

# KIC 006278403

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
006278403-01	OBS	No	469.086224	297.115546	345.9	19.742	49.5	23.0	2.62	10932	5.03	31.26
006278403-02	OBS	No	1.191241	131.954744	115.0	1.500	13.1	-1.0	2.62	10932	2.90	90227.92

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
006278403-01	OBS	FP	0.00	1	0	0	0	LPP_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_SATURATED
006278403-02	OBS	FP	0.00	1	0	0	0	SWEET_NTL—LPP_DV—LPP_ALT—MOD_NONUNIQ_ALT—CENT_SATURATED

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

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

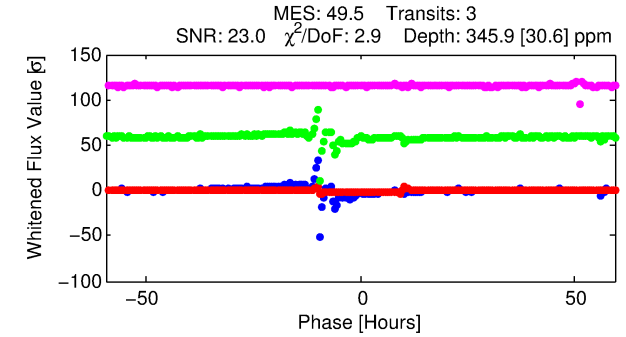
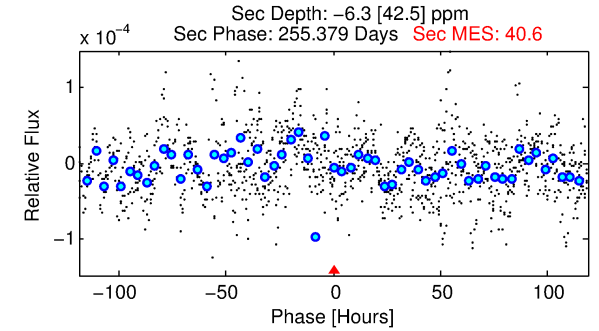
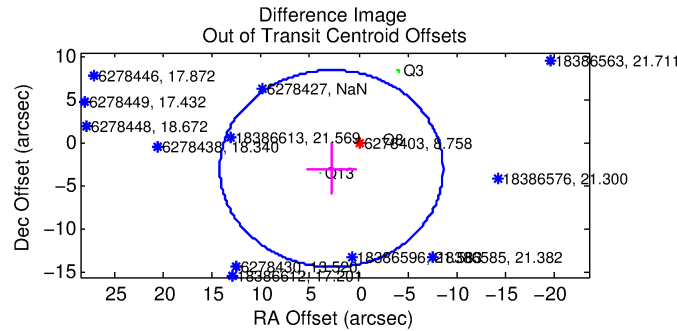
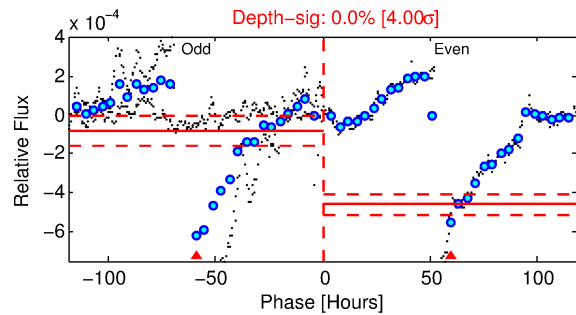
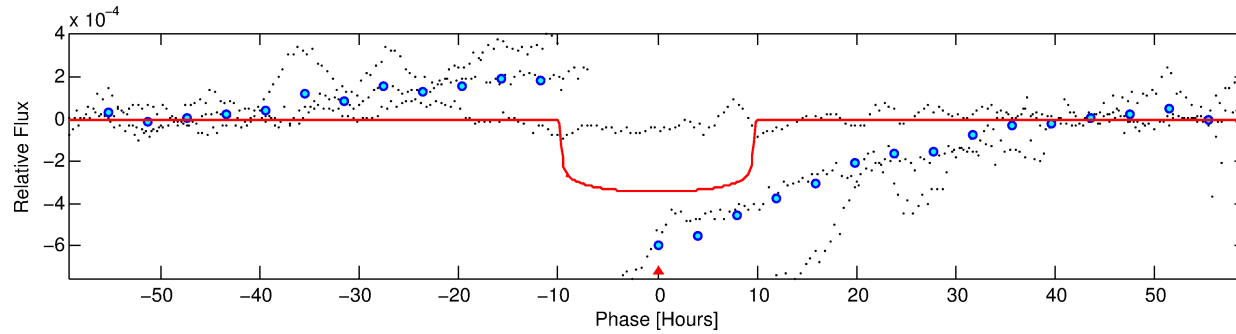
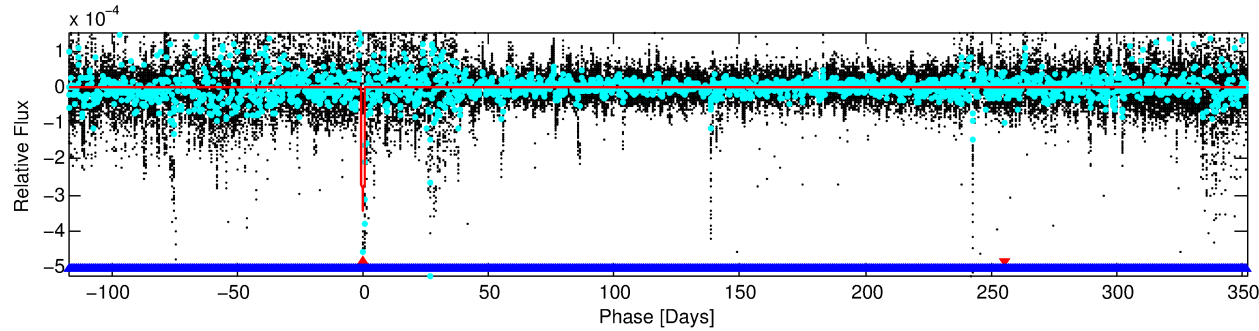
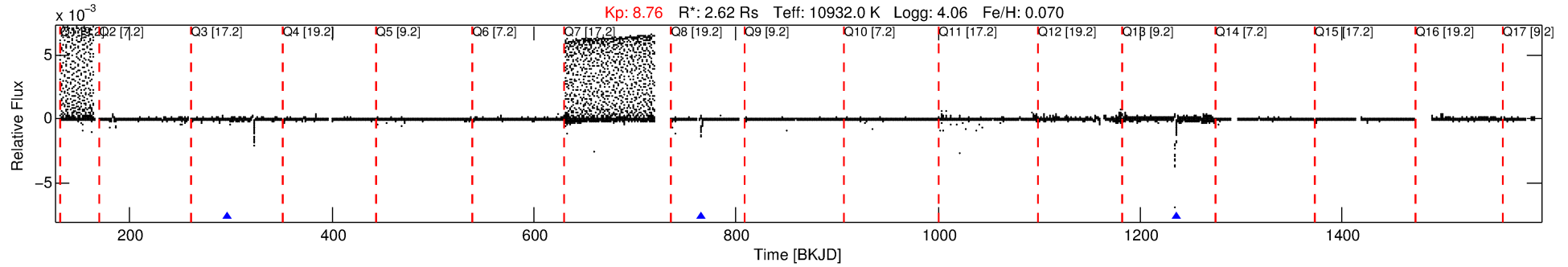
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 006278403-01

No Significant Match Found

# DV One-Page Summary

KIC: 6278403 Candidate: 1 of 2 Period: 469.086 d



## DV Fit Results:

Period = 469.08622 [0.00335] d  
Epoch = 297.1155 [0.0031] BKJD  
Rp/R\* = 0.0176 [0.0023]  
a/R\* = 179.70 [164.53]  
b = 0.24 [3.66]  
Seff = 31.26 [14.53]  
Teq = 603 [70] K  
Rp = 5.03 [1.84] Re  
a = 1.6731 [0.4874] AU  
Ag = N/A  
Teffp = N/A

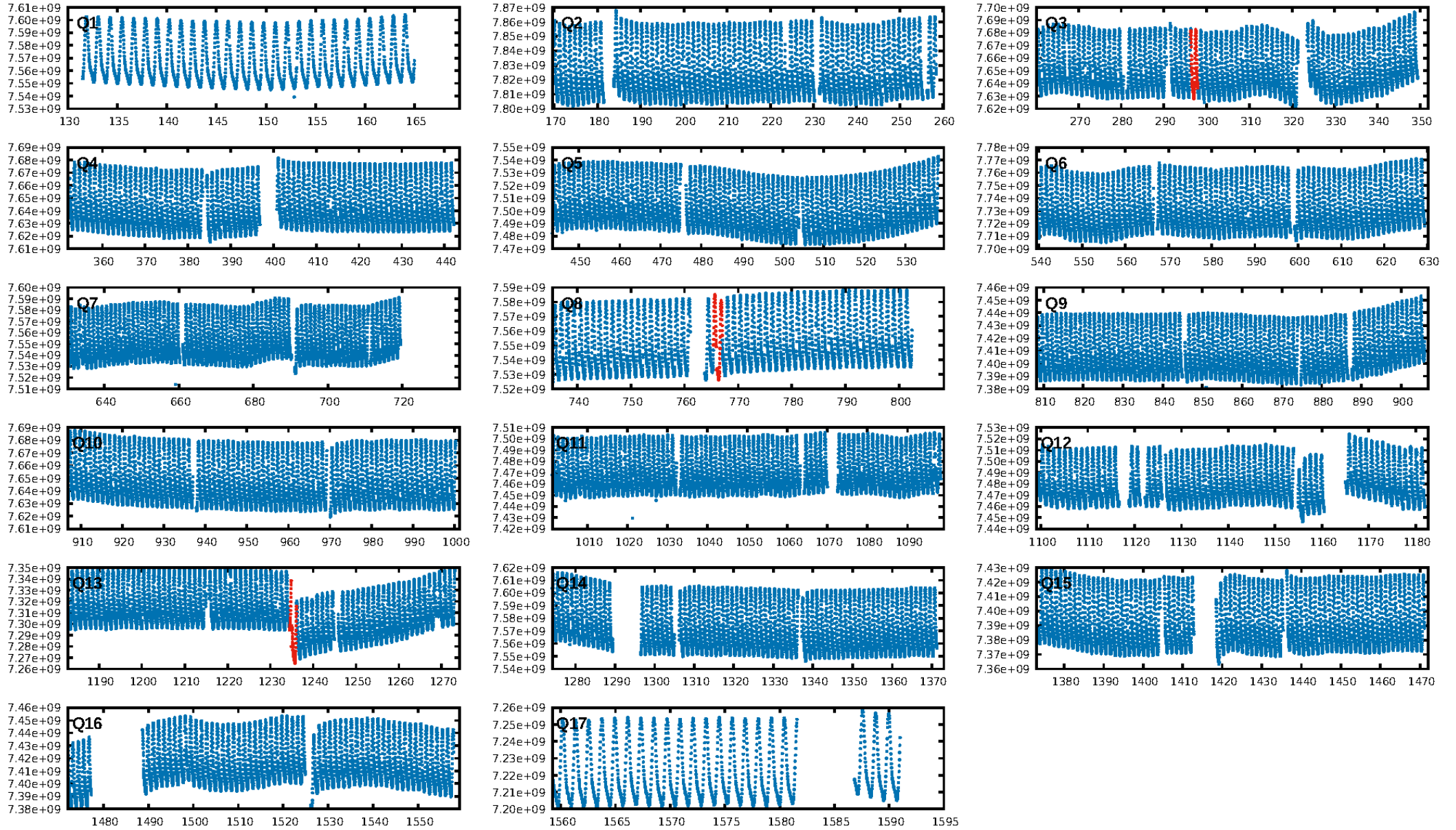
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [567.18 $\sigma$ ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: 0.0%  
ModelChiSquareGof-sig: 0.0%  
Bootstrap-pfa: N/A  
RollingBand-fgt: 1.00 [3/3]  
GhostDiagnostic-chr: N/A  
Centroid-sig: 42.8%  
Centroid-so: 1.291 arcsec [0.97 $\sigma$ ]  
OotOffset-rm: 4.081 arcsec [1.07 $\sigma$ ]  
KicOffset-rm: 5.293 arcsec [1.08 $\sigma$ ]  
OotOffset-st: 0/1/1/1 [3]  
KicOffset-st: 0/1/1/1 [3]  
DiffImageQuality-fgm: 0.00 [0/3]  
DiffImageOverlap-fno: 0.00 [0/3]

Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 31-Jan-2016 00:43:39 Z

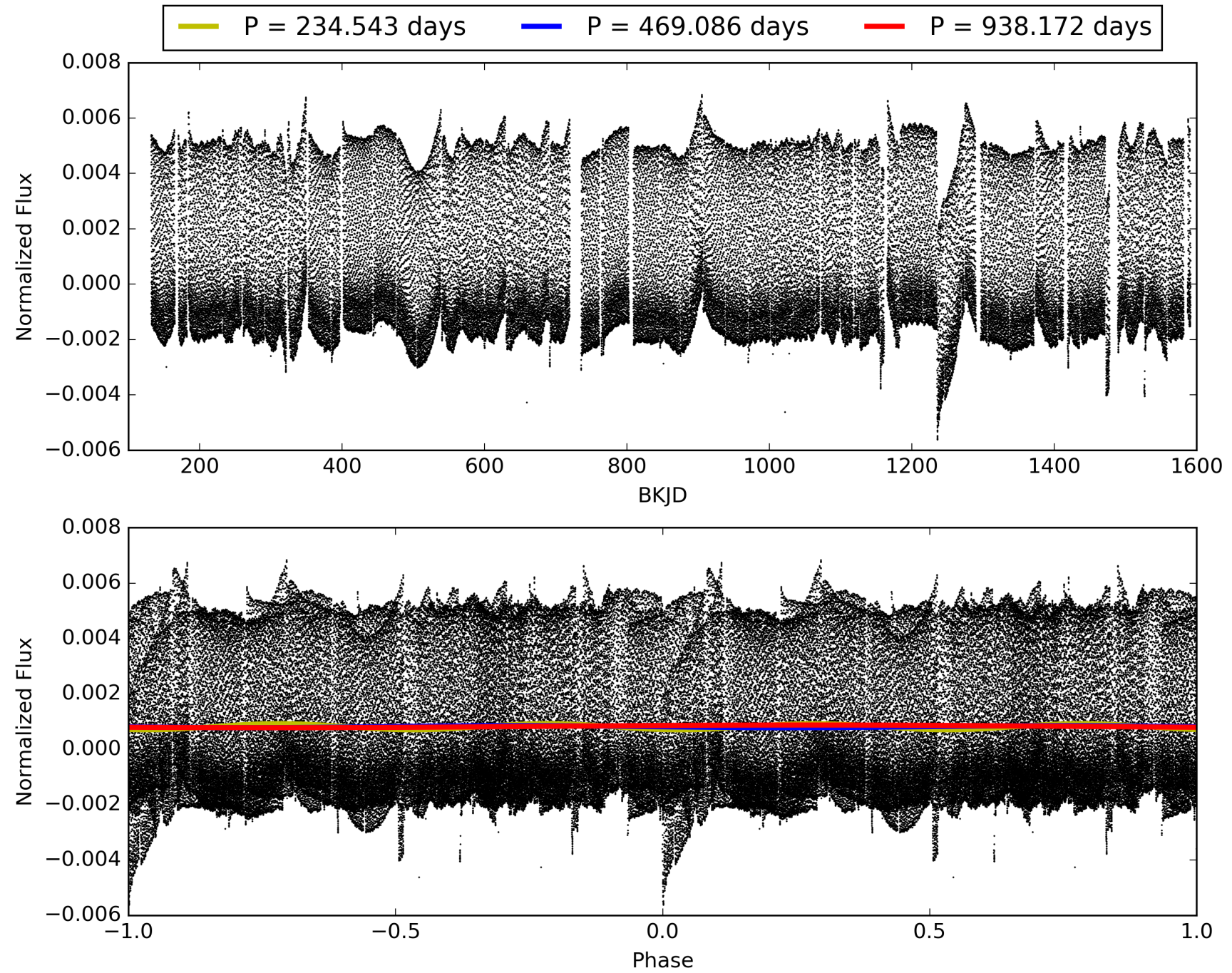
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

