

# KIC 010031885

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
010031885-01	OBS	0329.01	8.589654	132.017630	226.4	8.103	33.1	36.5	0.90	6024	2.60	143.21
010031885-02	OBS	No	8.589718	136.179662	57.5	12.289	10.6	11.4	0.90	6024	1.42	143.21

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
010031885-01	OBS	FP	0.00	0	1	1	1	MOD_SEC_DV—MOD_SEC_ALT—HAS_SEC_TCE—CENT_RESOLVED_OFFSET—HALO_GHOST—EPHEM_MATCH
010031885-02	OBS	FP	0.00	1	1	1	1	IS_SEC_TCE—CENT_UNRESOLVED_OFFSET—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.

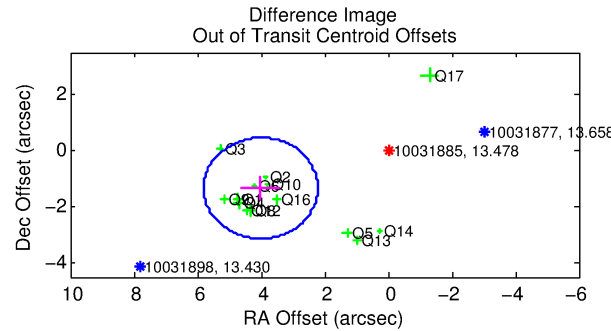
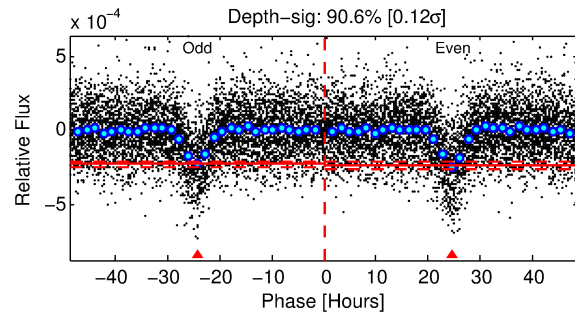
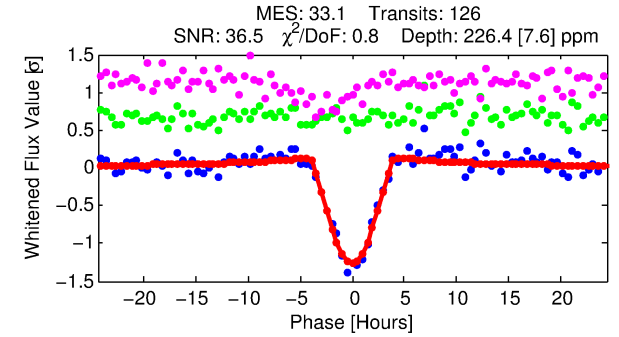
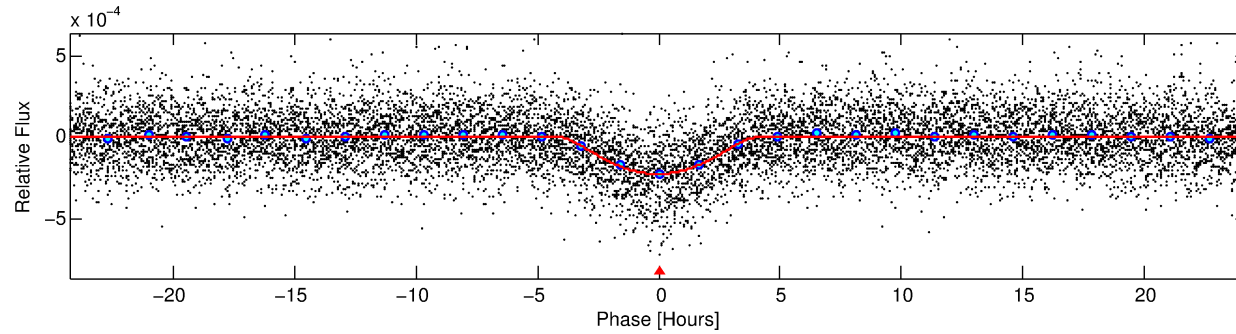
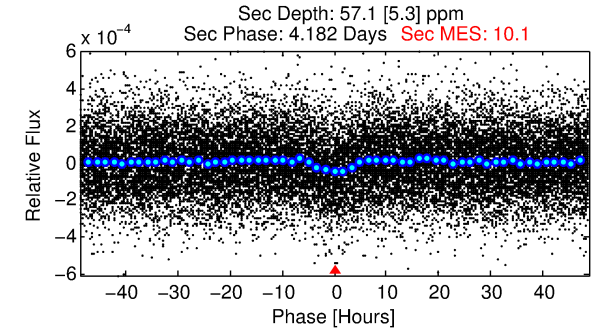
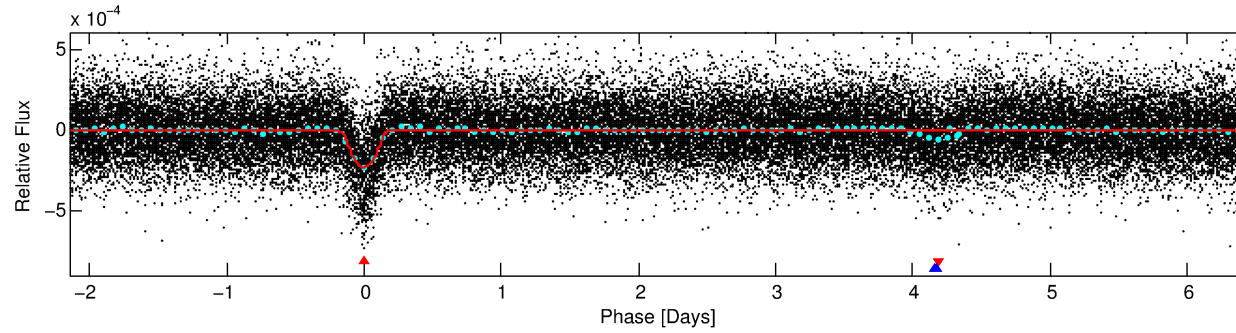
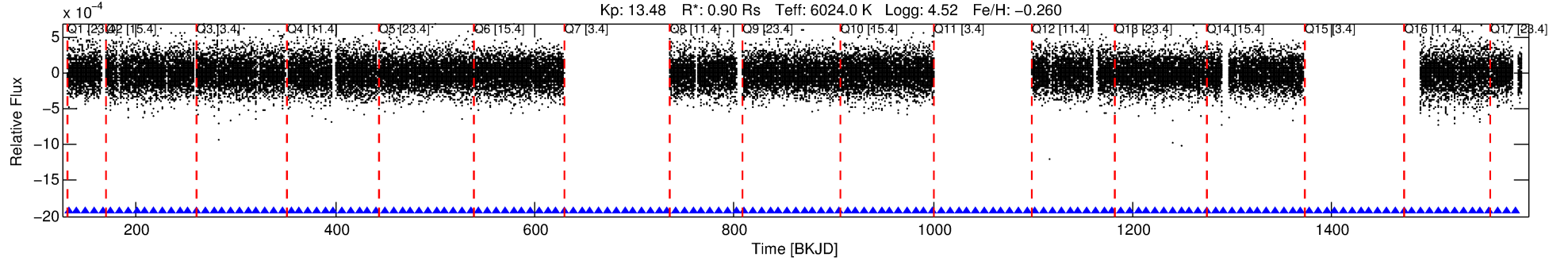
## Ephemeris Match Information For 010031885-01

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	$\sigma_P$	$\sigma_T$
010031885-01	10031885	010031808-01	10031808	1:1	62.5	-15	2	9.56	13.48	1195.30	Direct-PRF	0	0.46	0.43

**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: 10031885 Candidate: 1 of 2 Period: 8.590 d  
KOI: K00329.01 Corr: 0.978



## DV Fit Results:

Period = 8.58965 [0.00005] d  
Epoch = 132.0176 [0.0048] BKJD  
Rp/R\* = 0.0265 [0.0208]  
a/R\* = 2.18 [0.37]  
b = 1.00 [0.03]  
Seff = 143.21 [57.16]  
Teq = 882 [88] K  
Rp = 2.60 [2.18] Re  
a = 0.0817 [0.0208] AU  
Ag = 30.96 [50.01] [0.60σ]  
Teffp = 3217 [1266] K [1.84σ]

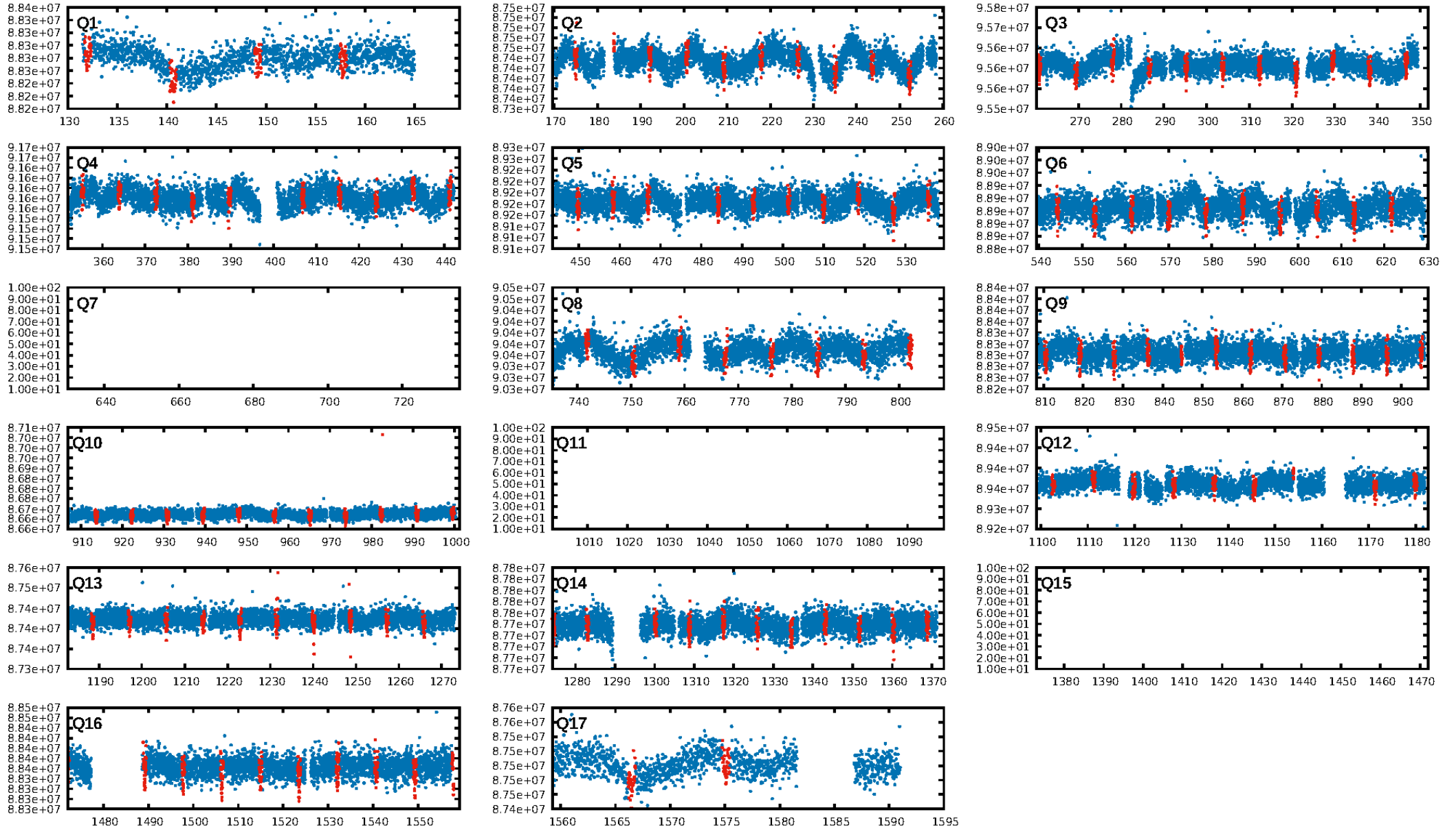
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
**LongPeriod-sig: 0.0% [0.00σ]**  
**ModelChiSquare2-sig: 0.0%**  
ModelChiSquareGof-sig: 100.0%  
Bootstrap-pfa: 2.38e-218  
RollingBand-fgt: 1.00 [120/120]  
**GhostDiagnostic-chr: -0.1306**  
**Centroid-sig: 0.0%**  
**Centroid-so: 2.544 arcsec [7.27σ]**  
**OotOffset-rm: 4.228 arcsec [7.06σ]**  
**KicOffset-rm: 4.501 arcsec [7.86σ]**  
OotOffset-st: 4/1/4/5 [14]  
KicOffset-st: 4/1/4/5 [14]  
DiffImageQuality-fgm: 0.00 [0/14]  
DiffImageOverlap-fno: 1.00 [14/14]

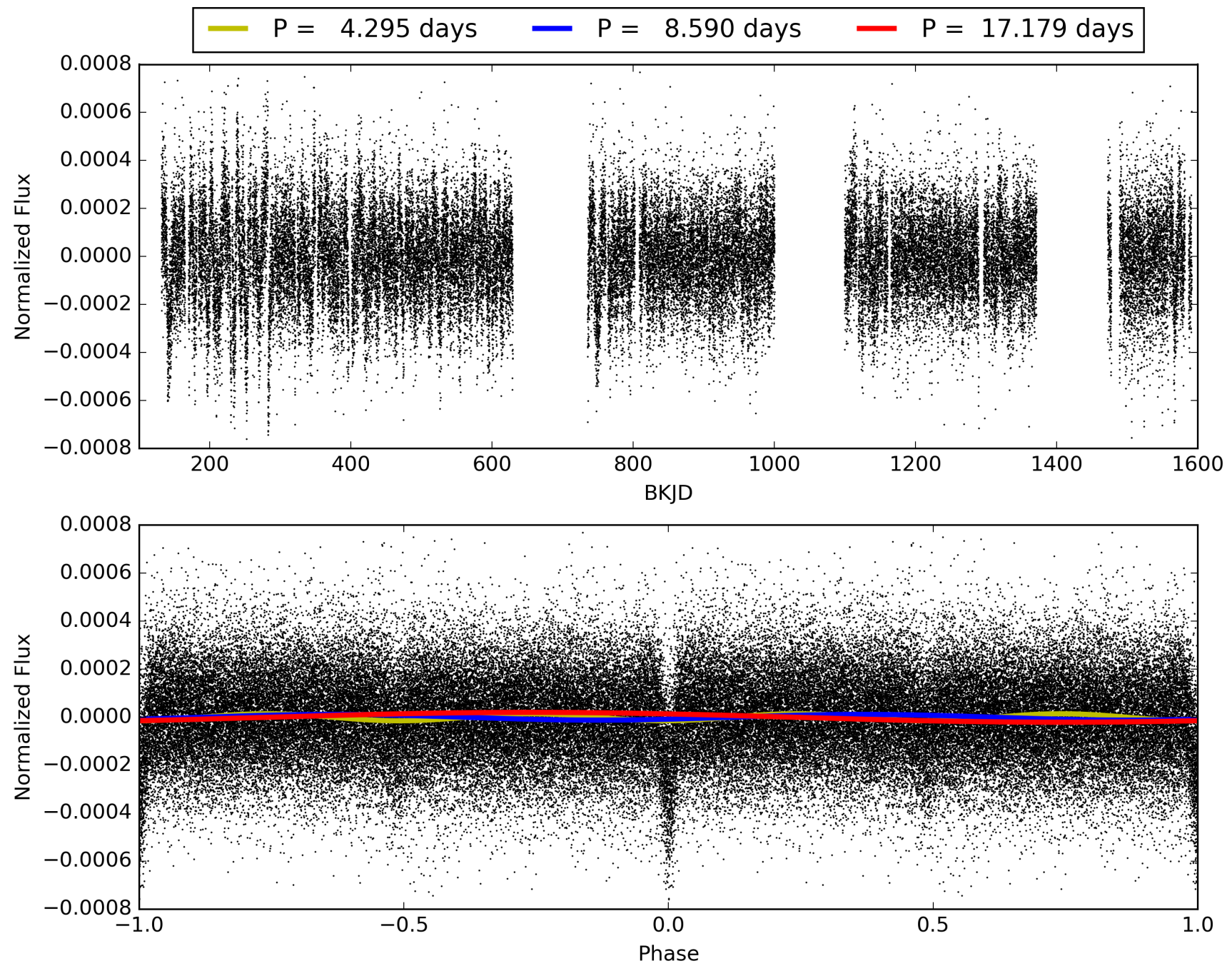
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 31-Jan-2016 14:57:14 Z

