

# KIC 012400984

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
012400984-01	OBS	No	0.718949	131.567811	126.4	3.085	13.4	15.0	1.99	7608	2.60	33349.78
012400984-02	OBS	No	2.797778	132.965662	221.2	33.573	12.5	20.2	1.99	7608	3.75	5448.45

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
012400984-01	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT
012400984-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_SKYE_ZUMA—TRANS_GAPPED—LPP_DV—CENT_FEW_DIFFS

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

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

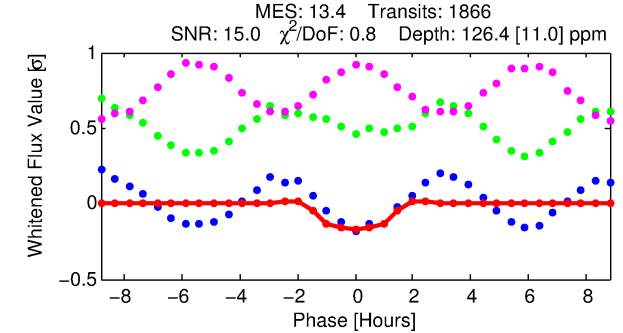
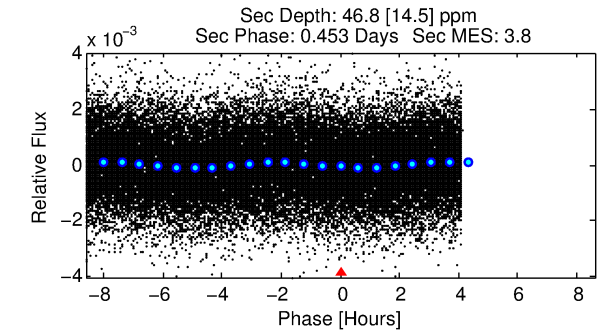
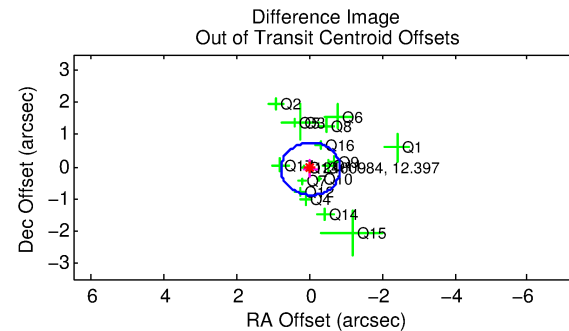
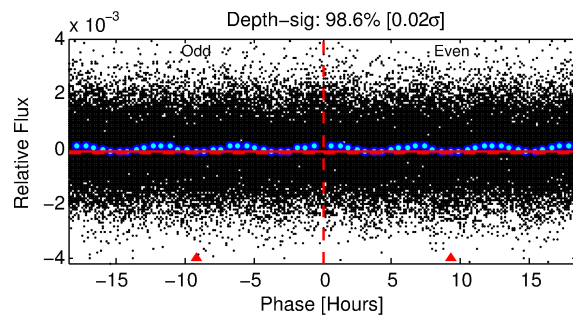
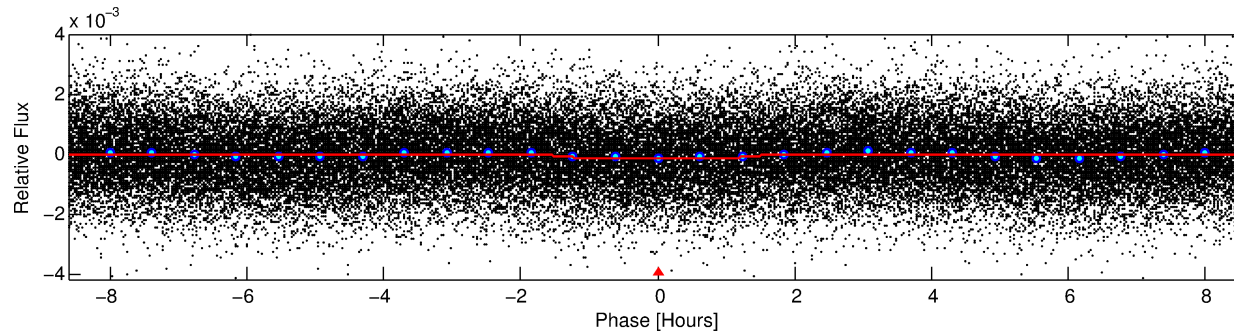
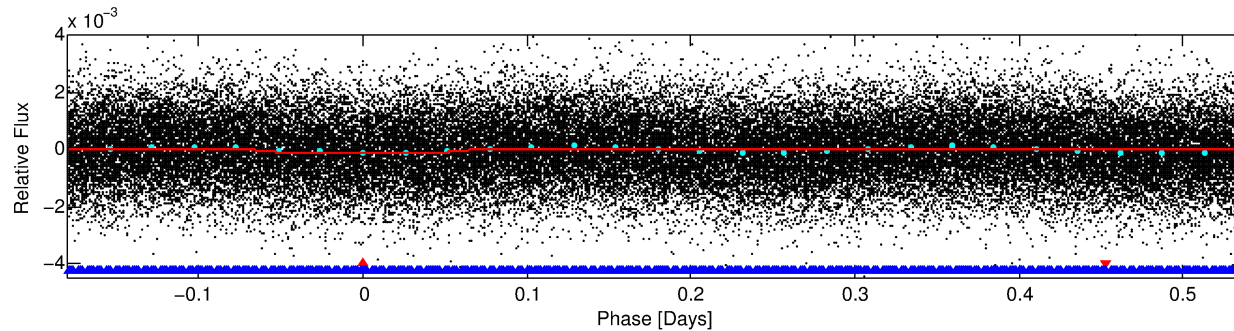
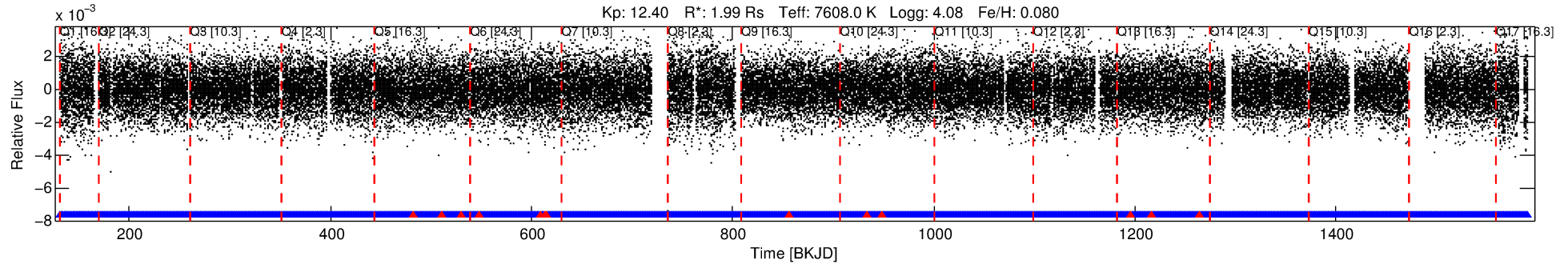
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 012400984-01

No Significant Match Found

# DV One-Page Summary

KIC: 12400984 Candidate: 1 of 2 Period: 0.719 d



## DV Fit Results:

Period = 0.71895 [0.00001] d  
Epoch = 131.5678 [0.0026] BKJD  
Rp/R\* = 0.0120 [0.0045]  
a/R\* = 1.24 [1.08]  
b = 0.90 [0.50]  
Seff = 33349.78 [12075.17]  
Teq = 3446 [312] K  
Rp = 2.60 [1.20] Re  
a = 0.0189 [0.0041] AU  
Ag = 1.36 [1.19] [0.30 $\sigma$ ]  
Teffp = 5753 [1204] K [1.85 $\sigma$ ]

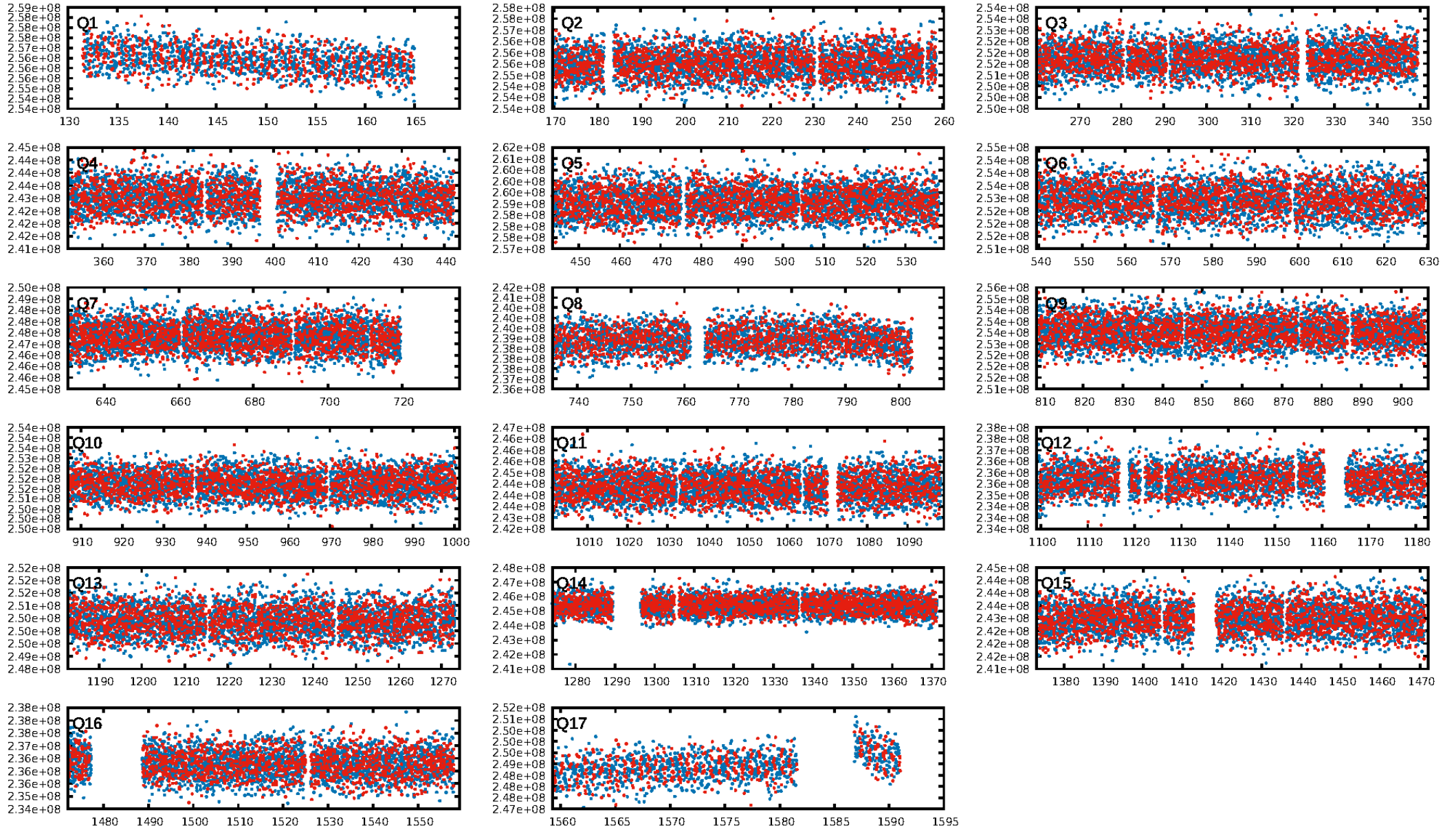
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 86.1% [1.48 $\sigma$ ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: N/A  
RollingBand-fgt: 0.99 [1769/1782]  
GhostDiagnostic-chr: 1.23  
Centroid-sig: 78.4%  
Centroid-so: 0.099 arcsec [0.83 $\sigma$ ]  
OotOffset-rm: 0.075 arcsec [0.27 $\sigma$ ]  
OotOffset-st: 4/4/4/5 [17]  
KicOffset-rm: 0.121 arcsec [0.44 $\sigma$ ]  
KicOffset-st: 4/4/4/5 [17]  
DiffImageQuality-fgm: 0.59 [10/17]  
DiffImageOverlap-fno: 1.00 [17/17]

Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 30-Jan-2016 05:04:16 Z

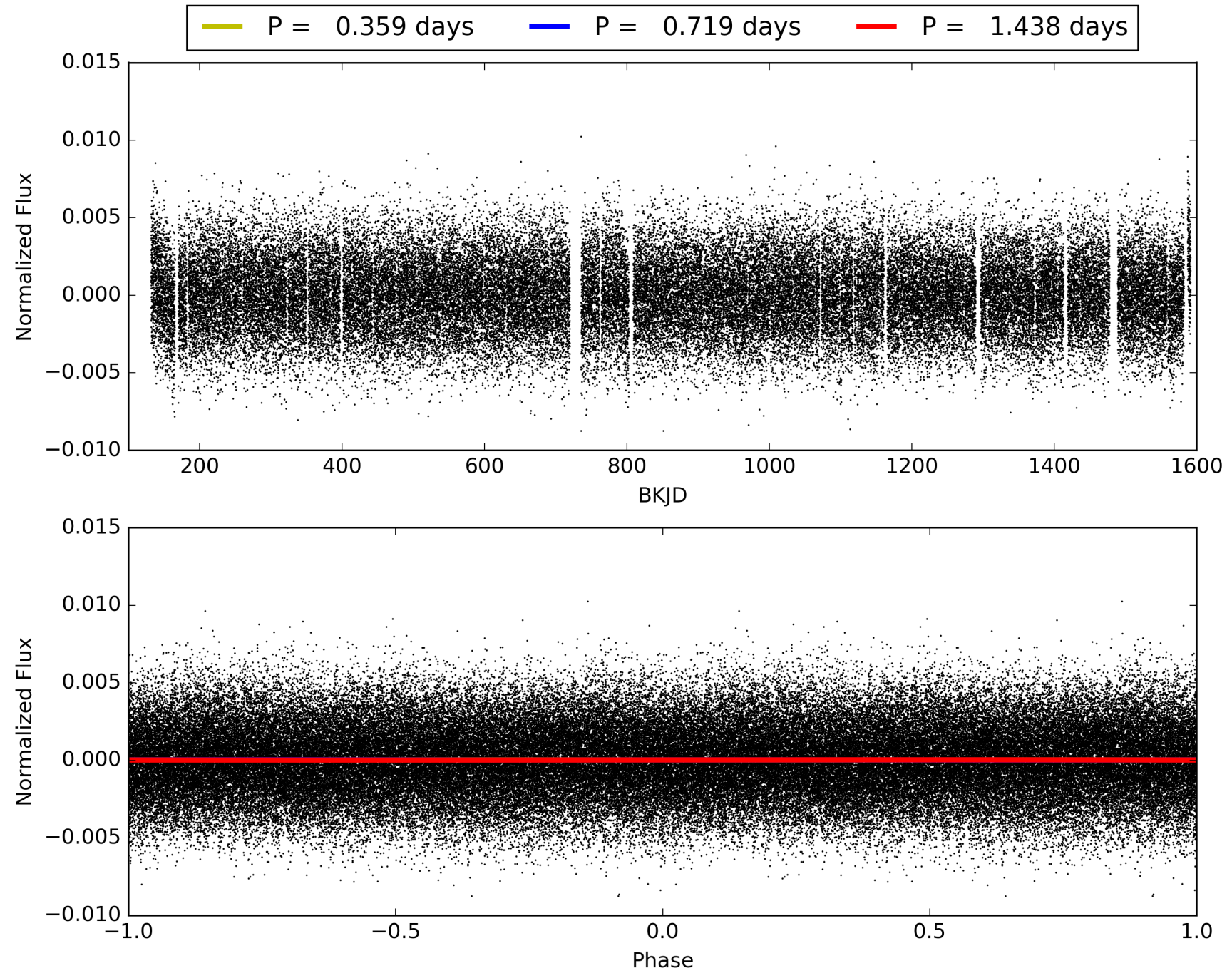
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