# TCE 006278403-01, PDC Light Curves



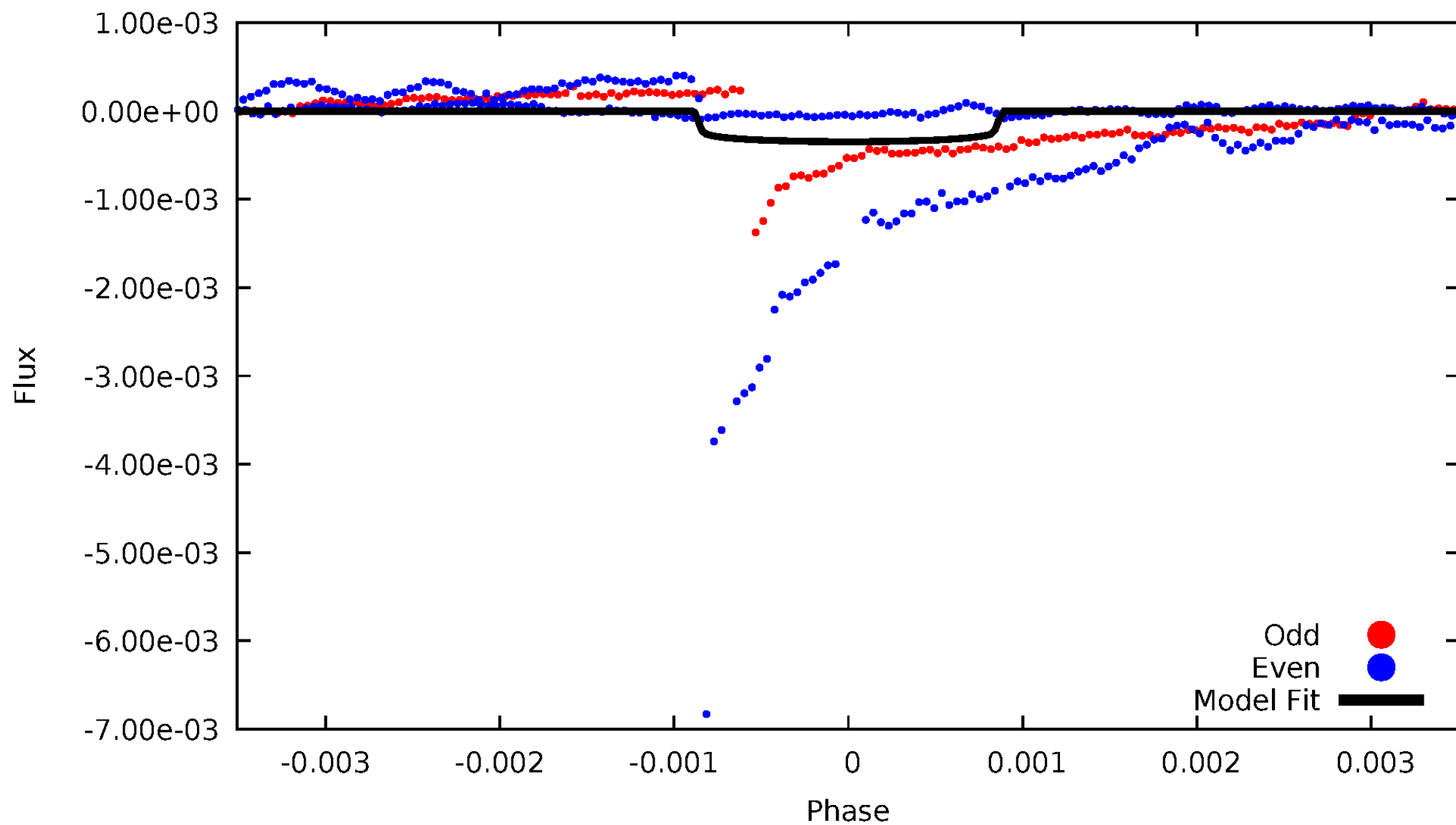


TCE 006278403-01



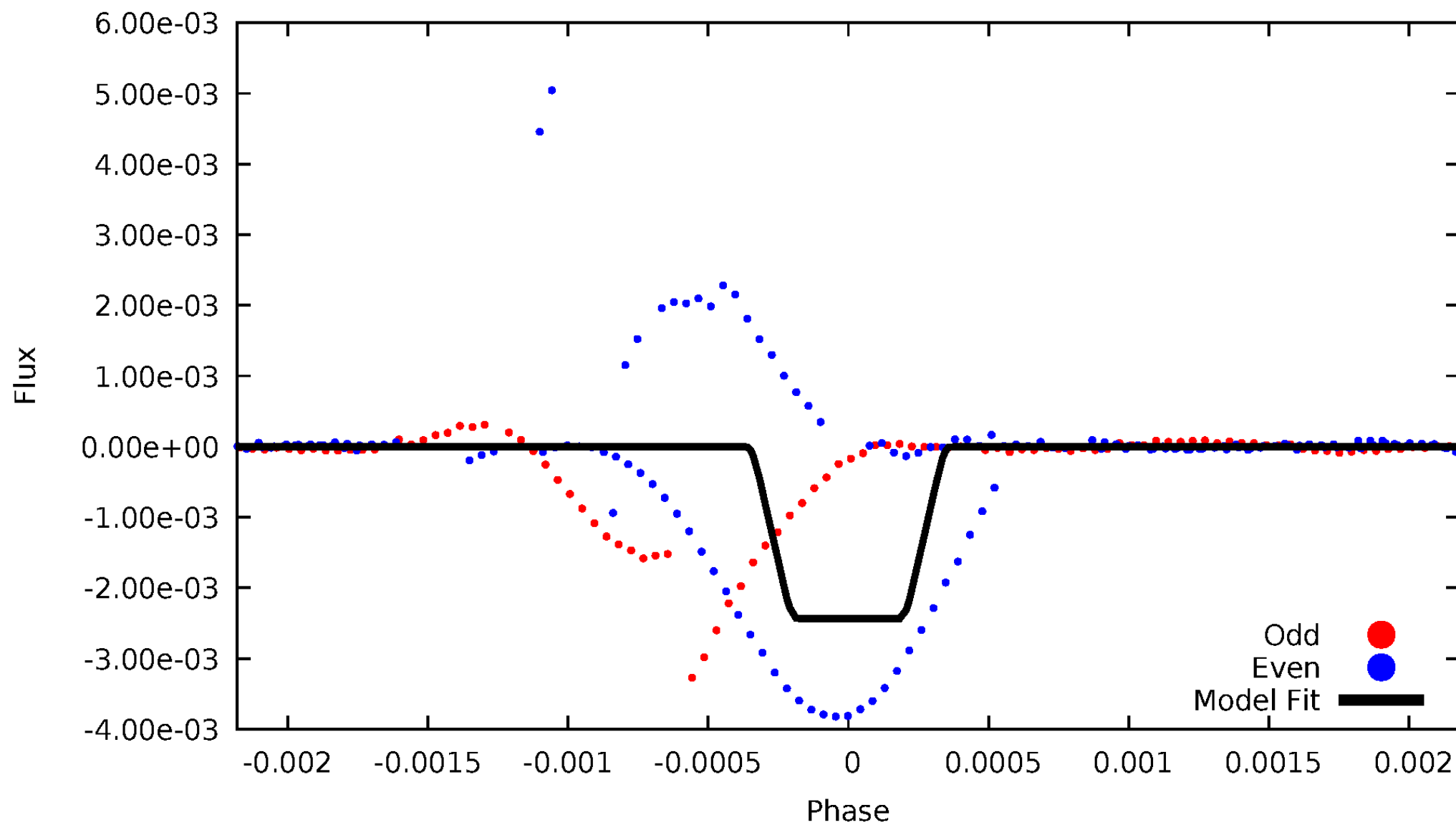
DV Odd/Even

TCE 006278403-01



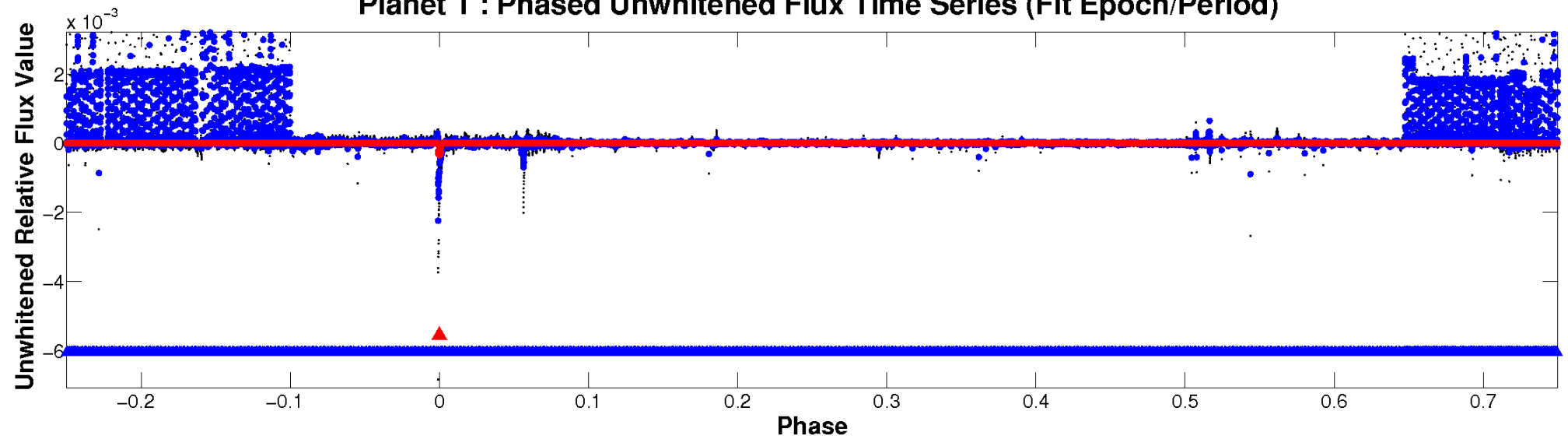
# ALT Odd/Even

TCE 006278403-01

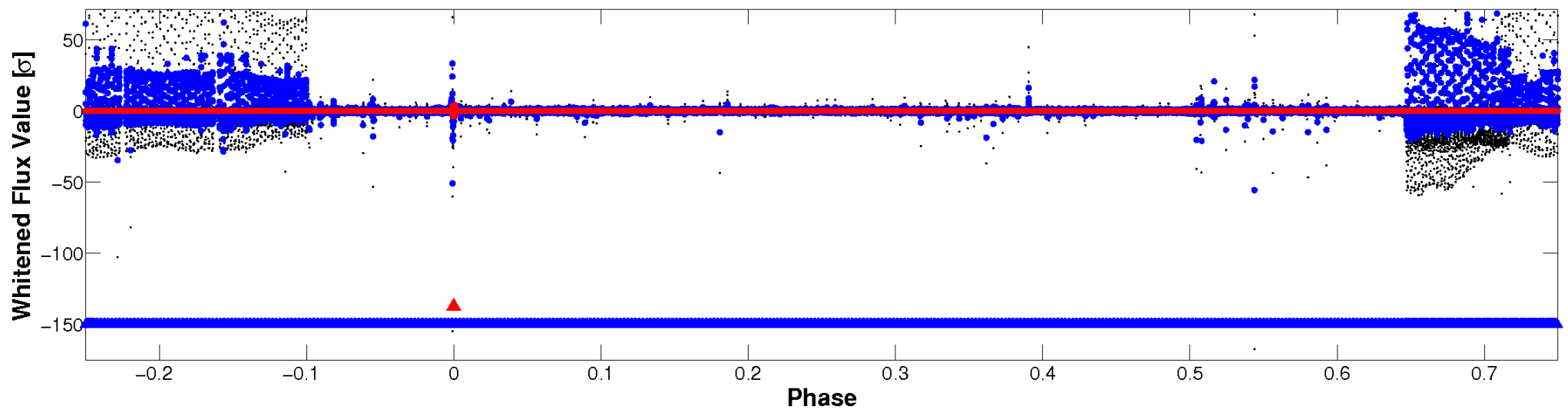


# Non-Whitened Vs. Whitened Light Curve

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

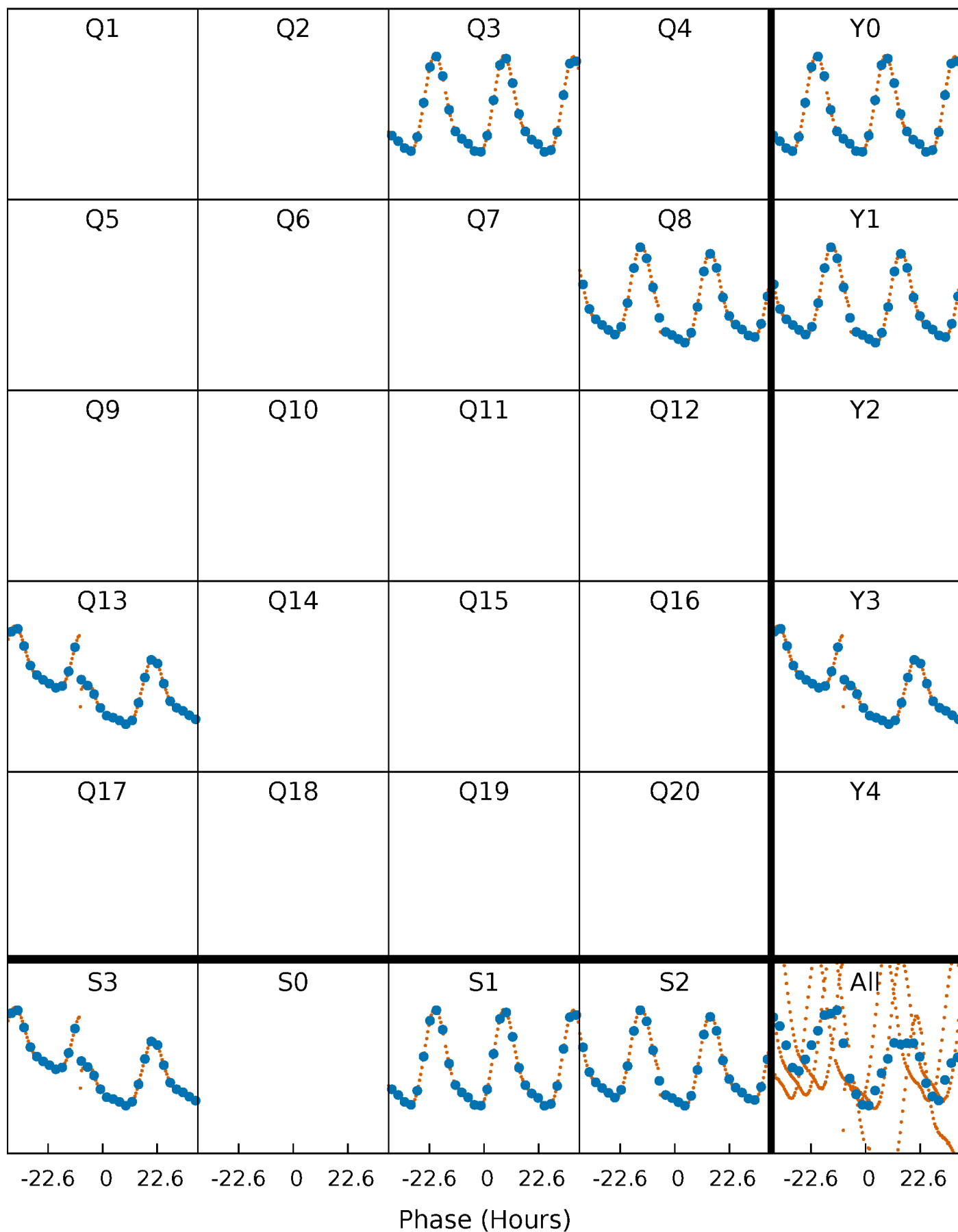


Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)



# PDC Quarter-Phased Transit Curves

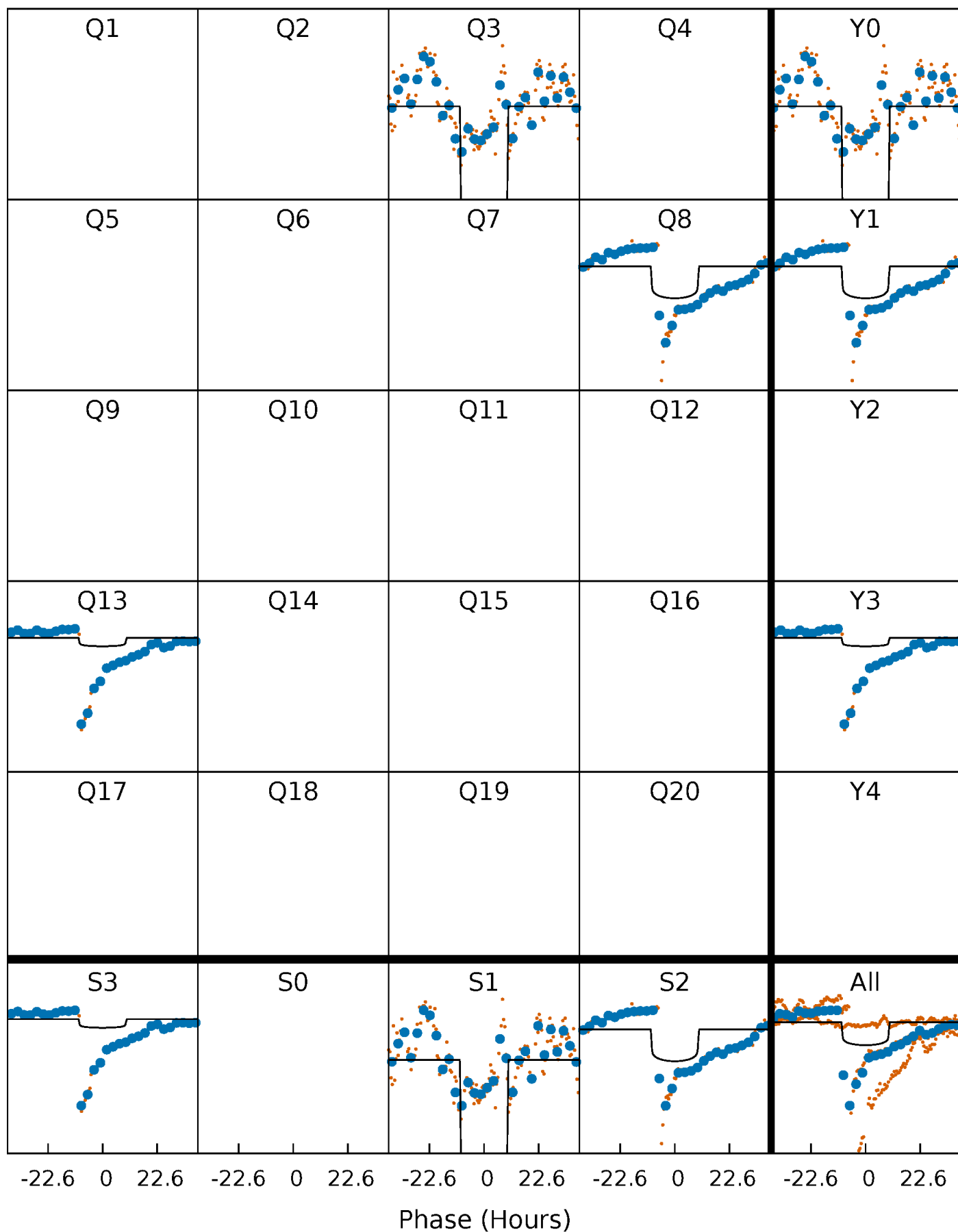
TCE 006278403-01 P=469.086224 Days  $T_0=297.115546$  (BKJD)





