

# KIC 002304235

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
002304235-01	OBS	No	0.570607	132.049211	75.1	1.160	17.5	20.4	26.32	4896	27.83	0.00
002304235-02	OBS	No	0.570599	131.768066	90.0	0.894	17.3	21.3	26.32	4896	26.45	0.00

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
002304235-01	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—CENT_SATURATED
002304235-02	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—SAME_NTL_PERIOD—CENT_SATURATED

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

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

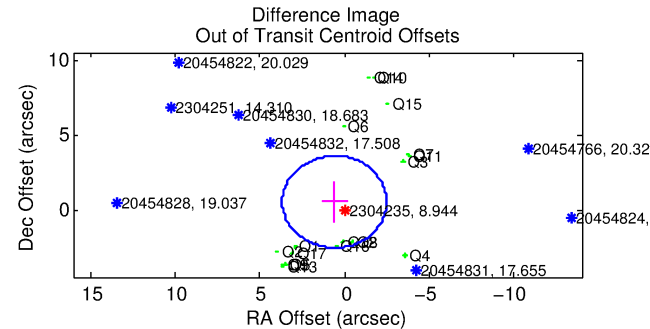
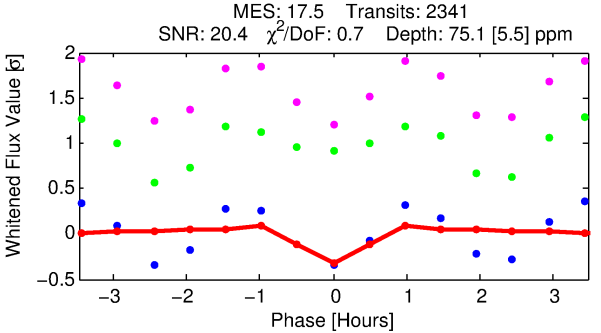
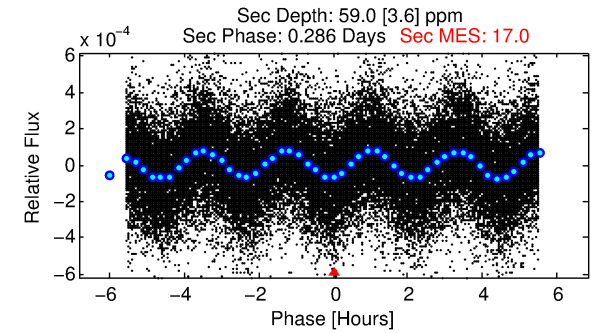
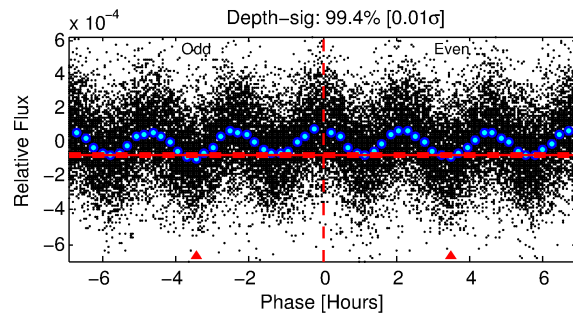
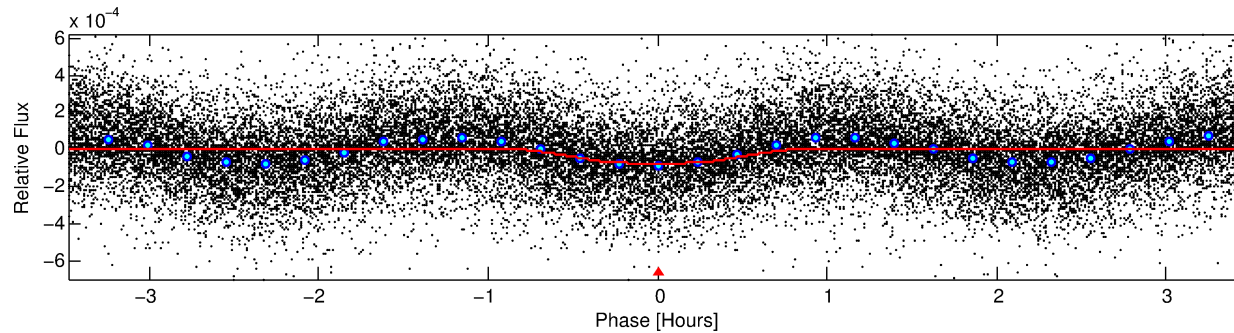
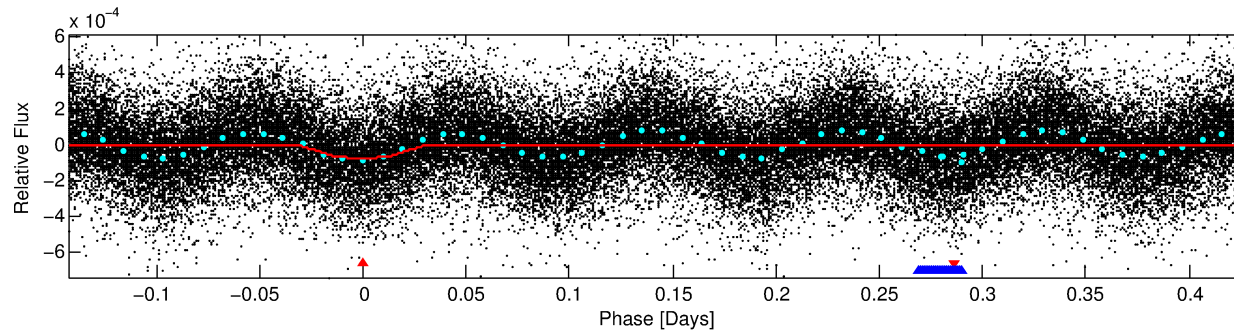
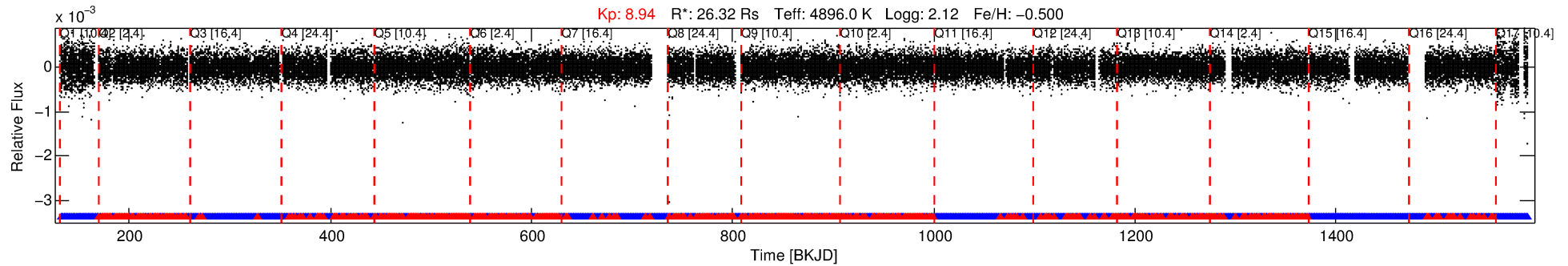
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 002304235-01

No Significant Match Found

# DV One-Page Summary

KIC: 2304235 Candidate: 1 of 2 Period: 0.571 d



## DV Fit Results:

Period = 0.57061 [0.00001] d  
Epoch = 132.0492 [0.0007] BKJD  
Rp/R\* = 0.0097 [0.0029]  
a/R\* = 1.96 [1.78]  
b = 0.90 [0.27]  
Seff = N/A  
Teq = N/A  
Rp = 27.83 [20.18] Re  
a = N/A  
Ag = N/A  
Teffp = N/A

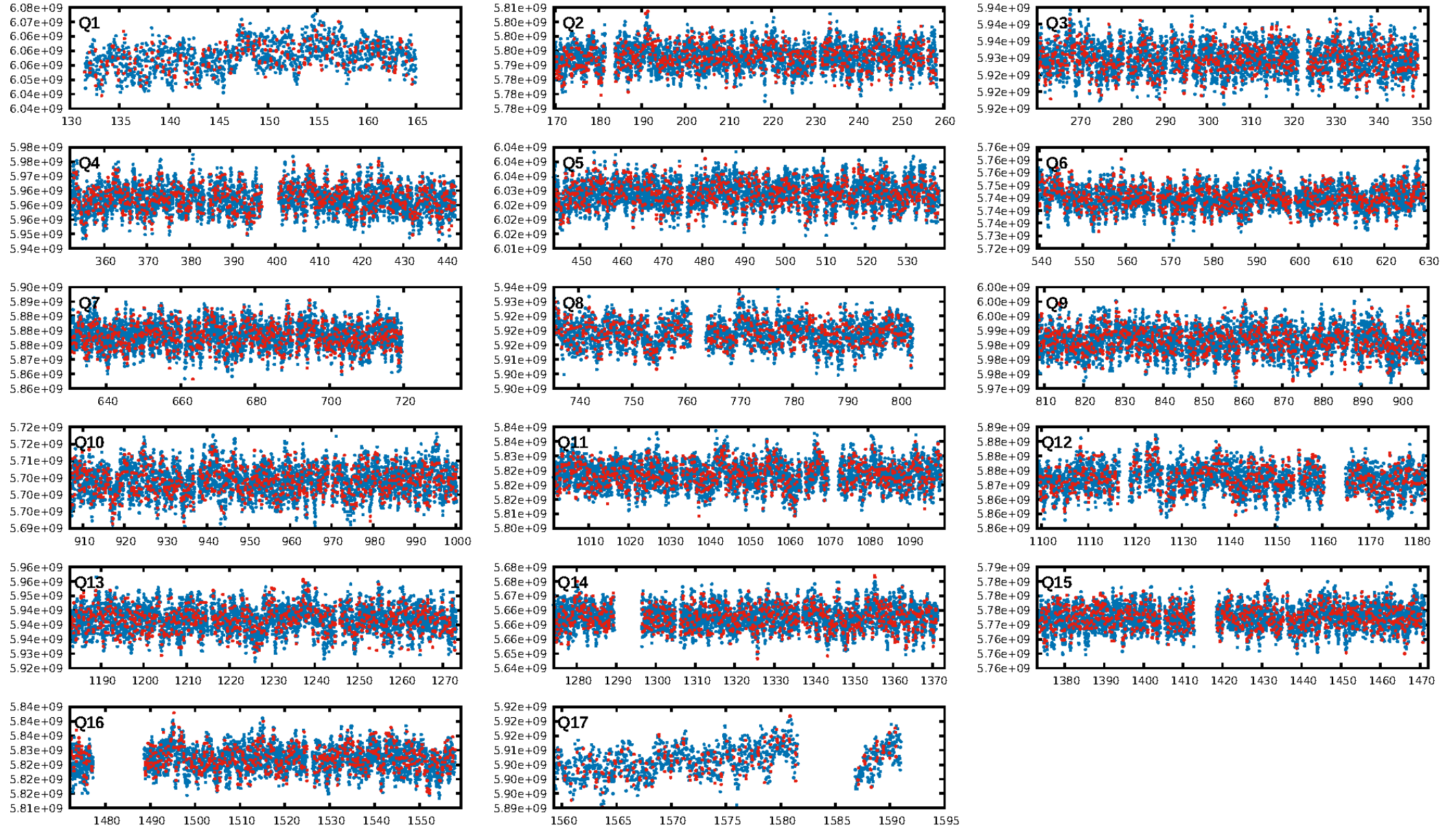
## DV Diagnostic Results:

ShortPeriod-sig: 0.0% [0.00σ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: 3.97e-111  
RollingBand-fgt: 0.75 [1674/2236]  
GhostDiagnostic-chr: N/A  
Centroid-sig: 0.6%  
Centroid-so: 1.601 arcsec [7.54σ]  
OotOffset-rm: 0.786 arcsec [0.77σ]  
KicOffset-rm: 1.654 arcsec [1.43σ]  
OotOffset-st: 4/4/4/5 [17]  
KicOffset-st: 4/4/4/5 [17]  
DiffImageQuality-fgm: 0.00 [0/17]  
DiffImageOverlap-fno: 1.00 [17/17]

Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 01-Feb-2016 08:24:00 Z

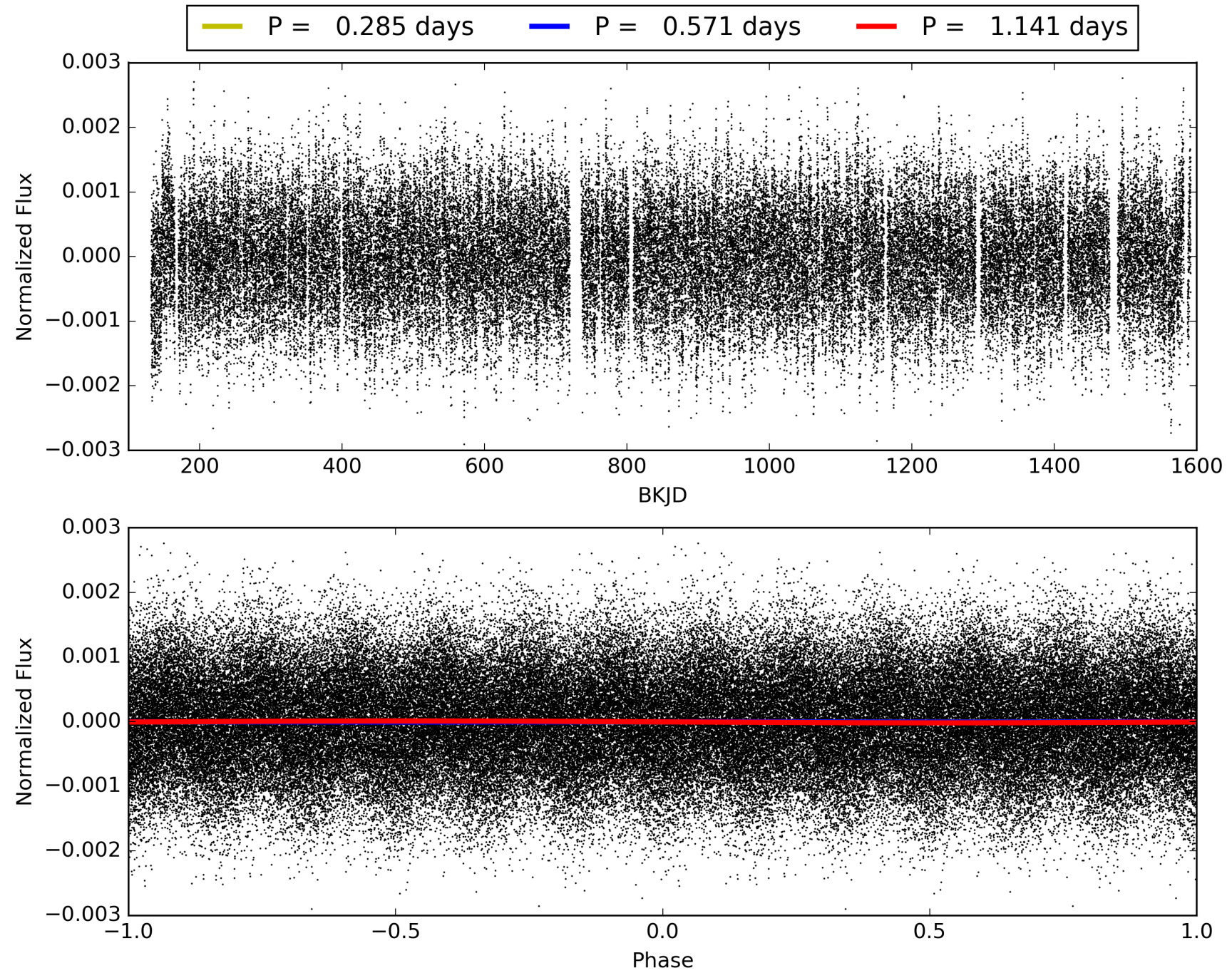
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