# TCE 012400984-01, PDC Light Curves



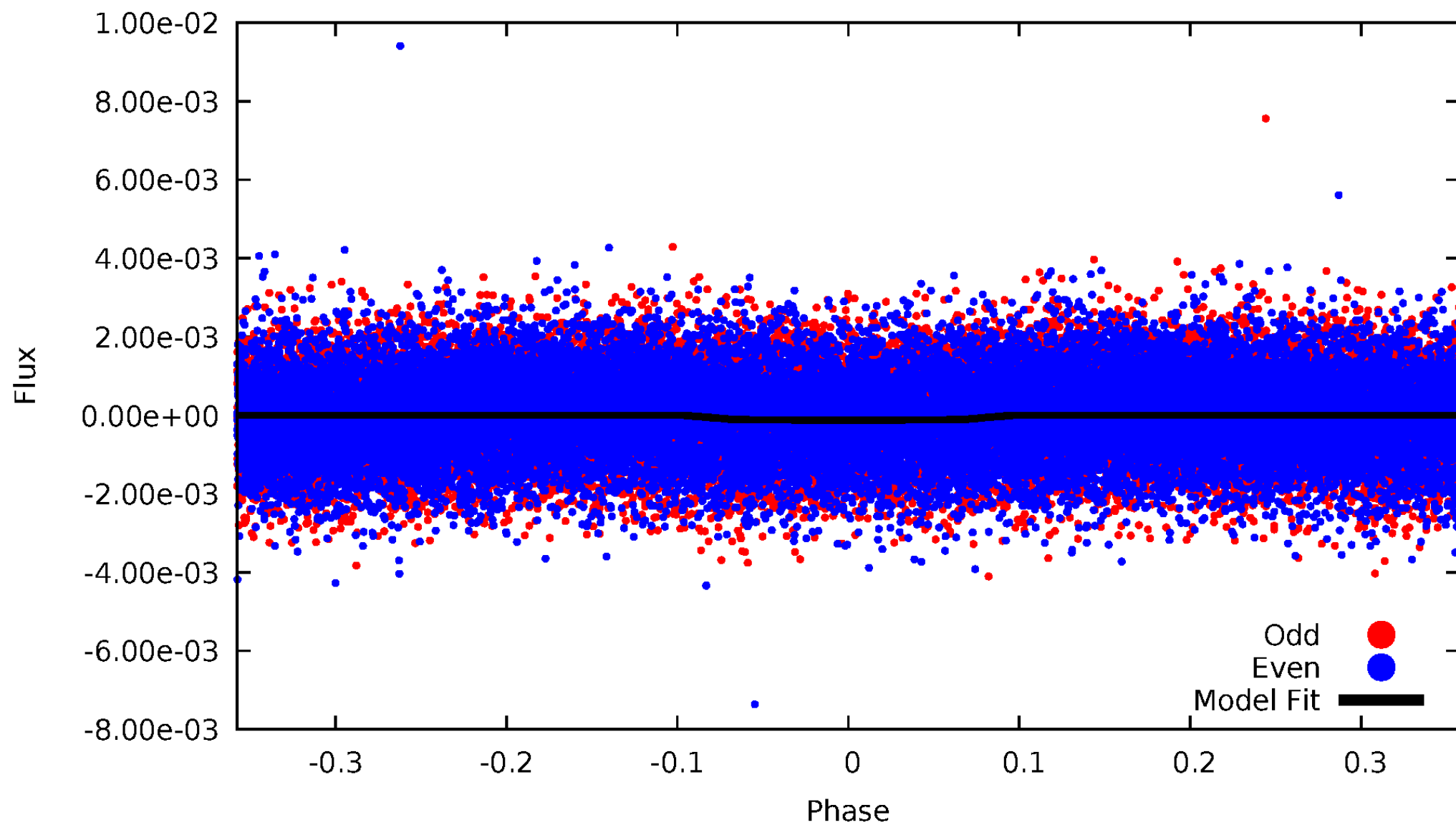


TCE 012400984-01



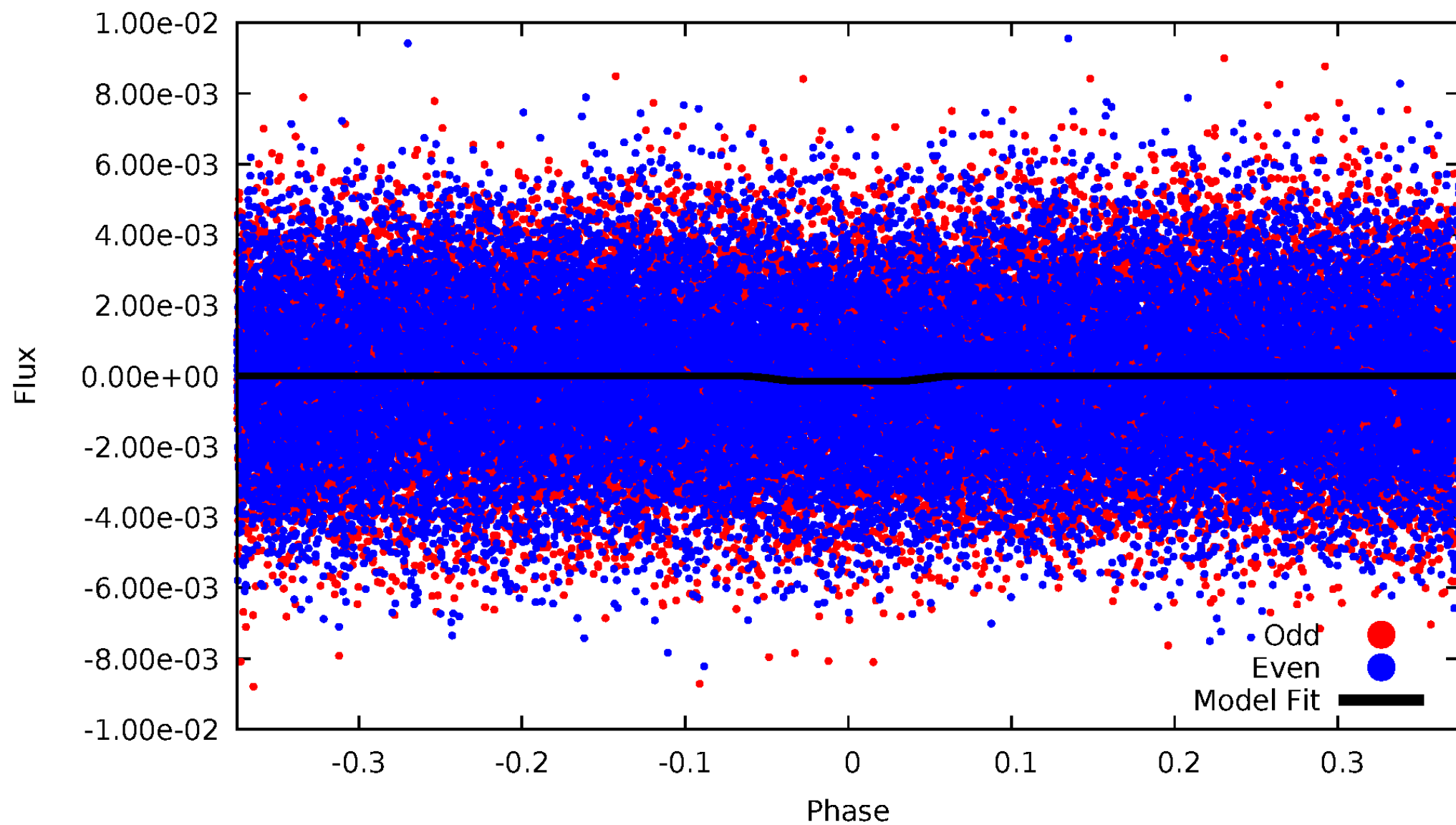
# DV Odd/Even

TCE 012400984-01



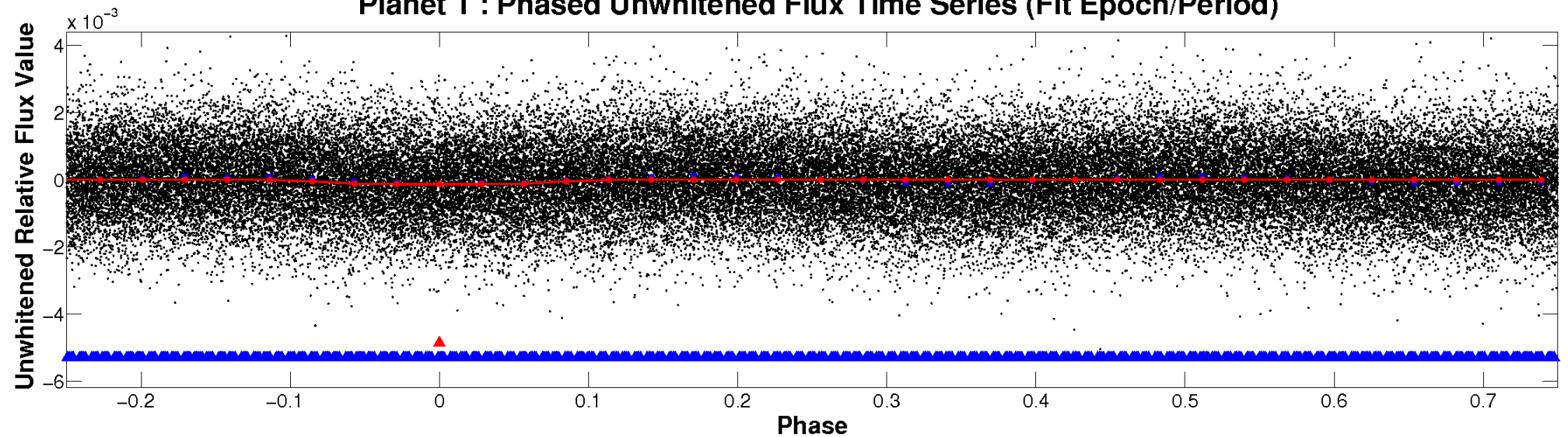
# ALT Odd/Even

TCE 012400984-01

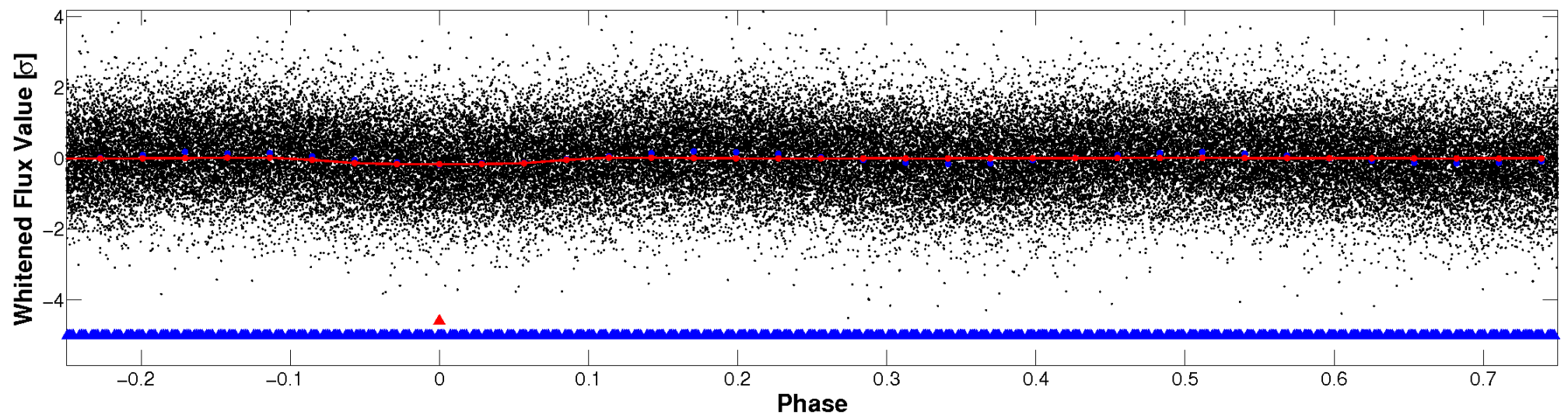


# Non-Whitened Vs. Whitened Light Curve

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



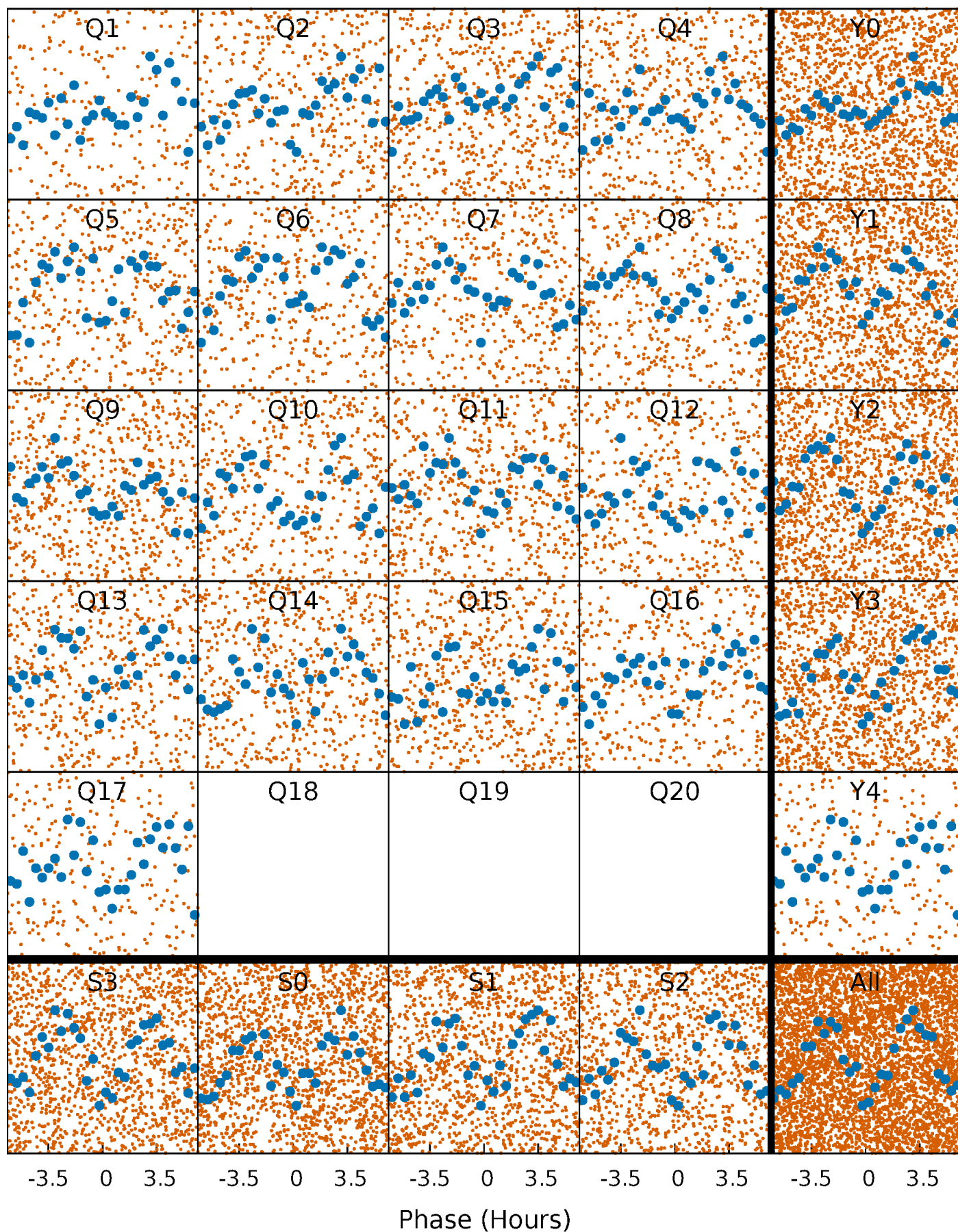
**Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)**





# PDC Quarter-Phased Transit Curves

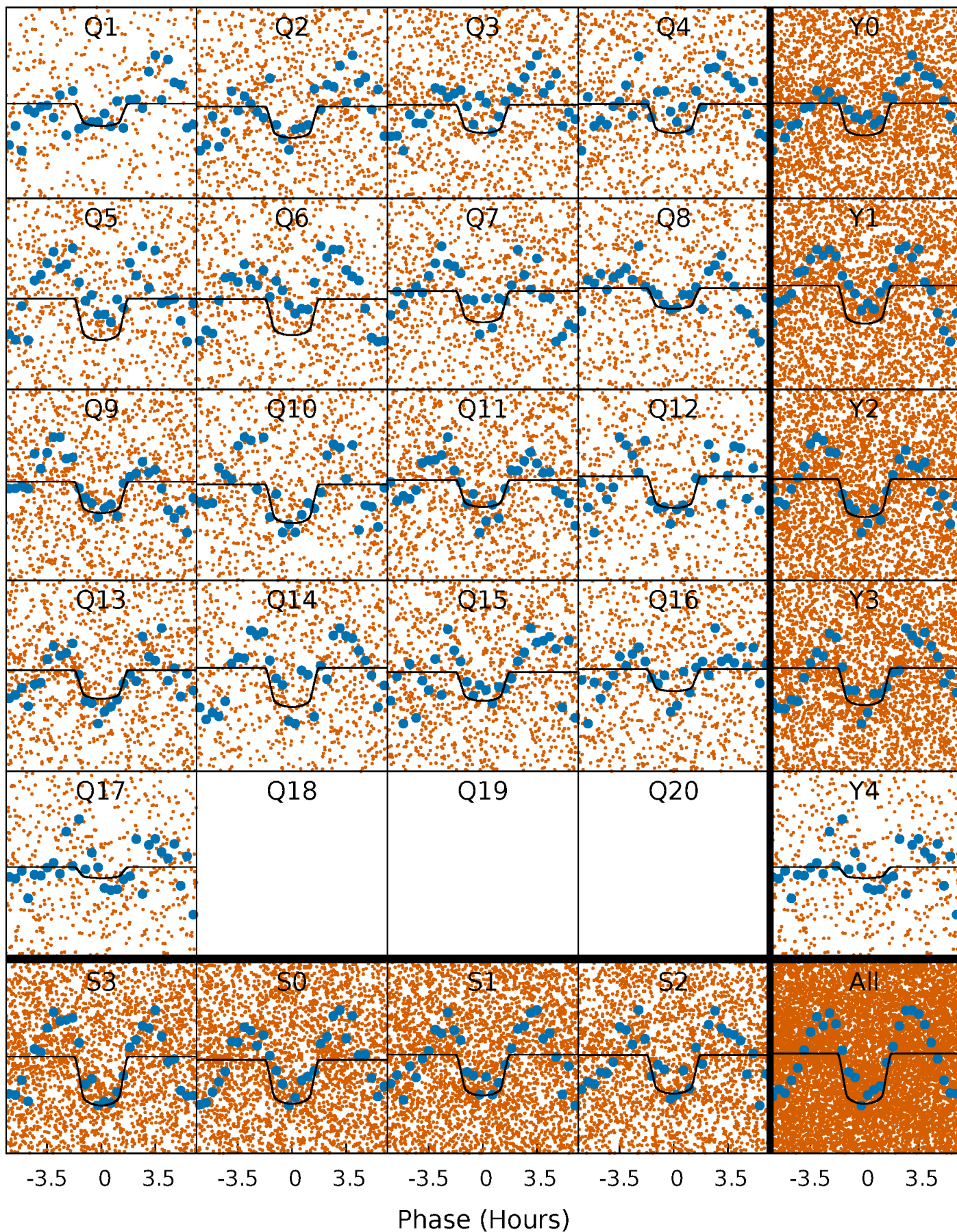
TCE 012400984-01 P= 0.718949 Days  $T_0=131.567811$  (BKJD)





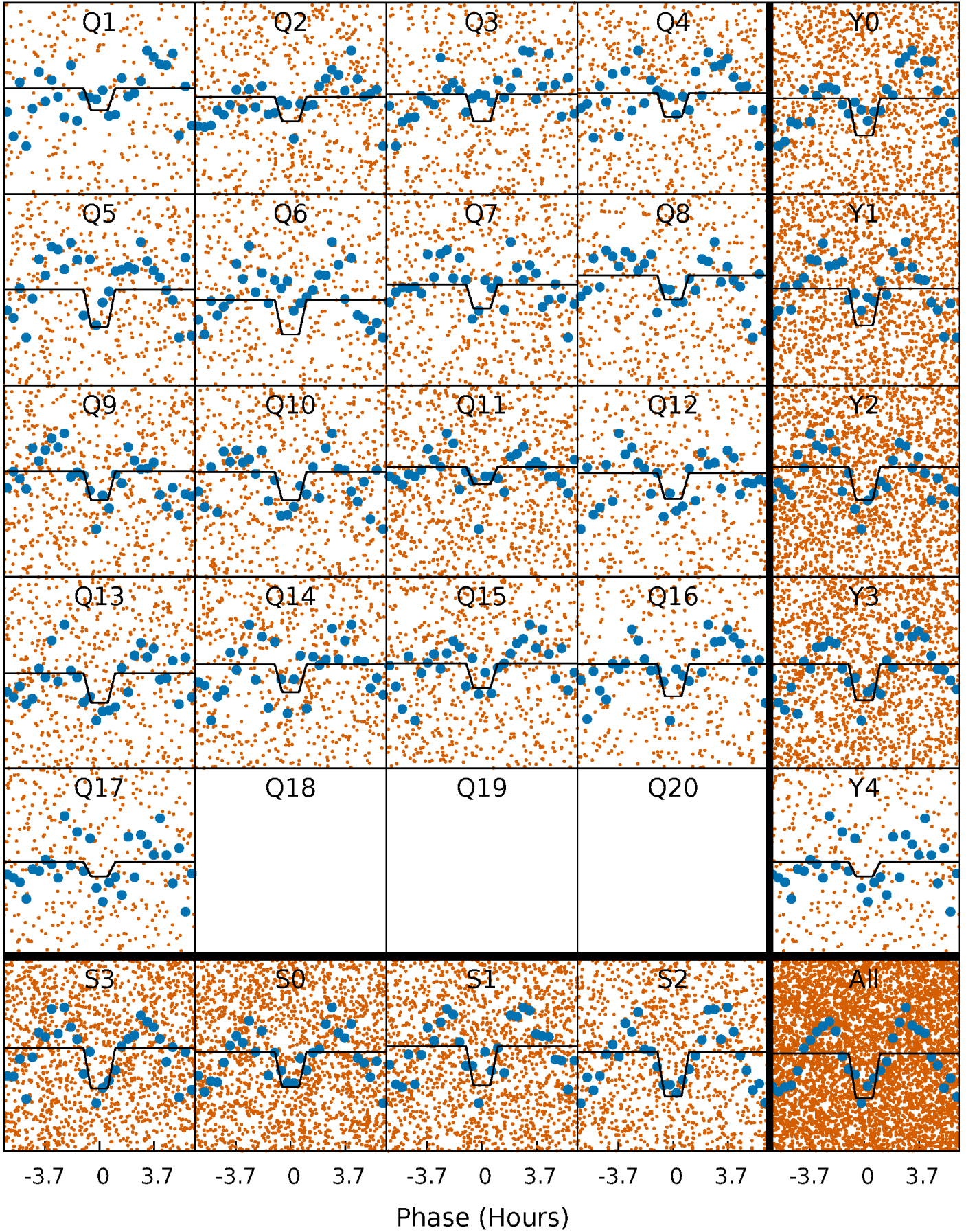
# DV Quarter-Phased Transit Curves

TCE 012400984-01 P= 0.718949 Days  $T_0=131.567811$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

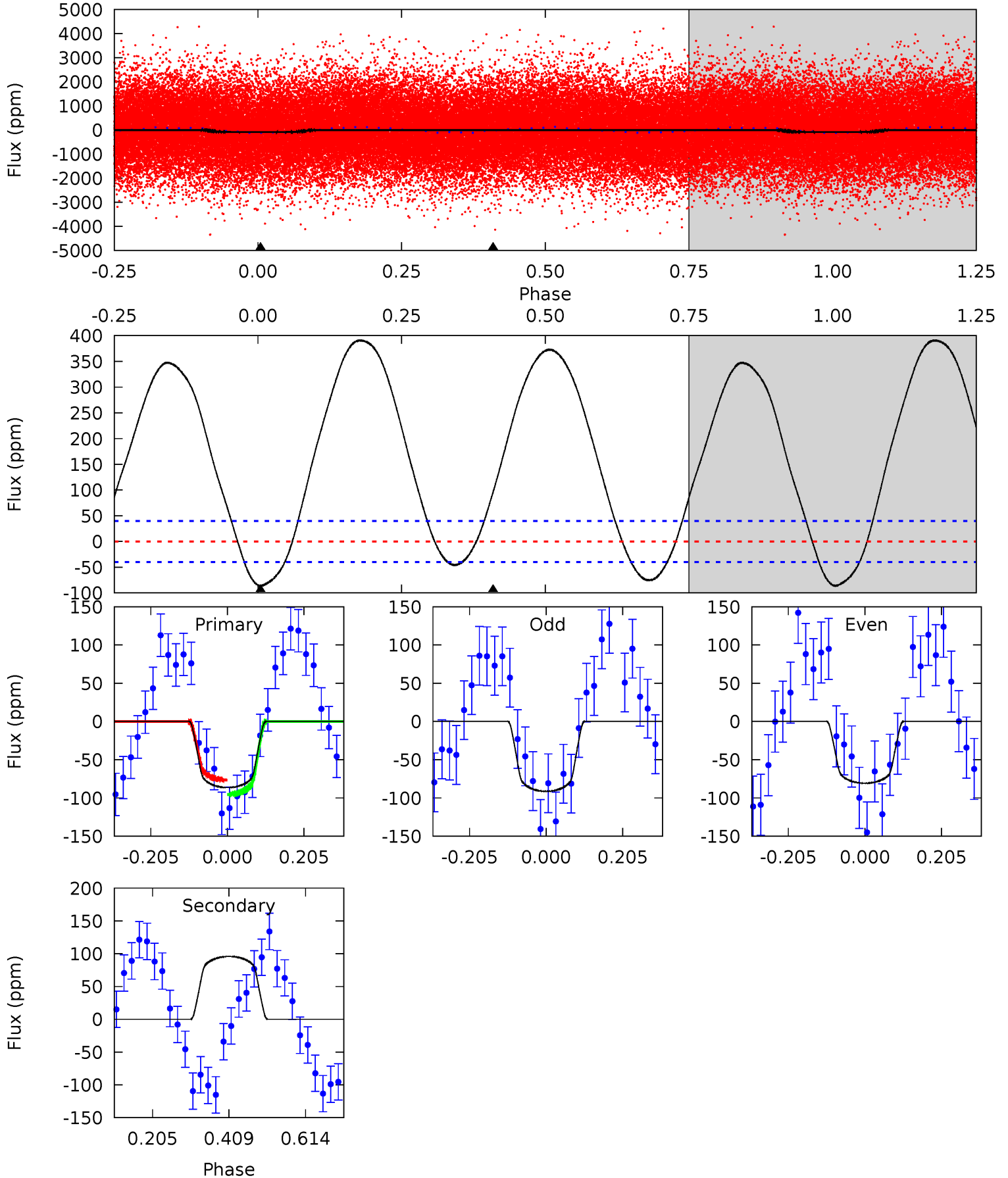
TCE 012400984-01 P= 0.718955 Days  $T_0=131.566927$  (BKJD)



# DV Model-Shift Uniqueness Test

012400984-01, P = 0.718949 Days, E = 130.848862 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
9.56	-10.6	0	0	4.41	1.27	11.0	9.56	9.56	-10.6	-10.6	0.59	1.03	0.82	1.04

