

# KIC 011516930

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
011516930-01	OBS	6240.01	4.768569	133.859655	320.6	1.171	15.9	21.0	0.89	5491	1.88	246.75
011516930-02	OBS	No	334.334773	389.094048	1055.6	9.177	15.4	6.5	0.89	5491	3.04	0.85
011516930-03	OBS	No	415.235829	202.527424	357.8	1.067	11.7	2.2	0.89	5491	1.76	0.64
011516930-05	OBS	No	335.431615	311.793866	825.8	2.872	10.8	6.7	0.89	5491	2.79	0.85

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
011516930-01	OBS	FP	0.00	0	1	1	0	MOD_SEC_DV—MOD_SEC_ALT—CENT_UNRESOLVED_OFFSET—HALO_GHOST
011516930-02	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—CENT_FEW_DIFFS
011516930-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_MARSHALL_TRACKER—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—CENT_FEW_DIFFS
011516930-05	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—ALL_TRANS_CHASES—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—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.

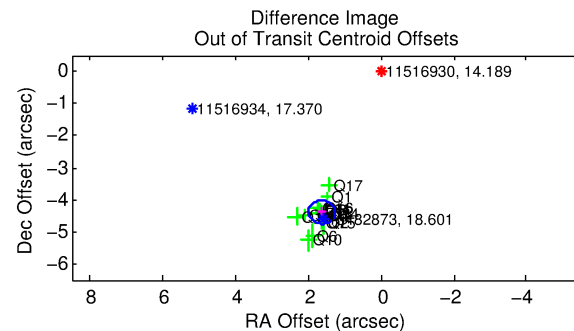
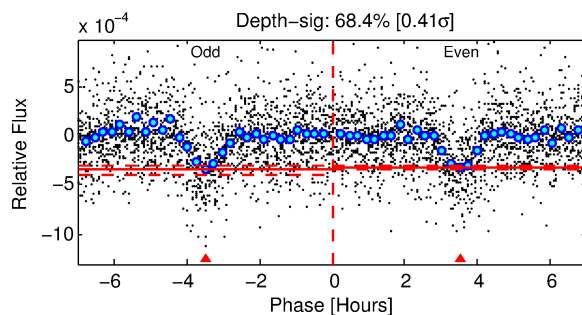
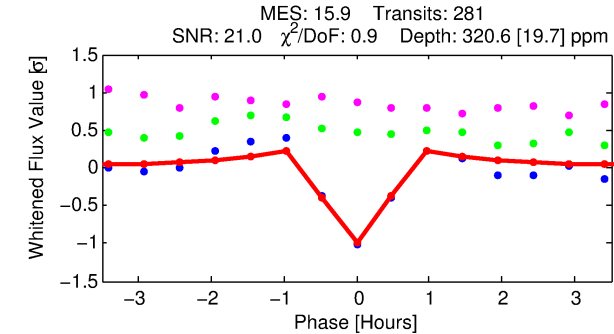
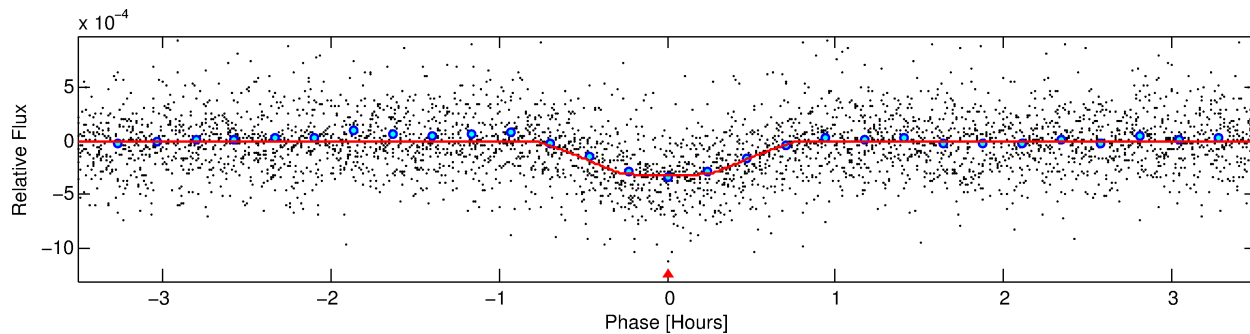
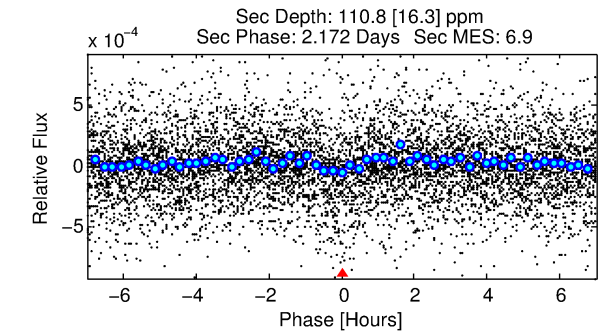
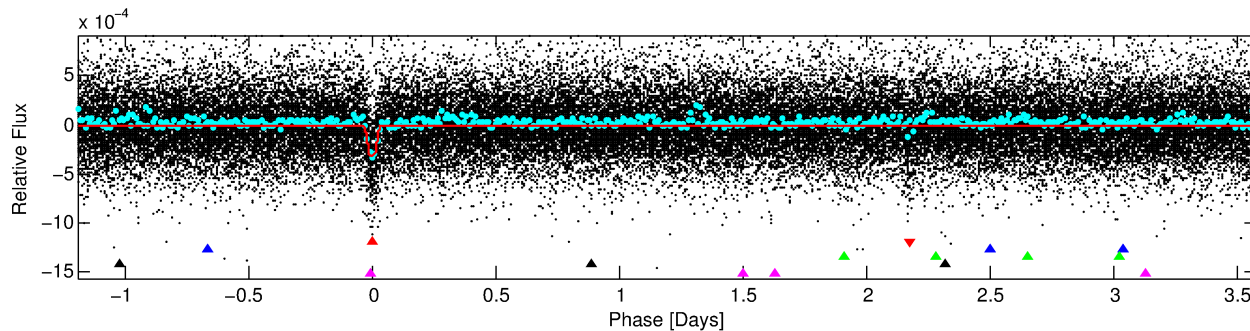
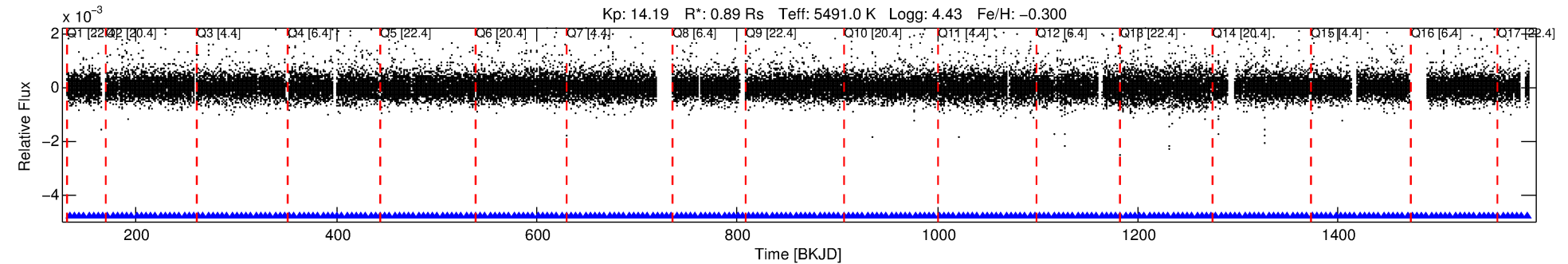
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 011516930-01

No Significant Match Found

# DV One-Page Summary

KIC: 11516930 Candidate: 1 of 5 Period: 4.769 d  
KOI: K06240.01 Corr: 0.940



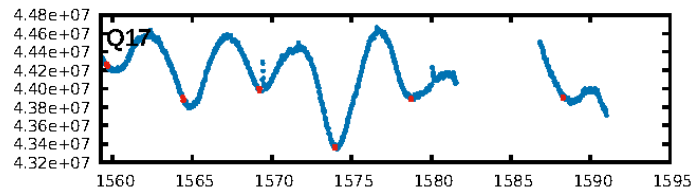
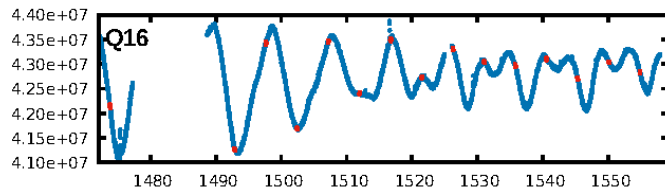
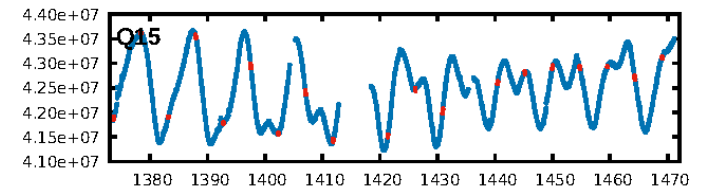
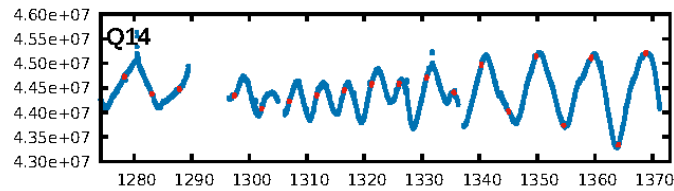
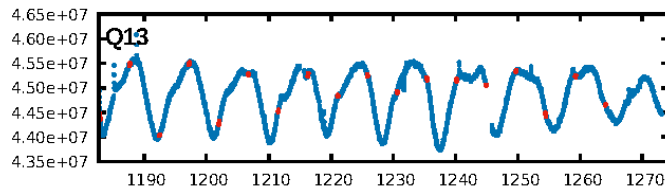
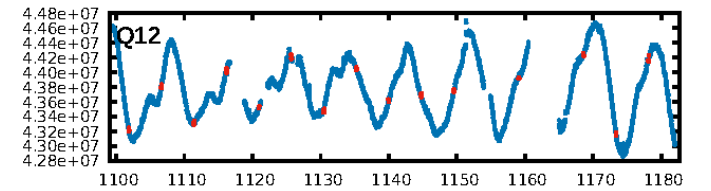
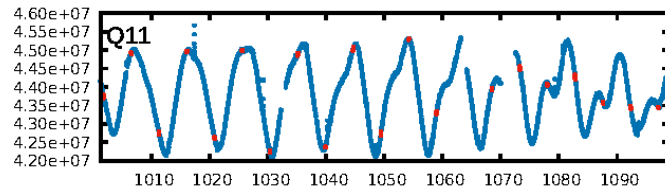
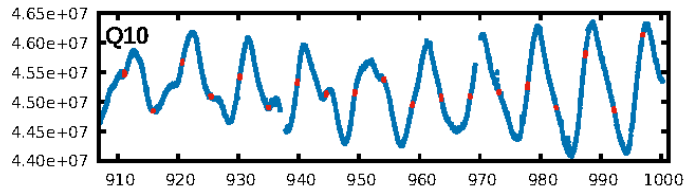
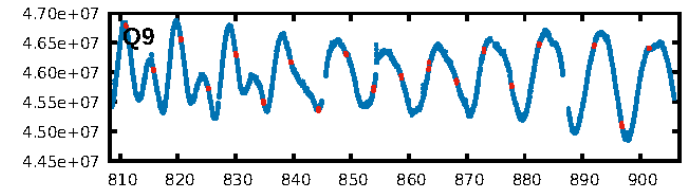
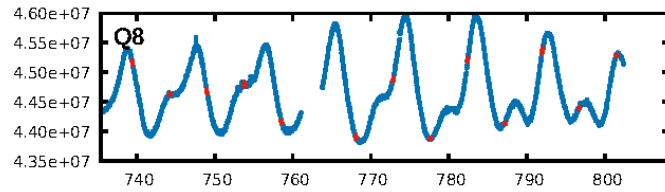
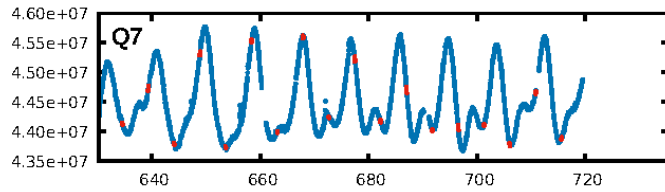
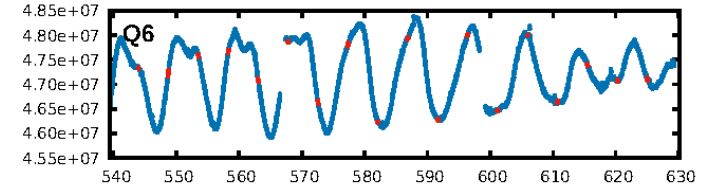
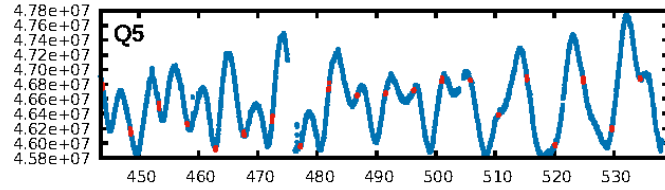
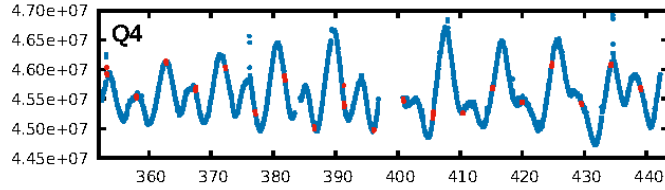
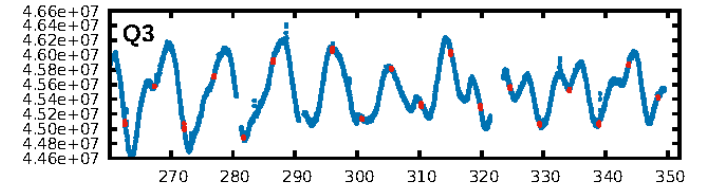
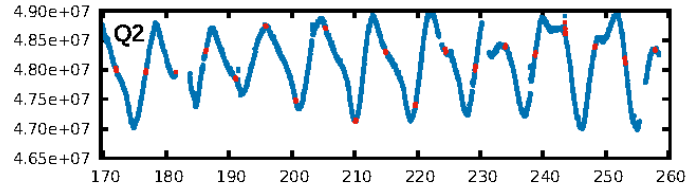
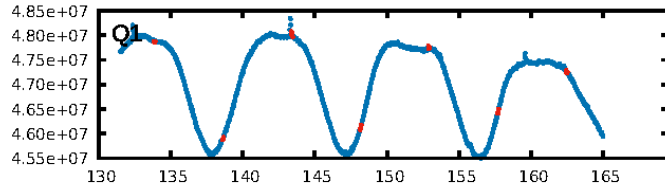
## DV Fit Results:

Period = 4.76857 [0.00001] d  
Epoch = 133.8597 [0.0011] BKJD  
Rp/R\* = 0.0194 [0.0065]  
a/R\* = 15.93 [23.73]  
b = 0.88 [0.39]  
Seff = 246.75 [99.19]  
Teq = 1011 [102] K  
Rp = 1.88 [0.80] Re  
a = 0.0510 [0.0125] AU  
Ag = 44.91 [35.40] [1.24 $\sigma$ ]  
Teffp = 4045 [707] K [4.25 $\sigma$ ]

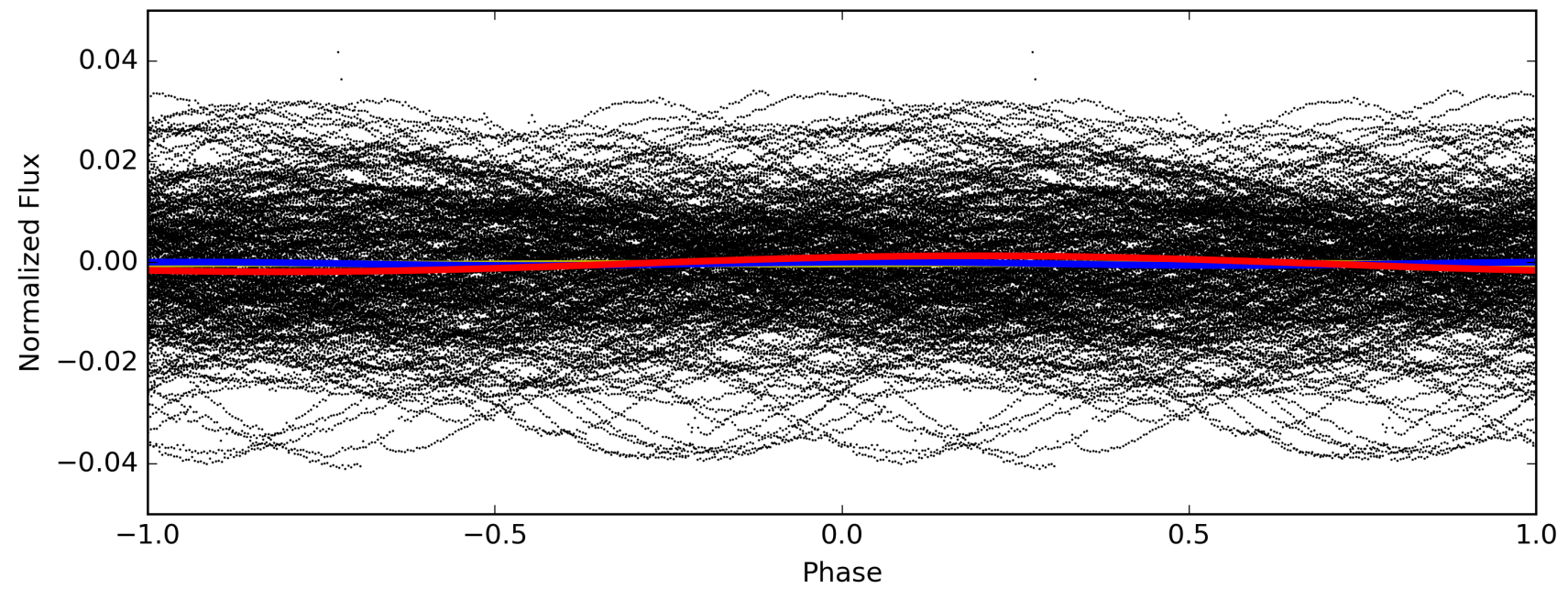
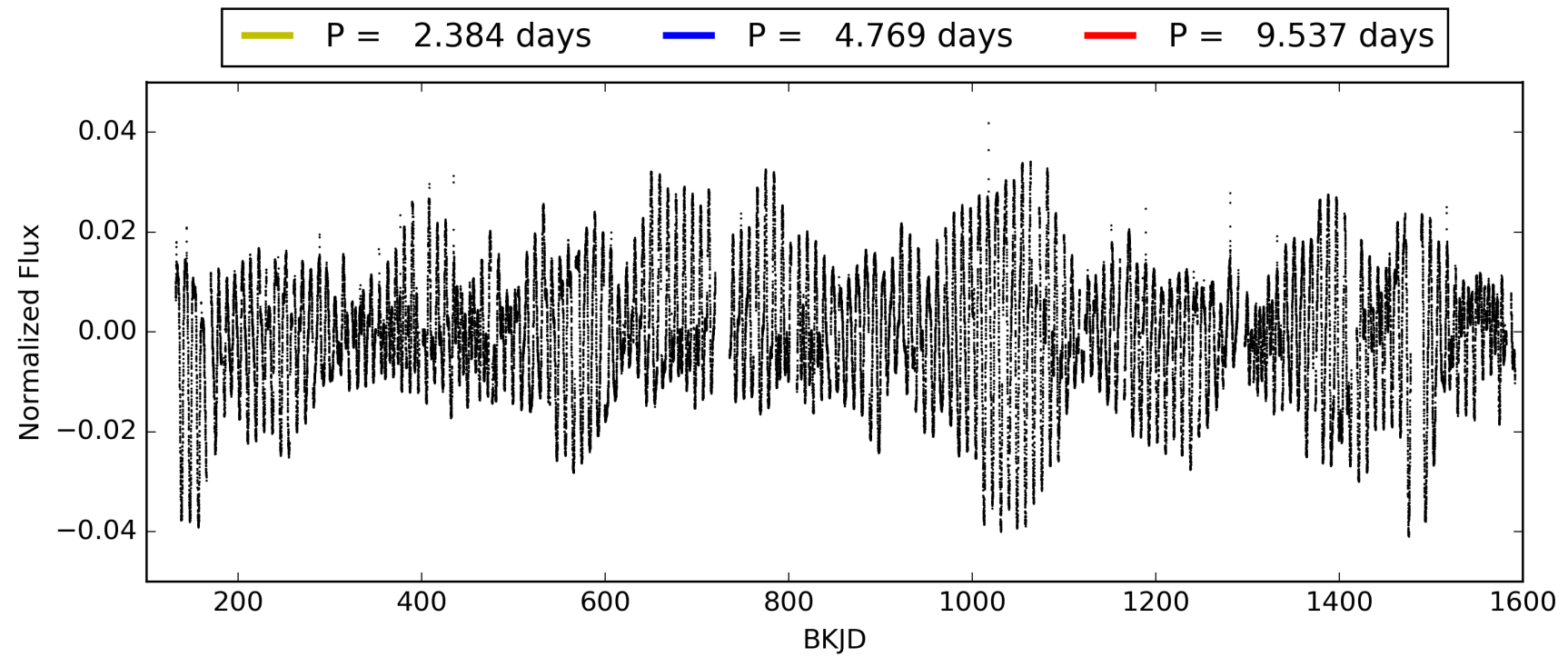
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 100.0% [854.97 $\sigma$ ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: 4.64e-41  
RollingBand-fgt: 1.00 [268/268]  
GhostDiagnostic-chr: 0.1971  
Centroid-sig: 0.0%  
Centroid-so: 7.441 arcsec [13.94 $\sigma$ ]  
OotOffset-rm: 4.686 arcsec [38.58 $\sigma$ ]  
KicOffset-rm: 4.780 arcsec [44.33 $\sigma$ ]  
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 011516930-01, PDC Light Curves



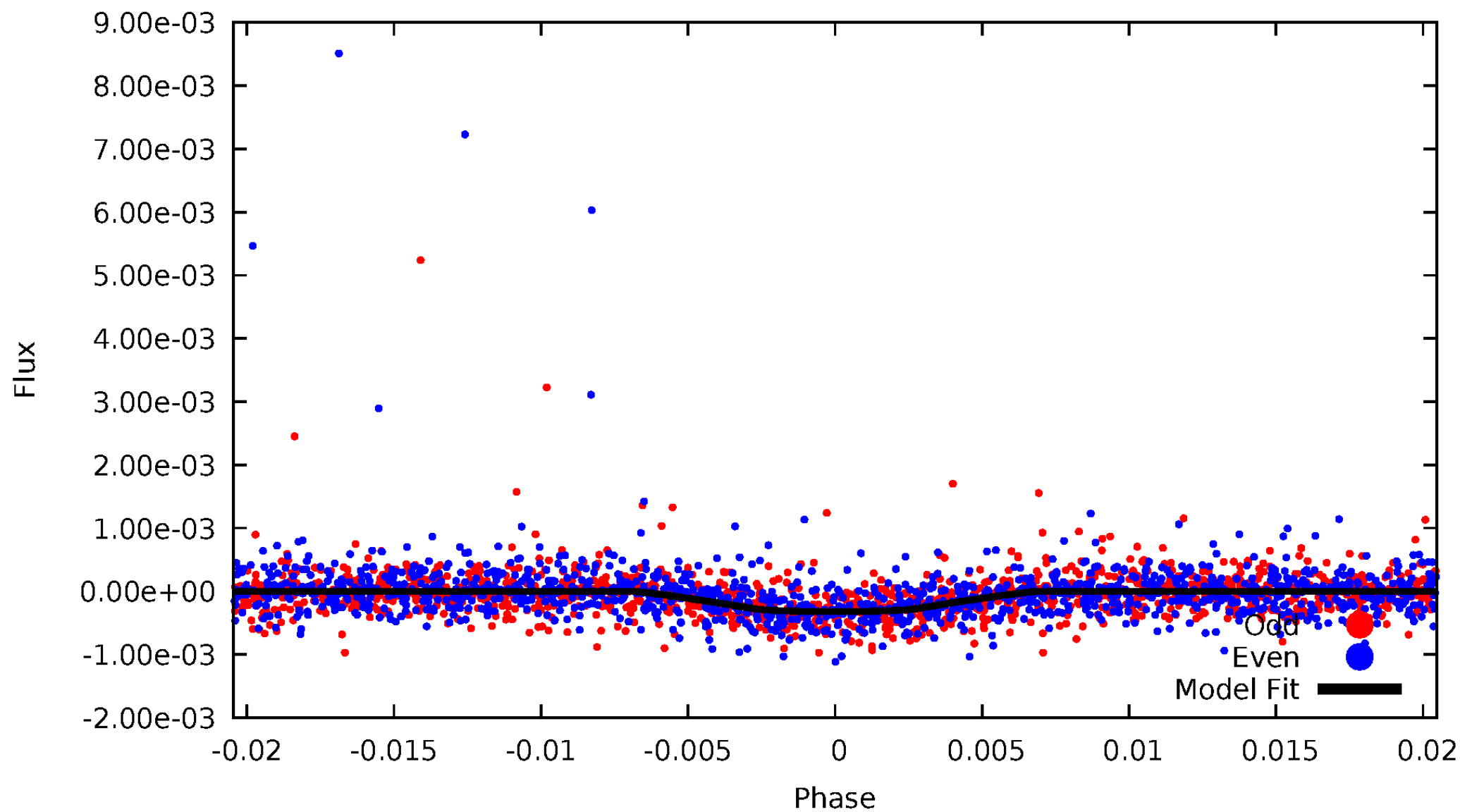
TCE 011516930-01





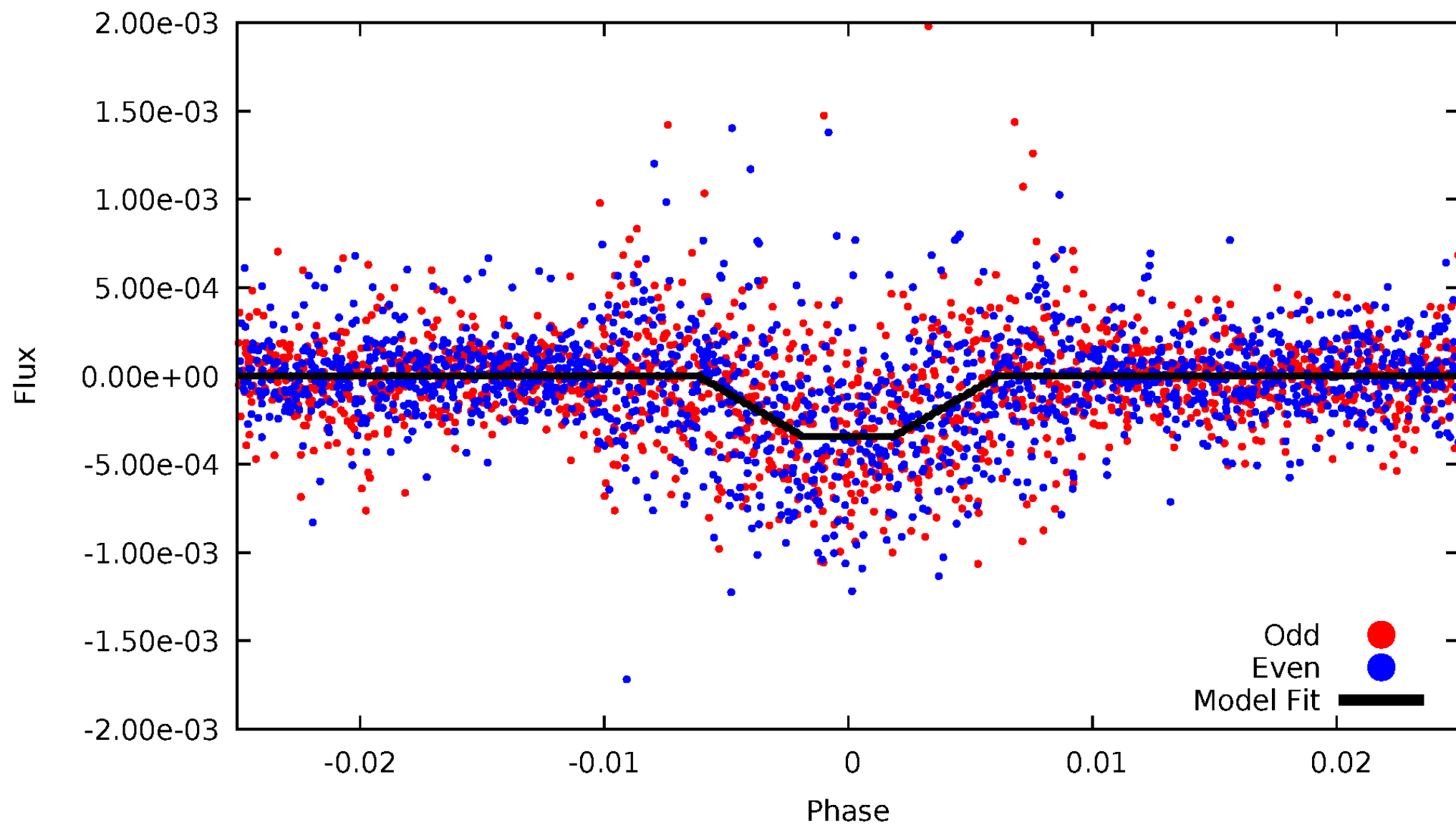
# DV Odd/Even

TCE 011516930-01



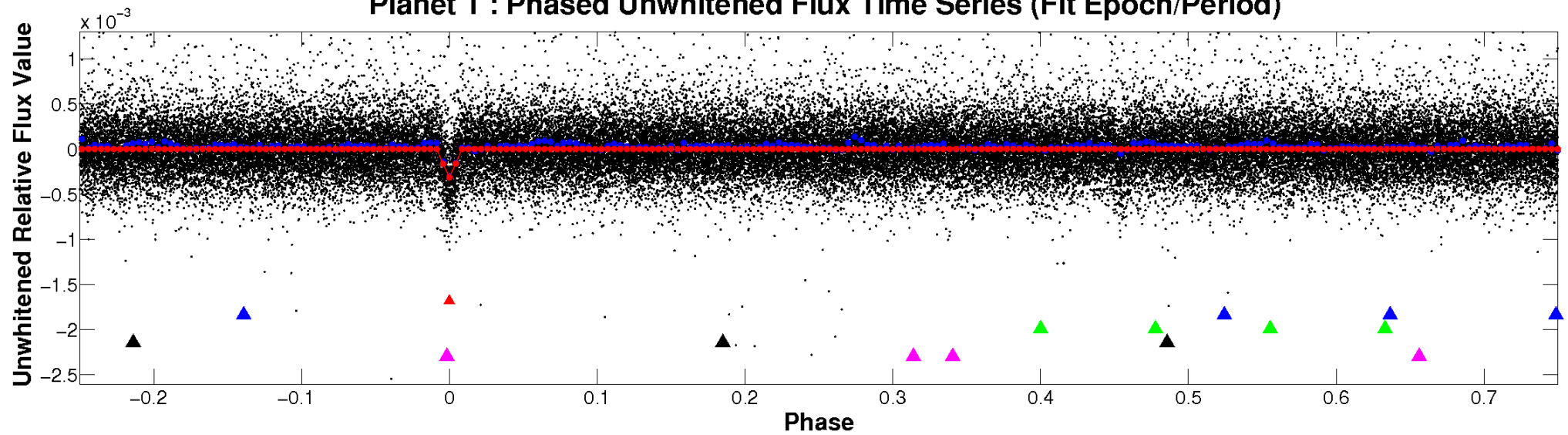
# ALT Odd/Even

TCE 011516930-01

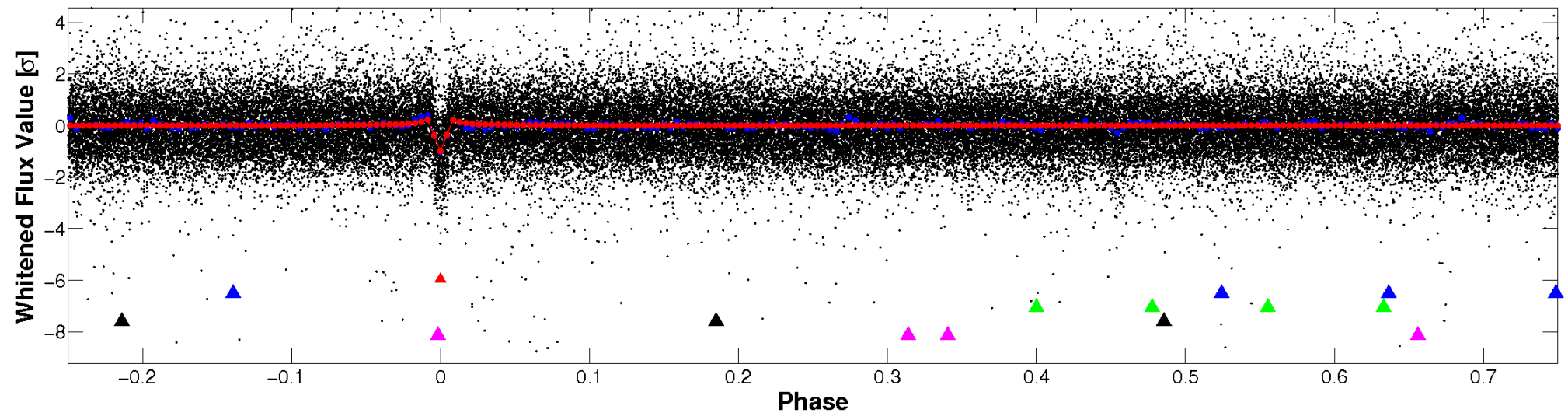


# Non-Whitened Vs. Whitened Light Curve

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

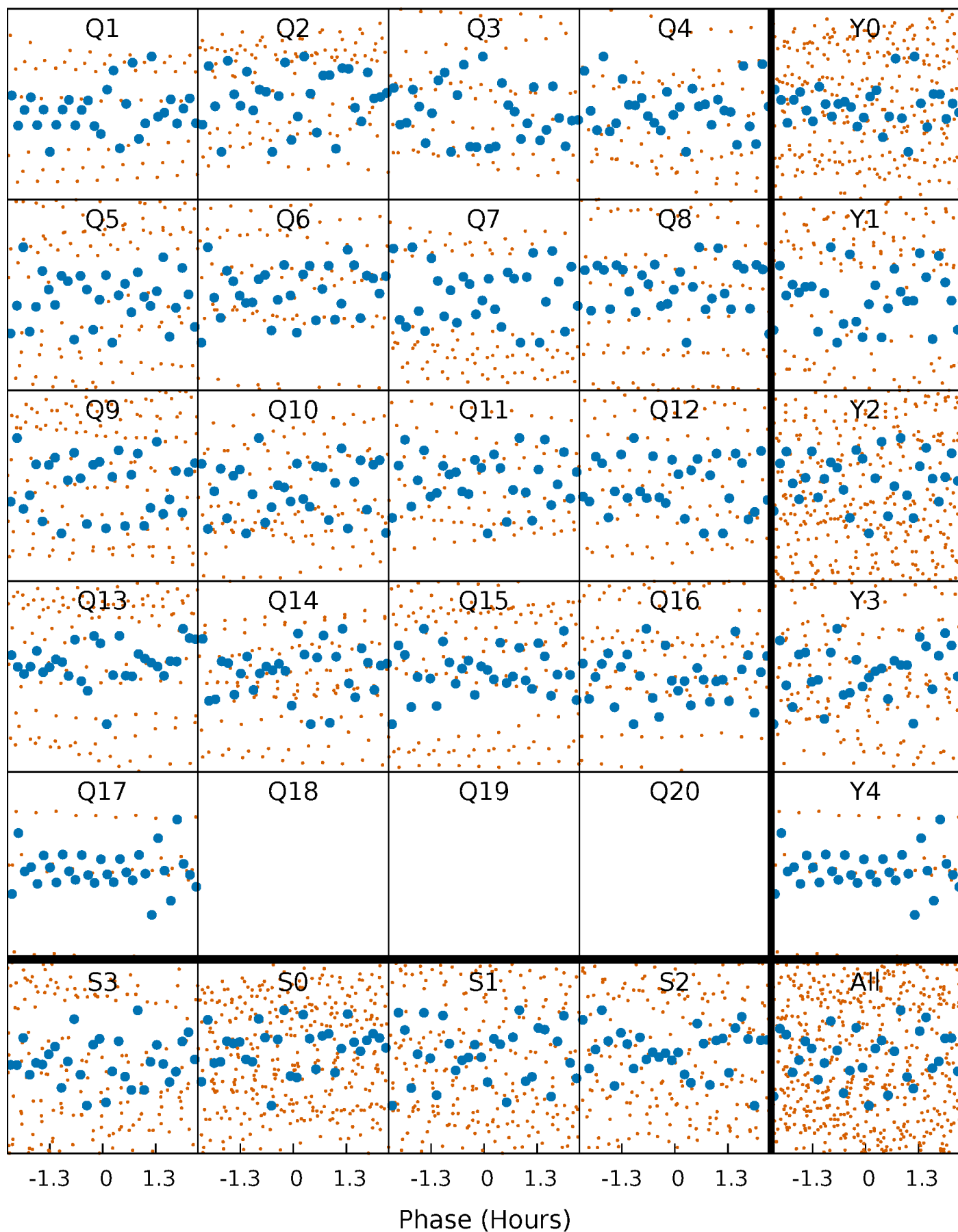


**Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)**



# PDC Quarter-Phased Transit Curves

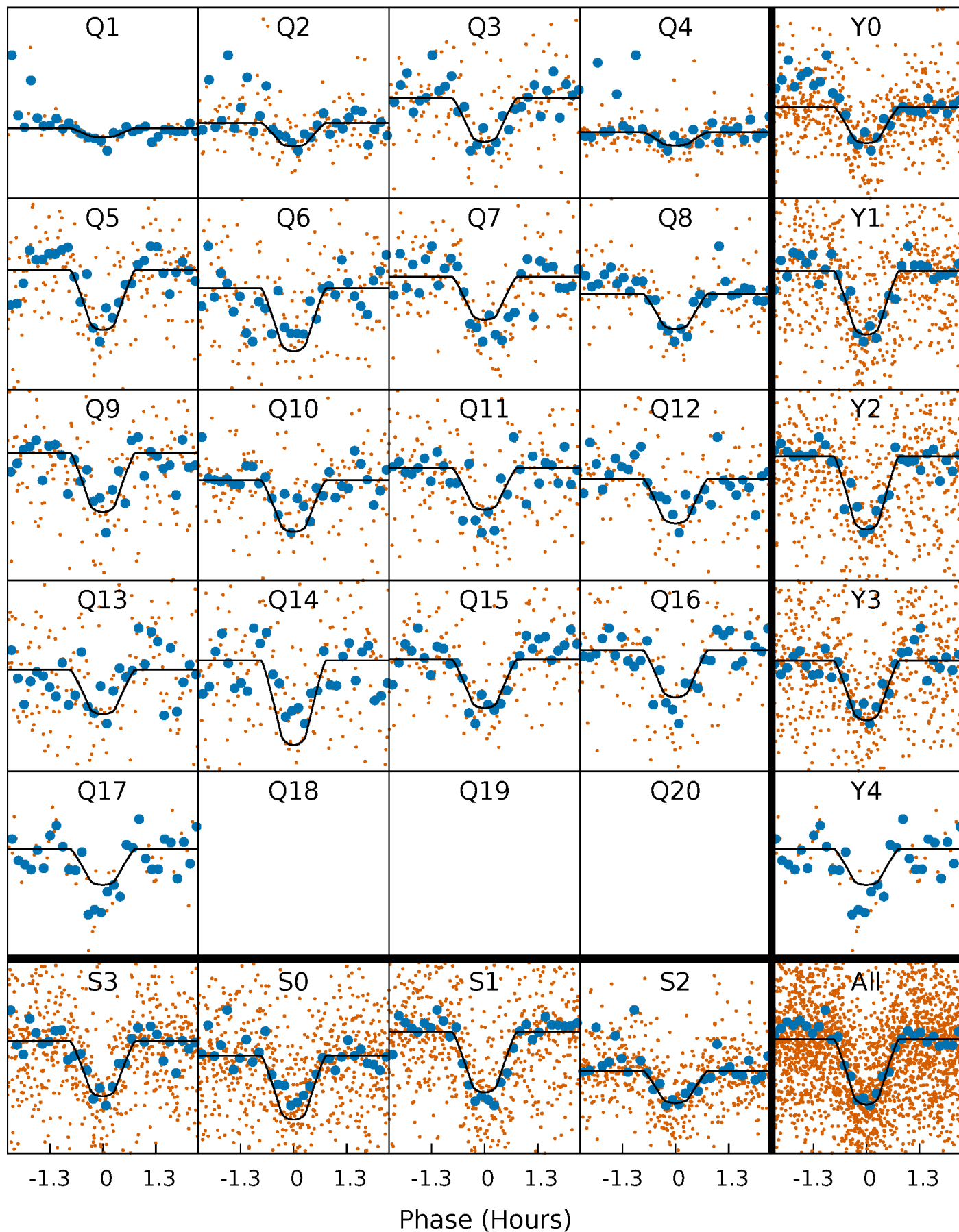
TCE 011516930-01 P= 4.768569 Days  $T_0=133.859655$  (BKJD)





