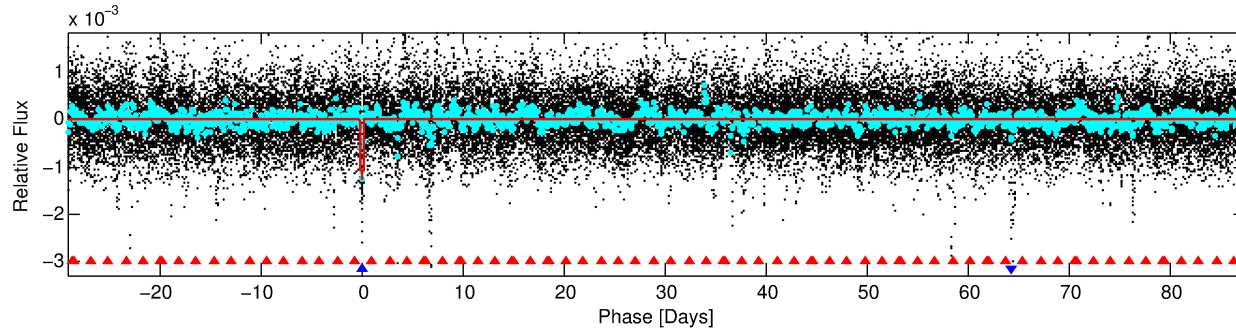
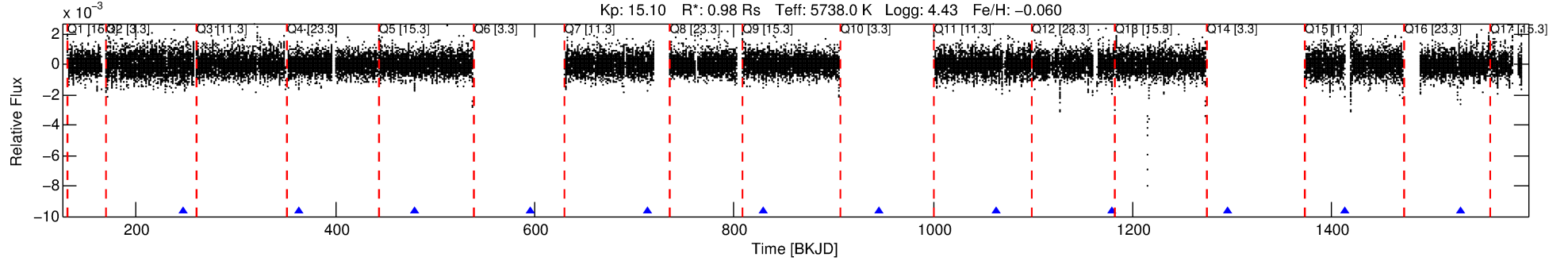
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 004173026-02

No Significant Match Found

# DV One-Page Summary

KIC: 4173026 Candidate: 2 of 2 Period: 116.585 d  
KOI: K02172.02 Corr: 0.924



## DV Fit Results:

Period = 116.58496 [0.00096] d  
Epoch = 246.6285 [0.0057] BKJD  
Rp/R\* = 0.0379 [0.0023]  
a/R\* = 69.92 [15.44]  
b = 0.88 [0.06]  
Seff = 4.48 [1.64]  
Teq = 371 [34] K  
Rp = 4.06 [1.19] Re  
a = 0.4570 [0.1094] AU  
Ag = 968.29 [691.49] [1.40σ]  
Teffp = 3199 [509] K [5.55σ]

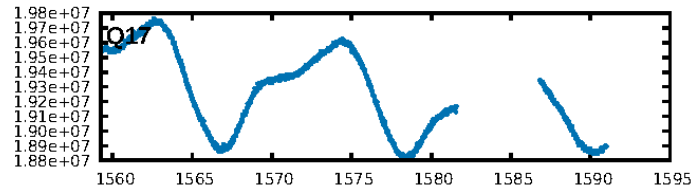
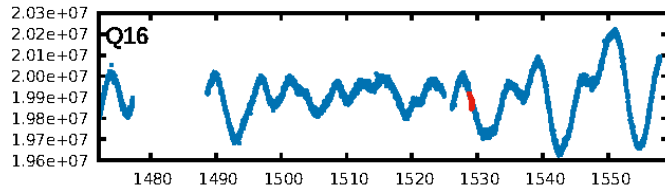
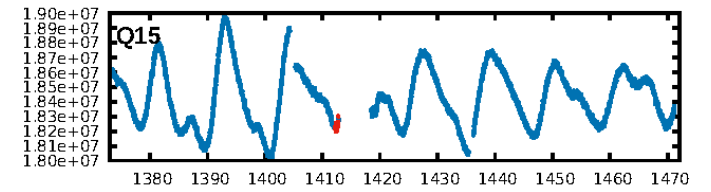
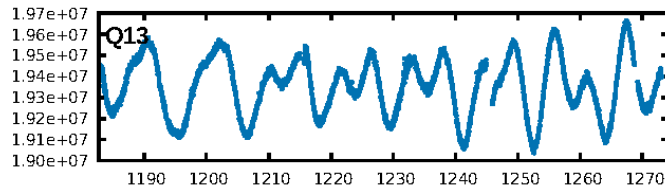
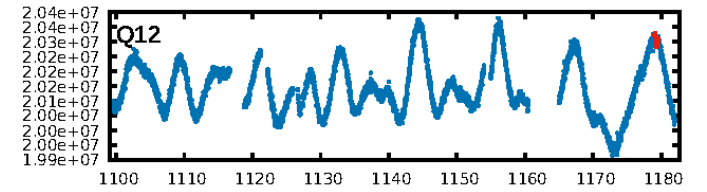
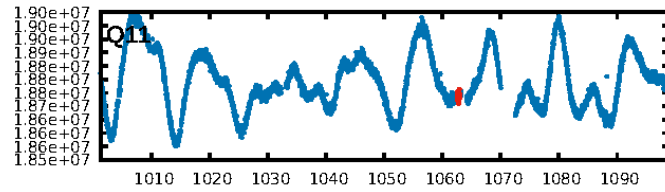
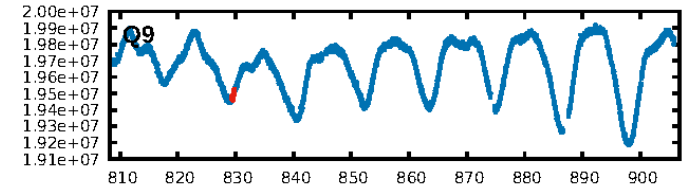
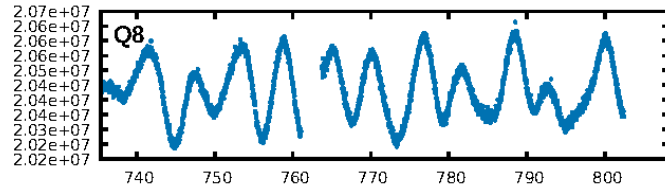
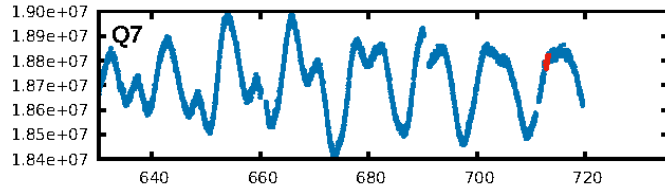
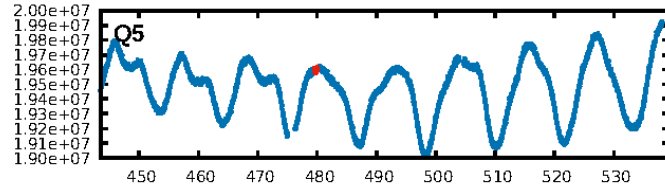
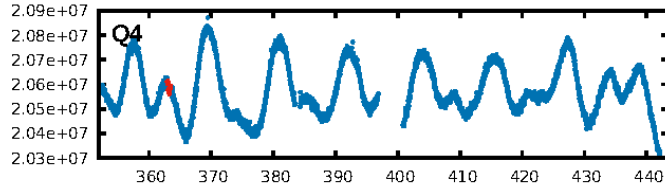
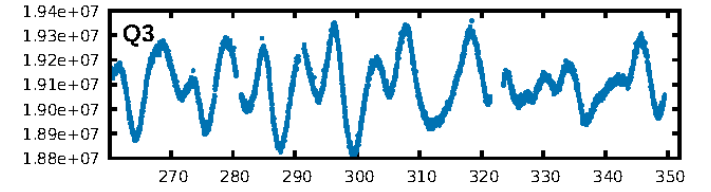
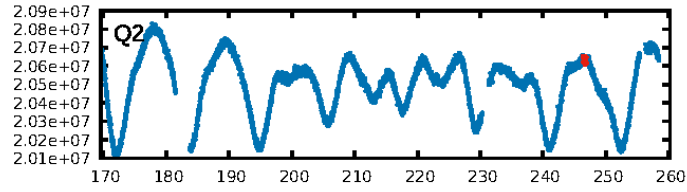
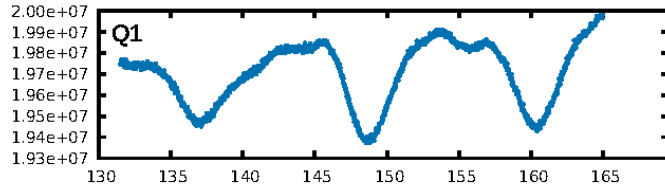
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [321.37σ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: 54.1%  
ModelChiSquareGof-sig: 100.0%  
Bootstrap-pfa: 4.06e-33  
RollingBand-fgt: 1.00 [9/9]  
GhostDiagnostic-chr: 1.368  
Centroid-sig: 9.6%  
Centroid-so: 1.130 arcsec [1.84σ]  
OotOffset-rm: 0.292 arcsec [1.56σ]  
KicOffset-rm: 0.140 arcsec [0.75σ]  
OotOffset-st: 0/1/2/2 [5]  
KicOffset-st: 0/1/2/2 [5]  
DiffImageQuality-fgm: 1.00 [5/5]  
DiffImageOverlap-fno: 1.00 [6/6]