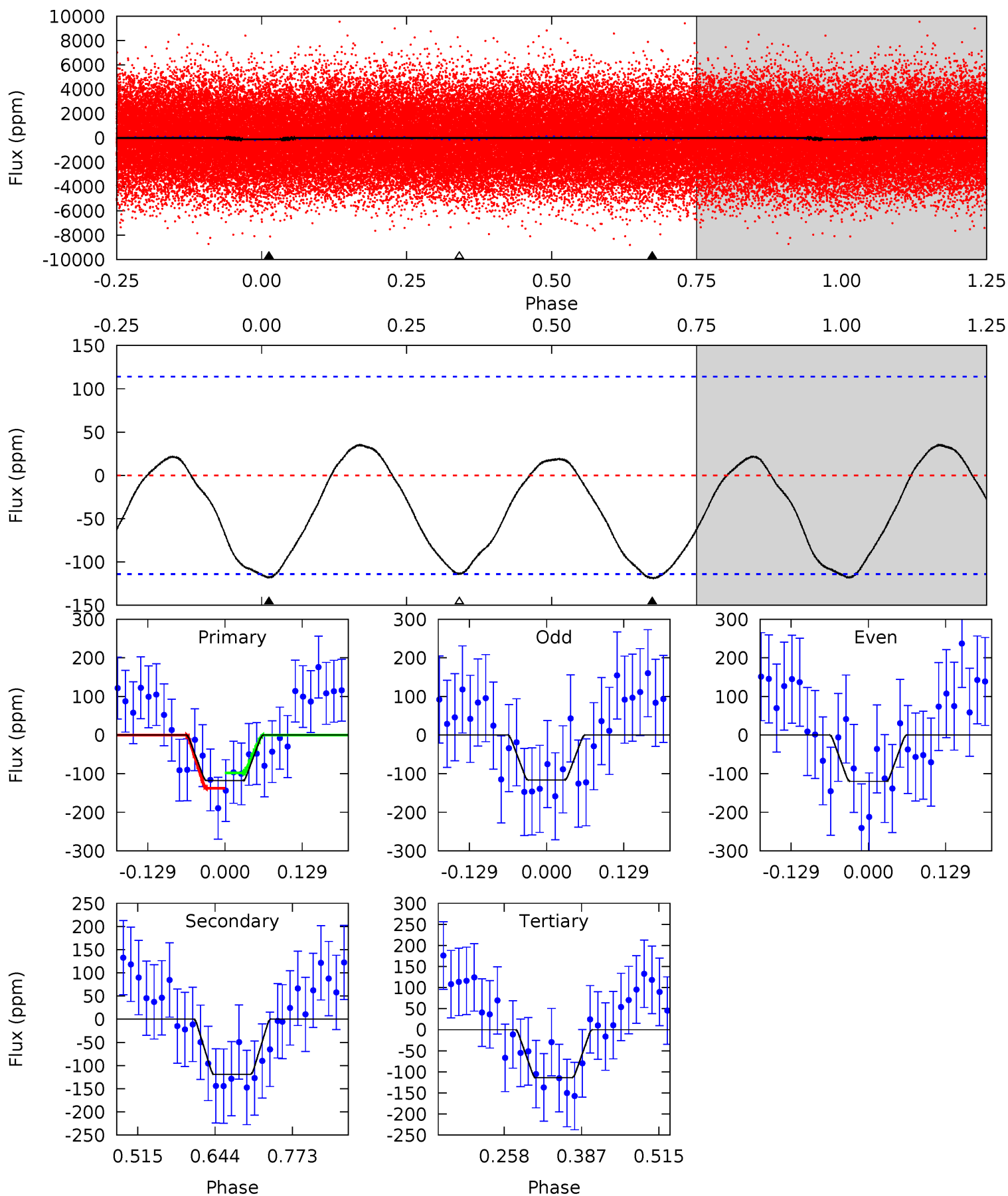




# Alt Model-Shift Uniqueness Test

012400984-01, P = 0.718955 Days, E = 130.847972 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
4.68	4.71	4.51	0	4.51	1.52	1.91	0.17	4.68	0.21	4.71	0.07	0.95	0.23	0.78





### Stellar Parameters For KIC 012400984

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$7608^{+211}_{-342}$	$4.080^{+0.139}_{-0.170}$	$0.080^{+0.200}_{-0.350}$	$1.991^{+0.523}_{-0.428}$	$1.738^{+0.195}_{-0.292}$	$0.310^{+0.219}_{-0.150}$
	+3%/-4%	+3%/-4%	+250%/-438%	+26%/-21%	+11%/-17%	+71%/-48%
Source	KIC0	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 012400984-01 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$96 \pm 9$	$2.63^{+1.06}_{-1.01}$	$4814^{+355}_{-269}$	$-6920^{+925}_{-2128}$	$-2.664^{+1.326}_{-4.263}$
Alt.	$-119 \pm 25$	$2.65^{+1.15}_{-0.99}$	$4825^{+332}_{-332}$	$6830^{+2537}_{-1238}$	$3.183^{+4.756}_{-1.617}$

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

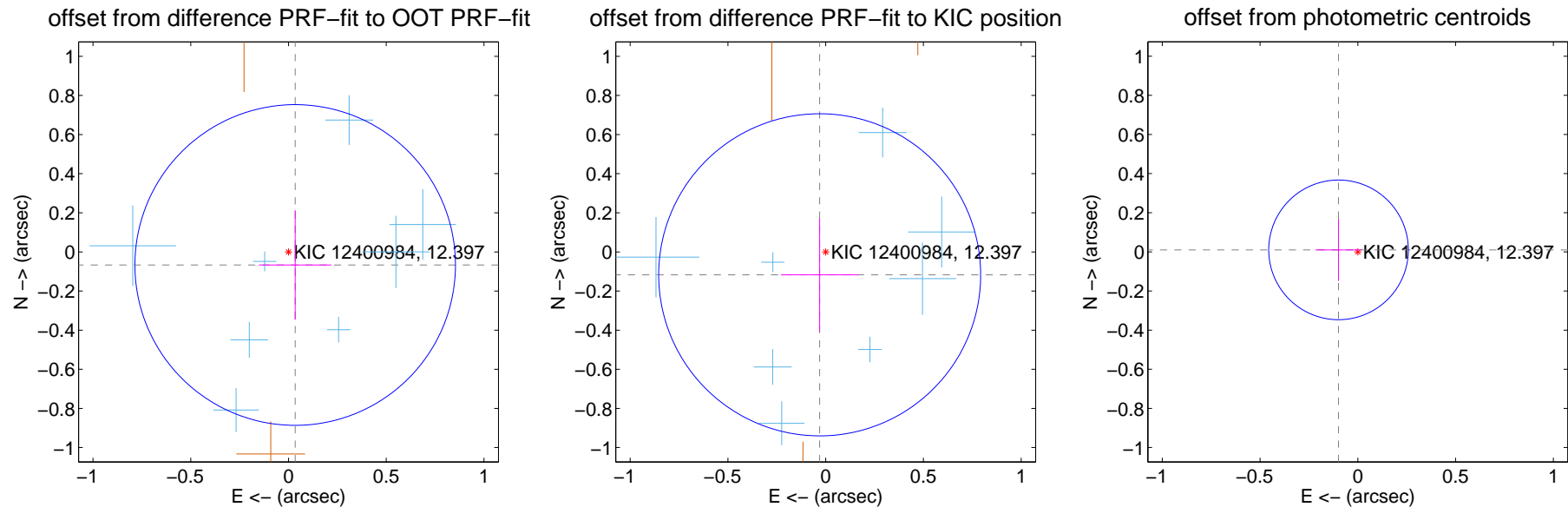
## DV Centroid Data

Supplemental centroid analysis for 012400984-01. Kepler magnitude: 12.40. Transit SNR 15.03

There are 10 quarters with good PRF difference image offsets

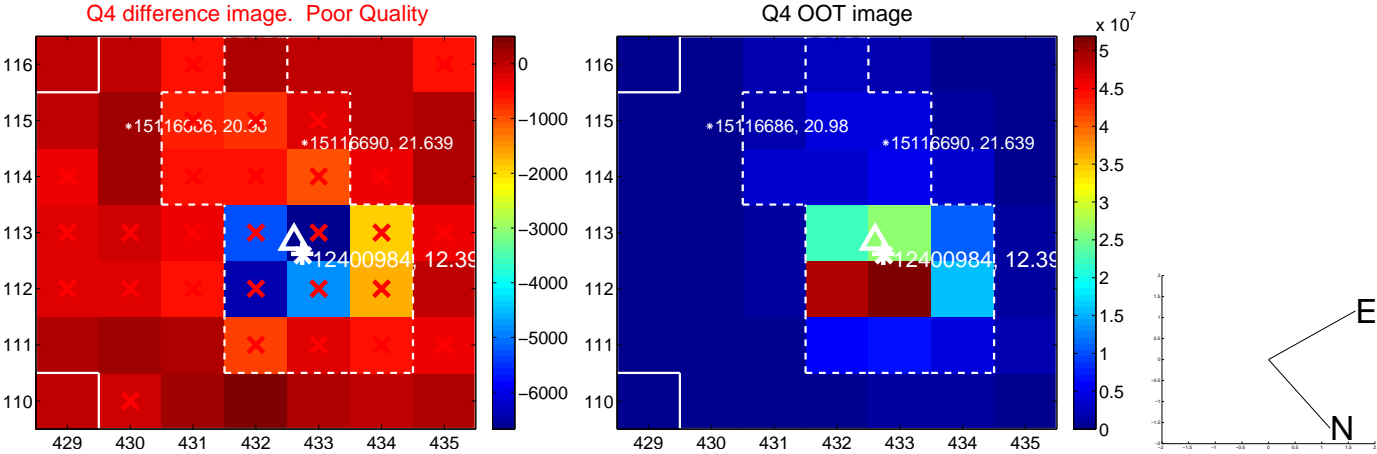
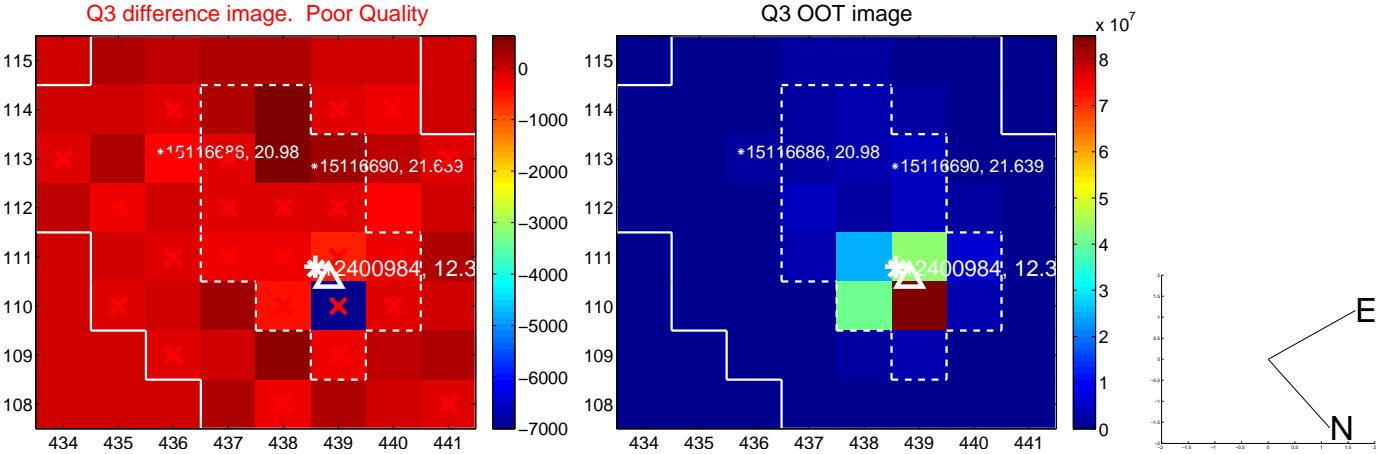
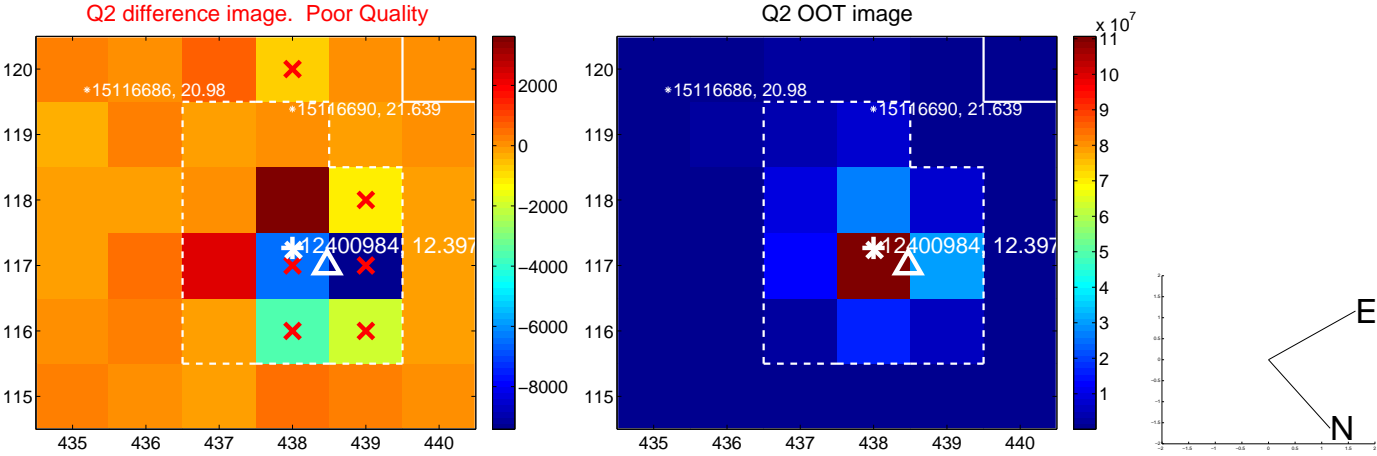
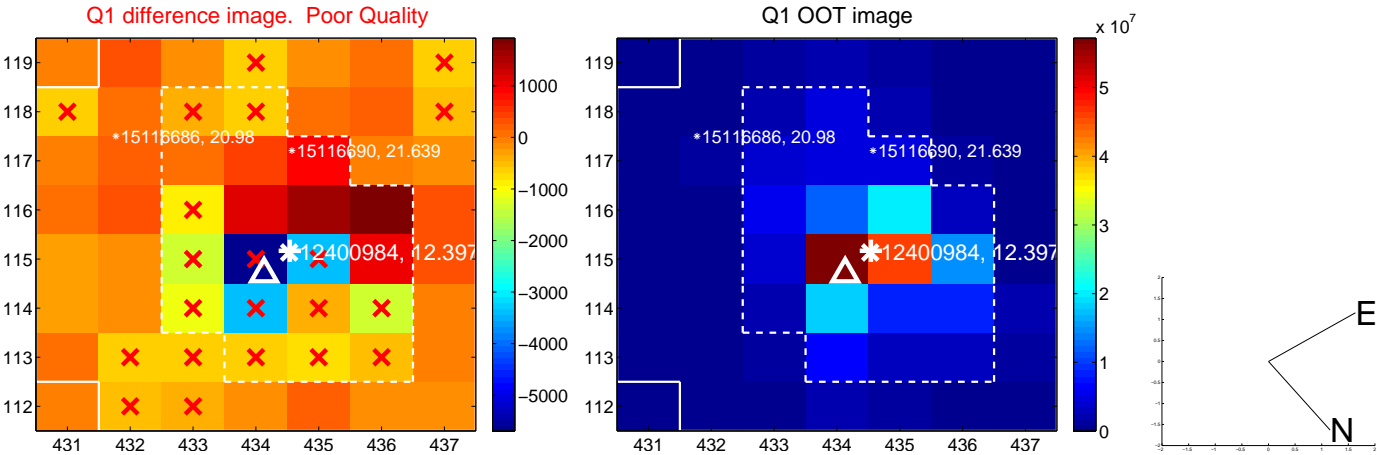
The direct PRF centroid is offset from the target star catalog position by about 0.09 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.075 \pm 0.273$	0.27	$-0.034 \pm 0.185$	$-0.067 \pm 0.280$
PRF-fit source offset from KIC position	$0.121 \pm 0.274$	0.44	$0.031 \pm 0.198$	$-0.117 \pm 0.289$
photometric centroid source offset	$0.10 \pm 0.12$	0.83	$0.10 \pm 0.12$	$0.01 \pm 0.16$

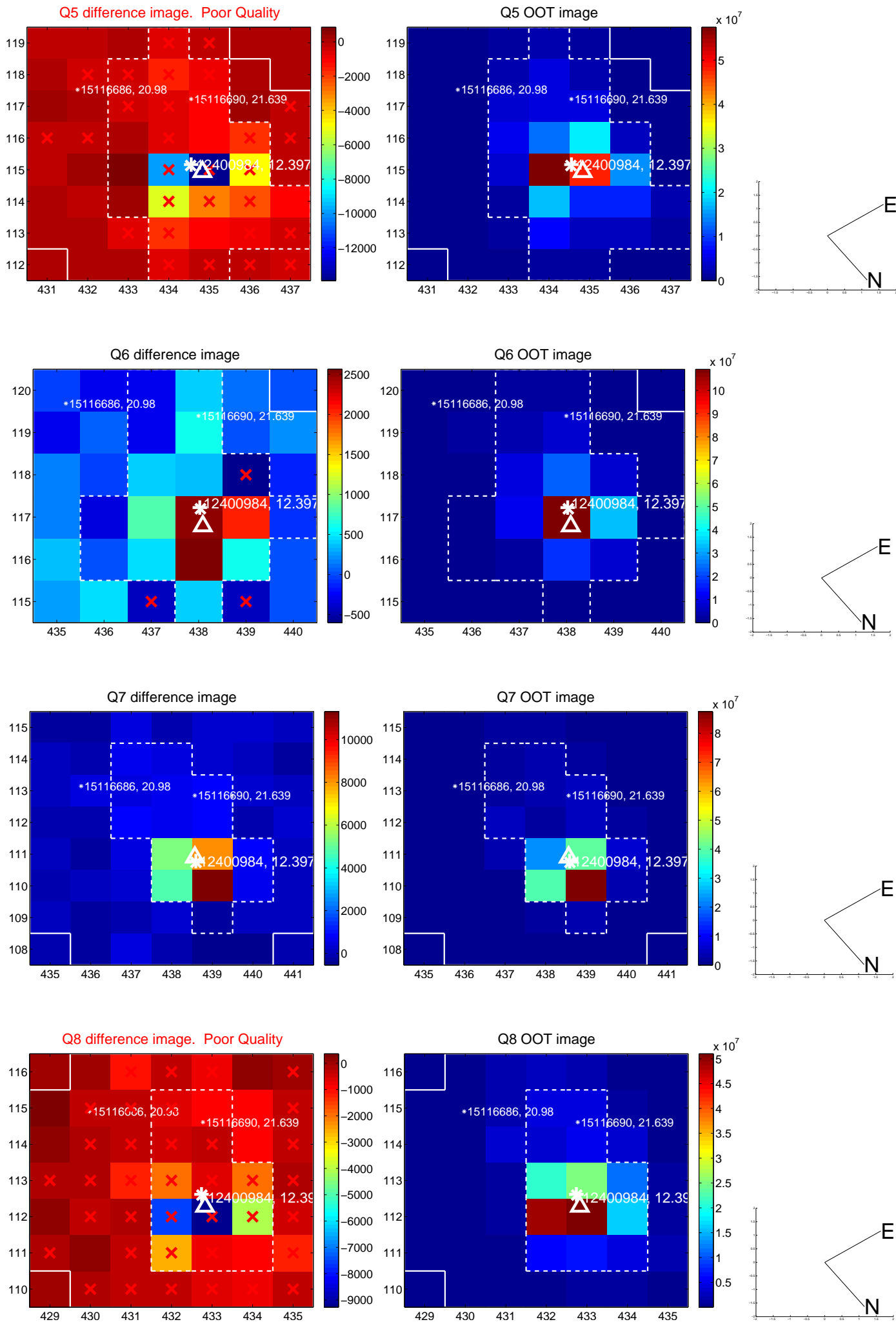


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses:** good quarterly centroid offsets; **Vermillion crosses:** bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

