

# KIC 003228918

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
003228918-01	OBS	No	1.461847	132.241974	247.3	2.572	9.8	14.4	0.90	5853	1.72	1335.84
003228918-02	OBS	No	0.730952	132.214119	2637.7	1.500	15.4	-1.0	0.90	5853	4.59	3365.93

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
003228918-01	OBS	FP	0.00	1	0	1	1	LPP_DV—LPP_ALT—MOD_NONUNIQ_ALT—CENT_RESOLVED_OFFSET—EPHEM_MATCH
003228918-02	OBS	FP	0.00	1	0	0	1	TRANS_GAPPED—LPP_ALT—MOD_NONUNIQ_ALT—SAME_NTL_PERIOD—CENT_NOFITS—EPHEM_MATCH

**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.

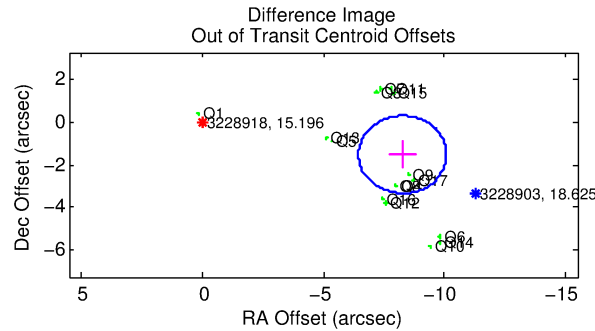
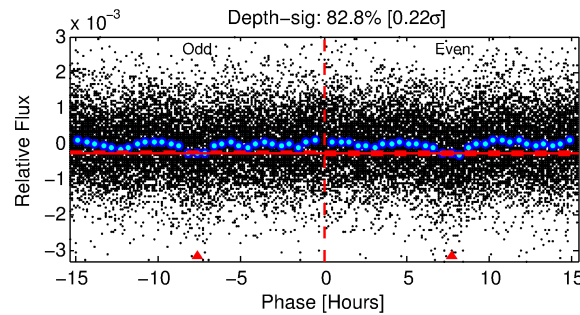
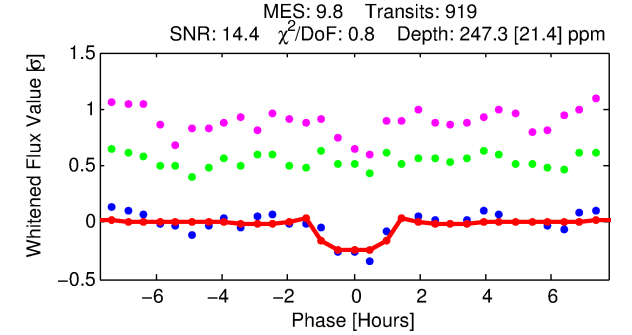
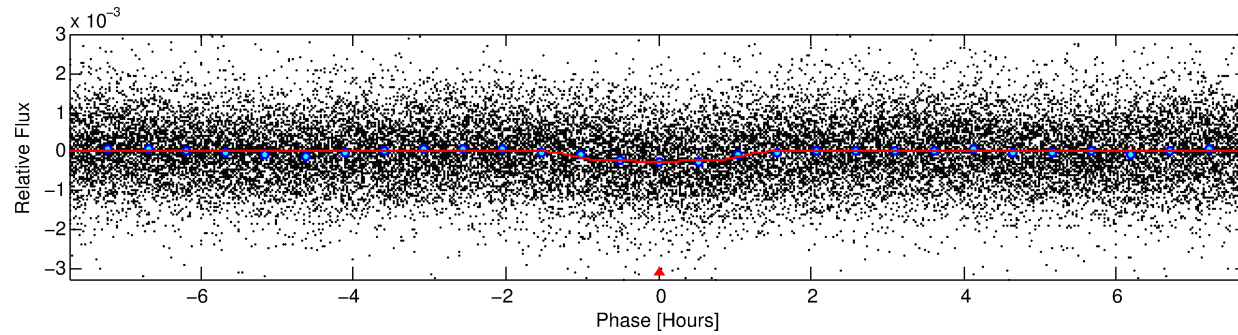
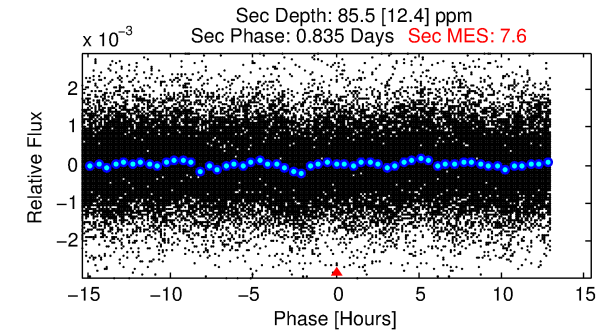
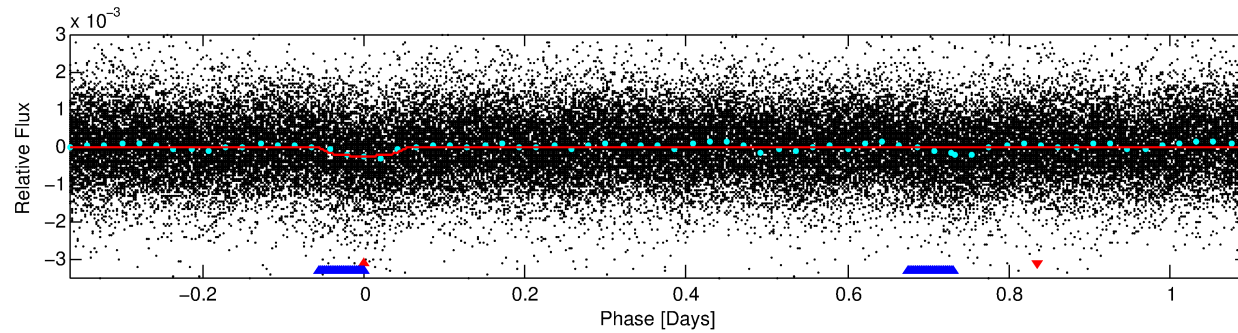
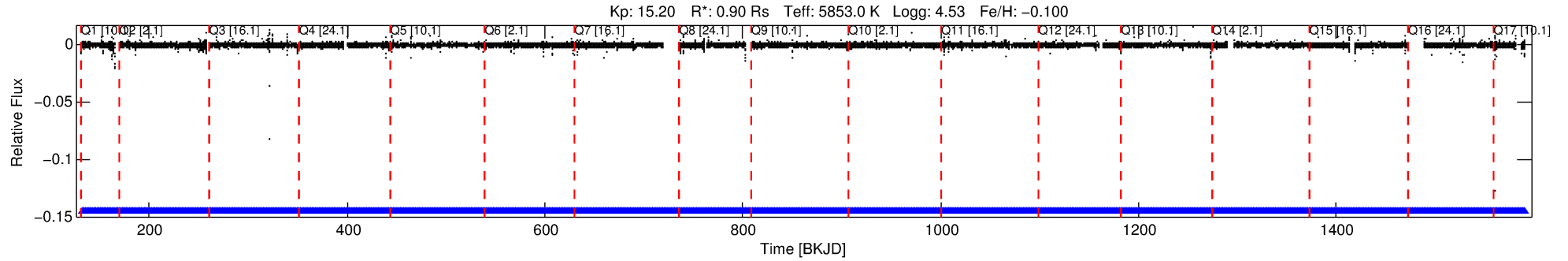
## Ephemeris Match Information For 003228918-01

TCE (1)	KIC	Parent (2)	Parent KIC	$P_1:P_2$	Dist ( $''$ )	$\Delta$ Row	$\Delta$ Col	$m_2$	$m_1$	$D_2/D_1$	Mechanism	Flag	$\sigma_P$	$\sigma_T$
003228918-01	3228918	003228988-01	3228988	2:1	52.6	-6	-12	15.31	15.19	0.25	Direct-PRF	1	4.67	0.72

**Notes:**  $P_1:P_2$  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.  $m_2$  and  $m_1$  are the magnitudes of the parent and child.  $D_2/D_1$  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: 3228918 Candidate: 1 of 2 Period: 1.462 d



## DV Fit Results:

Period = 1.46185 [0.00001] d  
Epoch = 132.2420 [0.0019] BKJD  
Rp/R\* = 0.0176 [0.0031]  
a/R\* = 2.06 [1.34]  
b = 0.93 [0.13]  
Seff = 1335.84 [491.62]  
Teff = 1542 [142] K  
Rp = 1.72 [0.56] Re  
a = 0.0251 [0.0059] AU  
Ag = 10.04 [5.17] [1.75 $\sigma$ ]  
Teffp = 4242 [426] K [6.01 $\sigma$ ]

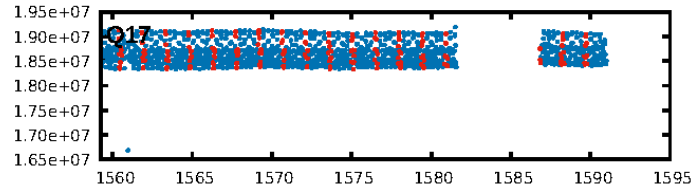
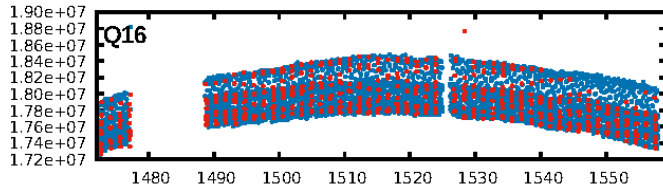
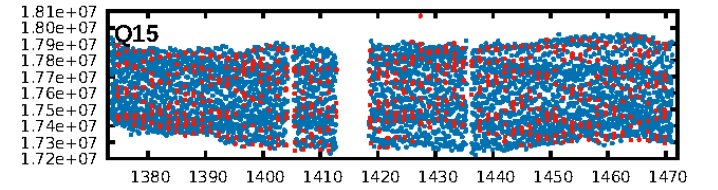
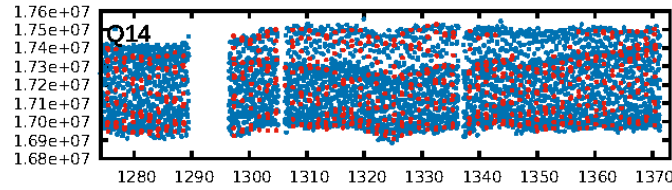
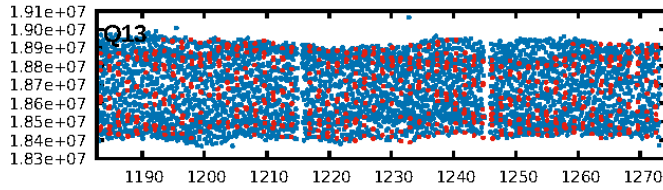
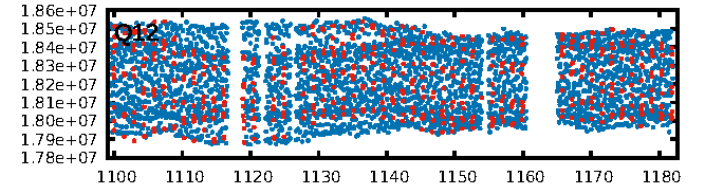
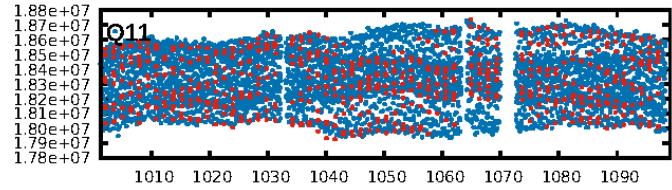
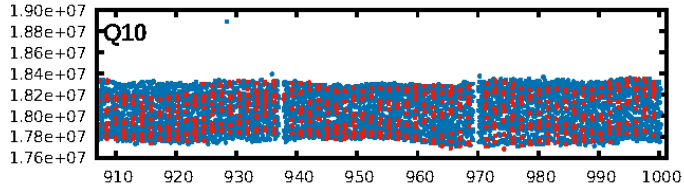
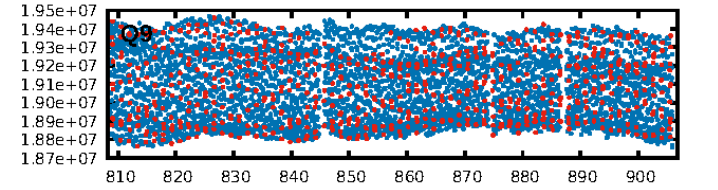
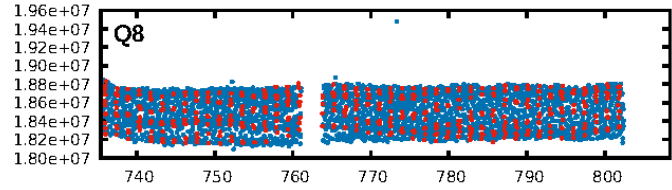
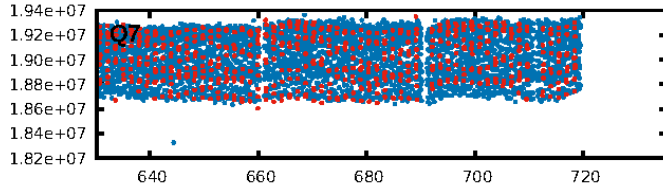
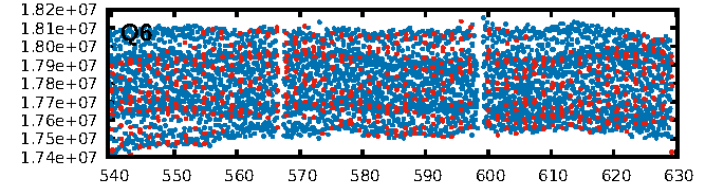
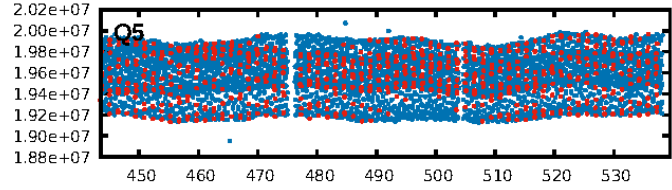
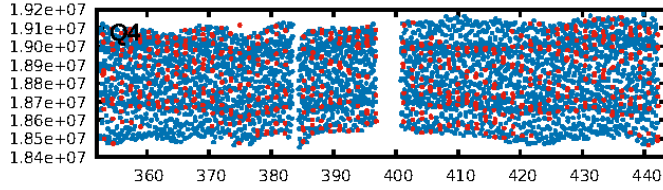
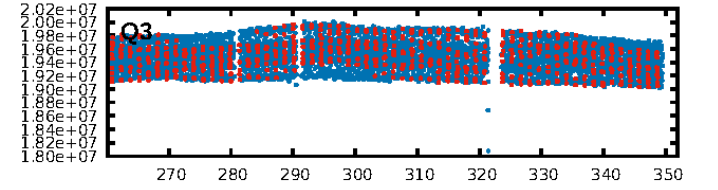
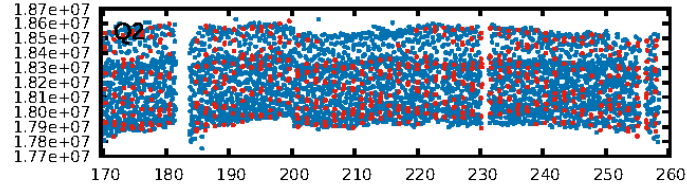
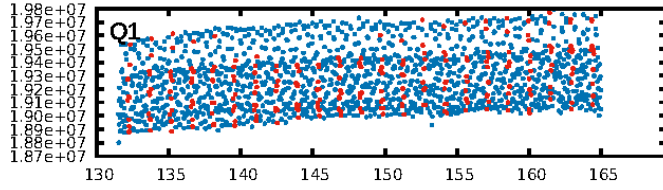
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [5.89 $\sigma$ ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: N/A  
RollingBand-fgt: 1.00 [878/878]  
GhostDiagnostic-chr: -1.831  
Centroid-sig: 0.0%  
Centroid-so: 3.417 arcsec [4.84 $\sigma$ ]  
OotOffset-rm: 8.409 arcsec [13.91 $\sigma$ ]  
KicOffset-rm: 8.383 arcsec [12.37 $\sigma$ ]  
OotOffset-st: 3/4/4/5 [16]  
KicOffset-st: 3/4/4/5 [16]  
DiffImageQuality-fgm: 0.06 [1/16]  
DiffImageOverlap-fno: 0.00 [0/17]

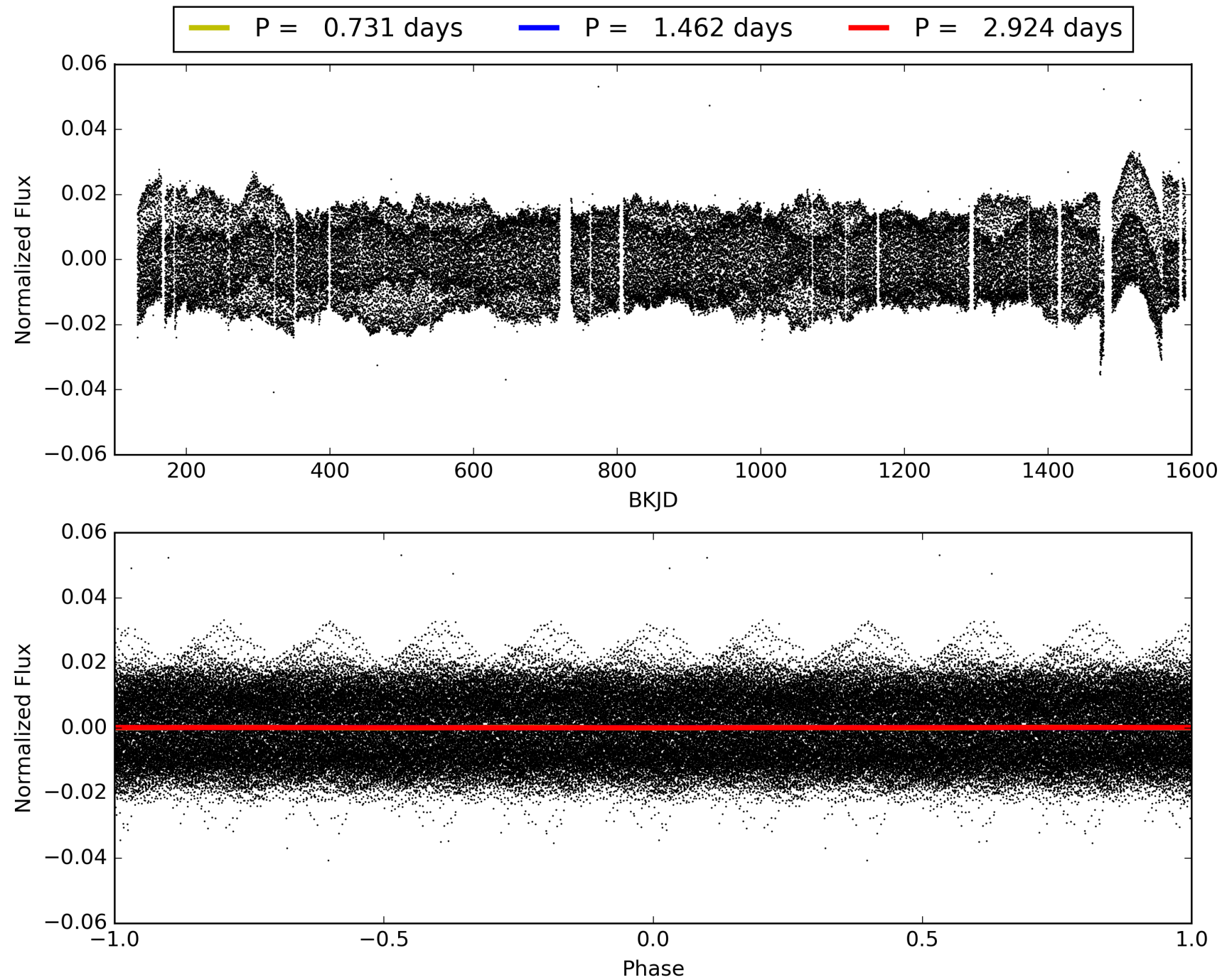
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This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

