

# KIC 005478055

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
005478055-01	OBS	0411.01	15.852339	142.522109	797.8	5.031	33.8	33.1	1.00	5903	3.80	85.47
005478055-02	OBS	No	529.038926	173.825610	741.1	8.922	8.0	8.0	1.00	5903	3.28	0.80

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
005478055-01	OBS	FP	0.00	0	0	1	1	CENT_RESOLVED_OFFSET—HALO_GHOST—EPHEM_MATCH
005478055-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_CHASES_MARSHALL_SKYE—MOD_POS_DV—INCONSISTENT_TRANS—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.

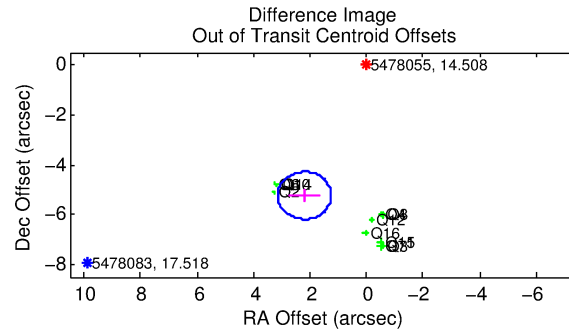
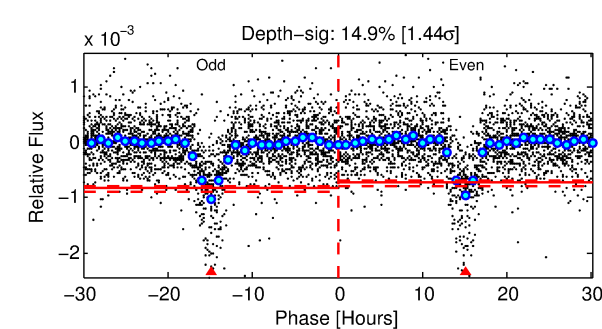
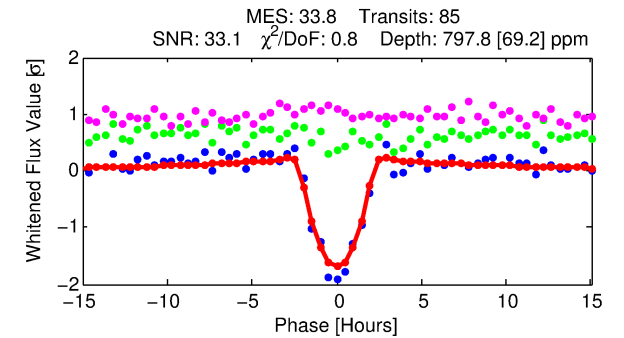
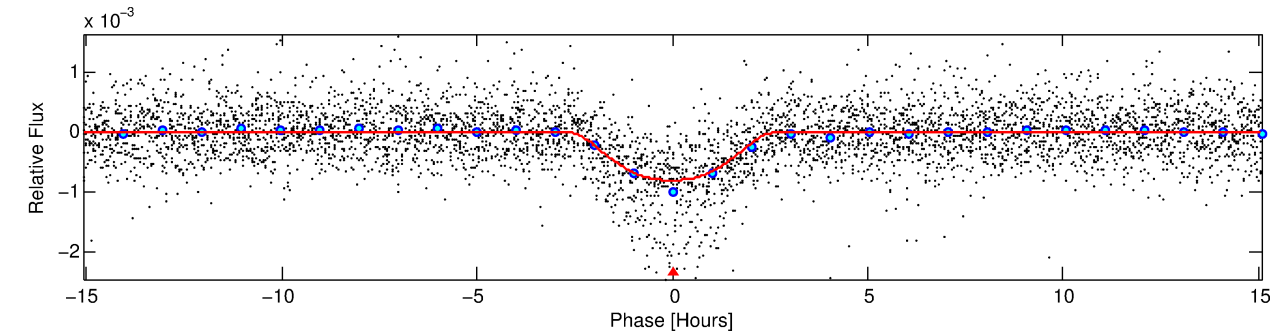
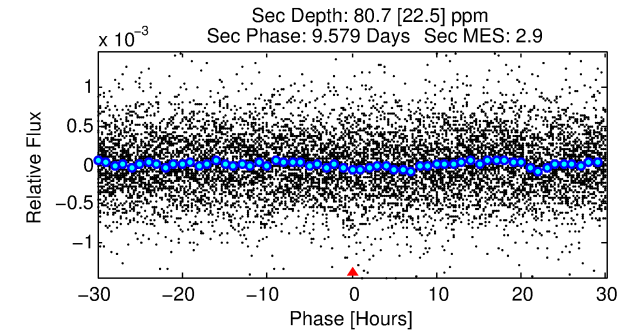
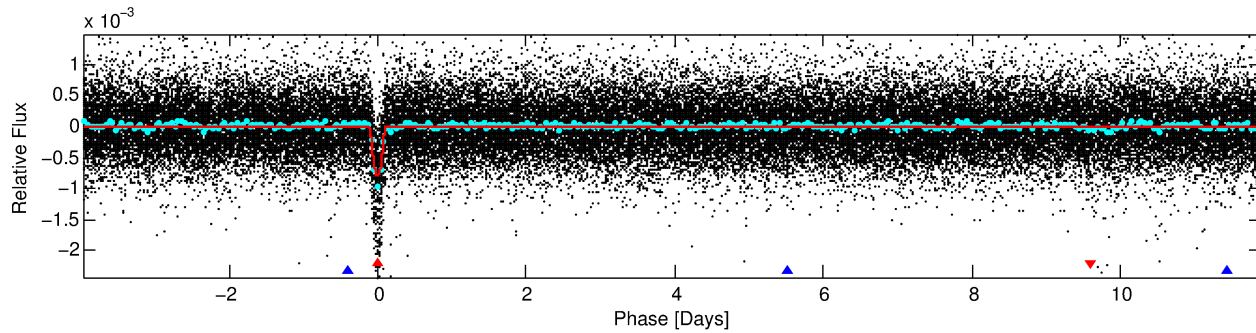
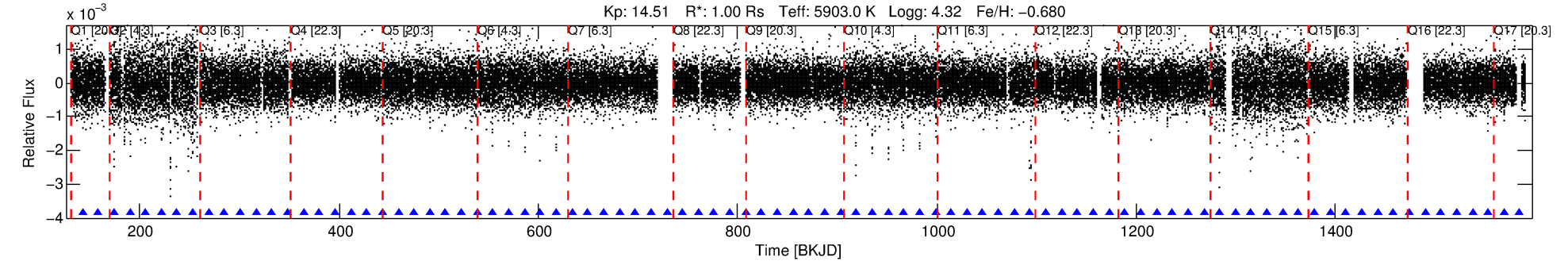
## Ephemeris Match Information For 005478055-01

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	$\sigma_P$	$\sigma_T$
005478055-01	5478055	005478083-01	5478083	1:1	12.6	2	1	17.52	14.51	593.71	Direct-PRF	0	0.04	0.05

**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: 5478055 Candidate: 1 of 2 Period: 15.852 d  
KOI: K00411.01 Corr: 0.997



## DV Fit Results:

Period = 15.85234 [0.00006] d  
Epoch = 142.5221 [0.0034] BKJD  
Rp/R\* = 0.0347 [0.0038]  
a/R\* = 8.67 [0.73]  
b = 0.97 [0.01]  
Seff = 85.47 [36.38]  
Teq = 775 [82] K  
Rp = 3.80 [1.15] Re  
a = 0.1134 [0.0296] AU  
Ag = 39.45 [21.33] [1.80σ]  
Teffp = 3004 [281] K [7.61σ]

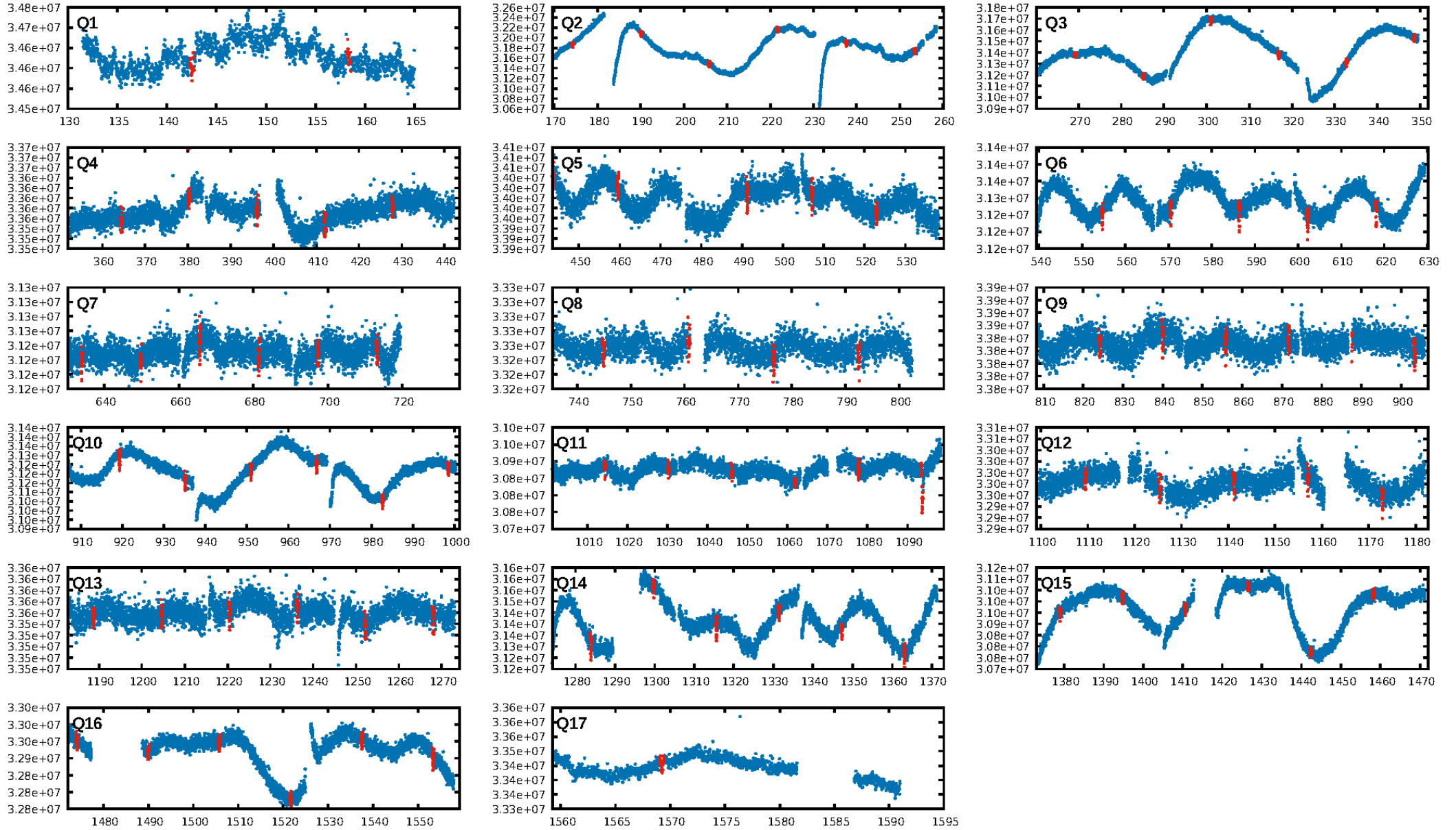
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 100.0% [1202.41σ]  
ModelChiSquare2-sig: 0.0%  
ModelChiSquareGof-sig: 100.0%  
Bootstrap-pfa: 4.70e-233  
RollingBand-fgt: 1.00 [82/82]  
GhostDiagnostic-chr: 0.0153  
Centroid-sig: 0.0%  
Centroid-so: 7.921 arcsec [35.41σ]  
OotOffset-rm: 5.681 arcsec [17.94σ]  
KicOffset-rm: 6.015 arcsec [34.62σ]  
OotOffset-st: 4/4/4/0 [12]  
KicOffset-st: 4/4/4/0 [12]  
DiffImageQuality-fgm: 1.00 [12/12]  
DiffImageOverlap-fno: 1.00 [17/17]

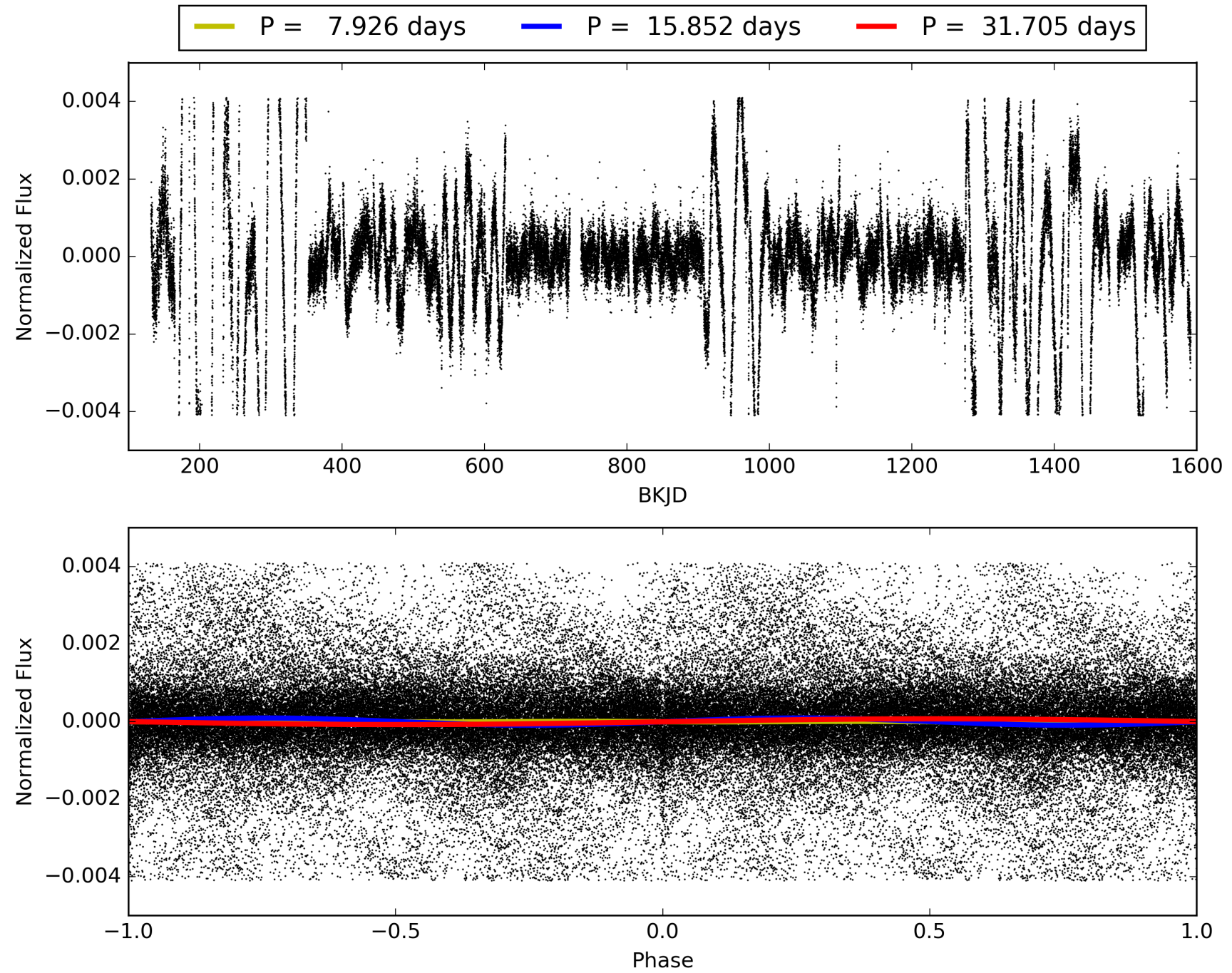
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 29-Jan-2016 13:23:48 Z

