

# KIC 009838060

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
009838060-01	OBS	3314.01	23.815836	154.845599	52587.6	3.937	752.6	708.0	0.82	5561	26.42	23.24
009838060-02	OBS	No	23.815823	141.847296	4832.8	3.834	72.3	71.9	0.82	5561	8.83	23.24

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009838060-01	OBS	FP	0.00	0	1	0	0	MOD_SEC_DV—MOD_SEC_ALT—DEEP_V_SHAPED—HAS_SEC_TCE
009838060-02	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.

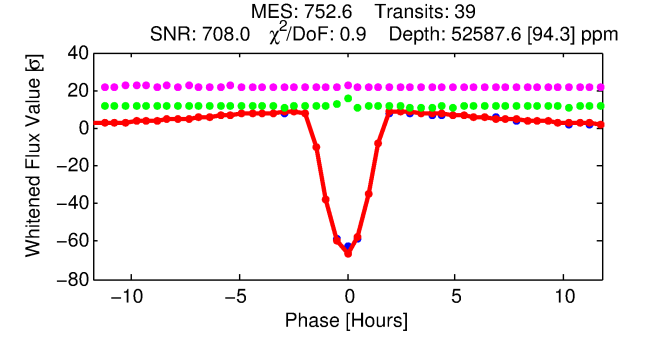
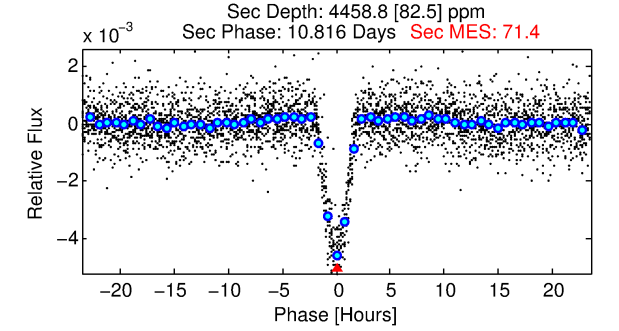
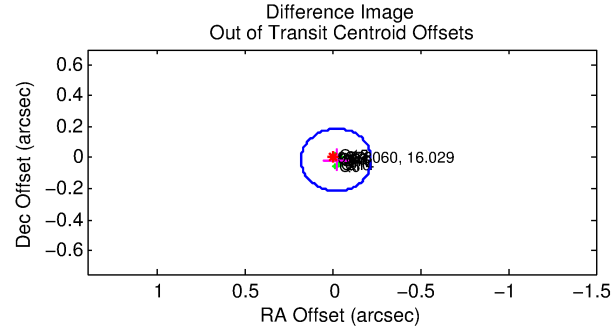
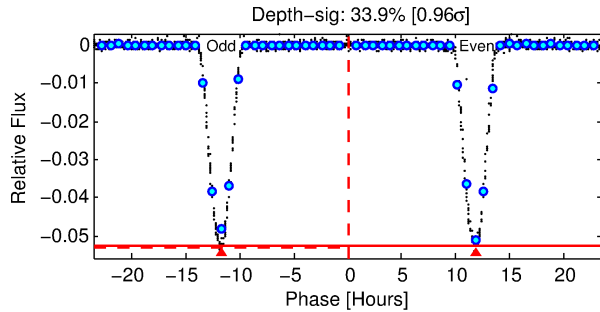
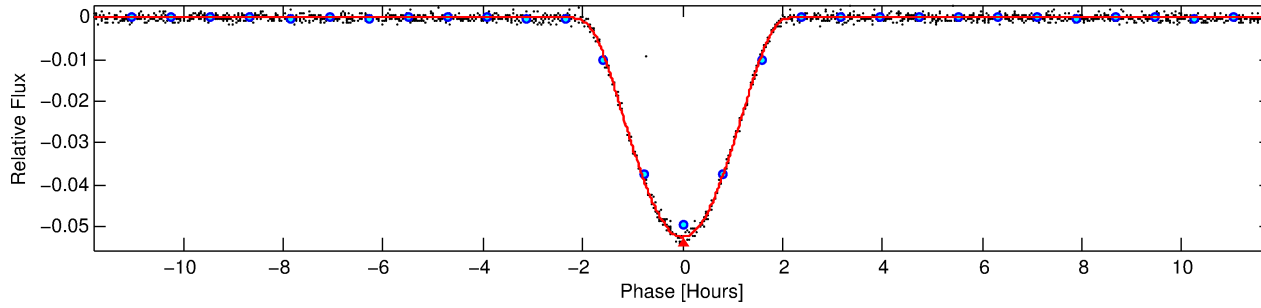
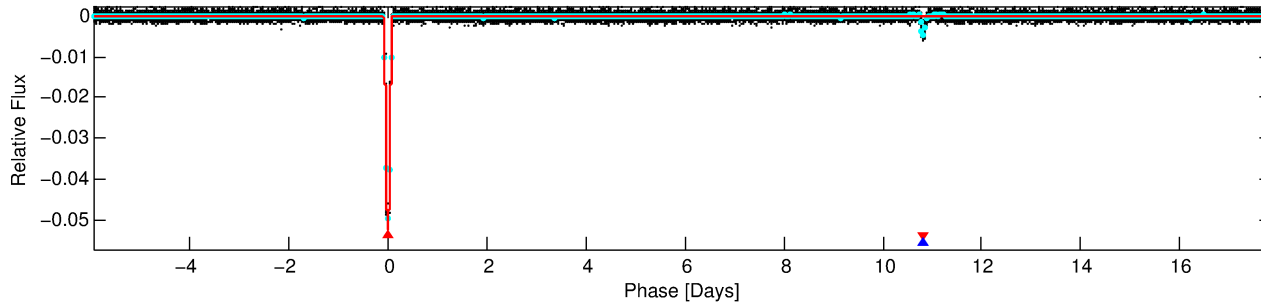
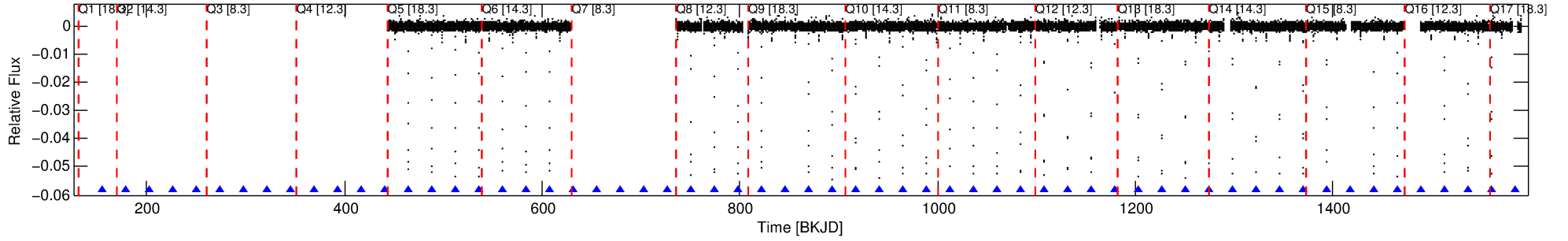
## Ephemeris Match Information For 009838060-01

No Significant Match Found

# DV One-Page Summary

KIC: 9838060 Candidate: 1 of 2 Period: 23.816 d  
KOI: K03314 Corr: No Ephemeris Match

Kp: 16.03 R\*: 0.82 Rs Teff: 5561.0 K Logg: 4.57 Fe/H: -0.120



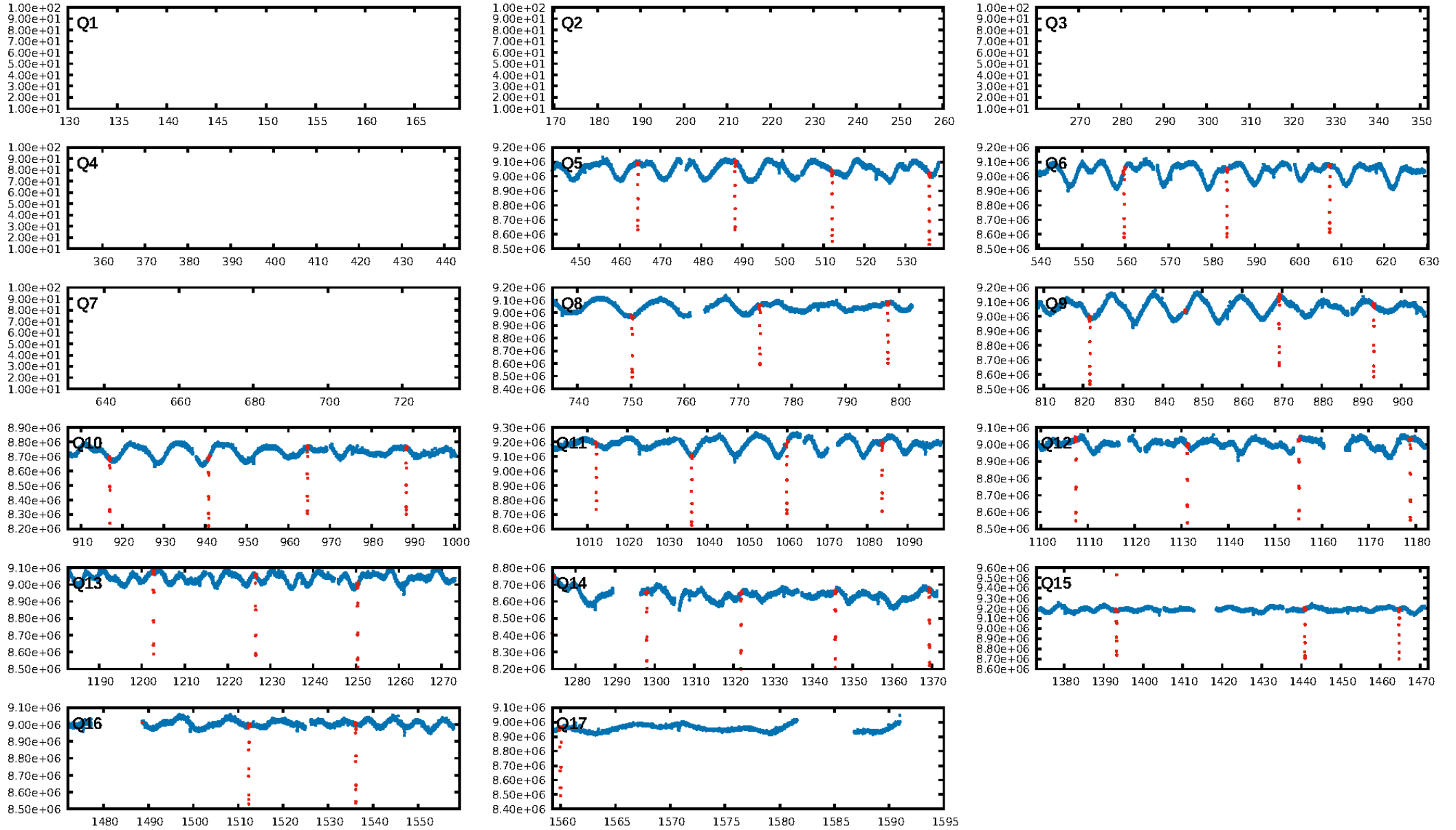
## DV Fit Results:

Period = 23.81584 [0.00001] d  
Epoch = 154.8456 [0.0002] BKJD  
Rp/R\* = 0.2960 [0.0162]  
a/R\* = 43.09 [0.23]  
b = 0.90 [0.03]  
Seff = 23.24 [7.15]  
Teq = 560 [43] K  
Rp = 26.42 [6.21] Re  
a = 0.1571 [0.0301] AU  
Ag = 86.69 [26.01] [3.29σ]  
Teffp = 2641 [113] K [17.15σ]

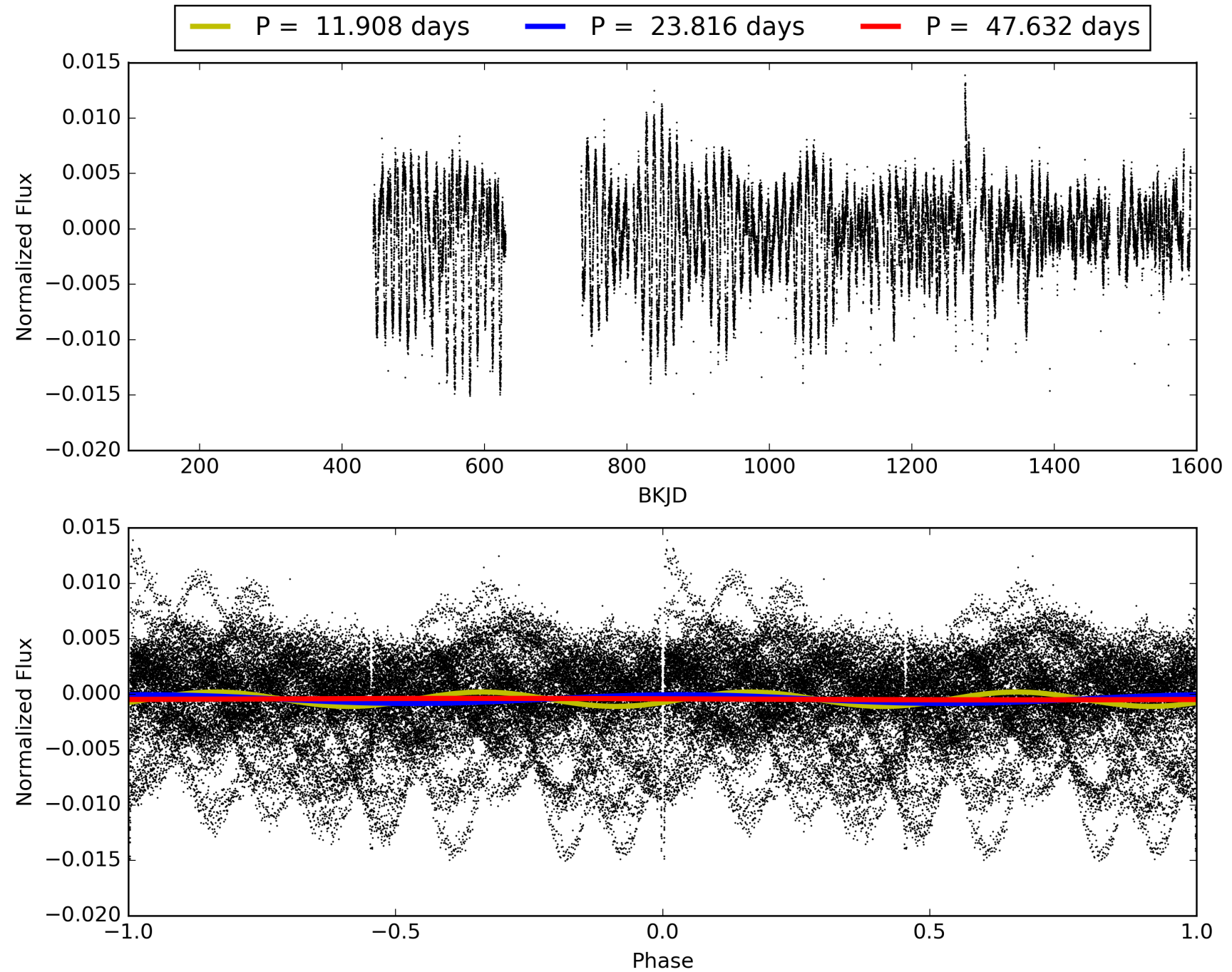
## DV Diagnostic Results:

ShortPeriod-sig: 0.0% [0.00σ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: 0.2%  
ModelChiSquareGof-sig: 100.0%  
Bootstrap-pfa: 0.00e+00  
RollingBand-fgt: 1.00 [38/38]  
GhostDiagnostic-chr: 4.414  
Centroid-sig: 0.0%  
Centroid-so: 0.156 arcsec [9.05σ]  
OotOffset-rm: 0.023 arcsec [0.34σ]  
KicOffset-rm: 0.149 arcsec [2.20σ]  
OotOffset-st: 3/2/3/3 [11]  
KicOffset-st: 3/2/3/3 [11]  
DiffImageQuality-fgm: 1.00 [11/11]  
DiffImageOverlap-fno: 1.00 [11/11]