# TCE 003228918-01, PDC Light Curves



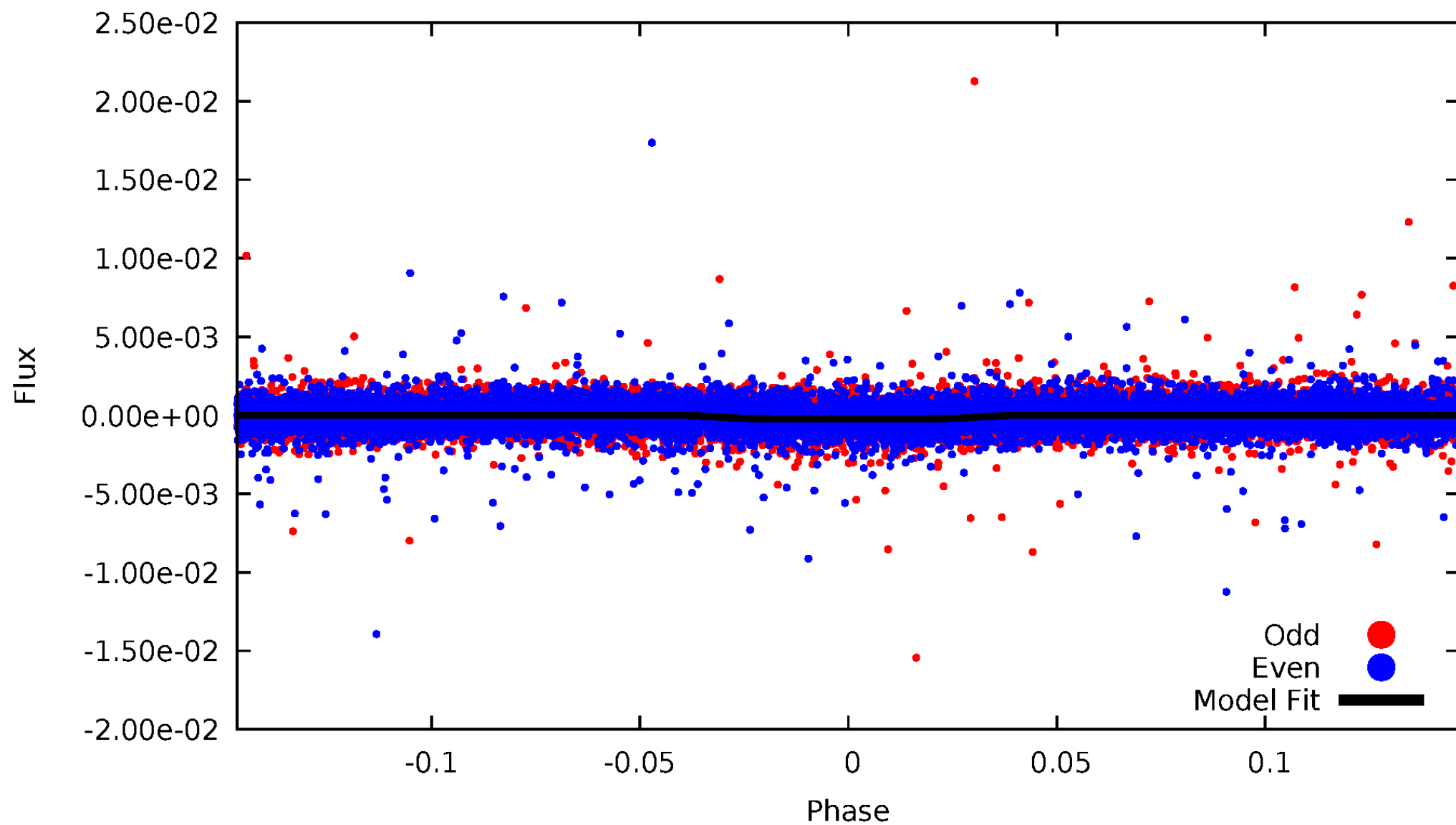
TCE 003228918-01





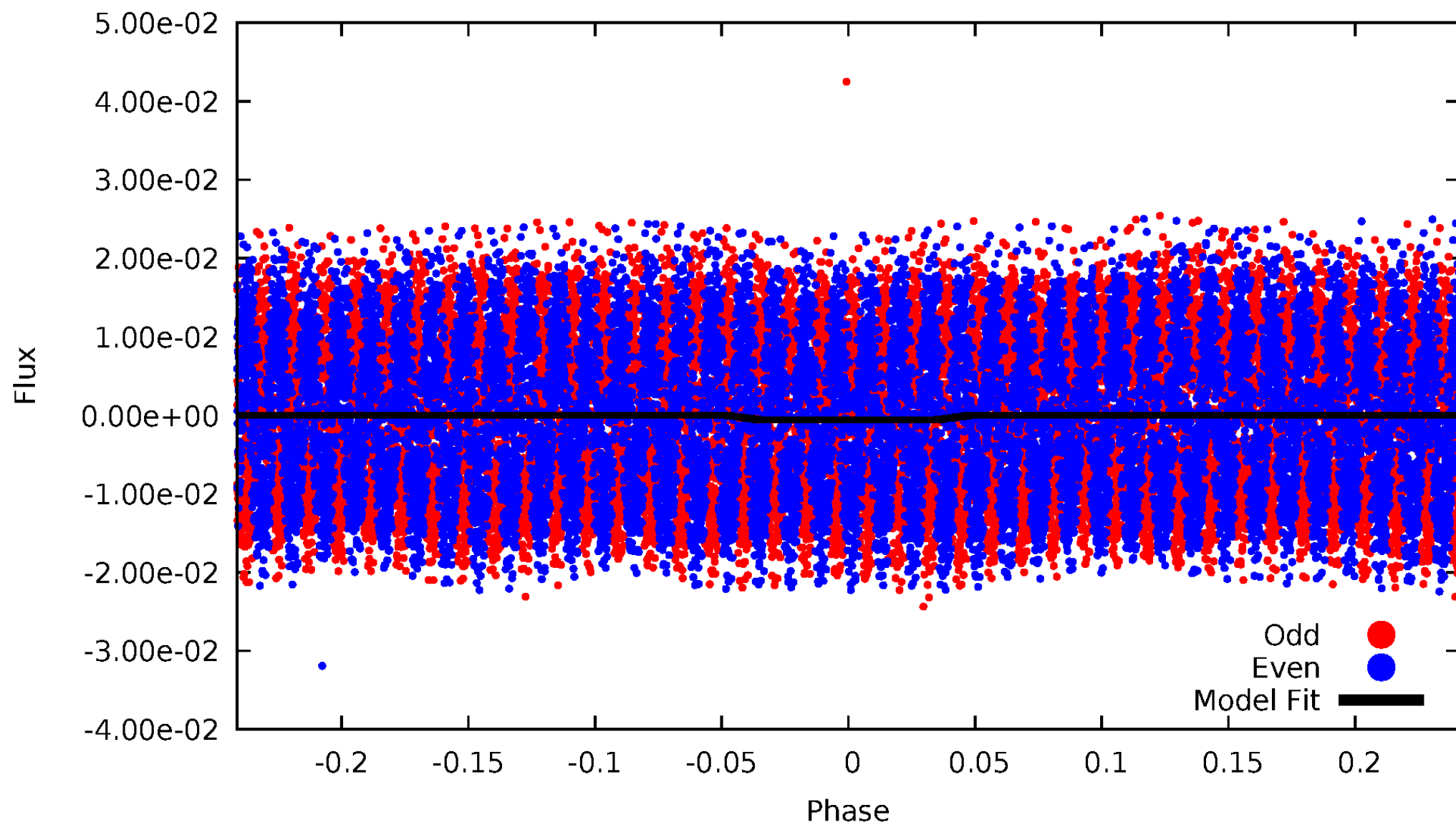
# DV Odd/Even

TCE 003228918-01



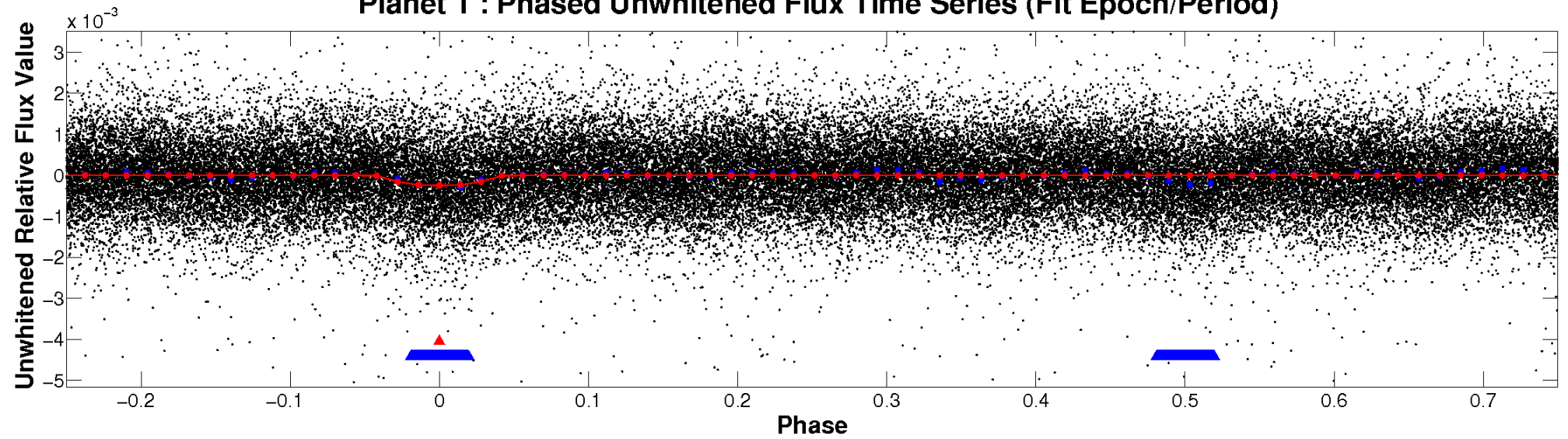
# ALT Odd/Even

TCE 003228918-01

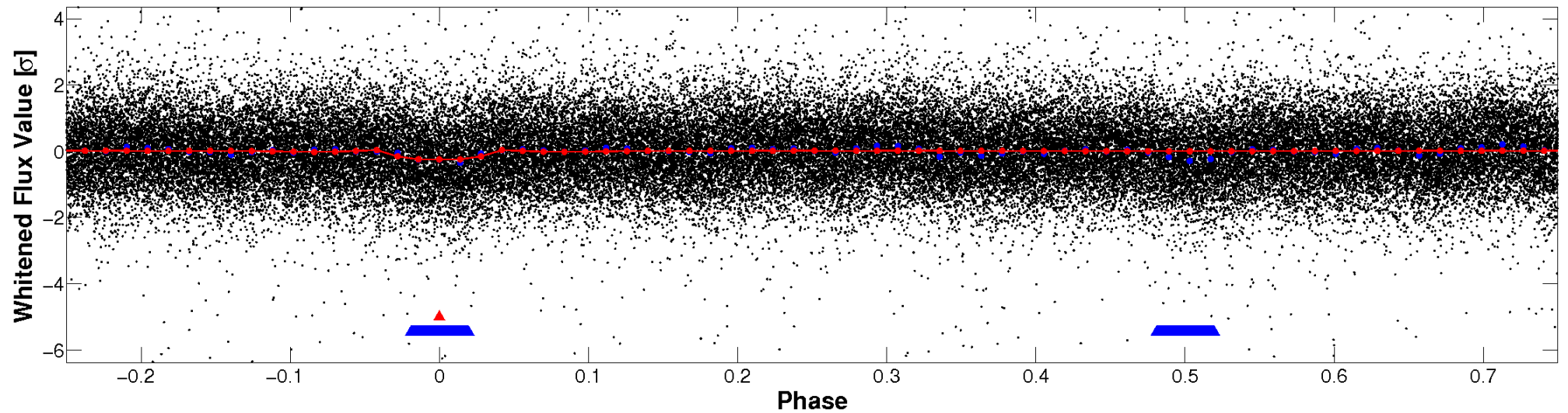


# Non-Whitened Vs. Whitened Light Curve

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

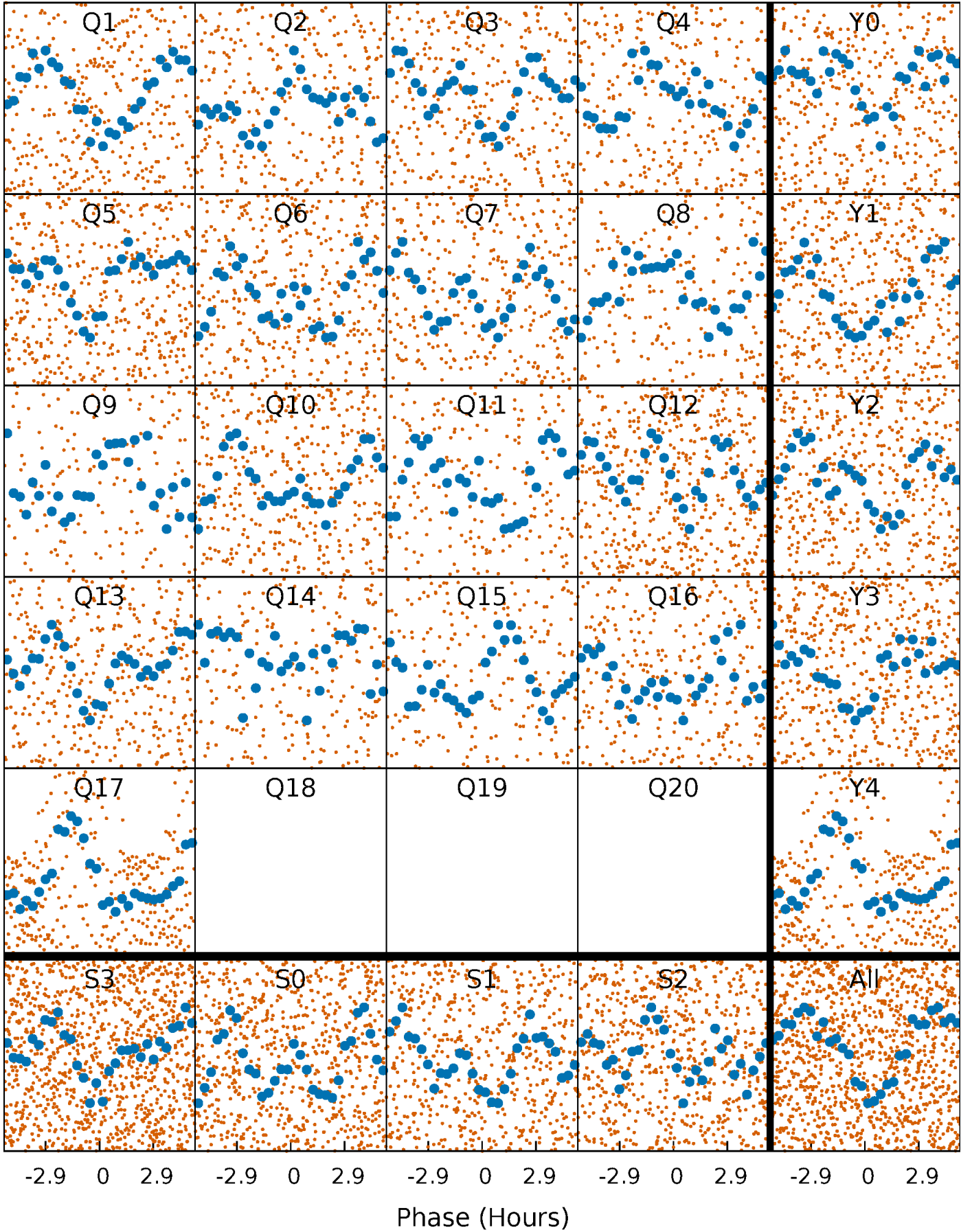


**Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)**



# PDC Quarter-Phased Transit Curves

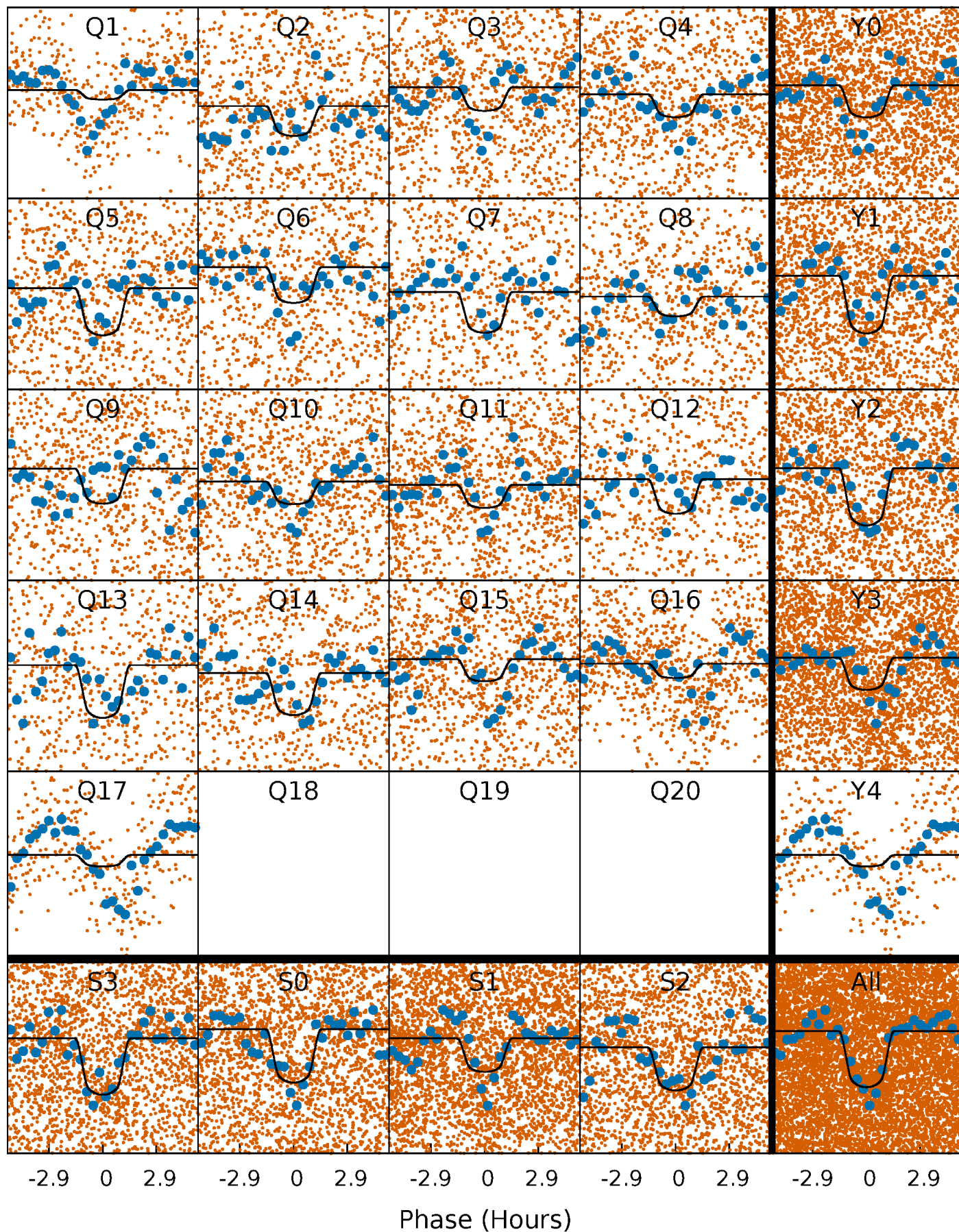
TCE 003228918-01   P= 1.461847 Days    $T_0=132.241974$  (BKJD)





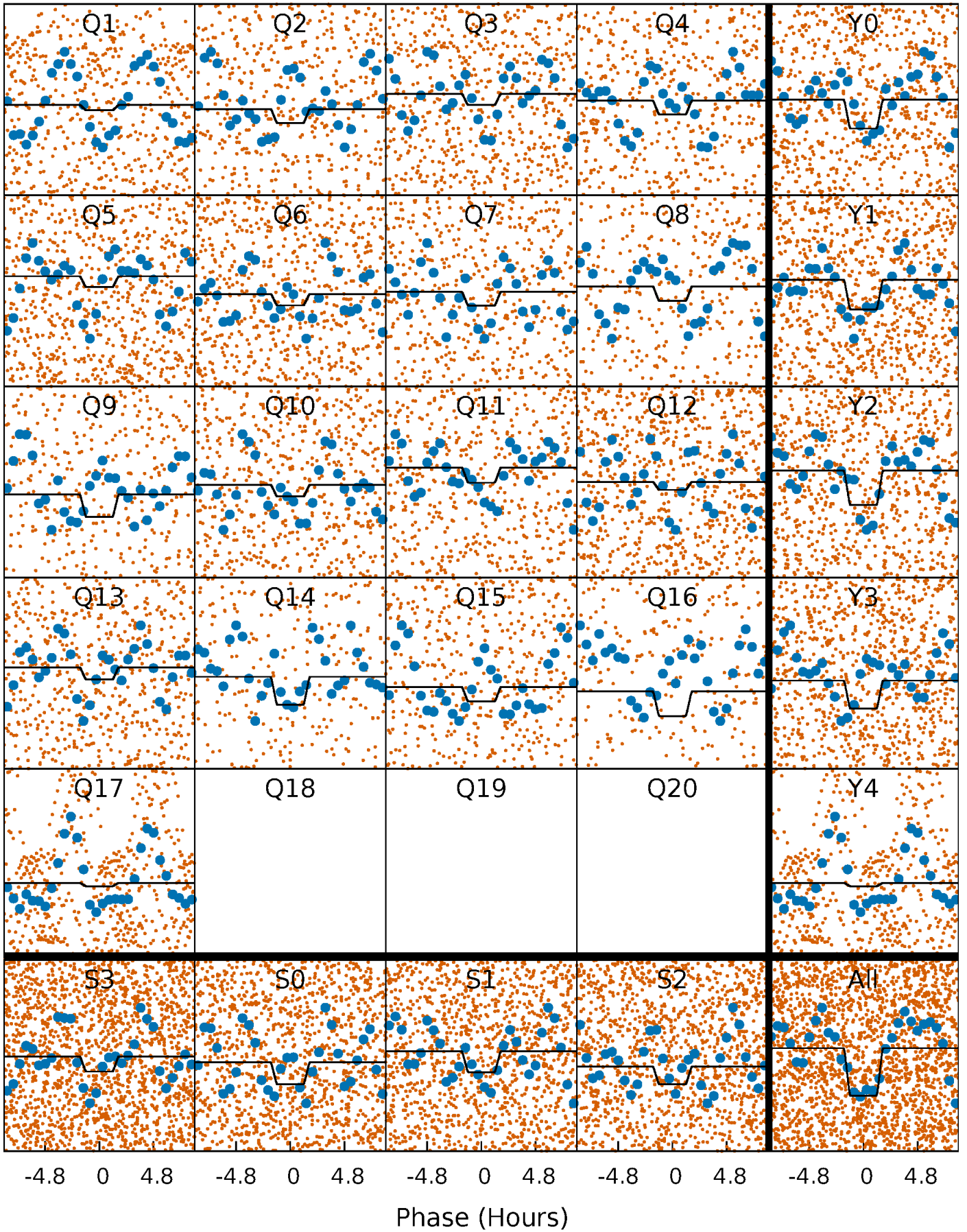
# DV Quarter-Phased Transit Curves

TCE 003228918-01 P= 1.461847 Days  $T_0=132.241974$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

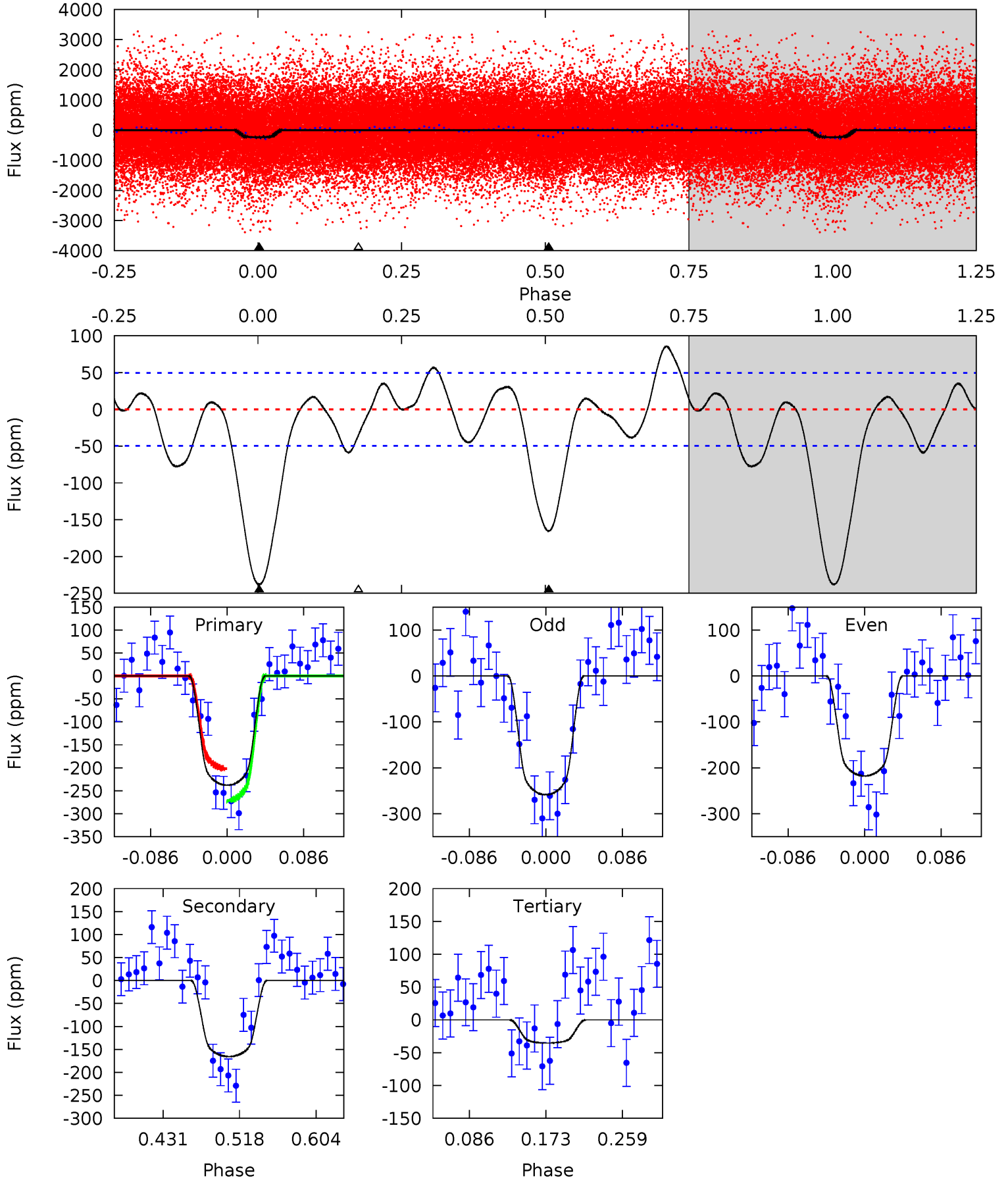
TCE 003228918-01 P= 1.461890 Days  $T_0=132.245498$  (BKJD)



# DV Model-Shift Uniqueness Test

003228918-01, P = 1.461847 Days, E = 130.780127 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
22.0	15.3	3.28	0	4.60	1.72	3.38	18.8	22.0	12.1	15.3	1.91	1.16	0.26	3.22