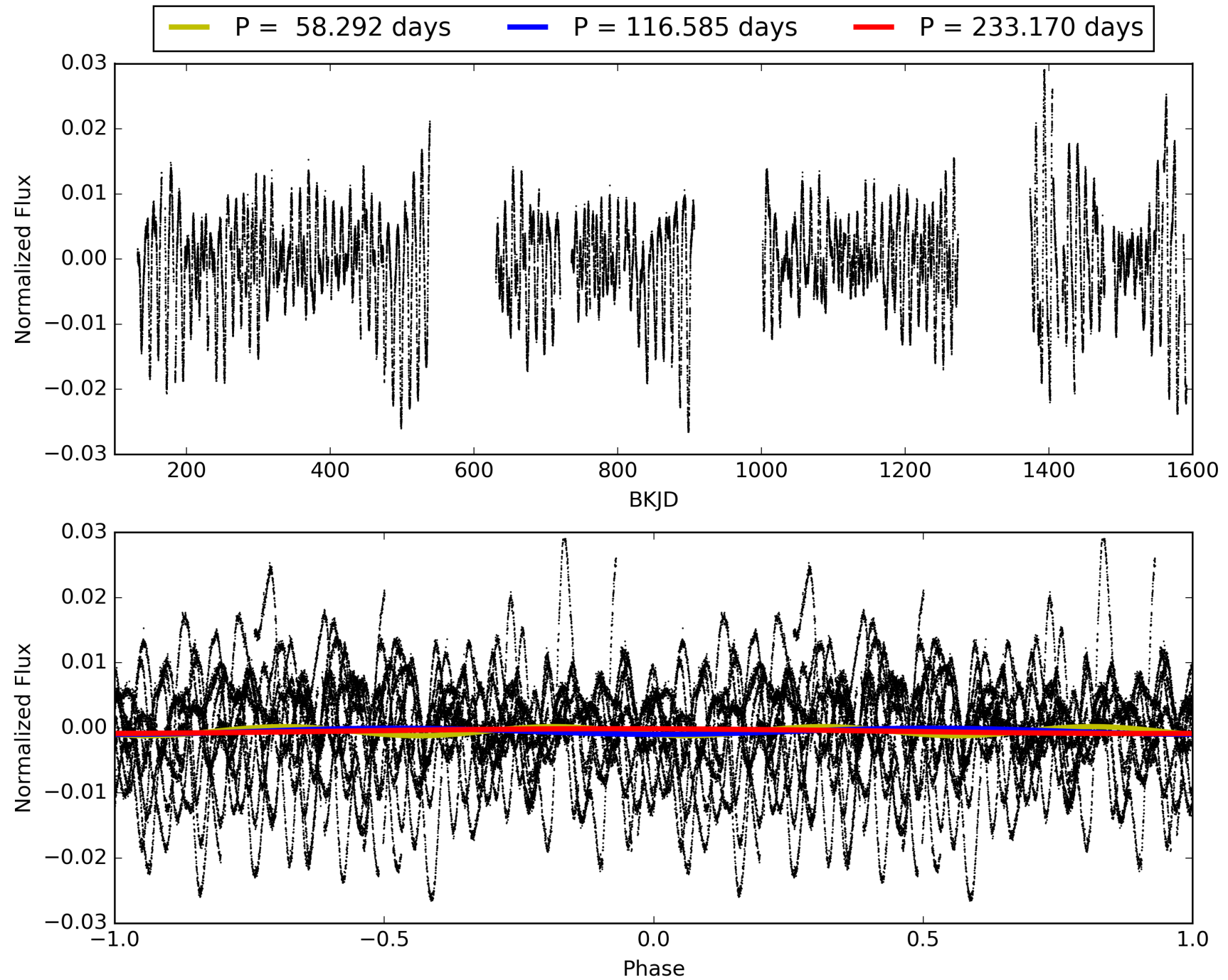
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 30-Jan-2016 00:56:01 Z

