

# KIC 011656840

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
011656840-01	OBS	0774.01	7.442653	132.758499	24531.4	2.376	1044.7	977.1	0.96	6108	15.32	207.25
011656840-02	OBS	No	3.721311	132.625719	261.2	4.103	13.1	12.3	0.96	6108	3.08	522.24

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
011656840-01	OBS	FP	0.01	0	1	0	0	MOD_SEC_DV—MOD_SEC_ALT—HAS_SEC_TCE
011656840-02	OBS	FP	0.00	1	1	0	0	IS_SEC_TCE

**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.

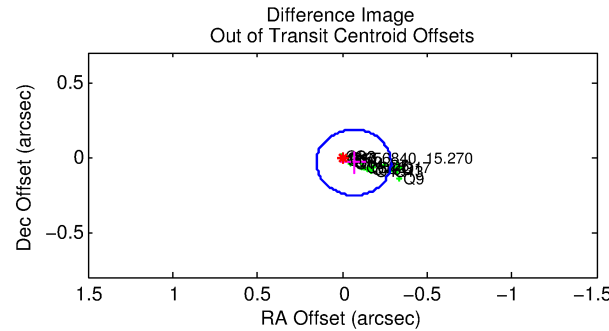
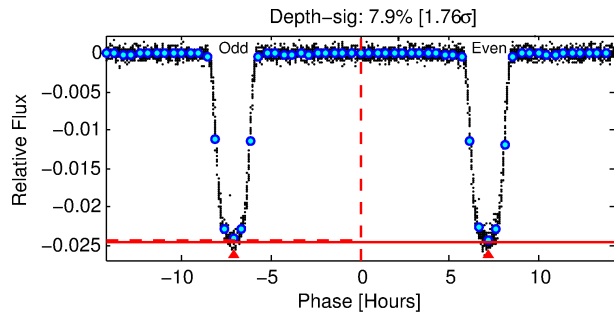
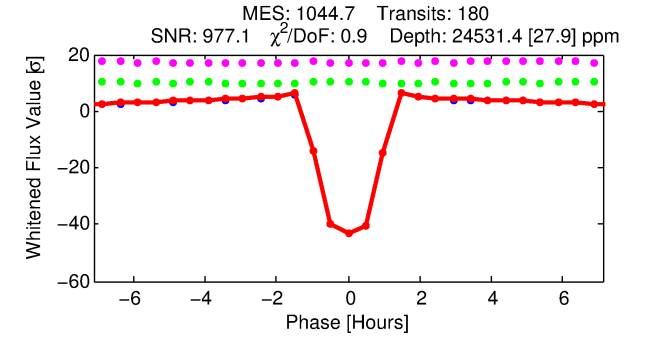
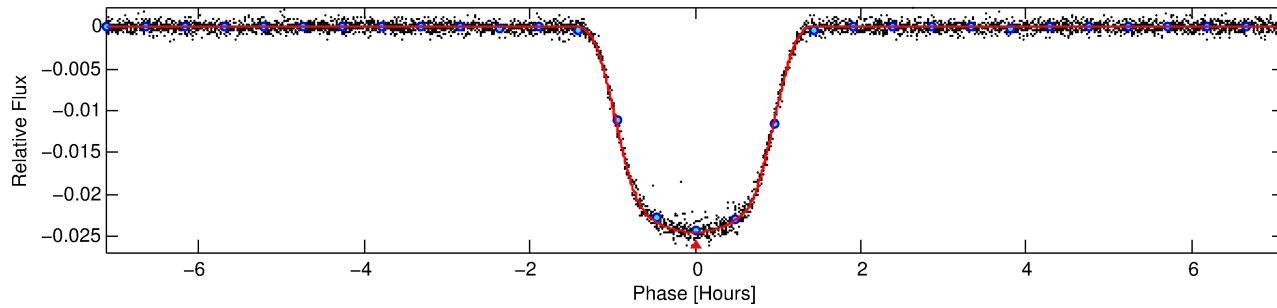
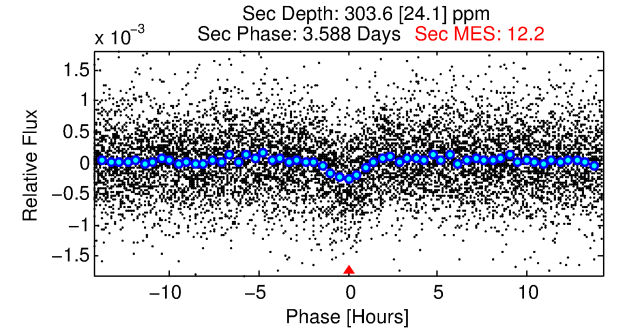
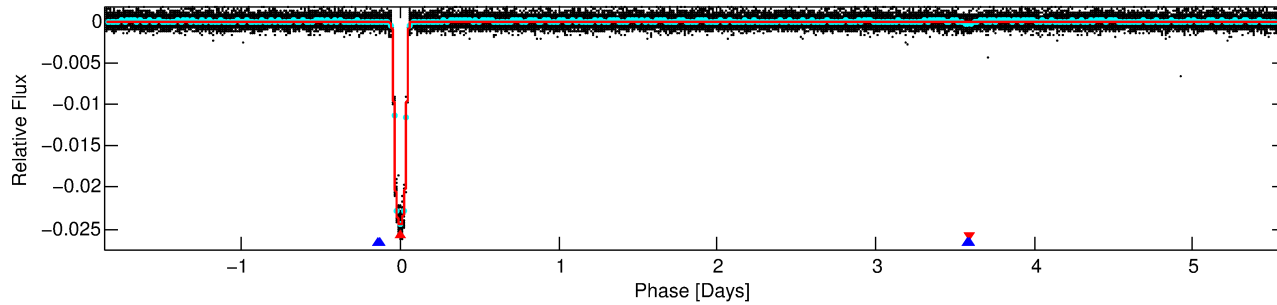
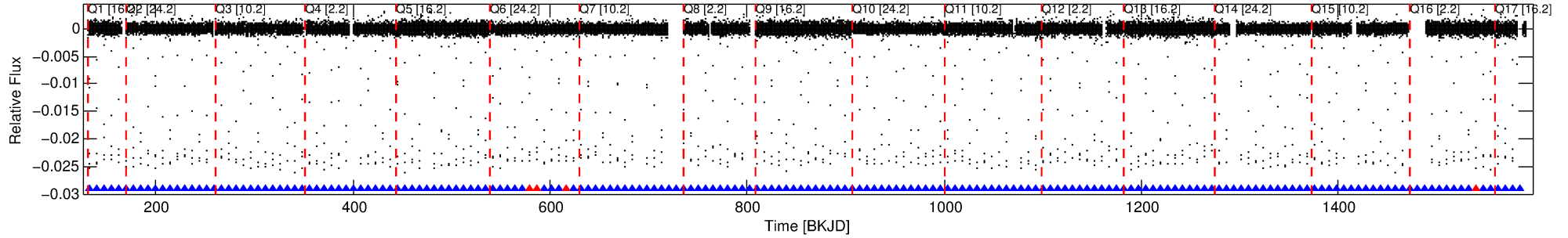
## Ephemeris Match Information For 011656840-01

No Significant Match Found

# DV One-Page Summary

KIC: 11656840 Candidate: 1 of 2 Period: 7.443 d  
KOI: K00774.01 Corr: 0.988

Kp: 15.27 R\*: 0.96 Rs Teff: 6108.0 K Logg: 4.47 Fe/H: -0.300



## DV Fit Results:

Period = 7.44265 [0.00000] d  
Epoch = 132.7585 [0.0000] BKJD  
Rp/R\* = 0.1468 [0.0004]  
a/R\* = 25.56 [0.30]  
b = 0.42 [0.02]  
Seff = 207.25 [84.26]  
Teq = 967 [98] K  
Rp = 15.32 [4.82] Re  
a = 0.0742 [0.0196] AU  
Ag = 3.92 [1.54] [1.90σ]  
Teffp = 2104 [81] K [8.93σ]

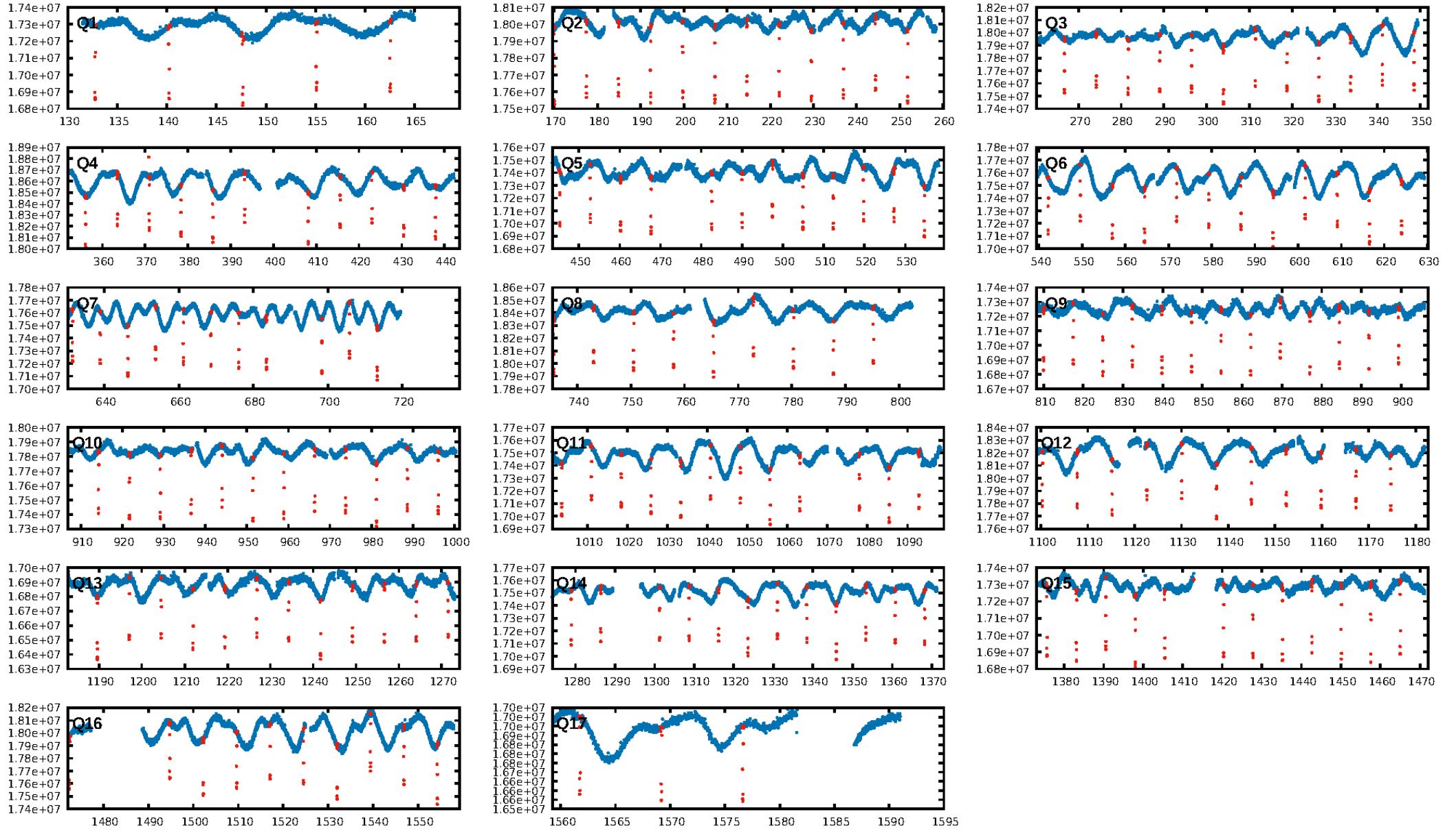
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [18.84σ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: 0.0%  
ModelChiSquareGof-sig: 100.0%  
Bootstrap-pfa: 0.00e+00  
RollingBand-fgt: 0.98 [168/172]  
GhostDiagnostic-chr: 3.631  
Centroid-sig: 0.0%  
Centroid-so: 0.208 arcsec [15.92σ]  
OotOffset-rm: 0.076 arcsec [1.04σ]  
KicOffset-st: 4/4/4/5 [17]  
KicOffset-st: 4/4/4/5 [17]  
DiffImageQuality-fgm: 1.00 [17/17]  
DiffImageOverlap-fno: 0.00 [0/17]

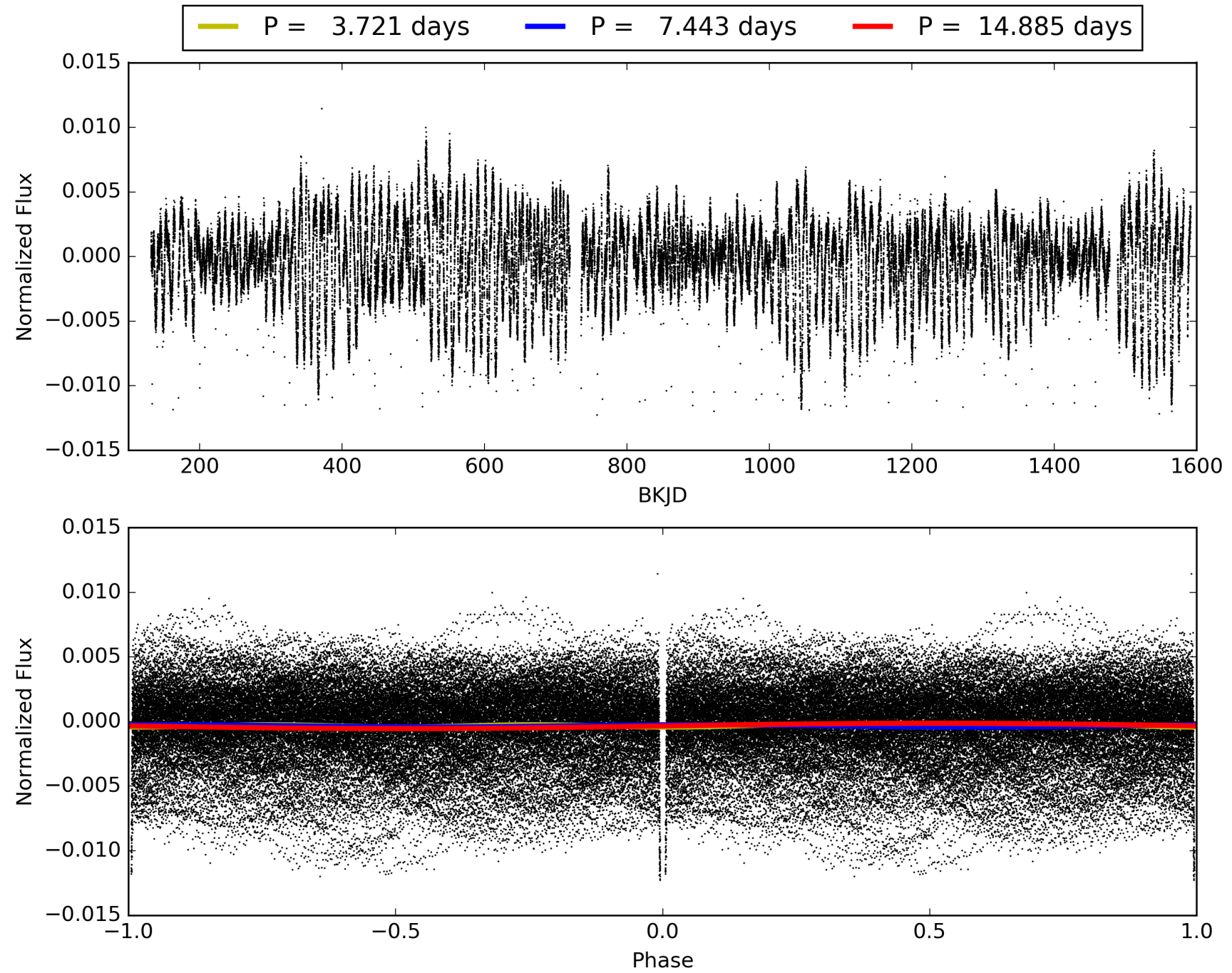
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 29-Jan-2016 12:05:06 Z