# TCE 002304235-01, PDC Light Curves



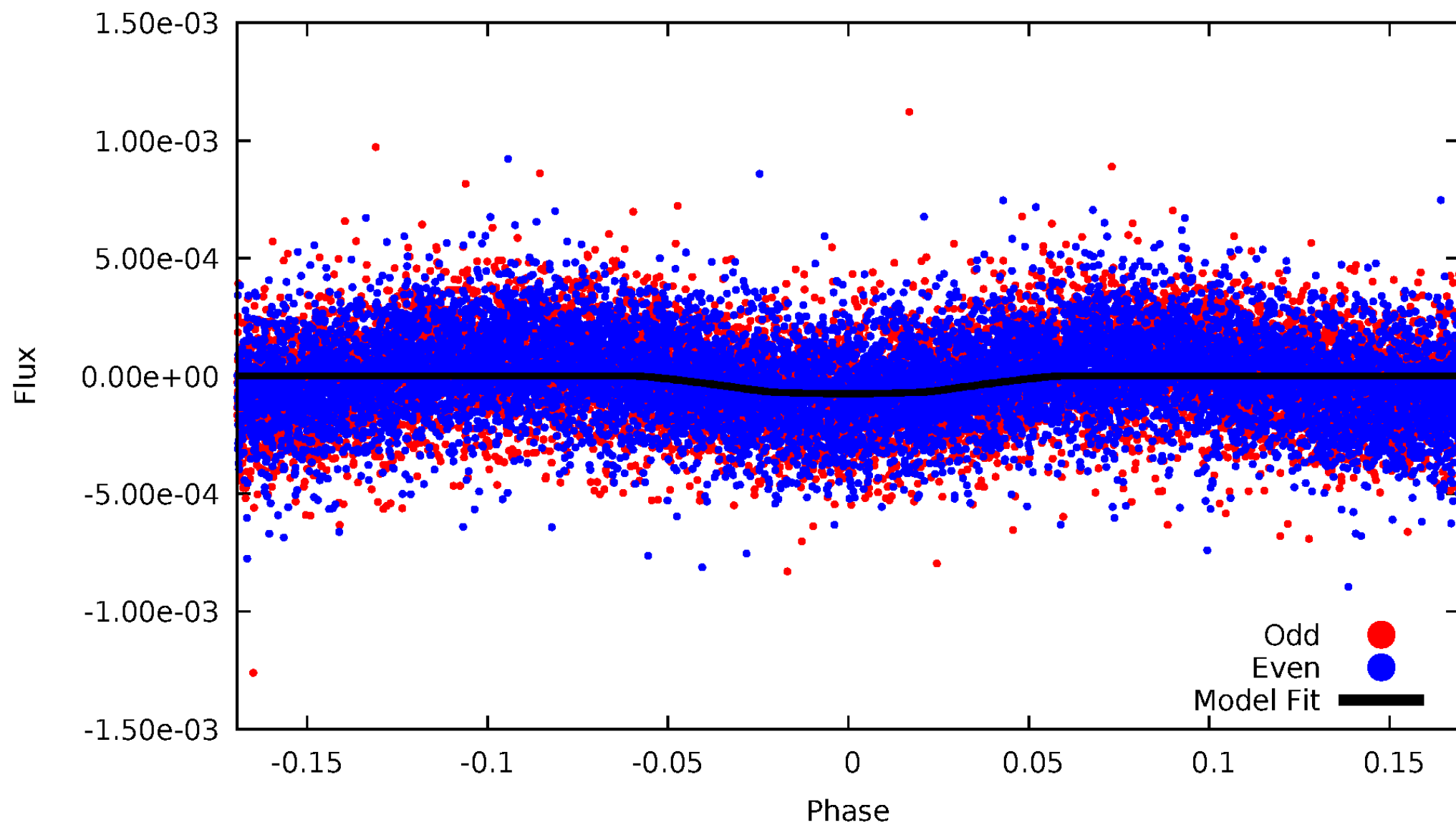


TCE 002304235-01



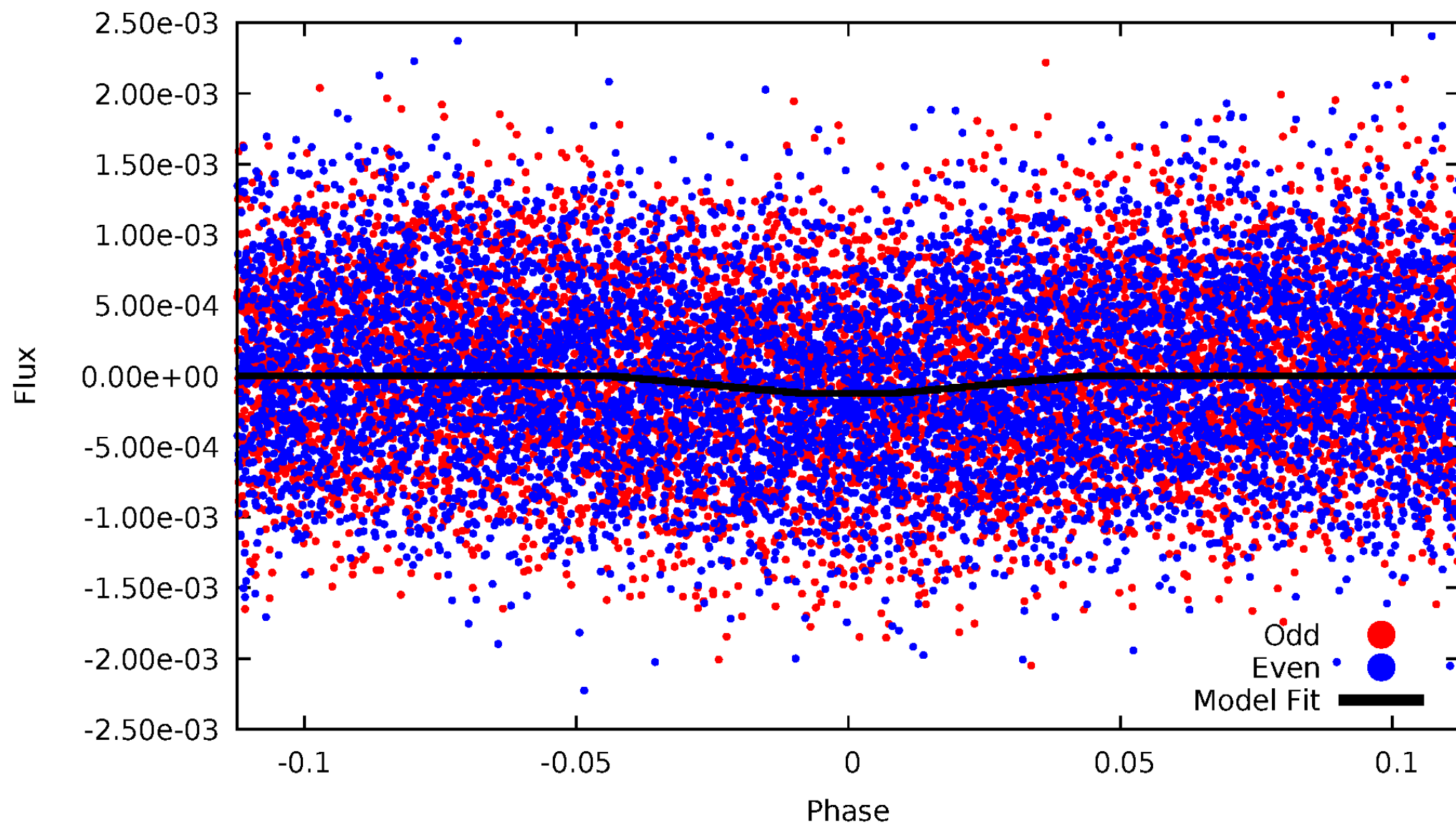
# DV Odd/Even

TCE 002304235-01



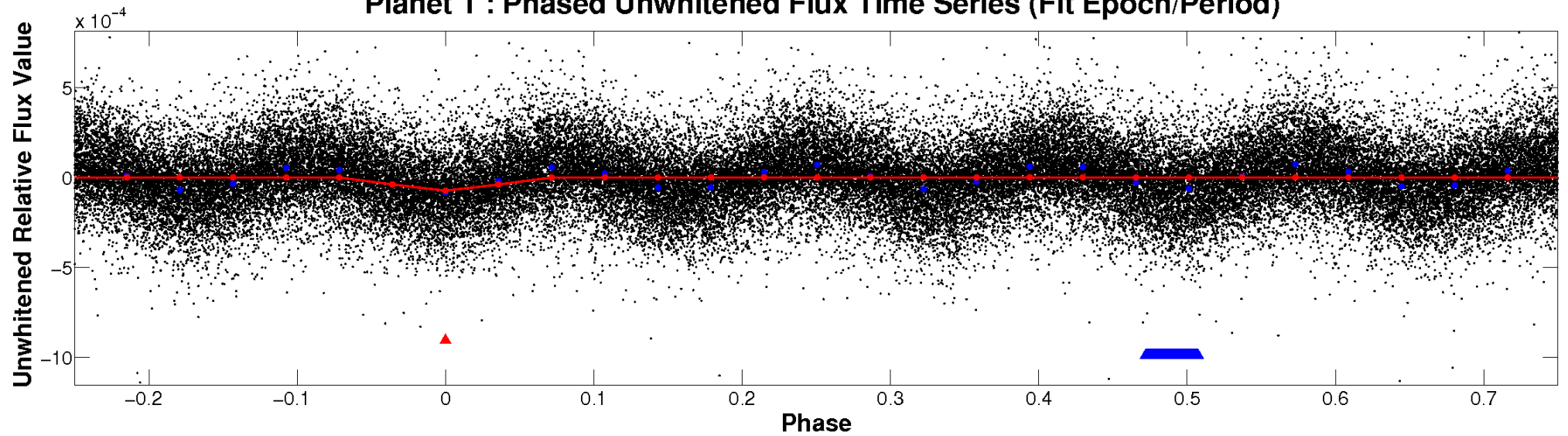
# ALT Odd/Even

TCE 002304235-01

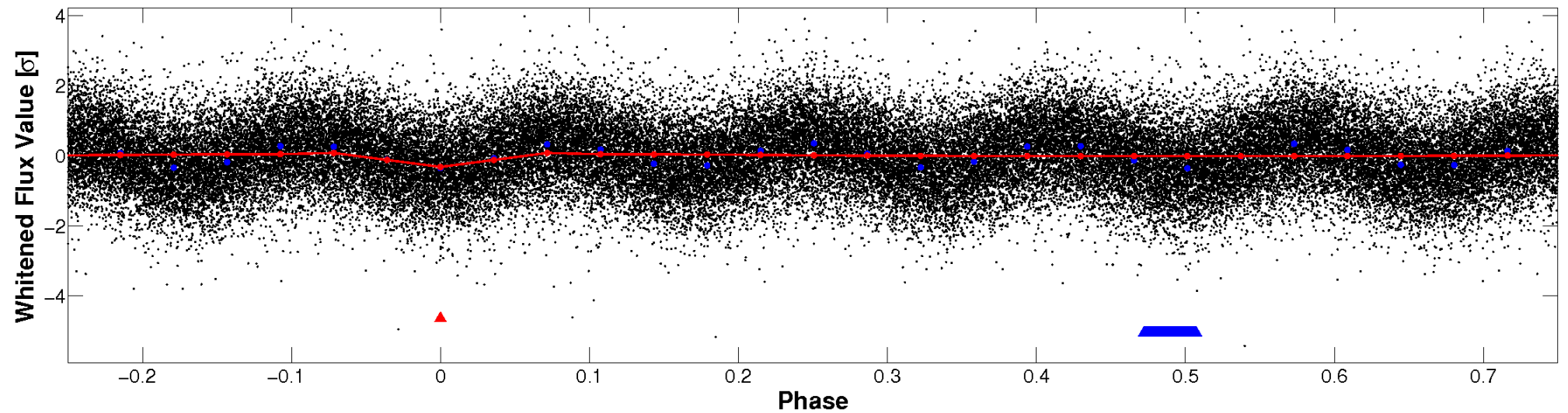


# Non-Whitened Vs. Whitened Light Curve

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



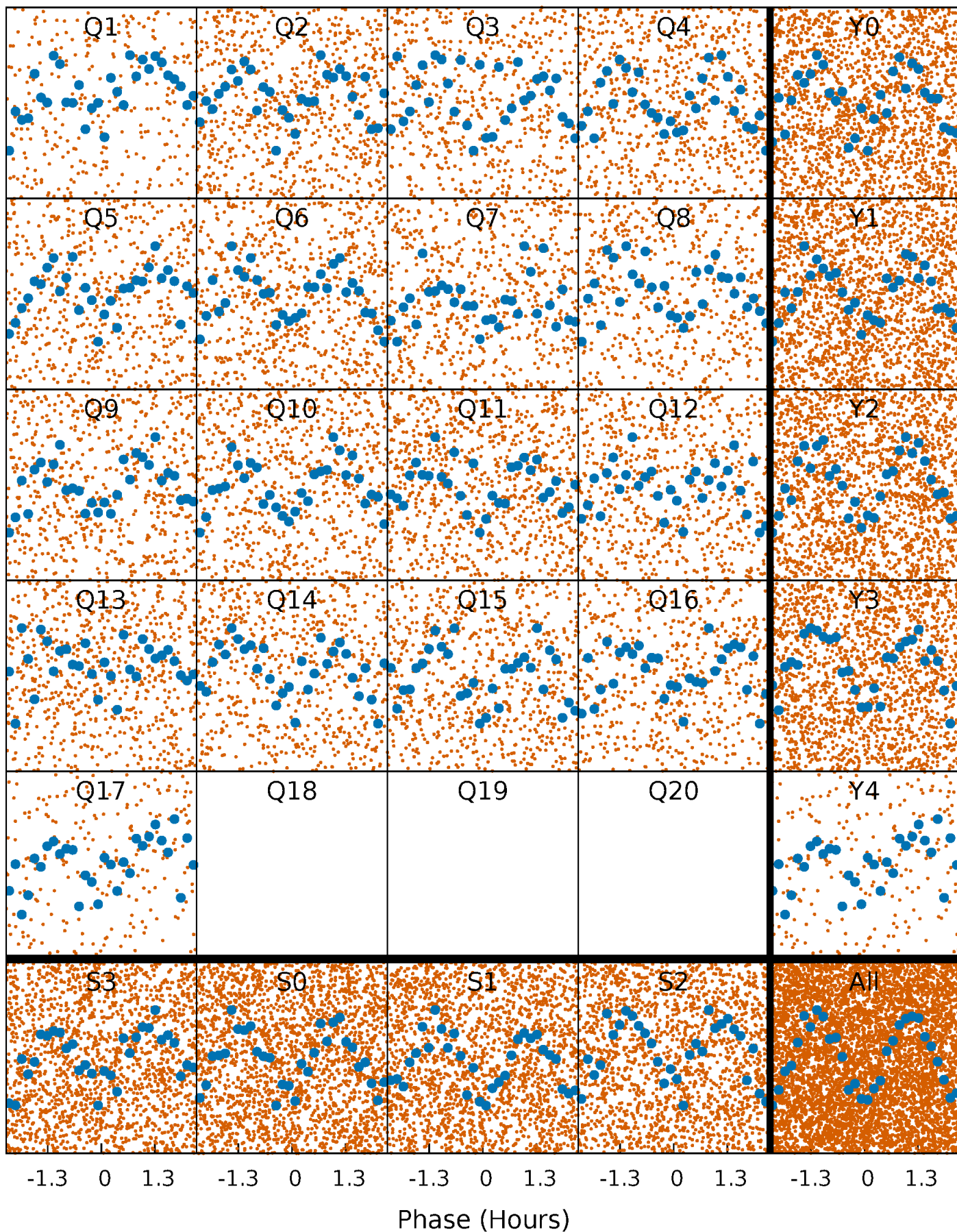
**Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)**





# PDC Quarter-Phased Transit Curves

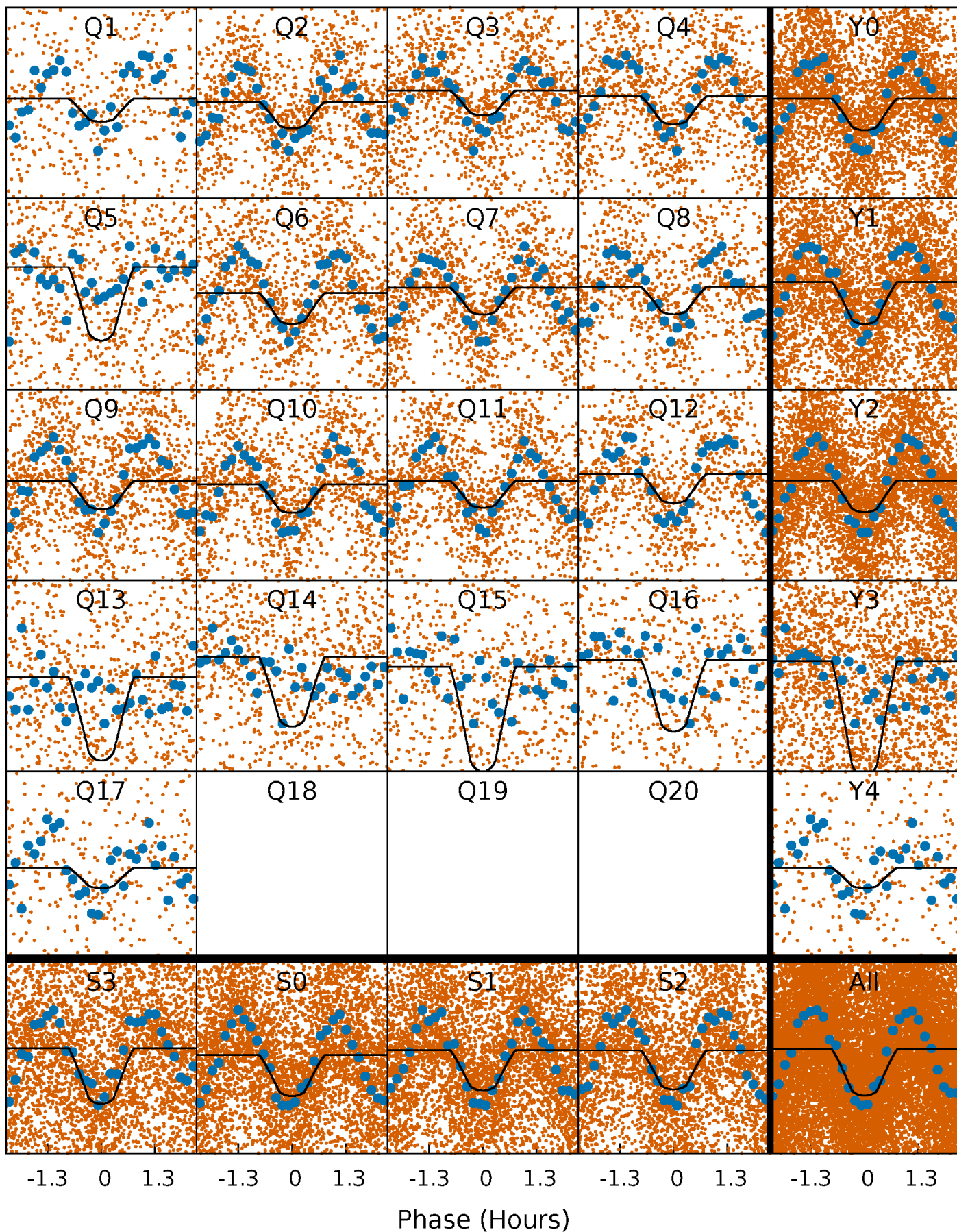
TCE 002304235-01 P= 0.570607 Days  $T_0=132.049211$  (BKJD)





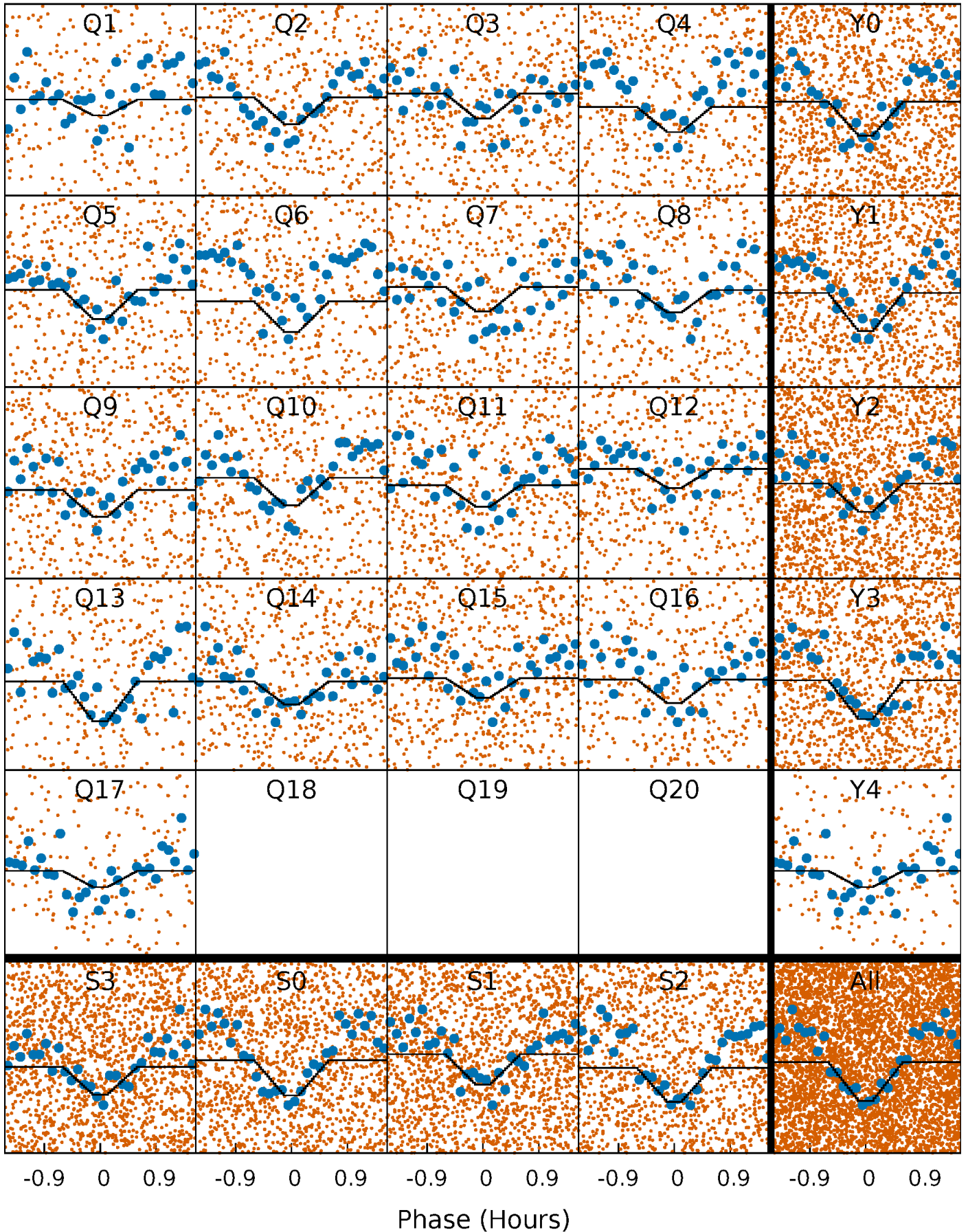
# DV Quarter-Phased Transit Curves

TCE 002304235-01 P= 0.570607 Days  $T_0=132.049211$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

