

# KIC 009872283

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
009872283-01	OBS	1815.01	3.126855	133.725898	762.0	1.320	78.3	92.6	1.75	4854	5.99	886.50
009872283-02	OBS	1815.02	1.746091	131.797696	52.0	1.517	8.4	9.1	1.75	4854	1.56	1927.81

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009872283-01	OBS	PC	1.00	0	0	0	0	NO_COMMENT
009872283-02	OBS	PC	0.97	0	0	0	0	NO_COMMENT

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

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

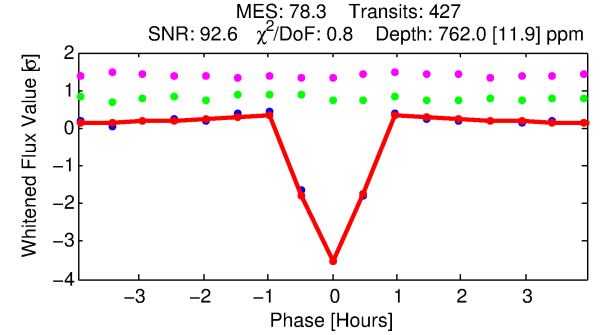
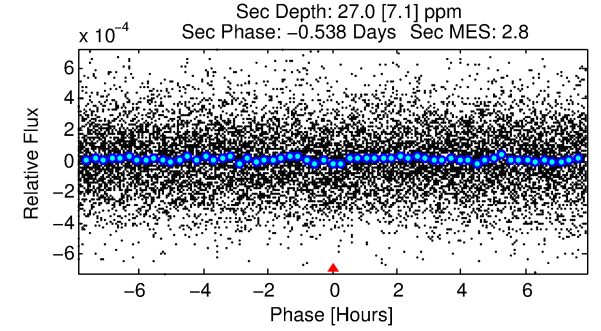
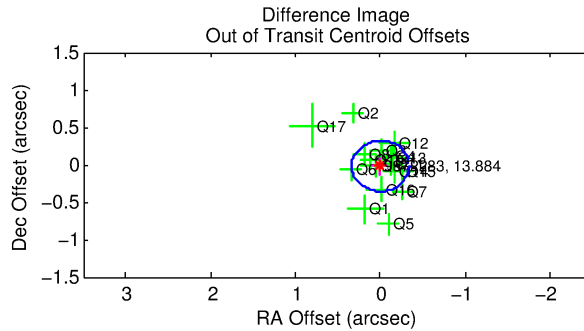
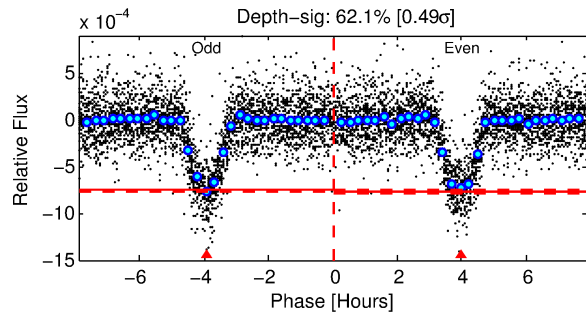
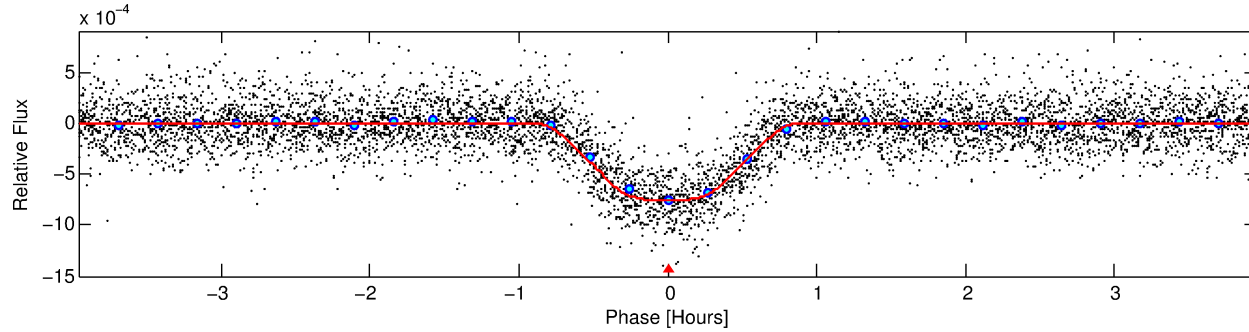
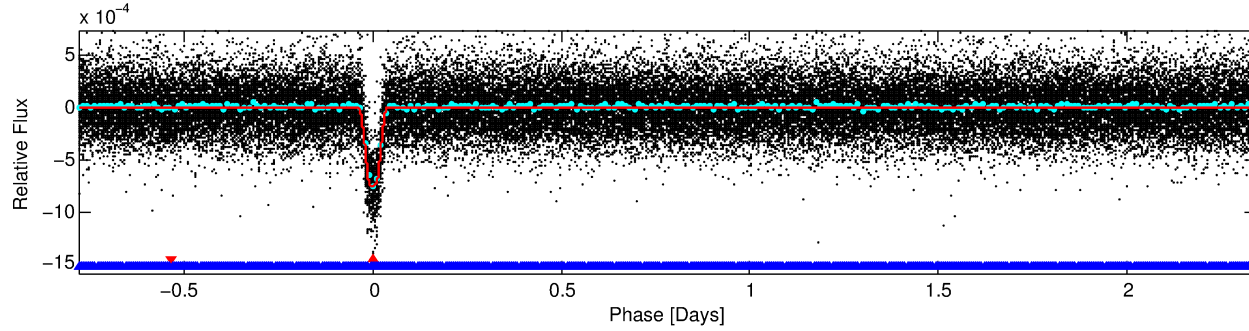
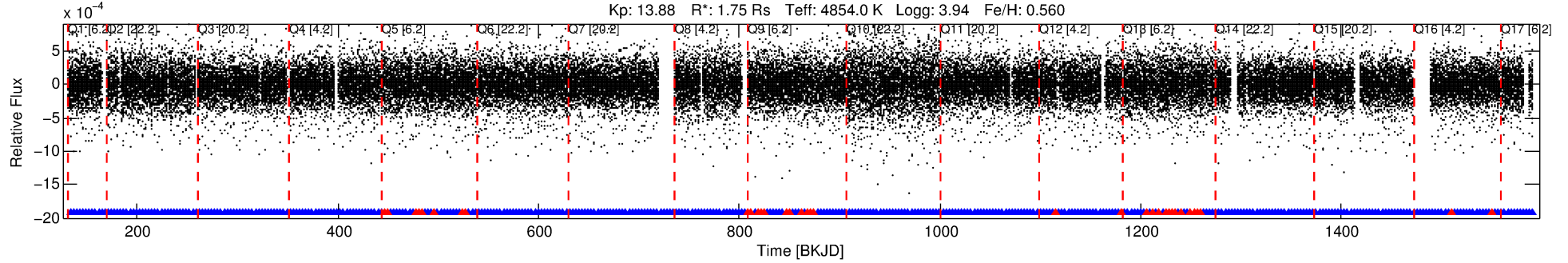
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 009872283-01

No Significant Match Found

# DV One-Page Summary

KIC: 9872283 Candidate: 1 of 2 Period: 3.127 d  
KOI: K01815.01 Corr: 0.953



## DV Fit Results:

Period = 3.12686 [0.00000] d  
Epoch = 133.7259 [0.0002] BKJD  
Rp/R\* = 0.0314 [0.0023]  
a/R\* = 9.18 [2.30]  
b = 0.90 [0.06]  
Seff = 886.49 [951.63]  
Teq = 1391 [373] K  
Rp = 5.99 [3.85] Re  
a = 0.0414 [0.0269] AU  
Ag = 0.71 [0.79] [-0.37 $\sigma$ ]  
Teffp = 1976 [159] K [1.44 $\sigma$ ]

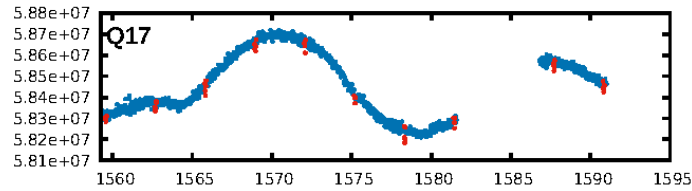
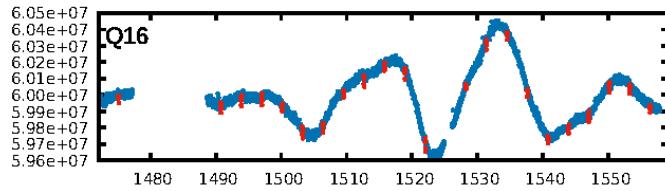
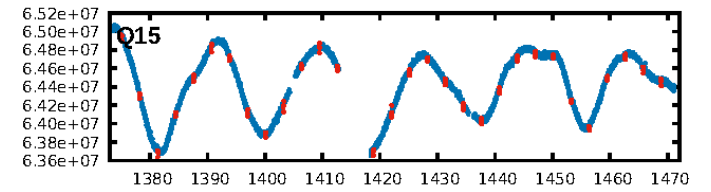
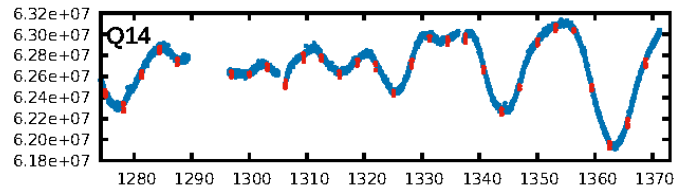
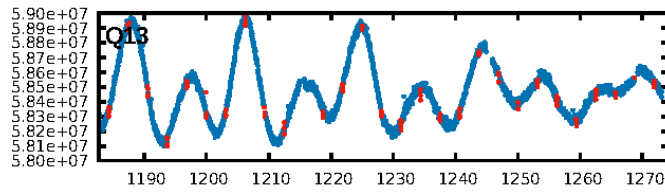
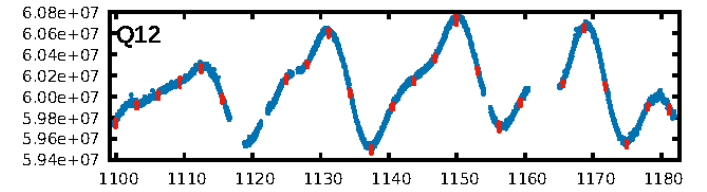
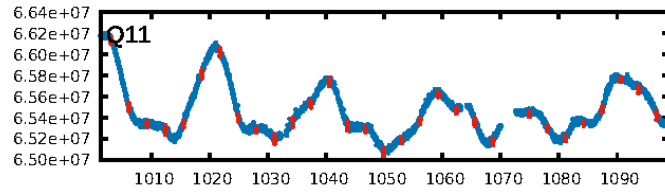
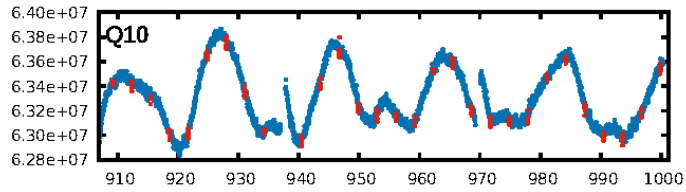
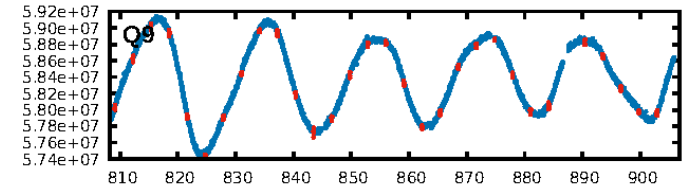
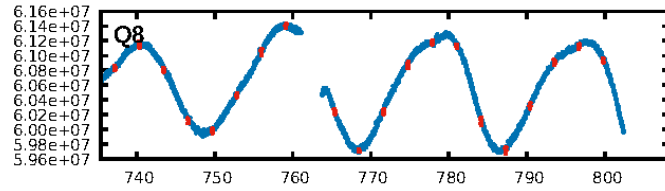
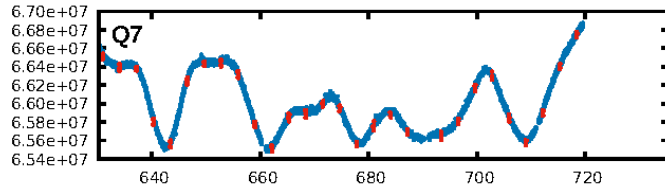
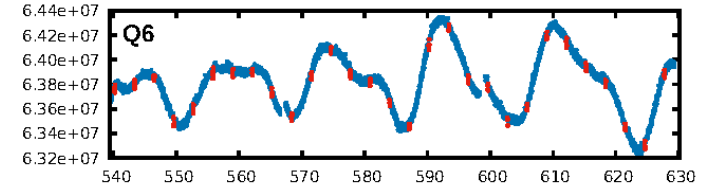
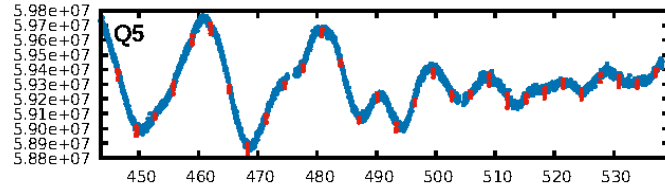
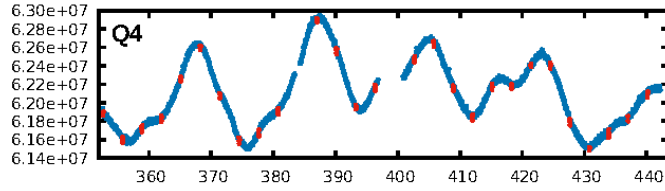
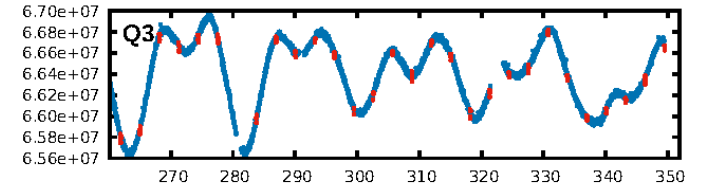
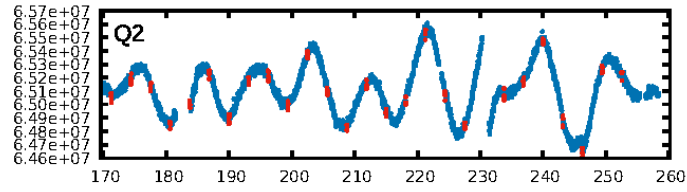
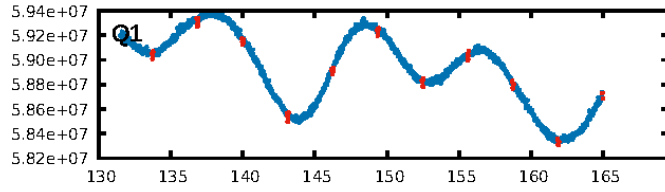
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [16.48 $\sigma$ ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: 0.00e+00  
RollingBand-fgt: 0.91 [371/406]  
GhostDiagnostic-chr: 2.534  
Centroid-sig: 0.0%  
Centroid-so: 0.461 arcsec [2.79 $\sigma$ ]  
OotOffset-rm: 0.019 arcsec [0.17 $\sigma$ ]  
KicOffset-rm: 0.171 arcsec [1.53 $\sigma$ ]  
OotOffset-st: 4/4/4/5 [17]  
KicOffset-st: 4/4/4/5 [17]  
DiffImageQuality-fgm: 1.00 [17/17]  
DiffImageOverlap-fno: 1.00 [17/17]

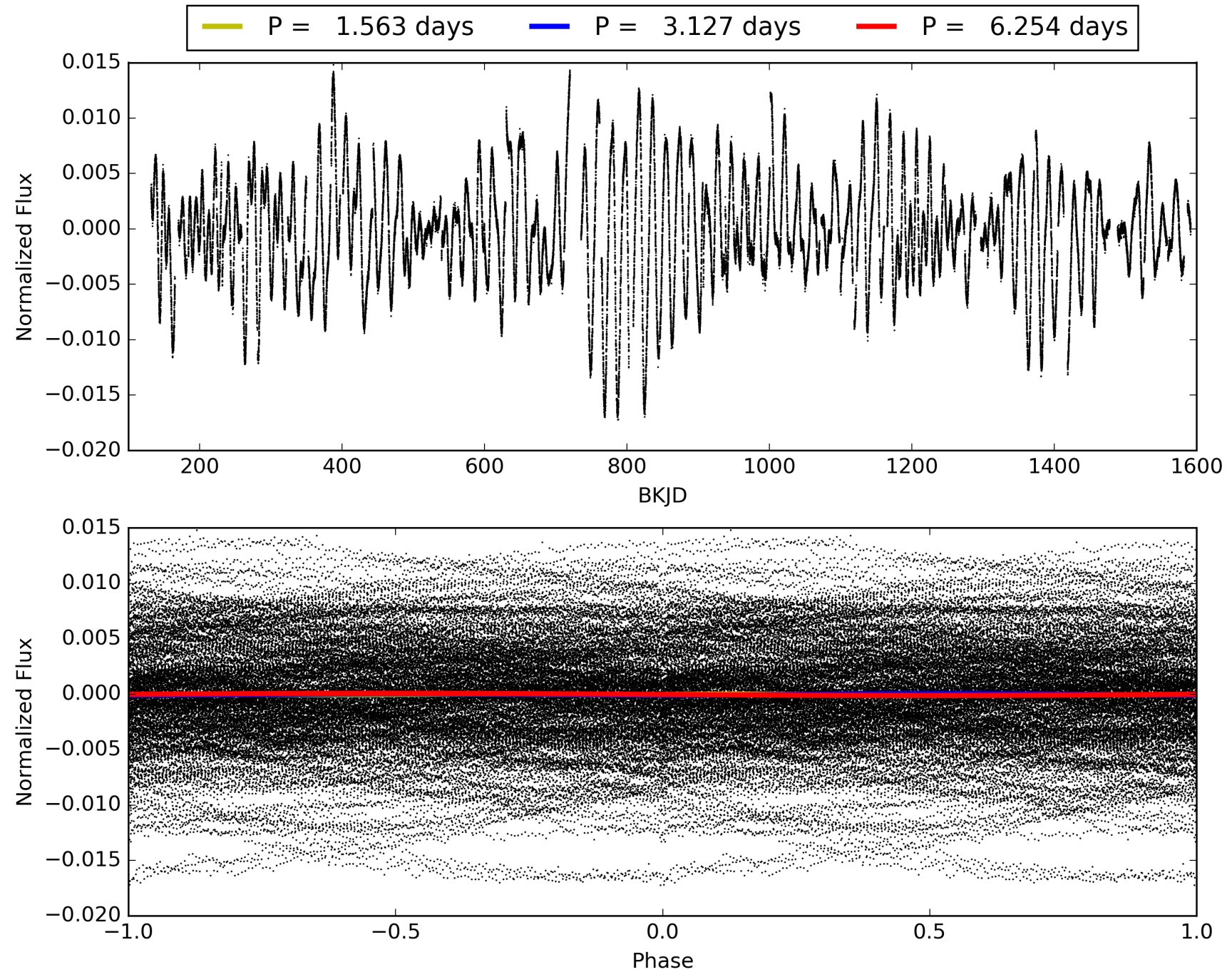
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This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