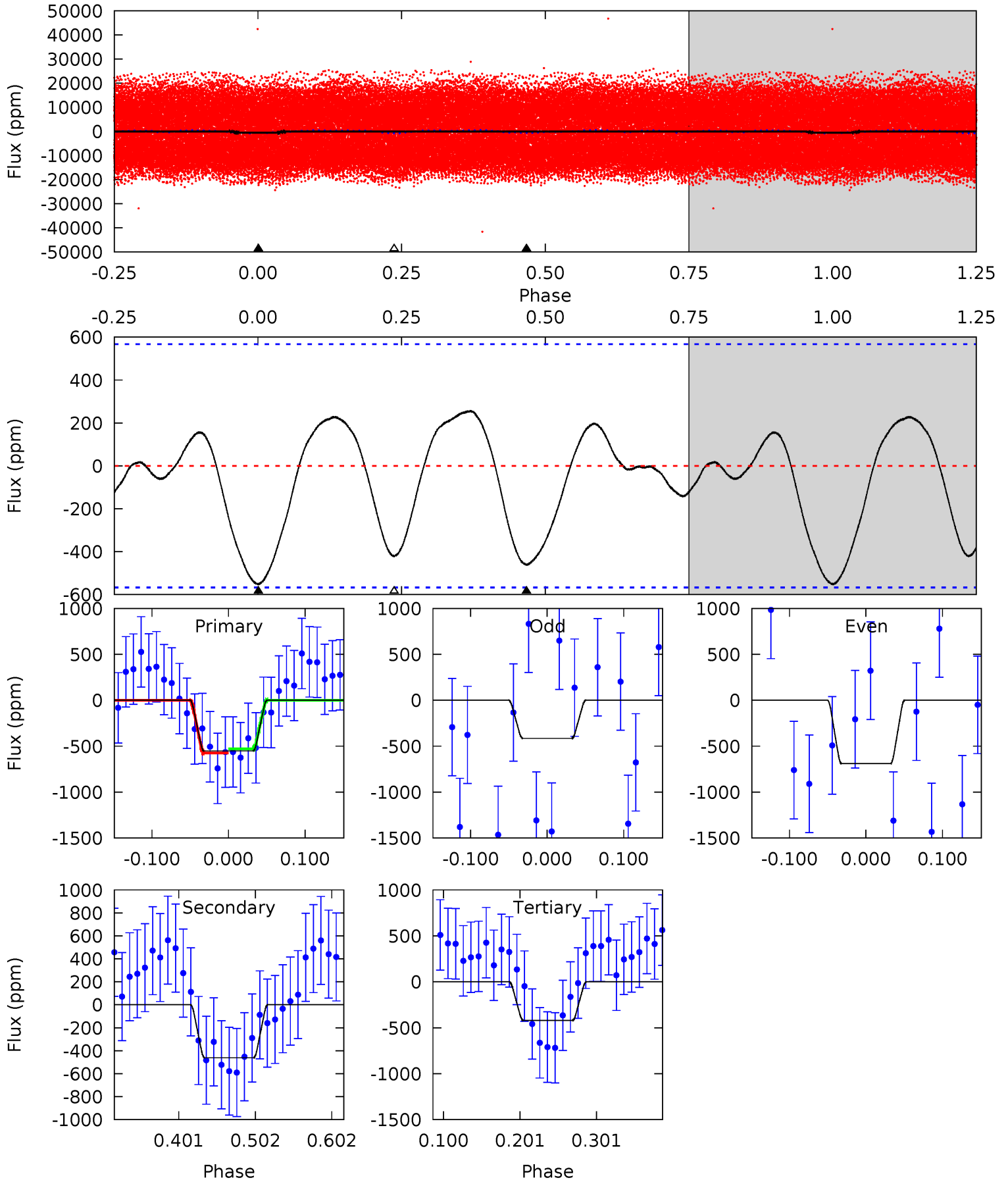




# Alt Model-Shift Uniqueness Test

003228918-01, P = 1.461890 Days, E = 130.783608 Days

Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
4.44	3.71	3.39	0	4.56	1.64	1.35	1.06	4.44	0.33	3.71	1.11	1.08	0.32	0.19





### Stellar Parameters For KIC 003228918

	$T_{\text{eff}} (K)$	$\log(g)$	$[\text{Fe}/\text{H}]$	$R (R_{\odot})$	$M (M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$5853^{+143}_{-184}$	$4.529^{+0.048}_{-0.192}$	$-0.100^{+0.250}_{-0.300}$	$0.895^{+0.243}_{-0.087}$	$0.990^{+0.104}_{-0.127}$	$1.941^{+0.378}_{-0.941}$
	+2%/-3%	+1%/-4%	+250%/-300%	+27%/-10%	+11%/-13%	+19%/-48%
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 003228918-01 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-166 \pm 11$	$1.80^{+0.39}_{-0.35}$	$2199^{+131}_{-94}$	$5043^{+469}_{-372}$	$17^{+9}_{-6}$
Alt.	$-461 \pm 124$	$2.51^{+0.48}_{-0.39}$	$2196^{+138}_{-101}$	$5453^{+516}_{-475}$	$24^{+12}_{-9}$

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

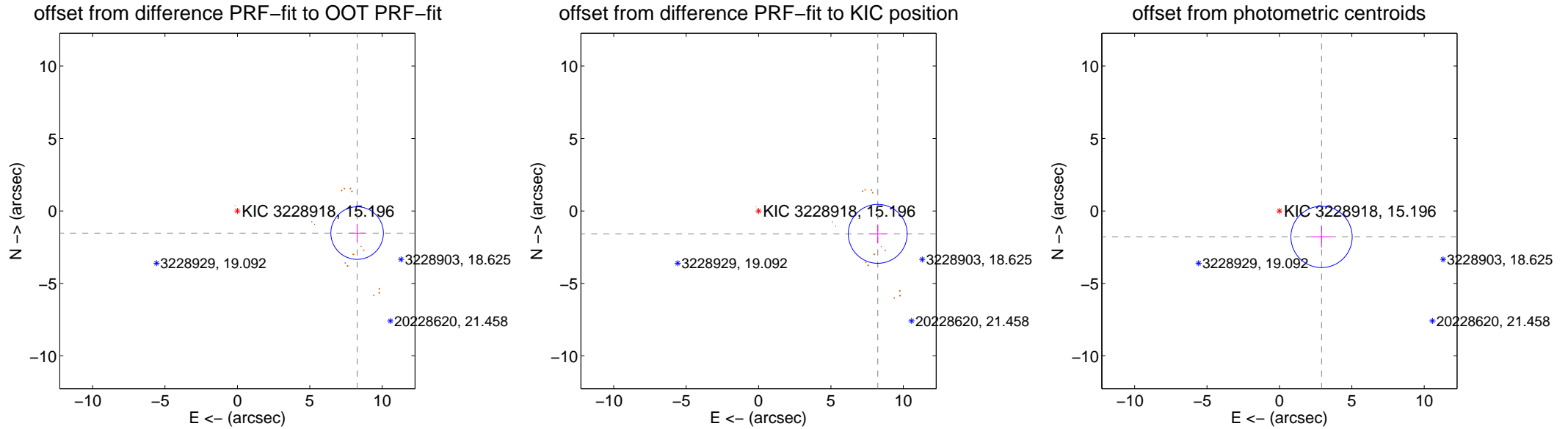
## DV Centroid Data

Supplemental centroid analysis for 003228918-01. Kepler magnitude: 15.20. Transit SNR 14.37

There are 1 quarters with good PRF difference image offsets

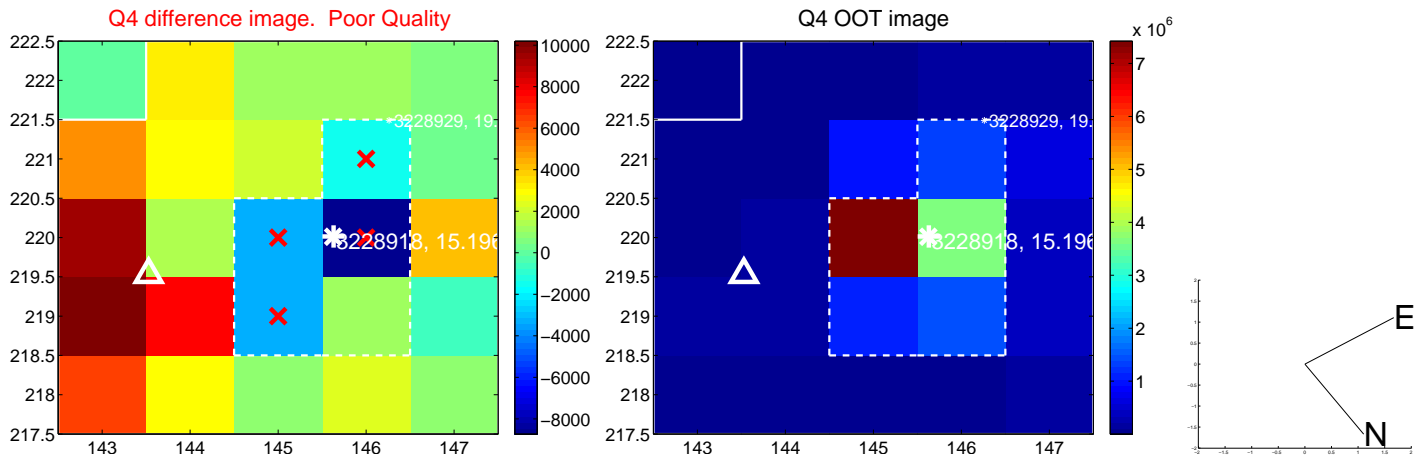
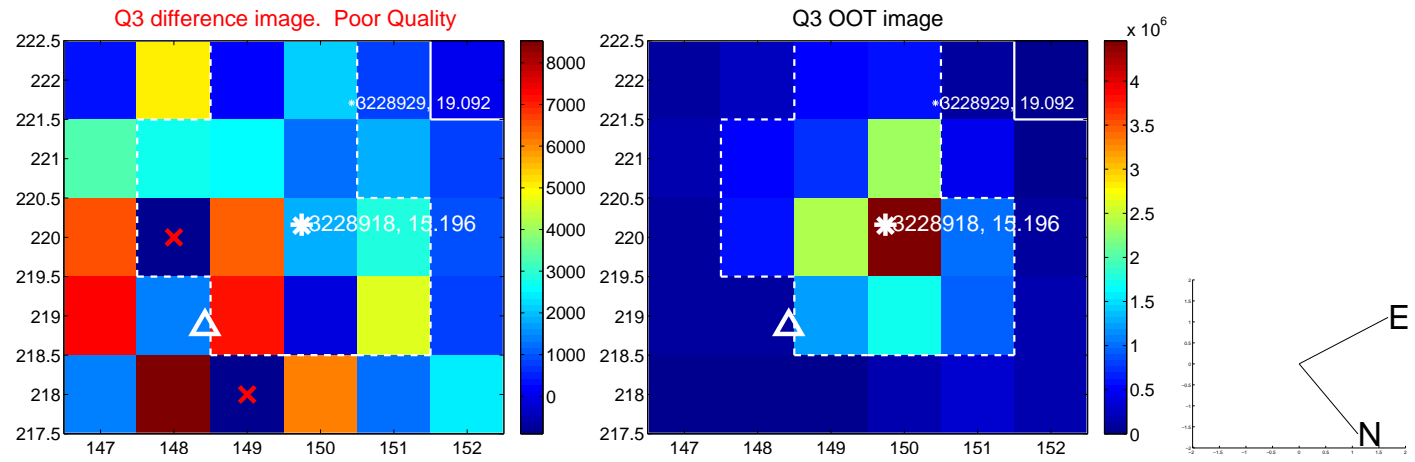
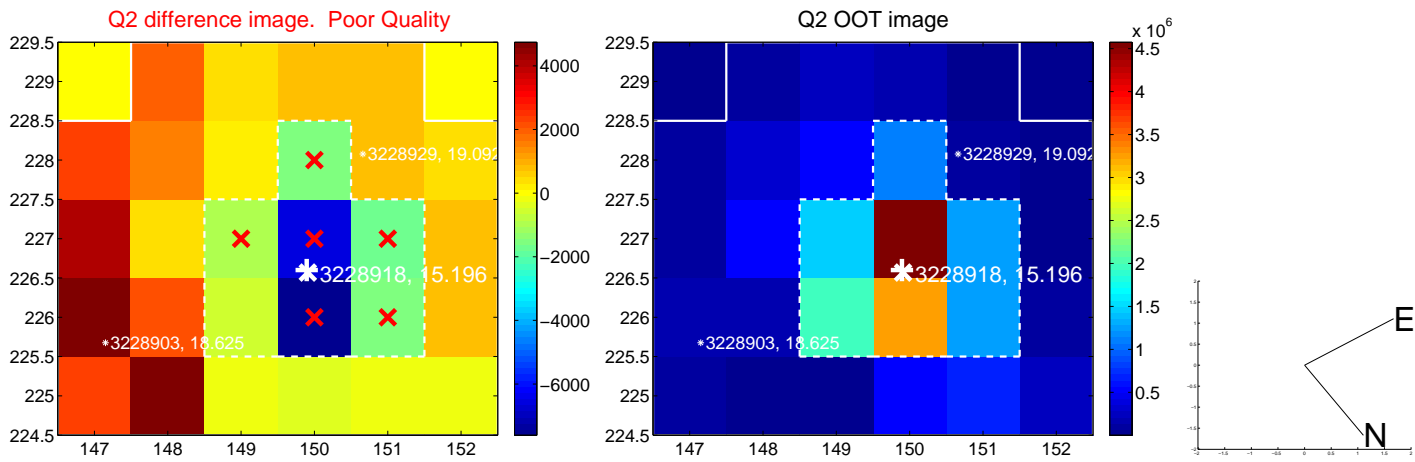
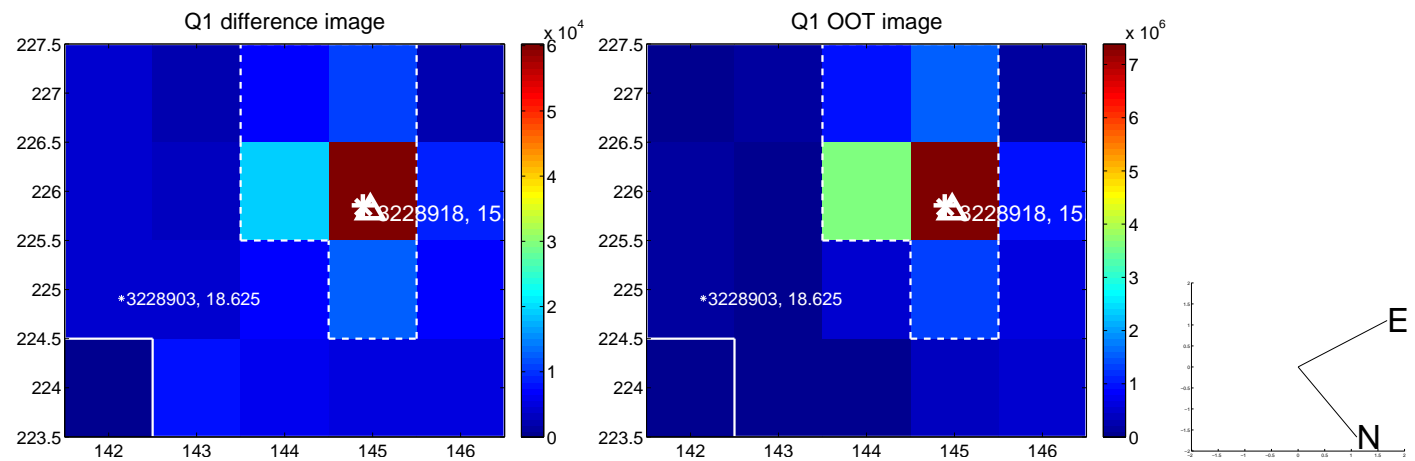
The direct PRF centroid is offset from the target star catalog position by about 0.02 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$8.409 \pm 0.605$	13.91	$-8.269 \pm 0.559$	$-1.527 \pm 0.622$
PRF-fit source offset from KIC position	$8.383 \pm 0.678$	12.37	$-8.233 \pm 0.617$	$-1.581 \pm 0.649$
photometric centroid source offset	$3.42 \pm 0.71$	4.84	$-2.91 \pm 0.70$	$-1.79 \pm 0.73$

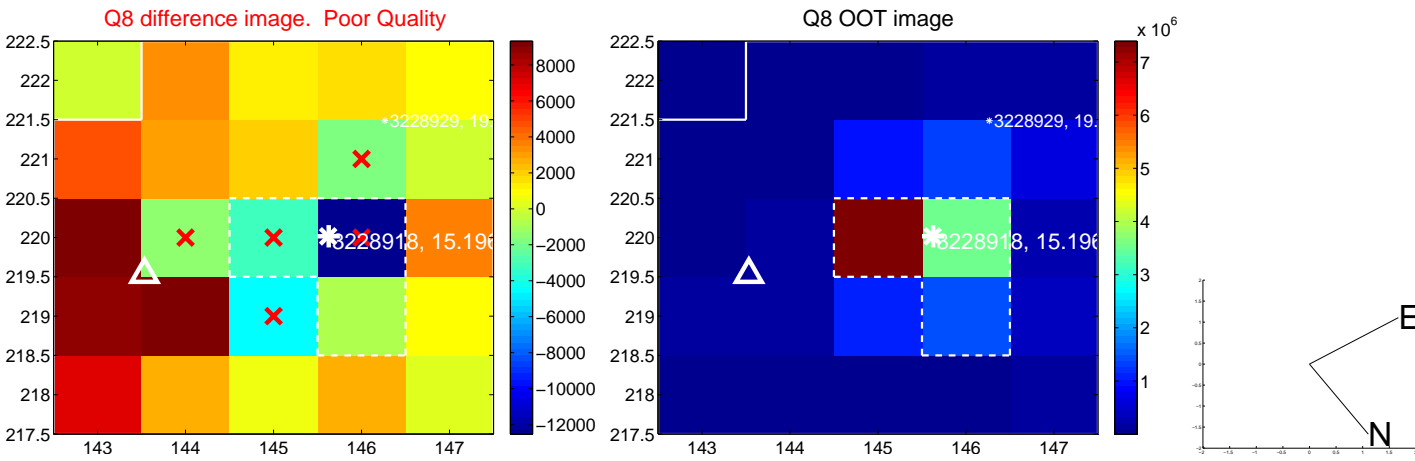
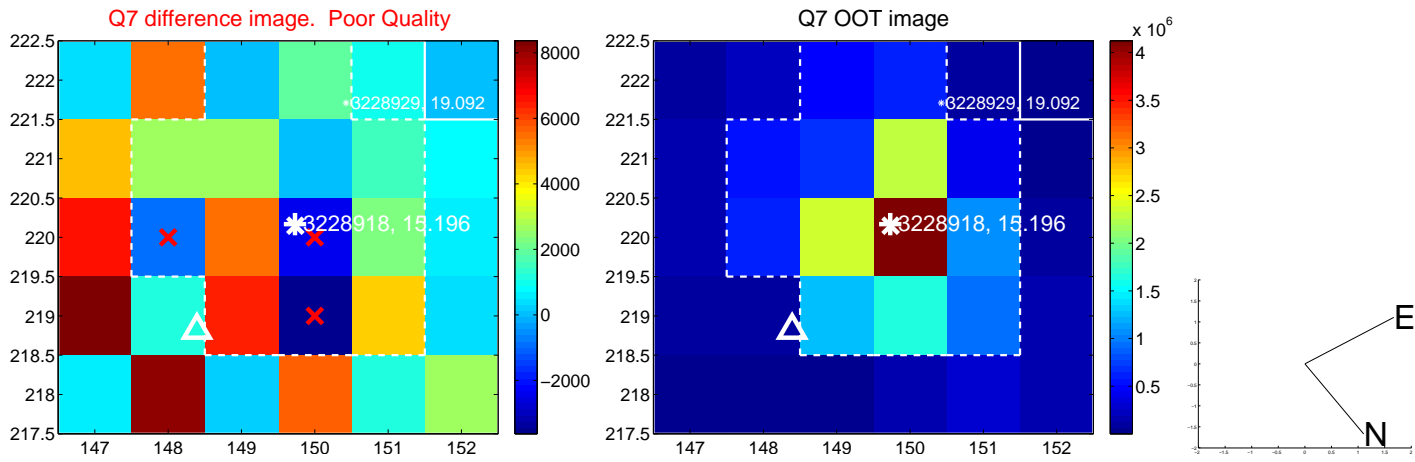
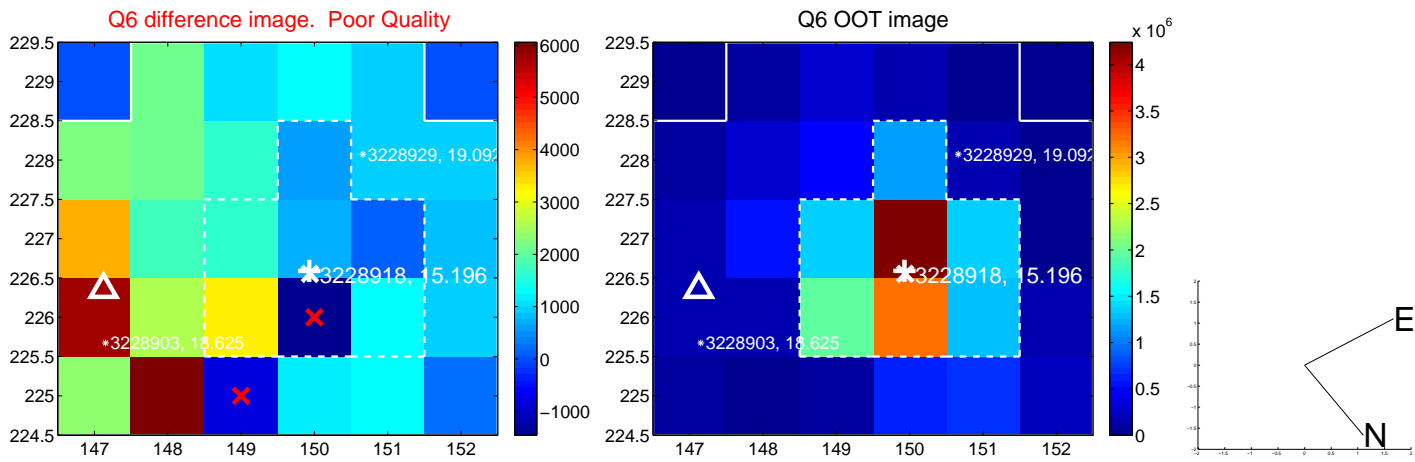
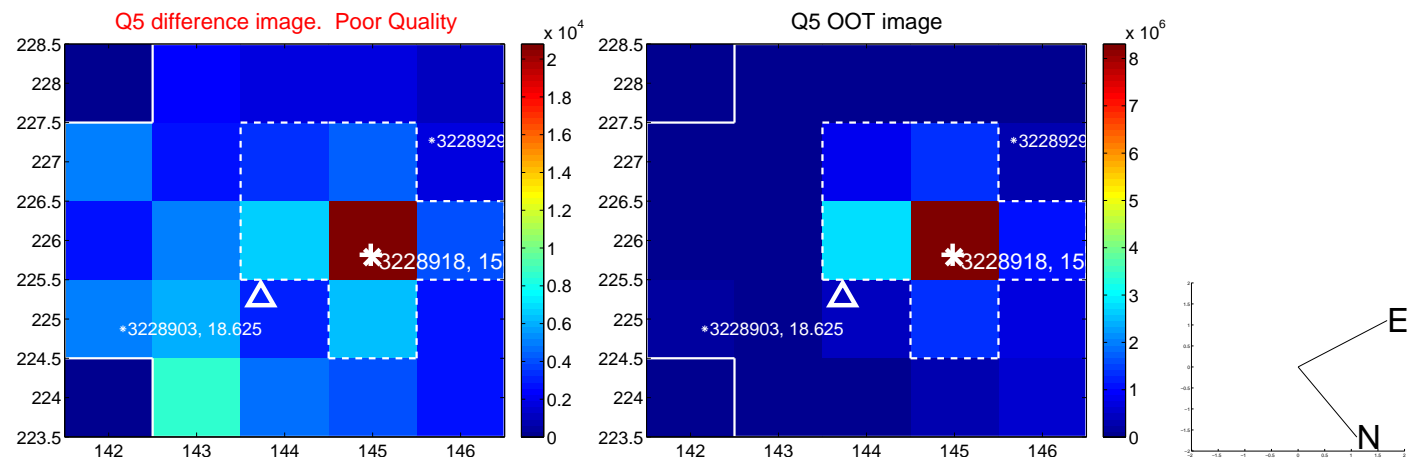


