

# KIC 004180375

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
004180375-01	OBS	No	1.826168	132.467439	51.4	8.821	10.7	12.1	1.58	7044	1.32	4957.78
004180375-02	OBS	No	1.826193	131.563620	74.6	3.583	13.5	16.5	1.58	7044	1.59	4957.69

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
004180375-01	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT
004180375-02	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_ALT—SAME_NTL_PERIOD

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

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

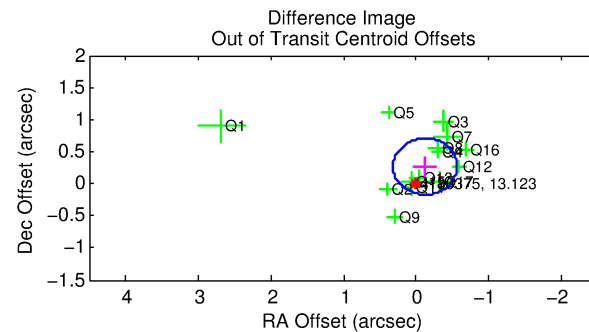
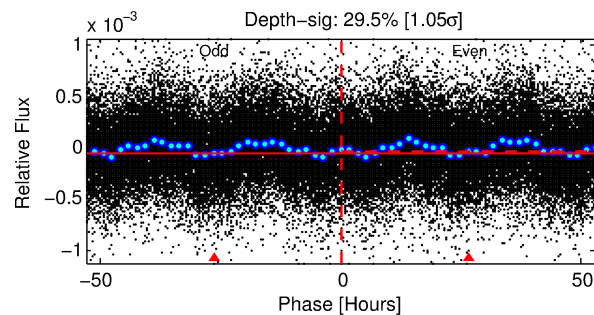
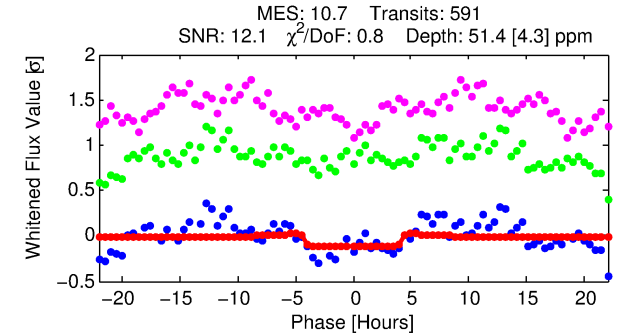
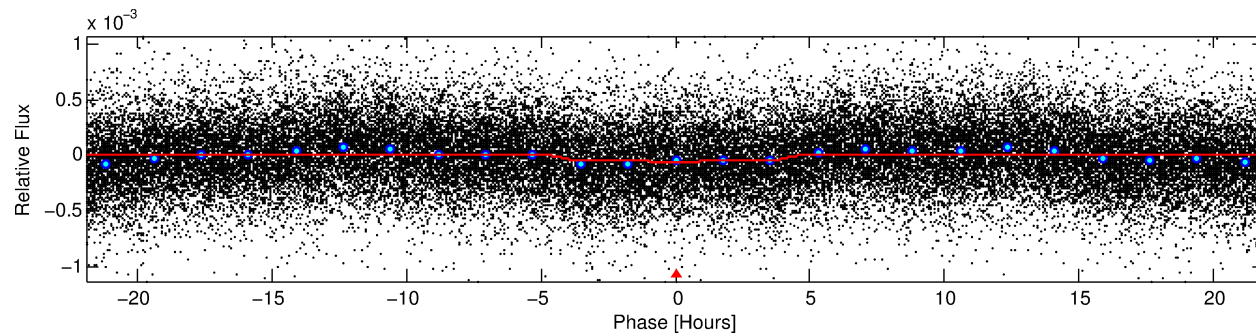
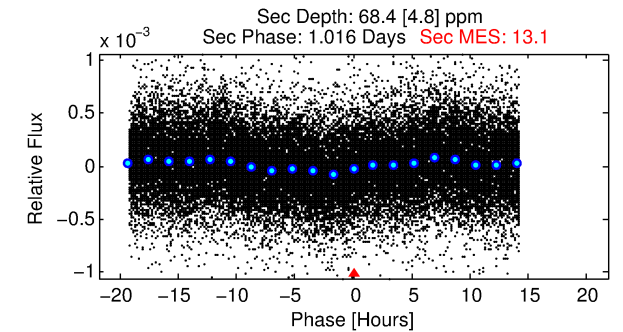
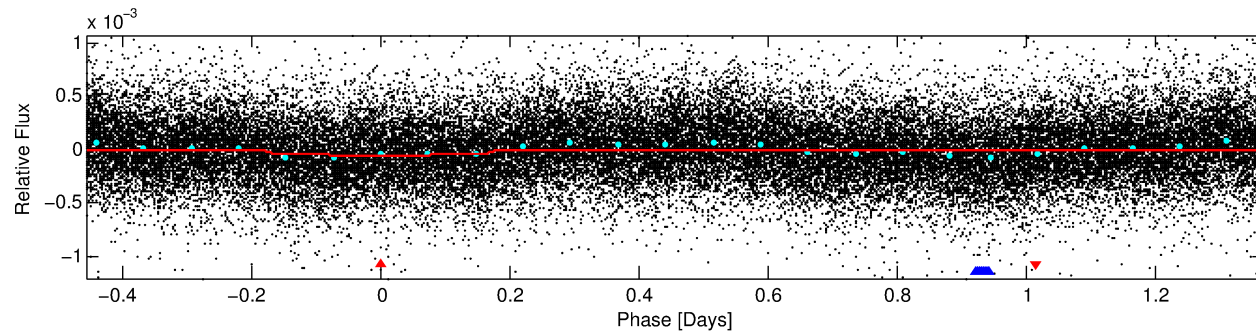
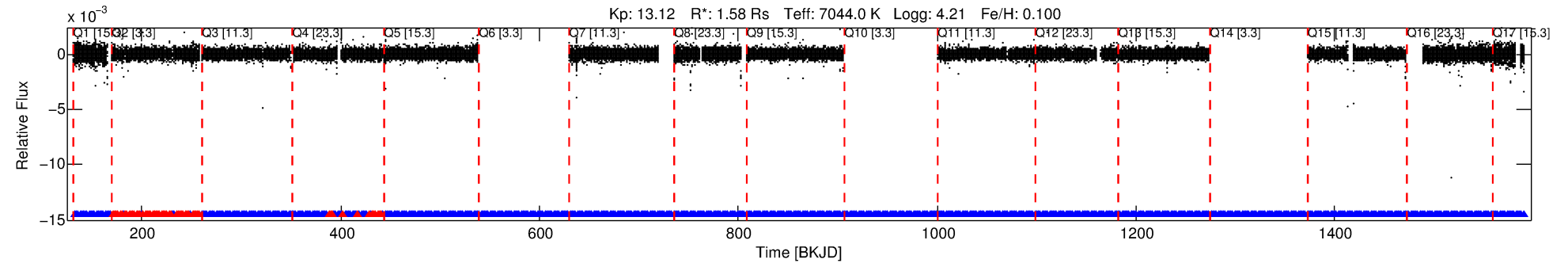
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 004180375-01

No Significant Match Found

# DV One-Page Summary

KIC: 4180375 Candidate: 1 of 2 Period: 1.826 d



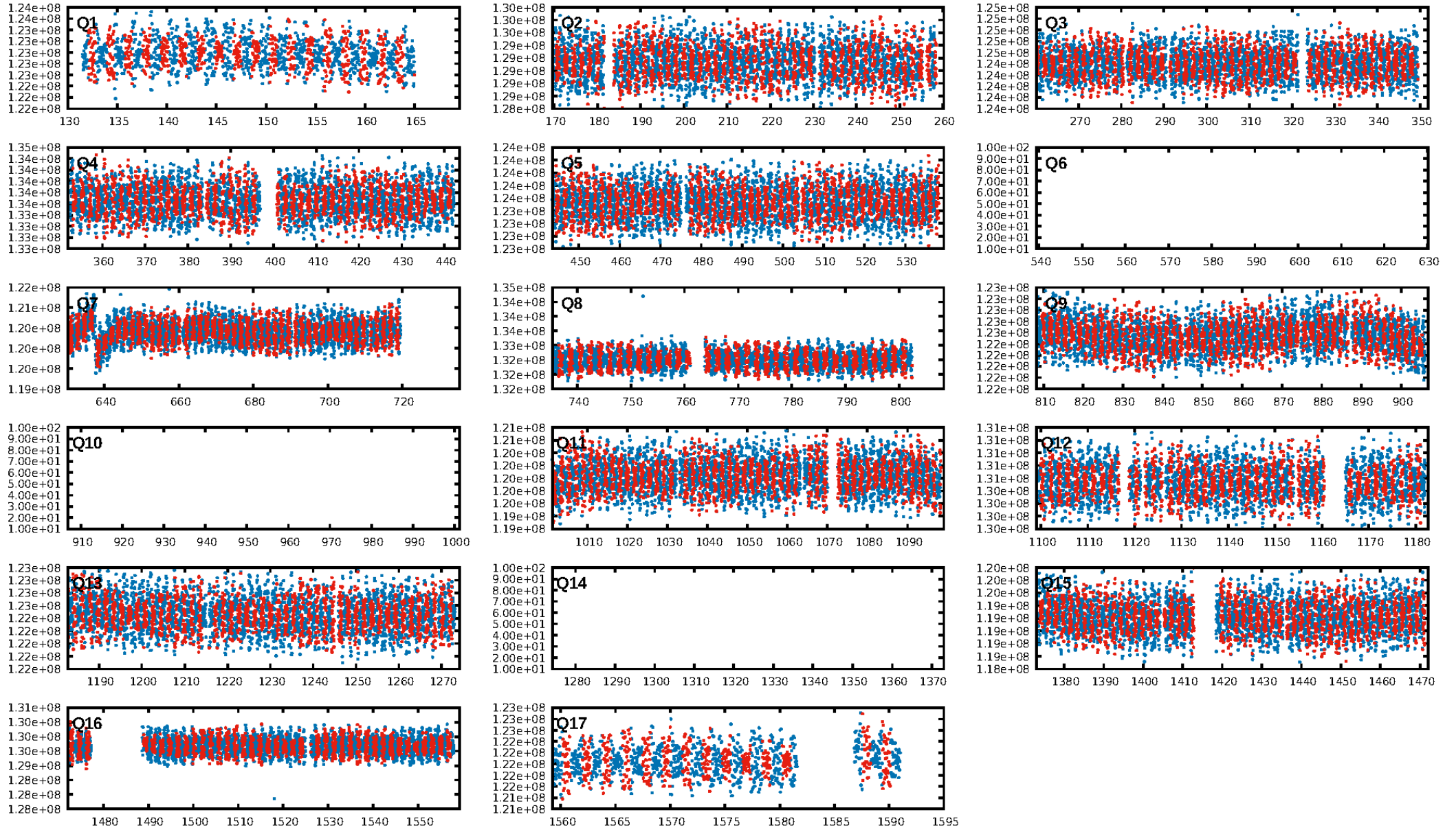
## DV Fit Results:

Period = 1.82617 [0.00002] d  
Epoch = 132.4674 [0.0054] BKJD  
Rp/R\* = 0.0076 [0.0013]  
a/R\* = 1.18 [0.34]  
b = 0.90 [0.22]  
Seff = 4957.78 [2100.76]  
Teq = 2140 [227] K  
Rp = 1.32 [0.52] Re  
a = 0.0334 [0.0094] AU  
Ag = 24.10 [12.65] [1.83σ]  
Teffp = 7330 [712] K [6.94σ]

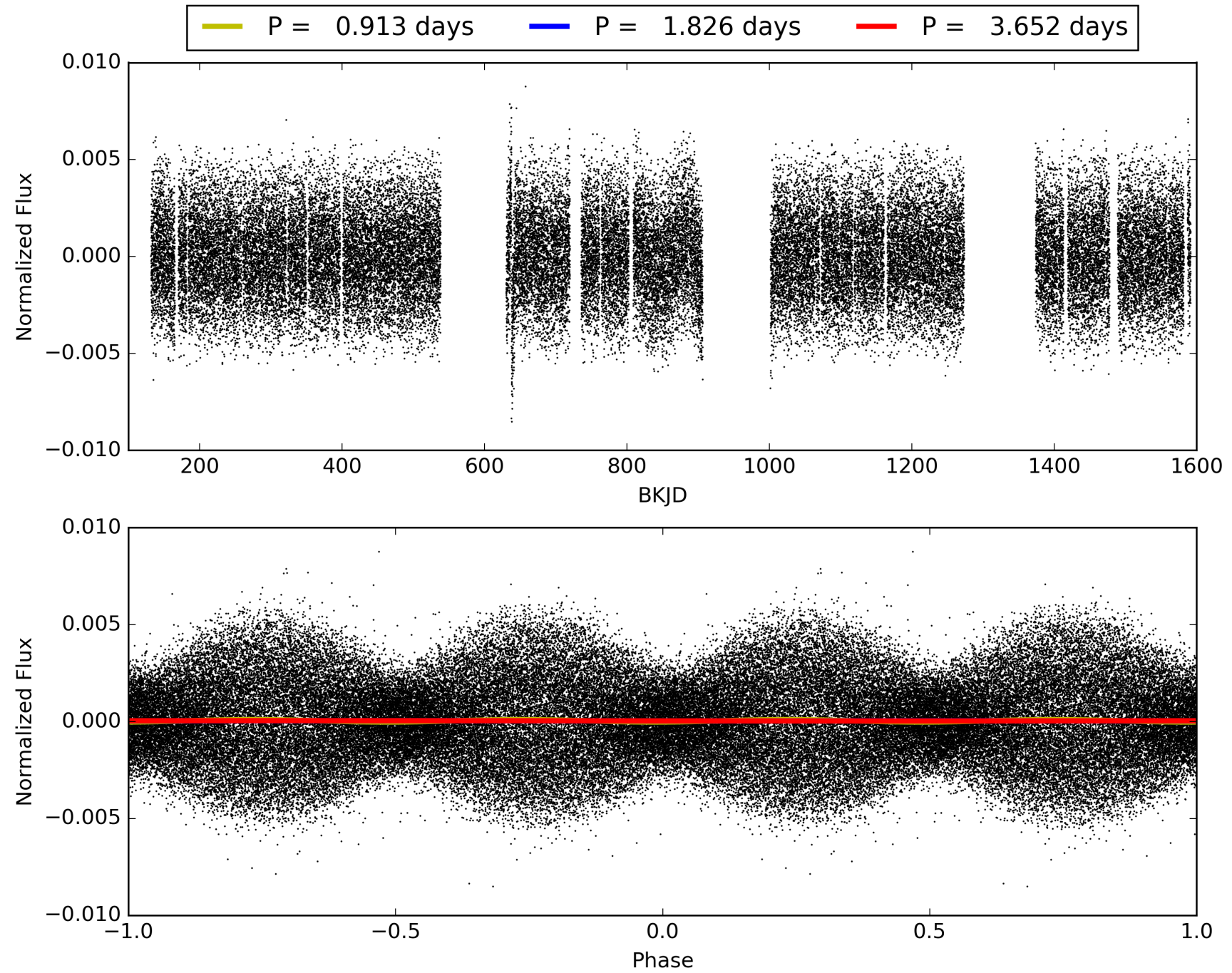
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 0.0% [0.00σ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: 1.72e-41  
RollingBand-fgt: 0.90 [503/559]  
GhostDiagnostic-chr: 2.963  
Centroid-sig: 0.0%  
Centroid-so: 1.692 arcsec [3.15σ]  
OotOffset-rm: 0.295 arcsec [2.01σ]  
KicOffset-rm: 0.338 arcsec [2.23σ]  
OotOffset-st: 1/4/4/5 [14]  
KicOffset-st: 1/4/4/5 [14]  
DiffImageQuality-fgm: 1.00 [14/14]  
DiffImageOverlap-fno: 1.00 [14/14]