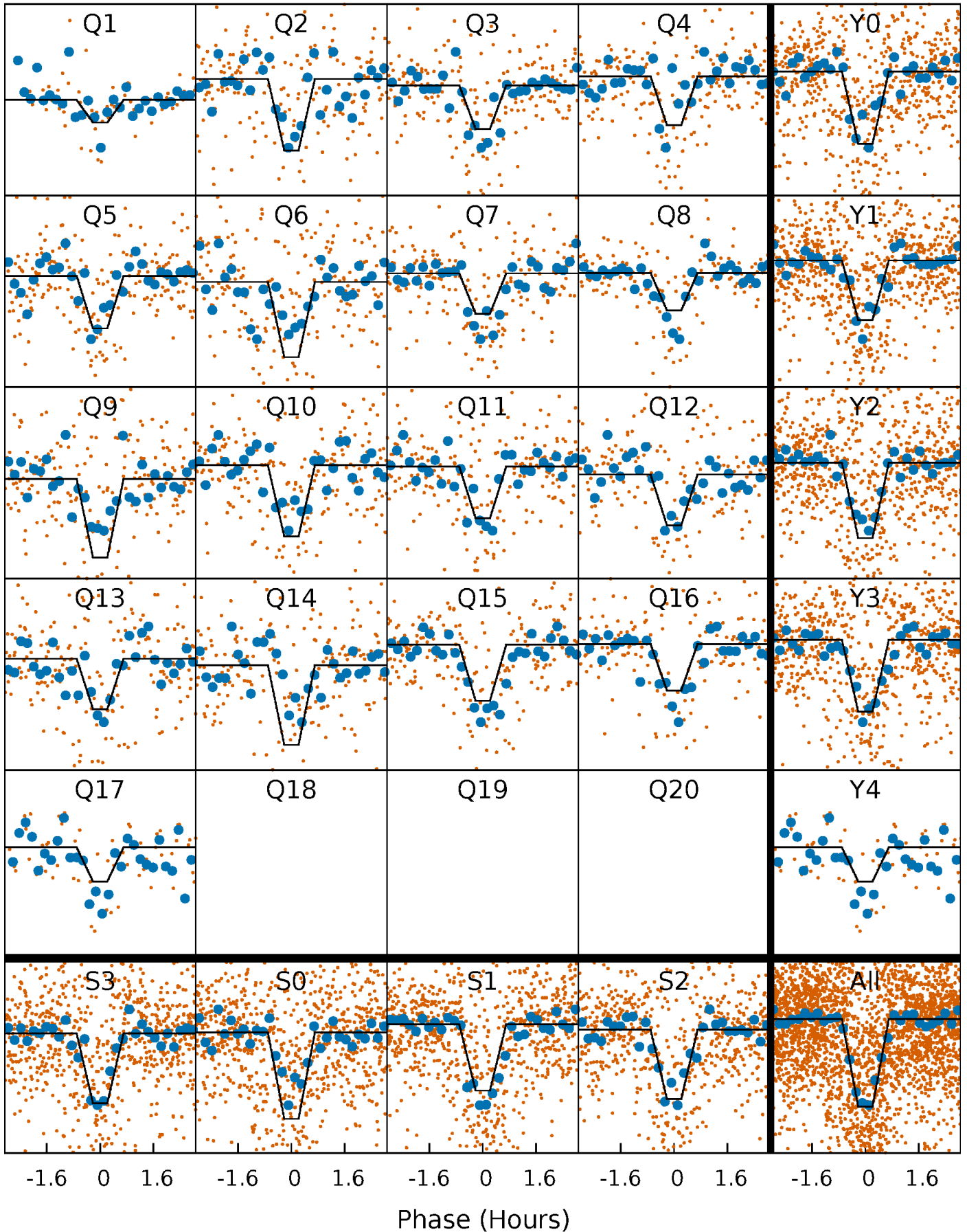
# DV Quarter-Phased Transit Curves

TCE 011516930-01 P= 4.768569 Days  $T_0=133.859655$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

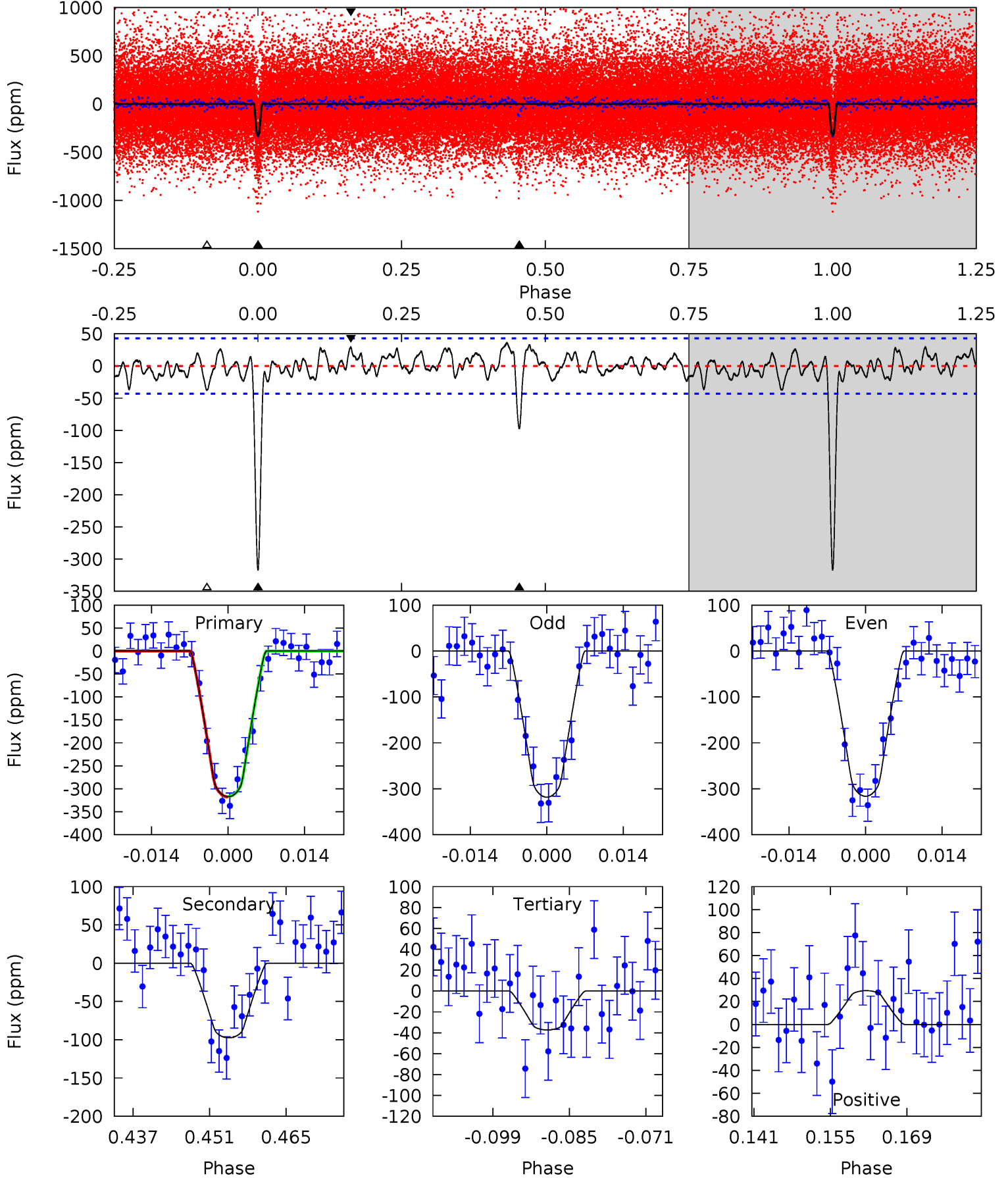
TCE 011516930-01   P= 4.768541 Days    $T_0=133.864474$  (BKJD)



# DV Model-Shift Uniqueness Test

011516930-01, P = 4.768569 Days, E = 129.091086 Days

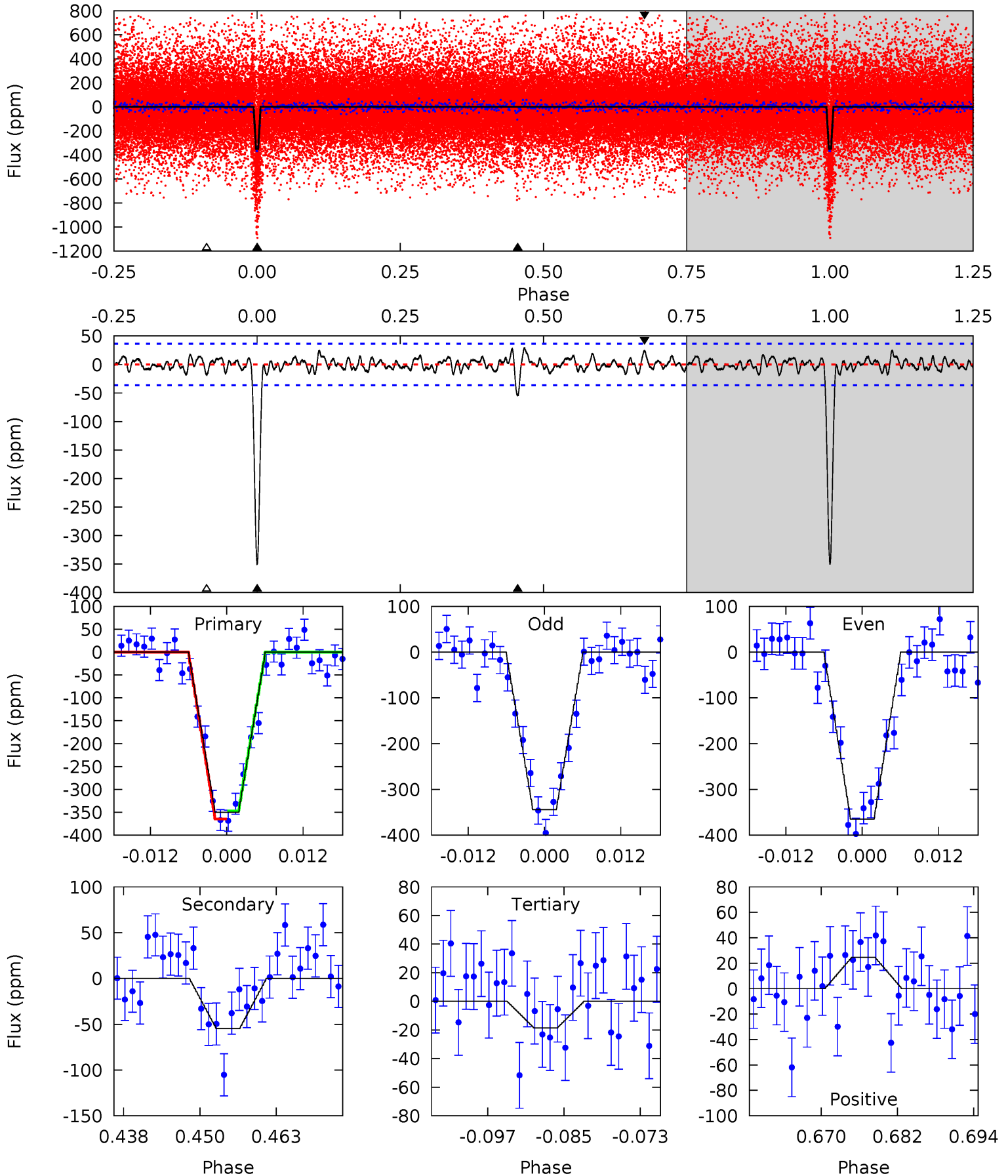
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
36.6	11.2	4.31	3.39	4.96	2.45	1.55	32.3	33.2	6.94	7.86	0.12	0.95	0.10	0.07



# Alt Model-Shift Uniqueness Test

011516930-01, P = 4.768541 Days, E = 129.095933 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
47.9	7.48	2.54	3.36	4.99	2.51	1.12	45.4	44.5	4.94	4.12	1.41	0.96	0.08	1.19





### Stellar Parameters For KIC 011516930

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R$ ( $R_{\odot}$ )	$M(M_{\odot})$	$p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ )
	$5491^{+164}_{-164}$	$4.432^{+0.130}_{-0.222}$	$-0.300^{+0.350}_{-0.300}$	$0.887^{+0.235}_{-0.137}$	$0.776^{+0.126}_{-0.054}$	$1.566^{+0.991}_{-0.852}$
	+3%/-3%	+3%/-5%	+117%/-100%	+26%/-15%	+16%/-7%	+63%/-54%
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 011516930-01 / KOI 6240.01

Detrend	Depth (ppm)	$R_p$ ( $R_{\oplus}$ )	$T_{max}$ (K)	$T_{obs}$ (K)	$A_{obs}$
DV	$-98 \pm 9$	$1.96^{+0.70}_{-0.67}$	$1431^{+107}_{-77}$	$4155^{+723}_{-388}$	$37^{+45}_{-16}$
Alt.	$-55 \pm 7$	$1.81^{+0.77}_{-0.59}$	$1421^{+109}_{-84}$	$3824^{+618}_{-373}$	$24^{+28}_{-12}$

$T_{max}$  = 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

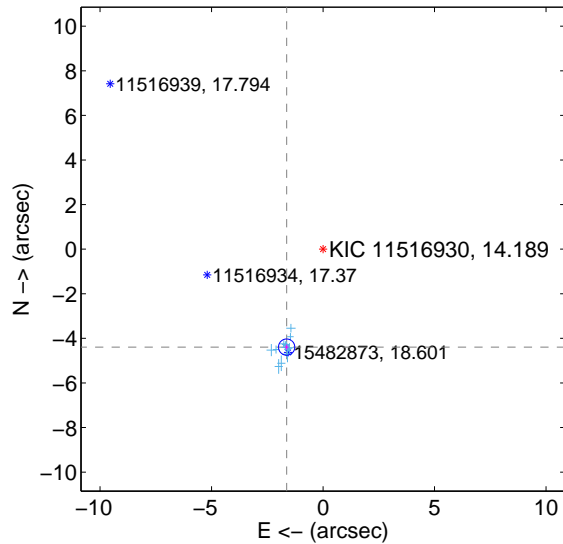
Supplemental centroid analysis for 011516930-01. Kepler magnitude: 14.19. Transit SNR 21.04

There are 17 quarters with good PRF difference image offsets

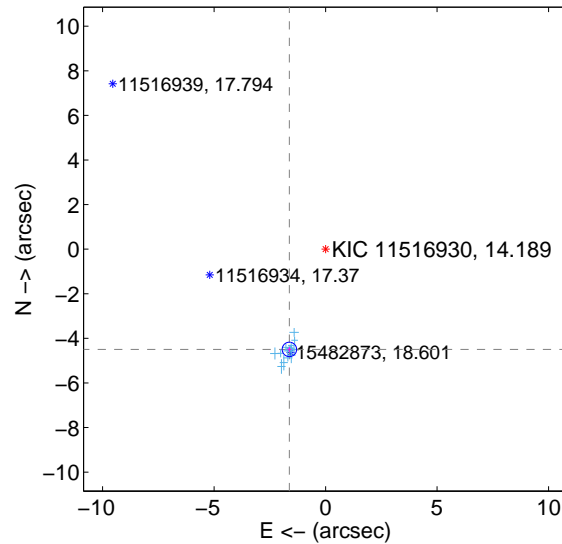
The direct PRF centroid is offset from the target star catalog position by about 0.19 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	4.686 $\pm$ 0.121	38.58	1.632 $\pm$ 0.088	-4.392 $\pm$ 0.115
PRF-fit source offset from KIC position	4.780 $\pm$ 0.108	44.33	1.623 $\pm$ 0.086	-4.496 $\pm$ 0.102
photometric centroid source offset	7.44 $\pm$ 0.53	13.94	1.79 $\pm$ 0.57	-7.22 $\pm$ 0.53

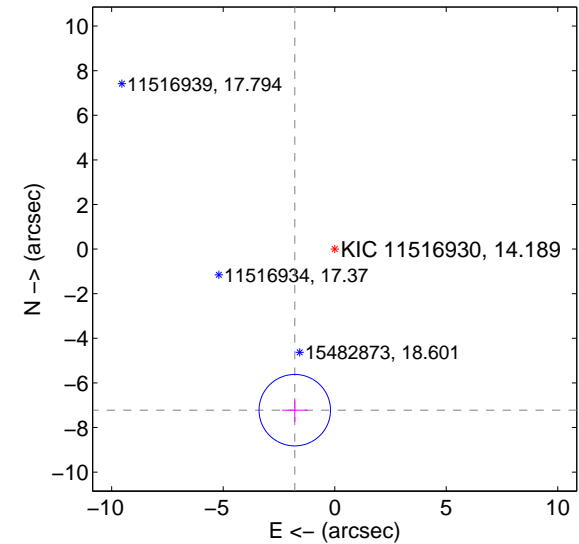
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position

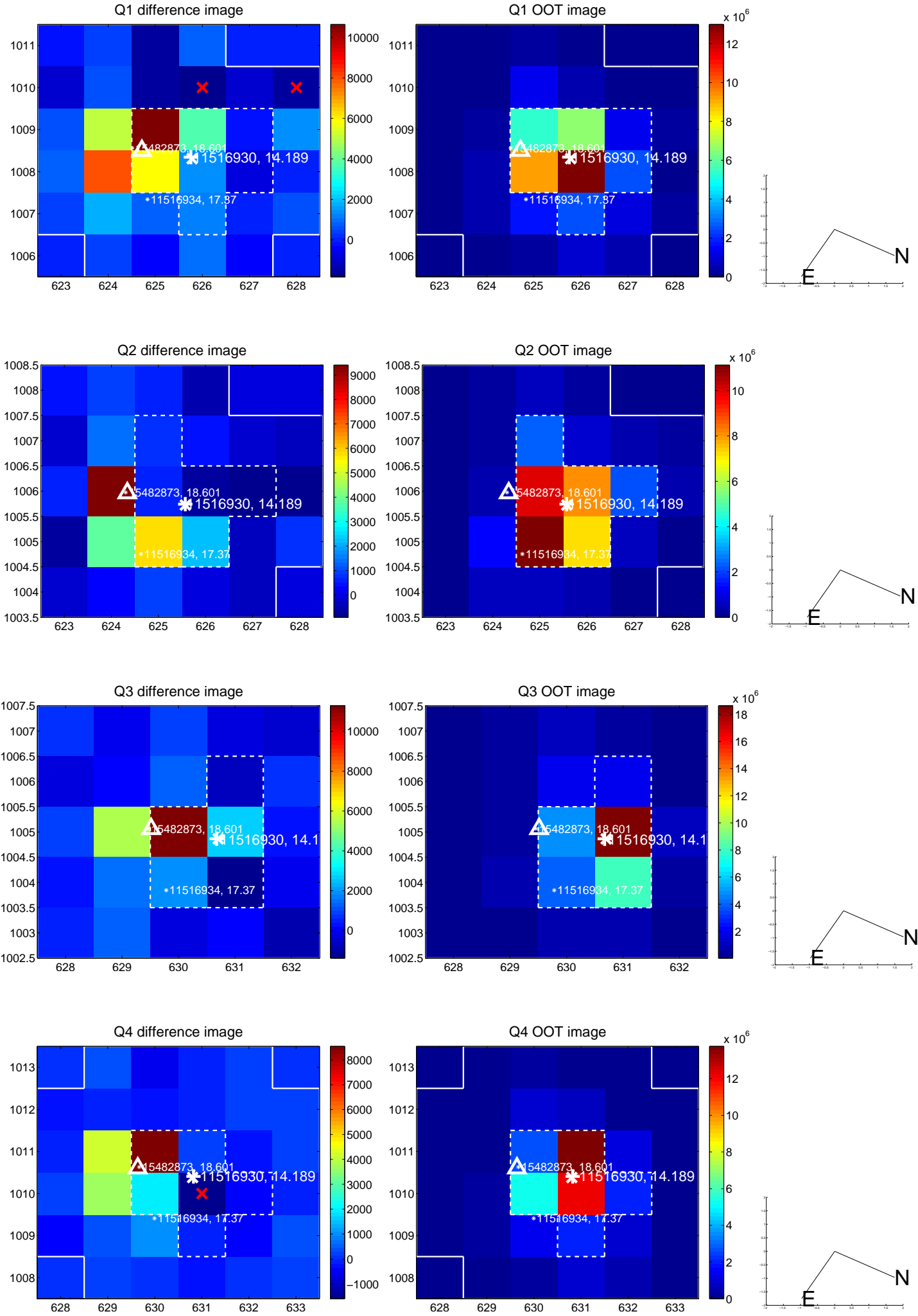


offset from photometric centroids

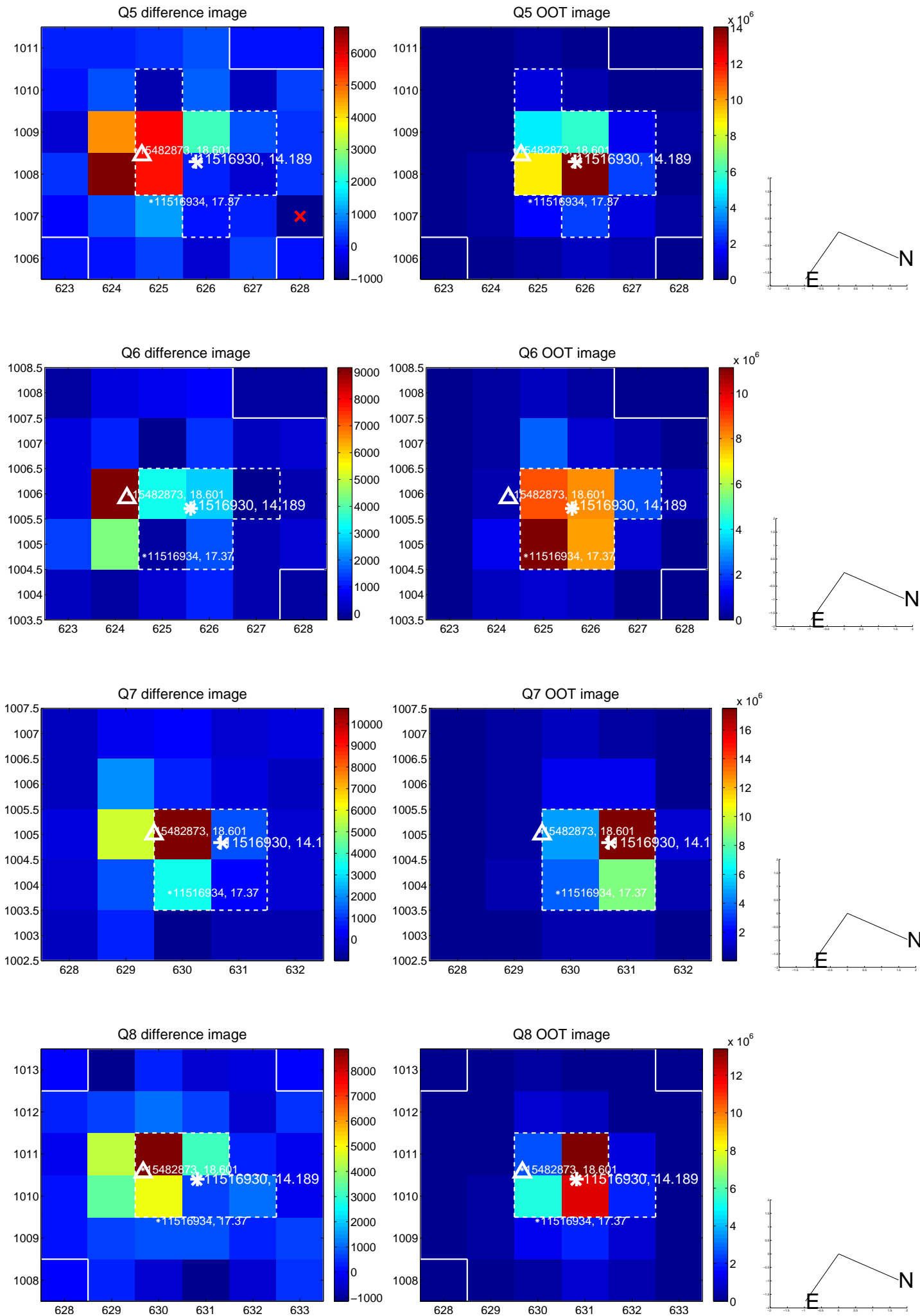


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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

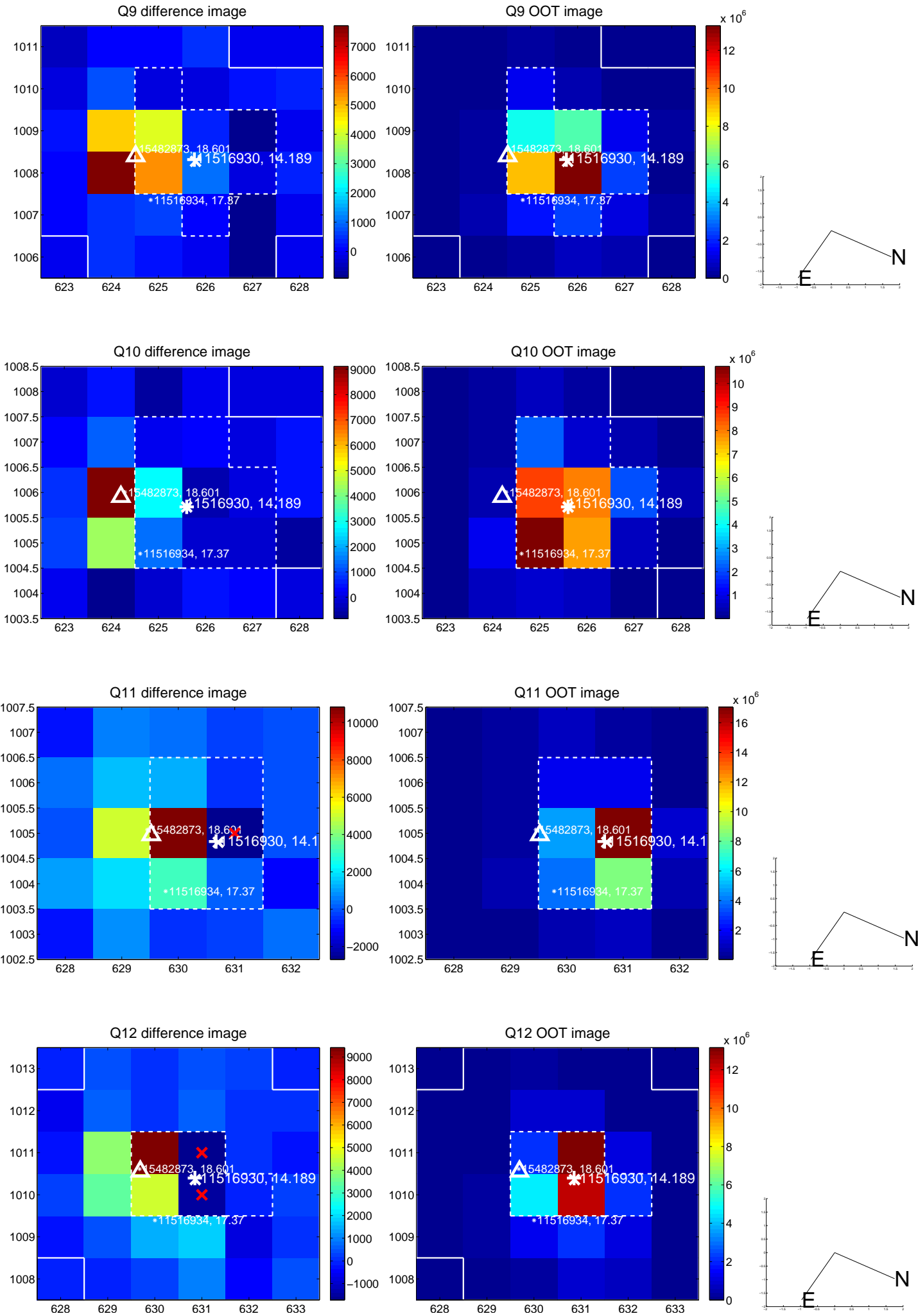


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

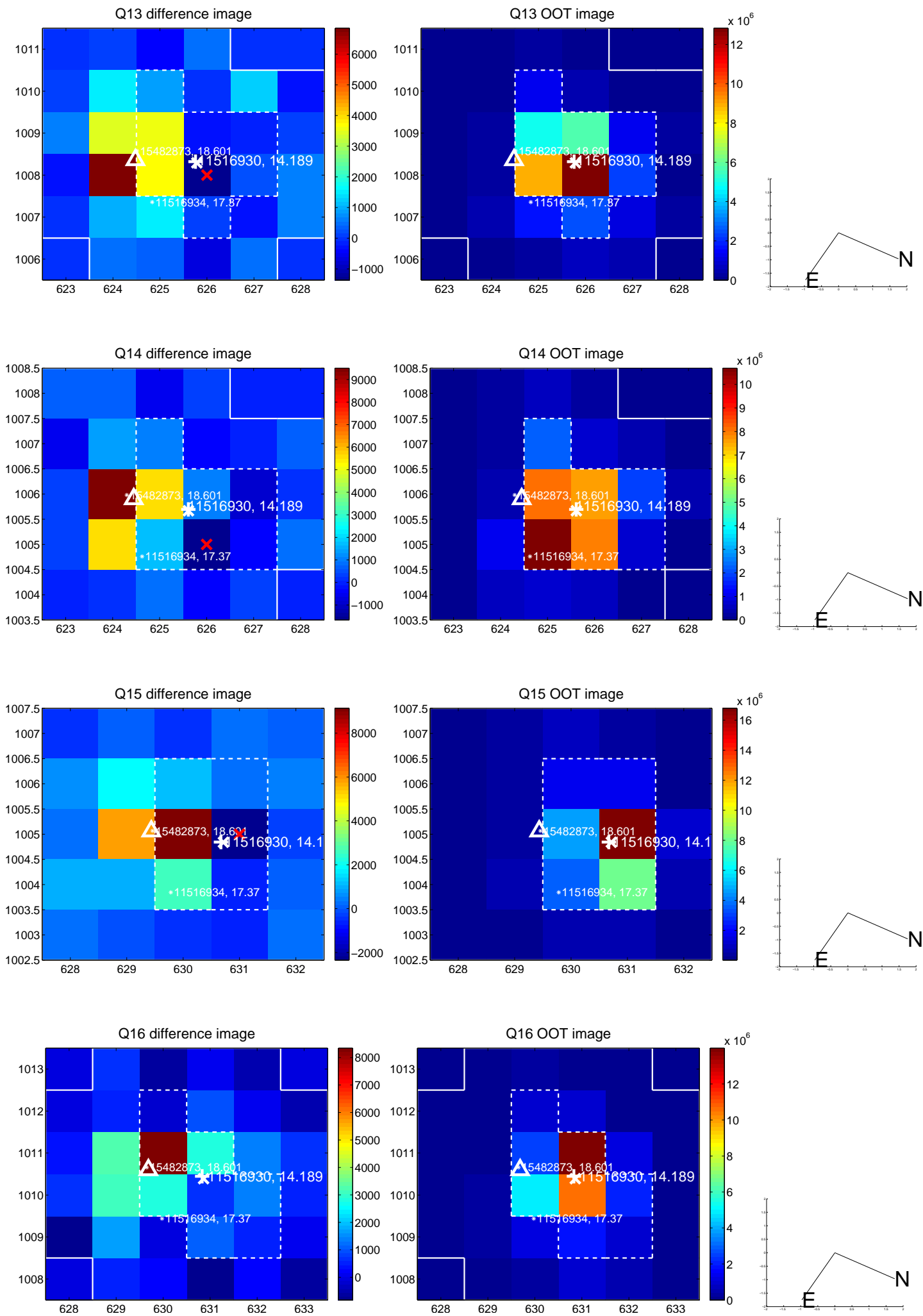




white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



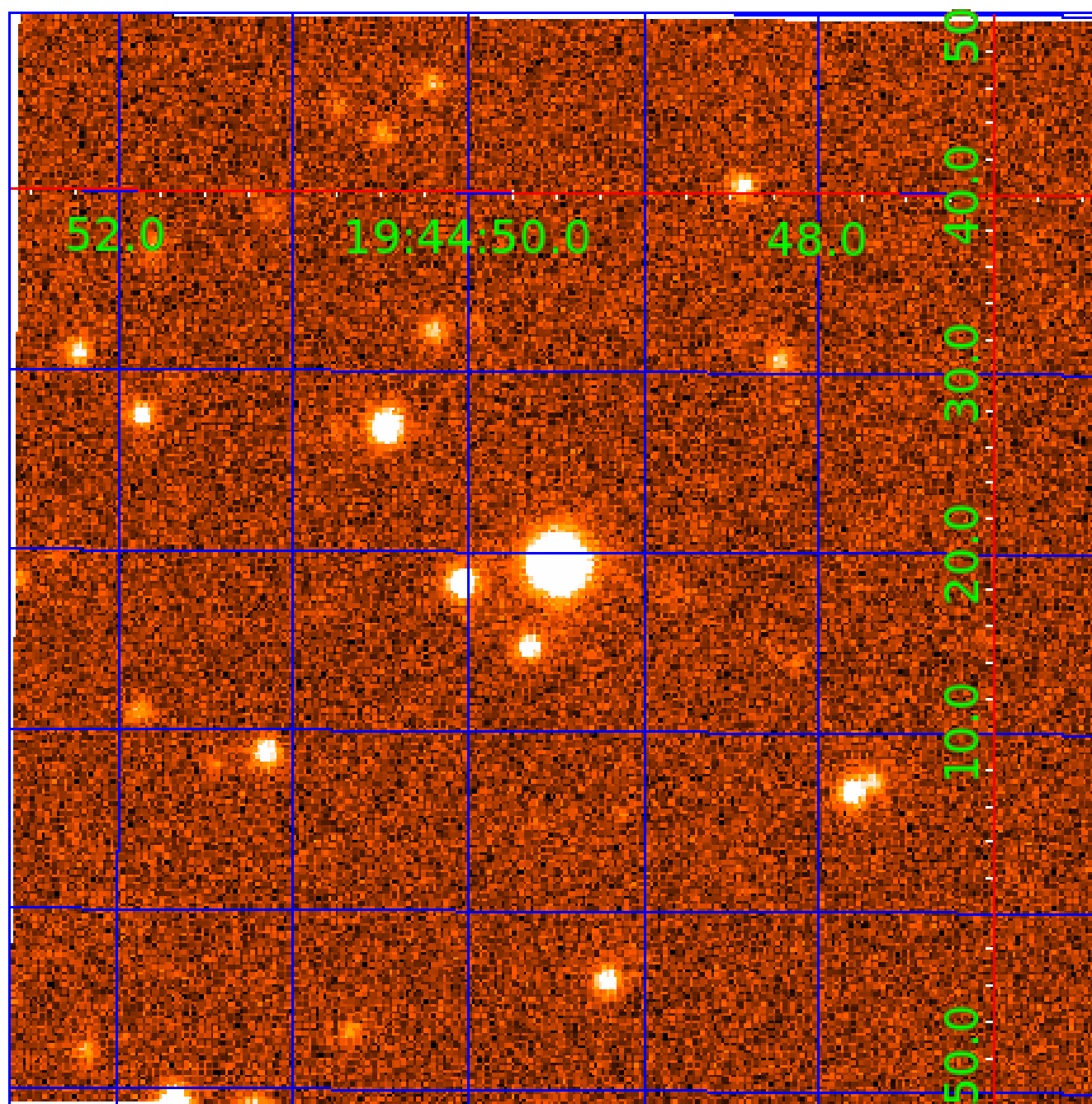
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.





UKIRT Image

Declination



# KIC 011516930

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
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## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
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011516930-02	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—CENT_FEW_DIFFS
011516930-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_MARSHALL_TRACKER—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—CENT_FEW_DIFFS
011516930-05	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—ALL_TRANS_CHASES—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—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.

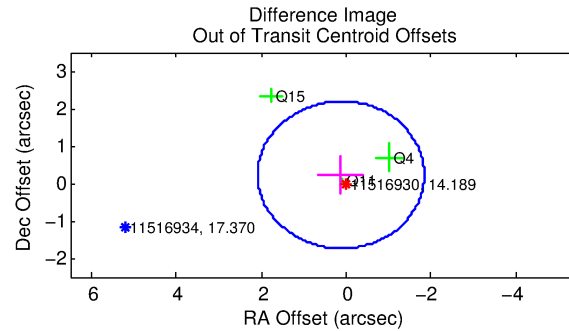
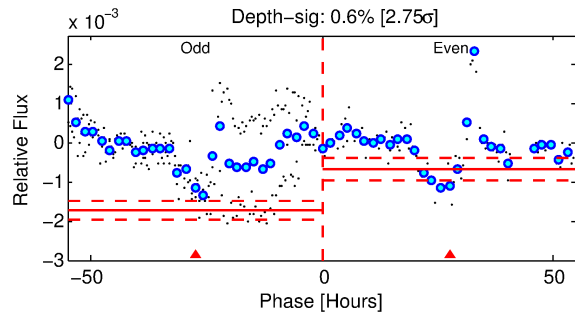
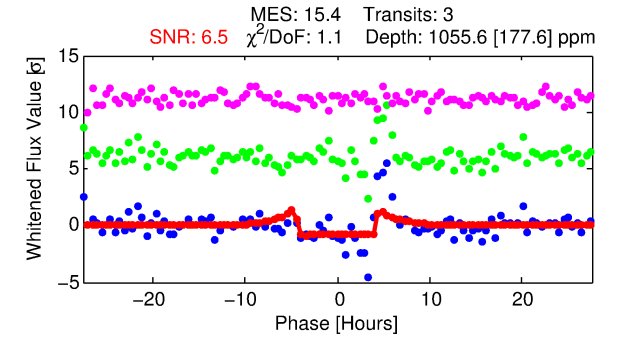
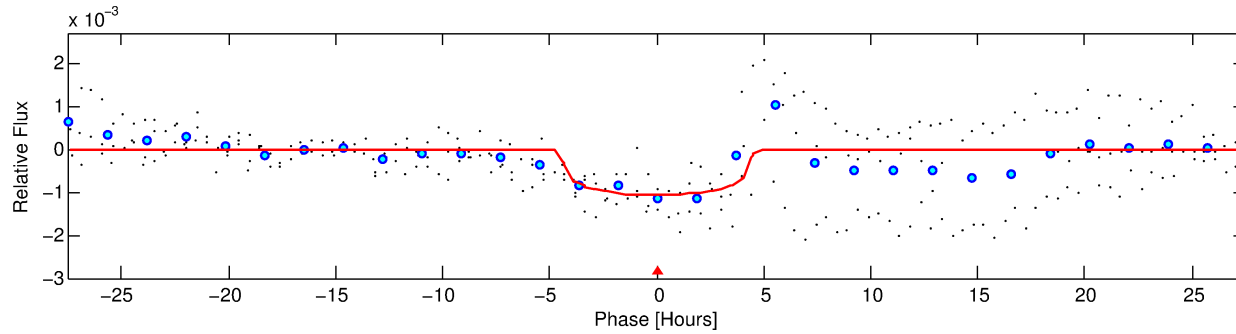
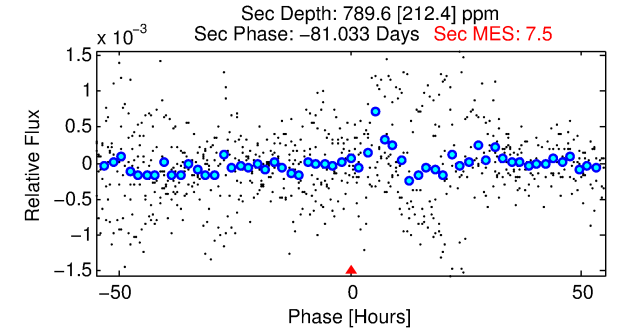
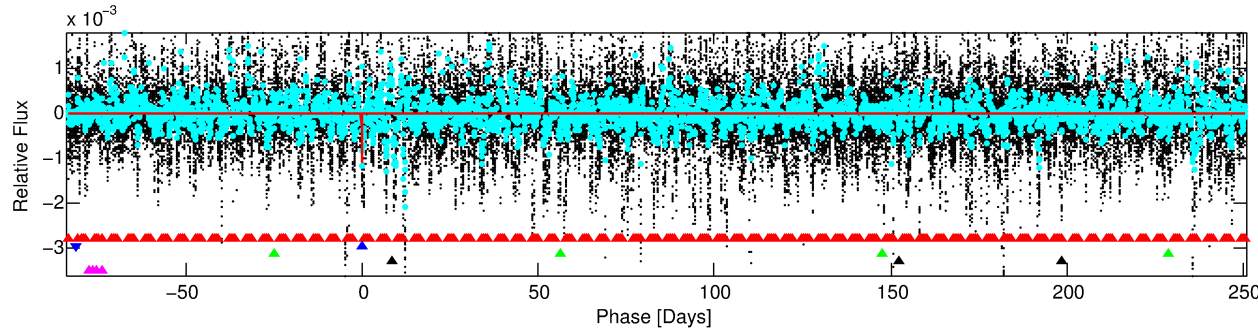
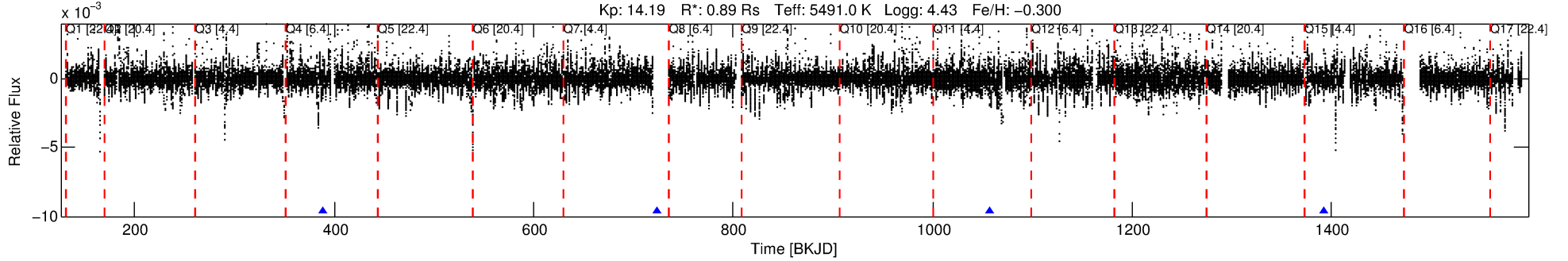
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 011516930-02

No Significant Match Found

# DV One-Page Summary

KIC: 11516930 Candidate: 2 of 5 Period: 334.335 d  
KOI: K06240 Corr: No Ephemeris Match



## DV Fit Results:

Period = 334.33477 [0.00402] d  
Epoch = 389.0940 [0.0090] BKJD  
Rp/R\* = 0.0314 [0.0100]  
a/R\* = 219.68 [268.80]  
b = 0.66 [1.05]  
Seff = 0.85 [0.34]  
Teq = 245 [25] K  
Rp = 3.04 [1.26] Re  
a = 0.8665 [0.2127] AU  
Ag = 35253.19 [27862.97] [1.27 $\sigma$ ]  
Teffp = 5192 [910] K [5.43 $\sigma$ ]

