

# KIC 002438114

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
002438114-01	OBS	No	104.556129	139.409048	62507.0	23.485	13.8	14.3	1.00	5780	42.86	5.30
002438114-02	OBS	No	85.360691	210.421422	59827.7	28.090	10.2	10.6	1.00	5780	25.88	6.94

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
002438114-01	OBS	FP	0.00	1	0	1	0	LPP_DV—ALL_TRANS_CHASES—MOD_POS_DV—CENT_FEW_DIFFS—HALO_GHOST
002438114-02	OBS	FP	0.00	1	0	0	0	LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—CENT_FEW_DIFFS

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

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

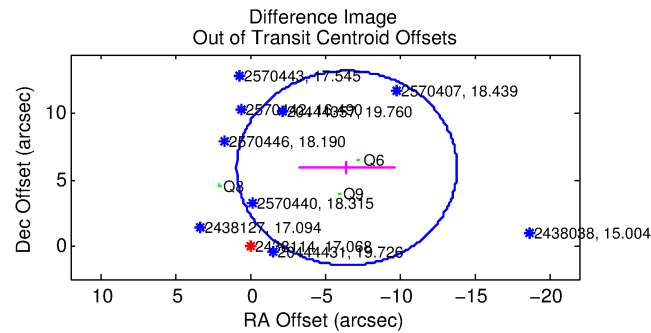
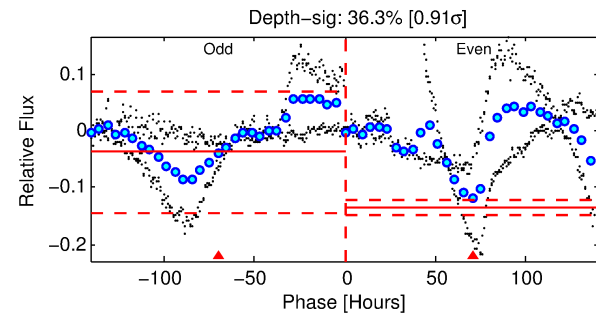
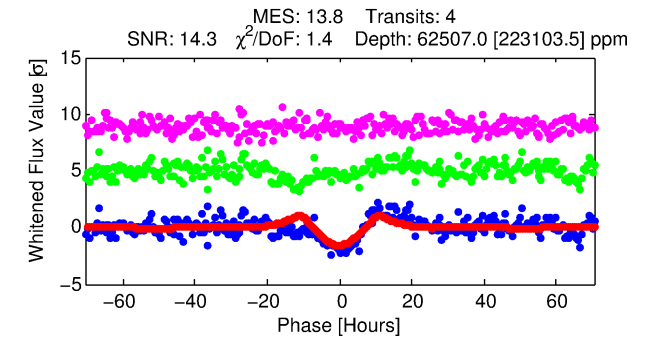
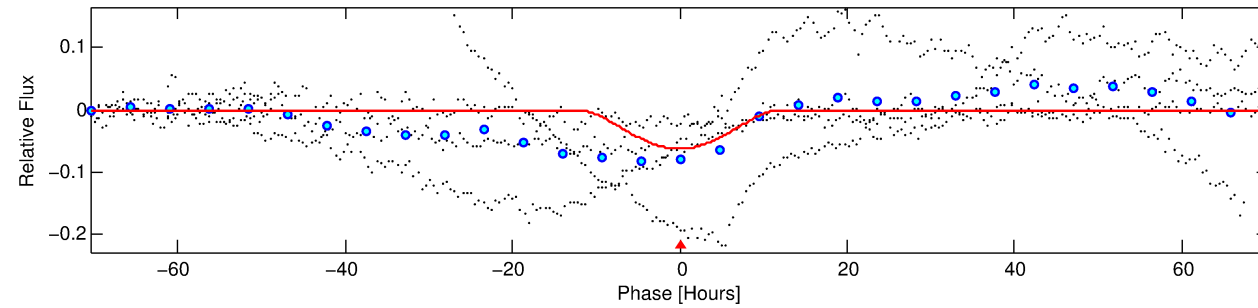
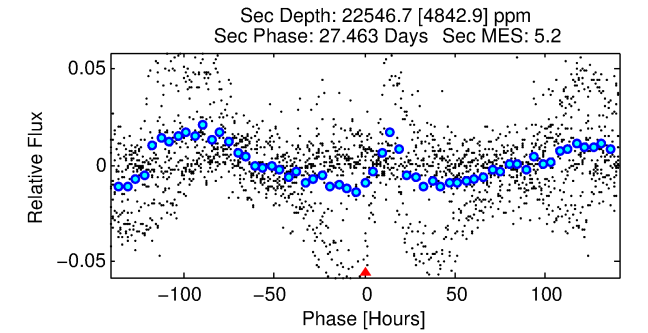
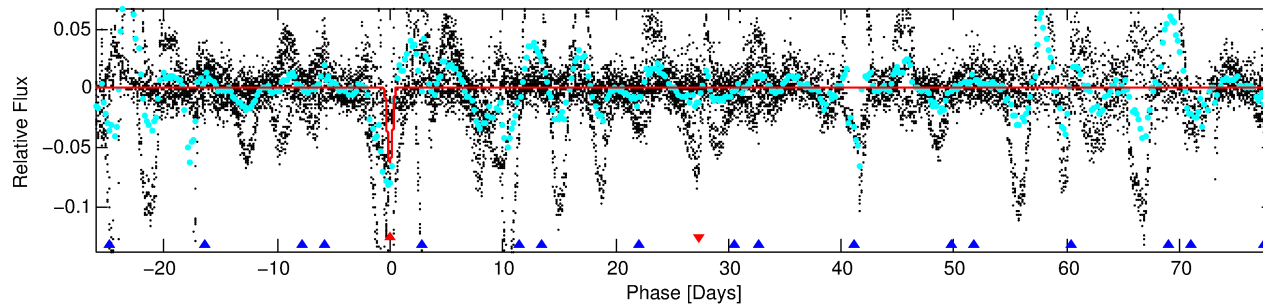
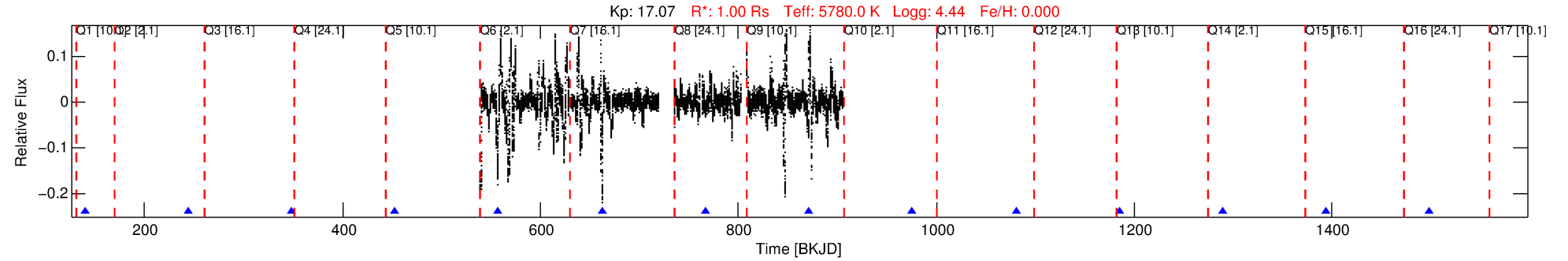
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 002438114-01

No Significant Match Found

# DV One-Page Summary

KIC: 2438114 Candidate: 1 of 2 Period: 104.556 d



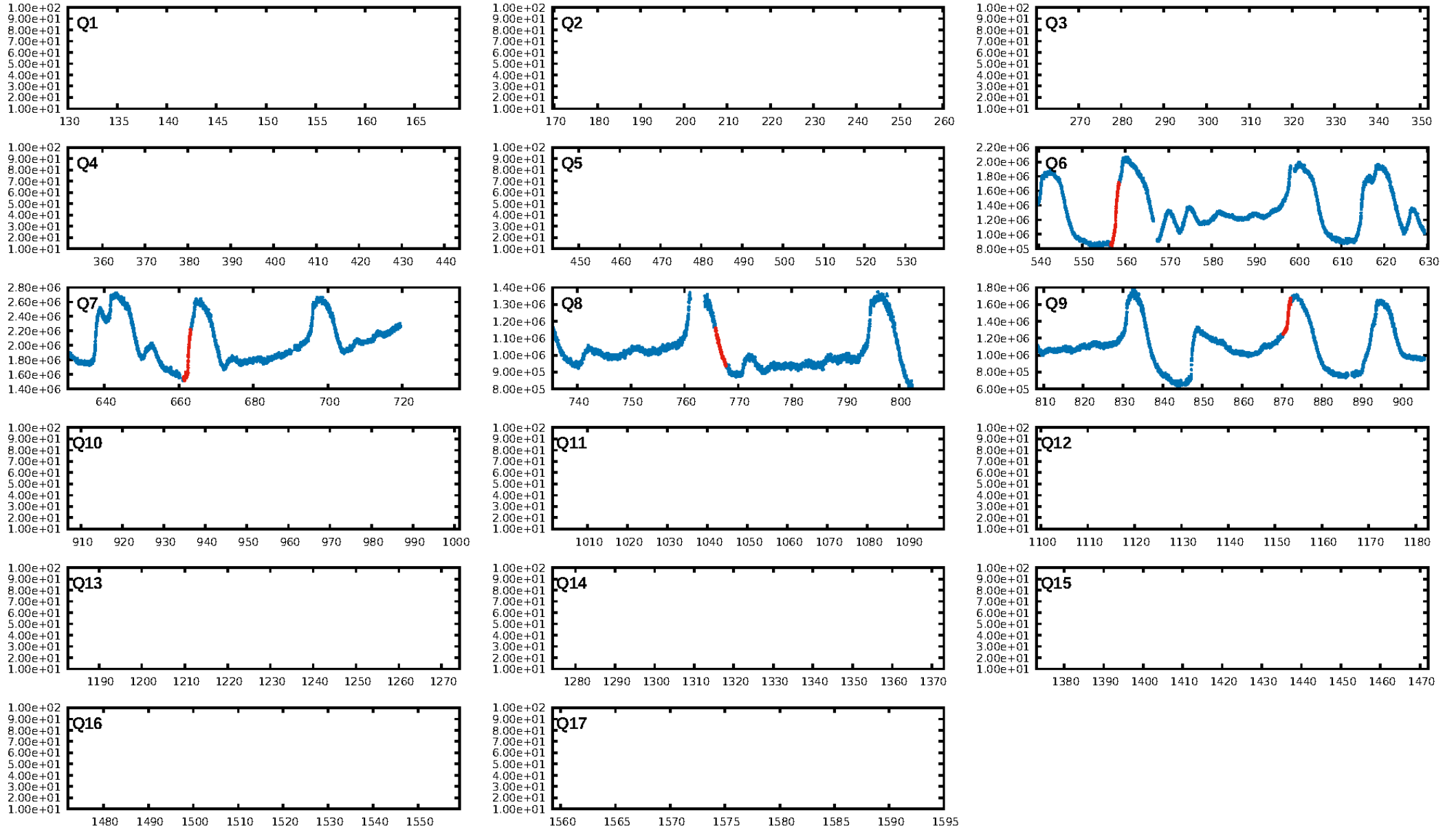
## DV Fit Results:

Period = 104.55613 [0.01419] d  
Epoch = 139.4090 [0.0783] BKJD  
Rp/R\* = 0.3928 [2.3511]  
a/R\* = 32.99 [3.94]  
b = 1.00 [2.21]  
Seff = 5.30 [0.00]  
Teq = 387 [0] K  
Rp = 42.86 [256.56] Re  
a = 0.4344 [0.0000] AU  
Ag = 1274.37 [15258.67] [0.08 $\sigma$ ]  
Teffp = 3574 [10698] K [0.30 $\sigma$ ]

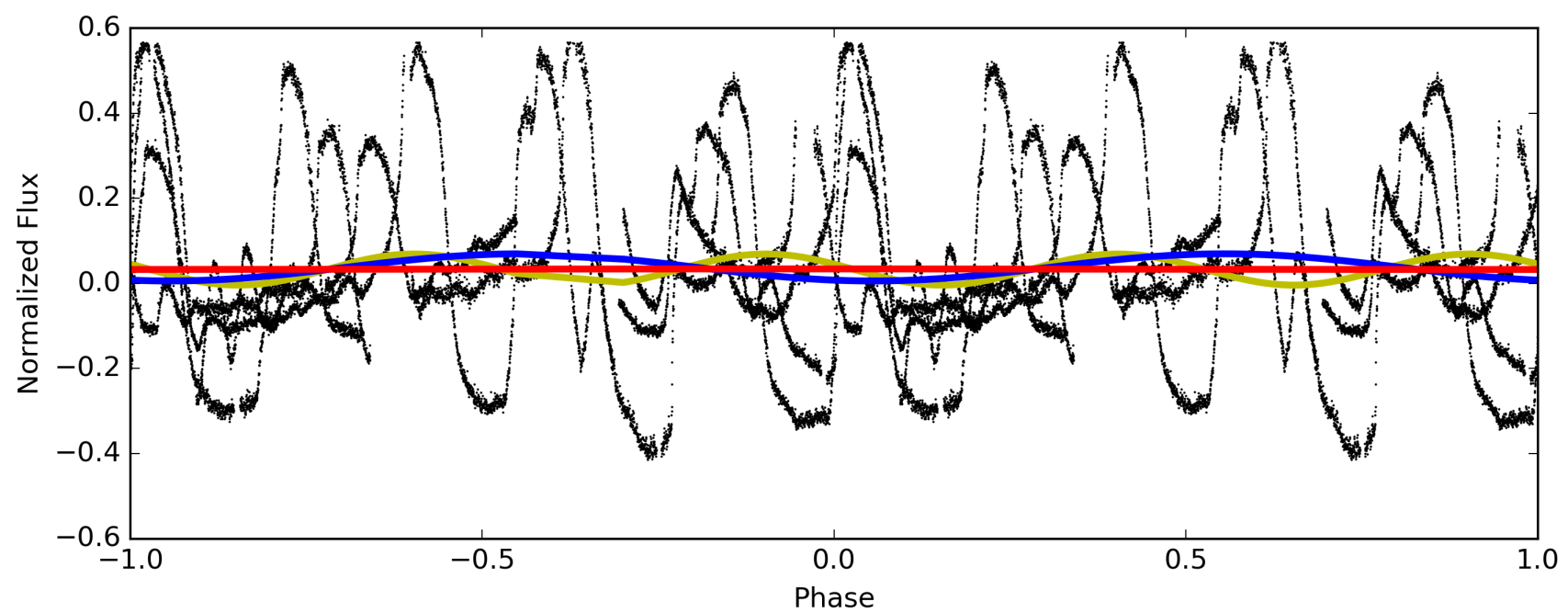
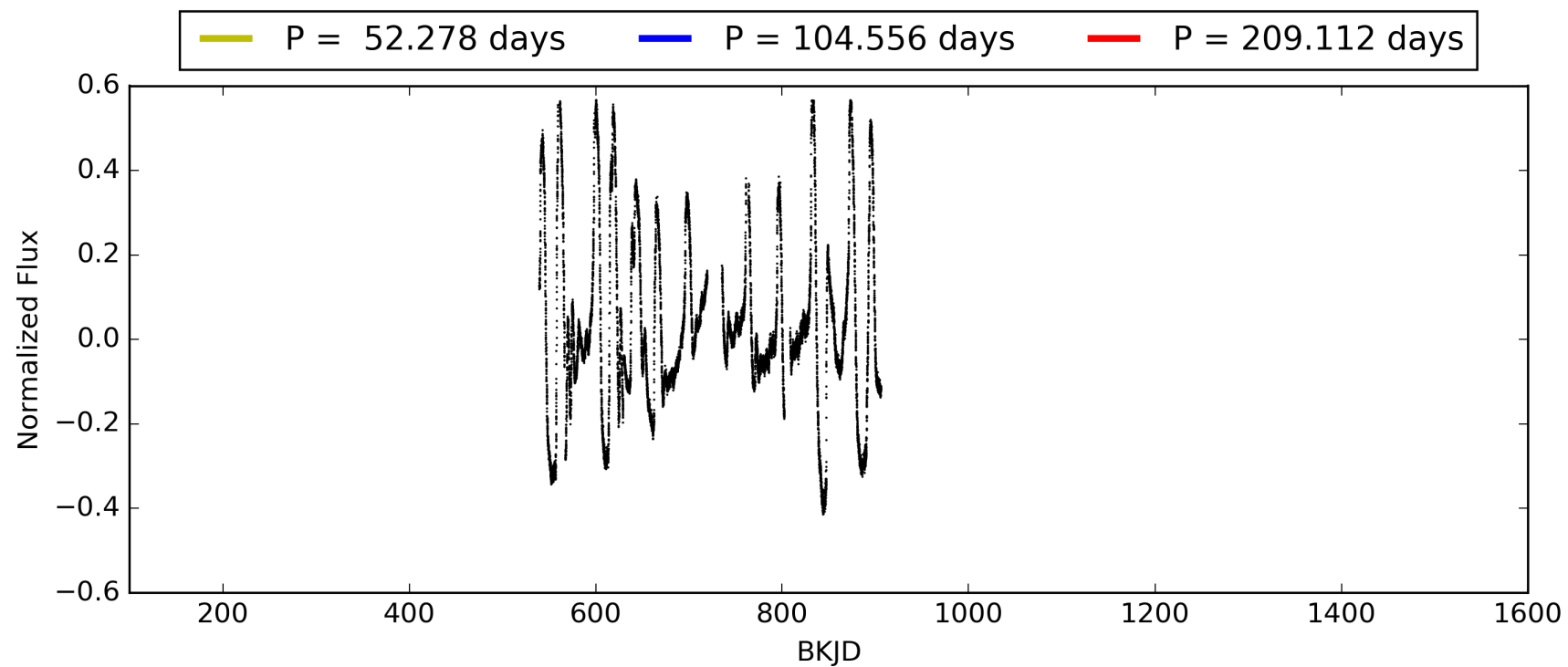
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [12.58 $\sigma$ ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: 0.0%  
ModelChiSquareGoF-sig: 42.9%  
Bootstrap-pfa: 1.24e-19  
RollingBand-fgt: 1.00 [4/4]  
GhostDiagnostic-chr: -0.07663  
Centroid-sig: 0.3%  
Centroid-so: 2.080 arcsec [16.36 $\sigma$ ]  
OotOffset-rm: 8.756 arcsec [3.57 $\sigma$ ]  
KicOffset-rm: 1.466 arcsec [10.62 $\sigma$ ]  
OotOffset-st: 1/0/1/1 [3]  
KicOffset-st: 1/0/1/1 [3]  
DiffImageQuality-fgm: 0.67 [2/3]  
DiffImageOverlap-fno: 1.00 [3/3]

