

# KIC 009823457

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
009823457-01	OBS	0954.01	8.115280	133.946094	830.9	3.225	49.6	54.4	0.89	5926	3.07	141.30
009823457-02	OBS	0954.02	36.925040	137.298270	901.6	4.989	30.9	33.7	0.89	5926	2.99	18.74

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009823457-01	OBS	PC	1.00	0	0	0	0	NO_COMMENT
009823457-02	OBS	PC	1.00	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.

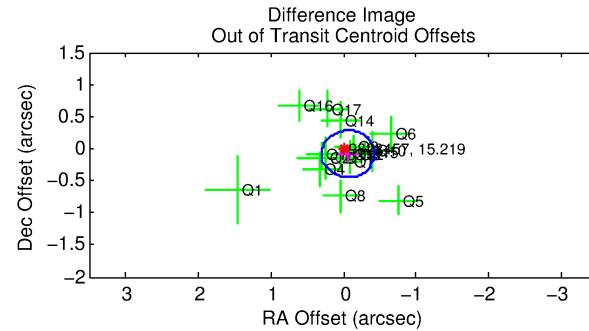
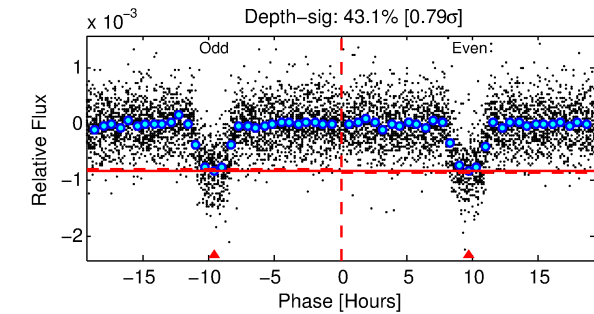
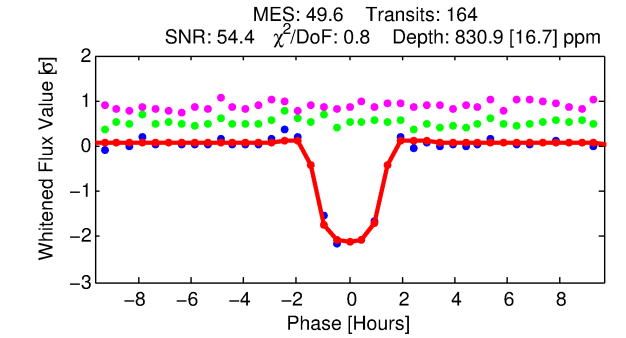
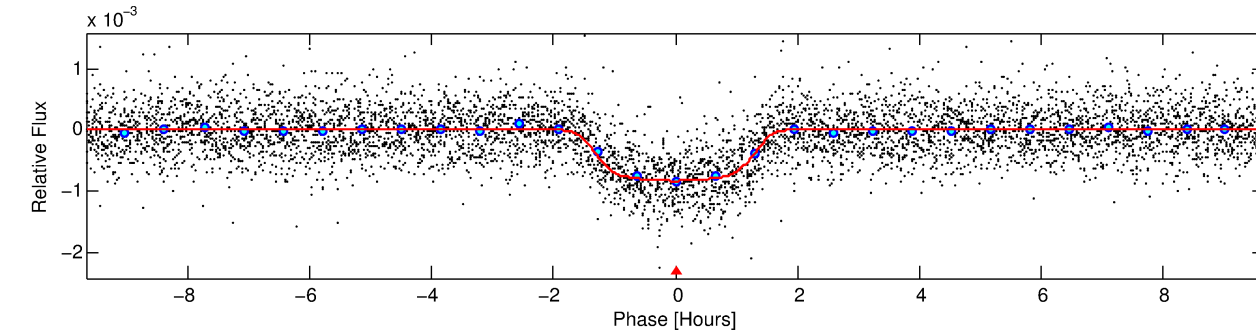
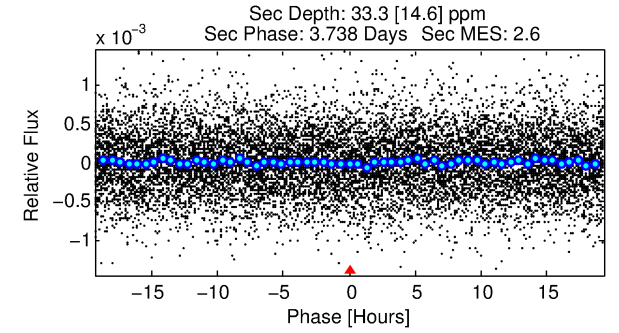
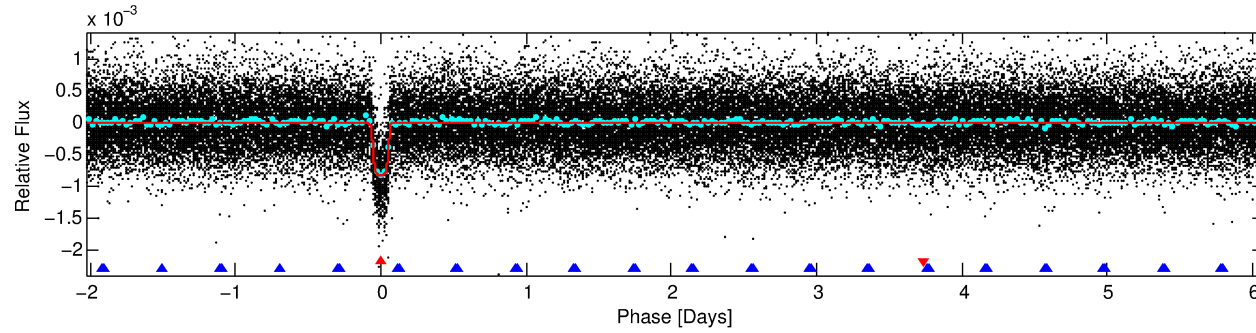
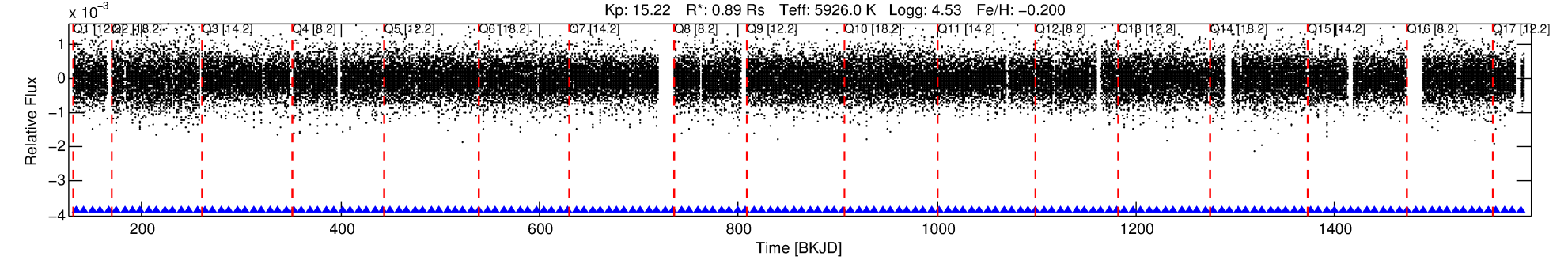
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 009823457-01

No Significant Match Found

# DV One-Page Summary

KIC: 9823457 Candidate: 1 of 2 Period: 8.115 d  
KOI: K00954.01 Name: Kepler-259b Corr: 0.947



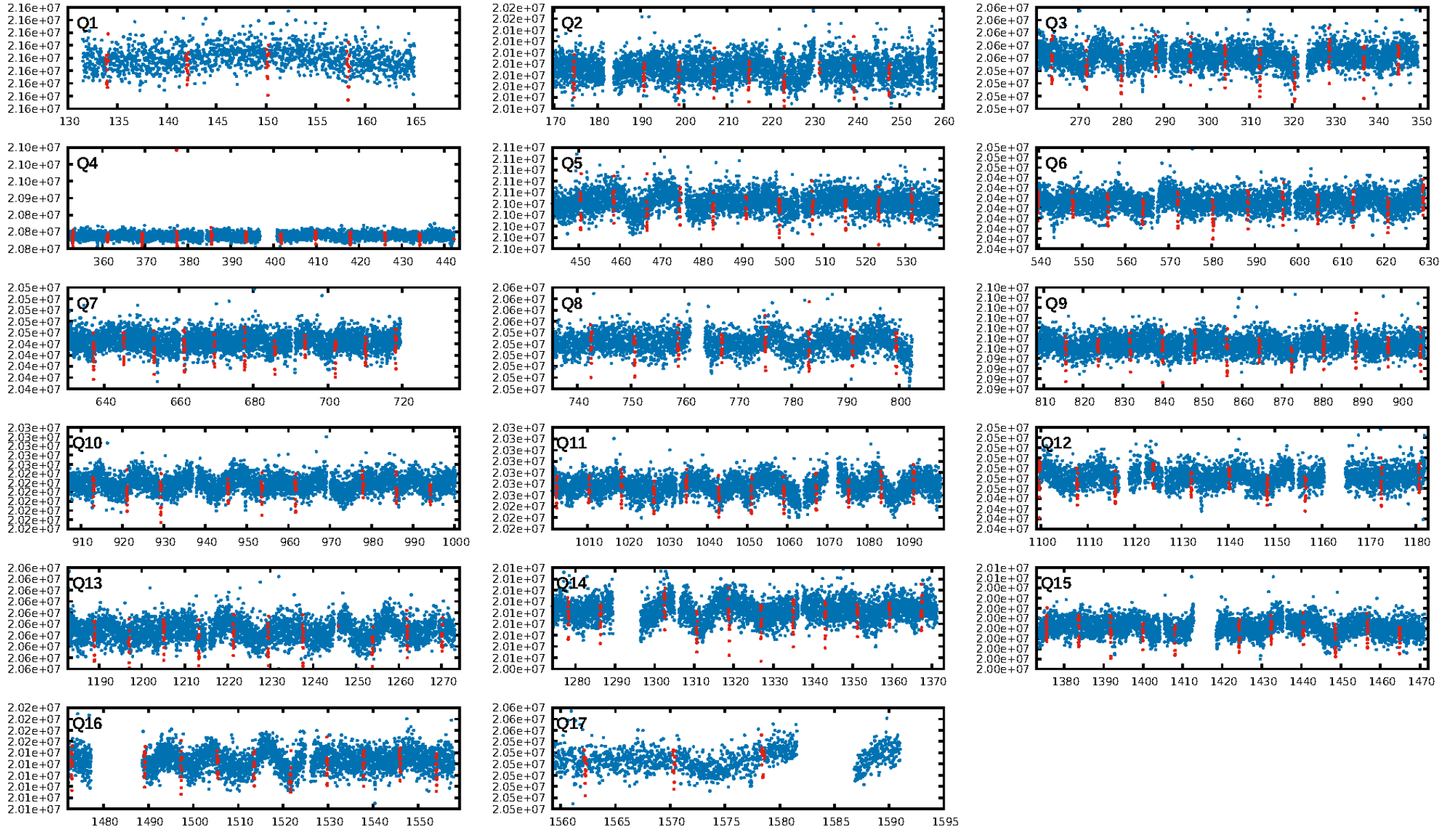
## DV Fit Results:

Period = 8.11528 [0.00001] d  
Epoch = 133.9461 [0.0013] BKJD  
Rp/R\* = 0.0317 [0.0010]  
a/R\* = 9.20 [1.25]  
b = 0.92 [0.02]  
Seff = 141.30 [54.80]  
Teq = 879 [85] K  
Rp = 3.07 [0.90] Re  
a = 0.0784 [0.0196] AU  
Ag = 11.96 [6.88] [1.59 $\sigma$ ]  
Teffp = 2528 [289] K [5.46 $\sigma$ ]

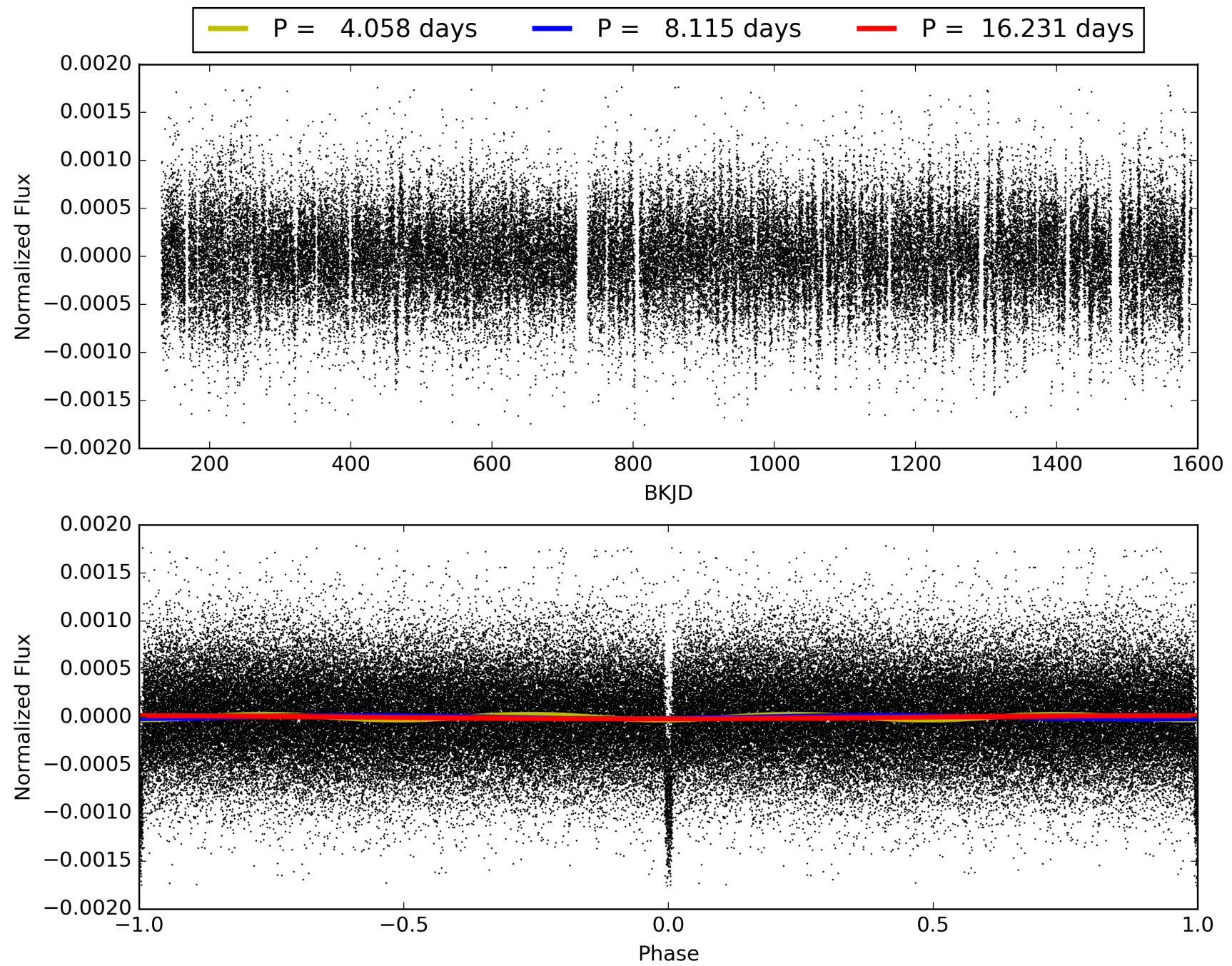
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 100.0% [116.39 $\sigma$ ]  
ModelChiSquare2-sig: 99.9%  
ModelChiSquareGof-sig: 100.0%  
Bootstrap-pfa: 0.00e+00  
RollingBand-fgt: 1.00 [157/157]  
GhostDiagnostic-chr: 3.731  
Centroid-sig: 0.0%  
Centroid-so: 0.551 arcsec [2.13 $\sigma$ ]  
OotOffset-rm: 0.102 arcsec [0.84 $\sigma$ ]  
KicOffset-rm: 0.162 arcsec [1.44 $\sigma$ ]  
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]