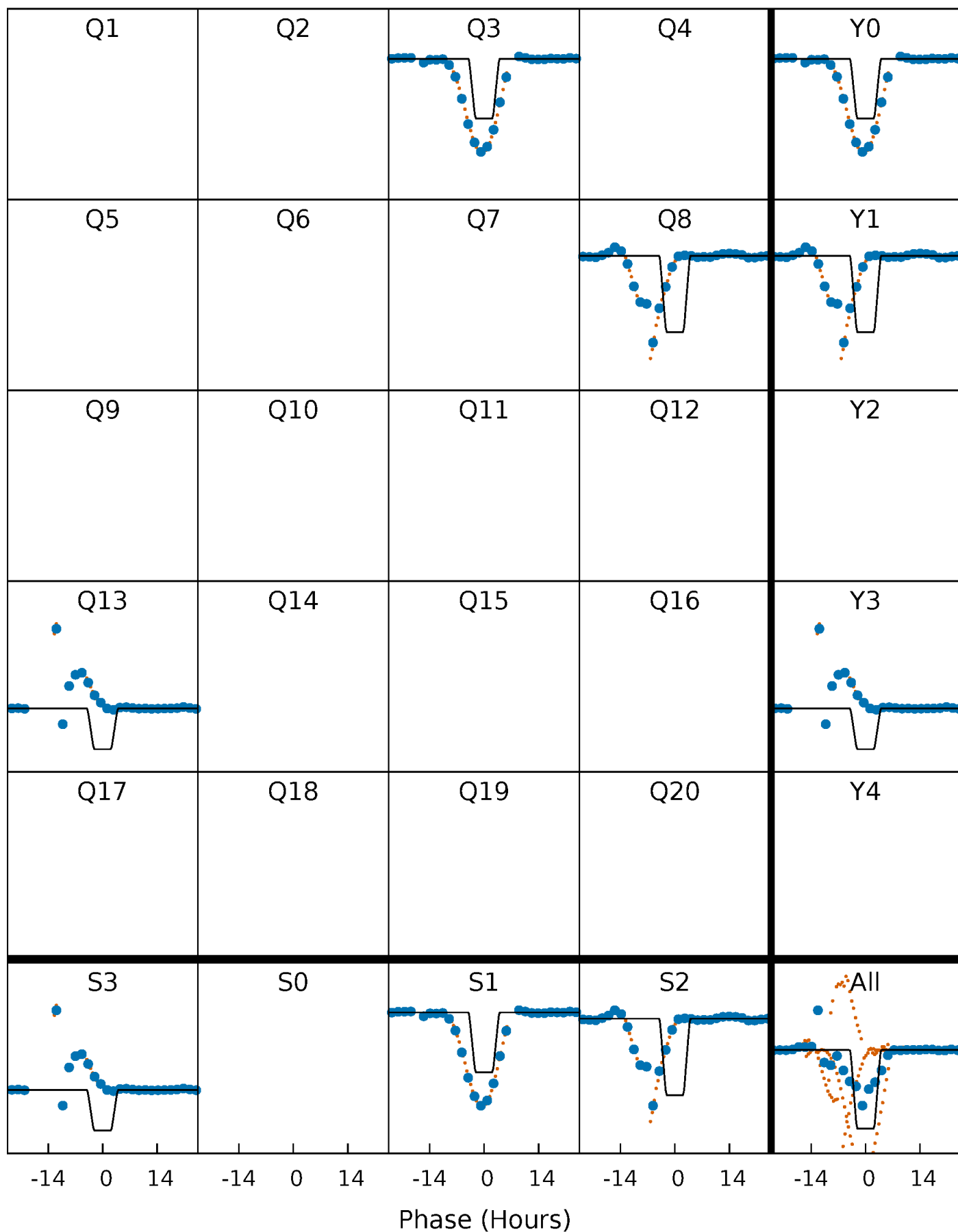
# DV Quarter-Phased Transit Curves

TCE 006278403-01 P=469.086224 Days  $T_0=297.115546$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

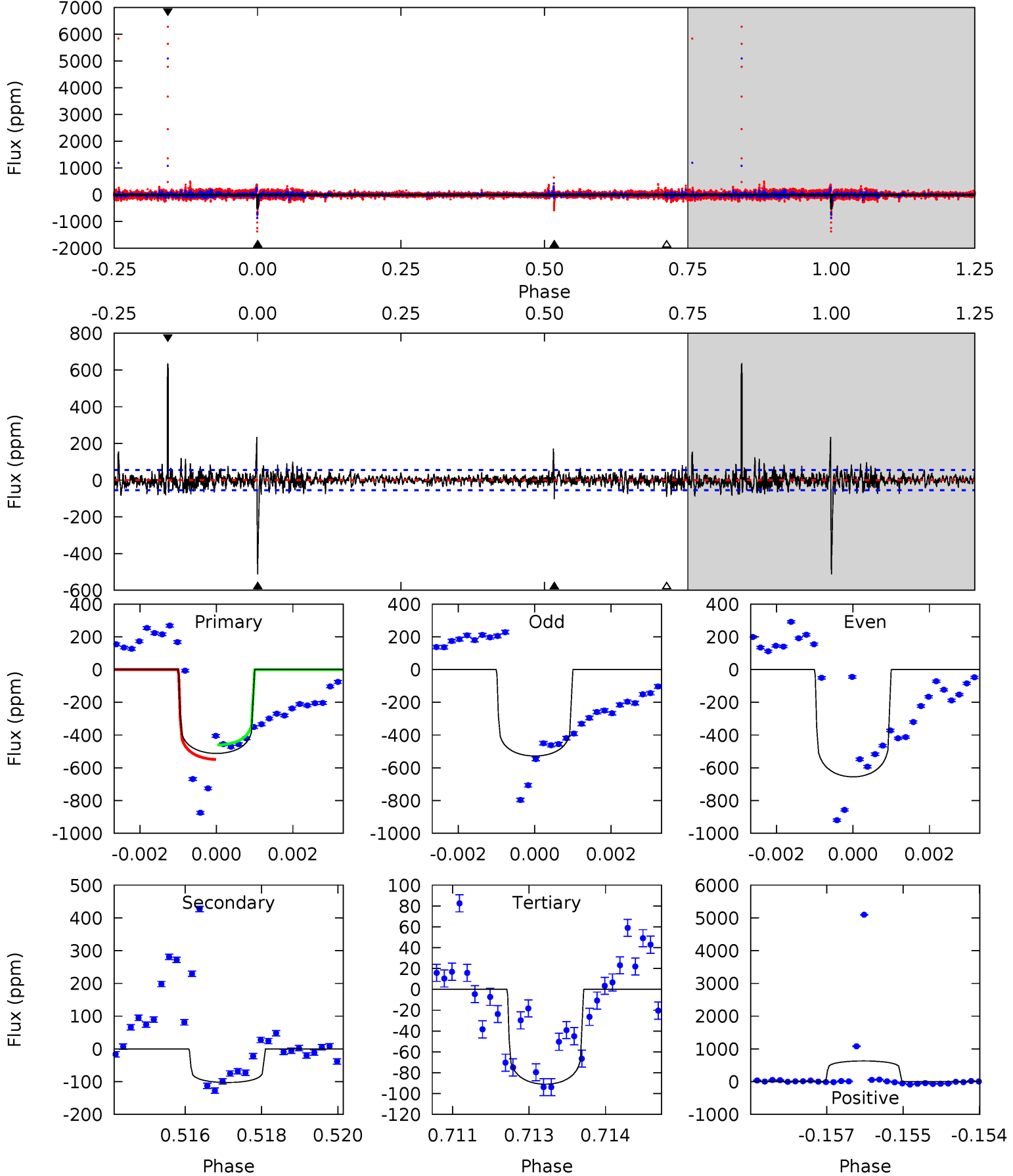
TCE 006278403-01 P=469.086426 Days  $T_0=297.126872$  (BKJD)



# DV Model-Shift Uniqueness Test

006278403-01, P = 469.086224 Days, E = 297.115546 Days

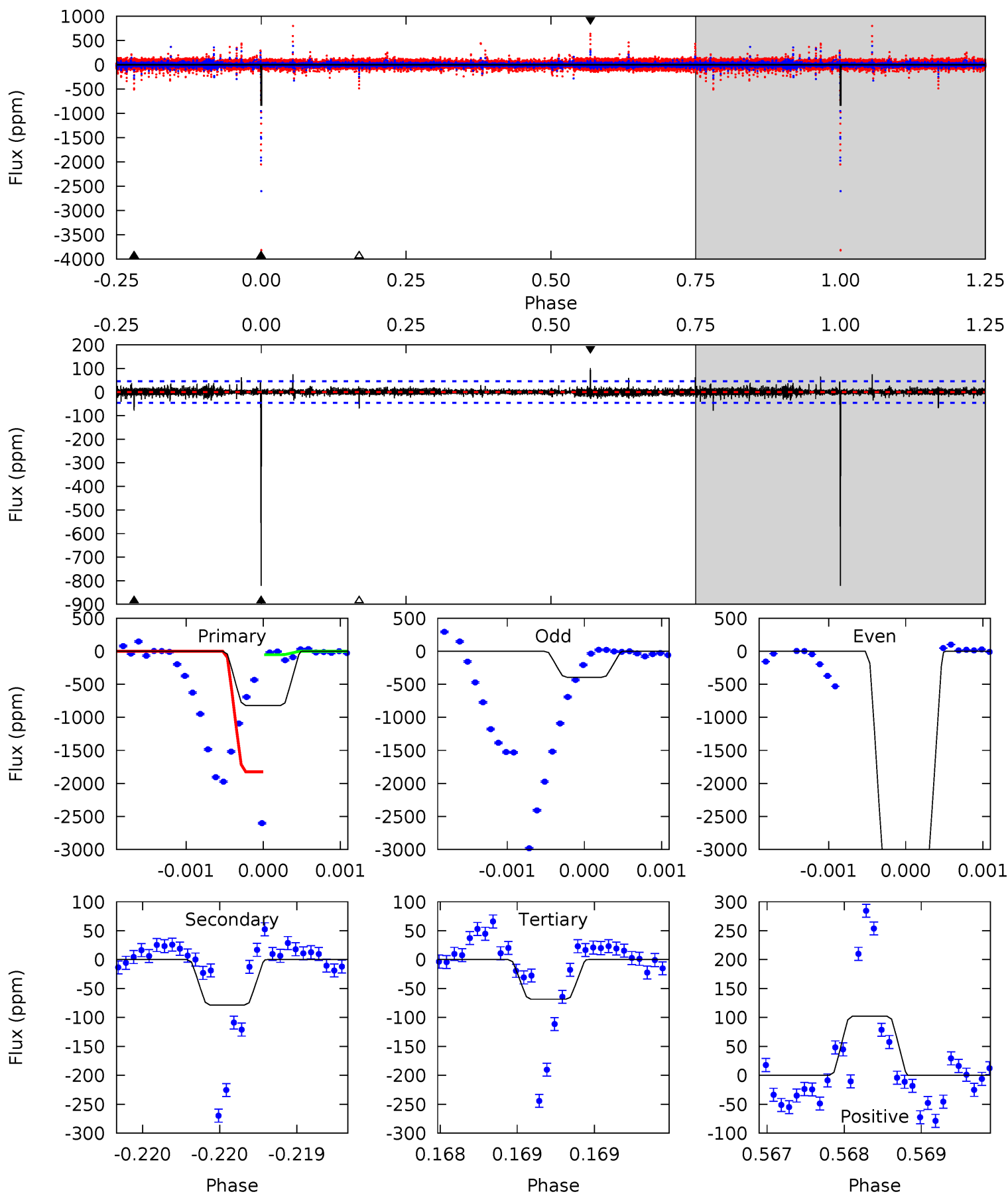
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
49.7	9.97	8.84	61.3	5.35	3.12	2.71	40.9	-11.6	1.12	-51.4	1.08	1.61	0.55	4.20



# Alt Model-Shift Uniqueness Test

006278403-01, P = 469.086426 Days, E = 297.126872 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
99.4	9.49	8.29	12.4	5.51	3.38	0.94	91.1	87.1	1.20	-2.87	145.7	3.20	0.11	106.0



### Stellar Parameters For KIC 006278403

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$10932^{+228}_{-495}$	$4.056^{+0.236}_{-0.193}$	$0.070^{+0.050}_{-0.600}$	$2.615^{+0.733}_{-0.895}$	$2.838^{+0.289}_{-0.674}$	$0.224^{+0.370}_{-0.106}$
	+2%/-5%	+6%/-5%	+71%/-857%	+28%/-34%	+10%/-24%	+165%/-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 006278403-01 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$-103 \pm 10$	$4.94^{+1.16}_{-1.02}$	$839^{+70}_{-72}$	$7441^{+775}_{-542}$	$6205^{+3500}_{-2031}$
Alt.	$-78 \pm 8$	$13.87^{+2.45}_{-2.47}$	$834^{+69}_{-74}$	$4343^{+144}_{-130}$	$614^{+268}_{-165}$

$T_{\text{max}}$  = 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

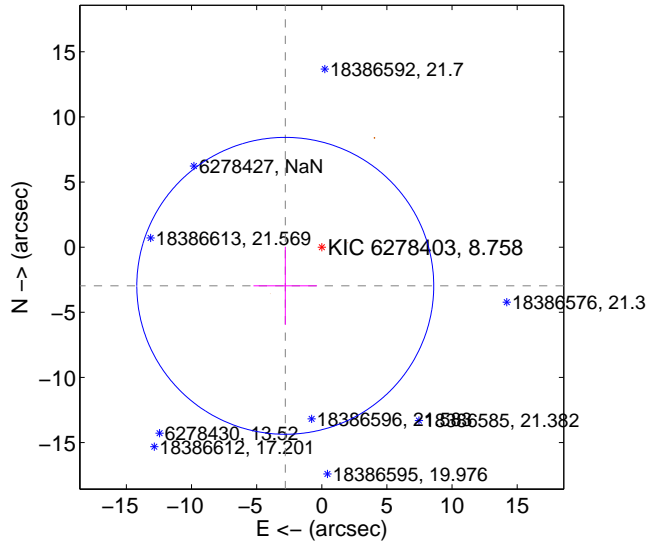
Supplemental centroid analysis for 006278403-01. **Kepler magnitude: 8.76.** Transit SNR 22.96

There are 0 quarters with good PRF difference image offsets

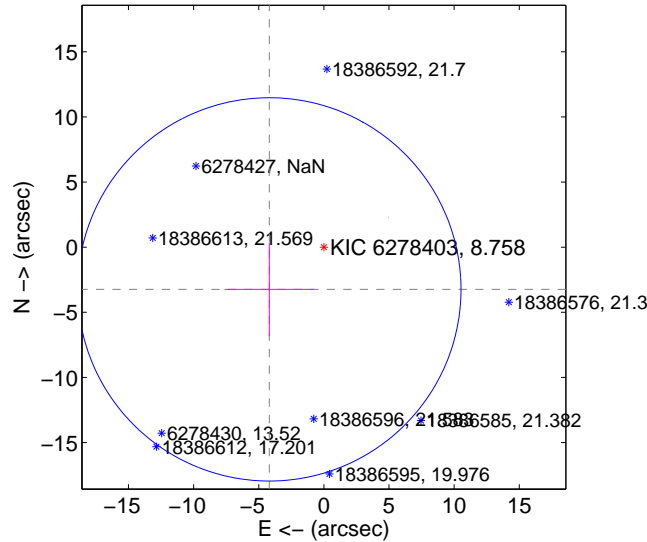
The OOT PRF centroid is offset from the target star catalog position by about 2.45 arcsec so the offset from difference PRF-fit to OOT-fit may be invalid.

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$4.081 \pm 3.797$	1.07	$2.802 \pm 2.437$	$-2.967 \pm 2.999$
PRF-fit source offset from KIC position	$5.293 \pm 4.903$	1.08	$4.186 \pm 3.441$	$-3.240 \pm 3.600$
photometric centroid source offset	$1.29 \pm 1.34$	0.97	$0.88 \pm 1.04$	$-0.94 \pm 1.55$

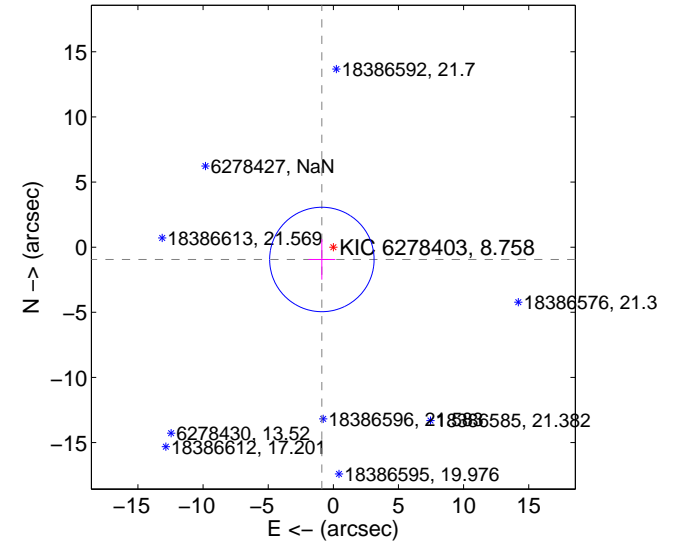
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position



