

# KIC 009774314

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
009774314-01	OBS	No	0.614988	131.909206	22.4	1.674	17.1	7.9	2.36	8143	1.35	72600.64
009774314-02	OBS	No	170.829583	167.118128	155.6	16.637	12.8	4.4	2.36	8143	3.29	40.06

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009774314-01	OBS	FP	0.00	1	0	0	0	SWEET_NTL—LPP_DV—LPP_ALT—MOD_NONUNIQ_ALT
009774314-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_CHASES—TRANS_GAPPED—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS

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

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

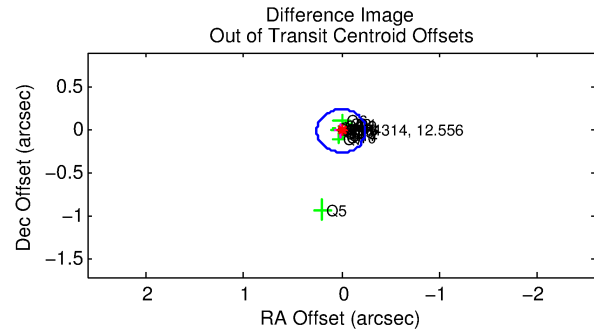
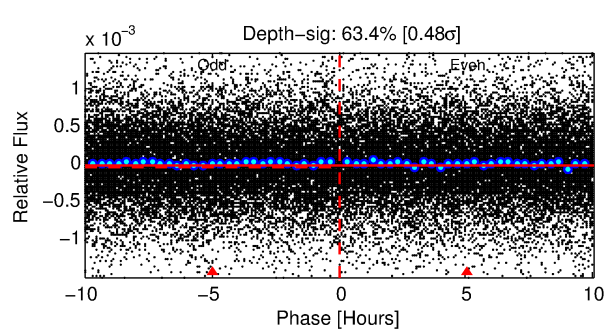
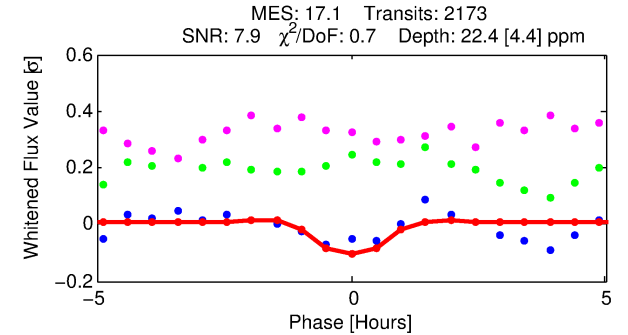
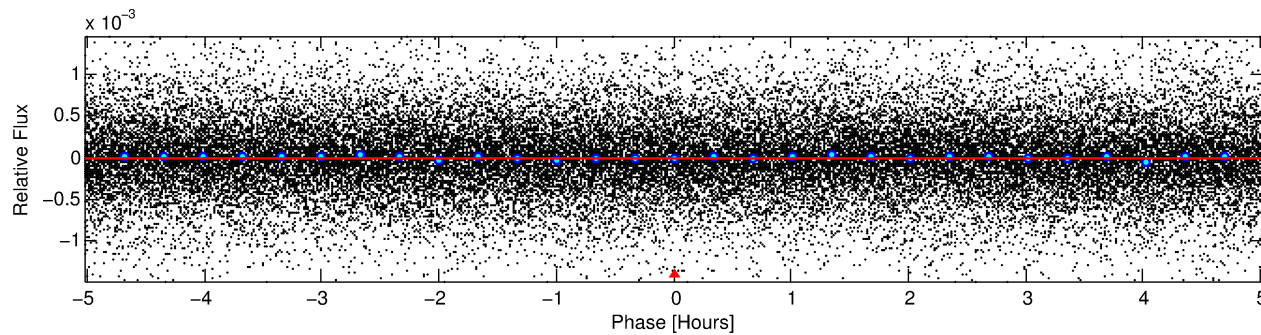
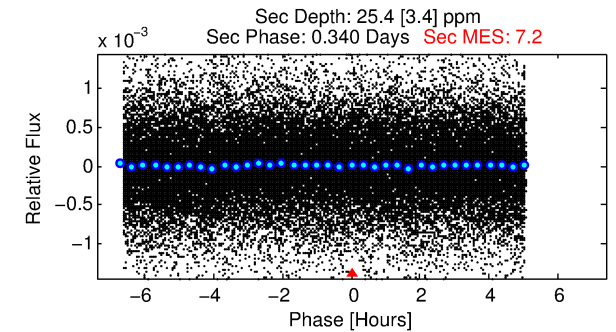
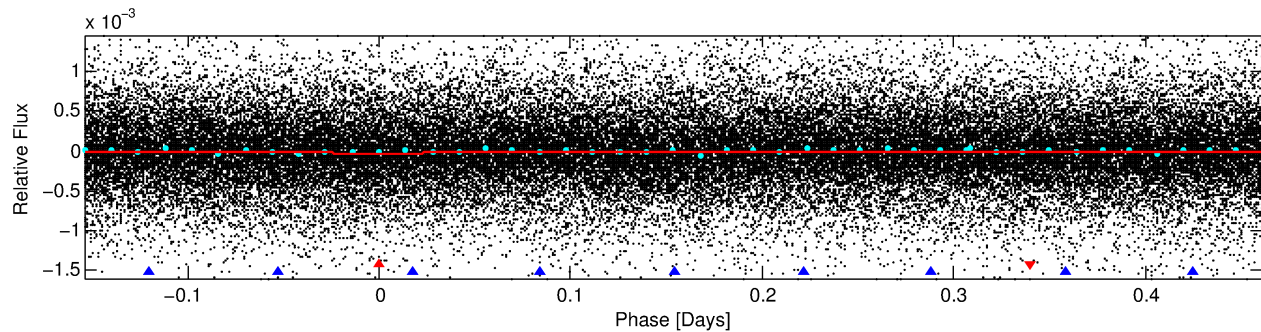
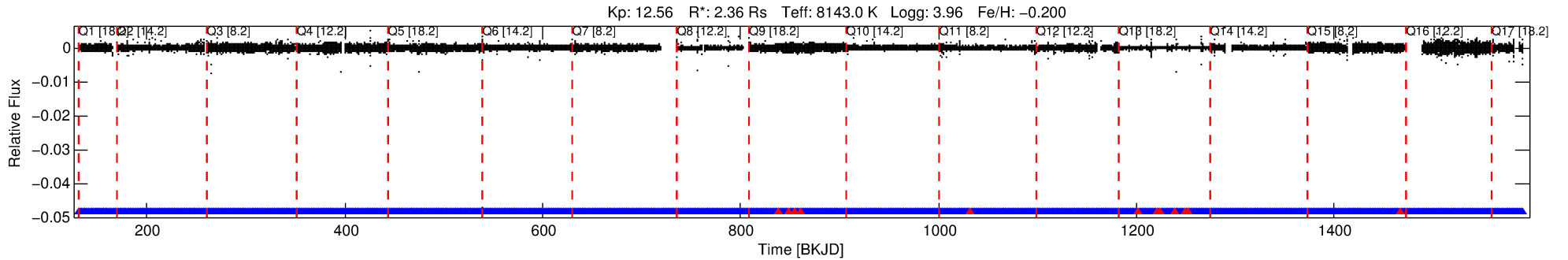
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 009774314-01

No Significant Match Found

# DV One-Page Summary

KIC: 9774314 Candidate: 1 of 2 Period: 0.615 d



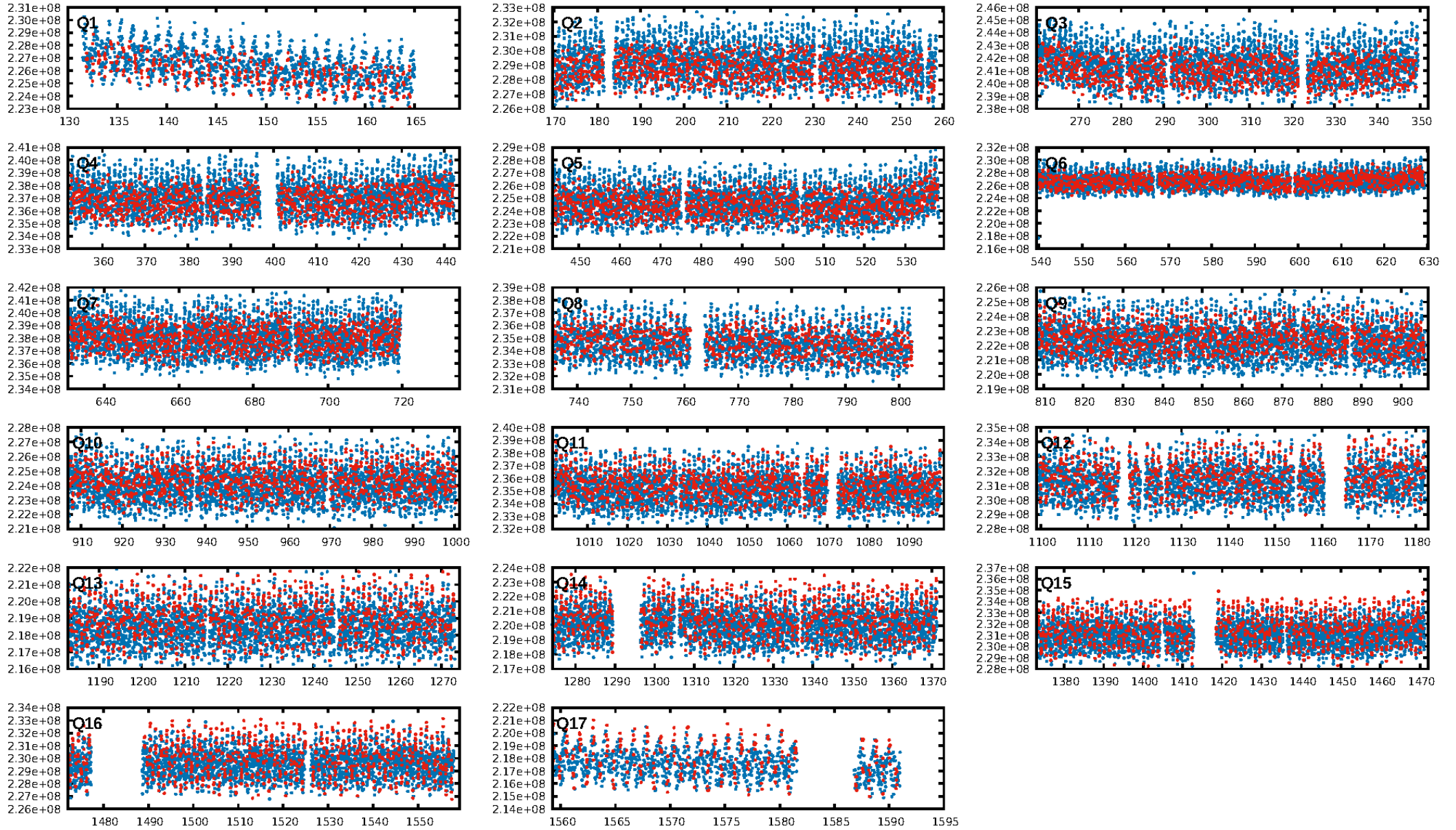
## DV Fit Results:

Period = 0.61499 [0.00001] d  
Epoch = 131.9092 [0.0032] BKJD  
Rp/R\* = 0.0052 [0.0031]  
a/R\* = 1.42 [2.72]  
b = 0.93 [0.53]  
Seff = 72600.64 [35927.29]  
Teff = 4186 [518] K  
Rp = 1.35 [0.92] Re  
a = 0.0174 [0.0053] AU  
Ag = 2.33 [3.01] [0.44σ]  
Teffp = 7997 [2427] K [1.54σ]

## DV Diagnostic Results:

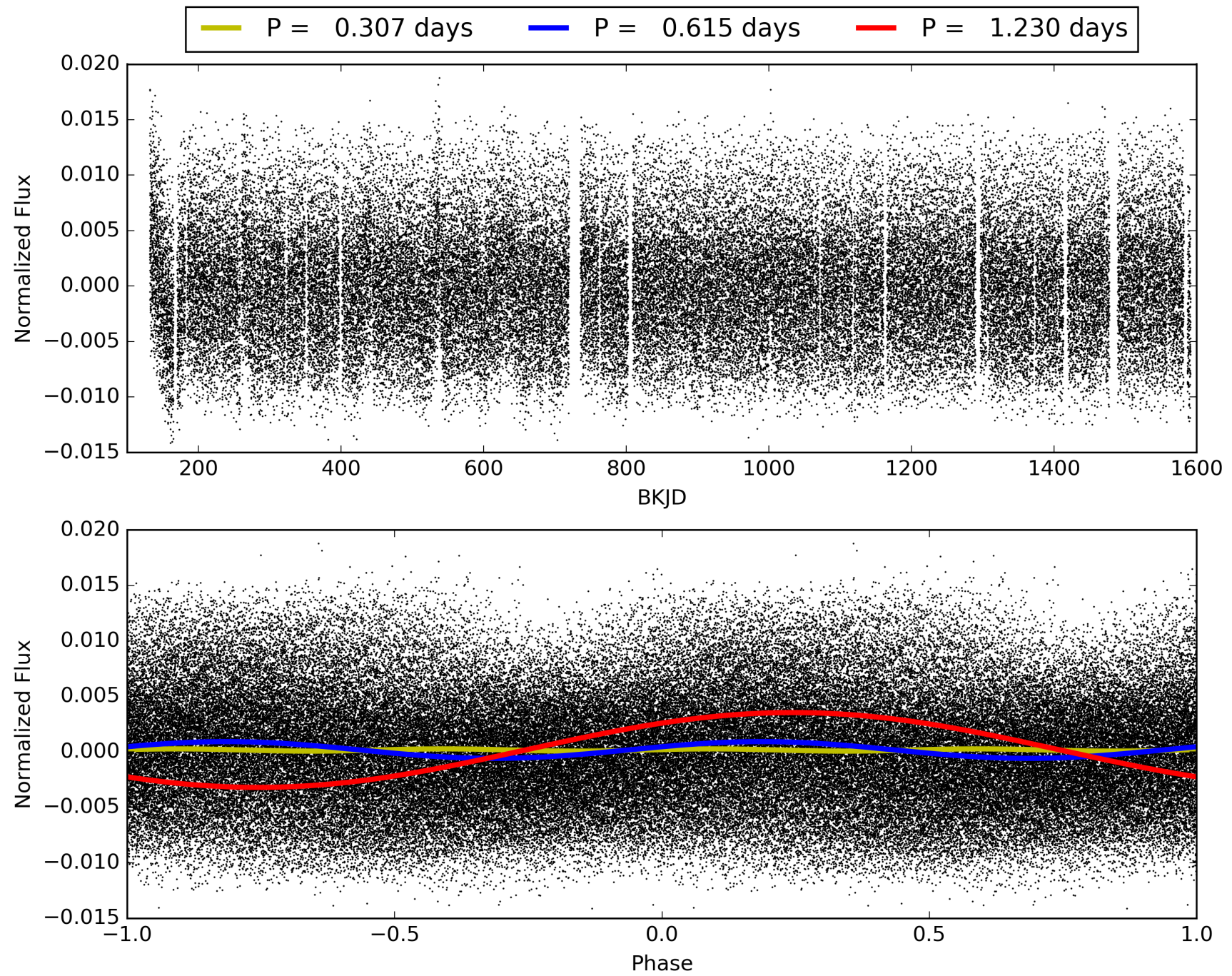
ShortPeriod-sig: N/A  
LongPeriod-sig: 100.0% [244.31σ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: 8.49e-78  
RollingBand-fgt: 0.99 [2063/2075]  
**GhostDiagnostic-chr: -0.6387**  
Centroid-sig: 11.8%  
Centroid-so: 1.055 arcsec [1.46σ]  
OotOffset-rm: 0.009 arcsec [0.11σ]  
KicOffset-rm: 0.173 arcsec [2.34σ]  
OotOffset-st: 4/4/4/5 [17]  
KicOffset-st: 4/4/4/5 [17]  
DiffImageQuality-fgm: 0.29 [5/17]  
DiffImageOverlap-fno: 1.00 [17/17]

