

# KIC 008181016

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
008181016-01	OBS	No	1.418019	132.204300	205.4	1.230	25.9	26.2	0.69	5350	1.23	759.55
008181016-02	OBS	No	0.709018	132.196881	260.7	1.167	49.8	32.8	0.69	5350	1.38	1913.91

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
008181016-01	OBS	FP	0.00	1	0	1	0	MOD_NONUNIQ_ALT—CENT_UNRESOLVED_OFFSET
008181016-02	OBS	FP	0.00	1	0	1	0	TRANS_GAPPED—SAME_NTL_PERIOD—CENT_UNRESOLVED_OFFSET—HALO_GHOST

**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 008181016-01

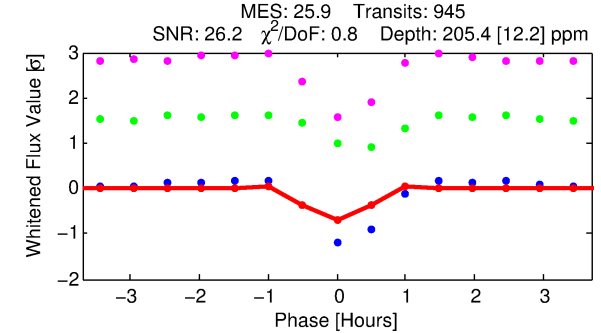
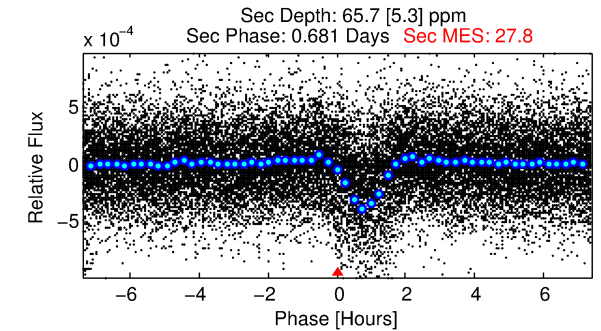
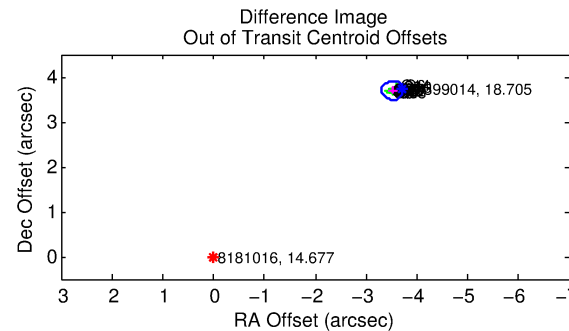
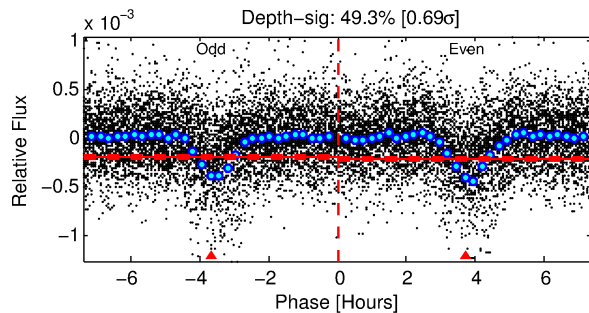
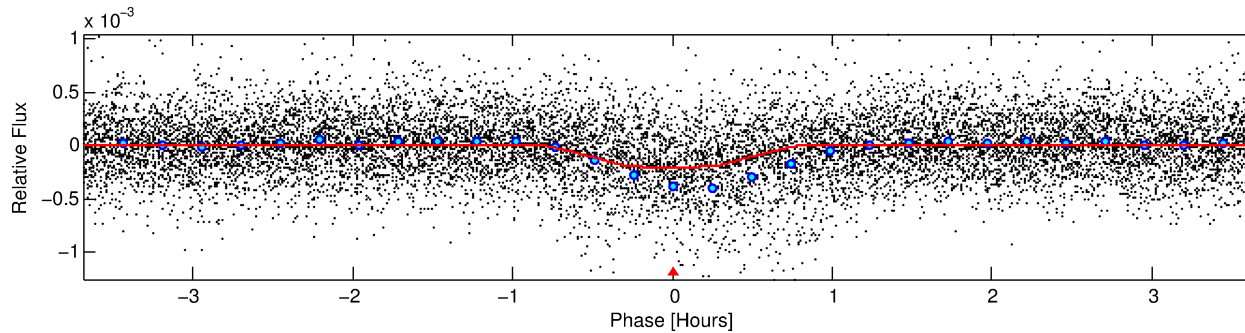
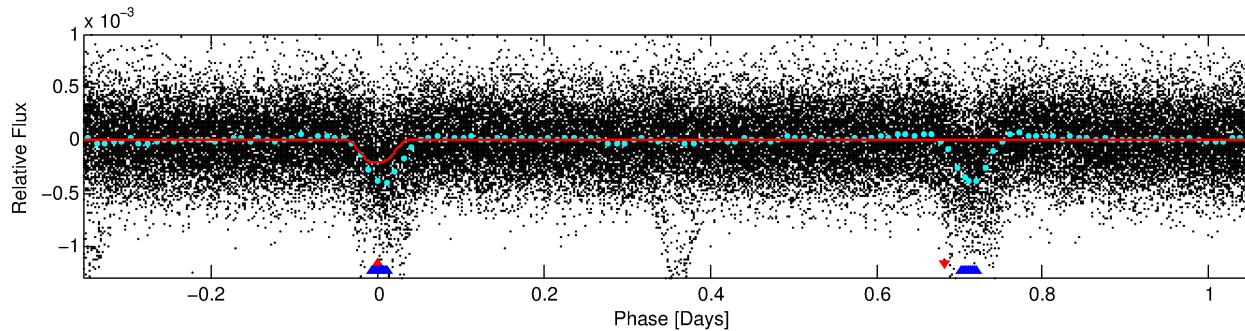
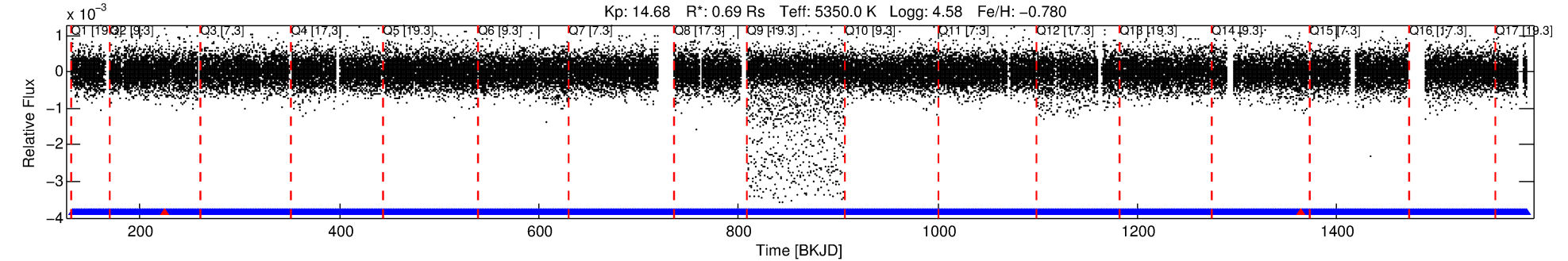
No Significant Match Found

# DV One-Page Summary

KIC: 8181016 Candidate: 1 of 2 Period: 1.418 d

KOI: K06174 Corr: No Ephemeris Match

Kp: 14.68 R\*: 0.69 Rs Teff: 5350.0 K Logg: 4.58 Fe/H: -0.780



## DV Fit Results:

Period = 1.41802 [0.00000] d  
Epoch = 132.2043 [0.0007] BKJD  
Rp/R\* = 0.0162 [0.0042]  
a/R\* = 3.79 [4.26]  
b = 0.93 [0.19]  
Seff = 759.55 [142.52]  
Teq = 1339 [63] K  
Rp = 1.23 [0.34] Re  
a = 0.0215 [0.0020] AU  
Ag = 11.17 [6.01] [1.69σ]  
Teffp = 3783 [503] K [4.82σ]

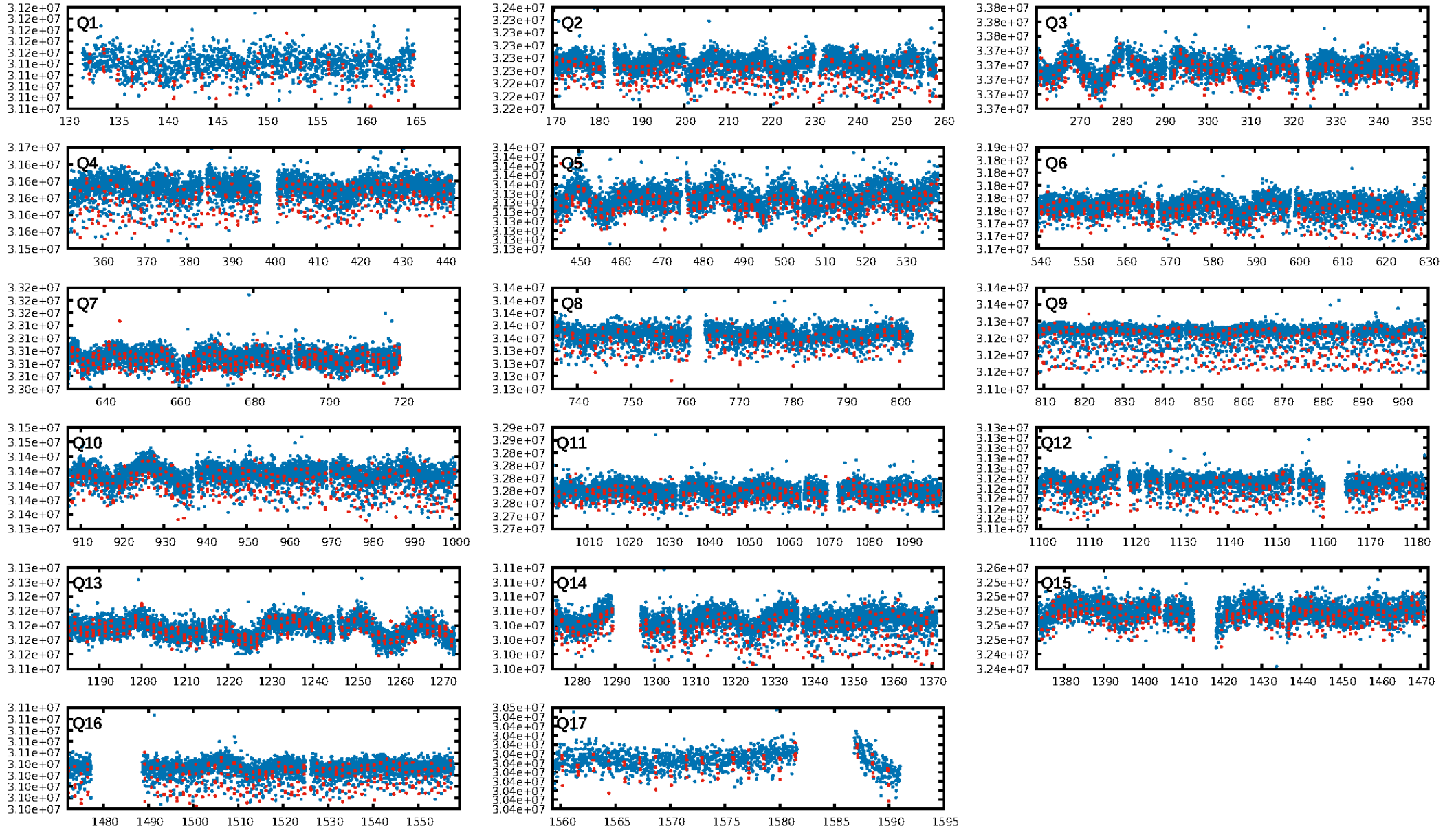
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [10.04σ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: 1.33e-127  
RollingBand-fgt: 1.00 [900/902]  
GhostDiagnostic-chr: -1.393  
Centroid-sig: N/A  
Centroid-so: 4.542 arcsec [7.41σ]  
OotOffset-rm: 5.100 arcsec [73.65σ]  
KicOffset-rm: 5.192 arcsec [76.19σ]  
OotOffset-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]

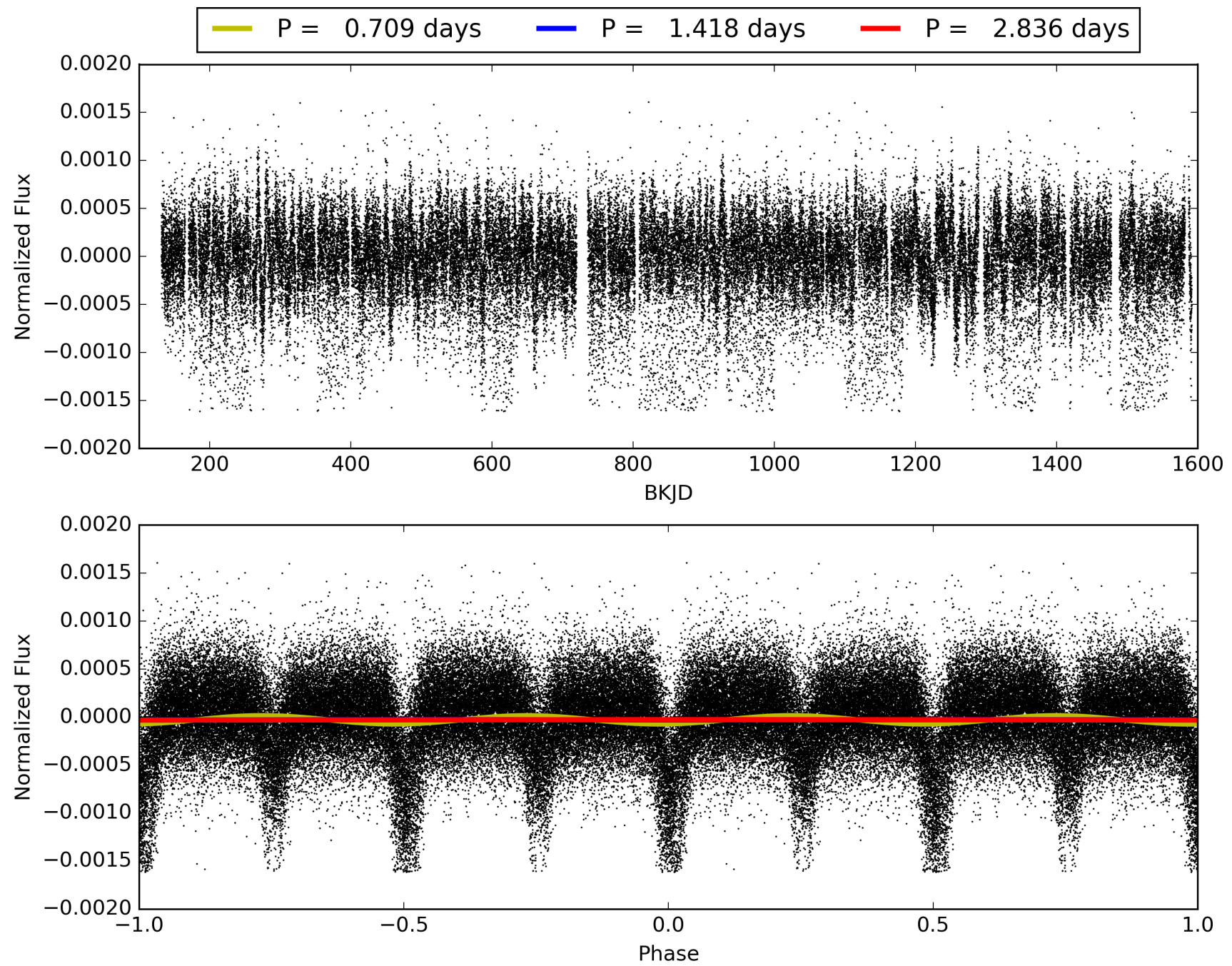
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 31-Jan-2016 23:31:13 Z

