

# KIC 008161830

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
008161830-01	OBS	No	2.203132	133.568522	19.2	12.117	10.6	11.1	0.83	5644	0.36	602.91
008161830-02	OBS	No	526.690613	343.691475	335.9	16.410	26.9	12.4	0.83	5644	1.67	0.41
008161830-03	OBS	No	111.075752	141.954731	254.3	1.659	8.2	7.3	0.83	5644	1.68	3.24
008161830-04	OBS	No	152.415640	274.880647	111.9	13.945	9.7	6.0	0.83	5644	0.95	2.12
008161830-05	OBS	No	155.141465	265.124220	242.7	14.015	9.3	9.0	0.83	5644	2.21	2.07

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
008161830-01	OBS	FP	0.00	1	0	1	1	LPP_DV—HALO_GHOST—EPHEM_MATCH
008161830-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_MARSHALL_SKYE—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS
008161830-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—MOD_NONUNIQ_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS
008161830-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_MARSHALL—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_NONUNIQ_ALT—INCONSISTENT_TRANS—CENT_FEW_MEAS
008161830-05	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_MARSHALL—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—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 008161830-01

TCE (1)	KIC	Parent (2)	Parent KIC	P <sub>1</sub> :P <sub>2</sub>	Dist (″)	$\Delta$ Row	$\Delta$ Col	m <sub>2</sub>	m <sub>1</sub>	D <sub>2</sub> /D <sub>1</sub>	Mechanism	Flag	$\sigma_P$	$\sigma_T$
008161830-01	8161830	008161816-01	8161816	1:1	24.2	0	-6	15.54	13.31	2.68	Direct-PRF	1	3.81	0.54

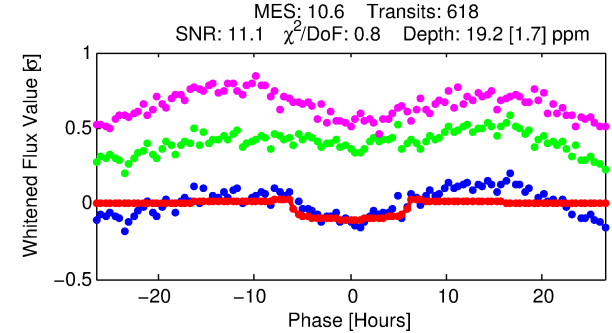
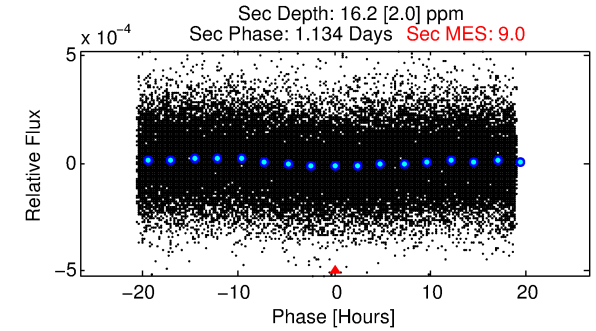
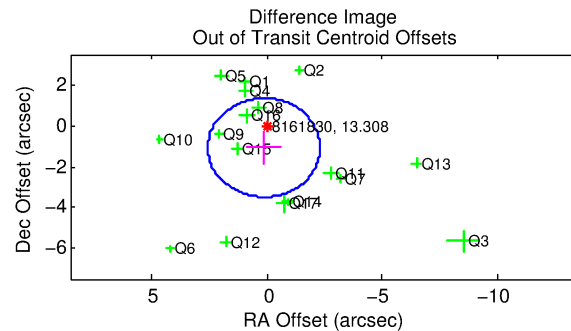
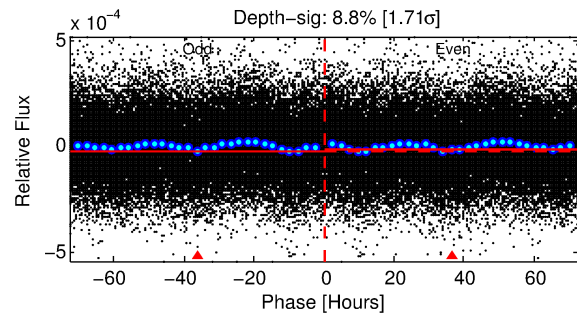
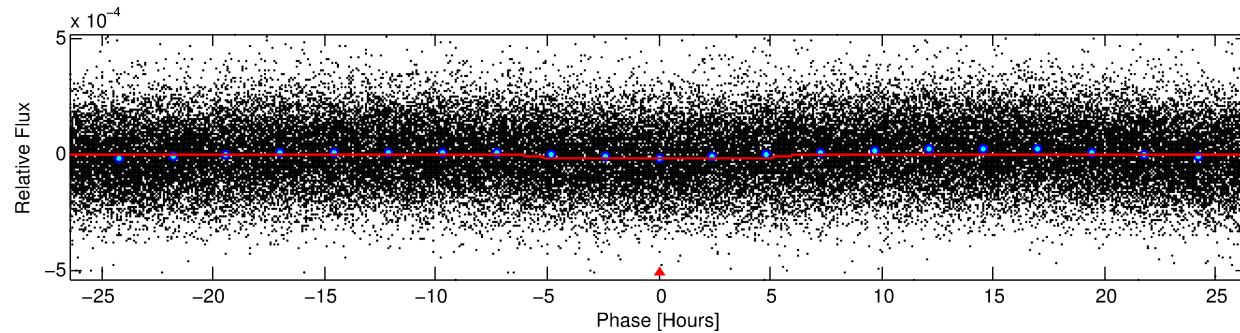
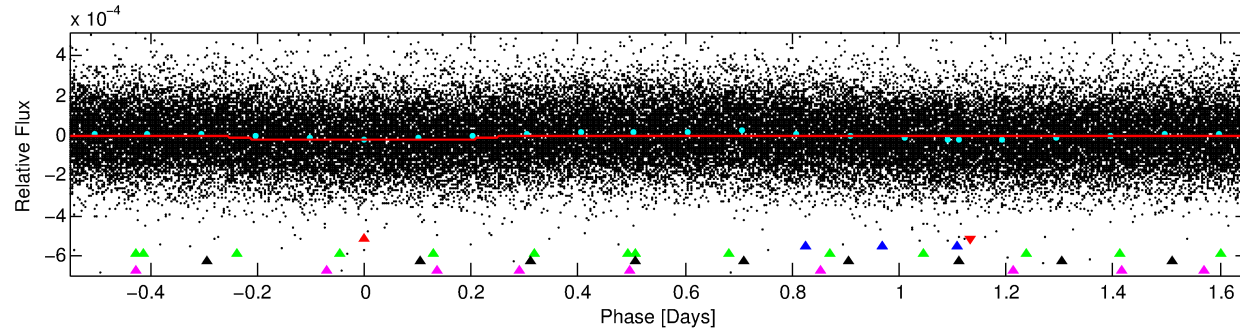
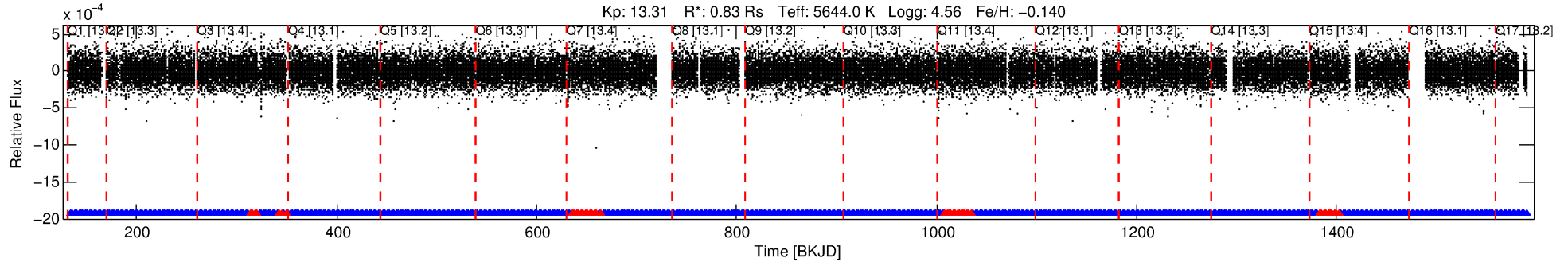
**Notes:** P<sub>1</sub>:P<sub>2</sub> is the period ratio. Dist is the distance in arcseconds.  $\Delta$ Row and  $\Delta$ Col are the number of pixels apart in row and column. m<sub>2</sub> and m<sub>1</sub> are the magnitudes of the parent and child. D<sub>2</sub>/D<sub>1</sub> is the parent's transit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

# DV One-Page Summary

KIC: 8161830 Candidate: 1 of 5 Period: 2.203 d

KOI: K03046 Corr: No Ephemeris Match

Kp: 13.31 R\*: 0.83 Rs Teff: 5644.0 K Logg: 4.56 Fe/H: -0.140



## DV Fit Results:

Period = 2.20313 [0.00003] d  
Epoch = 133.5685 [0.0087] BKJD  
Rp/R\* = 0.0040 [0.0044]  
a/R\* = 1.52 [4.16]  
b = 0.01 [773.30]  
Seff = 602.91 [181.14]  
Teq = 1264 [95] K  
Rp = 0.36 [0.41] Re  
a = 0.0323 [0.0063] AU  
Ag = 71.62 [161.00] [0.44σ]  
Teffp = 5683 [3173] K [1.39σ]

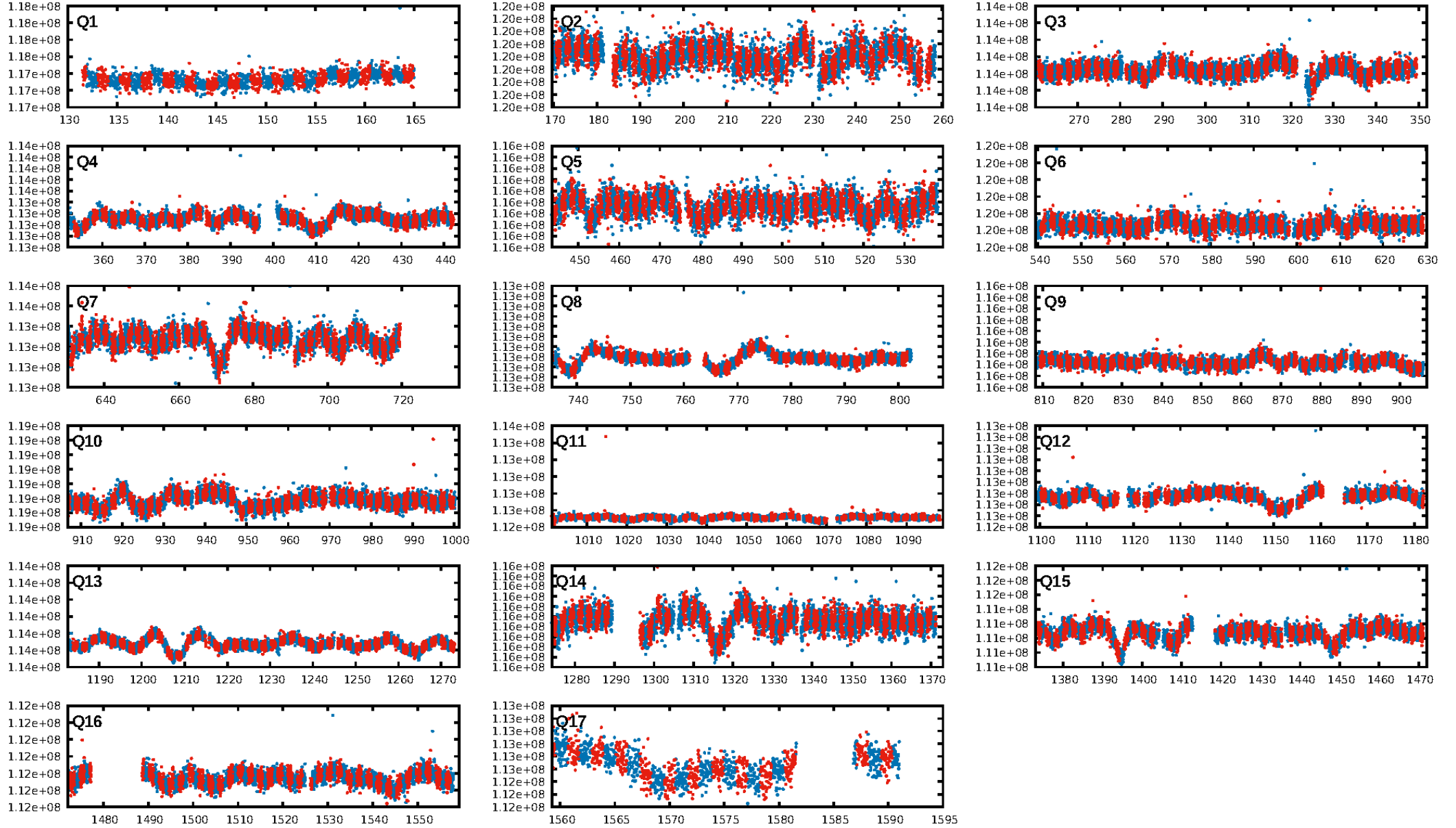
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 100.0% [213.64σ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGoF-sig: N/A  
Bootstrap-pfa: 7.09e-17  
RollingBand-fgt: 0.93 [546/589]  
**GhostDiagnostic-chr: 0.1261**  
**Centroid-sig: 0.0%**  
Centroid-so: 2.387 arcsec [2.20σ]  
OotOffset-rm: 1.078 arcsec [1.34σ]  
KicOffset-rm: 1.162 arcsec [1.43σ]  
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]

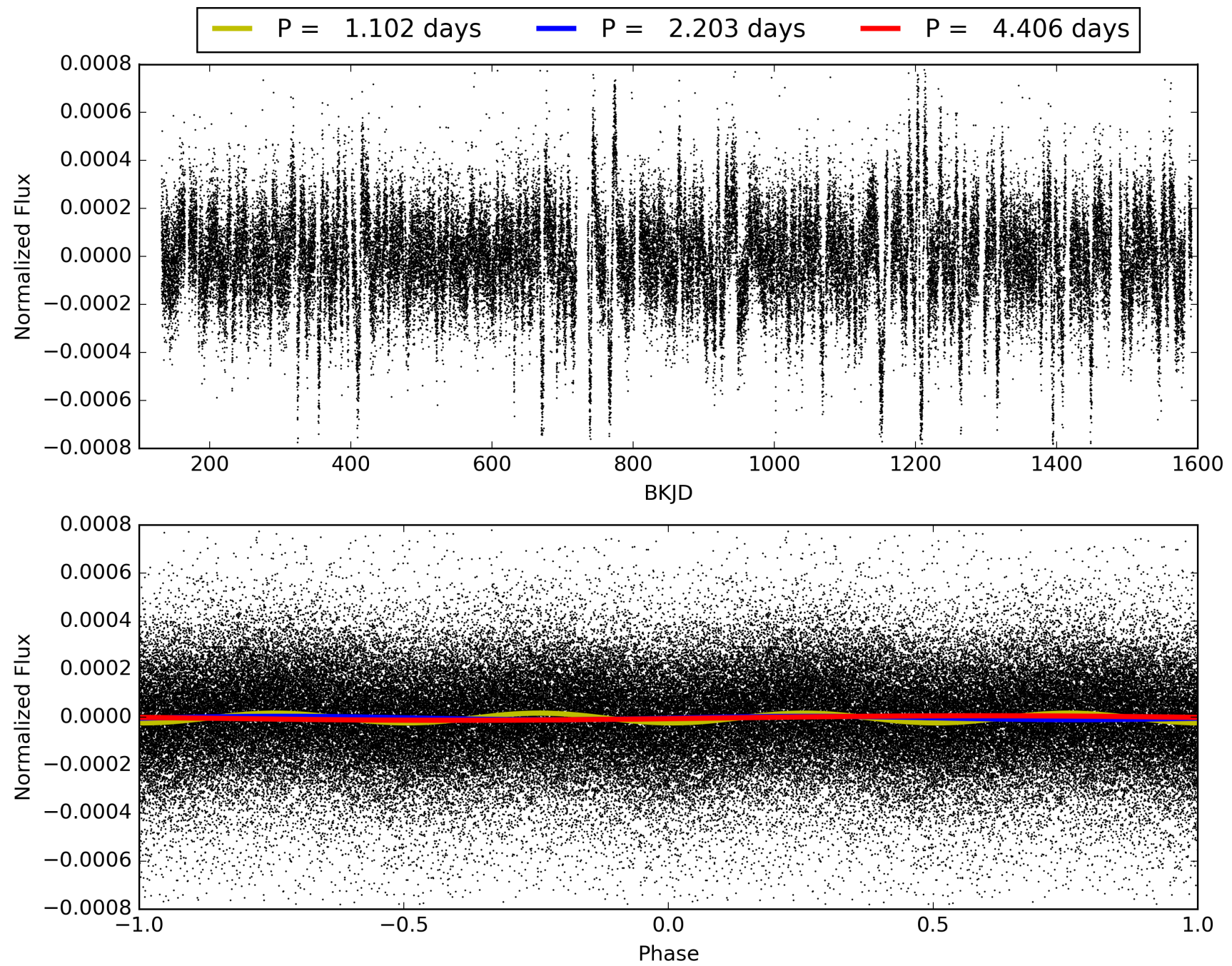
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 31-Jan-2016 08:30:34 Z

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

# TCE 008161830-01, PDC Light Curves



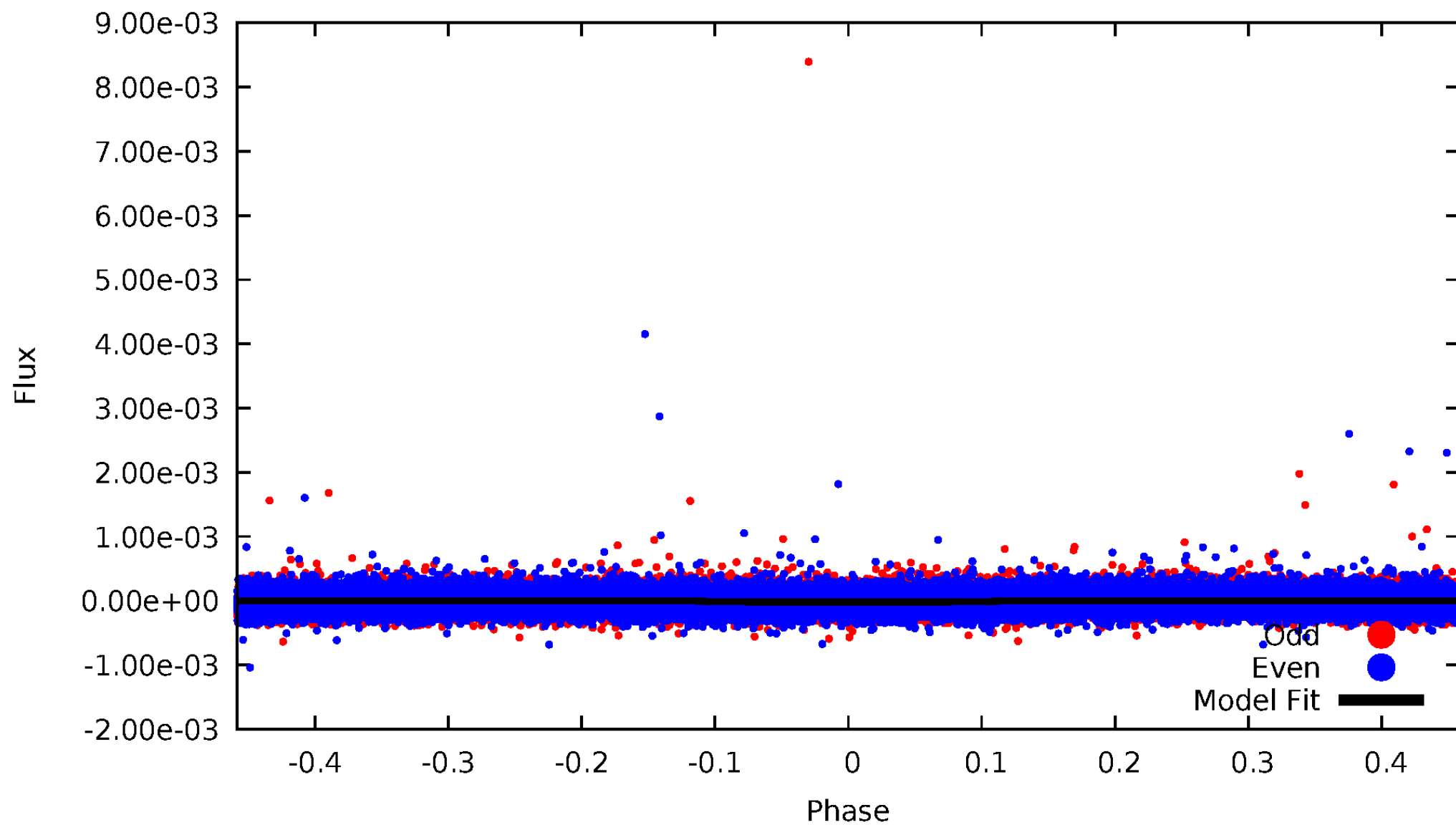
TCE 008161830-01





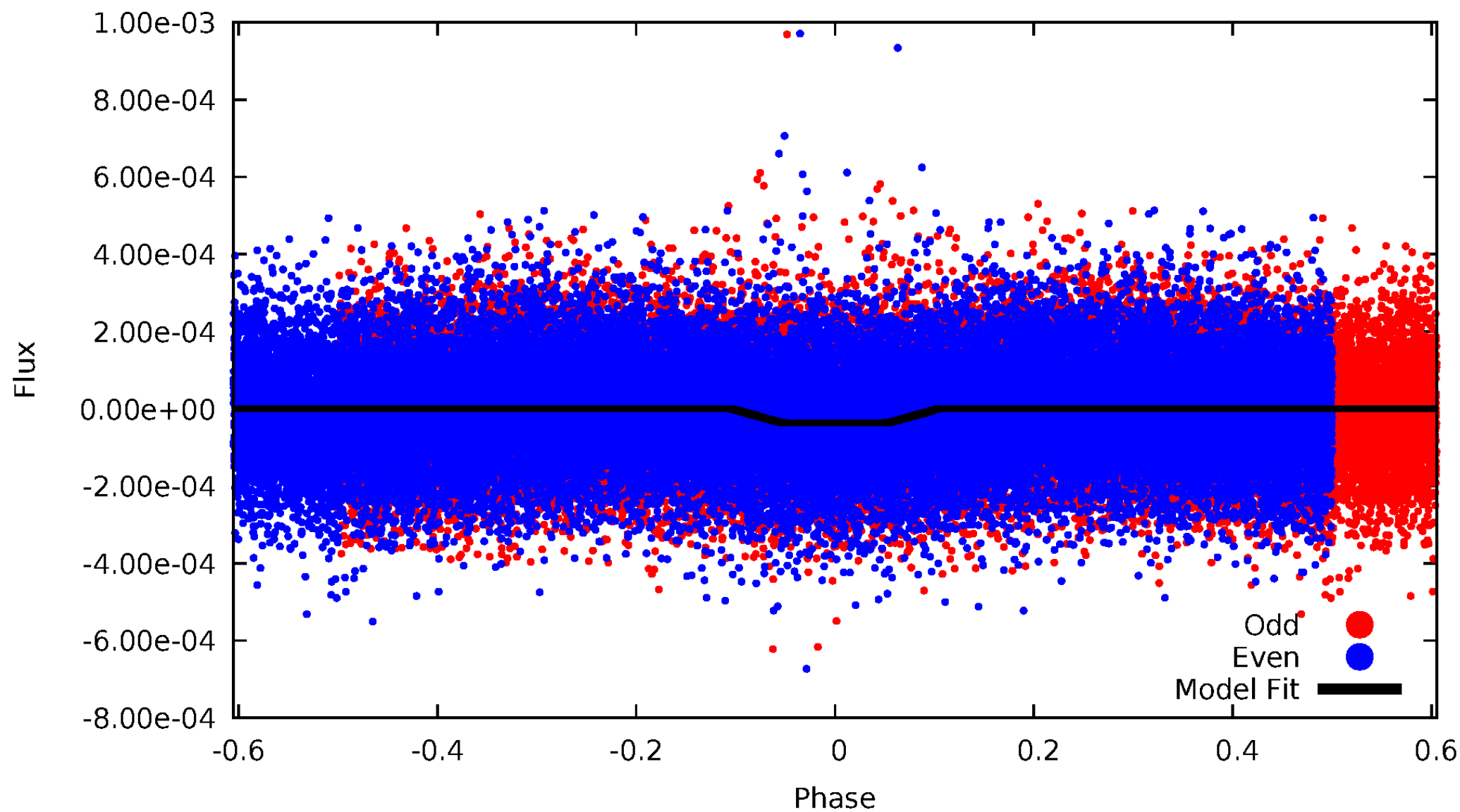
# DV Odd/Even

TCE 008161830-01

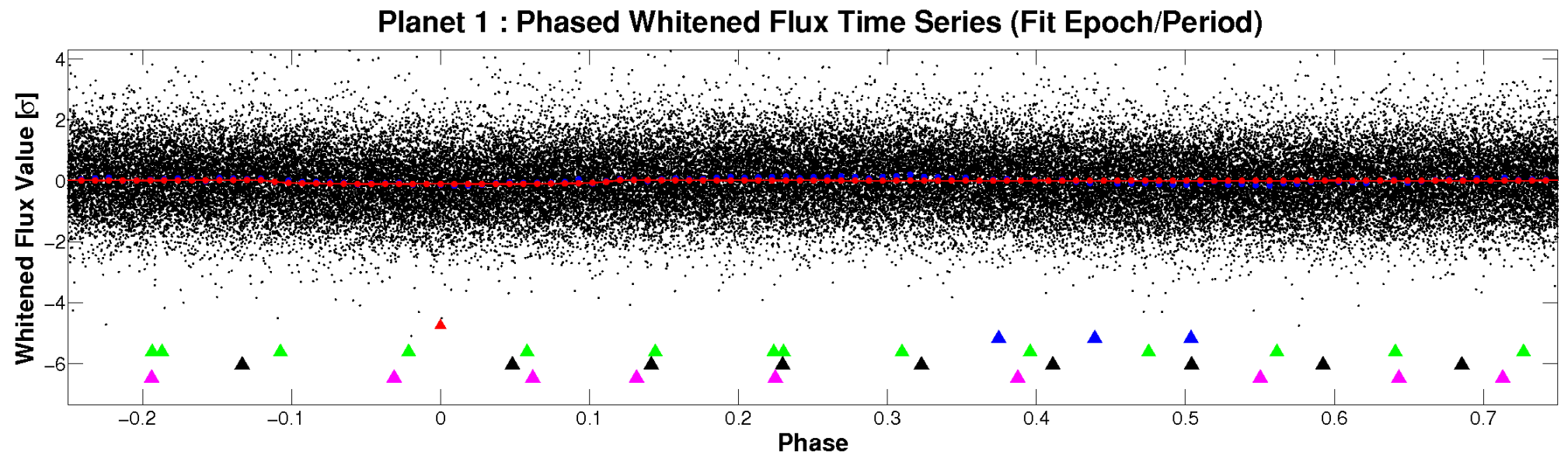
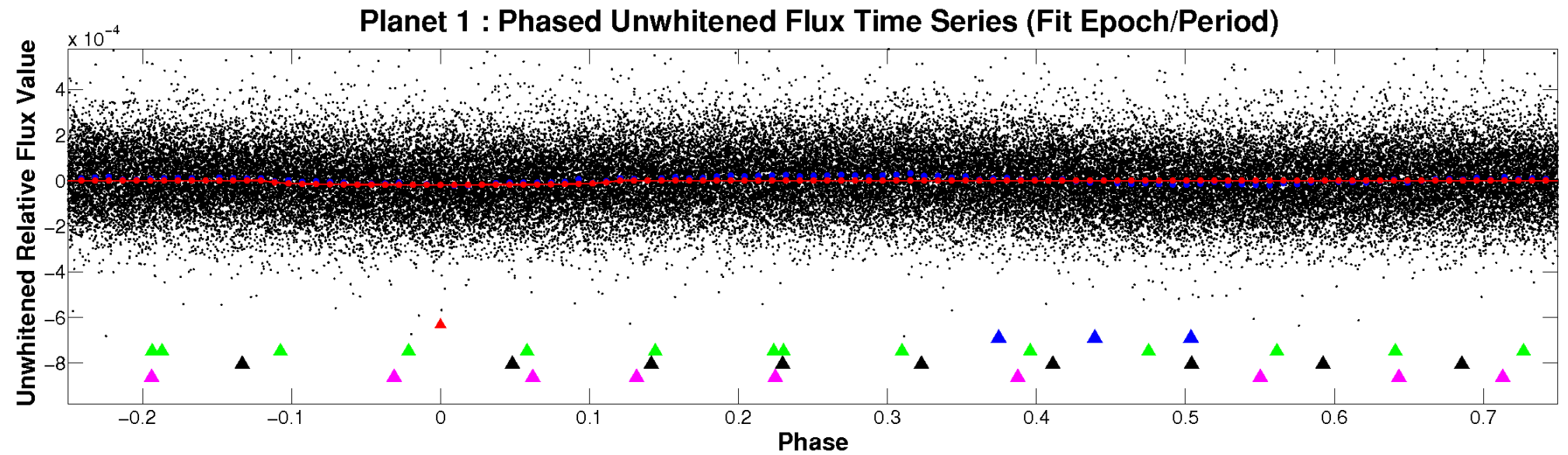


# ALT Odd/Even

TCE 008161830-01

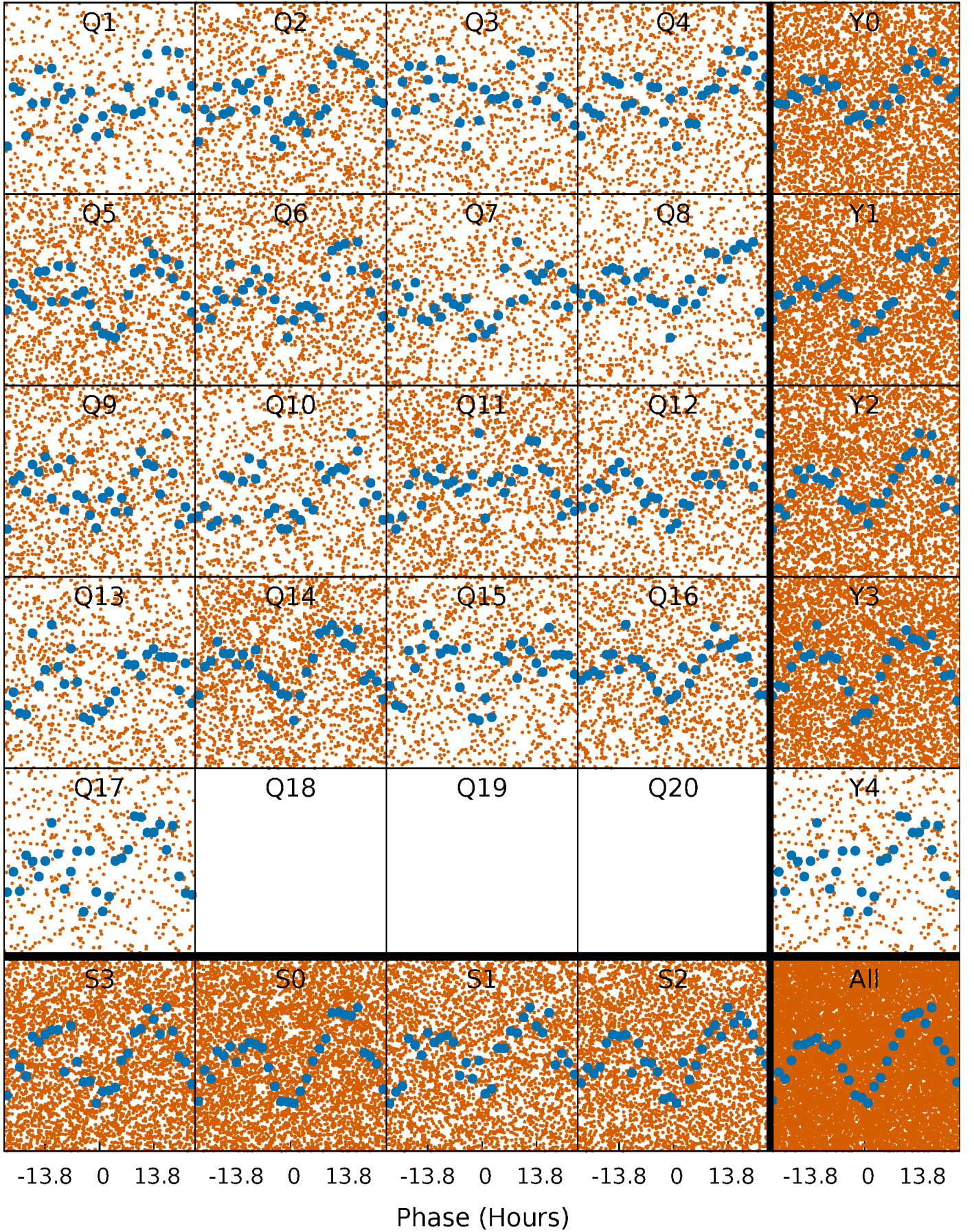


# Non-Whitened Vs. Whitened Light Curve



# PDC Quarter-Phased Transit Curves

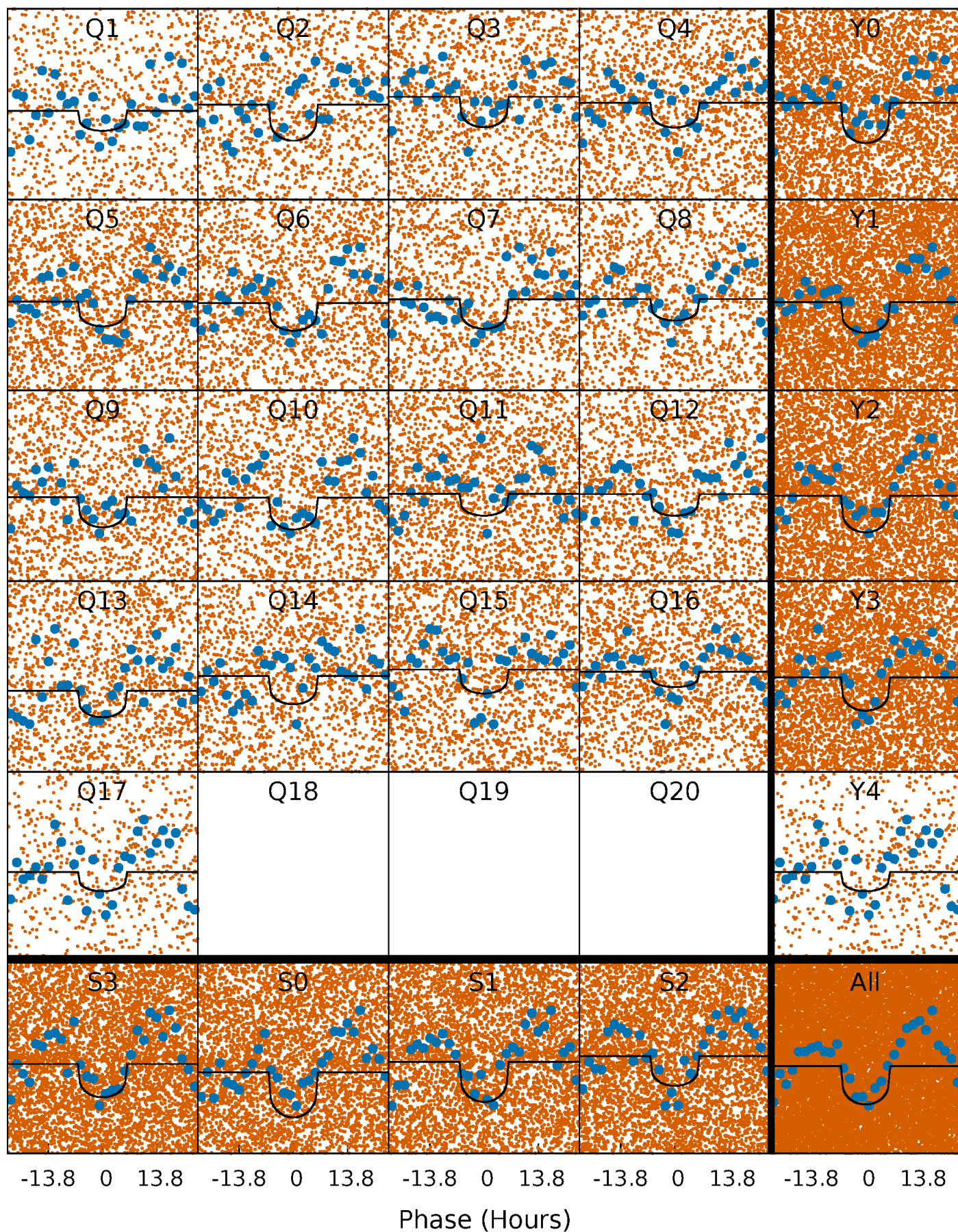
TCE 008161830-01 P= 2.203132 Days  $T_0=133.568522$  (BKJD)





# DV Quarter-Phased Transit Curves

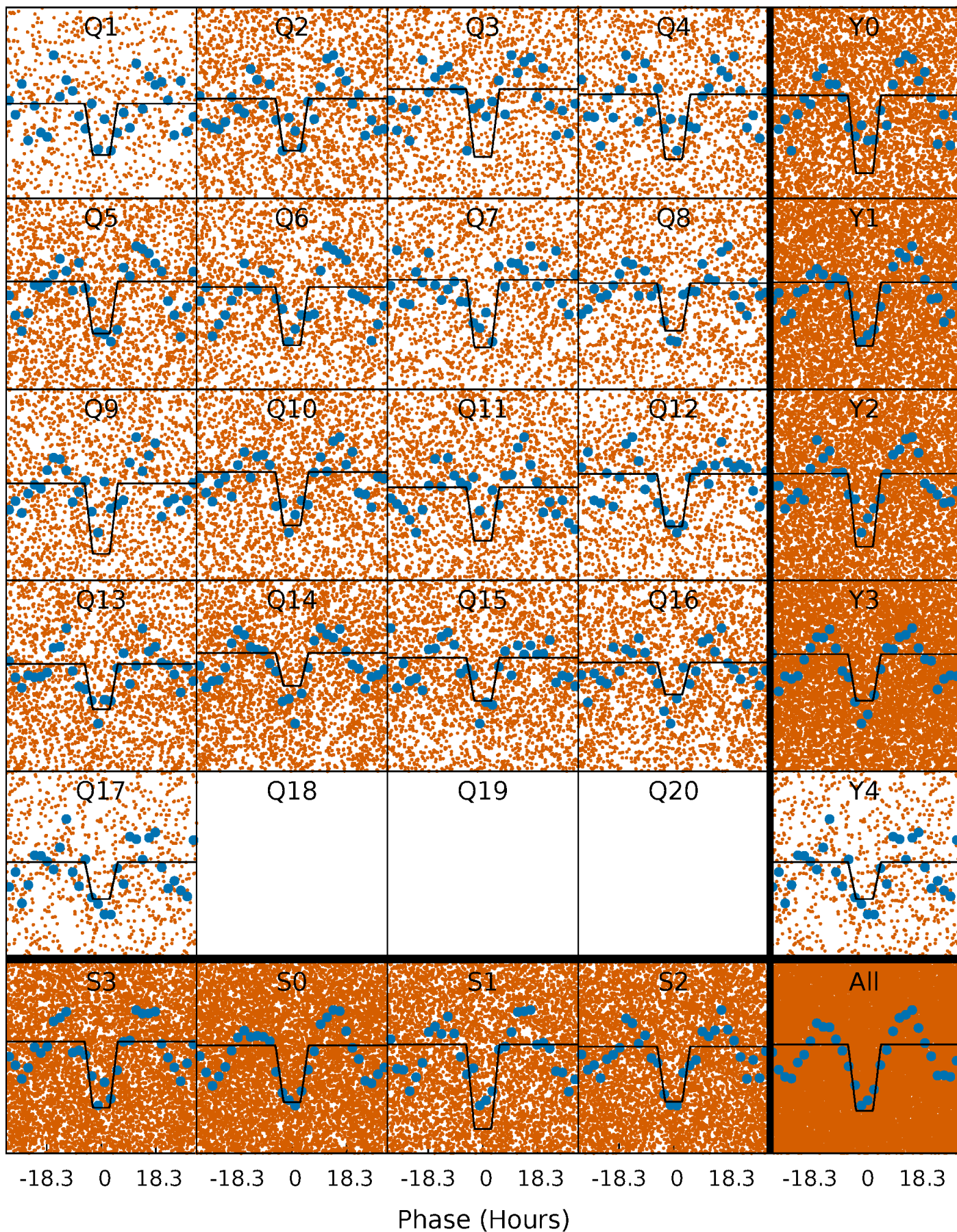
TCE 008161830-01 P= 2.203132 Days  $T_0=133.568522$  (BKJD)





# Alt. Detrend Quarter-Phased Transit Curves

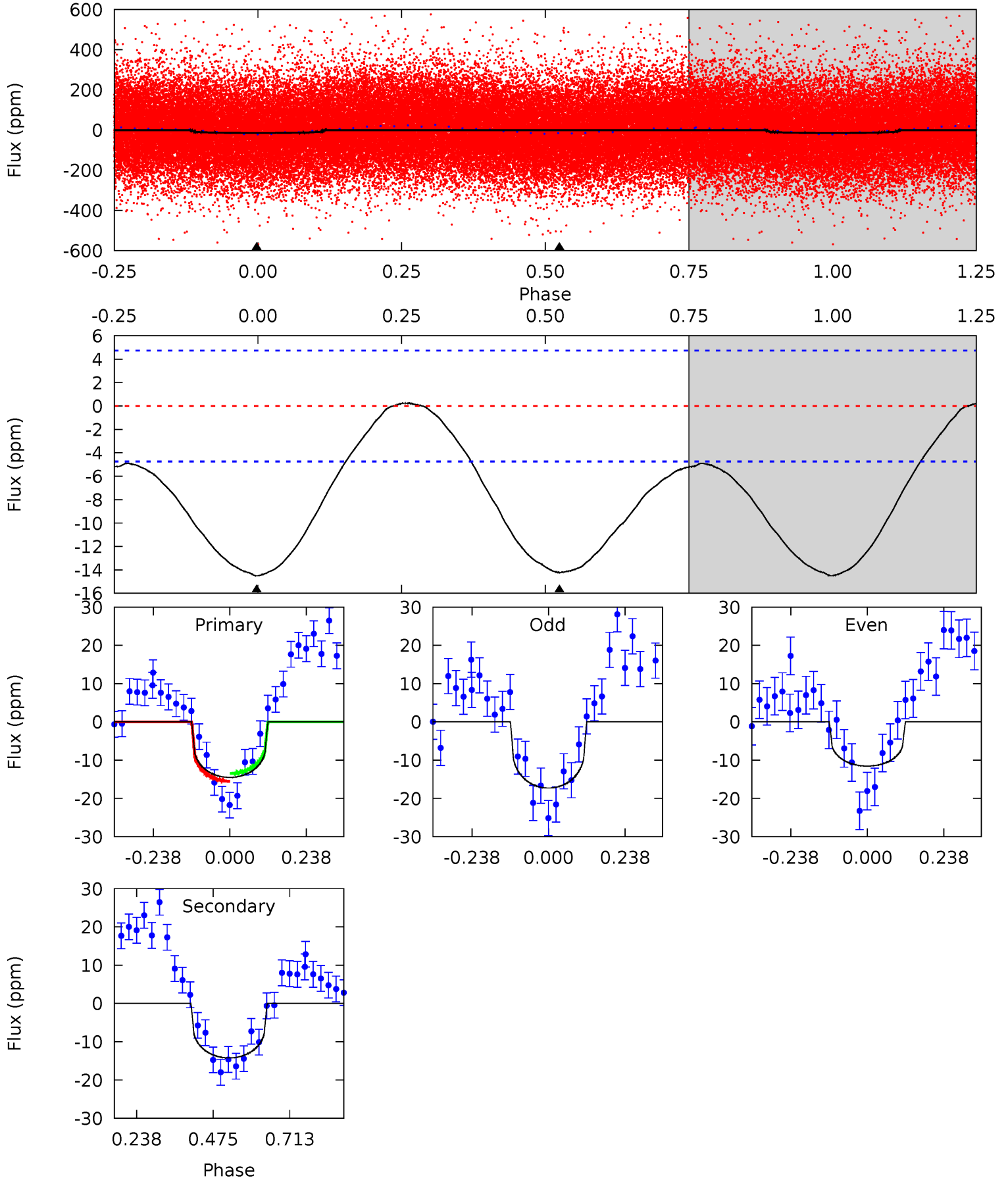
TCE 008161830-01 P= 2.203056 Days  $T_0=133.599559$  (BKJD)



# DV Model-Shift Uniqueness Test

008161830-01, P = 2.203132 Days, E = 131.365390 Days

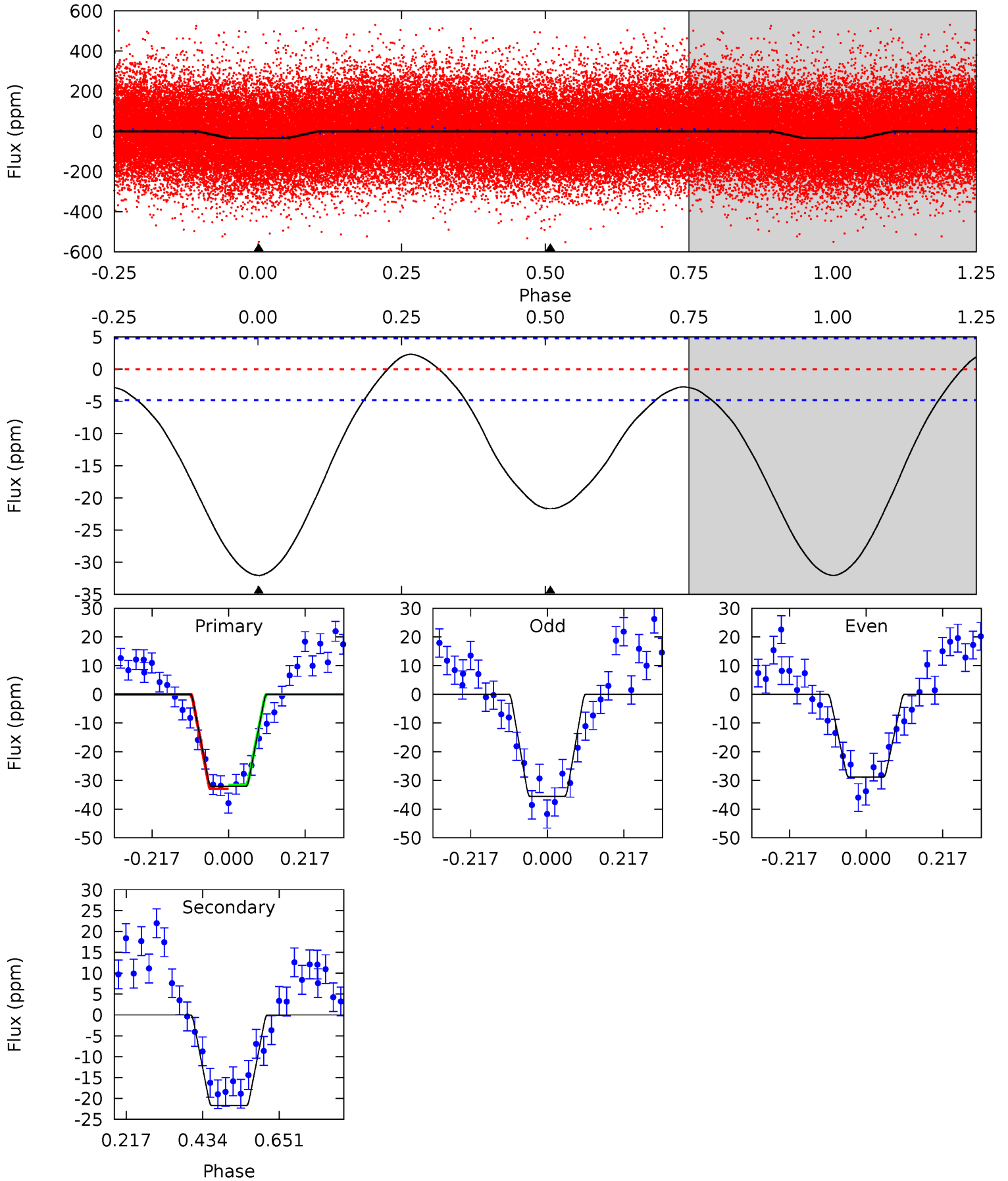
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
13.4	13.1	0	0	4.38	1.18	2.02	13.4	13.4	13.1	13.1	2.67	0.81	0.02	0.96