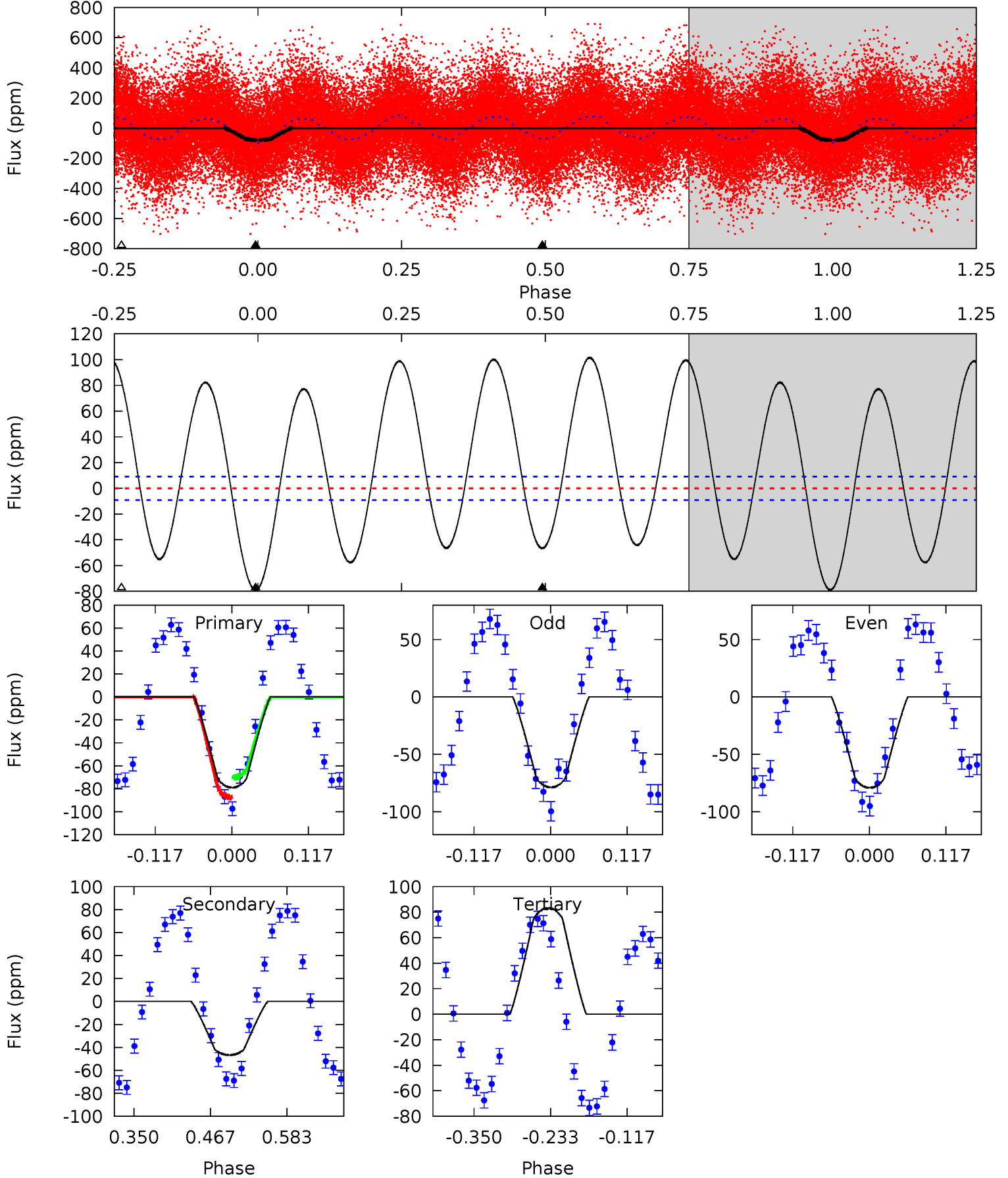
TCE 002304235-01 P= 0.570607 Days  $T_0=132.048993$  (BKJD)



# DV Model-Shift Uniqueness Test

002304235-01, P = 0.570607 Days, E = 131.478604 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
39.2	23.1	-41.3	0	4.53	1.57	24.7	80.5	39.2	64.4	23.1	0.09	0.98	0.56	4.32

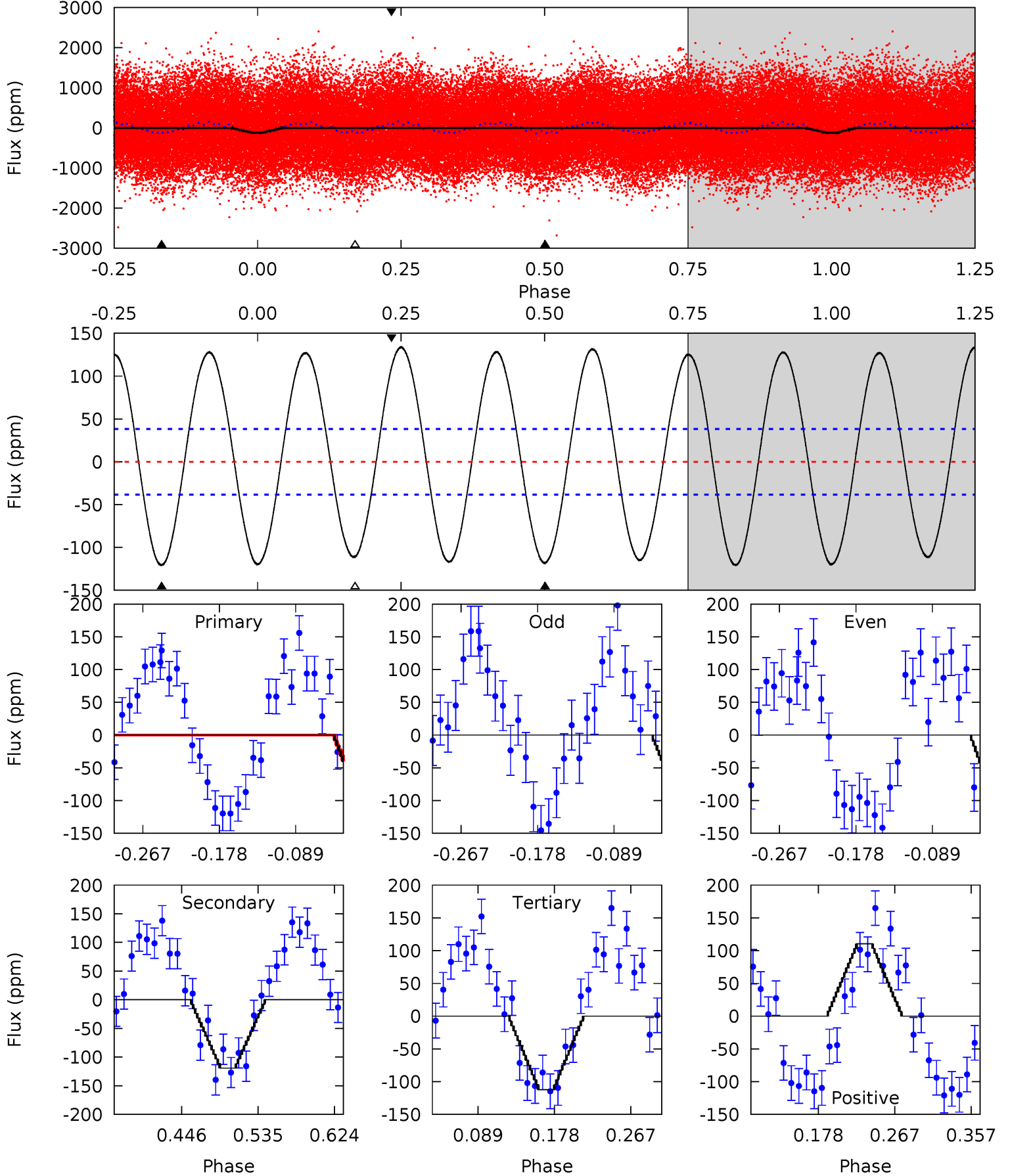




# Alt Model-Shift Uniqueness Test

002304235-01, P = 0.570607 Days, E = 131.478386 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
14.5	14.3	13.4	13.2	4.59	1.70	10.2	1.12	1.32	0.85	1.05	0.68	0.97	0.53	0.95





### Stellar Parameters For KIC 002304235

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$4896^{+100}_{-172}$	$2.115^{+0.561}_{-0.099}$	$-0.500^{+0.300}_{-0.250}$	$26.318^{+4.347}_{-17.387}$	$3.292^{+0.116}_{-2.198}$	$0.000^{+0.002}_{-0.000}$
	+2%/-4%	+27%/-5%	+60%/-50%	+17%/-66%	+4%/-67%	+954%/-35%
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 002304235-01 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$-47 \pm 2$	$24.26^{+10.66}_{-8.89}$	$10585^{+760}_{-1624}$	$-8644^{+1685}_{-1041}$	$0.017^{+0.023}_{-0.008}$
Alt.	$-119 \pm 8$	$27.63^{+11.05}_{-10.23}$	$10626^{+685}_{-1457}$	$-8518^{+1618}_{-957}$	$0.032^{+0.046}_{-0.015}$

$T_{\text{max}}$  = 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

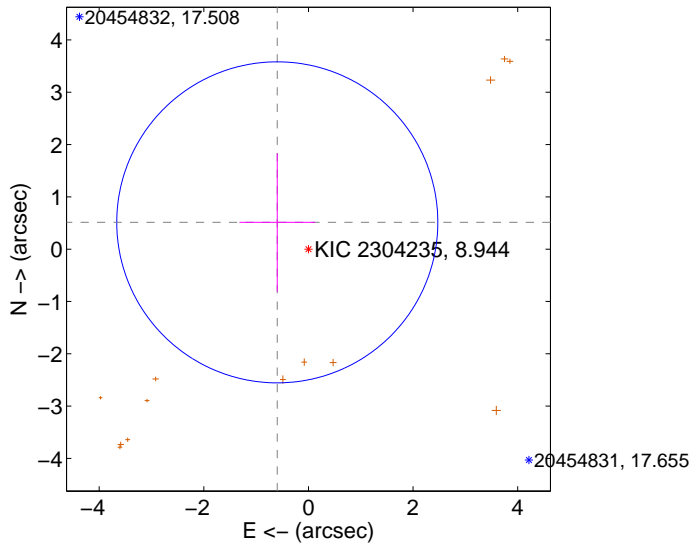
Supplemental centroid analysis for 002304235-01. **Kepler magnitude: 8.94.** Transit SNR 20.39

There are 0 quarters with good PRF difference image offsets

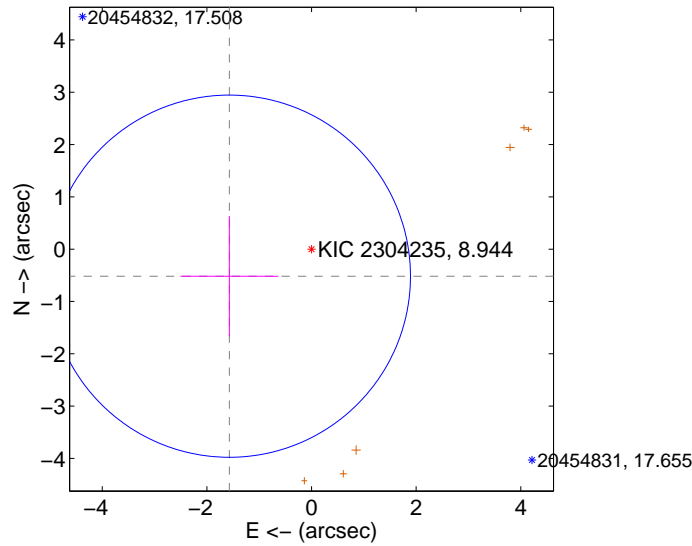
The OOT PRF centroid is offset from the target star catalog position by about 2.44 arcsec so the offset from difference PRF-fit to OOT-fit may be invalid.

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.786 \pm 1.023$	0.77	$0.596 \pm 0.724$	$0.513 \pm 1.324$
PRF-fit source offset from KIC position	$1.654 \pm 1.154$	1.43	$1.571 \pm 0.937$	$-0.517 \pm 1.151$
photometric centroid source offset	$1.60 \pm 0.21$	7.54	$1.14 \pm 0.16$	$-1.12 \pm 0.25$

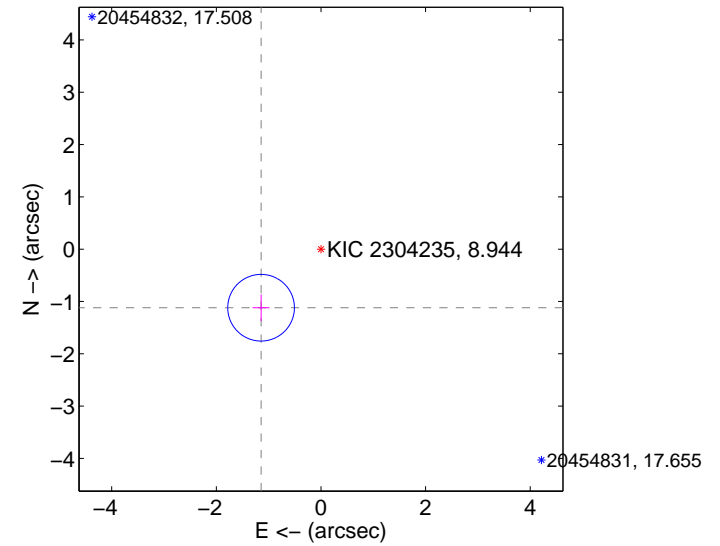
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position