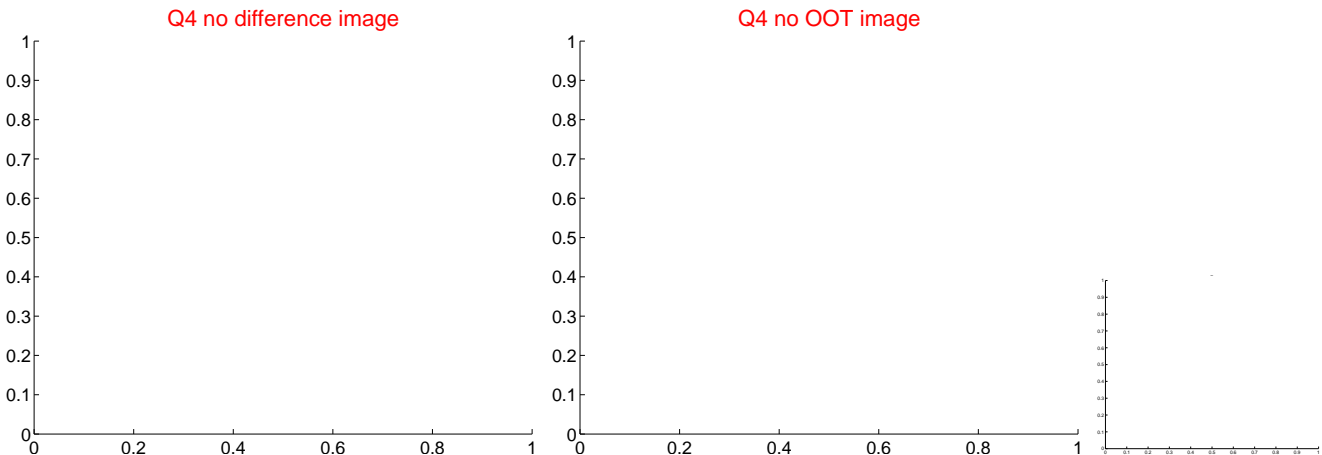
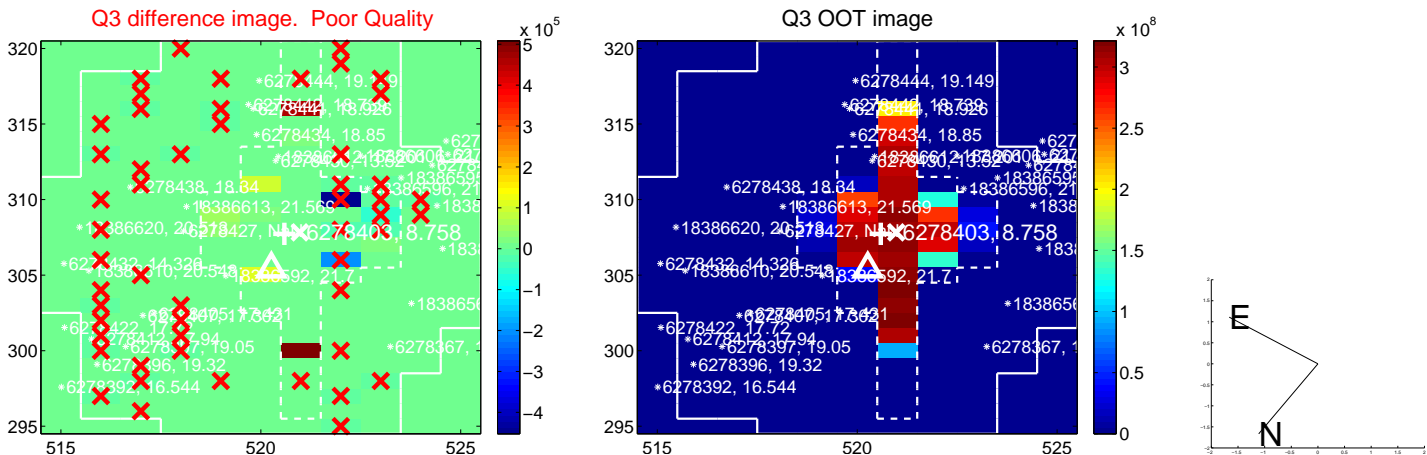
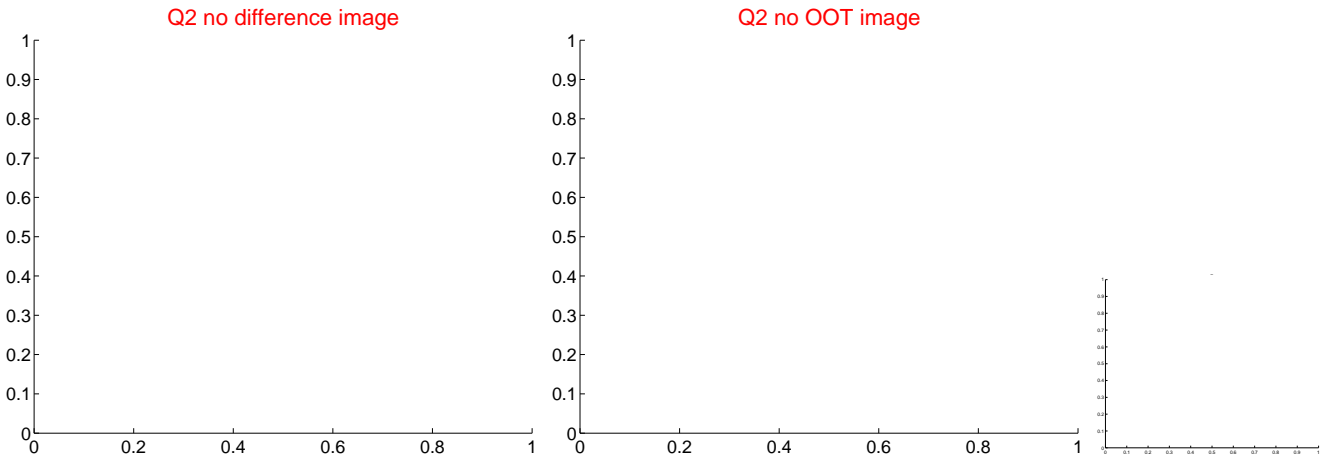
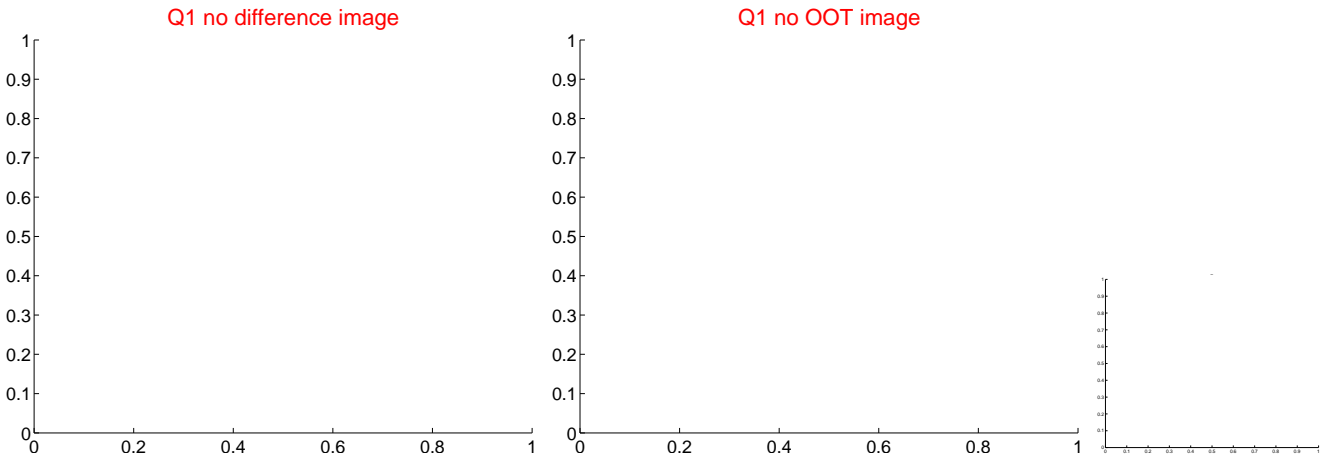
offset from photometric centroids



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.

Q5 no difference image



Q5 no OOT image



Q6 no difference image



Q6 no OOT image



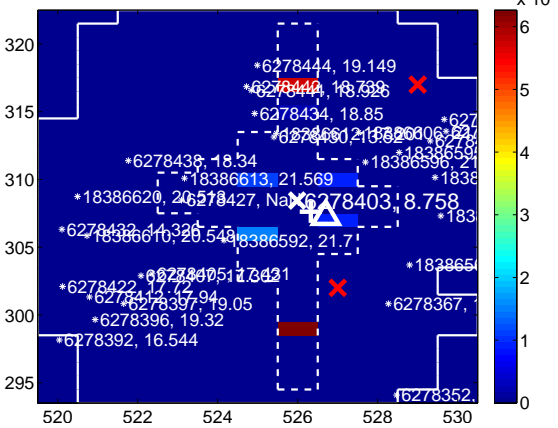
Q7 no difference image



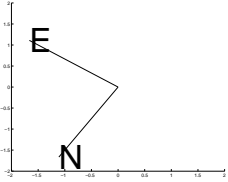
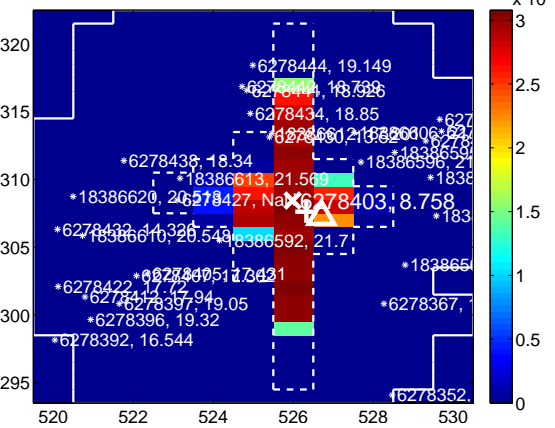
Q7 no OOT image



Q8 difference image. Poor Quality



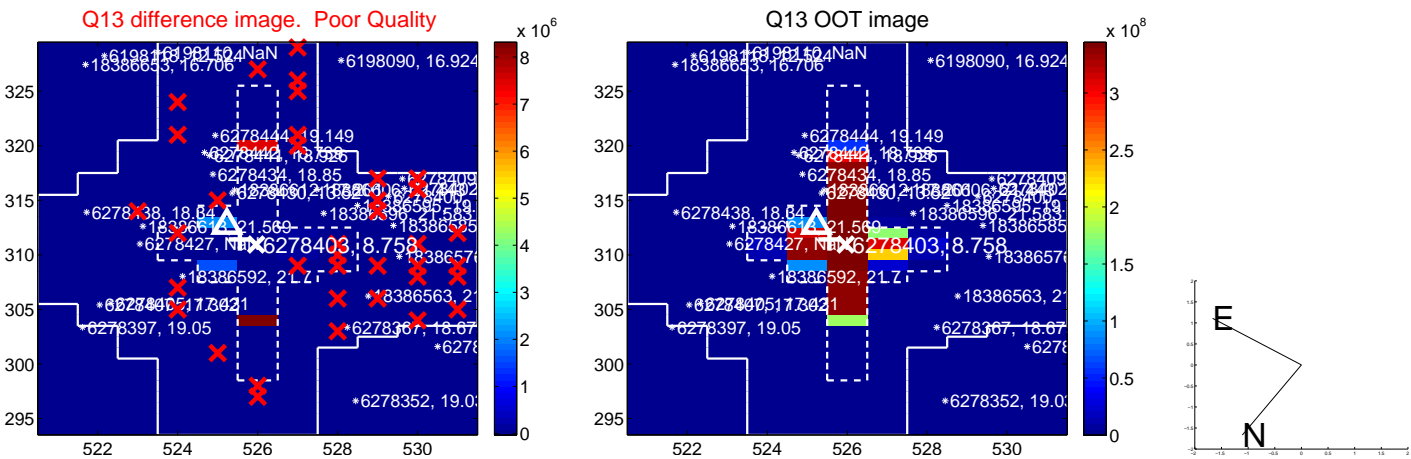
Q8 OOT image



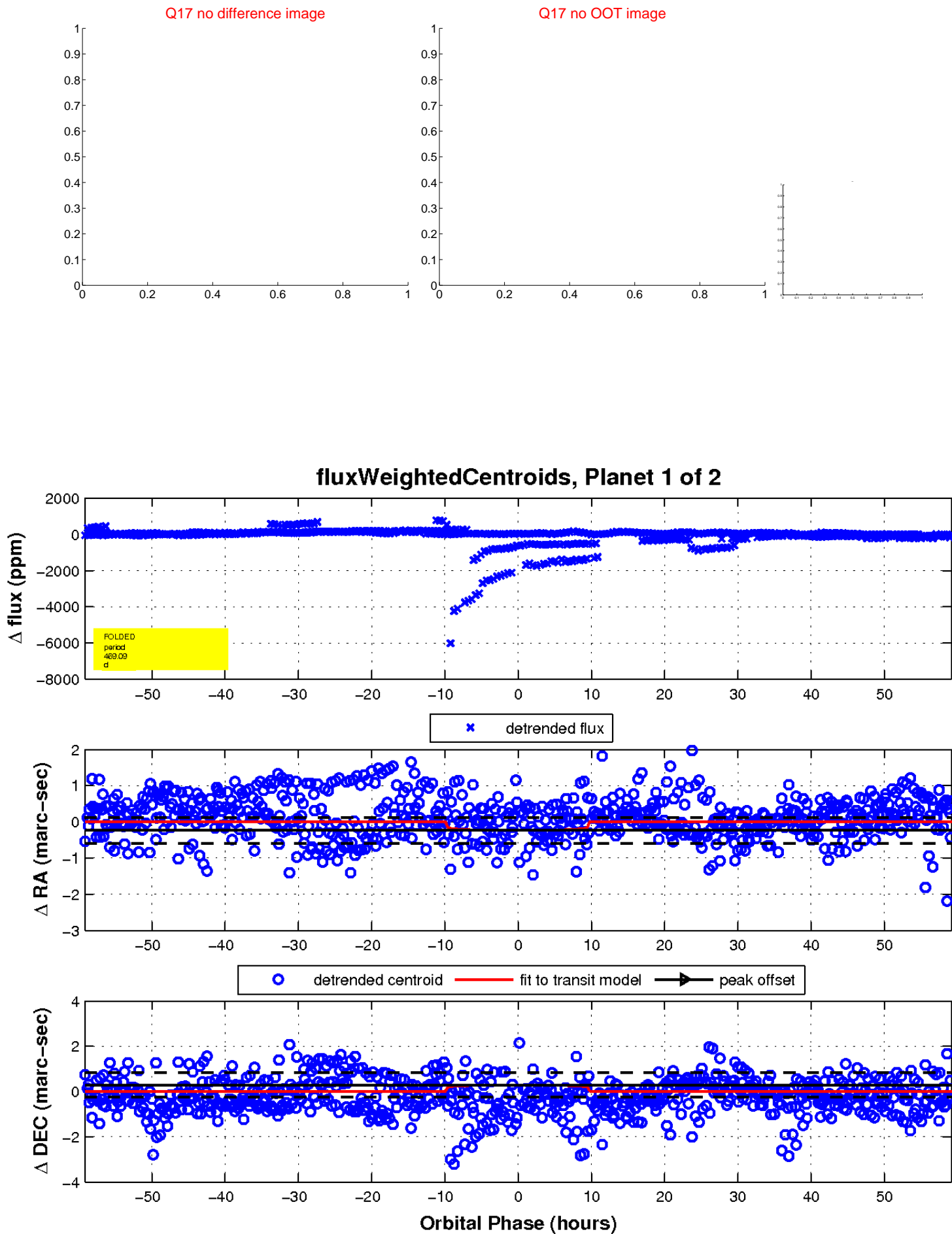
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



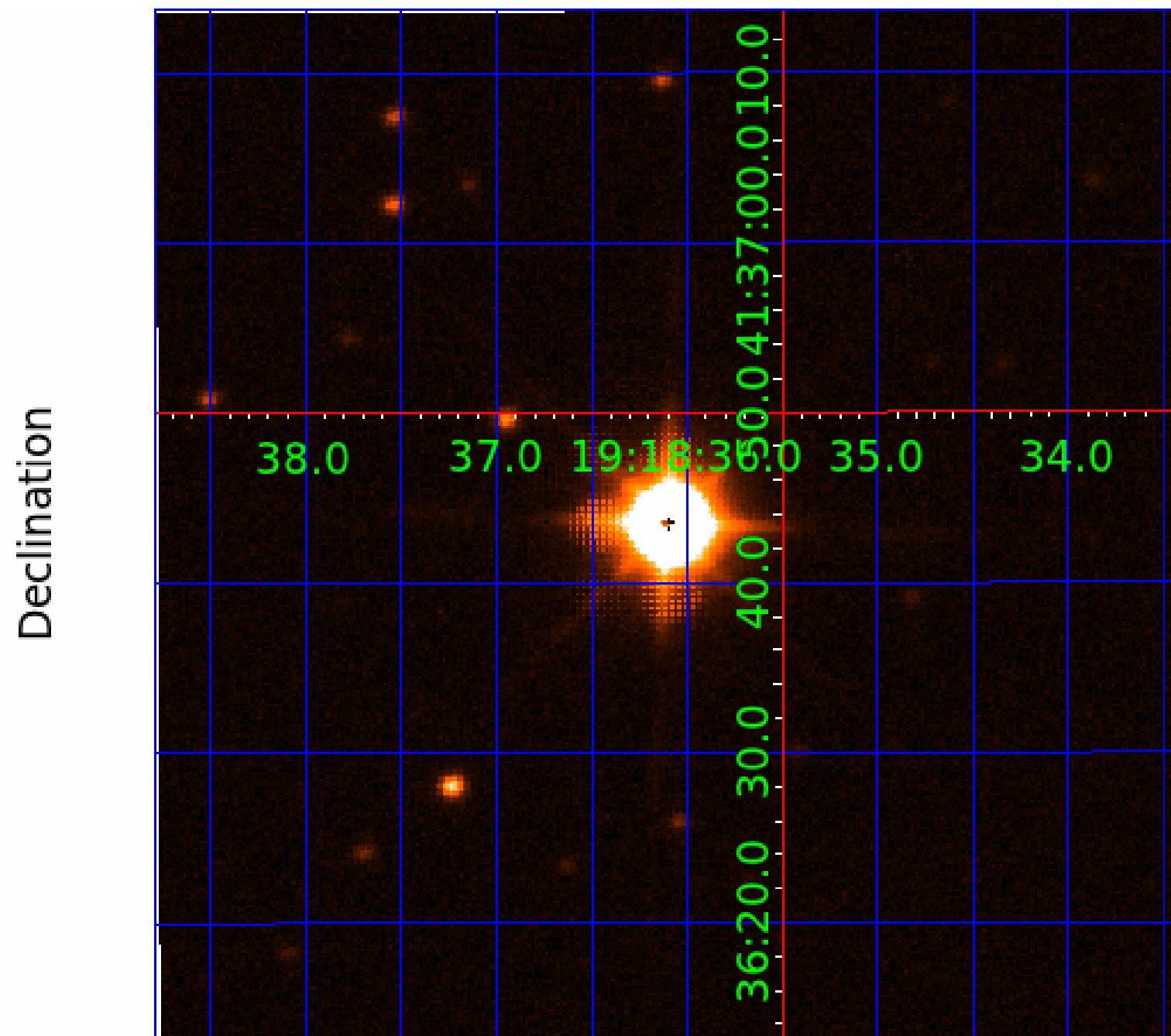
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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



UKIRT Image





# KIC 006278403

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
006278403-01	OBS	No	469.086224	297.115546	345.9	19.742	49.5	23.0	2.62	10932	5.03	31.26
006278403-02	OBS	No	1.191241	131.954744	115.0	1.500	13.1	-1.0	2.62	10932	2.90	90227.92

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
006278403-01	OBS	FP	0.00	1	0	0	0	LPP_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_SATURATED
006278403-02	OBS	FP	0.00	1	0	0	0	SWEET_NTL—LPP_DV—LPP_ALT—MOD_NONUNIQ_ALT—CENT_SATURATED