# Alt Model-Shift Uniqueness Test

008161830-01, P = 2.203056 Days, E = 131.396503 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
29.3	19.8	0	0	4.40	1.23	2.23	29.3	29.3	19.8	19.8	3.09	0.98	0.07	0.64





### Stellar Parameters For KIC 008161830

	$T_{\text{eff}} (K)$	$\log(g)$	$[\text{Fe}/\text{H}]$	$R (R_{\odot})$	$M (M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$5644^{+152}_{-152}$	$4.564^{+0.038}_{-0.152}$	$-0.140^{+0.300}_{-0.300}$	$0.831^{+0.194}_{-0.078}$	$0.928^{+0.083}_{-0.104}$	$2.279^{+0.443}_{-0.987}$
	+3%/-3%	+1%/-3%	+214%/-214%	+23%/-9%	+9%/-11%	+19%/-43%
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 008161830-01 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$-14 \pm 1$	$0.50^{+0.40}_{-0.33}$	$1798^{+99}_{-72}$	$4847^{+3643}_{-976}$	$32^{+241}_{-23}$
Alt.	$-22 \pm 1$	$0.62^{+0.41}_{-0.37}$	$1796^{+110}_{-71}$	$4854^{+2665}_{-874}$	$33^{+166}_{-21}$

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

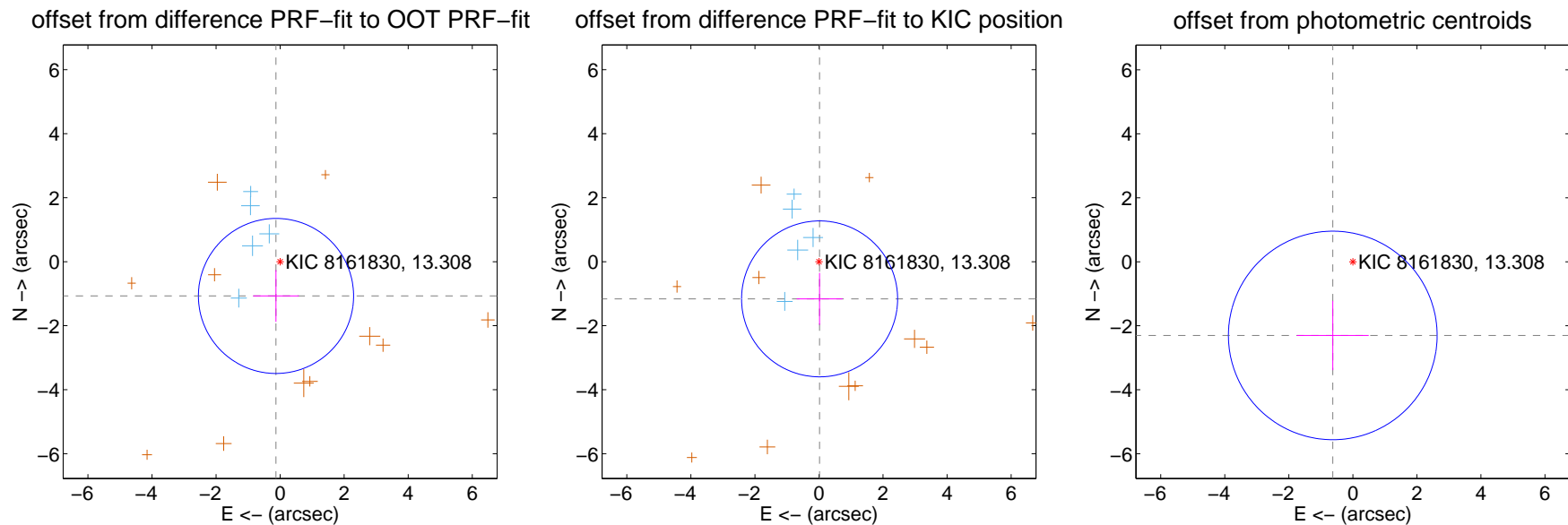
## DV Centroid Data

Supplemental centroid analysis for 008161830-01. Kepler magnitude: 13.31. Transit SNR 11.08

There are 5 quarters with good PRF difference image offsets

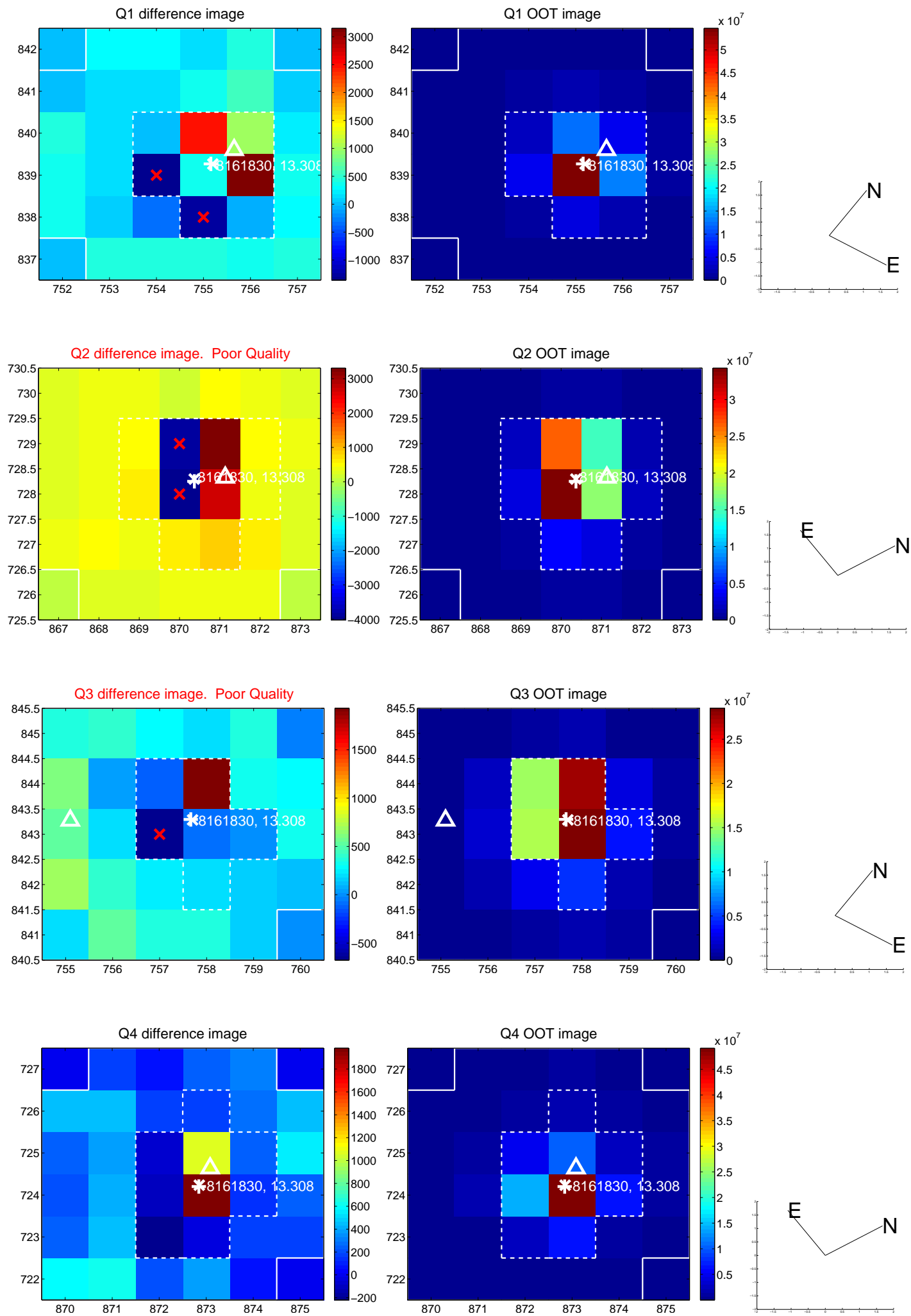
The direct PRF centroid is offset from the target star catalog position by about 0.22 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$1.078 \pm 0.808$	1.34	$0.128 \pm 0.713$	$-1.070 \pm 0.809$
PRF-fit source offset from KIC position	$1.162 \pm 0.812$	1.43	$-0.019 \pm 0.715$	$-1.162 \pm 0.812$
photometric centroid source offset	$2.39 \pm 1.09$	2.20	$0.63 \pm 1.12$	$-2.30 \pm 1.08$

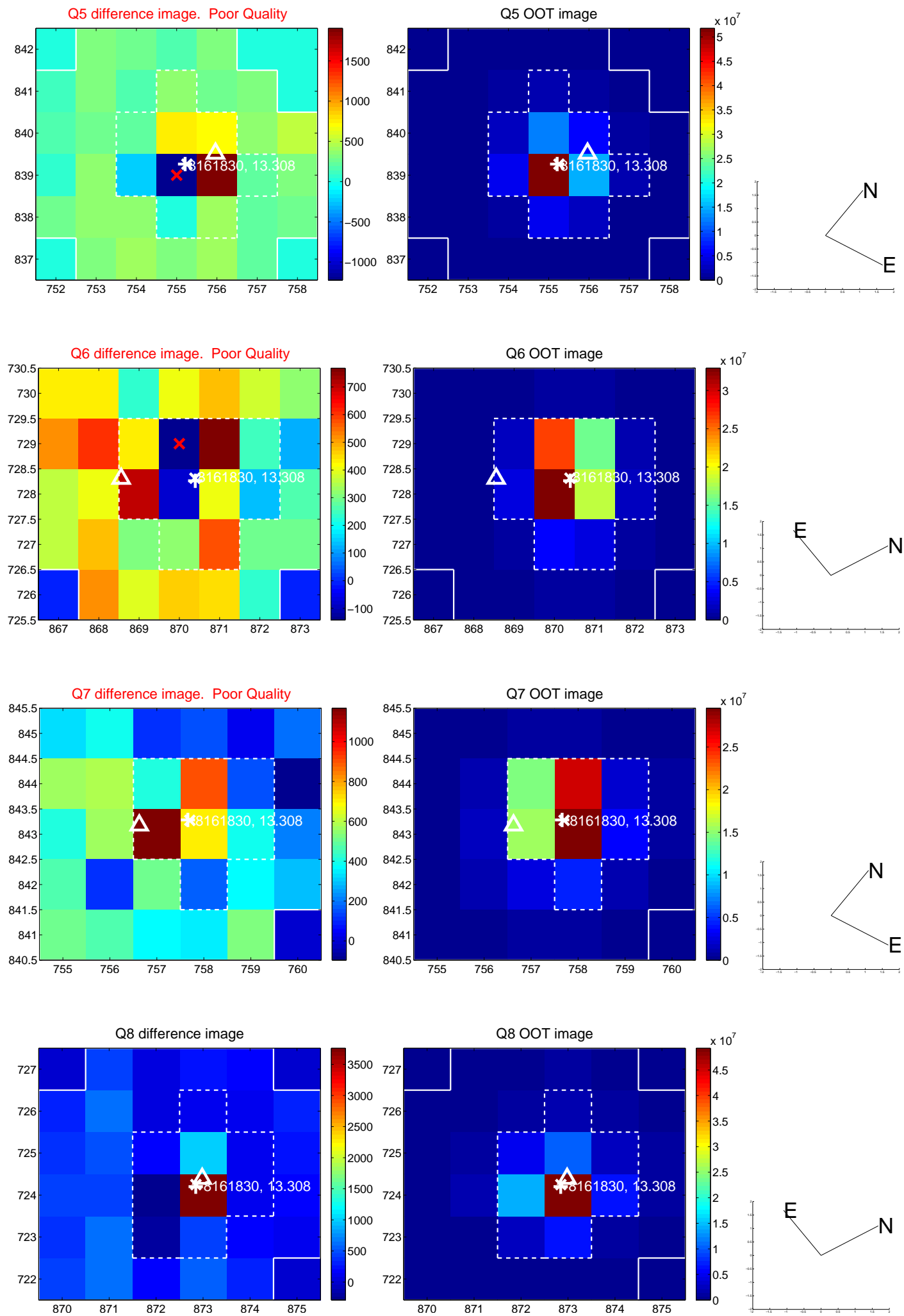


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses:** good quarterly centroid offsets; **Vermillion crosses:** bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

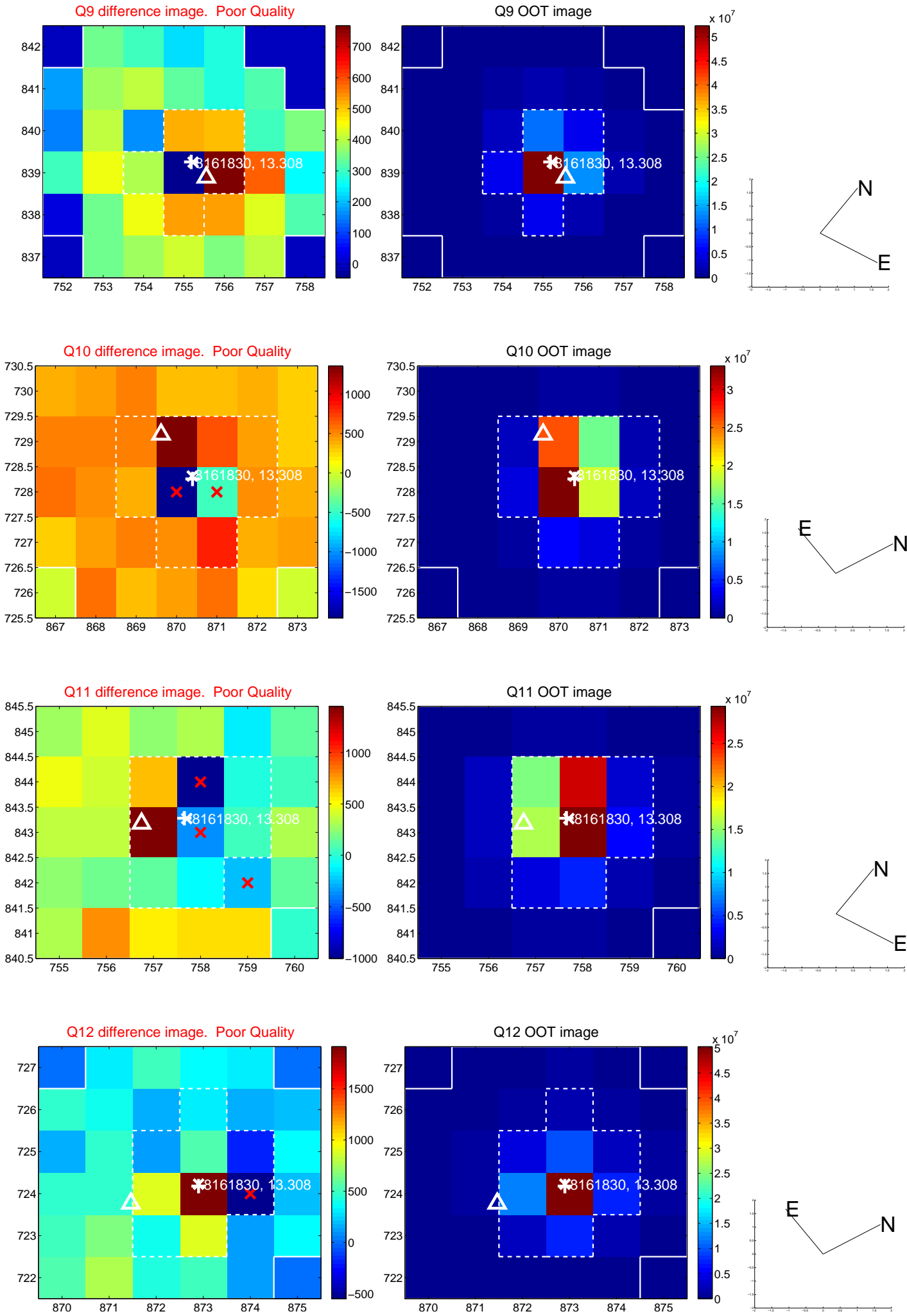


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

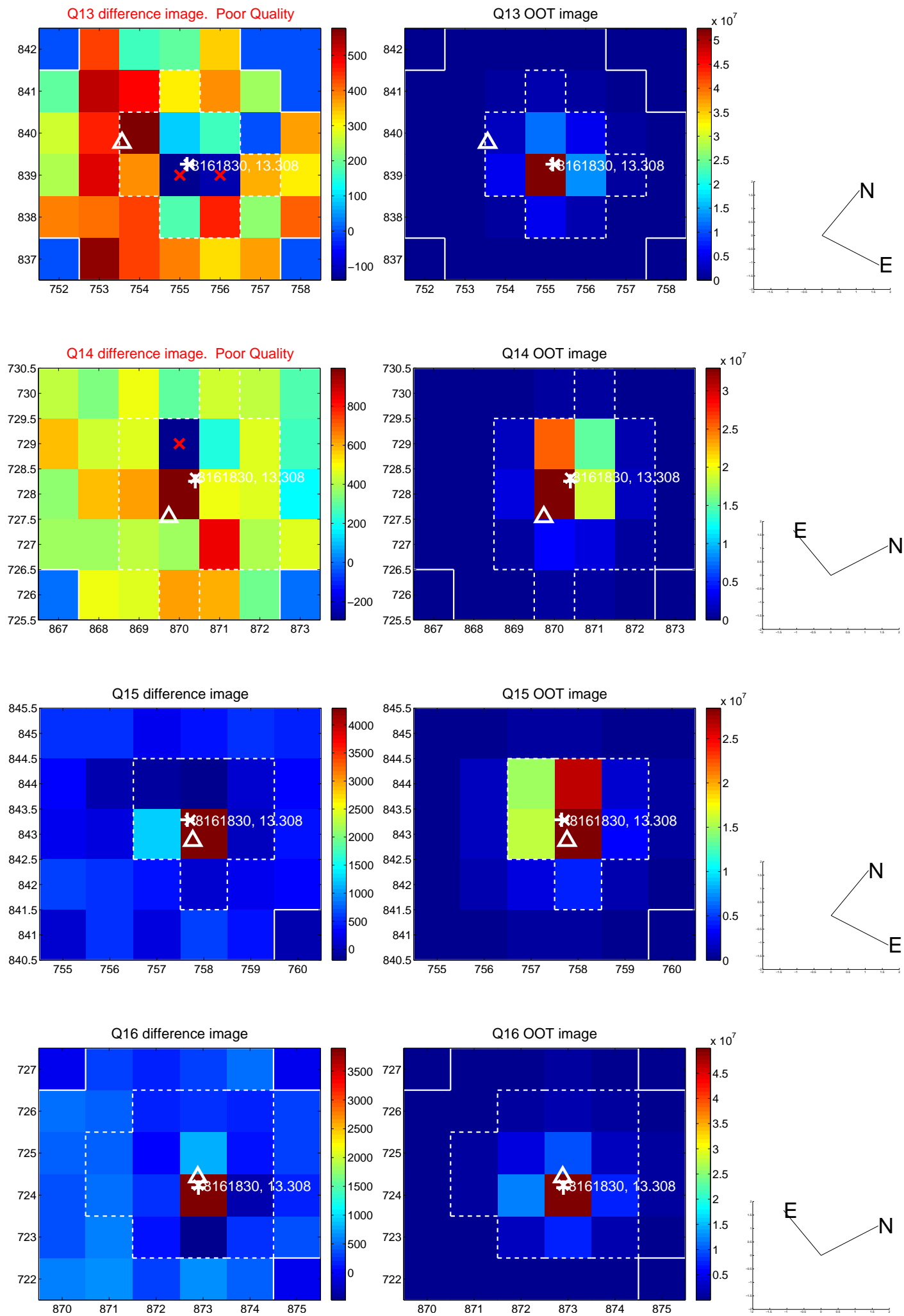




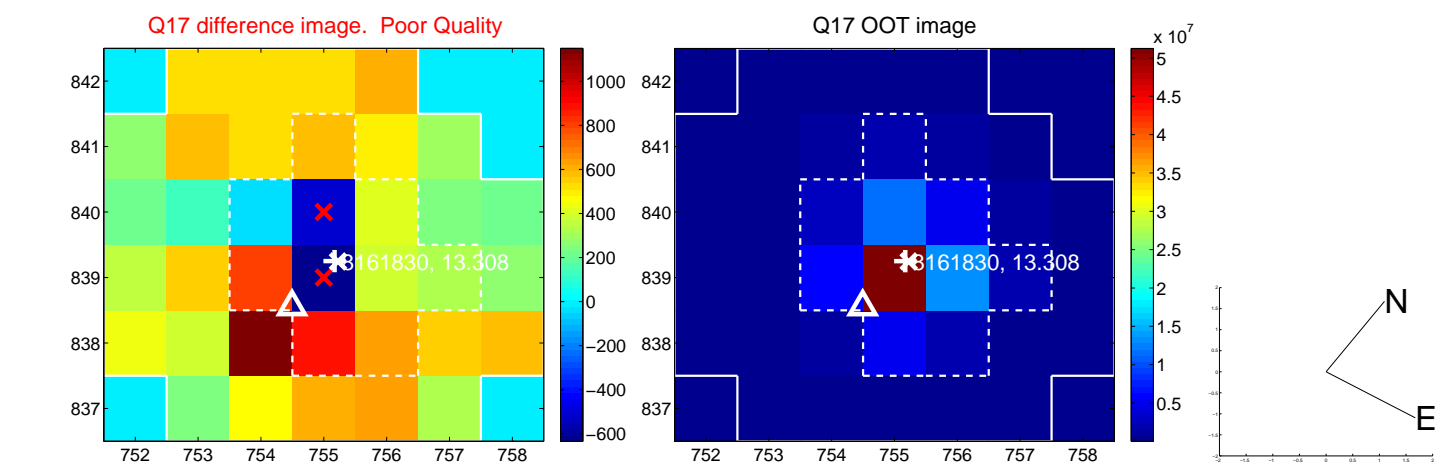
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



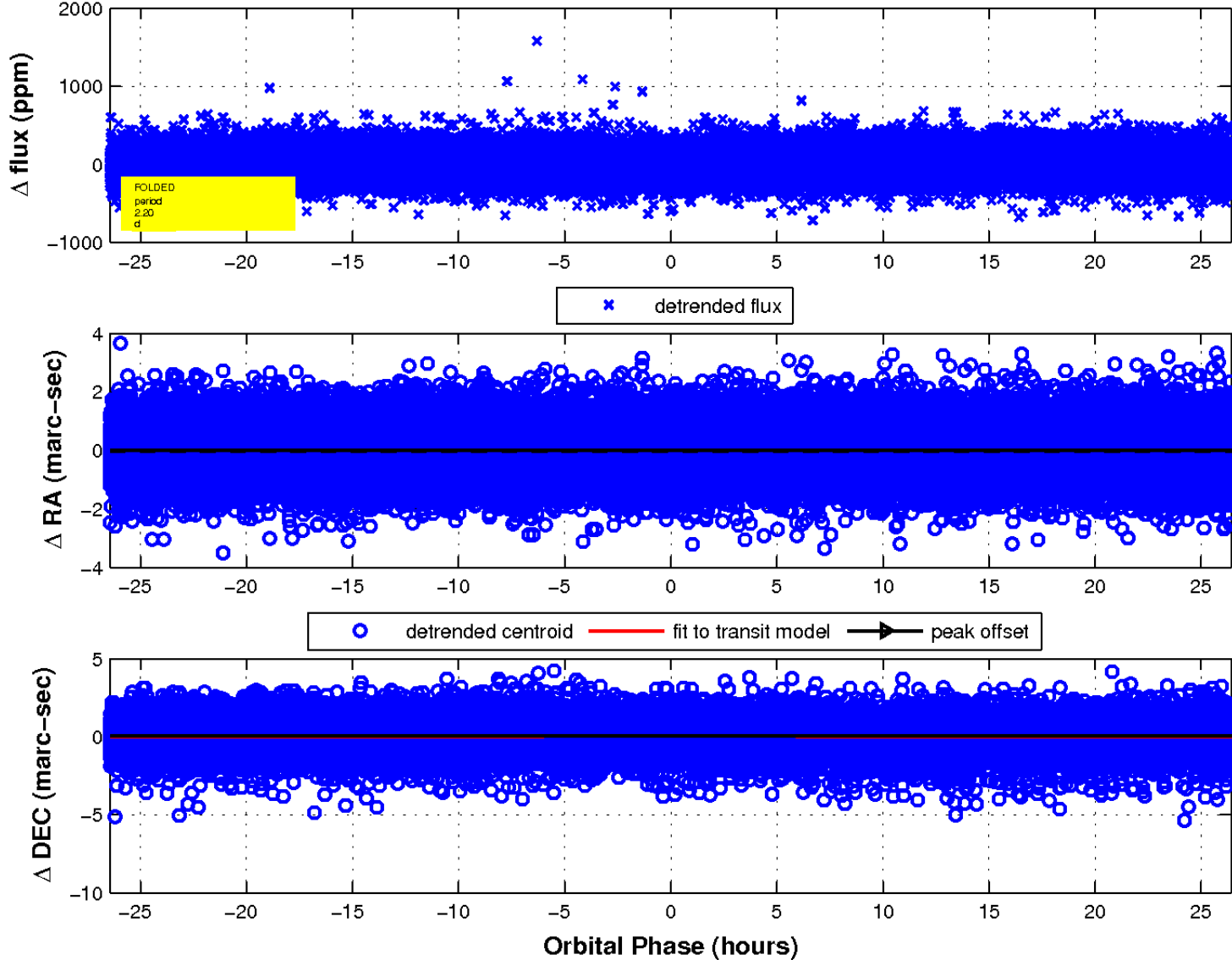
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

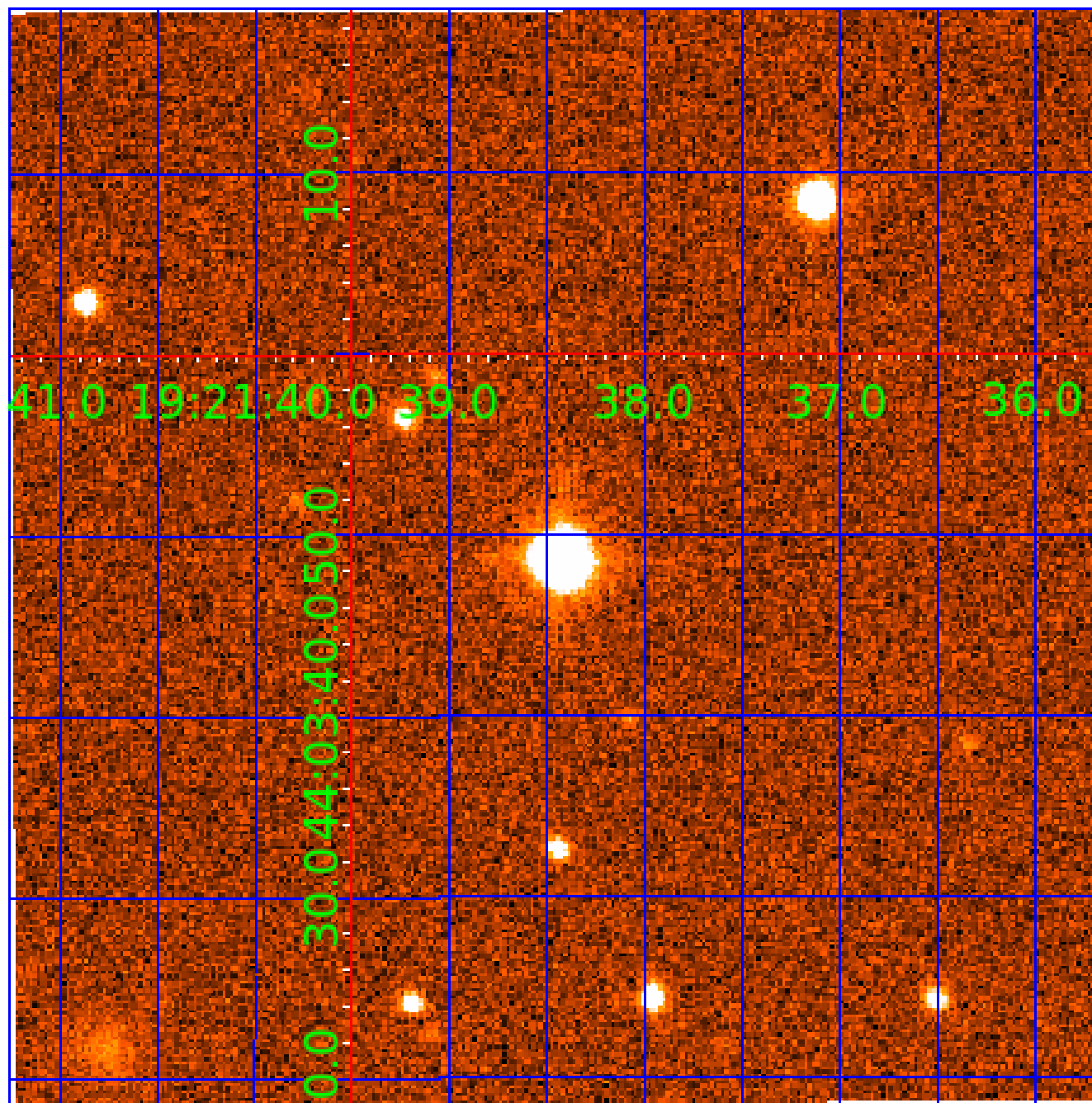


fluxWeightedCentroids, Planet 1 of 5



UKIRT Image

Declination





# KIC 008161830

## 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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008161830-05	OBS	No	155.141465	265.124220	242.7	14.015	9.3	9.0	0.83	5644	2.21	2.07

## Robovetter Results

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008161830-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_MARSHALL_SKYE—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS
008161830-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—MOD_NONUNIQ_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS
008161830-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_MARSHALL—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_NONUNIQ_ALT—INCONSISTENT_TRANS—CENT_FEW_MEAS
008161830-05	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_MARSHALL—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—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.

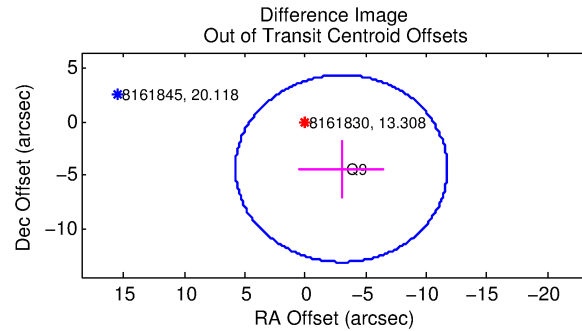
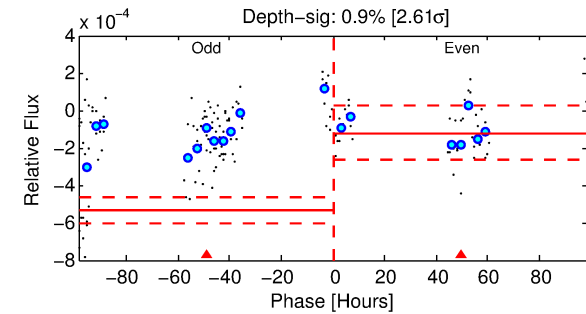
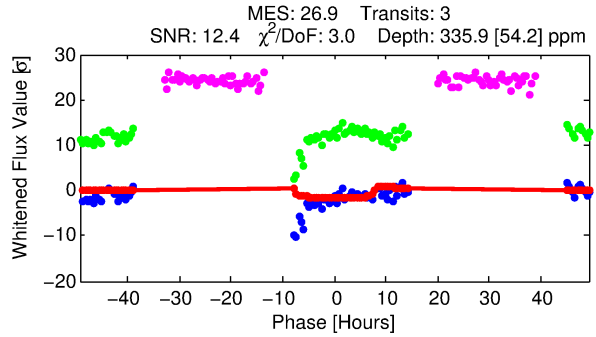
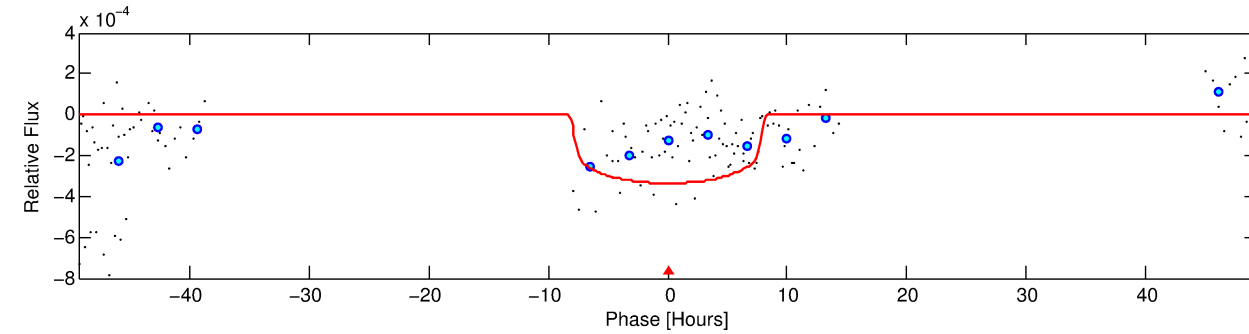
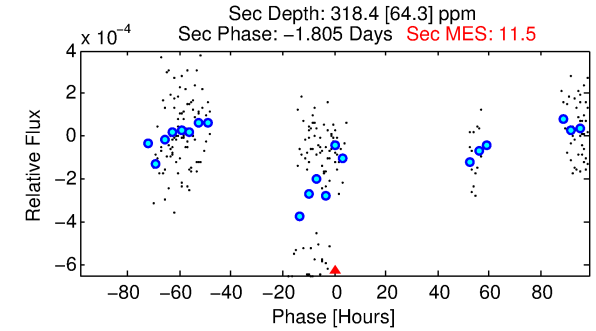
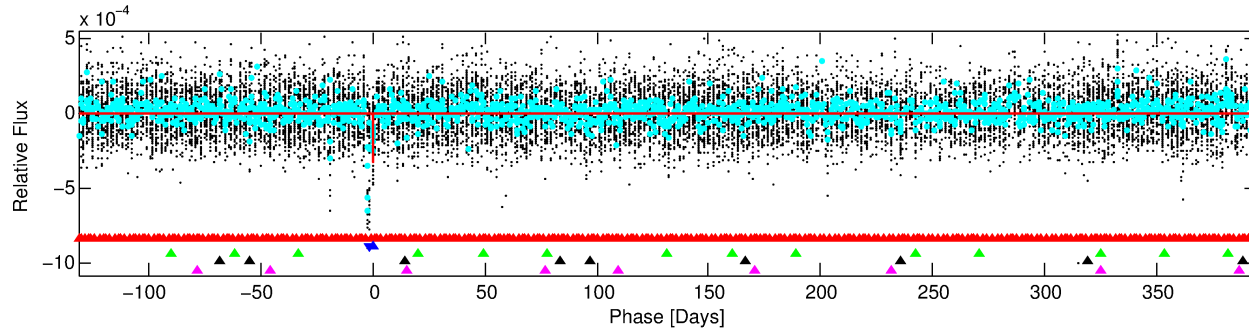
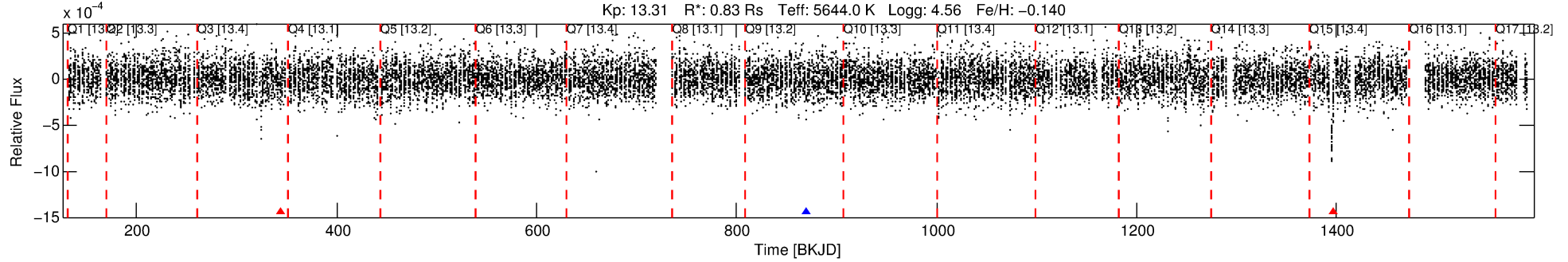
## Ephemeris Match Information For 008161830-02

No Significant Match Found

# DV One-Page Summary

KIC: 8161830 Candidate: 2 of 5 Period: 526.691 d  
KOI: K03046 Corr: No Ephemeris Match

Kp: 13.31 R\*: 0.83 Rs Teff: 5644.0 K Logg: 4.56 Fe/H: -0.140



## DV Fit Results:

Period = 526.69061 [0.01943] d  
Epoch = 343.6915 [0.0315] BKJD  
Rp/R\* = 0.0184 [0.0064]  
a/R\* = 161.69 [236.54]  
b = 0.78 [0.75]  
Seff = 0.41 [0.12]  
Teq = 204 [15] K  
Rp = 1.67 [0.70] Re  
a = 1.2430 [0.2418] AU  
Ag = 96793.47 [74596.06] [1.30σ]  
Teffp = 5552 [1008] K [5.31σ]

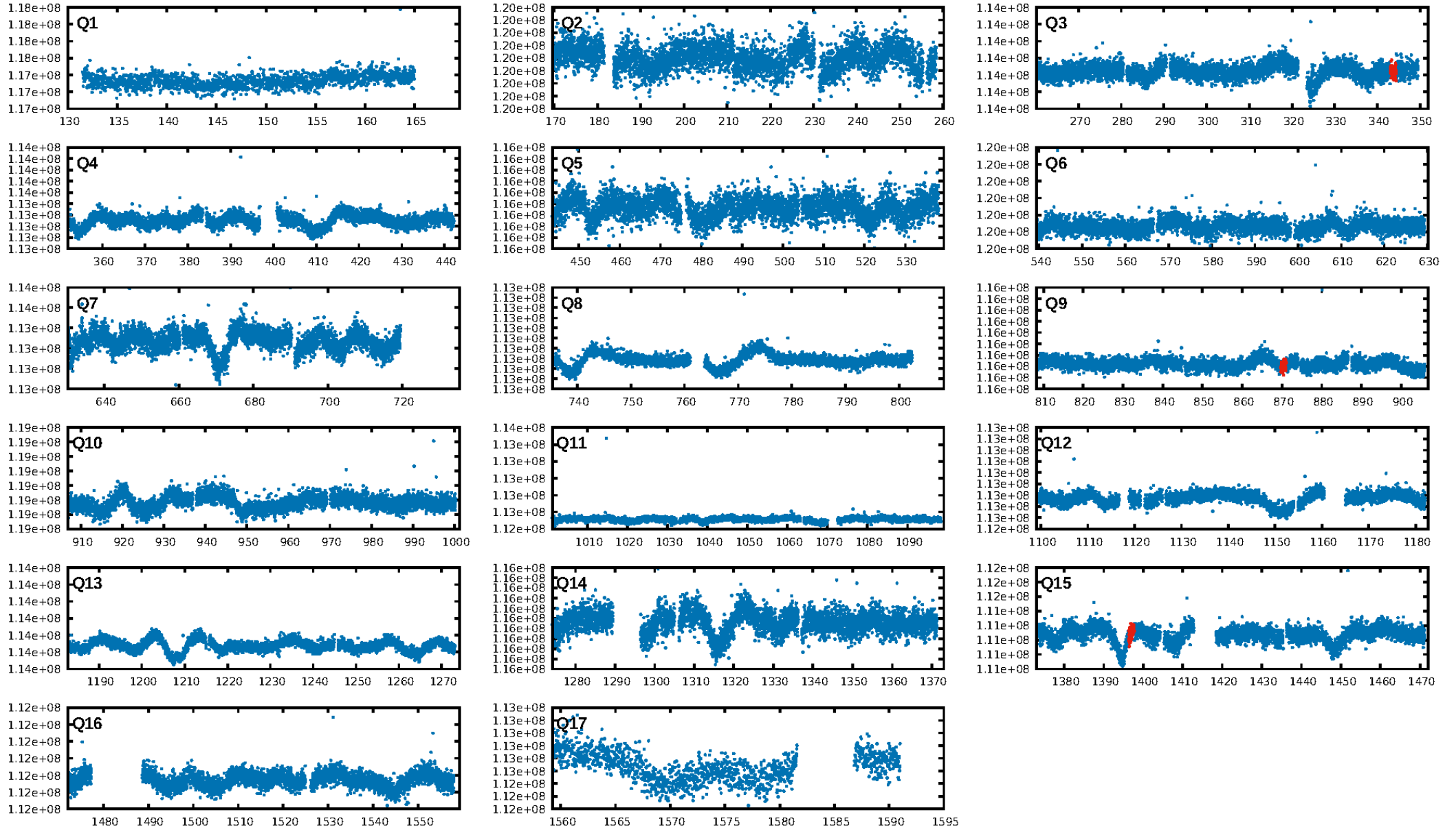
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [413.21σ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: 0.0%  
ModelChiSquareGof-sig: 0.8%  
Bootstrap-pfa: 2.41e-30  
RollingBand-fgt: 0.33 [1/3]  
GhostDiagnostic-chr: 0.5471  
Centroid-sig: 84.2%  
Centroid-so: 0.294 arcsec [0.33σ]  
OotOffset-rm: 5.292 arcsec [1.82σ]  
OotOffset-st: 0/0/0/1 [1]  
KicOffset-rm: 5.465 arcsec [1.87σ]  
KicOffset-st: 0/0/0/1 [1]  
DiffImageQuality-fgm: 0.00 [0/1]  
DiffImageOverlap-fno: 0.00 [0/2]

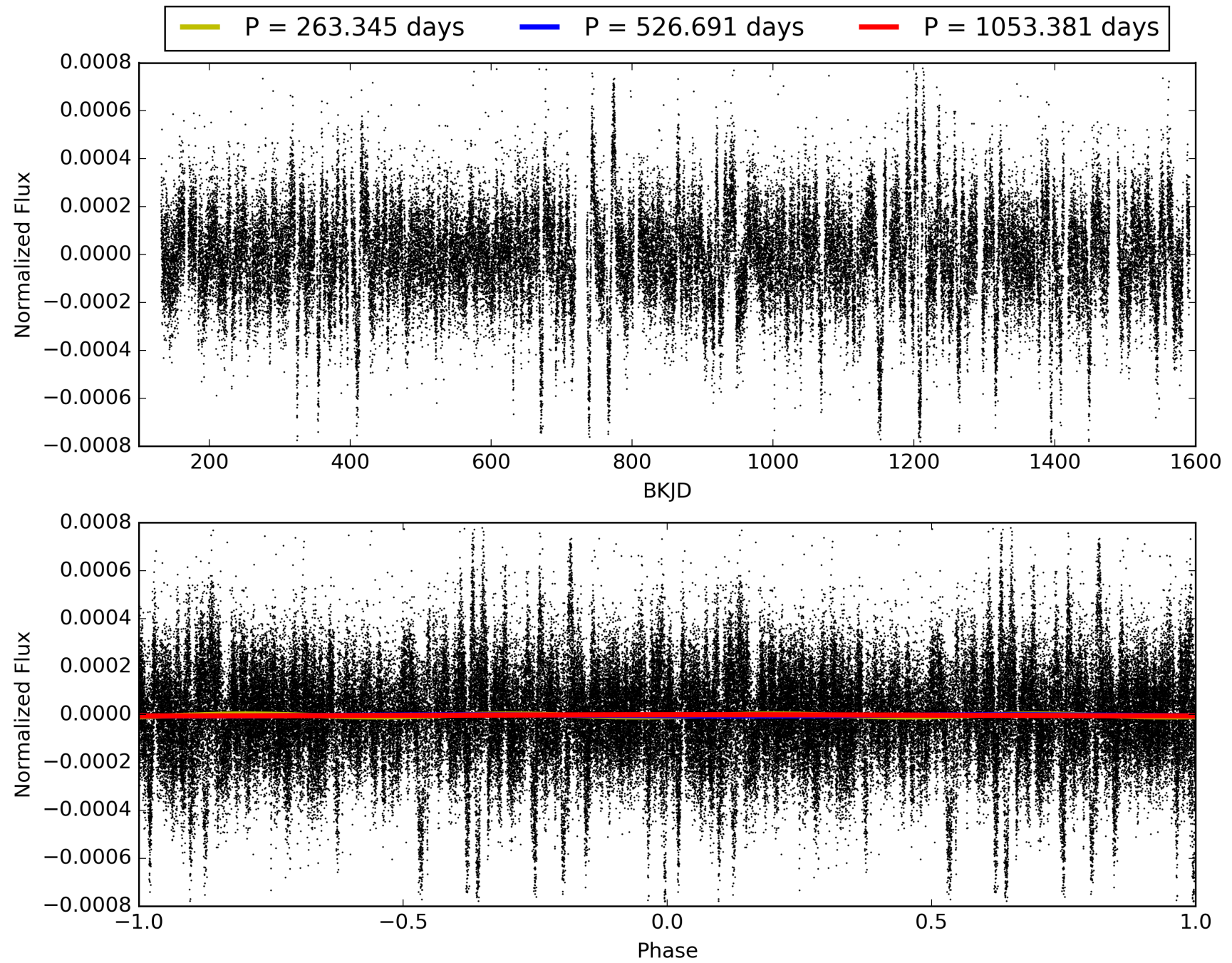
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This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