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

# TCE 005478055-01, PDC Light Curves

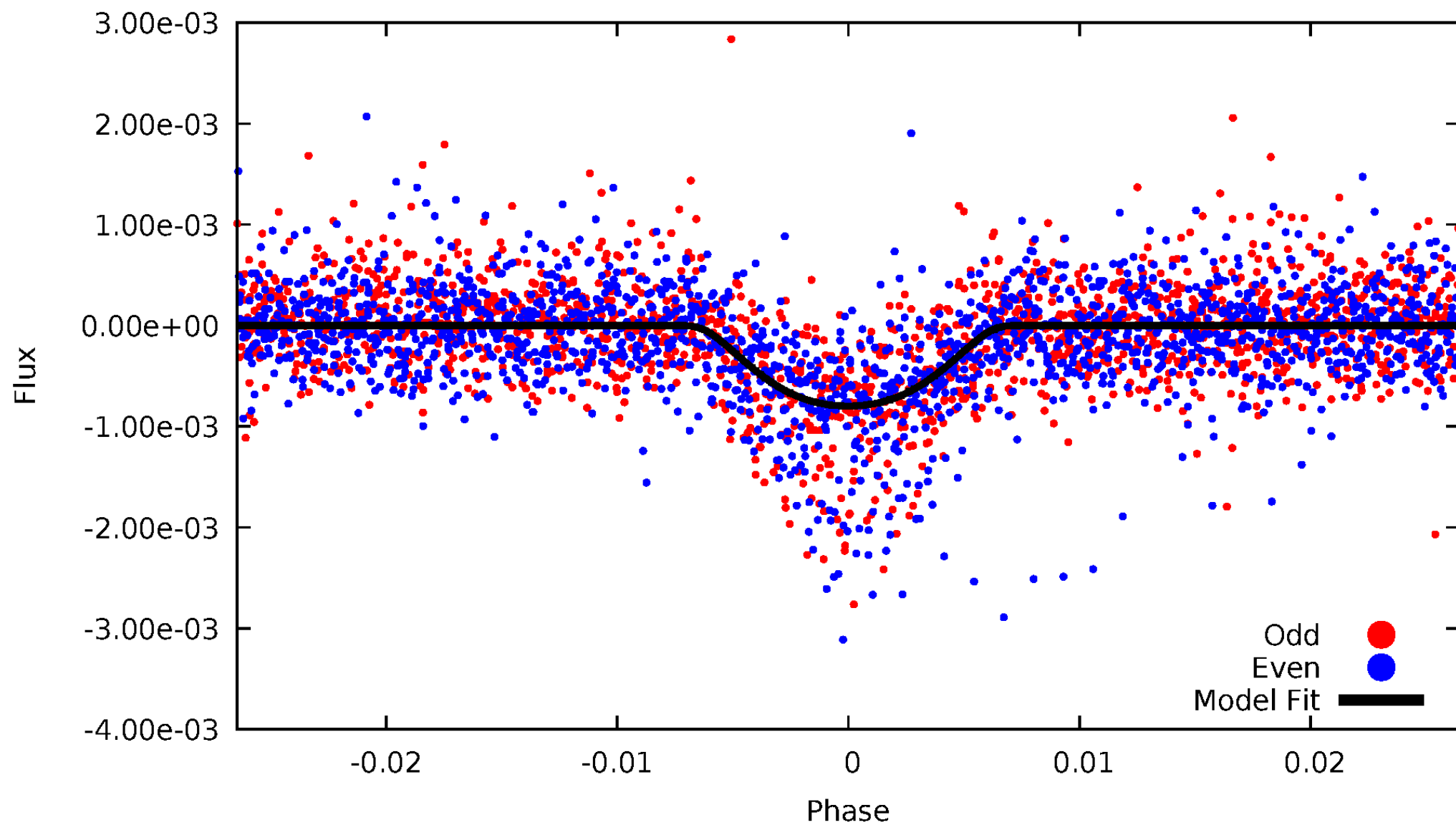


TCE 005478055-01



# DV Odd/Even

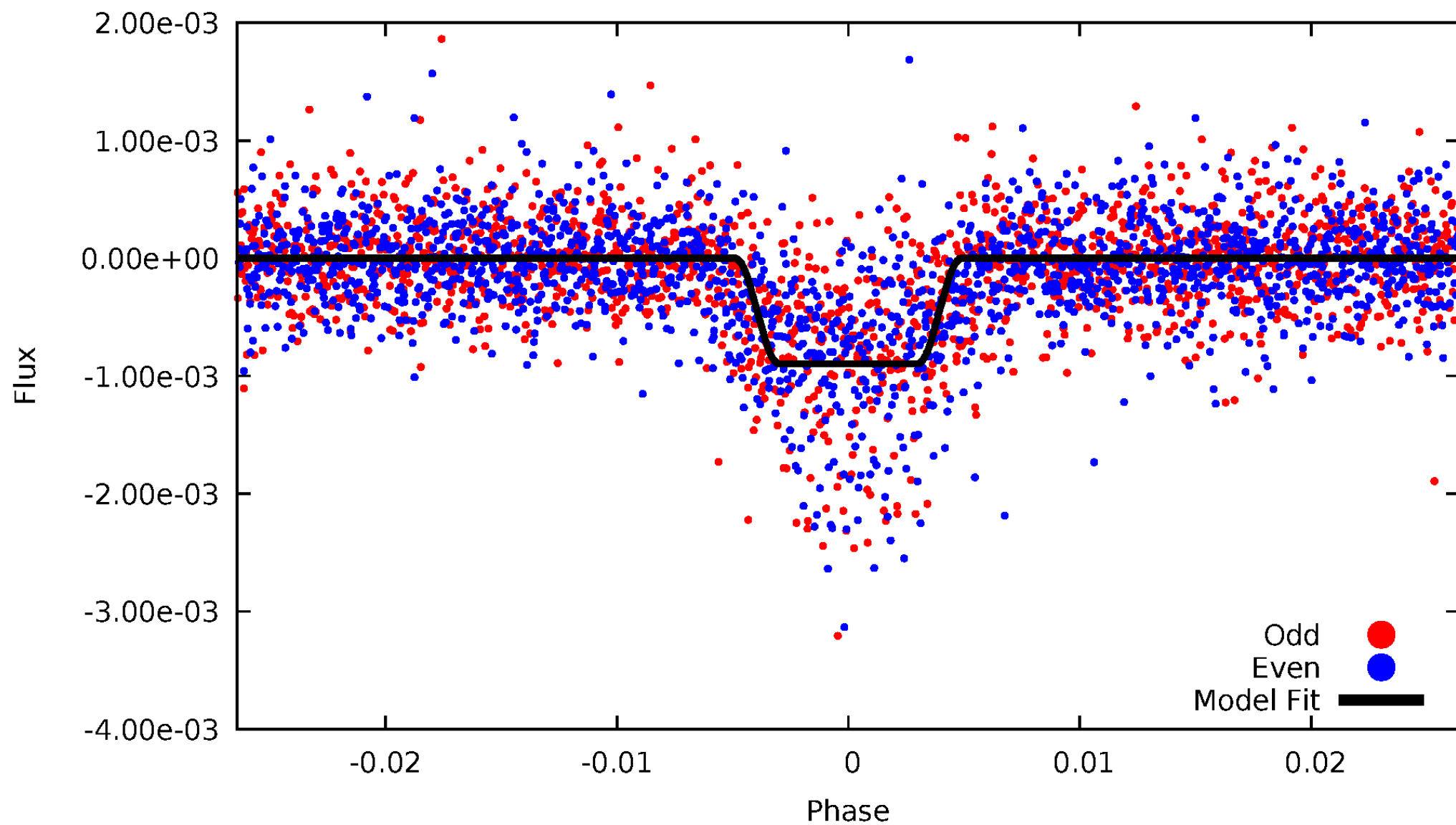
TCE 005478055-01





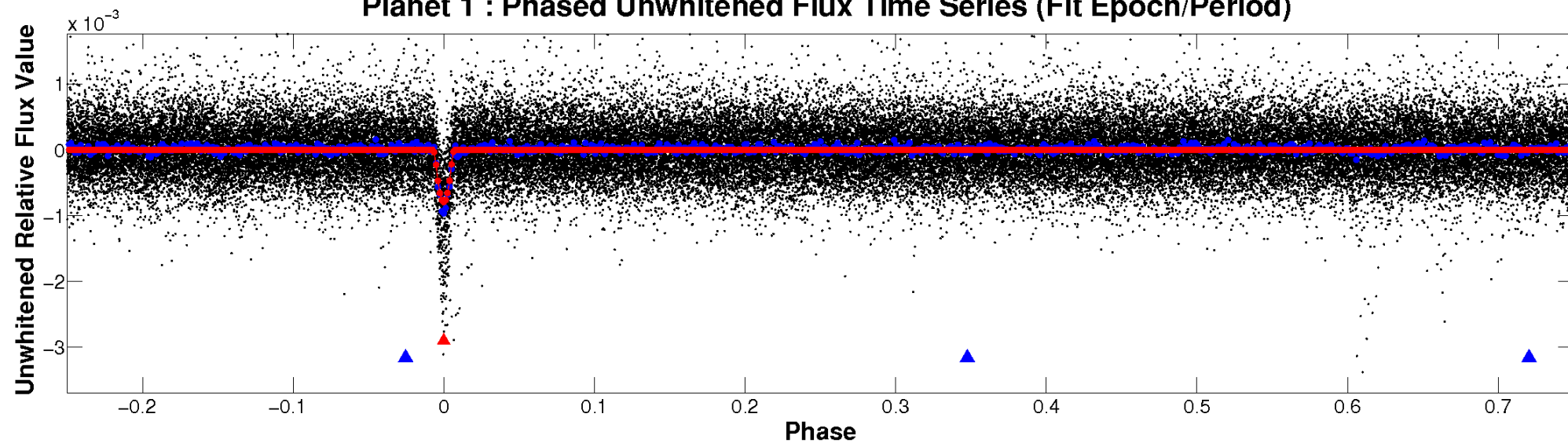
# ALT Odd/Even

TCE 005478055-01

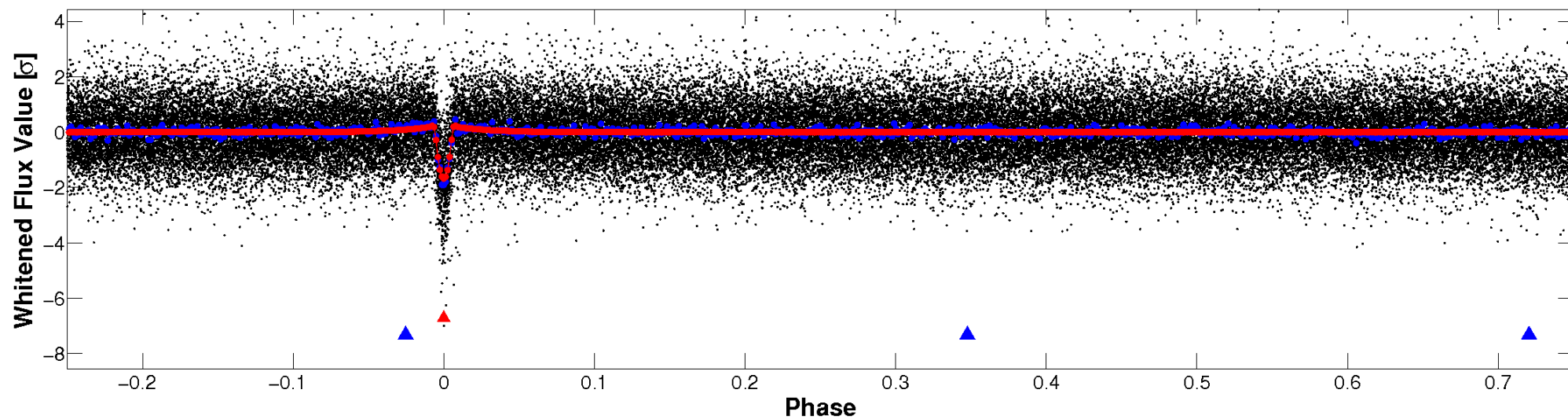


# Non-Whitened Vs. Whitened Light Curve

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

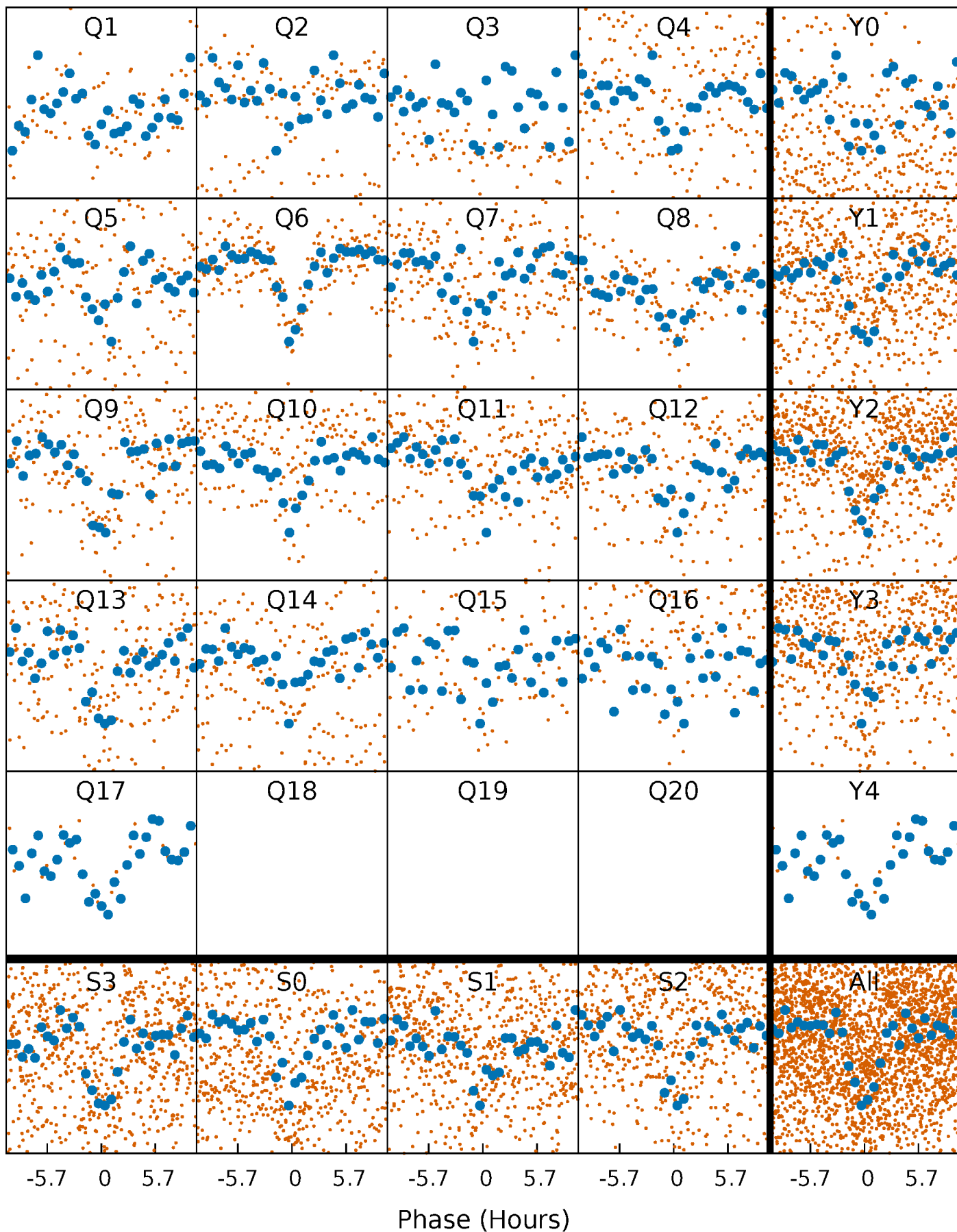


**Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)**



# PDC Quarter-Phased Transit Curves

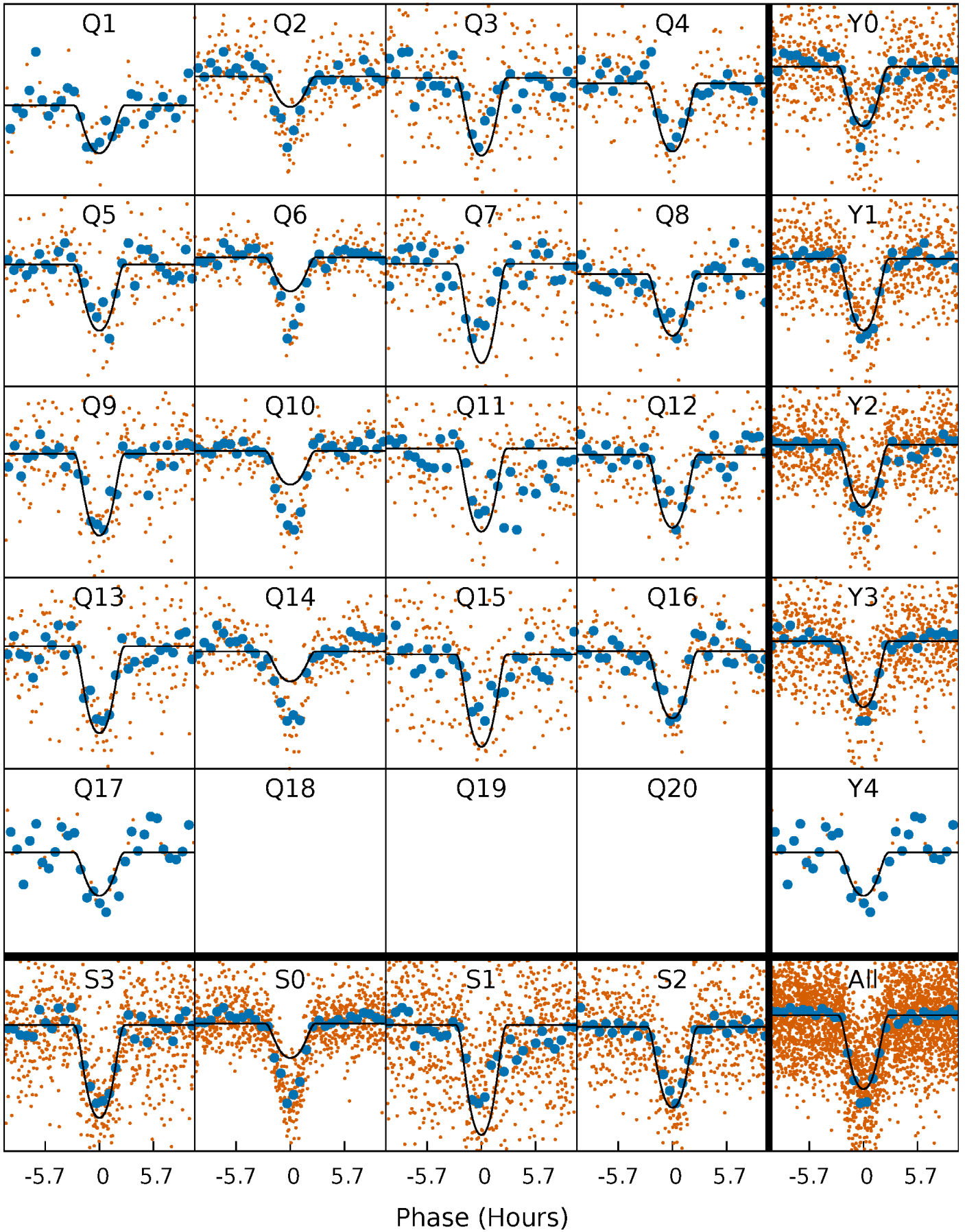
TCE 005478055-01 P= 15.852339 Days  $T_0=142.522109$  (BKJD)





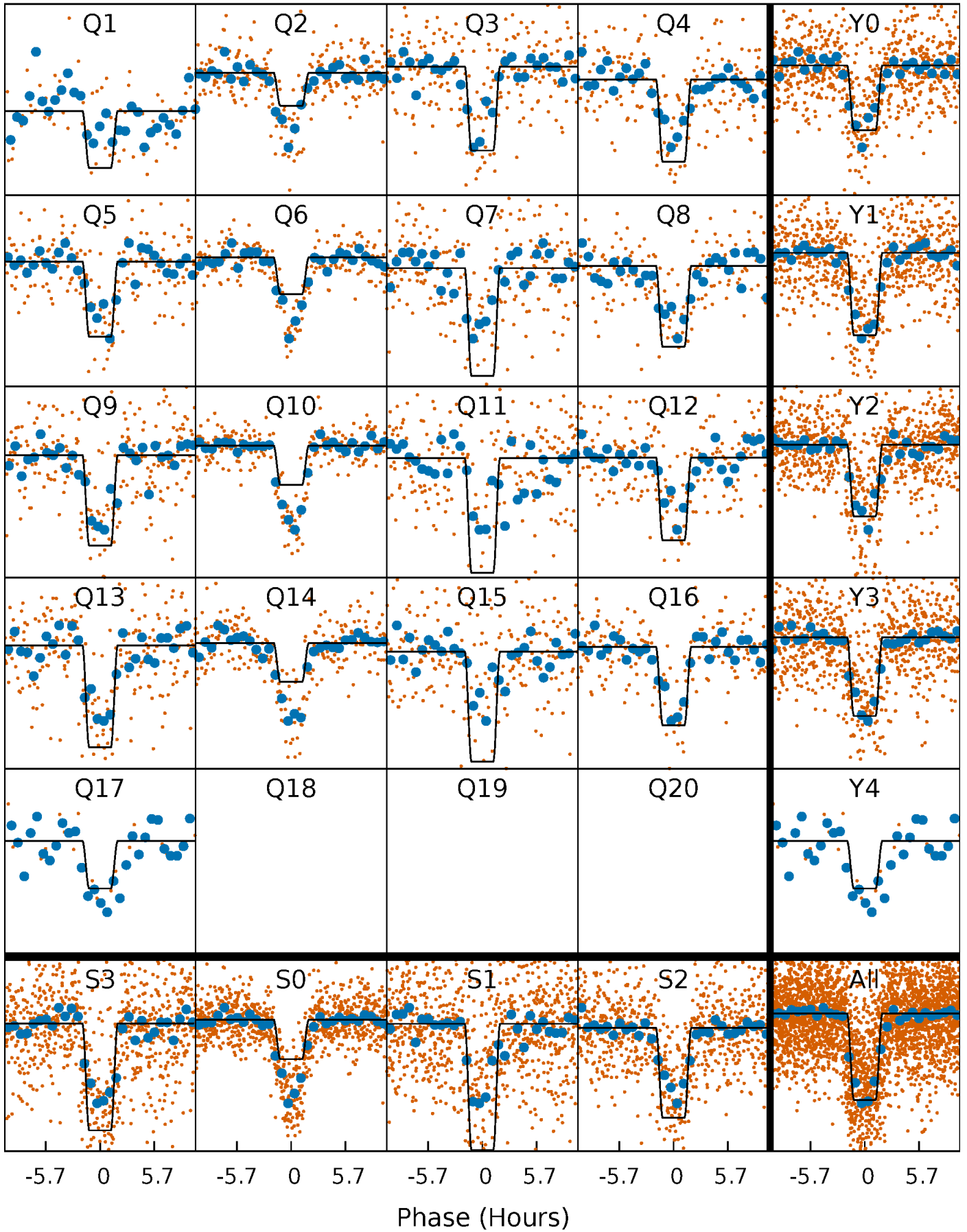
# DV Quarter-Phased Transit Curves

TCE 005478055-01 P= 15.852339 Days  $T_0=142.522109$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