# TCE 009872283-01, PDC Light Curves

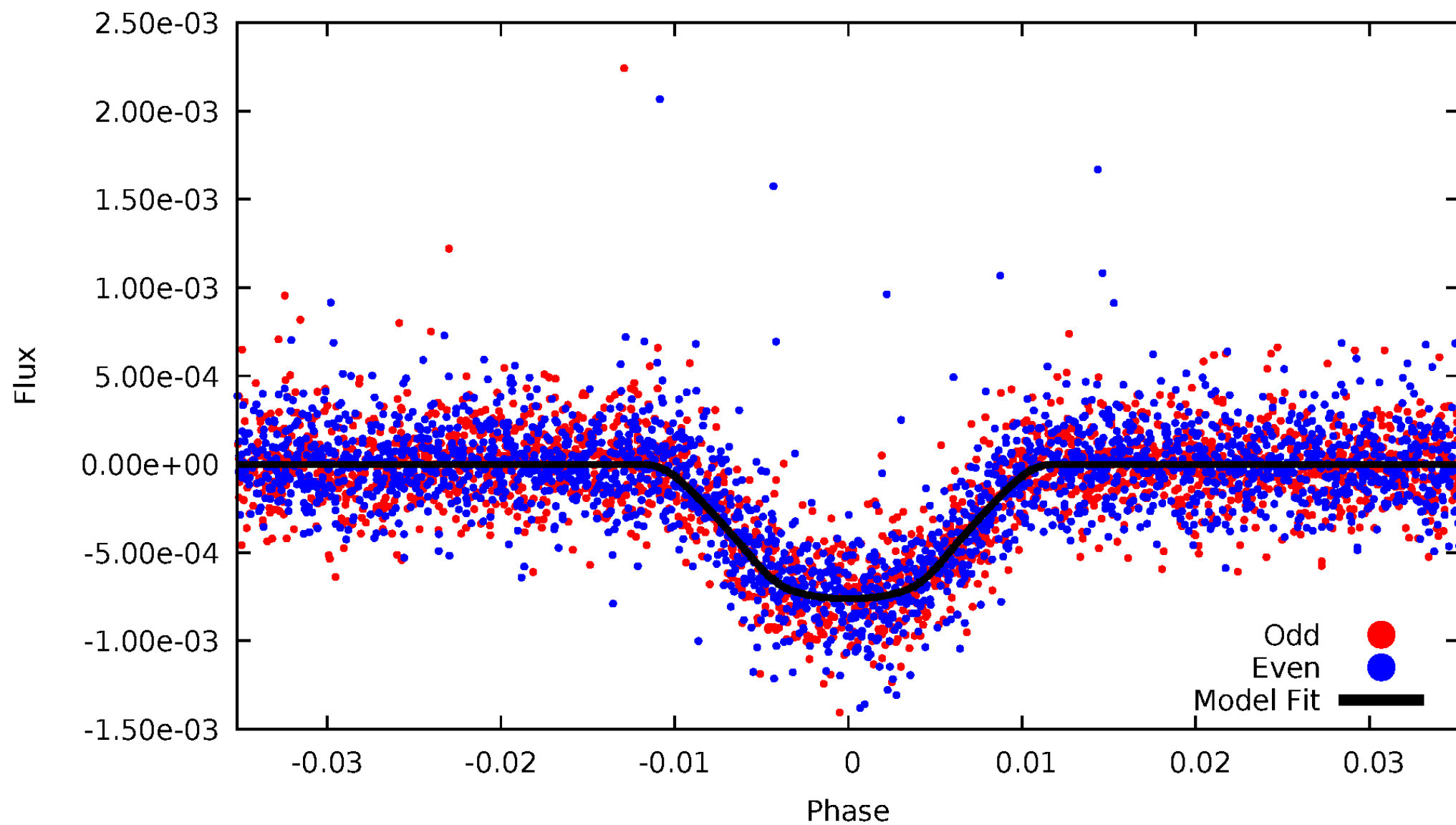


TCE 009872283-01



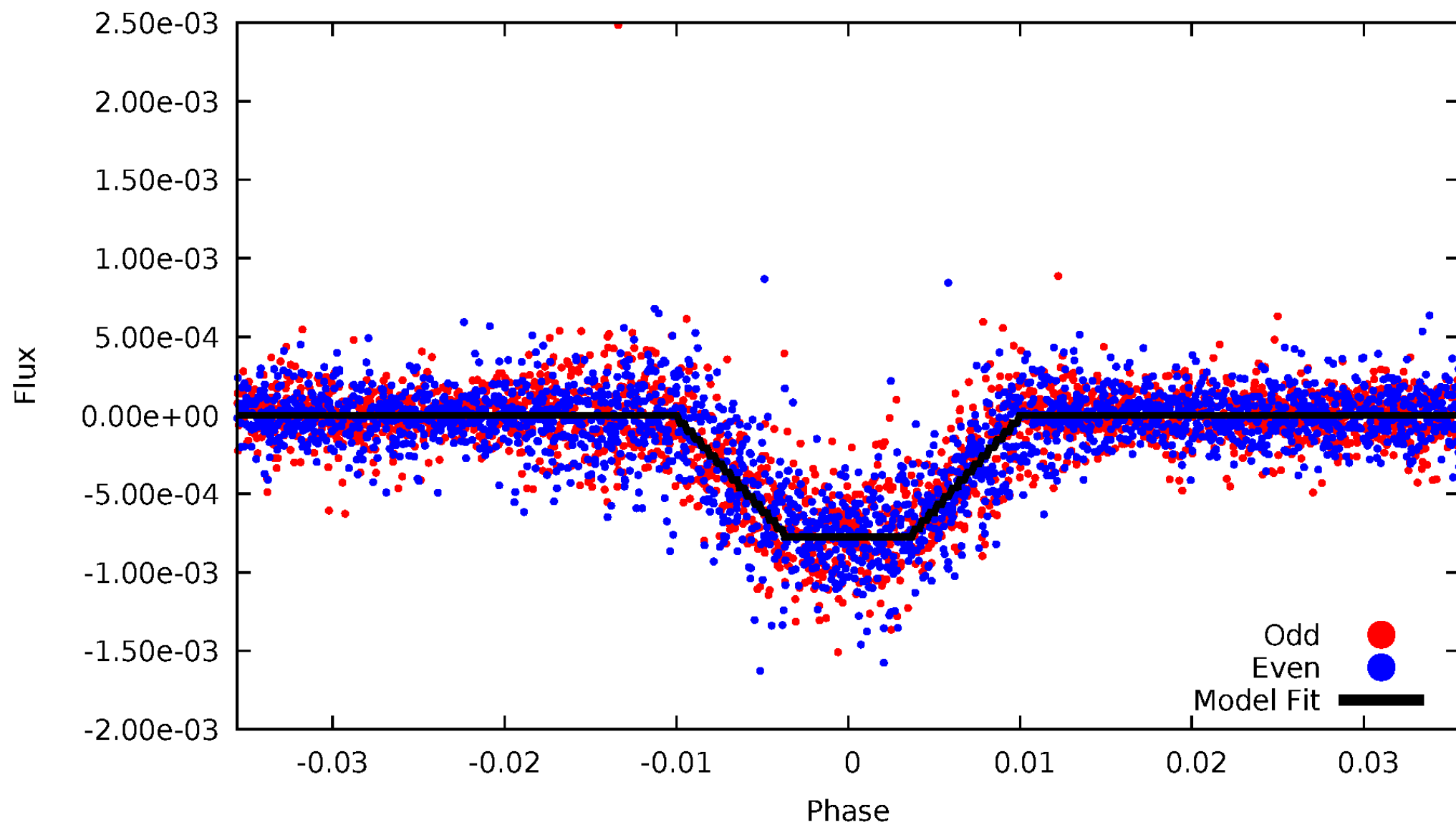
# DV Odd/Even

TCE 009872283-01



# ALT Odd/Even

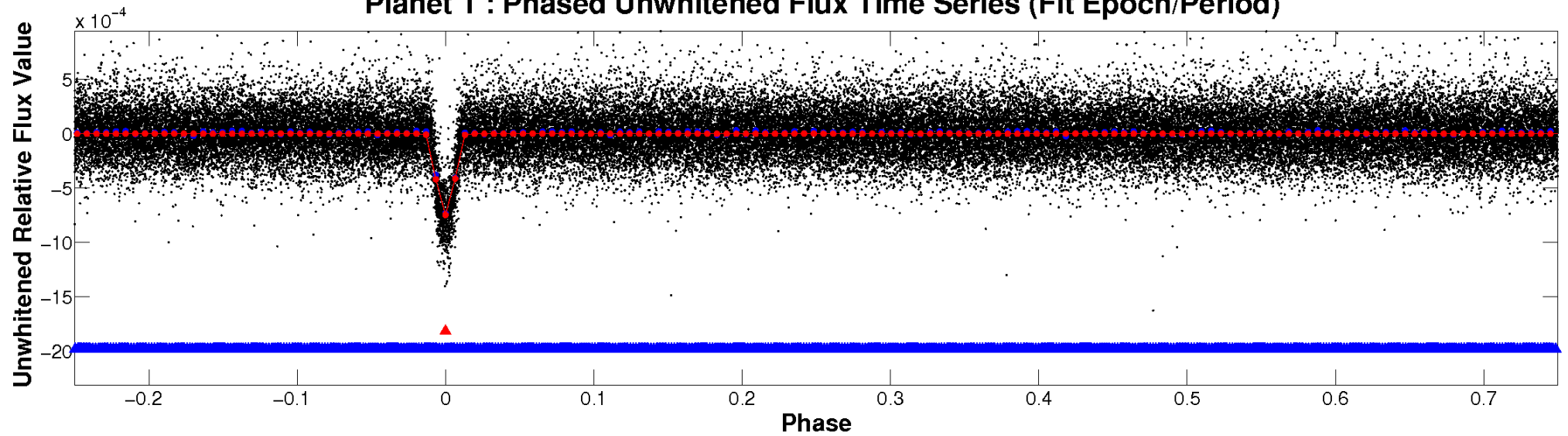
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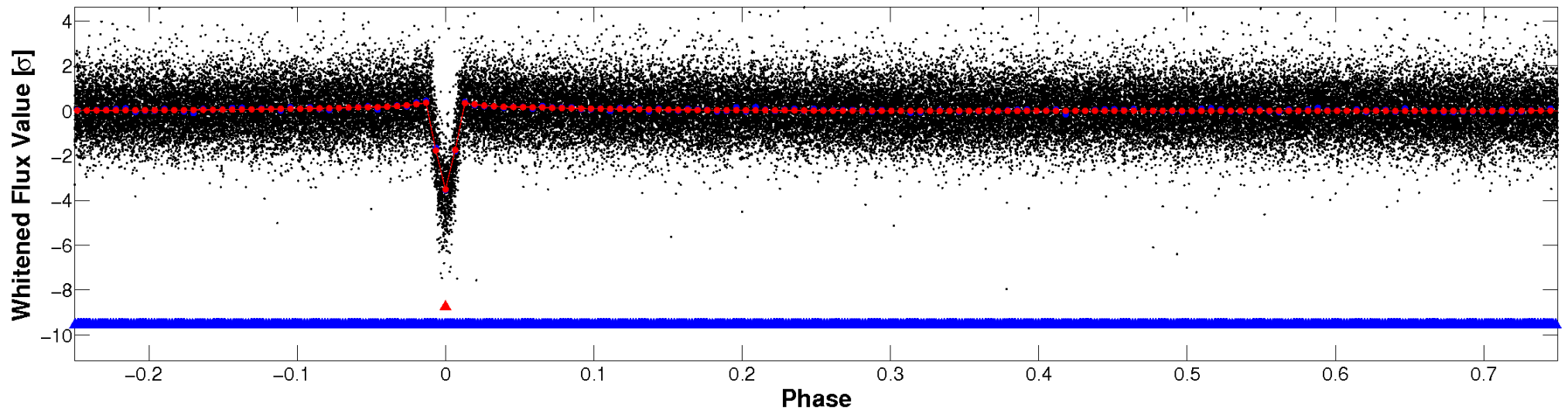


# Non-Whitened Vs. Whitened Light Curve

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

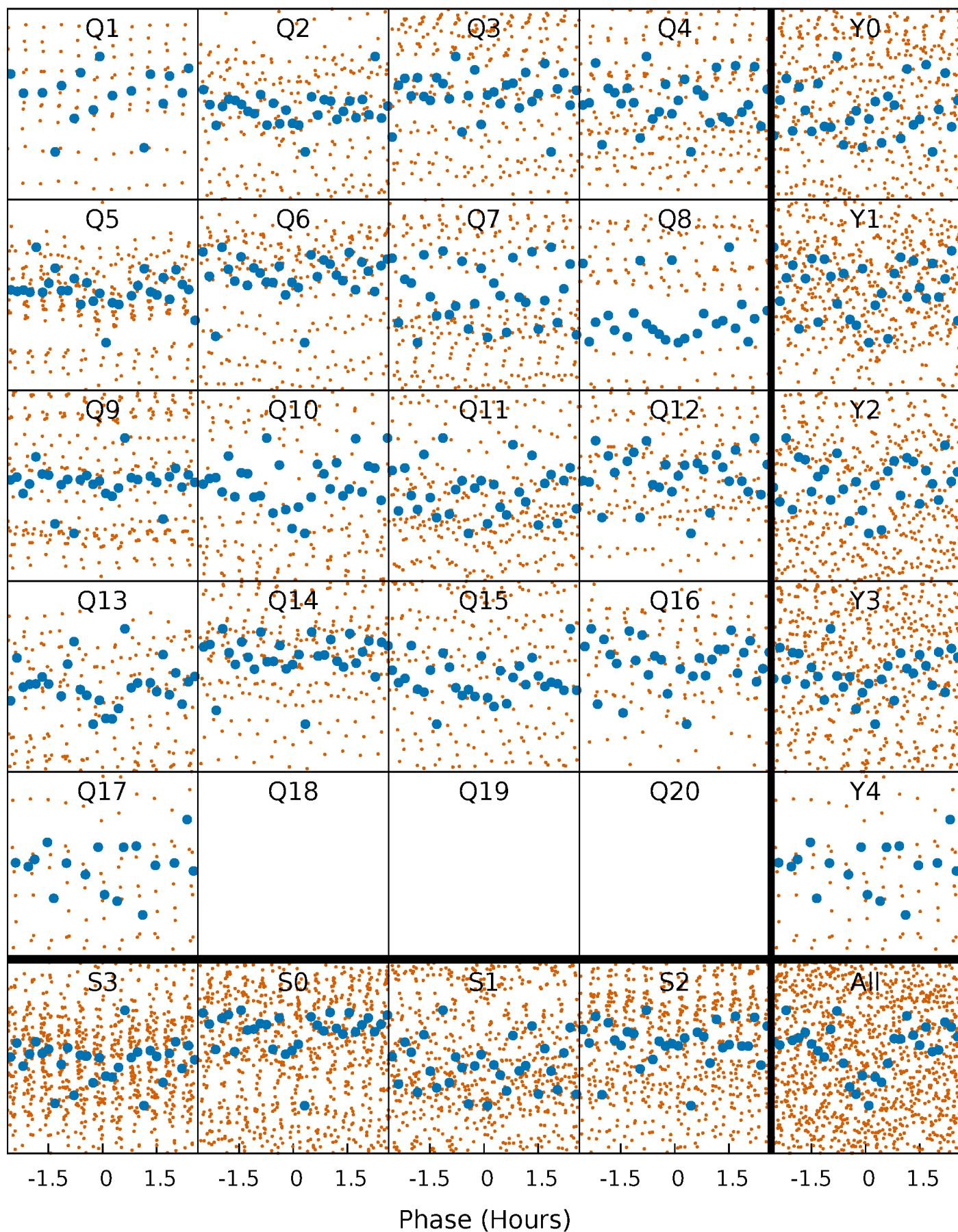


**Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)**



# PDC Quarter-Phased Transit Curves

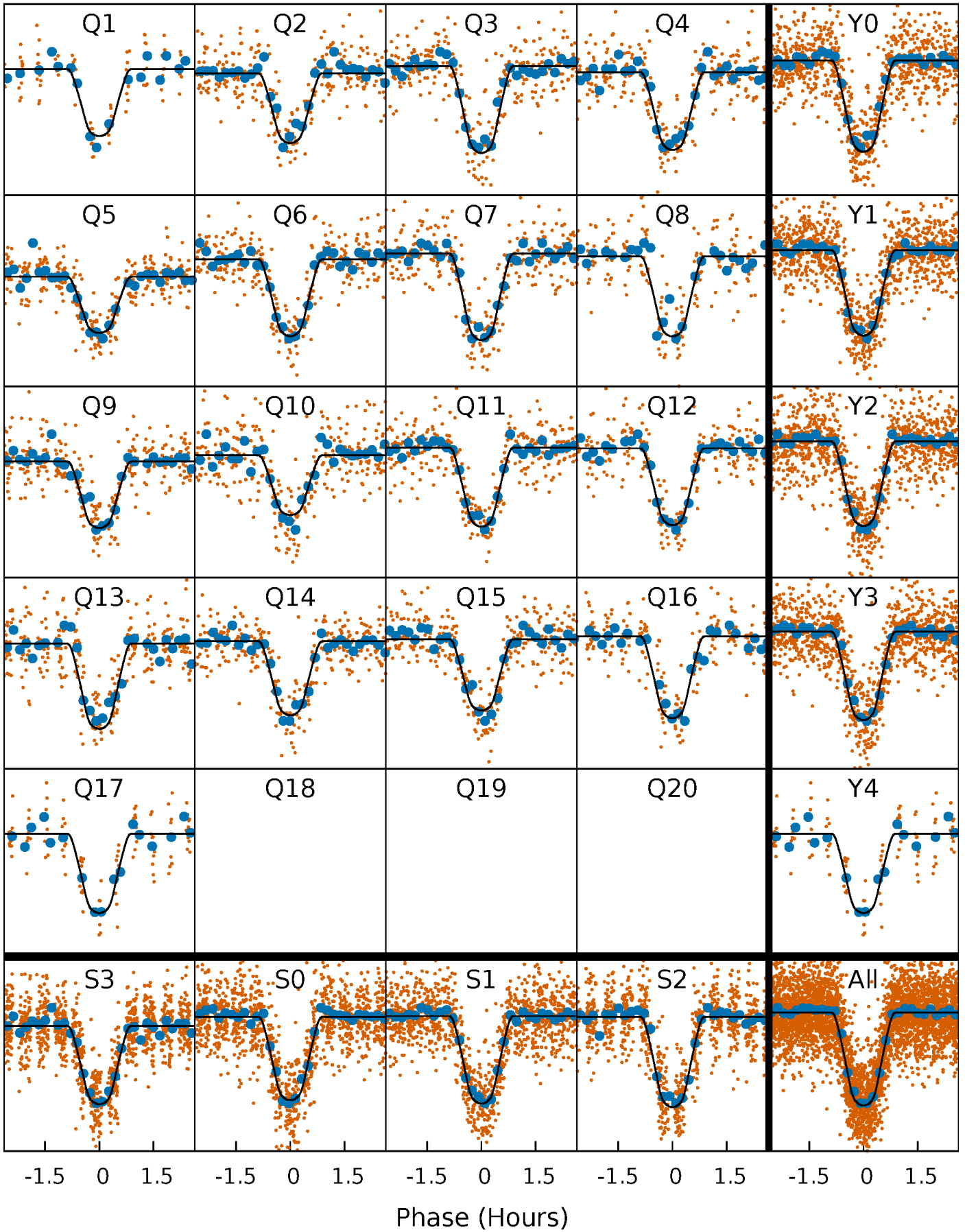
TCE 009872283-01 P= 3.126855 Days  $T_0=133.725898$  (BKJD)