# TCE 008161830-02, PDC Light Curves

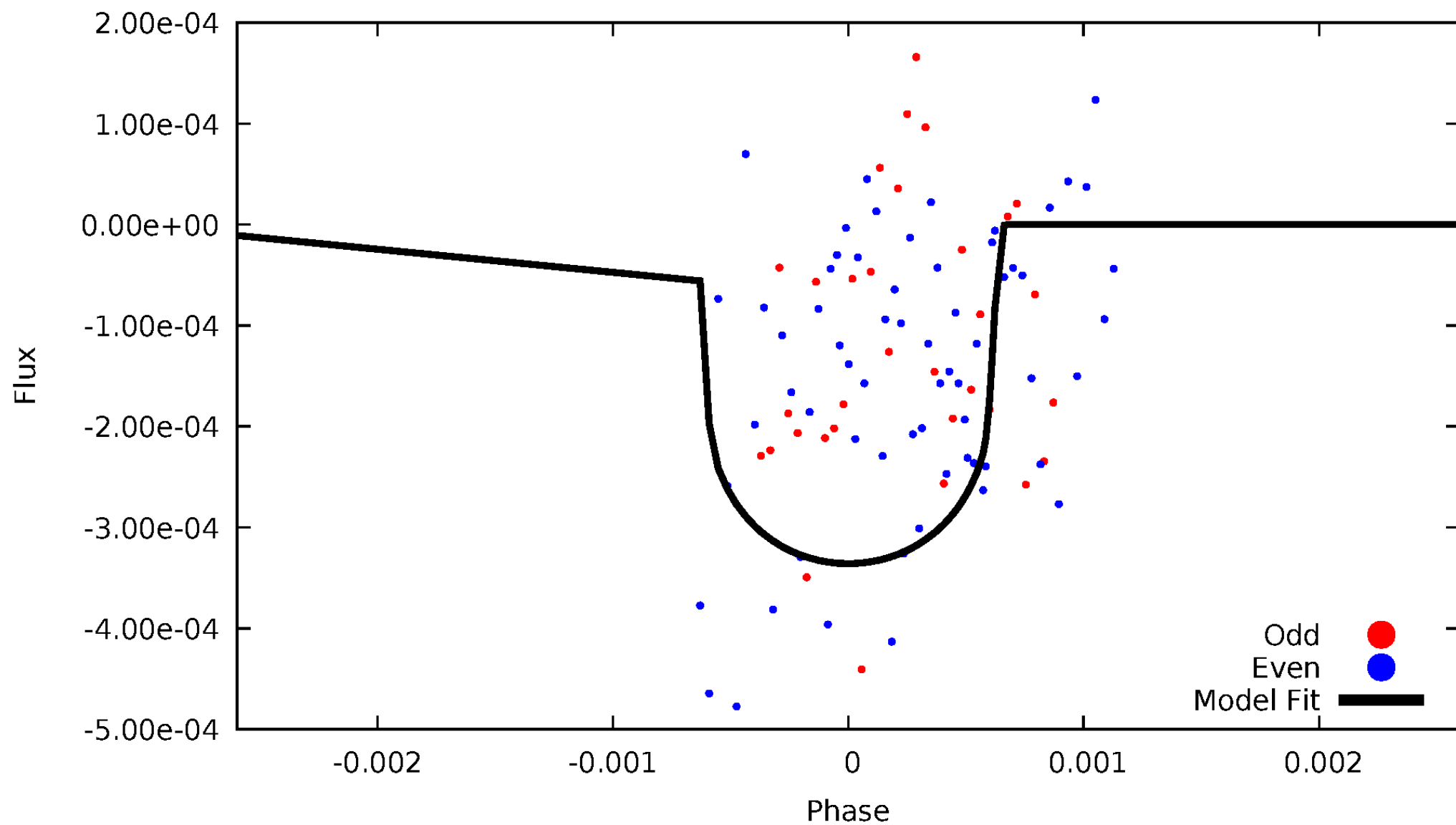


TCE 008161830-02



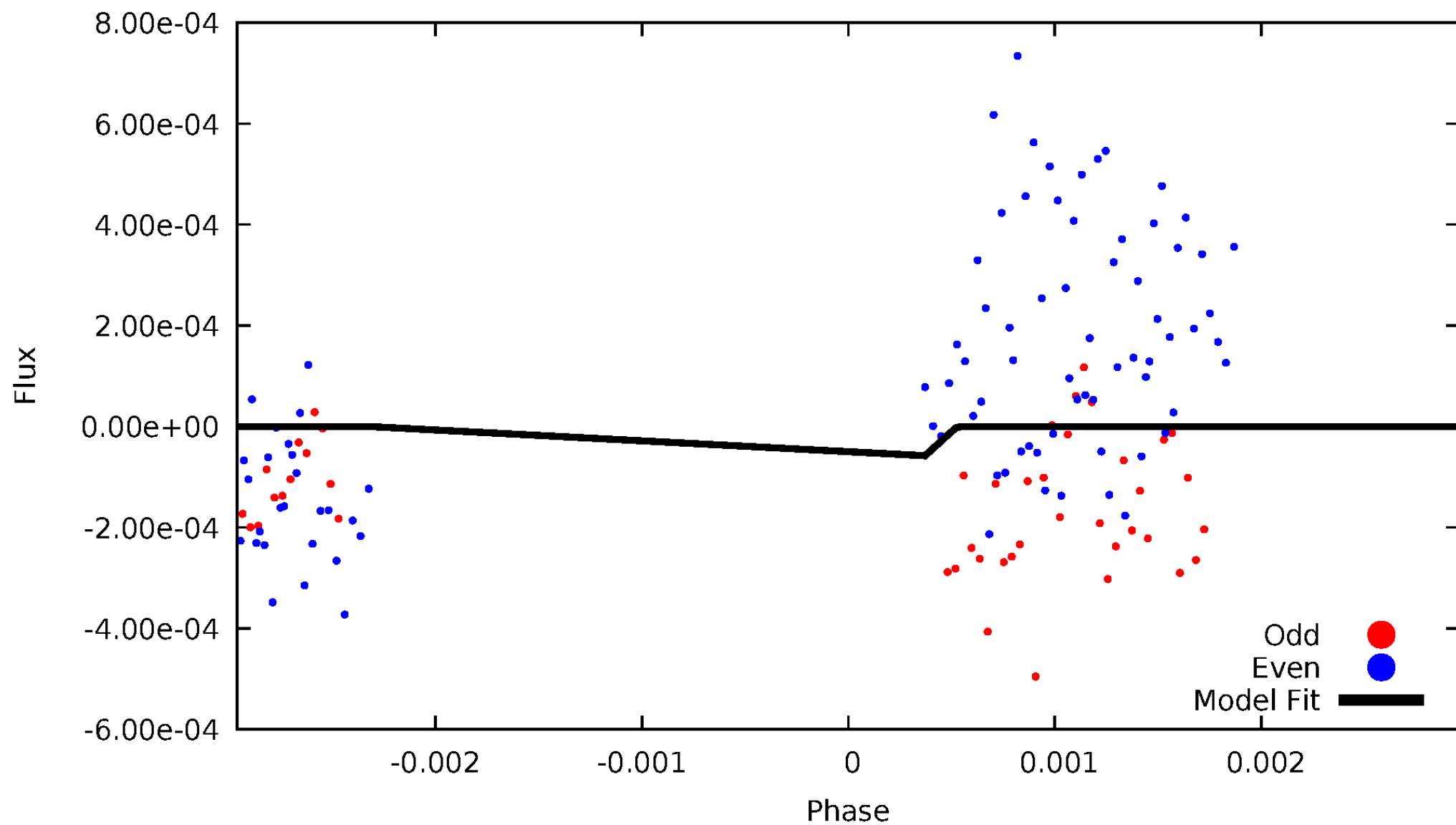
# DV Odd/Even

TCE 008161830-02



# ALT Odd/Even

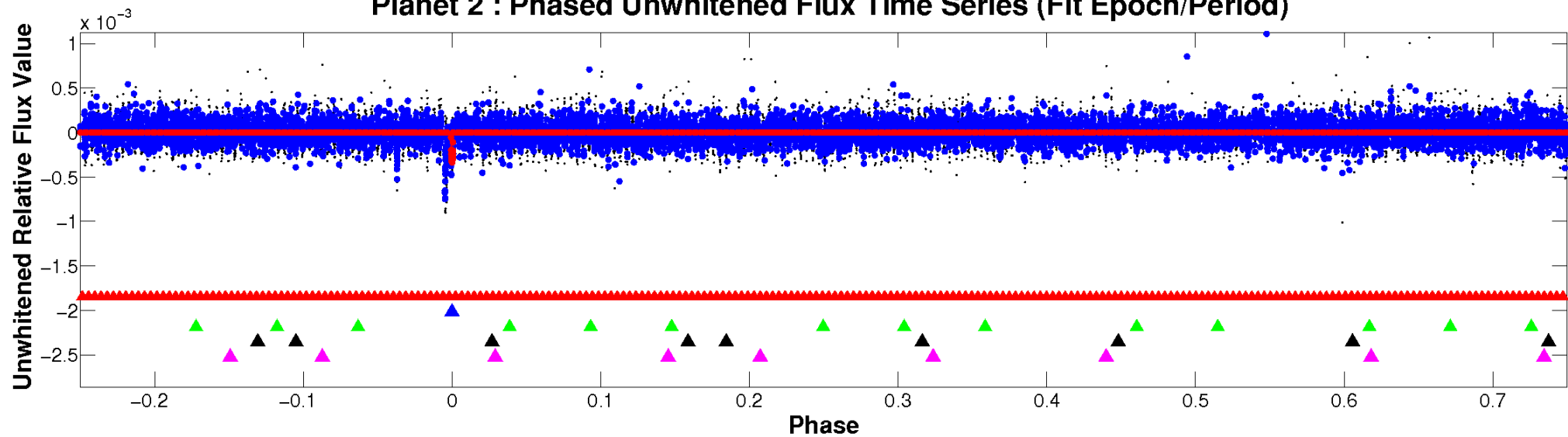
TCE 008161830-02



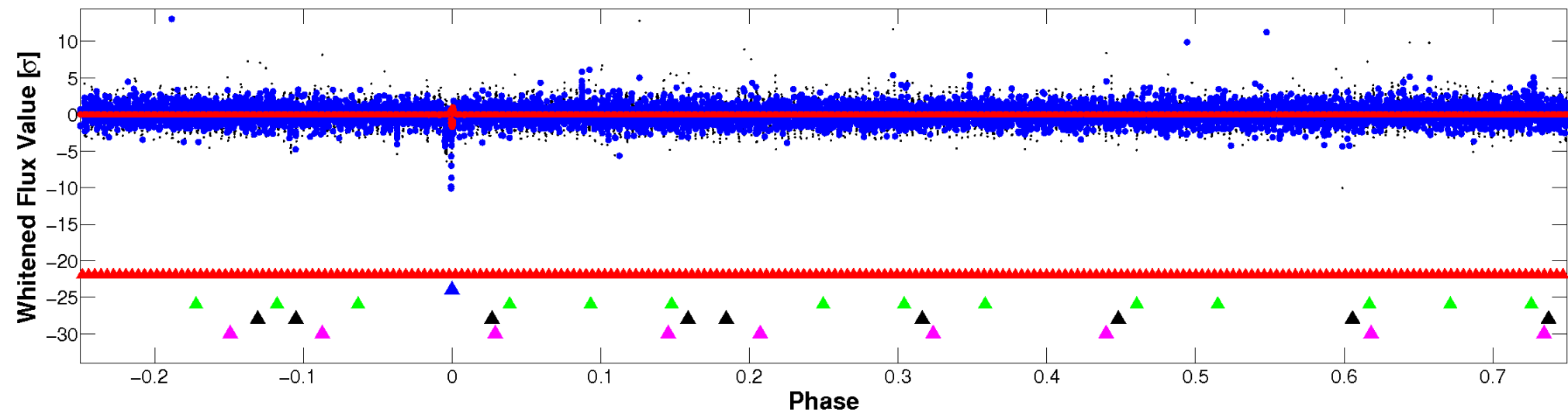


# Non-Whitened Vs. Whitened Light Curve

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

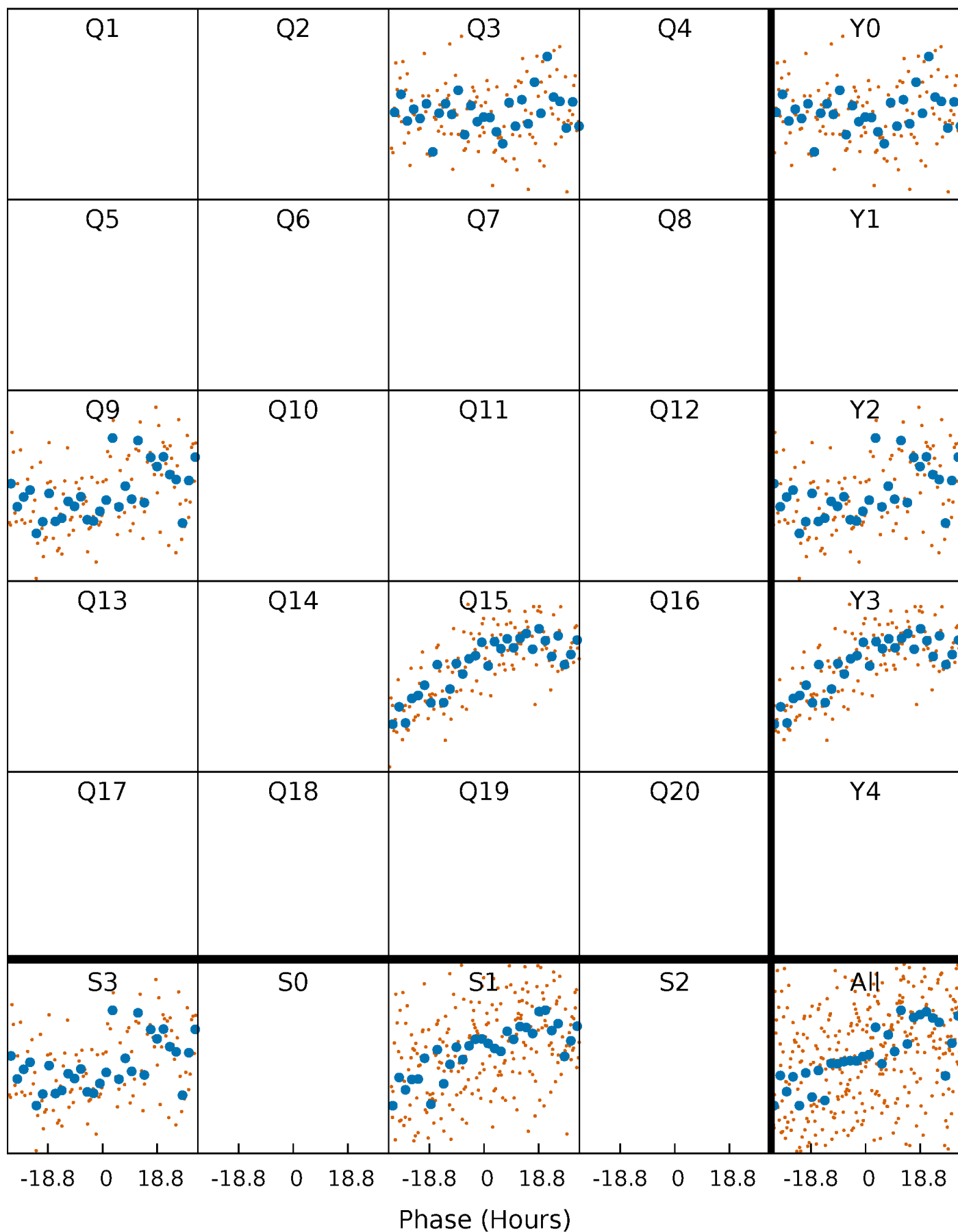


## Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



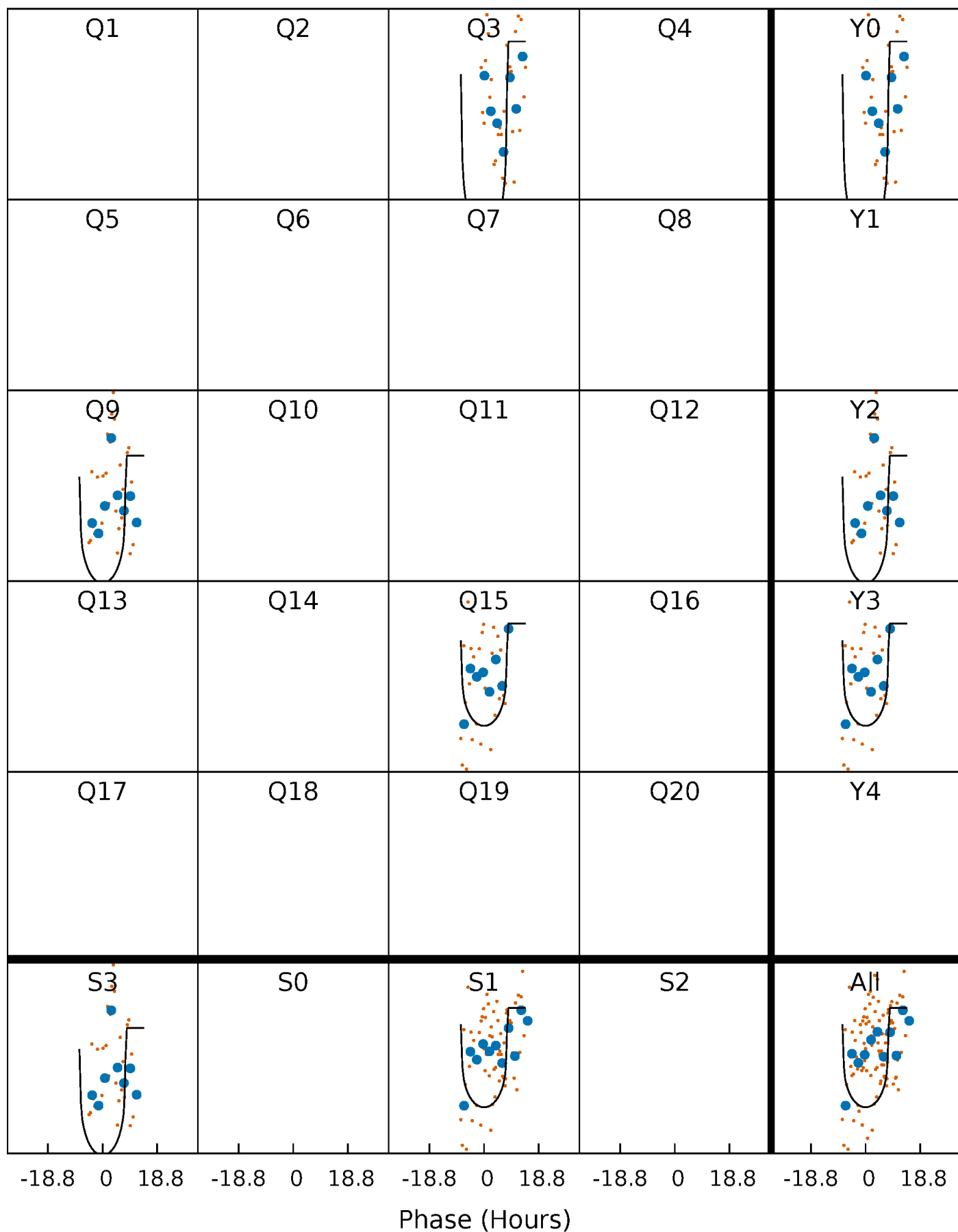
# PDC Quarter-Phased Transit Curves

TCE 008161830-02     $P=526.690613$  Days     $T_0=343.691475$  (BKJD)



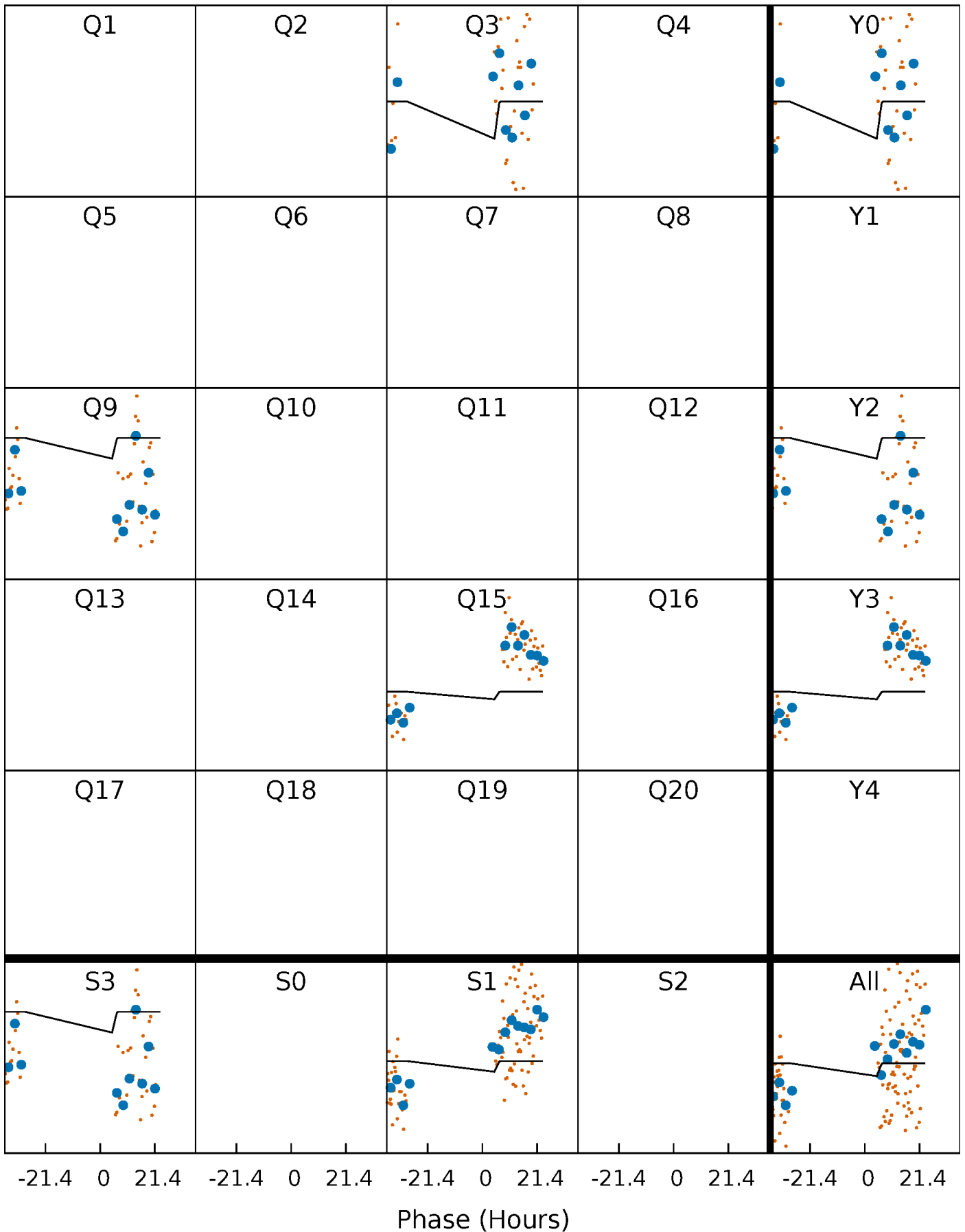
# DV Quarter-Phased Transit Curves

TCE 008161830-02 P=526.690613 Days  $T_0=343.691475$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

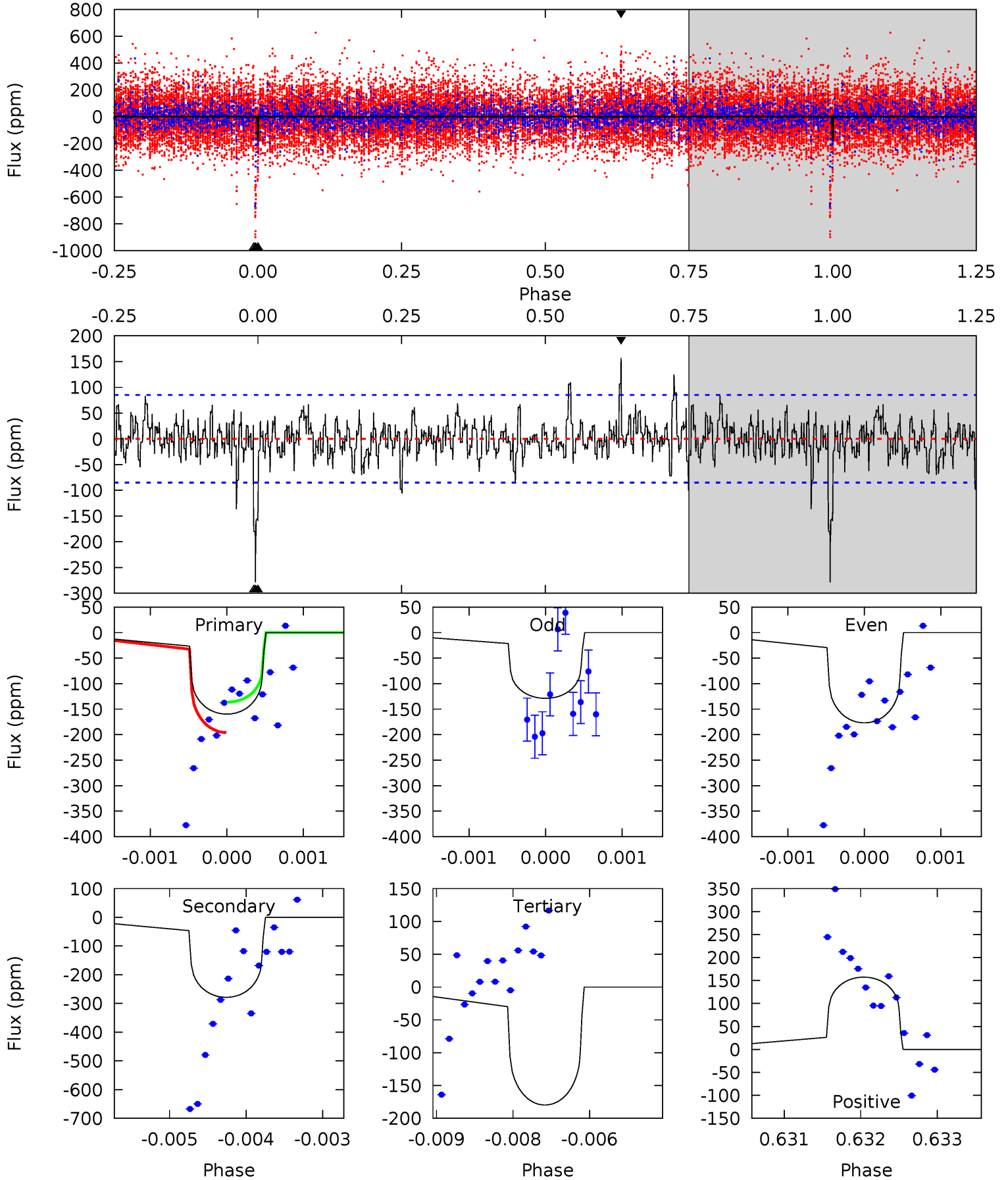
TCE 008161830-02   P=526.477485 Days    $T_0=343.456164$  (BKJD)



# DV Model-Shift Uniqueness Test

008161830-02, P = 526.690613 Days, E = 343.691475 Days

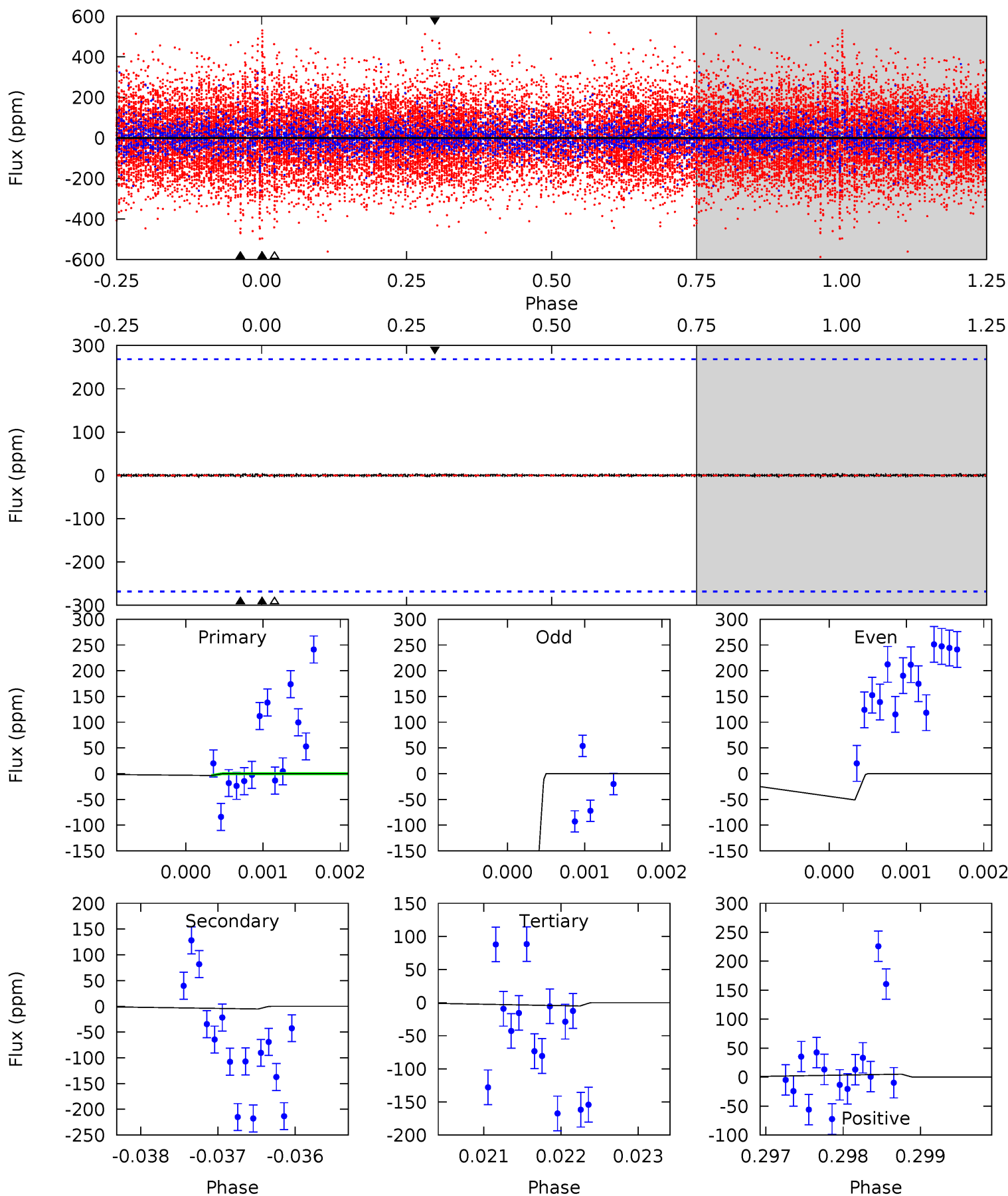
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
10.2	17.7	11.4	10.0	5.41	3.22	1.93	-1.27	0.16	6.29	7.72	1.46	1.20	0.36	1.82



# Alt Model-Shift Uniqueness Test

008161830-02,  $P = 526.477485$  Days,  $E = 343.456164$  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
0.07	0.10	0.10	0.10	5.43	3.26	0.02	-0.03	-0.03	0.00	0.00	2.58	1.00	0.50	0





### Stellar Parameters For KIC 008161830

	$T_{\text{eff}} (K)$	$\log(g)$	$[\text{Fe}/\text{H}]$	$R (R_{\odot})$	$M (M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$5644^{+152}_{-152}$	$4.564^{+0.038}_{-0.152}$	$-0.140^{+0.300}_{-0.300}$	$0.831^{+0.194}_{-0.078}$	$0.928^{+0.083}_{-0.104}$	$2.279^{+0.443}_{-0.987}$
	+3%/-3%	+1%/-3%	+214%/-214%	+23%/-9%	+9%/-11%	+19%/-43%
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 008161830-02 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$-279 \pm 16$	$1.73^{+0.64}_{-0.58}$	$290^{+15}_{-12}$	$5408^{+1160}_{-656}$	$76413^{+93354}_{-34340}$
Alt.	$-5 \pm 49$	$1.00^{+0.62}_{-0.53}$	$290^{+15}_{-12}$	$3131^{+2104}_{-7806}$	$3609^{+62654}_{-42460}$

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

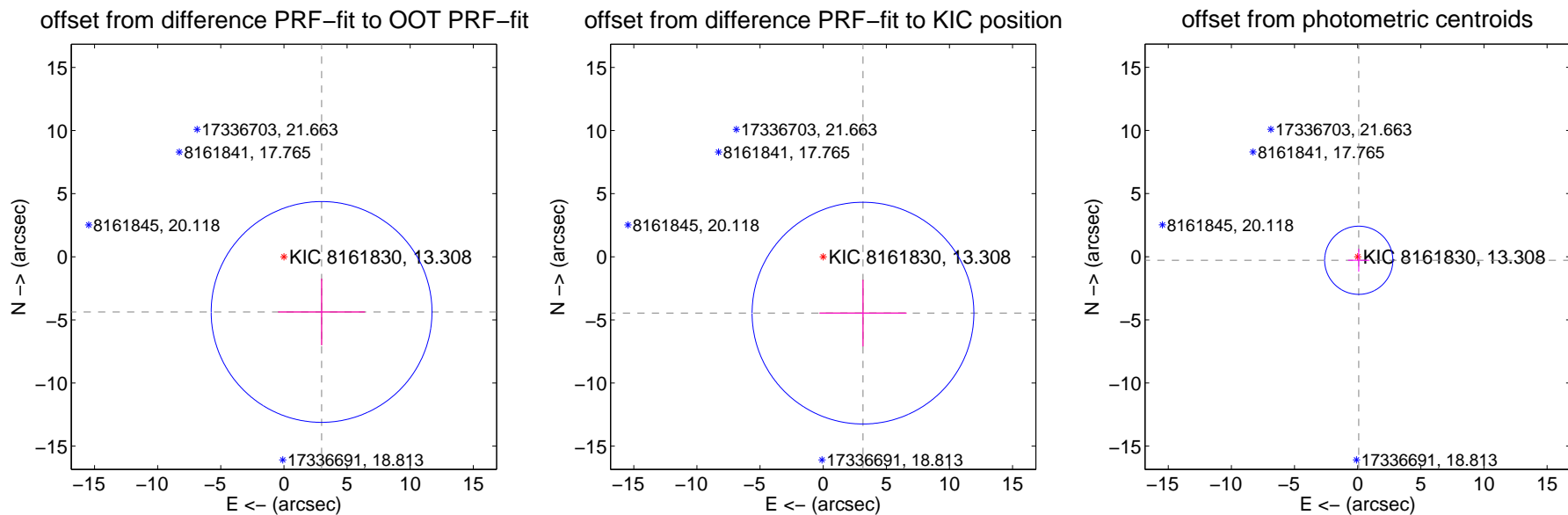
## DV Centroid Data

Supplemental centroid analysis for 008161830-02. Kepler magnitude: 13.31. Transit SNR 12.43

There are 0 quarters with good PRF difference image offsets

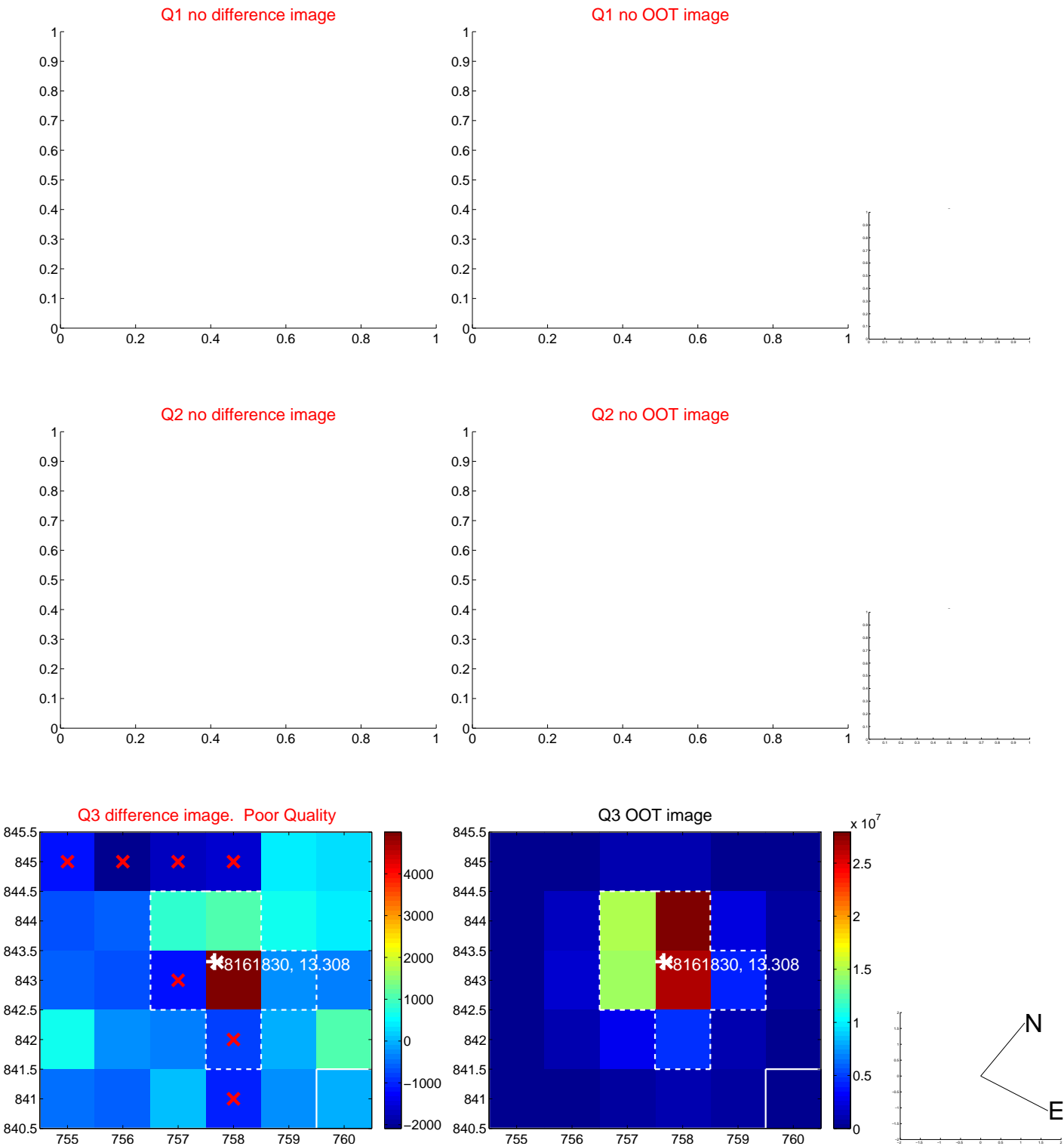
The direct PRF centroid is offset from the target star catalog position by about 0.19 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$5.292 \pm 2.915$	1.82	$-2.983 \pm 3.442$	$-4.372 \pm 2.634$
PRF-fit source offset from KIC position	$5.465 \pm 2.928$	1.87	$-3.153 \pm 3.442$	$-4.464 \pm 2.634$
photometric centroid source offset	$0.29 \pm 0.90$	0.33	$-0.08 \pm 0.85$	$-0.28 \pm 0.90$



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.

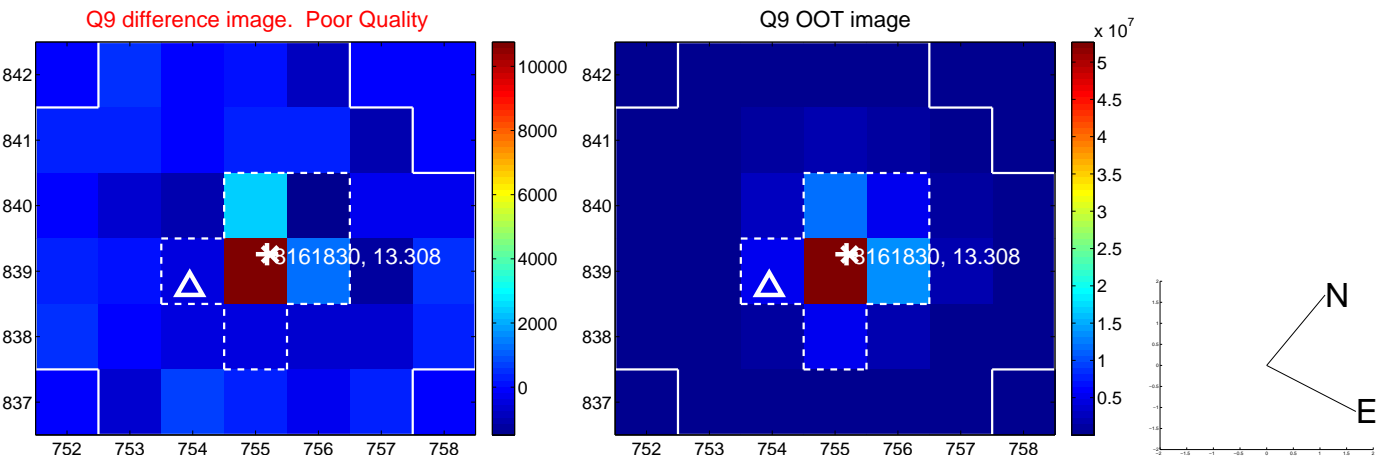
white ×: KIC target position; +: OOT centroid; △: difference centroid. red ✕: large negative pixel value.



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.

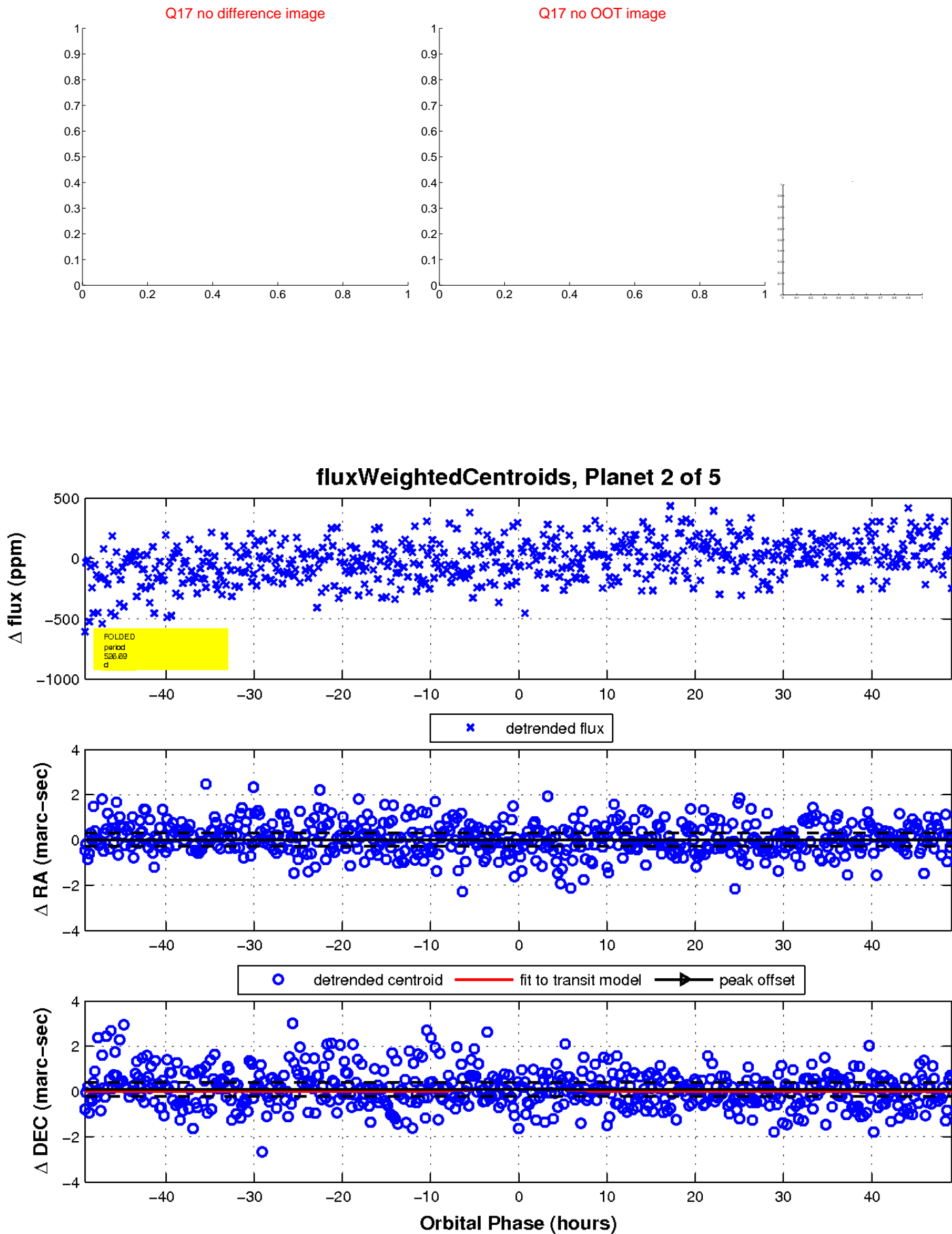




white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

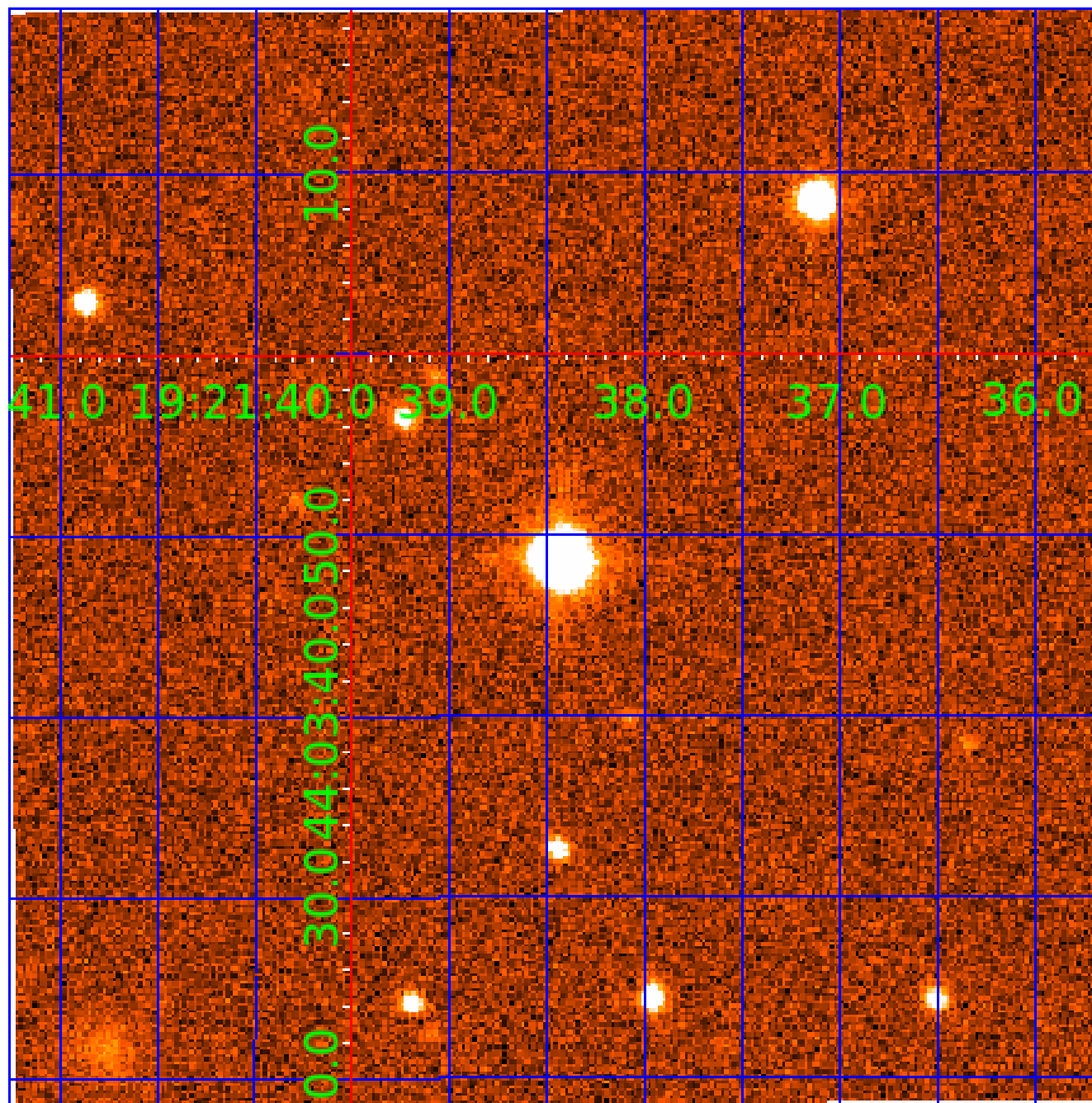


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination



# KIC 008161830

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
008161830-01	OBS	No	2.203132	133.568522	19.2	12.117	10.6	11.1	0.83	5644	0.36	602.91
008161830-02	OBS	No	526.690613	343.691475	335.9	16.410	26.9	12.4	0.83	5644	1.67	0.41
008161830-03	OBS	No	111.075752	141.954731	254.3	1.659	8.2	7.3	0.83	5644	1.68	3.24
008161830-04	OBS	No	152.415640	274.880647	111.9	13.945	9.7	6.0	0.83	5644	0.95	2.12
008161830-05	OBS	No	155.141465	265.124220	242.7	14.015	9.3	9.0	0.83	5644	2.21	2.07

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
008161830-01	OBS	FP	0.00	1	0	1	1	LPP_DV—HALO_GHOST—EPHEM_MATCH
008161830-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_MARSHALL_SKYE—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS
008161830-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—MOD_NONUNIQ_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS
008161830-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_MARSHALL—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_NONUNIQ_ALT—INCONSISTENT_TRANS—CENT_FEW_MEAS
008161830-05	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_MARSHALL—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—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.