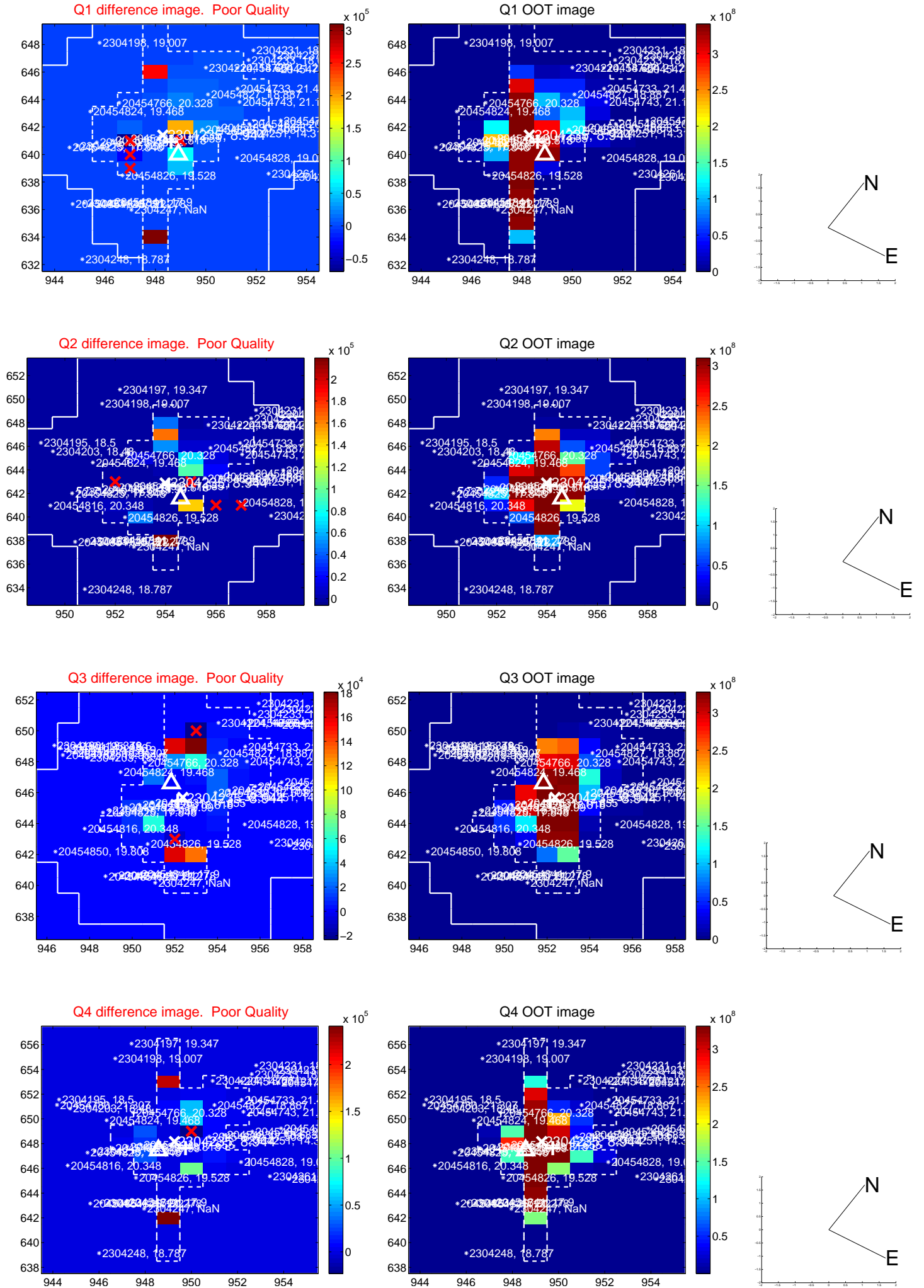


offset from photometric centroids

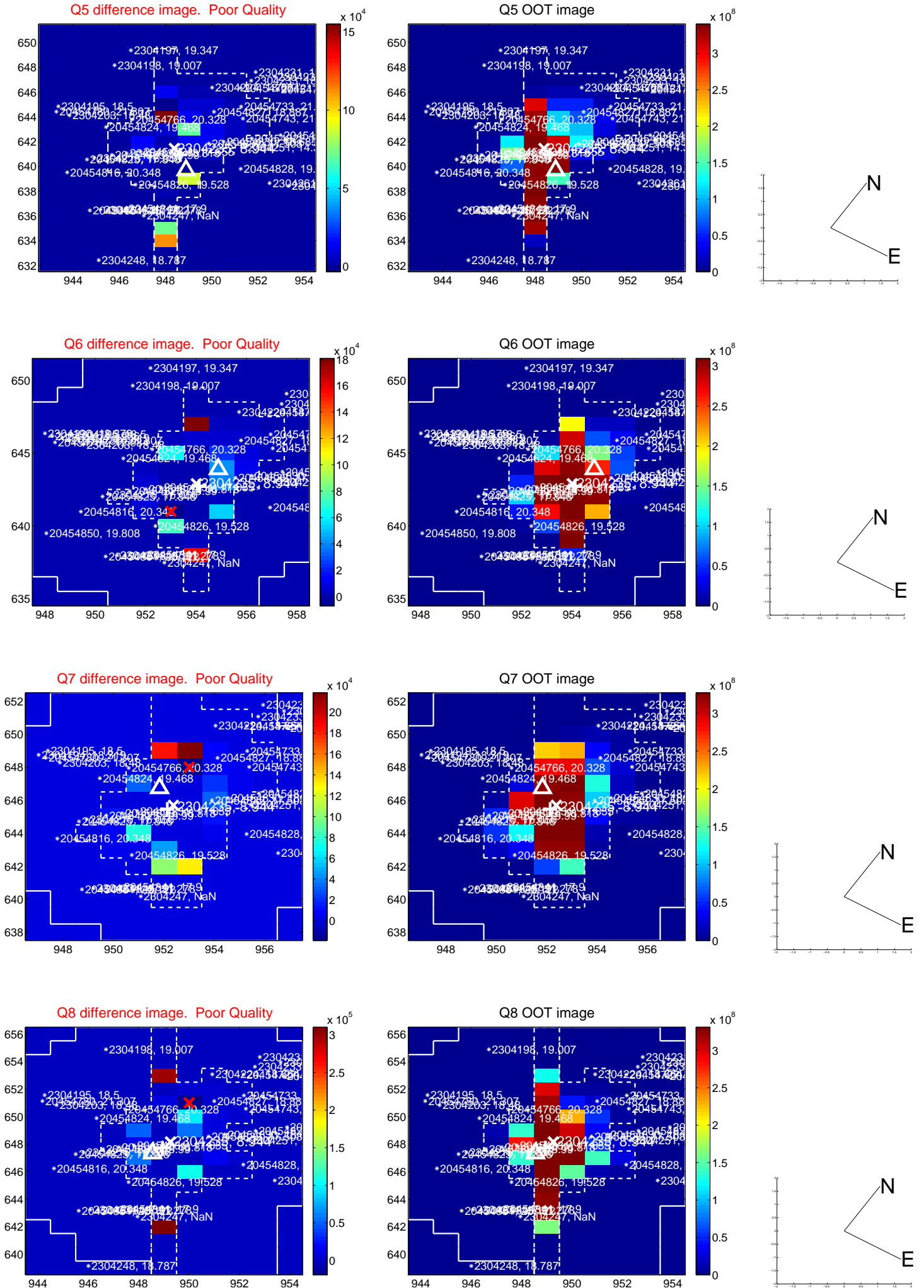


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets;** magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

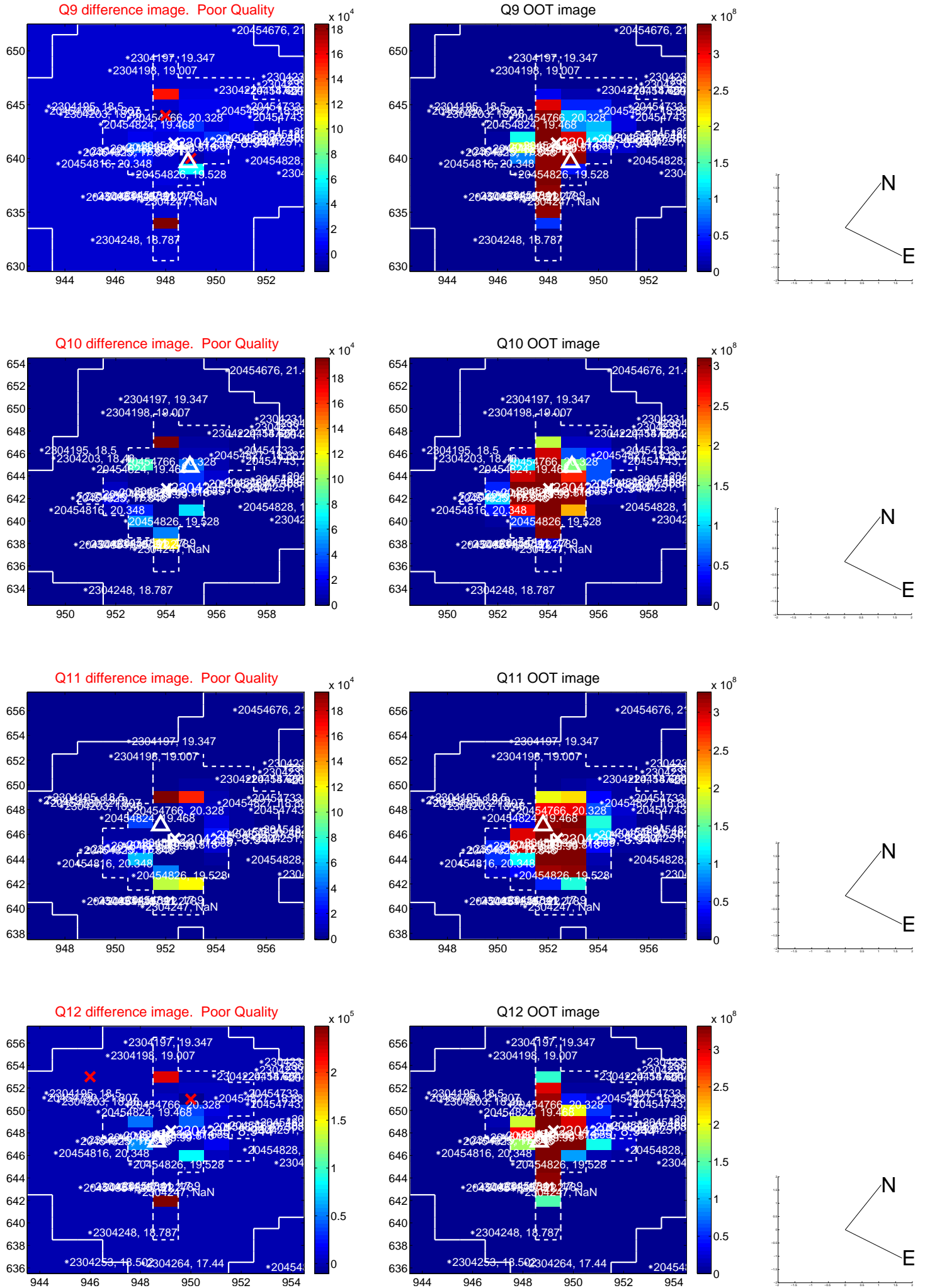


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

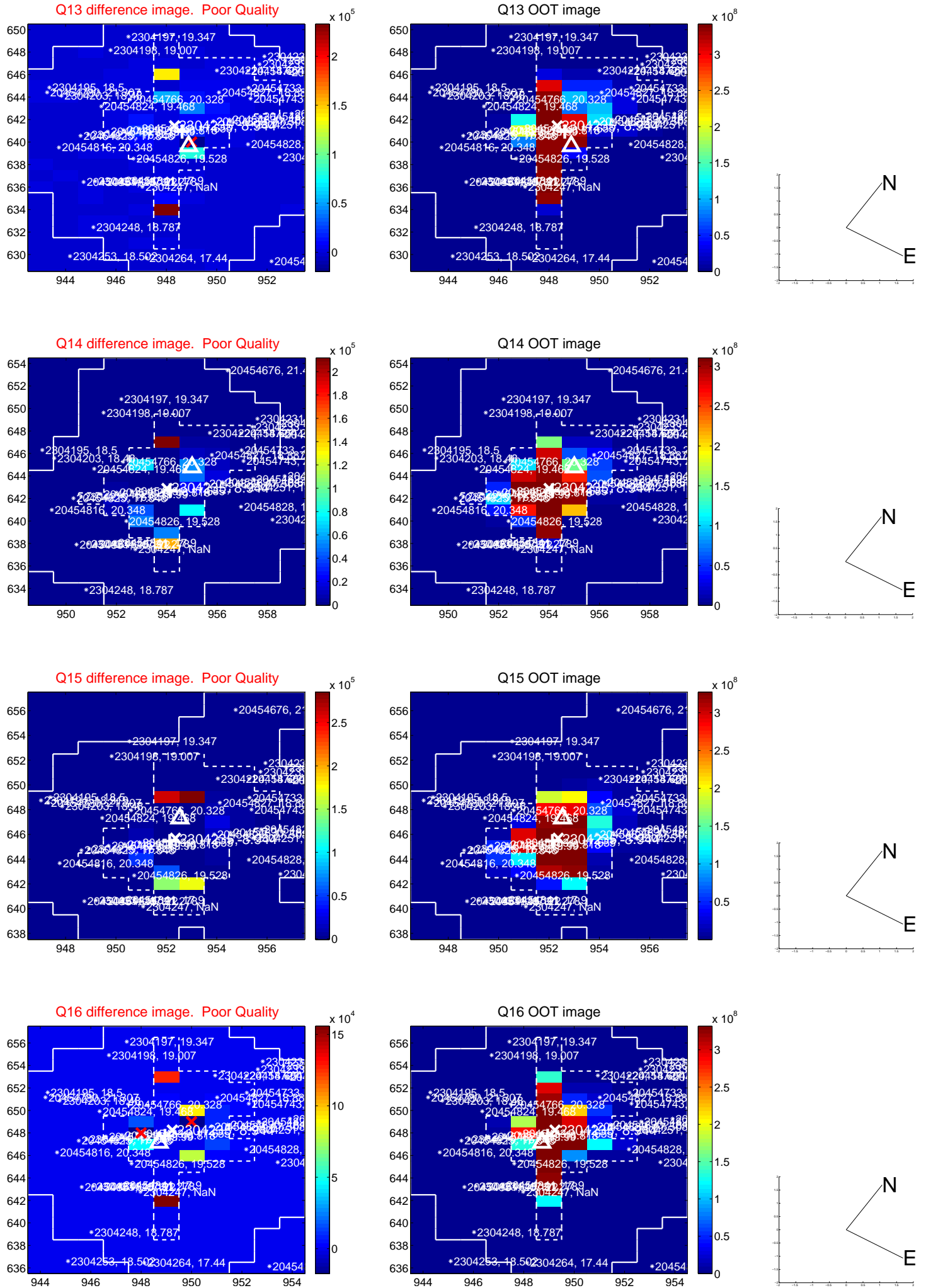




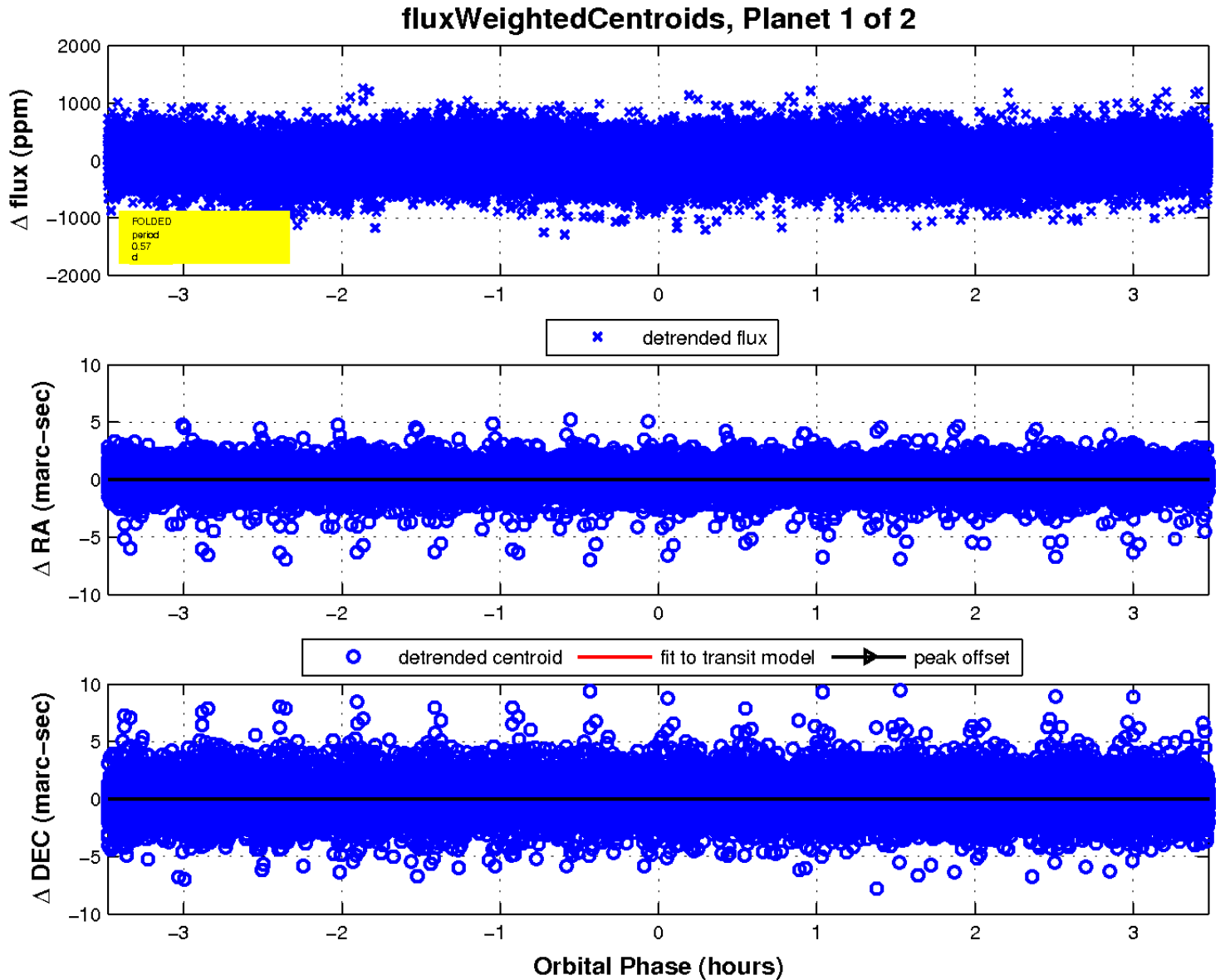
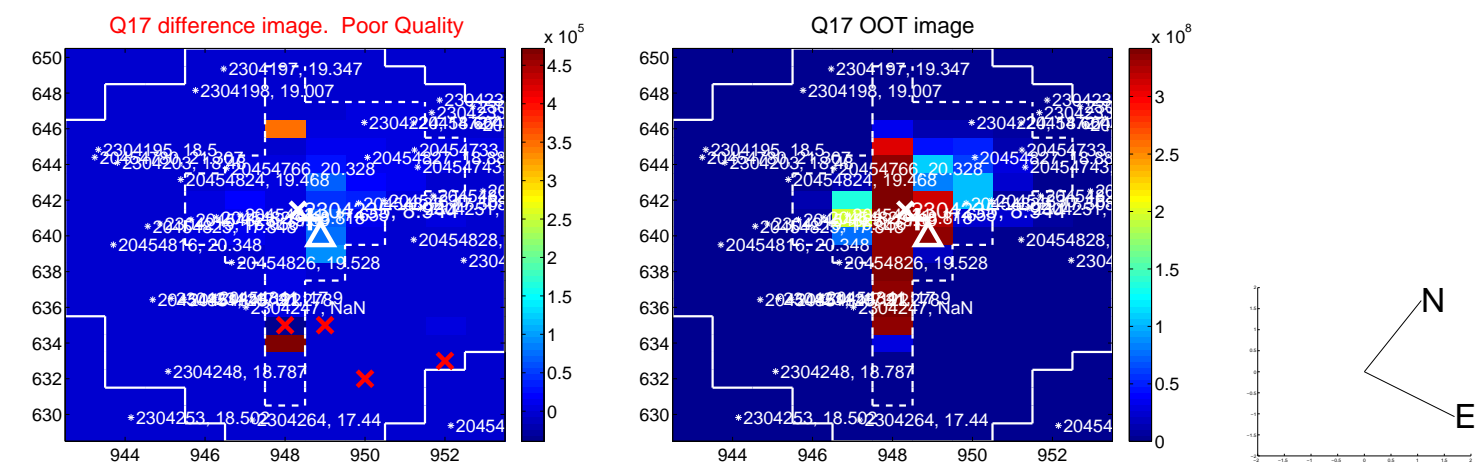
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