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

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

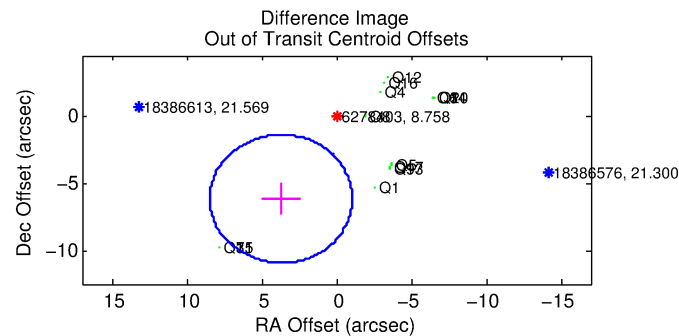
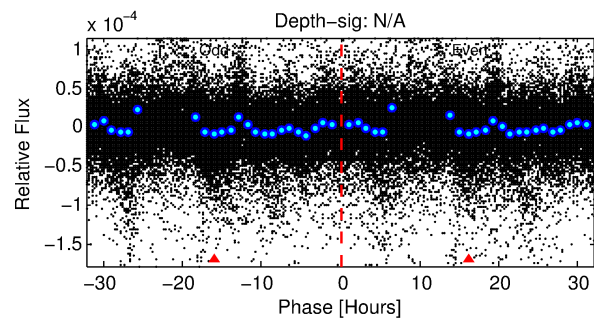
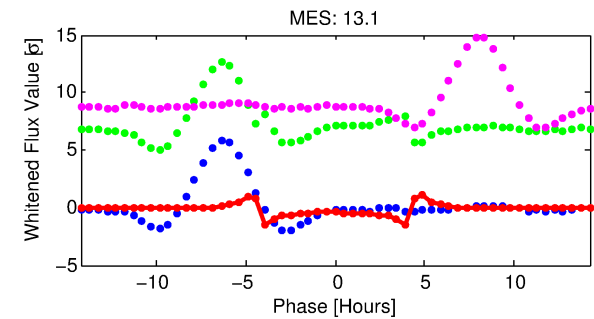
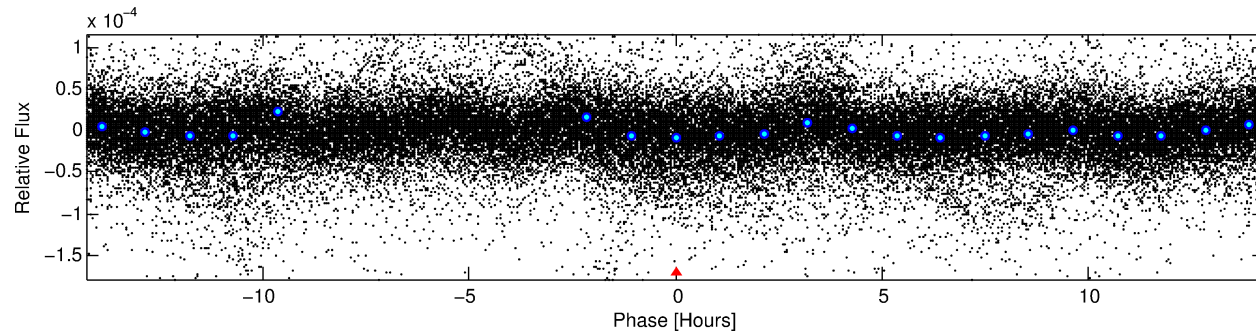
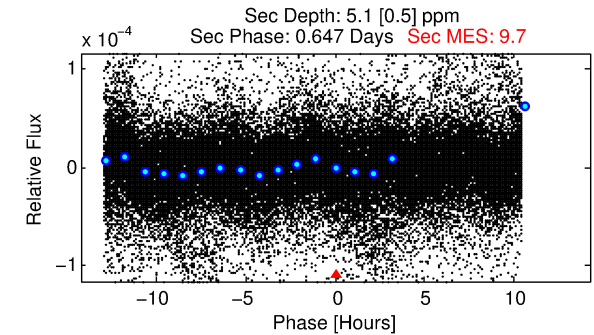
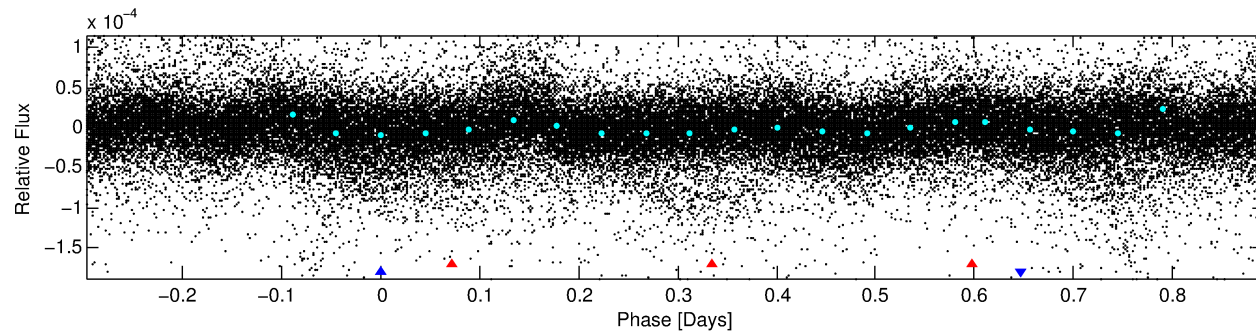
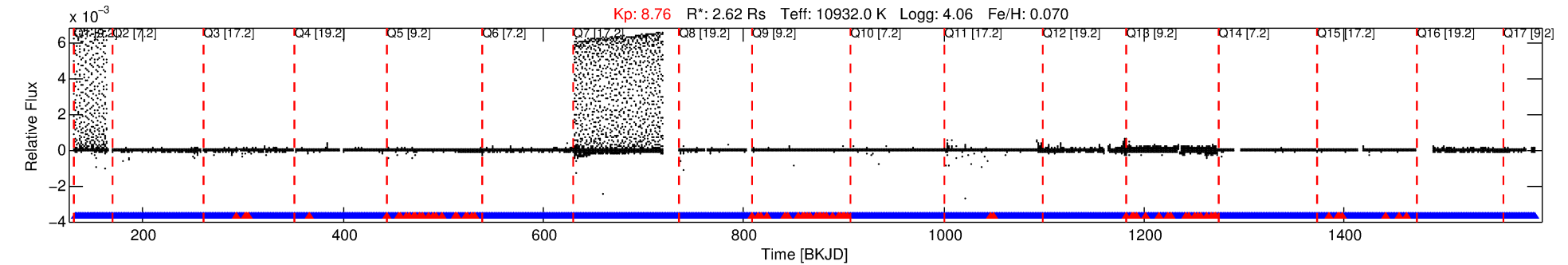
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 006278403-02

No Significant Match Found

# DV One-Page Summary

KIC: 6278403 Candidate: 2 of 2 Period: 1.191 d



TPS TCE Results:

Period = 1.19124 d  
Epoch = 131.9547 BKJD

DV fit results are unavailable

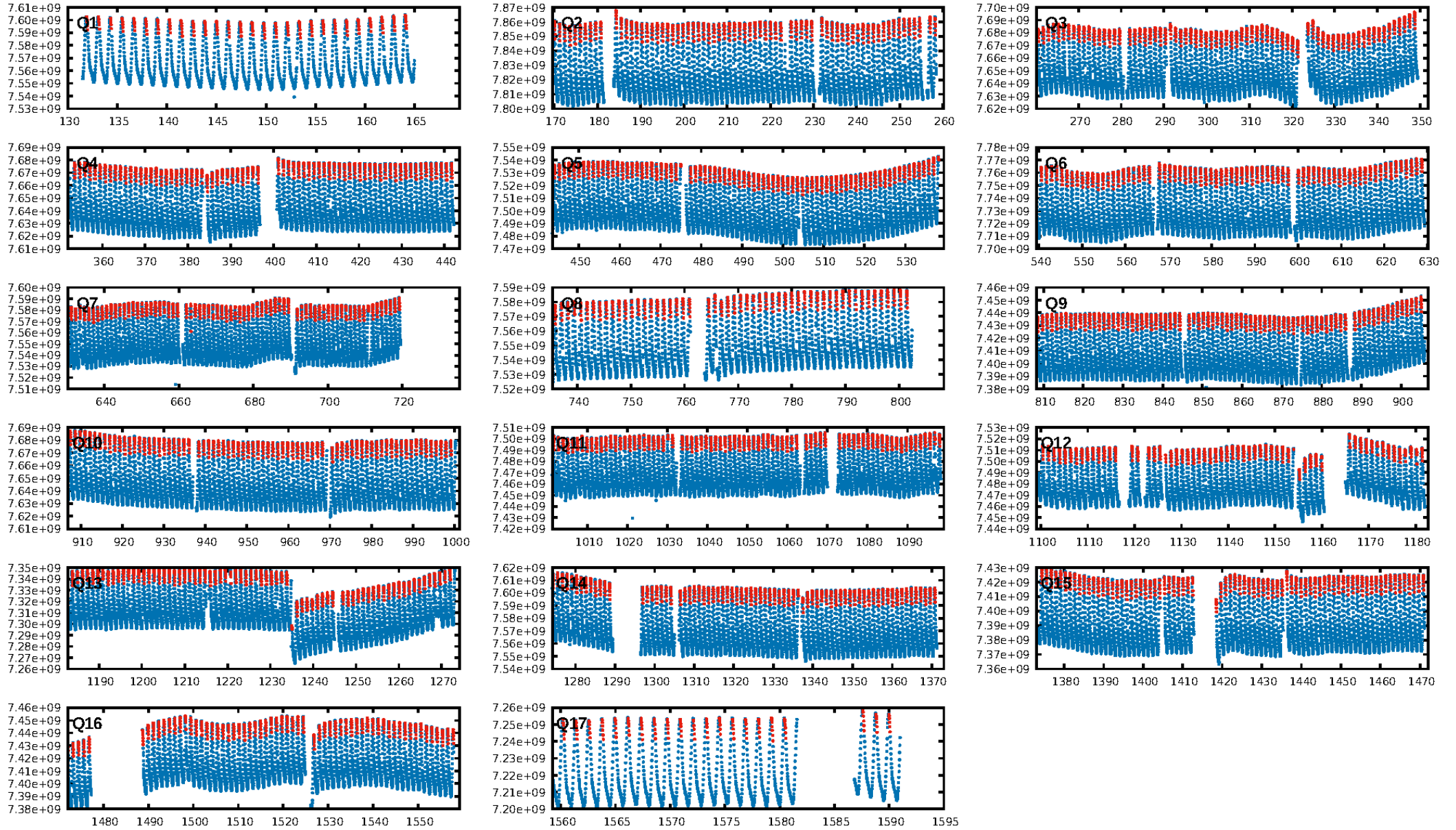
DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 100.0% [567.18σ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: N/A  
RollingBand-fgt: 0.93 [997/1072]  
GhostDiagnostic-chr: N/A  
Centroid-sig: 0.1%  
Centroid-so: 0.628 arcsec [1.64σ]  
OotOffset-rm: 7.192 arcsec [4.53σ]  
KicOffset-rm: 6.377 arcsec [3.30σ]  
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: 31-Jan-2016 00:43:46 Z

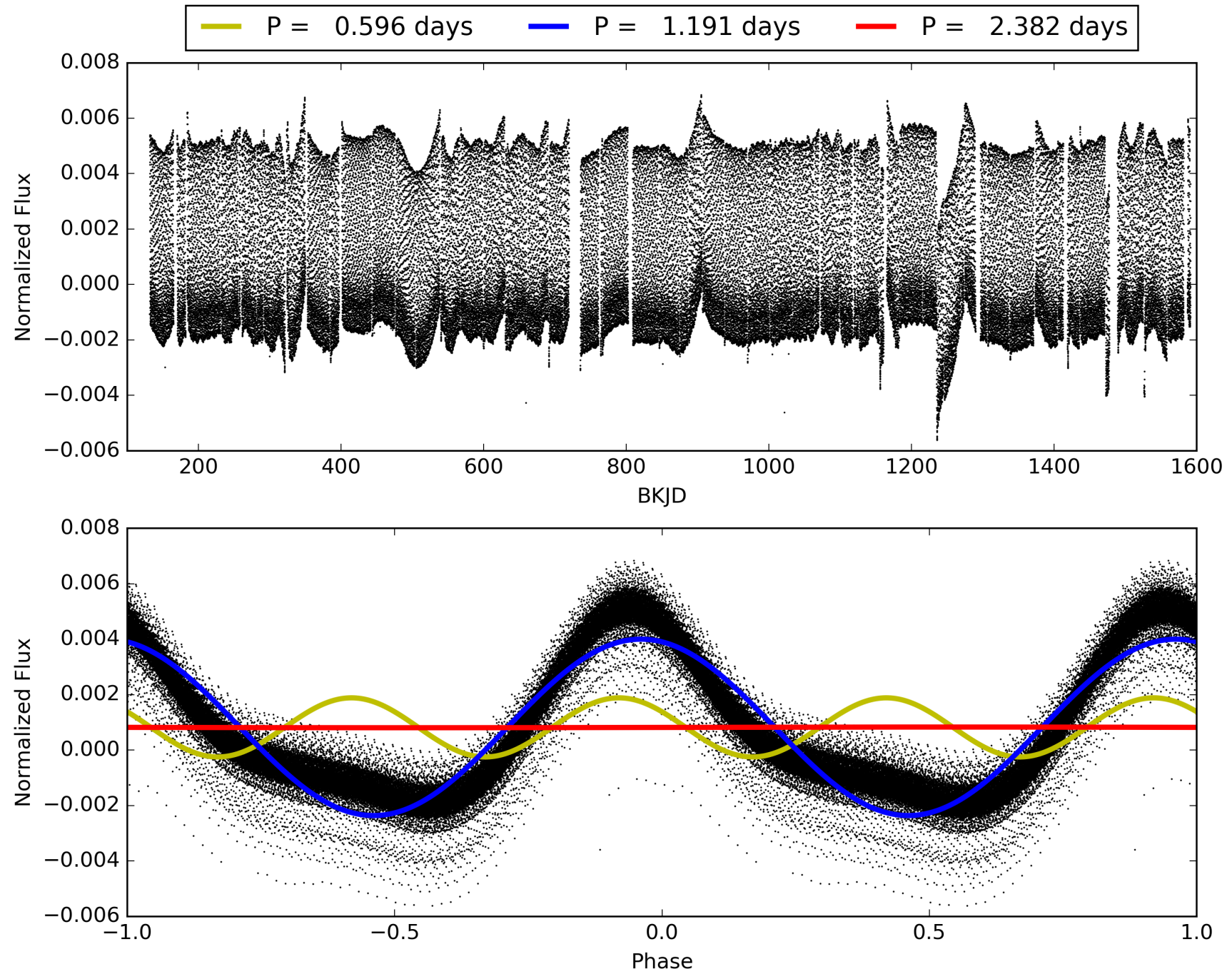
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

