

# KIC 010198109

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
010198109-01	OBS	7294.01	17.918638	146.394531	113646.4	3.000	7447.3	-1.0	1.63	5870	55.47	186.42
010198109-02	OBS	No	17.918732	140.351230	4805.8	7.065	348.6	348.7	1.63	5870	12.86	186.42

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
010198109-01	OBS	FP	0.00	0	1	0	0	MOD_SEC_ALT—HAS_SEC_TCE—CENT_NOFITS
010198109-02	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.

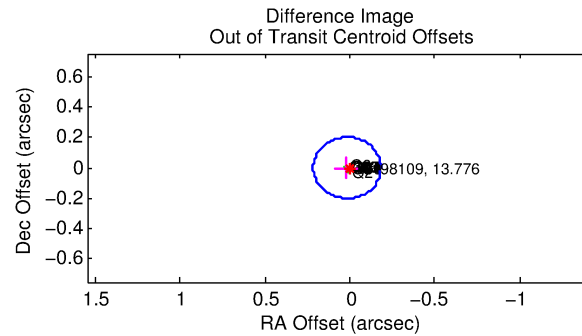
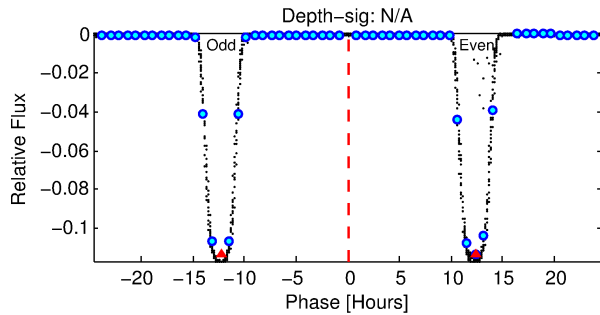
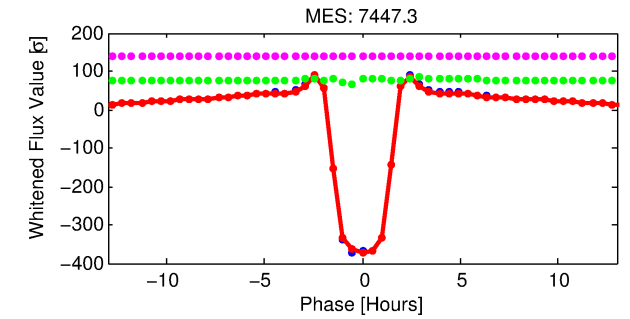
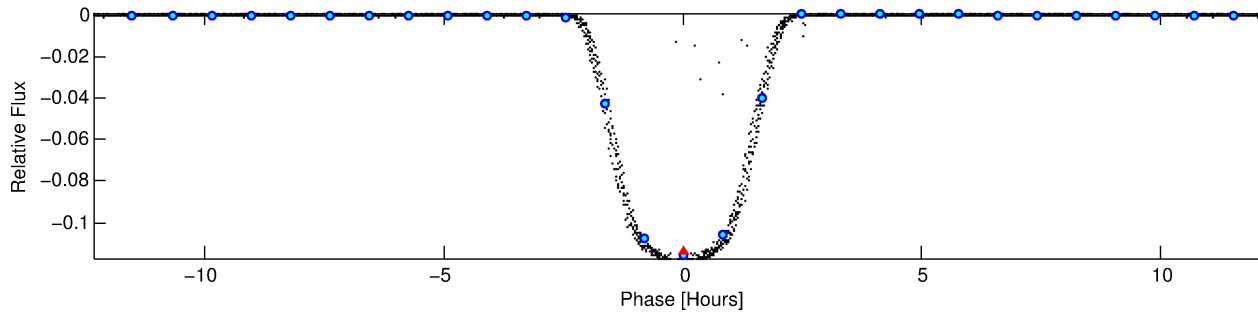
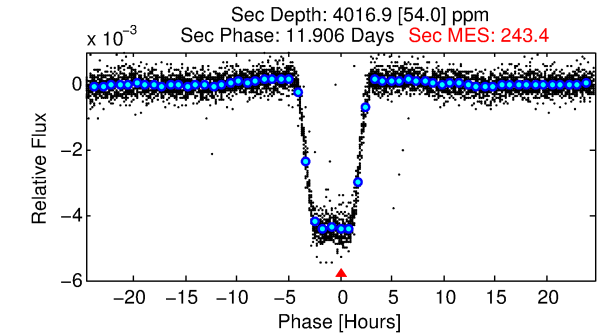
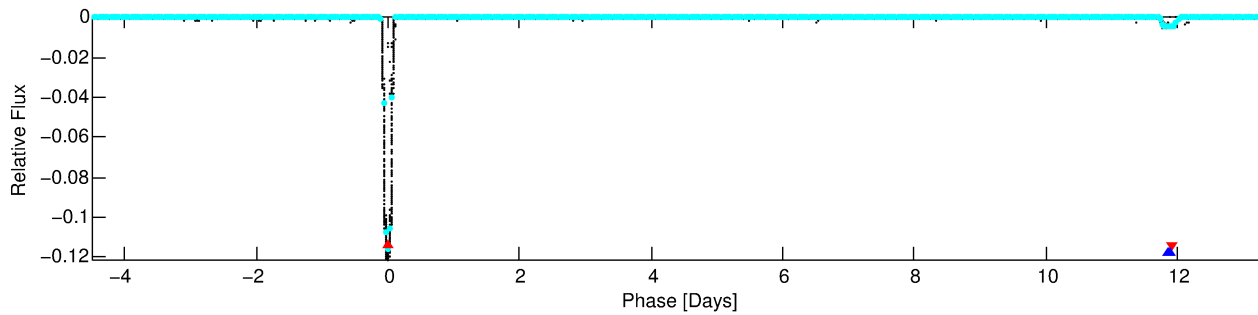
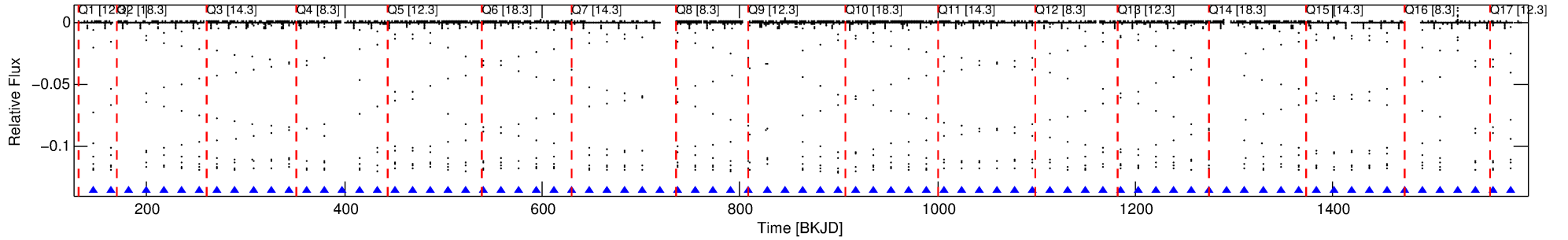
## Ephemeris Match Information For 010198109-01

No Significant Match Found

# DV One-Page Summary

KIC: 10198109 Candidate: 1 of 2 Period: 17.919 d  
KOI: K07294.01 Corr: 0.829

Kp: 13.78 R\*: 1.63 Rs Teff: 5870.0 K Logg: 3.90 Fe/H: -1.100



## TPS TCE Results:

Period = 17.91864 d  
Epoch = 146.3945 BKJD

DV fit results are unavailable

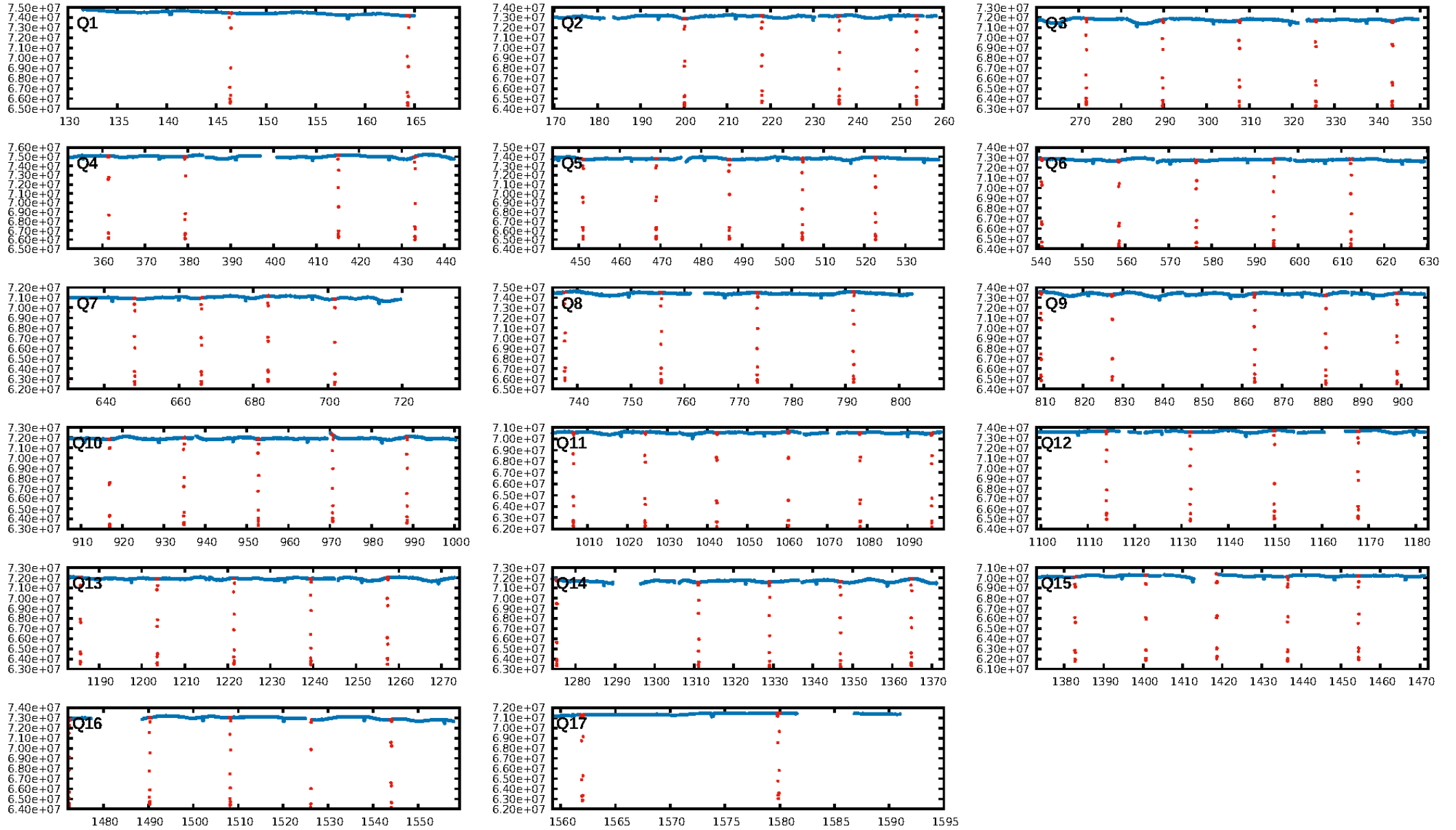
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 0.0% [0.00σ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: 0.00e+00  
RollingBand-fgt: 1.00 [71/71]  
GhostDiagnostic-chr: 1.99  
Centroid-sig: 0.0%  
Centroid-so: 0.058 arcsec [56.67σ]  
OotOffset-rm: 0.018 arcsec [0.27σ]  
KicOffset-rm: 0.069 arcsec [1.02σ]  
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]

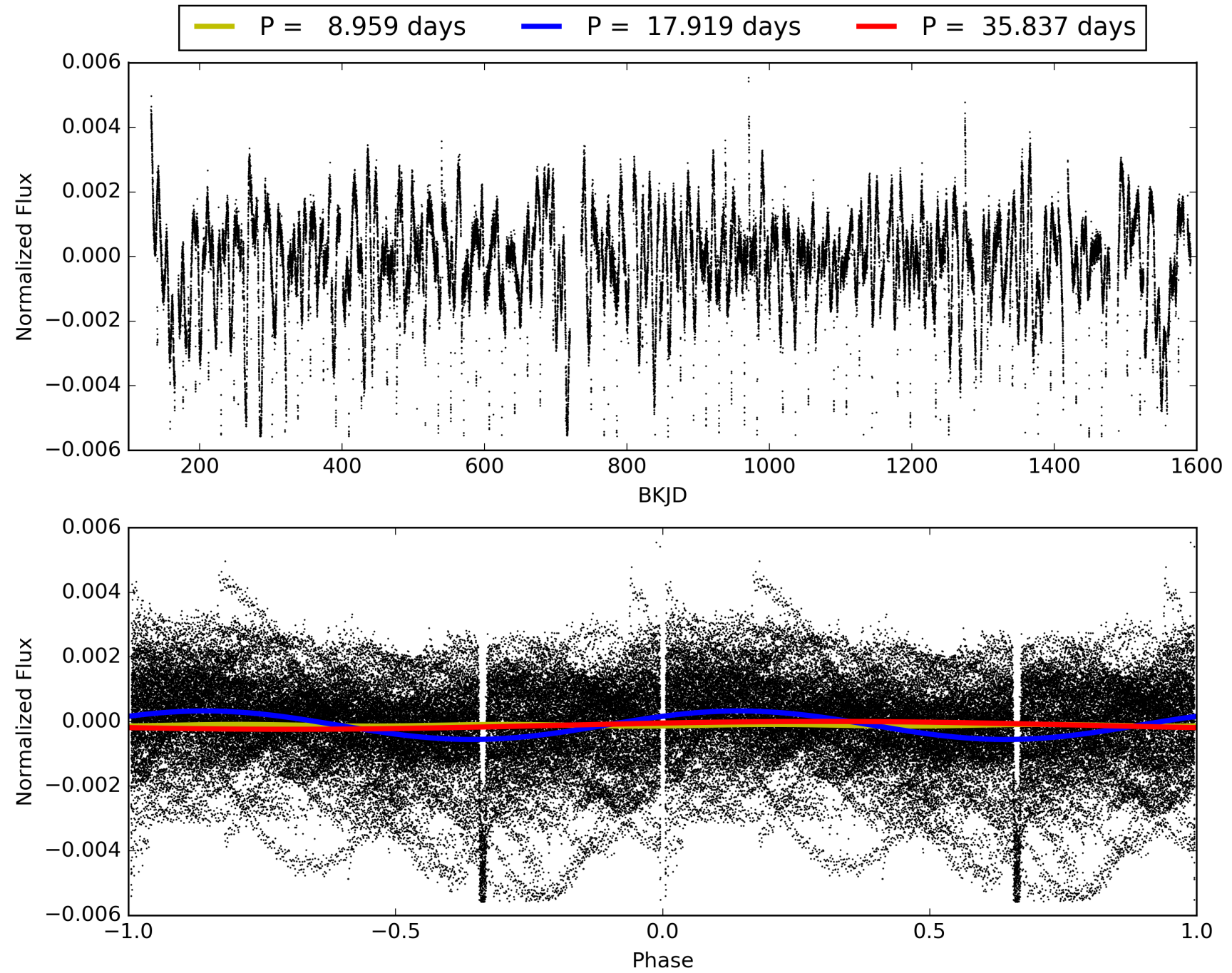
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 29-Jan-2016 09:02:00 Z