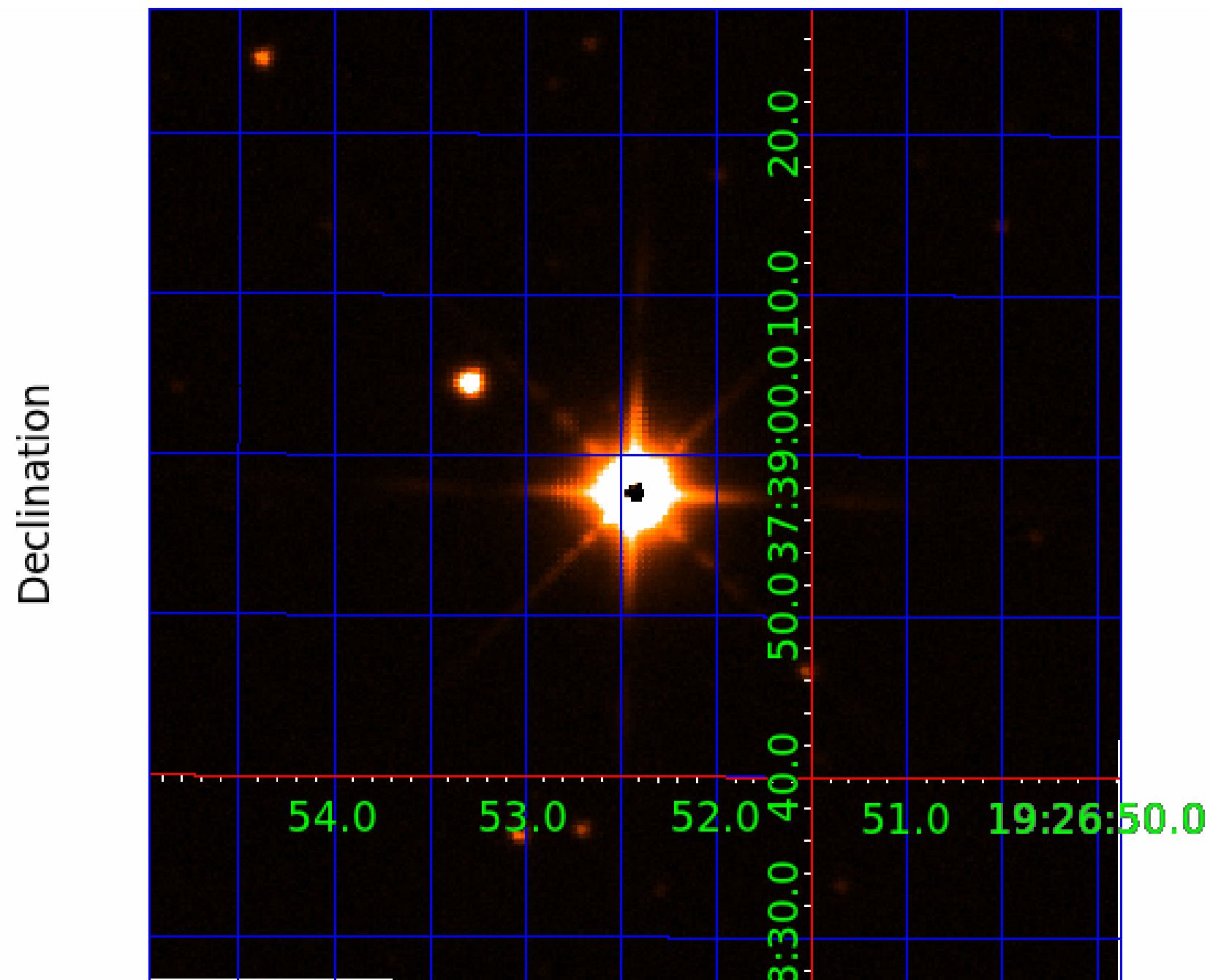
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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



UKIRT Image





# KIC 002304235

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
002304235-01	OBS	No	0.570607	132.049211	75.1	1.160	17.5	20.4	26.32	4896	27.83	0.00
002304235-02	OBS	No	0.570599	131.768066	90.0	0.894	17.3	21.3	26.32	4896	26.45	0.00

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
002304235-01	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—CENT_SATURATED
002304235-02	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—SAME_NTL_PERIOD—CENT_SATURATED

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

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

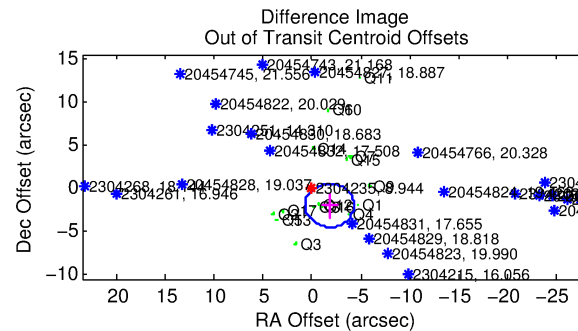
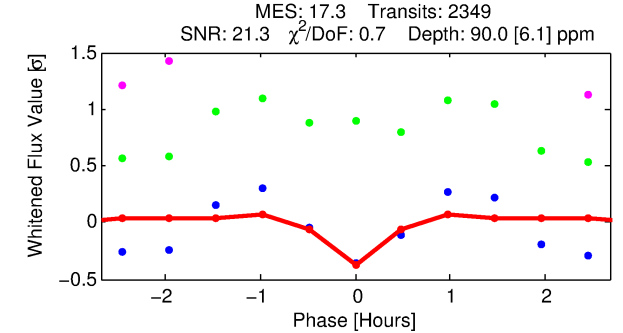
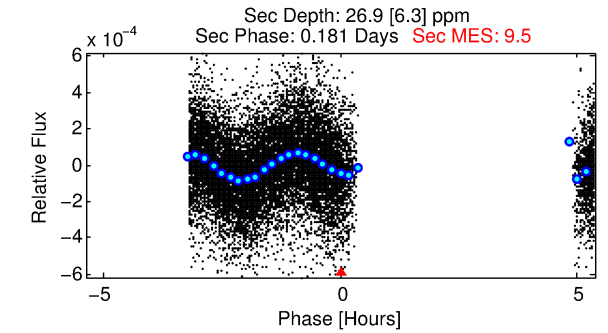
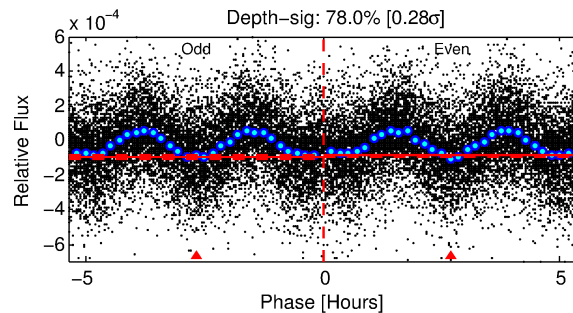
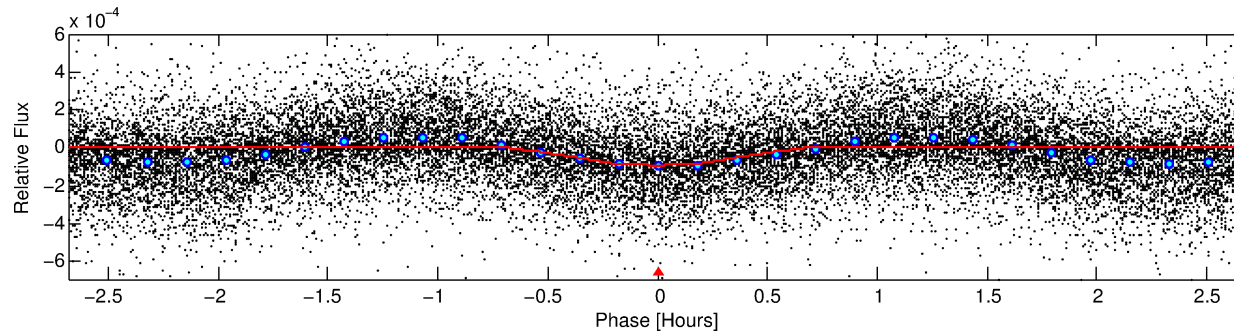
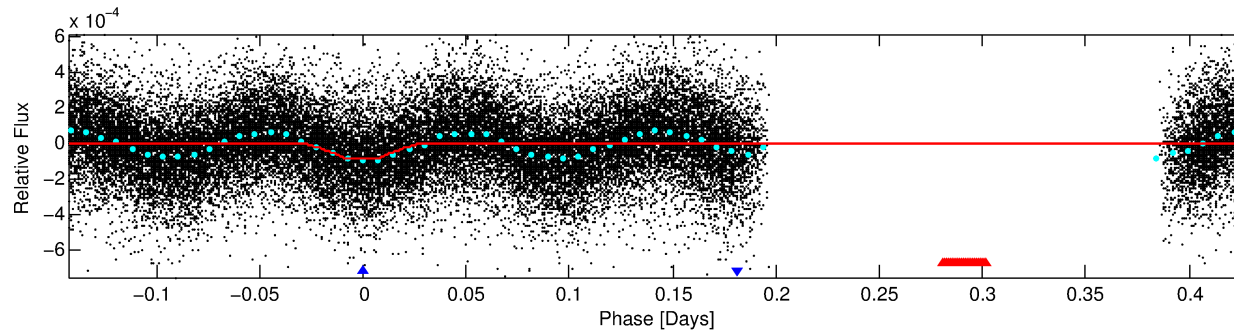
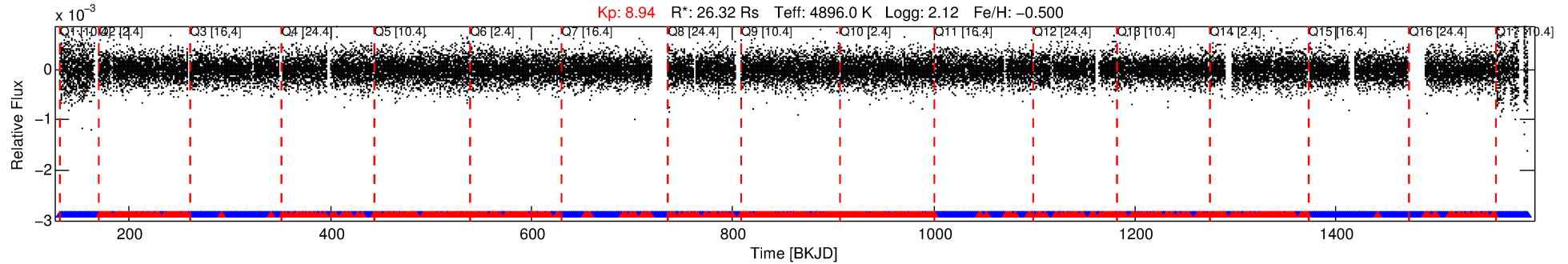
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 002304235-02

No Significant Match Found

# DV One-Page Summary

KIC: 2304235 Candidate: 2 of 2 Period: 0.571 d



## DV Fit Results:

Period = 0.57060 [0.00001] d  
Epoch = 131.7681 [0.0006] BKJD  
Rp/R\* = 0.0092 [0.0023]  
a/R\* = 3.91 [3.25]  
b = 0.63 [0.85]  
Seff = N/A  
Teq = N/A  
Rp = 26.45 [18.63] Re  
a = N/A  
Ag = N/A  
Teff = N/A

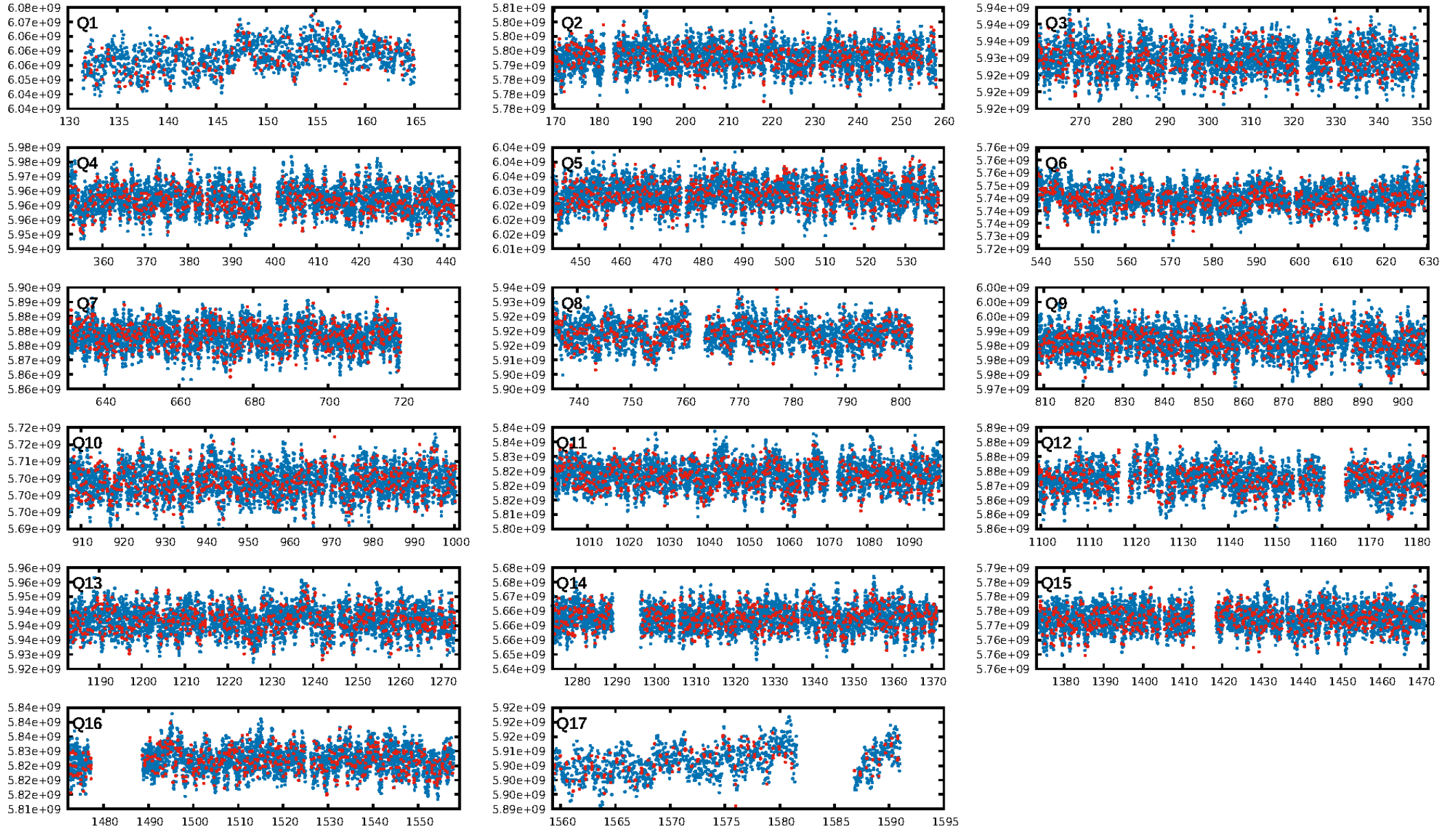
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 0.0% [0.00σ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: 1.71e-109  
RollingBand-fgt: 0.73 [1636/2243]  
GhostDiagnostic-chr: N/A  
Centroid-sig: 1.6%  
Centroid-so: 1.453 arcsec [7.52σ]  
OotOffset-rm: 2.673 arcsec [3.21σ]  
OotOffset-st: 4/4/4/5 [17]  
KicOffset-rm: 3.322 arcsec [2.76σ]  
KicOffset-st: 4/4/4/5 [17]  
DiffImageQuality-fgm: 0.00 [0/17]  
DiffImageOverlap-fno: 1.00 [17/17]

Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 01-Feb-2016 08:24:10 Z

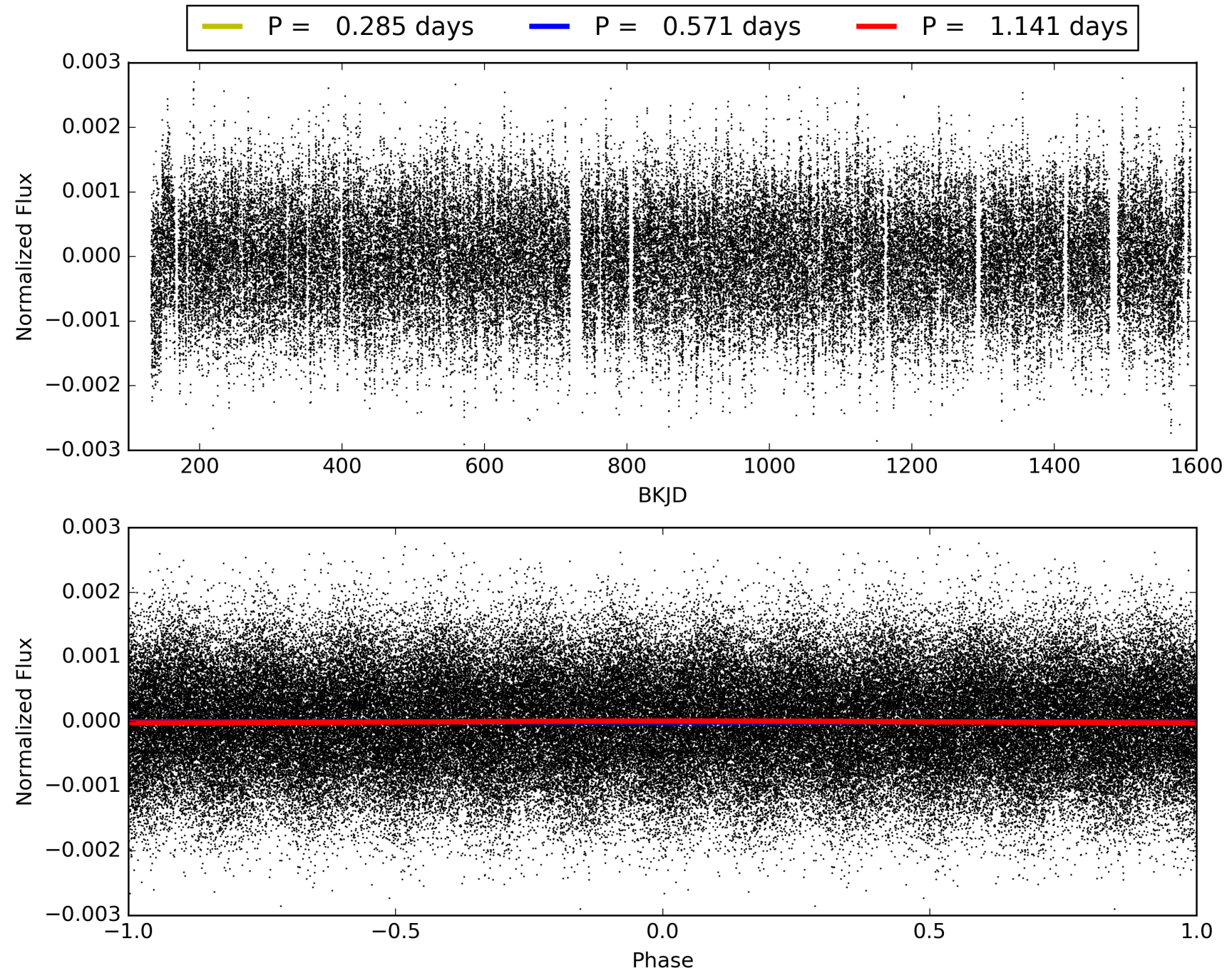
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