# TCE 002438114-01, PDC Light Curves

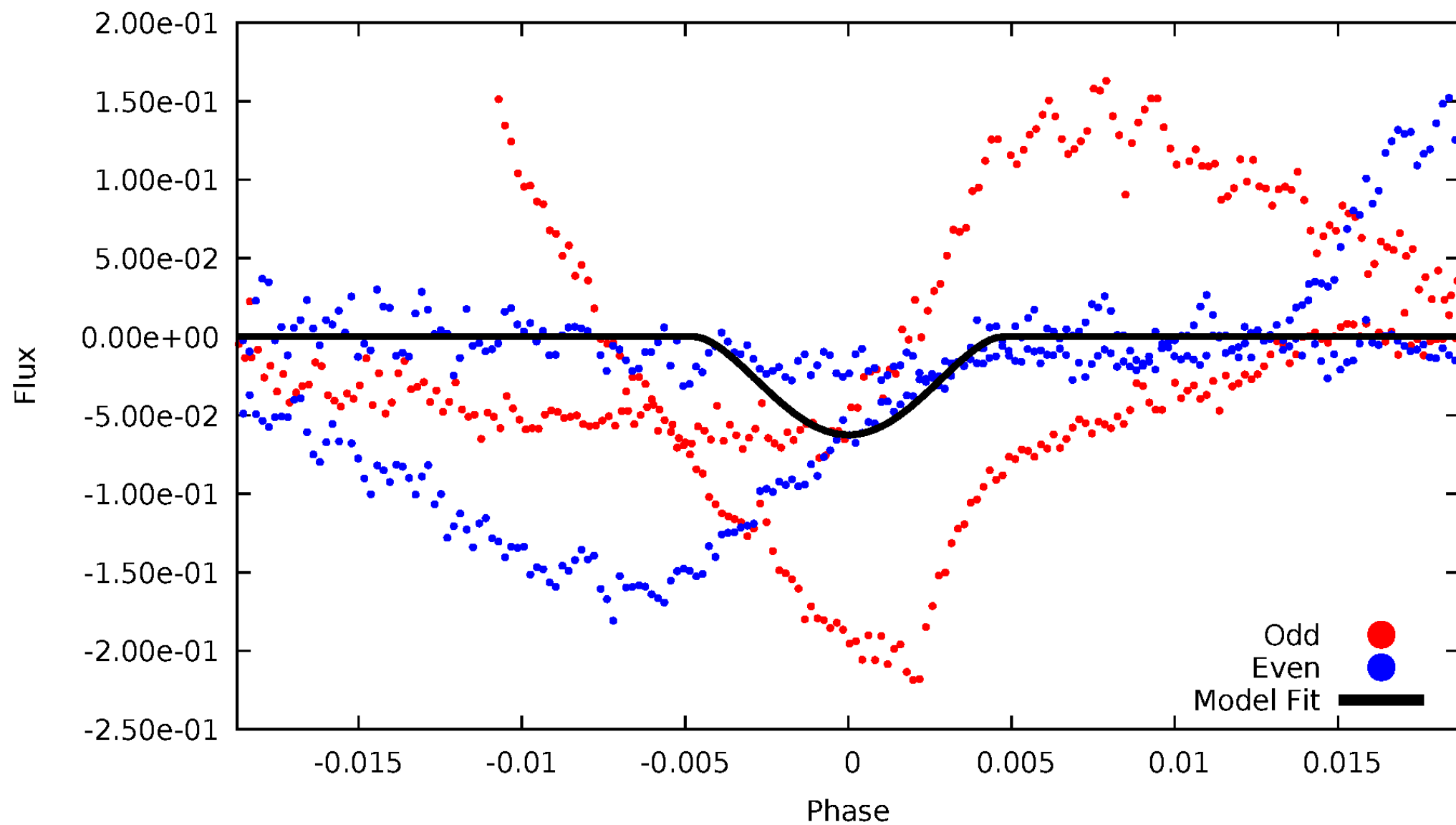


TCE 002438114-01



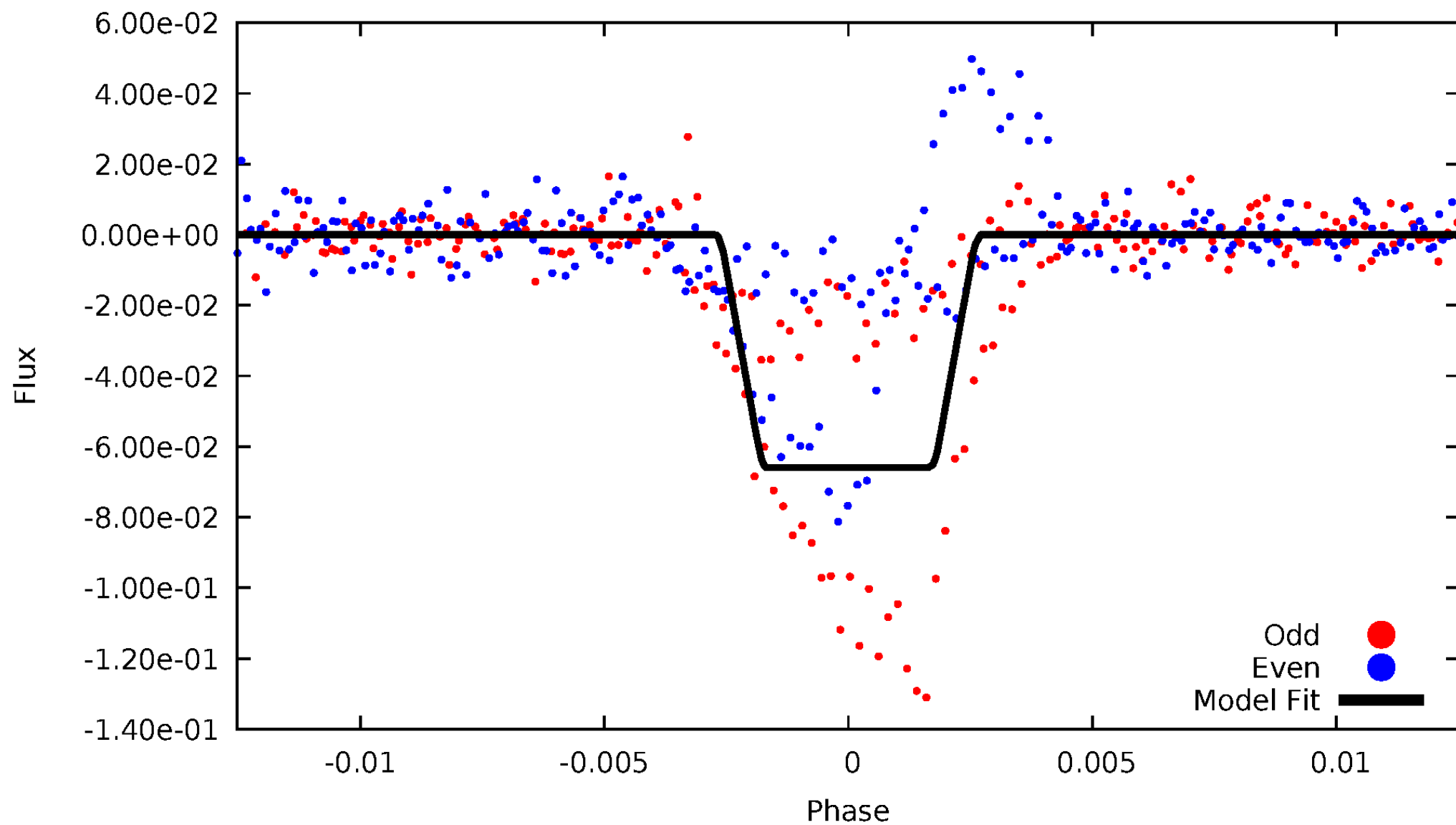
# DV Odd/Even

TCE 002438114-01



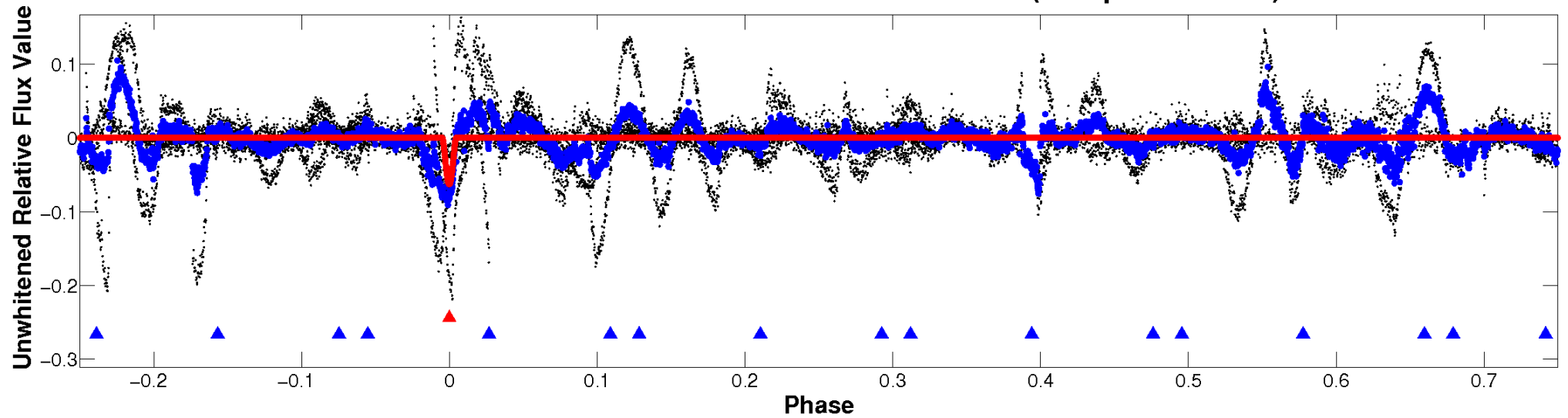
# ALT Odd/Even

TCE 002438114-01

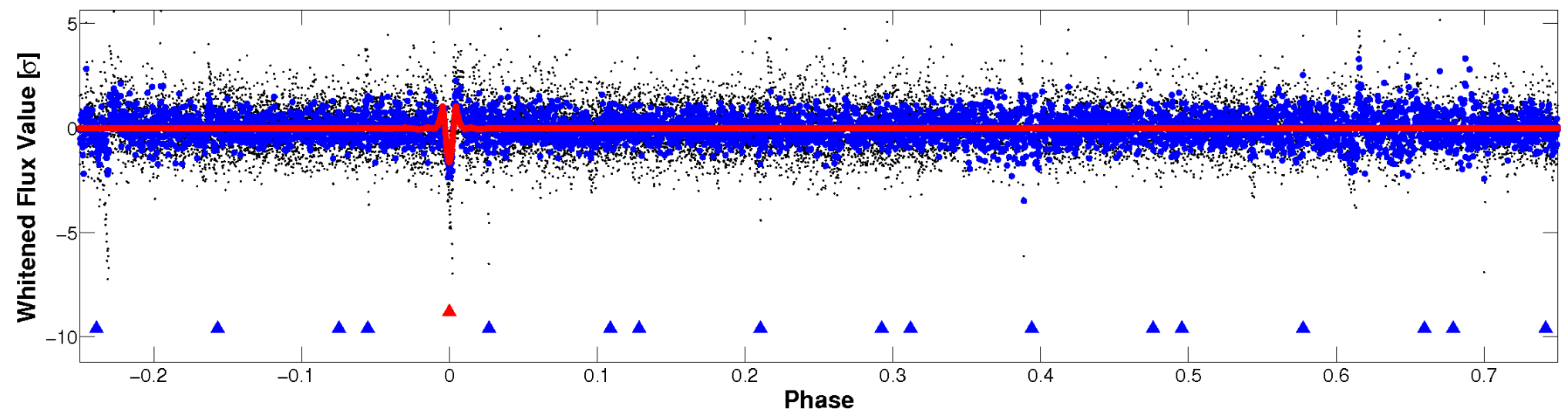


# Non-Whitened Vs. Whitened Light Curve

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

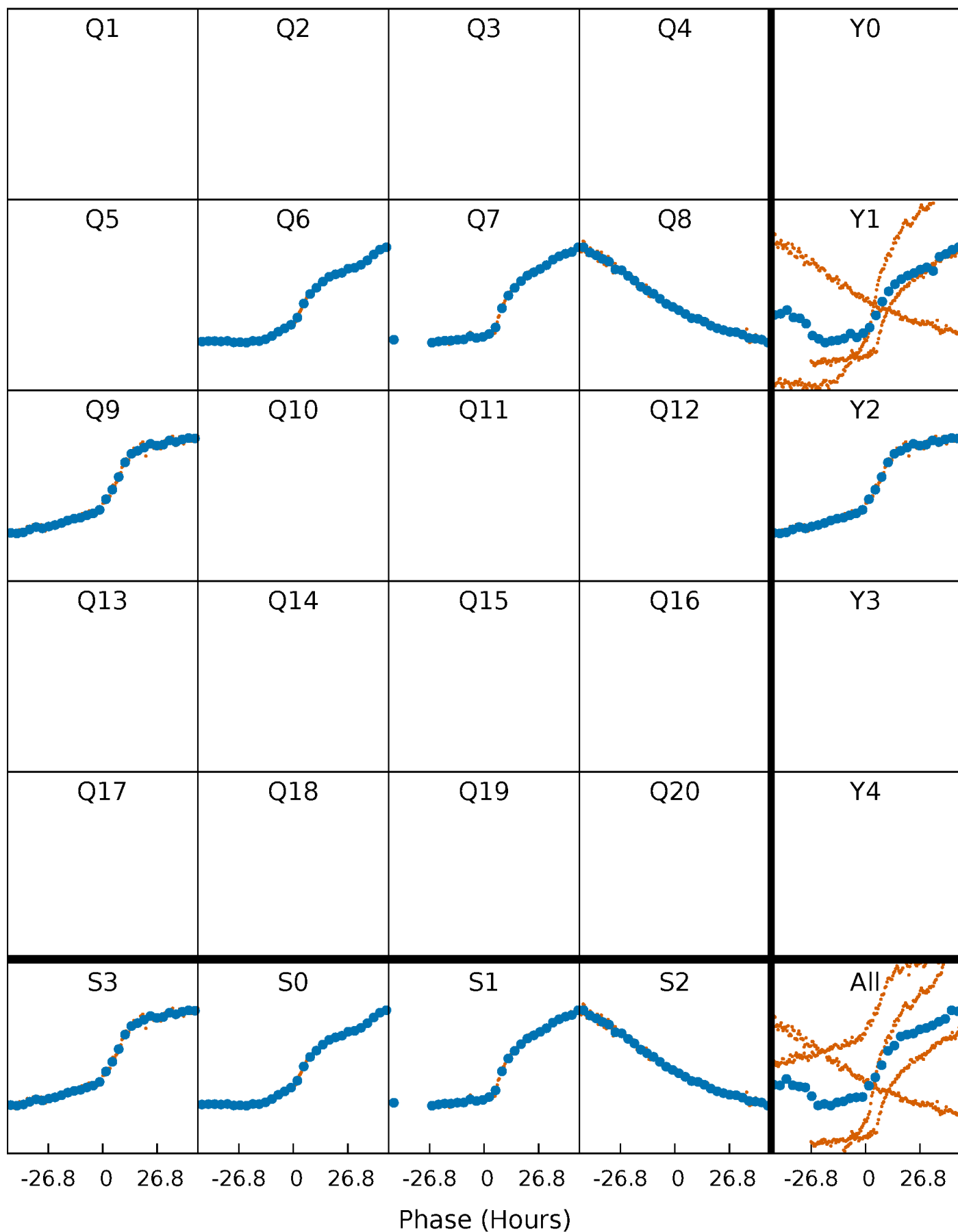


Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)