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

# TCE 010198109-01, PDC Light Curves

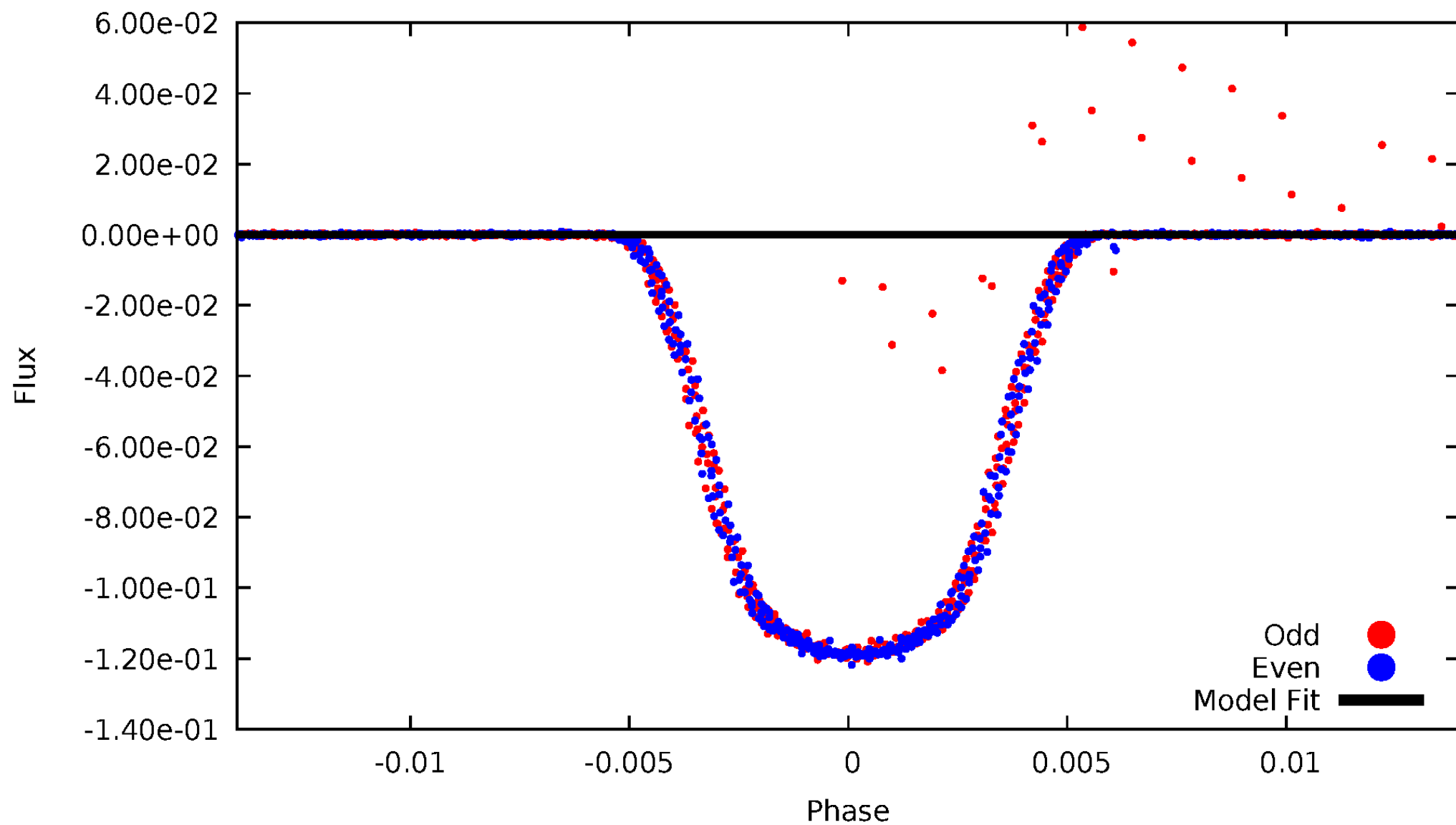


TCE 010198109-01



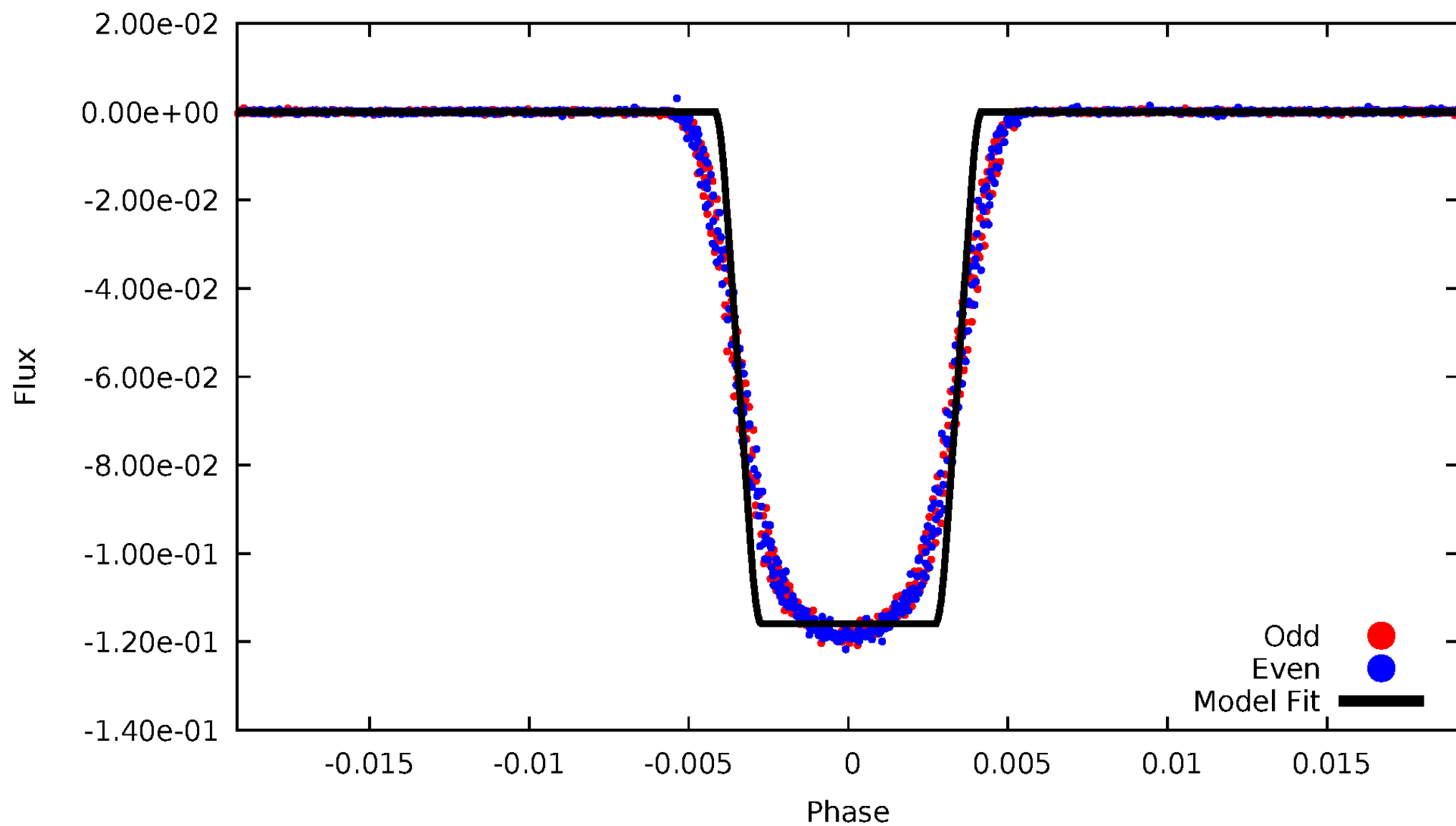
# DV Odd/Even

TCE 010198109-01



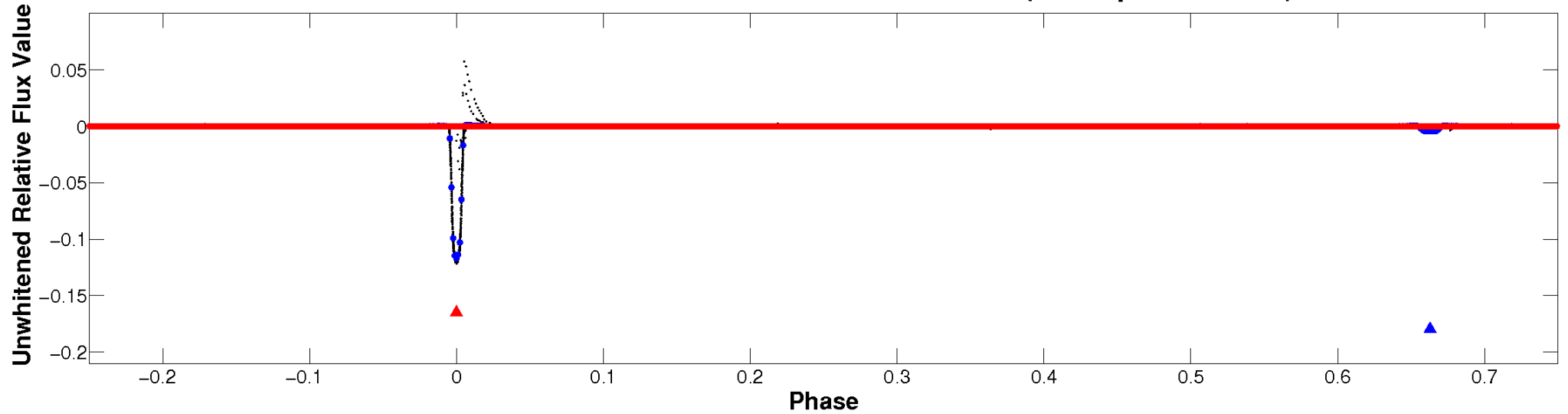
# ALT Odd/Even

TCE 010198109-01

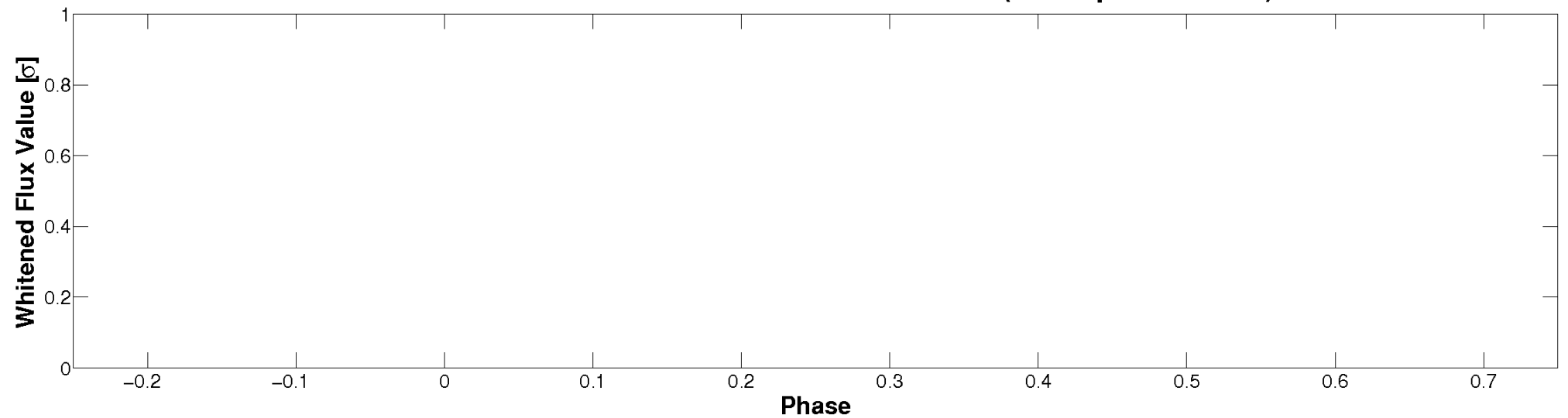


# Non-Whitened Vs. Whitened Light Curve

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

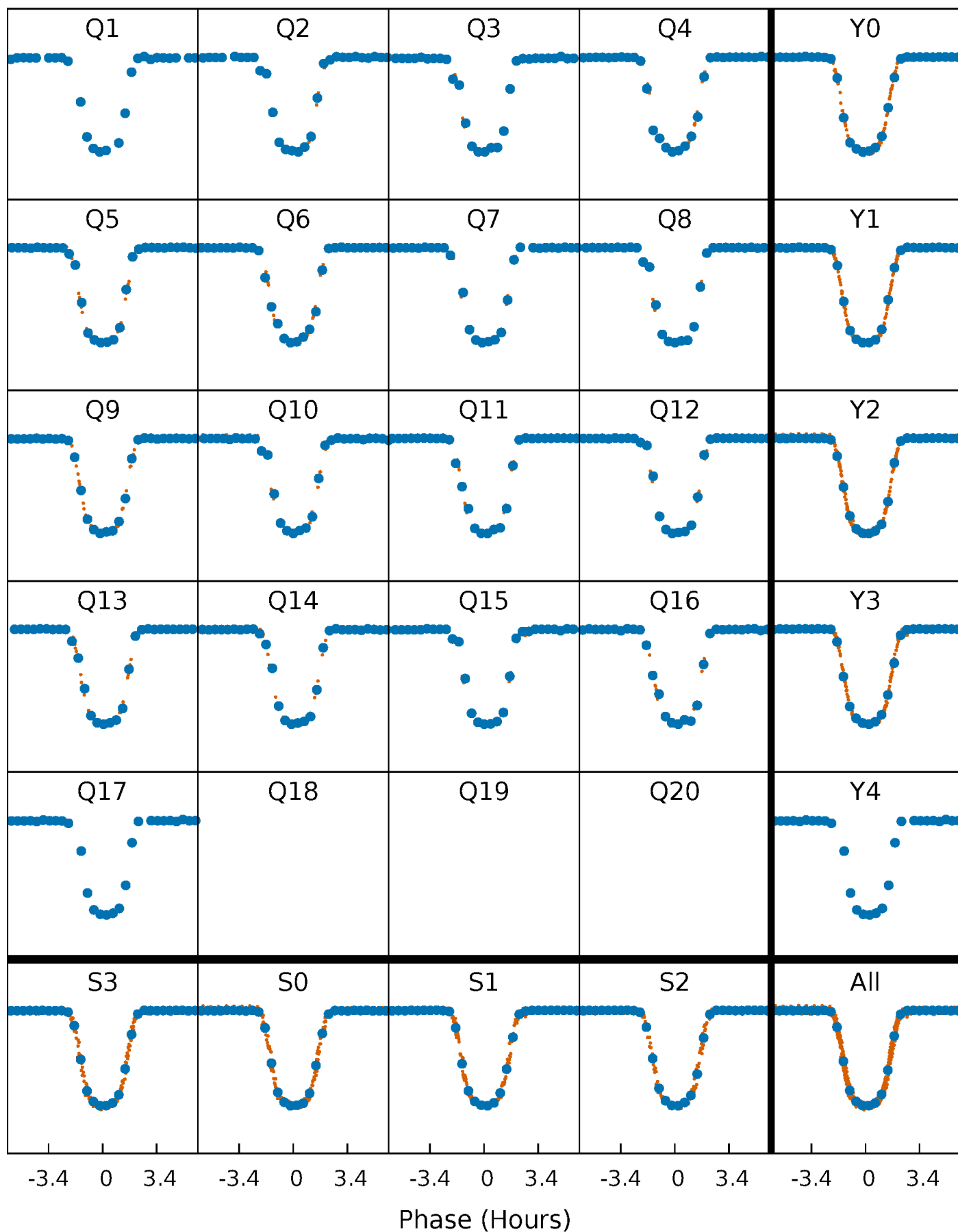


Planet 1 : Phased Whitened Flux Time Series (TPS Epoch/Period)



# PDC Quarter-Phased Transit Curves

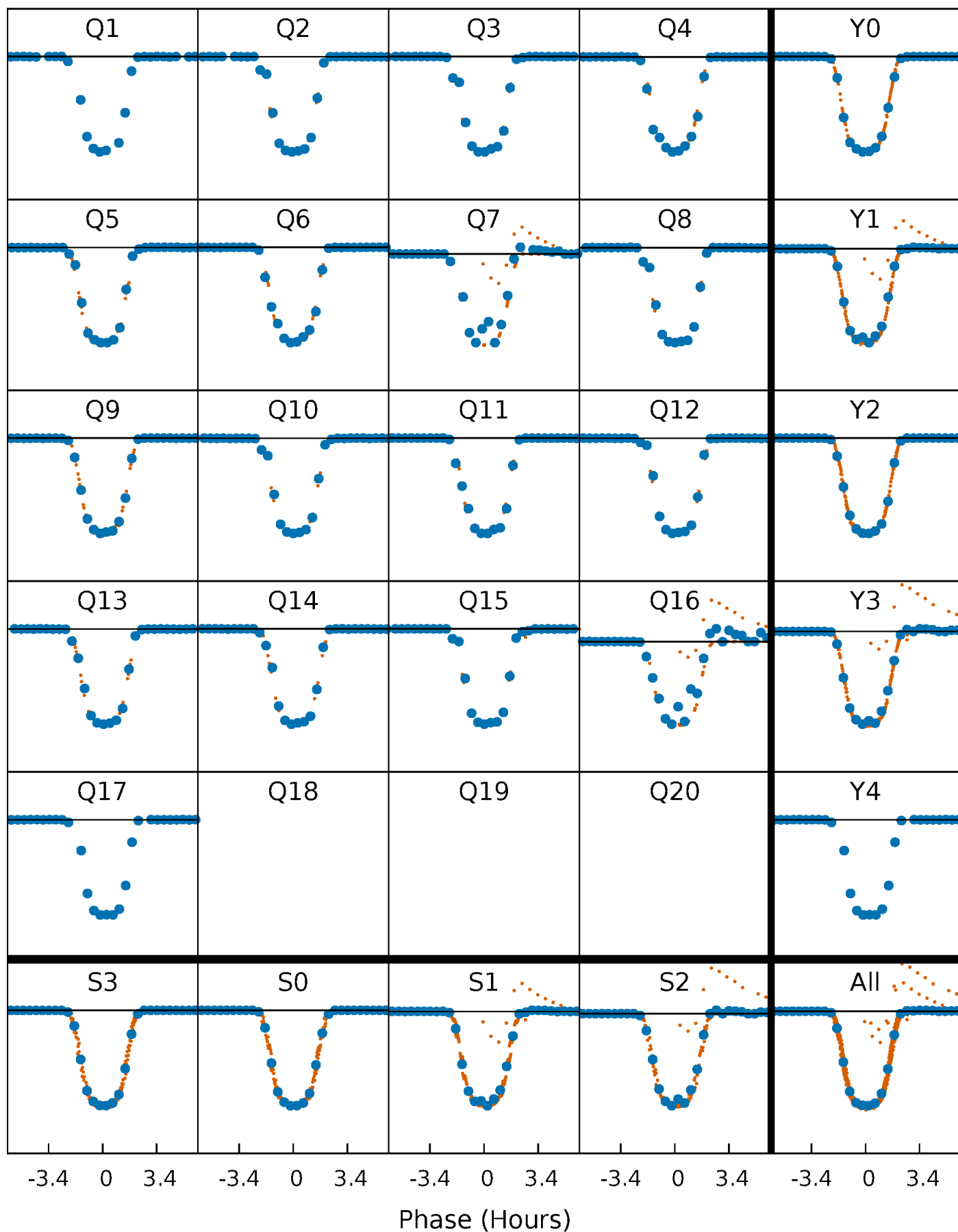
TCE 010198109-01 P= 17.918638 Days  $T_0=146.394531$  (BKJD)





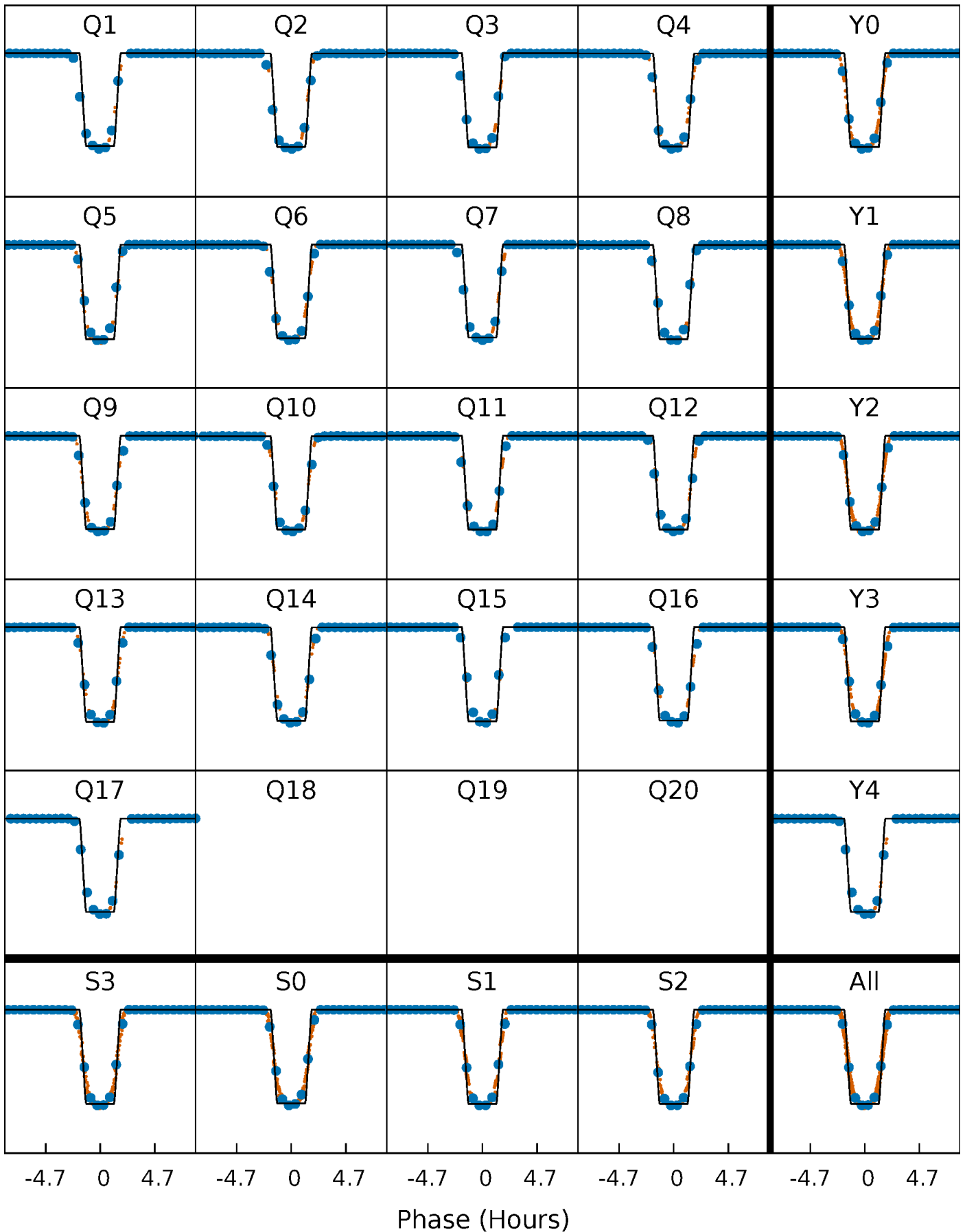
# DV Quarter-Phased Transit Curves

TCE 010198109-01 P= 17.918638 Days  $T_0=146.394531$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

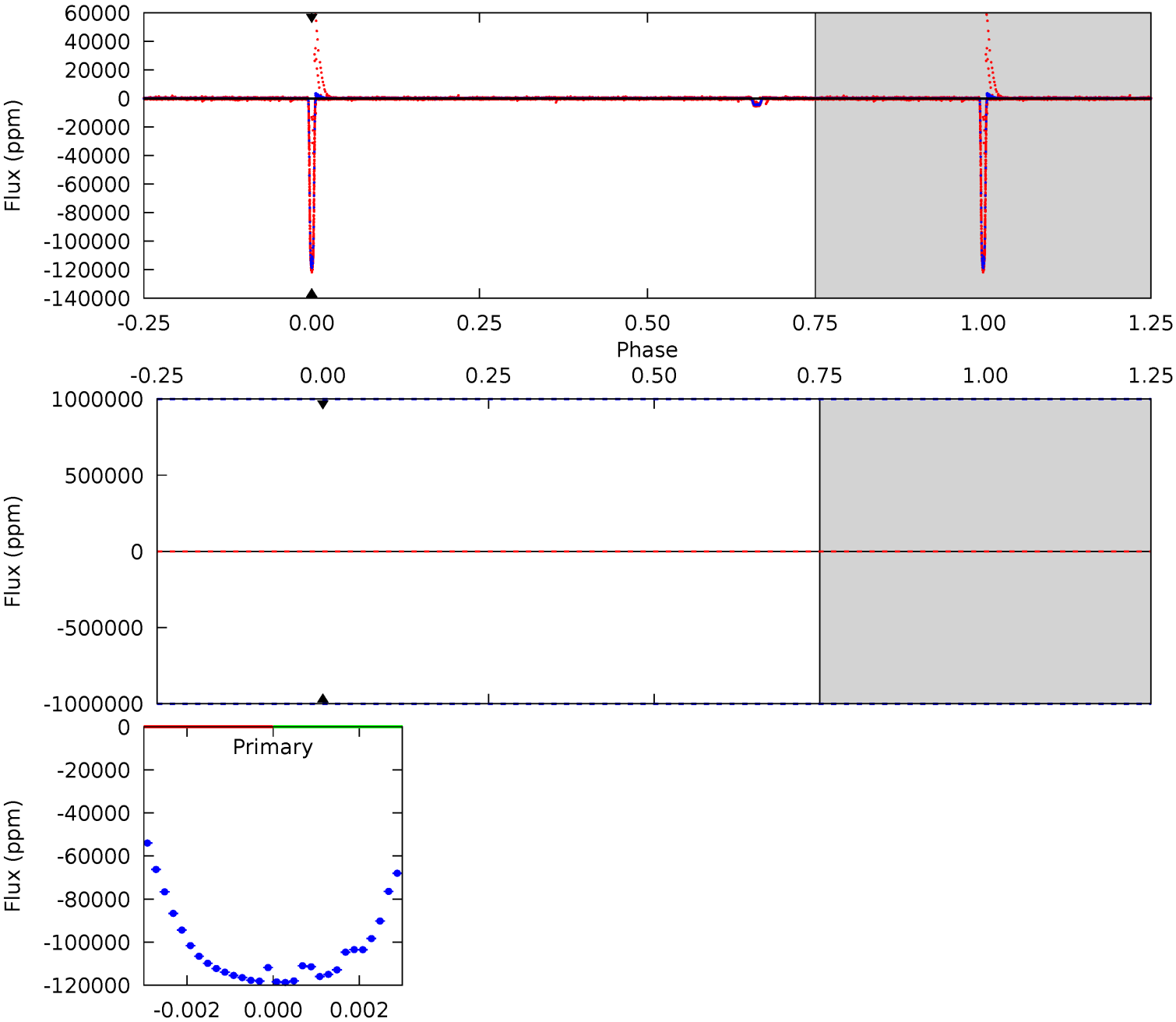
TCE 010198109-01 P= 17.918638 Days  $T_0=146.397268$  (BKJD)