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

# TCE 011656840-01, PDC Light Curves

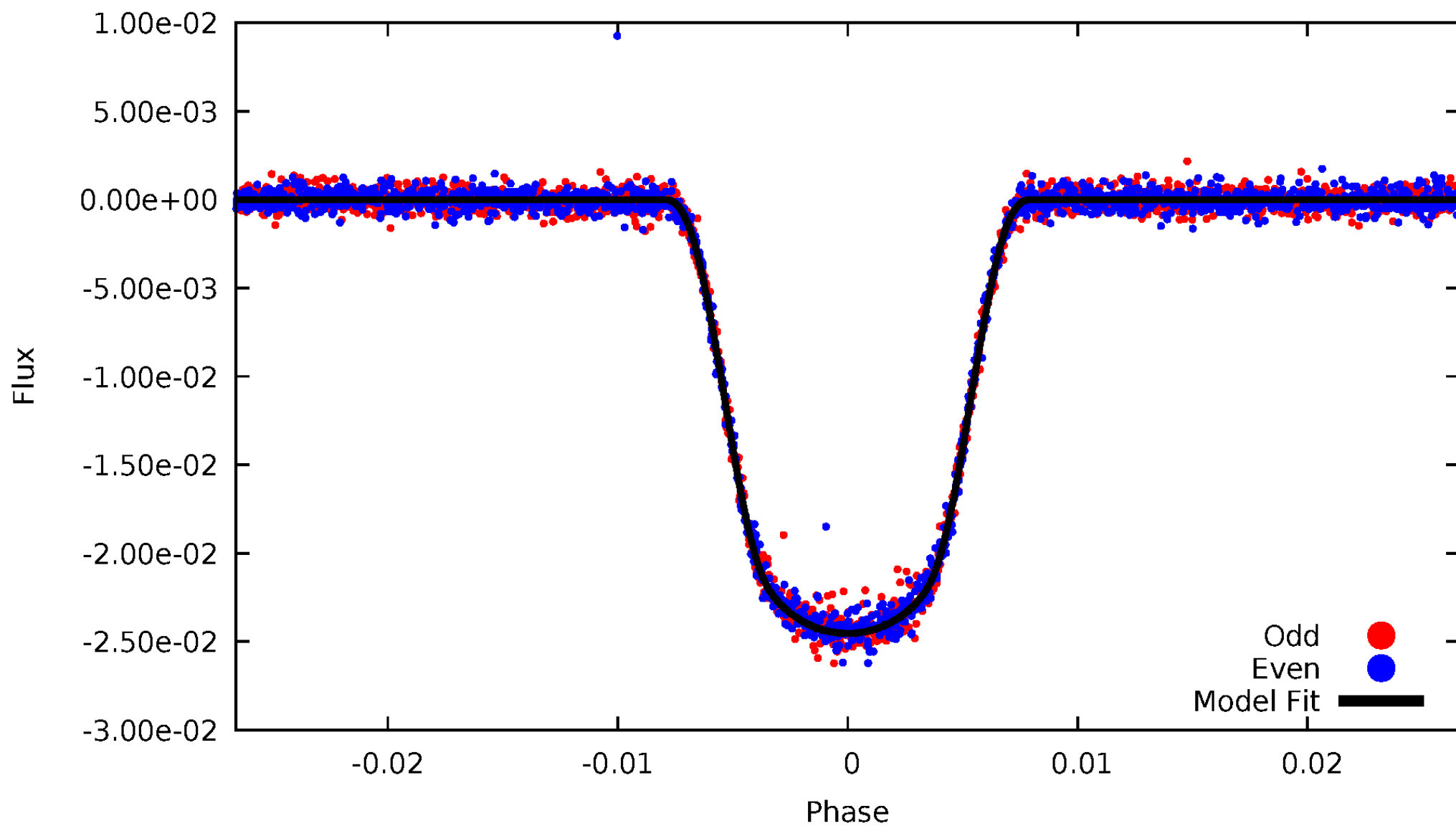


TCE 011656840-01



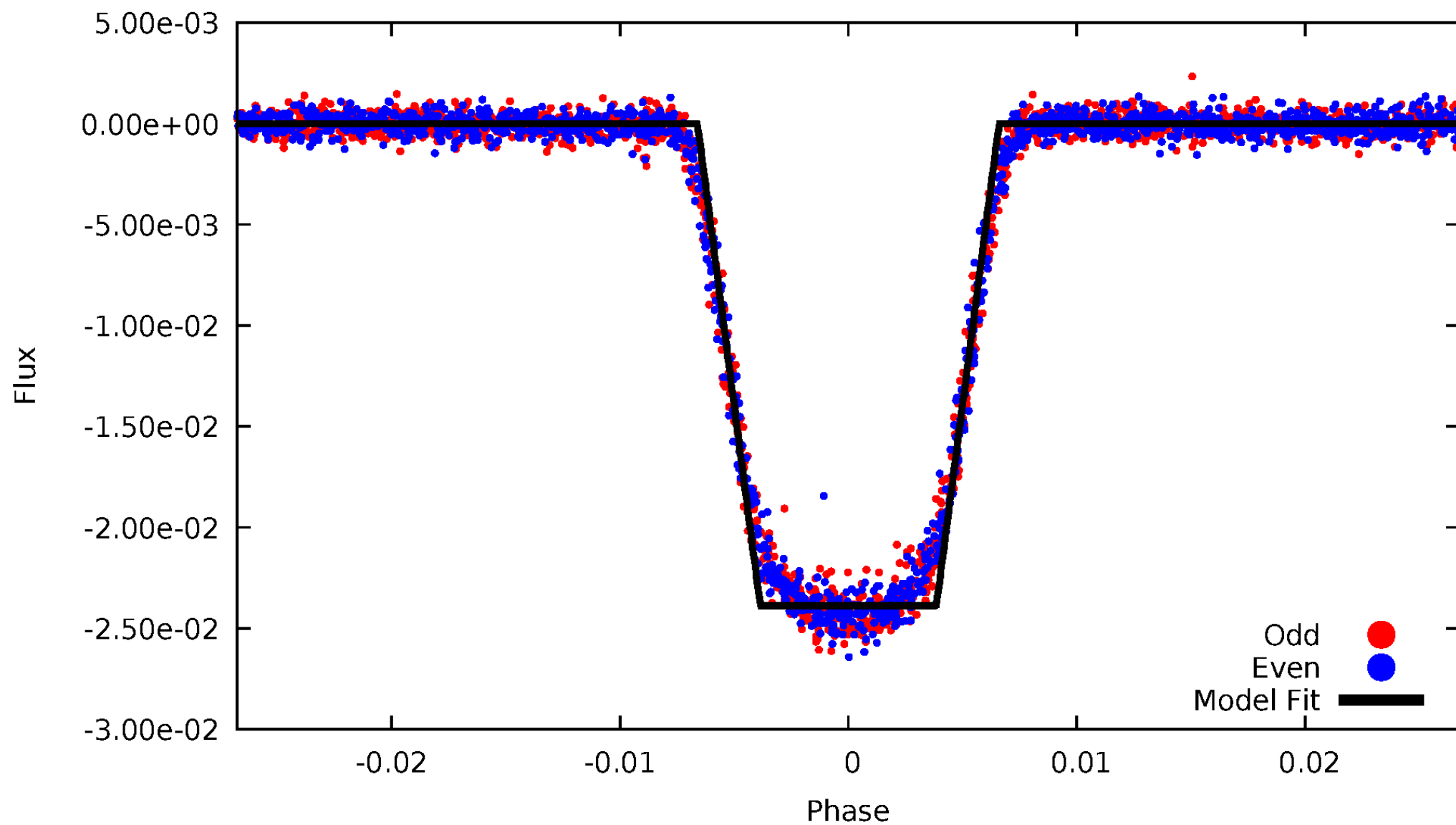
# DV Odd/Even

TCE 011656840-01



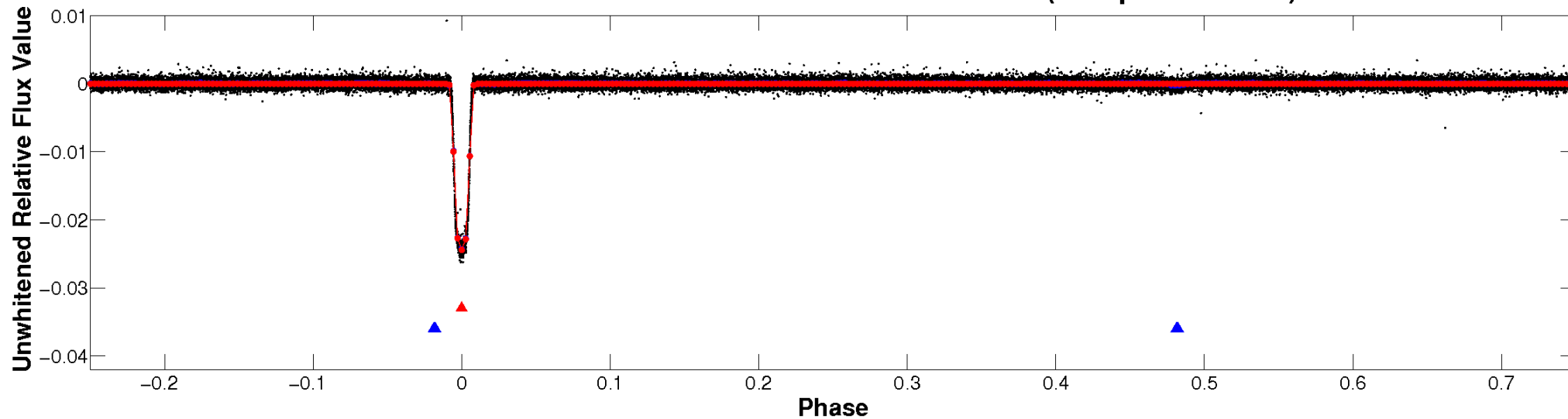
# ALT Odd/Even

TCE 011656840-01

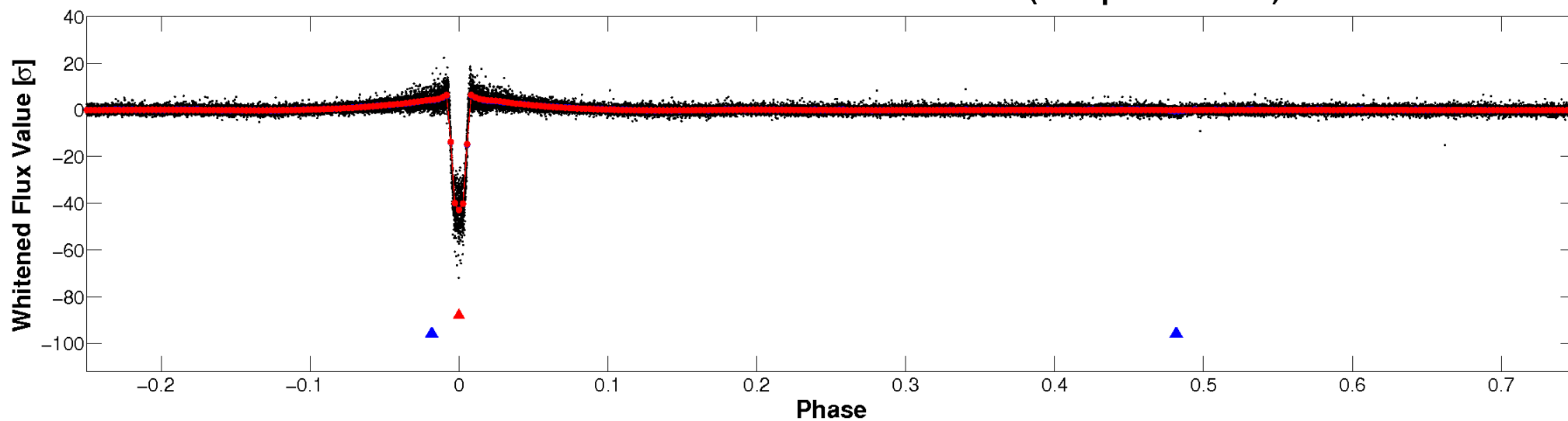


# Non-Whitened Vs. Whitened Light Curve

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

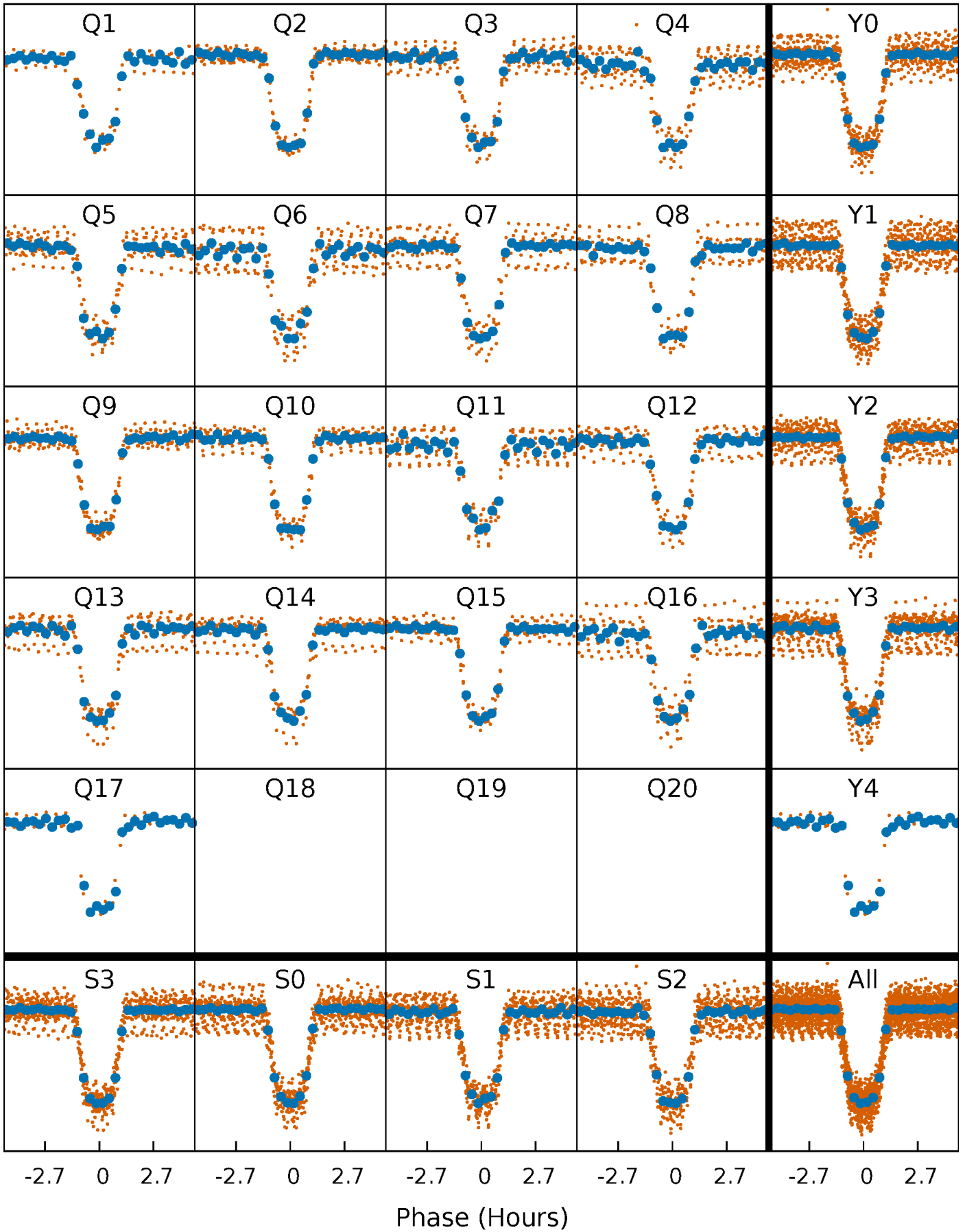


Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)



# PDC Quarter-Phased Transit Curves

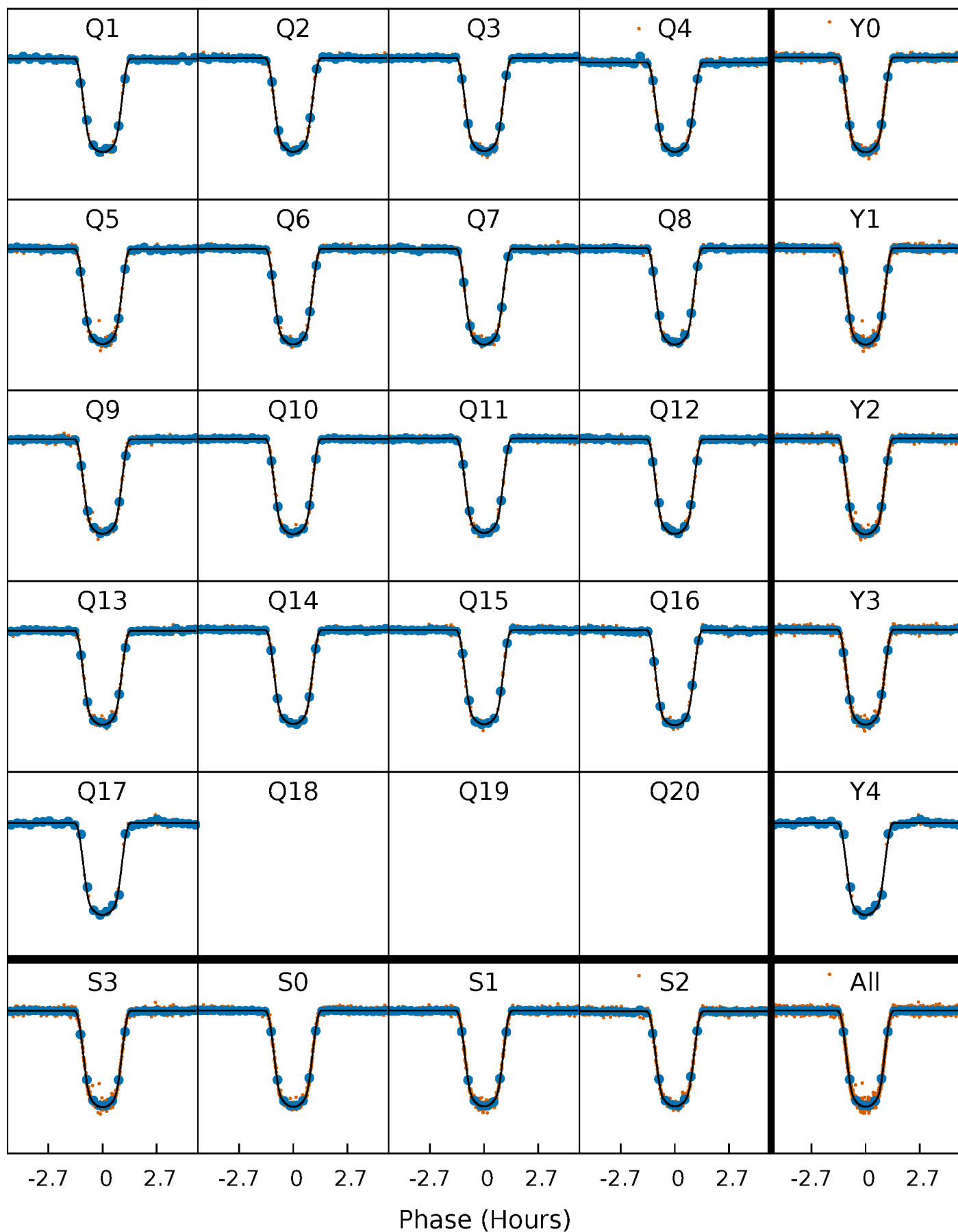
TCE 011656840-01 P= 7.442653 Days  $T_0=132.758499$  (BKJD)





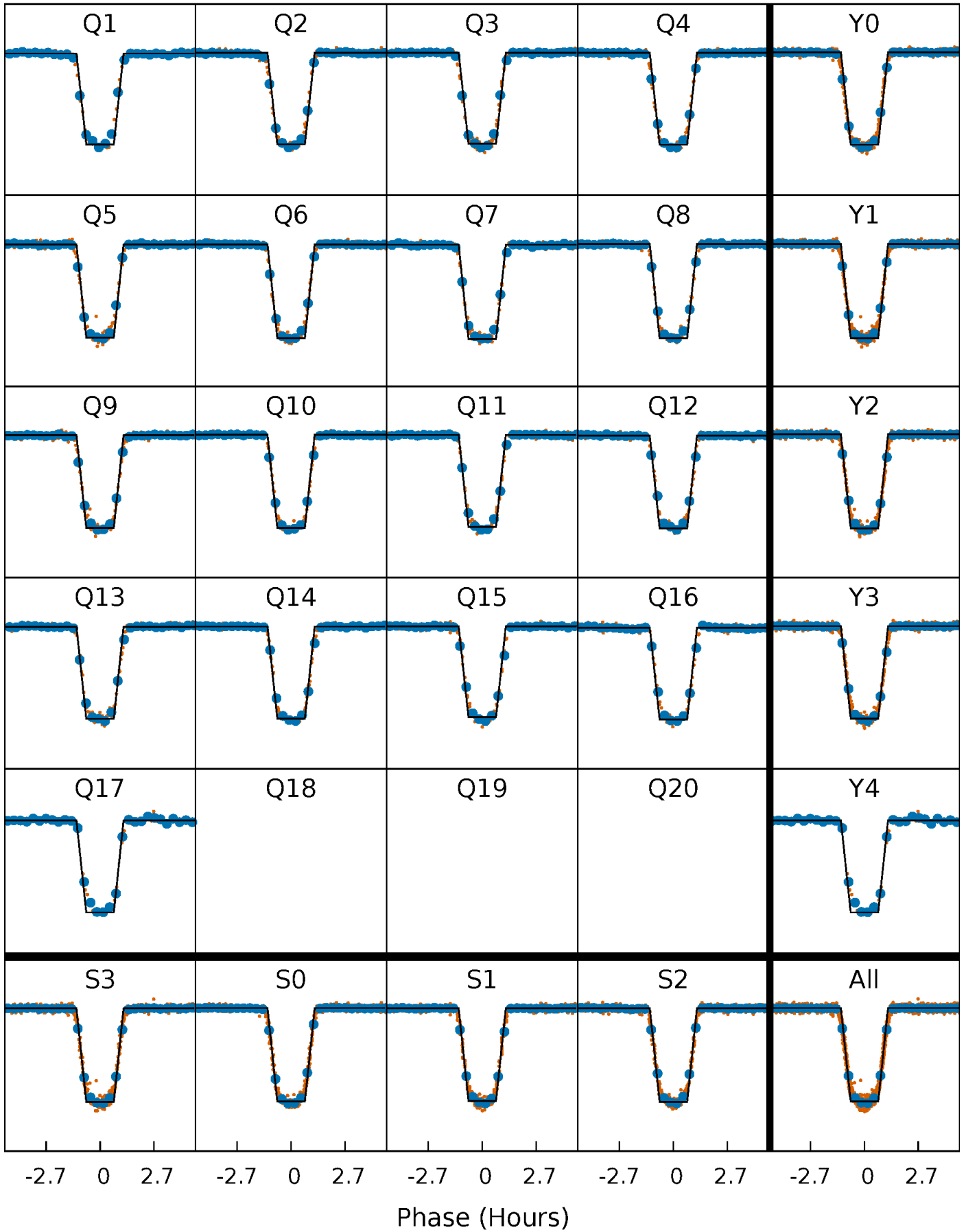
# DV Quarter-Phased Transit Curves

TCE 011656840-01 P= 7.442653 Days  $T_0=132.758499$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

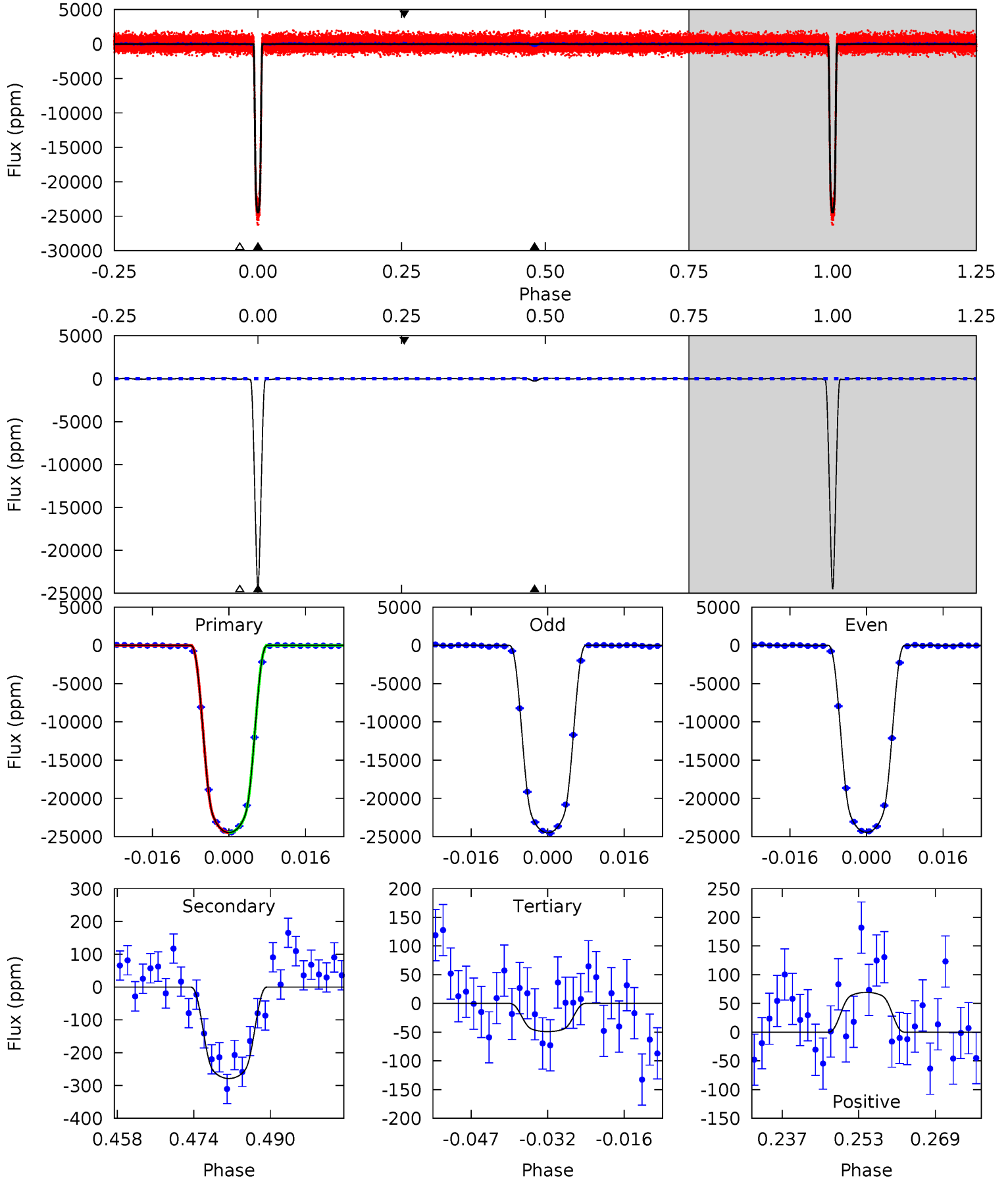
TCE 011656840-01 P= 7.442631 Days  $T_0=132.760539$  (BKJD)