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

# TCE 010031885-01, PDC Light Curves

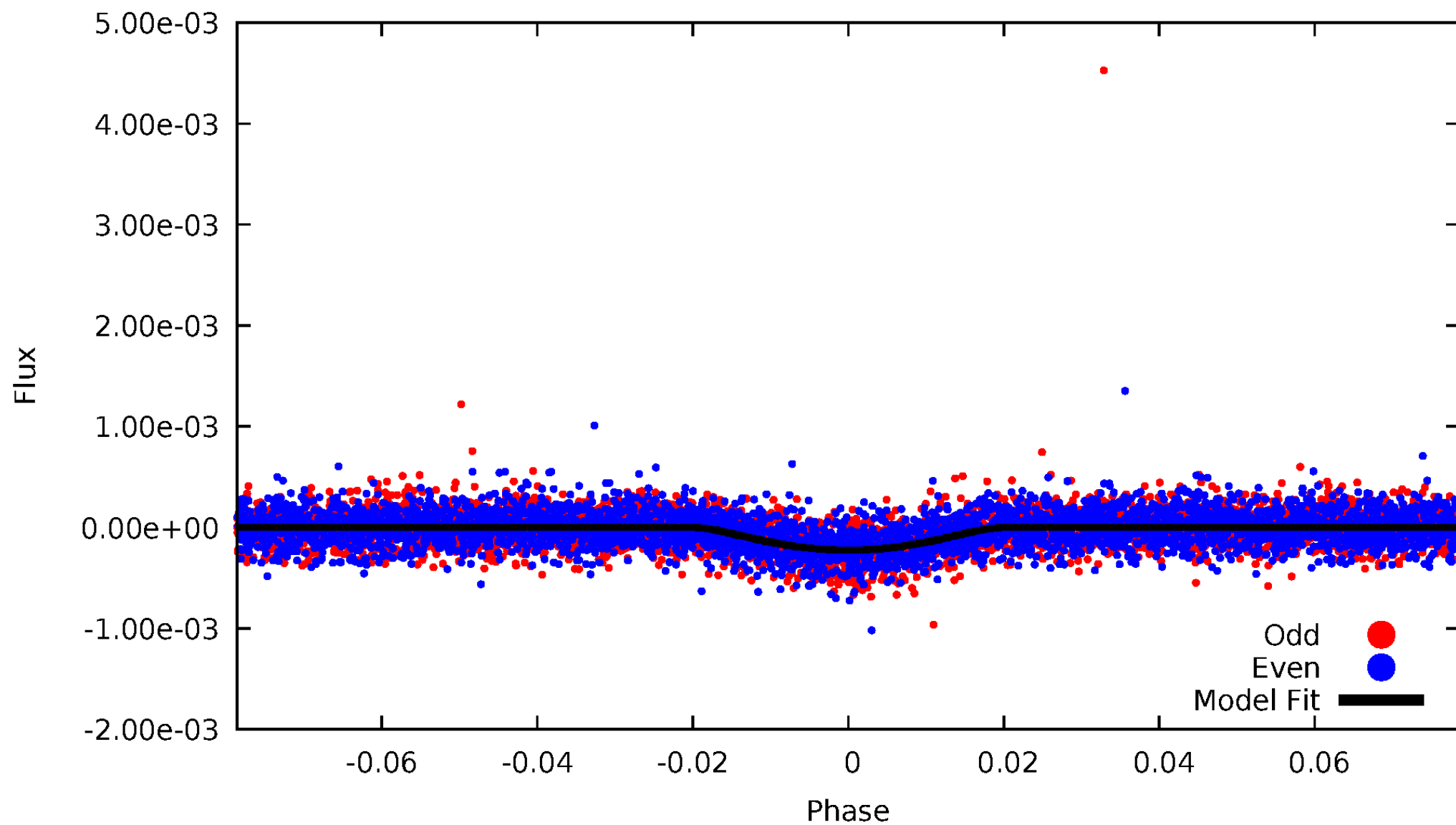


TCE 010031885-01



# DV Odd/Even

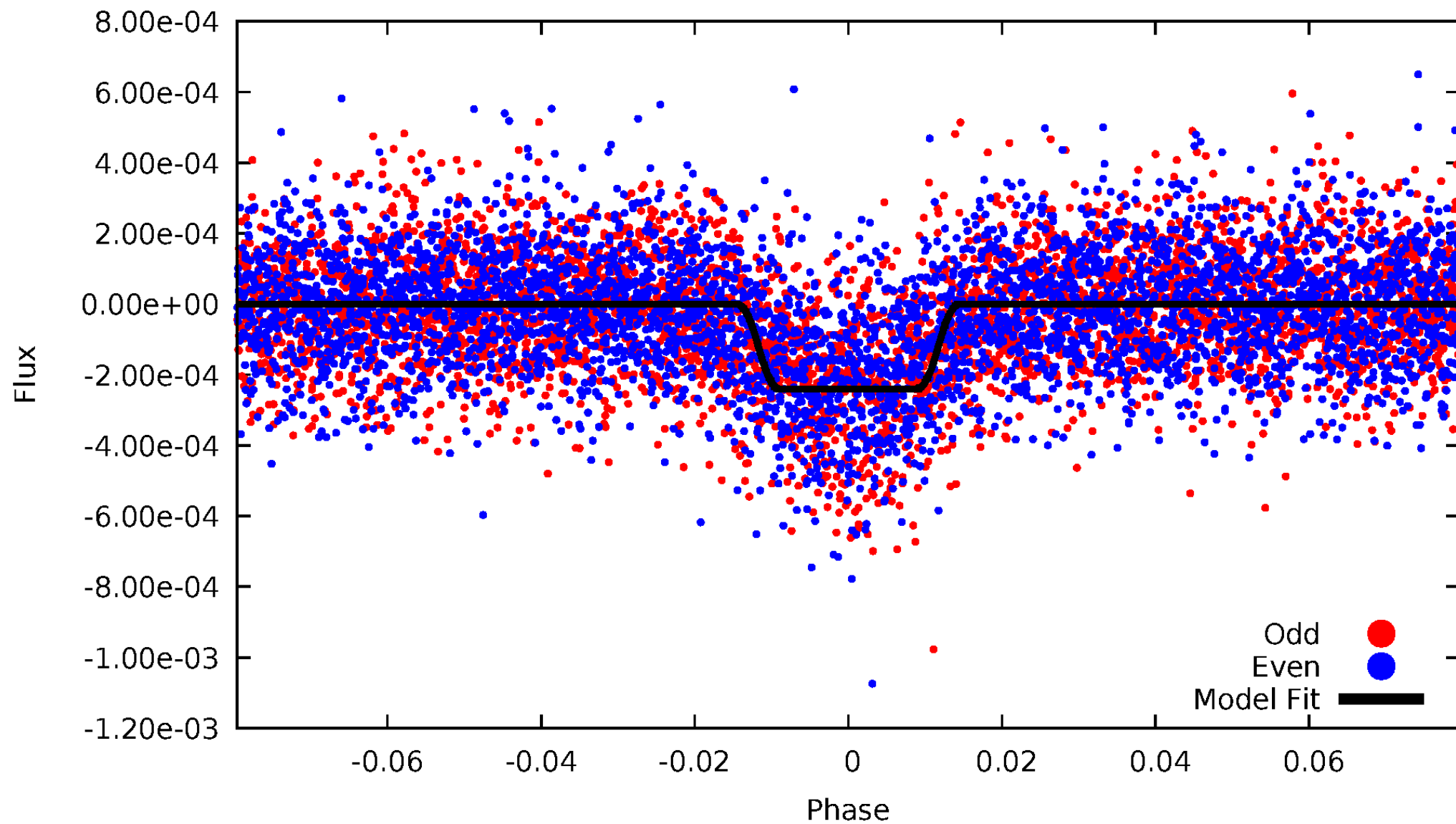
TCE 010031885-01





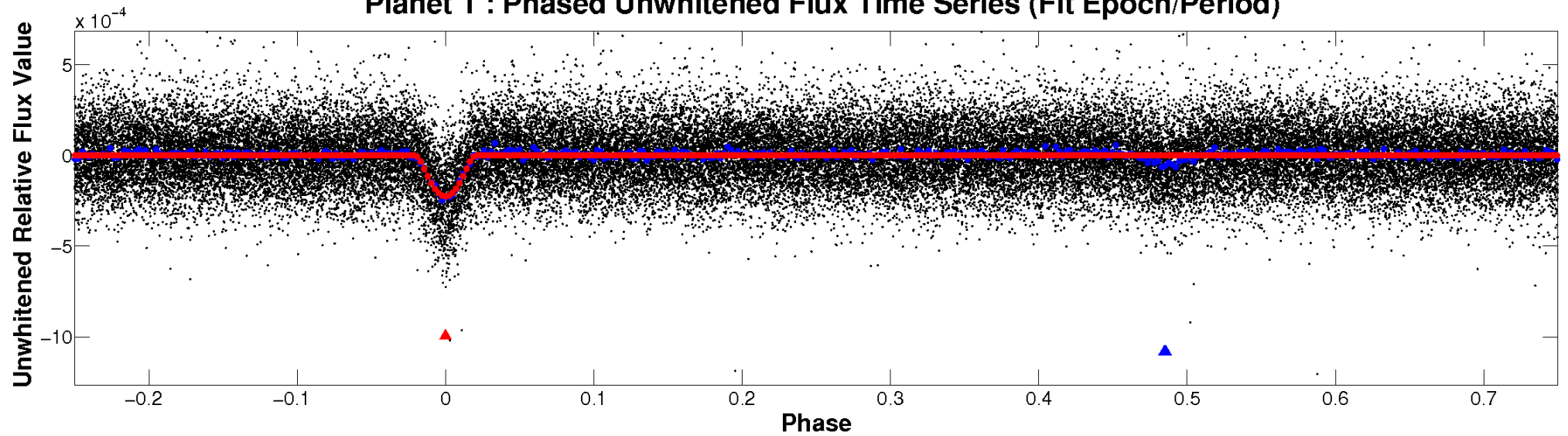
# ALT Odd/Even

TCE 010031885-01

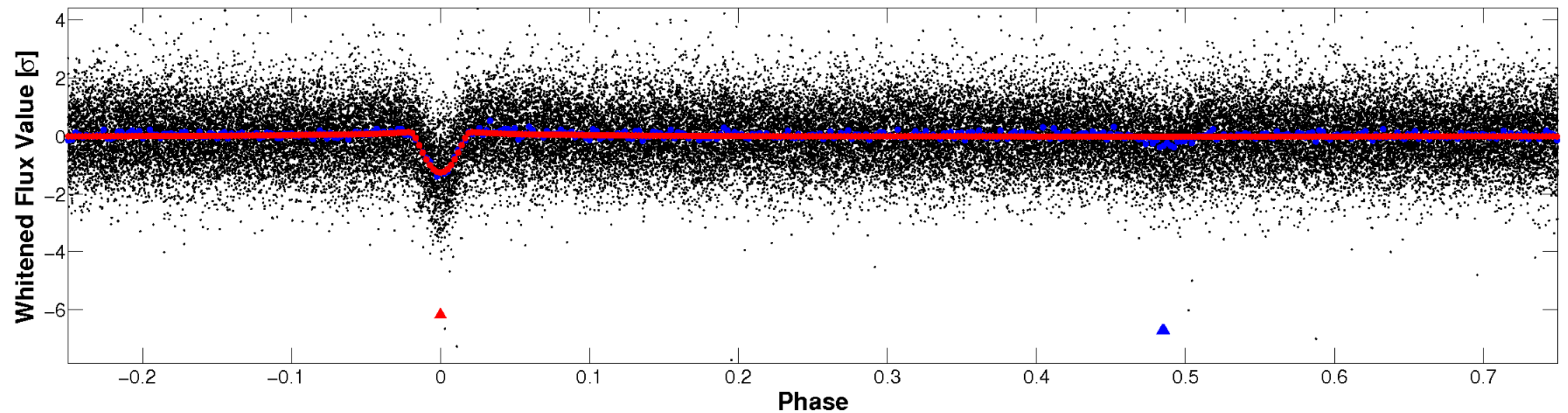


# Non-Whitened Vs. Whitened Light Curve

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

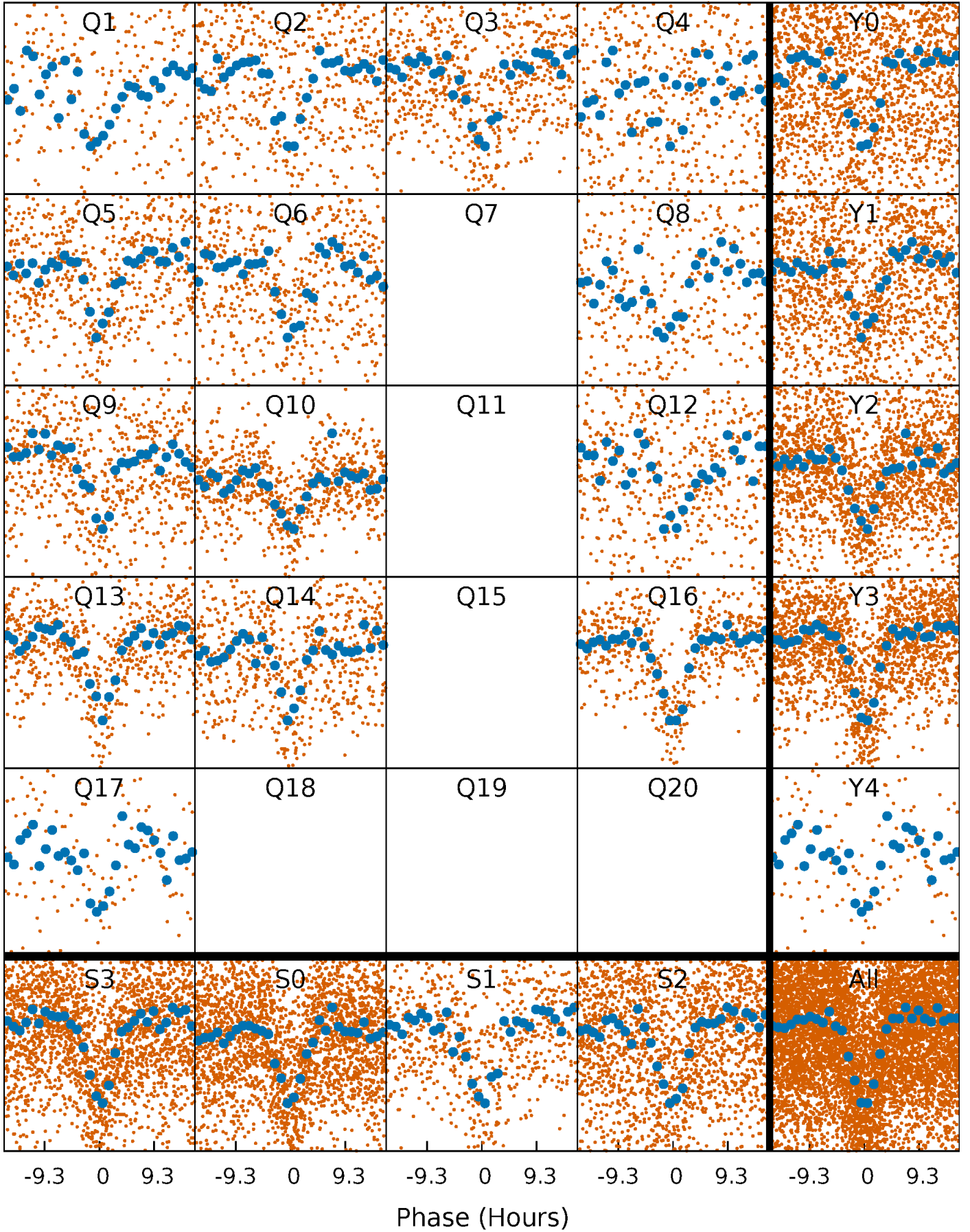


**Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)**



# PDC Quarter-Phased Transit Curves

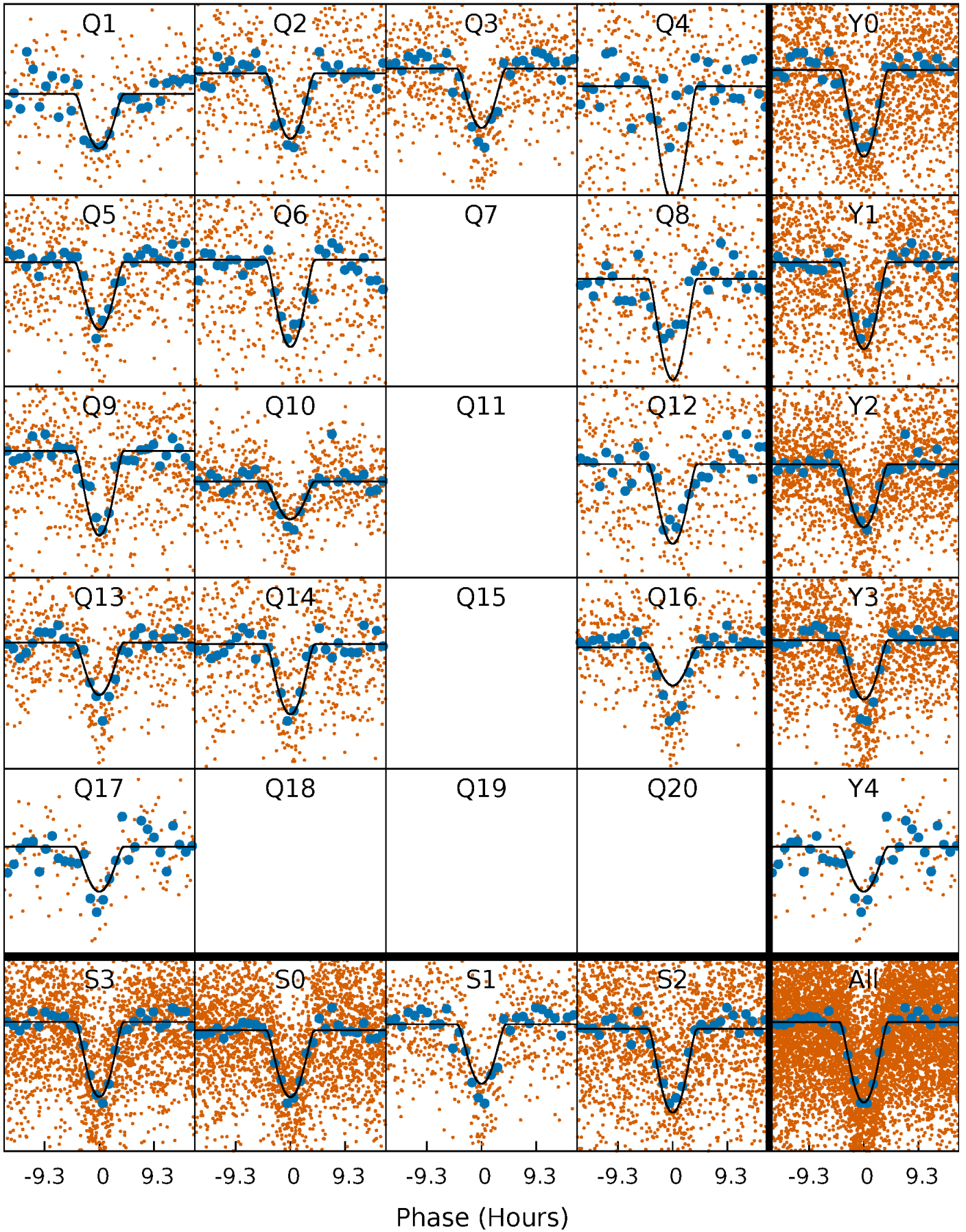
TCE 010031885-01   P= 8.589654 Days    $T_0=132.017630$  (BKJD)





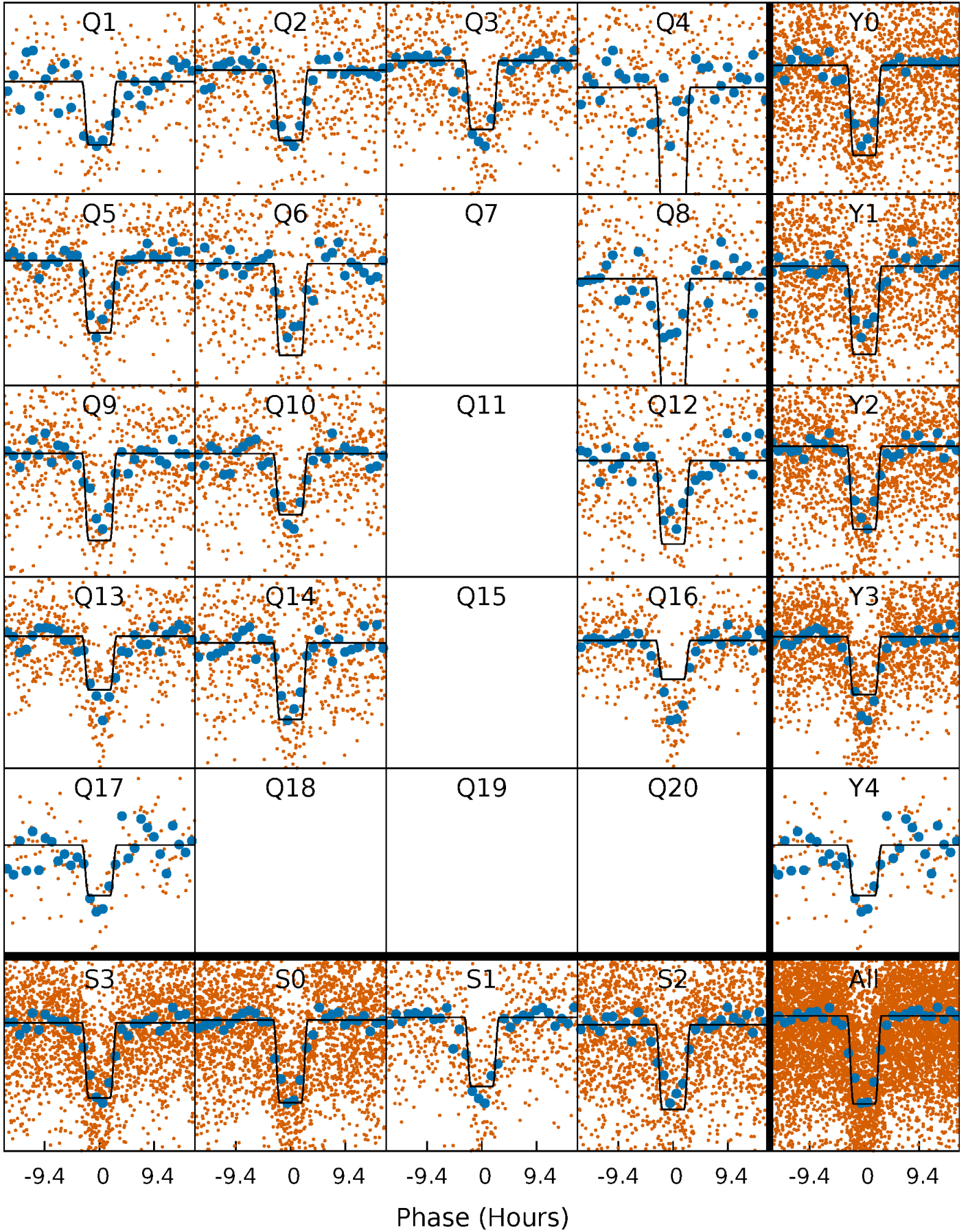
# DV Quarter-Phased Transit Curves

TCE 010031885-01   P= 8.589654 Days    $T_0=132.017630$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

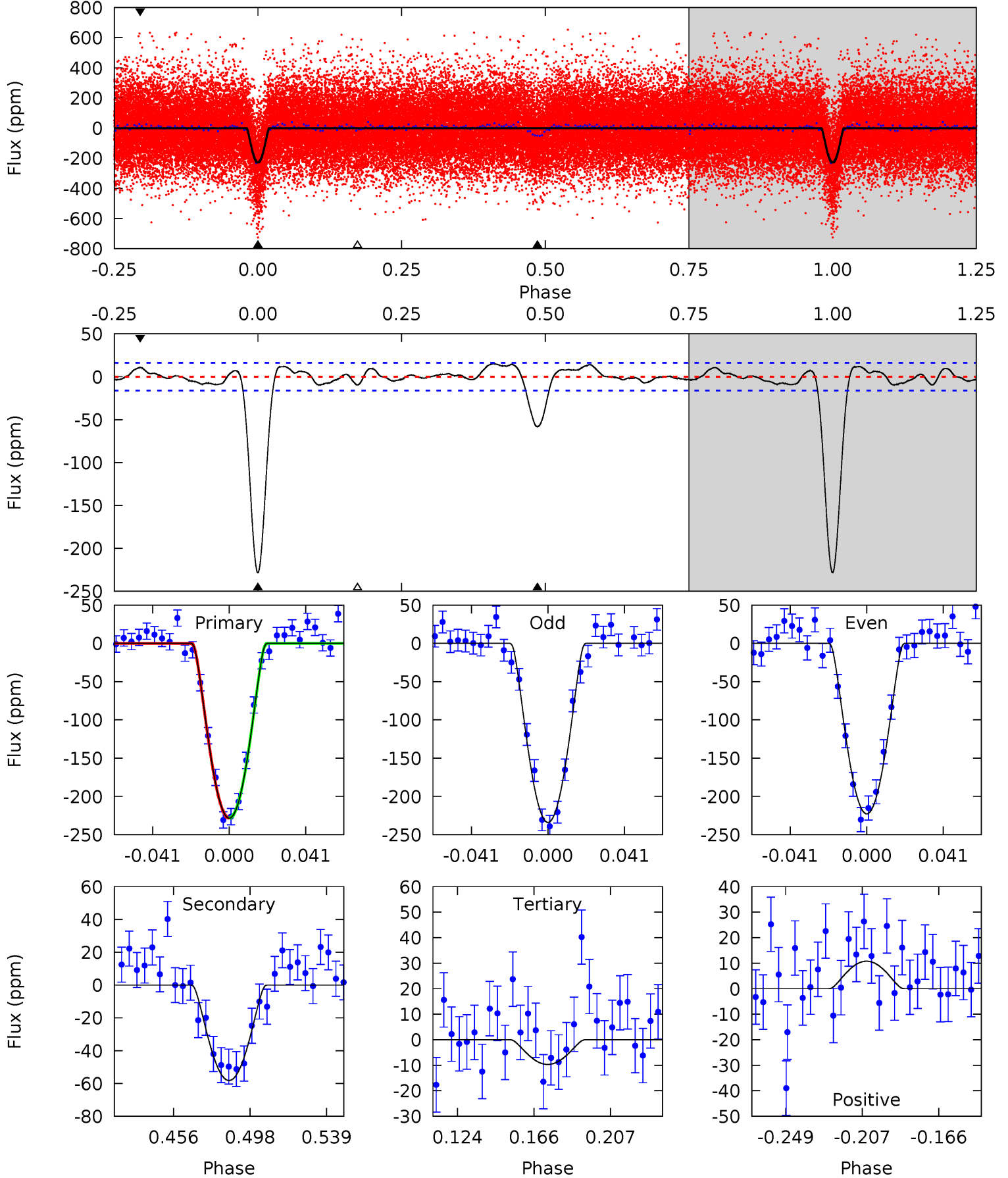
TCE 010031885-01 P= 8.589616 Days  $T_0=132.021515$  (BKJD)



