

# KIC 004169315

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
004169315-01	OBS	8245.01	371.515353	263.294252	914.2	4.184	9.2	9.2	1.16	6525	4.04	1.91
004169315-02	OBS	No	371.523173	294.232617	967.4	5.453	8.9	9.8	1.16	6525	4.56	1.91
004169315-03	OBS	No	371.514390	325.205495	961.1	5.587	8.6	8.9	1.16	6525	4.57	1.91

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
004169315-01	OBS	FP	0.00	0	1	1	0	MOD_SEC_ALT—HAS_SEC_TCE—PERIOD_ALIAS_ALT—CENT_UNRESOLVED_OFFSET
004169315-02	OBS	FP	0.00	1	1	1	1	IS_SEC_TCE—CENT_UNRESOLVED_OFFSET—EPHEM_MATCH
004169315-03	OBS	FP	0.00	1	0	1	0	MOD_TER_DV—MOD_NONUNIQ_ALT—SAME_NTL_PERIOD—CENT_UNRESOLVED_OFFSET

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

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

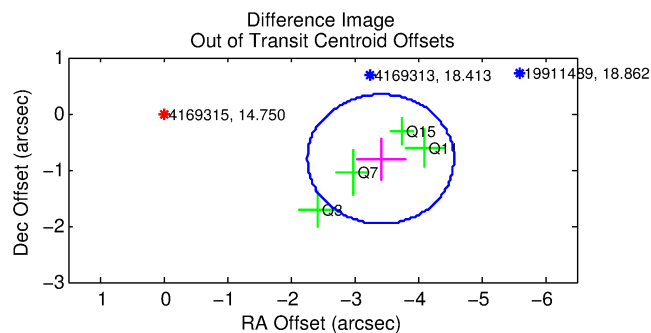
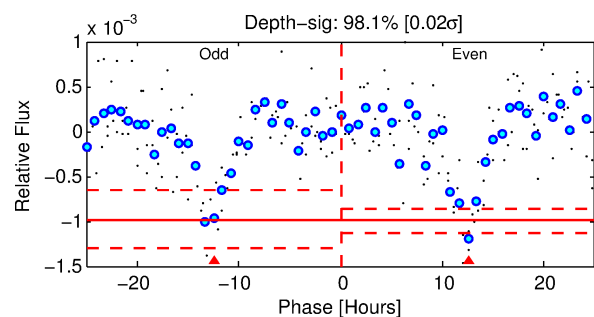
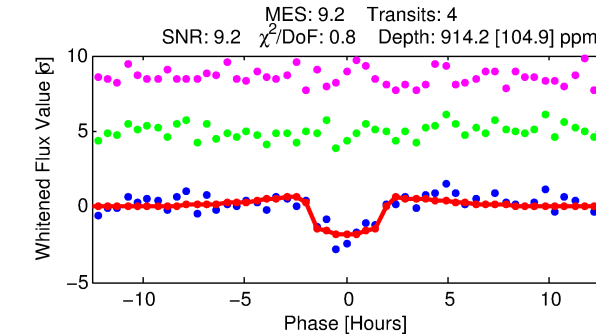
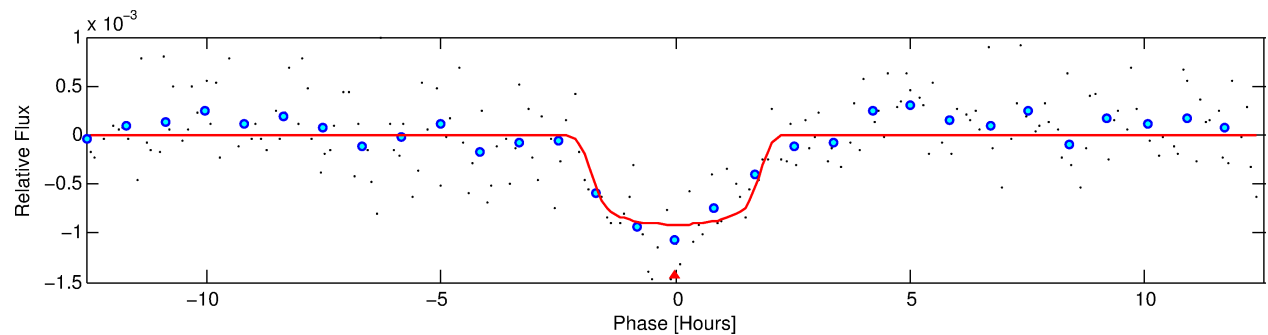
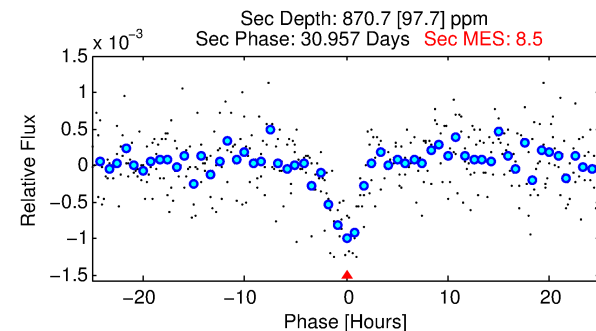
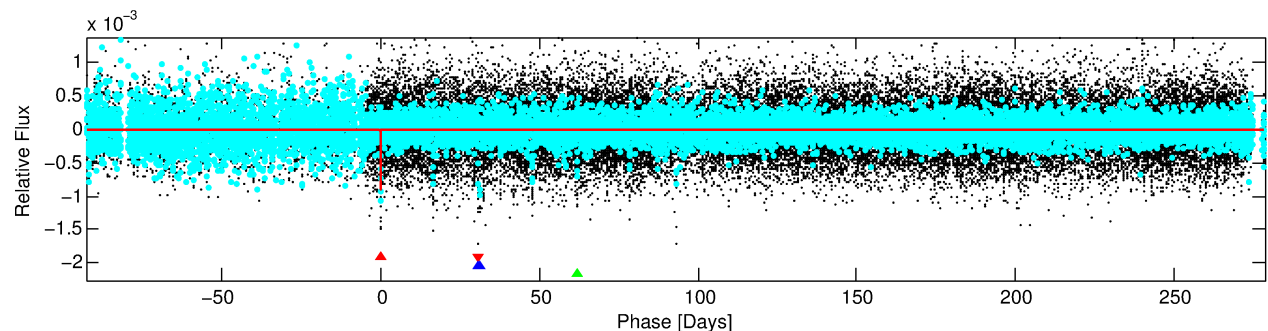
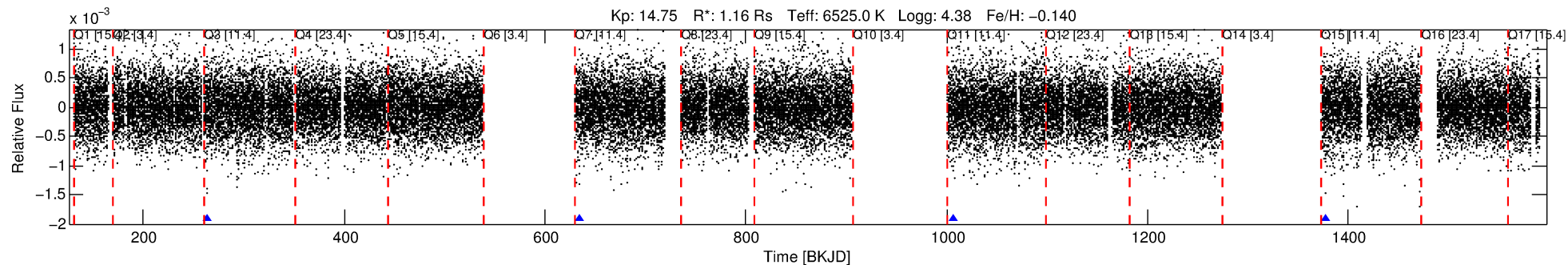
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 004169315-01

No Significant Match Found

# DV One-Page Summary

KIC: 4169315 Candidate: 1 of 3 Period: 371.515 d



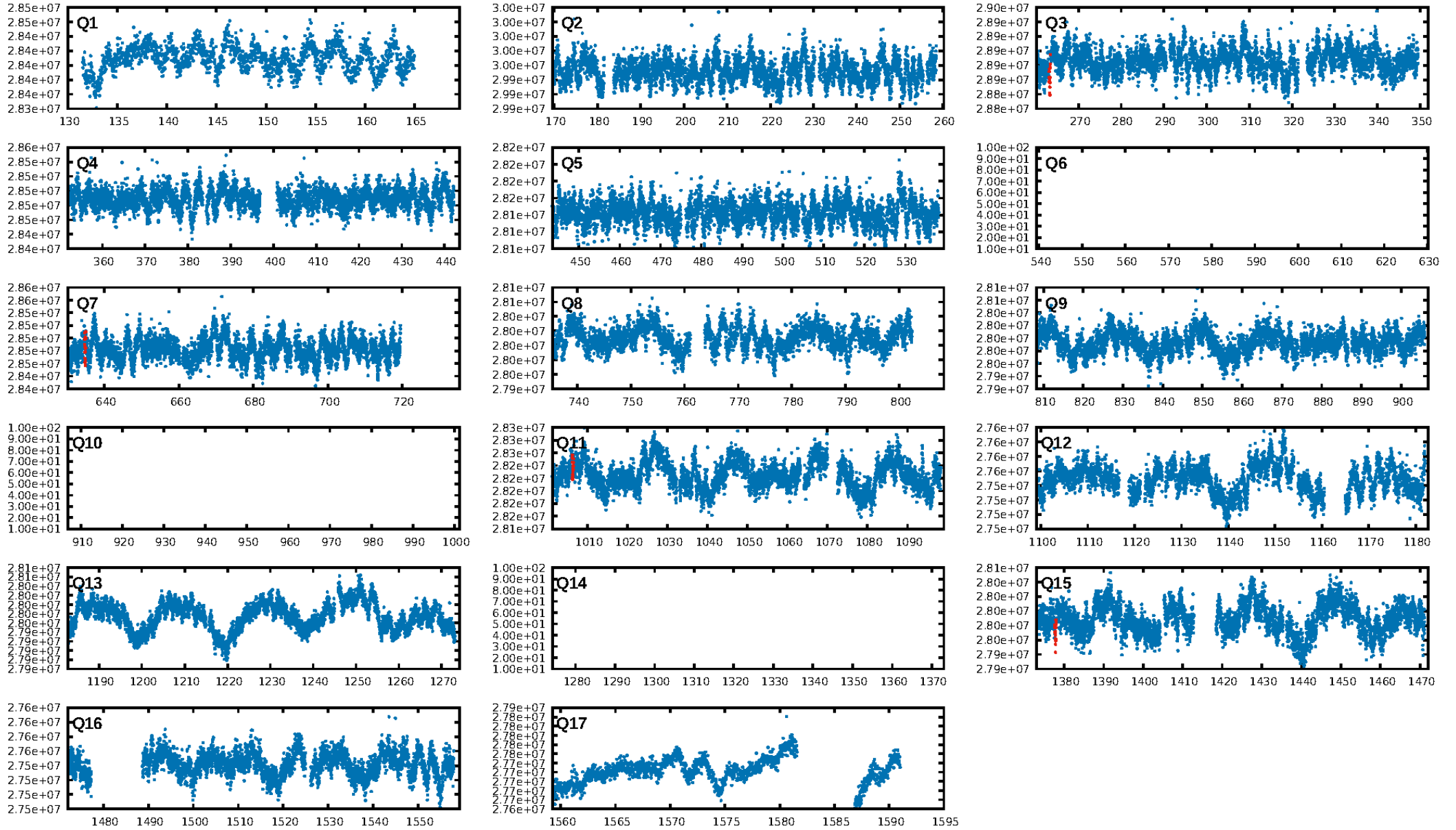
## DV Fit Results:

Period = 371.51535 [0.00342] d  
Epoch = 263.2943 [0.0066] BKJD  
Rp/R\* = 0.0319 [0.0049]  
a/R\* = 368.11 [264.96]  
b = 0.88 [0.19]  
Seff = 1.91 [0.76]  
Teq = 300 [30] K  
Rp = 4.04 [1.40] Re  
a = 1.0696 [0.2769] AU  
Ag = 33624.74 [16702.76] [2.01 $\sigma$ ]  
**Teff = 6279 [559] K [10.68 $\sigma$ ]**

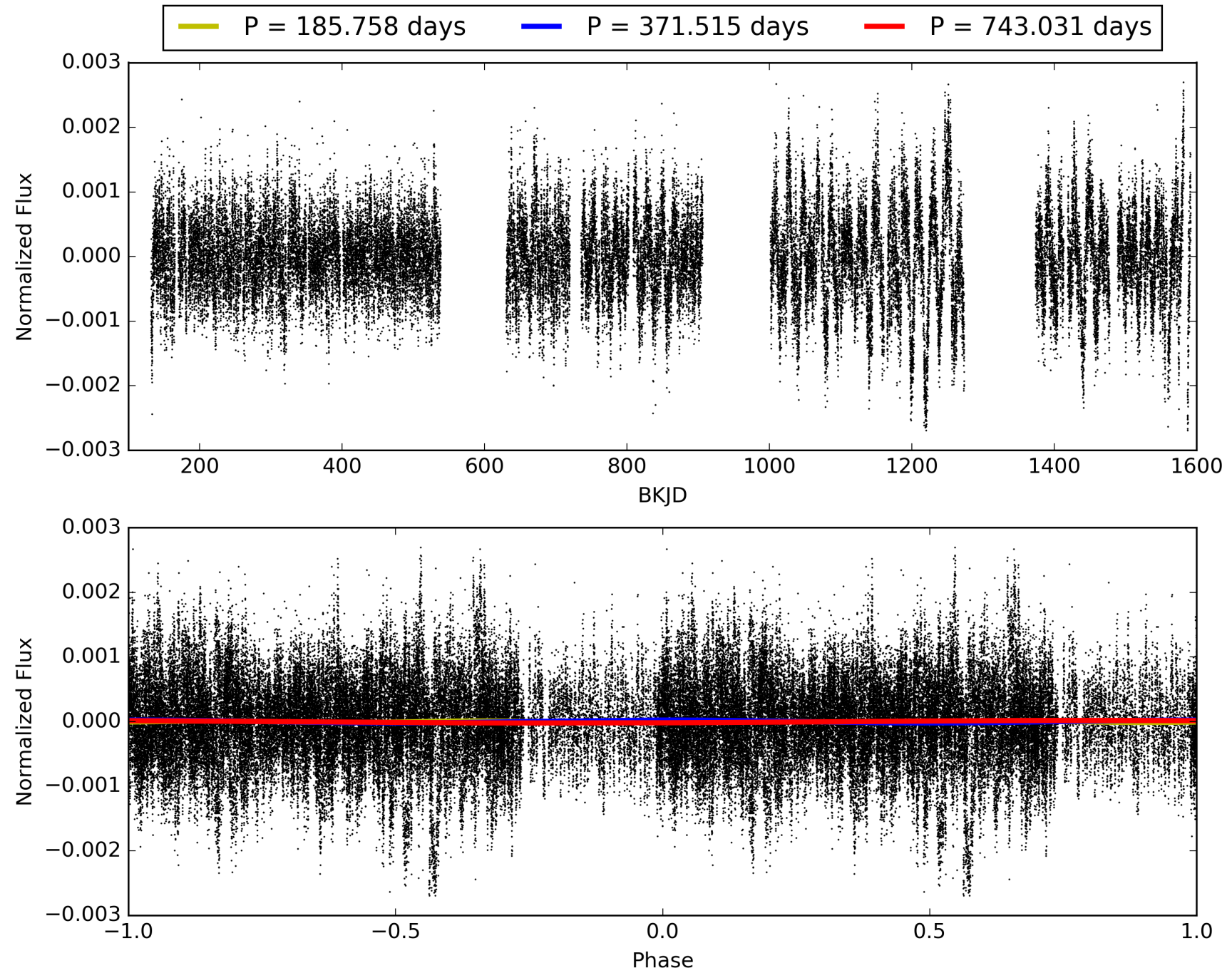
## DV Diagnostic Results:

**ShortPeriod-sig: 0.3% [0.00 $\sigma$ ]**  
LongPeriod-sig: 2.2% [0.03 $\sigma$ ]  
ModelChiSquare2-sig: 85.1%  
ModelChiSquareGof-sig: 99.8%  
**Bootstrap-pfa: 1.01e-11**  
RollingBand-fgt: 1.00 [4/4]  
**GhostDiagnostic-chr: 0.5966**  
Centroid-sig: 0.0%  
Centroid-so: 4.207 arcsec [3.69 $\sigma$ ]  
OotOffset-rm: 3.510 arcsec [9.13 $\sigma$ ]  
KicOffset-rm: 3.539 arcsec [9.19 $\sigma$ ]  
OotOffset-st: 0/4/0/0 [4]  
KicOffset-st: 0/4/0/0 [4]  
DiffImageQuality-fgm: 1.00 [4/4]  
DiffImageOverlap-fno: 1.00 [4/4]