# TCE 009823457-01, PDC Light Curves

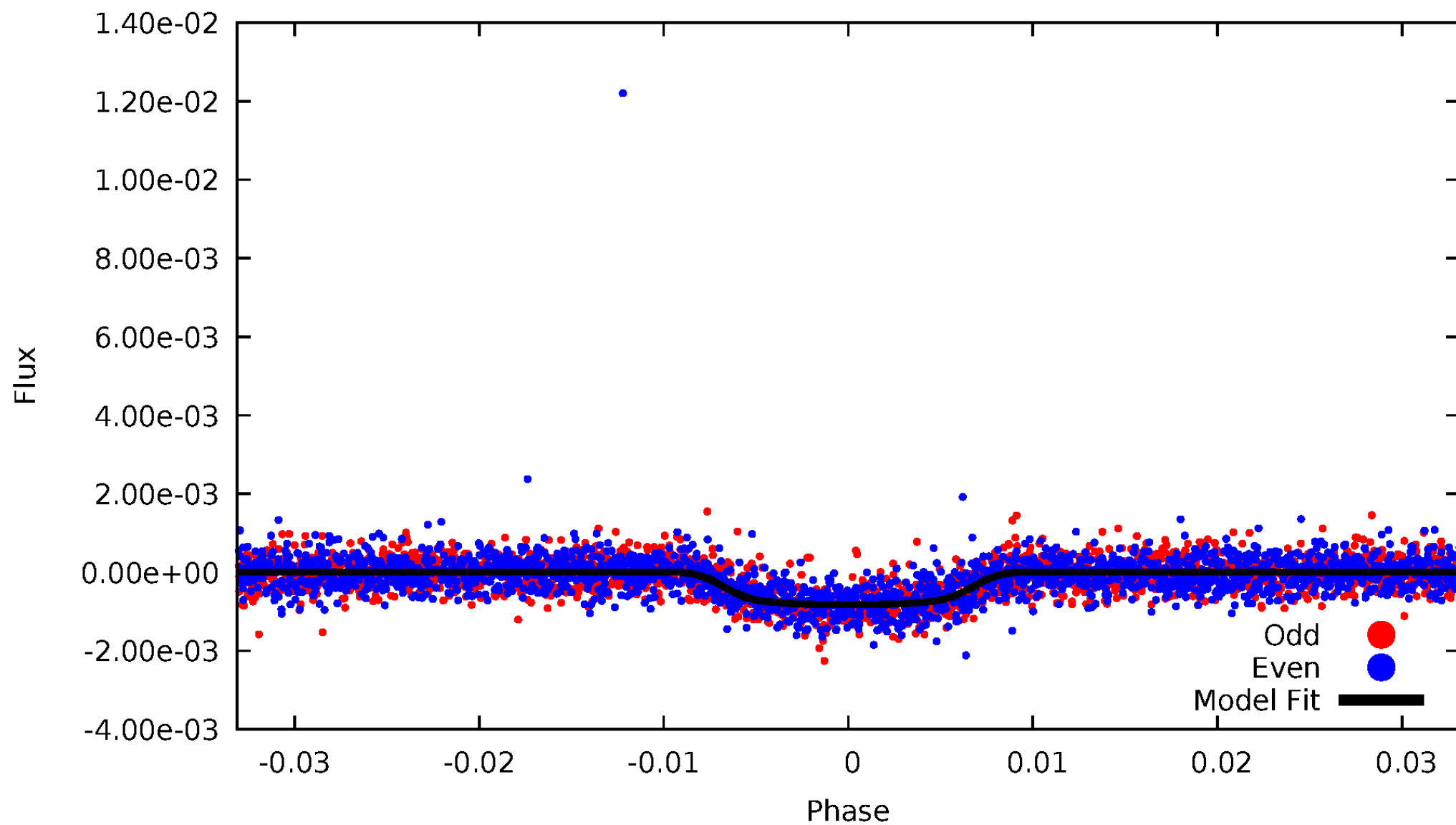


TCE 009823457-01



# DV Odd/Even

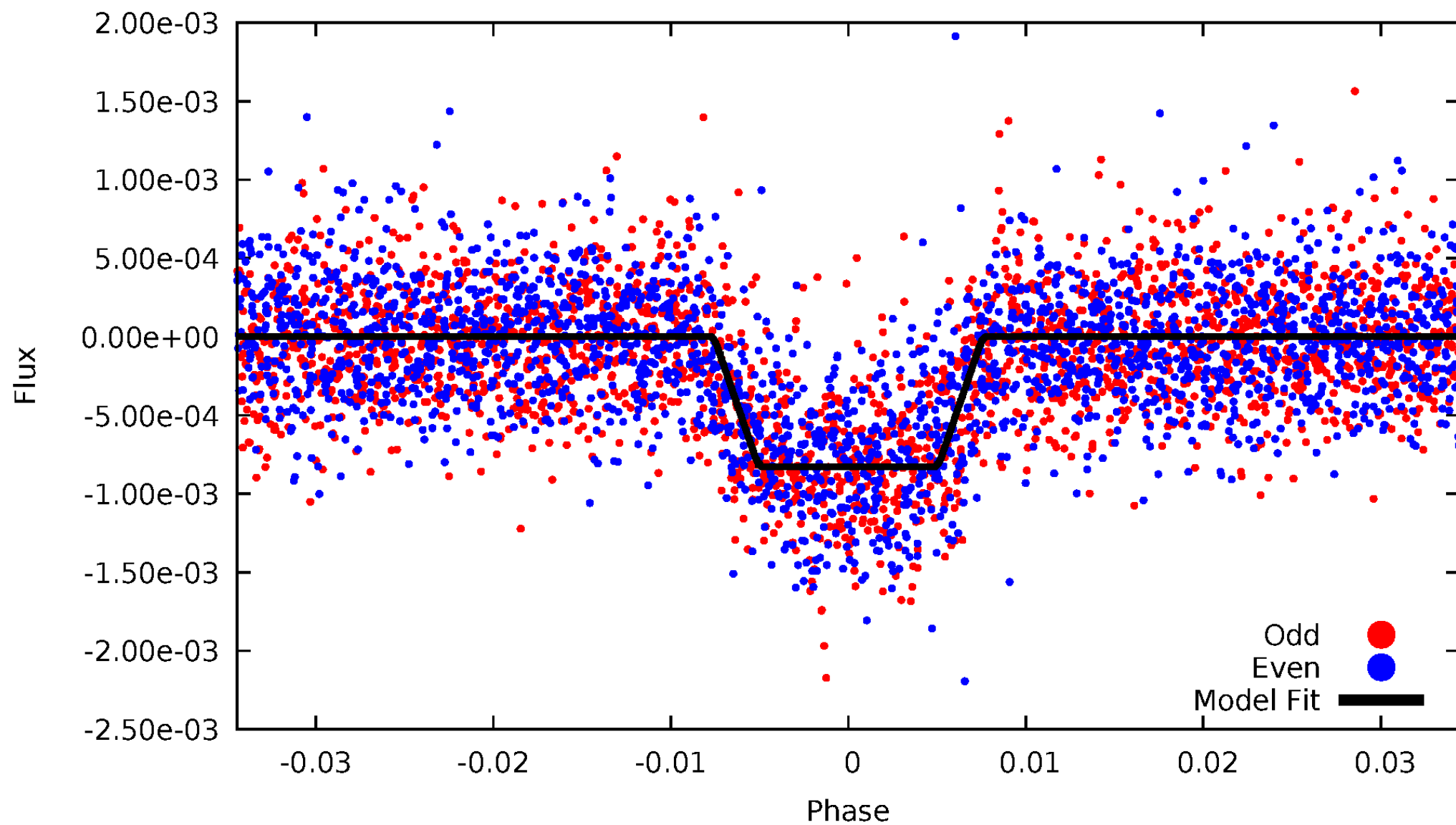
TCE 009823457-01





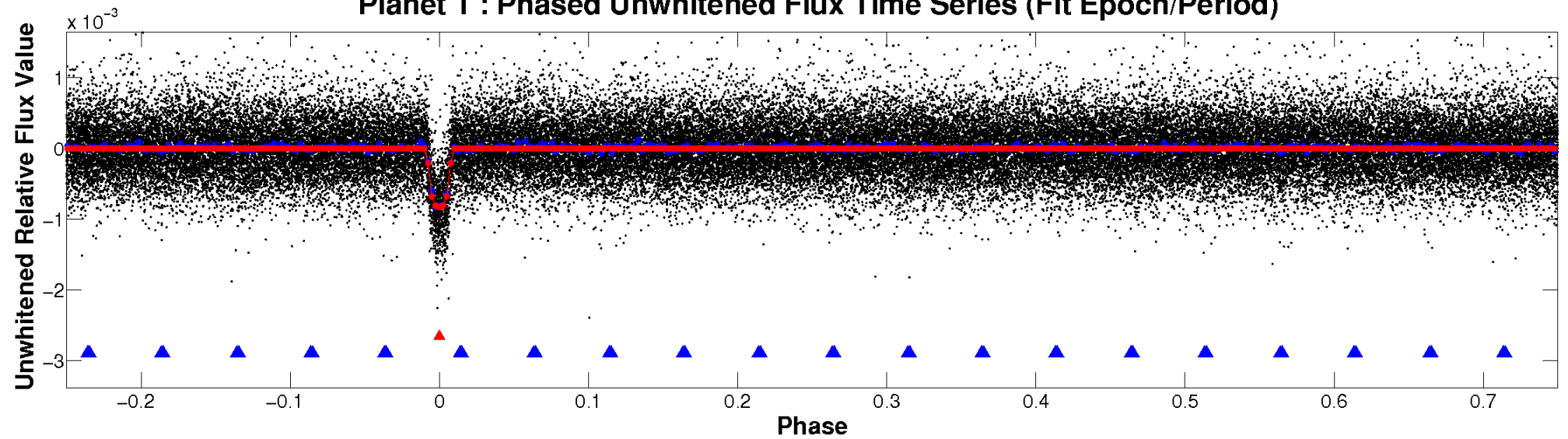
# ALT Odd/Even

TCE 009823457-01

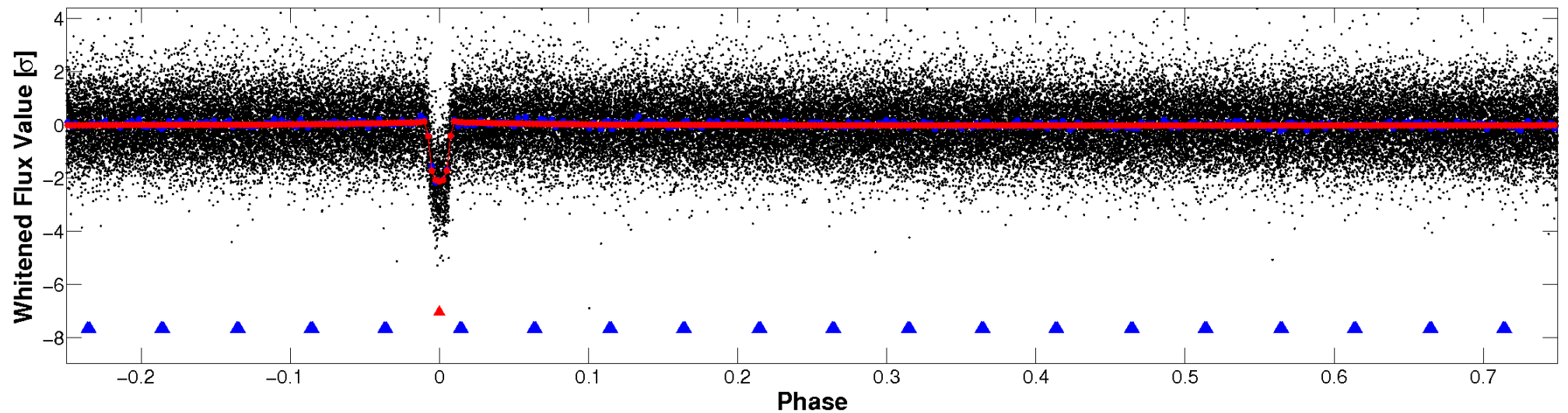


# Non-Whitened Vs. Whitened Light Curve

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

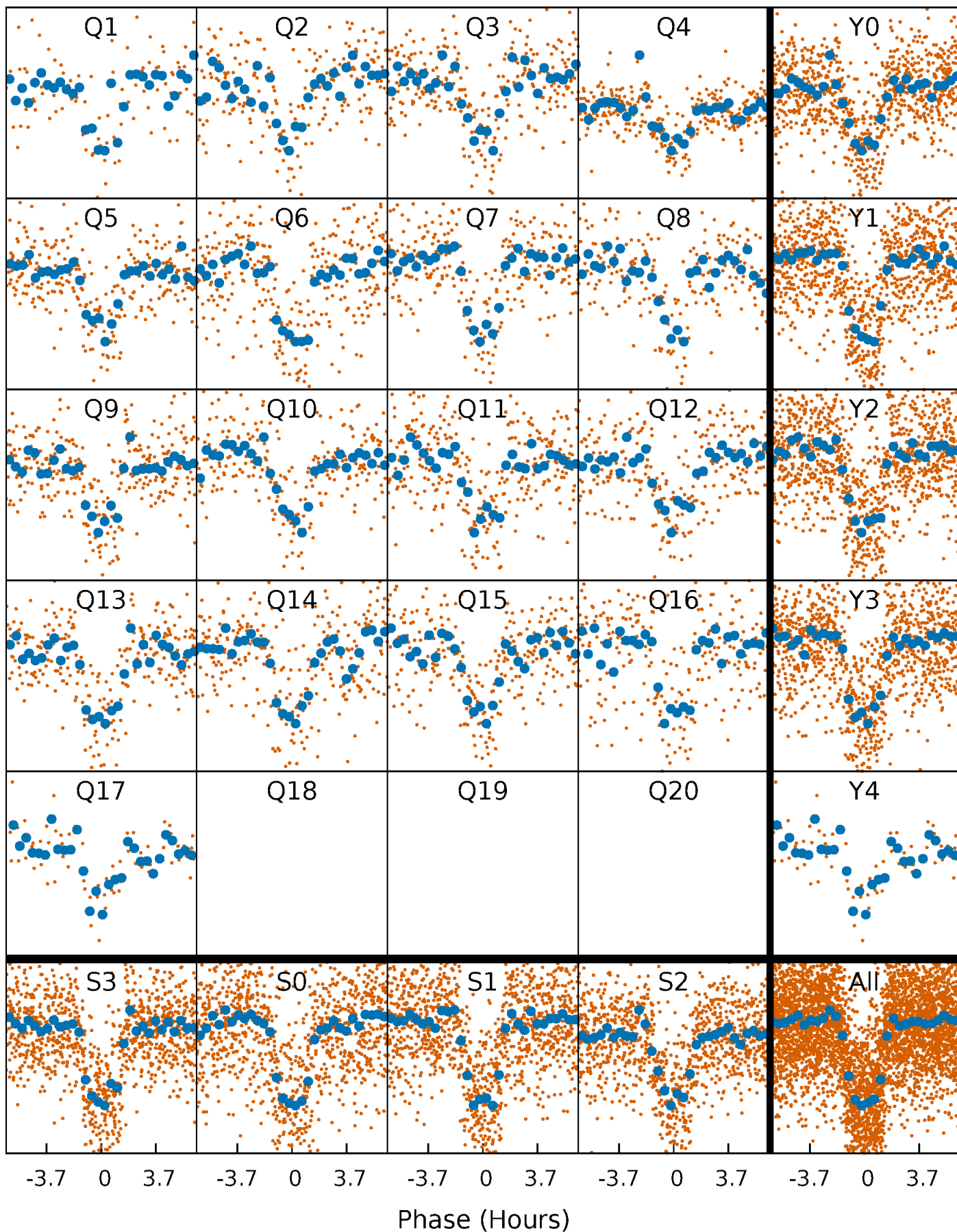


**Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)**



# PDC Quarter-Phased Transit Curves

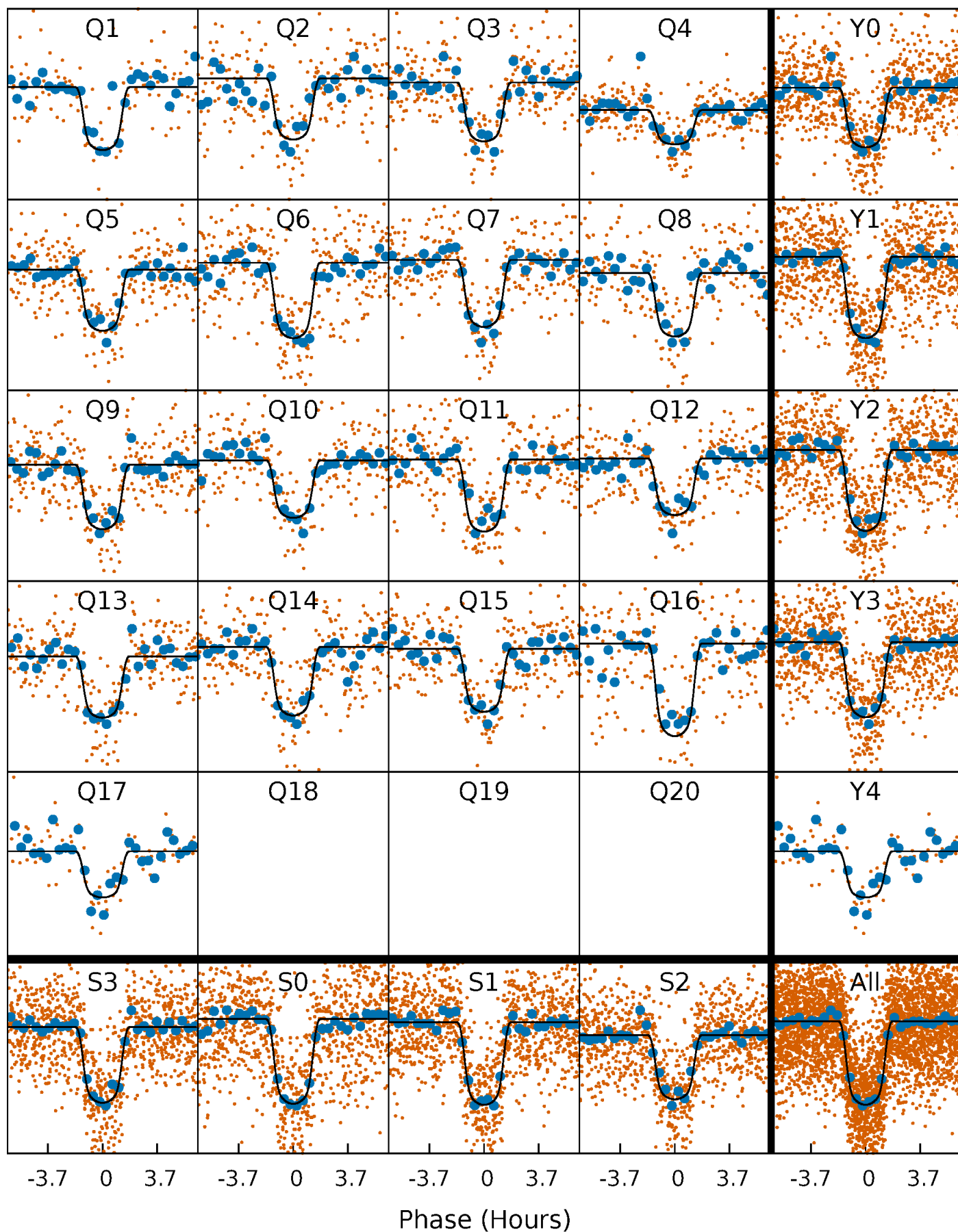
TCE 009823457-01 P= 8.115280 Days  $T_0=133.946094$  (BKJD)





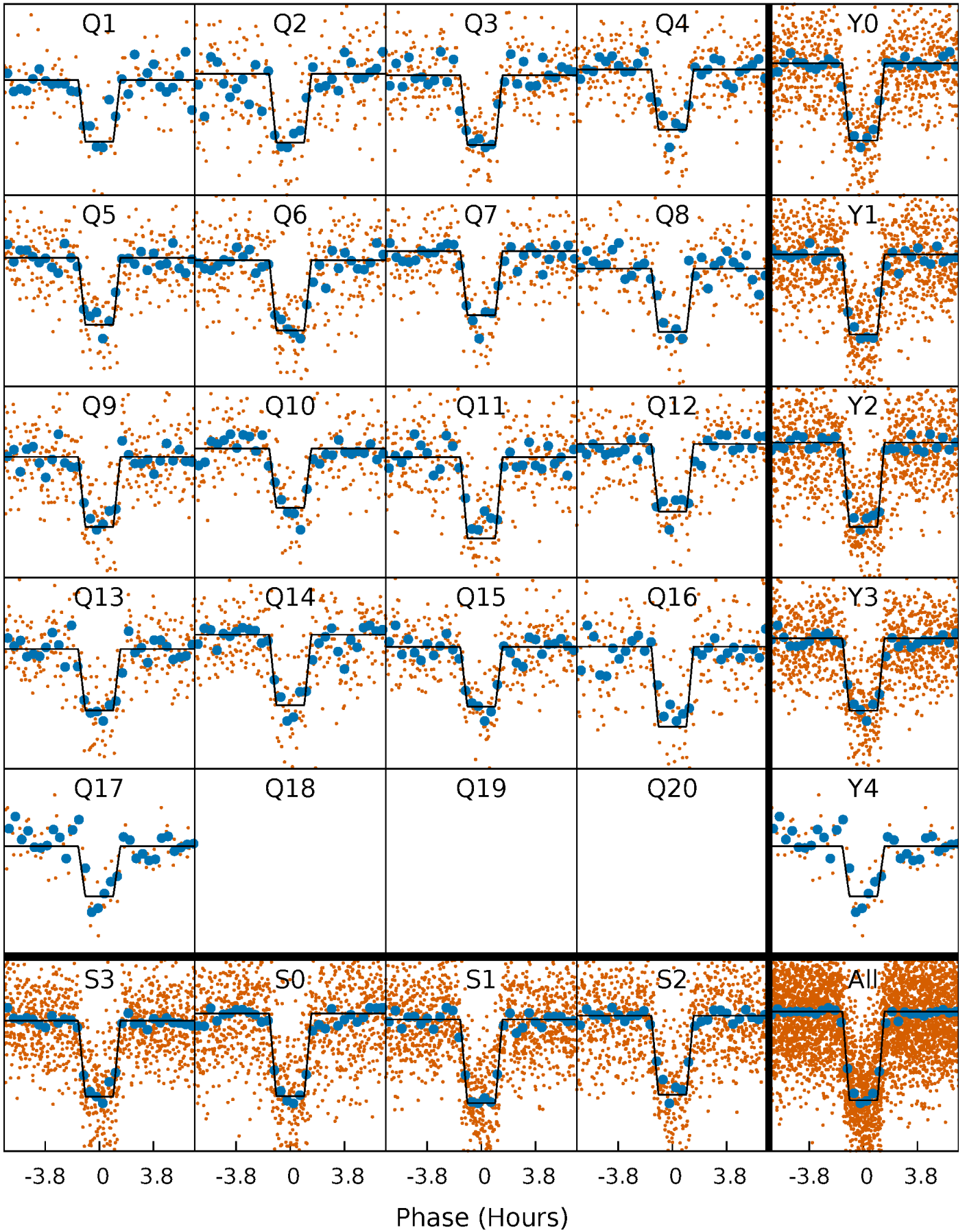
# DV Quarter-Phased Transit Curves

TCE 009823457-01 P= 8.115280 Days  $T_0=133.946094$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