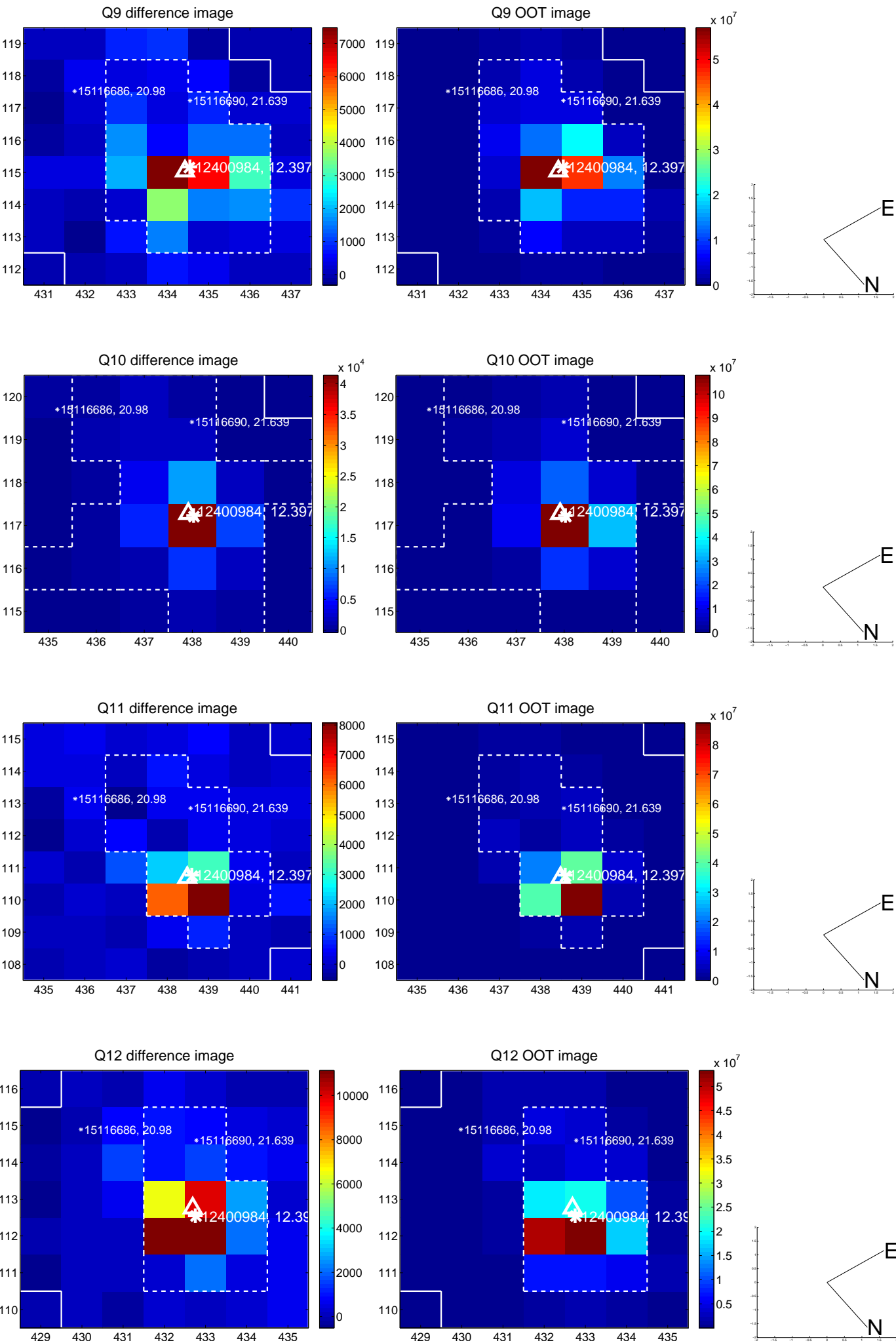


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

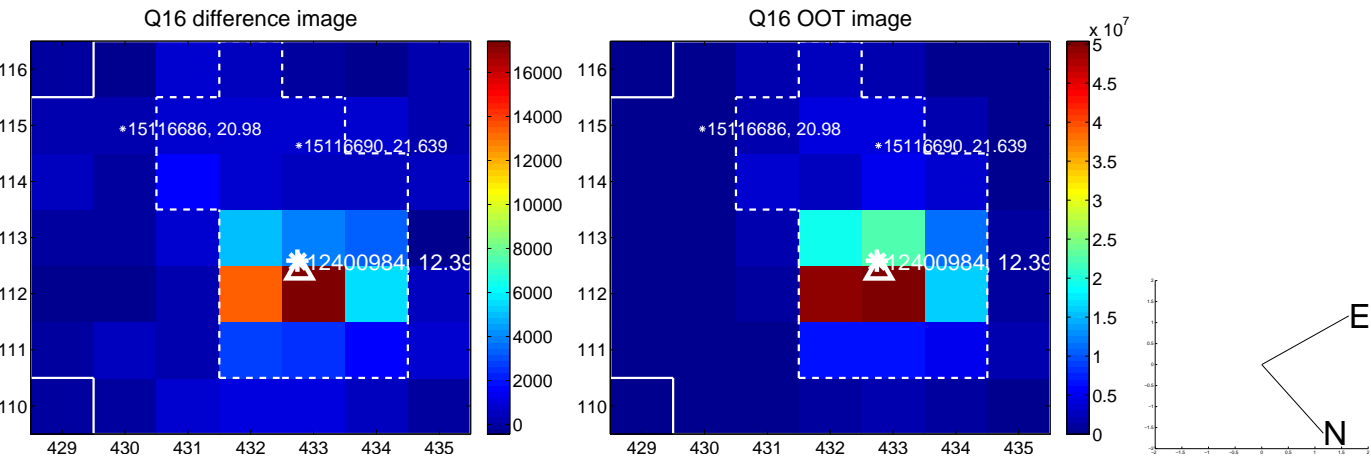
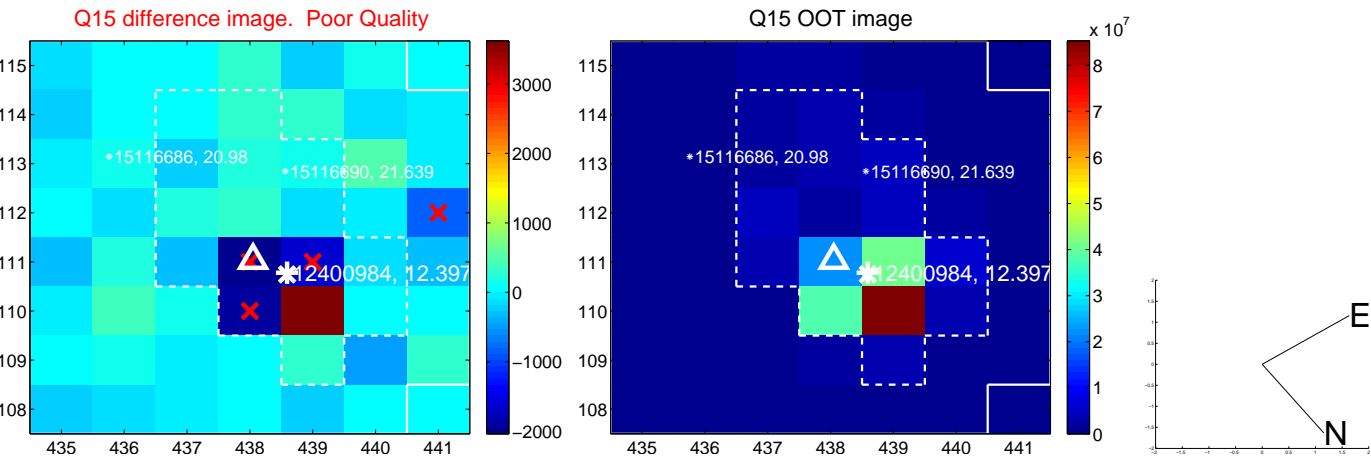
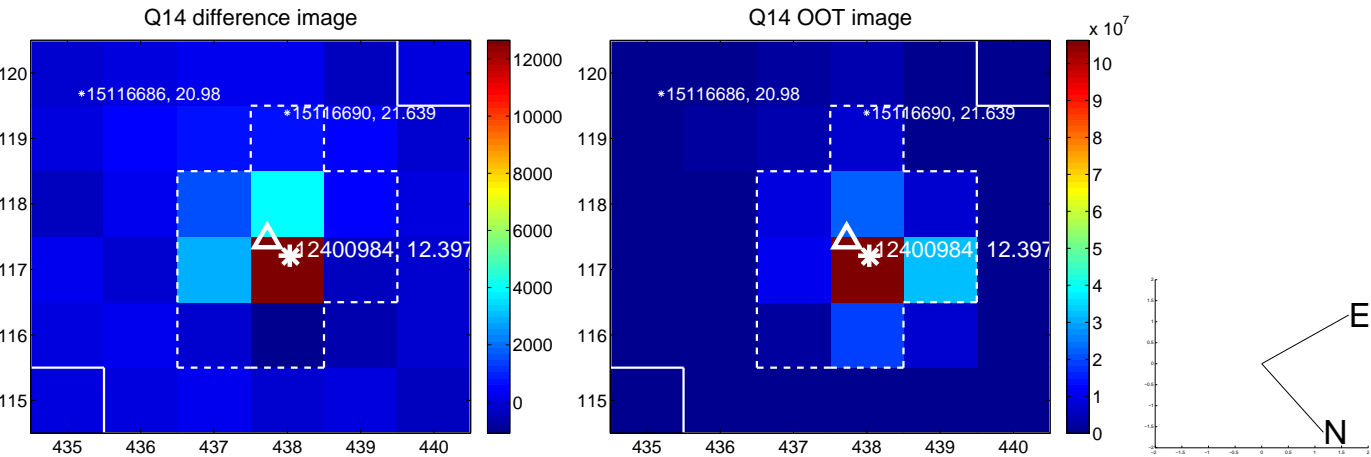
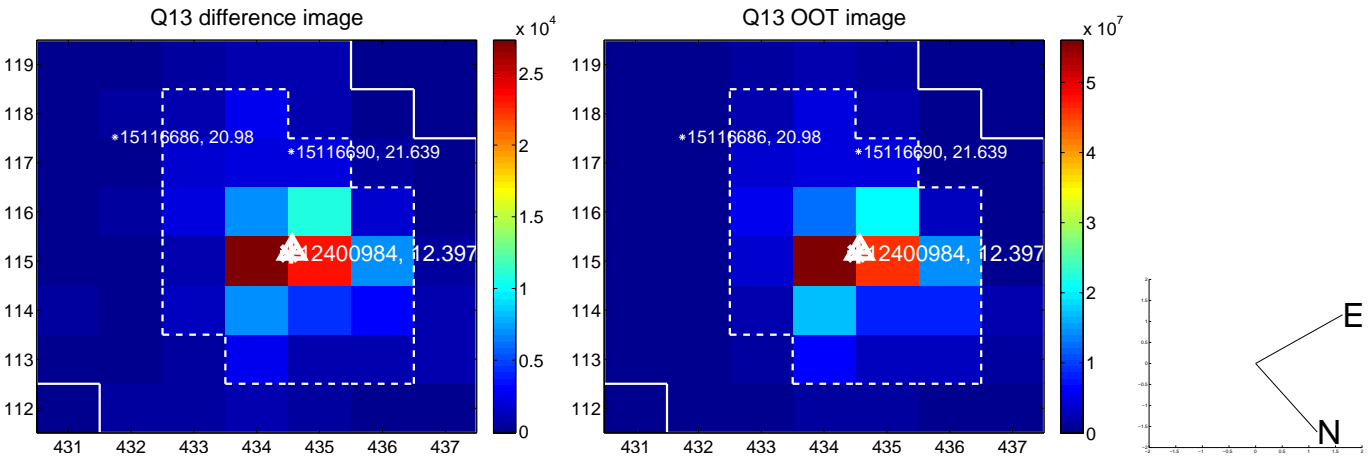




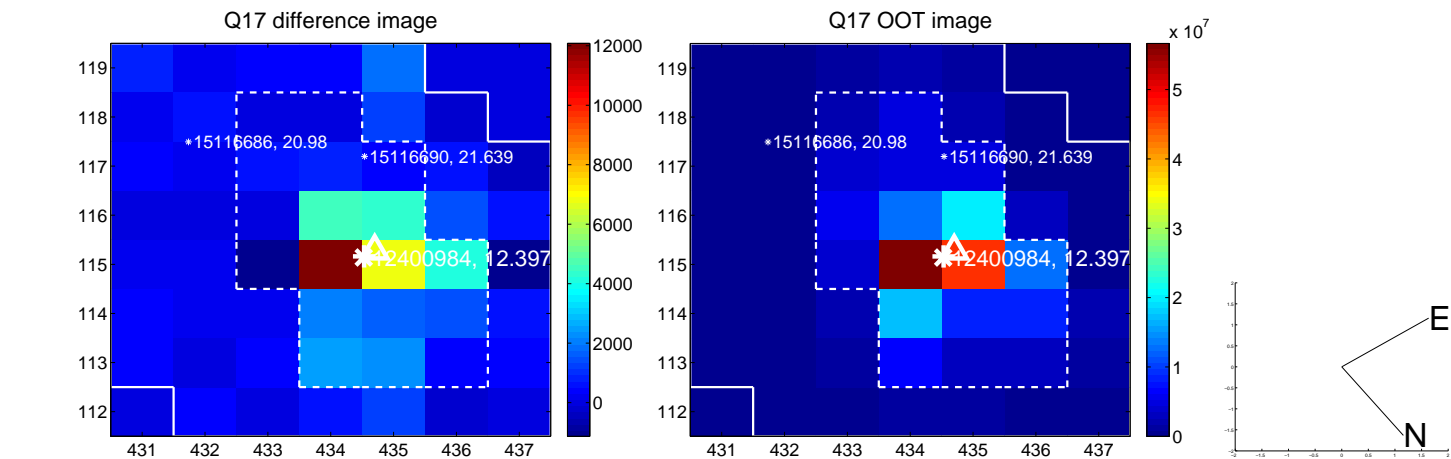
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



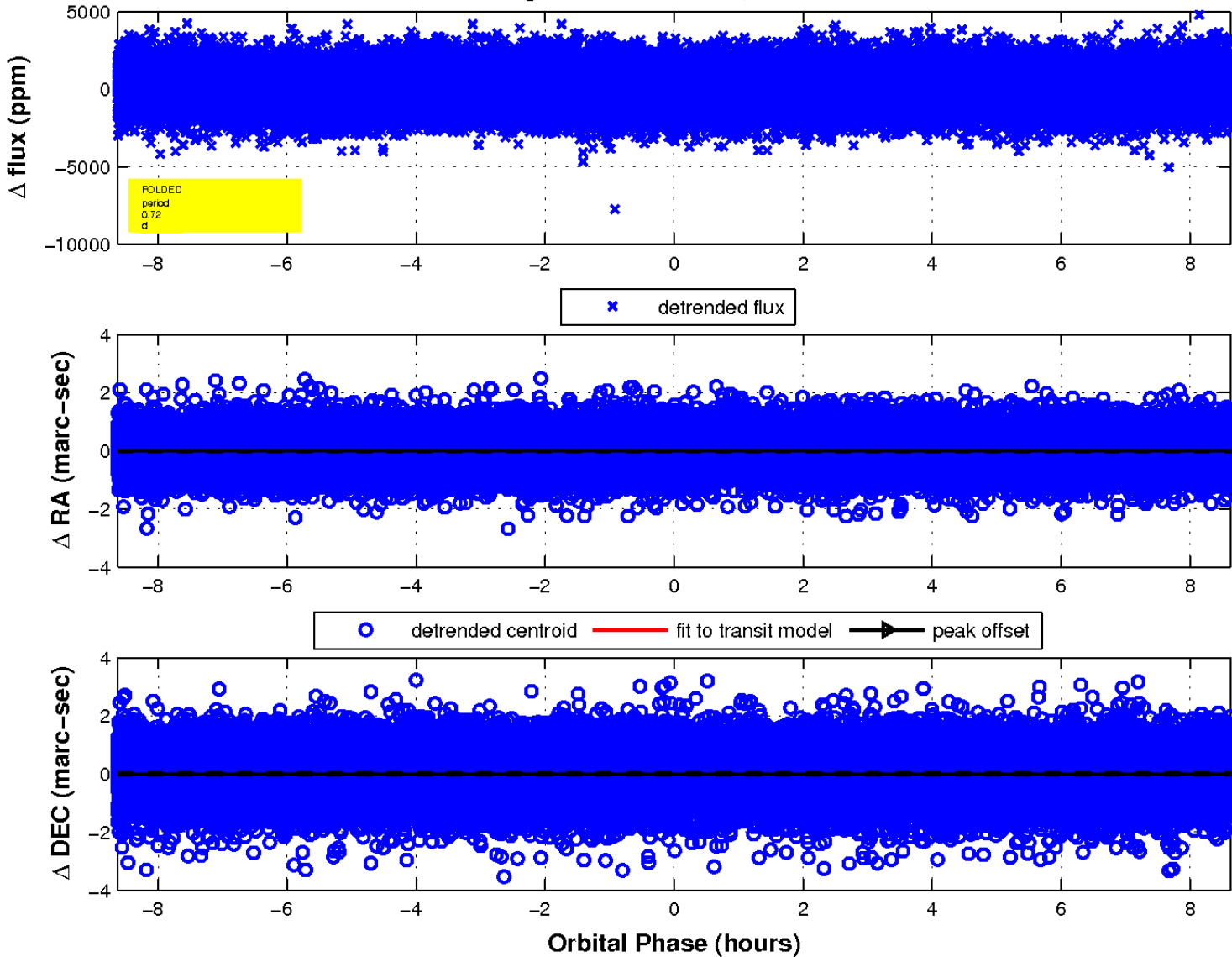
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

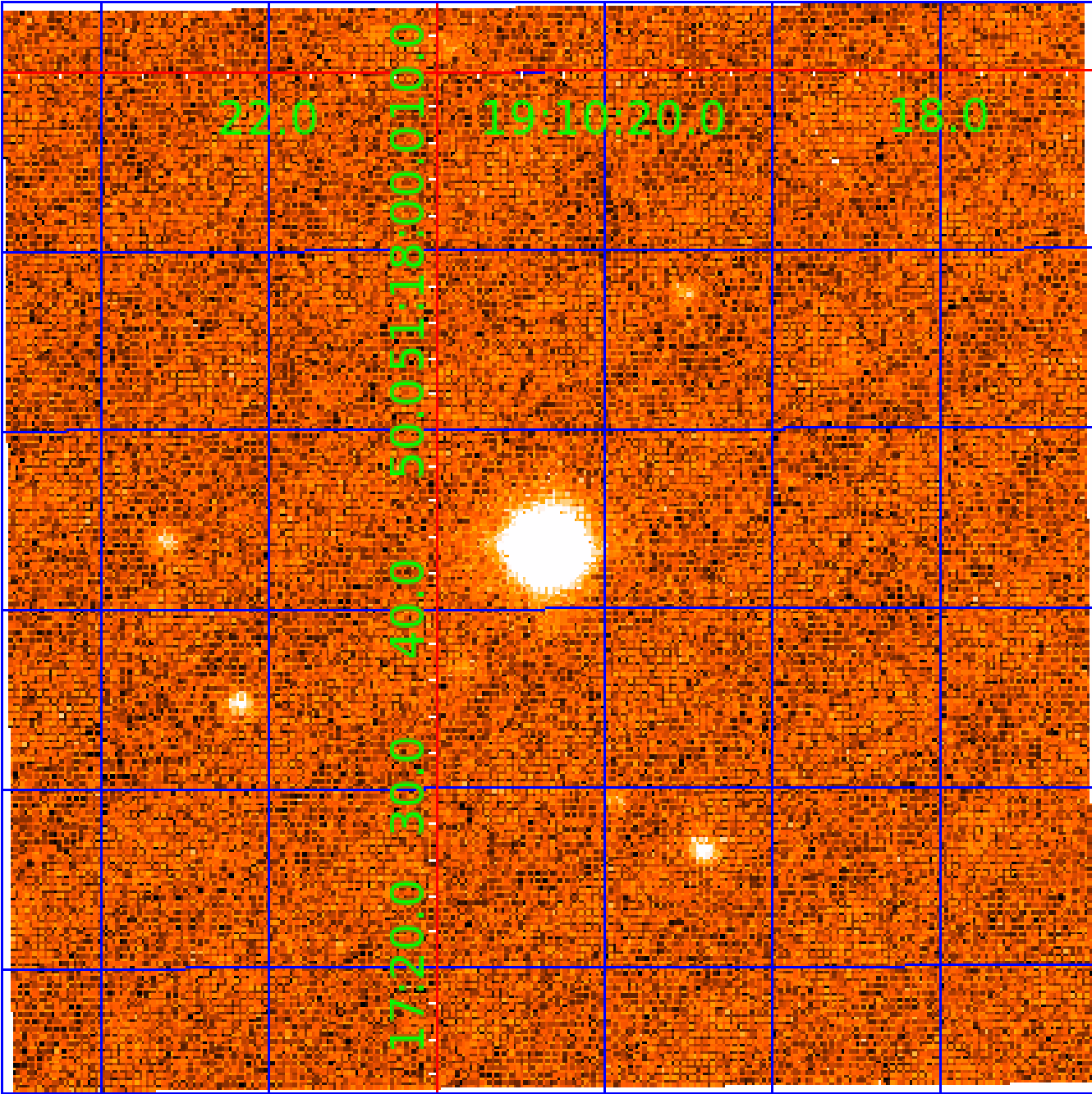


fluxWeightedCentroids, Planet 1 of 2



UKIRT Image

Declination





# KIC 012400984

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
012400984-01	OBS	No	0.718949	131.567811	126.4	3.085	13.4	15.0	1.99	7608	2.60	33349.78
012400984-02	OBS	No	2.797778	132.965662	221.2	33.573	12.5	20.2	1.99	7608	3.75	5448.45

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
012400984-01	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT
012400984-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_SKYE_ZUMA—TRANS_GAPPED—LPP_DV—CENT_FEW_DIFFS