# TCE 004180375-01, PDC Light Curves



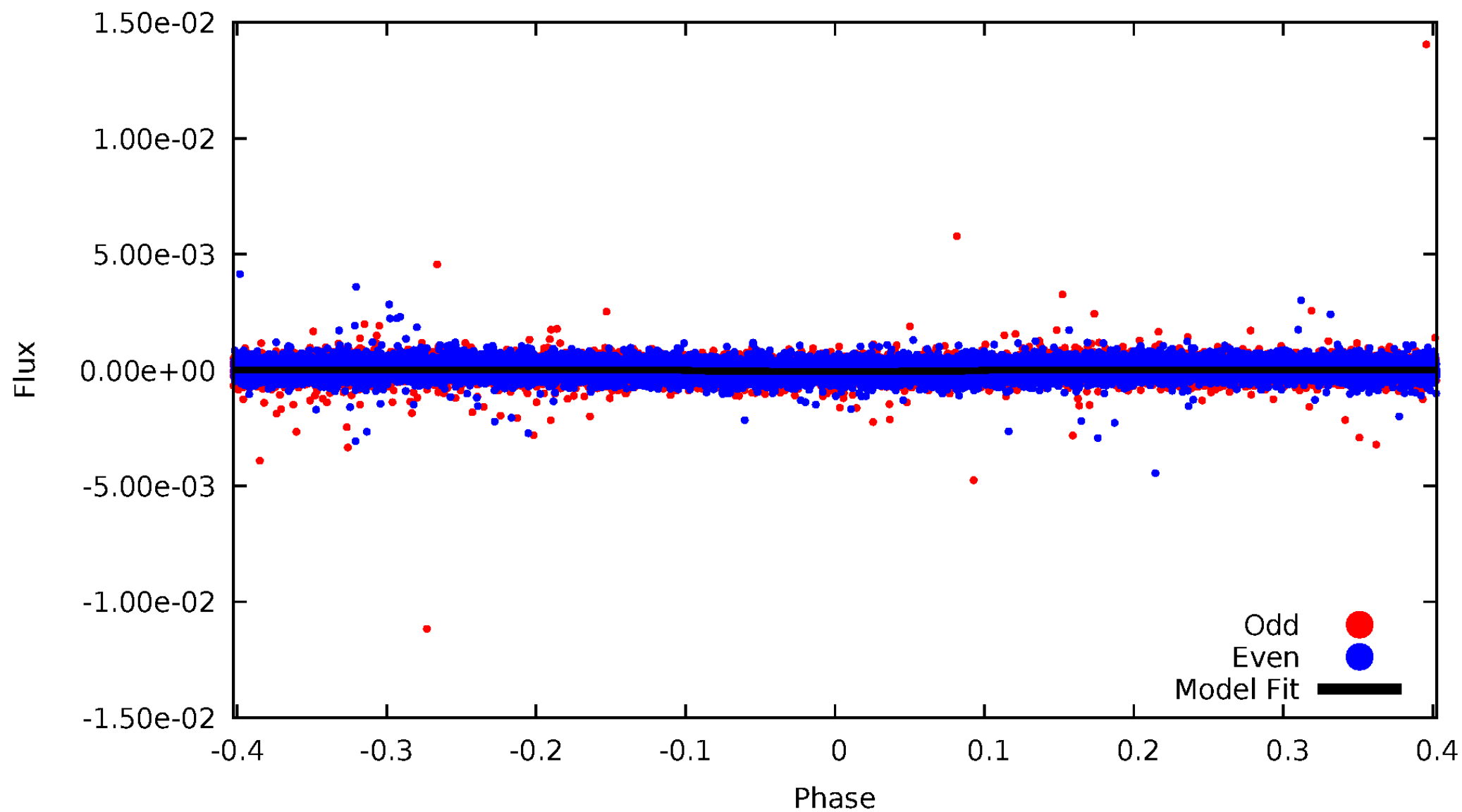
TCE 004180375-01





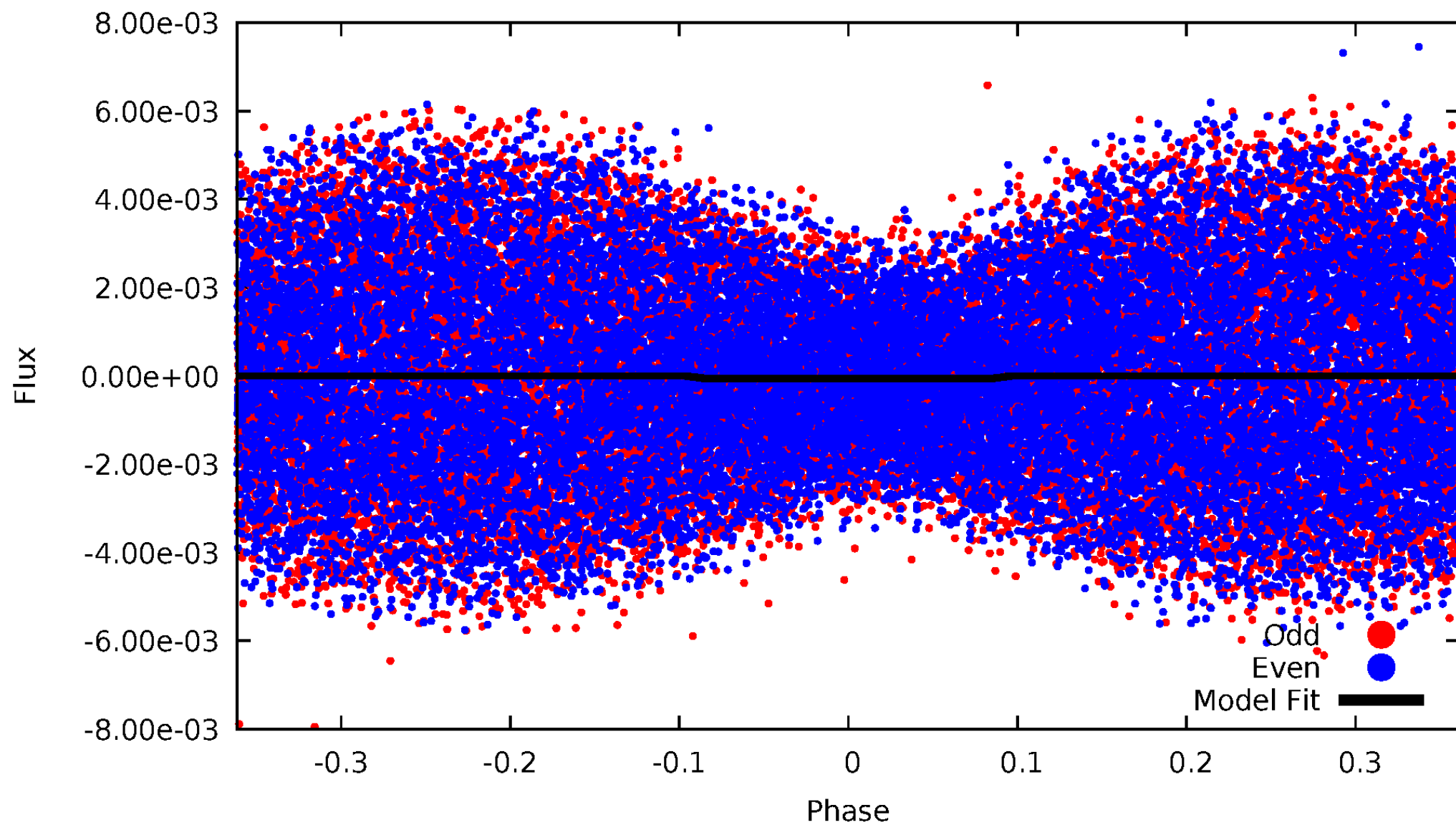
# DV Odd/Even

TCE 004180375-01

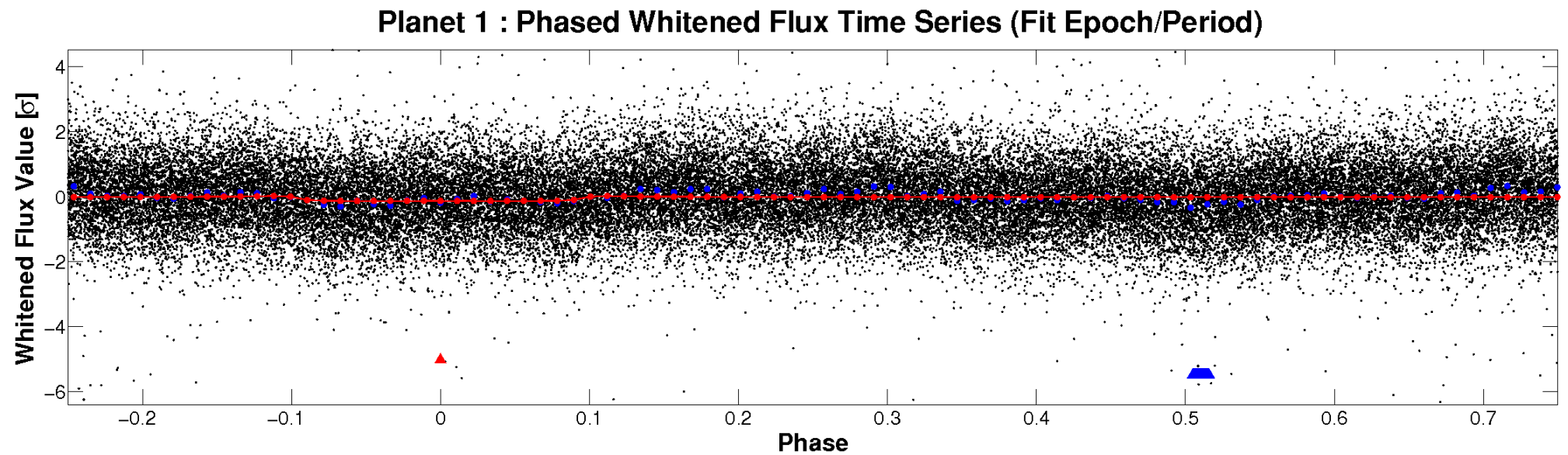
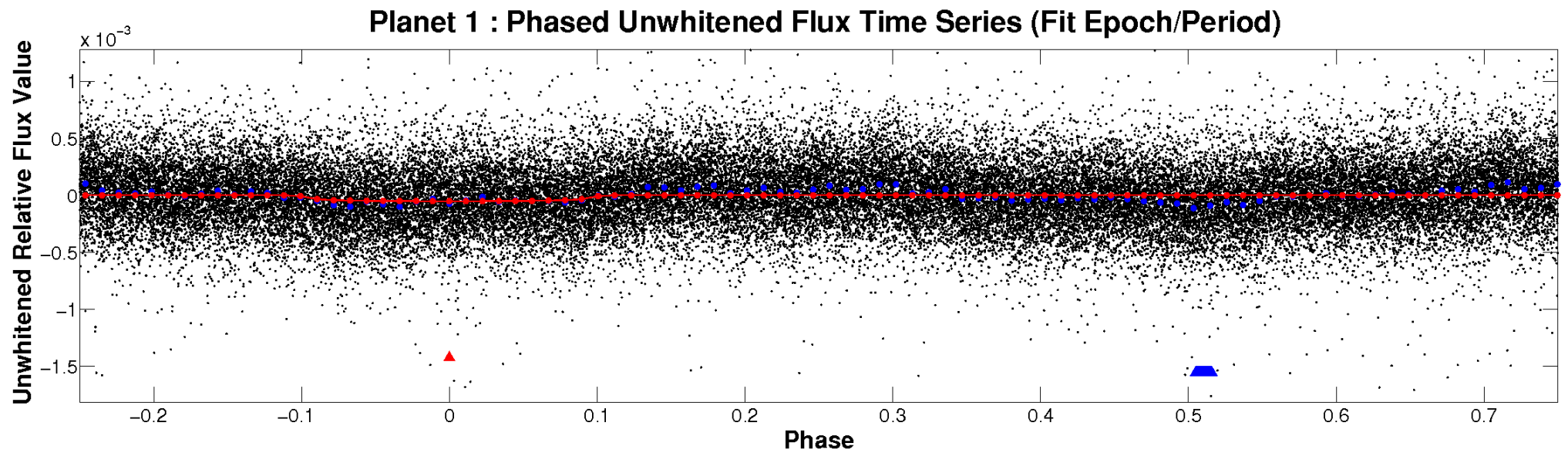


# ALT Odd/Even

TCE 004180375-01

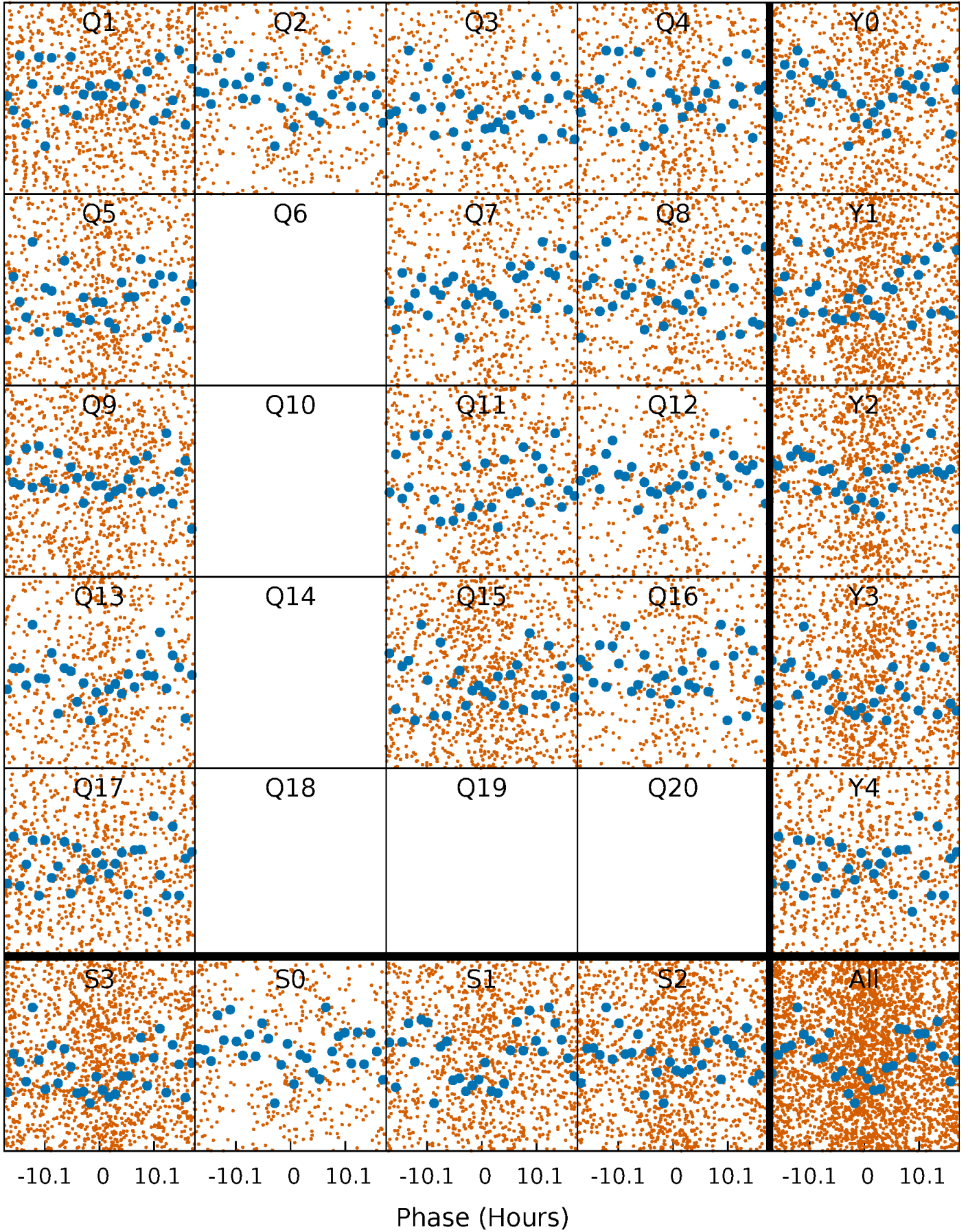


# Non-Whitened Vs. Whitened Light Curve



# PDC Quarter-Phased Transit Curves

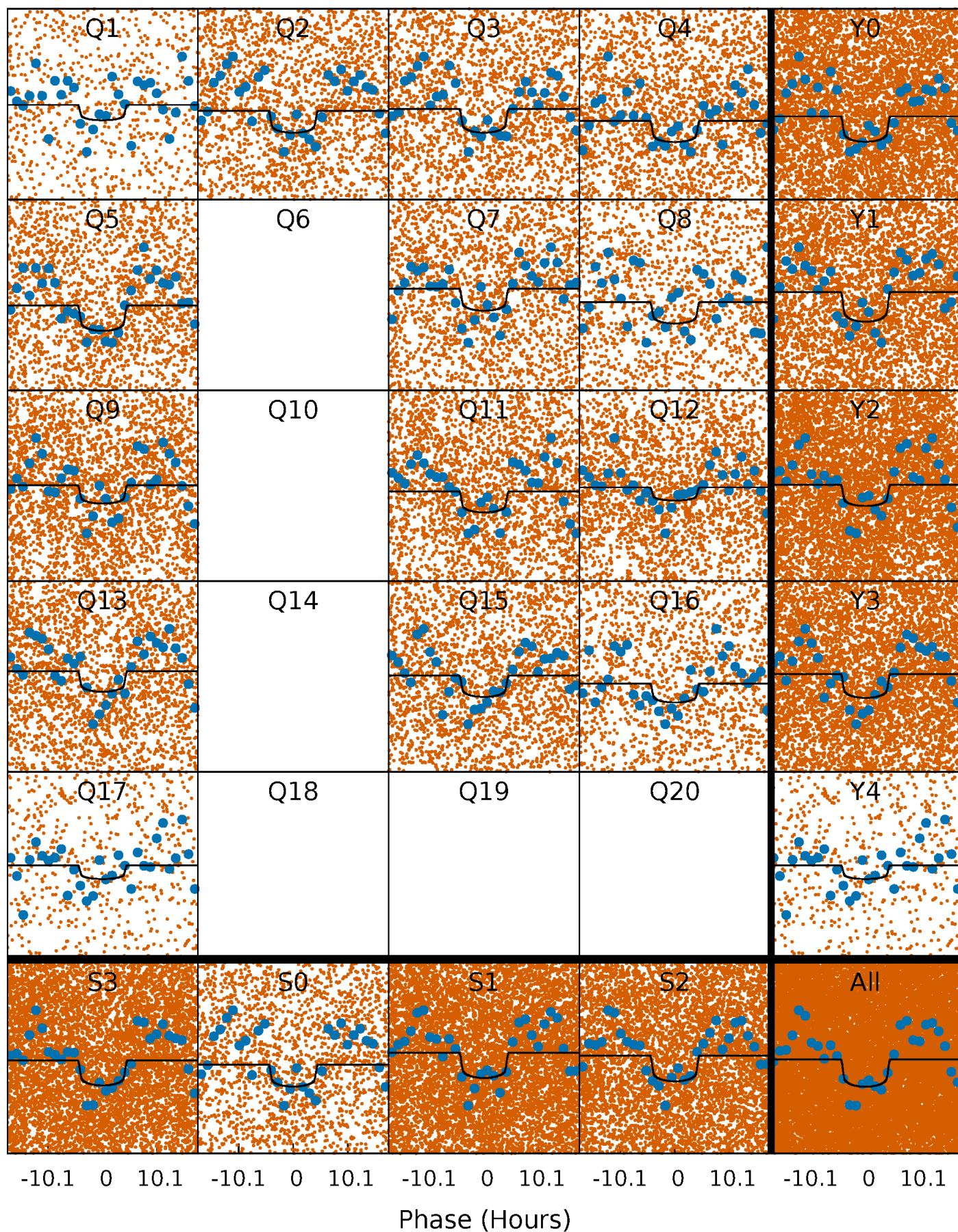
TCE 004180375-01   P= 1.826168 Days    $T_0=132.467439$  (BKJD)





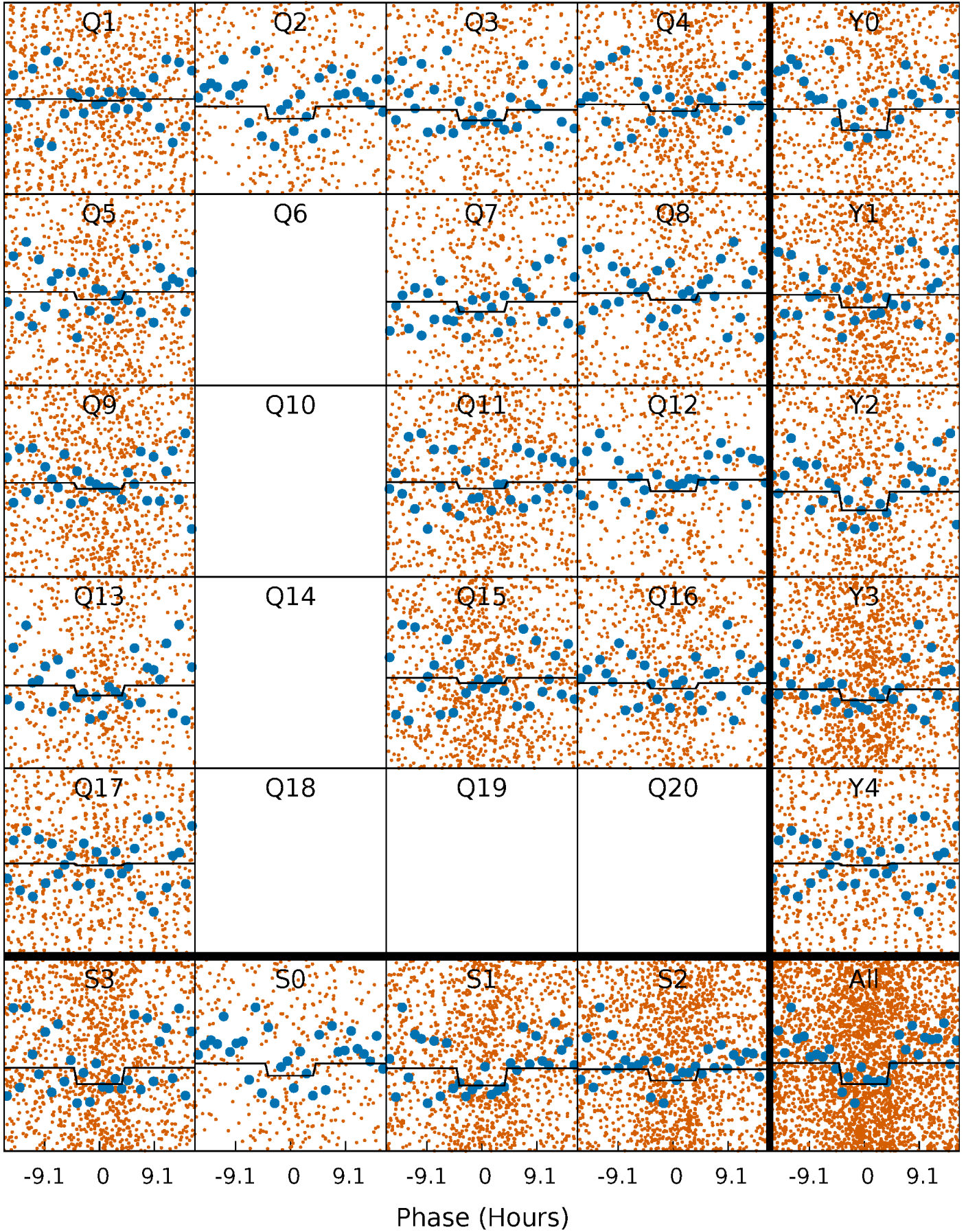
# DV Quarter-Phased Transit Curves

TCE 004180375-01 P= 1.826168 Days  $T_0=132.467439$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

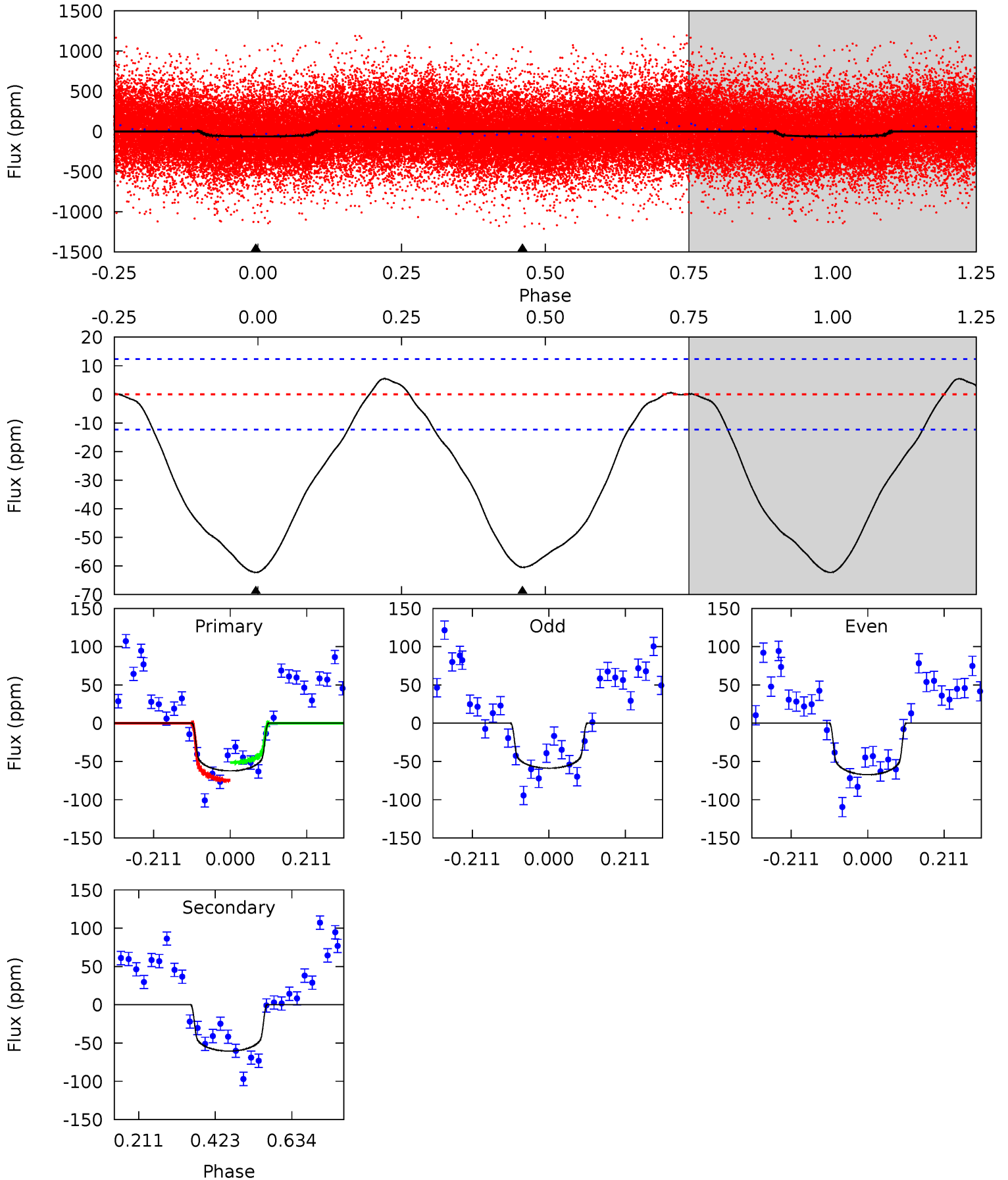
TCE 004180375-01 P= 1.826174 Days  $T_0=132.462199$  (BKJD)