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

# TCE 008181016-01, PDC Light Curves



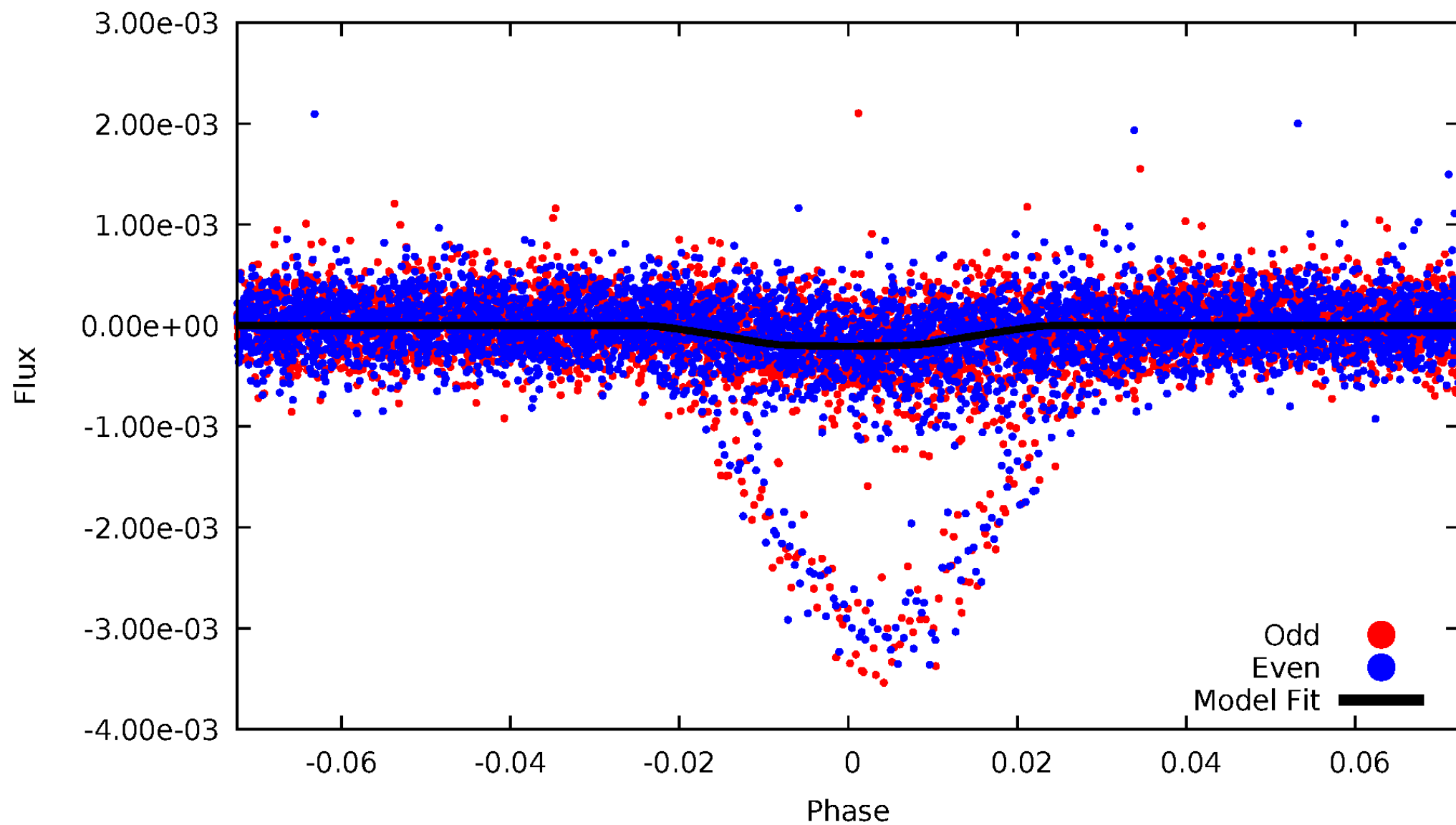
TCE 008181016-01





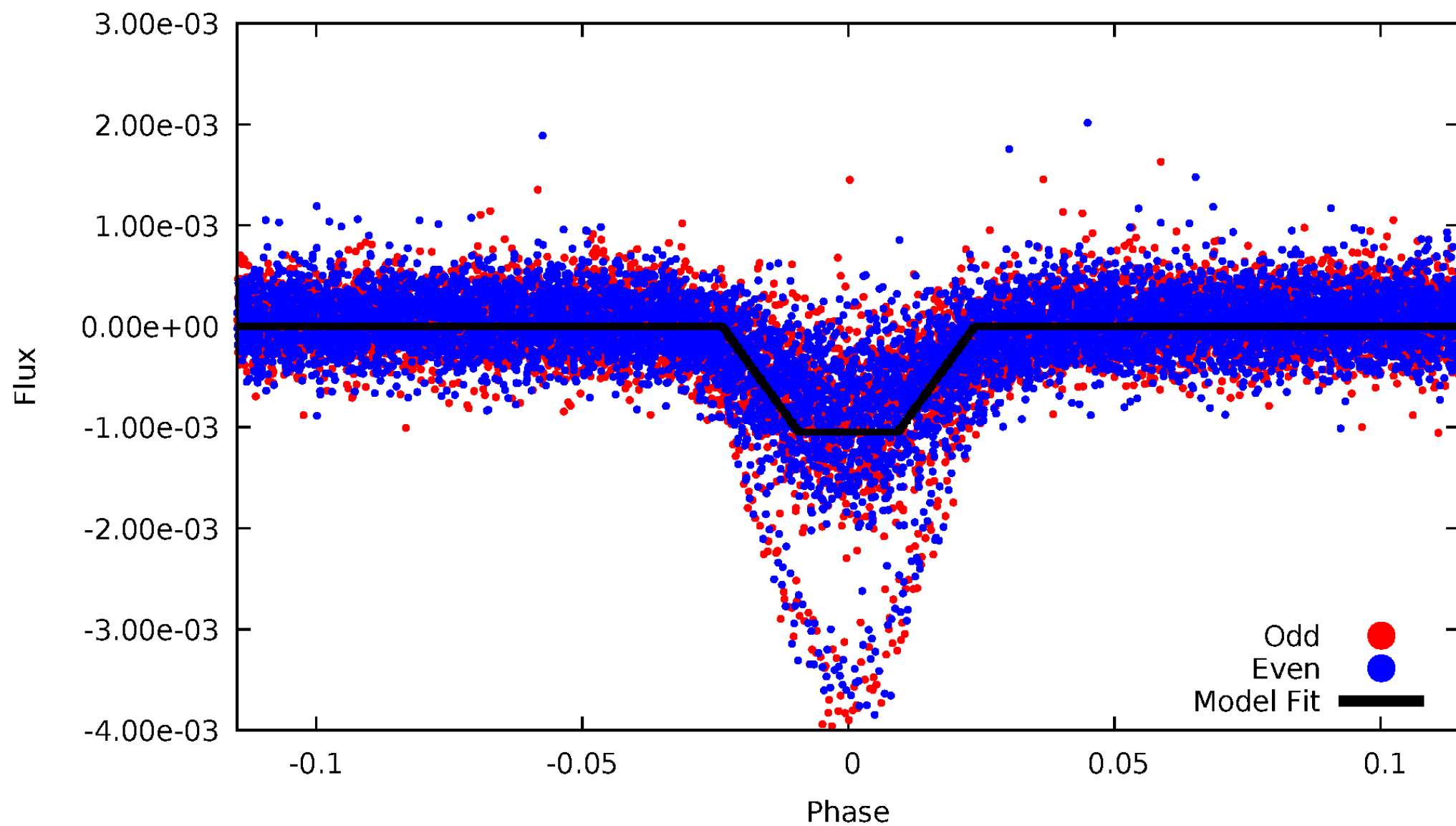
# DV Odd/Even

TCE 008181016-01



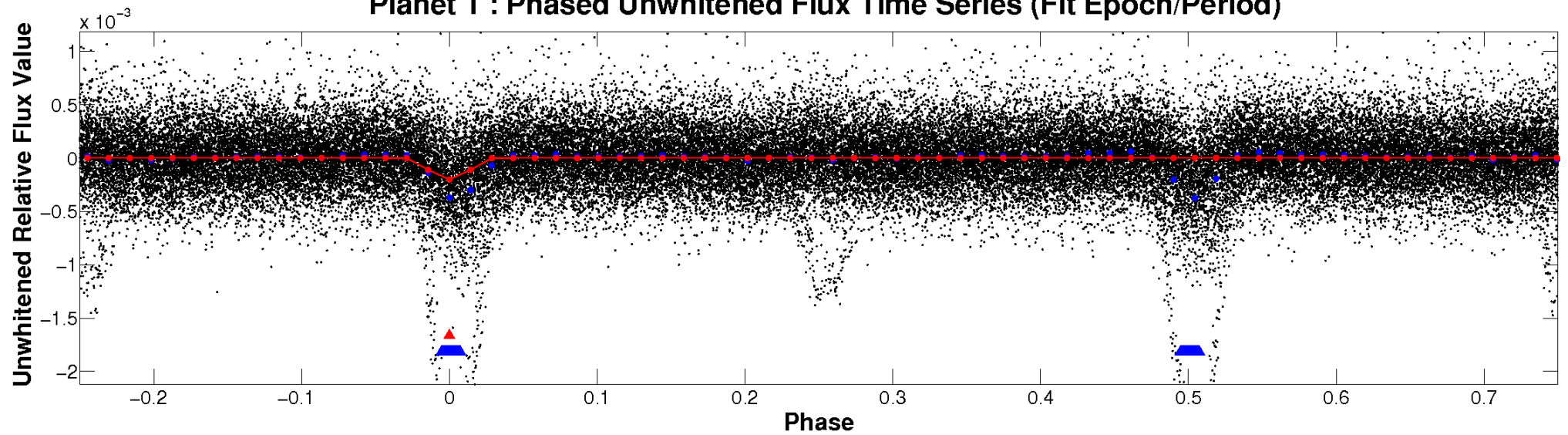
# ALT Odd/Even

TCE 008181016-01

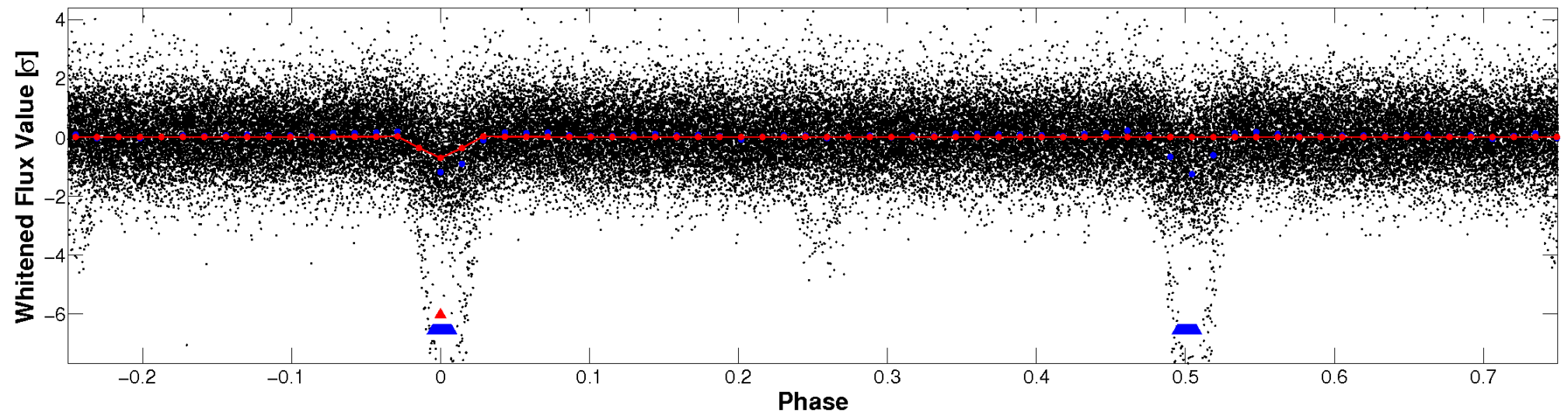


# Non-Whitened Vs. Whitened Light Curve

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

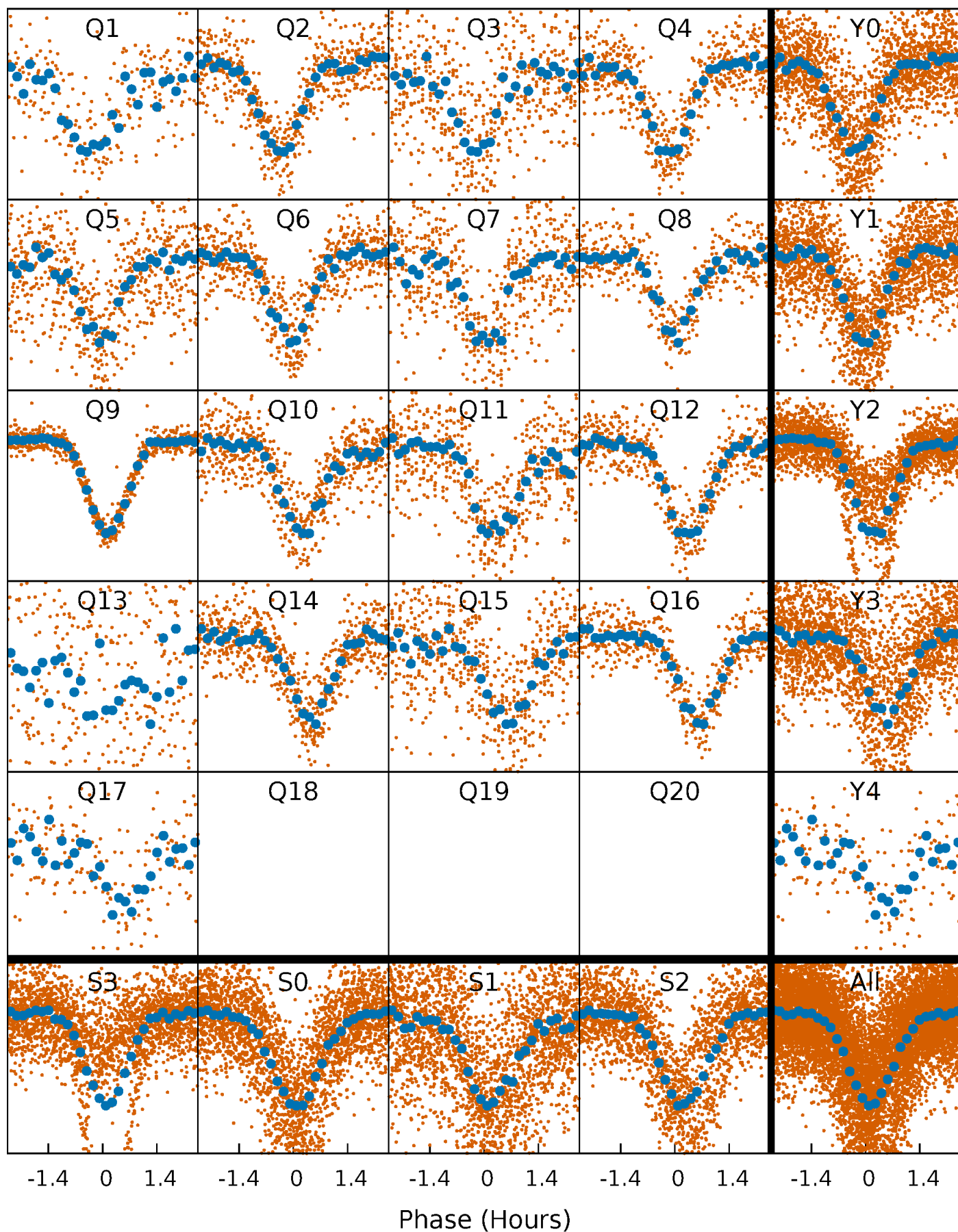


**Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)**



# PDC Quarter-Phased Transit Curves

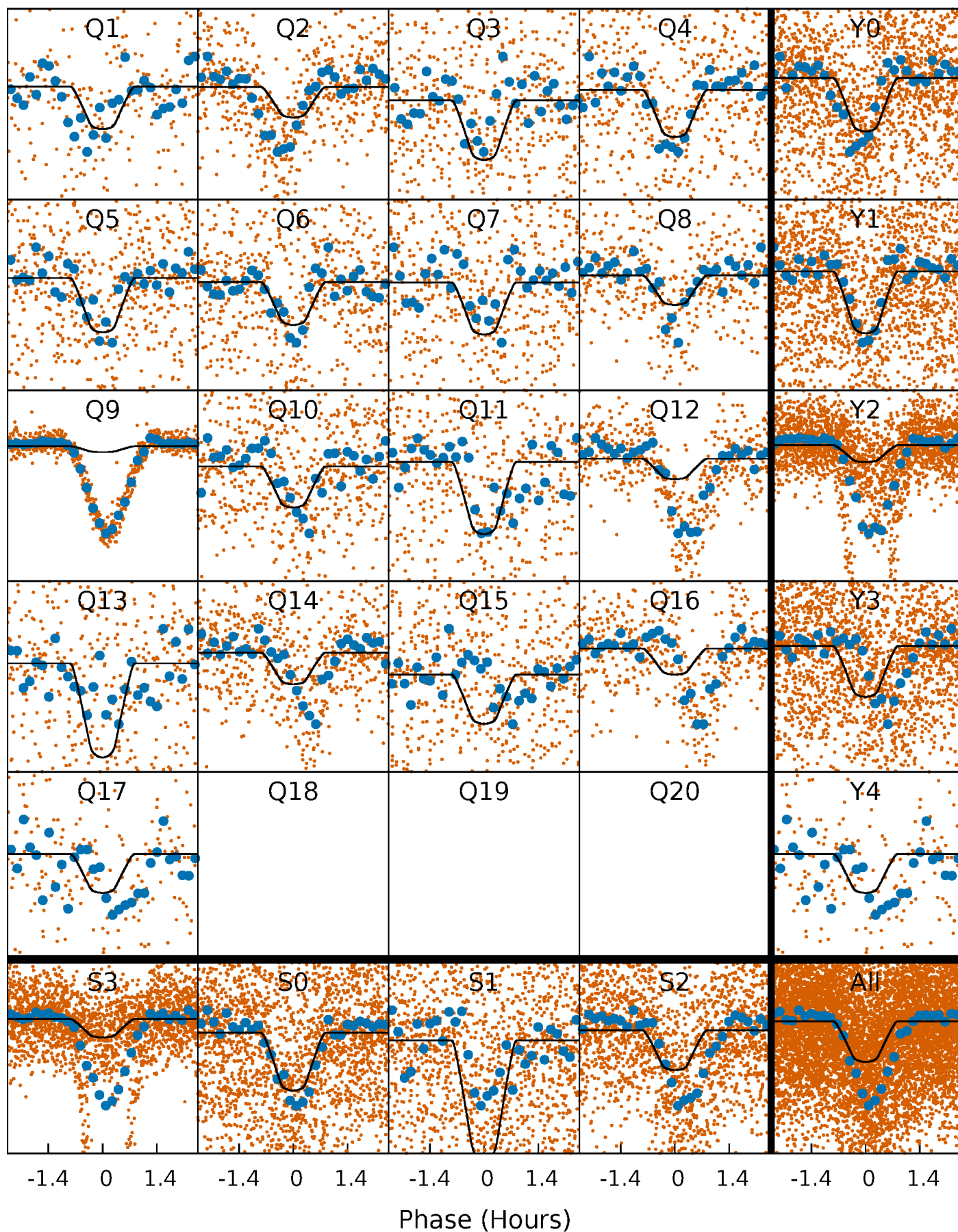
TCE 008181016-01 P= 1.418019 Days  $T_0=132.204300$  (BKJD)





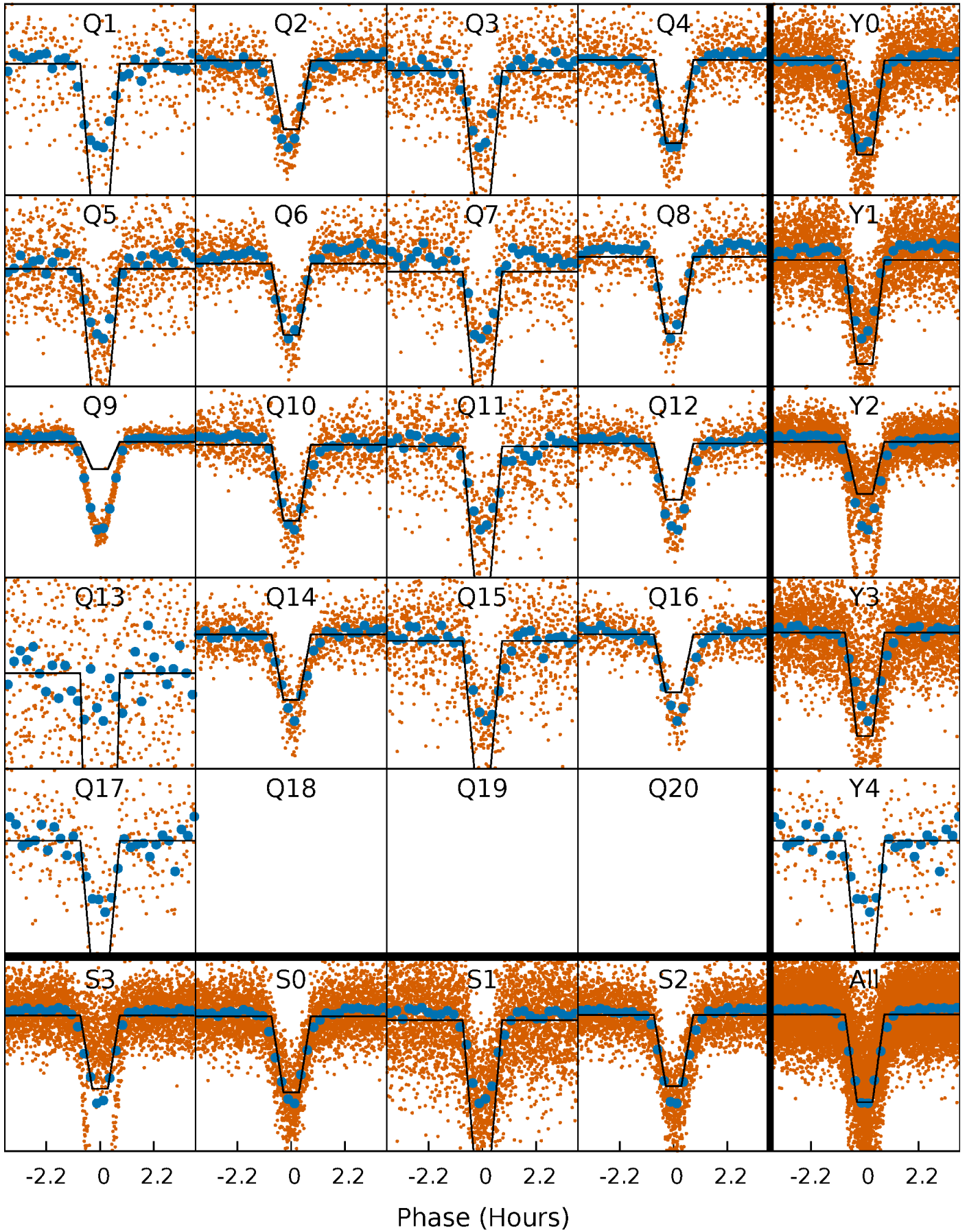
# DV Quarter-Phased Transit Curves

TCE 008181016-01 P= 1.418019 Days  $T_0=132.204300$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

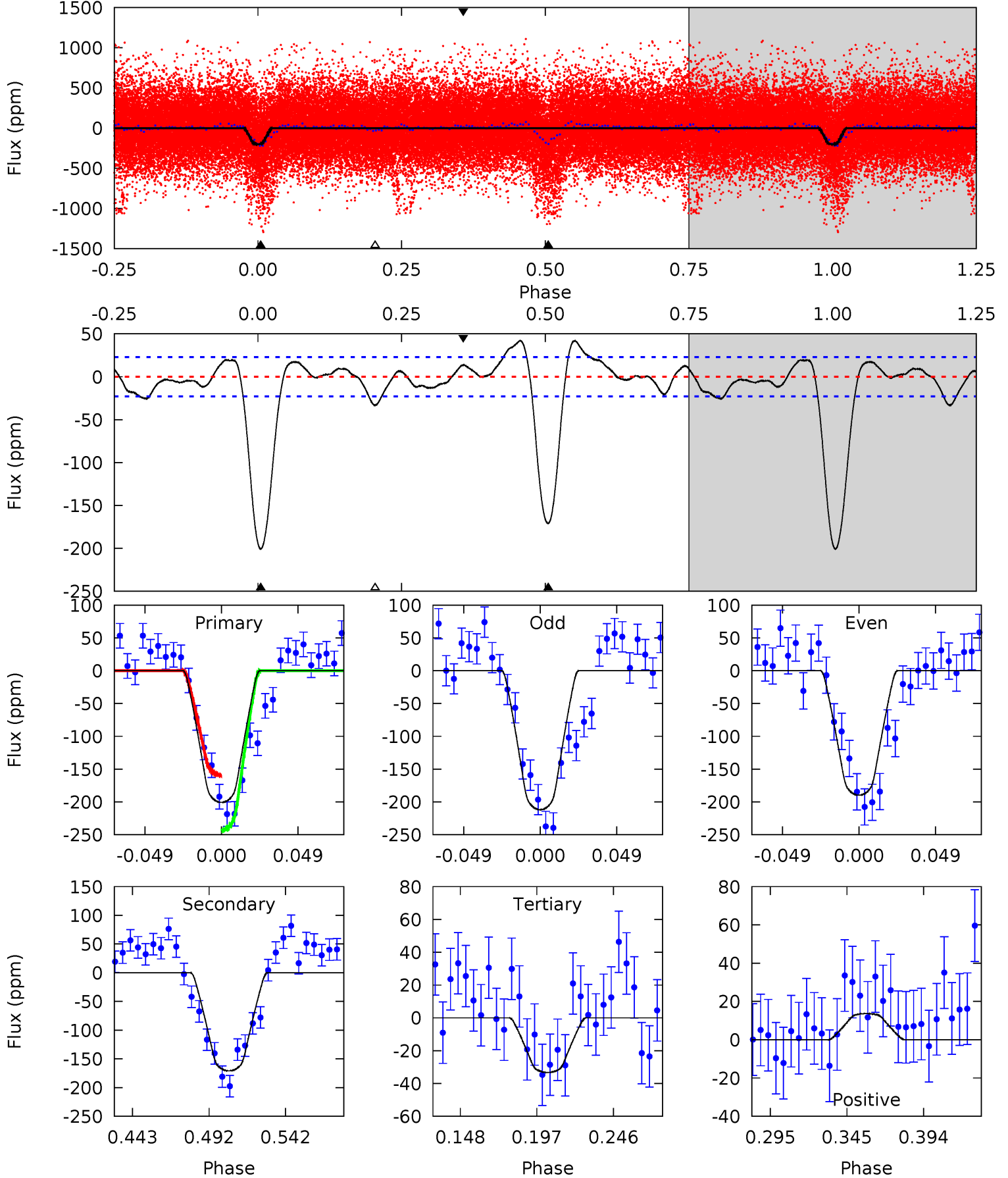
TCE 008181016-01 P= 1.418049 Days  $T_0=132.194642$  (BKJD)



# DV Model-Shift Uniqueness Test

008181016-01, P = 1.418019 Days, E = 130.786281 Days

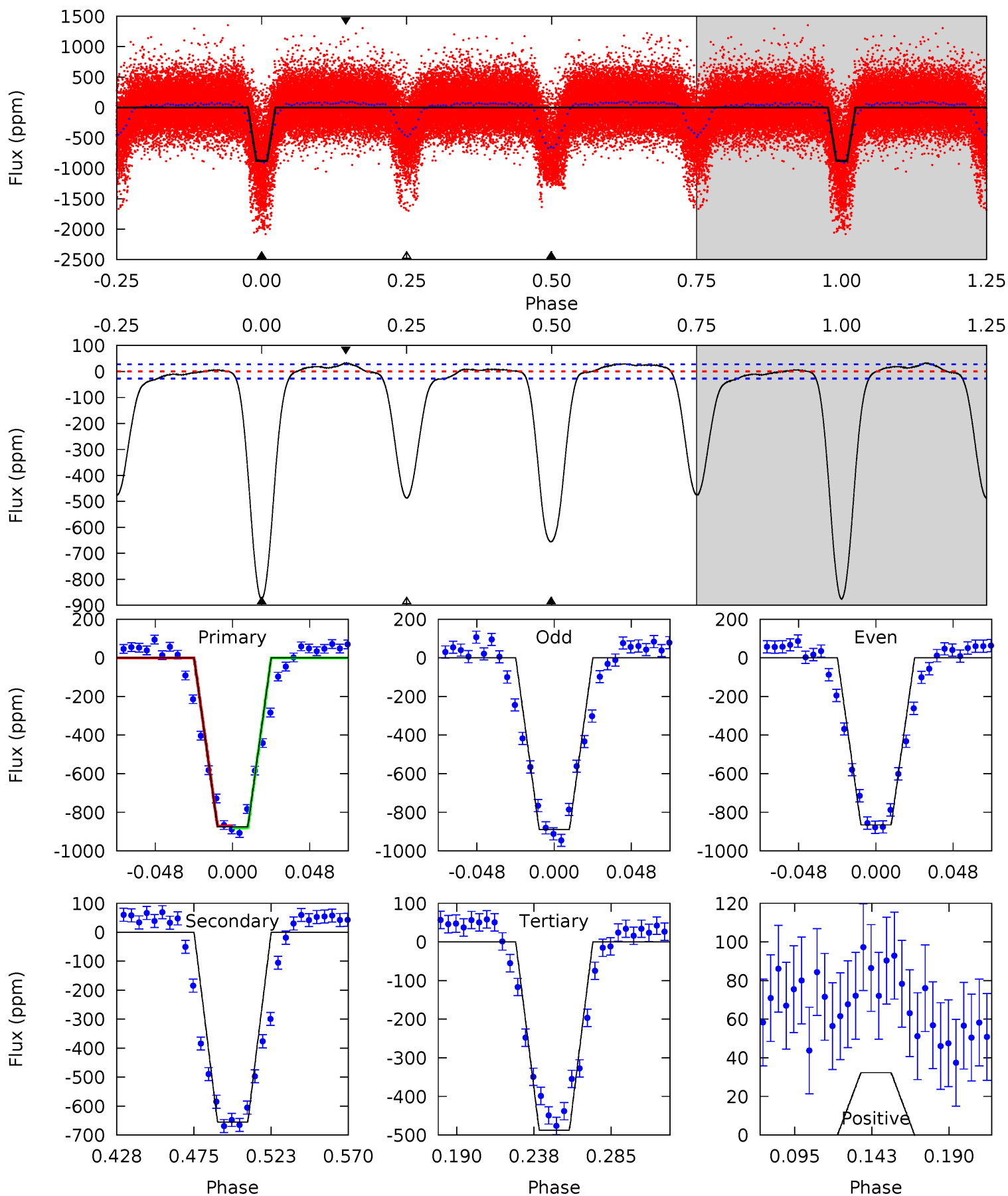
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
41.3	35.2	6.84	2.81	4.71	1.97	2.93	34.5	38.5	28.3	32.3	2.28	1.88	0.17	8.66