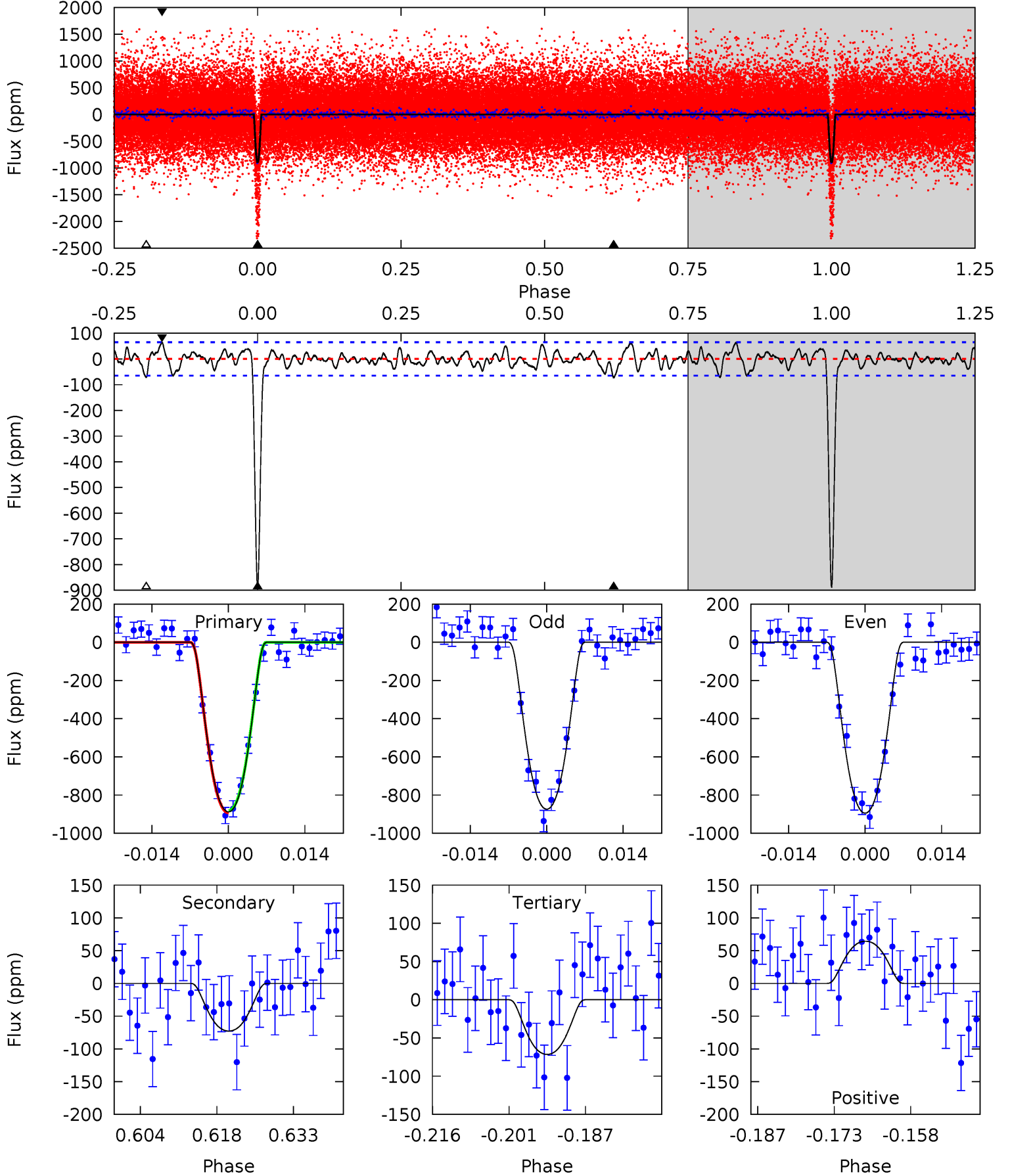
TCE 005478055-01 P= 15.852306 Days  $T_0=142.523588$  (BKJD)



# DV Model-Shift Uniqueness Test

005478055-01,  $P = 15.852339$  Days,  $E = 126.669770$  Days

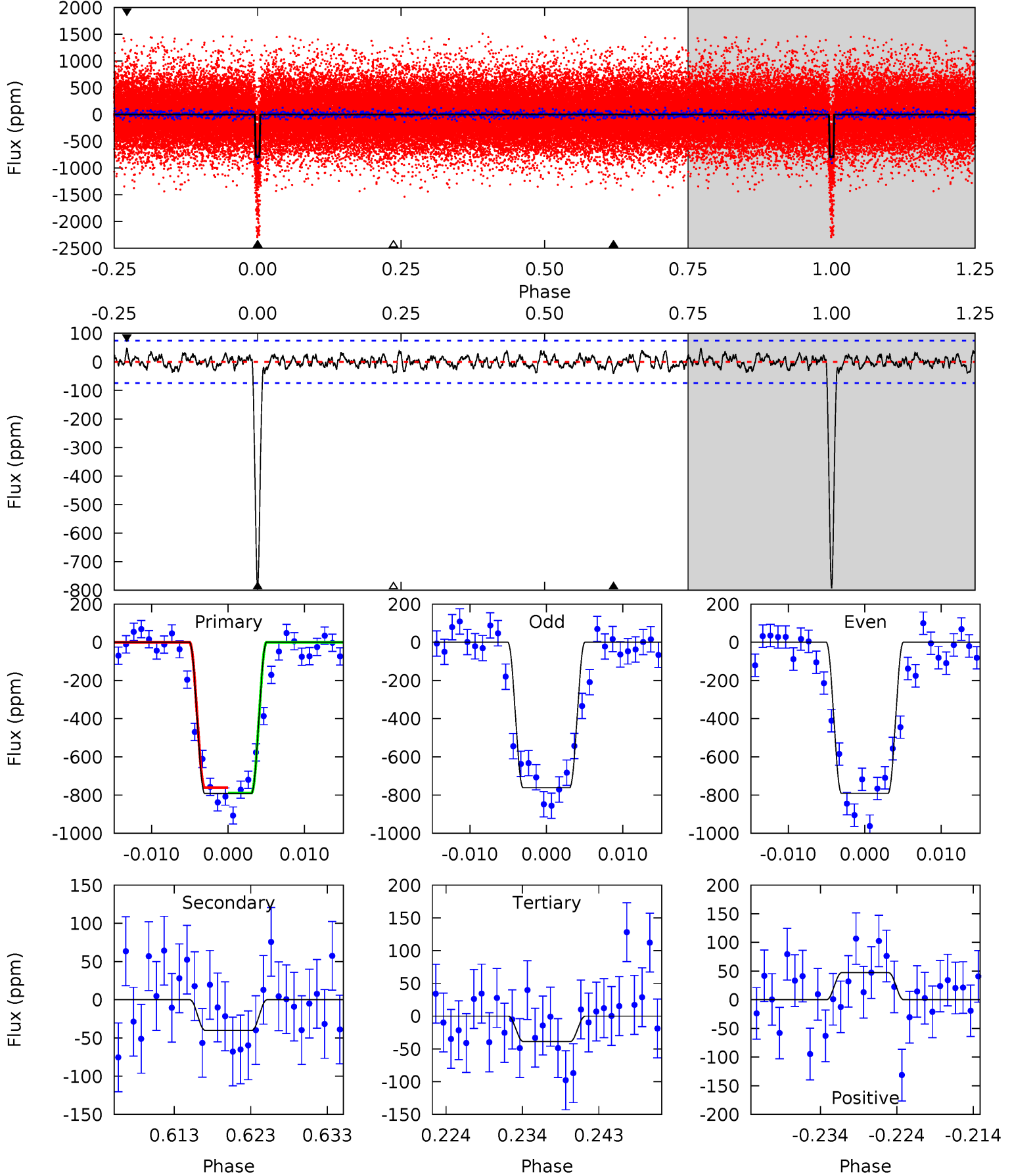
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
67.8	5.55	5.46	4.91	4.96	2.45	1.77	62.3	62.9	0.09	0.64	0.80	1.35	0.07	0.39



# Alt Model-Shift Uniqueness Test

005478055-01,  $P = 15.852306$  Days,  $E = 126.671282$  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
53.6	2.71	2.63	3.20	5.03	2.59	1.08	50.9	50.3	0.08	-0.49	0.99	1.15	0.06	0.95



### Stellar Parameters For KIC 005478055

	$T_{\text{eff}} (K)$	$\log(g)$	$[\text{Fe}/\text{H}]$	$R (R_{\odot})$	$M (M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$5903^{+177}_{-177}$	$4.322^{+0.236}_{-0.215}$	$-0.680^{+0.300}_{-0.300}$	$1.005^{+0.284}_{-0.207}$	$0.772^{+0.110}_{-0.047}$	$1.071^{+1.219}_{-0.570}$
	+3%/-3%	+5%/-5%	+44%/-44%	+28%/-21%	+14%/-6%	+114%/-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 005478055-01 / KOI 0411.01

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$-73 \pm 13$	$3.83^{+0.82}_{-0.68}$	$1080^{+97}_{-77}$	$3430^{+180}_{-169}$	$35^{+20}_{-12}$
Alt.	$-40 \pm 15$	$3.33^{+0.70}_{-0.63}$	$1084^{+89}_{-80}$	$3271^{+224}_{-242}$	$25^{+17}_{-11}$

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



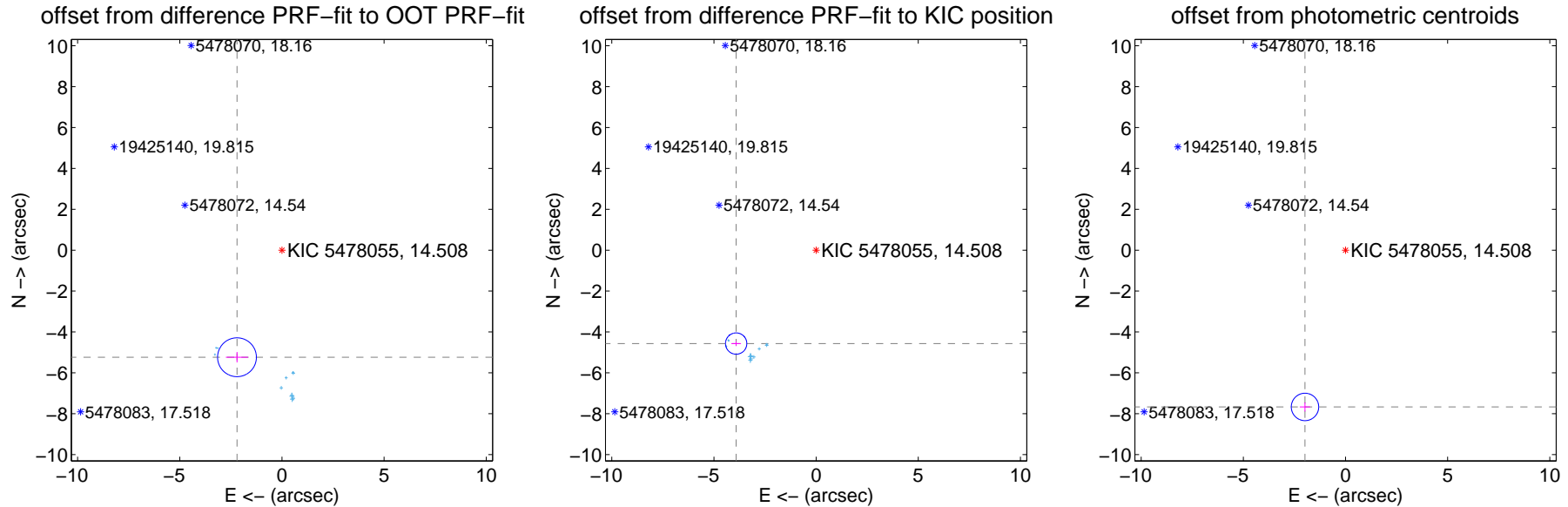
## DV Centroid Data

Supplemental centroid analysis for 005478055-01. Kepler magnitude: 14.51. Transit SNR 33.05

There are 12 quarters with good PRF difference image offsets

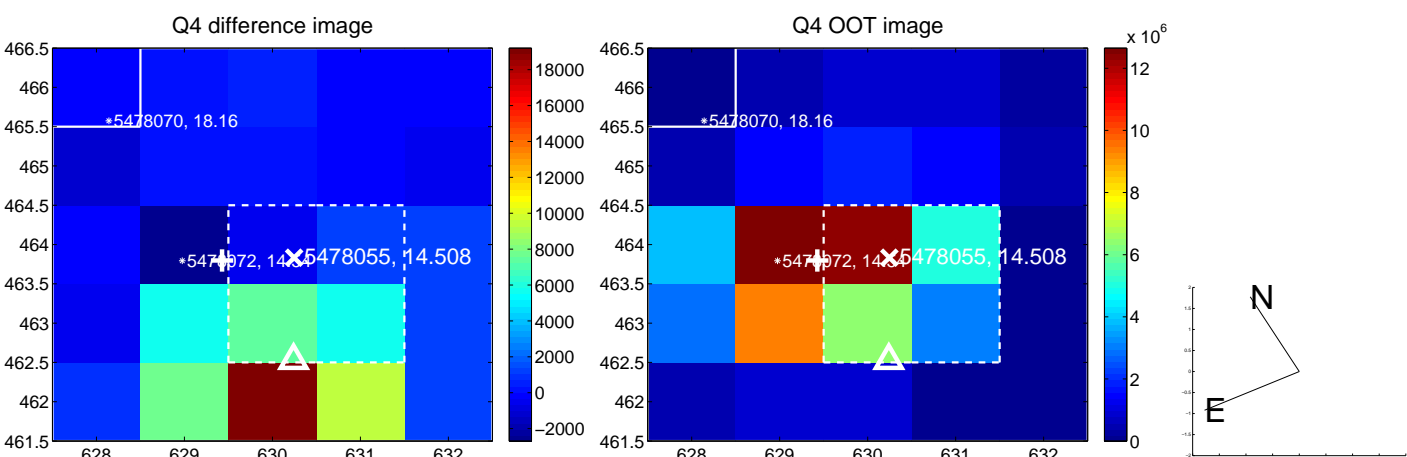
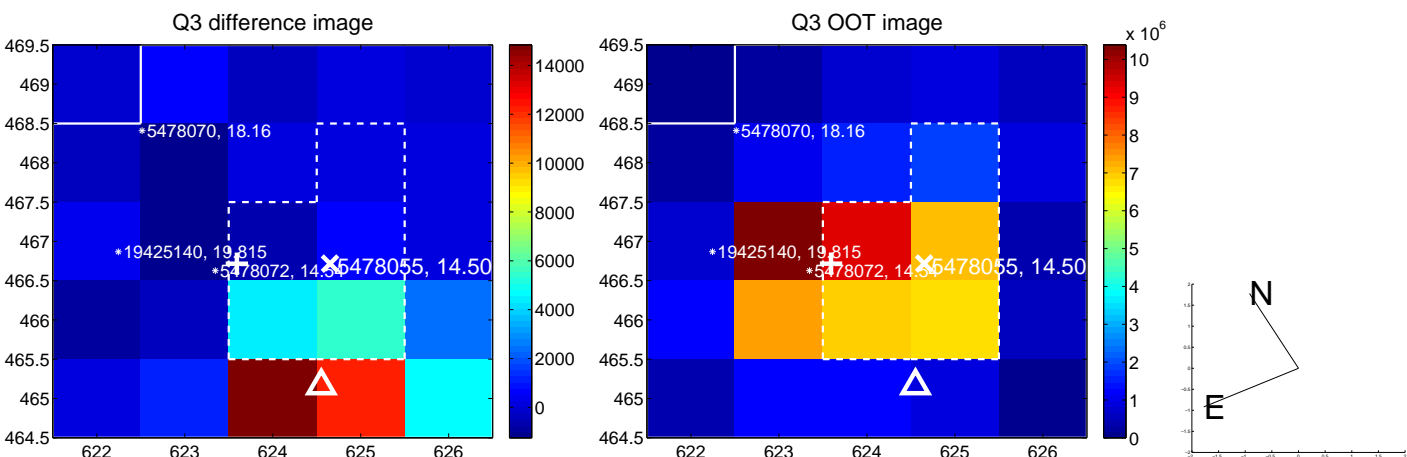
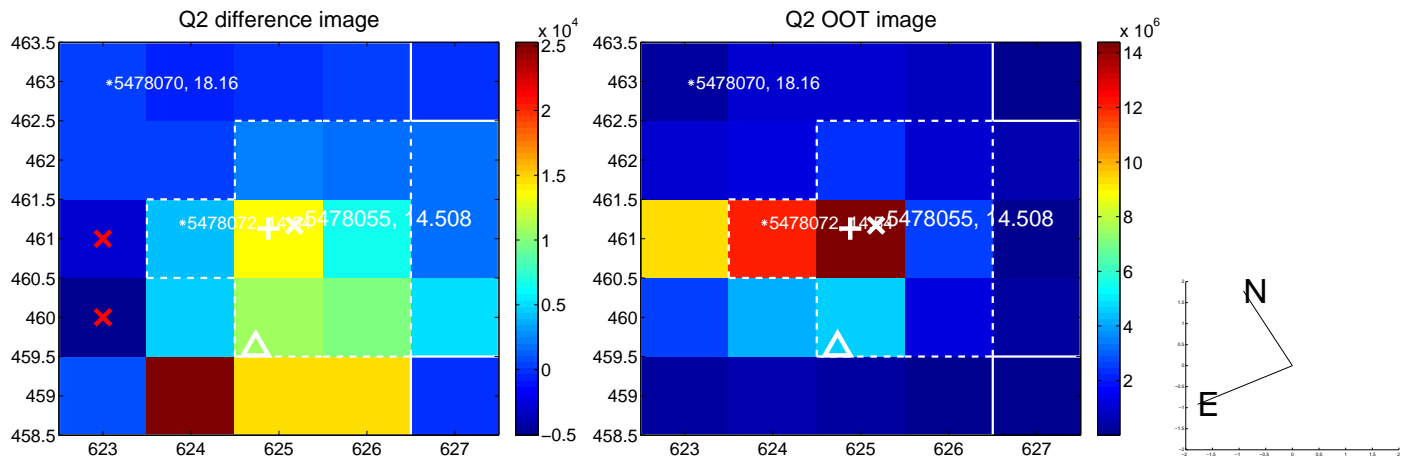
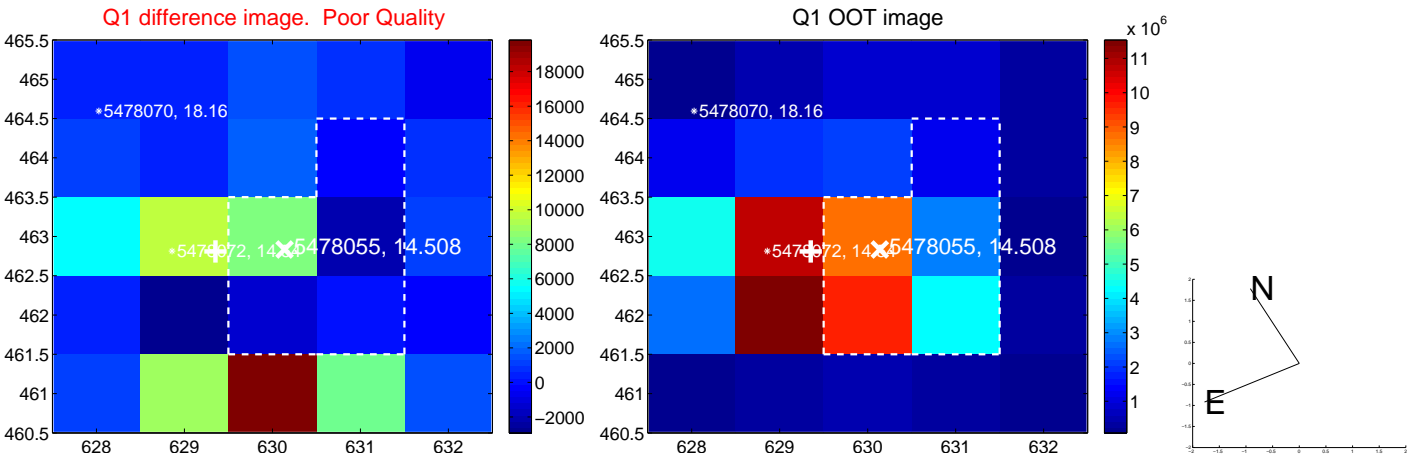
The OOT PRF centroid is offset from the target star catalog position by about 3.37 arcsec so the offset from difference PRF-fit to OOT-fit may be invalid.