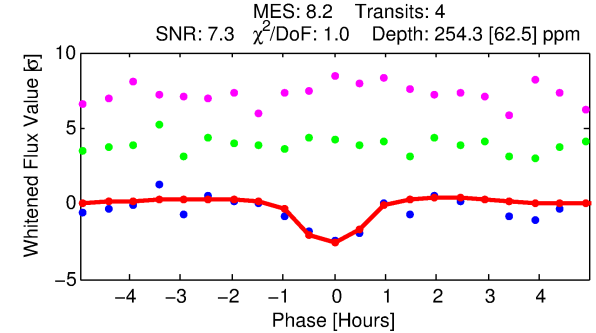
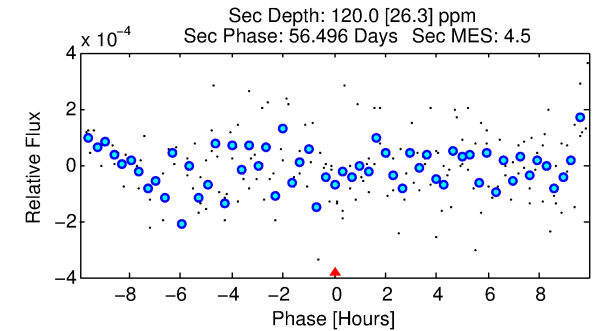
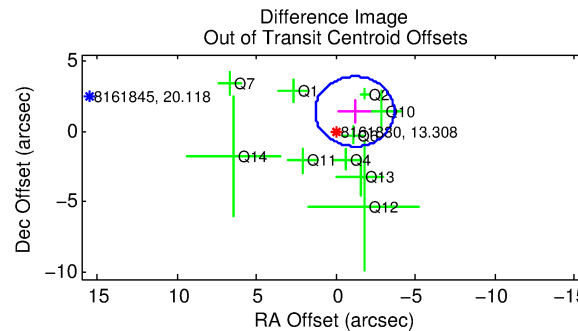
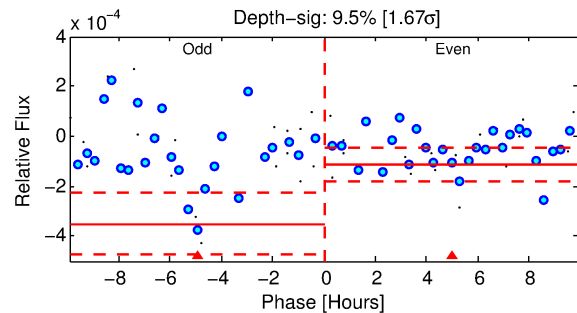
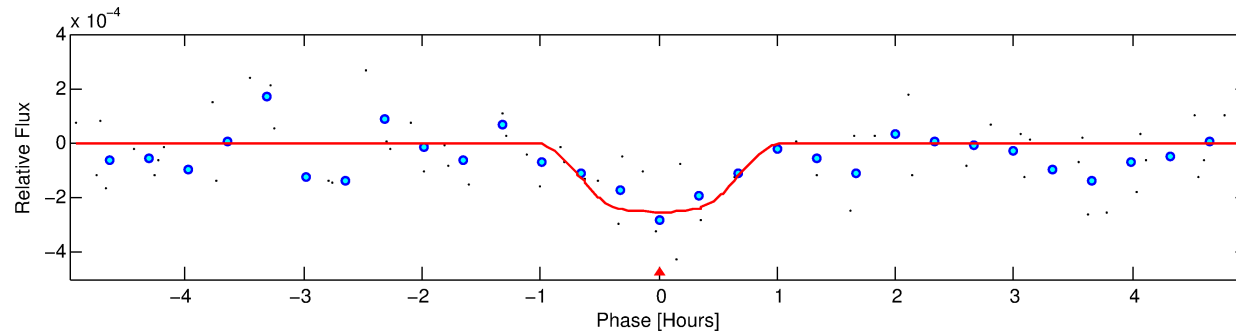
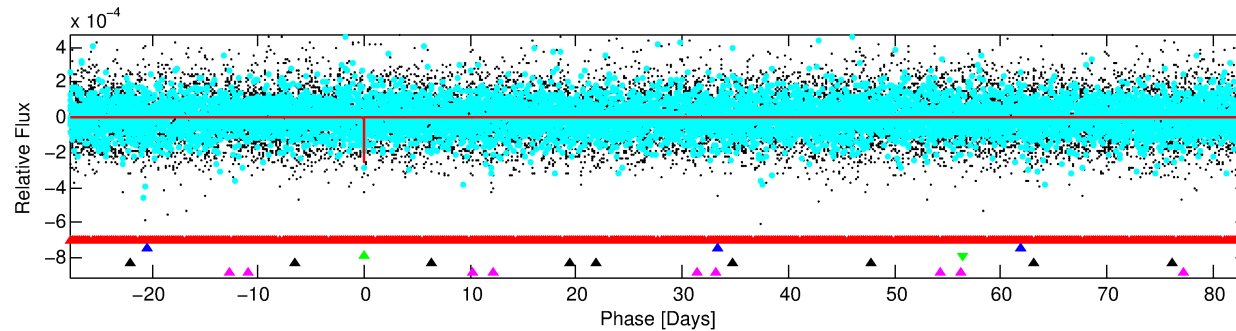
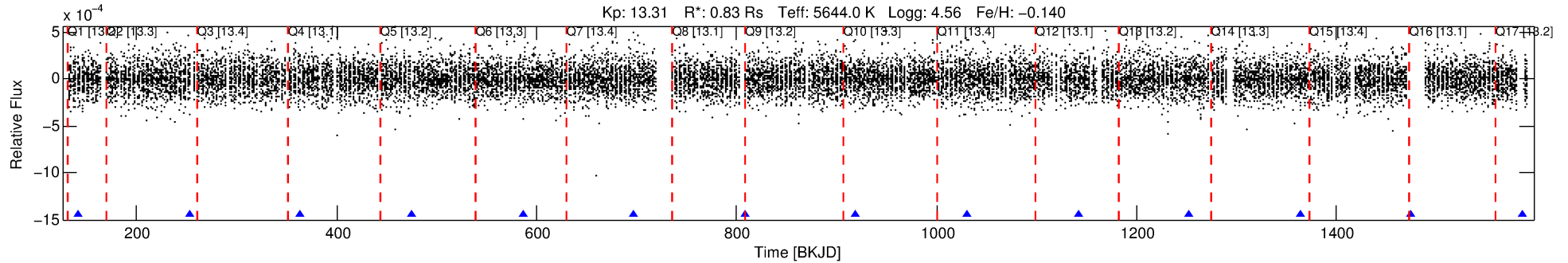
## Ephemeris Match Information For 008161830-03

No Significant Match Found

# DV One-Page Summary

KIC: 8161830 Candidate: 3 of 5 Period: 111.076 d

KOI: K03046 Corr: No Ephemeris Match



## DV Fit Results:

Period = 111.07575 [0.00113] d  
Epoch = 141.9547 [0.0090] BKJD  
Rp/R\* = 0.0185 [0.0212]  
a/R\* = 194.48 [1089.75]  
b = 0.94 [0.65]  
Seff = 3.24 [0.97]  
Teq = 342 [26] K  
Rp = 1.68 [1.96] Re  
a = 0.4404 [0.0857] AU  
Ag = 4544.76 [10544.68] [0.43σ]  
Teffp = 4342 [2503] K [1.60σ]

## DV Diagnostic Results:

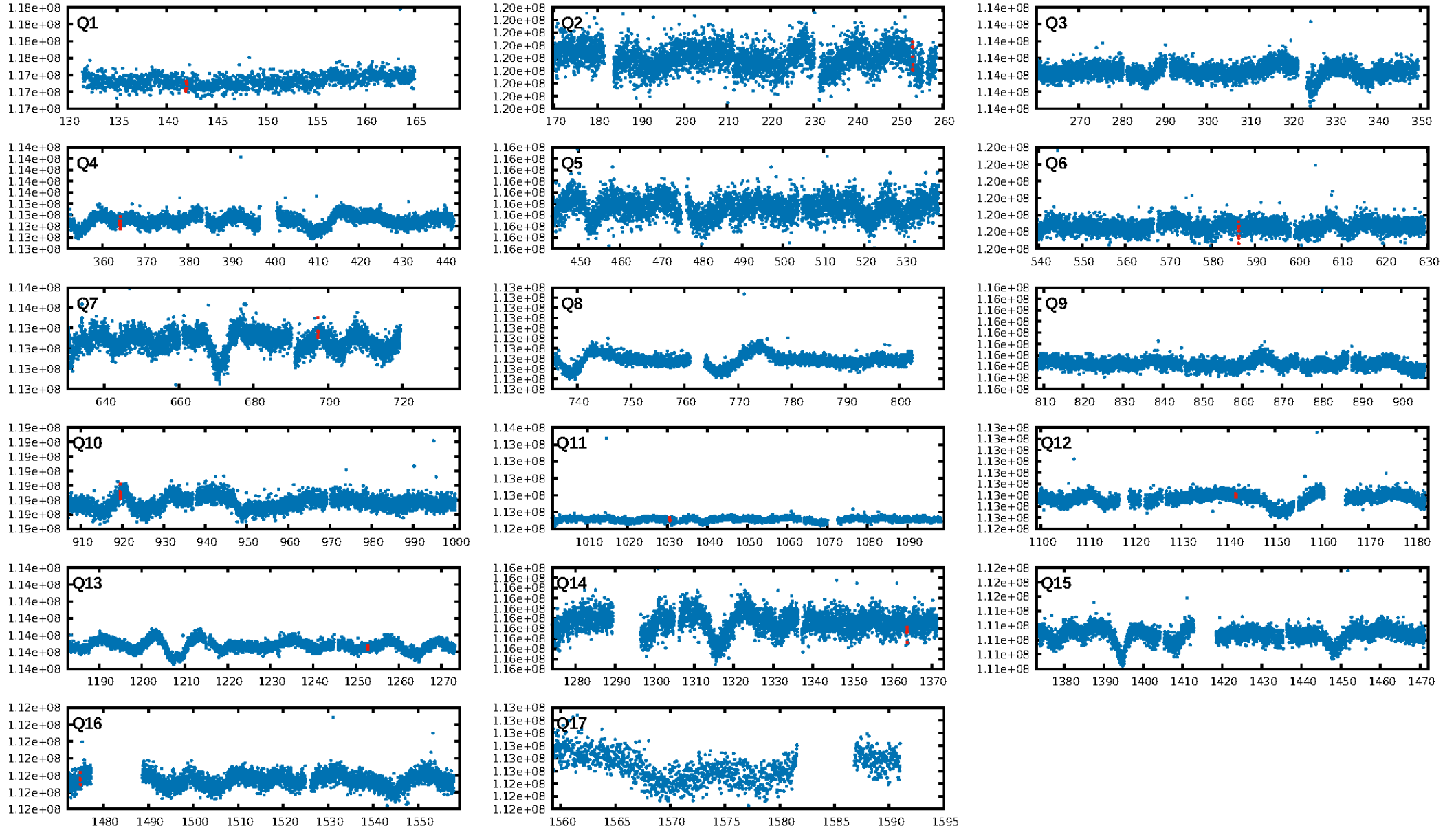
ShortPeriod-sig: 100.0% [213.64σ]  
LongPeriod-sig: 100.0% [70.65σ]  
ModelChiSquare2-sig: 5.3%  
ModelChiSquareGof-sig: 83.4%  
**Bootstrap-pfa: 6.20e-11**  
RollingBand-fgt: 1.00 [4/4]  
GhostDiagnostic-chr: -0.6399  
Centroid-sig: 57.6%  
Centroid-so: 1.282 arcsec [0.77σ]  
OotOffset-rm: 1.865 arcsec [2.25σ]  
KicOffset-rm: 1.902 arcsec [2.48σ]  
OotOffset-st: 4/2/2 [10]  
KicOffset-st: 4/2/2 [10]  
DiffImageQuality-fgm: 0.10 [1/10]  
DiffImageOverlap-fno: 0.60 [6/10]

Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 31-Jan-2016 08:30:52 Z

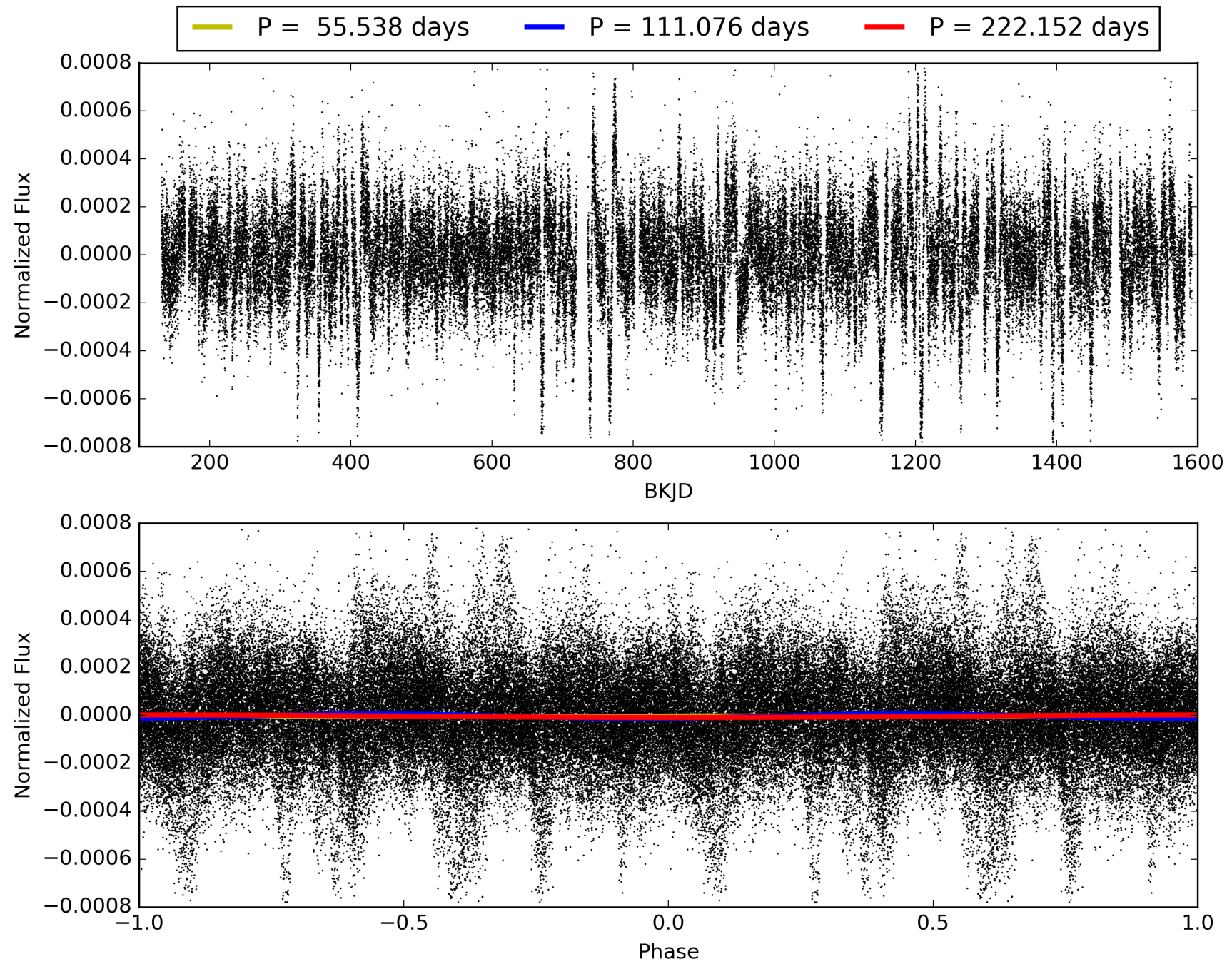
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# TCE 008161830-03, PDC Light Curves

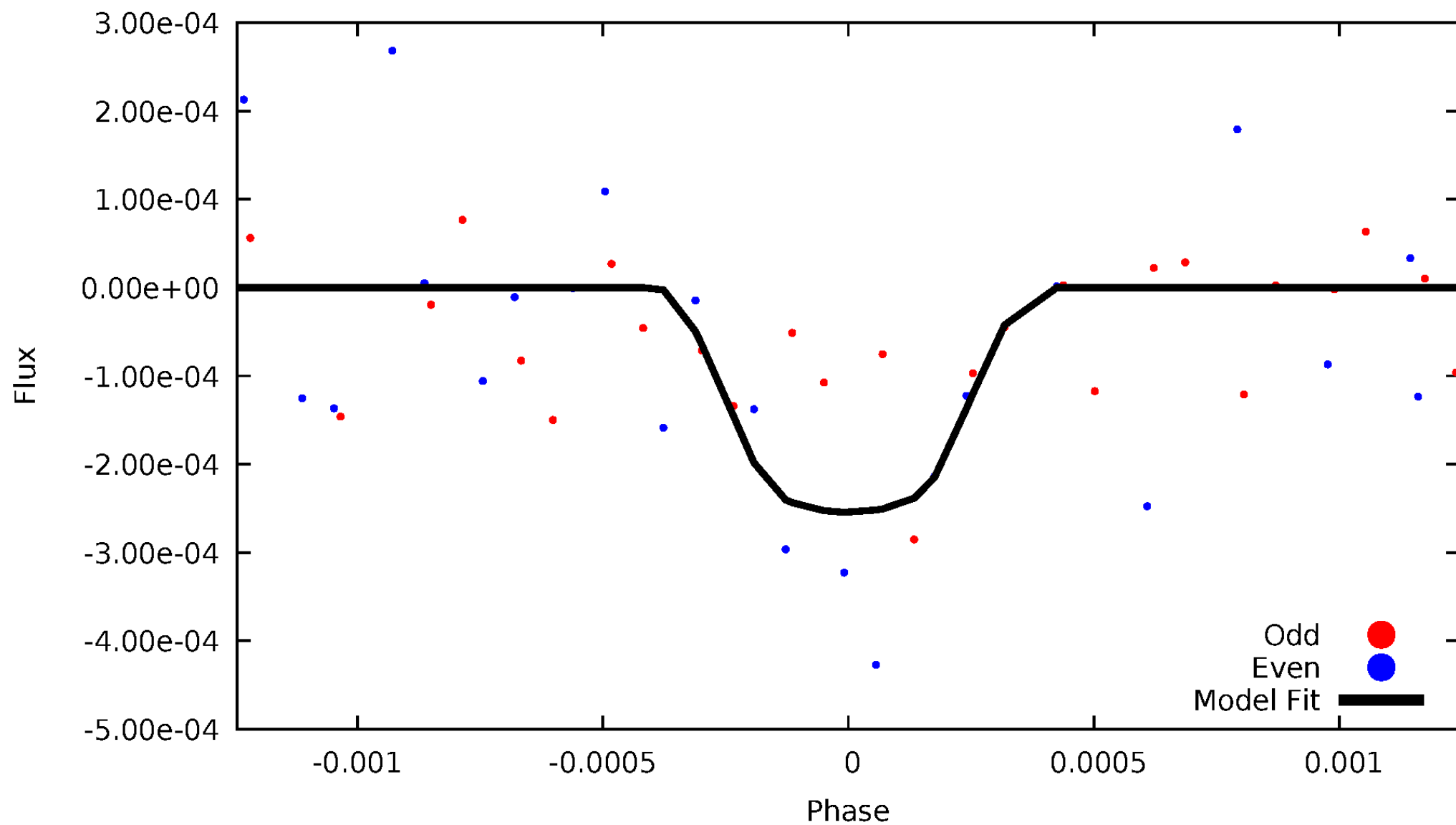


TCE 008161830-03



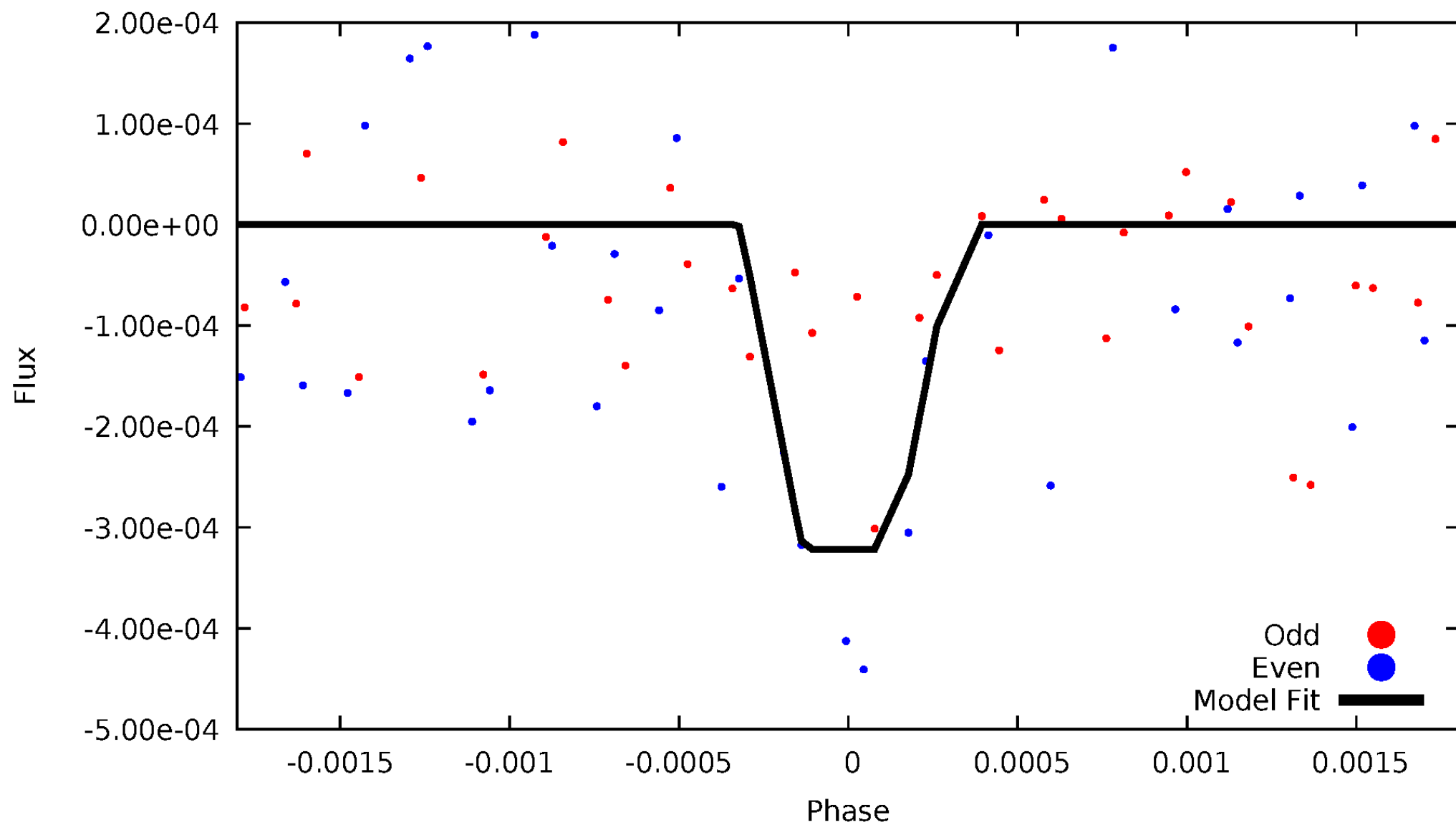
# DV Odd/Even

TCE 008161830-03



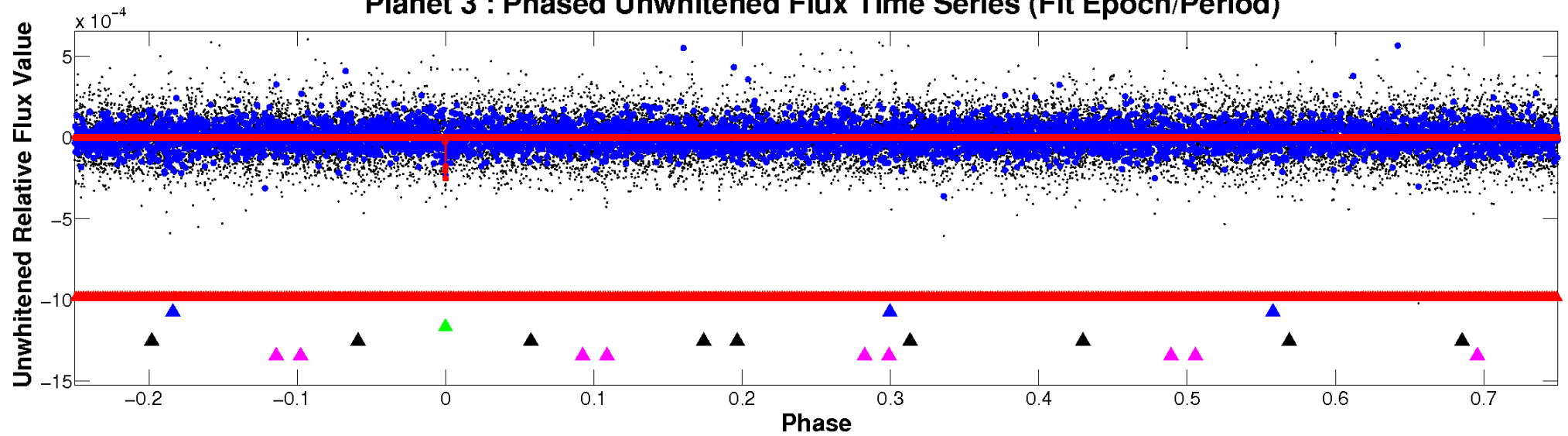
# ALT Odd/Even

TCE 008161830-03

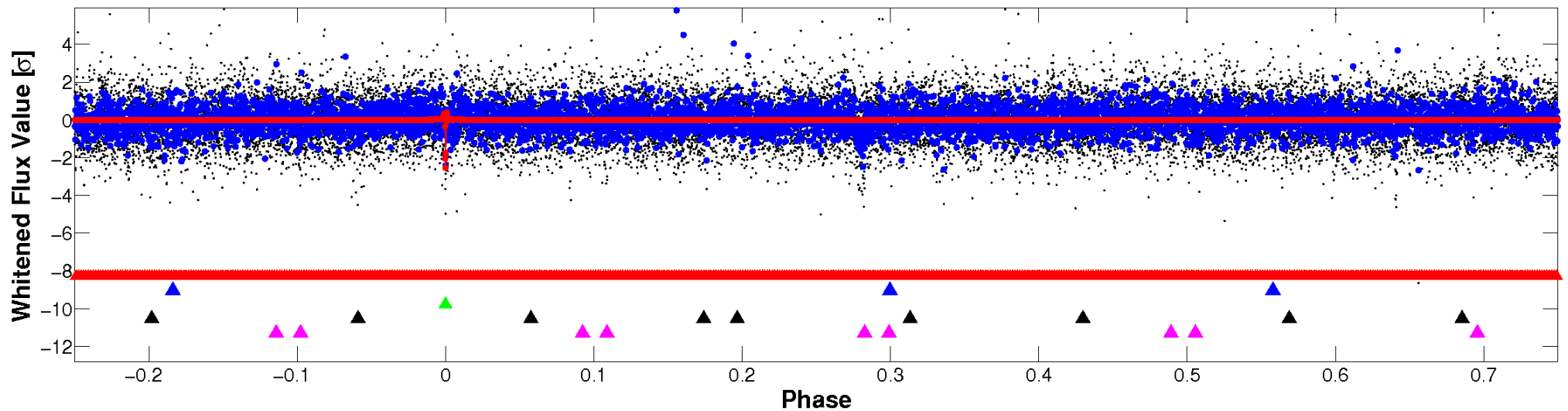


# Non-Whitened Vs. Whitened Light Curve

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

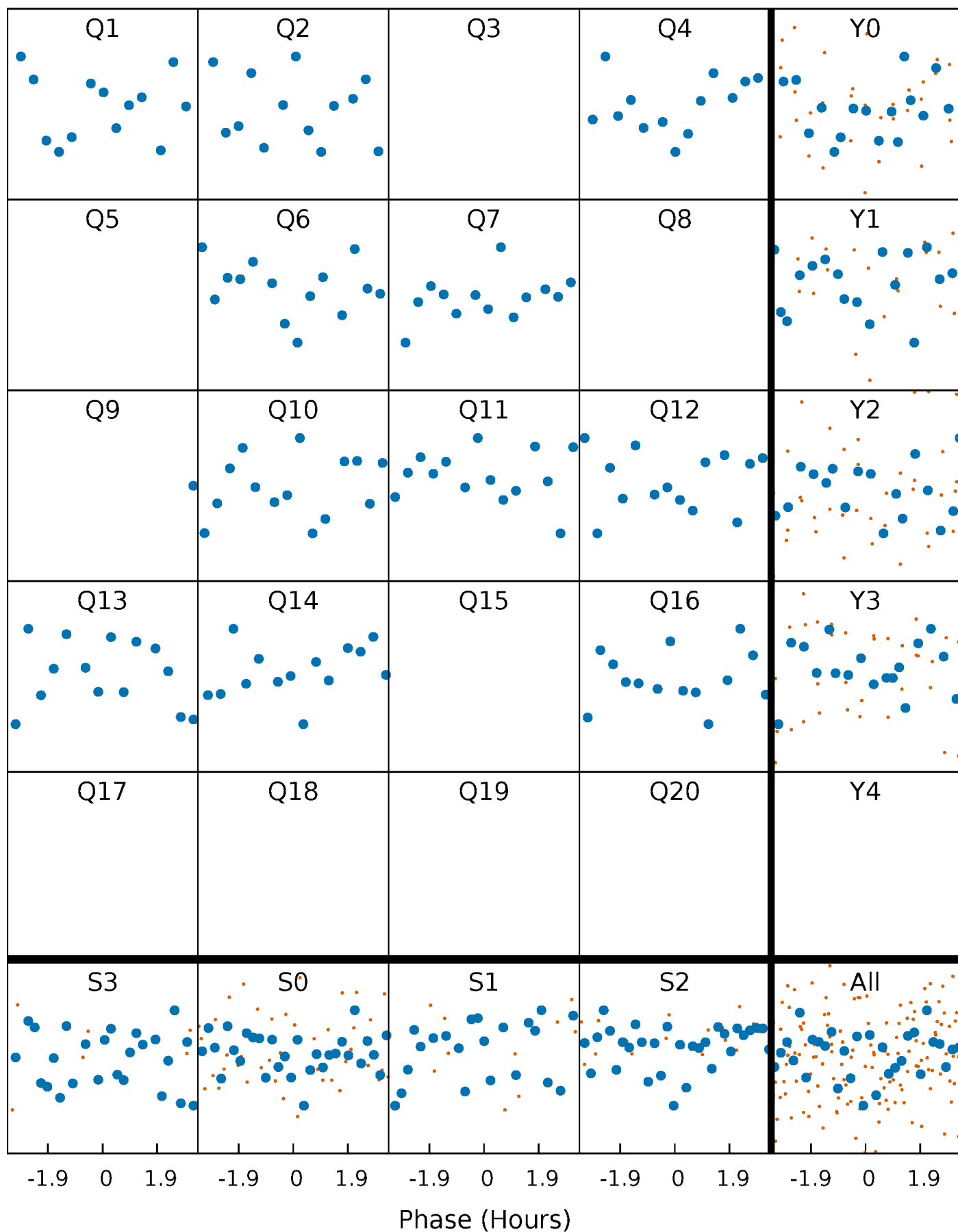


## Planet 3 : Phased Whitened Flux Time Series (Fit Epoch/Period)



# PDC Quarter-Phased Transit Curves

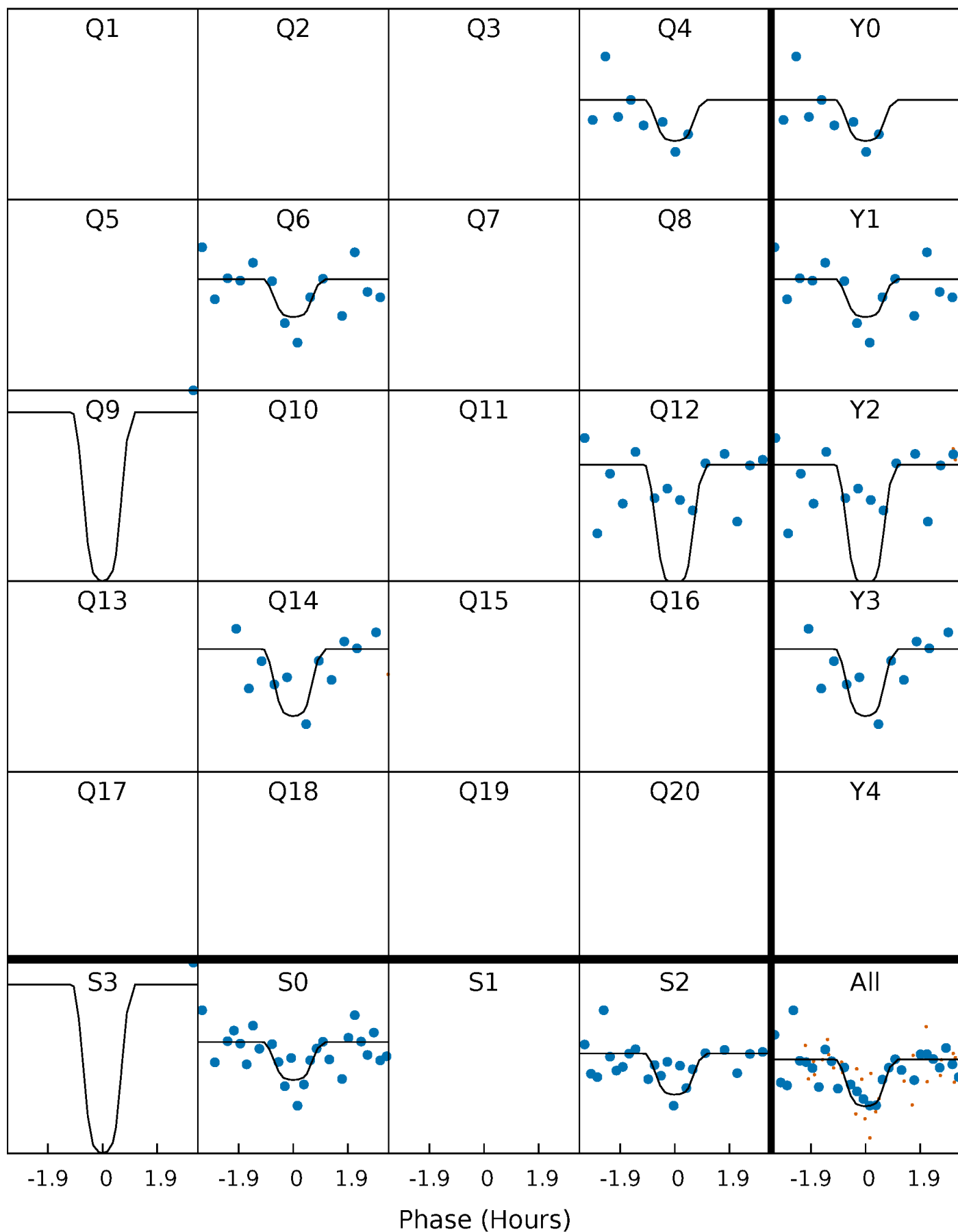
TCE 008161830-03 P=111.075752 Days  $T_0=141.954731$  (BKJD)





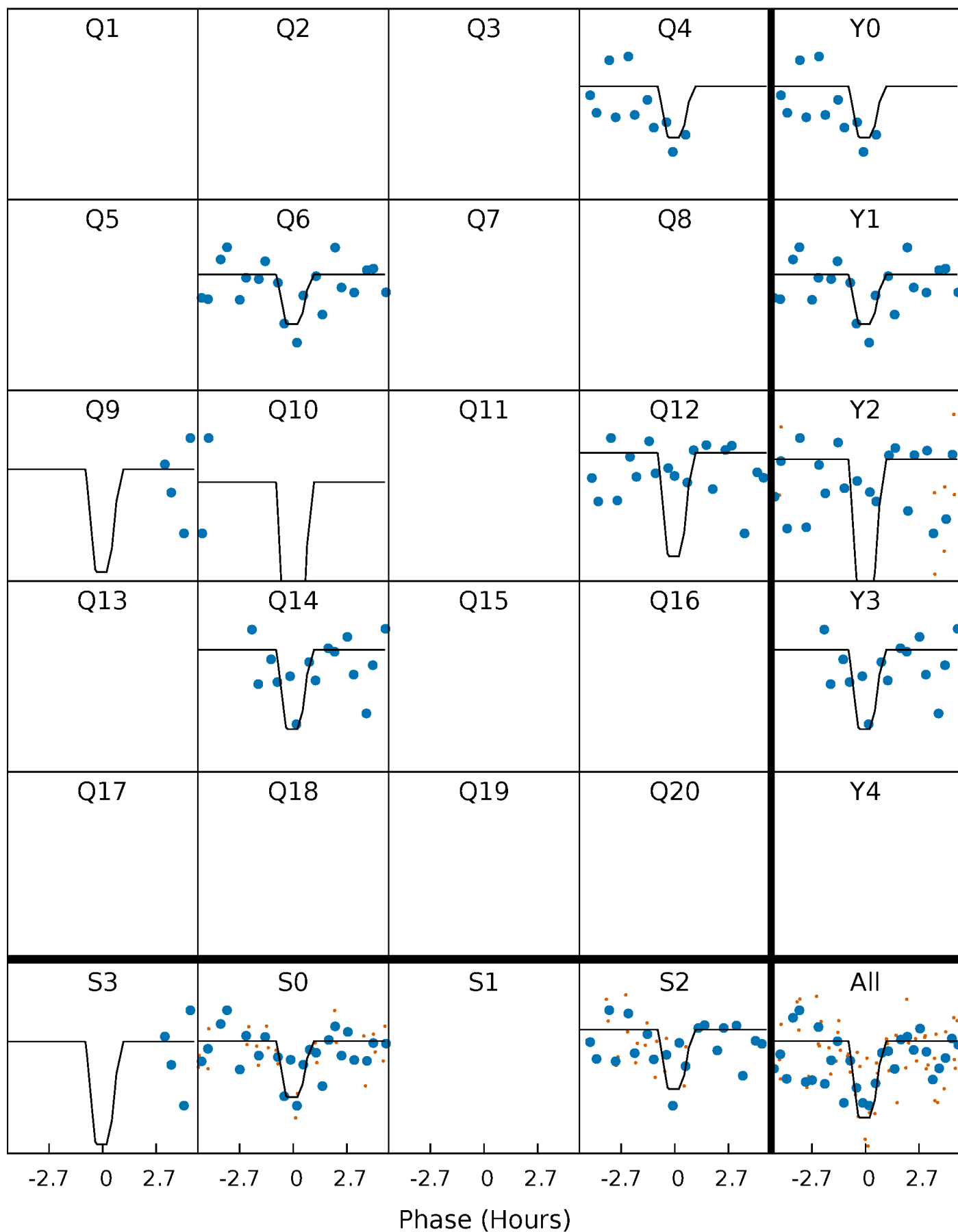
# DV Quarter-Phased Transit Curves

TCE 008161830-03 P=111.075752 Days  $T_0=141.954731$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

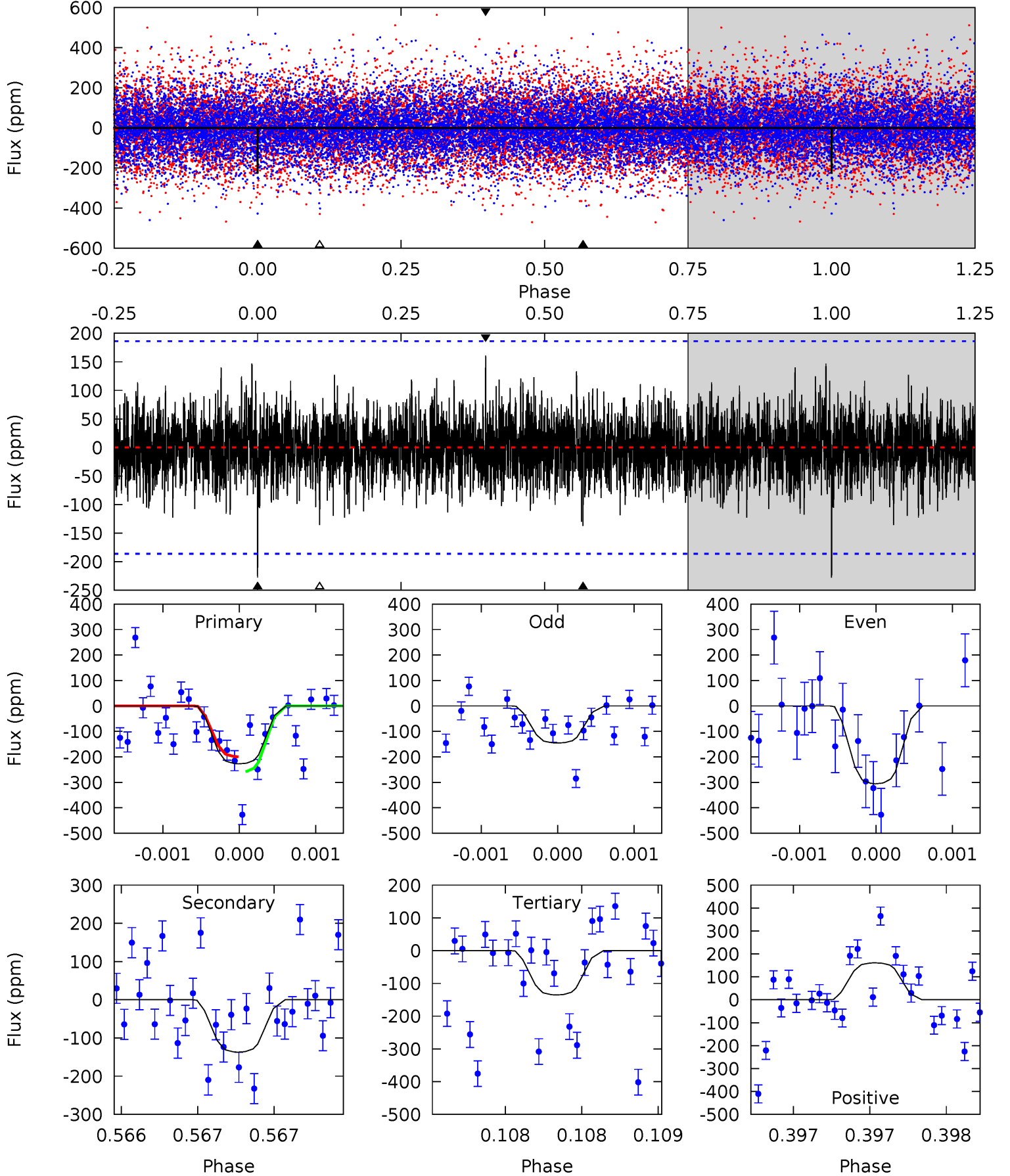
TCE 008161830-03 P=111.076473 Days  $T_0=141.953087$  (BKJD)



# DV Model-Shift Uniqueness Test

008161830-03,  $P = 111.075752$  Days,  $E = 30.878979$  Days

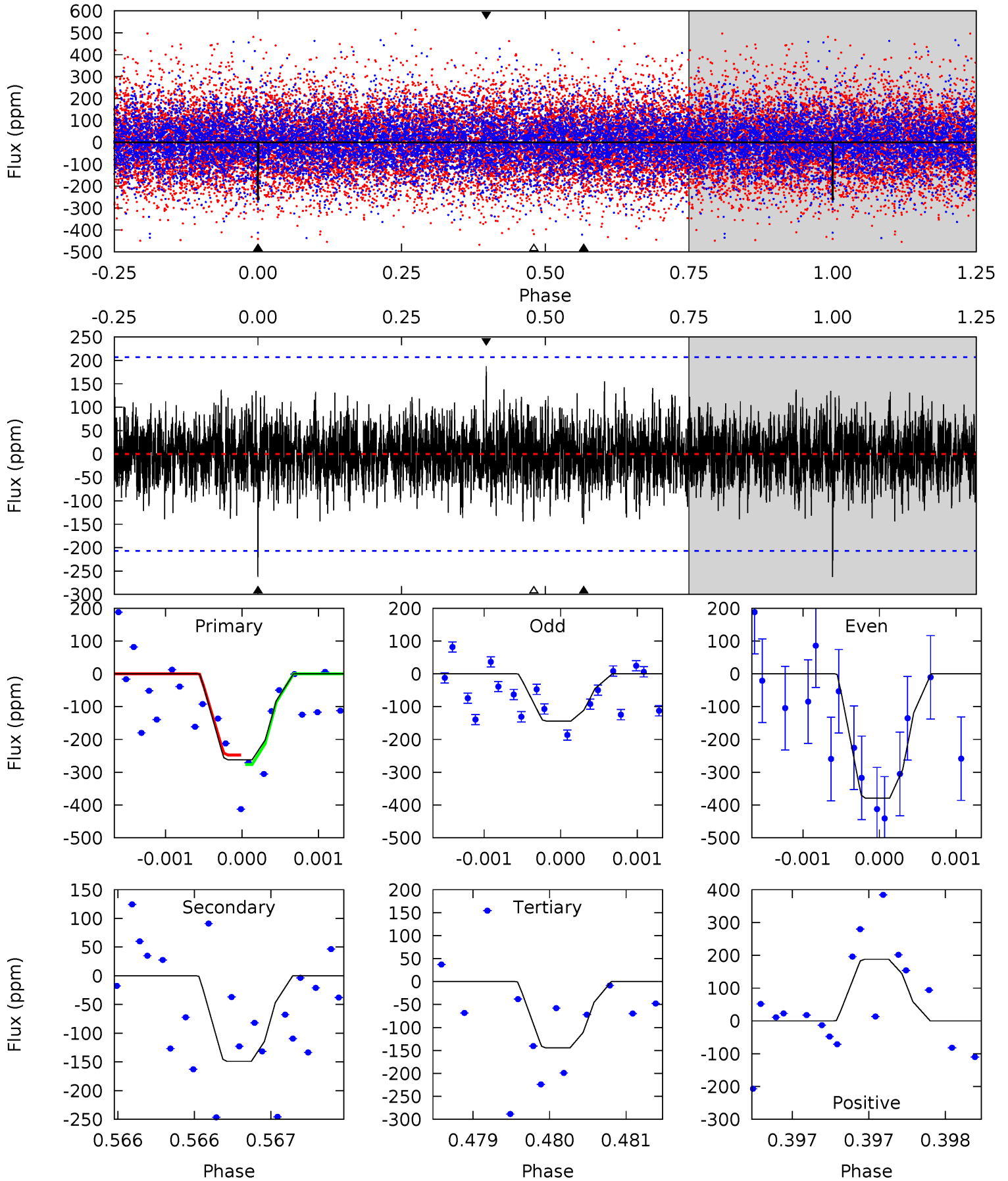
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
6.74	4.06	4.01	4.78	5.52	3.39	1.18	2.73	1.97	0.05	-0.71	2.46	0.96	0.41	0.86



# Alt Model-Shift Uniqueness Test

008161830-03, P = 111.076473 Days, E = 30.876614 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
7.03	4.00	3.87	5.04	5.55	3.44	1.18	3.16	2.00	0.12	-1.04	3.16	0.90	0.42	0.39



### Stellar Parameters For KIC 008161830

	$T_{\text{eff}} (K)$	$\log(g)$	$[\text{Fe}/\text{H}]$	$R (R_{\odot})$	$M (M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$5644^{+152}_{-152}$	$4.564^{+0.038}_{-0.152}$	$-0.140^{+0.300}_{-0.300}$	$0.831^{+0.194}_{-0.078}$	$0.928^{+0.083}_{-0.104}$	$2.279^{+0.443}_{-0.987}$
	+3%/-3%	+1%/-3%	+214%/-214%	+23%/-9%	+9%/-11%	+19%/-43%
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 008161830-03 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-137 \pm 34$	$2.22^{+1.93}_{-1.46}$	$488^{+25}_{-20}$	$4196^{+2595}_{-781}$	$2826^{+22647}_{-1985}$
Alt.	$-149 \pm 37$	$2.14^{+1.73}_{-1.46}$	$486^{+25}_{-18}$	$4354^{+3006}_{-872}$	$3438^{+29723}_{-2488}$