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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

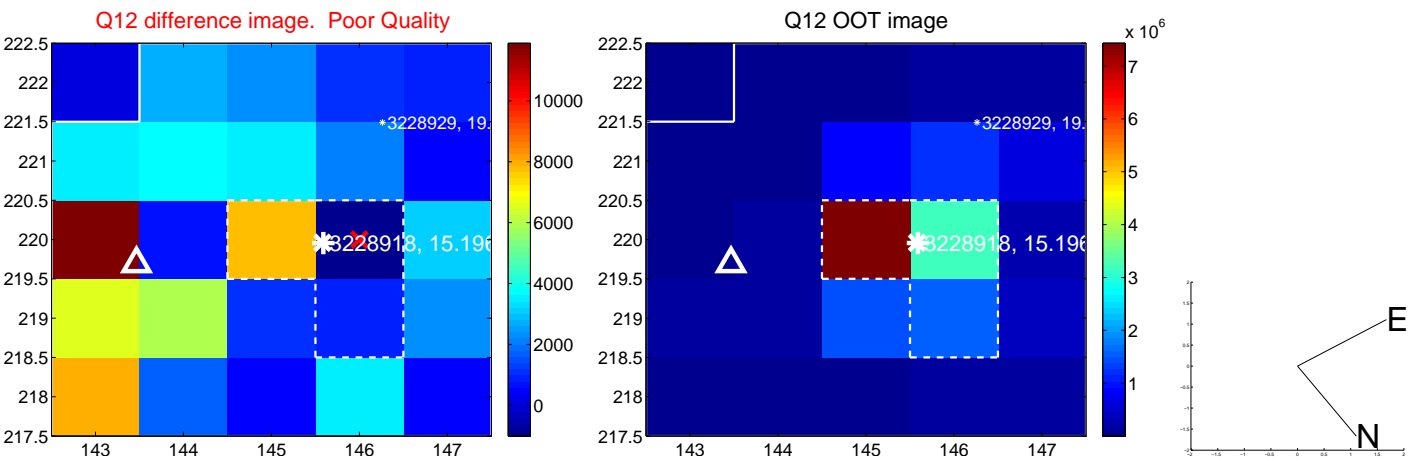
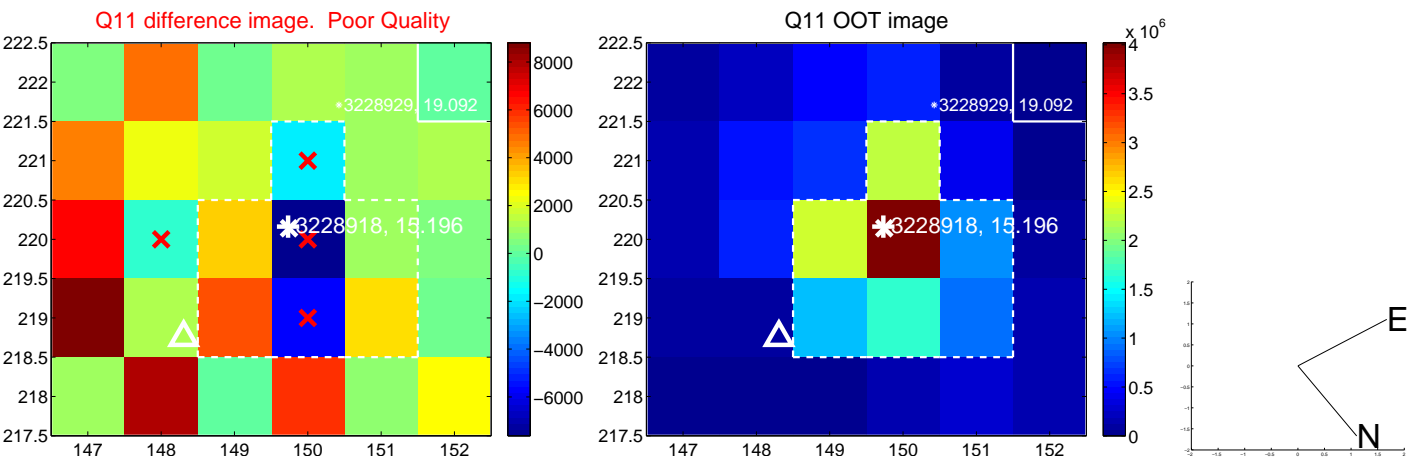
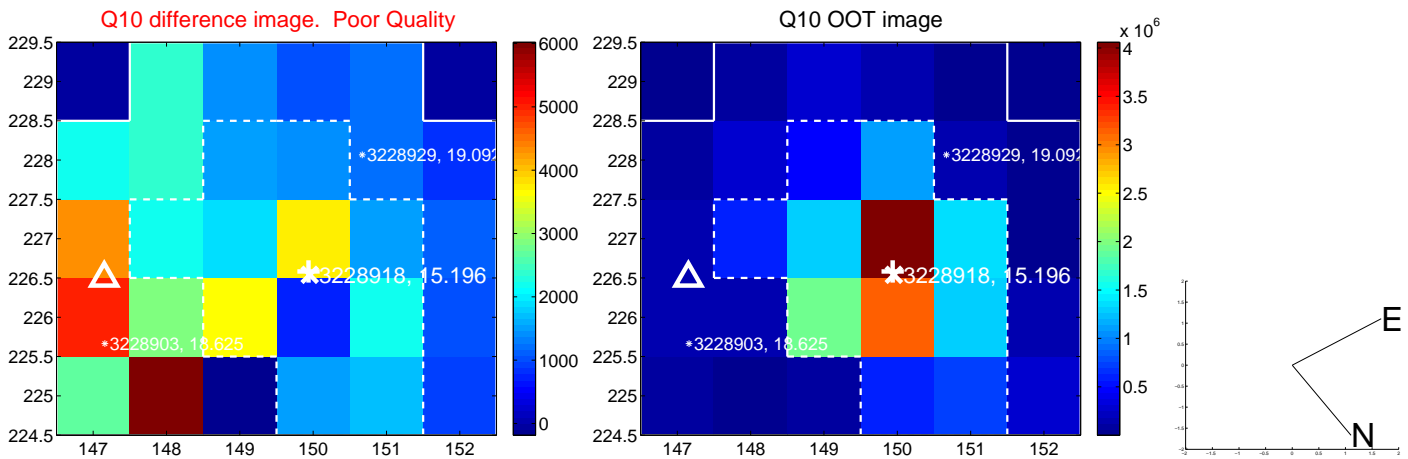
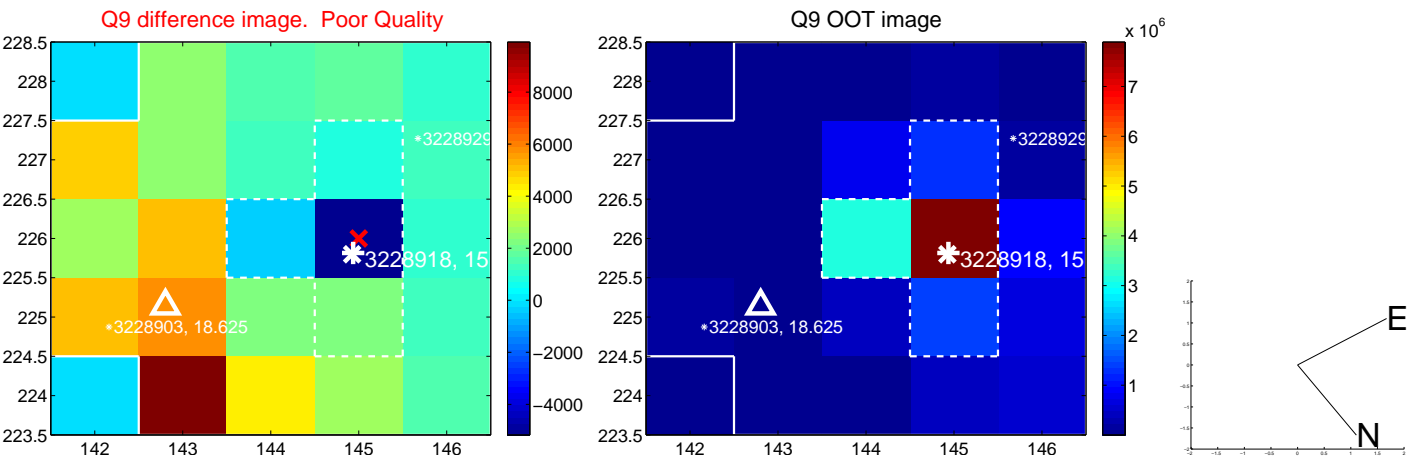


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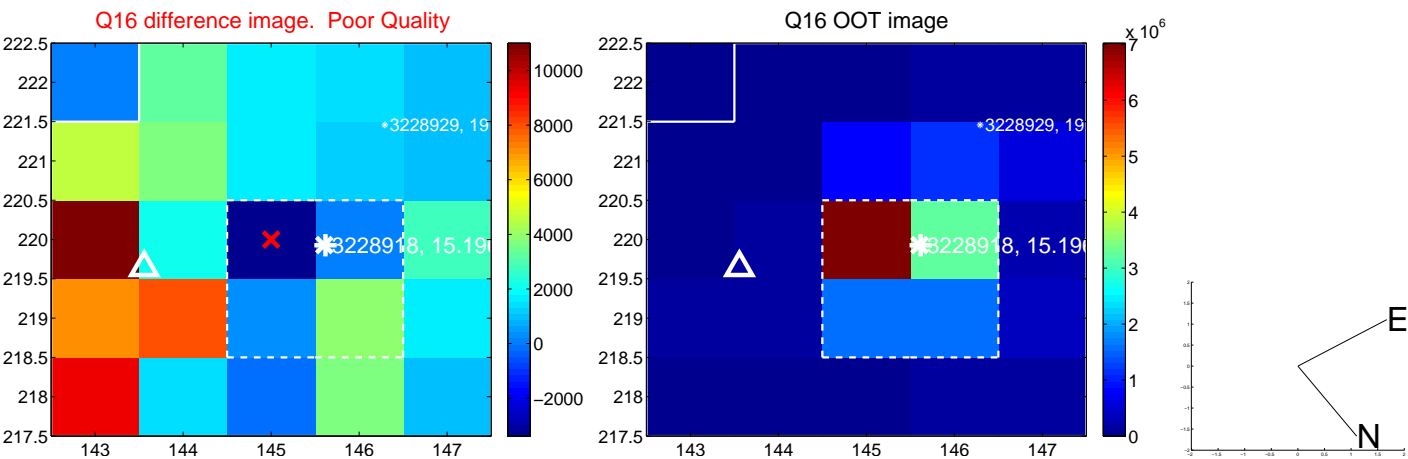
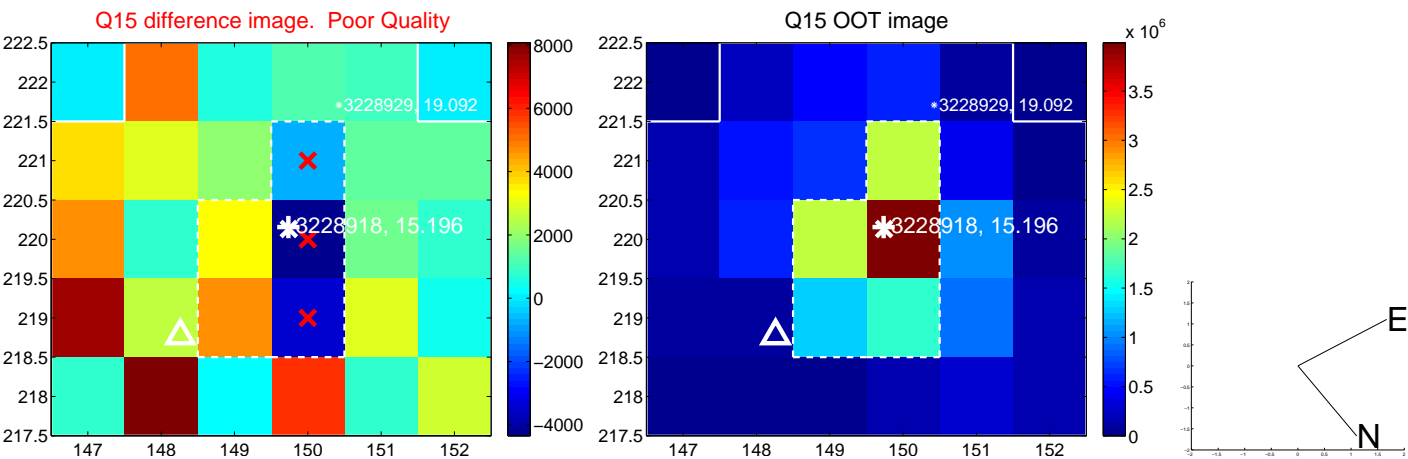
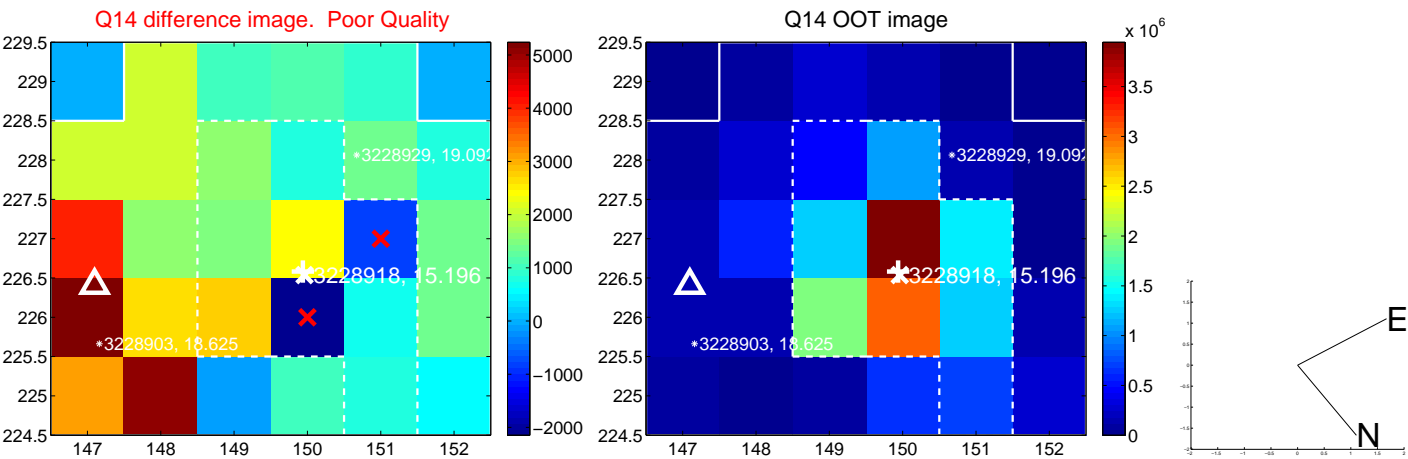
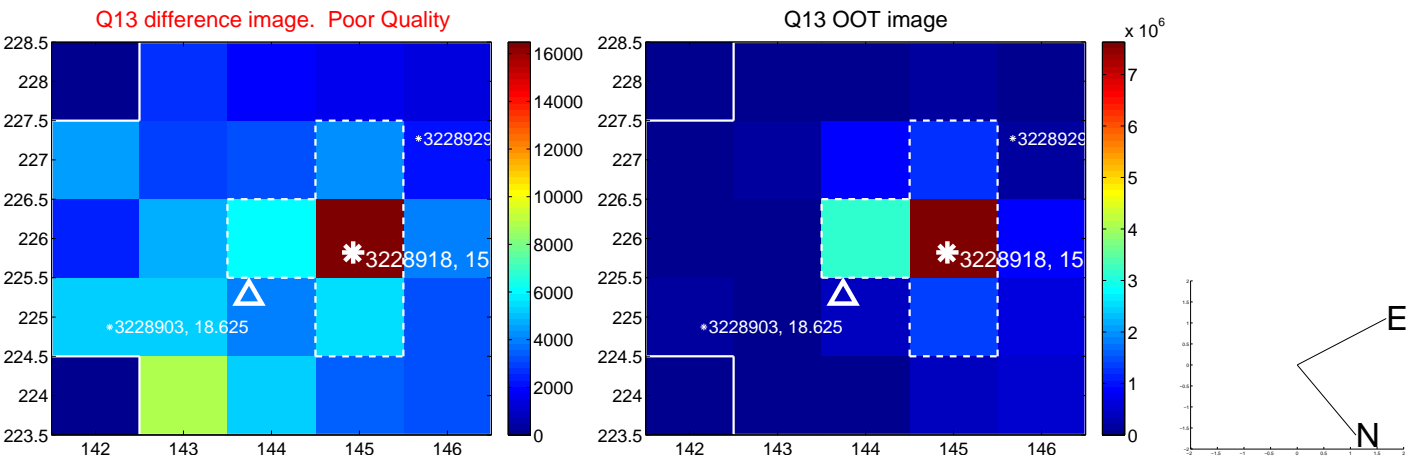




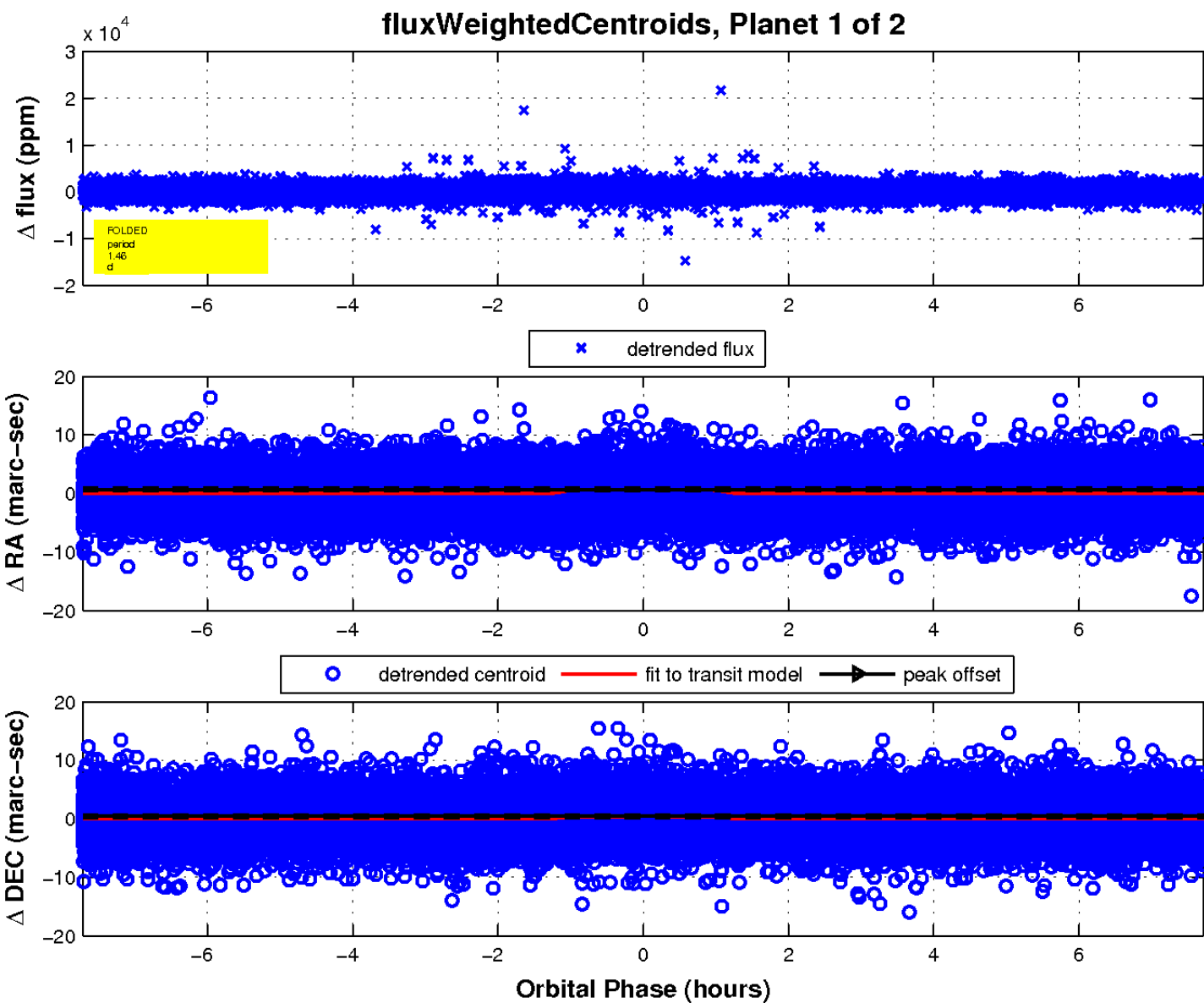
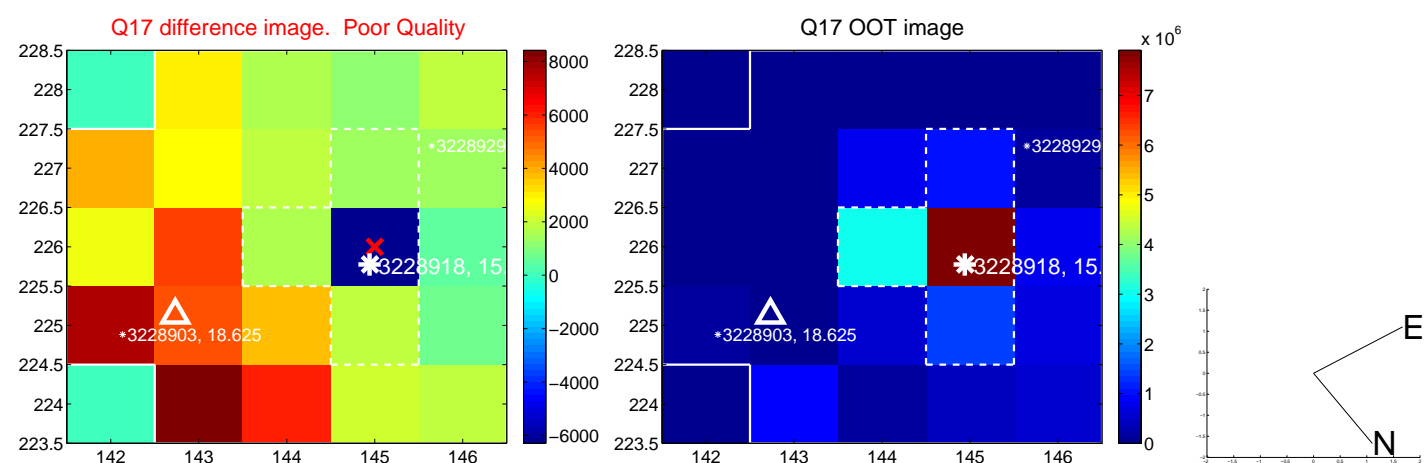
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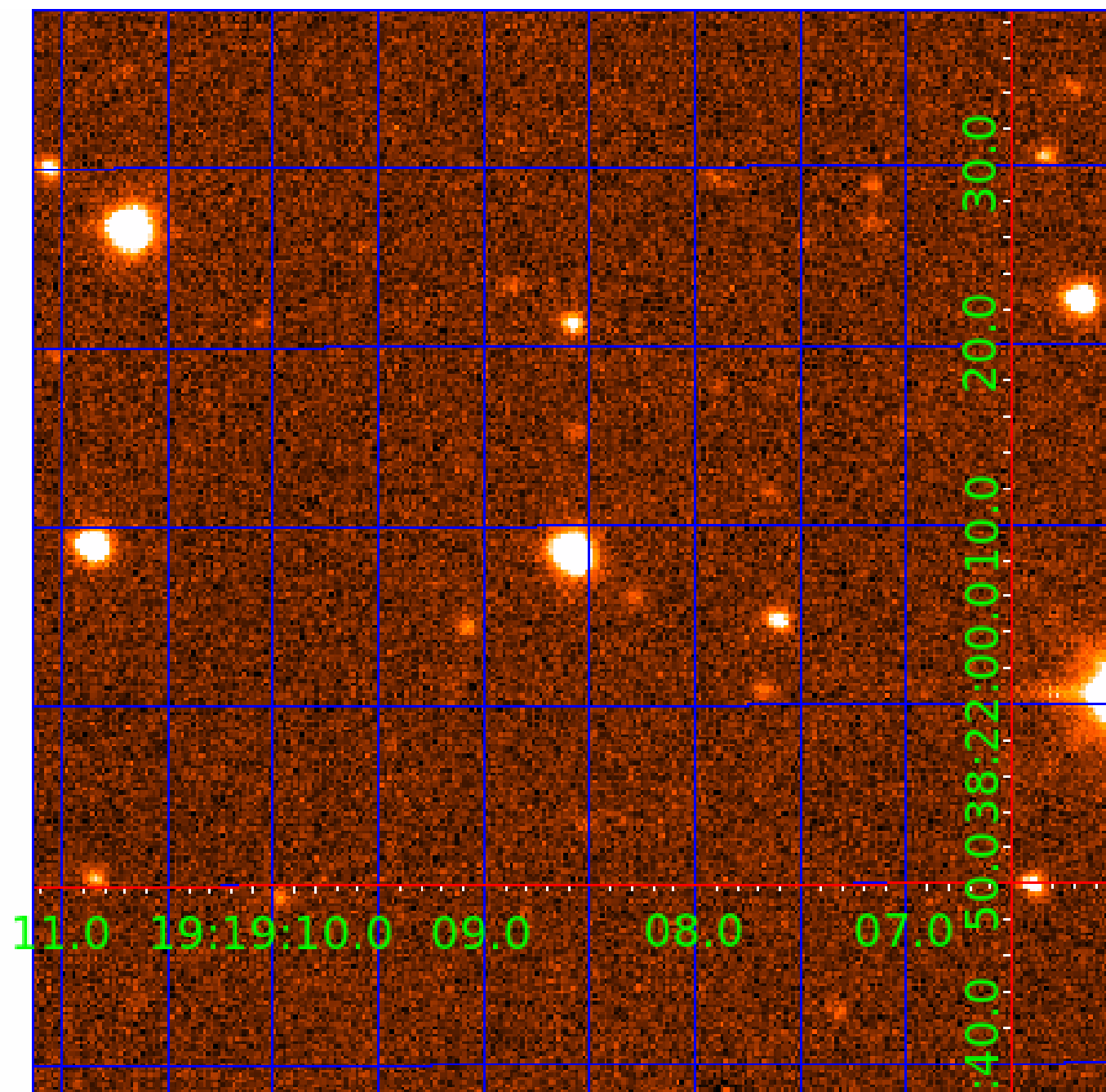