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$5.681 \pm 0.317$	17.94	$2.200 \pm 0.545$	$-5.238 \pm 0.256$
PRF-fit source offset from KIC position	$6.015 \pm 0.174$	34.62	$3.913 \pm 0.236$	$-4.568 \pm 0.107$
photometric centroid source offset	$7.92 \pm 0.22$	35.41	$1.98 \pm 0.25$	$-7.67 \pm 0.22$

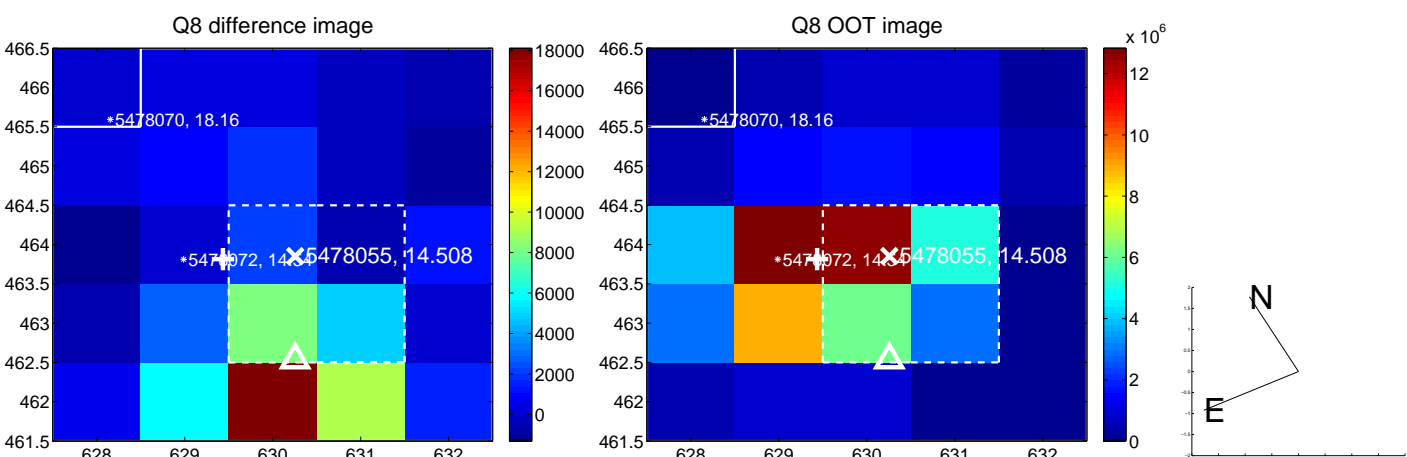
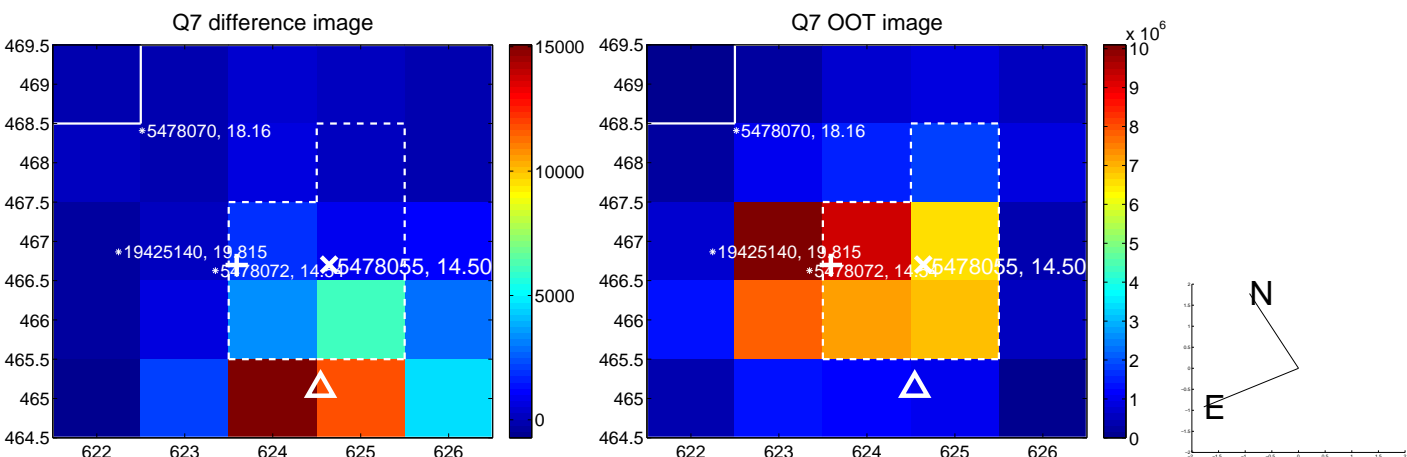
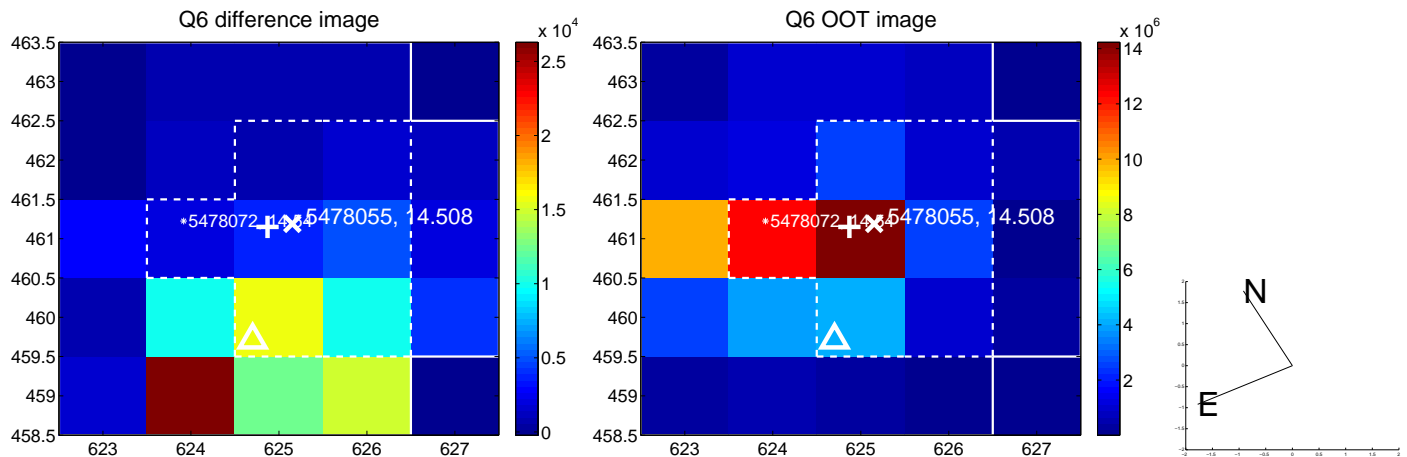
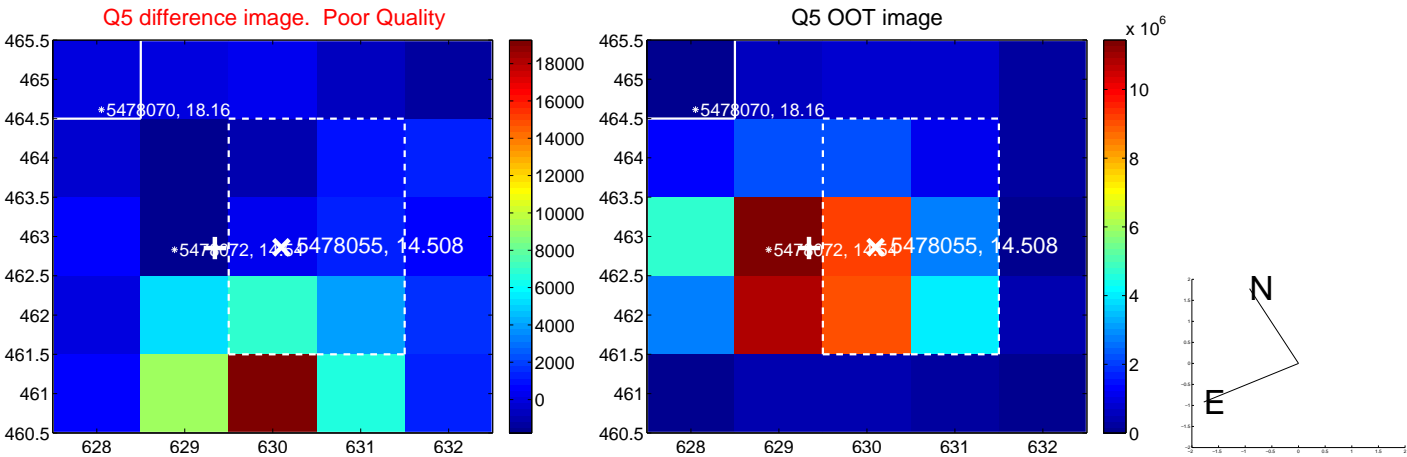


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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

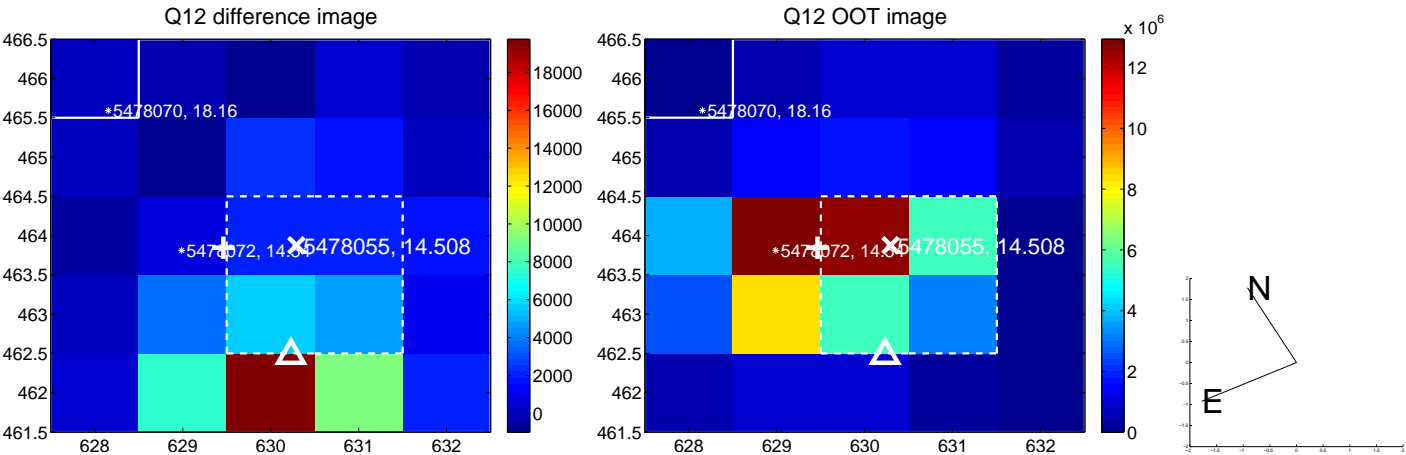
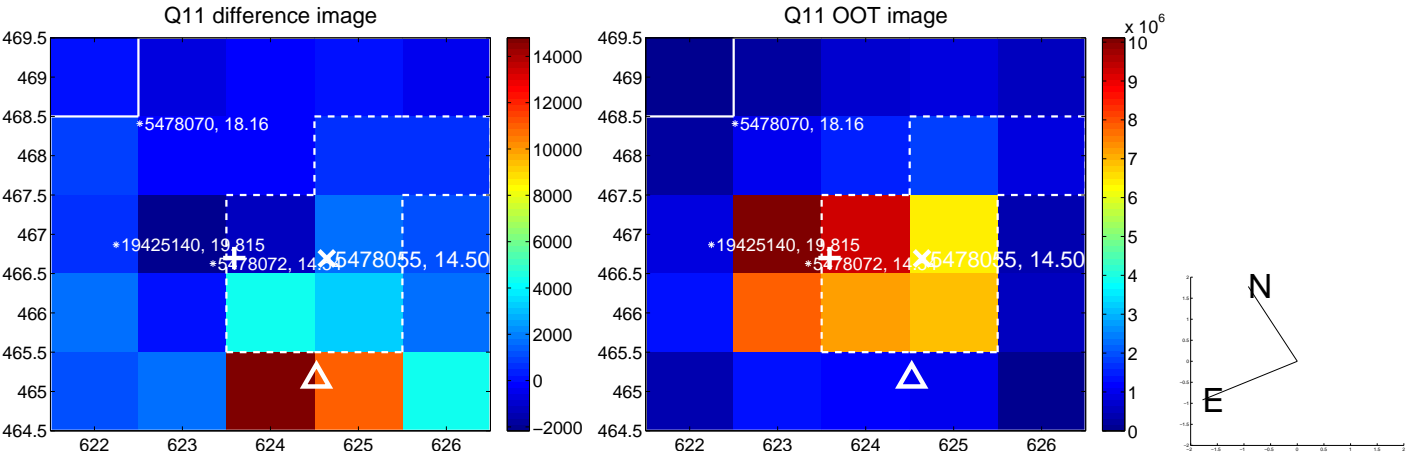
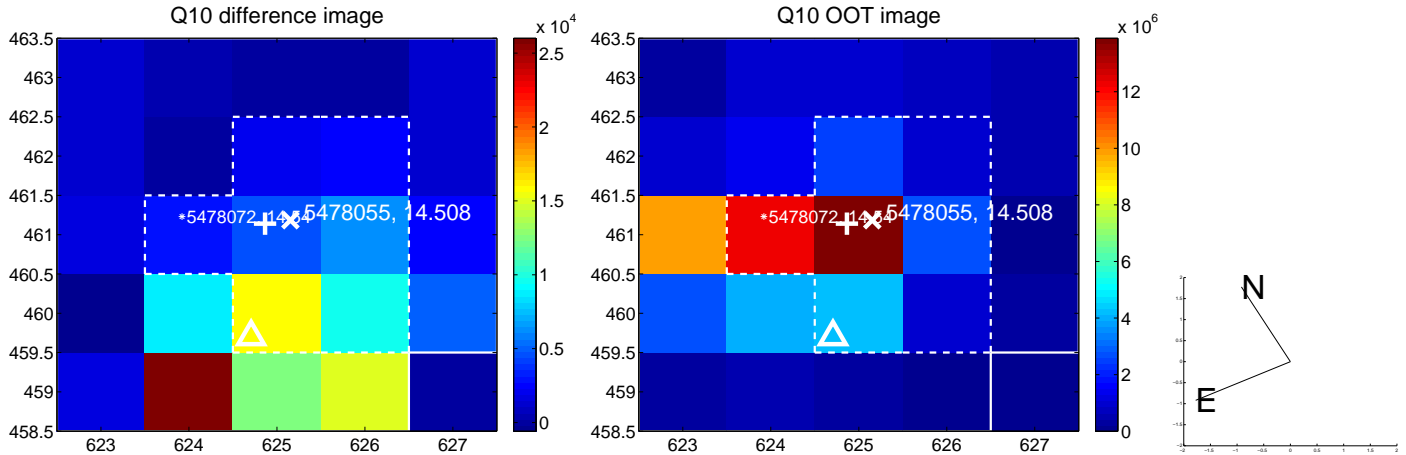
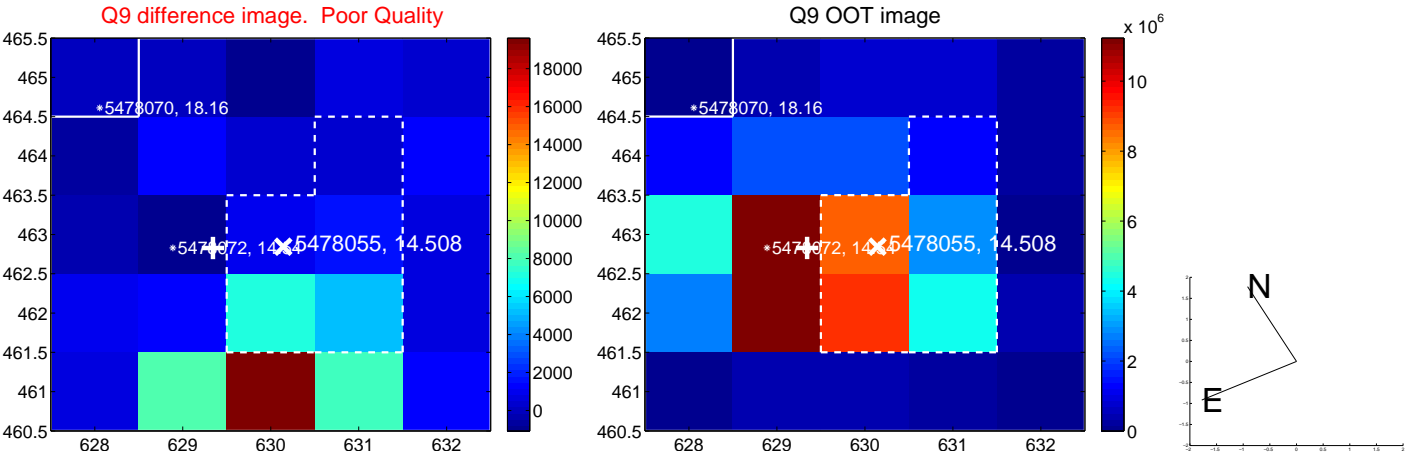
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