# DV Model-Shift Uniqueness Test

004180375-01, P = 1.826168 Days, E = 130.641271 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
22.3	21.6	0	0	4.41	1.25	0.94	22.3	22.3	21.6	21.6	1.52	0.95	0.08	4.26

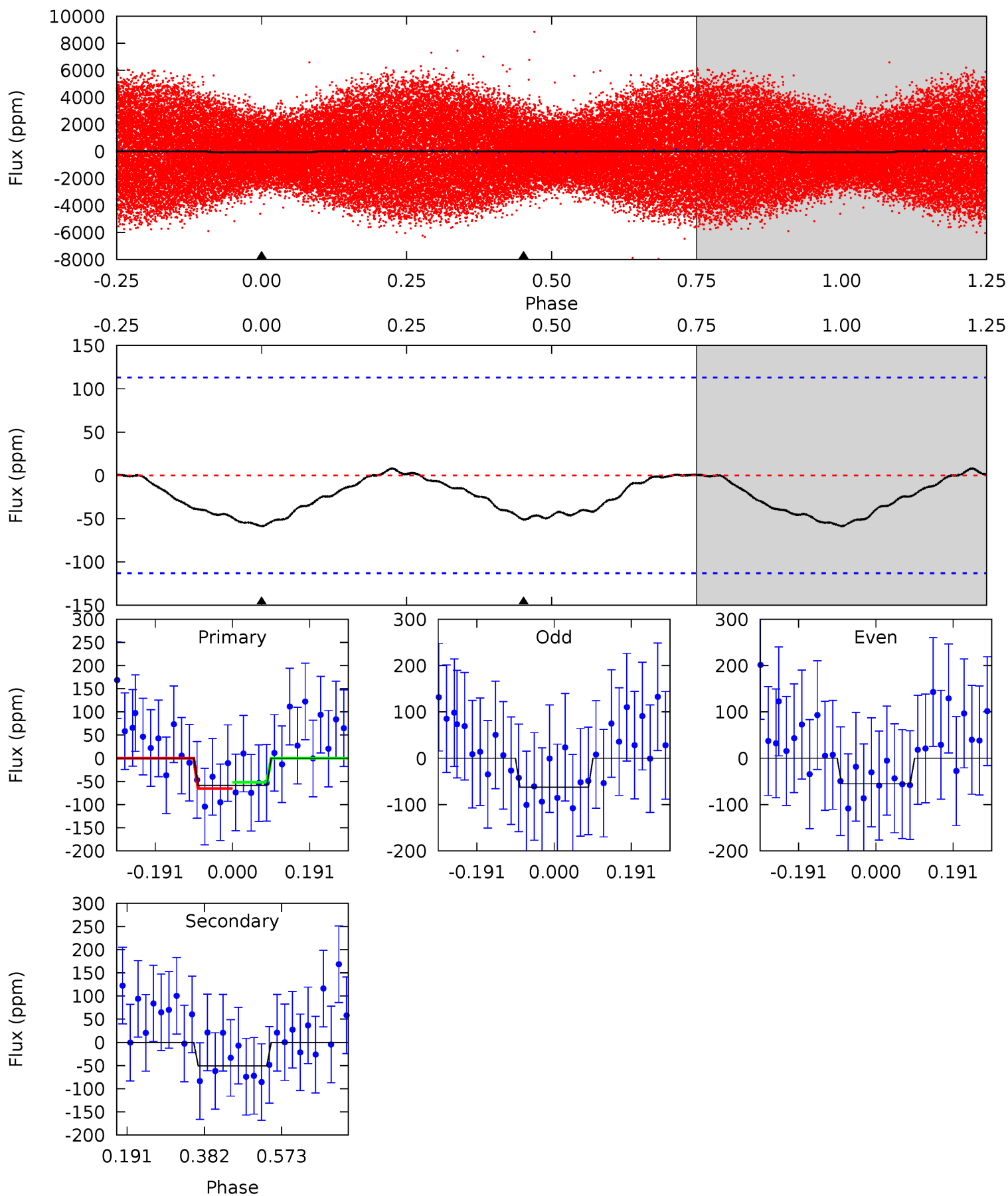




# Alt Model-Shift Uniqueness Test

004180375-01, P = 1.826174 Days, E = 130.636025 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
2.30	2.00	0	0	4.43	1.31	0.15	2.30	2.30	2.00	2.00	0.14	0.82	0.12	0.26





### Stellar Parameters For KIC 004180375

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$7044^{+195}_{-293}$	$4.212^{+0.087}_{-0.203}$	$0.100^{+0.200}_{-0.350}$	$1.584^{+0.556}_{-0.238}$	$1.491^{+0.214}_{-0.214}$	$0.528^{+0.215}_{-0.291}$
	+3%/-4%	+2%/-5%	+200%/-350%	+35%/-15%	+14%/-14%	+41%/-55%
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 004180375-01 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-60 \pm 3$	$1.35^{+0.37}_{-0.25}$	$3019^{+232}_{-177}$	$7049^{+832}_{-667}$	$20^{+10}_{-7}$
Alt.	$-51 \pm 26$	$1.33^{+0.33}_{-0.28}$	$3029^{+233}_{-184}$	$6762^{+1363}_{-1247}$	$17^{+16}_{-9}$

$T_{max}$  = 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

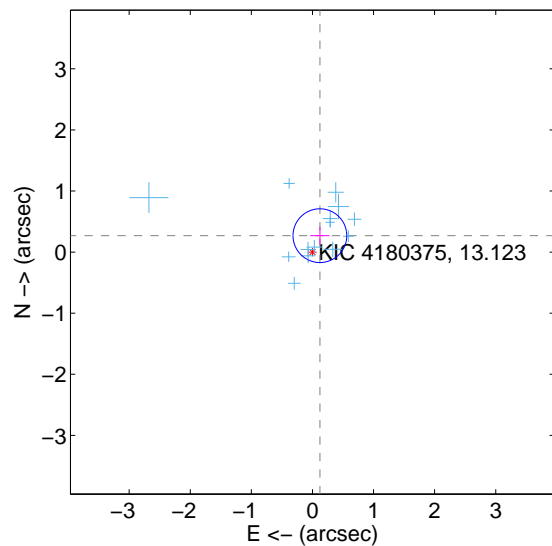
Supplemental centroid analysis for 004180375-01. Kepler magnitude: 13.12. Transit SNR 12.13

There are 14 quarters with good PRF difference image offsets

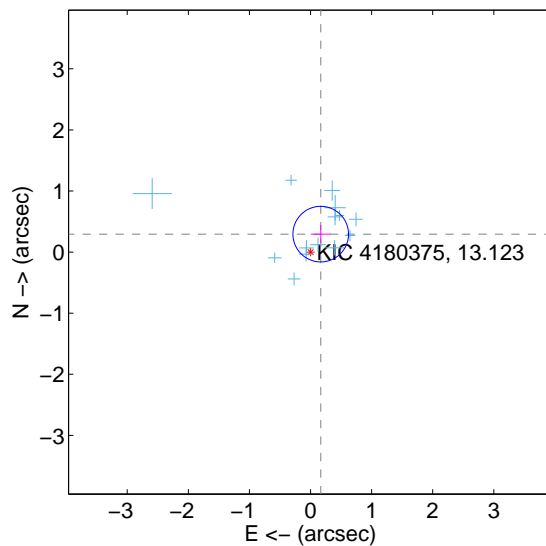
The direct PRF centroid is offset from the target star catalog position by about 0.07 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.295 \pm 0.147$	2.01	$-0.122 \pm 0.159$	$0.269 \pm 0.144$
PRF-fit source offset from KIC position	$0.338 \pm 0.152$	2.23	$-0.167 \pm 0.162$	$0.294 \pm 0.148$
photometric centroid source offset	$1.69 \pm 0.54$	3.15	$-0.94 \pm 0.48$	$1.41 \pm 0.56$

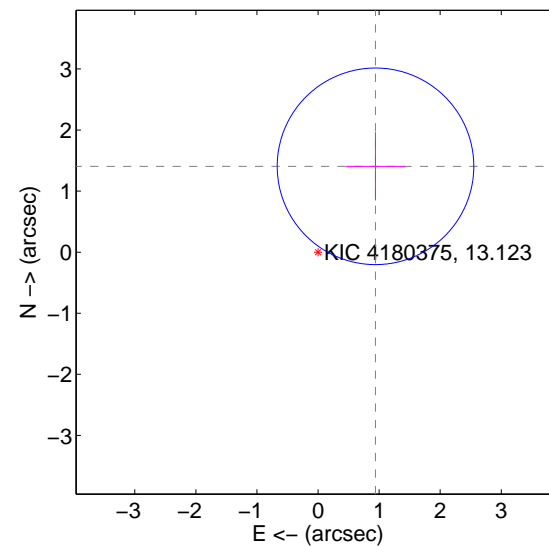
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position

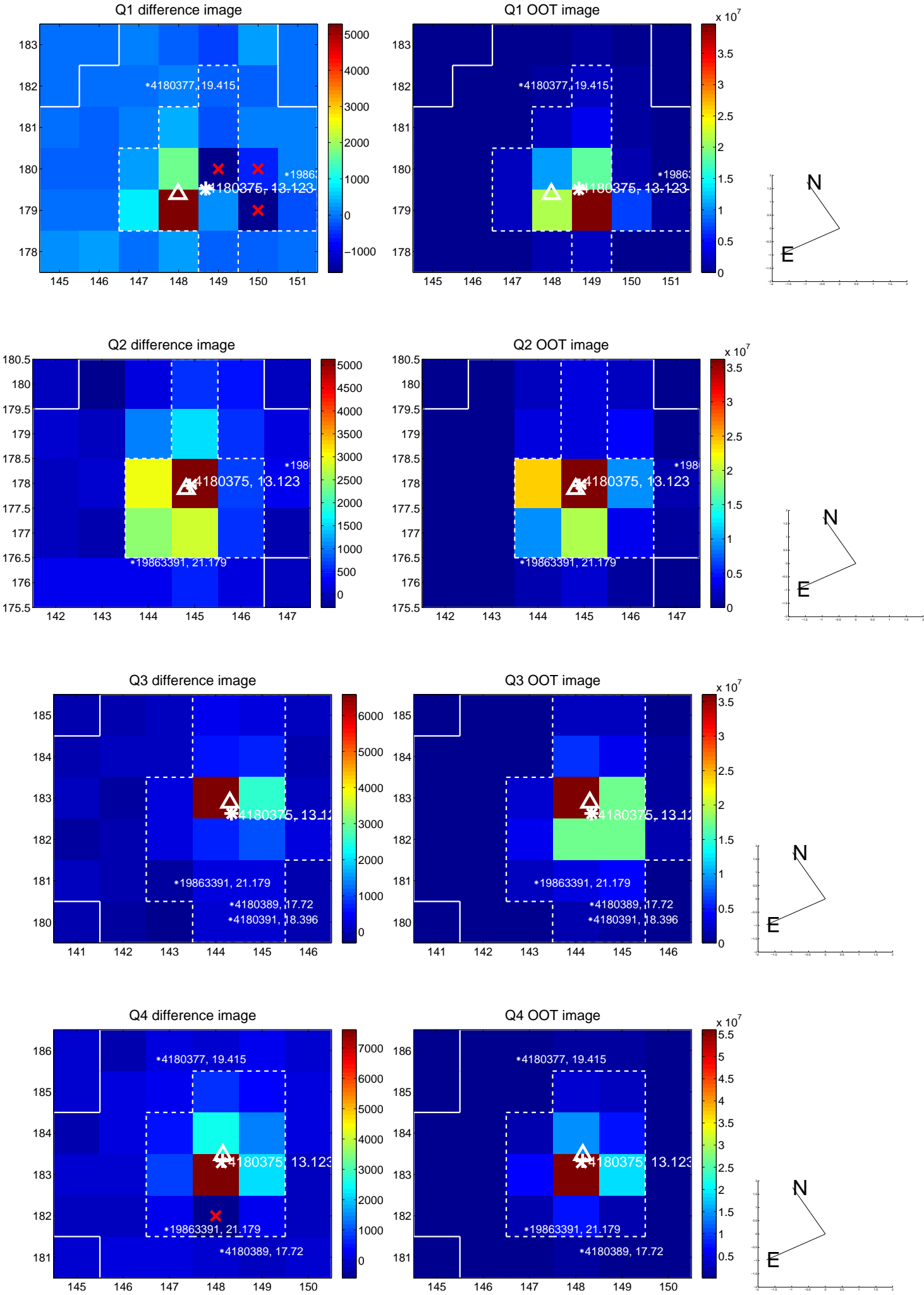


offset from photometric centroids

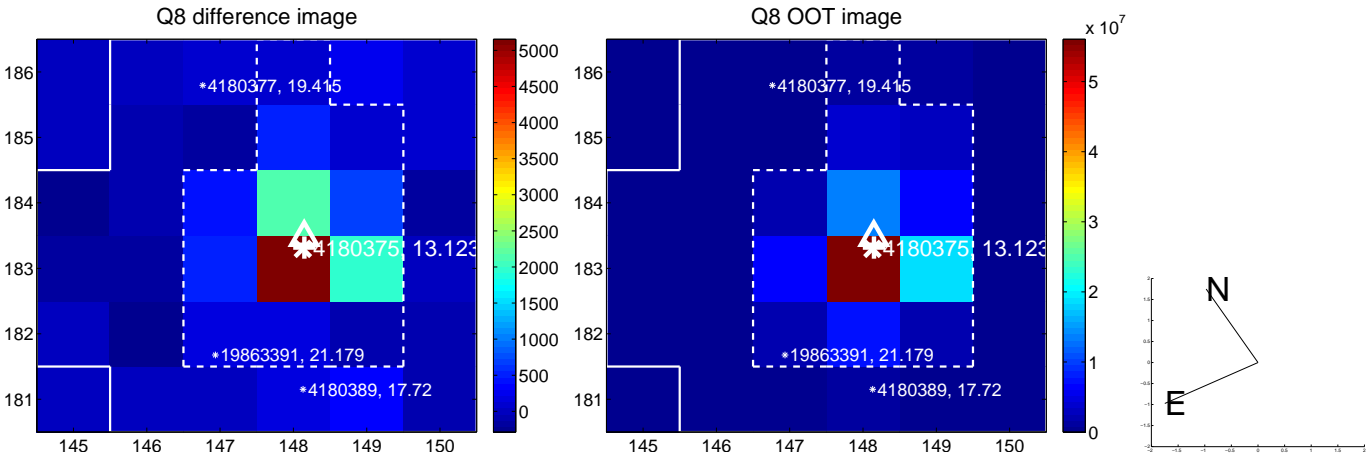
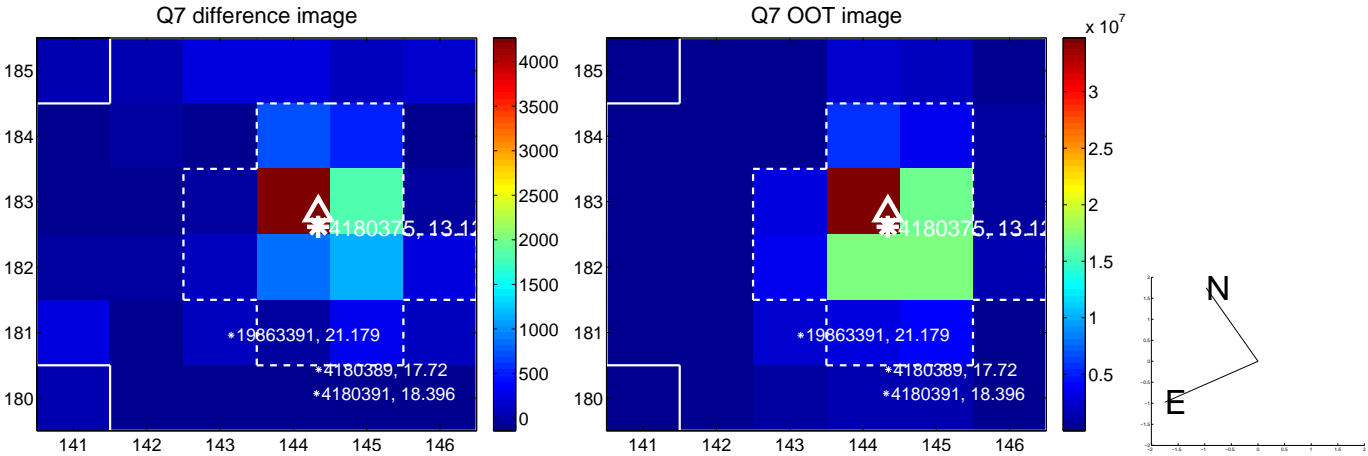
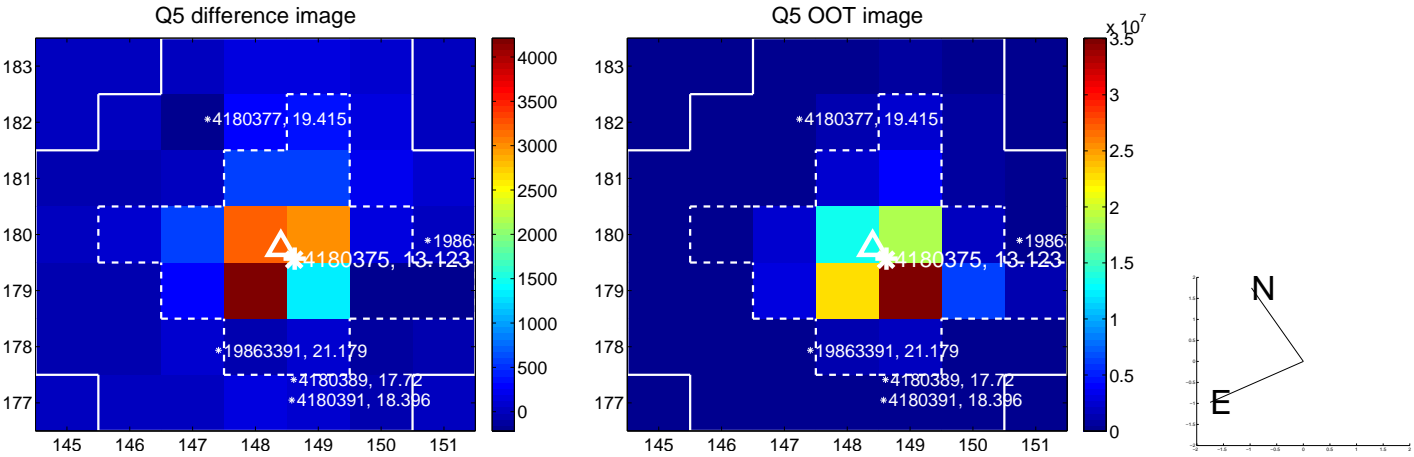


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets**; **Vermillion crosses: bad quarterly centroid offsets**; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