# DV Model-Shift Uniqueness Test

011656840-01, P = 7.442653 Days, E = 125.315846 Days

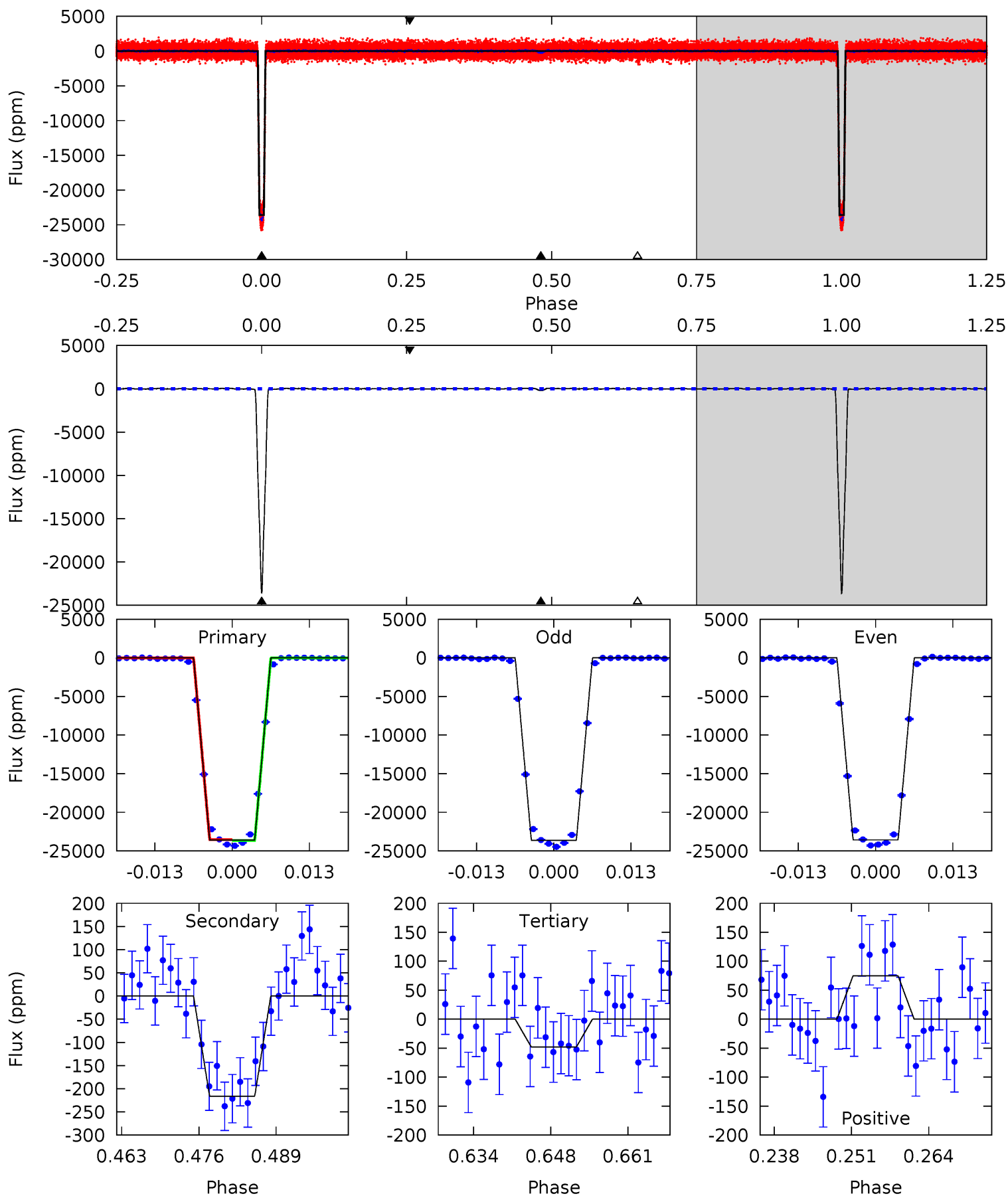
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
1607	18.3	3.22	4.55	4.94	2.41	1.76	1603	1602	15.1	13.8	1.78	1.00	0.00	0.63



# Alt Model-Shift Uniqueness Test

011656840-01, P = 7.442631 Days, E = 125.317908 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
1351	12.4	2.75	4.28	4.97	2.48	1.20	1349	1347	9.65	8.11	1.84	1.00	0.00	3.76



### Stellar Parameters For KIC 011656840

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$6108^{+183}_{-201}$	$4.469^{+0.070}_{-0.210}$	$-0.300^{+0.300}_{-0.300}$	$0.956^{+0.301}_{-0.100}$	$0.981^{+0.128}_{-0.128}$	$1.582^{+0.553}_{-0.829}$
	+3%/-3%	+2%/-5%	+100%/-100%	+31%/-10%	+13%/-13%	+35%/-52%
Source	PHO1	KIC0	KIC0	DSEP		

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

### Secondary Eclipse Parameters for KIC 011656840-01 / KOI 0774.01

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-279 \pm 15$	$15.63^{+2.54}_{-1.17}$	$1373^{+106}_{-68}$	$2768^{+50}_{-55}$	$3.369^{+0.597}_{-0.814}$
Alt.	$-216 \pm 17$	$16.30^{+2.81}_{-1.15}$	$1371^{+109}_{-67}$	$2626^{+53}_{-59}$	$2.378^{+0.429}_{-0.609}$

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

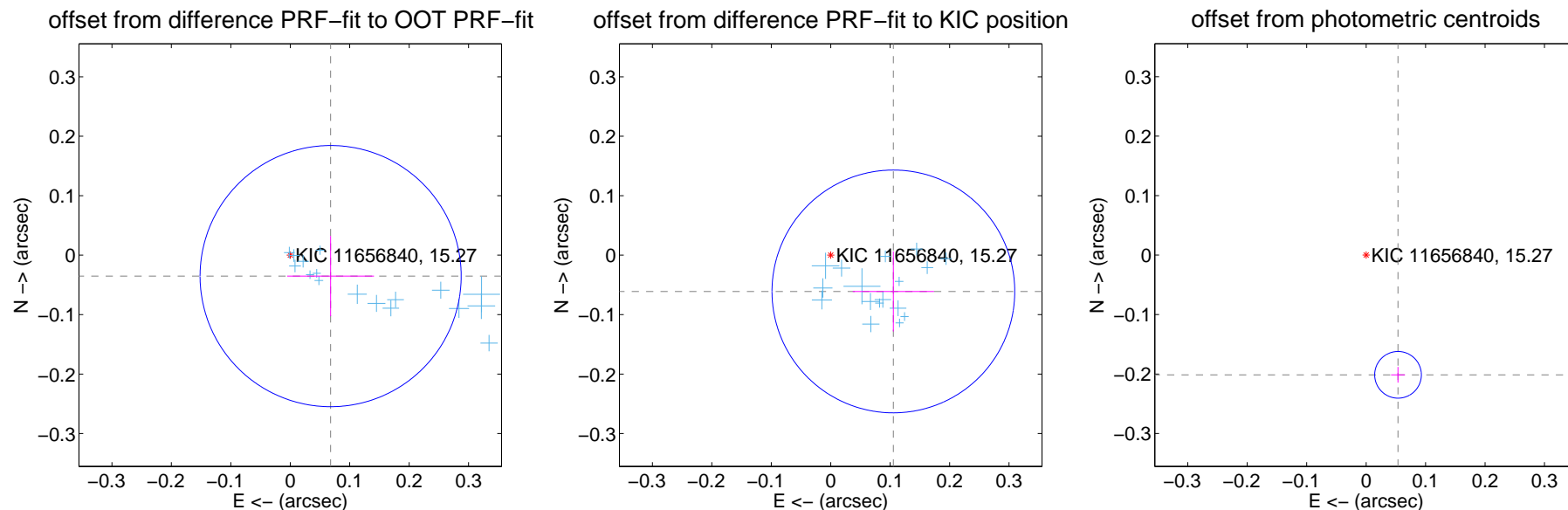
## DV Centroid Data

Supplemental centroid analysis for 011656840-01. Kepler magnitude: 15.27. Transit SNR 977.07

There are 17 quarters with good PRF difference image offsets

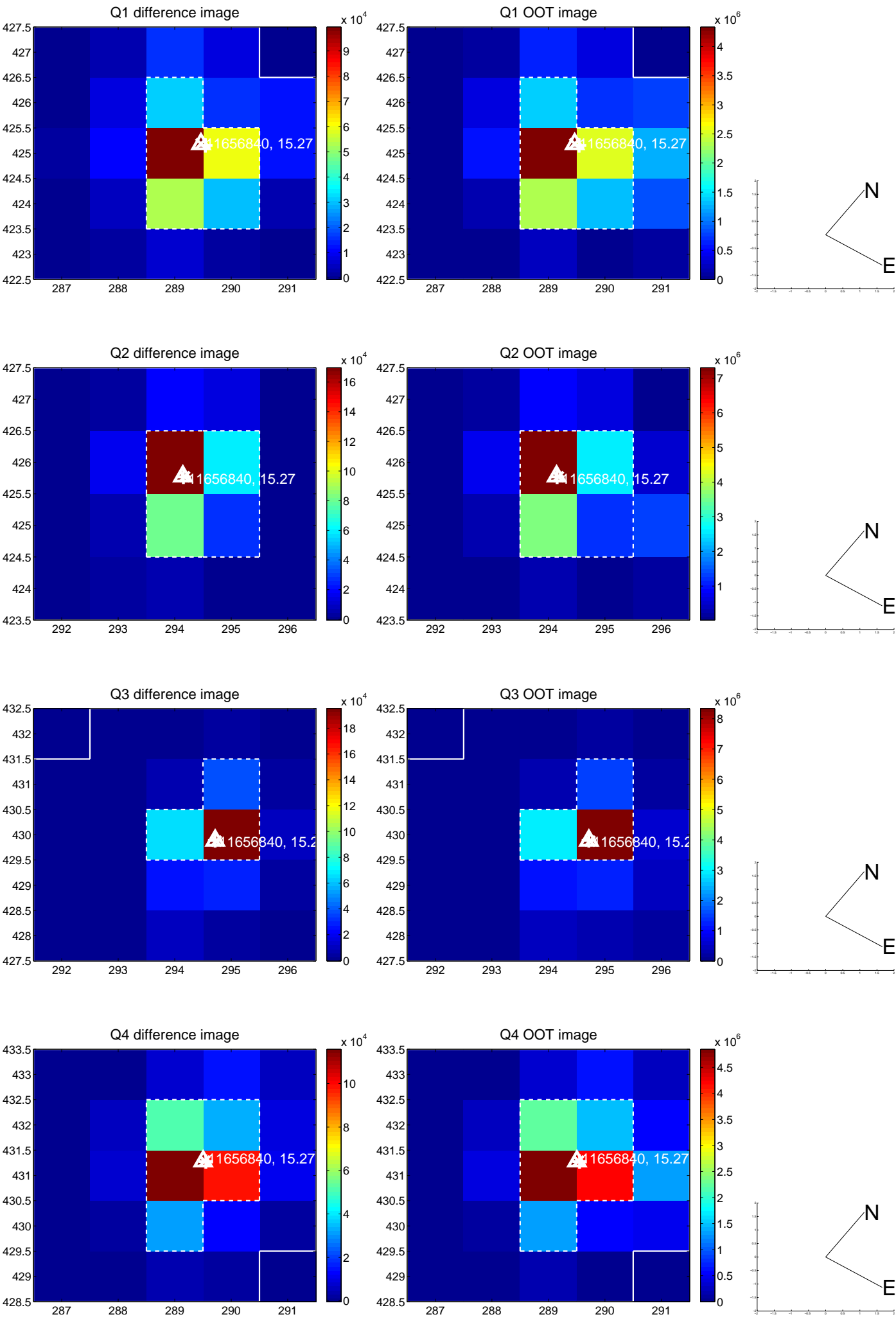
The direct PRF centroid is offset from the target star catalog position by about 0.27 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.076 \pm 0.073$	1.04	$-0.068 \pm 0.073$	$-0.035 \pm 0.067$
PRF-fit source offset from KIC position	$0.122 \pm 0.068$	1.79	$-0.105 \pm 0.068$	$-0.061 \pm 0.067$
photometric centroid source offset	$0.21 \pm 0.01$	15.92	$-0.05 \pm 0.01$	$-0.20 \pm 0.01$

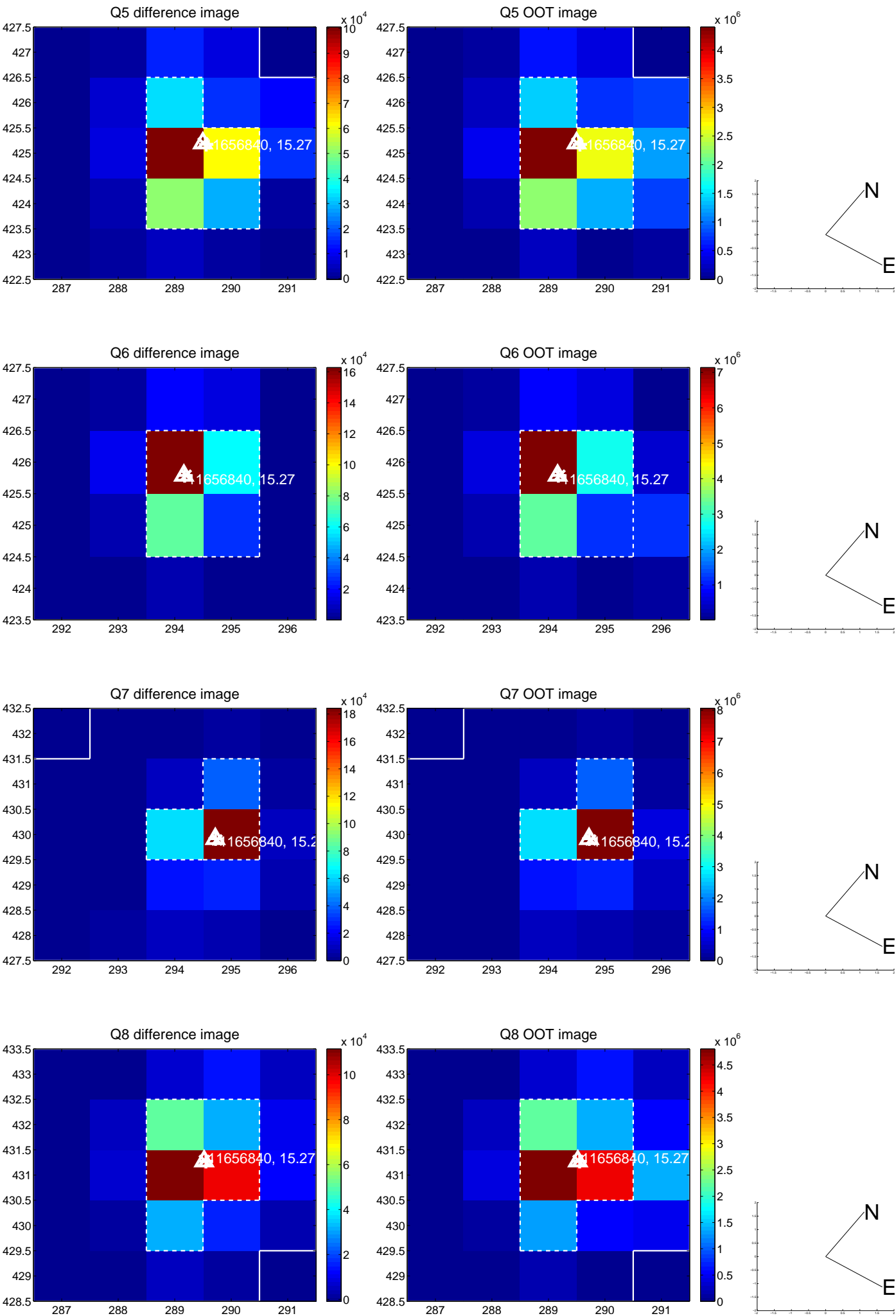


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses:** good quarterly centroid offsets; **Vermillion crosses:** bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