# TCE 004169315-01, PDC Light Curves

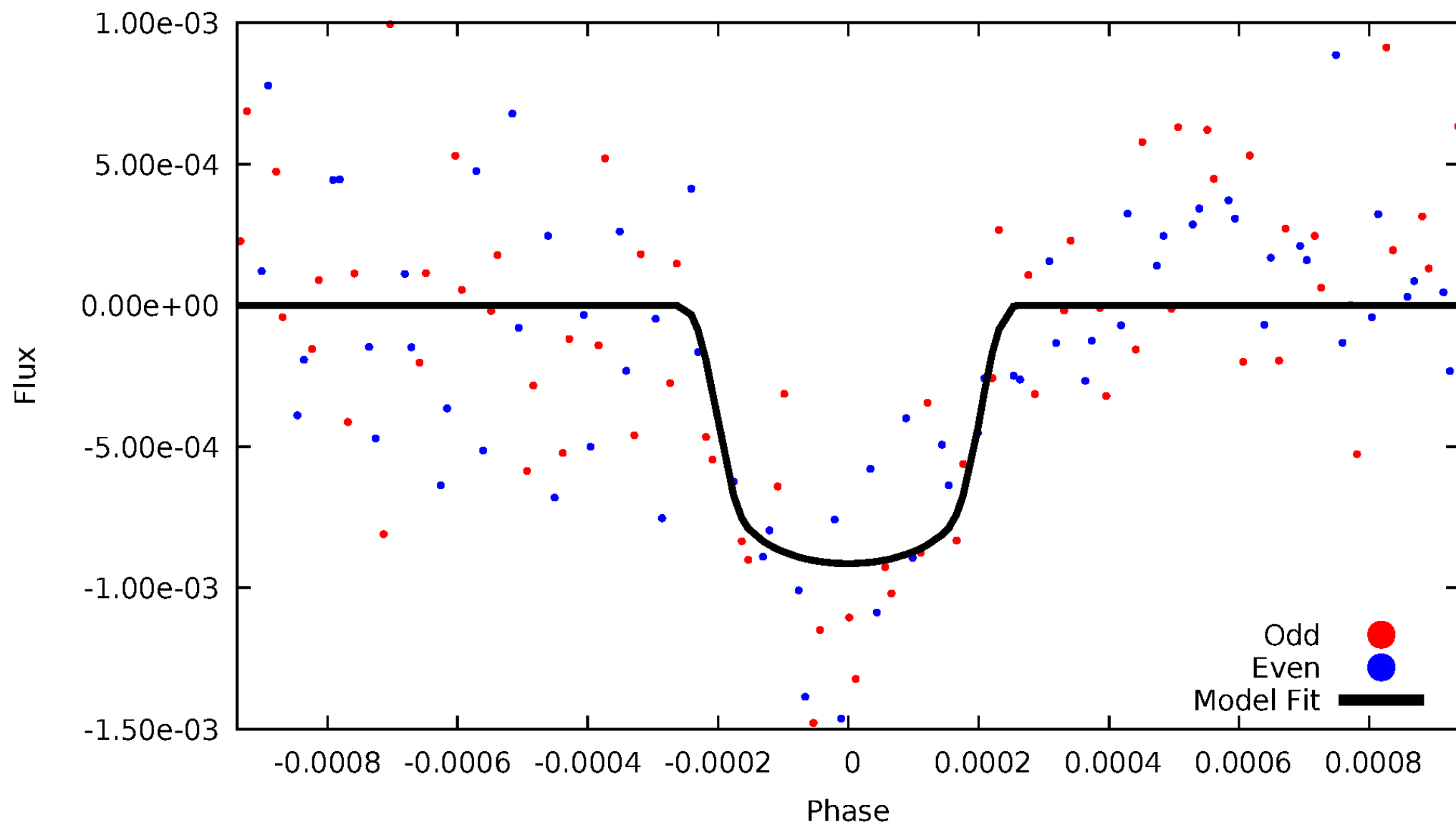


TCE 004169315-01



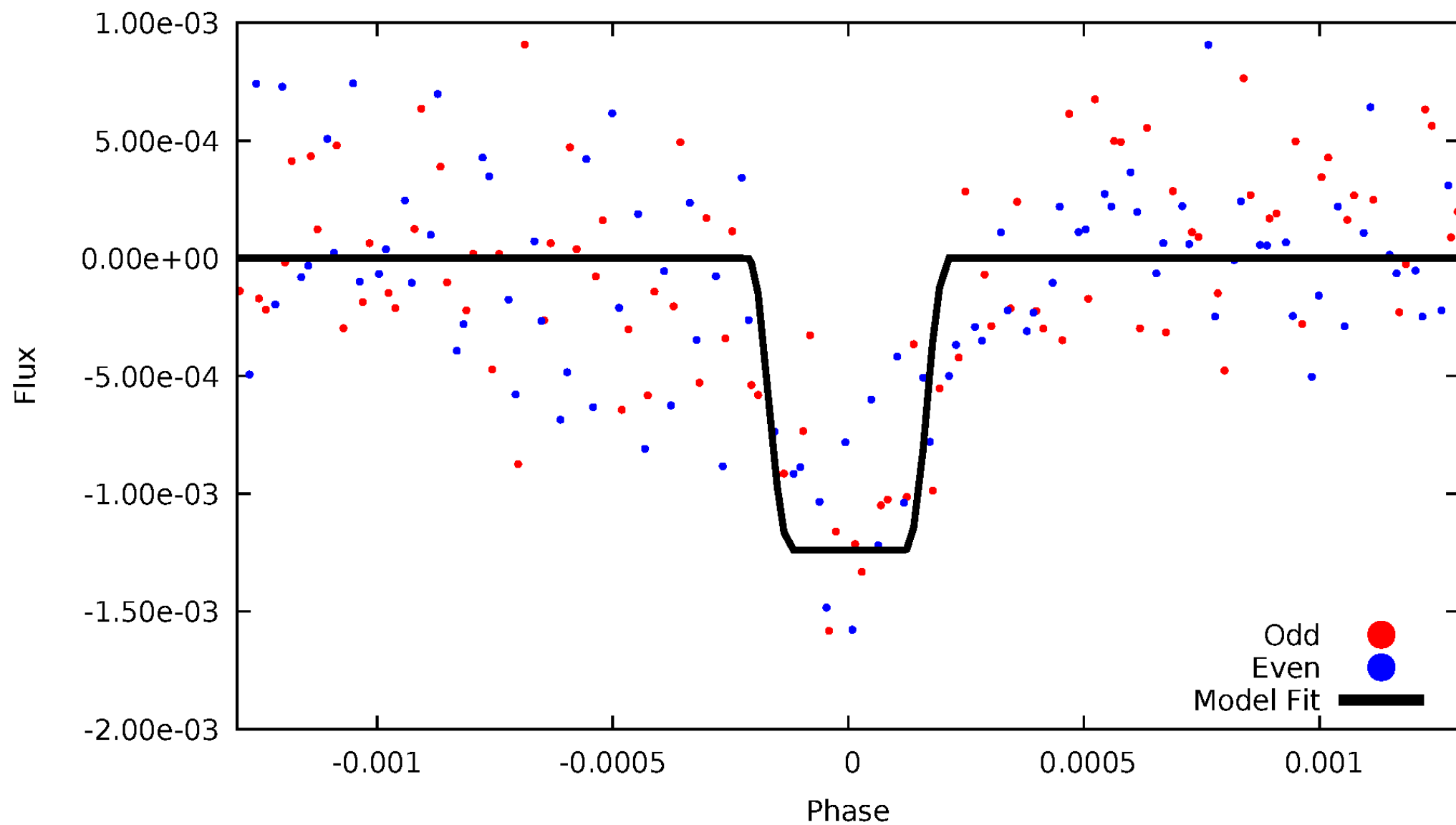
# DV Odd/Even

TCE 004169315-01



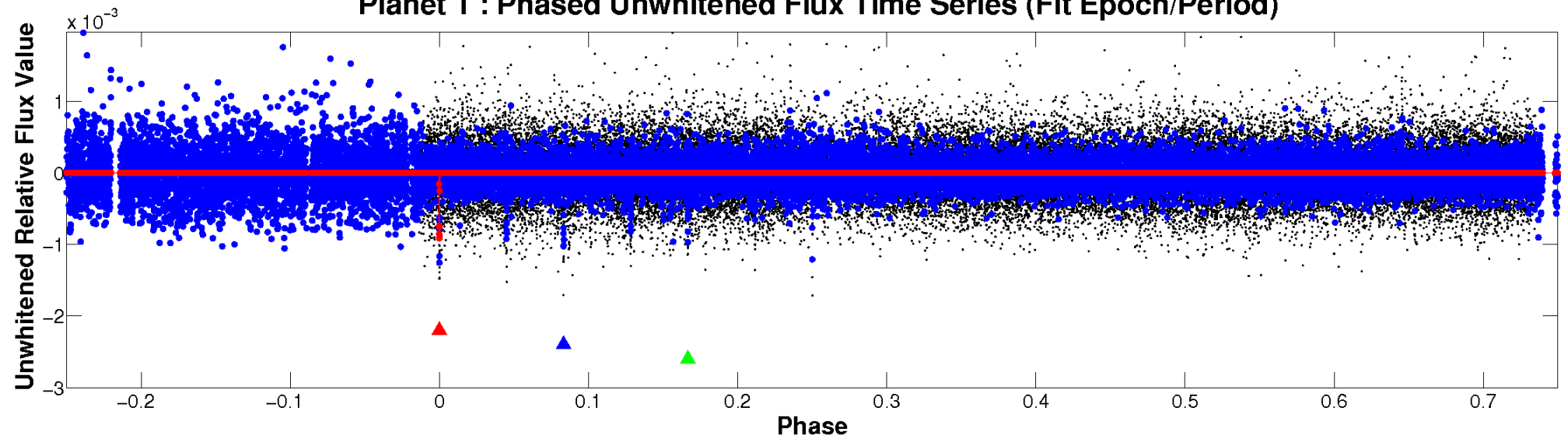
# ALT Odd/Even

TCE 004169315-01

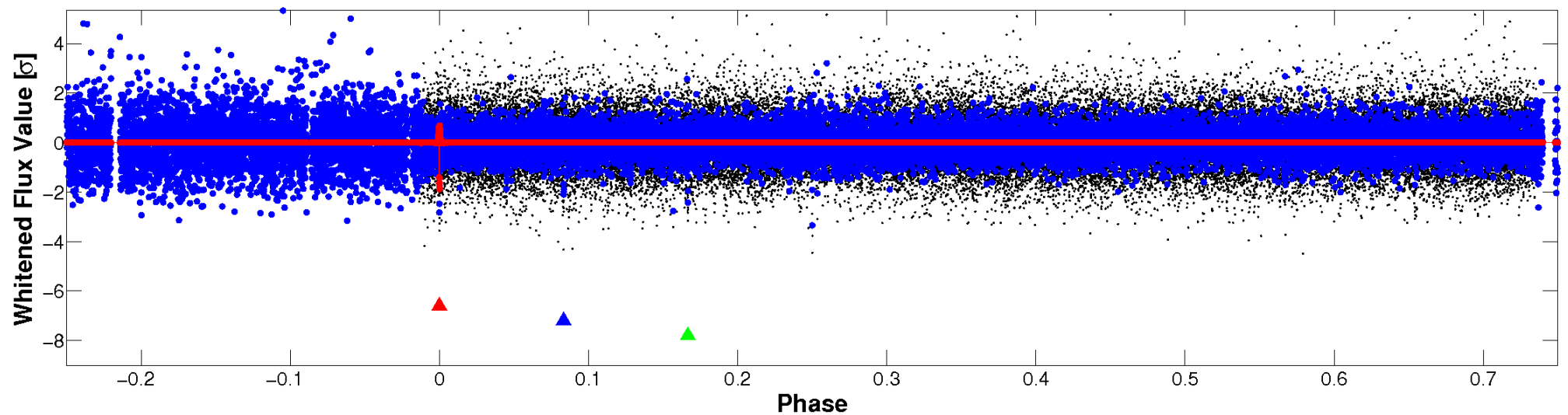


# Non-Whitened Vs. Whitened Light Curve

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



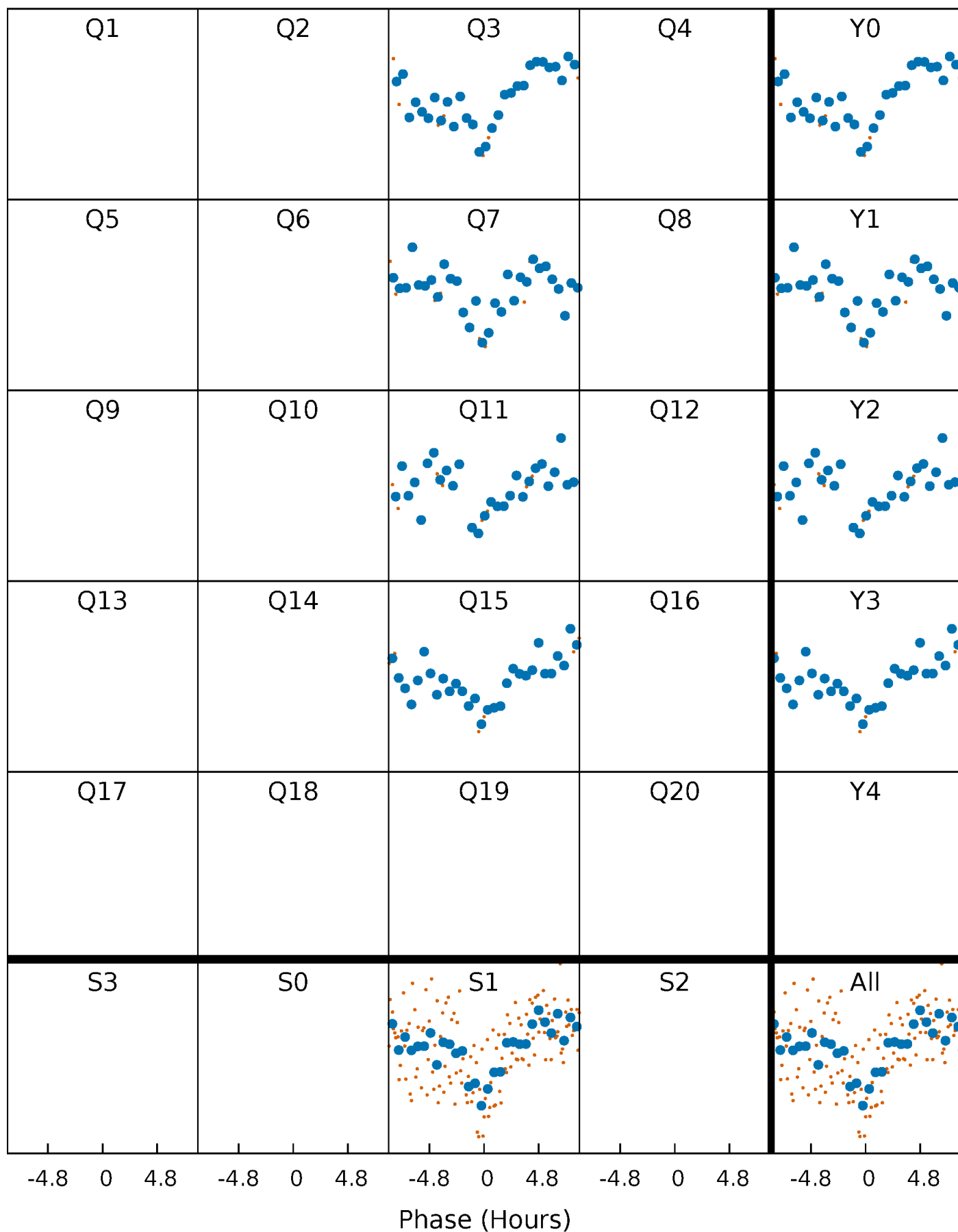
Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)





# PDC Quarter-Phased Transit Curves

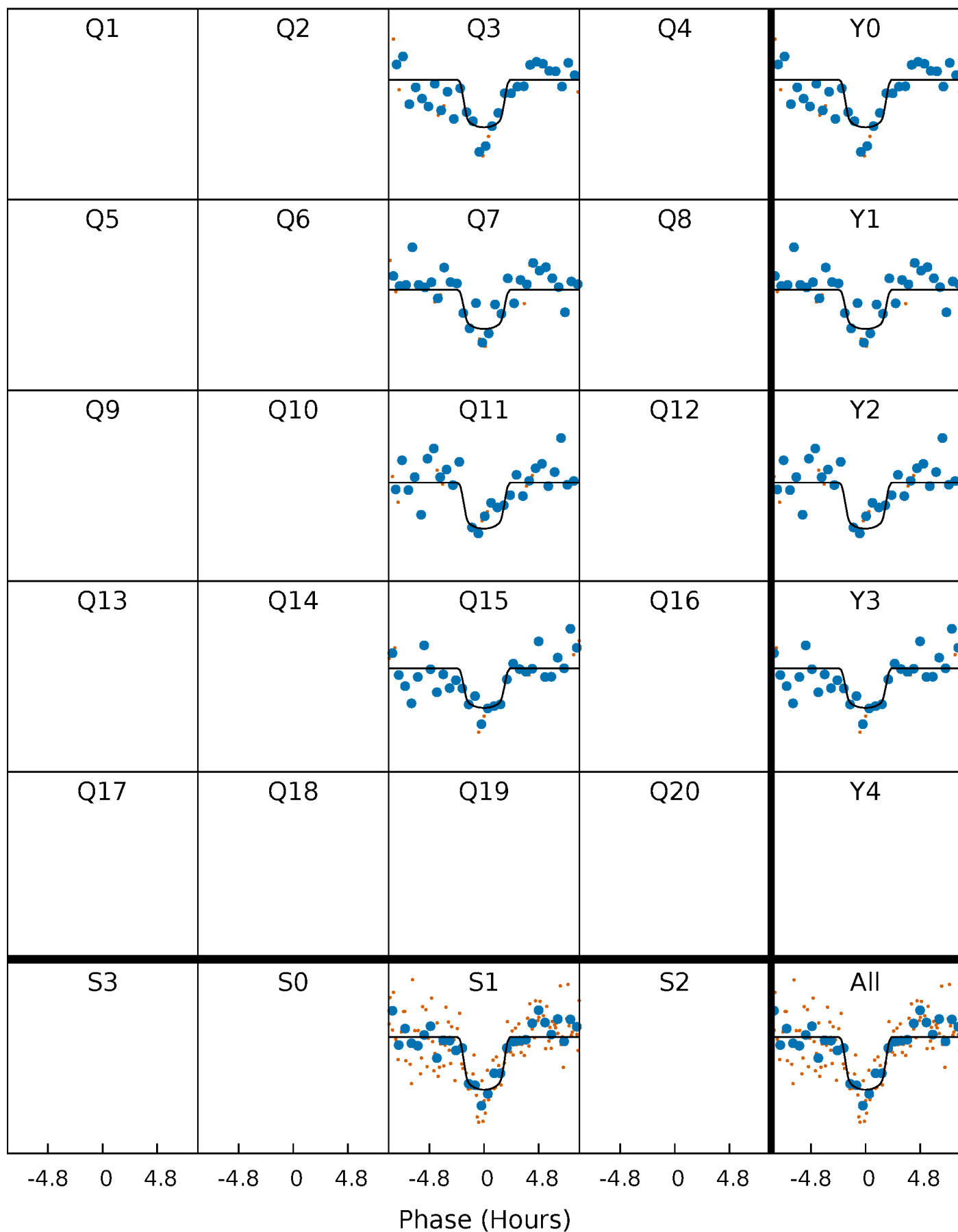
TCE 004169315-01 P=371.515353 Days  $T_0=263.294252$  (BKJD)





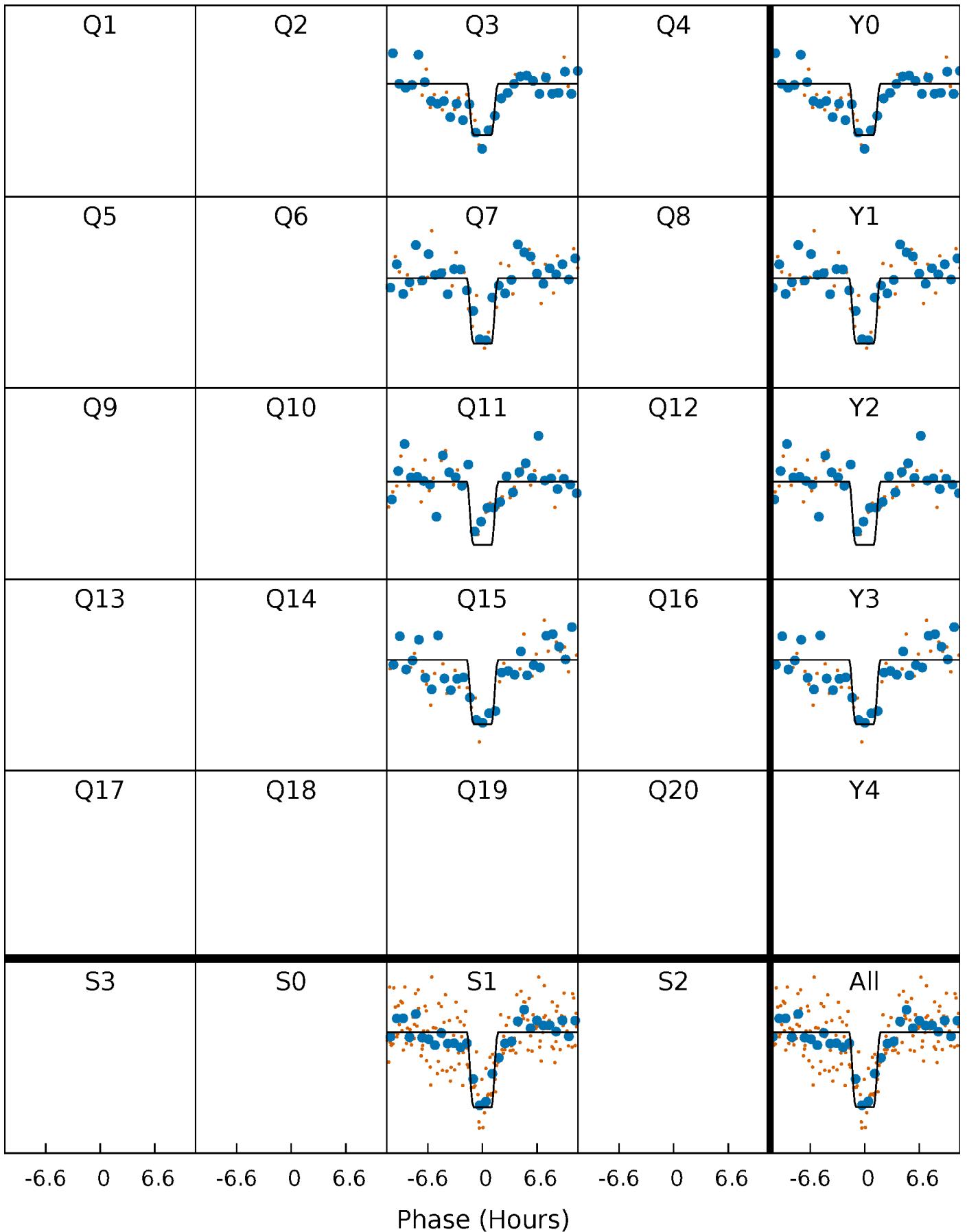
# DV Quarter-Phased Transit Curves

TCE 004169315-01 P=371.515353 Days  $T_0=263.294252$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

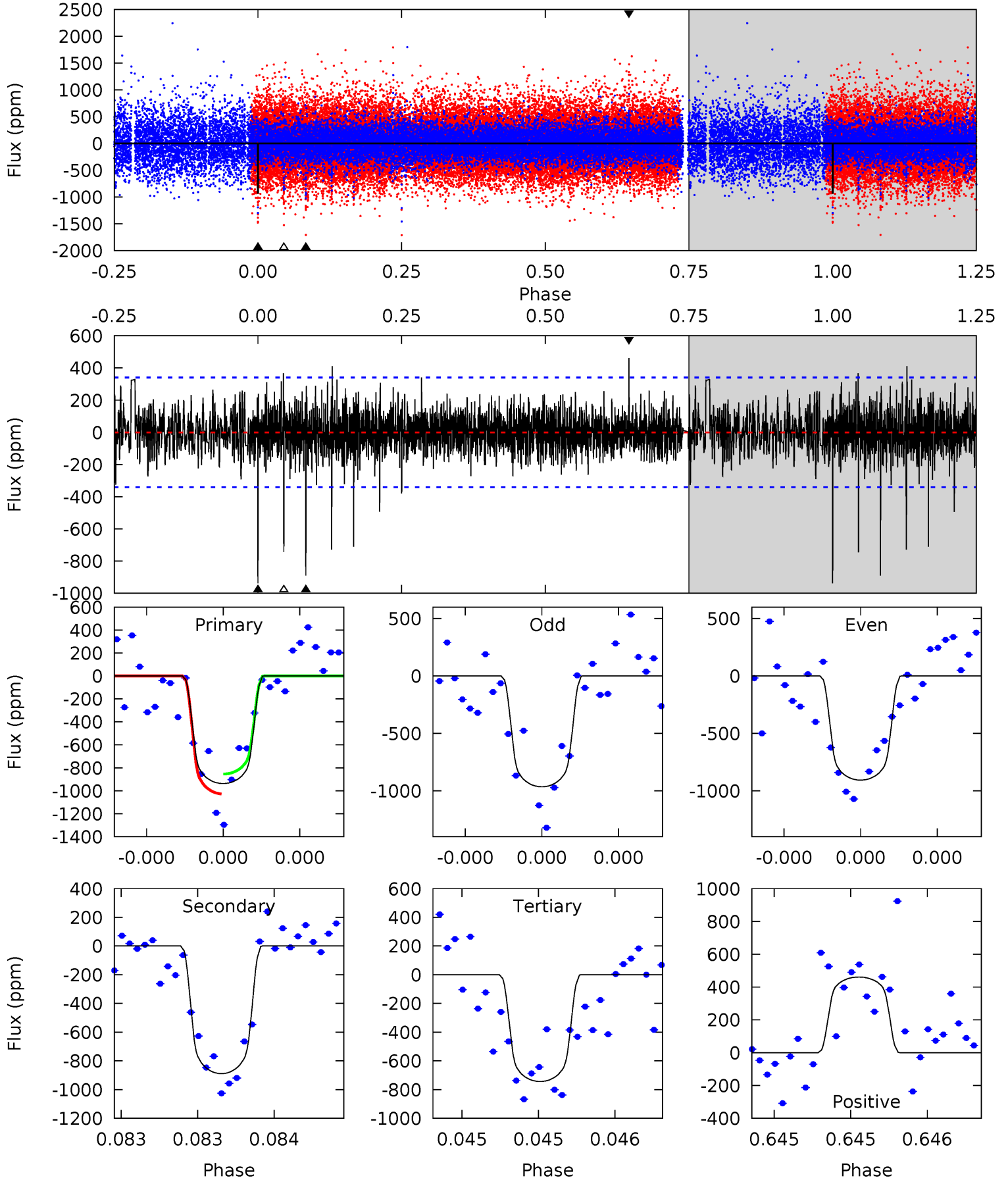
TCE 004169315-01 P=371.516177 Days  $T_0=263.287030$  (BKJD)



# DV Model-Shift Uniqueness Test

004169315-01, P = 371.515353 Days, E = 263.294252 Days

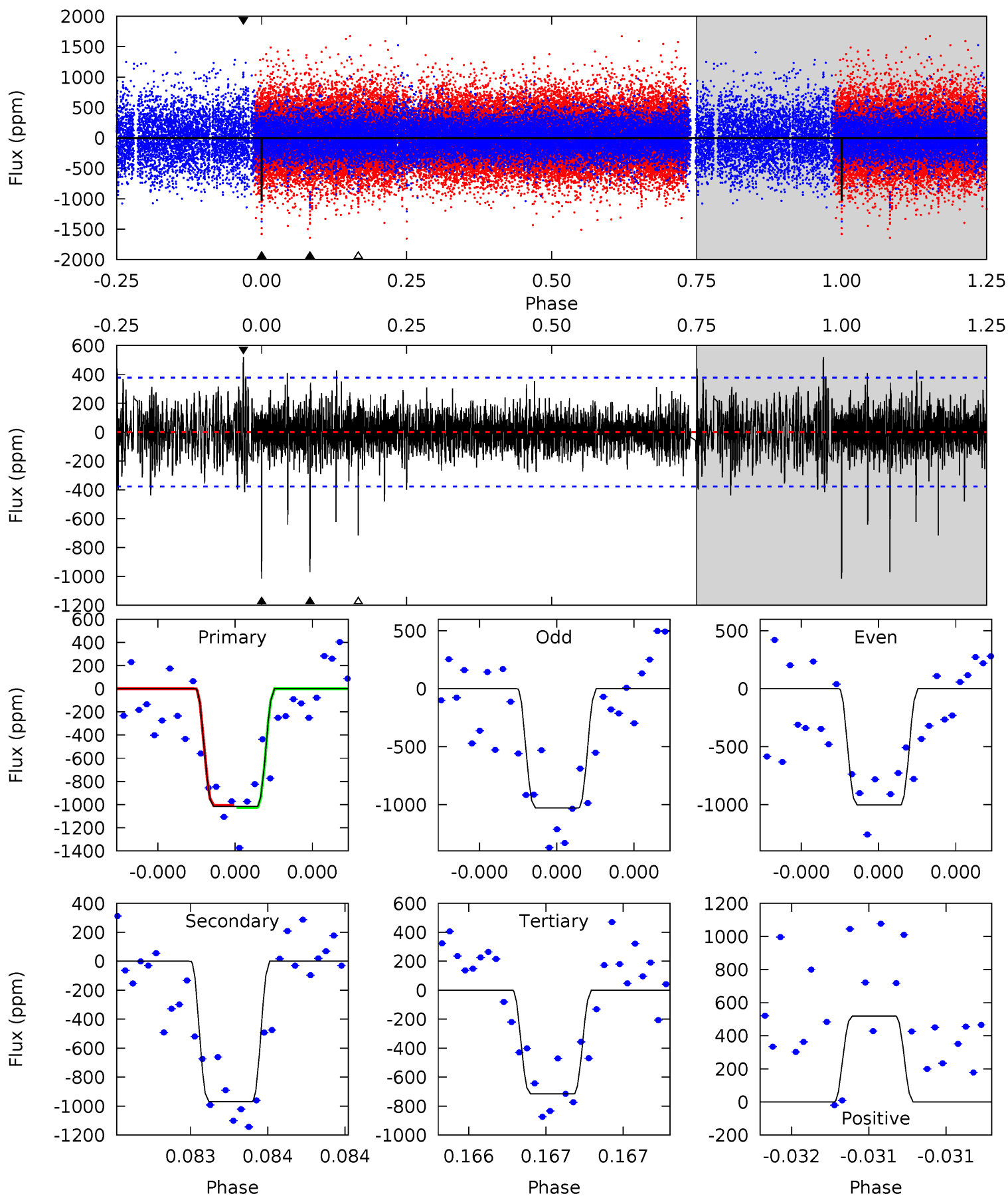
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
15.3	14.5	12.2	7.54	5.58	3.48	1.60	3.16	7.78	2.37	6.99	0.48	0.97	0.33	1.41



# Alt Model-Shift Uniqueness Test

004169315-01, P = 371.516177 Days, E = 263.287030 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
15.1	14.4	10.6	7.70	5.60	3.53	1.52	4.45	7.38	3.77	6.69	0.18	0.99	0.34	0.12



### Stellar Parameters For KIC 004169315

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$6525^{+158}_{-226}$	$4.381^{+0.067}_{-0.202}$	$-0.140^{+0.250}_{-0.300}$	$1.161^{+0.361}_{-0.155}$	$1.183^{+0.162}_{-0.162}$	$1.065^{+0.312}_{-0.550}$
	+2%/-3%	+2%/-5%	+179%/-214%	+31%/-13%	+14%/-14%	+29%/-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 004169315-01 / KOI 8245.01

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-889 \pm 61$	$4.17^{+0.93}_{-0.77}$	$425^{+29}_{-22}$	$6308^{+563}_{-504}$	$31487^{+14335}_{-9975}$
Alt.	$-970 \pm 67$	$4.64^{+0.91}_{-0.79}$	$426^{+30}_{-21}$	$6087^{+551}_{-390}$	$27793^{+12437}_{-8389}$

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

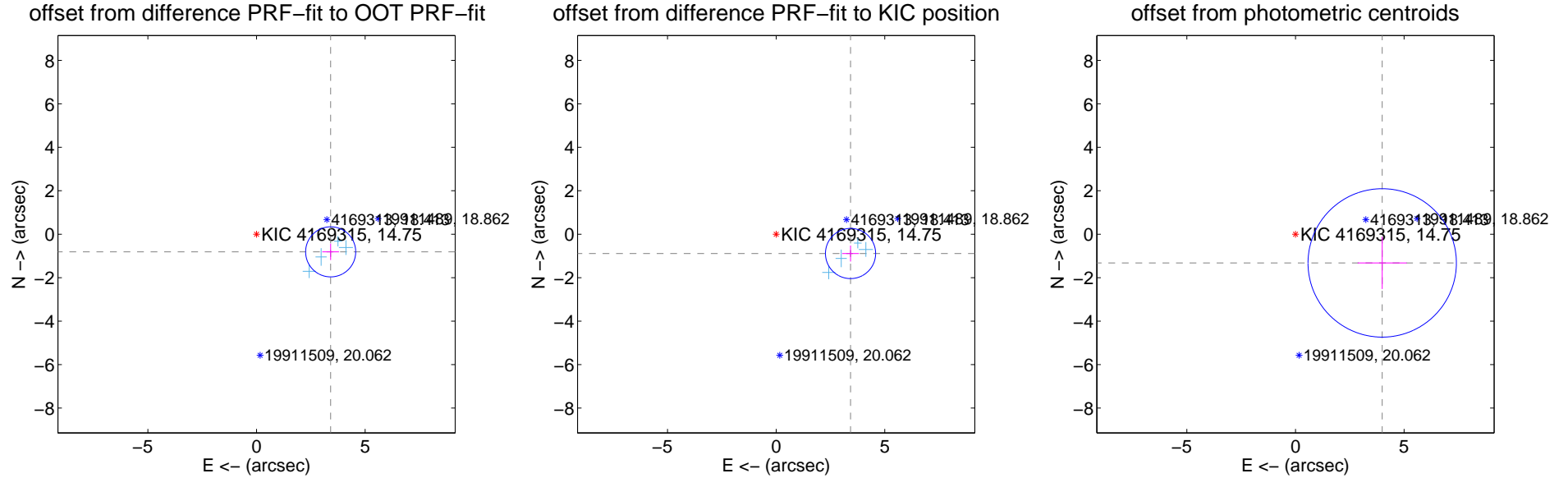
## DV Centroid Data

Supplemental centroid analysis for 004169315-01. Kepler magnitude: 14.75. Transit SNR 9.23

There are 4 quarters with good PRF difference image offsets

The direct PRF centroid is offset from the target star catalog position by about 0.09 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$3.510 \pm 0.384$	9.13	$-3.415 \pm 0.385$	$-0.811 \pm 0.377$
PRF-fit source offset from KIC position	$3.539 \pm 0.385$	9.19	$-3.426 \pm 0.386$	$-0.888 \pm 0.368$
photometric centroid source offset	$4.21 \pm 1.14$	3.69	$-3.99 \pm 1.13$	$-1.32 \pm 1.20$



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.