# TCE 009838060-01, PDC Light Curves

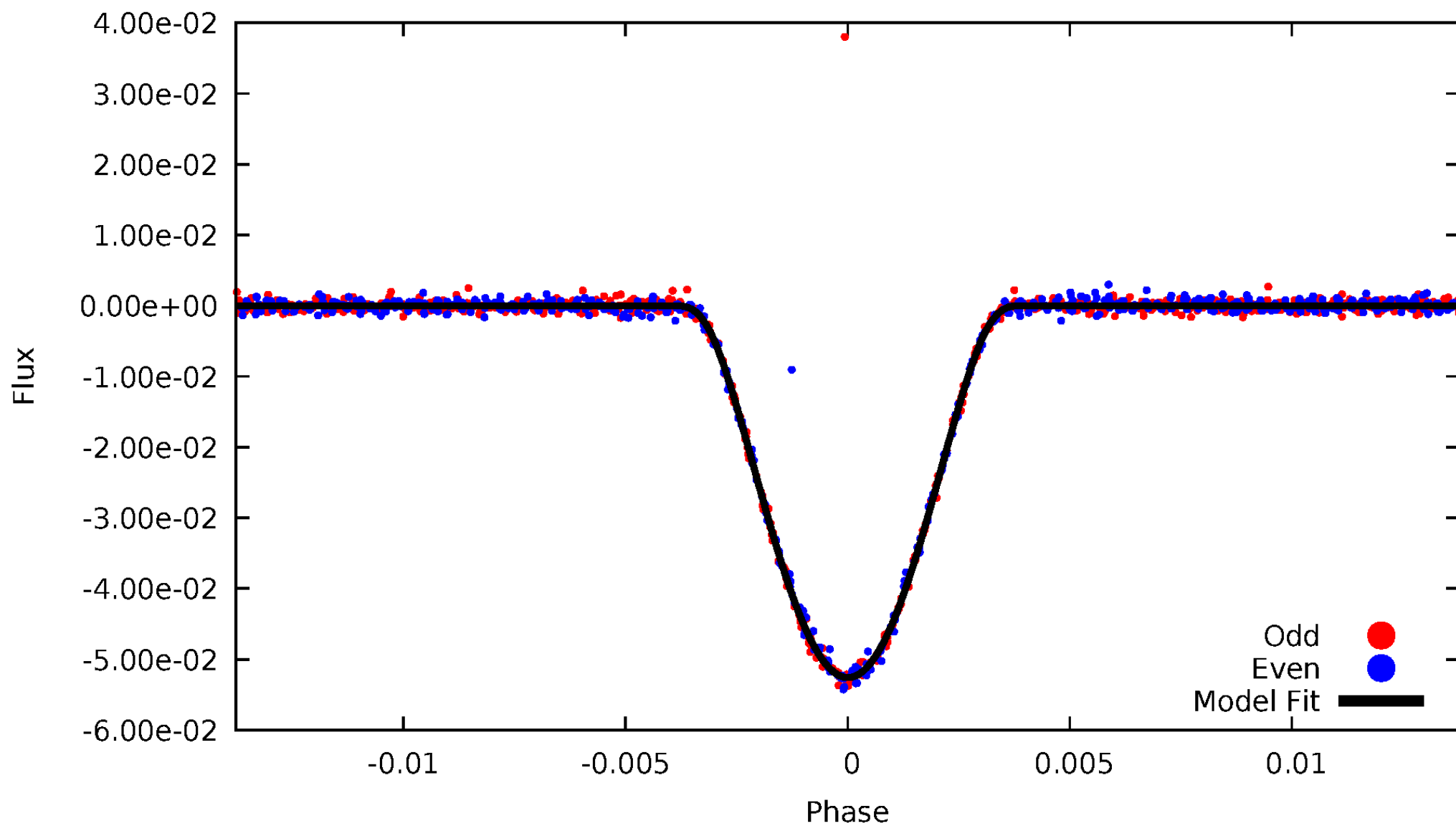


TCE 009838060-01



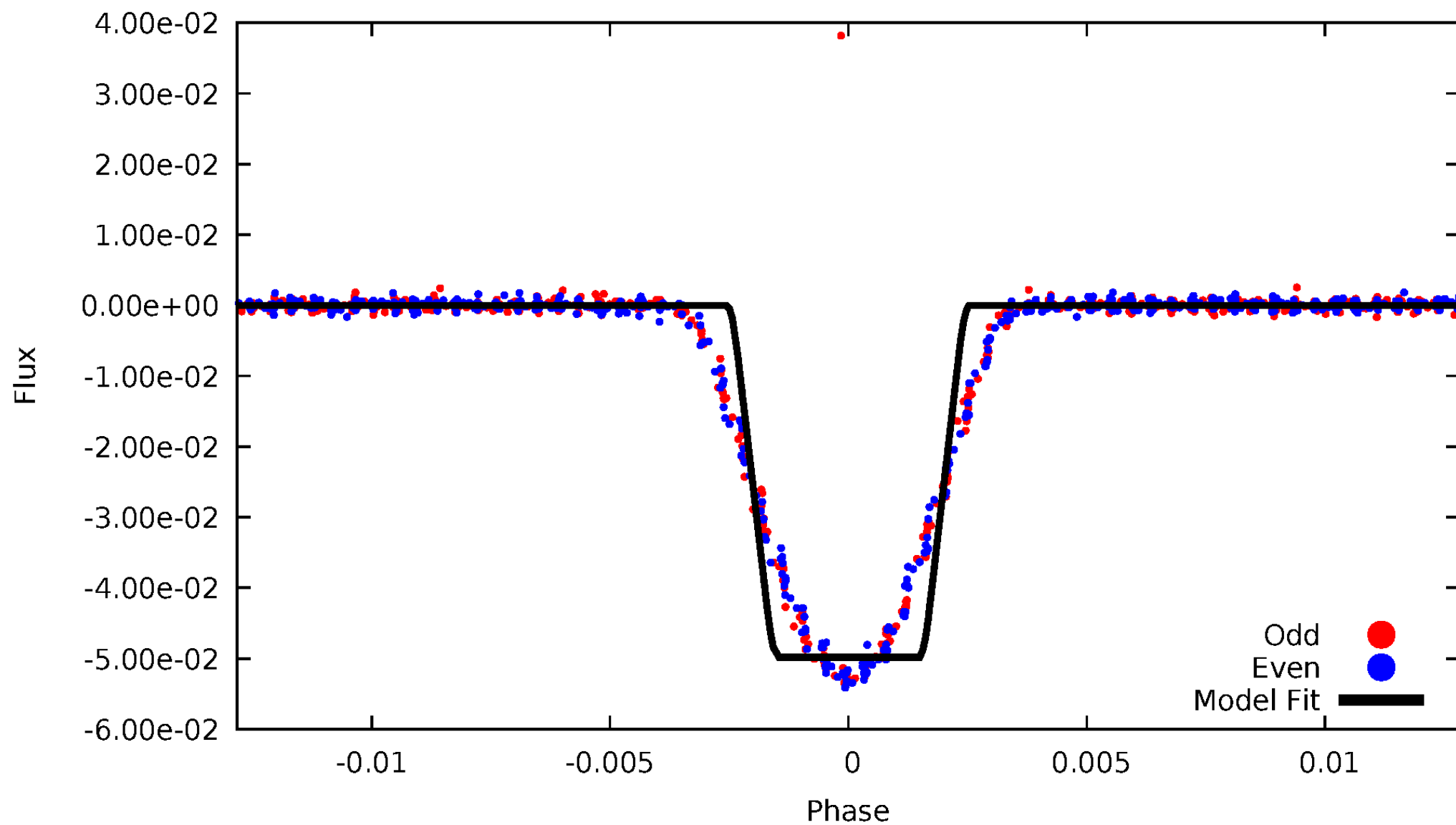
# DV Odd/Even

TCE 009838060-01



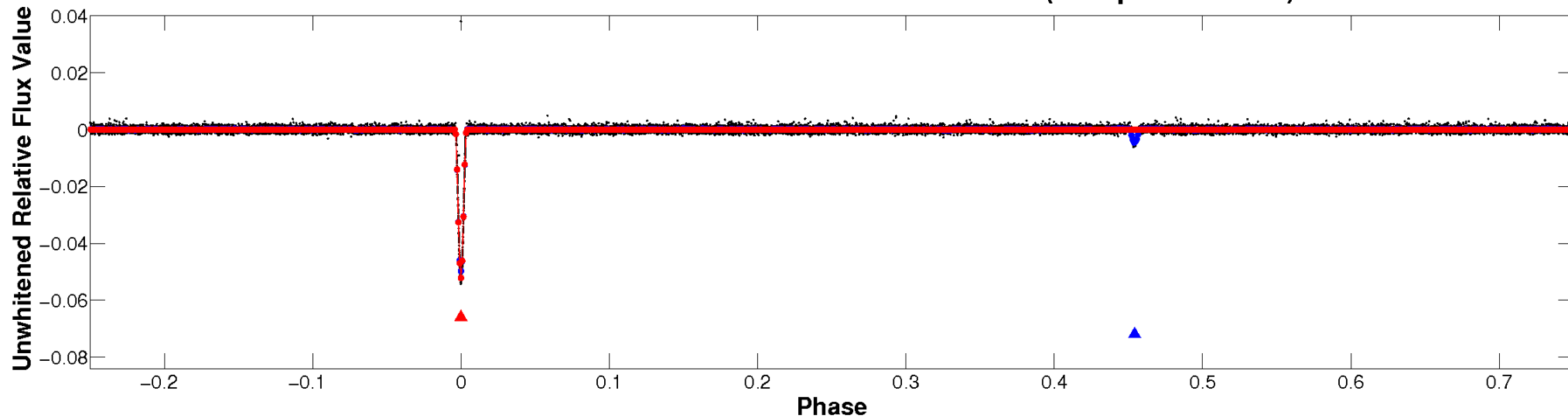
# ALT Odd/Even

TCE 009838060-01

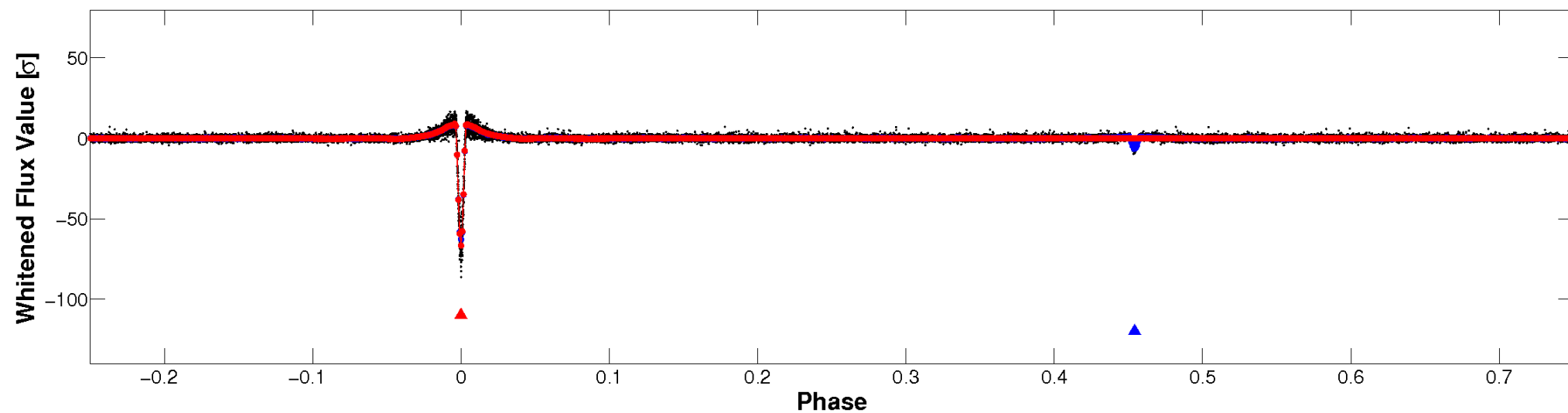


# Non-Whitened Vs. Whitened Light Curve

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

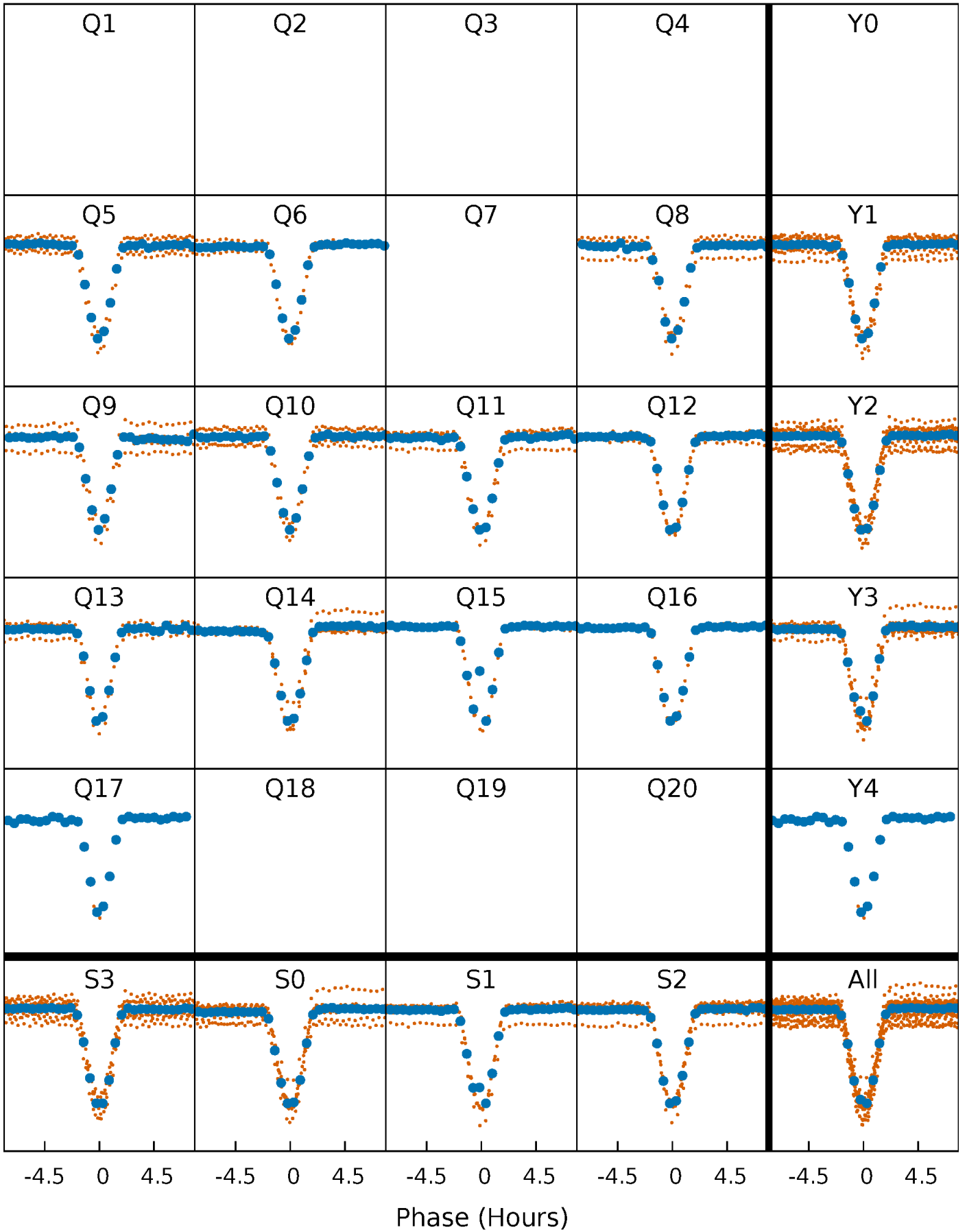


**Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)**



# PDC Quarter-Phased Transit Curves

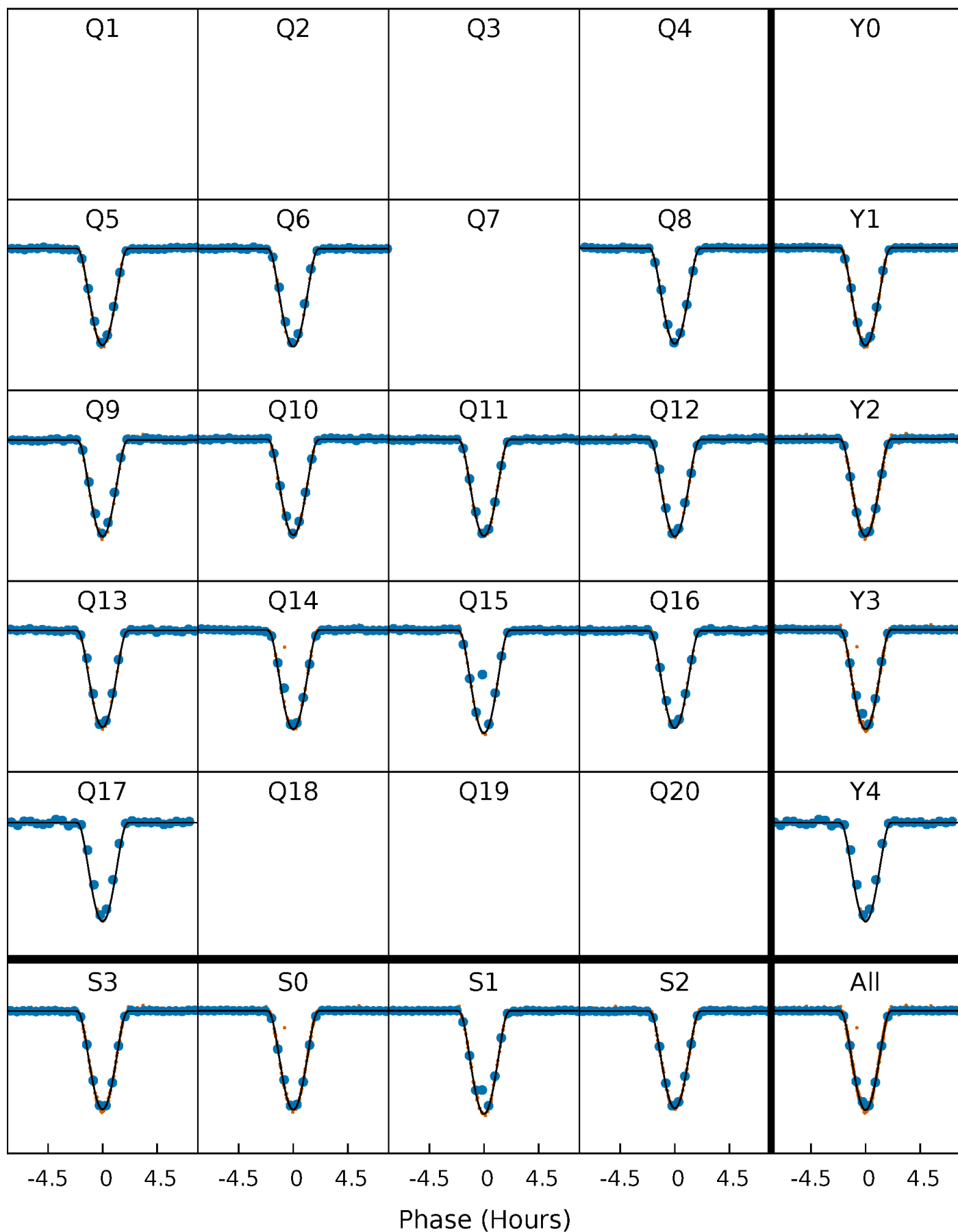
TCE 009838060-01   P= 23.815836 Days    $T_0=154.845598$  (BKJD)





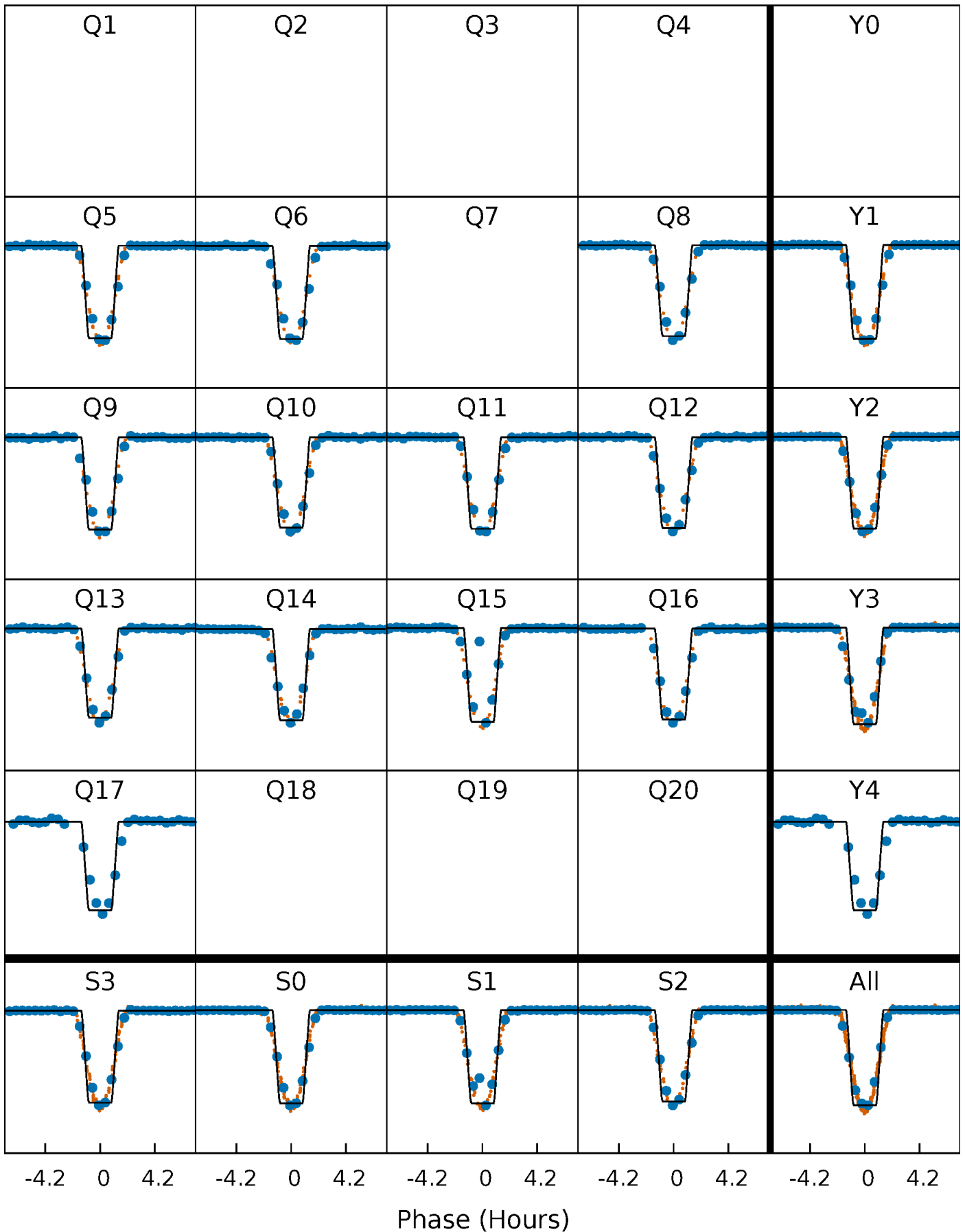
# DV Quarter-Phased Transit Curves

TCE 009838060-01 P= 23.815836 Days  $T_0=154.845598$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