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



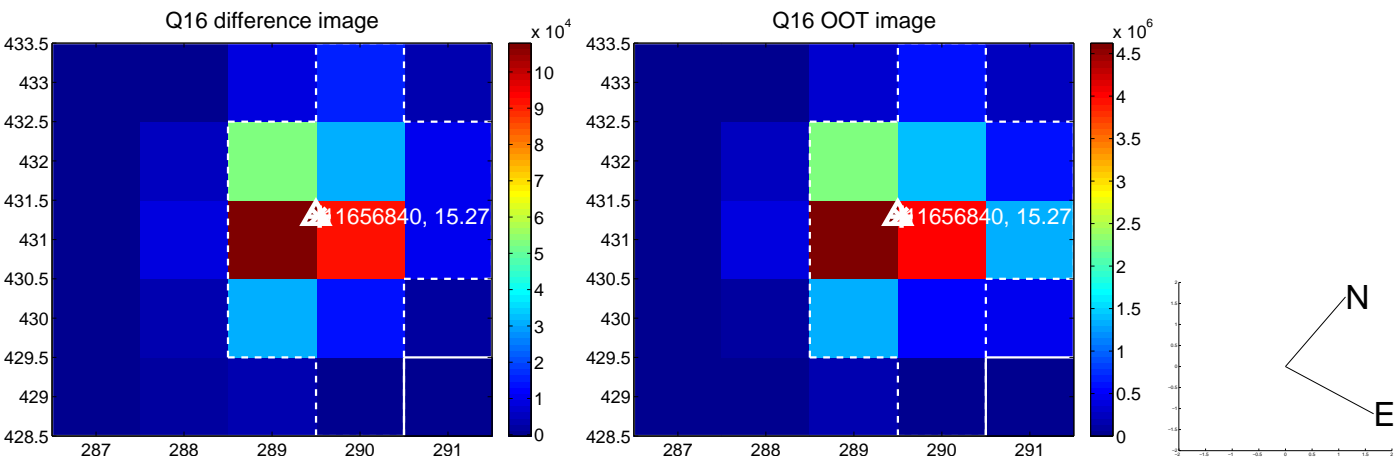
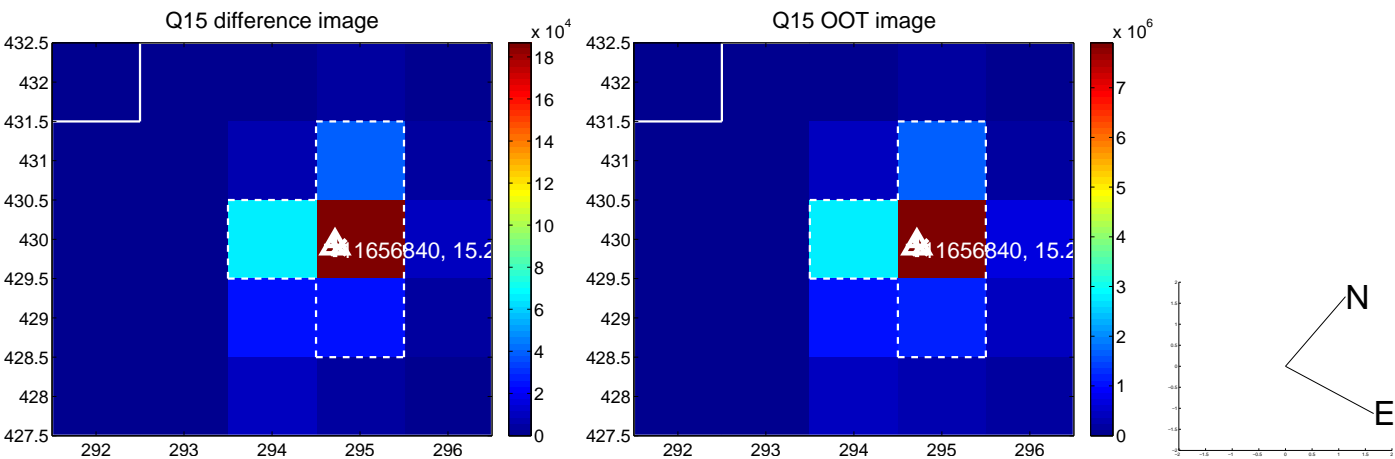
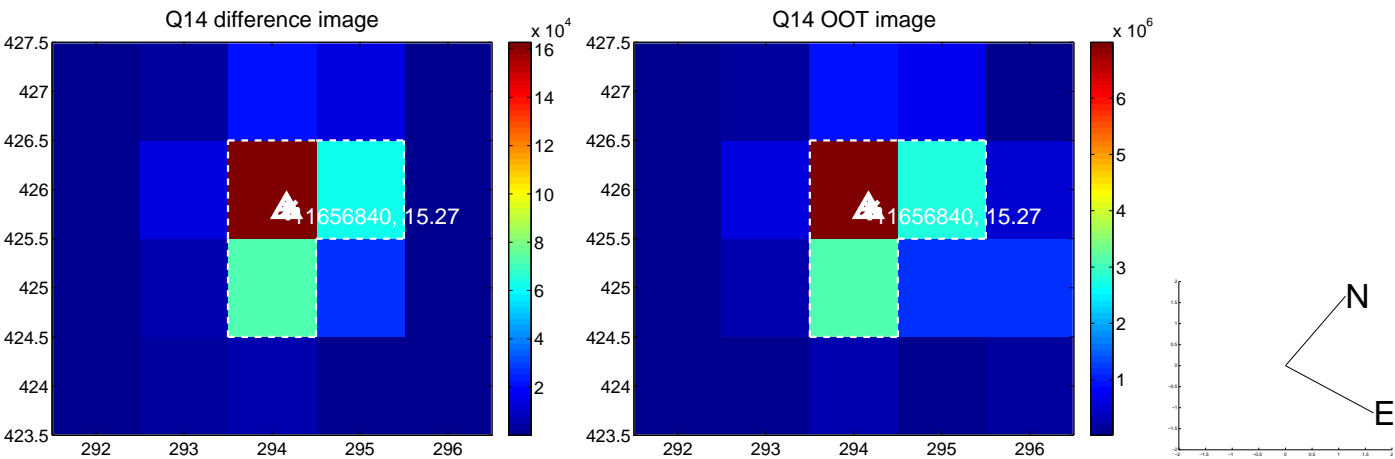
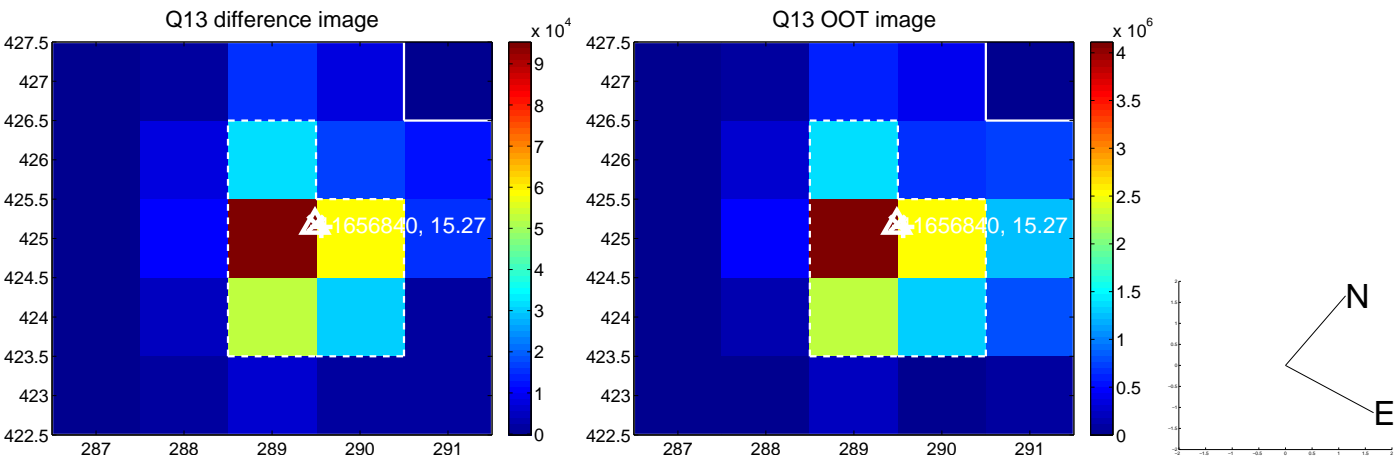
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



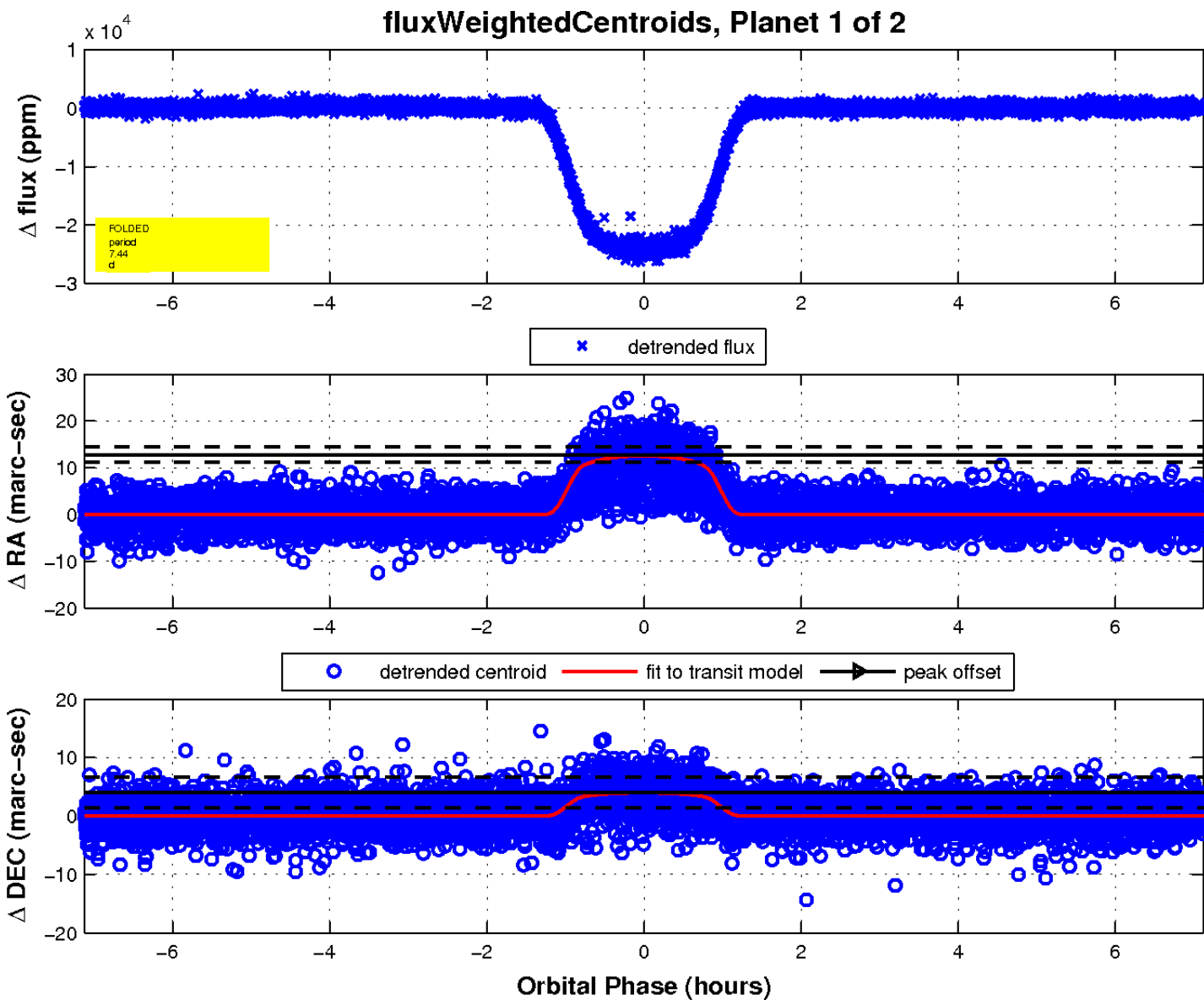
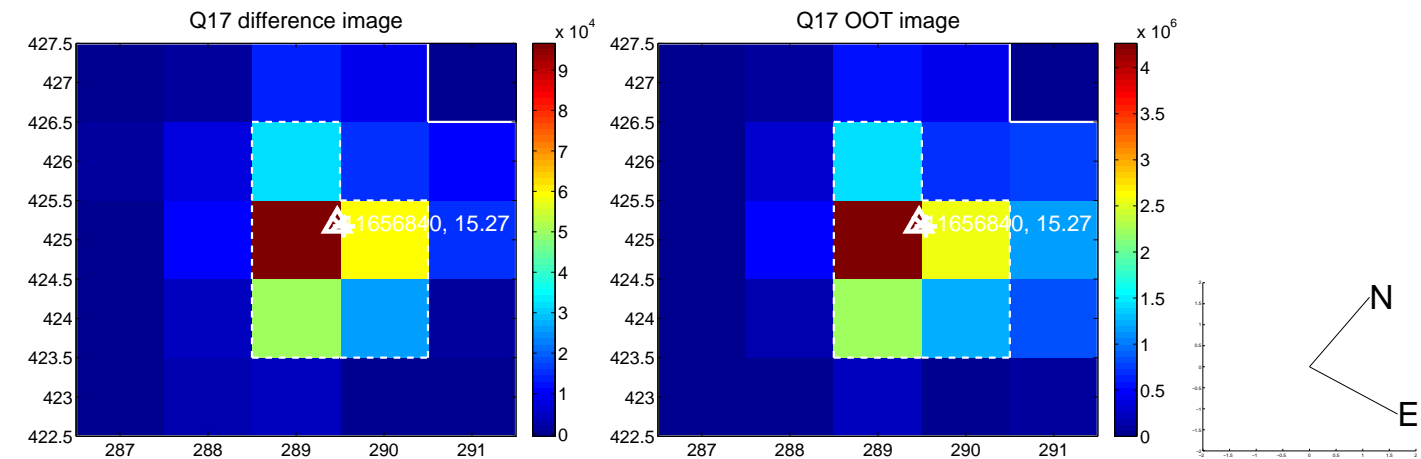




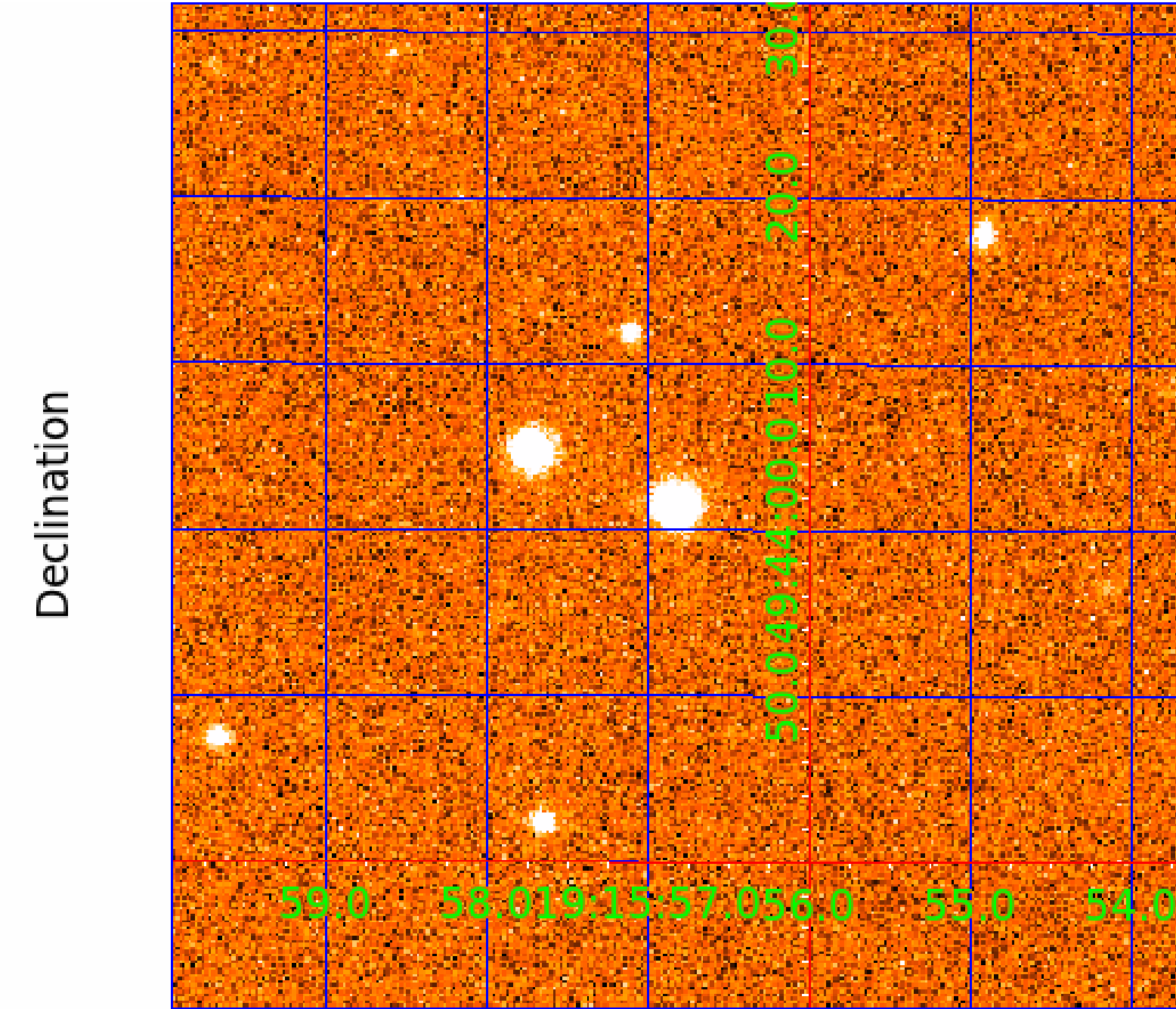
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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



UKIRT Image



# KIC 011656840

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
011656840-01	OBS	0774.01	7.442653	132.758499	24531.4	2.376	1044.7	977.1	0.96	6108	15.32	207.25
011656840-02	OBS	No	3.721311	132.625719	261.2	4.103	13.1	12.3	0.96	6108	3.08	522.24

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
011656840-01	OBS	FP	0.01	0	1	0	0	MOD_SEC_DV—MOD_SEC_ALT—HAS_SEC_TCE
011656840-02	OBS	FP	0.00	1	1	0	0	IS_SEC_TCE

**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.

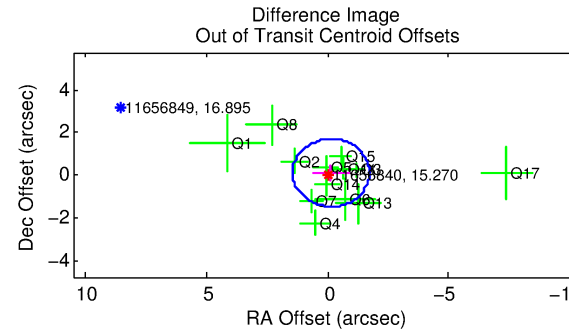
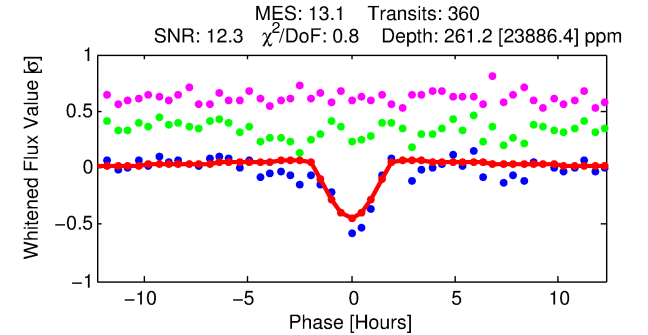
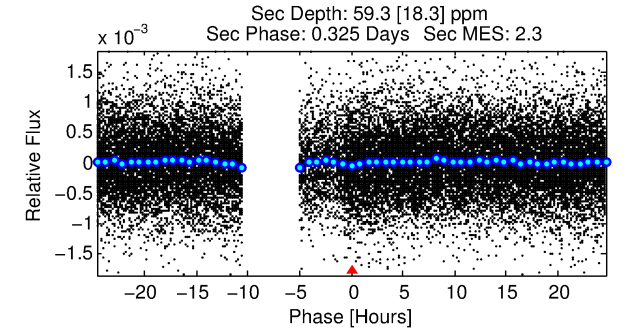
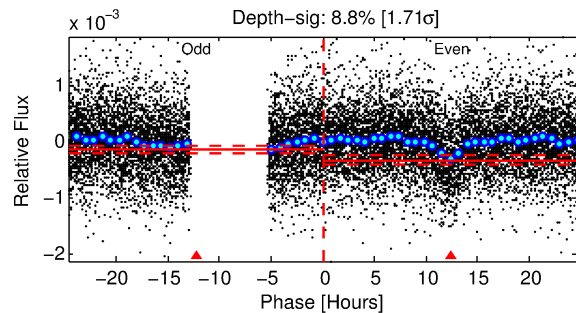
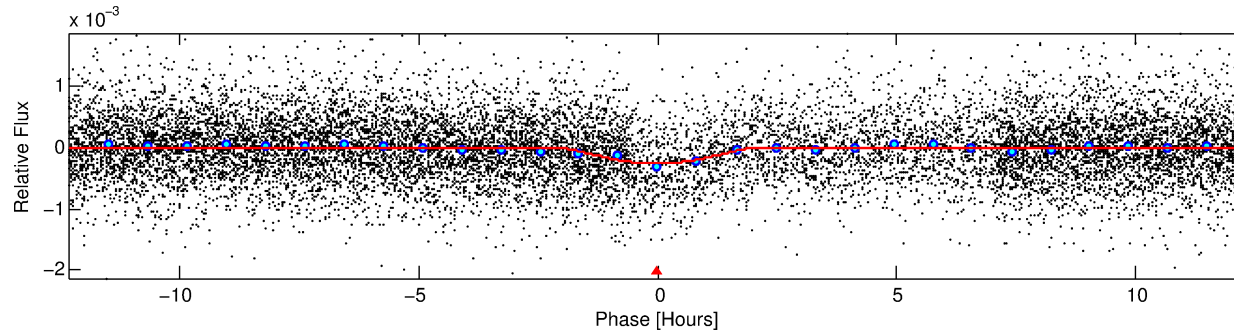
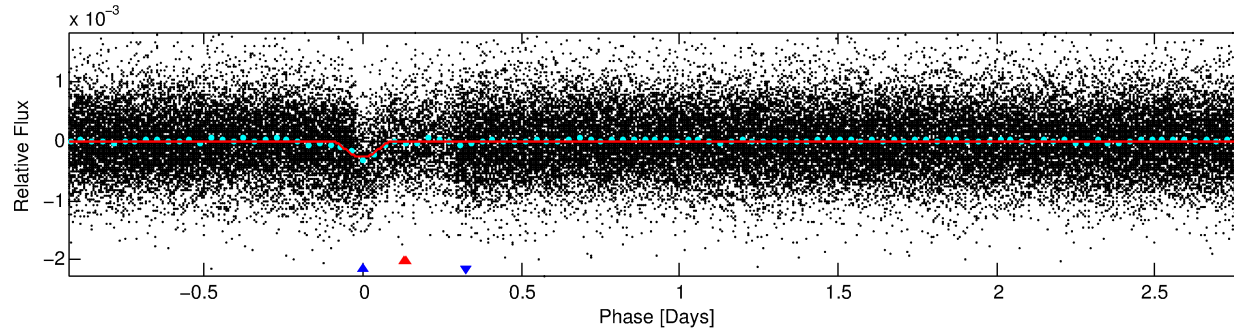
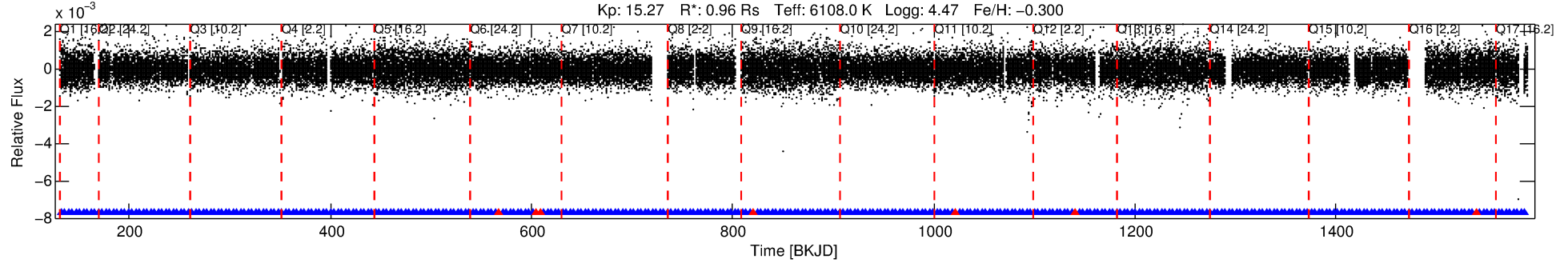
## Ephemeris Match Information For 011656840-02