# PDC Quarter-Phased Transit Curves

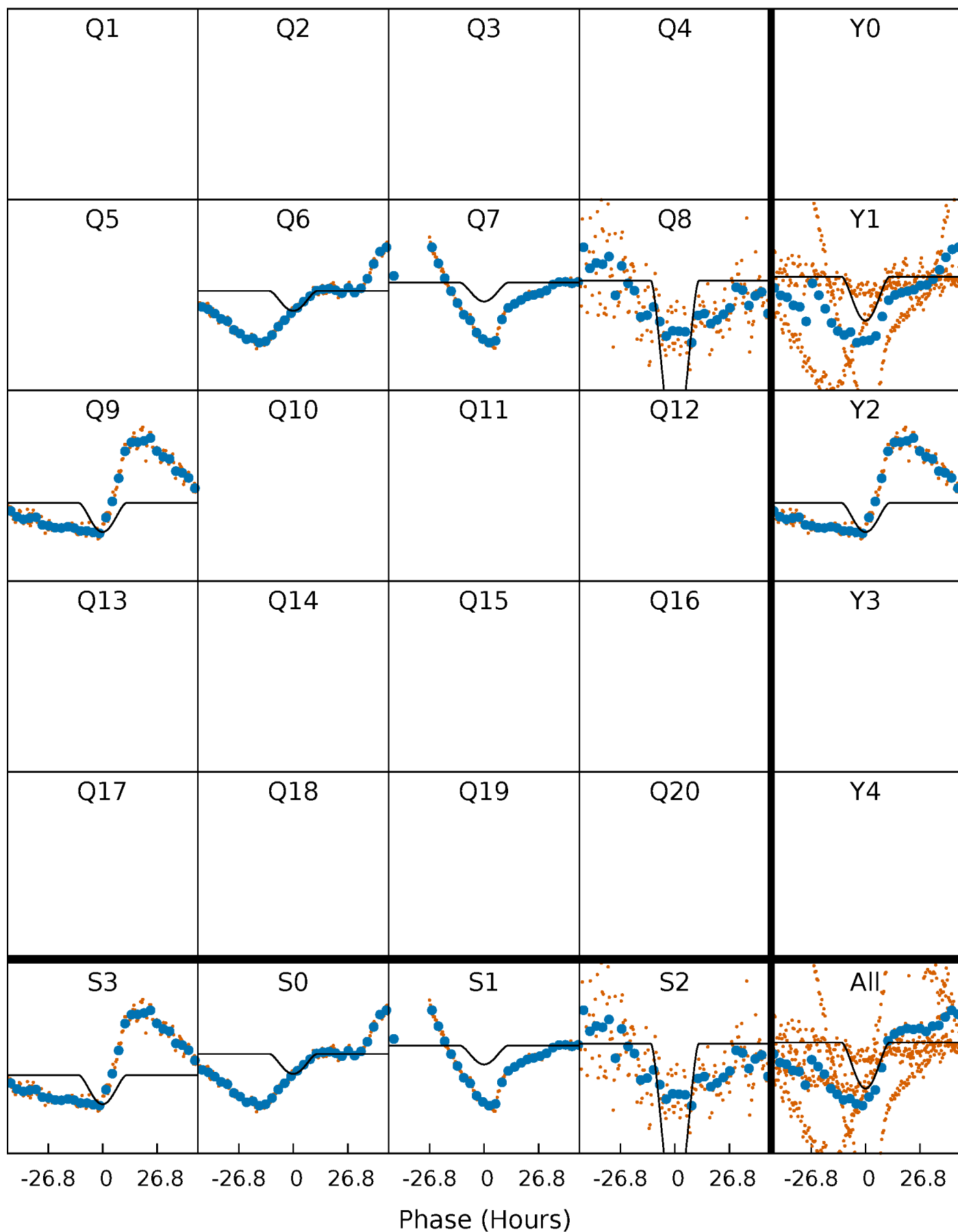
TCE 002438114-01 P=104.556129 Days  $T_0=139.409048$  (BKJD)





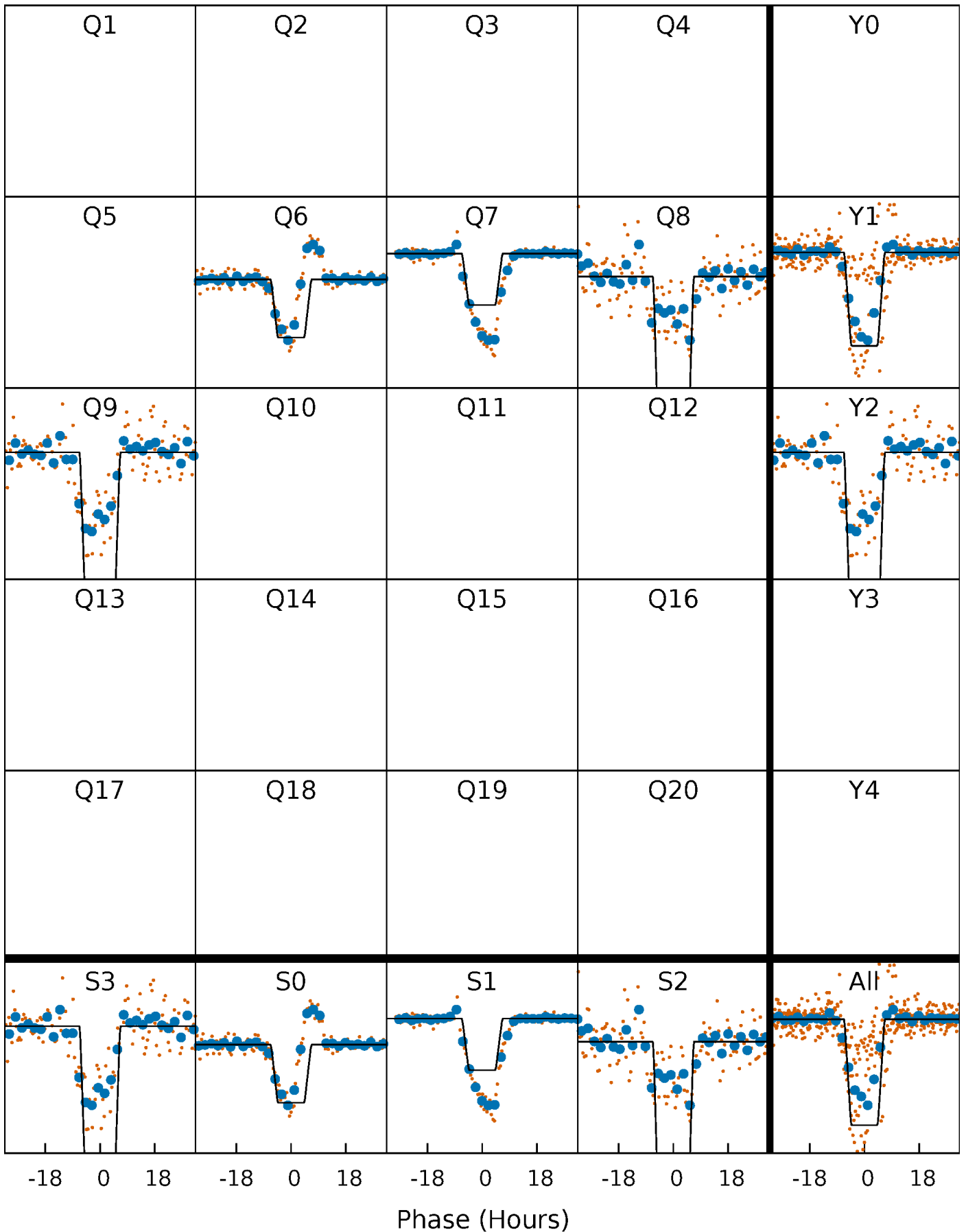
# DV Quarter-Phased Transit Curves

TCE 002438114-01 P=104.556129 Days  $T_0=139.409048$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

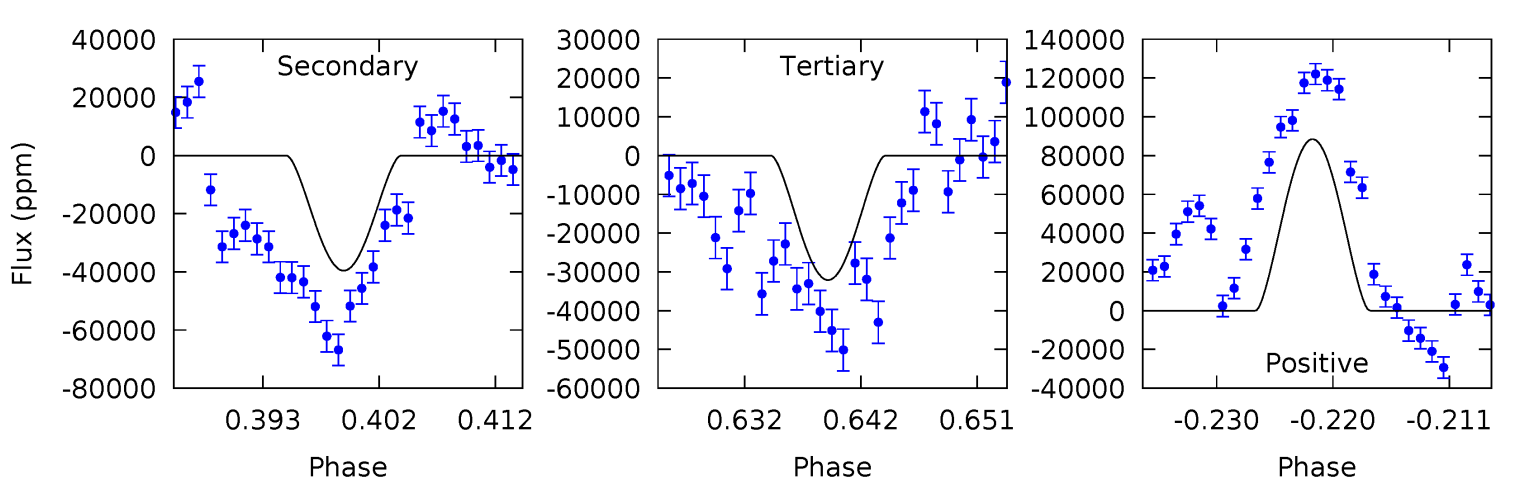
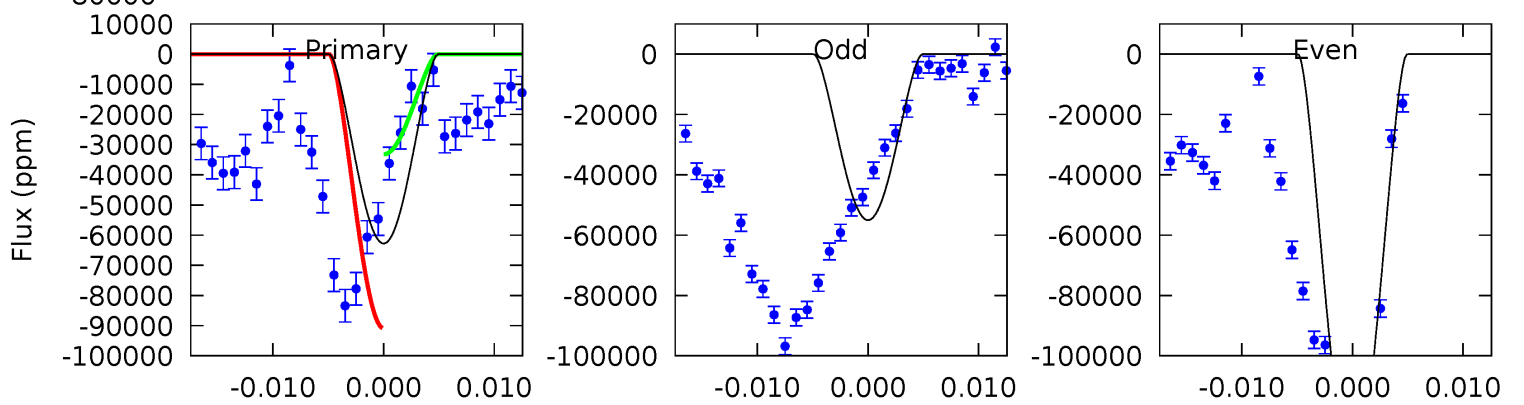
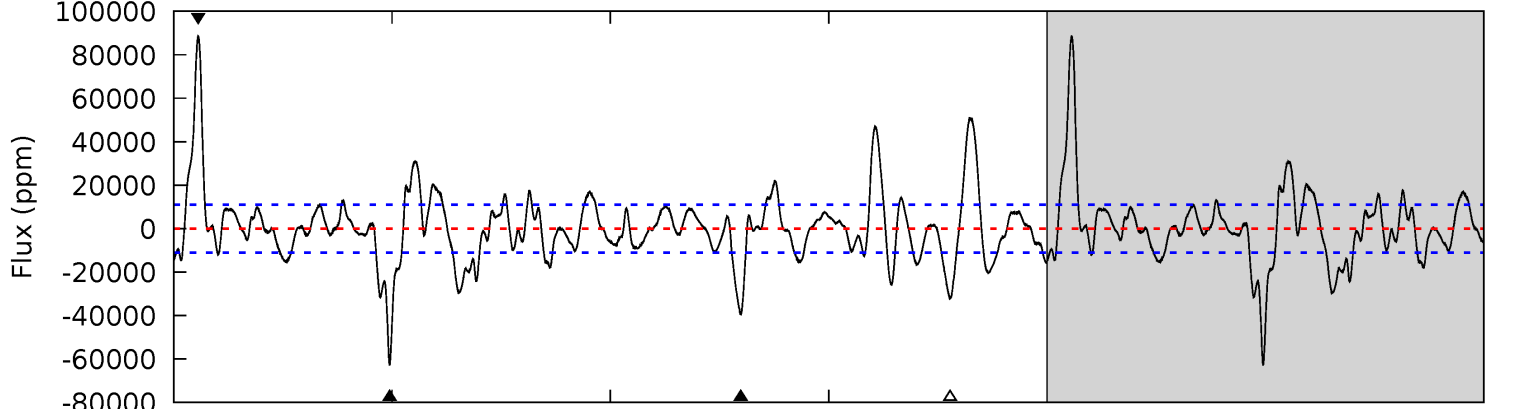
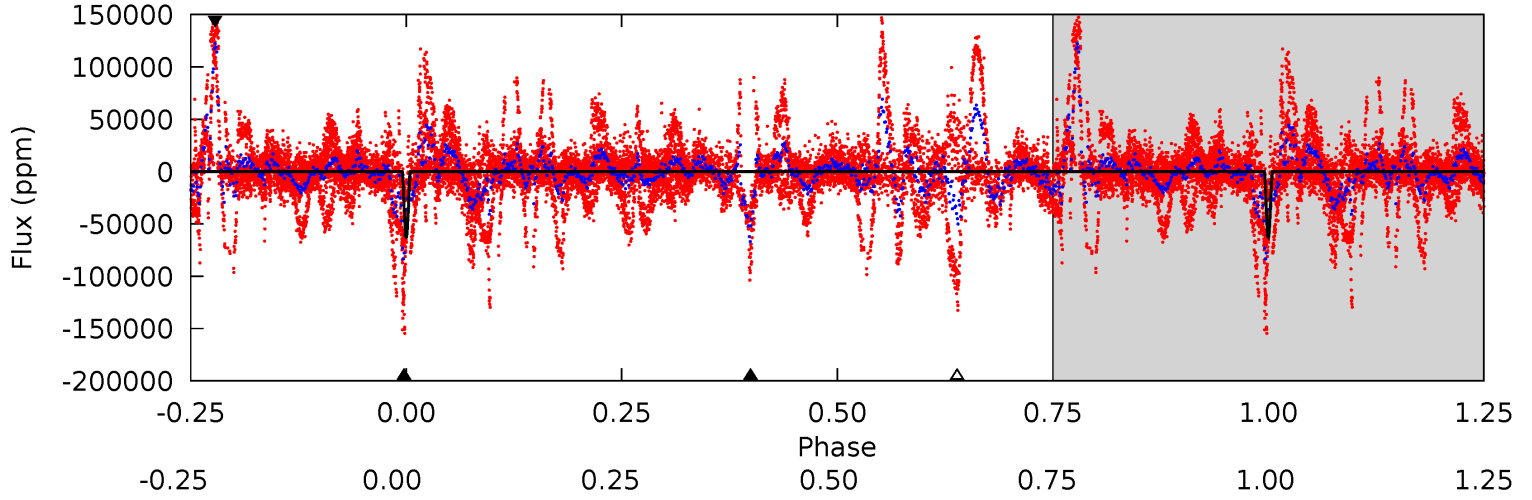
TCE 002438114-01 P=104.572149 Days  $T_0=139.390393$  (BKJD)