Q1 no difference image



Q1 no OOT image



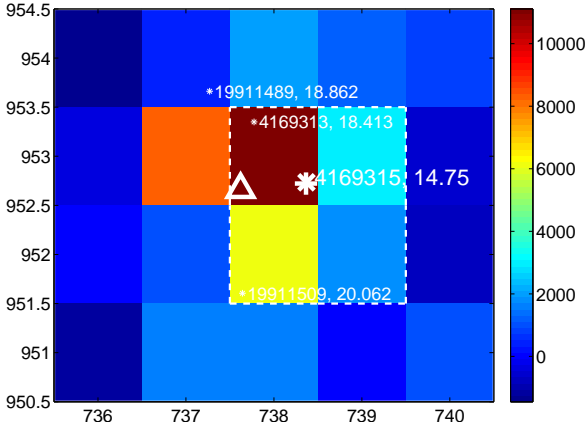
Q2 no difference image



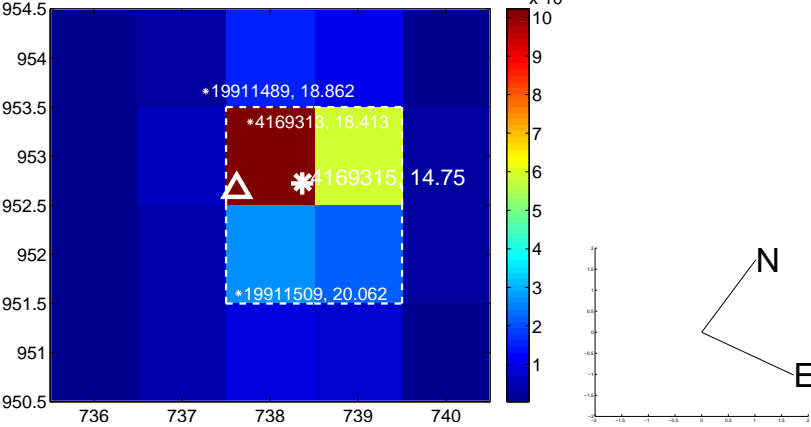
Q2 no OOT image



Q3 difference image



Q3 OOT image



Q4 no difference image



Q4 no OOT image





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

Q5 no difference image



Q5 no OOT image



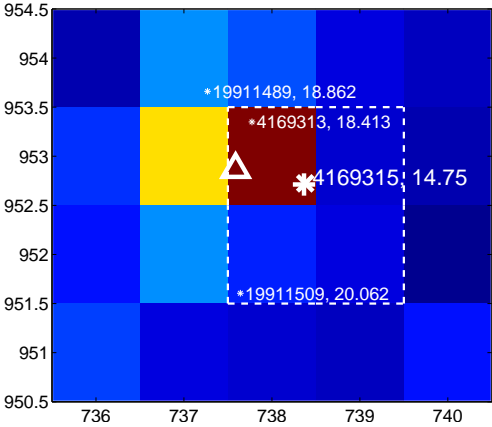
Q6 no difference image



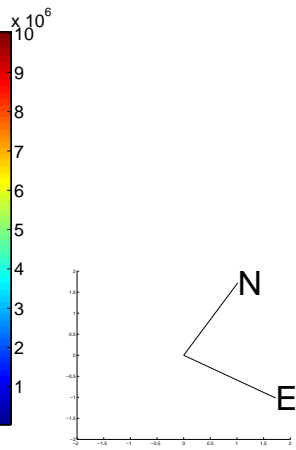
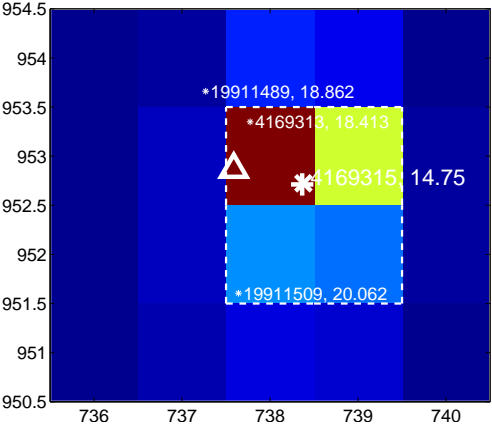
Q6 no OOT image



Q7 difference image



Q7 OOT image



Q8 no difference image



Q8 no OOT image



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

Q9 no difference image



Q9 no OOT image



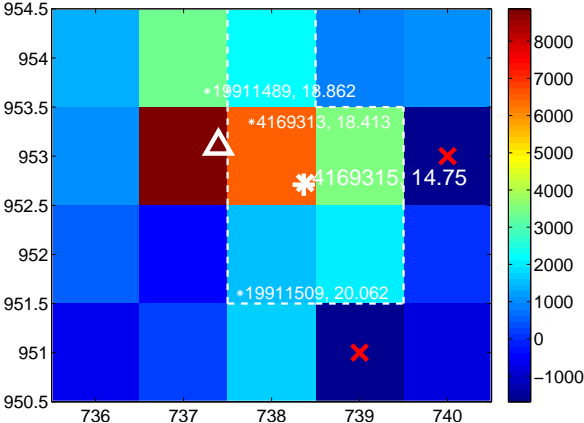
Q10 no difference image



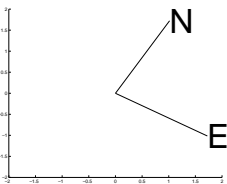
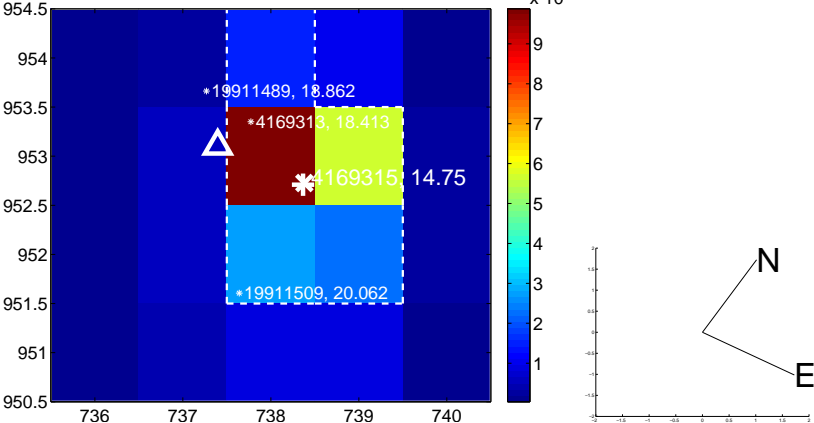
Q10 no OOT image



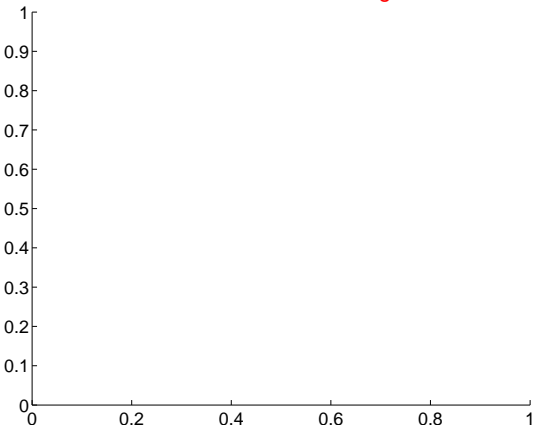
Q11 difference image



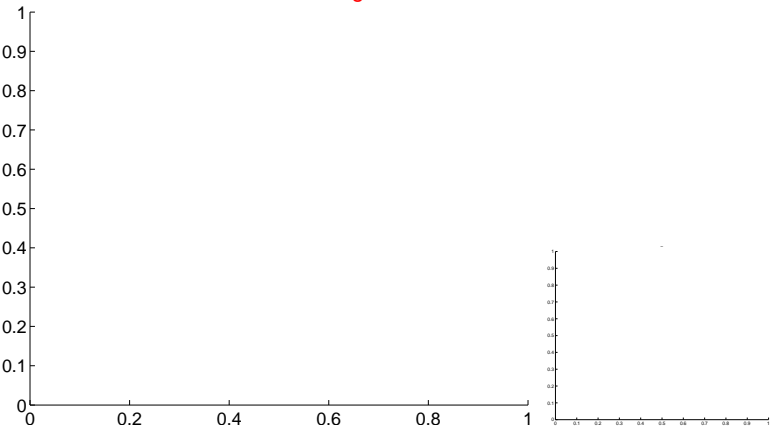
Q11 OOT image



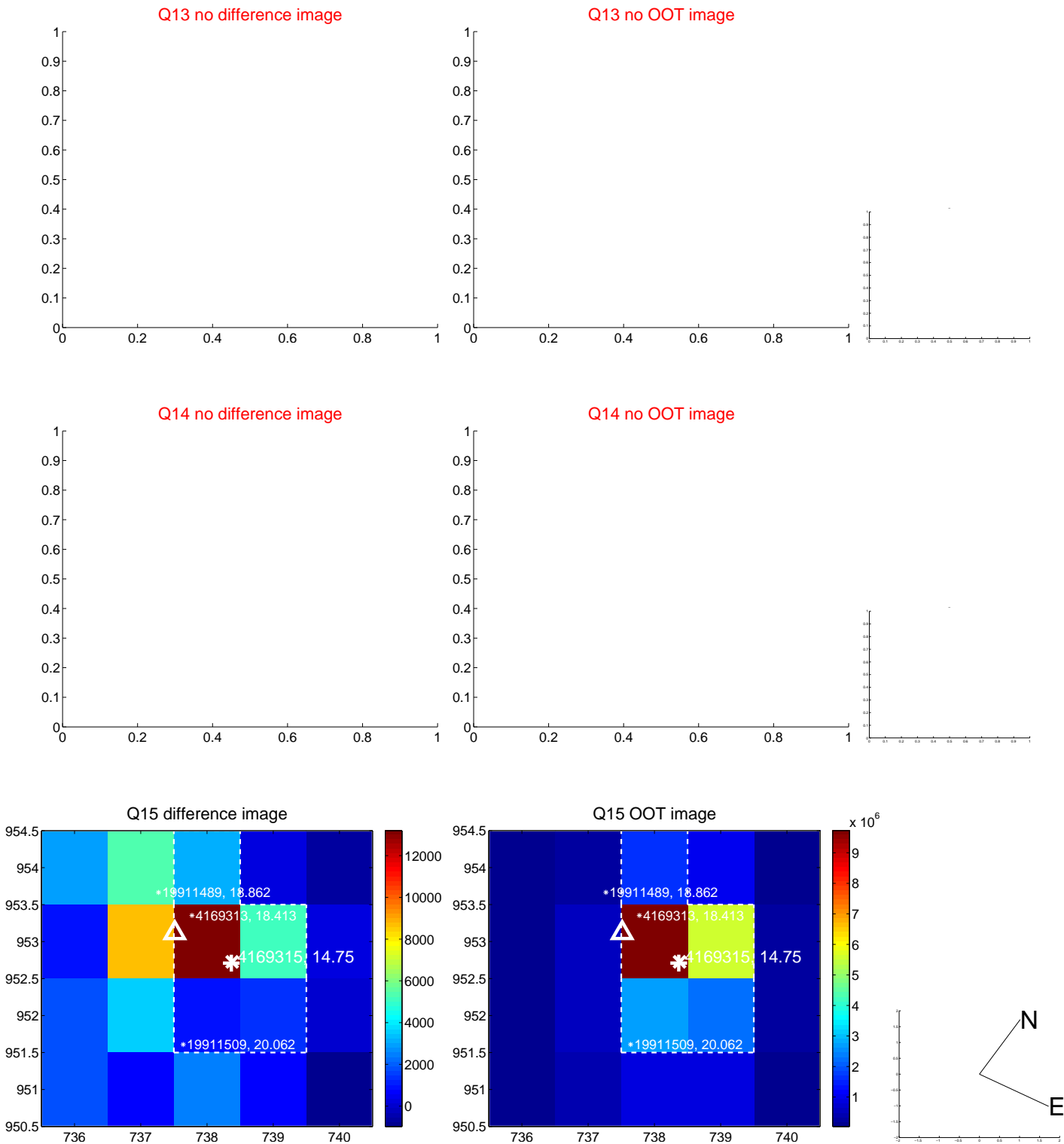
Q12 no difference image



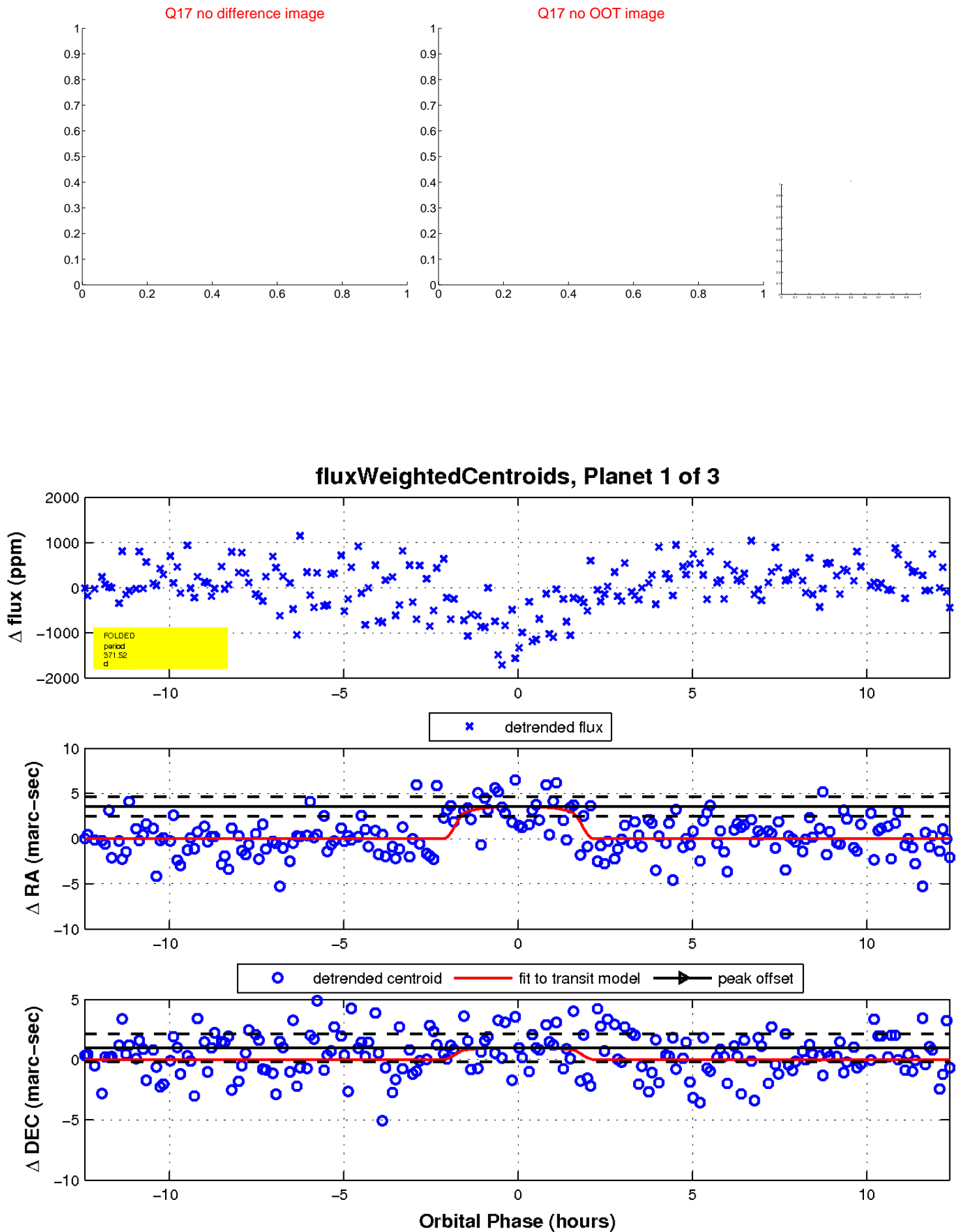
Q12 no OOT image



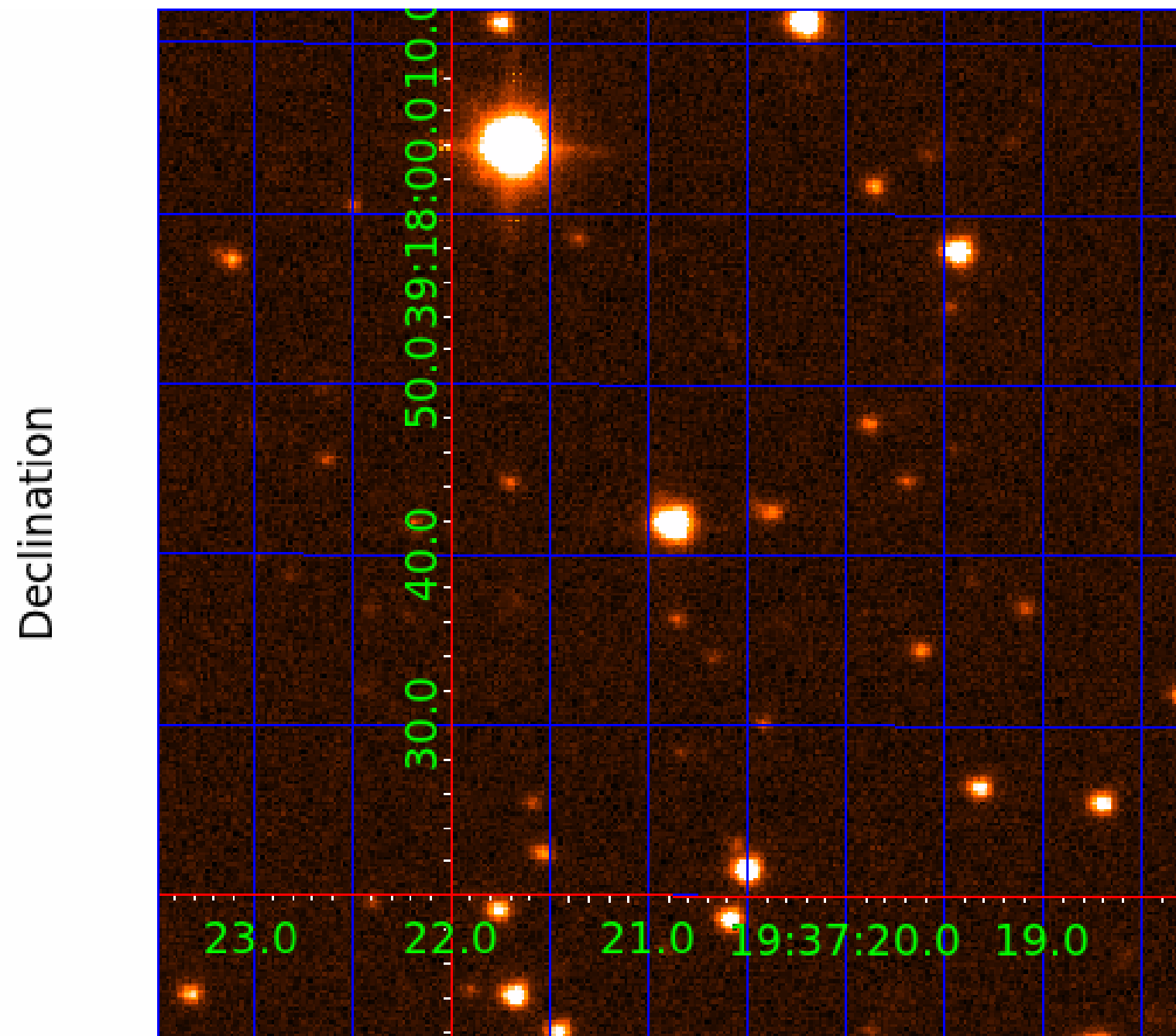
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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



UKIRT Image



# KIC 004169315

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
004169315-01	OBS	8245.01	371.515353	263.294252	914.2	4.184	9.2	9.2	1.16	6525	4.04	1.91
004169315-02	OBS	No	371.523173	294.232617	967.4	5.453	8.9	9.8	1.16	6525	4.56	1.91
004169315-03	OBS	No	371.514390	325.205495	961.1	5.587	8.6	8.9	1.16	6525	4.57	1.91

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
004169315-01	OBS	FP	0.00	0	1	1	0	MOD_SEC_ALT—HAS_SEC_TCE—PERIOD_ALIAS_ALT—CENT_UNRESOLVED_OFFSET
004169315-02	OBS	FP	0.00	1	1	1	1	IS_SEC_TCE—CENT_UNRESOLVED_OFFSET—EPHEM_MATCH
004169315-03	OBS	FP	0.00	1	0	1	0	MOD_TER_DV—MOD_NONUNIQ_ALT—SAME_NTL_PERIOD—CENT_UNRESOLVED_OFFSET

**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.

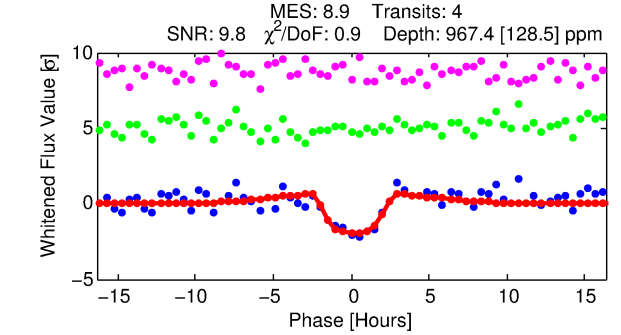
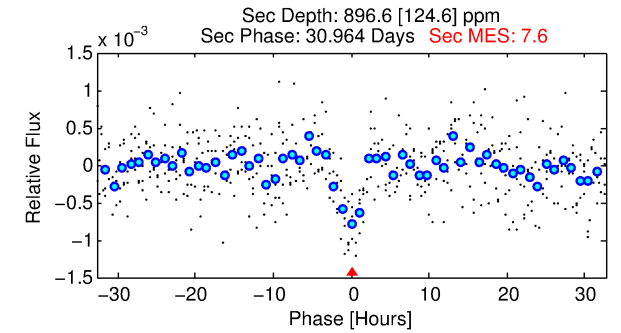
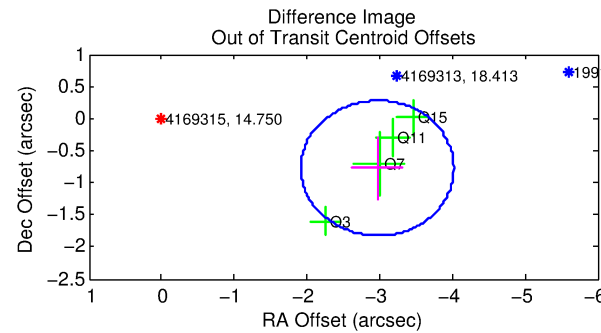
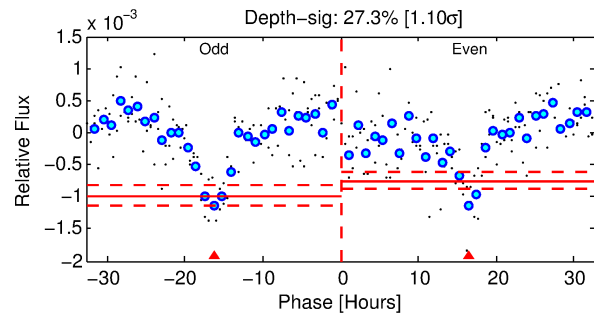
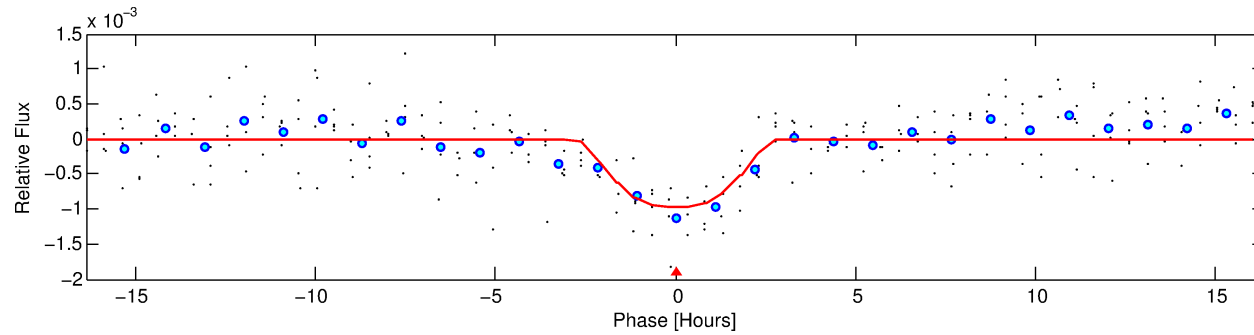
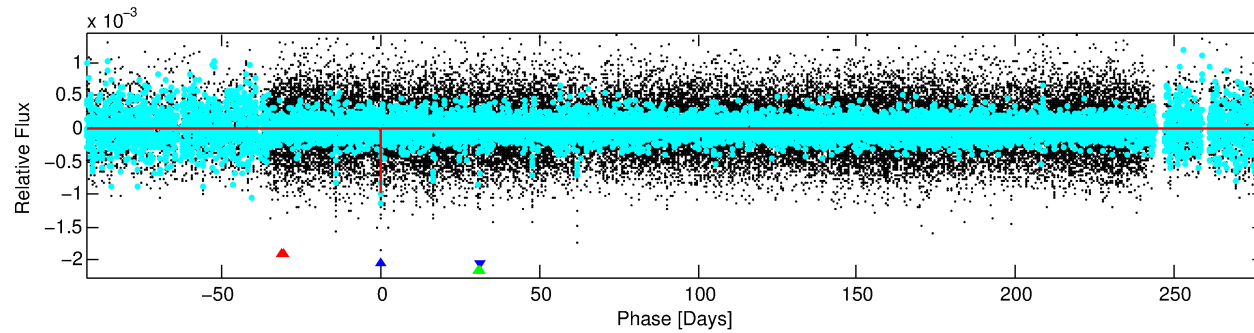
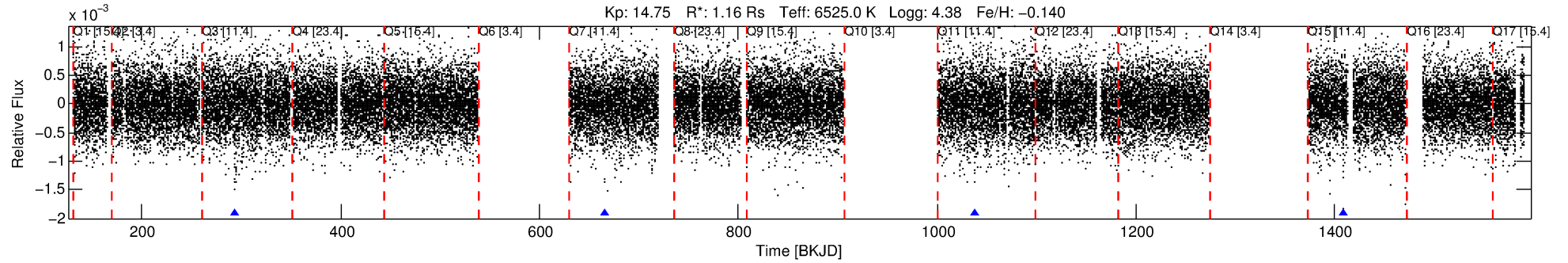
## Ephemeris Match Information For 004169315-02

TCE (1)	KIC	Parent (2)	Parent KIC	P <sub>1</sub> :P <sub>2</sub>	Dist ( $\mu$ )	$\Delta$ Row	$\Delta$ Col	m <sub>2</sub>	m <sub>1</sub>	D <sub>2</sub> /D <sub>1</sub>	Mechanism	Flag	$\sigma_P$	$\sigma_T$
004169315-02	4169315	004847832-02	4847832	12:1	3147.8	-7	2	12.45	14.75	406.71	Cross-Talk	0	0.49	0.03

**Notes:** P<sub>1</sub>:P<sub>2</sub> is the period ratio. Dist is the distance in arcseconds.  $\Delta$ Row and  $\Delta$ Col are the number of pixels apart in row and column. m<sub>2</sub> and m<sub>1</sub> are the magnitudes of the parent and child. D<sub>2</sub>/D<sub>1</sub> is the parent's transit depth divided by the child's.  $\sigma_P$  and  $\sigma_T$  are the significance of the match in period and epoch. For a match to be considered significant  $\sigma_P < 5.0$  and  $\sigma_T < 5.0$ . Matches which have  $\sigma_P$  and  $\sigma_T$  very close to this cutoff should receive extra scrutiny, especially if the period ratio is very large.