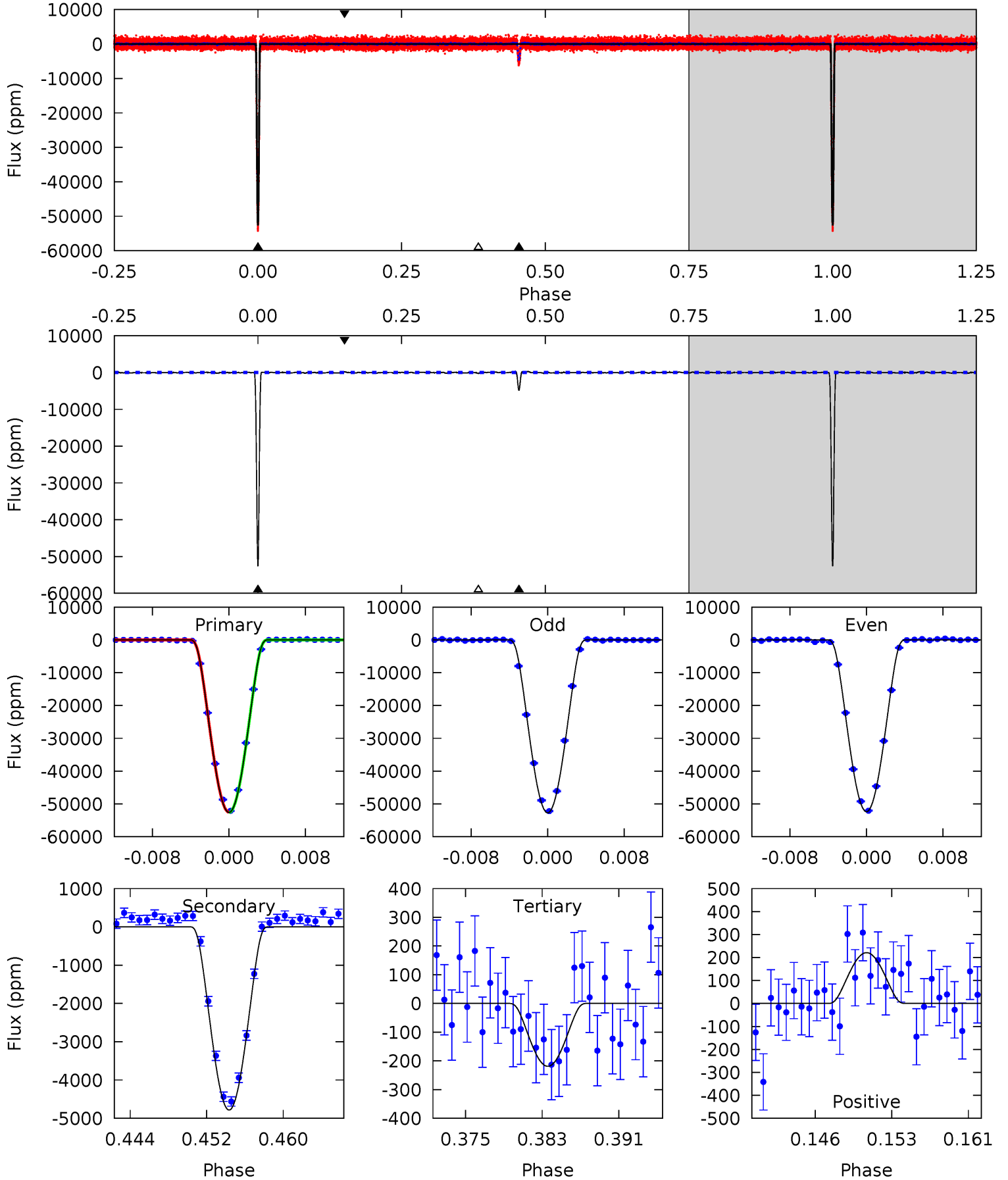
TCE 009838060-01 P= 23.815969 Days  $T_0=154.840727$  (BKJD)



# DV Model-Shift Uniqueness Test

009838060-01, P = 23.815836 Days, E = 154.845598 Days

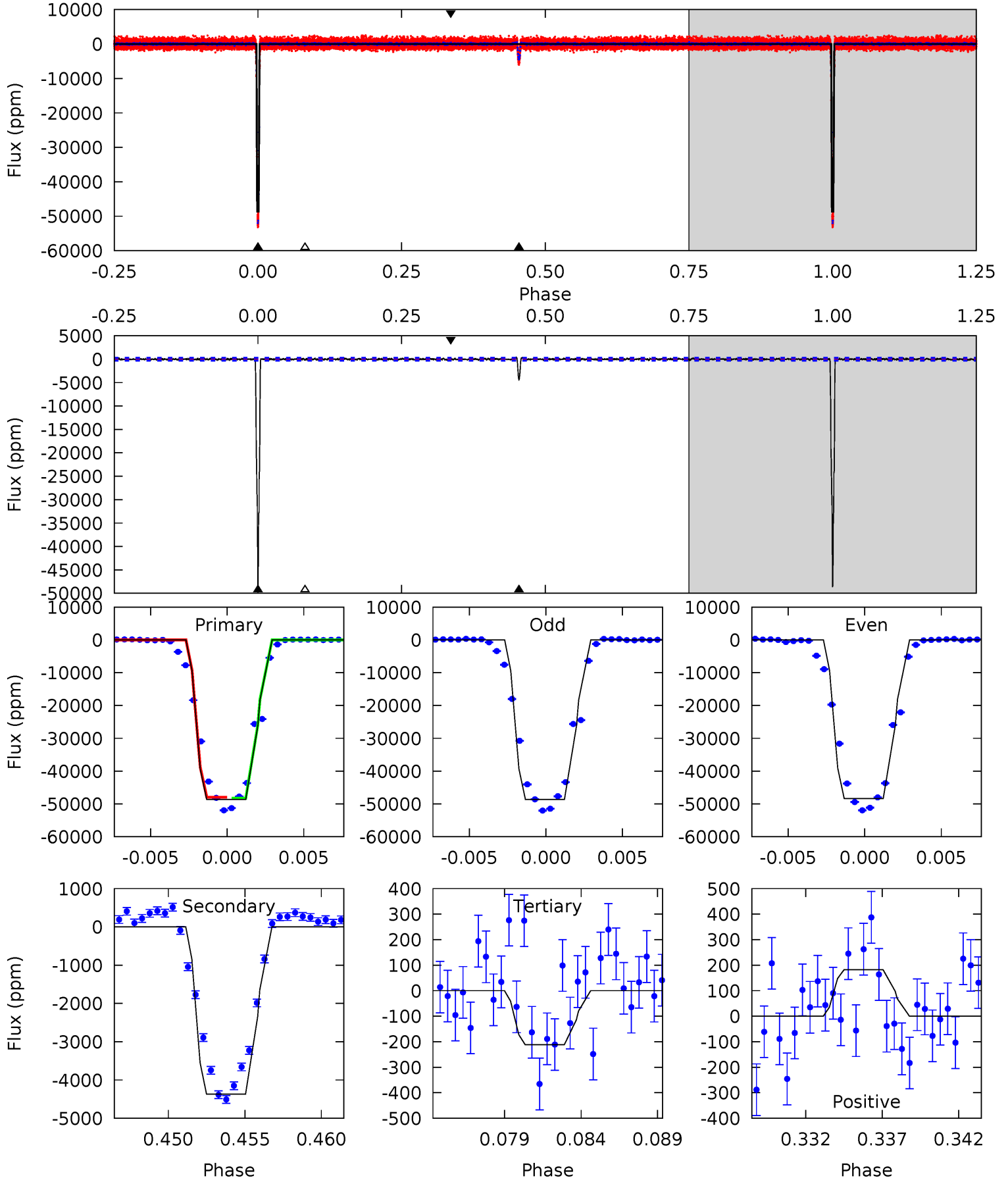
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
1459	132.7	6.07	6.13	5.08	2.67	1.94	1453	1453	126.6	126.5	4.90	0.98	0.01	1.17



# Alt Model-Shift Uniqueness Test

009838060-01, P = 23.815969 Days, E = 154.840727 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
881.2	79.1	3.84	3.30	5.16	2.81	1.09	877.4	877.9	75.3	75.8	2.48	0.99	0.01	2.71



### Stellar Parameters For KIC 009838060

	$T_{\text{eff}} (K)$	$\log(g)$	$[\text{Fe}/\text{H}]$	$R (R_{\odot})$	$M (M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$5561^{+182}_{-182}$	$4.572^{+0.038}_{-0.152}$	$-0.120^{+0.300}_{-0.300}$	$0.818^{+0.187}_{-0.067}$	$0.915^{+0.081}_{-0.112}$	$2.358^{+0.472}_{-0.991}$
	+3%/-3%	+1%/-3%	+250%/-250%	+23%/-8%	+9%/-12%	+20%/-42%
Source	KIC0	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 009838060-01 / KOI 3314.01

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-4784 \pm 36$	$27.09^{+3.55}_{-2.33}$	$797^{+48}_{-35}$	$3260^{+88}_{-87}$	$86^{+17}_{-16}$
Alt.	$-4370 \pm 55$	$20.61^{+2.84}_{-2.18}$	$798^{+47}_{-36}$	$3501^{+122}_{-107}$	$137^{+33}_{-27}$

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

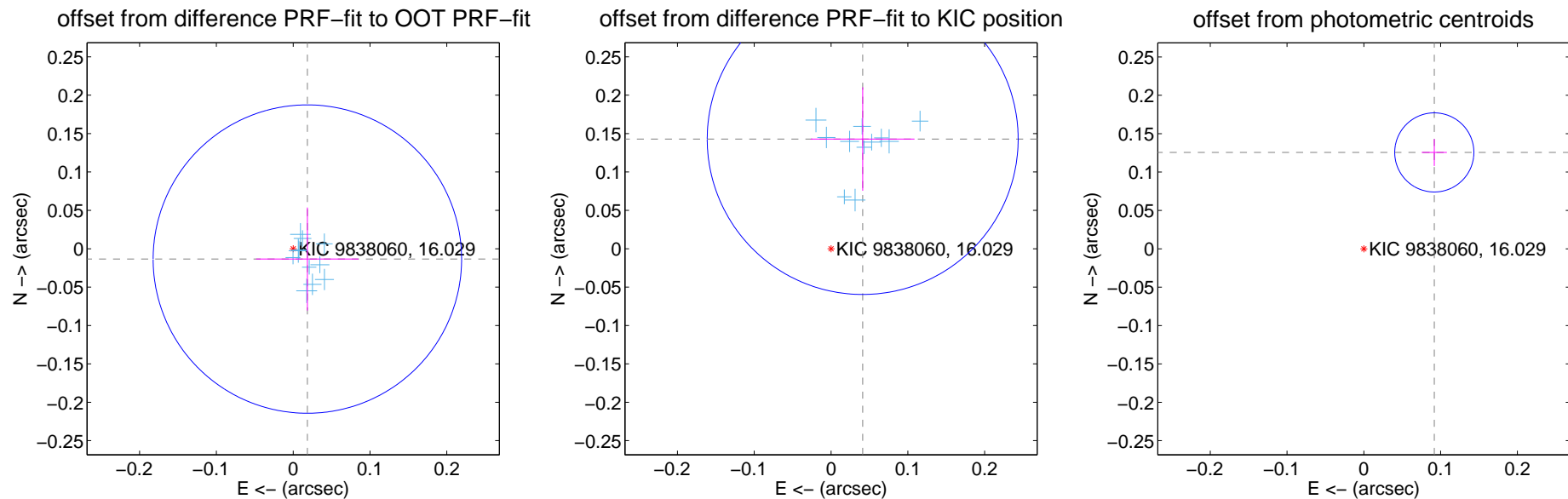
## DV Centroid Data

Supplemental centroid analysis for 009838060-01. Kepler magnitude: 16.03. Transit SNR 708.00

There are 11 quarters with good PRF difference image offsets

The direct PRF centroid is offset from the target star catalog position by about 0.16 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.023 \pm 0.067$	0.34	$-0.018 \pm 0.067$	$-0.013 \pm 0.067$
PRF-fit source offset from KIC position	$0.149 \pm 0.067$	2.20	$-0.041 \pm 0.068$	$0.143 \pm 0.067$
photometric centroid source offset	$0.16 \pm 0.02$	9.05	$-0.09 \pm 0.02$	$0.13 \pm 0.02$

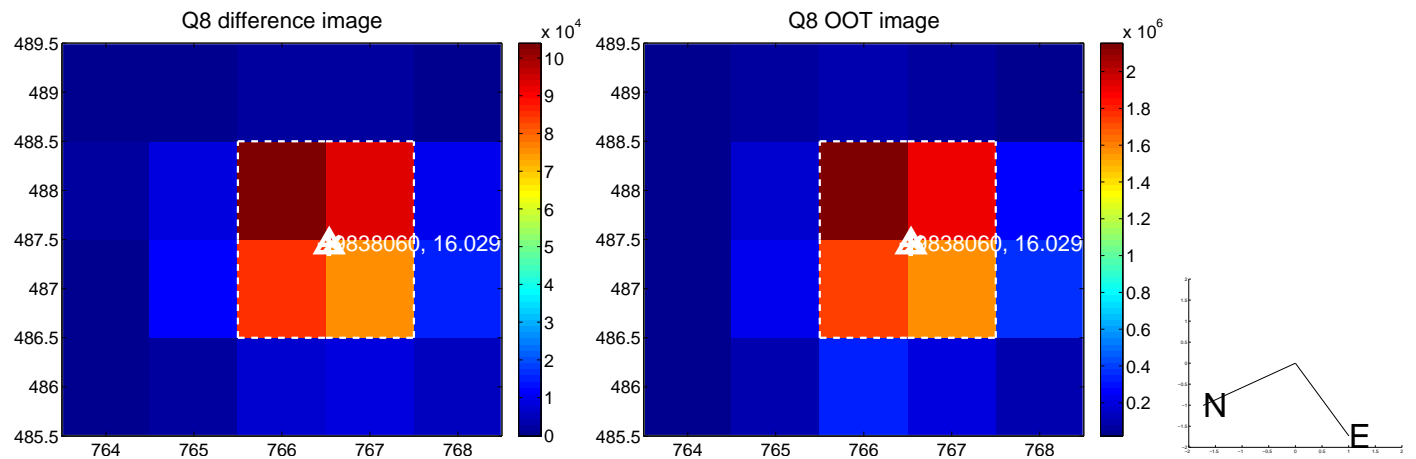
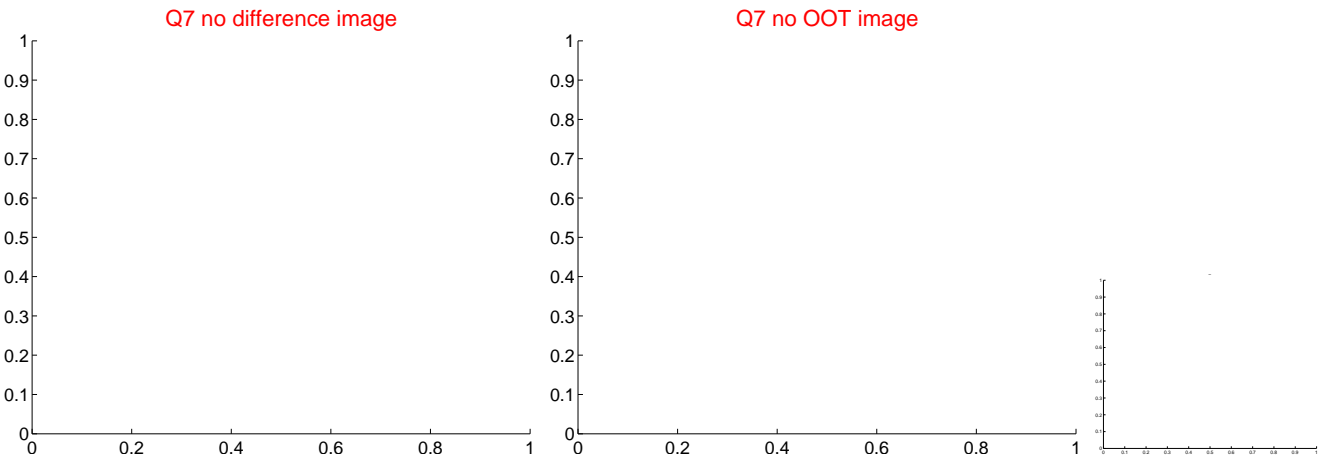
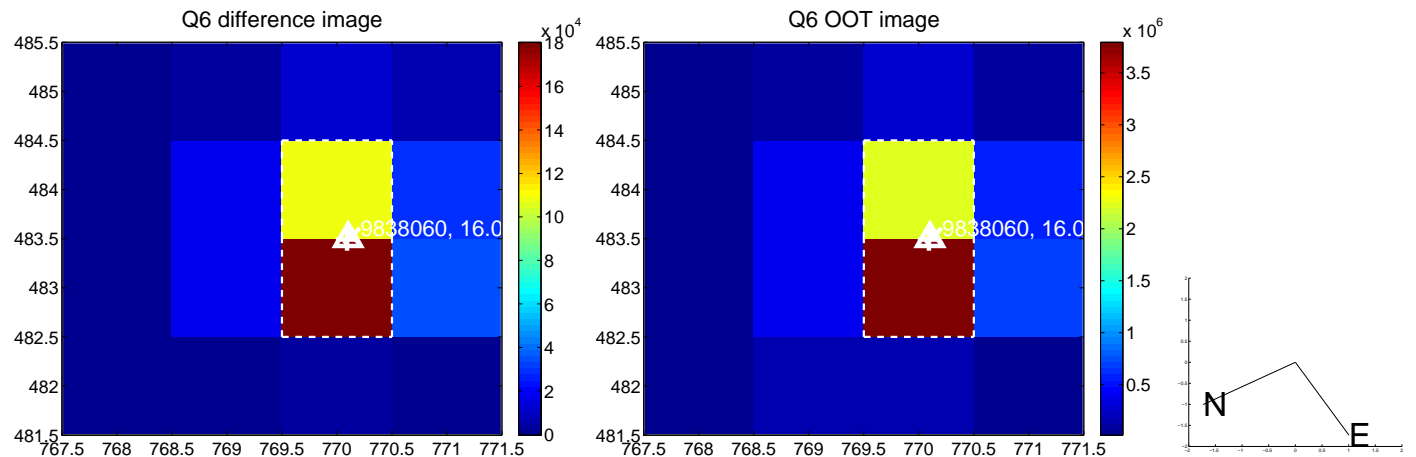
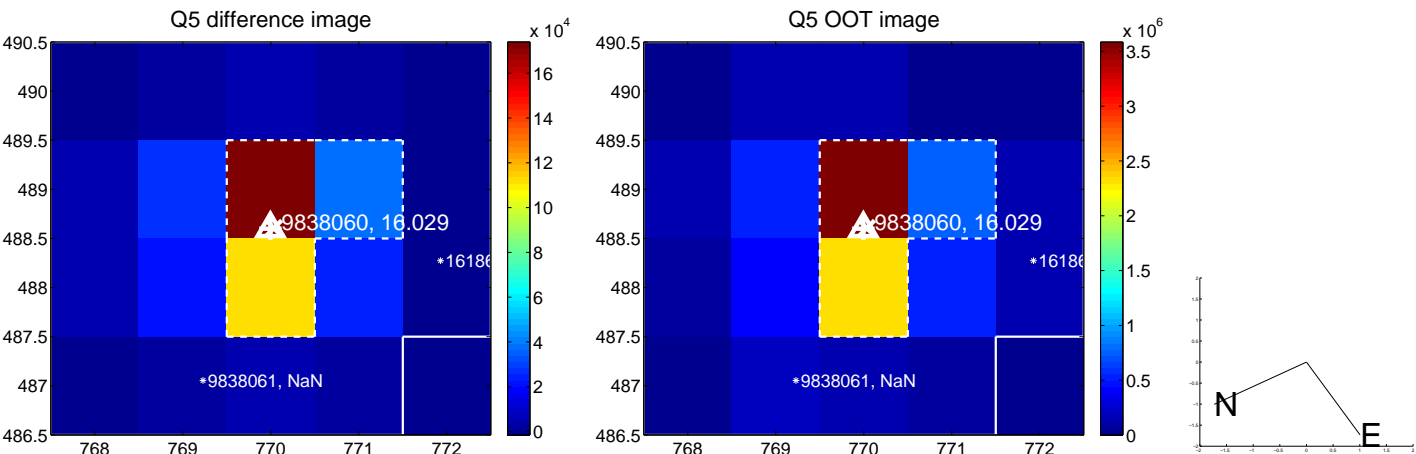