# Alt Model-Shift Uniqueness Test

008181016-01, P = 1.418049 Days, E = 130.776593 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
151.5	113.4	84.3	5.59	4.72	1.98	22.1	67.2	145.9	29.1	107.8	2.09	1.18	0.04	0.78



### Stellar Parameters For KIC 008181016

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R$ ( $R_{\odot}$ )	$M(M_{\odot})$	$p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ )
	$5350^{+160}_{-160}$	$4.578^{+0.083}_{-0.053}$	$-0.780^{+0.300}_{-0.300}$	$0.693^{+0.071}_{-0.071}$	$0.663^{+0.076}_{-0.027}$	$2.805^{+0.999}_{-0.573}$
	+3%/-3%	+2%/-1%	+38%/-38%	+10%/-10%	+11%/-4%	+36%/-20%
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 008181016-01 / KOI

Detrend	Depth (ppm)	$R_p$ ( $R_{\oplus}$ )	$T_{max}$ (K)	$T_{obs}$ (K)	$A_{obs}$
DV	$-171 \pm 5$	$1.23^{+0.32}_{-0.32}$	$1861^{+78}_{-76}$	$4865^{+680}_{-458}$	$29^{+26}_{-11}$
Alt.	$-655 \pm 6$	$2.47^{+0.35}_{-0.32}$	$1863^{+73}_{-70}$	$4811^{+302}_{-265}$	$28^{+9}_{-6}$

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



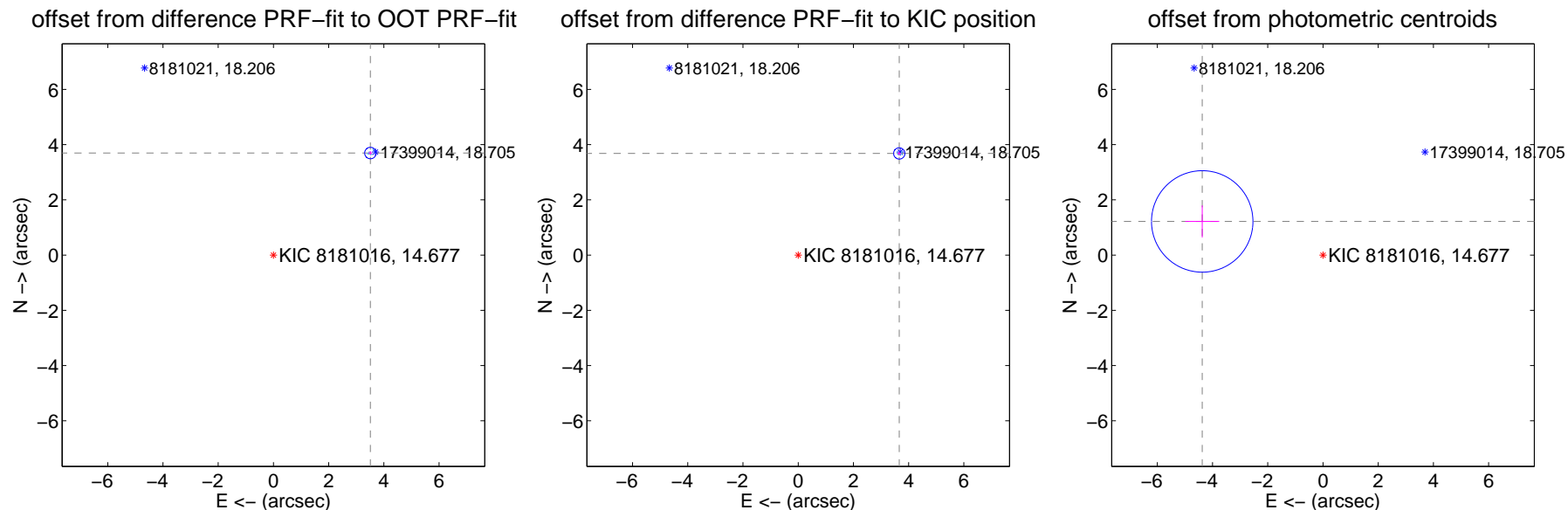
## DV Centroid Data

Supplemental centroid analysis for 008181016-01. Kepler magnitude: 14.68. Transit SNR 26.16

There are 17 quarters with good PRF difference image offsets

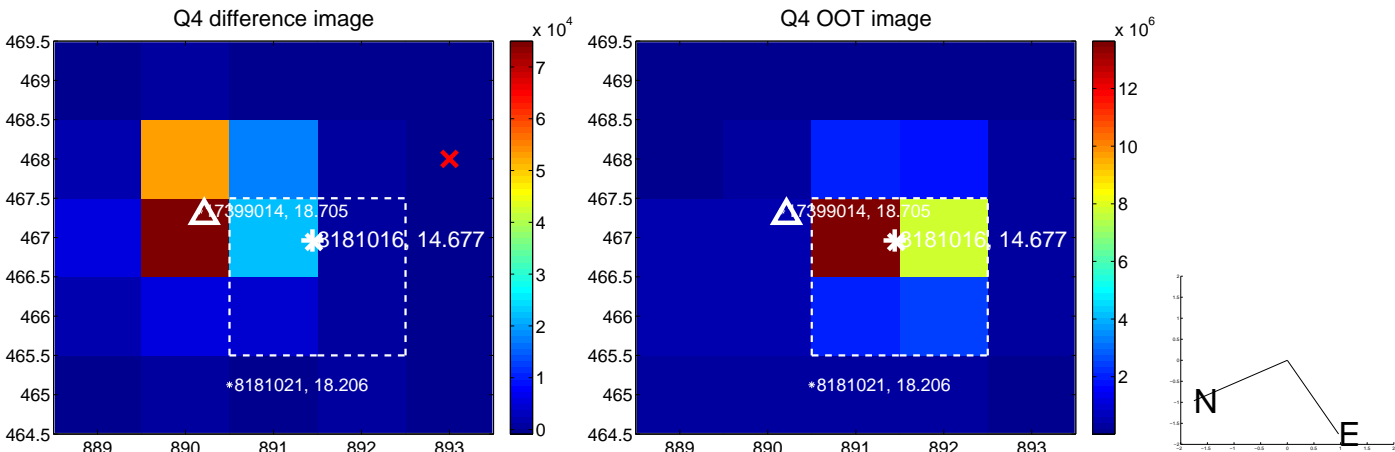
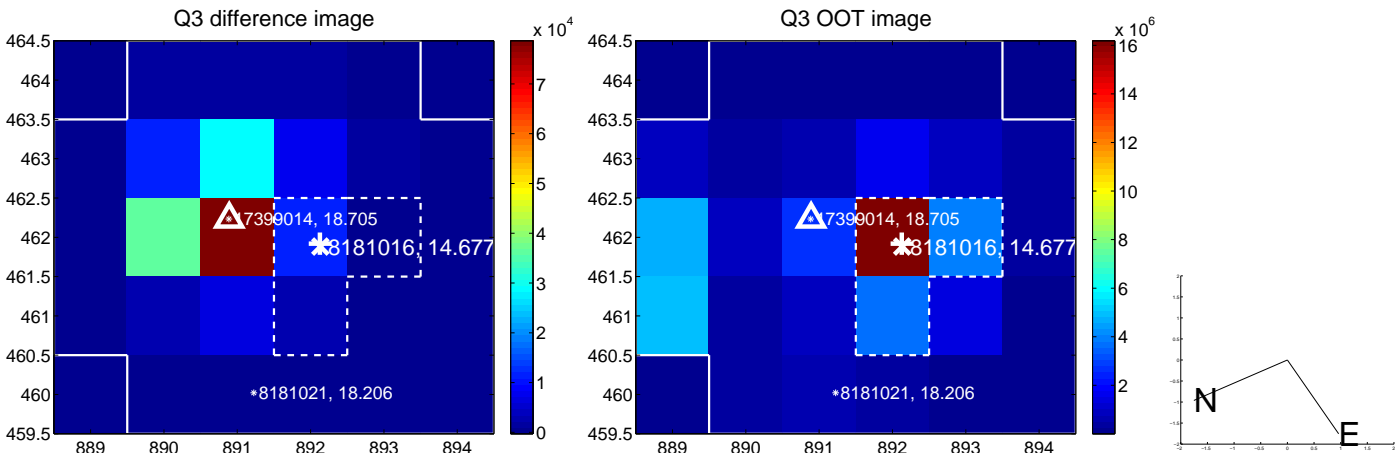
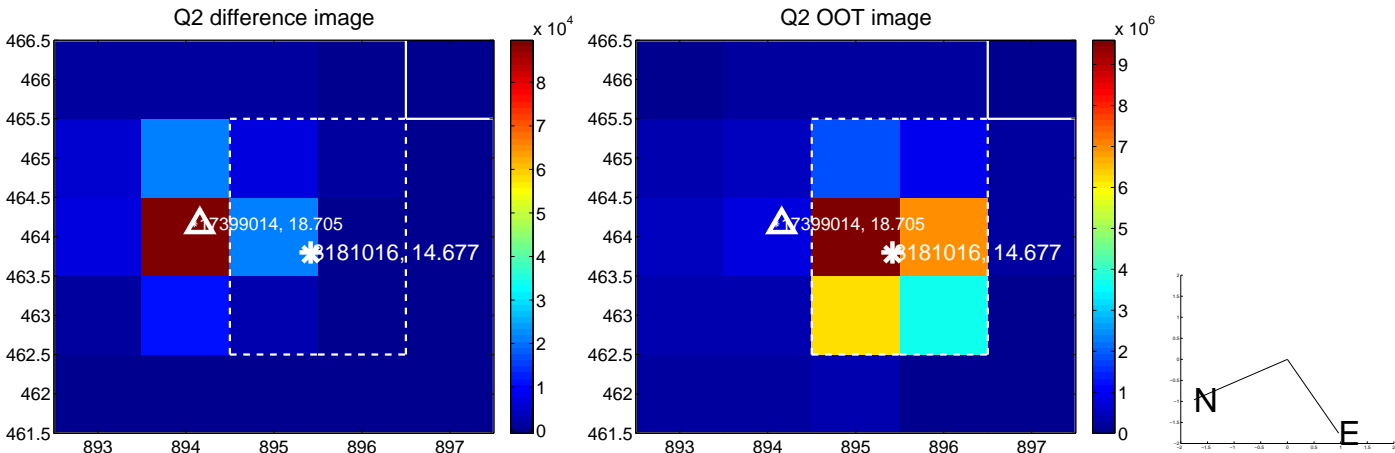
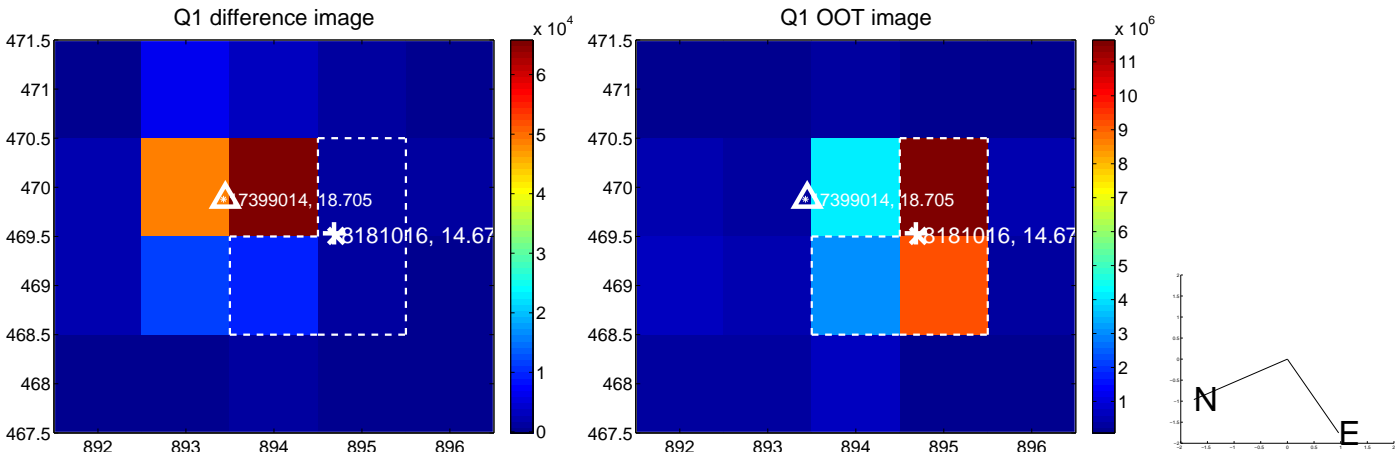
The direct PRF centroid is offset from the target star catalog position by about 0.23 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	5.100 $\pm$ 0.069	73.65	-3.514 $\pm$ 0.069	3.696 $\pm$ 0.068
PRF-fit source offset from KIC position	5.192 $\pm$ 0.068	76.19	-3.662 $\pm$ 0.069	3.682 $\pm$ 0.067
photometric centroid source offset	4.54 $\pm$ 0.61	7.41	4.37 $\pm$ 0.62	1.22 $\pm$ 0.58

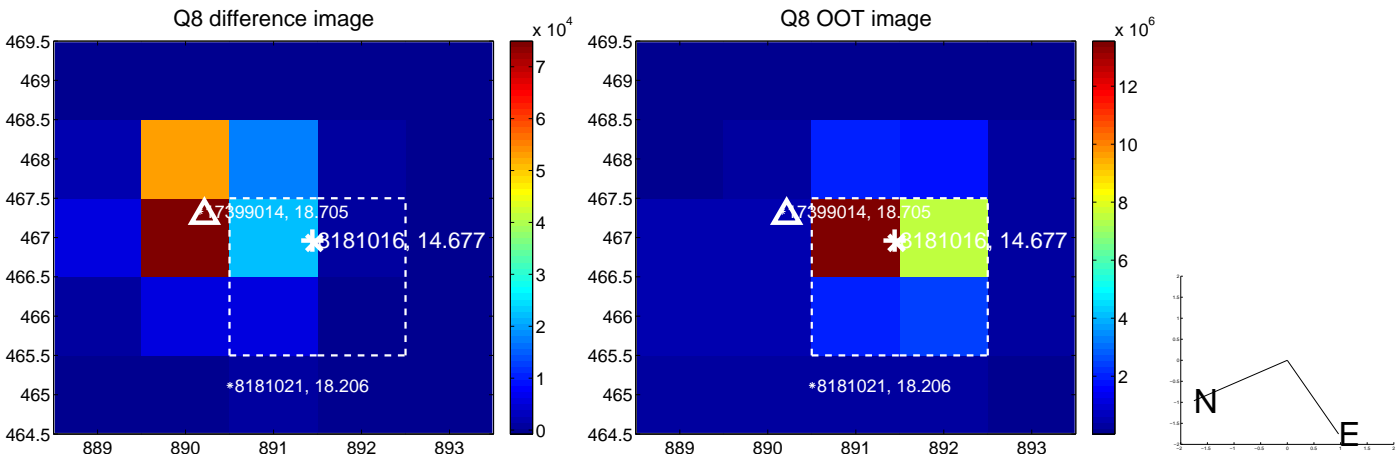
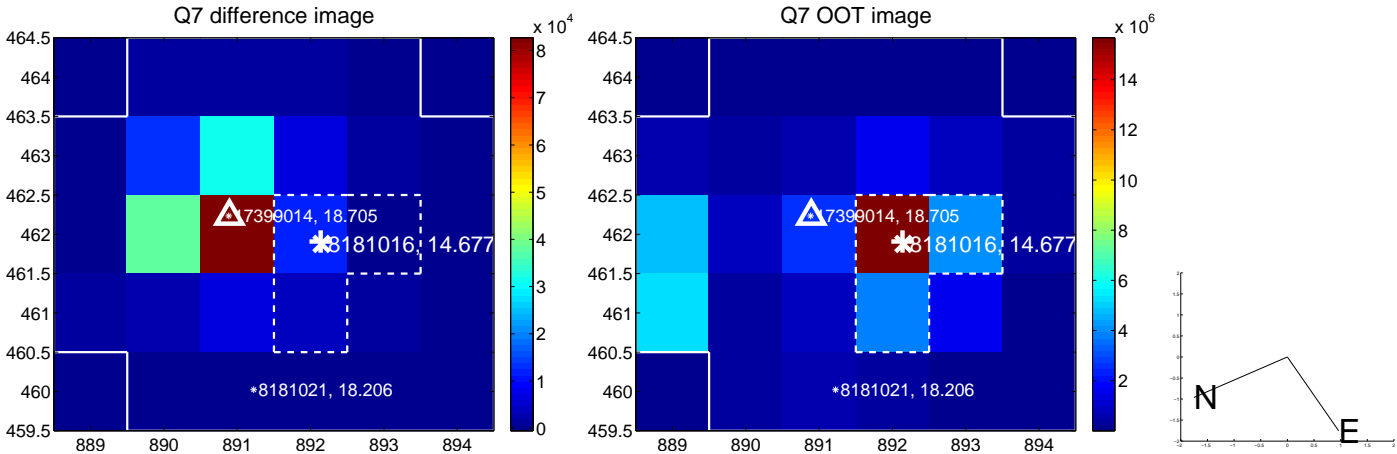
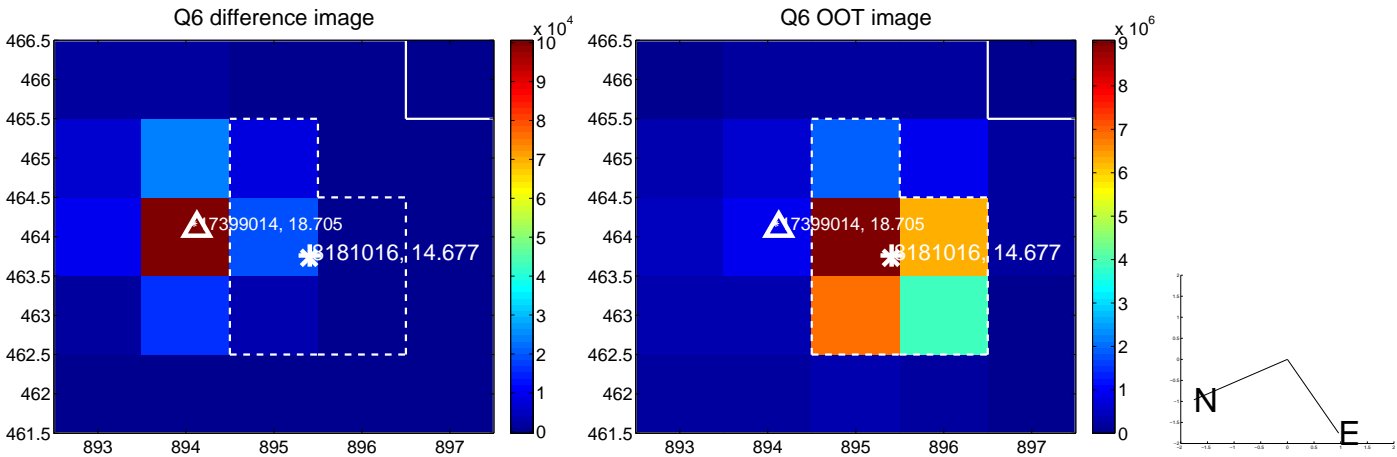
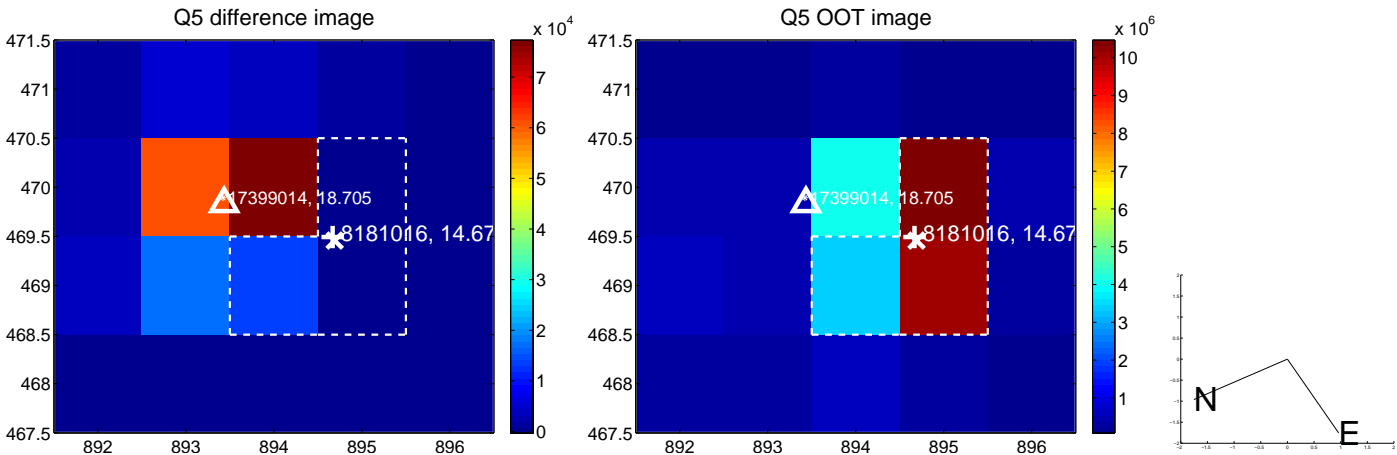


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets**; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