# DV One-Page Summary

KIC: 4169315 Candidate: 2 of 3 Period: 371.523 d



## DV Fit Results:

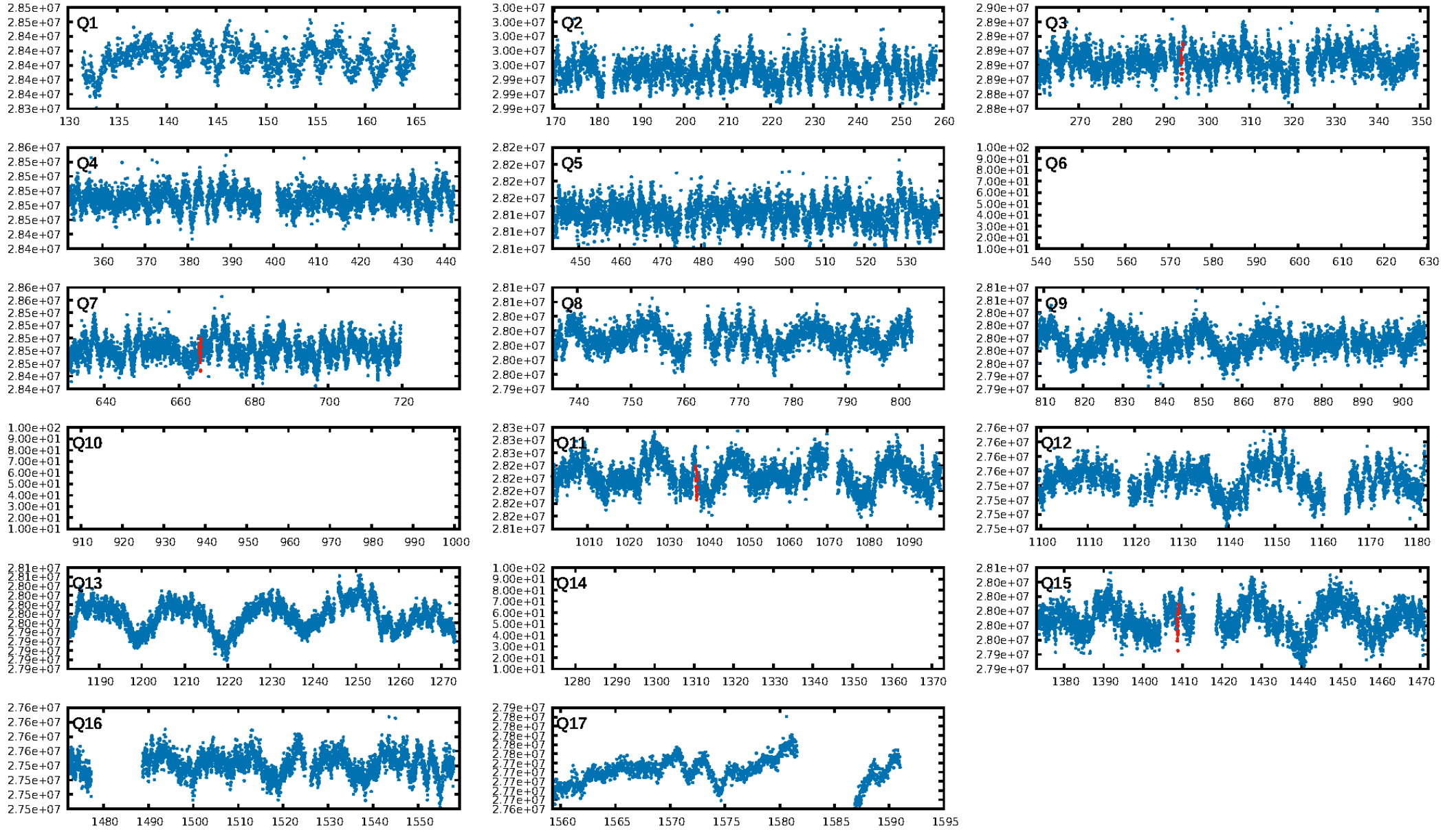
Period = 371.52317 [0.00473] d  
Epoch = 294.2326 [0.0083] BKJD  
Rp/R\* = 0.0360 [0.0033]  
a/R\* = 204.10 [35.09]  
b = 0.96 [0.02]  
Seff = 1.91 [0.76]  
Teq = 300 [30] K  
Rp = 4.56 [1.48] Re  
a = 1.0697 [0.2769] AU  
Ag = 27150.48 [11871.97] [2.29 $\sigma$ ]  
Teff = 5952 [397] K [14.19 $\sigma$ ]

## DV Diagnostic Results:

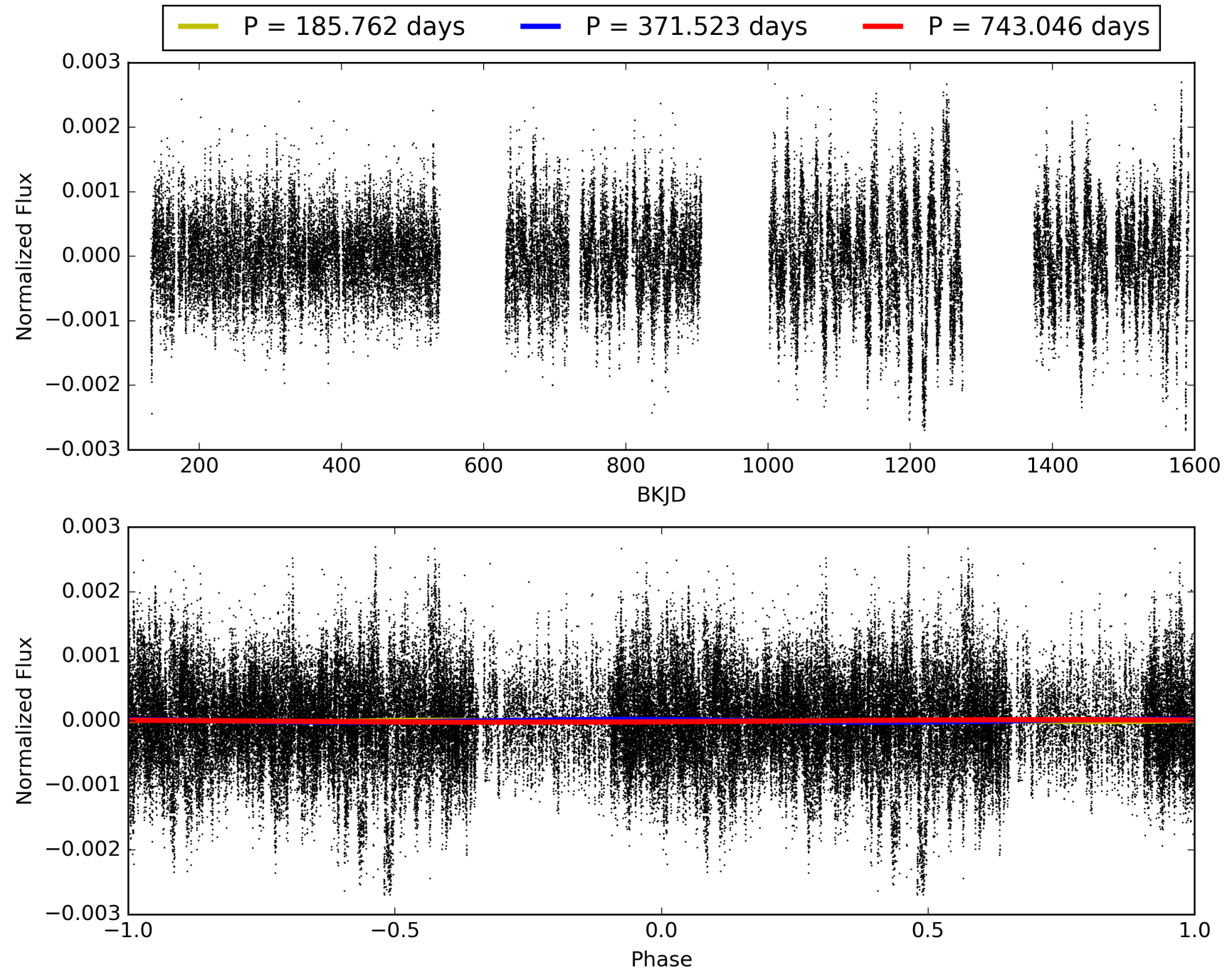
ShortPeriod-sig: 2.2% [0.03 $\sigma$ ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: 89.5%  
ModelChiSquareGof-sig: 100.0%  
Bootstrap-pfa: 3.02e-11  
RollingBand-fgt: 1.00 [4/4]  
GhostDiagnostic-chr: 0.8004  
Centroid-sig: 0.0%  
Centroid-so: 3.558 arcsec [3.17 $\sigma$ ]  
OotOffset-rm: 3.066 arcsec [8.74 $\sigma$ ]  
KicOffset-rm: 3.117 arcsec [8.78 $\sigma$ ]  
OotOffset-st: 0/4/0/0 [4]  
KicOffset-st: 0/4/0/0 [4]  
DiffImageQuality-fgm: 1.00 [4/4]  
DiffImageOverlap-fno: 1.00 [4/4]



# TCE 004169315-02, PDC Light Curves

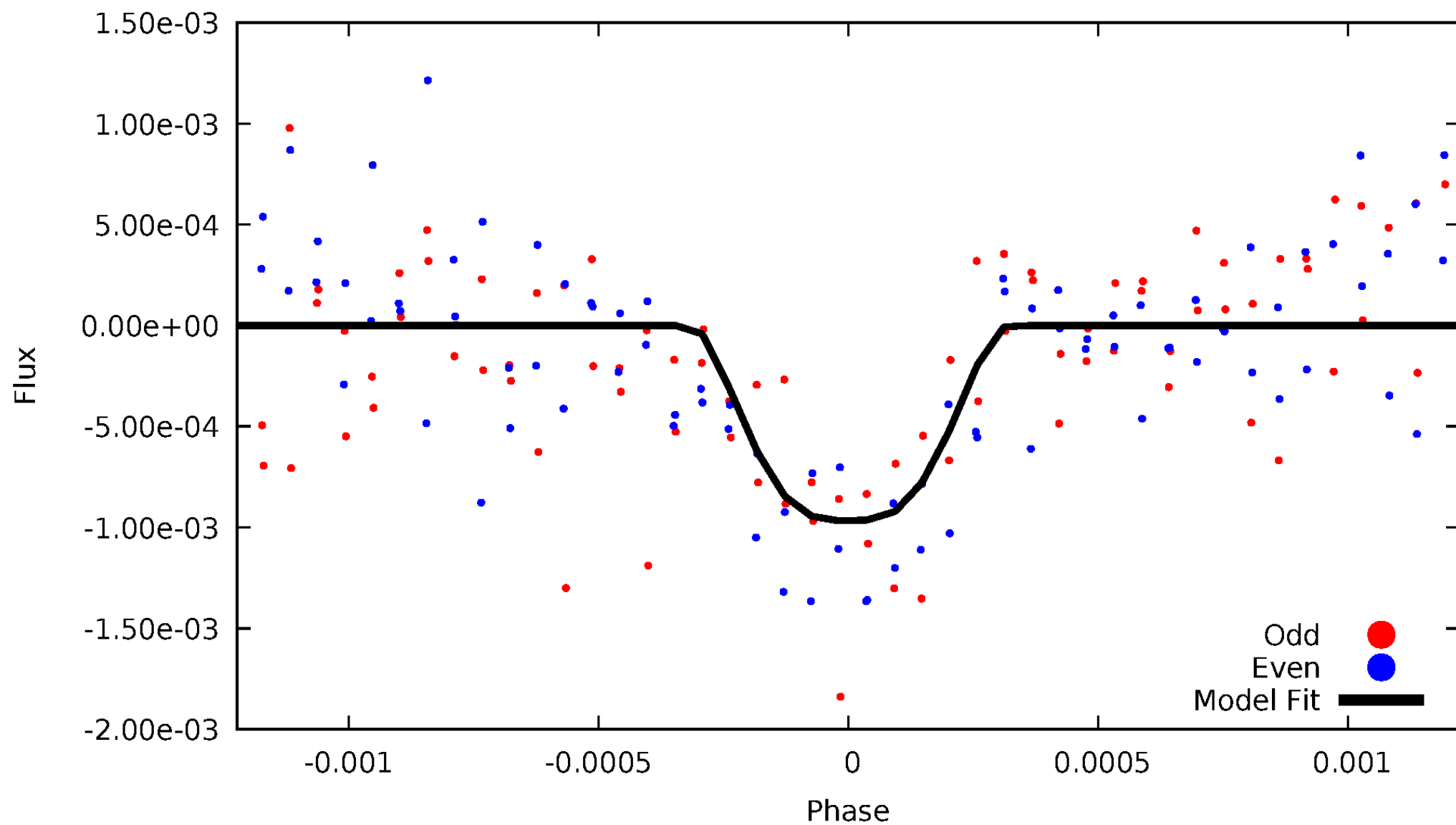


# TCE 004169315-02



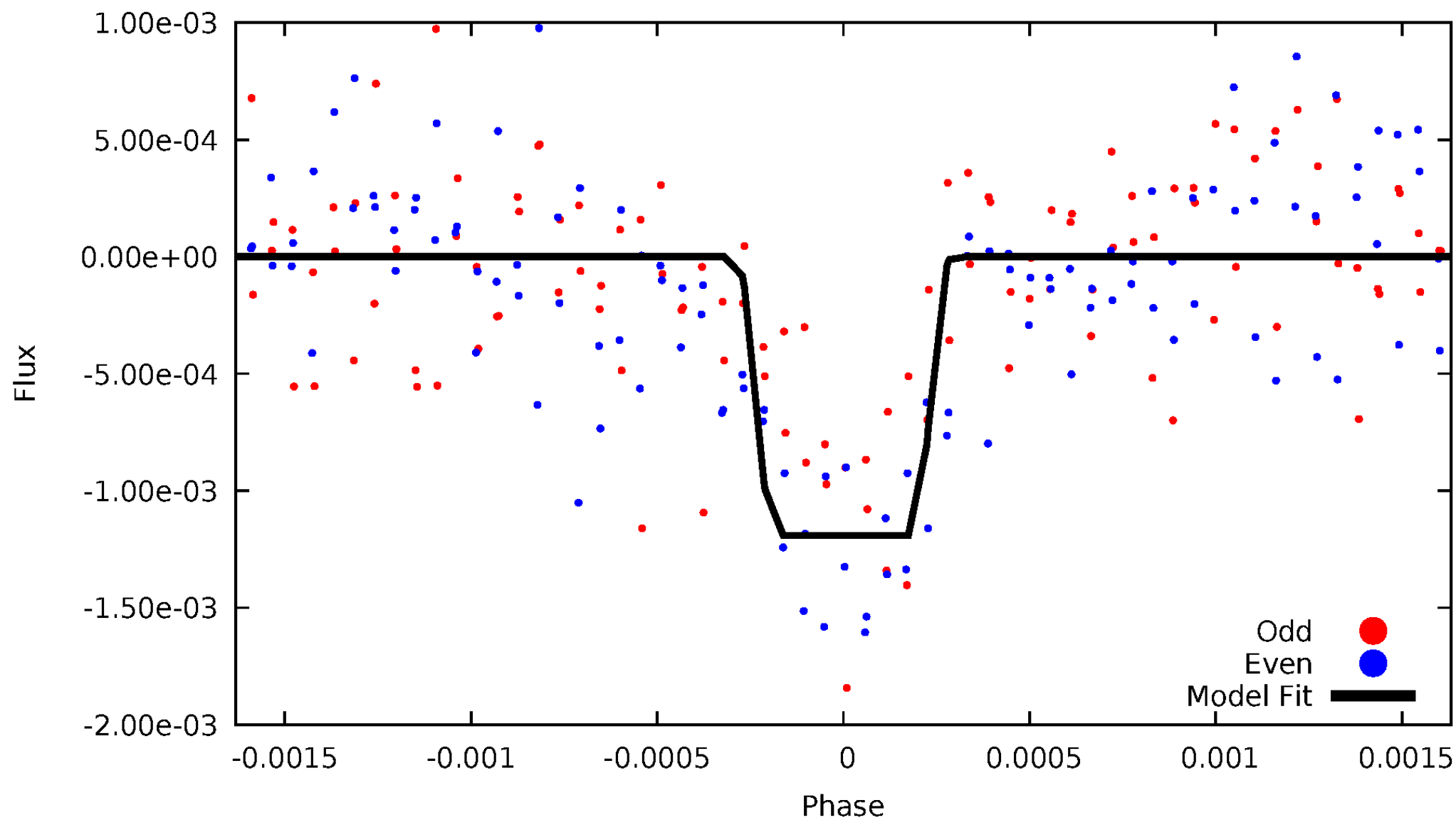
# DV Odd/Even

TCE 004169315-02



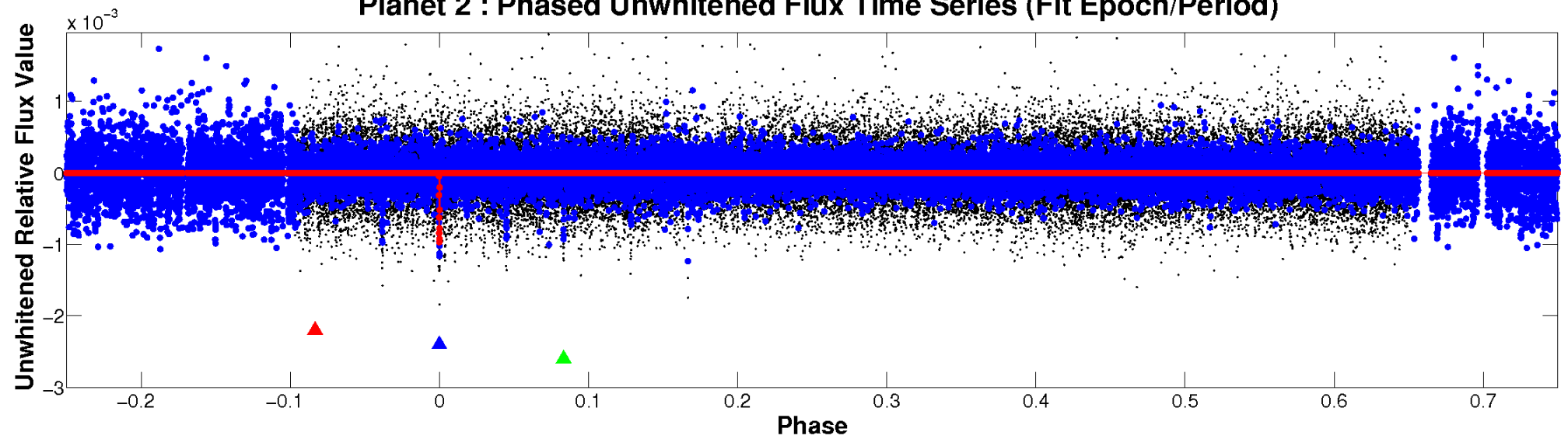
# ALT Odd/Even

TCE 004169315-02

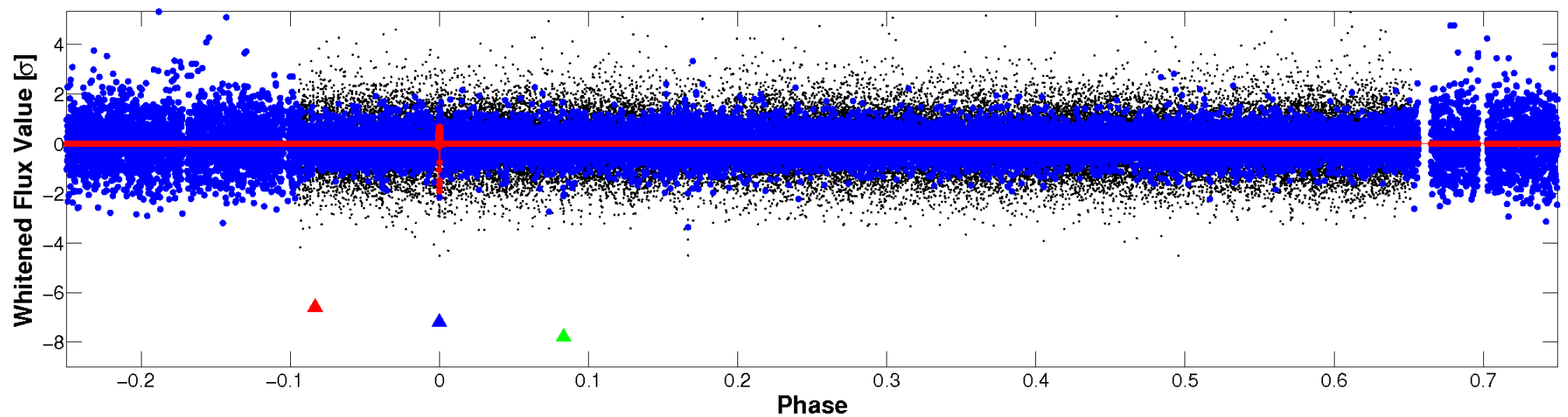


# Non-Whitened Vs. Whitened Light Curve

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

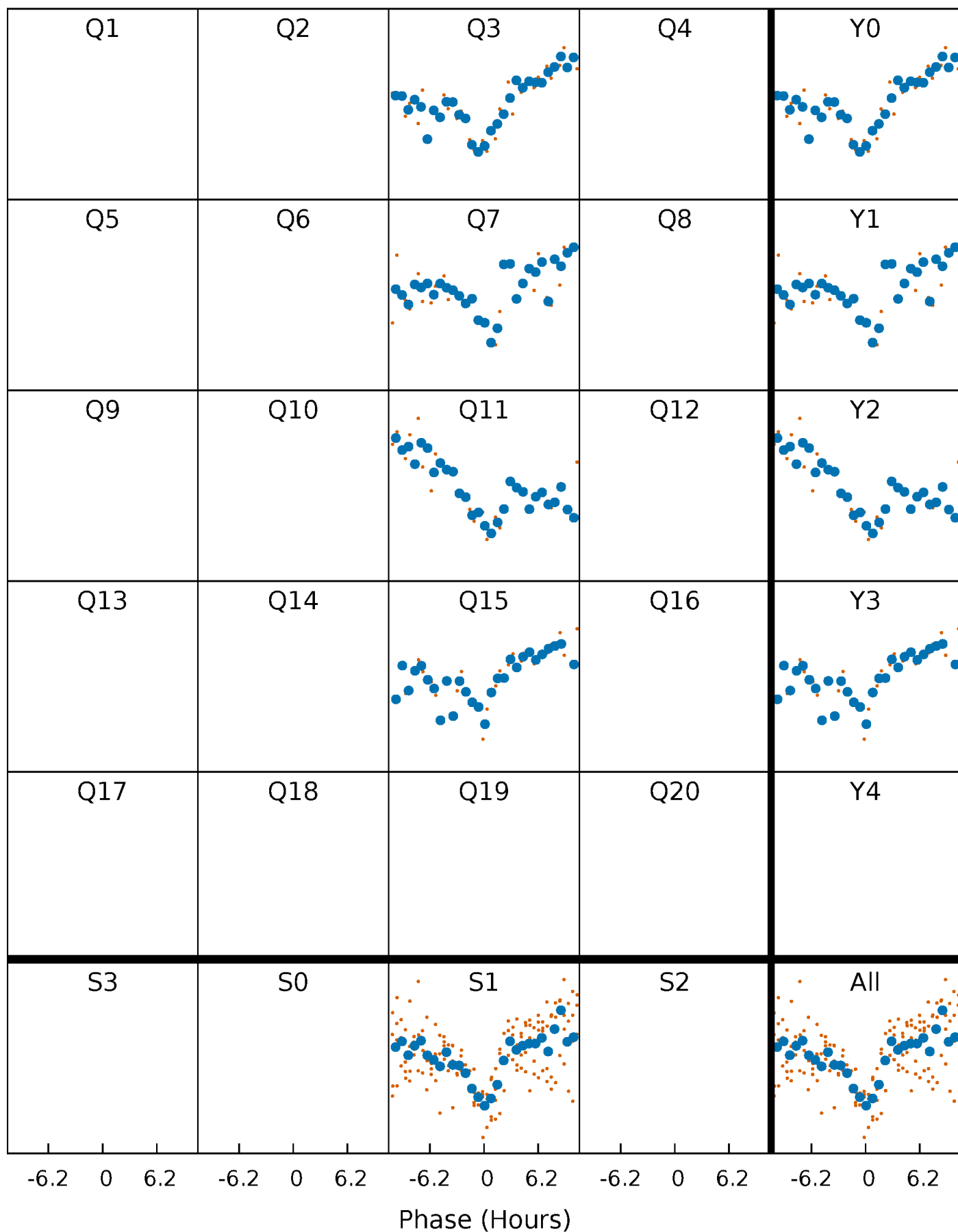


Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



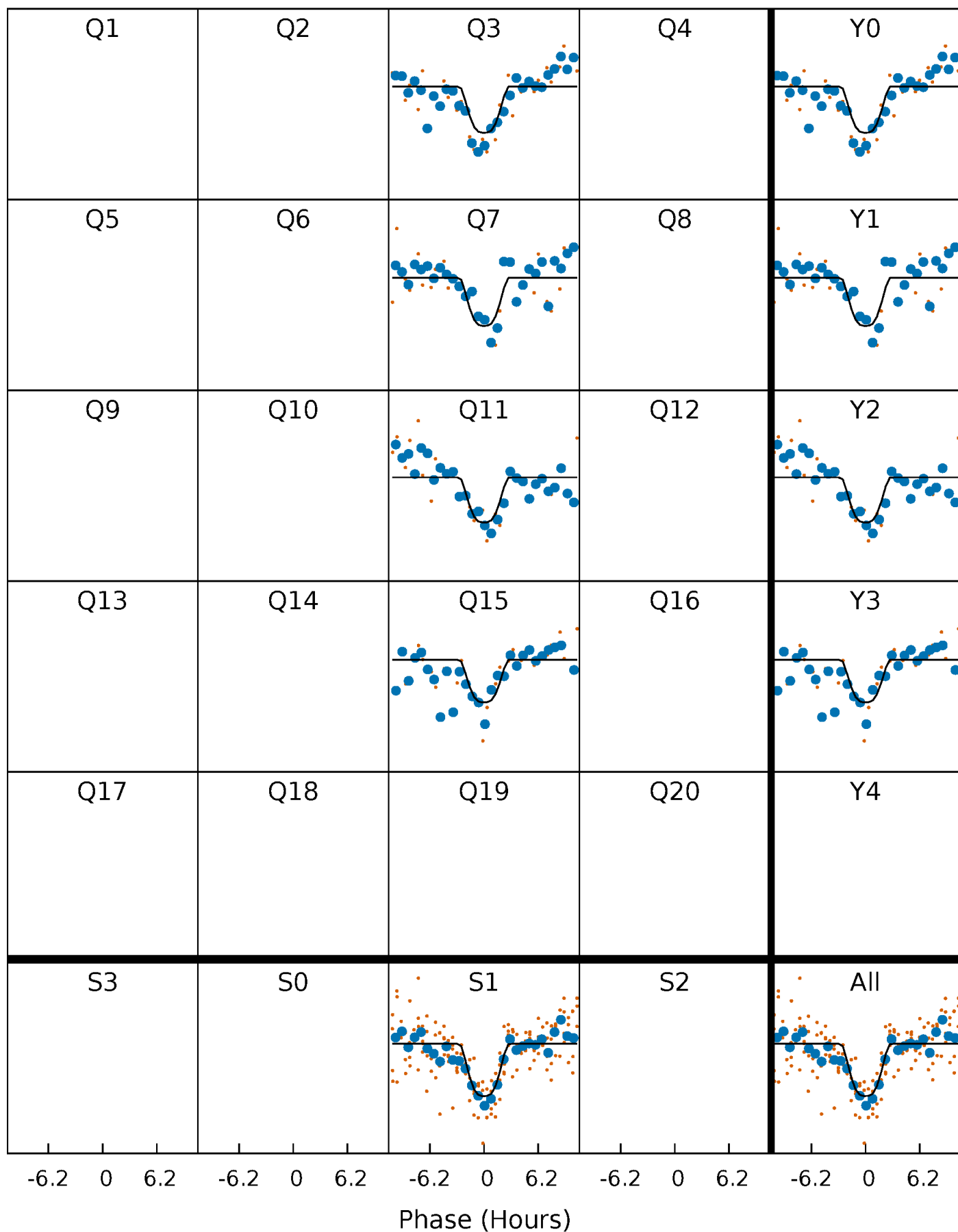
# PDC Quarter-Phased Transit Curves

TCE 004169315-02   P=371.523173 Days    $T_0=294.232617$  (BKJD)