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

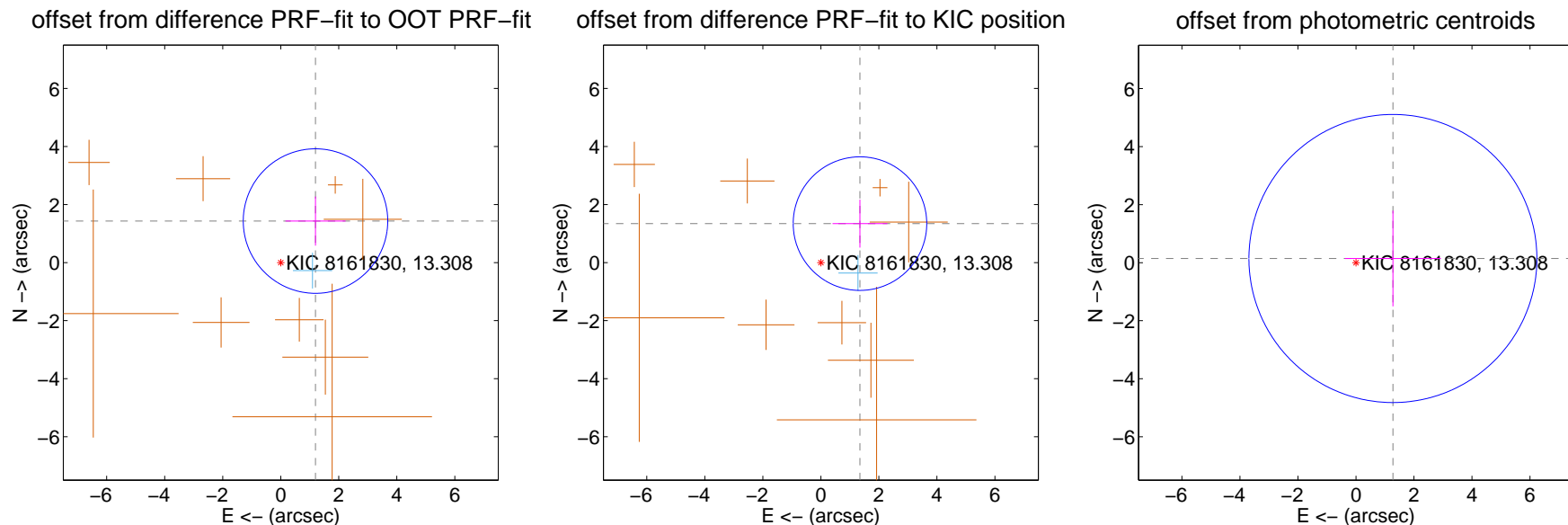
## DV Centroid Data

Supplemental centroid analysis for 008161830-03. Kepler magnitude: 13.31. Transit SNR 7.35

There are 1 quarters with good PRF difference image offsets

The direct PRF centroid is offset from the target star catalog position by about 0.25 arcsec

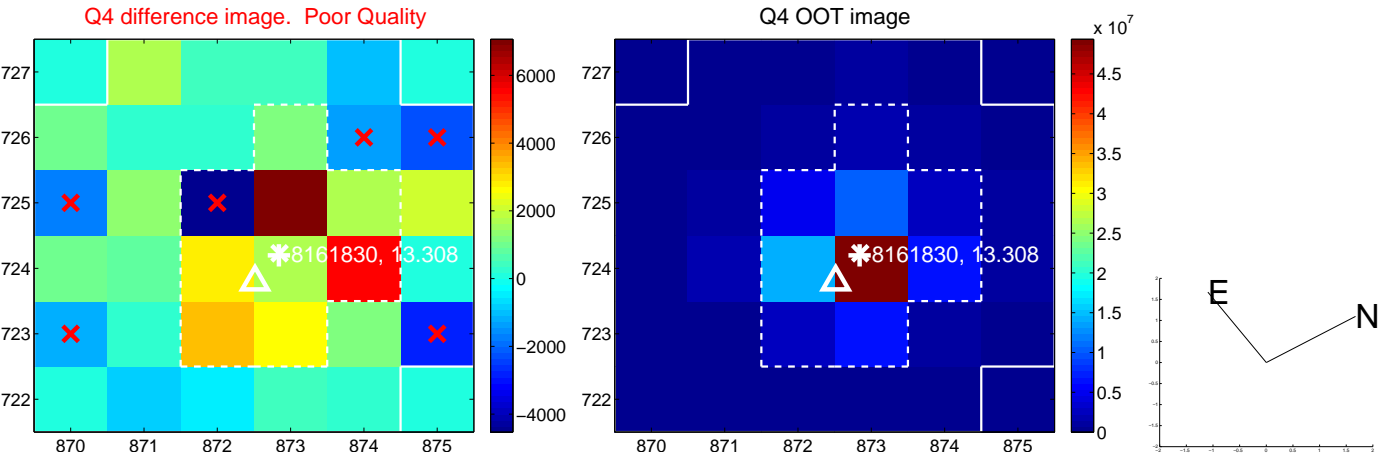
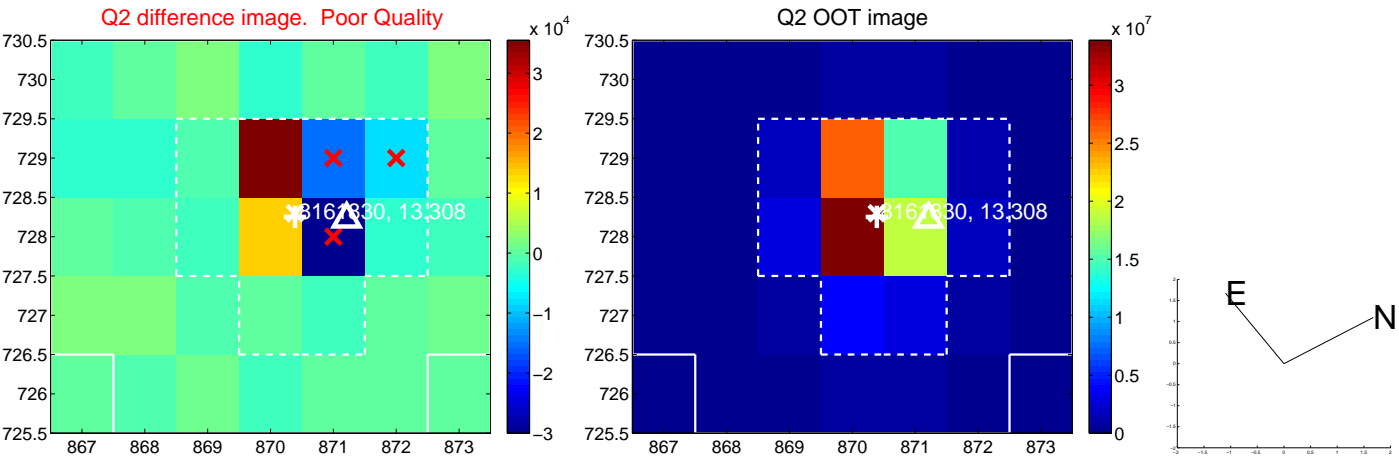
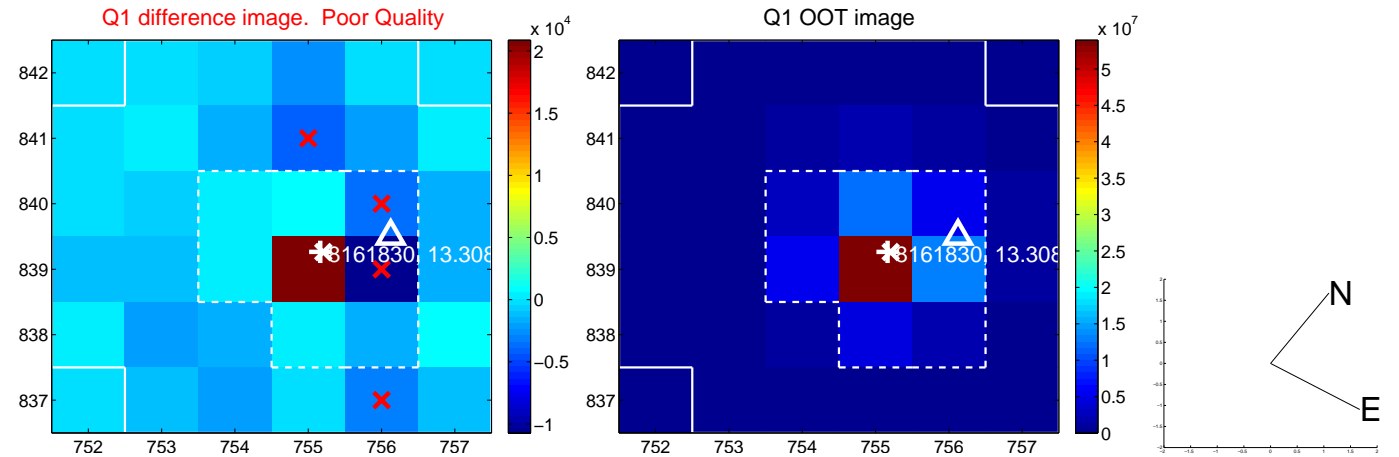
	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$1.865 \pm 0.830$	2.25	$-1.197 \pm 1.035$	$1.430 \pm 0.846$
PRF-fit source offset from KIC position	$1.902 \pm 0.767$	2.48	$-1.348 \pm 0.946$	$1.343 \pm 0.826$
photometric centroid source offset	$1.28 \pm 1.65$	0.77	$-1.27 \pm 1.65$	$0.14 \pm 1.65$



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.

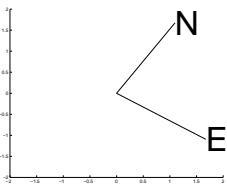
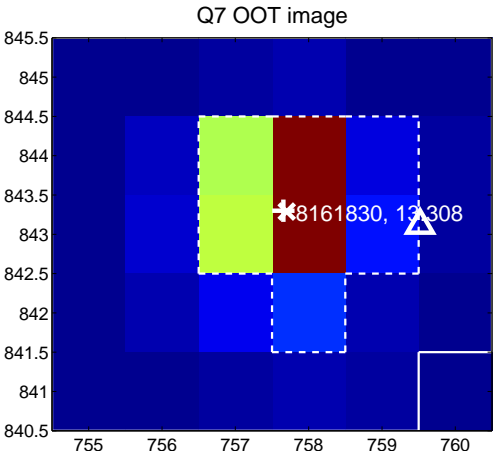
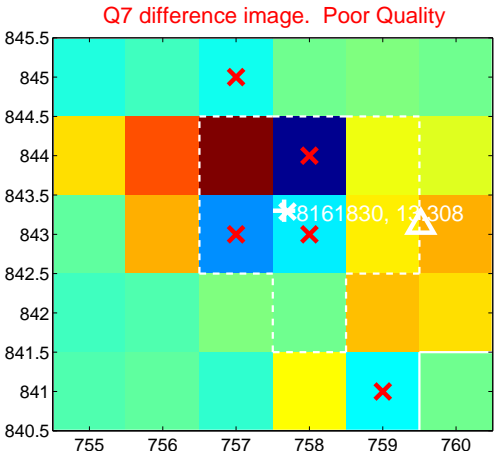
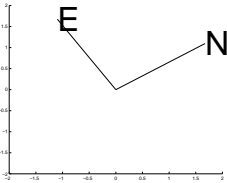
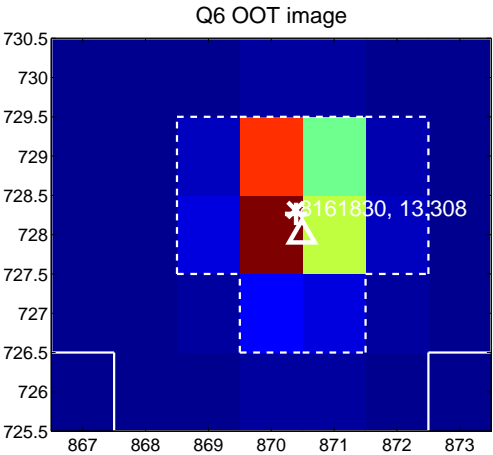
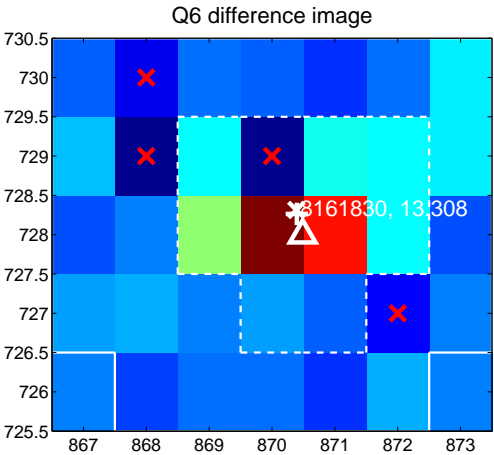


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

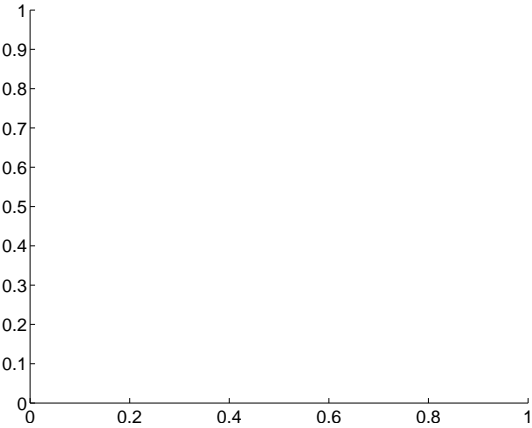
Q5 no difference image



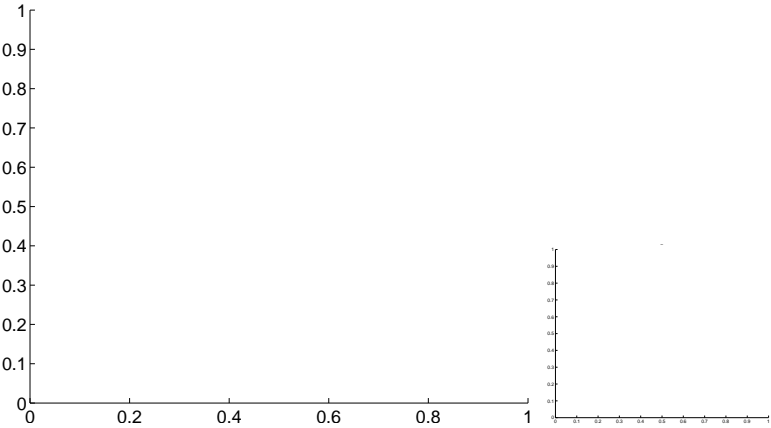
Q5 no OOT image



Q8 no difference image

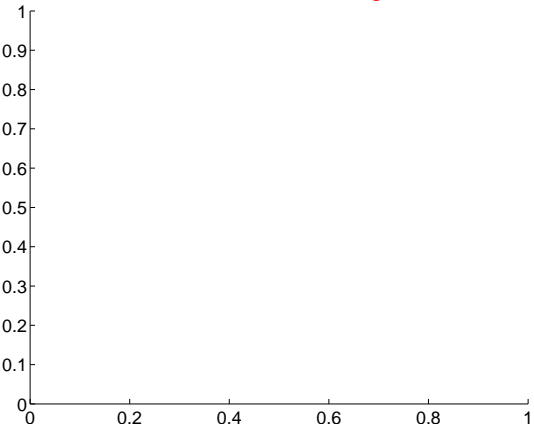


Q8 no OOT image

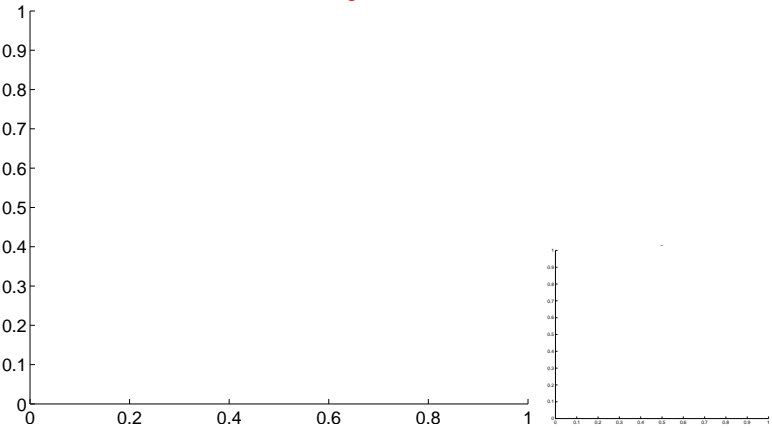


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

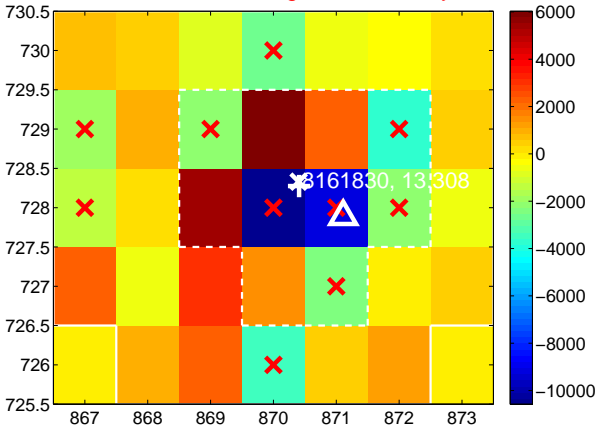
Q9 no difference image



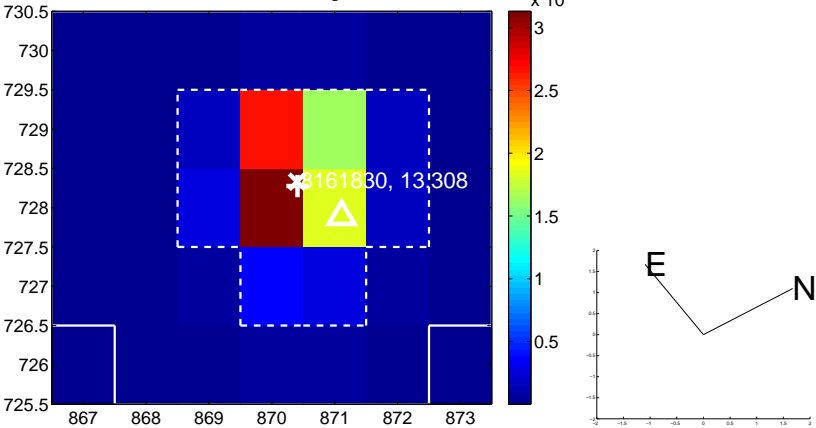
Q9 no OOT image



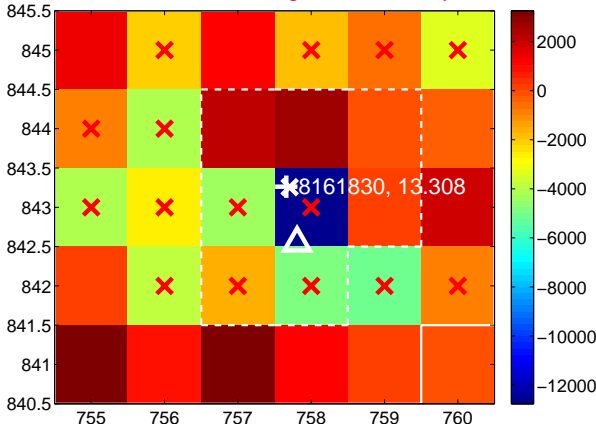
Q10 difference image. Poor Quality



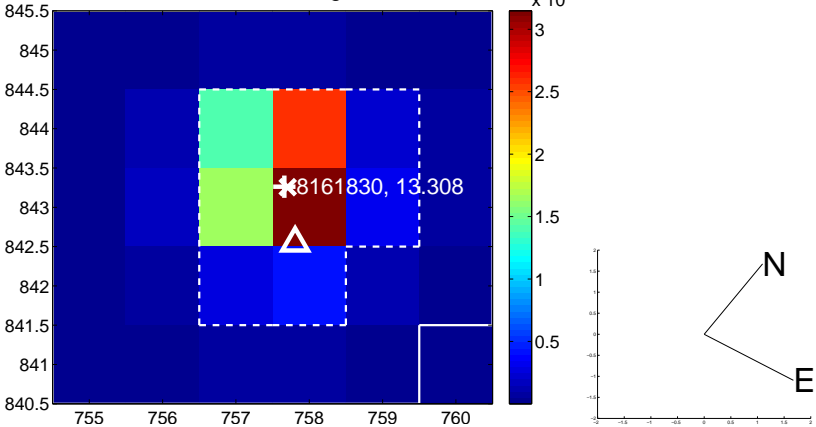
Q10 OOT image



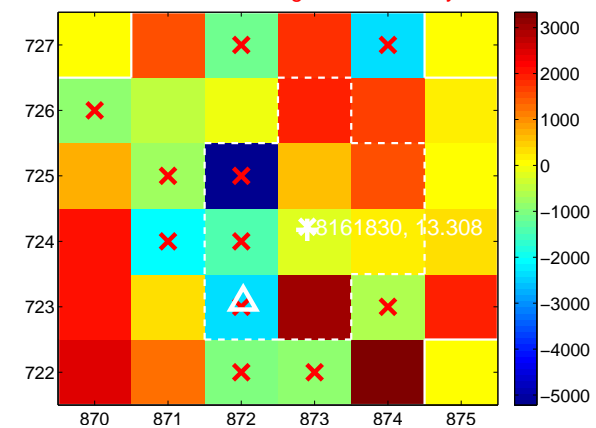
Q11 difference image. Poor Quality



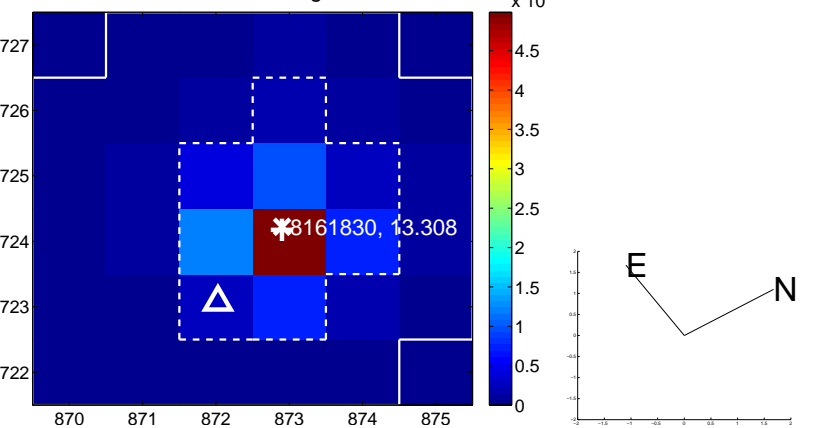
Q11 OOT image



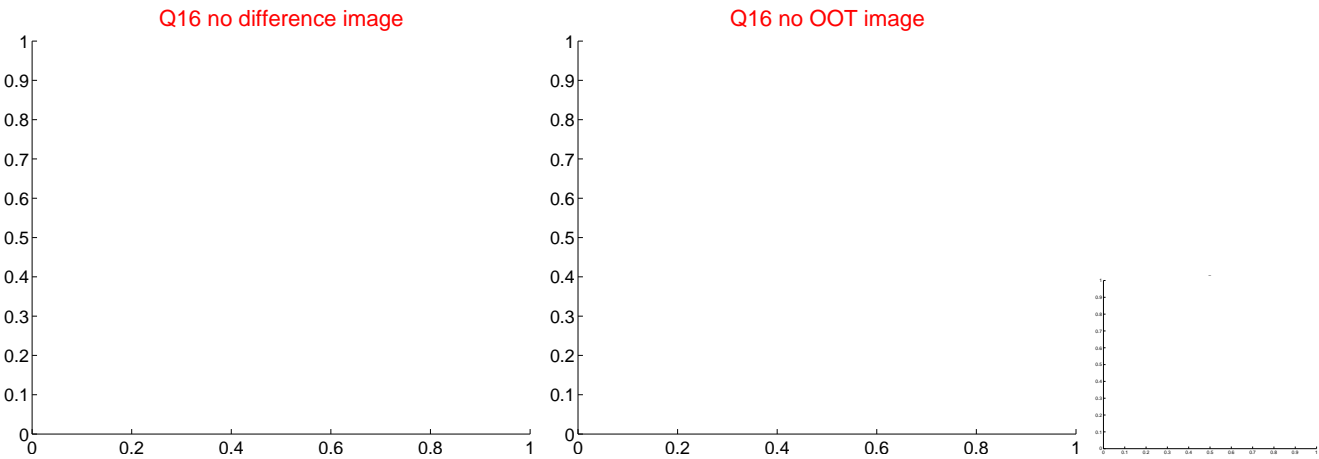
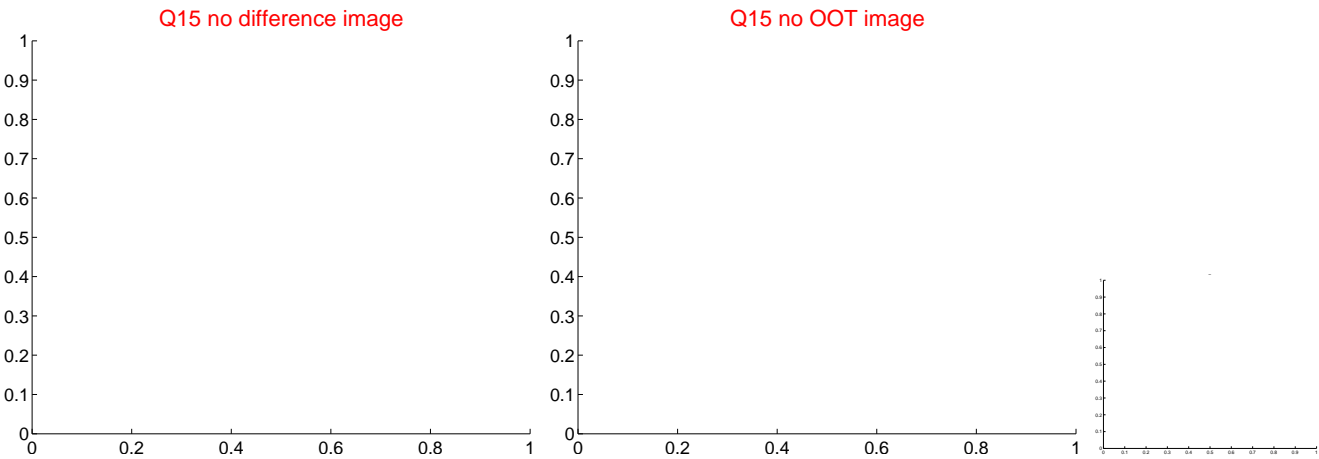
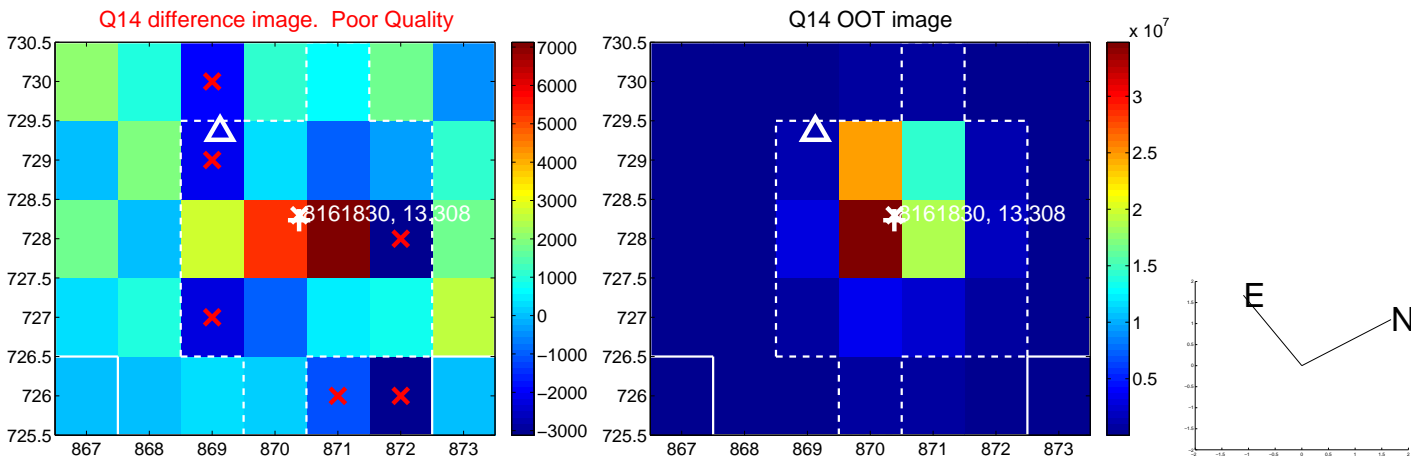
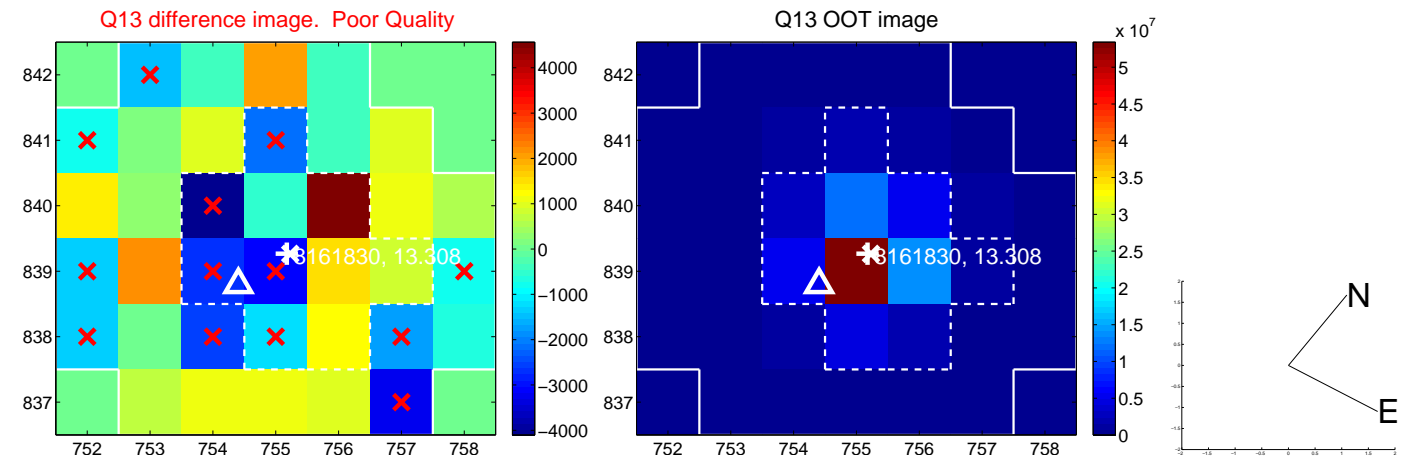
Q12 difference image. Poor Quality



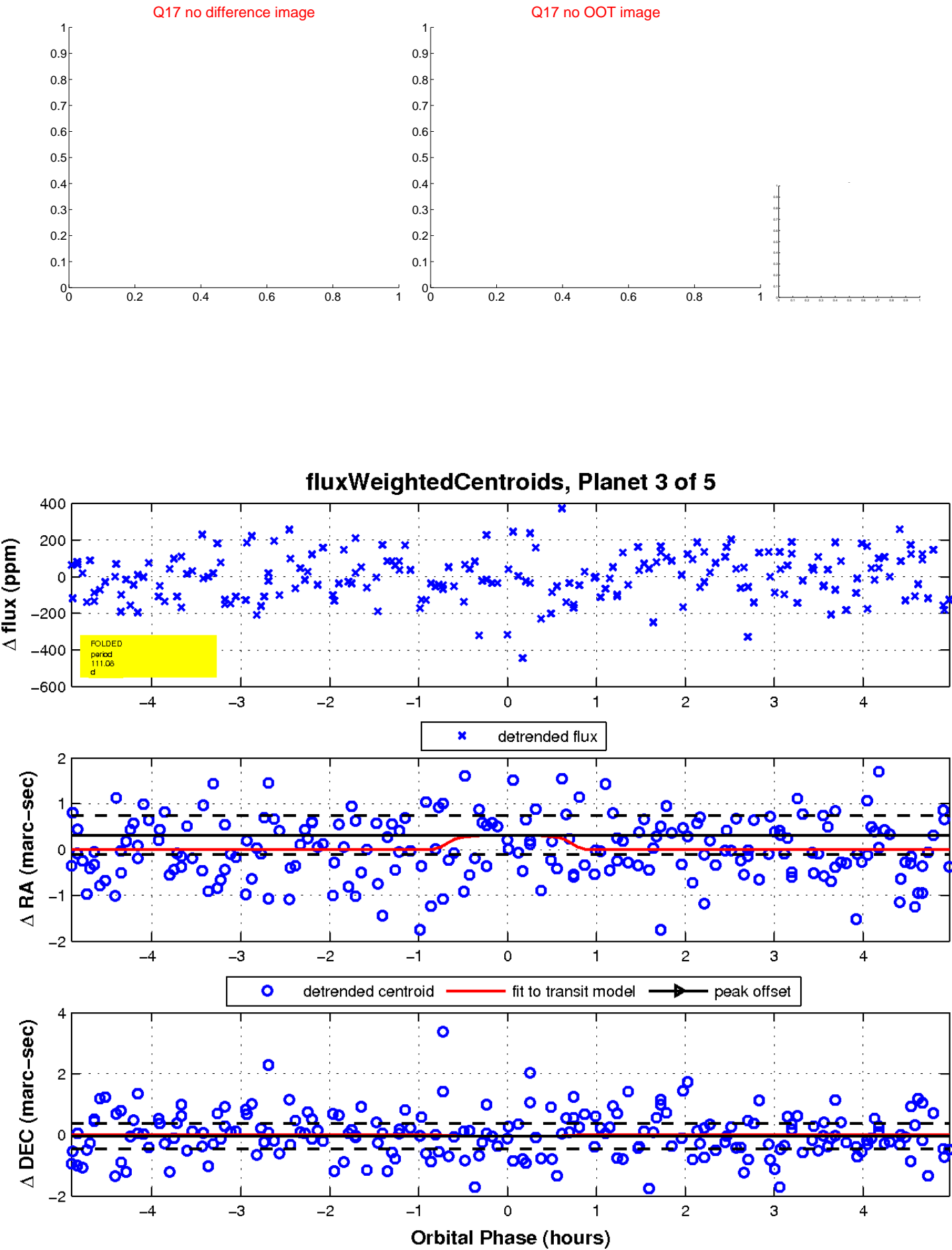
Q12 OOT image



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

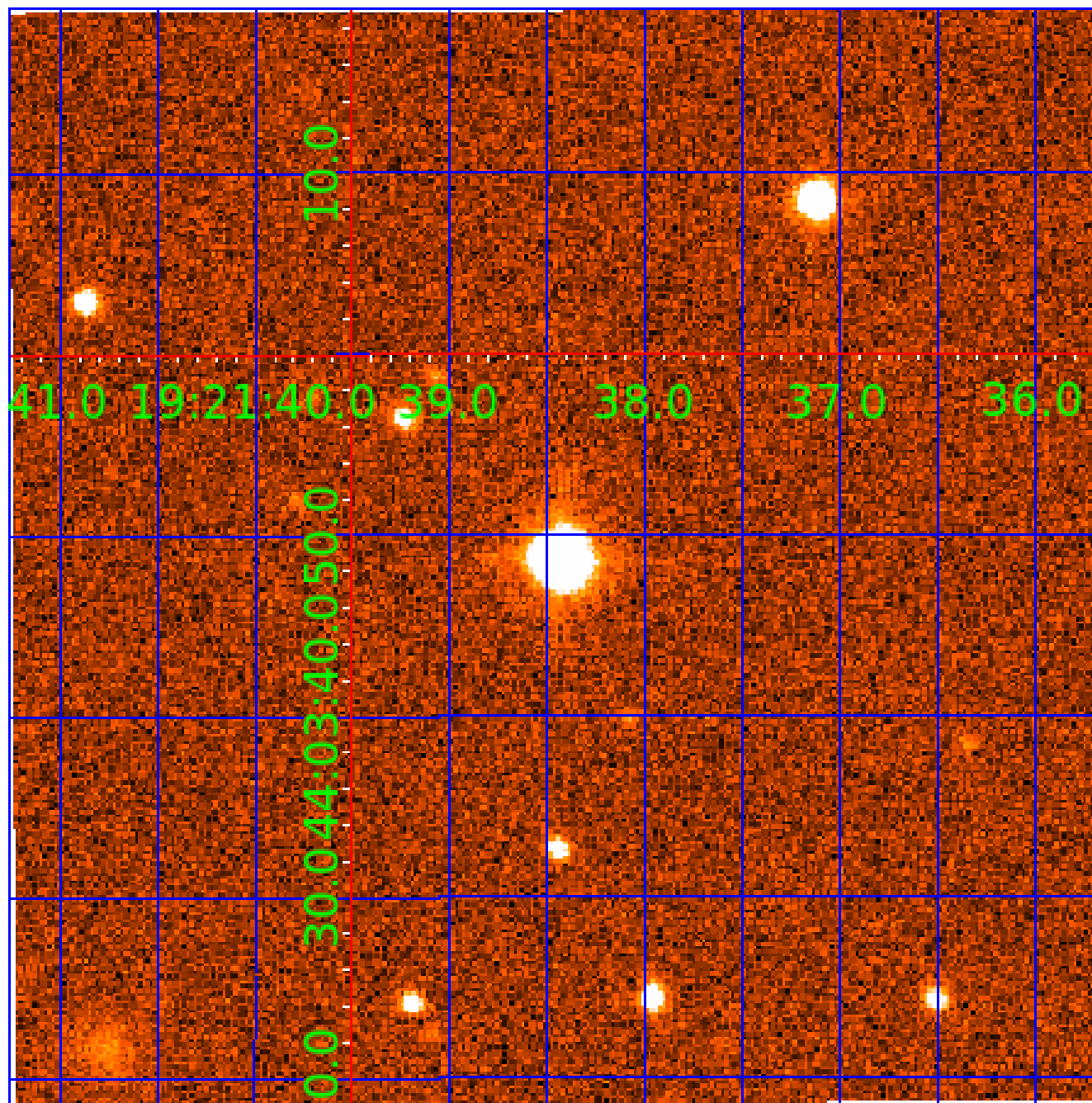


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination



# KIC 008161830

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
008161830-01	OBS	No	2.203132	133.568522	19.2	12.117	10.6	11.1	0.83	5644	0.36	602.91
008161830-02	OBS	No	526.690613	343.691475	335.9	16.410	26.9	12.4	0.83	5644	1.67	0.41
008161830-03	OBS	No	111.075752	141.954731	254.3	1.659	8.2	7.3	0.83	5644	1.68	3.24
008161830-04	OBS	No	152.415640	274.880647	111.9	13.945	9.7	6.0	0.83	5644	0.95	2.12
008161830-05	OBS	No	155.141465	265.124220	242.7	14.015	9.3	9.0	0.83	5644	2.21	2.07

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
008161830-01	OBS	FP	0.00	1	0	1	1	LPP_DV—HALO_GHOST—EPHEM_MATCH
008161830-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_MARSHALL_SKYE—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS
008161830-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—MOD_NONUNIQ_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS
008161830-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_MARSHALL—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_NONUNIQ_ALT—INCONSISTENT_TRANS—CENT_FEW_MEAS
008161830-05	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_MARSHALL—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—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 008161830-04

No Significant Match Found

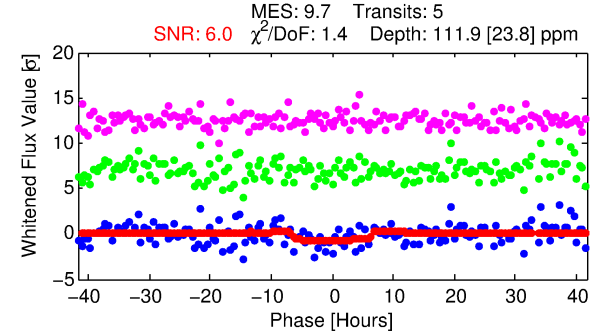
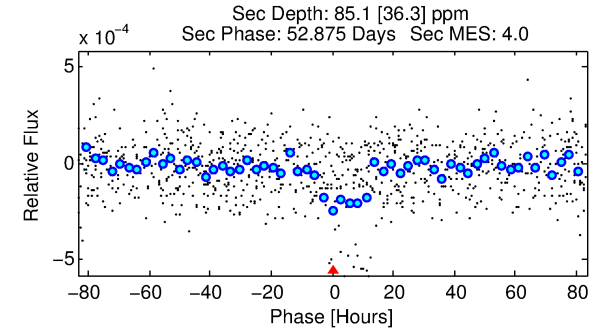
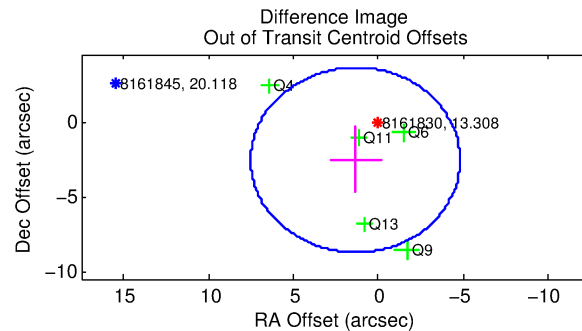
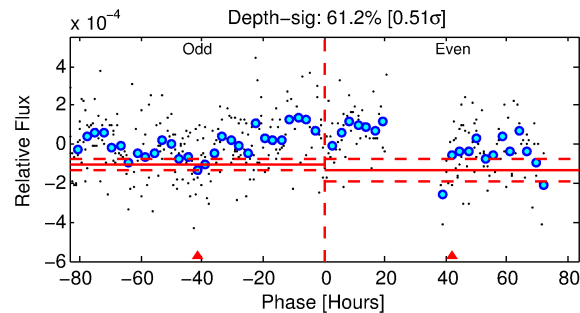
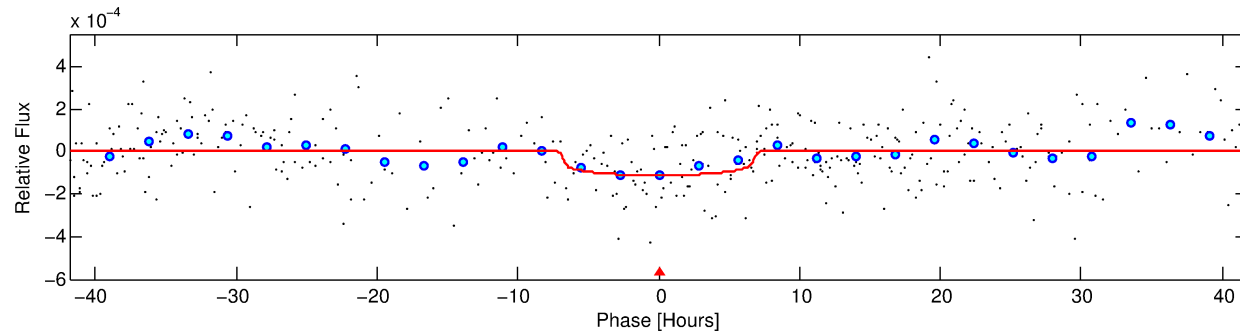
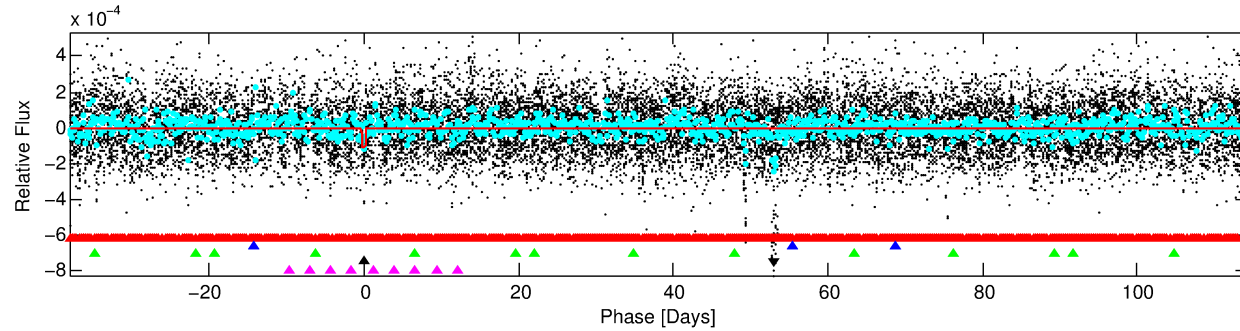
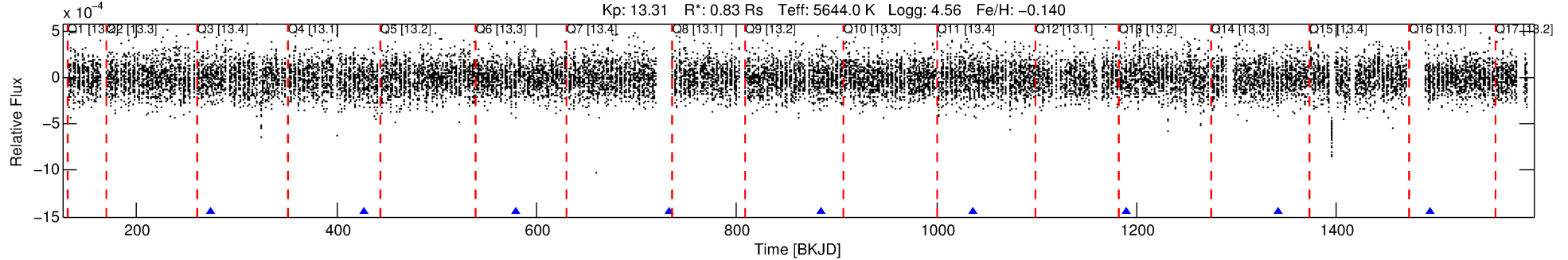


# DV One-Page Summary

KIC: 8161830 Candidate: 4 of 5 Period: 152.416 d

KOI: K03046 Corr: No Ephemeris Match

Kp: 13.31 R\*: 0.83 Rs Teff: 5644.0 K Logg: 4.56 Fe/H: -0.140



## DV Fit Results:

Period = 152.41564 [0.00762] d  
Epoch = 274.8806 [0.0382] BKJD  
Rp/R\* = 0.0105 [0.0064]  
a/R\* = 58.09 [151.54]  
b = 0.73 [1.67]  
Seff = 2.12 [0.64]  
Teq = 308 [23] K  
Rp = 0.95 [0.62] Re  
a = 0.5438 [0.1058] AU  
Ag = 15398.70 [20387.84] [0.76σ]  
Teffp = 5301 [1721] K [2.90σ]

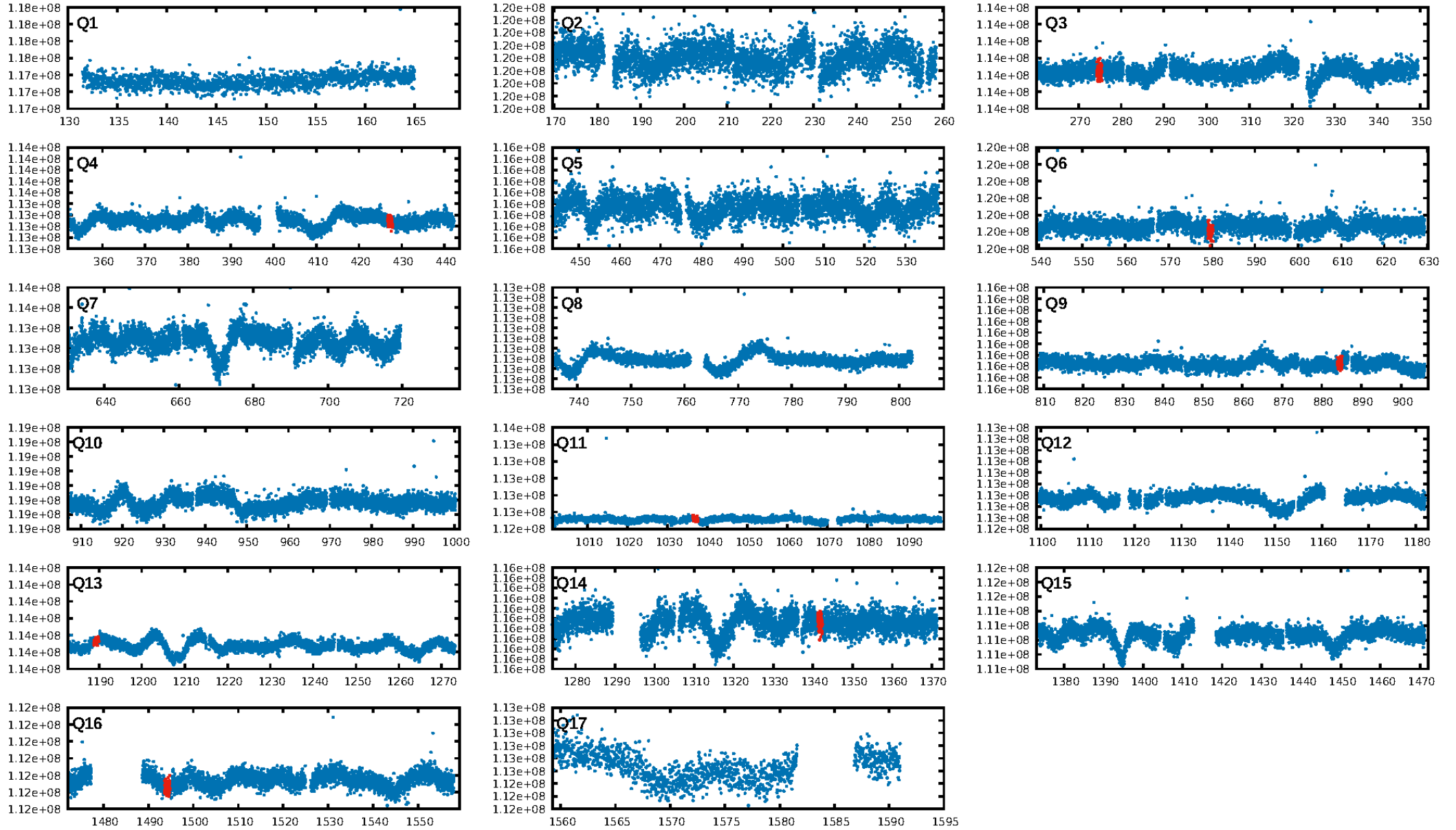
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [70.65σ]  
LongPeriod-sig: 99.9% [3.31σ]  
ModelChiSquare2-sig: 6.3%  
ModelChiSquareGof-sig: 100.0%  
Bootstrap-pfa: 1.46e-09  
RollingBand-fgt: 1.00 [5/5]  
GhostDiagnostic-chr: -0.3686  
Centroid-sig: 0.0%  
Centroid-so: 5.039 arcsec [3.22σ]  
OotOffset-rm: 2.882 arcsec [1.40σ]  
KicOffset-rm: 2.893 arcsec [1.38σ]  
OotOffset-st: 1/1/1/2 [5]  
KicOffset-st: 1/1/1/2 [5]  
DiffImageQuality-fgm: 0.40 [2/5]  
DiffImageOverlap-fno: 0.00 [0/8]