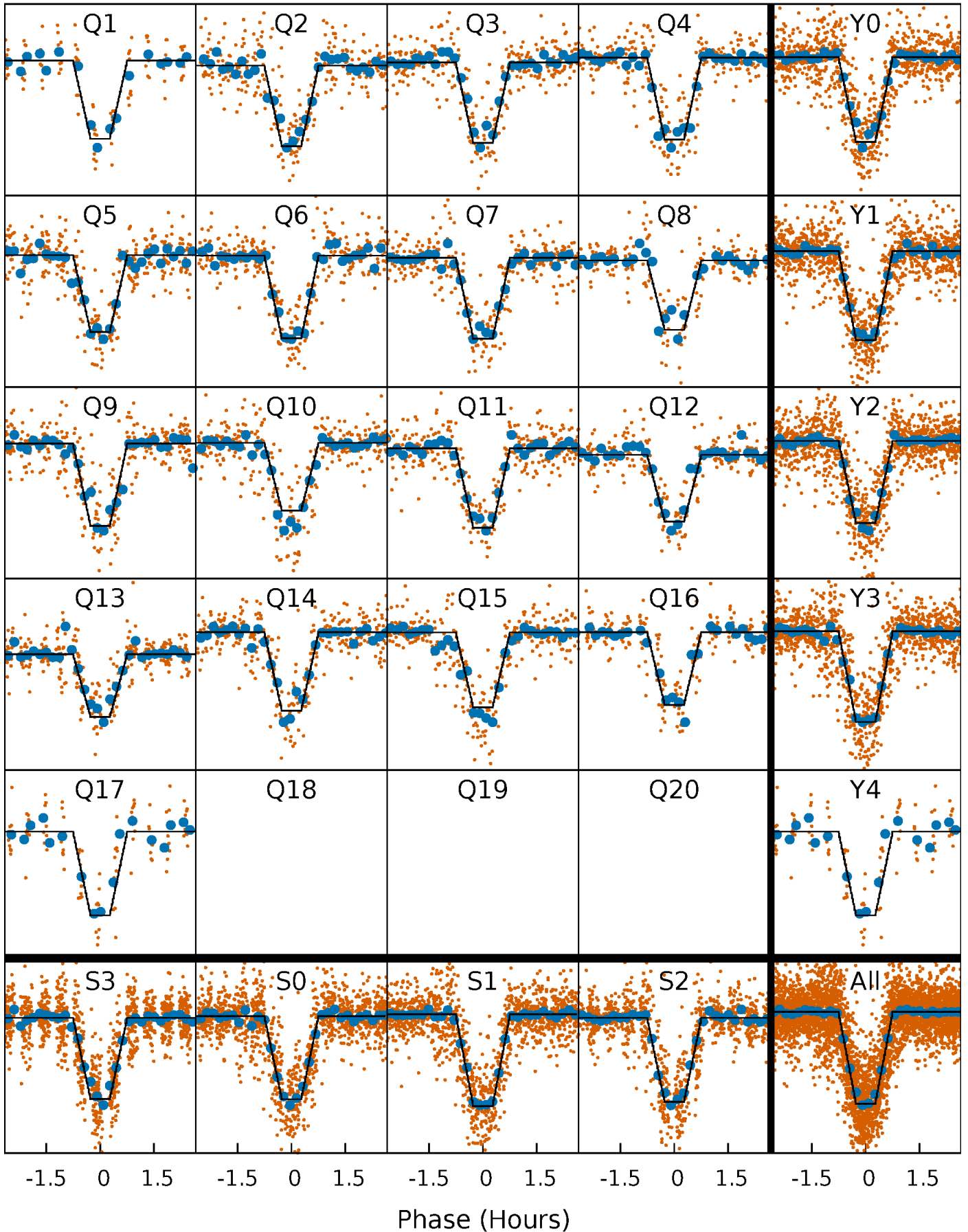
# DV Quarter-Phased Transit Curves

TCE 009872283-01   P= 3.126855 Days    $T_0=133.725898$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

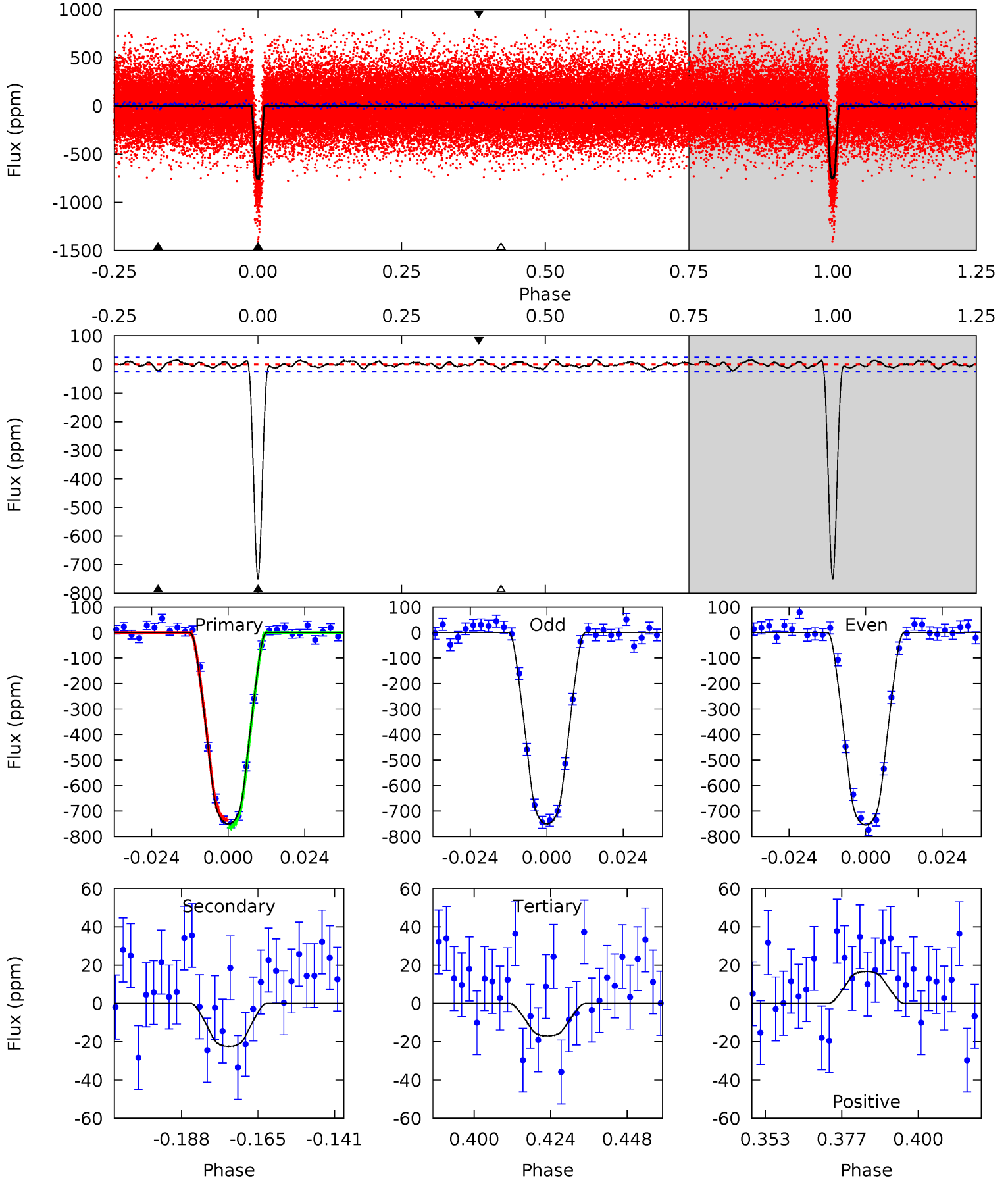
TCE 009872283-01     $P = 3.126866$  Days     $T_0 = 133.723799$  (BKJD)



# DV Model-Shift Uniqueness Test

009872283-01, P = 3.126855 Days, E = 130.599043 Days

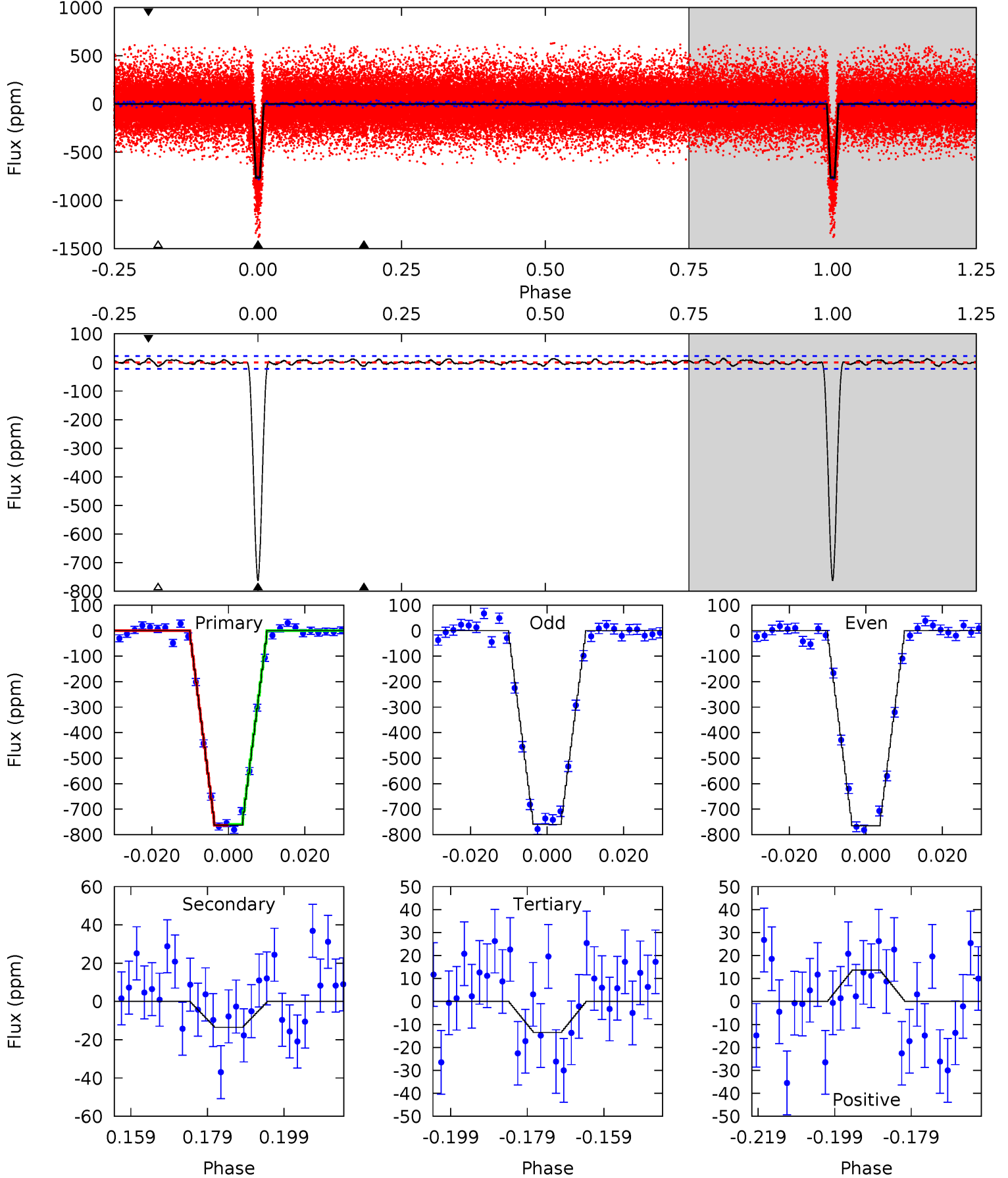
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
142.8	4.28	3.23	3.18	4.86	2.26	1.47	139.6	139.7	1.05	1.10	0.36	0.99	0.02	2.78



# Alt Model-Shift Uniqueness Test

009872283-01, P = 3.126866 Days, E = 130.596933 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
168.4	2.99	2.98	3.02	4.89	2.33	1.17	165.4	165.4	0.01	-0.03	0.61	1.01	0.02	0.38



### Stellar Parameters For KIC 009872283

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R$ ( $R_{\odot}$ )	$M$ ( $M_{\odot}$ )	$p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ )
	$4854^{+145}_{-116}$	$3.939^{+0.637}_{-0.343}$	$0.560^{+0.050}_{-0.250}$	$1.749^{+1.119}_{-1.017}$	$0.970^{+0.209}_{-0.152}$	$0.255^{+2.124}_{-0.170}$
	+3%/-2%	+16%/-9%	+9%/-45%	+64%/-58%	+22%/-16%	+832%/-66%
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 009872283-01 / KOI 1815.01

Detrend	Depth (ppm)	$R_p$ ( $R_{\oplus}$ )	$T_{max}$ (K)	$T_{obs}$ (K)	$A_{obs}$
DV	$-22 \pm 5$	$5.92^{+2.02}_{-1.73}$	$1946^{+267}_{-310}$	$2403^{+199}_{-761}$	$0.575^{+0.716}_{-0.270}$
Alt.	$-14 \pm 5$	$5.15^{+1.91}_{-1.50}$	$1924^{+314}_{-305}$	$2252^{+273}_{-4467}$	$0.468^{+0.503}_{-0.256}$

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



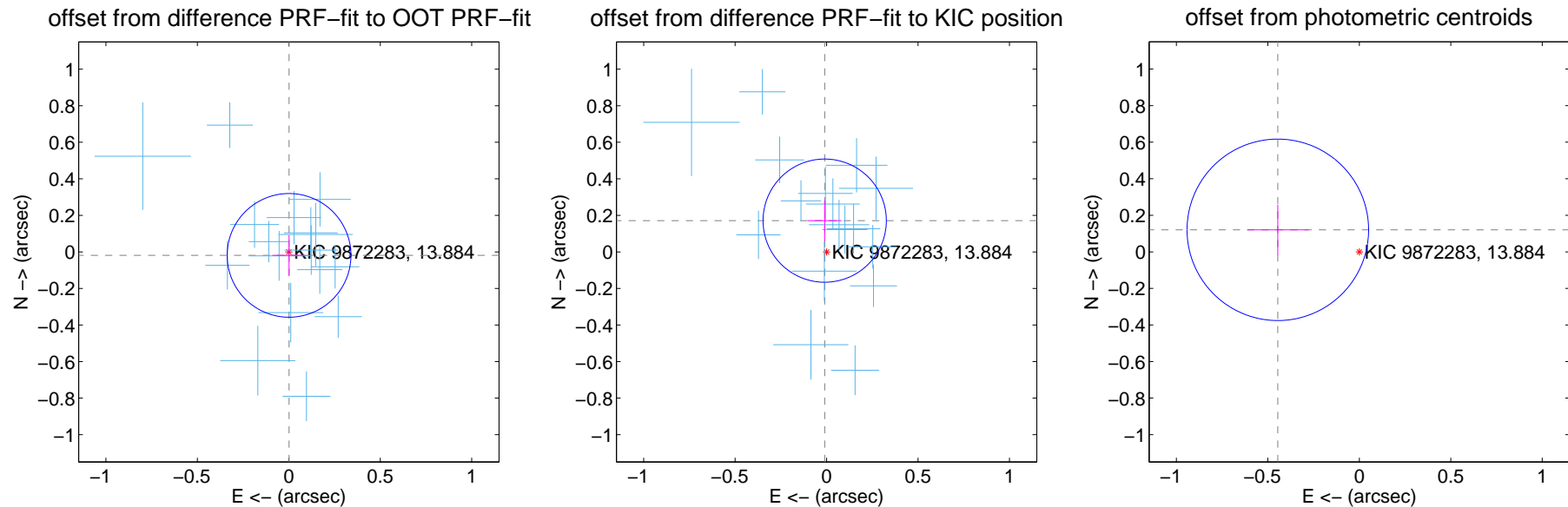
## DV Centroid Data

Supplemental centroid analysis for 009872283-01. Kepler magnitude: 13.88. Transit SNR 92.62

There are 17 quarters with good PRF difference image offsets

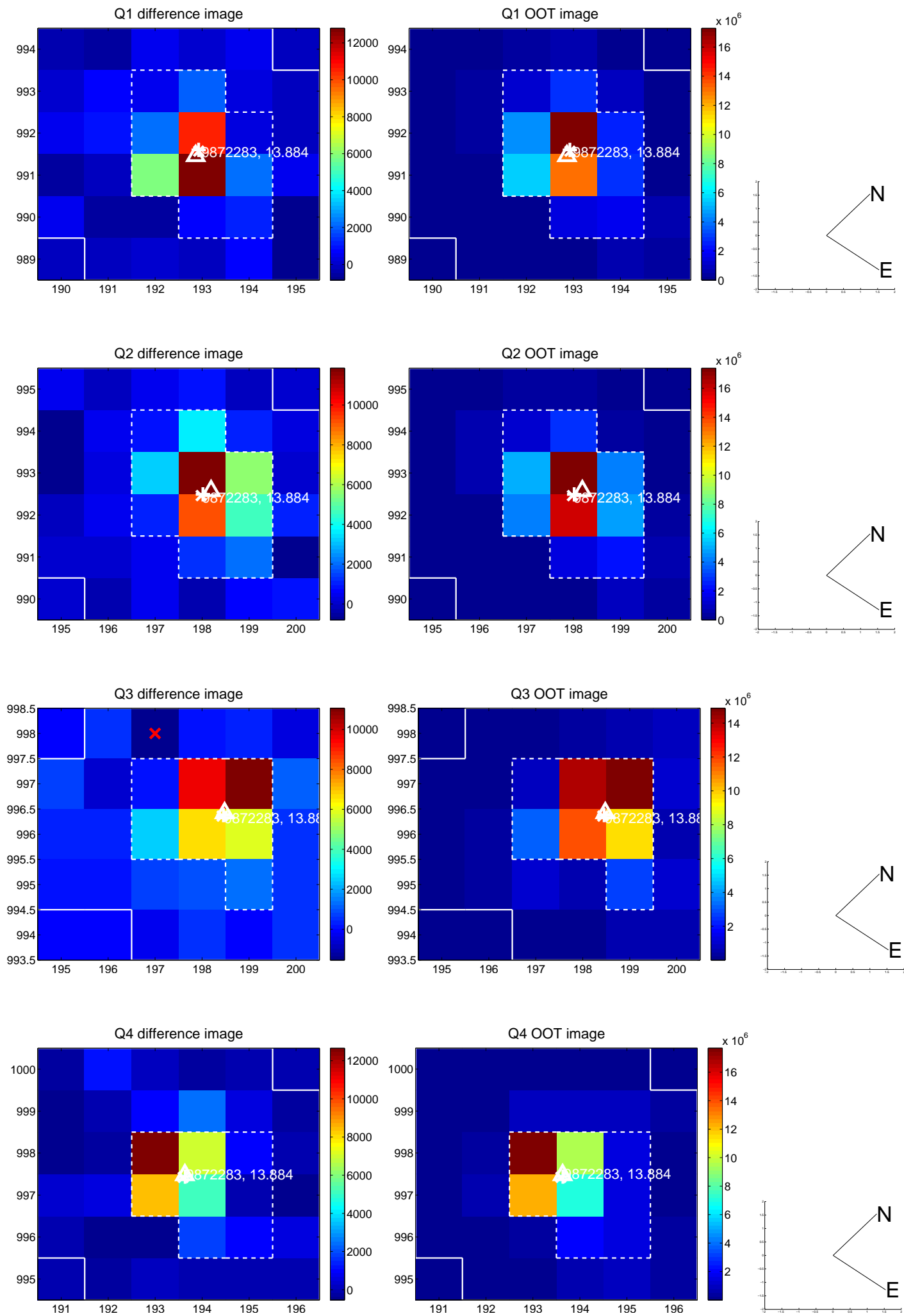
The direct PRF centroid is offset from the target star catalog position by about 0.19 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.019 \pm 0.113$	0.17	$-0.001 \pm 0.091$	$-0.019 \pm 0.111$
PRF-fit source offset from KIC position	$0.171 \pm 0.112$	1.53	$0.010 \pm 0.092$	$0.171 \pm 0.111$
photometric centroid source offset	$0.46 \pm 0.17$	2.79	$0.45 \pm 0.17$	$0.12 \pm 0.14$