# DV Model-Shift Uniqueness Test

010031885-01, P = 8.589654 Days, E = 123.427976 Days

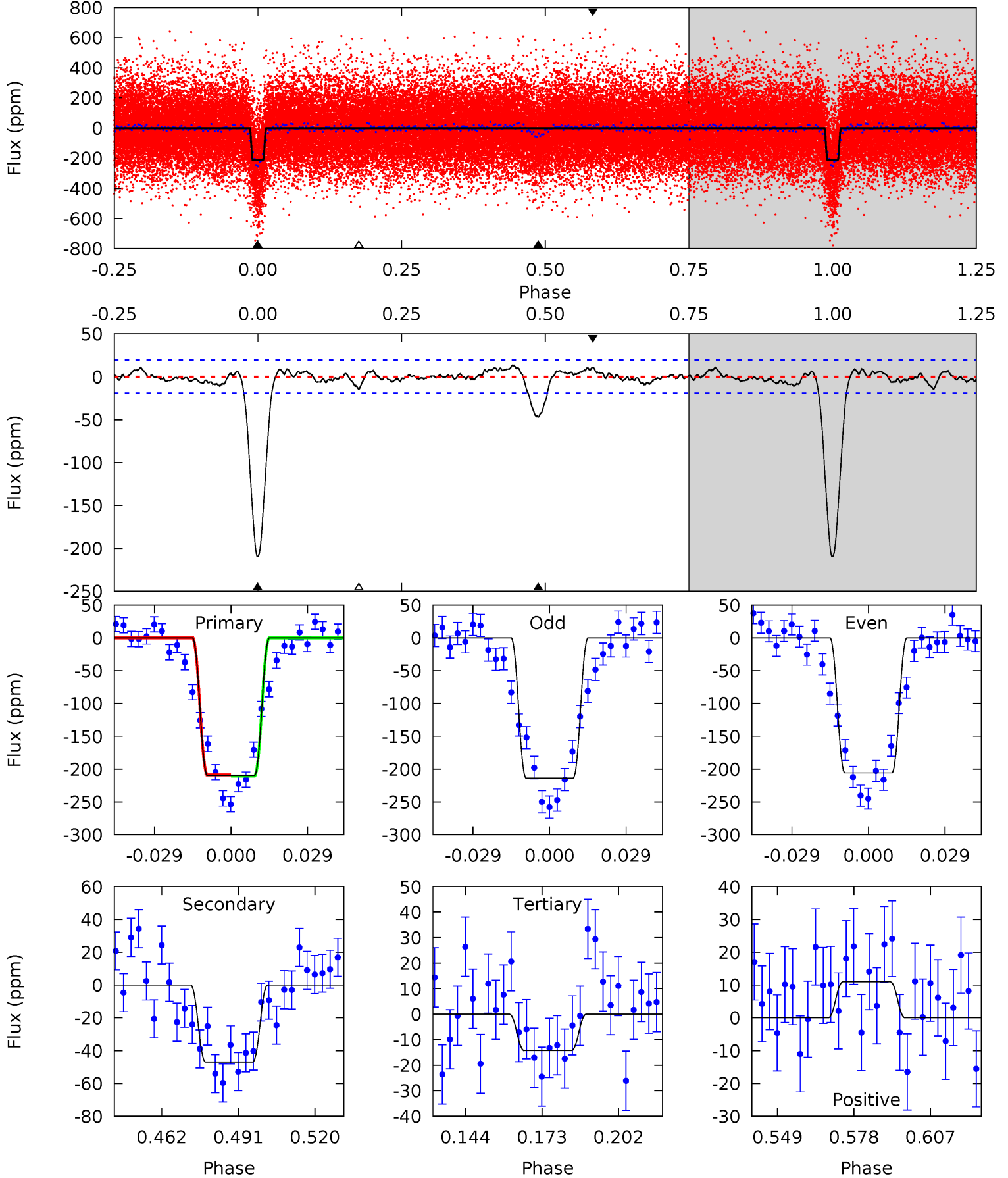
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
67.4	17.2	2.85	3.18	4.75	2.04	1.81	64.5	64.2	14.3	14.0	1.65	0.98	0.06	0.04



# Alt Model-Shift Uniqueness Test

010031885-01, P = 8.589616 Days, E = 123.431899 Days

Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
52.4	11.7	3.56	2.75	4.82	2.18	1.25	48.8	49.6	8.17	8.98	0.98	0.98	0.06	0.23





### Stellar Parameters For KIC 010031885

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$6024^{+163}_{-181}$	$4.523^{+0.050}_{-0.213}$	$-0.260^{+0.300}_{-0.300}$	$0.900^{+0.263}_{-0.088}$	$0.985^{+0.117}_{-0.130}$	$1.903^{+0.389}_{-1.002}$
	+3%/-3%	+1%/-5%	+115%/-115%	+29%/-10%	+12%/-13%	+20%/-53%
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 010031885-01 / KOI 0329.01

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$-58 \pm 3$	$3.00^{+2.05}_{-1.84}$	$1260^{+96}_{-58}$	$3546^{+1450}_{-534}$	$23^{+130}_{-14}$
Alt.	$-47 \pm 4$	$2.20^{+1.66}_{-1.37}$	$1260^{+87}_{-60}$	$3776^{+1849}_{-620}$	$35^{+203}_{-23}$

$T_{\text{max}}$  = 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

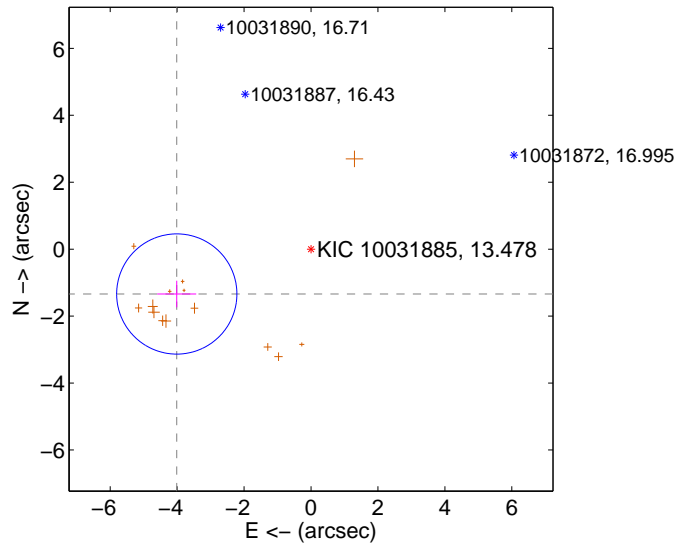
Supplemental centroid analysis for 010031885-01. Kepler magnitude: 13.48. Transit SNR 36.55

There are 0 quarters with good PRF difference image offsets

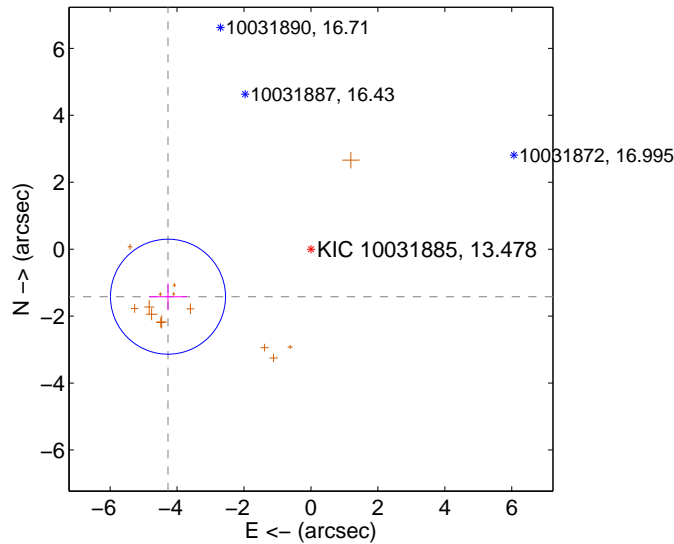
The direct PRF centroid is offset from the target star catalog position by about 0.11 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$4.228 \pm 0.599$	7.06	$4.010 \pm 0.582$	$-1.340 \pm 0.397$
PRF-fit source offset from KIC position	$4.501 \pm 0.573$	7.86	$4.271 \pm 0.565$	$-1.420 \pm 0.397$
photometric centroid source offset	$2.54 \pm 0.35$	7.27	$1.62 \pm 0.37$	$1.96 \pm 0.33$

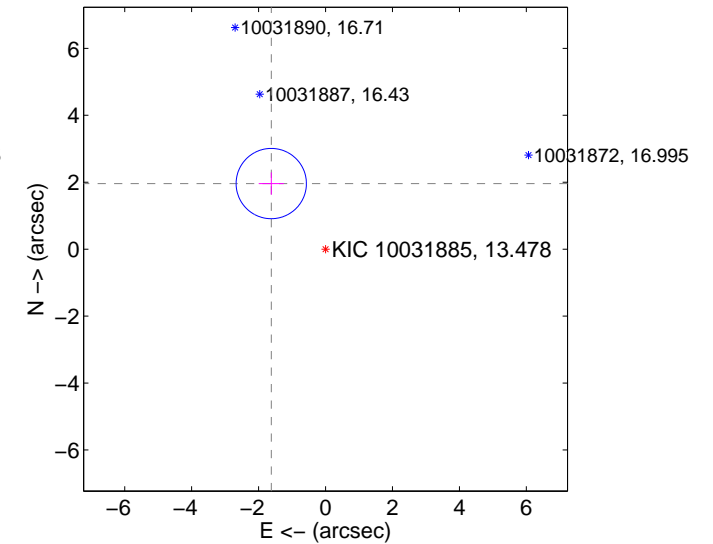
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position



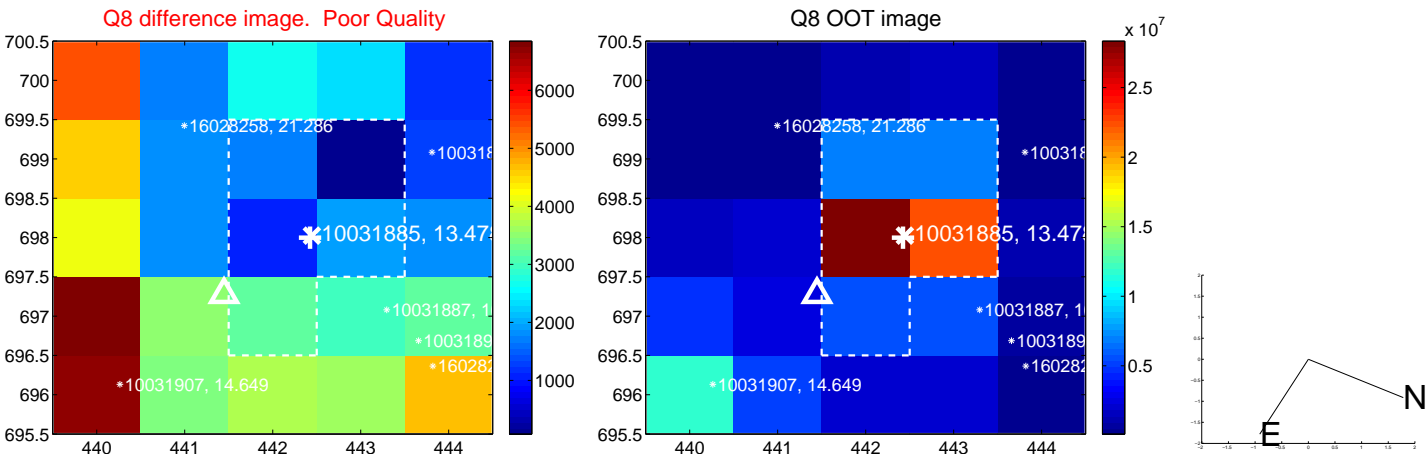
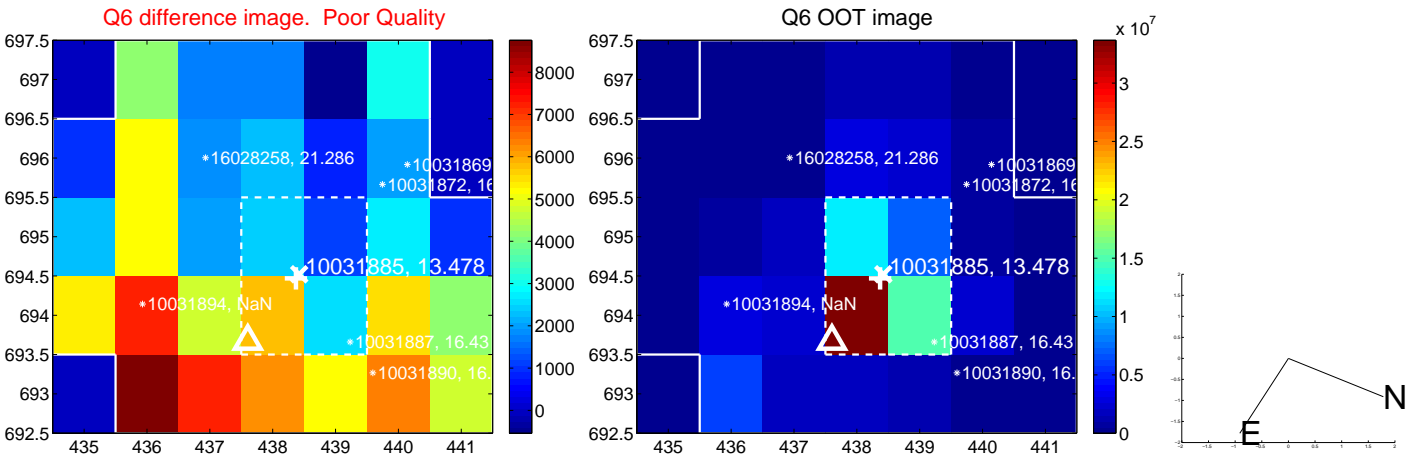
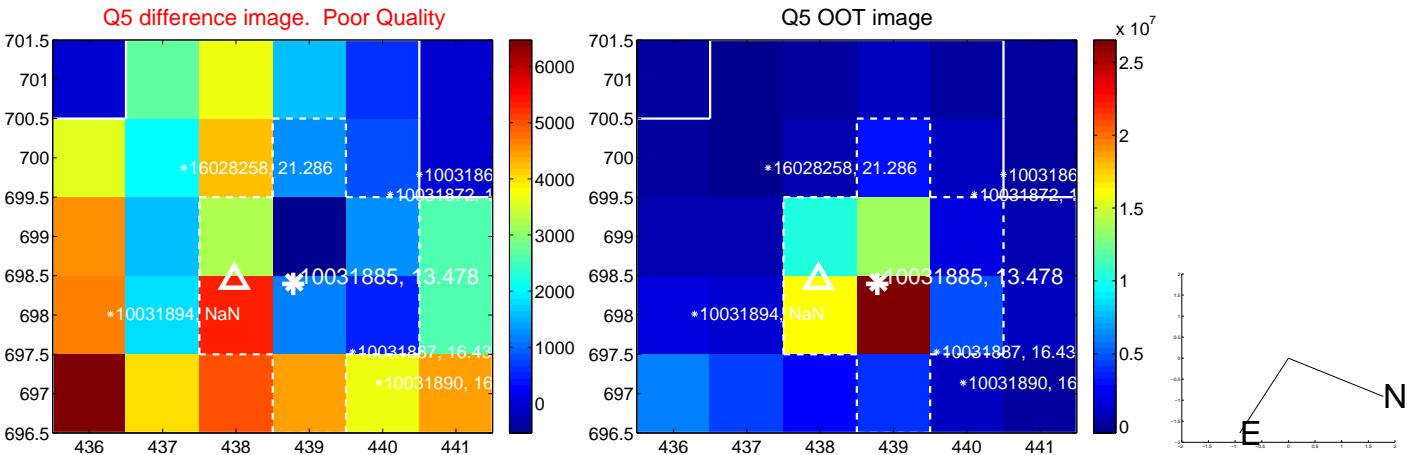
offset from photometric centroids



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.

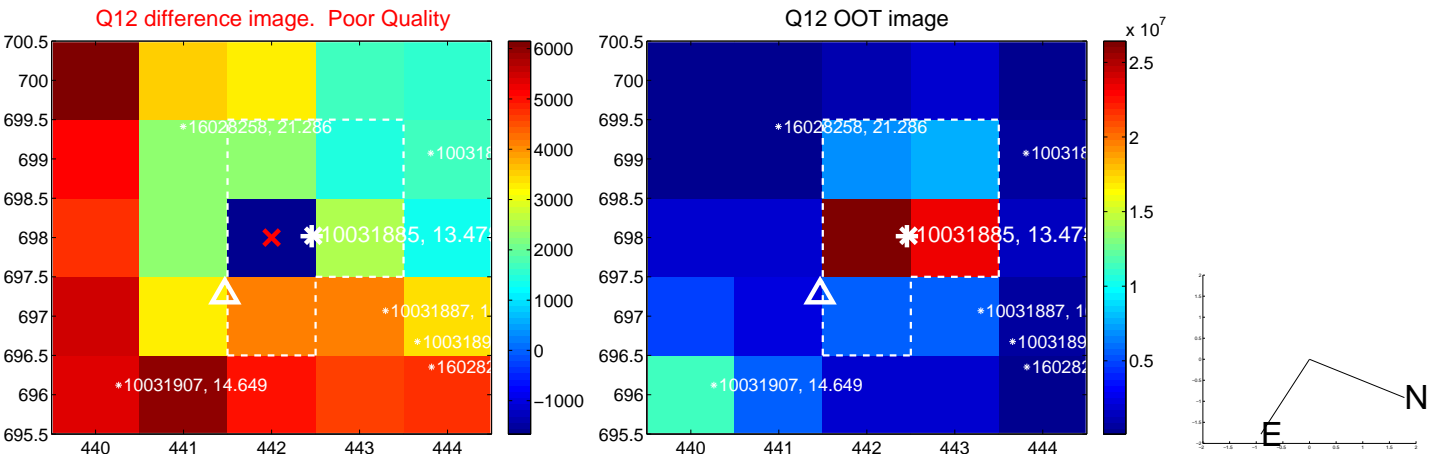
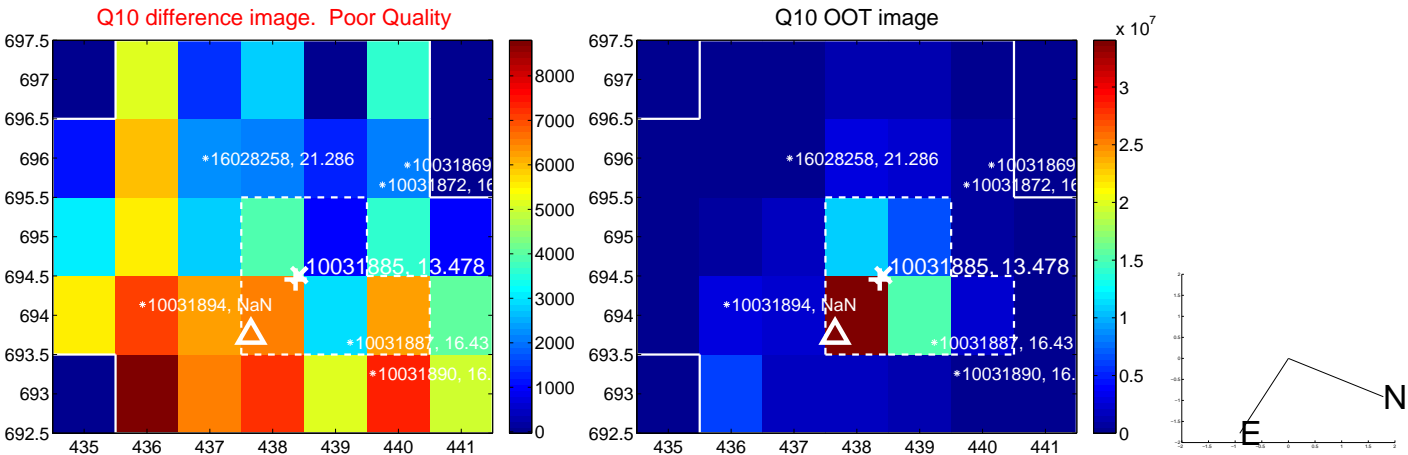
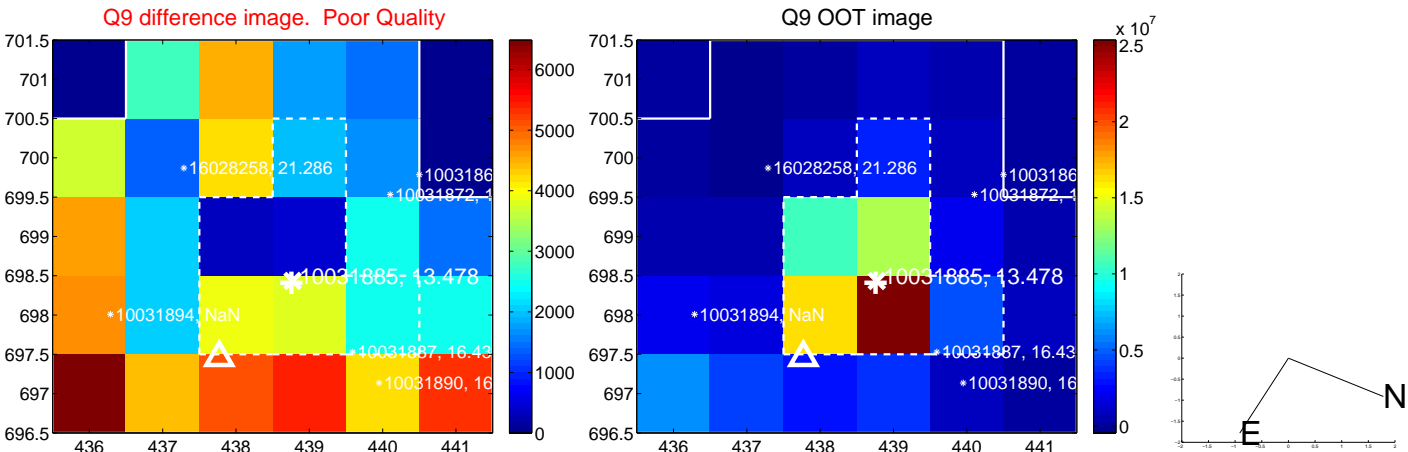