No Significant Match Found

# DV One-Page Summary

KIC: 11656840 Candidate: 2 of 2 Period: 3.721 d  
KOI: K00774 Corr: No Ephemeris Match

Kp: 15.27 R\*: 0.96 Rs Teff: 6108.0 K Logg: 4.47 Fe/H: -0.300



## DV Fit Results:

Period = 3.72131 [0.00003] d  
Epoch = 132.6257 [0.0060] BKJD  
Rp/R\* = 0.0295 [0.0808]  
a/R\* = 1.97 [1.00]  
b = 1.00 [1.73]  
Seff = 522.24 [212.33]  
Teq = 1219 [124] K  
Rp = 3.08 [8.49] Re  
a = 0.0467 [0.0124] AU  
Ag = 7.51 [41.35] [0.16σ]  
Teffp = 3120 [4284] K [0.44σ]

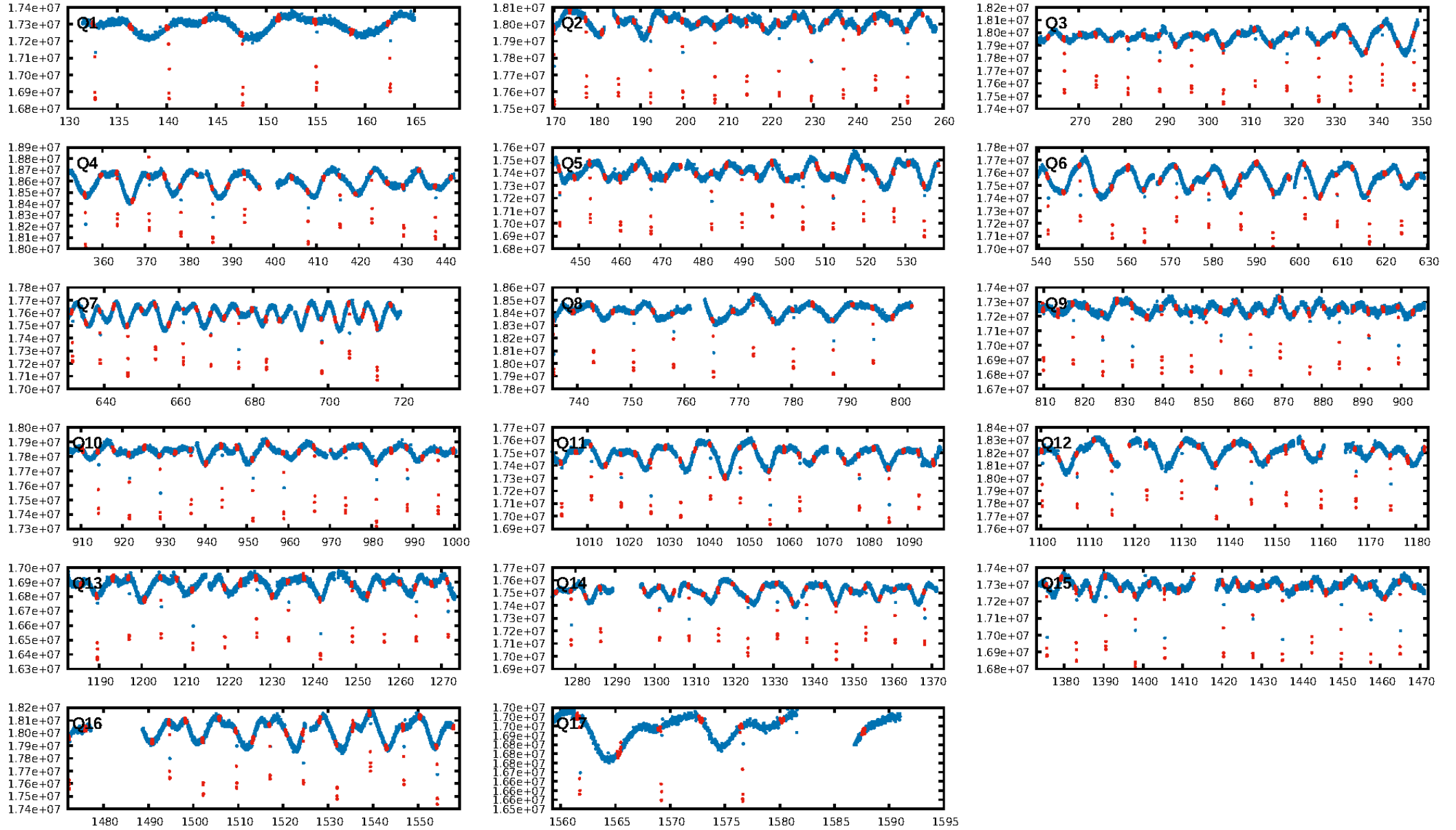
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 100.0% [18.84σ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: 4.26e-38  
RollingBand-fgt: 0.98 [337/344]  
GhostDiagnostic-chr: 1.02  
Centroid-sig: 0.1%  
Centroid-so: 1.474 arcsec [1.84σ]  
OotOffset-rm: 0.182 arcsec [0.35σ]  
KicOffset-rm: 0.234 arcsec [0.36σ]  
OotOffset-st: 3/4/2/4 [13]  
KicOffset-st: 3/4/2/4 [13]  
DiffImageQuality-fgm: 0.69 [9/13]  
DiffImageOverlap-fno: 1.00 [17/17]

Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 29-Jan-2016 12:05:12 Z

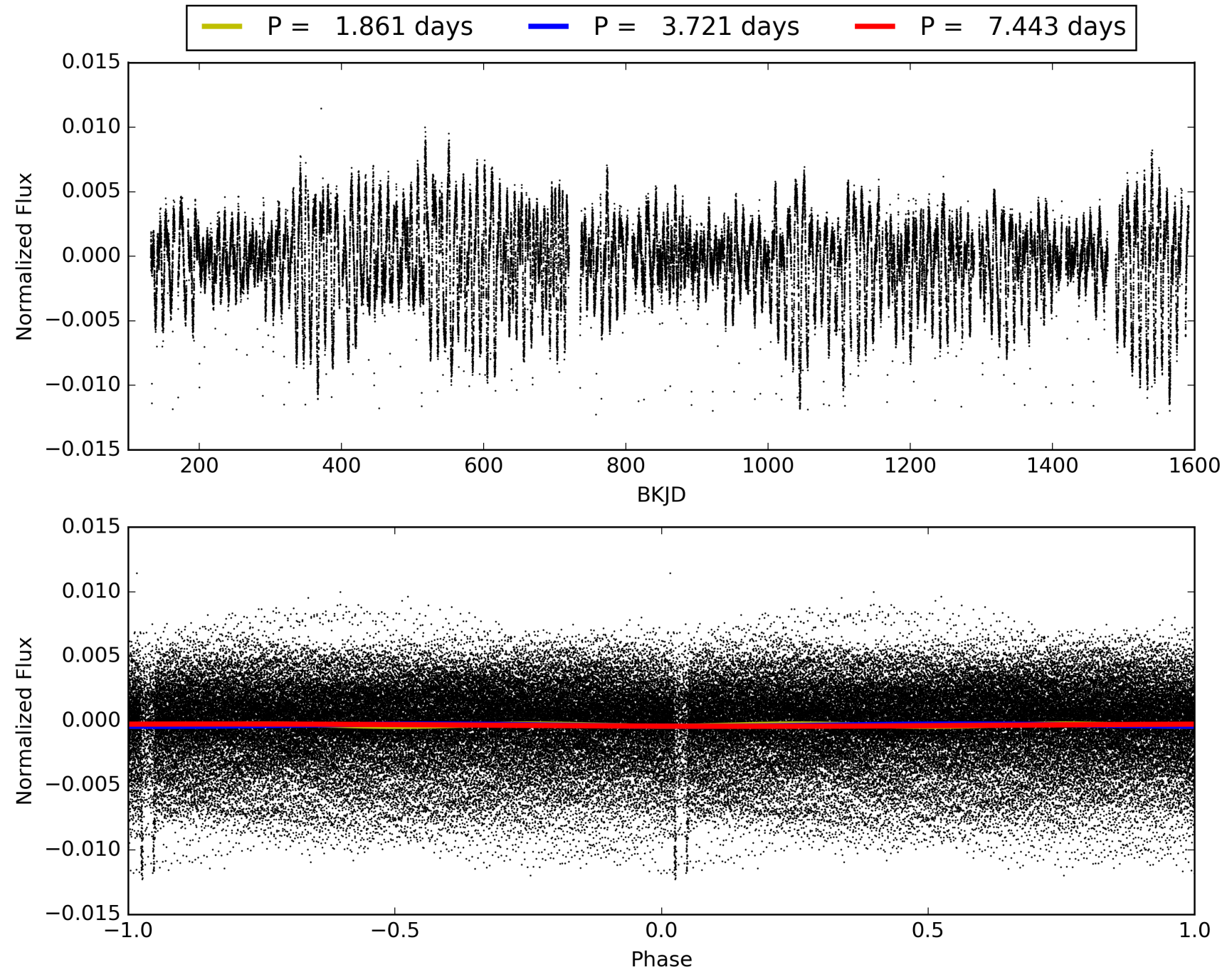
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

# TCE 011656840-02, PDC Light Curves





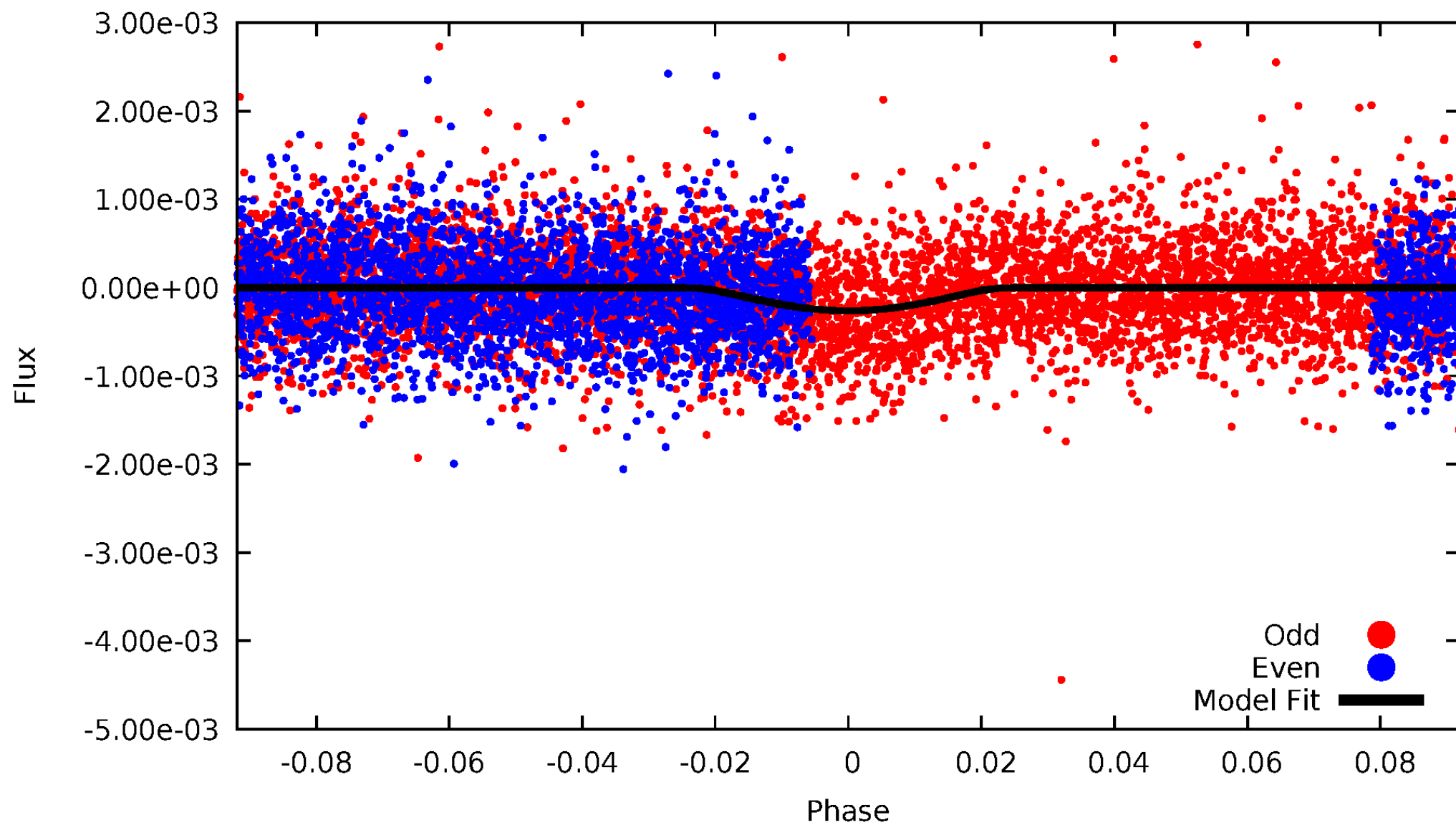
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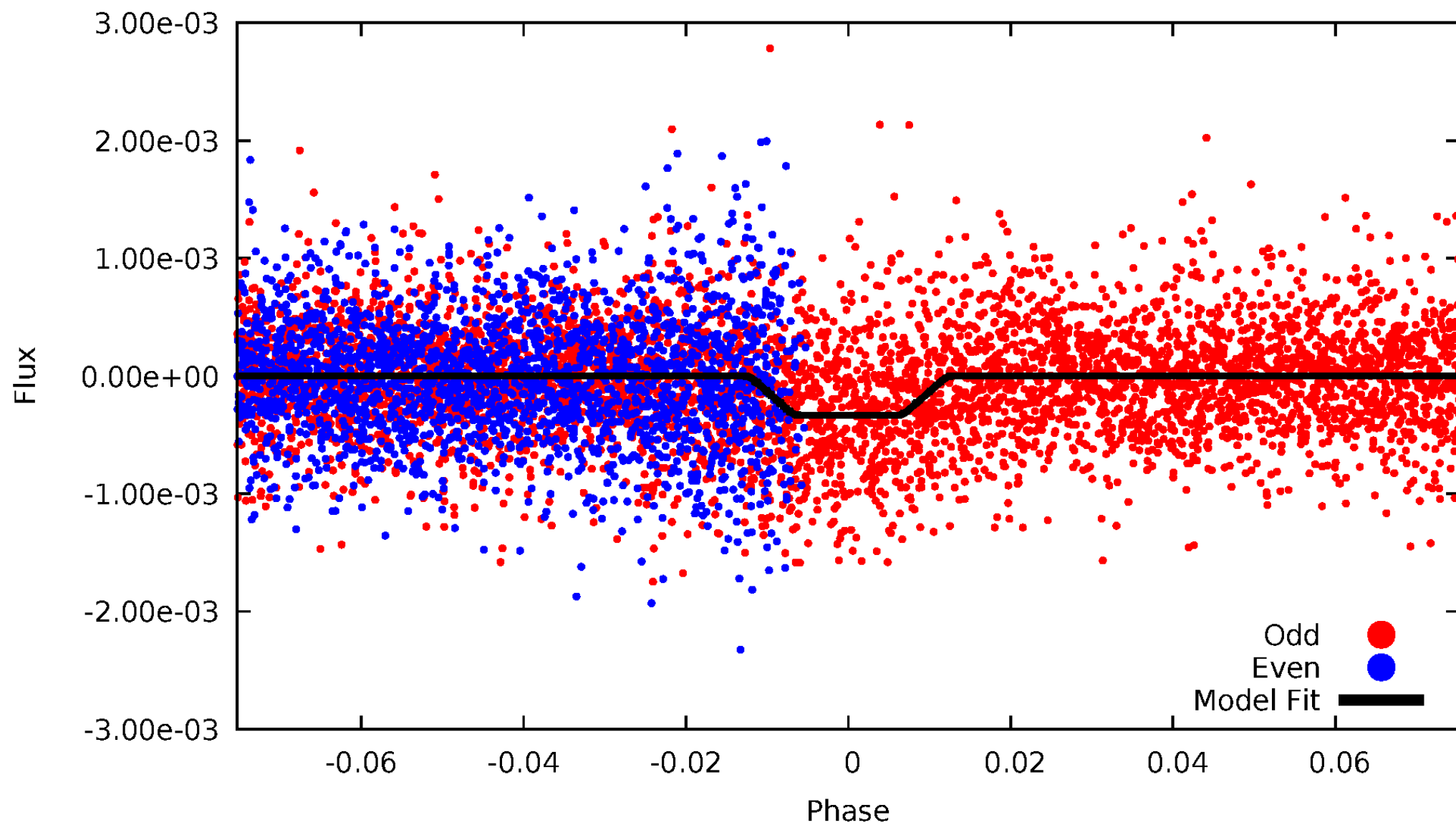
# DV Odd/Even