# TCE 006278403-02, PDC Light Curves



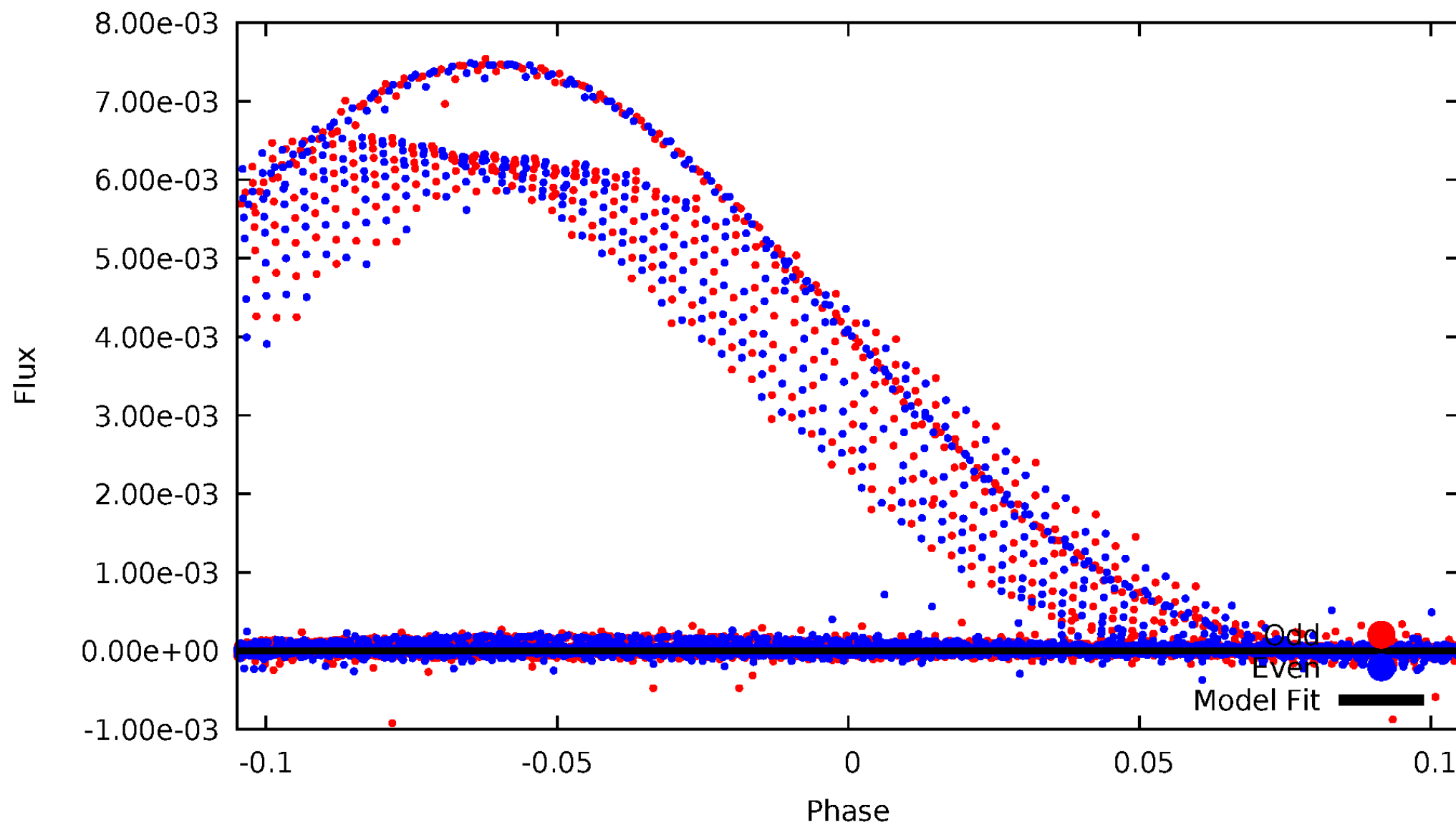


TCE 006278403-02



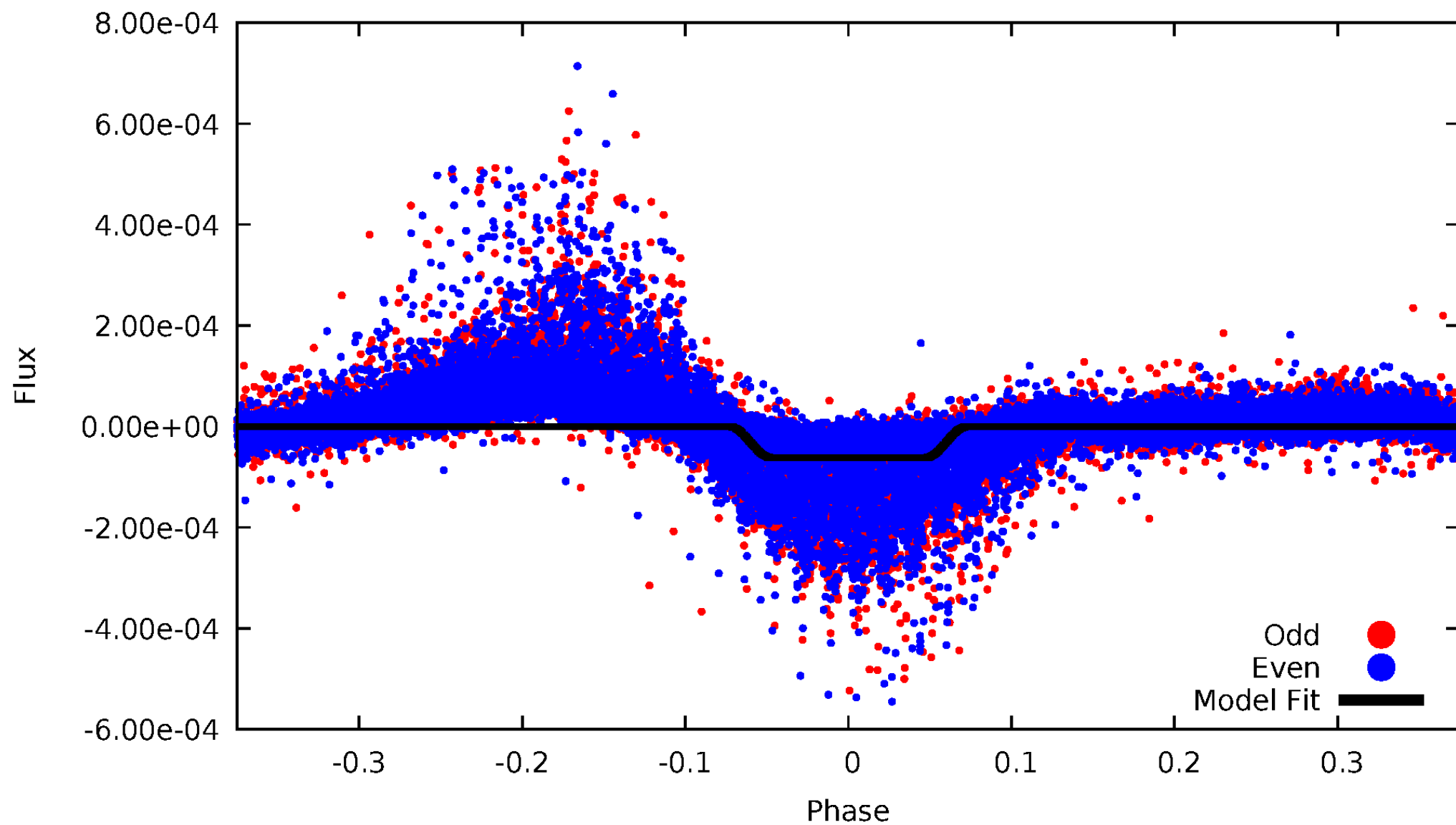
# DV Odd/Even

TCE 006278403-02



# ALT Odd/Even

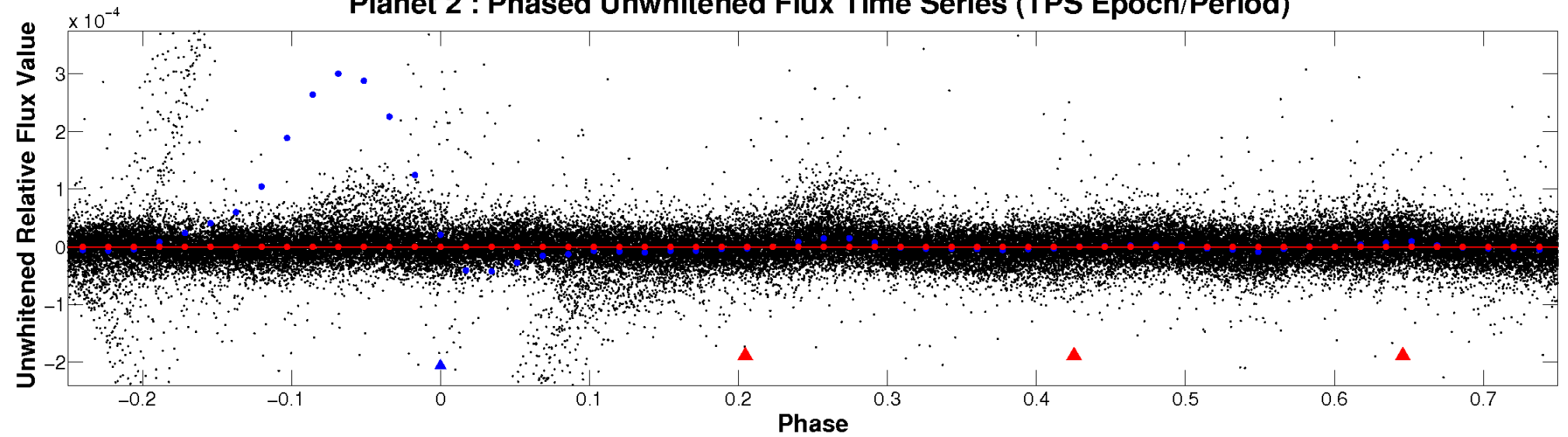
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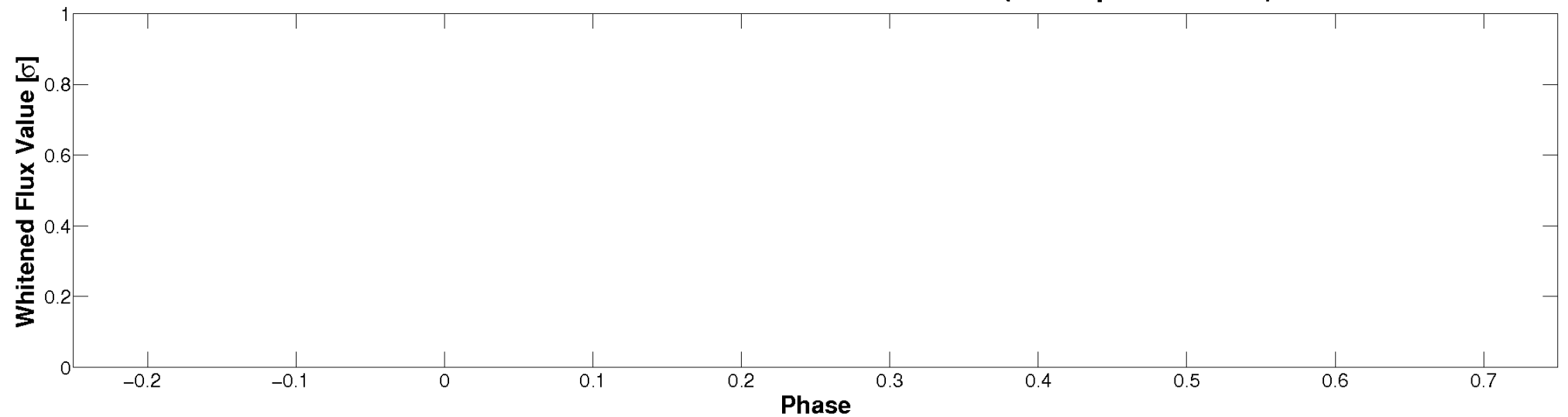


# Non-Whitened Vs. Whitened Light Curve

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

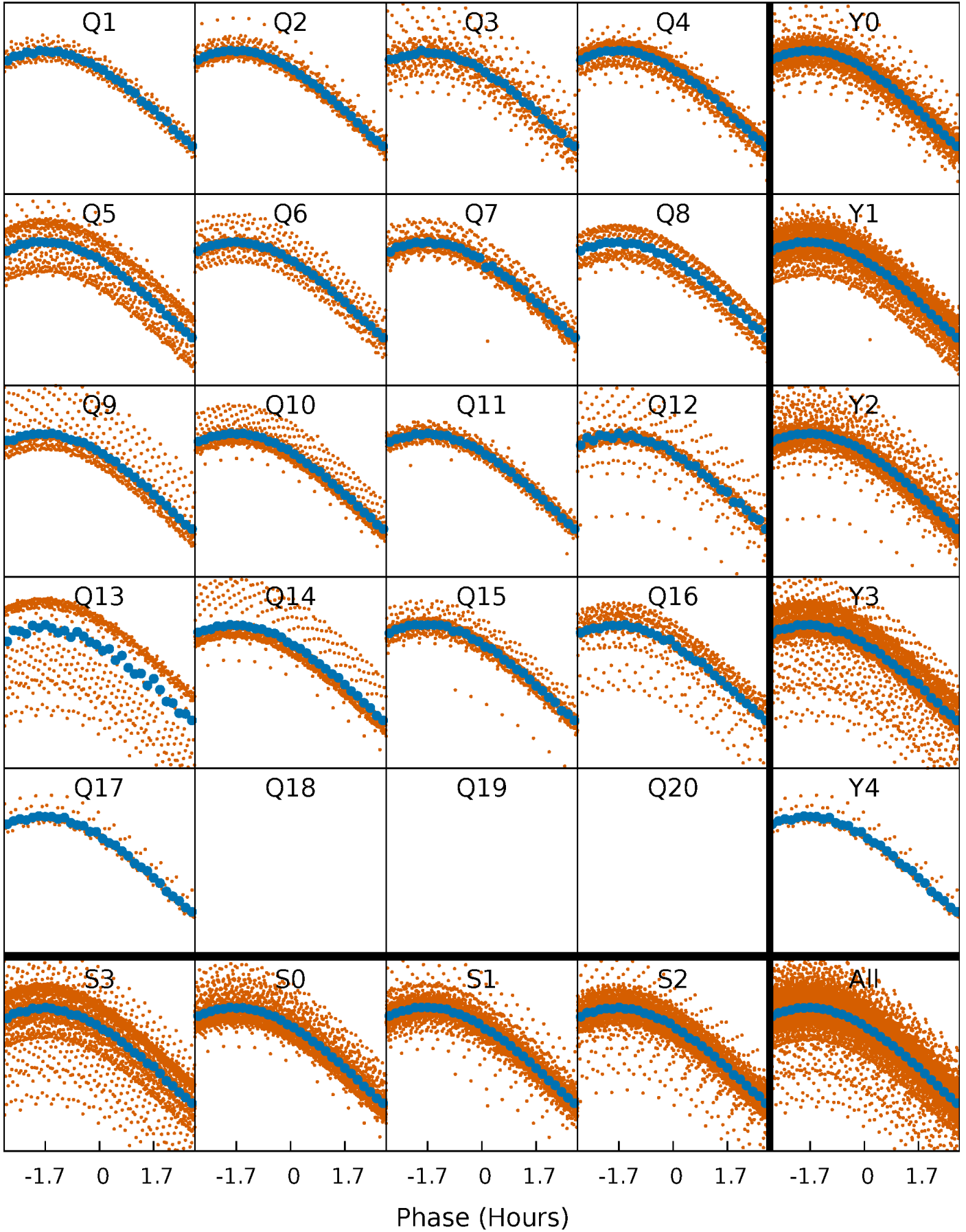


**Planet 2 : Phased Whitened Flux Time Series (TPS Epoch/Period)**



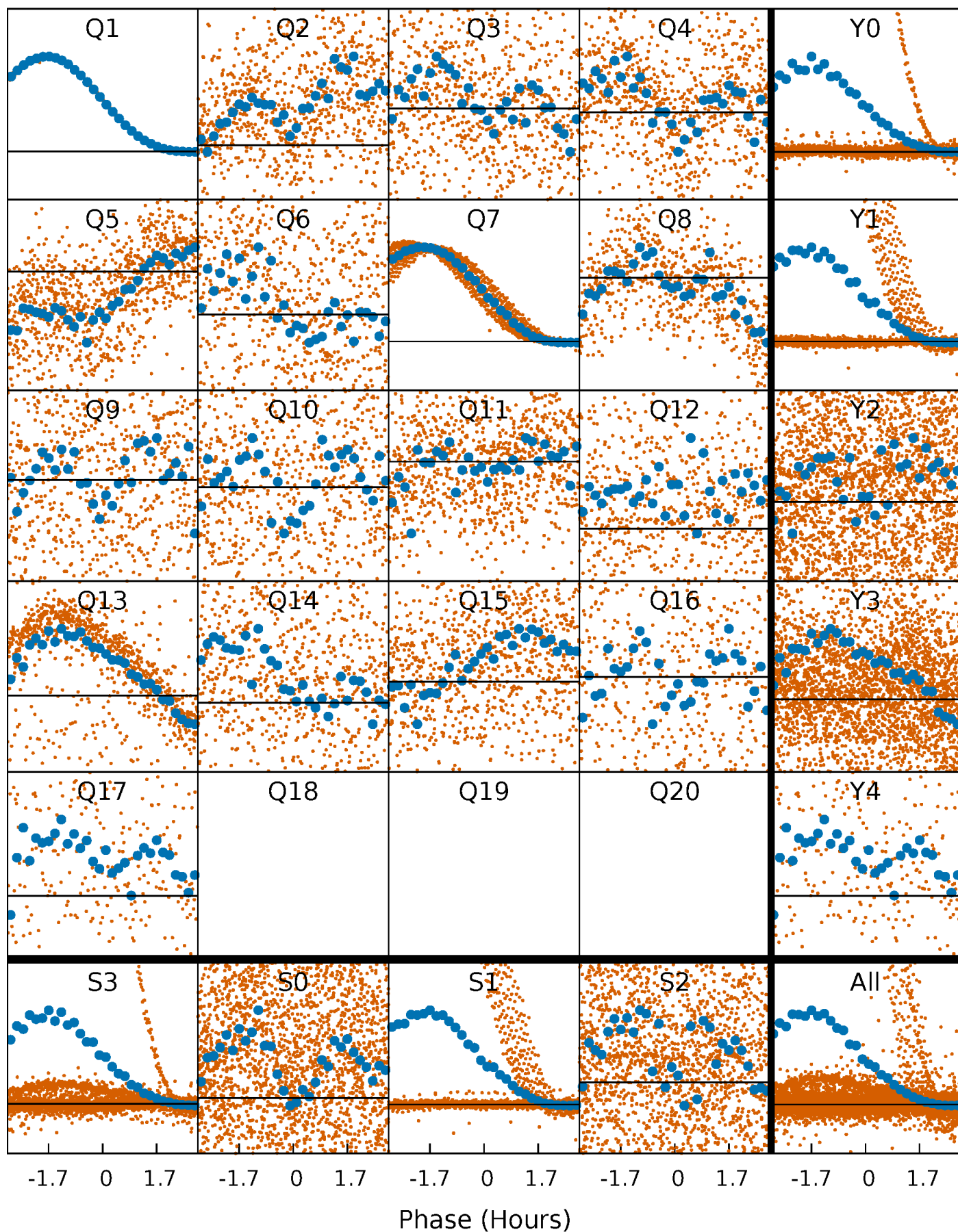
# PDC Quarter-Phased Transit Curves

TCE 006278403-02   P= 1.191241 Days    $T_0=131.954744$  (BKJD)



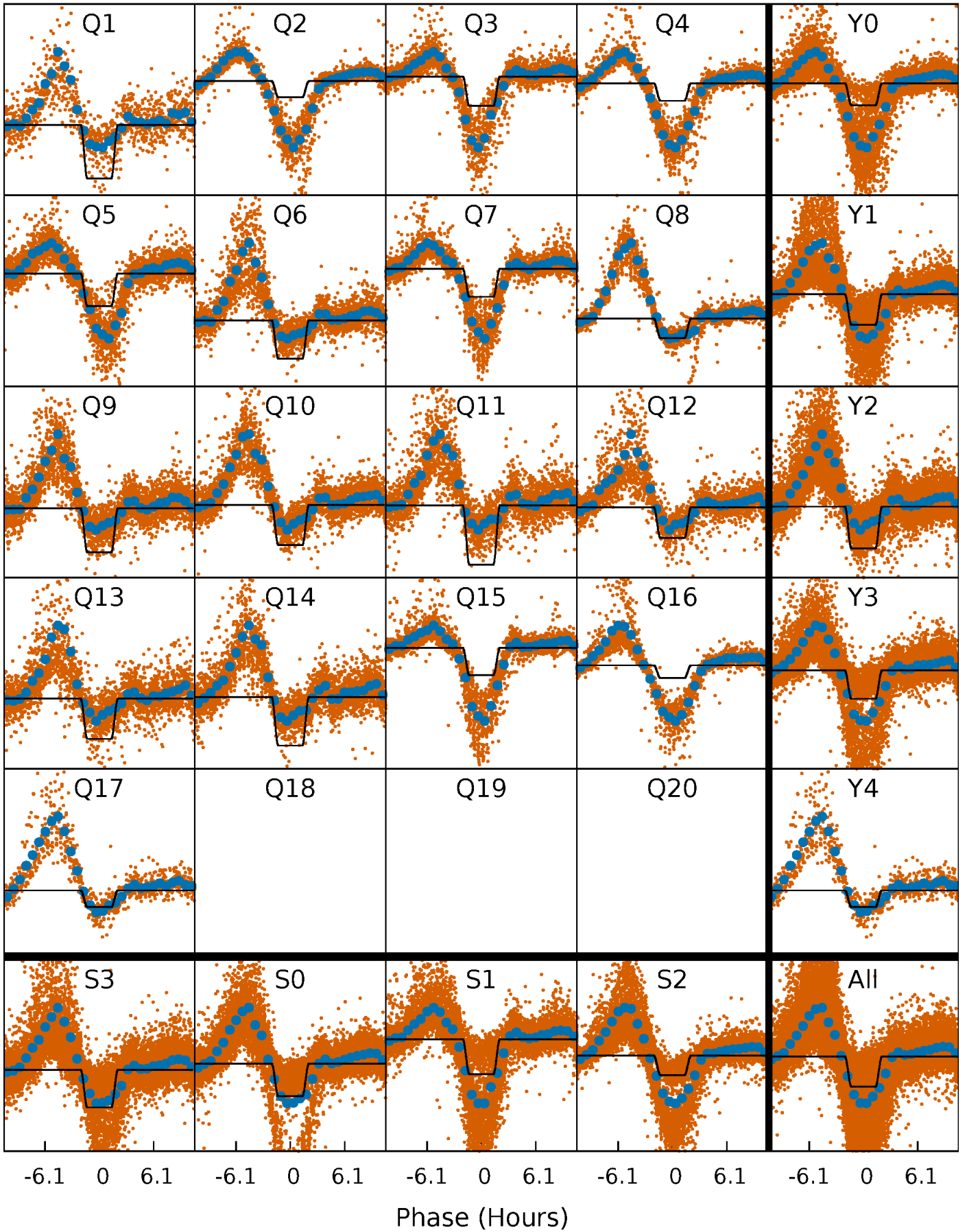
# DV Quarter-Phased Transit Curves

TCE 006278403-02 P= 1.191241 Days  $T_0=131.954744$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