# TCE 002304235-02, PDC Light Curves





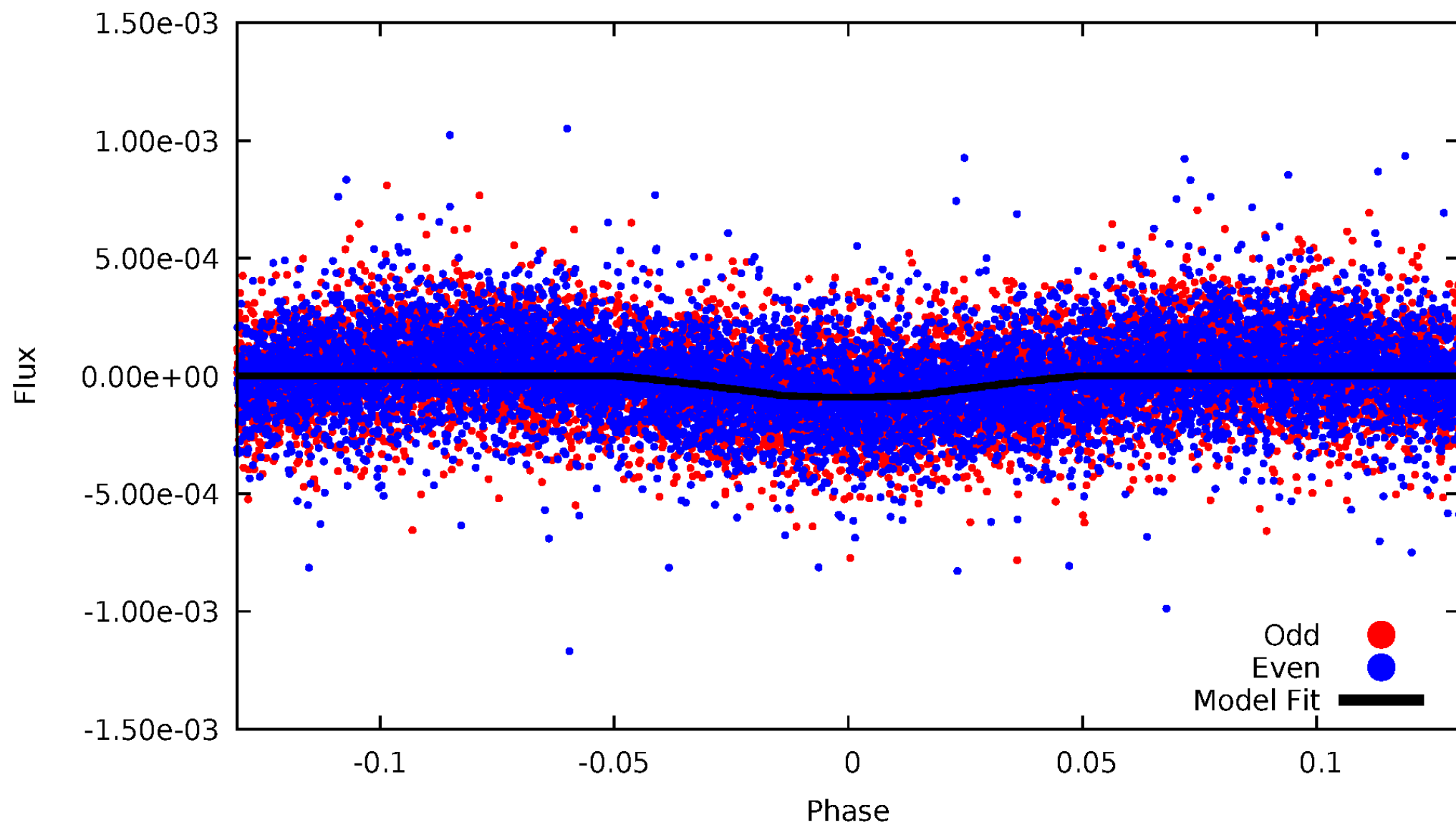
TCE 002304235-02





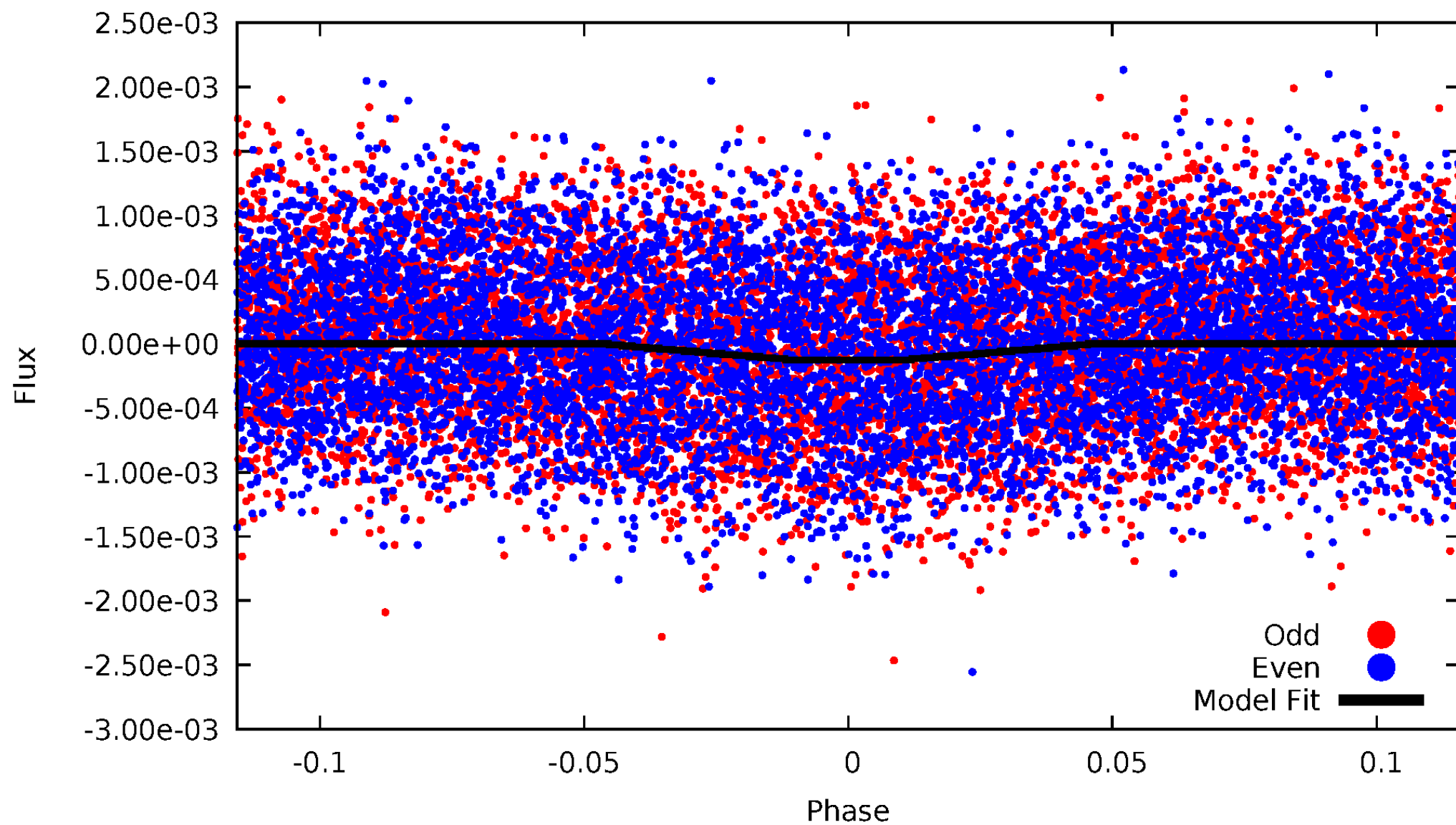
DV Odd/Even

TCE 002304235-02



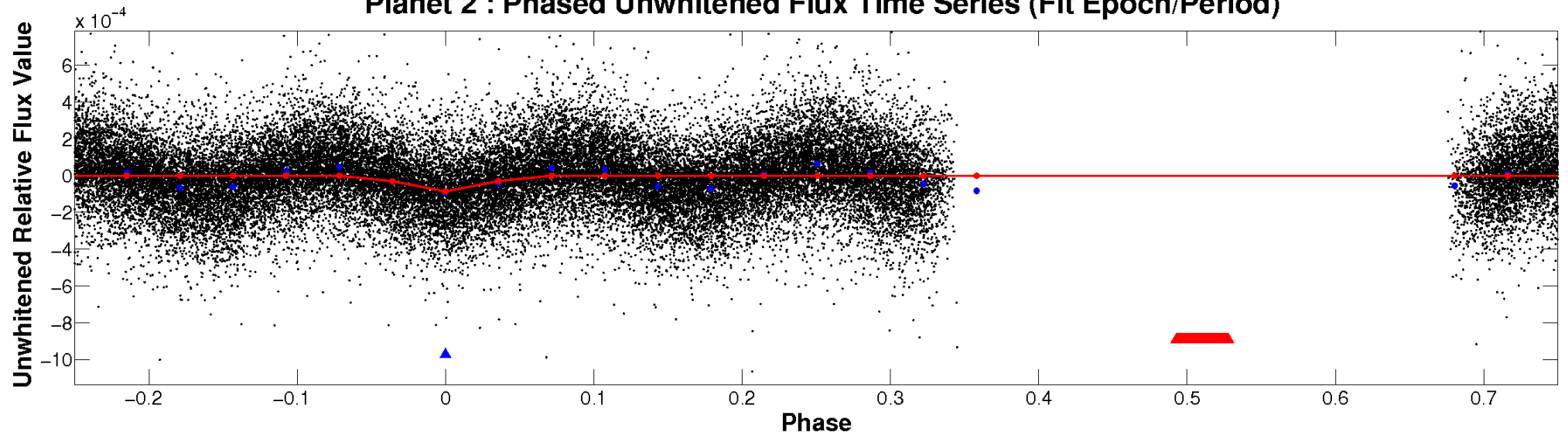
# ALT Odd/Even

TCE 002304235-02

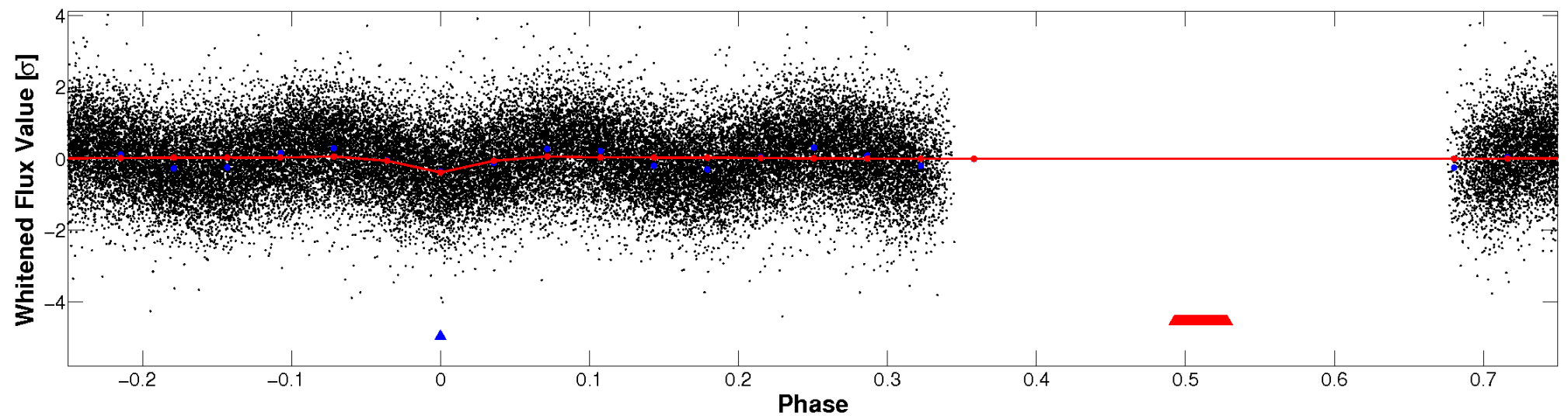


# Non-Whitened Vs. Whitened Light Curve

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

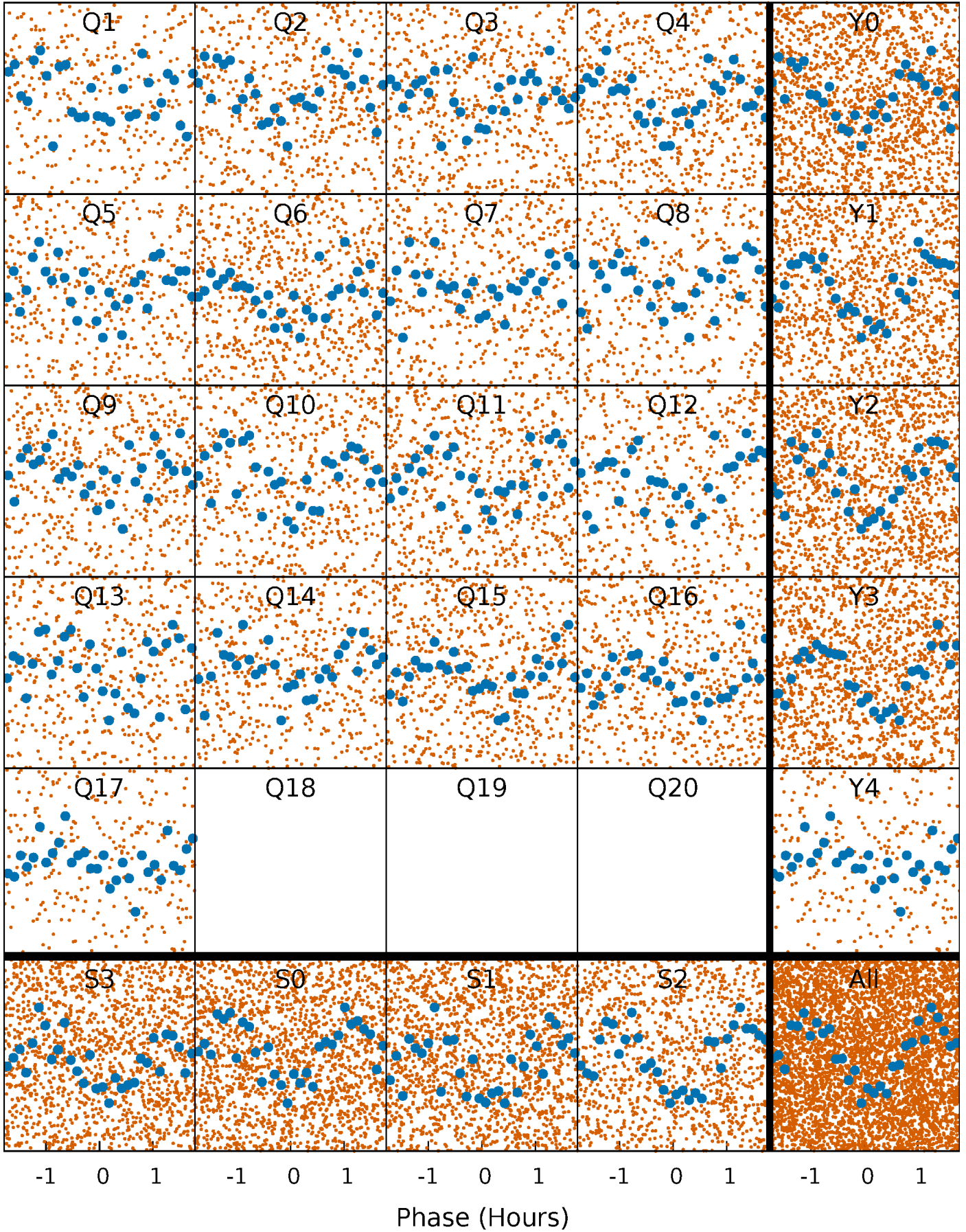


## Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



# PDC Quarter-Phased Transit Curves

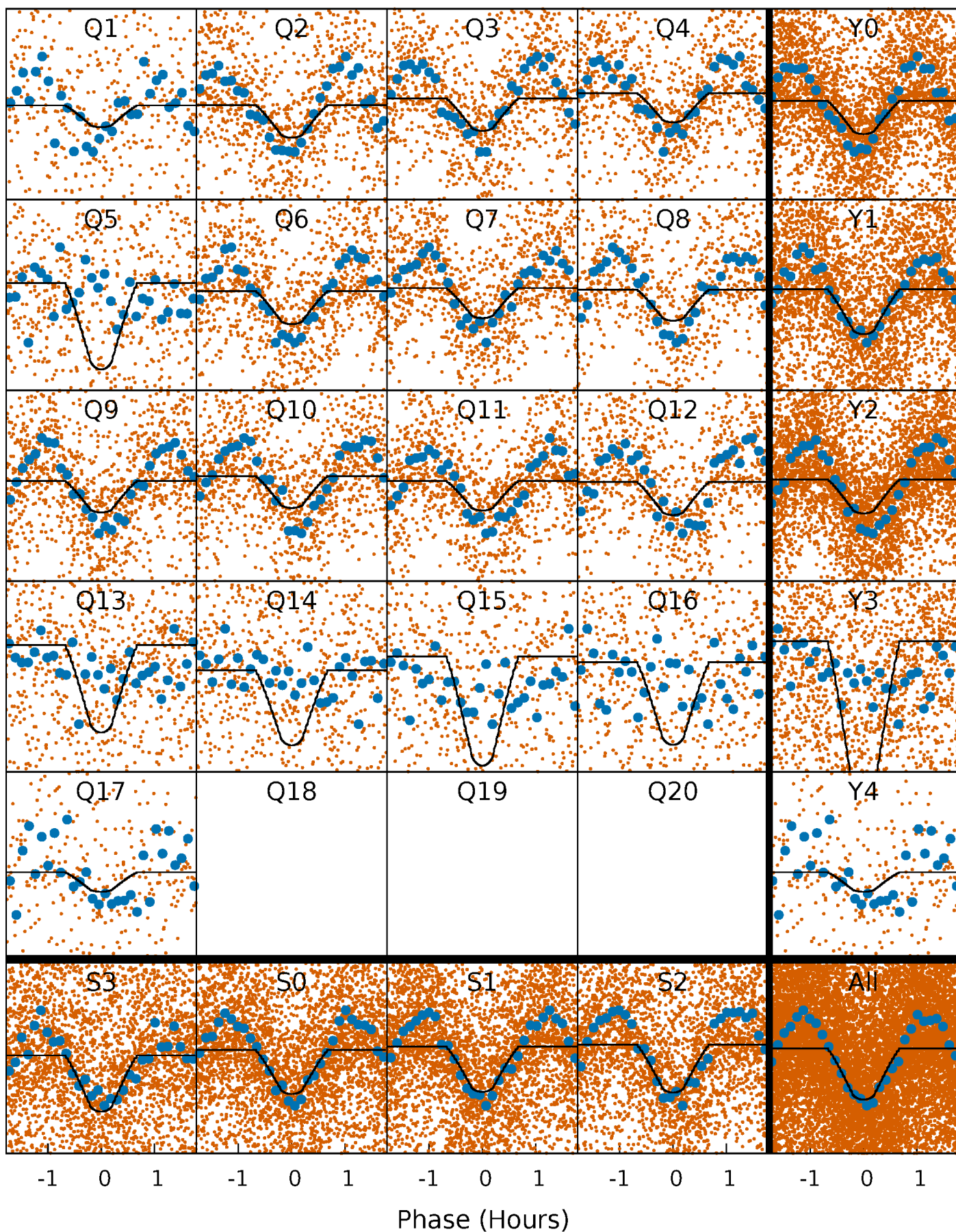
TCE 002304235-02     $P = 0.570599$  Days     $T_0 = 131.768066$  (BKJD)