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

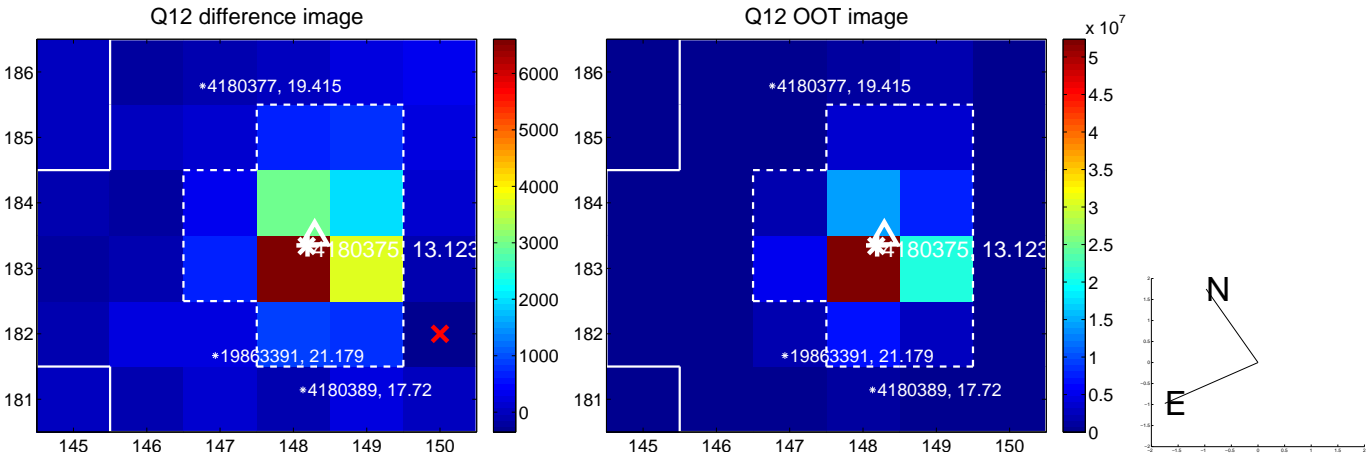
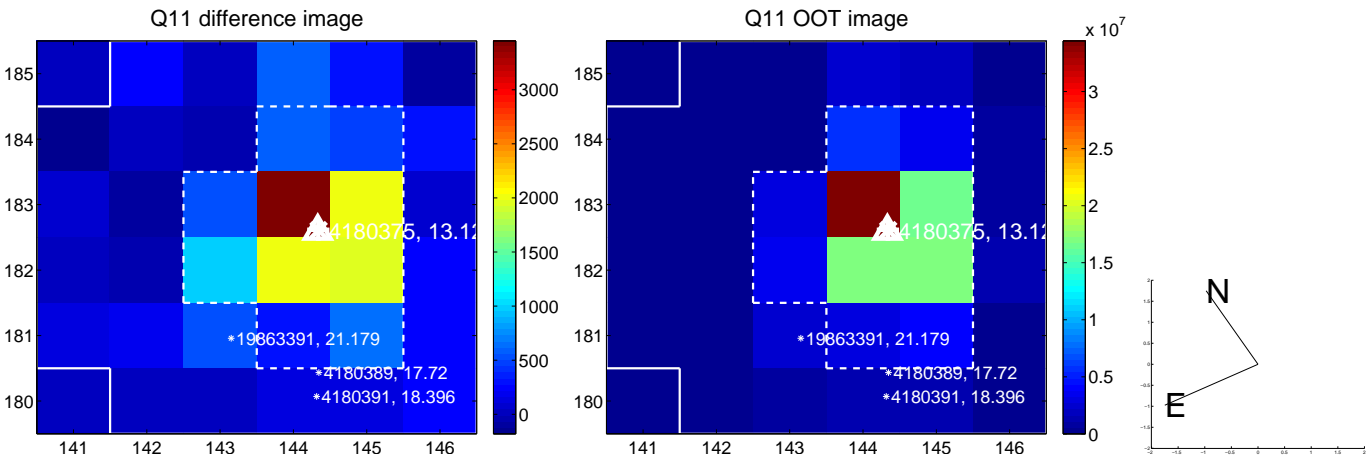
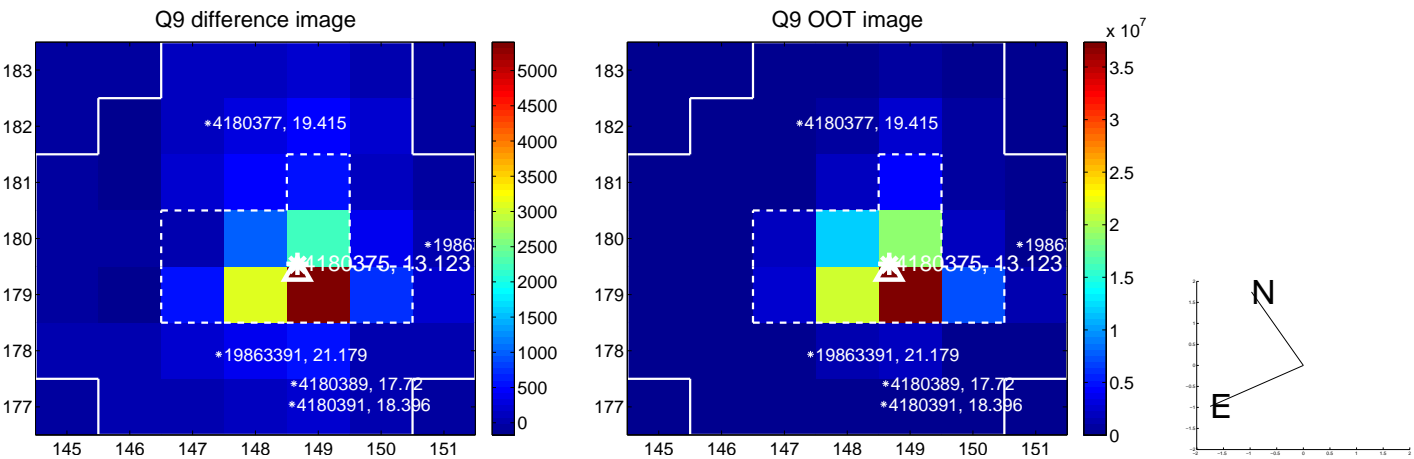


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

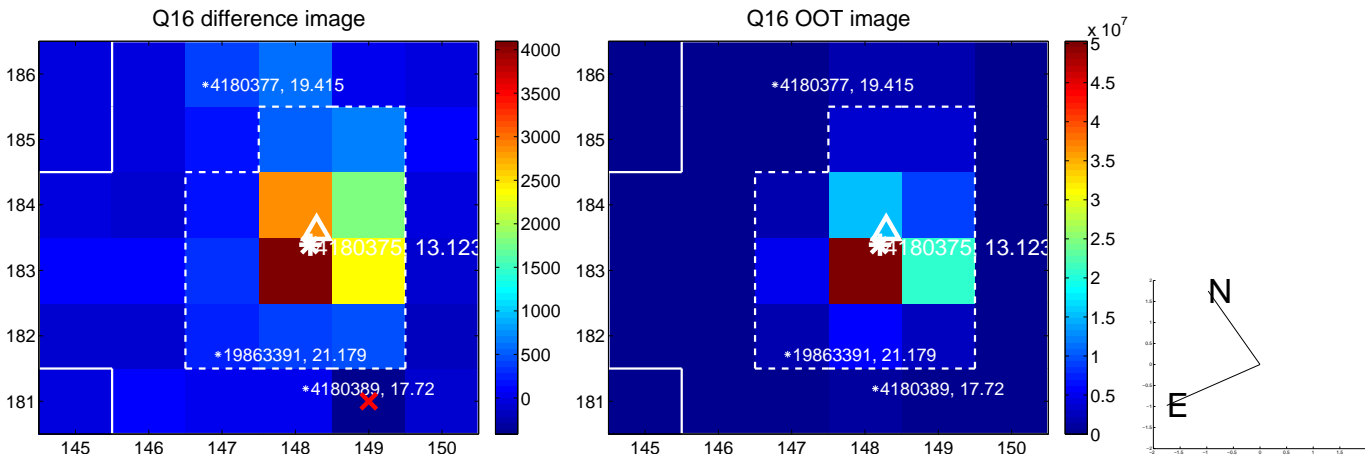
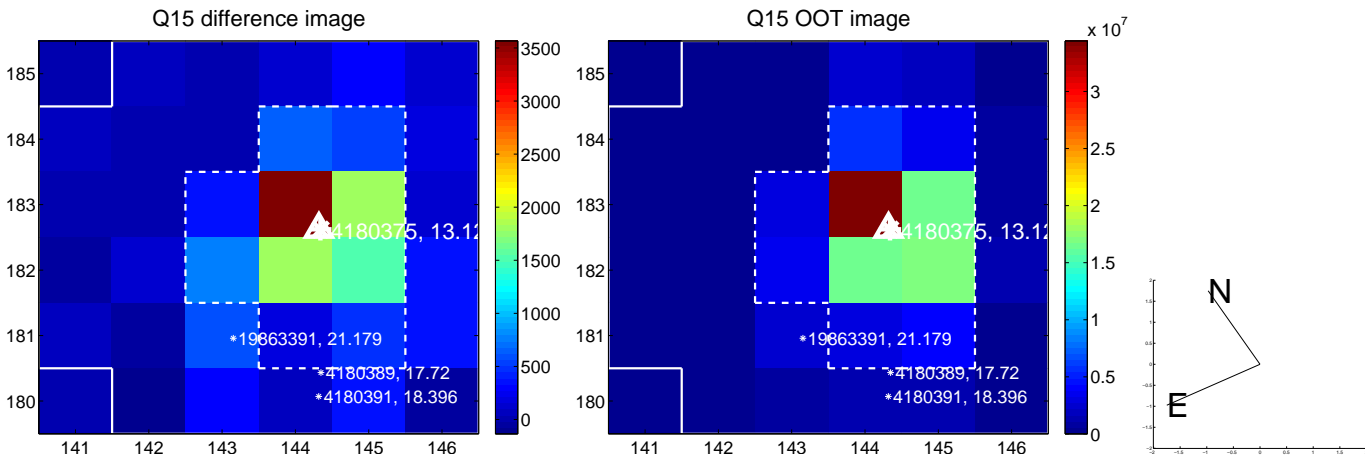
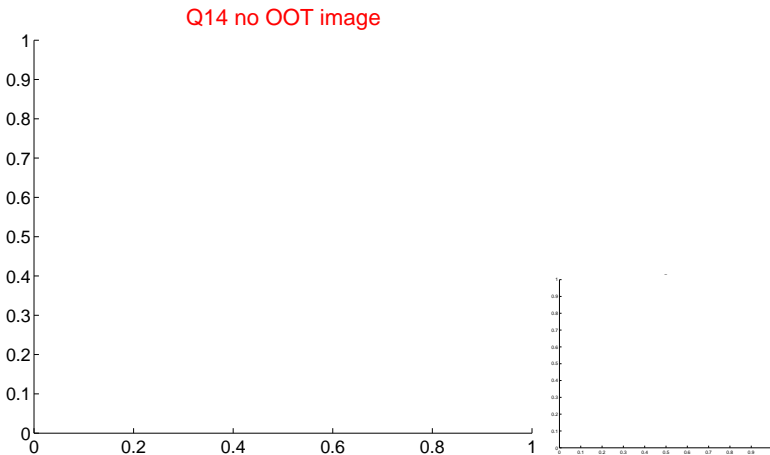
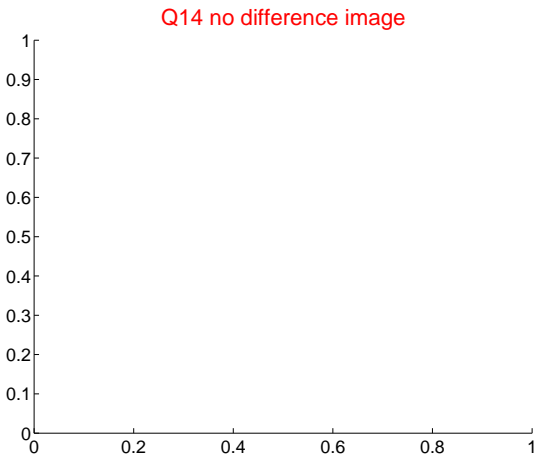
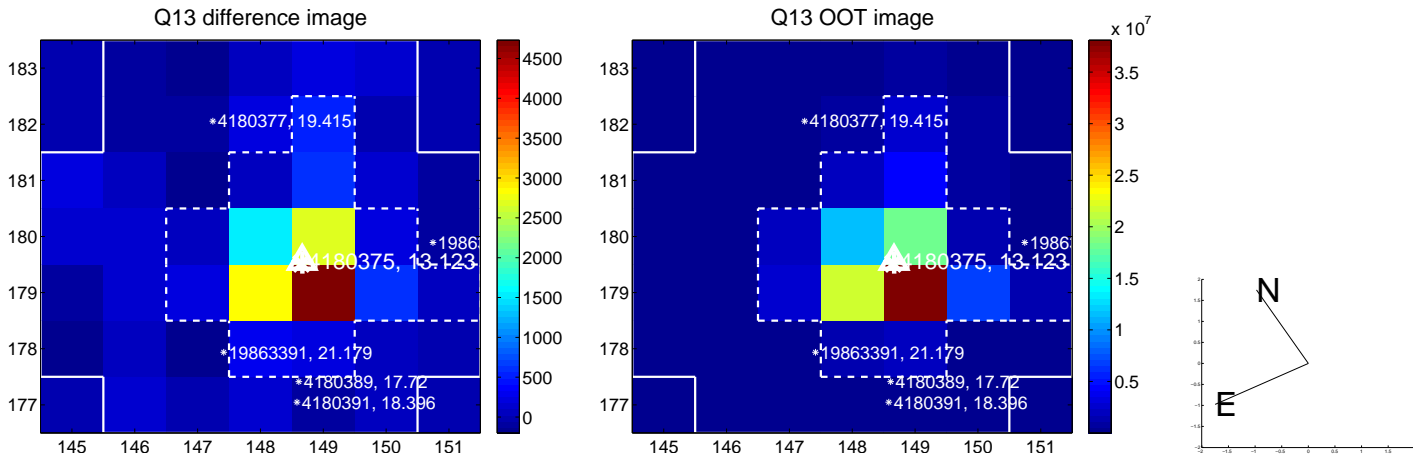




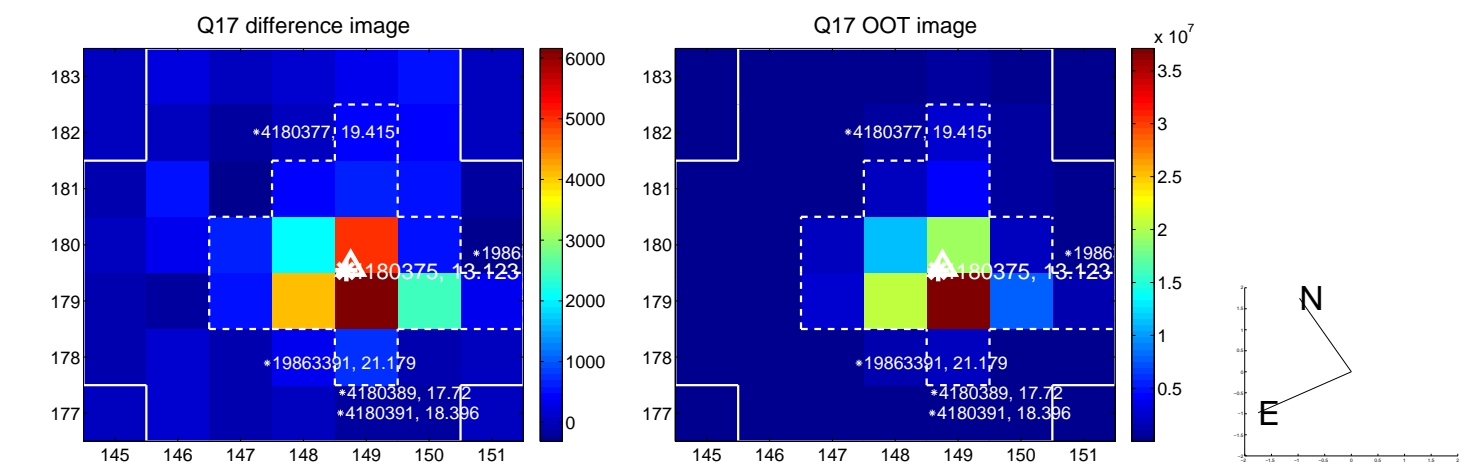
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



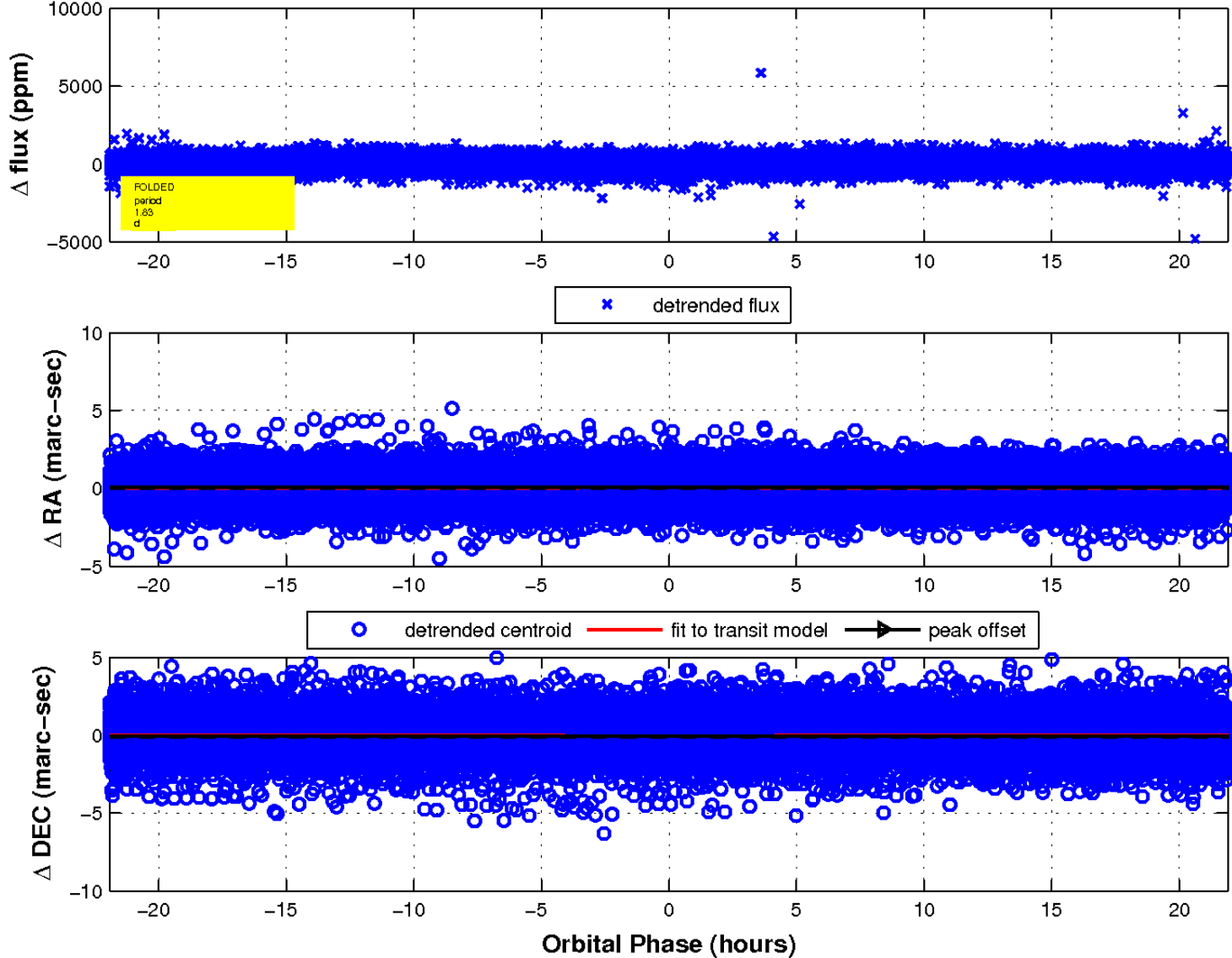
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