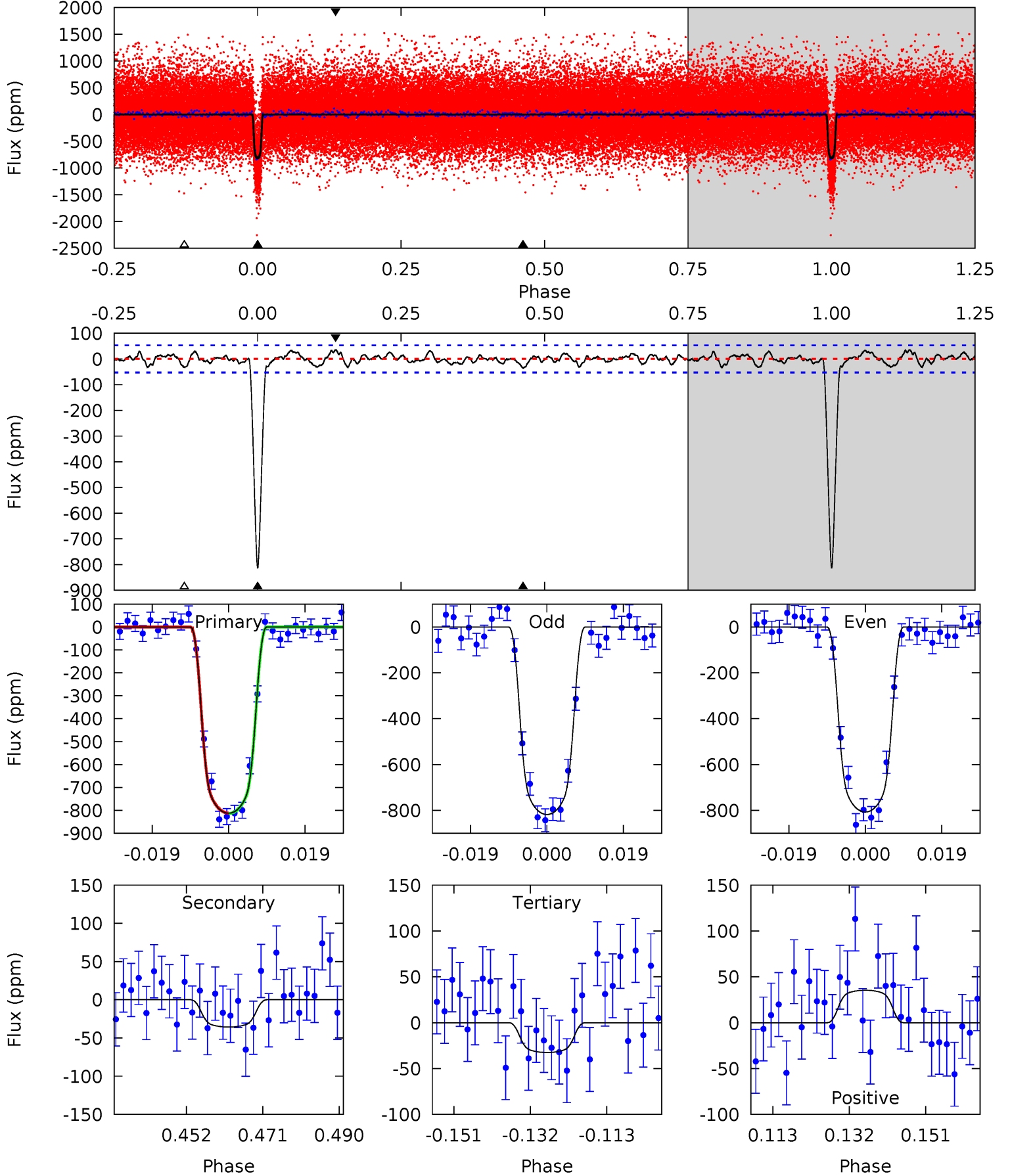
TCE 009823457-01 P= 8.115236 Days  $T_0=133.951012$  (BKJD)



# DV Model-Shift Uniqueness Test

009823457-01, P = 8.115280 Days, E = 125.830814 Days

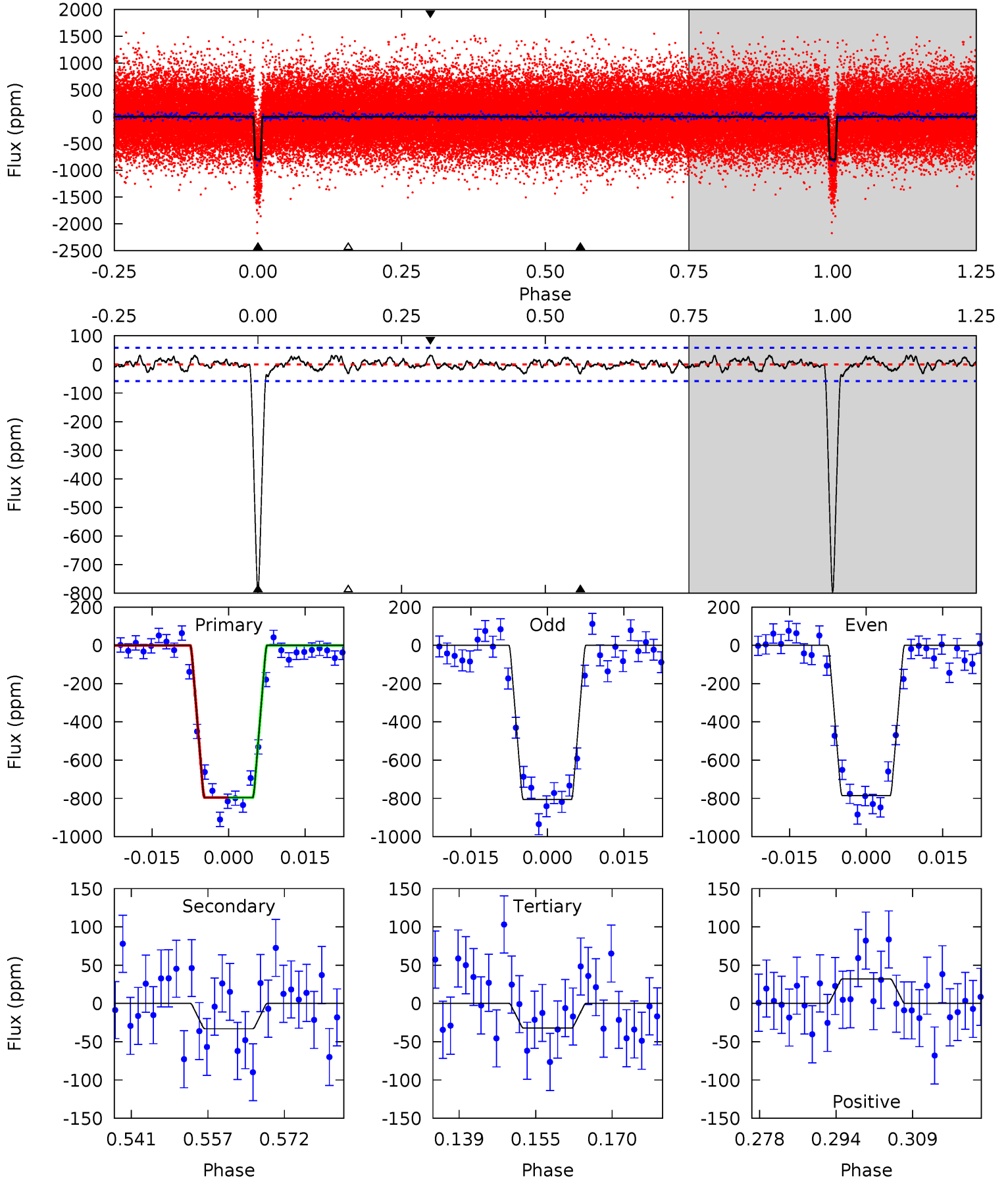
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
75.3	3.31	3.01	3.28	4.90	2.35	1.26	72.3	72.0	0.29	0.02	0.50	1.00	0.04	0.08



# Alt Model-Shift Uniqueness Test

009823457-01, P = 8.115236 Days, E = 125.835776 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
67.2	2.79	2.72	2.70	4.94	2.42	1.09	64.4	64.4	0.07	0.09	0.88	1.00	0.04	0.01



### Stellar Parameters For KIC 009823457

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$5926^{+160}_{-178}$	$4.532^{+0.036}_{-0.204}$	$-0.200^{+0.300}_{-0.300}$	$0.887^{+0.259}_{-0.086}$	$0.978^{+0.119}_{-0.119}$	$1.971^{+0.392}_{-1.022}$
	+3%/-3%	+1%/-5%	+150%/-150%	+29%/-10%	+12%/-12%	+20%/-52%
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 009823457-01 / KOI 0954.01

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-36 \pm 11$	$3.20^{+0.54}_{-0.27}$	$1263^{+85}_{-57}$	$3158^{+151}_{-168}$	$11^{+5}_{-4}$
Alt.	$-33 \pm 12$	$2.90^{+0.44}_{-0.25}$	$1258^{+91}_{-54}$	$3207^{+176}_{-200}$	$12^{+6}_{-5}$

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



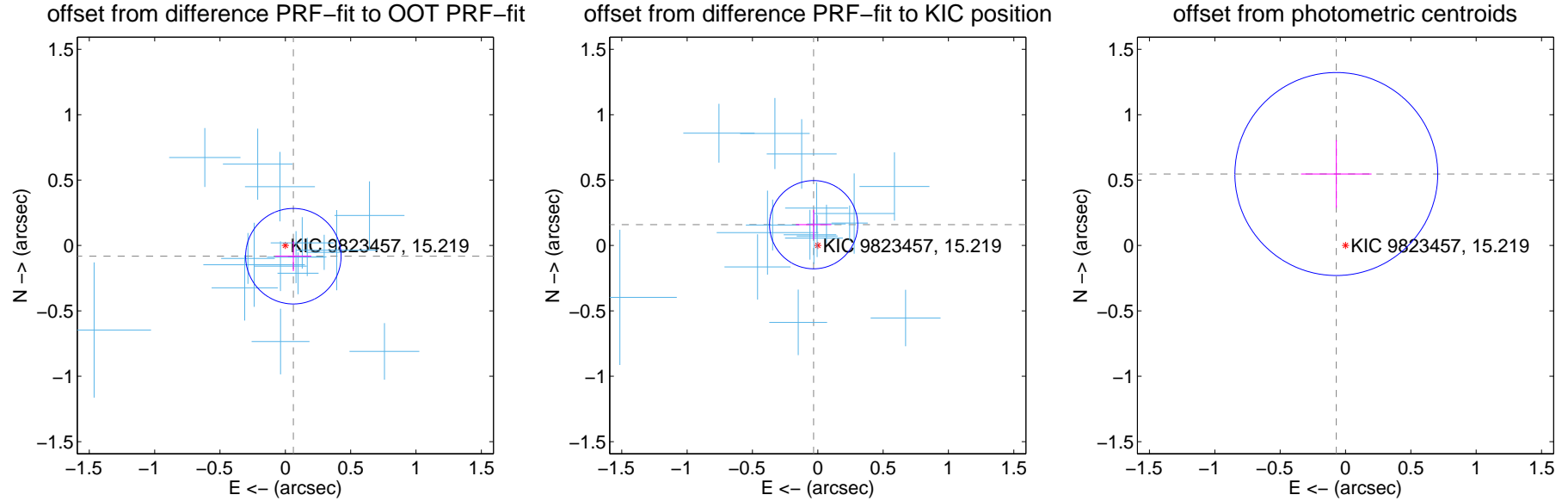
## DV Centroid Data

Supplemental centroid analysis for 009823457-01. Kepler magnitude: 15.22. Transit SNR 54.42

There are 17 quarters with good PRF difference image offsets

The direct PRF centroid is offset from the target star catalog position by about 0.26 arcsec

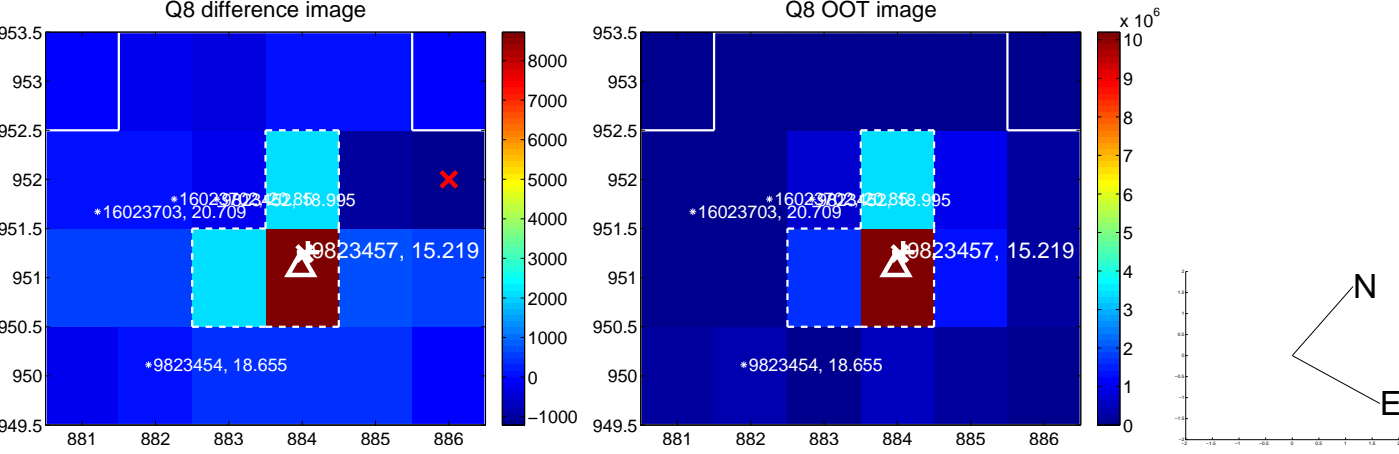
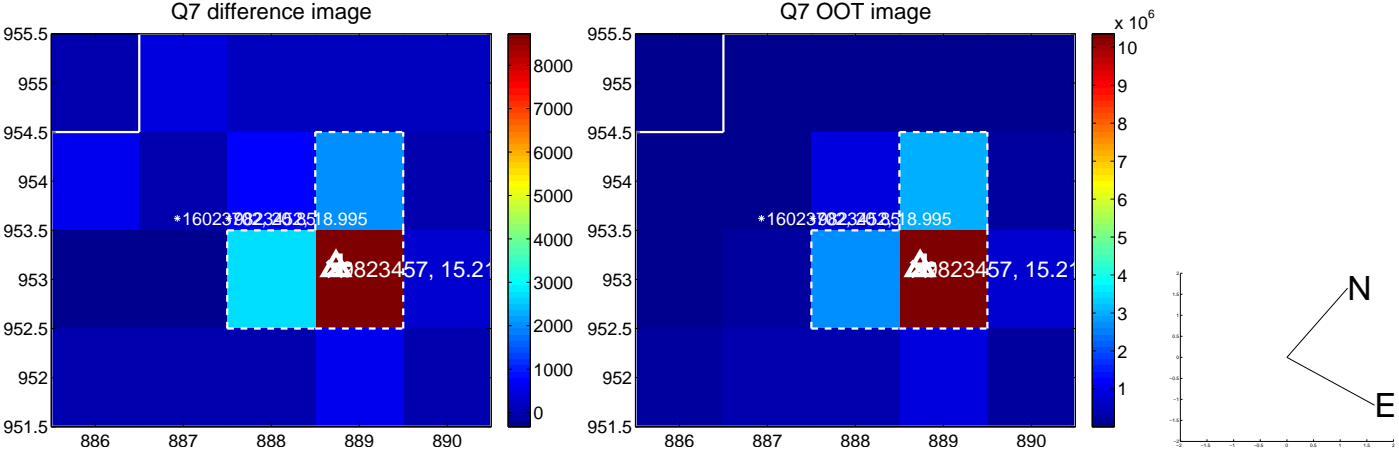
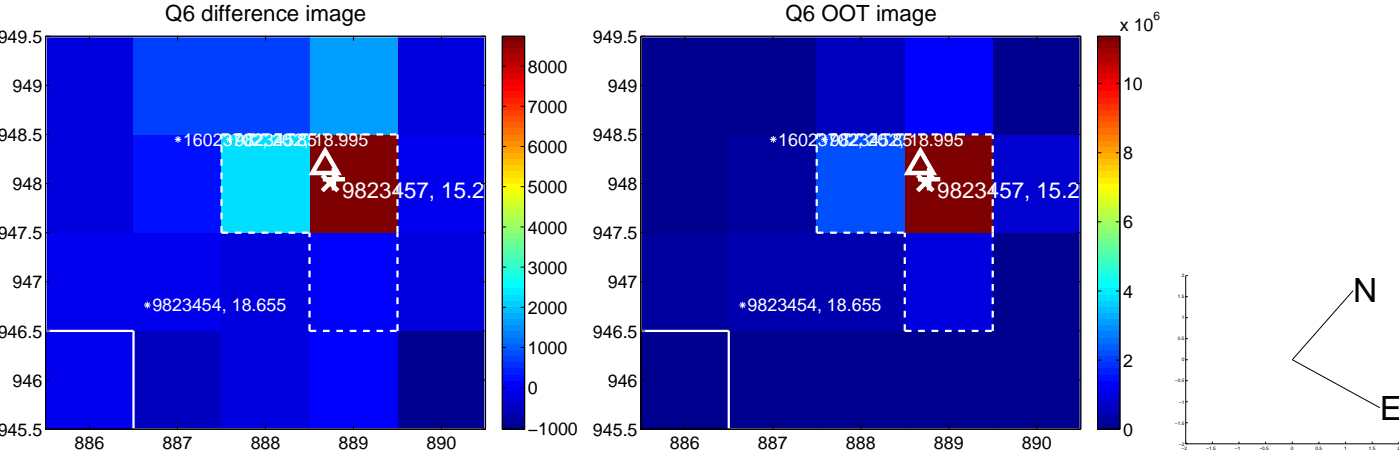
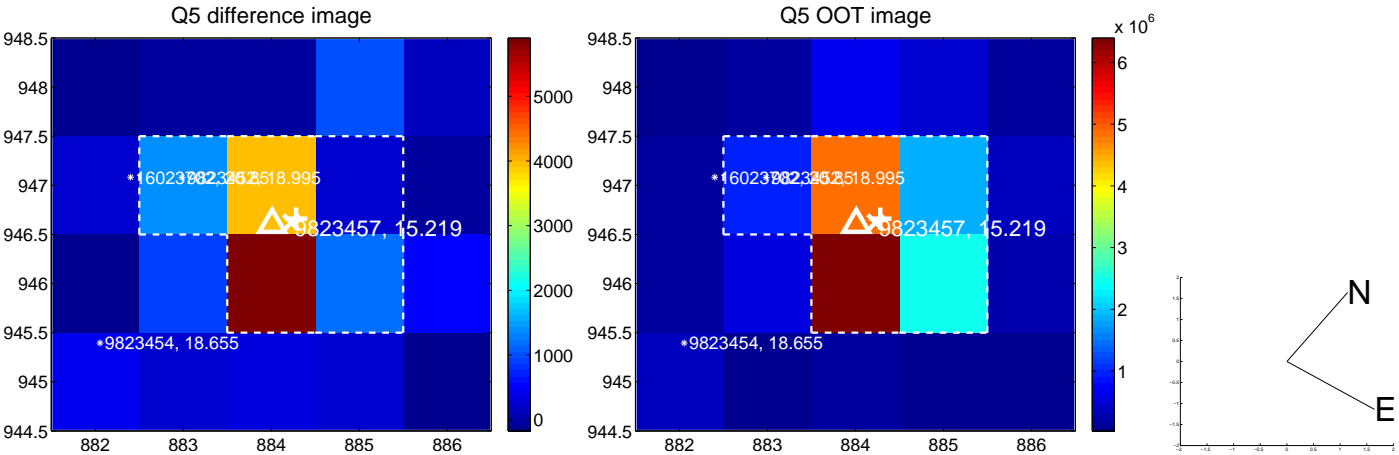
	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.102 \pm 0.122$	0.84	$-0.061 \pm 0.138$	$-0.082 \pm 0.114$
PRF-fit source offset from KIC position	$0.162 \pm 0.112$	1.44	$0.032 \pm 0.136$	$0.159 \pm 0.113$
photometric centroid source offset	$0.55 \pm 0.26$	2.13	$0.07 \pm 0.27$	$0.55 \pm 0.26$