# TCE 009774314-01, PDC Light Curves



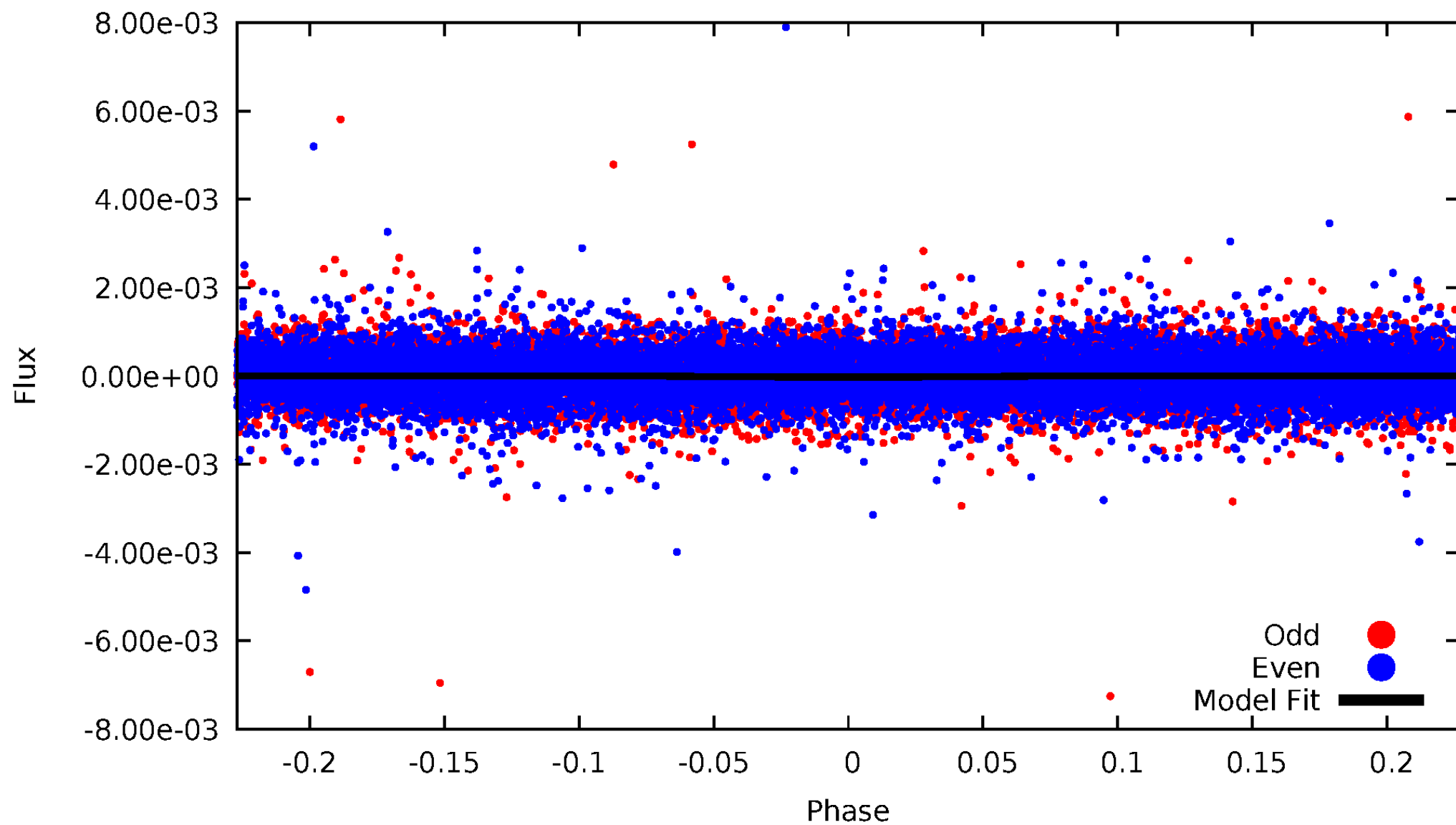


TCE 009774314-01



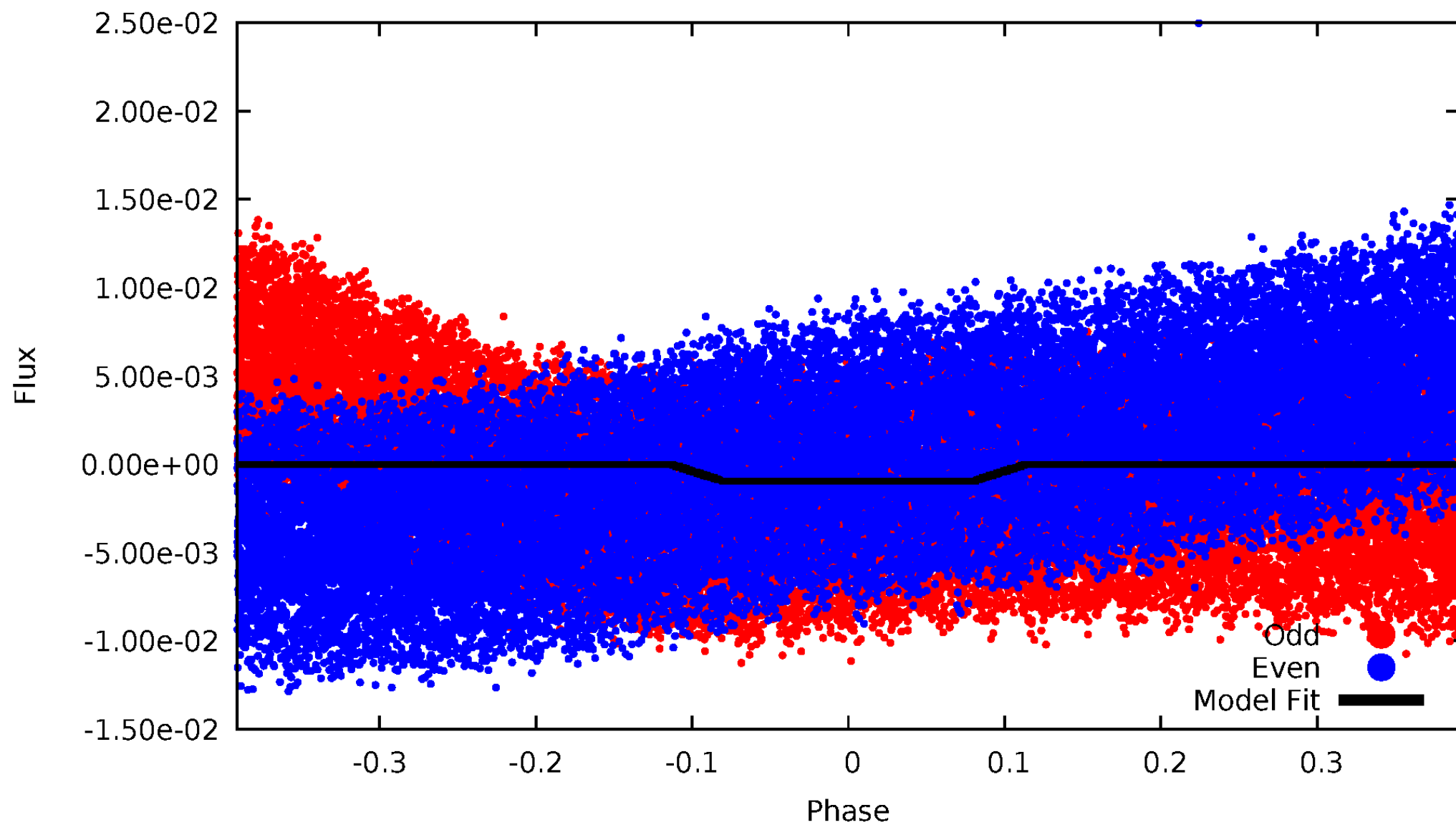
# DV Odd/Even

TCE 009774314-01



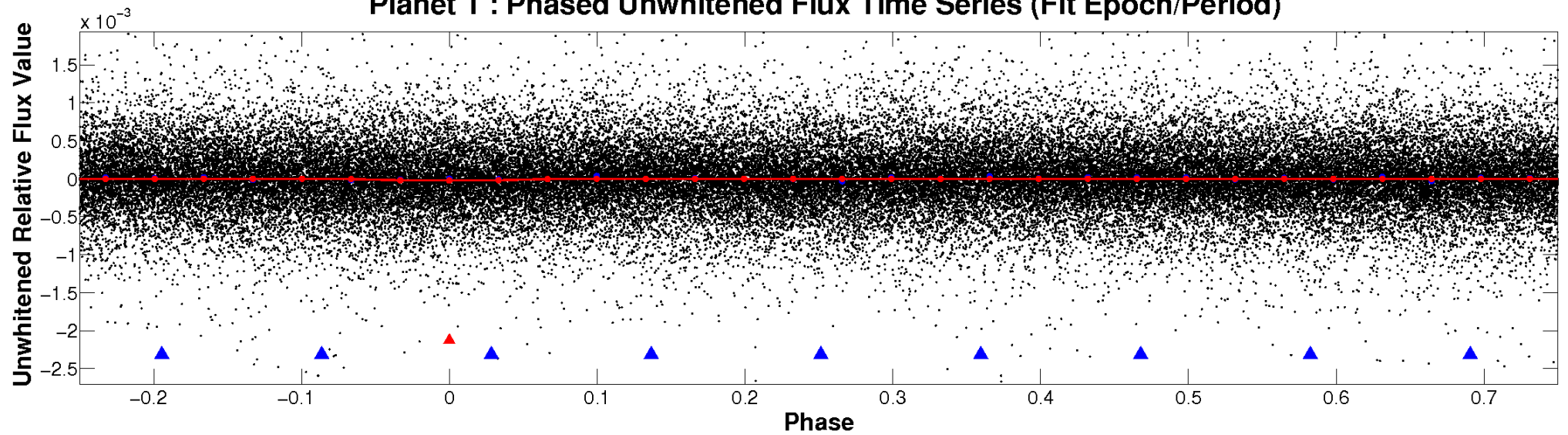
# ALT Odd/Even

TCE 009774314-01

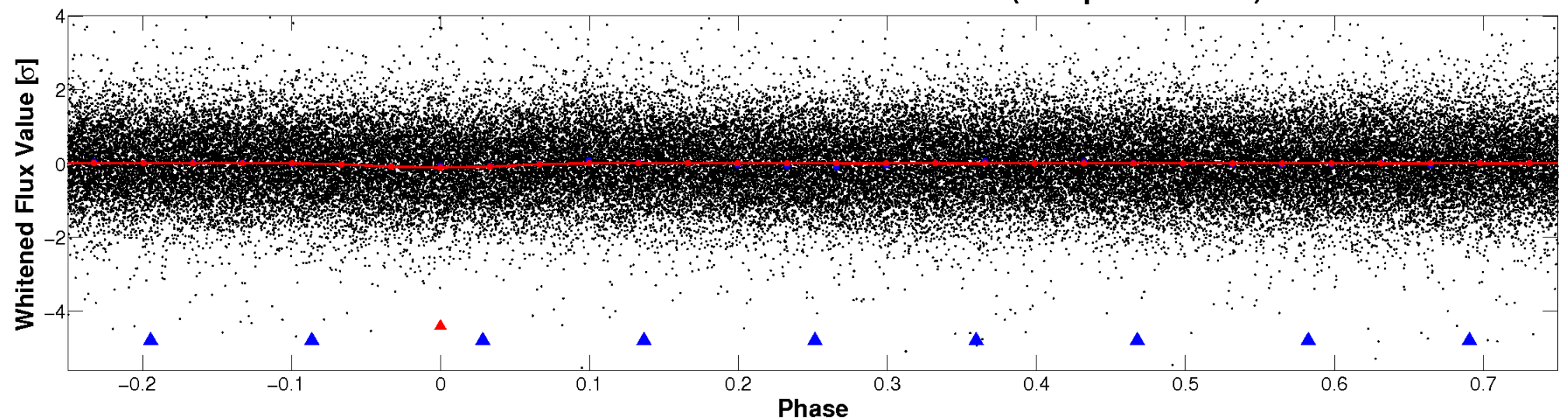


# Non-Whitened Vs. Whitened Light Curve

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



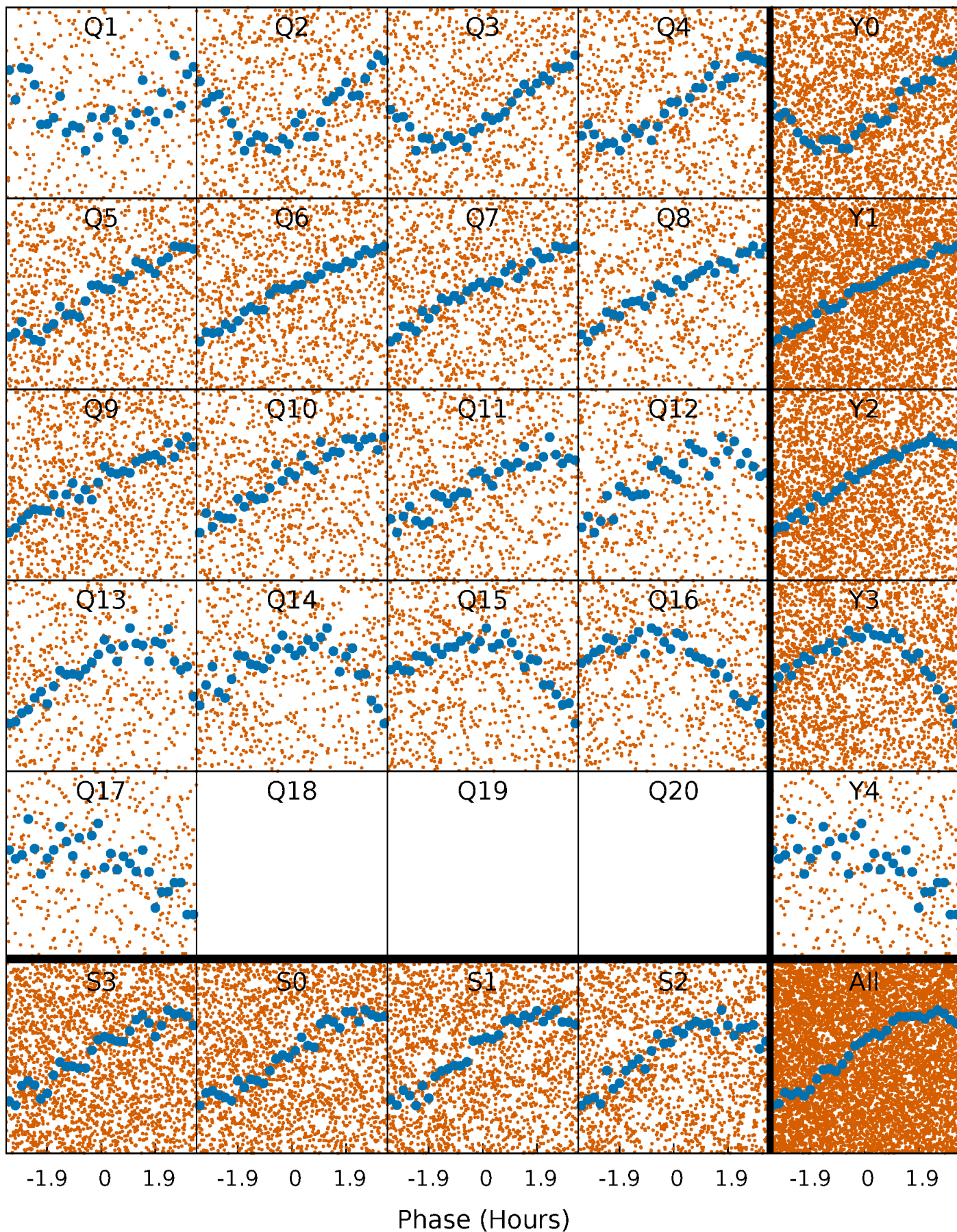
**Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)**





# PDC Quarter-Phased Transit Curves

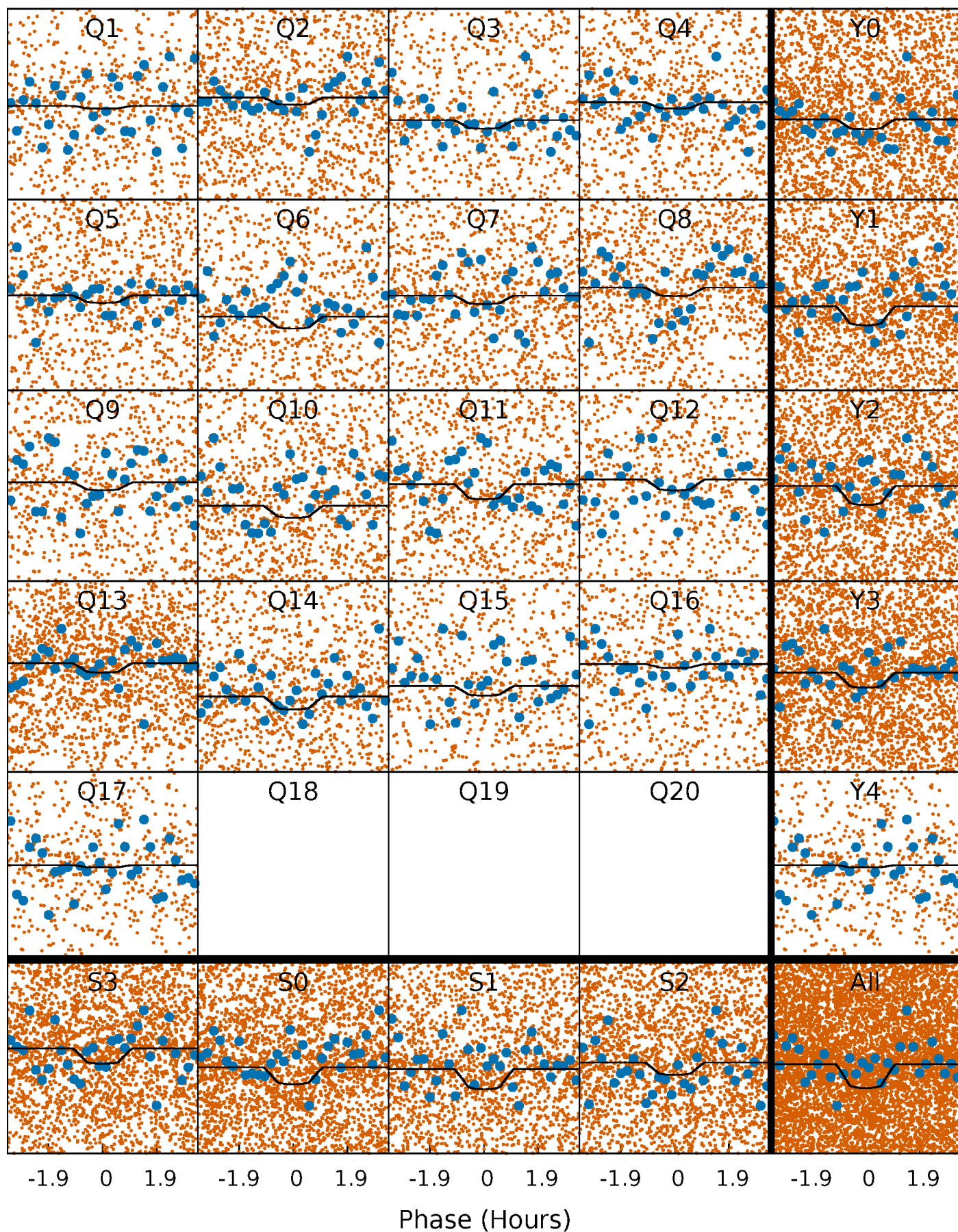
TCE 009774314-01 P= 0.614988 Days  $T_0=131.909206$  (BKJD)





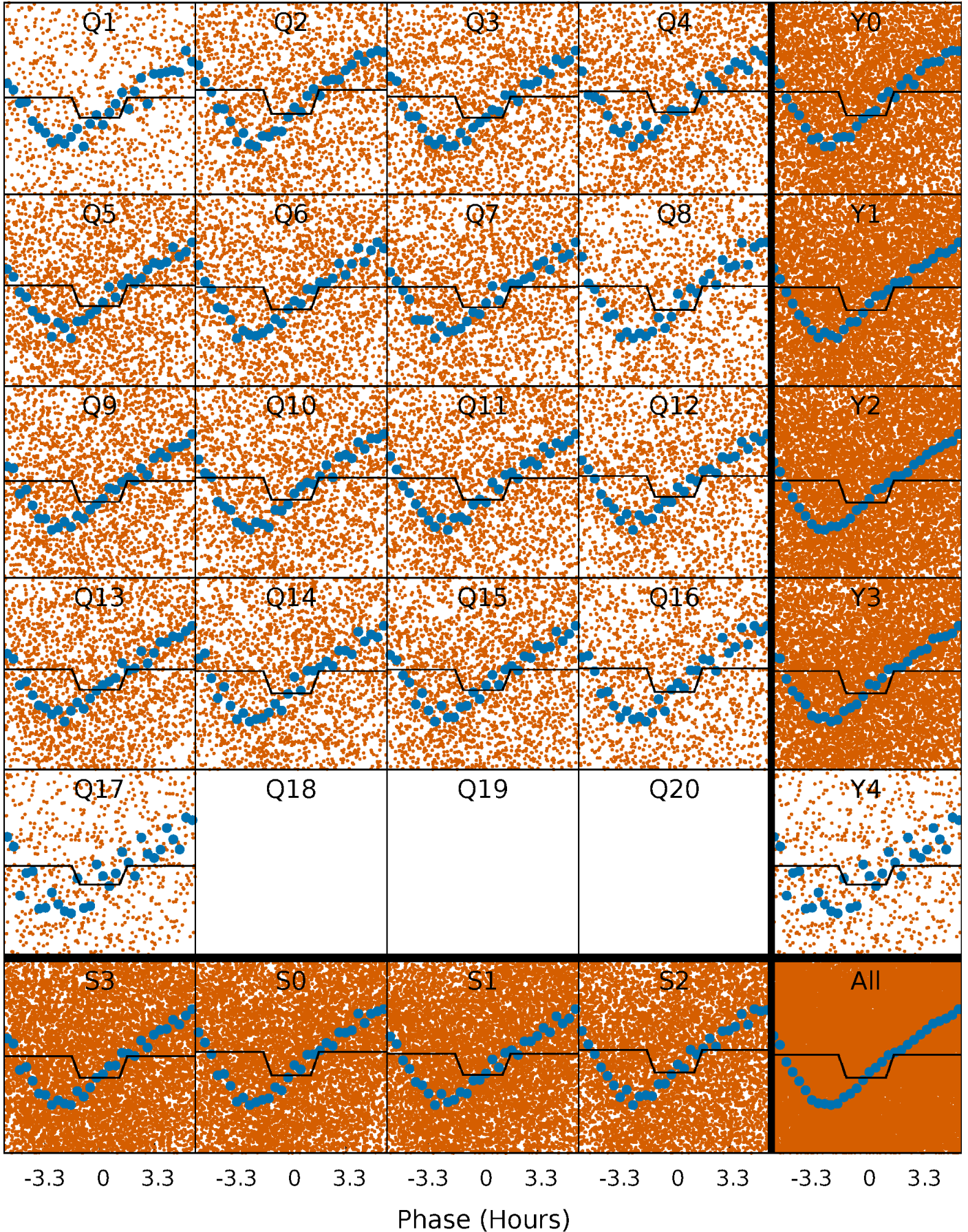
# DV Quarter-Phased Transit Curves

TCE 009774314-01 P= 0.614988 Days  $T_0=131.909206$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

TCE 009774314-01 P= 0.614812 Days  $T_0=131.990492$  (BKJD)