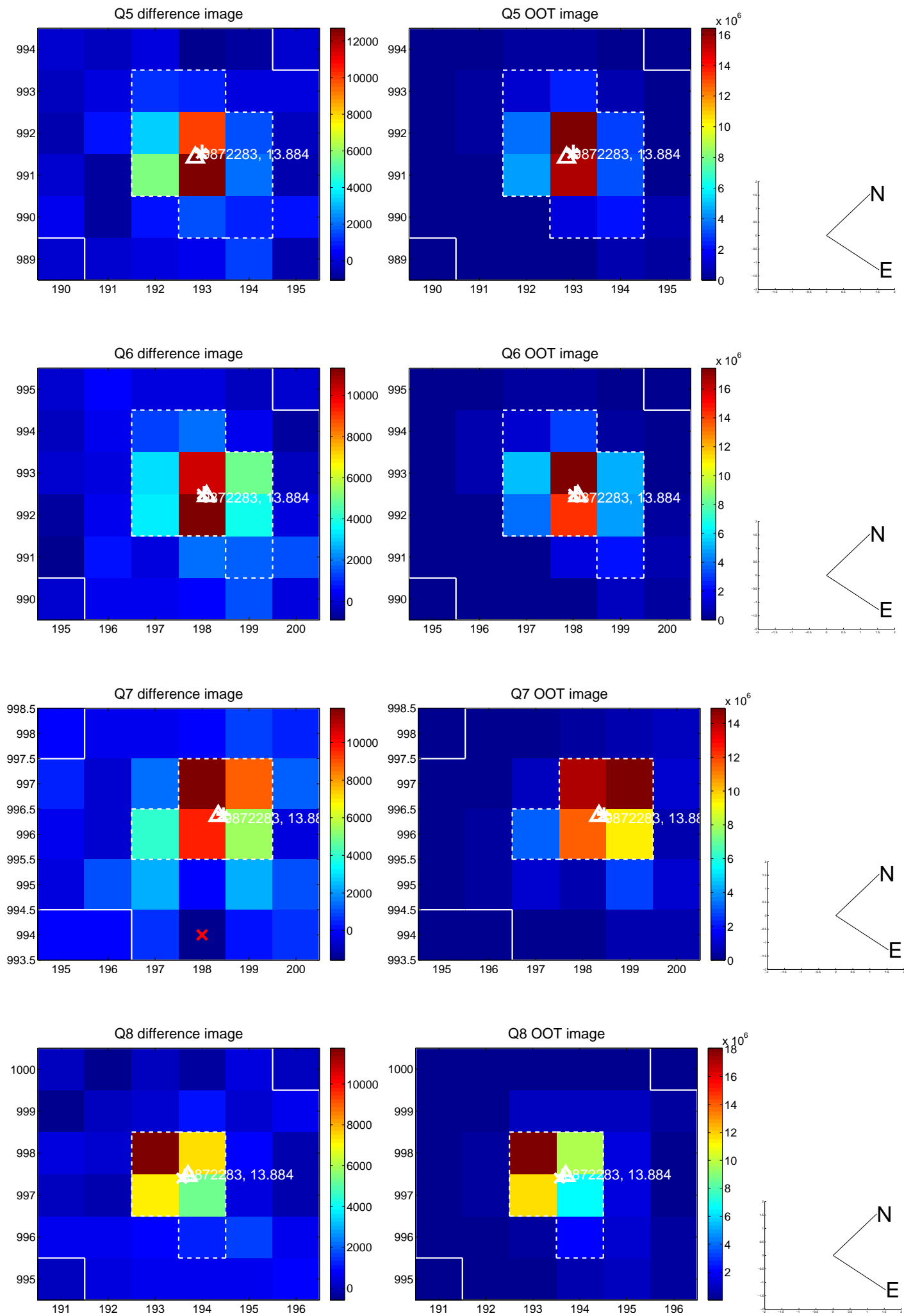


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses:** good quarterly centroid offsets; **Vermillion crosses:** bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

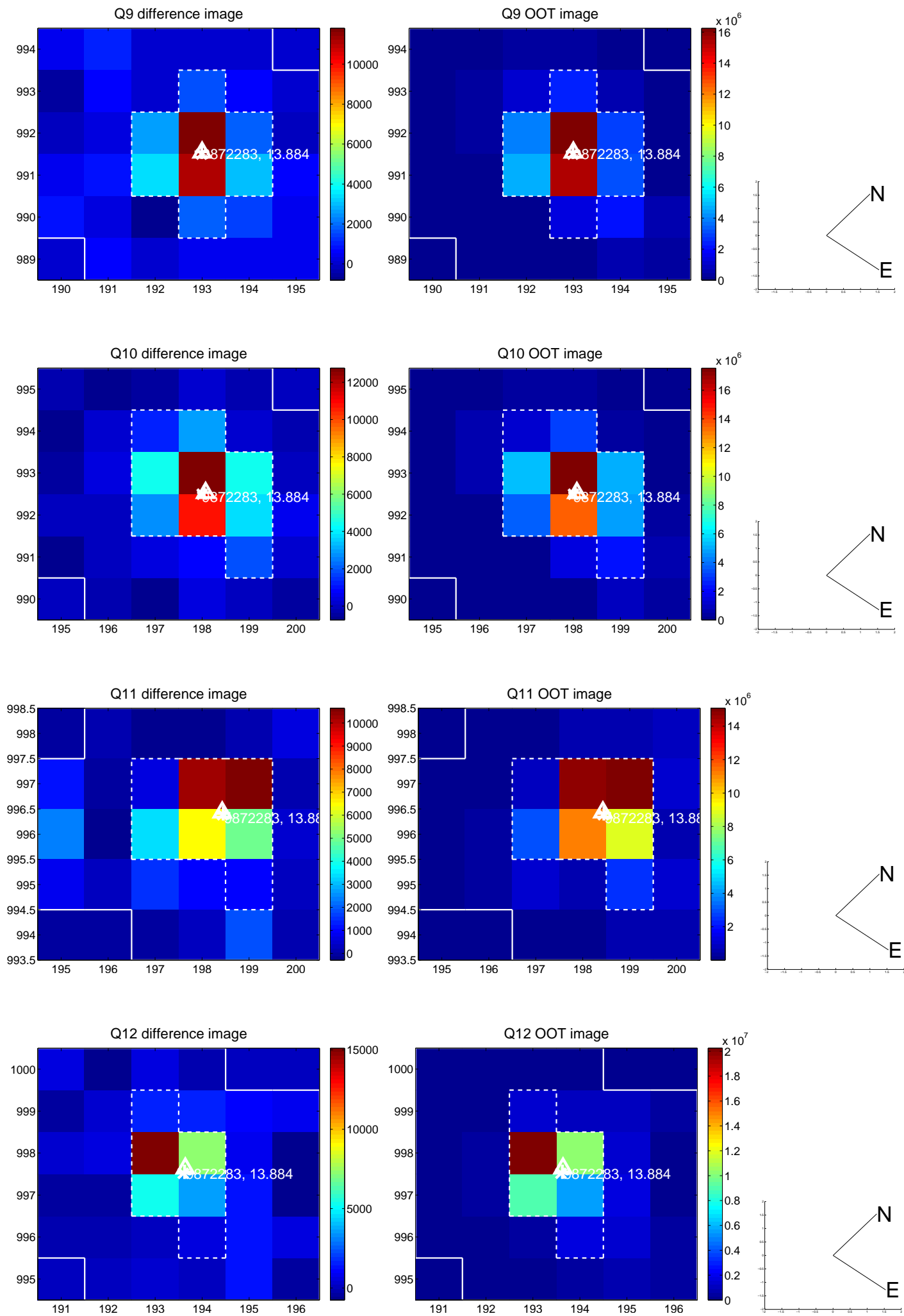
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



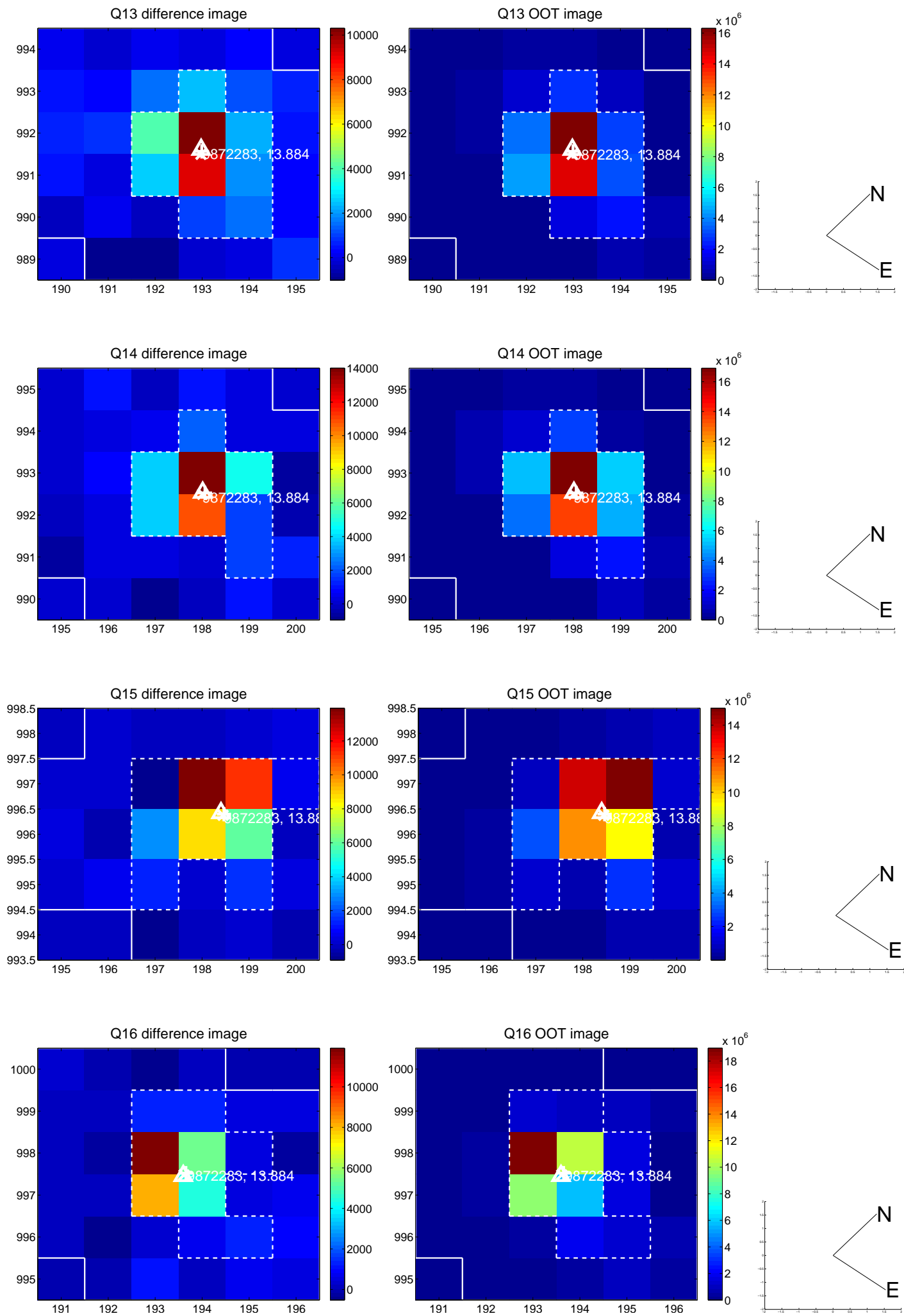
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

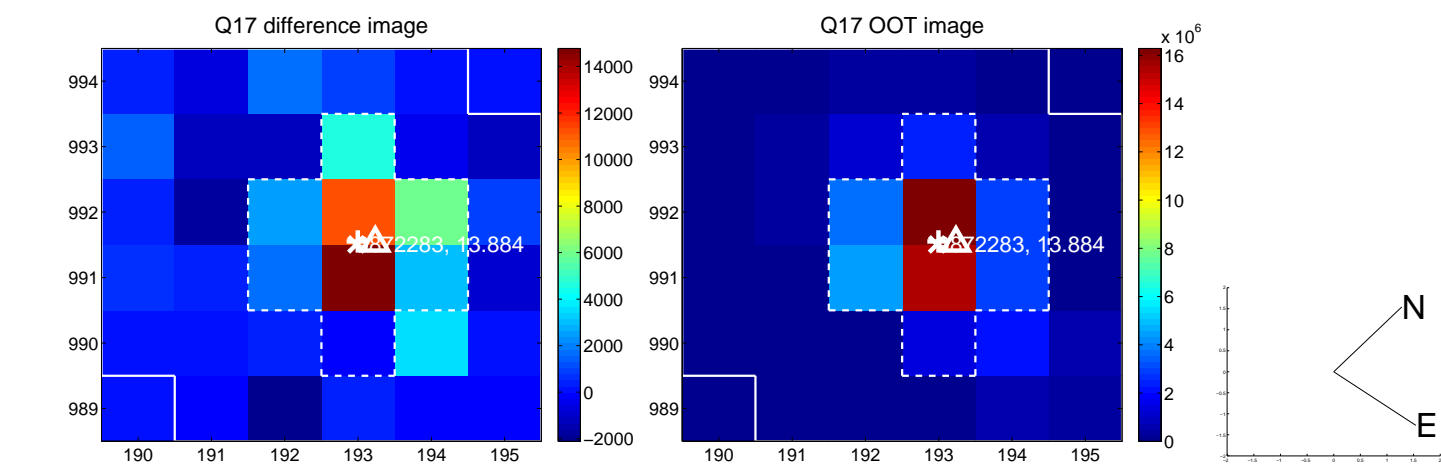


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

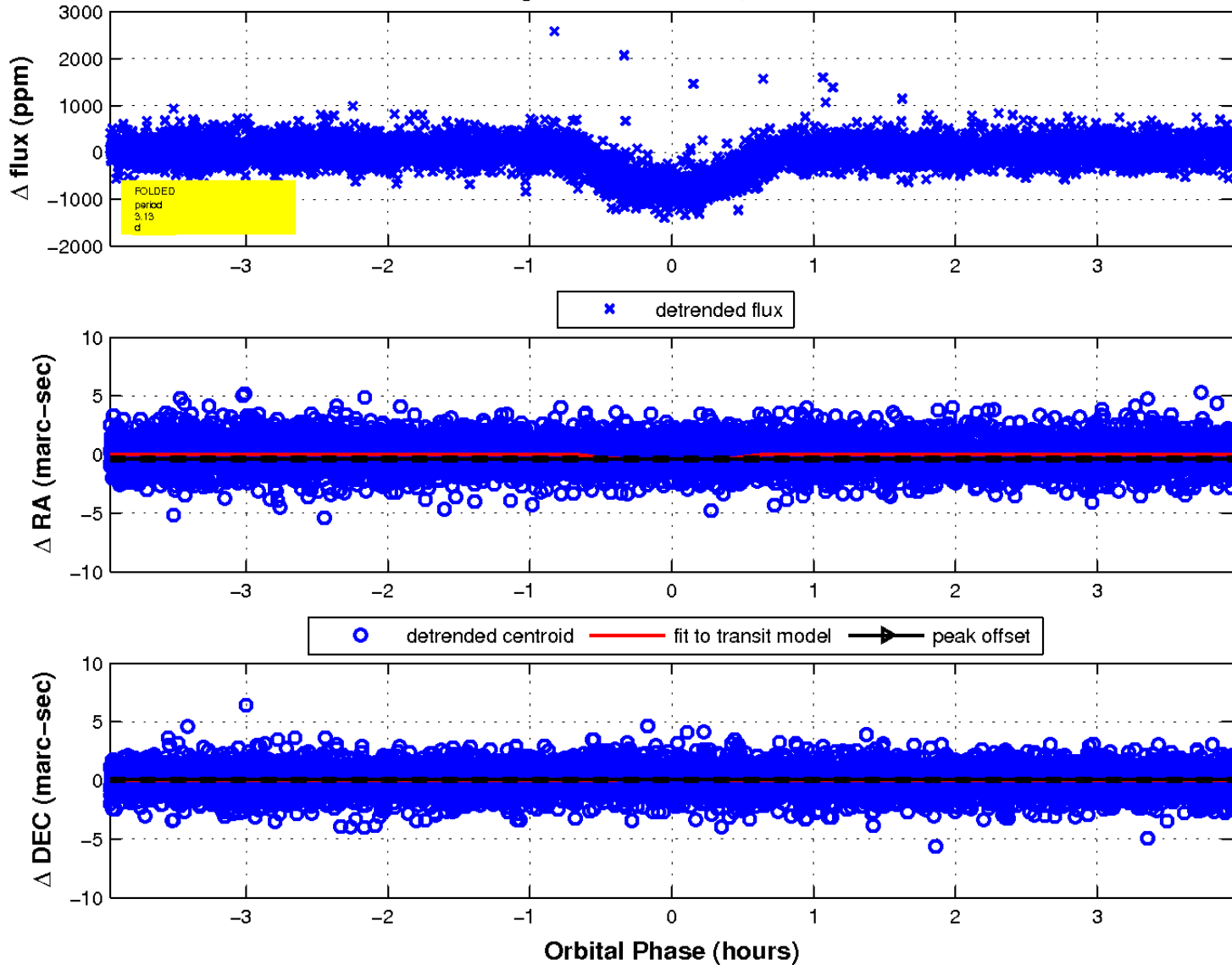




white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

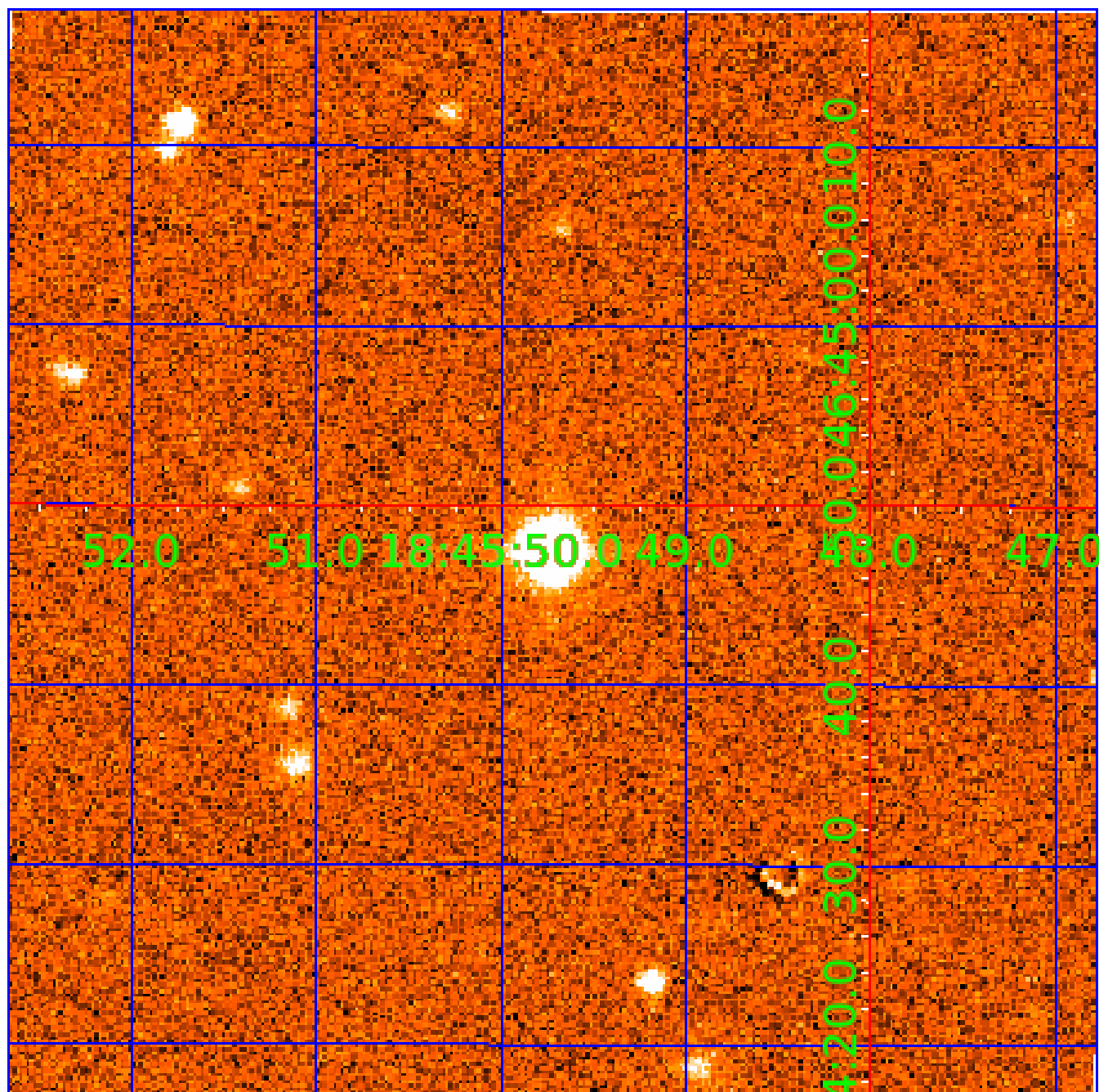


fluxWeightedCentroids, Planet 1 of 2



# UKIRT Image

Declination



# KIC 009872283

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
009872283-01	OBS	1815.01	3.126855	133.725898	762.0	1.320	78.3	92.6	1.75	4854	5.99	886.50
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## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009872283-01	OBS	PC	1.00	0	0	0	0	NO_COMMENT
009872283-02	OBS	PC	0.97	0	0	0	0	NO_COMMENT