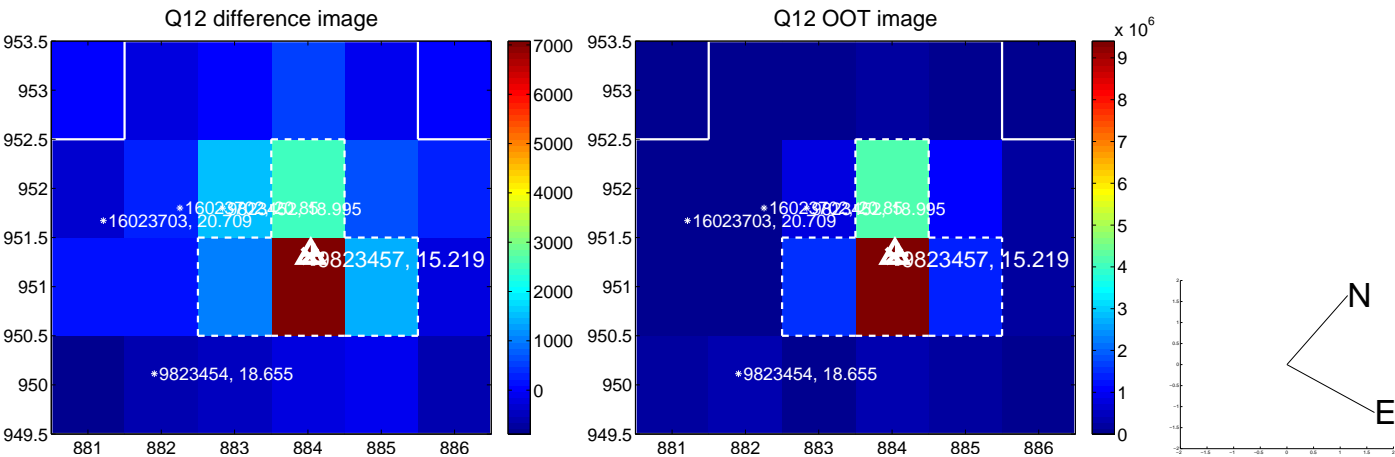
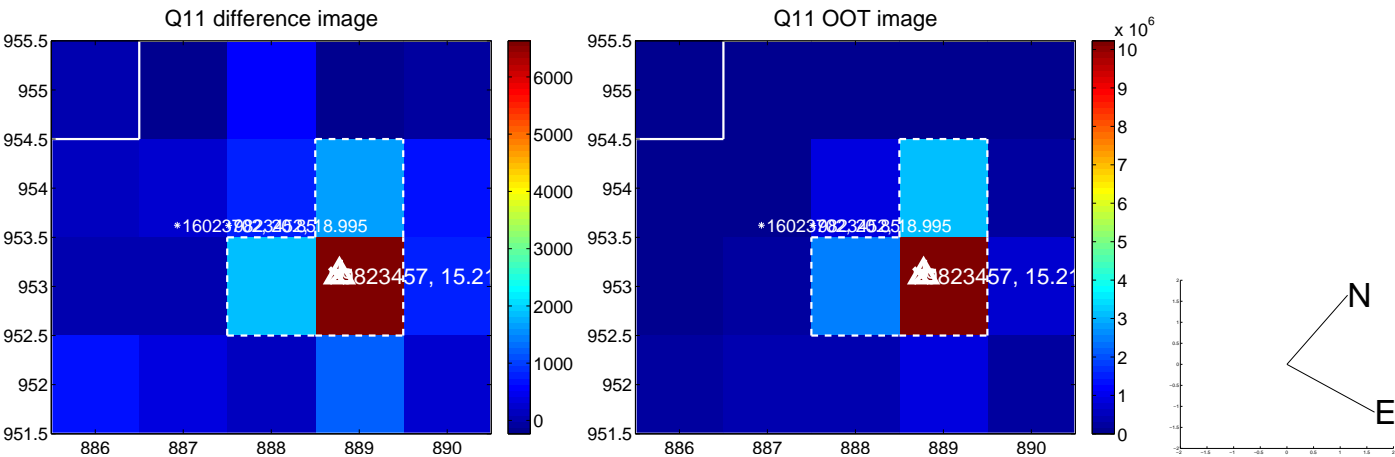
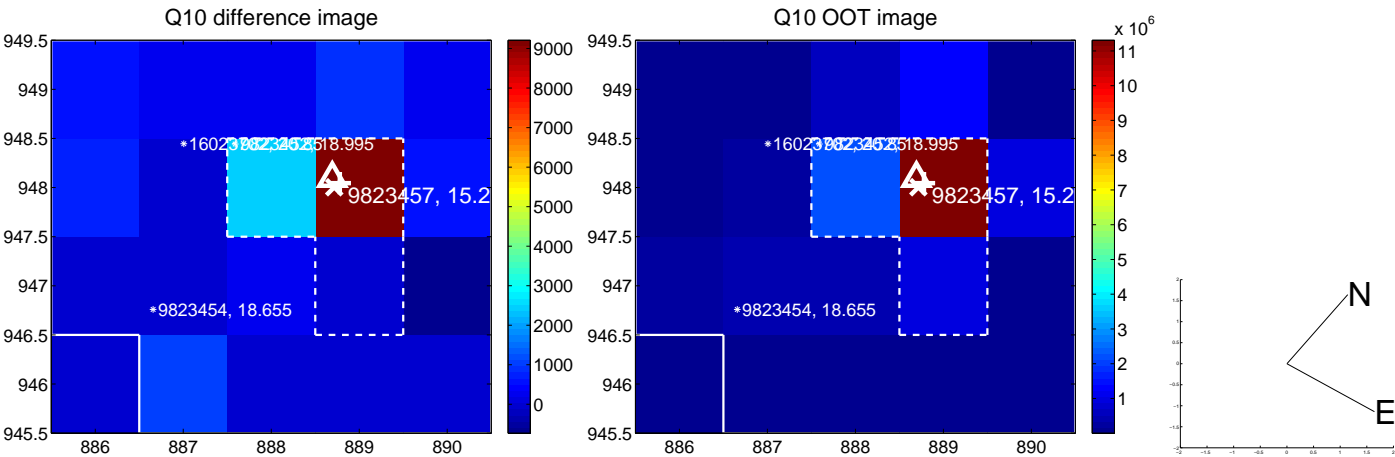
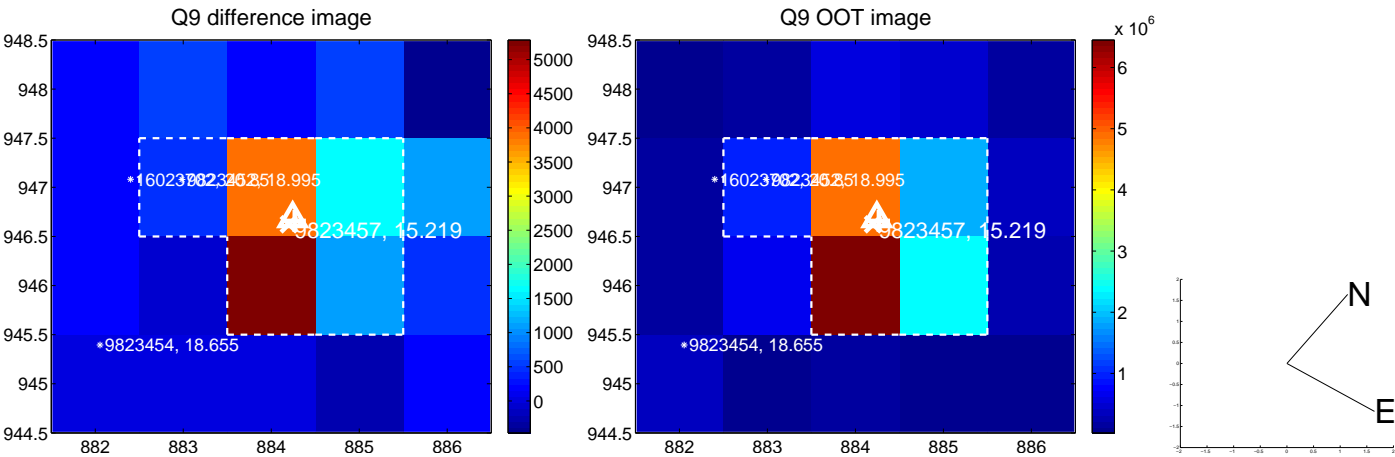
Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses:** good quarterly centroid offsets; **Vermillion crosses:** bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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



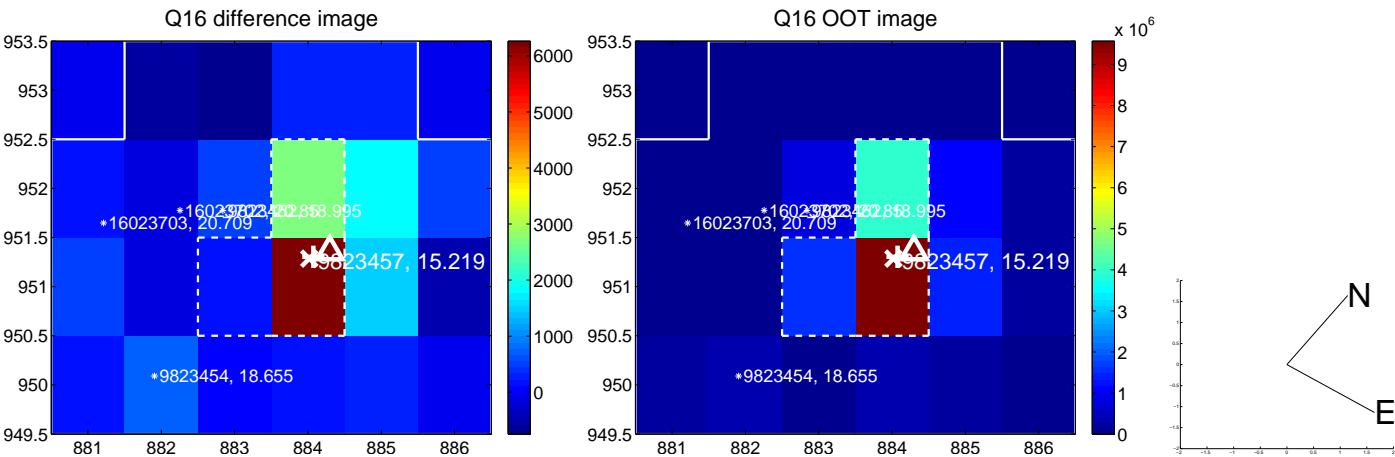
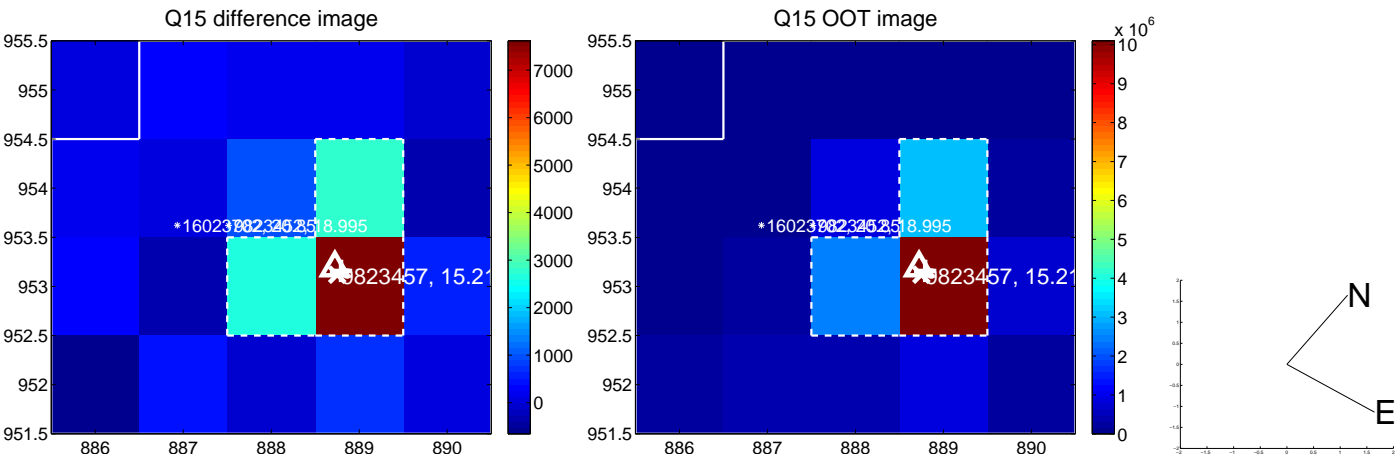
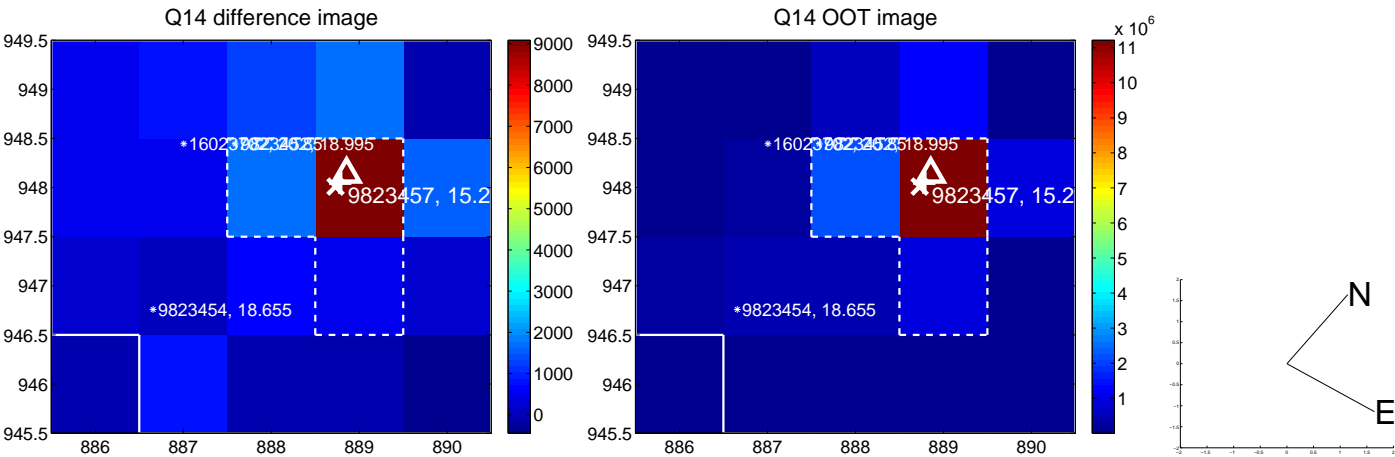
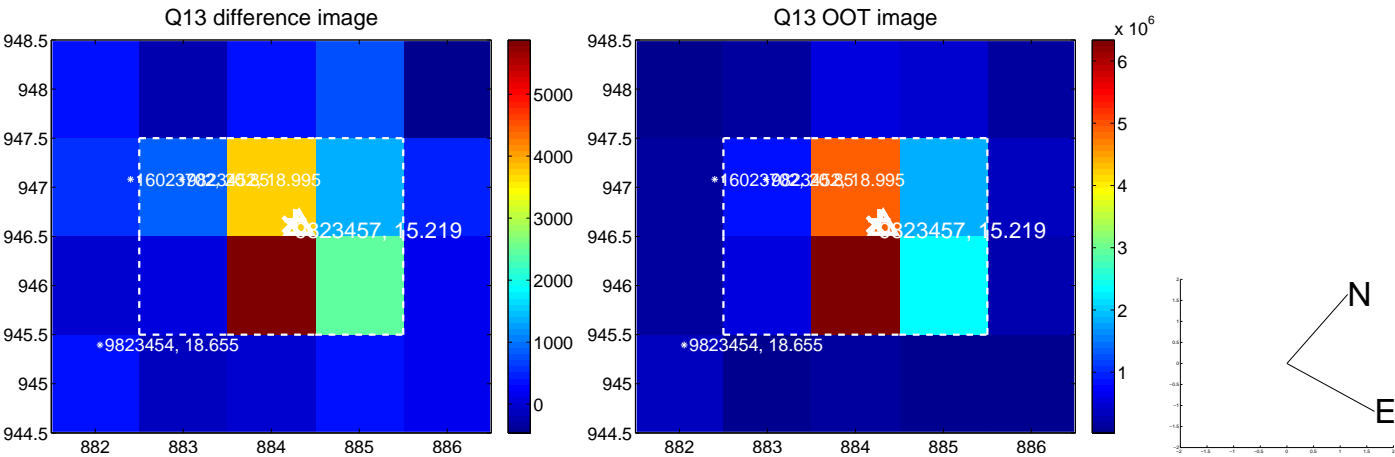
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