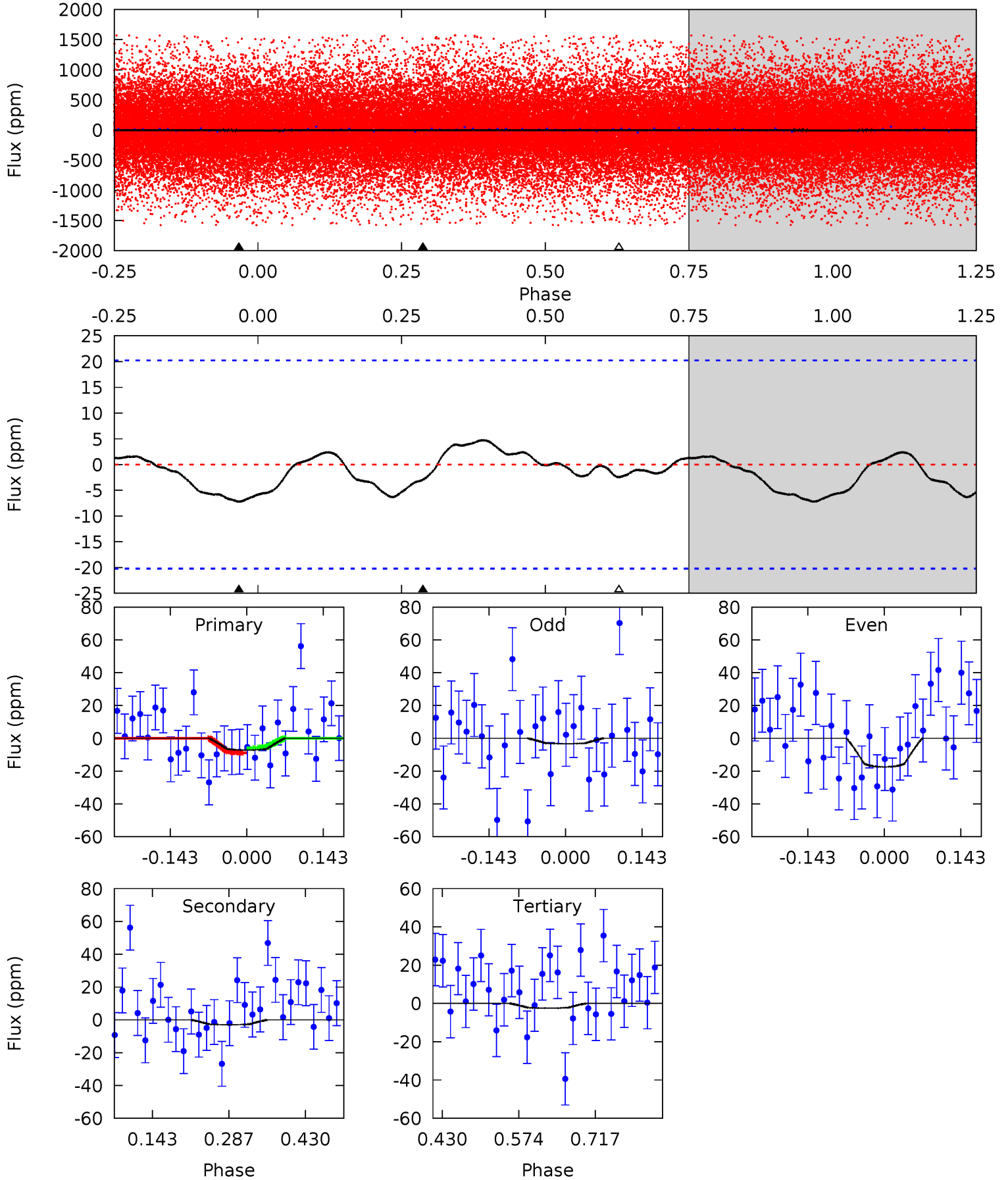




# DV Model-Shift Uniqueness Test

009774314-01, P = 0.614988 Days, E = 131.294218 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
1.60	0.66	0.54	0	4.49	1.46	0.33	1.06	1.60	0.12	0.66	1.57	0.36	0.40	0.33

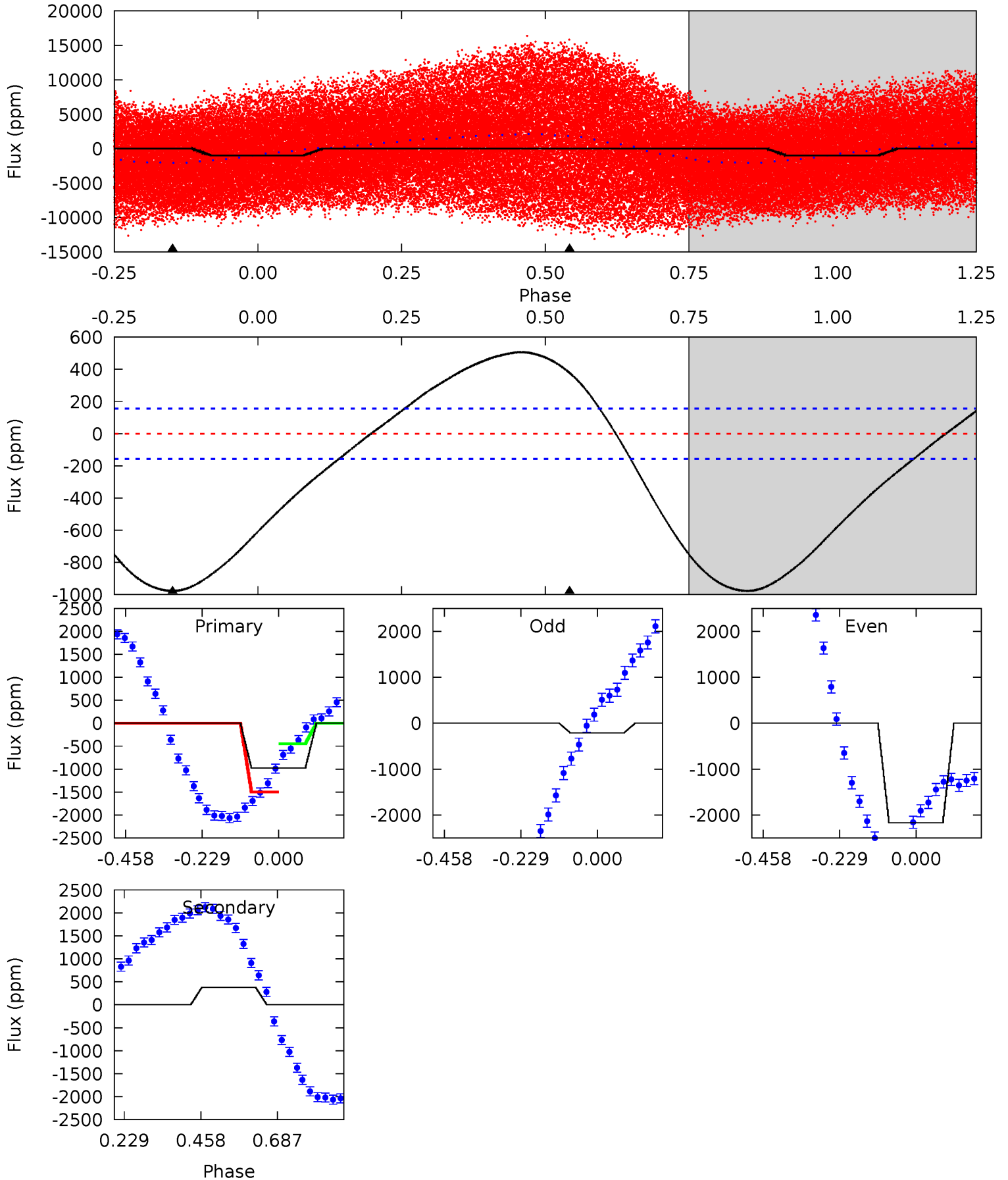




# Alt Model-Shift Uniqueness Test

009774314-01, P = 0.614812 Days, E = 131.375680 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
27.5	-10.6	0	0	4.39	1.20	5.18	27.5	27.5	-10.6	-10.6	28.3	0.98	0.34	13.7



### Stellar Parameters For KIC 009774314

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$8143^{+226}_{-340}$	$3.960^{+0.266}_{-0.114}$	$-0.200^{+0.200}_{-0.350}$	$2.361^{+0.367}_{-0.794}$	$1.854^{+0.077}_{-0.410}$	$0.198^{+0.373}_{-0.068}$
	+3%/-4%	+7%/-3%	+100%/-175%	+16%/-34%	+4%/-22%	+188%/-34%
Source	KIC0	KIC0	KIC0	DSEP		

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

### Secondary Eclipse Parameters for KIC 009774314-01 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-3 \pm 5$	$1.31^{+0.85}_{-0.65}$	$5747^{+384}_{-465}$	$-3721^{+9720}_{-1442}$	$0.210^{+1.107}_{-0.334}$
Alt.	$377 \pm 36$	$7.75^{+1.24}_{-1.51}$	$5788^{+345}_{-480}$	$-6696^{+384}_{-422}$	$-1.028^{+0.261}_{-0.483}$

$T_{max}$  = 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

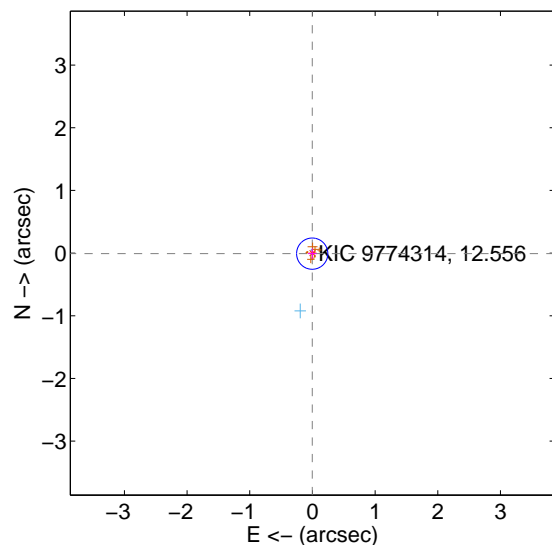
Supplemental centroid analysis for 009774314-01. Kepler magnitude: 12.56. Transit SNR 7.86

There are 5 quarters with good PRF difference image offsets

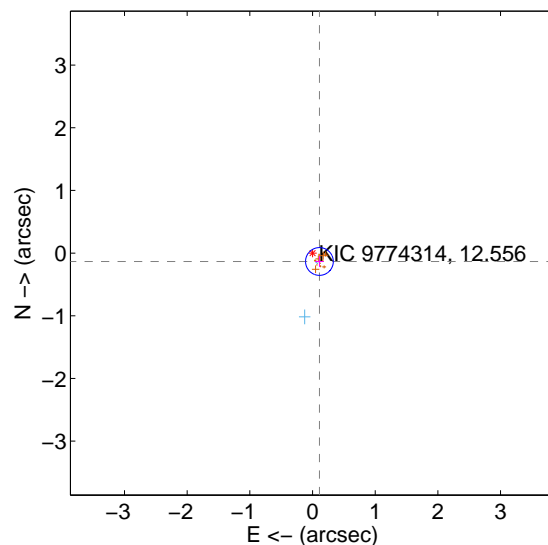
The direct PRF centroid is offset from the target star catalog position by about 0.14 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.009 \pm 0.083$	0.11	$0.004 \pm 0.068$	$-0.009 \pm 0.083$
PRF-fit source offset from KIC position	$0.173 \pm 0.074$	2.34	$-0.110 \pm 0.069$	$-0.134 \pm 0.084$
photometric centroid source offset	$1.06 \pm 0.72$	1.46	$-0.31 \pm 0.70$	$-1.01 \pm 0.72$

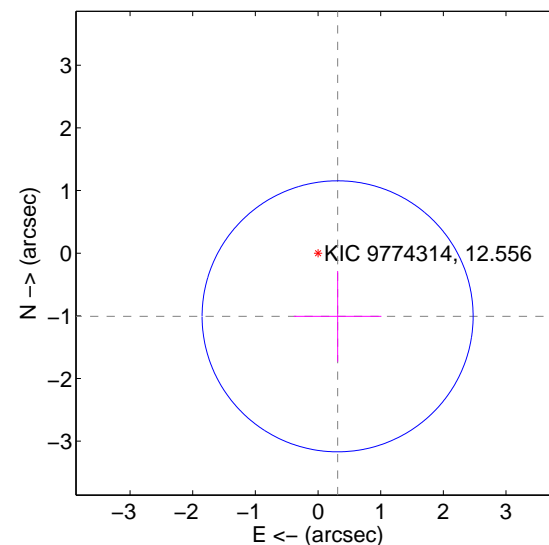
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position



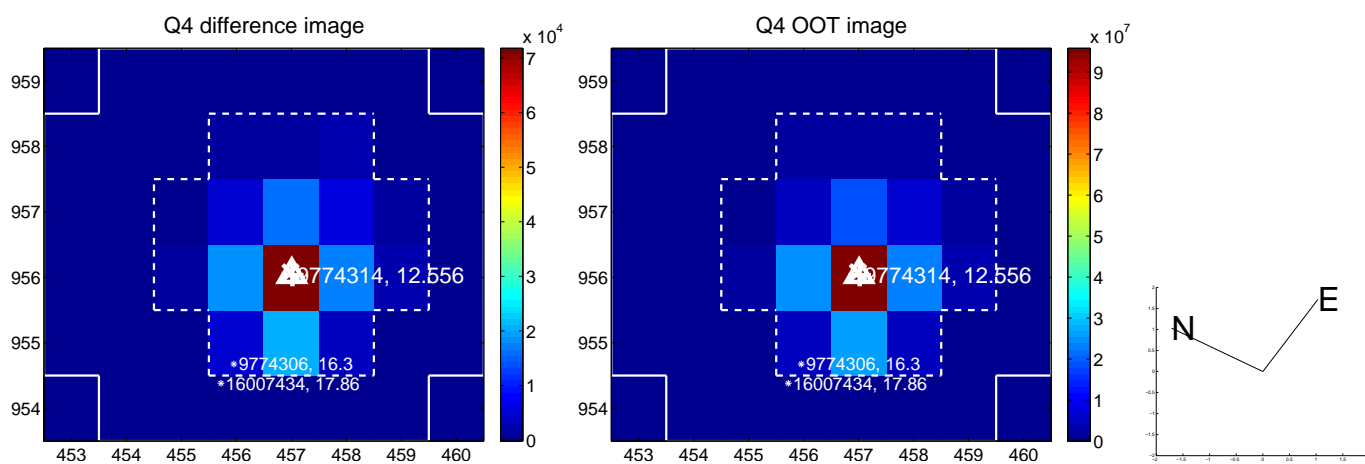
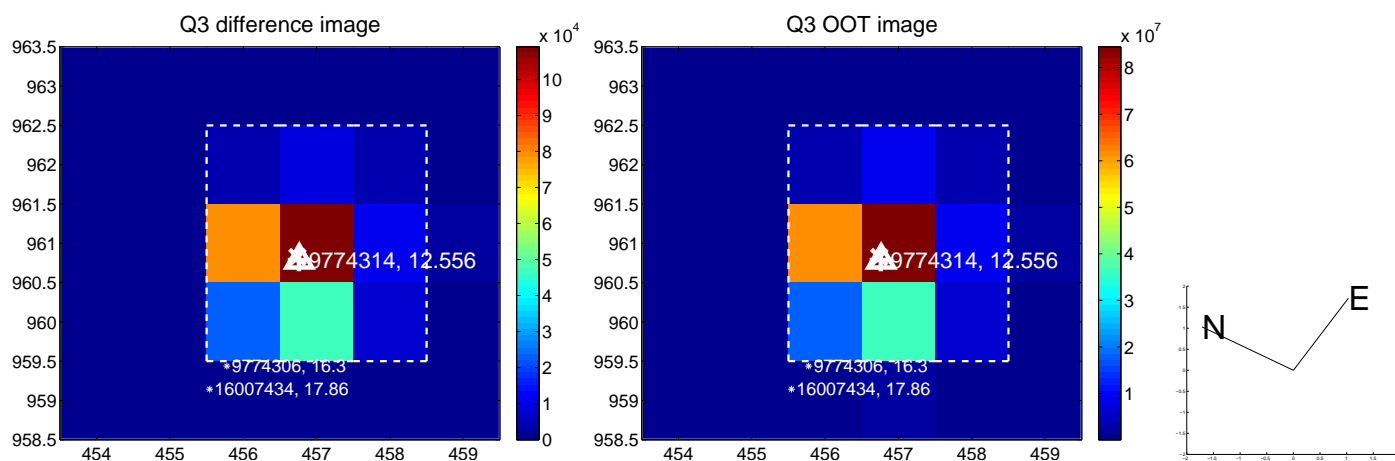
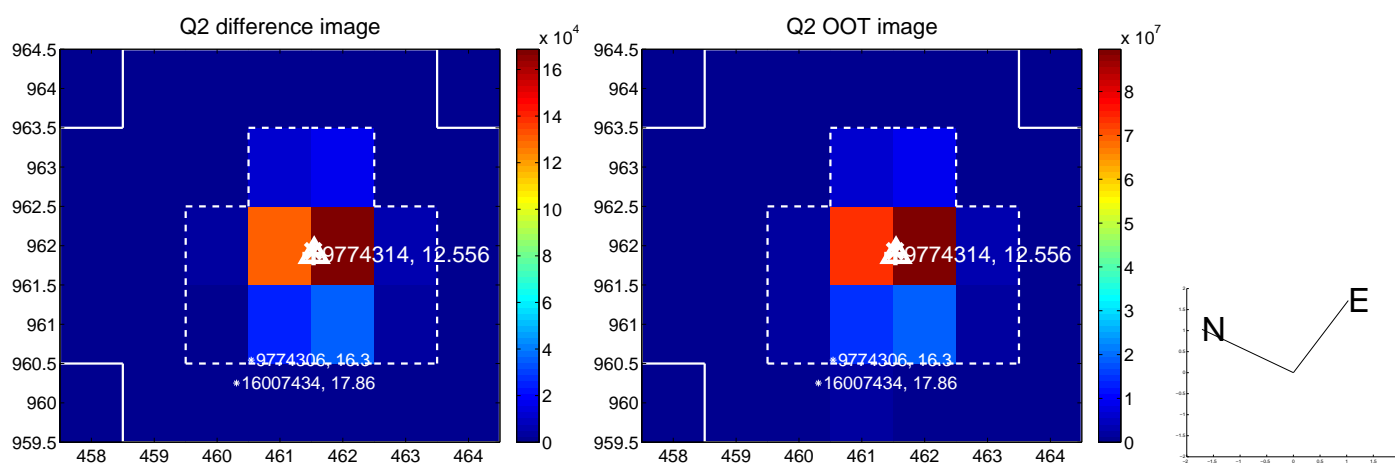
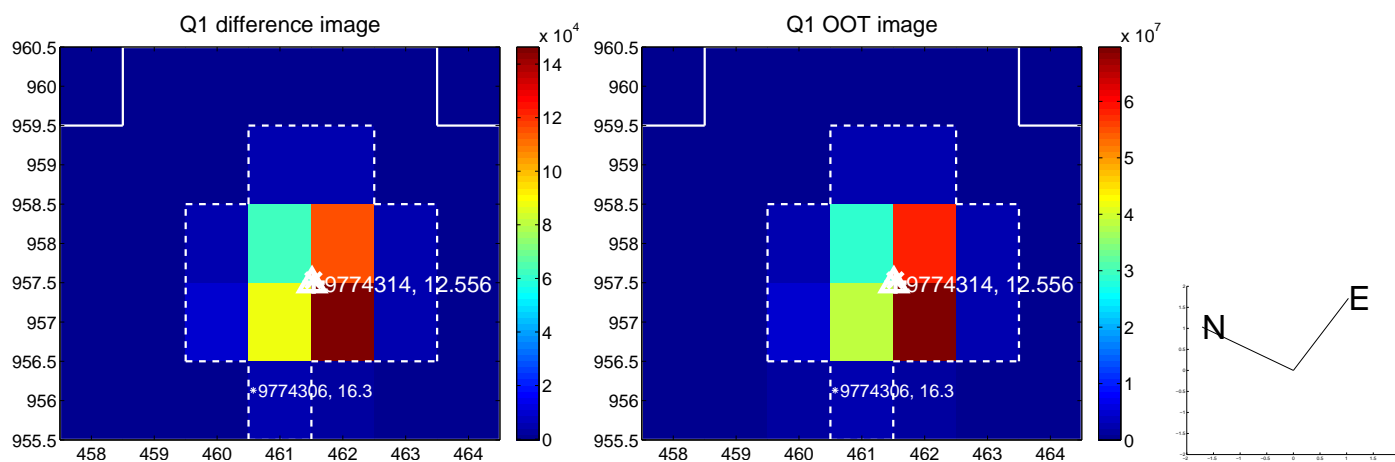
offset from photometric centroids