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

# TCE 004173026-02, PDC Light Curves

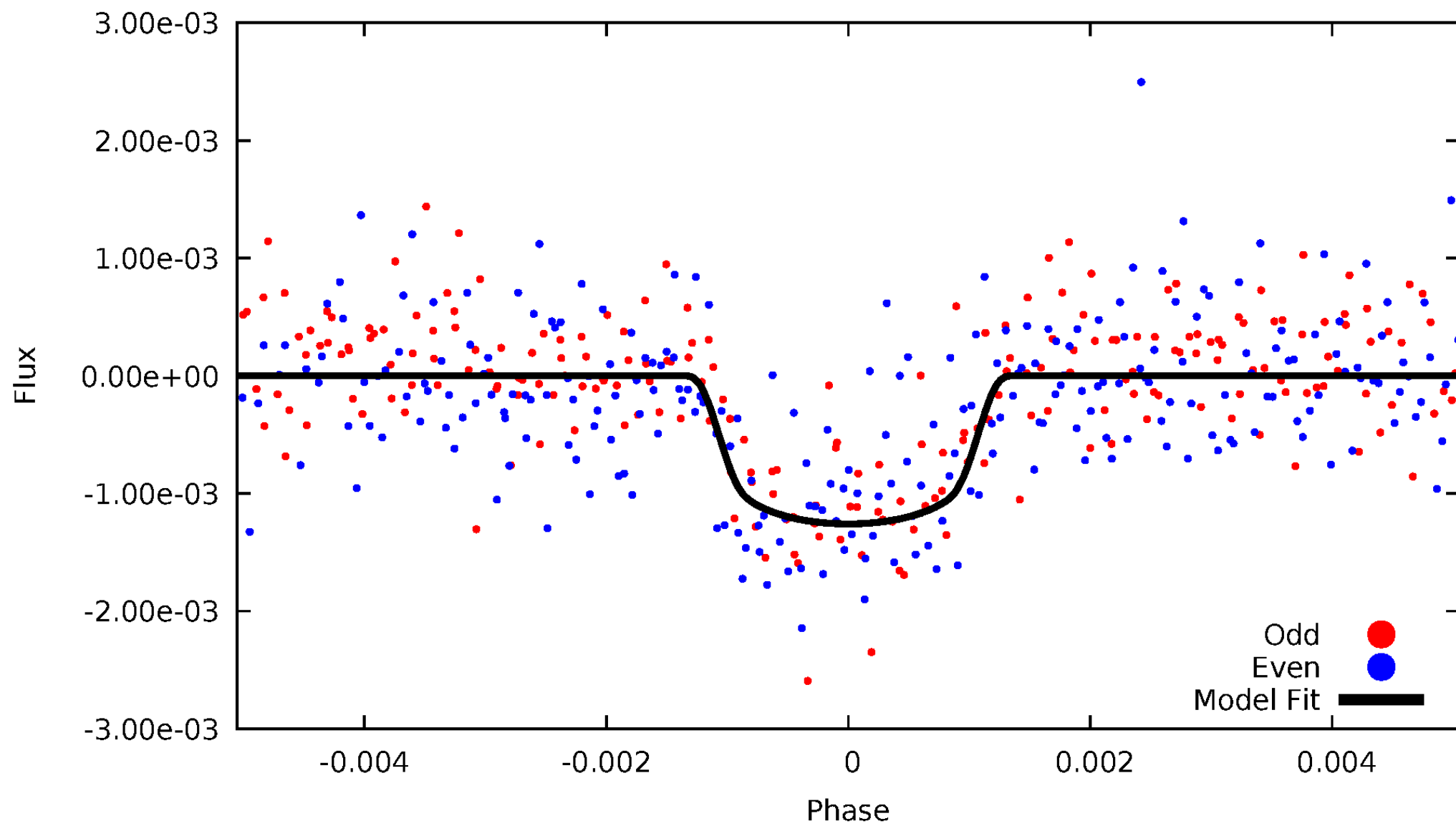


TCE 004173026-02



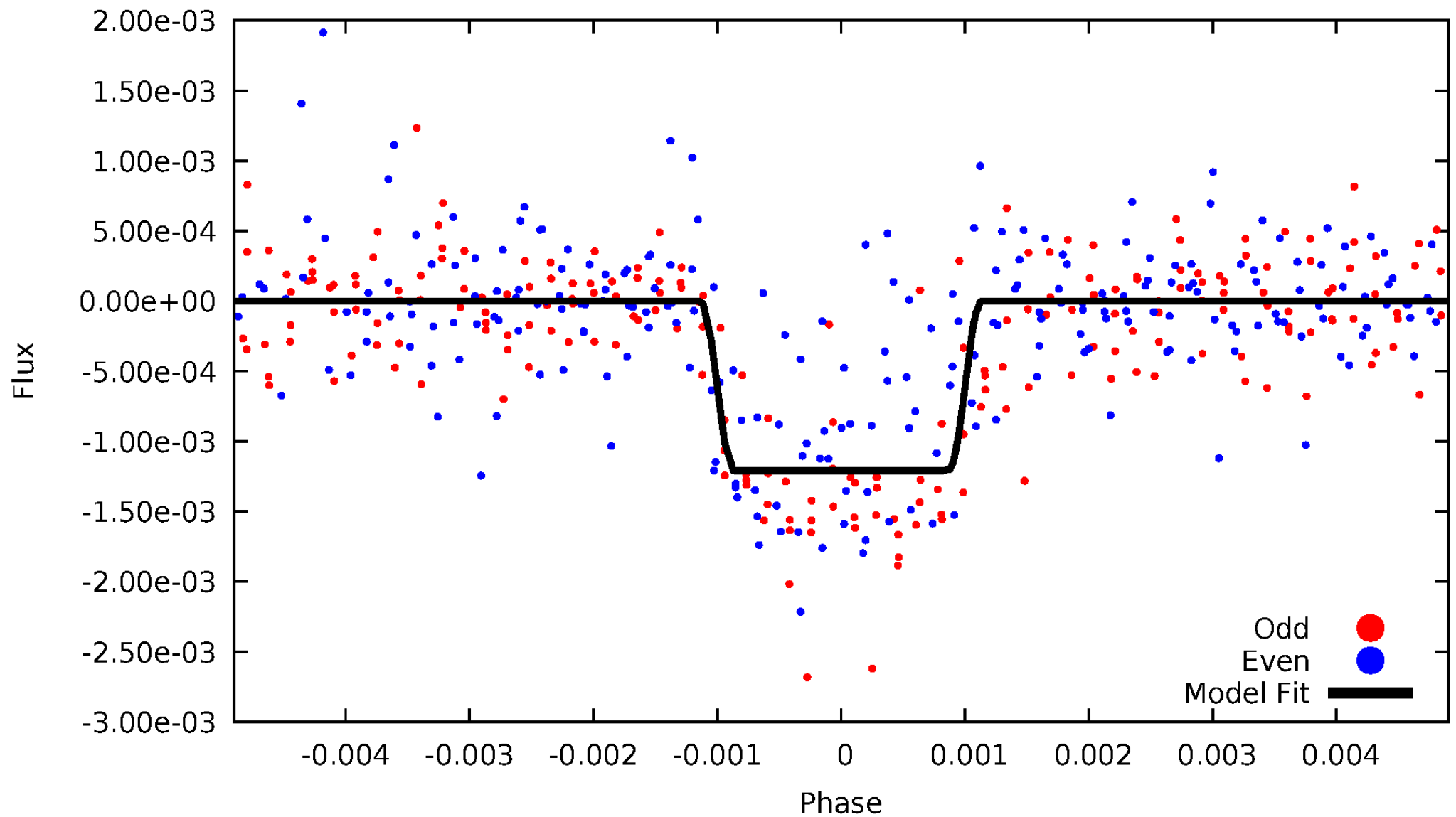
# DV Odd/Even

TCE 004173026-02



# ALT Odd/Even

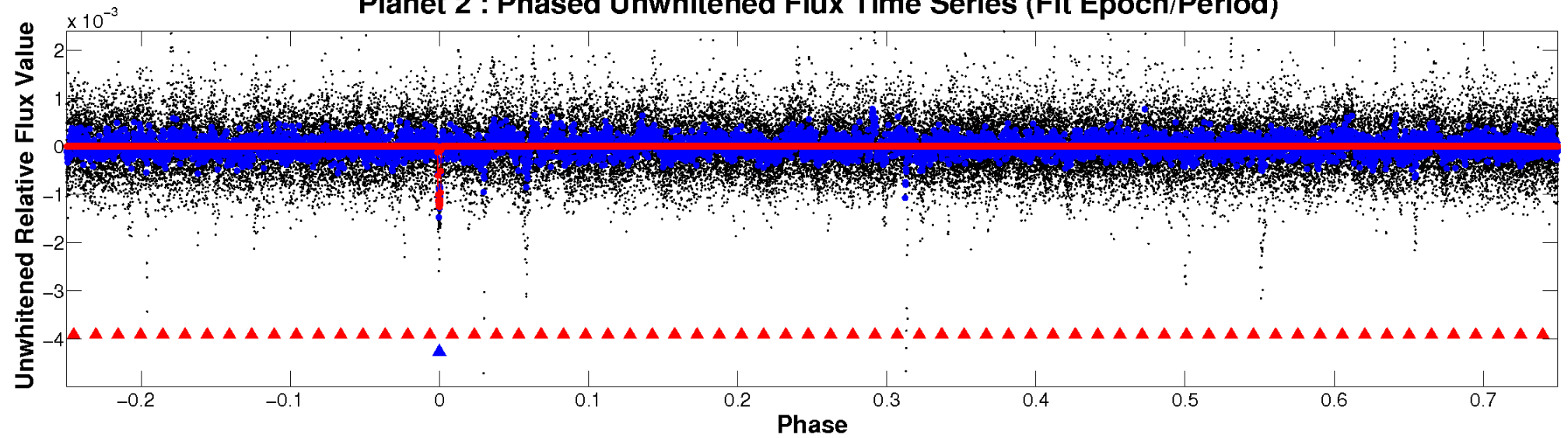
TCE 004173026-02



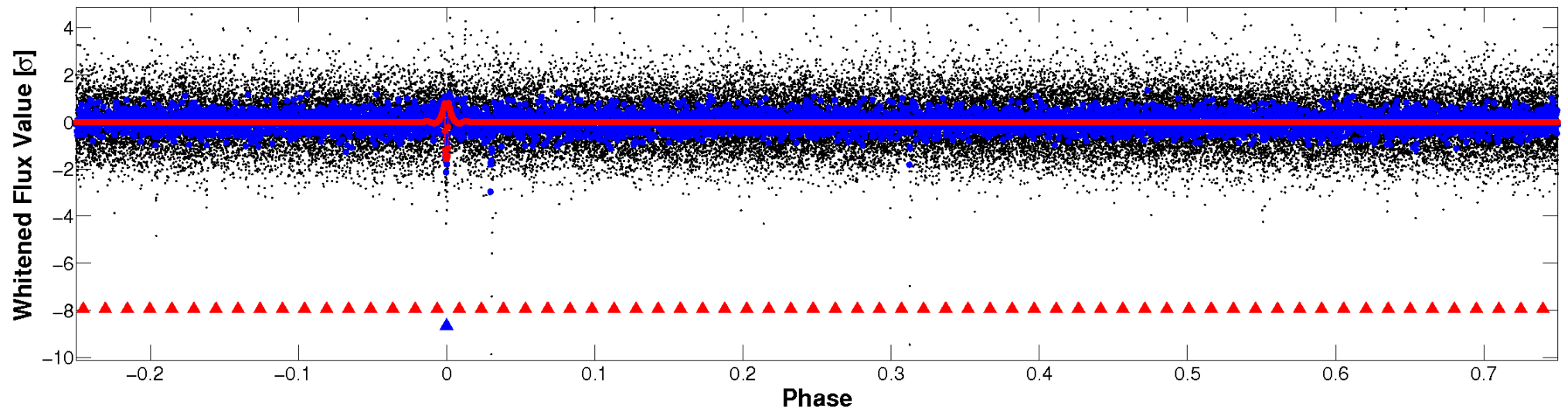