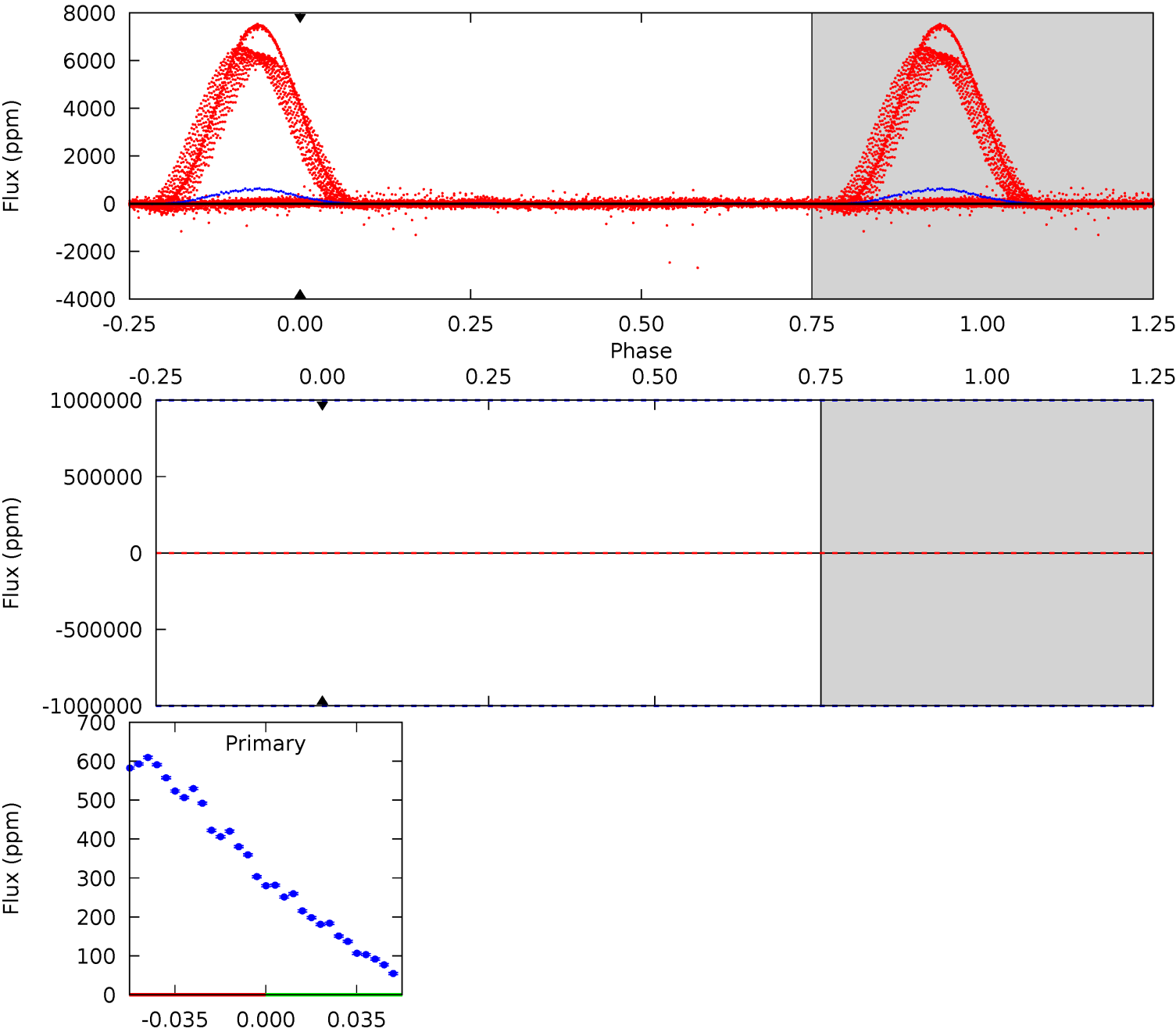
TCE 006278403-02 P= 1.191241 Days  $T_0=132.127119$  (BKJD)



# DV Model-Shift Uniqueness Test

006278403-02, P = 1.191241 Days, E = 130.763503 Days

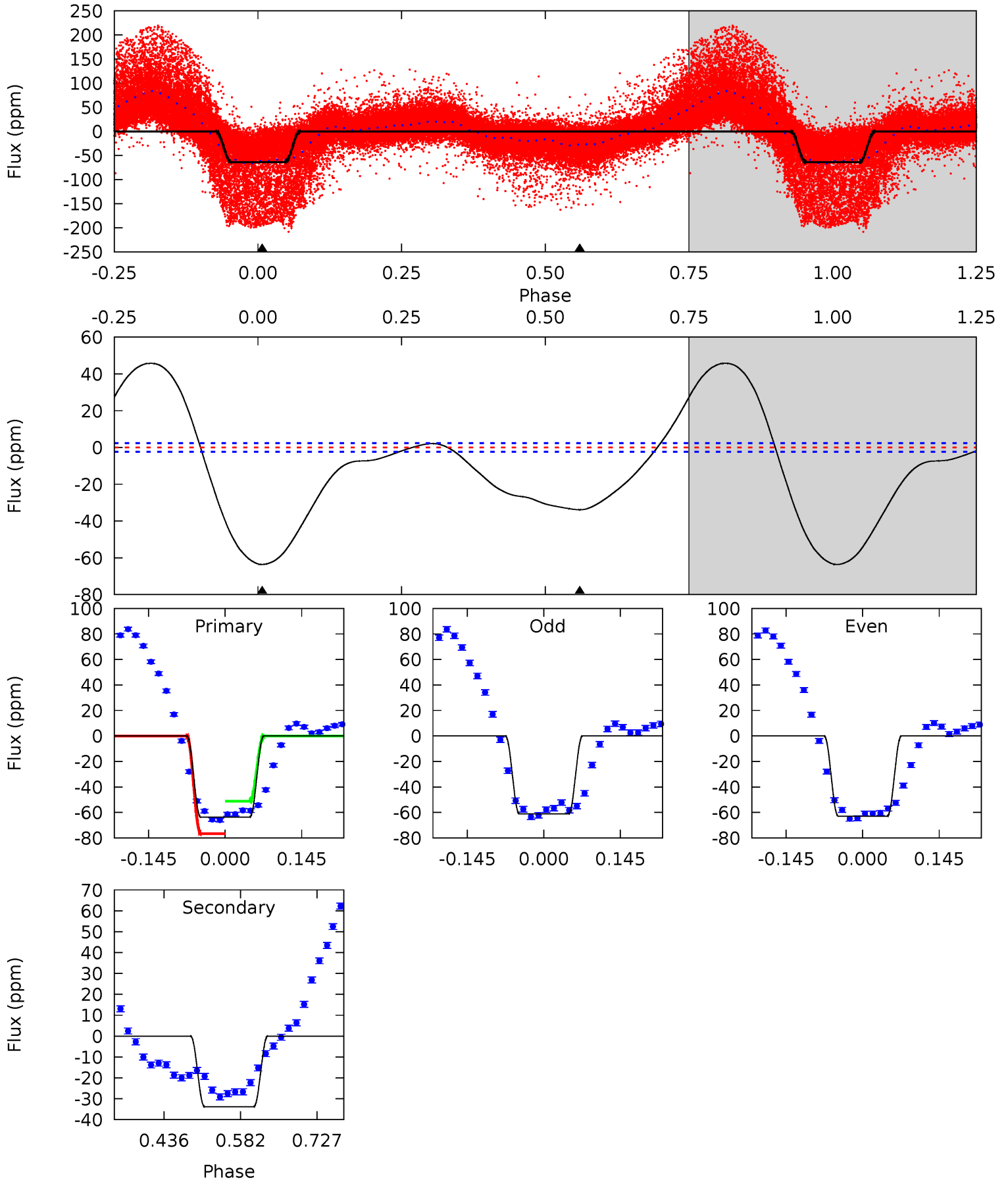
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
0	0	0	0	1.00	1.00	1.00	0	0	0	0	0	0	0	0



# Alt Model-Shift Uniqueness Test

006278403-02, P = 1.191241 Days, E = 130.935878 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
120.0	63.9	0	0	4.49	1.46	38.2	120.0	120.0	63.9	63.9	1.72	1.94	0.42	23.0





### Stellar Parameters For KIC 006278403

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$10932^{+228}_{-495}$	$4.056^{+0.236}_{-0.193}$	$0.070^{+0.050}_{-0.600}$	$2.615^{+0.733}_{-0.895}$	$2.838^{+0.289}_{-0.674}$	$0.224^{+0.370}_{-0.106}$
	+2%/-5%	+6%/-5%	+71%/-857%	+28%/-34%	+10%/-24%	+165%/-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 006278403-02 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$0 \pm 1000000$	$20.45^{+21.66}_{-14.51}$	$6126^{+481}_{-569}$	$-7953^{+110367}_{-92213}$	$-2.239^{+214.543}_{-220.431}$
Alt.	$-34 \pm 1$	$19.18^{+21.15}_{-13.57}$	$6150^{+494}_{-531}$	$-4360^{+8810}_{-433}$	$0.049^{+0.532}_{-0.038}$

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

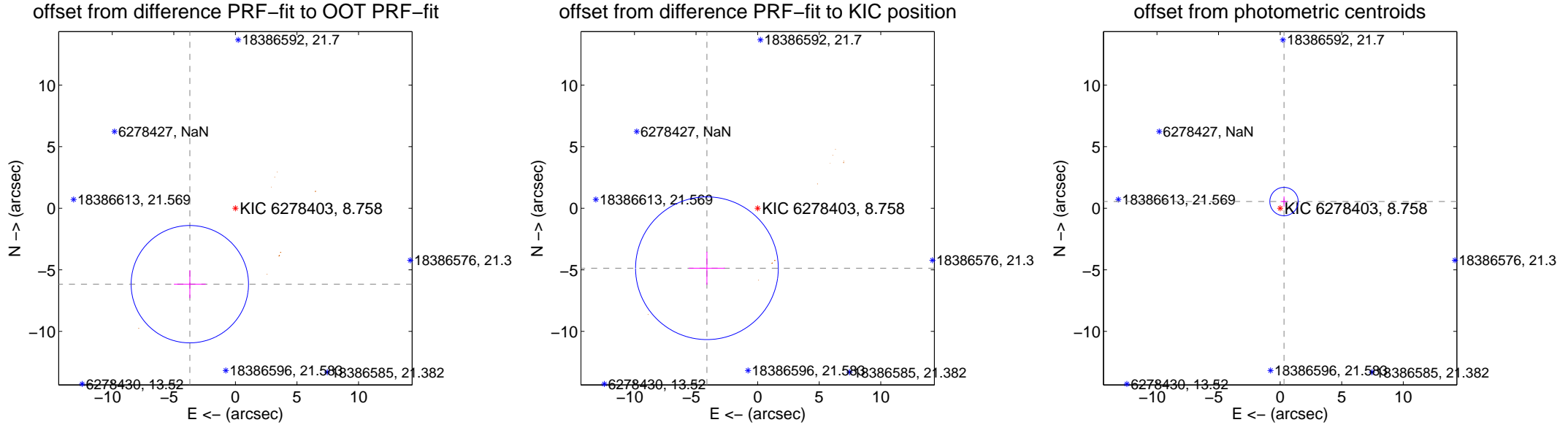
## DV Centroid Data

Supplemental centroid analysis for 006278403-02. **Kepler magnitude: 8.76.** Transit SNR -1.00

There are 0 quarters with good PRF difference image offsets

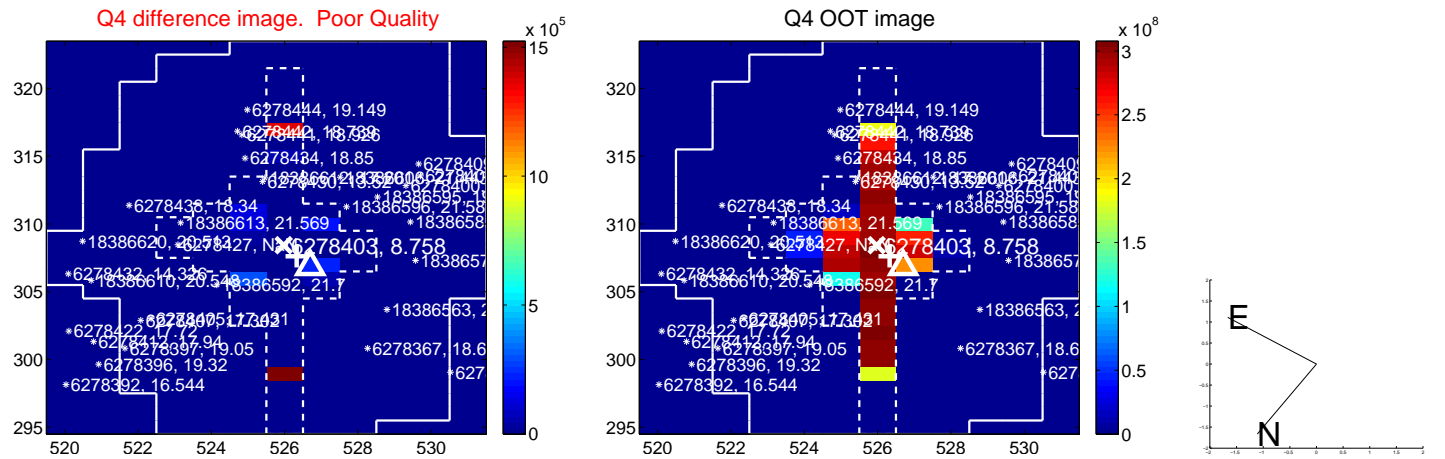
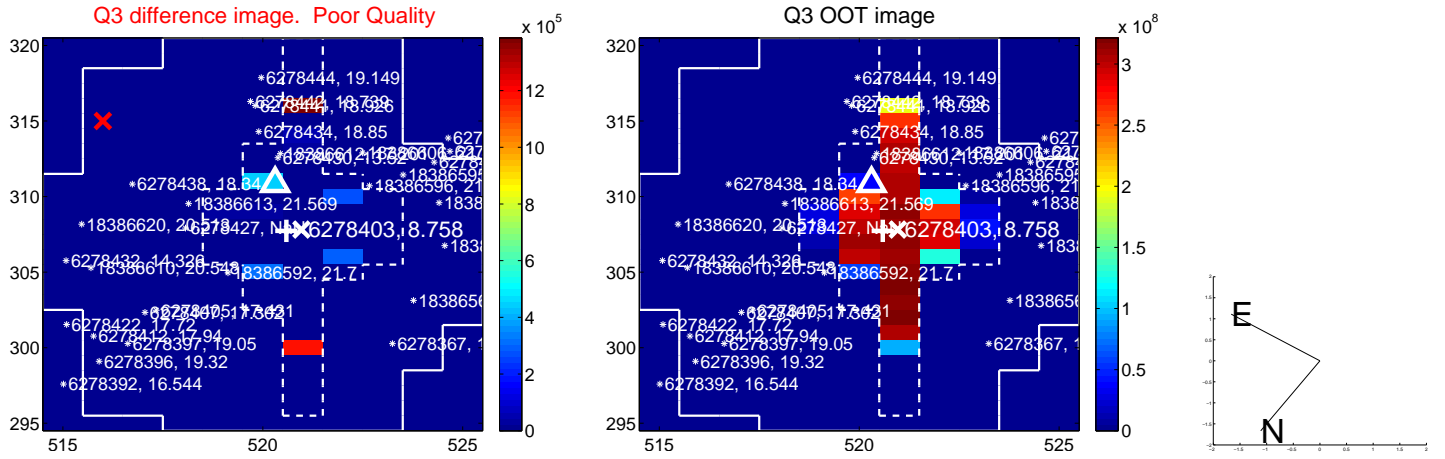
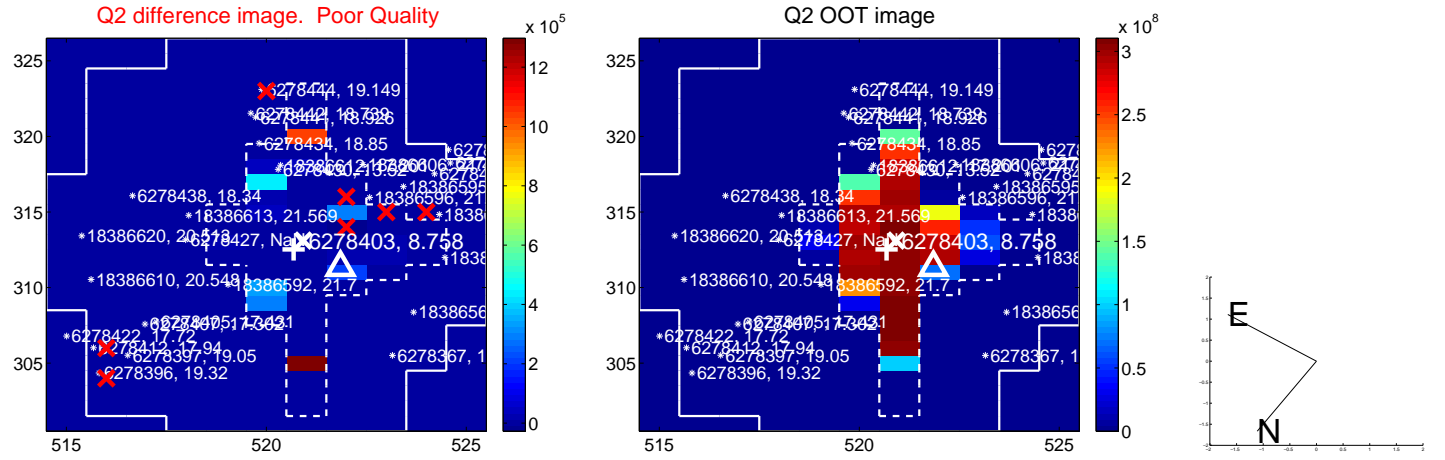
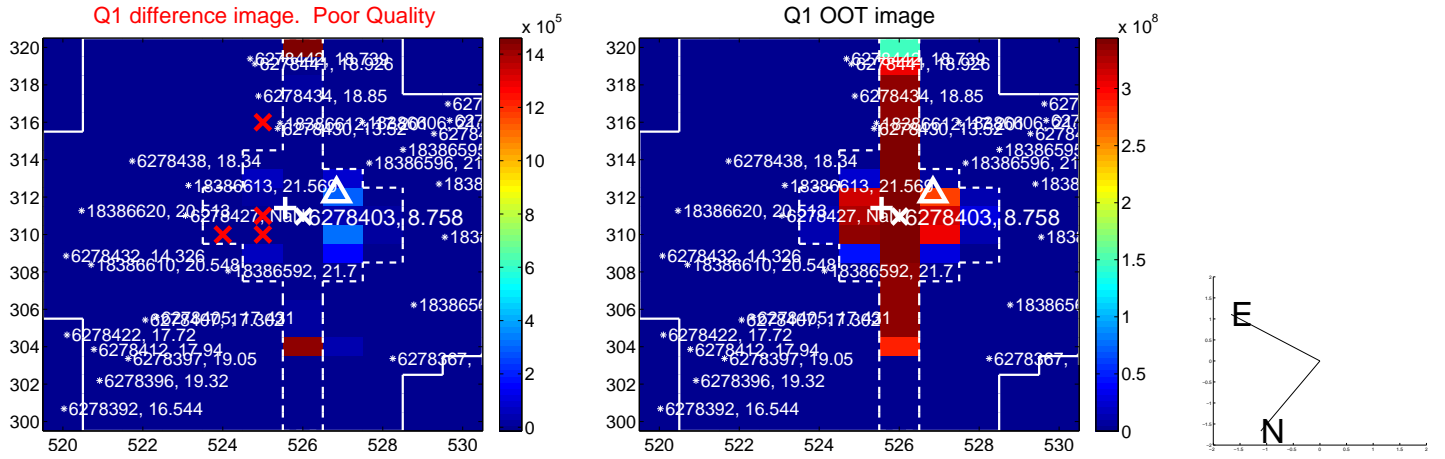
The OOT PRF centroid is offset from the target star catalog position by about 2.46 arcsec so the offset from difference PRF-fit to OOT-fit may be invalid.