# DV Model-Shift Uniqueness Test

010198109-01, P = 17.918638 Days, E = 128.475893 Days

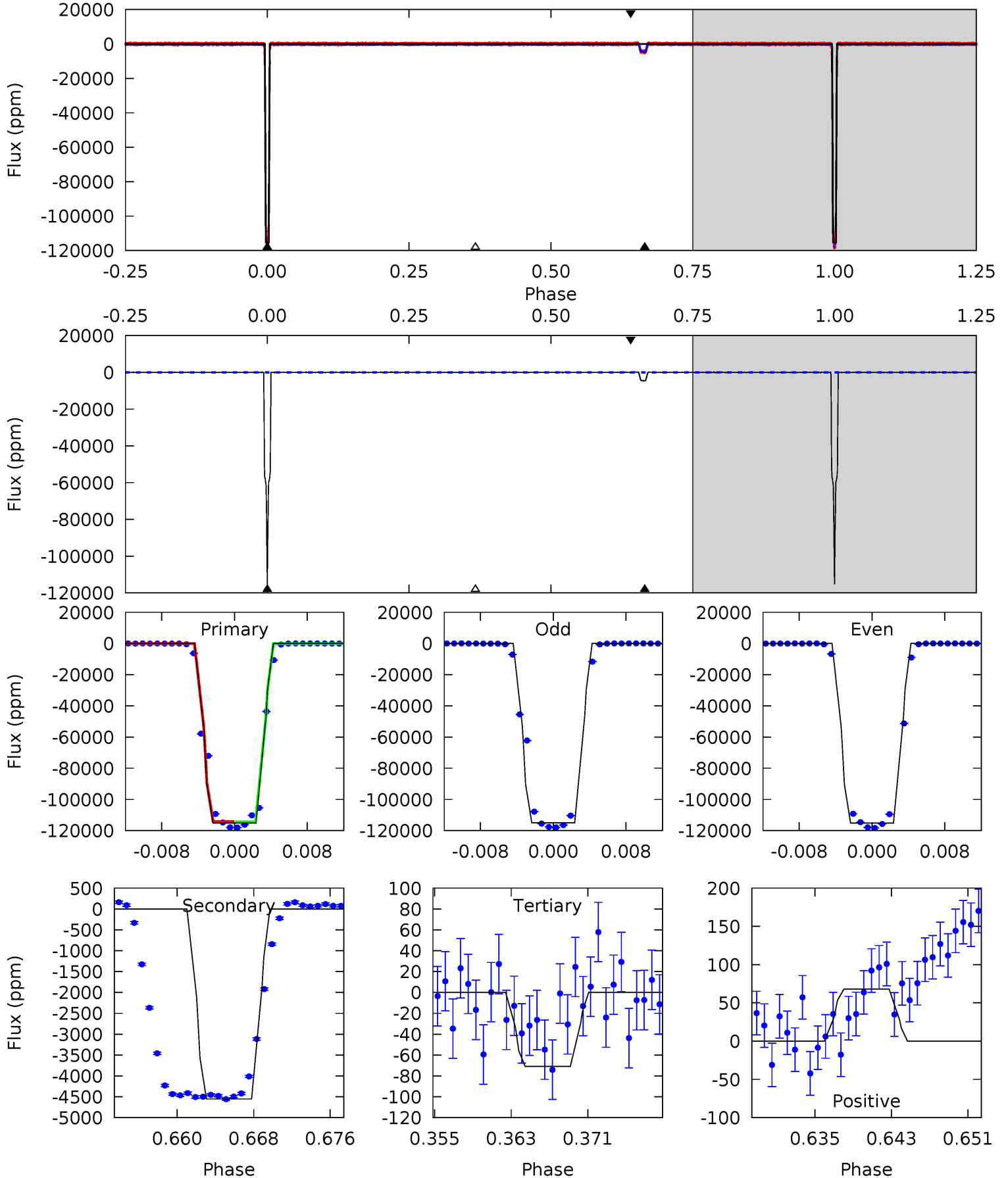
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
0	0	0	0	1.00	1.00	1.00	0	0	0	0	0	0	0	0



# Alt Model-Shift Uniqueness Test

010198109-01, P = 17.918638 Days, E = 128.478630 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
6148	242.9	3.79	3.63	5.06	2.64	4.33	6145	6145	239.1	239.3	2.57	1.00	0.00	0



### Stellar Parameters For KIC 010198109

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$5870^{+184}_{-164}$	$3.903^{+0.705}_{-0.235}$	$-1.100^{+0.350}_{-0.300}$	$1.630^{+0.646}_{-0.969}$	$0.775^{+0.070}_{-0.070}$	$0.252^{+2.597}_{-0.131}$
	+3%/-3%	+18%/-6%	+32%/-27%	+40%/-59%	+9%/-9%	+1031%/-52%
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 010198109-01 / KOI 7294.01

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$0 \pm 1000000$	$52.64^{+21.63}_{-22.25}$	$1304^{+129}_{-200}$	$-2823^{+9056}_{-3077}$	$-3.249^{+400.465}_{-316.014}$
Alt.	$-4553 \pm 19$	$54.67^{+24.37}_{-22.56}$	$1288^{+153}_{-234}$	$3203^{+367}_{-245}$	$13^{+25}_{-7}$

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

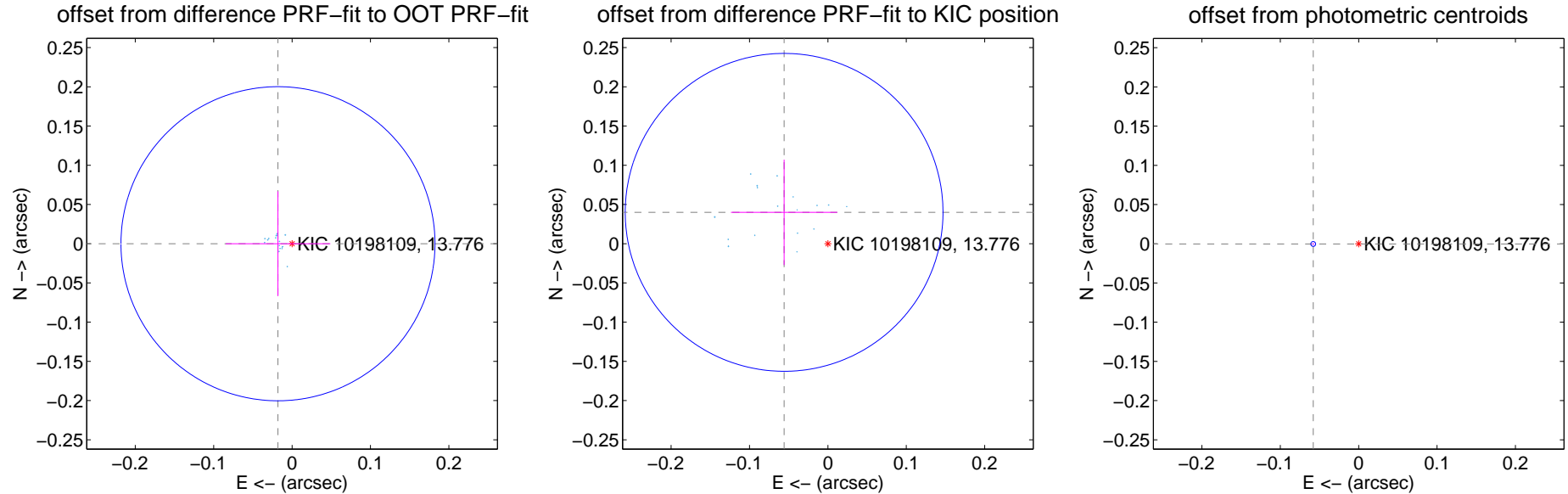
## DV Centroid Data

Supplemental centroid analysis for 010198109-01. Kepler magnitude: 13.78. Transit SNR -1.00

There are 17 quarters with good PRF difference image offsets

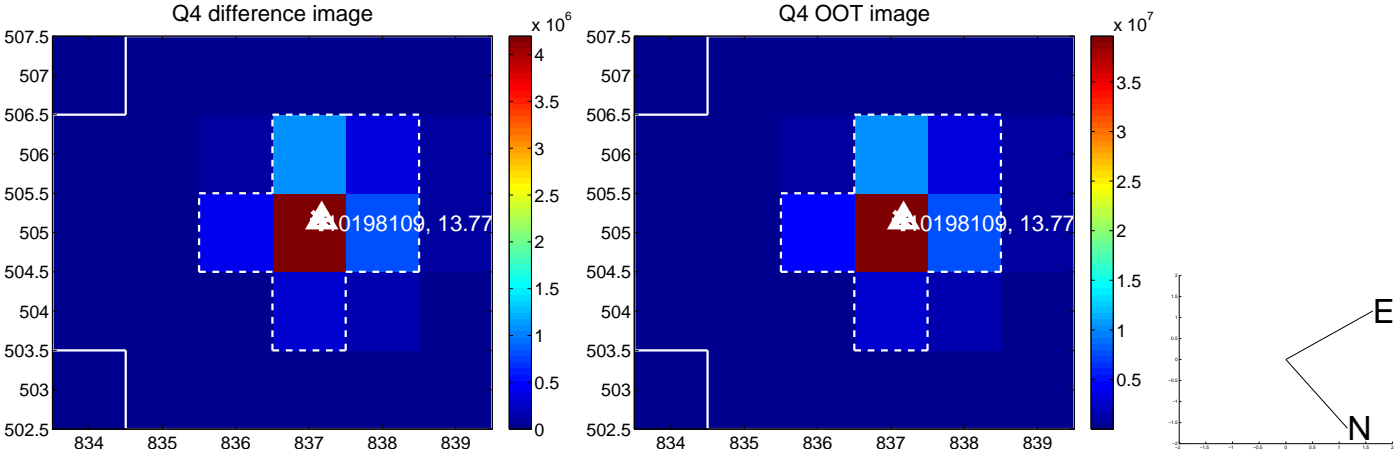
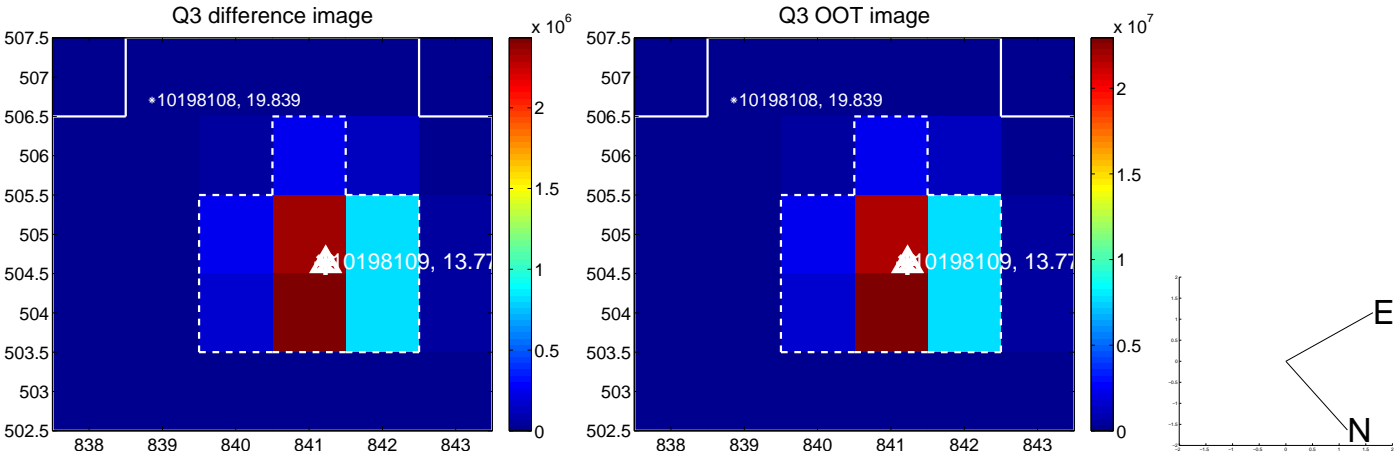
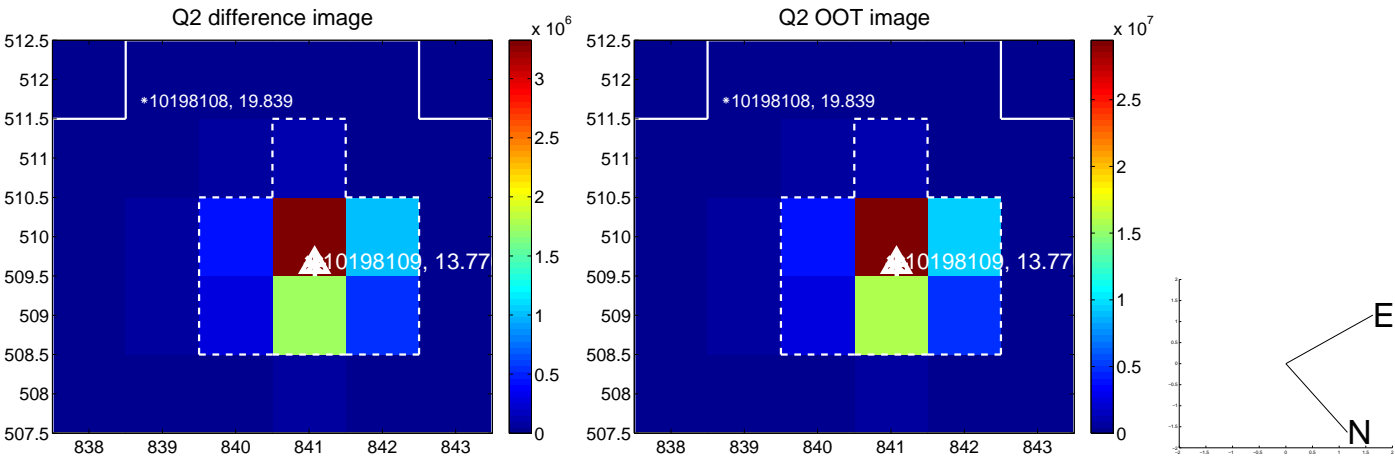
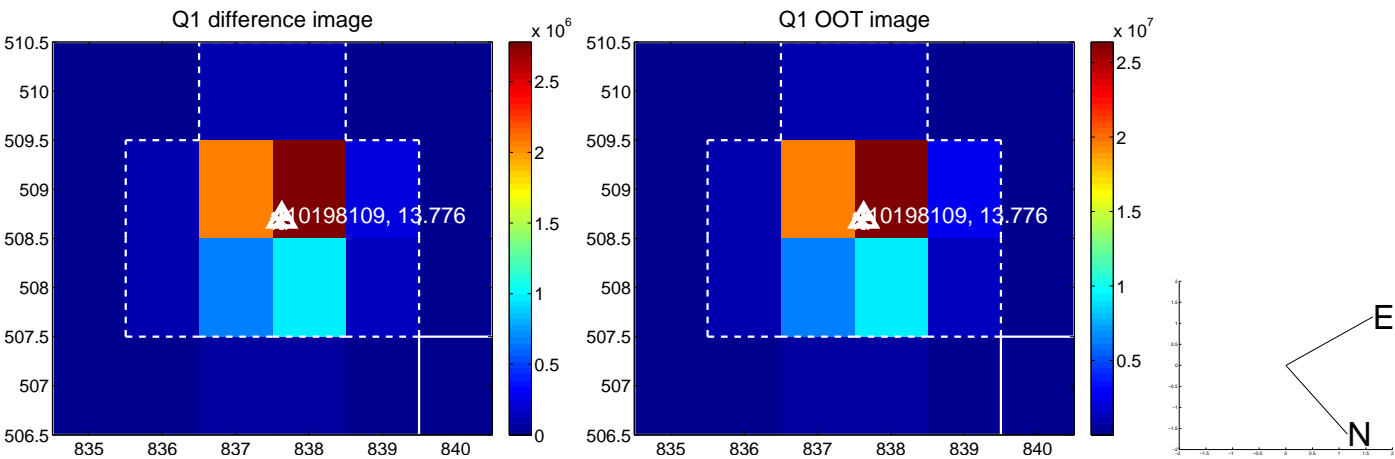
The direct PRF centroid is offset from the target star catalog position by about 0.13 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.018 \pm 0.067$	0.27	$0.018 \pm 0.067$	$-0.000 \pm 0.067$
PRF-fit source offset from KIC position	$0.069 \pm 0.068$	1.02	$0.056 \pm 0.068$	$0.040 \pm 0.067$
photometric centroid source offset	$0.06 \pm 0.00$	56.67	$0.06 \pm 0.00$	$-0.00 \pm 0.00$

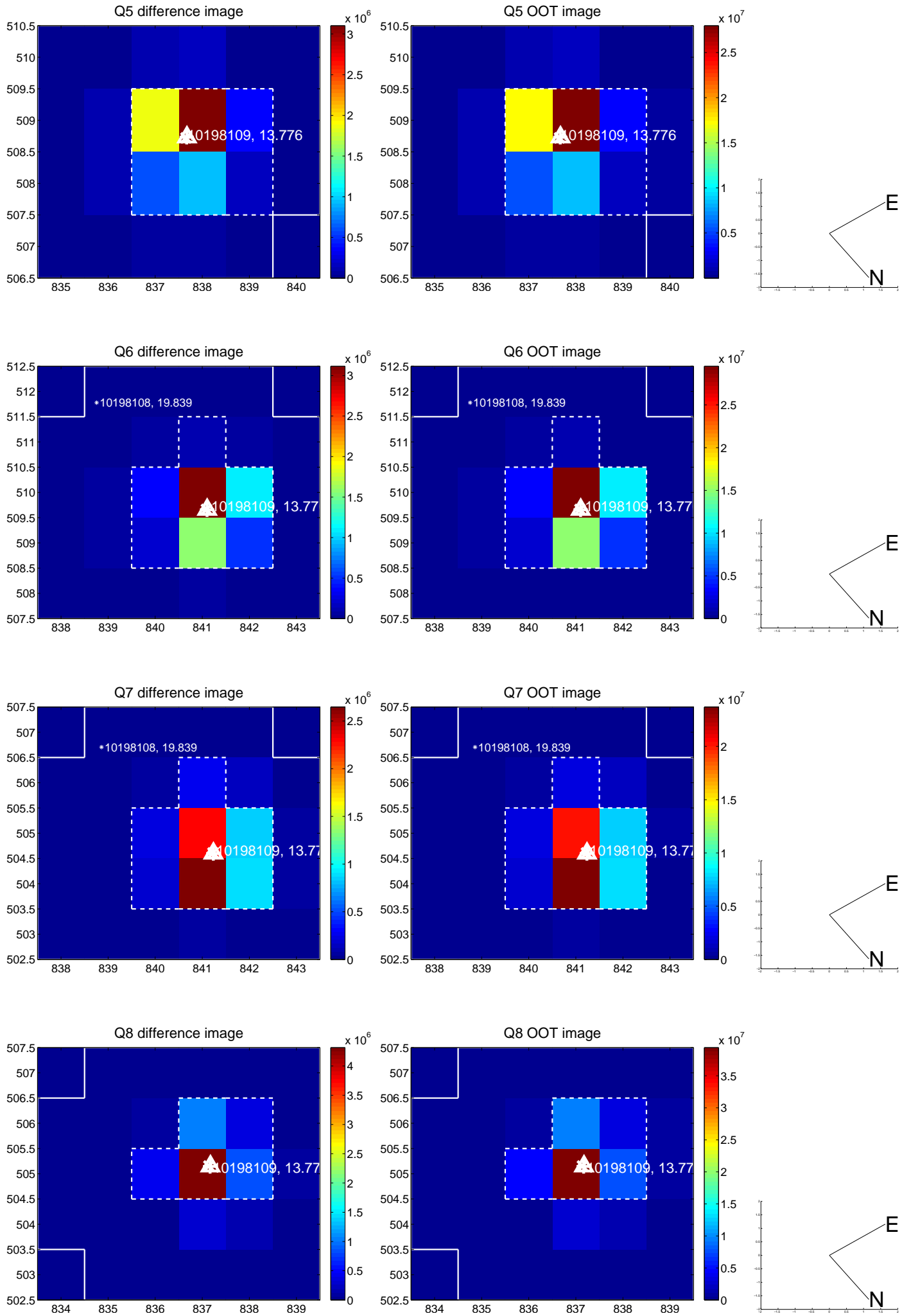


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets**; **Vermillion crosses: bad quarterly centroid offsets**; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