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination





# KIC 003228918

## Q1-17 DR25 TCE Parameters

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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 003228918-02

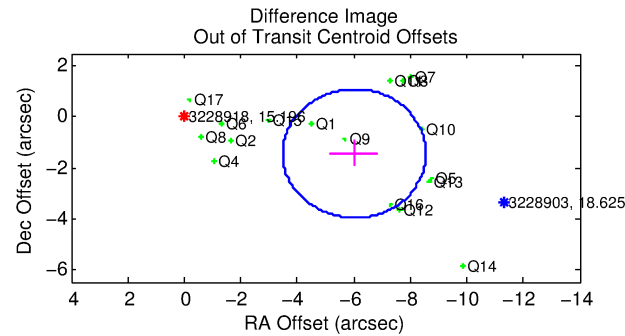
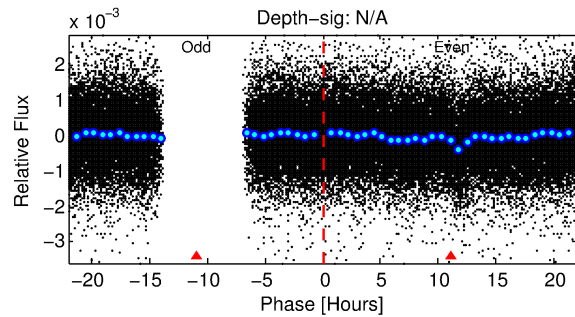
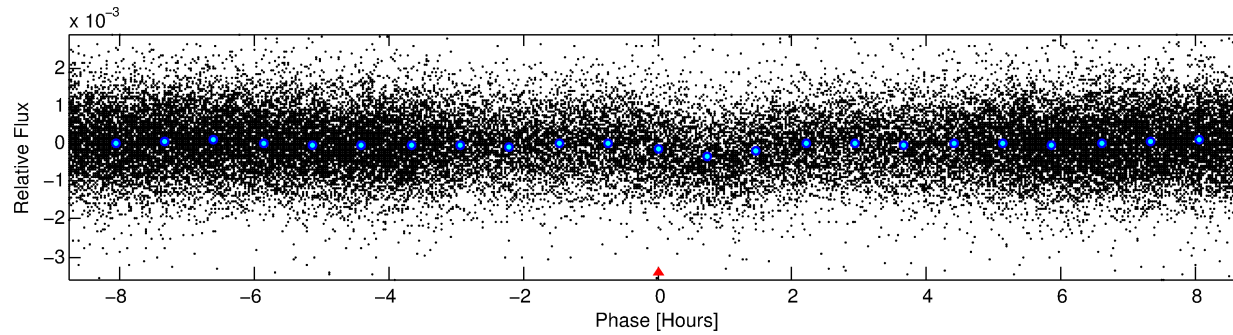
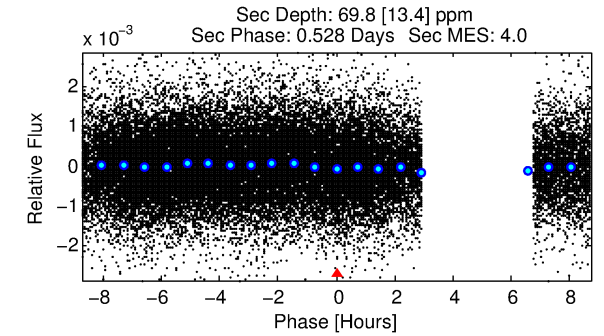
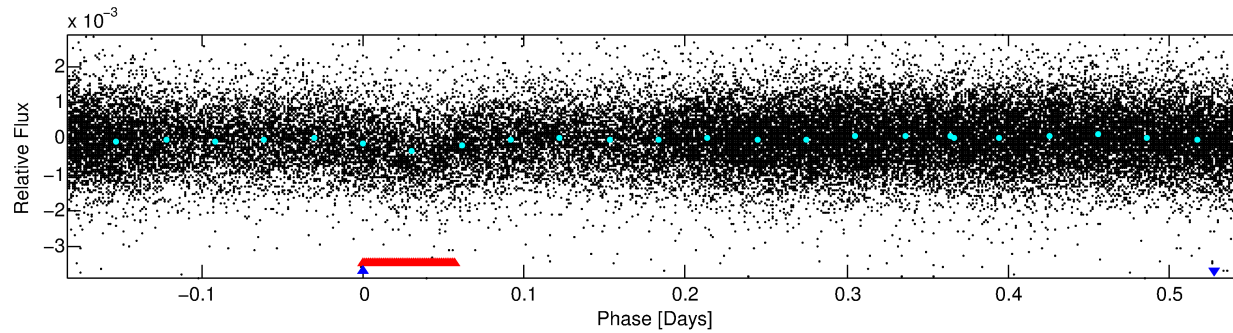
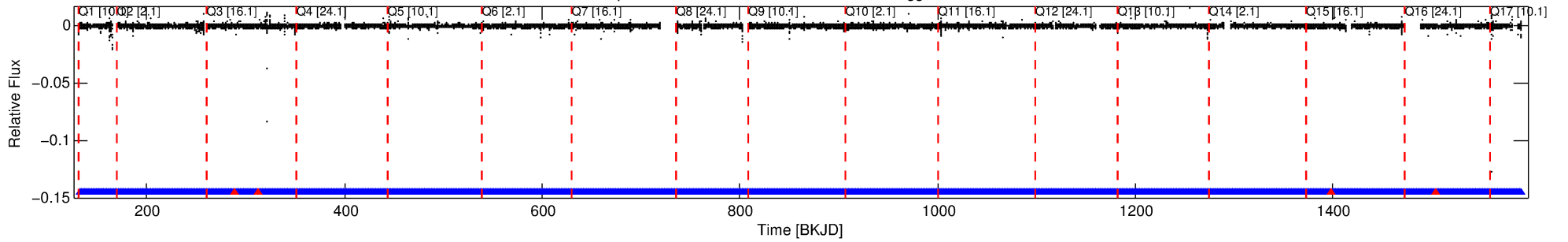
TCE (1)	KIC	Parent (2)	Parent KIC	$P_1:P_2$	Dist ( $''$ )	$\Delta$ Row	$\Delta$ Col	$m_2$	$m_1$	$D_2/D_1$	Mechanism	Flag	$\sigma_P$	$\sigma_T$
003228918-02	3228918	V404-Lyr-pri	3228863	1:1	31.9	2	8	11.82	15.20	197.64	Direct-PRF	0	1.27	1.20

**Notes:**  $P_1:P_2$  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.  $m_2$  and  $m_1$  are the magnitudes of the parent and child.  $D_2/D_1$  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: 3228918 Candidate: 2 of 2 Period: 0.731 d

Kp: 15.20 R\*: 0.90 Rs Teff: 5853.0 K Logg: 4.53 Fe/H: -0.100



## TPS TCE Results:

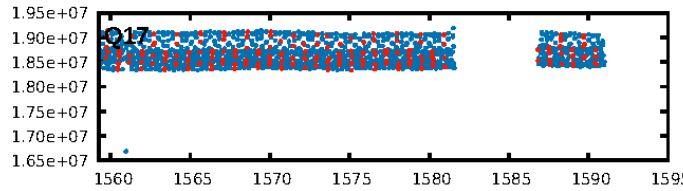
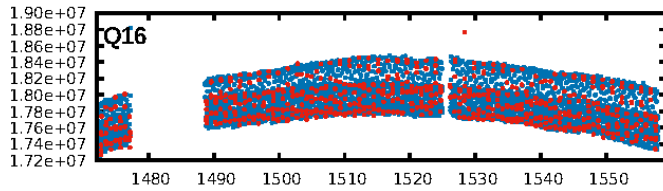
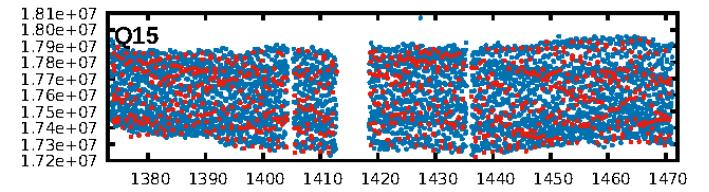
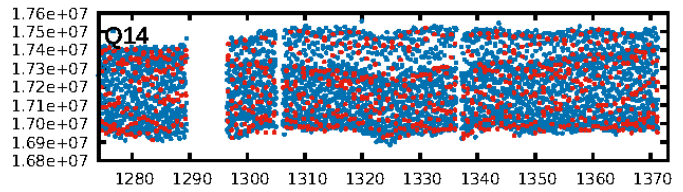
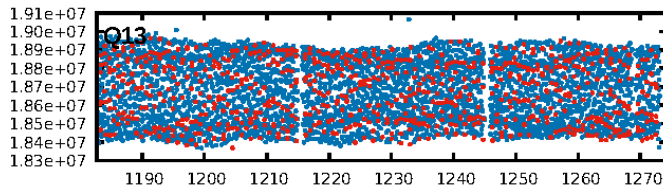
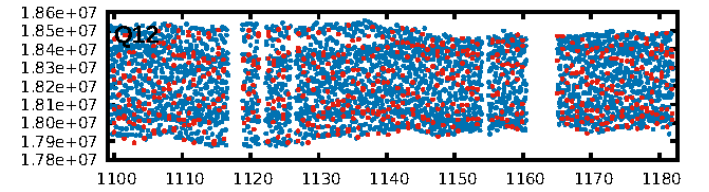
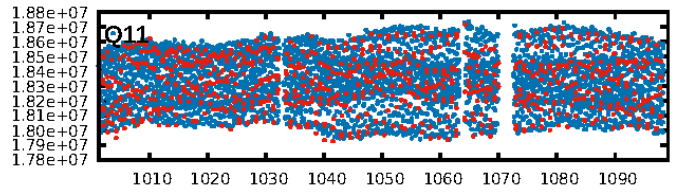
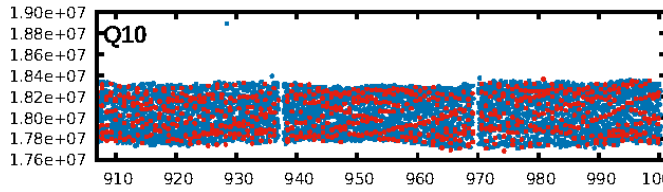
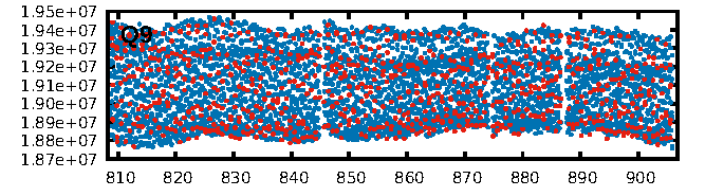
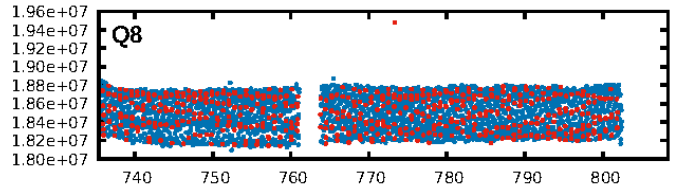
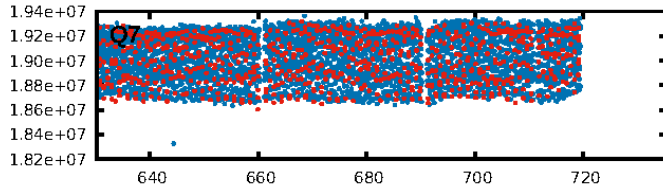
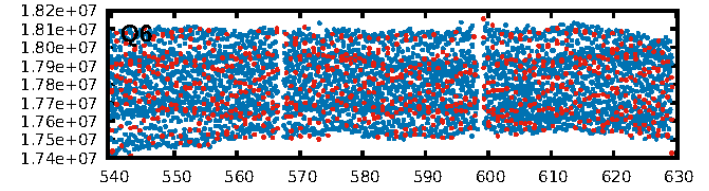
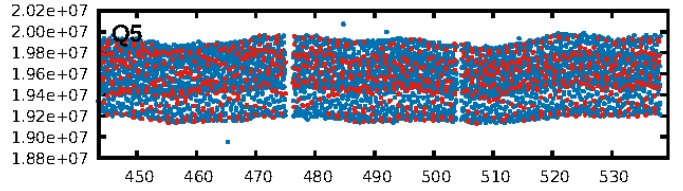
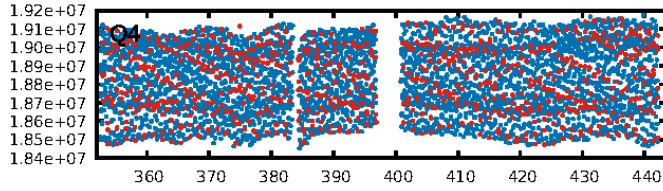
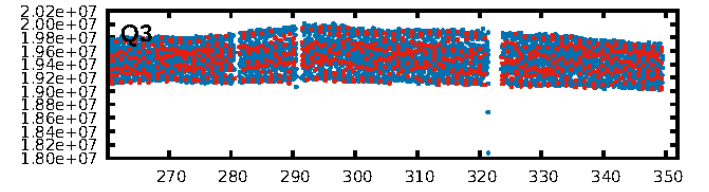
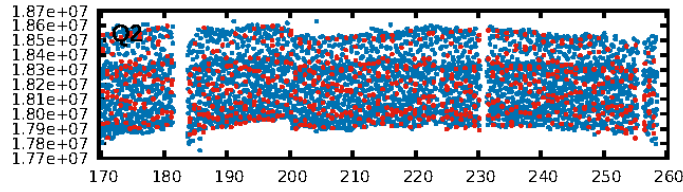
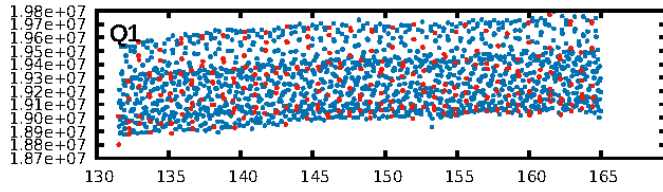
Period = 0.73095 d  
Epoch = 132.2141 BKJD

DV fit results are unavailable

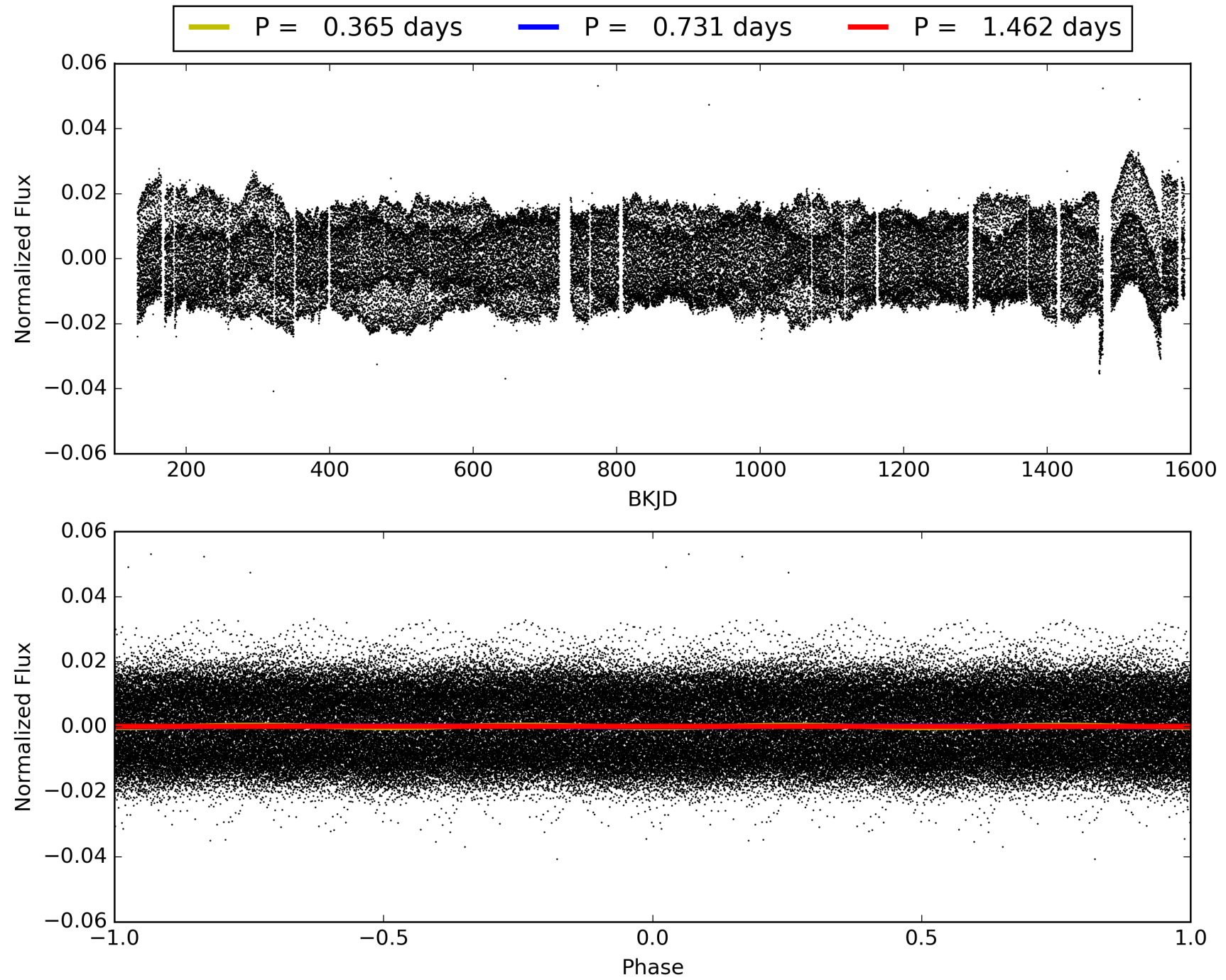
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 100.0% [5.89σ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: N/A  
RollingBand-fgt: 1.00 [870/874]  
GhostDiagnostic-chr: -2.584  
Centroid-sig: 0.0%  
Centroid-so: 0.640 arcsec [3.93σ]  
OotOffset-rm: 6.187 arcsec [7.32σ]  
KicOffset-rm: 6.168 arcsec [7.55σ]  
OotOffset-st: 4/4/4/5 [17]  
KicOffset-st: 4/4/4/5 [17]  
DiffImageQuality-fgm: 0.12 [2/17]  
DiffImageOverlap-fno: 1.00 [17/17]