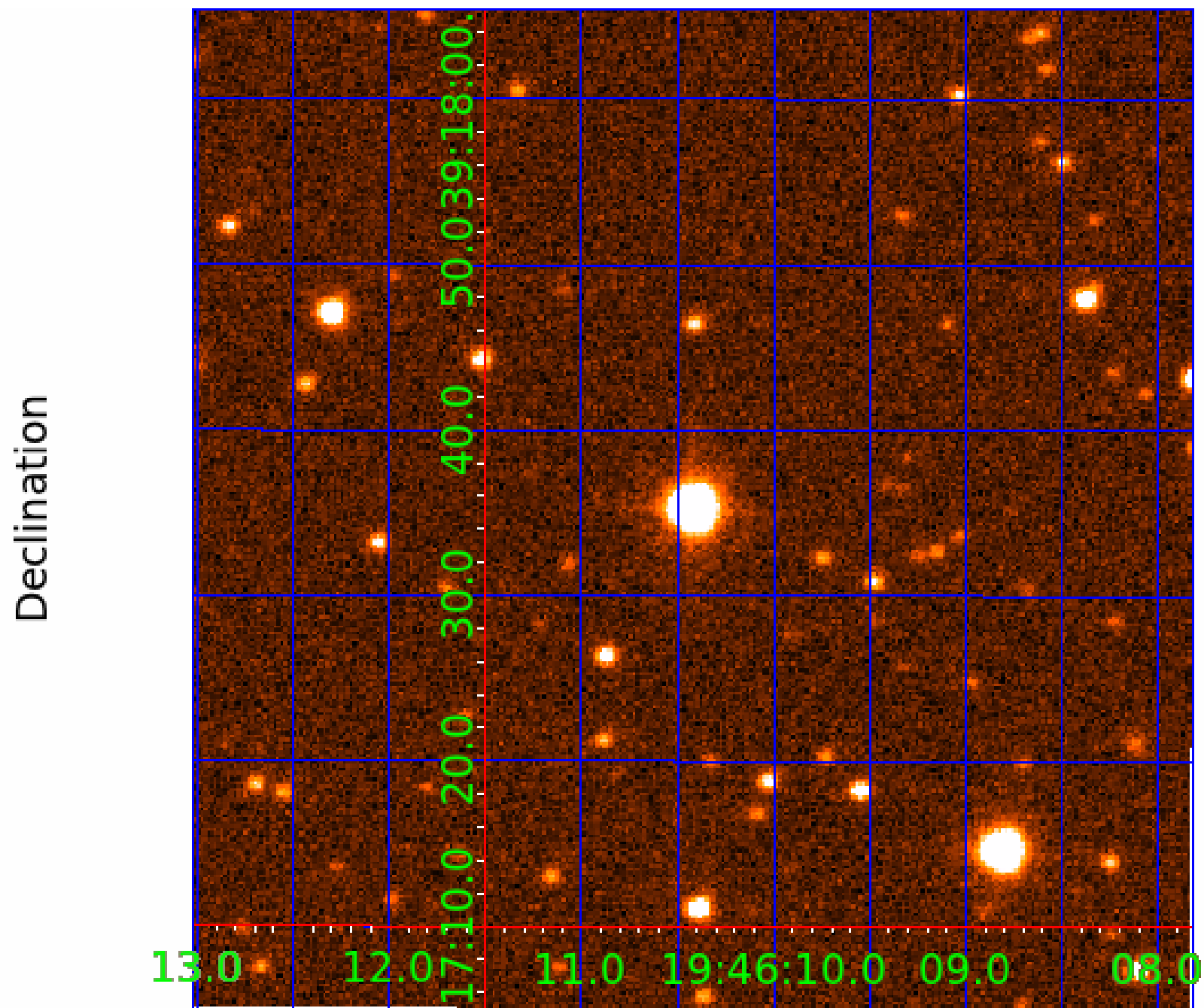
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



fluxWeightedCentroids, Planet 1 of 2



UKIRT Image





# KIC 004180375

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
004180375-01	OBS	No	1.826168	132.467439	51.4	8.821	10.7	12.1	1.58	7044	1.32	4957.78
004180375-02	OBS	No	1.826193	131.563620	74.6	3.583	13.5	16.5	1.58	7044	1.59	4957.69

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
004180375-01	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT
004180375-02	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_ALT—SAME_NTL_PERIOD

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

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

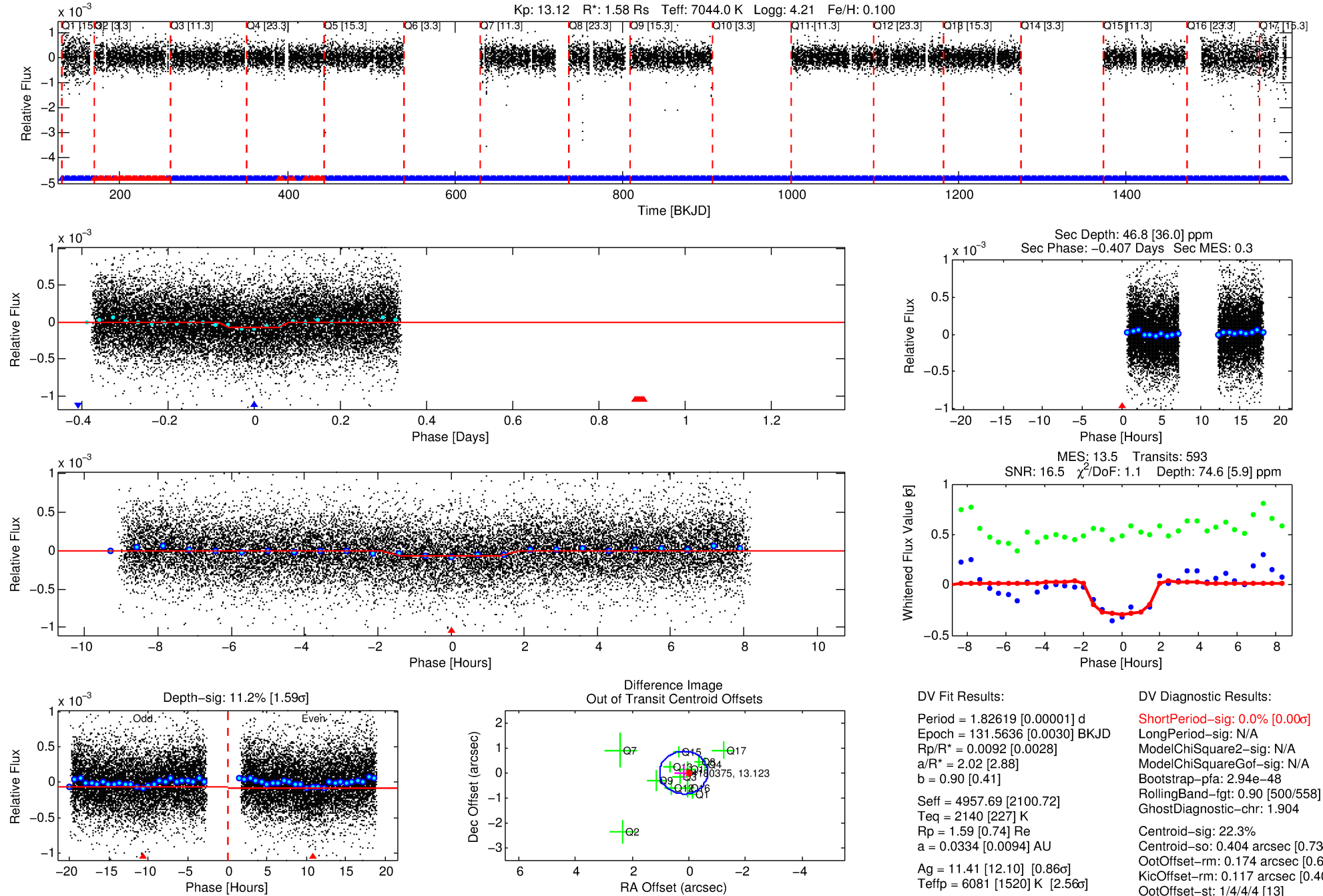
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 004180375-02

No Significant Match Found

# DV One-Page Summary

KIC: 4180375 Candidate: 2 of 2 Period: 1.826 d



## DV Fit Results:

Period = 1.82619 [0.00001] d  
Epoch = 131.5636 [0.0030] BKJD  
Rp/R\* = 0.0092 [0.0028]  
a/R\* = 2.02 [2.88]  
b = 0.90 [0.41]  
Seff = 4957.69 [2100.72]  
Teff = 2140 [227] K  
Rp = 1.59 [0.74] Re  
a = 0.0334 [0.0094] AU  
Ag = 11.41 [12.10] [0.86 $\sigma$ ]  
Teffp = 6081 [1520] K [2.56 $\sigma$ ]

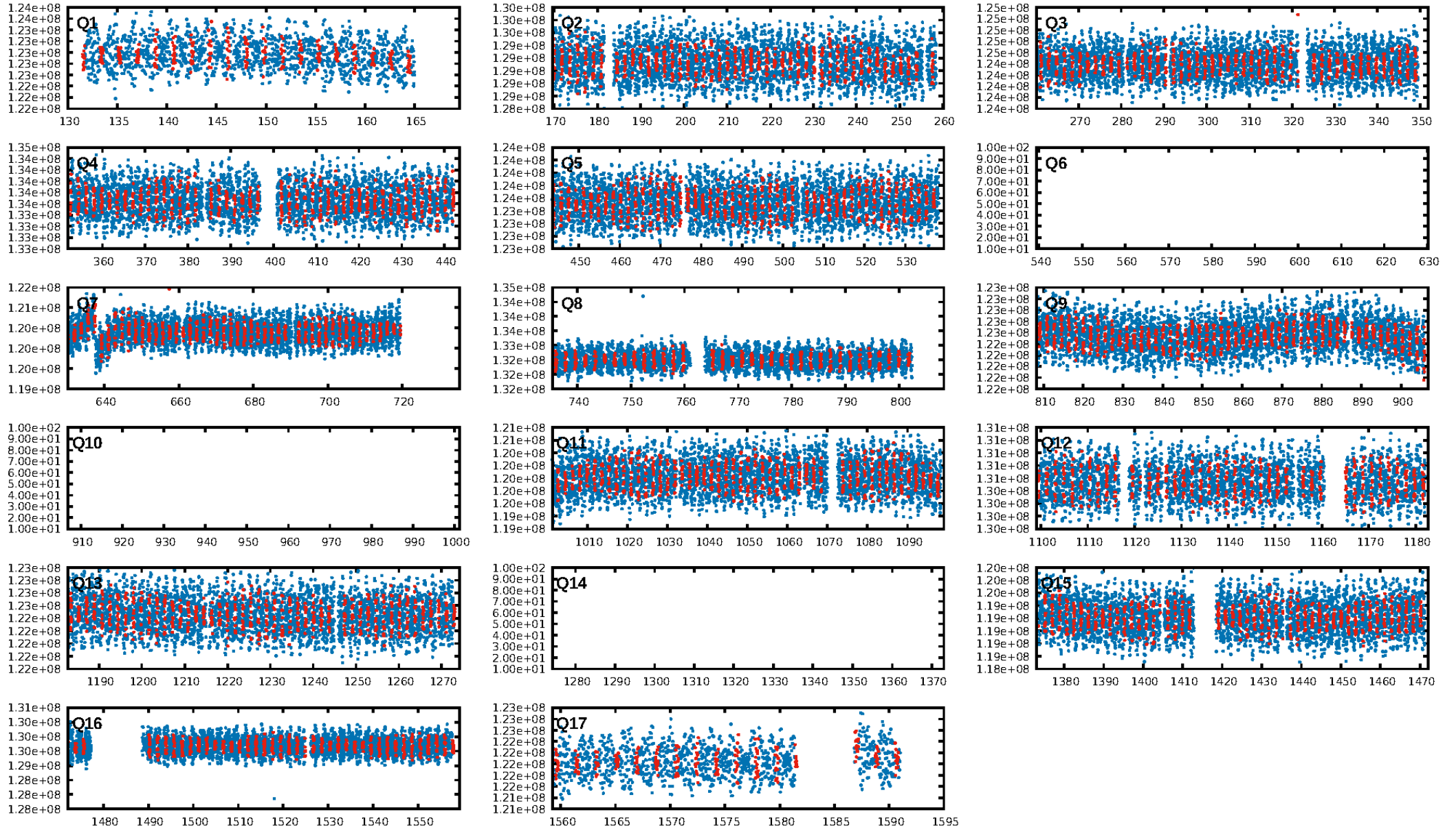
## DV Diagnostic Results:

ShortPeriod-sig: 0.0% [0.00 $\sigma$ ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: 2.94e-48  
RollingBand-fgt: 0.90 [500/558]  
GhostDiagnostic-chr: 1.904  
Centroid-sig: 22.3%  
Centroid-so: 0.404 arcsec [0.73 $\sigma$ ]  
OotOffset-rm: 0.174 arcsec [0.61 $\sigma$ ]  
KicOffset-rm: 0.117 arcsec [0.40 $\sigma$ ]  
OotOffset-st: 1/4/4/4 [13]  
KicOffset-st: 1/4/4/4 [13]  
DiffImageQuality-fgm: 0.92 [12/13]  
DiffImageOverlap-fno: 1.00 [14/14]

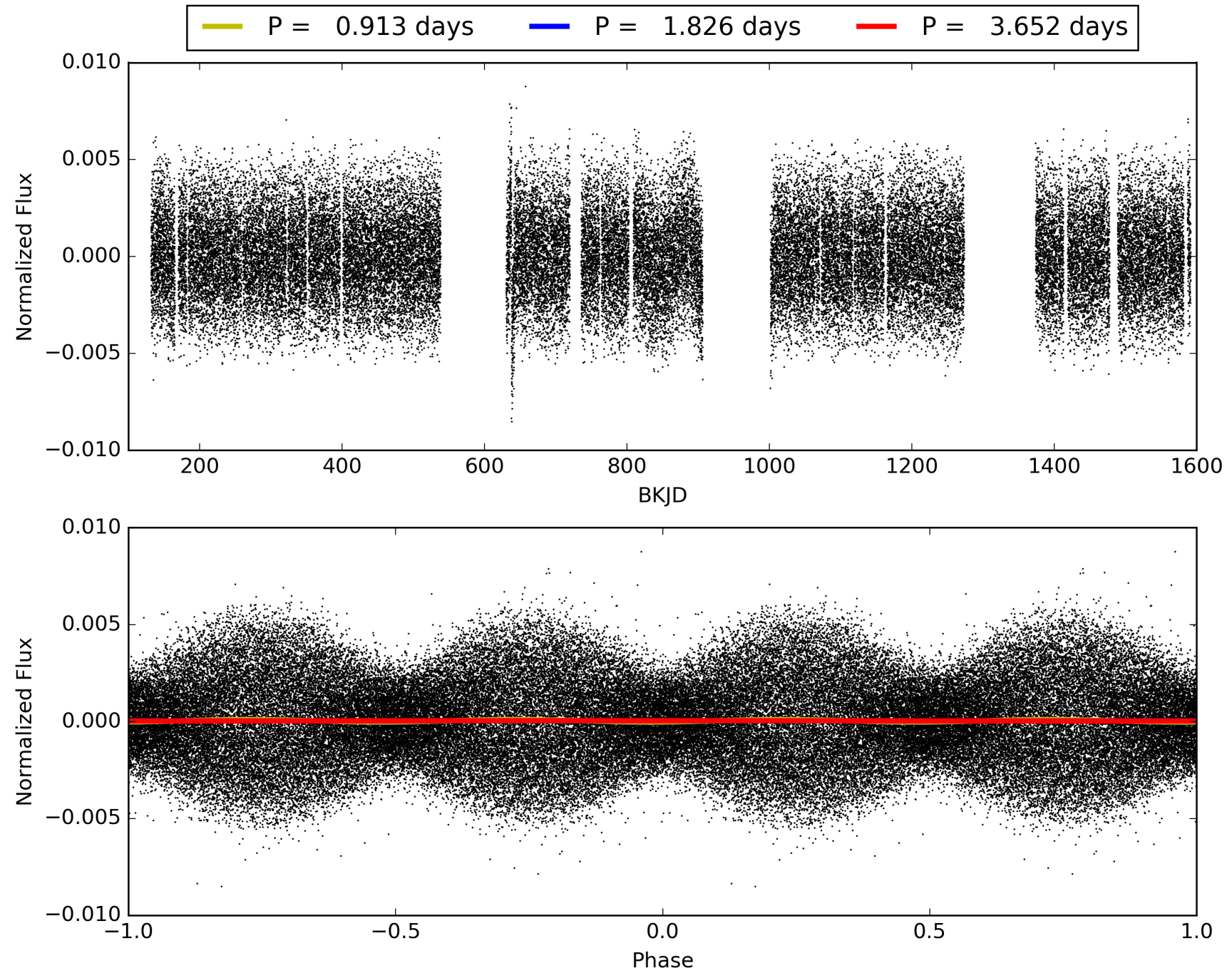
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 30-Jan-2016 06:12:02 Z