TCE 011656840-02



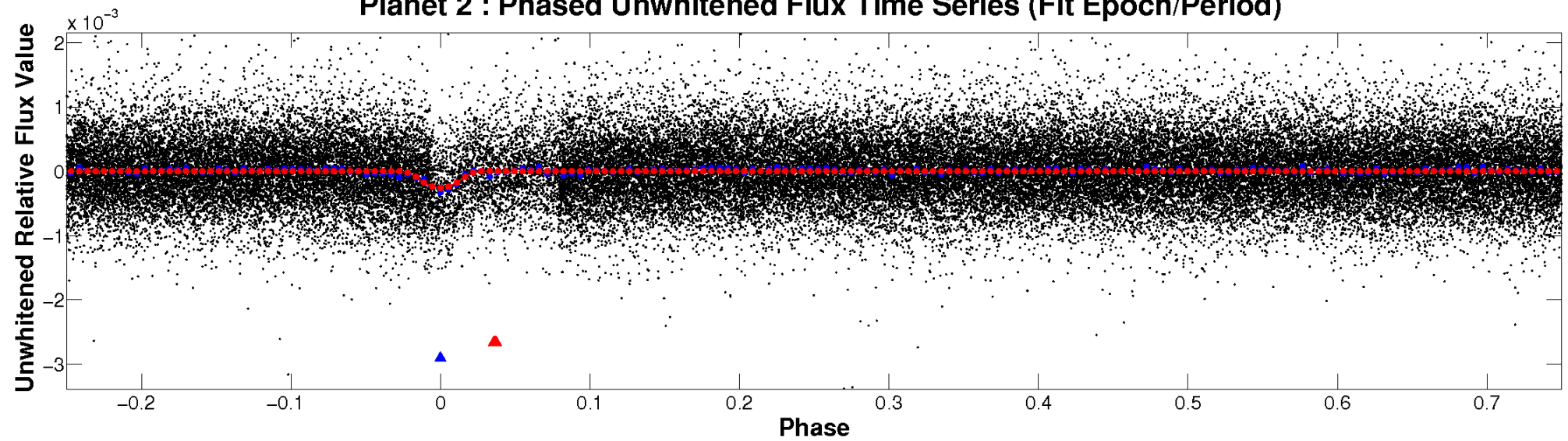
# ALT Odd/Even

TCE 011656840-02

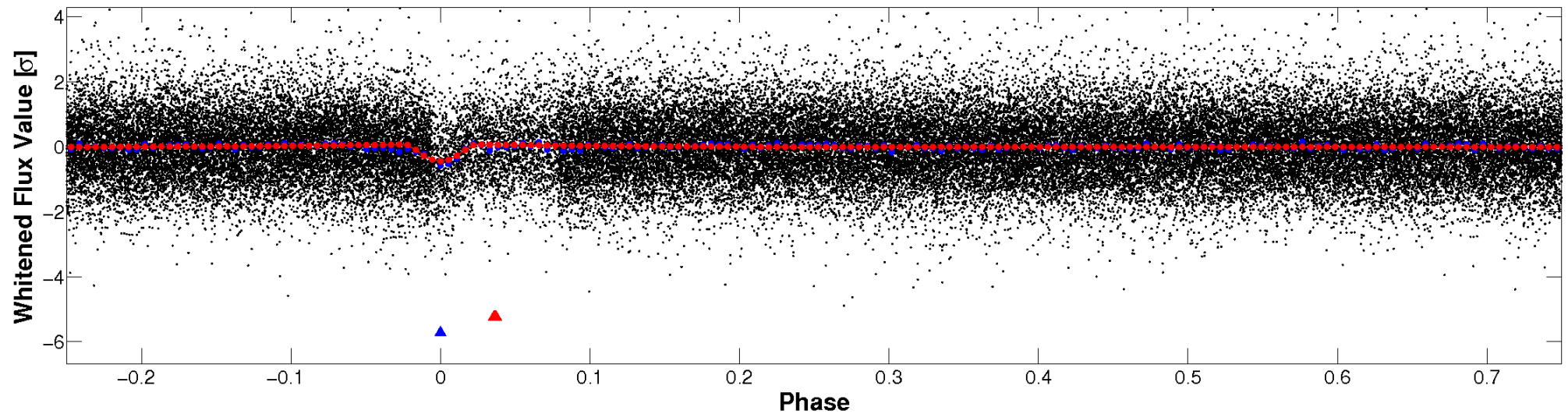


# Non-Whitened Vs. Whitened Light Curve

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

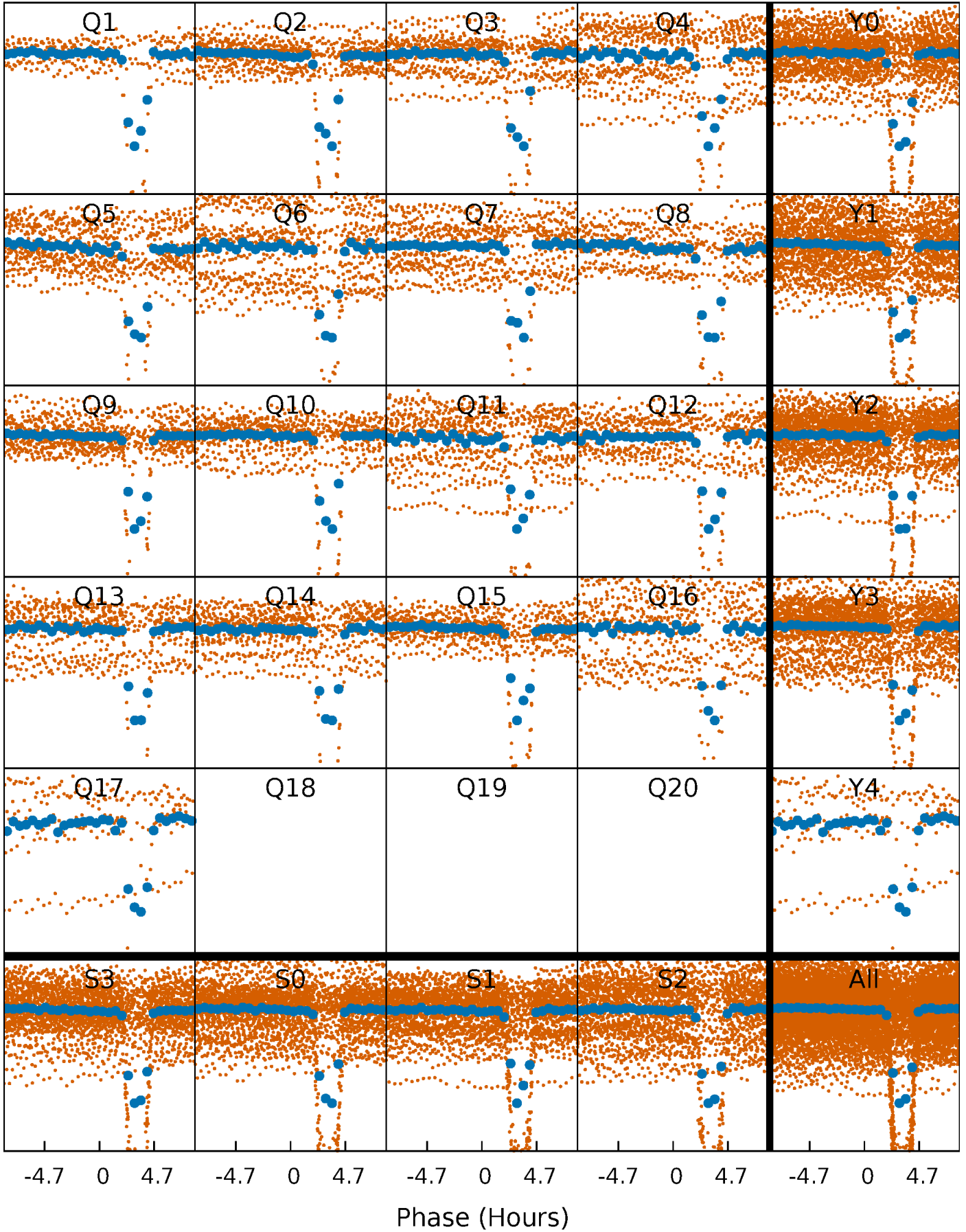


## Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



# PDC Quarter-Phased Transit Curves

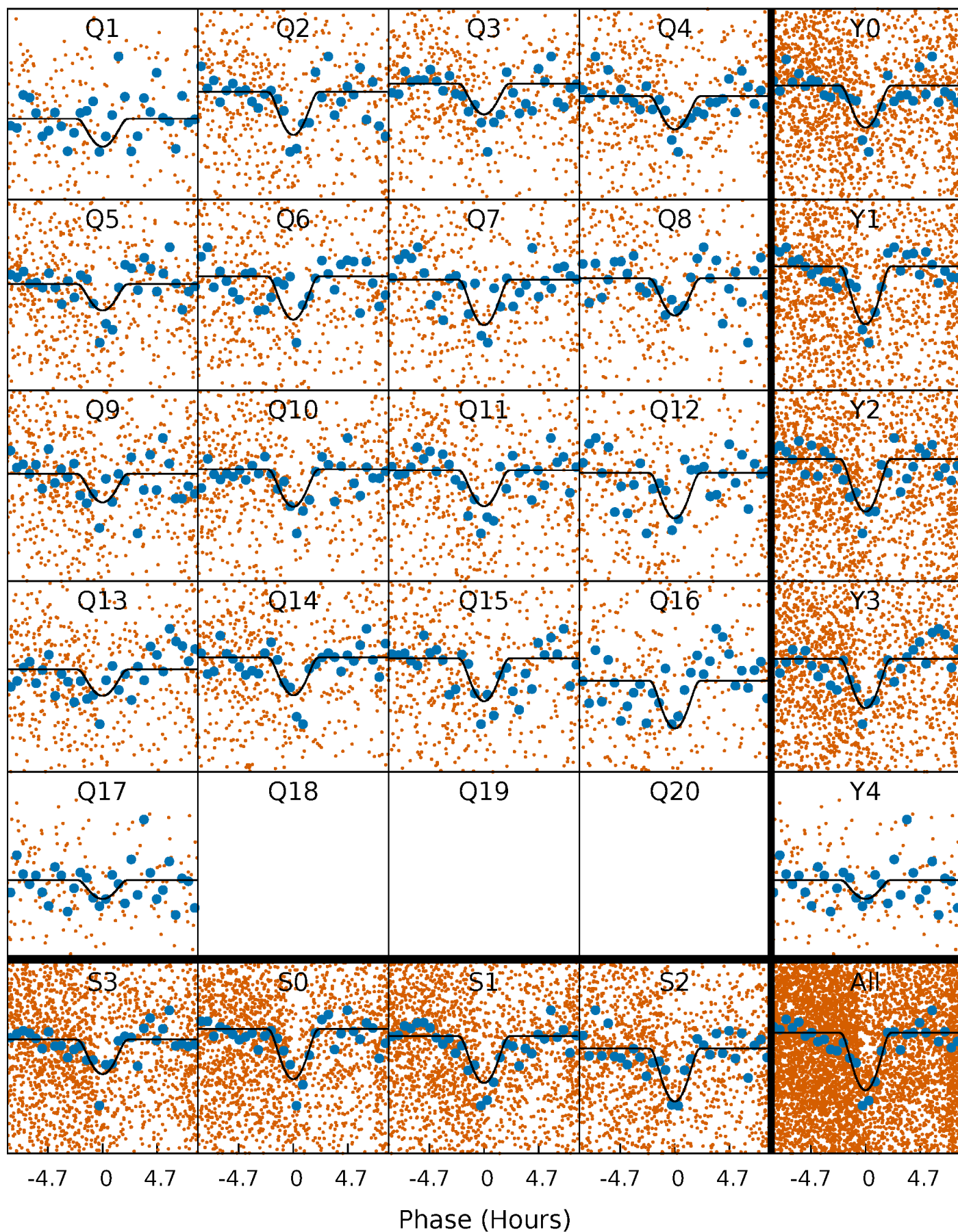
TCE 011656840-02 P= 3.721311 Days  $T_0=132.625719$  (BKJD)





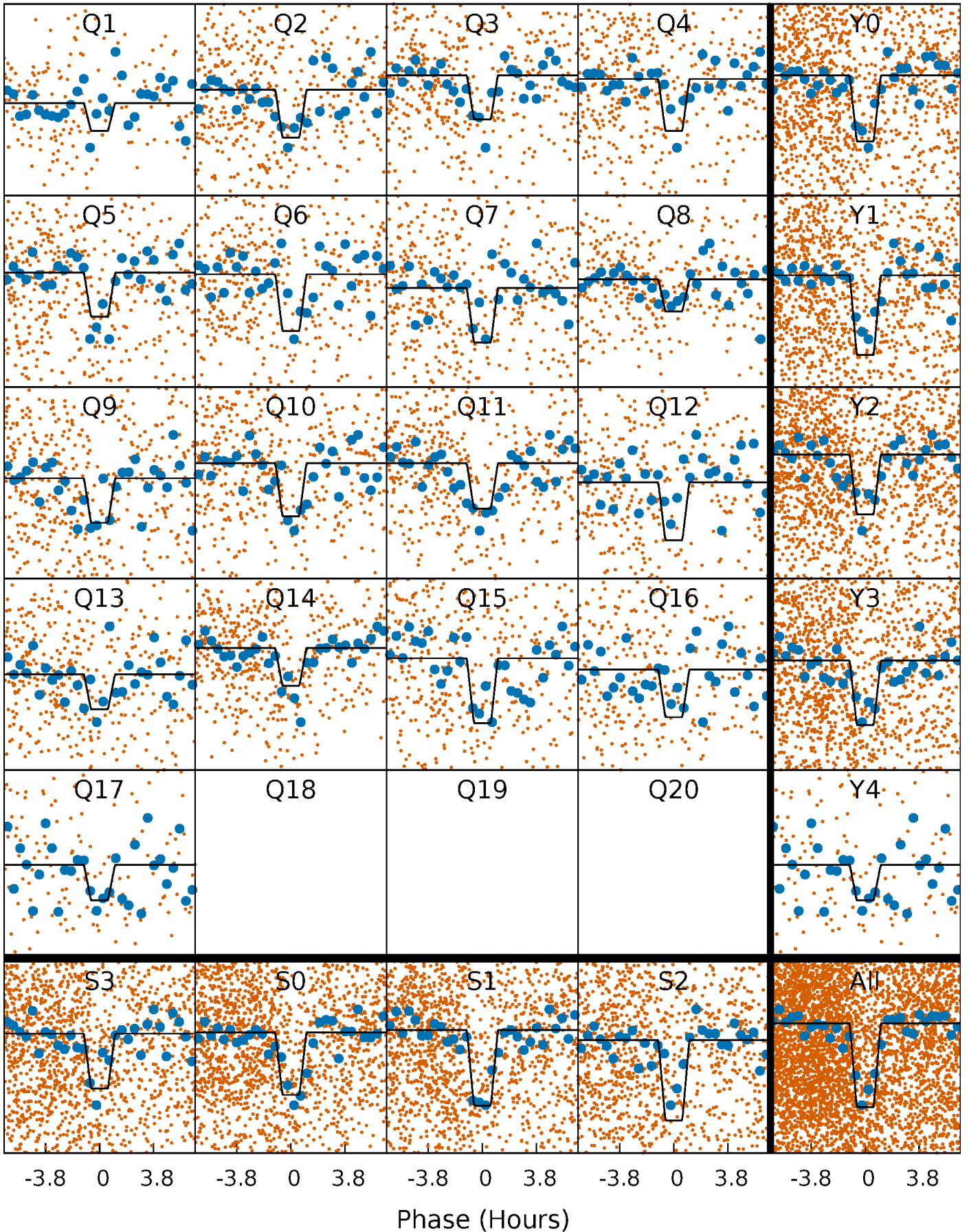
# DV Quarter-Phased Transit Curves

TCE 011656840-02 P= 3.721311 Days  $T_0=132.625719$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

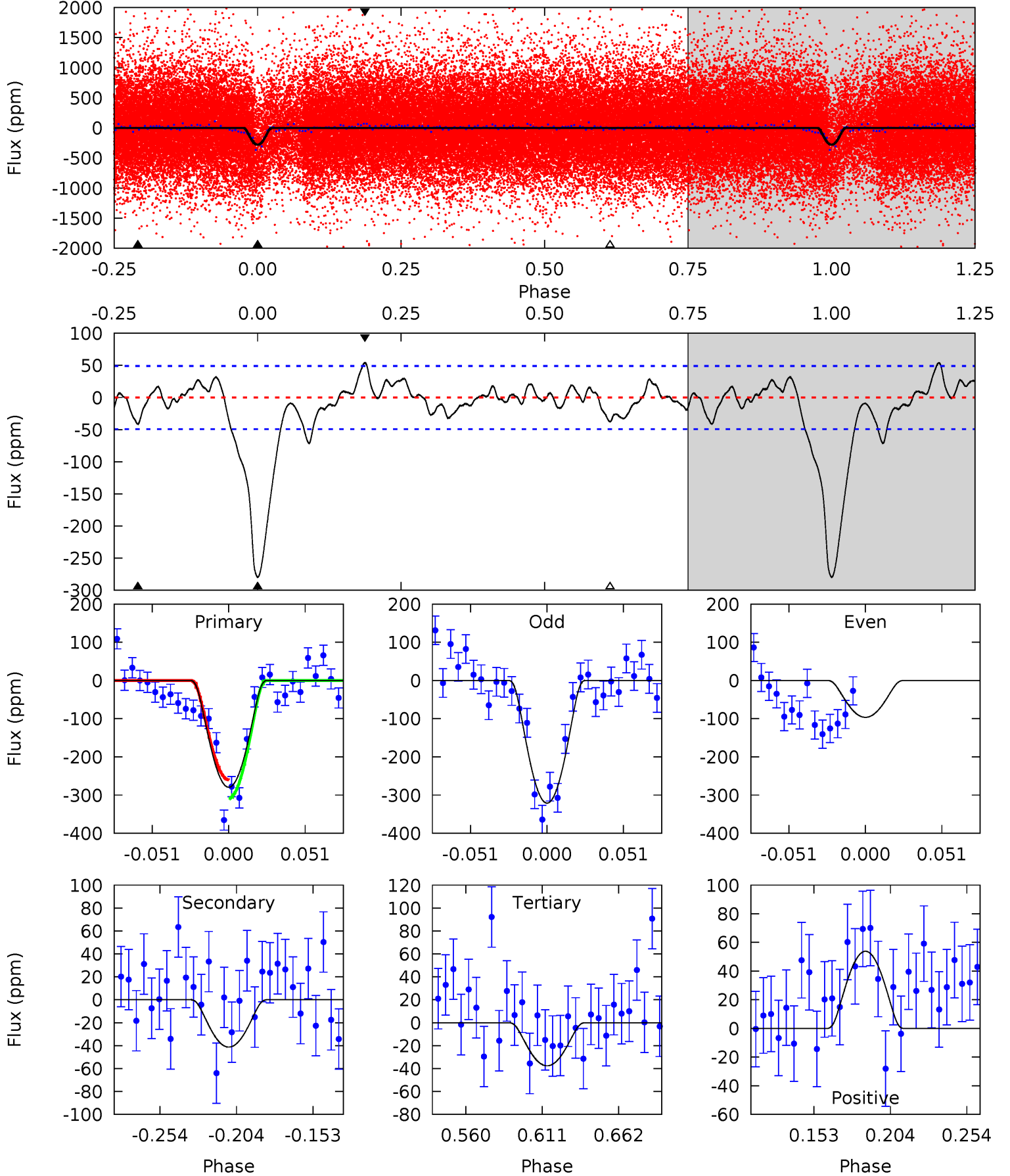
TCE 011656840-02 P= 3.721279 Days  $T_0=132.636614$  (BKJD)



# DV Model-Shift Uniqueness Test

011656840-02, P = 3.721311 Days, E = 128.904408 Days

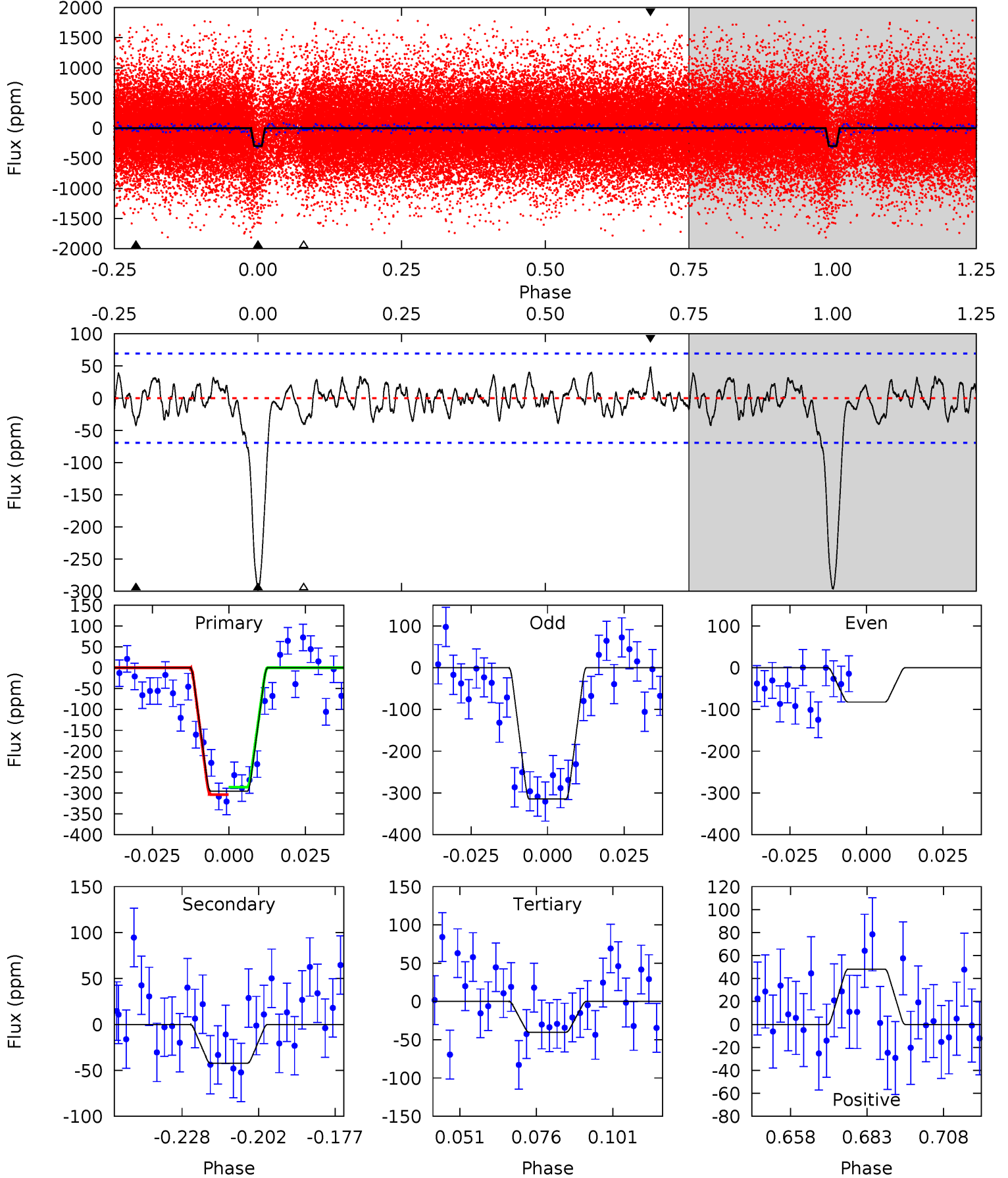
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
26.8	3.96	3.61	5.16	4.70	1.95	1.87	23.2	21.6	0.35	-1.21	9.76	0.79	0.16	2.24



# Alt Model-Shift Uniqueness Test

011656840-02, P = 3.721279 Days, E = 128.915335 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
20.7	2.96	2.81	3.36	4.85	2.24	1.19	17.8	17.3	0.15	-0.40	6.17	0.87	0.14	0.62





### Stellar Parameters For KIC 011656840

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$6108^{+183}_{-201}$	$4.469^{+0.070}_{-0.210}$	$-0.300^{+0.300}_{-0.300}$	$0.956^{+0.301}_{-0.100}$	$0.981^{+0.128}_{-0.128}$	$1.582^{+0.553}_{-0.829}$
	+3%/-3%	+2%/-5%	+100%/-100%	+31%/-10%	+13%/-13%	+35%/-52%
Source	PHO1	KIC0	KIC0	DSEP		

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

### Secondary Eclipse Parameters for KIC 011656840-02 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-41 \pm 10$	$7.16^{+7.03}_{-5.06}$	$1730^{+125}_{-89}$	$2538^{+1295}_{-4524}$	$0.909^{+9.901}_{-0.678}$
Alt.	$-42 \pm 14$	$6.76^{+6.57}_{-4.78}$	$1727^{+125}_{-90}$	$2621^{+1281}_{-4549}$	$1.113^{+10.117}_{-0.861}$

$T_{max}$  = Theoretical Maximum Planetary Temperature

$T_{obs}$  = Observed Planetary Temperature (Assuming  $A=0.3$ )

$A_{obs}$  = Observed Albedo (Assuming  $T=0$ )

If a secondary eclipse is present, the system is likely an EB if  $T_{obs} \gg T_{max}$  AND  $A_{obs} \gg 1.0$