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

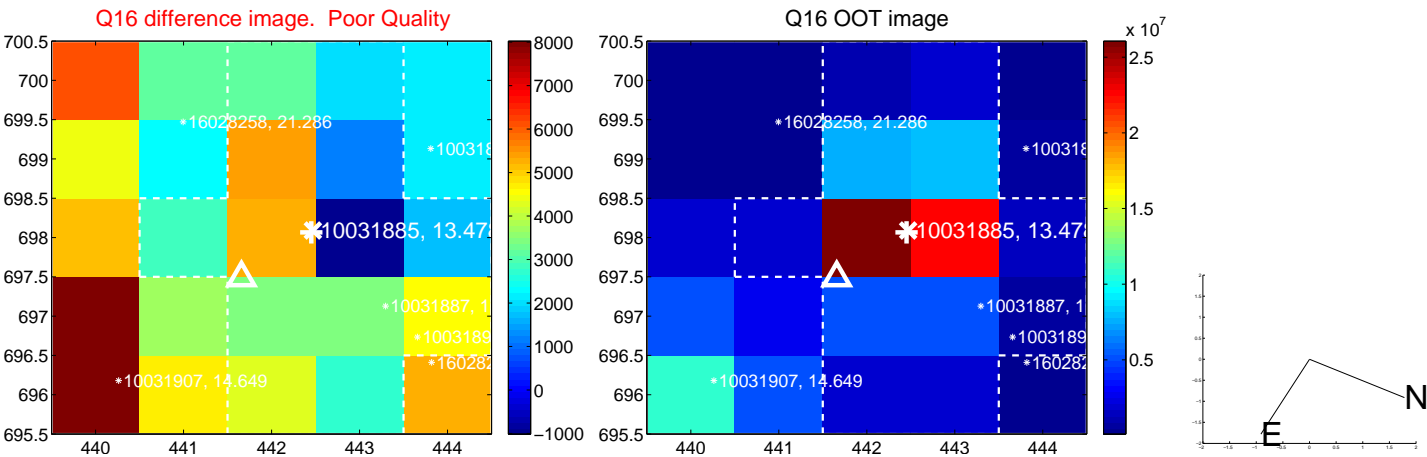
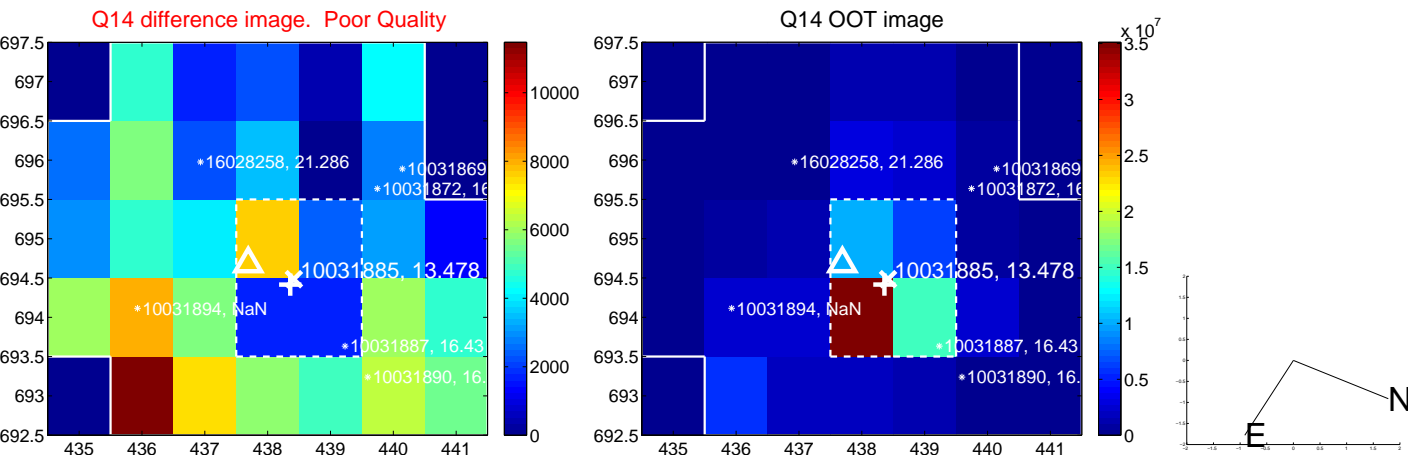
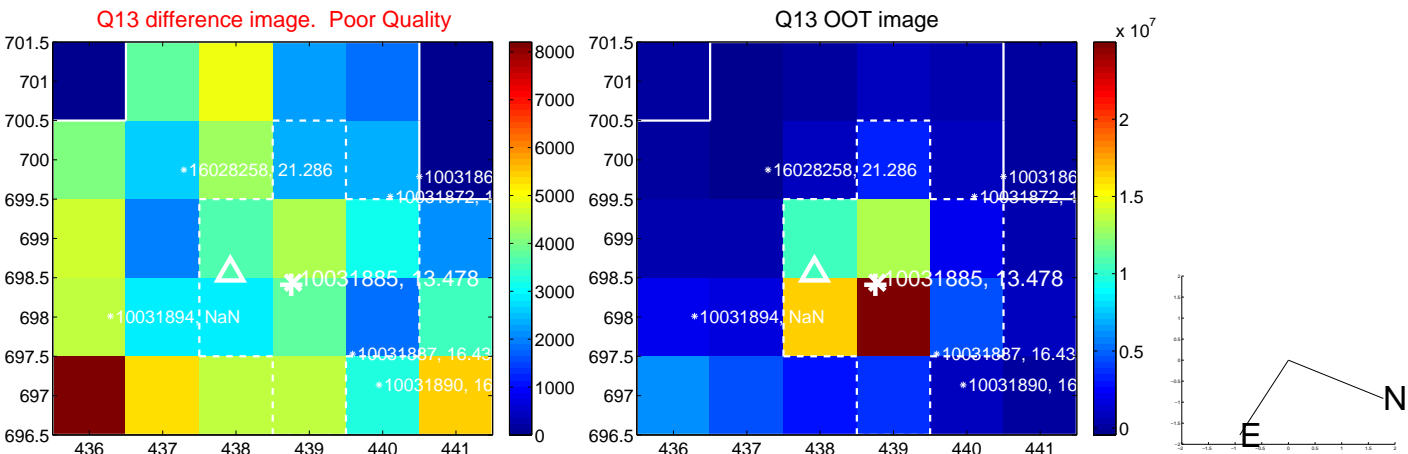




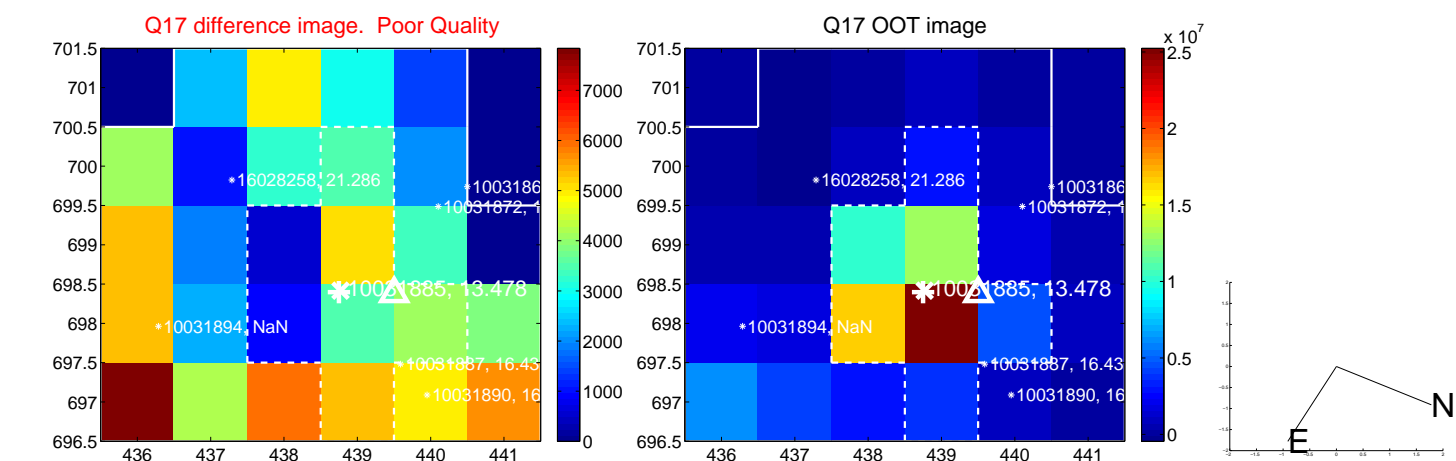
white ×: KIC target position; +: OOT centroid; △: difference centroid. red ×: large negative pixel value.



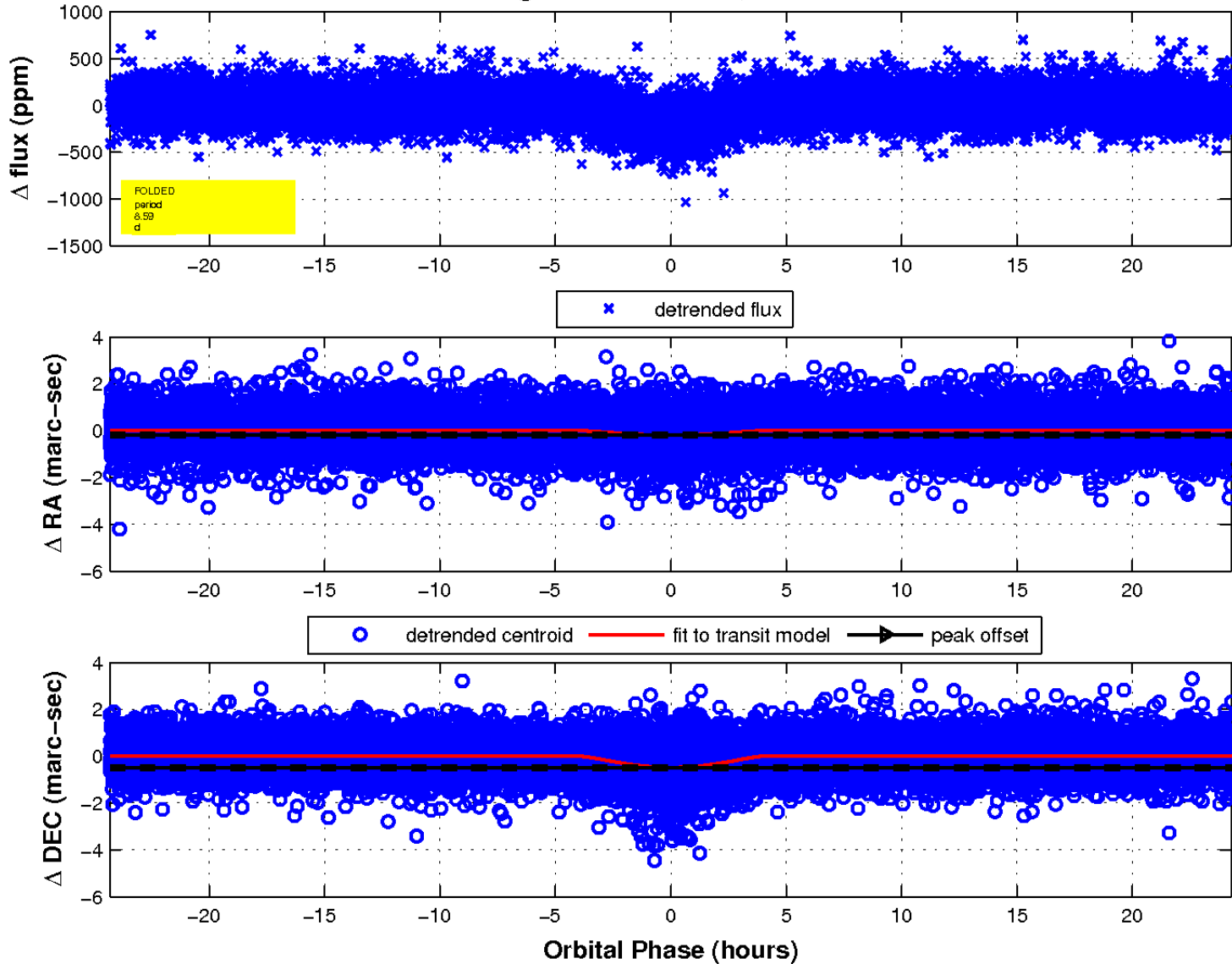
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

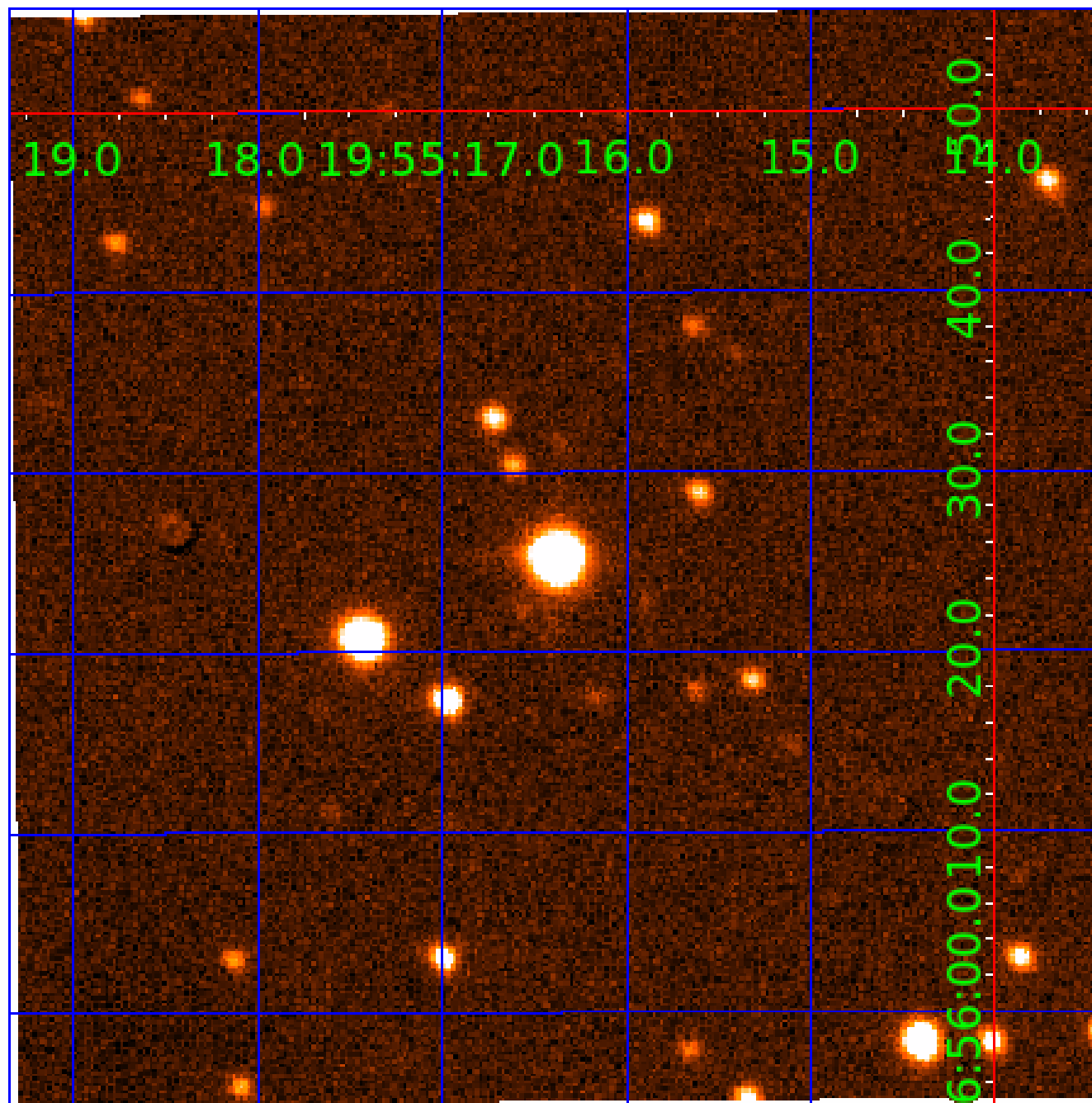


fluxWeightedCentroids, Planet 1 of 2



UKIRT Image

Declination





# KIC 010031885

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
010031885-01	OBS	0329.01	8.589654	132.017630	226.4	8.103	33.1	36.5	0.90	6024	2.60	143.21
010031885-02	OBS	No	8.589718	136.179662	57.5	12.289	10.6	11.4	0.90	6024	1.42	143.21

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
010031885-01	OBS	FP	0.00	0	1	1	1	MOD_SEC_DV—MOD_SEC_ALT—HAS_SEC_TCE—CENT_RESOLVED_OFFSET—HALO_GHOST—EPHEM_MATCH
010031885-02	OBS	FP	0.00	1	1	1	1	IS_SEC_TCE—CENT_UNRESOLVED_OFFSET—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 010031885-02

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	$\sigma_P$	$\sigma_T$
010031885-02	10031885	010031808-02	10031808	1:1	62.5	-15	2	9.56	13.48	1391.30	Direct-PRF	0	0.47	0.91