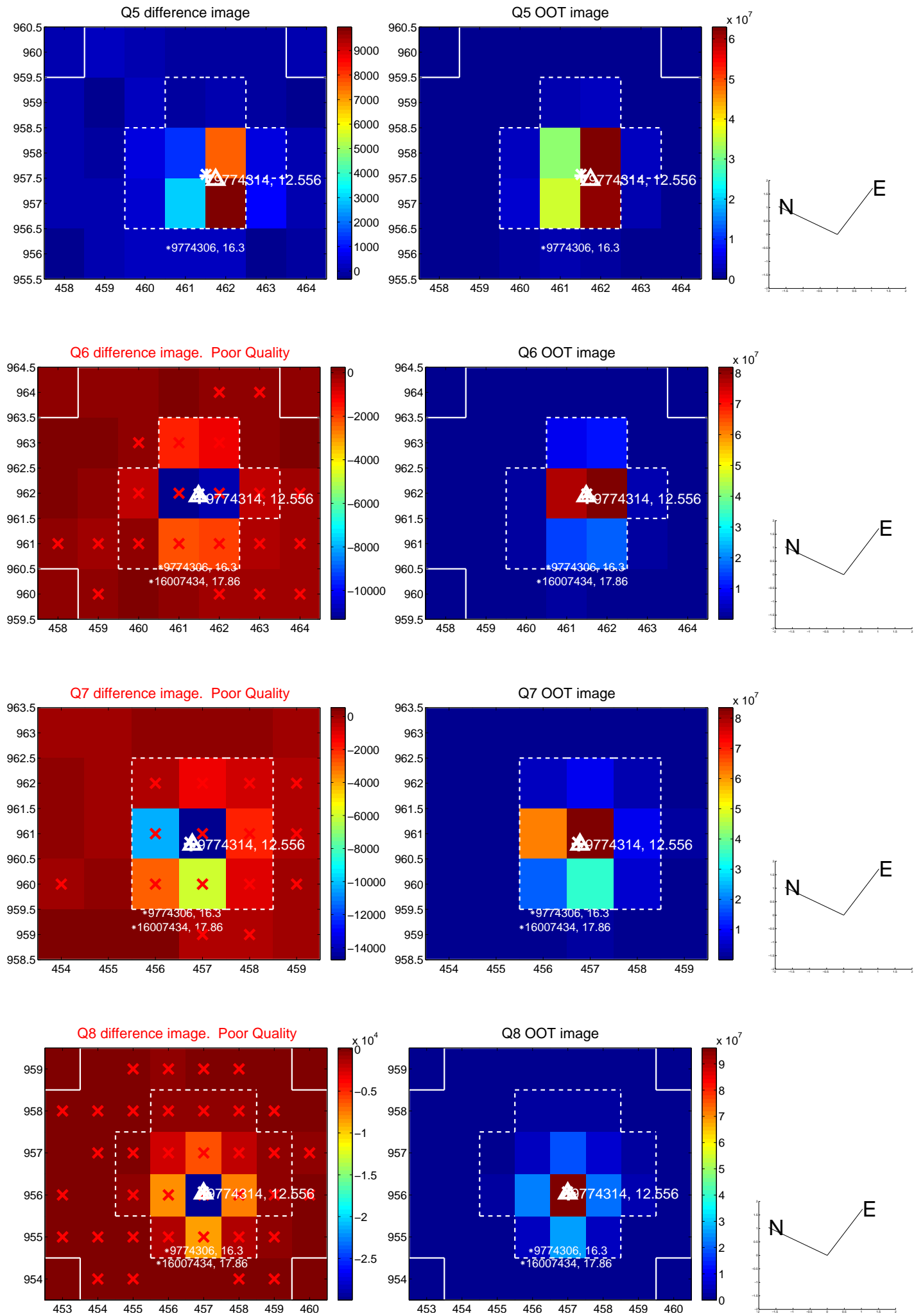
Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets**; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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



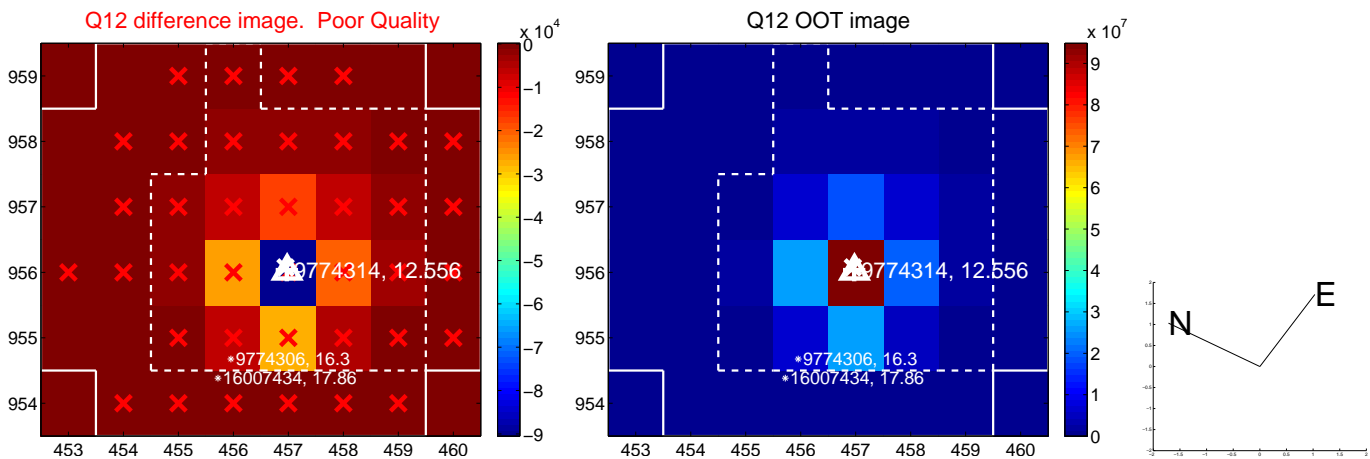
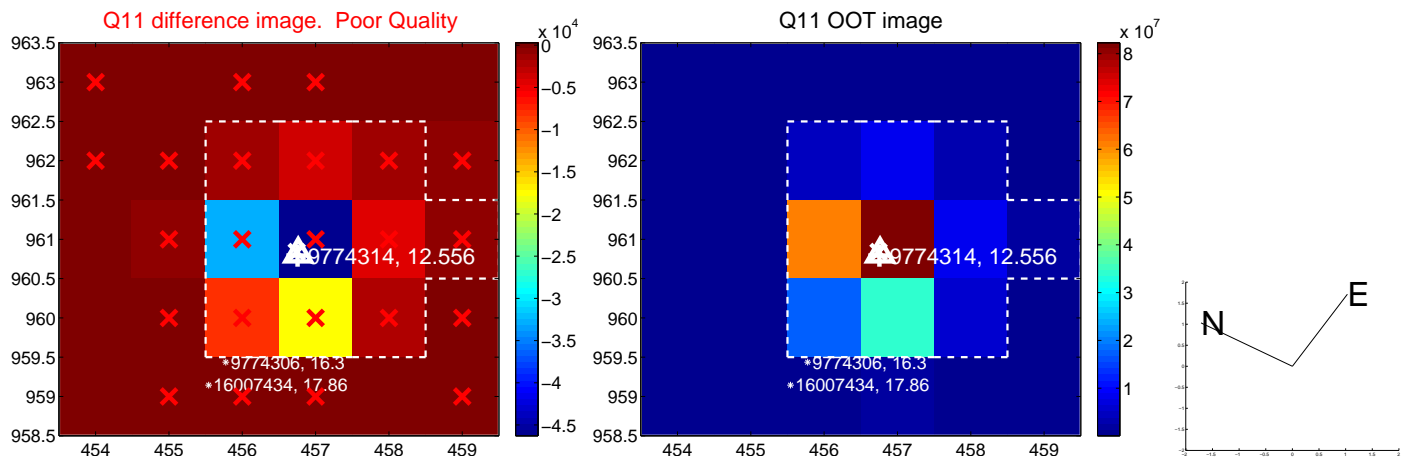
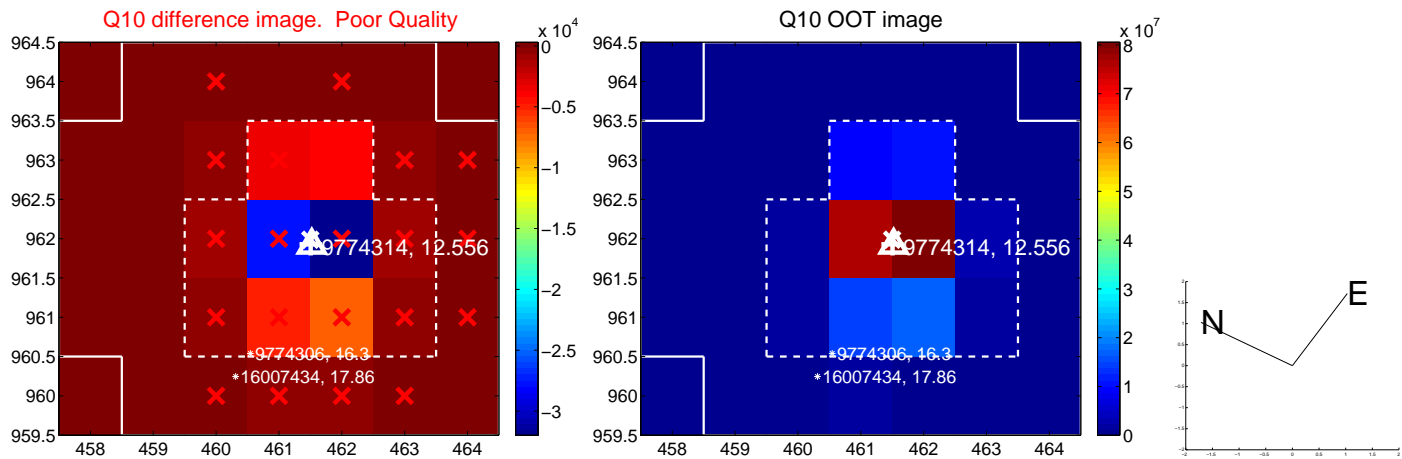
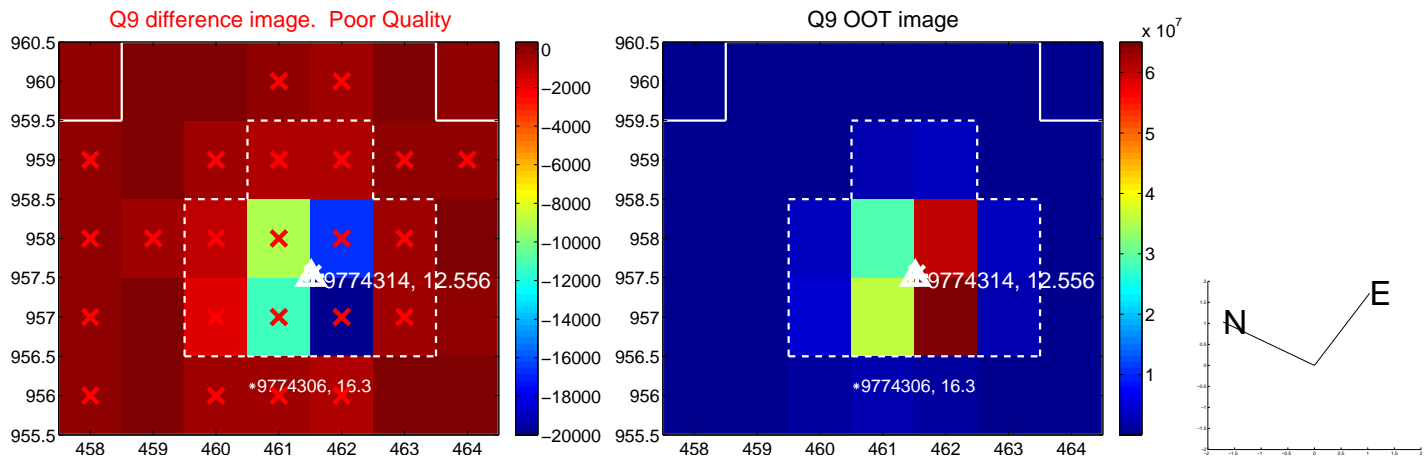
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

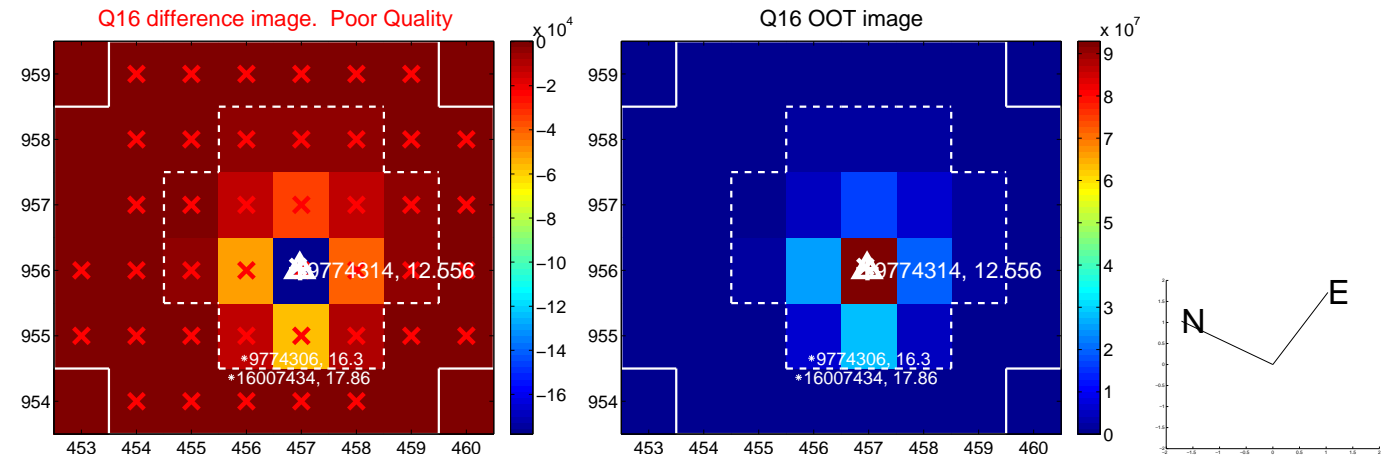
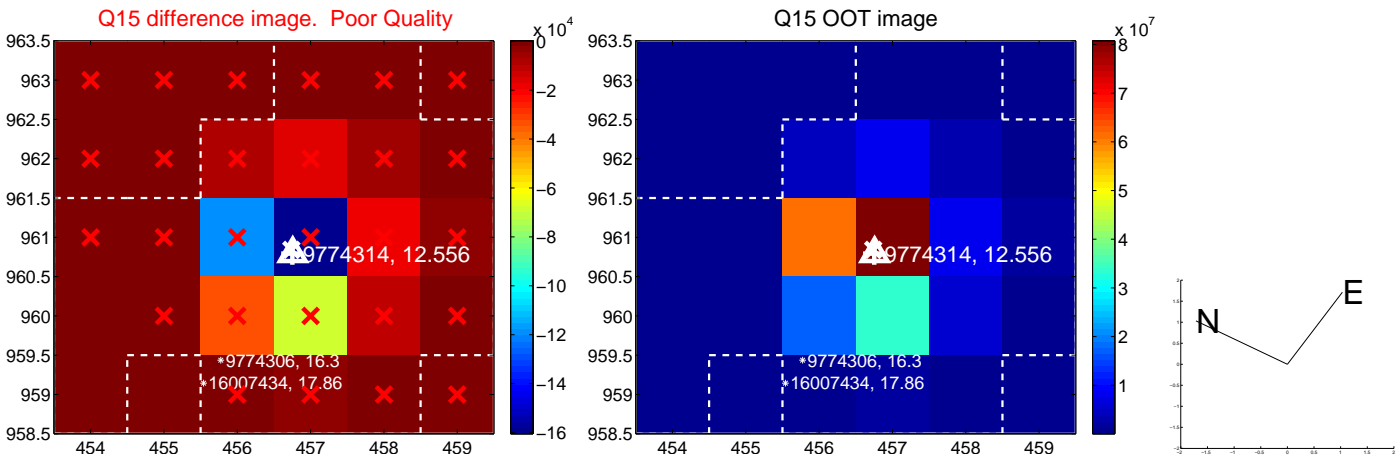
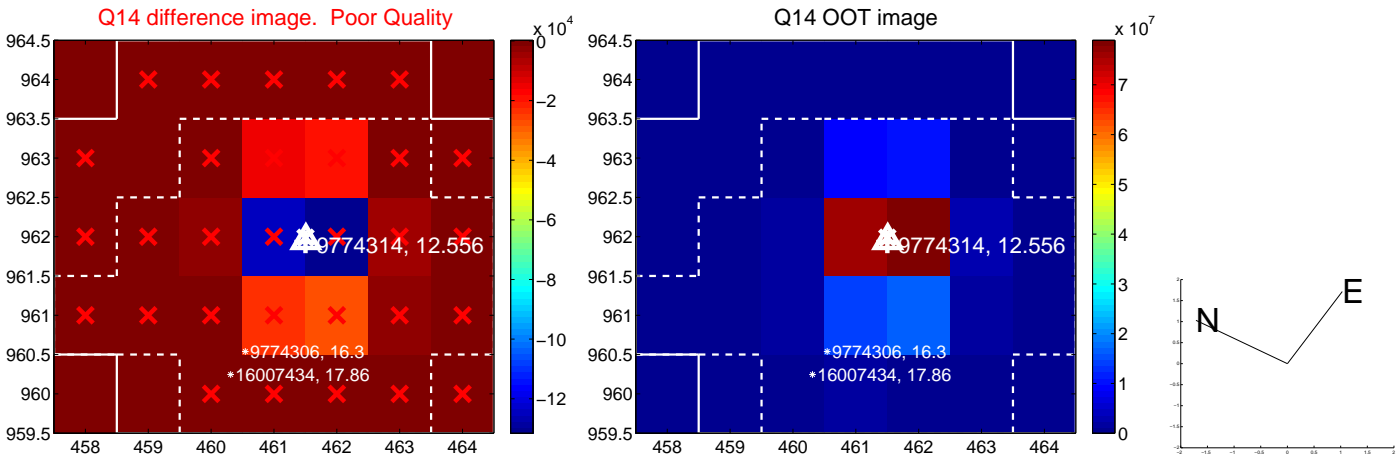
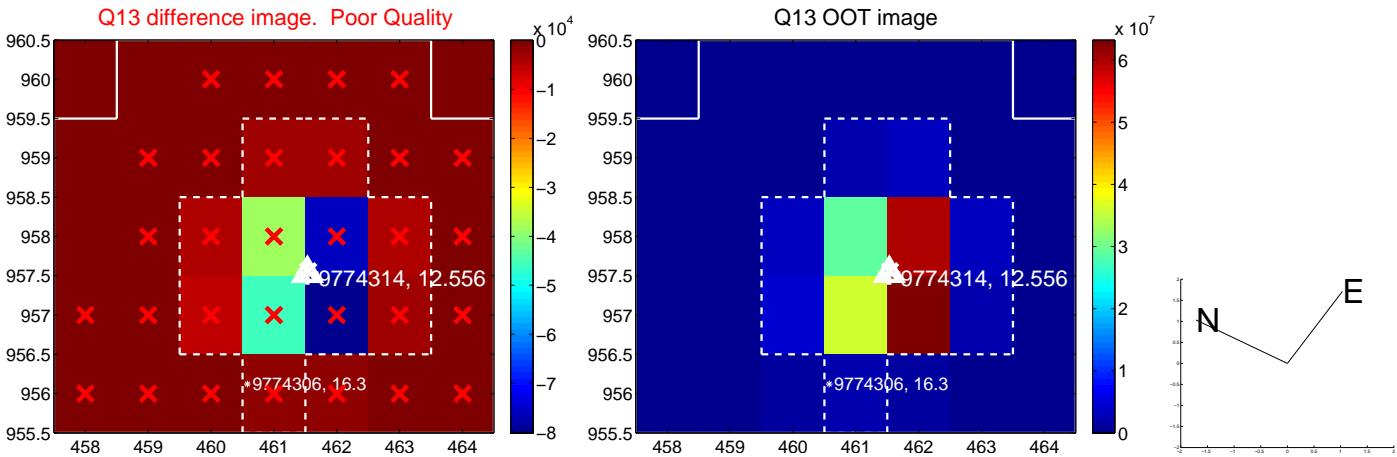