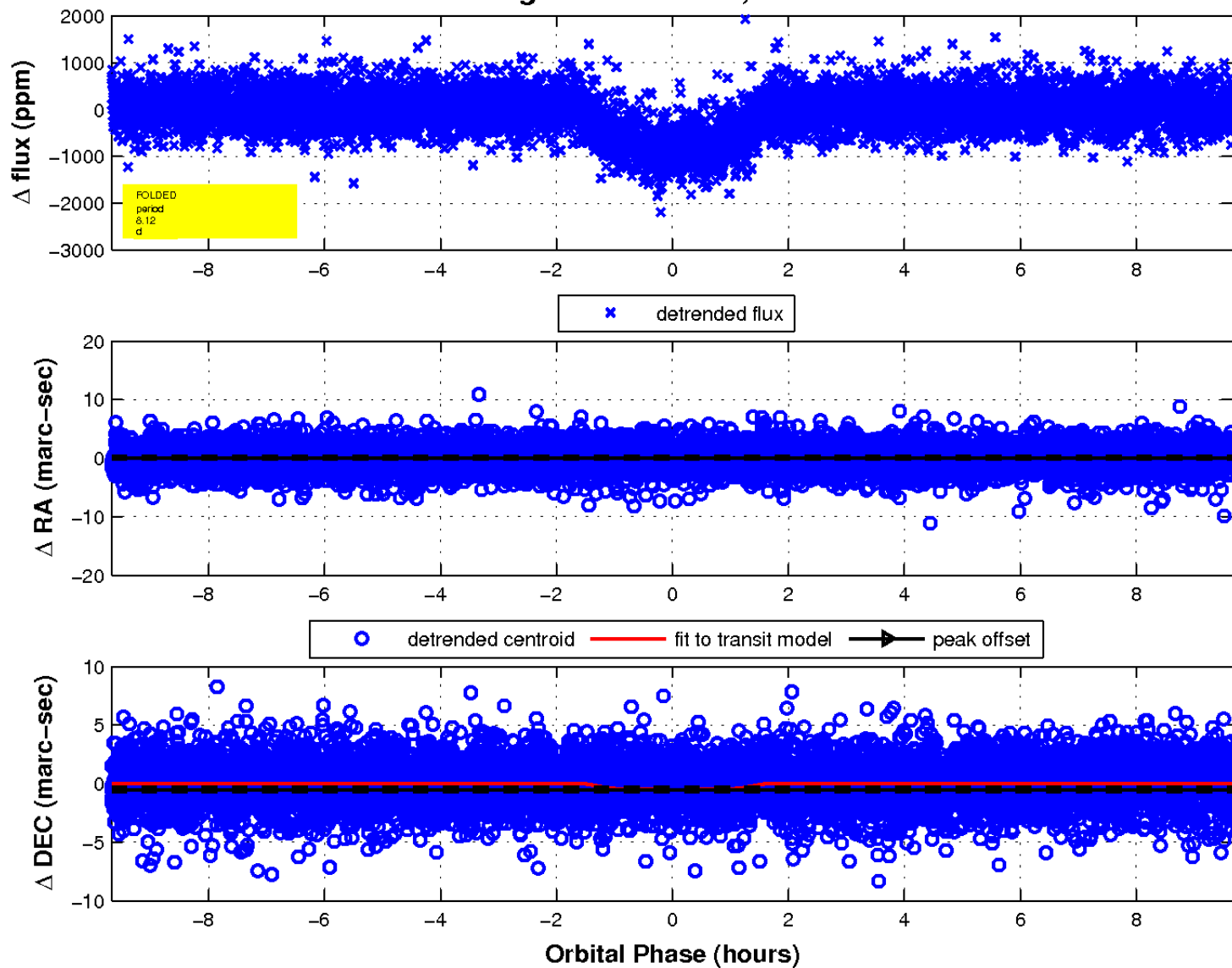
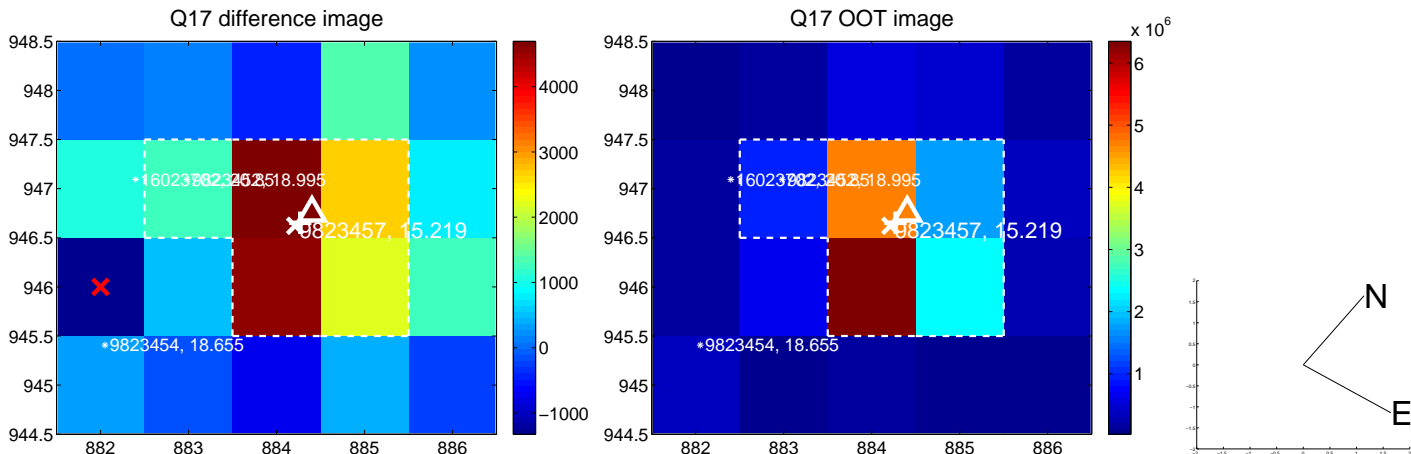


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



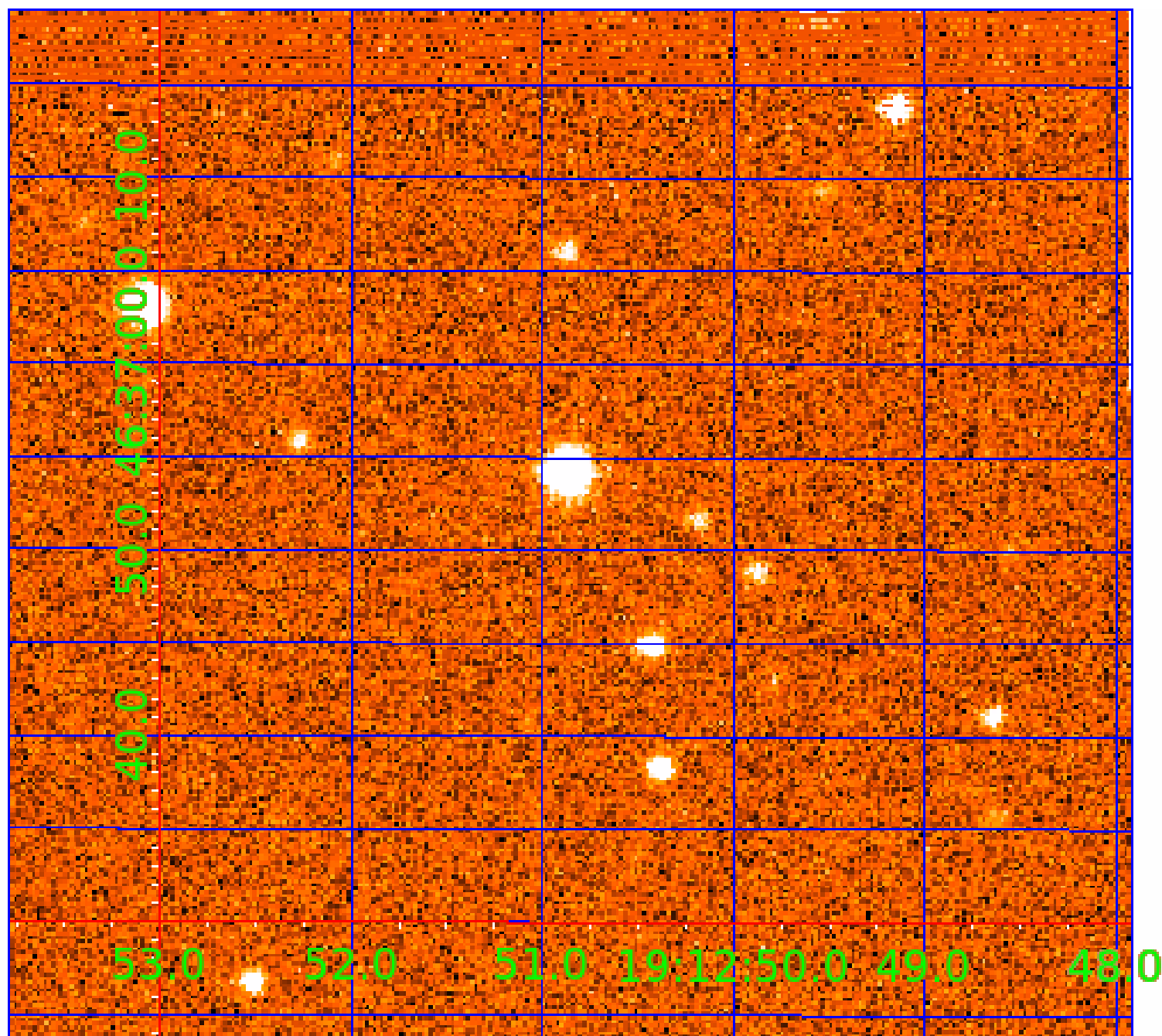


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\Delta$ : difference centroid. red  $\times$ : large negative pixel value.



# UKIRT Image

Declination



# KIC 009823457

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
009823457-01	OBS	0954.01	8.115280	133.946094	830.9	3.225	49.6	54.4	0.89	5926	3.07	141.30
009823457-02	OBS	0954.02	36.925040	137.298270	901.6	4.989	30.9	33.7	0.89	5926	2.99	18.74

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009823457-01	OBS	PC	1.00	0	0	0	0	NO_COMMENT
009823457-02	OBS	PC	1.00	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.

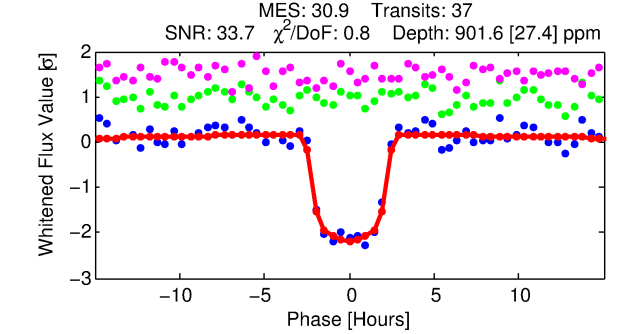
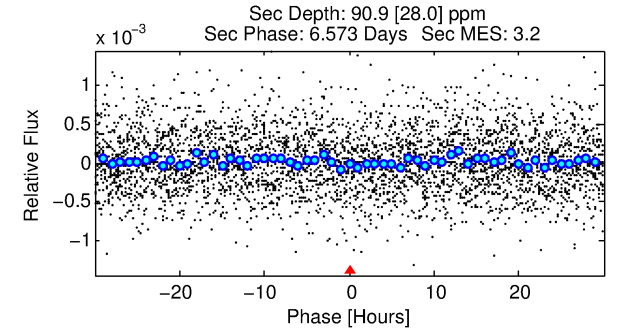
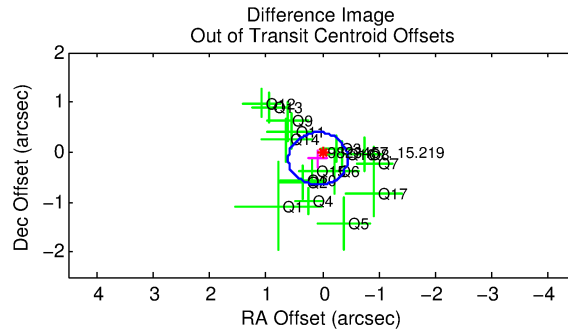
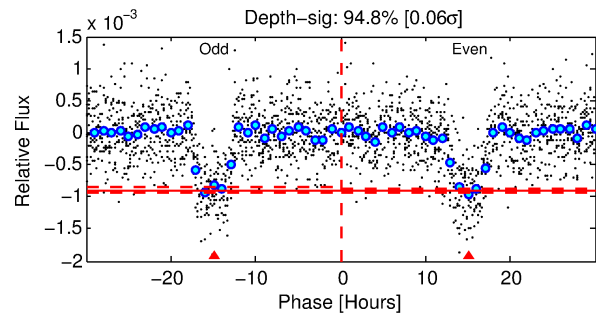
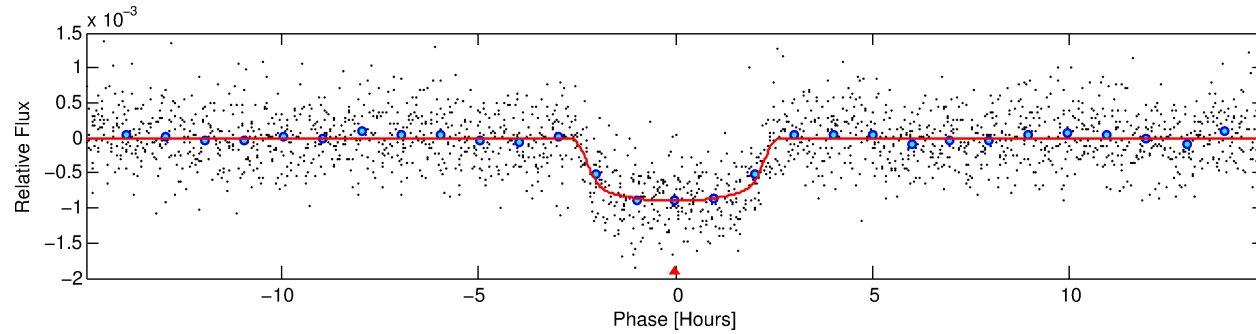
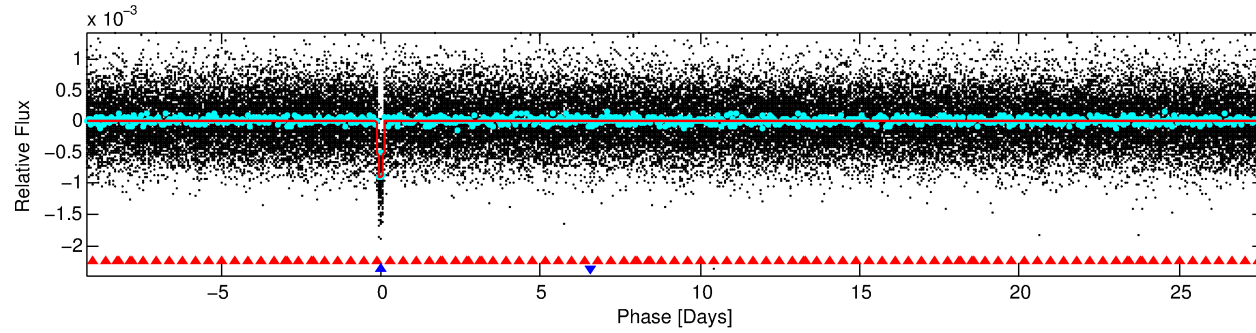
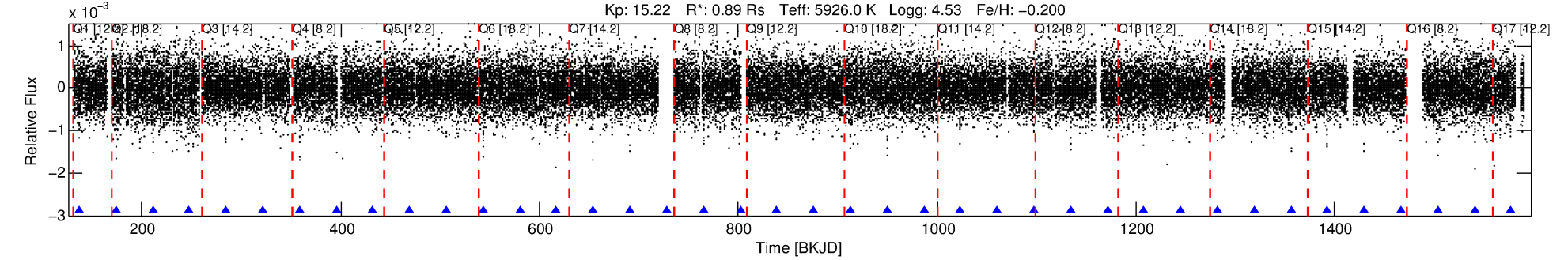
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 009823457-02

No Significant Match Found

# DV One-Page Summary

KIC: 9823457 Candidate: 2 of 2 Period: 36.925 d  
KOI: K00954.02 Name: Kepler-259c Corr: 0.972



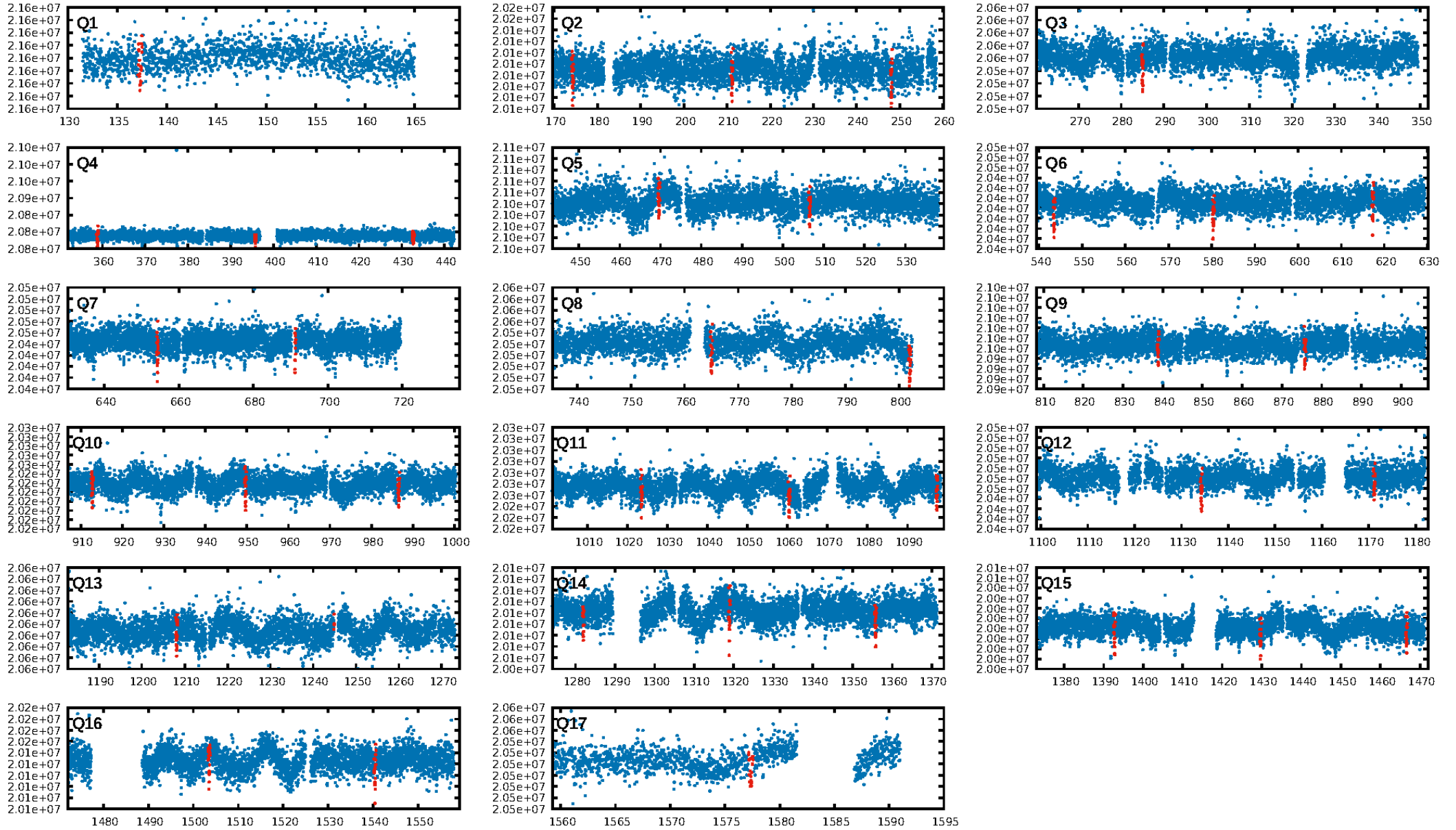
## DV Fit Results:

Period = 36.92504 [0.00014] d  
Epoch = 137.2983 [0.0032] BKJD  
Rp/R\* = 0.0309 [0.0025]  
a/R\* = 34.72 [12.74]  
b = 0.83 [0.14]  
Seff = 18.74 [7.27]  
Teff = 531 [51] K  
Rp = 2.99 [0.91] Re  
a = 0.2154 [0.0538] AU  
Ag = 258.84 [131.02] [1.97 $\sigma$ ]  
Teffp = 3290 [302] K [9.01 $\sigma$ ]

## DV Diagnostic Results:

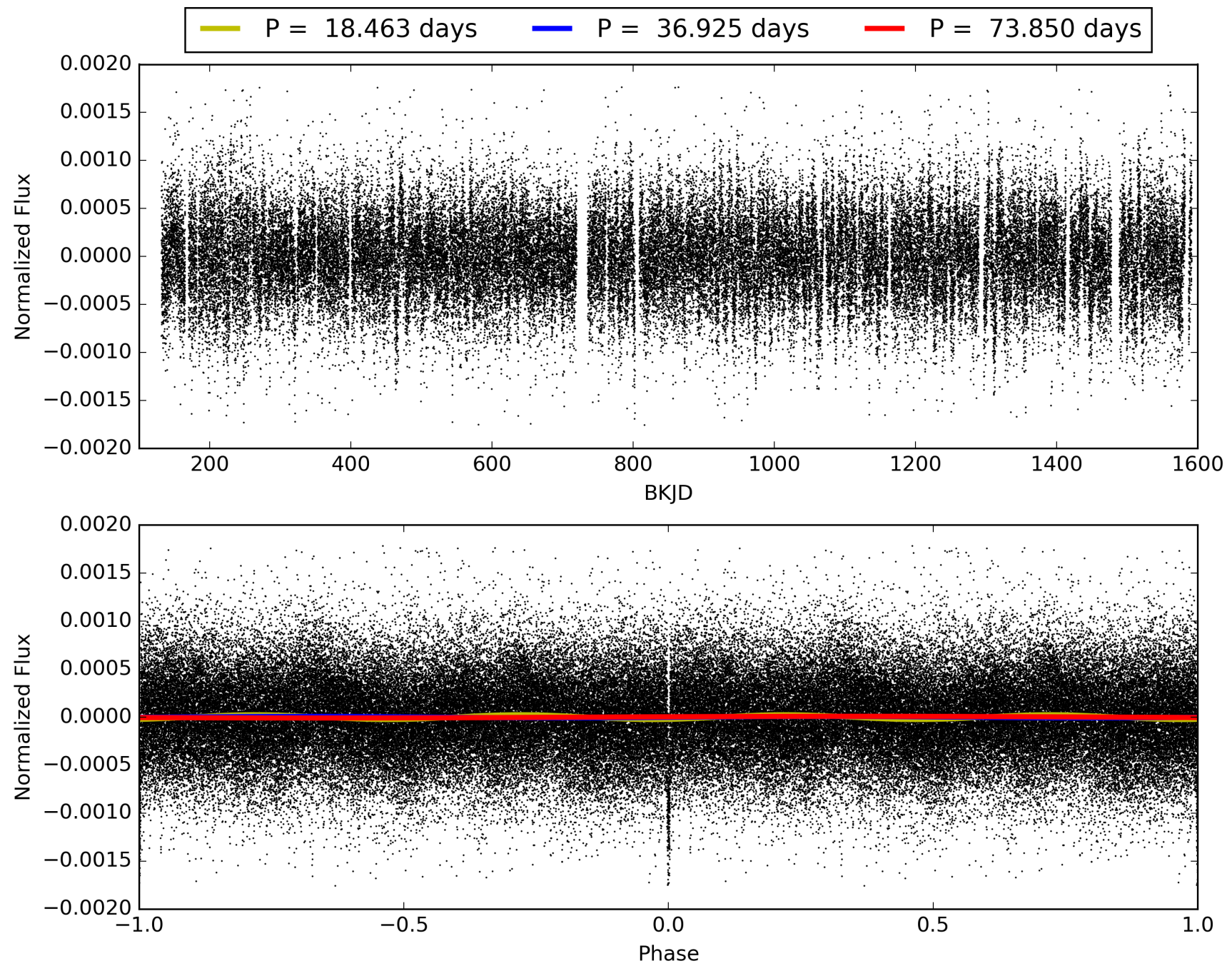
ShortPeriod-sig: 100.0% [116.39 $\sigma$ ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: 95.4%  
ModelChiSquareGof-sig: 100.0%  
Bootstrap-pfa: 5.56e-203  
RollingBand-fgt: 1.00 [35/35]  
GhostDiagnostic-chr: 2.934  
Centroid-sig: 0.0%  
Centroid-so: 1.384 arcsec [3.36 $\sigma$ ]  
OotOffset-rm: 0.152 arcsec [0.87 $\sigma$ ]  
KicOffset-rm: 0.205 arcsec [1.10 $\sigma$ ]  
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]