# TCE 003228918-02, PDC Light Curves



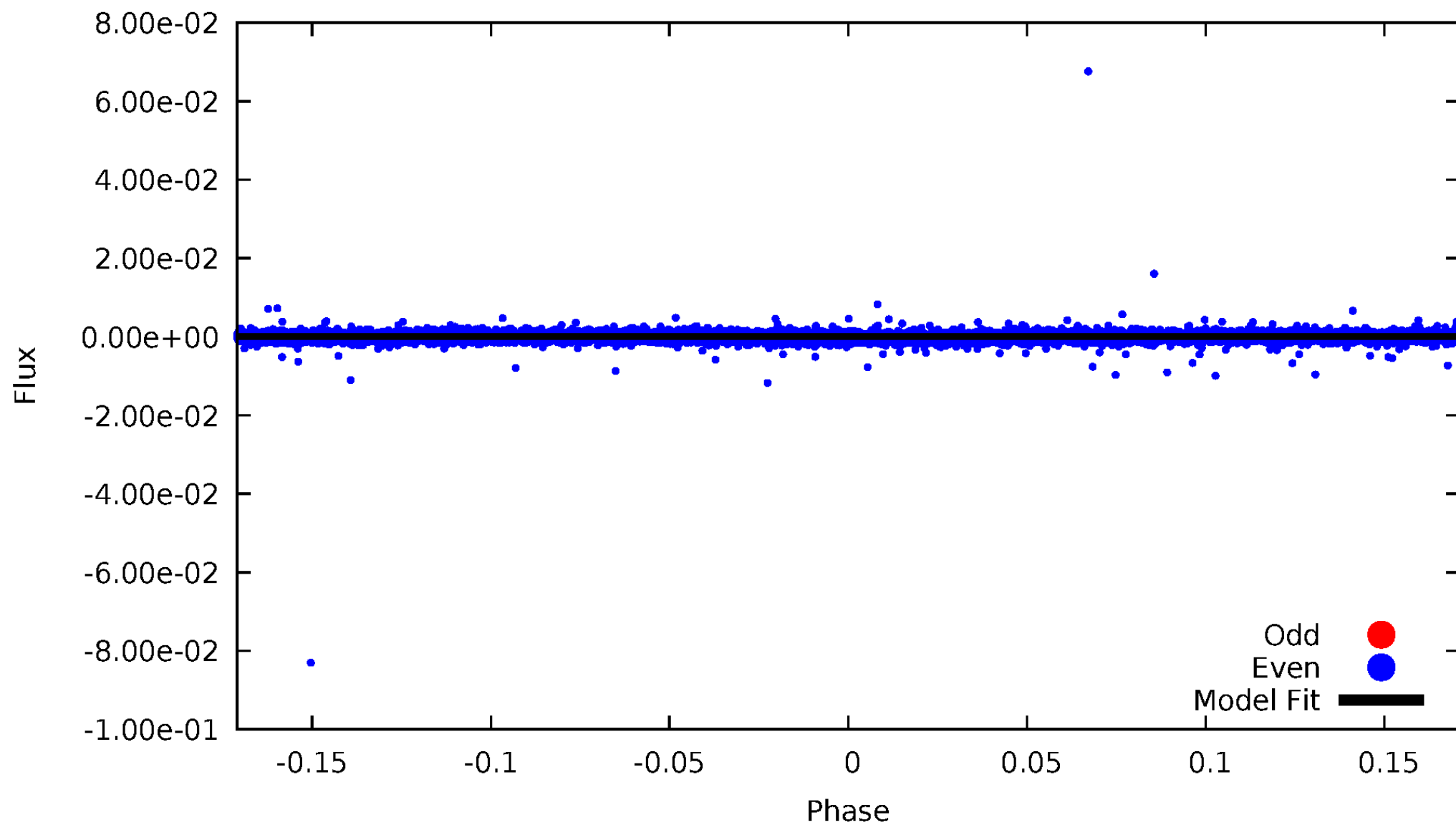
TCE 003228918-02





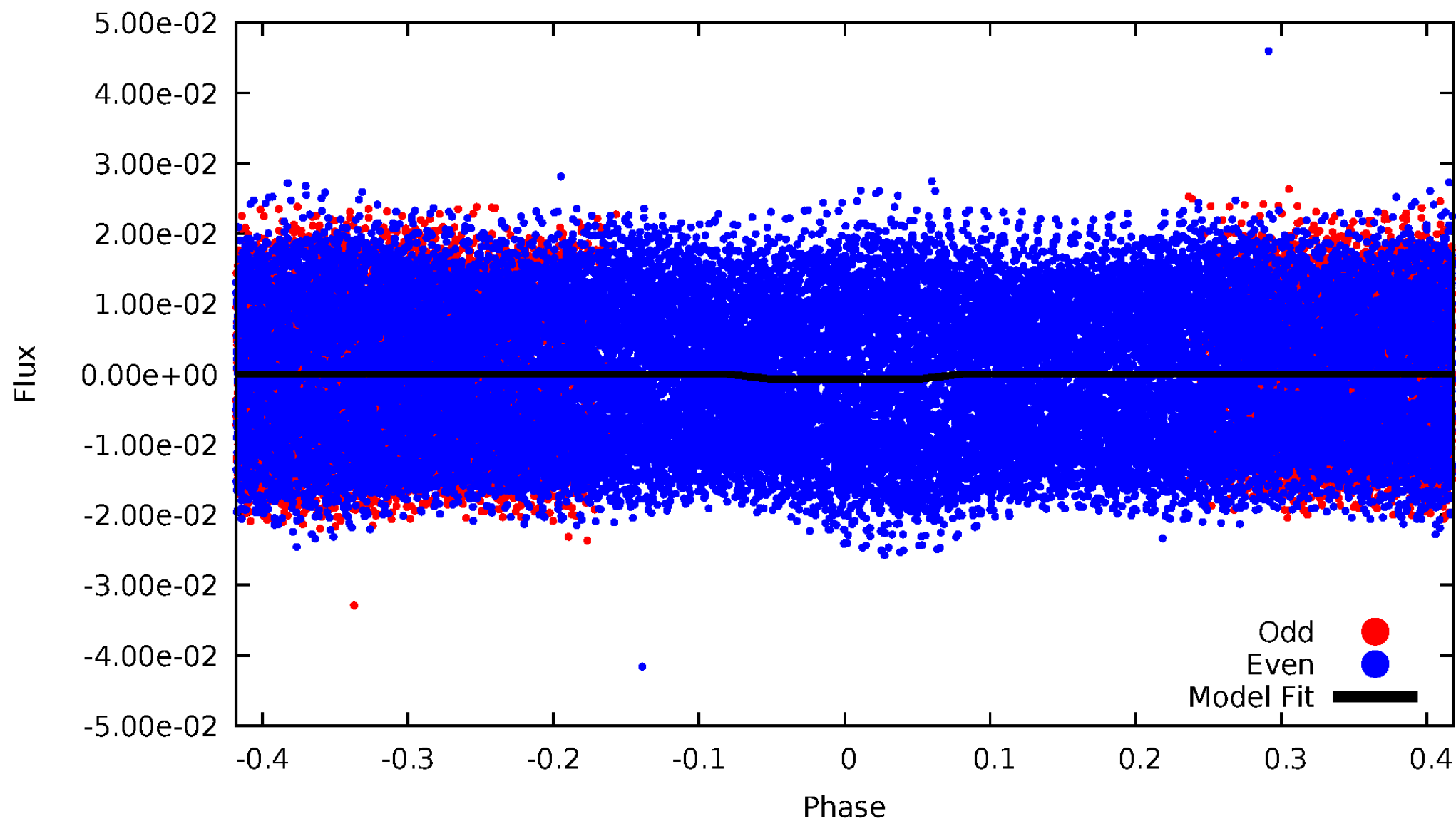
# DV Odd/Even

TCE 003228918-02



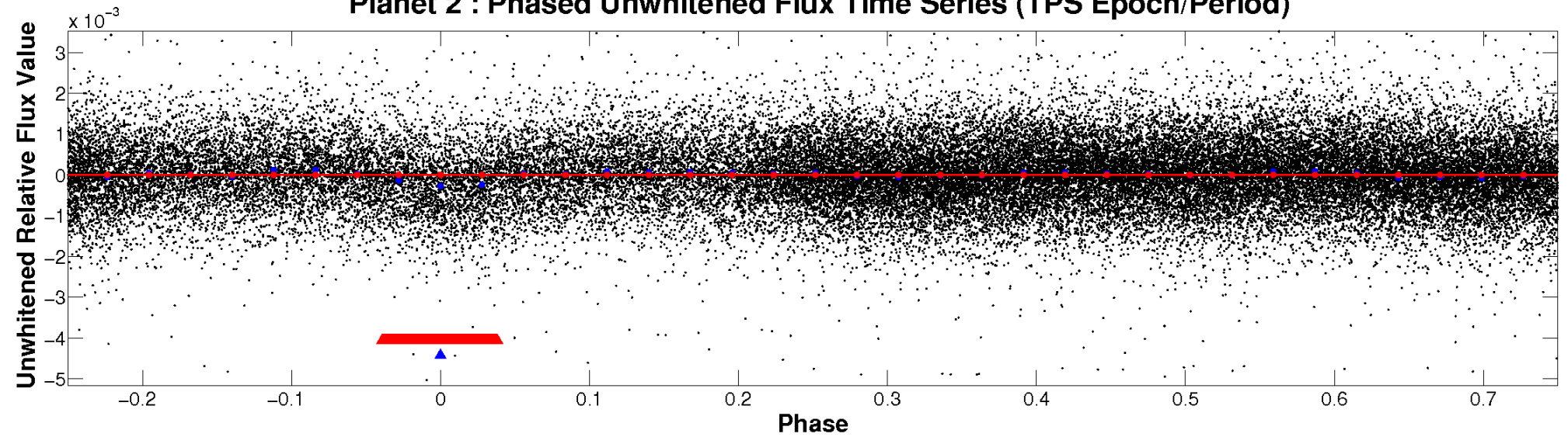
ALT Odd/Even

TCE 003228918-02



# Non-Whitened Vs. Whitened Light Curve

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

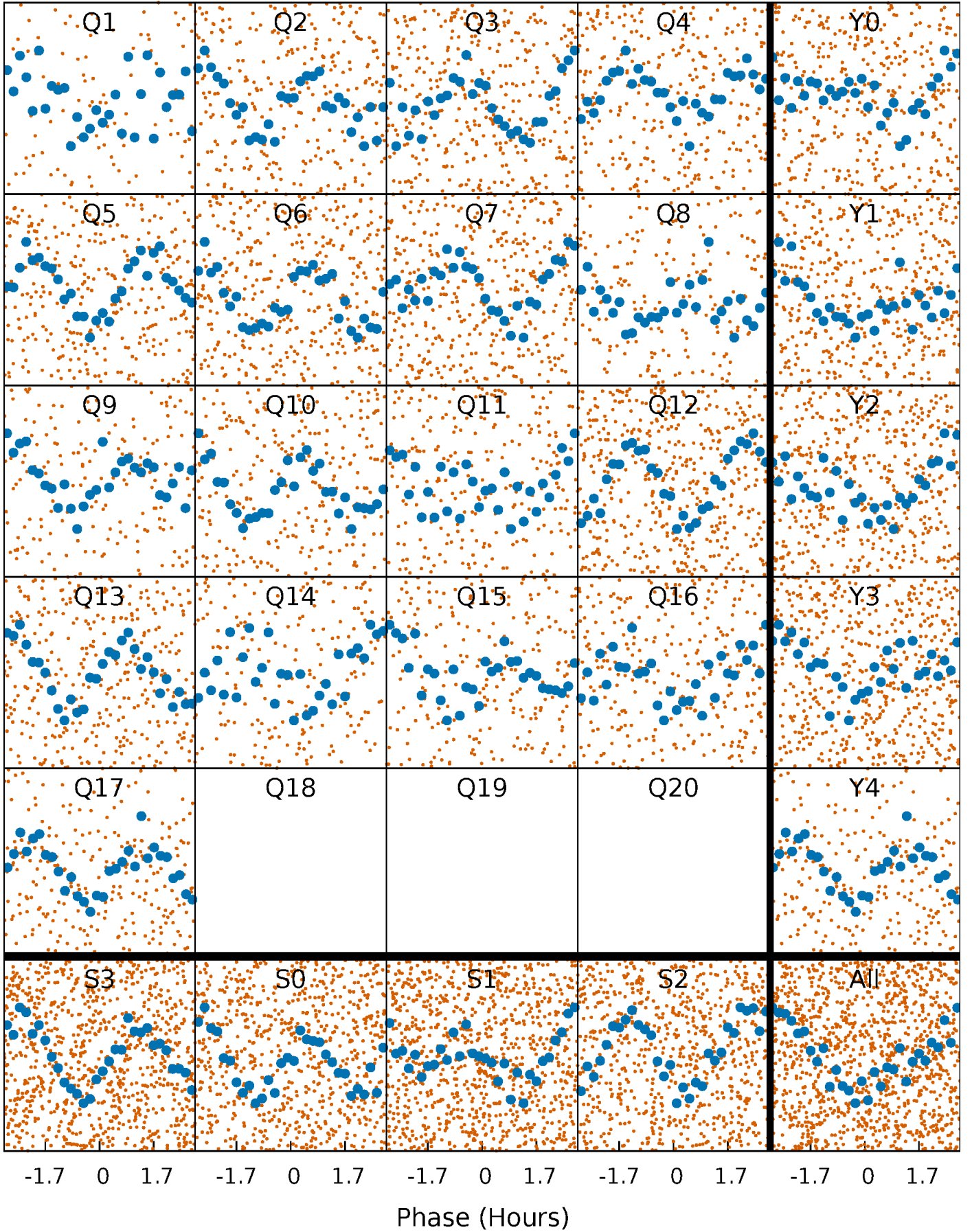


**Planet 2 : Phased Whitened Flux Time Series (TPS Epoch/Period)**



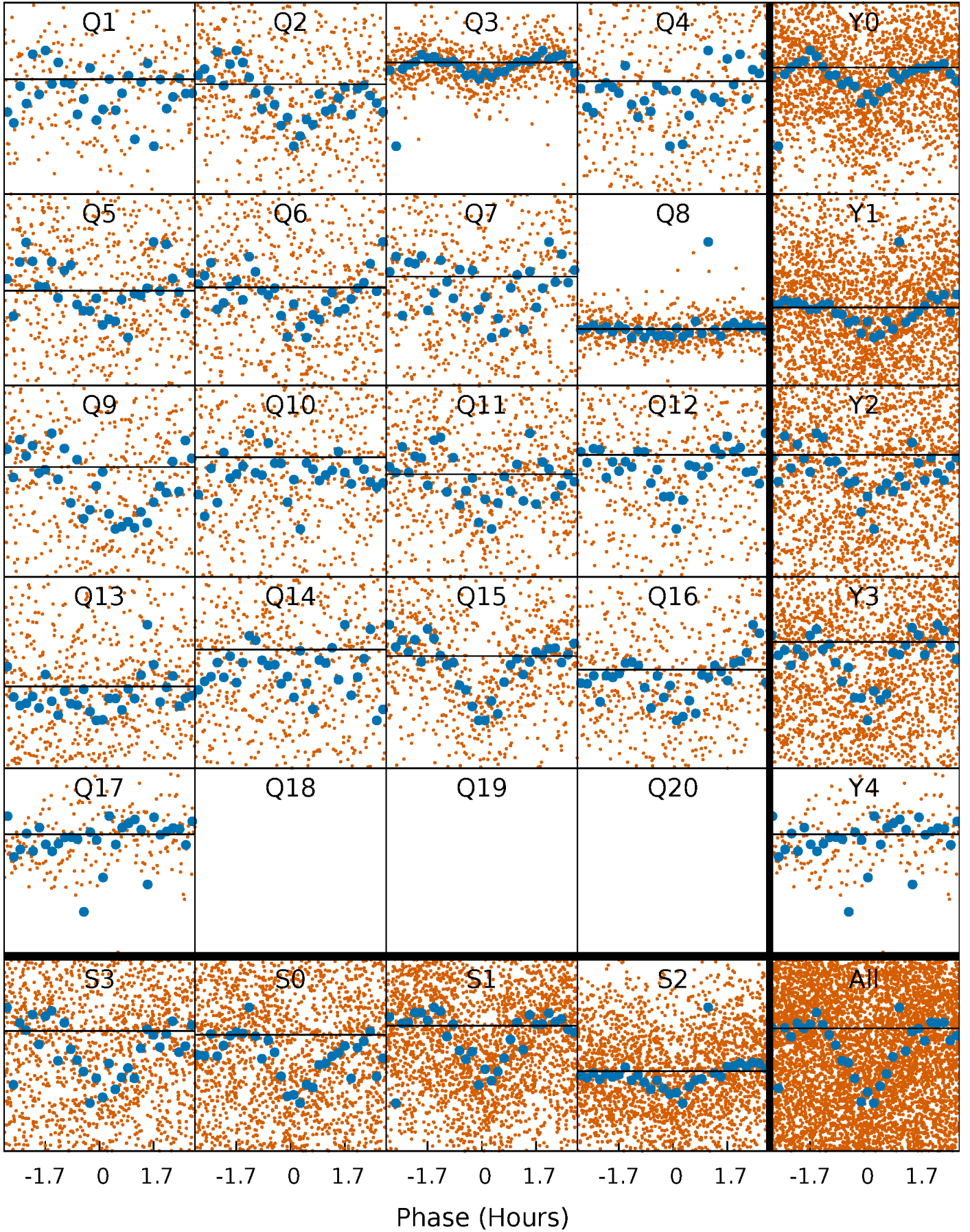
# PDC Quarter-Phased Transit Curves

TCE 003228918-02   P= 0.730952 Days    $T_0=132.214119$  (BKJD)



# DV Quarter-Phased Transit Curves

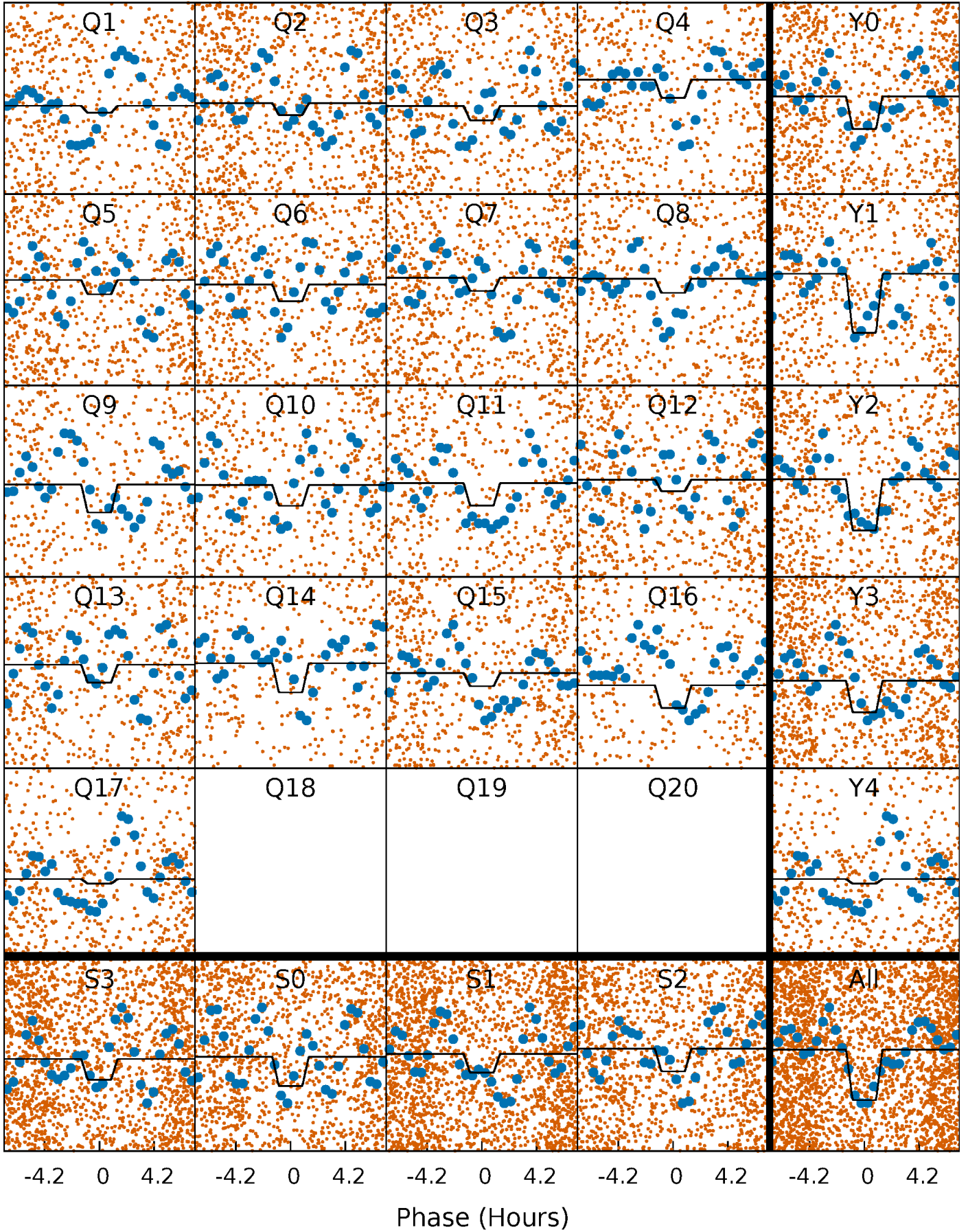
TCE 003228918-02   P= 0.730952 Days    $T_0=132.214119$  (BKJD)





# Alt. Detrend Quarter-Phased Transit Curves

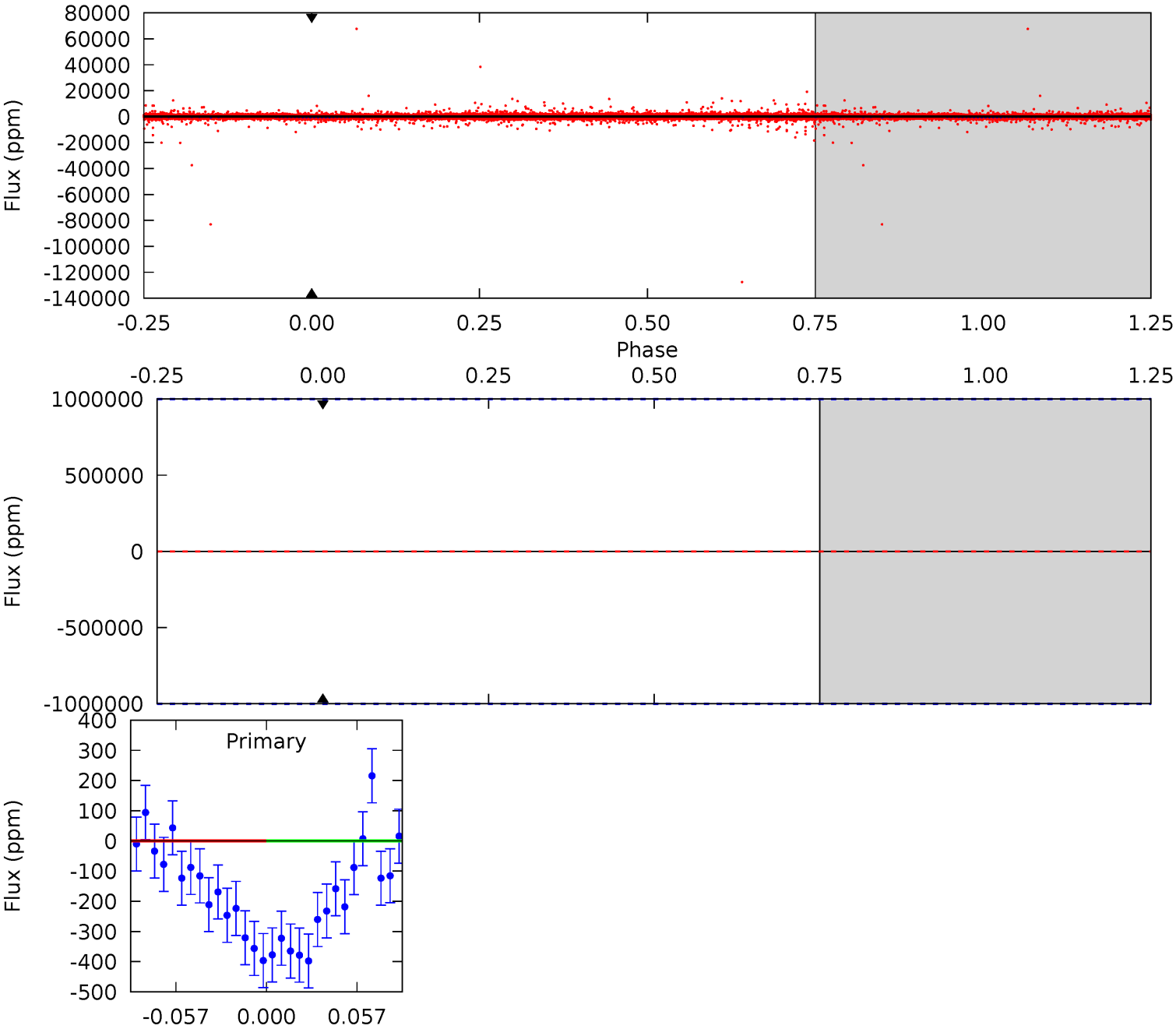
TCE 003228918-02   P= 0.730952 Days    $T_0=132.185278$  (BKJD)



# DV Model-Shift Uniqueness Test

003228918-02, P = 0.730952 Days, E = 131.483167 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	0	0	0	1.00	1.00	1.00	0	0	0	0	0	0	0	0