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

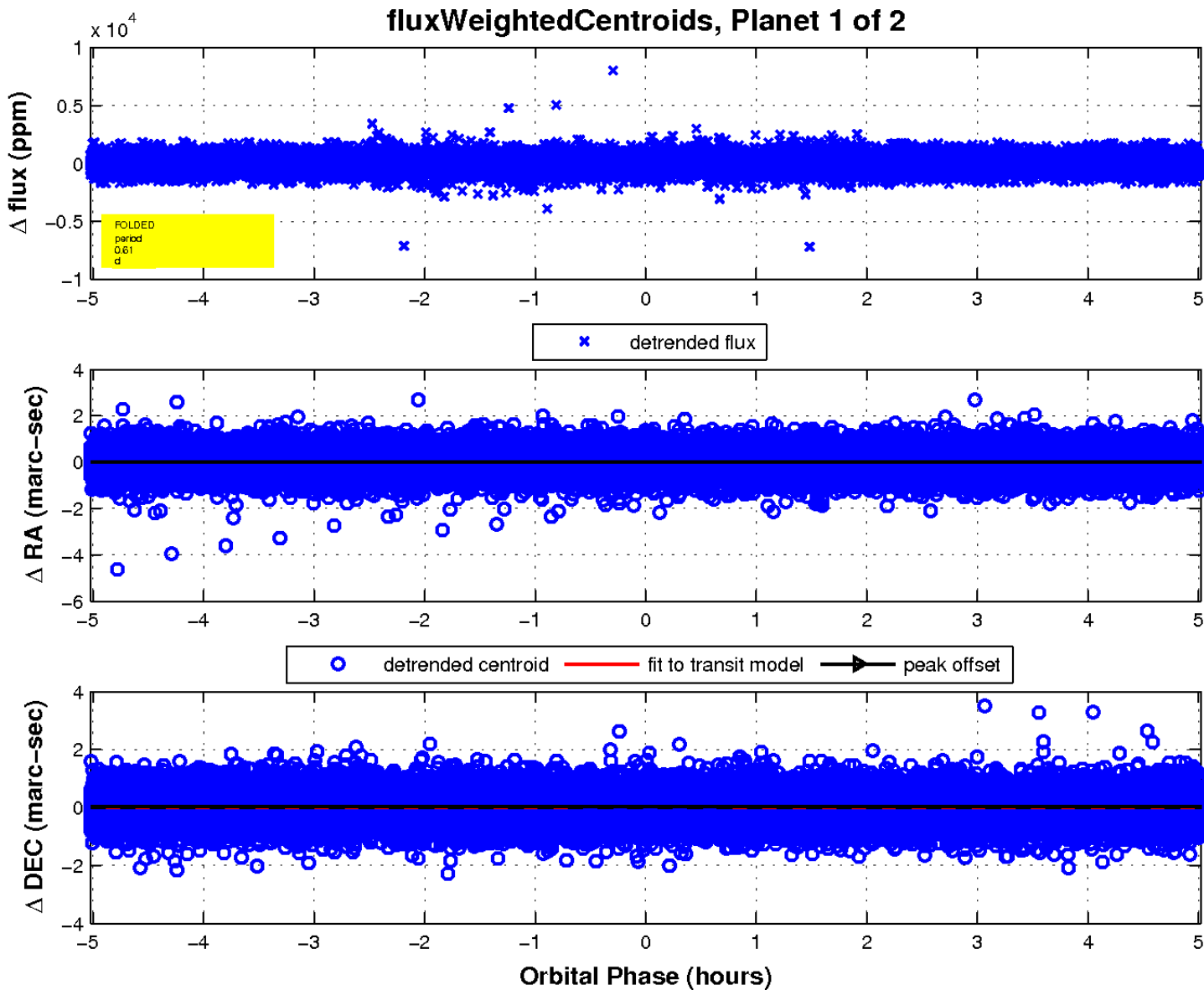
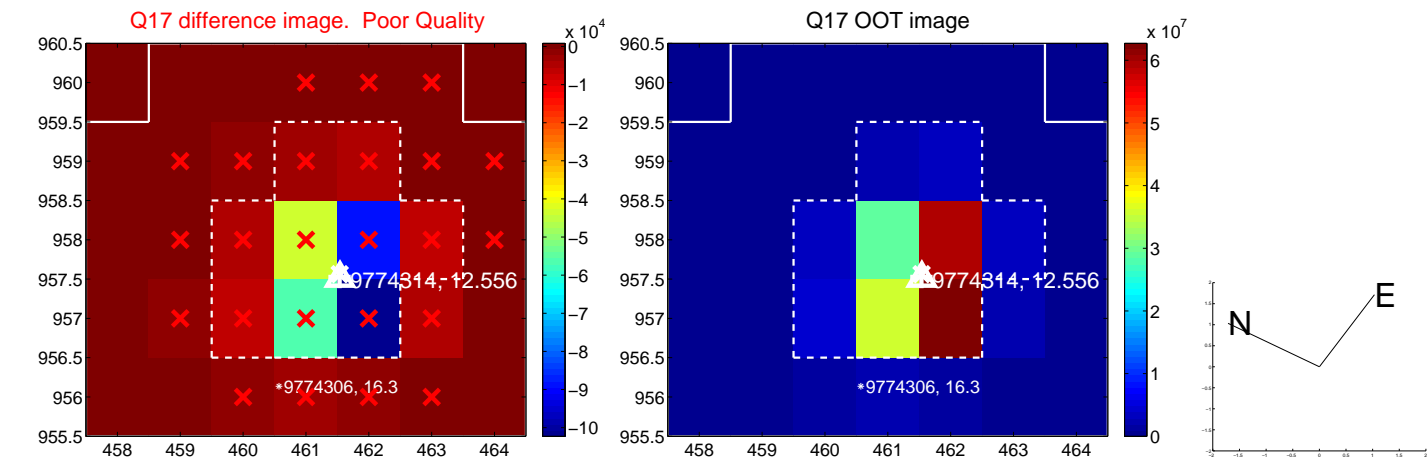




white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

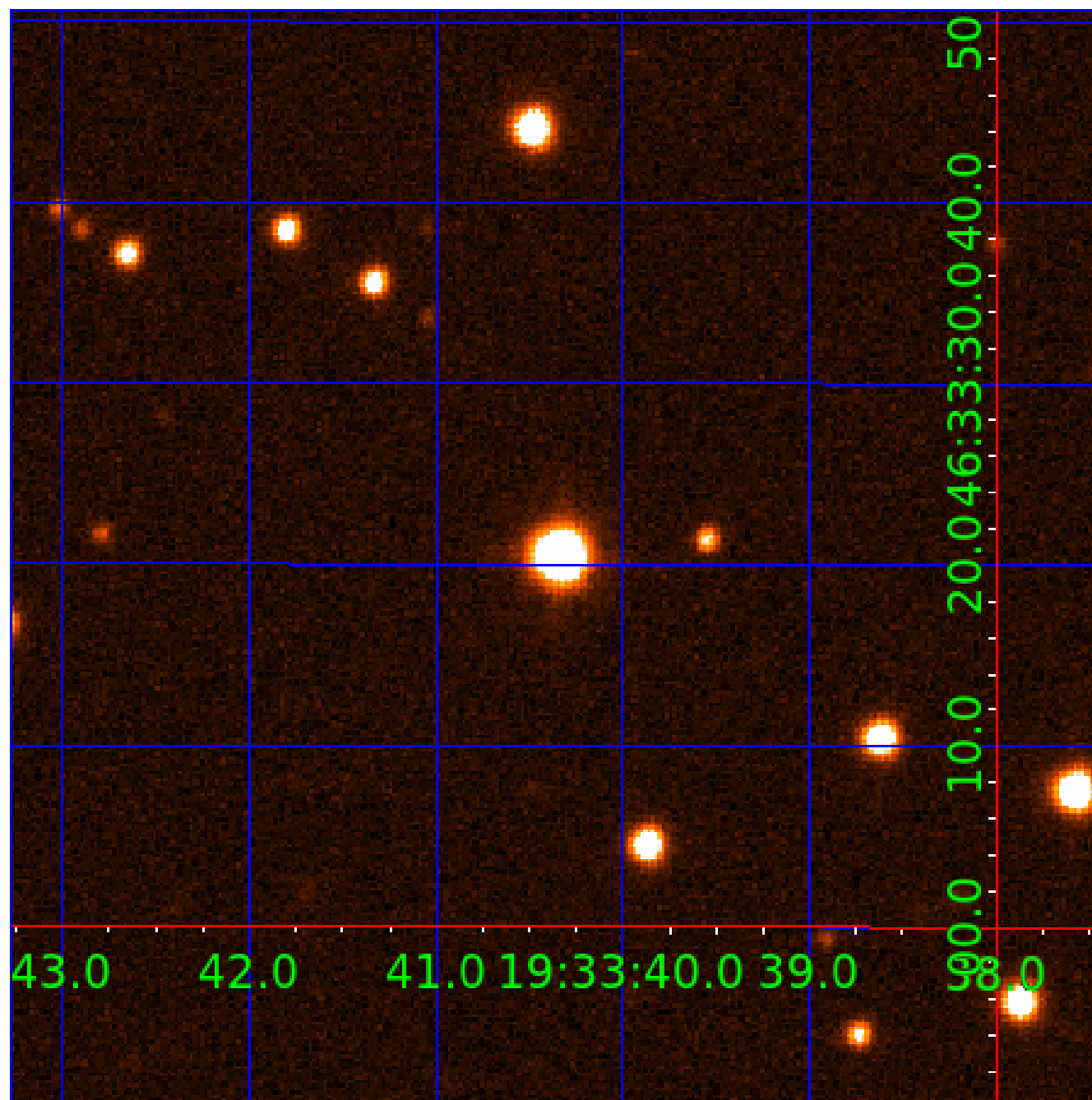


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination





# KIC 009774314

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
009774314-01	OBS	No	0.614988	131.909206	22.4	1.674	17.1	7.9	2.36	8143	1.35	72600.64
009774314-02	OBS	No	170.829583	167.118128	155.6	16.637	12.8	4.4	2.36	8143	3.29	40.06

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009774314-01	OBS	FP	0.00	1	0	0	0	SWEET_NTL—LPP_DV—LPP_ALT—MOD_NONUNIQ_ALT
009774314-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_CHASES—TRANS_GAPPED—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS

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

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

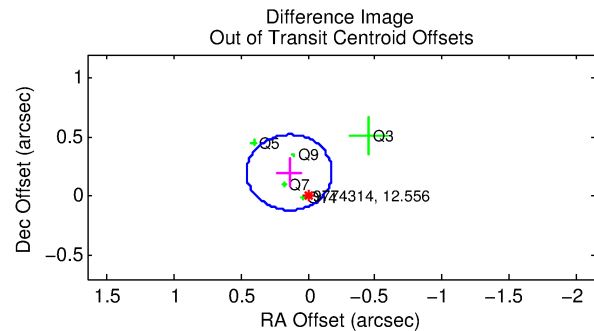
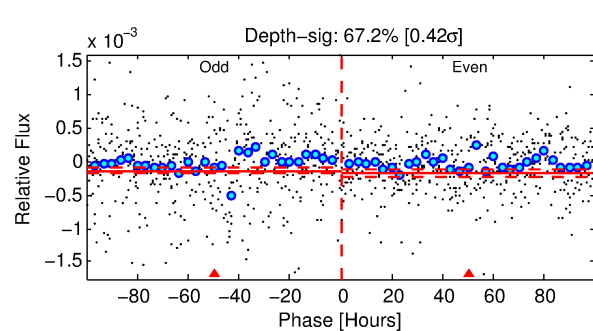
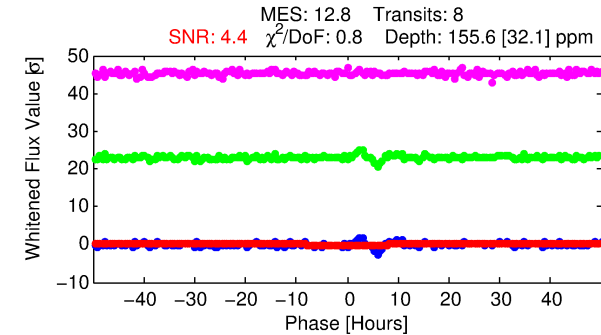
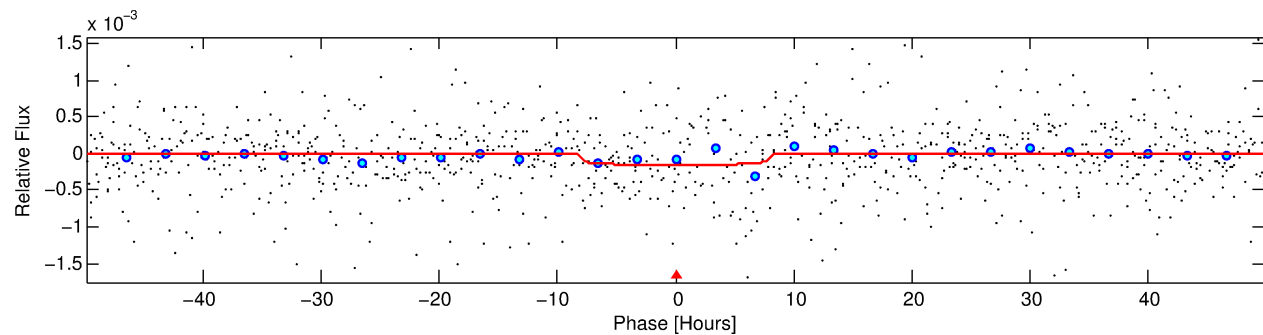
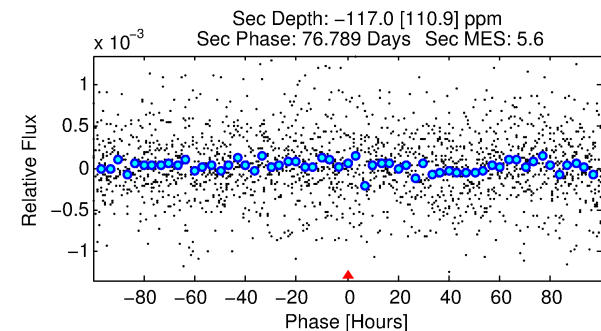
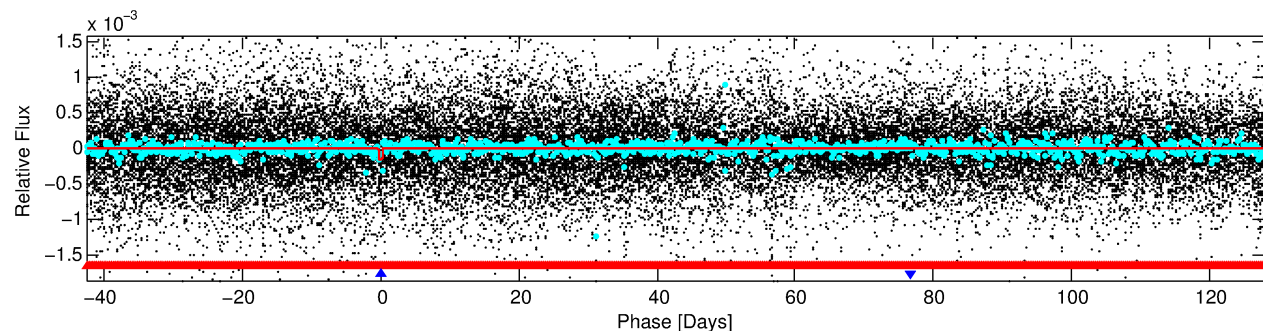
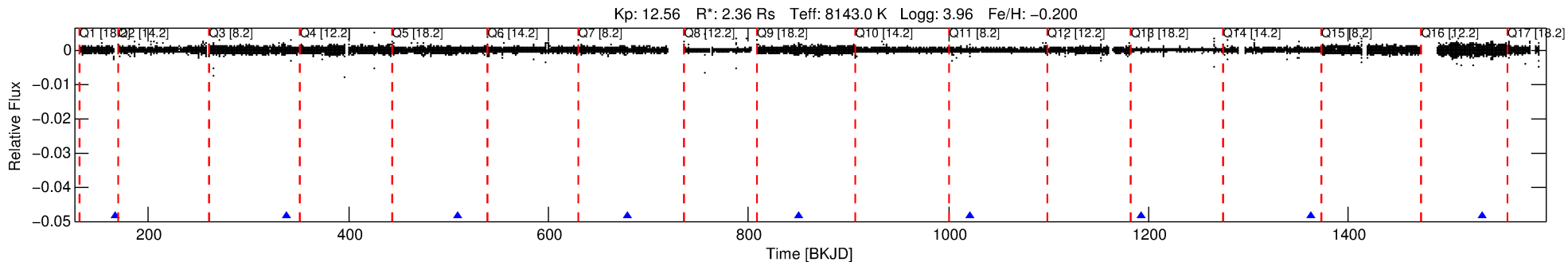
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 009774314-02

No Significant Match Found

# DV One-Page Summary

KIC: 9774314 Candidate: 2 of 2 Period: 170.830 d



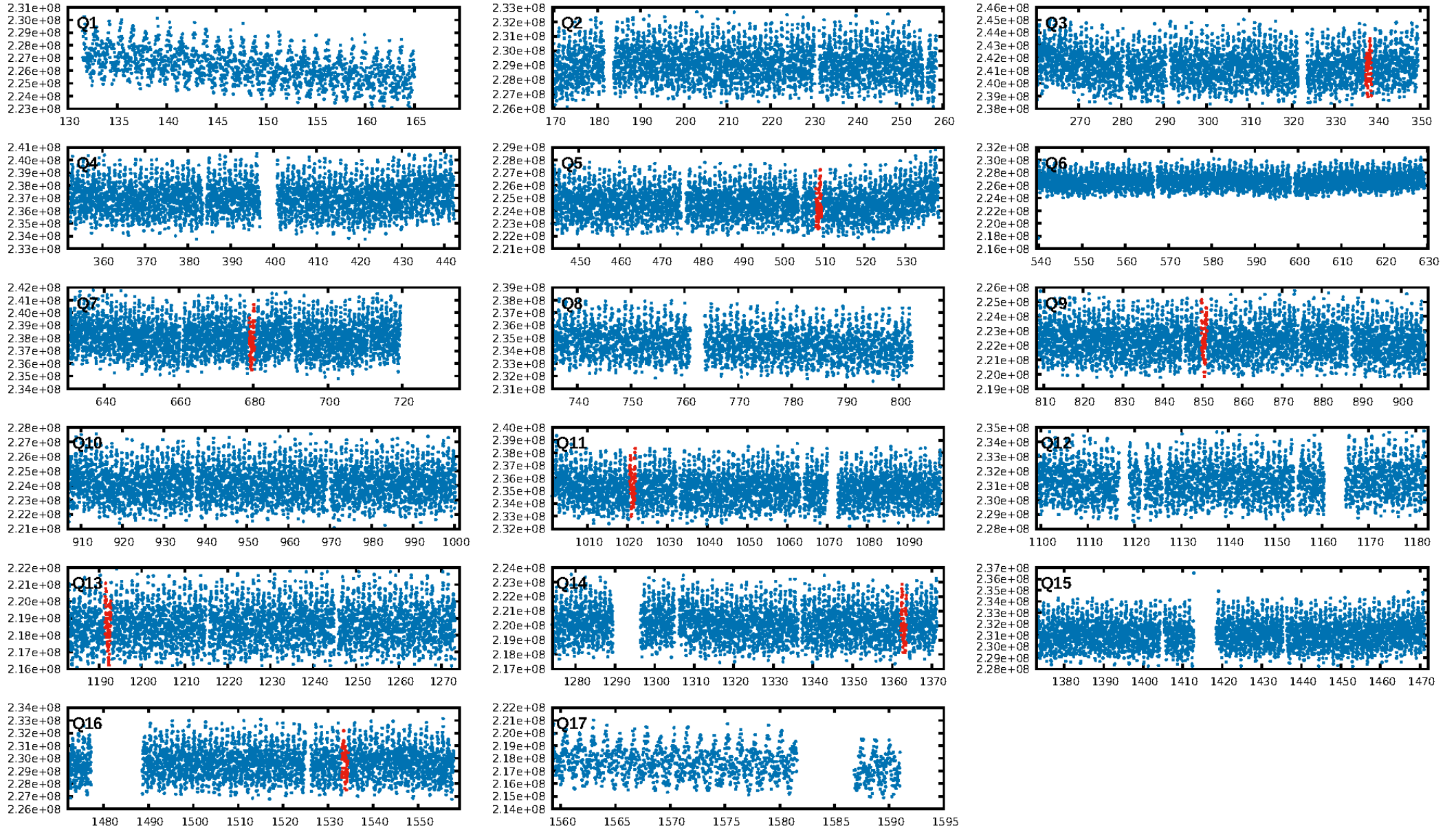
## DV Fit Results:

Period = 170.82958 [0.00957] d  
Epoch = 167.1181 [0.0481] BKJD  
Rp/R\* = 0.0128 [0.0041]  
a/R\* = 45.93 [81.40]  
b = 0.83 [0.68]  
Seff = 40.06 [19.82]  
Teq = 641 [79] K  
Rp = 3.29 [1.53] Re  
a = 0.7404 [0.2245] AU  
Ag = N/A  
Teffp = N/A