# Non-Whitened Vs. Whitened Light Curve

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

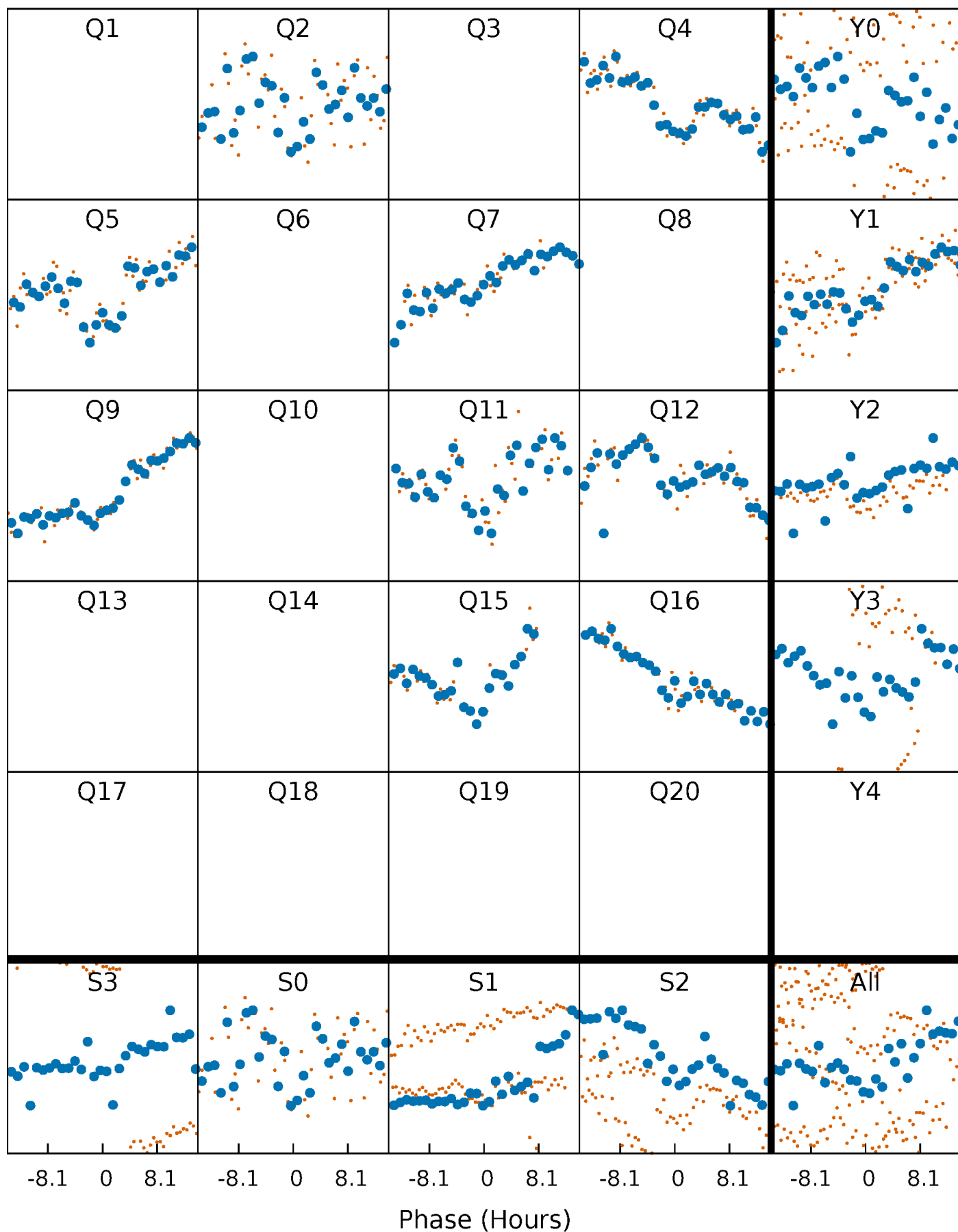


## Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



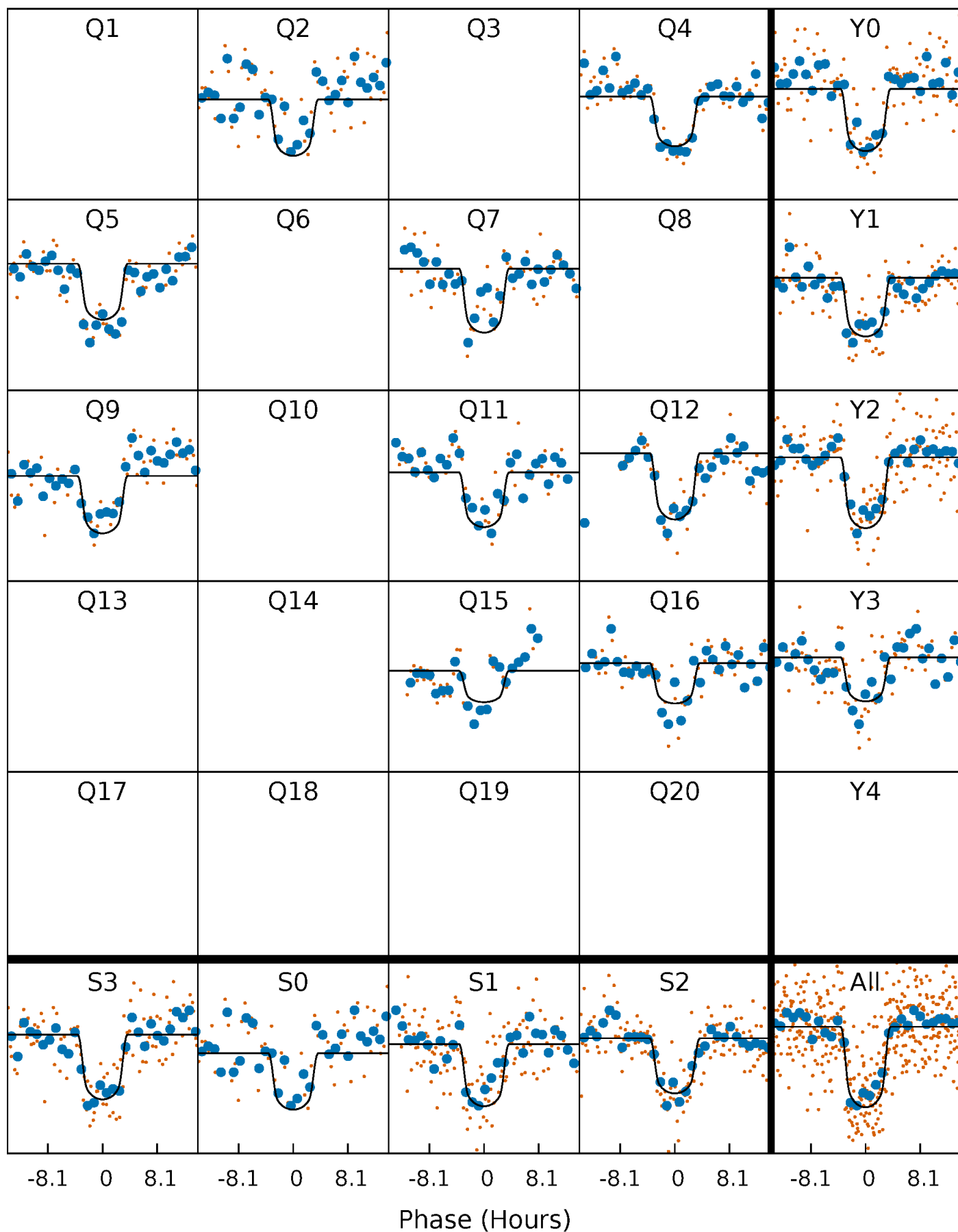
# PDC Quarter-Phased Transit Curves

TCE 004173026-02     $P=116.584962$  Days     $T_0=246.628520$  (BKJD)