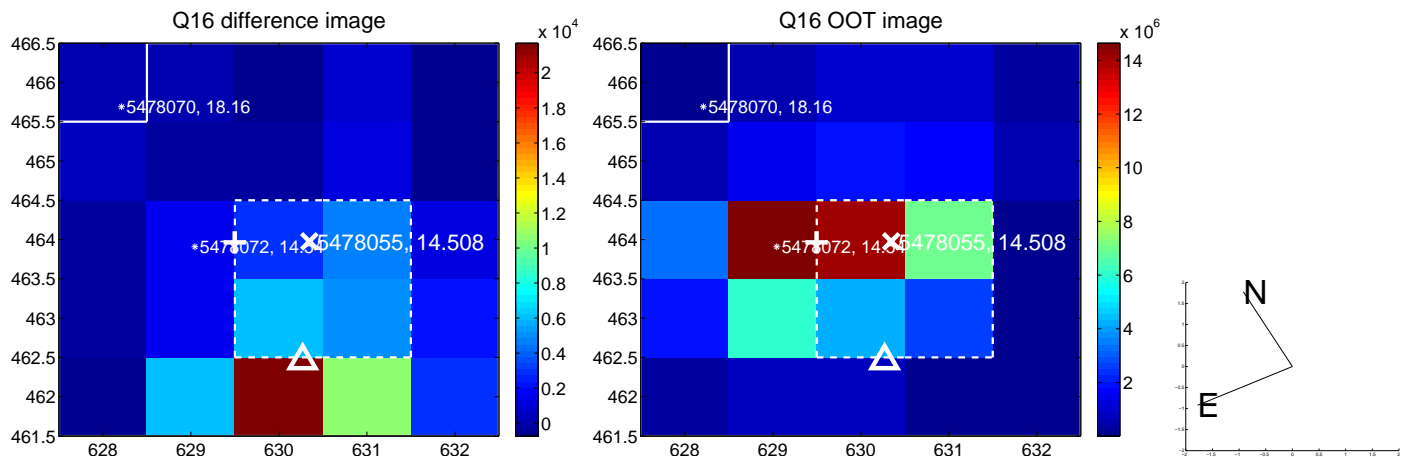
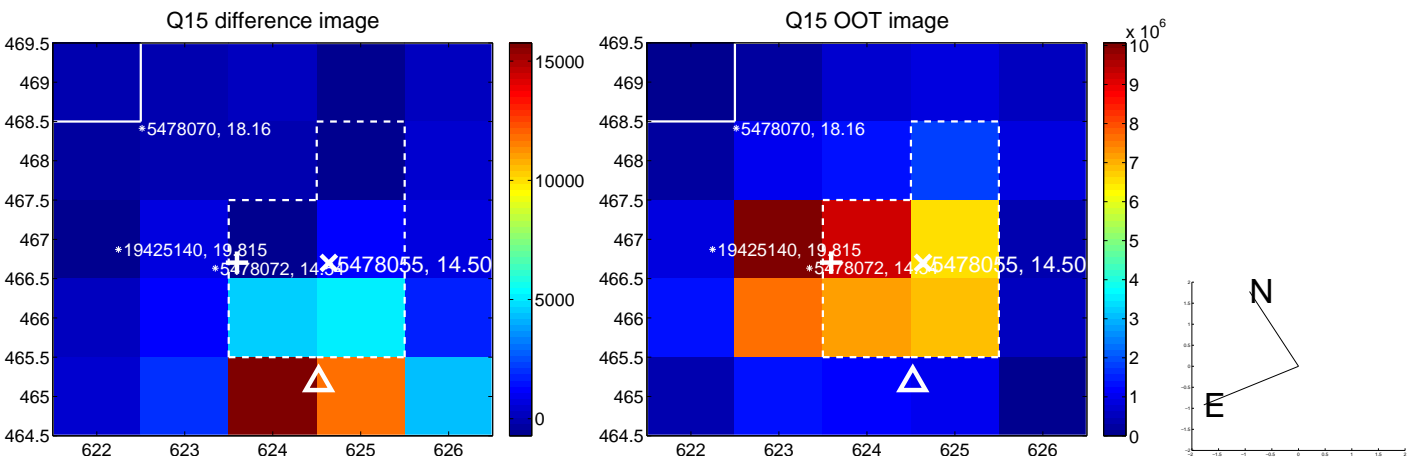
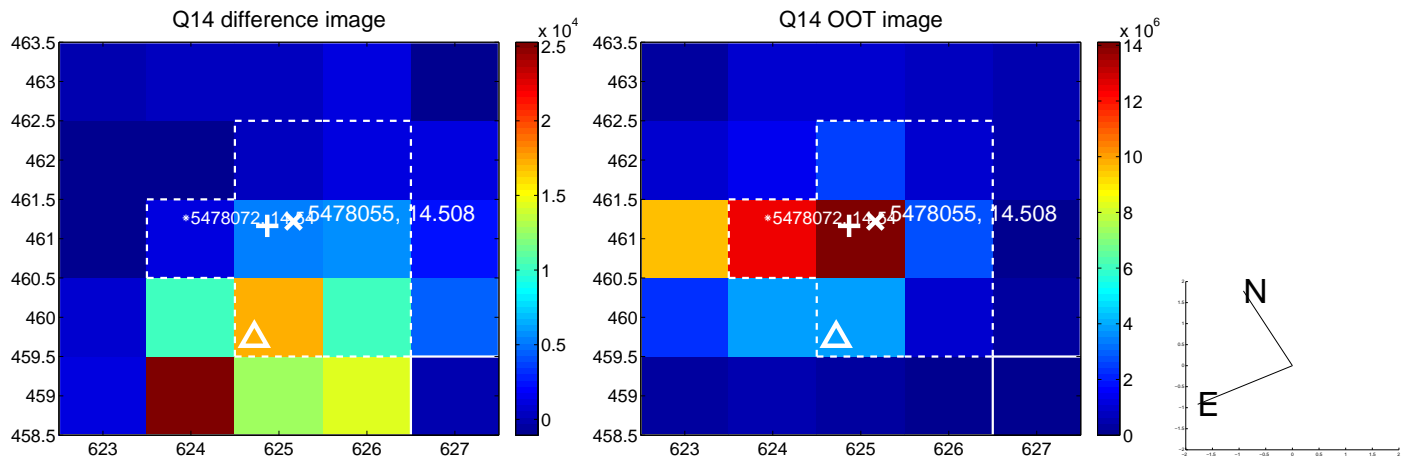
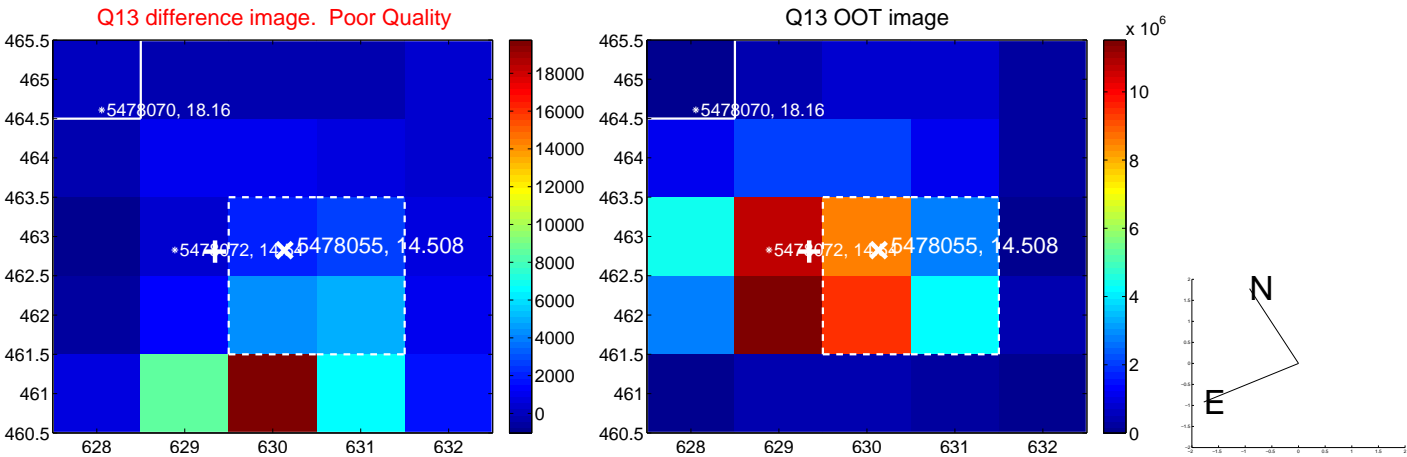
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white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

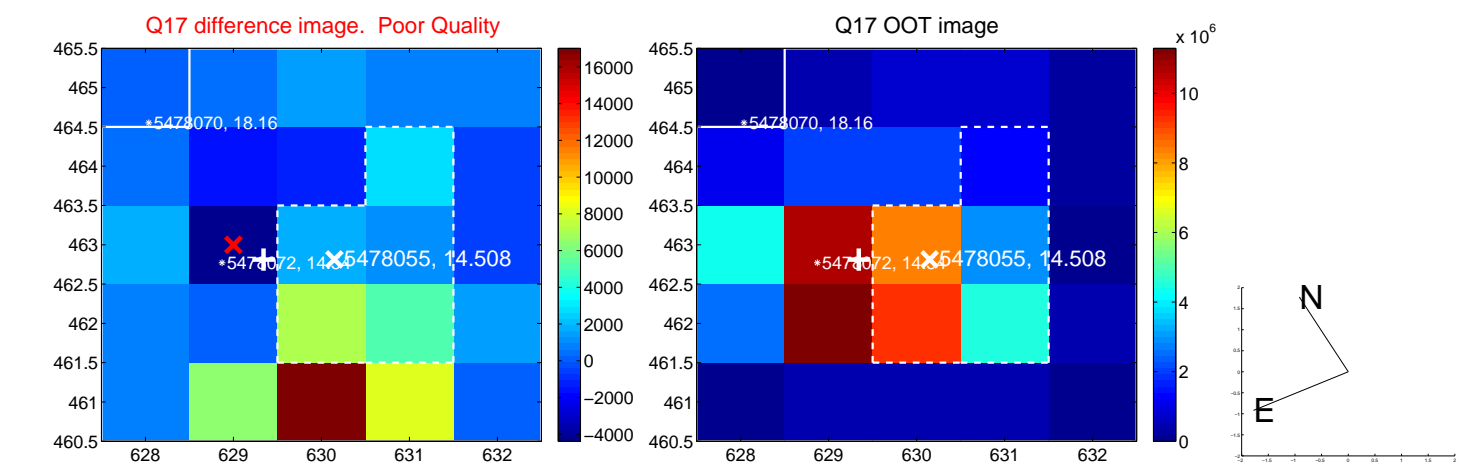


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

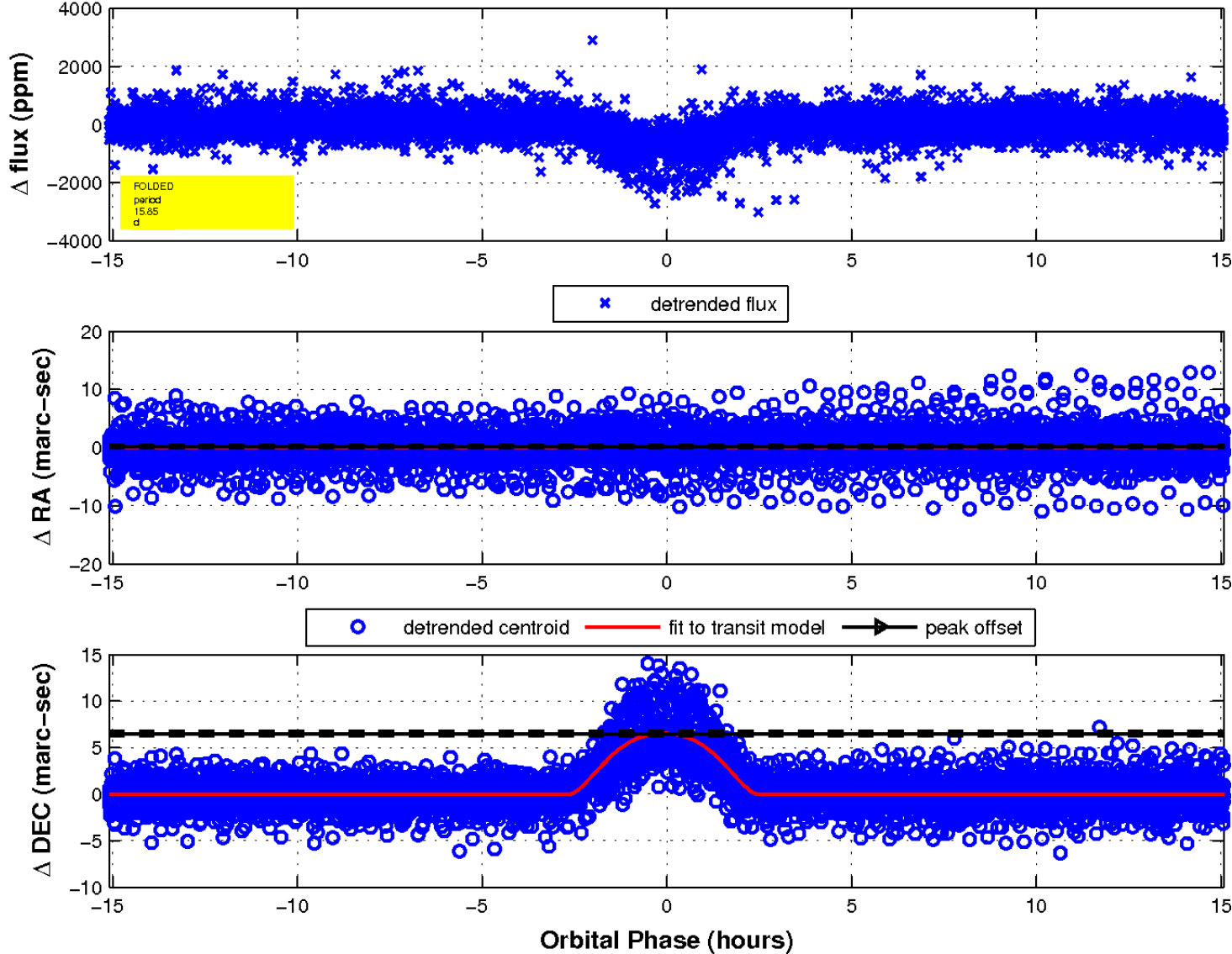




white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

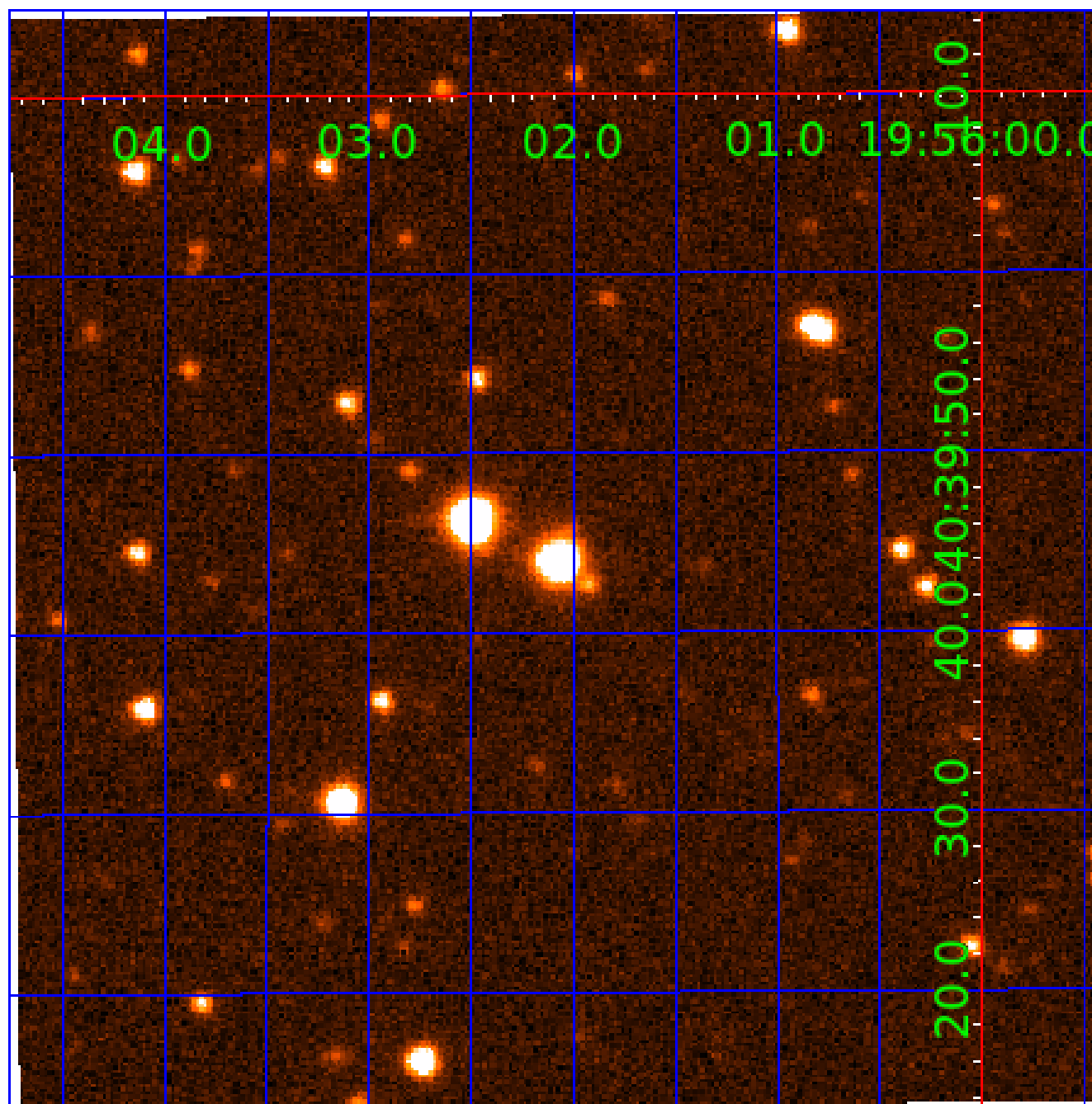


fluxWeightedCentroids, Planet 1 of 2



UKIRT Image

Declination



# KIC 005478055

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
005478055-01	OBS	0411.01	15.852339	142.522109	797.8	5.031	33.8	33.1	1.00	5903	3.80	85.47
005478055-02	OBS	No	529.038926	173.825610	741.1	8.922	8.0	8.0	1.00	5903	3.28	0.80

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
005478055-01	OBS	FP	0.00	0	0	1	1	CENT_RESOLVED_OFFSET—HALO_GHOST—EPHEM_MATCH
005478055-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_CHASES_MARSHALL_SKYE—MOD_POS_DV—INCONSISTENT_TRANS—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.