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

# TCE 004180375-02, PDC Light Curves

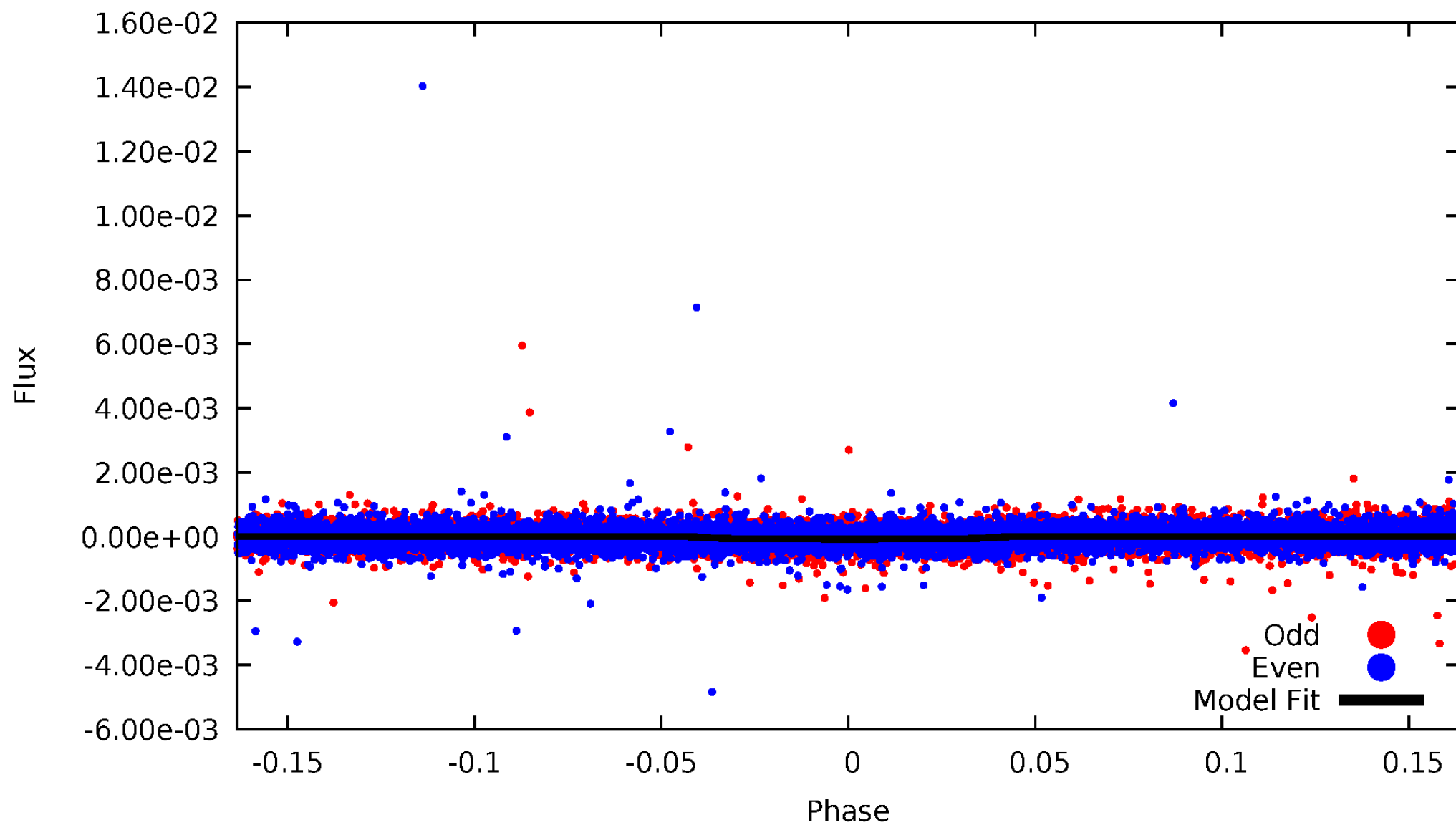


TCE 004180375-02



# DV Odd/Even

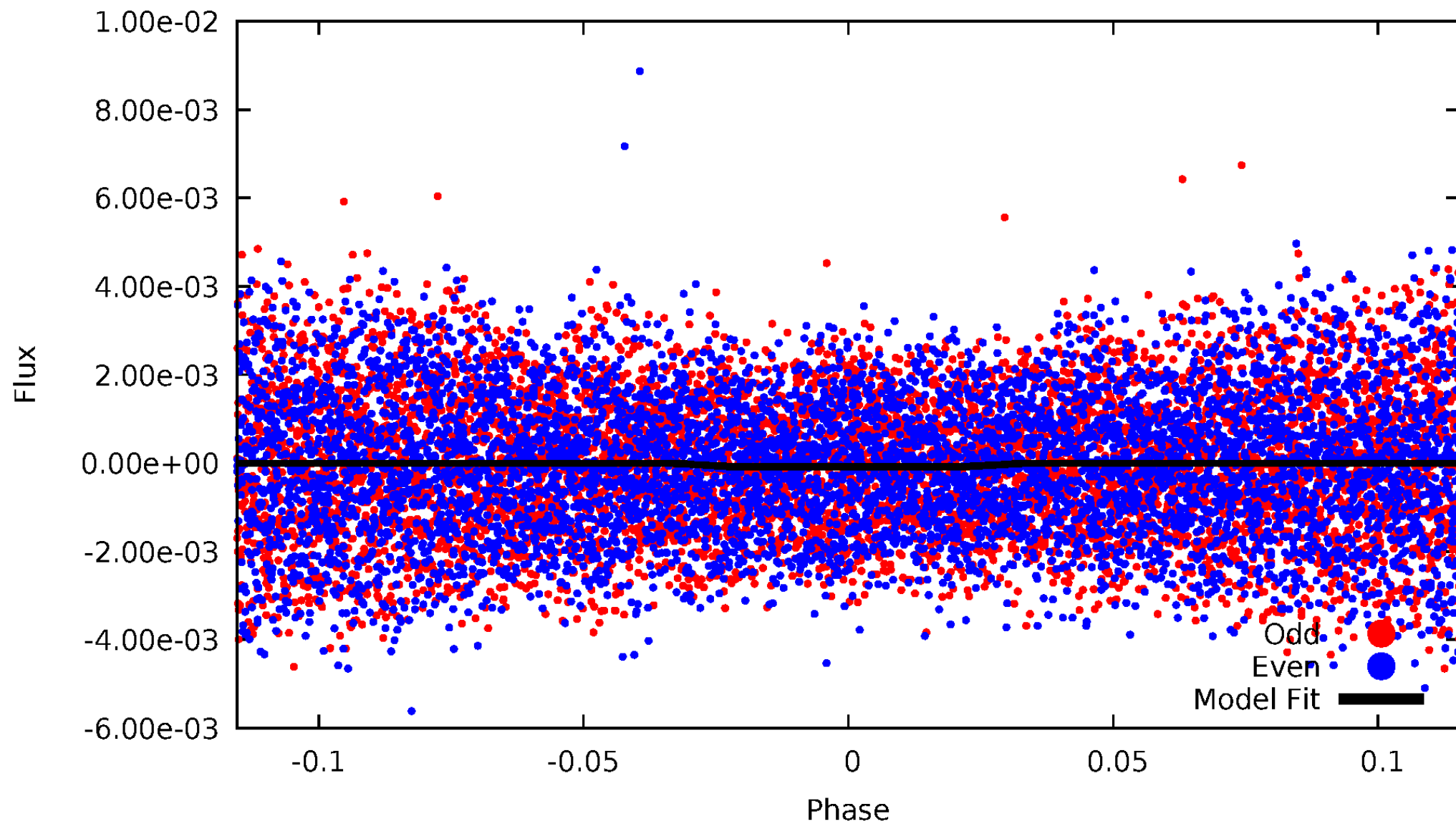
TCE 004180375-02





# ALT Odd/Even

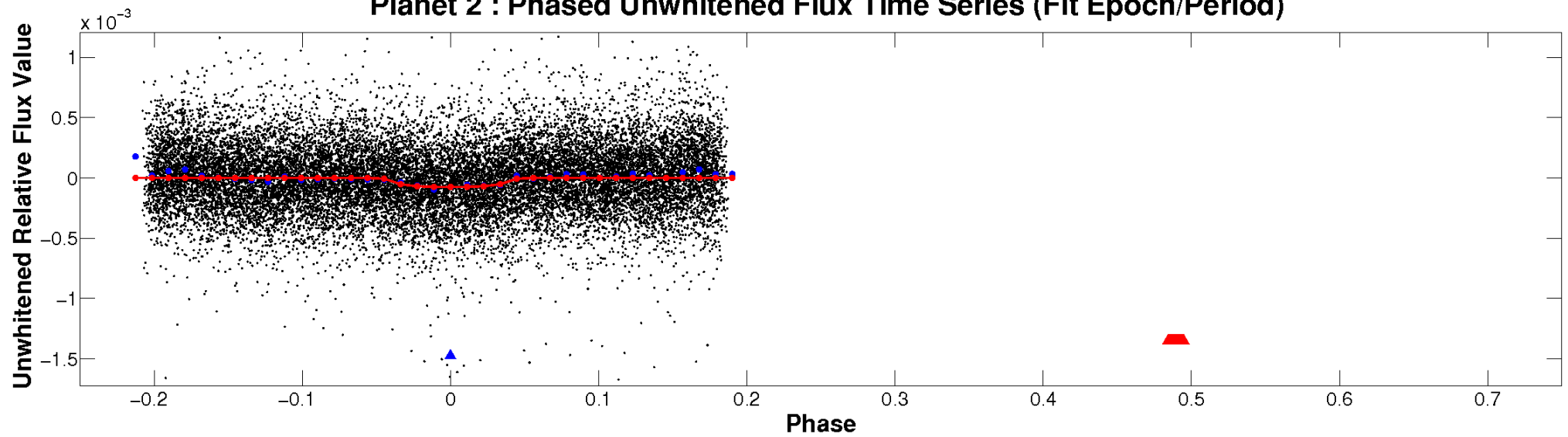
TCE 004180375-02



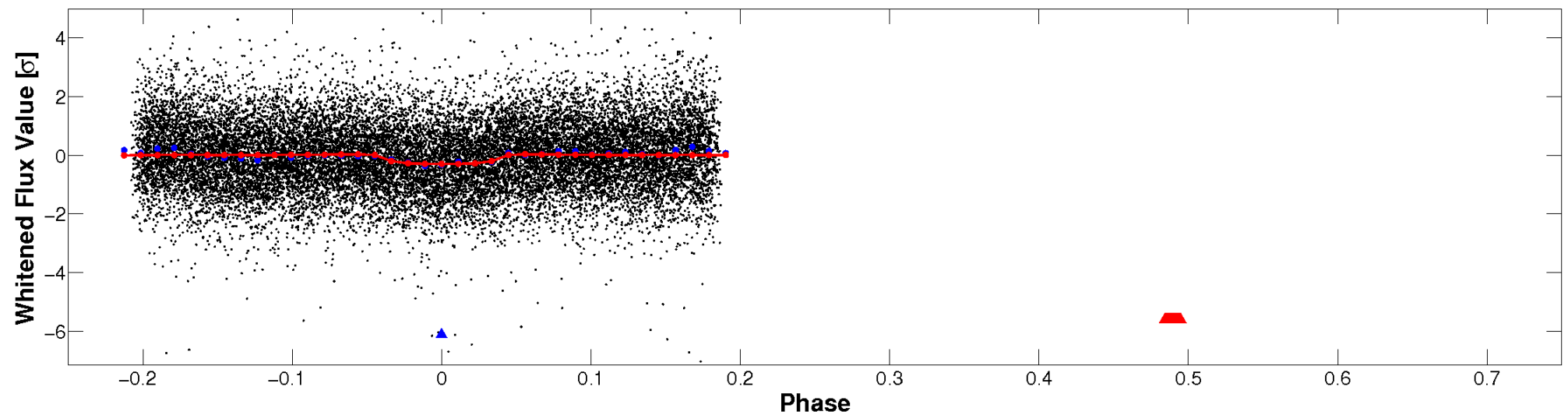


# Non-Whitened Vs. Whitened Light Curve

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

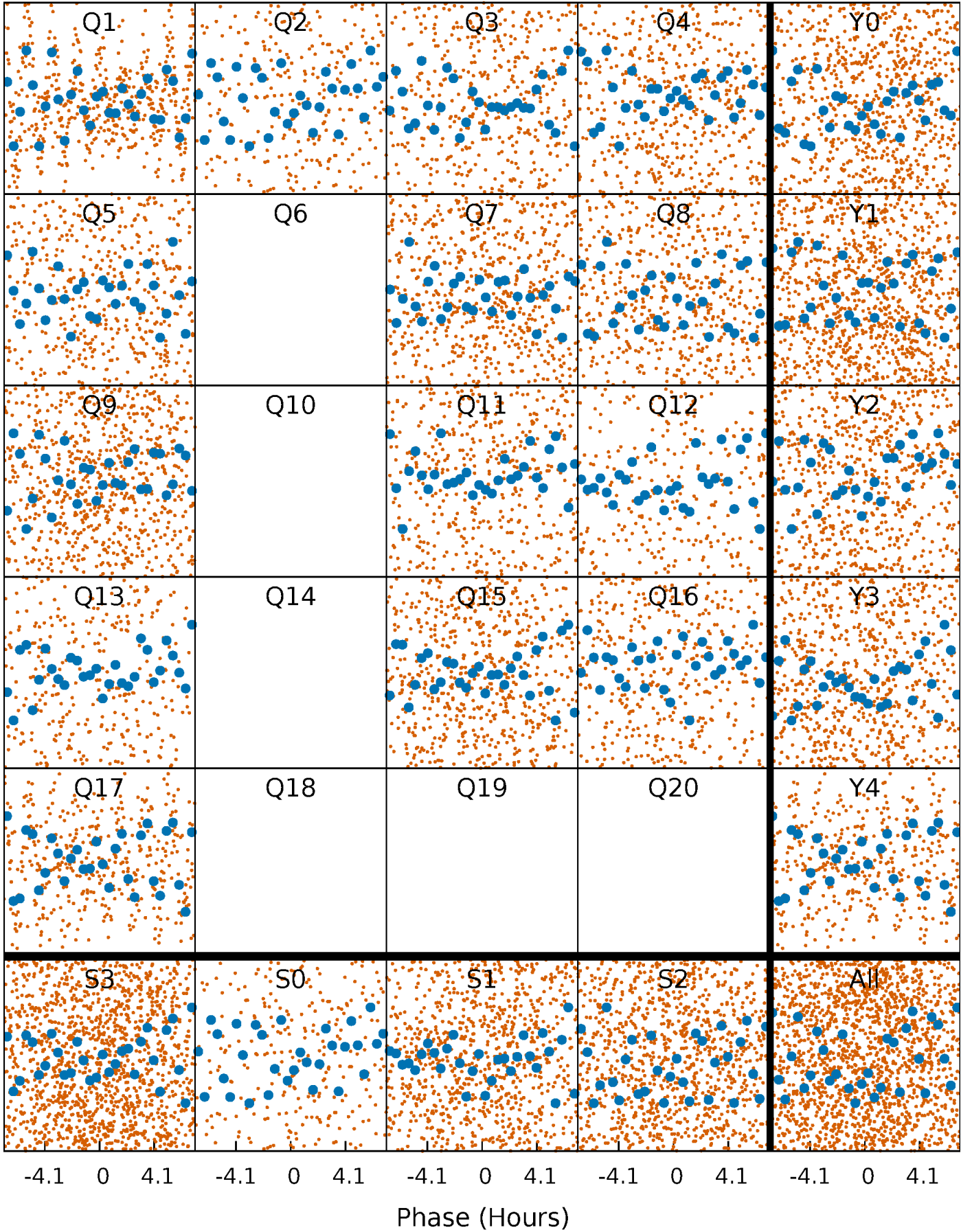


## Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



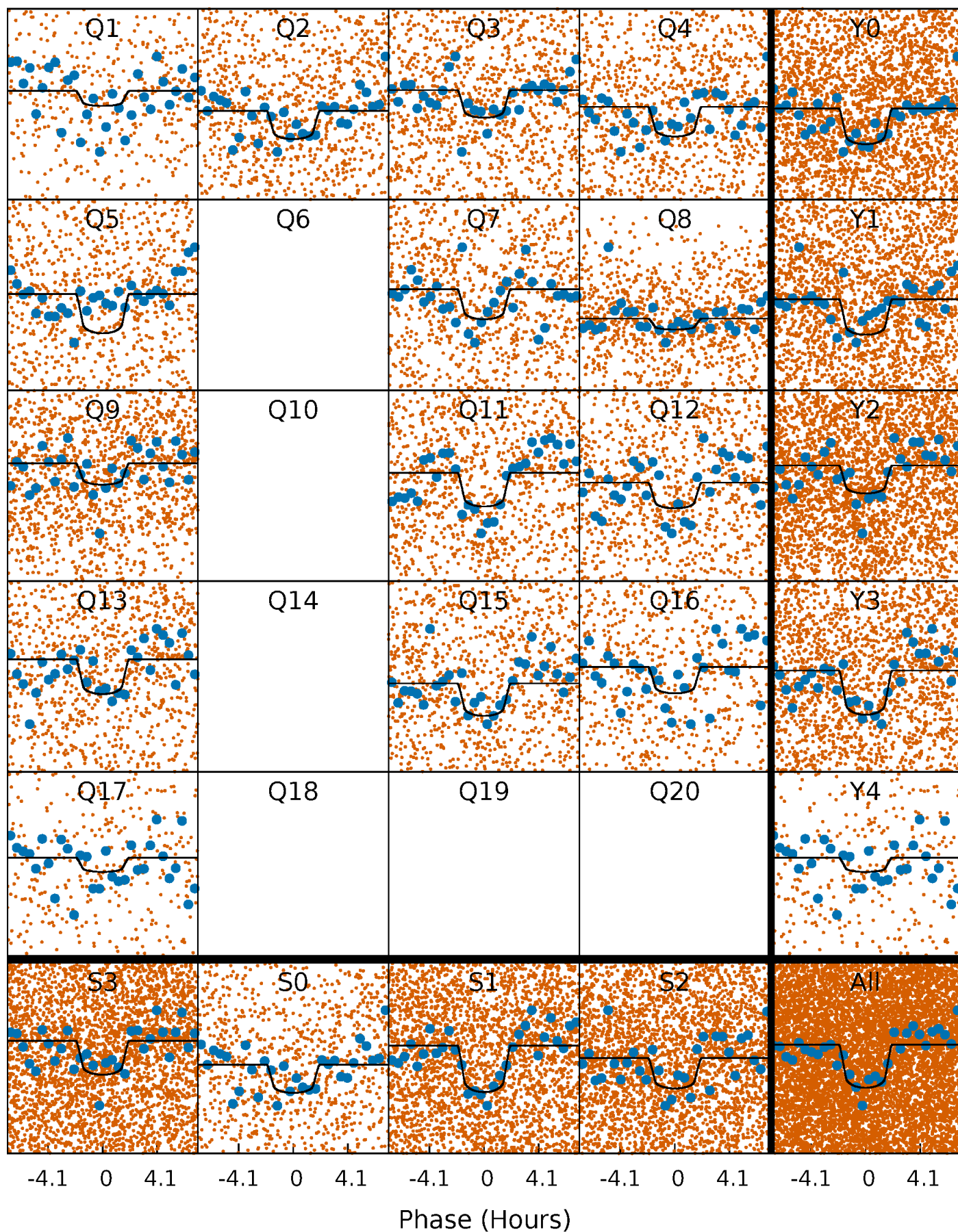
# PDC Quarter-Phased Transit Curves

TCE 004180375-02   P= 1.826193 Days    $T_0=131.563620$  (BKJD)



# DV Quarter-Phased Transit Curves

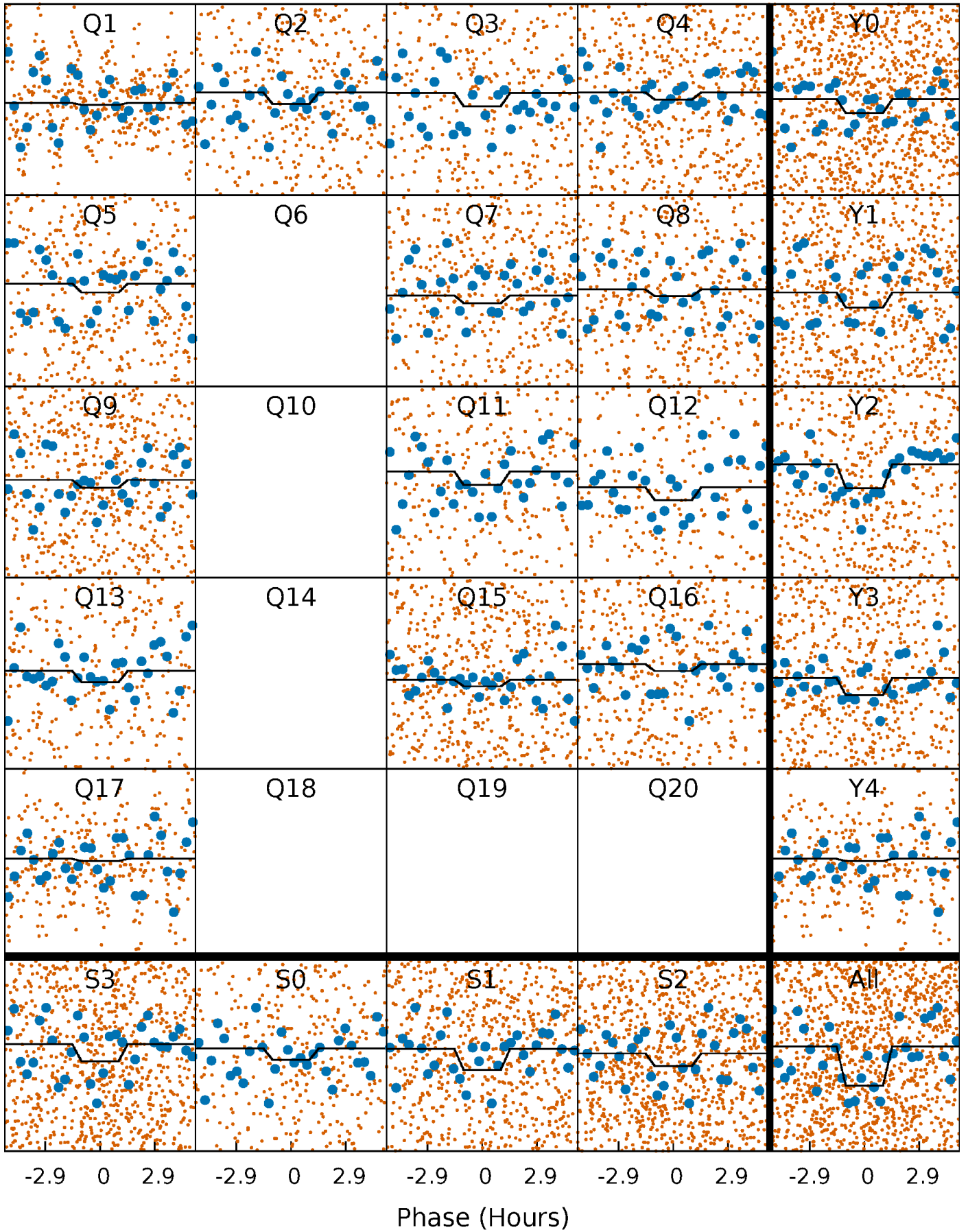
TCE 004180375-02 P= 1.826193 Days  $T_0=131.563620$  (BKJD)





# Alt. Detrend Quarter-Phased Transit Curves

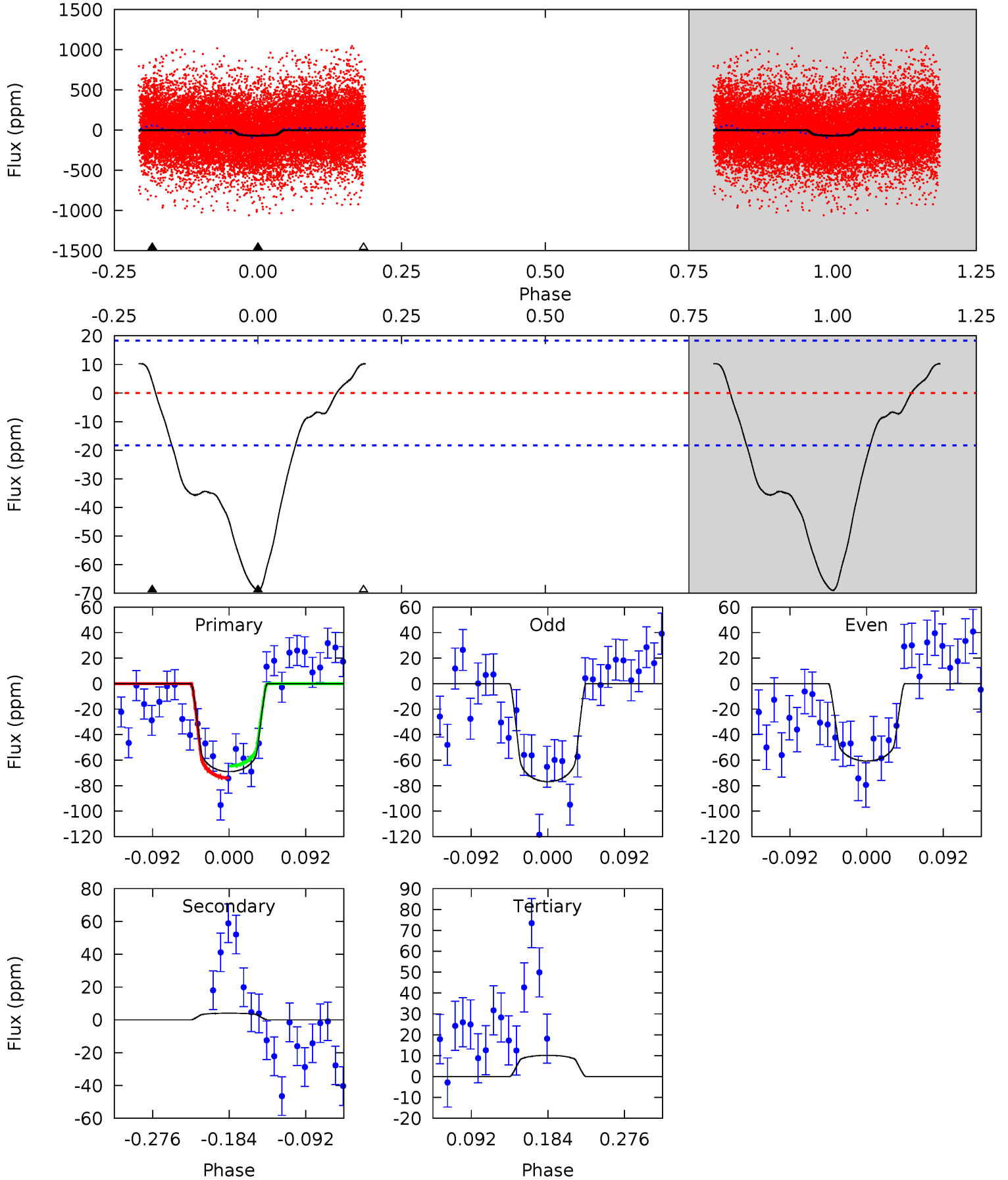
TCE 004180375-02   P= 1.826235 Days    $T_0=131.549380$  (BKJD)