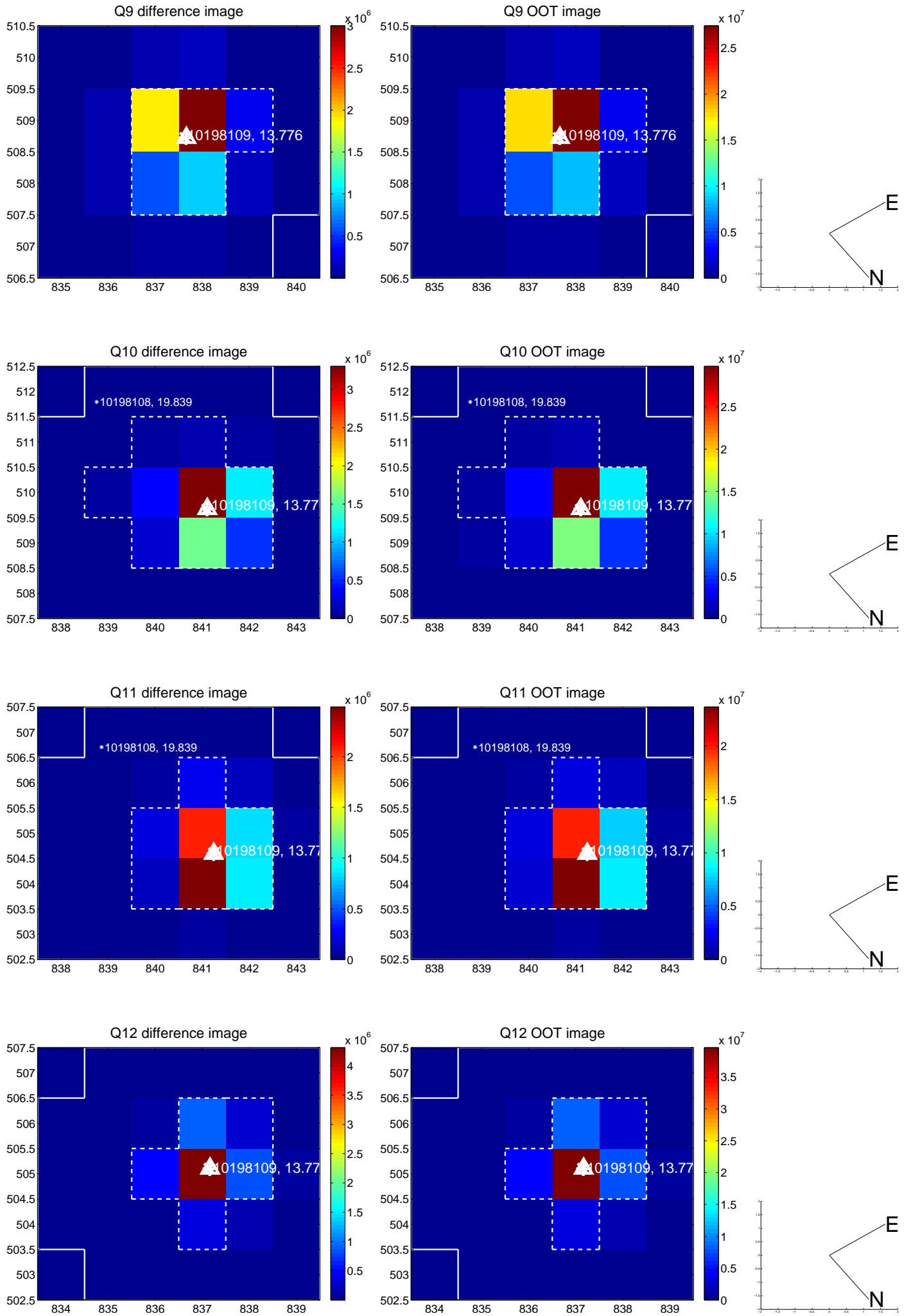


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

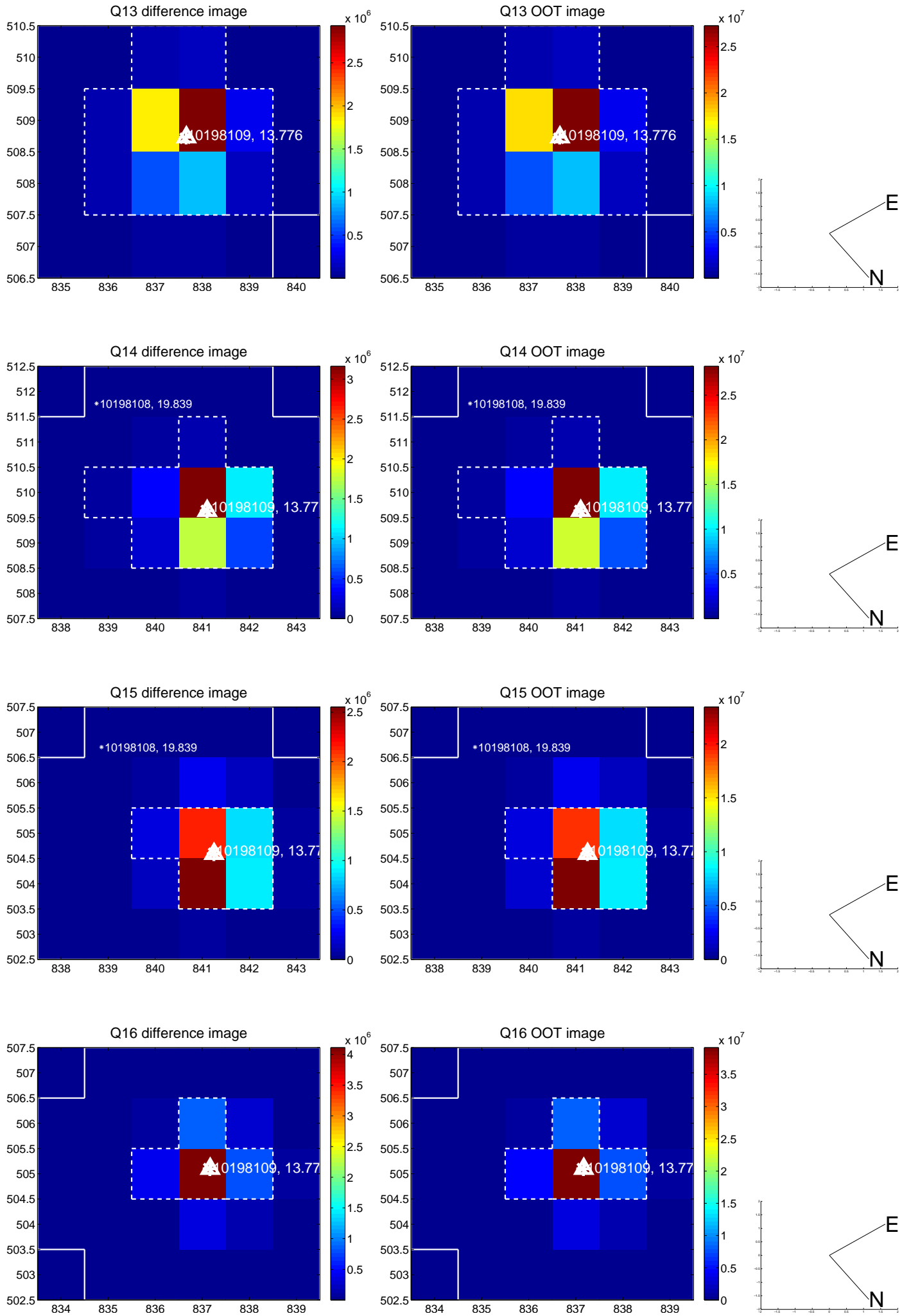




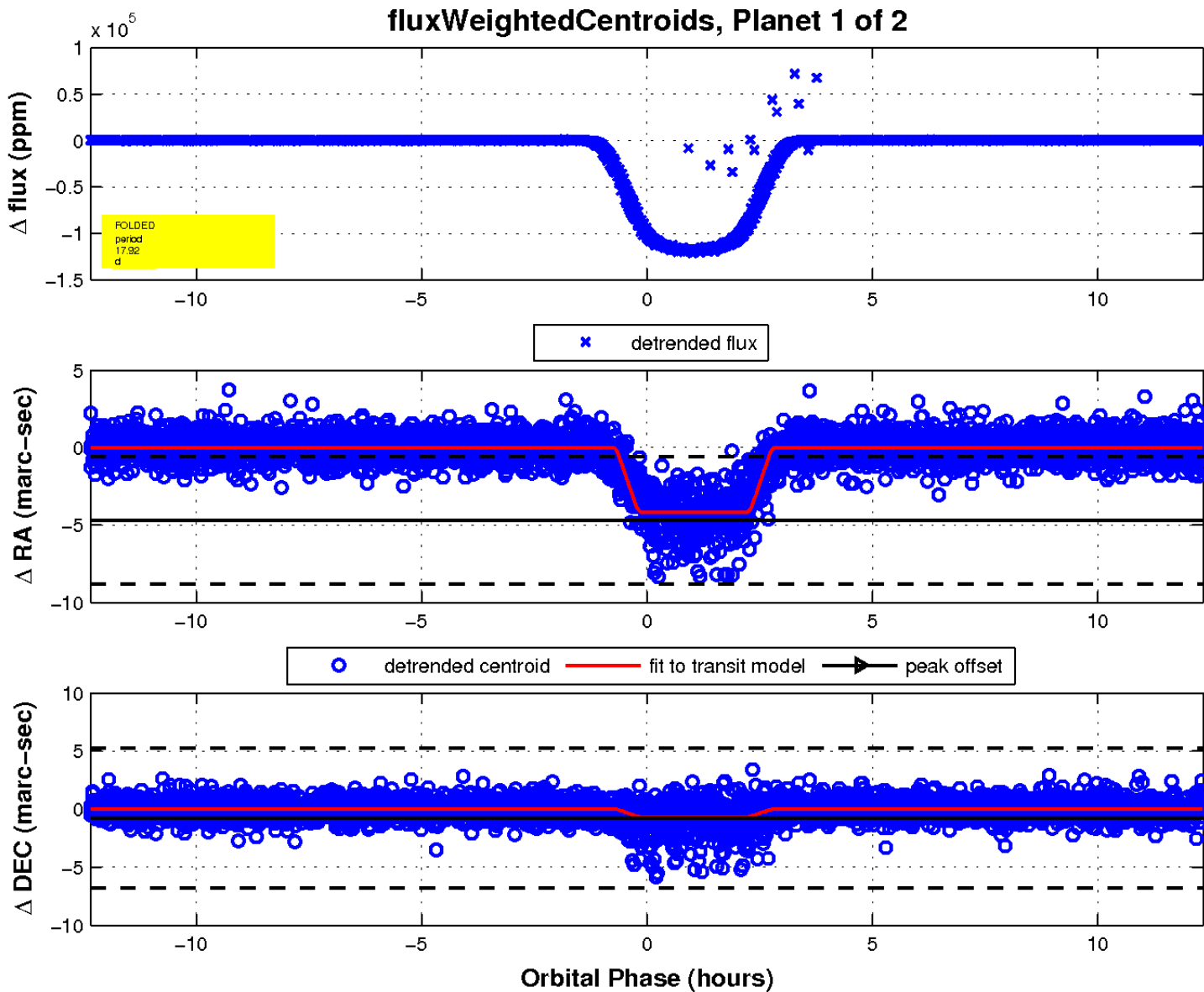
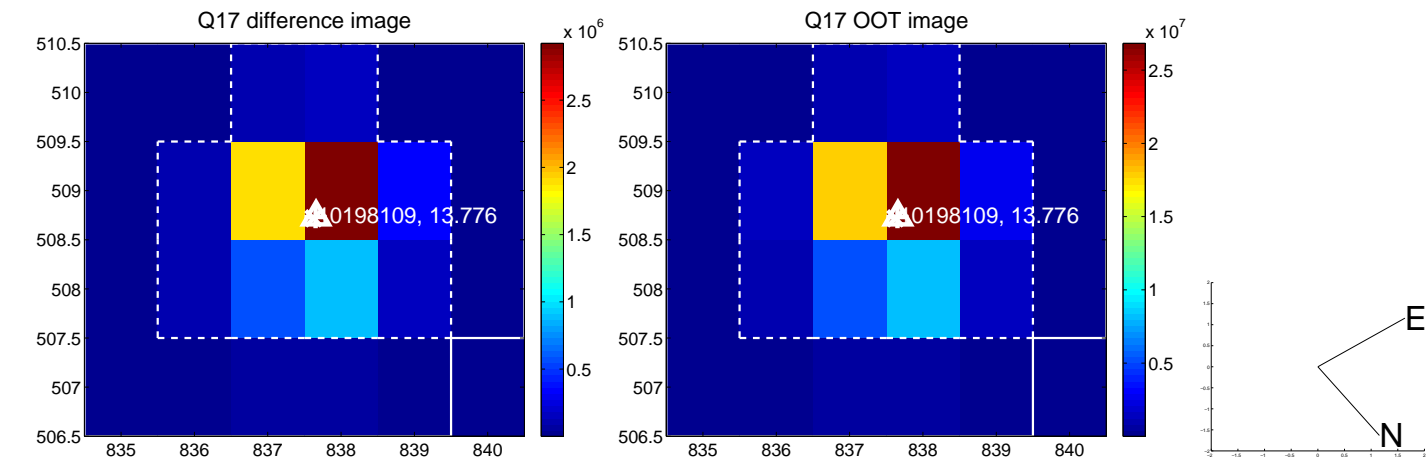
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

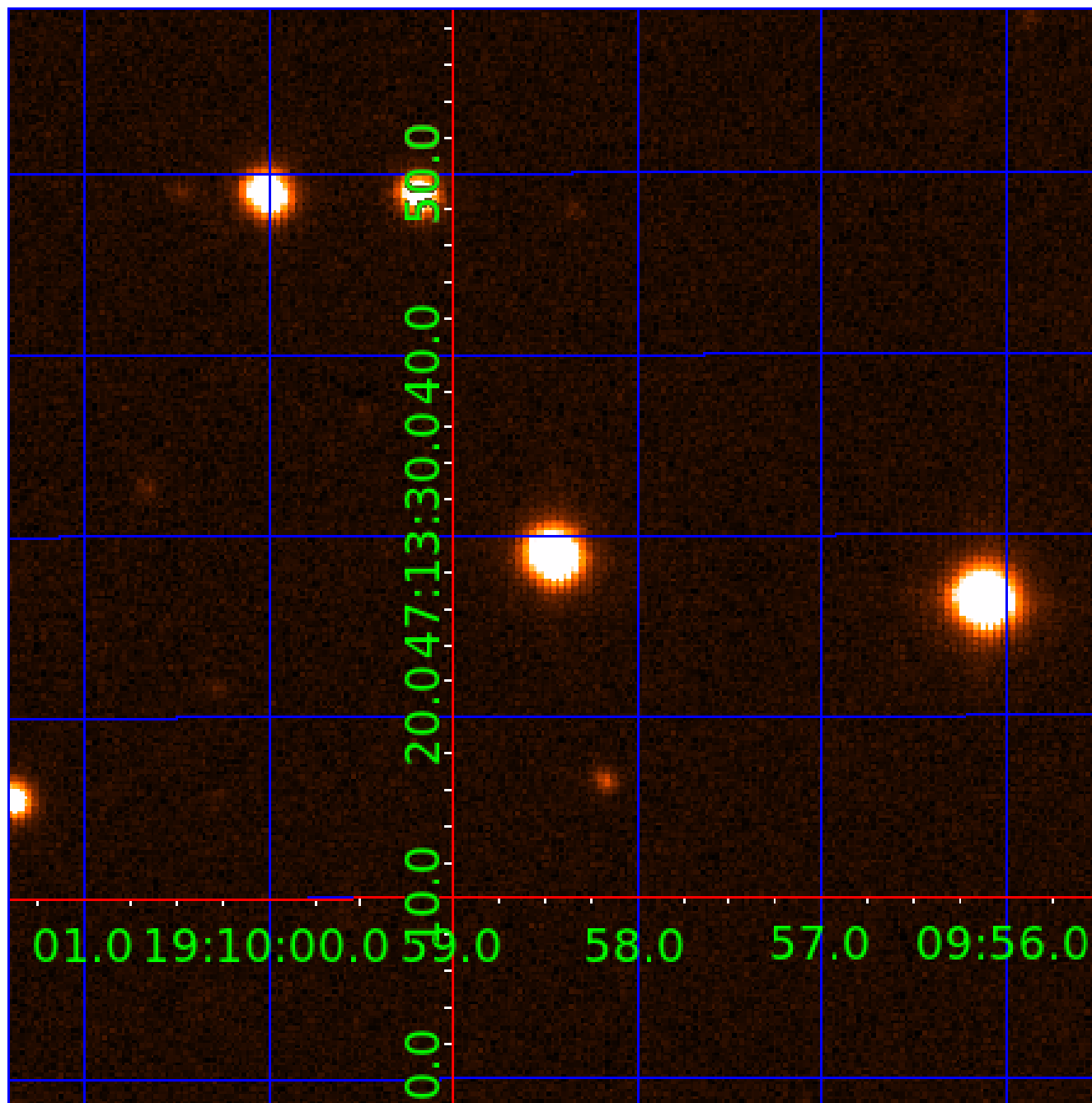


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination



# KIC 010198109

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
010198109-01	OBS	7294.01	17.918638	146.394531	113646.4	3.000	7447.3	-1.0	1.63	5870	55.47	186.42
010198109-02	OBS	No	17.918732	140.351230	4805.8	7.065	348.6	348.7	1.63	5870	12.86	186.42

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
010198109-01	OBS	FP	0.00	0	1	0	0	MOD_SEC_ALT—HAS_SEC_TCE—CENT_NOFITS
010198109-02	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.