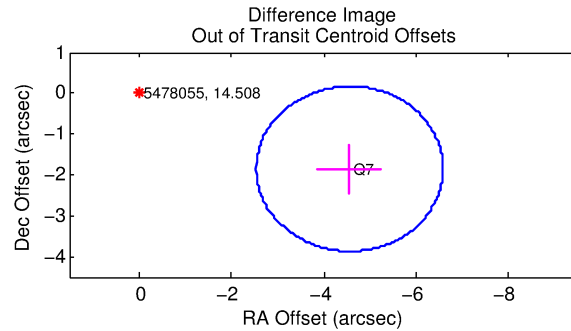
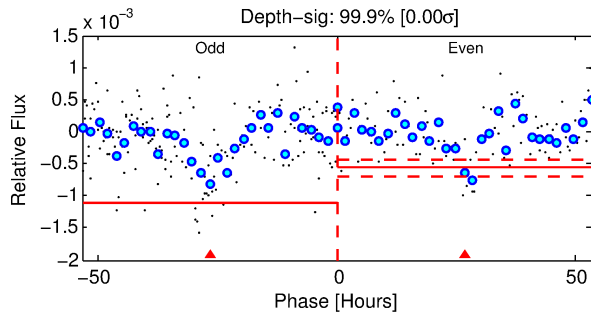
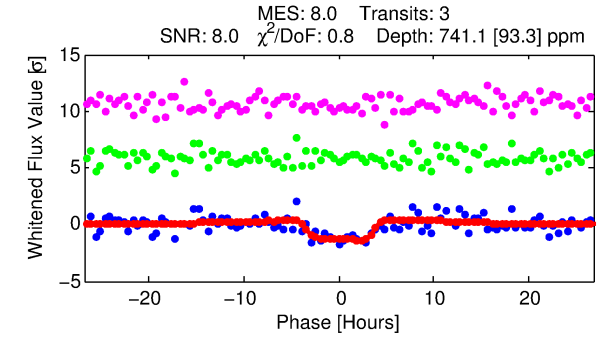
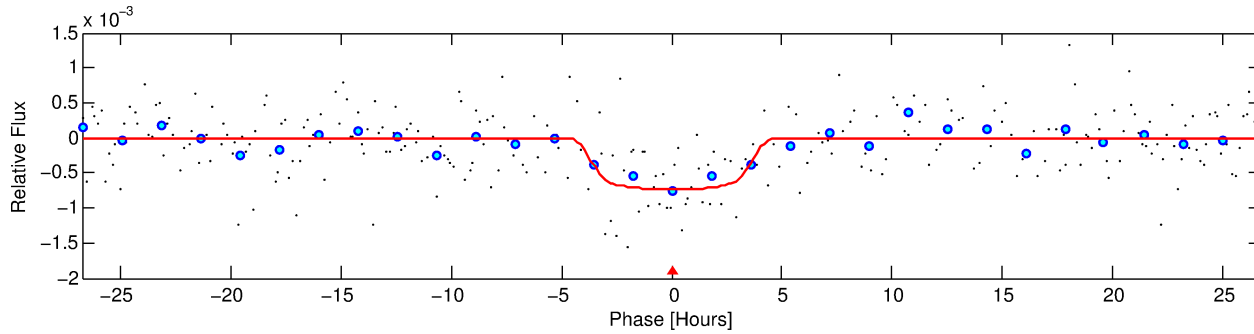
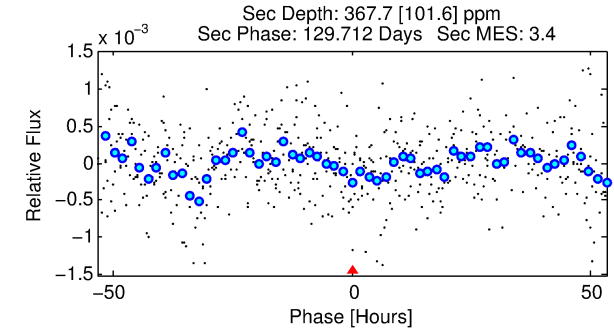
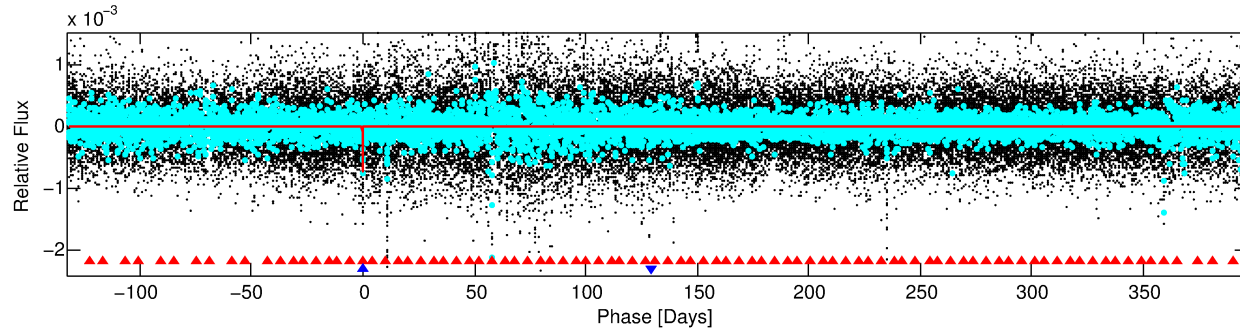
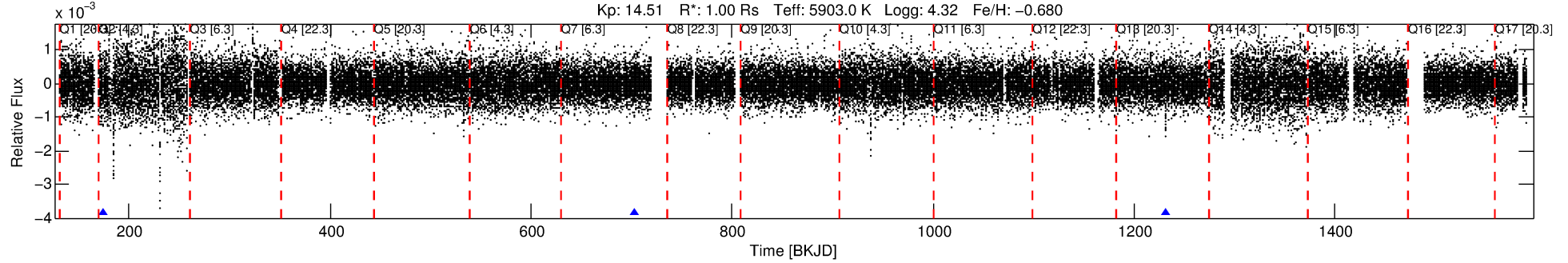
## Ephemeris Match Information For 005478055-02

No Significant Match Found

# DV One-Page Summary

KIC: 5478055 Candidate: 2 of 2 Period: 529.039 d  
KOI: K00411 Corr: No Ephemeris Match

Kp: 14.51 R\*: 1.00 Rs Teff: 5903.0 K Logg: 4.32 Fe/H: -0.680



## DV Fit Results:

Period = 529.03893 [0.02110] d  
Epoch = 173.8256 [0.0261] BKJD  
Rp/R\* = 0.0299 [0.0035]  
a/R\* = 209.30 [95.99]  
b = 0.92 [0.08]  
Seff = 0.80 [0.34]  
Teq = 241 [26] K  
Rp = 3.28 [1.00] Re  
a = 1.1753 [0.3071] AU  
Ag = 25933.17 [14140.86] [1.83σ]  
Teffp = 4725 [450] K [9.95σ]

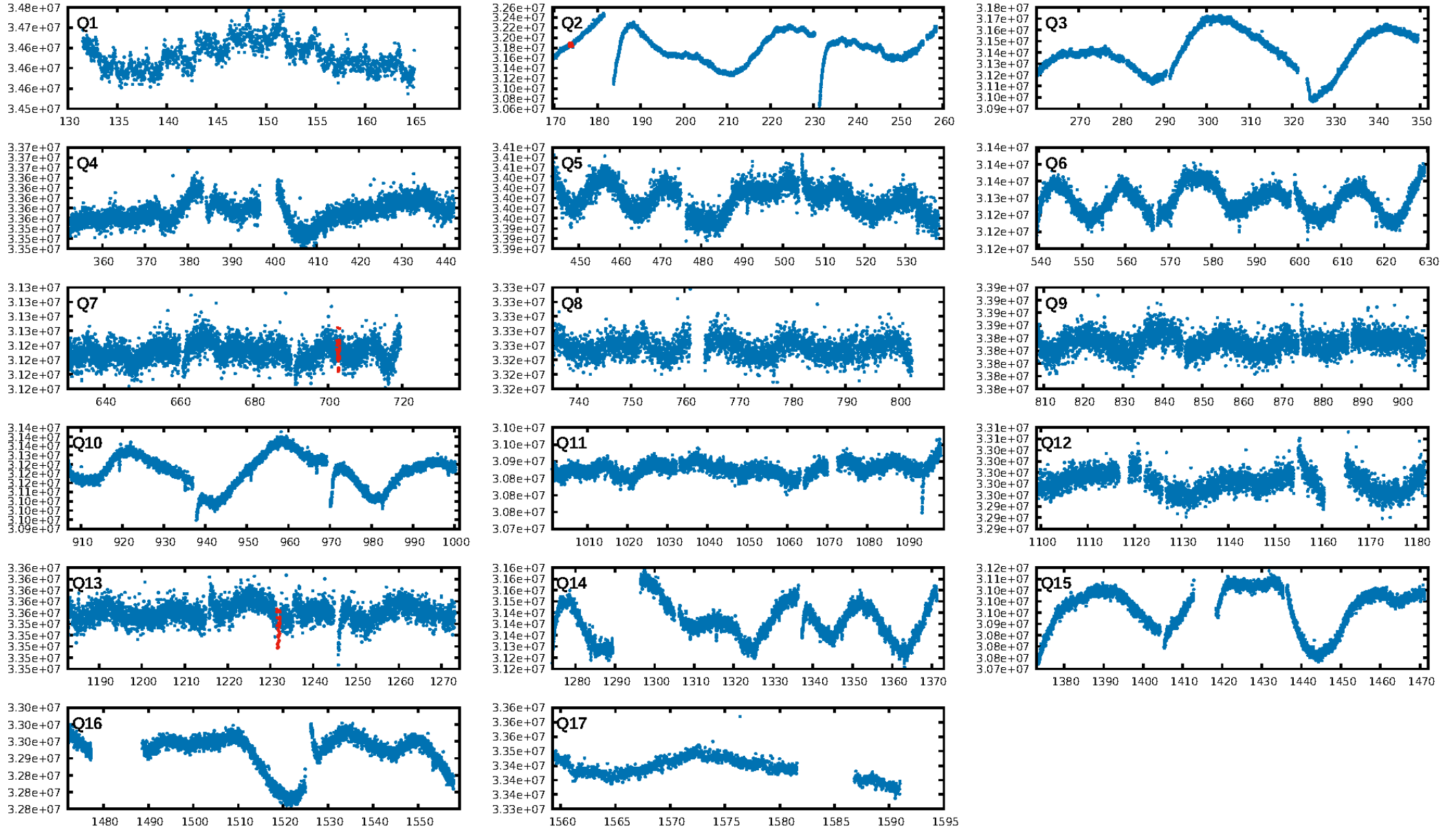
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [1202.41σ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: 5.1%  
ModelChiSquareGof-sig: 99.6%  
**Bootstrap-pfa: 3.91e-09**  
RollingBand-fgt: 1.00 [3/3]  
GhostDiagnostic-chr: -162.3  
Centroid-sig: 83.6%  
Centroid-so: 2.643 arcsec [2.39σ]  
**OotOffset-rm: 4.922 arcsec [7.31σ]**  
KicOffset-rm: 0.757 arcsec [1.11σ]  
OotOffset-st: 0/1/0/0 [1]  
KicOffset-st: 0/1/0/0 [1]  
DiffImageQuality-fgm: 1.00 [1/1]  
DiffImageOverlap-fno: 0.50 [1/2]

Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 29-Jan-2016 13:24:01 Z

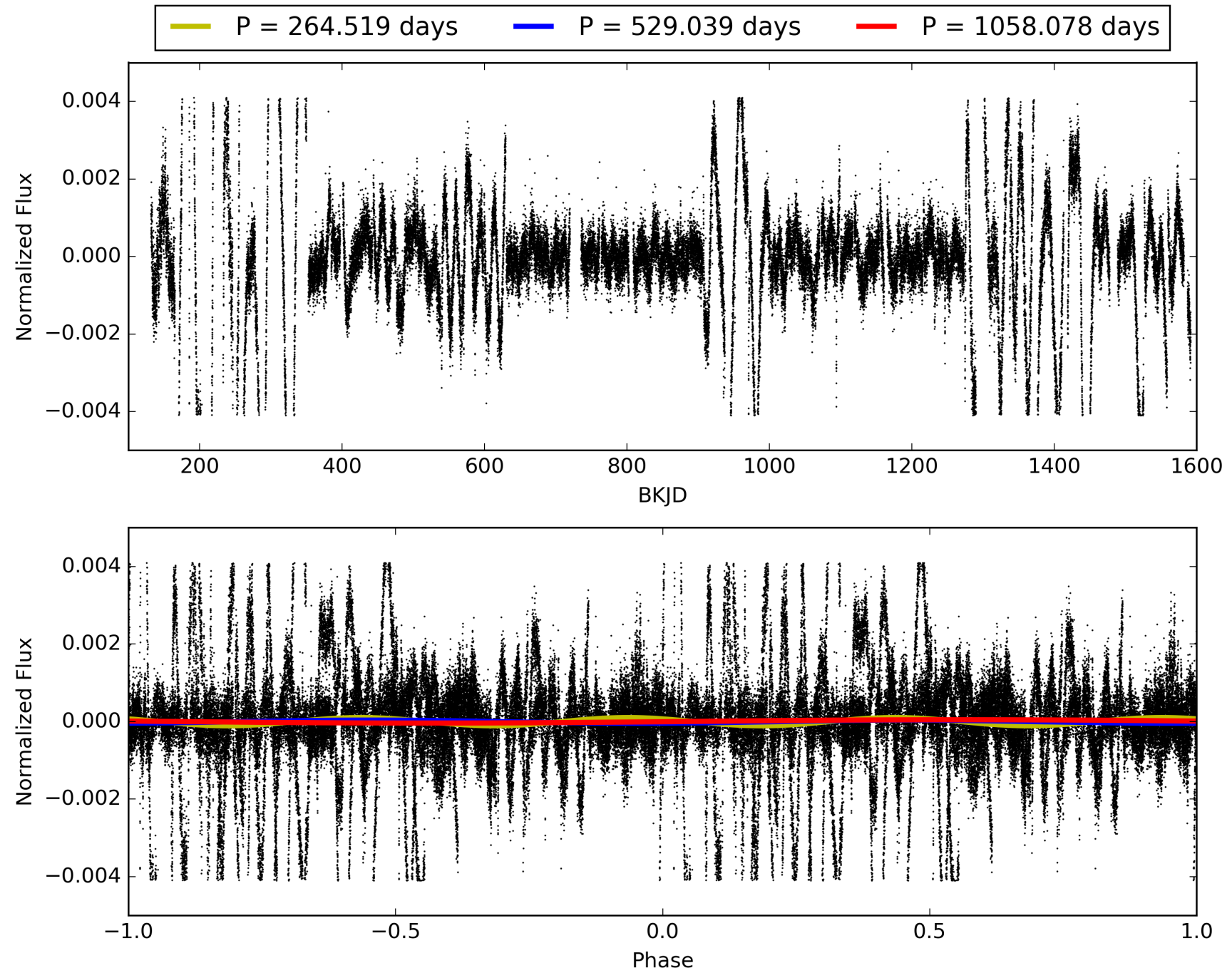
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