# DV Model-Shift Uniqueness Test

002438114-01, P = 104.556129 Days, E = 139.409048 Days

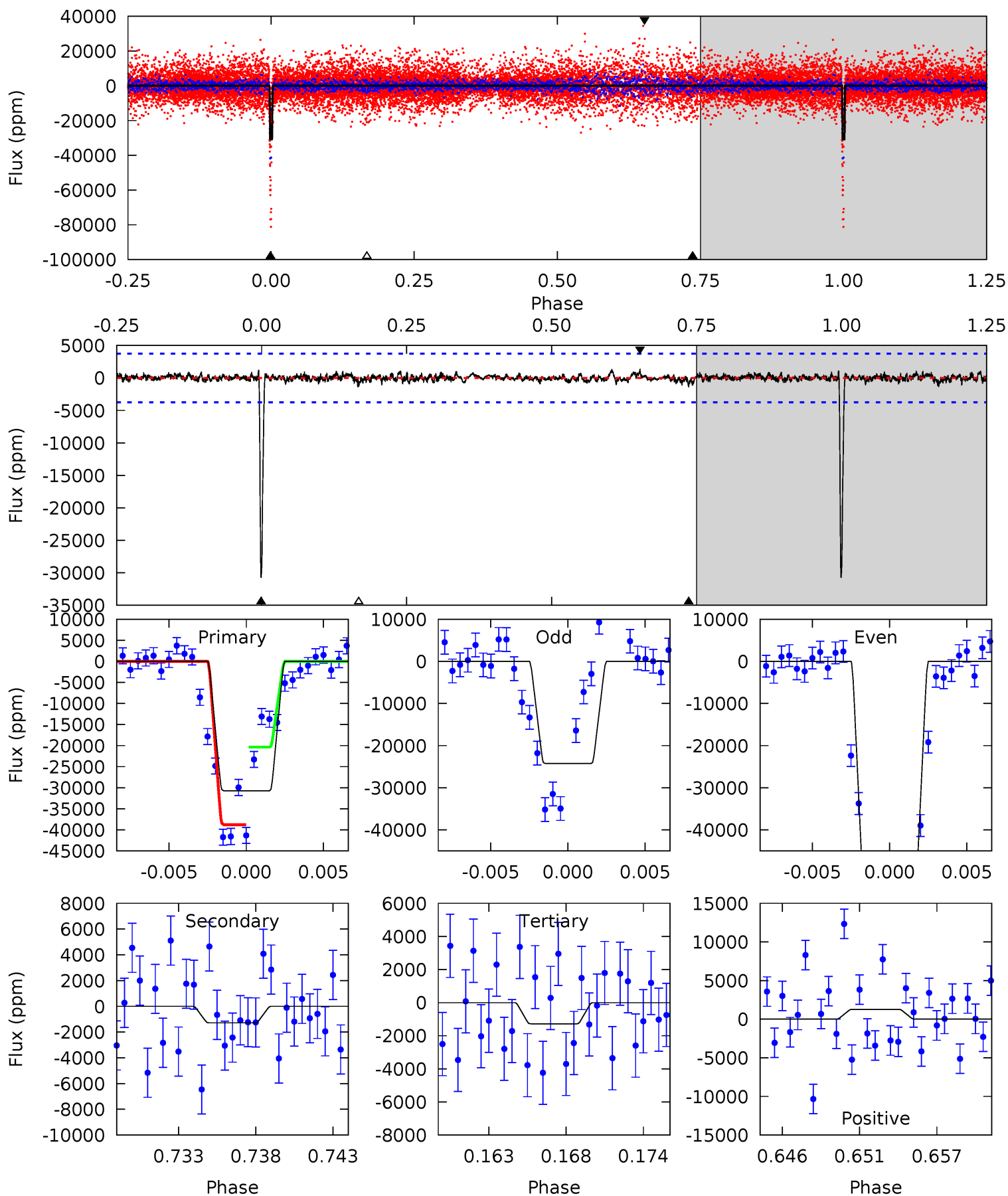
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
28.6	18.0	14.6	40.3	5.03	2.59	6.13	14.0	-11.7	3.41	-22.3	17.7	1.48	0.59	13.2



# Alt Model-Shift Uniqueness Test

002438114-01, P = 104.572149 Days, E = 139.390393 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
42.1	1.77	1.75	1.75	5.14	2.78	0.47	40.4	40.4	0.01	0.02	30.2	1.40	0.04	12.6



### Stellar Parameters For KIC 002438114

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$5780^{+1}_{-1}$	$4.438^{+1.000}_{-1.000}$	$0.000^{+1.000}_{-1.000}$	$1.000^{+1.000}_{-1.000}$	$-1.000^{+1.000}_{-1.000}$	$-1.000^{+1.000}_{-1.000}$
	+0%/-0%	+23%/-23%	+inf%/-inf%	+100%/-100%	+100%/-100%	+100%/-100%
Source	Solar	Solar	Solar	Solar		

KIC = Kepler Input Catalog; PHO = Photometry; SPE = Spectroscopy; AST = Asteroseismology  
 TRA = Transits; DESP = Dartmouth Models; MULT = Multiple Models

### Secondary Eclipse Parameters for KIC 002438114-01 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-39580 \pm 2196$	$198.66^{+193.85}_{-137.67}$	$542^{+26}_{-26}$	$2725^{+1125}_{-435}$	$108^{+1038}_{-80}$
Alt.	$-1288 \pm 730$	$182.67^{+194.72}_{-130.44}$	$542^{+26}_{-27}$	$1838^{+576}_{-319}$	$3.529^{+34.571}_{-2.861}$

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

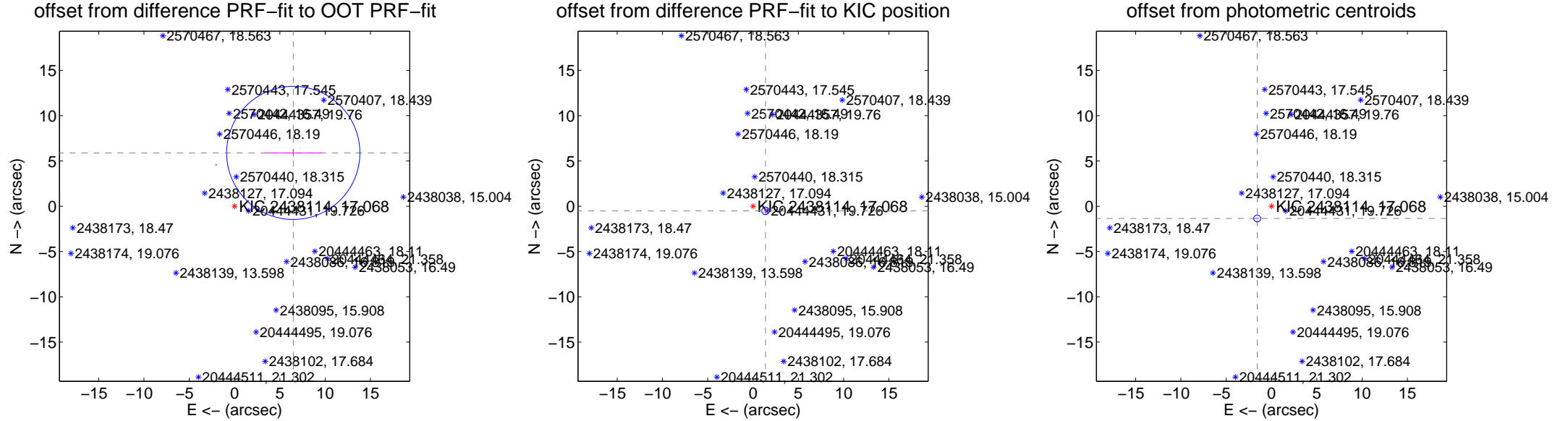
## DV Centroid Data

Supplemental centroid analysis for 002438114-01. Kepler magnitude: 17.07. Transit SNR 14.30

There are 2 quarters with good PRF difference image offsets

The OOT PRF centroid is offset from the target star catalog position by about 6.68 arcsec so the offset from difference PRF-fit to OOT-fit may be invalid.

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$8.756 \pm 2.451$	$3.57$	$-6.478 \pm 3.194$	$5.890 \pm 0.404$
PRF-fit source offset from KIC position	$1.466 \pm 0.138$	$10.62$	$-1.373 \pm 0.153$	$-0.512 \pm 0.083$
photometric centroid source offset	$2.08 \pm 0.13$	$16.36$	$1.58 \pm 0.16$	$-1.35 \pm 0.05$

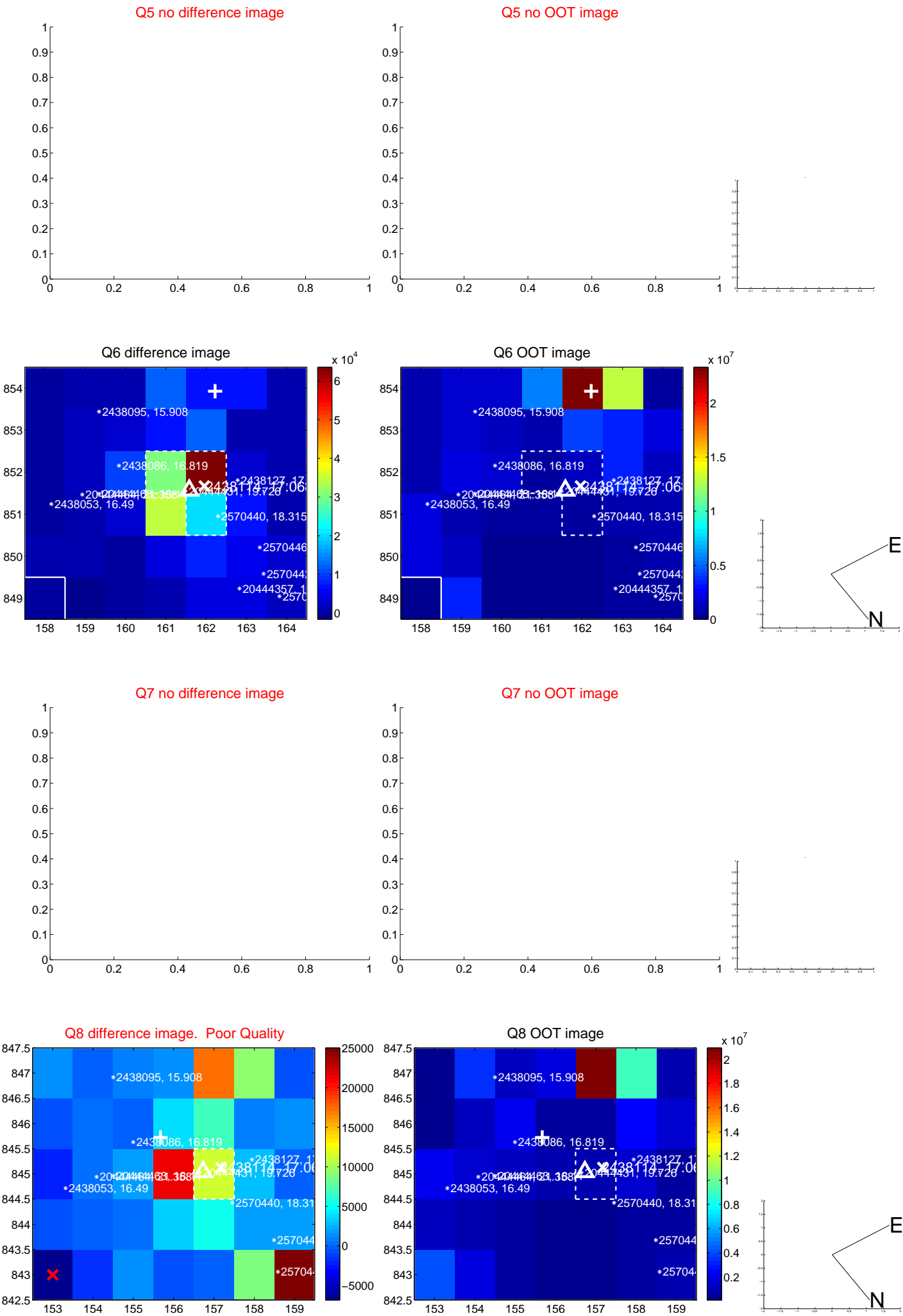


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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

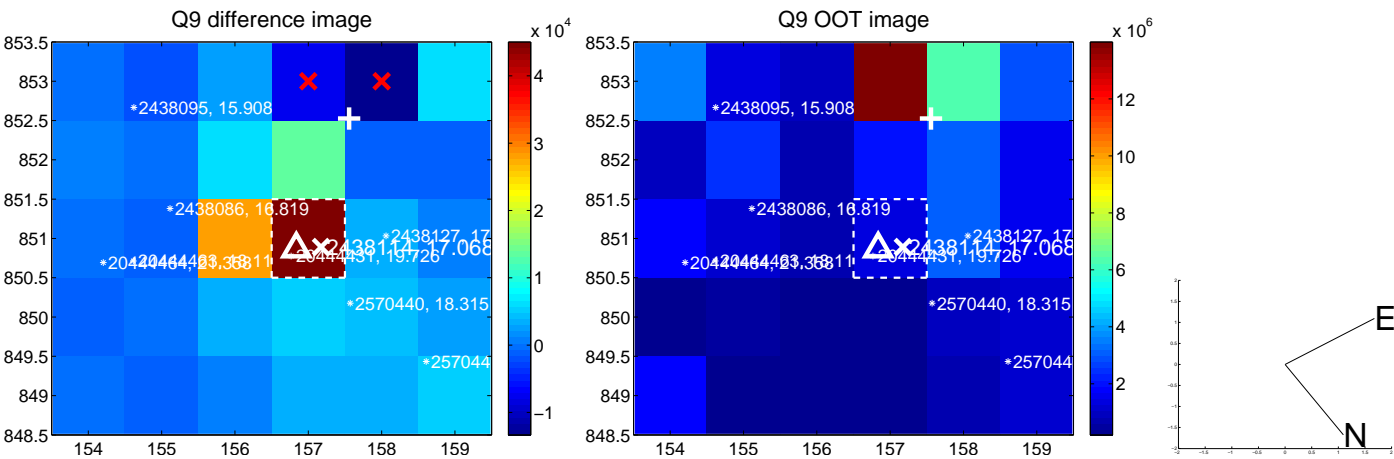


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.