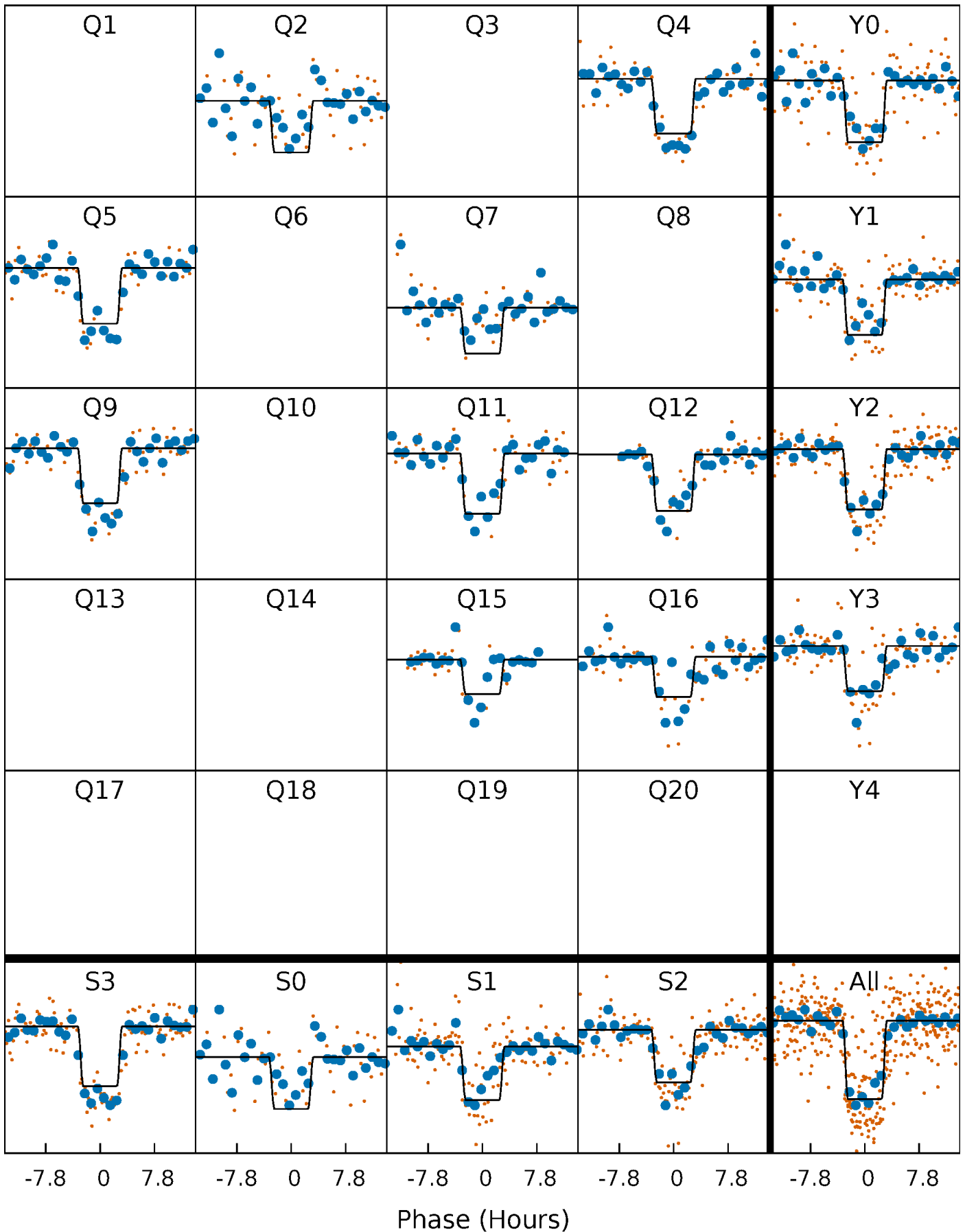
# DV Quarter-Phased Transit Curves

TCE 004173026-02 P=116.584962 Days  $T_0=246.628520$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

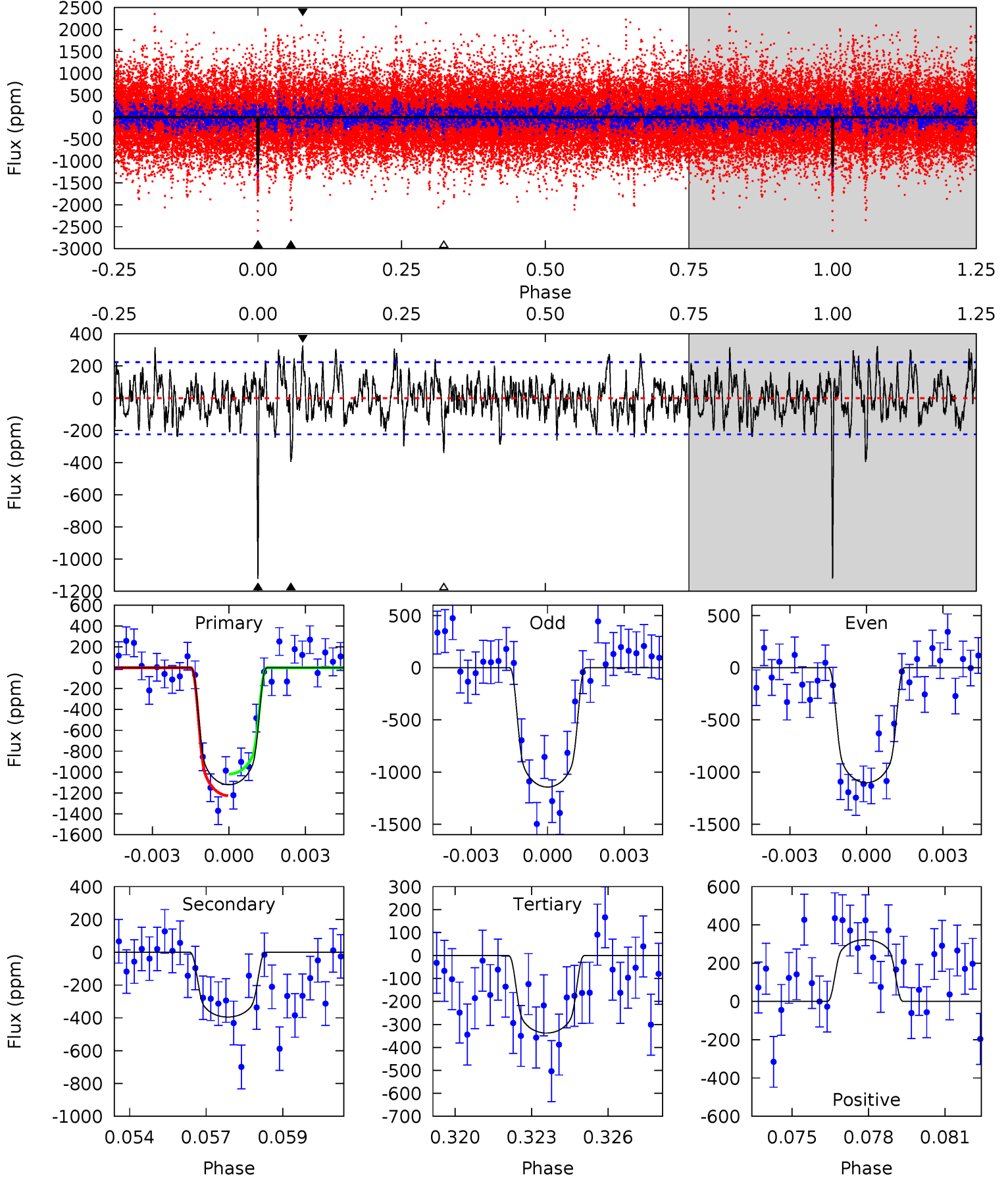
TCE 004173026-02 P=116.584256 Days  $T_0=246.628938$  (BKJD)



# DV Model-Shift Uniqueness Test

004173026-02, P = 116.584962 Days, E = 130.043558 Days

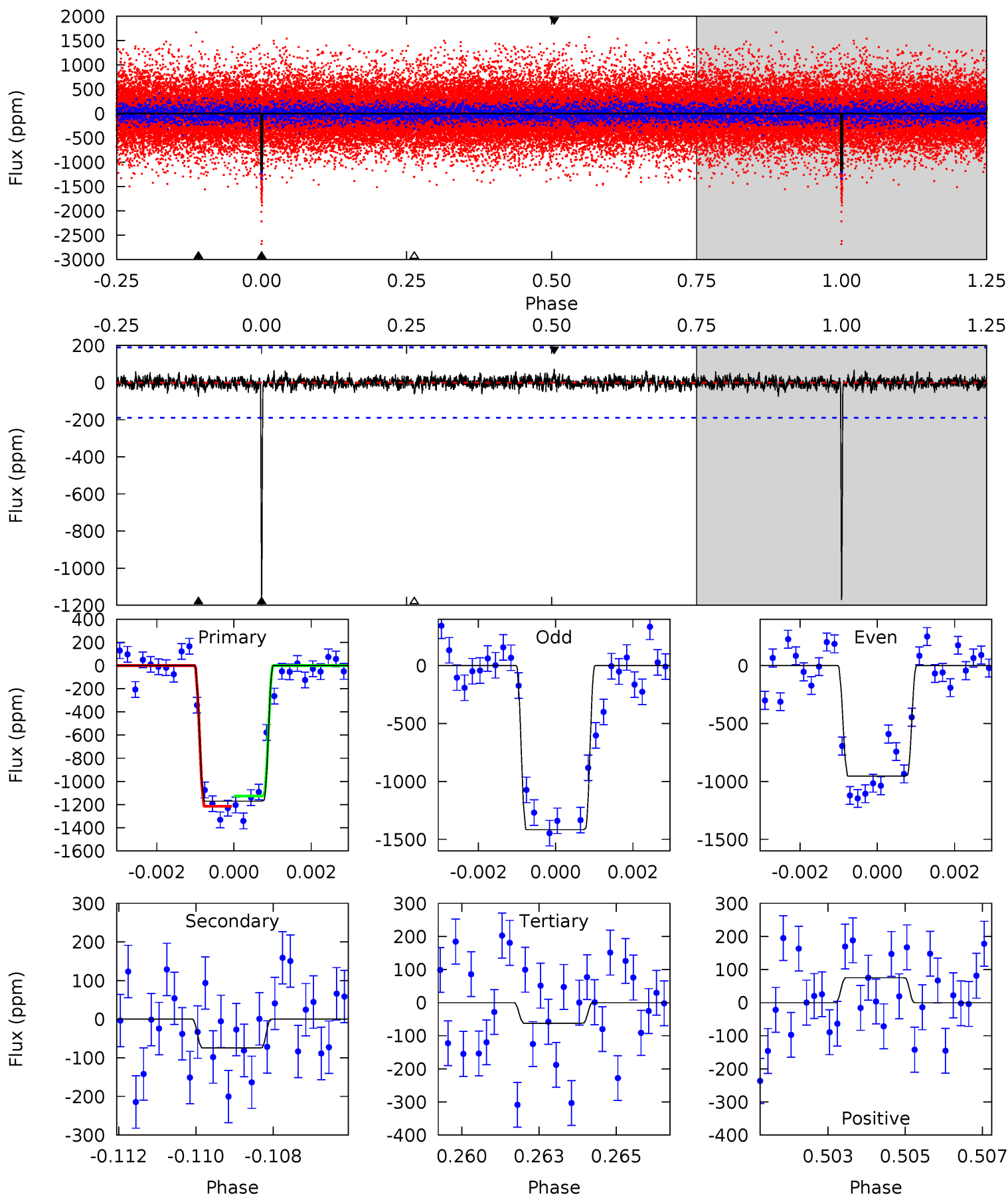
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
26.3	9.28	7.93	7.59	5.27	3.00	2.33	18.4	18.8	1.35	1.69	0.49	1.04	0.22	2.44