## DV Diagnostic Results:

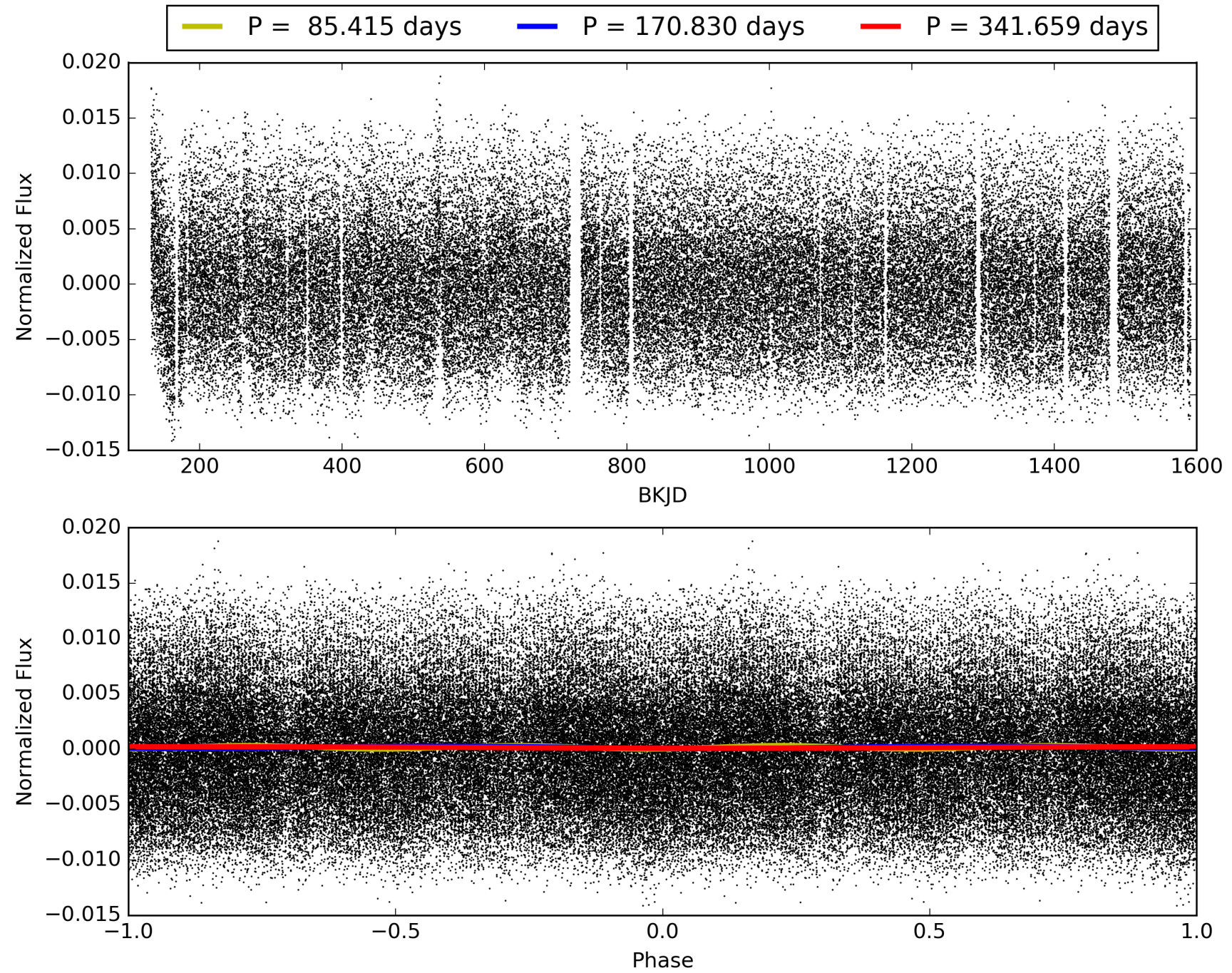
ShortPeriod-sig: 100.0% [244.31σ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: 11.3%  
ModelChiSquareGof-sig: 100.0%  
**Bootstrap-pfa: 1.99e-12**  
RollingBand-fgt: 1.00 [8/8]  
GhostDiagnostic-chr: -1.095  
Centroid-sig: 35.6%  
Centroid-so: 0.512 arcsec [0.73σ]  
OotOffset-rm: 0.245 arcsec [2.30σ]  
OotOffset-st: 1/2/0/2 [5]  
KicOffset-rm: 0.105 arcsec [0.88σ]  
KicOffset-st: 1/2/0/2 [5]  
DiffImageQuality-fgm: 0.80 [4/5]  
DiffImageOverlap-fno: 0.00 [0/5]