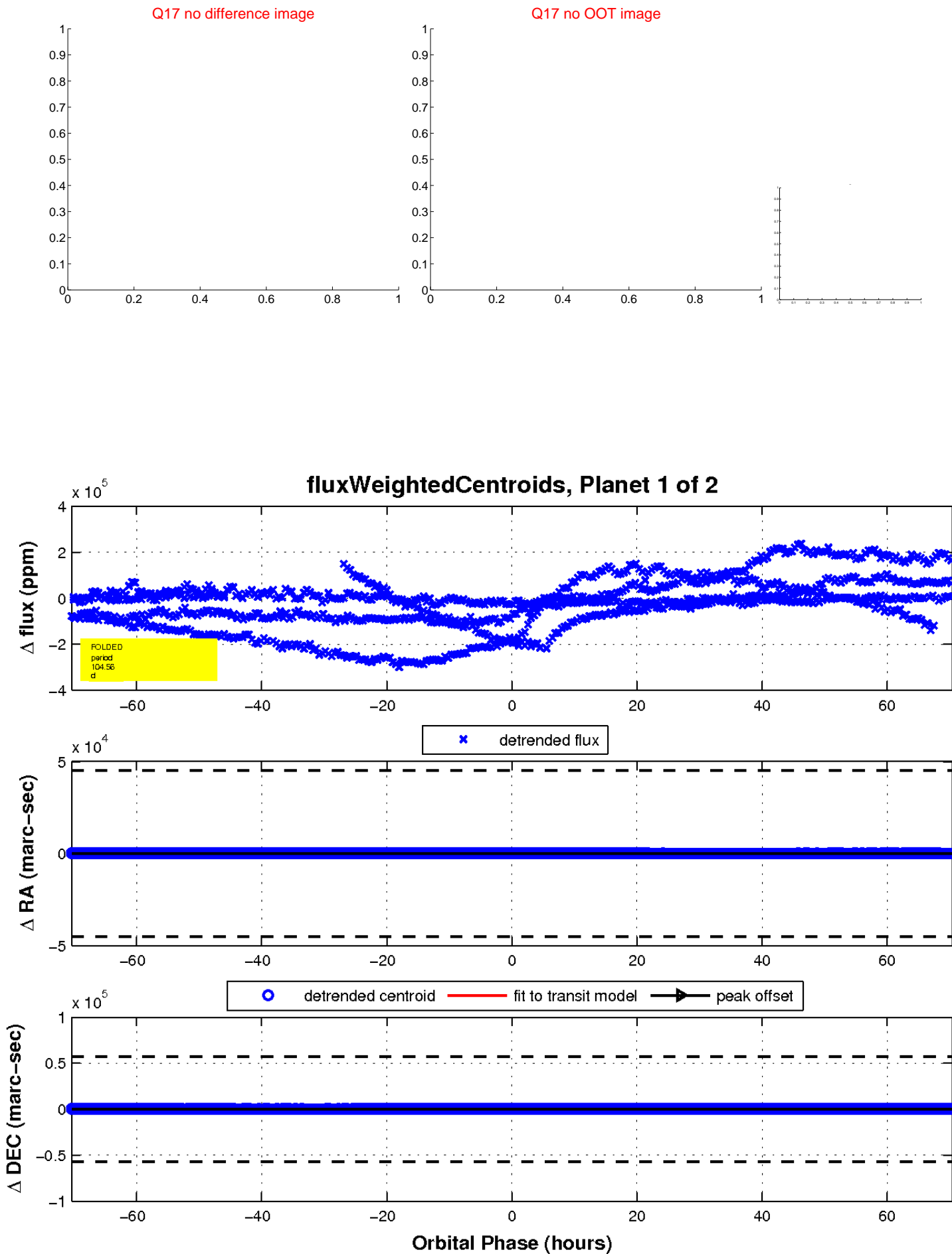
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



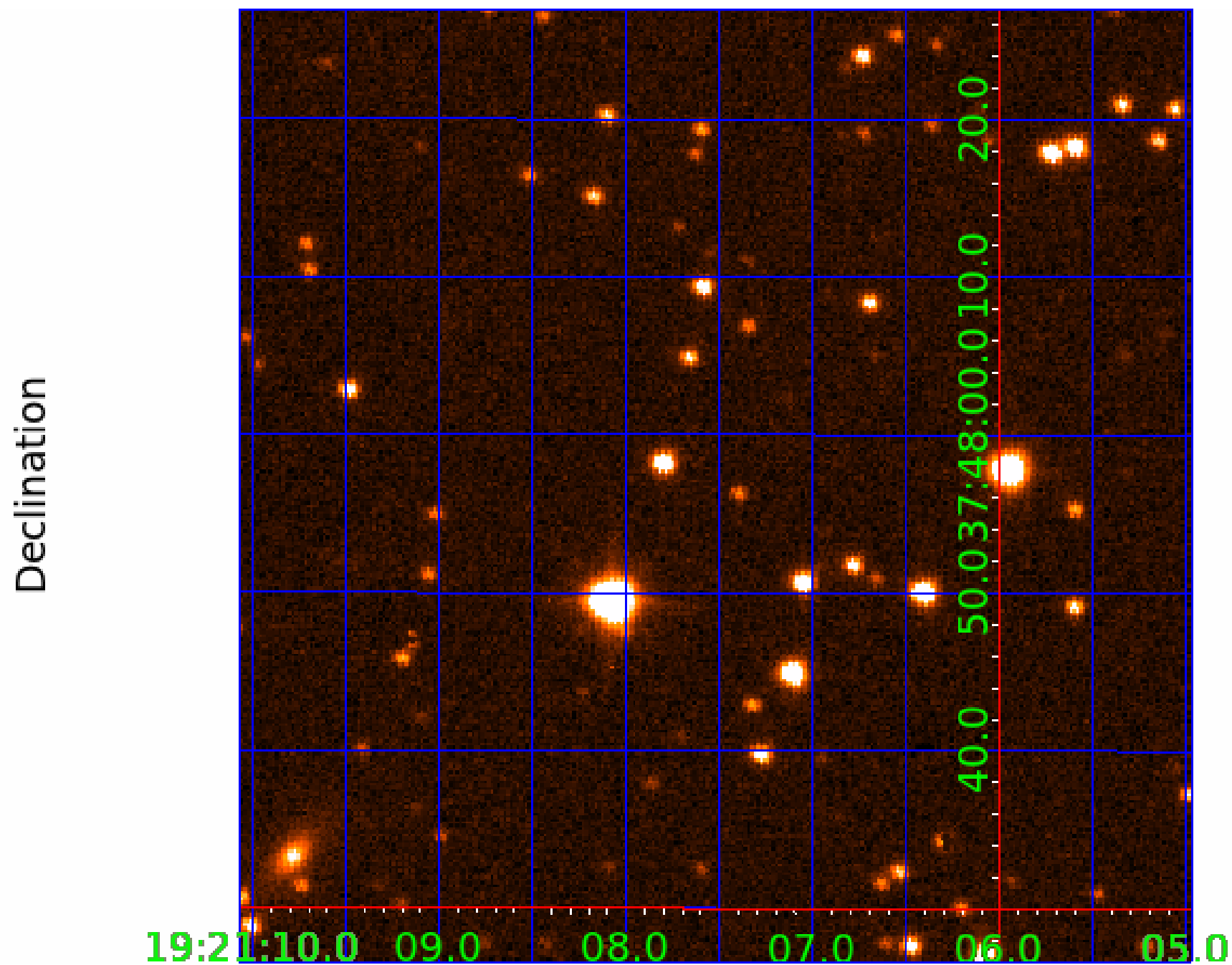
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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



UKIRT Image



# KIC 002438114

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
002438114-01	OBS	No	104.556129	139.409048	62507.0	23.485	13.8	14.3	1.00	5780	42.86	5.30
002438114-02	OBS	No	85.360691	210.421422	59827.7	28.090	10.2	10.6	1.00	5780	25.88	6.94

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
002438114-01	OBS	FP	0.00	1	0	1	0	LPP_DV—ALL_TRANS_CHASES—MOD_POS_DV—CENT_FEW_DIFFS—HALO_GHOST
002438114-02	OBS	FP	0.00	1	0	0	0	LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—CENT_FEW_DIFFS

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

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

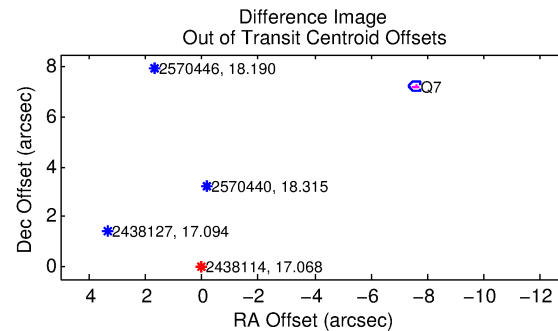
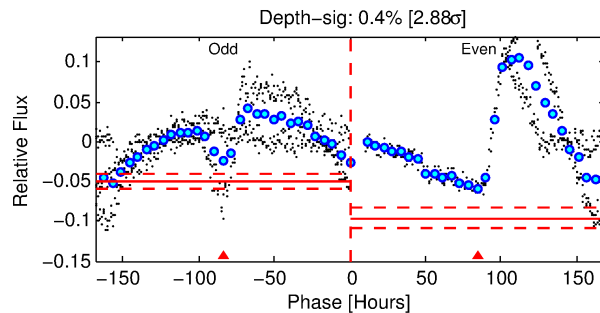
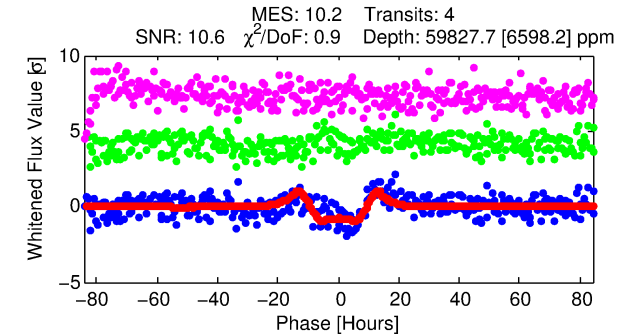
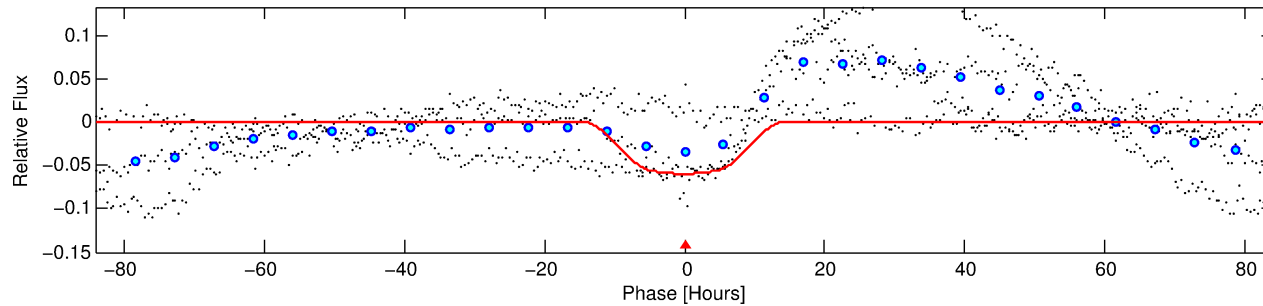
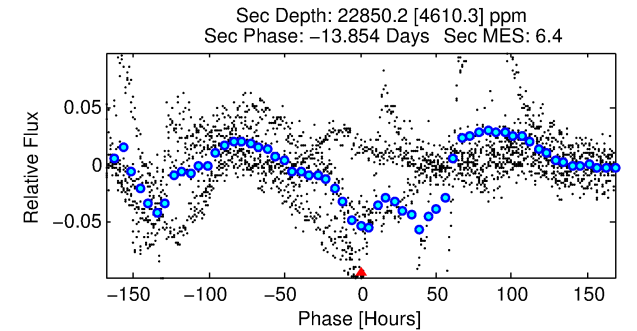
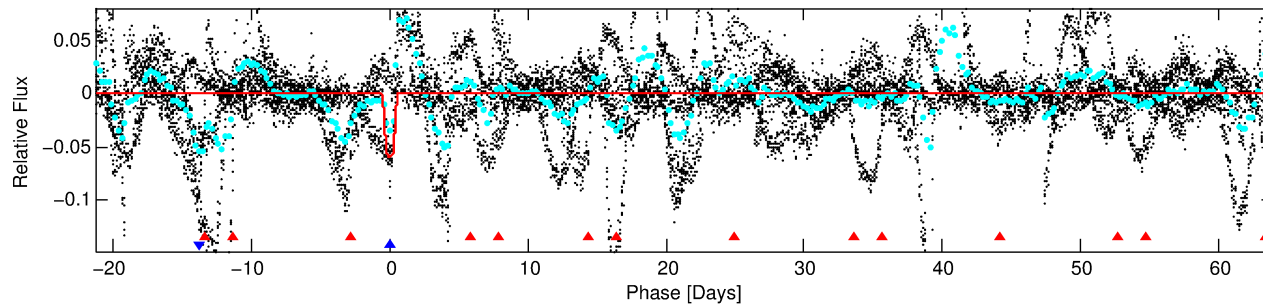
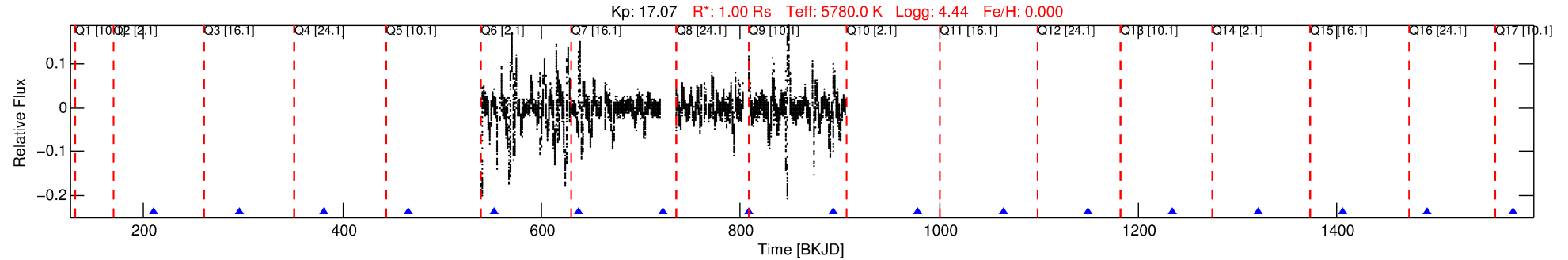
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 002438114-02

No Significant Match Found

# DV One-Page Summary

KIC: 2438114 Candidate: 2 of 2 Period: 85.361 d



## DV Fit Results:

Period = 85.36069 [0.00938] d  
Epoch = 210.4214 [0.0568] BKJD  
Rp/R\* = 0.2371 [0.0144]  
a/R\* = 24.65 [1.63]  
b = 0.64 [0.06]  
Seff = 6.94 [0.00]  
Teq = 414 [0] K  
Rp = 25.88 [1.57] Re  
a = 0.3795 [0.0000] AU  
Ag = 2703.81 [636.24] [4.25σ]  
Teffp = 4615 [271] K [15.47σ]

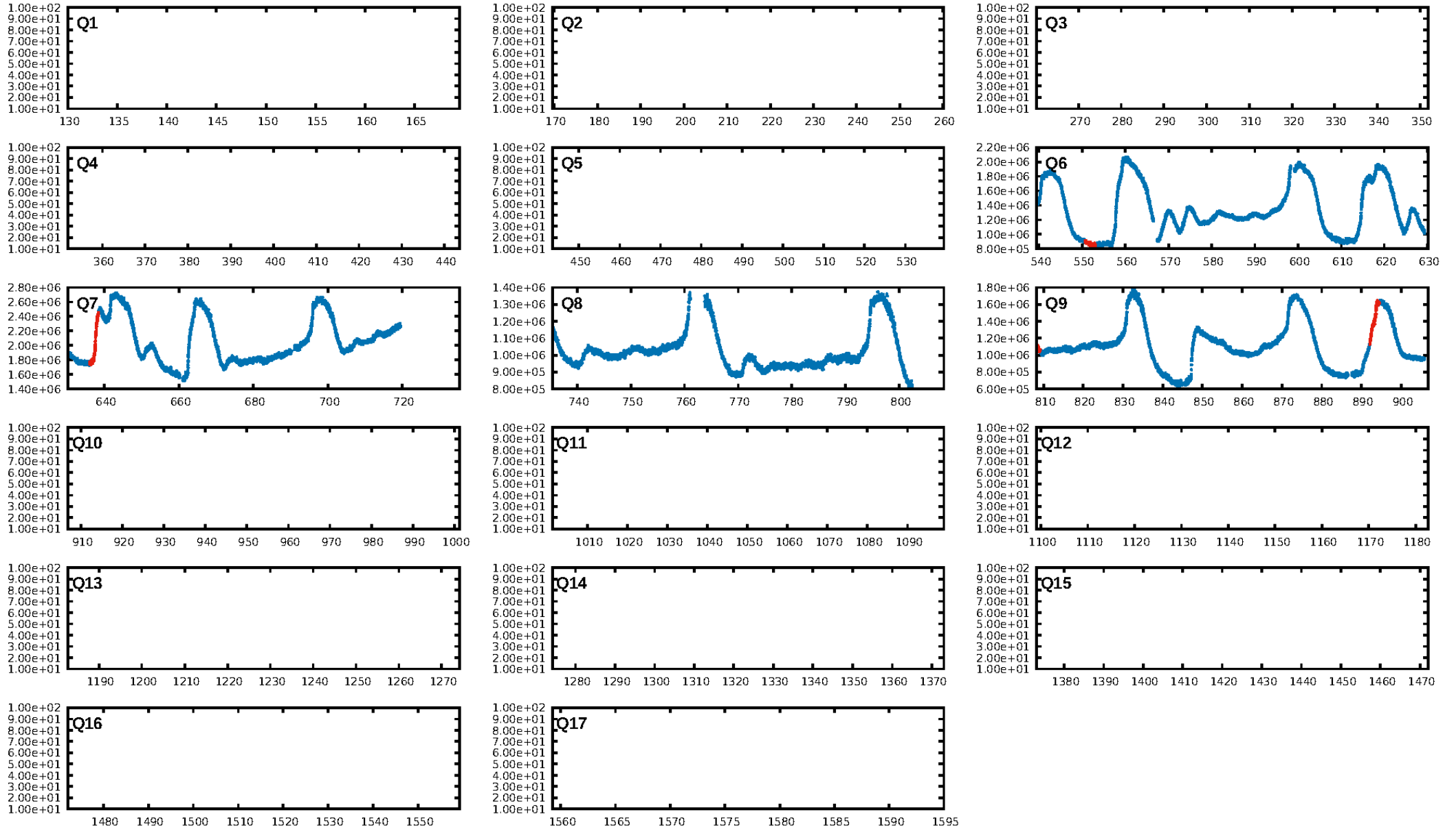
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 100.0% [12.58σ]  
ModelChiSquare2-sig: 2.1%  
ModelChiSquareGof-sig: 100.0%  
Bootstrap-pfa: 6.67e-13  
RollingBand-fgt: 1.00 [4/4]  
GhostDiagnostic-chr: 1.989  
Centroid-sig: 0.0%  
Centroid-so: 1.934 arcsec [12.22σ]  
OotOffset-rm: 10.467 arcsec [149.84σ]  
KicOffset-rm: 1.568 arcsec [22.66σ]  
OotOffset-st: 0/1/0/0 [1]  
KicOffset-st: 0/1/0/0 [1]  
DiffImageQuality-fgm: 1.00 [1/1]  
DiffImageOverlap-fno: 1.00 [3/3]