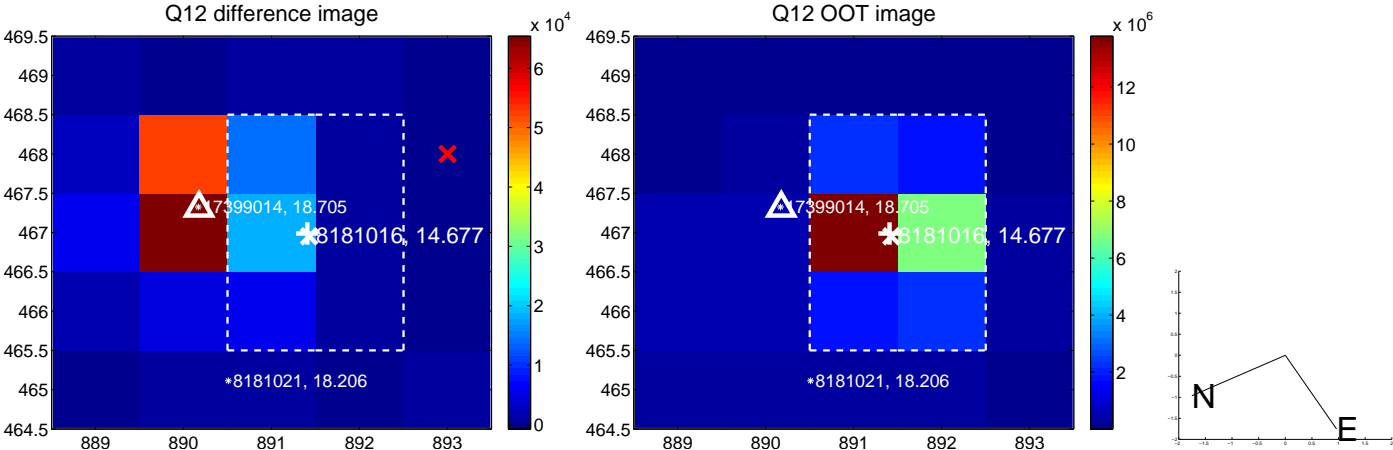
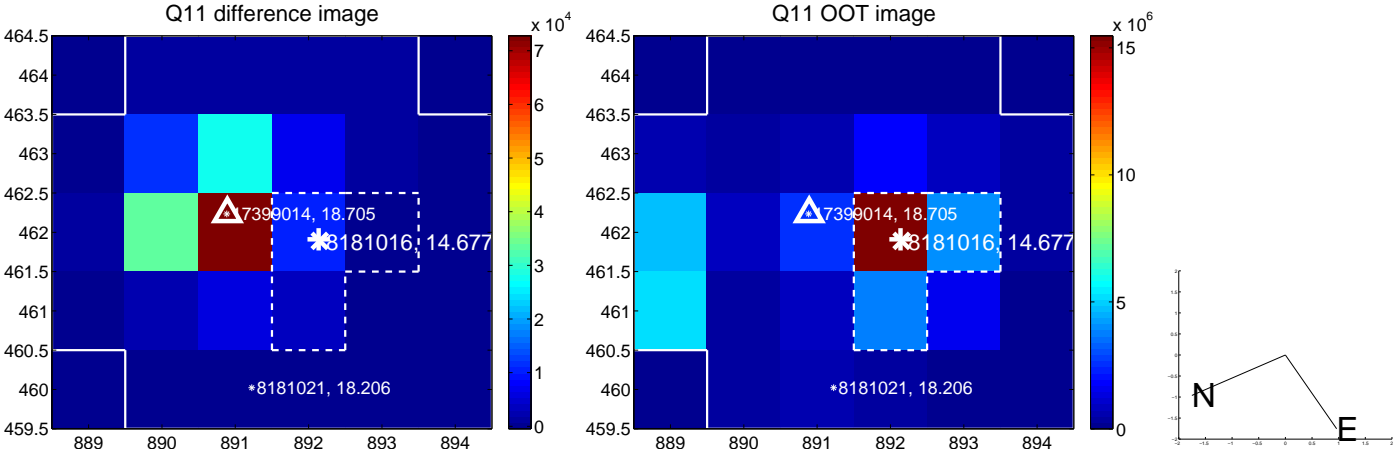
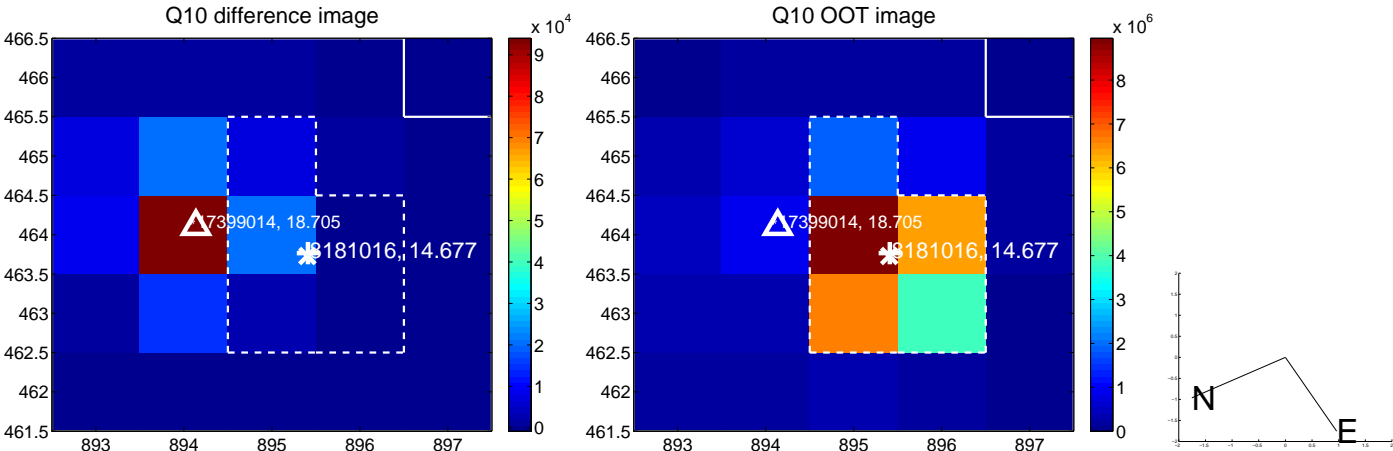
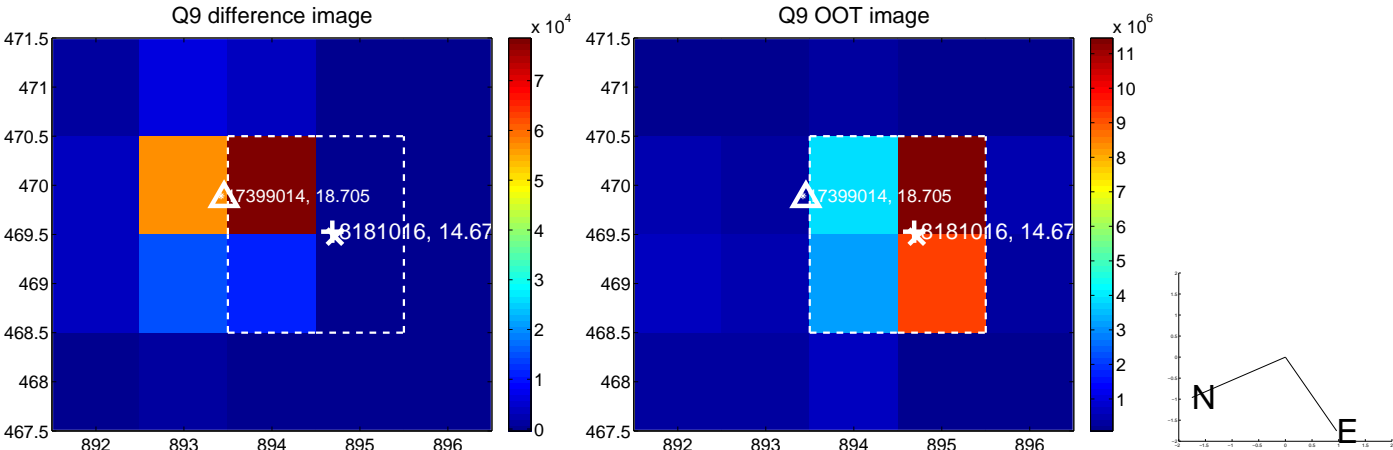
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



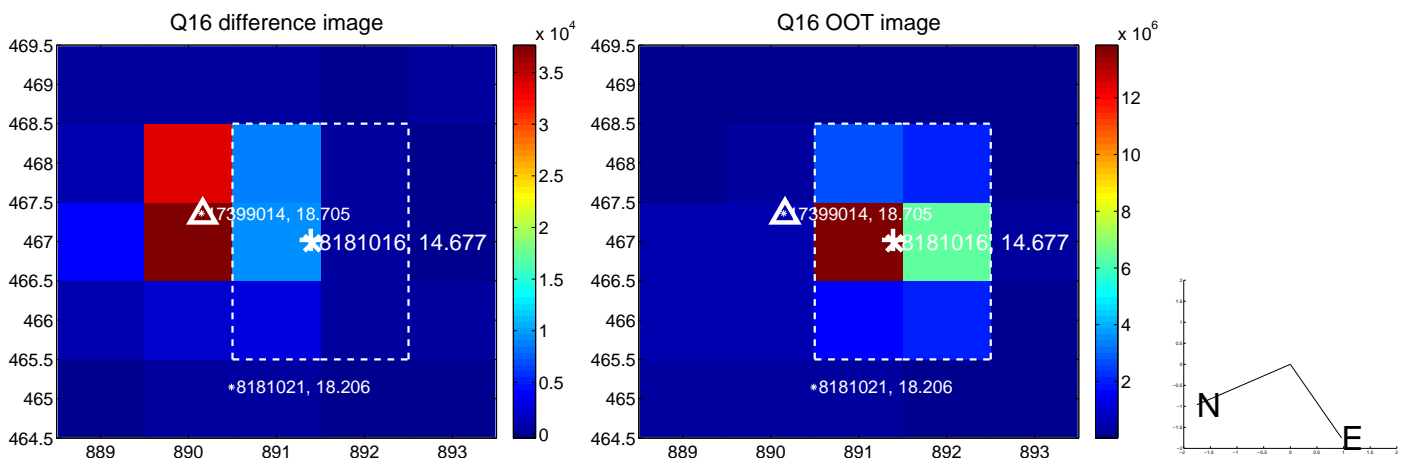
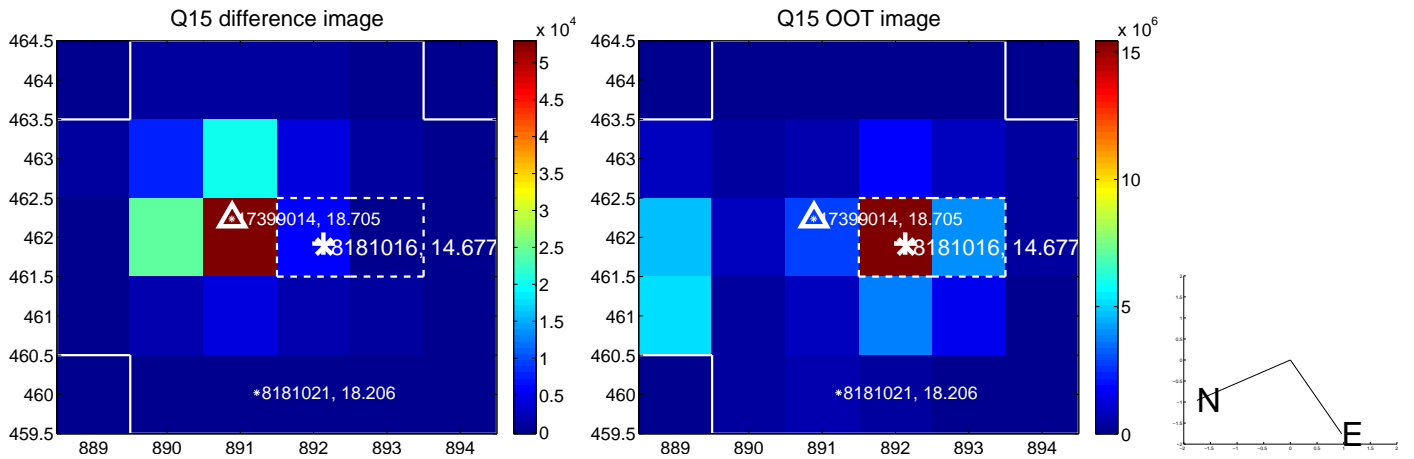
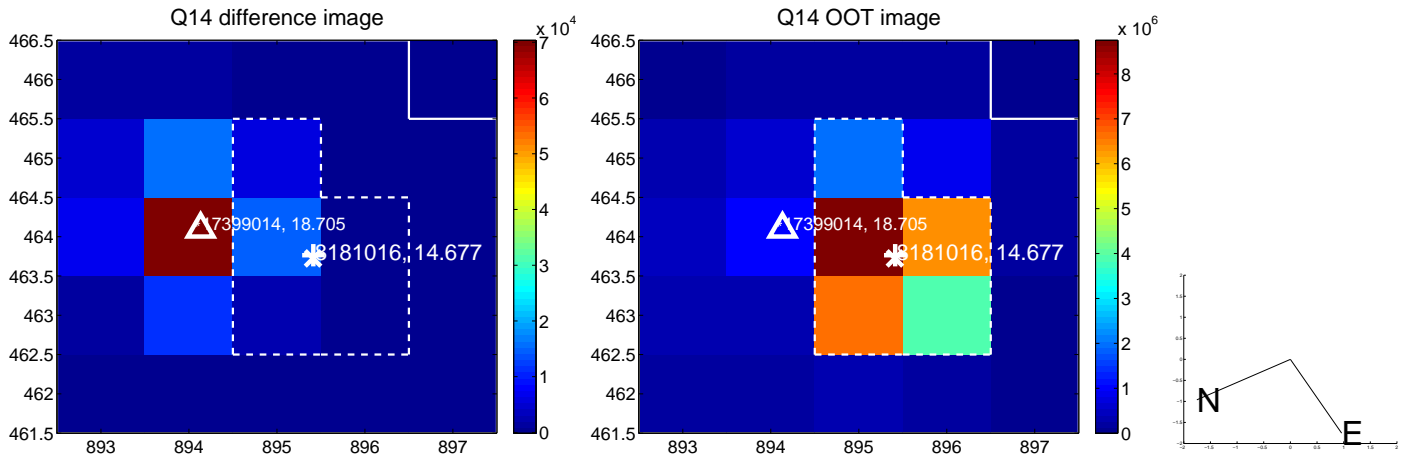
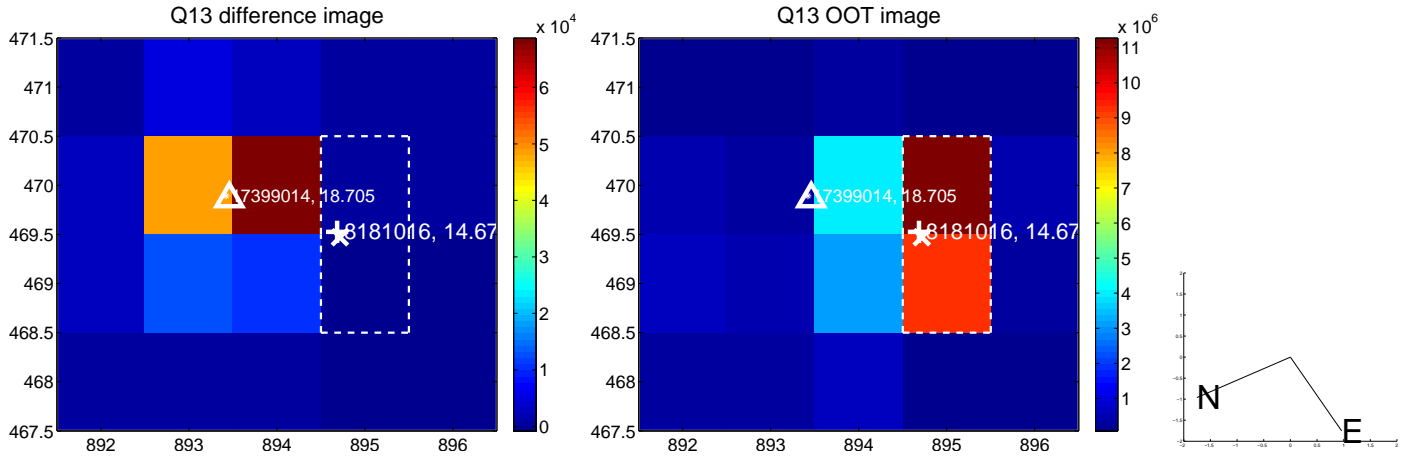
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

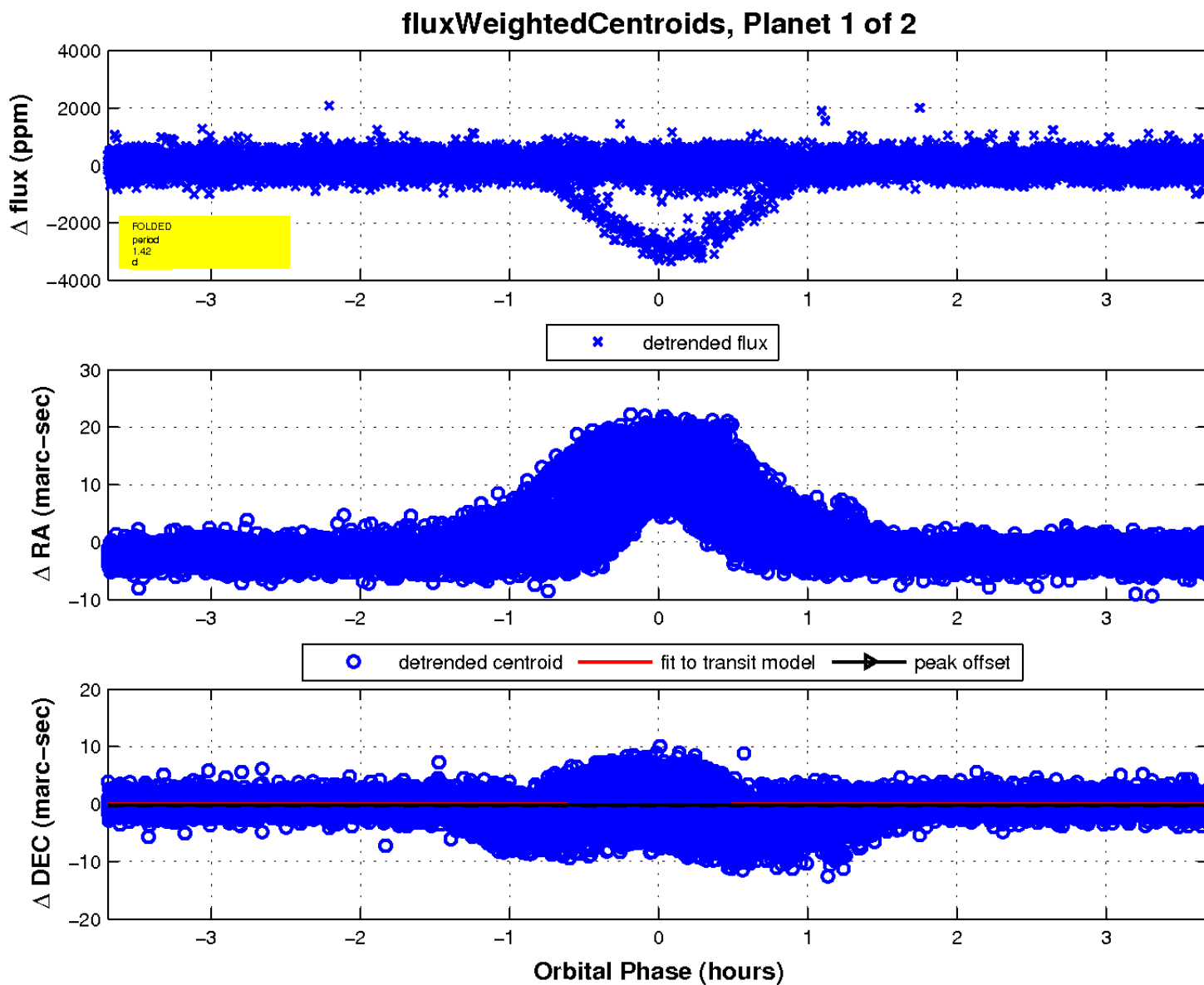
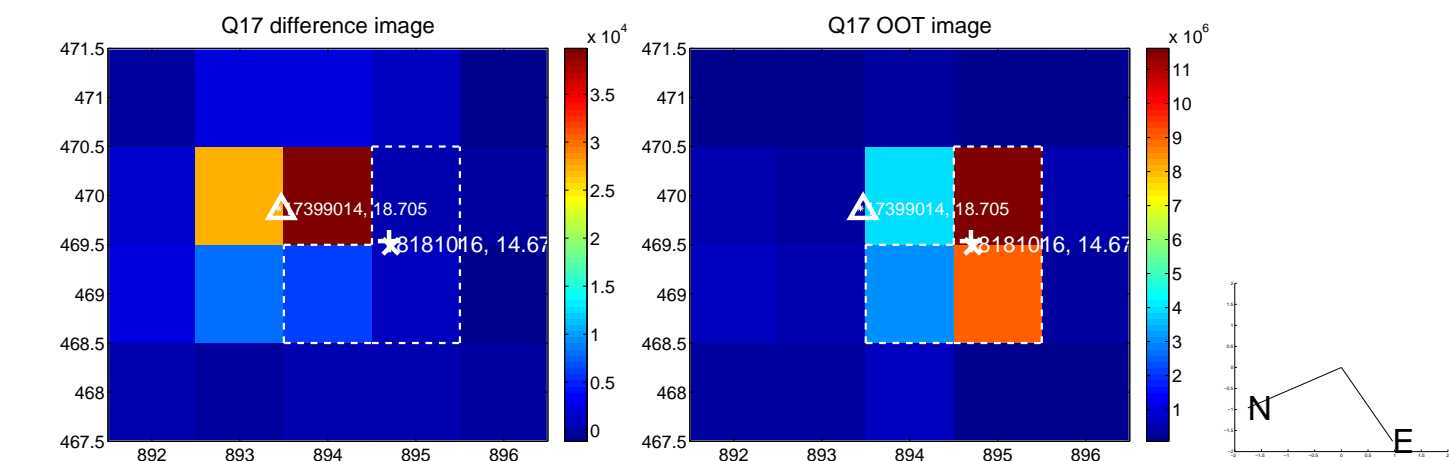


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



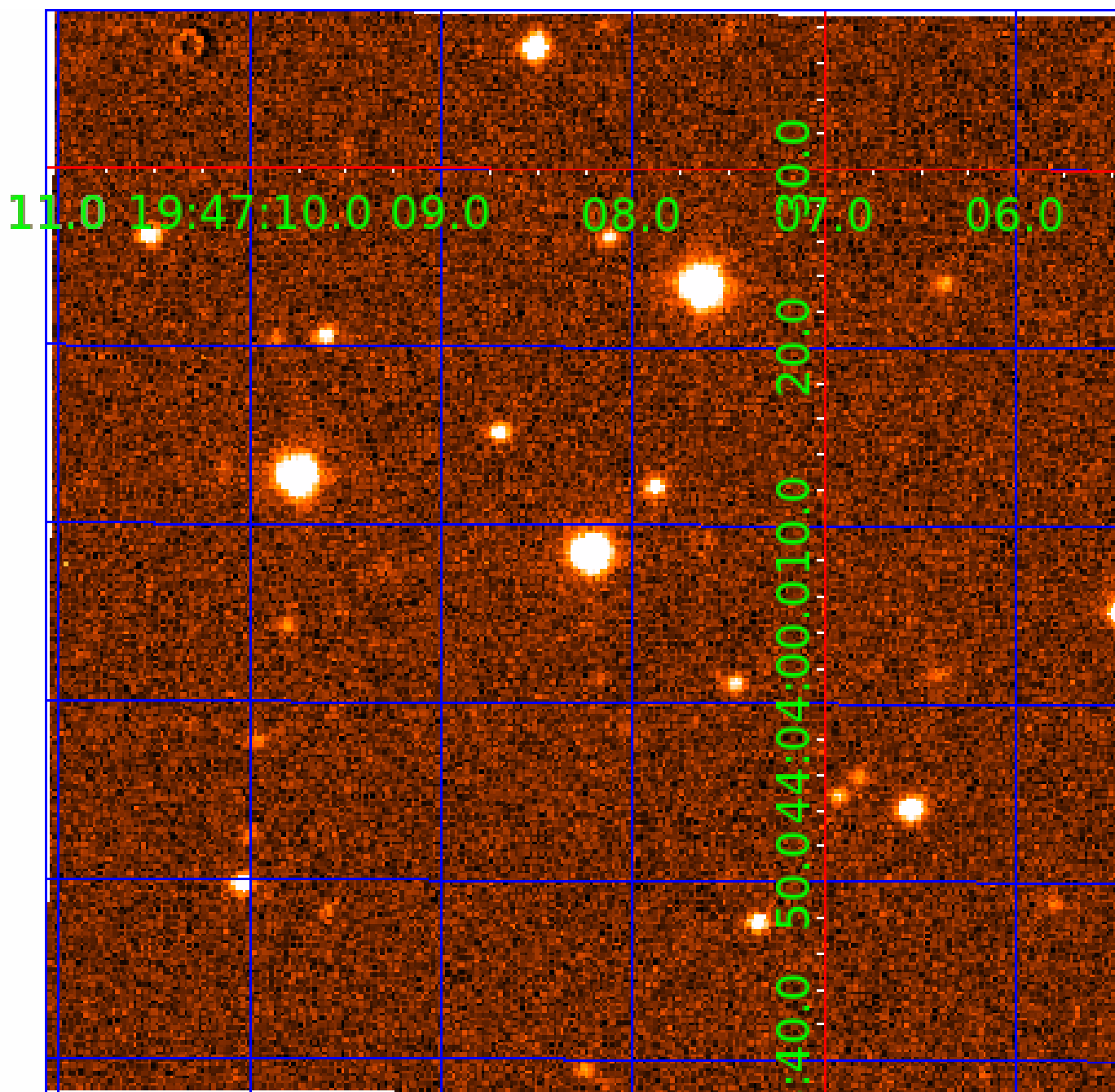


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\Delta$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination



# KIC 008181016

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
008181016-01	OBS	No	1.418019	132.204300	205.4	1.230	25.9	26.2	0.69	5350	1.23	759.55
008181016-02	OBS	No	0.709018	132.196881	260.7	1.167	49.8	32.8	0.69	5350	1.38	1913.91

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
008181016-01	OBS	FP	0.00	1	0	1	0	MOD_NONUNIQ_ALT—CENT_UNRESOLVED_OFFSET
008181016-02	OBS	FP	0.00	1	0	1	0	TRANS_GAPPED—SAME_NTL_PERIOD—CENT_UNRESOLVED_OFFSET—HALO_GHOST

**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.

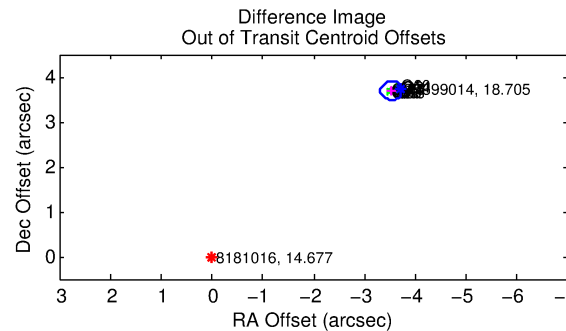
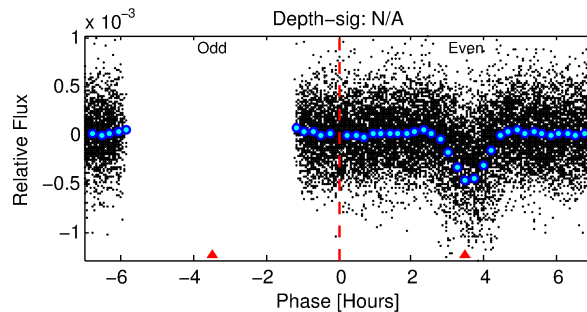
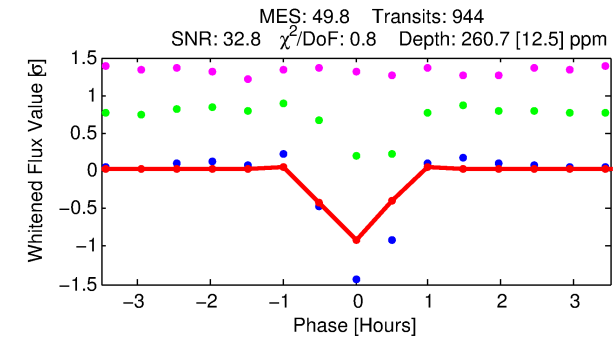
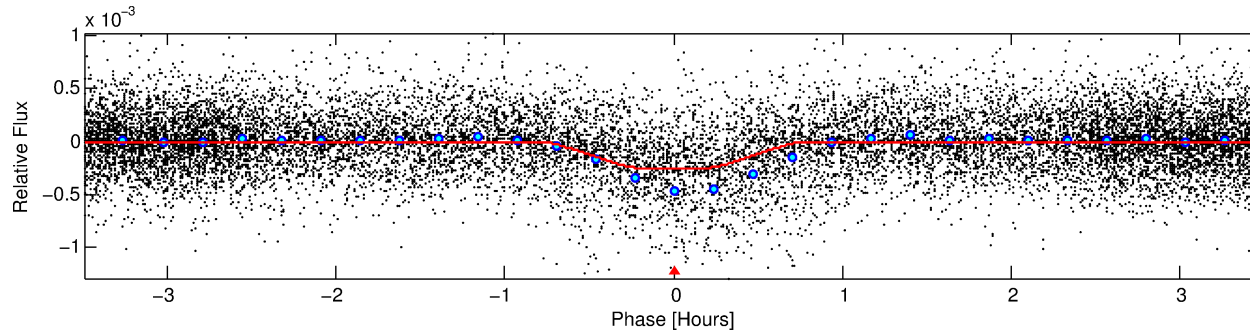
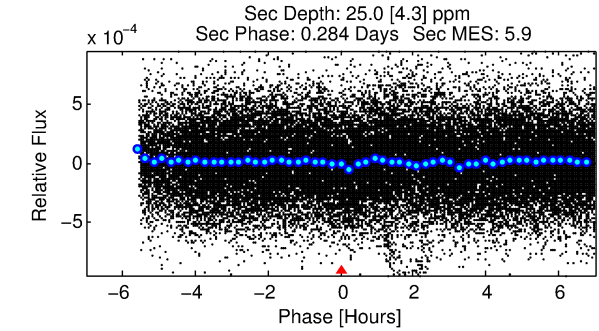
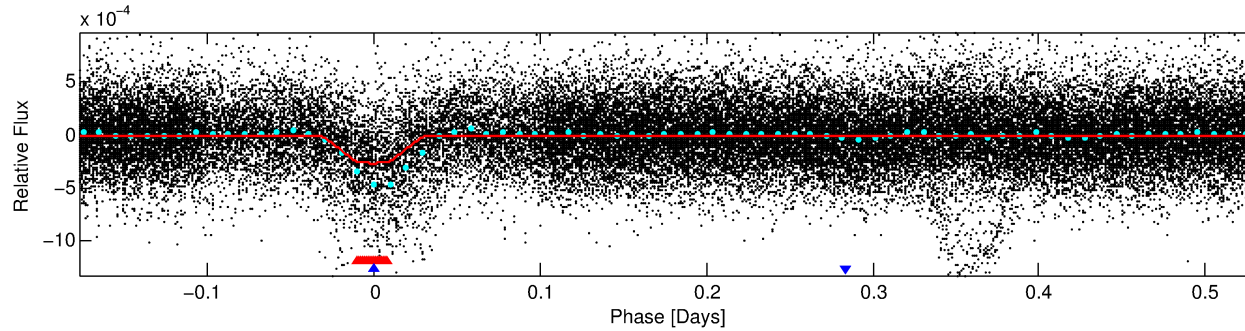
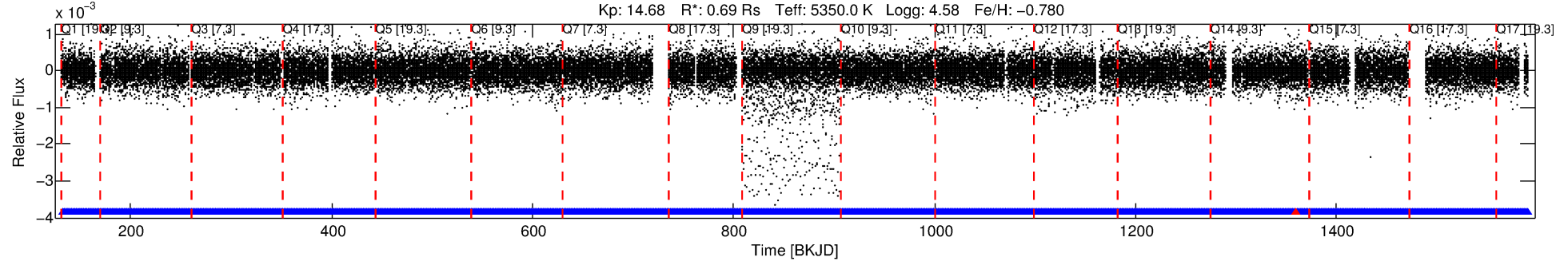
## Ephemeris Match Information For 008181016-02

No Significant Match Found

# DV One-Page Summary

KIC: 8181016 Candidate: 2 of 2 Period: 0.709 d  
KOI: K06174 Corr: No Ephemeris Match

Kp: 14.68 R\*: 0.69 Rs Teff: 5350.0 K Logg: 4.58 Fe/H: -0.780



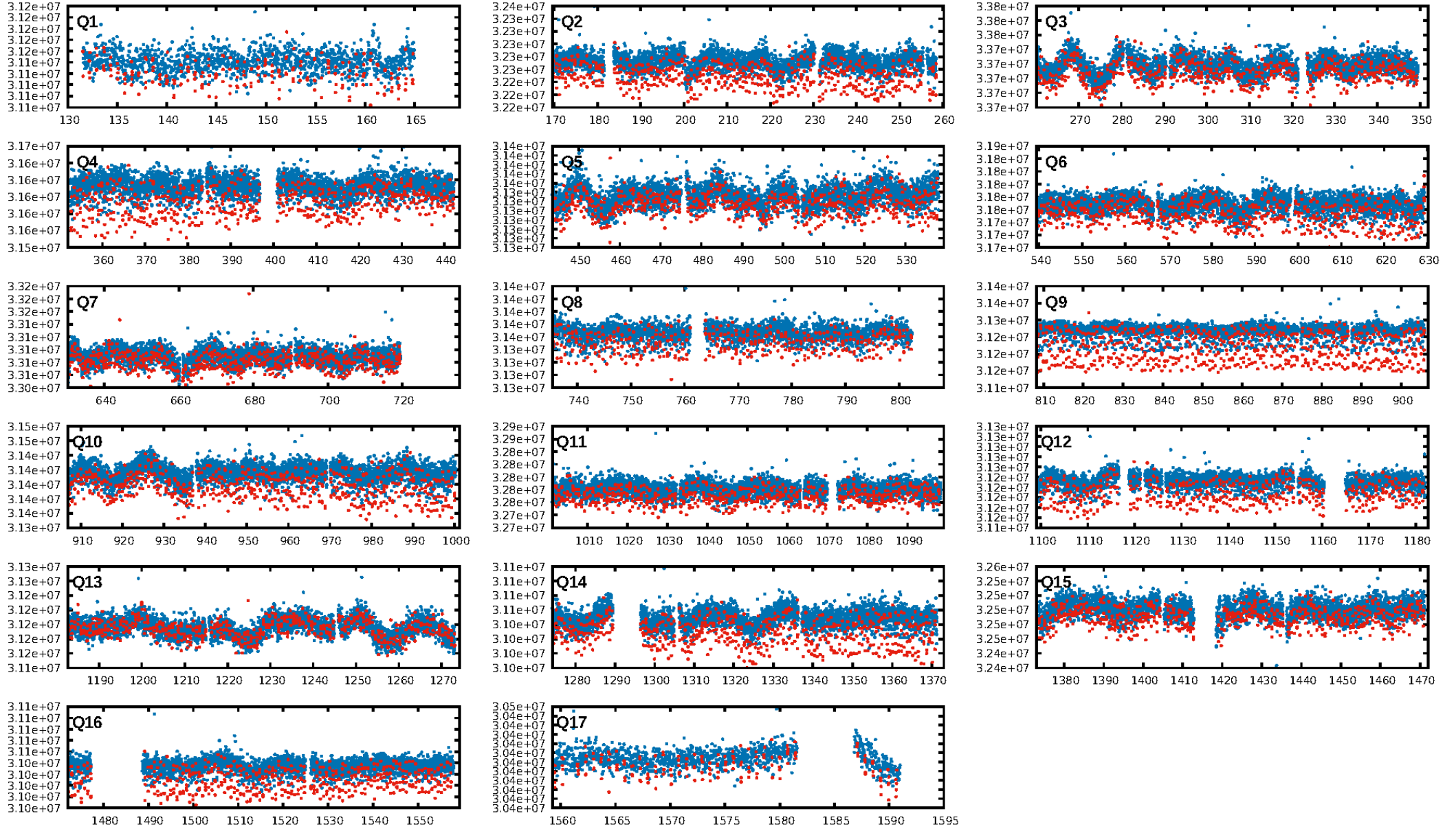
## DV Fit Results:

Period = 0.70902 [0.00000] d  
Epoch = 132.1969 [0.0005] BKJD  
Rp/R\* = 0.0183 [0.0033]  
a/R\* = 2.18 [1.46]  
b = 0.93 [0.13]  
Seff = 1913.91 [359.13]  
Teff = 1687 [79] K  
Rp = 1.38 [0.29] Re  
a = 0.0136 [0.0013] AU  
Ag = 1.32 [0.57] [0.57σ]  
Teffp = 2796 [295] K [3.64σ]

## DV Diagnostic Results:

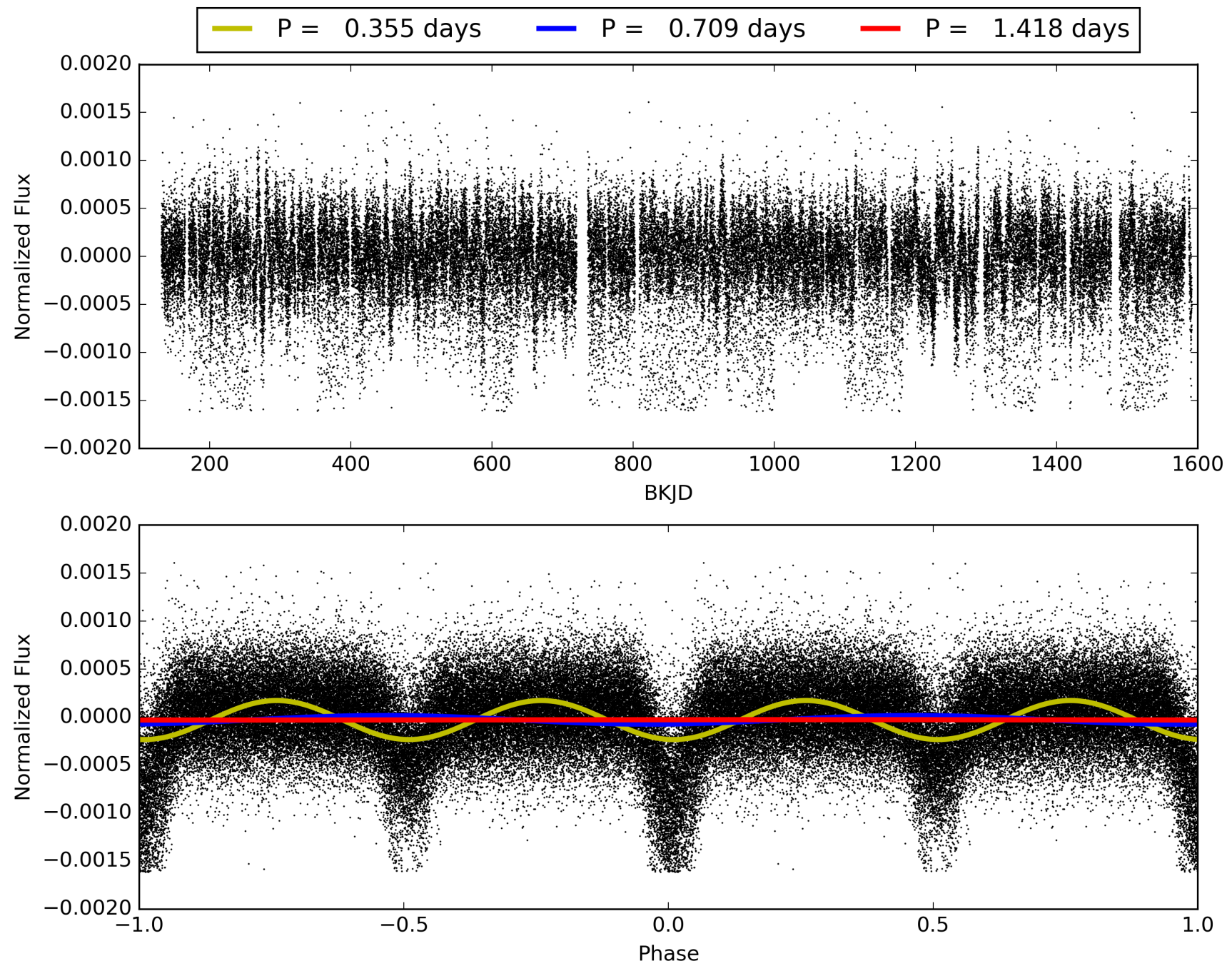
ShortPeriod-sig: N/A  
LongPeriod-sig: 100.0% [10.04σ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: 0.00e+00  
RollingBand-fgt: 1.00 [901/902]  
GhostDiagnostic-chr: -0.1121  
Centroid-sig: N/A  
Centroid-so: 83.871 arcsec [241.51σ]  
OotOffset-rm: 5.103 arcsec [73.47σ]  
KicOffset-rm: 5.195 arcsec [76.33σ]  
OotOffset-st: 4/4/4/5 [17]  
KicOffset-st: 4/4/4/5 [17]  
DiffImageQuality-fgm: 1.00 [17/17]  
DiffImageOverlap-fno: 1.00 [17/17]