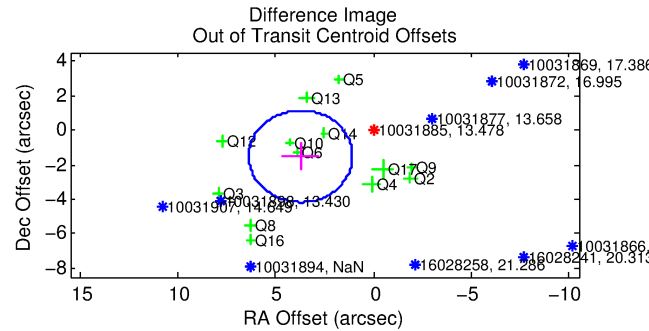
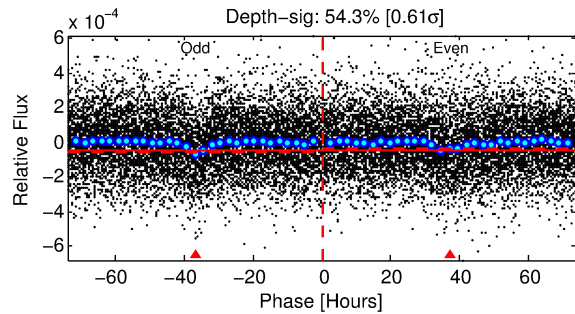
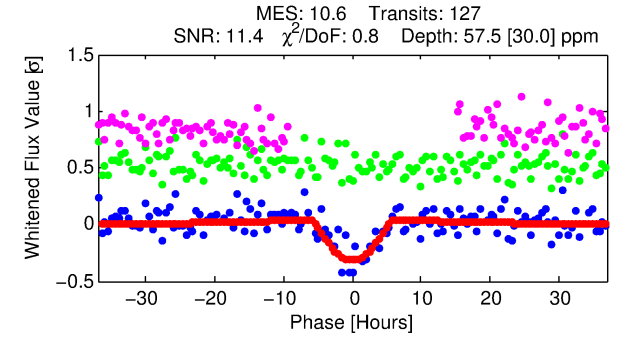
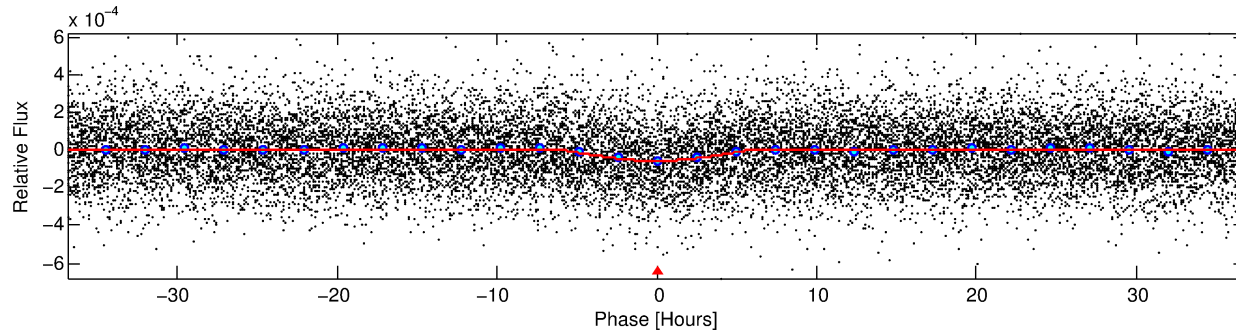
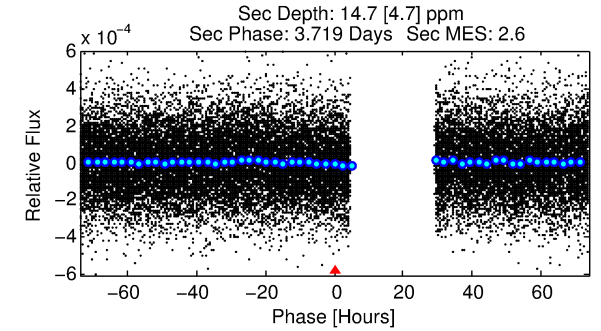
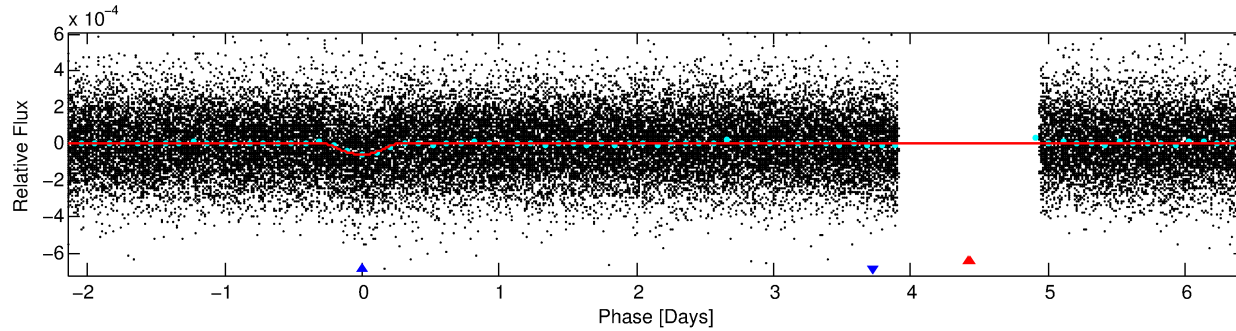
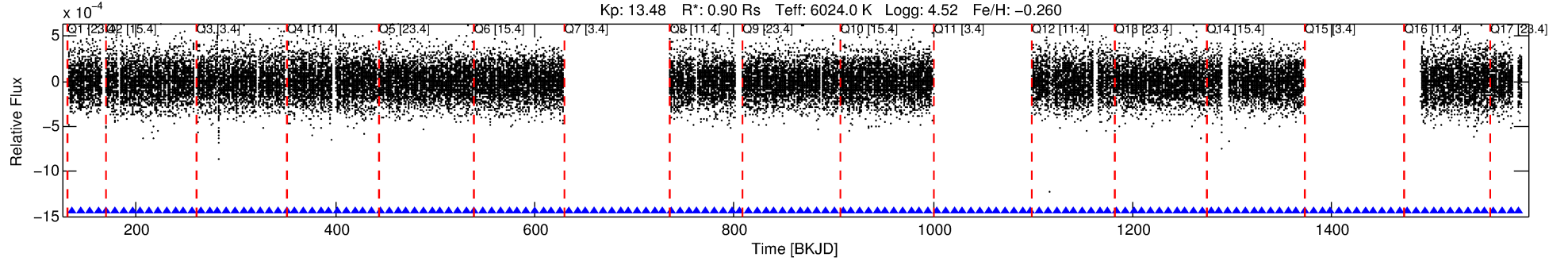
**Notes:**  $P_1:P_2$  is the period ratio. Dist is the distance in arcseconds.  $\Delta$ Row and  $\Delta$ Col are the number of pixels apart in row and column.  $m_2$  and  $m_1$  are the magnitudes of the parent and child.  $D_2/D_1$  is the parent's transit depth divided by the child's.  $\sigma_P$  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: 10031885 Candidate: 2 of 2 Period: 8.590 d

KOI: K00329 Corr: No Ephemeris Match

Kp: 13.48 R\*: 0.90 Rs Teff: 6024.0 K Logg: 4.52 Fe/H: -0.260



## DV Fit Results:

Period = 8.58972 [0.00024] d  
Epoch = 136.1797 [0.0226] BKJD  
Rp/R\* = 0.0144 [0.0397]  
a/R\* = 1.36 [0.44]  
b = 1.00 [0.07]  
Seff = 143.20 [57.16]  
Teq = 882 [88] K  
Rp = 1.42 [3.93] Re  
a = 0.0817 [0.0208] AU  
Ag = 26.86 [148.37] [0.17σ]  
Teff = 3105 [4278] K [0.52σ]

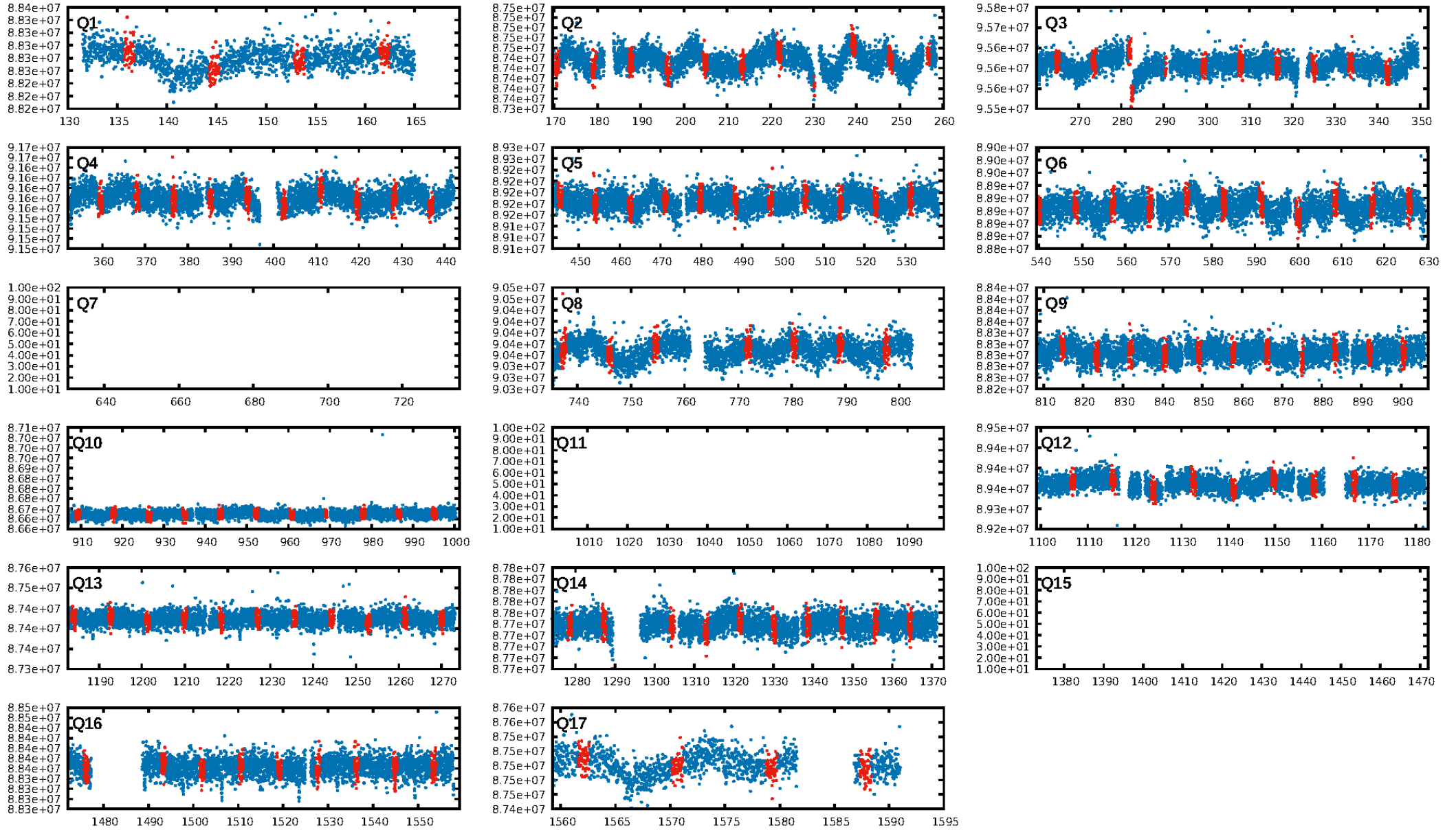
## DV Diagnostic Results:

ShortPeriod-sig: 0.0% [0.00σ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: 73.8%  
ModelChiSquareGof-sig: 100.0%  
Bootstrap-pfa: 9.80e-25  
RollingBand-fgt: 1.00 [119/119]  
GhostDiagnostic-chr: -0.2569  
Centroid-sig: 3.8%  
Centroid-so: 1.516 arcsec [1.21σ]  
OotOffset-rm: 4.030 arcsec [4.56σ]  
KicOffset-rm: 4.258 arcsec [4.19σ]  
OotOffset-st: 4/1/4/4 [13]  
KicOffset-st: 4/1/4/4 [13]  
DiffImageQuality-fgm: 0.00 [0/13]  
DiffImageOverlap-fno: 1.00 [14/14]

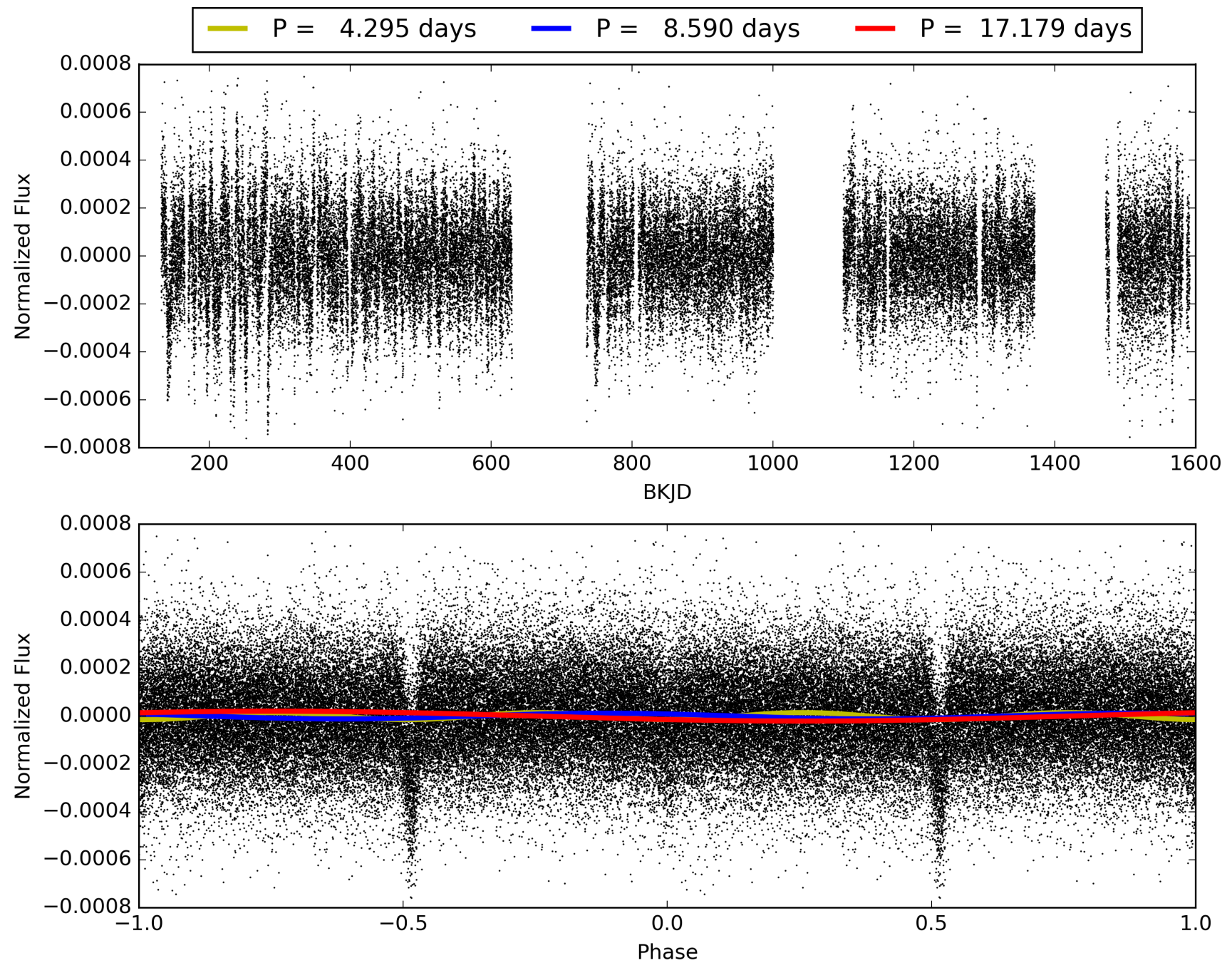
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 31-Jan-2016 14:57:22 Z

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

# TCE 010031885-02, PDC Light Curves



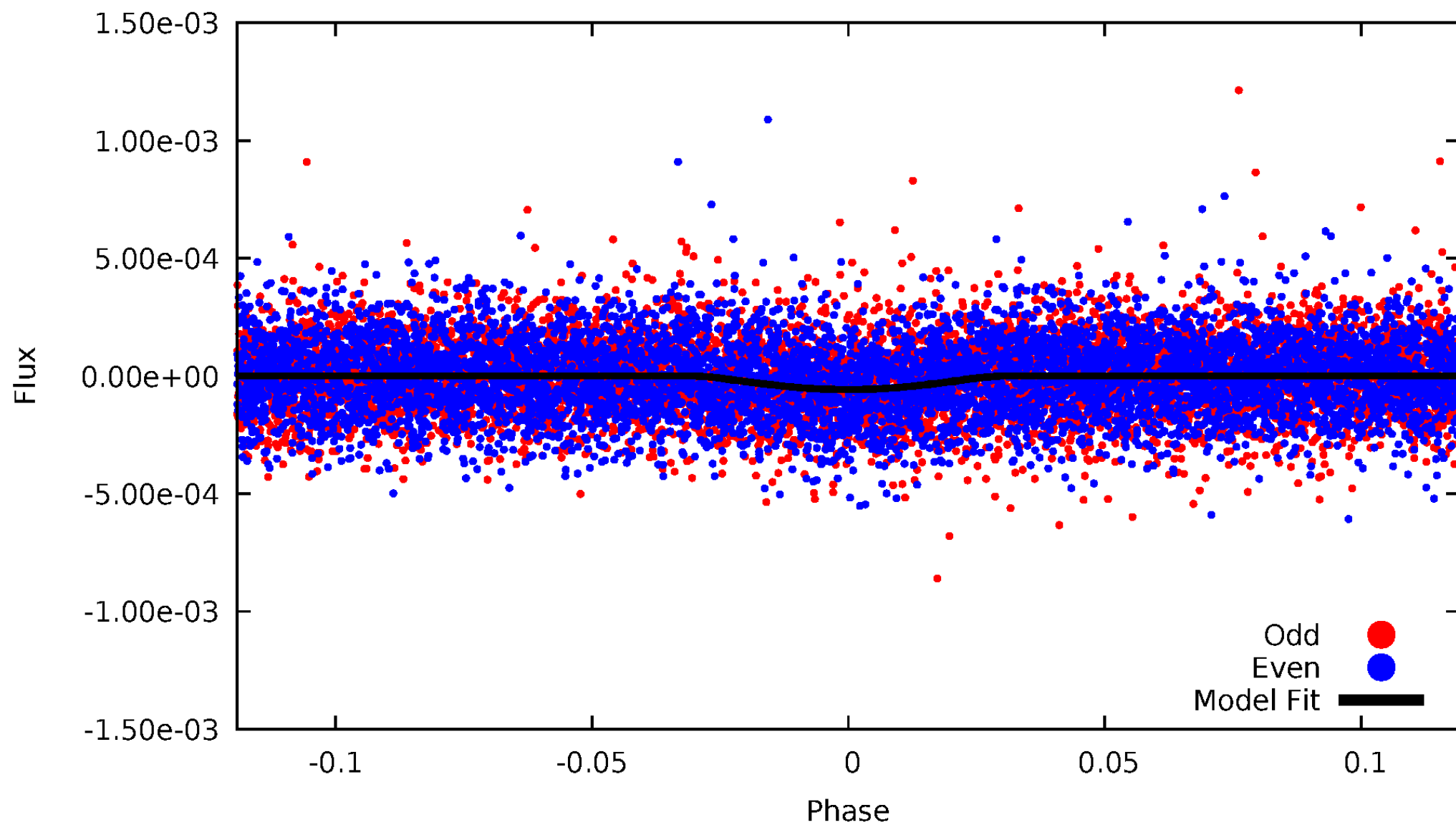
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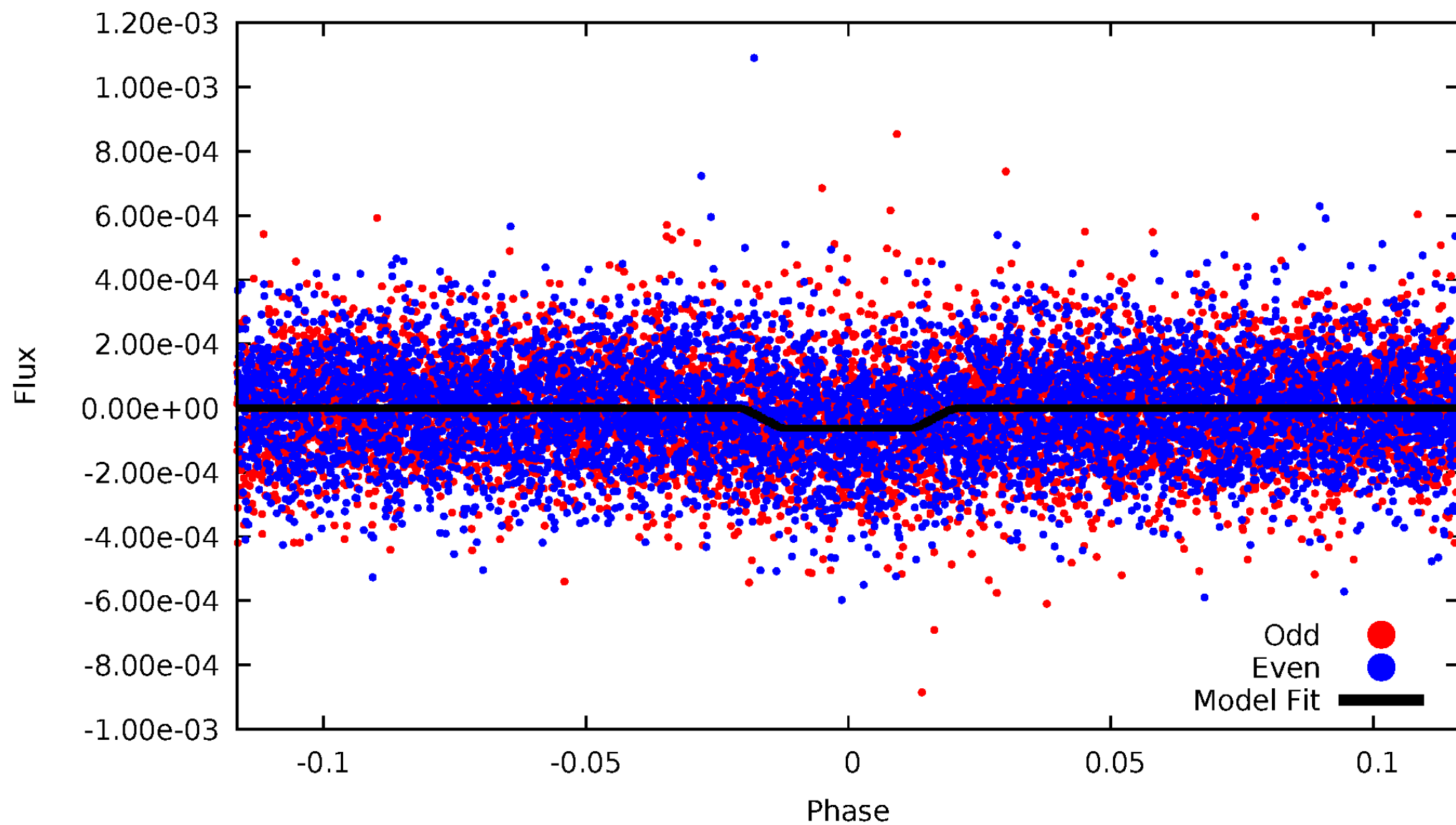
DV Odd/Even