## DV Diagnostic Results:

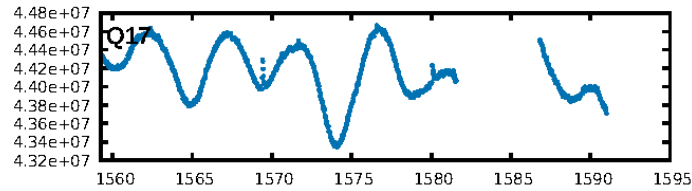
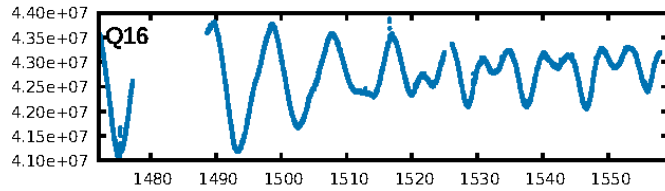
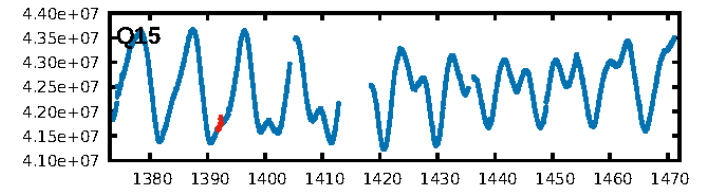
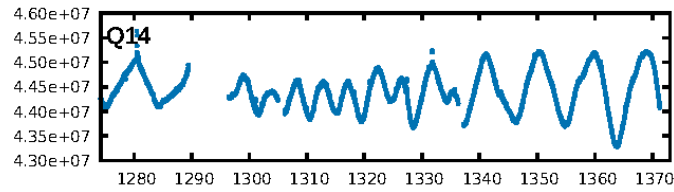
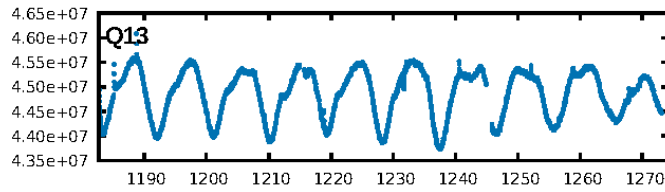
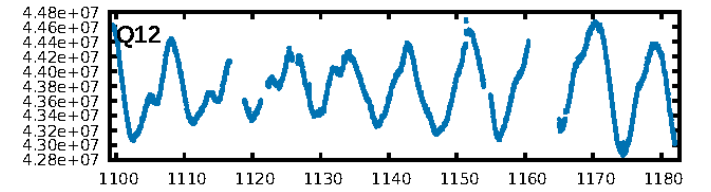
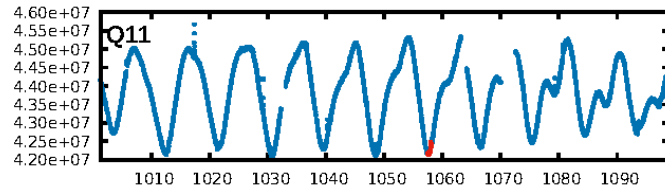
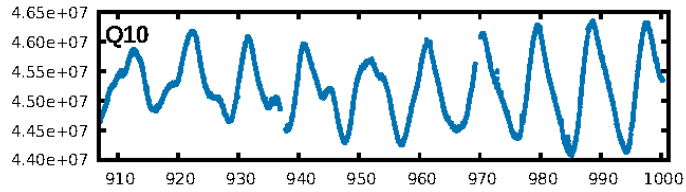
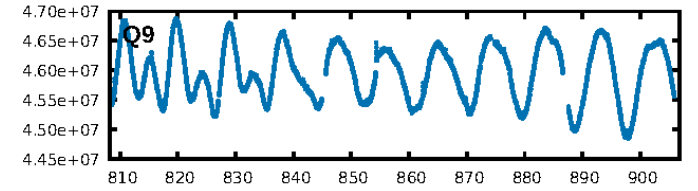
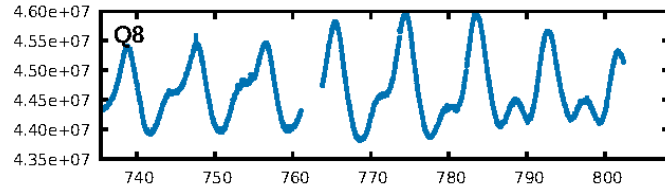
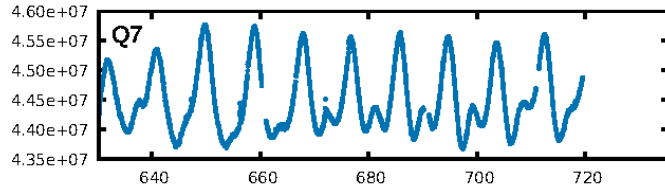
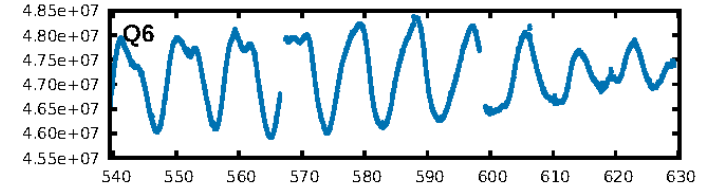
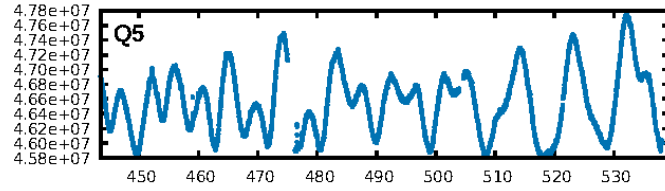
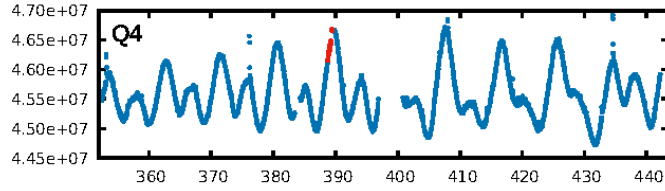
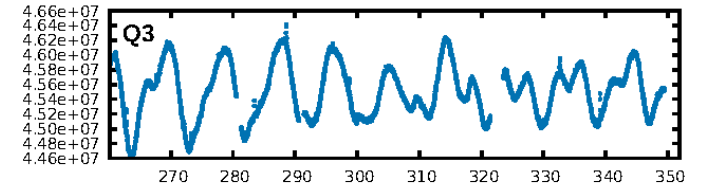
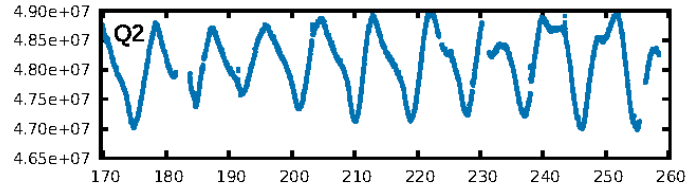
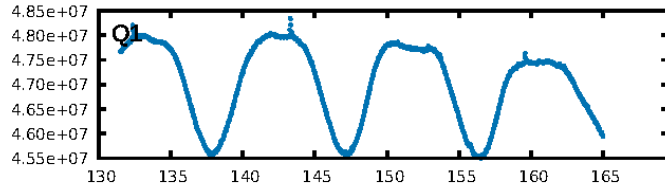
ShortPeriod-sig: 100.0% [854.97 $\sigma$ ]  
LongPeriod-sig: 99.4% [2.74 $\sigma$ ]  
ModelChiSquare2-sig: 66.9%  
ModelChiSquareGof-sig: 88.8%  
Bootstrap-pfa: 1.04e-14  
RollingBand-fgt: 1.00 [3/3]  
GhostDiagnostic-chr: 0.8874  
Centroid-sig: 10.0%  
Centroid-so: 1.144 arcsec [1.29 $\sigma$ ]  
OotOffset-rm: 0.253 arcsec [0.39 $\sigma$ ]  
OotOffset-st: 0/2/1/0 [3]  
KicOffset-rm: 0.170 arcsec [0.25 $\sigma$ ]  
KicOffset-st: 0/2/1/0 [3]  
DiffImageQuality-fgm: 0.67 [2/3]  
DiffImageOverlap-fno: 0.67 [2/3]

Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 30-Jan-2016 01:28:13 Z

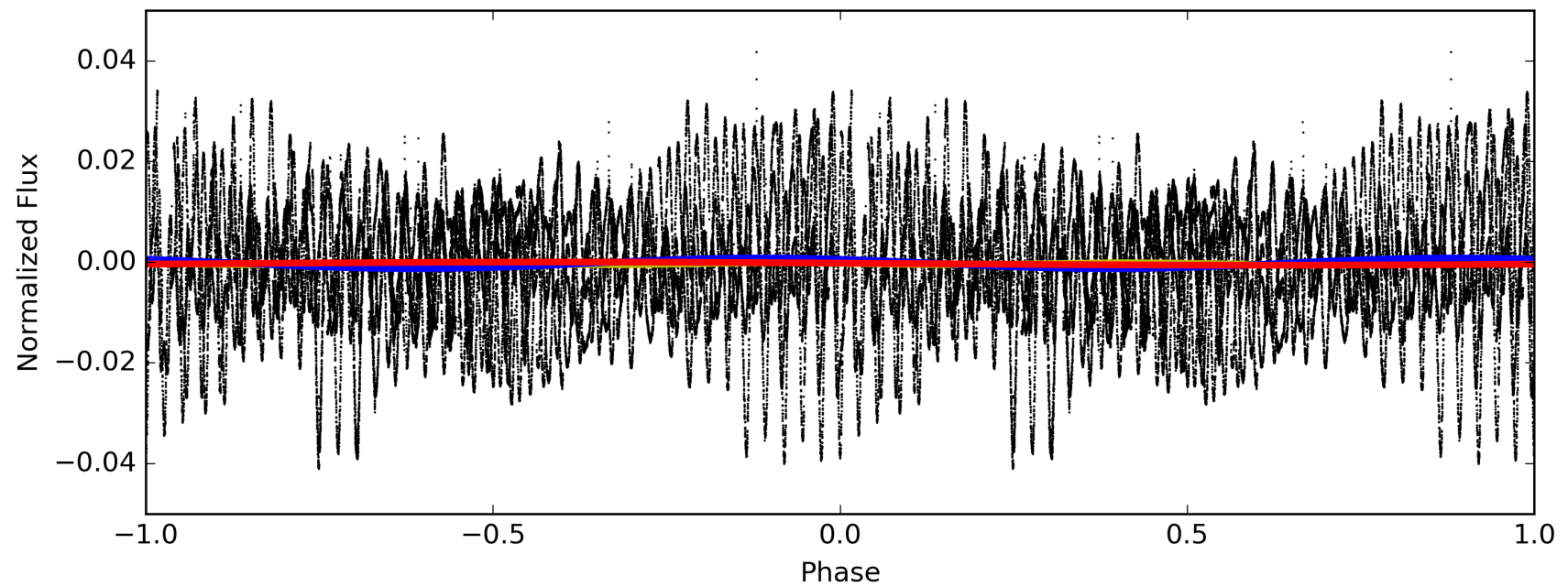
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center



# TCE 011516930-02, PDC Light Curves

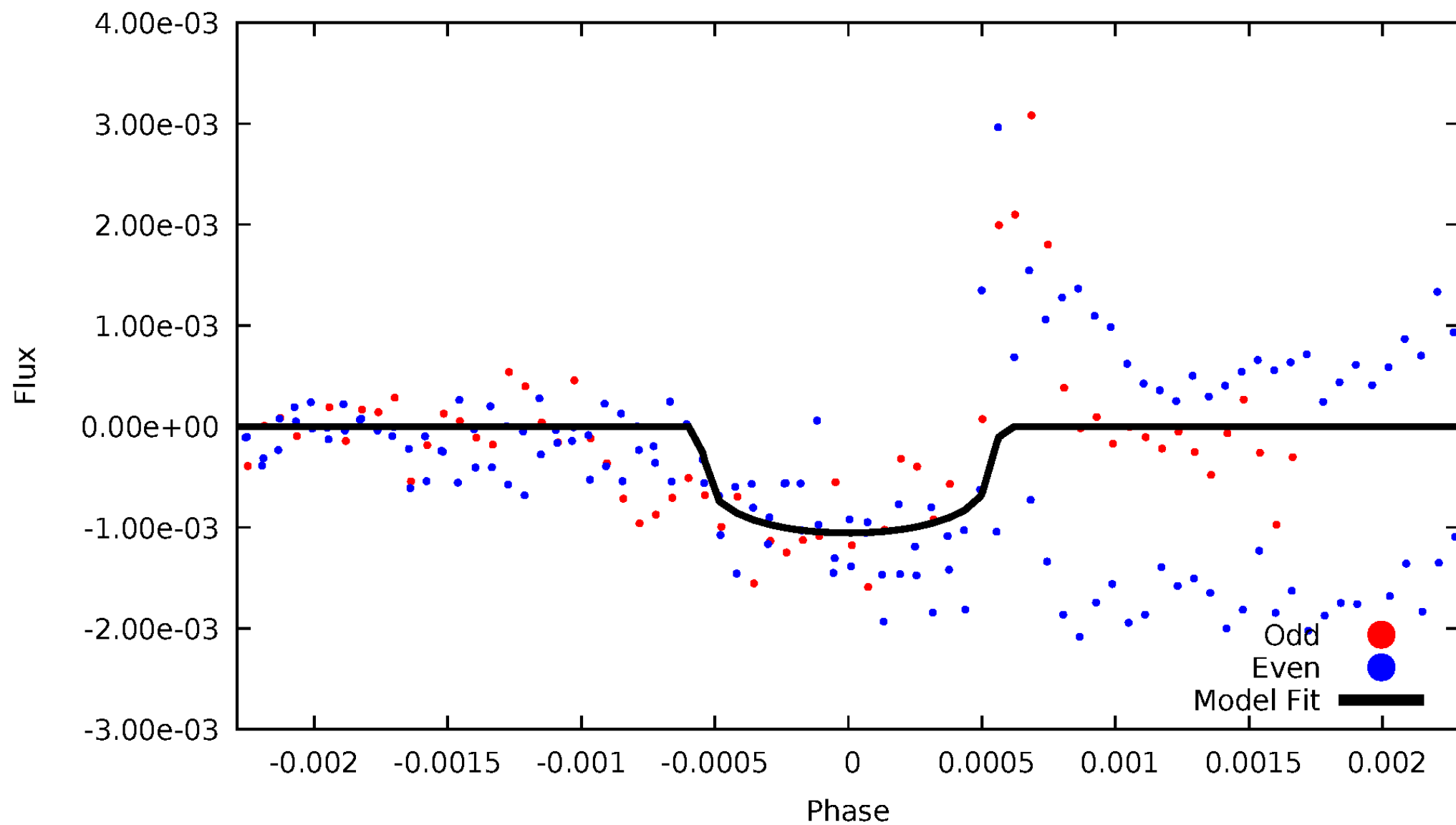


— P = 167.167 days      — P = 334.335 days      — P = 668.670 days



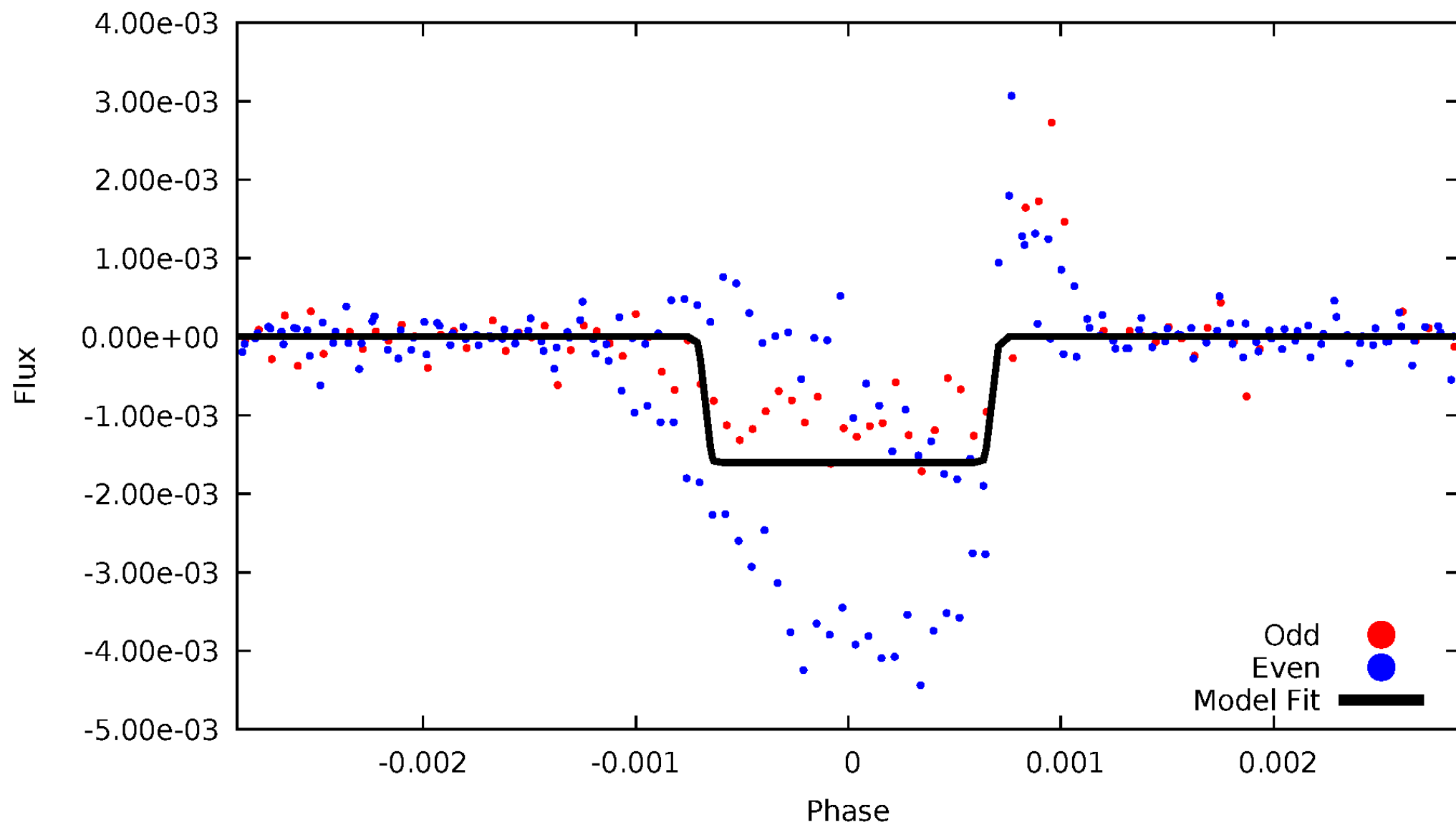
# DV Odd/Even

TCE 011516930-02



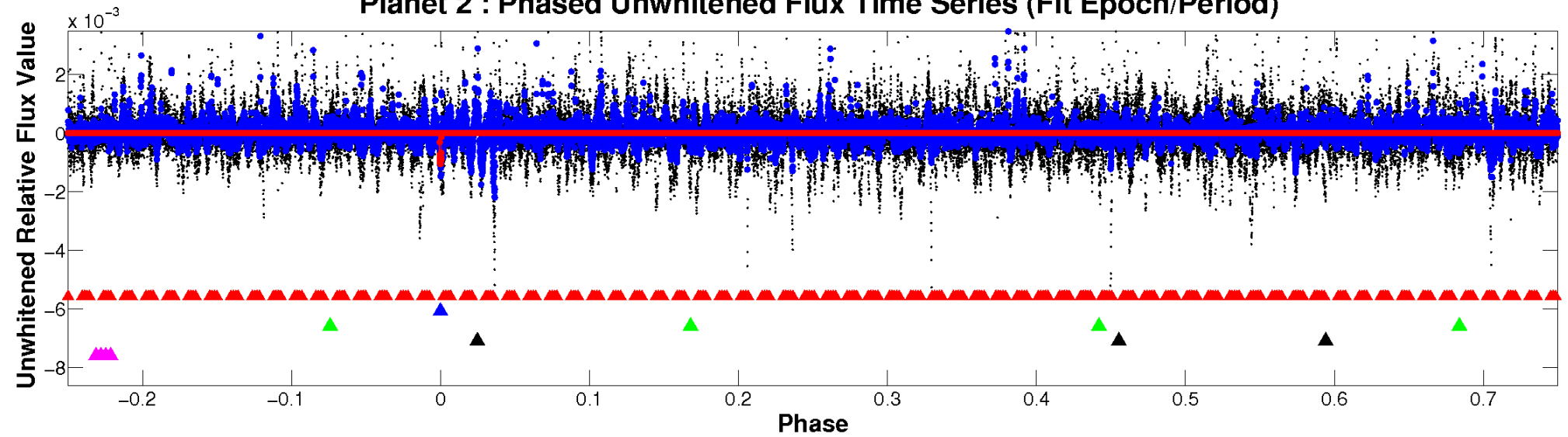
# ALT Odd/Even

TCE 011516930-02

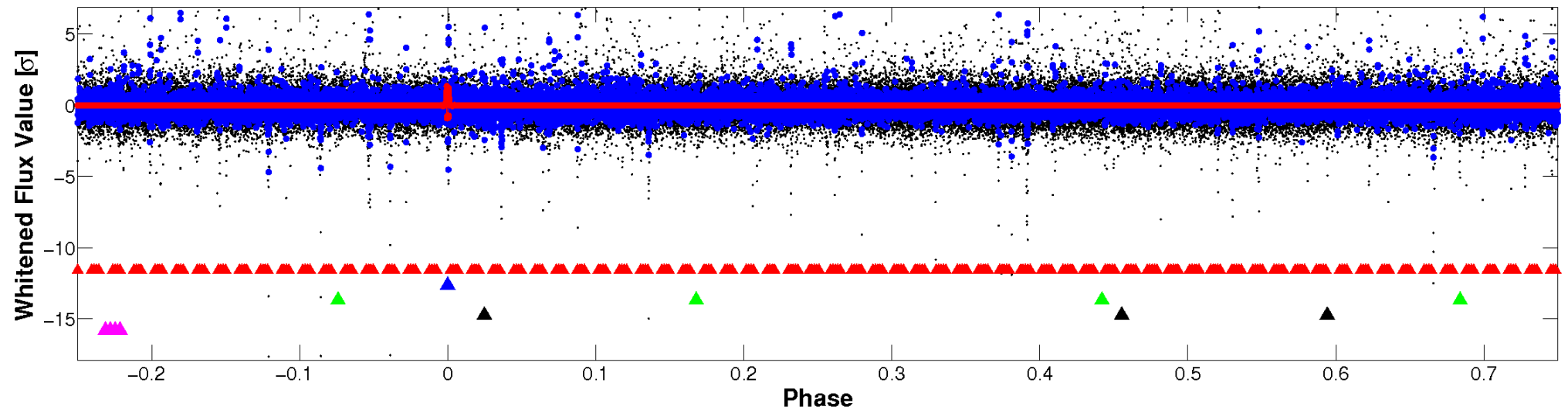


# Non-Whitened Vs. Whitened Light Curve

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

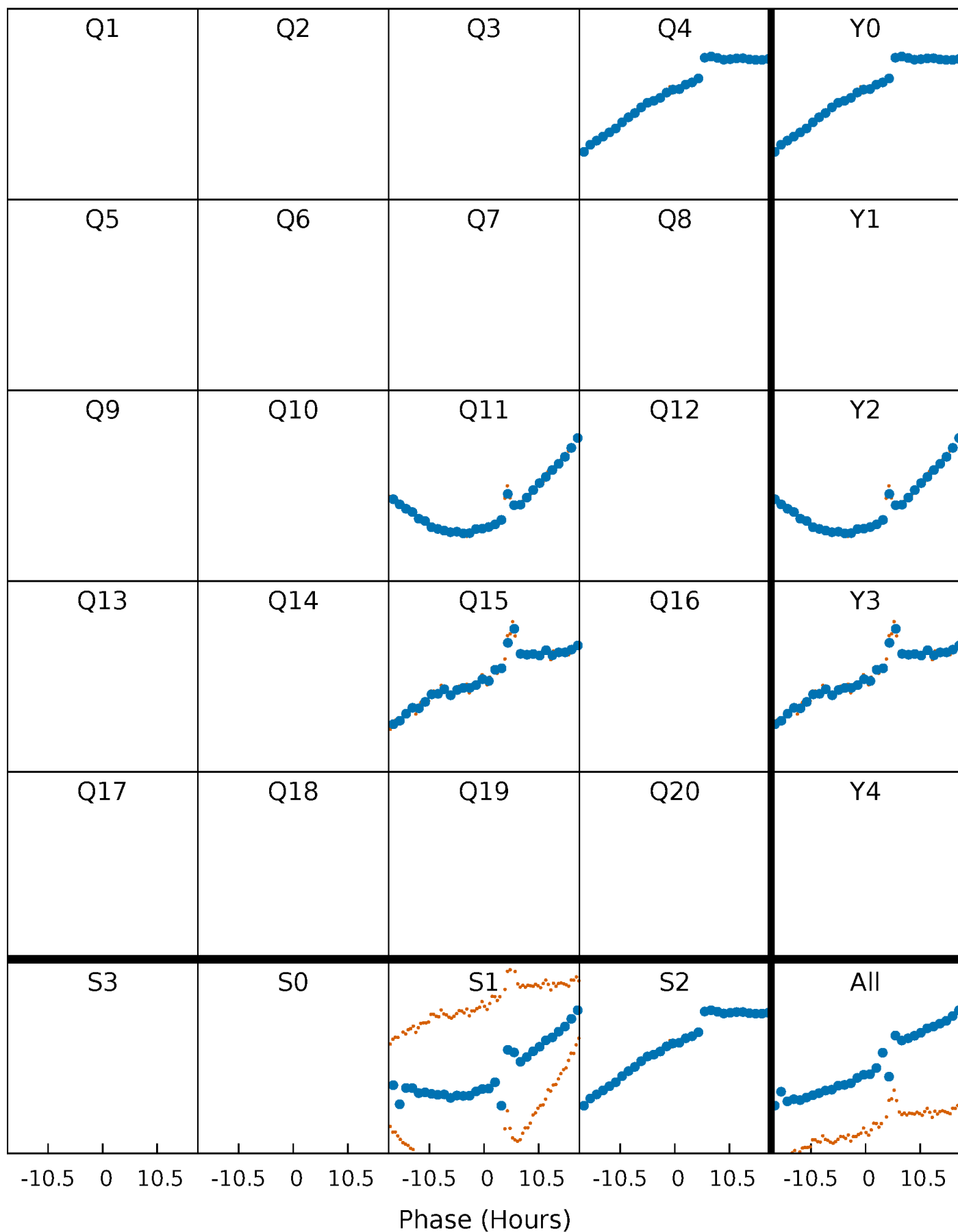


## Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



# PDC Quarter-Phased Transit Curves

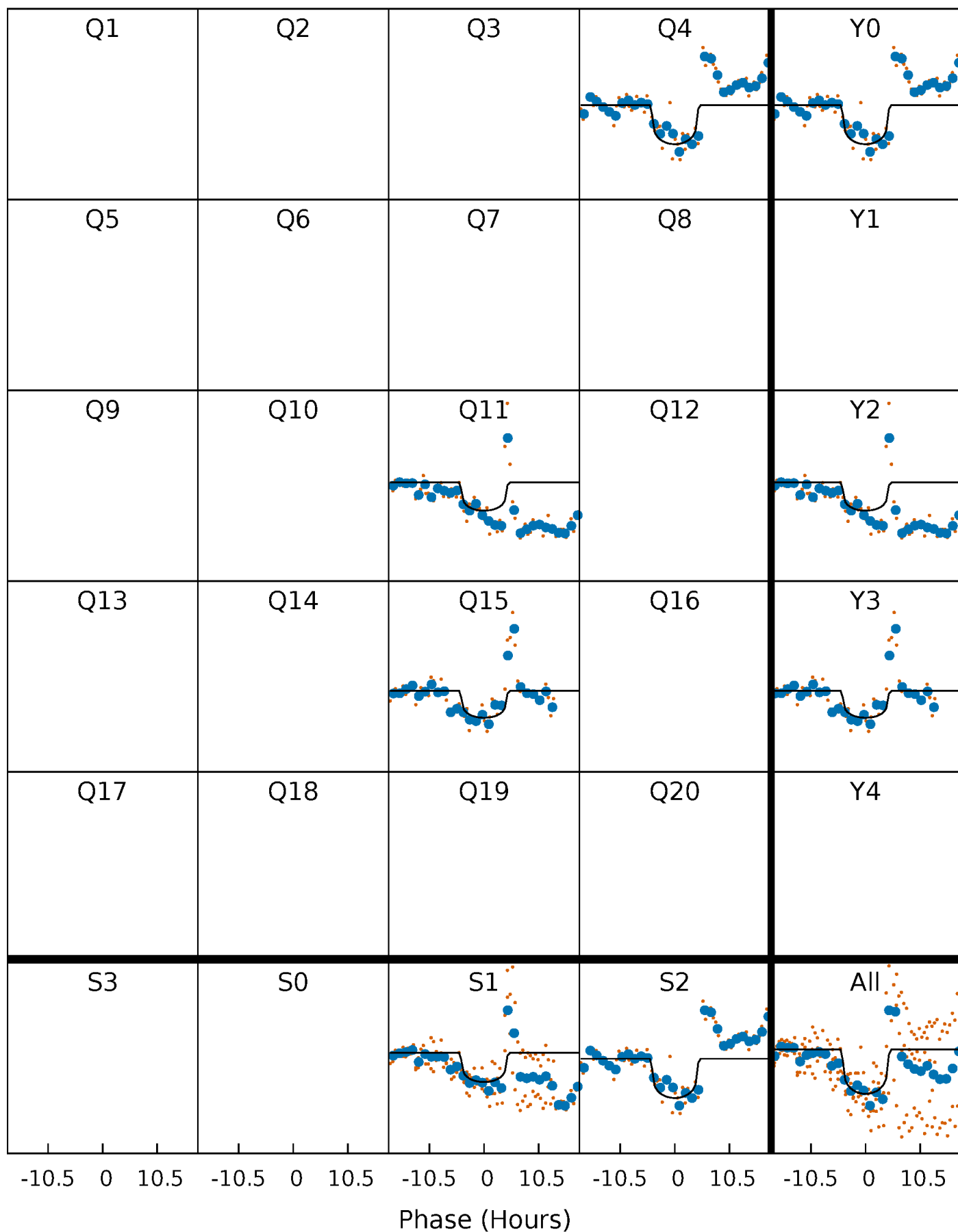
TCE 011516930-02     $P=334.334773$  Days     $T_0=389.094048$  (BKJD)





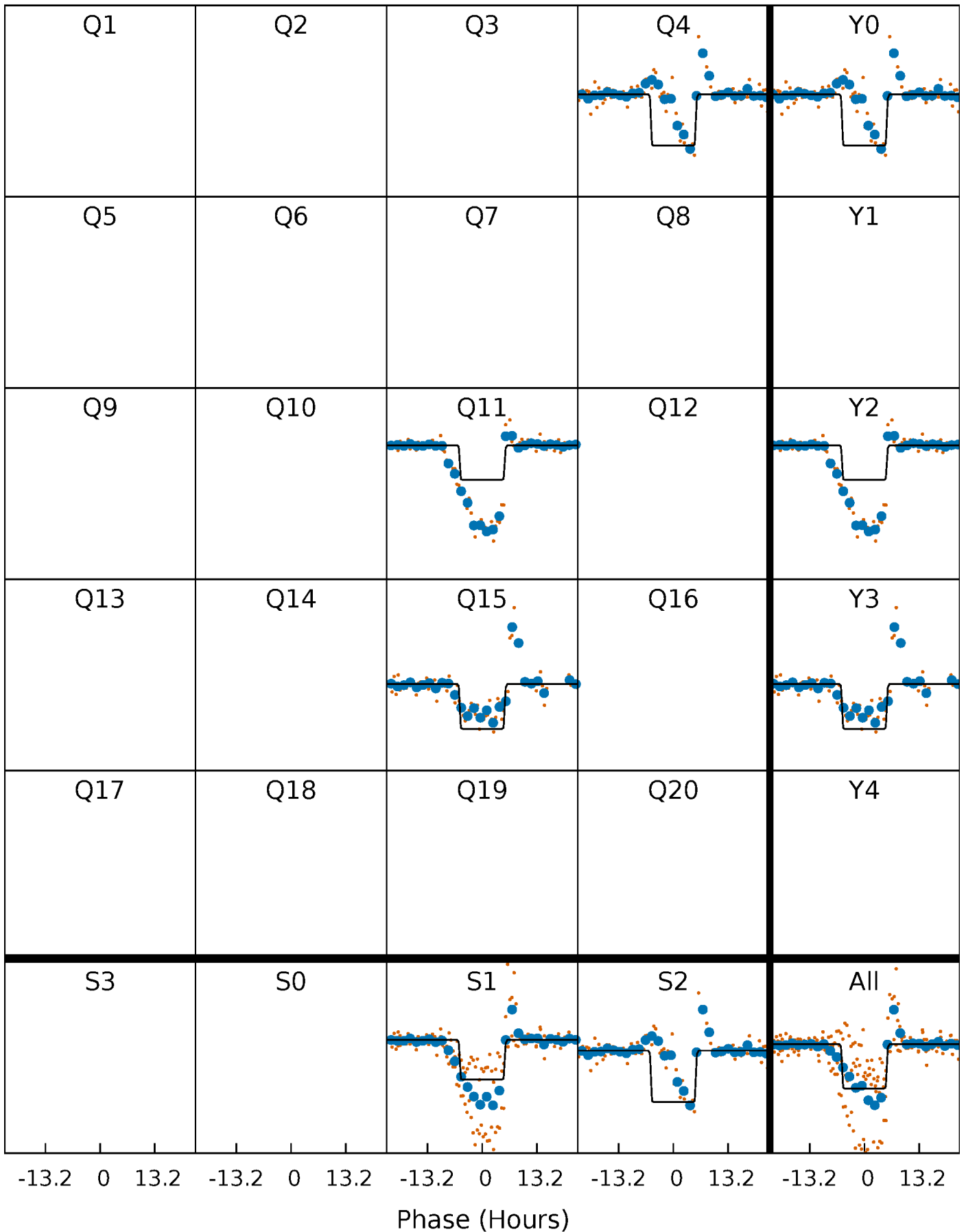
# DV Quarter-Phased Transit Curves

TCE 011516930-02     $P=334.334773$  Days     $T_0=389.094048$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

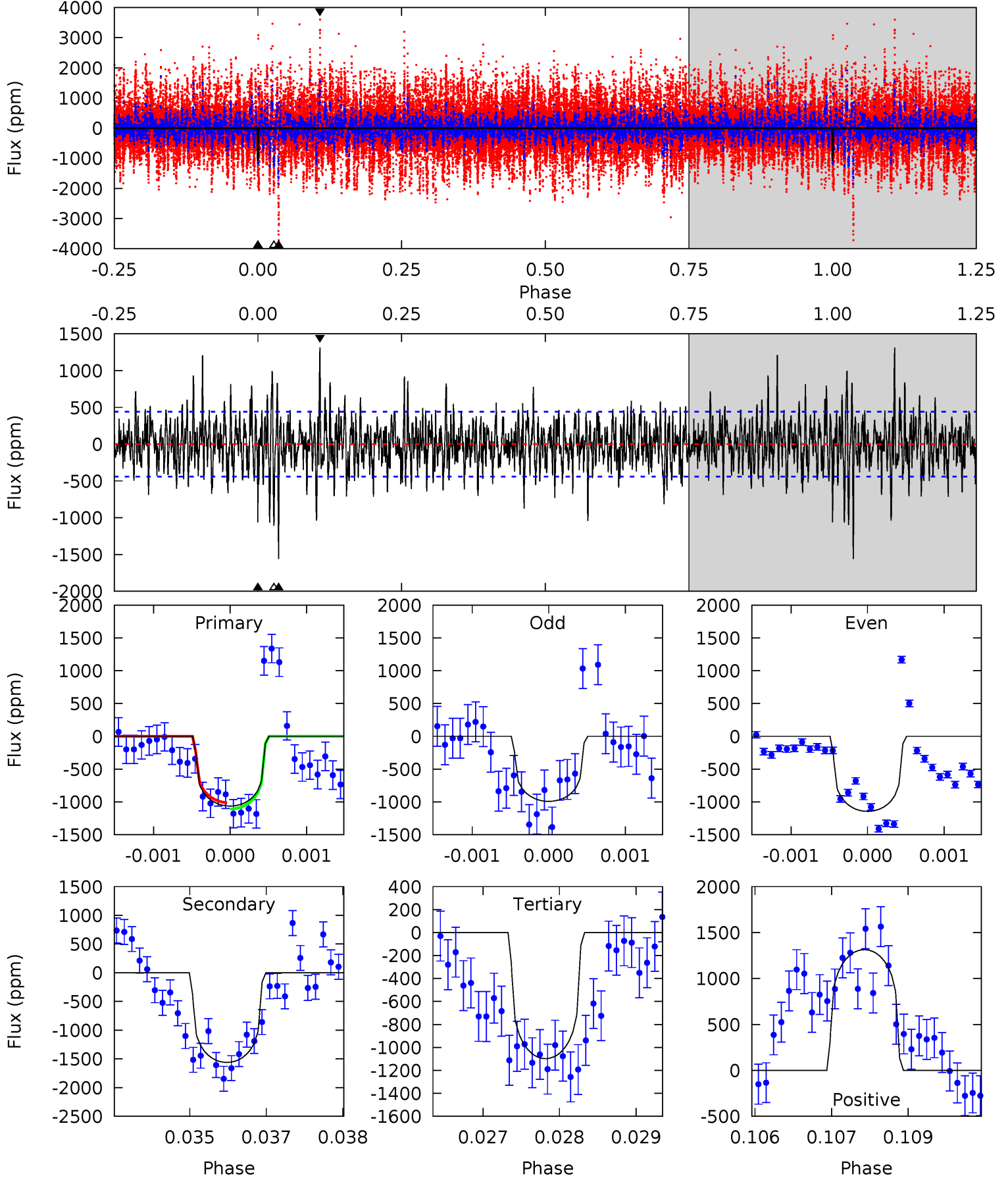
TCE 011516930-02     $P=334.313475$  Days     $T_0=389.067467$  (BKJD)



# DV Model-Shift Uniqueness Test

011516930-02,  $P = 334.334773$  Days,  $E = 54.759275$  Days

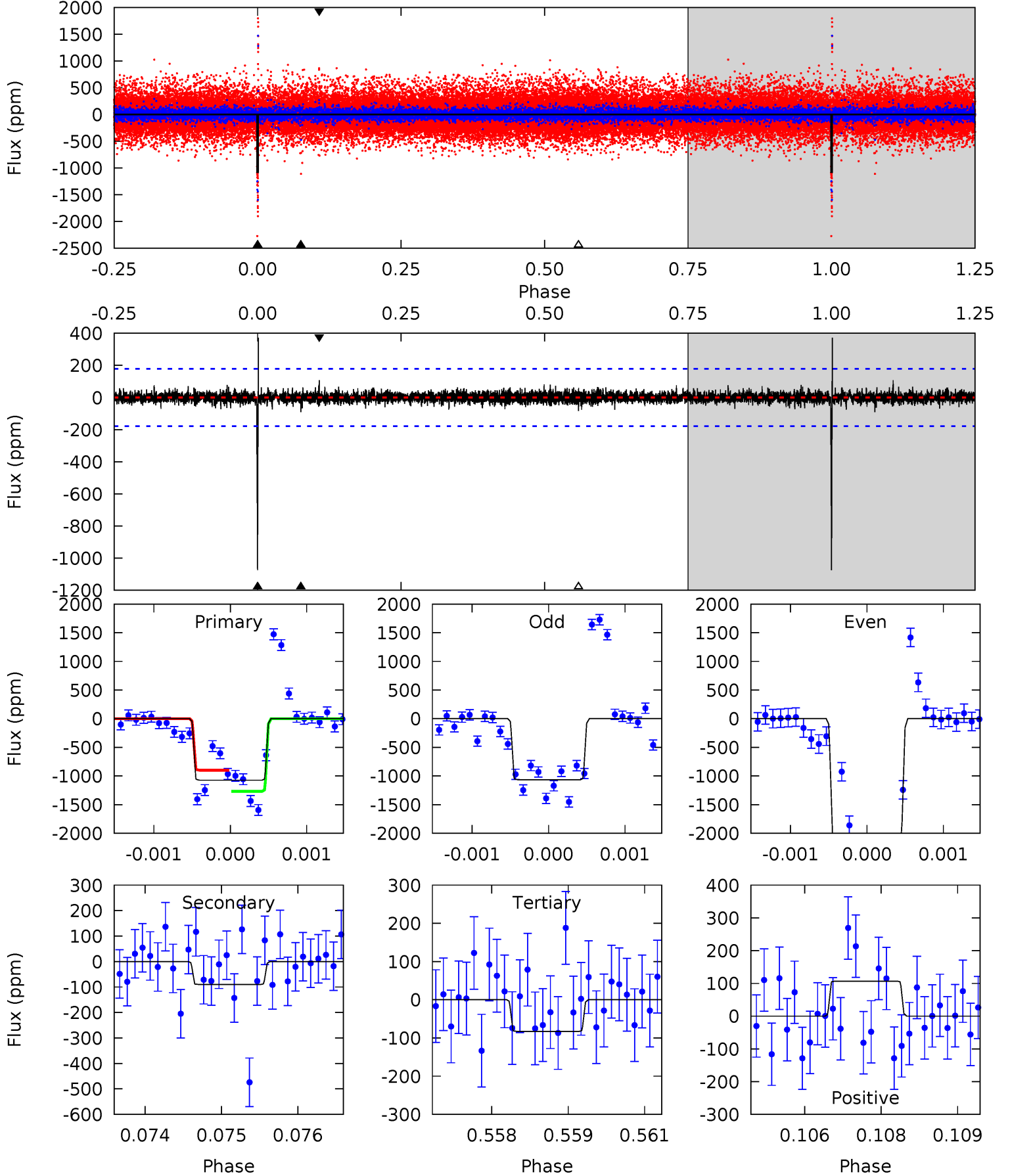
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
13.1	19.2	13.5	16.1	5.42	3.23	3.26	-0.42	-3.07	5.69	3.04	0.82	1.07	0.46	0.58



# Alt Model-Shift Uniqueness Test

011516930-02, P = 334.313475 Days, E = 54.753992 Days

Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
32.4	2.71	2.50	3.22	5.39	3.19	0.55	29.9	29.2	0.21	-0.52	19.3	1.59	0.26	5.50