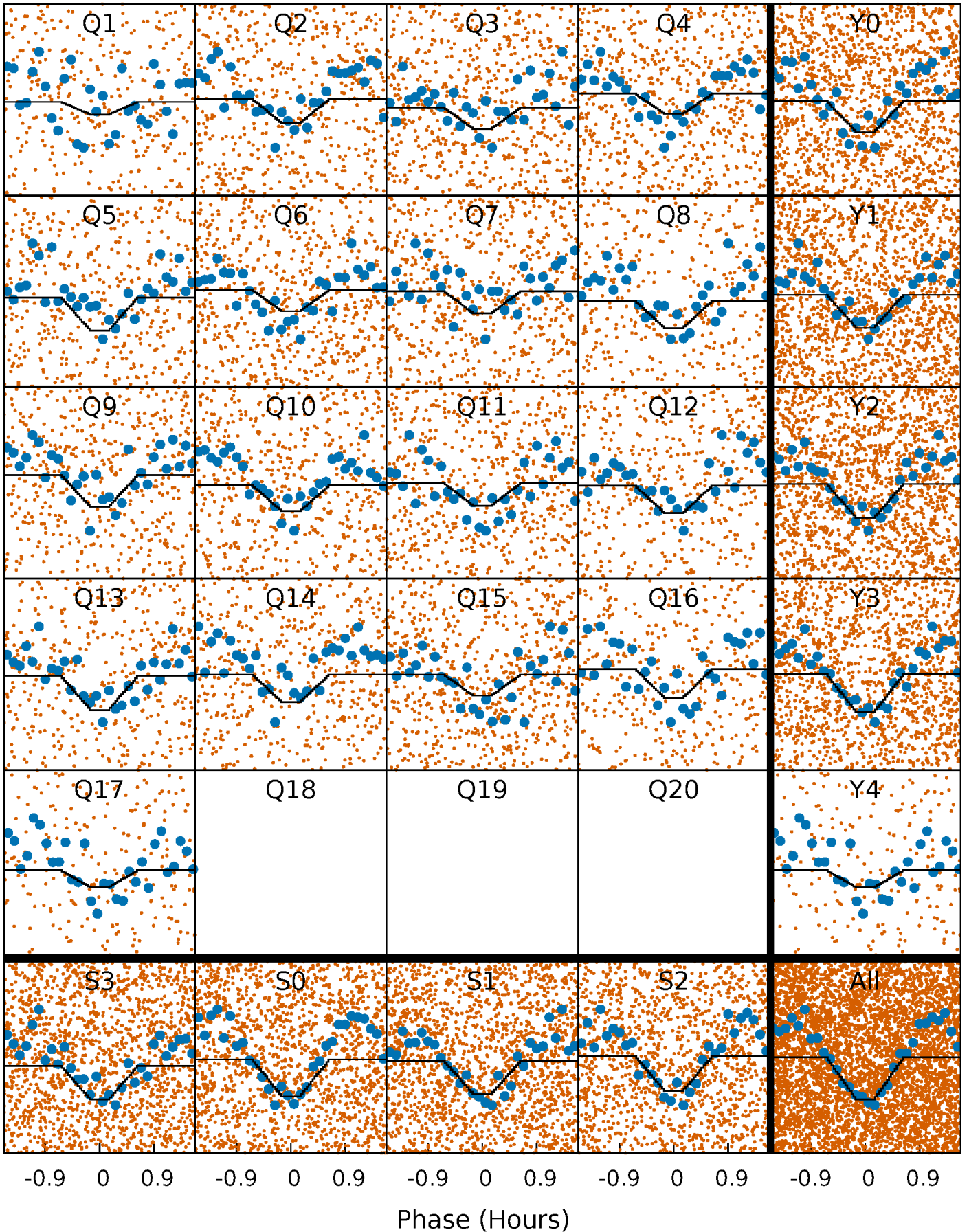
# DV Quarter-Phased Transit Curves

TCE 002304235-02 P= 0.570599 Days  $T_0=131.768066$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

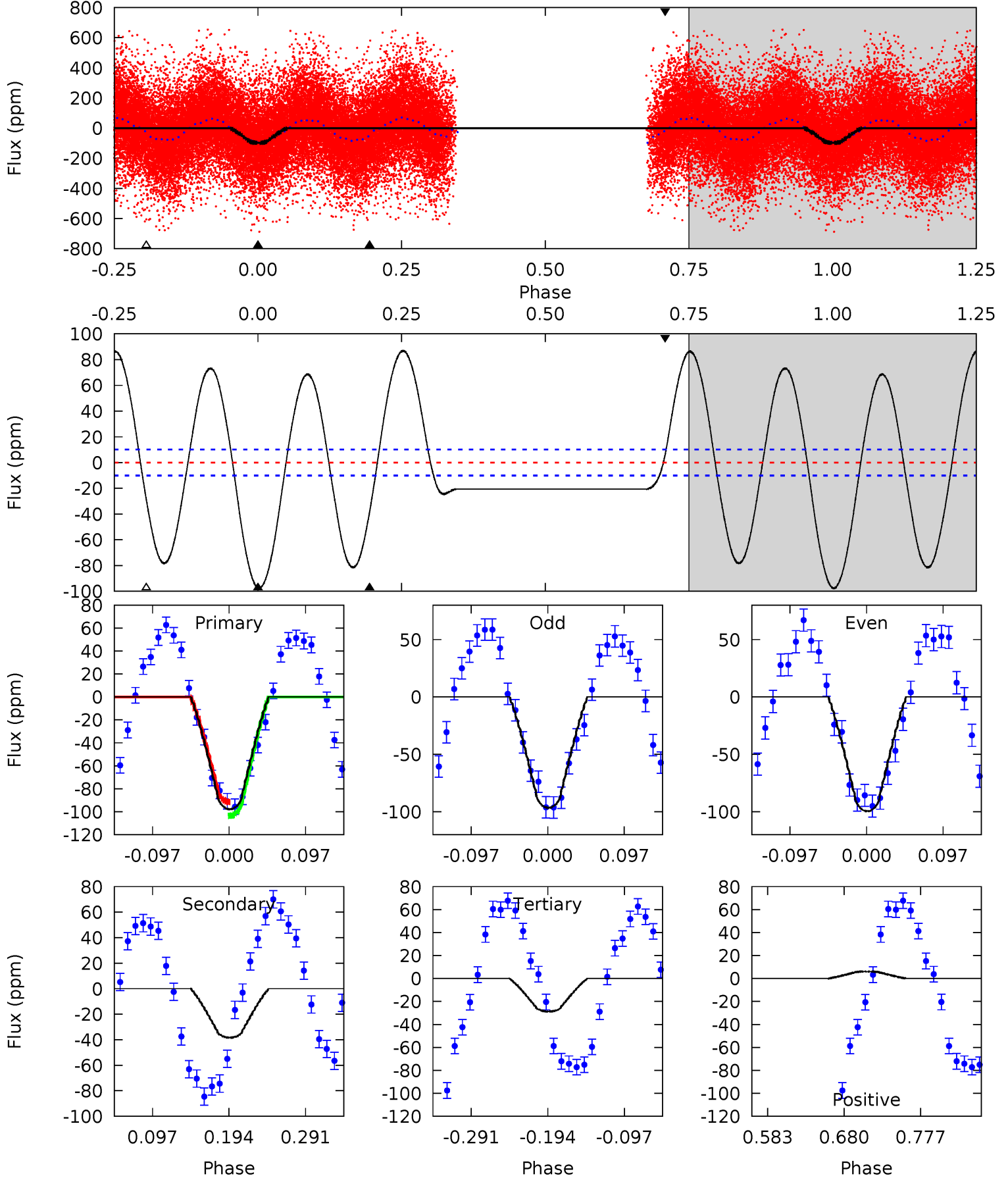
TCE 002304235-02   P= 0.570607 Days    $T_0=131.763540$  (BKJD)



# DV Model-Shift Uniqueness Test

002304235-02, P = 0.570599 Days, E = 131.197467 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
44.0	17.3	12.9	2.74	4.57	1.66	22.5	31.1	41.3	4.32	14.5	0.66	1.00	0.47	2.81

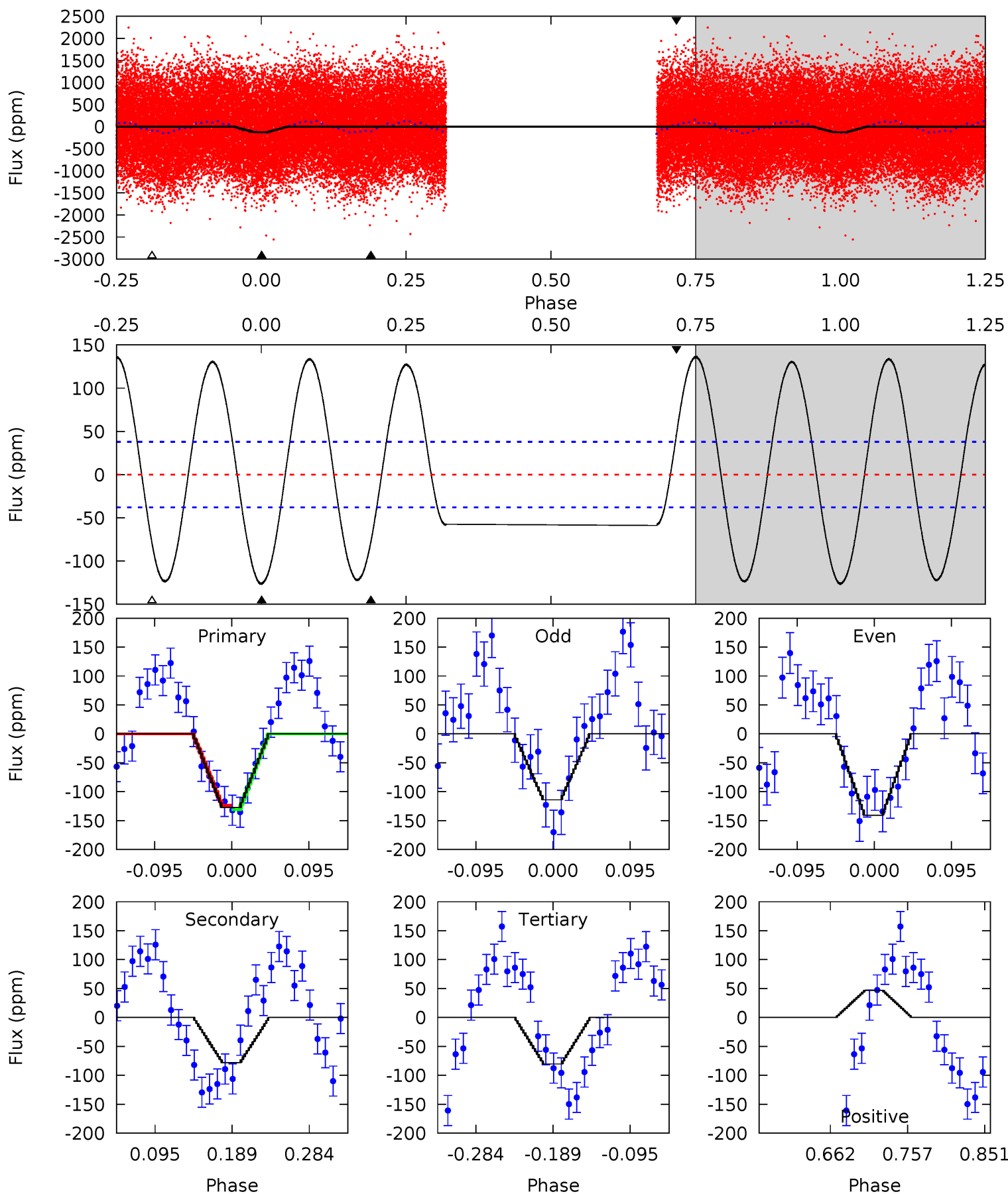




# Alt Model-Shift Uniqueness Test

002304235-02, P = 0.570607 Days, E = 131.192933 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
15.4	9.43	9.70	5.67	4.58	1.67	9.76	5.69	9.72	-0.27	3.76	1.61	0.94	0.52	0.45





### Stellar Parameters For KIC 002304235

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$4896^{+100}_{-172}$	$2.115^{+0.561}_{-0.099}$	$-0.500^{+0.300}_{-0.250}$	$26.318^{+4.347}_{-17.387}$	$3.292^{+0.116}_{-2.198}$	$0.000^{+0.002}_{-0.000}$
	+2%/-4%	+27%/-5%	+60%/-50%	+17%/-66%	+4%/-67%	+954%/-35%
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 002304235-02 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$-38 \pm 2$	$22.90^{+8.08}_{-8.32}$	$10459^{+878}_{-1627}$	$-8555^{+1631}_{-1108}$	$0.016^{+0.020}_{-0.007}$
Alt.	$-78 \pm 8$	$28.47^{+9.18}_{-9.78}$	$10631^{+728}_{-1663}$	$-8703^{+1741}_{-932}$	$0.020^{+0.023}_{-0.009}$

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

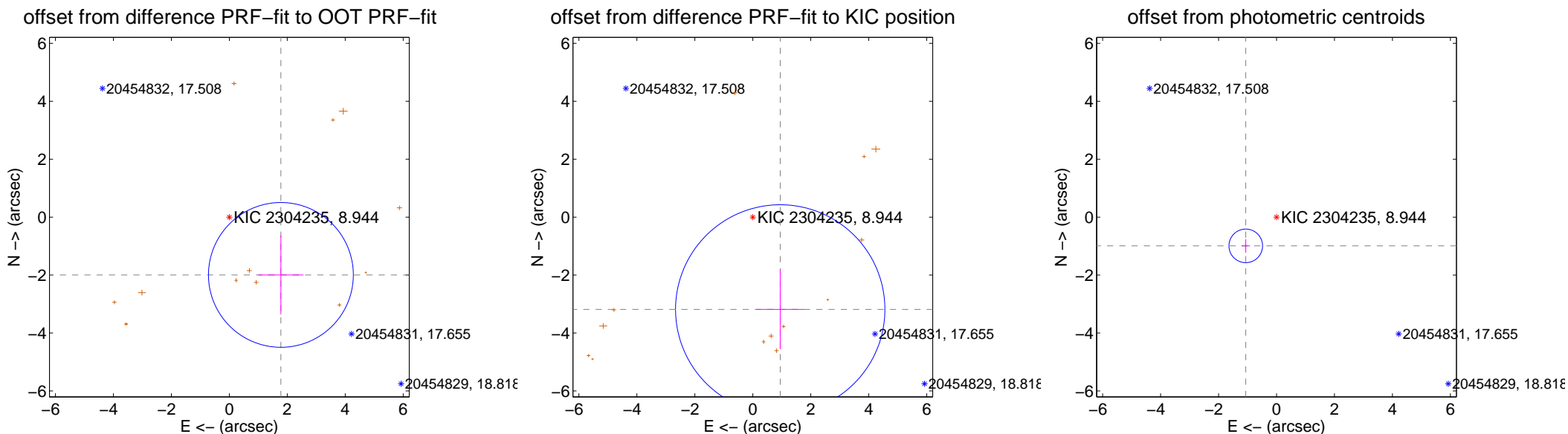
## DV Centroid Data

Supplemental centroid analysis for 002304235-02. **Kepler magnitude: 8.94.** Transit SNR 21.34

There are 0 quarters with good PRF difference image offsets

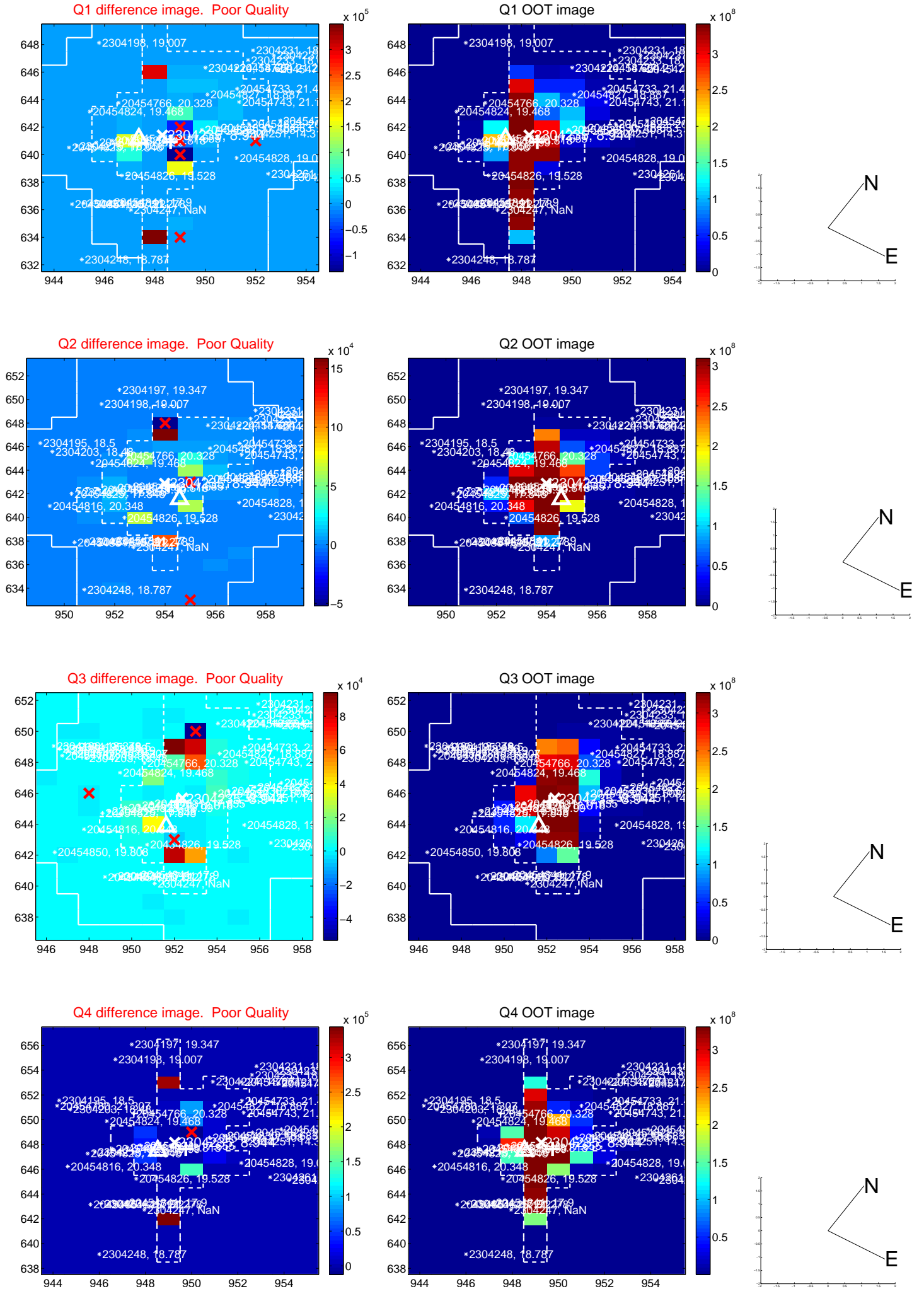
The OOT PRF centroid is offset from the target star catalog position by about 2.43 arcsec so the offset from difference PRF-fit to OOT-fit may be invalid.