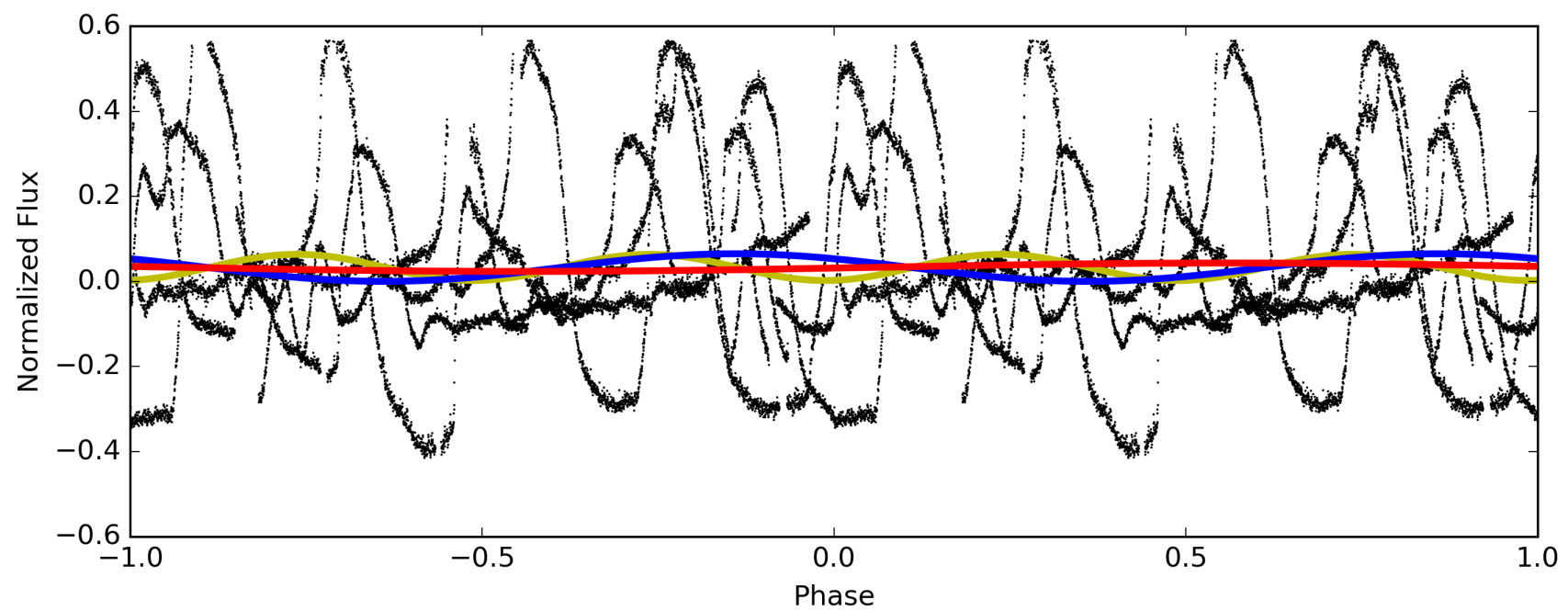
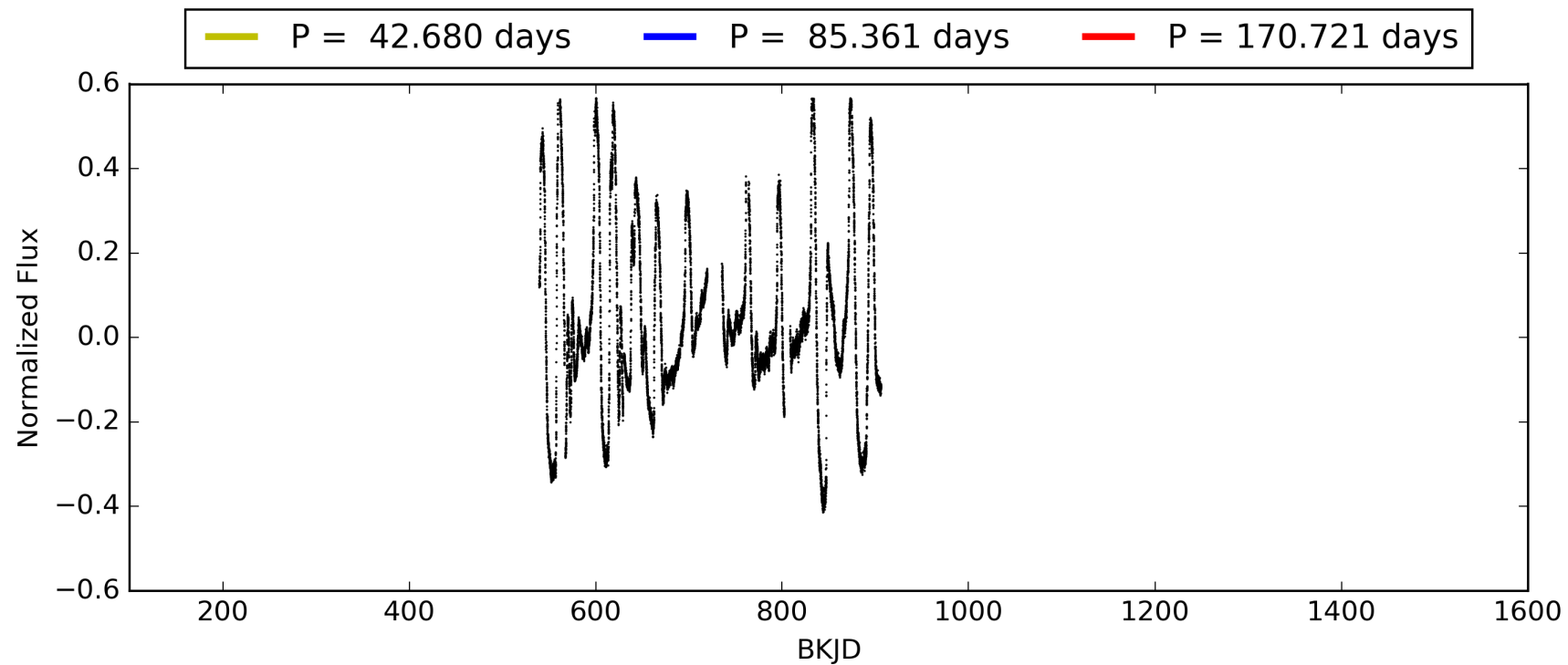
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 30-Jan-2016 20:16:40 Z