# TCE 009774314-02, PDC Light Curves



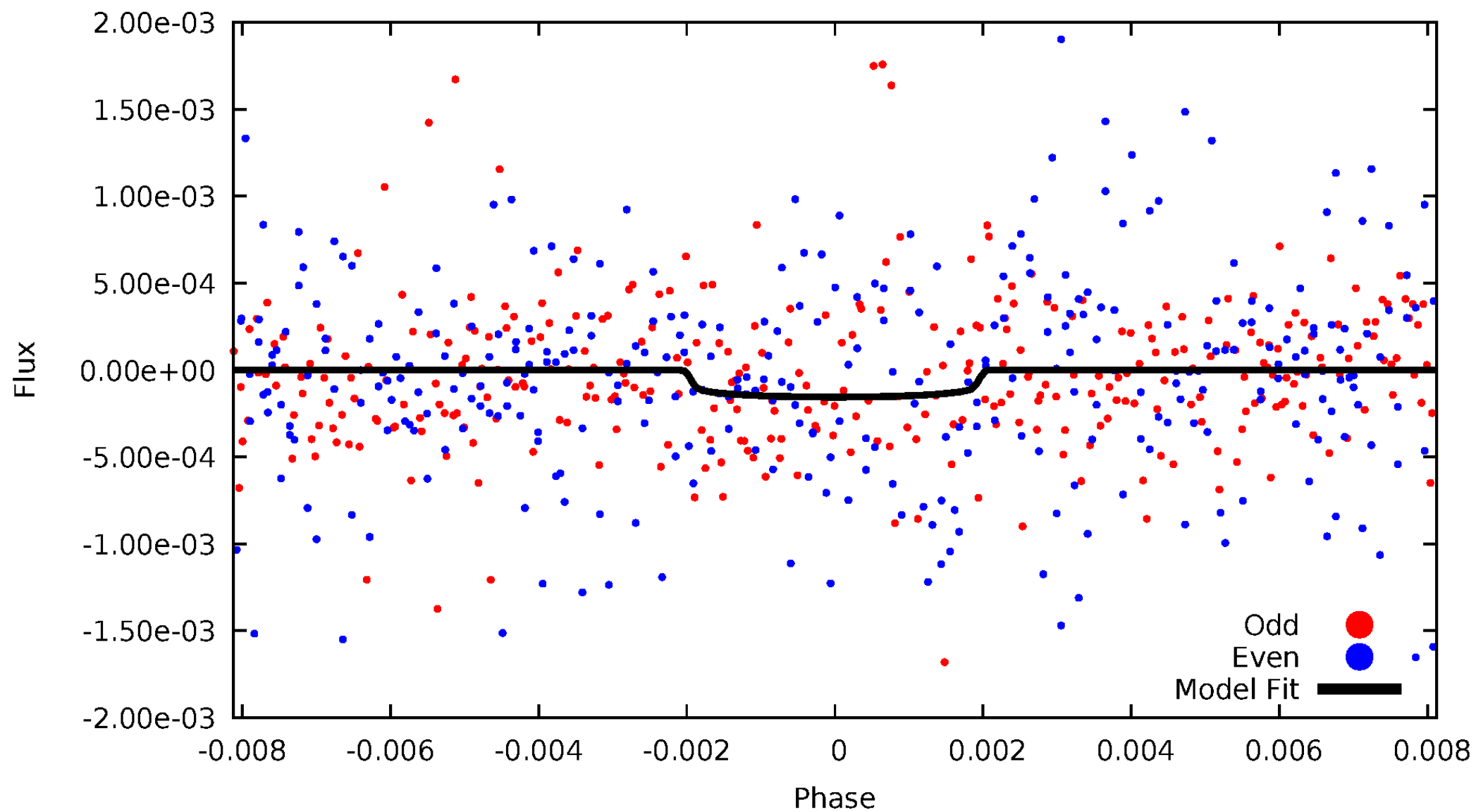


TCE 009774314-02



# DV Odd/Even

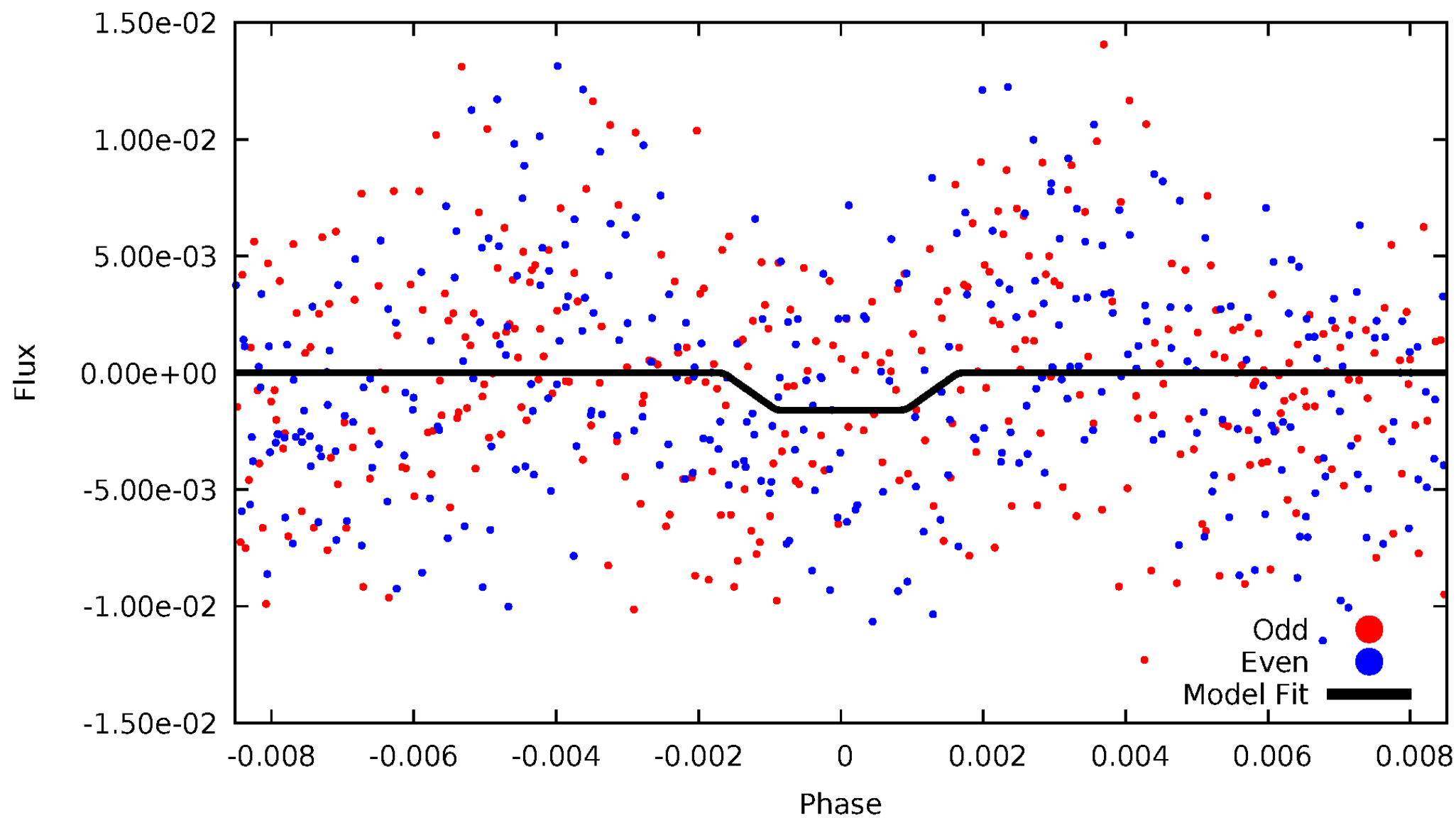
TCE 009774314-02





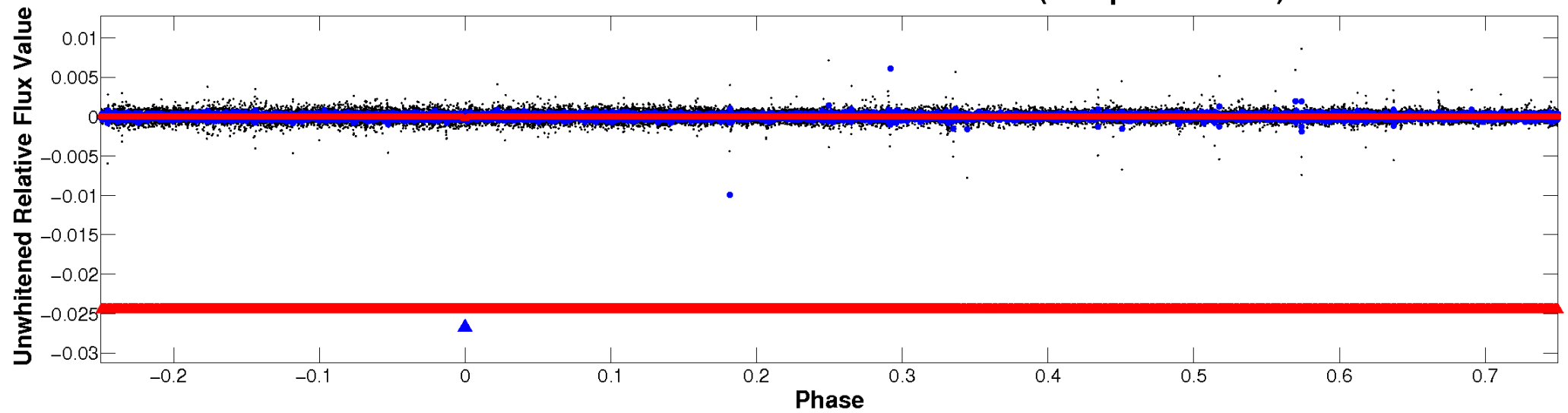
# ALT Odd/Even

TCE 009774314-02

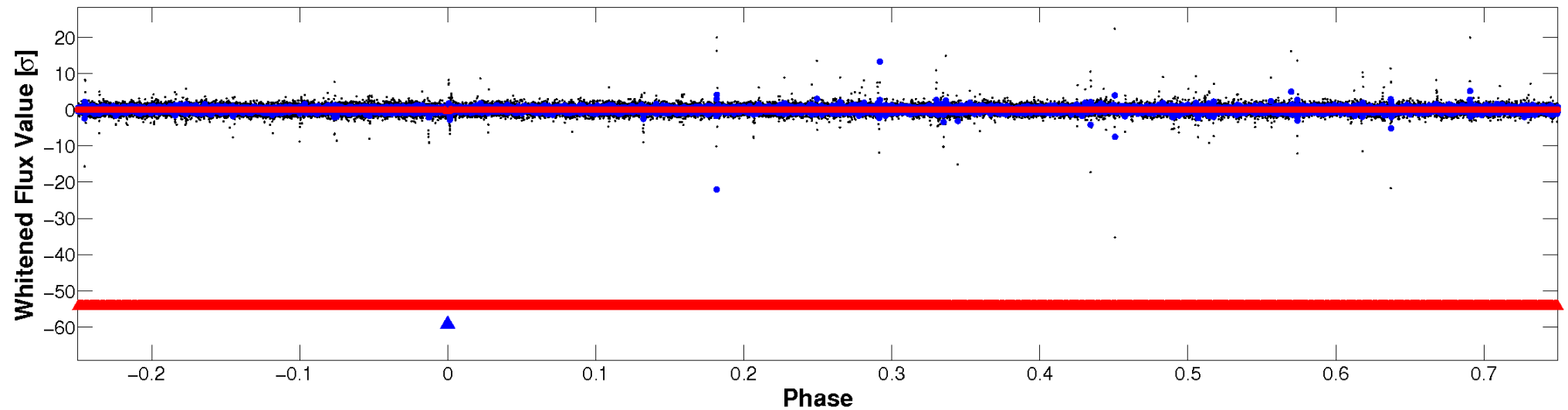


# Non-Whitened Vs. Whitened Light Curve

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

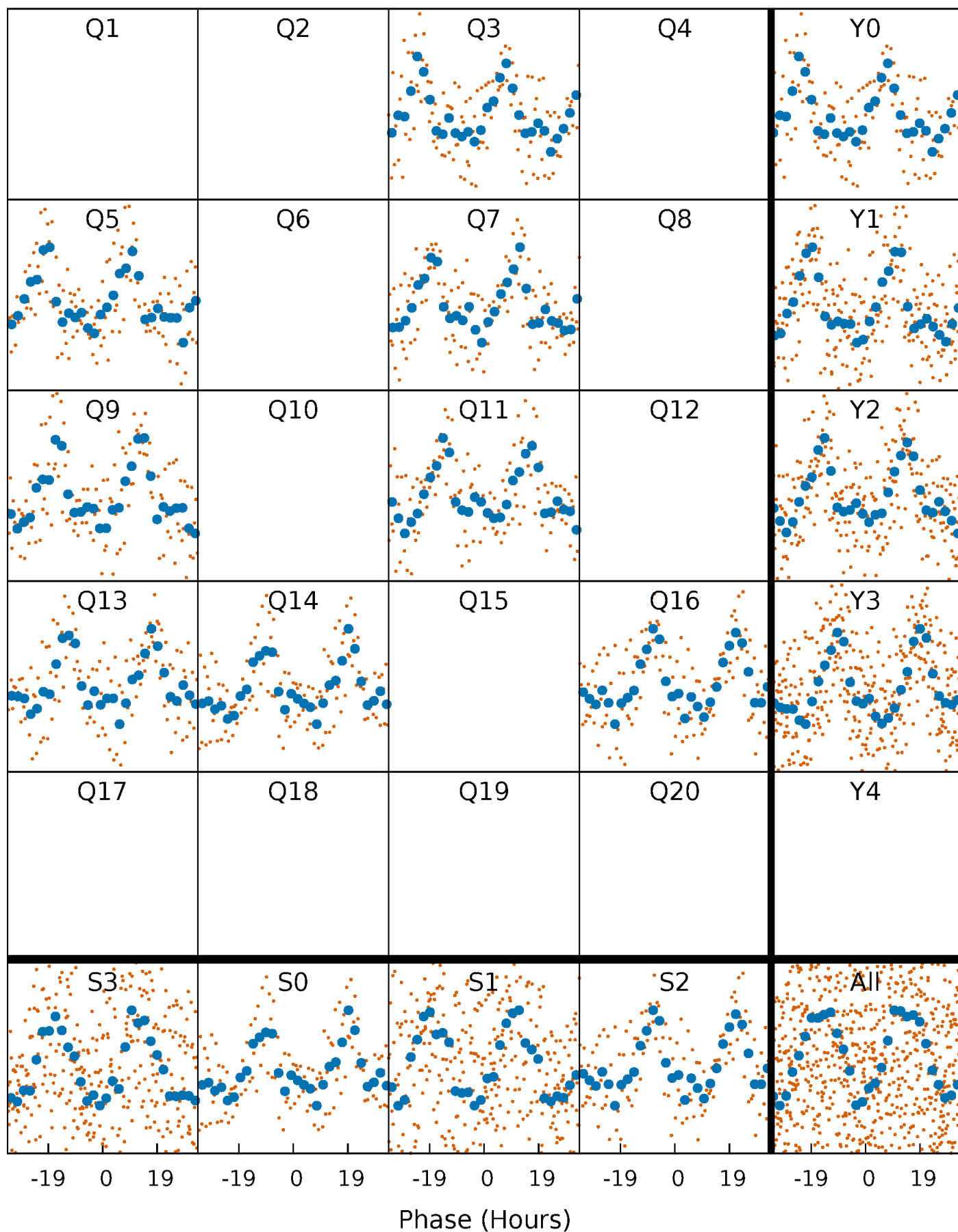


**Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)**



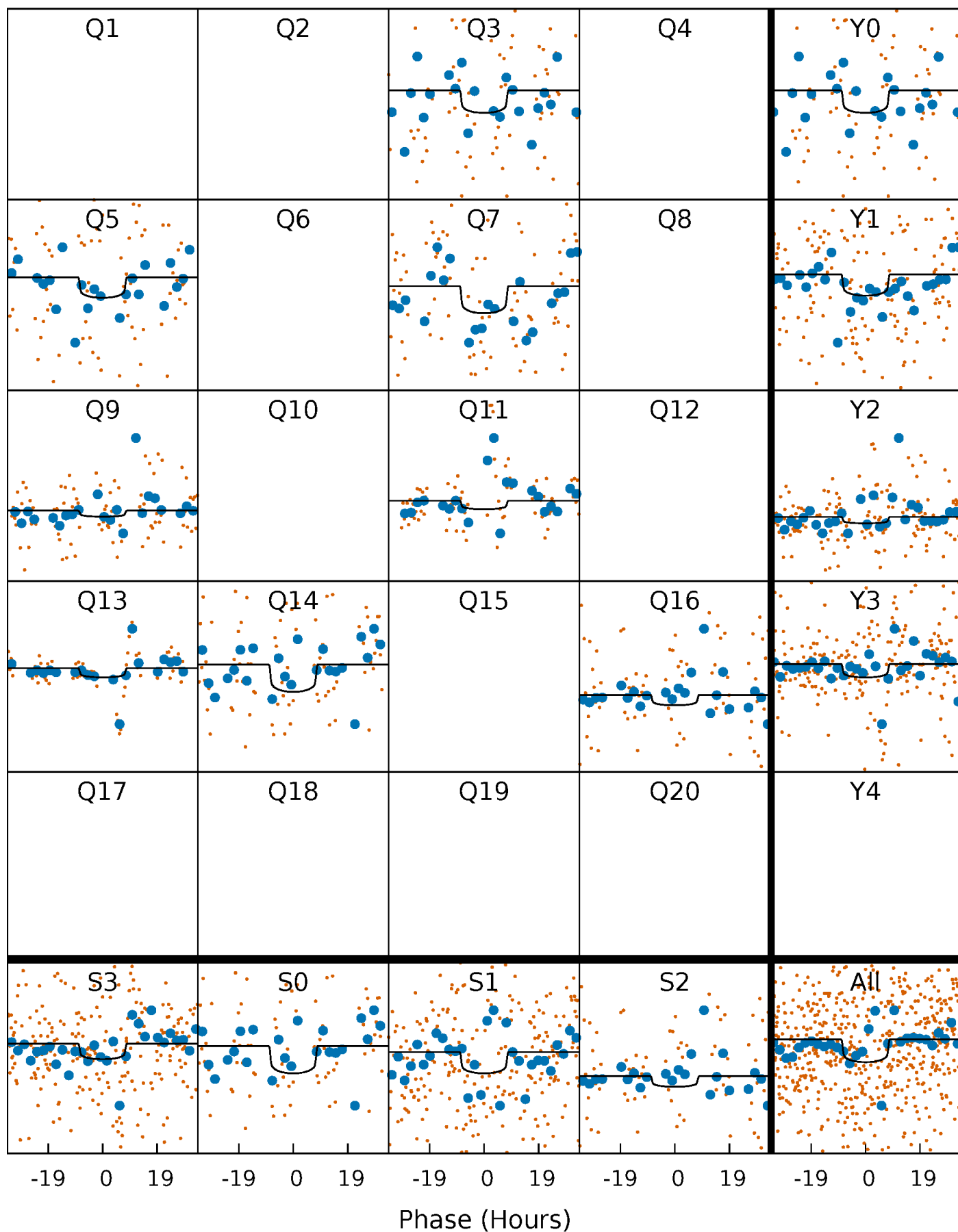
# PDC Quarter-Phased Transit Curves

TCE 009774314-02 P=170.829583 Days  $T_0=167.118128$  (BKJD)



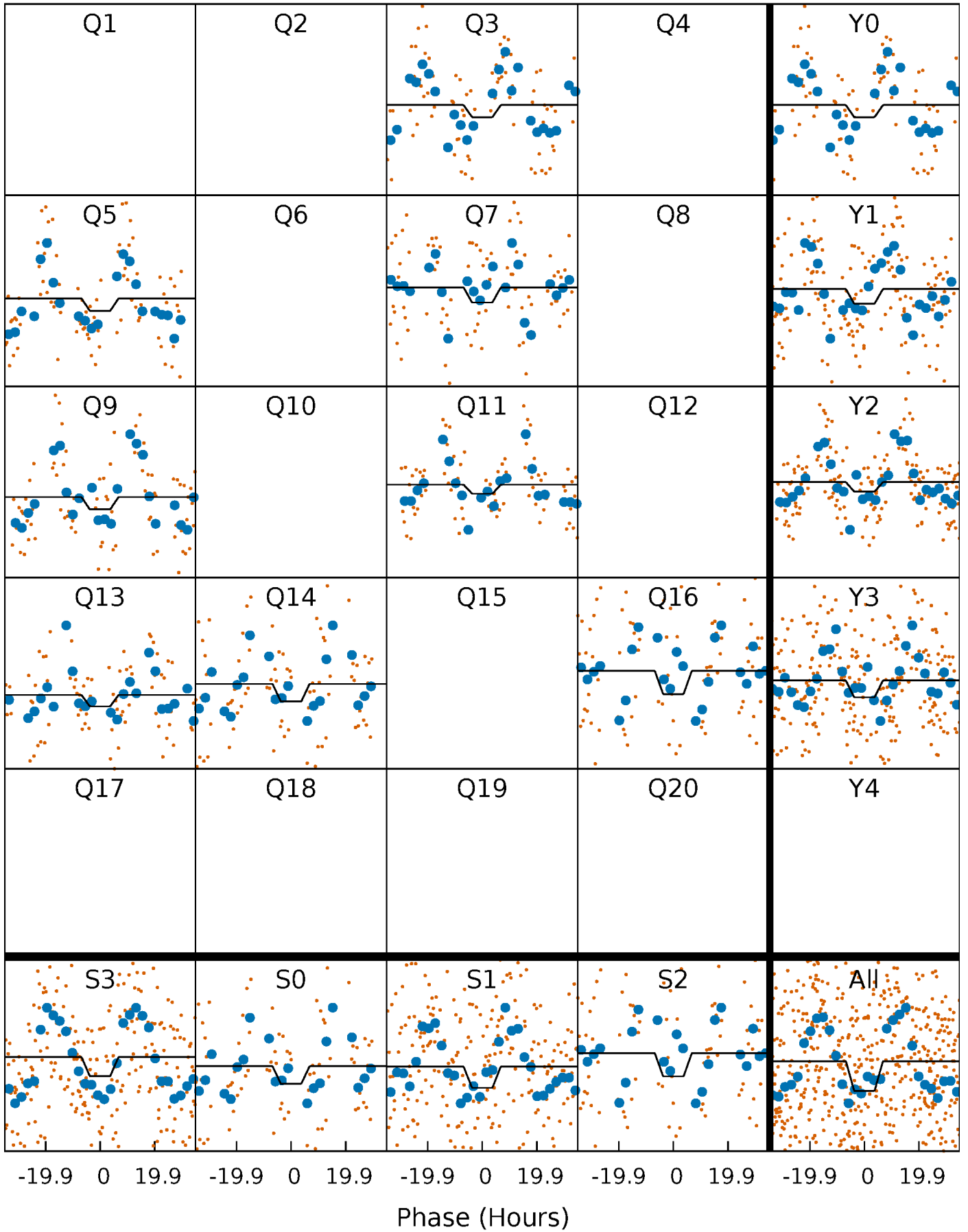
# DV Quarter-Phased Transit Curves

TCE 009774314-02 P=170.829583 Days  $T_0=167.118128$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

TCE 009774314-02 P=170.843768 Days  $T_0=167.077643$  (BKJD)

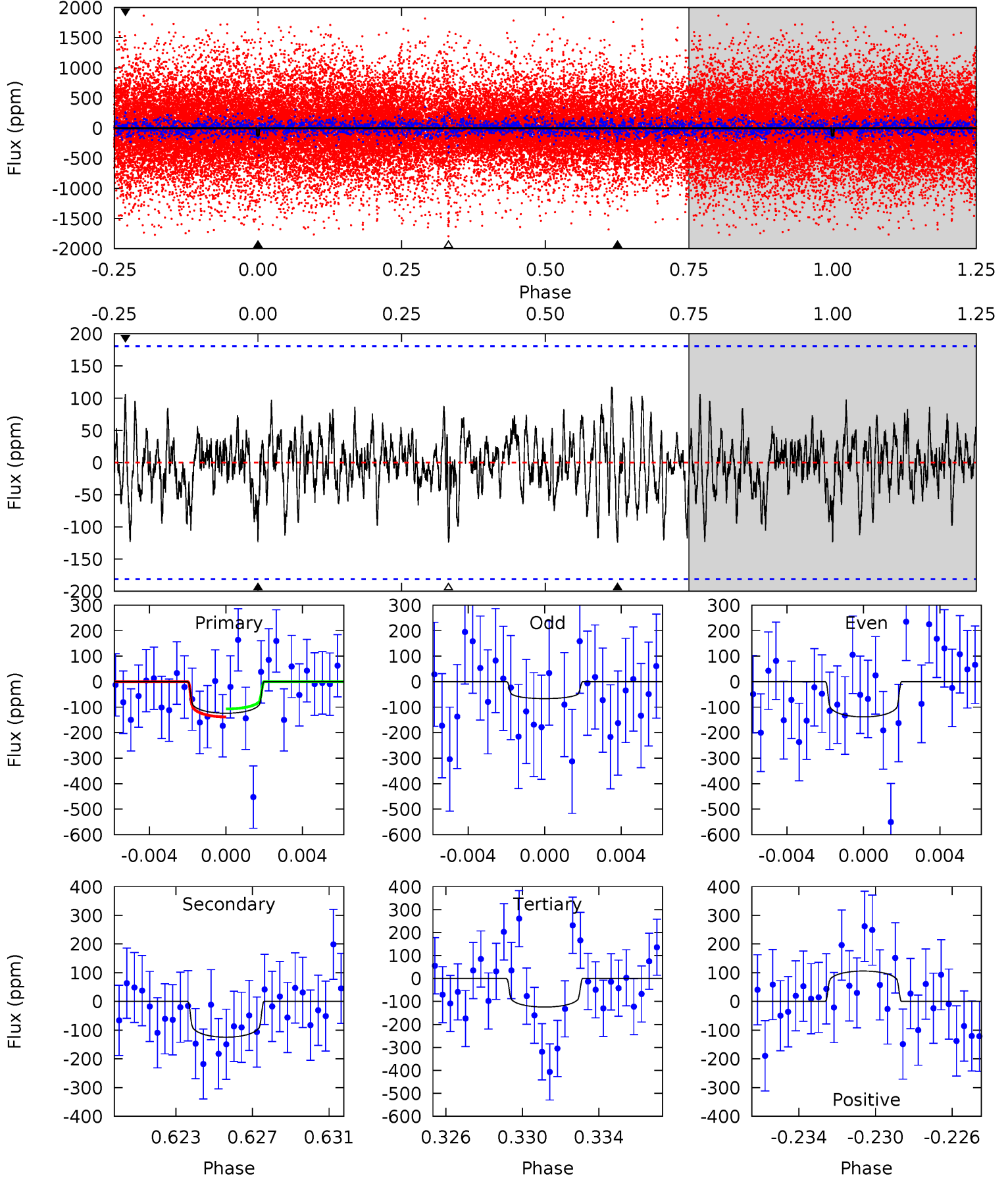




# DV Model-Shift Uniqueness Test

009774314-02, P = 170.829583 Days, E = 167.118128 Days

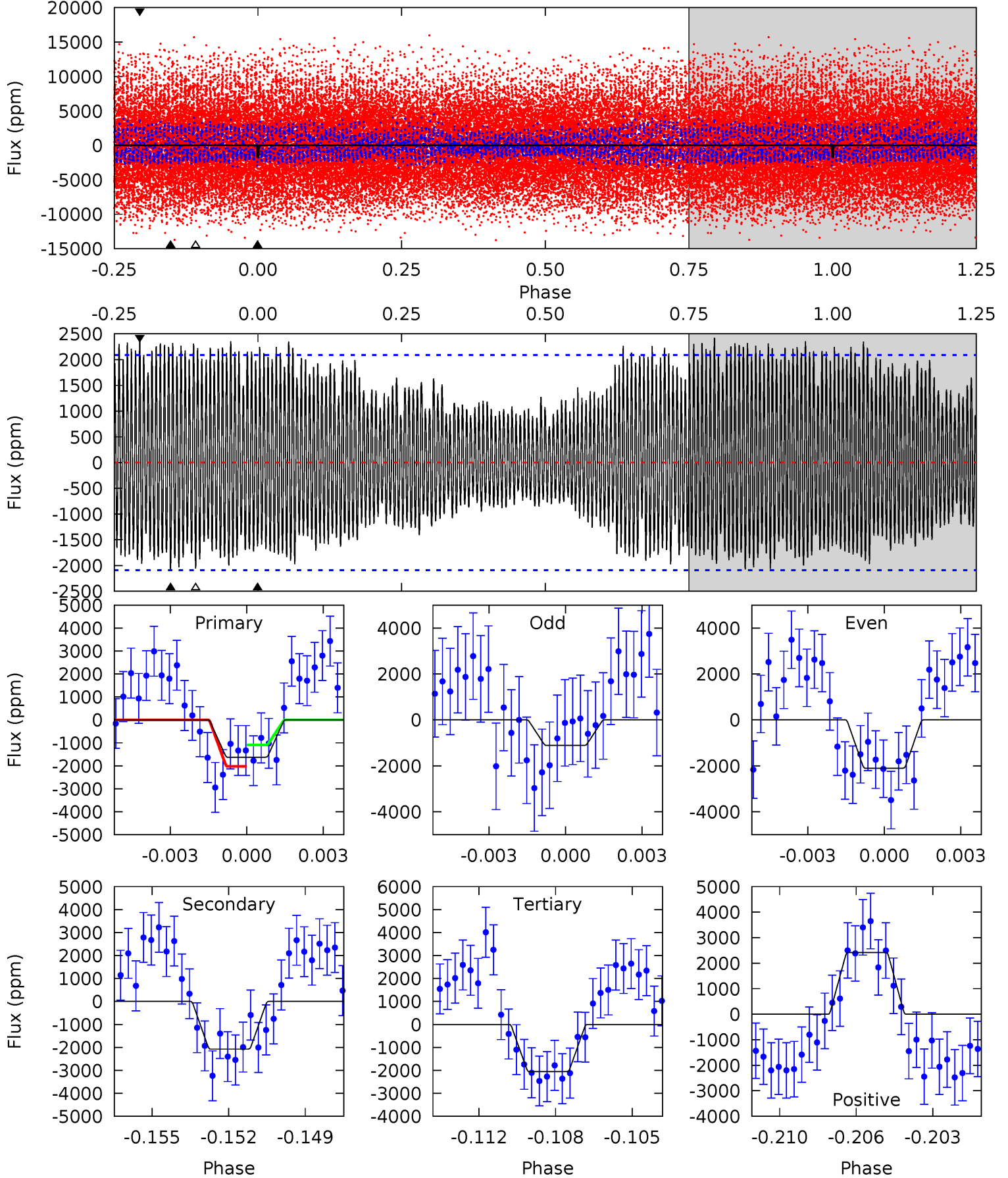
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
3.56	3.57	3.57	3.04	5.19	2.86	1.11	-0.01	0.52	0.00	0.53	1.04	0.97	0.49	0.45



# Alt Model-Shift Uniqueness Test

009774314-02, P = 170.843768 Days, E = 167.077643 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
4.07	5.20	5.14	6.06	5.23	2.93	2.81	-1.07	-1.99	0.05	-0.87	1.24	0.92	0.54	1.16



### Stellar Parameters For KIC 009774314

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$8143^{+226}_{-340}$	$3.960^{+0.266}_{-0.114}$	$-0.200^{+0.200}_{-0.350}$	$2.361^{+0.367}_{-0.794}$	$1.854^{+0.077}_{-0.410}$	$0.198^{+0.373}_{-0.068}$
	+3%/-4%	+7%/-3%	+100%/-175%	+16%/-34%	+4%/-22%	+188%/-34%
Source	KIC0	KIC0	KIC0	DSEP		

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

### Secondary Eclipse Parameters for KIC 009774314-02 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$-124 \pm 35$	$3.02^{+1.17}_{-0.96}$	$879^{+60}_{-76}$	$7451^{+2130}_{-1256}$	$3882^{+4563}_{-1961}$
Alt.	$-2075 \pm 399$	$9.95^{+1.63}_{-1.81}$	$883^{+56}_{-73}$	$8733^{+954}_{-787}$	$6148^{+3079}_{-1848}$

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

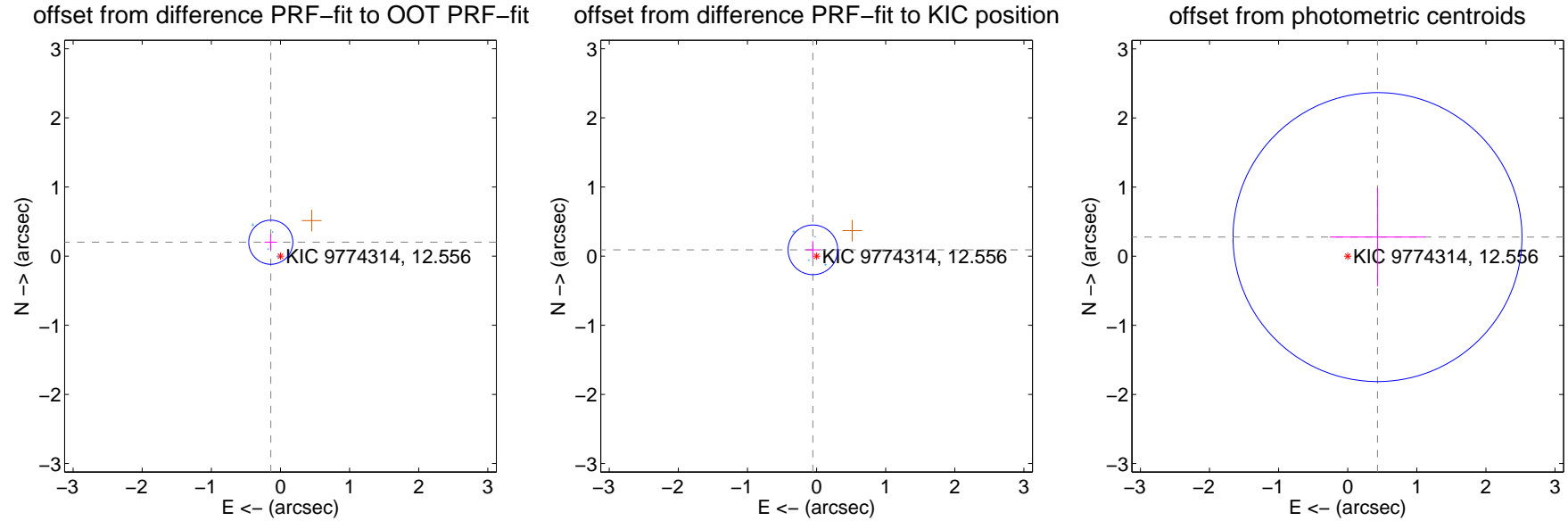
## DV Centroid Data

Supplemental centroid analysis for 009774314-02. Kepler magnitude: 12.56. Transit SNR 4.42