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	<b><math>2.673 \pm 0.833</math></b>	<b>3.21</b>	$-1.779 \pm 0.780$	$-1.995 \pm 1.365$
PRF-fit source offset from KIC position	$3.322 \pm 1.204$	2.76	$-0.947 \pm 0.832$	$-3.184 \pm 1.374$
photometric centroid source offset	<b><math>1.45 \pm 0.19</math></b>	<b>7.52</b>	$1.06 \pm 0.15$	$-0.99 \pm 0.23$

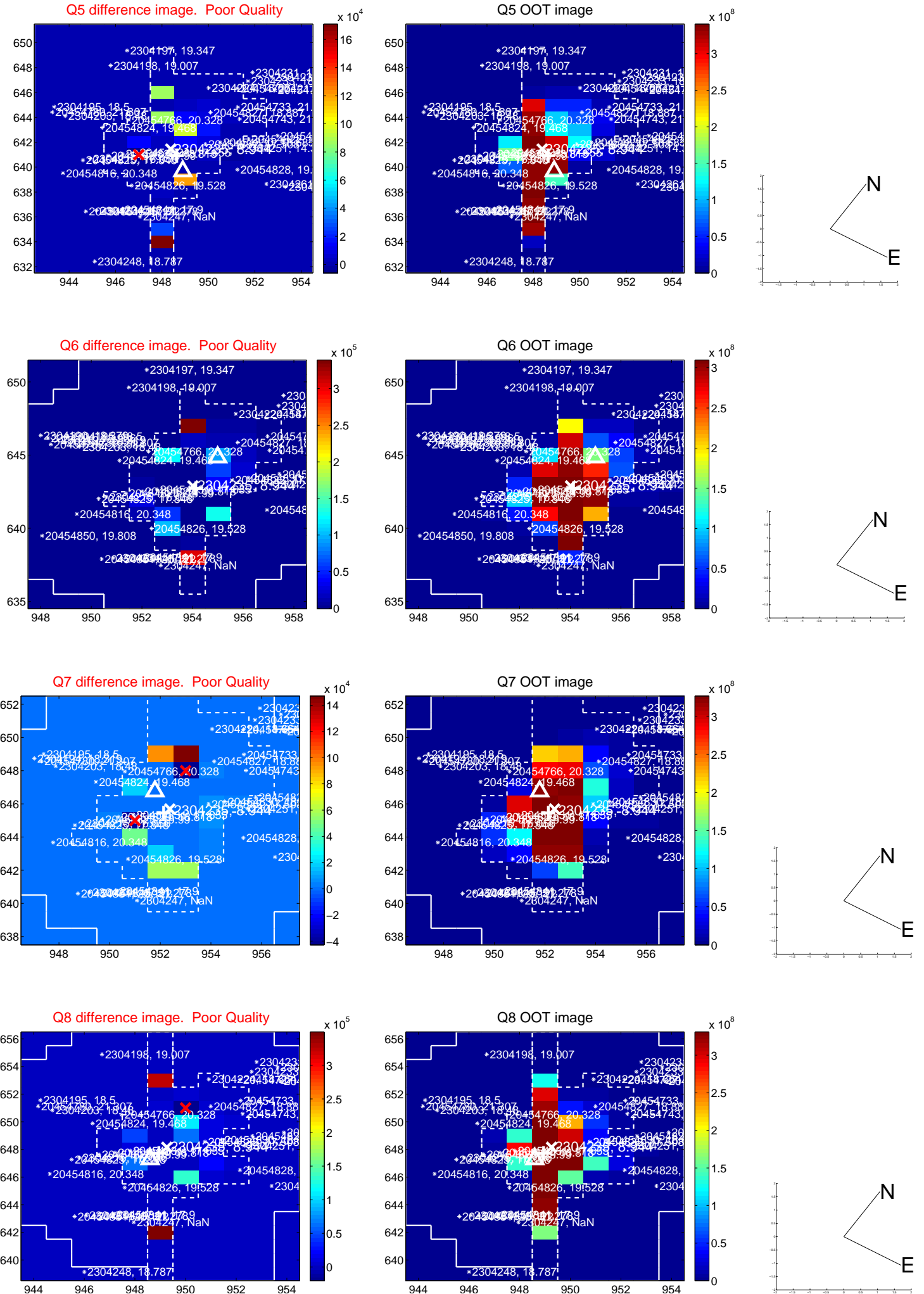


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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

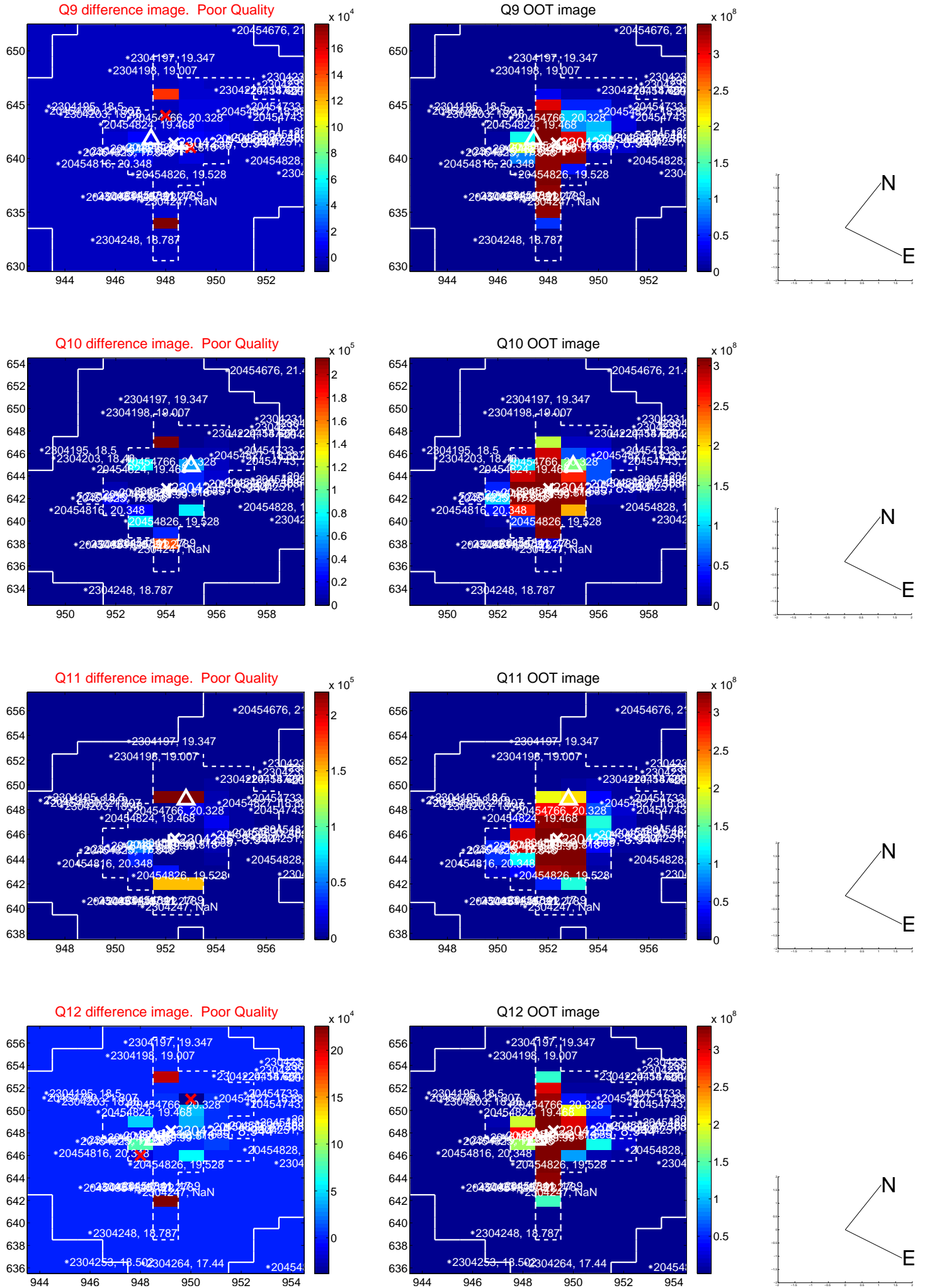


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

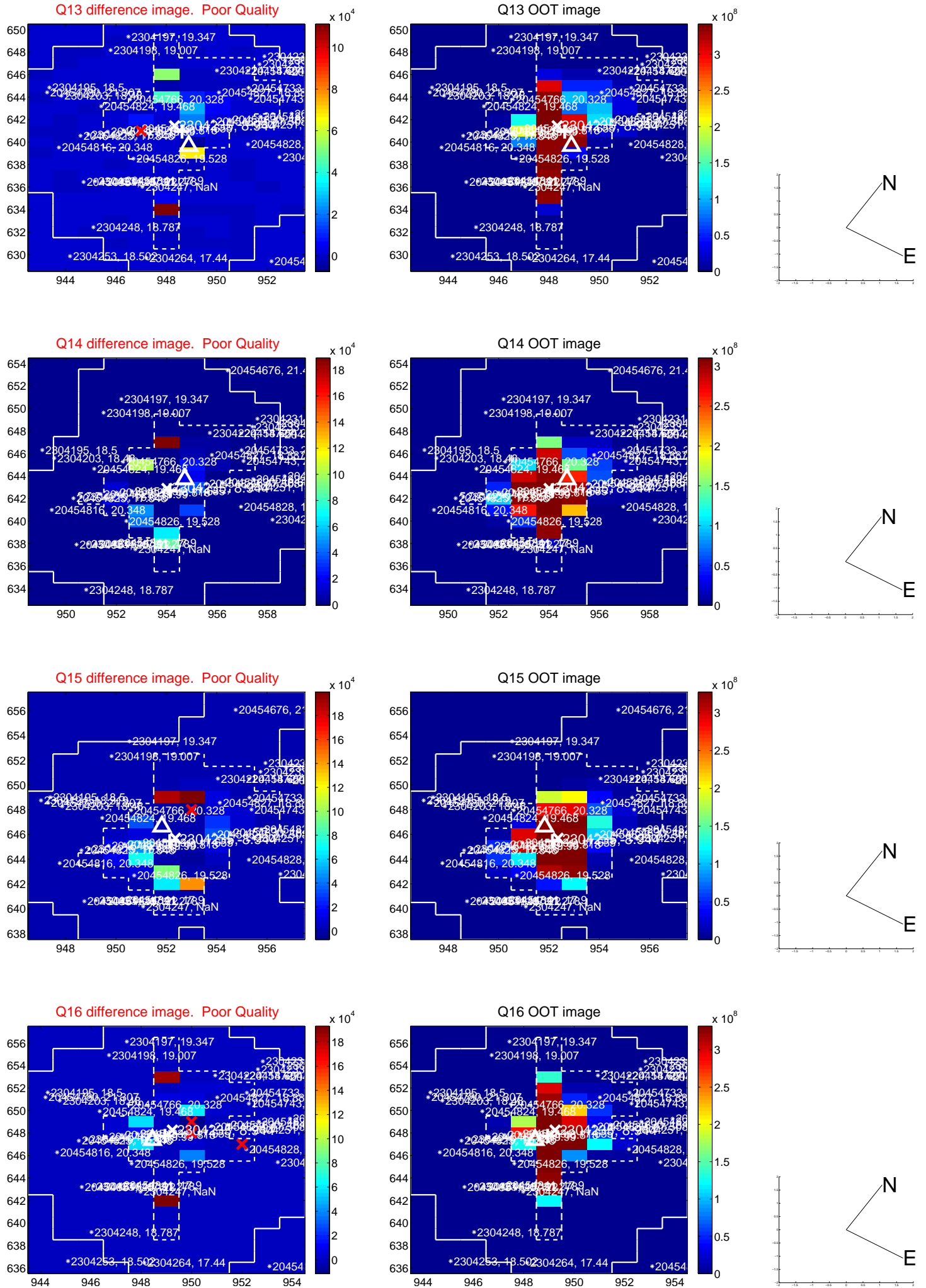




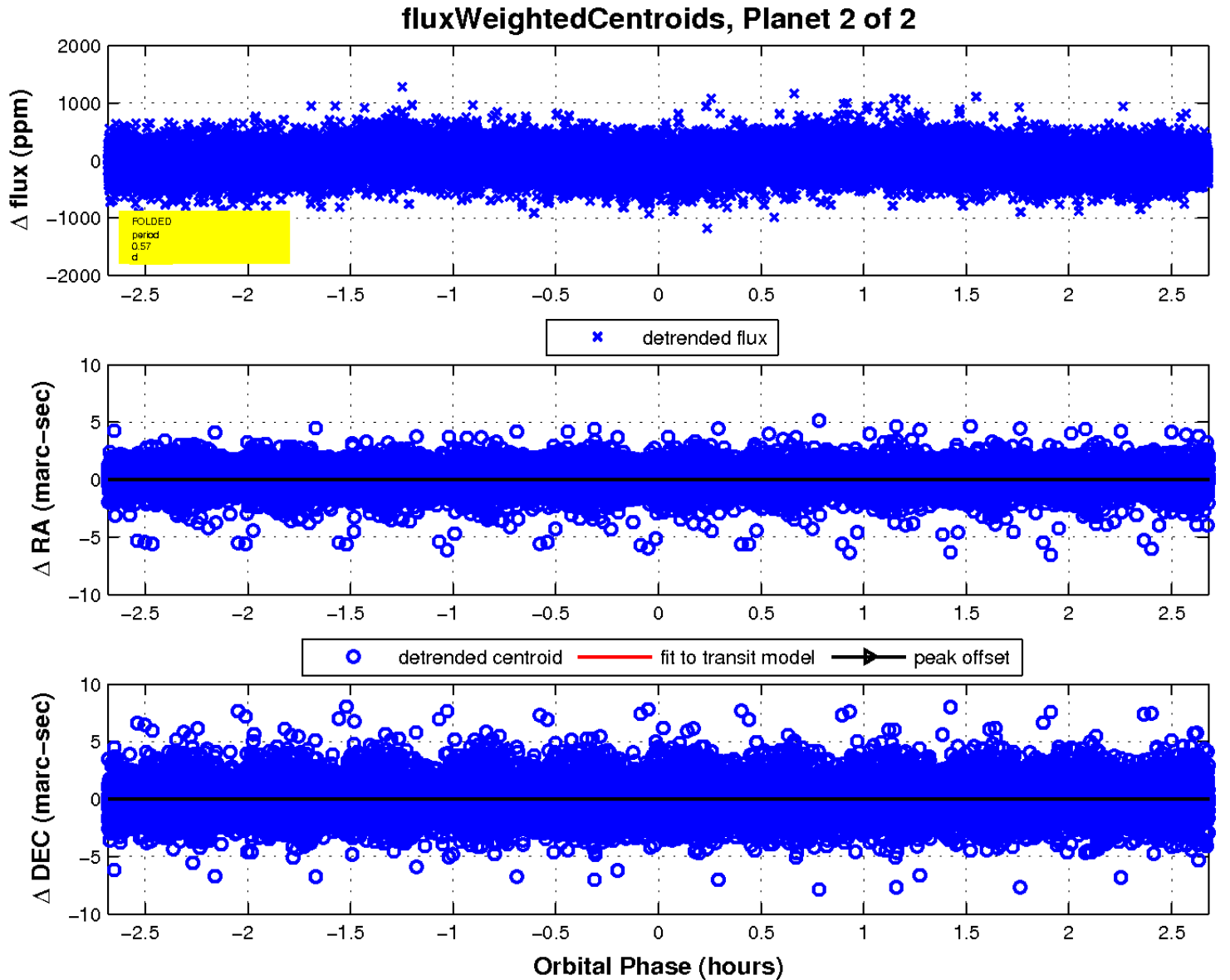
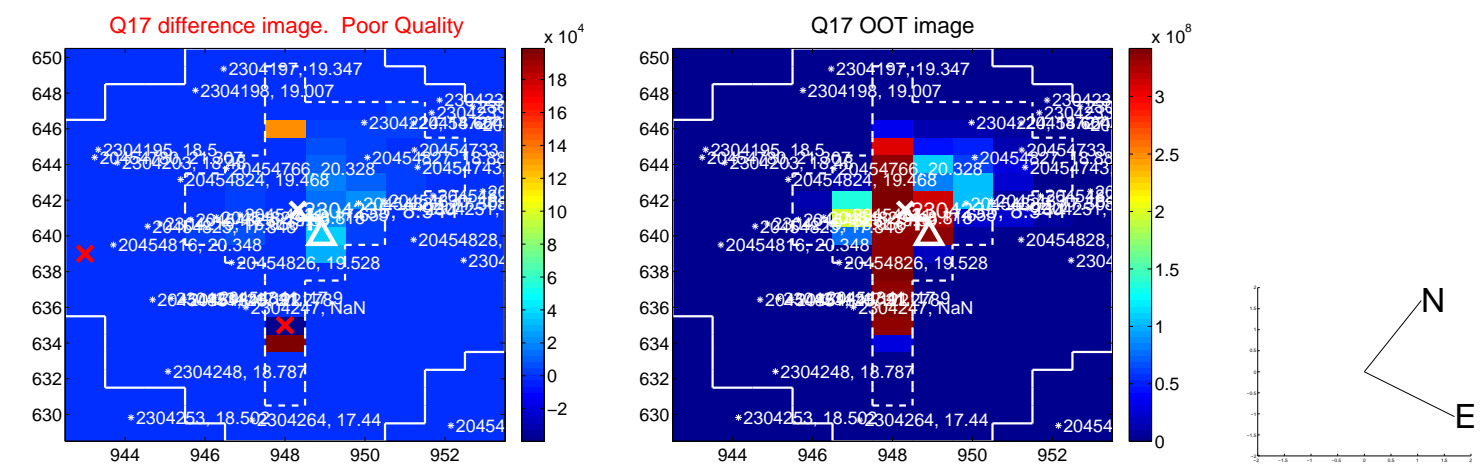
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