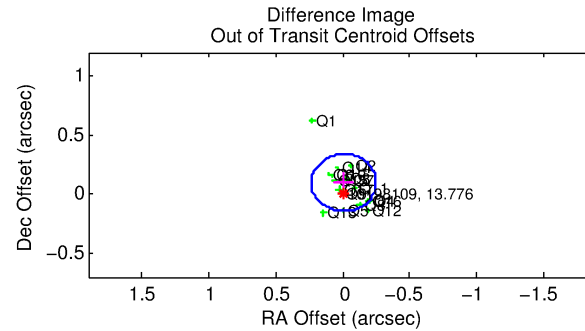
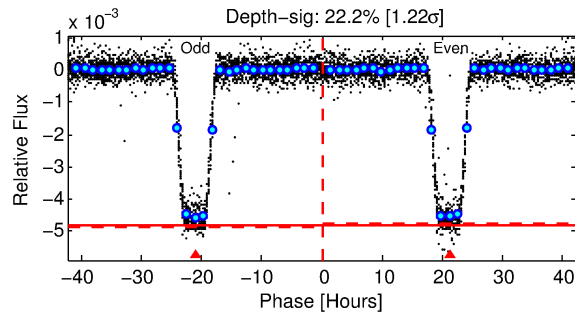
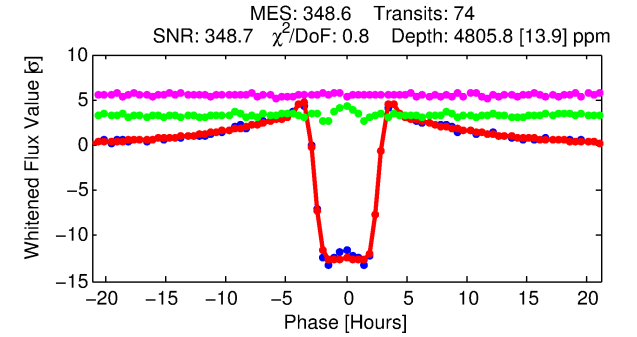
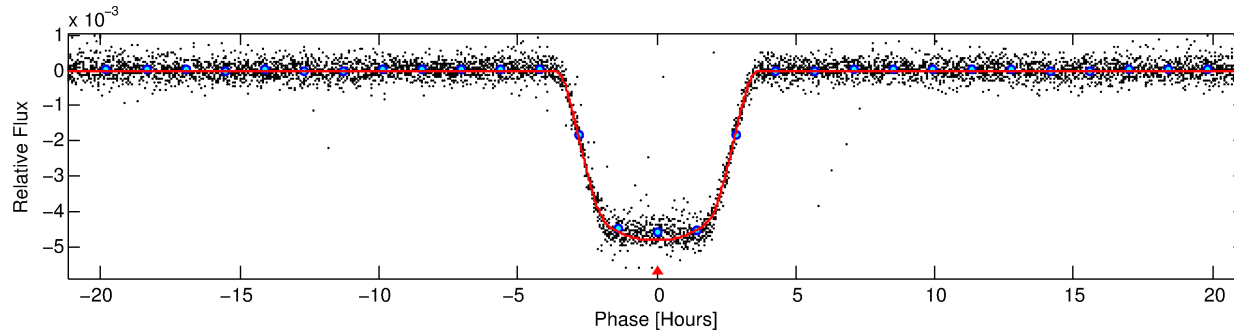
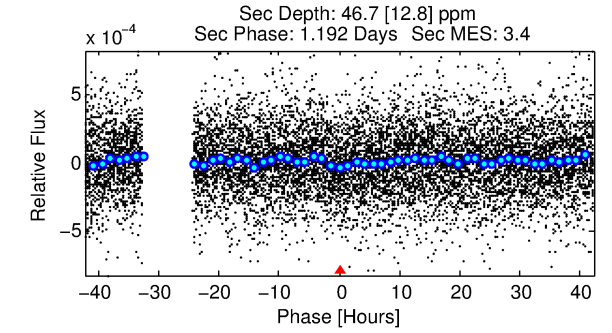
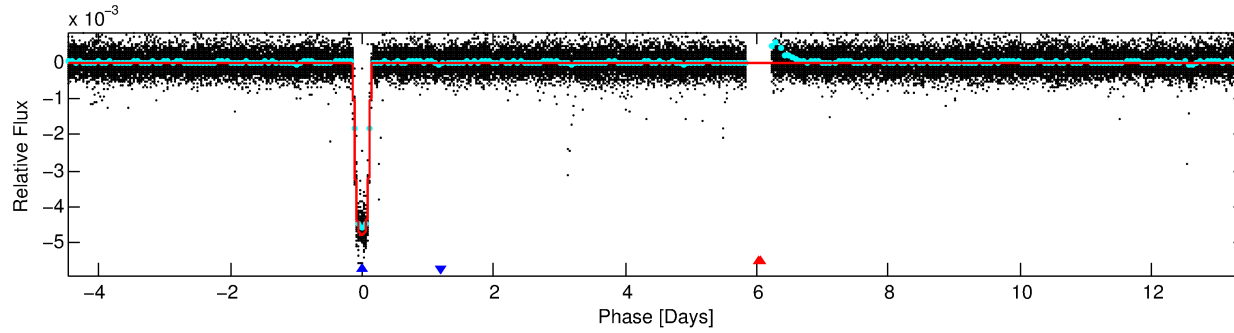
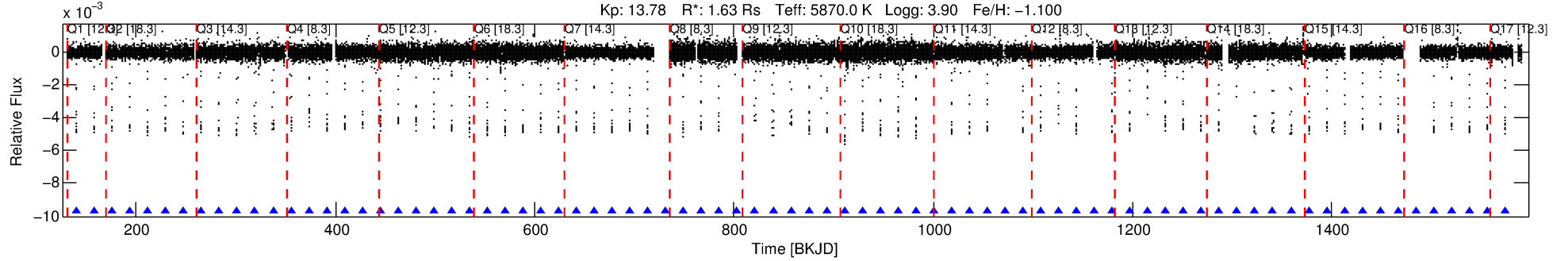
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 010198109-02

No Significant Match Found

# DV One-Page Summary

KIC: 10198109 Candidate: 2 of 2 Period: 17.919 d  
KOI: K07294 Corr: No Ephemeris Match



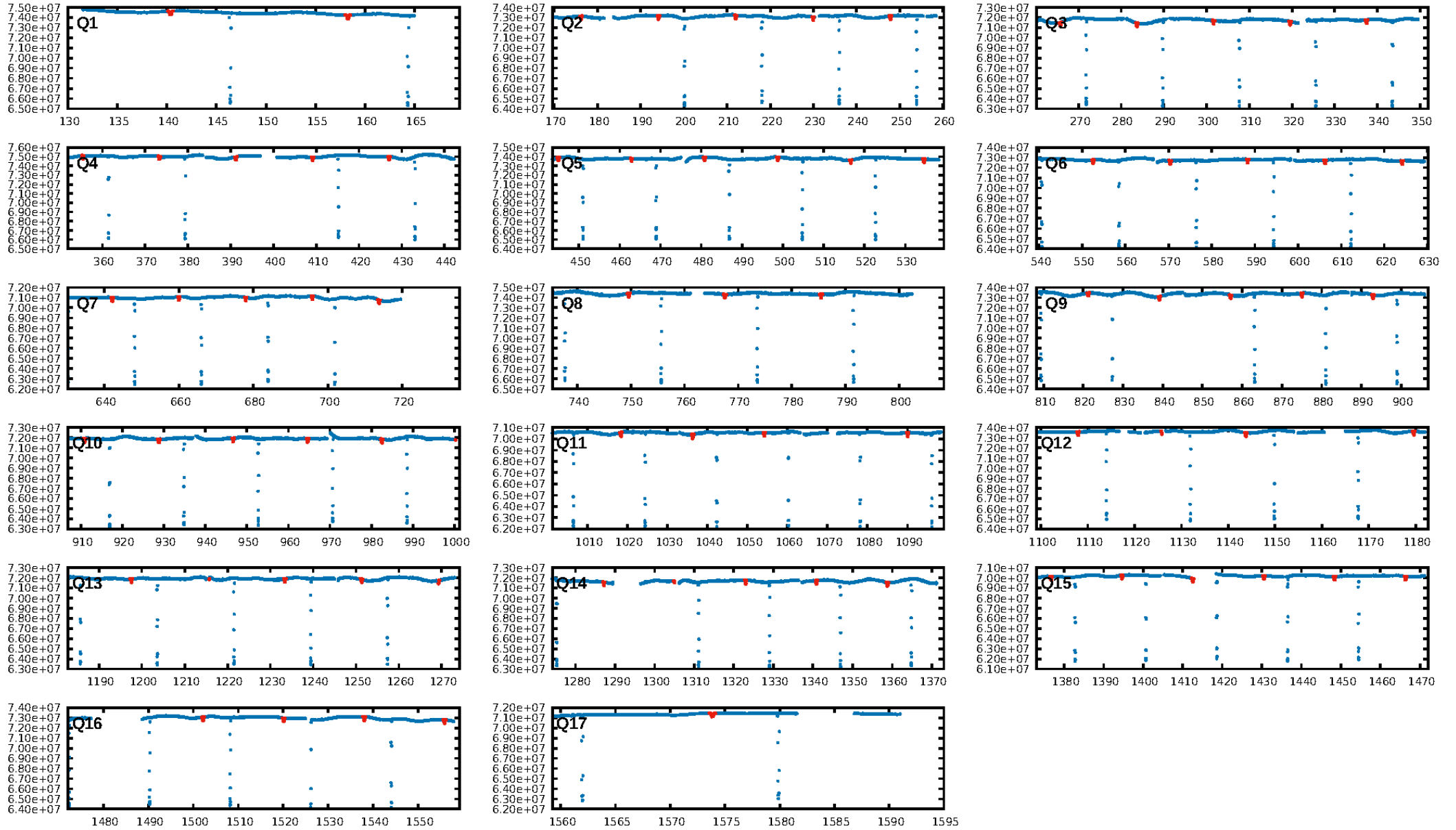
## DV Fit Results:

Period = 17.91873 [0.00001] d  
Epoch = 140.3512 [0.0003] BKJD  
Rp/R\* = 0.0723 [0.0001]  
a/R\* = 12.57 [0.07]  
b = 0.86 [0.00]  
Seff = 186.42 [216.12]  
Teq = 942 [273] K  
Rp = 12.86 [7.65] Re  
a = 0.1231 [0.0826] AU  
Ag = 2.35 [2.79] [0.49 $\sigma$ ]  
Teffp = 1804 [136] K [2.82 $\sigma$ ]

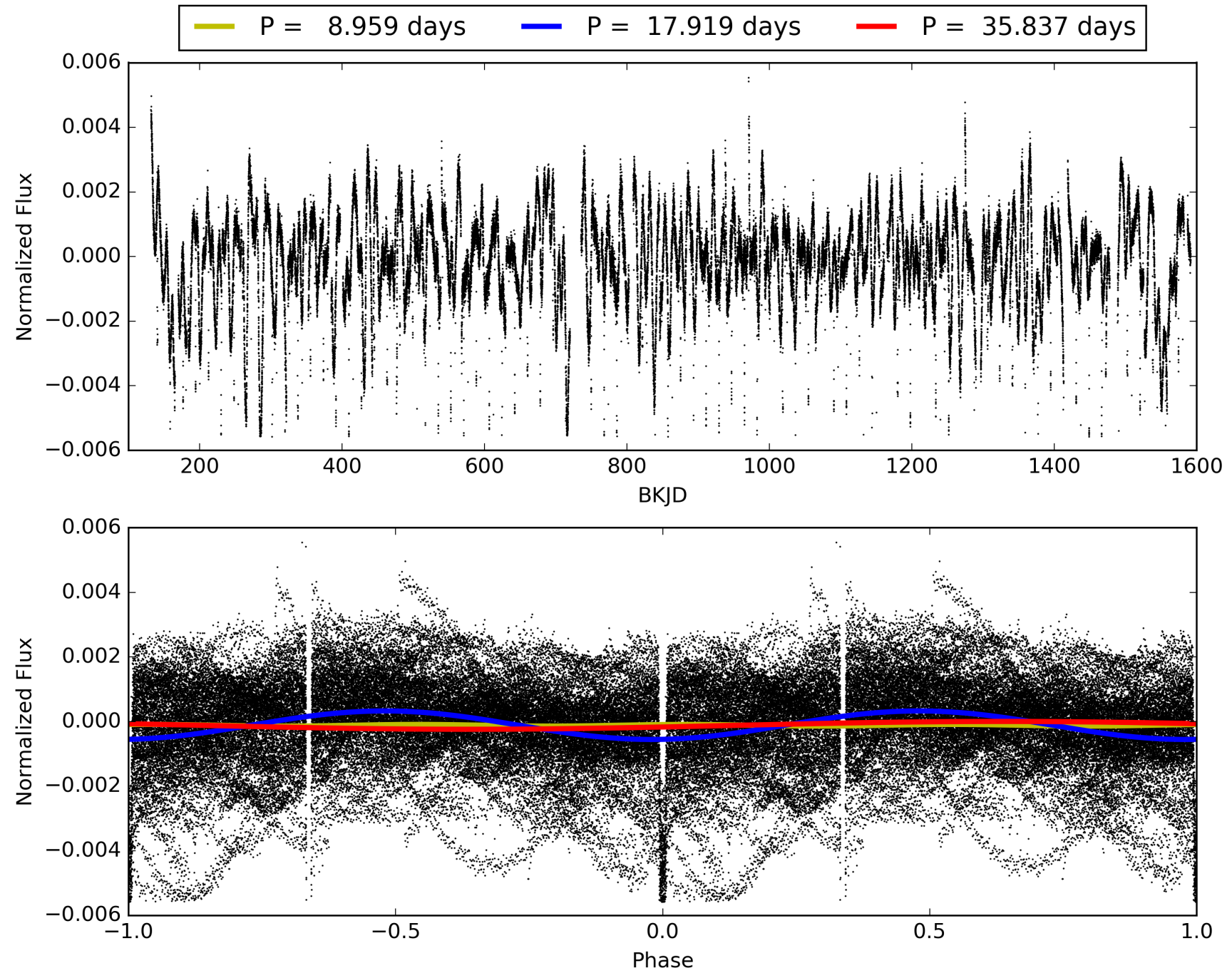
## DV Diagnostic Results:

ShortPeriod-sig: 0.0% [0.00 $\sigma$ ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: 45.8%  
ModelChiSquareGof-sig: 100.0%  
Bootstrap-pfa: 0.00e+00  
RollingBand-fgt: 1.00 [71/71]  
GhostDiagnostic-chr: 2.922  
Centroid-sig: 0.0%  
Centroid-so: 0.096 arcsec [5.27 $\sigma$ ]  
OotOffset-rm: 0.098 arcsec [1.22 $\sigma$ ]  
KicOffset-rm: 0.140 arcsec [1.75 $\sigma$ ]  
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]