# DV Quarter-Phased Transit Curves

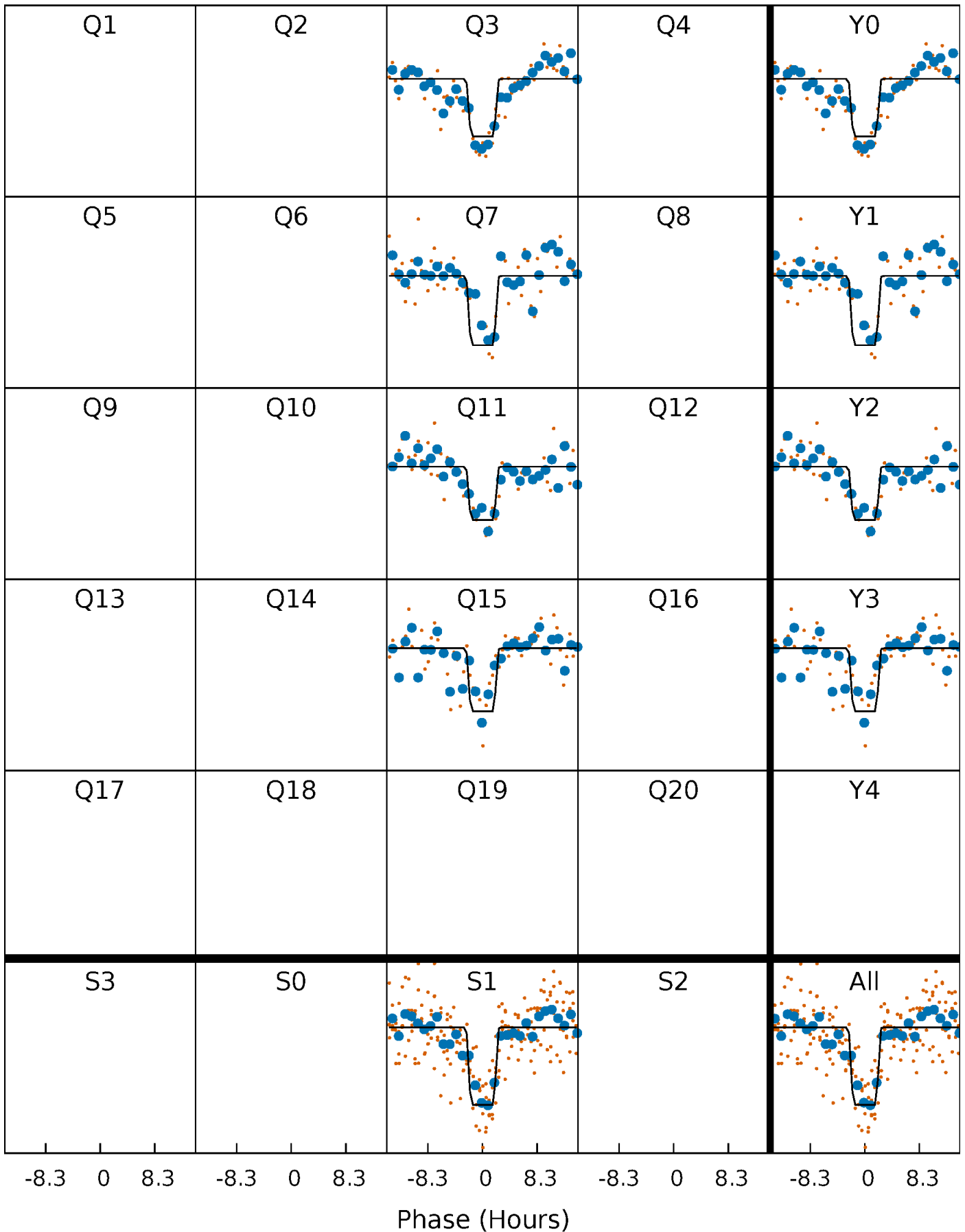
TCE 004169315-02   P=371.523173 Days    $T_0=294.232617$  (BKJD)





# Alt. Detrend Quarter-Phased Transit Curves

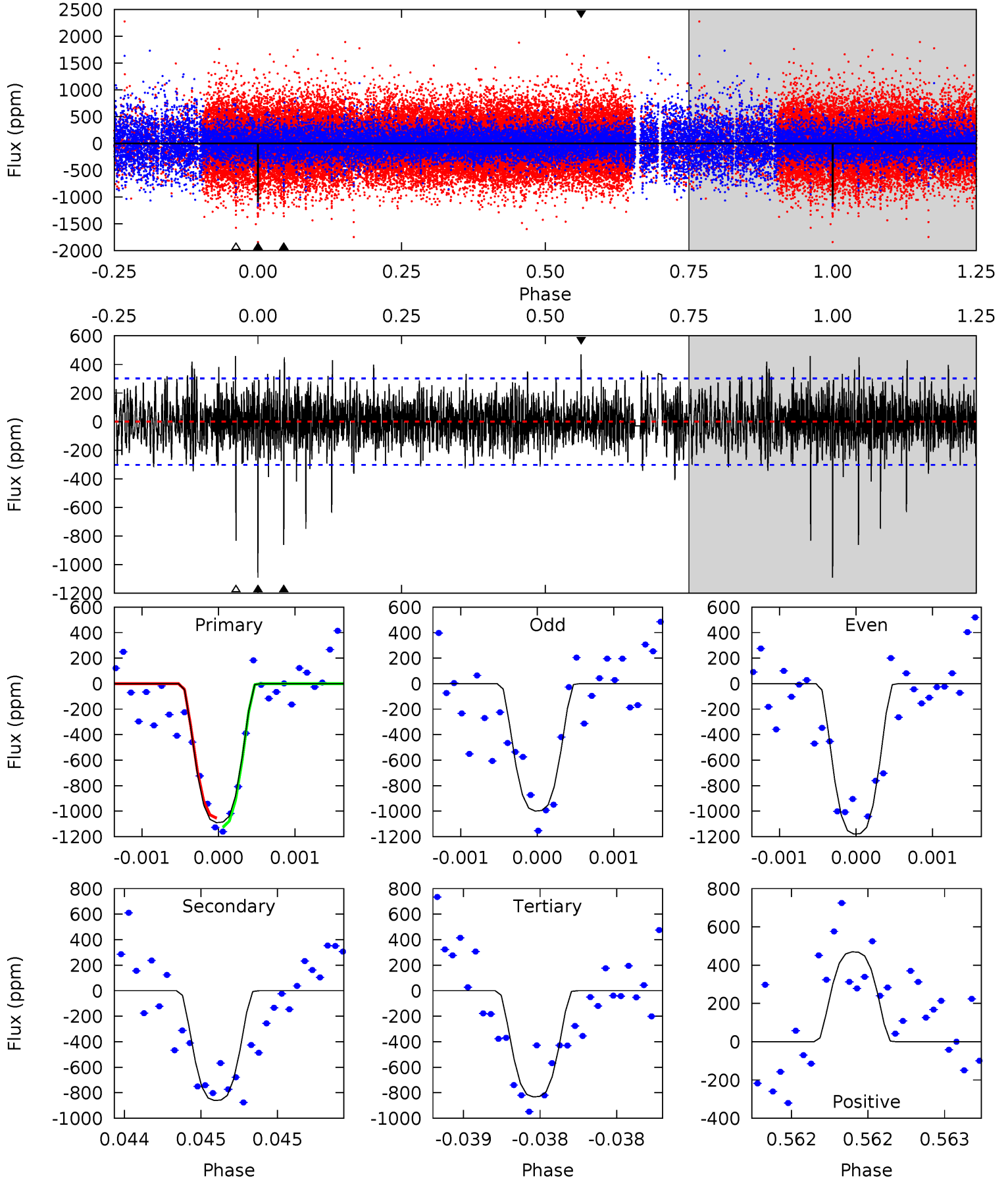
TCE 004169315-02     $P=371.522988$  Days     $T_0=294.223921$  (BKJD)



# DV Model-Shift Uniqueness Test

004169315-02, P = 371.523173 Days, E = 294.232617 Days

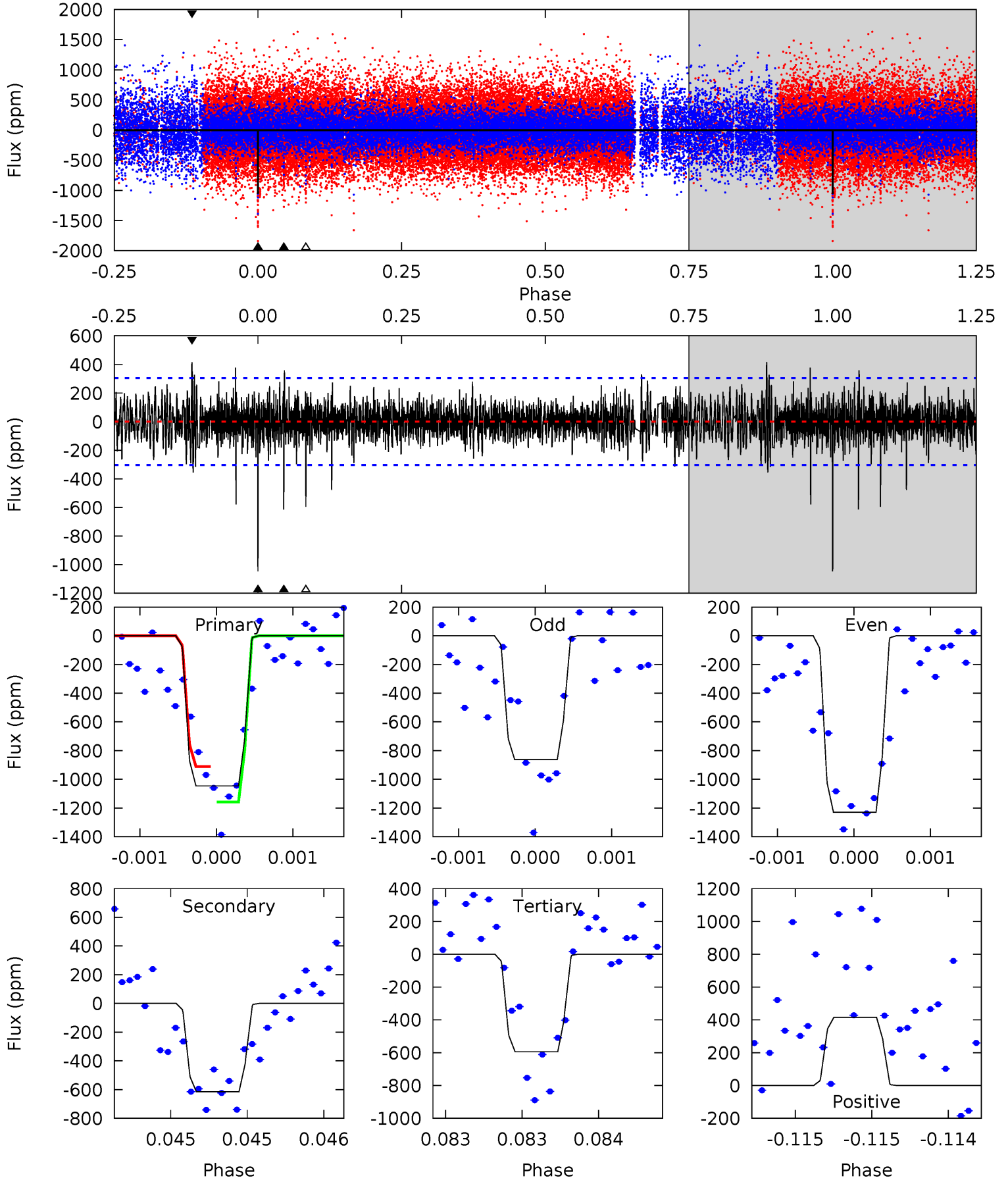
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
19.9	15.7	15.2	8.59	5.53	3.41	2.16	4.71	11.3	0.52	7.15	1.66	1.01	0.30	0.66



# Alt Model-Shift Uniqueness Test

004169315-02, P = 371.522988 Days, E = 294.223921 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
19.1	11.2	10.8	7.57	5.54	3.43	1.59	8.24	11.5	0.36	3.63	3.35	1.04	0.28	2.22



### Stellar Parameters For KIC 004169315

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$6525^{+158}_{-226}$	$4.381^{+0.067}_{-0.202}$	$-0.140^{+0.250}_{-0.300}$	$1.161^{+0.361}_{-0.155}$	$1.183^{+0.162}_{-0.162}$	$1.065^{+0.312}_{-0.550}$
	+2%/-3%	+2%/-5%	+179%/-214%	+31%/-13%	+14%/-14%	+29%/-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 004169315-02 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$-861 \pm 55$	$4.70^{+0.89}_{-0.59}$	$425^{+31}_{-21}$	$5853^{+385}_{-282}$	$23998^{+7283}_{-6265}$
Alt.	$-614 \pm 55$	$4.55^{+0.80}_{-0.60}$	$426^{+29}_{-20}$	$5529^{+343}_{-280}$	$18454^{+5599}_{-4694}$

$T_{\text{max}}$  = 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

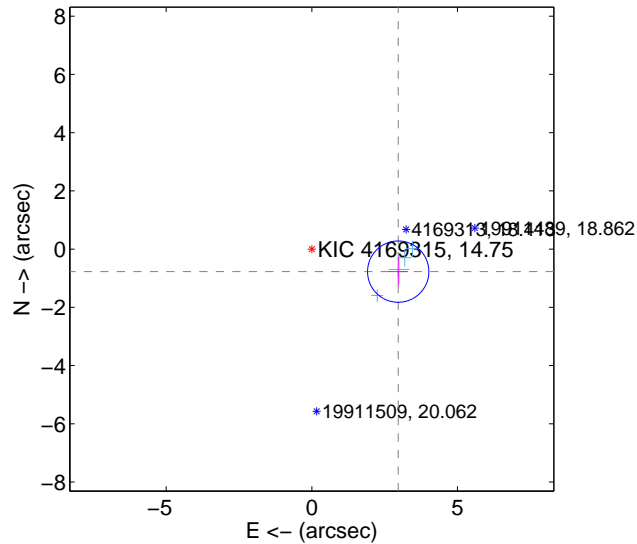
Supplemental centroid analysis for 004169315-02. Kepler magnitude: 14.75. Transit SNR 9.78

There are 4 quarters with good PRF difference image offsets

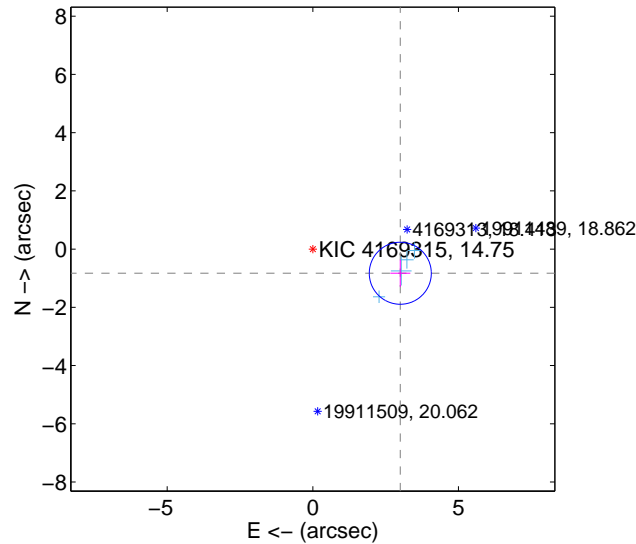
The direct PRF centroid is offset from the target star catalog position by about 0.08 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$3.066 \pm 0.351$	8.74	$-2.967 \pm 0.341$	$-0.774 \pm 0.475$
PRF-fit source offset from KIC position	$3.117 \pm 0.355$	8.78	$-3.004 \pm 0.345$	$-0.829 \pm 0.467$
photometric centroid source offset	$3.56 \pm 1.12$	3.17	$-3.42 \pm 1.12$	$-0.98 \pm 1.18$

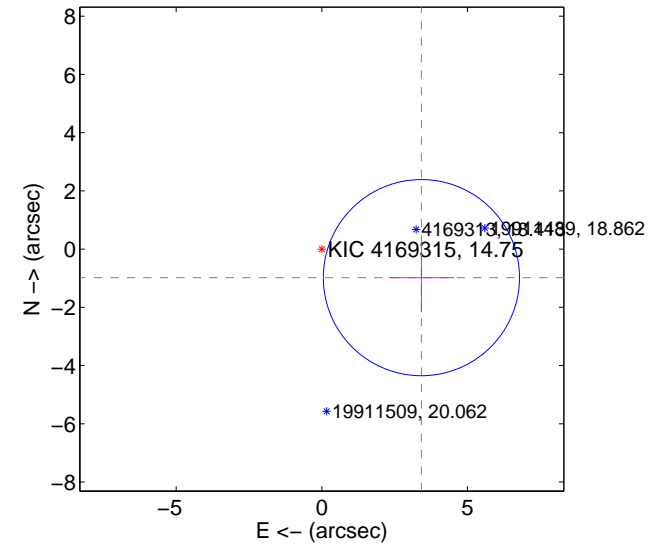
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position

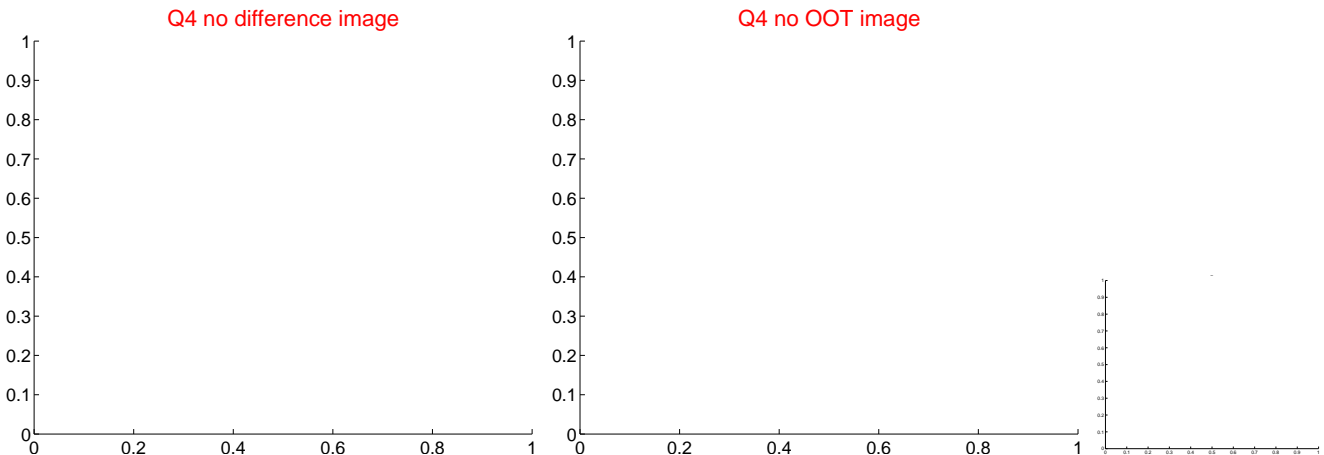
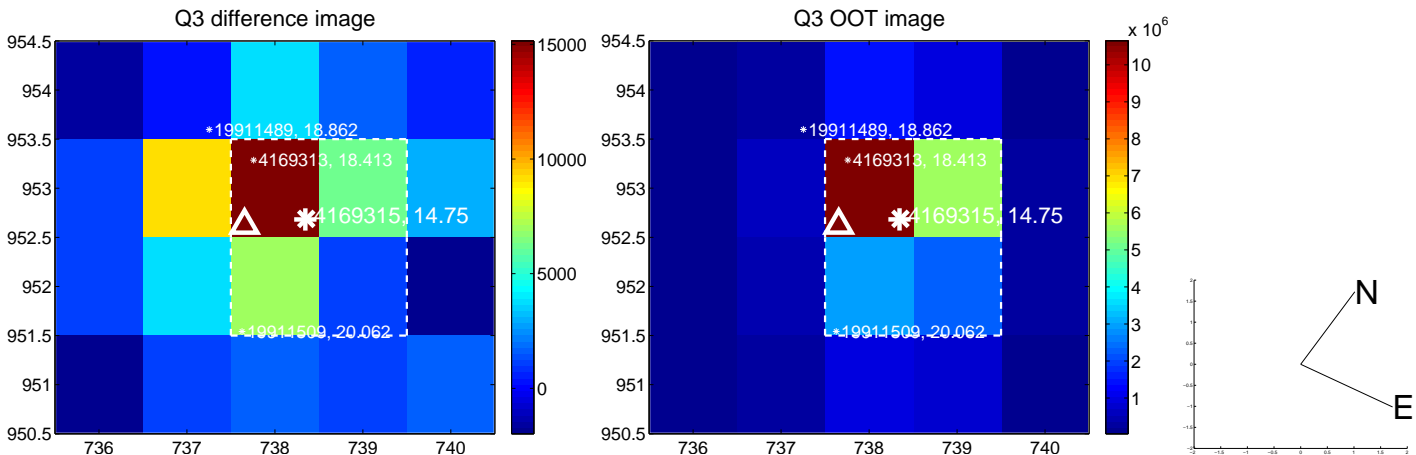
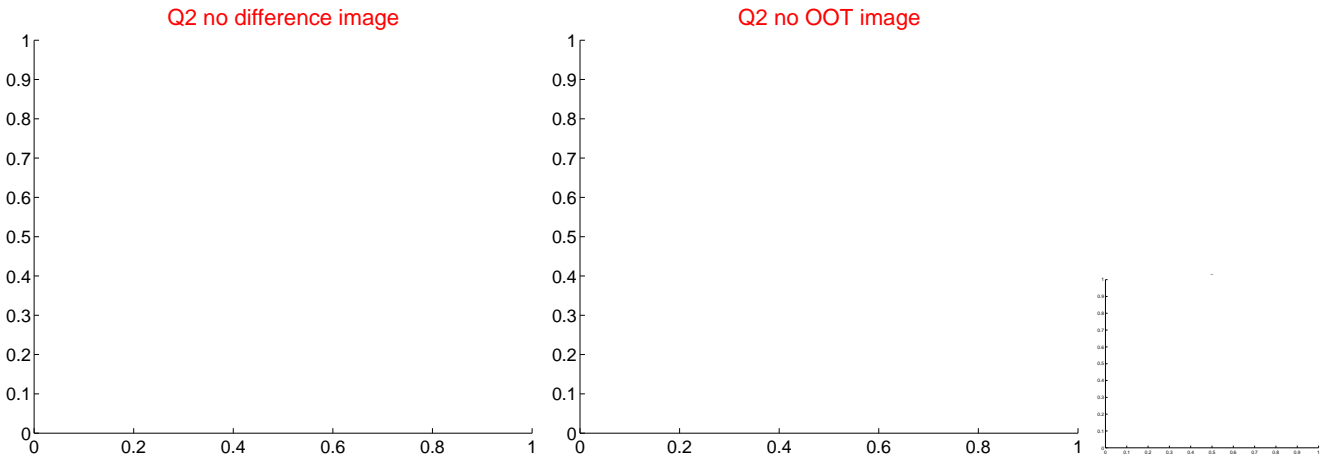
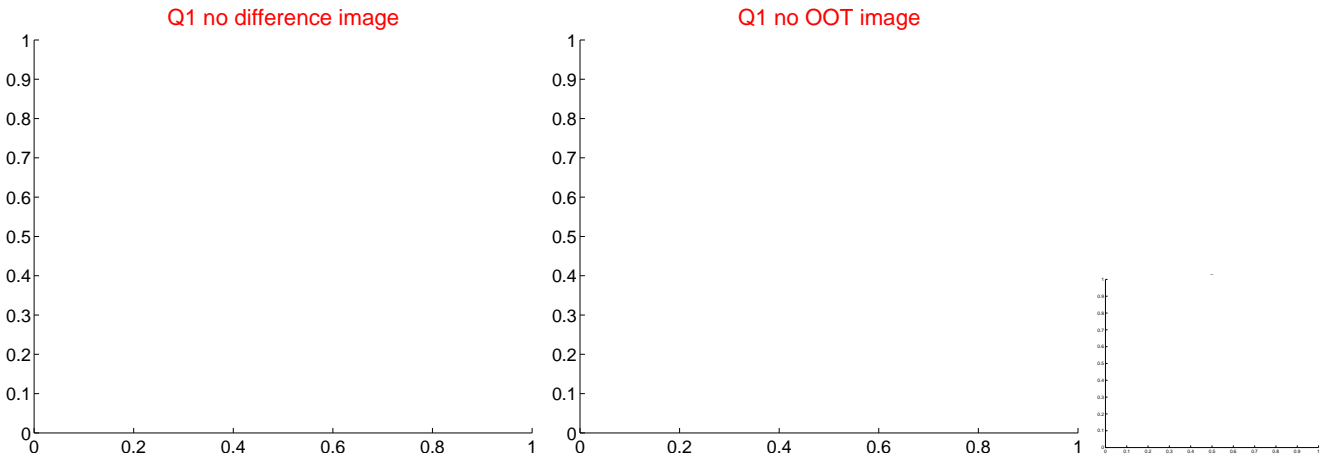


offset from photometric centroids



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.