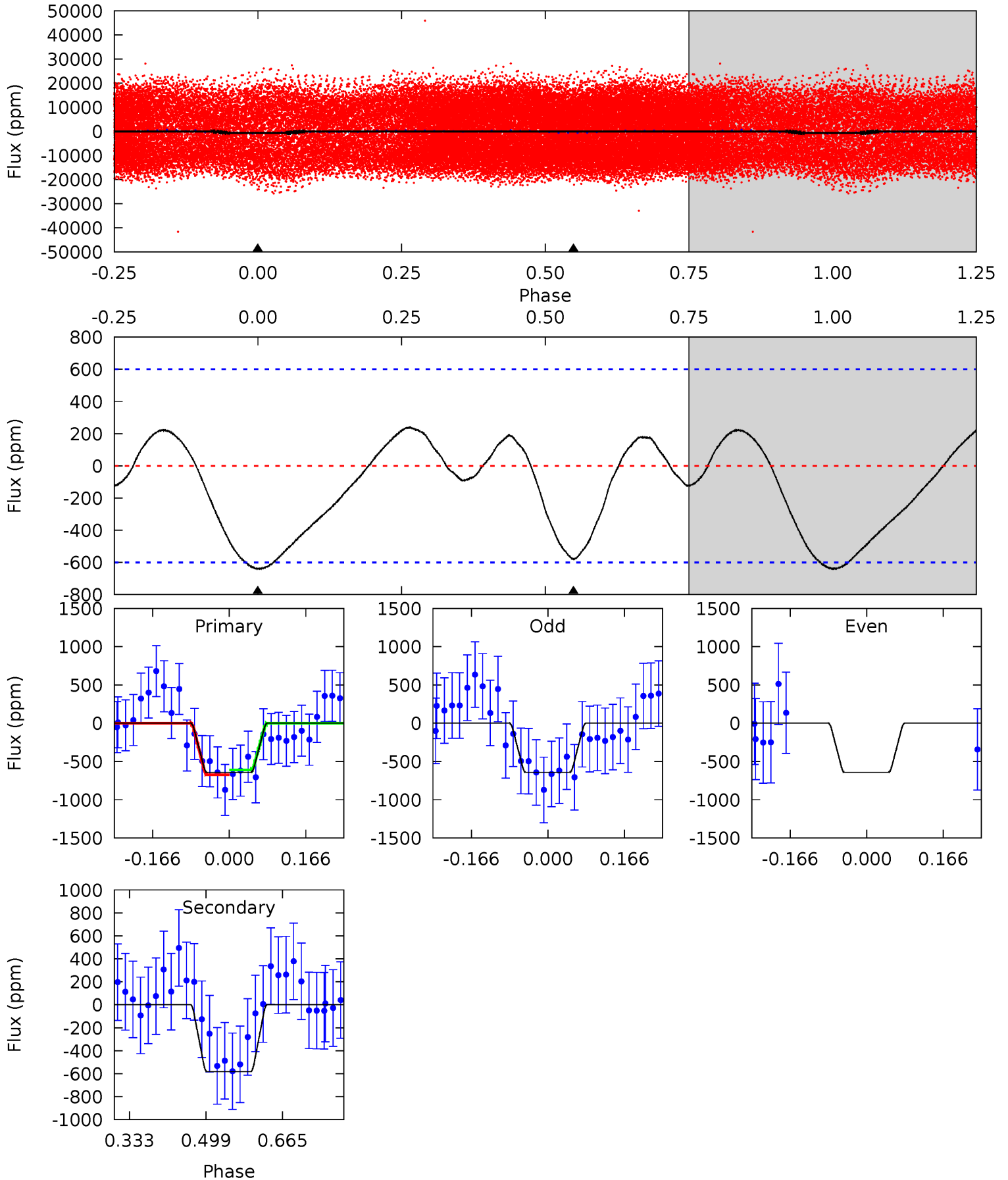




# Alt Model-Shift Uniqueness Test

003228918-02, P = 0.730952 Days, E = 131.454326 Days

Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
4.77	4.31	0	0	4.46	1.38	0.88	4.77	4.77	4.31	4.31	0	0.73	0.27	0.22



### Stellar Parameters For KIC 003228918

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$5853^{+143}_{-184}$	$4.529^{+0.048}_{-0.192}$	$-0.100^{+0.250}_{-0.300}$	$0.895^{+0.243}_{-0.087}$	$0.990^{+0.104}_{-0.127}$	$1.941^{+0.378}_{-0.941}$
	+2%/-3%	+1%/-4%	+250%/-300%	+27%/-10%	+11%/-13%	+19%/-48%
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 003228918-02 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$0 \pm 1000000$	$9.47^{+8.54}_{-6.12}$	$2776^{+171}_{-124}$	$4822^{+10956}_{-20056}$	$5.577^{+232.776}_{-210.972}$
Alt.	$-581 \pm 135$	$7.61^{+8.13}_{-5.25}$	$2773^{+154}_{-130}$	$3596^{+2369}_{-1758}$	$1.358^{+12.621}_{-1.054}$

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

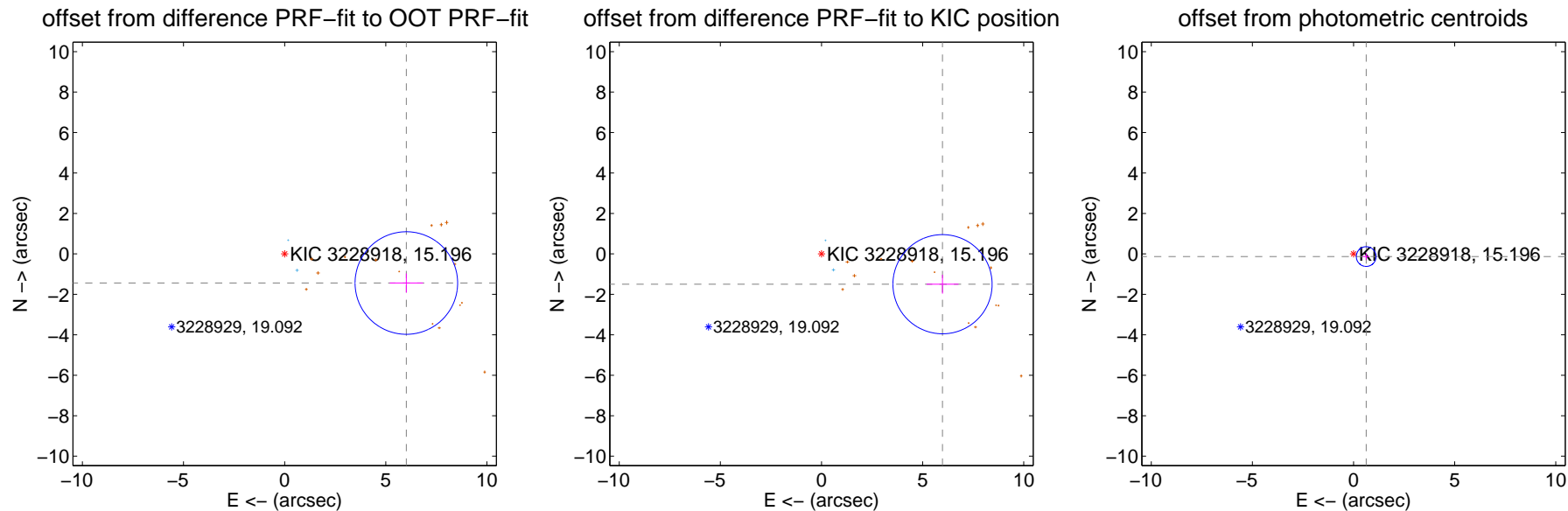
## DV Centroid Data

Supplemental centroid analysis for 003228918-02. Kepler magnitude: 15.20. Transit SNR -1.00

There are 2 quarters with good PRF difference image offsets

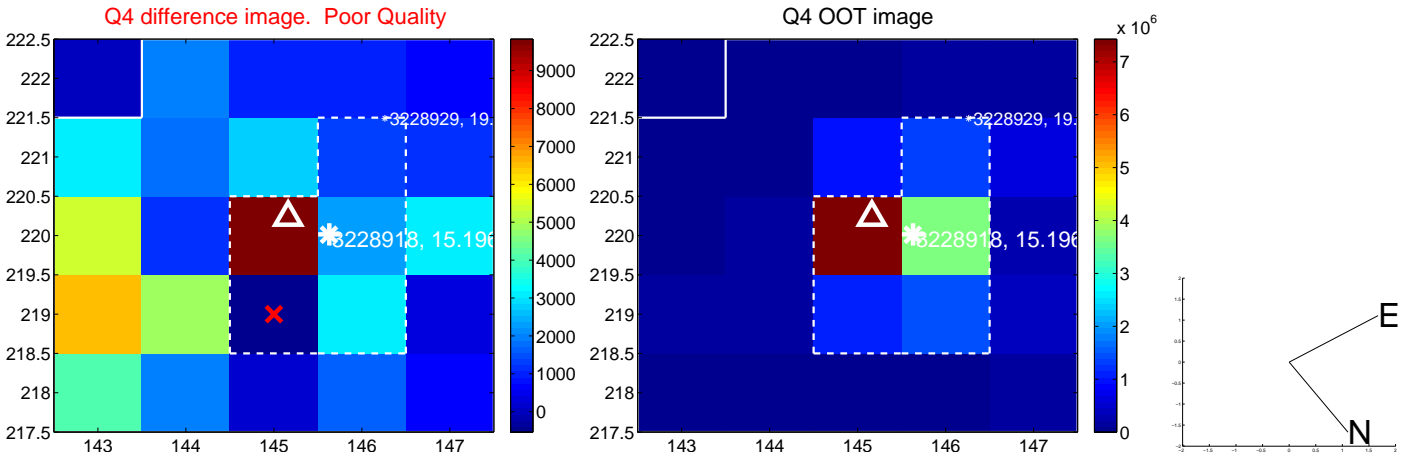
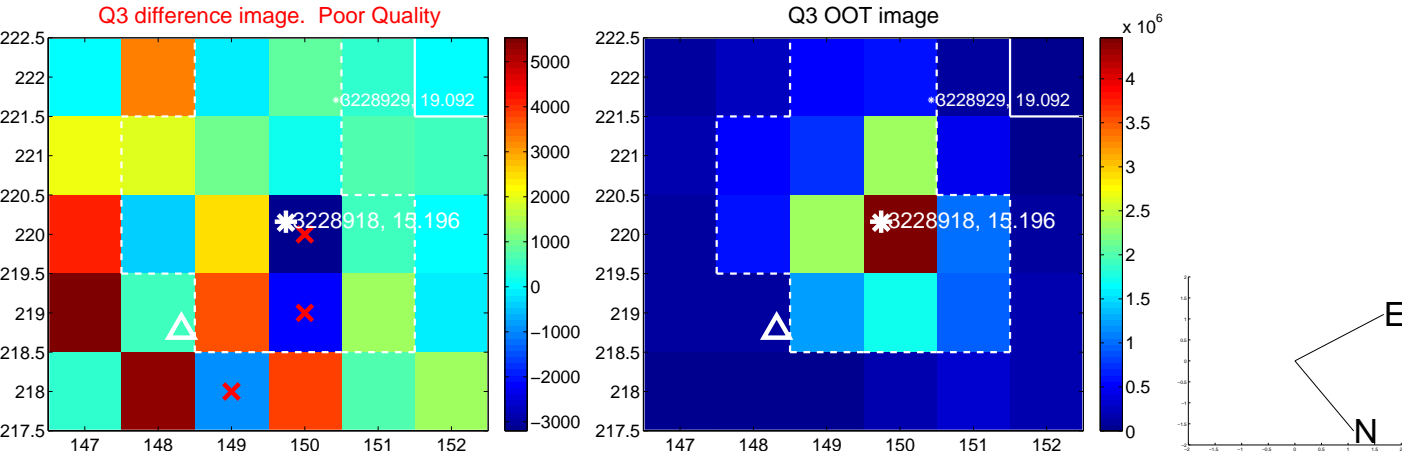
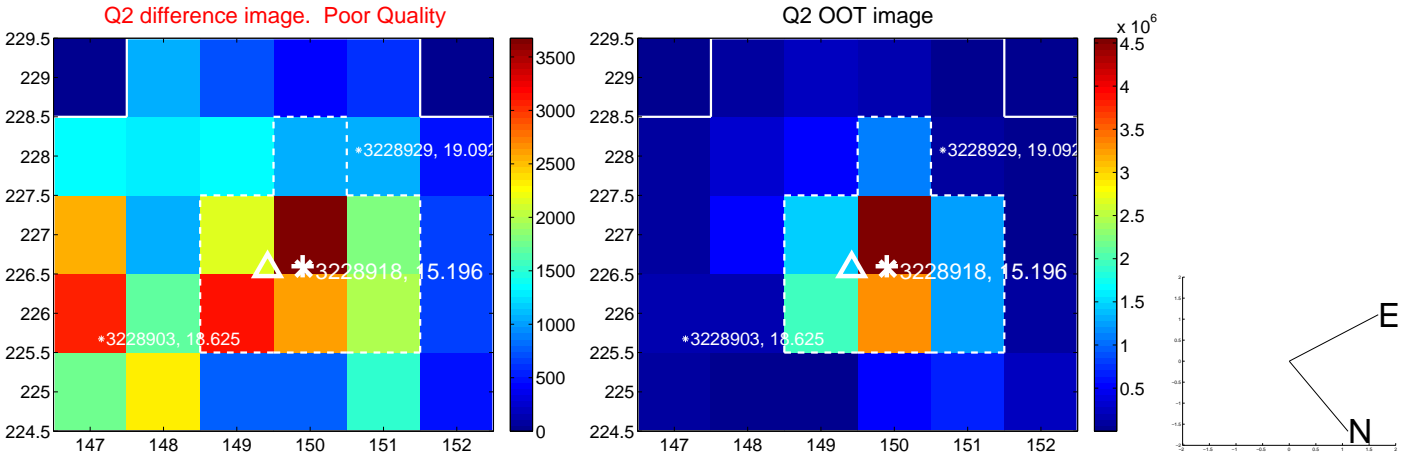
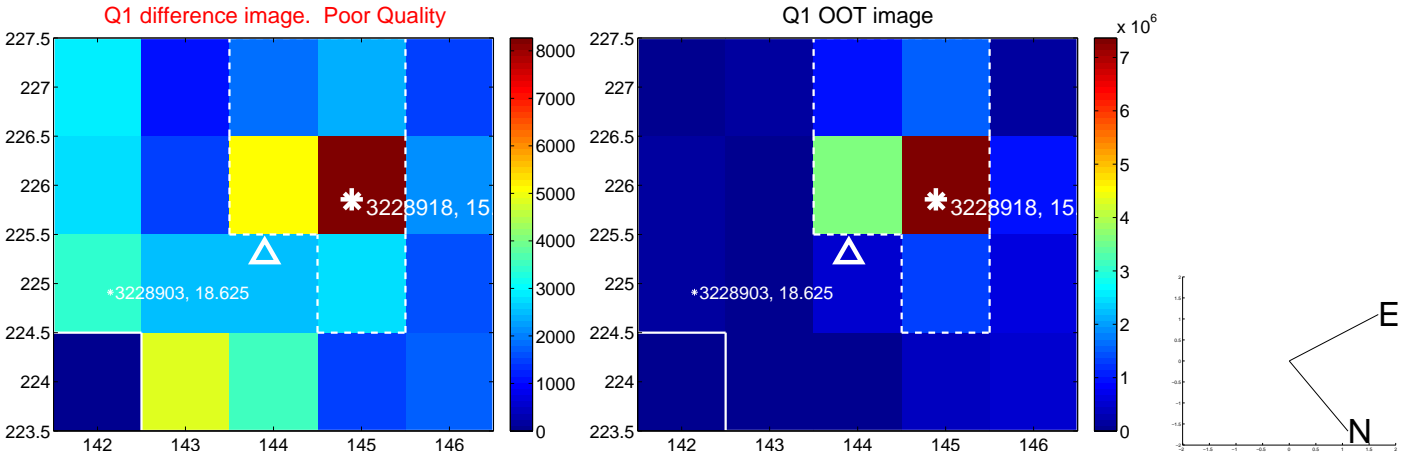
The direct PRF centroid is offset from the target star catalog position by about 0.02 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$6.187 \pm 0.845$	7.32	$-6.017 \pm 0.825$	$-1.440 \pm 0.473$
PRF-fit source offset from KIC position	$6.168 \pm 0.817$	7.55	$-5.983 \pm 0.792$	$-1.498 \pm 0.465$
photometric centroid source offset	$0.64 \pm 0.16$	3.93	$-0.63 \pm 0.16$	$-0.13 \pm 0.17$

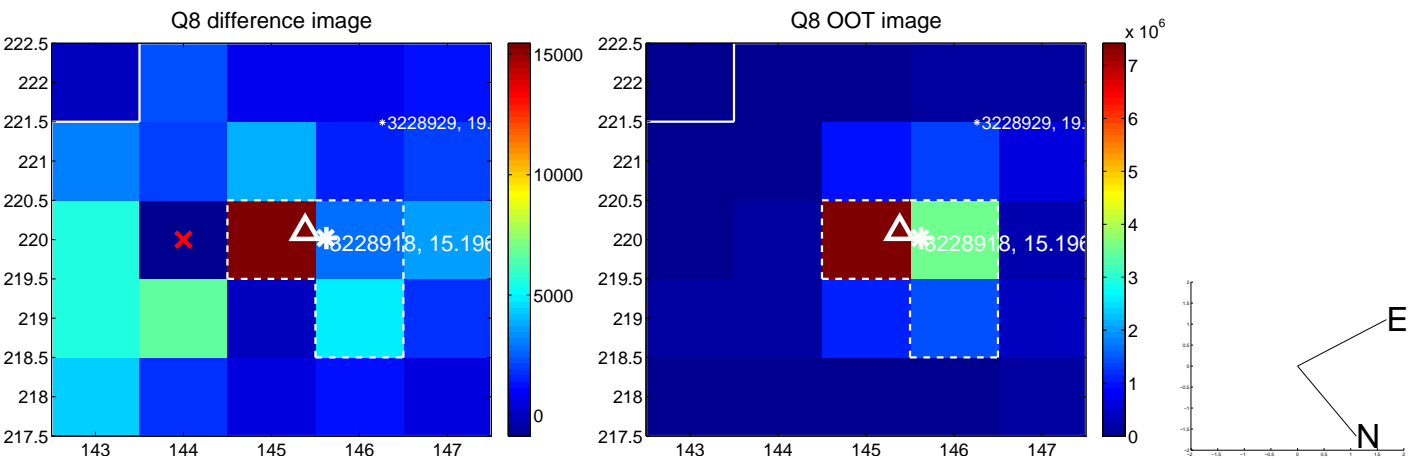
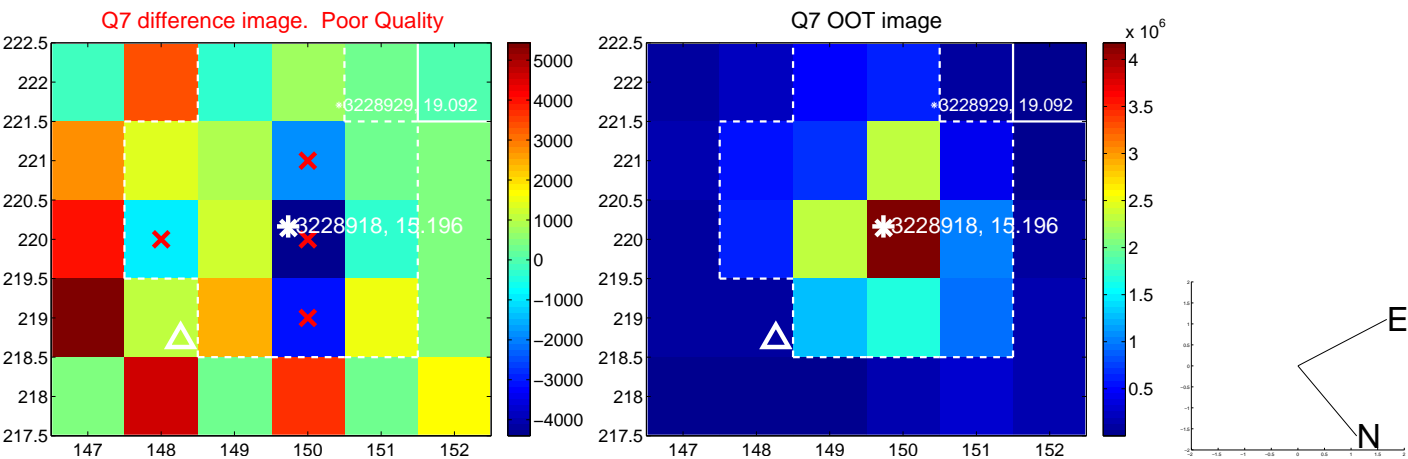
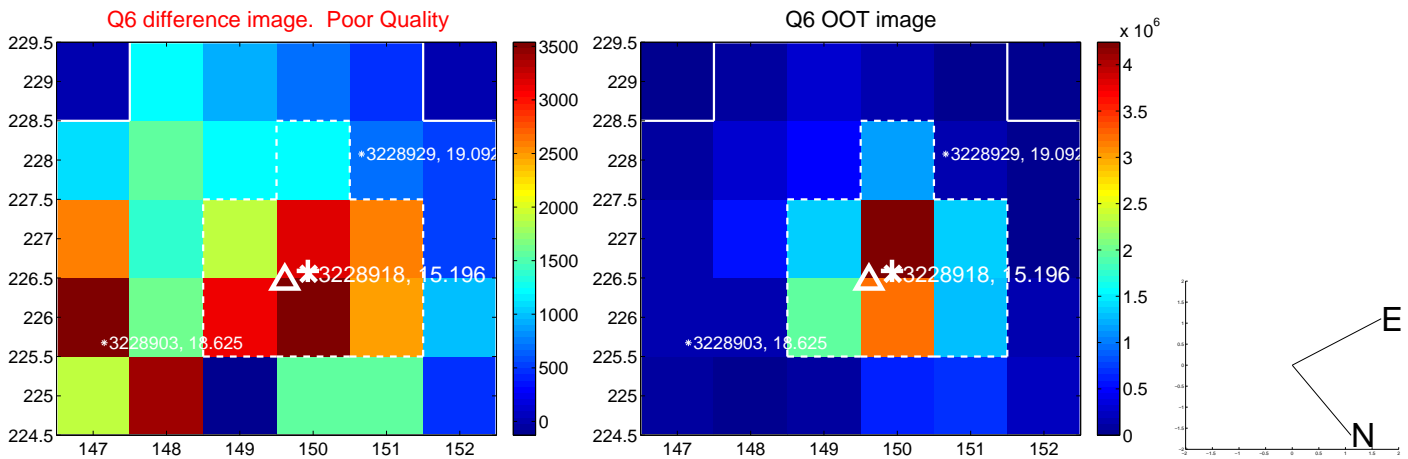
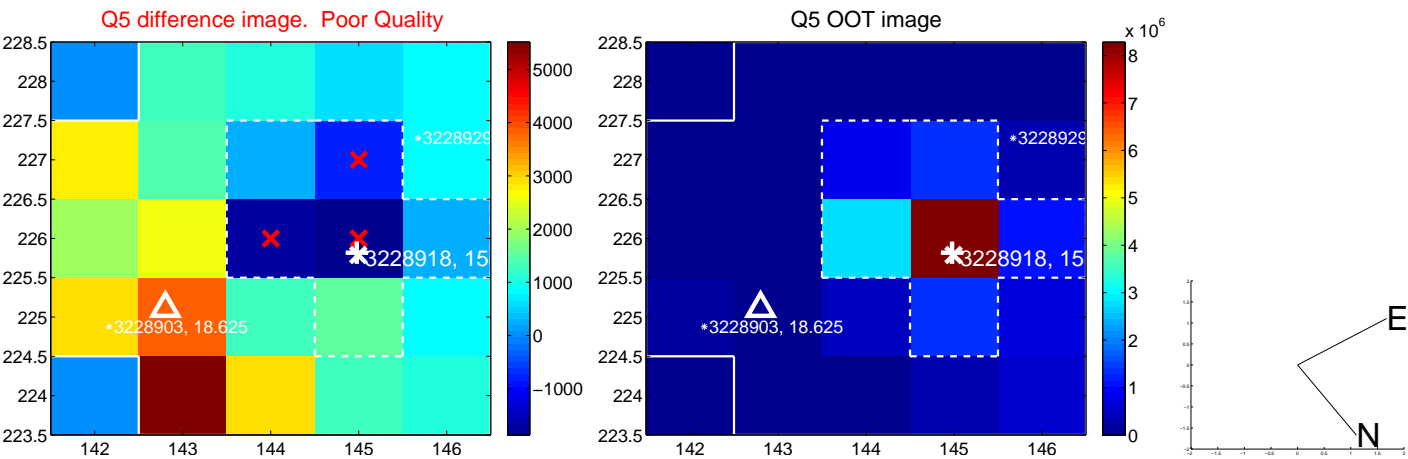