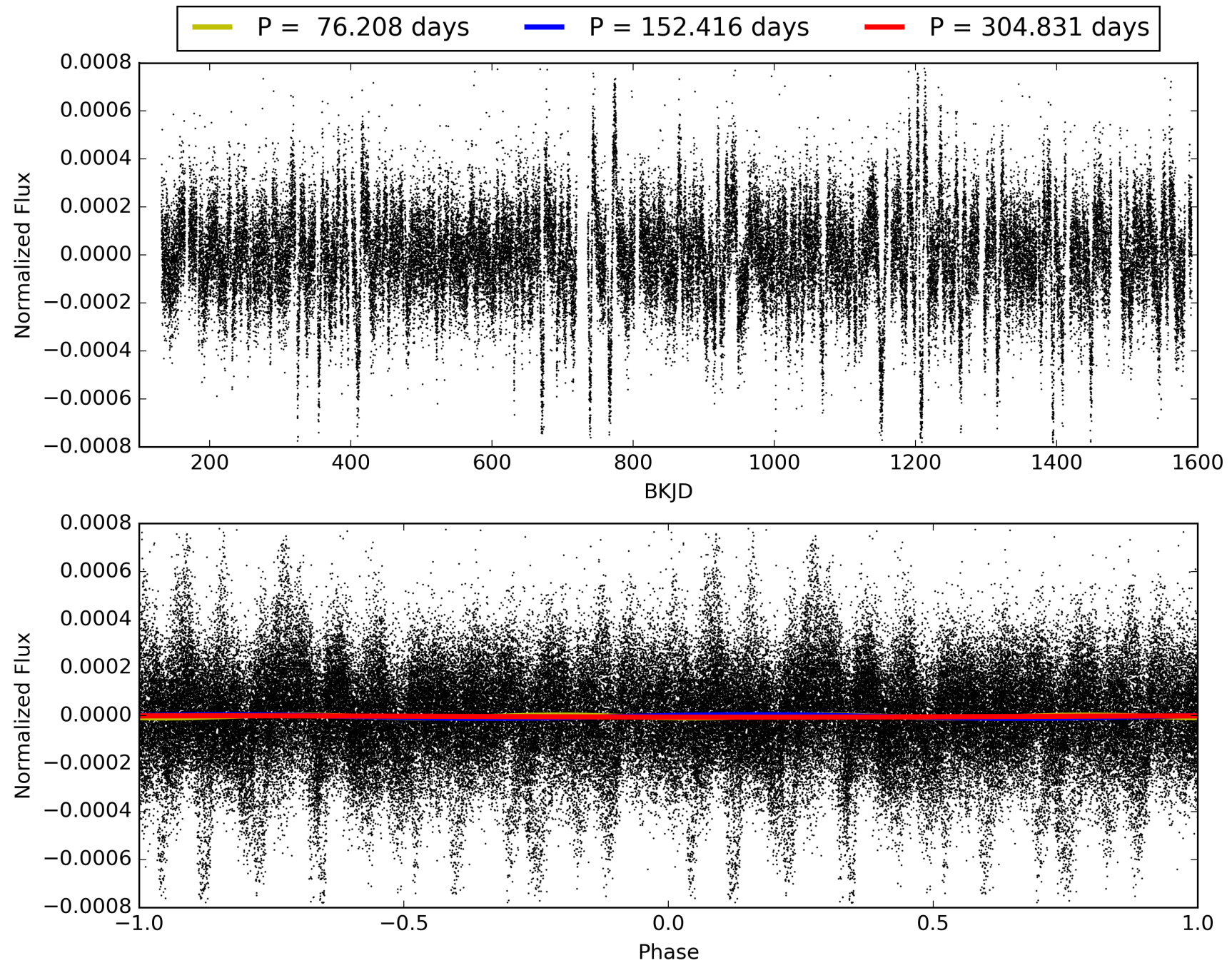
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 31-Jan-2016 08:30:57 Z

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

# TCE 008161830-04, PDC Light Curves

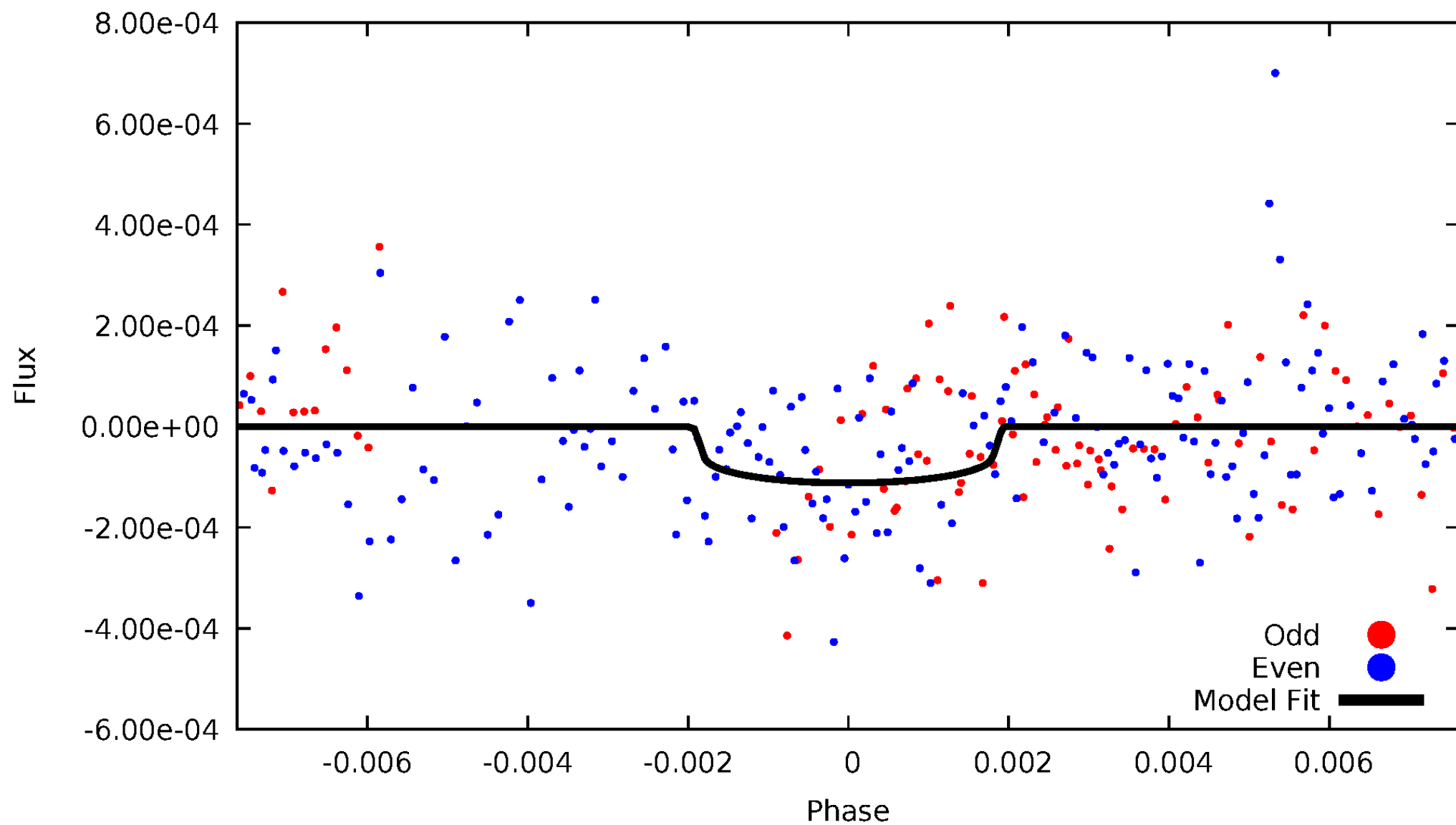


TCE 008161830-04



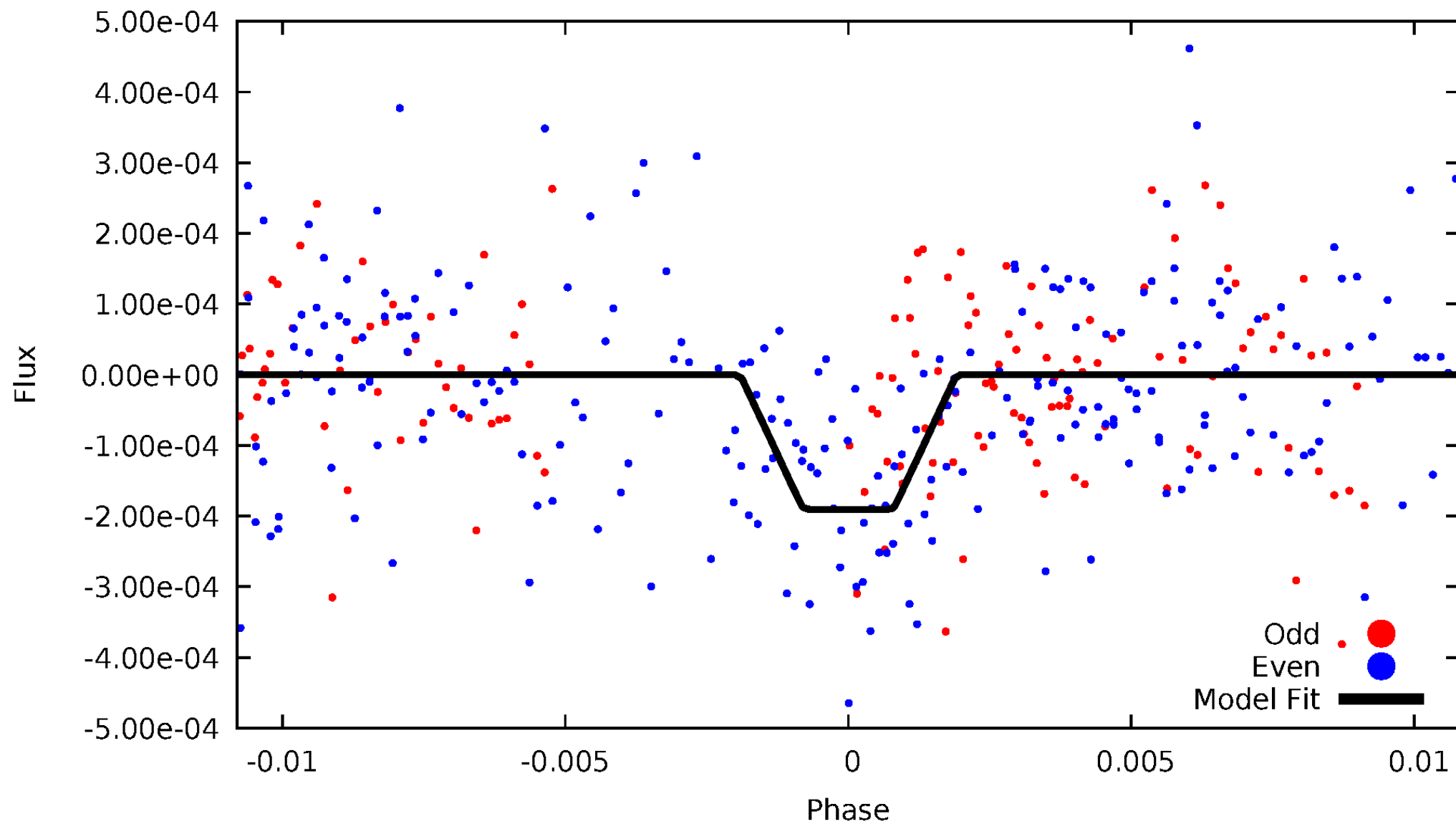
# DV Odd/Even

TCE 008161830-04



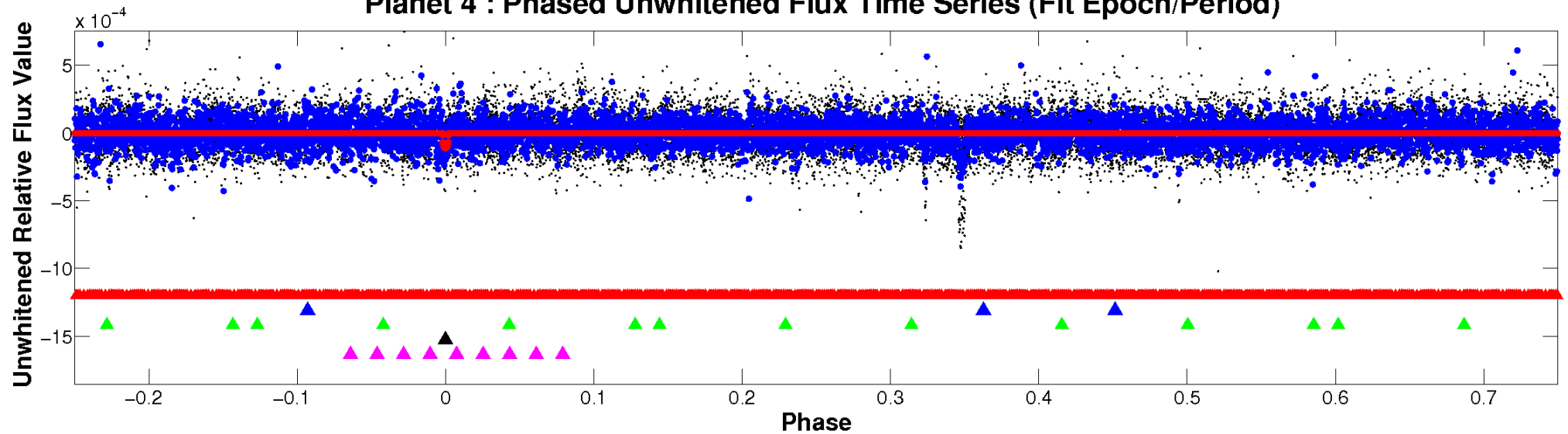
# ALT Odd/Even

TCE 008161830-04

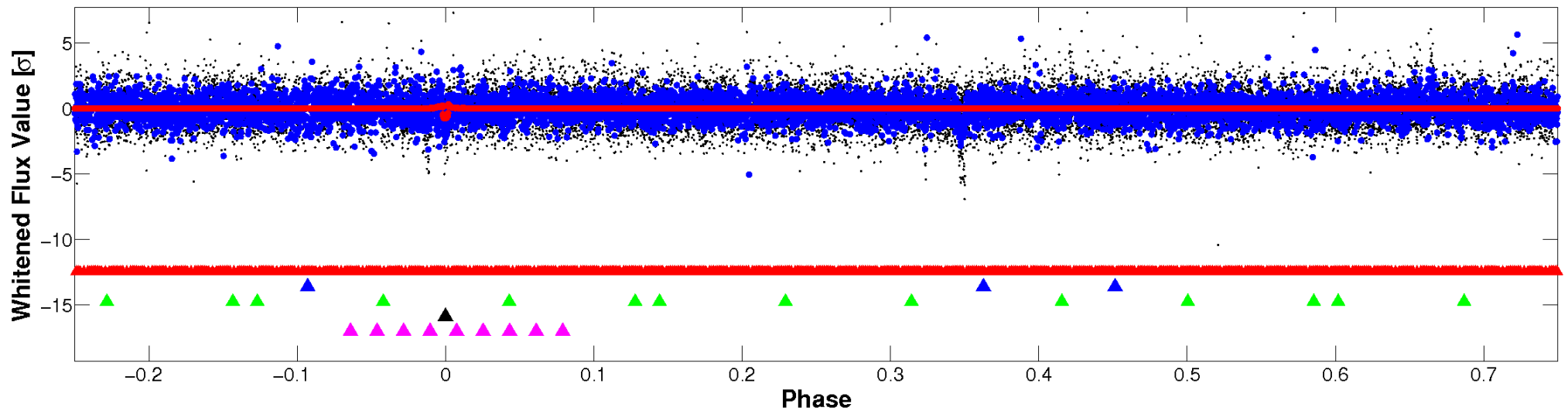


# Non-Whitened Vs. Whitened Light Curve

## Planet 4 : Phased Unwhitened Flux Time Series (Fit Epoch/Period)



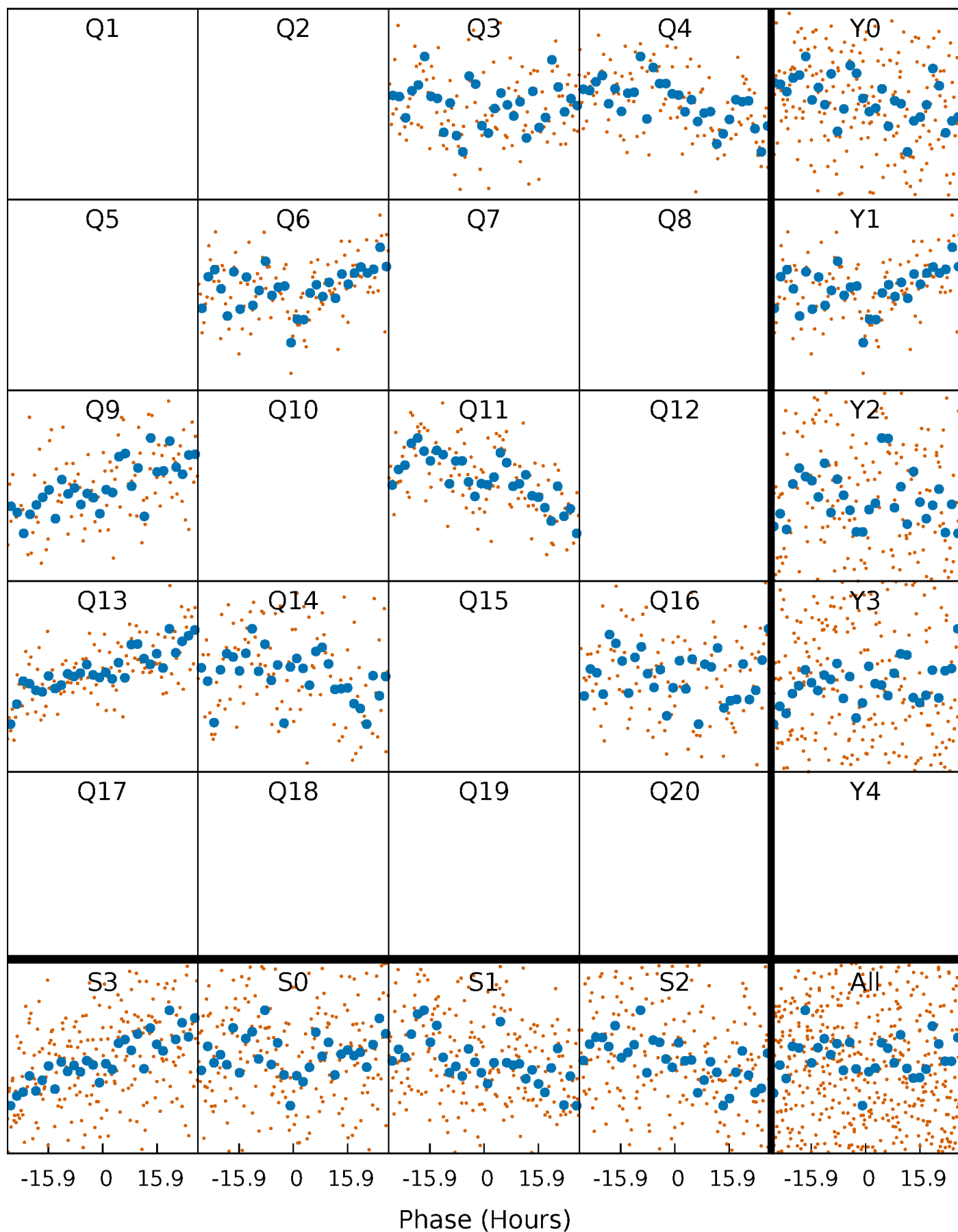
## Planet 4 : Phased Whitened Flux Time Series (Fit Epoch/Period)





# PDC Quarter-Phased Transit Curves

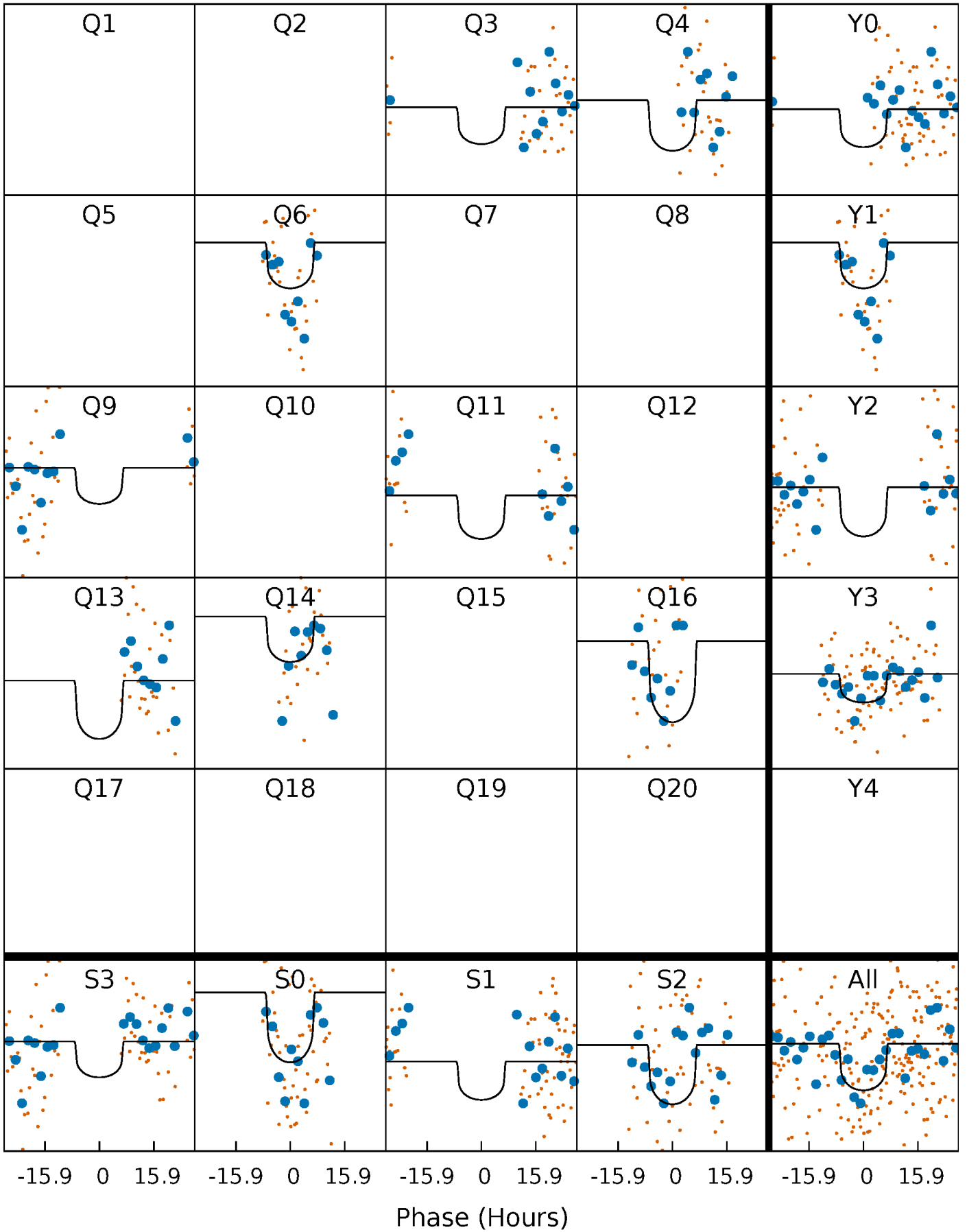
TCE 008161830-04   P=152.415640 Days    $T_0=274.880647$  (BKJD)





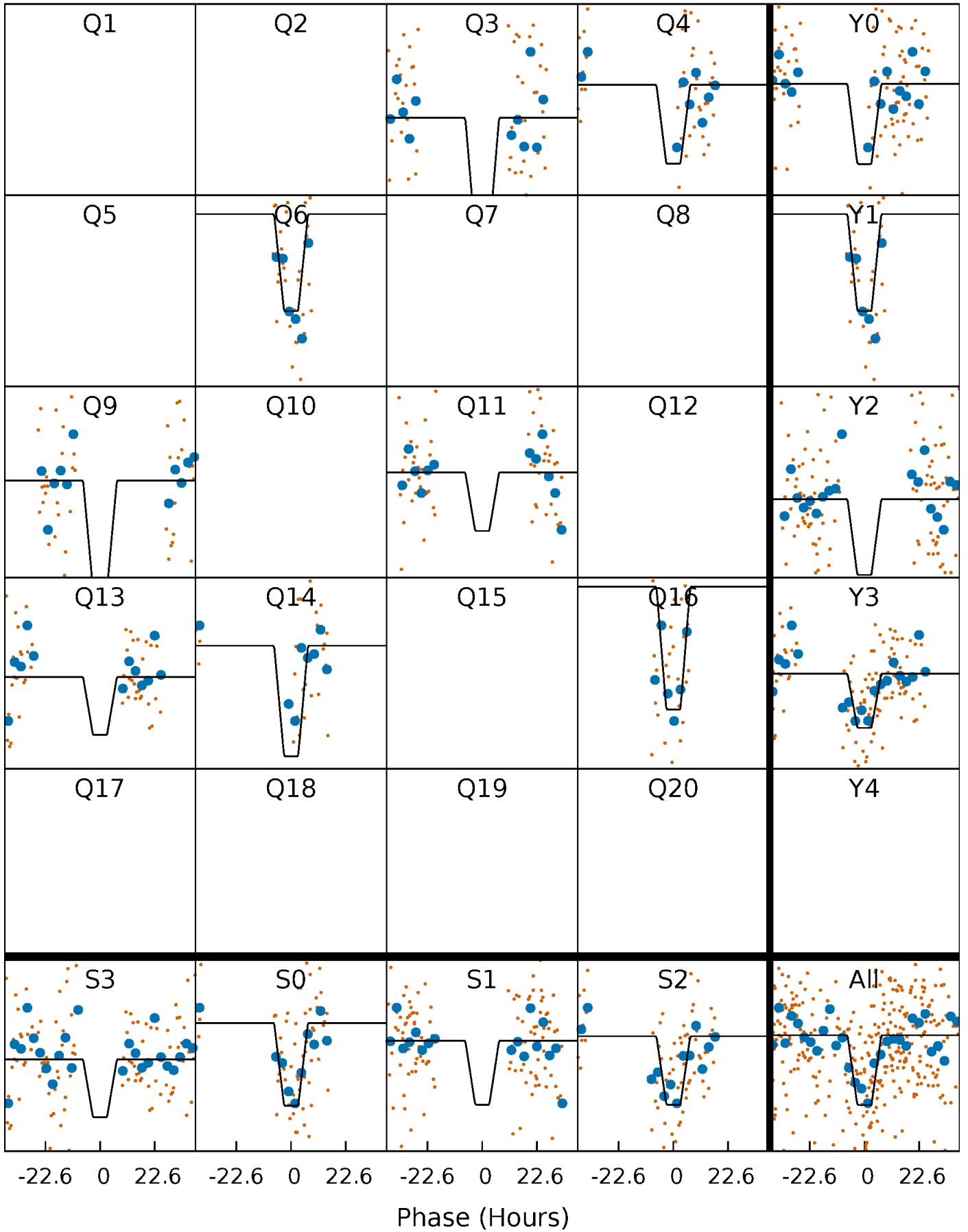
# DV Quarter-Phased Transit Curves

TCE 008161830-04 P=152.415640 Days  $T_0=274.880647$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

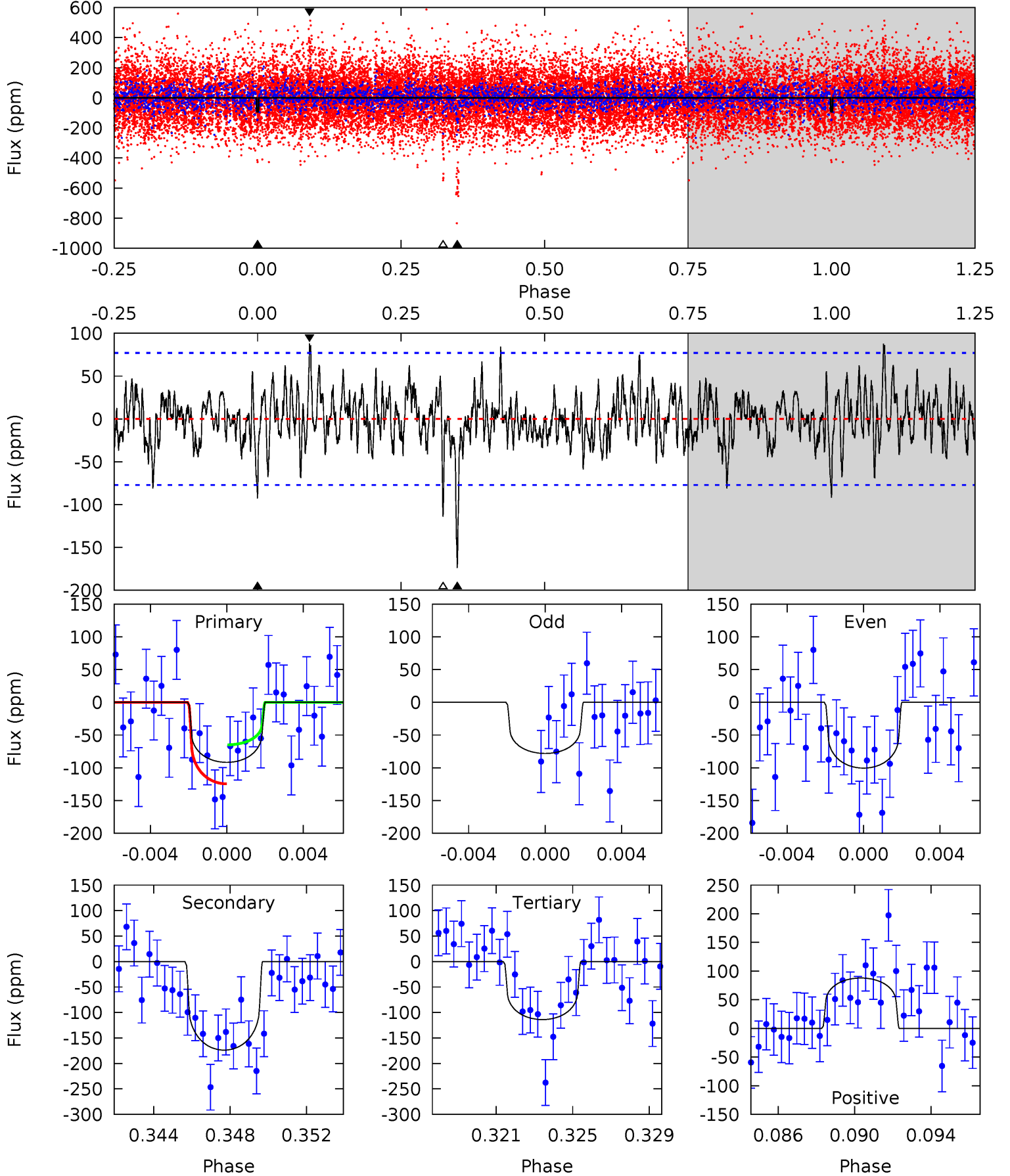
TCE 008161830-04 P=152.393491 Days  $T_0=274.896144$  (BKJD)



# DV Model-Shift Uniqueness Test

008161830-04,  $P = 152.415640$  Days,  $E = 122.465007$  Days

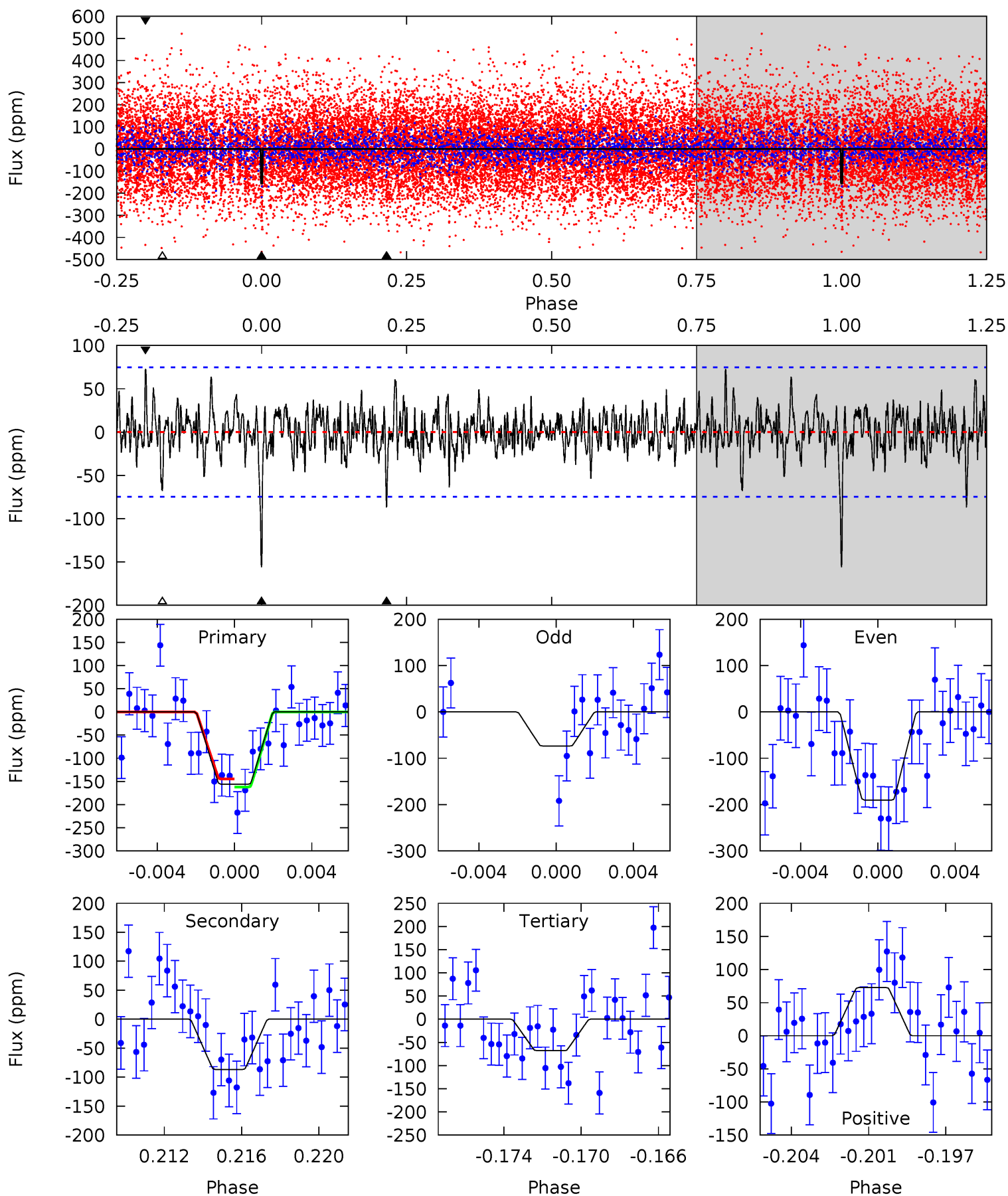
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
6.19	11.7	7.69	5.93	5.20	2.89	1.69	-1.50	0.25	4.04	5.80	0.74	1.32	0.34	1.99



# Alt Model-Shift Uniqueness Test

008161830-04,  $P = 152.393491$  Days,  $E = 122.502653$  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
10.9	6.04	4.73	5.07	5.21	2.89	1.31	6.13	5.80	1.31	0.97	3.77	1.01	0.32	0.56



### Stellar Parameters For KIC 008161830

	$T_{\text{eff}} (K)$	$\log(g)$	$[\text{Fe}/\text{H}]$	$R (R_{\odot})$	$M (M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$5644^{+152}_{-152}$	$4.564^{+0.038}_{-0.152}$	$-0.140^{+0.300}_{-0.300}$	$0.831^{+0.194}_{-0.078}$	$0.928^{+0.083}_{-0.104}$	$2.279^{+0.443}_{-0.987}$
	+3%/-3%	+1%/-3%	+214%/-214%	+23%/-9%	+9%/-11%	+19%/-43%
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 008161830-04 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$-174 \pm 15$	$1.07^{+0.60}_{-0.57}$	$439^{+23}_{-19}$	$6102^{+3031}_{-1129}$	$24270^{+81009}_{-14206}$
Alt.	$-87 \pm 14$	$1.32^{+0.58}_{-0.59}$	$438^{+24}_{-18}$	$4722^{+1492}_{-645}$	$7790^{+18386}_{-4139}$

$T_{\text{max}}$  = 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

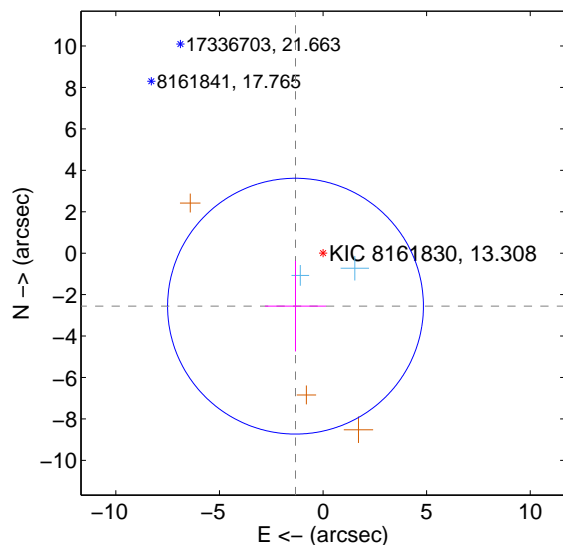
Supplemental centroid analysis for 008161830-04. Kepler magnitude: 13.31. Transit SNR 6.01

There are 2 quarters with good PRF difference image offsets

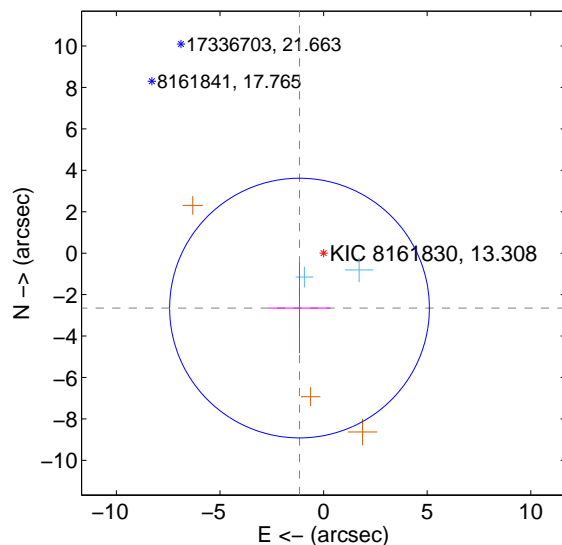
The direct PRF centroid is offset from the target star catalog position by about 0.20 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$2.882 \pm 2.058$	1.40	$1.328 \pm 1.476$	$-2.557 \pm 2.188$
PRF-fit source offset from KIC position	$2.893 \pm 2.089$	1.38	$1.161 \pm 1.491$	$-2.649 \pm 2.185$
photometric centroid source offset	$5.04 \pm 1.56$	3.22	$-4.55 \pm 1.56$	$-2.17 \pm 1.58$

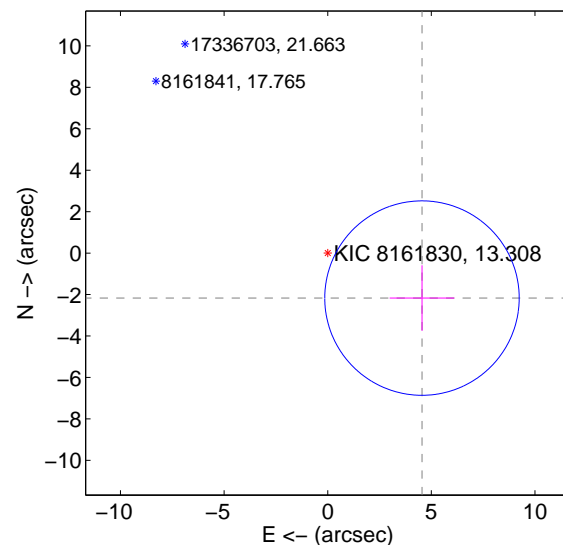
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position

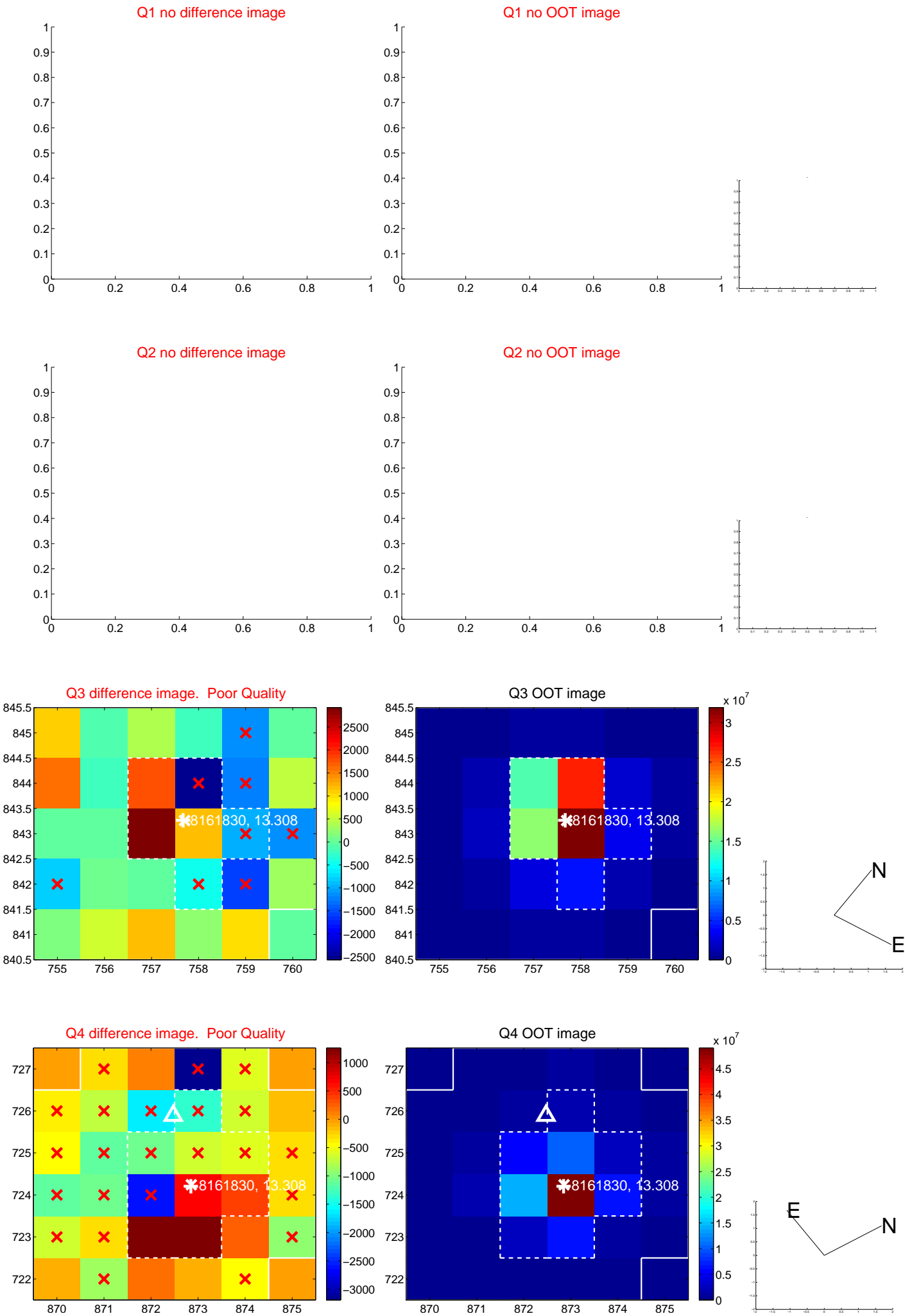


offset from photometric centroids



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

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





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

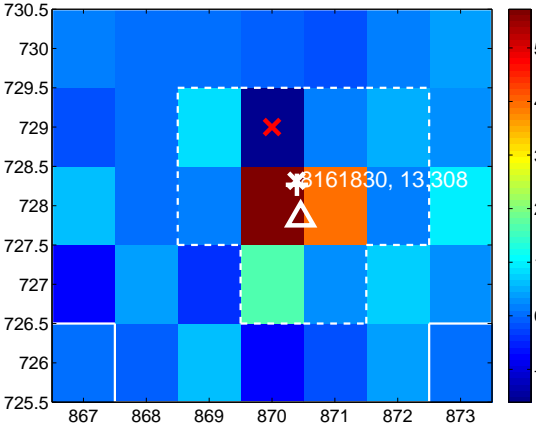
Q5 no difference image



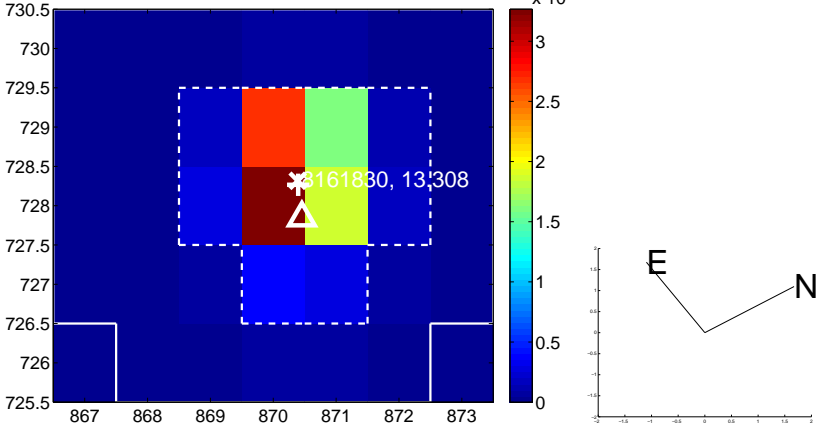
Q5 no OOT image



Q6 difference image



Q6 OOT image



Q7 no difference image



Q7 no OOT image



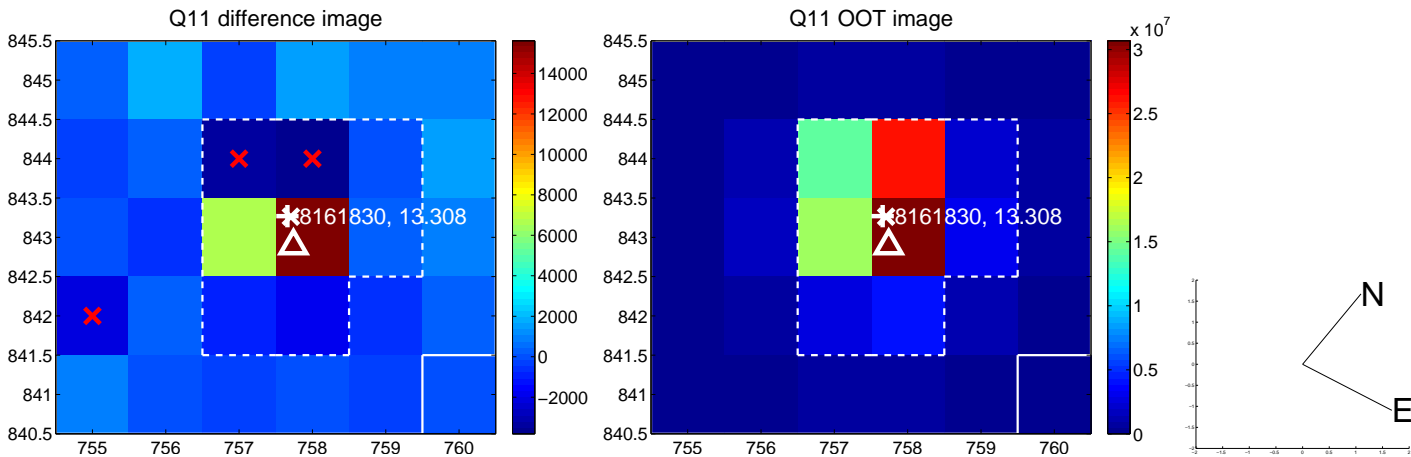
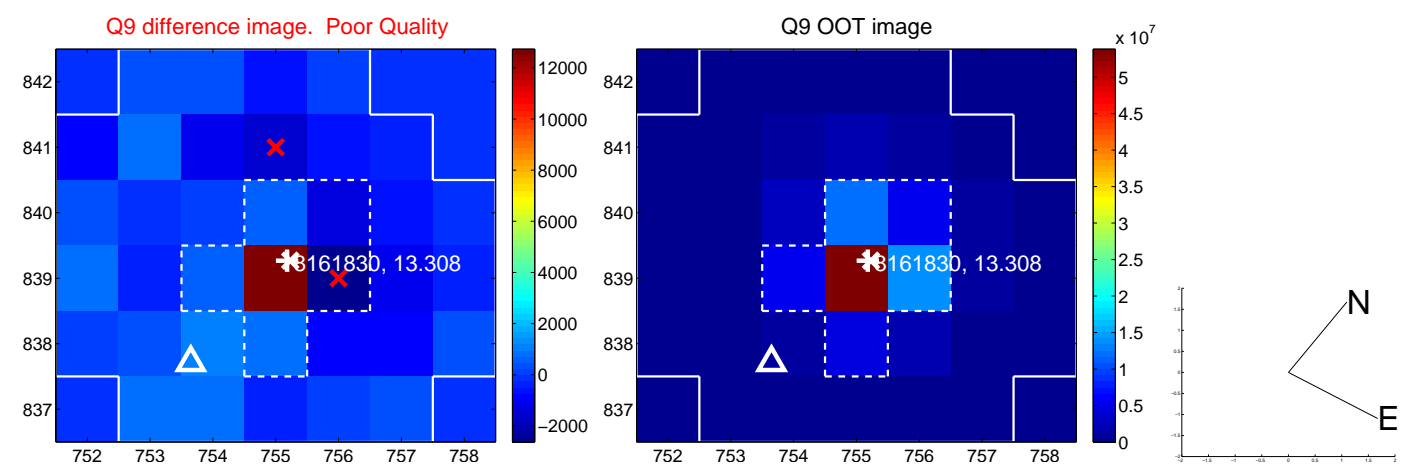
Q8 no difference image