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

# TCE 002438114-02, PDC Light Curves



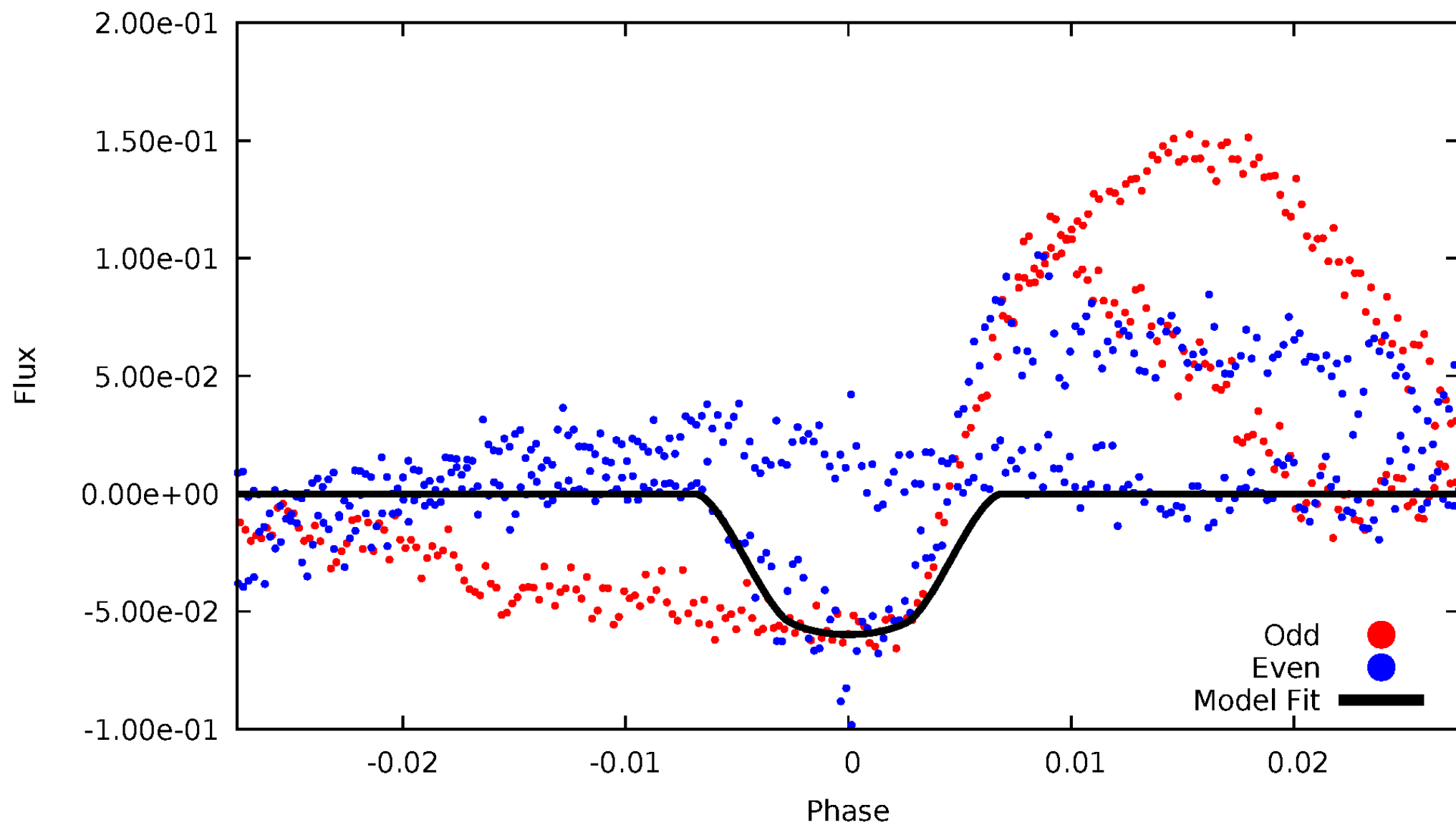
TCE 002438114-02





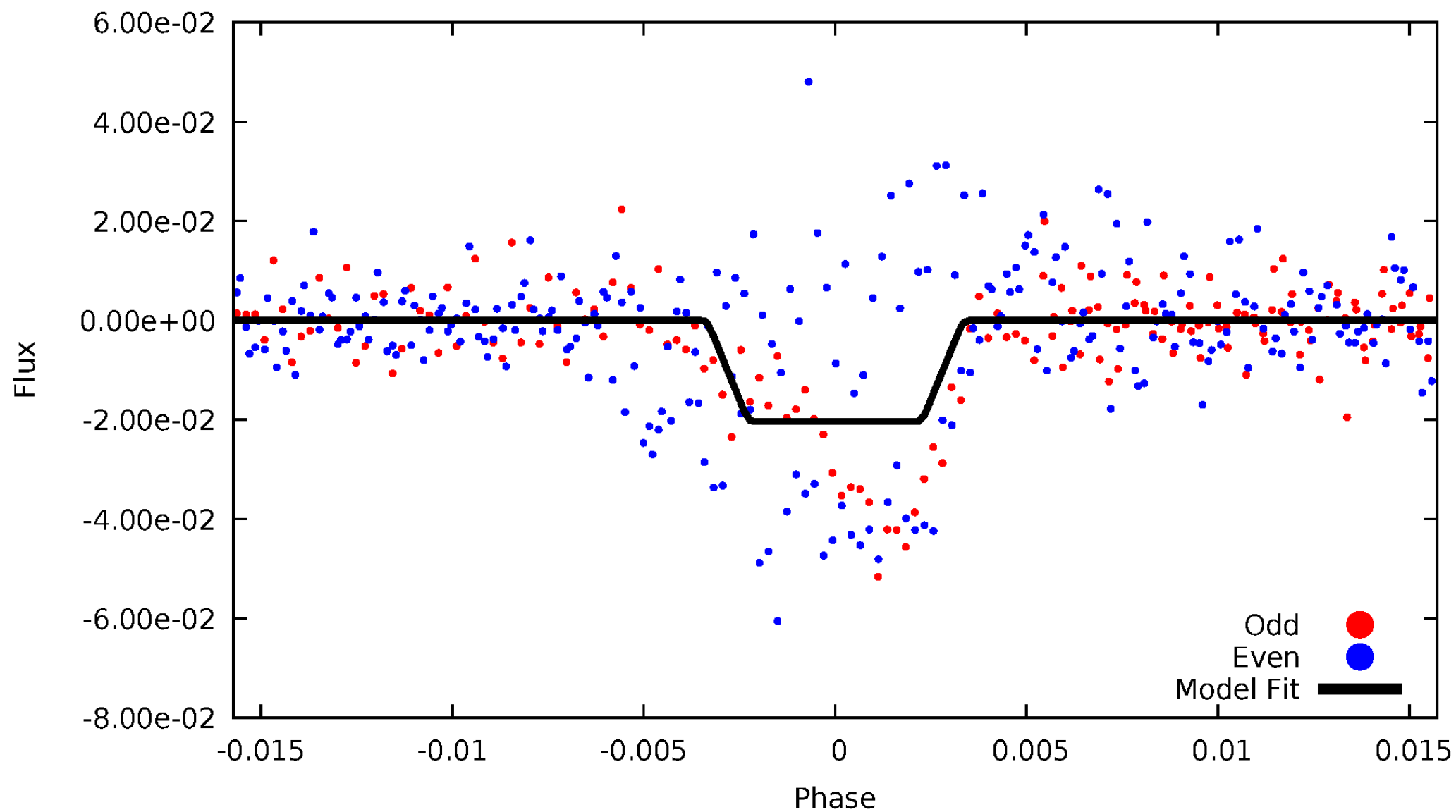
# DV Odd/Even

TCE 002438114-02



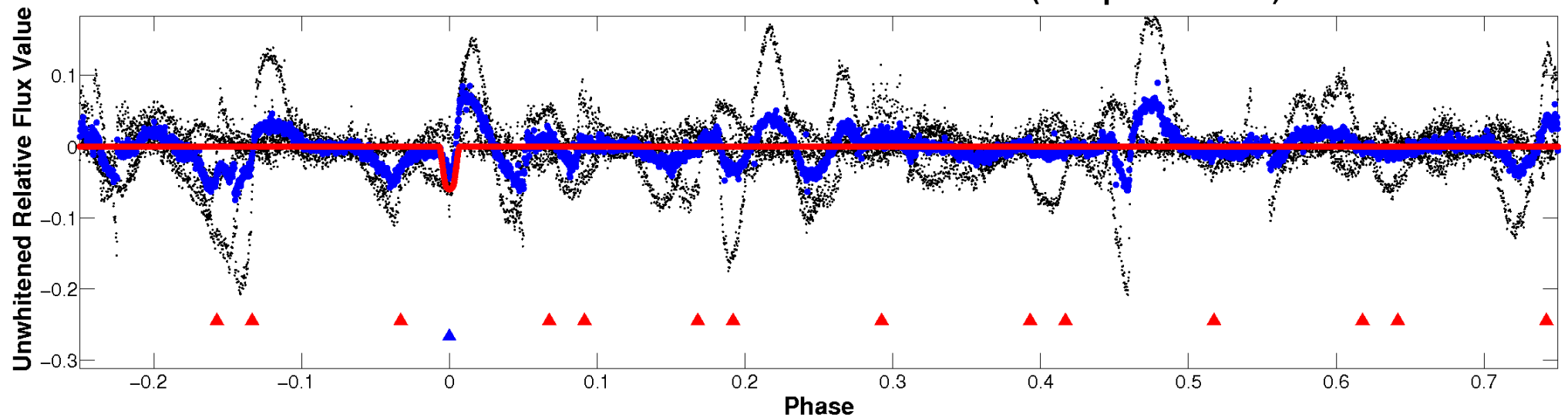
# ALT Odd/Even

TCE 002438114-02

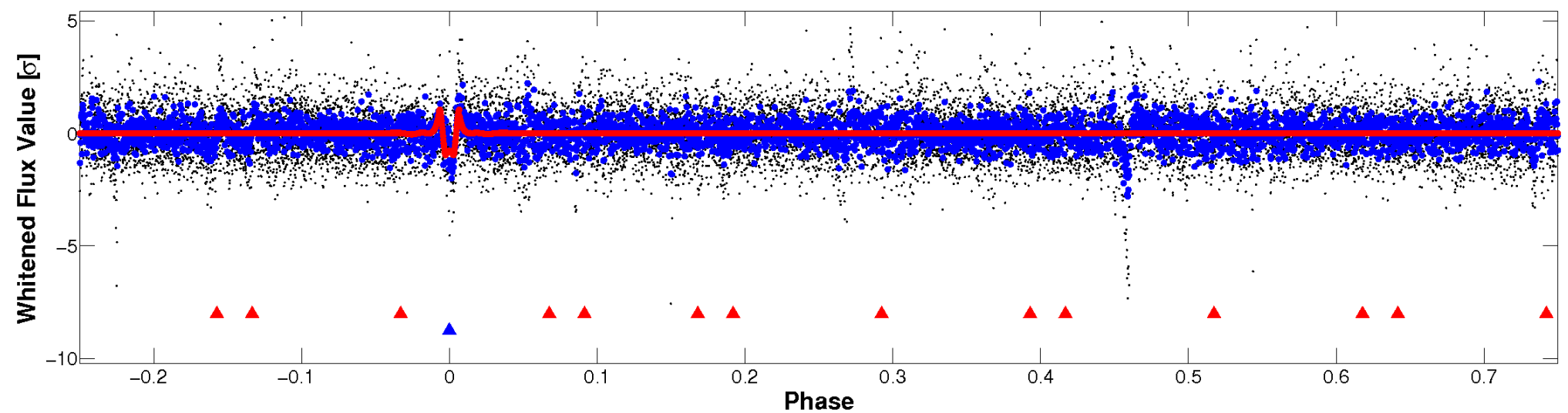


# Non-Whitened Vs. Whitened Light Curve

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

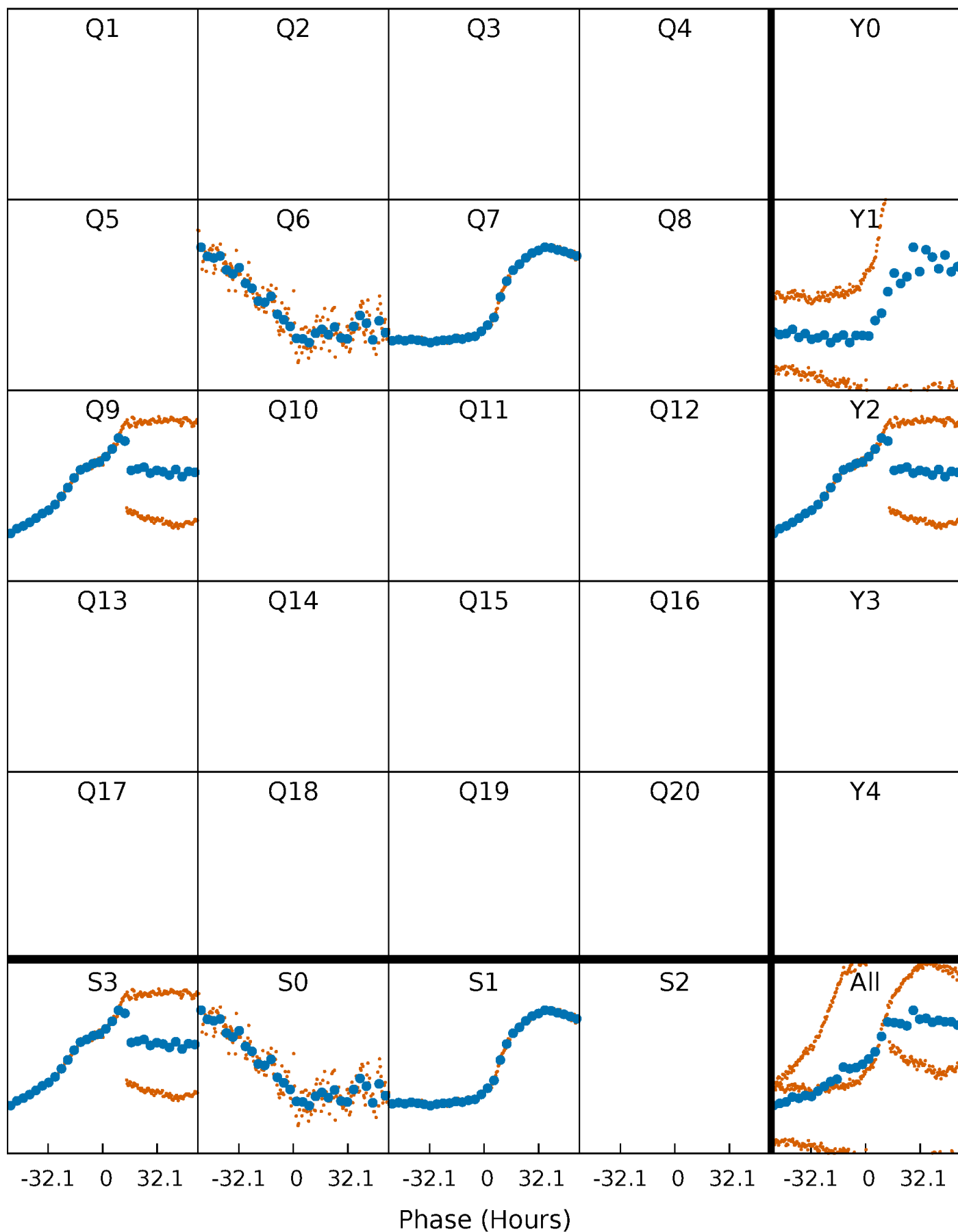


## Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



# PDC Quarter-Phased Transit Curves

TCE 002438114-02   P= 85.360691 Days    $T_0=210.421423$  (BKJD)



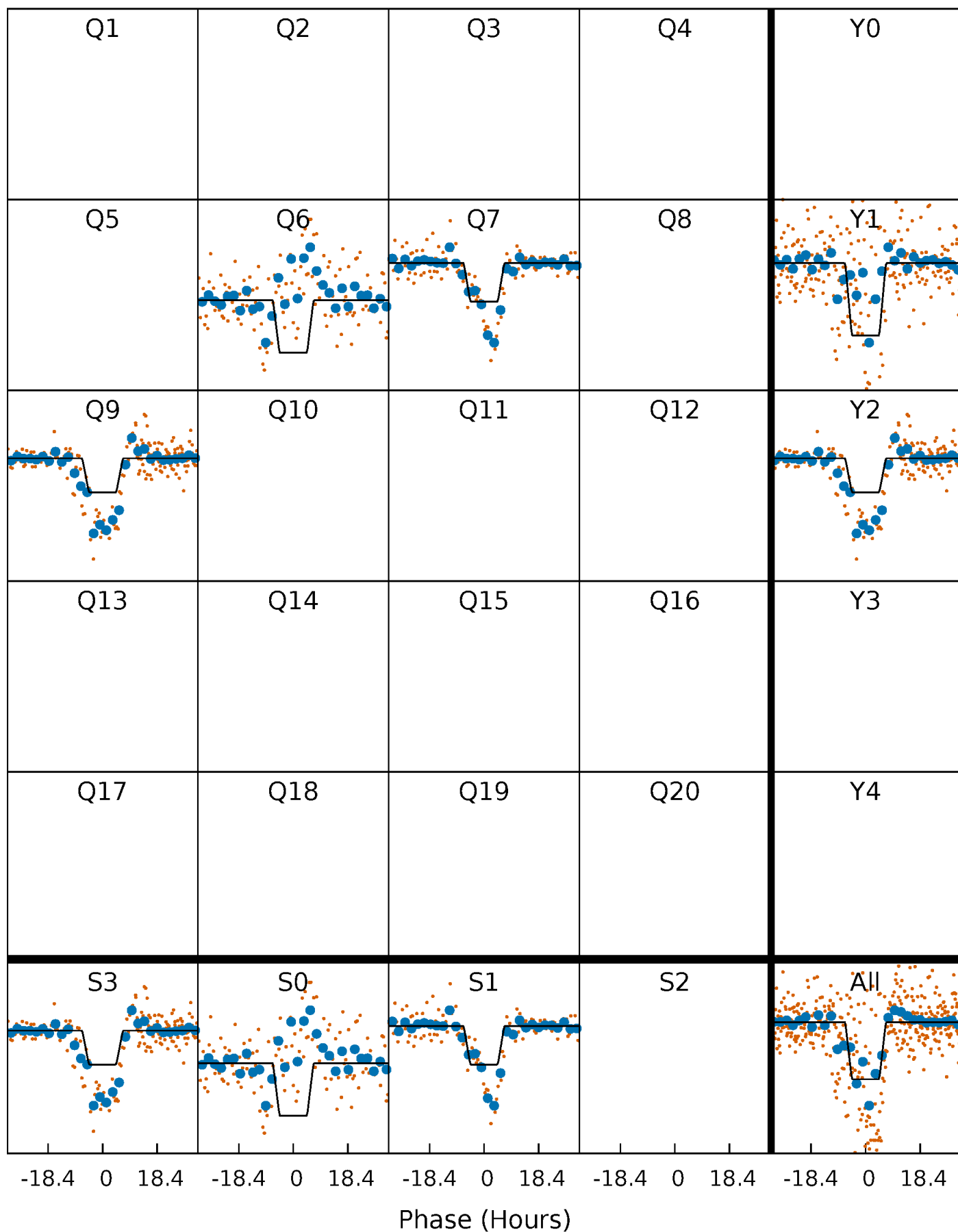
# DV Quarter-Phased Transit Curves

TCE 002438114-02   P= 85.360691 Days    $T_0=210.421423$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

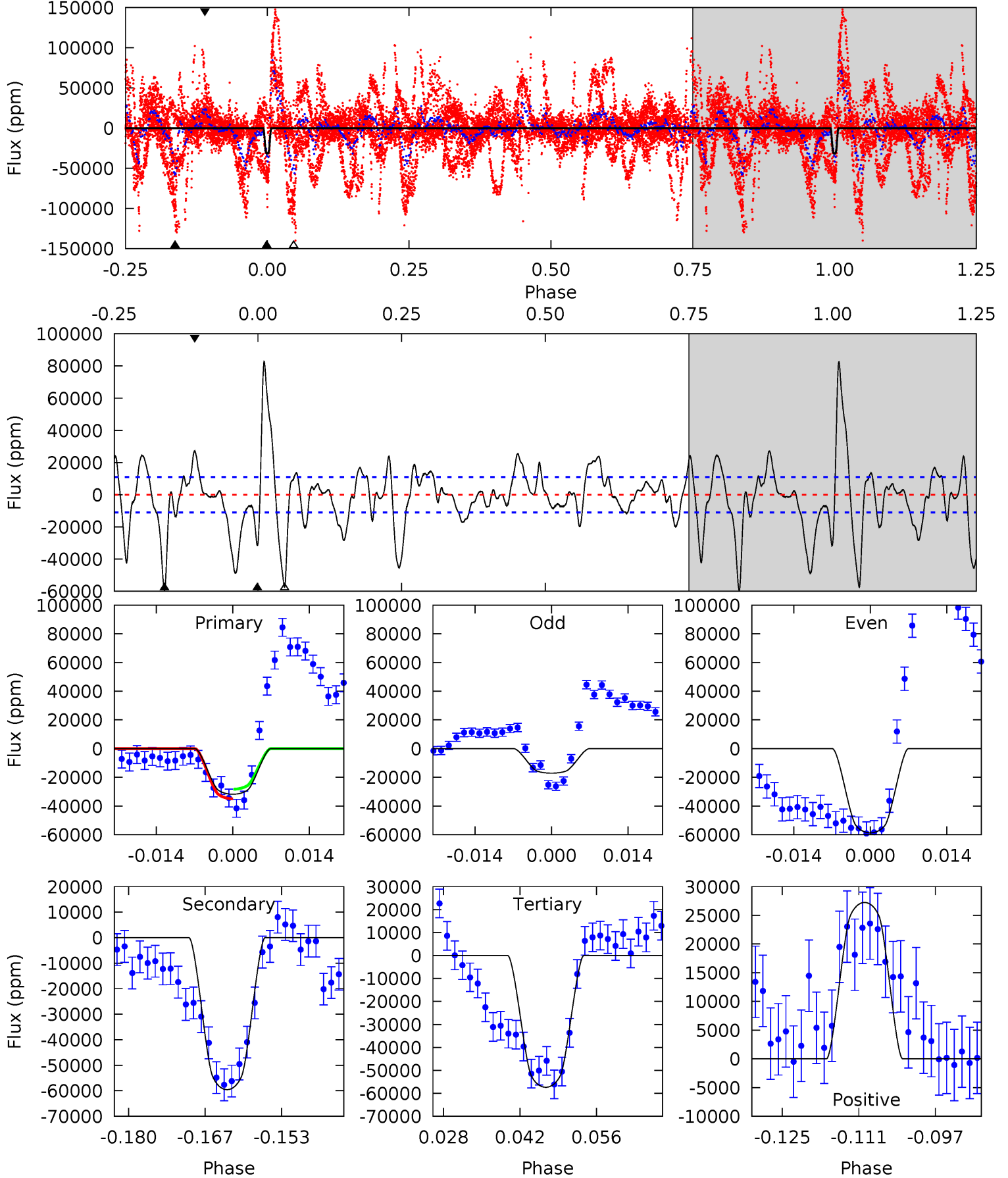
TCE 002438114-02 P= 85.378225 Days  $T_0=210.421334$  (BKJD)