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses:** good quarterly centroid offsets; **Vermillion crosses:** bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

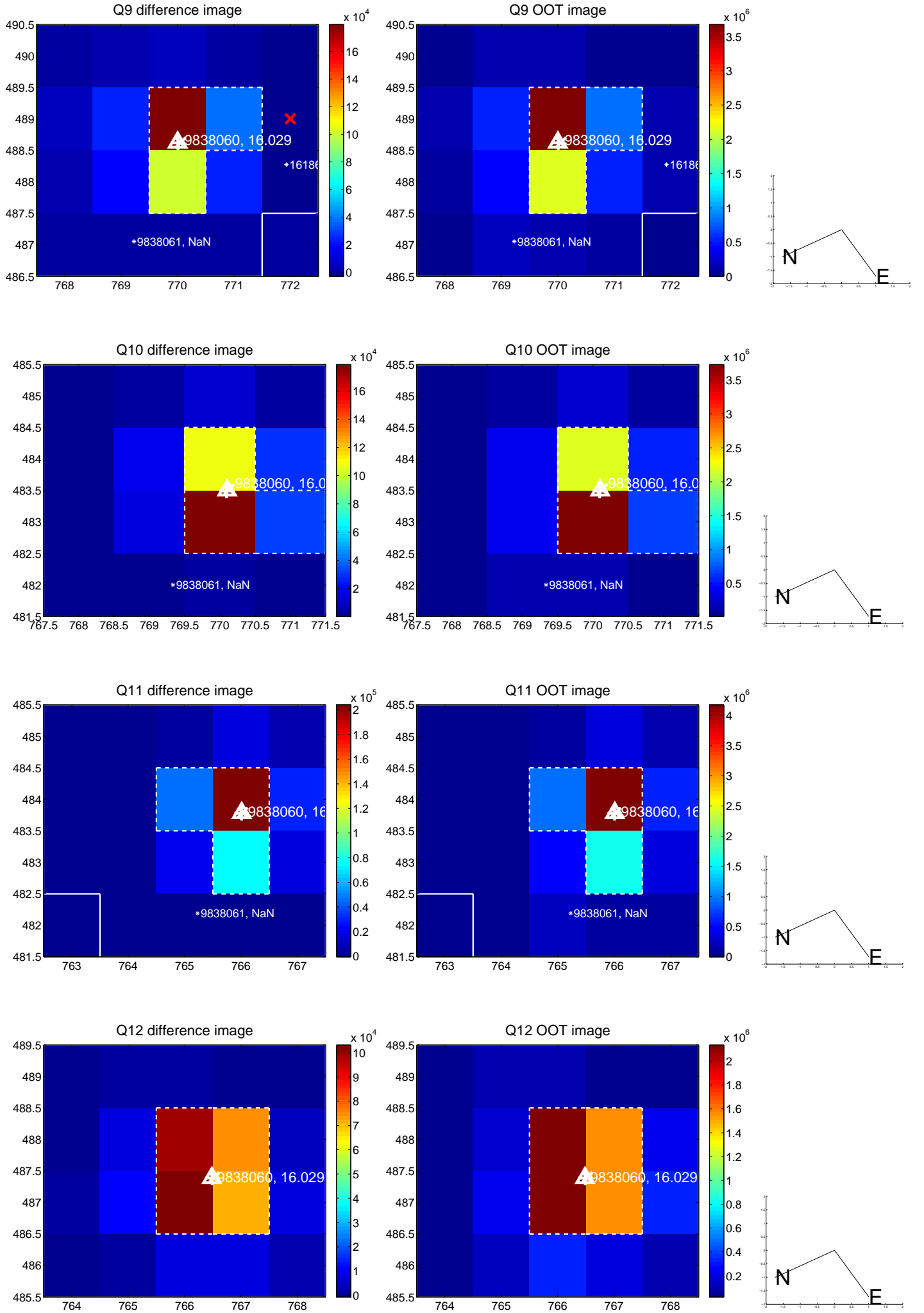


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

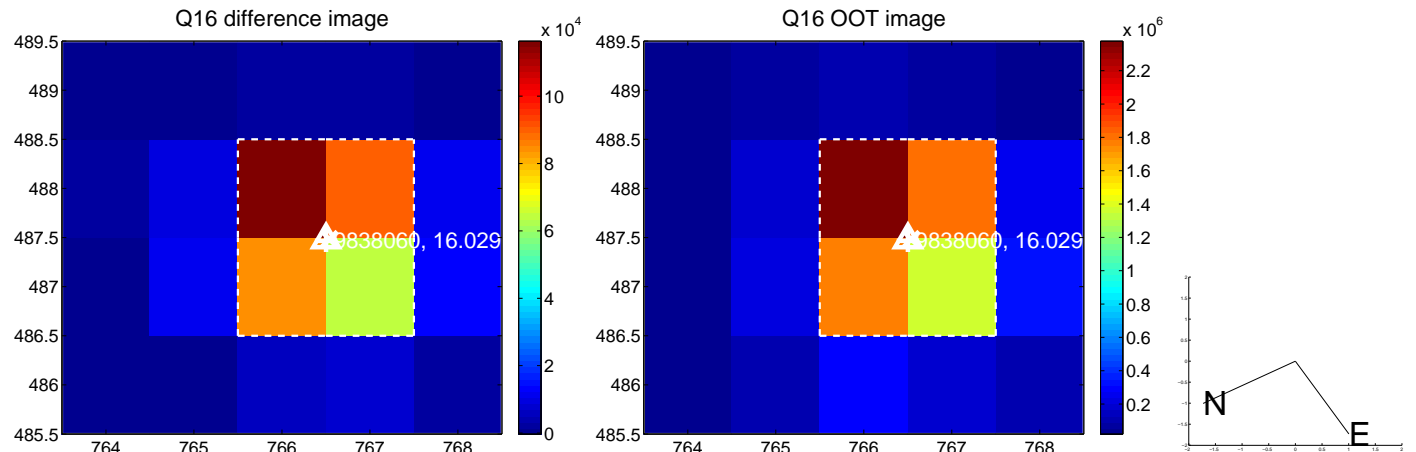
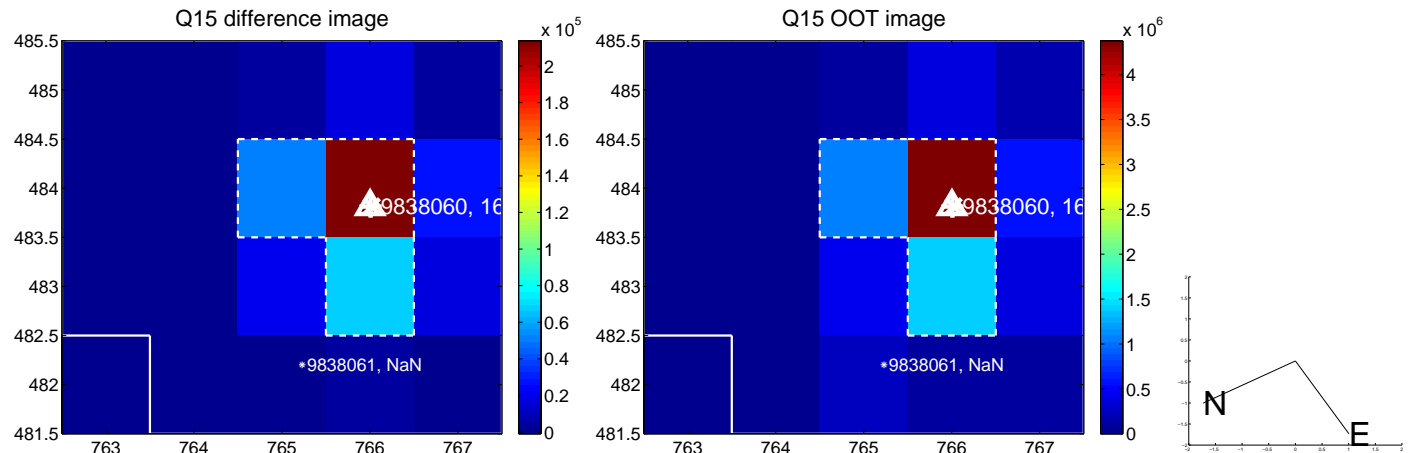
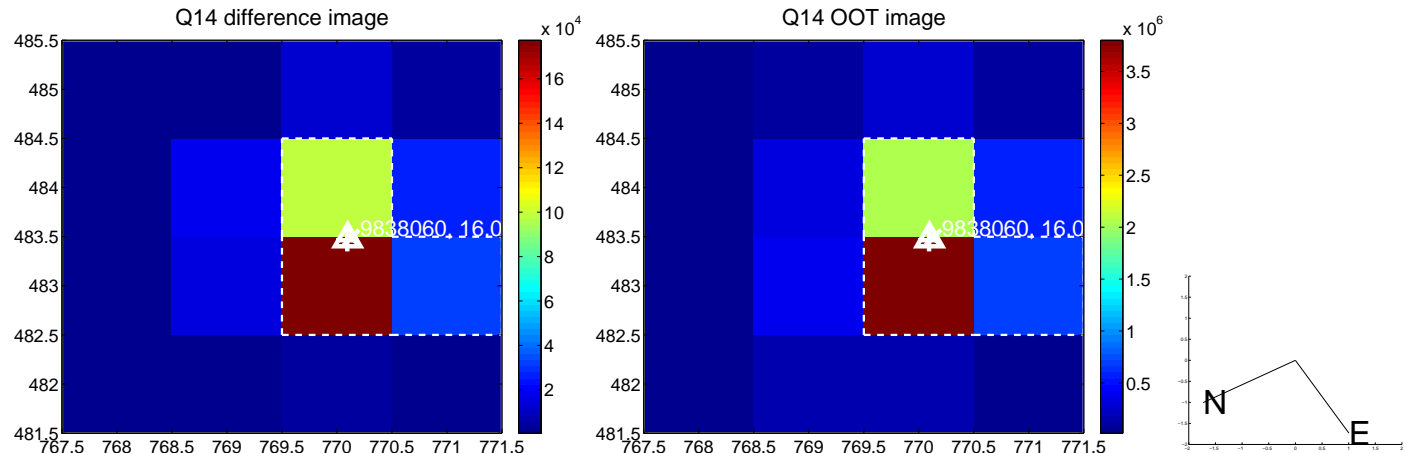
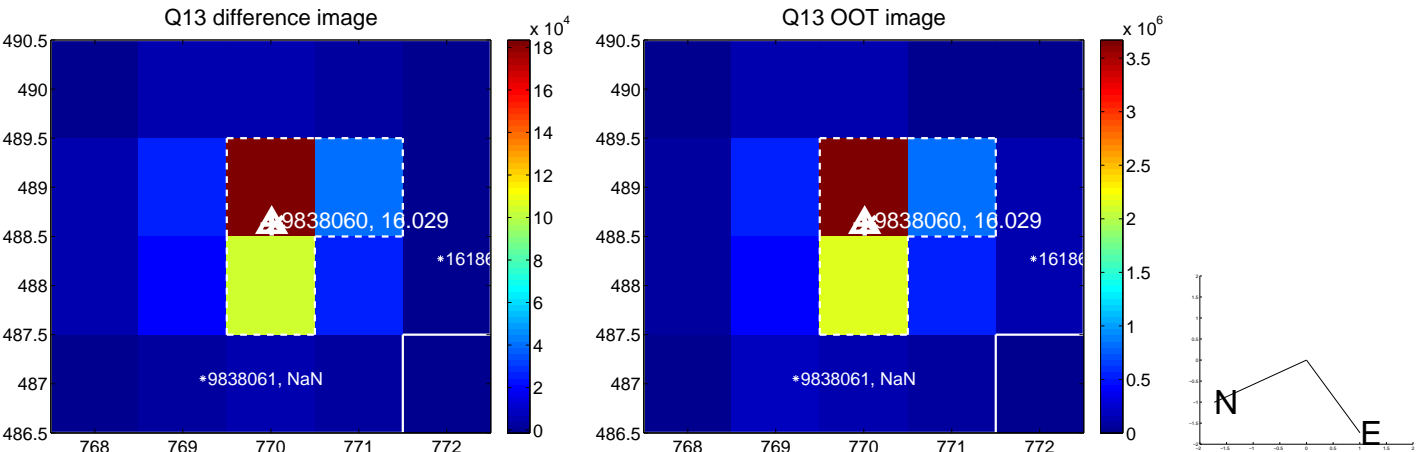




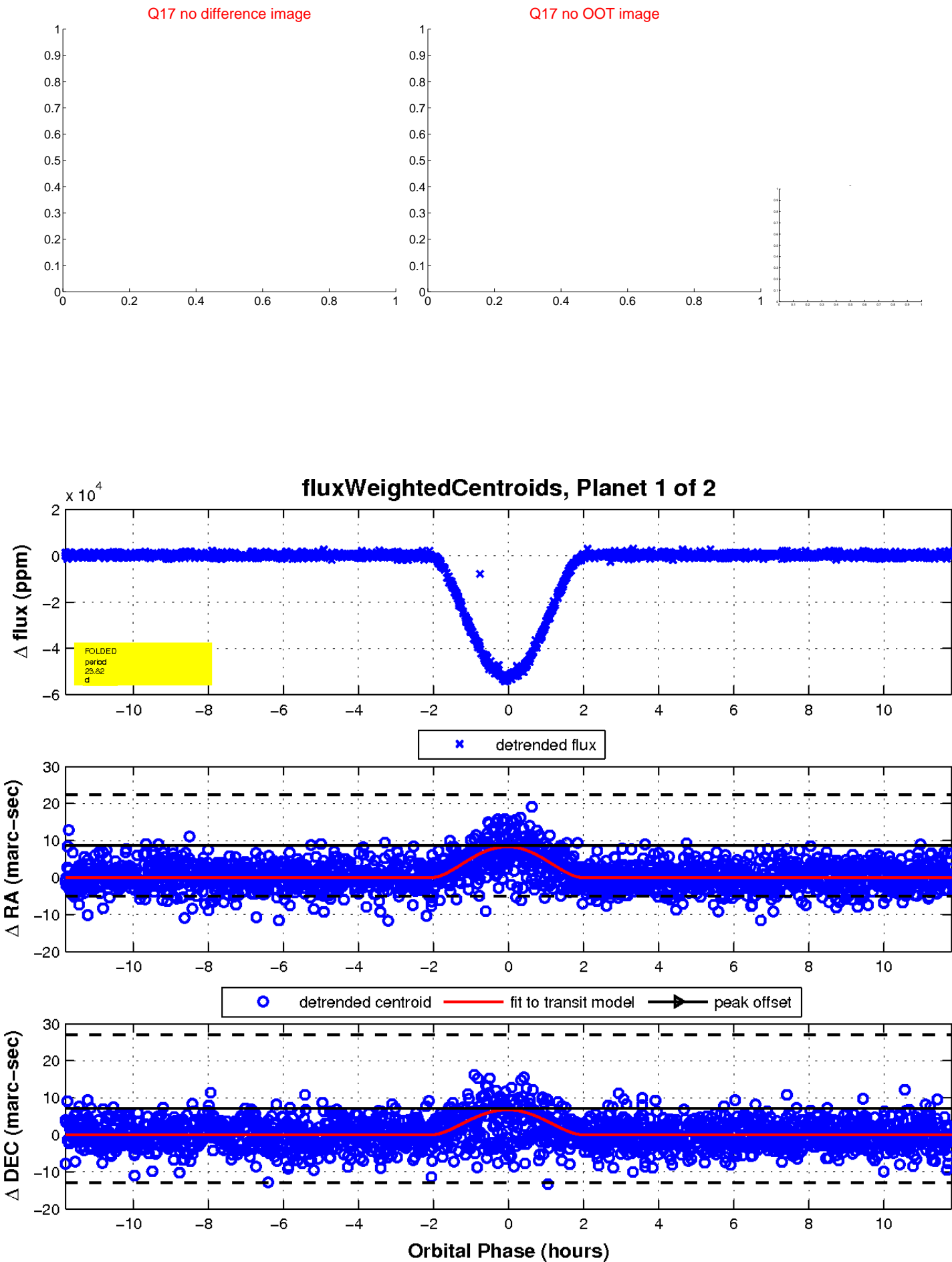
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

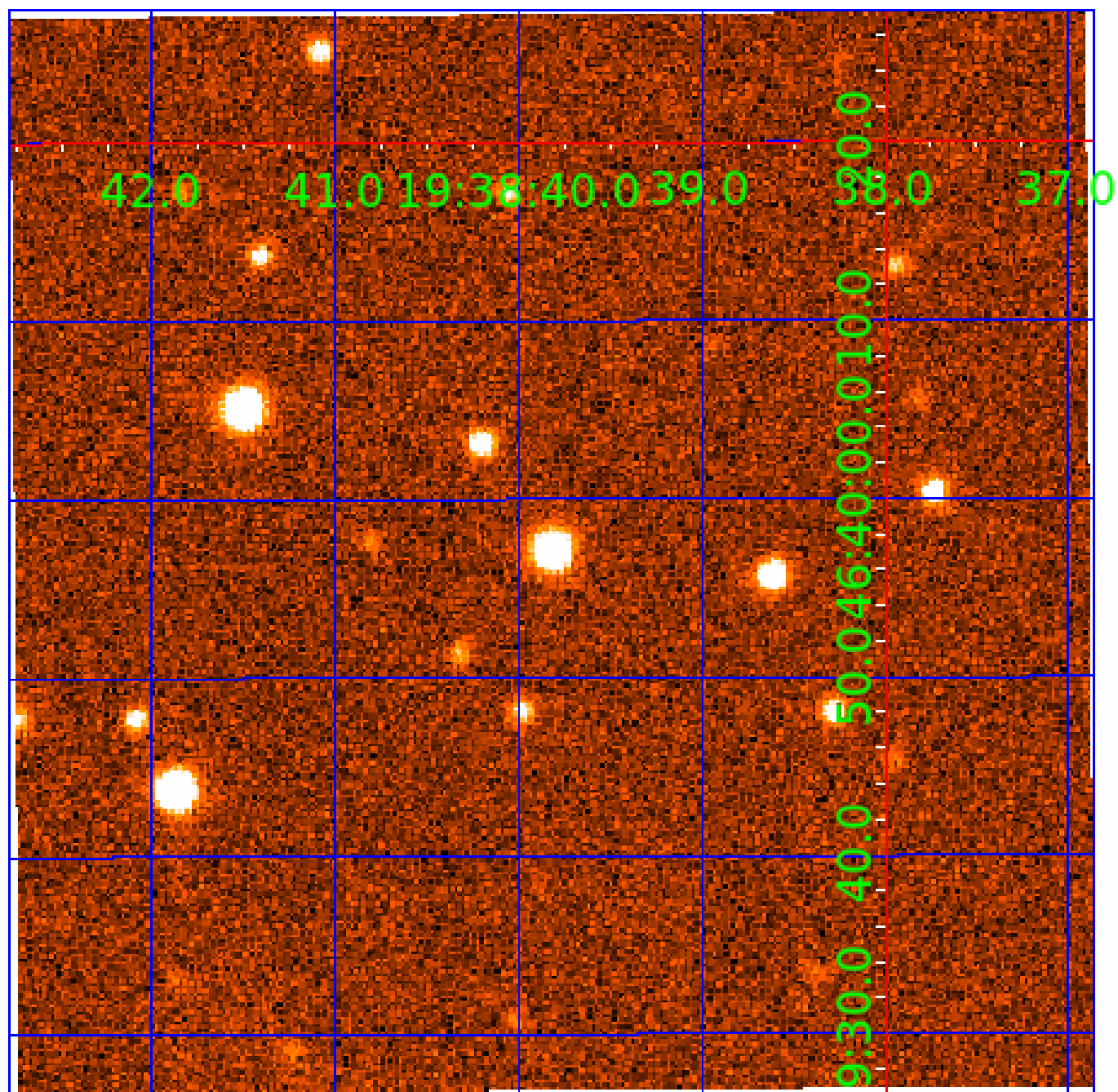


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination



# KIC 009838060

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
009838060-01	OBS	3314.01	23.815836	154.845599	52587.6	3.937	752.6	708.0	0.82	5561	26.42	23.24
009838060-02	OBS	No	23.815823	141.847296	4832.8	3.834	72.3	71.9	0.82	5561	8.83	23.24

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009838060-01	OBS	FP	0.00	0	1	0	0	MOD_SEC_DV—MOD_SEC_ALT—DEEP_V_SHAPED—HAS_SEC_TCE
009838060-02	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.