### Stellar Parameters For KIC 011516930

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R$ ( $R_{\odot}$ )	$M$ ( $M_{\odot}$ )	$p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ )
	$5491^{+164}_{-164}$	$4.432^{+0.130}_{-0.222}$	$-0.300^{+0.350}_{-0.300}$	$0.887^{+0.235}_{-0.137}$	$0.776^{+0.126}_{-0.054}$	$1.566^{+0.991}_{-0.852}$
	+3%/-3%	+3%/-5%	+117%/-100%	+26%/-15%	+16%/-7%	+63%/-54%
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 011516930-02 / KOI

Detrend	Depth (ppm)	$R_p$ ( $R_{\oplus}$ )	$T_{max}$ (K)	$T_{obs}$ (K)	$A_{obs}$
DV	$-1561 \pm 81$	$3.10^{+1.15}_{-1.09}$	$347^{+27}_{-21}$	$6233^{+1637}_{-849}$	$69087^{+92656}_{-32613}$
Alt.	$-90 \pm 33$	$4.01^{+1.25}_{-1.06}$	$347^{+26}_{-21}$	$3223^{+365}_{-295}$	$2273^{+2265}_{-1174}$

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

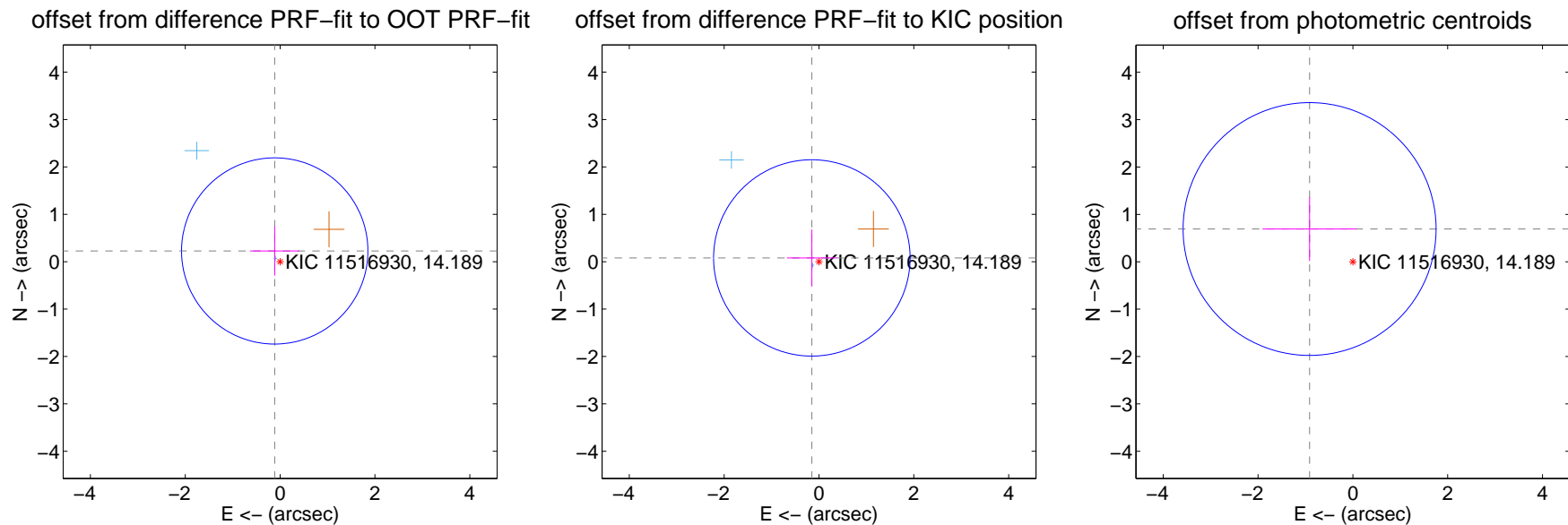
## DV Centroid Data

Supplemental centroid analysis for 011516930-02. Kepler magnitude: 14.19. Transit SNR 6.52

There are 2 quarters with good PRF difference image offsets

The direct PRF centroid is offset from the target star catalog position by about 0.22 arcsec

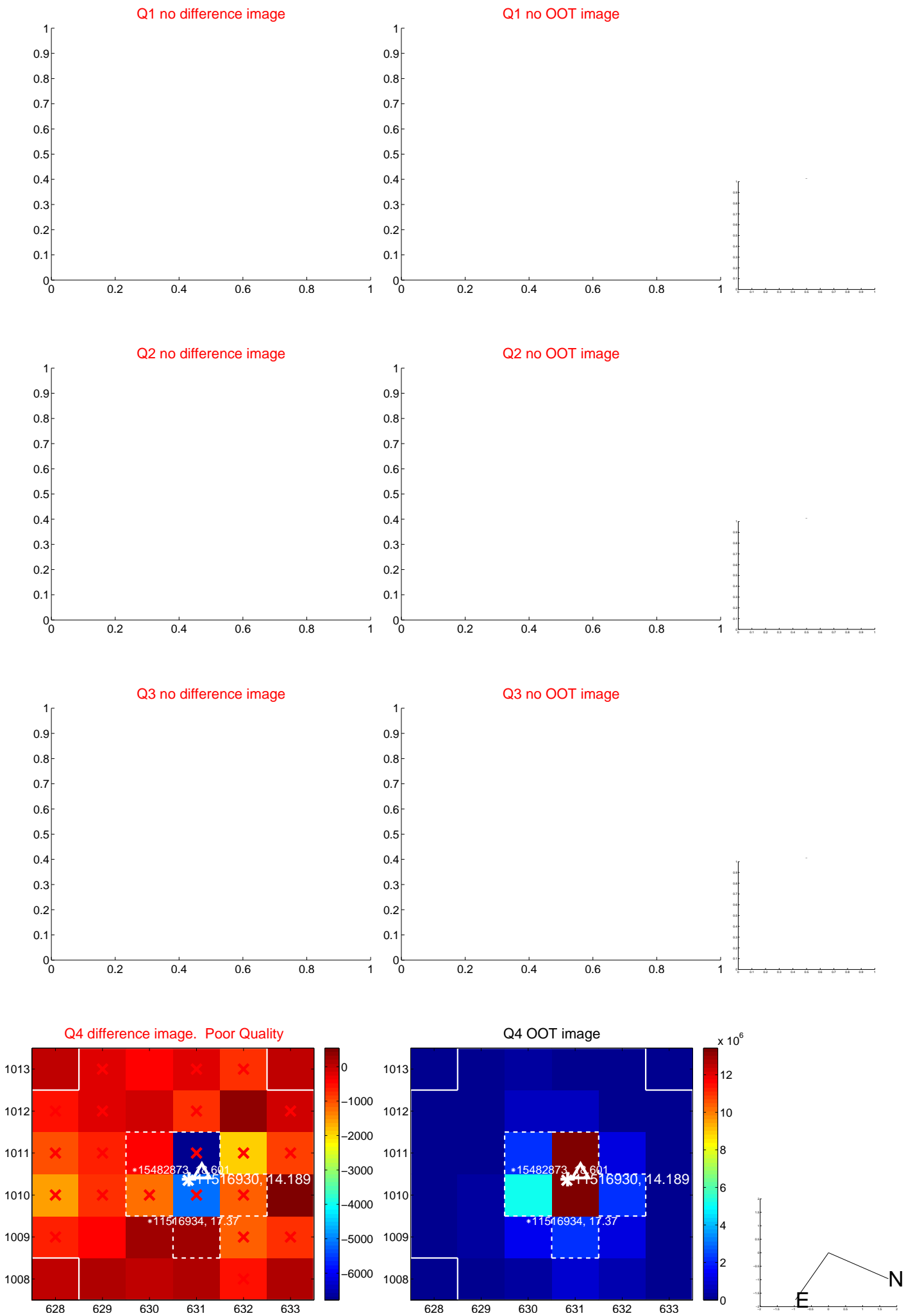
	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.253 \pm 0.655$	0.39	$0.114 \pm 0.522$	$0.227 \pm 0.521$
PRF-fit source offset from KIC position	$0.170 \pm 0.690$	0.25	$0.150 \pm 0.525$	$0.080 \pm 0.598$
photometric centroid source offset	$1.14 \pm 0.89$	1.29	$0.91 \pm 0.99$	$0.69 \pm 0.67$



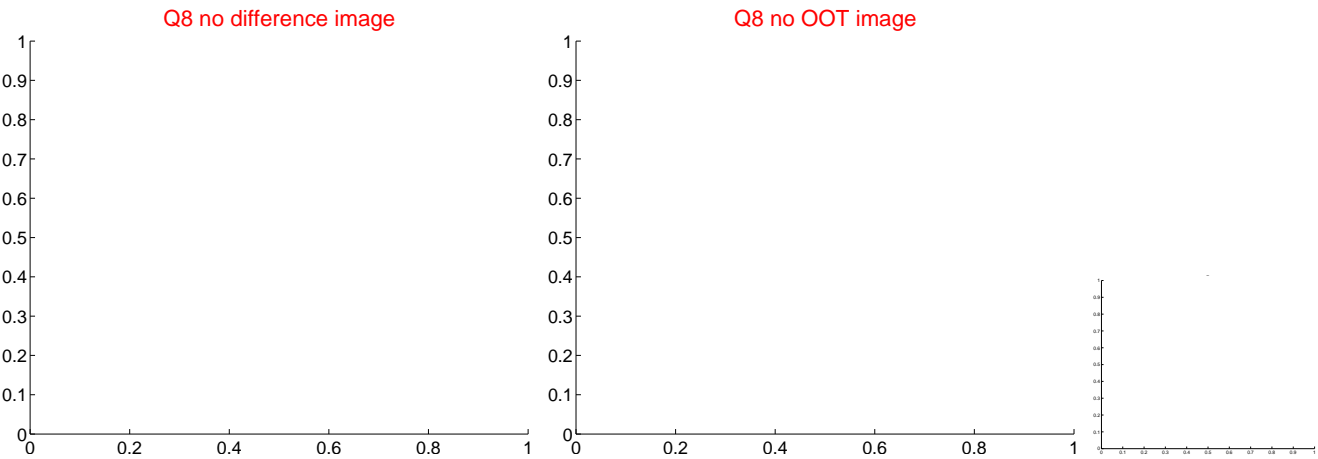
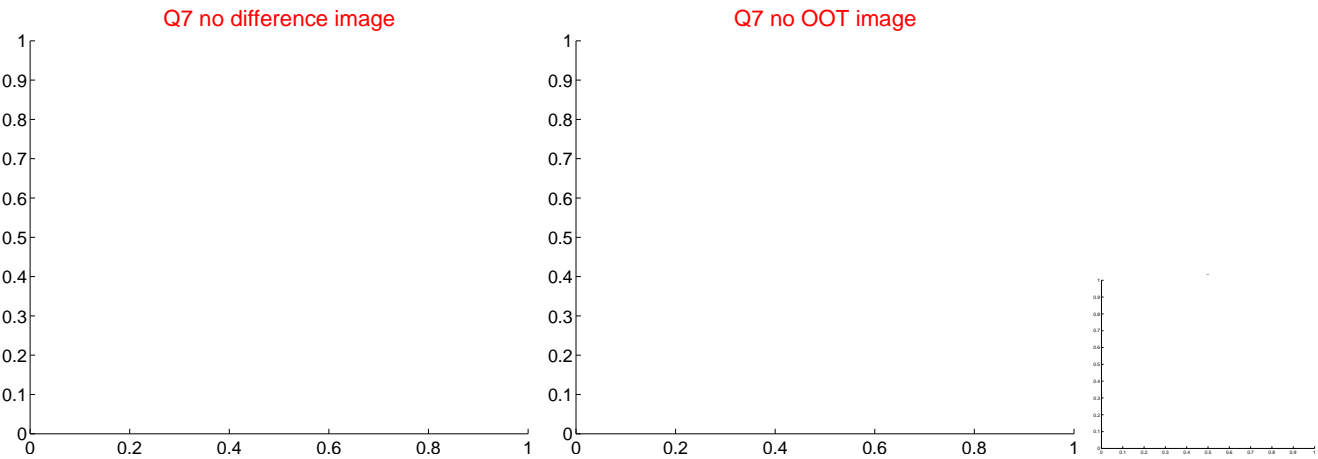
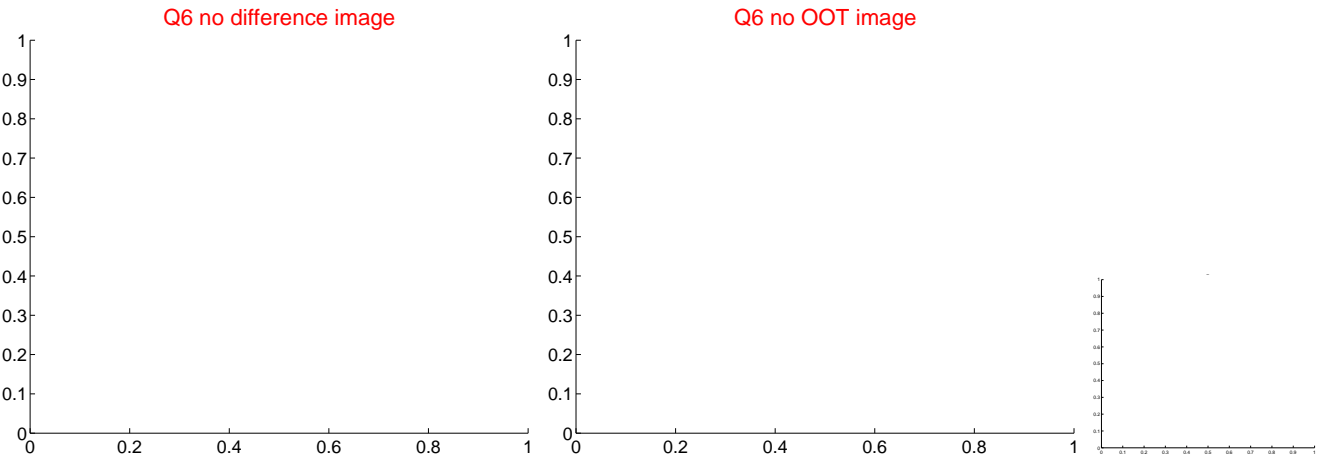
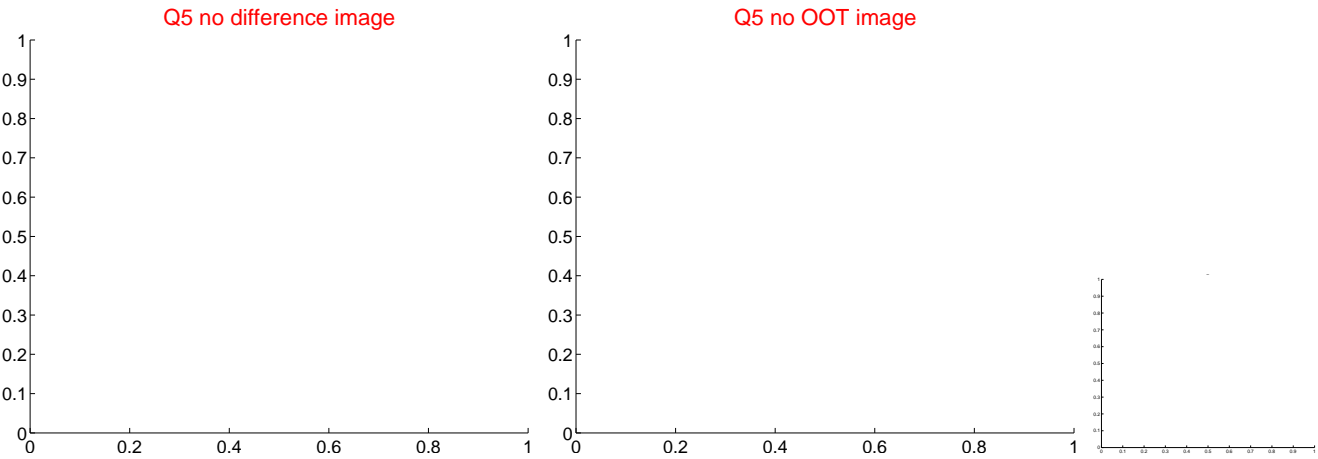
Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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



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

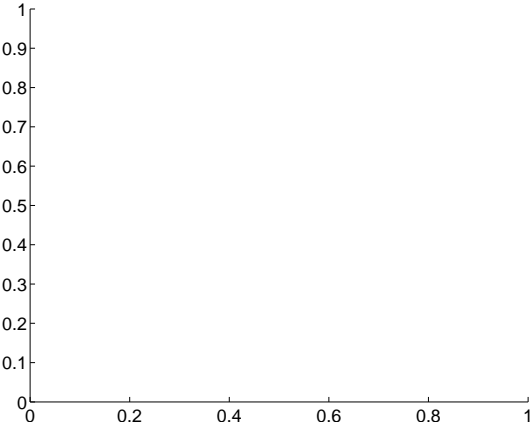


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

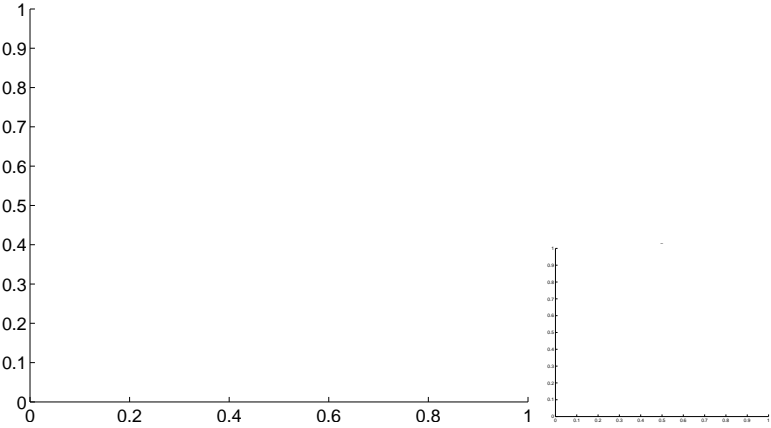


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

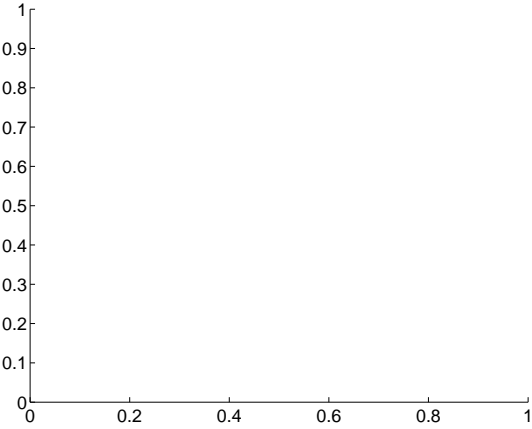
Q9 no difference image



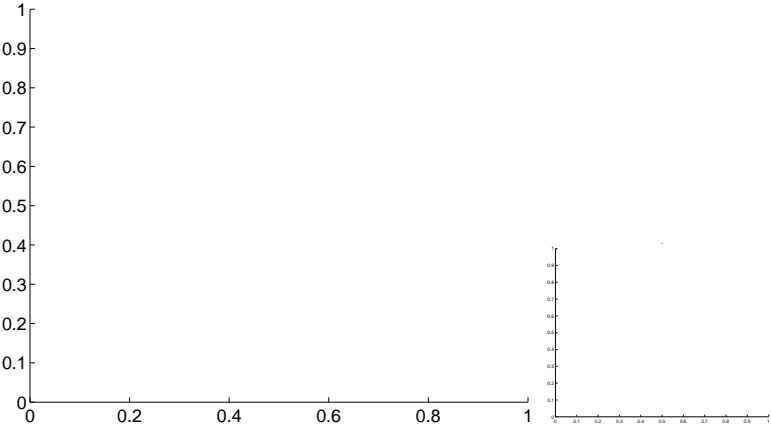
Q9 no OOT image



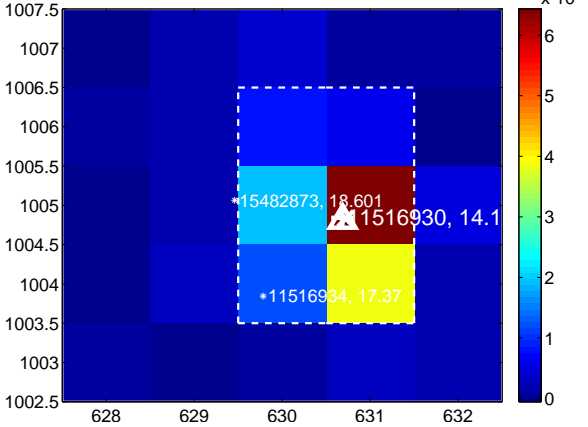
Q10 no difference image



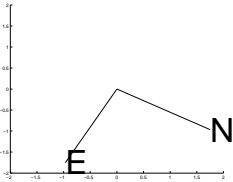
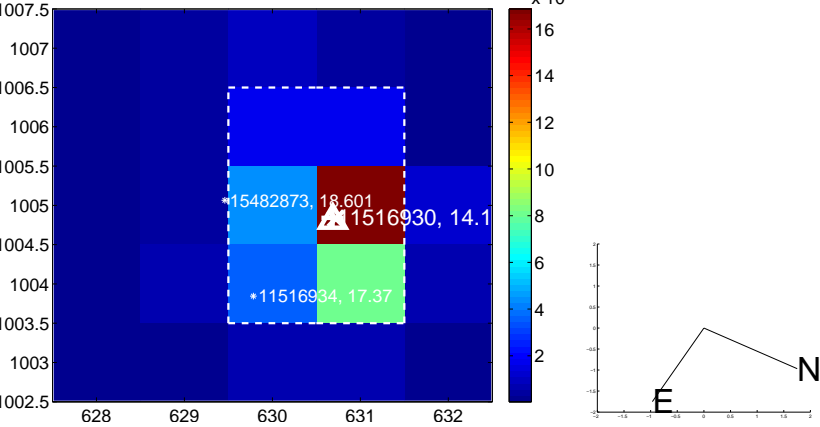
Q10 no OOT image



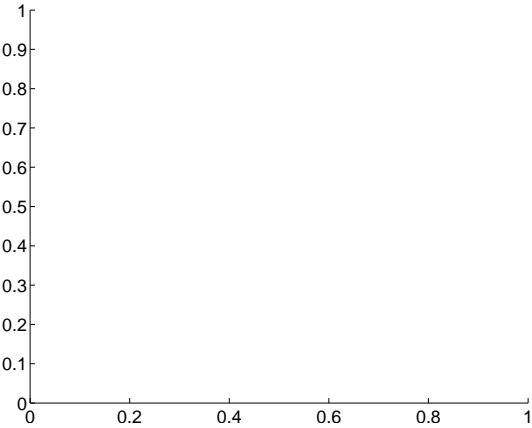
Q11 difference image



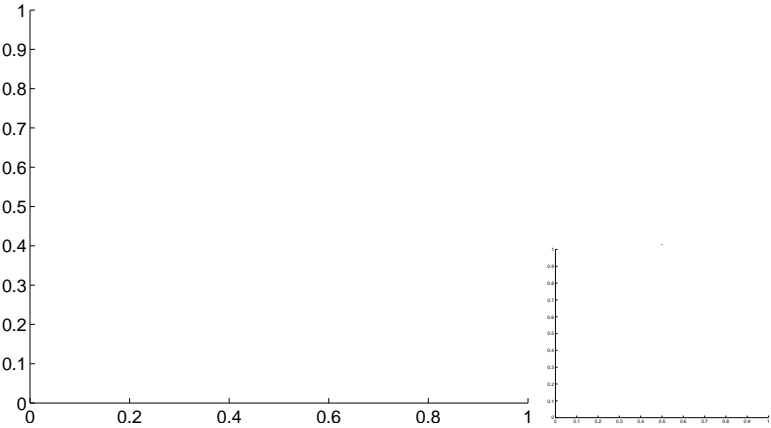
Q11 OOT image



Q12 no difference image

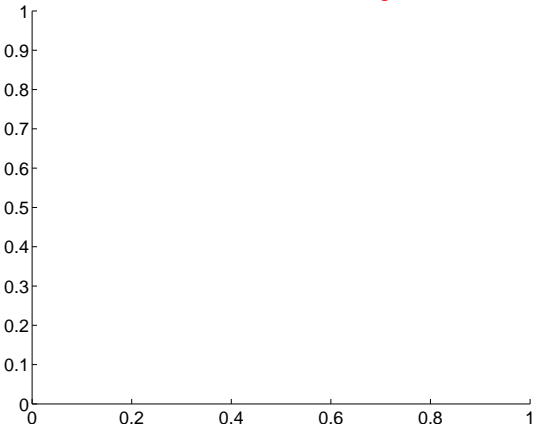


Q12 no OOT image

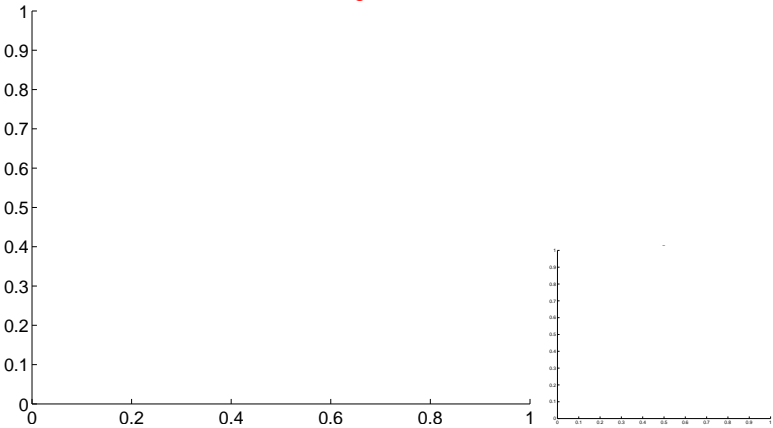


white ×: KIC target position; +: OOT centroid; △: difference centroid. red ✕: large negative pixel value.

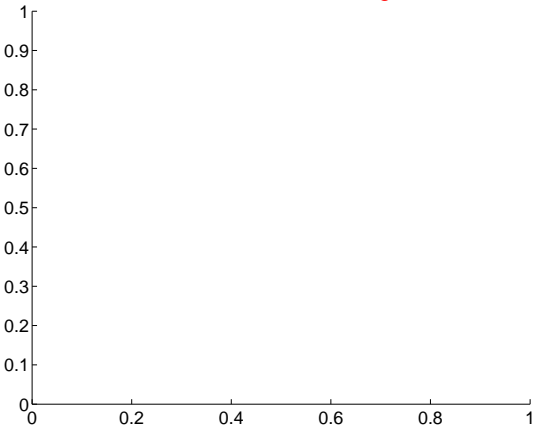
Q13 no difference image



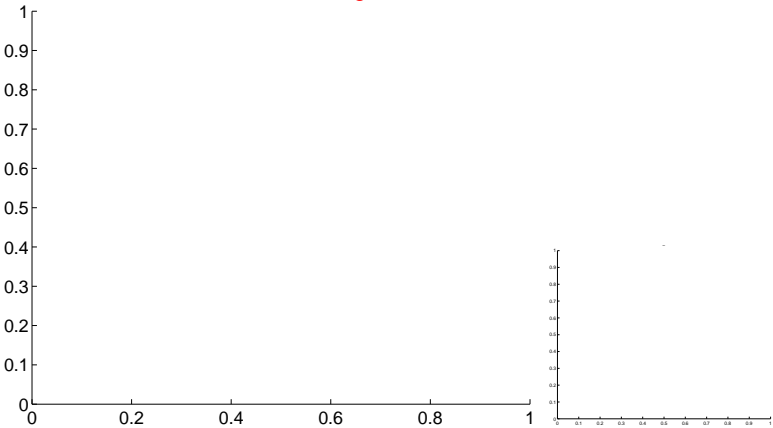
Q13 no OOT image



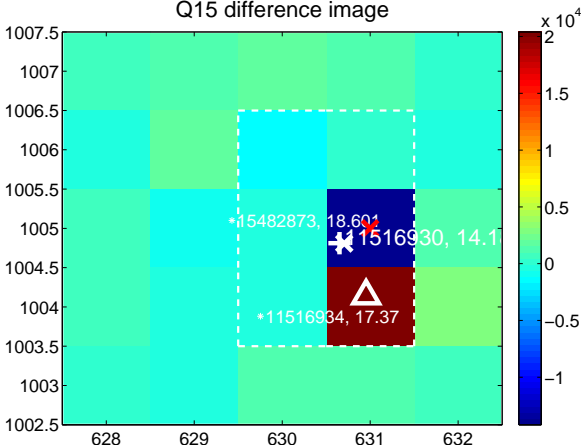
Q14 no difference image



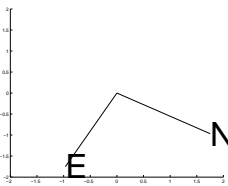
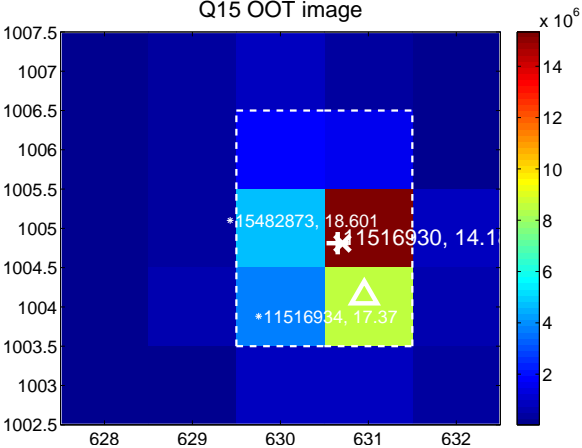
Q14 no OOT image



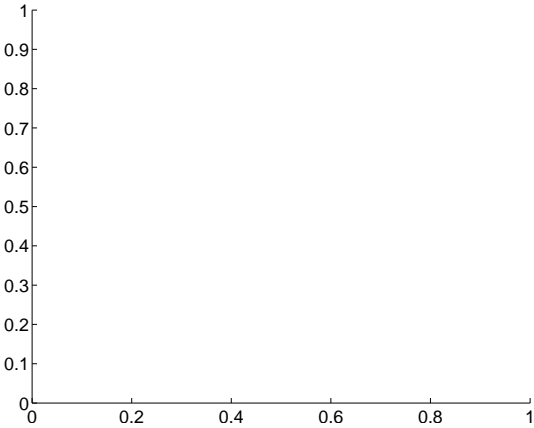
Q15 difference image



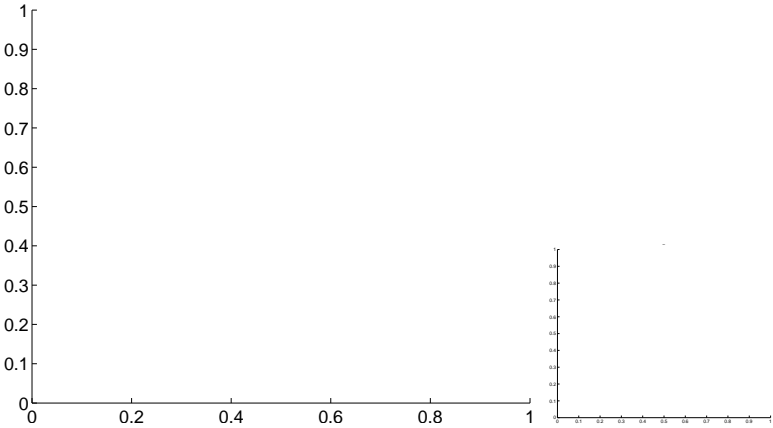
Q15 OOT image



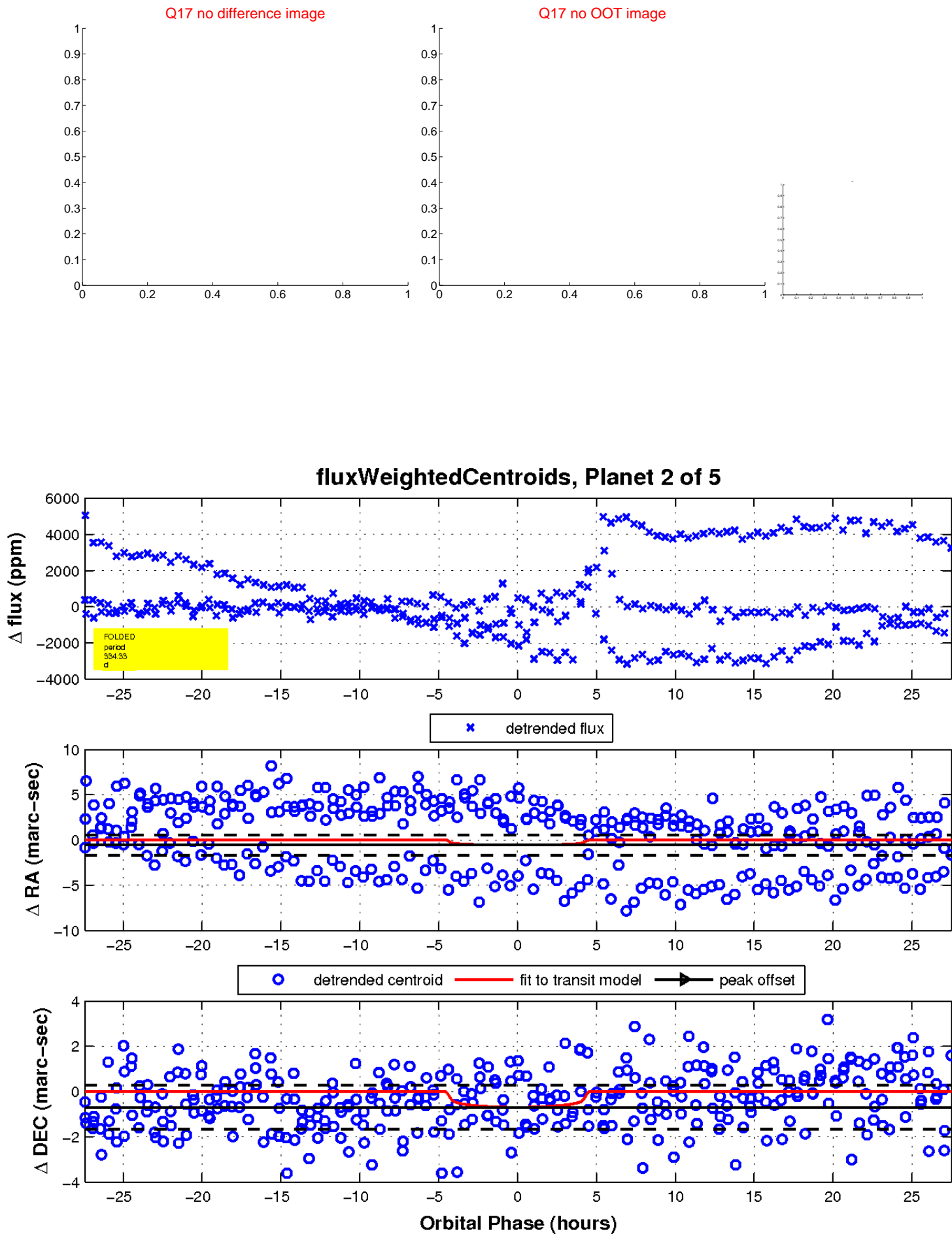
Q16 no difference image



Q16 no OOT image

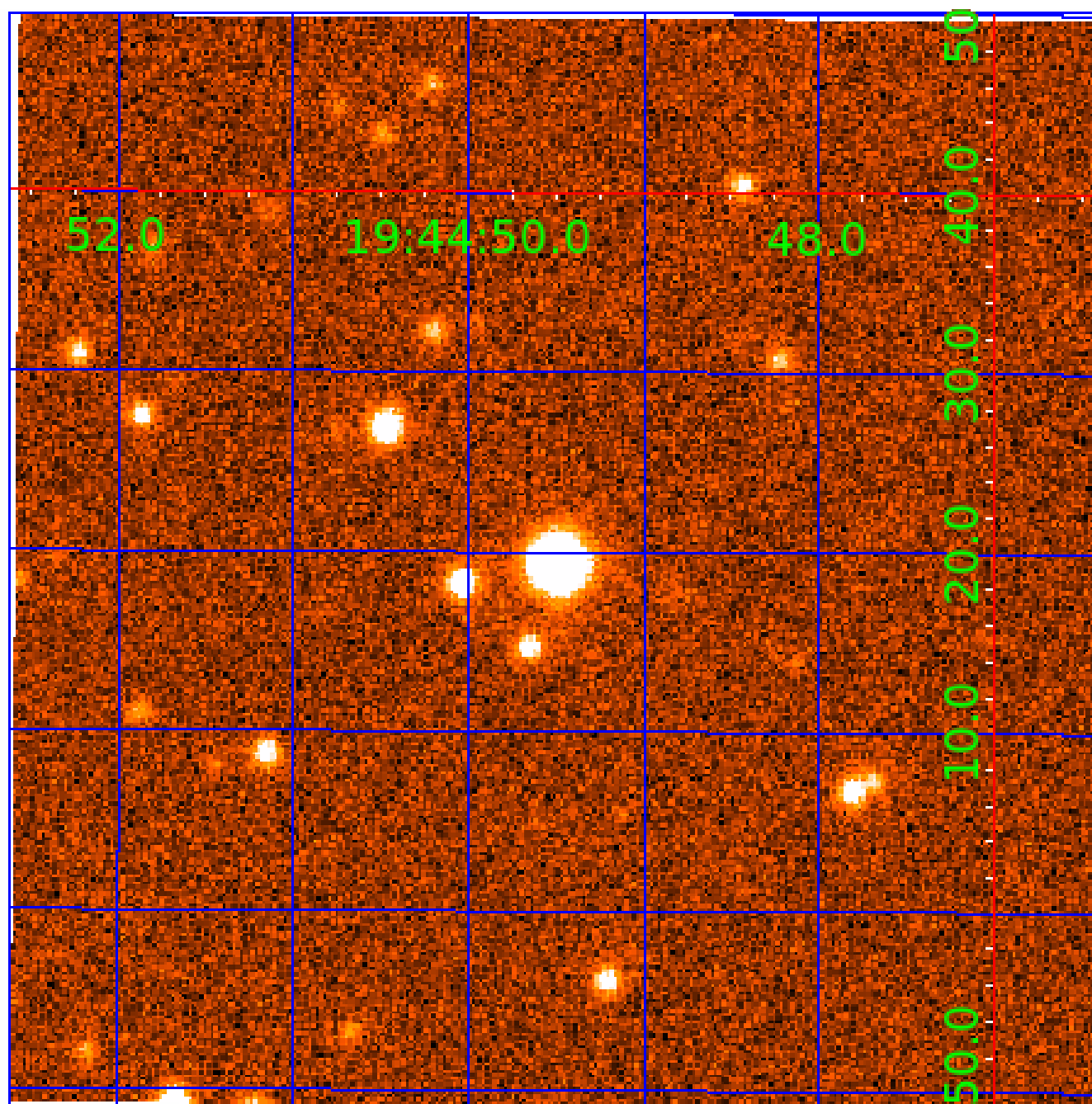


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination





# KIC 011516930

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
011516930-01	OBS	6240.01	4.768569	133.859655	320.6	1.171	15.9	21.0	0.89	5491	1.88	246.75
011516930-02	OBS	No	334.334773	389.094048	1055.6	9.177	15.4	6.5	0.89	5491	3.04	0.85
011516930-03	OBS	No	415.235829	202.527424	357.8	1.067	11.7	2.2	0.89	5491	1.76	0.64
011516930-05	OBS	No	335.431615	311.793866	825.8	2.872	10.8	6.7	0.89	5491	2.79	0.85

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
011516930-01	OBS	FP	0.00	0	1	1	0	MOD_SEC_DV—MOD_SEC_ALT—CENT_UNRESOLVED_OFFSET—HALO_GHOST
011516930-02	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—CENT_FEW_DIFFS
011516930-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_MARSHALL_TRACKER—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—CENT_FEW_DIFFS
011516930-05	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—ALL_TRANS_CHASES—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—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.