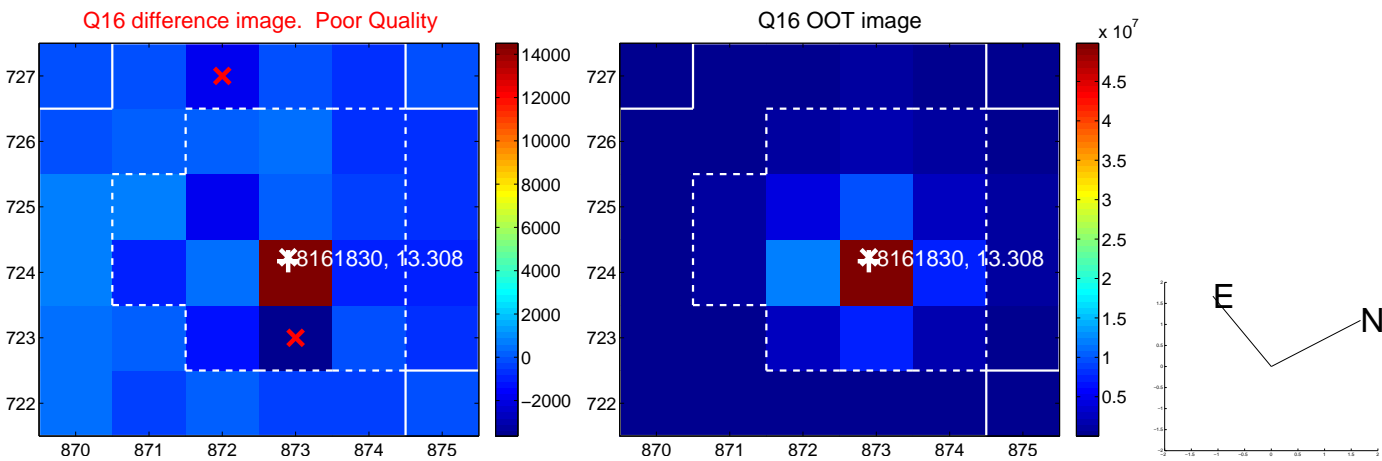
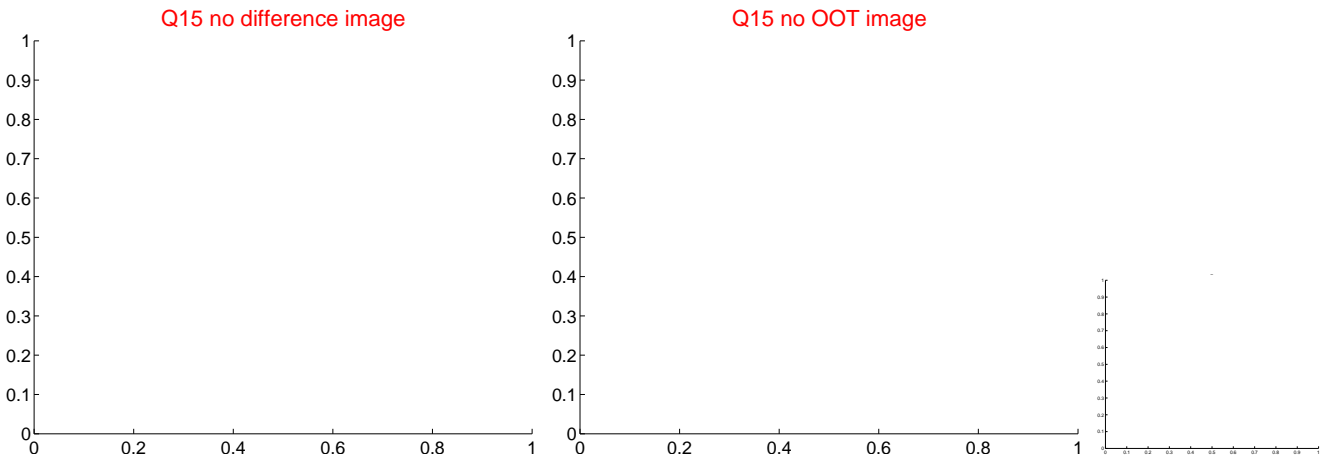
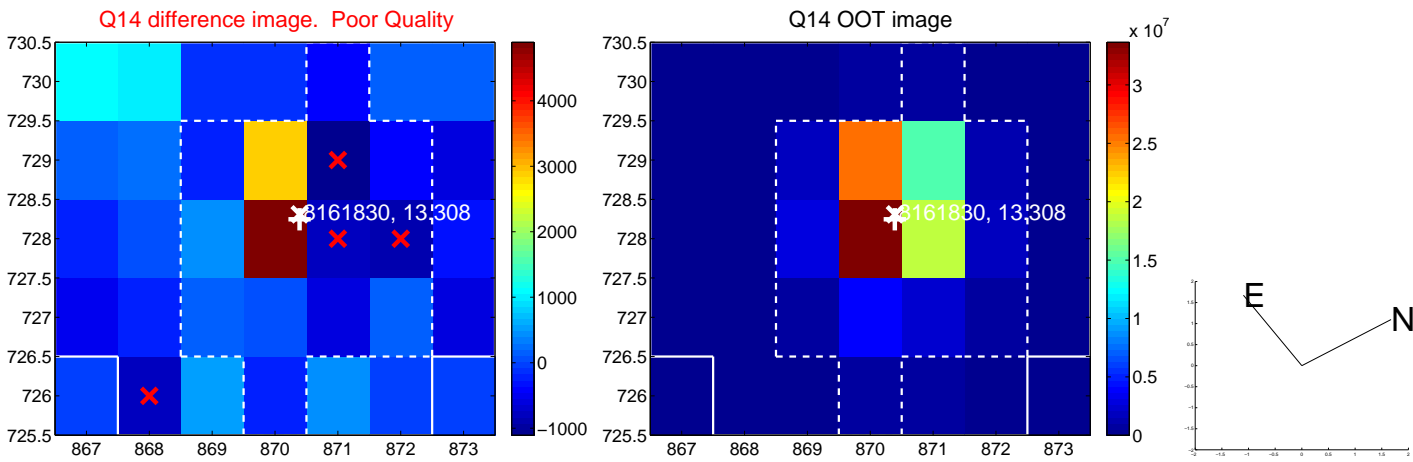
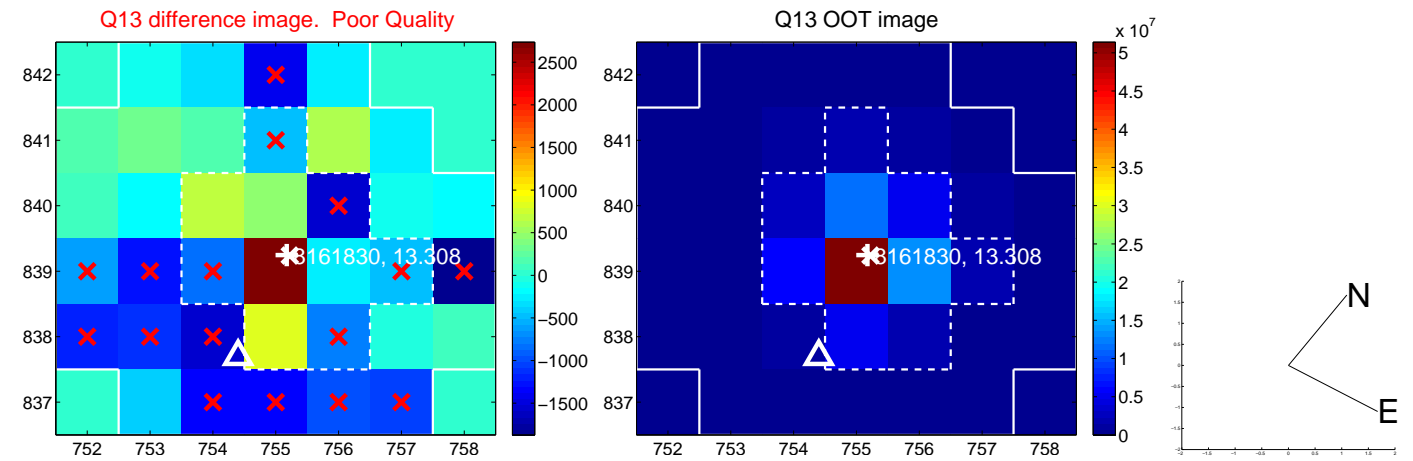
Q8 no OOT image



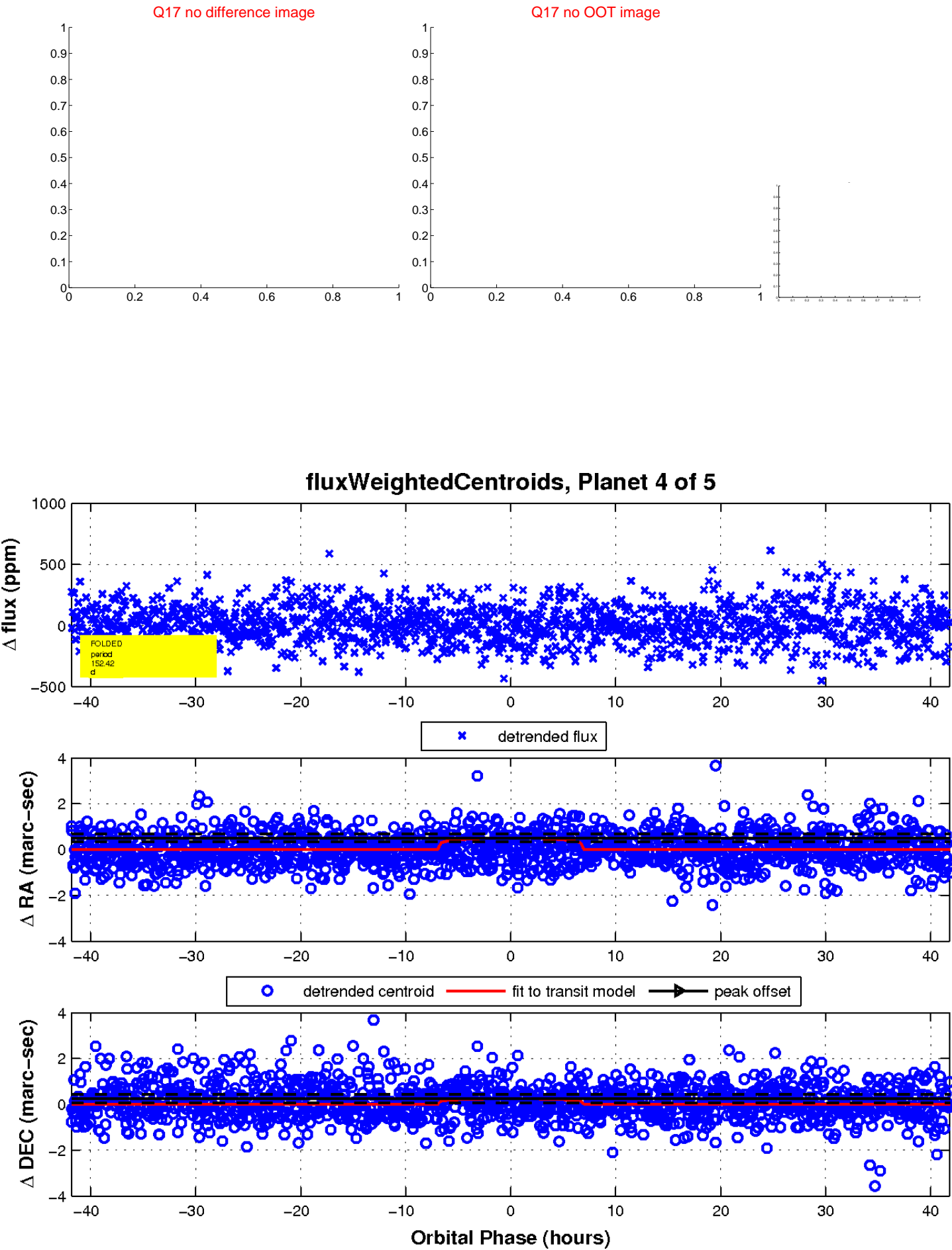
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

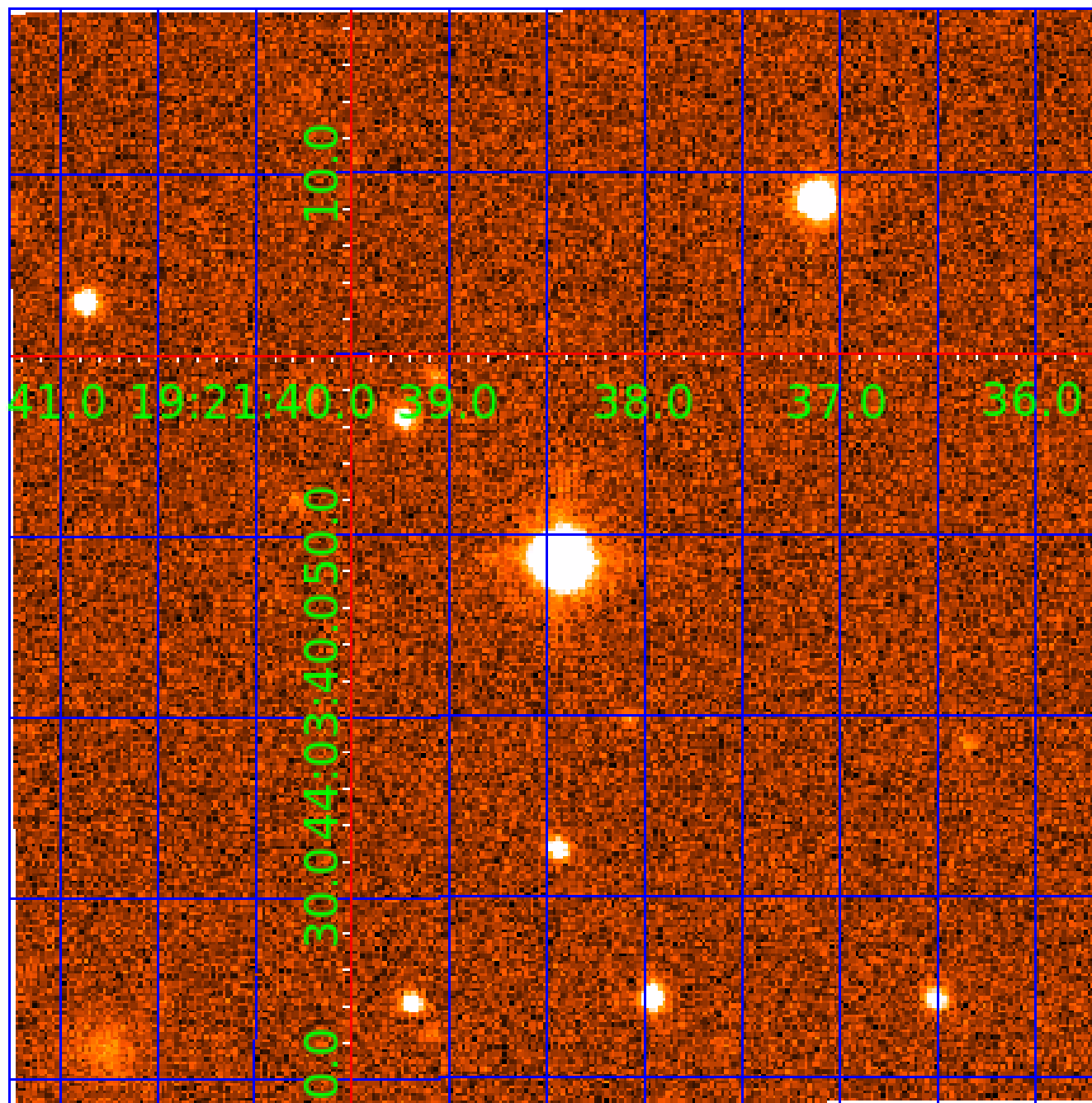


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination



# KIC 008161830

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
008161830-01	OBS	No	2.203132	133.568522	19.2	12.117	10.6	11.1	0.83	5644	0.36	602.91
008161830-02	OBS	No	526.690613	343.691475	335.9	16.410	26.9	12.4	0.83	5644	1.67	0.41
008161830-03	OBS	No	111.075752	141.954731	254.3	1.659	8.2	7.3	0.83	5644	1.68	3.24
008161830-04	OBS	No	152.415640	274.880647	111.9	13.945	9.7	6.0	0.83	5644	0.95	2.12
008161830-05	OBS	No	155.141465	265.124220	242.7	14.015	9.3	9.0	0.83	5644	2.21	2.07

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
008161830-01	OBS	FP	0.00	1	0	1	1	LPP_DV—HALO_GHOST—EPHEM_MATCH
008161830-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_MARSHALL_SKYE—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS
008161830-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—MOD_NONUNIQ_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS
008161830-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_MARSHALL—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_NONUNIQ_ALT—INCONSISTENT_TRANS—CENT_FEW_MEAS
008161830-05	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_MARSHALL—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—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 008161830-05

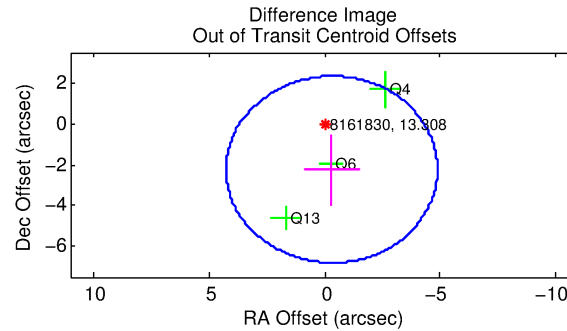
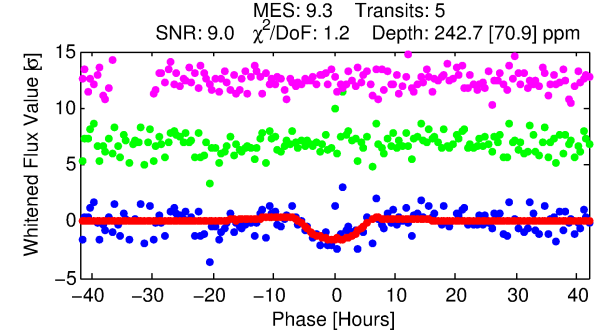
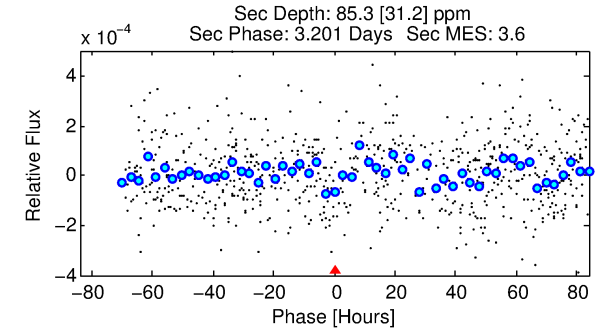
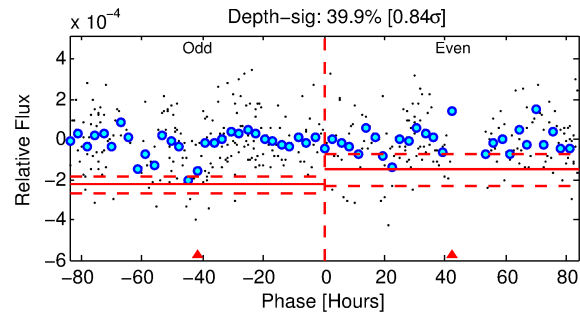
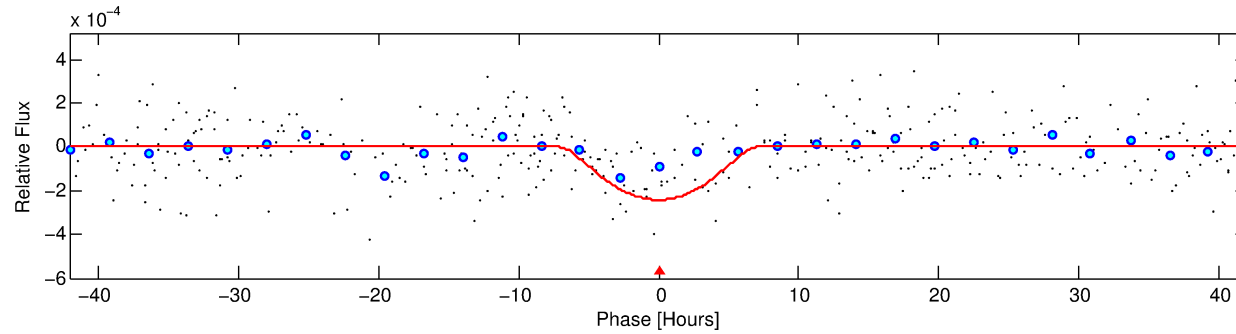
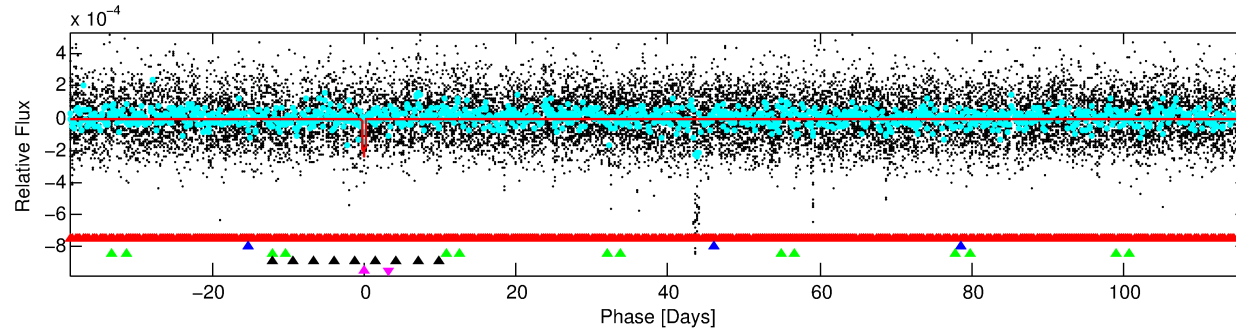
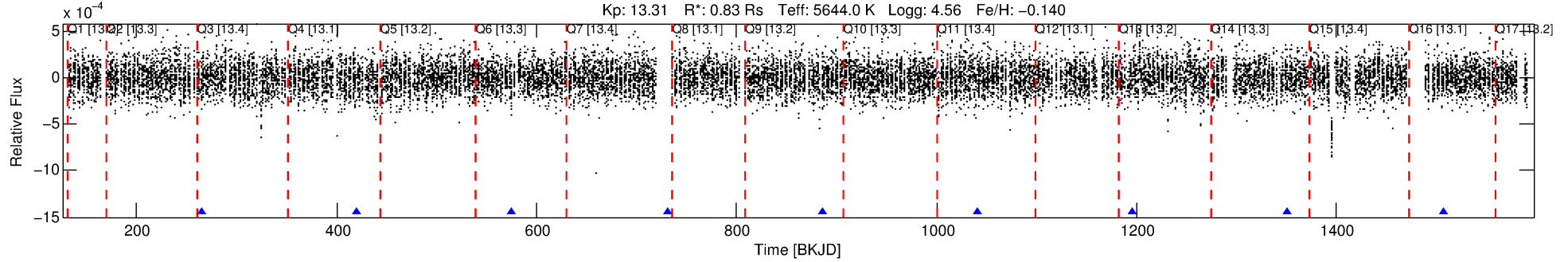
No Significant Match Found

# DV One-Page Summary

KIC: 8161830 Candidate: 5 of 5 Period: 155.141 d

KOI: K03046 Corr: No Ephemeris Match

Kp: 13.31 R\*: 0.83 Rs Teff: 5644.0 K Logg: 4.56 Fe/H: -0.140



## DV Fit Results:

Period = 155.14146 [0.00839] d  
Epoch = 265.1242 [0.0303] BKJD  
Rp/R\* = 0.0243 [0.0459]  
a/R\* = 21.64 [15.09]  
b = 0.99 [0.08]  
Seff = 2.07 [0.62]  
Teq = 306 [23] K  
Rp = 2.21 [4.19] Re  
a = 0.5503 [0.1070] AU  
Ag = 2922.04 [11103.87] [0.26σ]  
Teffp = 3478 [3297] K [0.96σ]

## DV Diagnostic Results:

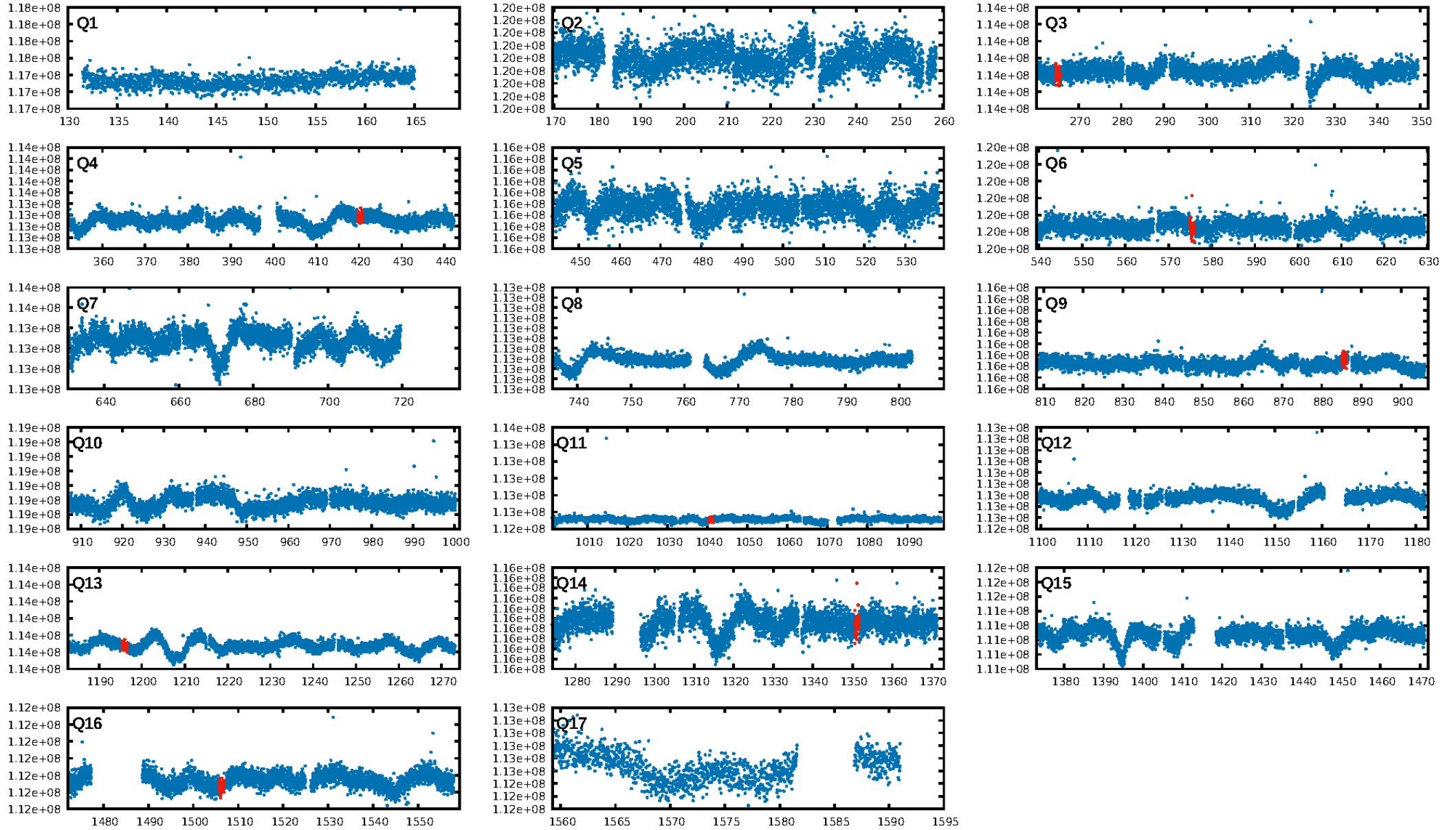
ShortPeriod-sig: 99.9% [3.31σ]  
LongPeriod-sig: 100.0% [413.21σ]  
ModelChiSquare2-sig: 47.4%  
ModelChiSquareGof-sig: 100.0%  
**Bootstrap-pfa: 1.11e-09**  
RollingBand-fgt: 1.00 [5/5]  
**GhostDiagnostic-chr: -0.5385**  
Centroid-sig: 47.8%  
Centroid-so: 0.681 arcsec [0.74σ]  
OotOffset-rm: 2.258 arcsec [1.48σ]  
KicOffset-rm: 2.370 arcsec [1.71σ]  
OotOffset-st: 1/0/1/1 [3]  
KicOffset-st: 1/0/1/1 [3]  
DiffImageQuality-fgm: 0.33 [1/3]  
DiffImageOverlap-fno: 0.00 [0/6]

Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 31-Jan-2016 08:31:01 Z

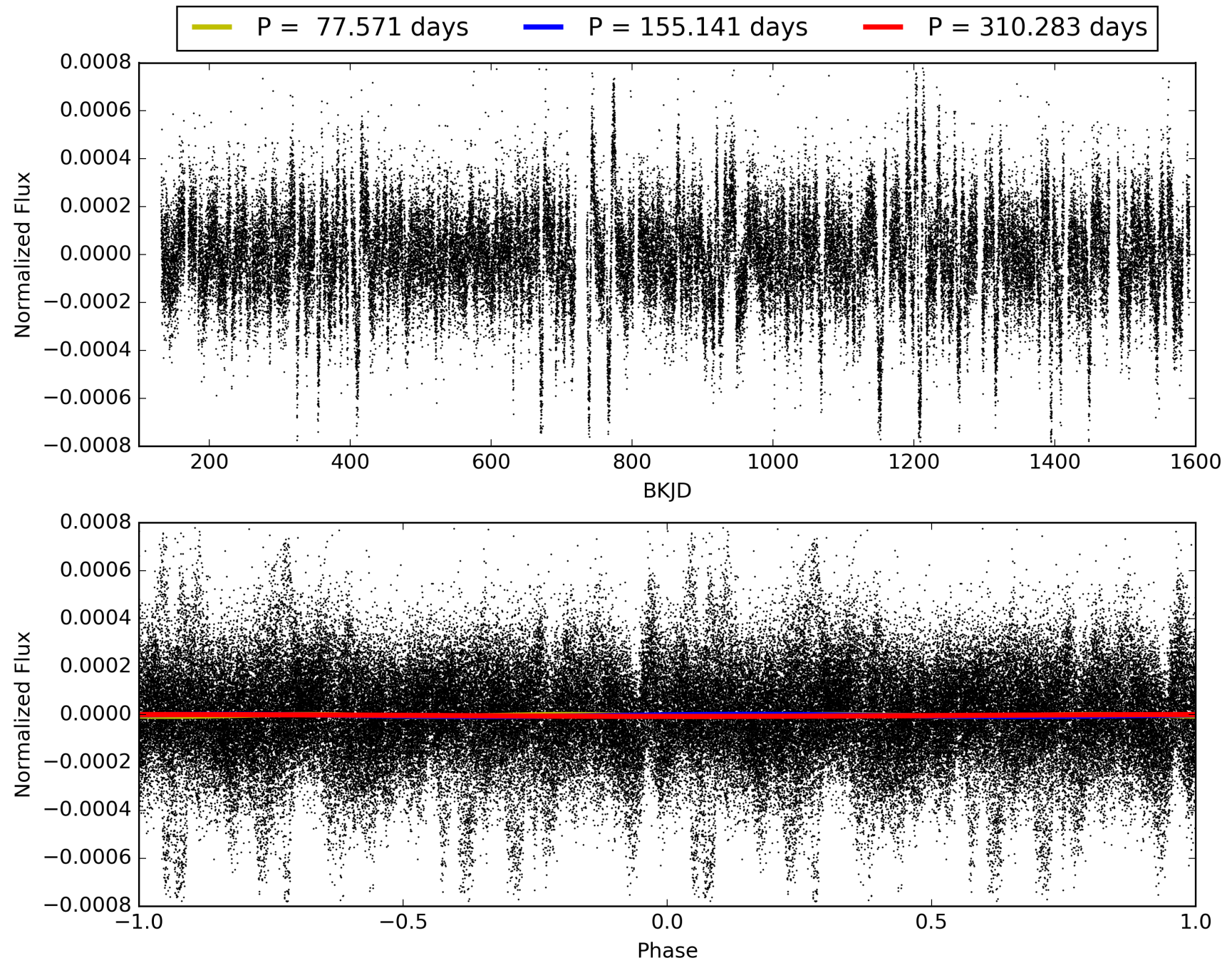
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center



# TCE 008161830-05, PDC Light Curves

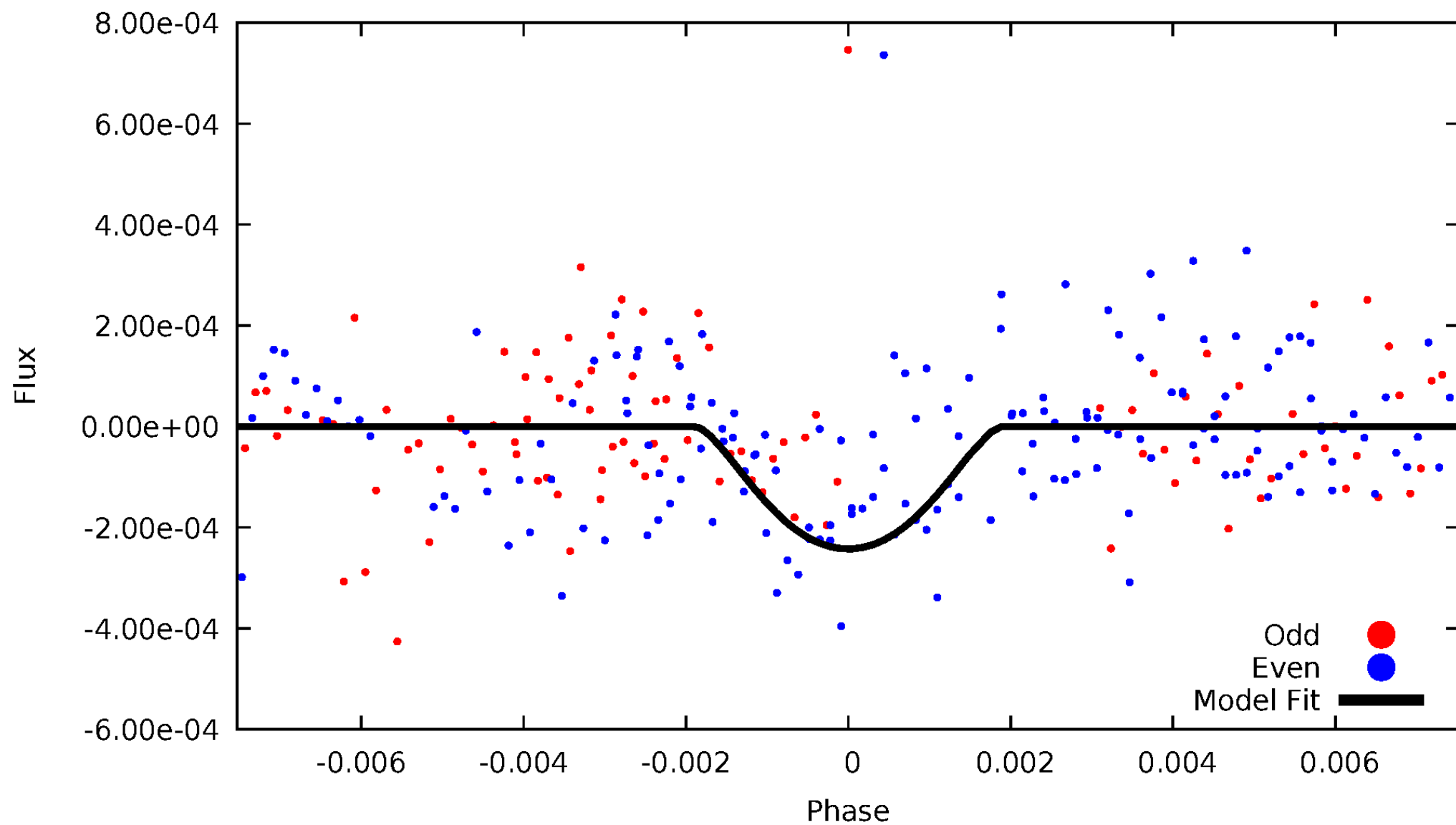


TCE 008161830-05



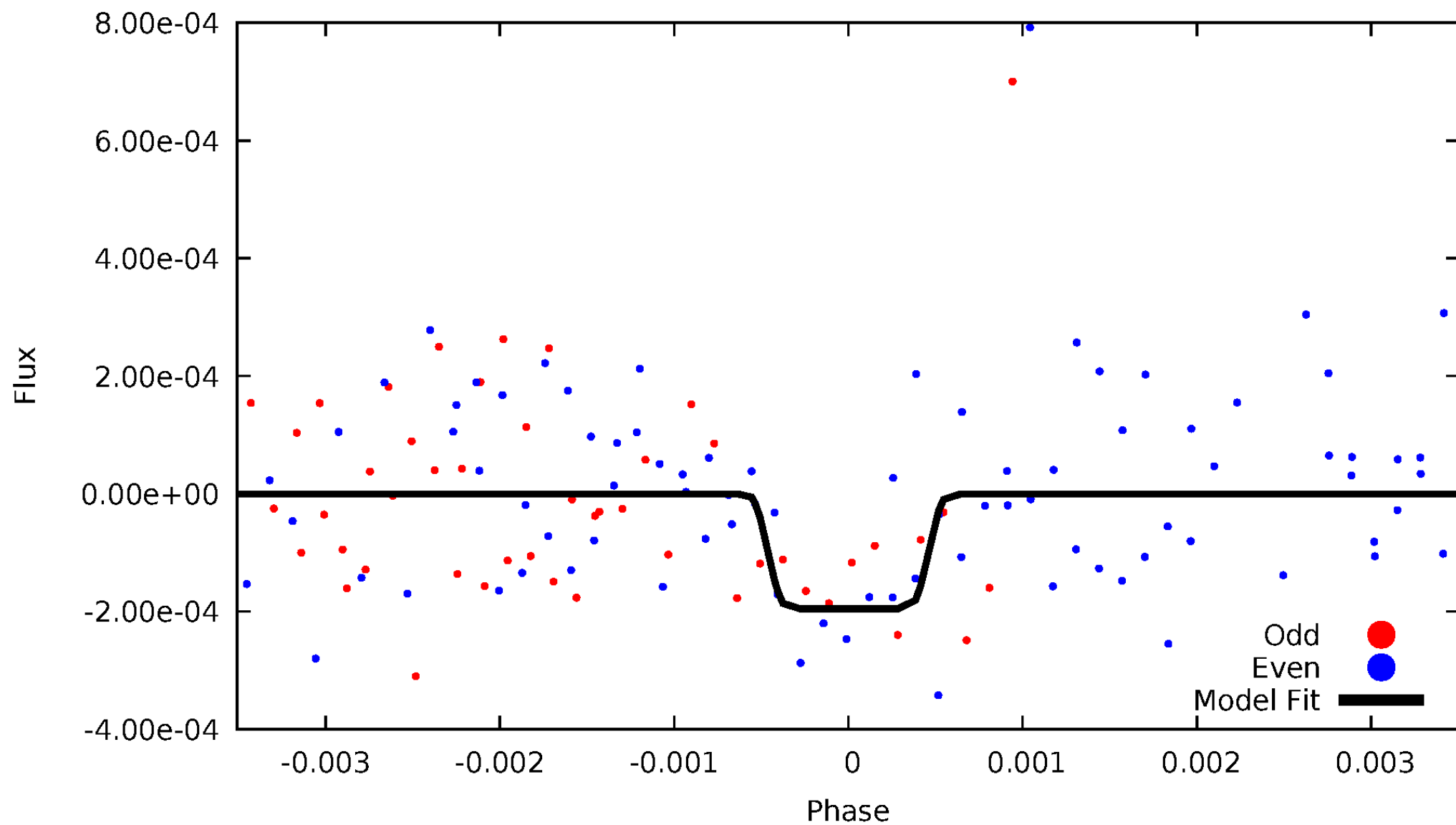
# DV Odd/Even

TCE 008161830-05



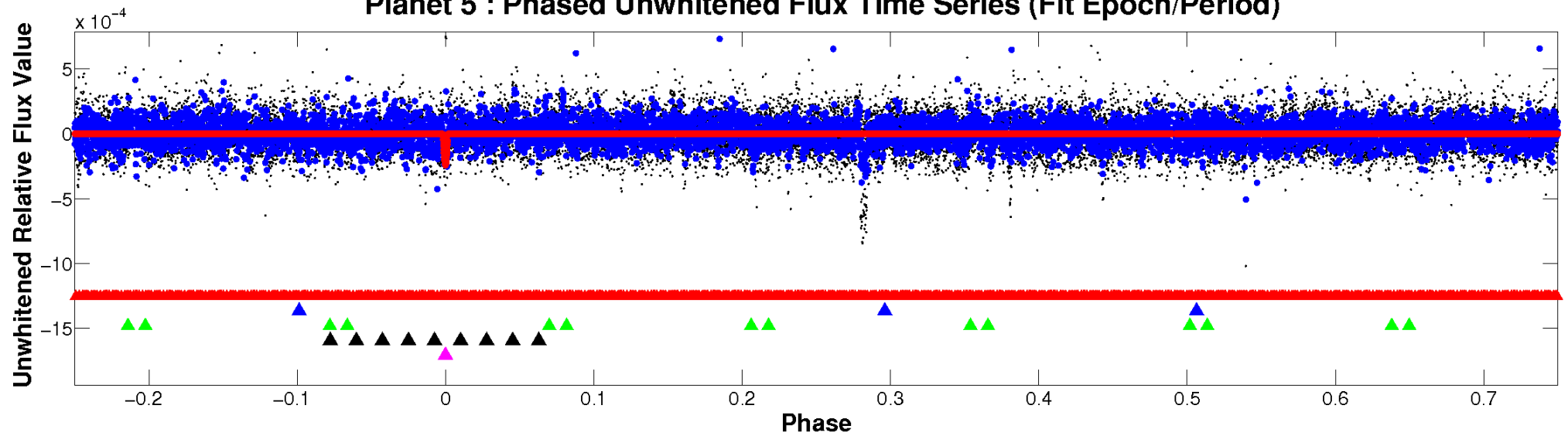
# ALT Odd/Even

TCE 008161830-05

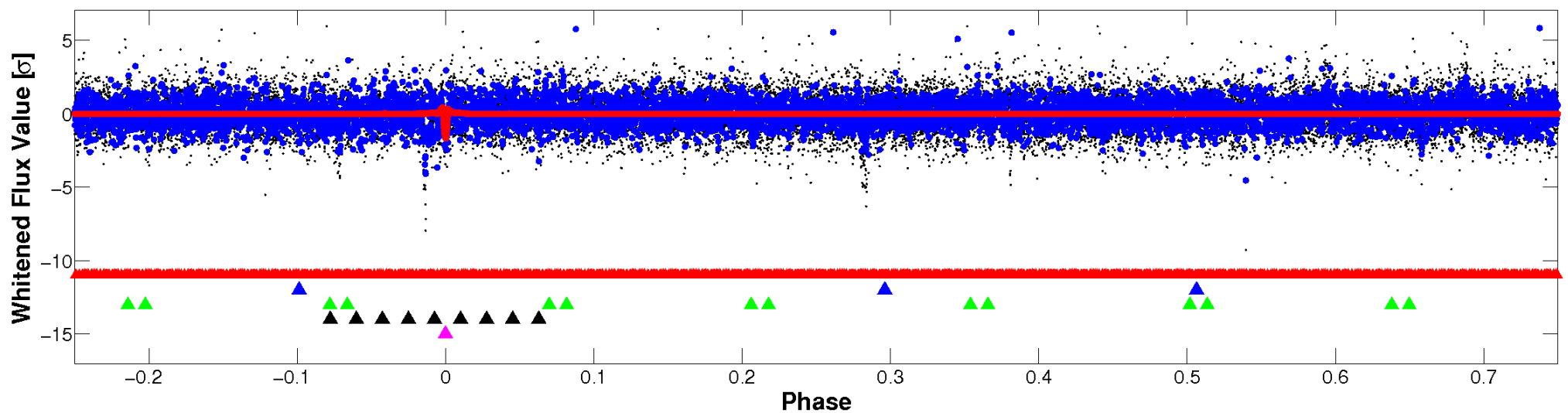


# Non-Whitened Vs. Whitened Light Curve

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

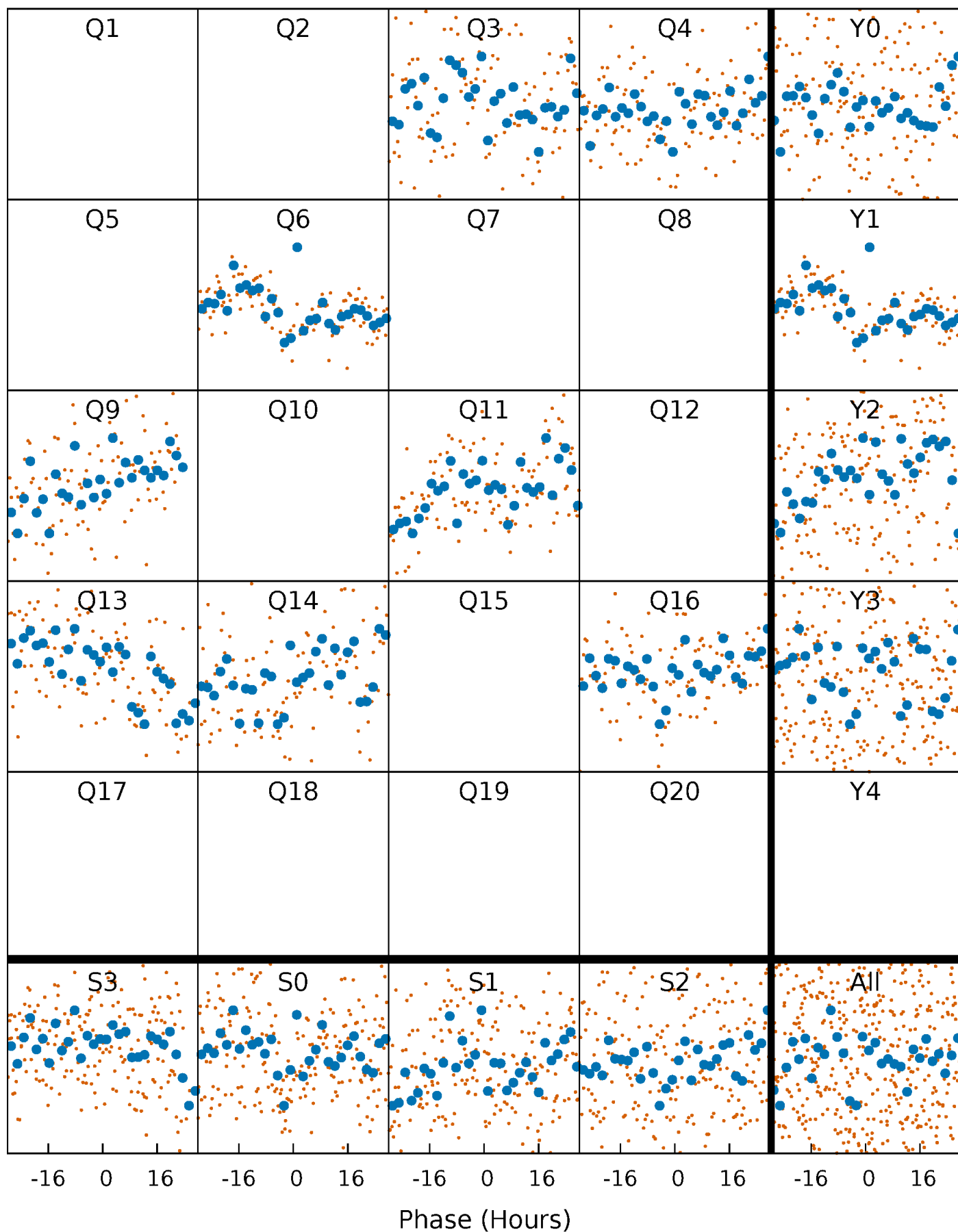


Planet 5 : Phased Whitened Flux Time Series (Fit Epoch/Period)