**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.

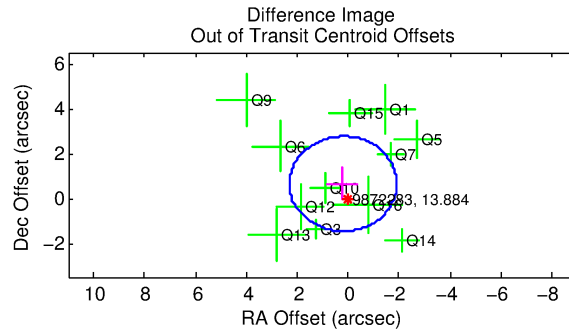
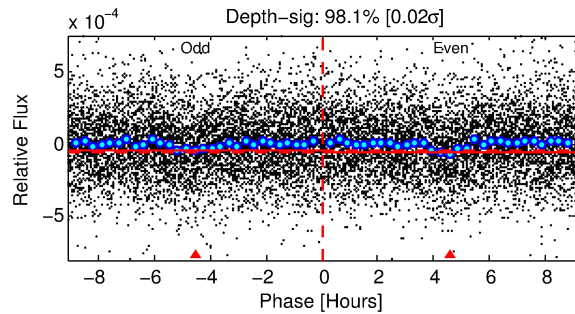
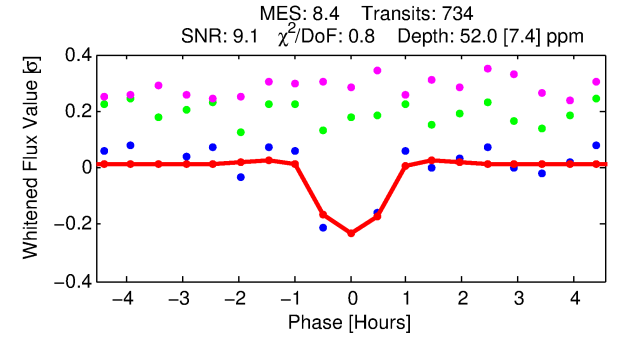
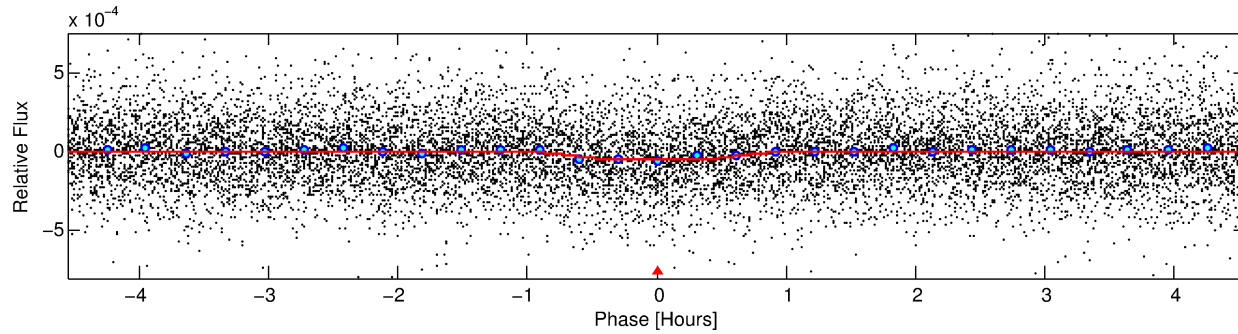
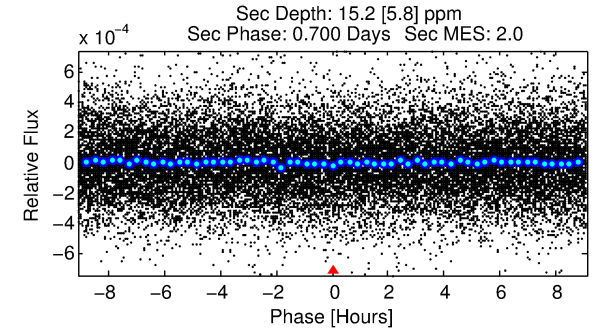
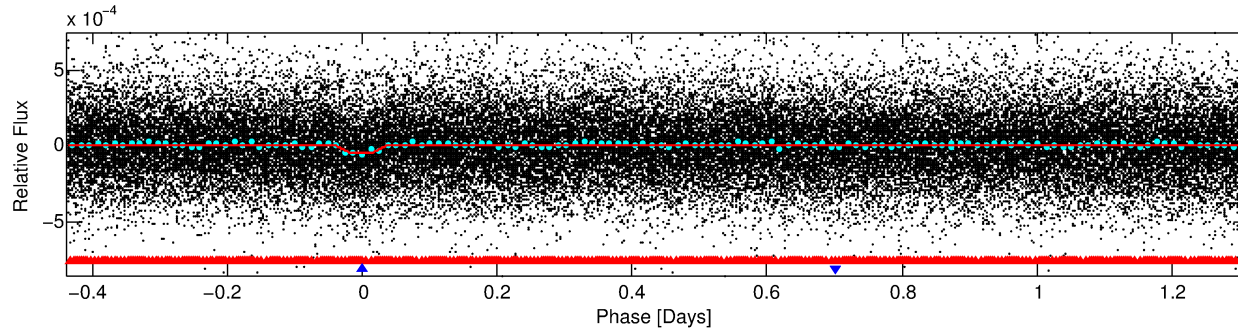
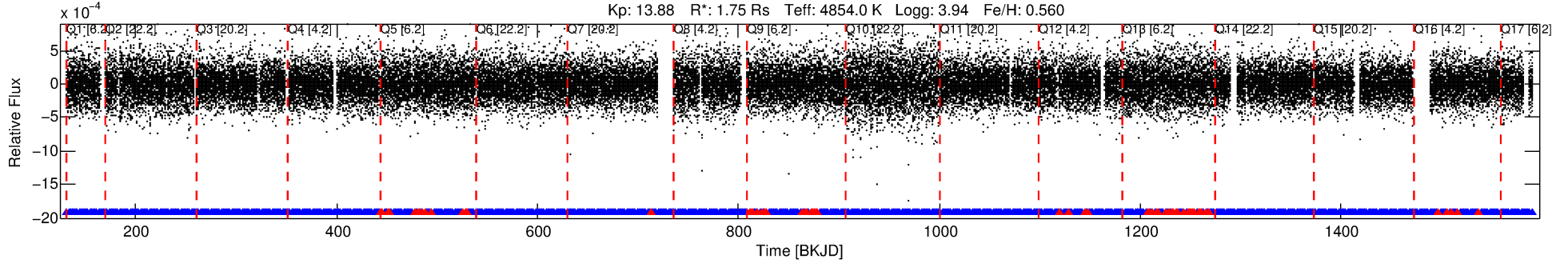
## Ephemeris Match Information For 009872283-02

No Significant Match Found

# DV One-Page Summary

KIC: 9872283 Candidate: 2 of 2 Period: 1.746 d

KOI: K01815 Corr: No Ephemeris Match



## DV Fit Results:

Period = 1.74609 [0.00001] d  
Epoch = 131.7977 [0.0024] BKJD  
Rp/R\* = 0.0082 [0.0072]  
a/R\* = 4.10 [12.78]  
b = 0.90 [0.72]  
Seff = 1927.81 [2069.47]  
Teff = 1690 [453] K  
Rp = 1.56 [1.69] Re  
a = 0.0281 [0.0182] AU  
Ag = 2.72 [5.67] [0.30σ]  
Teffp = 3354 [1508] K [1.06σ]

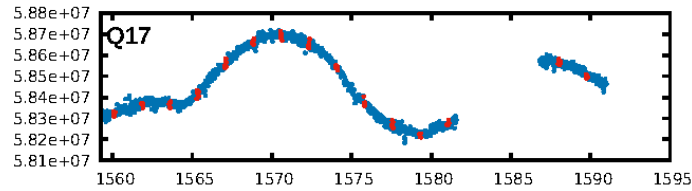
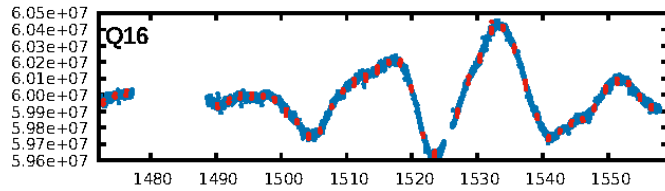
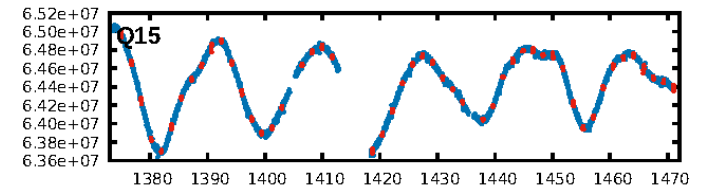
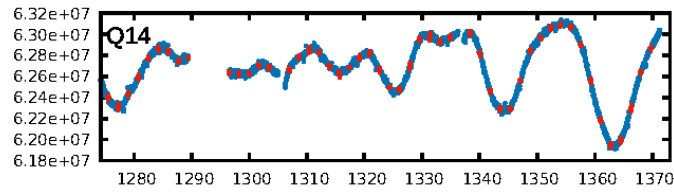
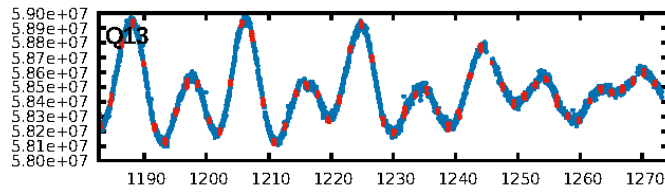
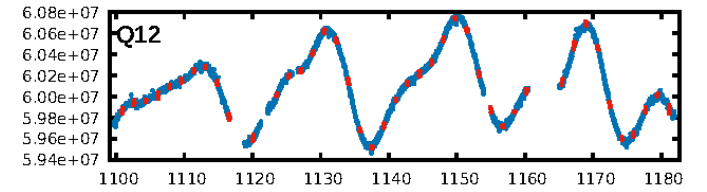
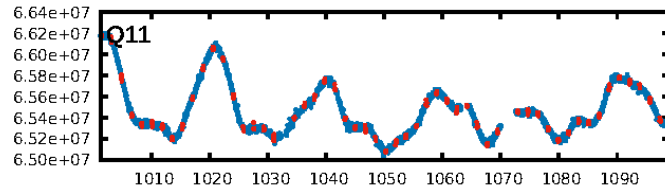
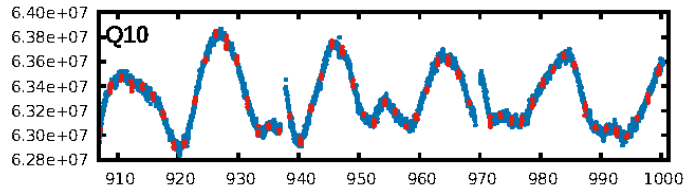
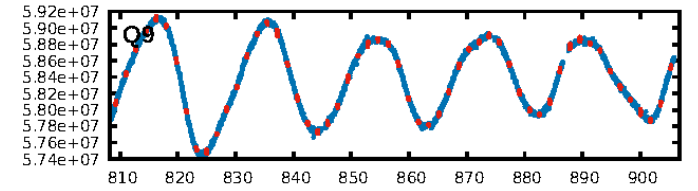
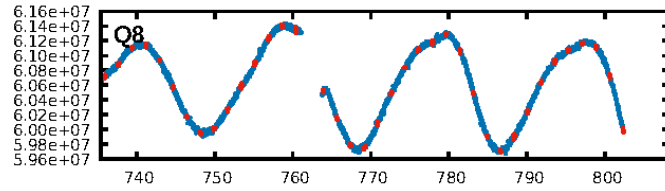
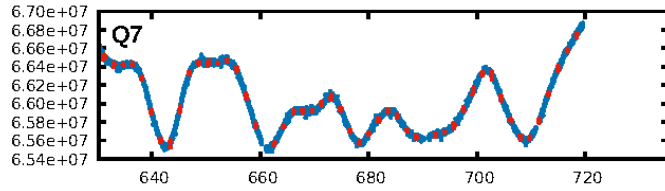
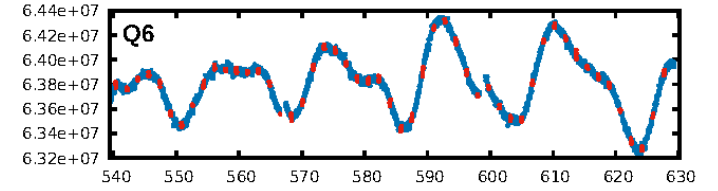
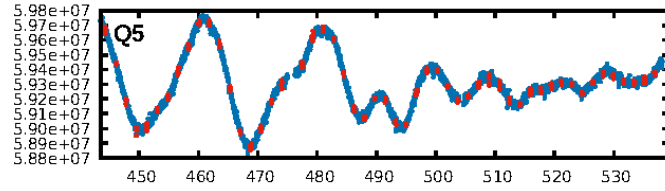
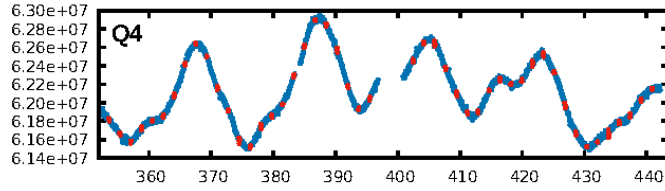
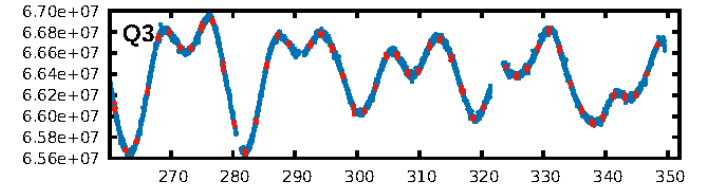
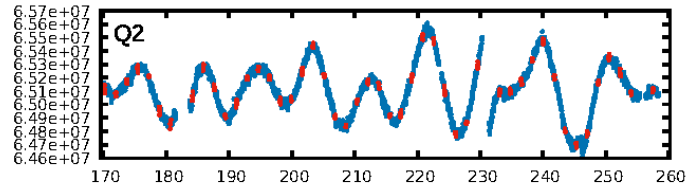
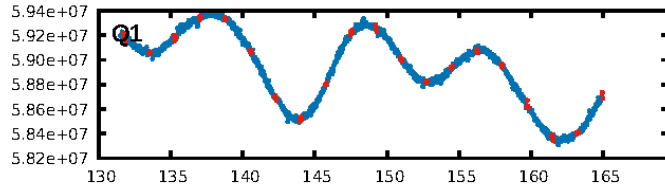
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 100.0% [16.48σ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: 4.76e-17  
RollingBand-fgt: 0.91 [640/700]  
GhostDiagnostic-chr: -16.74  
Centroid-sig: 0.1%  
Centroid-so: 3.407 arcsec [2.30σ]  
OotOffset-rm: 0.678 arcsec [0.96σ]  
KicOffset-rm: 0.855 arcsec [1.22σ]  
OotOffset-st: 3/3/2/4 [12]  
KicOffset-st: 3/3/2/4 [12]  
DiffImageQuality-fgm: 0.25 [3/12]  
DiffImageOverlap-fno: 1.00 [17/17]

Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 29-Jan-2016 04:11:27 Z

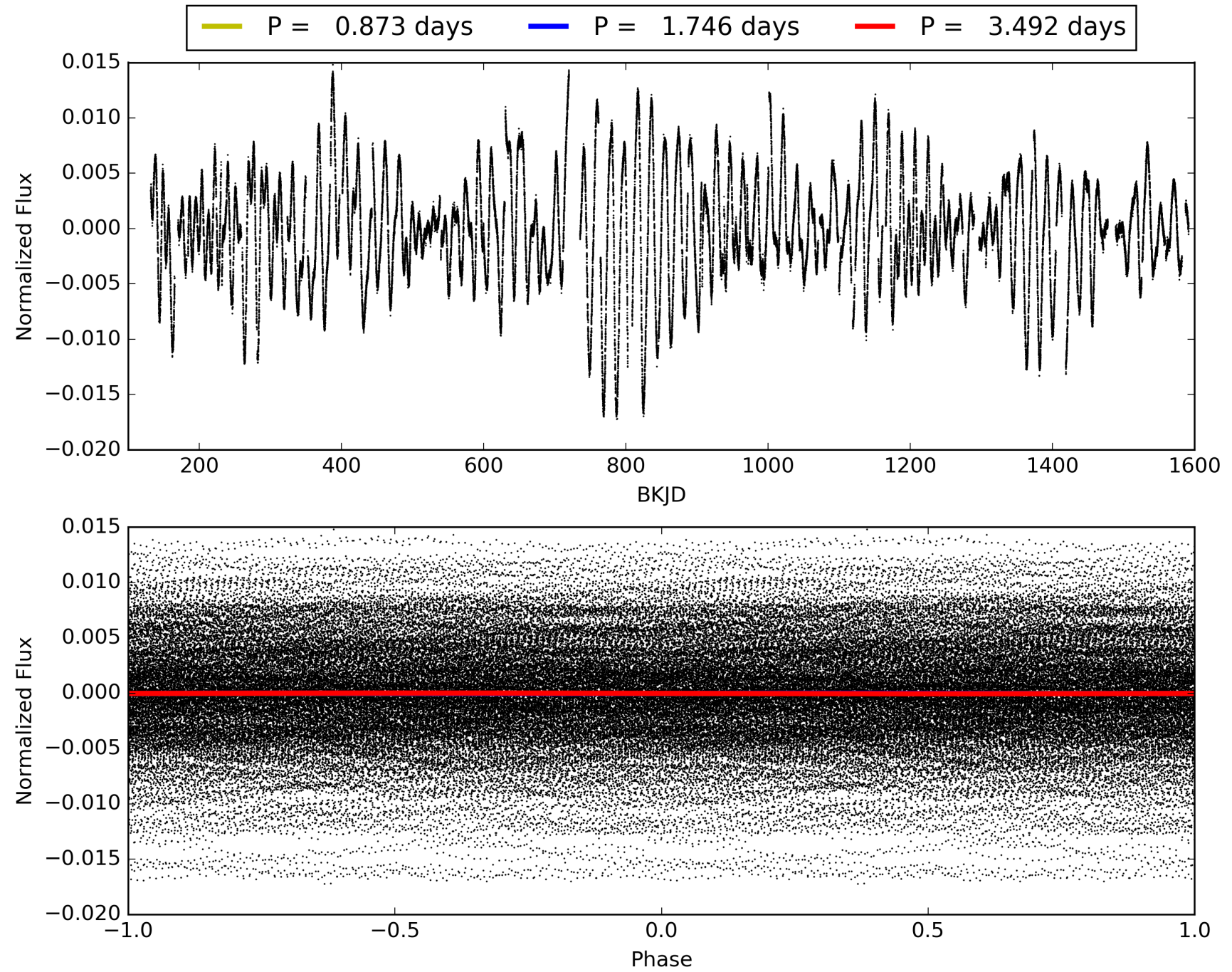
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