# Alt Model-Shift Uniqueness Test

004173026-02, P = 116.584256 Days, E = 130.044682 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
32.7	2.08	1.74	2.10	5.31	3.06	0.52	31.0	30.6	0.34	-0.02	6.43	1.01	0.06	1.25





### Stellar Parameters For KIC 004173026

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$5738^{+156}_{-173}$	$4.426^{+0.101}_{-0.188}$	$-0.060^{+0.300}_{-0.300}$	$0.981^{+0.281}_{-0.141}$	$0.936^{+0.114}_{-0.093}$	$1.397^{+0.624}_{-0.700}$
	+3%/-3%	+2%/-4%	+500%/-500%	+29%/-14%	+12%/-10%	+45%/-50%
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 004173026-02 / KOI 2172.02

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$-395 \pm 43$	$4.11^{+0.65}_{-0.42}$	$522^{+39}_{-28}$	$4360^{+183}_{-157}$	$2640^{+761}_{-664}$
Alt.	$-74 \pm 36$	$3.79^{+0.63}_{-0.44}$	$523^{+38}_{-29}$	$3370^{+247}_{-308}$	$565^{+344}_{-271}$

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

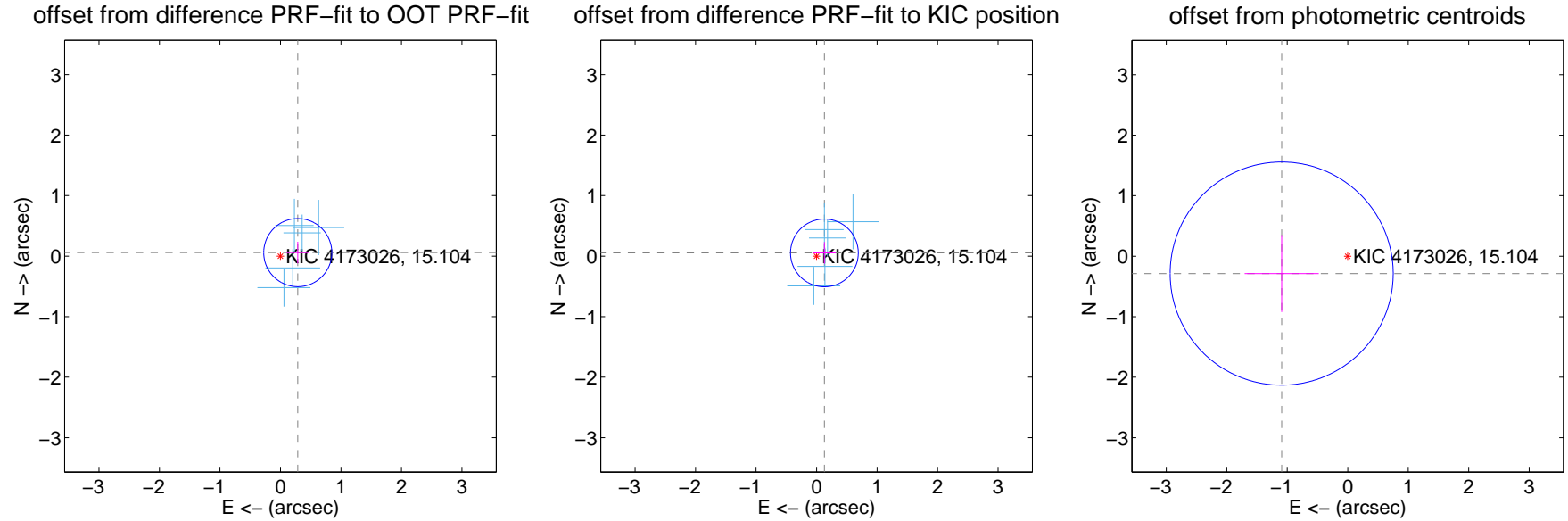
## DV Centroid Data

Supplemental centroid analysis for 004173026-02. Kepler magnitude: 15.10. Transit SNR 16.49

There are 5 quarters with good PRF difference image offsets

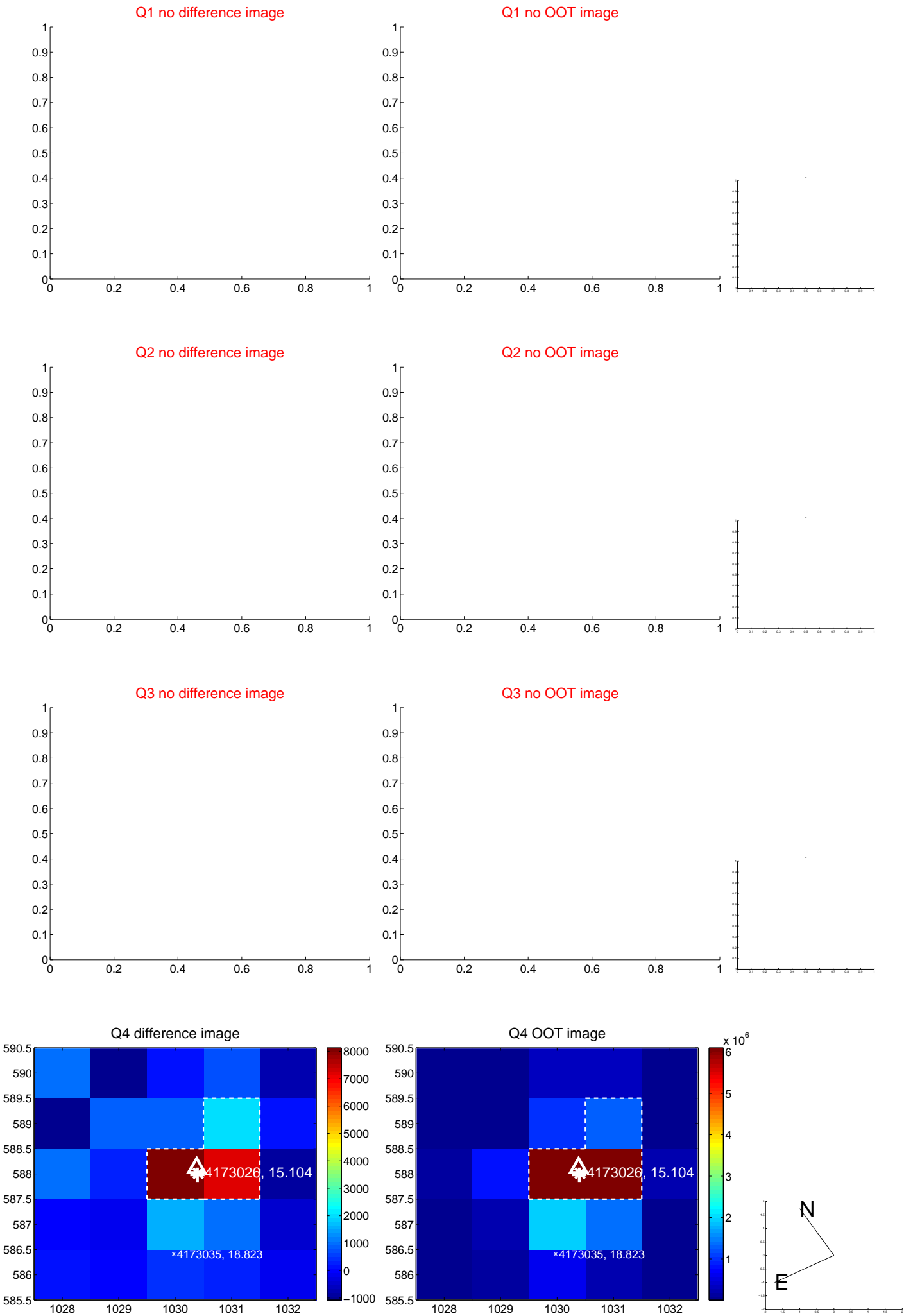
The direct PRF centroid is offset from the target star catalog position by about 0.20 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.292 \pm 0.188$	1.56	$-0.286 \pm 0.188$	$0.058 \pm 0.179$
PRF-fit source offset from KIC position	$0.140 \pm 0.187$	0.75	$-0.129 \pm 0.188$	$0.053 \pm 0.179$
photometric centroid source offset	$1.13 \pm 0.61$	1.84	$1.09 \pm 0.61$	$-0.29 \pm 0.64$