# TCE 005478055-02, PDC Light Curves



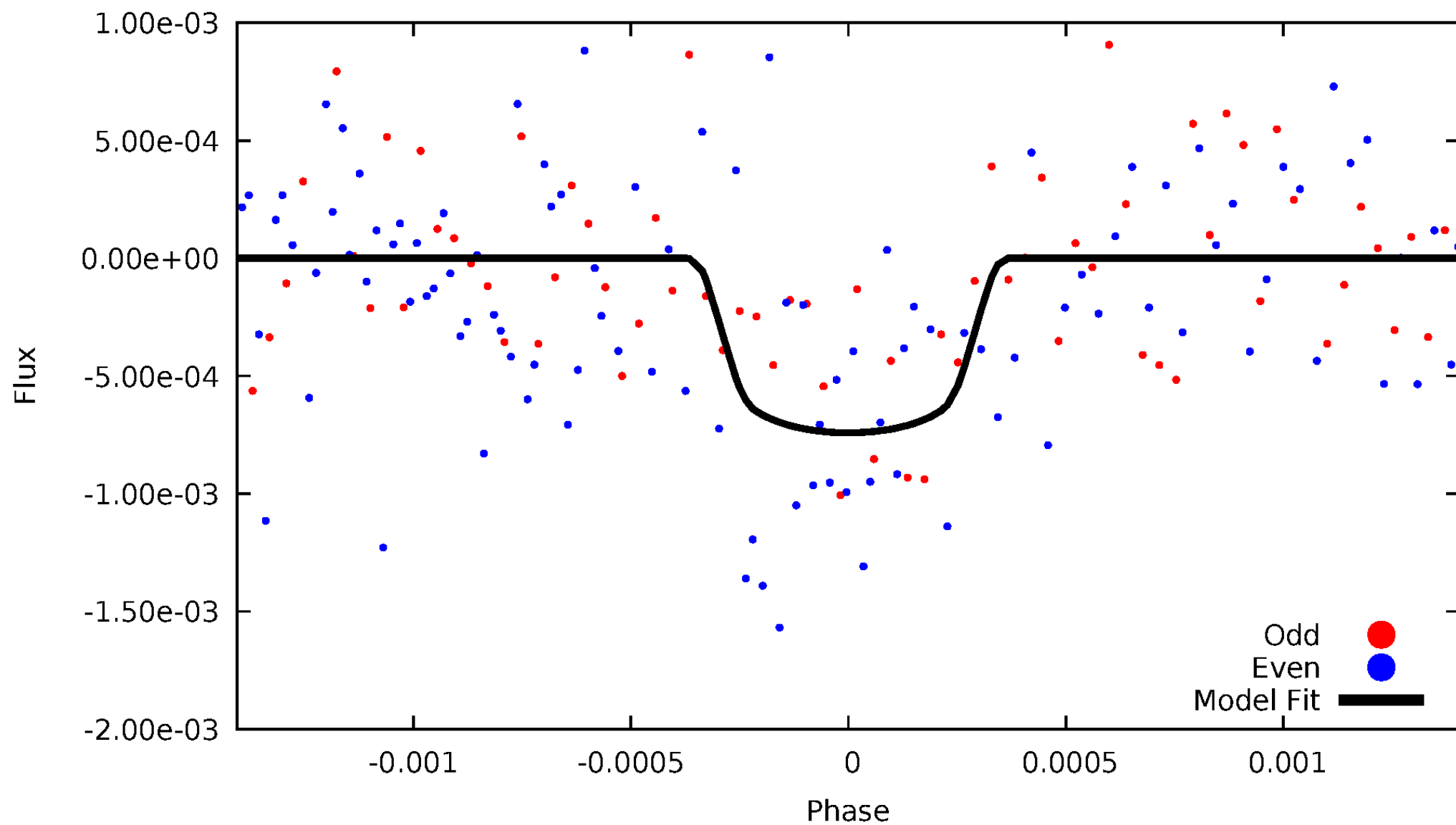


TCE 005478055-02



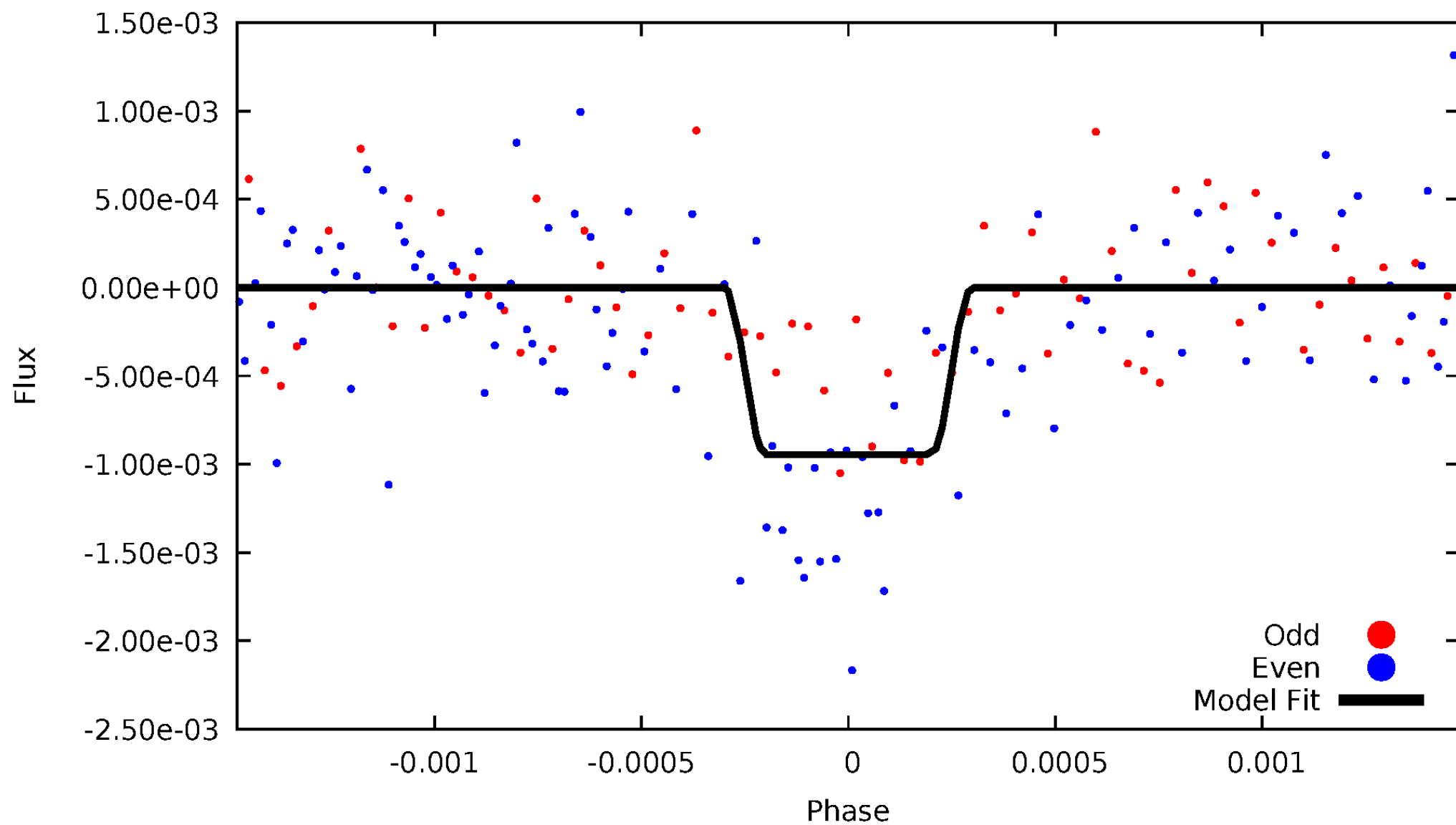
# DV Odd/Even

TCE 005478055-02



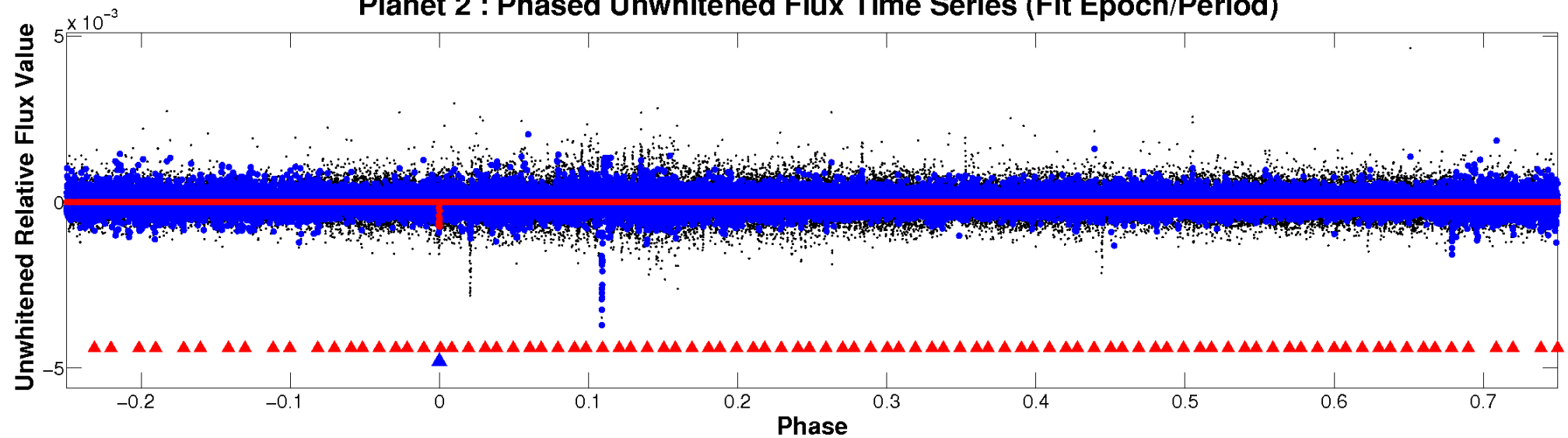
# ALT Odd/Even

TCE 005478055-02

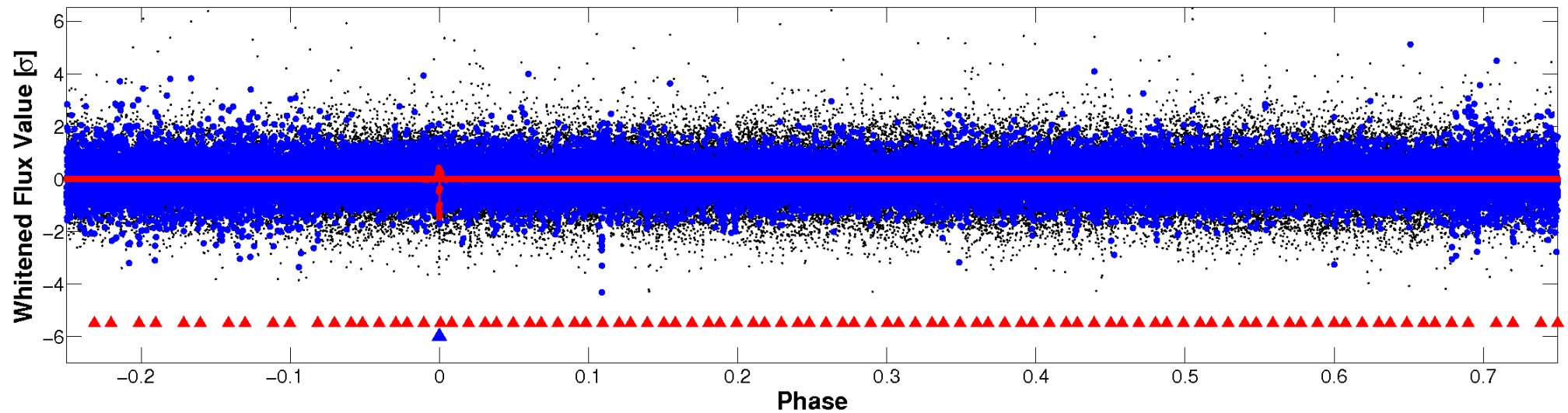


# Non-Whitened Vs. Whitened Light Curve

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

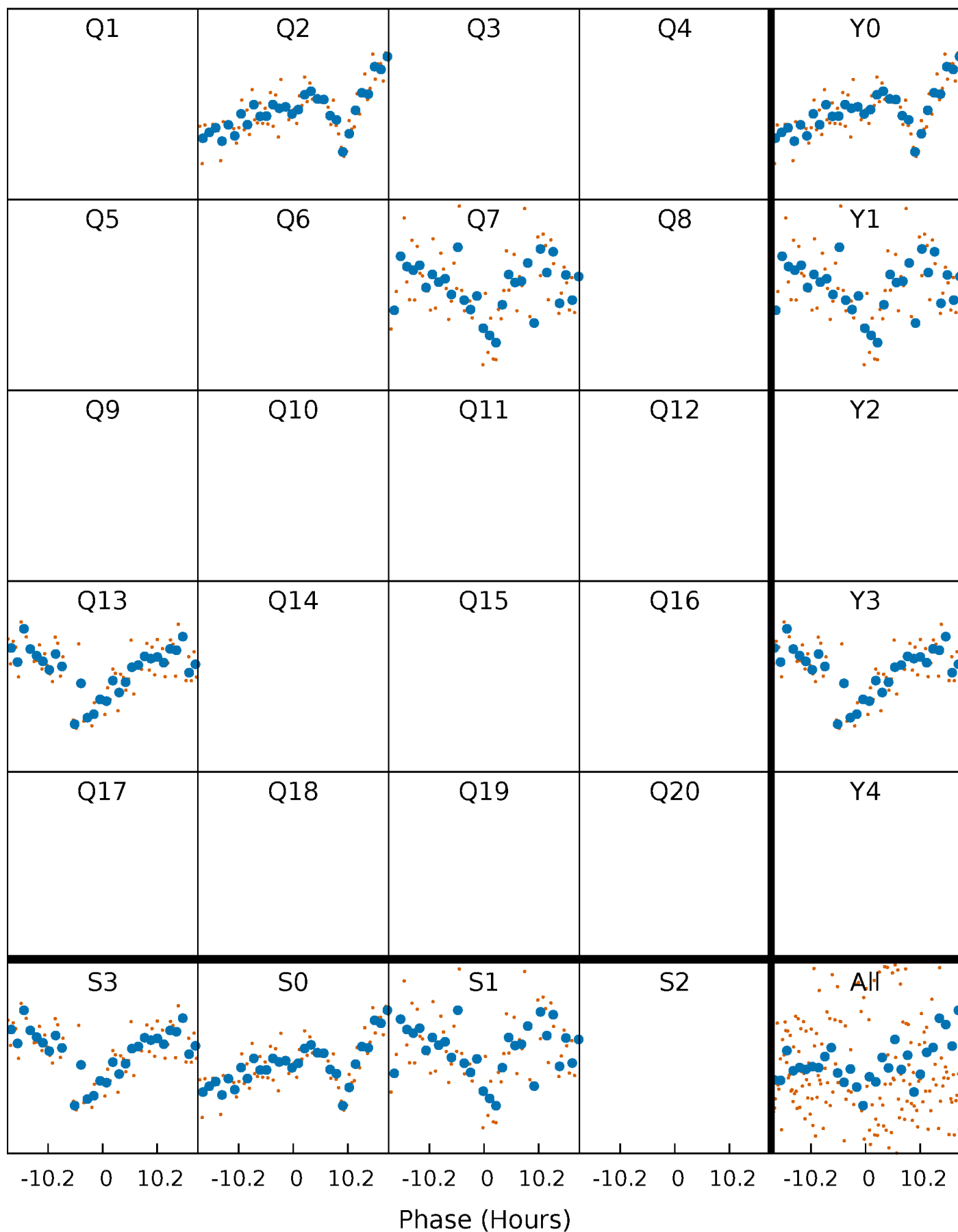


Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



# PDC Quarter-Phased Transit Curves

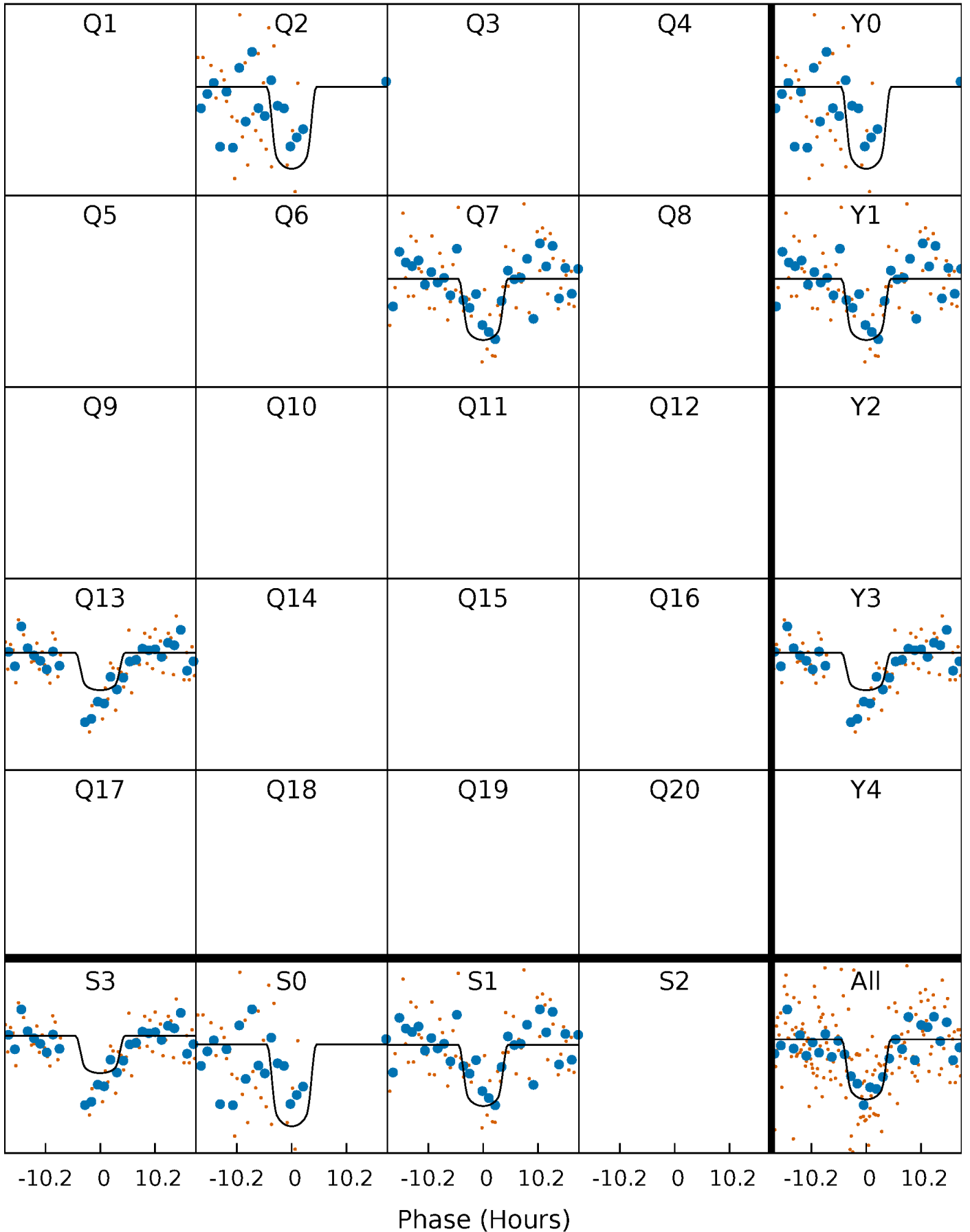
TCE 005478055-02 P=529.038926 Days  $T_0=173.825610$  (BKJD)





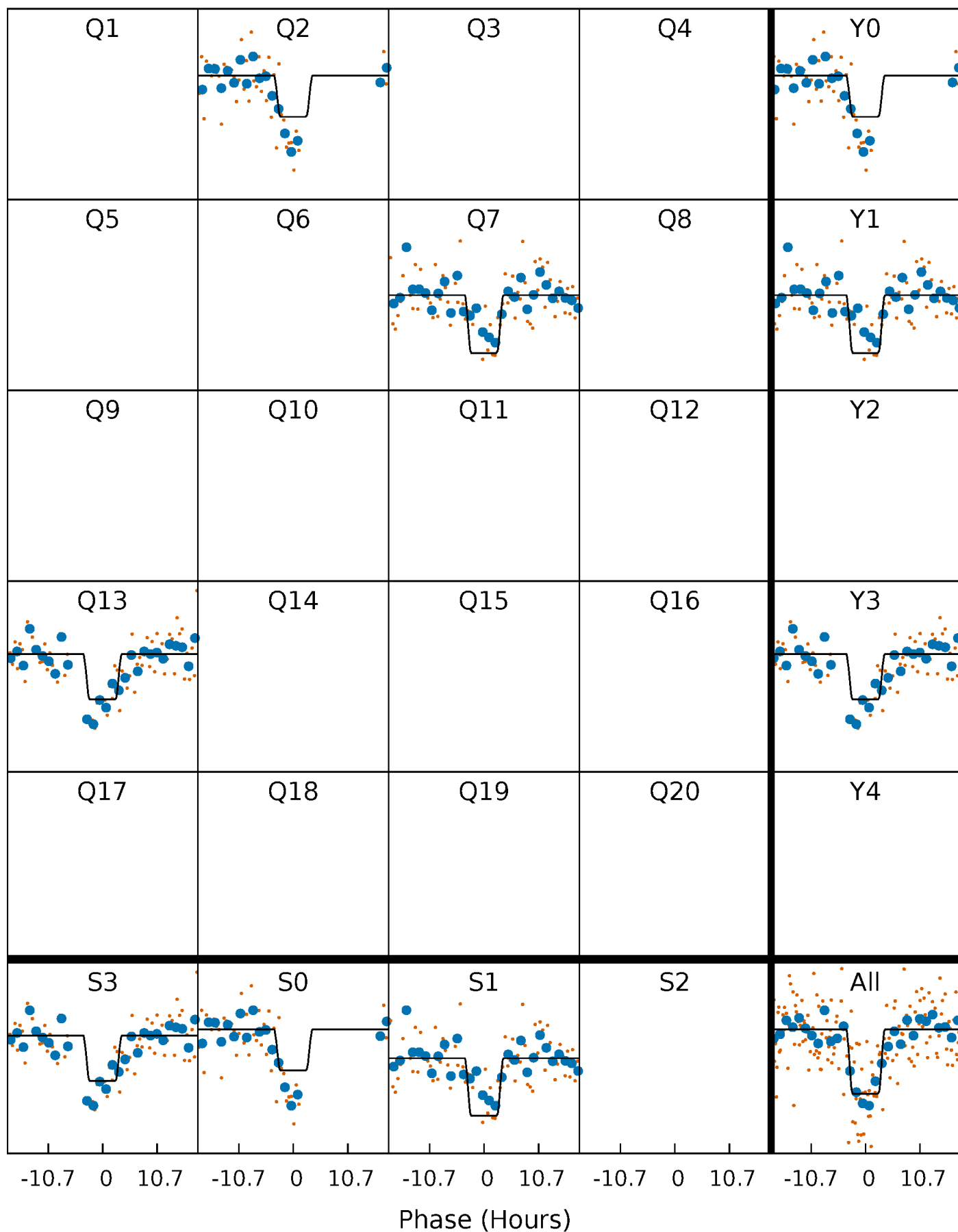
# DV Quarter-Phased Transit Curves

TCE 005478055-02     $P=529.038926$  Days     $T_0=173.825610$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

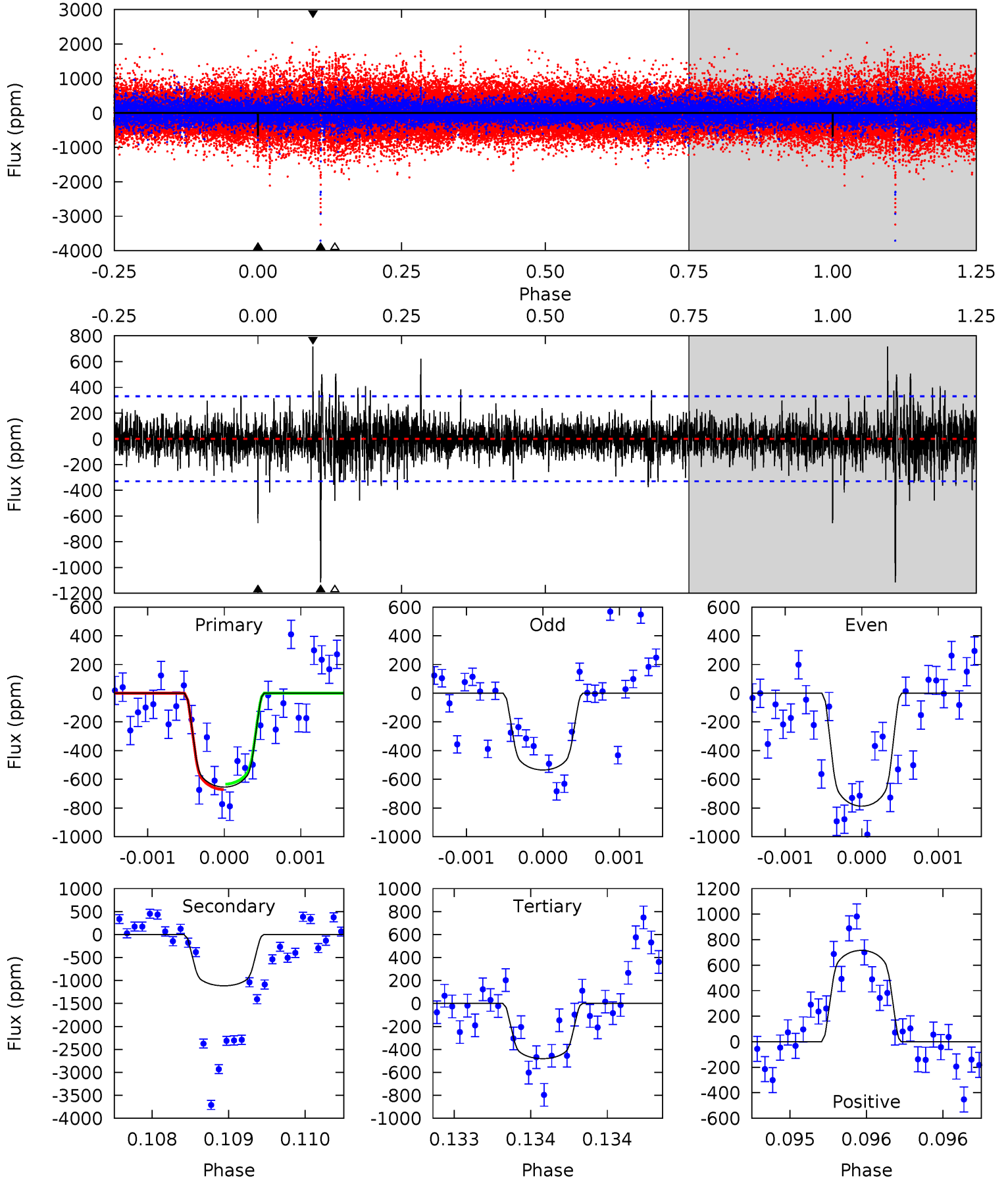
TCE 005478055-02 P=529.018057 Days  $T_0=173.847280$  (BKJD)