# TCE 008181016-02, PDC Light Curves



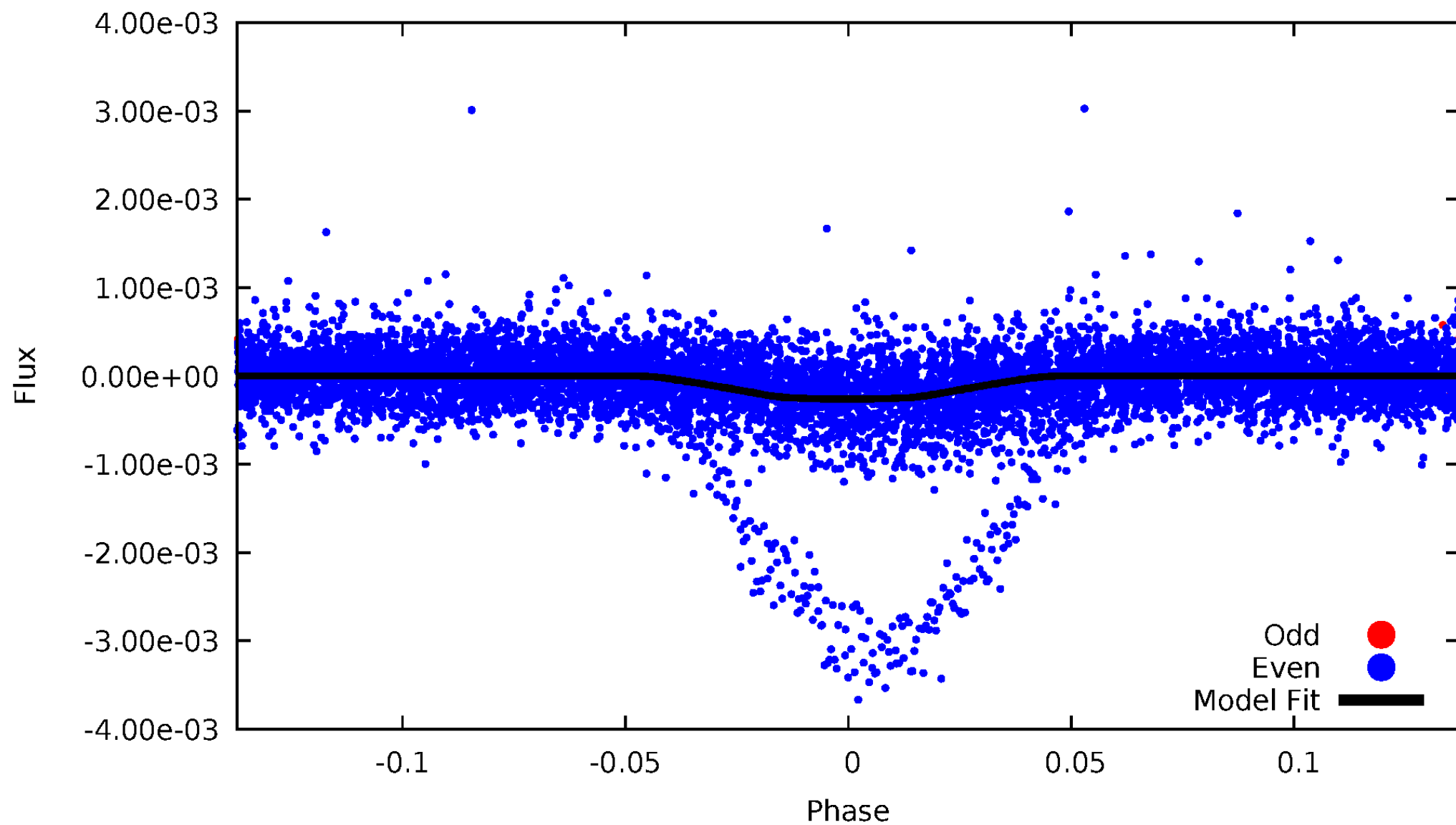


TCE 008181016-02



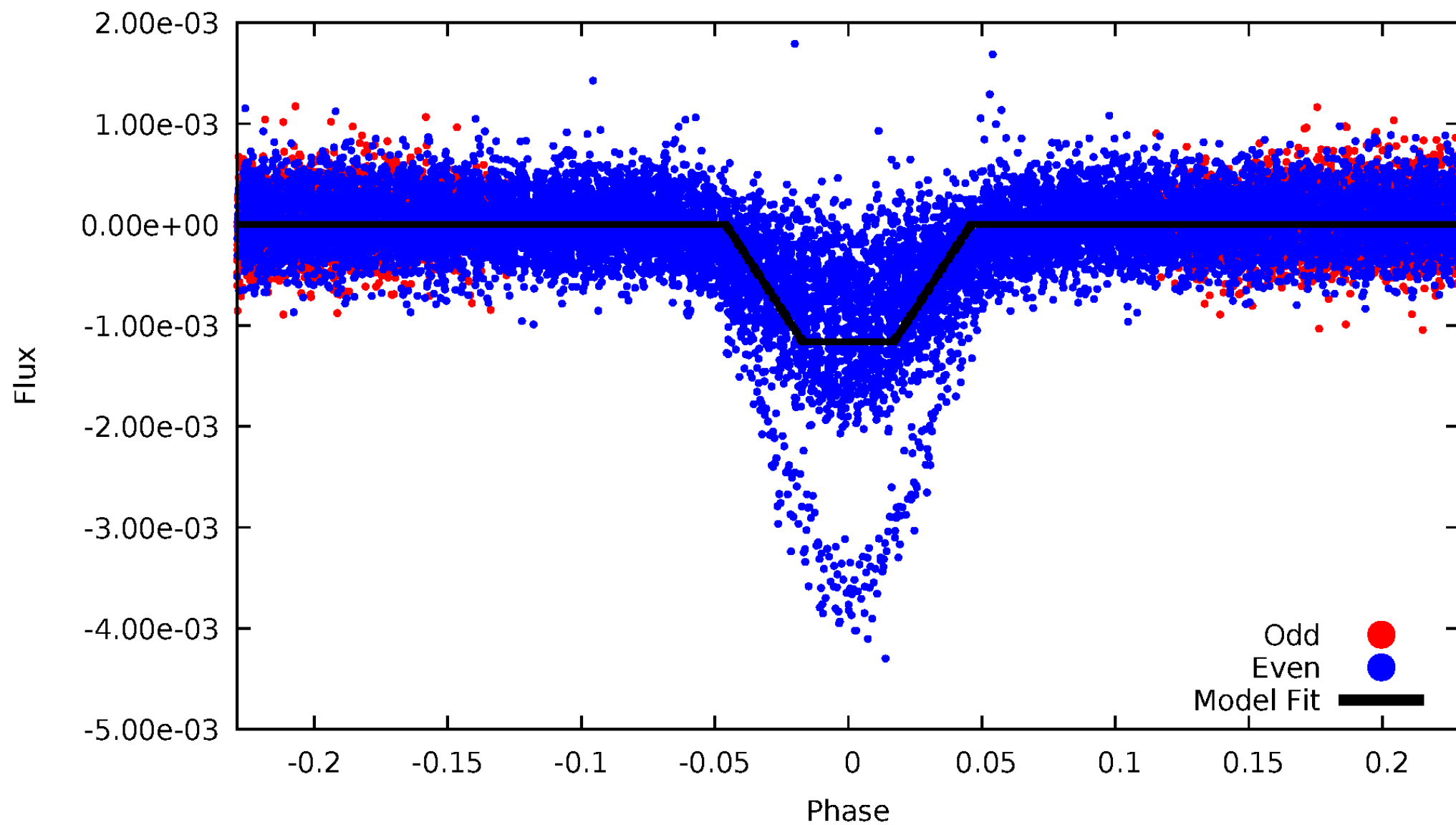
# DV Odd/Even

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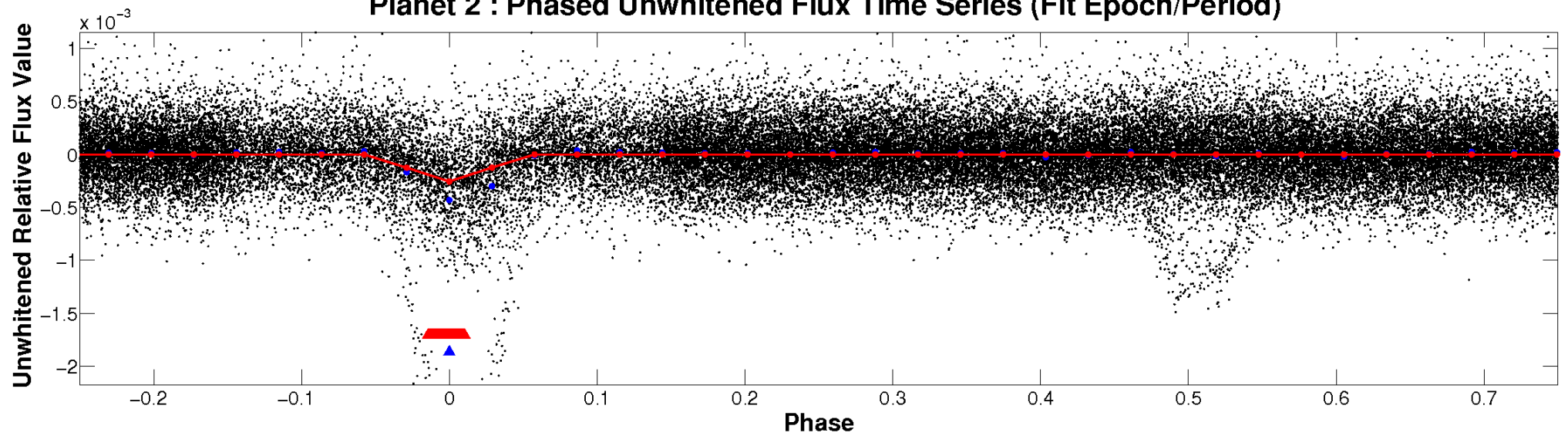
# ALT Odd/Even

TCE 008181016-02

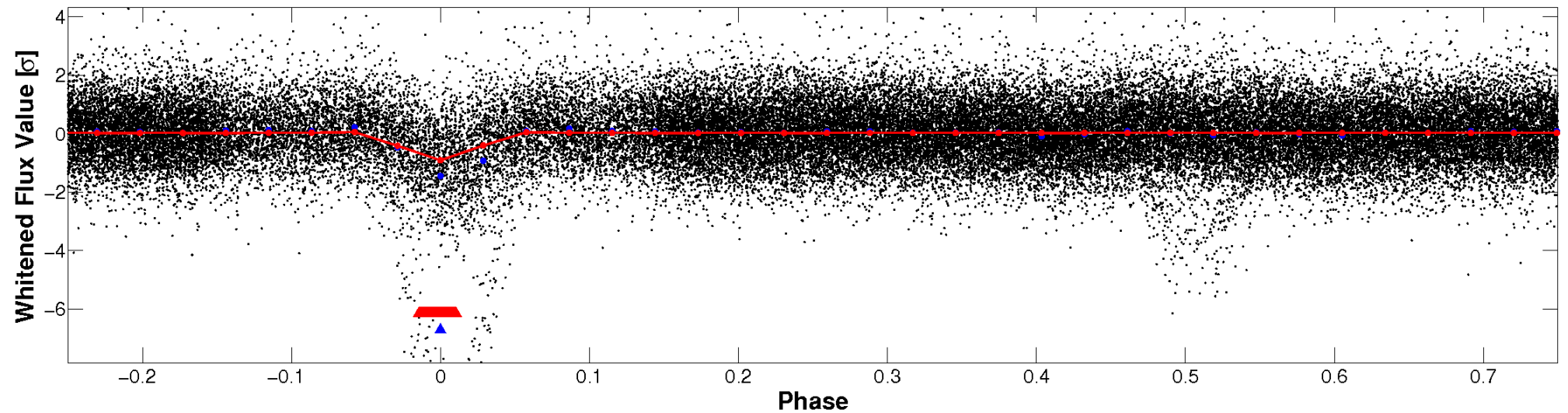


# Non-Whitened Vs. Whitened Light Curve

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



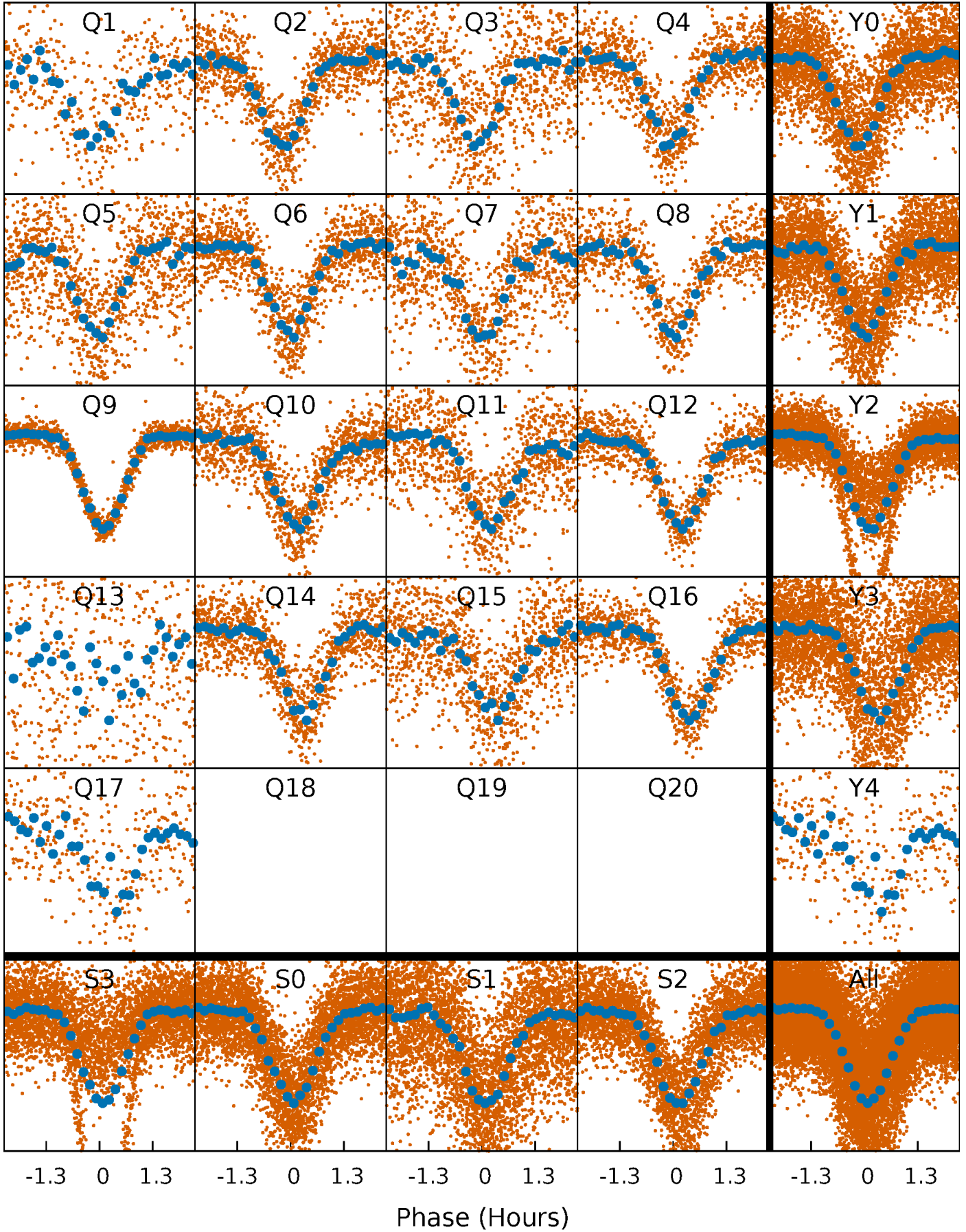
## Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)





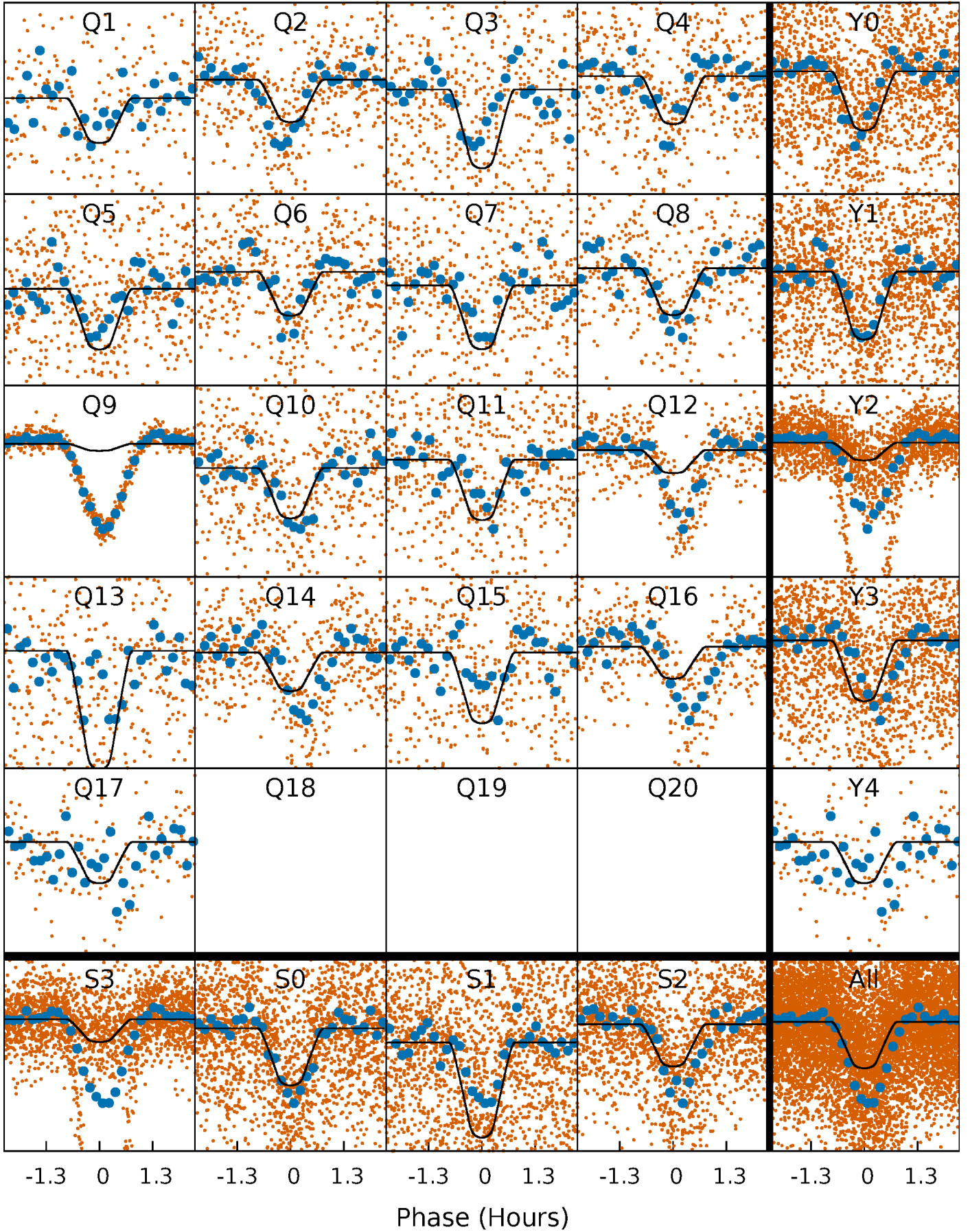
# PDC Quarter-Phased Transit Curves

TCE 008181016-02   P= 0.709018 Days    $T_0=132.196881$  (BKJD)



# DV Quarter-Phased Transit Curves

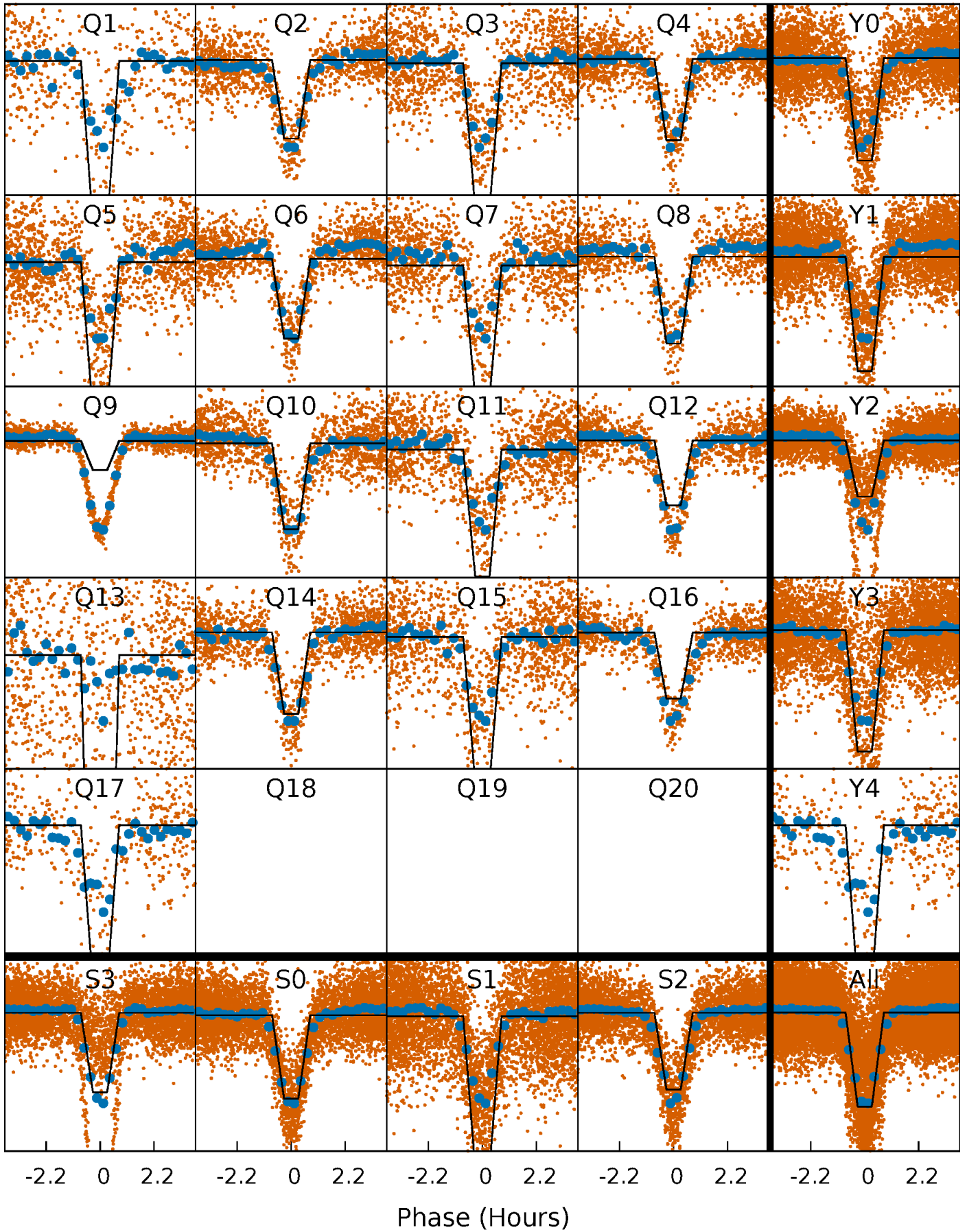
TCE 008181016-02 P= 0.709018 Days  $T_0=132.196881$  (BKJD)





# Alt. Detrend Quarter-Phased Transit Curves

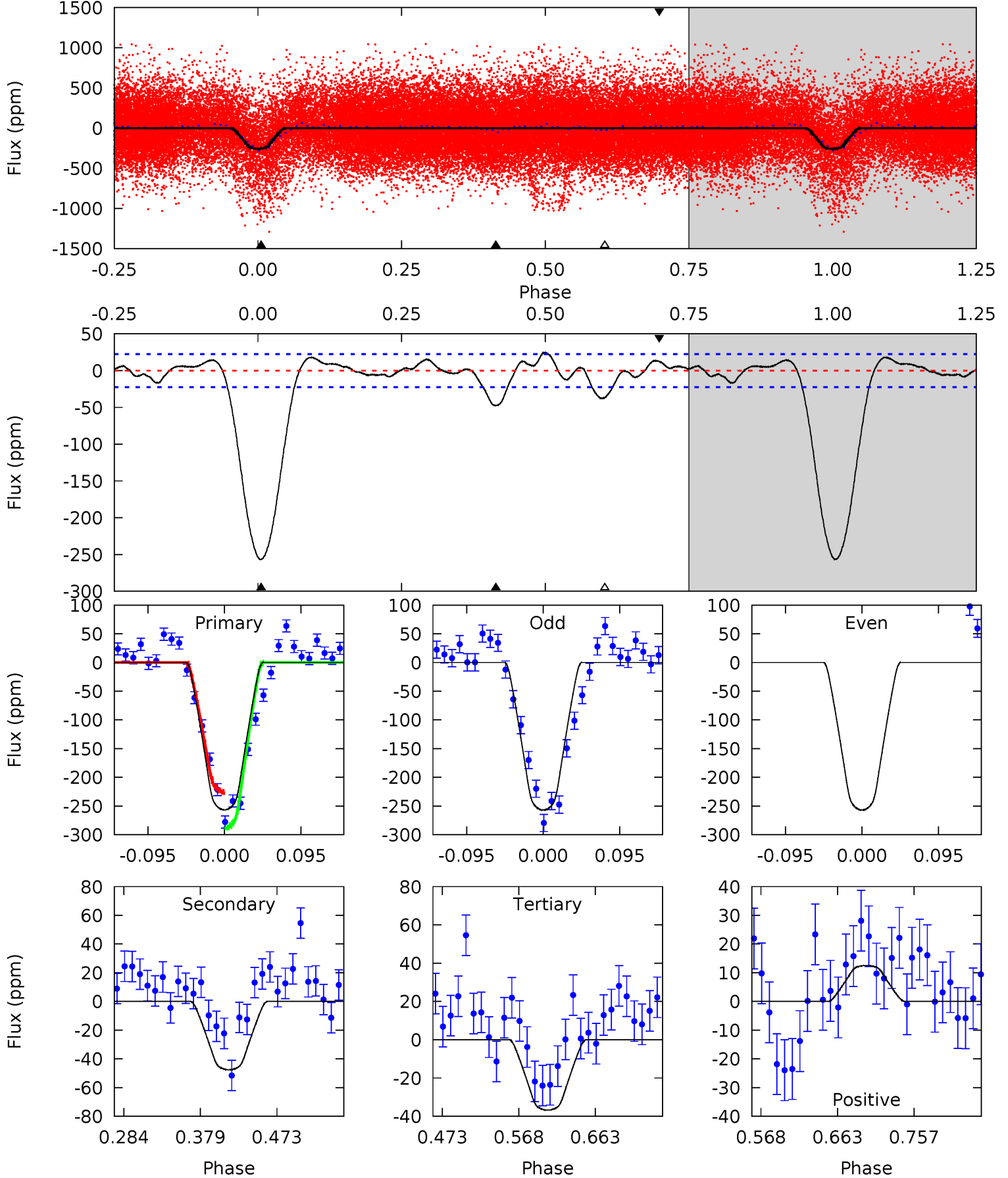
TCE 008181016-02   P= 0.709031 Days    $T_0=132.187574$  (BKJD)