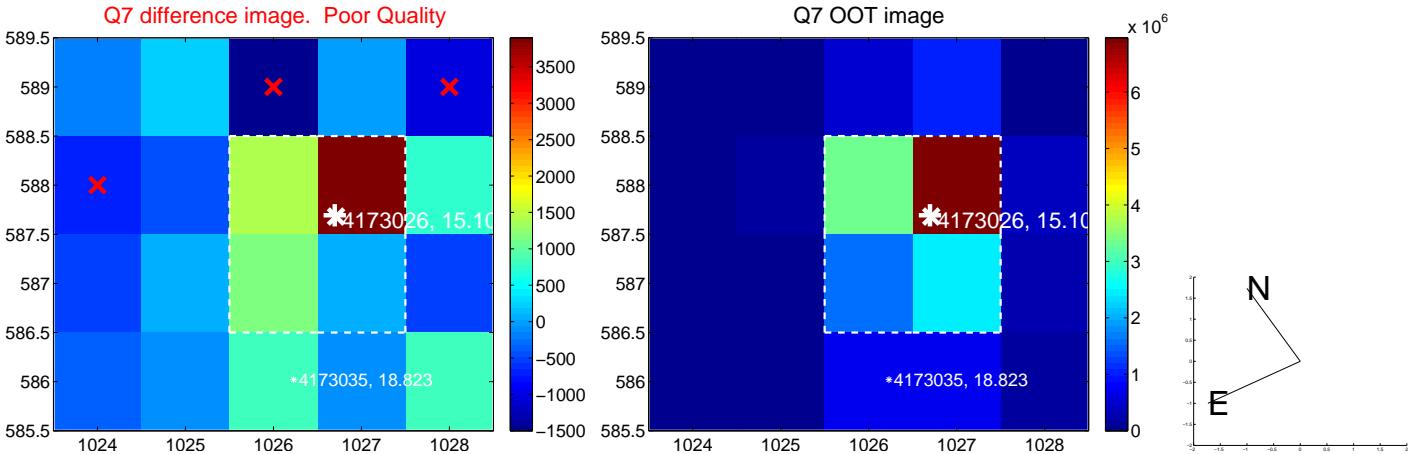
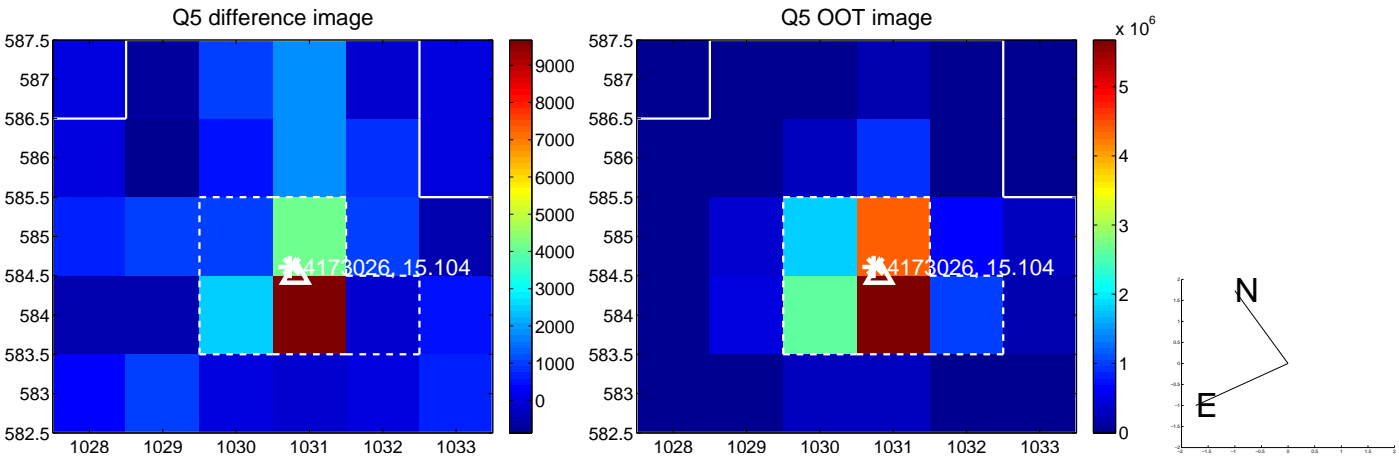


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets**; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

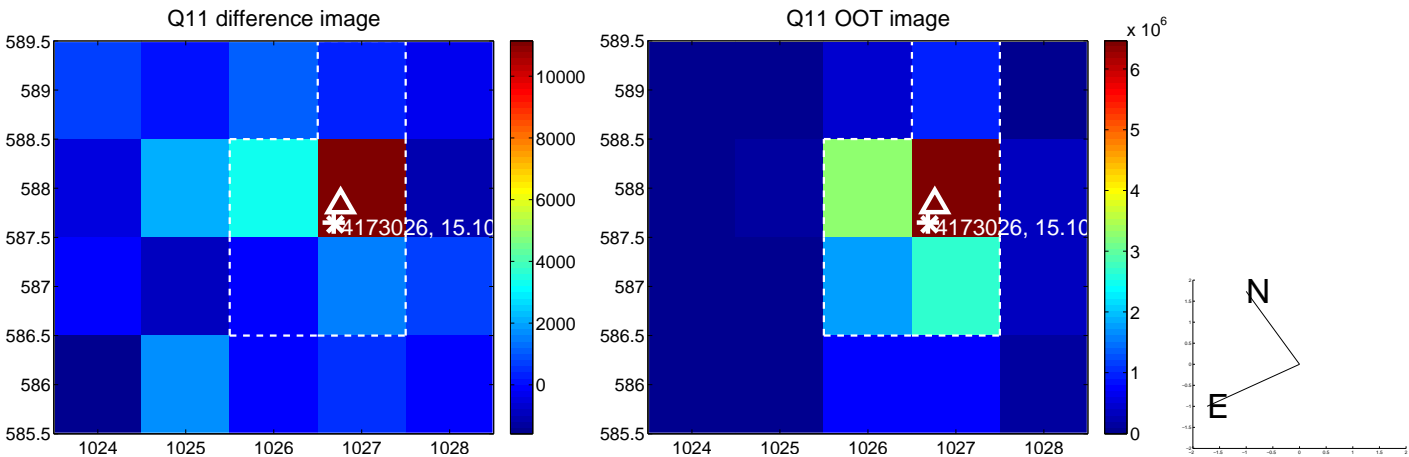
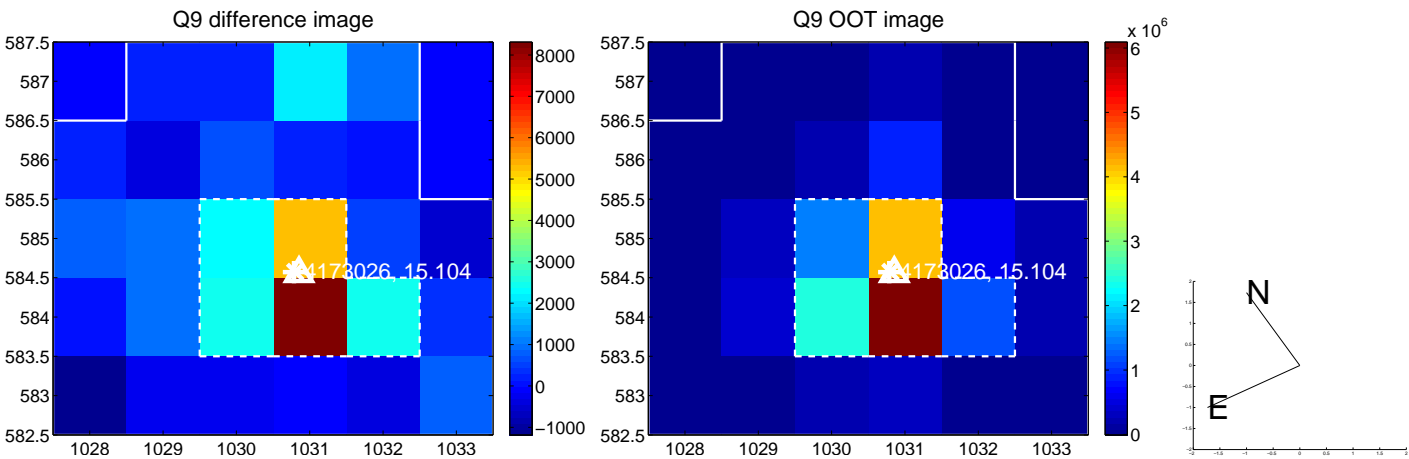
white ×: KIC target position; +: OOT centroid; △: difference centroid. red ×: large negative pixel value.