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

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

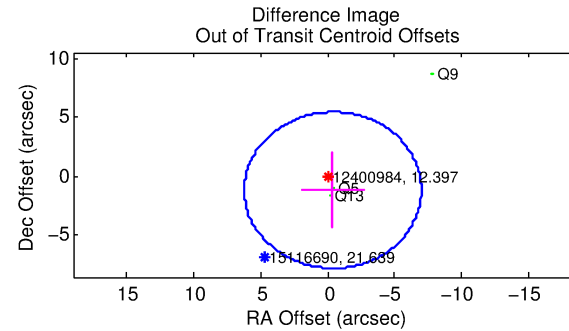
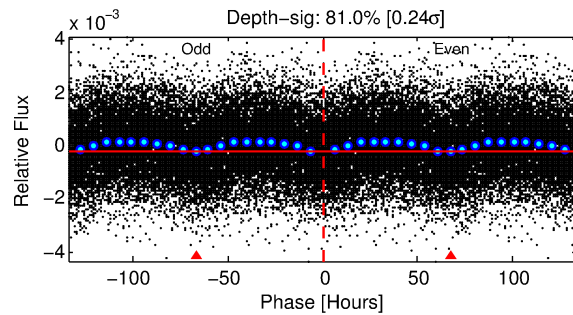
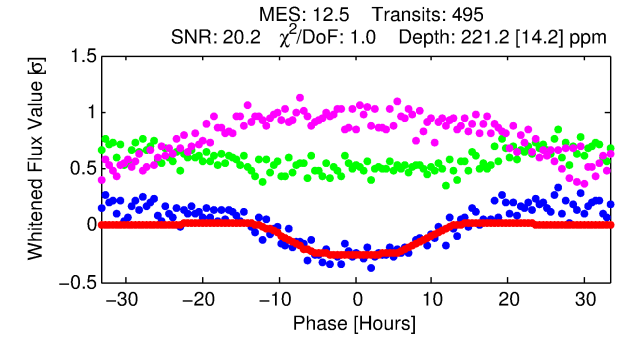
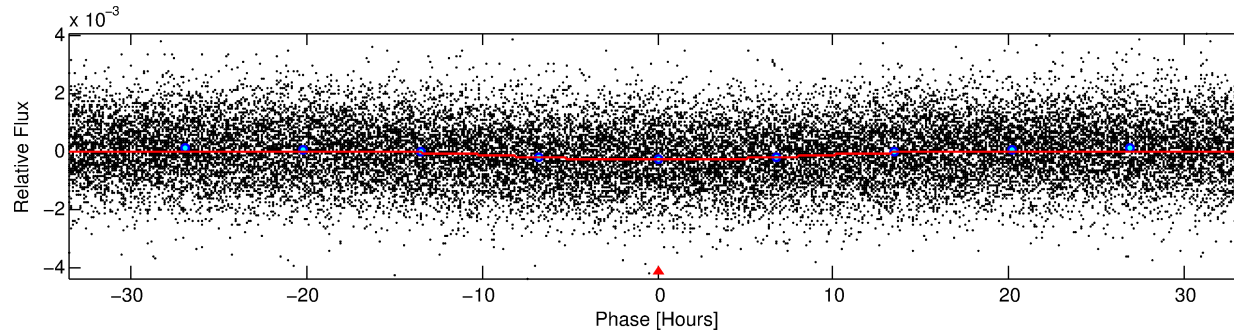
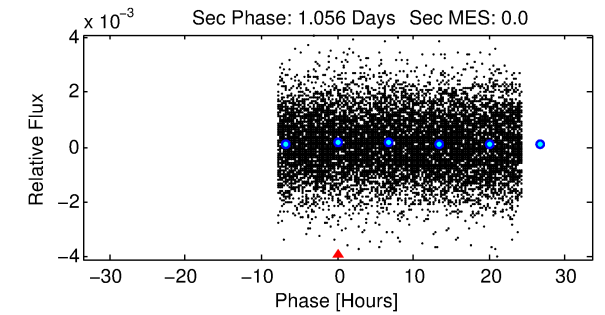
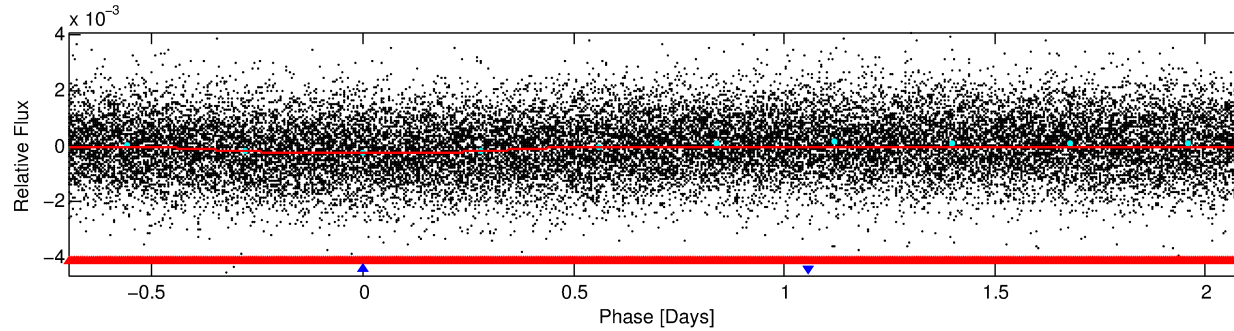
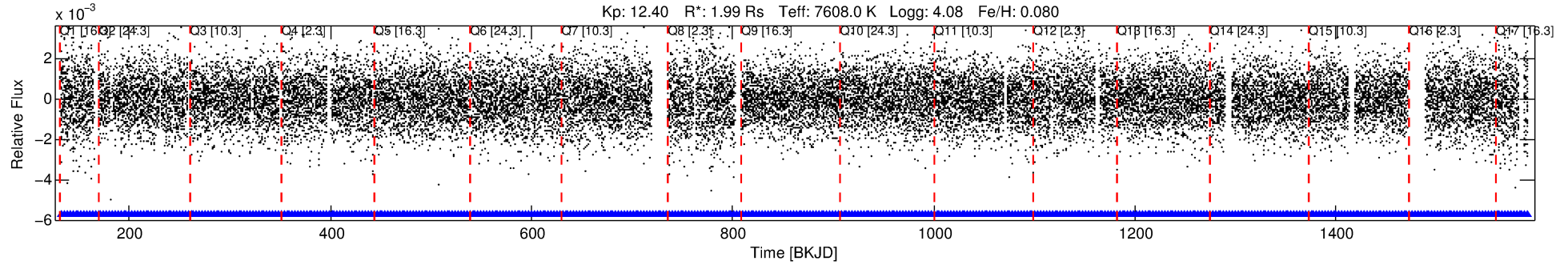
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 012400984-02

No Significant Match Found

# DV One-Page Summary

KIC: 12400984 Candidate: 2 of 2 Period: 2.798 d



## DV Fit Results:

Period = 2.79778 [0.00012] d  
Epoch = 132.9657 [0.0366] BKJD  
Rp/R\* = 0.0173 [0.0007]  
a/R\* = 1.02 [0.00]  
b = 0.97 [0.01]  
Seff = 5448.45 [1972.75]  
Teq = 2191 [198] K  
Rp = 3.75 [1.00] Re  
a = 0.0467 [0.0102] AU  
Ag = N/A  
Teffp = N/A

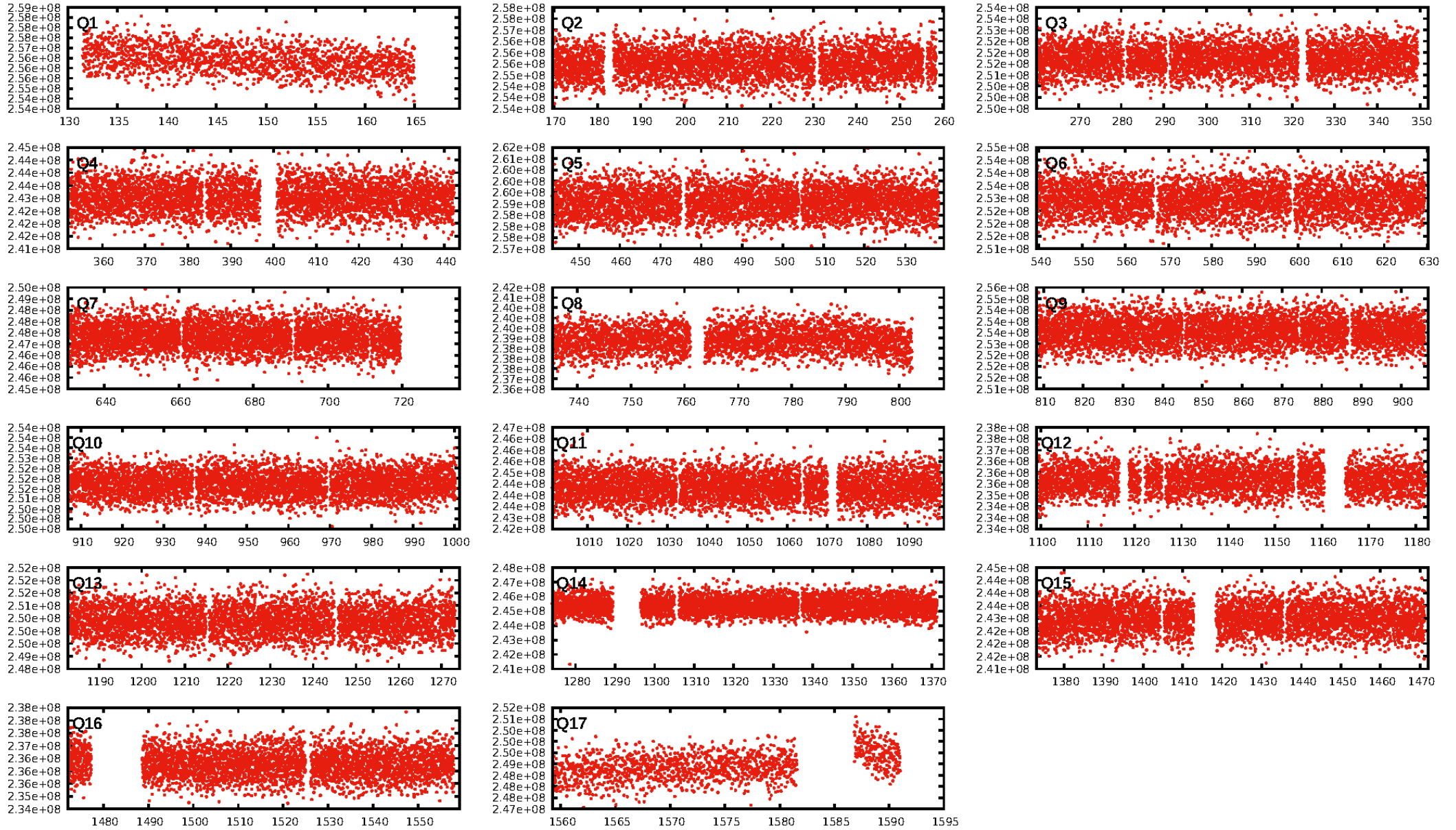
## DV Diagnostic Results:

ShortPeriod-sig: 86.1% [1.48σ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: N/A  
RollingBand-fgt: 1.00 [473/473]  
GhostDiagnostic-chr: 1.564  
Centroid-sig: 16.8%  
Centroid-so: 0.135 arcsec [2.24σ]  
OotOffset-rm: 1.226 arcsec [0.56σ]  
KicOffset-rm: 1.250 arcsec [0.65σ]  
OotOffset-st: 0/0/0/3 [3]  
KicOffset-st: 0/0/0/3 [3]  
DiffImageQuality-fgm: 0.67 [2/3]  
DiffImageOverlap-fno: 0.00 [0/17]

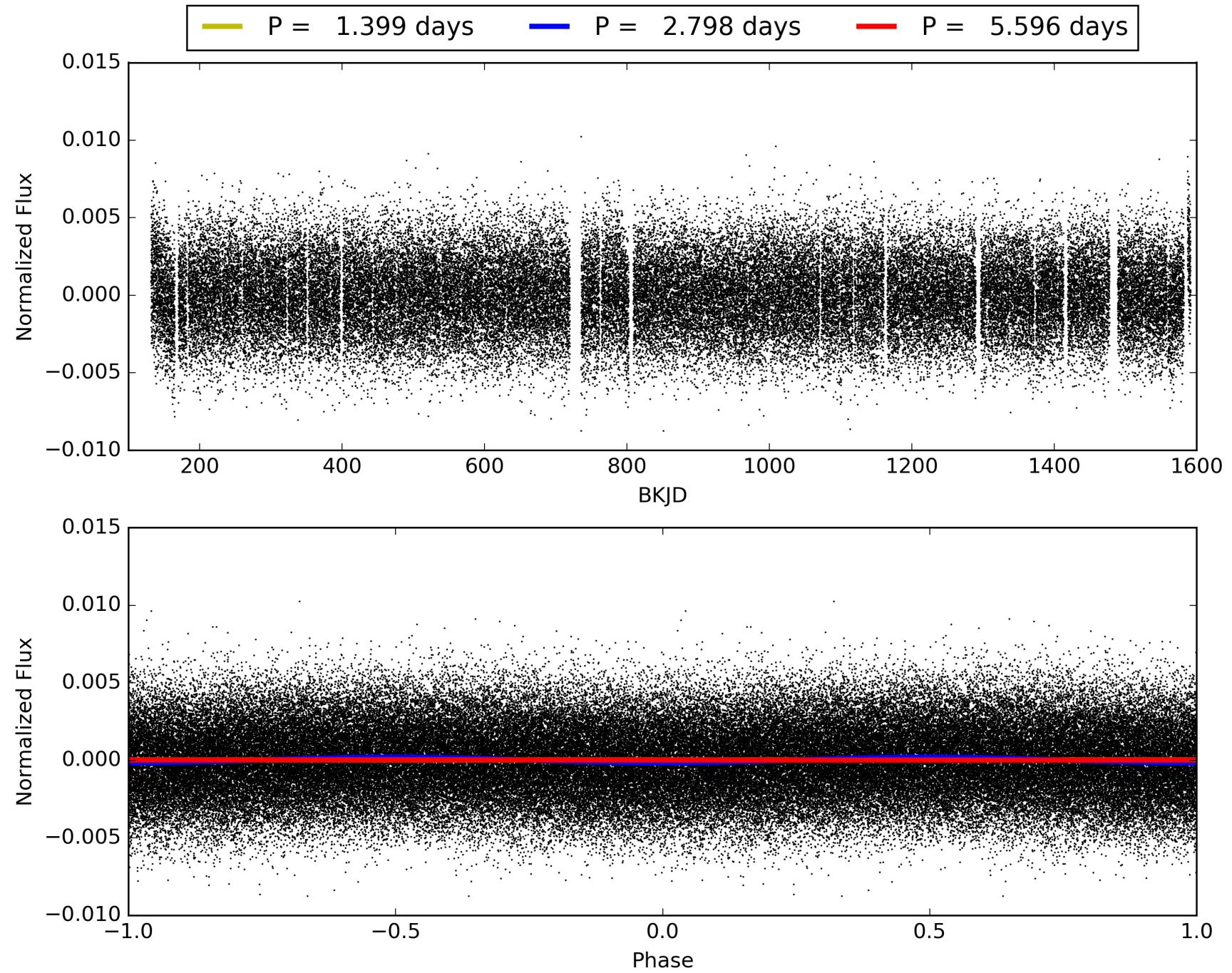
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 30-Jan-2016 05:04:33 Z