# TCE 009872283-02, PDC Light Curves



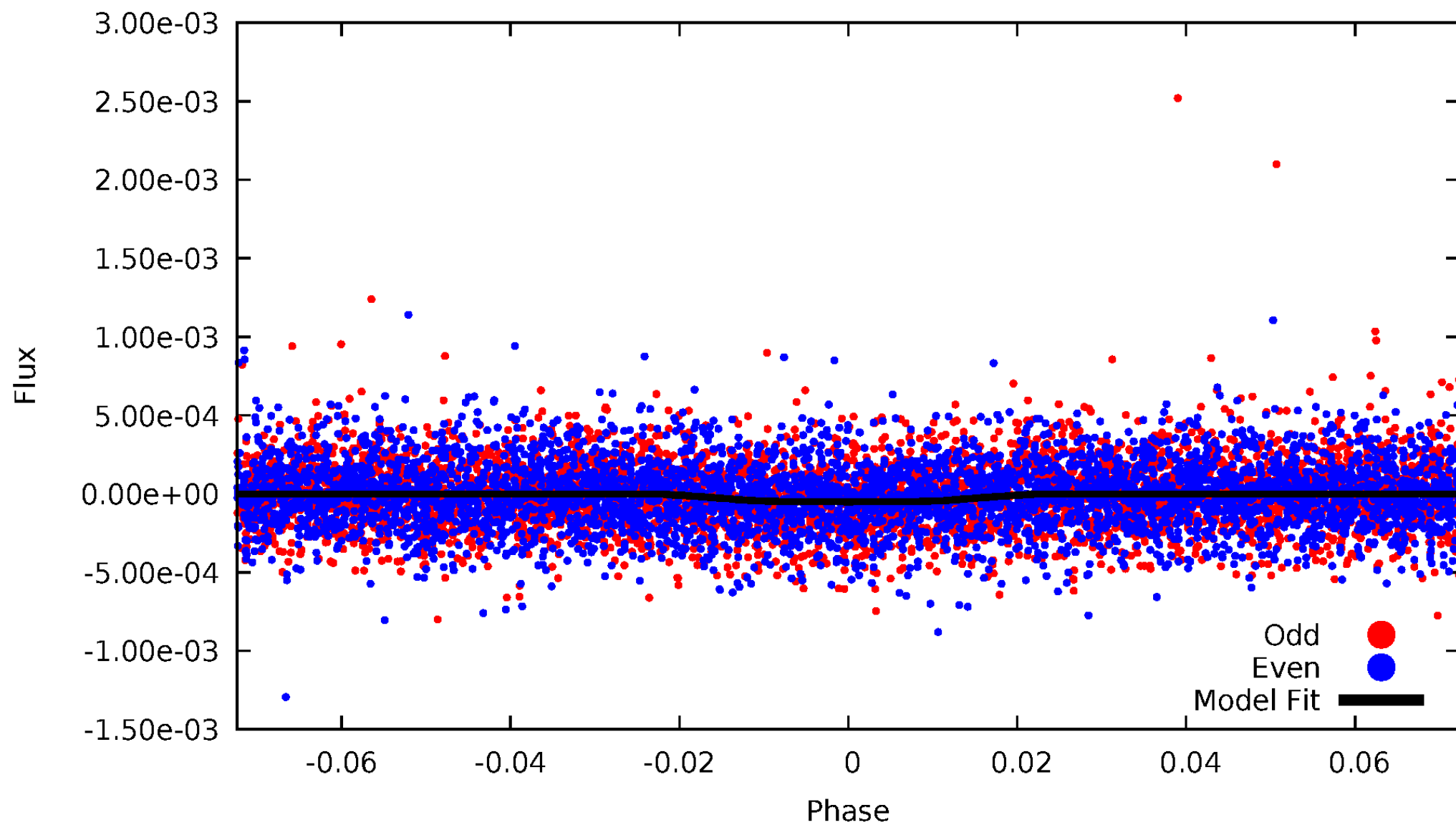


# TCE 009872283-02



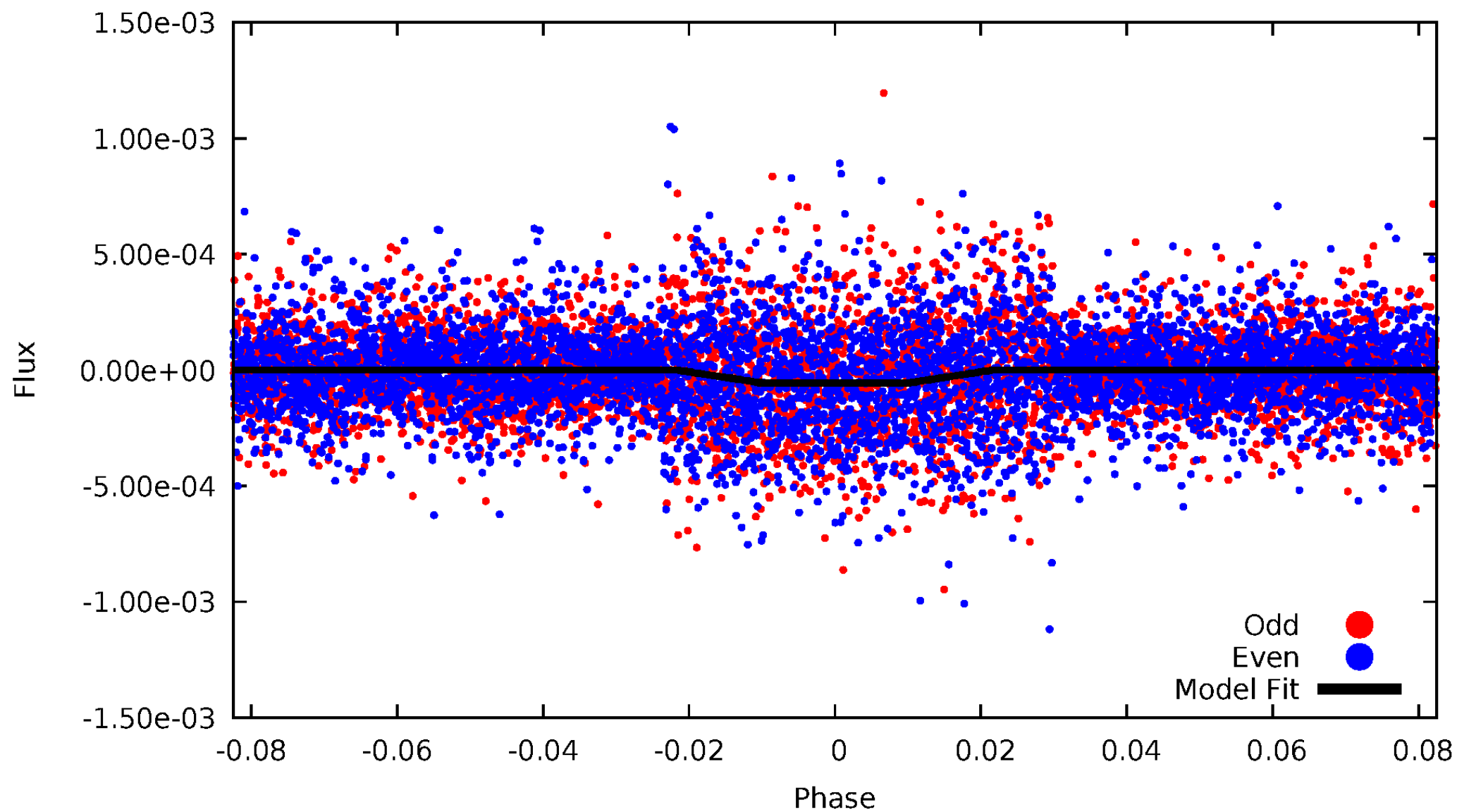
# DV Odd/Even

TCE 009872283-02



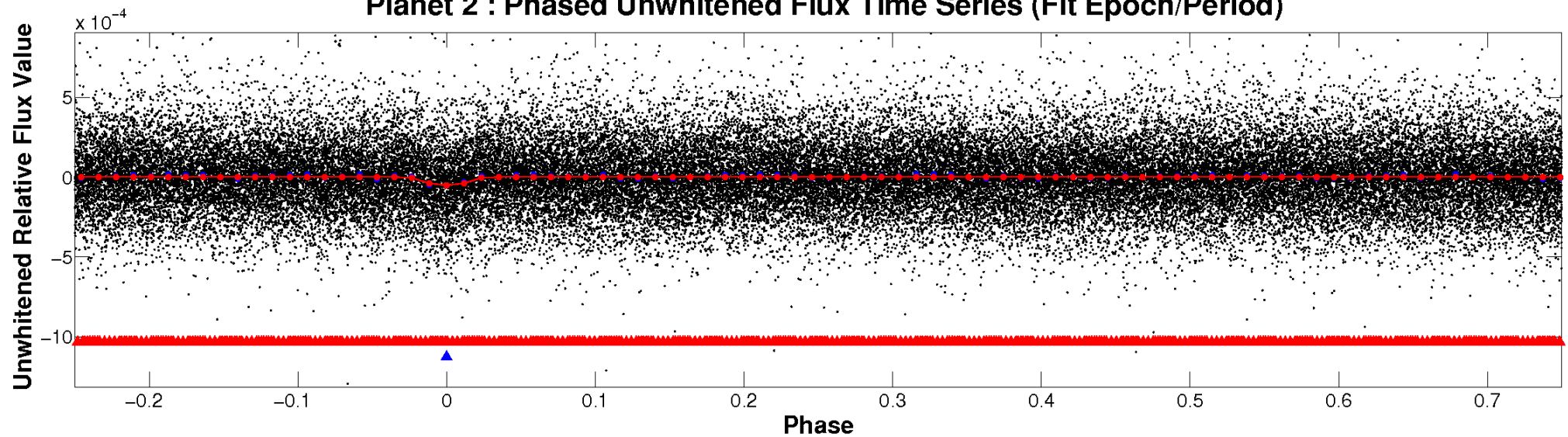
# ALT Odd/Even

TCE 009872283-02

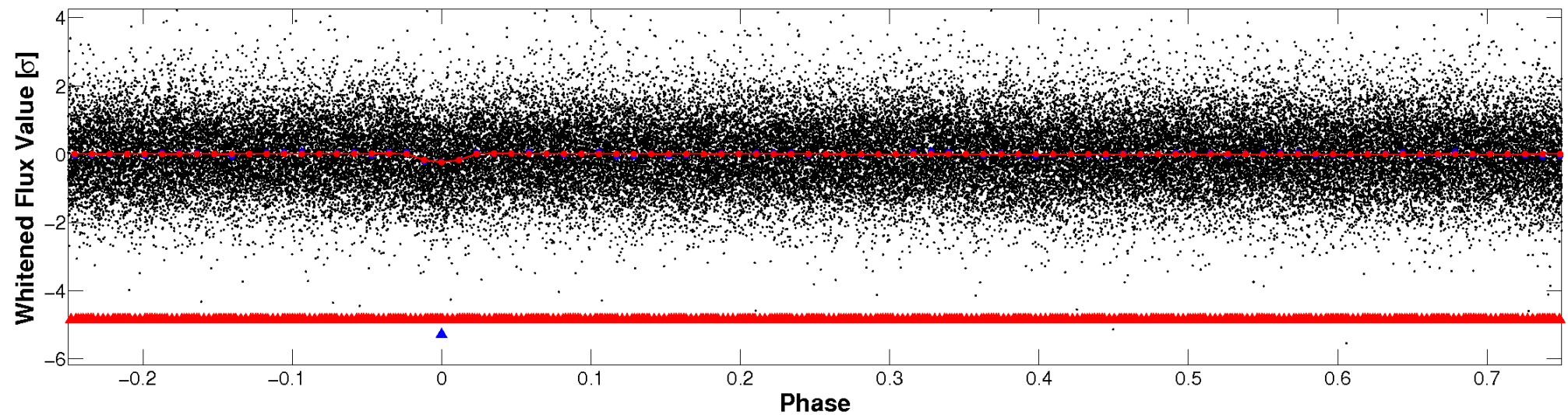


# Non-Whitened Vs. Whitened Light Curve

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



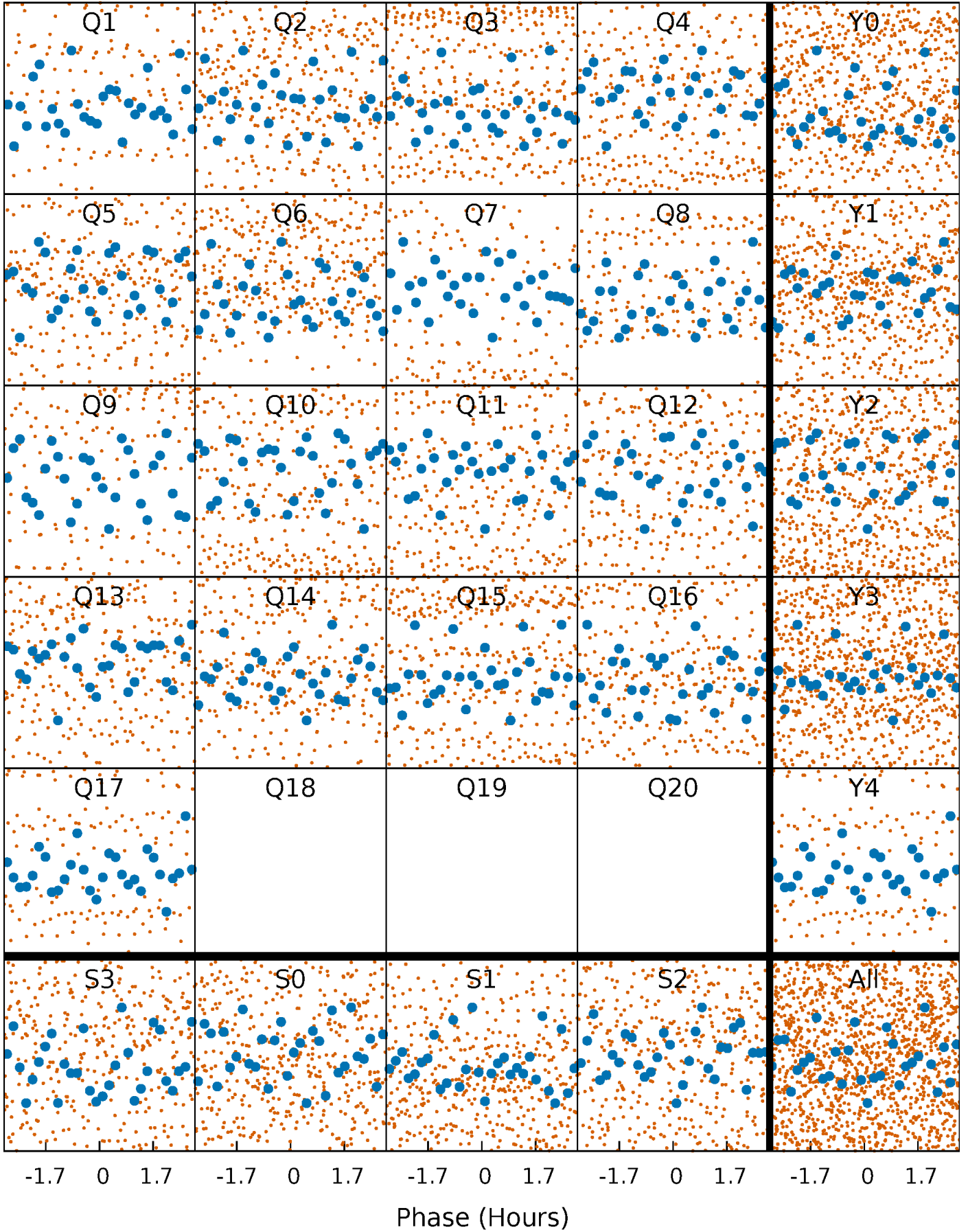
**Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)**





# PDC Quarter-Phased Transit Curves

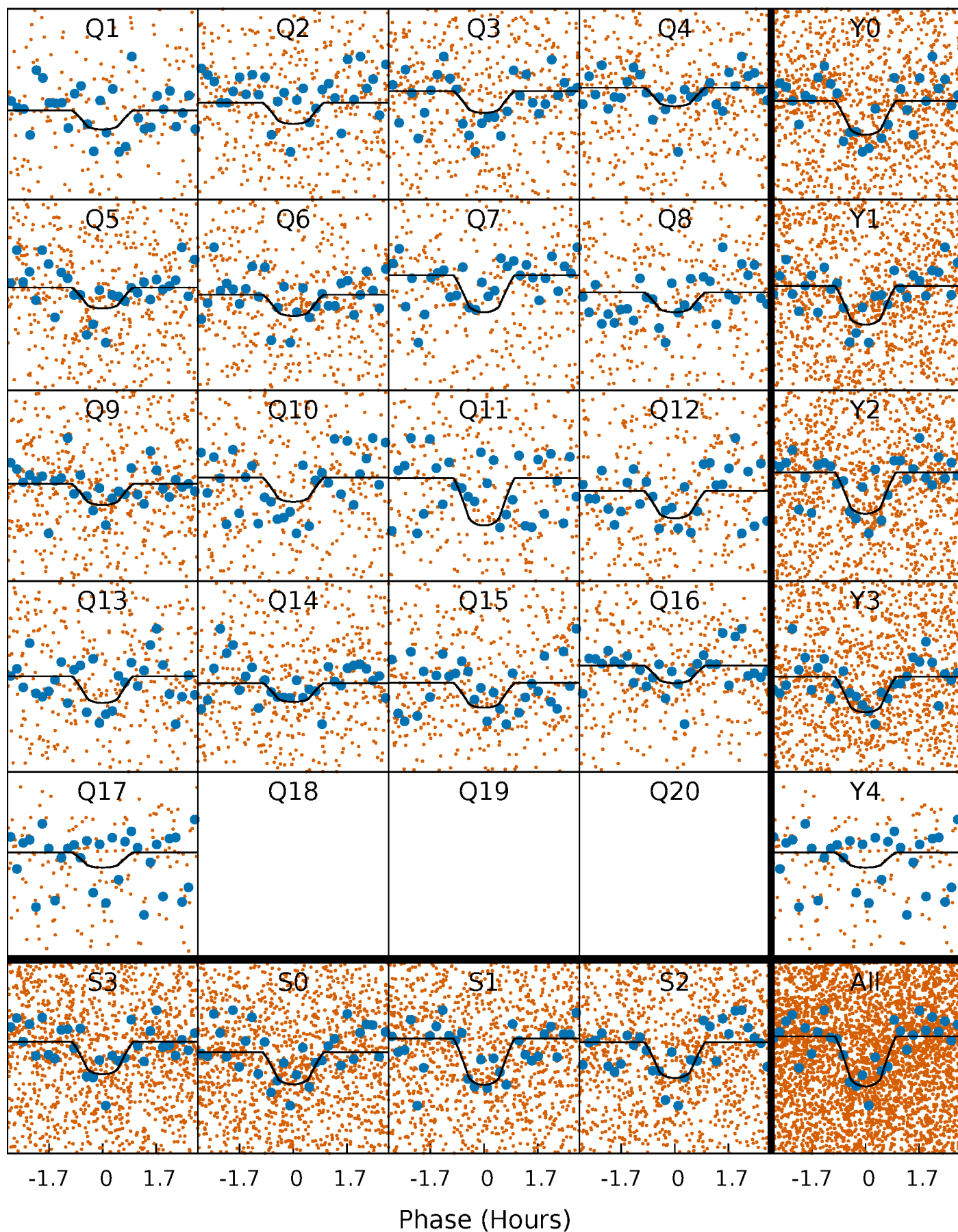
TCE 009872283-02   P= 1.746091 Days    $T_0=131.797696$  (BKJD)