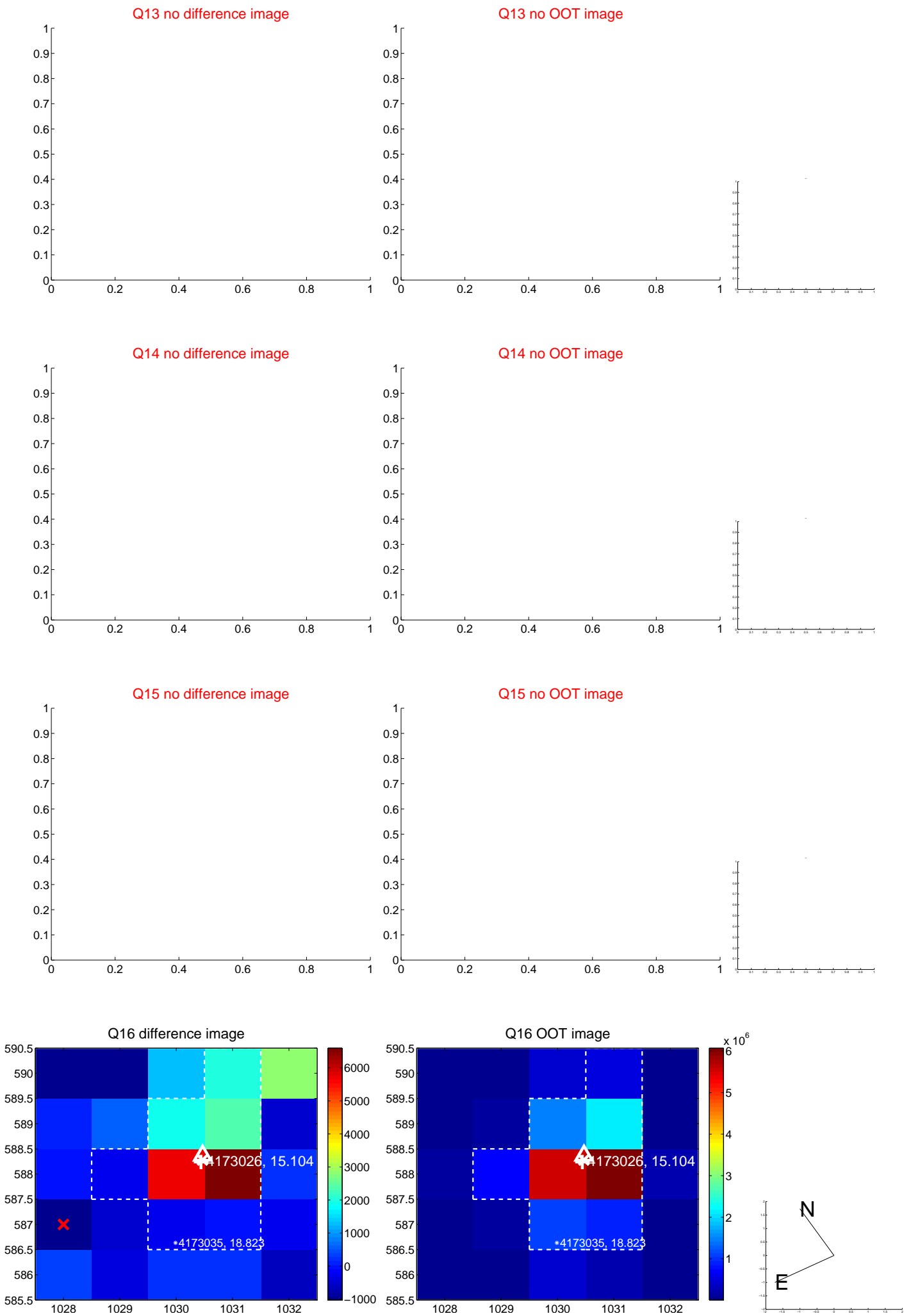
white ×: KIC target position; +: OOT centroid; △: difference centroid. red ×: large negative pixel value.



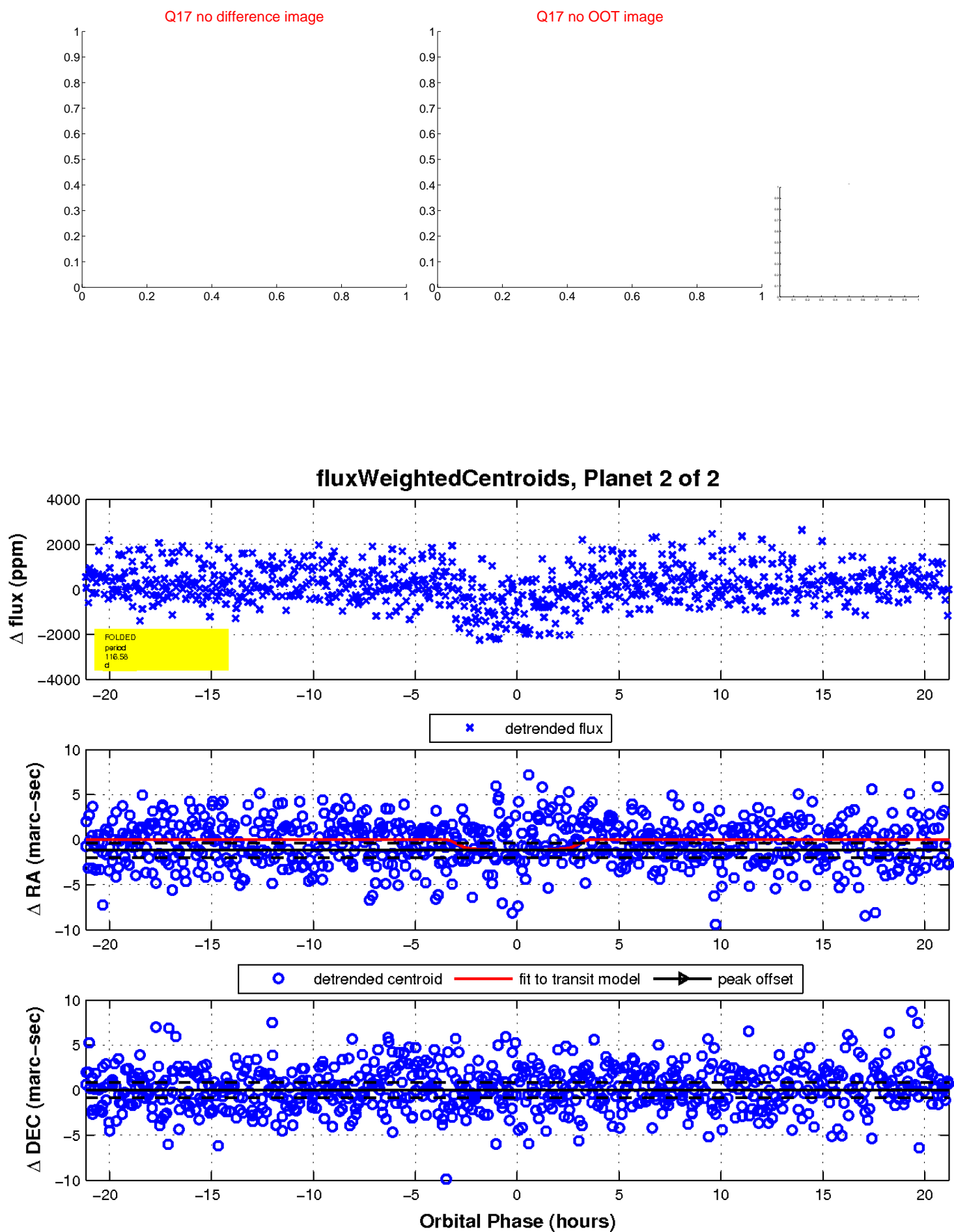
white ×: KIC target position; +: OOT centroid; △: difference centroid. red ×: large negative pixel value.



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