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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

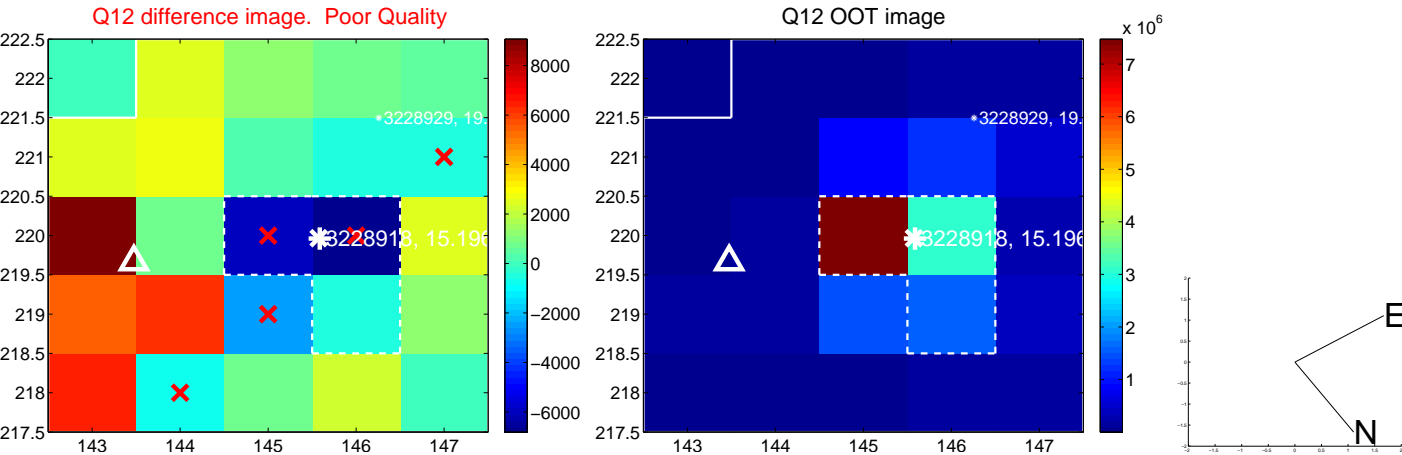
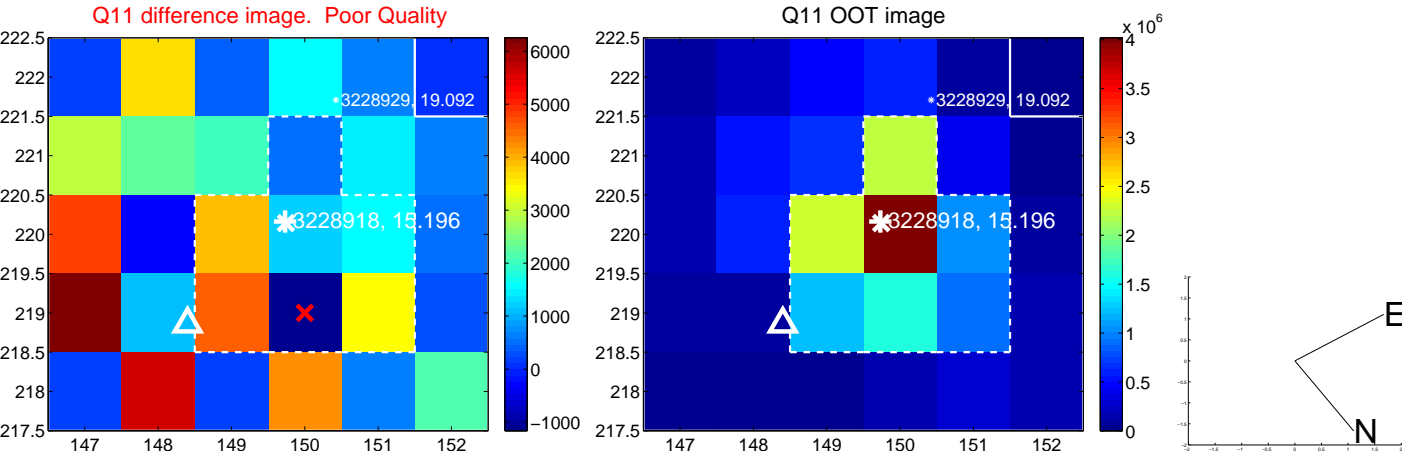
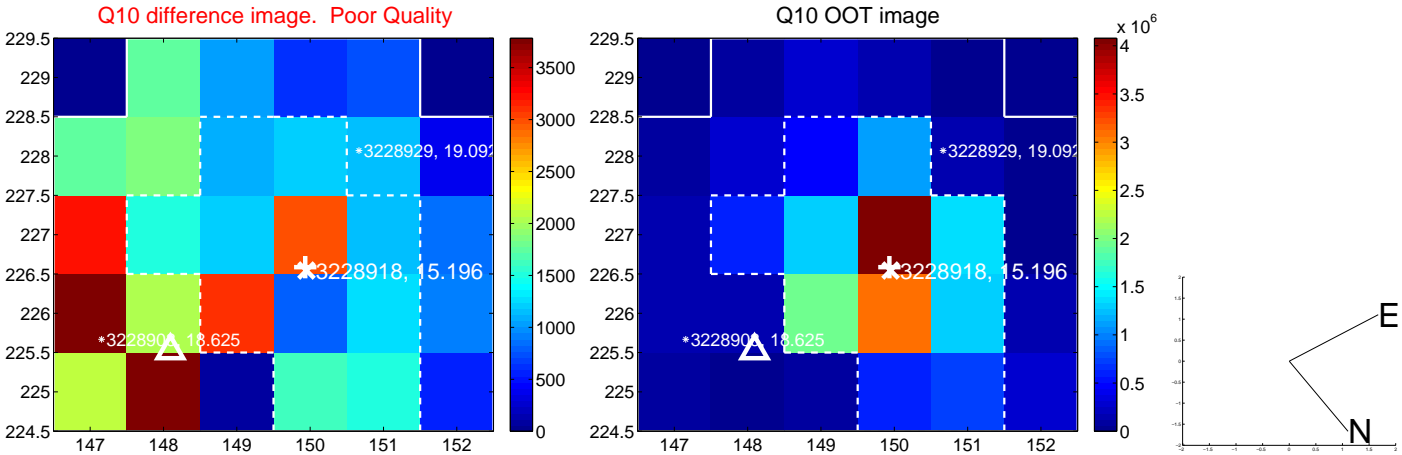
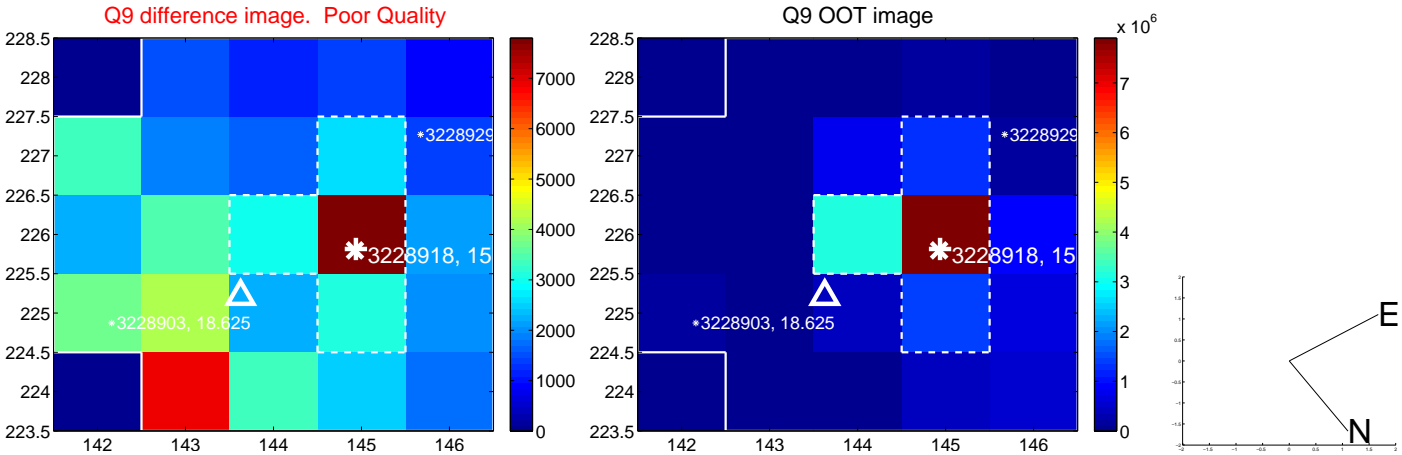
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



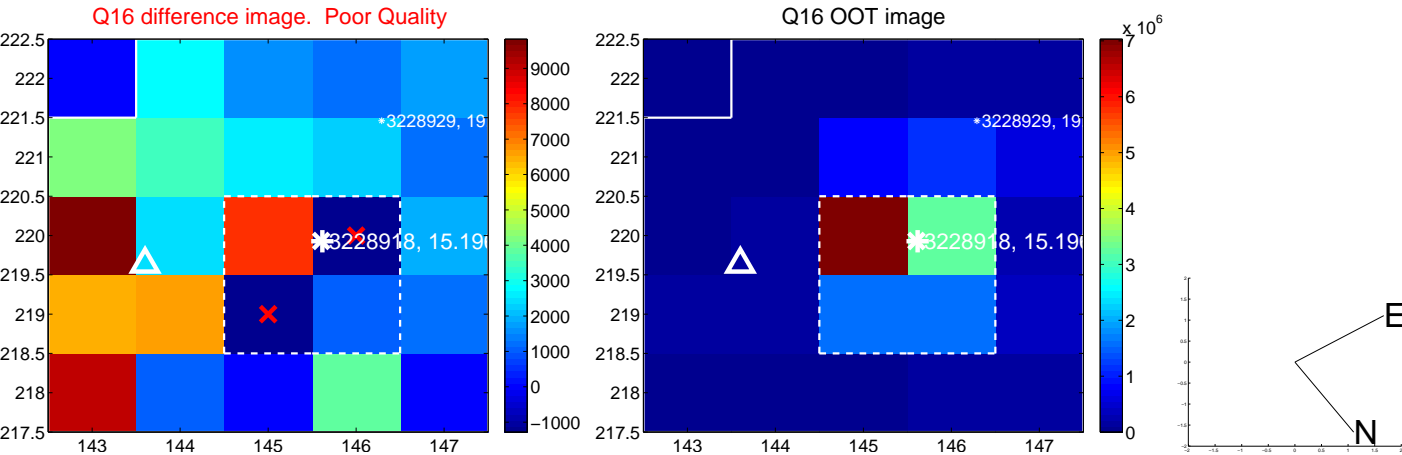
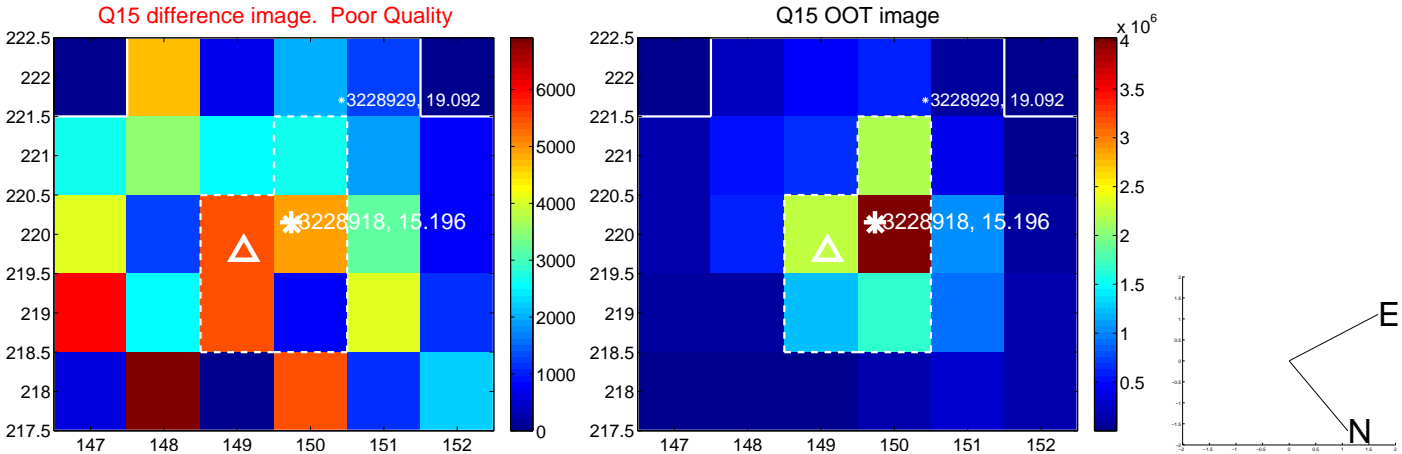
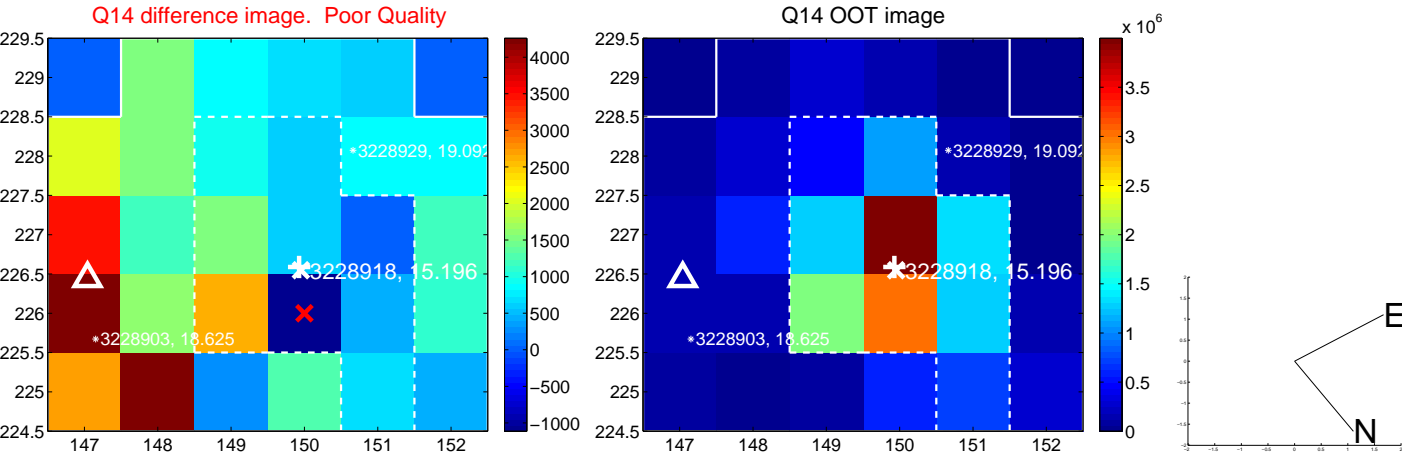
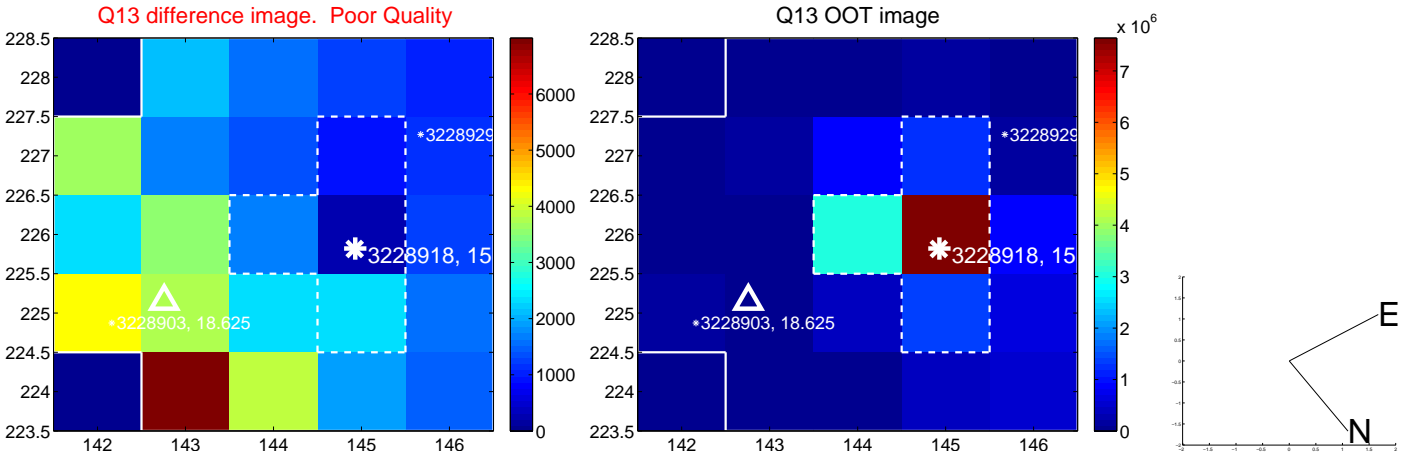
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

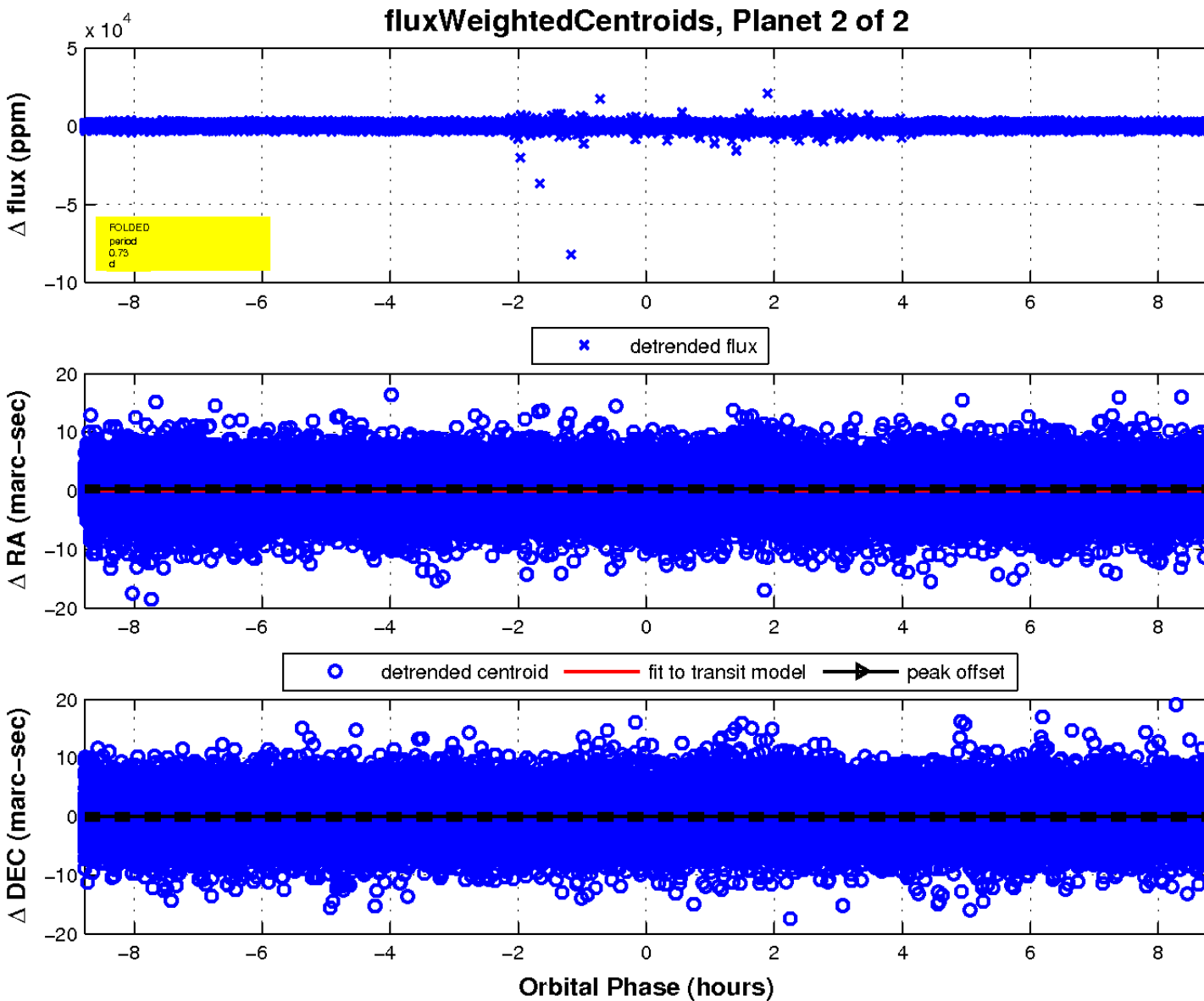
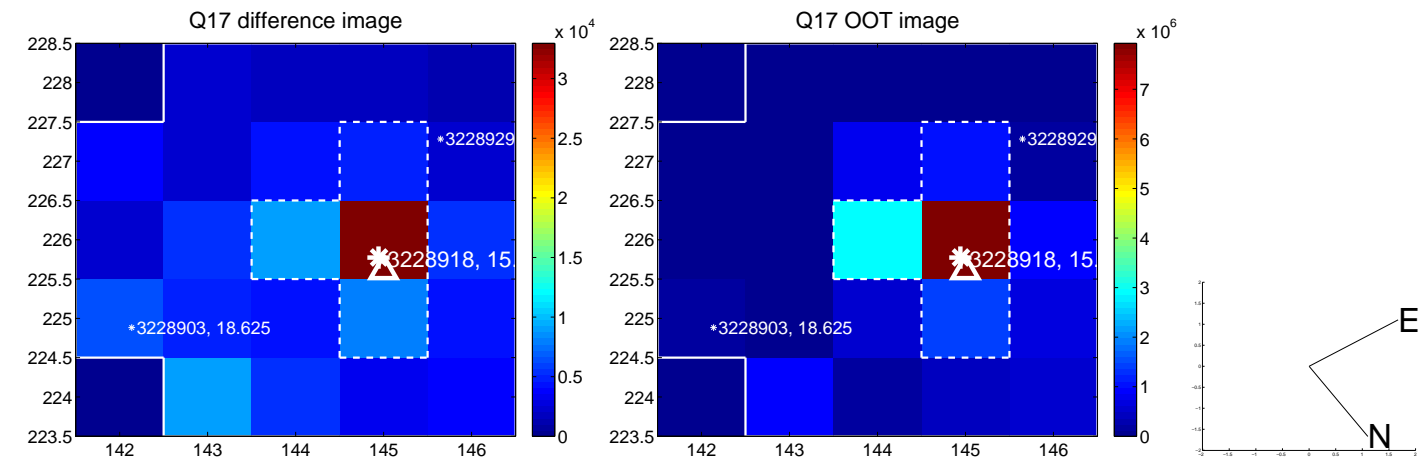


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.





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



UKIRT Image

Declination