Q5 no difference image



Q5 no OOT image



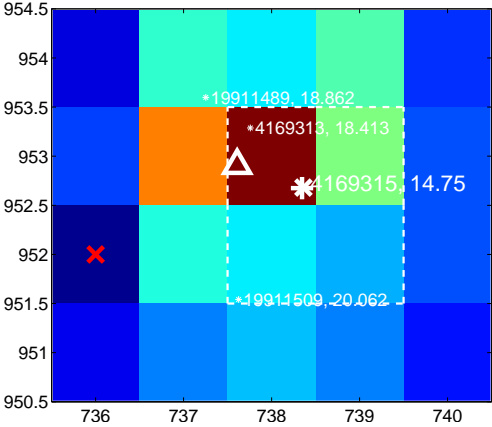
Q6 no difference image



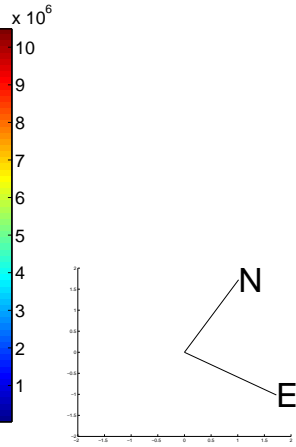
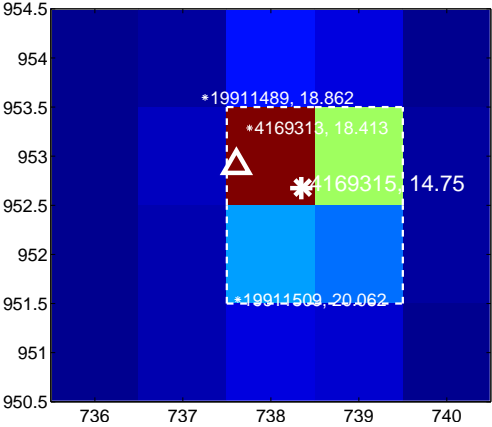
Q6 no OOT image



Q7 difference image



Q7 OOT image



Q8 no difference image

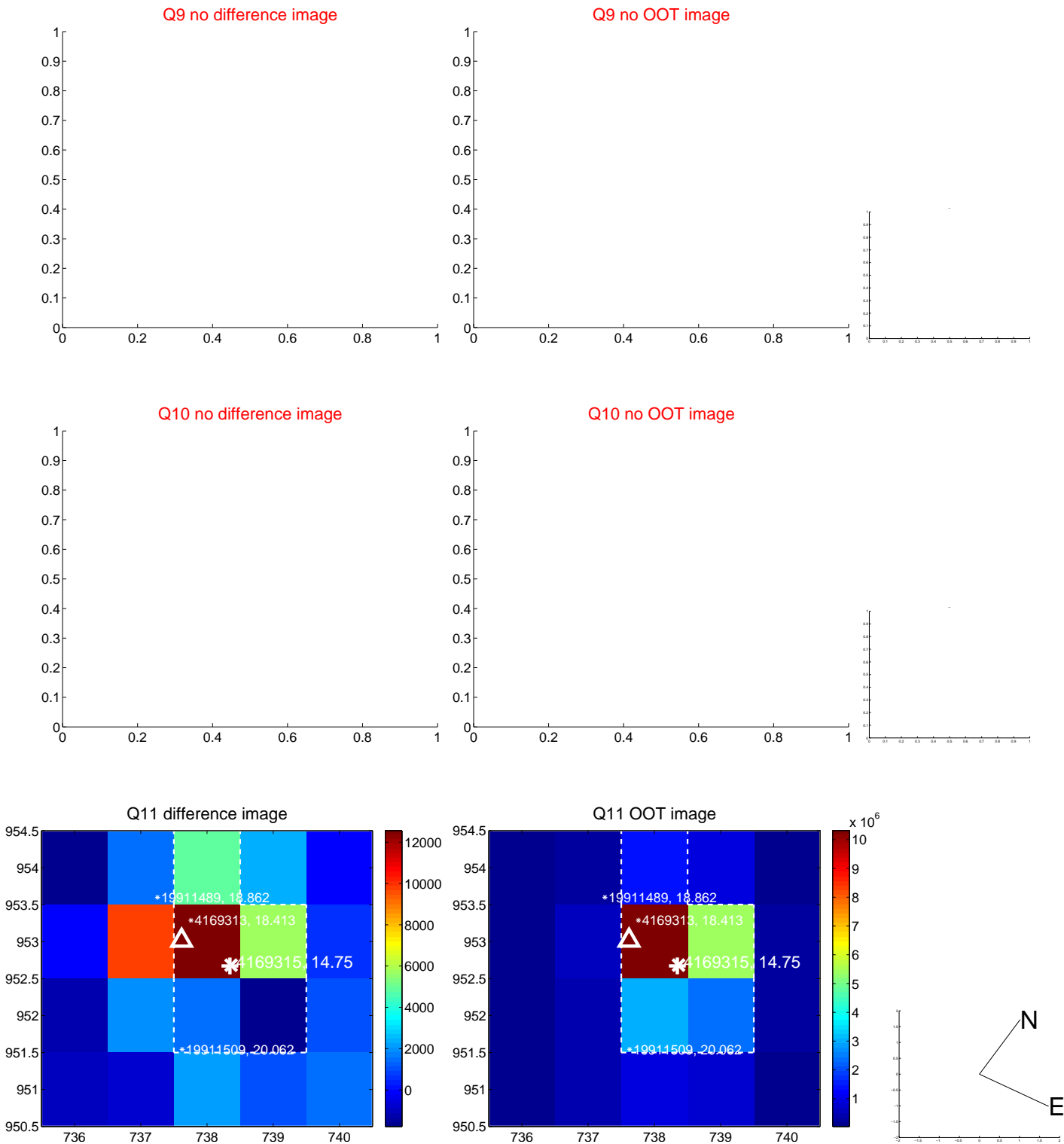


Q8 no OOT image

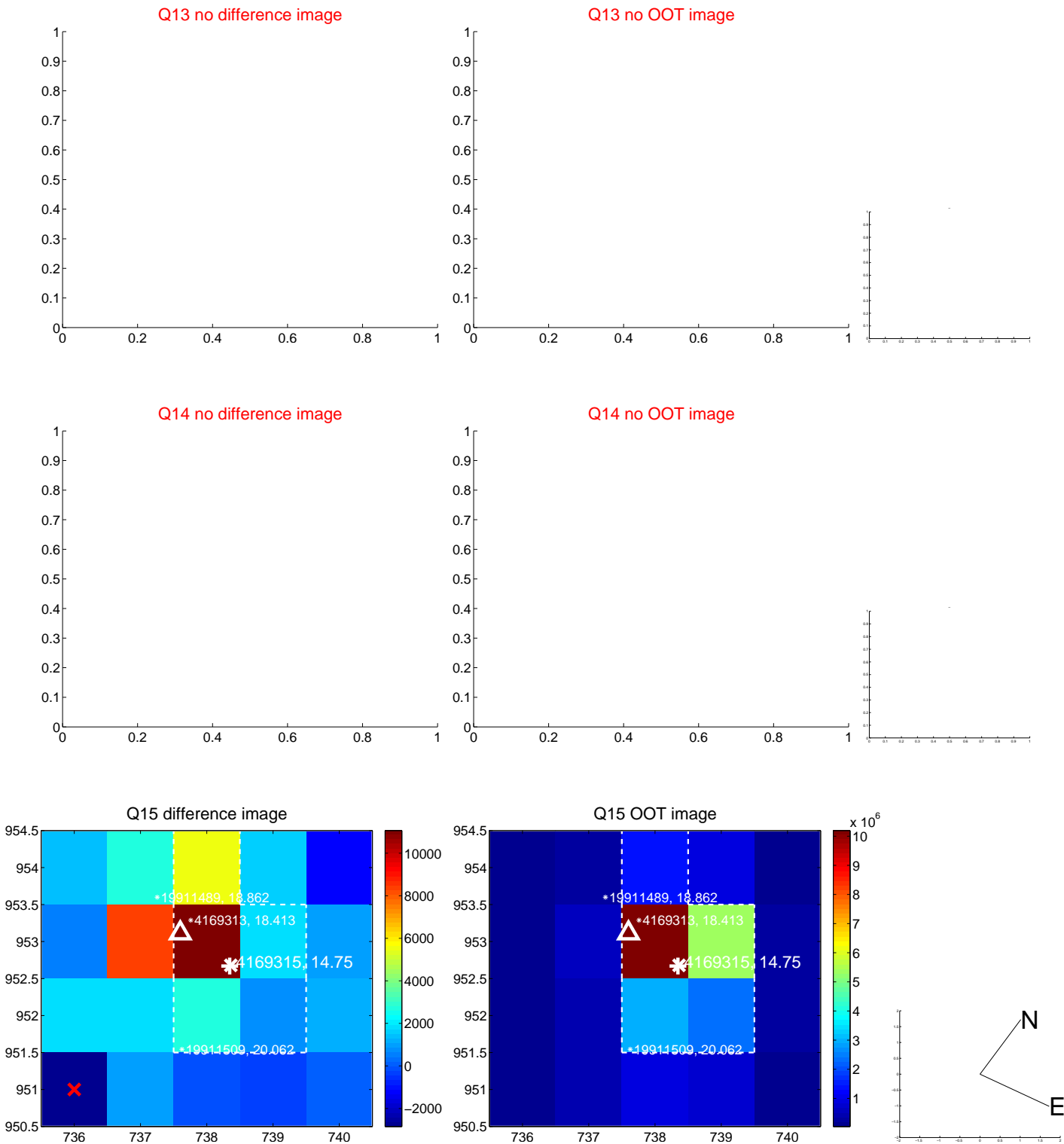




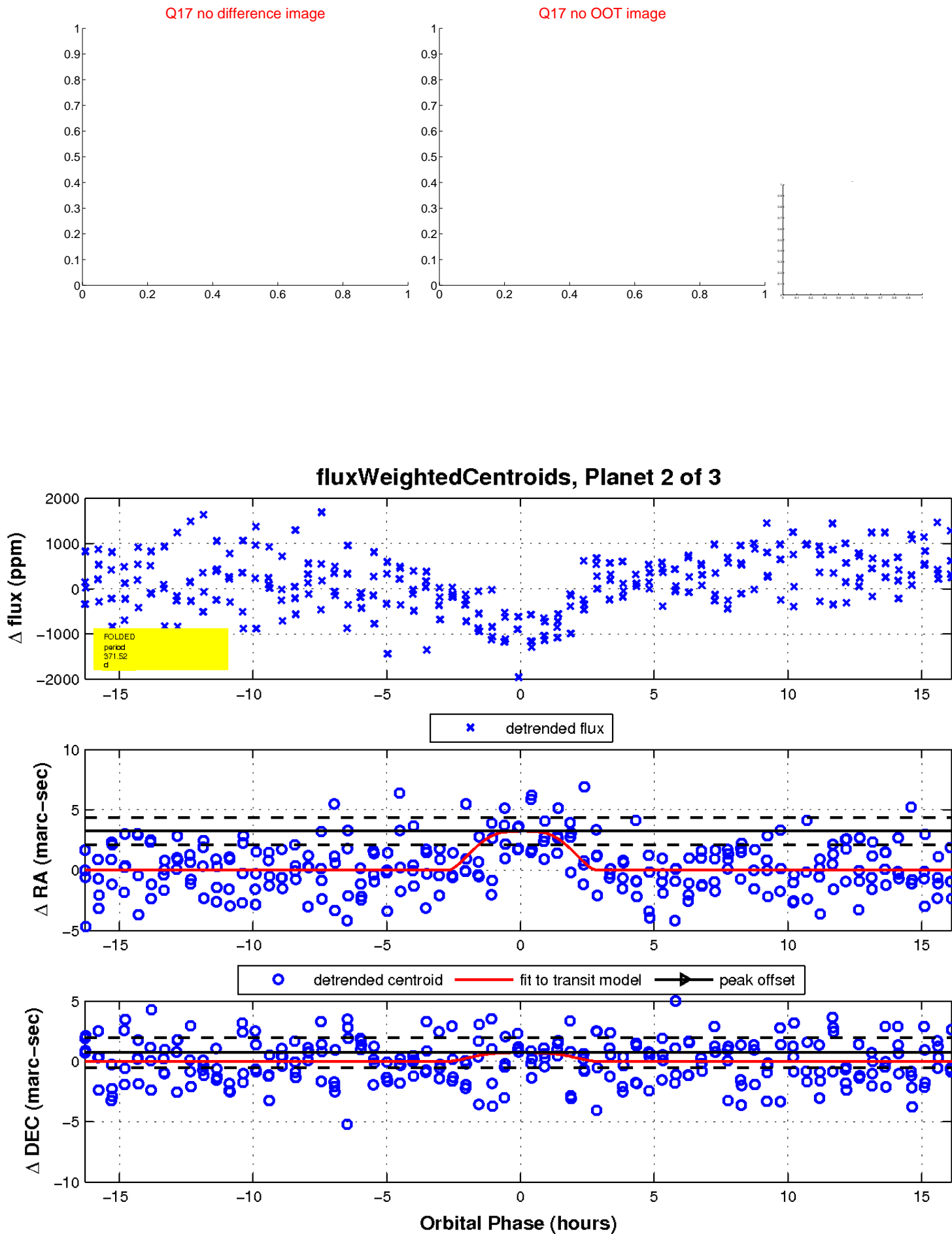
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



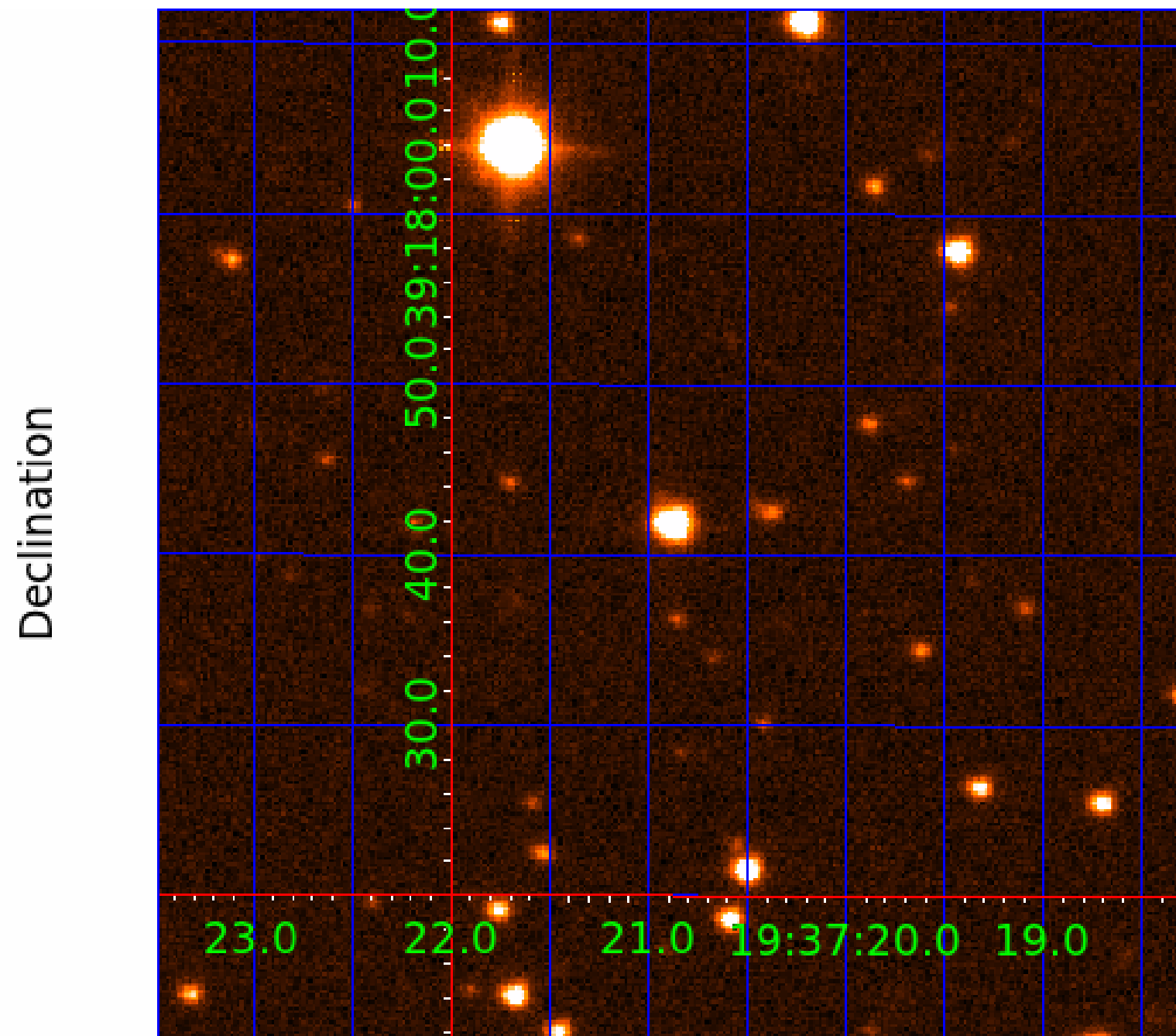
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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



UKIRT Image



# KIC 004169315

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
004169315-01	OBS	8245.01	371.515353	263.294252	914.2	4.184	9.2	9.2	1.16	6525	4.04	1.91
004169315-02	OBS	No	371.523173	294.232617	967.4	5.453	8.9	9.8	1.16	6525	4.56	1.91
004169315-03	OBS	No	371.514390	325.205495	961.1	5.587	8.6	8.9	1.16	6525	4.57	1.91

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
004169315-01	OBS	FP	0.00	0	1	1	0	MOD_SEC_ALT—HAS_SEC_TCE—PERIOD_ALIAS_ALT—CENT_UNRESOLVED_OFFSET
004169315-02	OBS	FP	0.00	1	1	1	1	IS_SEC_TCE—CENT_UNRESOLVED_OFFSET—EPHEM_MATCH
004169315-03	OBS	FP	0.00	1	0	1	0	MOD_TER_DV—MOD_NONUNIQ_ALT—SAME_NTL_PERIOD—CENT_UNRESOLVED_OFFSET

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

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

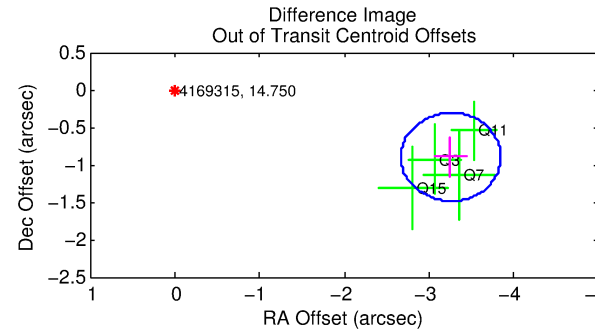
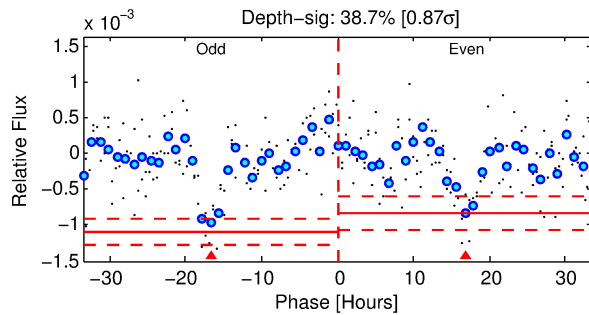
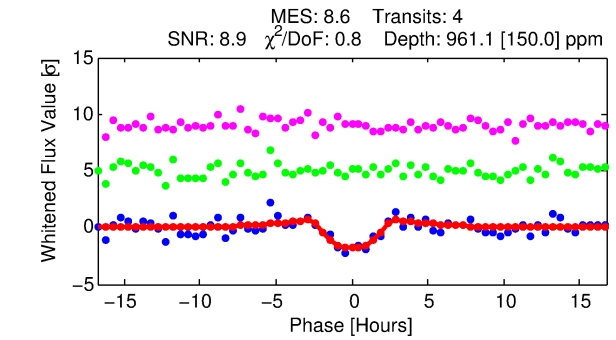
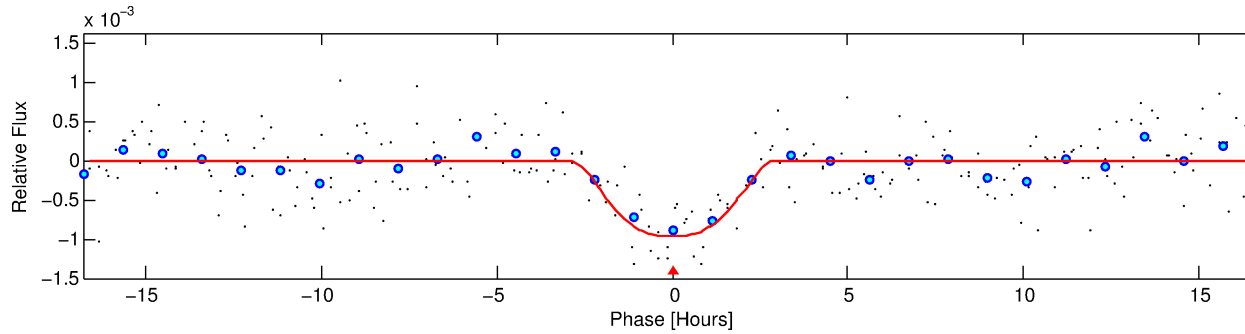
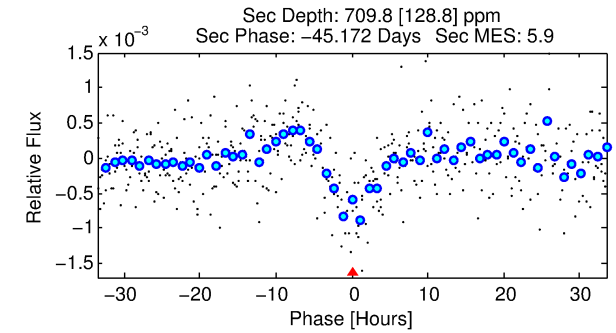
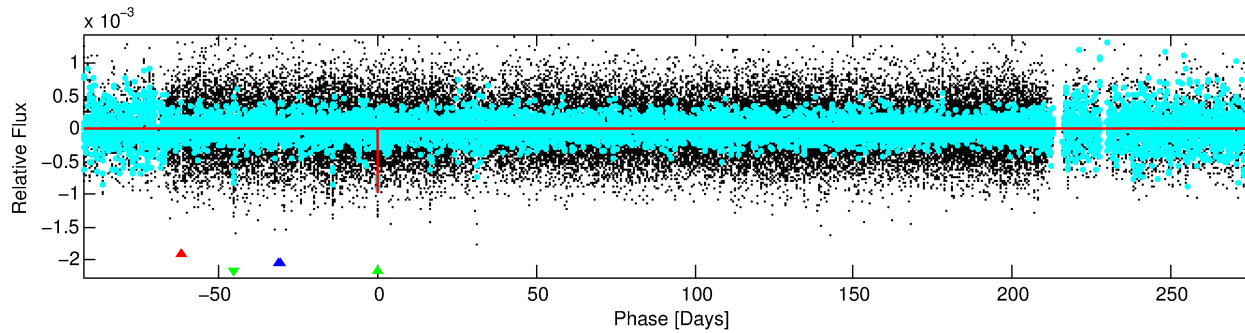
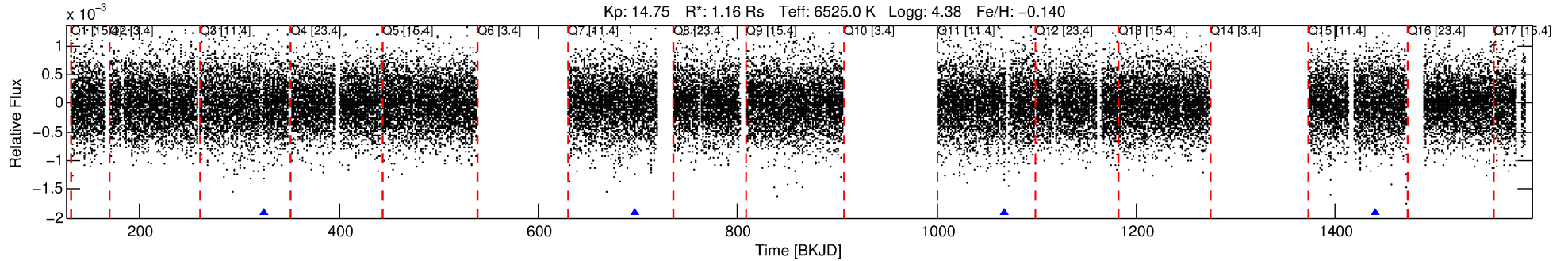
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 004169315-03

No Significant Match Found

# DV One-Page Summary

KIC: 4169315 Candidate: 3 of 3 Period: 371.514 d



## DV Fit Results:

Period = 371.51439 [0.00527] d  
Epoch = 325.2055 [0.0099] BKJD  
Rp/R\* = 0.0361 [0.0039]  
a/R\* = 195.79 [34.34]  
b = 0.96 [0.02]  
Seff = 1.91 [0.76]  
Teq = 300 [30] K  
Rp = 4.57 [1.51] Re  
a = 1.0696 [0.2769] AU  
Ag = 21353.82 [10000.15] [2.14σ]  
Teffp = 5605 [442] K [11.98σ]

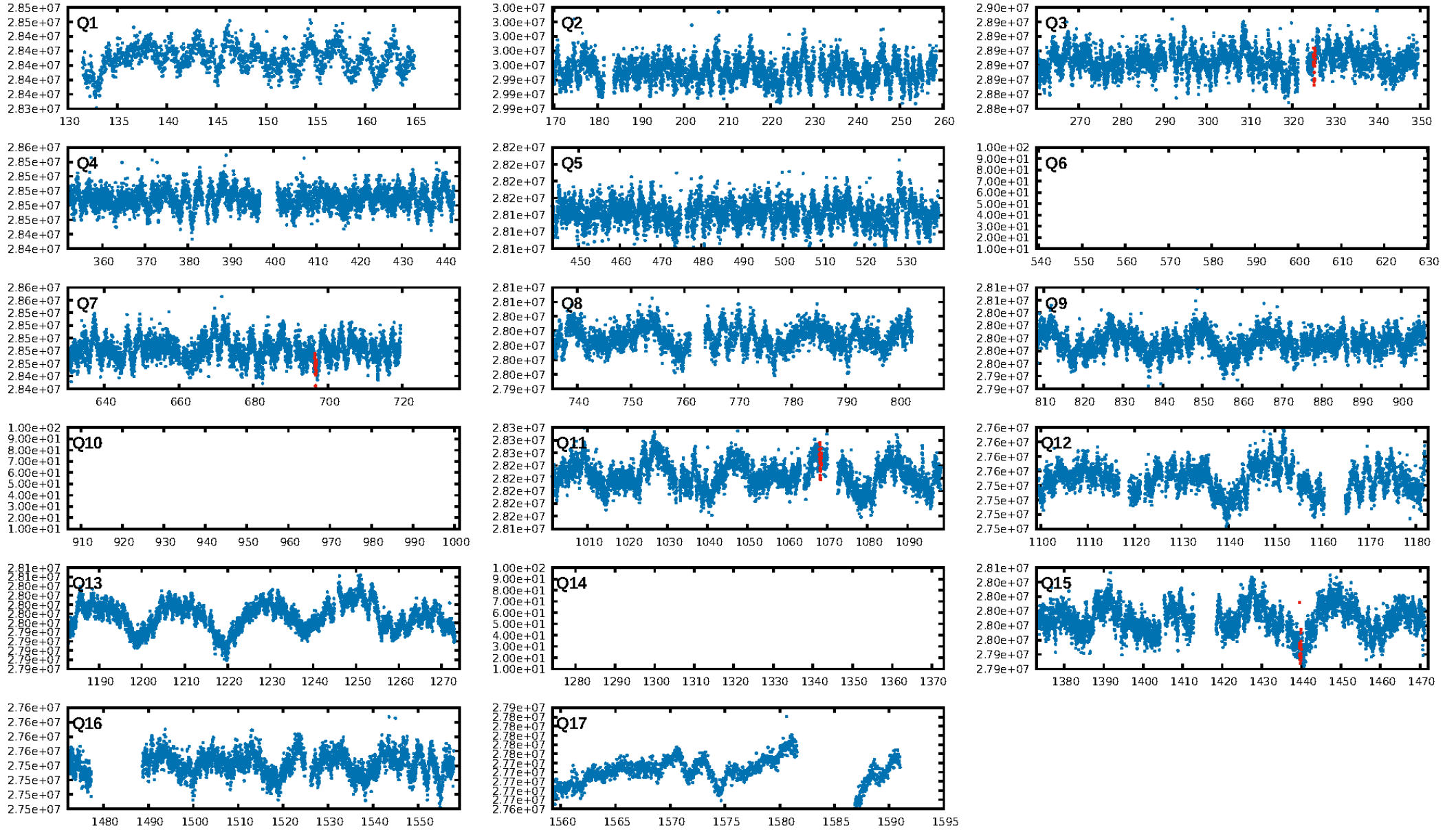
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 0.3% [0.00σ]  
ModelChiSquare2-sig: 87.3%  
ModelChiSquareGof-sig: 100.0%  
Bootstrap-pfa: 2.11e-10  
RollingBand-fgt: 1.00 [4/4]  
GhostDiagnostic-chr: 0.7648  
Centroid-sig: 0.0%  
Centroid-so: 3.387 arcsec [2.94σ]  
OotOffset-rm: 3.378 arcsec [17.21σ]  
OotOffset-st: 0/4/0/0 [4]  
KicOffset-rm: 3.438 arcsec [17.49σ]  
KicOffset-st: 0/4/0/0 [4]  
DiffImageQuality-fgm: 1.00 [4/4]  
DiffImageOverlap-fno: 1.00 [4/4]

Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 30-Jan-2016 18:42:41 Z

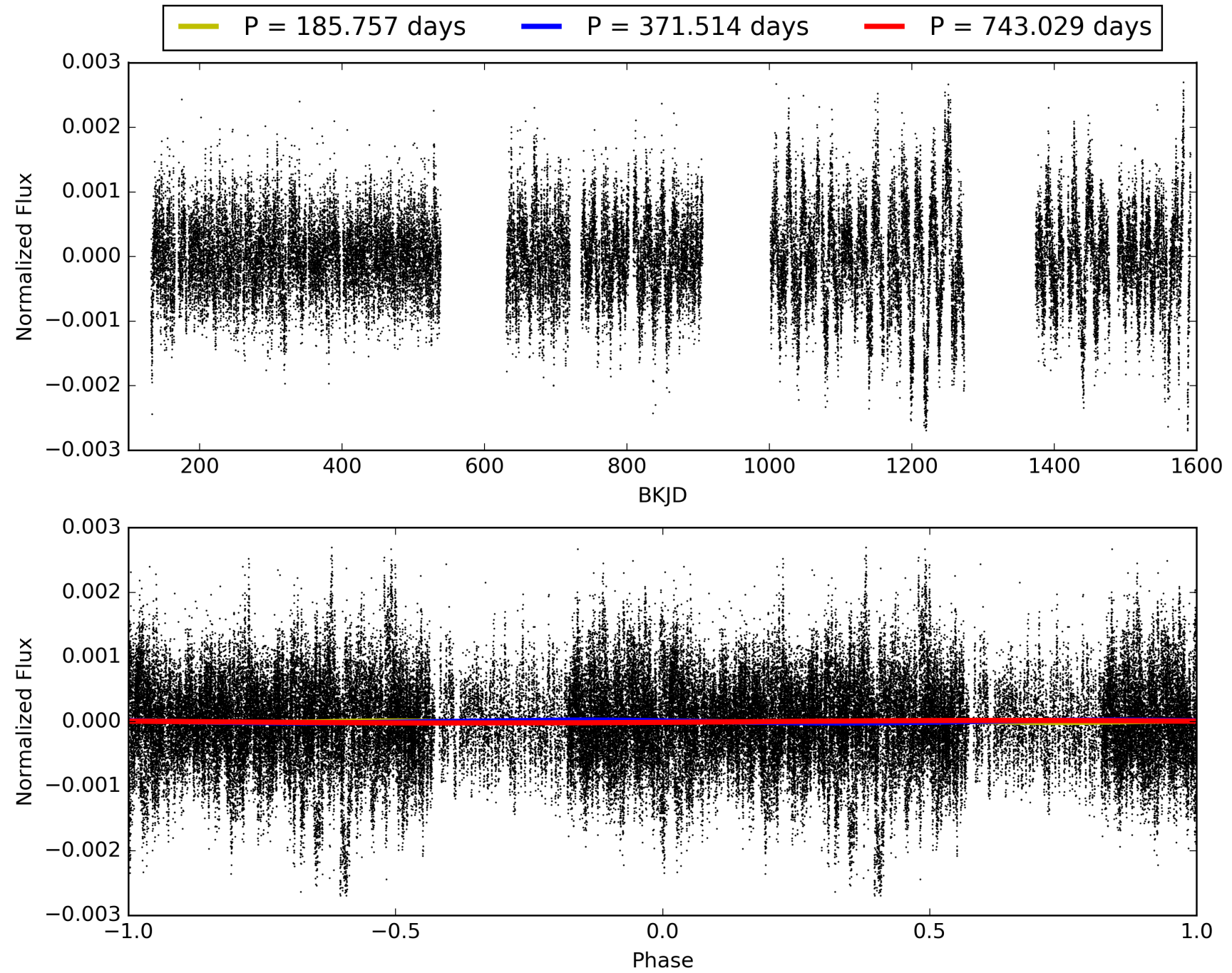
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

# TCE 004169315-03, PDC Light Curves





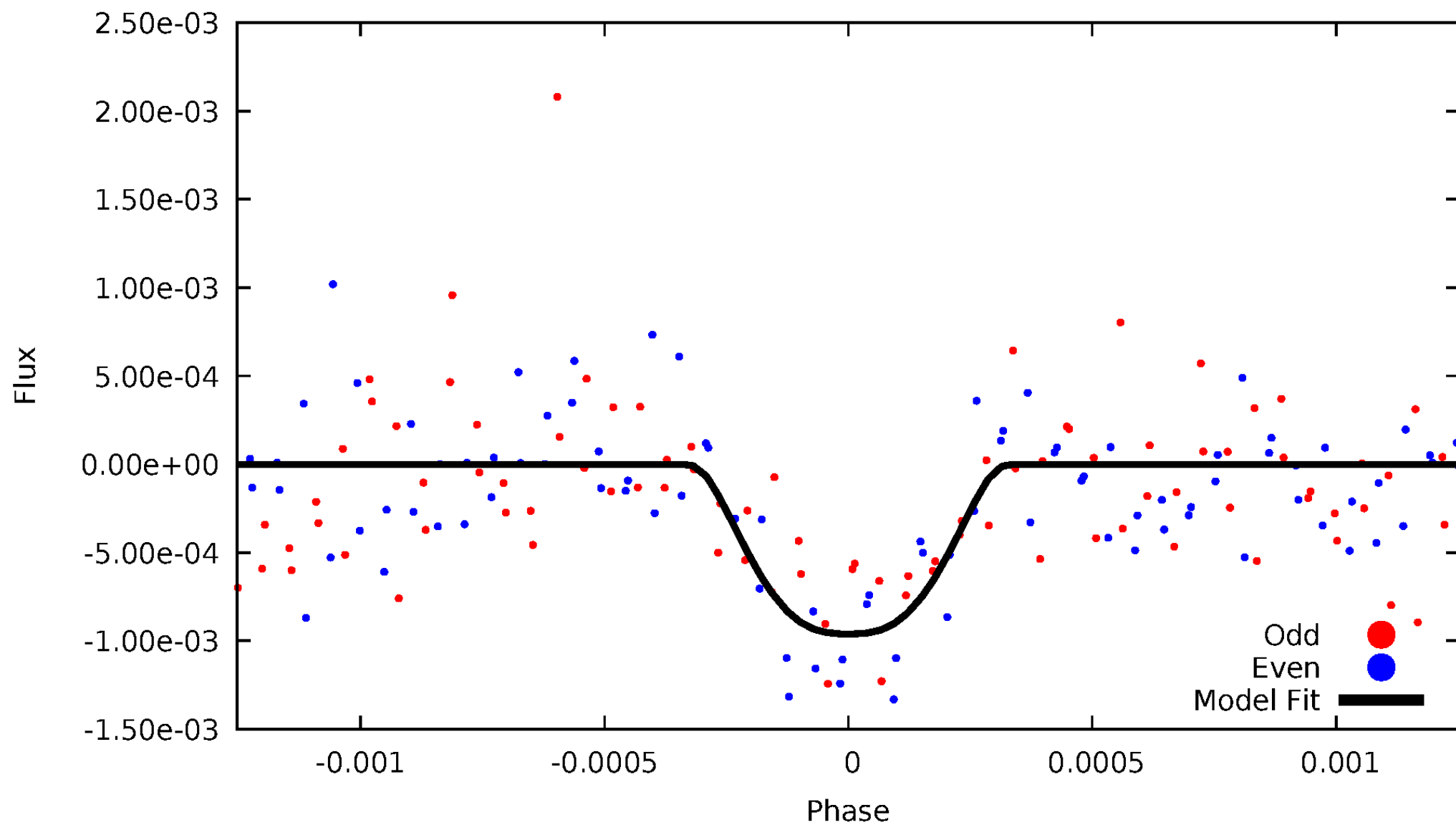
# TCE 004169315-03





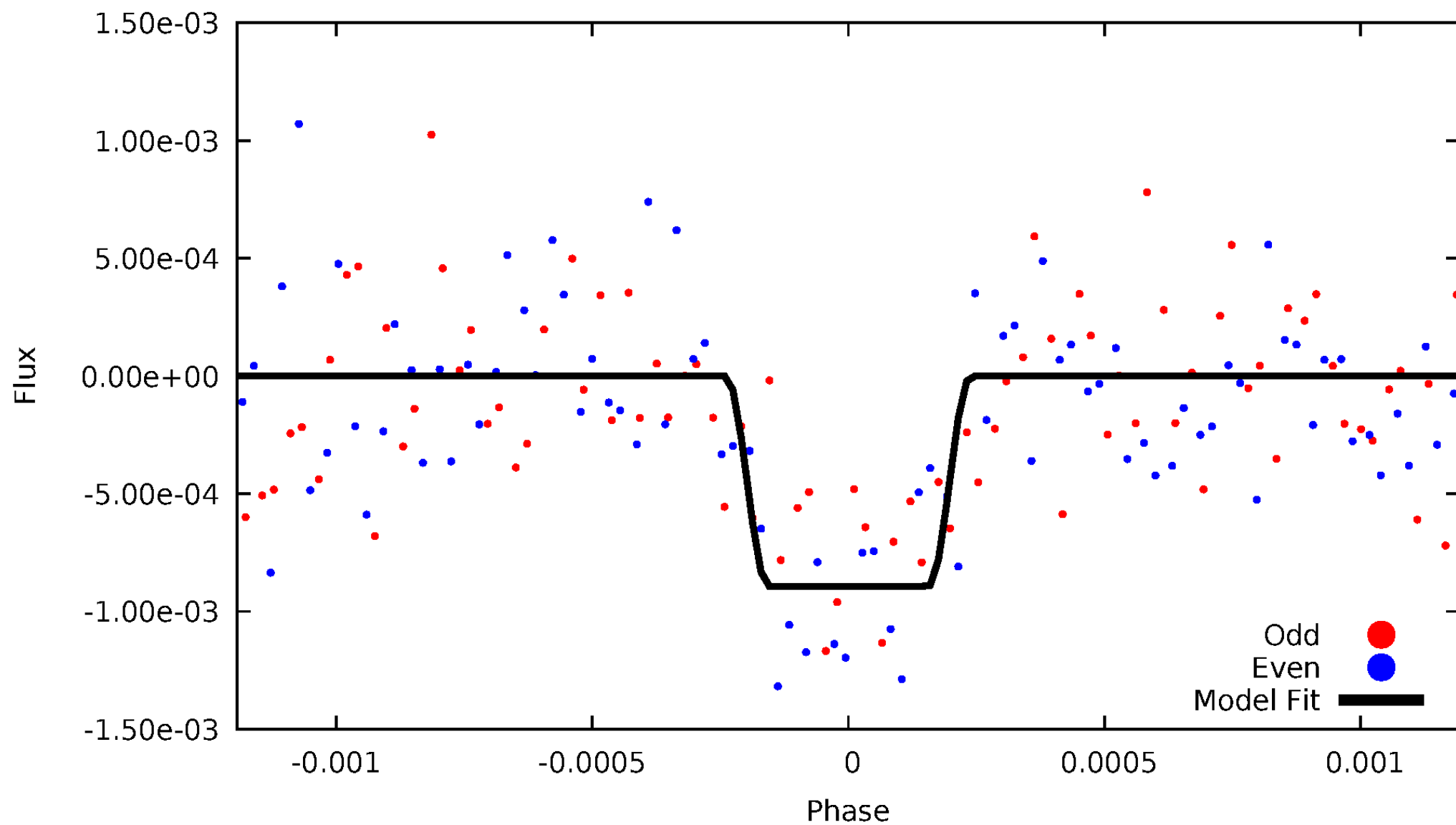
# DV Odd/Even

TCE 004169315-03



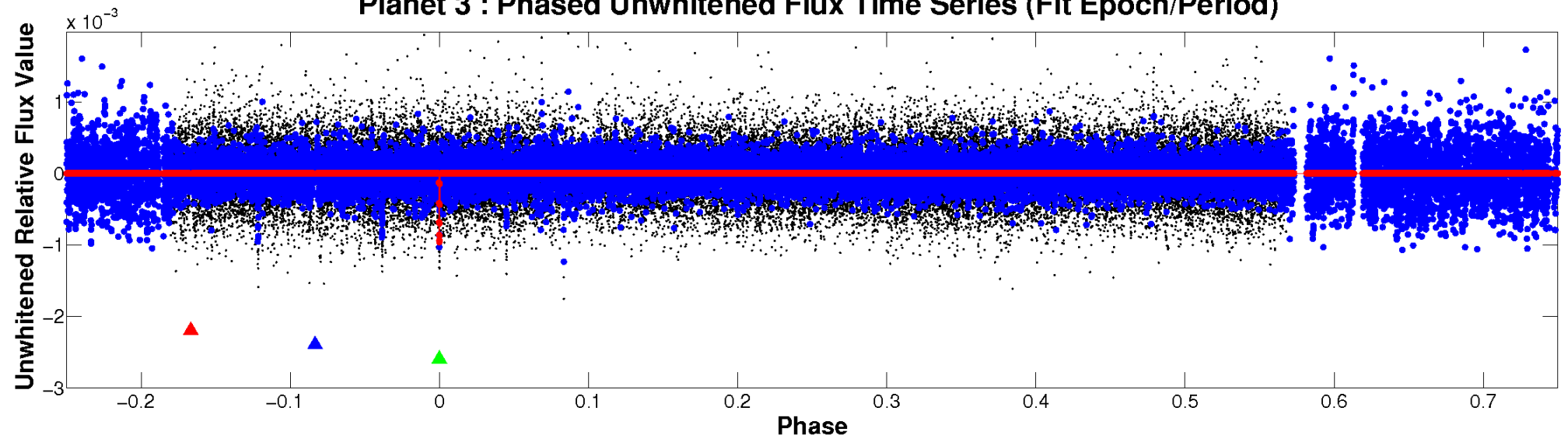
# ALT Odd/Even

TCE 004169315-03

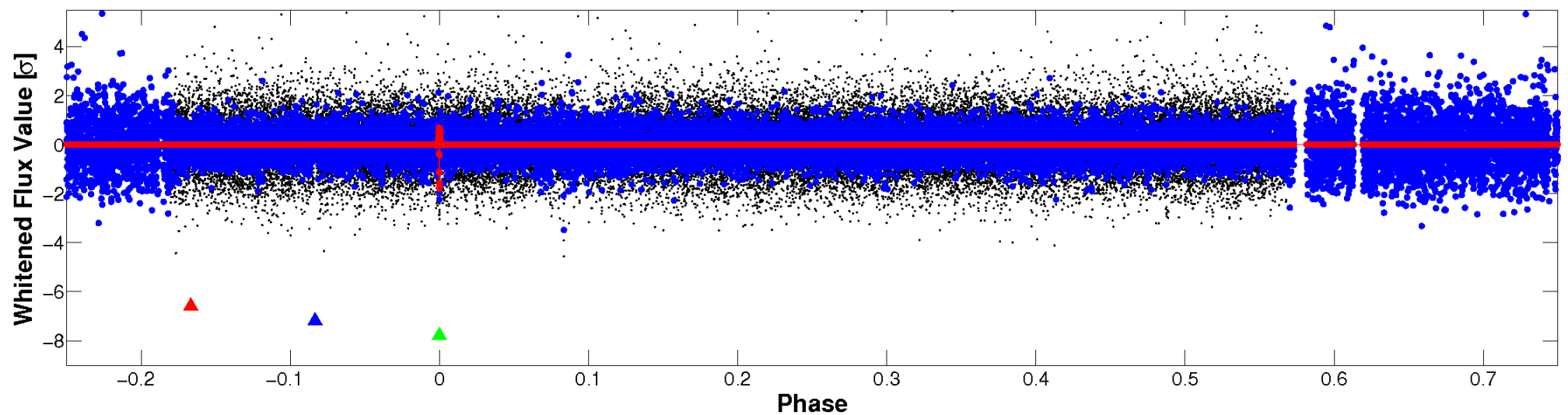


# Non-Whitened Vs. Whitened Light Curve

**Planet 3 : Phased Unwhitened Flux Time Series (Fit Epoch/Period)**

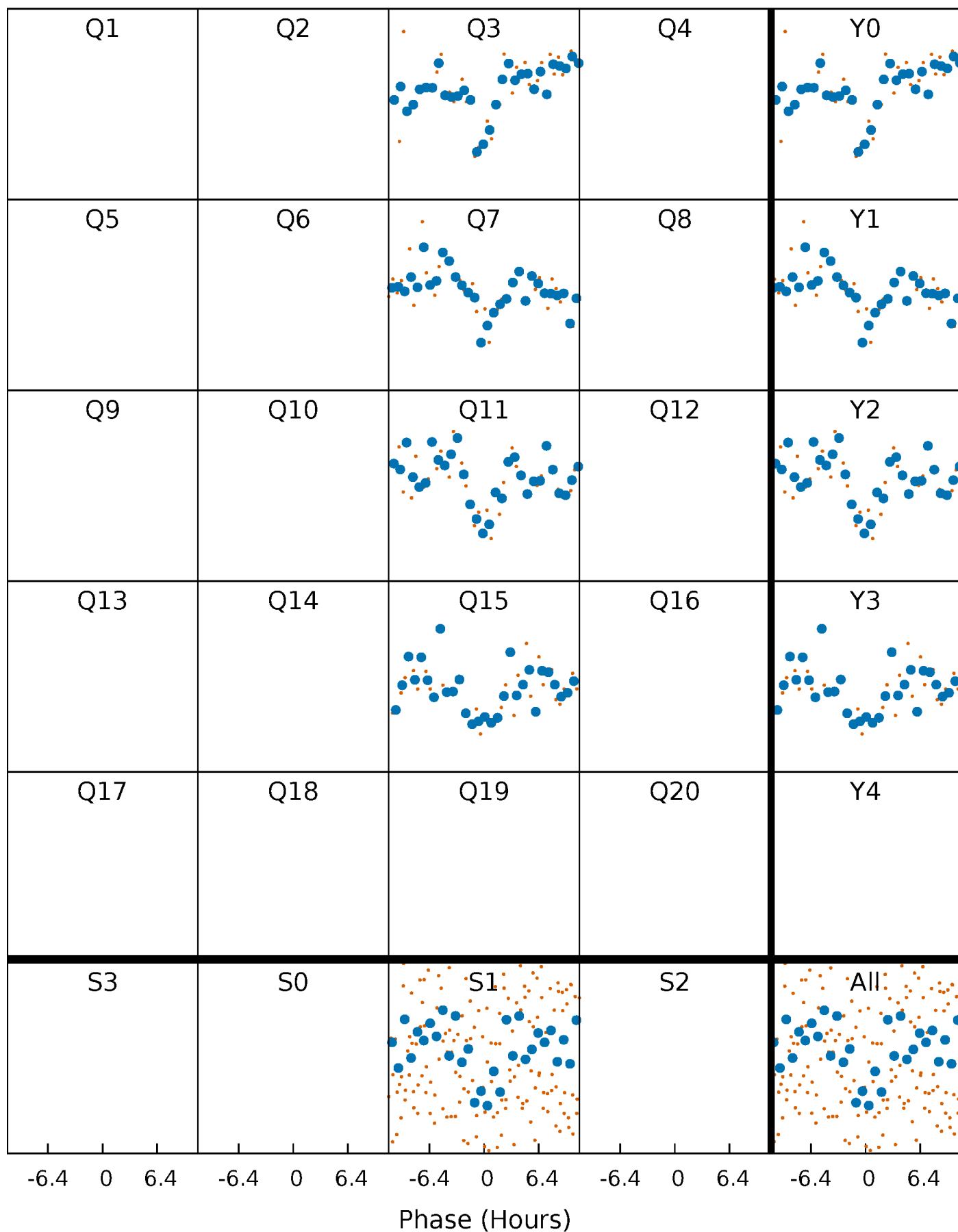


**Planet 3 : Phased Whitened Flux Time Series (Fit Epoch/Period)**



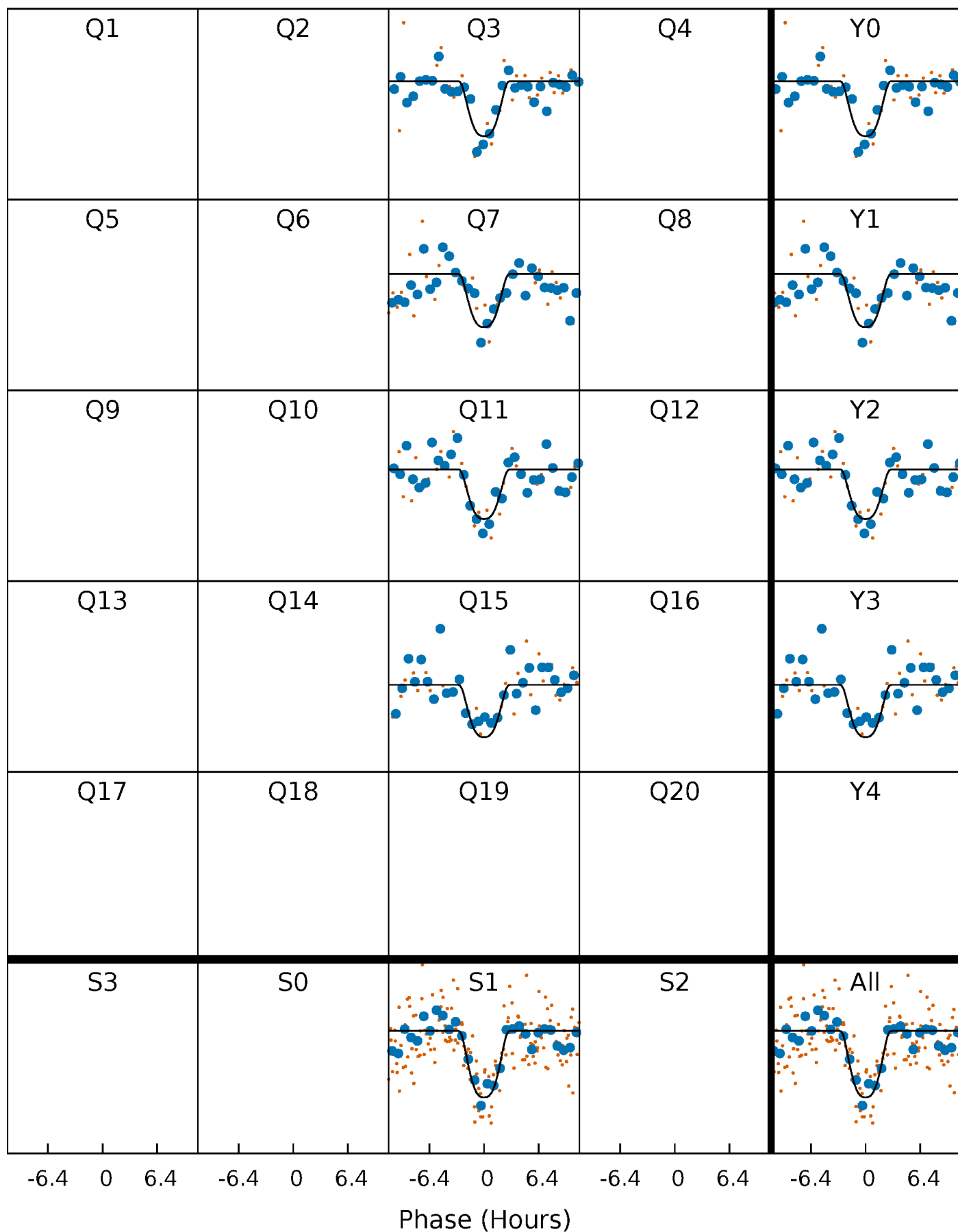
# PDC Quarter-Phased Transit Curves

TCE 004169315-03     $P=371.514390$  Days     $T_0=325.205495$  (BKJD)



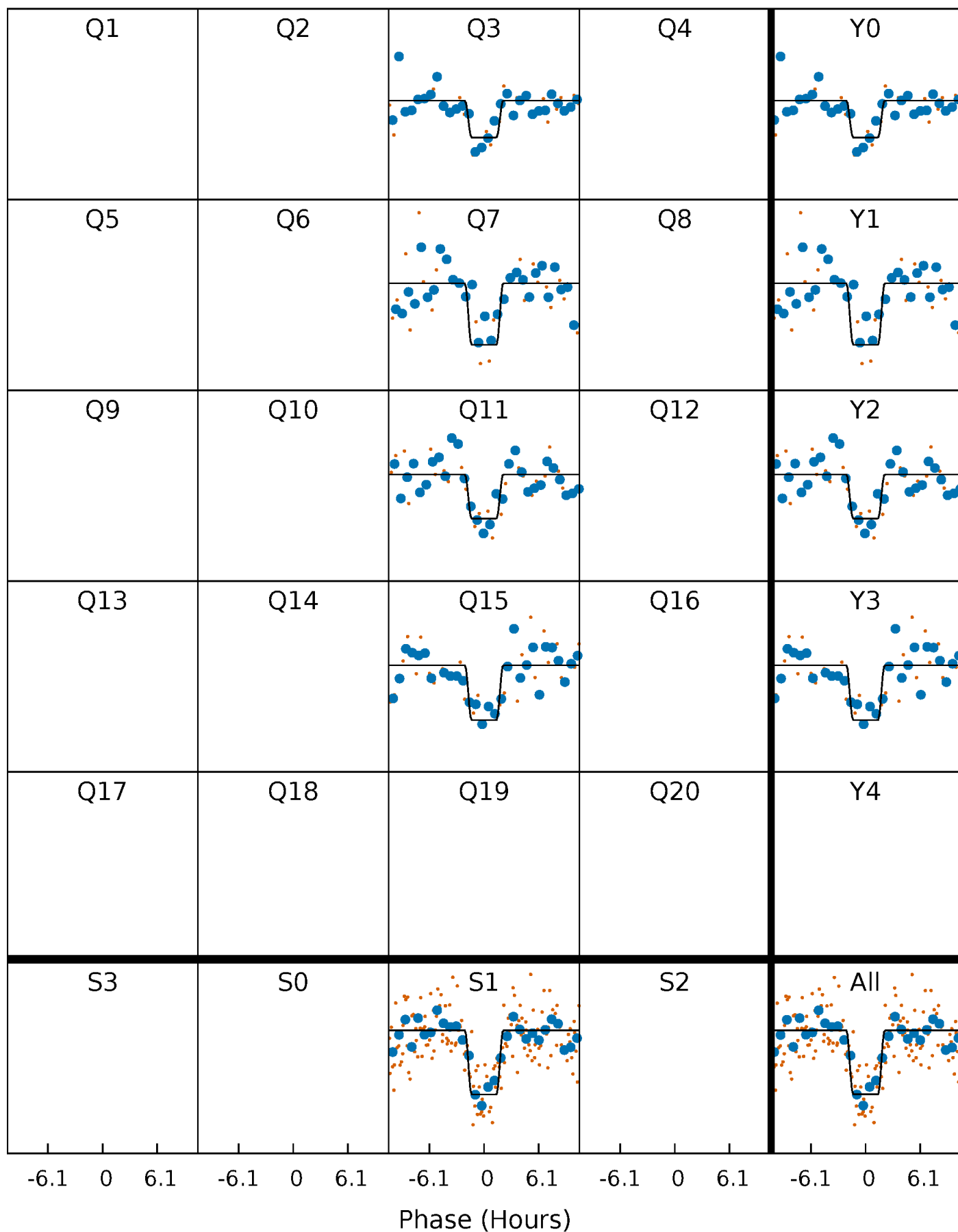
# DV Quarter-Phased Transit Curves

TCE 004169315-03   P=371.514390 Days    $T_0=325.205495$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