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

# TCE 012400984-02, PDC Light Curves



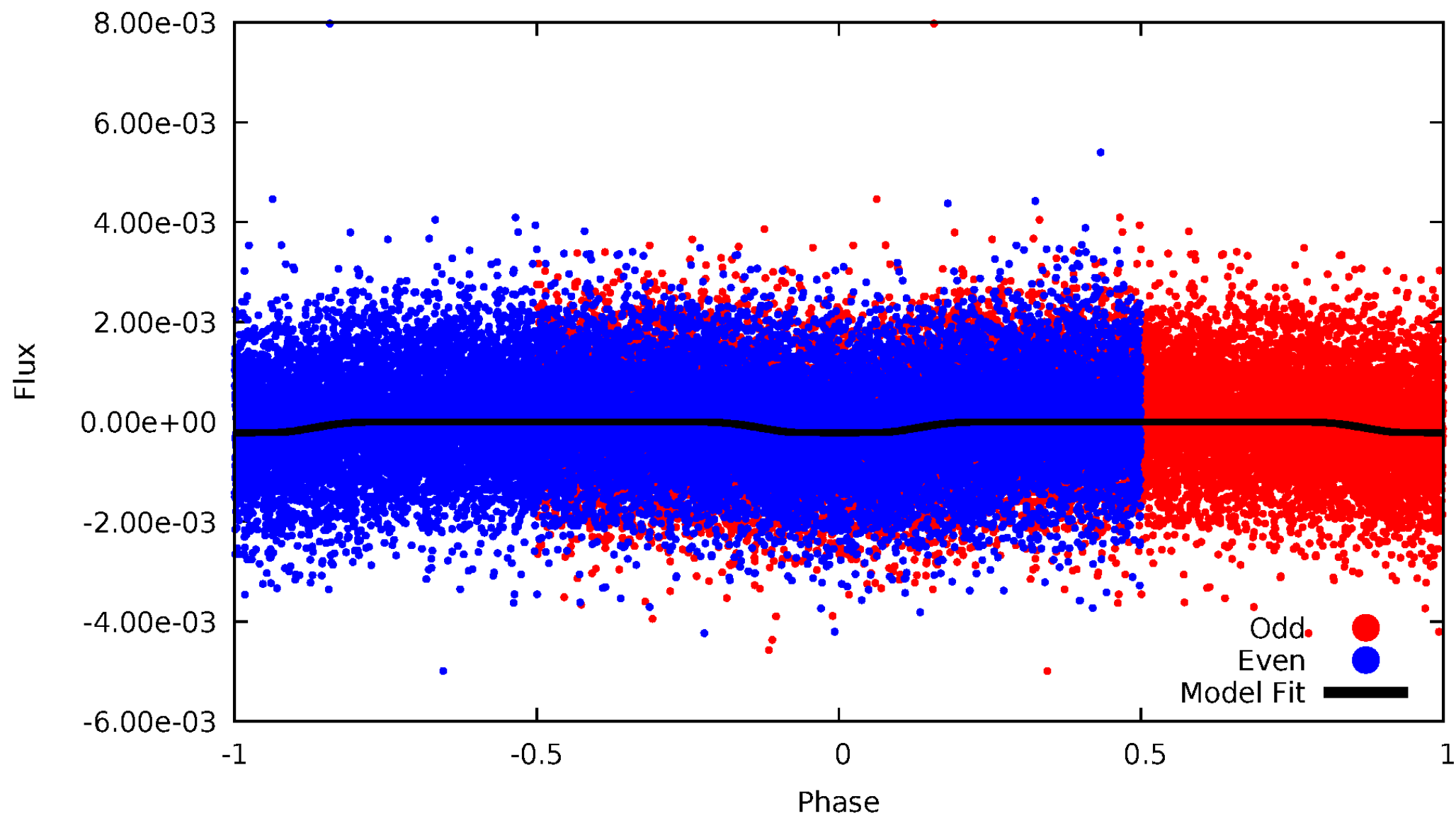
TCE 012400984-02





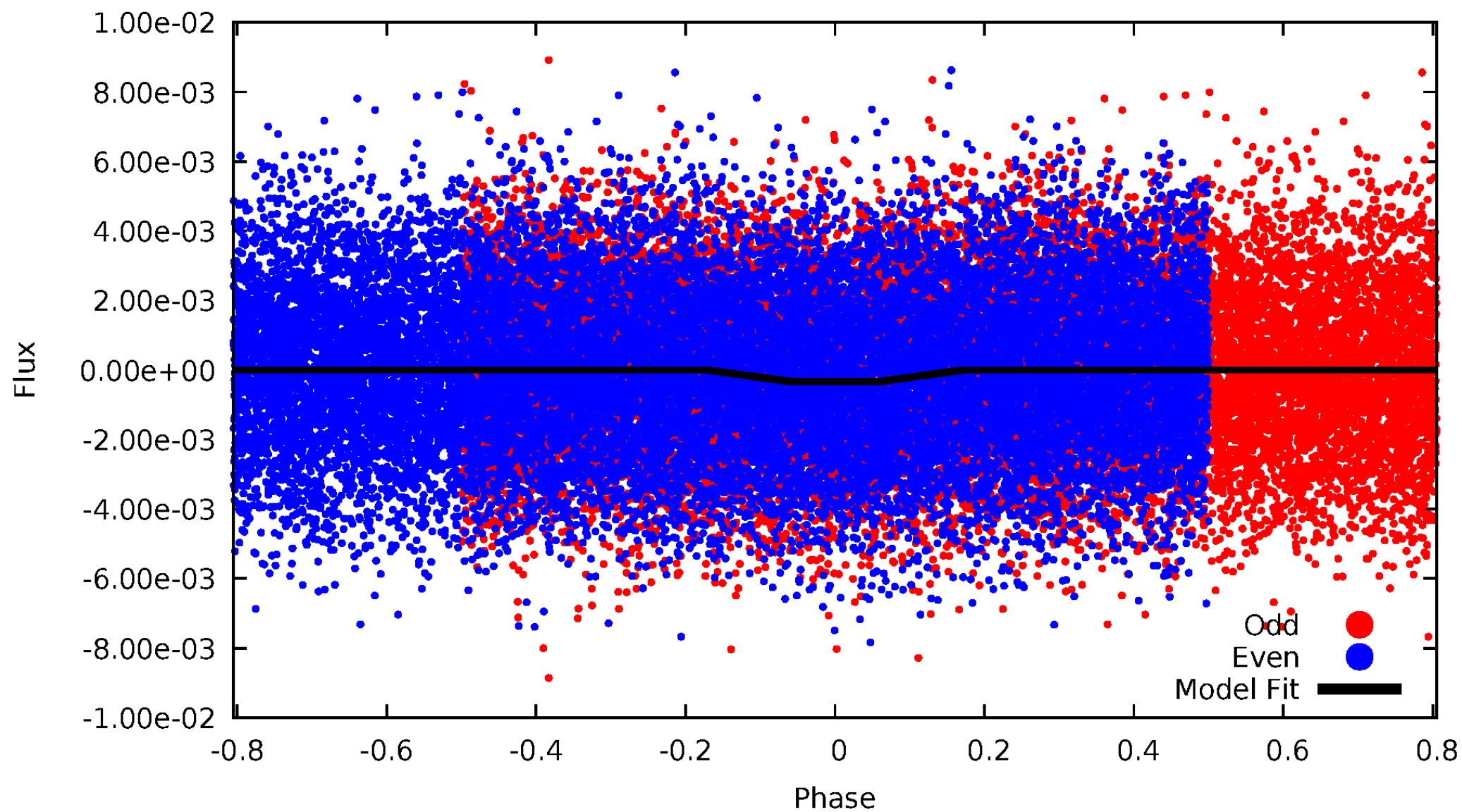
# DV Odd/Even

TCE 012400984-02



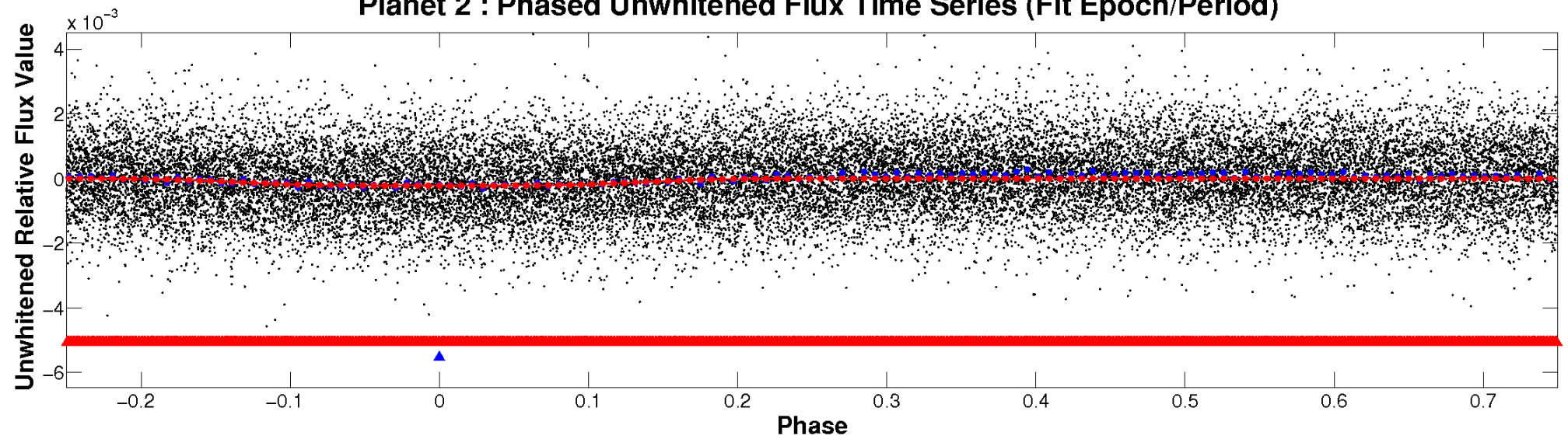
# ALT Odd/Even

TCE 012400984-02

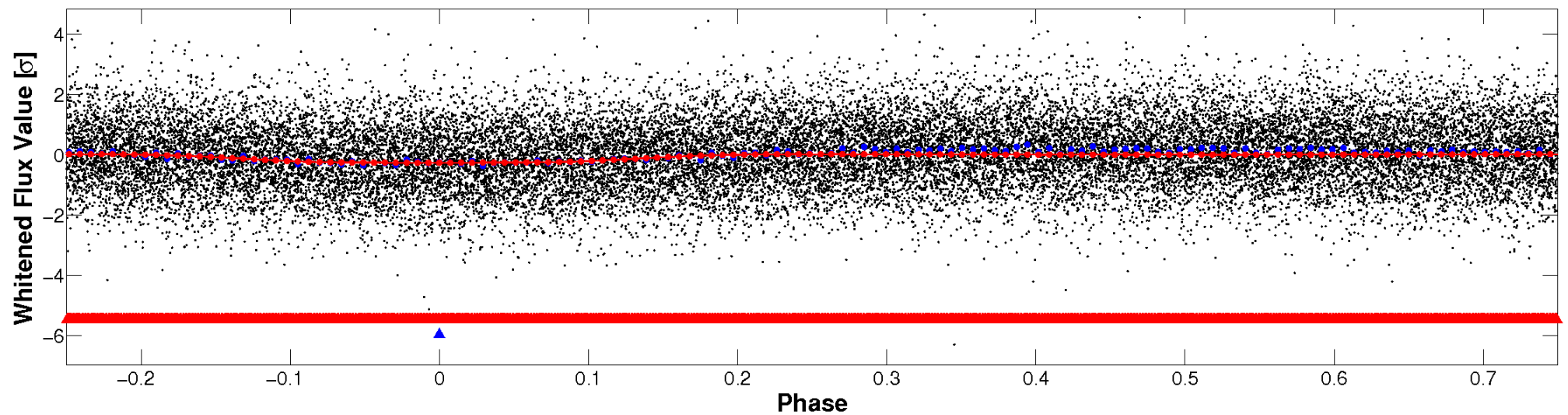


# Non-Whitened Vs. Whitened Light Curve

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

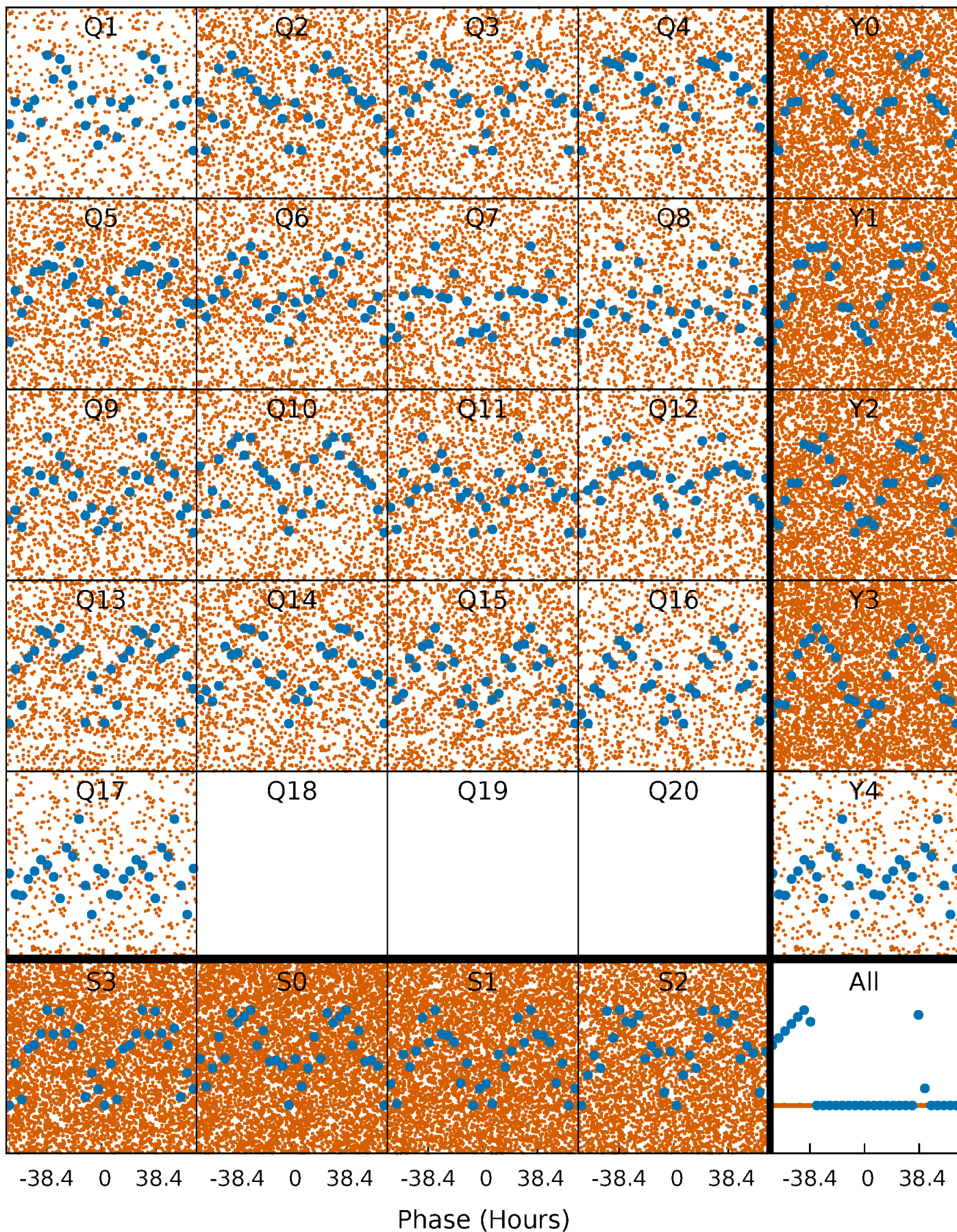


## Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



# PDC Quarter-Phased Transit Curves

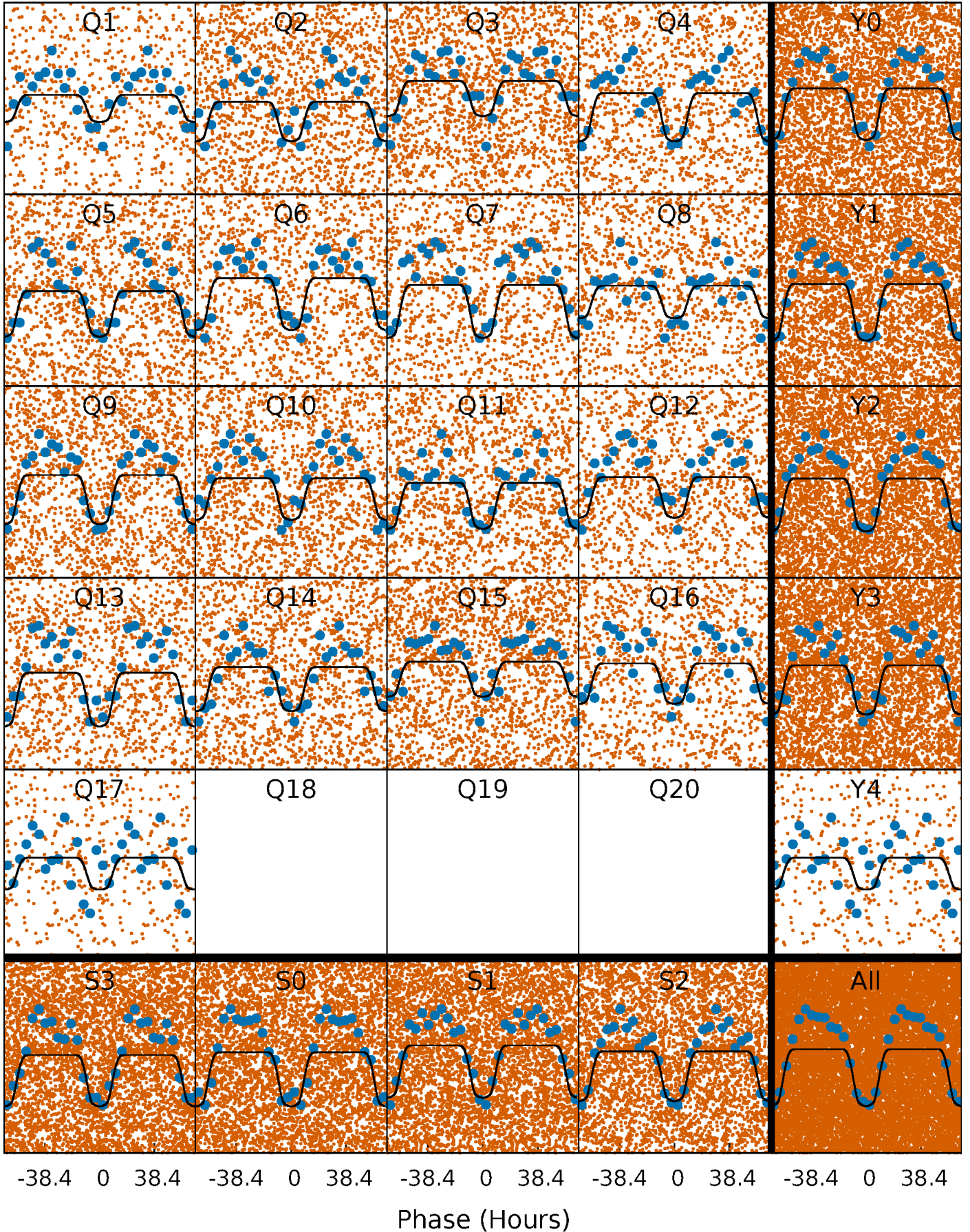
TCE 012400984-02   P= 2.797778 Days    $T_0=132.965662$  (BKJD)





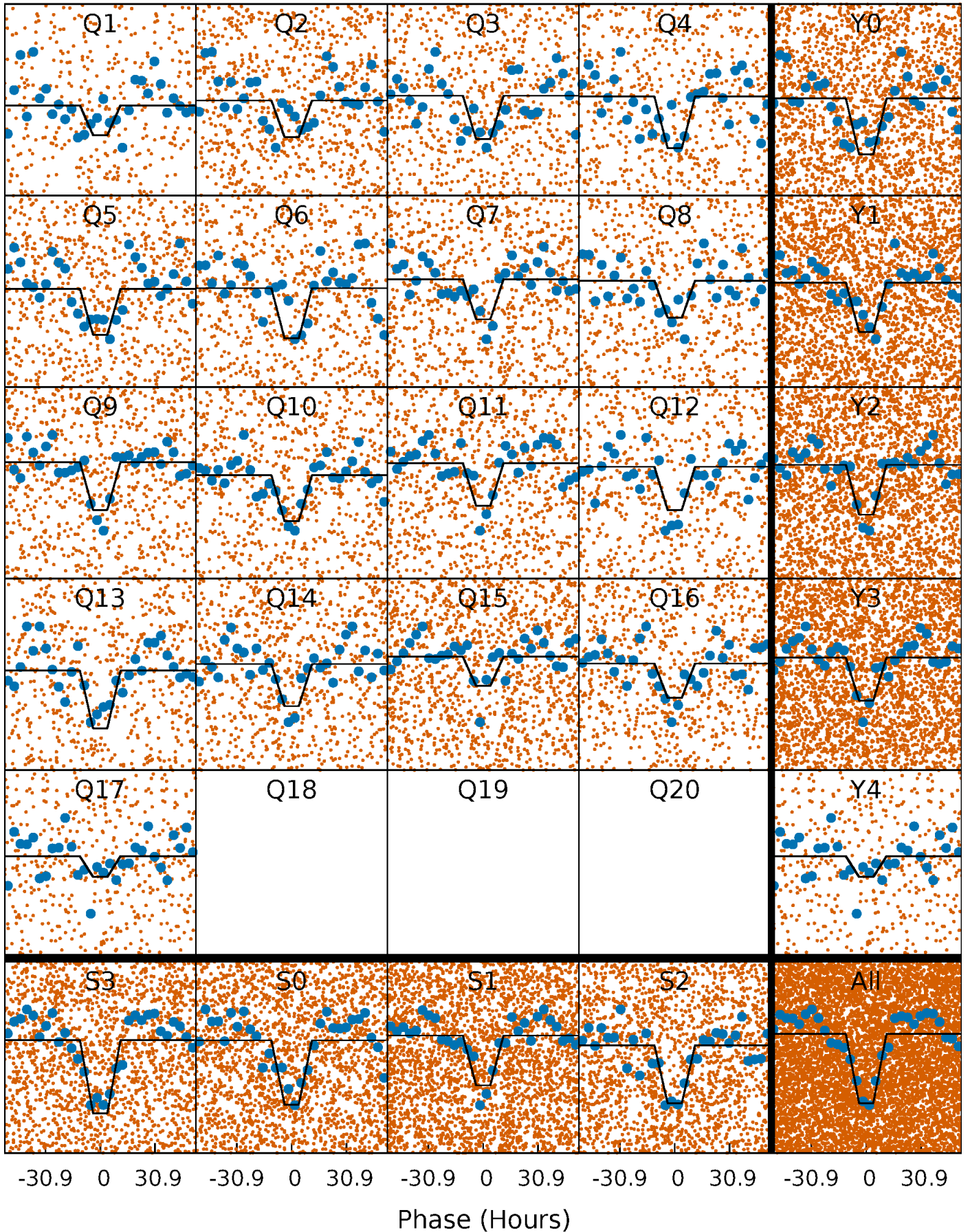
# DV Quarter-Phased Transit Curves

TCE 012400984-02   P= 2.797778 Days    $T_0=132.965662$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

TCE 012400984-02   P= 2.797489 Days    $T_0=133.095740$  (BKJD)

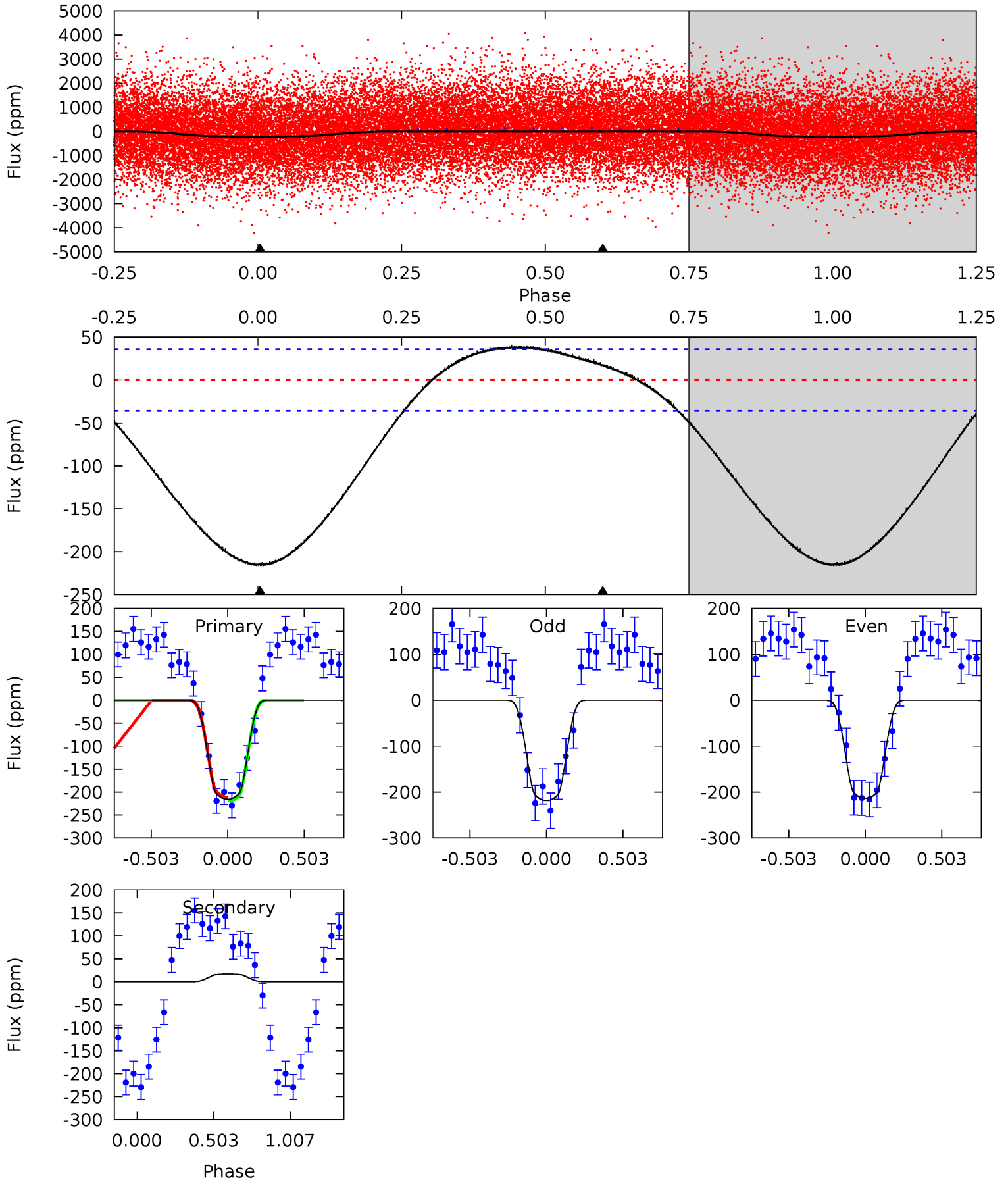




# DV Model-Shift Uniqueness Test

012400984-02, P = 2.797778 Days, E = 130.167884 Days

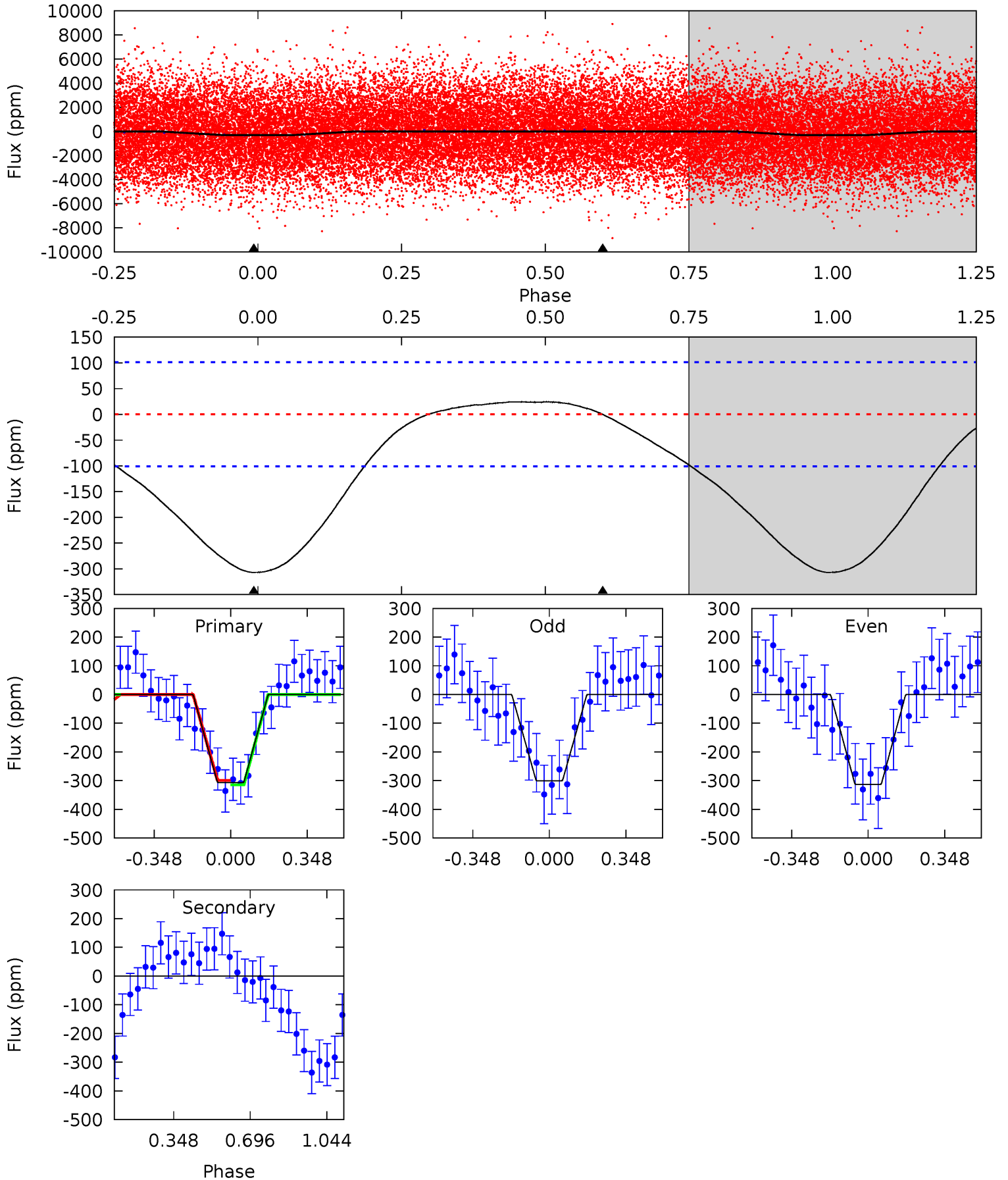
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
25.3	-1.98	0	0	4.21	0.67	2.09	25.3	25.3	-1.98	-1.98	0.28	-9.70	0.16	0.45