# TCE 009823457-02, PDC Light Curves



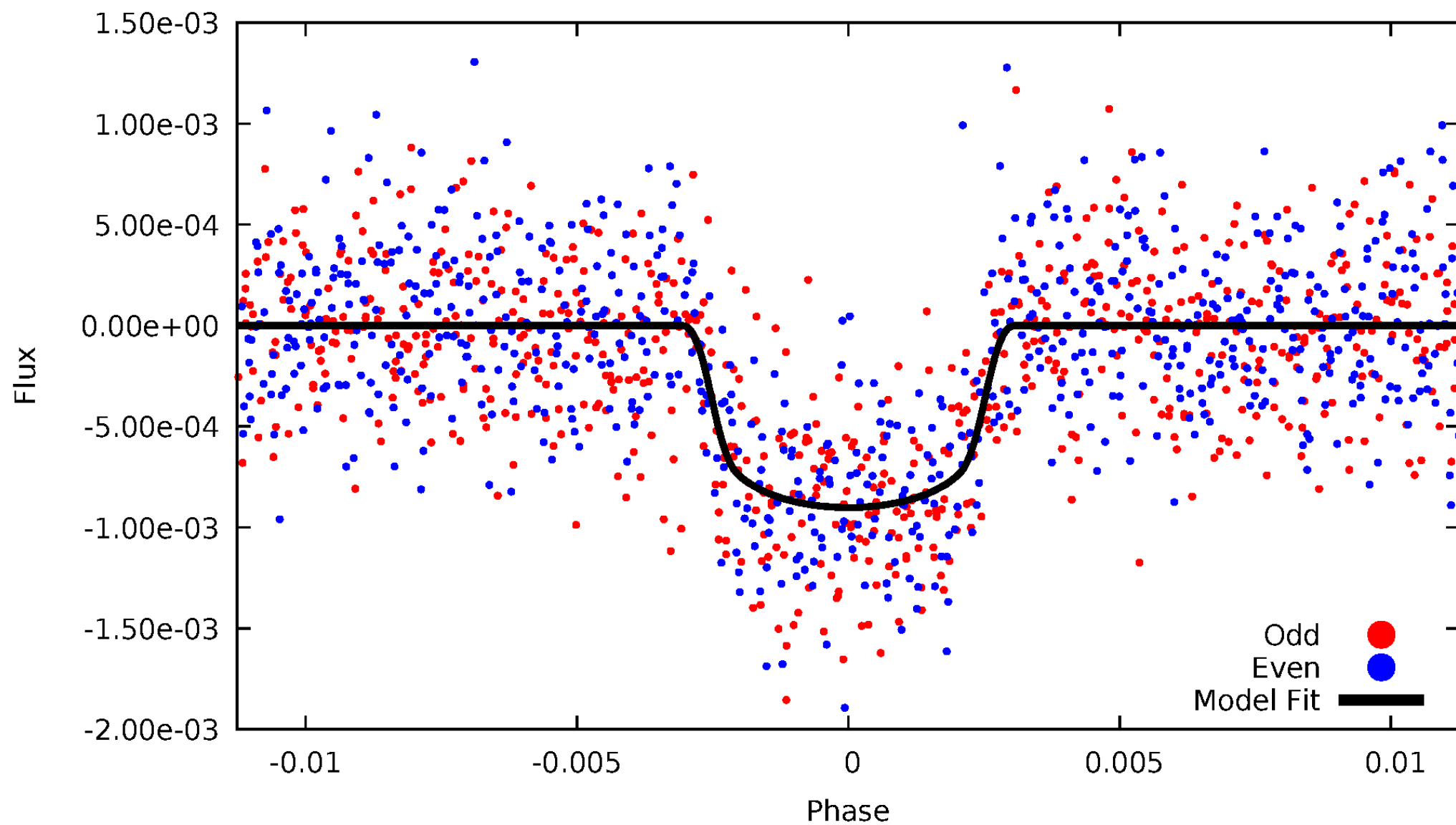


TCE 009823457-02



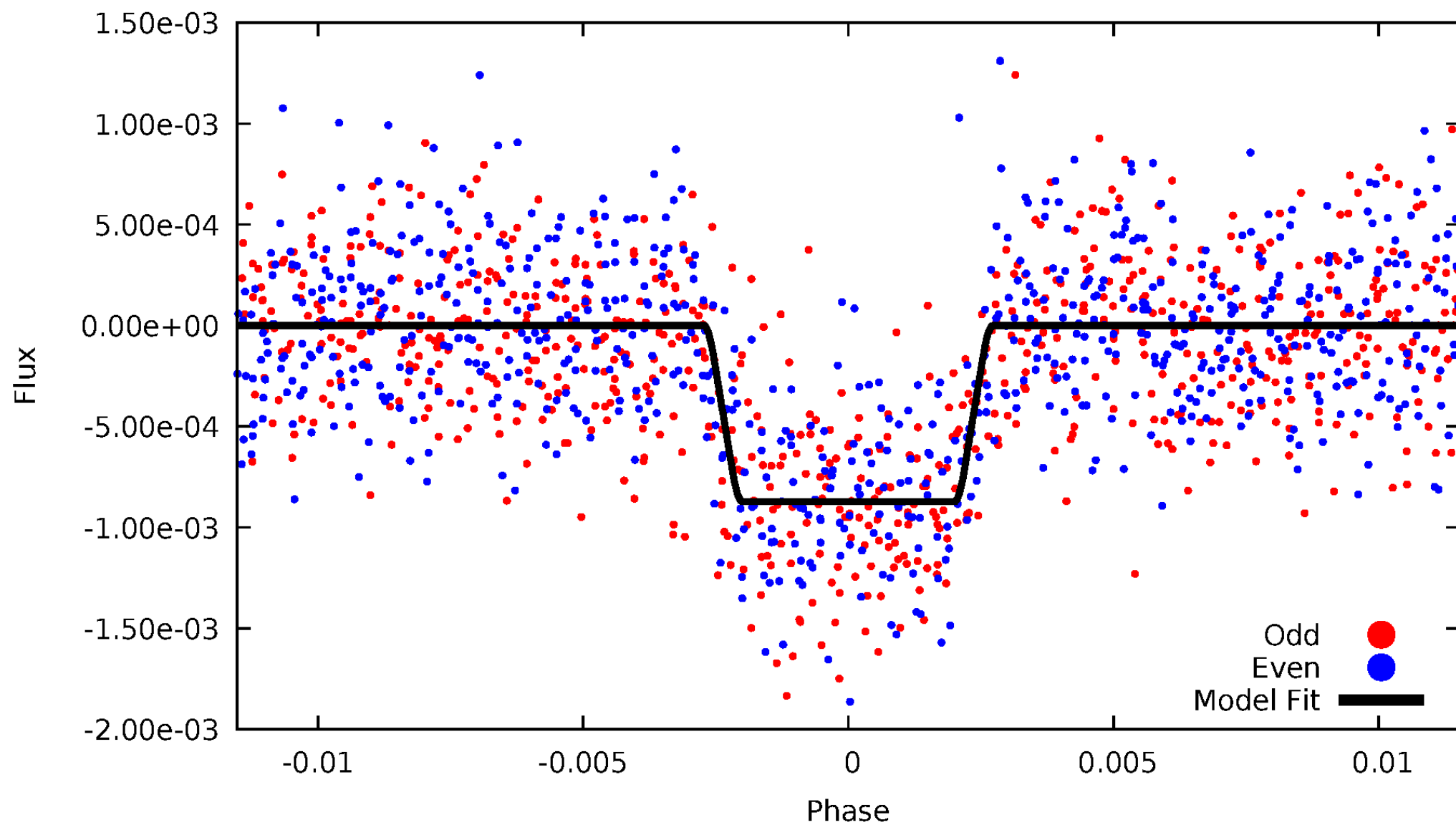
# DV Odd/Even

TCE 009823457-02



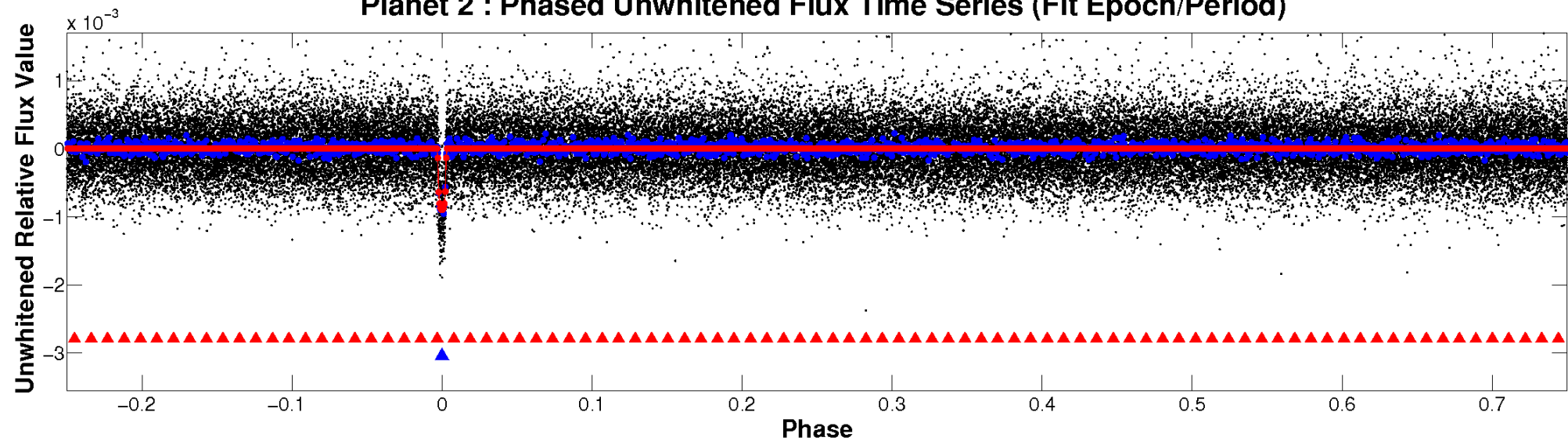
# ALT Odd/Even

TCE 009823457-02

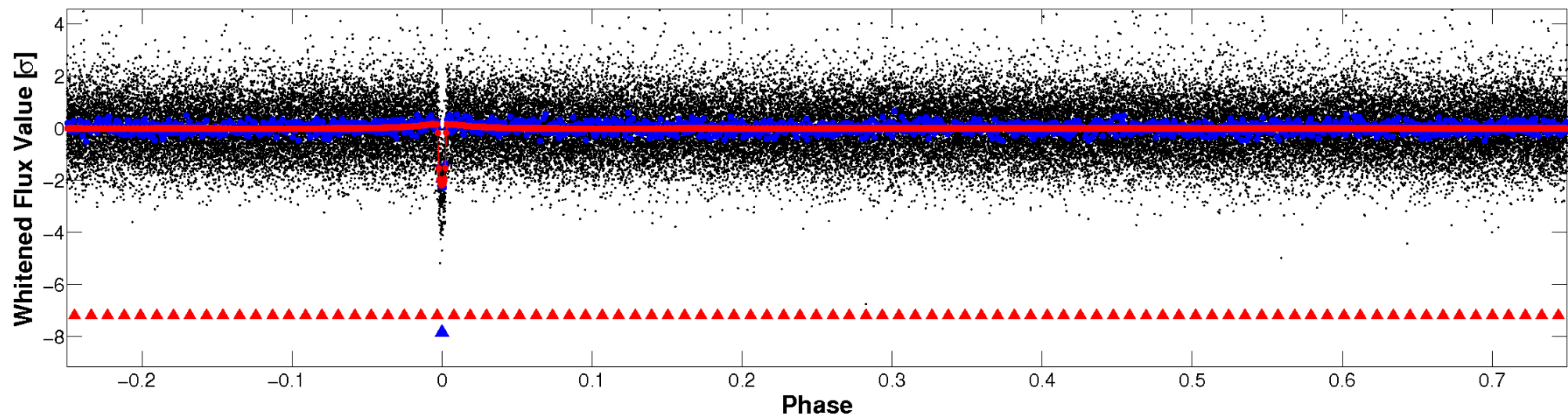


# Non-Whitened Vs. Whitened Light Curve

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

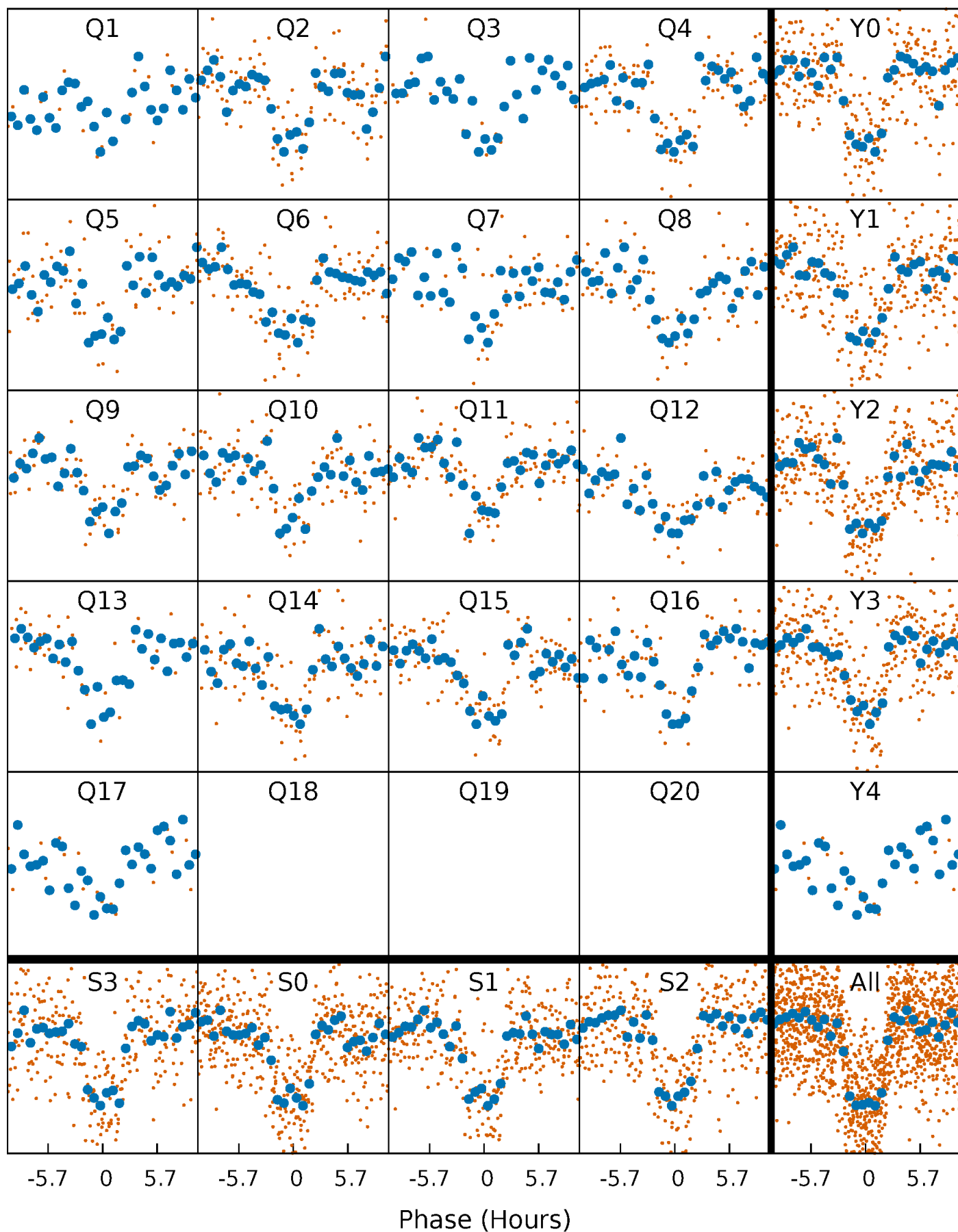


## Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



# PDC Quarter-Phased Transit Curves

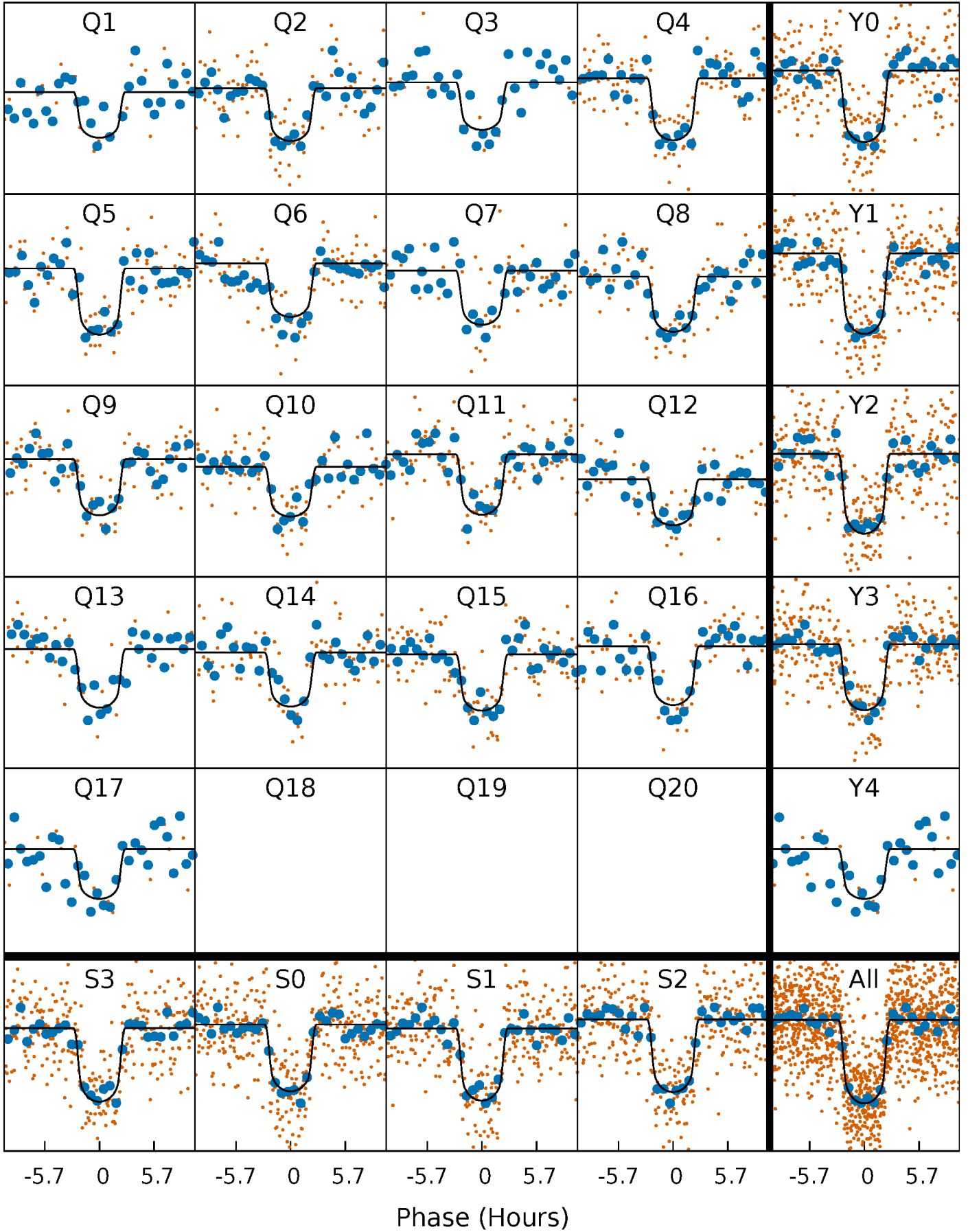
TCE 009823457-02   P= 36.925040 Days    $T_0=137.298270$  (BKJD)





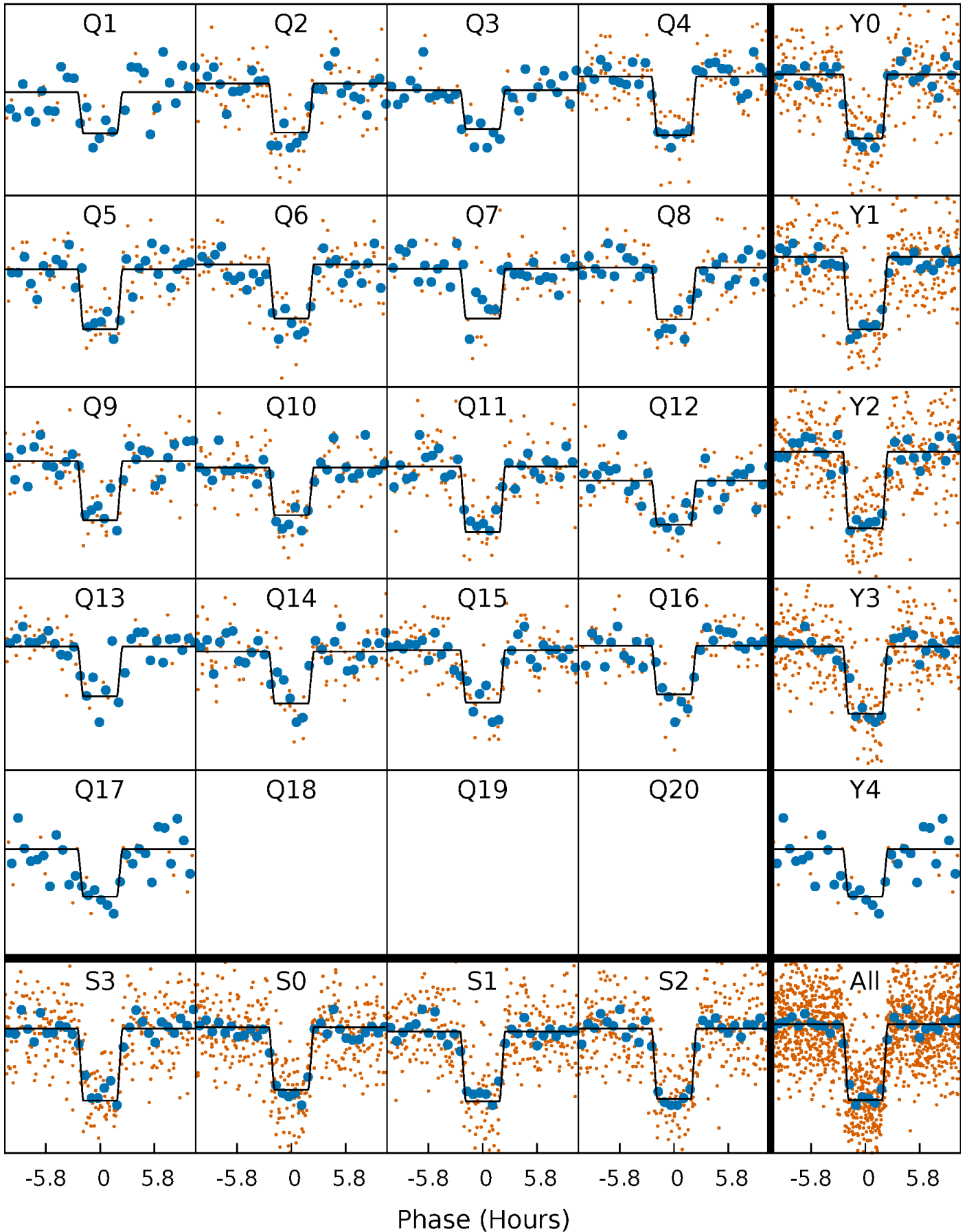
# DV Quarter-Phased Transit Curves

TCE 009823457-02 P= 36.925040 Days  $T_0=137.298270$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

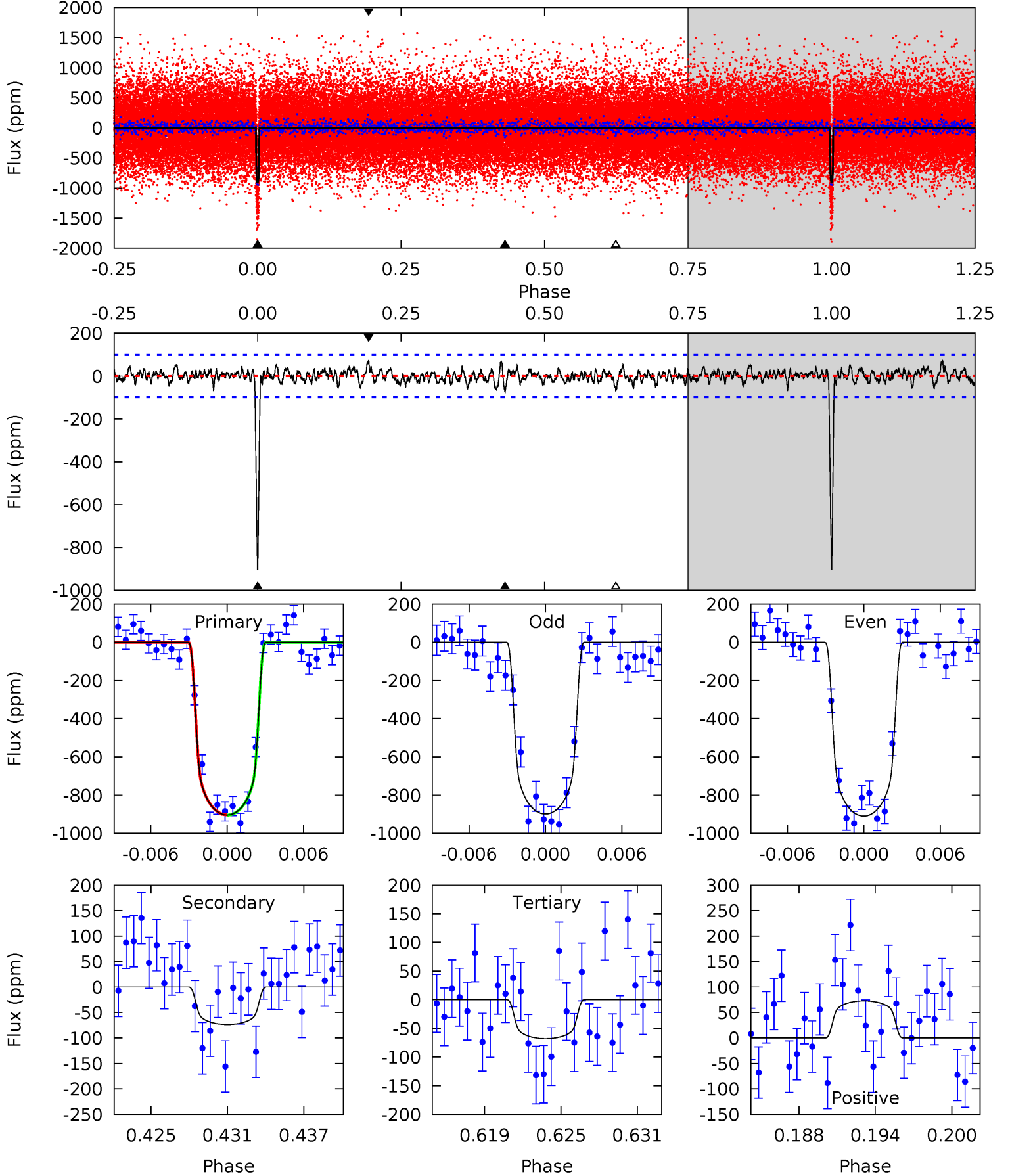
TCE 009823457-02   P= 36.924863 Days    $T_0=137.301340$  (BKJD)



# DV Model-Shift Uniqueness Test

009823457-02, P = 36.925040 Days, E = 100.373230 Days

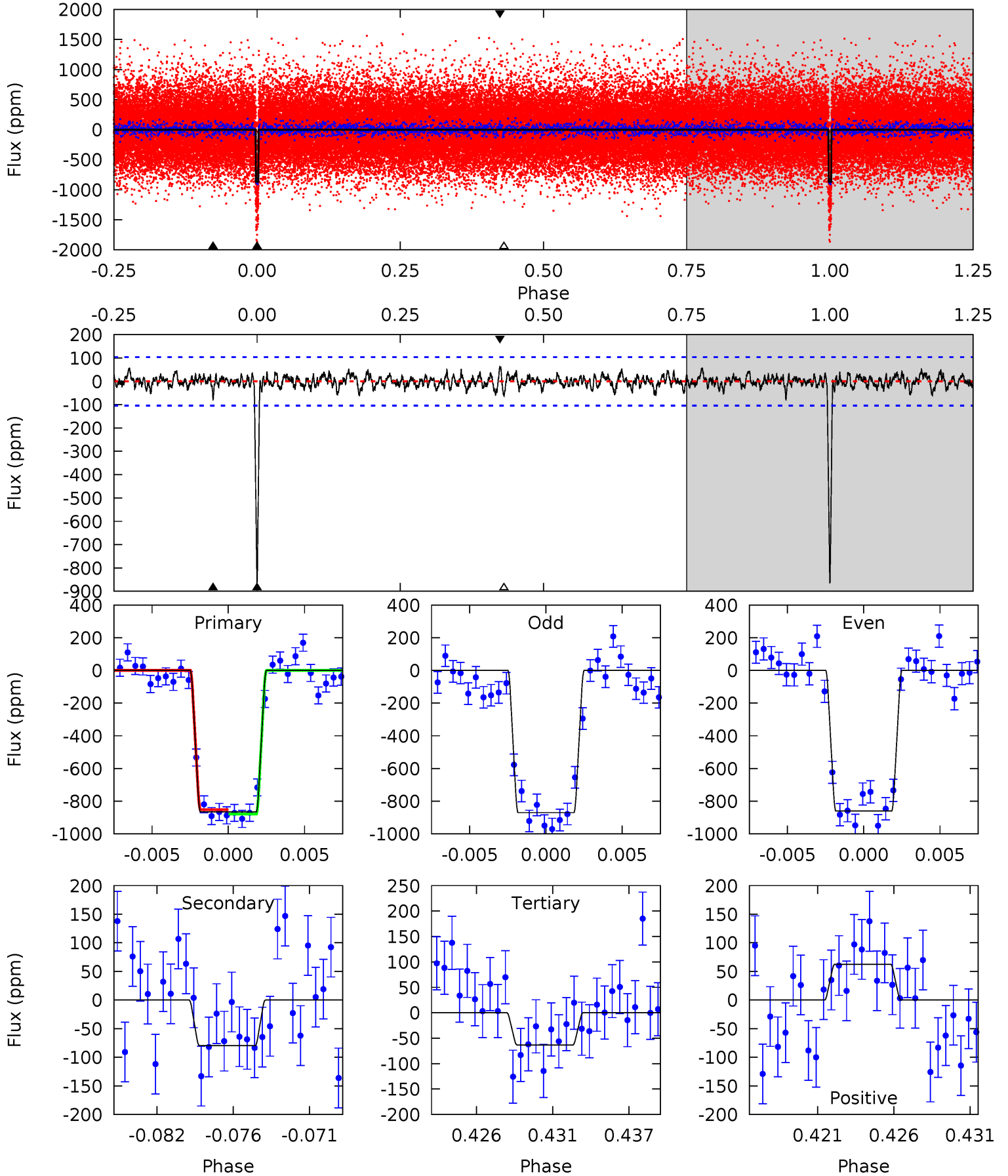
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
47.1	3.84	3.54	3.79	5.12	2.74	1.12	43.6	43.3	0.30	0.05	0.27	1.00	0.07	0.04



# Alt Model-Shift Uniqueness Test

009823457-02, P = 36.924863 Days, E = 100.376477 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
42.8	3.94	3.13	3.09	5.14	2.78	1.00	39.7	39.7	0.81	0.85	0.25	1.01	0.07	0.70



### Stellar Parameters For KIC 009823457

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$5926^{+160}_{-178}$	$4.532^{+0.036}_{-0.204}$	$-0.200^{+0.300}_{-0.300}$	$0.887^{+0.259}_{-0.086}$	$0.978^{+0.119}_{-0.119}$	$1.971^{+0.392}_{-1.022}$
	+3%/-3%	+1%/-5%	+150%/-150%	+29%/-10%	+12%/-12%	+20%/-52%
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 009823457-02 / KOI 0954.02

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$-74 \pm 19$	$3.17^{+0.52}_{-0.39}$	$762^{+58}_{-31}$	$3562^{+180}_{-197}$	$175^{+72}_{-53}$
Alt.	$-80 \pm 20$	$3.04^{+0.53}_{-0.36}$	$763^{+55}_{-34}$	$3655^{+214}_{-216}$	$208^{+84}_{-72}$