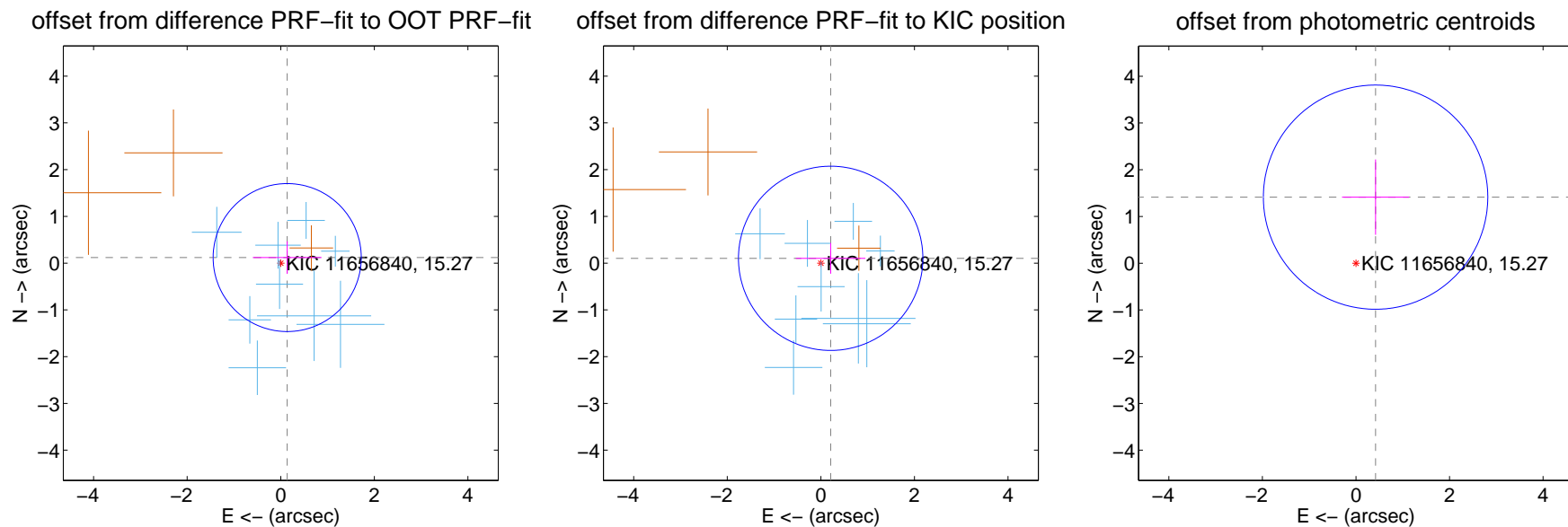
## DV Centroid Data

Supplemental centroid analysis for 011656840-02. Kepler magnitude: 15.27. Transit SNR 12.33

There are 9 quarters with good PRF difference image offsets

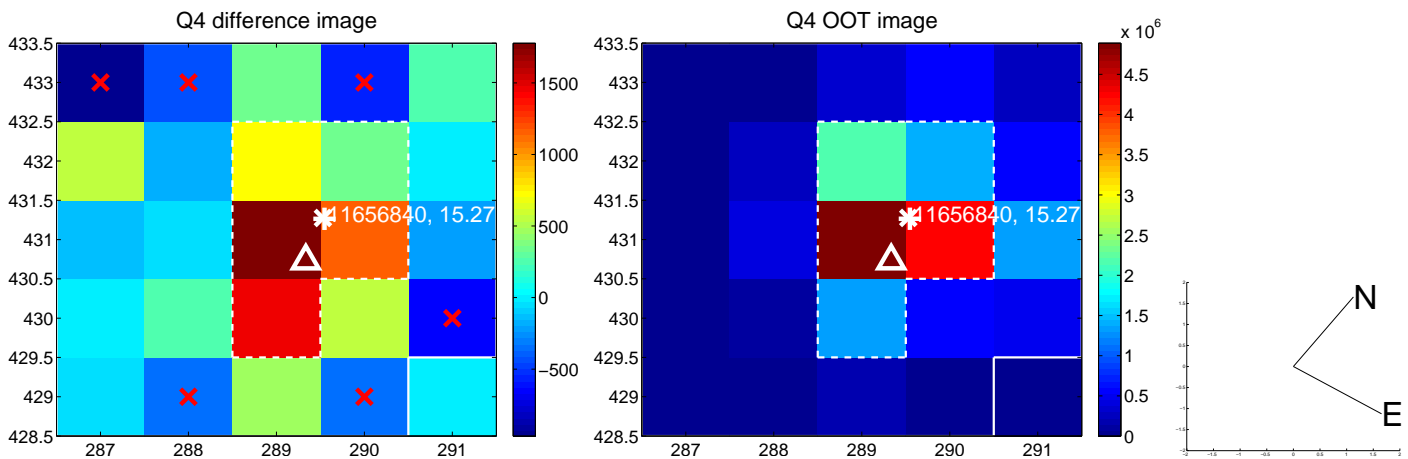
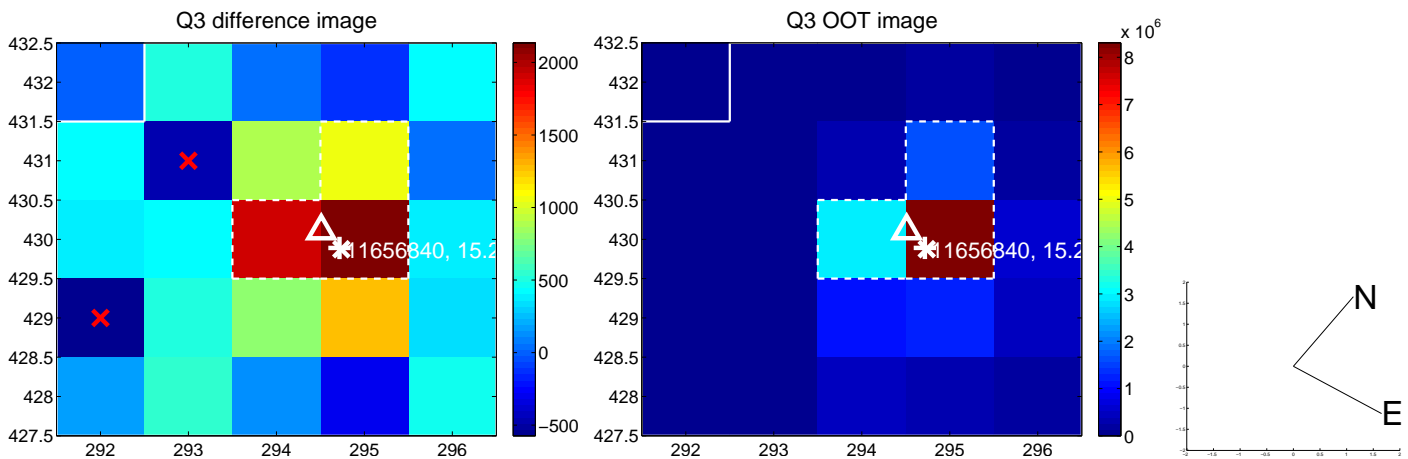
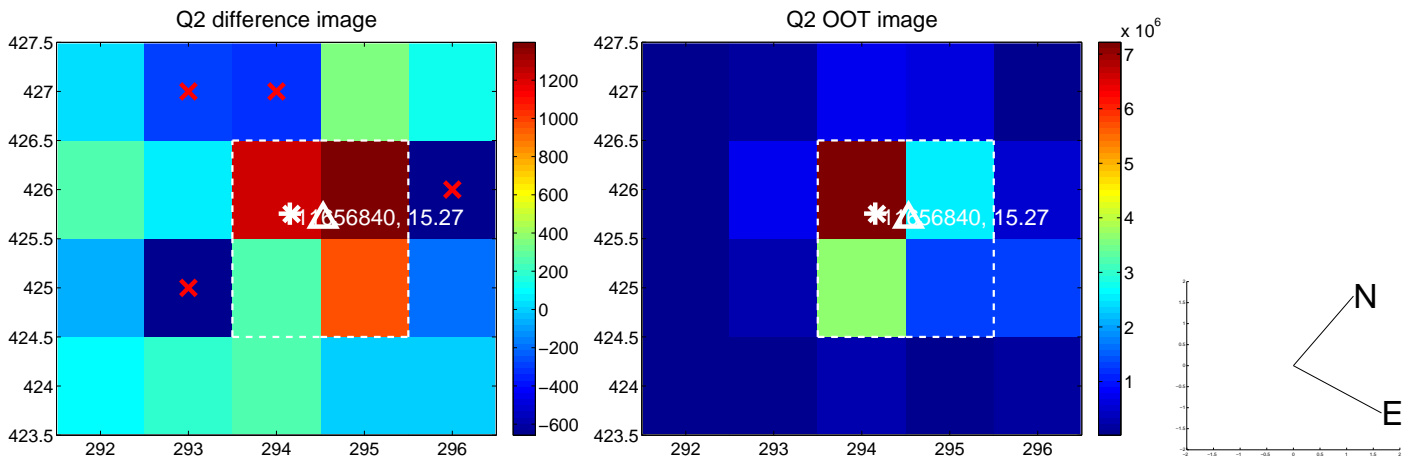
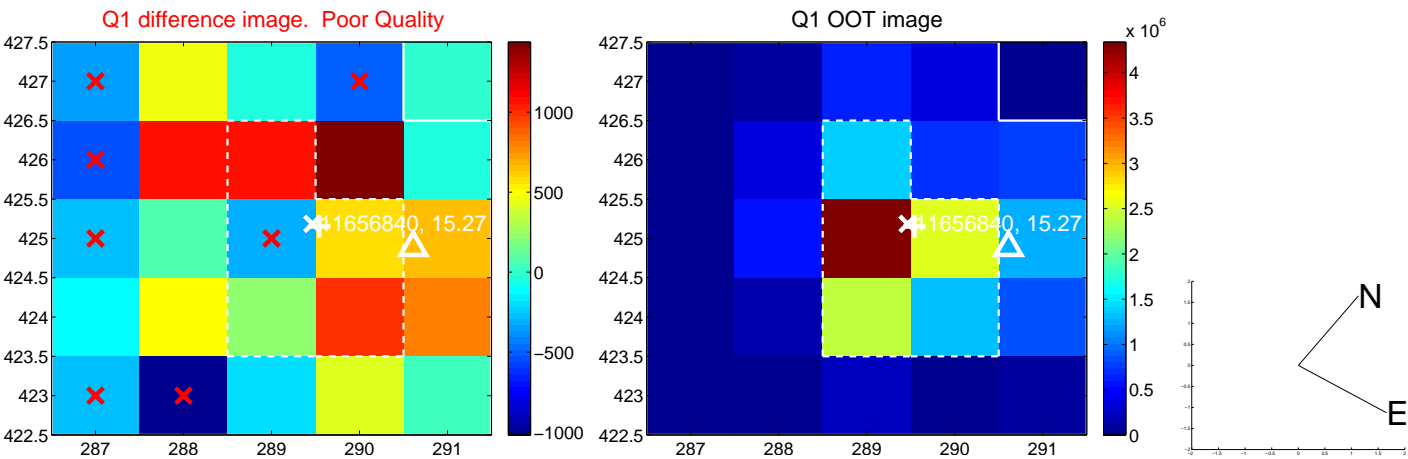
The direct PRF centroid is offset from the target star catalog position by about 0.27 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.182 \pm 0.528$	0.35	$-0.138 \pm 0.734$	$0.119 \pm 0.348$
PRF-fit source offset from KIC position	$0.234 \pm 0.657$	0.36	$-0.210 \pm 0.742$	$0.103 \pm 0.328$
photometric centroid source offset	$1.47 \pm 0.80$	1.84	$-0.42 \pm 0.72$	$1.41 \pm 0.81$

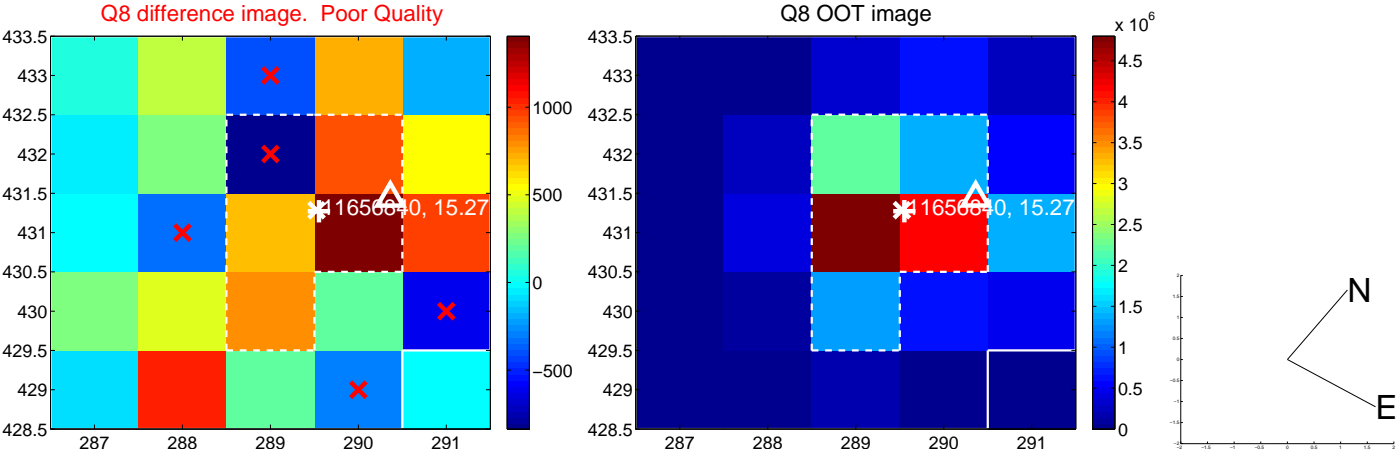
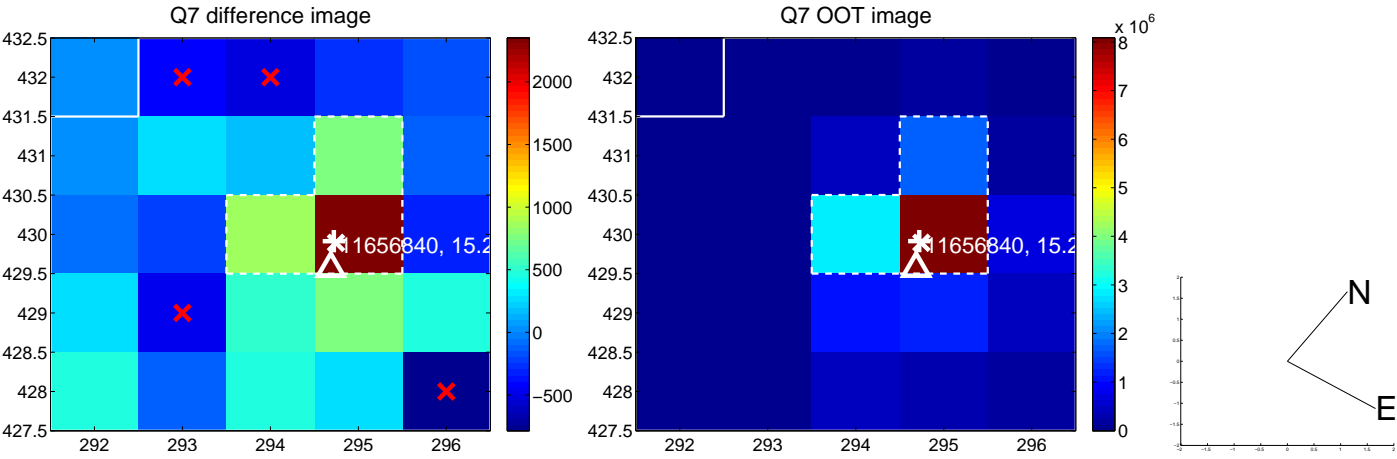
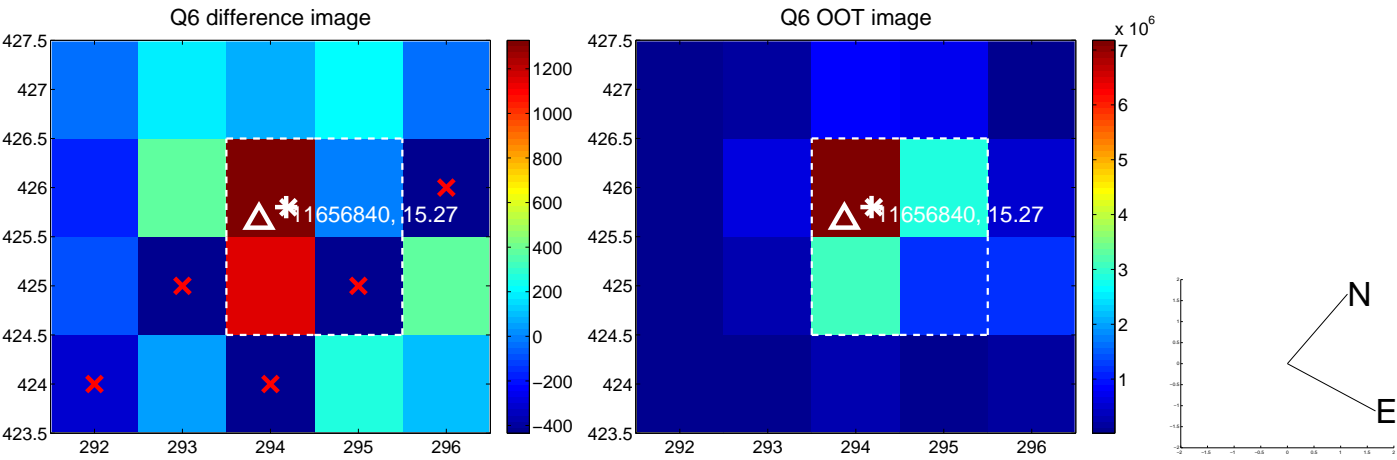
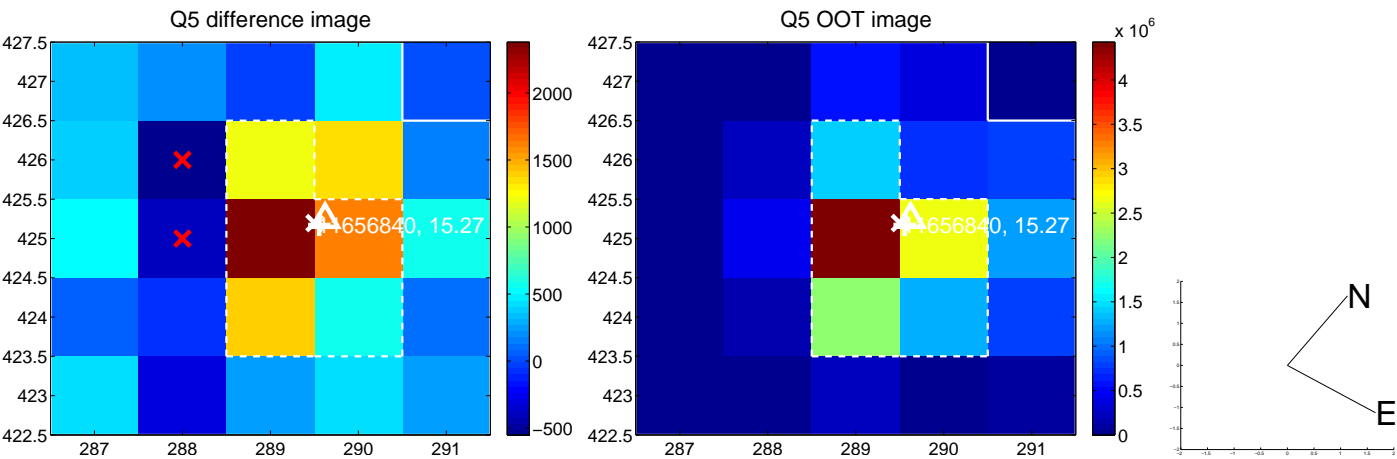


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets**; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