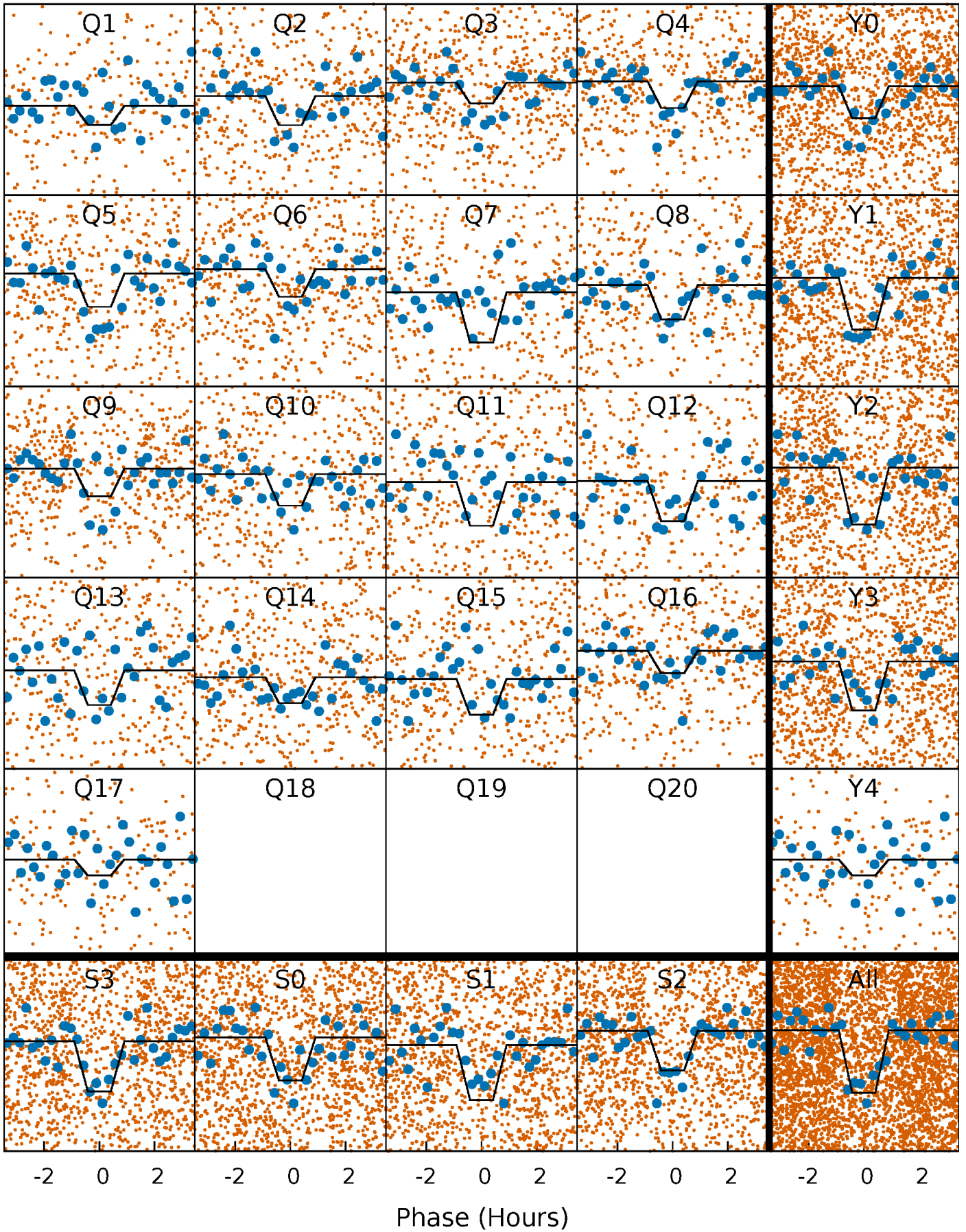
# DV Quarter-Phased Transit Curves

TCE 009872283-02   P= 1.746091 Days    $T_0=131.797696$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

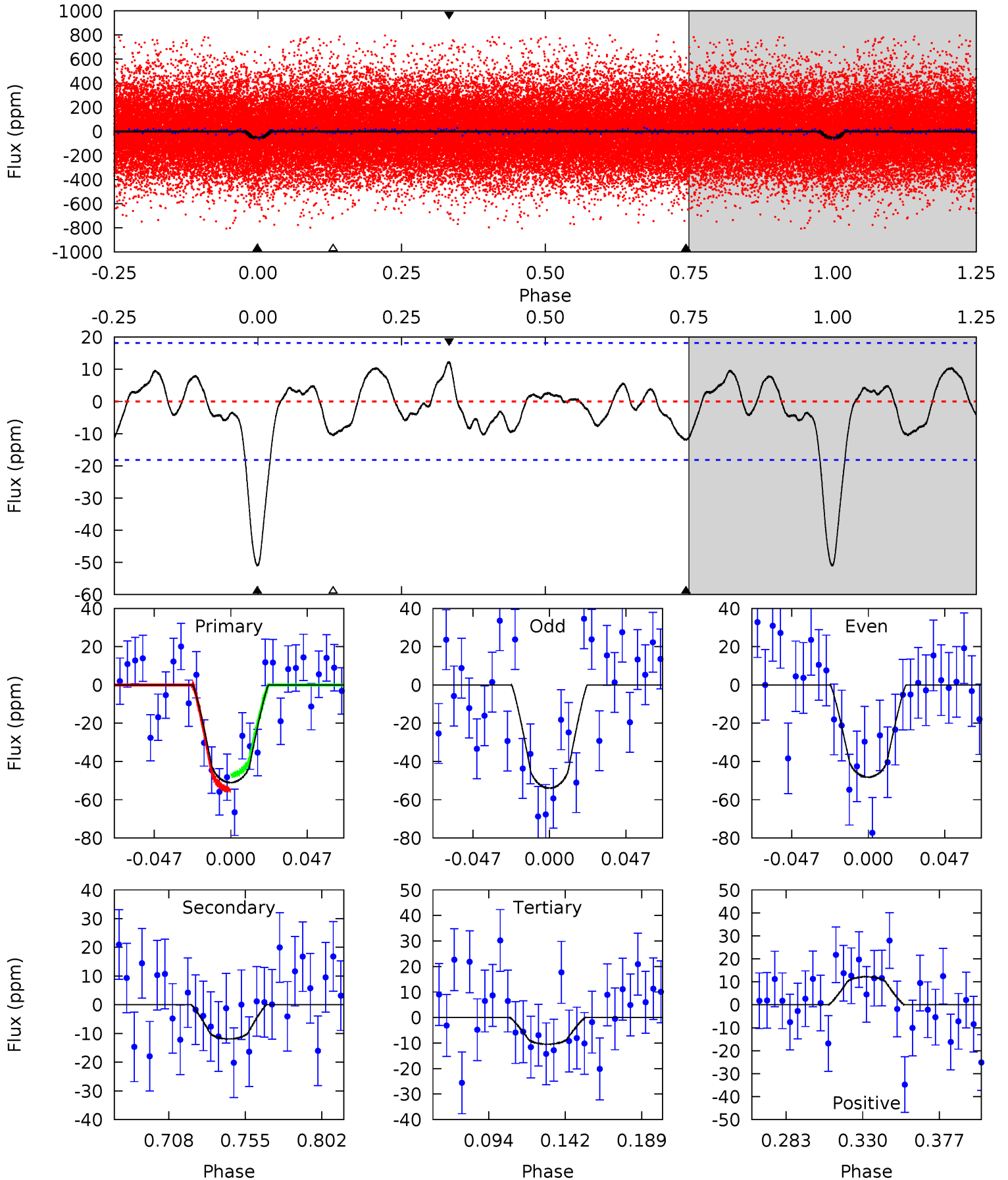
TCE 009872283-02 P= 1.746095 Days  $T_0=131.793608$  (BKJD)



# DV Model-Shift Uniqueness Test

009872283-02, P = 1.746091 Days, E = 130.051605 Days

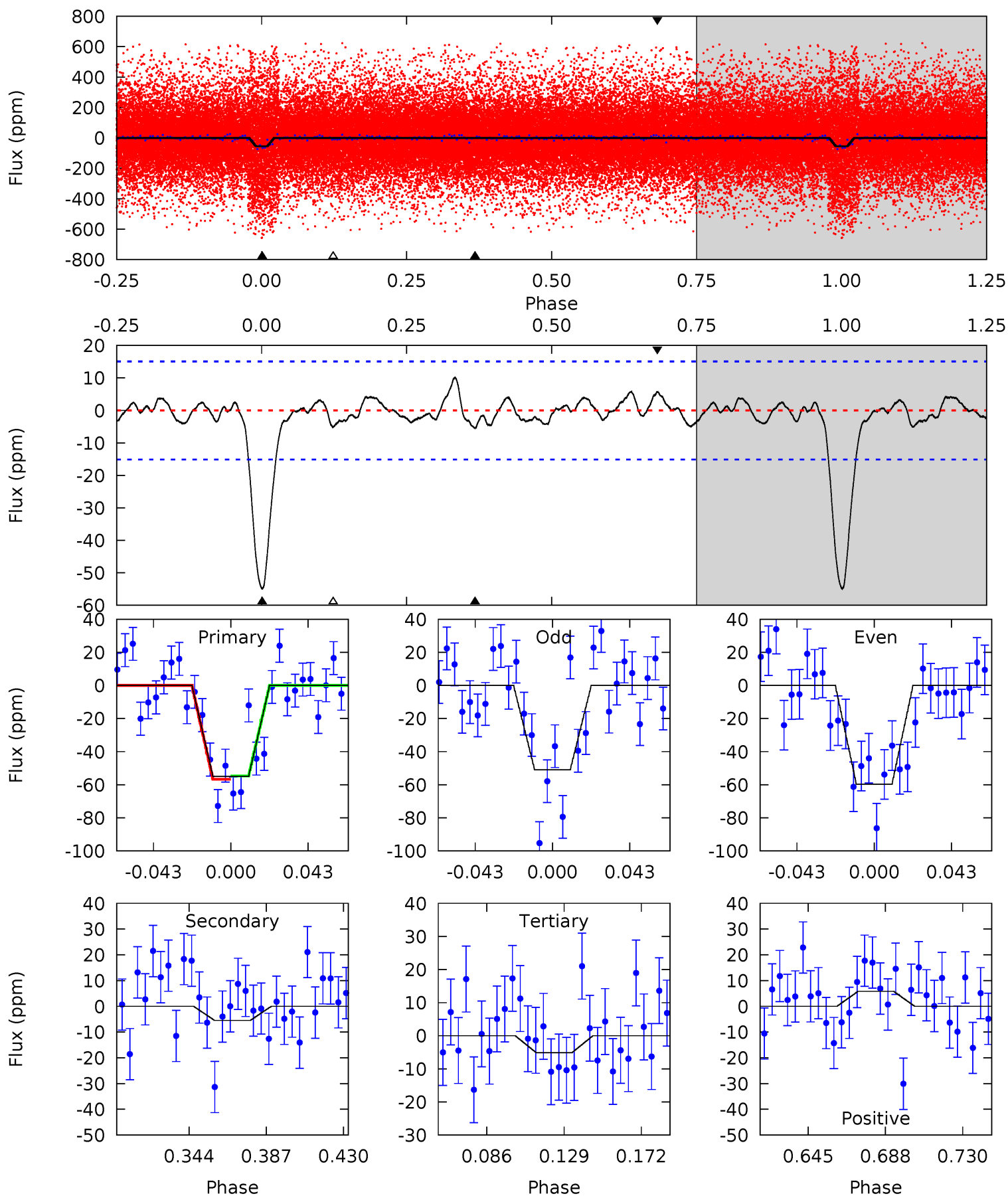
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
13.3	3.10	2.72	3.17	4.72	1.98	1.40	10.5	10.1	0.38	-0.07	0.75	0.92	0.19	1.02



# Alt Model-Shift Uniqueness Test

009872283-02, P = 1.746095 Days, E = 130.047513 Days

Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
17.3	1.73	1.61	1.83	4.74	2.02	0.79	15.6	15.4	0.11	-0.10	1.37	0.99	0.16	0.31



### Stellar Parameters For KIC 009872283

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R$ ( $R_{\odot}$ )	$M(M_{\odot})$	$p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ )
	$4854^{+145}_{-116}$	$3.939^{+0.637}_{-0.343}$	$0.560^{+0.050}_{-0.250}$	$1.749^{+1.119}_{-1.017}$	$0.970^{+0.209}_{-0.152}$	$0.255^{+2.124}_{-0.170}$
	+3%/-2%	+16%/-9%	+9%/-45%	+64%/-58%	+22%/-16%	+832%/-66%
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 009872283-02 / KOI 1815.02

Detrend	Depth (ppm)	$R_p$ ( $R_{\oplus}$ )	$T_{\text{max}}$ (K)	$T_{\text{obs}}$ (K)	$A_{\text{obs}}$
DV	$-12 \pm 4$	$1.61^{+1.47}_{-0.97}$	$2314^{+412}_{-361}$	$3282^{+1494}_{-698}$	$1.888^{+11.144}_{-1.384}$
Alt.	$-6 \pm 3$	$1.58^{+1.38}_{-1.01}$	$2347^{+352}_{-363}$	$2847^{+1277}_{-5300}$	$0.834^{+6.407}_{-0.643}$

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



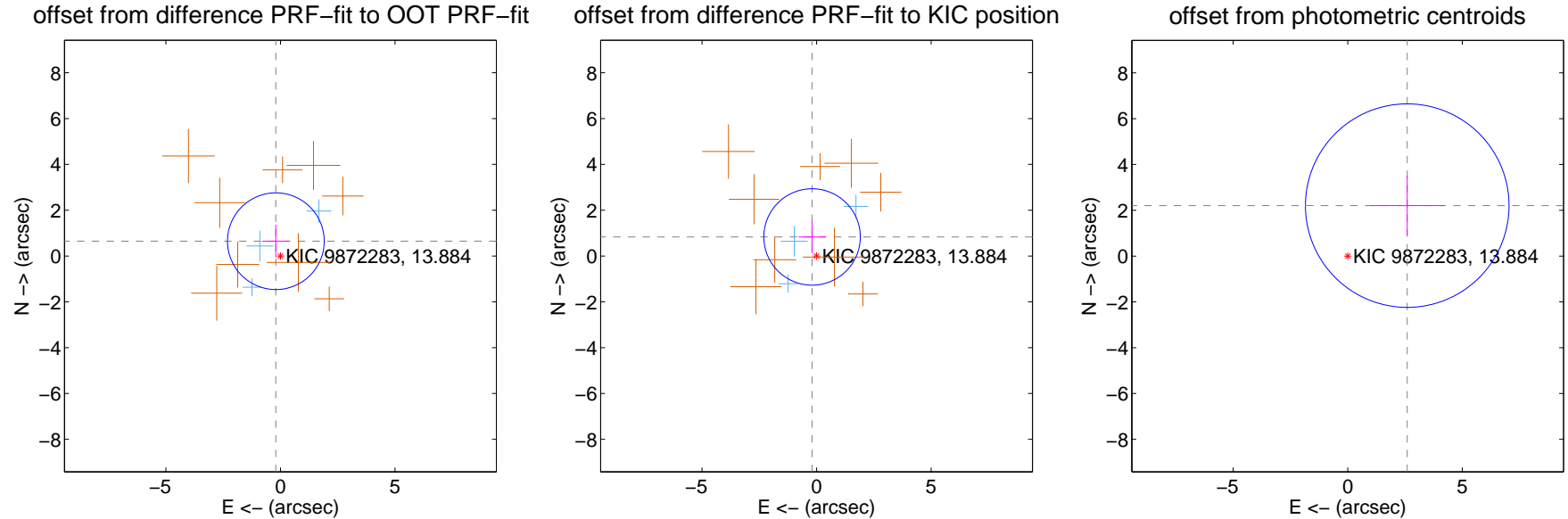
## DV Centroid Data

Supplemental centroid analysis for 009872283-02. Kepler magnitude: 13.88. Transit SNR 9.15

There are 3 quarters with good PRF difference image offsets

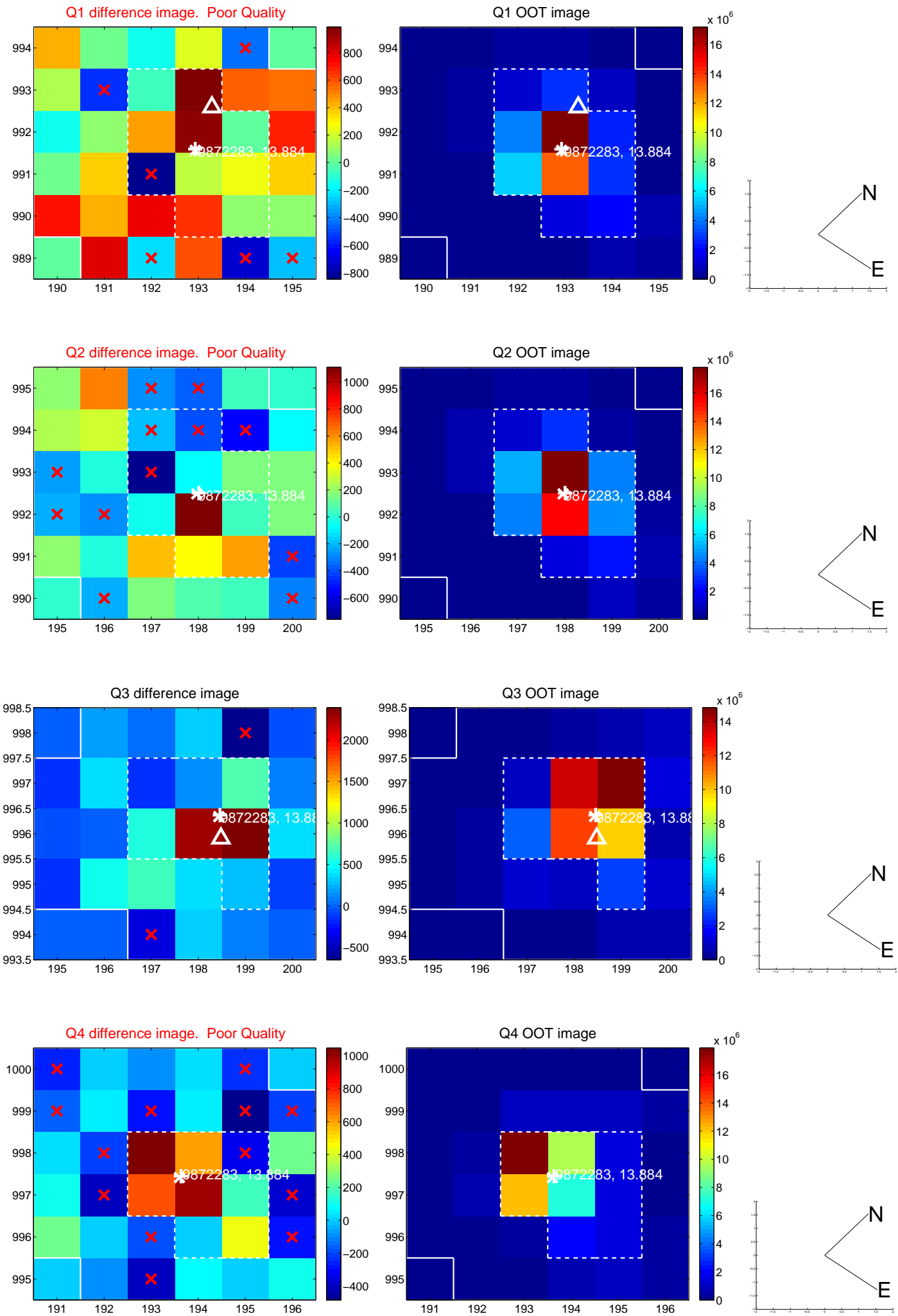
The direct PRF centroid is offset from the target star catalog position by about 0.23 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.678 \pm 0.704$	0.96	$0.201 \pm 0.596$	$0.647 \pm 0.713$
PRF-fit source offset from KIC position	$0.855 \pm 0.701$	1.22	$0.197 \pm 0.594$	$0.832 \pm 0.707$
photometric centroid source offset	$3.41 \pm 1.48$	2.30	$-2.60 \pm 1.60$	$2.20 \pm 1.30$