# Alt Model-Shift Uniqueness Test

012400984-02, P = 2.797489 Days, E = 130.298251 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
13.0	0	0	0	4.30	0.94	0.50	13.0	13.0	0	0	0.26	1.09	0.07	0.34



### Stellar Parameters For KIC 012400984

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$7608^{+211}_{-342}$	$4.080^{+0.139}_{-0.170}$	$0.080^{+0.200}_{-0.350}$	$1.991^{+0.523}_{-0.428}$	$1.738^{+0.195}_{-0.292}$	$0.310^{+0.219}_{-0.150}$
	+3%/-4%	+3%/-4%	+250%/-438%	+26%/-21%	+11%/-17%	+71%/-48%
Source	KIC0	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 012400984-02 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$17 \pm 9$	$3.79^{+0.58}_{-0.44}$	$3060^{+232}_{-194}$	$-4105^{+368}_{-302}$	$-1.366^{+0.709}_{-0.886}$
Alt.	$-0 \pm 24$	$3.94^{+0.60}_{-0.51}$	$3057^{+209}_{-200}$	$-3165^{+7210}_{-1094}$	$-0.032^{+1.957}_{-1.785}$

$T_{max}$  = 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

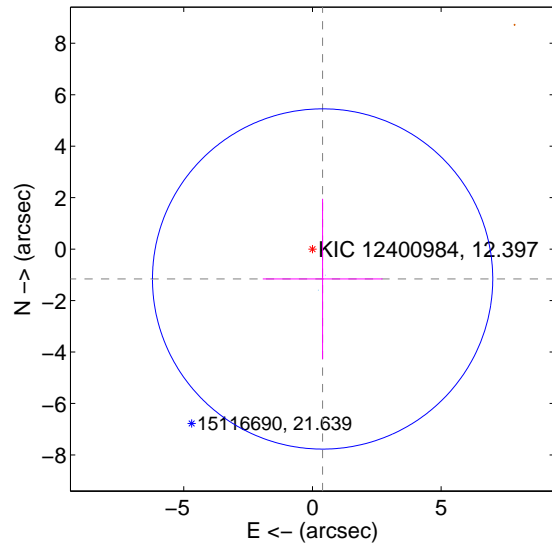
Supplemental centroid analysis for 012400984-02. Kepler magnitude: 12.40. Transit SNR 20.23

There are 2 quarters with good PRF difference image offsets

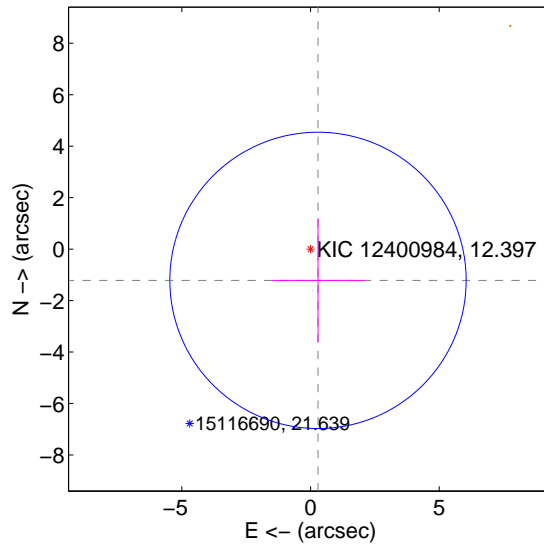
The direct PRF centroid is offset from the target star catalog position by about 0.15 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$1.226 \pm 2.204$	0.56	$-0.395 \pm 2.326$	$-1.161 \pm 3.119$
PRF-fit source offset from KIC position	$1.250 \pm 1.920$	0.65	$-0.291 \pm 1.811$	$-1.216 \pm 2.406$
photometric centroid source offset	$0.14 \pm 0.06$	2.24	$0.14 \pm 0.06$	$0.00 \pm 0.09$

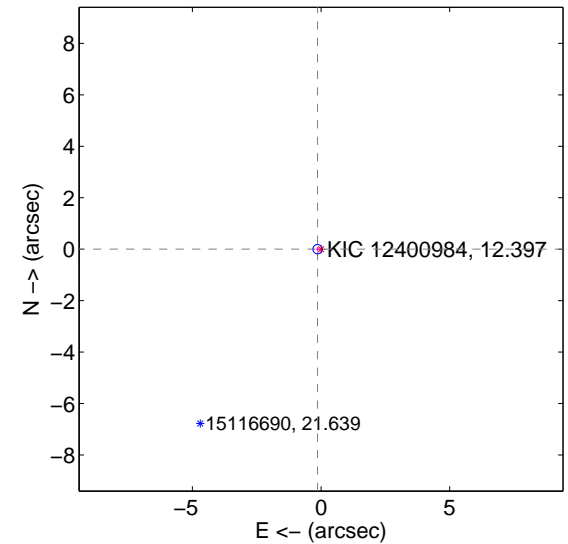
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position

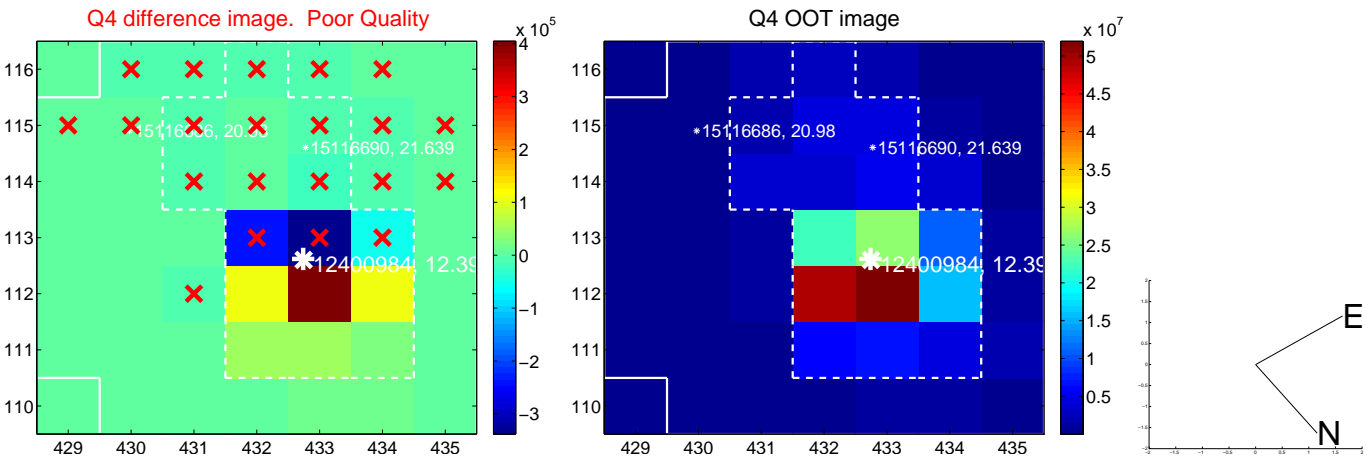
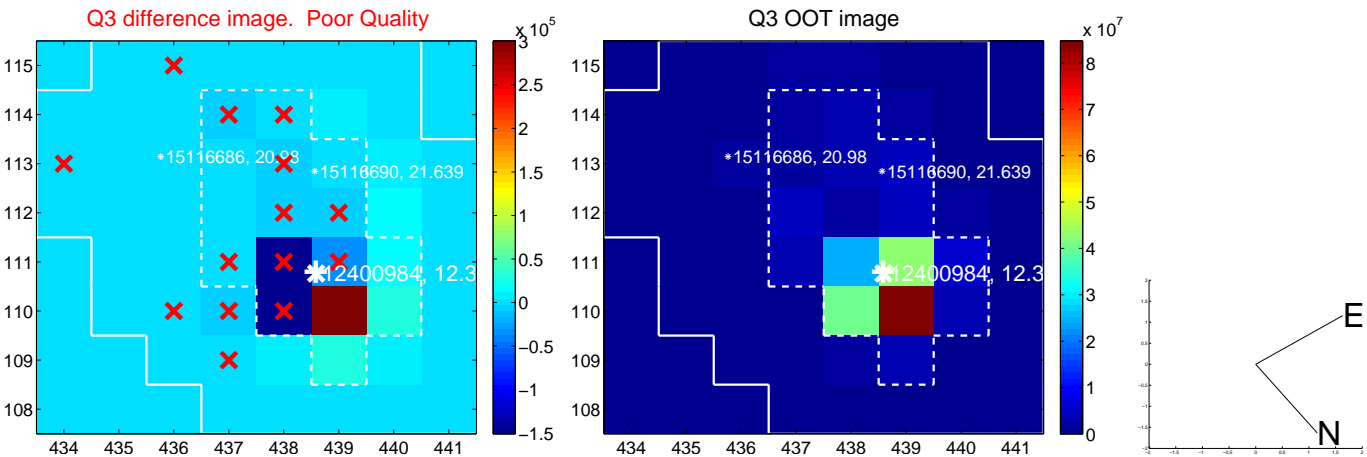
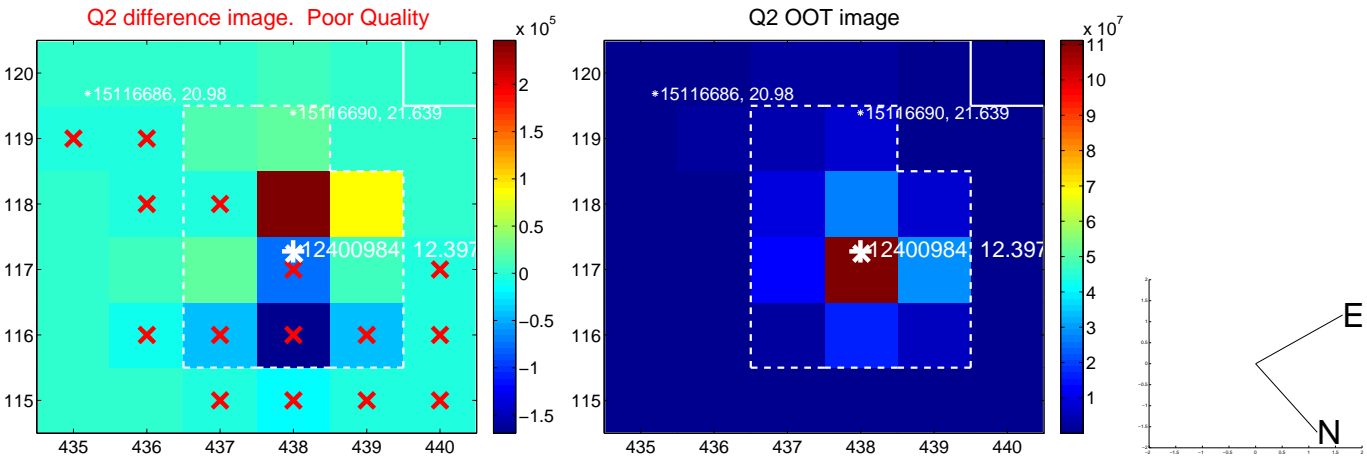
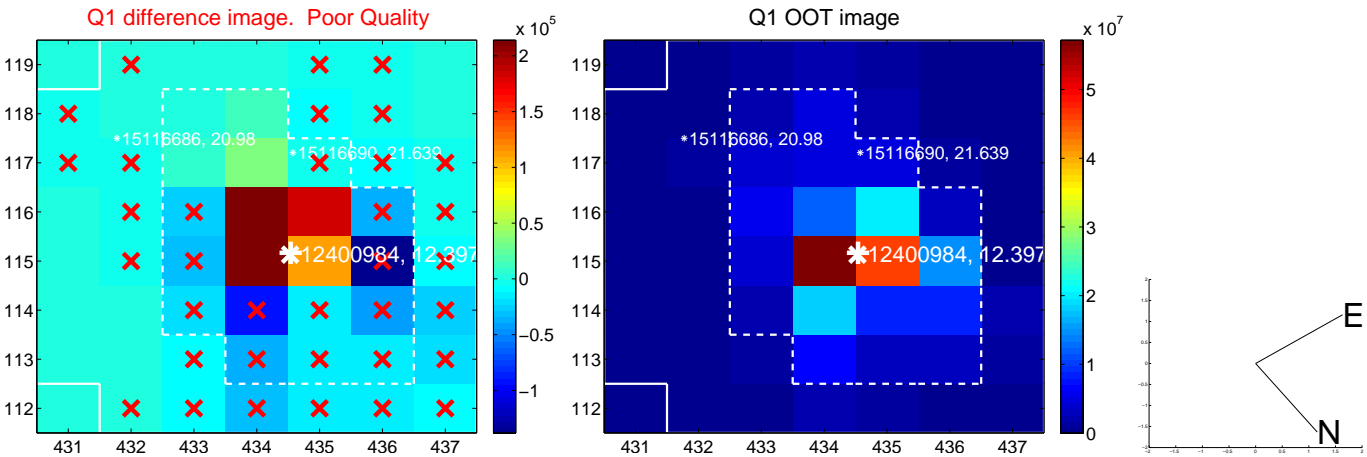


offset from photometric centroids

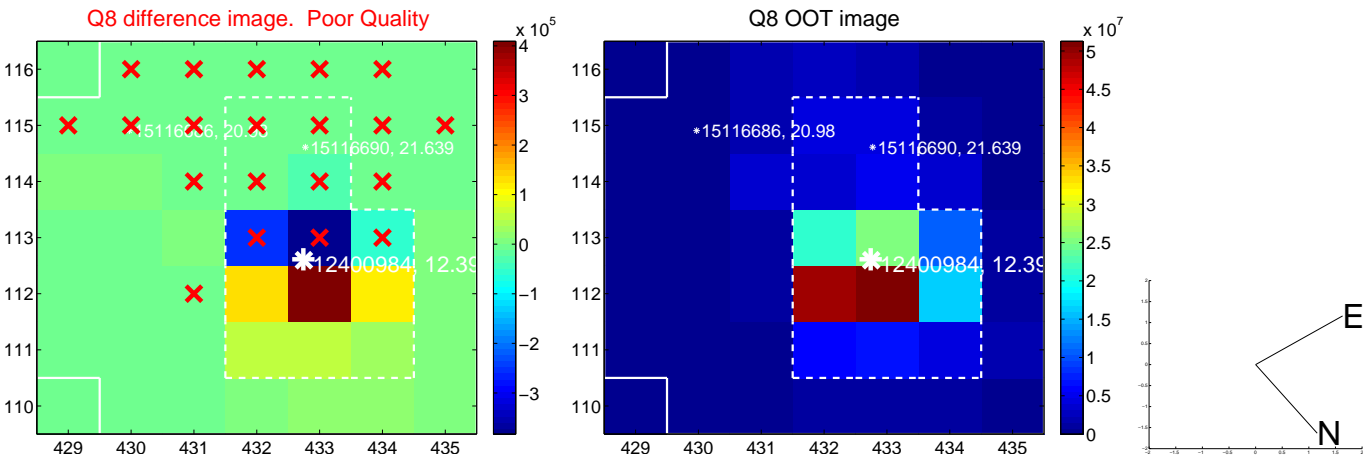
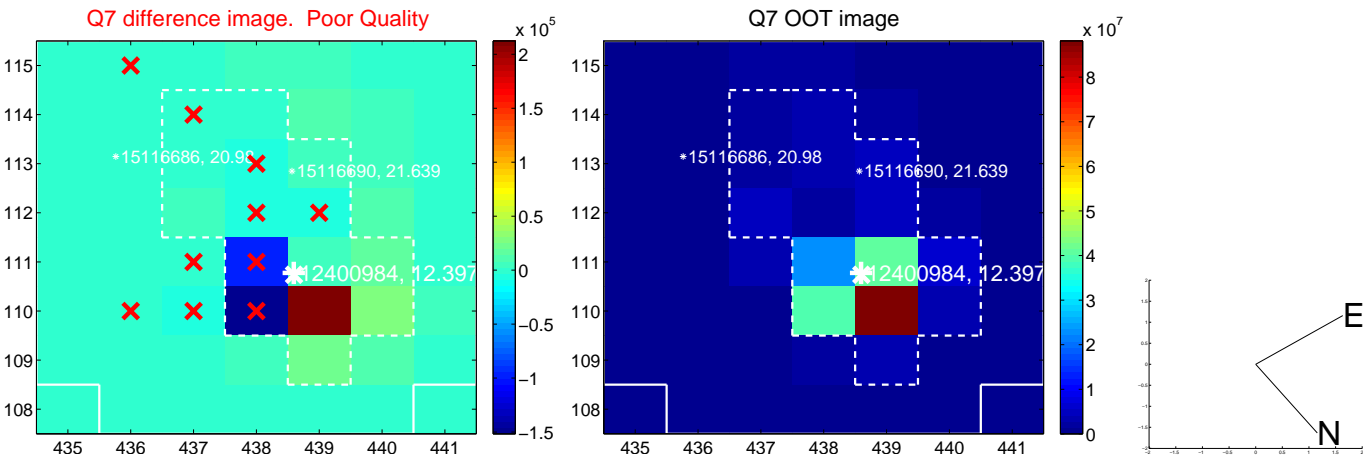
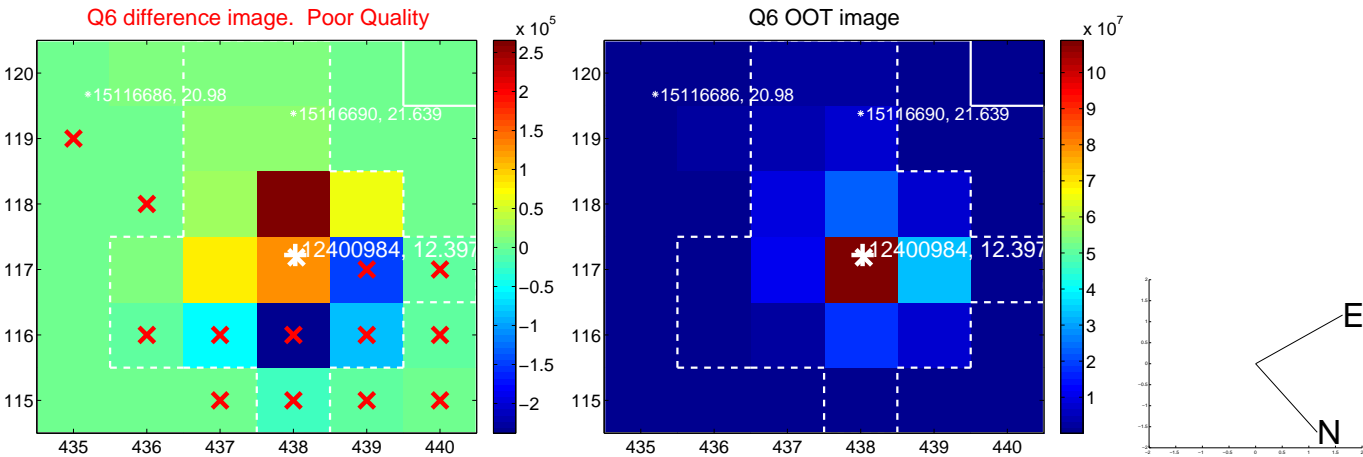
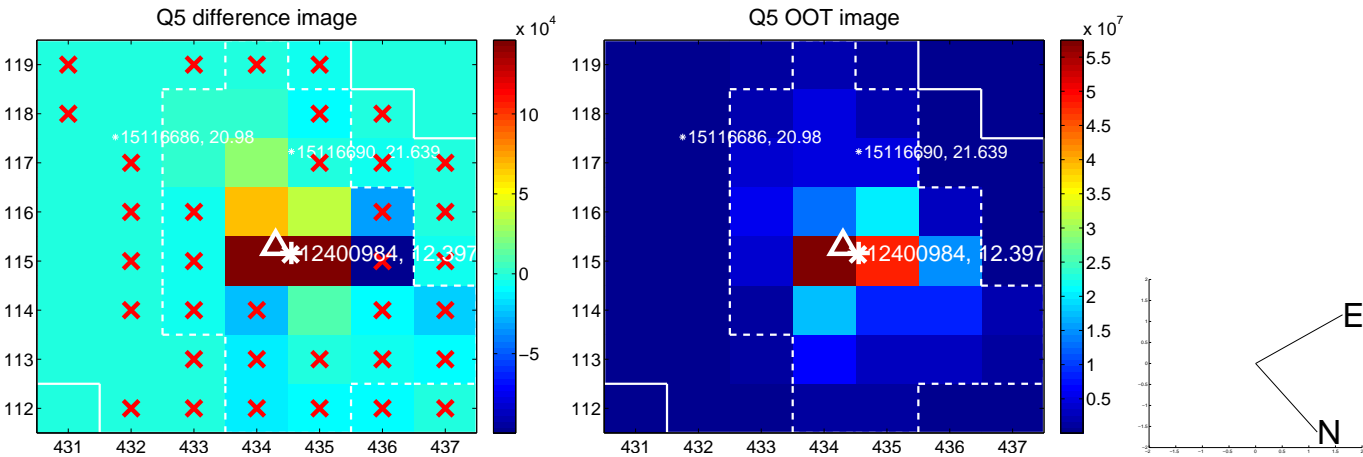


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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