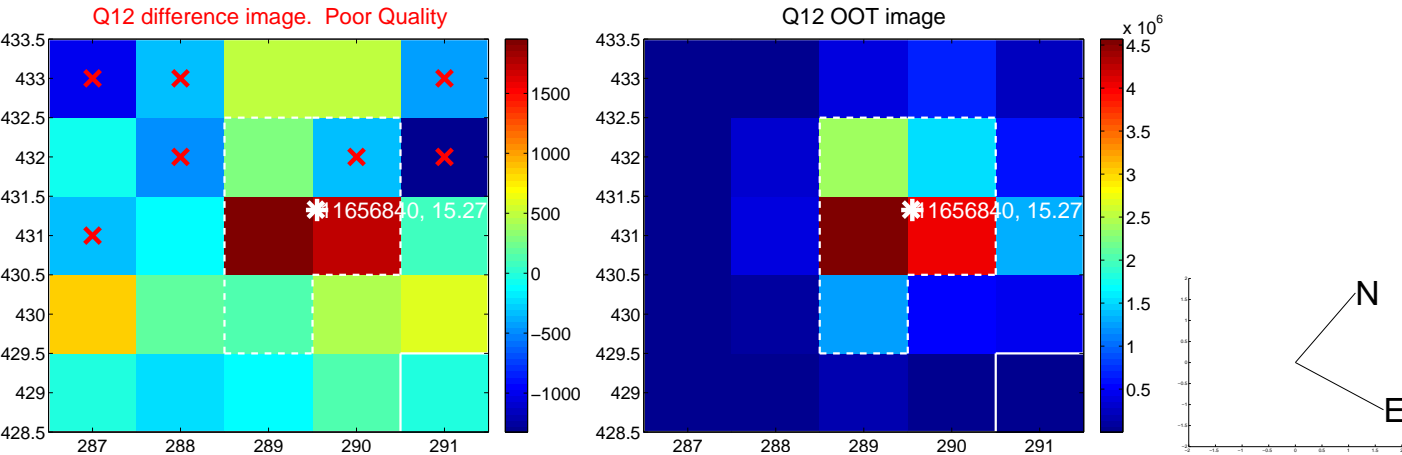
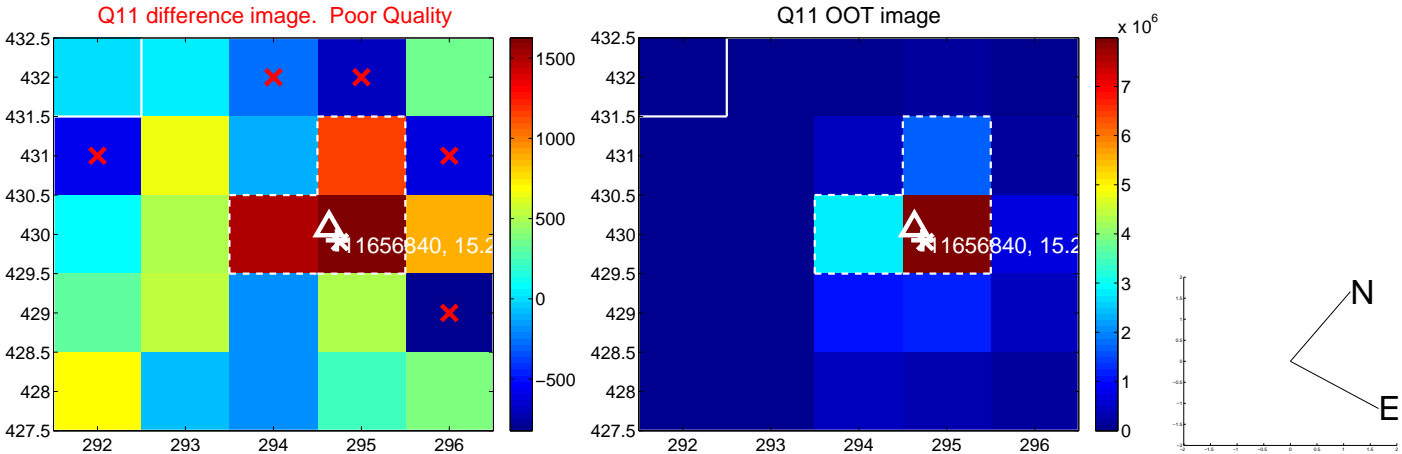
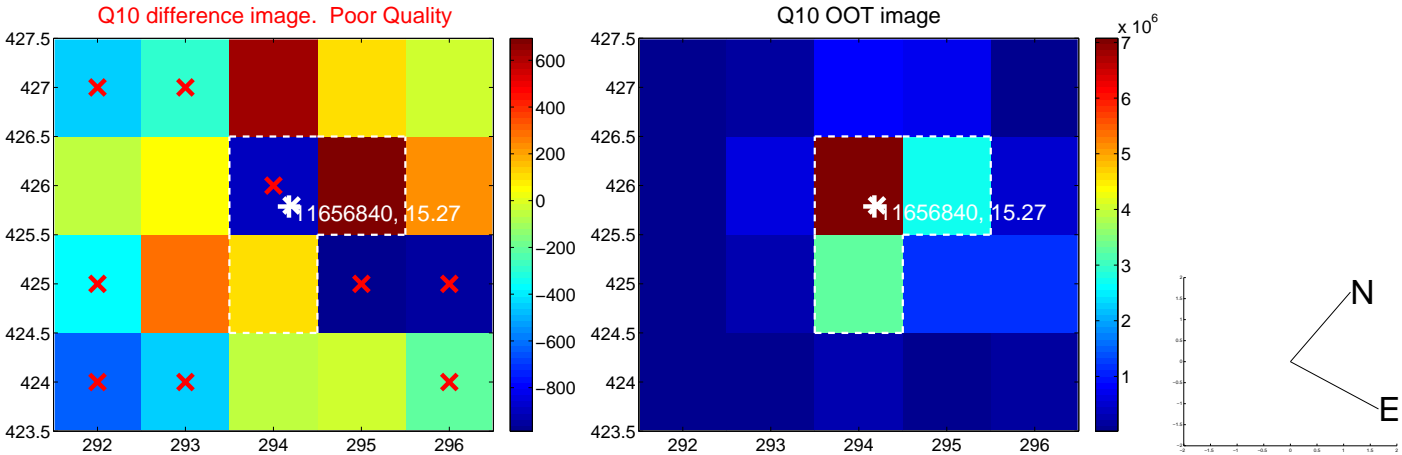
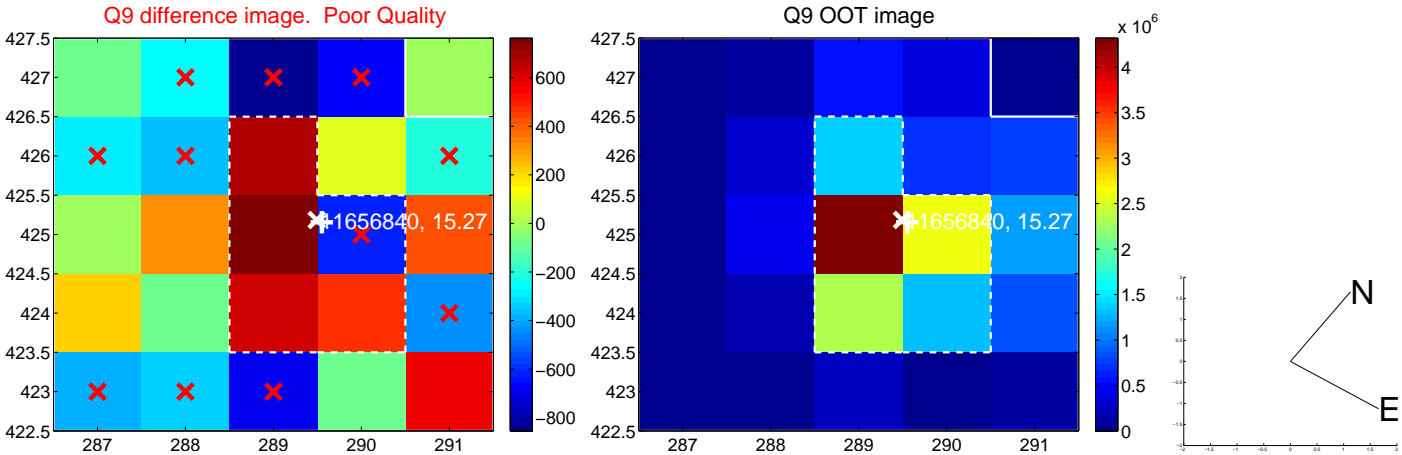
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



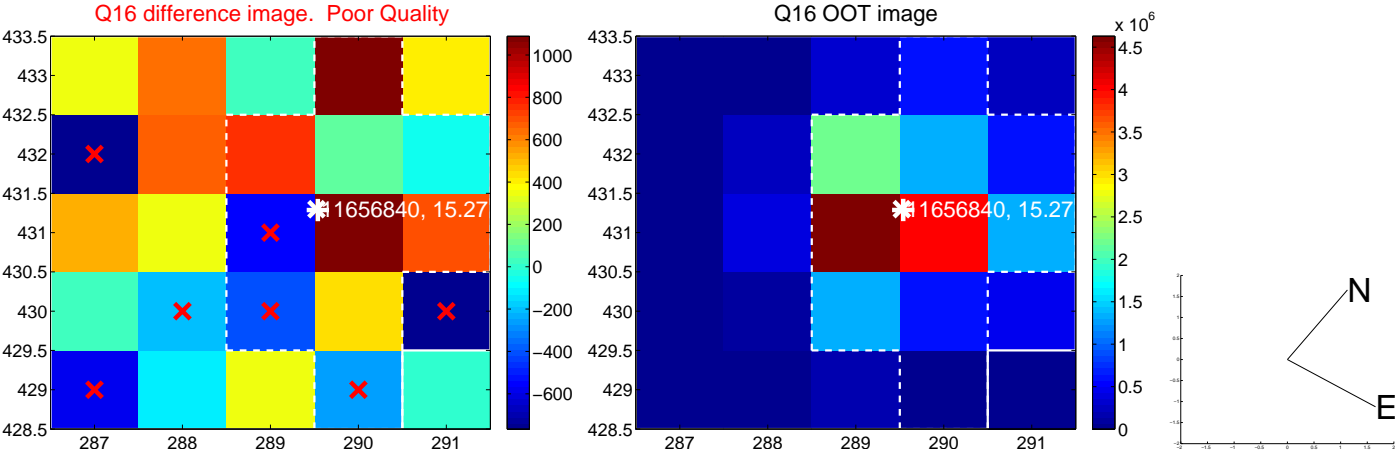
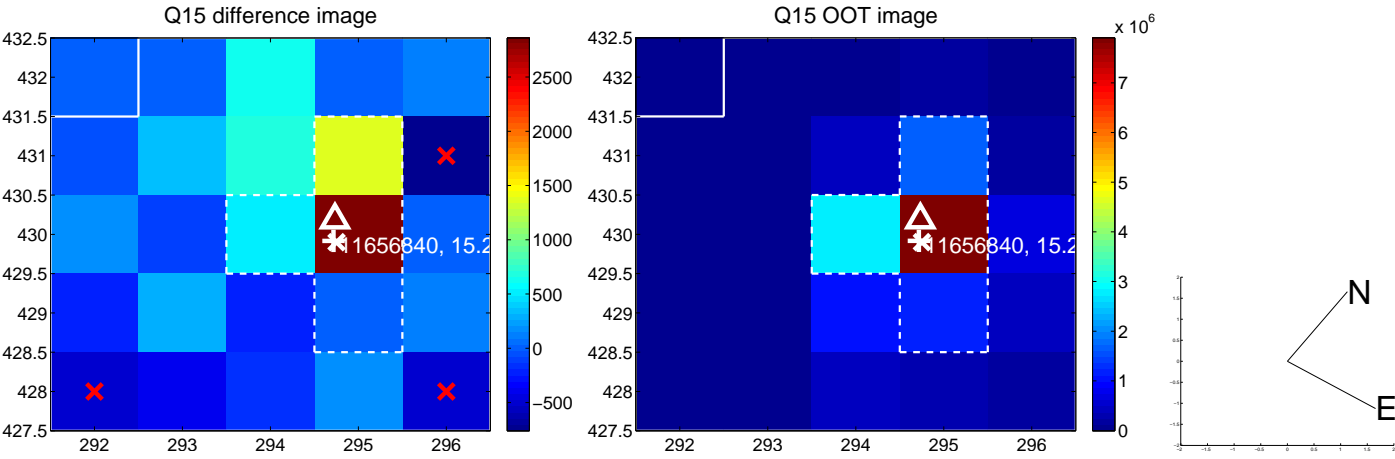
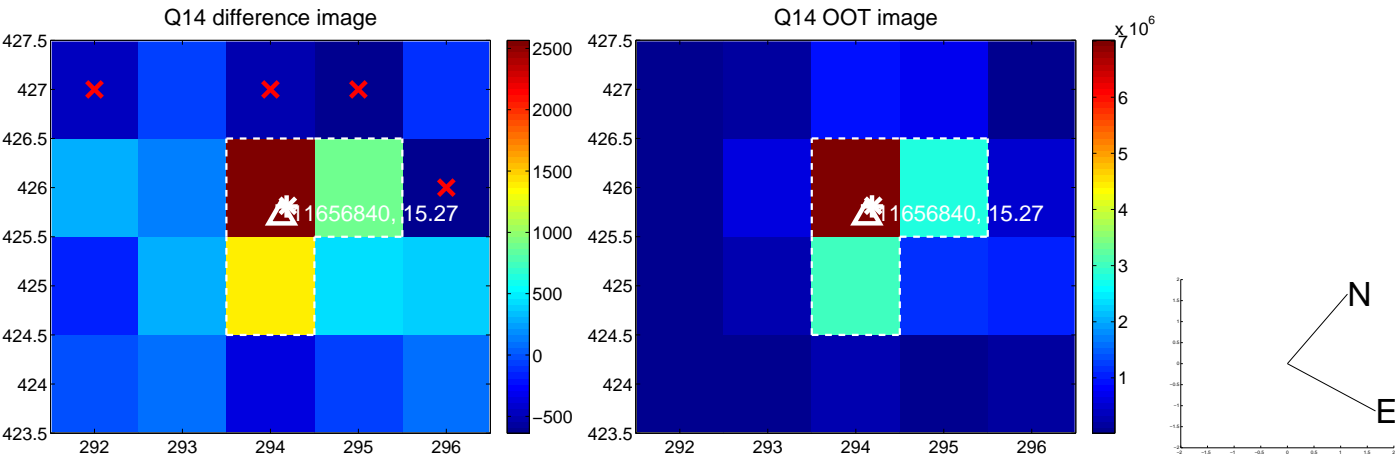
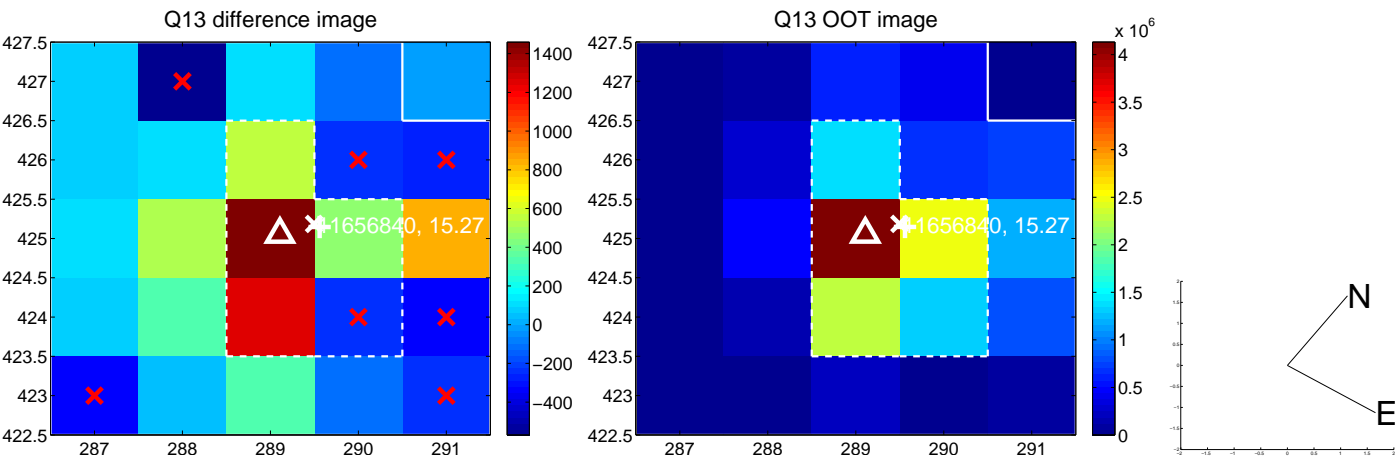
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



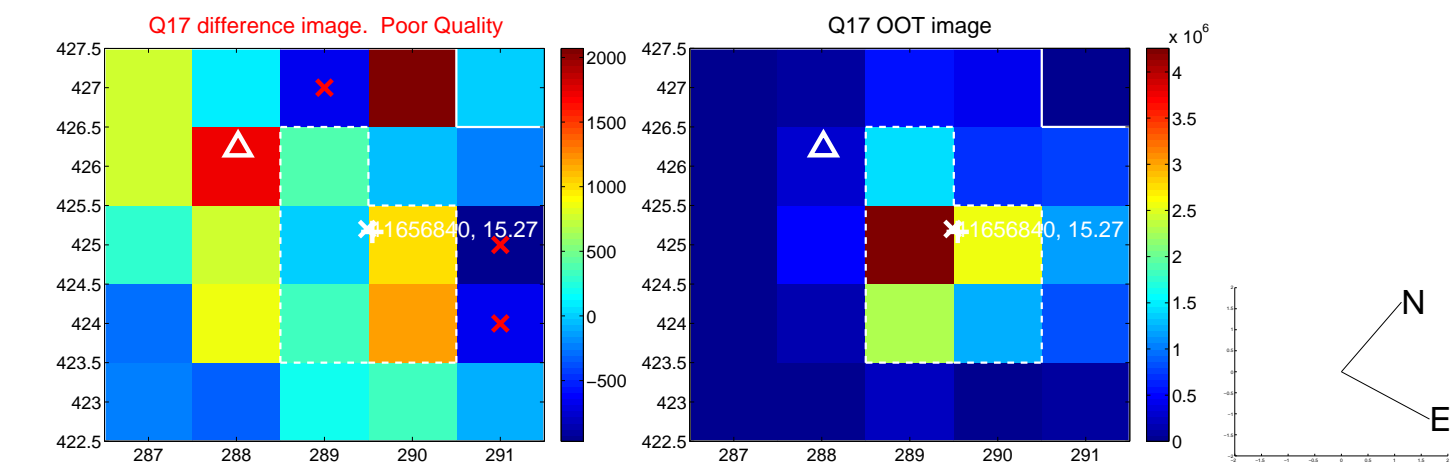
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



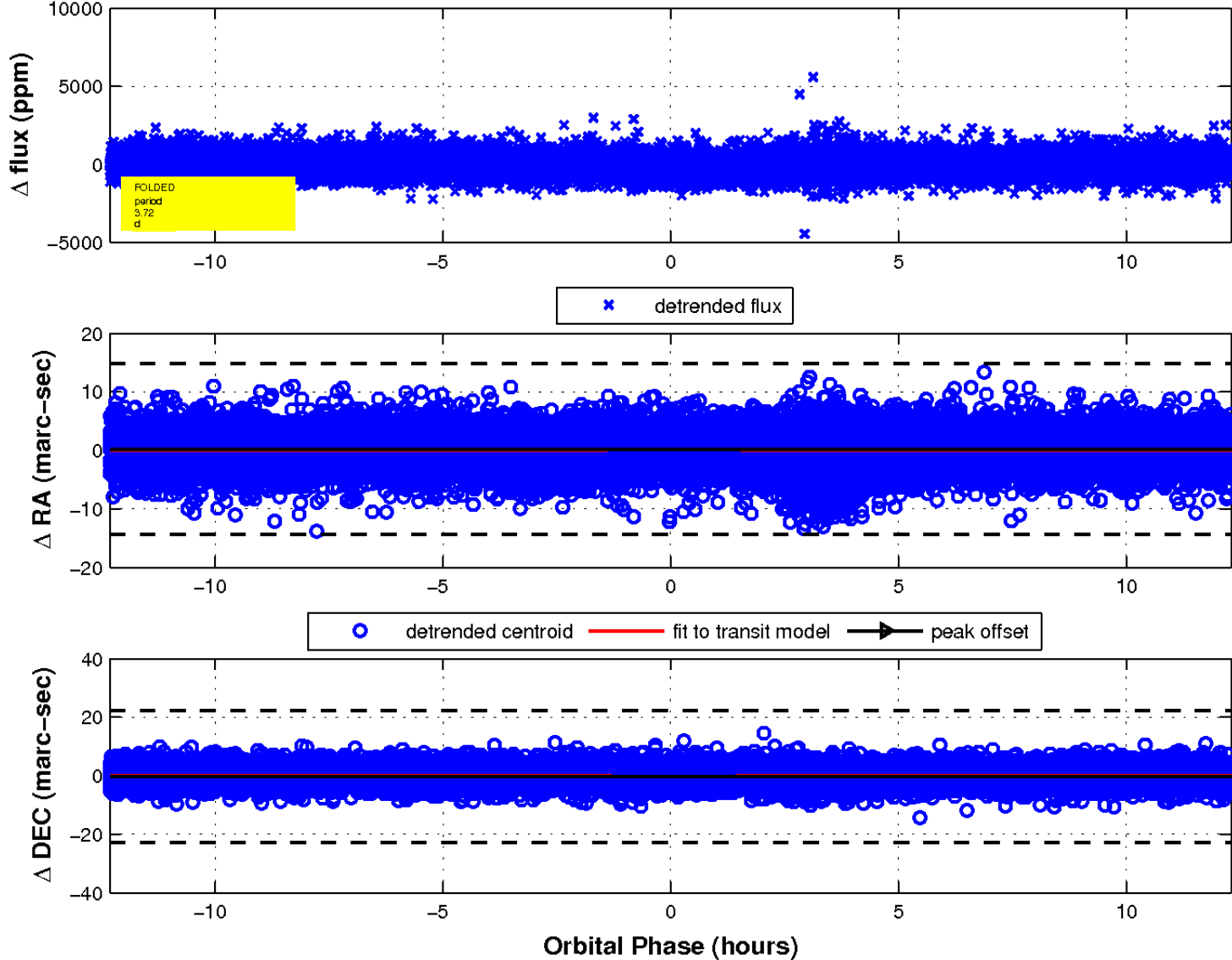
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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



fluxWeightedCentroids, Planet 2 of 2



UKIRT Image