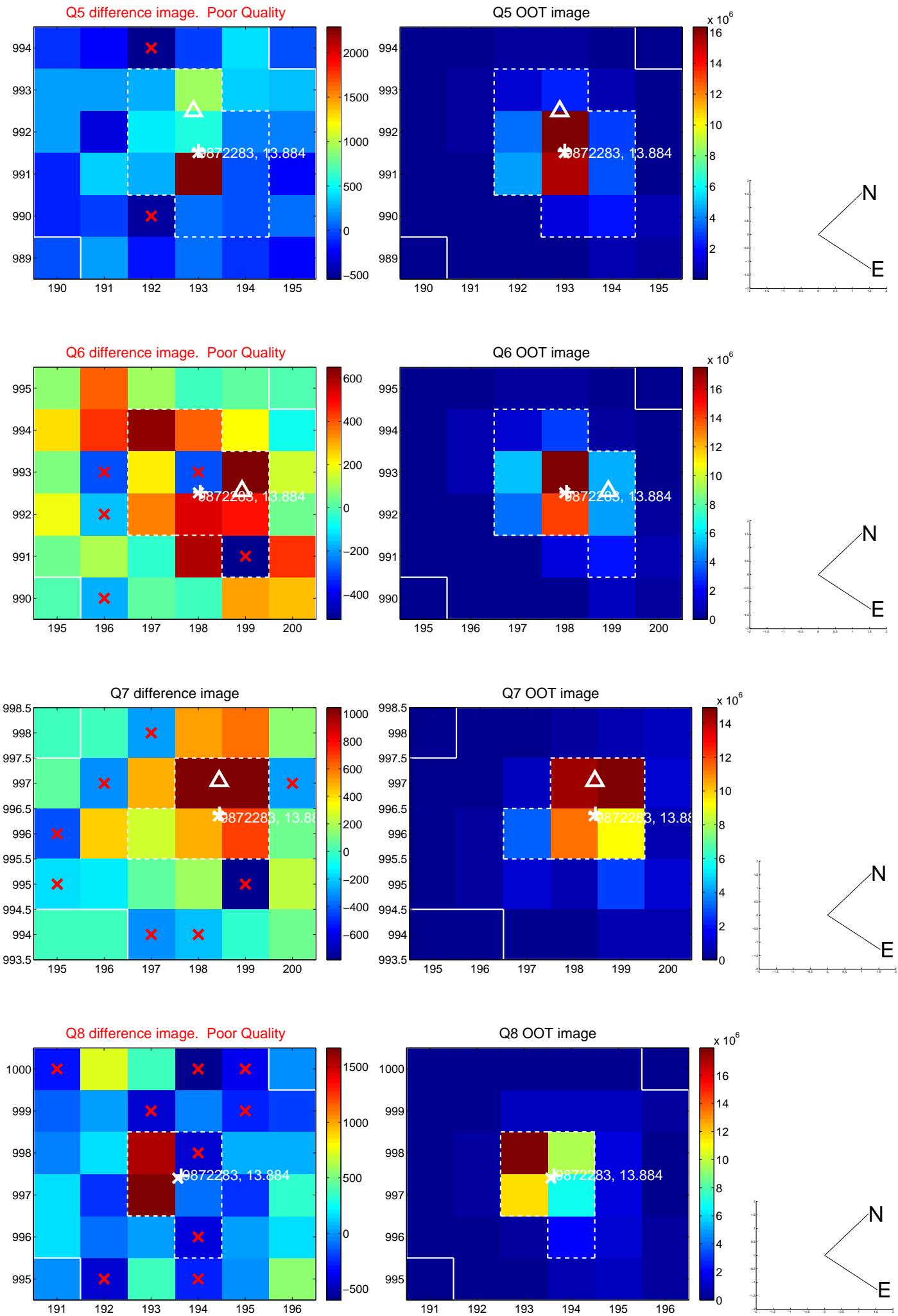
Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets**; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

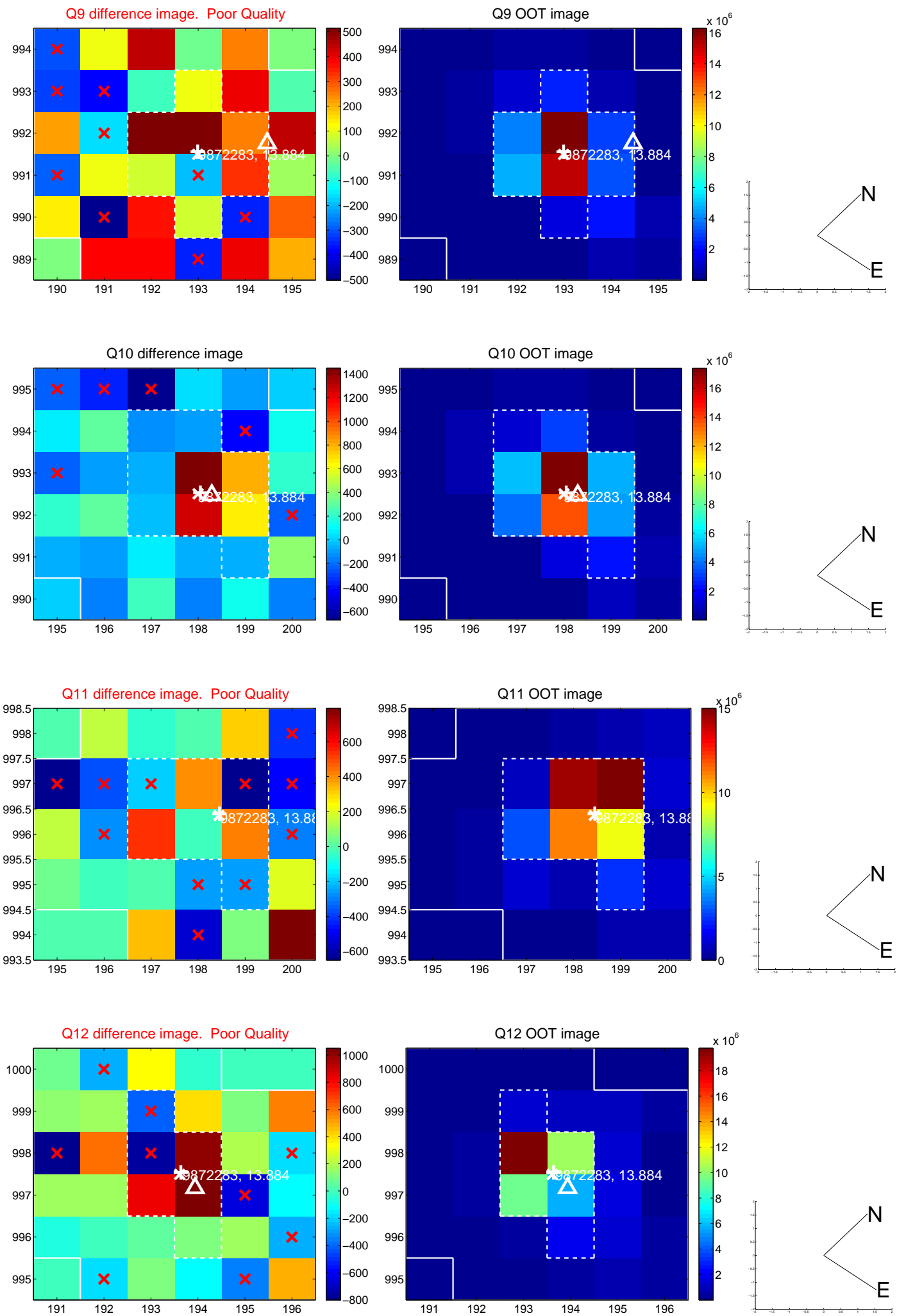




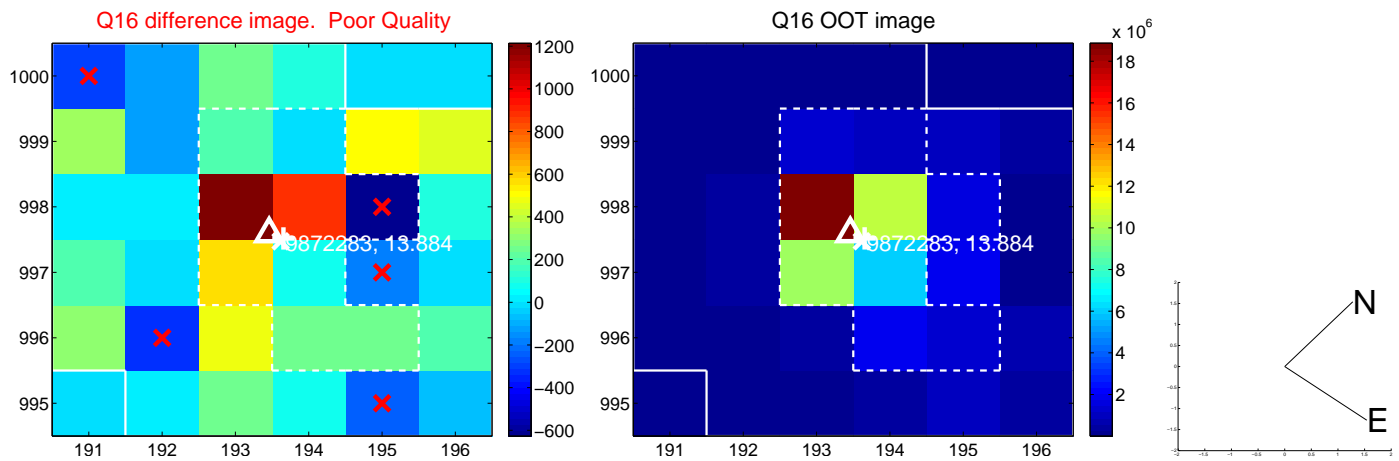
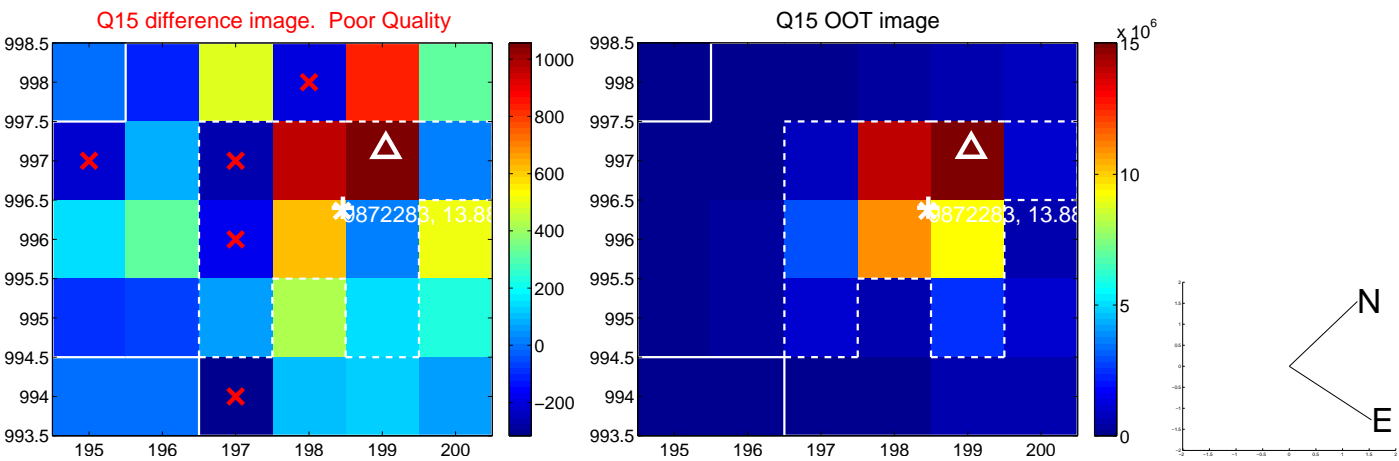
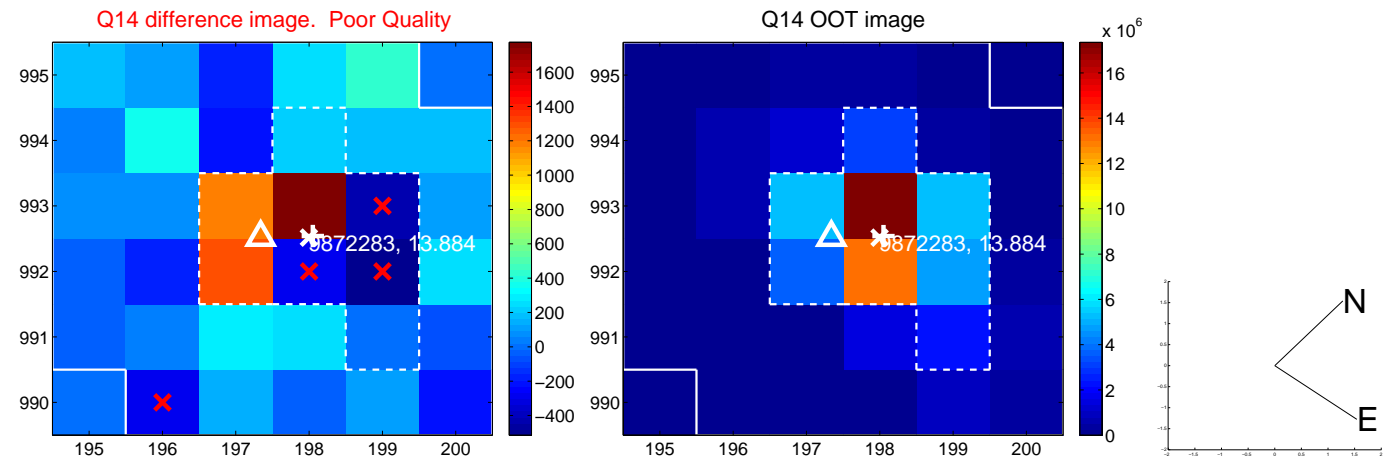
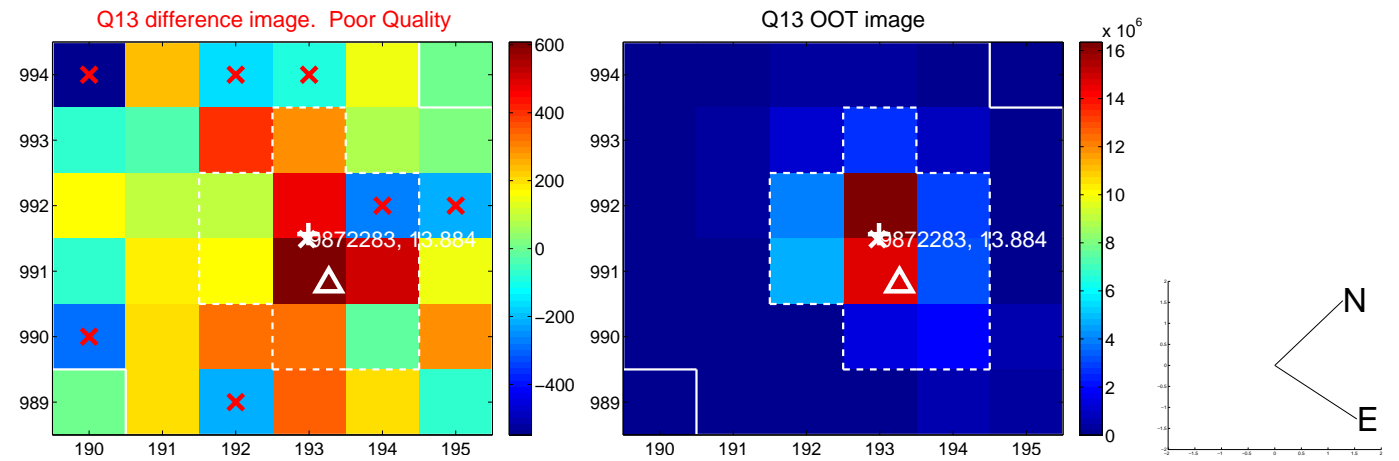
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



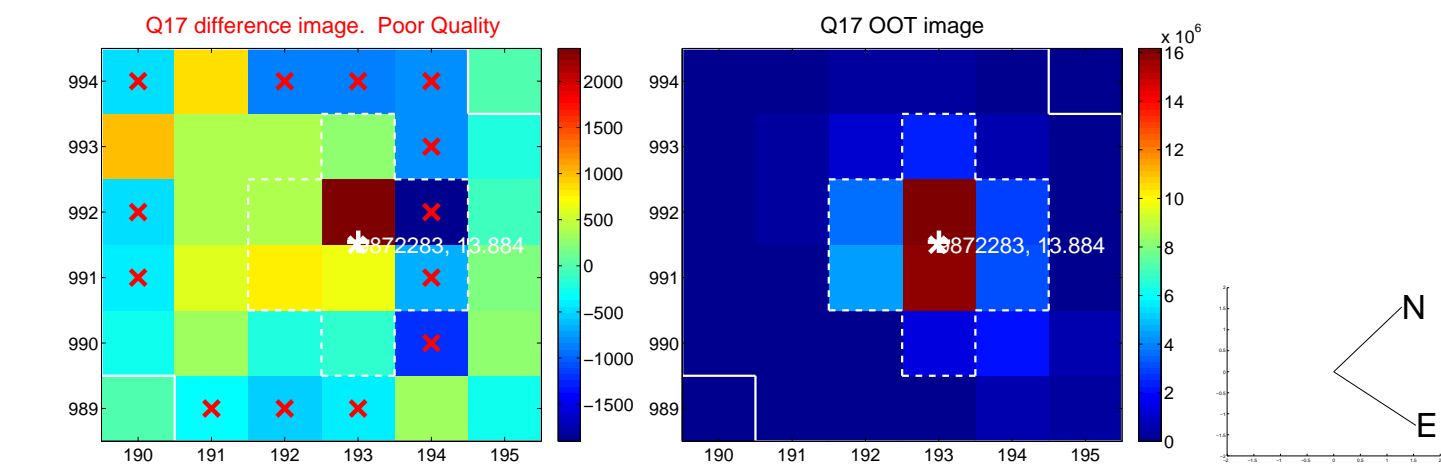
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



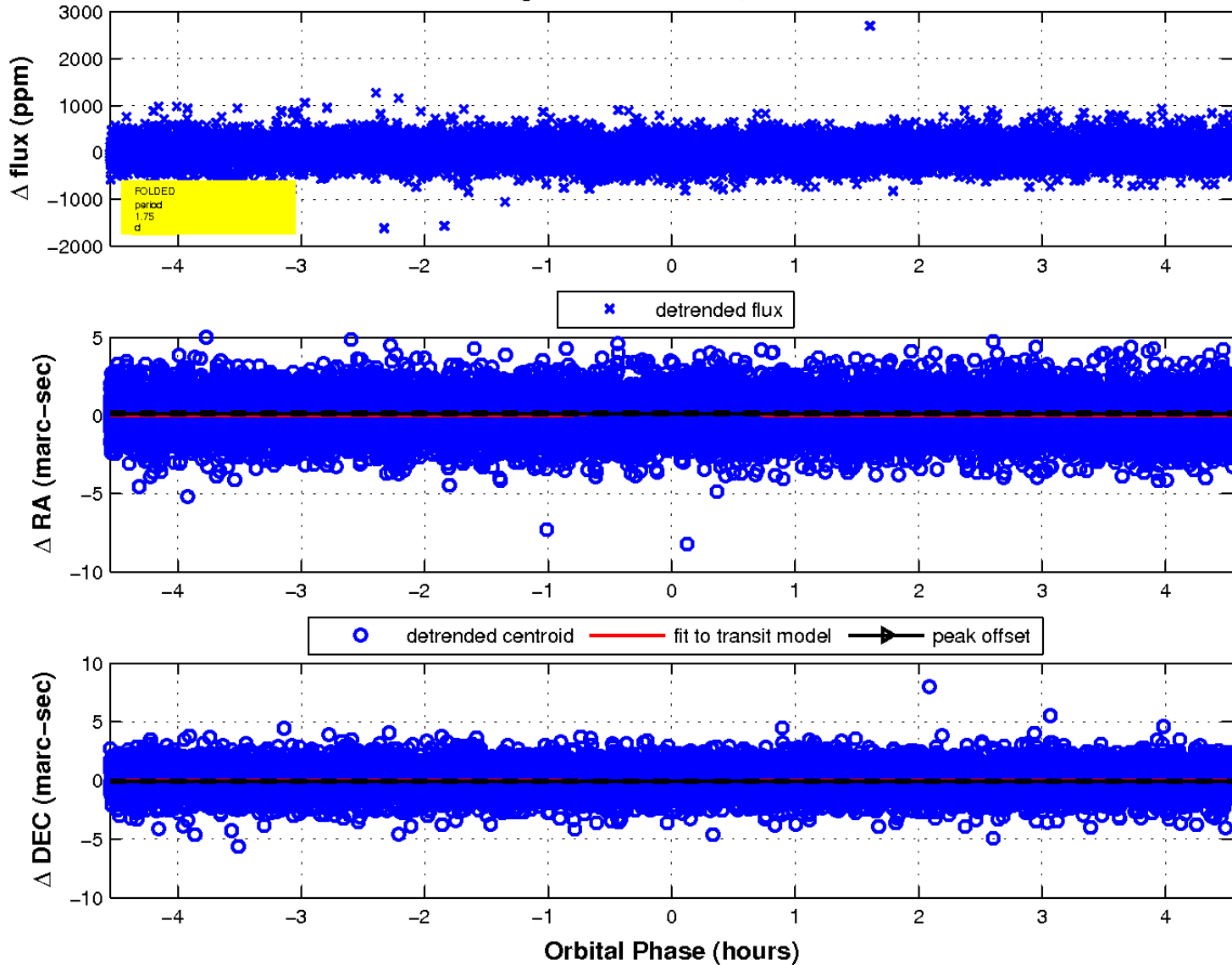
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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



fluxWeightedCentroids, Planet 2 of 2



# UKIRT Image

Declination