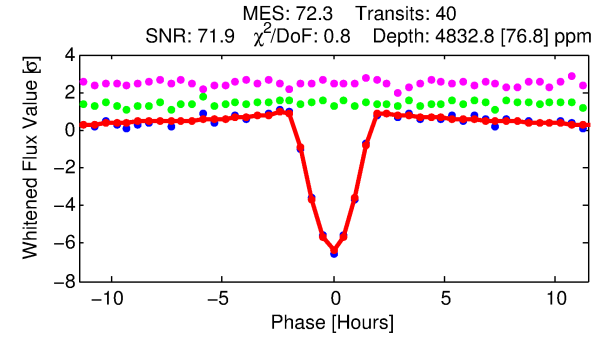
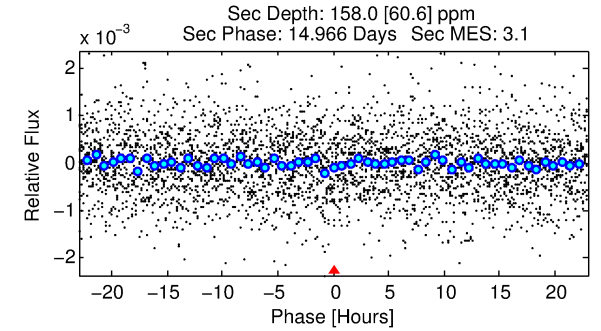
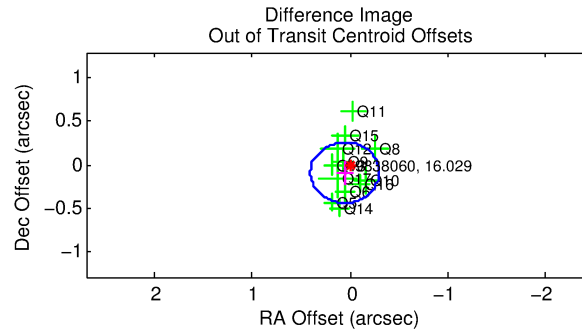
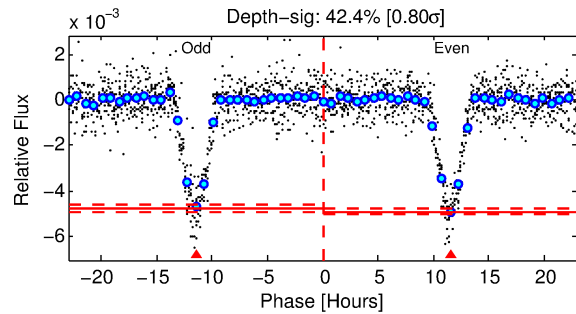
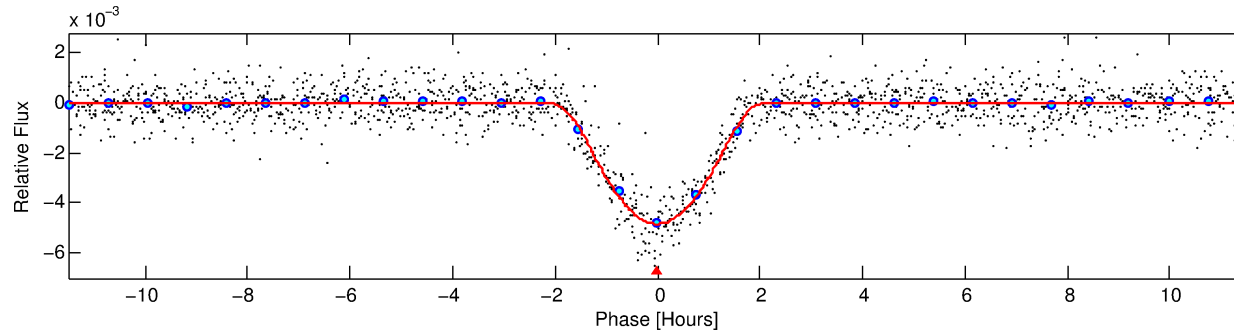
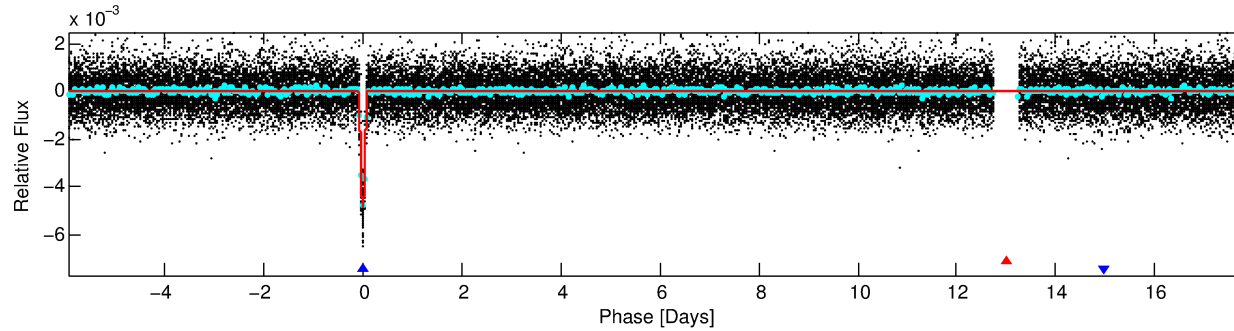
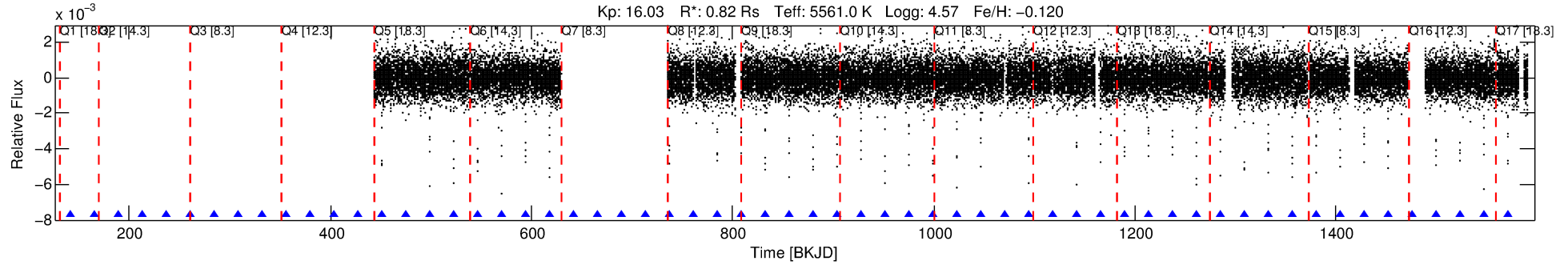
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 009838060-02

No Significant Match Found

# DV One-Page Summary

KIC: 9838060 Candidate: 2 of 2 Period: 23.816 d  
KOI: K03314.01 Corr: 0.987



## DV Fit Results:

Period = 23.81582 [0.00004] d  
Epoch = 141.8473 [0.0017] BKJD  
Rp/R\* = 0.0989 [0.0289]  
a/R\* = 24.65 [1.97]  
b = 0.97 [0.05]  
Seff = 23.24 [7.15]  
Teq = 560 [43] K  
Rp = 8.83 [3.27] Re  
a = 0.1571 [0.0301] AU  
Ag = 27.49 [20.67] [1.28 $\sigma$ ]  
Teffp = 1982 [352] K [4.01 $\sigma$ ]

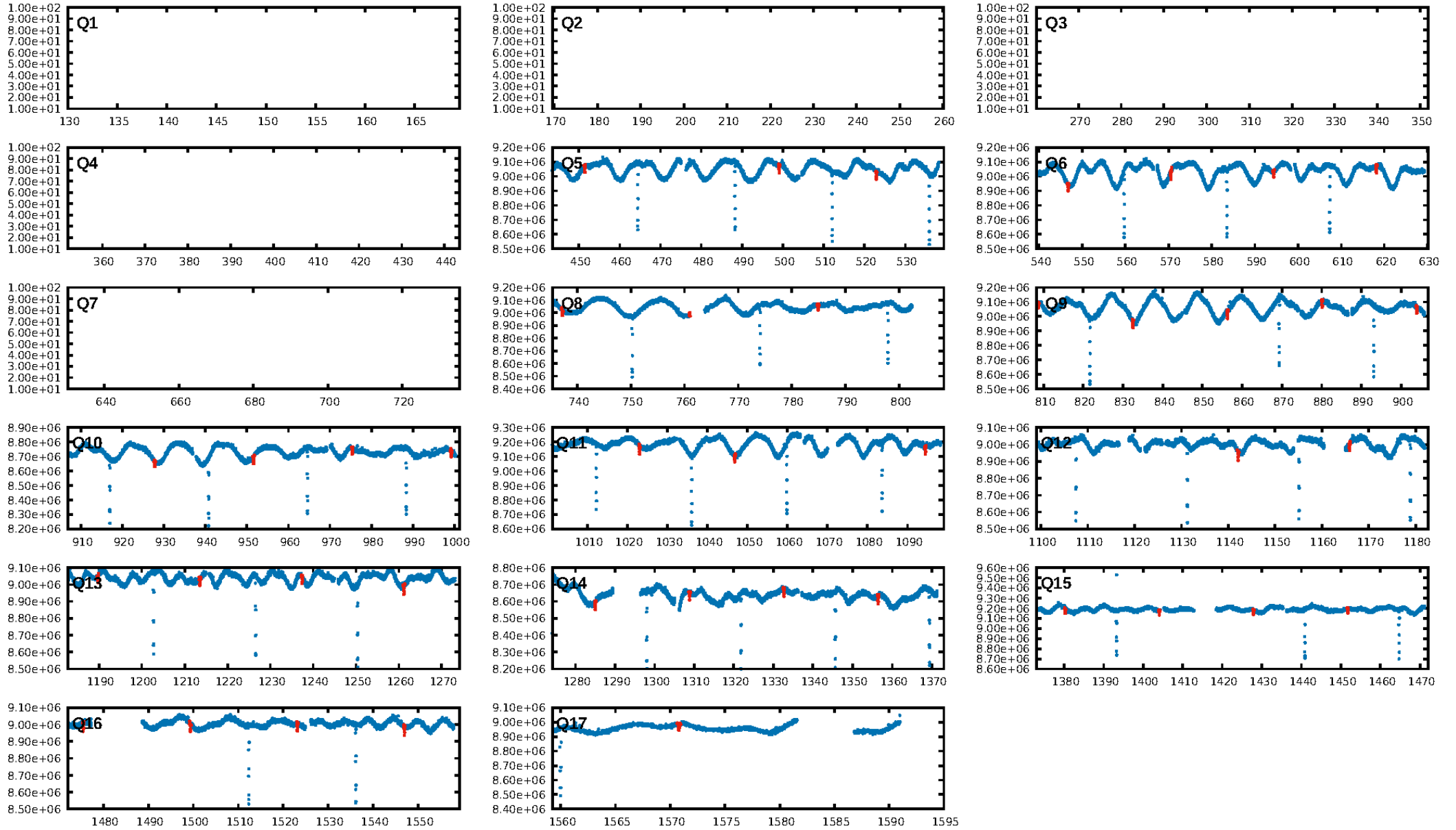
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 0.0% [0.00 $\sigma$ ]  
ModelChiSquare2-sig: 71.8%  
ModelChiSquareGof-sig: 100.0%  
Bootstrap-pfa: 0.00e+00  
RollingBand-fgt: 1.00 [39/39]  
GhostDiagnostic-chr: 2.747  
Centroid-sig: 52.9%  
Centroid-so: 0.302 arcsec [1.70 $\sigma$ ]  
OotOffset-rm: 0.109 arcsec [0.93 $\sigma$ ]  
KicOffset-rm: 0.065 arcsec [0.57 $\sigma$ ]  
OotOffset-st: 3/2/3/4 [12]  
KicOffset-st: 3/2/3/4 [12]  
DiffImageQuality-fgm: 1.00 [12/12]  
DiffImageOverlap-fno: 1.00 [12/12]

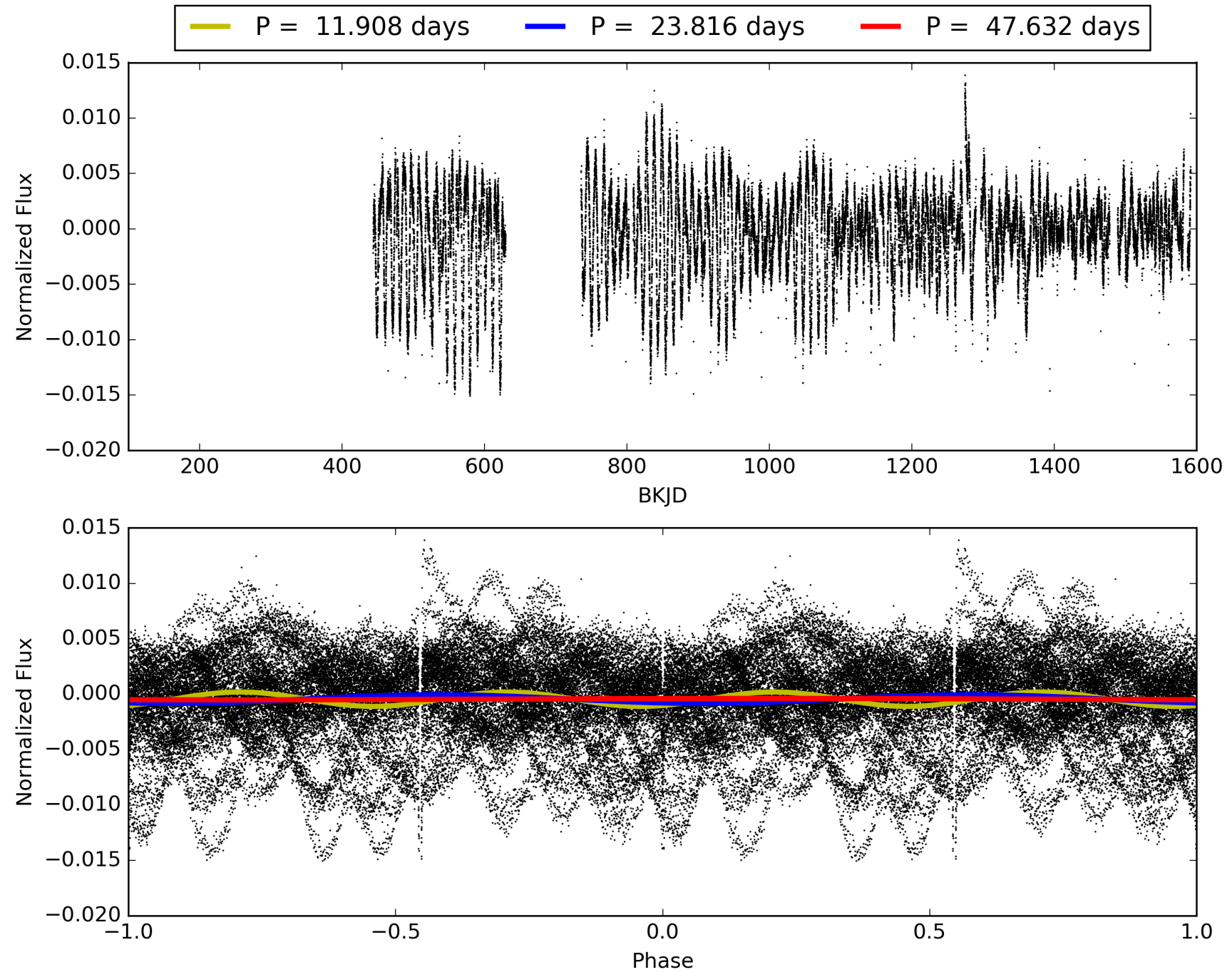
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 29-Jan-2016 20:28:56 Z