# DV Model-Shift Uniqueness Test

005478055-02, P = 529.038926 Days, E = 173.825610 Days

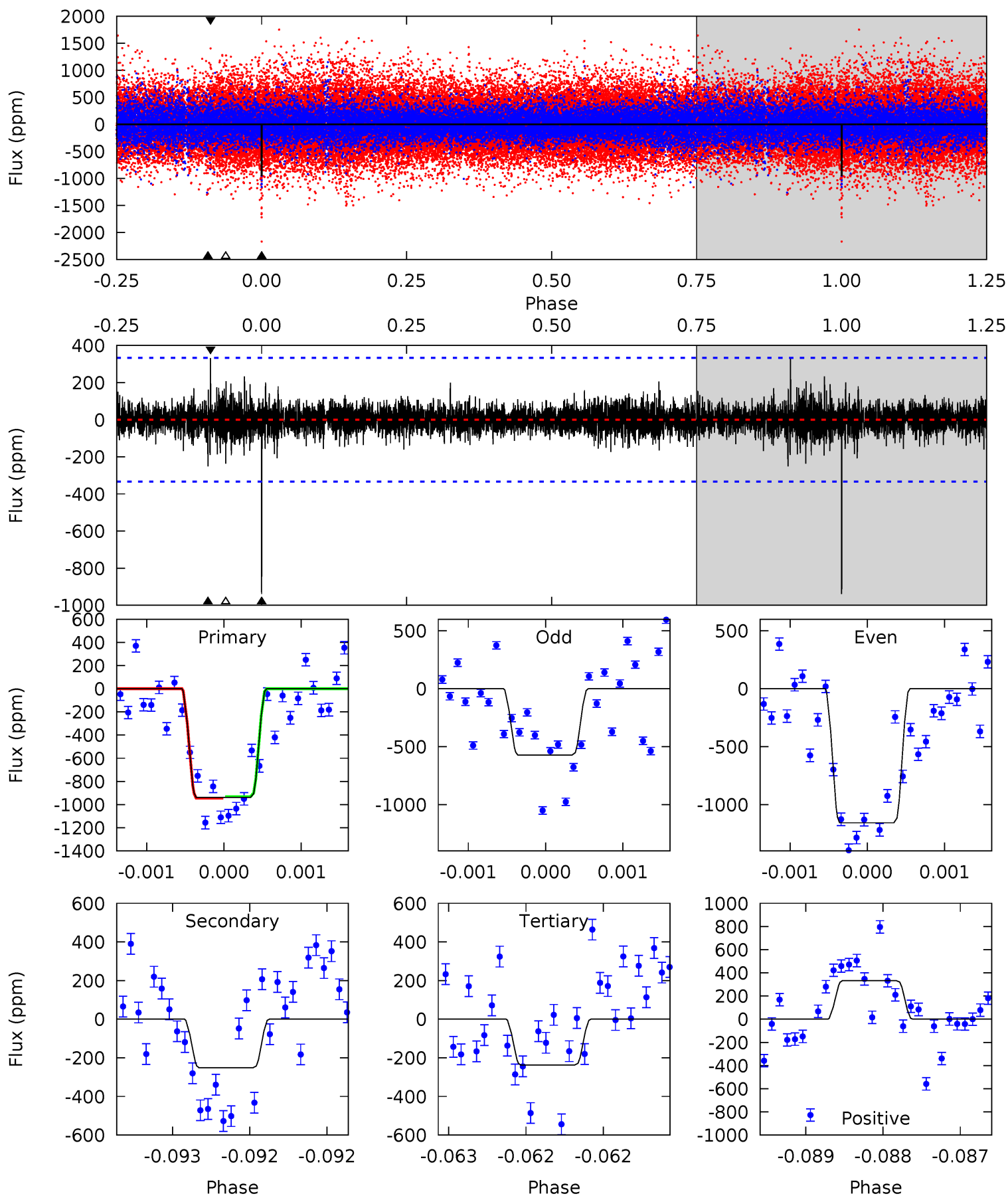
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
10.9	18.6	8.02	12.0	5.51	3.39	1.72	2.90	-1.03	10.6	6.68	2.09	1.19	0.39	0.31



# Alt Model-Shift Uniqueness Test

005478055-02, P = 529.018057 Days, E = 173.847280 Days

Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
15.7	4.19	3.96	5.53	5.56	3.46	0.80	11.7	10.1	0.24	-1.34	4.82	0.98	0.26	0.09



### Stellar Parameters For KIC 005478055

	$T_{\text{eff}} (K)$	$\log(g)$	$[\text{Fe}/\text{H}]$	$R (R_{\odot})$	$M (M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$5903^{+177}_{-177}$	$4.322^{+0.236}_{-0.215}$	$-0.680^{+0.300}_{-0.300}$	$1.005^{+0.284}_{-0.207}$	$0.772^{+0.110}_{-0.047}$	$1.071^{+1.219}_{-0.570}$
	+3%/-3%	+5%/-5%	+44%/-44%	+28%/-21%	+14%/-6%	+114%/-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 005478055-02 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$-1116 \pm 60$	$3.27^{+0.72}_{-0.58}$	$334^{+29}_{-25}$	$6223^{+450}_{-378}$	$80623^{+37505}_{-26814}$
Alt.	$-251 \pm 60$	$3.38^{+0.72}_{-0.55}$	$336^{+28}_{-27}$	$4433^{+314}_{-307}$	$16760^{+9841}_{-6232}$

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

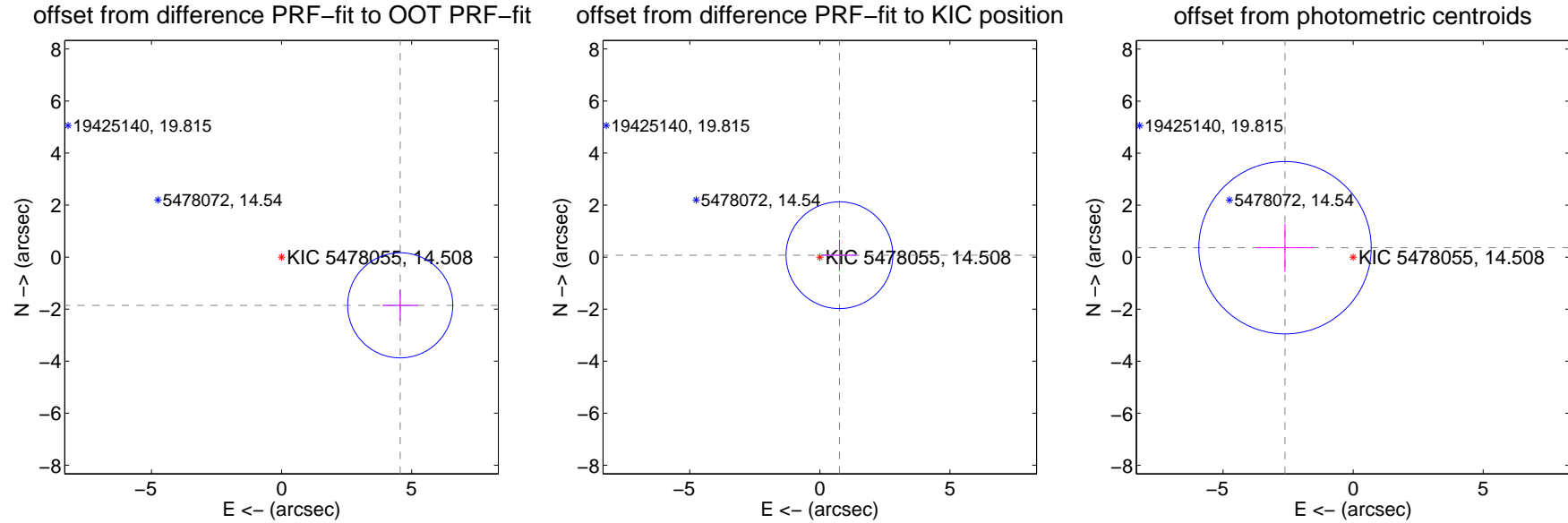
## DV Centroid Data

Supplemental centroid analysis for 005478055-02. Kepler magnitude: 14.51. Transit SNR 7.99

There are 1 quarters with good PRF difference image offsets

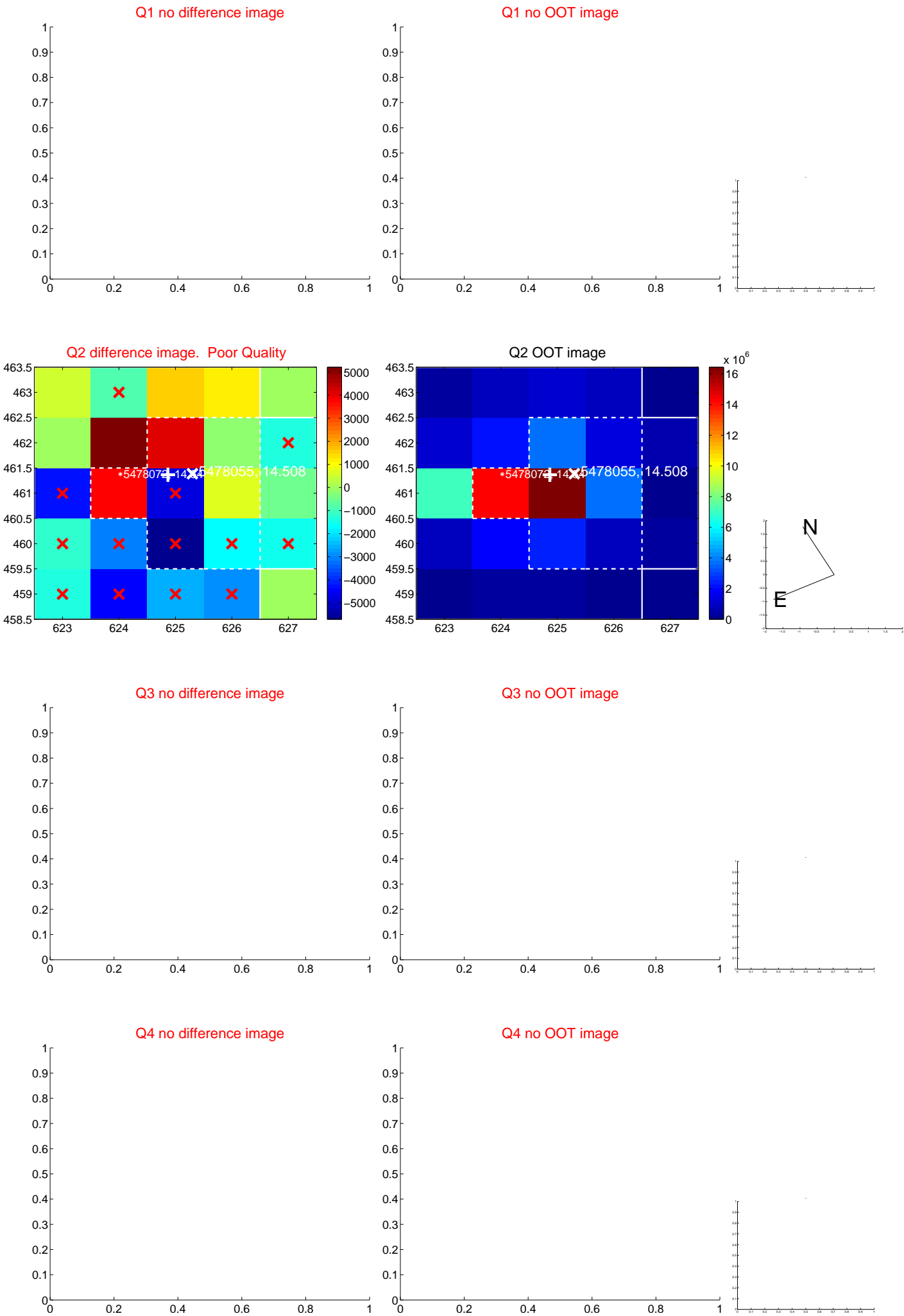
The OOT PRF centroid is offset from the target star catalog position by about 4.27 arcsec so the offset from difference PRF-fit to OOT-fit may be invalid.

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$4.922 \pm 0.673$	7.31	$-4.560 \pm 0.685$	$-1.853 \pm 0.599$
PRF-fit source offset from KIC position	$0.757 \pm 0.684$	1.11	$-0.753 \pm 0.685$	$0.073 \pm 0.599$
photometric centroid source offset	$2.64 \pm 1.10$	2.39	$2.62 \pm 1.11$	$0.36 \pm 0.92$



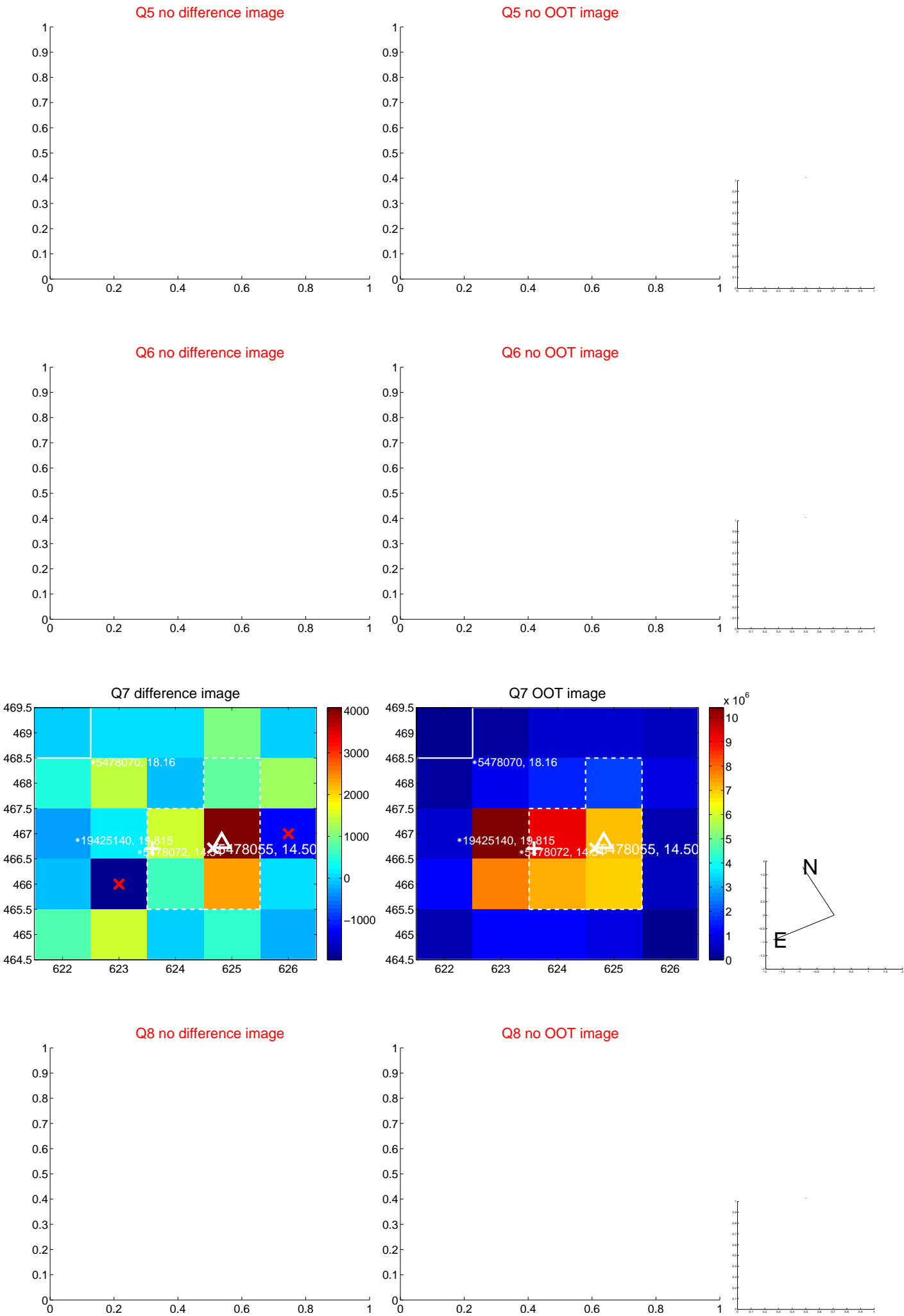
Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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



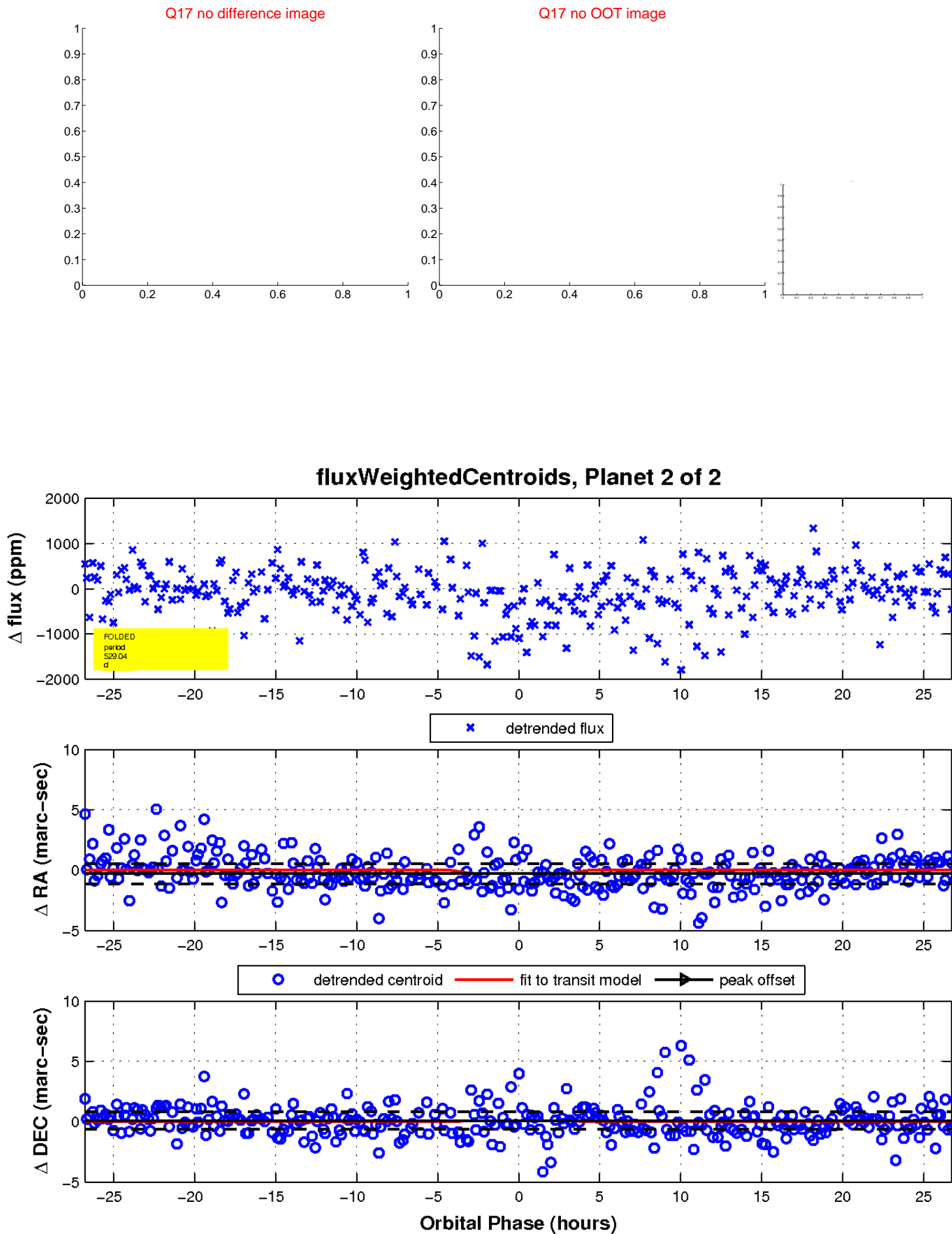
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



white  $\times$ : 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