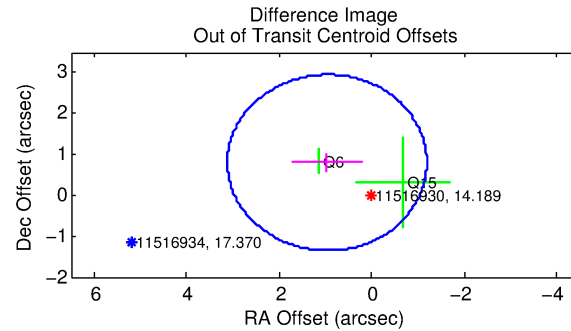
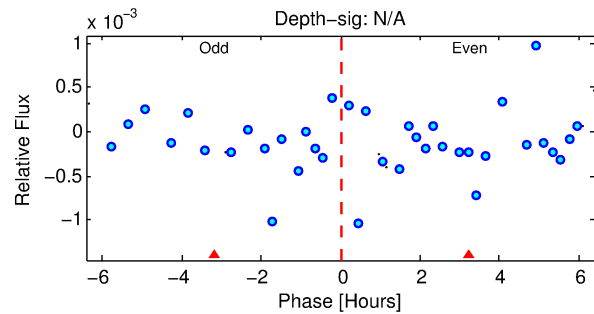
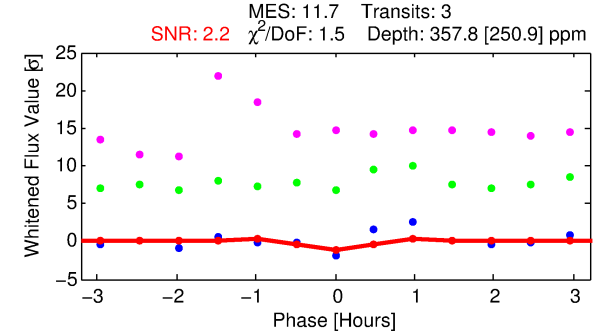
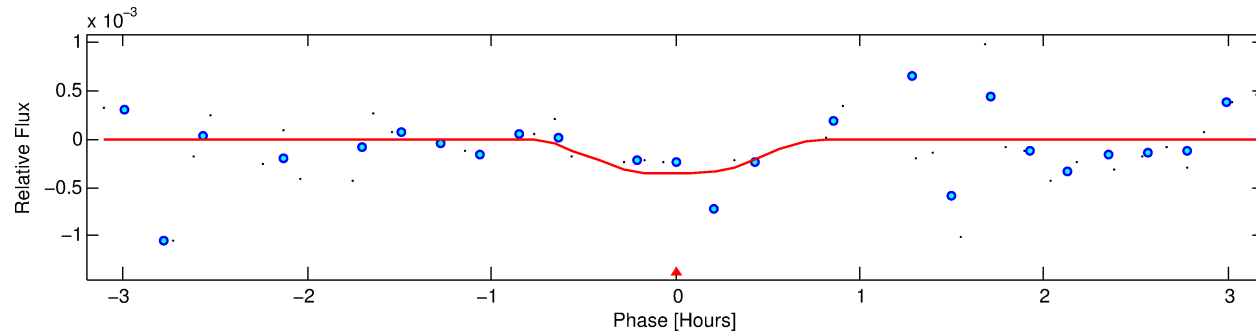
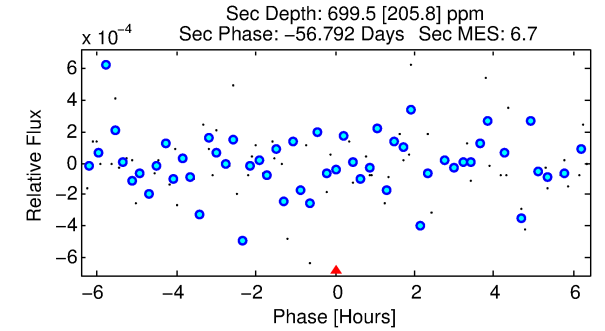
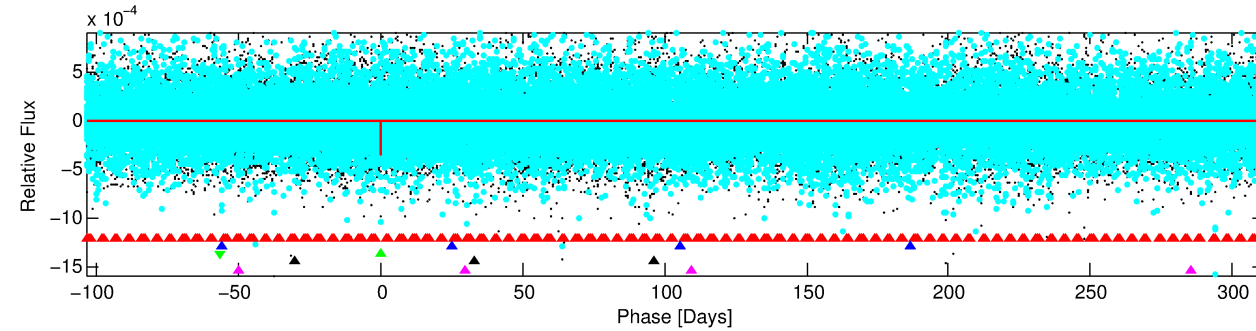
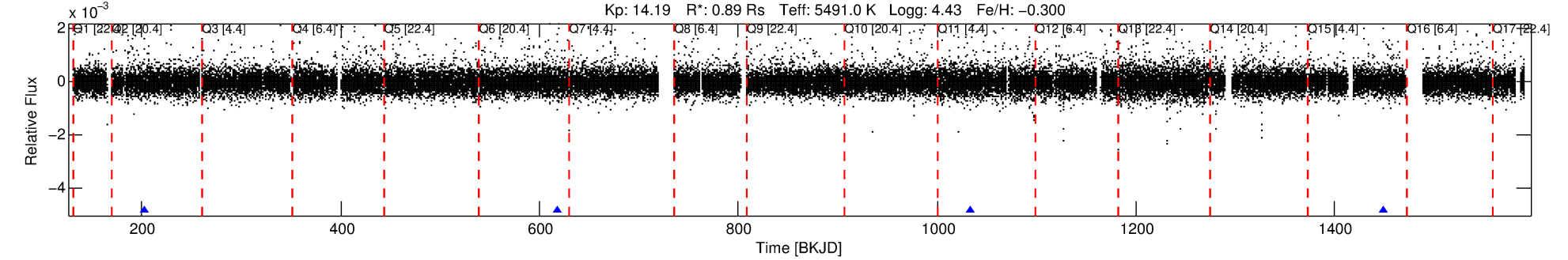
## Ephemeris Match Information For 011516930-03

No Significant Match Found

# DV One-Page Summary

KIC: 11516930 Candidate: 3 of 5 Period: 415.236 d  
KOI: K06240 Corr: No Ephemeris Match

Kp: 14.19 R\*: 0.89 Rs Teff: 5491.0 K Logg: 4.43 Fe/H: -0.300



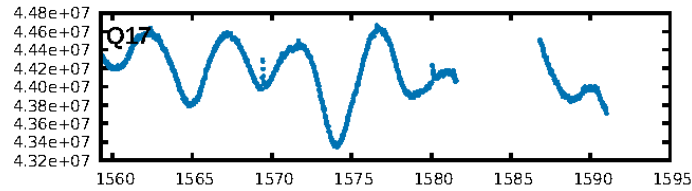
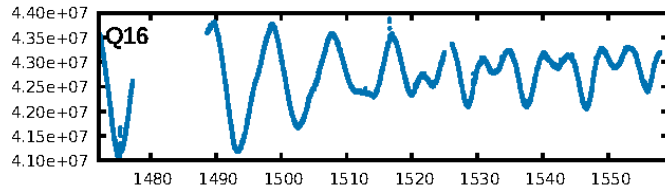
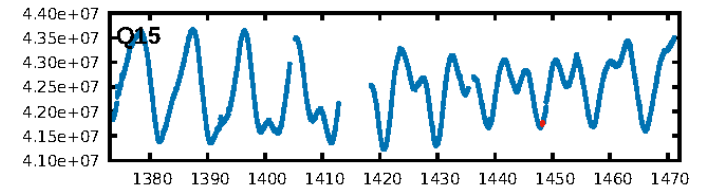
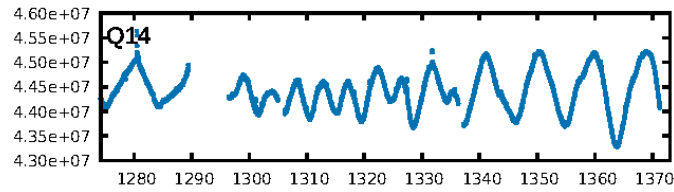
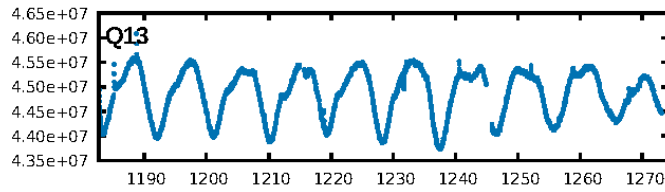
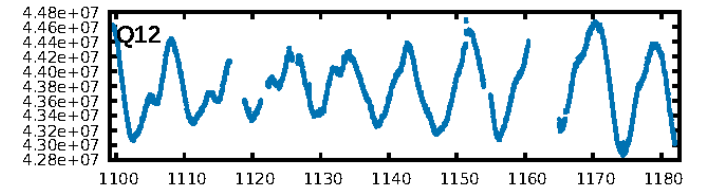
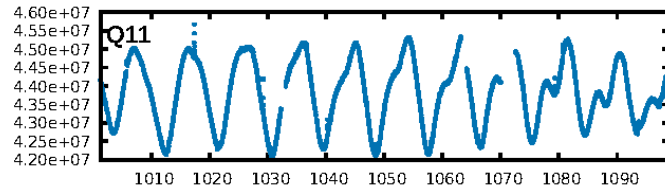
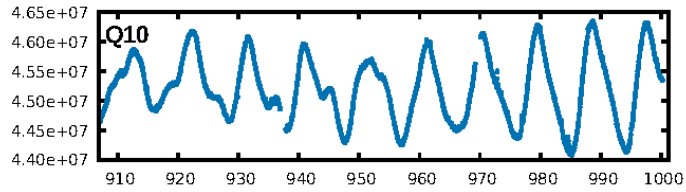
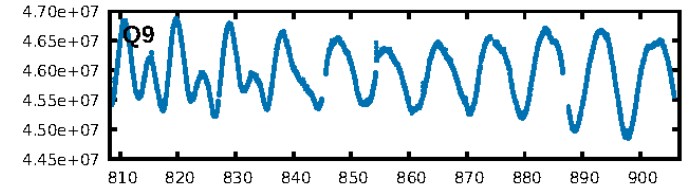
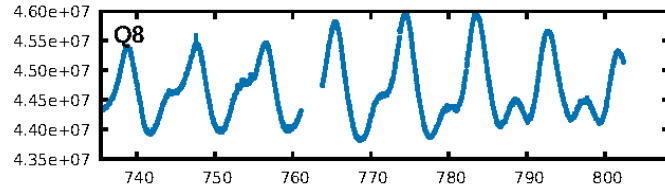
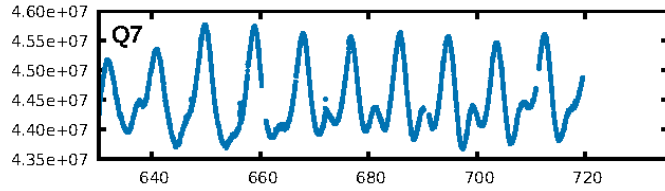
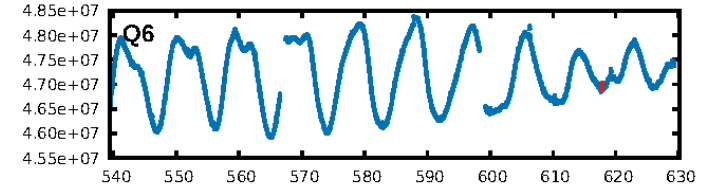
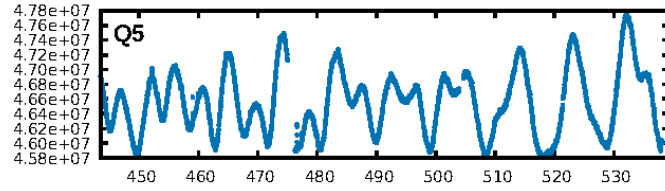
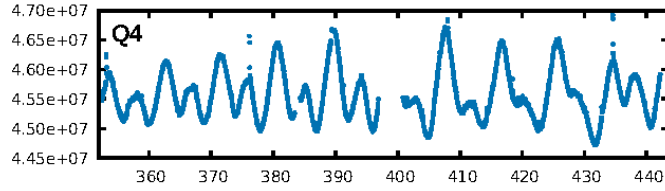
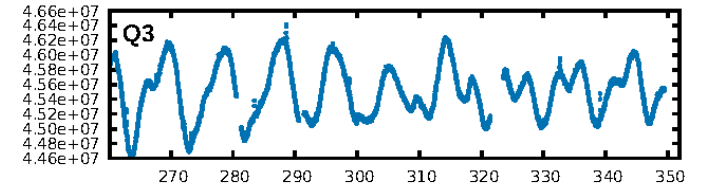
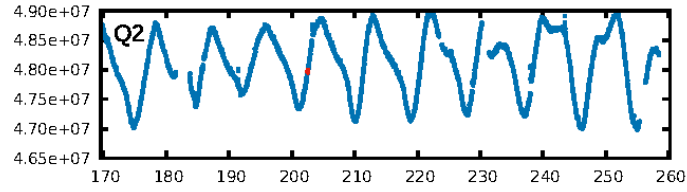
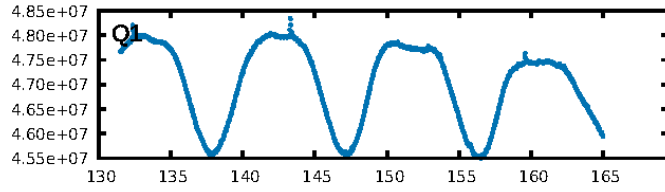
## DV Fit Results:

Period = 415.23583 [0.00700] d  
Epoch = 202.5274 [0.0155] BKJD  
Rp/R\* = 0.0182 [0.1185]  
a/R\* = 2448.88 [65472.93]  
b = 0.60 [29.11]  
Seff = 0.64 [0.26]  
Teq = 228 [23] K  
Rp = 1.76 [11.48] Re  
a = 1.0012 [0.2457] AU  
Ag = 124103.58 [1615715.98] [0.08]  
Teffp = 6617 [21528] K [0.30]

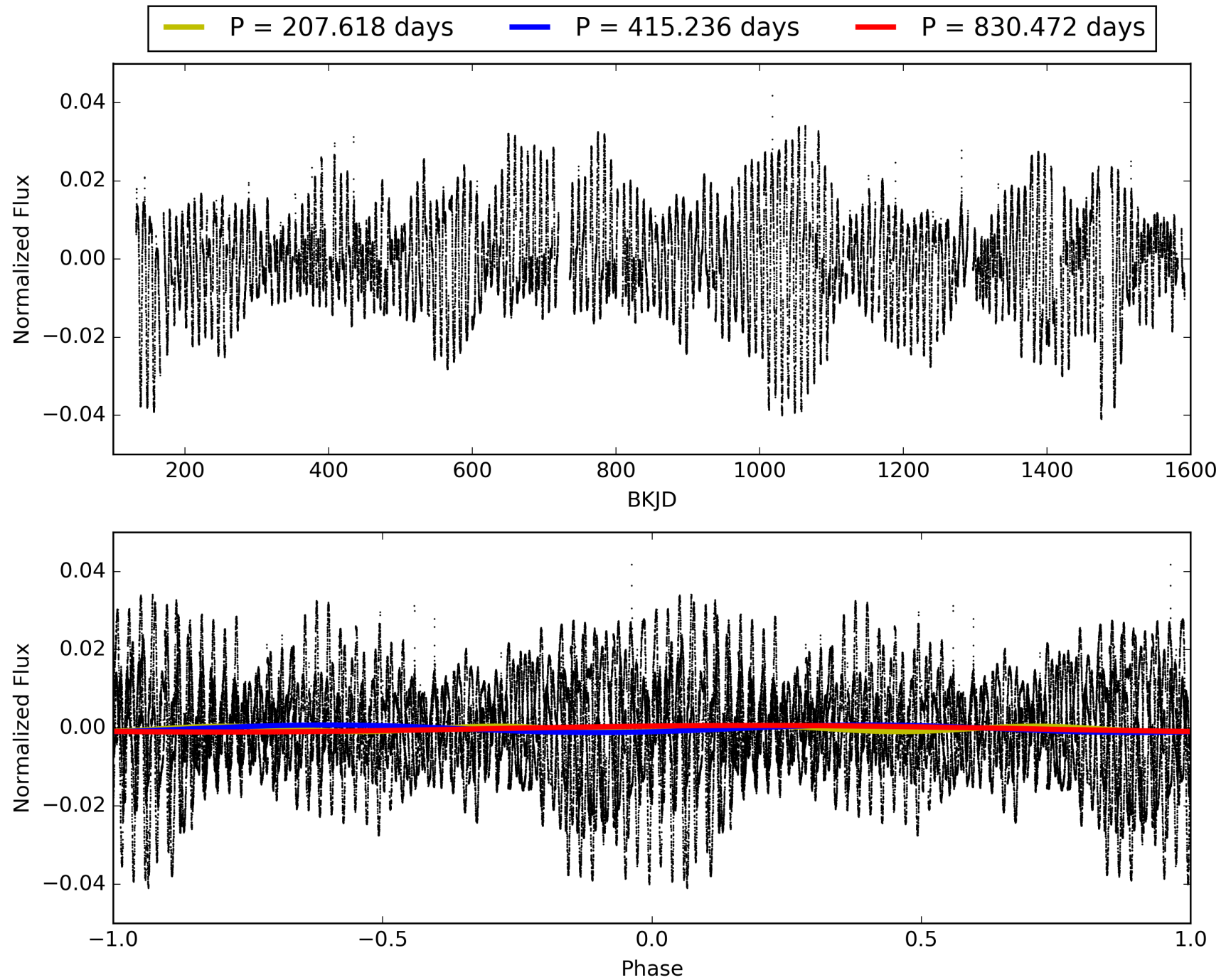
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [625.09]  
LongPeriod-sig: 100.0% [420.05]  
ModelChiSquare2-sig: 16.8%  
ModelChiSquareGof-sig: 94.7%  
**Bootstrap-pfa: 9.13e-10**  
RollingBand-fgt: 1.00 [3/3]  
GhostDiagnostic-chr: 1.346  
Centroid-sig: 80.2%  
Centroid-so: 1.600 arcsec [0.32]  
OotOffset-rm: 1.251 arcsec [1.74]  
KicOffset-rm: 1.336 arcsec [1.72]  
OotOffset-st: 1/1/0/0 [2]  
KicOffset-st: 1/1/0/0 [2]  
DiffImageQuality-fgm: 1.00 [2/2]  
DiffImageOverlap-fno: 1.00 [3/3]

# TCE 011516930-03, PDC Light Curves

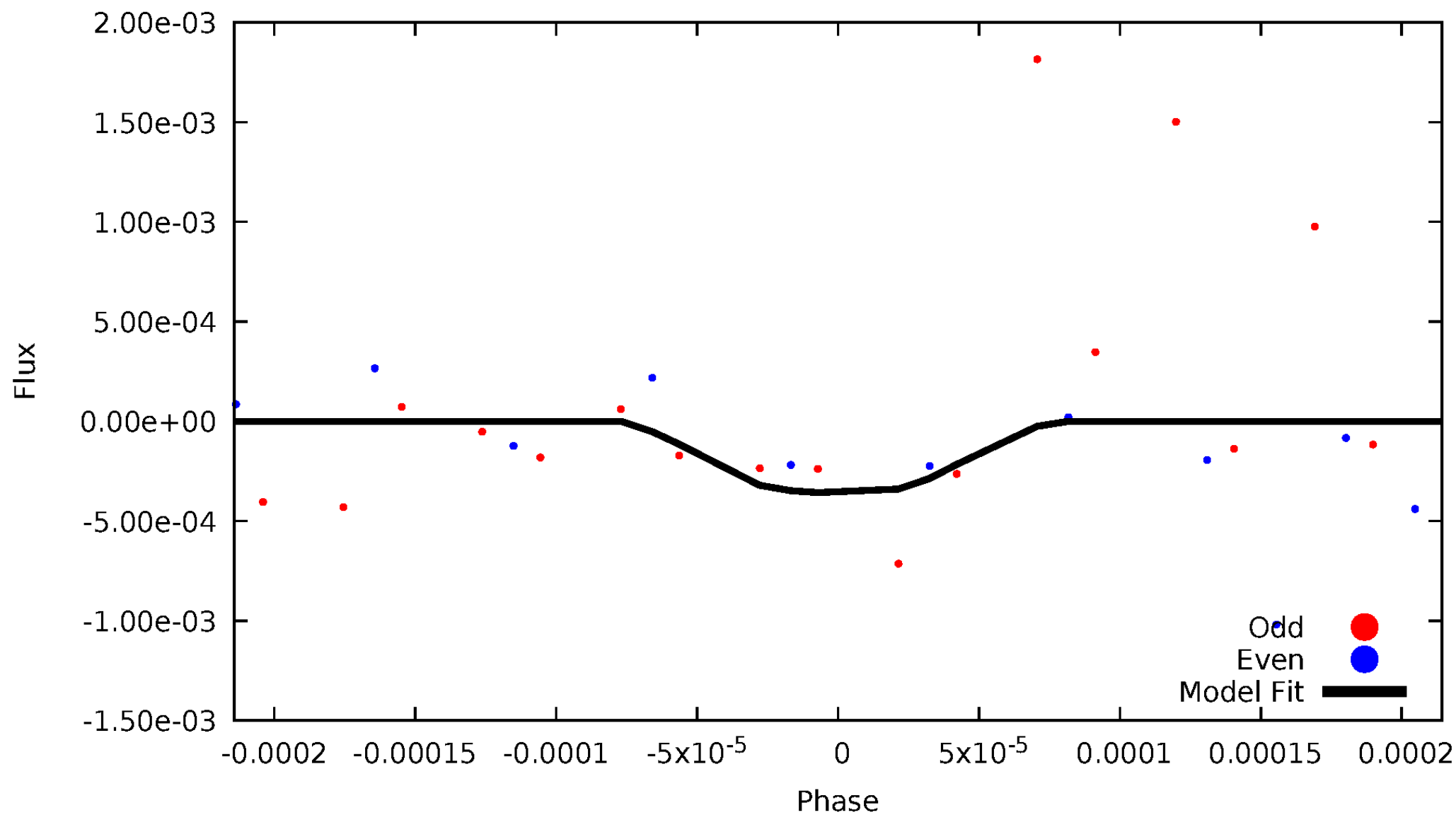


TCE 011516930-03



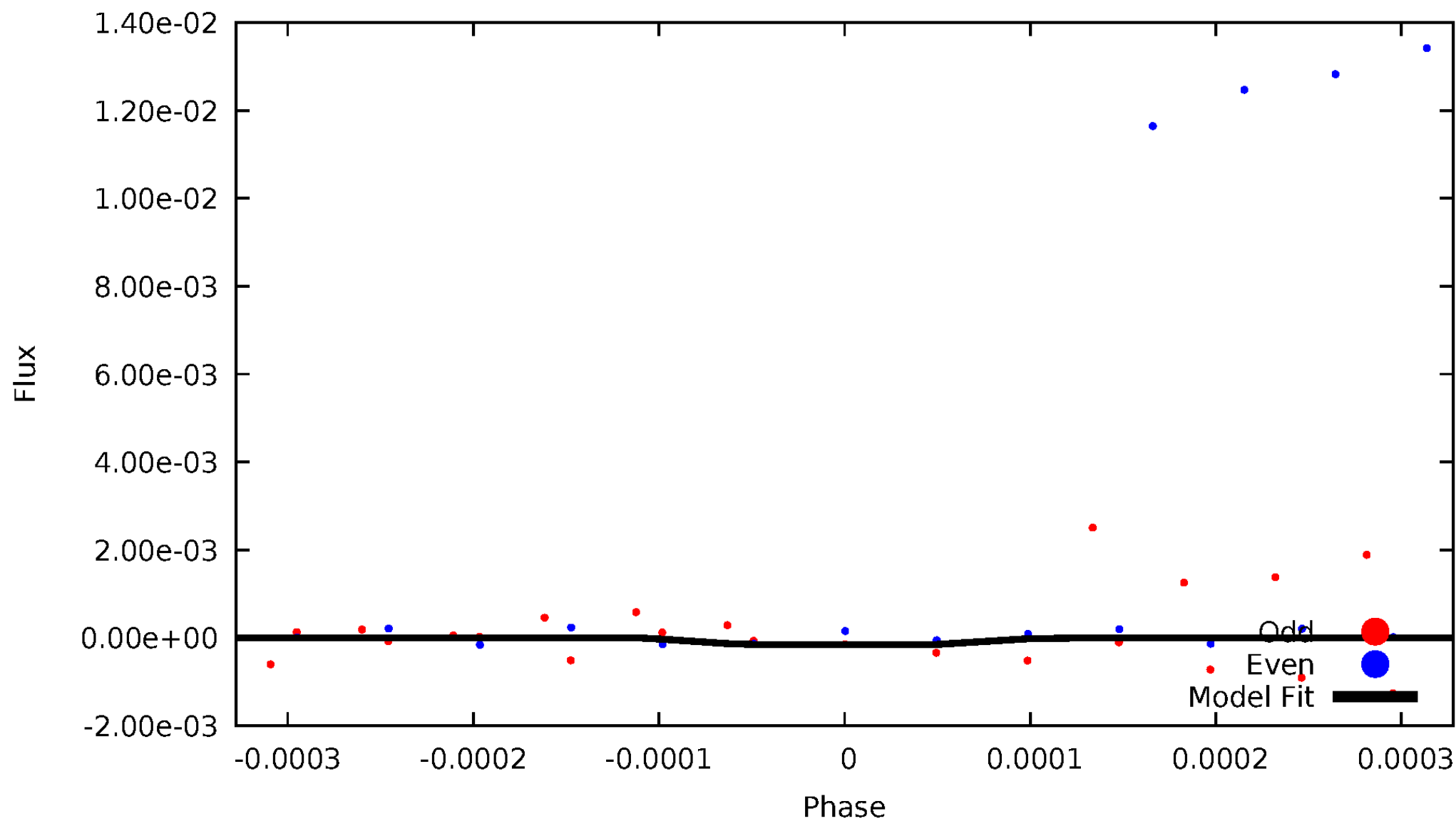
# DV Odd/Even

TCE 011516930-03



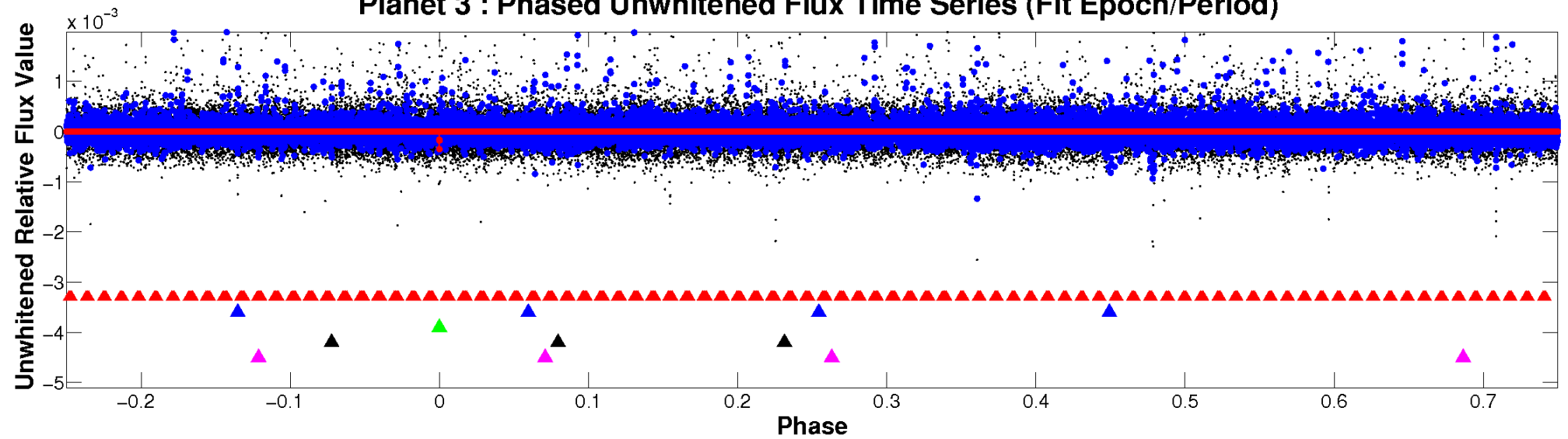
# ALT Odd/Even

TCE 011516930-03

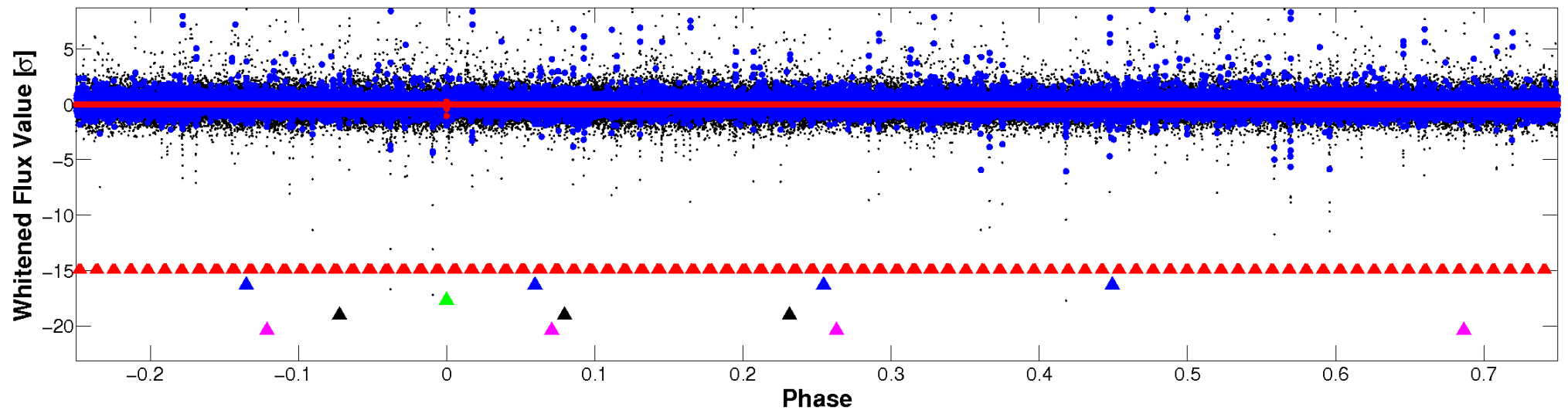


# Non-Whitened Vs. Whitened Light Curve

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

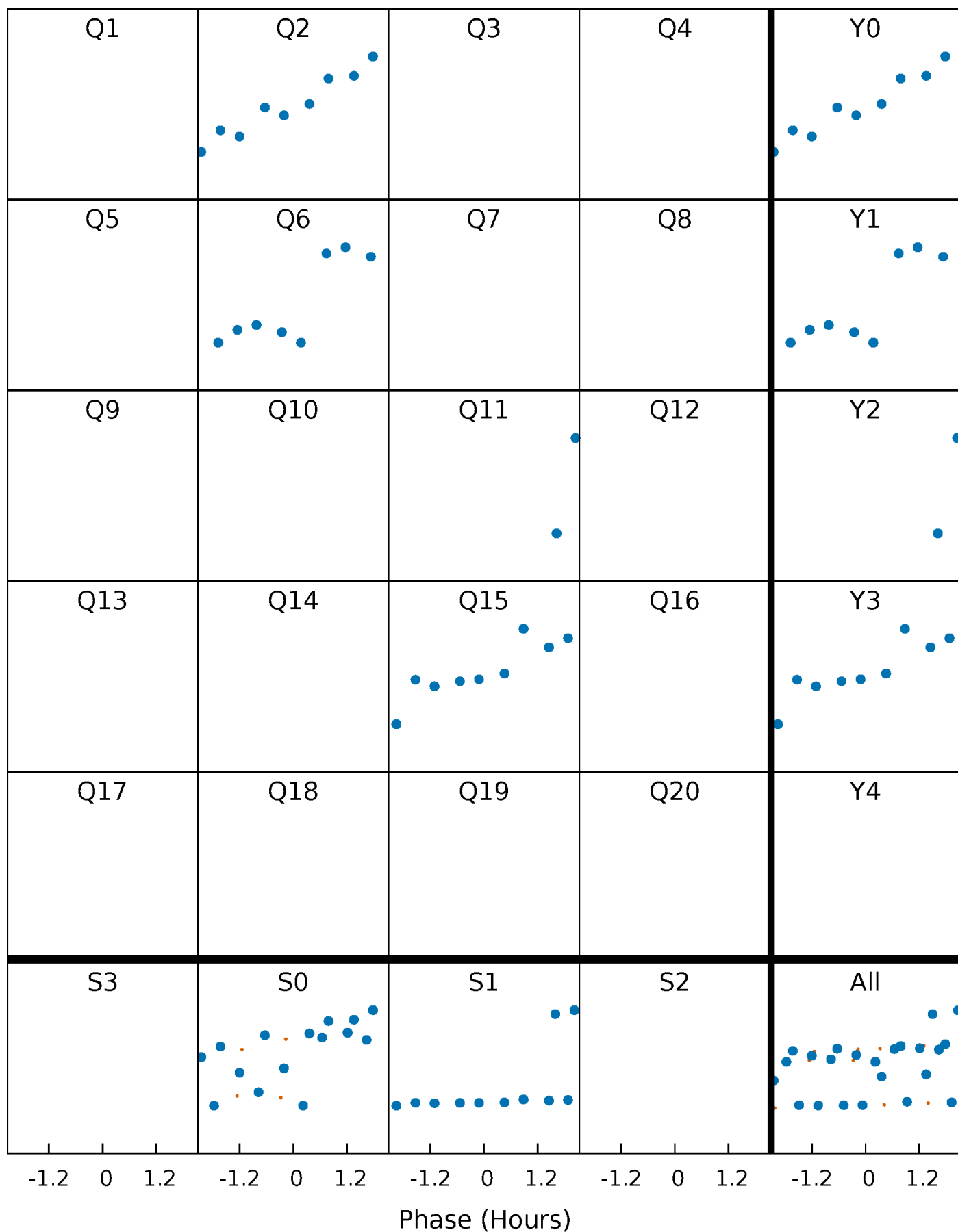


## Planet 3 : Phased Whitened Flux Time Series (Fit Epoch/Period)



# PDC Quarter-Phased Transit Curves

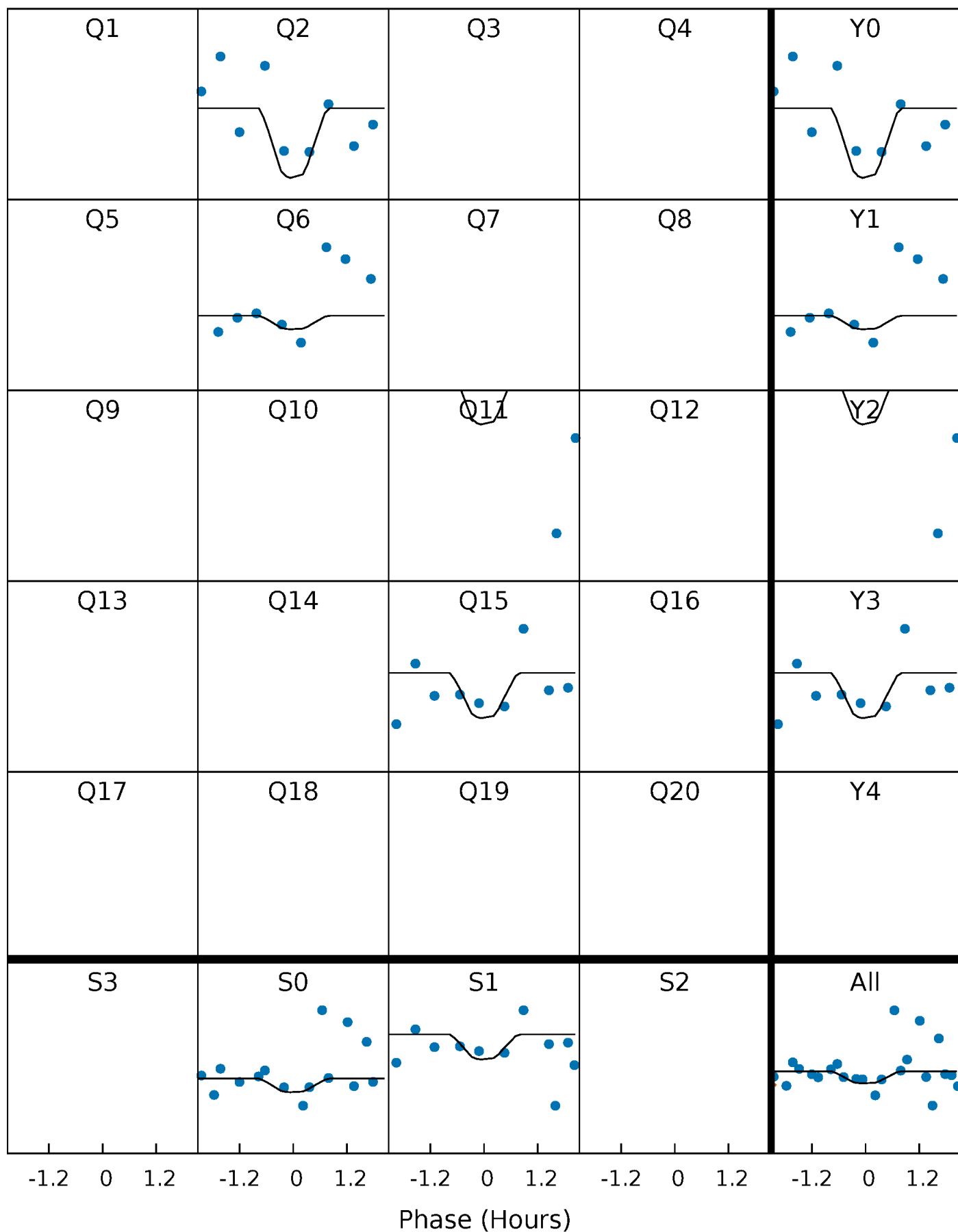
TCE 011516930-03 P=415.235829 Days  $T_0=202.527424$  (BKJD)





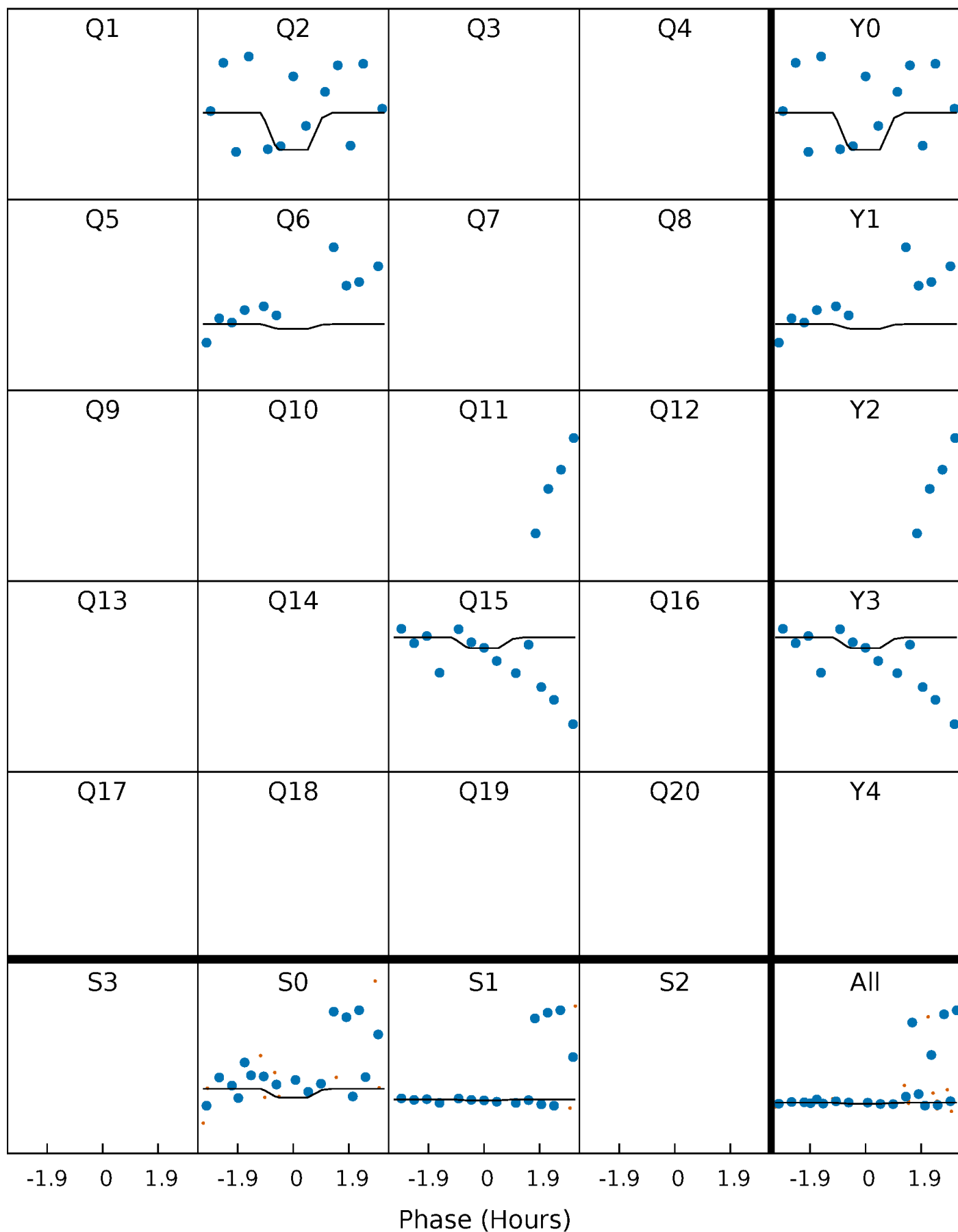
# DV Quarter-Phased Transit Curves

TCE 011516930-03 P=415.235829 Days  $T_0=202.527424$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

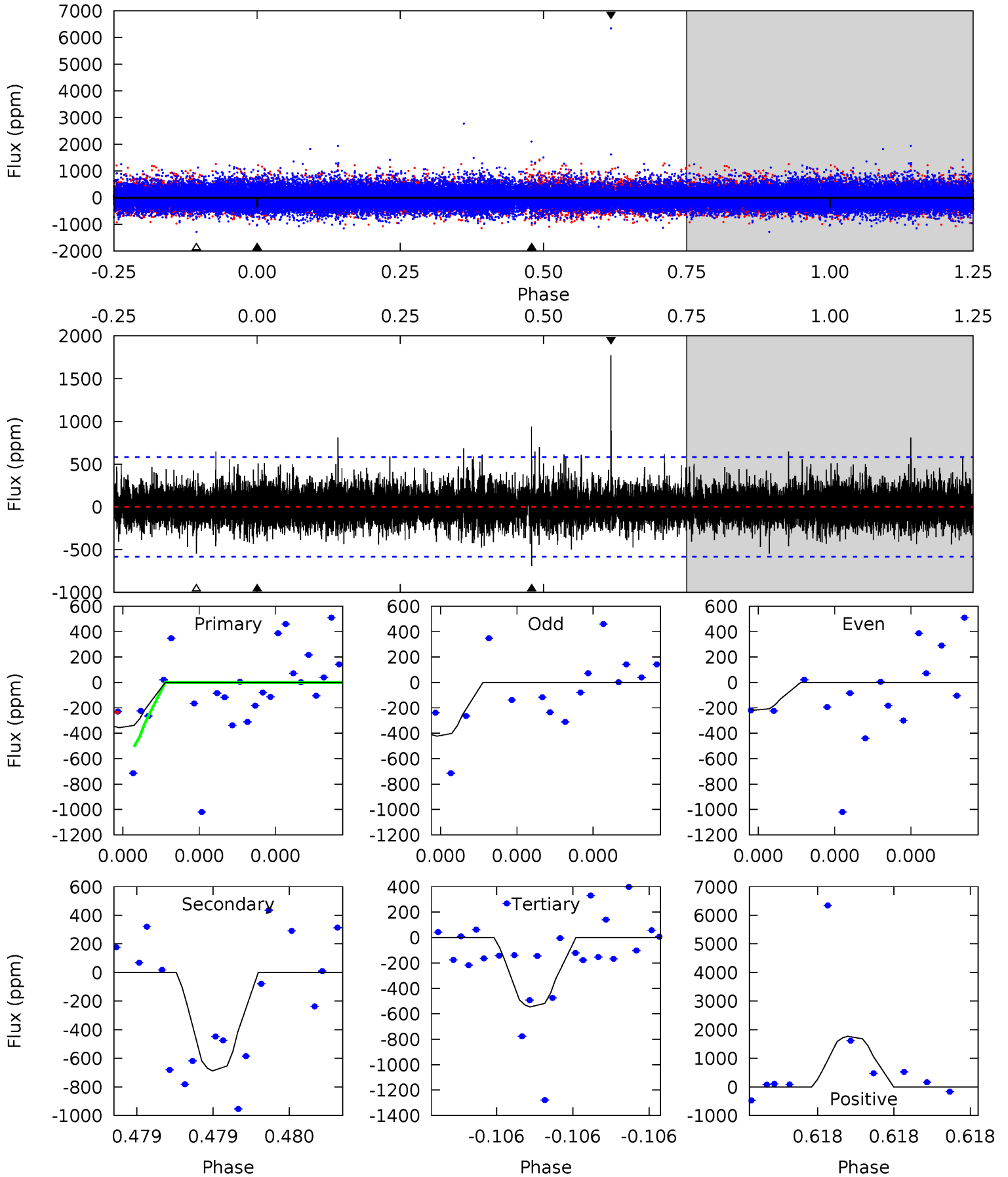
TCE 011516930-03 P=415.216750 Days  $T_0=202.561204$  (BKJD)