There are 4 quarters with good PRF difference image offsets

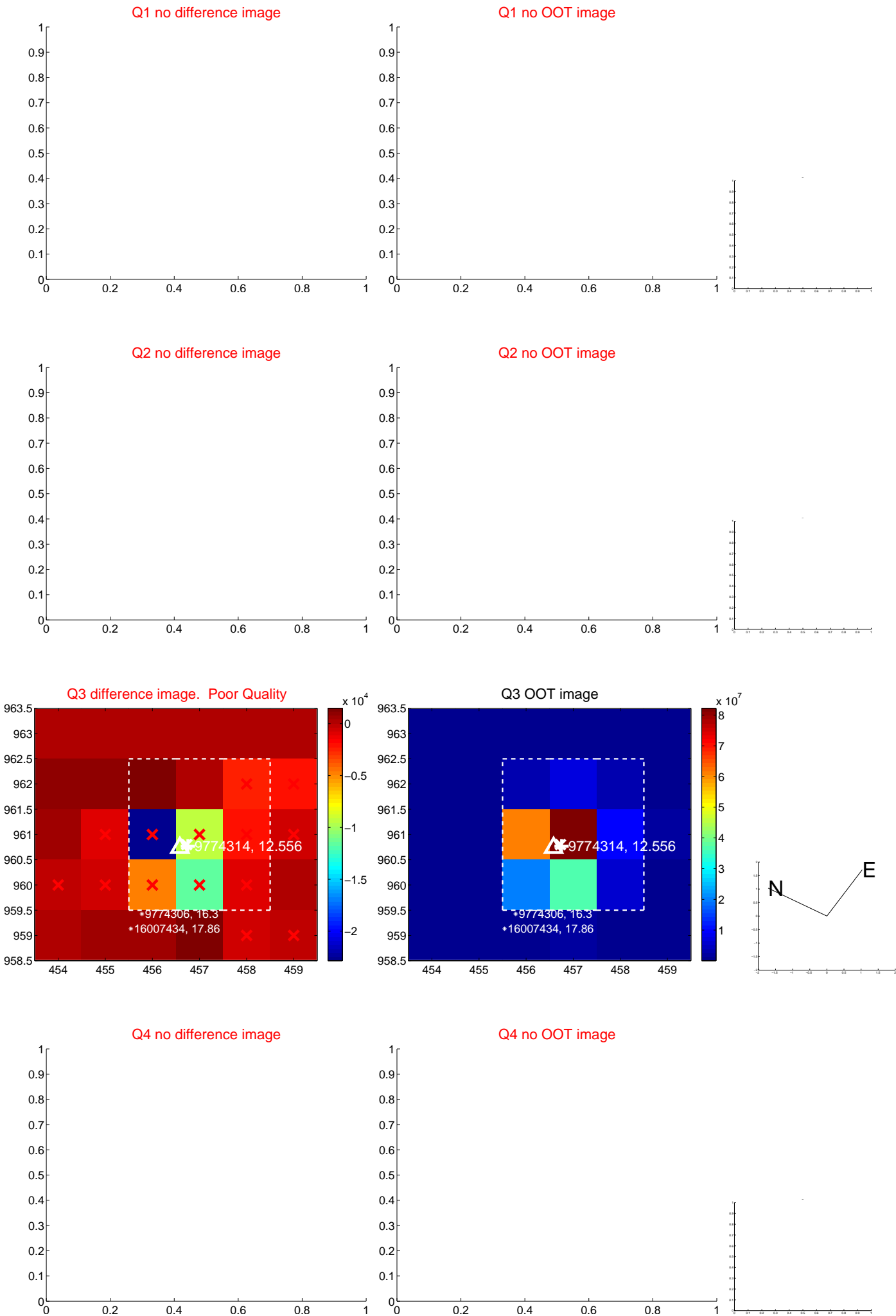
The direct PRF centroid is offset from the target star catalog position by about 0.20 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.245 \pm 0.106$	2.30	$0.140 \pm 0.090$	$0.201 \pm 0.114$
PRF-fit source offset from KIC position	$0.105 \pm 0.120$	0.88	$0.053 \pm 0.100$	$0.091 \pm 0.126$
photometric centroid source offset	$0.51 \pm 0.70$	0.73	$-0.43 \pm 0.69$	$0.28 \pm 0.71$



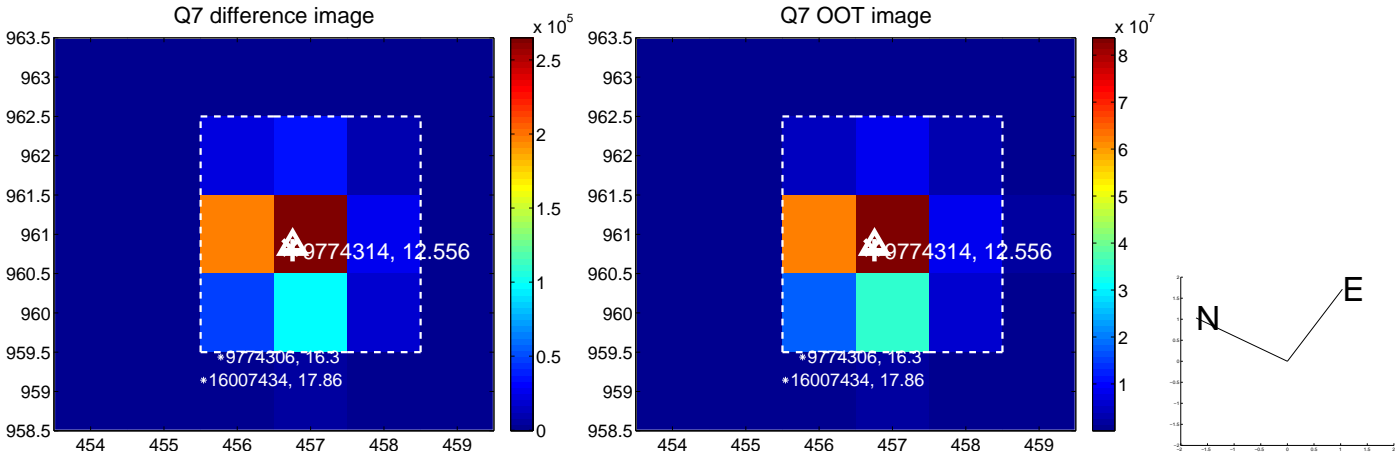
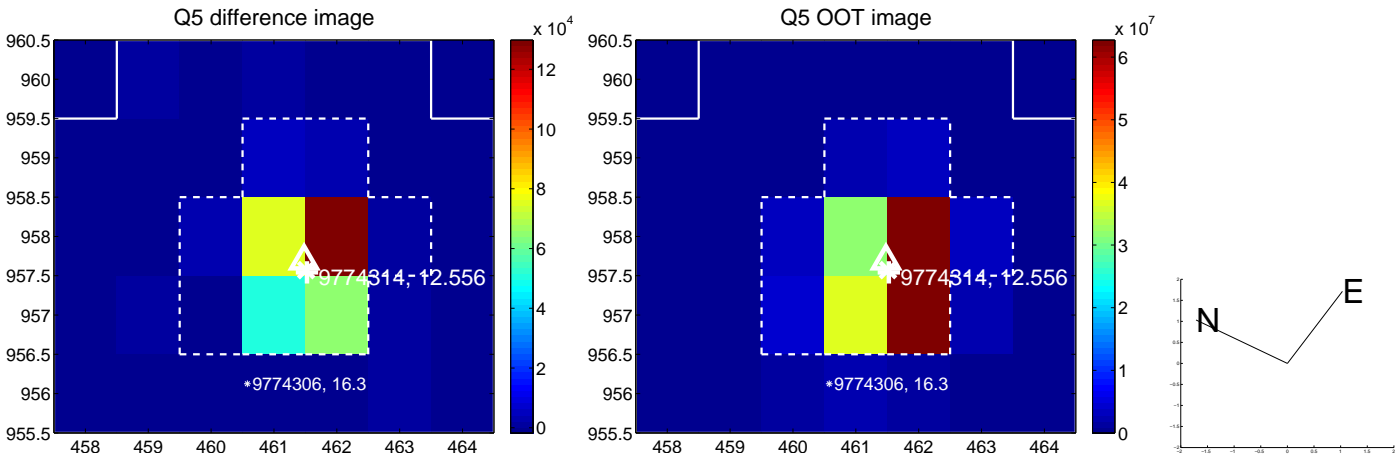
Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets**; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

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

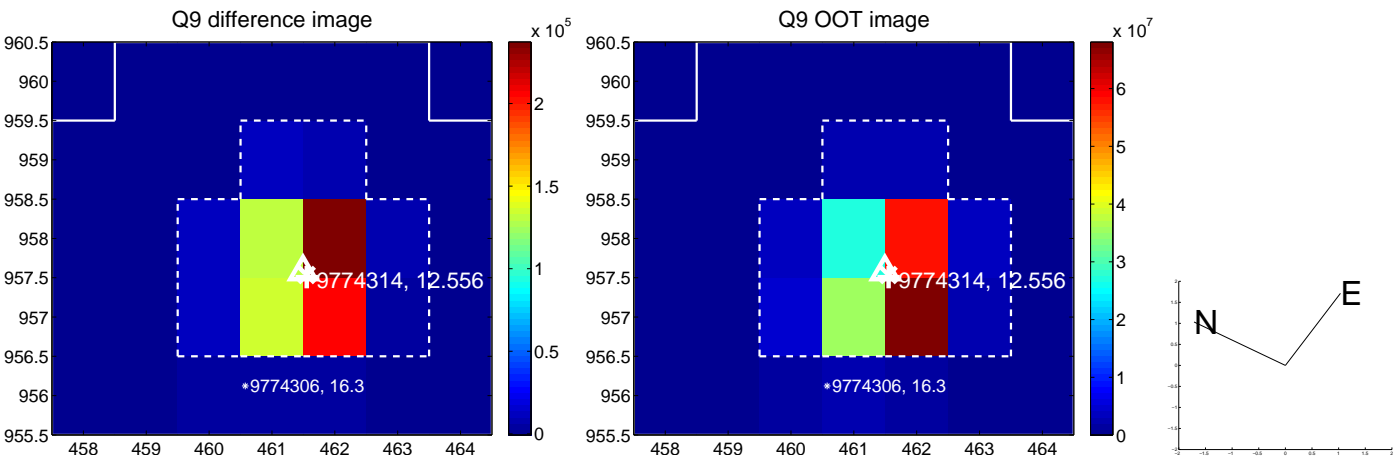




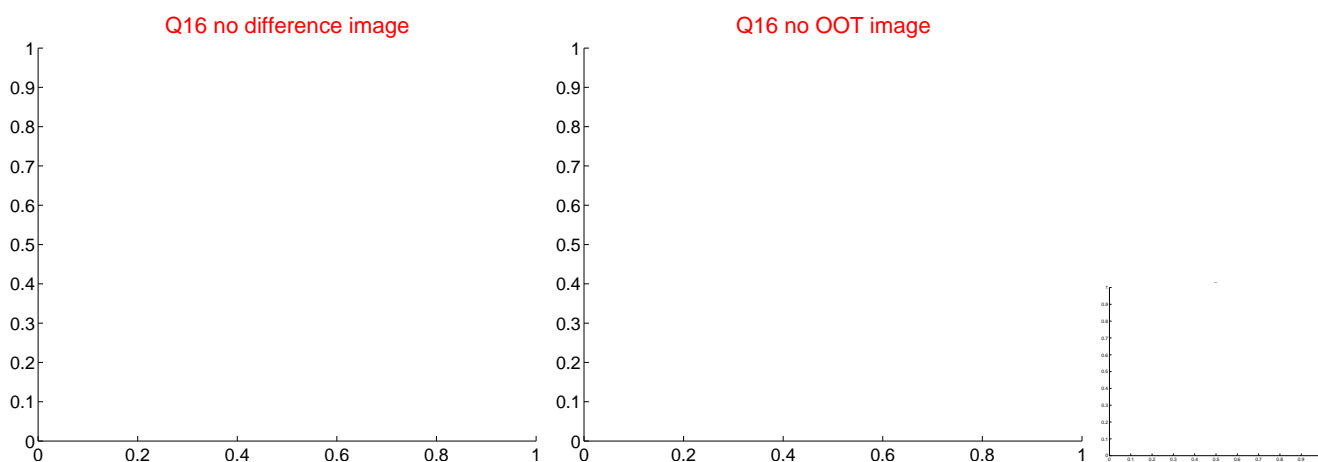
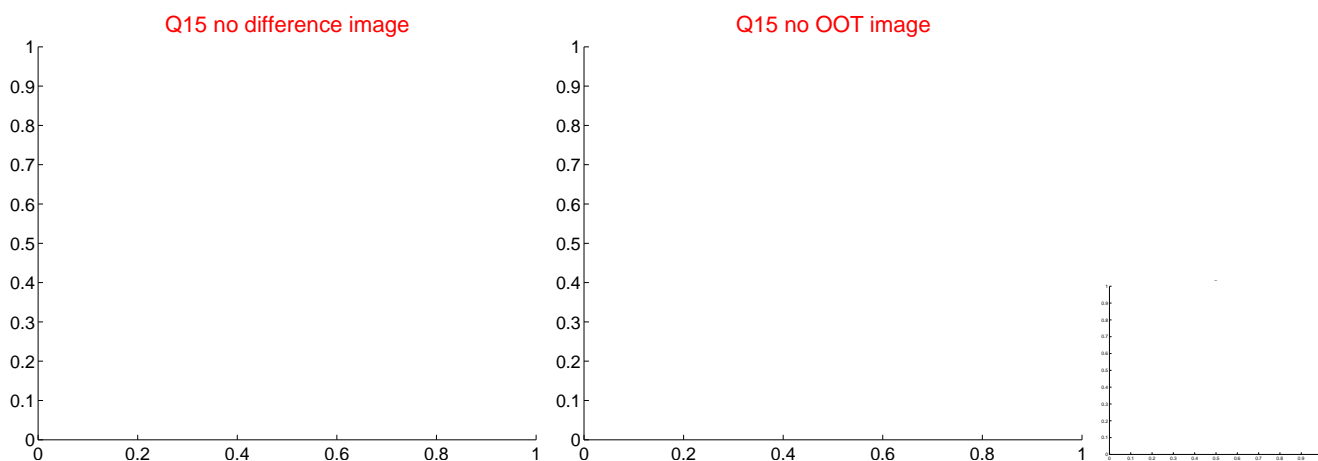
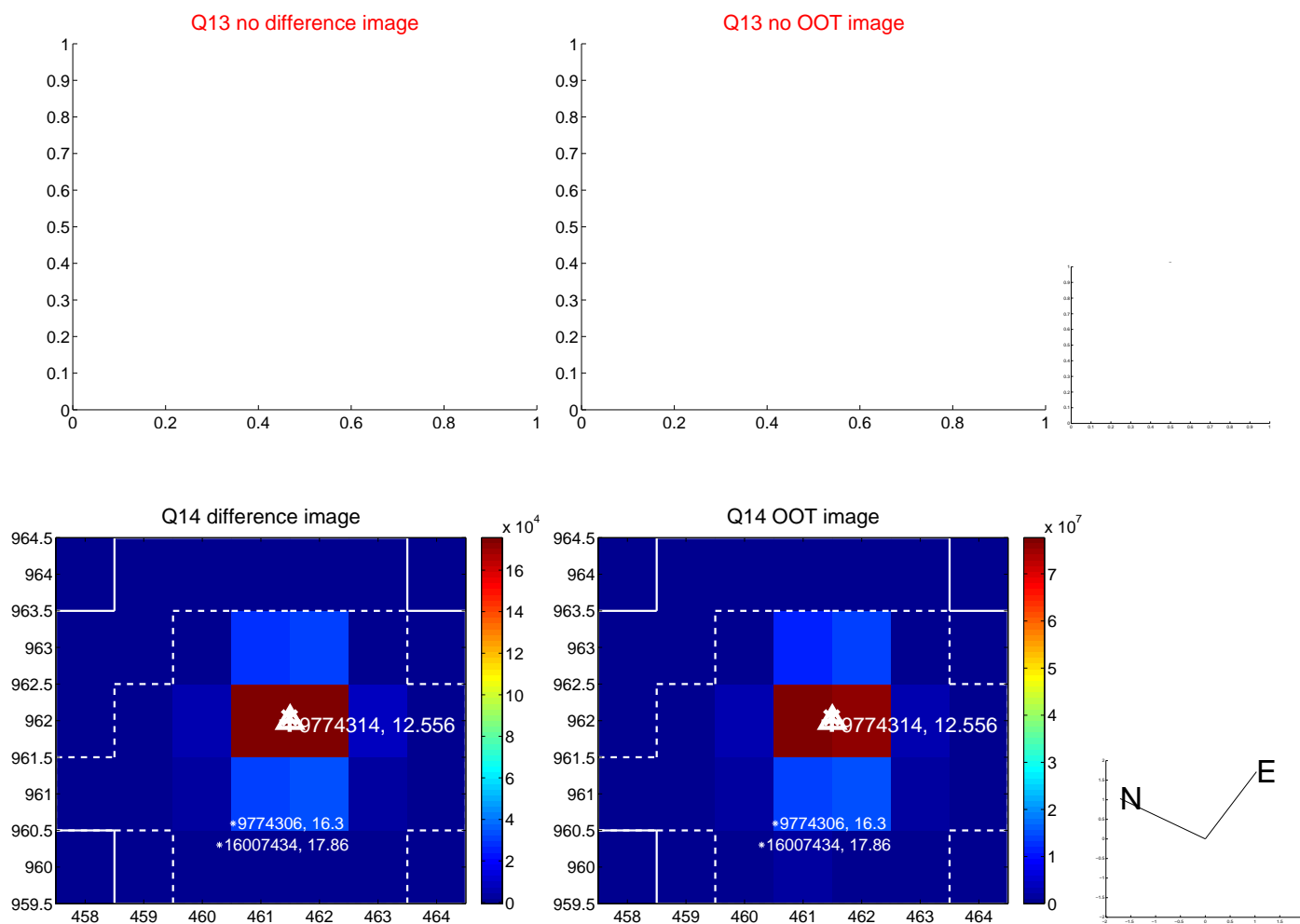
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



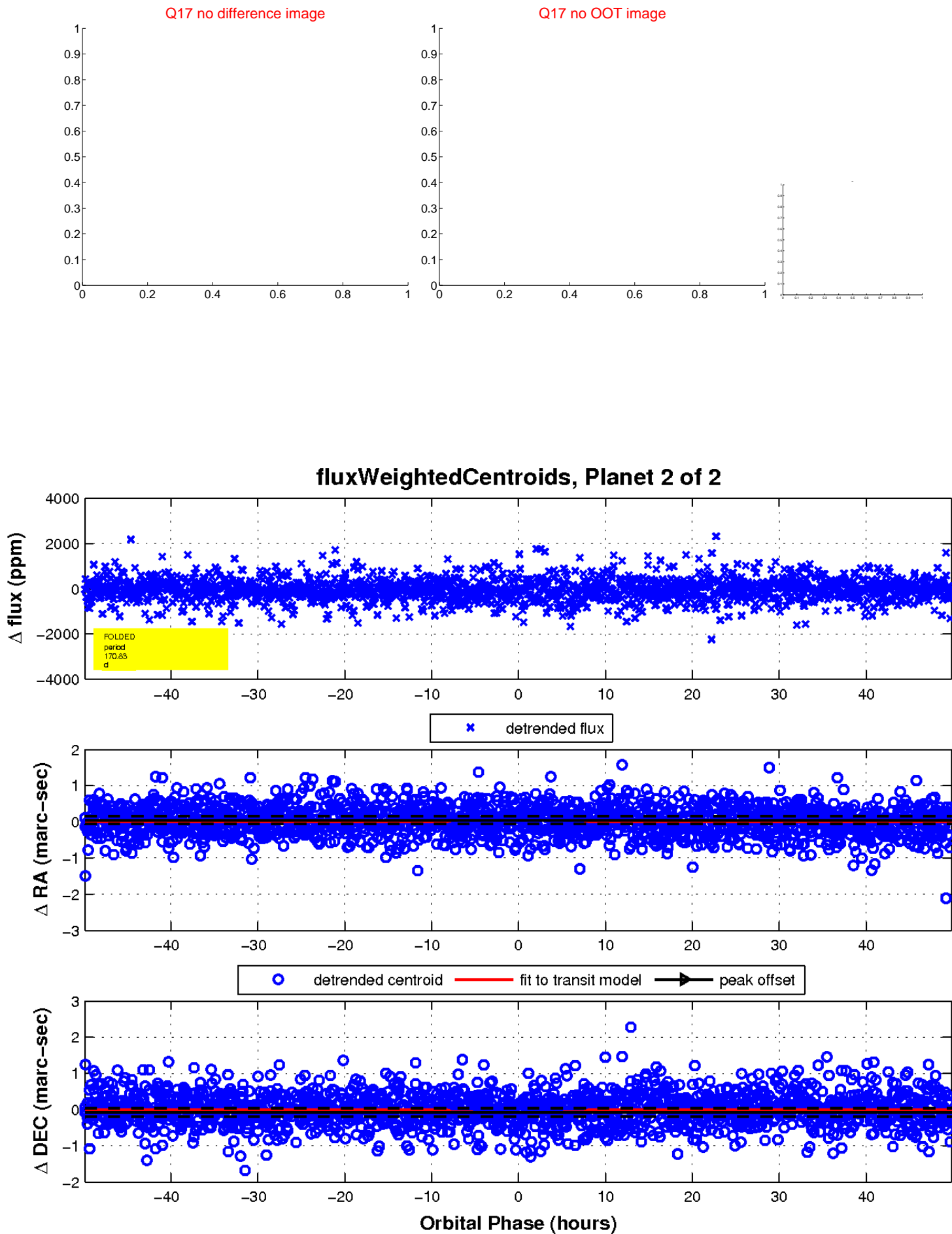
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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



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



UKIRT Image

Declination