# DV Model-Shift Uniqueness Test

008181016-02, P = 0.709018 Days, E = 131.487863 Days

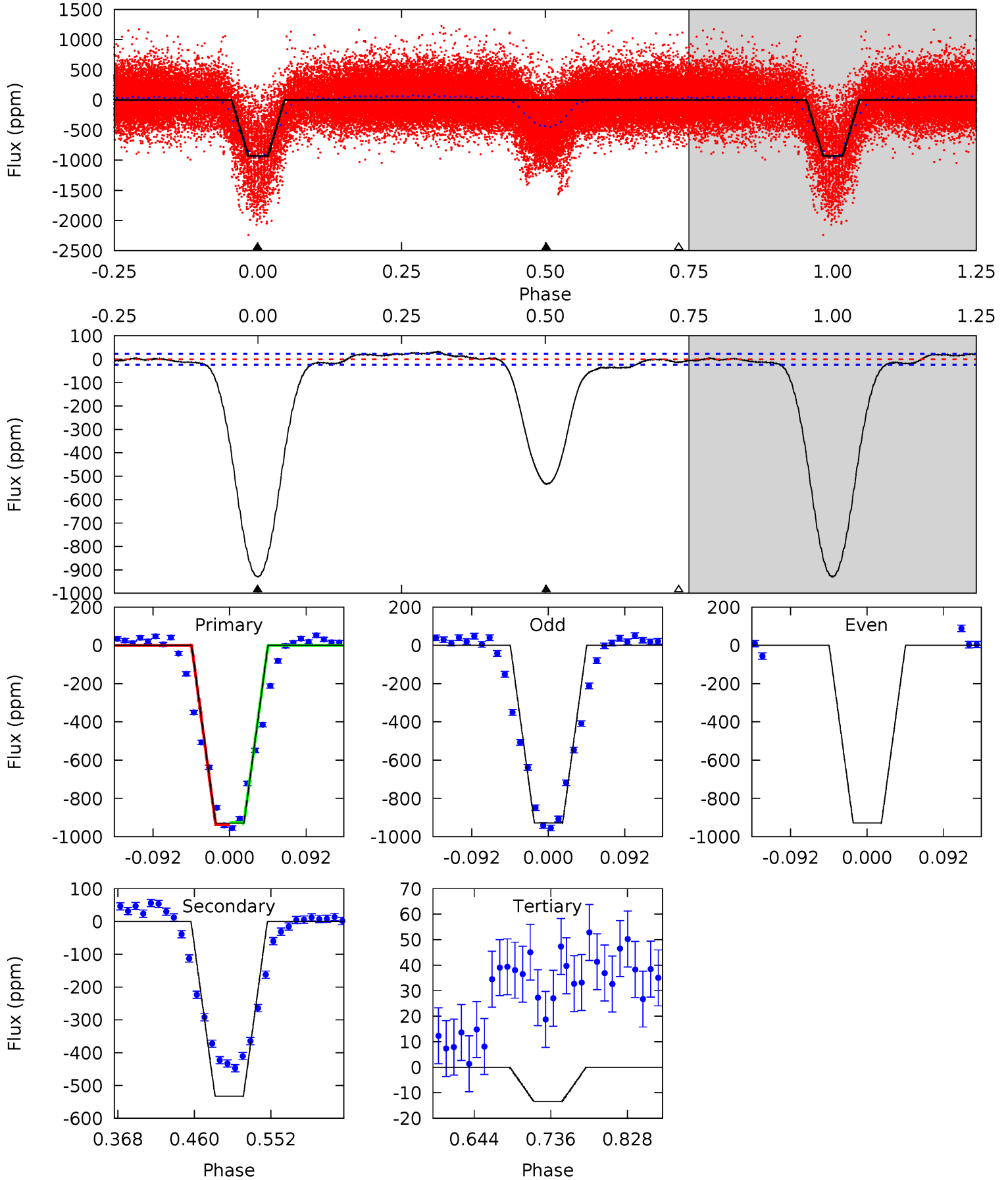
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
52.3	9.70	7.49	2.55	4.58	1.67	2.25	44.8	49.8	2.20	7.15	0	1.64	0.09	6.53



# Alt Model-Shift Uniqueness Test

008181016-02, P = 0.709031 Days, E = 131.478543 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
179.6	103.0	2.59	0	4.58	1.69	3.52	177.0	179.6	100.4	103.0	0	1.17	0.03	1.05



### Stellar Parameters For KIC 008181016

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R$ ( $R_{\odot}$ )	$M(M_{\odot})$	$p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ )
	$5350^{+160}_{-160}$	$4.578^{+0.083}_{-0.053}$	$-0.780^{+0.300}_{-0.300}$	$0.693^{+0.071}_{-0.071}$	$0.663^{+0.076}_{-0.027}$	$2.805^{+0.999}_{-0.573}$
	+3%/-3%	+2%/-1%	+38%/-38%	+10%/-10%	+11%/-4%	+36%/-20%
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 008181016-02 / KOI

Detrend	Depth (ppm)	$R_p$ ( $R_{\oplus}$ )	$T_{max}$ (K)	$T_{obs}$ (K)	$A_{obs}$
DV	$-48 \pm 5$	$1.38^{+0.28}_{-0.26}$	$2342^{+94}_{-89}$	$3605^{+297}_{-235}$	$2.577^{+1.329}_{-0.800}$
Alt.	$-533 \pm 5$	$2.57^{+0.33}_{-0.28}$	$2342^{+91}_{-96}$	$4514^{+223}_{-214}$	$8.331^{+2.146}_{-1.686}$

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

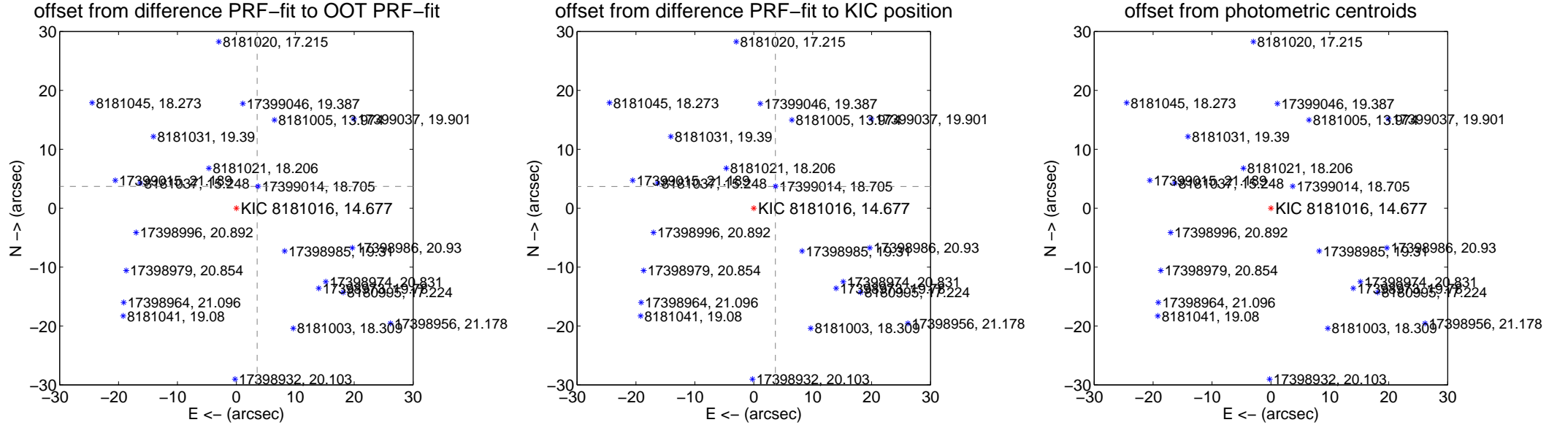
## DV Centroid Data

Supplemental centroid analysis for 008181016-02. Kepler magnitude: 14.68. Transit SNR 32.77

There are 17 quarters with good PRF difference image offsets

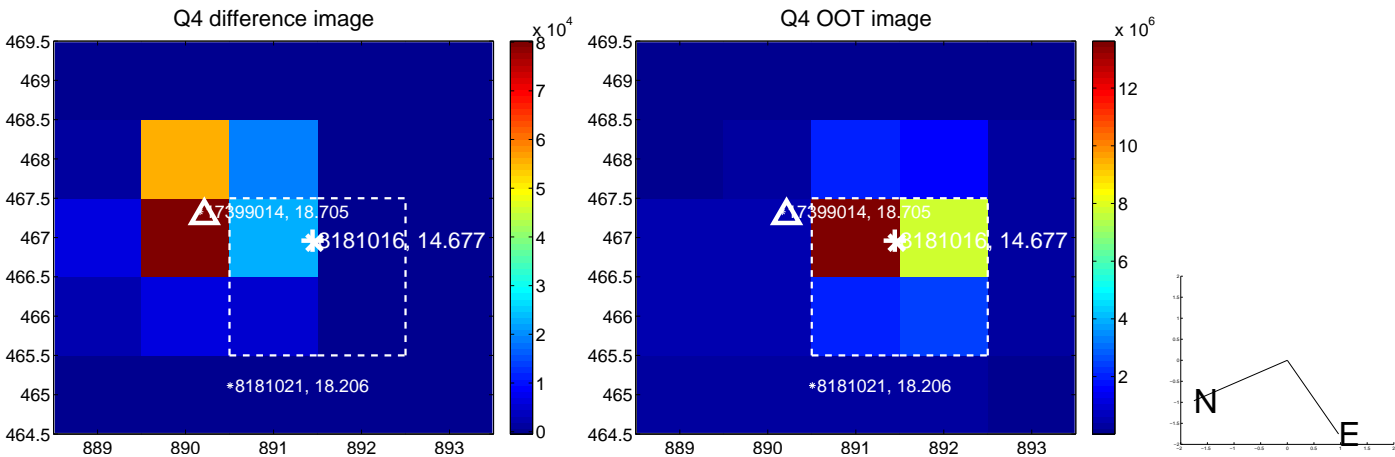
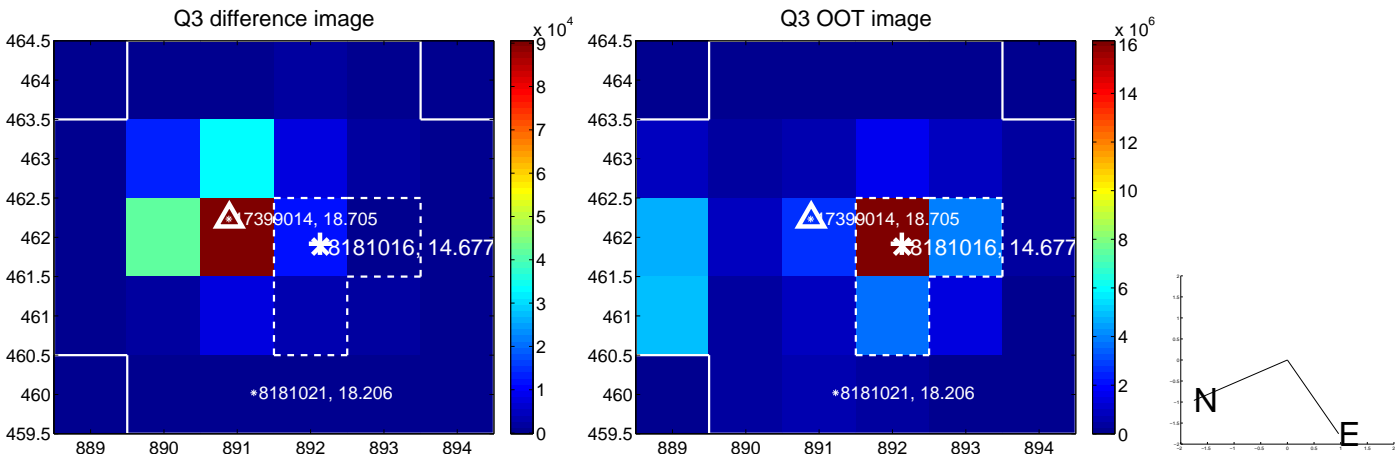
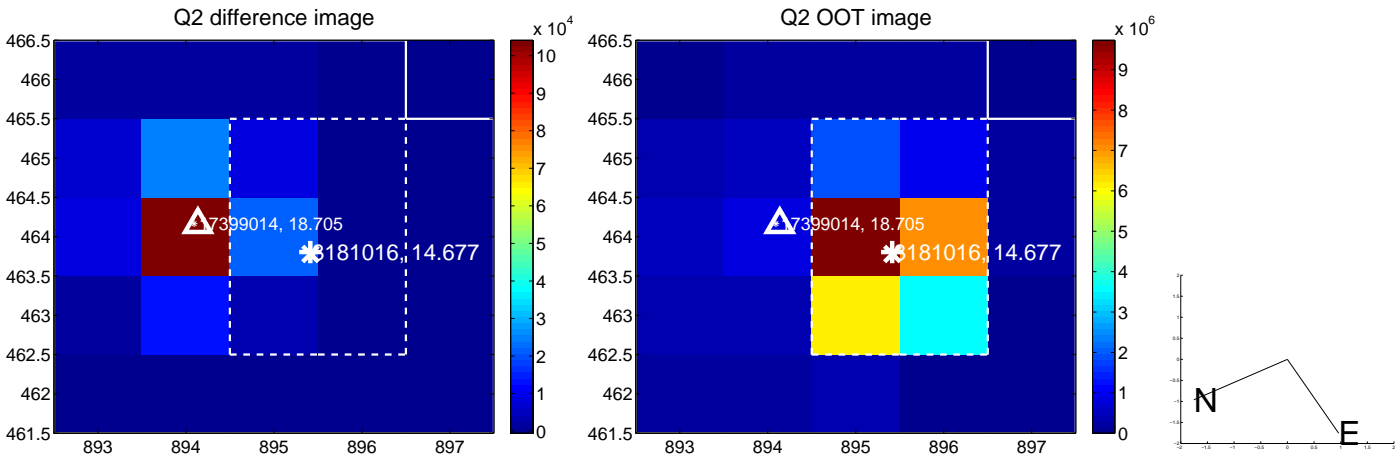
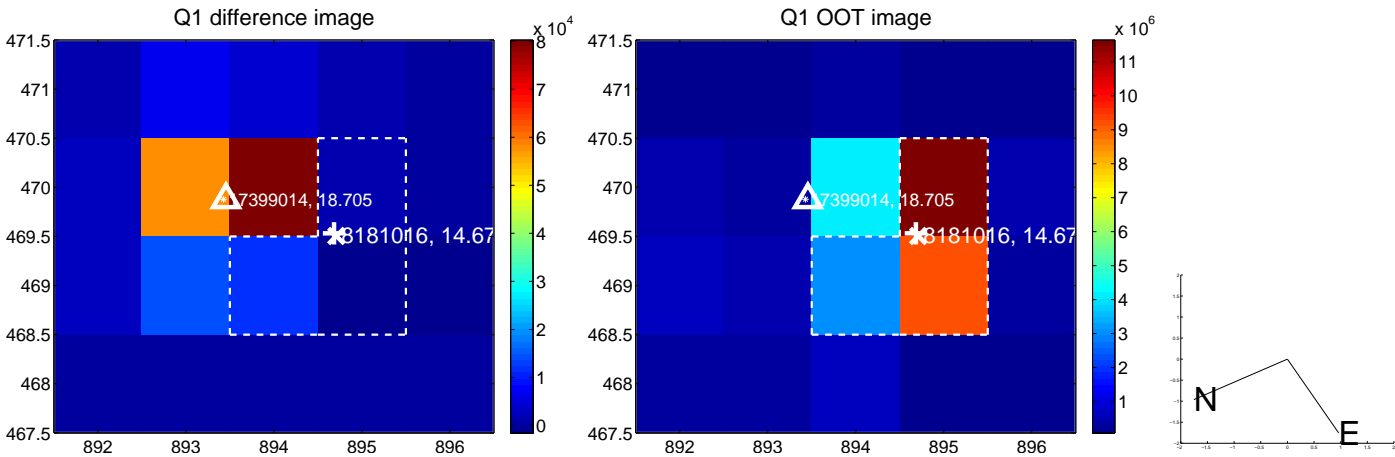
The direct PRF centroid is offset from the target star catalog position by about 0.22 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	<b>5.103 <math>\pm</math> 0.069</b>	<b>73.47</b>	-3.524 $\pm$ 0.069	3.692 $\pm$ 0.068
PRF-fit source offset from KIC position	<b>5.195 <math>\pm</math> 0.068</b>	<b>76.33</b>	-3.669 $\pm$ 0.069	3.678 $\pm$ 0.067
photometric centroid source offset	<b>83.86 <math>\pm</math> 0.35</b>	<b>241.51</b>	-65.53 $\pm$ 0.35	52.32 $\pm$ 0.34



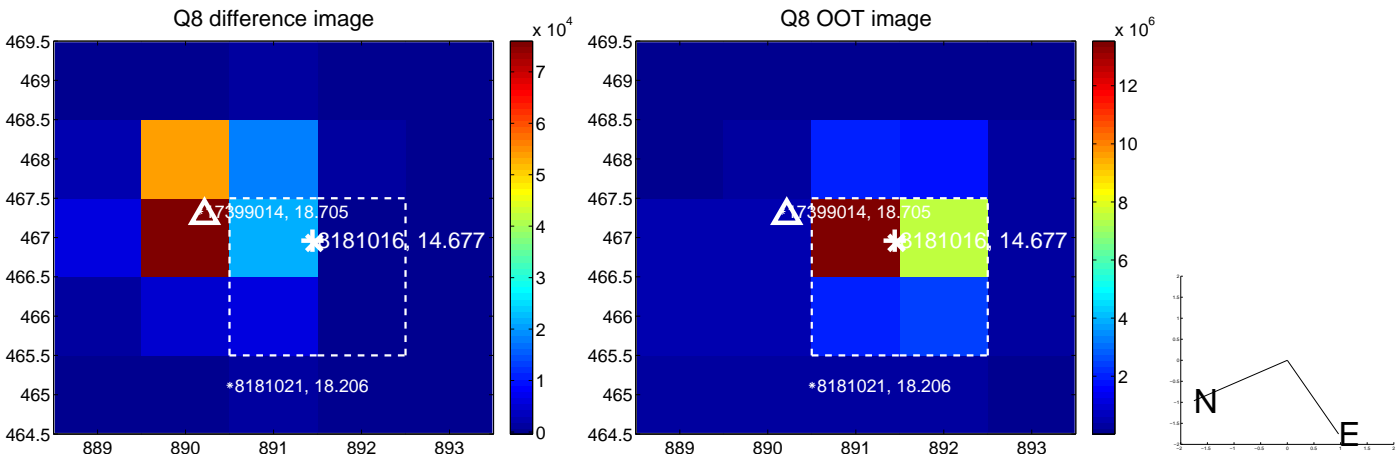
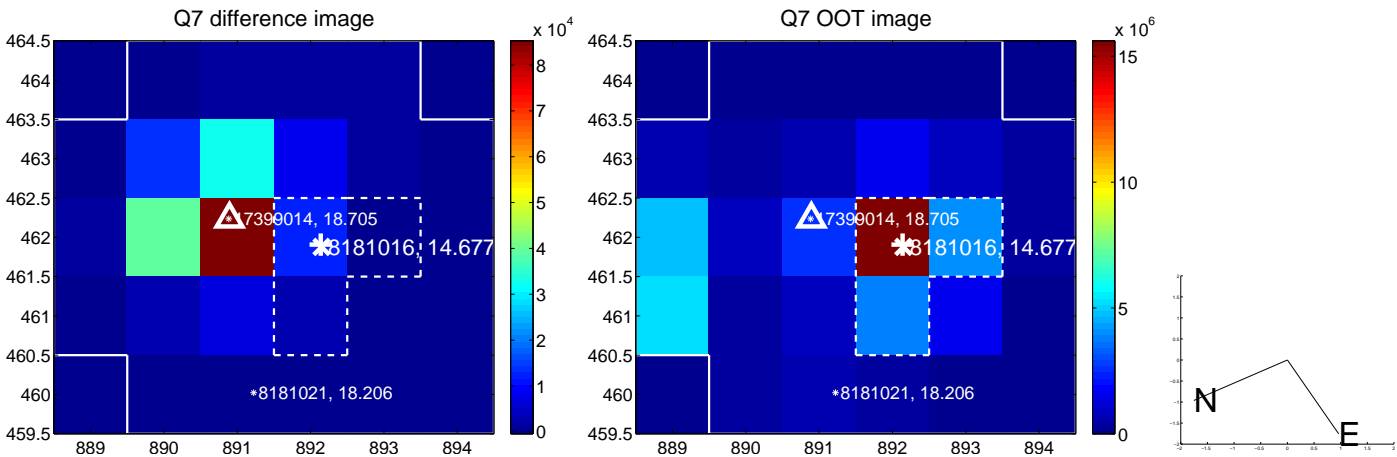
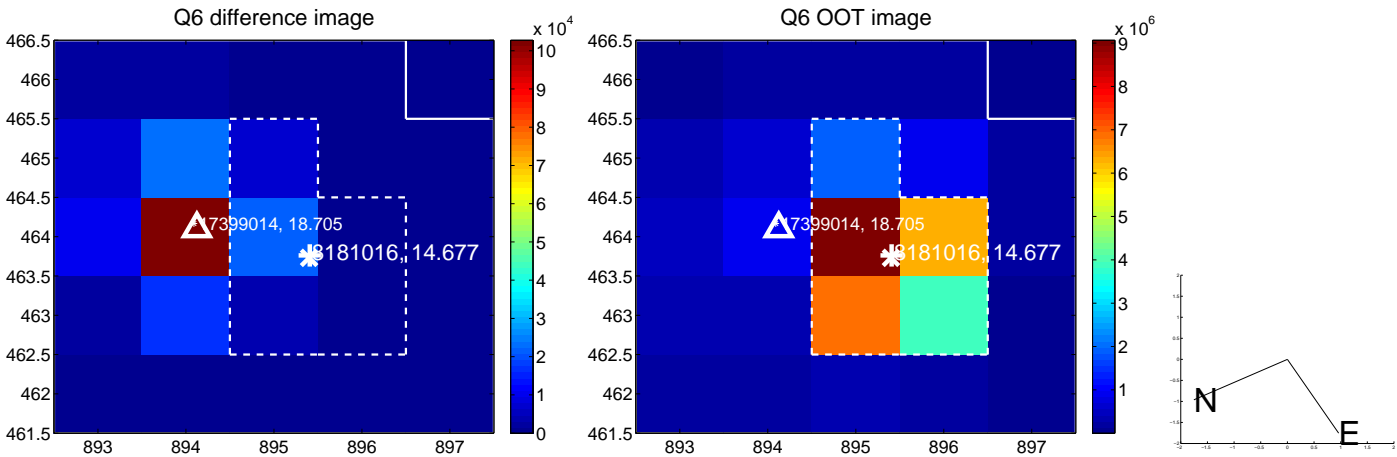
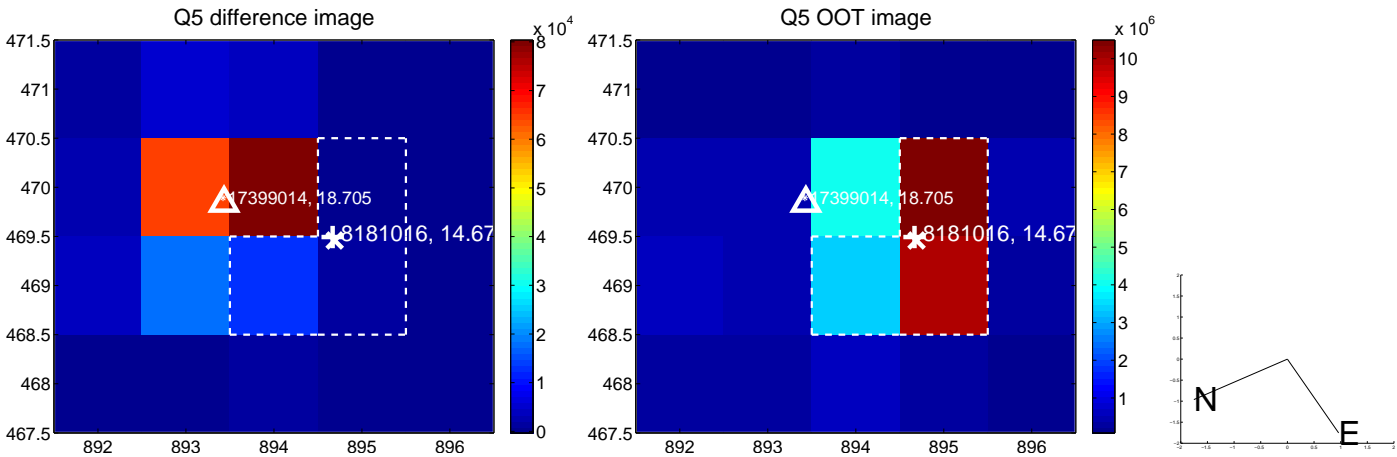
Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets**; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