# DV Model-Shift Uniqueness Test

011516930-03, P = 415.235829 Days, E = 202.527424 Days

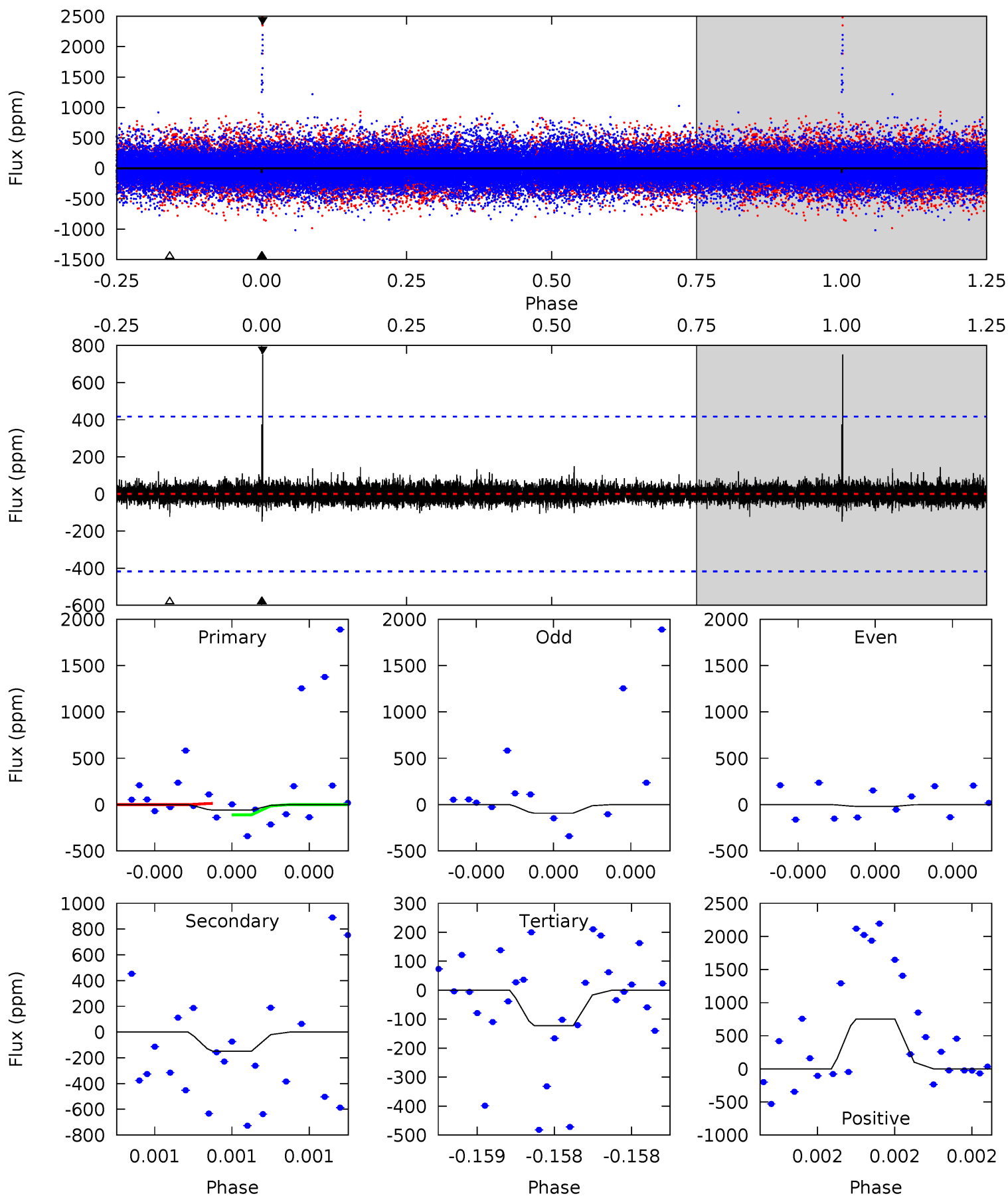
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
3.53	6.83	5.42	17.6	5.78	3.80	1.24	-1.89	-14.0	1.41	-10.7	0.96	1.06	0.72	1.31



# Alt Model-Shift Uniqueness Test

011516930-03, P = 415.216750 Days, E = 202.561204 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
0.83	2.05	1.69	10.3	5.73	3.72	0.37	-0.86	-9.52	0.36	-8.29	0.39	1.00	0.83	0.67



### Stellar Parameters For KIC 011516930

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$5491^{+164}_{-164}$	$4.432^{+0.130}_{-0.222}$	$-0.300^{+0.350}_{-0.300}$	$0.887^{+0.235}_{-0.137}$	$0.776^{+0.126}_{-0.054}$	$1.566^{+0.991}_{-0.852}$
	+3%/-3%	+3%/-5%	+117%/-100%	+26%/-15%	+16%/-7%	+63%/-54%
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 011516930-03 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-688 \pm 101$	$9.26^{+9.39}_{-6.45}$	$323^{+25}_{-21}$	$3432^{+1879}_{-628}$	$4521^{+42367}_{-3422}$
Alt.	$-149 \pm 73$	$8.22^{+9.57}_{-5.61}$	$322^{+23}_{-19}$	$2778^{+1366}_{-492}$	$1062^{+12726}_{-858}$

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

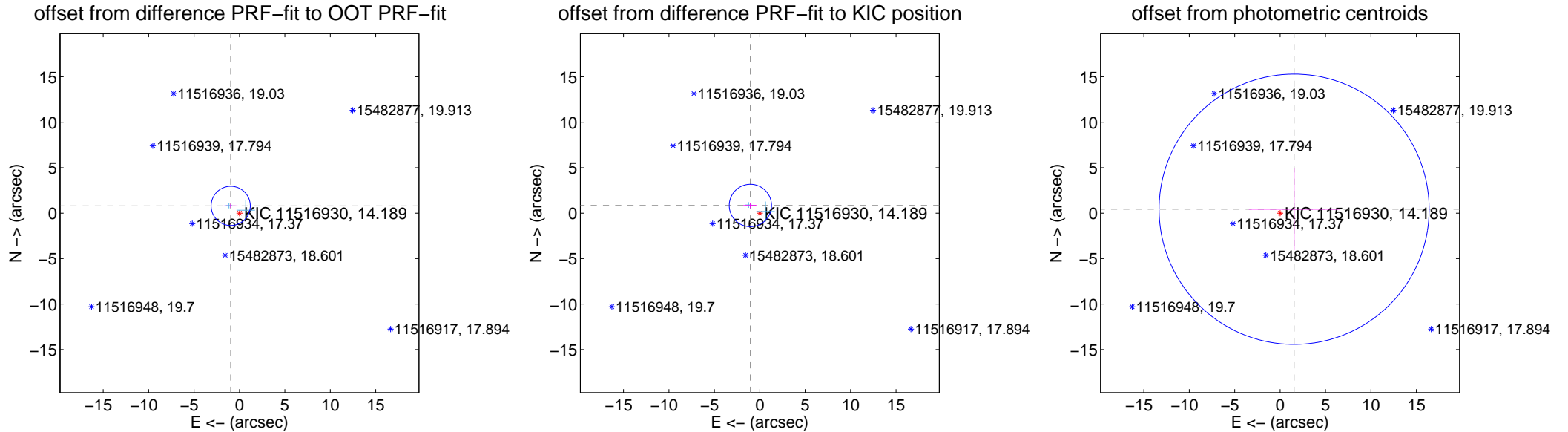
## DV Centroid Data

Supplemental centroid analysis for 011516930-03. Kepler magnitude: 14.19. Transit SNR 2.17

There are 2 quarters with good PRF difference image offsets

The direct PRF centroid is offset from the target star catalog position by about 0.15 arcsec

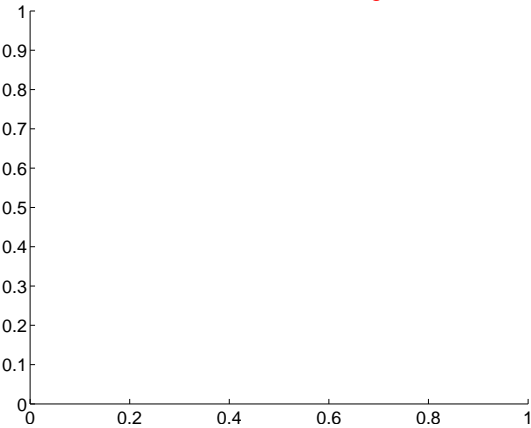
	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$1.251 \pm 0.719$	1.74	$0.963 \pm 0.757$	$0.799 \pm 0.221$
PRF-fit source offset from KIC position	$1.336 \pm 0.777$	1.72	$1.035 \pm 0.763$	$0.845 \pm 0.299$
photometric centroid source offset	$1.60 \pm 4.95$	0.32	$-1.54 \pm 4.99$	$0.43 \pm 4.49$



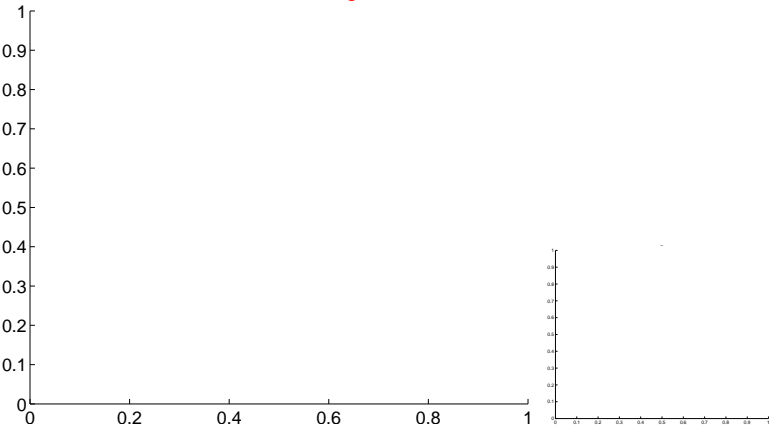
Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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

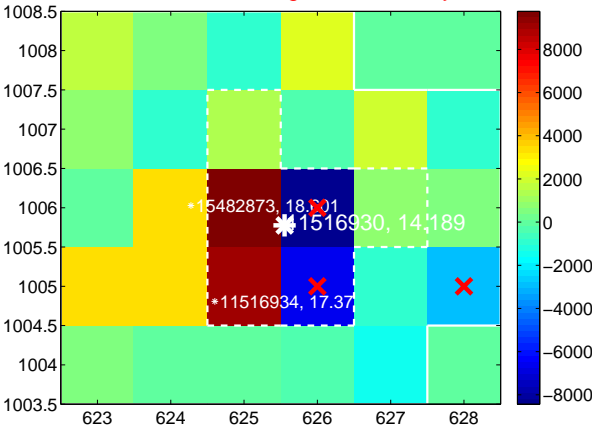
Q1 no difference image



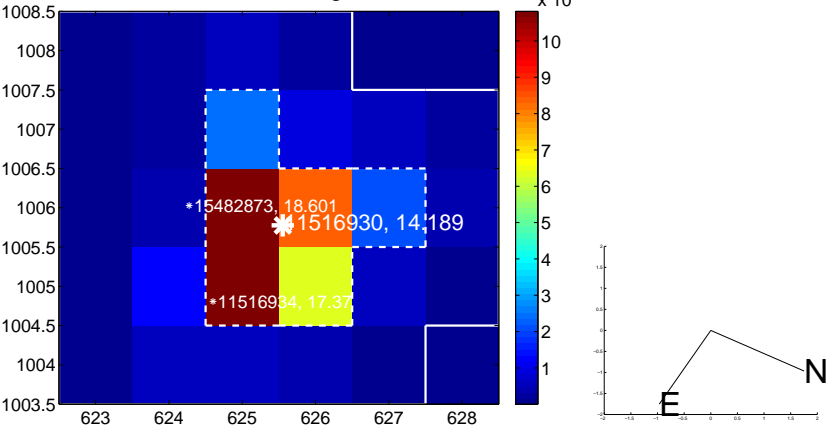
Q1 no OOT image



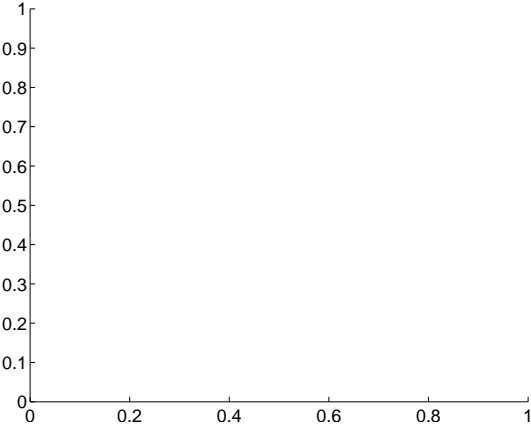
Q2 difference image. Poor Quality



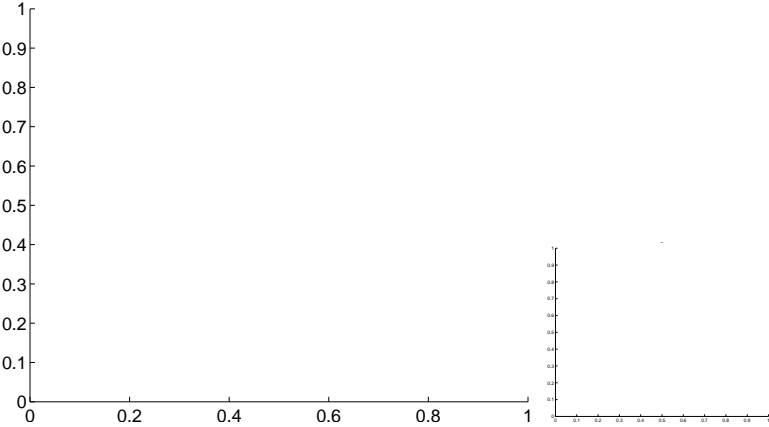
Q2 OOT image



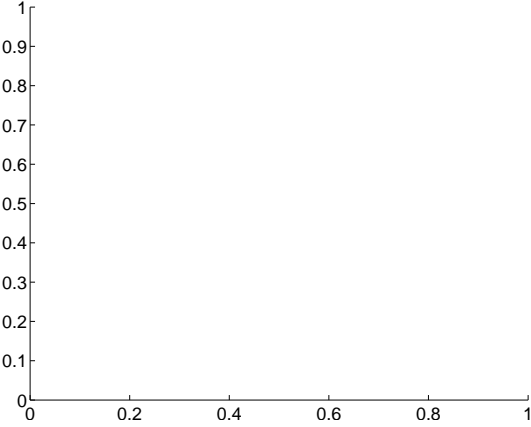
Q3 no difference image



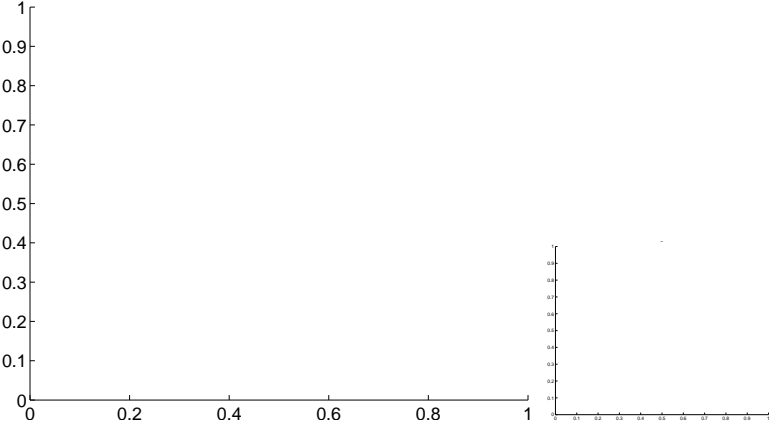
Q3 no OOT image



Q4 no difference image

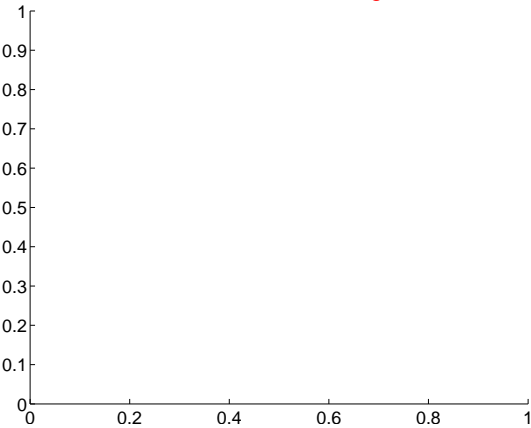


Q4 no OOT image

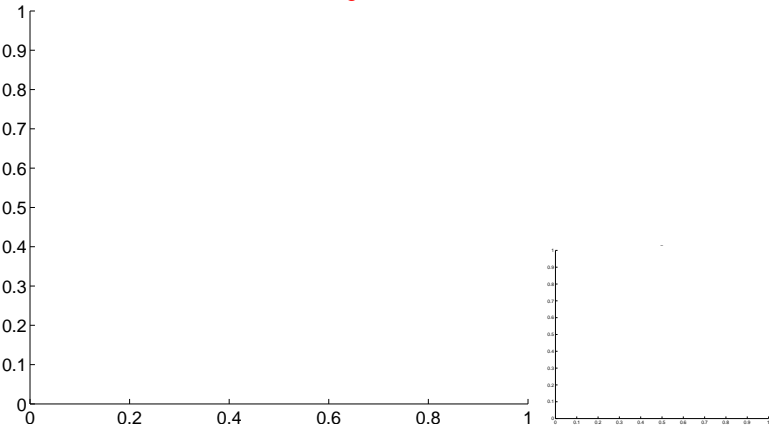


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

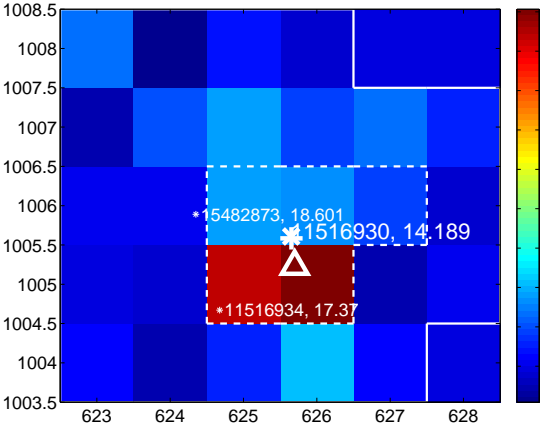
Q5 no difference image



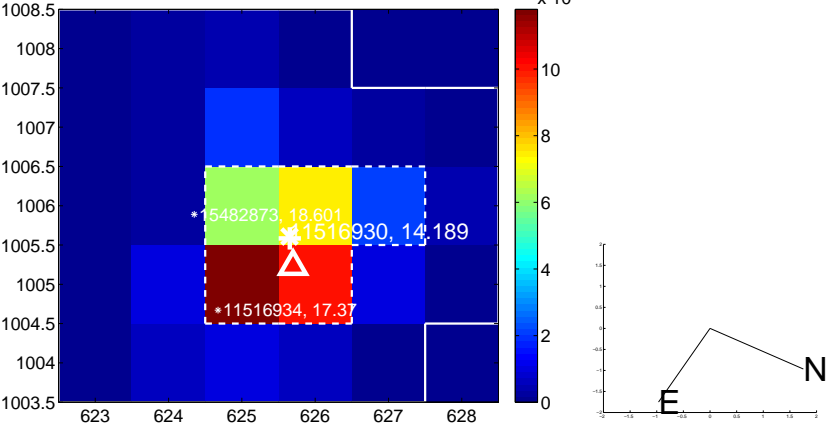
Q5 no OOT image



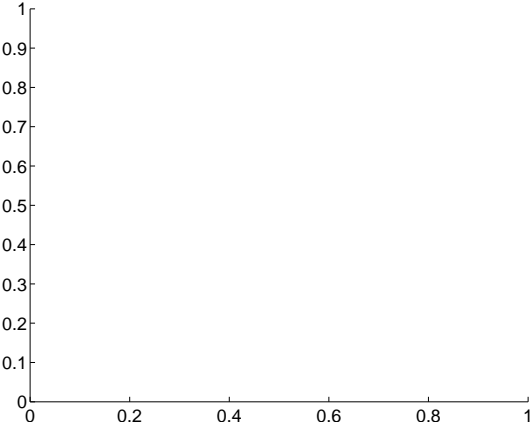
Q6 difference image



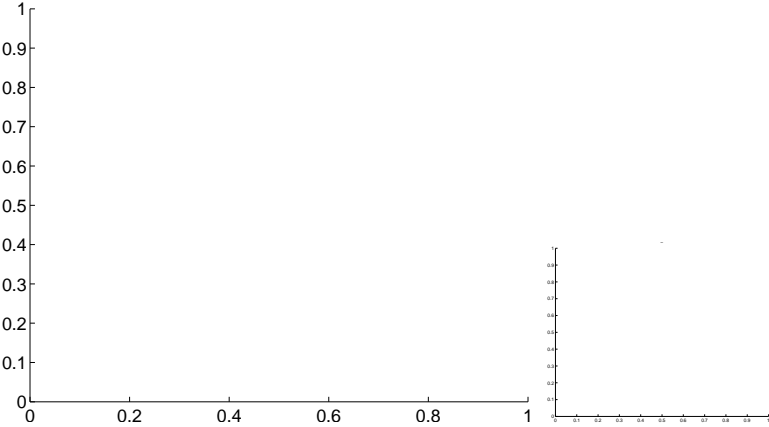
Q6 OOT image



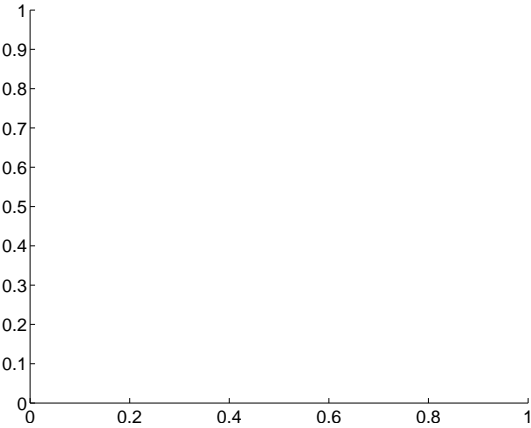
Q7 no difference image



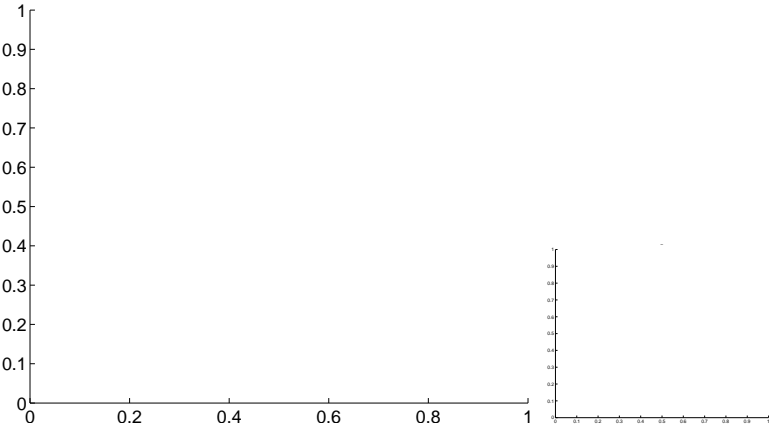
Q7 no OOT image



Q8 no difference image



Q8 no OOT image

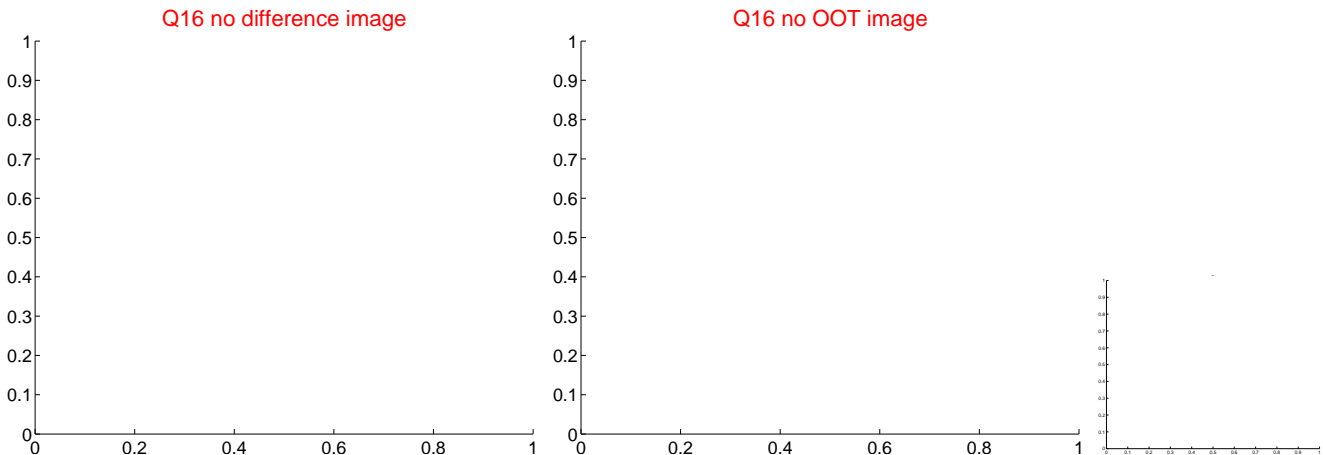
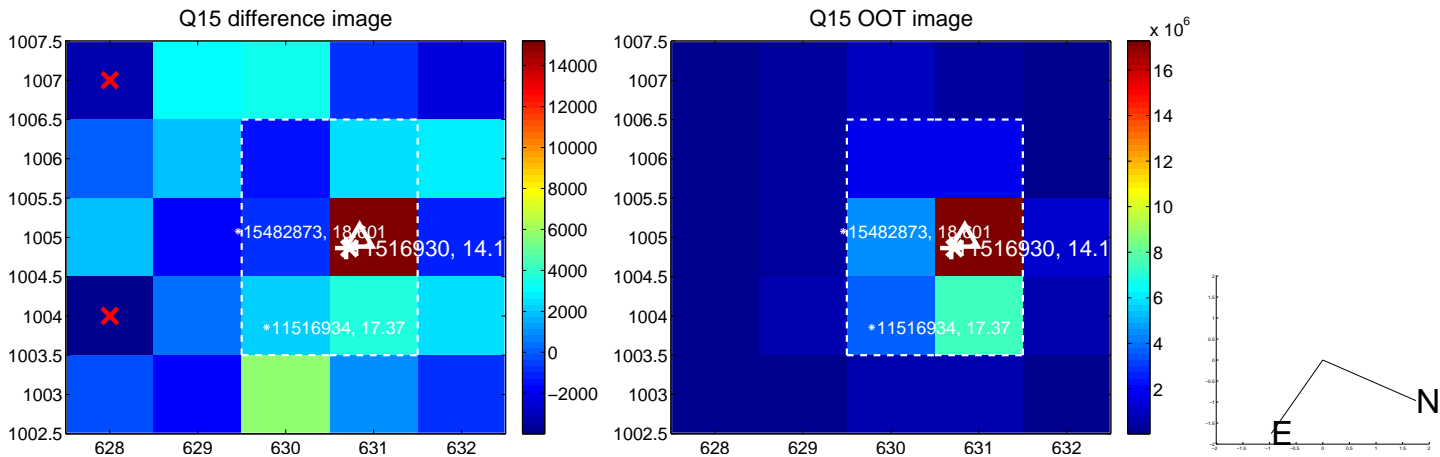
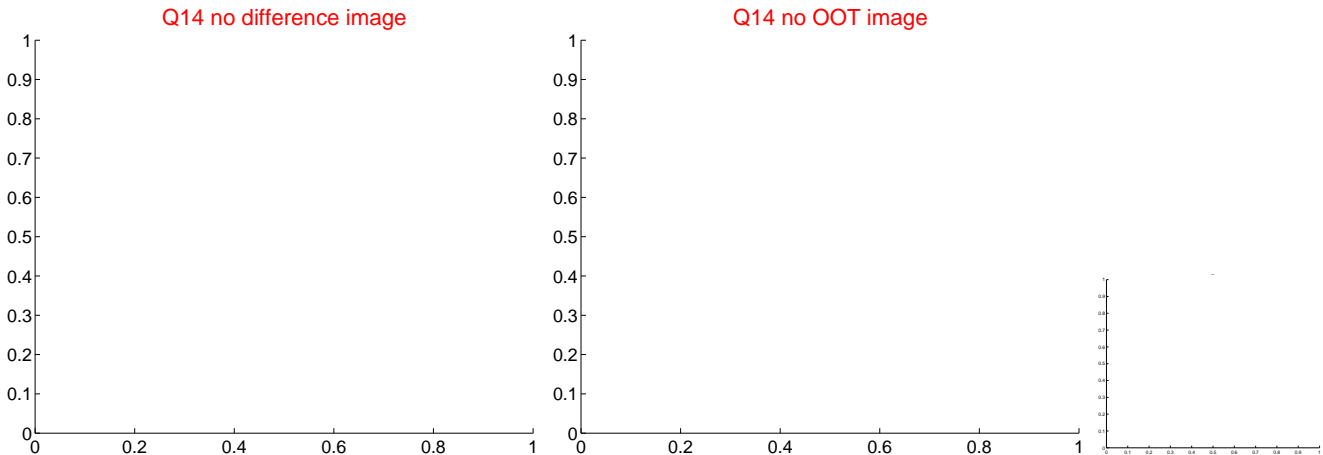
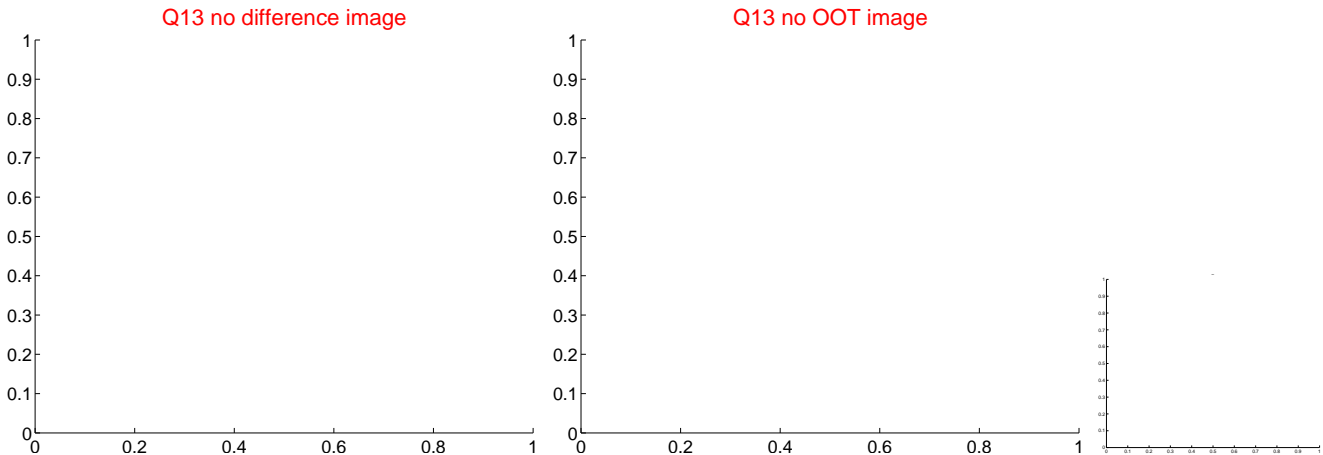




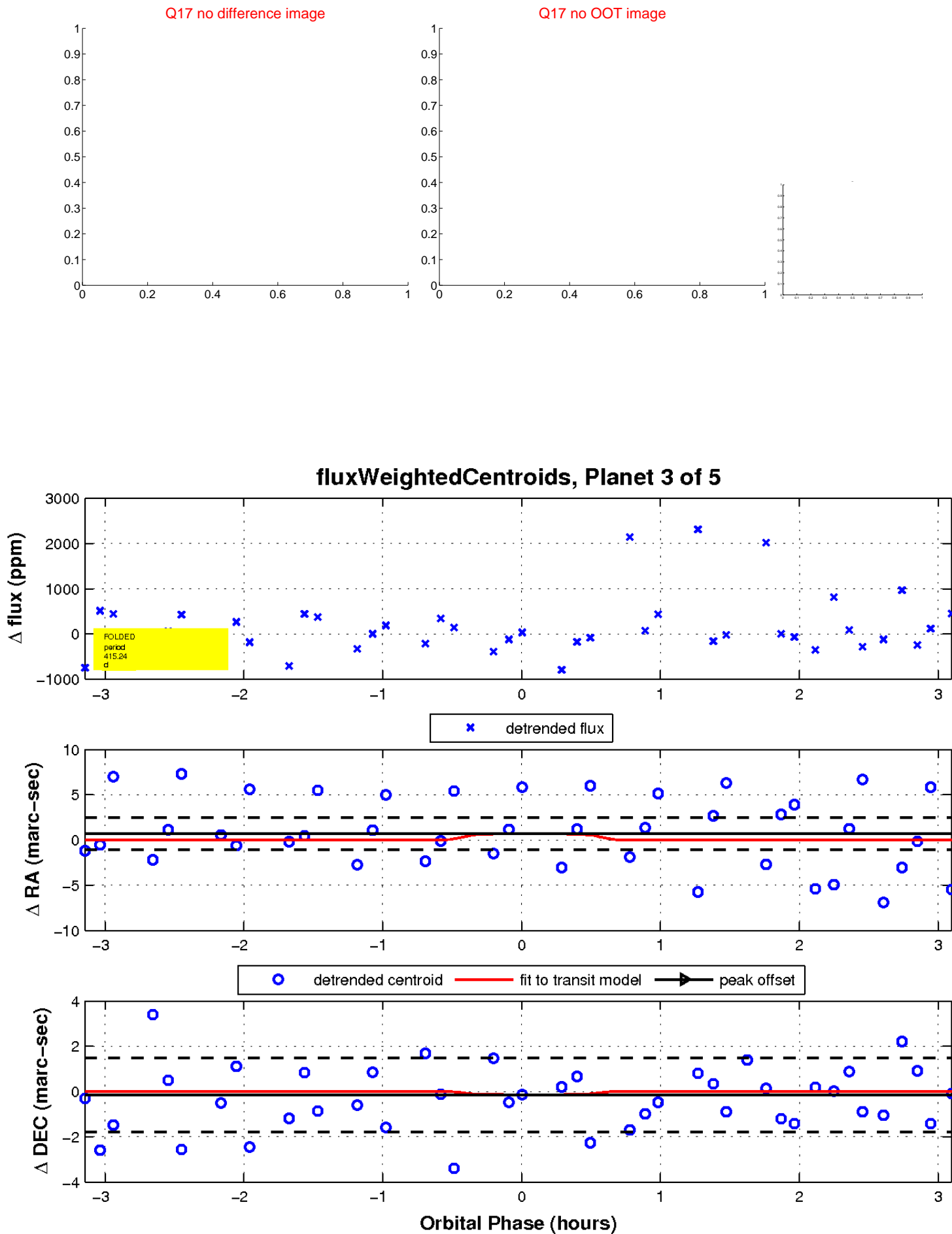
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

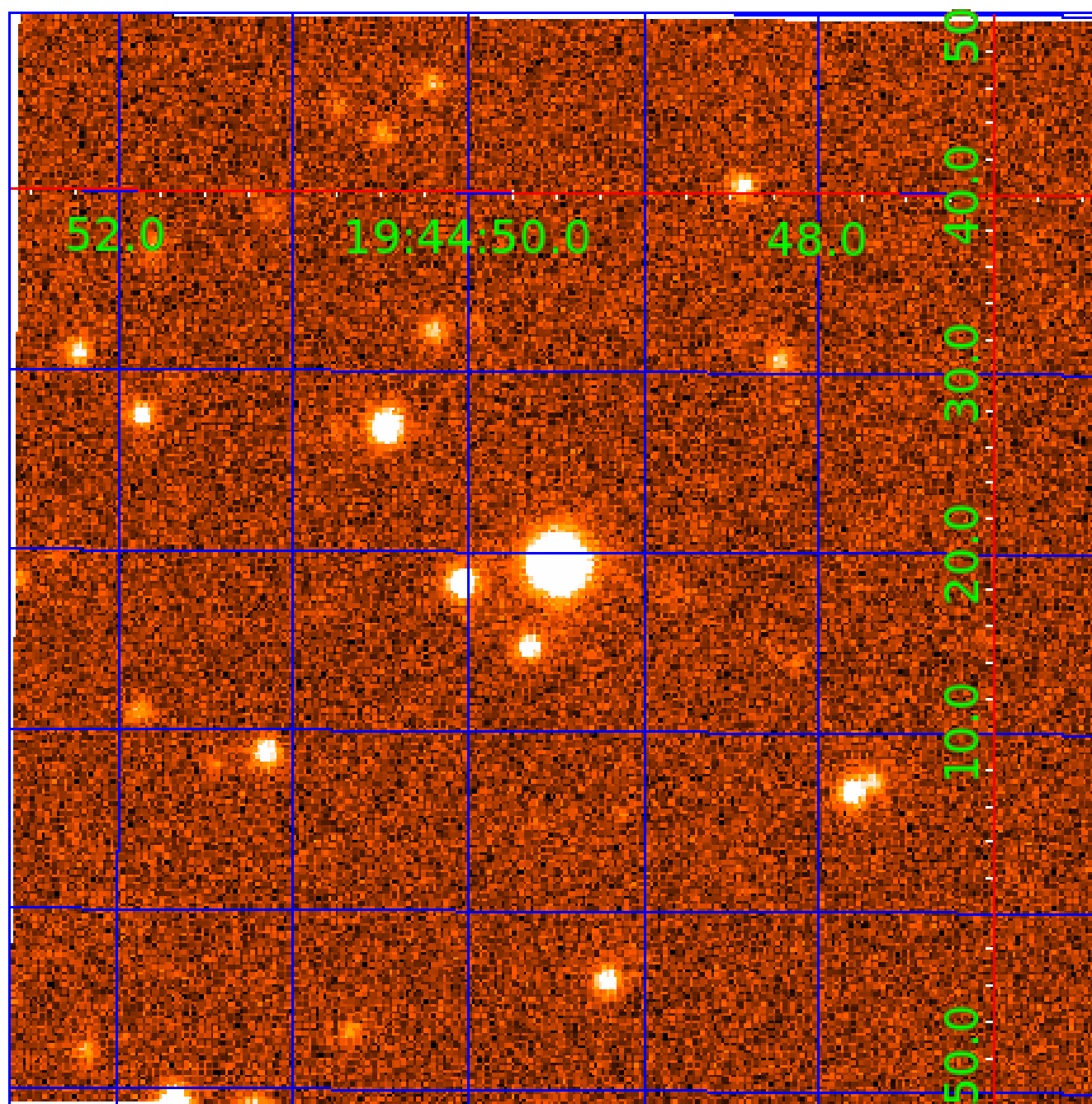


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination



# KIC 011516930

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
011516930-01	OBS	6240.01	4.768569	133.859655	320.6	1.171	15.9	21.0	0.89	5491	1.88	246.75
011516930-02	OBS	No	334.334773	389.094048	1055.6	9.177	15.4	6.5	0.89	5491	3.04	0.85
011516930-03	OBS	No	415.235829	202.527424	357.8	1.067	11.7	2.2	0.89	5491	1.76	0.64
011516930-05	OBS	No	335.431615	311.793866	825.8	2.872	10.8	6.7	0.89	5491	2.79	0.85

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
011516930-01	OBS	FP	0.00	0	1	1	0	MOD_SEC_DV—MOD_SEC_ALT—CENT_UNRESOLVED_OFFSET—HALO_GHOST
011516930-02	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—CENT_FEW_DIFFS
011516930-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_MARSHALL_TRACKER—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—CENT_FEW_DIFFS
011516930-05	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—ALL_TRANS_CHASES—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—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.