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

# TCE 009838060-02, PDC Light Curves



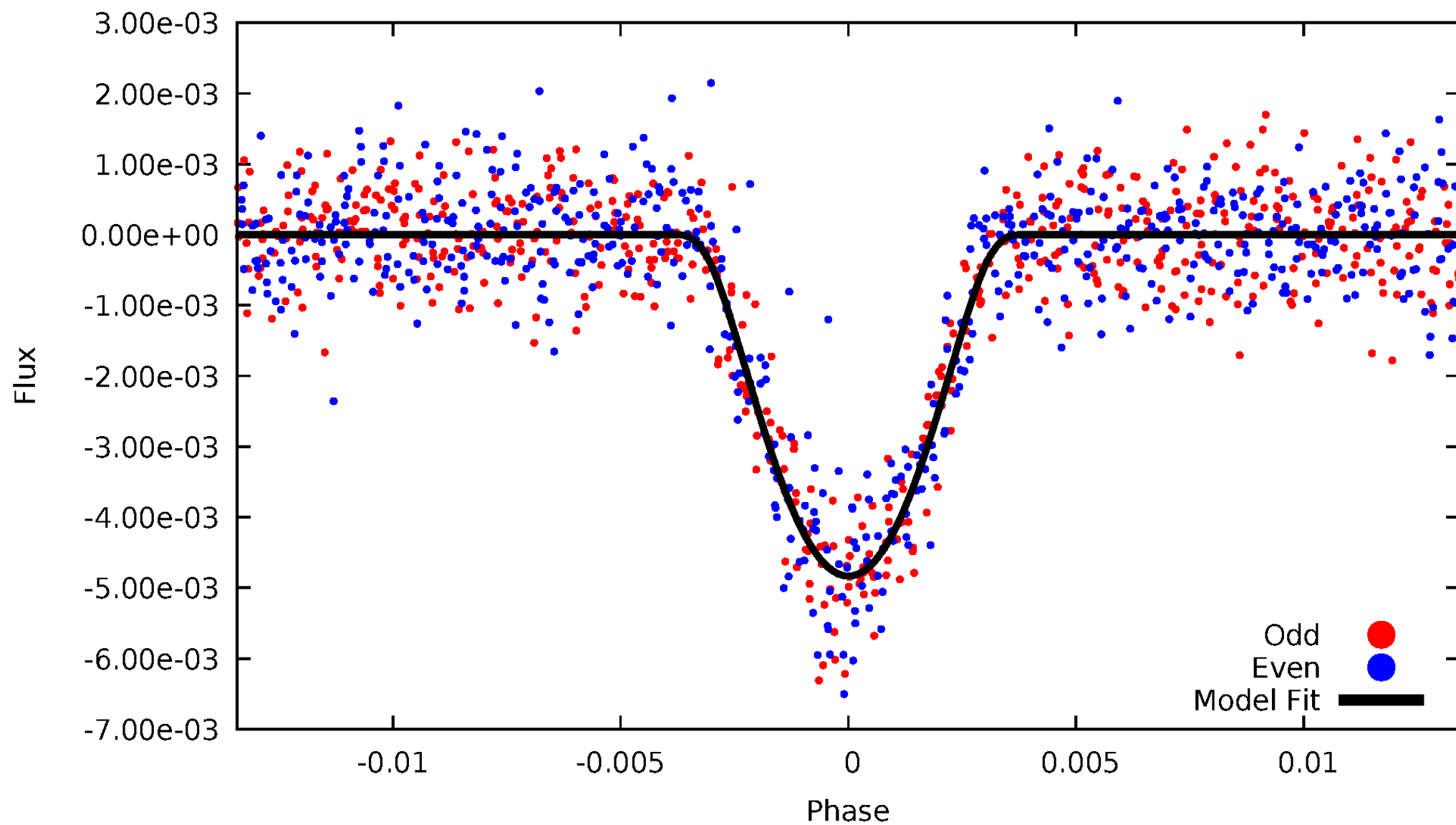
TCE 009838060-02





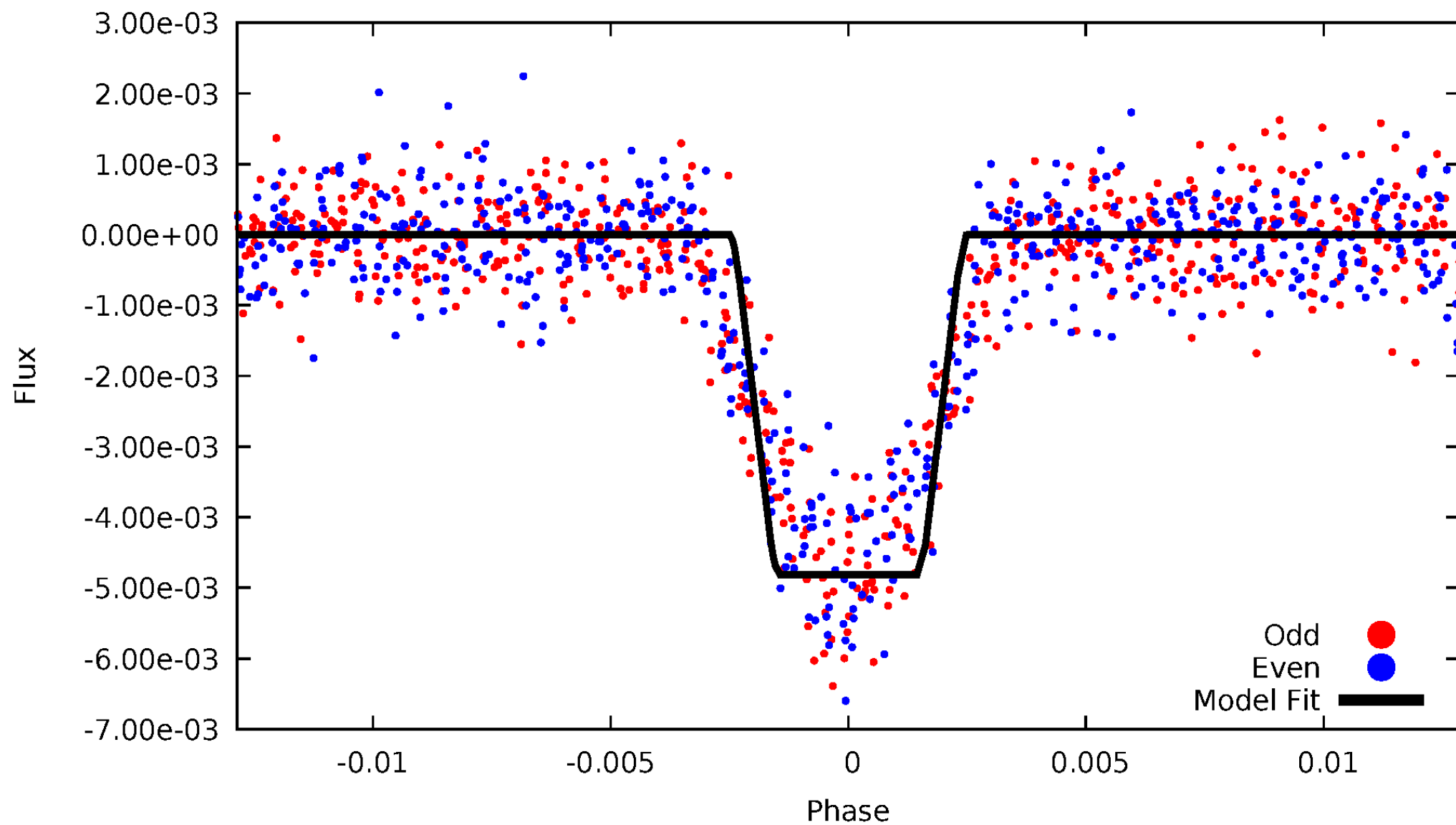
# DV Odd/Even

TCE 009838060-02



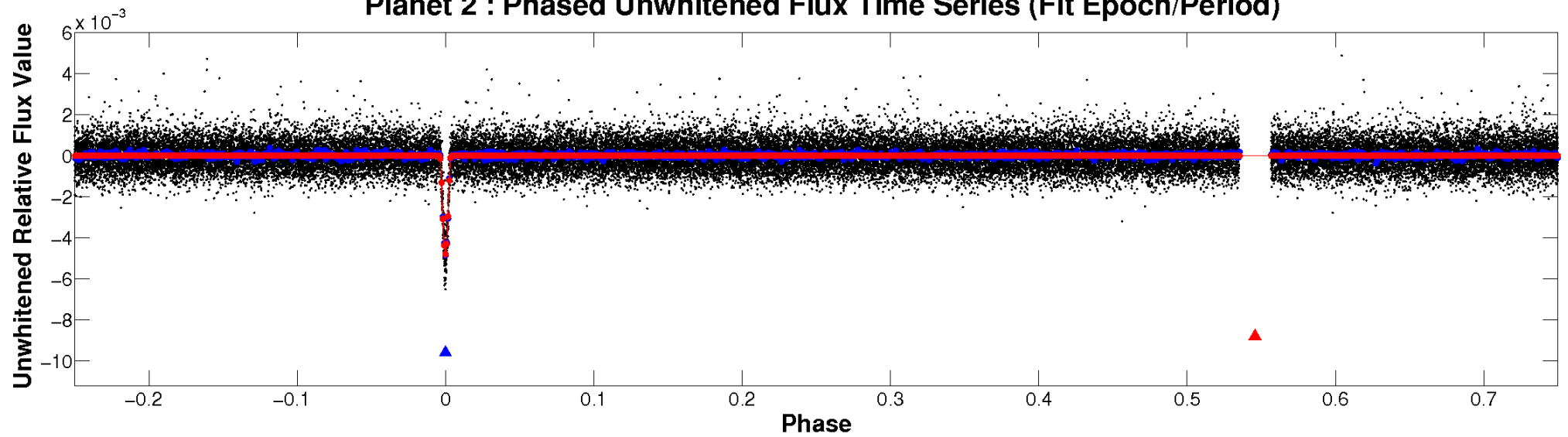
# ALT Odd/Even

TCE 009838060-02

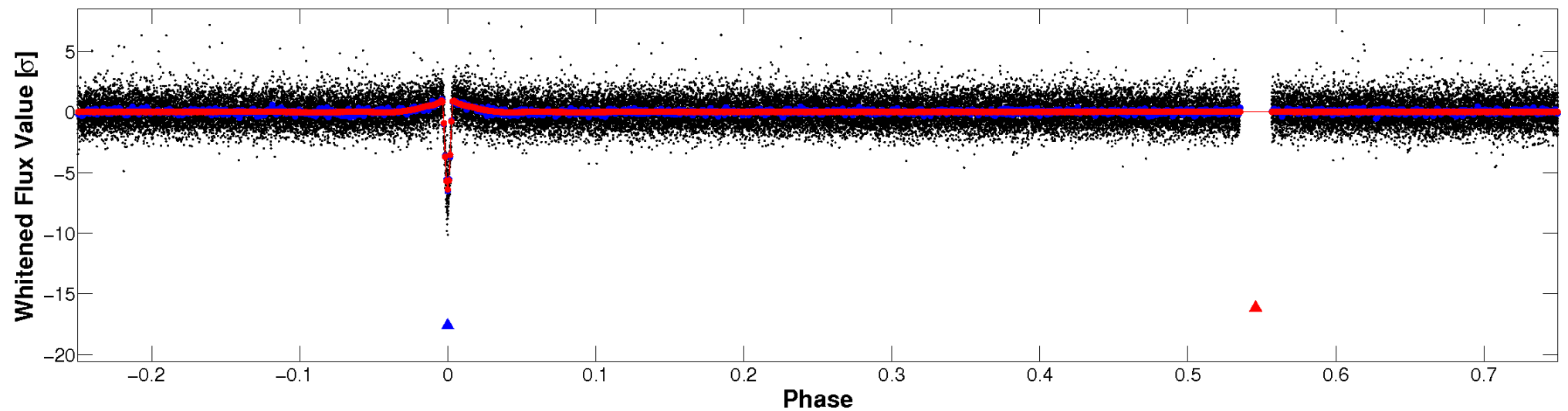


# Non-Whitened Vs. Whitened Light Curve

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

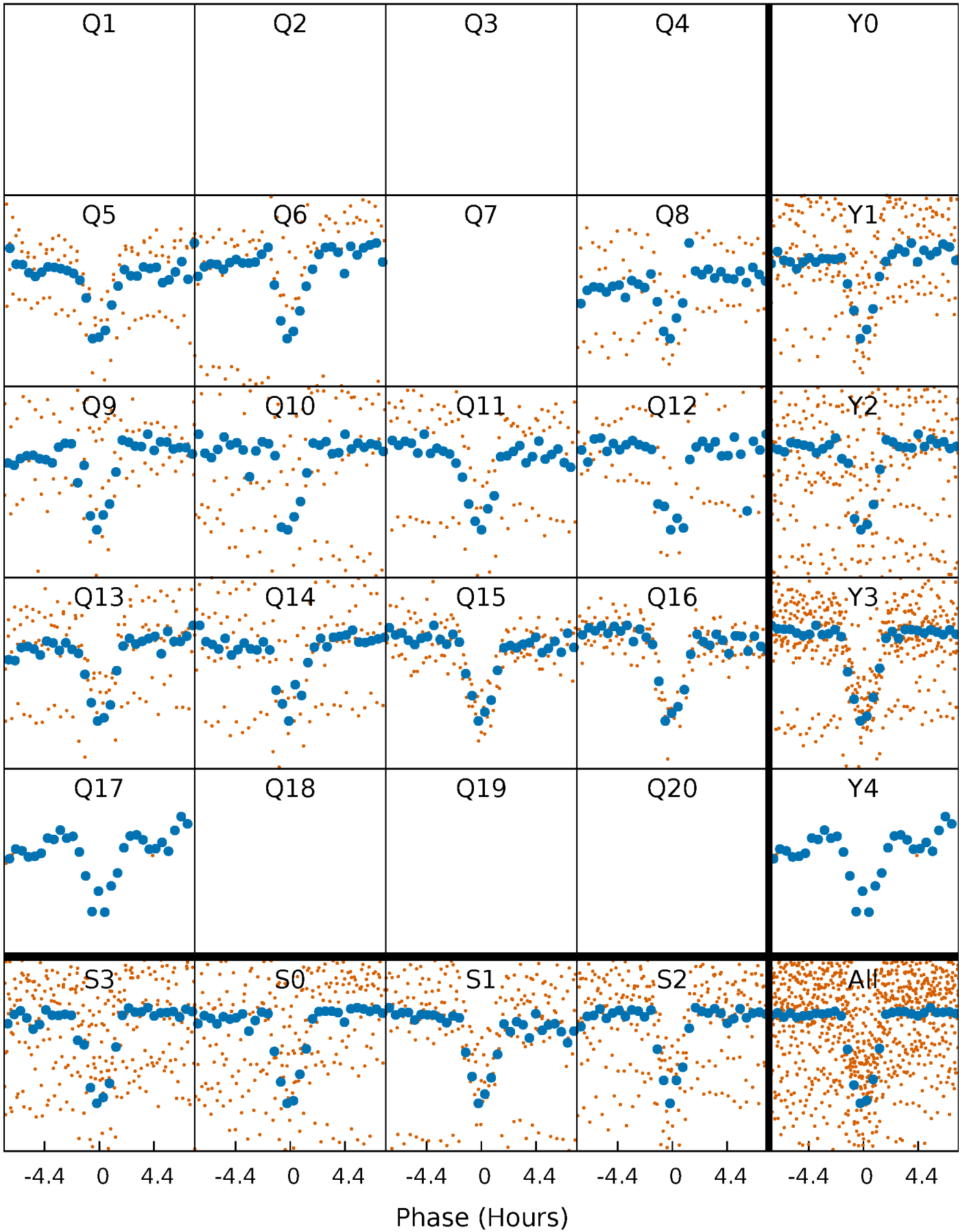


## Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



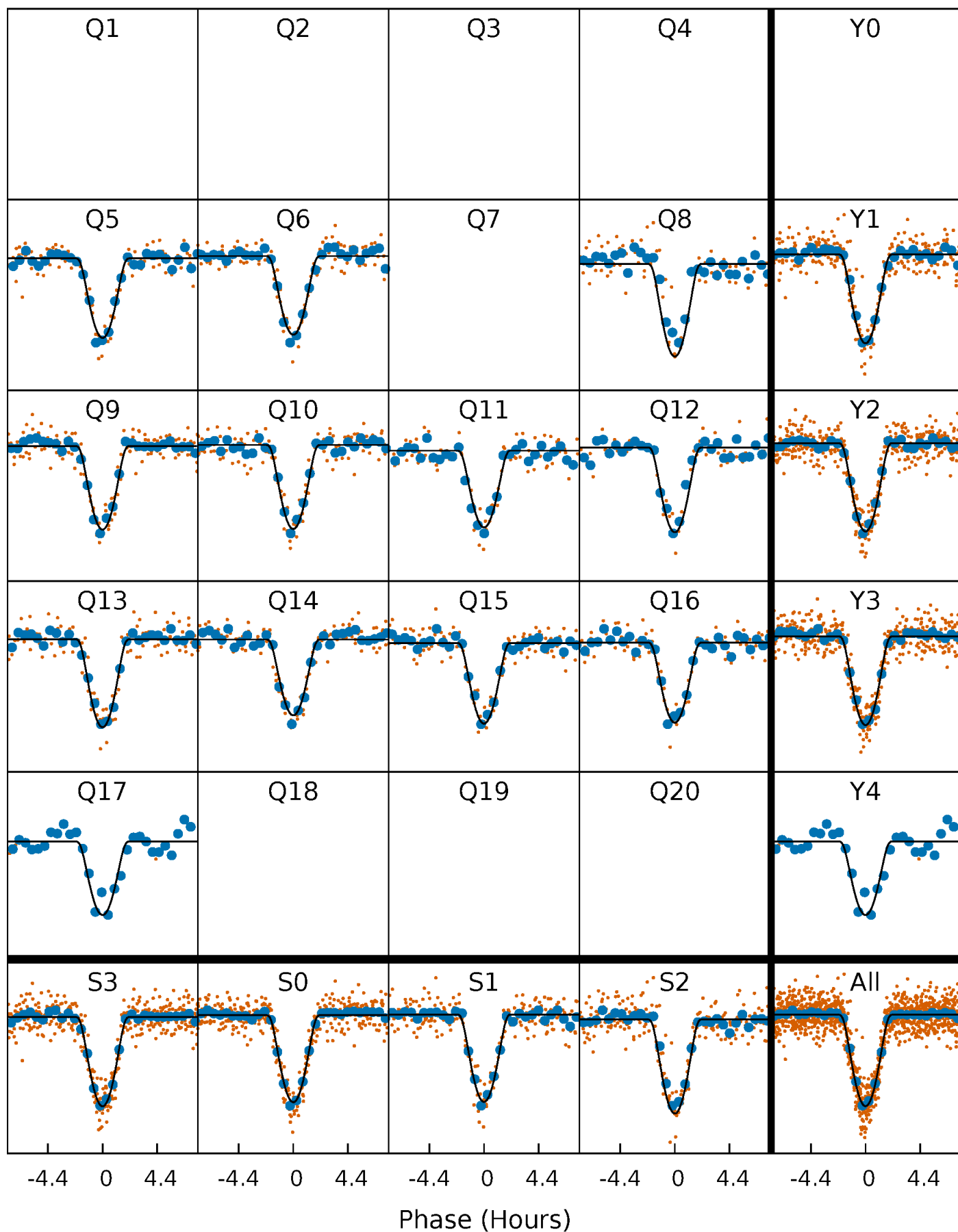
# PDC Quarter-Phased Transit Curves

TCE 009838060-02   P= 23.815823 Days    $T_0=141.847296$  (BKJD)



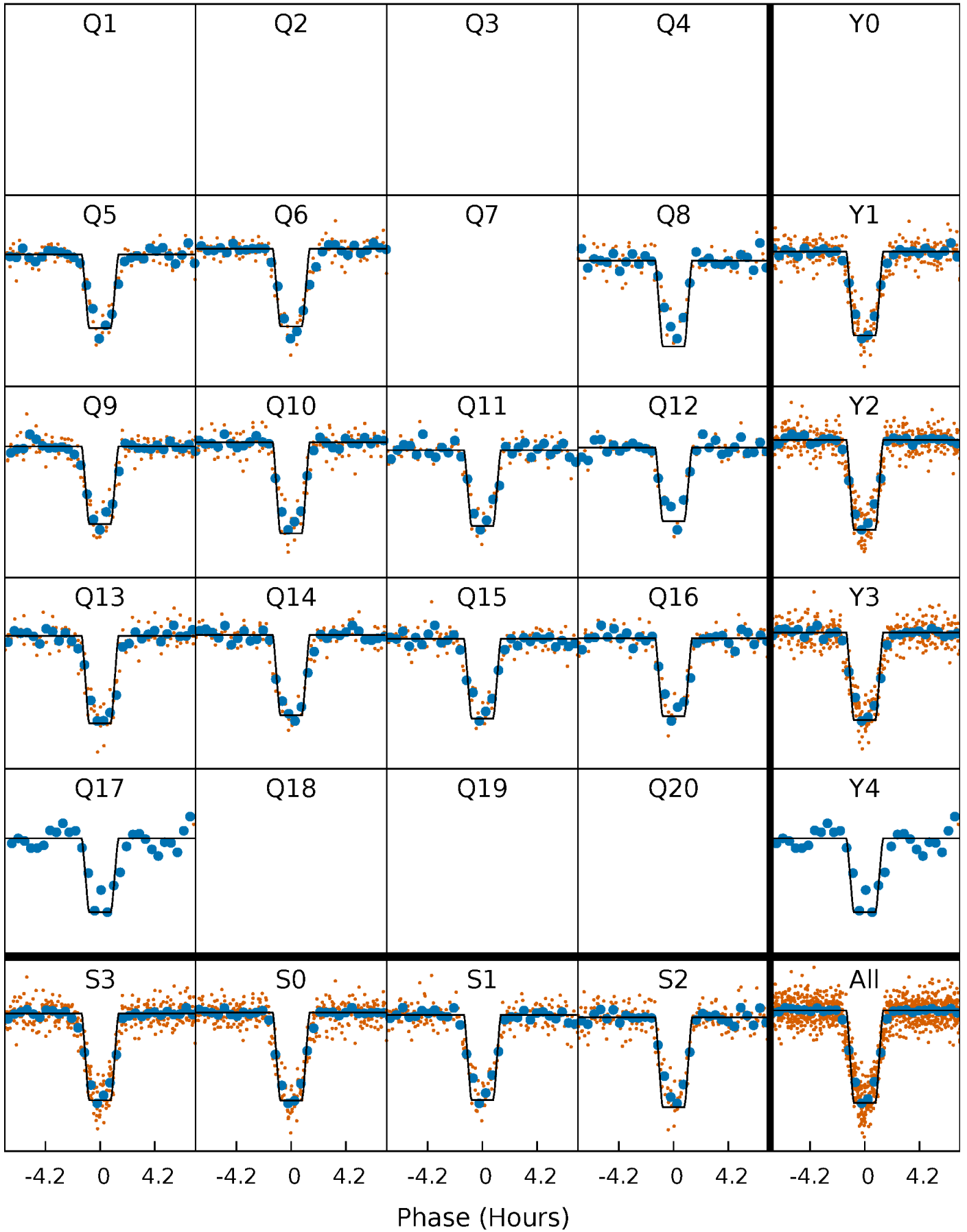
# DV Quarter-Phased Transit Curves

TCE 009838060-02   P= 23.815823 Days    $T_0=141.847296$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