# TCE 010198109-02, PDC Light Curves



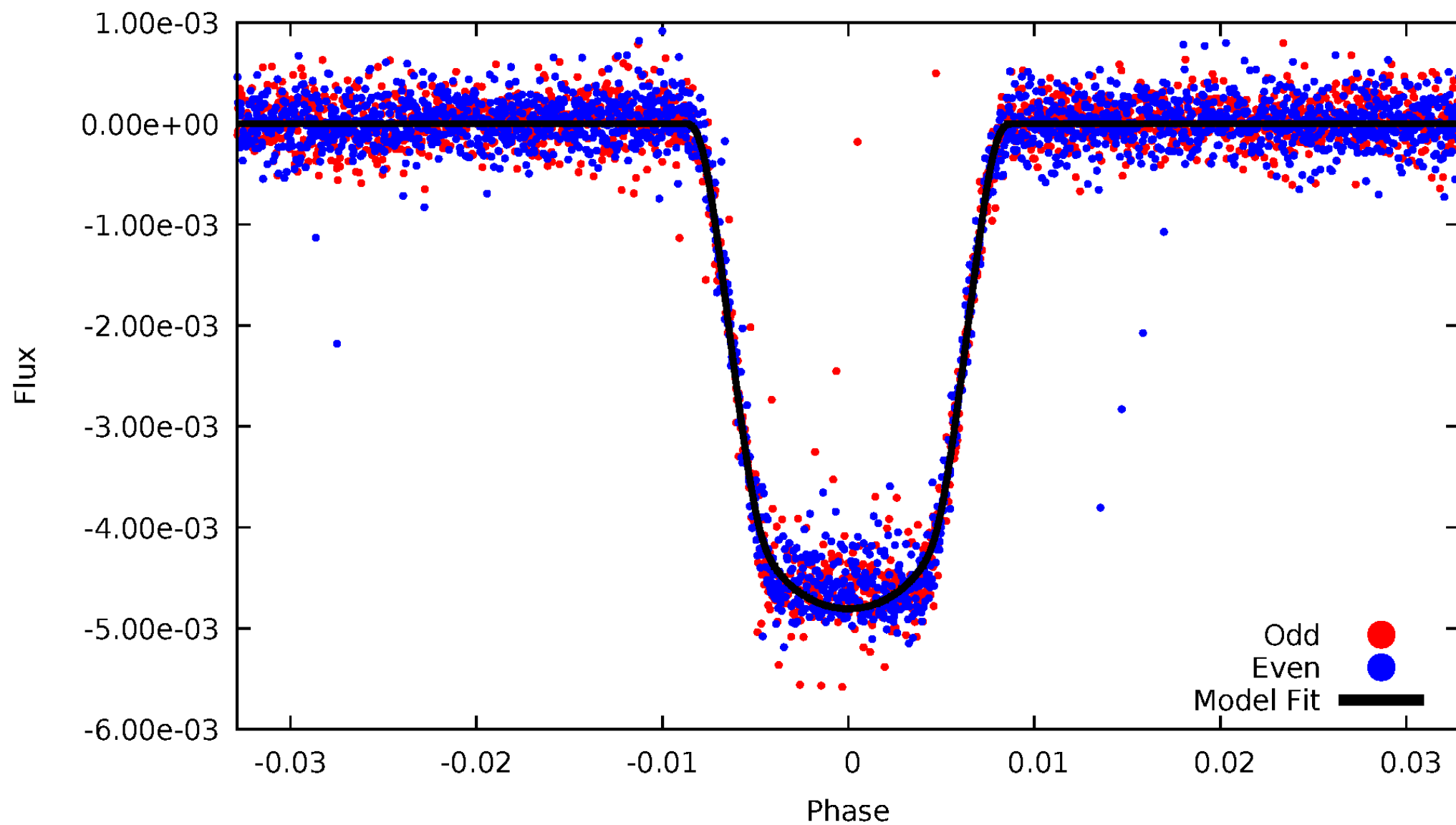
TCE 010198109-02





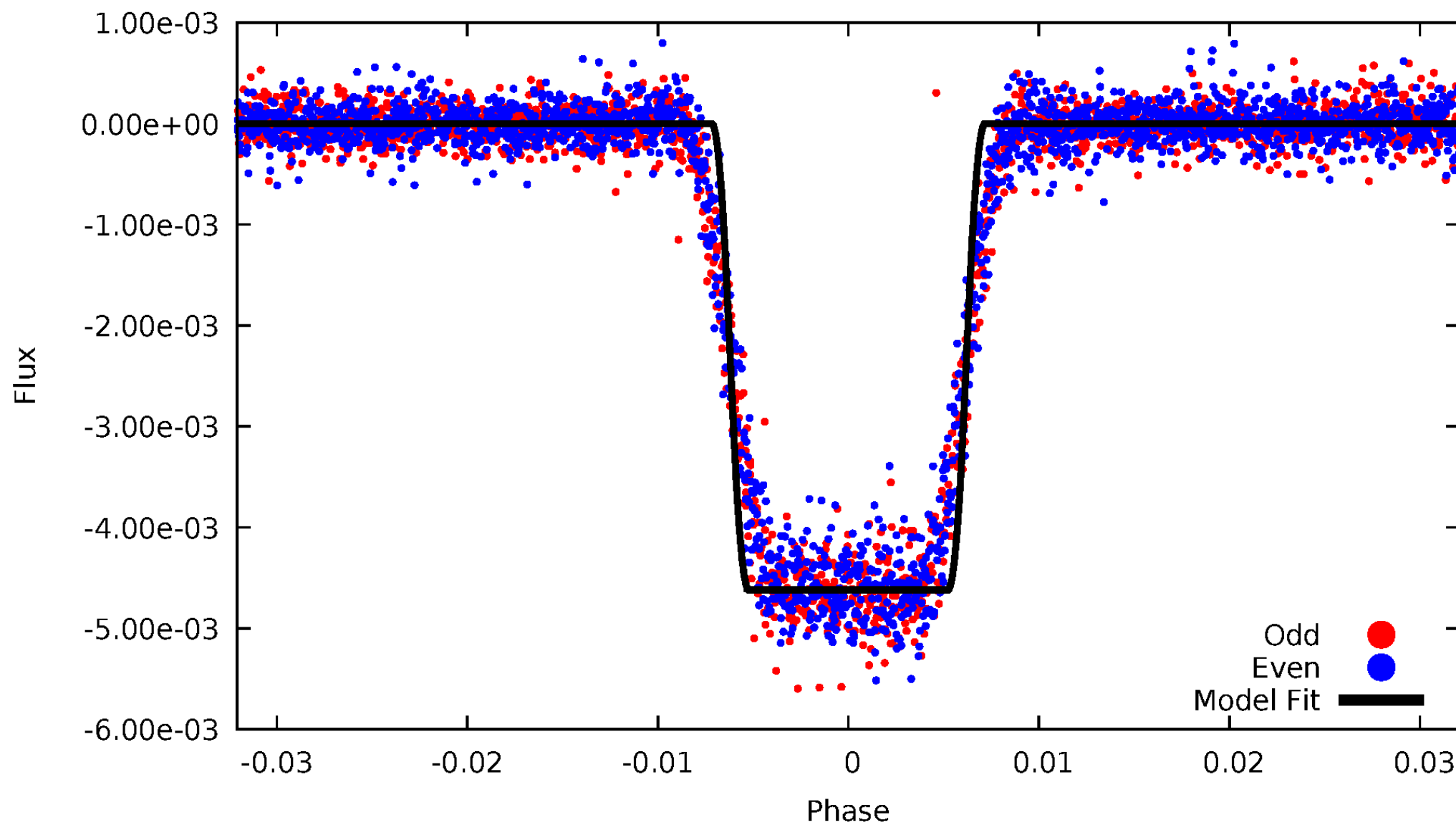
# DV Odd/Even

TCE 010198109-02



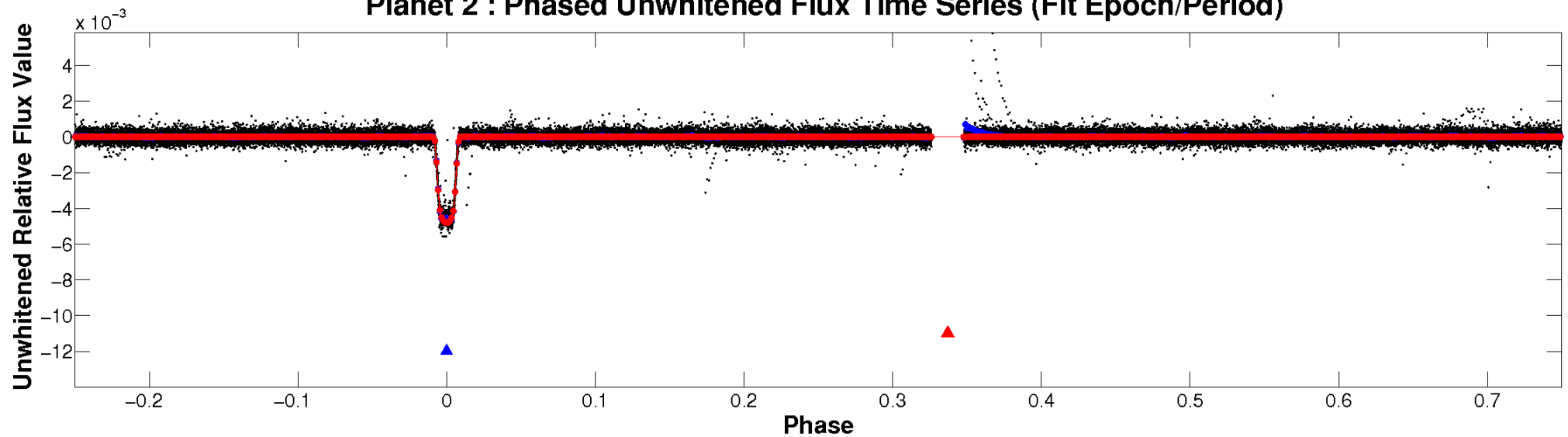
# ALT Odd/Even

TCE 010198109-02

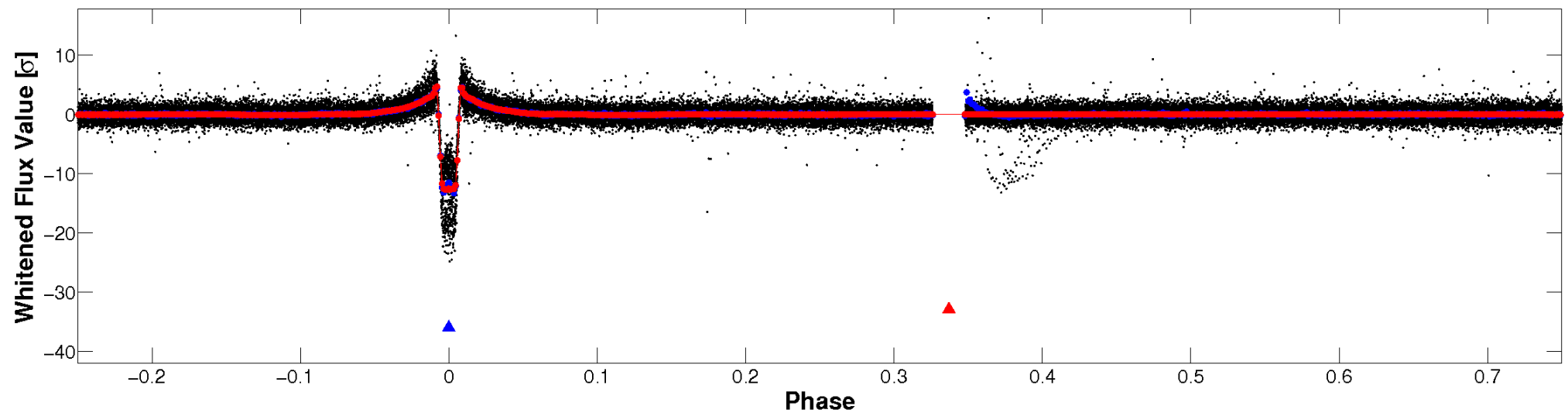


# Non-Whitened Vs. Whitened Light Curve

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

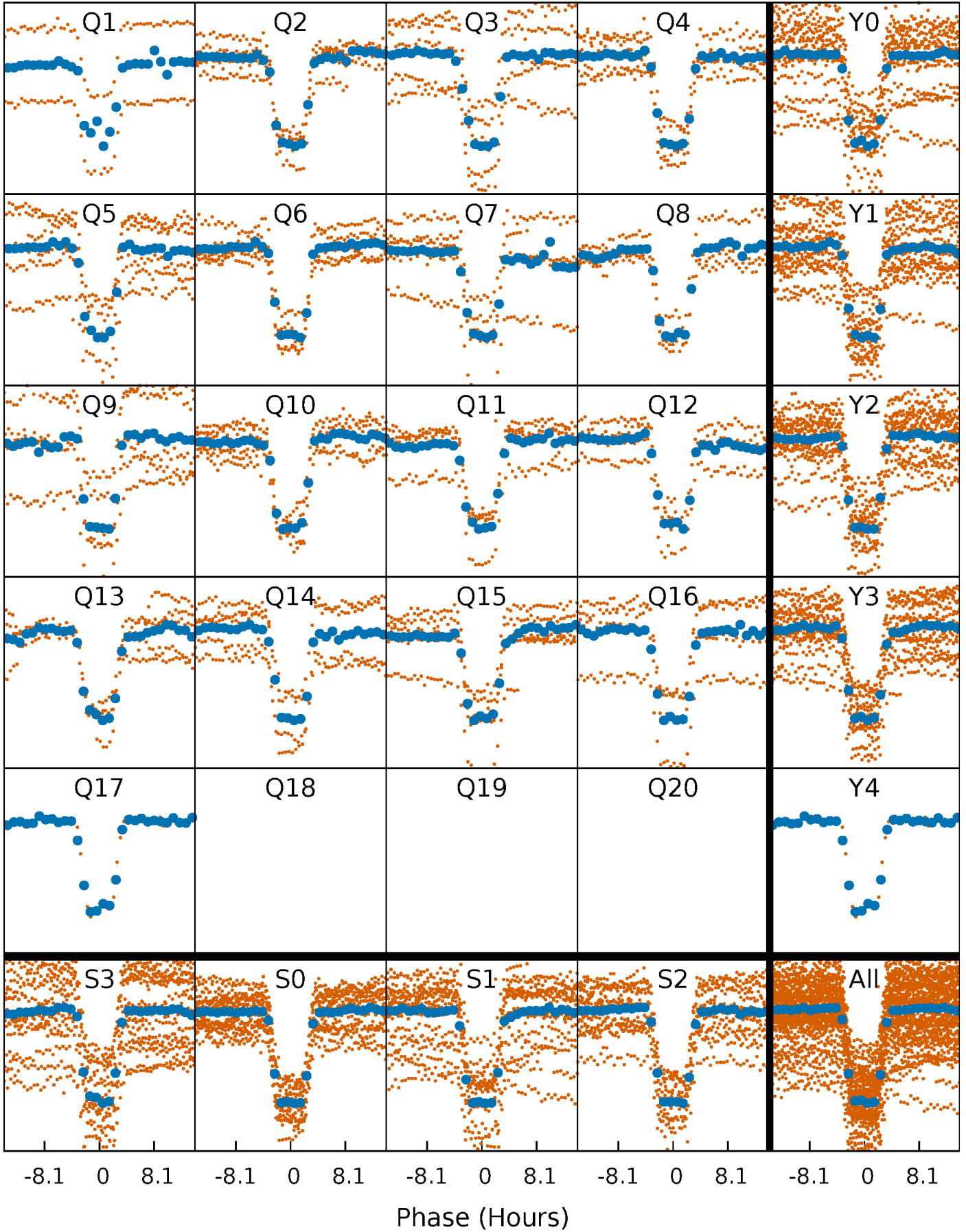


## Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



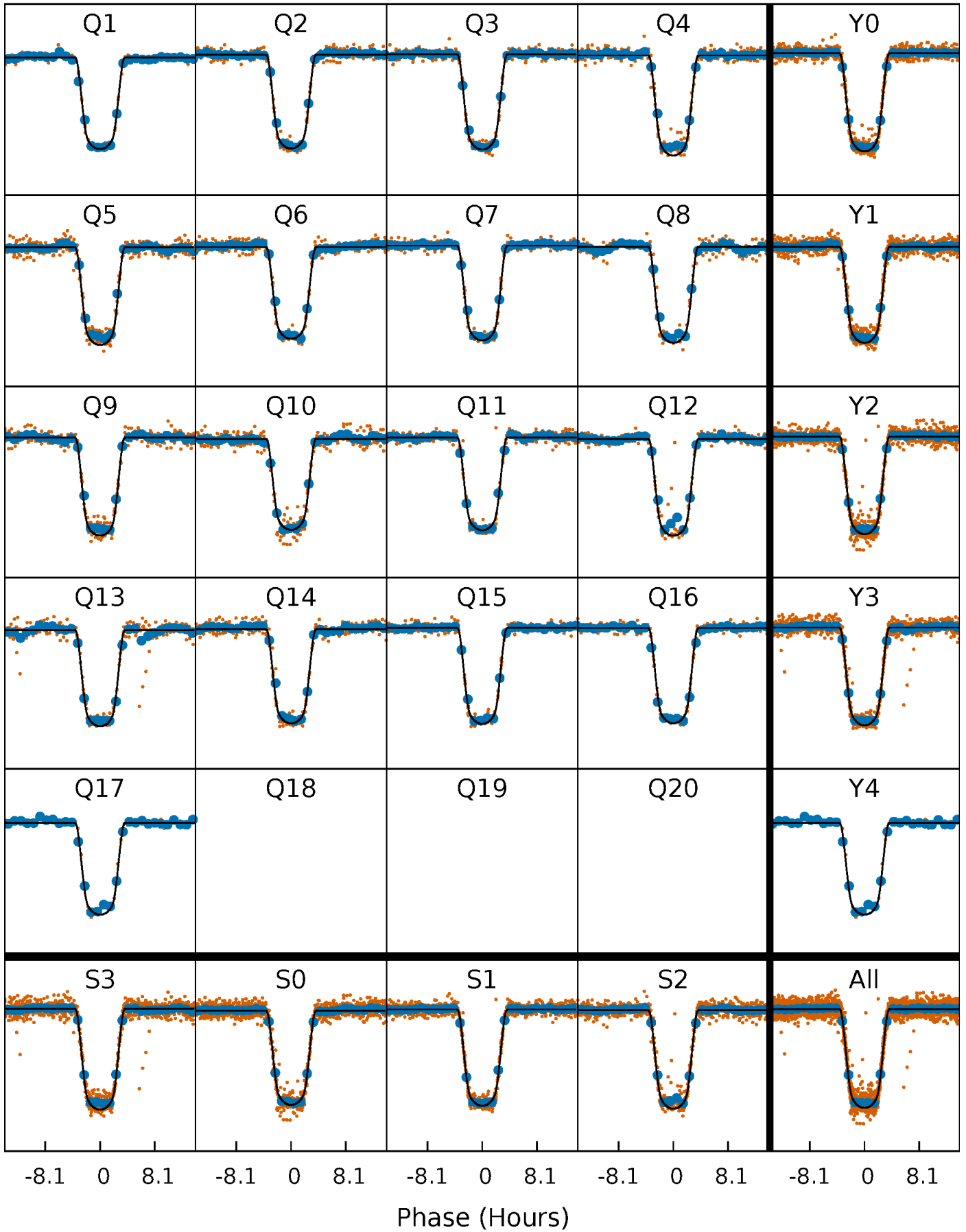
# PDC Quarter-Phased Transit Curves

TCE 010198109-02 P= 17.918732 Days  $T_0=140.351230$  (BKJD)



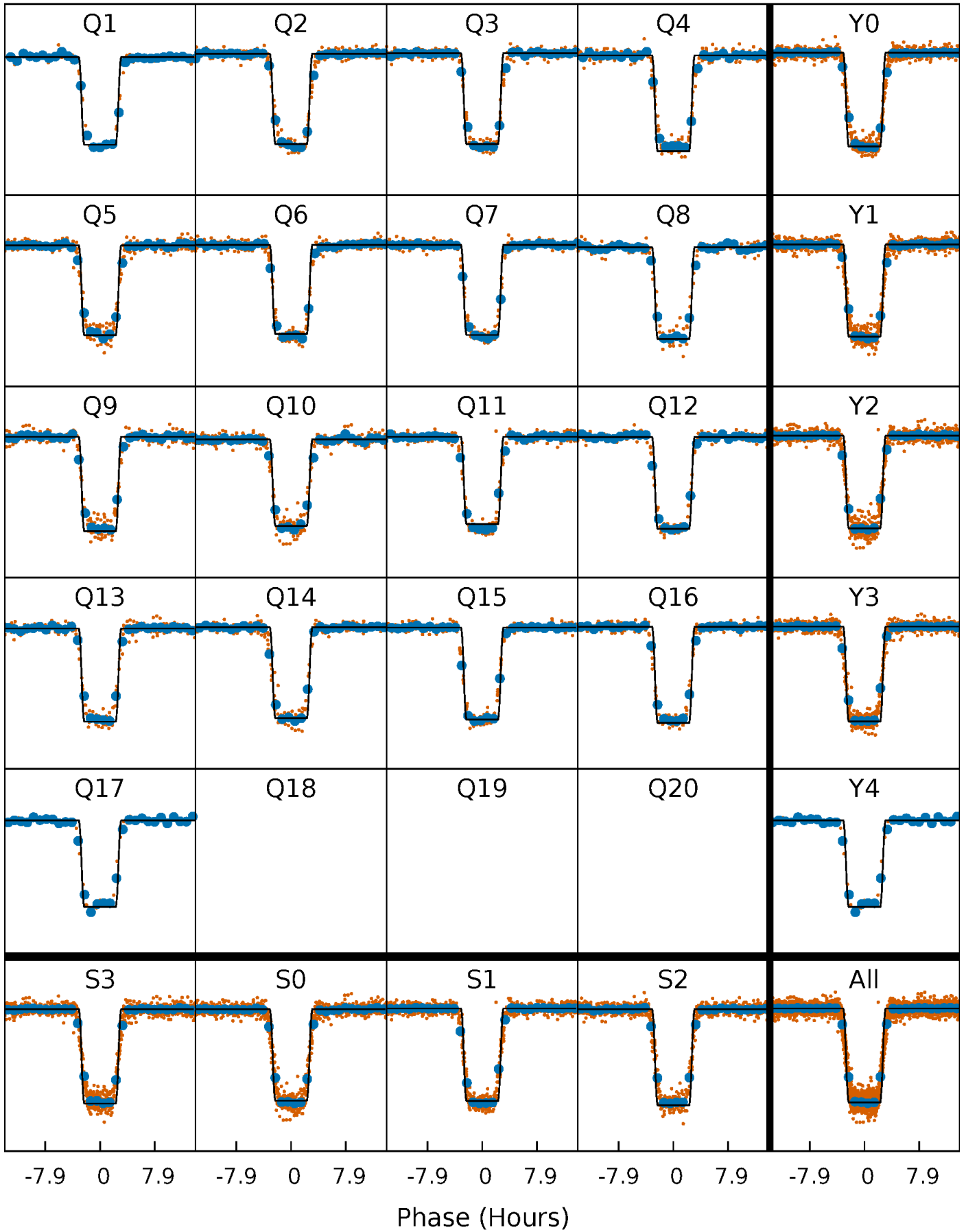
# DV Quarter-Phased Transit Curves

TCE 010198109-02   P= 17.918732 Days    $T_0=140.351230$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

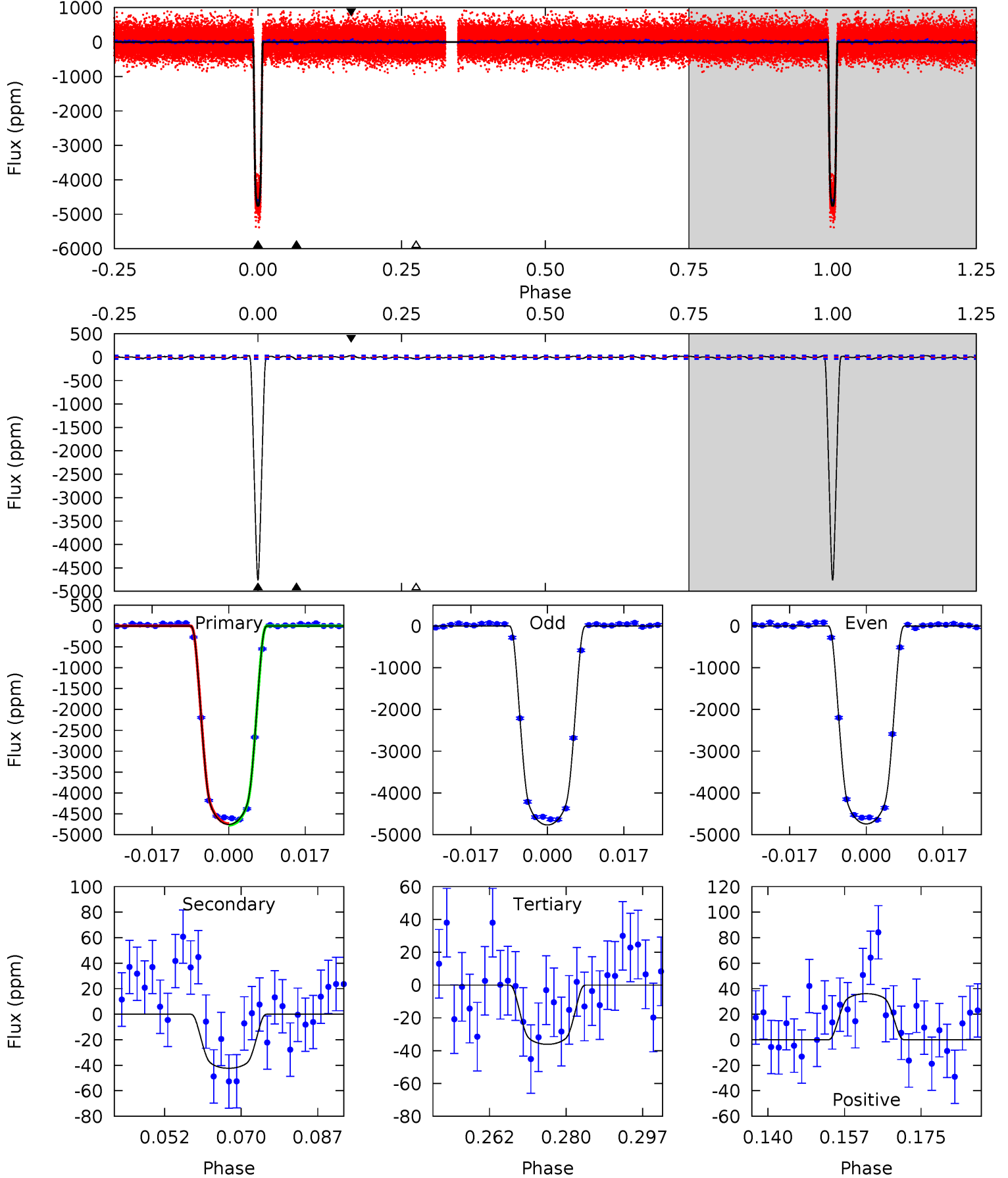
TCE 010198109-02   P= 17.918906 Days    $T_0=140.344515$  (BKJD)