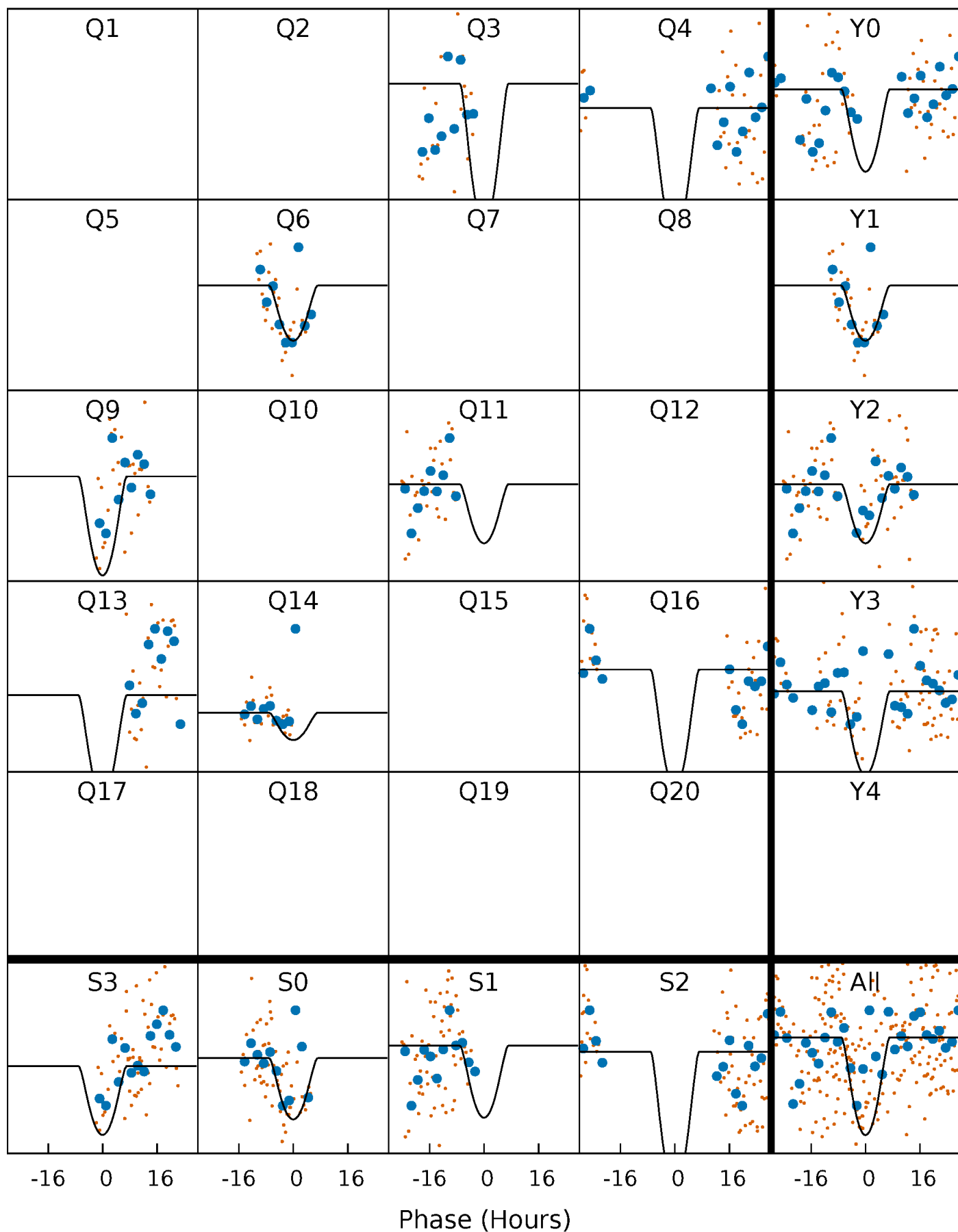
# PDC Quarter-Phased Transit Curves

TCE 008161830-05     $P=155.141465$  Days     $T_0=265.124220$  (BKJD)



# DV Quarter-Phased Transit Curves

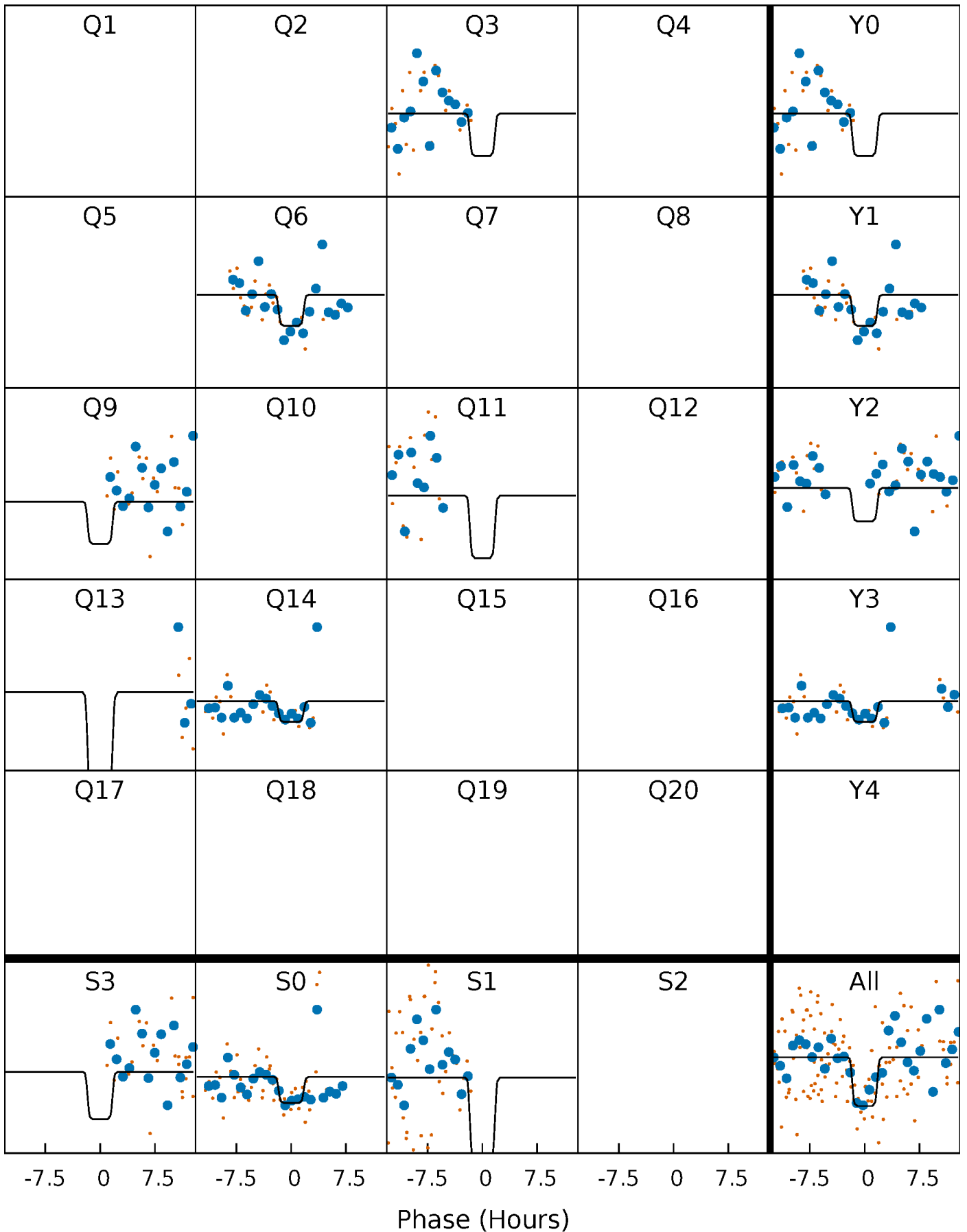
TCE 008161830-05     $P=155.141465$  Days     $T_0=265.124220$  (BKJD)





# Alt. Detrend Quarter-Phased Transit Curves

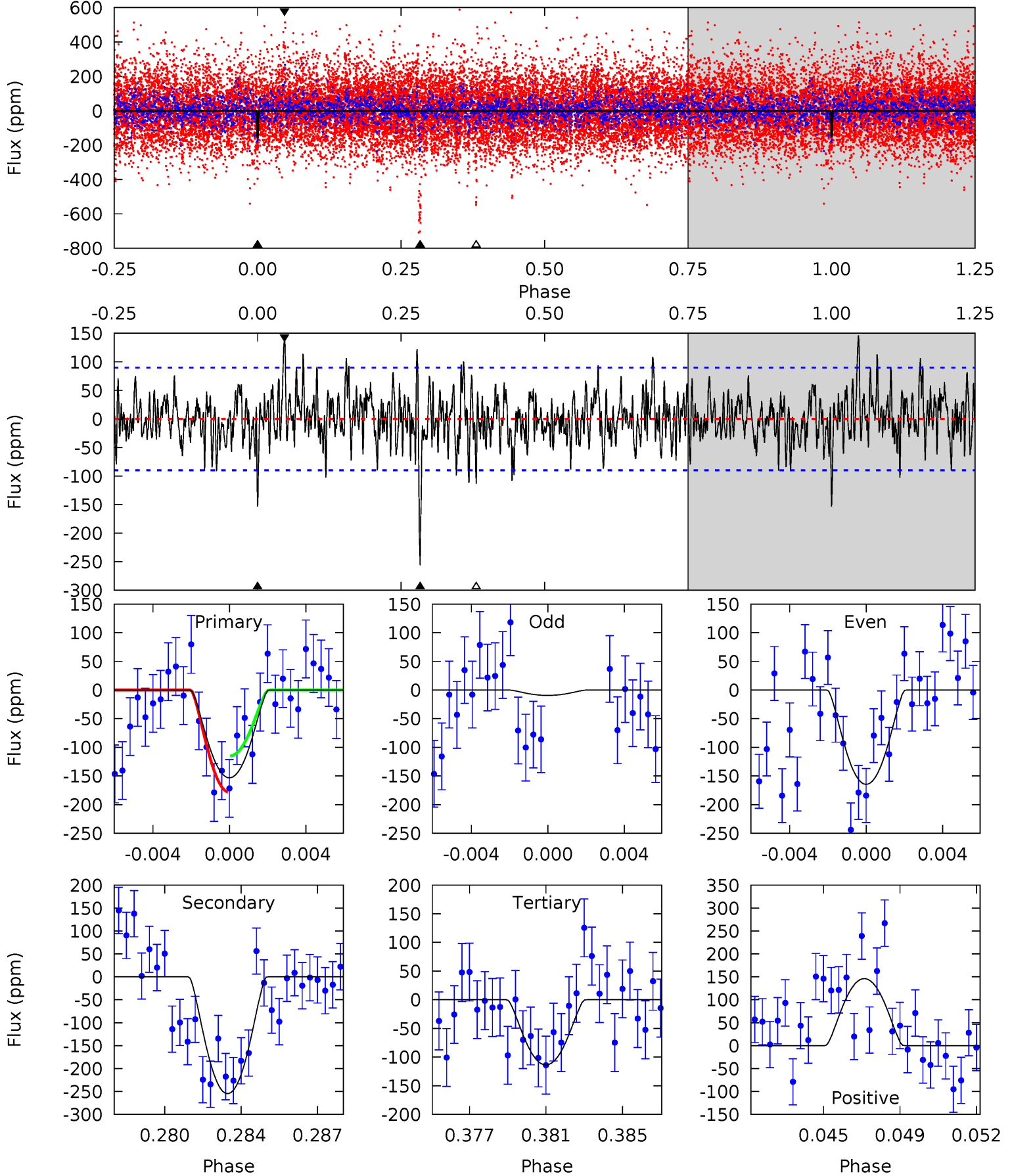
TCE 008161830-05     $P=155.130904$  Days     $T_0=265.051391$  (BKJD)



# DV Model-Shift Uniqueness Test

008161830-05, P = 155.141465 Days, E = 109.982755 Days

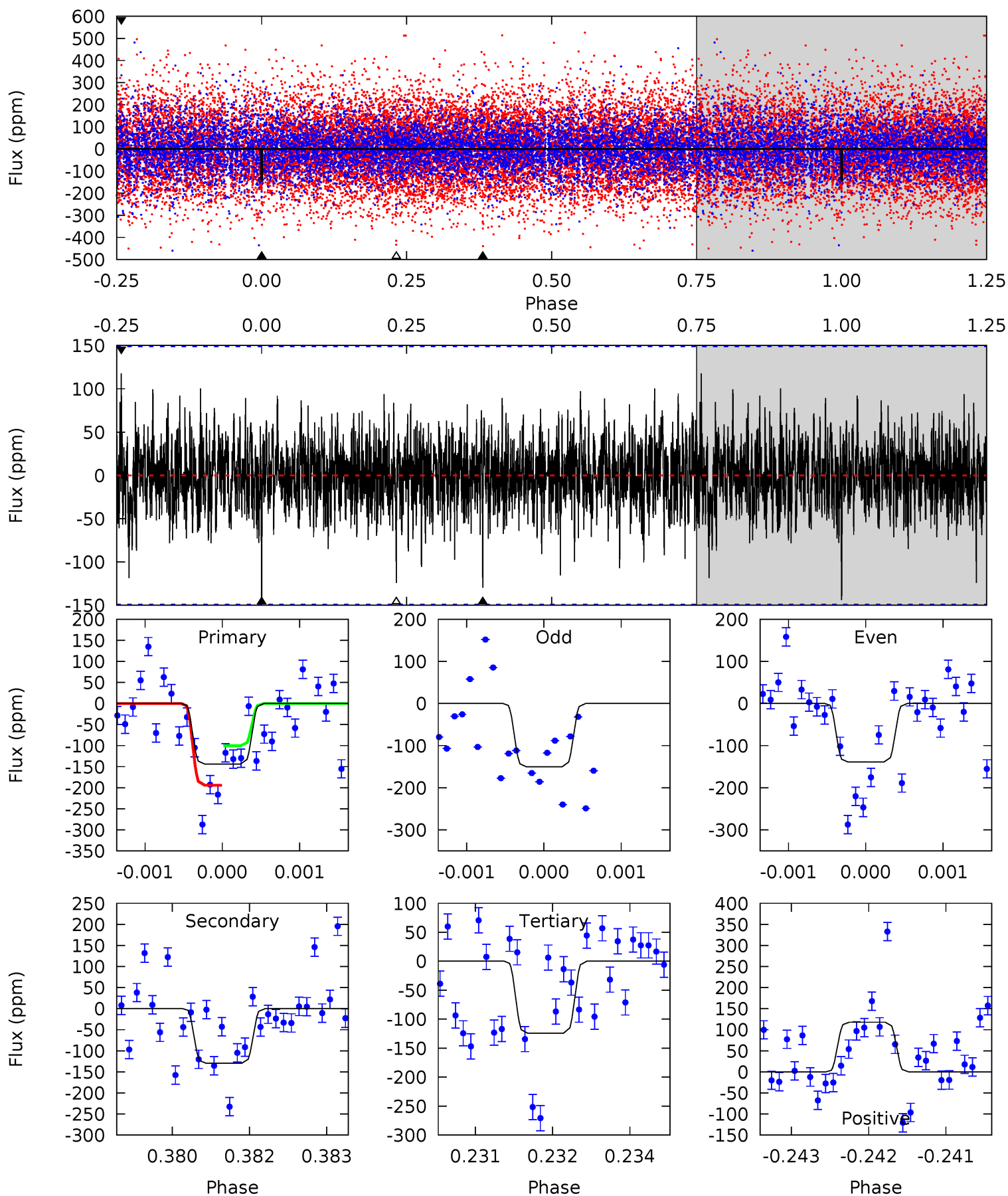
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
8.89	14.8	6.59	8.48	5.21	2.90	2.09	2.30	0.41	8.19	6.31	3.71	0.94	0.36	0



# Alt Model-Shift Uniqueness Test

008161830-05, P = 155.130904 Days, E = 109.920487 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
5.23	4.70	4.51	4.28	5.42	3.24	1.11	0.72	0.95	0.19	0.42	0.20	0.78	0.45	1.69



### Stellar Parameters For KIC 008161830

	$T_{\text{eff}} (K)$	$\log(g)$	$[\text{Fe}/\text{H}]$	$R (R_{\odot})$	$M (M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$5644^{+152}_{-152}$	$4.564^{+0.038}_{-0.152}$	$-0.140^{+0.300}_{-0.300}$	$0.831^{+0.194}_{-0.078}$	$0.928^{+0.083}_{-0.104}$	$2.279^{+0.443}_{-0.987}$
	+3%/-3%	+1%/-3%	+214%/-214%	+23%/-9%	+9%/-11%	+19%/-43%
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 008161830-05 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-255 \pm 17$	$4.03^{+3.57}_{-2.59}$	$436^{+22}_{-18}$	$3827^{+1925}_{-704}$	$2601^{+17382}_{-1890}$
Alt.	$-129 \pm 28$	$3.53^{+3.71}_{-2.44}$	$437^{+24}_{-19}$	$3569^{+2032}_{-696}$	$1601^{+15582}_{-1205}$

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

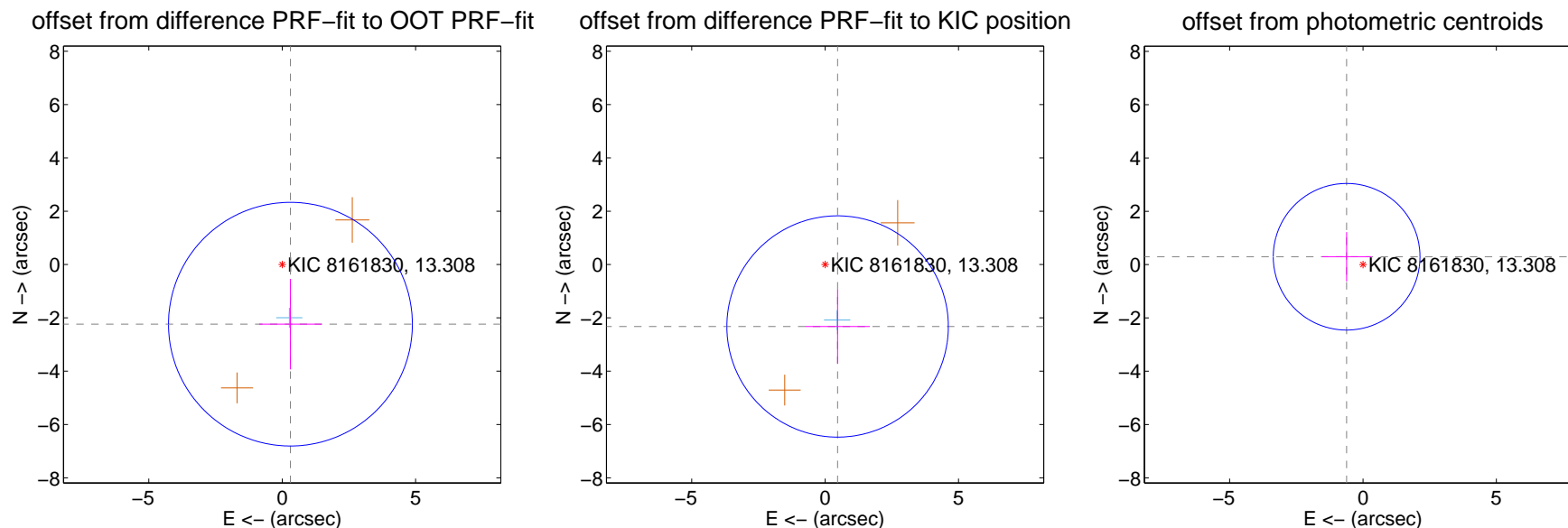
## DV Centroid Data

Supplemental centroid analysis for 008161830-05. Kepler magnitude: 13.31. Transit SNR 9.02

There are 1 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	$2.258 \pm 1.523$	1.48	$-0.309 \pm 1.173$	$-2.237 \pm 1.699$
PRF-fit source offset from KIC position	$2.370 \pm 1.384$	1.71	$-0.468 \pm 1.209$	$-2.323 \pm 1.390$
photometric centroid source offset	$0.68 \pm 0.92$	0.74	$0.61 \pm 0.92$	$0.29 \pm 0.92$



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.

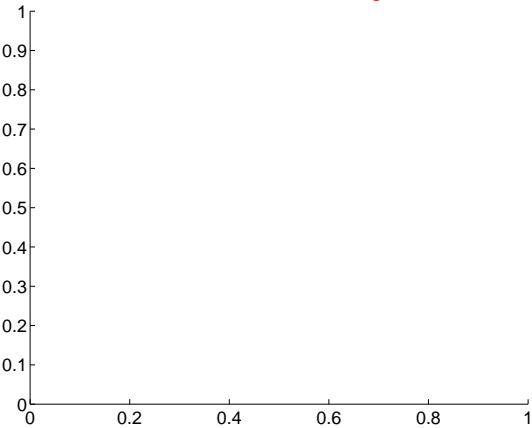
Q1 no difference image



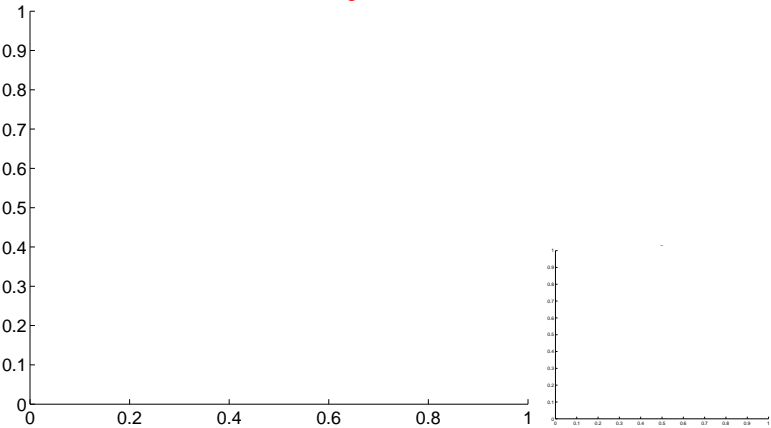
Q1 no OOT image



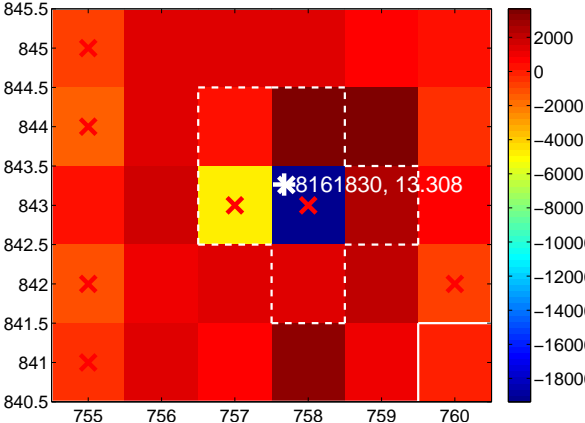
Q2 no difference image



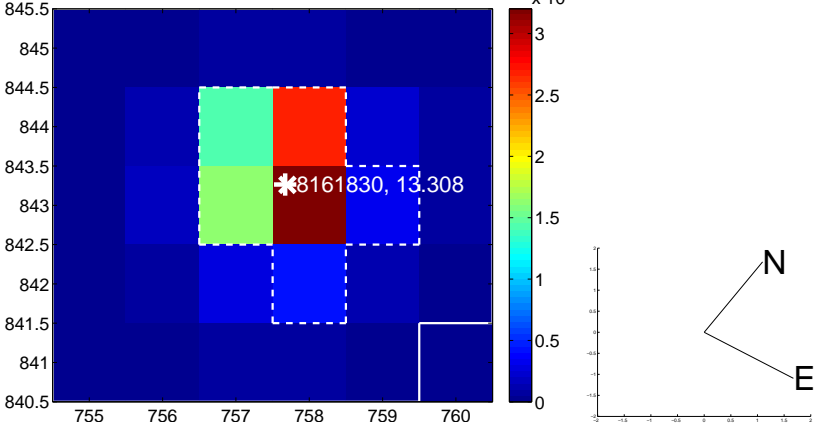
Q2 no OOT image



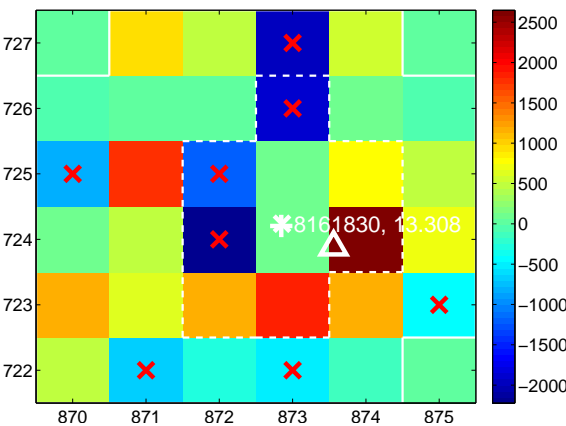
Q3 difference image. Poor Quality



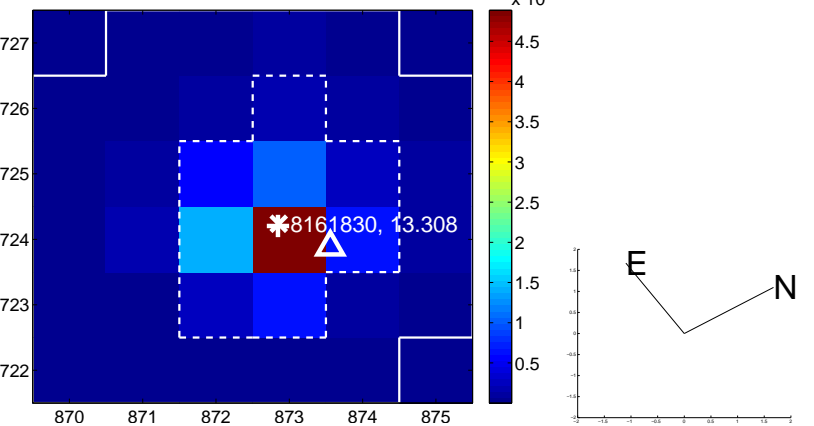
Q3 OOT image



Q4 difference image. Poor Quality



Q4 OOT image

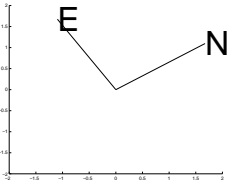
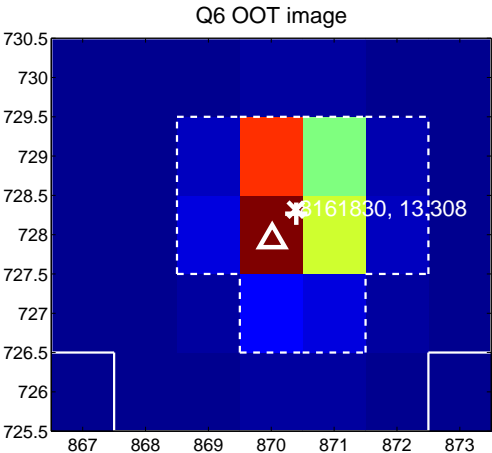
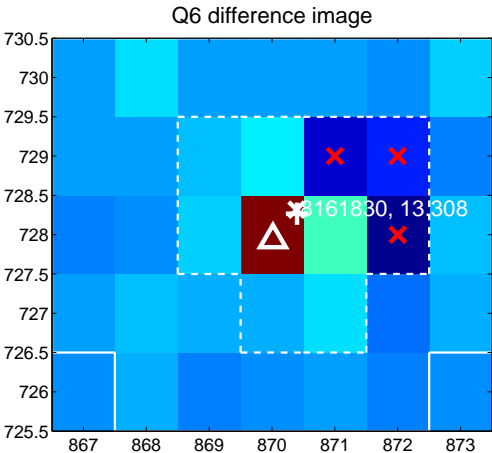


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

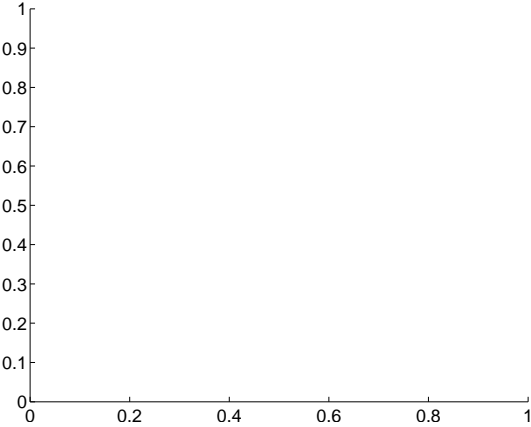
Q5 no difference image



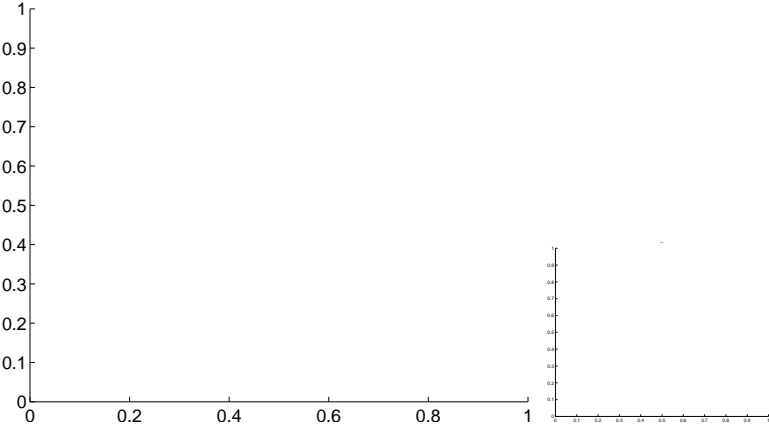
Q5 no OOT image



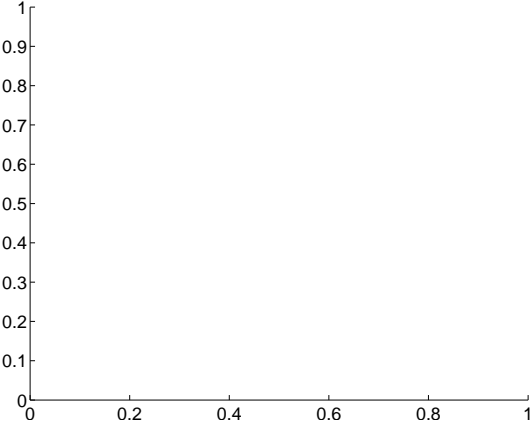
Q7 no difference image



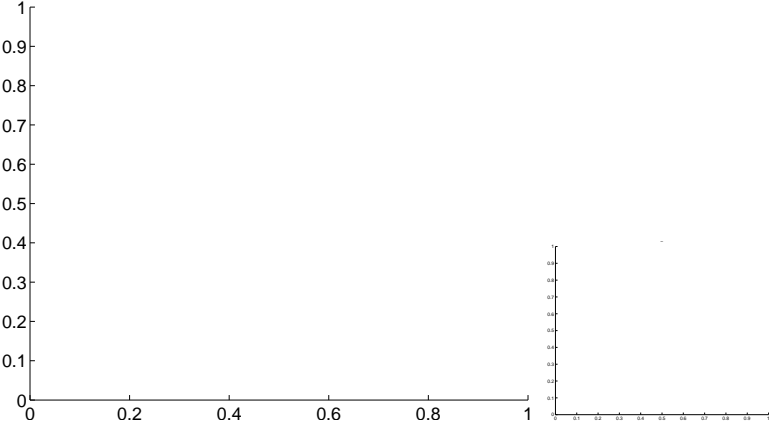
Q7 no OOT image



Q8 no difference image

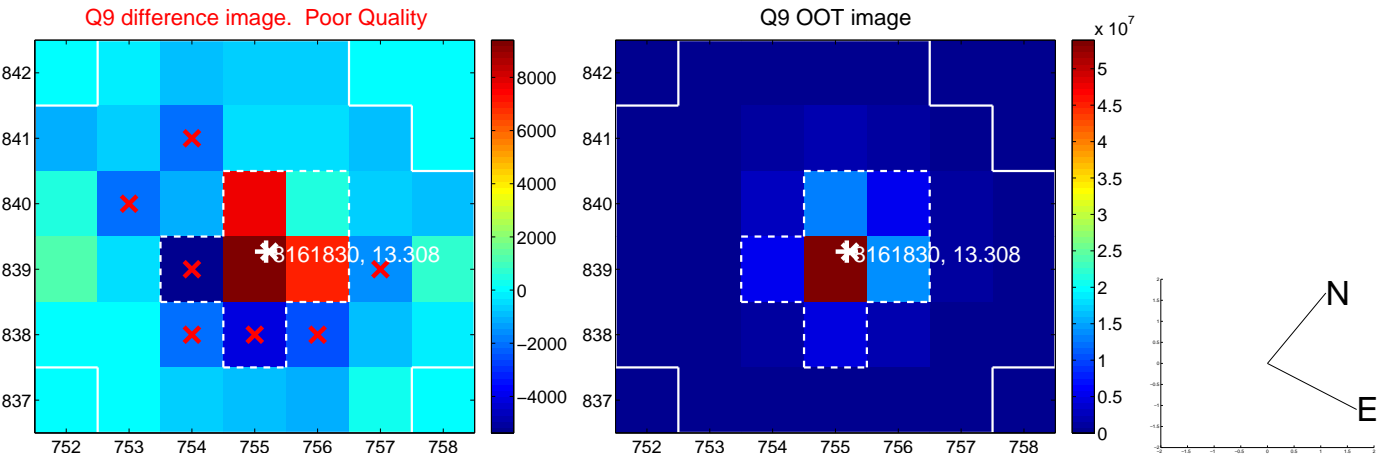


Q8 no OOT image

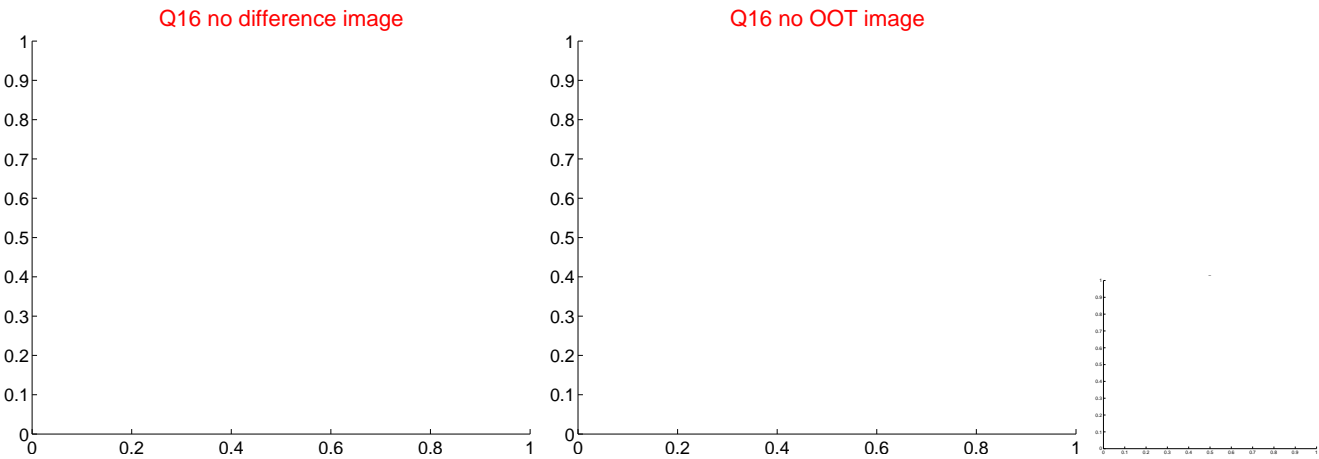
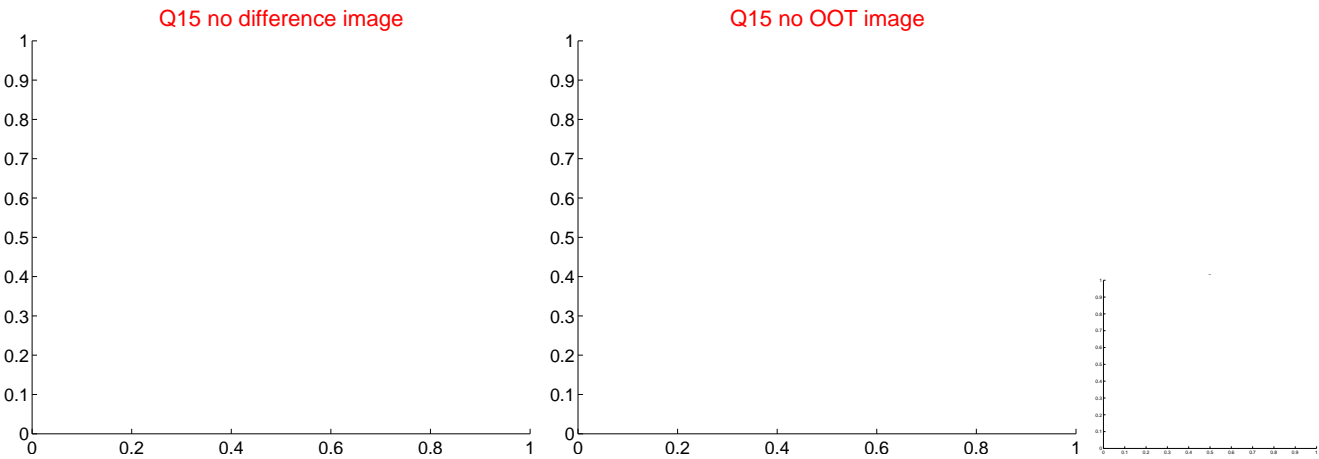
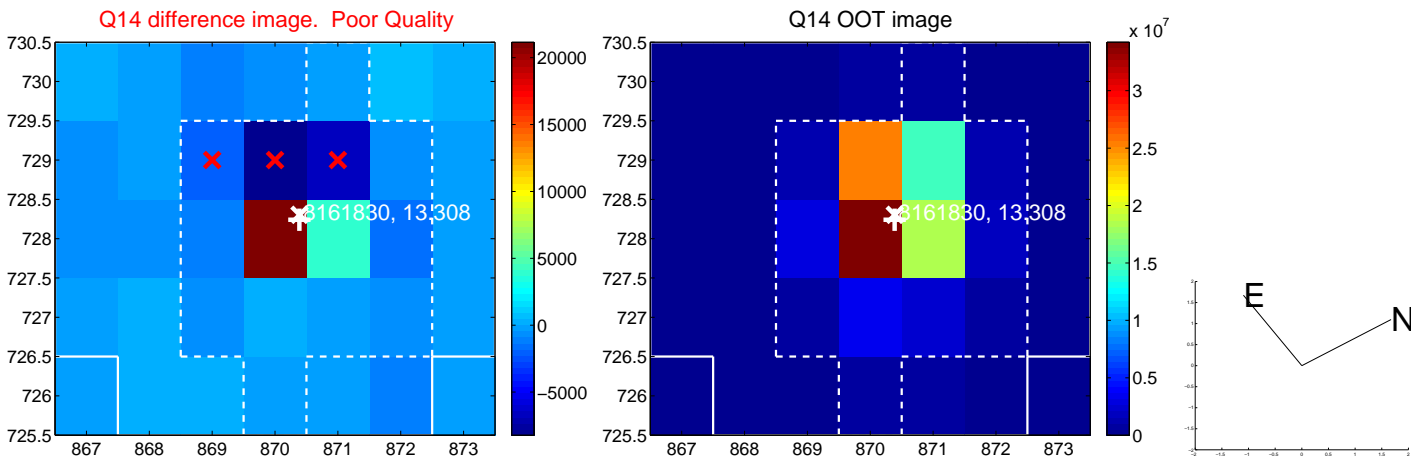
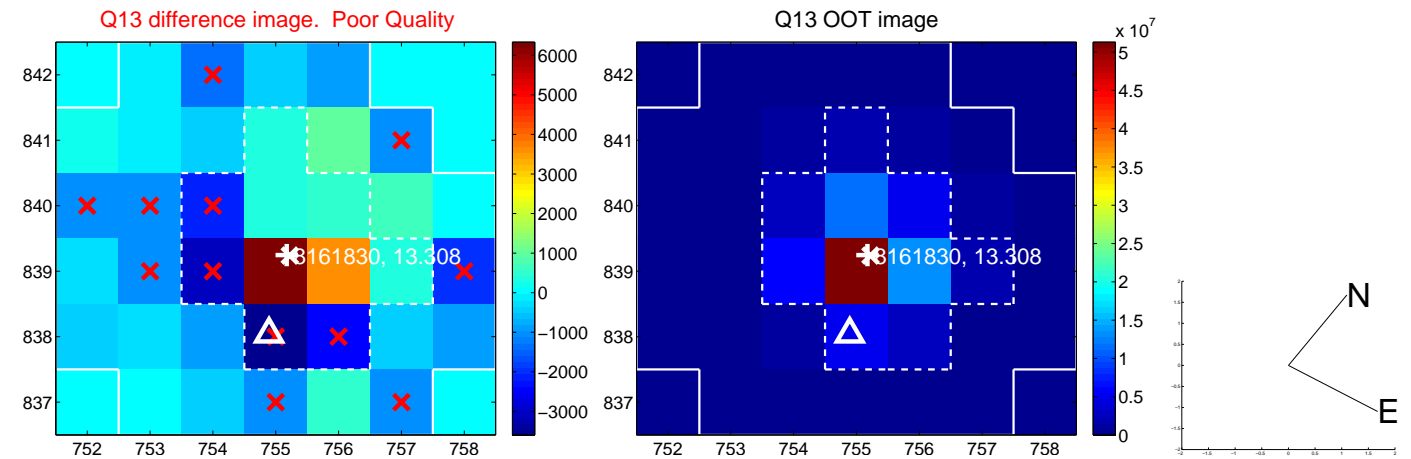




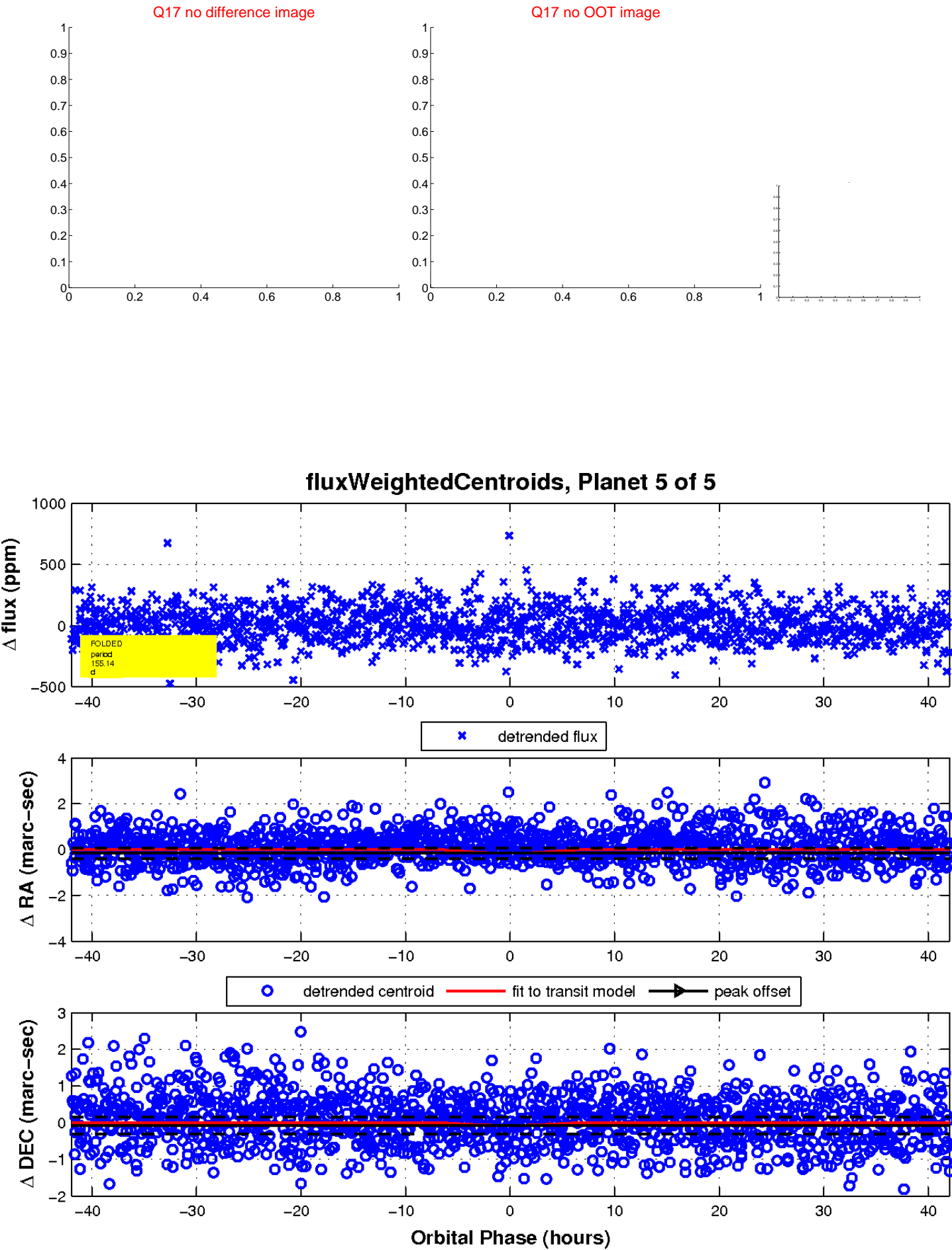
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