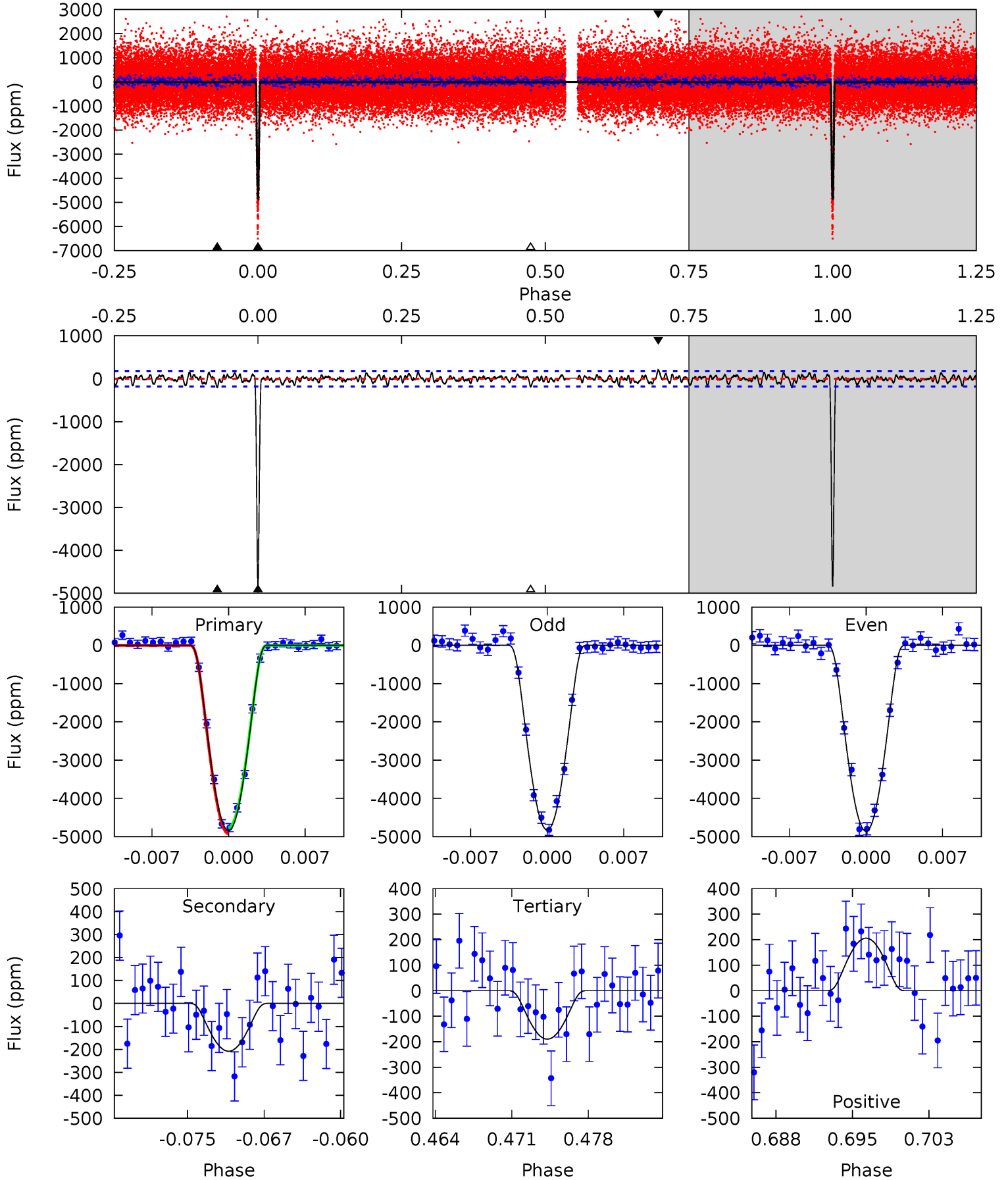
TCE 009838060-02     $P = 23.815885$  Days     $T_0 = 141.845252$  (BKJD)



# DV Model-Shift Uniqueness Test

009838060-02, P = 23.815823 Days, E = 141.847296 Days

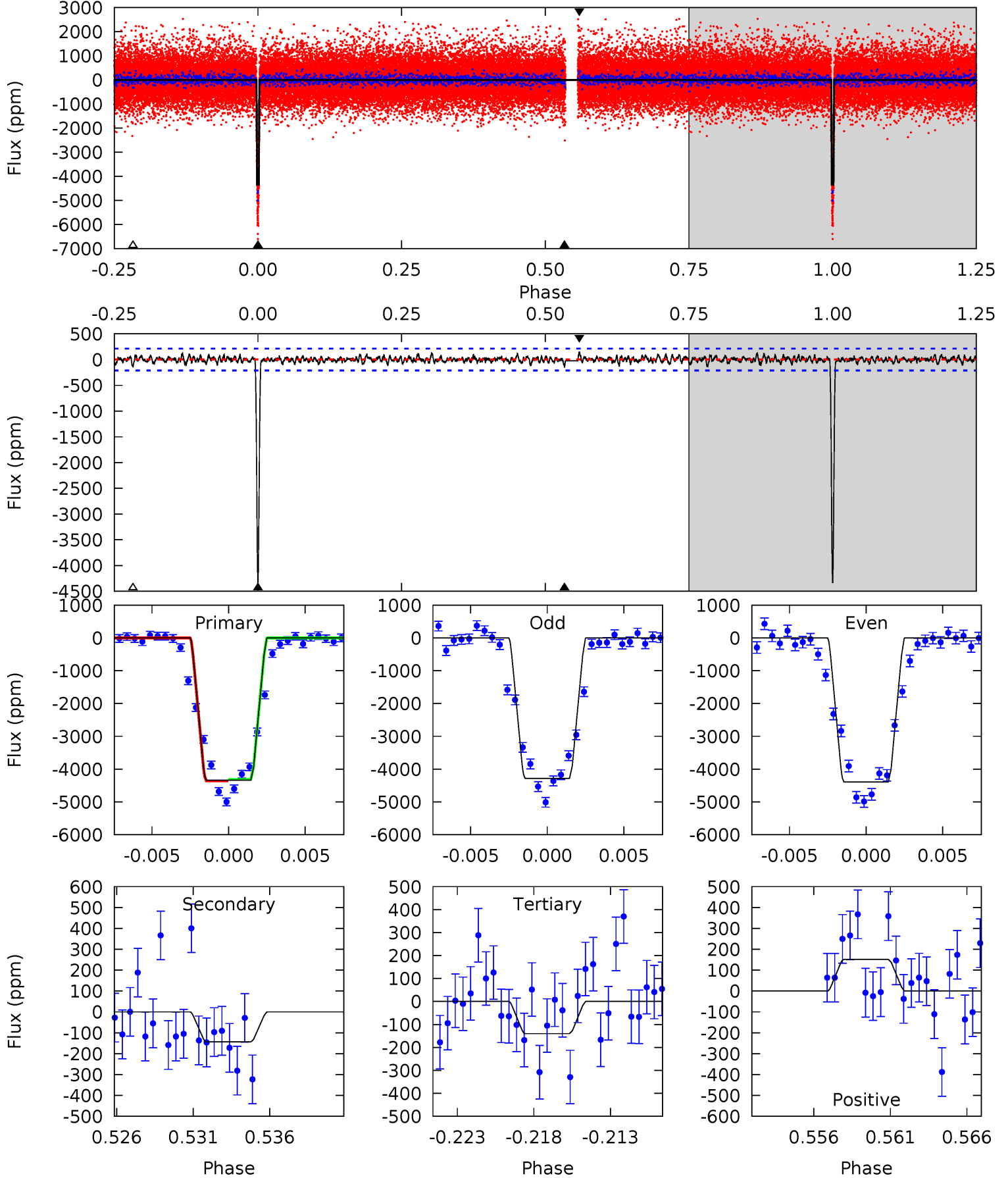
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
135.9	5.83	5.32	5.77	5.08	2.67	1.63	130.5	130.1	0.51	0.06	0.46	0.98	0.04	2.15



# Alt Model-Shift Uniqueness Test

009838060-02,  $P = 23.815885$  Days,  $E = 141.845252$  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
105.5	3.50	3.41	3.70	5.16	2.81	0.97	102.1	101.8	0.09	-0.20	1.31	1.00	0.03	0.56





### Stellar Parameters For KIC 009838060

	$T_{\text{eff}} (K)$	$\log(g)$	$[\text{Fe}/\text{H}]$	$R (R_{\odot})$	$M (M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$5561^{+182}_{-182}$	$4.572^{+0.038}_{-0.152}$	$-0.120^{+0.300}_{-0.300}$	$0.818^{+0.187}_{-0.067}$	$0.915^{+0.081}_{-0.112}$	$2.358^{+0.472}_{-0.991}$
	+3%/-3%	+1%/-3%	+250%/-250%	+23%/-8%	+9%/-12%	+20%/-42%
Source	KIC0	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 009838060-02 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$-208 \pm 36$	$9.44^{+2.94}_{-2.99}$	$797^{+45}_{-36}$	$2820^{+288}_{-202}$	$31^{+32}_{-13}$
Alt.	$-144 \pm 41$	$6.37^{+2.59}_{-2.64}$	$798^{+45}_{-33}$	$2973^{+546}_{-293}$	$47^{+92}_{-26}$

$T_{\text{max}}$  = 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

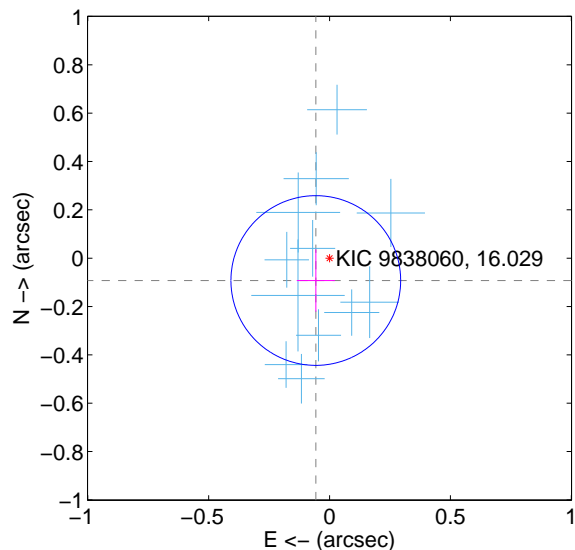
Supplemental centroid analysis for 009838060-02. Kepler magnitude: 16.03. Transit SNR 71.95

There are 12 quarters with good PRF difference image offsets

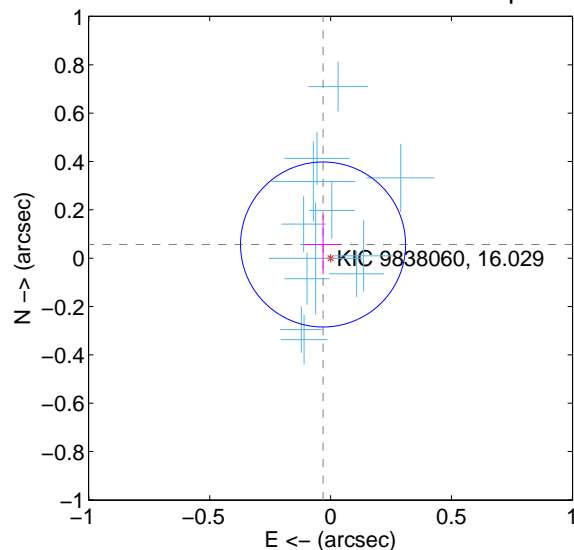
The direct PRF centroid is offset from the target star catalog position by about 0.17 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.109 \pm 0.117$	0.93	$0.057 \pm 0.079$	$-0.092 \pm 0.129$
PRF-fit source offset from KIC position	$0.065 \pm 0.114$	0.57	$0.031 \pm 0.075$	$0.057 \pm 0.123$
photometric centroid source offset	$0.30 \pm 0.18$	1.70	$-0.07 \pm 0.17$	$0.29 \pm 0.18$

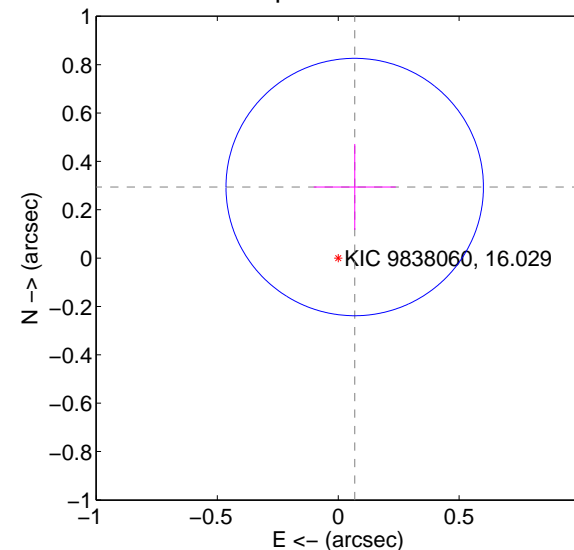
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position



offset from photometric centroids

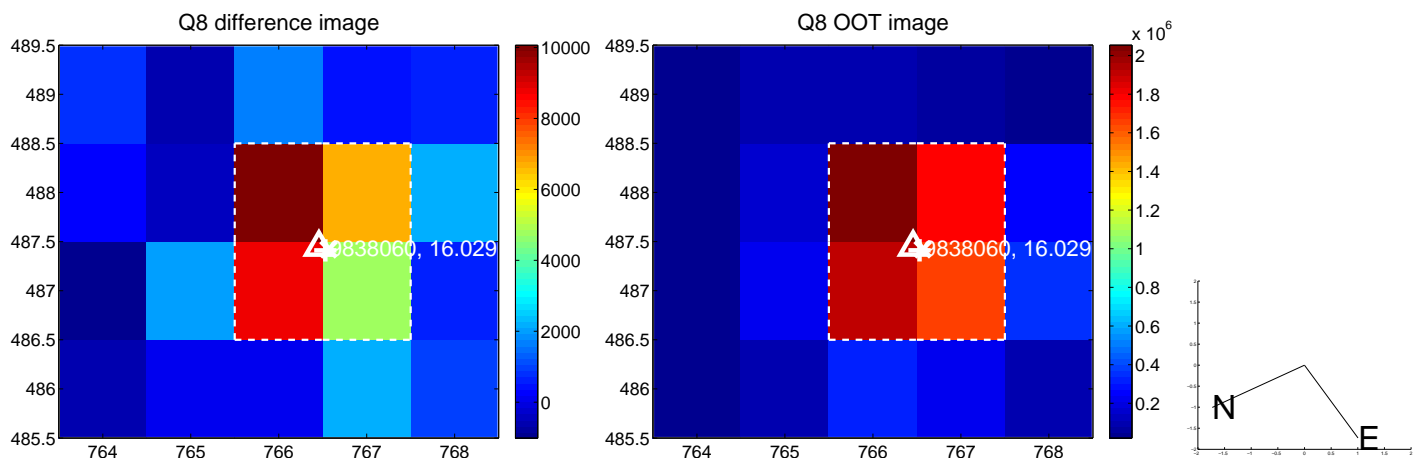
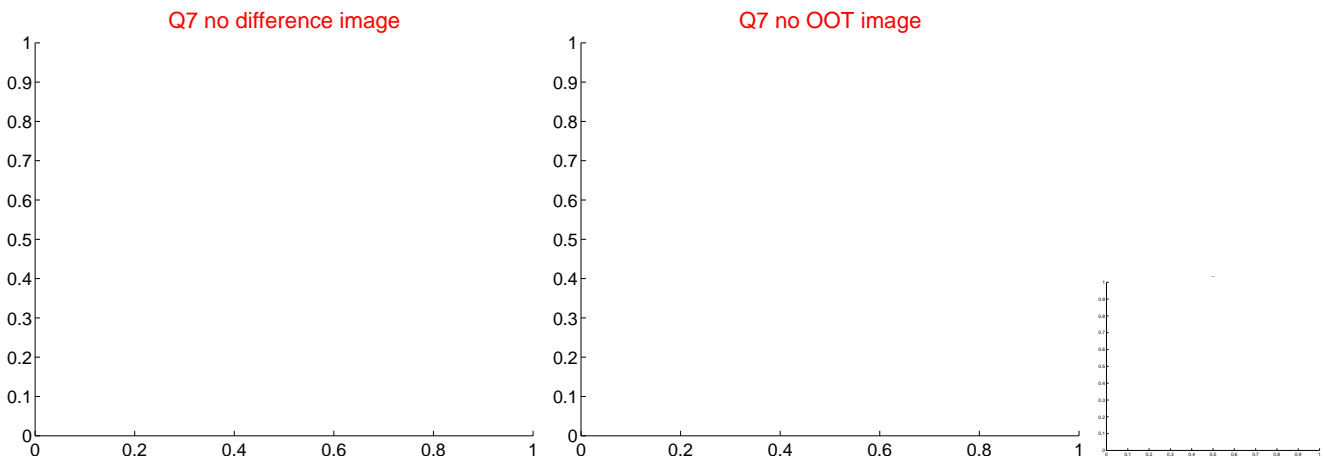
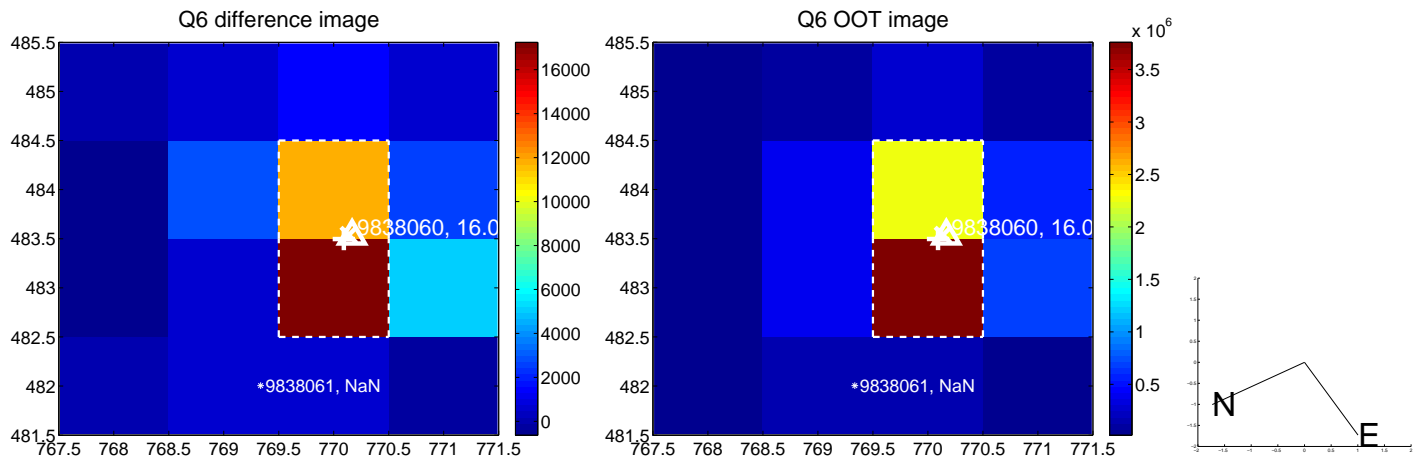
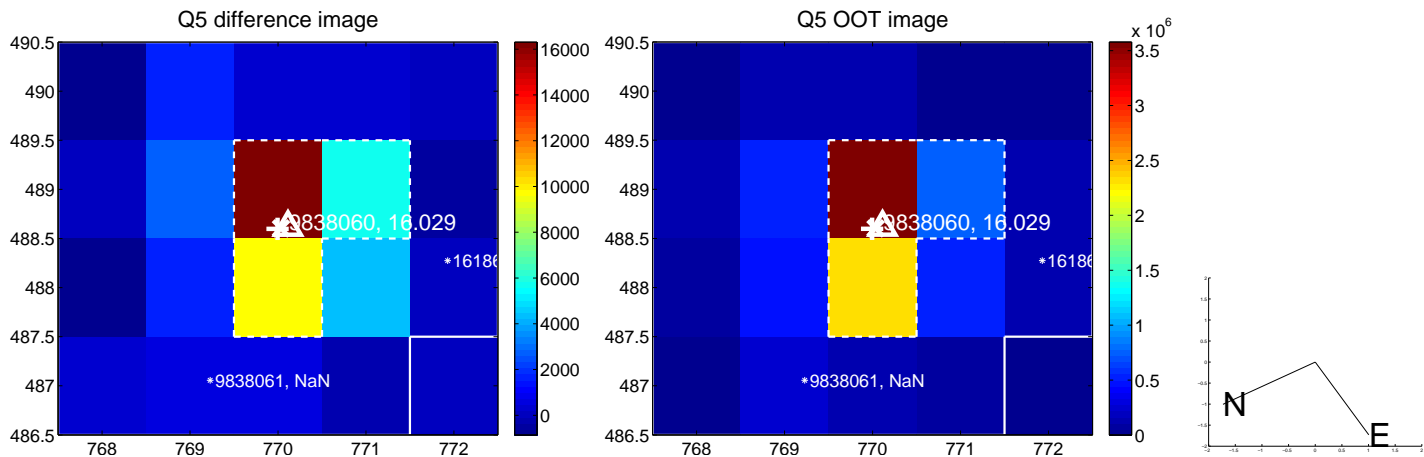