# DV Model-Shift Uniqueness Test

002438114-02, P = 85.360691 Days, E = 210.421423 Days

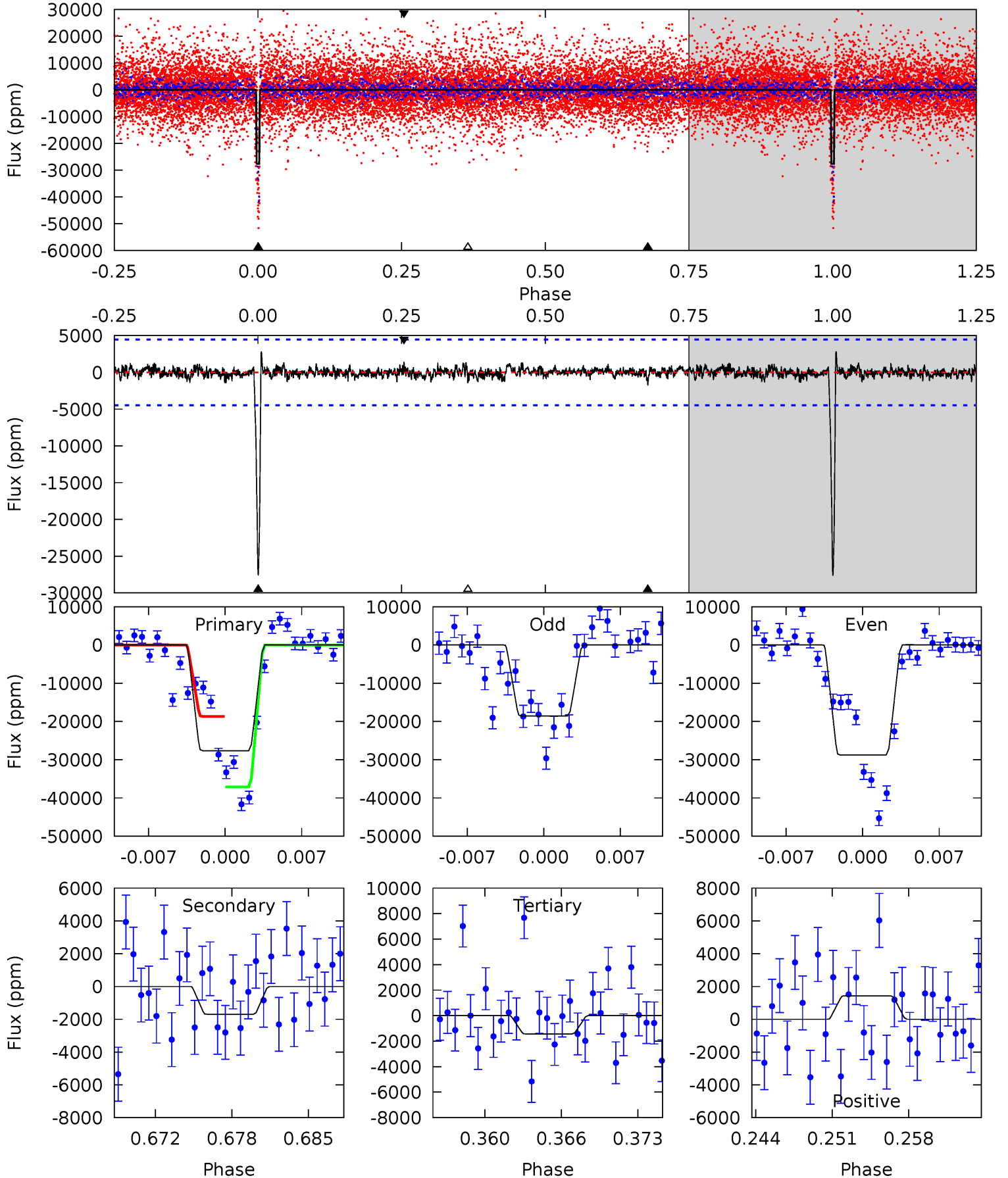
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
14.4	26.9	25.9	12.3	4.96	2.46	7.27	-11.6	2.06	0.99	14.6	6.65	0.60	0.58	1.57



# Alt Model-Shift Uniqueness Test

002438114-02, P = 85.378225 Days, E = 210.421334 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
31.5	1.94	1.64	1.63	5.10	2.71	0.50	29.9	29.9	0.30	0.31	5.92	0.70	0.09	10.5





### Stellar Parameters For KIC 002438114

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$5780^{+1}_{-1}$	$4.438^{+1.000}_{-1.000}$	$0.000^{+1.000}_{-1.000}$	$1.000^{+1.000}_{-1.000}$	$-1.000^{+1.000}_{-1.000}$	$-1.000^{+1.000}_{-1.000}$
	+0%/-0%	+23%/-23%	+inf%/-inf%	+100%/-100%	+100%/-100%	+100%/-100%
Source	Solar	Solar	Solar	Solar		

KIC = Kepler Input Catalog; PHO = Photometry; SPE = Spectroscopy; AST = Asteroseismology  
 TRA = Transits; DESP = Dartmouth Models; MULT = Multiple Models

### Secondary Eclipse Parameters for KIC 002438114-02 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$-59556 \pm 2211$	$25.94^{+2.43}_{-2.48}$	$580^{+26}_{-30}$	$5957^{+291}_{-288}$	$7438^{+1543}_{-1182}$
Alt.	$-1698 \pm 877$	$15.65^{+1.91}_{-1.93}$	$578^{+28}_{-28}$	$3539^{+315}_{-383}$	$537^{+362}_{-279}$

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

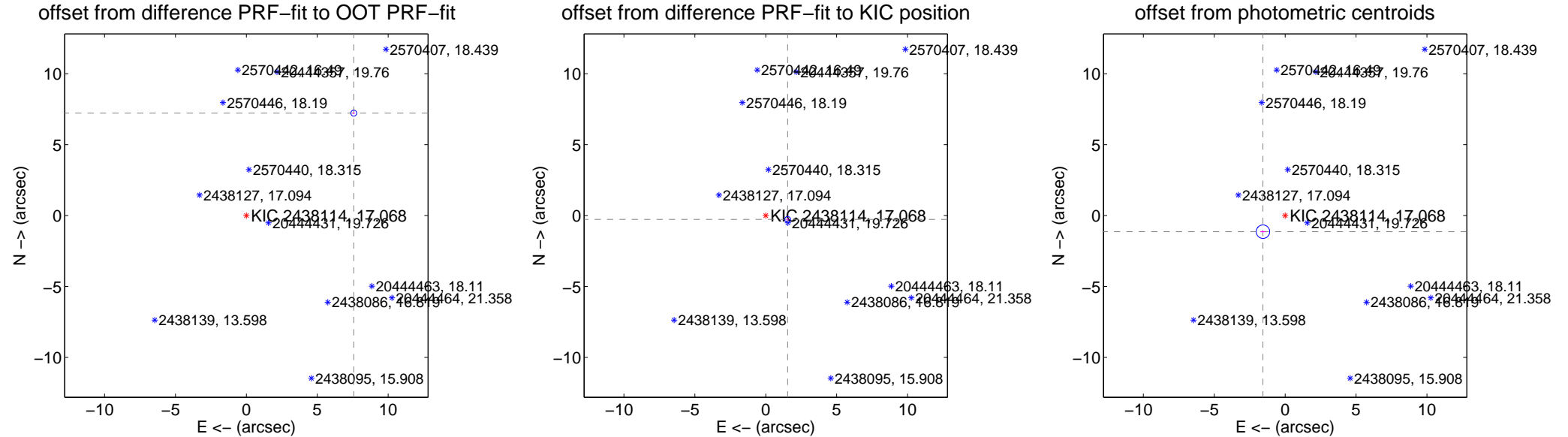
## DV Centroid Data

Supplemental centroid analysis for 002438114-02. Kepler magnitude: 17.07. Transit SNR 10.58

There are 1 quarters with good PRF difference image offsets

The OOT PRF centroid is offset from the target star catalog position by about 9.62 arcsec so the offset from difference PRF-fit to OOT-fit may be invalid.

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$10.467 \pm 0.070$	149.84	$-7.576 \pm 0.069$	$7.223 \pm 0.071$
PRF-fit source offset from KIC position	$1.568 \pm 0.069$	22.66	$-1.544 \pm 0.069$	$-0.270 \pm 0.071$
photometric centroid source offset	$1.93 \pm 0.16$	12.22	$1.57 \pm 0.19$	$-1.14 \pm 0.07$

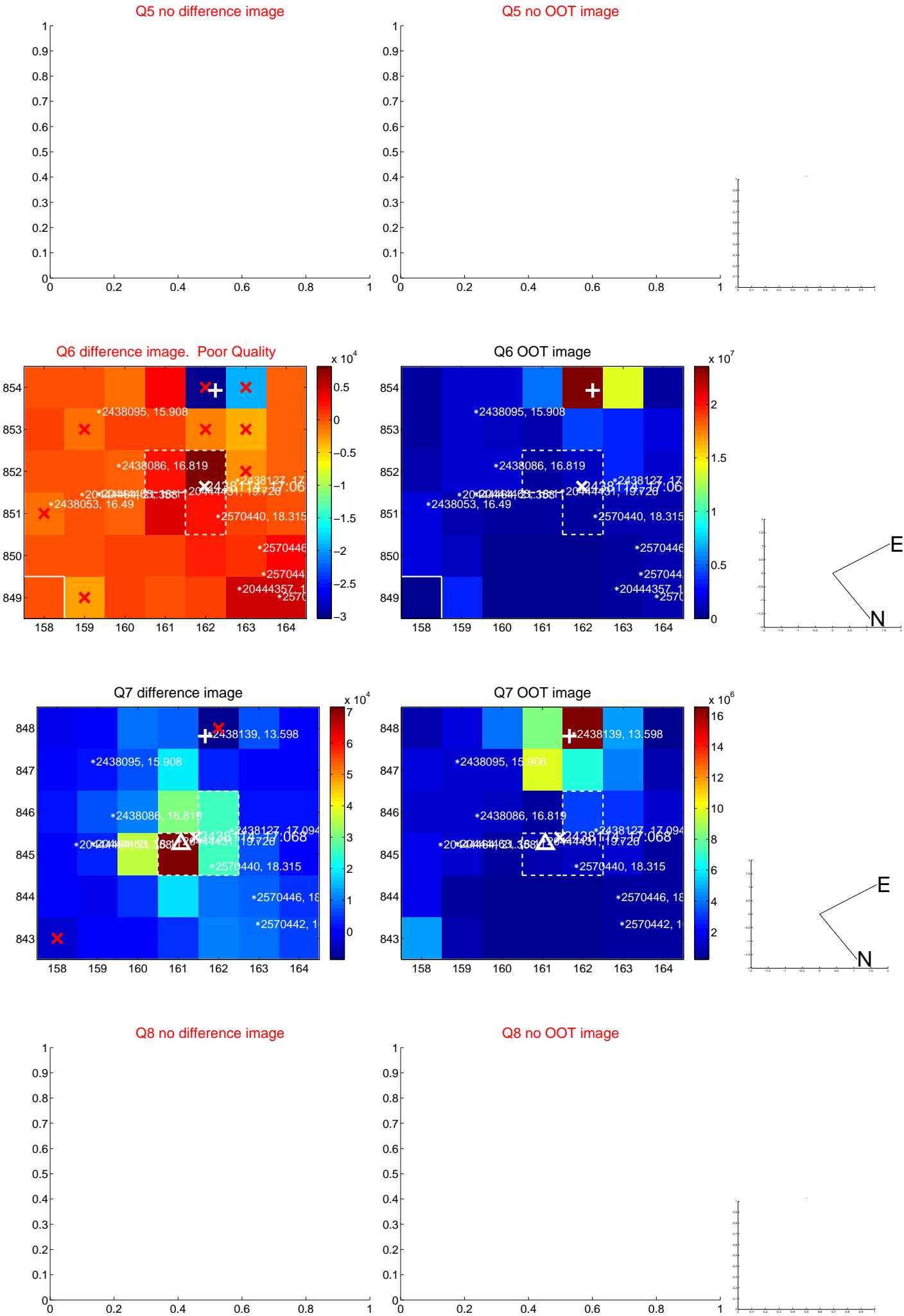


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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

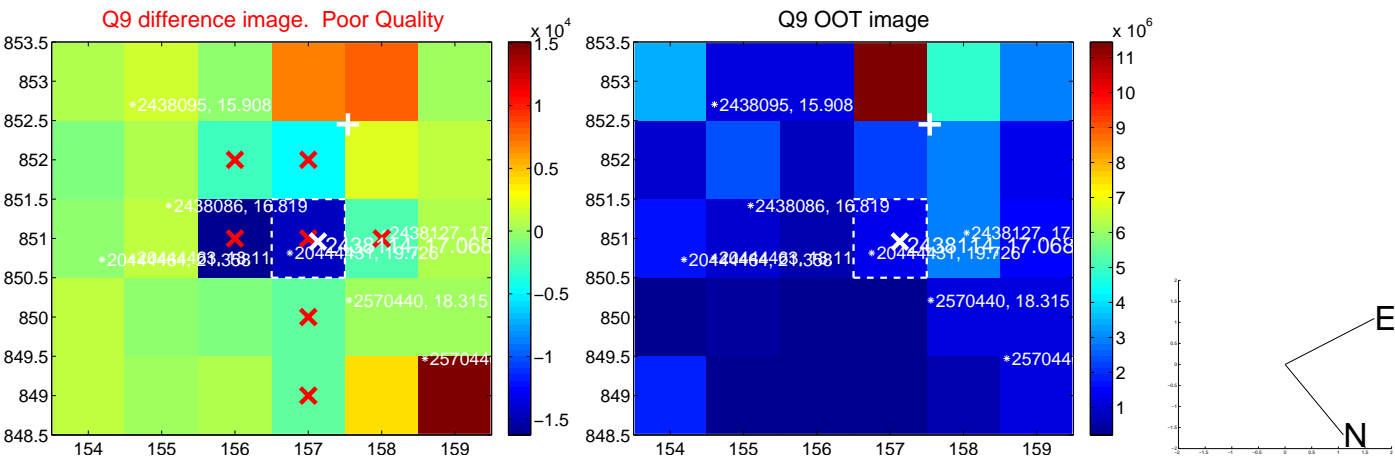
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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



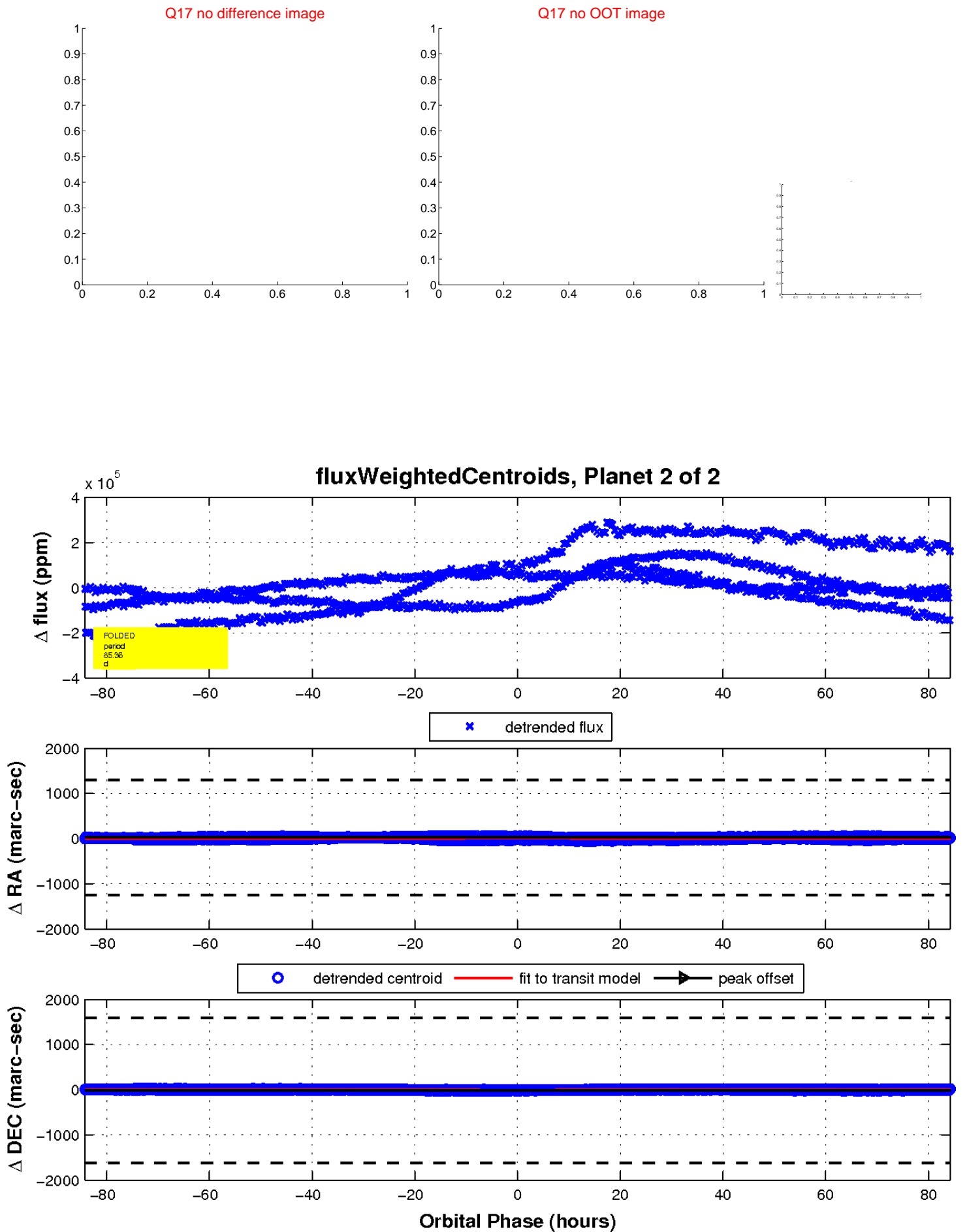
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