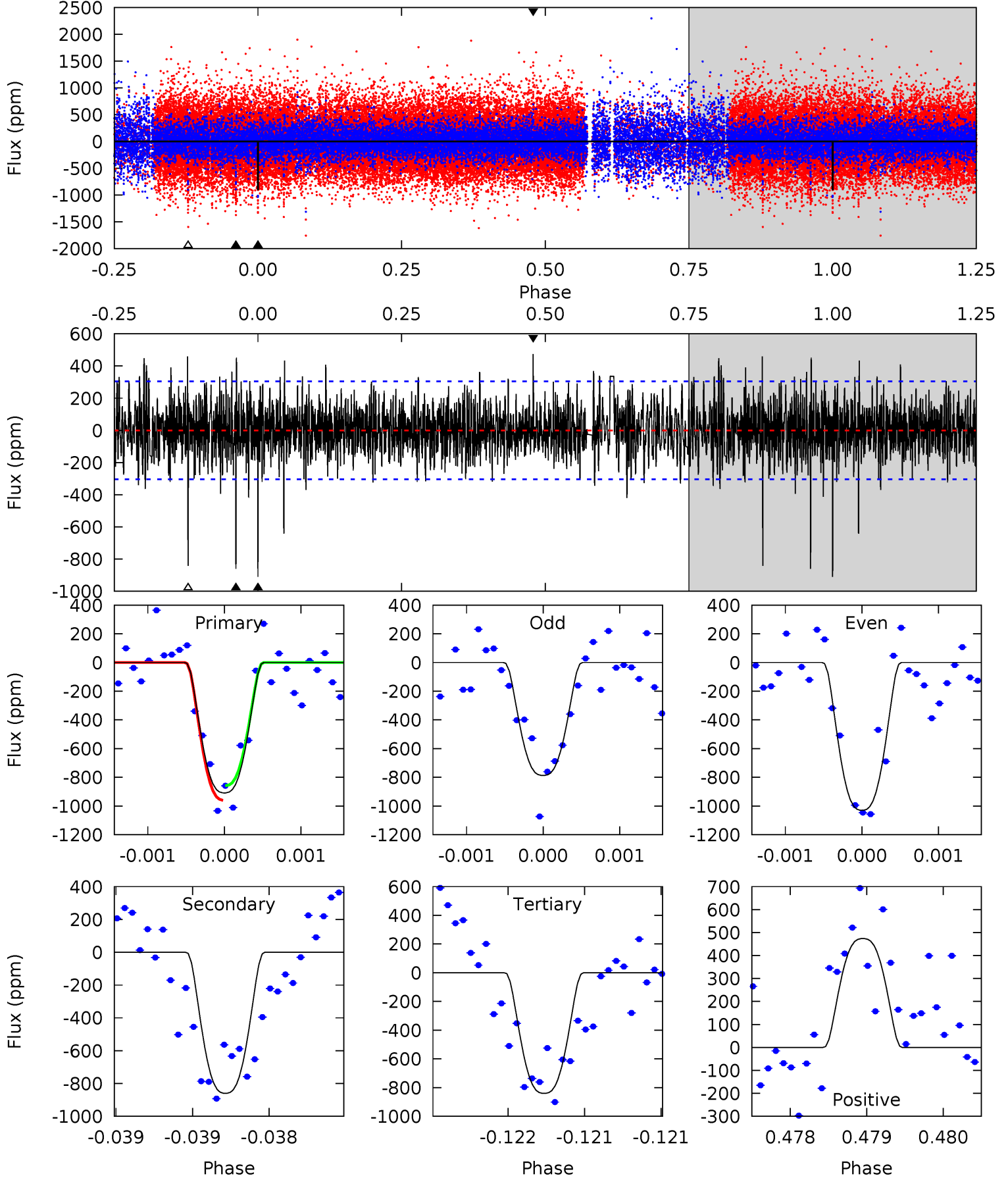
TCE 004169315-03 P=371.509366 Days  $T_0=325.211259$  (BKJD)



# DV Model-Shift Uniqueness Test

004169315-03, P = 371.514390 Days, E = 325.205495 Days

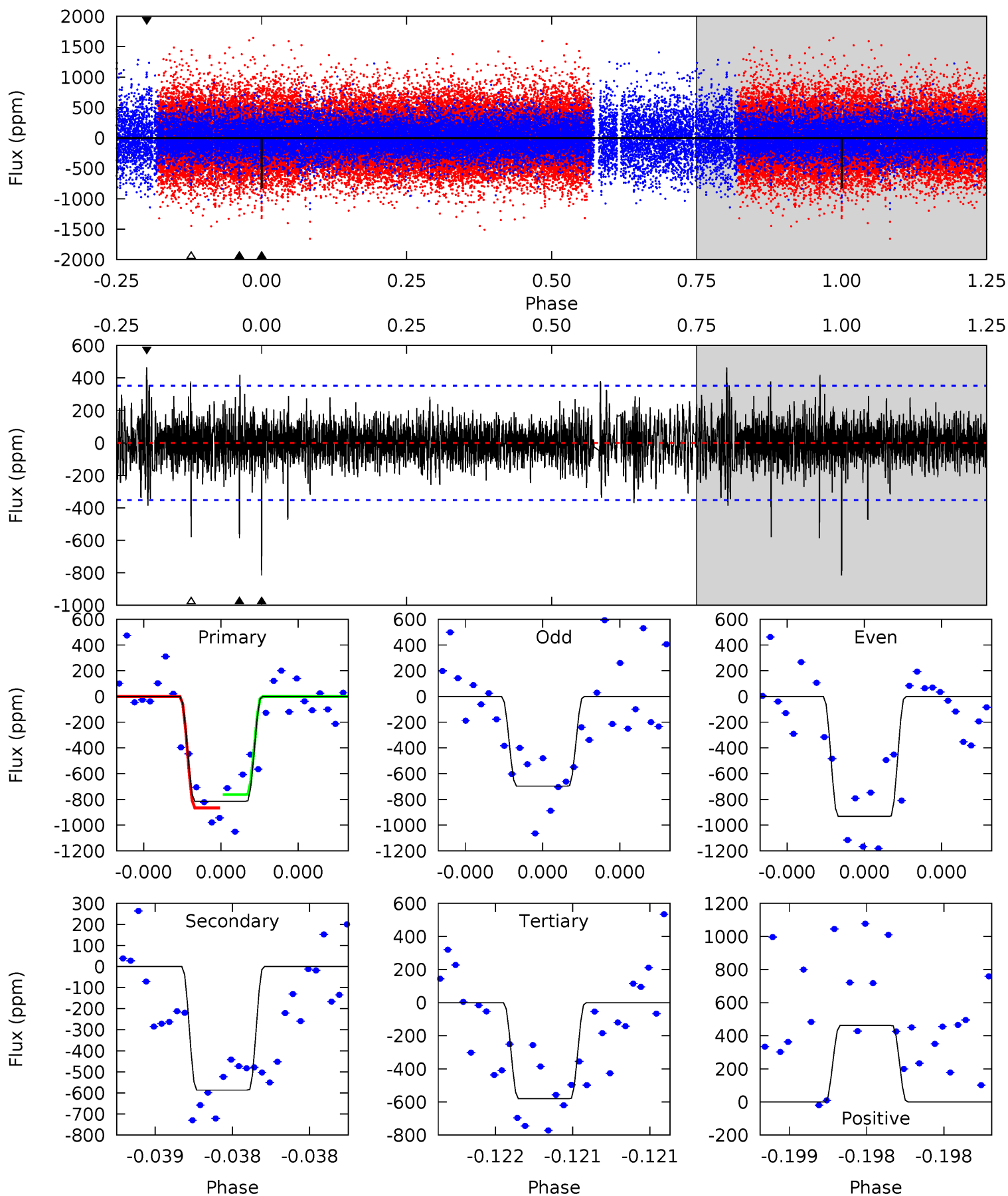
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
16.5	15.6	15.3	8.61	5.53	3.41	2.21	1.24	7.90	0.36	7.01	2.21	1.01	0.34	0.92



# Alt Model-Shift Uniqueness Test

004169315-03, P = 371.509366 Days, E = 325.211259 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
13.0	9.33	9.23	7.35	5.59	3.51	1.47	3.74	5.61	0.10	1.98	1.87	0.98	0.36	0.82





### Stellar Parameters For KIC 004169315

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$6525^{+158}_{-226}$	$4.381^{+0.067}_{-0.202}$	$-0.140^{+0.250}_{-0.300}$	$1.161^{+0.361}_{-0.155}$	$1.183^{+0.162}_{-0.162}$	$1.065^{+0.312}_{-0.550}$
	+2%/-3%	+2%/-5%	+179%/-214%	+31%/-13%	+14%/-14%	+29%/-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 004169315-03 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-860 \pm 55$	$4.78^{+0.96}_{-0.66}$	$427^{+30}_{-22}$	$5858^{+394}_{-359}$	$23317^{+7836}_{-6624}$
Alt.	$-587 \pm 63$	$3.94^{+0.81}_{-0.64}$	$428^{+30}_{-22}$	$5861^{+501}_{-408}$	$23361^{+9643}_{-7538}$

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

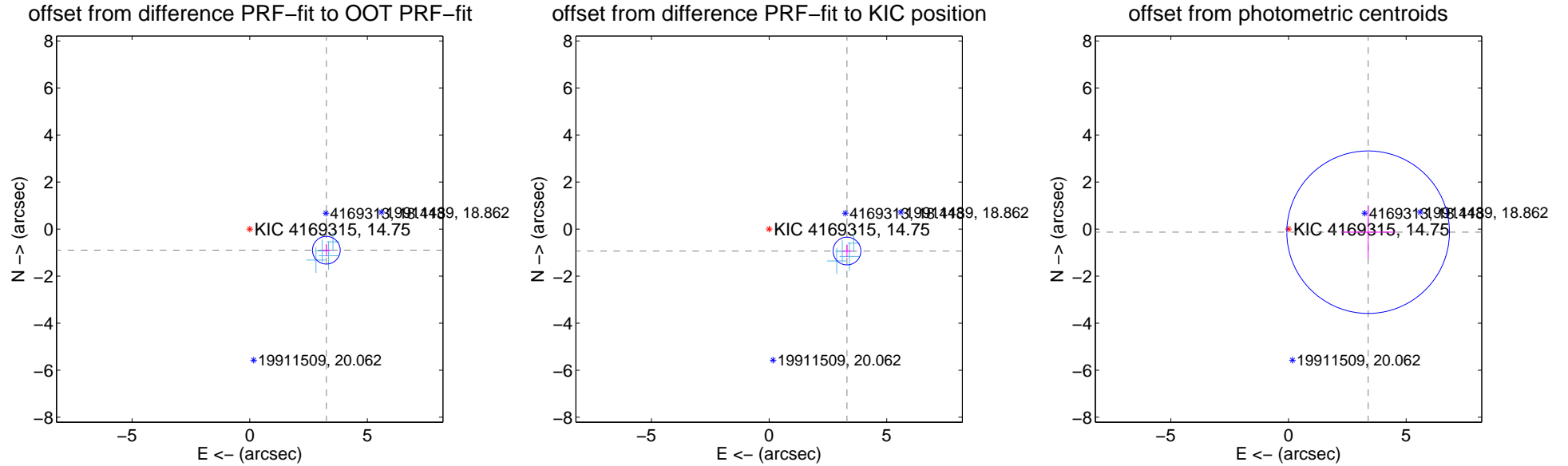
## DV Centroid Data

Supplemental centroid analysis for 004169315-03. Kepler magnitude: 14.75. Transit SNR 8.88

There are 4 quarters with good PRF difference image offsets

The direct PRF centroid is offset from the target star catalog position by about 0.07 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$3.378 \pm 0.196$	17.21	$-3.257 \pm 0.190$	$-0.897 \pm 0.263$
PRF-fit source offset from KIC position	$3.438 \pm 0.197$	17.49	$-3.309 \pm 0.190$	$-0.933 \pm 0.263$
photometric centroid source offset	$3.39 \pm 1.15$	2.94	$-3.38 \pm 1.15$	$-0.13 \pm 1.12$



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.

Q1 no difference image



Q1 no OOT image



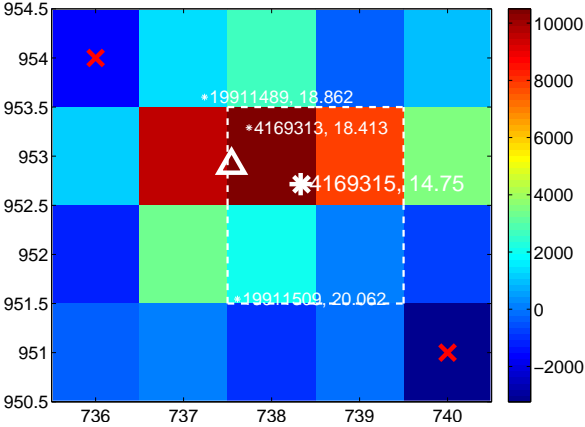
Q2 no difference image



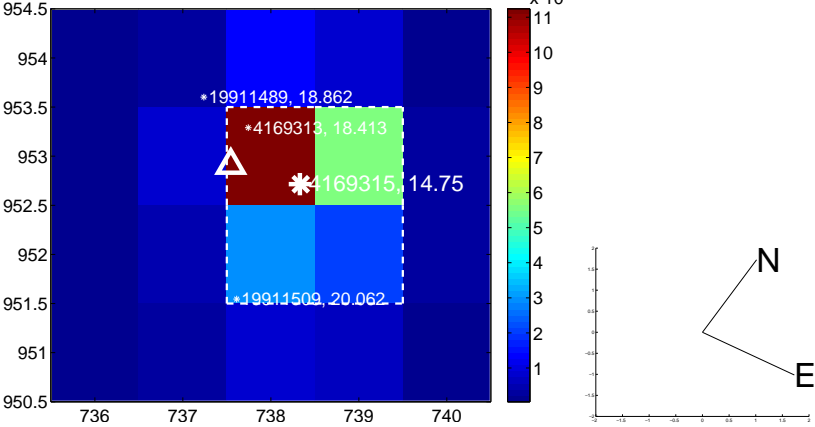
Q2 no OOT image



Q3 difference image



Q3 OOT image



Q4 no difference image



Q4 no OOT image



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

Q5 no difference image



Q5 no OOT image



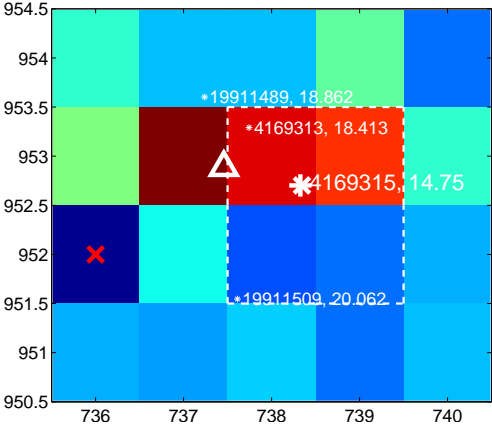
Q6 no difference image



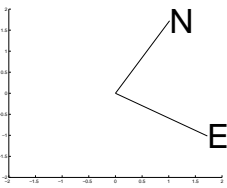
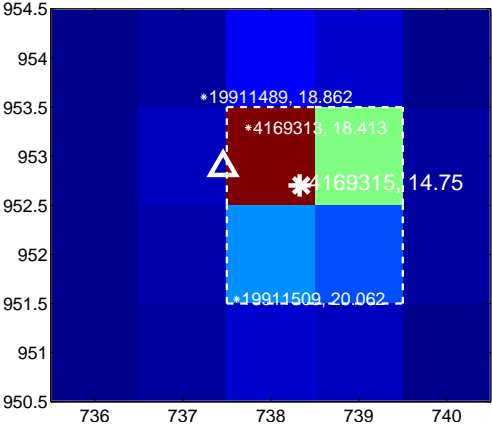
Q6 no OOT image



Q7 difference image



Q7 OOT image



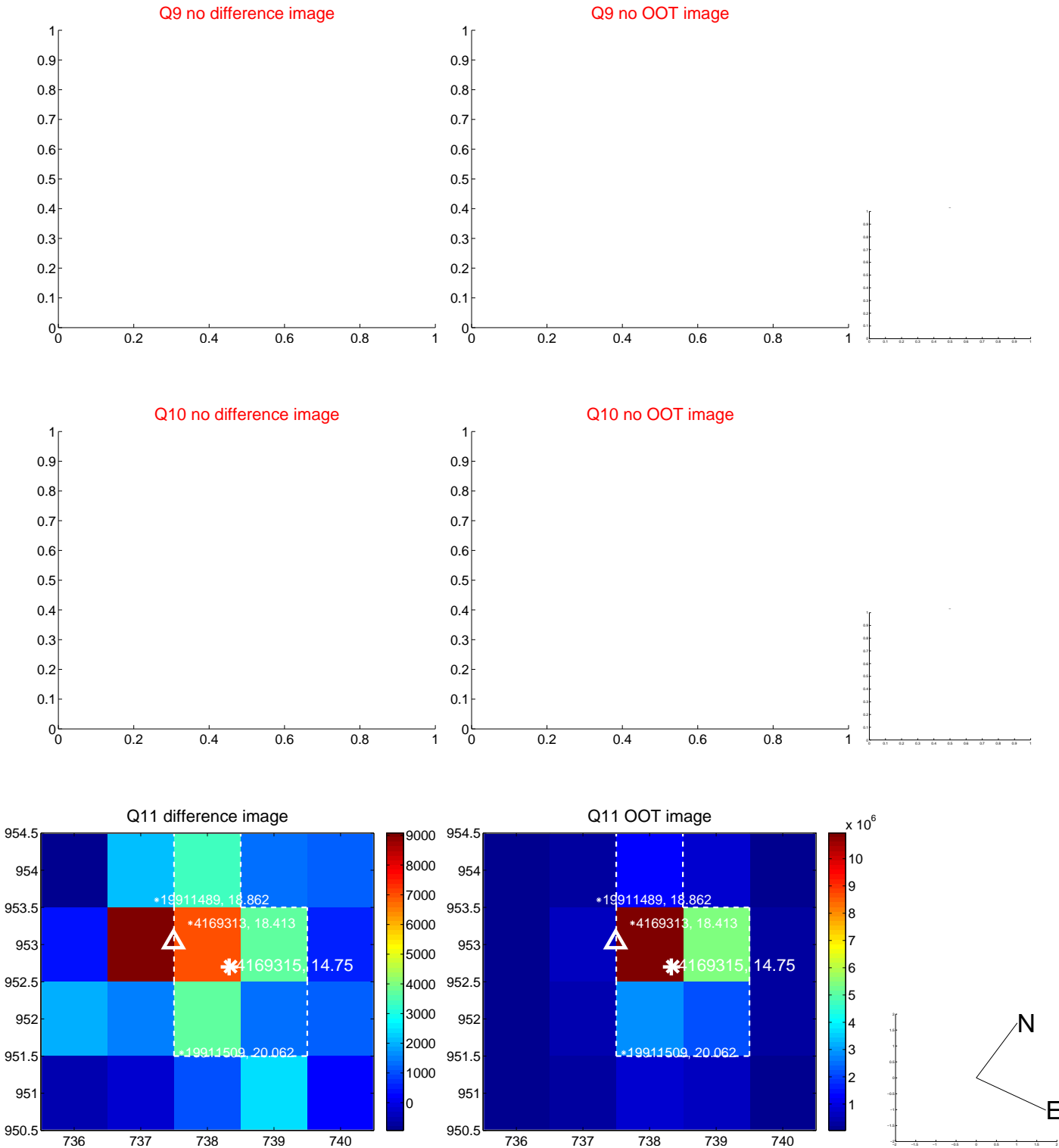
Q8 no difference image



Q8 no OOT image



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.

Q13 no difference image



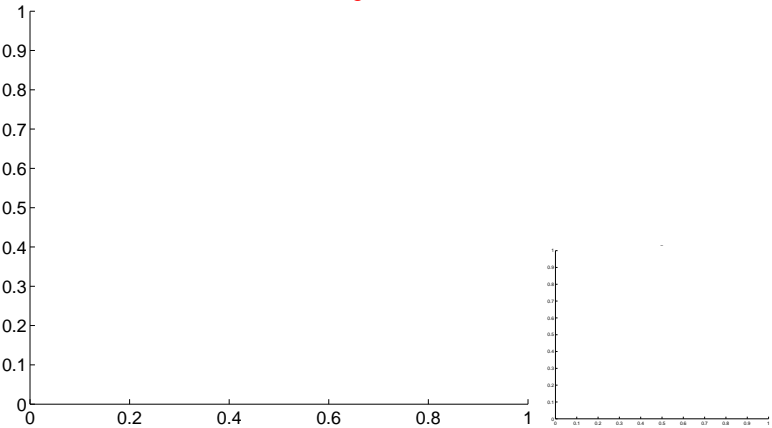
Q13 no OOT image



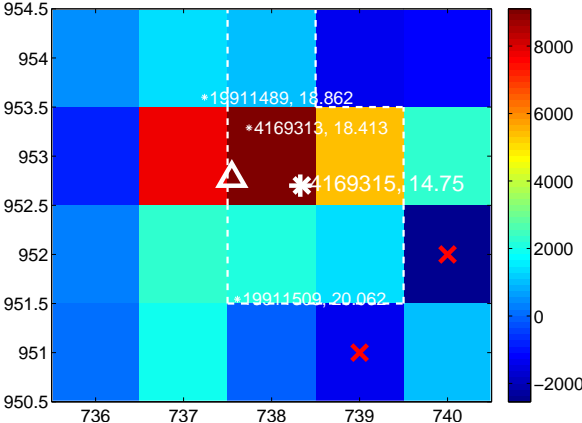
Q14 no difference image



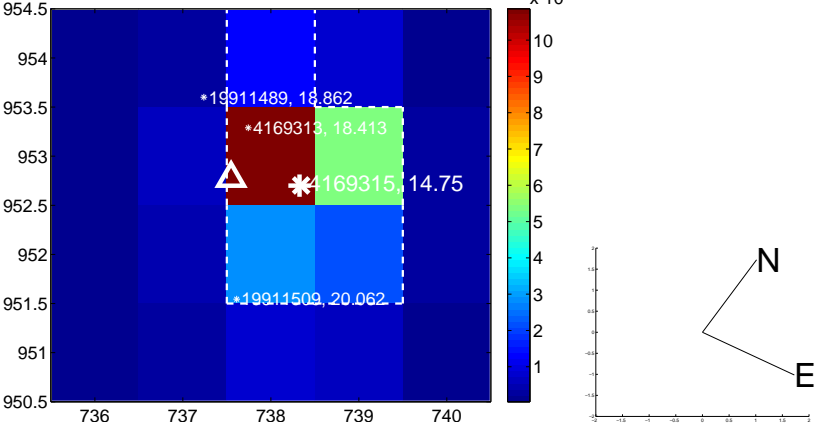
Q14 no OOT image



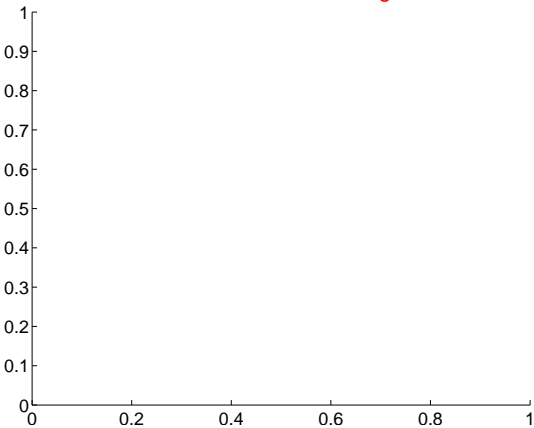
Q15 difference image



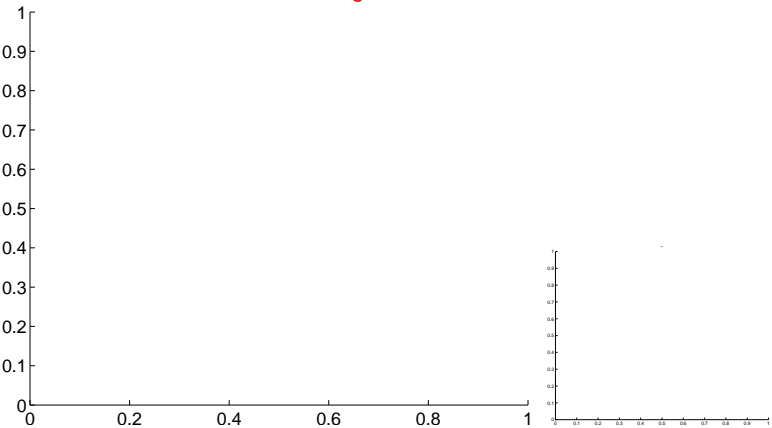
Q15 OOT image



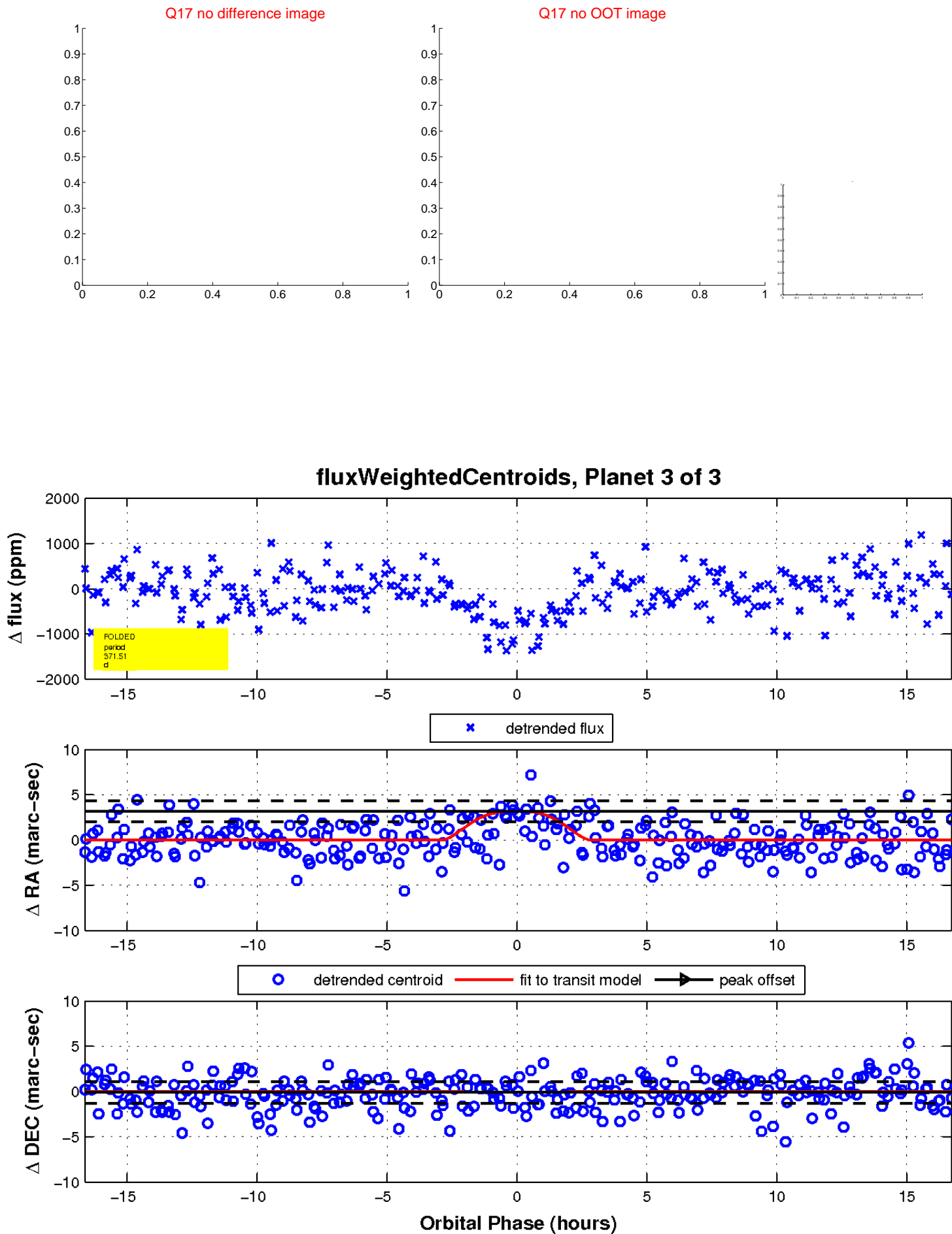
Q16 no difference image



Q16 no OOT image



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



UKIRT Image