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses:** good quarterly centroid offsets; **Vermillion crosses:** bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

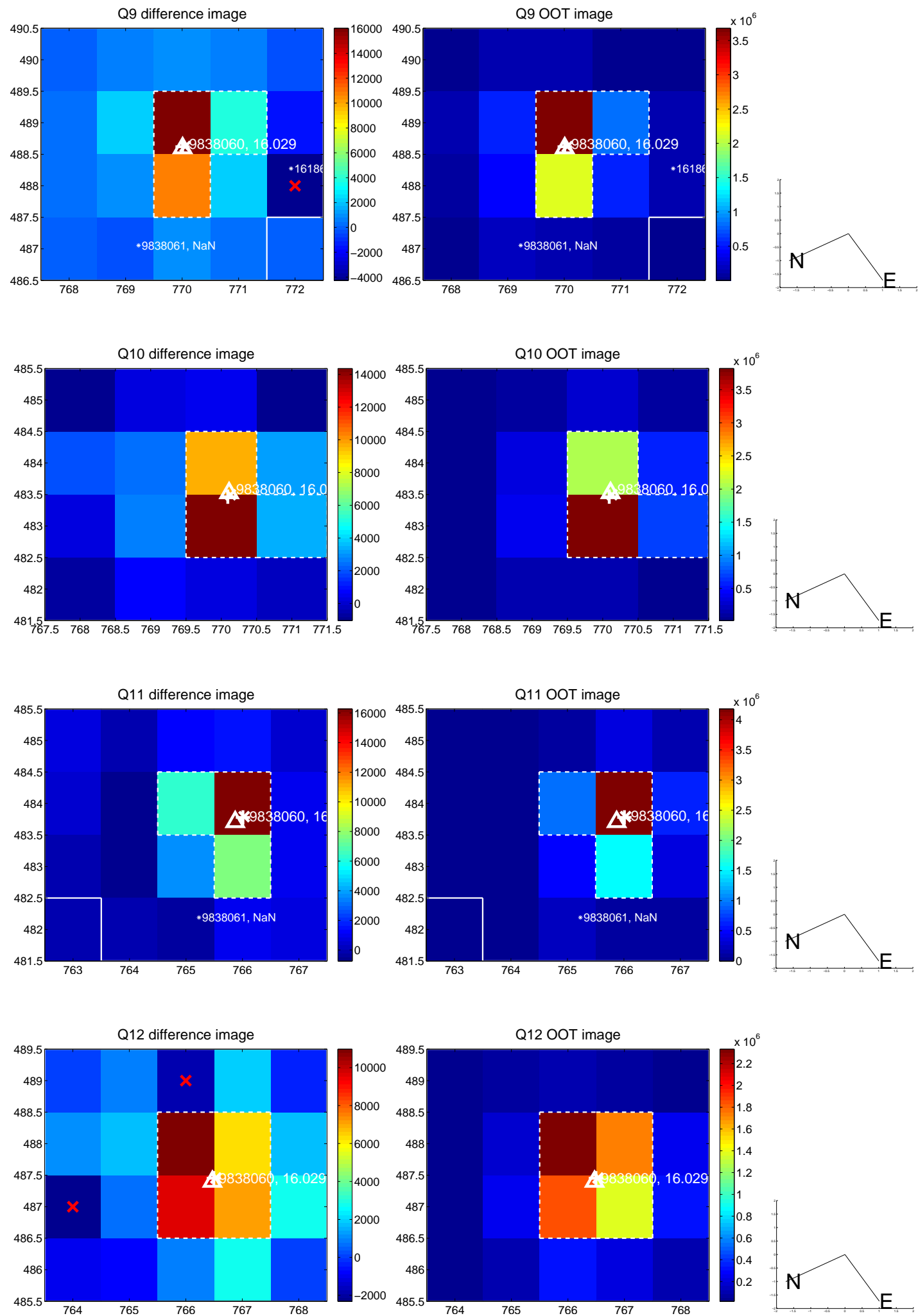
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



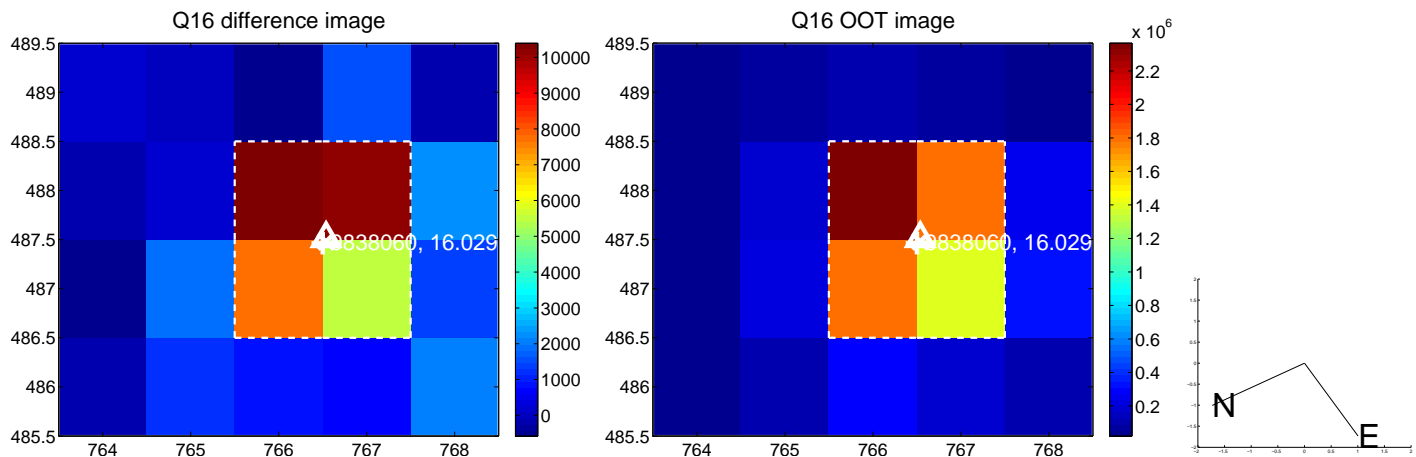
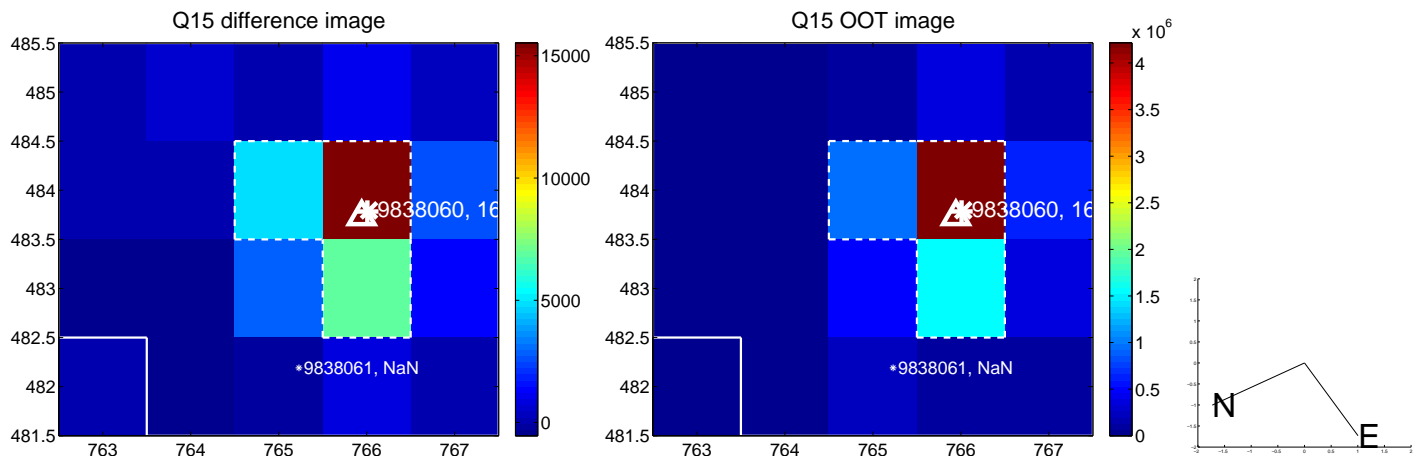
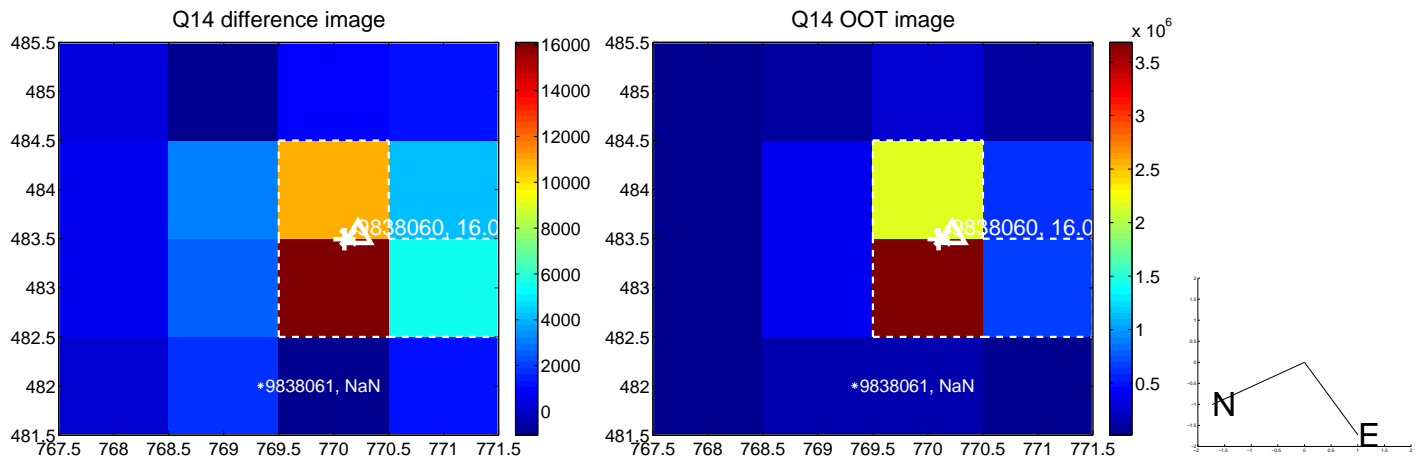
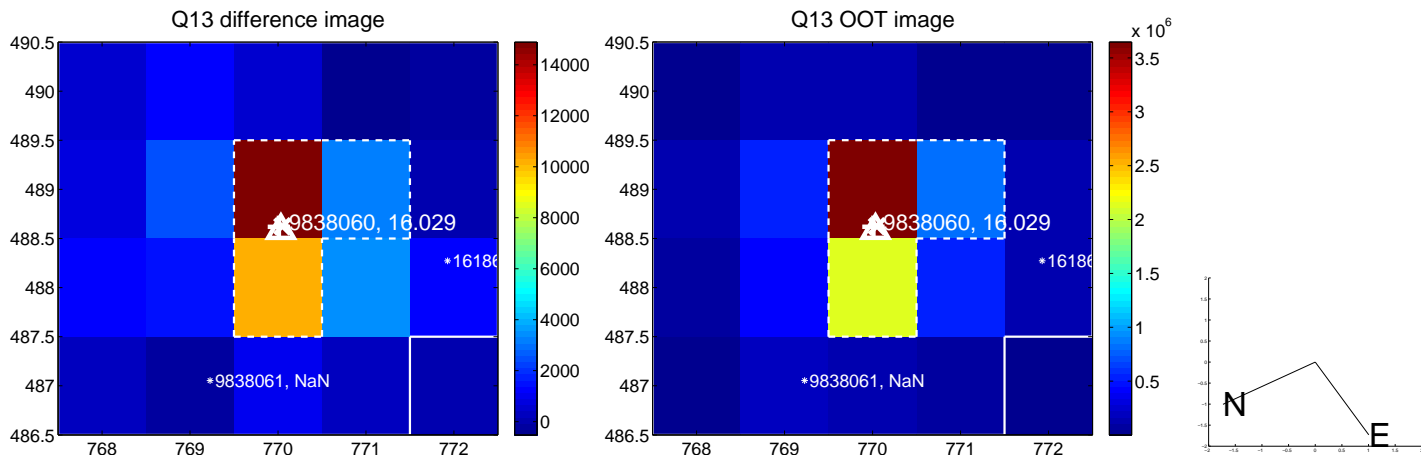
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



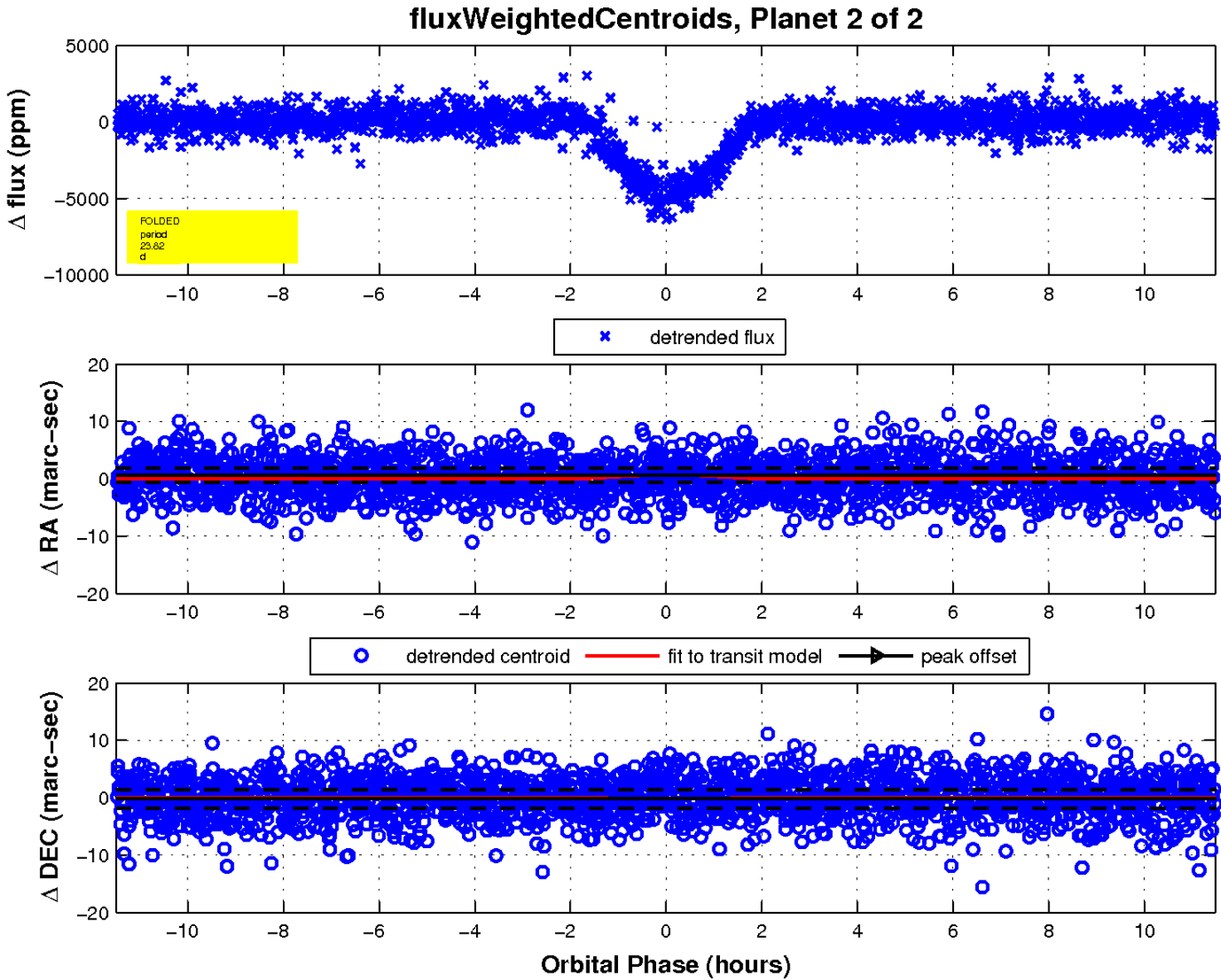
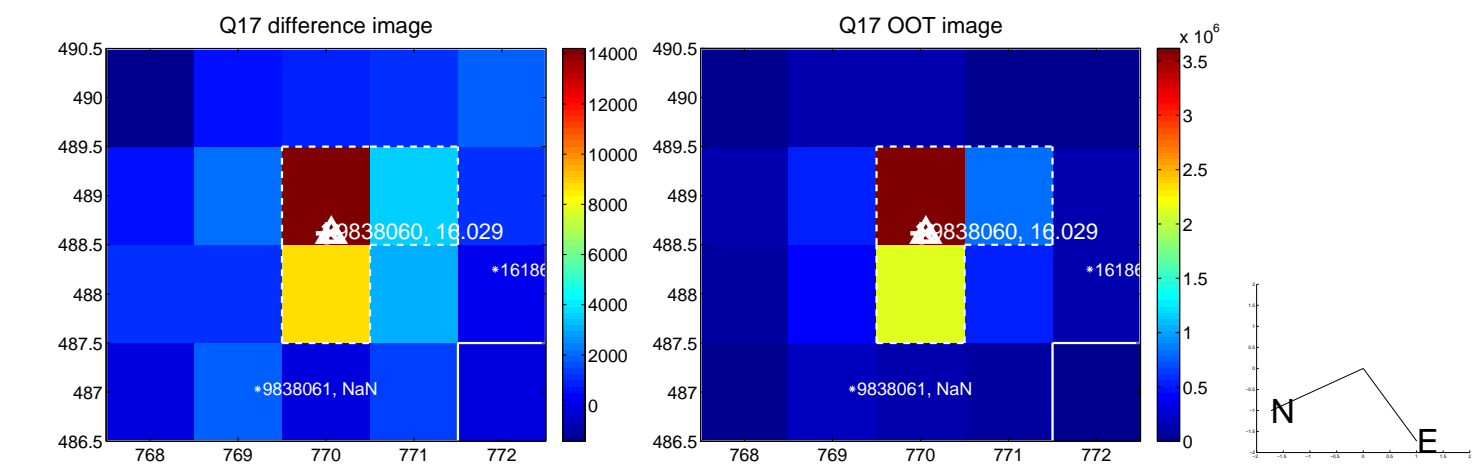
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UKIRT Image

Declination