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	<b><math>7.192 \pm 1.588</math></b>	<b>4.53</b>	$3.701 \pm 1.294$	$-6.167 \pm 1.135$
PRF-fit source offset from KIC position	<b><math>6.377 \pm 1.932</math></b>	<b>3.30</b>	$4.116 \pm 1.460$	$-4.871 \pm 1.339$
photometric centroid source offset	$0.63 \pm 0.38$	1.64	$-0.31 \pm 0.27$	$0.54 \pm 0.42$

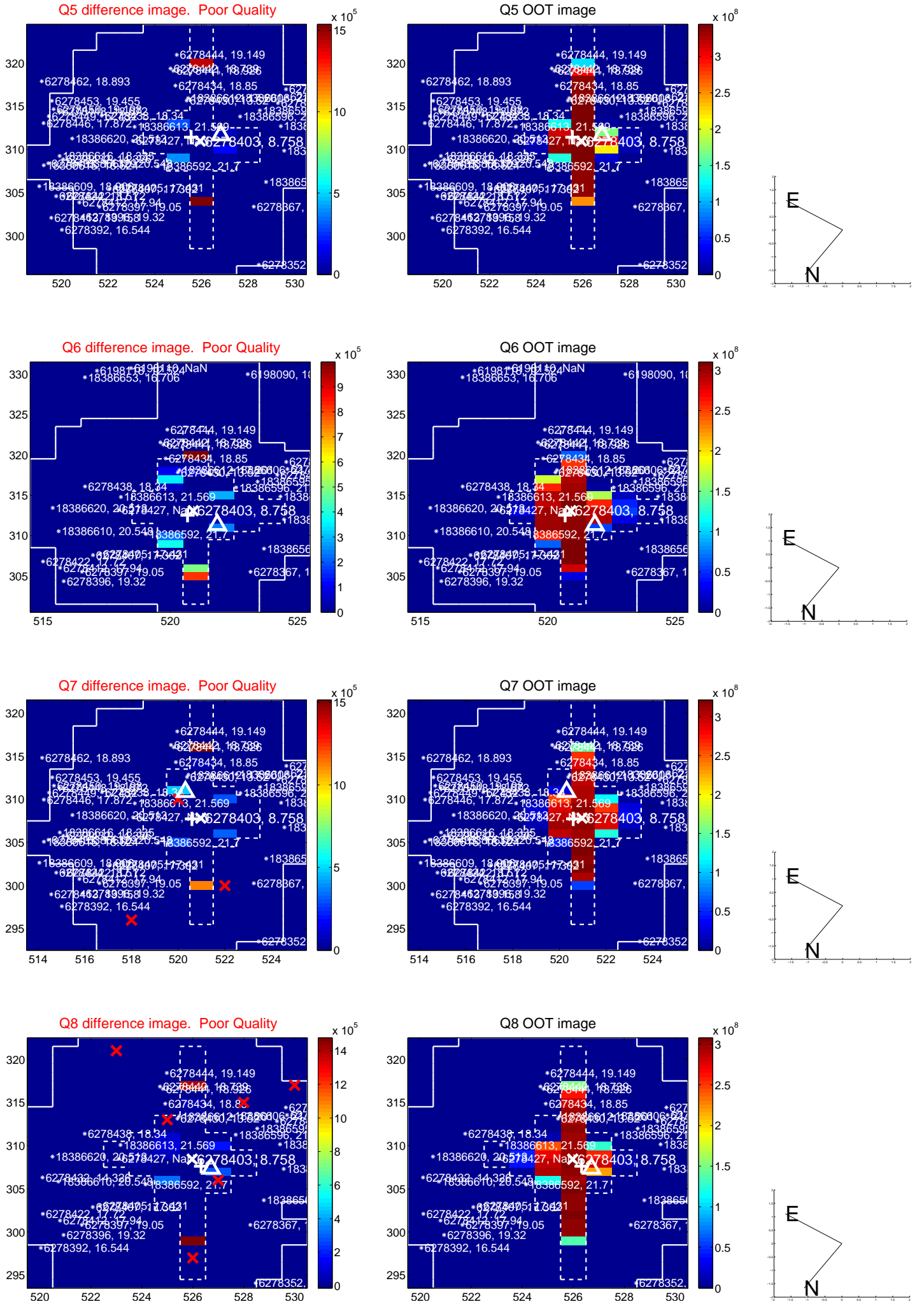


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets;** magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

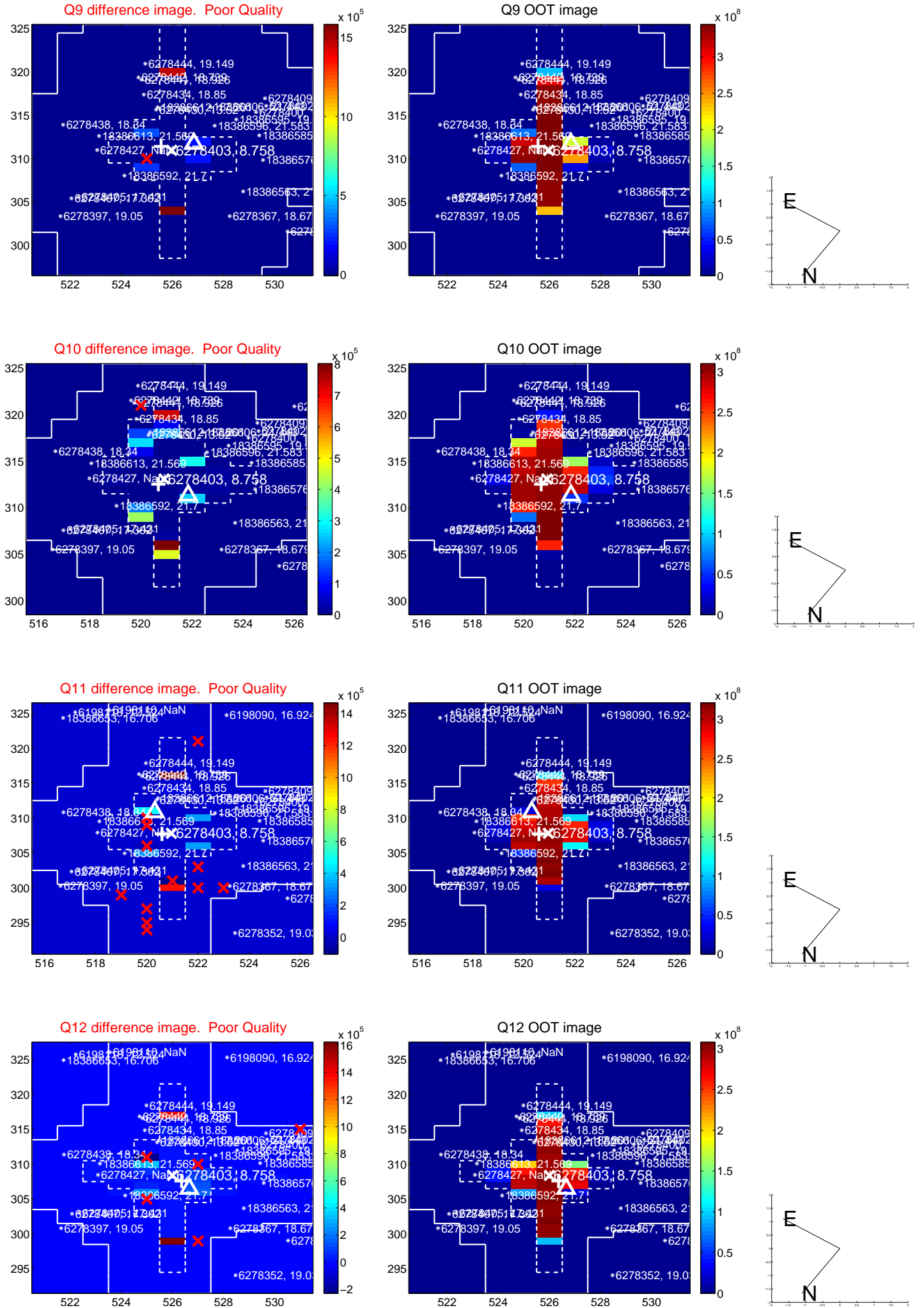
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



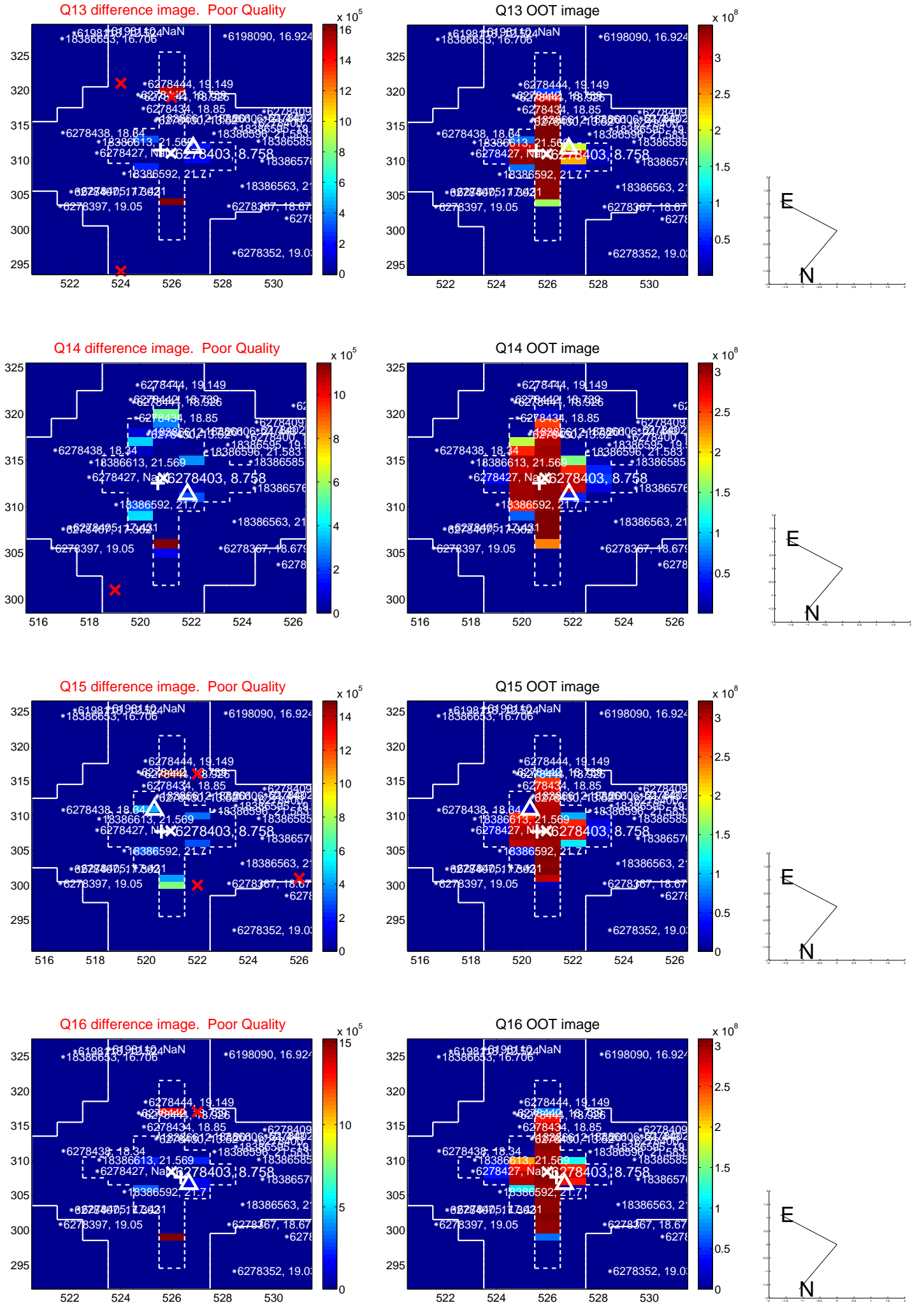
white ×: KIC target position; +: OOT centroid; △: difference centroid. red ×: large negative pixel value.



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

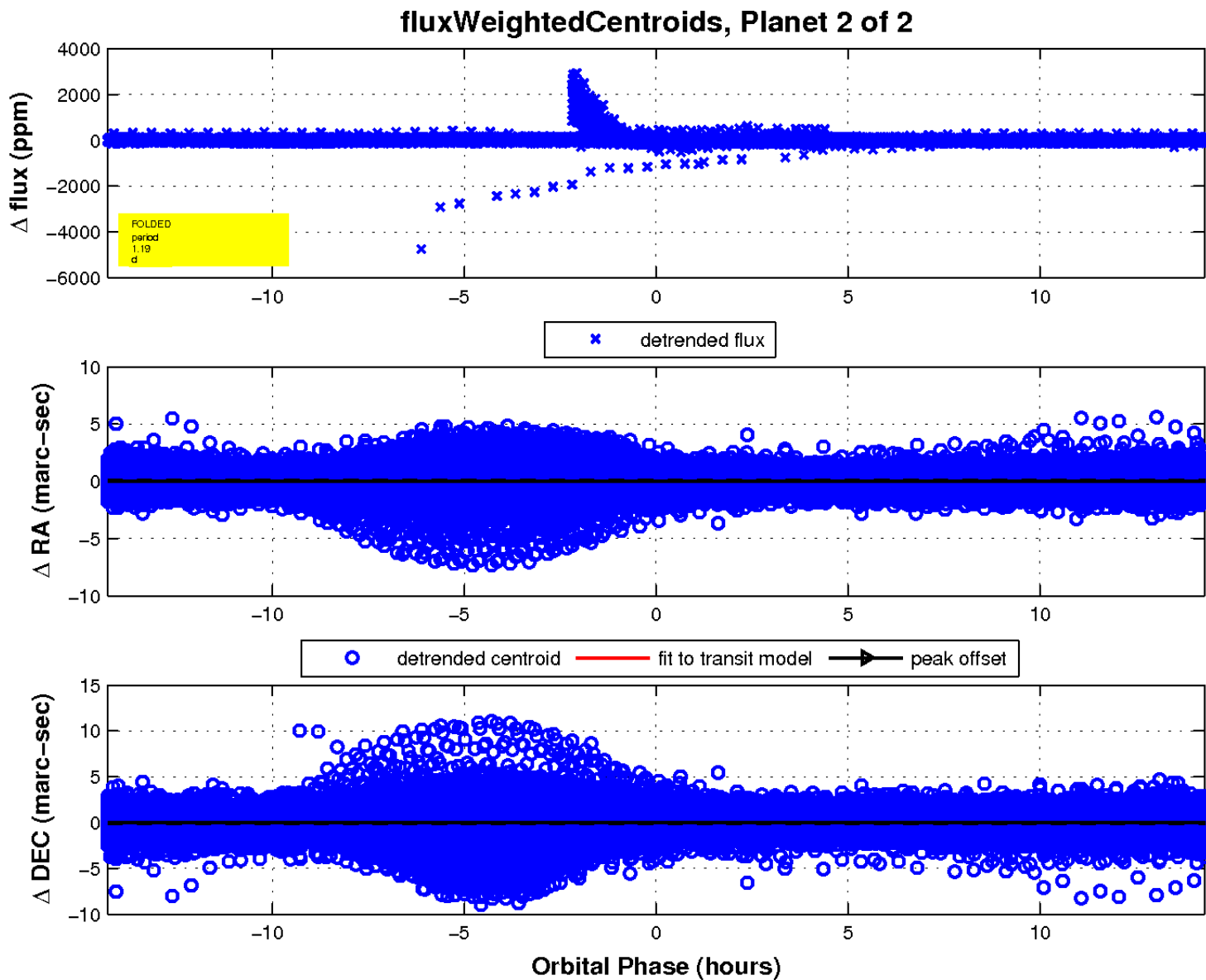
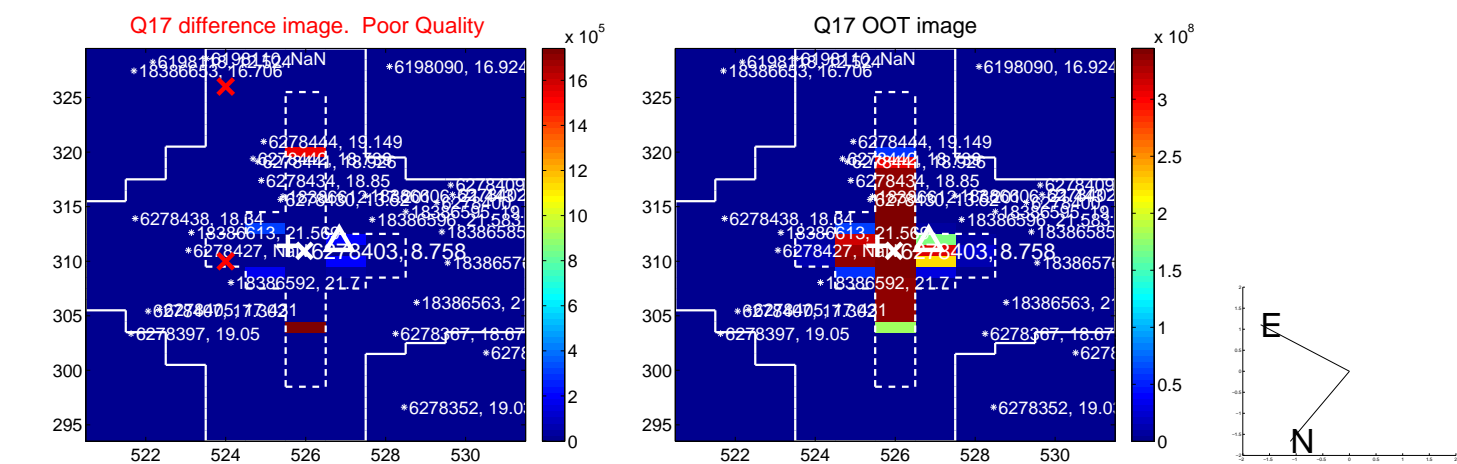


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.





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



UKIRT Image