# DV Model-Shift Uniqueness Test

004180375-02, P = 1.826193 Days, E = 129.737427 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
17.3	-1.02	-2.54	0	4.58	1.69	1.54	19.8	17.3	1.53	-1.02	2.04	1.06	0.13	1.19

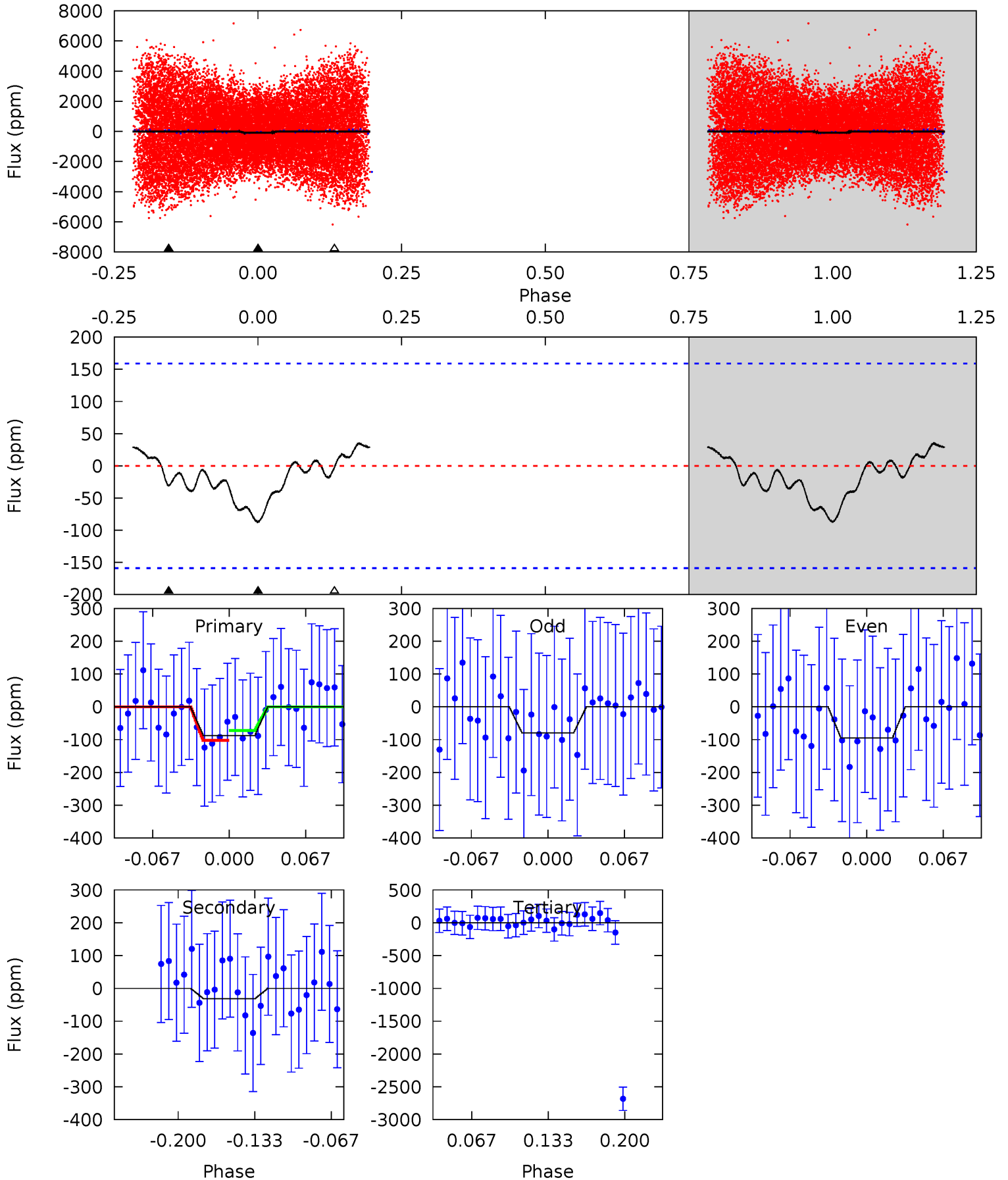




# Alt Model-Shift Uniqueness Test

004180375-02, P = 1.826235 Days, E = 129.723145 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
2.55	0.92	0.08	0	4.65	1.83	0.54	2.48	2.55	0.84	0.92	0.22	1.08	0.29	0.53



### Stellar Parameters For KIC 004180375

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$7044^{+195}_{-293}$	$4.212^{+0.087}_{-0.203}$	$0.100^{+0.200}_{-0.350}$	$1.584^{+0.556}_{-0.238}$	$1.491^{+0.214}_{-0.214}$	$0.528^{+0.215}_{-0.291}$
	+3%/-4%	+2%/-5%	+200%/-350%	+35%/-15%	+14%/-14%	+41%/-55%
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 004180375-02 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$4 \pm 4$	$1.66^{+0.55}_{-0.51}$	$3023^{+234}_{-166}$	$-3814^{+716}_{-619}$	$-0.806^{+0.781}_{-1.495}$
Alt.	$-32 \pm 34$	$1.60^{+0.60}_{-0.50}$	$3025^{+225}_{-180}$	$5370^{+1732}_{-9023}$	$6.733^{+14.377}_{-7.154}$

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

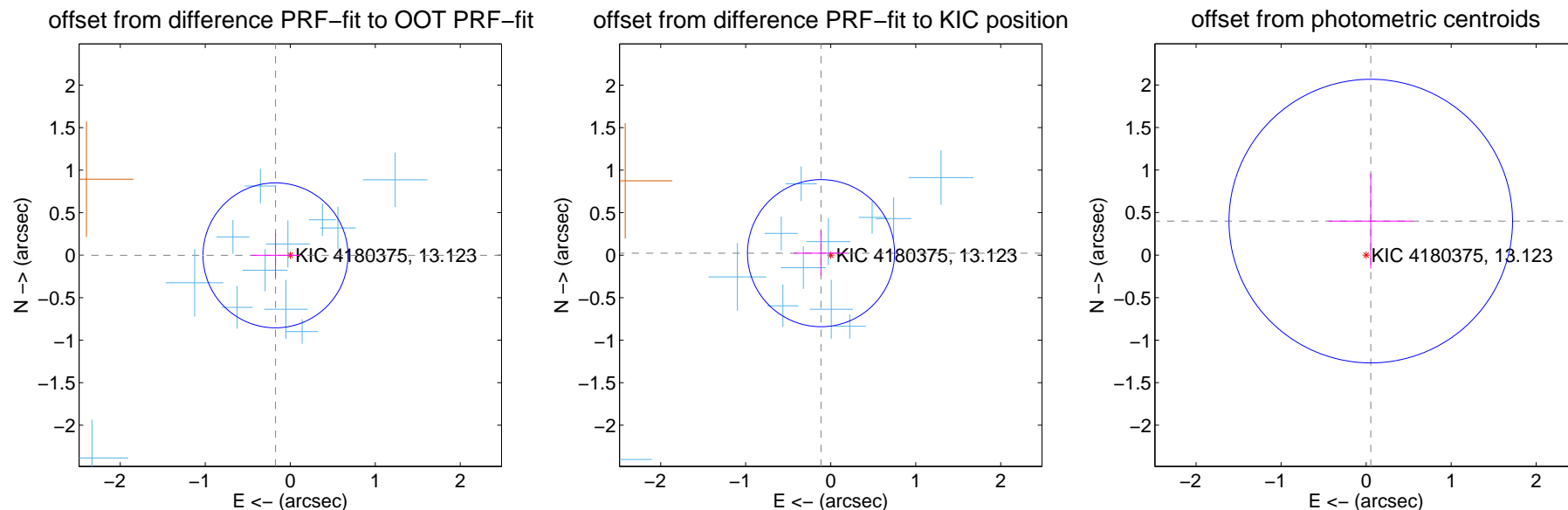
## DV Centroid Data

Supplemental centroid analysis for 004180375-02. Kepler magnitude: 13.12. Transit SNR 16.45

There are 12 quarters with good PRF difference image offsets

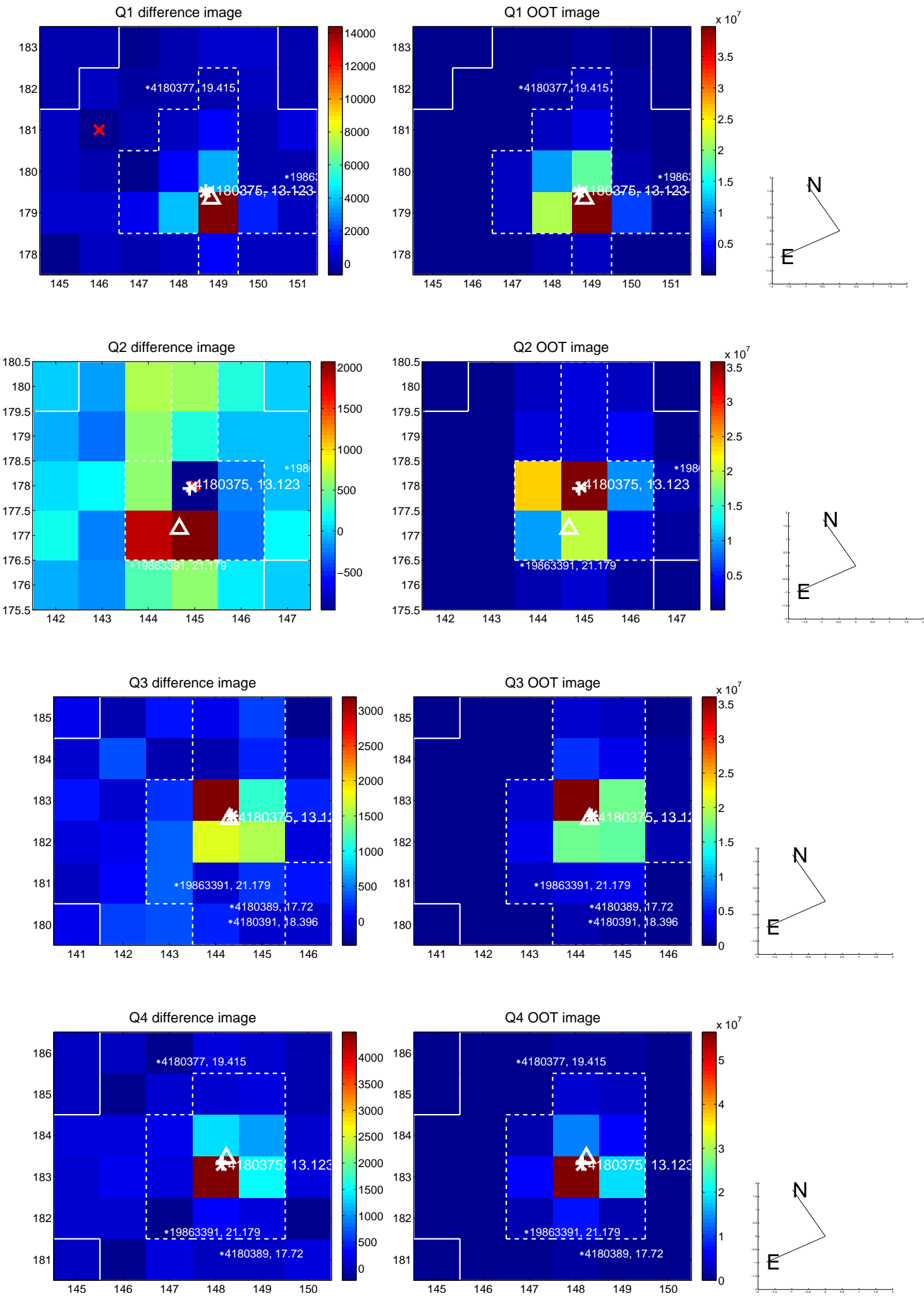
The direct PRF centroid is offset from the target star catalog position by about 0.07 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.174 \pm 0.284$	0.61	$0.174 \pm 0.283$	$-0.002 \pm 0.256$
PRF-fit source offset from KIC position	$0.117 \pm 0.288$	0.40	$0.114 \pm 0.318$	$0.023 \pm 0.266$
photometric centroid source offset	$0.40 \pm 0.56$	0.73	$-0.05 \pm 0.50$	$0.40 \pm 0.56$

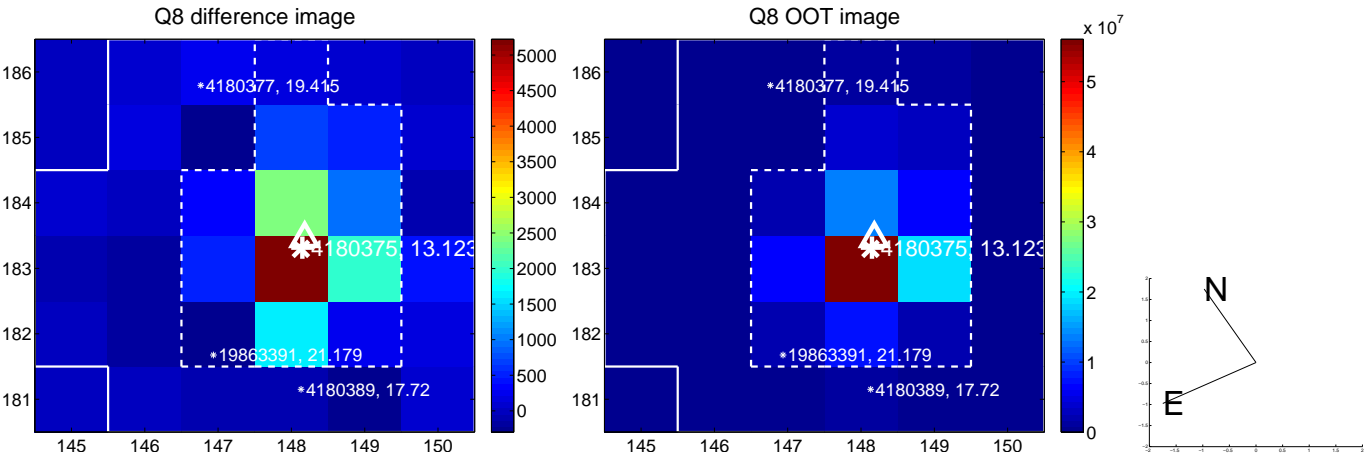
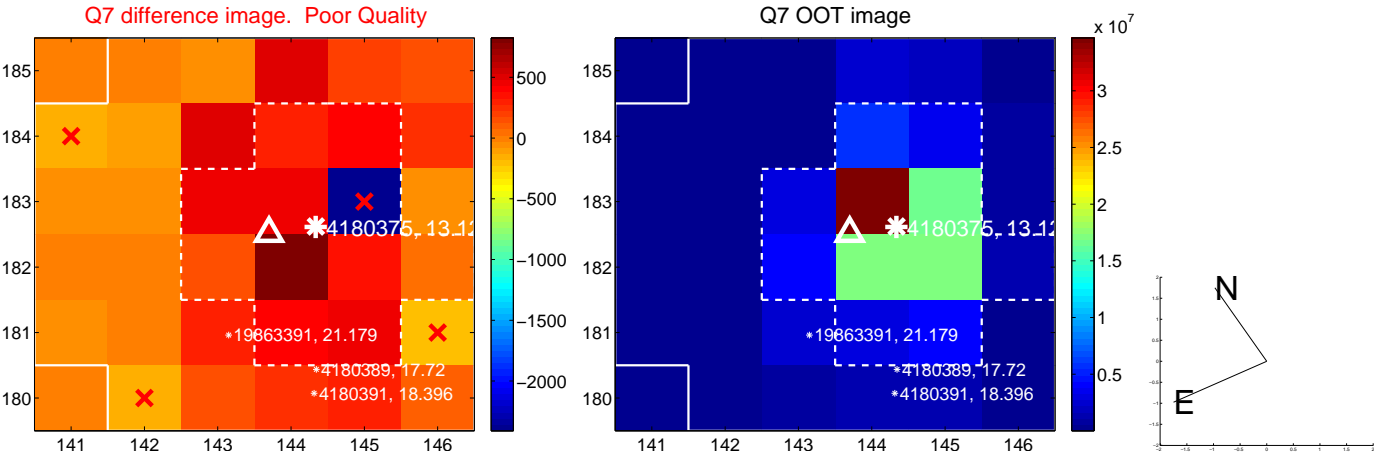
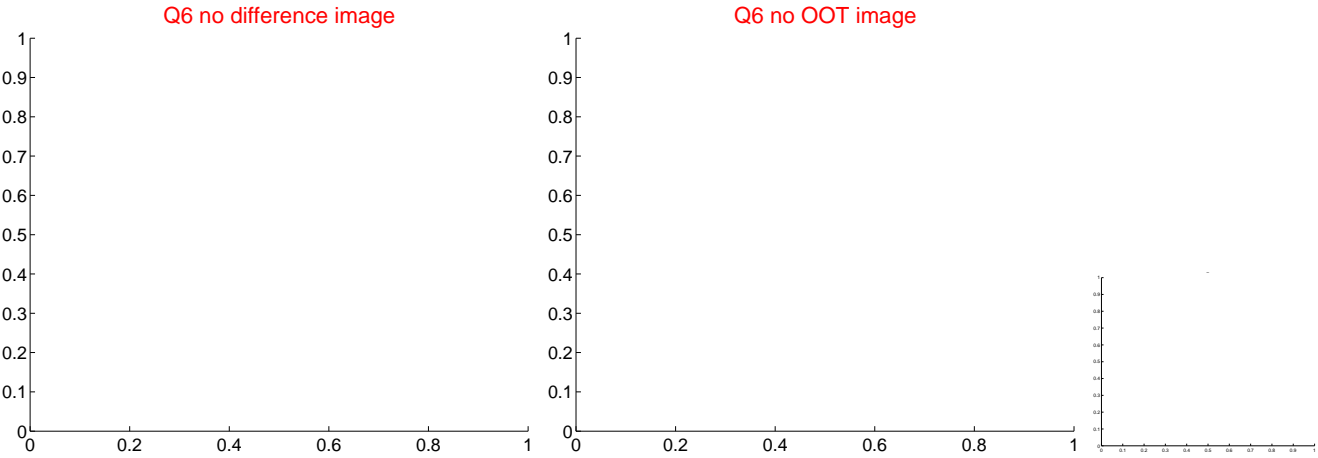
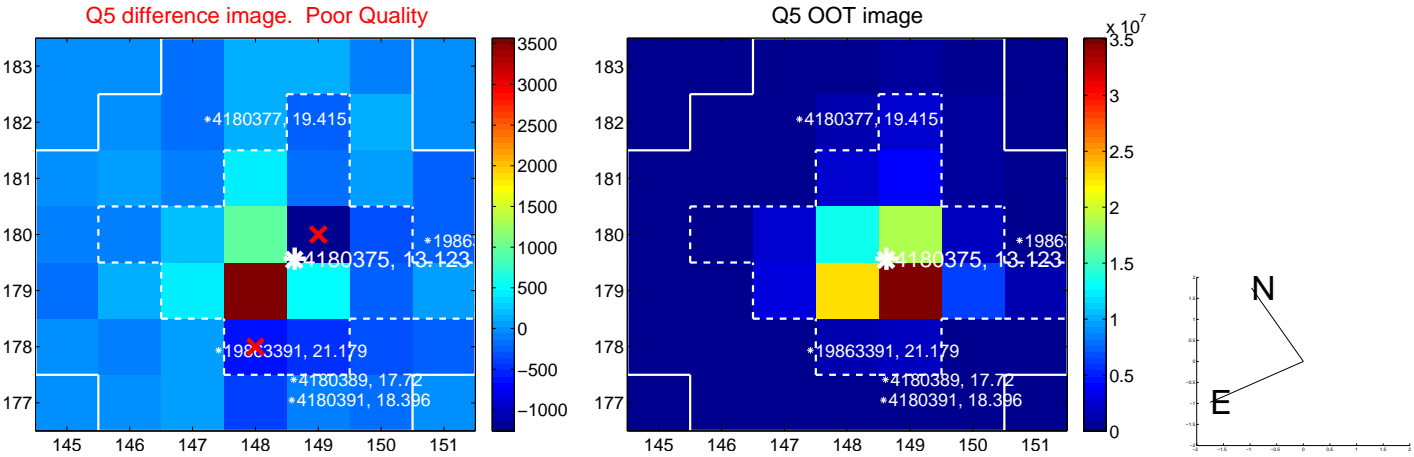