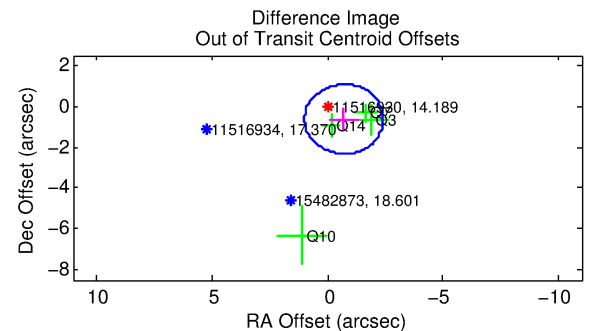
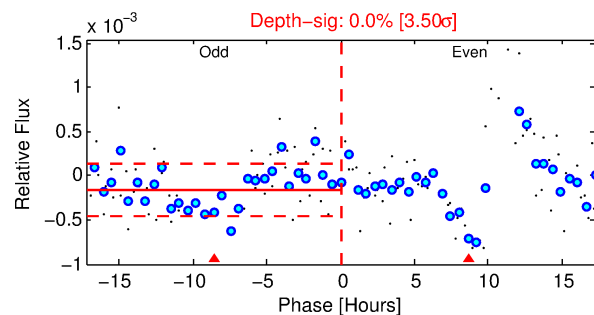
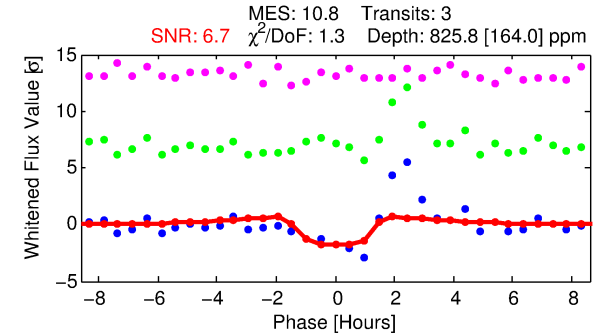
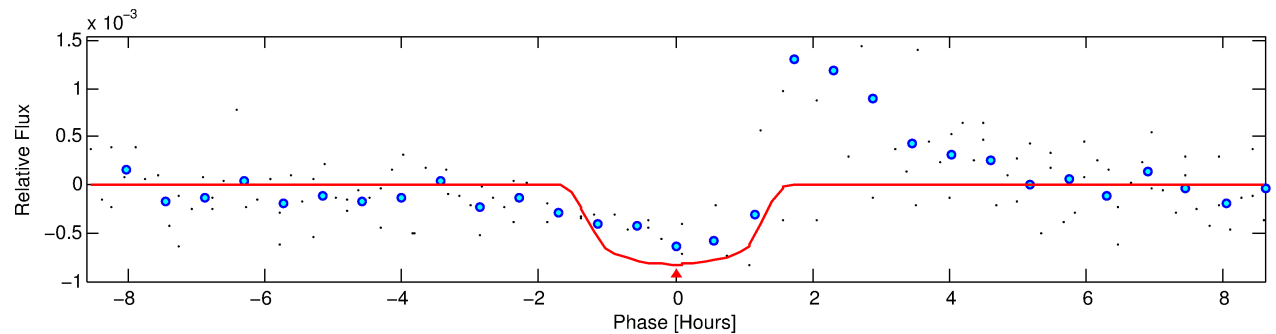
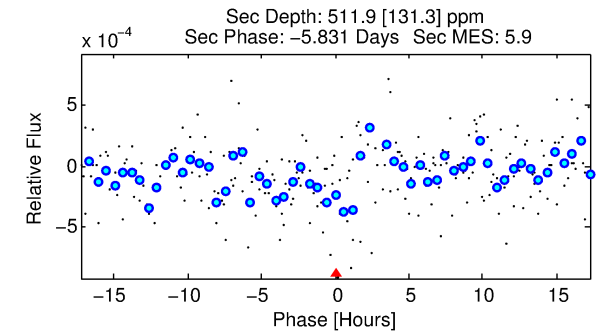
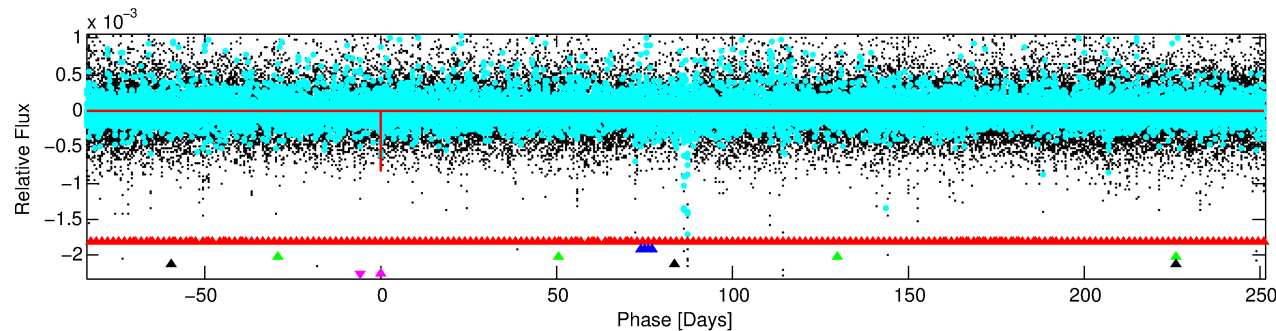
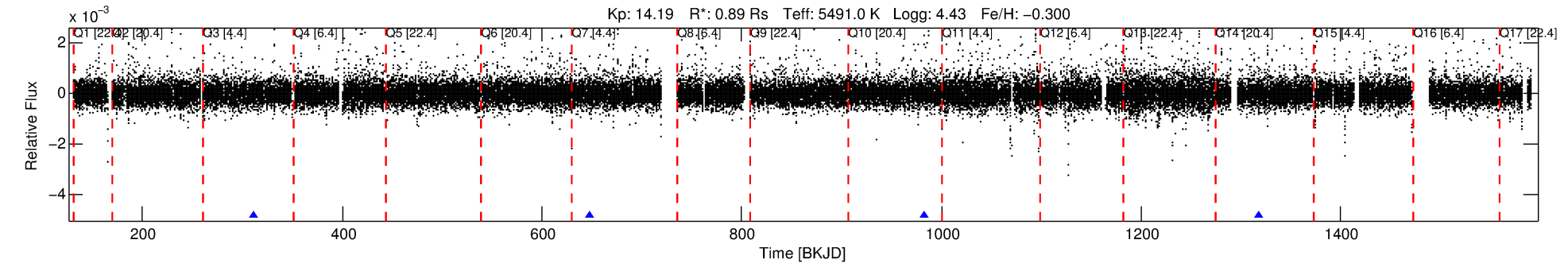
## Ephemeris Match Information For 011516930-05

No Significant Match Found

# DV One-Page Summary

KIC: 11516930 Candidate: 5 of 5 Period: 335.432 d  
KOI: K06240 Corr: No Ephemeris Match

Kp: 14.19 R\*: 0.89 Rs Teff: 5491.0 K Logg: 4.43 Fe/H: -0.300



## DV Fit Results:

Period = 335.43162 [0.00458] d  
Epoch = 311.7939 [0.0078] BKJD  
Rp/R\* = 0.0288 [0.0356]  
a/R\* = 615.36 [3153.65]  
b = 0.76 [2.86]  
Seff = 0.85 [0.34]  
Teq = 245 [25] K  
Rp = 2.79 [3.53] Re  
a = 0.8684 [0.2131] AU  
Ag = 27323.22 [68802.32] [0.40σ]  
Teffp = 4867 [3031] K [1.52σ]

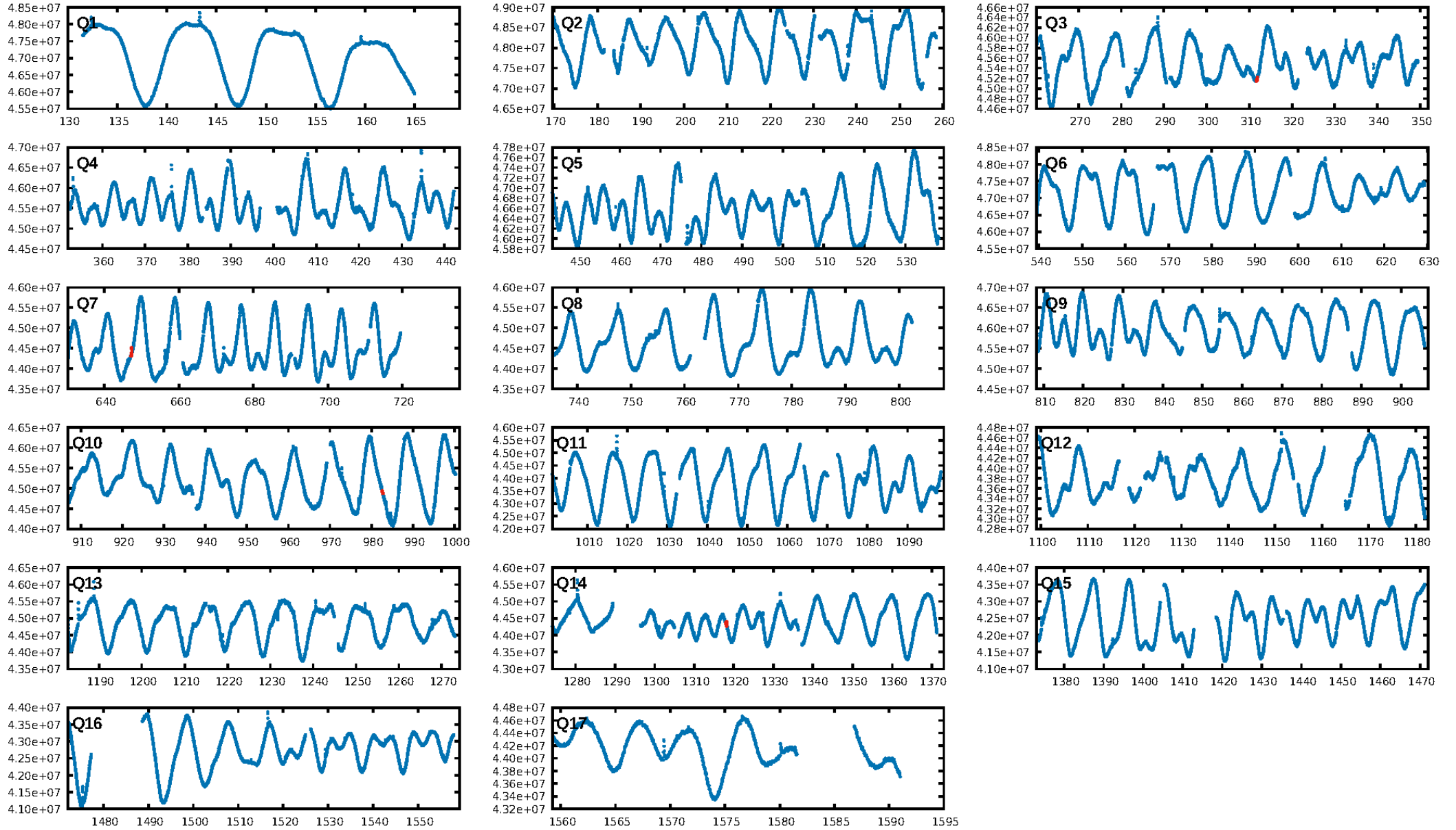
## DV Diagnostic Results:

ShortPeriod-sig: 99.4% [2.74σ]  
LongPeriod-sig: 100.0% [625.09σ]  
ModelChiSquare2-sig: 0.3%  
ModelChiSquareGof-sig: 42.9%  
**Bootstrap-pfa: 8.75e-10**  
RollingBand-fgt: 1.00 [3/3]  
**GhostDiagnostic-chr: -1.345**  
Centroid-sig: 25.9%  
Centroid-so: 1.030 arcsec [0.89σ]  
OotOffset-rm: 0.951 arcsec [1.67σ]  
KicOffset-rm: 0.983 arcsec [2.04σ]  
OotOffset-st: 2/2/0/0 [4]  
KicOffset-st: 2/2/0/0 [4]  
DiffImageQuality-fgm: 0.75 [3/4]  
DiffImageOverlap-fno: 0.75 [3/4]

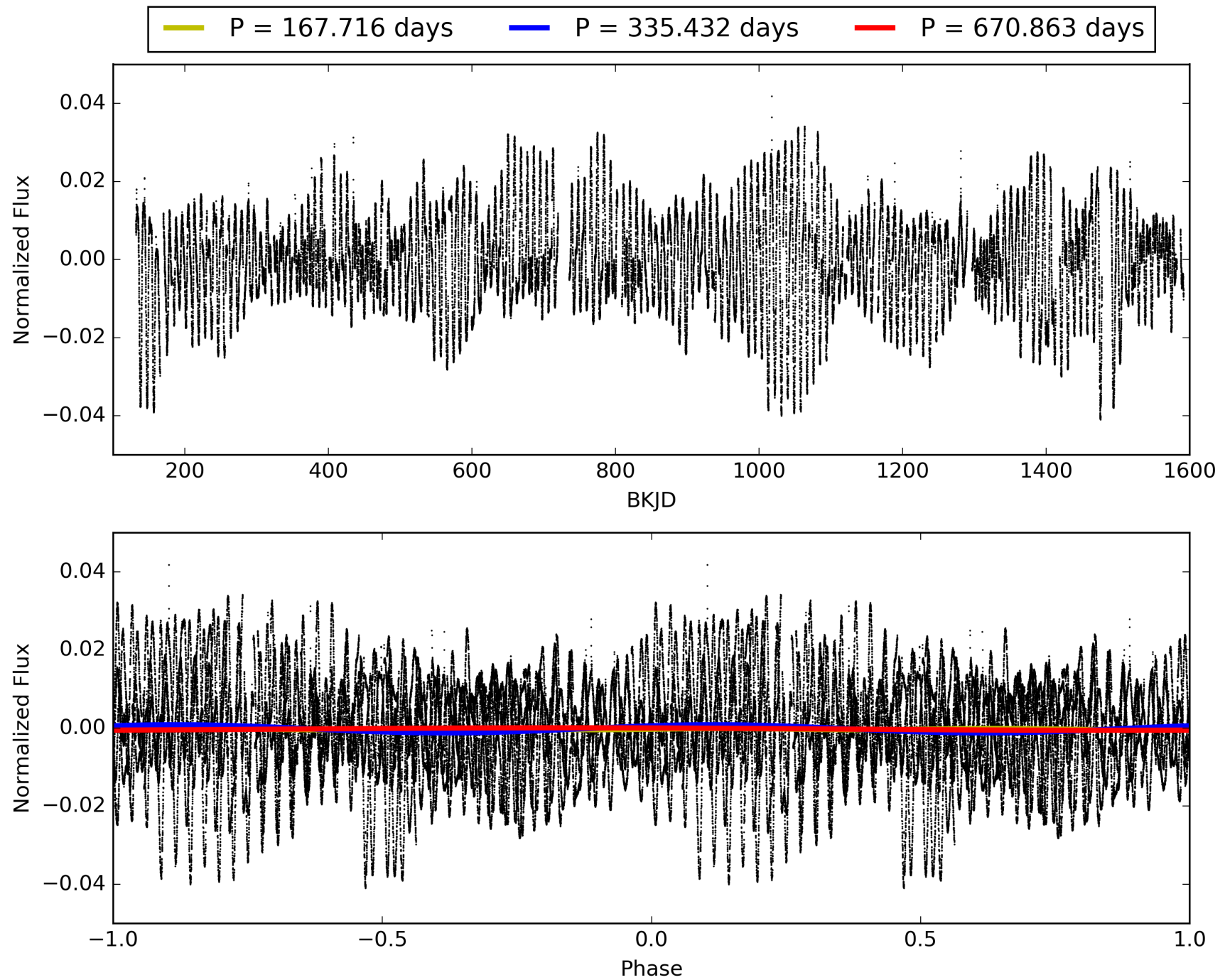
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 30-Jan-2016 01:29:33 Z

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

# TCE 011516930-05, PDC Light Curves



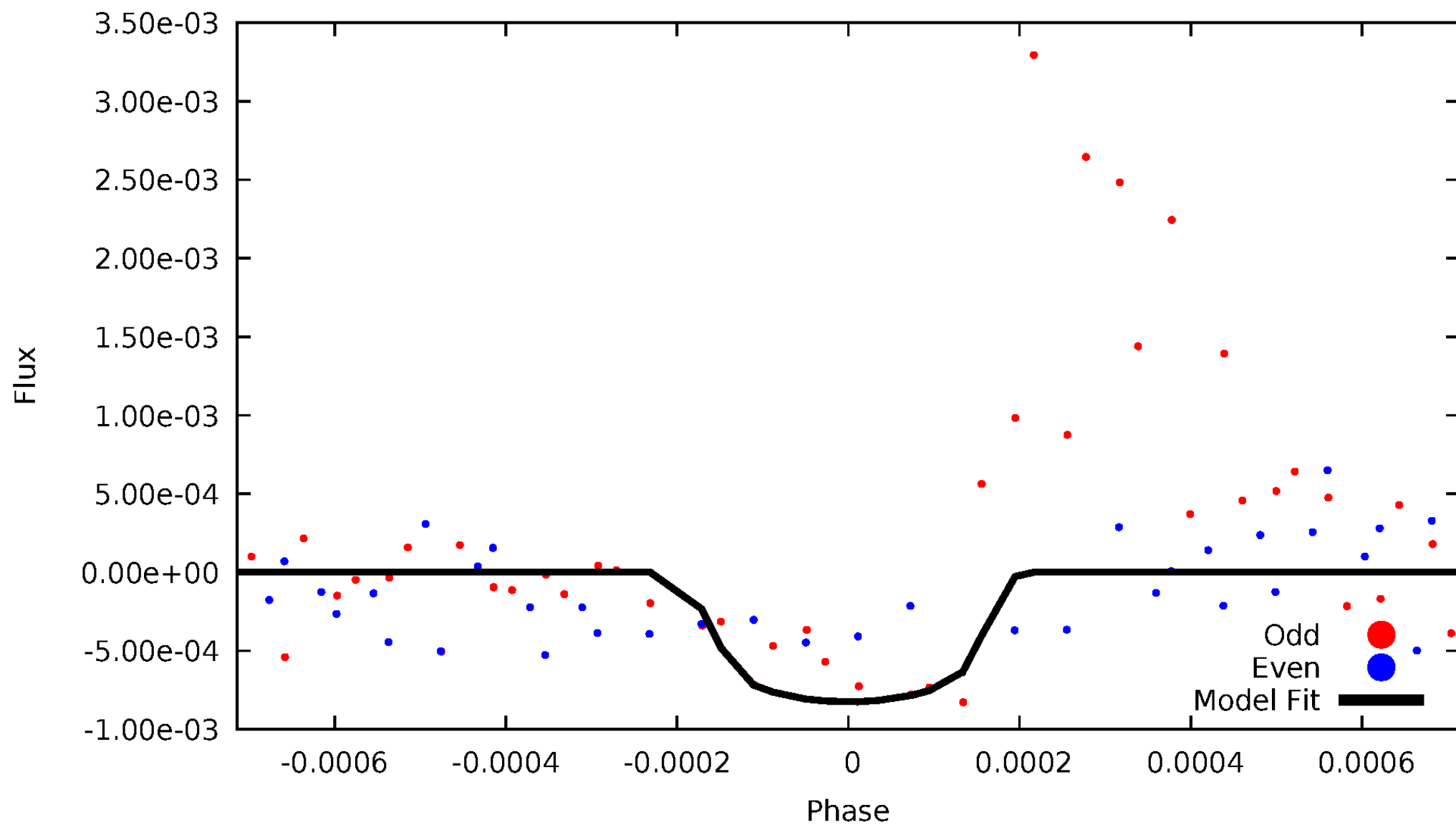
TCE 011516930-05





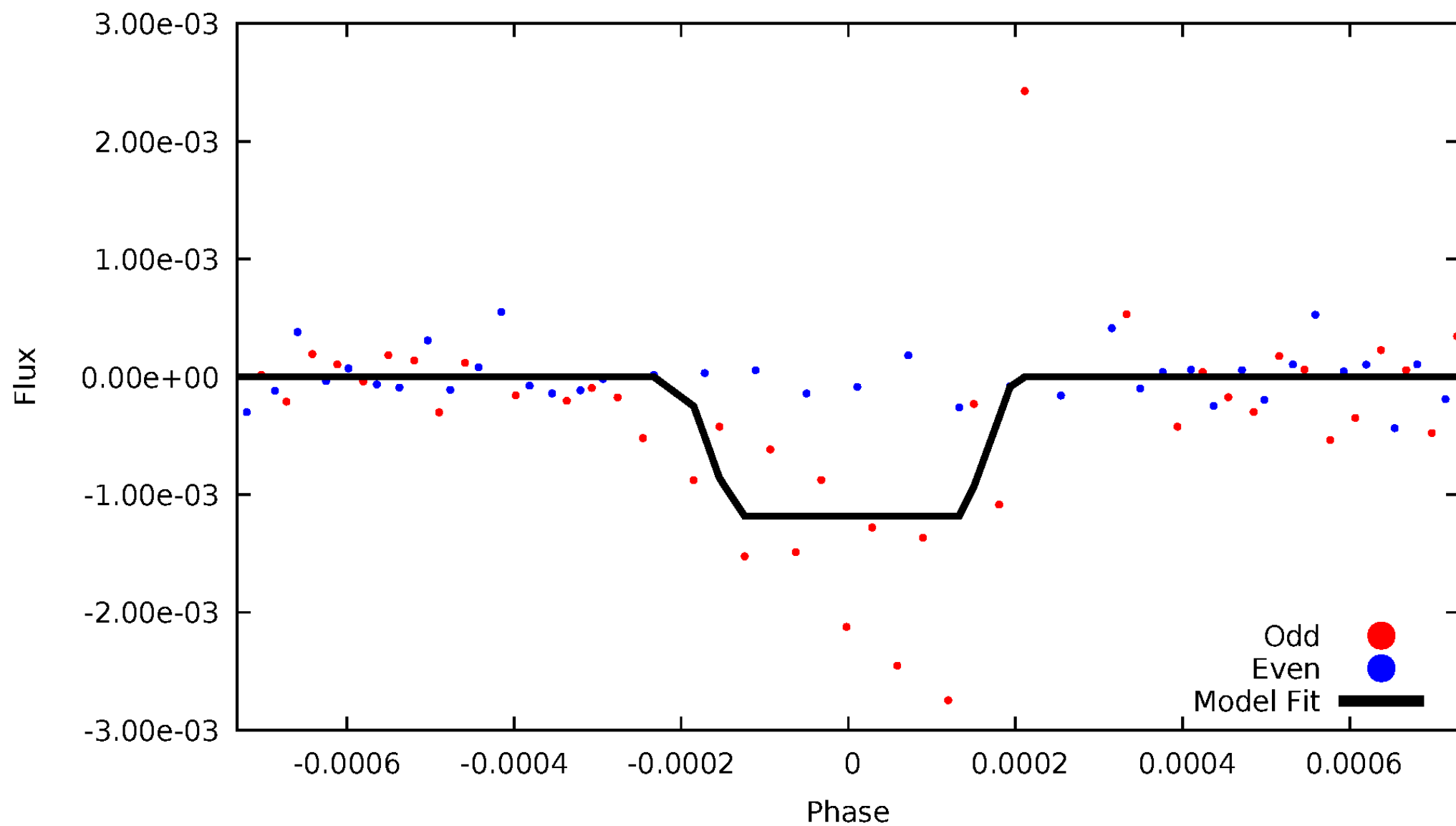
# DV Odd/Even

TCE 011516930-05



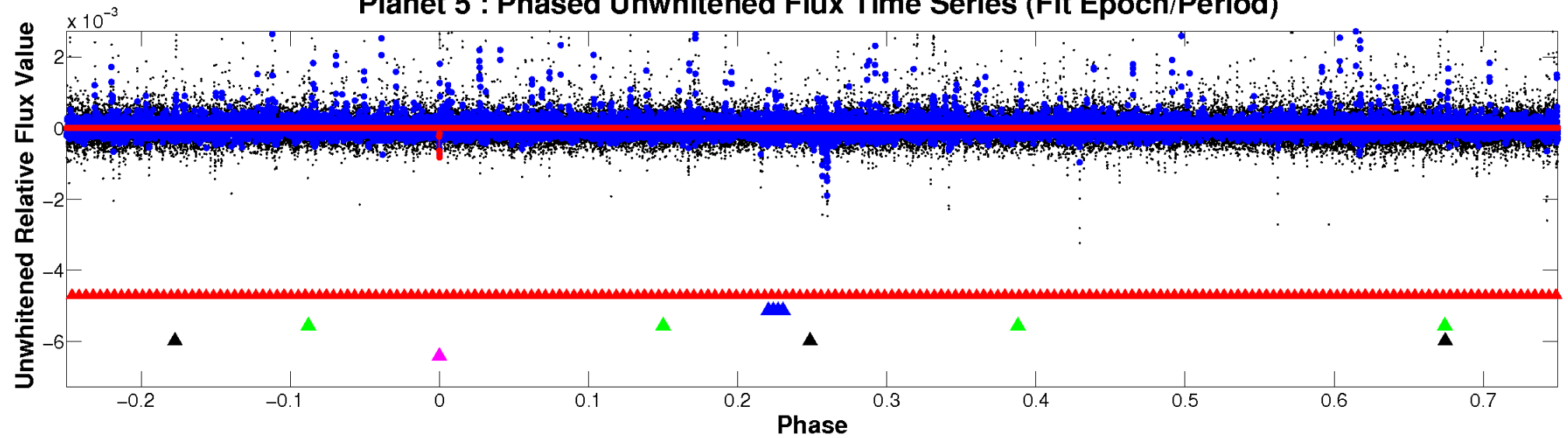
# ALT Odd/Even

TCE 011516930-05

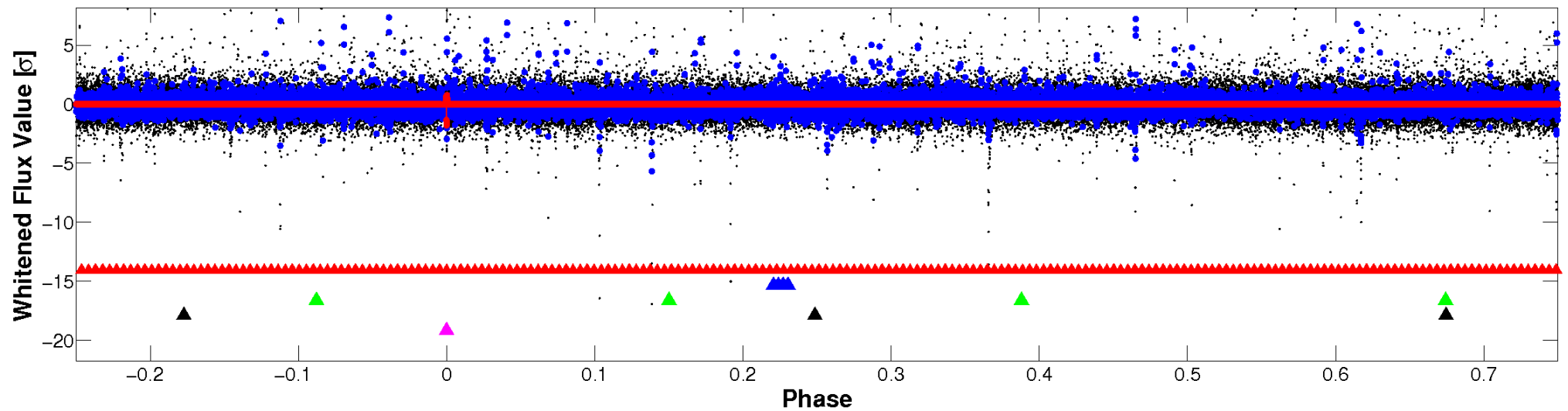


# Non-Whitened Vs. Whitened Light Curve

Planet 5 : Phased Unwhitened Flux Time Series (Fit Epoch/Period)

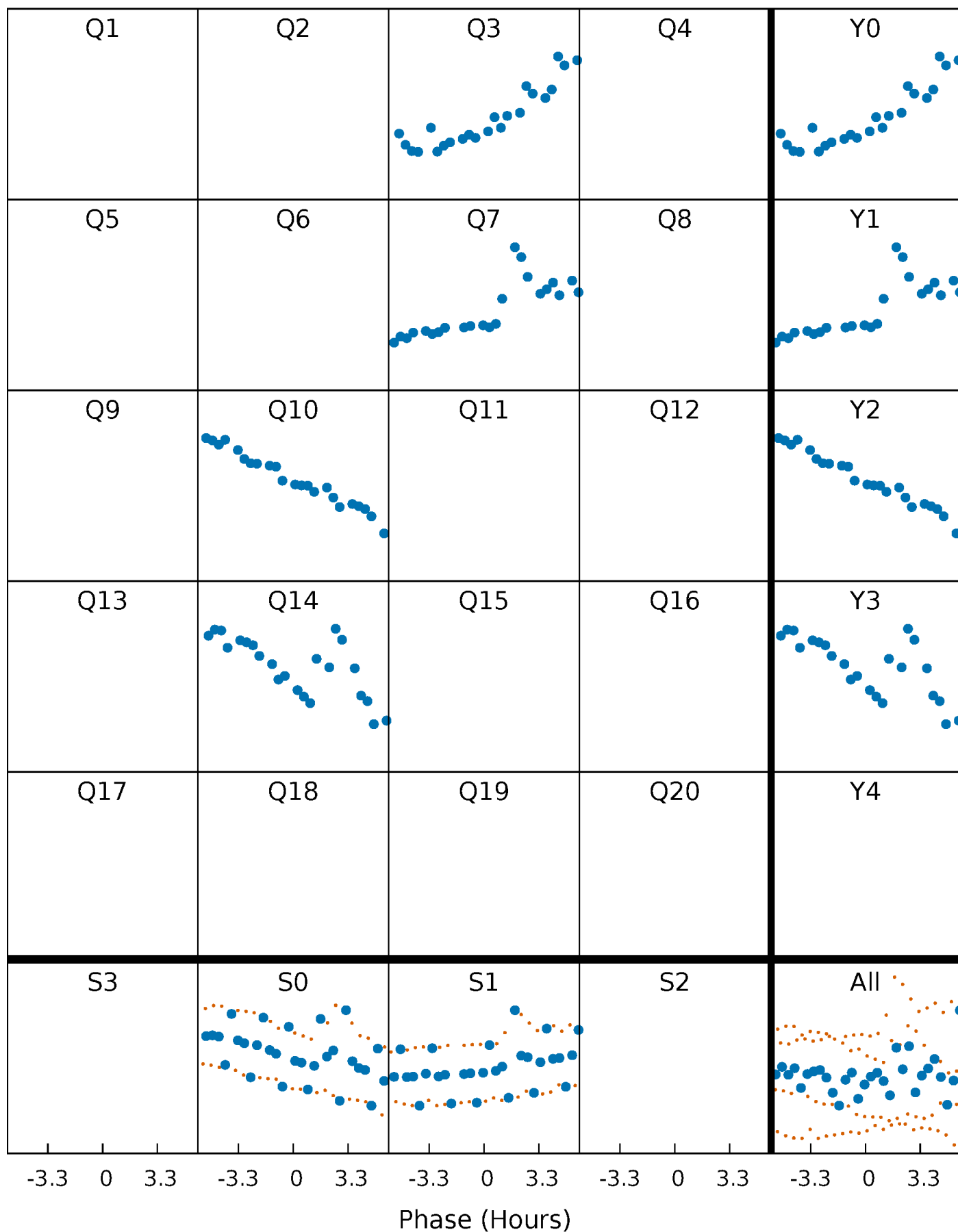


Planet 5 : Phased Whitened Flux Time Series (Fit Epoch/Period)



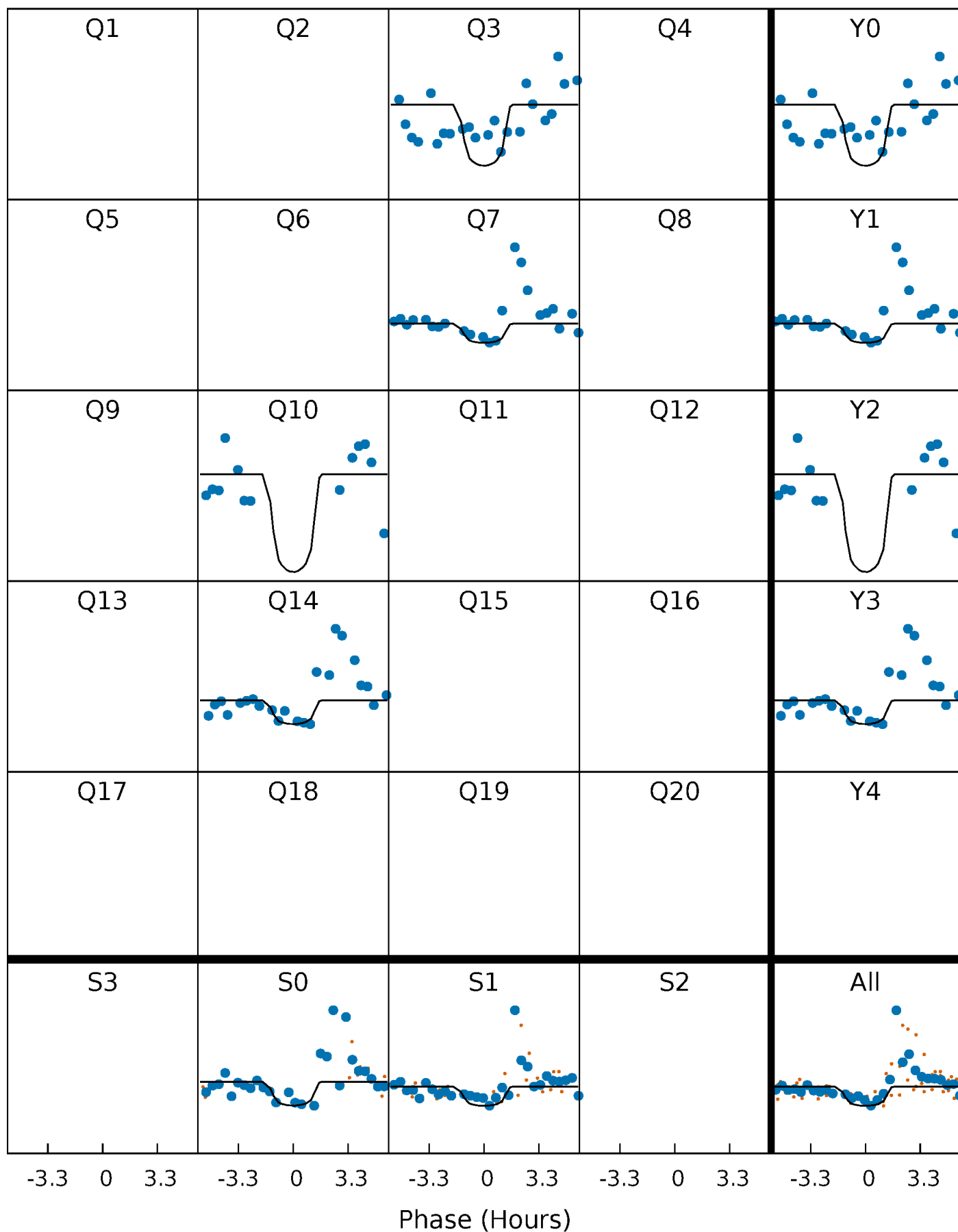
# PDC Quarter-Phased Transit Curves

TCE 011516930-05     $P=335.431615$  Days     $T_0=311.793866$  (BKJD)



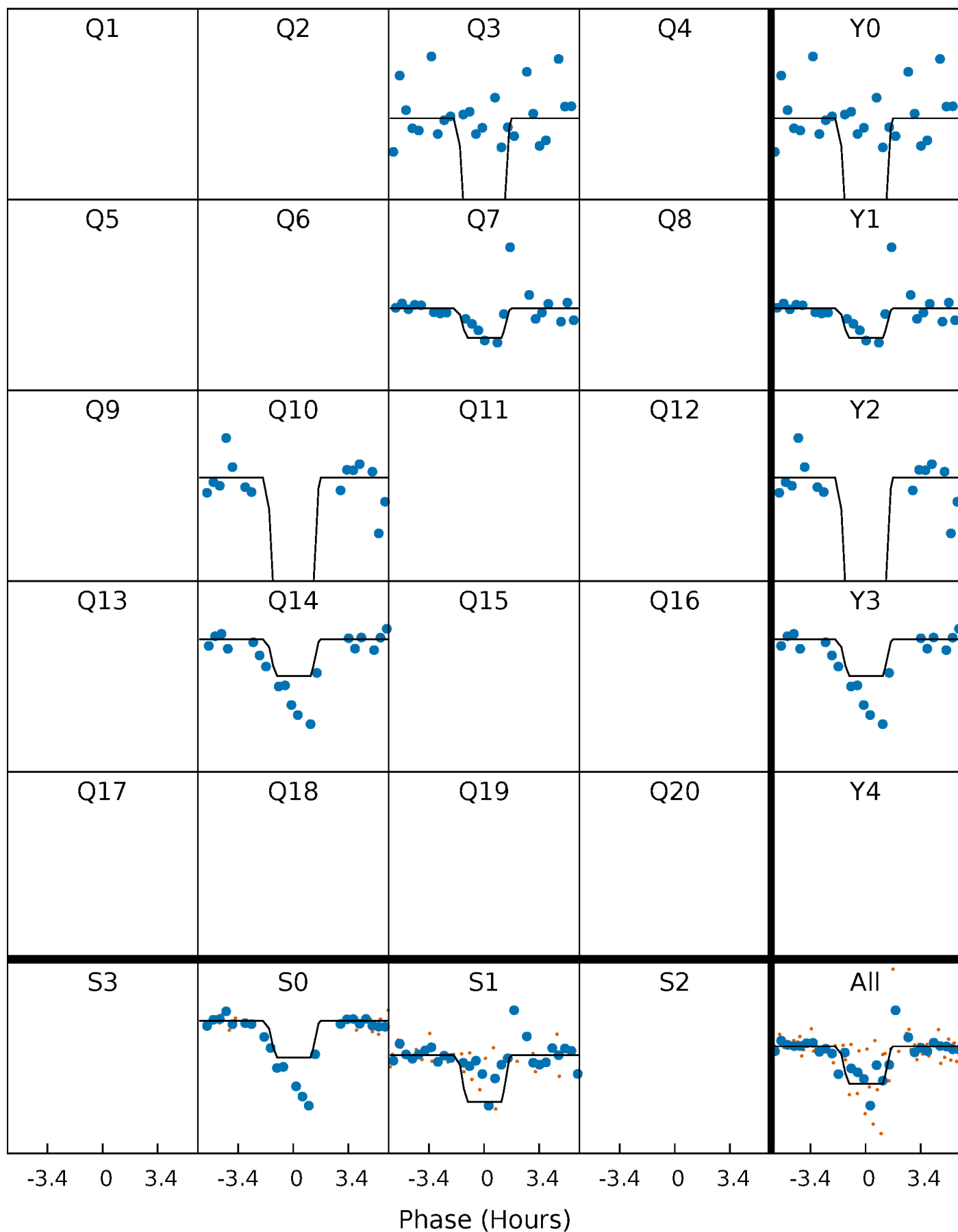
# DV Quarter-Phased Transit Curves

TCE 011516930-05     $P=335.431615$  Days     $T_0=311.793866$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

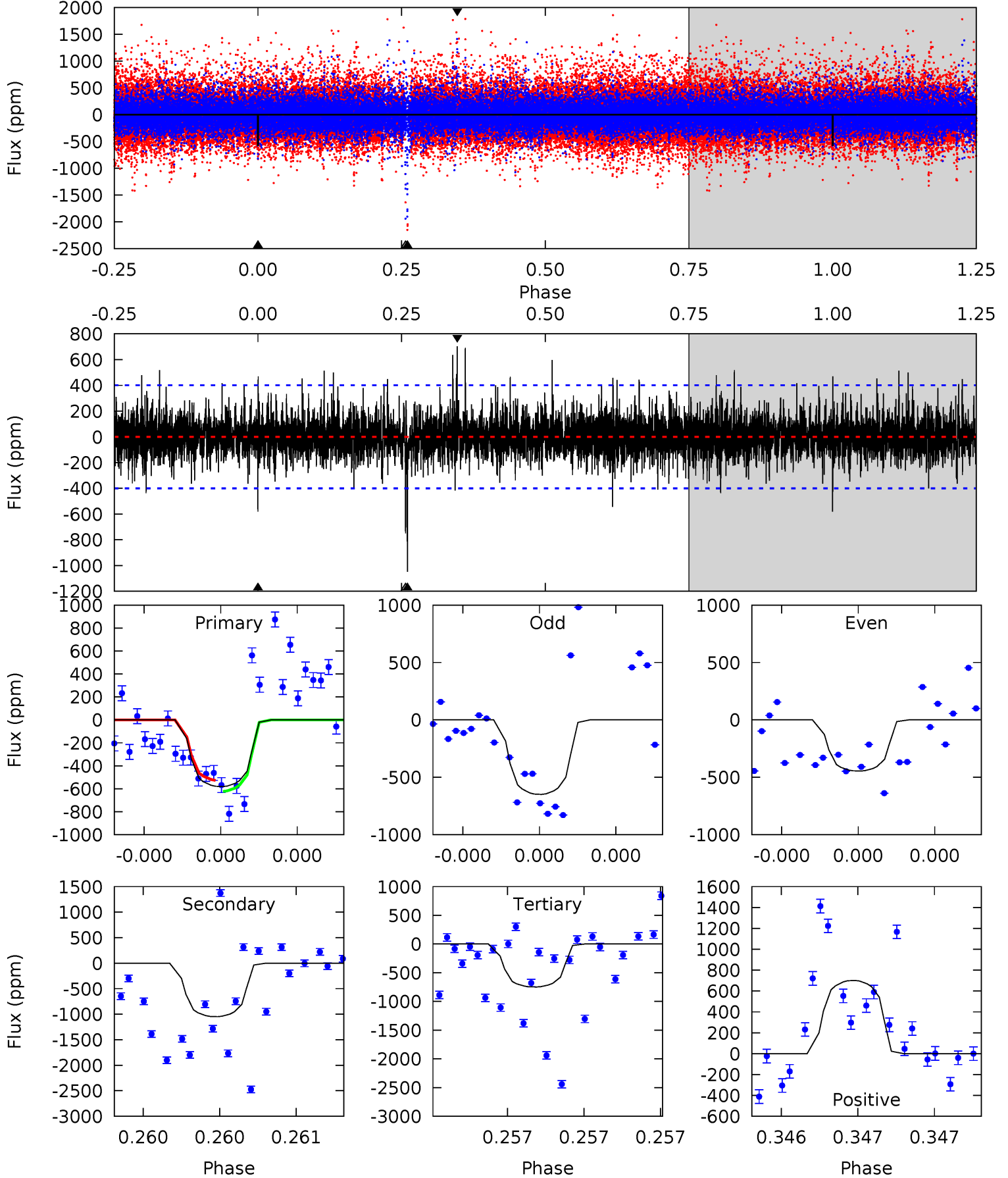
TCE 011516930-05     $P=335.433180$  Days     $T_0=311.794085$  (BKJD)