TCE 010031885-02



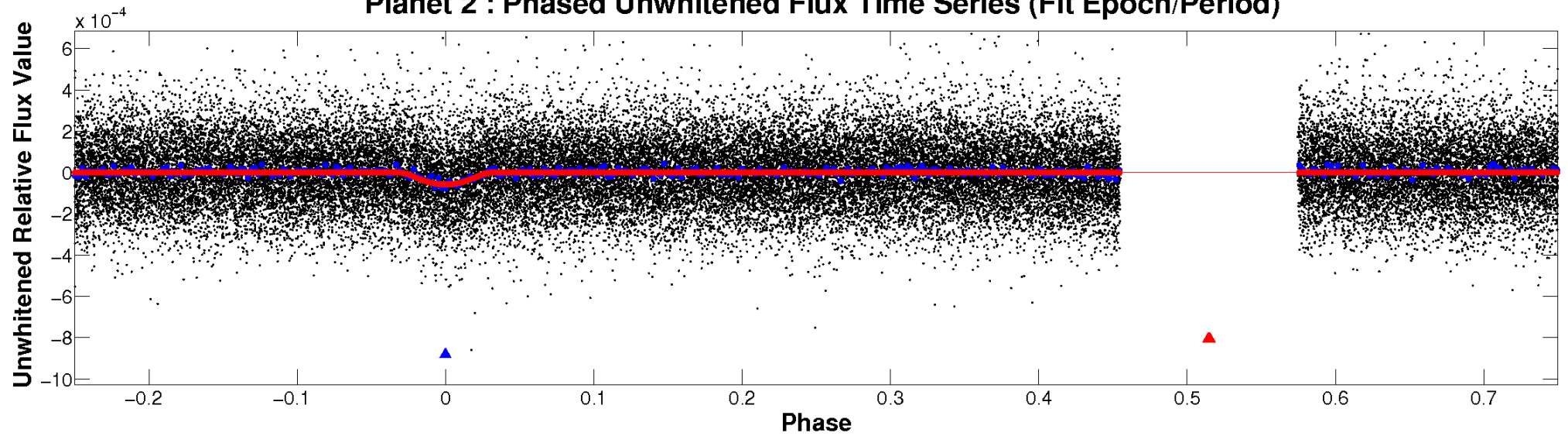
# ALT Odd/Even

TCE 010031885-02

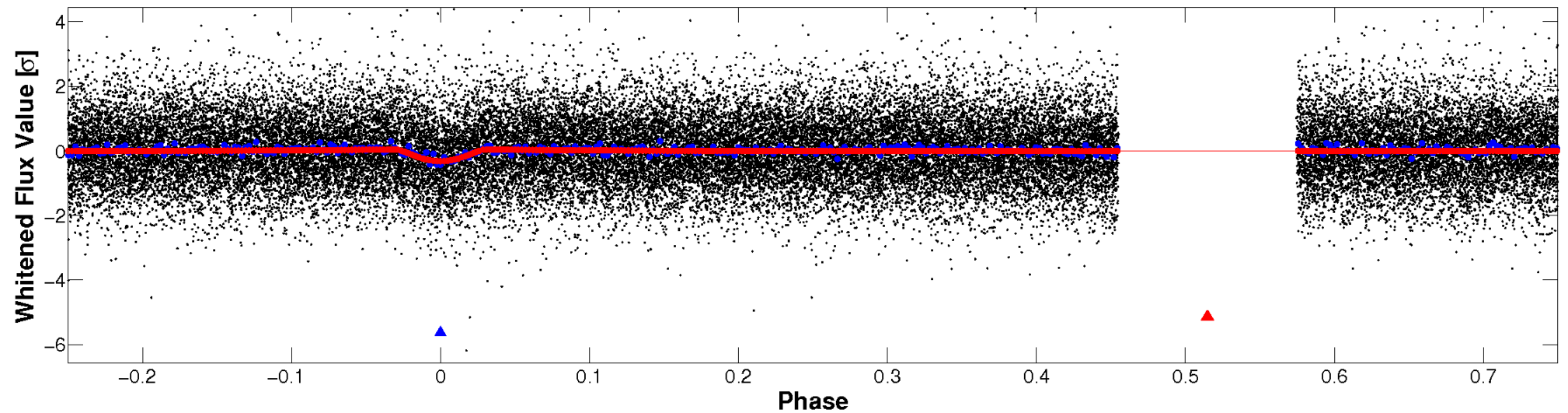


# Non-Whitened Vs. Whitened Light Curve

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

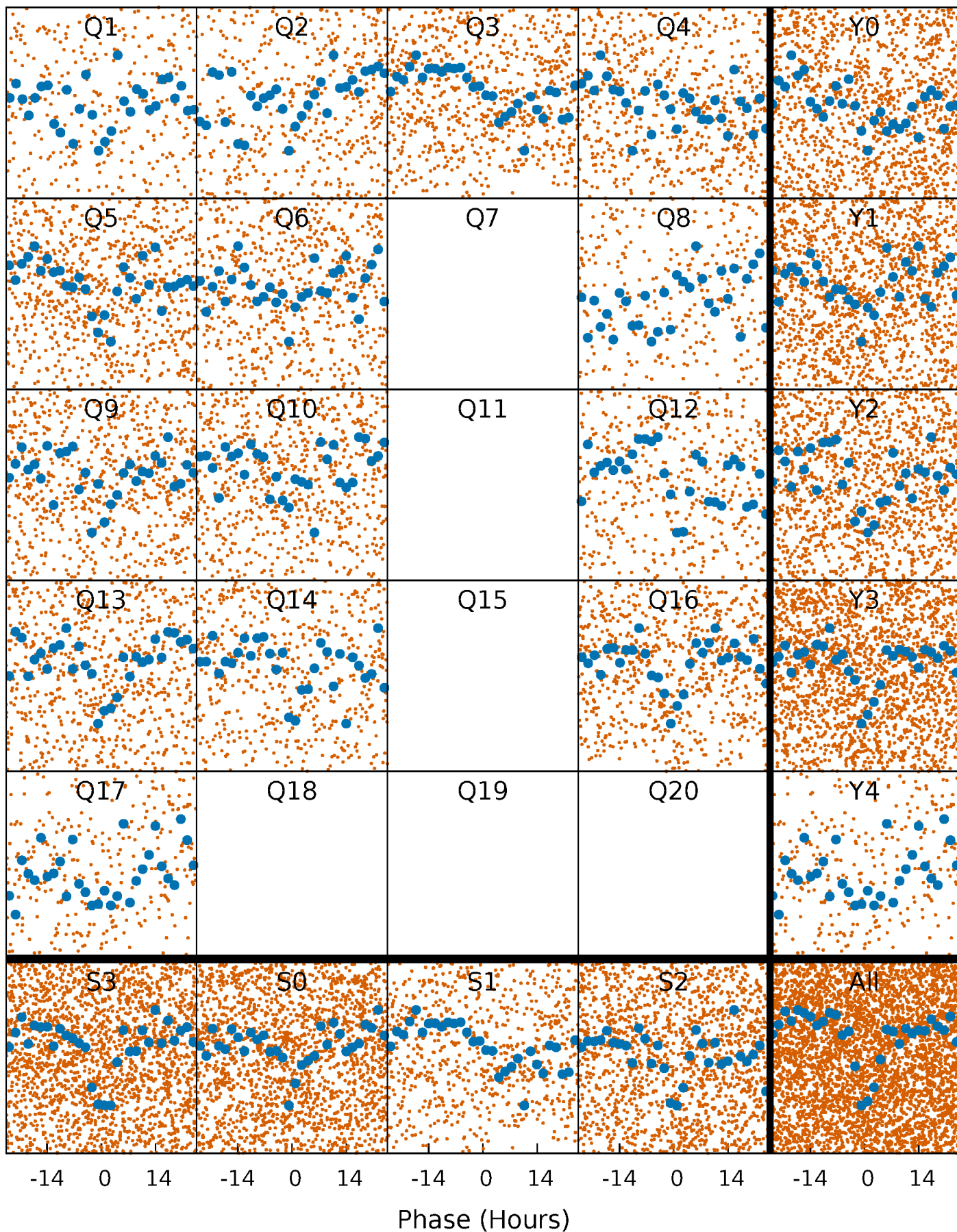


## Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



# PDC Quarter-Phased Transit Curves

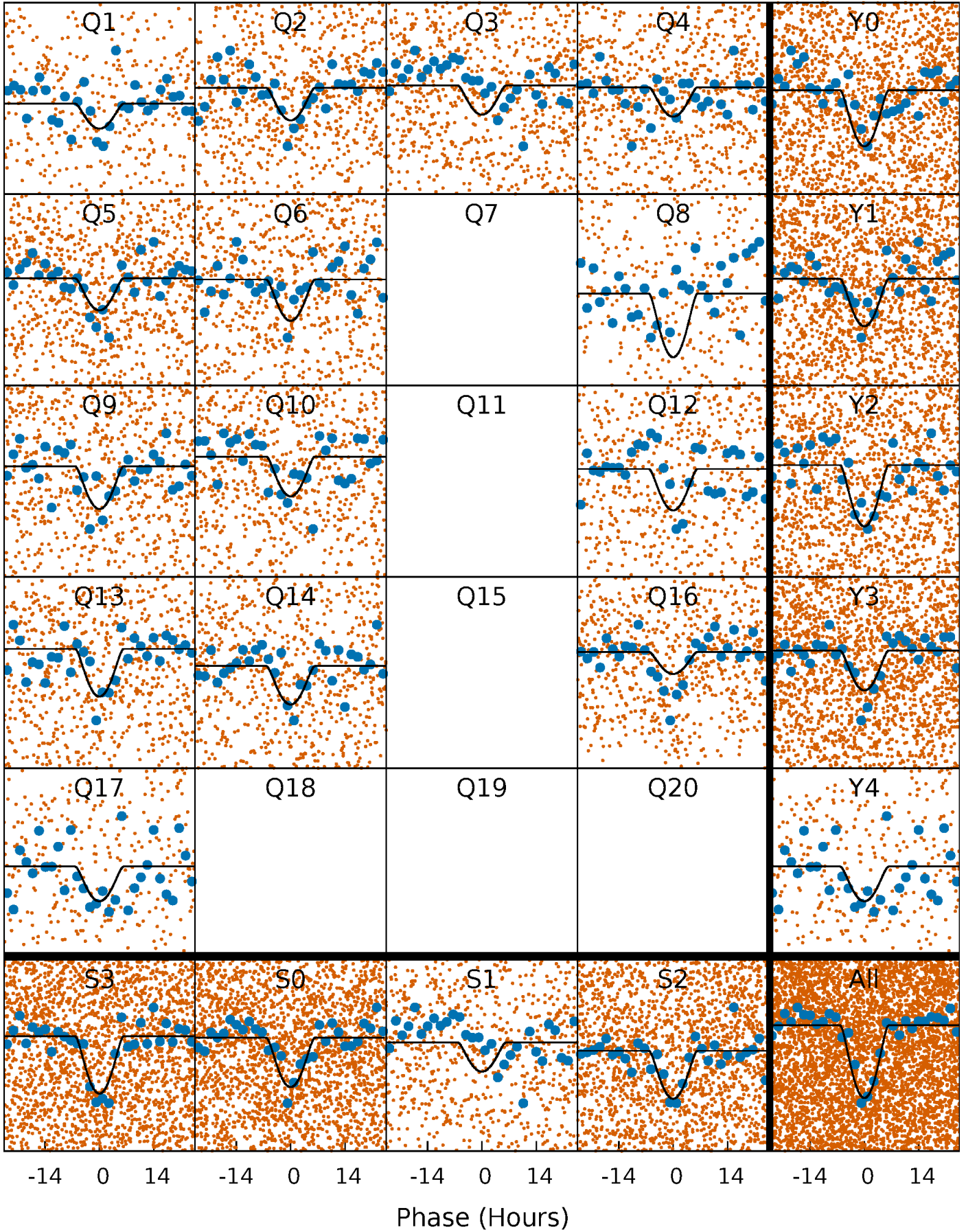
TCE 010031885-02 P= 8.589718 Days  $T_0=136.179662$  (BKJD)





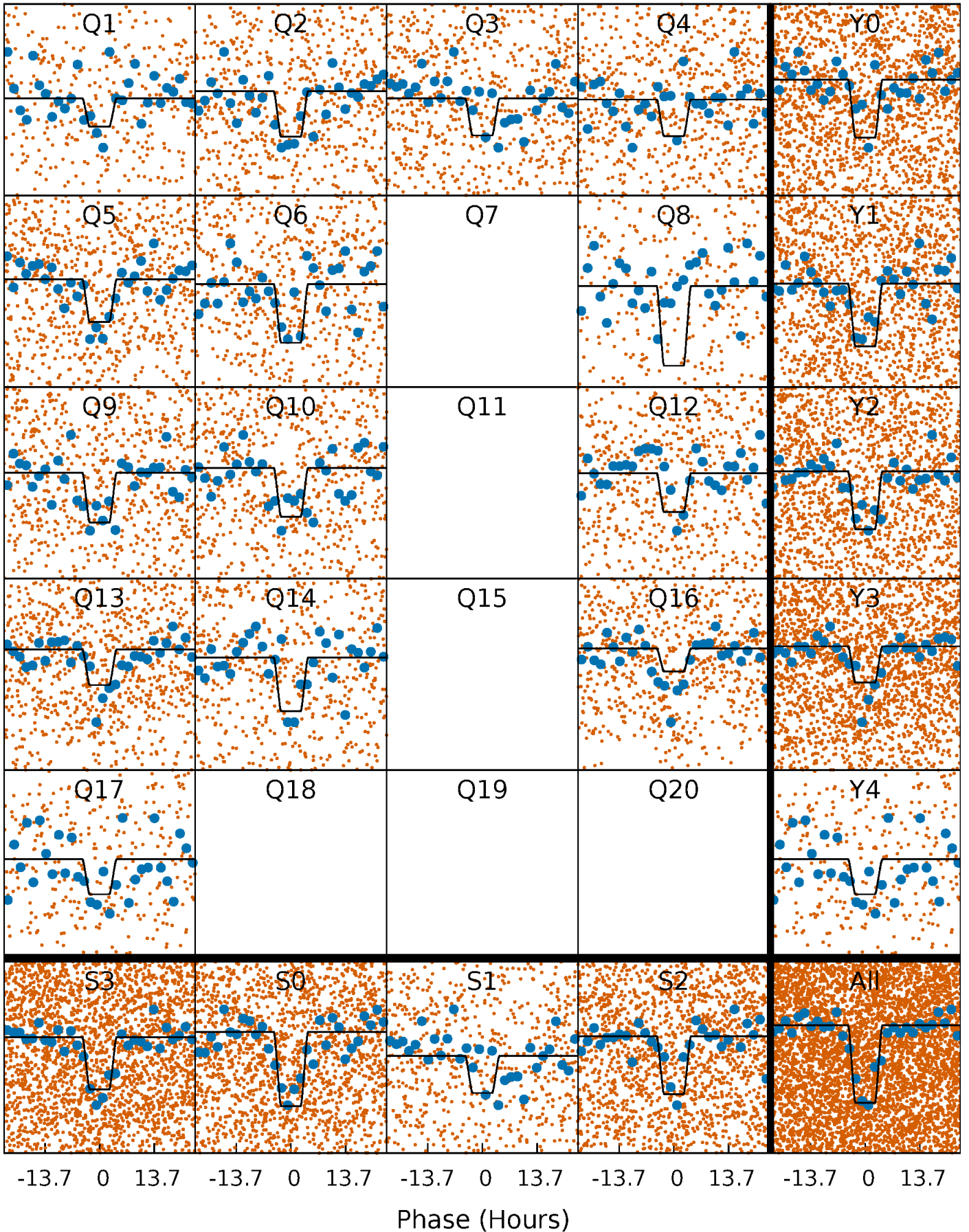
# DV Quarter-Phased Transit Curves

TCE 010031885-02   P= 8.589718 Days    $T_0=136.179662$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

TCE 010031885-02   P= 8.589544 Days    $T_0=136.211443$  (BKJD)

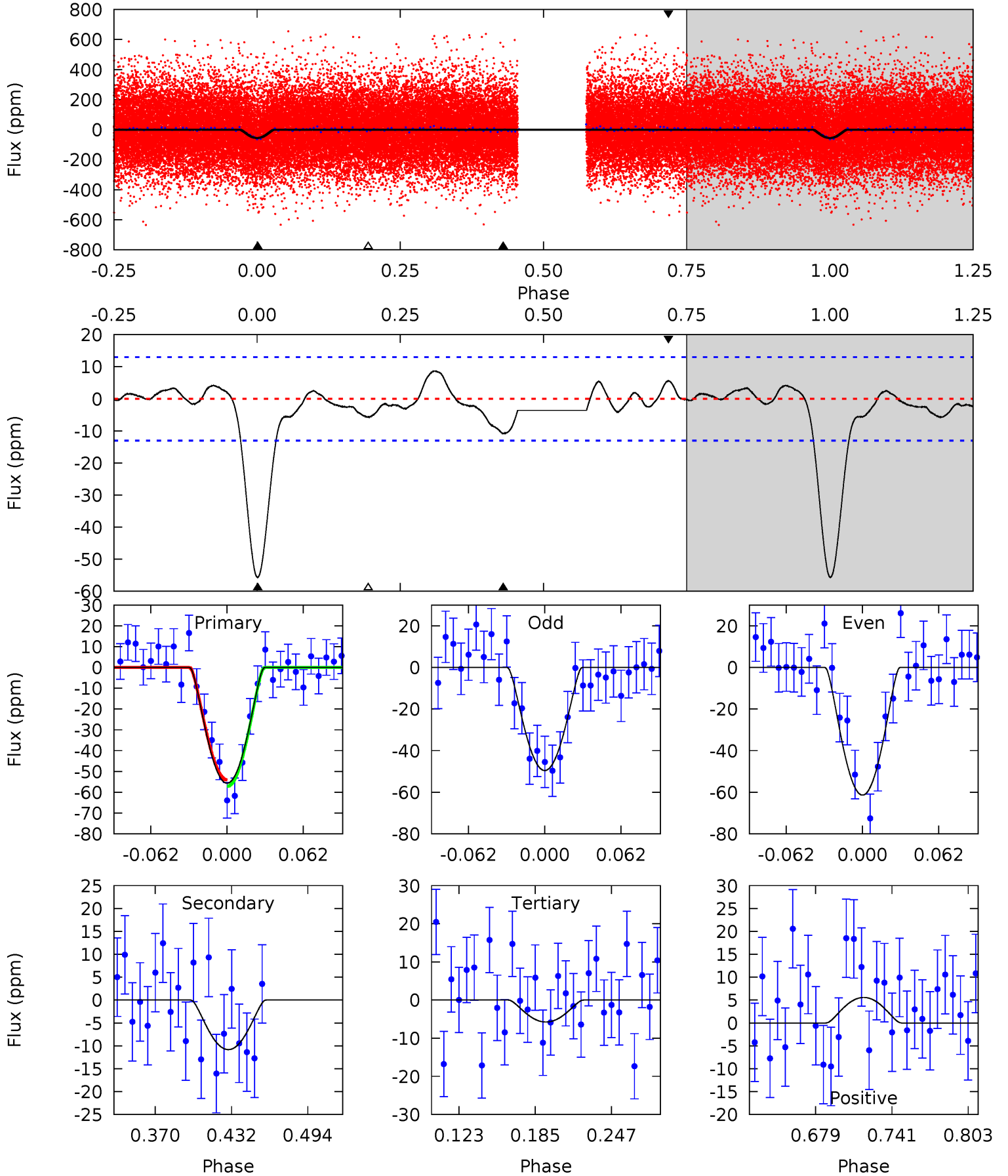




# DV Model-Shift Uniqueness Test

010031885-02, P = 8.589718 Days, E = 127.589944 Days

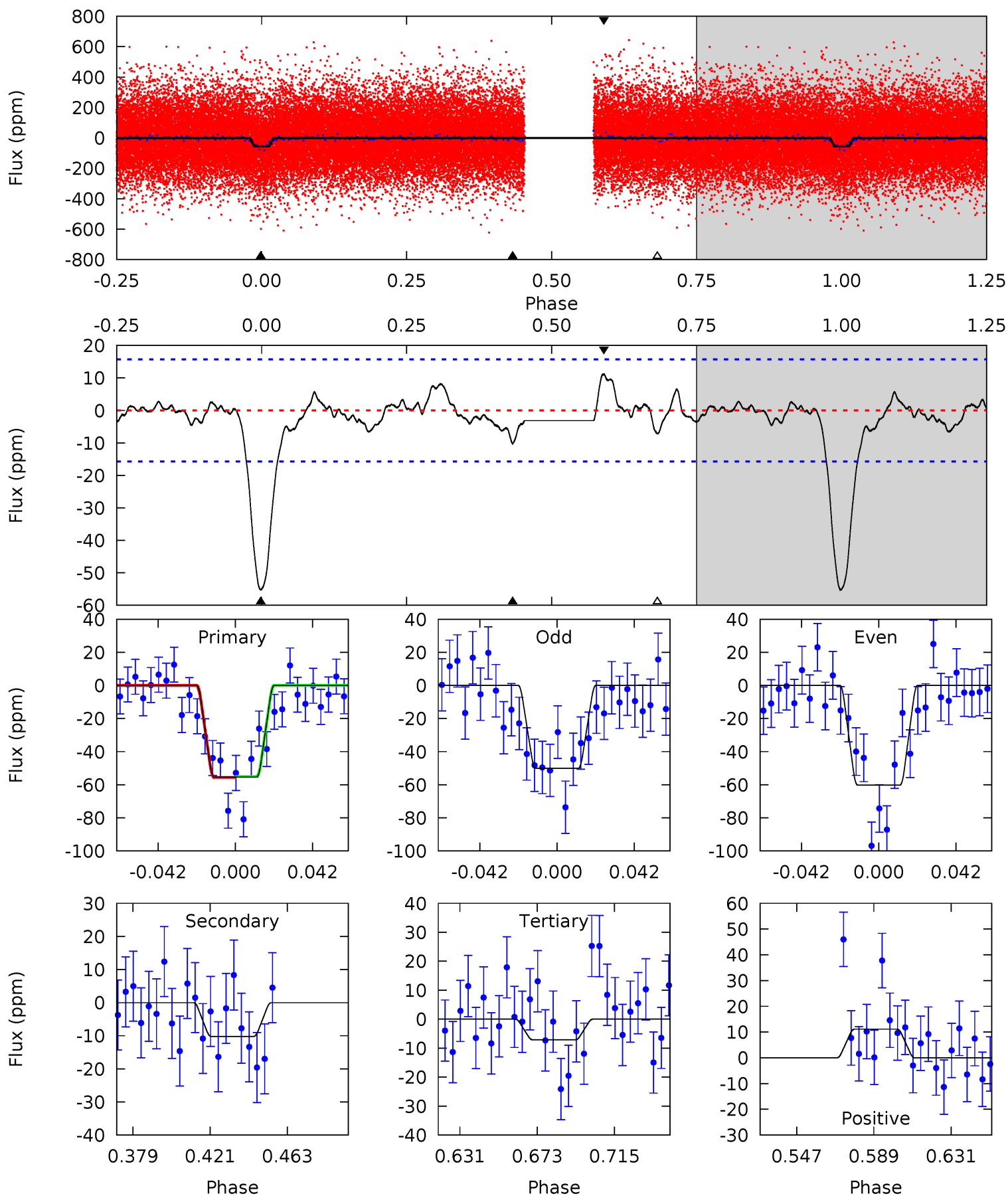
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
20.0	3.89	2.07	2.00	4.66	1.87	1.11	17.9	18.0	1.82	1.89	2.12	0.90	0.13	0.56