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses:** good quarterly centroid offsets; **Vermillion crosses:** bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

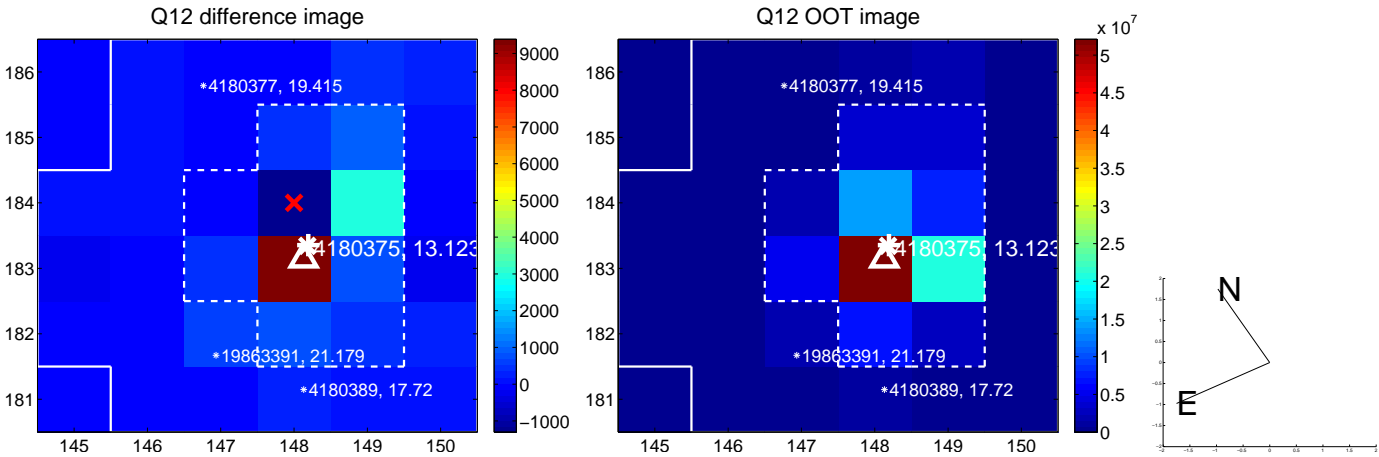
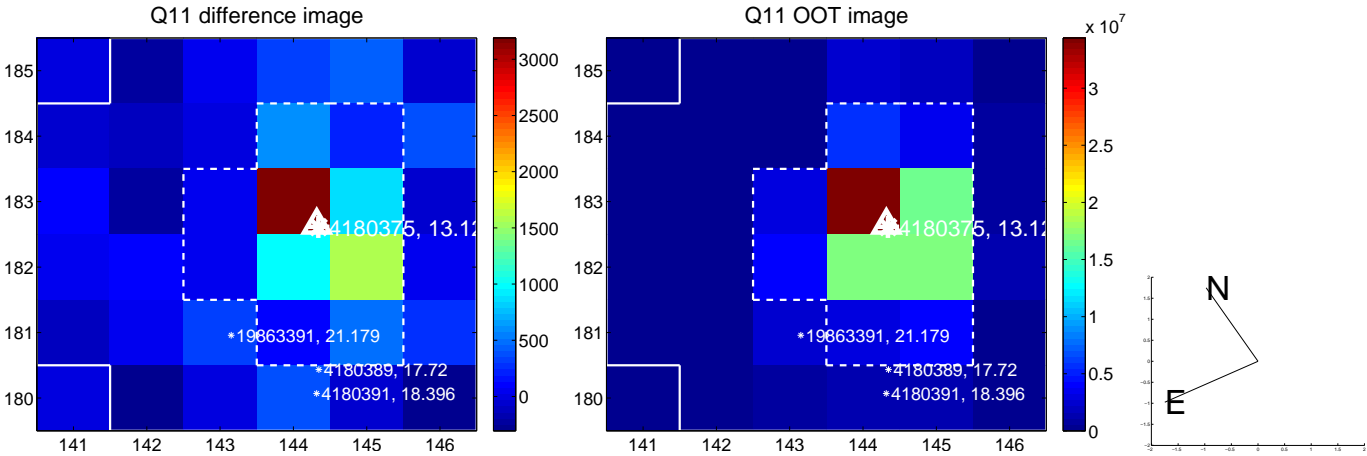
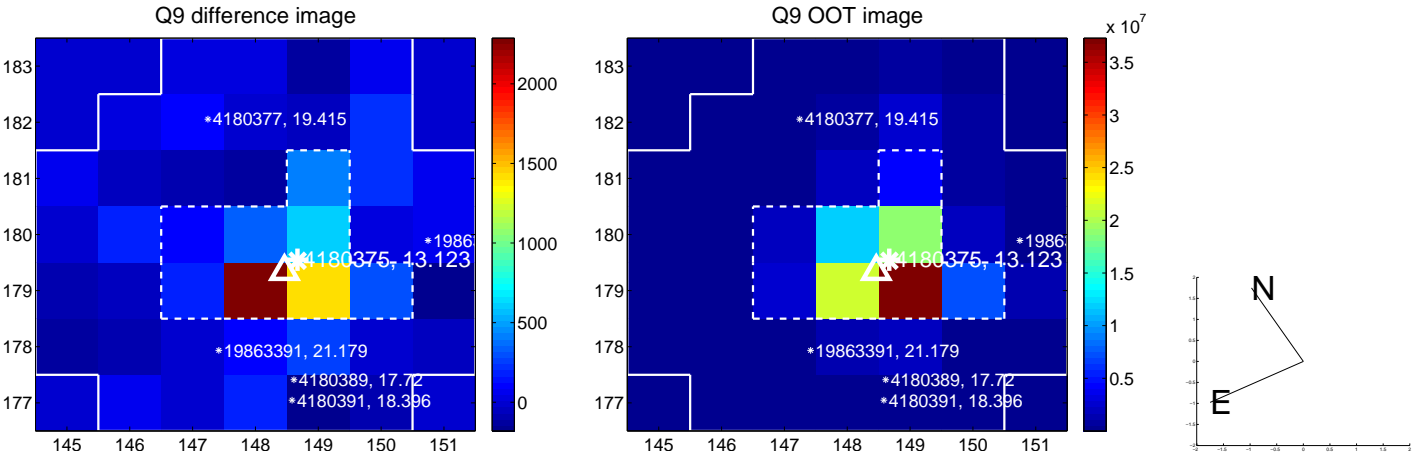


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

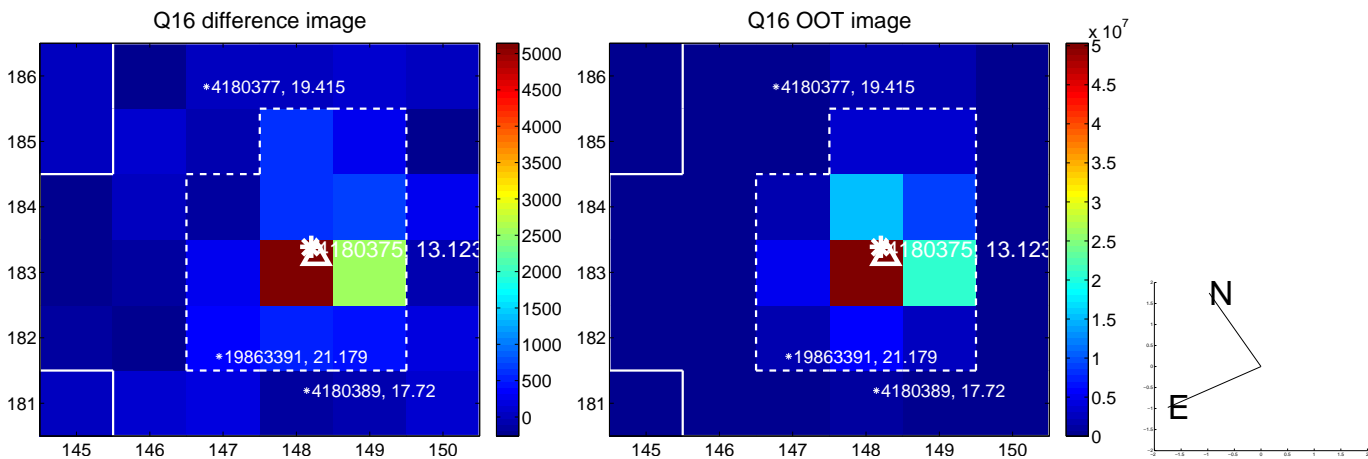
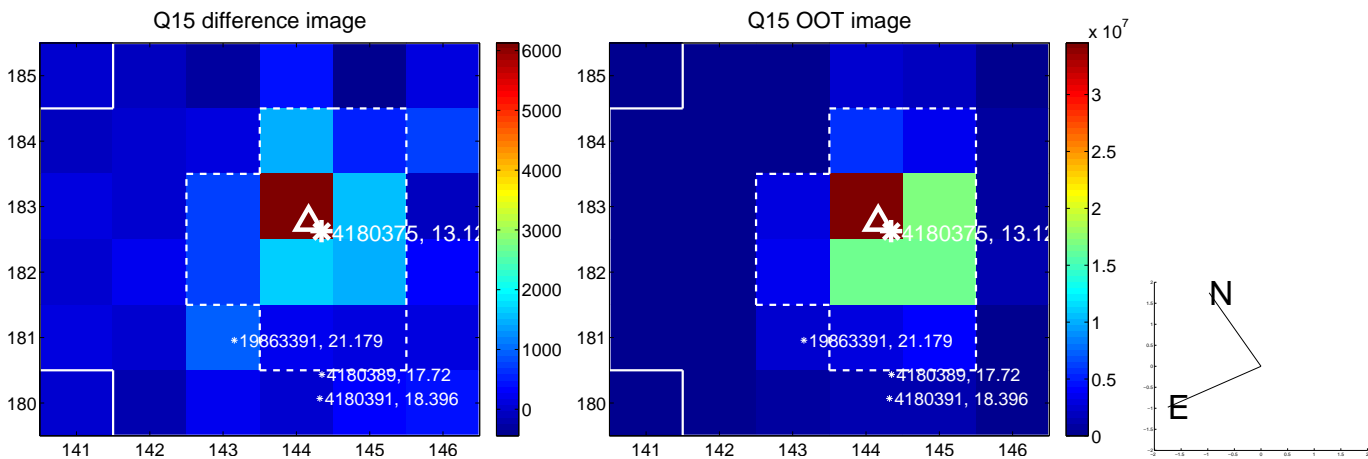
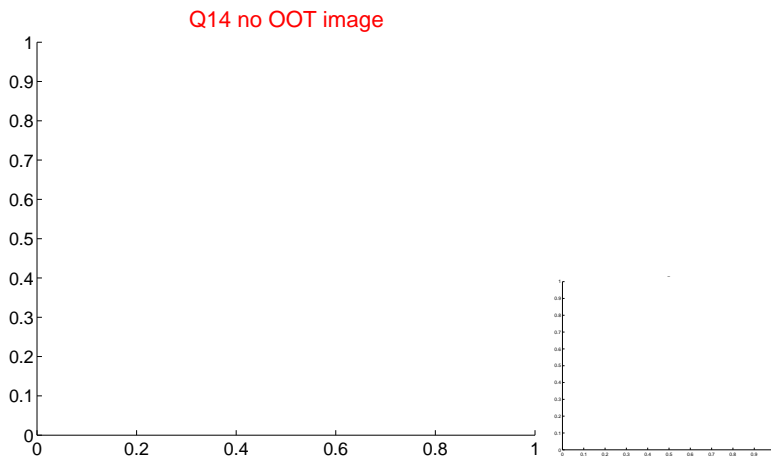
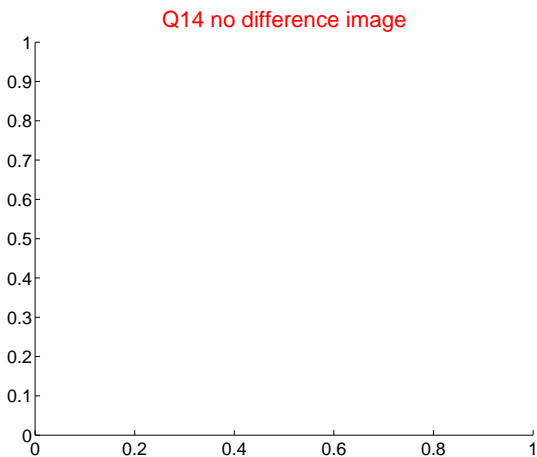
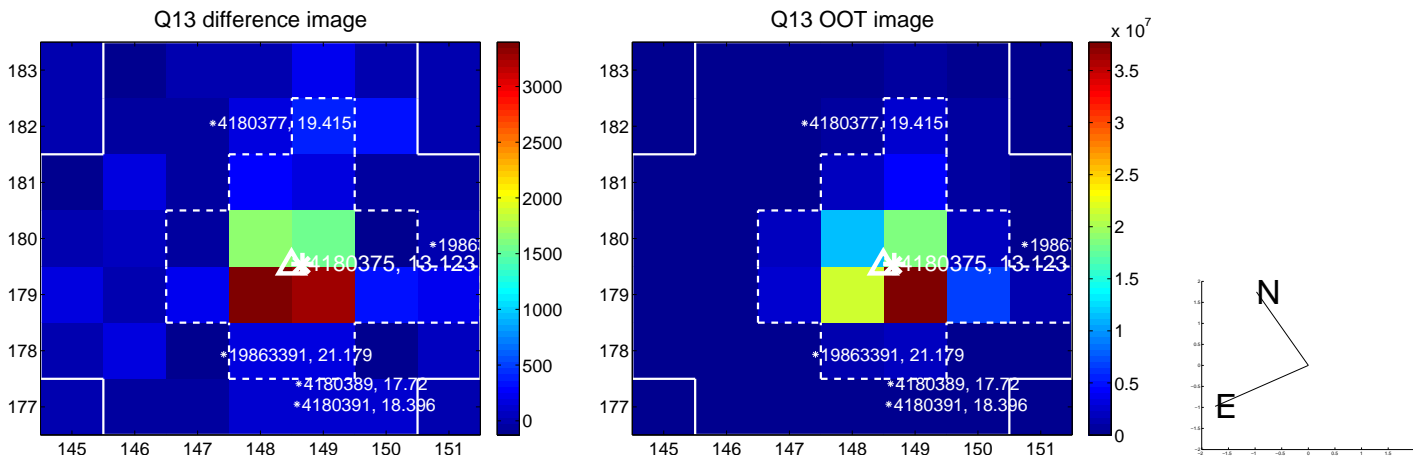




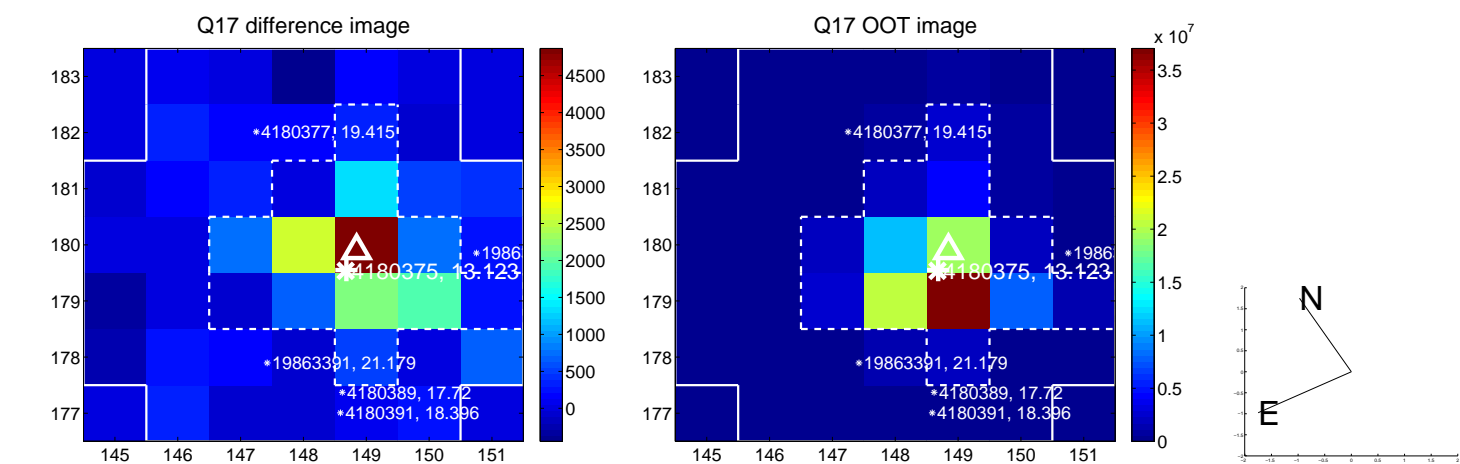
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



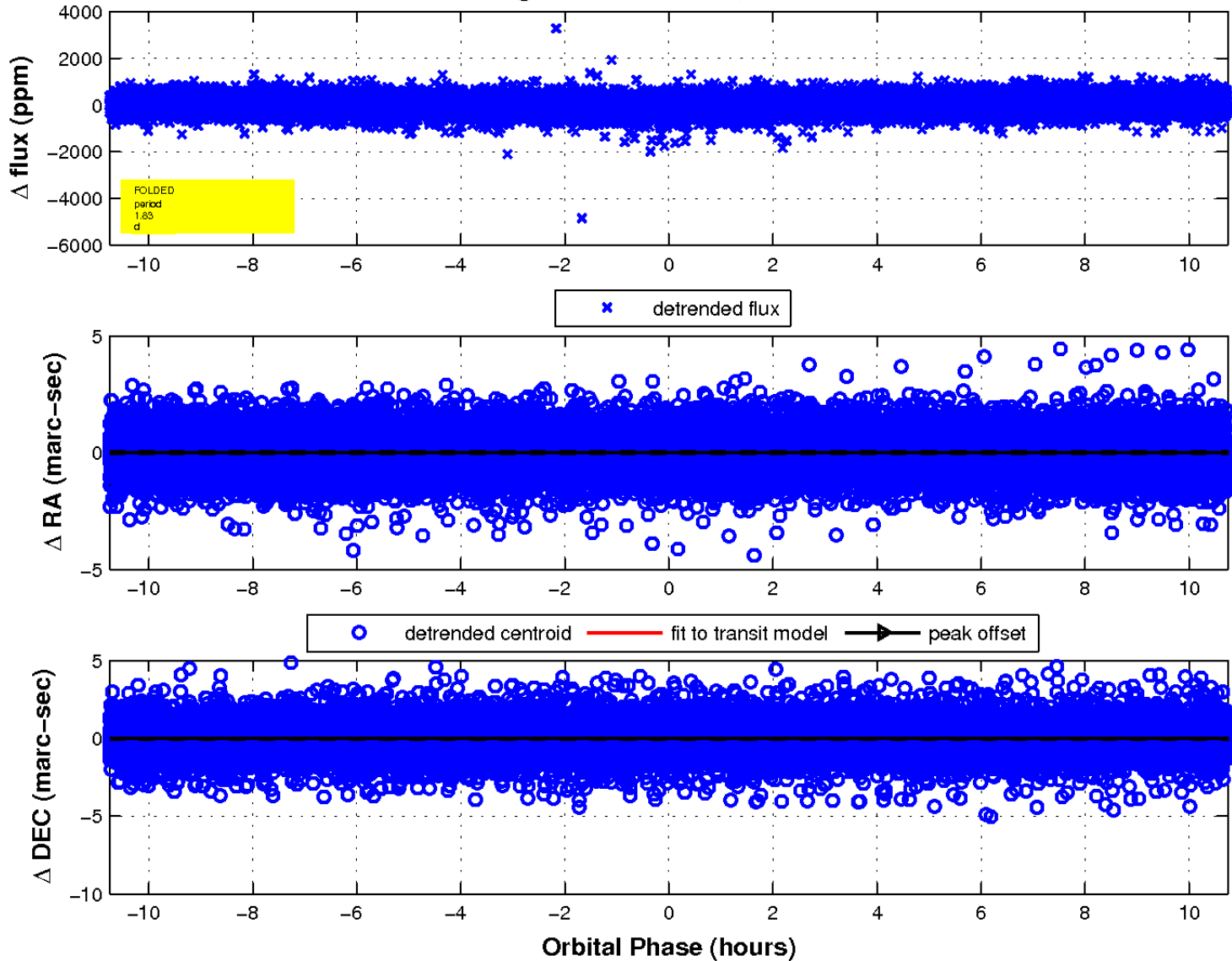
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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



### fluxWeightedCentroids, Planet 2 of 2



UKIRT Image