# DV Model-Shift Uniqueness Test

011516930-05, P = 335.431615 Days, E = 311.793866 Days

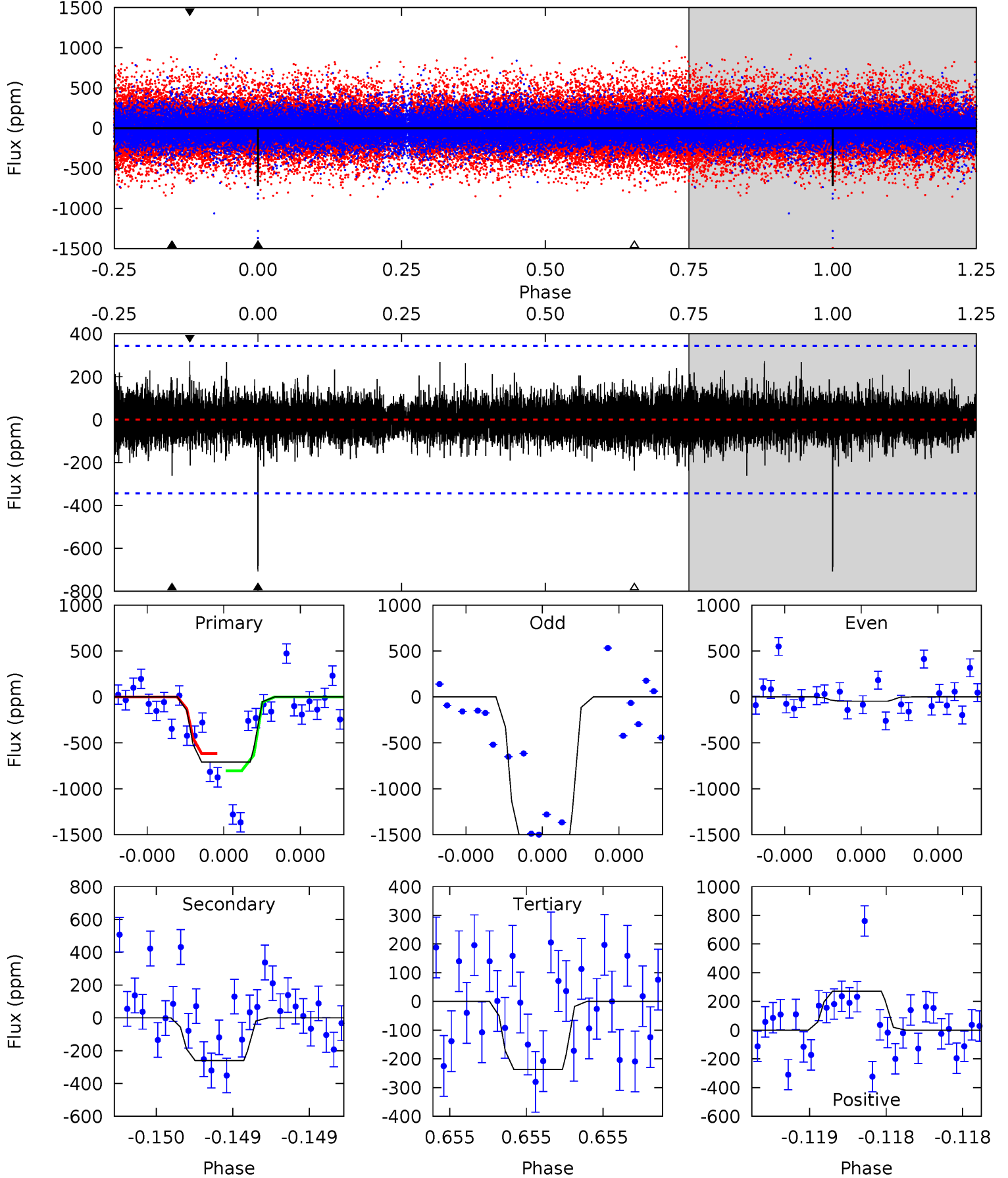
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
8.14	14.7	10.5	9.84	5.62	3.55	1.54	-2.35	-1.69	4.21	4.86	1.23	1.03	0.40	0.66



# Alt Model-Shift Uniqueness Test

011516930-05, P = 335.433180 Days, E = 311.794085 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
11.6	4.25	3.86	4.44	5.62	3.55	0.89	7.69	7.11	0.39	-0.19	14.4	1.13	0.28	0





### Stellar Parameters For KIC 011516930

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R$ ( $R_{\odot}$ )	$M$ ( $M_{\odot}$ )	$p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ )
	$5491^{+164}_{-164}$	$4.432^{+0.130}_{-0.222}$	$-0.300^{+0.350}_{-0.300}$	$0.887^{+0.235}_{-0.137}$	$0.776^{+0.126}_{-0.054}$	$1.566^{+0.991}_{-0.852}$
	+3%/-3%	+3%/-5%	+117%/-100%	+26%/-15%	+16%/-7%	+63%/-54%
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 011516930-05 / KOI

Detrend	Depth (ppm)	$R_p$ ( $R_{\oplus}$ )	$T_{max}$ (K)	$T_{obs}$ (K)	$A_{obs}$
DV	$-1048 \pm 71$	$3.86^{+3.10}_{-2.52}$	$346^{+25}_{-20}$	$5131^{+3864}_{-1076}$	$29535^{+205801}_{-20305}$
Alt.	$-260 \pm 61$	$4.14^{+3.35}_{-2.62}$	$345^{+26}_{-19}$	$3773^{+1777}_{-607}$	$6021^{+37494}_{-4055}$

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

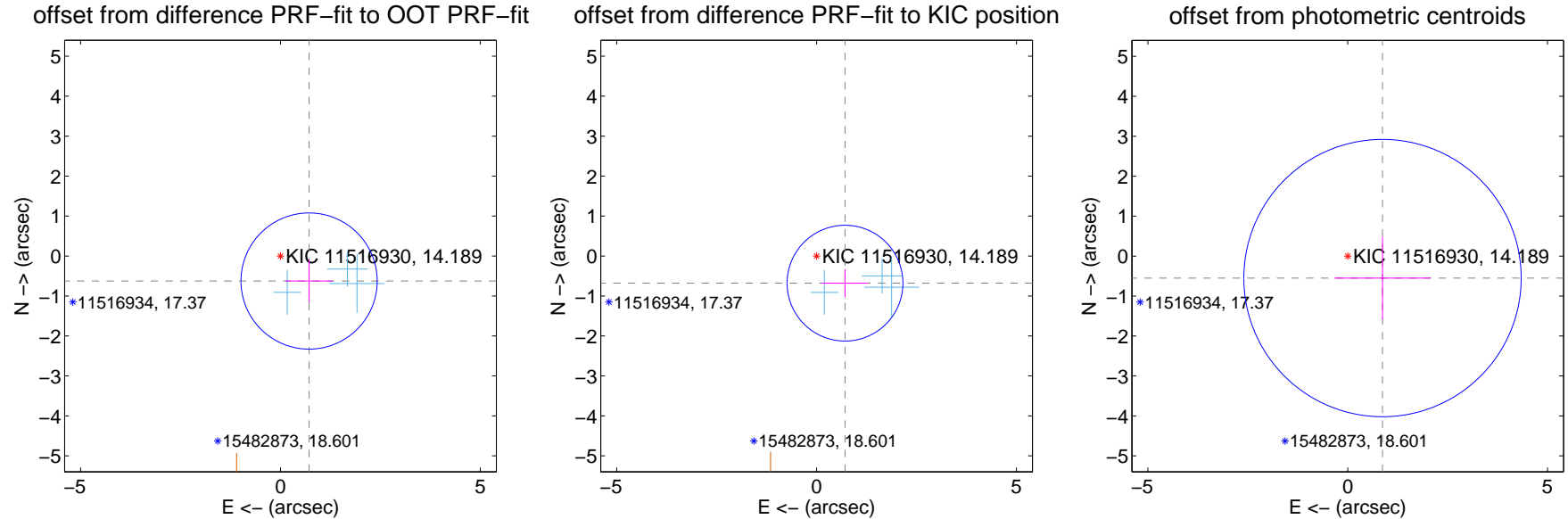
## DV Centroid Data

Supplemental centroid analysis for 011516930-05. Kepler magnitude: 14.19. Transit SNR 6.74

There are 3 quarters with good PRF difference image offsets

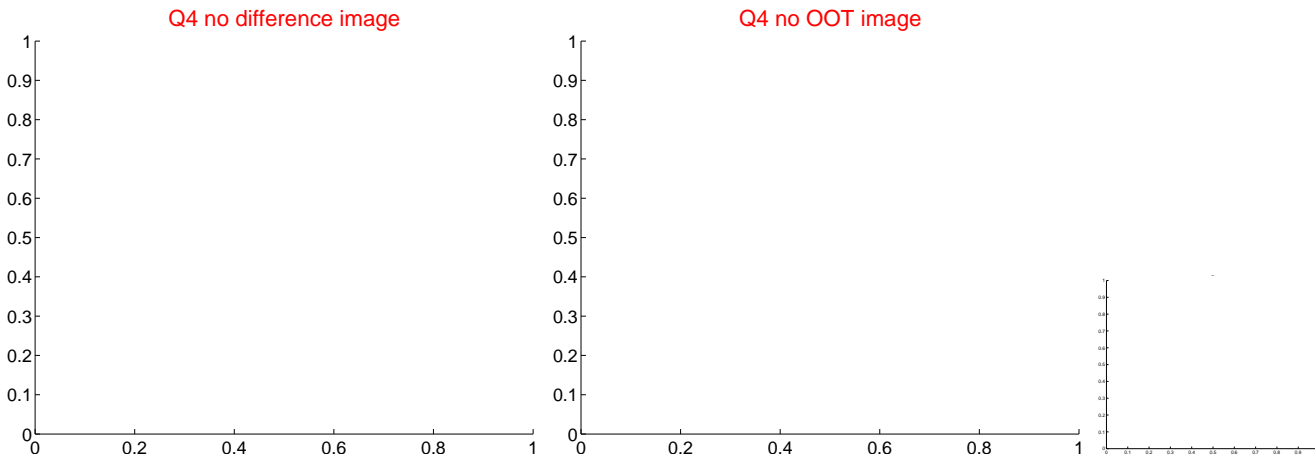
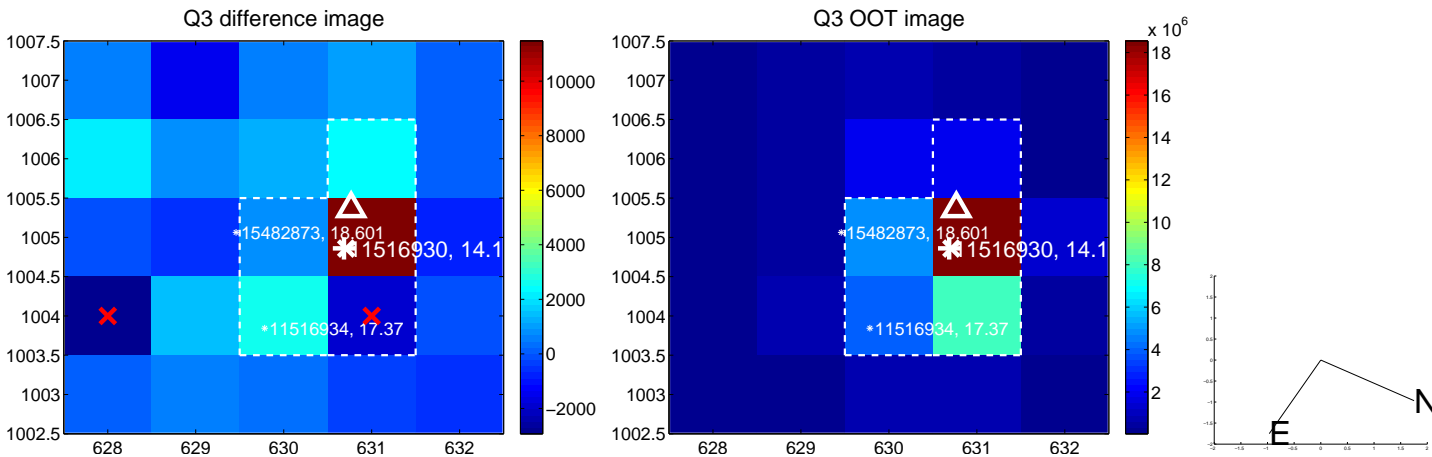
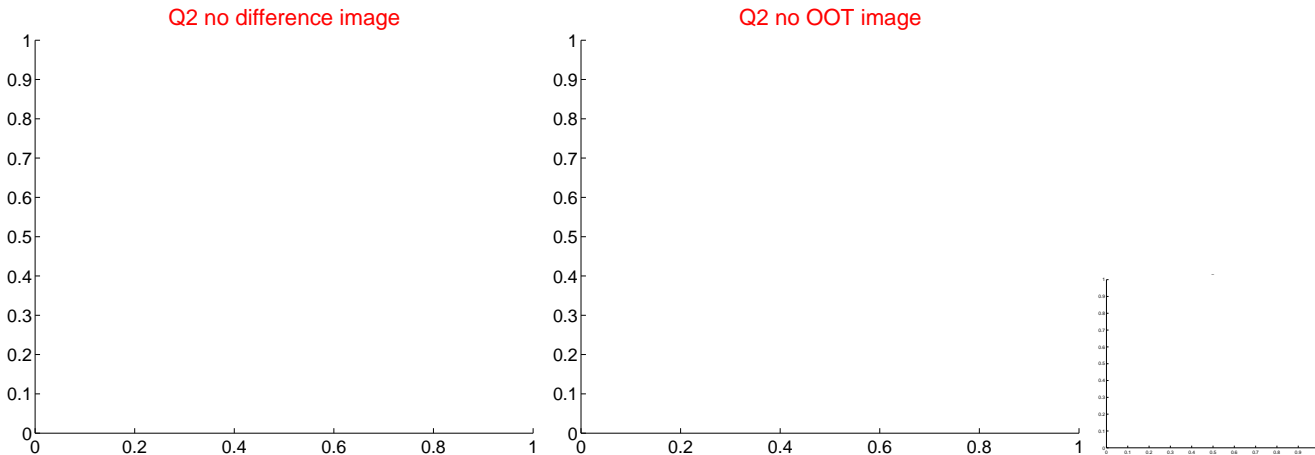
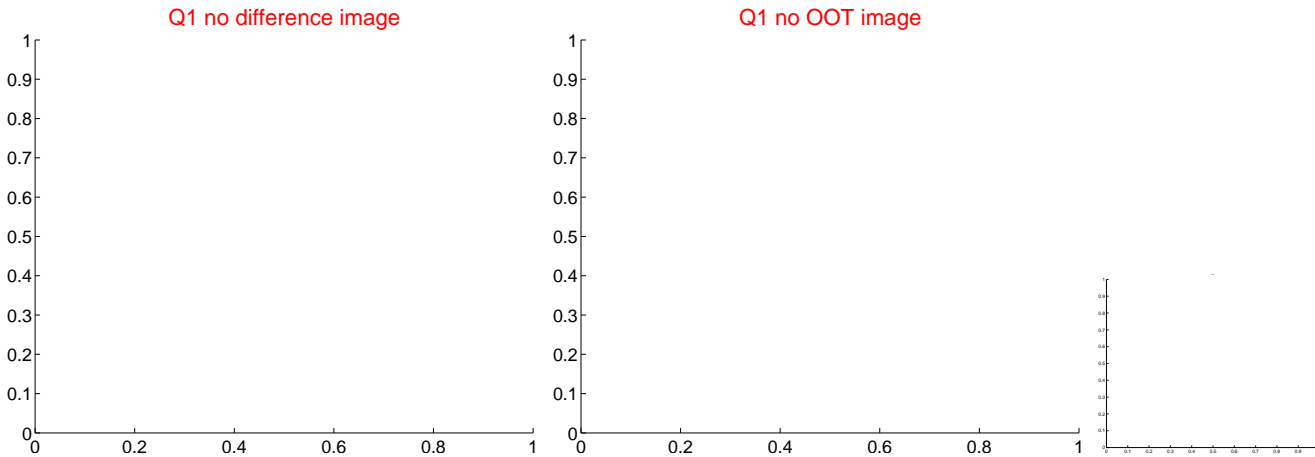
The direct PRF centroid is offset from the target star catalog position by about 0.03 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.951 \pm 0.568$	1.67	$-0.716 \pm 0.590$	$-0.626 \pm 0.538$
PRF-fit source offset from KIC position	$0.983 \pm 0.483$	2.04	$-0.711 \pm 0.576$	$-0.679 \pm 0.353$
photometric centroid source offset	$1.03 \pm 1.16$	0.89	$-0.87 \pm 1.20$	$-0.55 \pm 1.03$



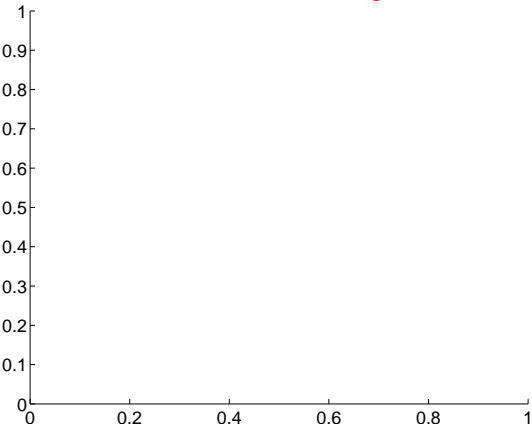
Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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

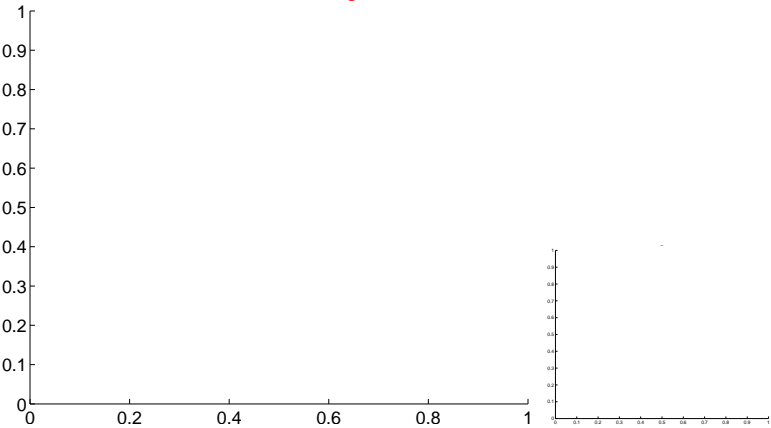


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

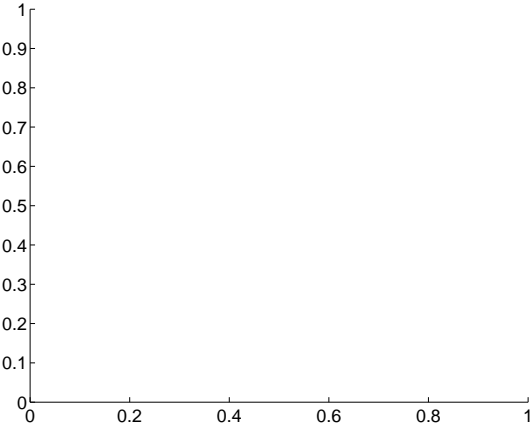
Q5 no difference image



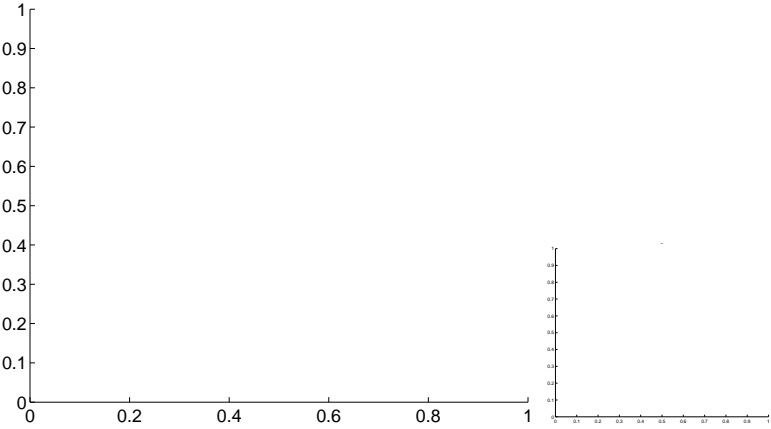
Q5 no OOT image



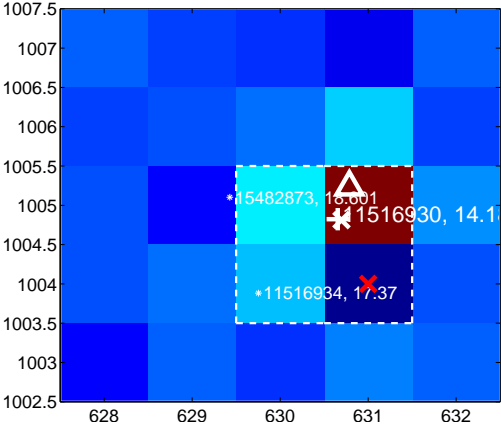
Q6 no difference image



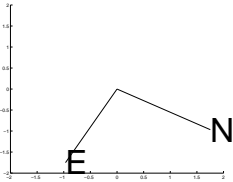
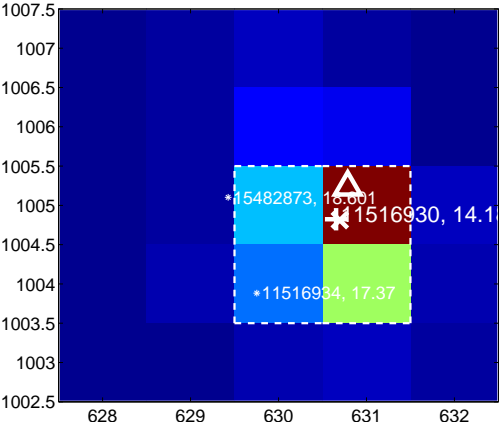
Q6 no OOT image



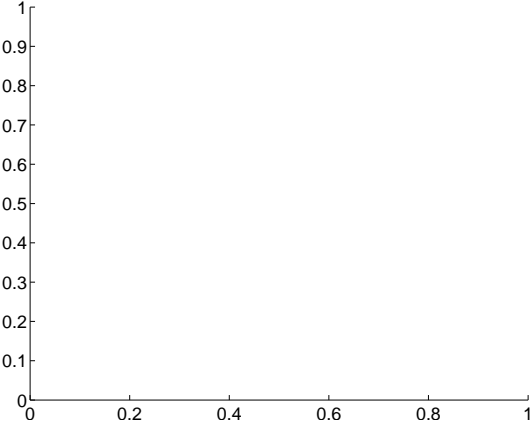
Q7 difference image



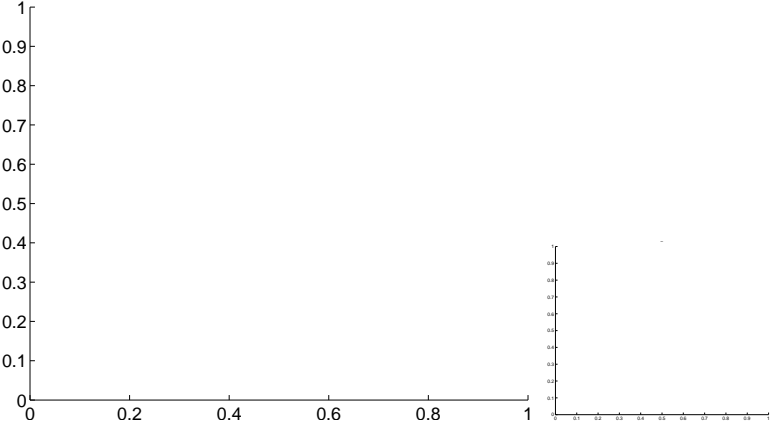
Q7 OOT image



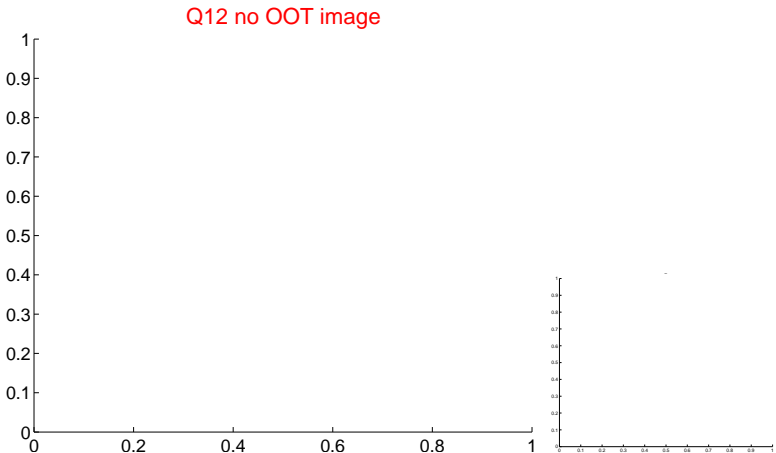
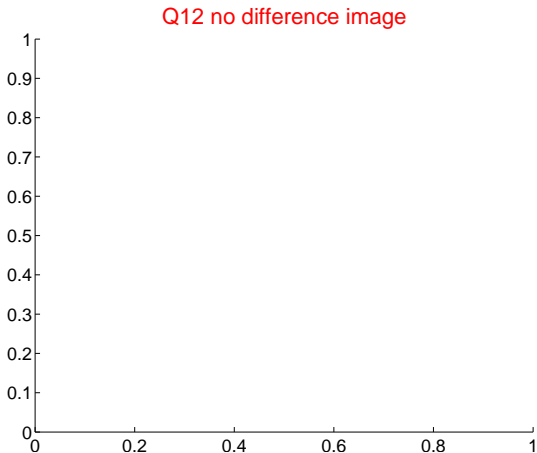
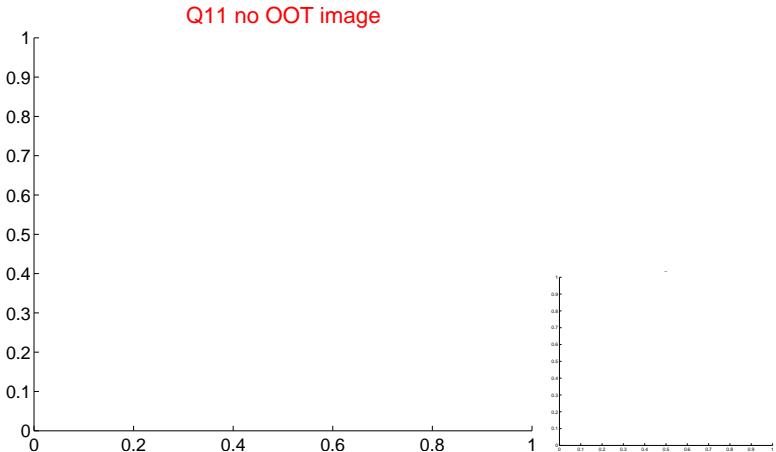
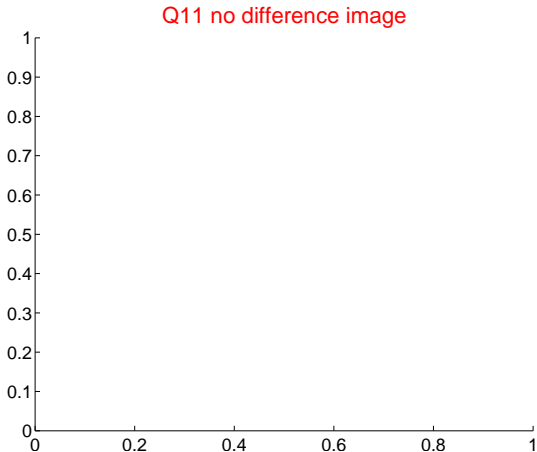
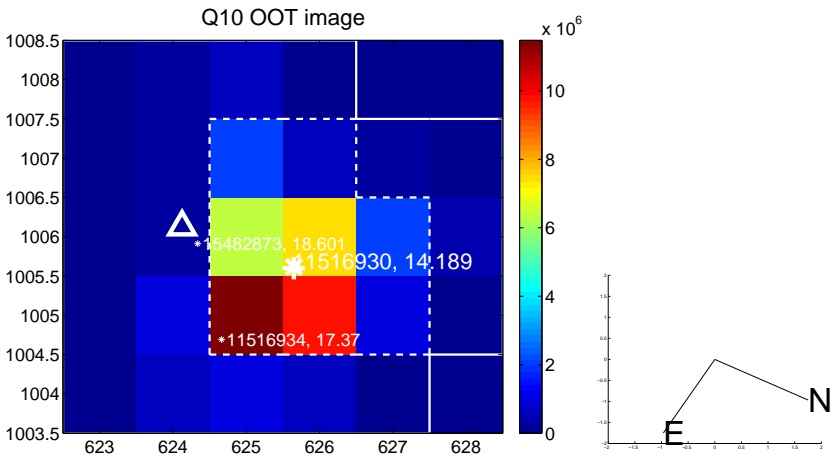
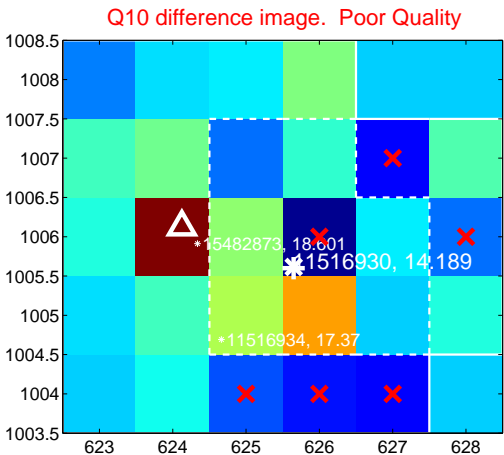
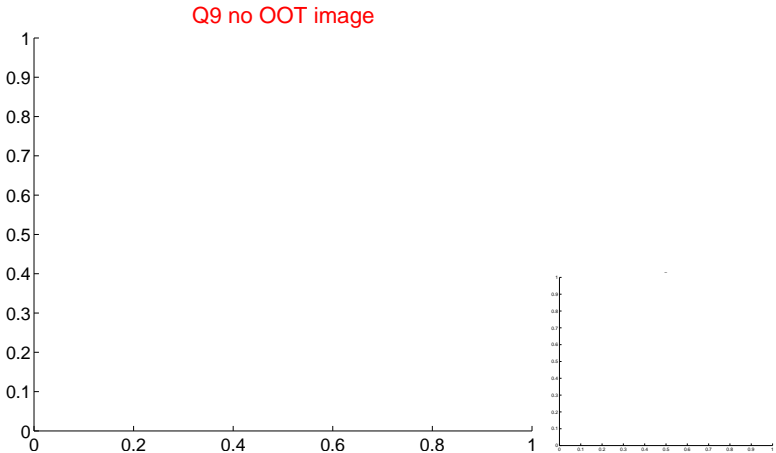
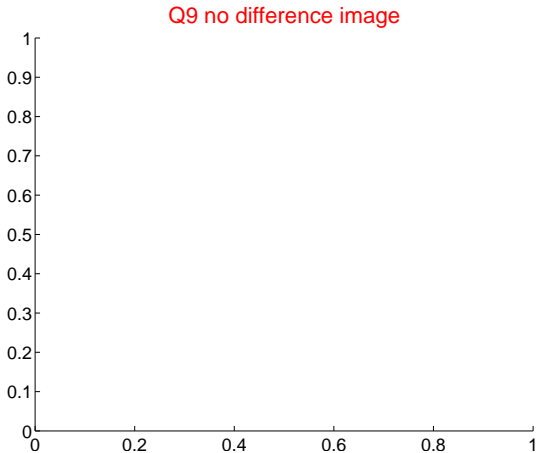
Q8 no difference image



Q8 no OOT image

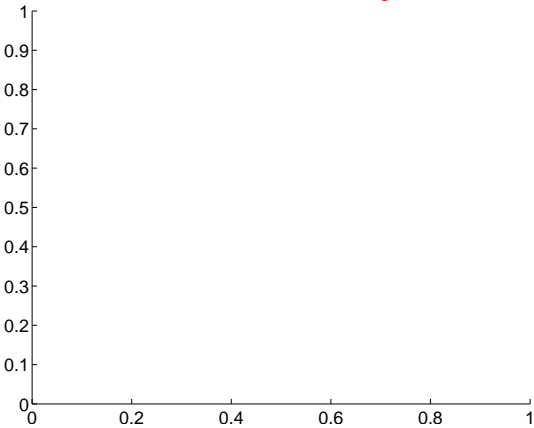


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value

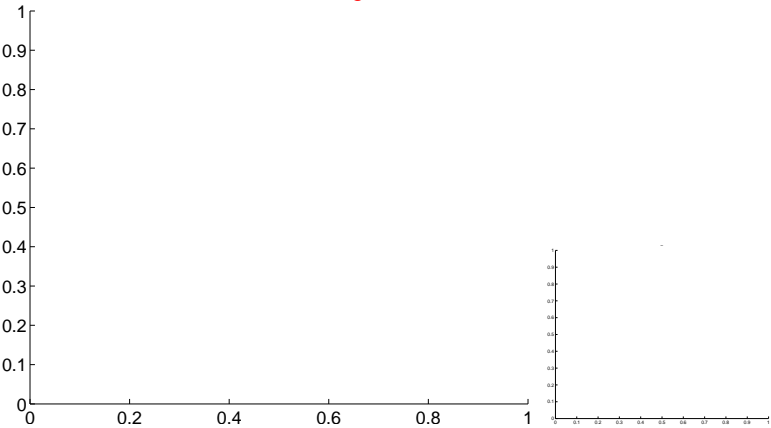


white ×: KIC target position; +: OOT centroid; △: difference centroid. red ✕: large negative pixel value.

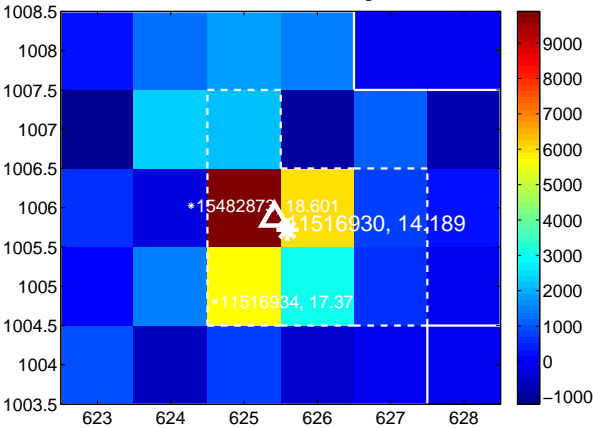
Q13 no difference image



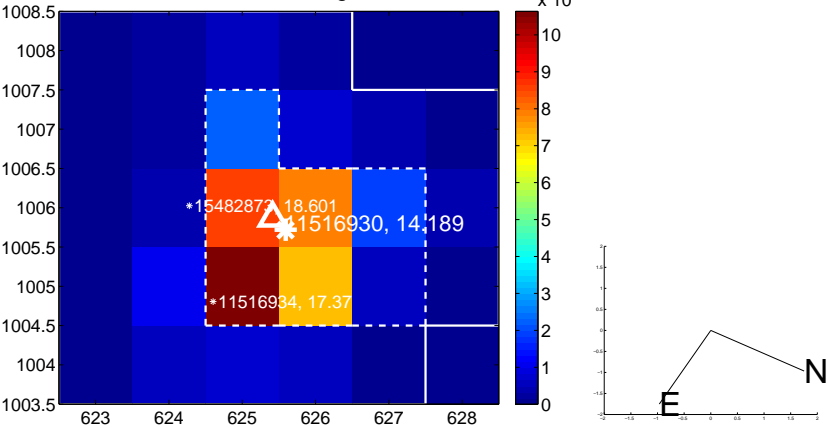
Q13 no OOT image



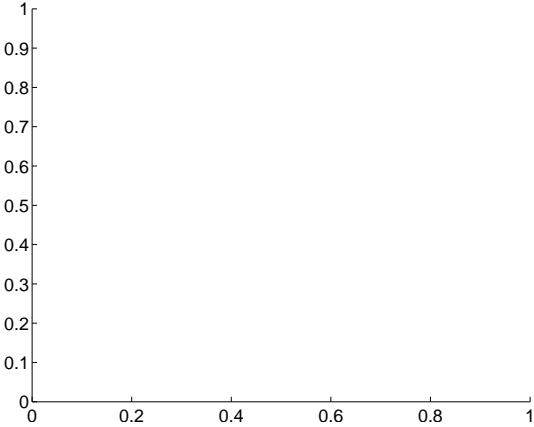
Q14 difference image



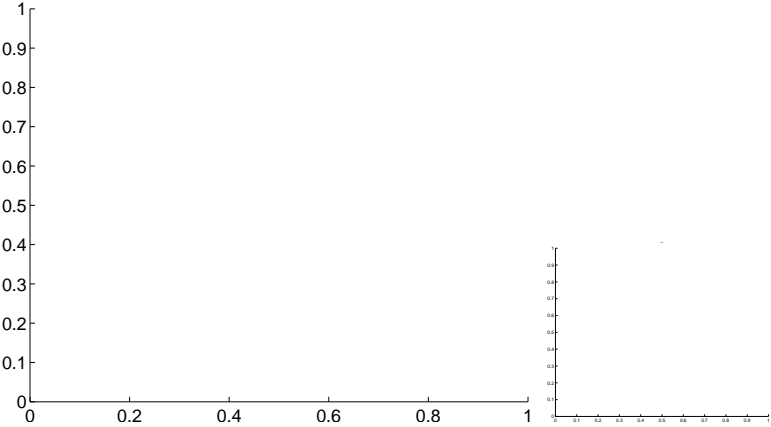
Q14 OOT image



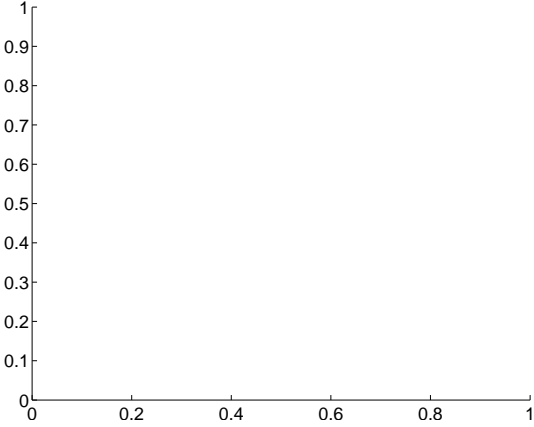
Q15 no difference image



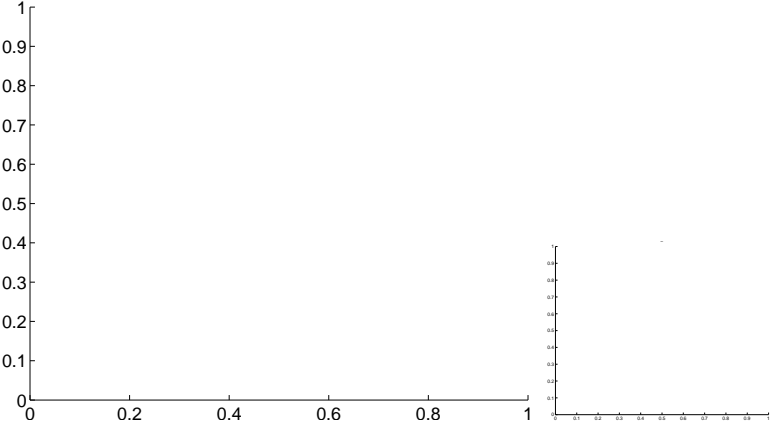
Q15 no OOT image



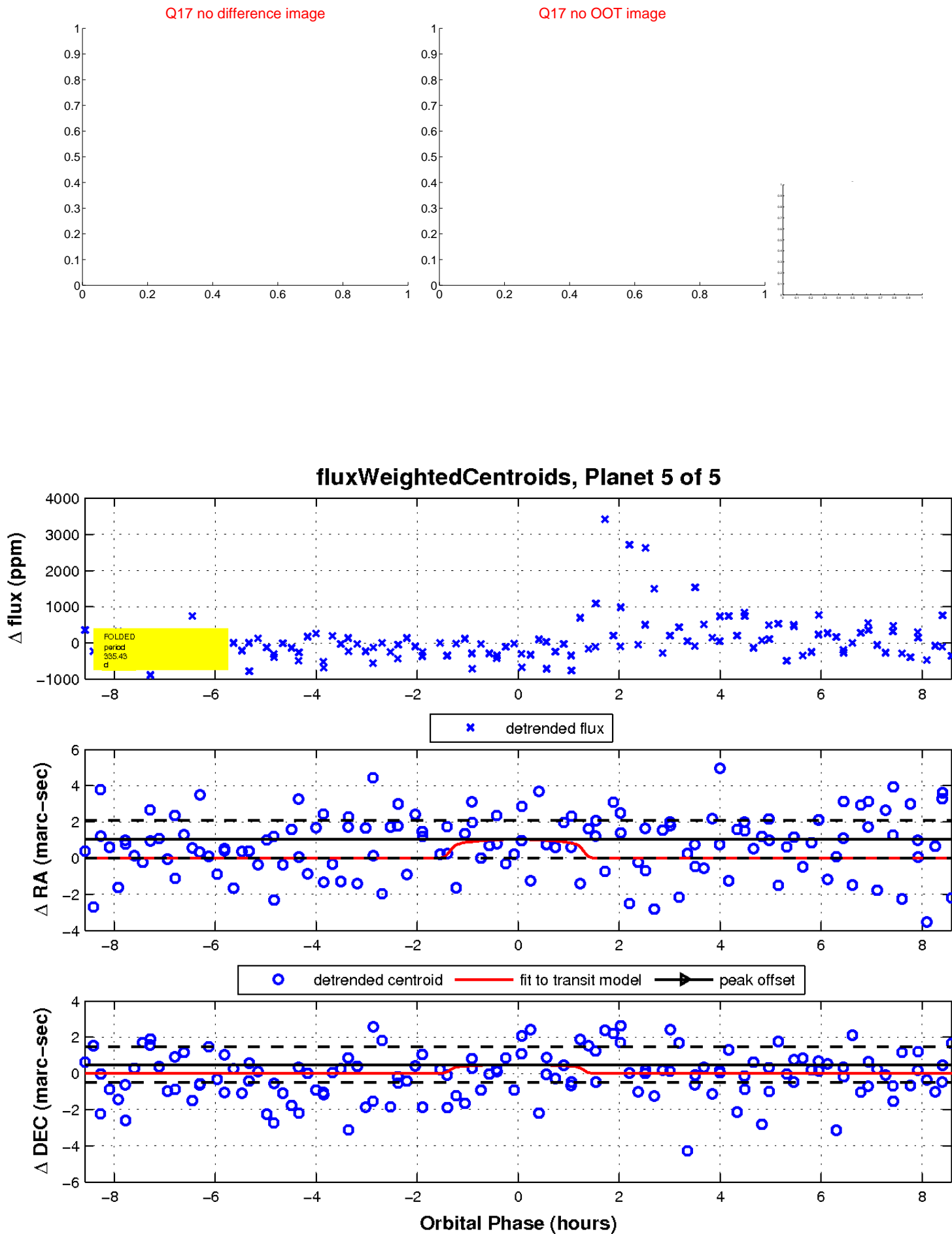
Q16 no difference image



Q16 no OOT image



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



UKIRT Image

Declination