# Alt Model-Shift Uniqueness Test

010031885-02, P = 8.589544 Days, E = 127.621899 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
16.7	3.08	2.15	3.36	4.74	2.03	1.04	14.5	13.3	0.92	-0.28	1.52	1.00	0.17	0.08



### Stellar Parameters For KIC 010031885

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$6024^{+163}_{-181}$	$4.523^{+0.050}_{-0.213}$	$-0.260^{+0.300}_{-0.300}$	$0.900^{+0.263}_{-0.088}$	$0.985^{+0.117}_{-0.130}$	$1.903^{+0.389}_{-1.002}$
	+3%/-3%	+1%/-5%	+115%/-115%	+29%/-10%	+12%/-13%	+20%/-53%
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 010031885-02 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$-11 \pm 3$	$3.53^{+3.26}_{-2.36}$	$1256^{+83}_{-55}$	$2623^{+1050}_{-490}$	$2.972^{+26.162}_{-2.156}$
Alt.	$-10 \pm 3$	$3.22^{+3.33}_{-2.30}$	$1262^{+87}_{-58}$	$2682^{+1254}_{-546}$	$3.593^{+38.812}_{-2.823}$

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

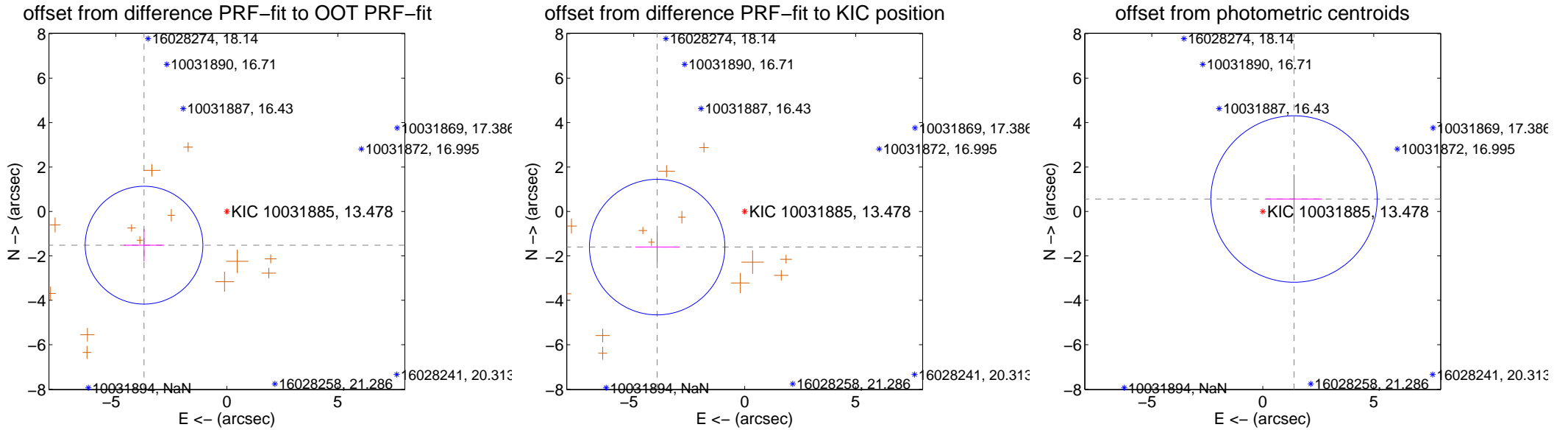
## DV Centroid Data

Supplemental centroid analysis for 010031885-02. Kepler magnitude: 13.48. Transit SNR 11.35

There are 0 quarters with good PRF difference image offsets

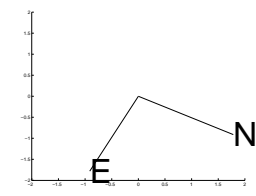
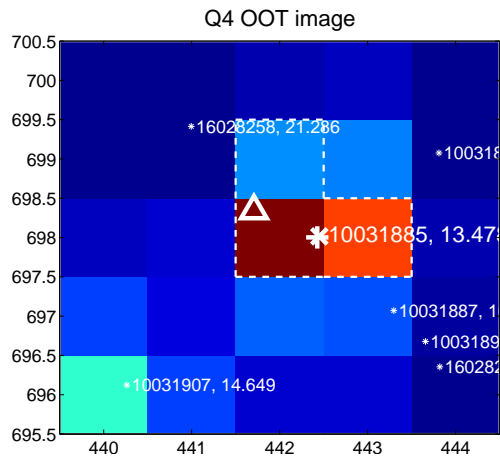
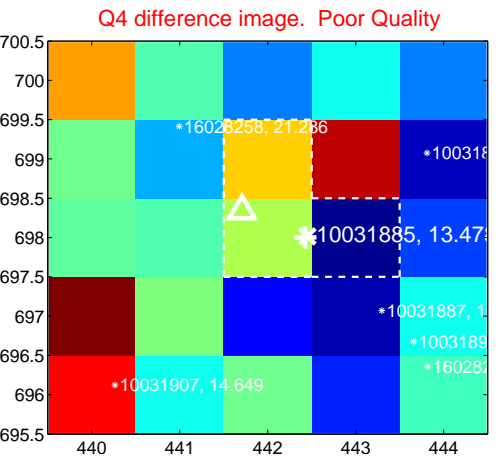
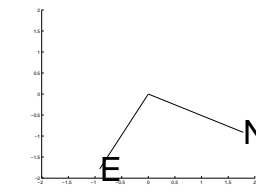
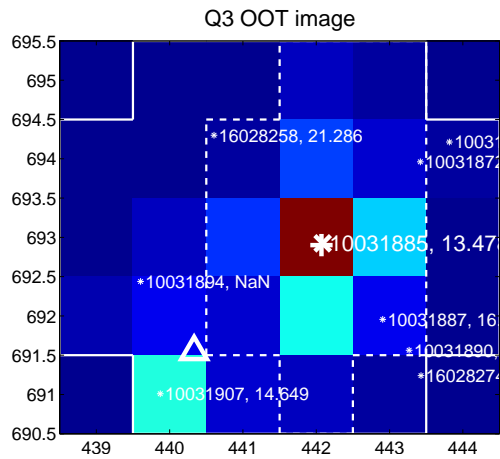
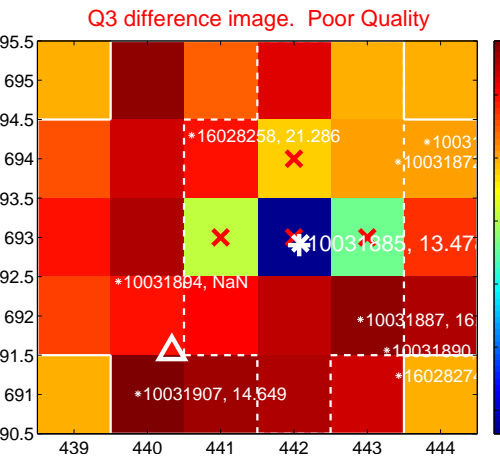
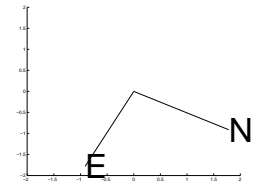
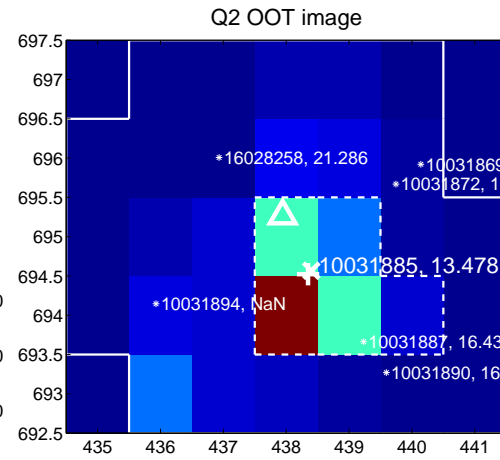
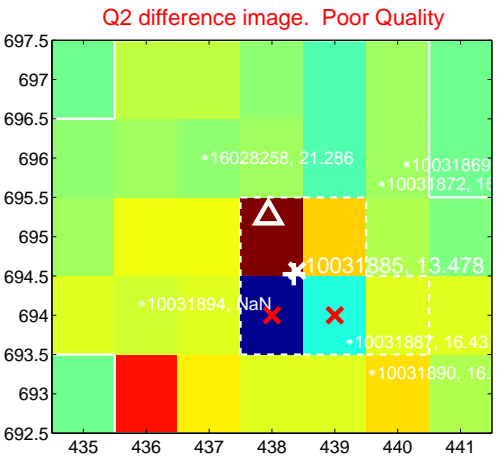
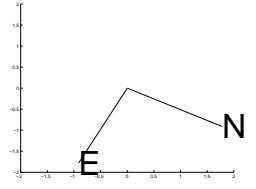
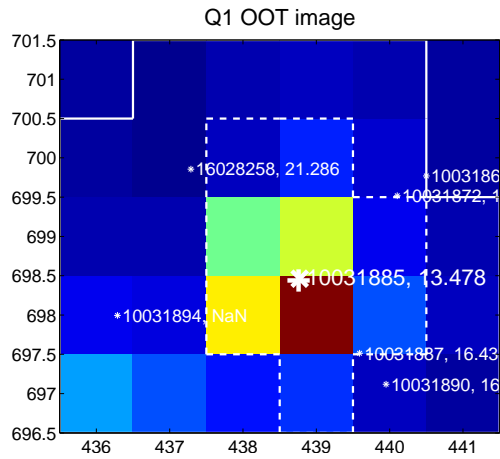
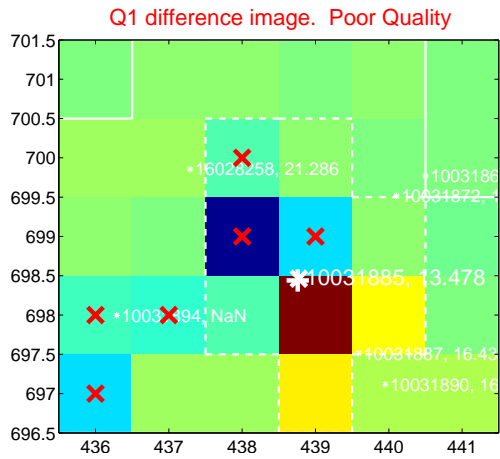
The direct PRF centroid is offset from the target star catalog position by about 0.12 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$4.030 \pm 0.884$	4.56	$3.733 \pm 0.907$	$-1.519 \pm 0.734$
PRF-fit source offset from KIC position	$4.258 \pm 1.017$	4.19	$3.944 \pm 0.985$	$-1.605 \pm 0.699$
photometric centroid source offset	$1.52 \pm 1.25$	1.21	$-1.41 \pm 1.27$	$0.56 \pm 1.11$

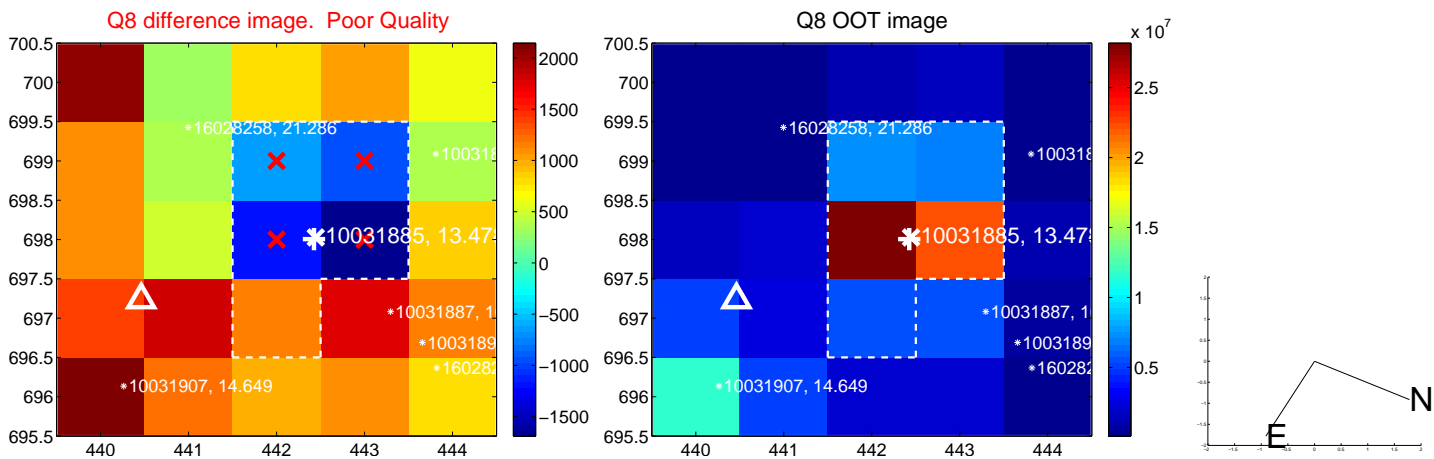
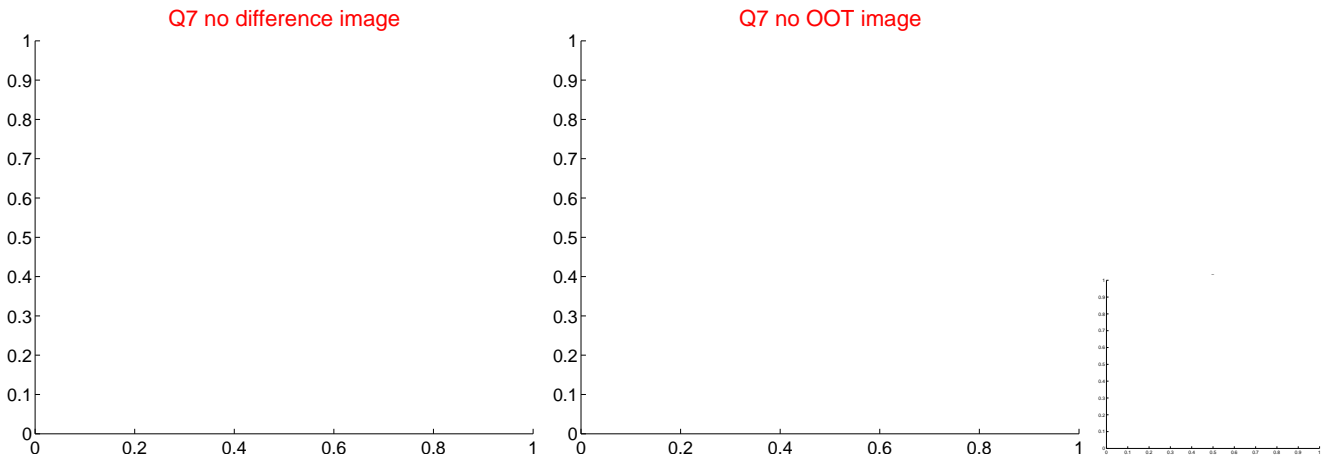
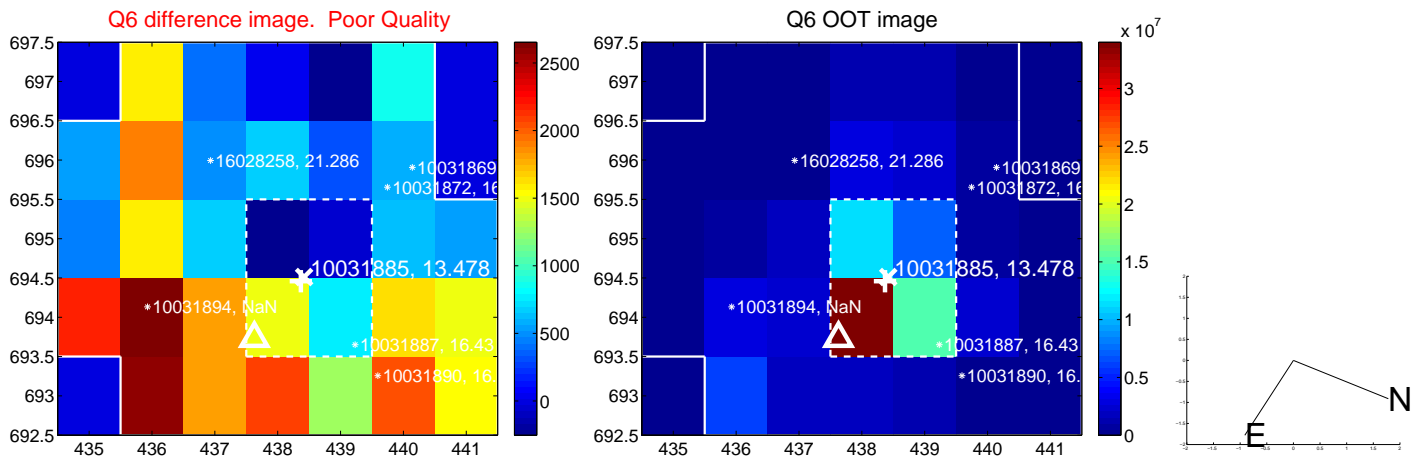
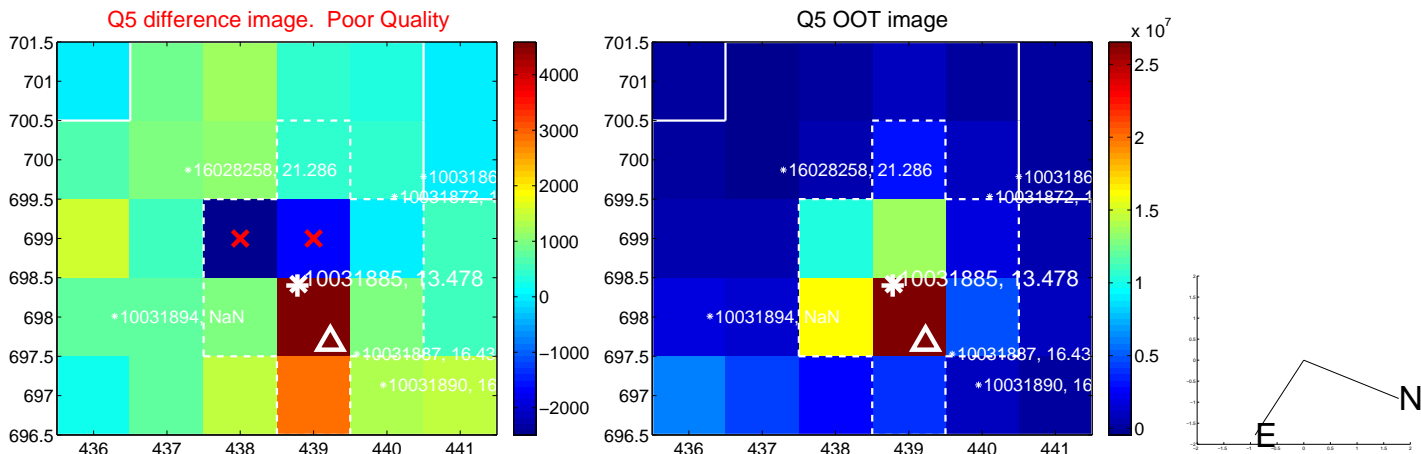


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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