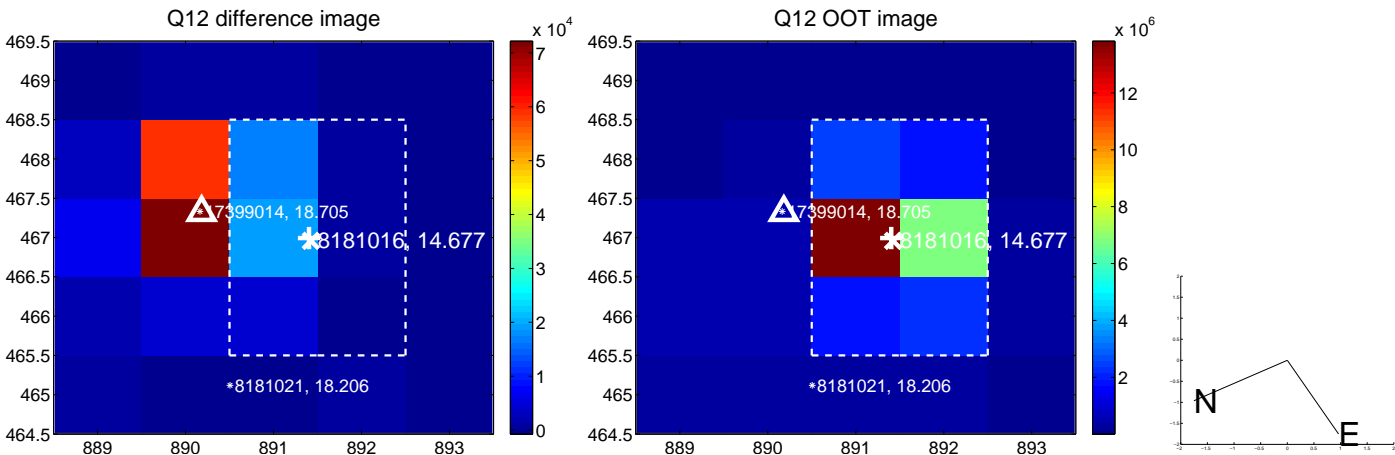
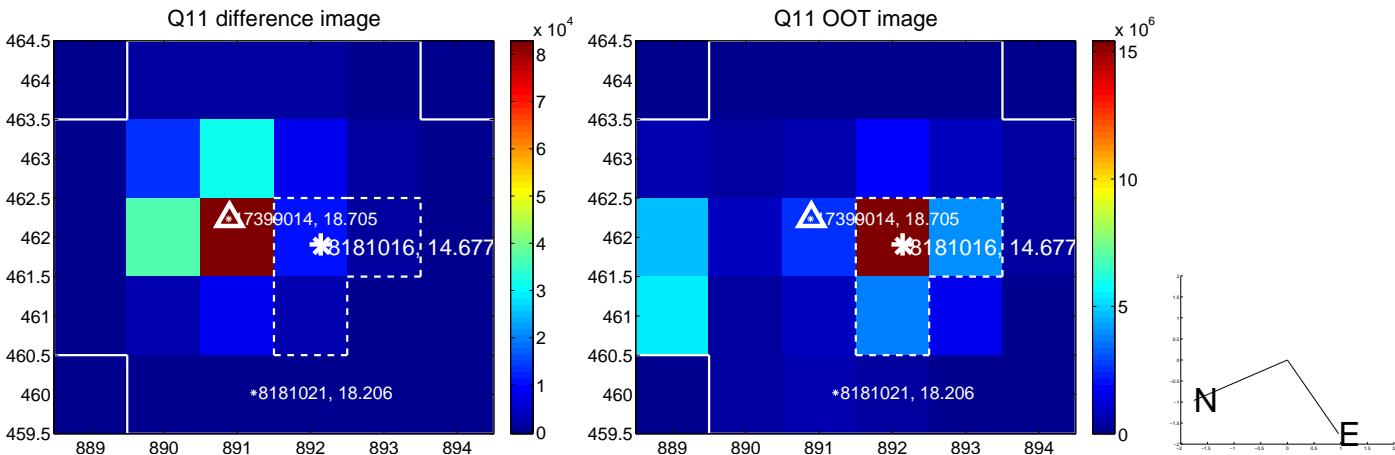
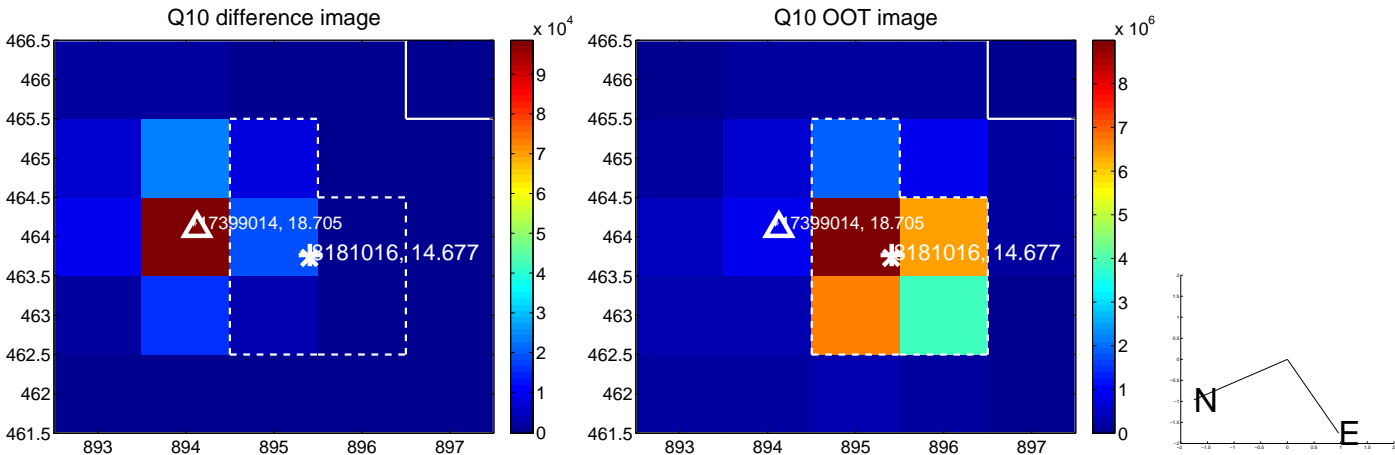
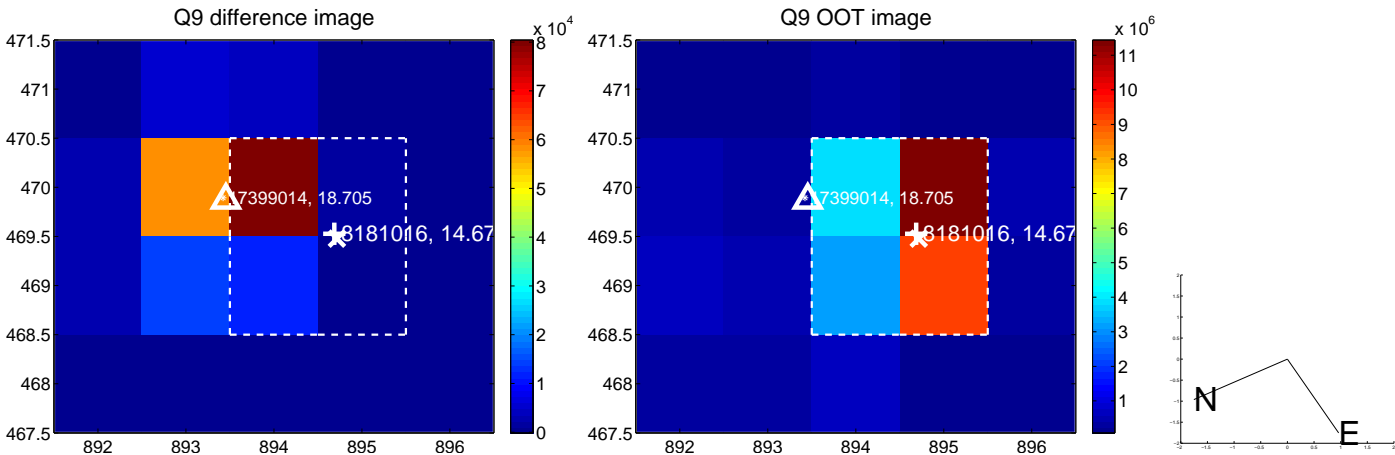




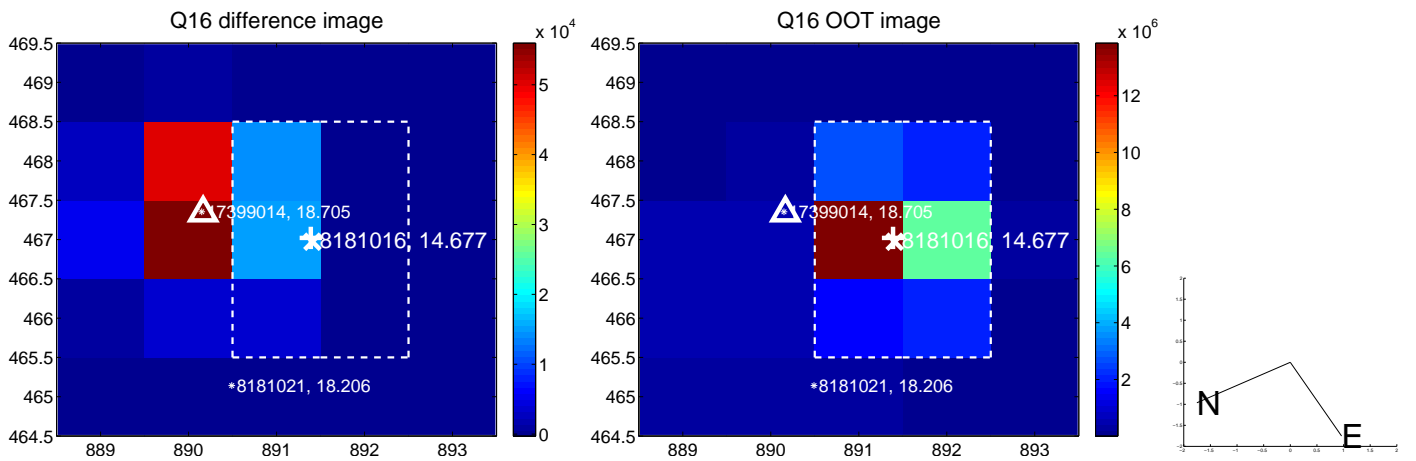
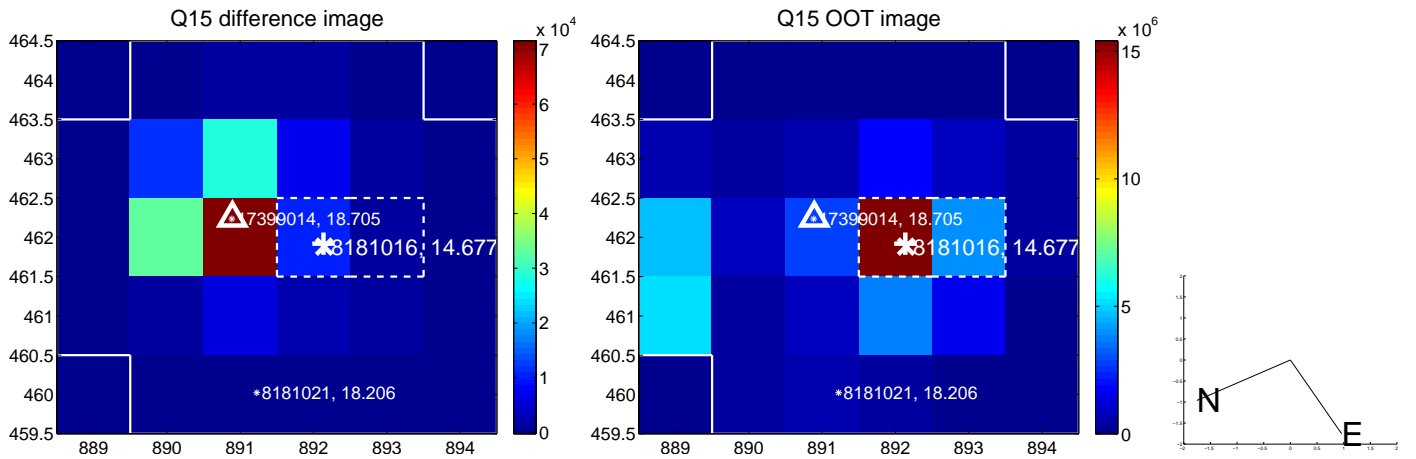
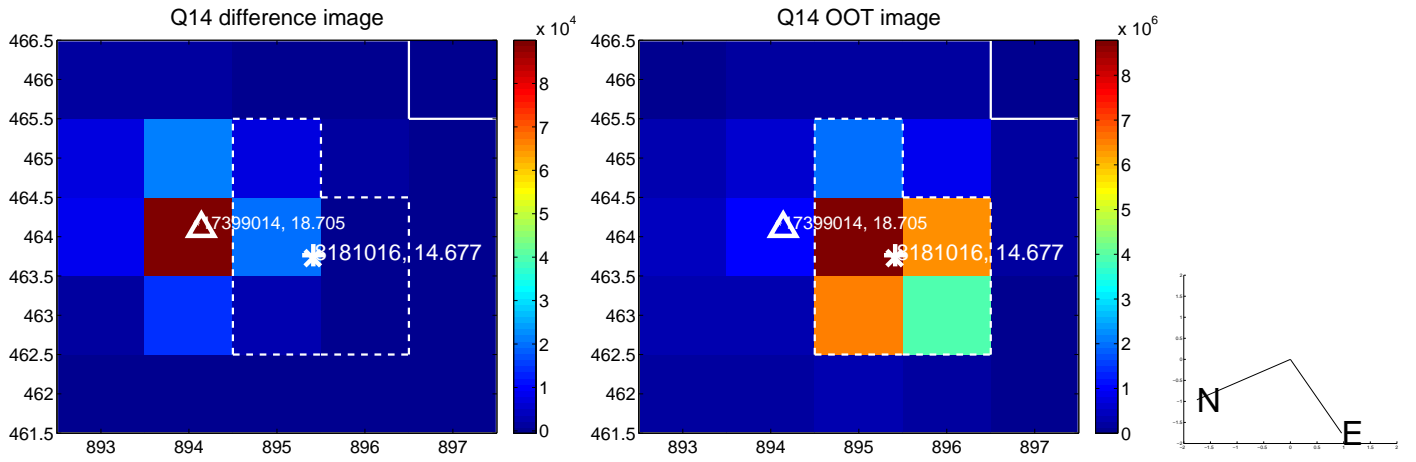
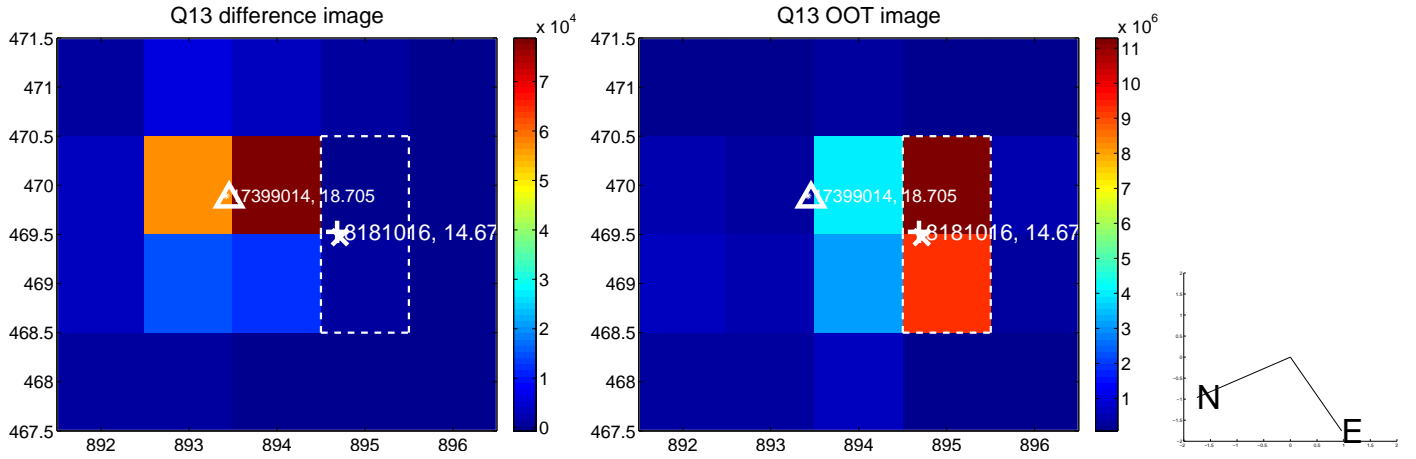
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



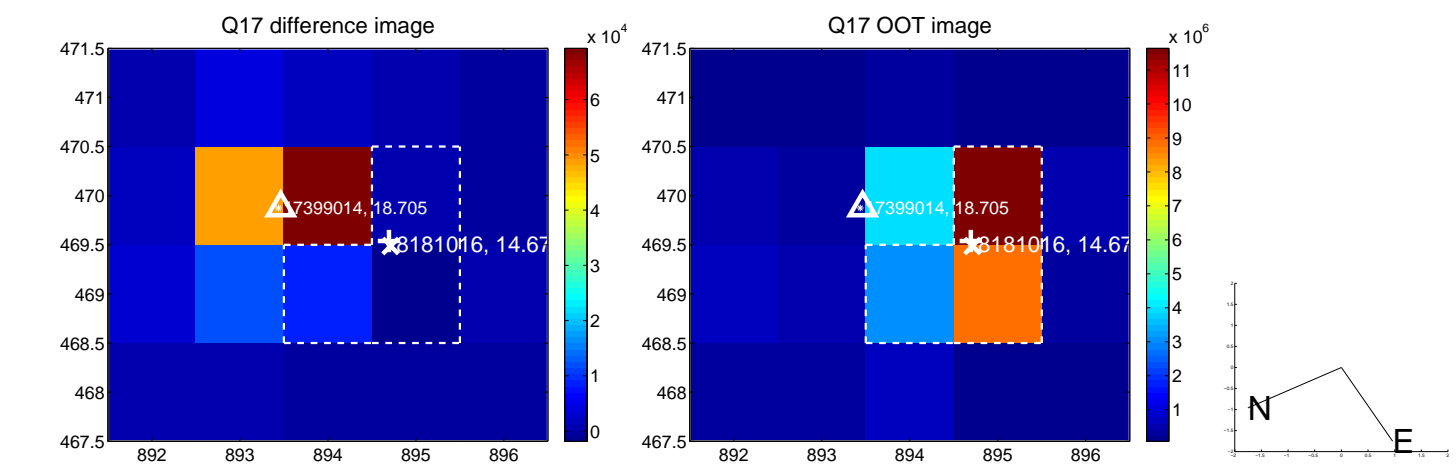
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



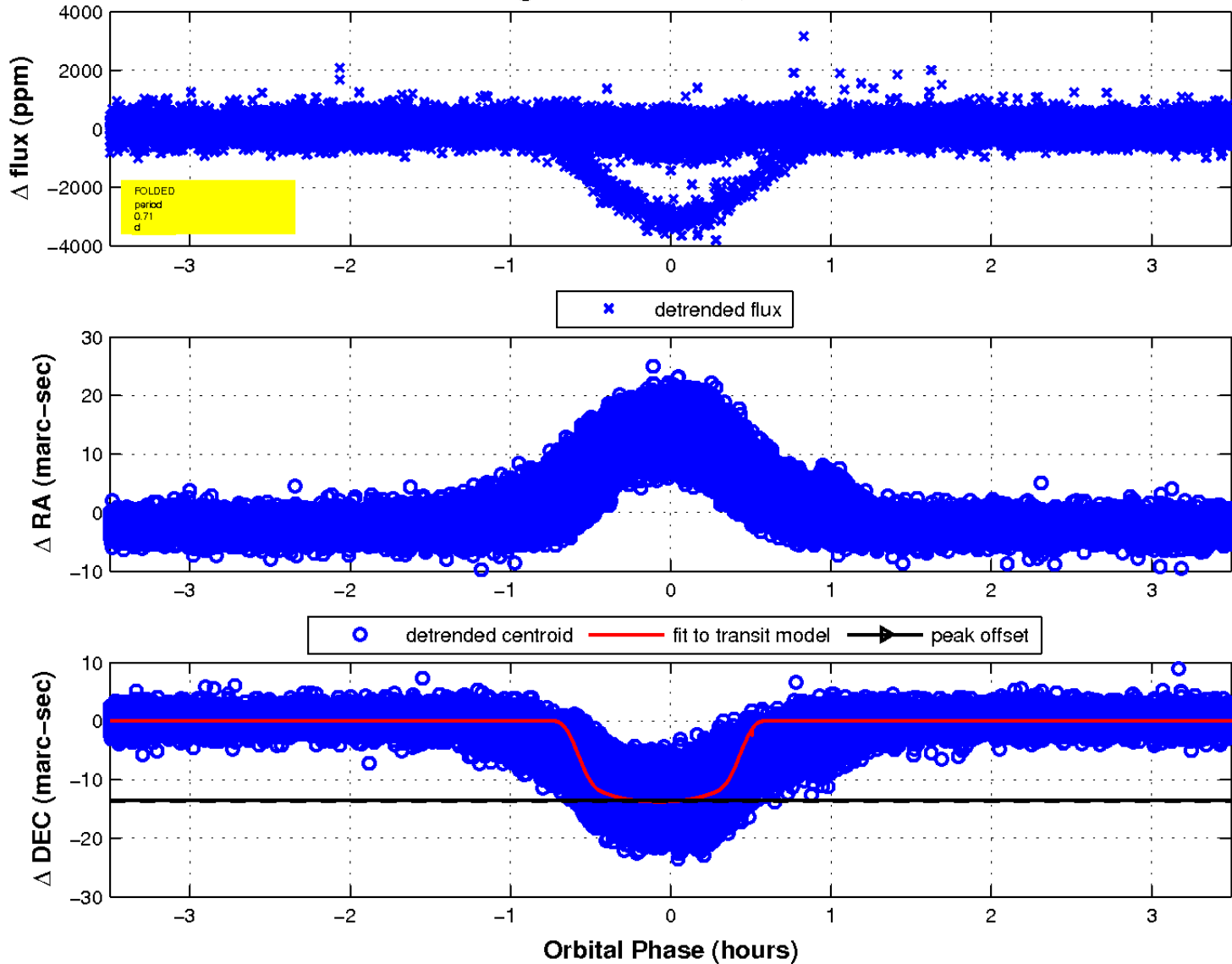
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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



fluxWeightedCentroids, Planet 2 of 2



UKIRT Image

Declination