# DV Model-Shift Uniqueness Test

010198109-02, P = 17.918732 Days, E = 122.432498 Days

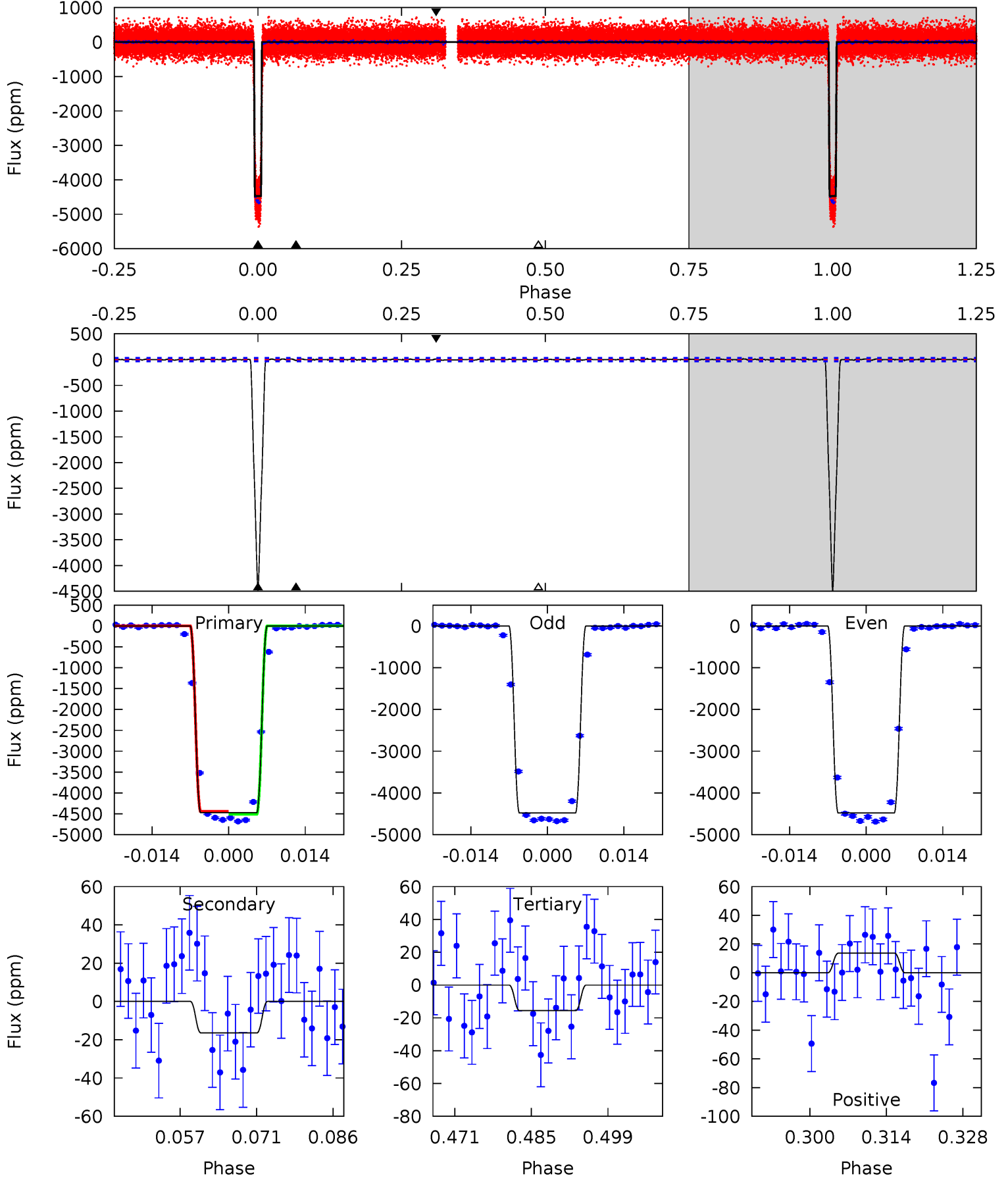
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
687.6	6.13	5.22	5.22	4.92	2.38	1.90	682.4	682.4	0.90	0.91	1.85	0.99	0.01	2.46



# Alt Model-Shift Uniqueness Test

010198109-02, P = 17.918906 Days, E = 122.425609 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
708.5	2.61	2.47	2.17	4.96	2.45	0.74	706.0	706.3	0.14	0.44	0.16	0.99	0.00	5.01





### Stellar Parameters For KIC 010198109

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$5870^{+184}_{-164}$	$3.903^{+0.705}_{-0.235}$	$-1.100^{+0.350}_{-0.300}$	$1.630^{+0.646}_{-0.969}$	$0.775^{+0.070}_{-0.070}$	$0.252^{+2.597}_{-0.131}$
	+3%/-3%	+18%/-6%	+32%/-27%	+40%/-59%	+9%/-9%	+1031%/-52%
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 010198109-02 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-42 \pm 7$	$12.44^{+2.68}_{-3.74}$	$1290^{+146}_{-209}$	$2537^{+71}_{-82}$	$2.239^{+2.498}_{-0.770}$
Alt.	$-16 \pm 6$	$11.77^{+2.52}_{-3.70}$	$1293^{+147}_{-227}$	$2243^{+123}_{-217}$	$0.990^{+1.202}_{-0.480}$

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

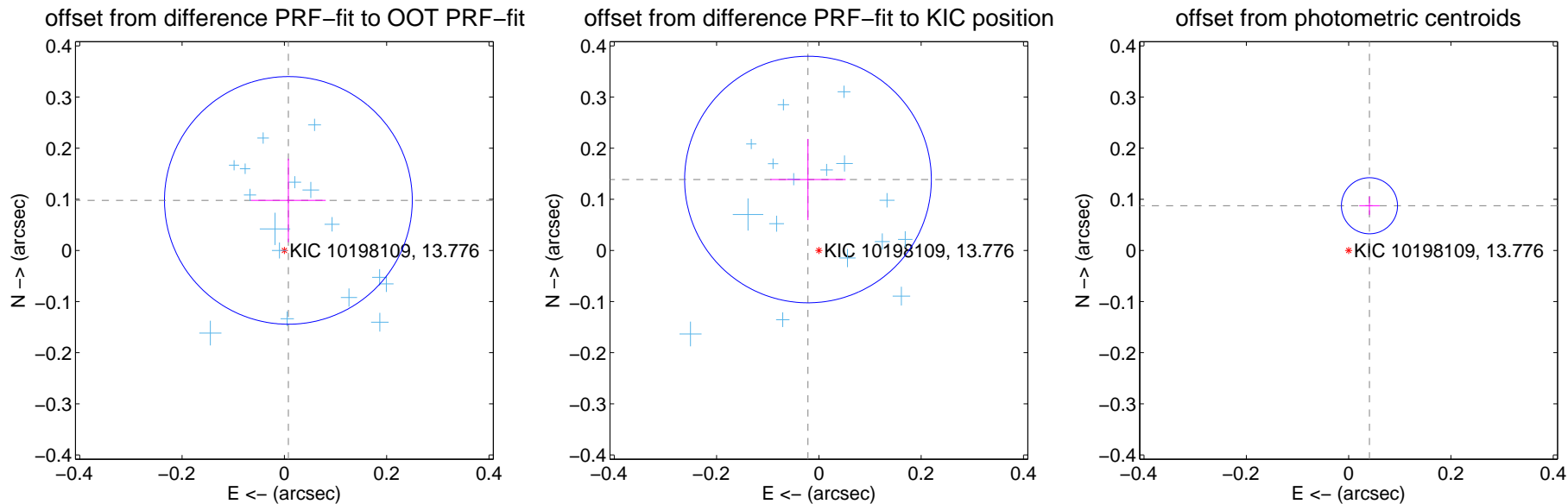
## DV Centroid Data

Supplemental centroid analysis for 010198109-02. Kepler magnitude: 13.78. Transit SNR 348.66

There are 17 quarters with good PRF difference image offsets

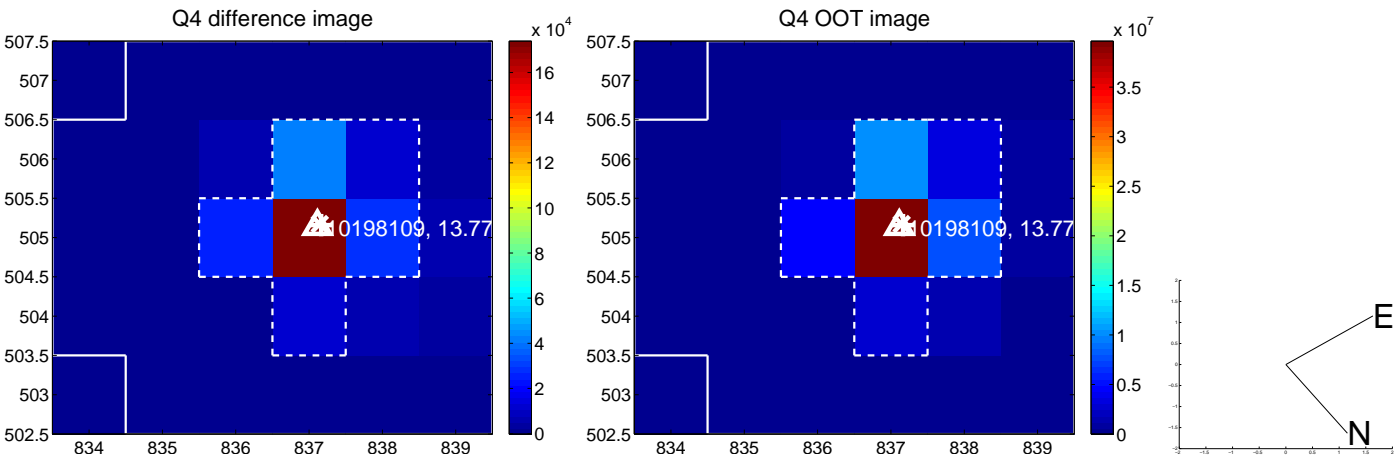
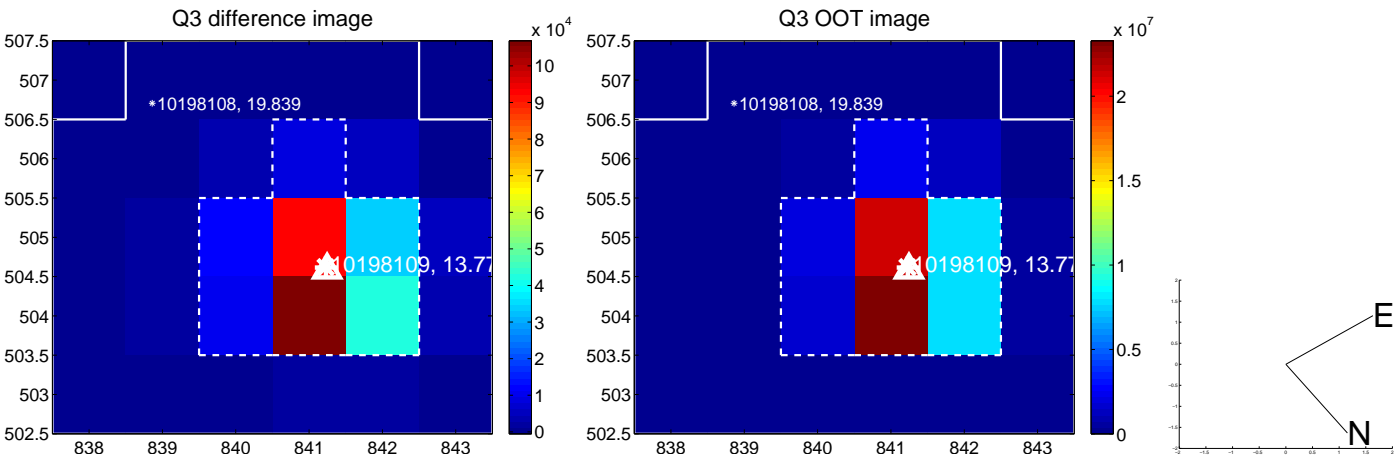
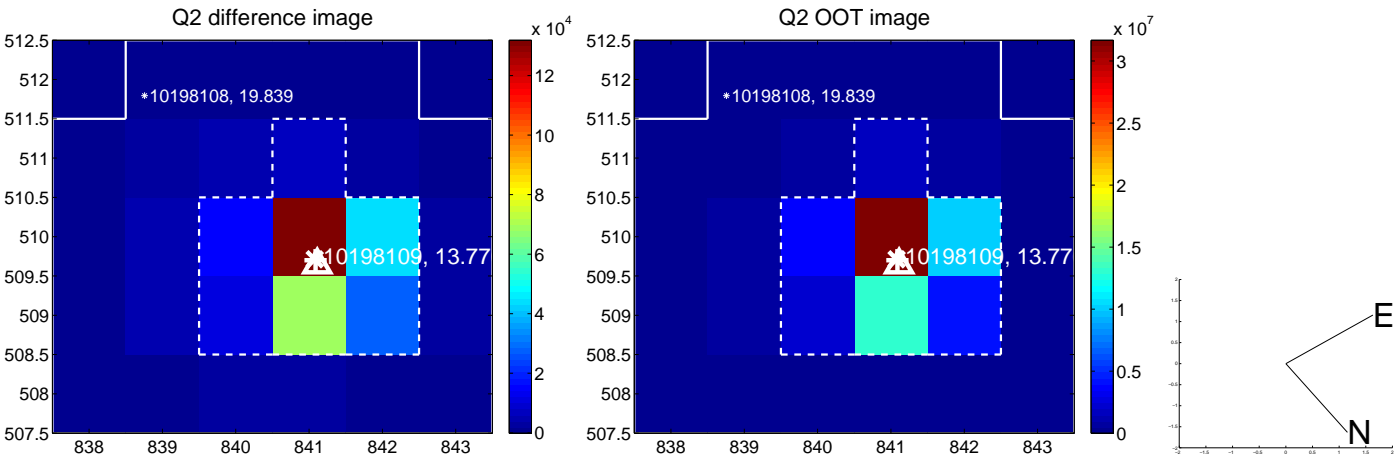
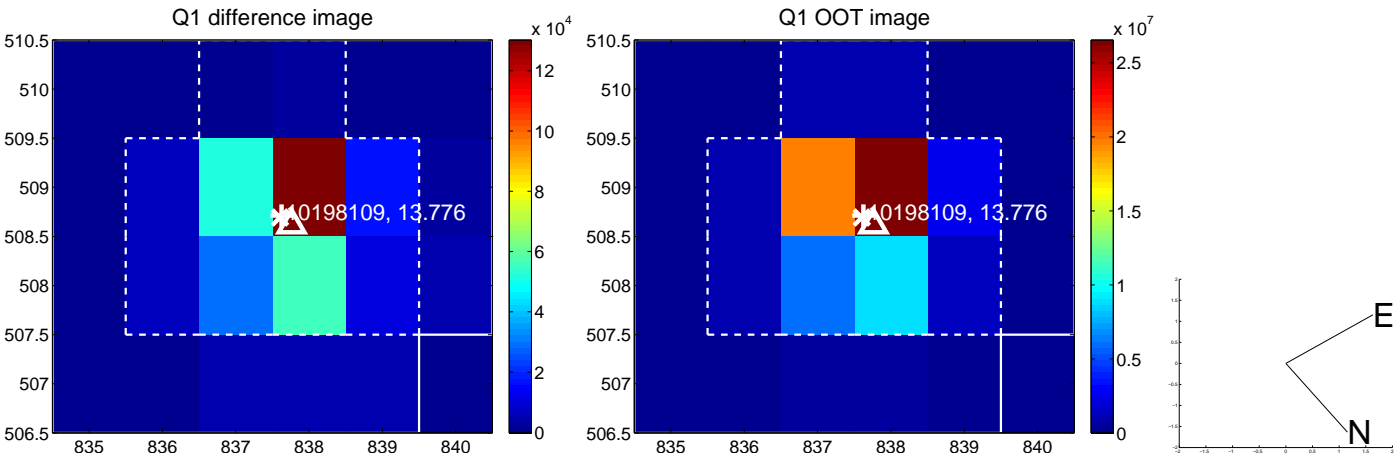
The direct PRF centroid is offset from the target star catalog position by about 0.12 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.098 \pm 0.081$	1.22	$-0.008 \pm 0.073$	$0.098 \pm 0.082$
PRF-fit source offset from KIC position	$0.140 \pm 0.080$	1.75	$0.021 \pm 0.074$	$0.139 \pm 0.079$
photometric centroid source offset	$0.10 \pm 0.02$	5.27	$-0.04 \pm 0.02$	$0.09 \pm 0.02$

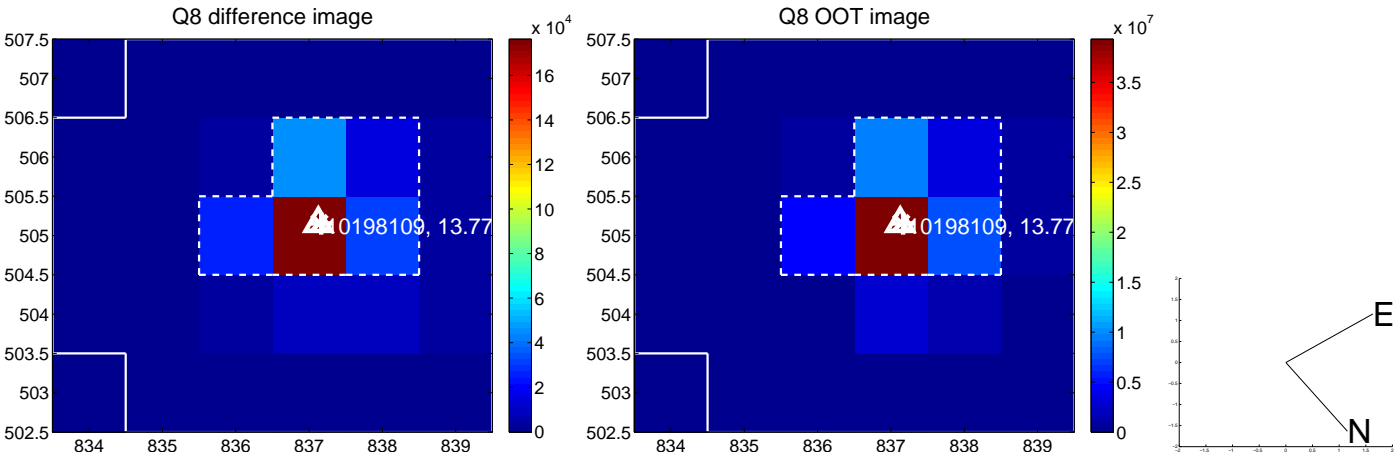
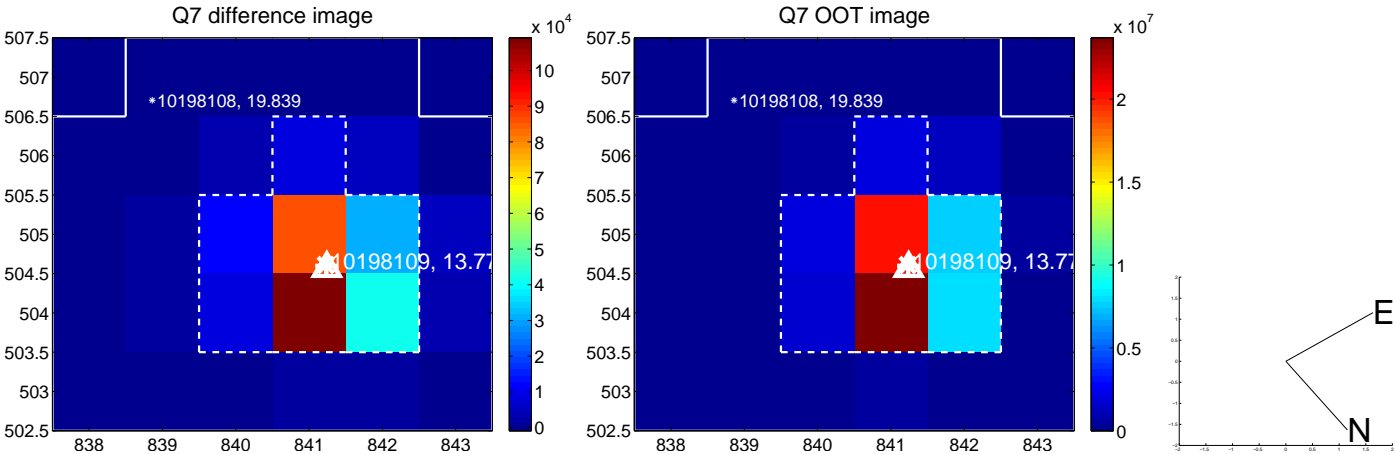
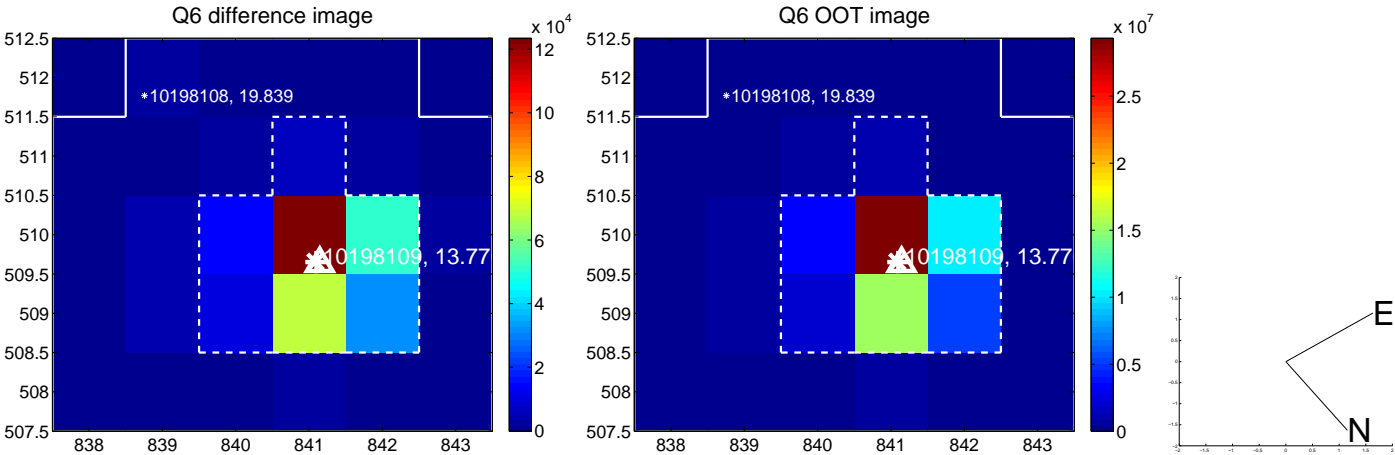
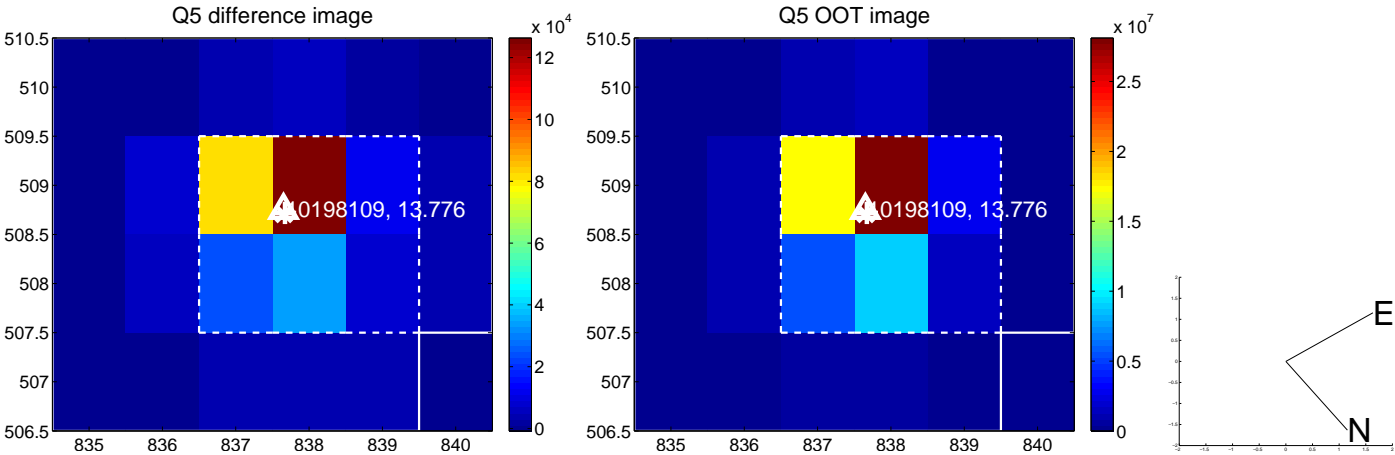