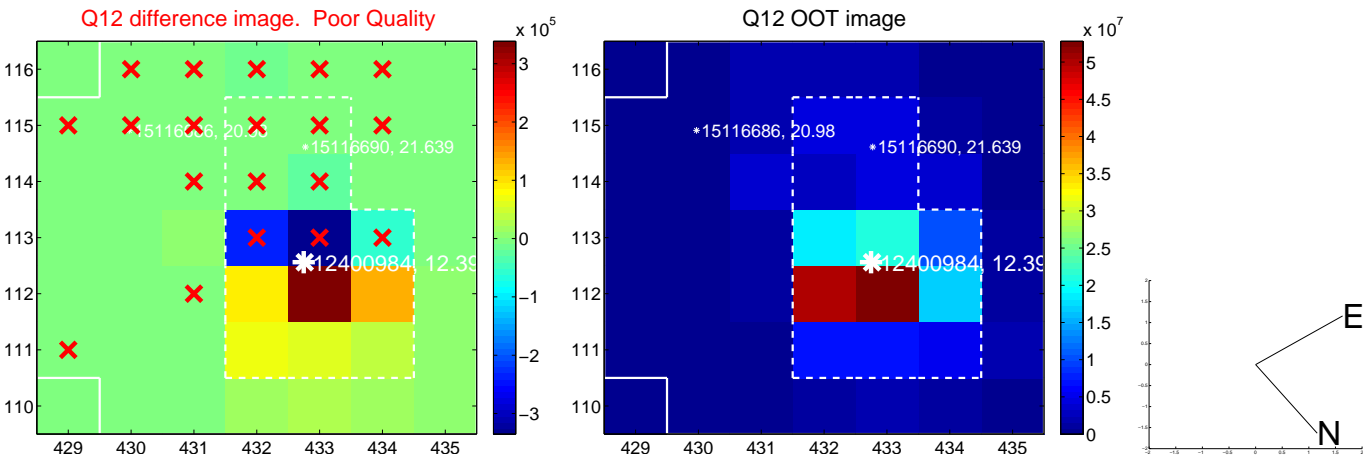
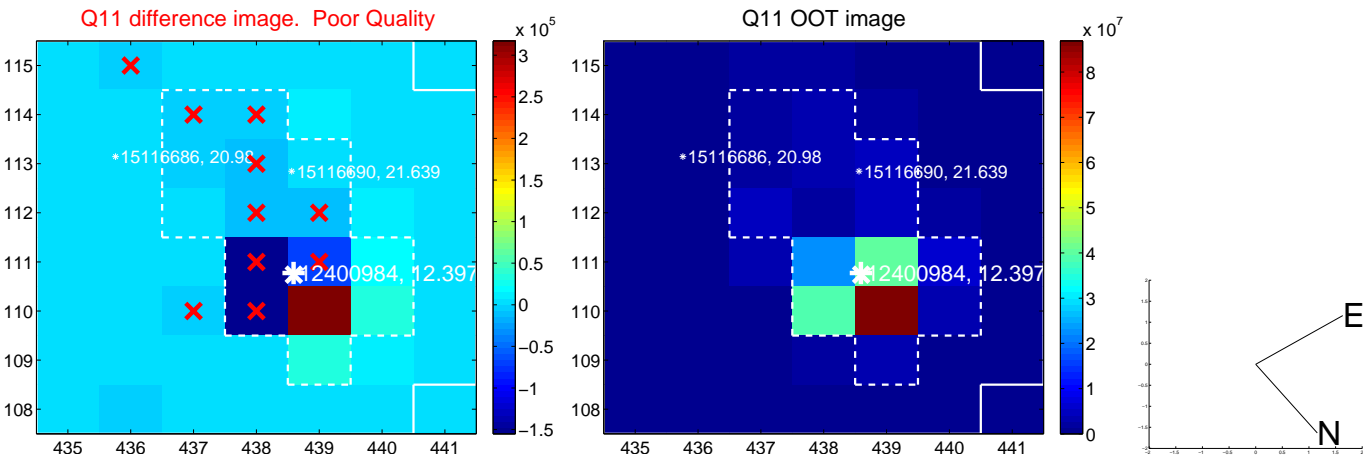
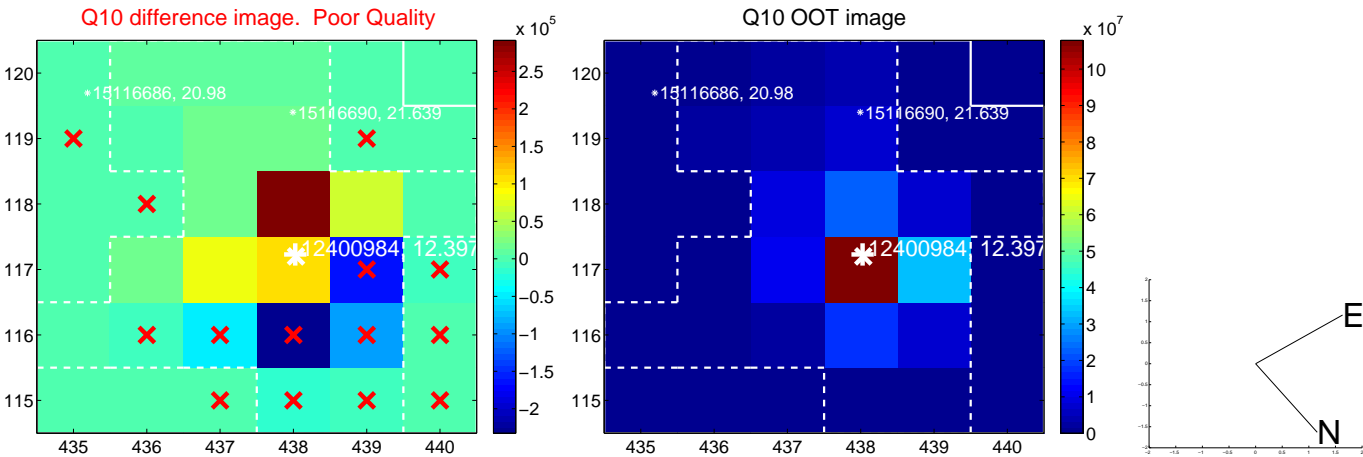
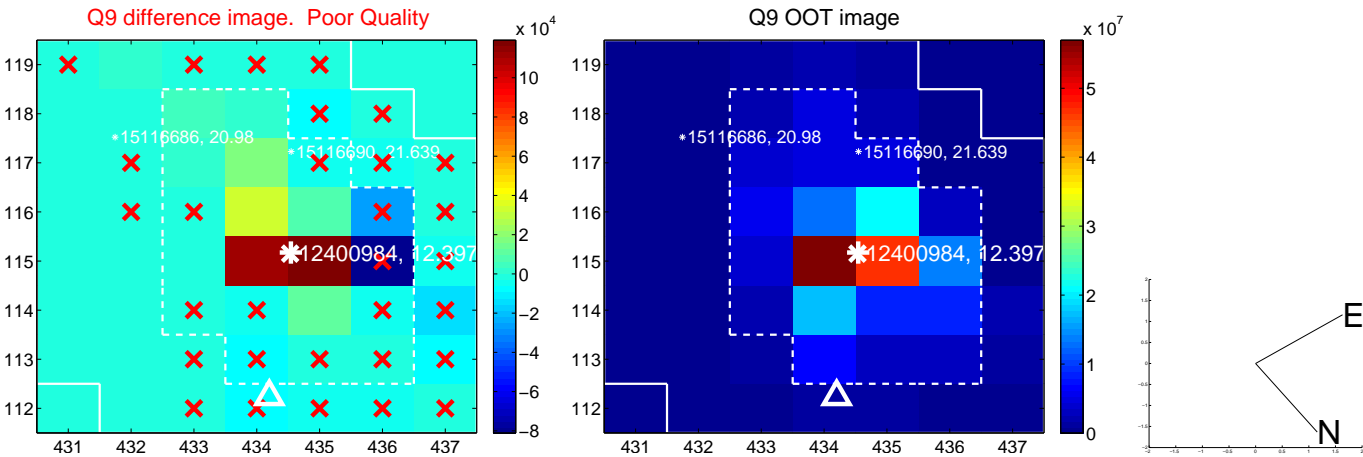


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

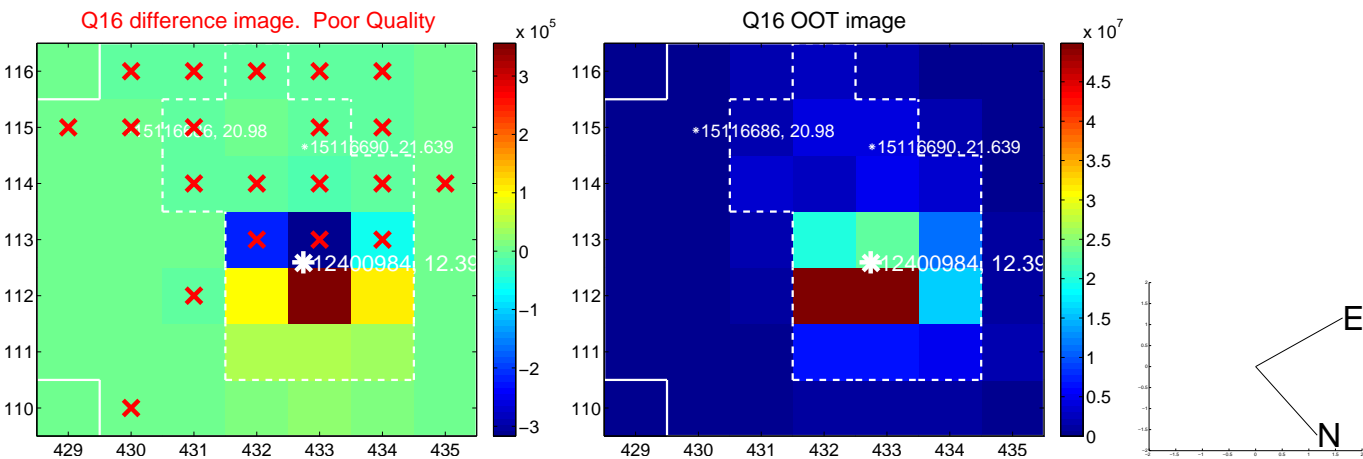
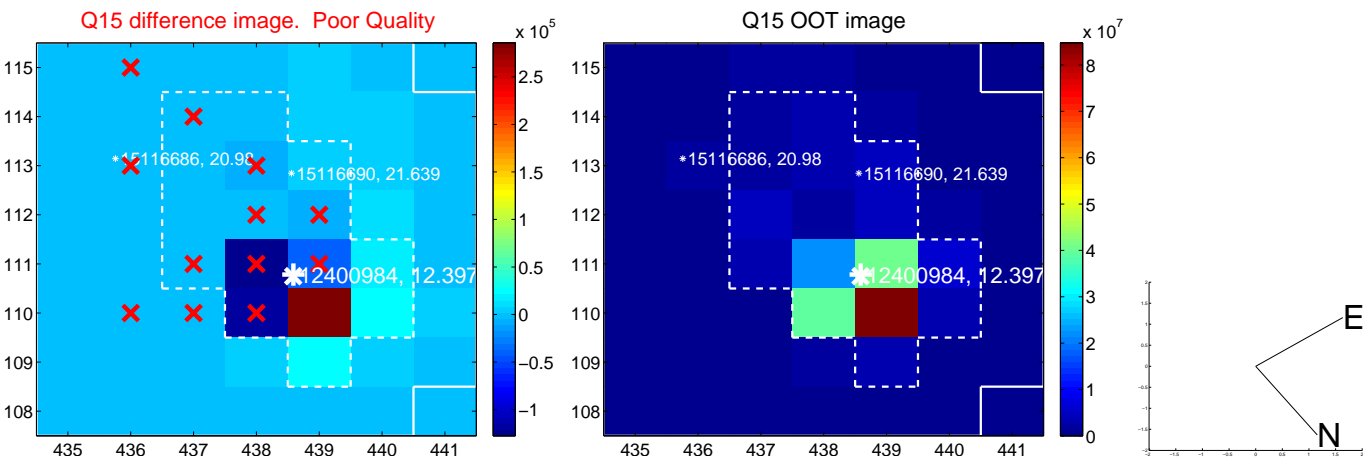
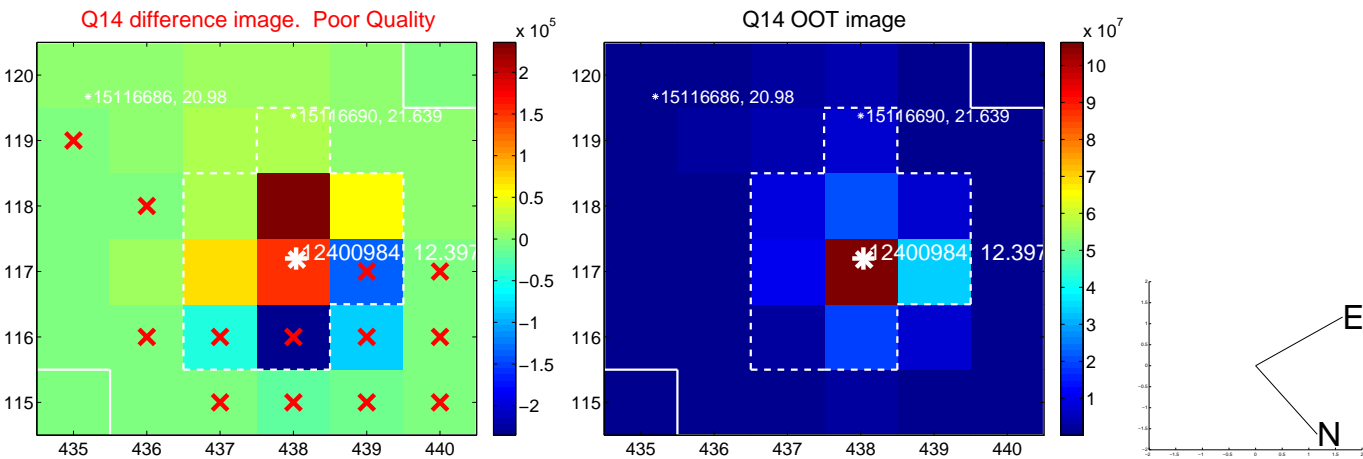
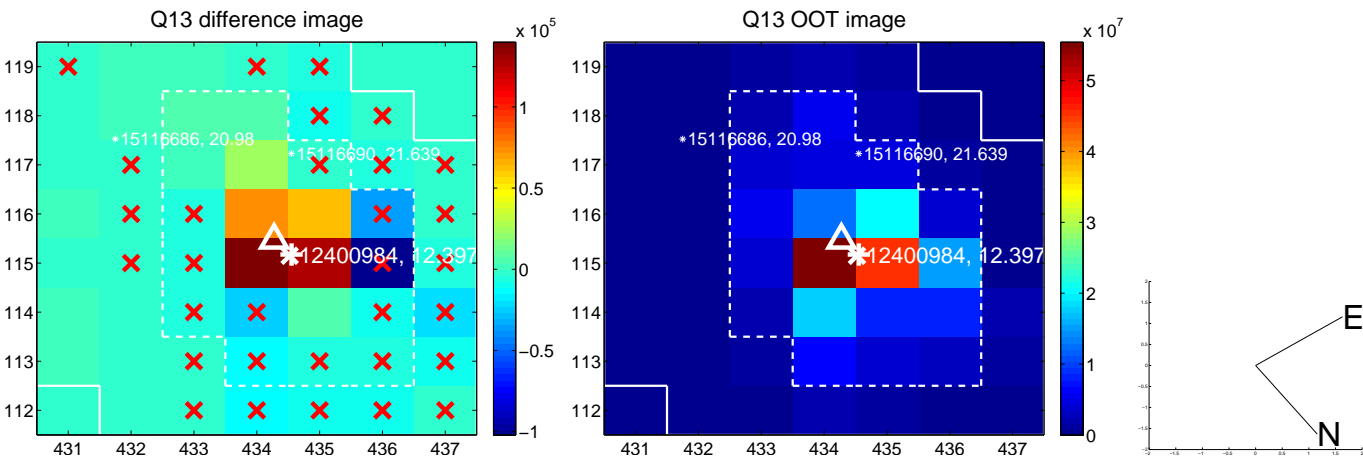




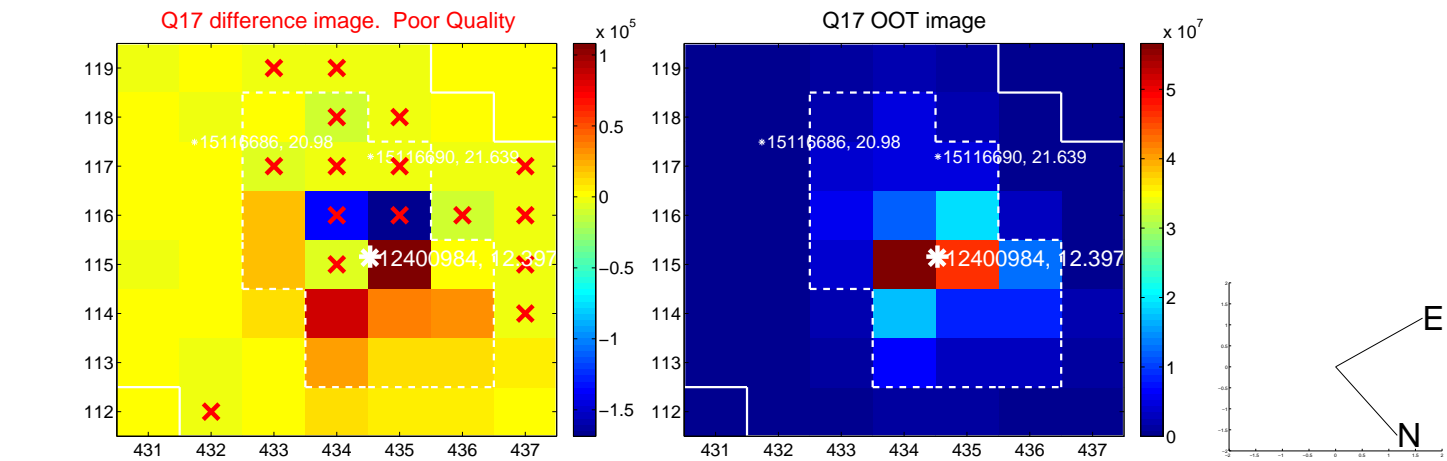
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



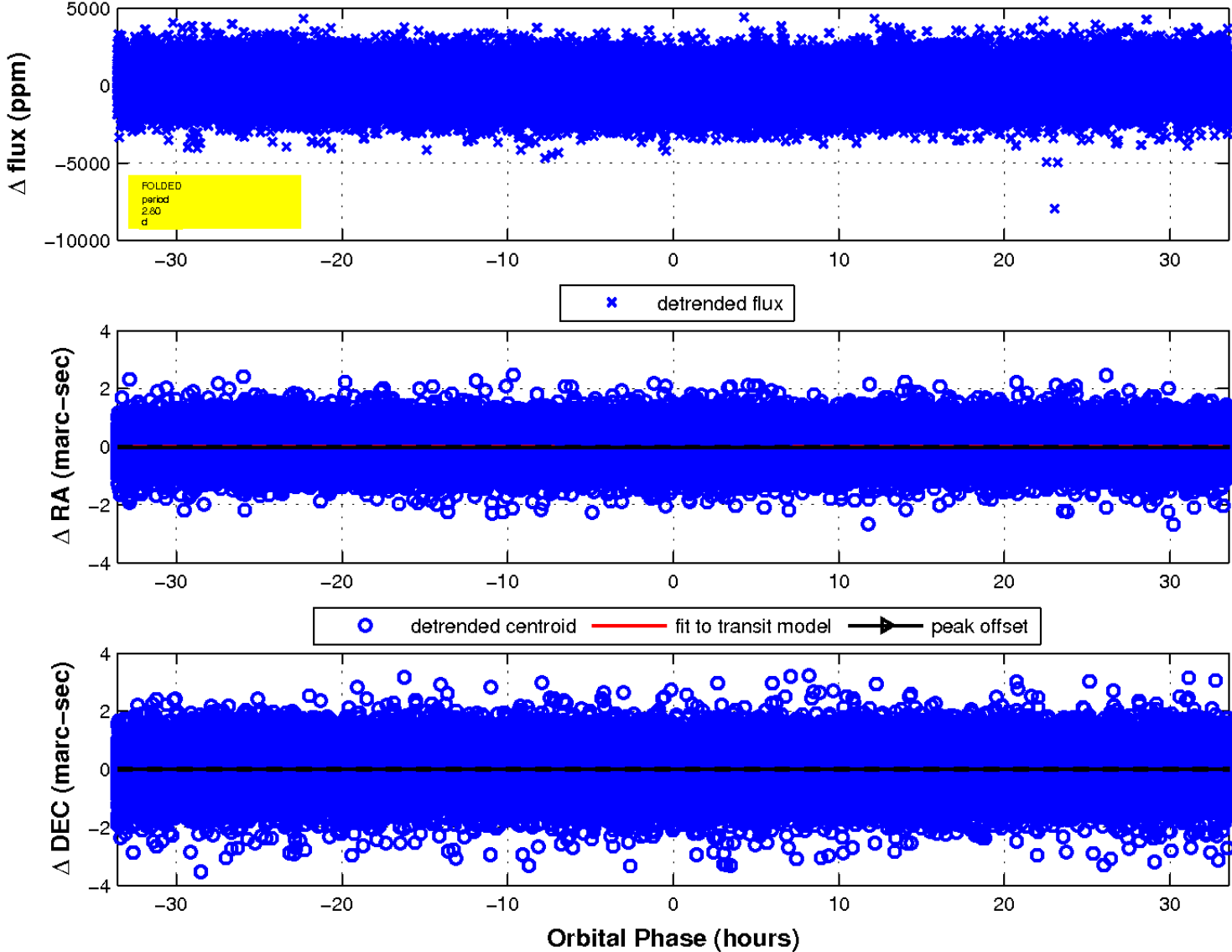
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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



fluxWeightedCentroids, Planet 2 of 2



UKIRT Image

Declination