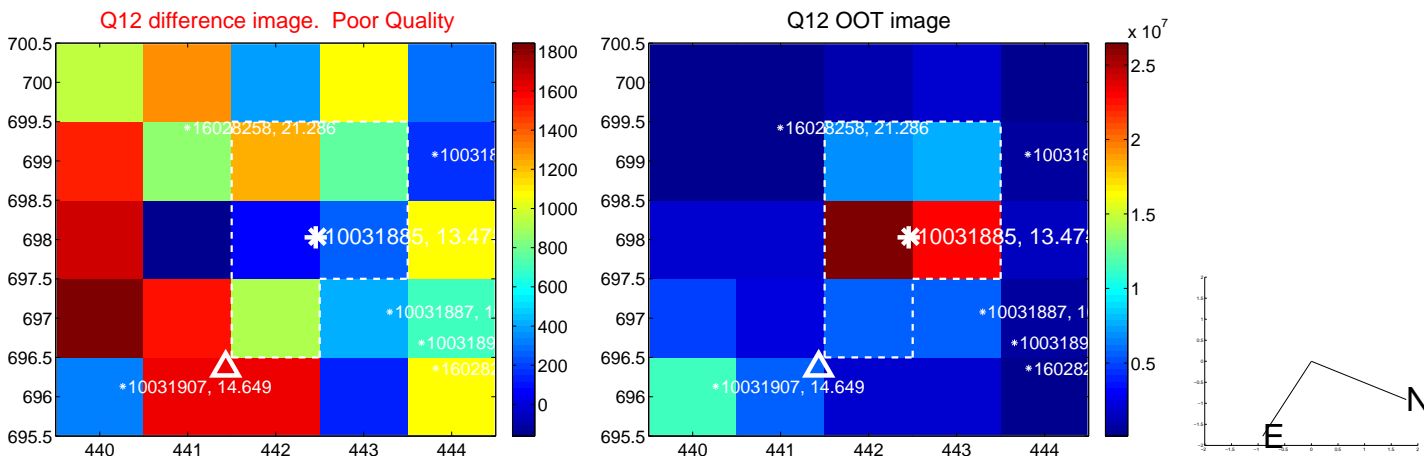
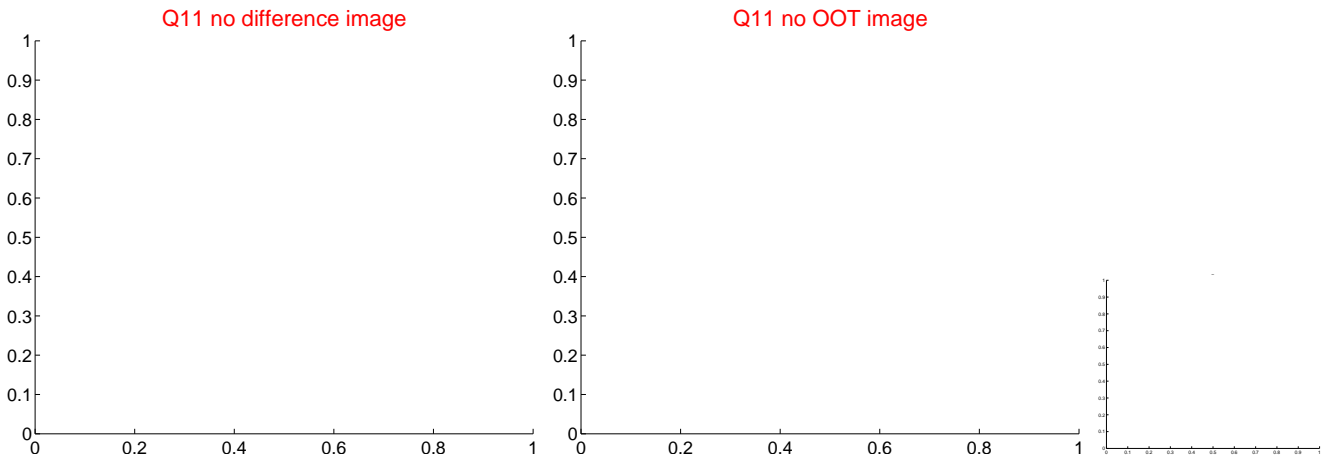
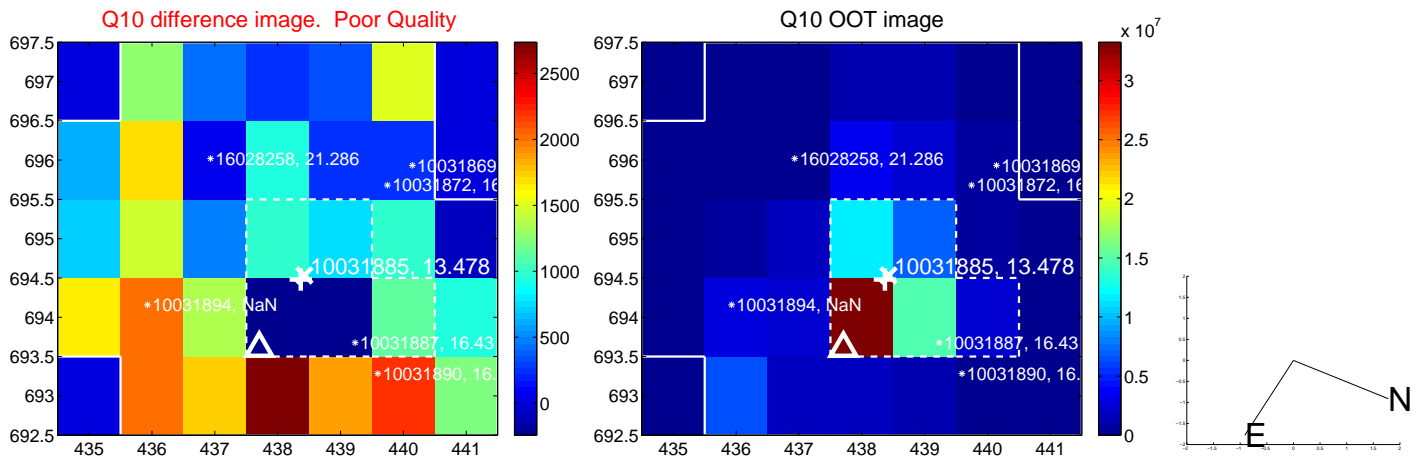
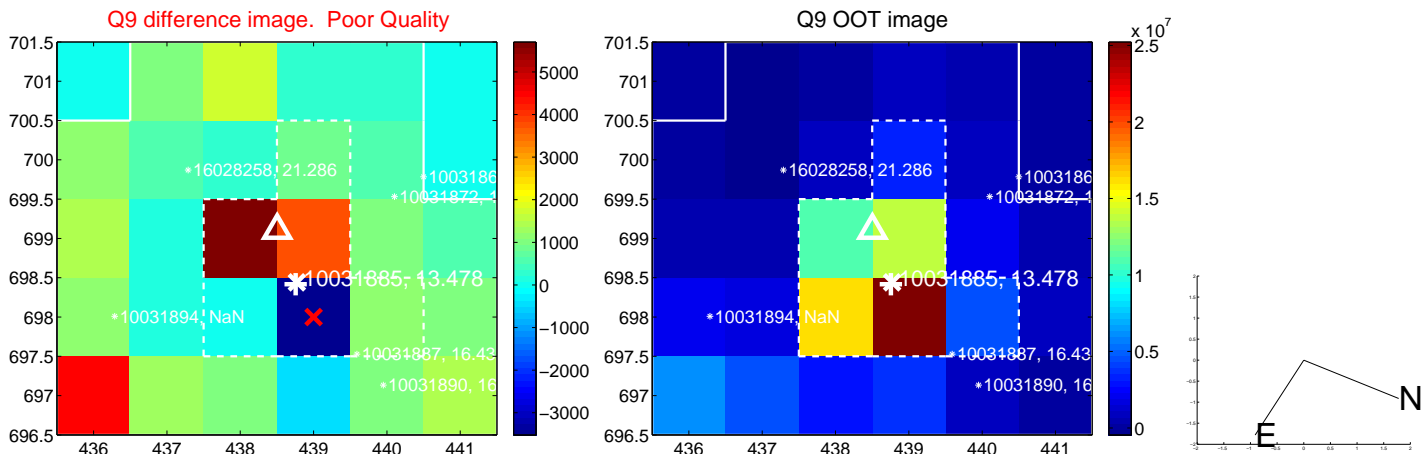
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

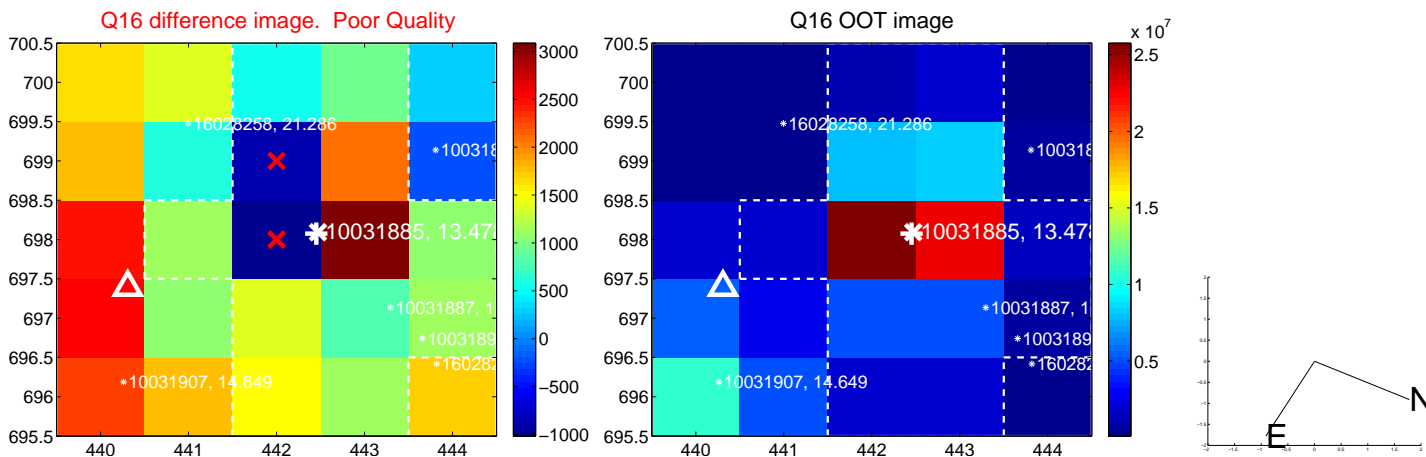
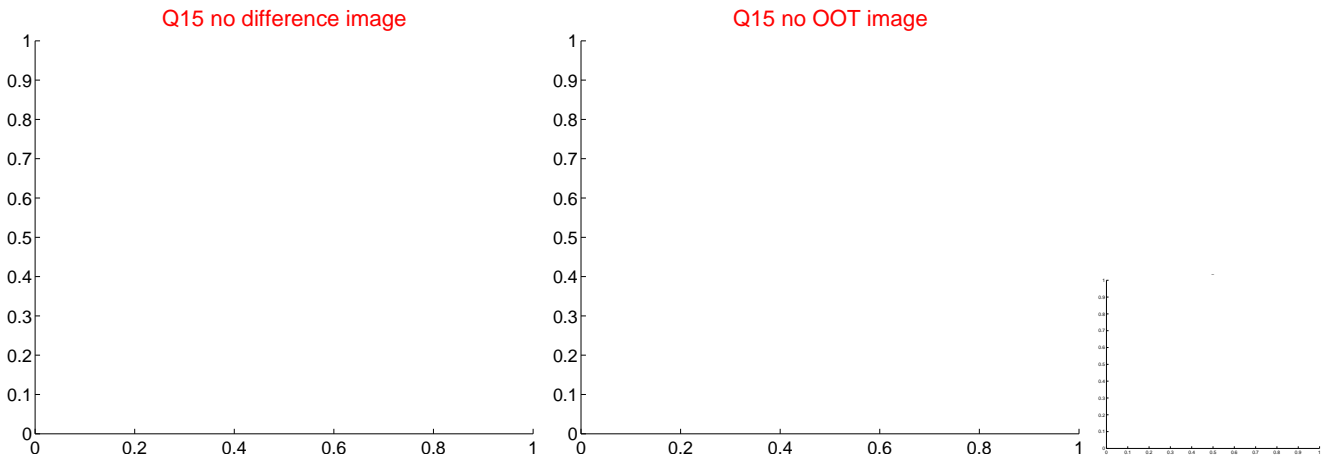
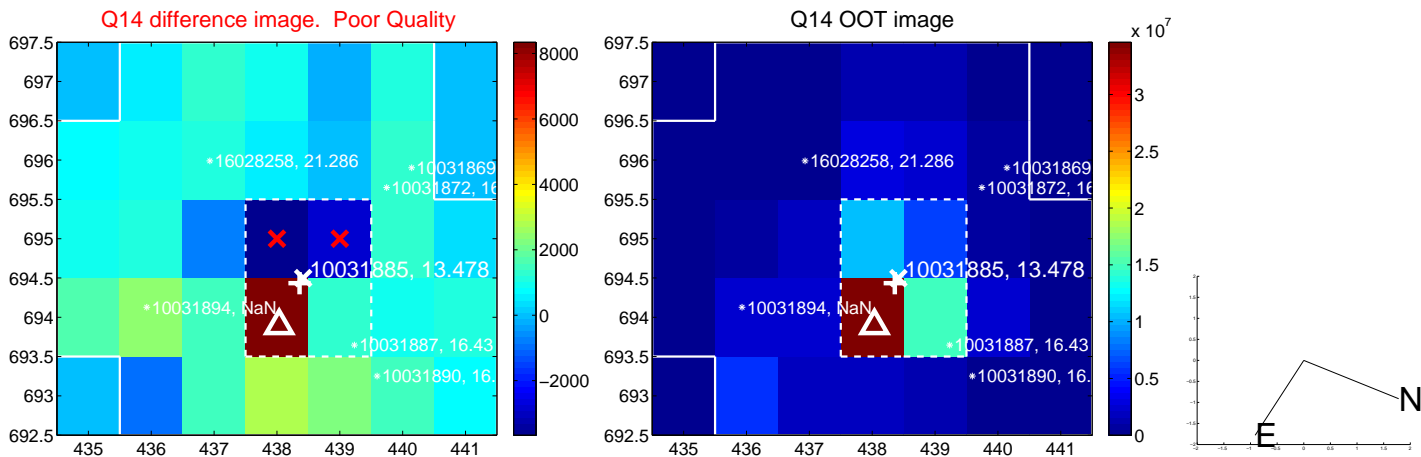
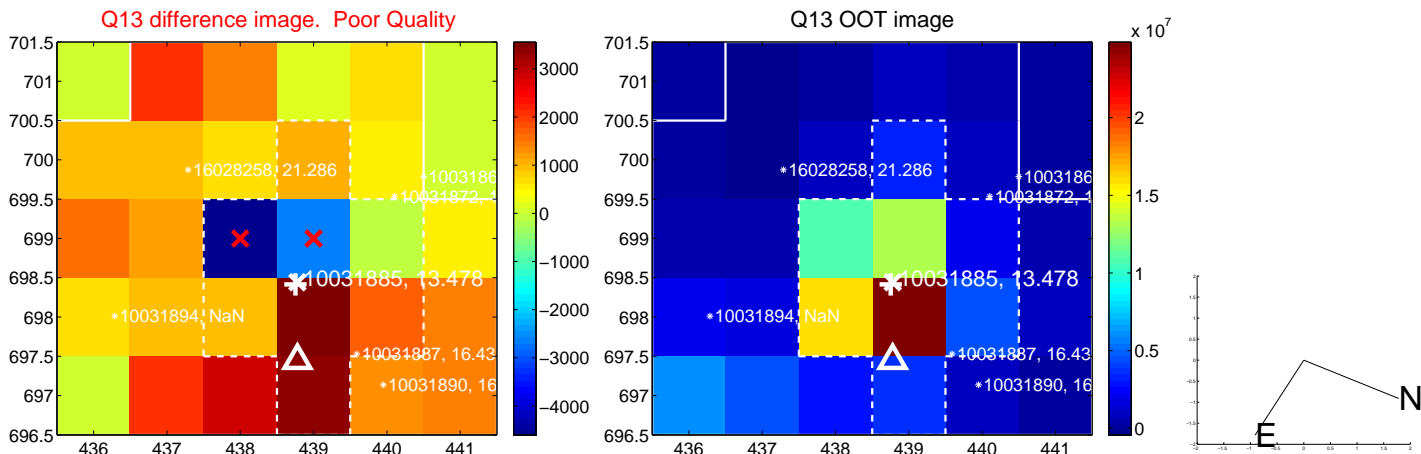


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

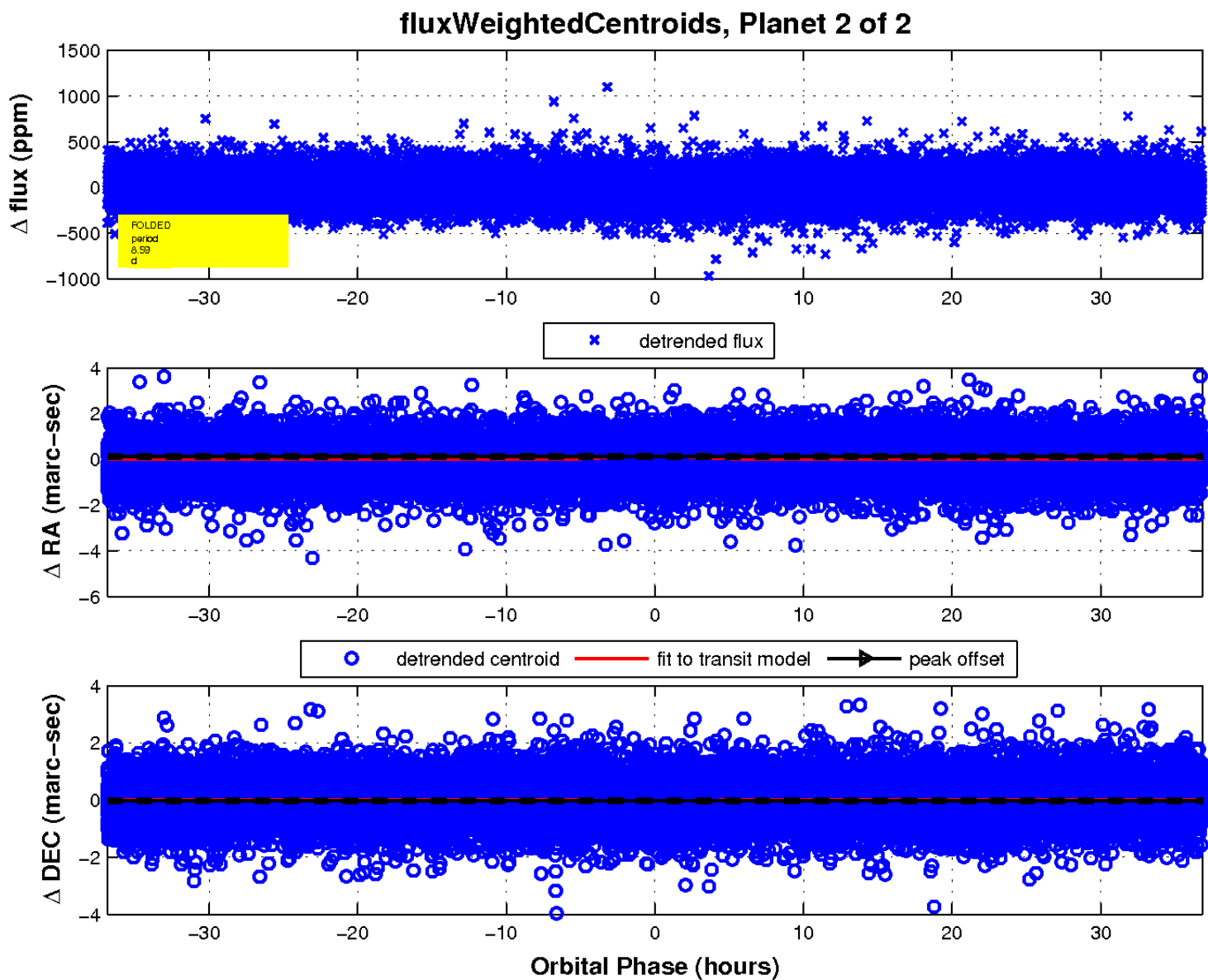
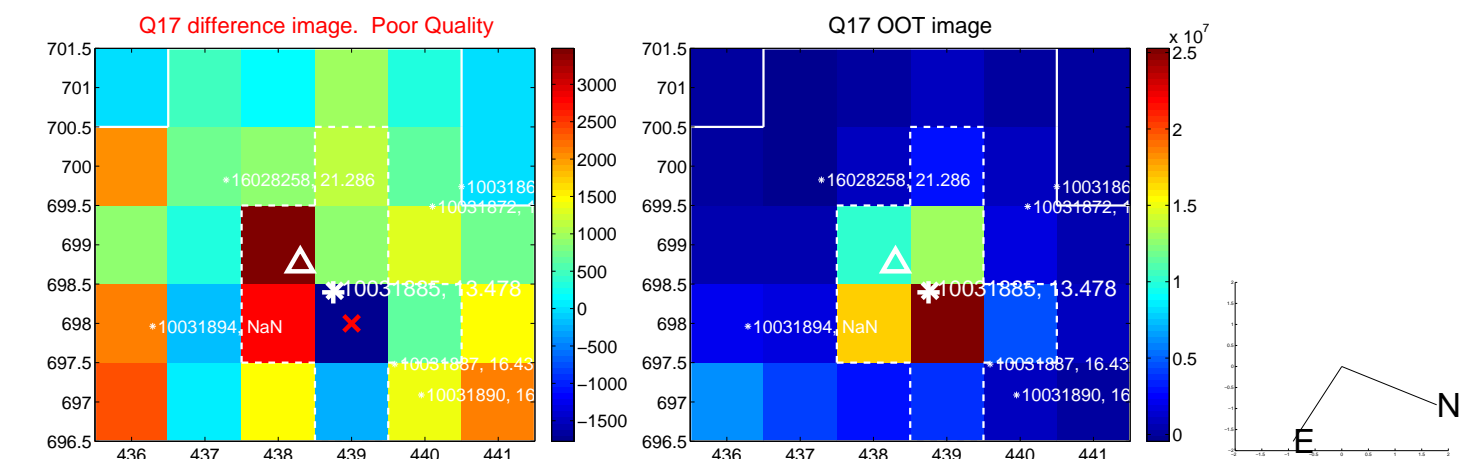




white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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



UKIRT Image

Declination