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses:** good quarterly centroid offsets; **Vermillion crosses:** bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

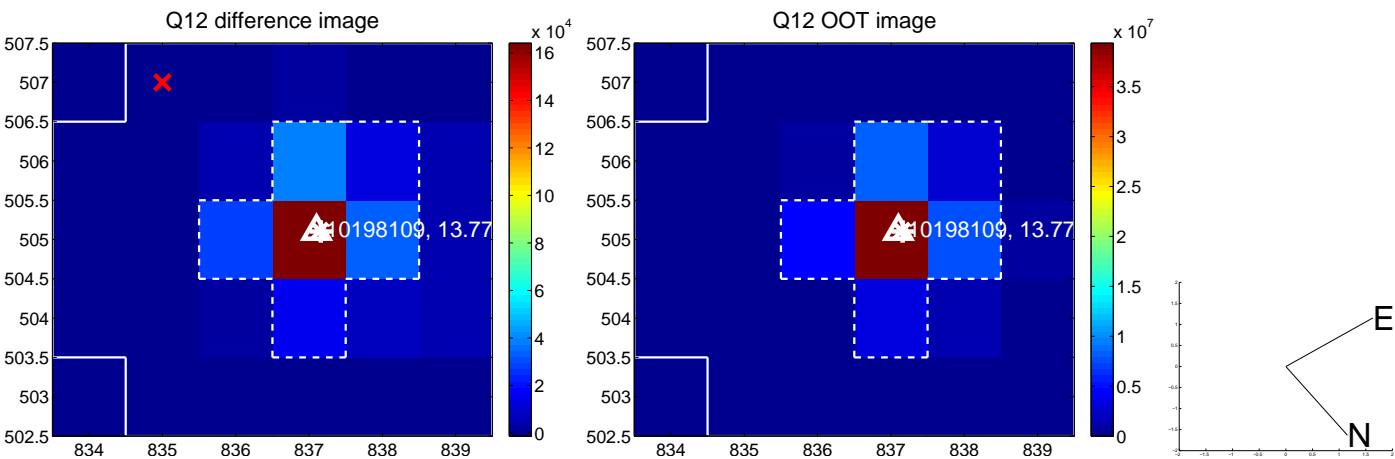
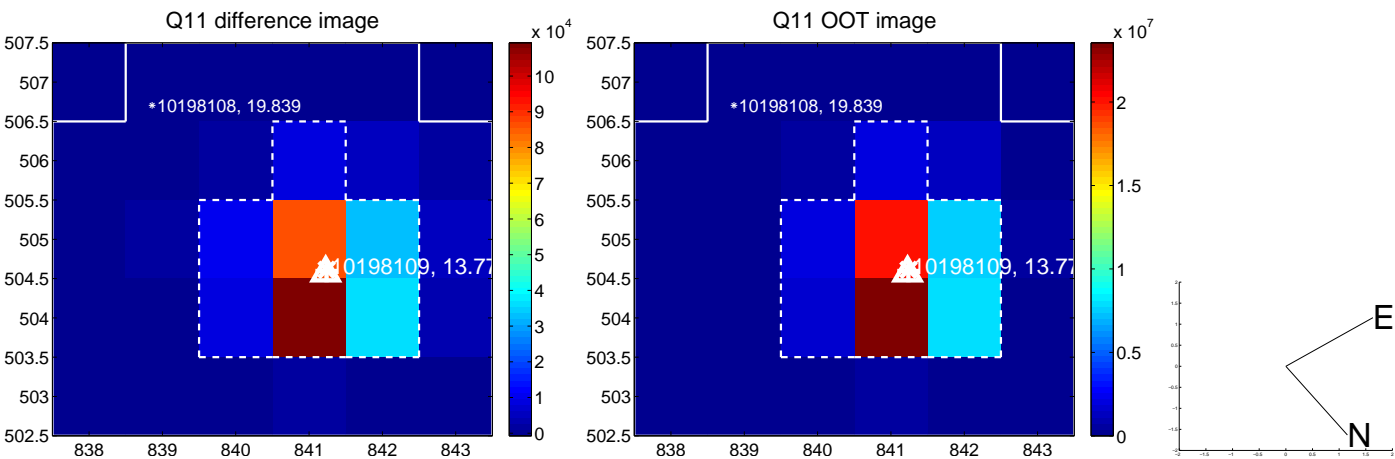
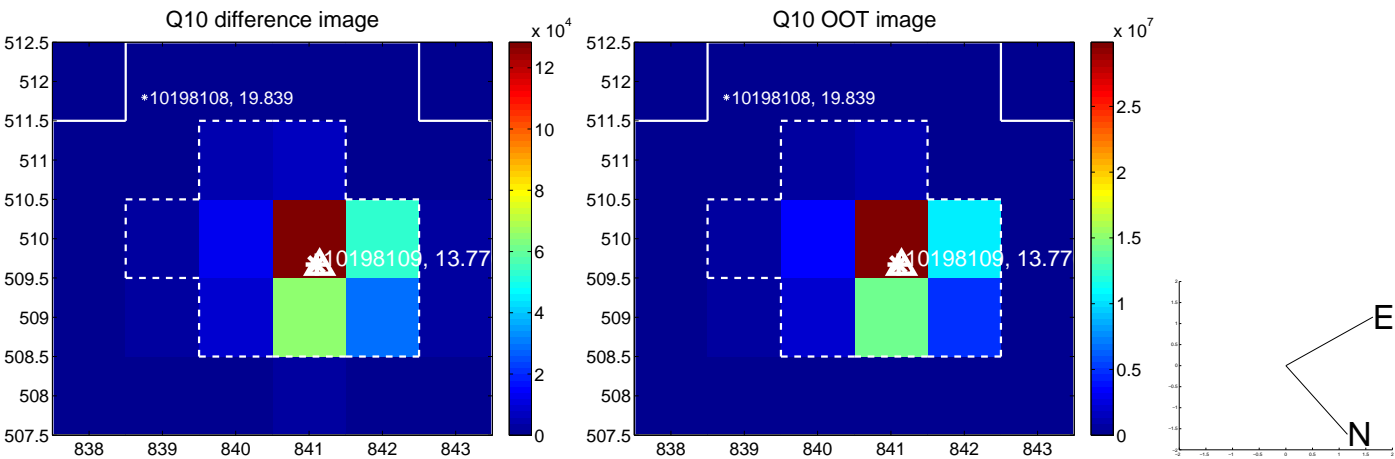
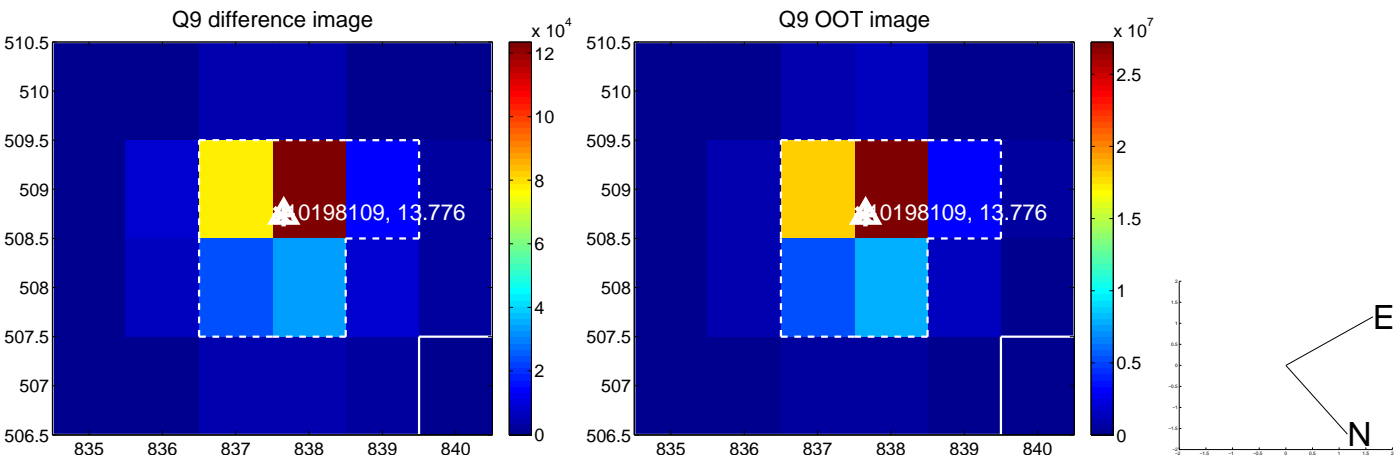
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



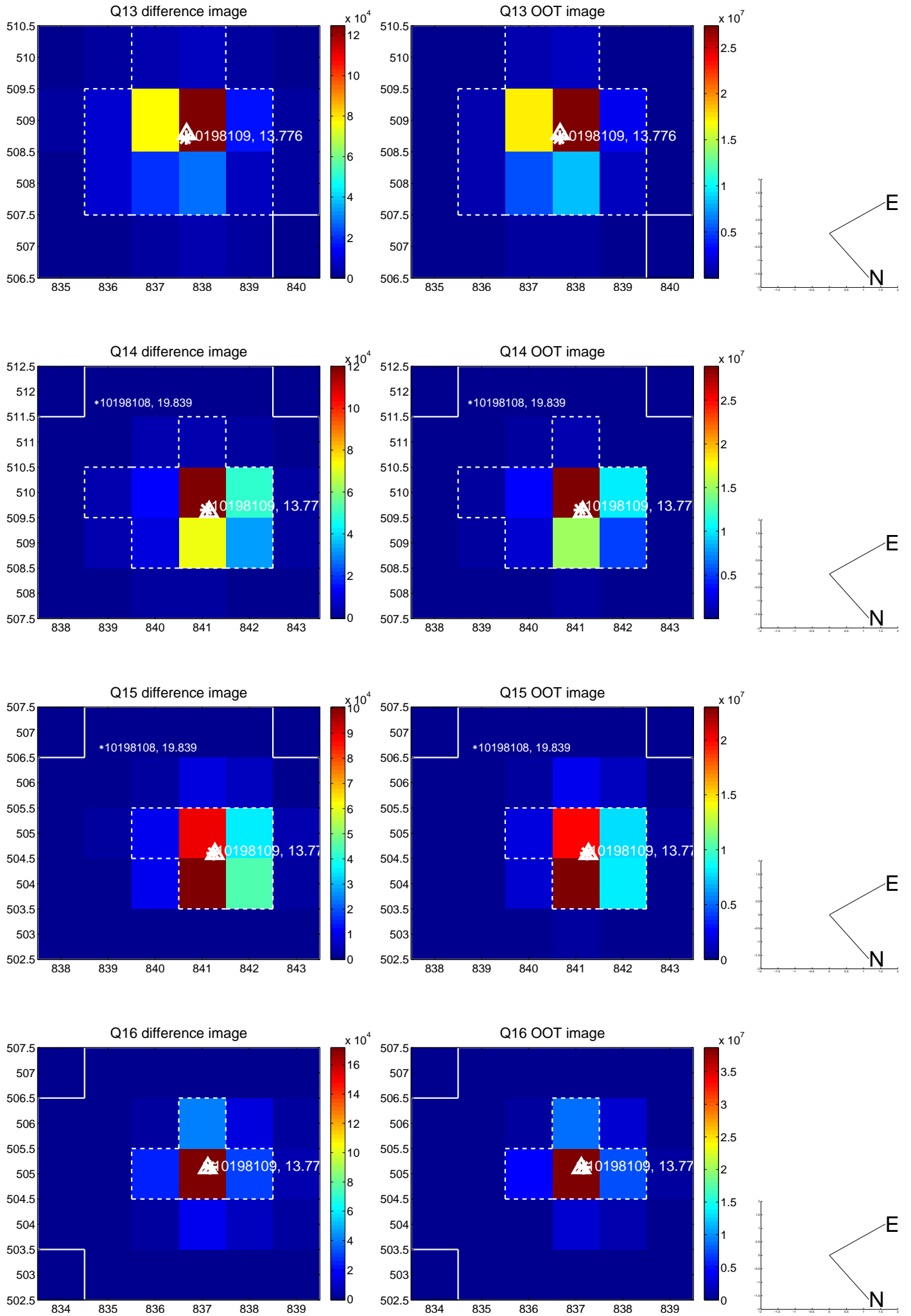
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



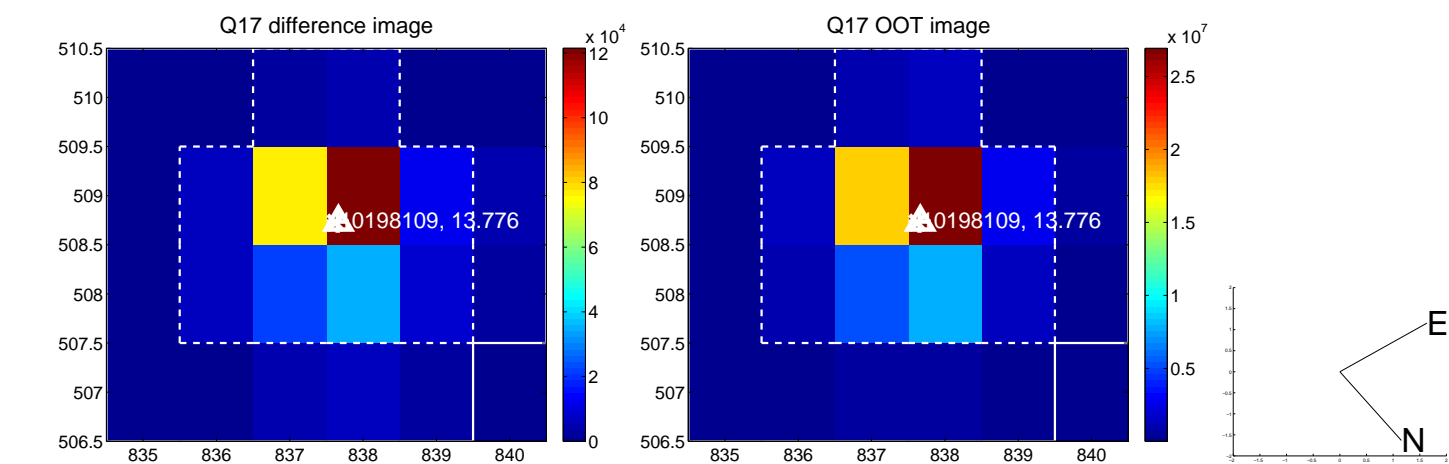
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



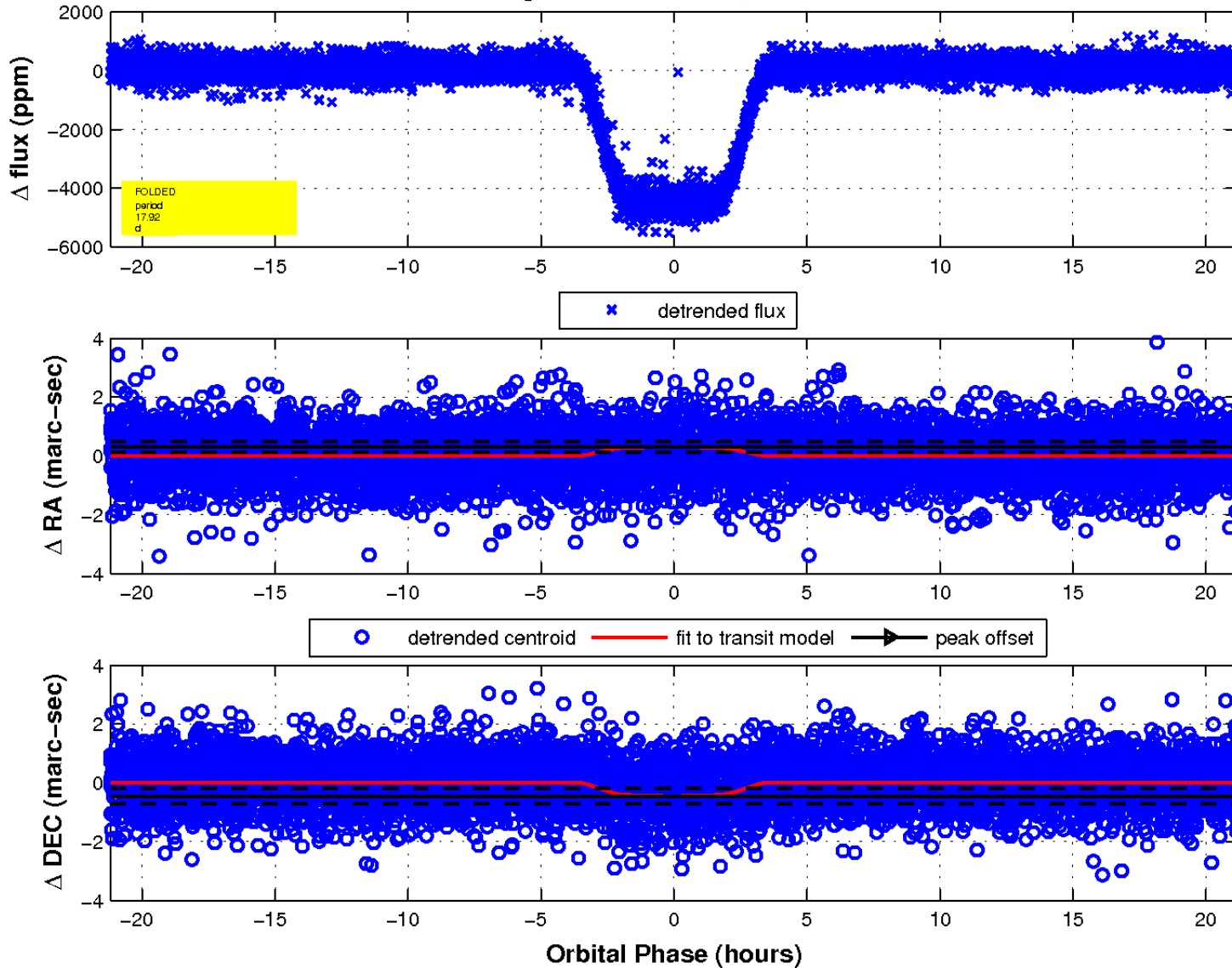
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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



fluxWeightedCentroids, Planet 2 of 2



UKIRT Image

Declination