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

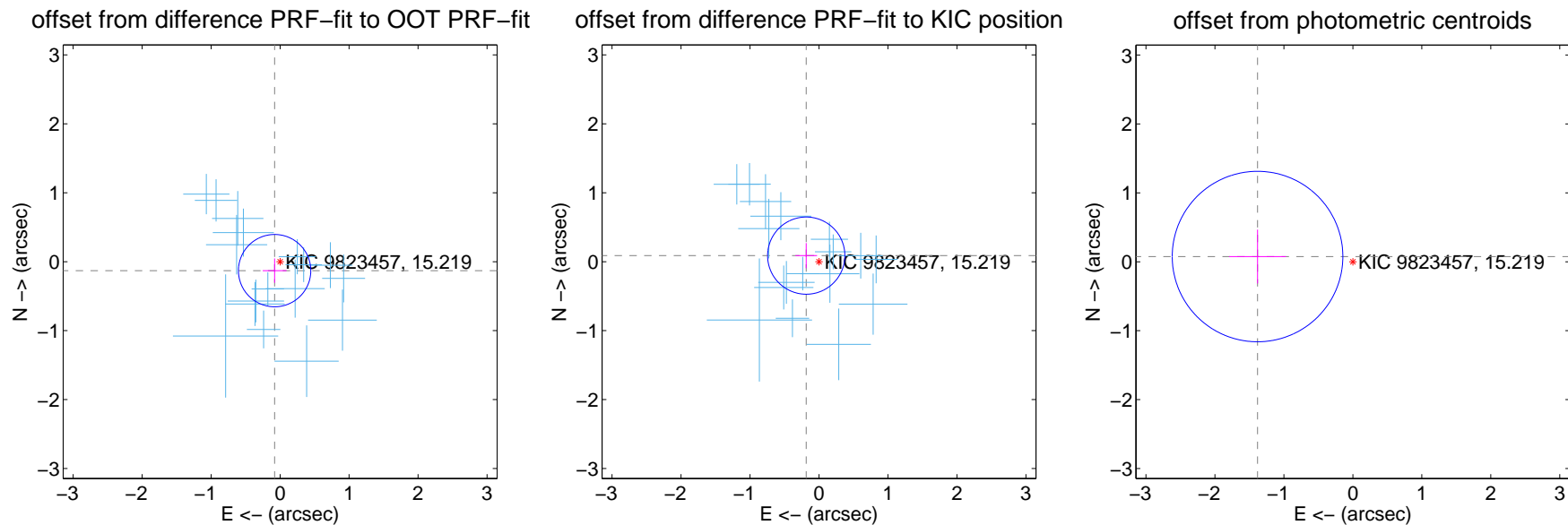
## DV Centroid Data

Supplemental centroid analysis for 009823457-02. Kepler magnitude: 15.22. Transit SNR 33.68

There are 17 quarters with good PRF difference image offsets

The direct PRF centroid is offset from the target star catalog position by about 0.26 arcsec

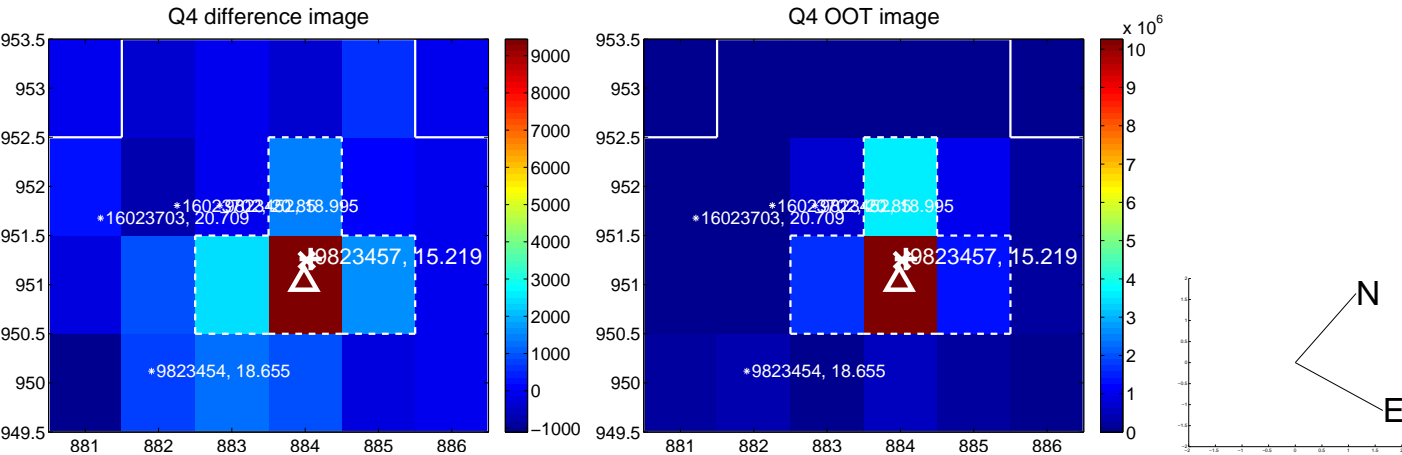
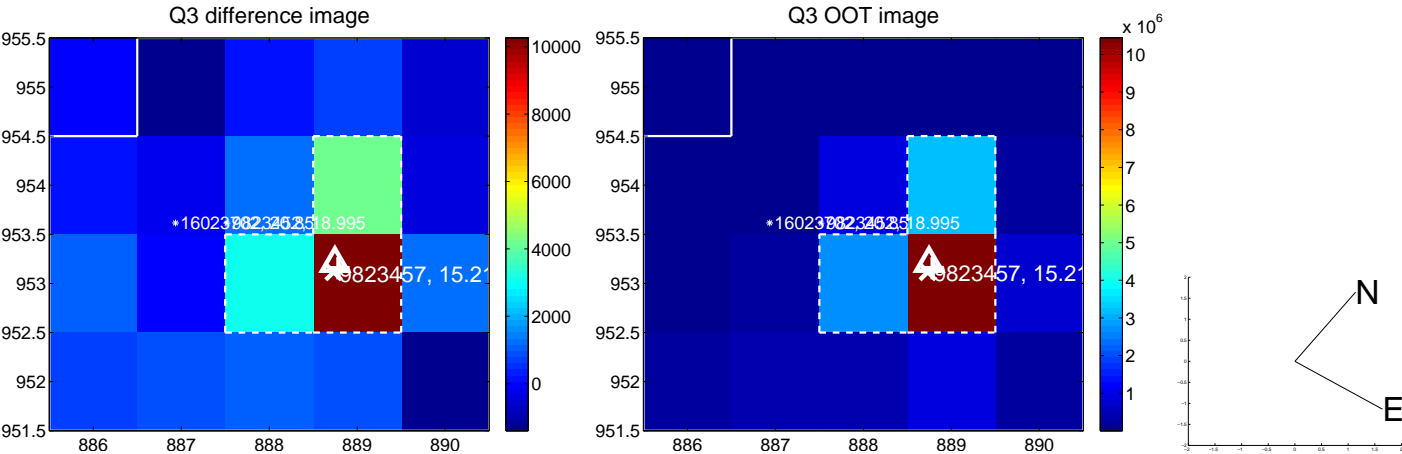
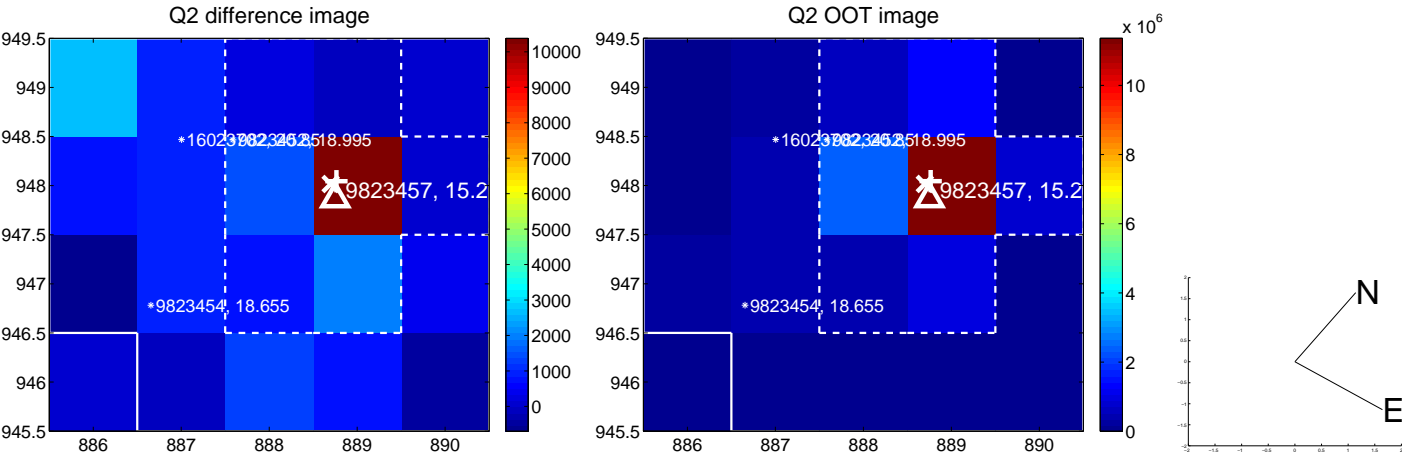
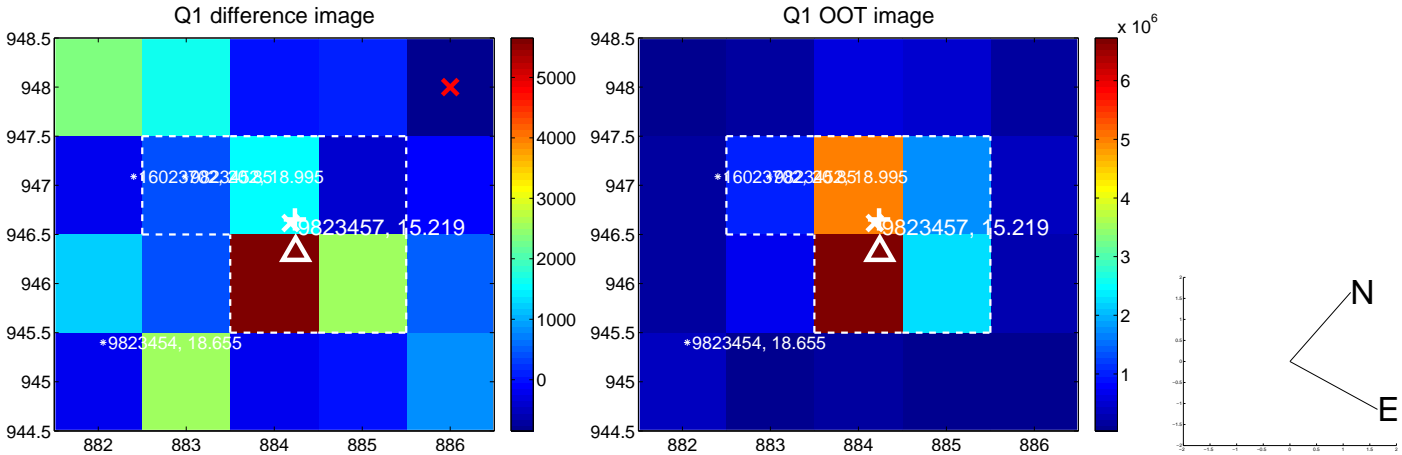
	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.152 \pm 0.175$	0.87	$0.080 \pm 0.172$	$-0.130 \pm 0.176$
PRF-fit source offset from KIC position	$0.205 \pm 0.187$	1.10	$0.185 \pm 0.157$	$0.088 \pm 0.182$
photometric centroid source offset	$1.38 \pm 0.41$	<b>3.36</b>	$1.38 \pm 0.41$	$0.08 \pm 0.39$



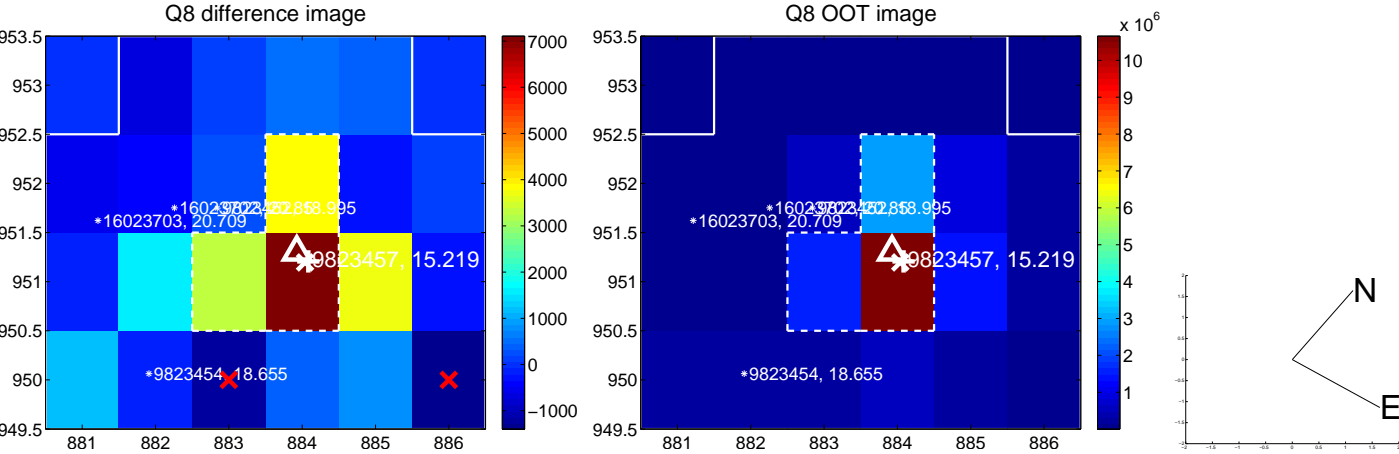
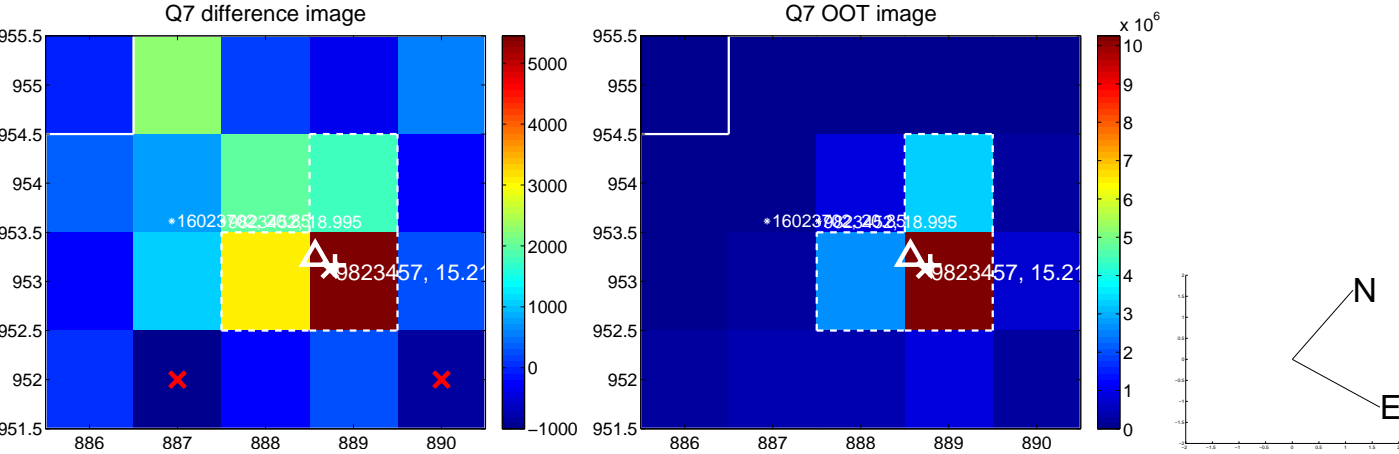
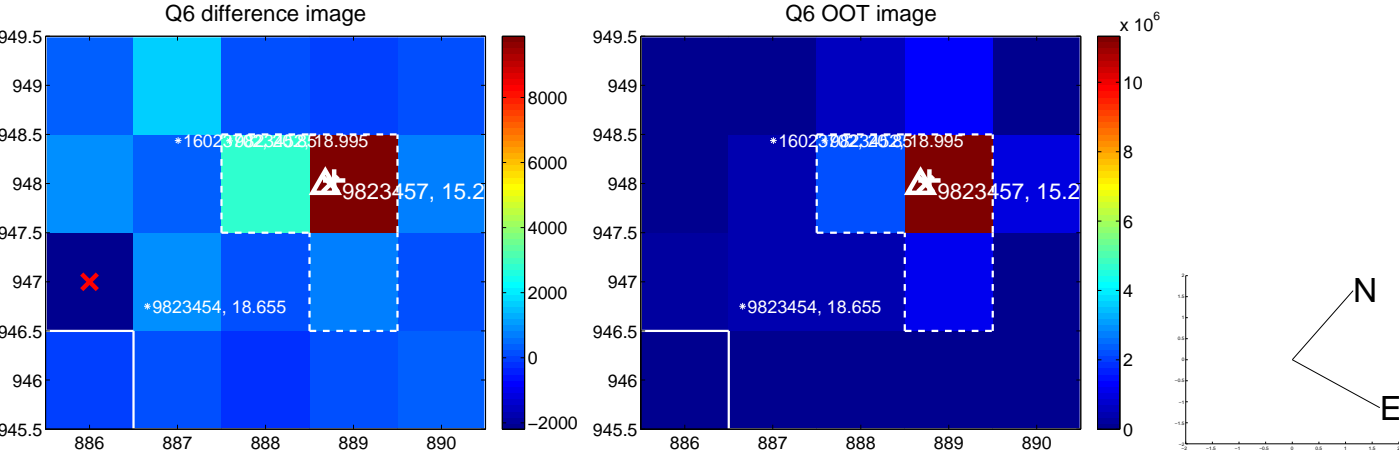
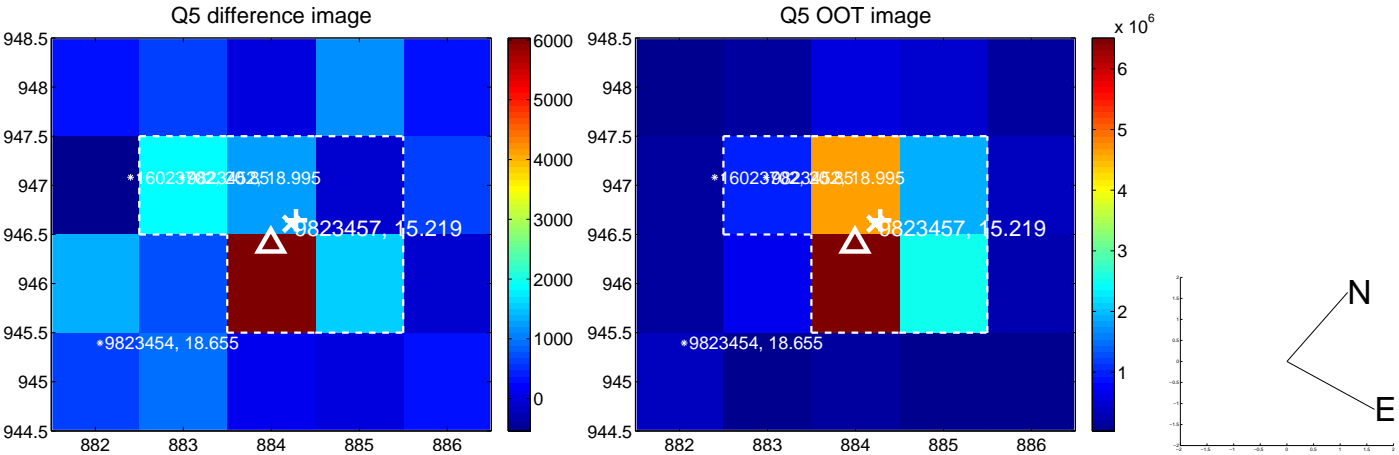
Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets**; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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



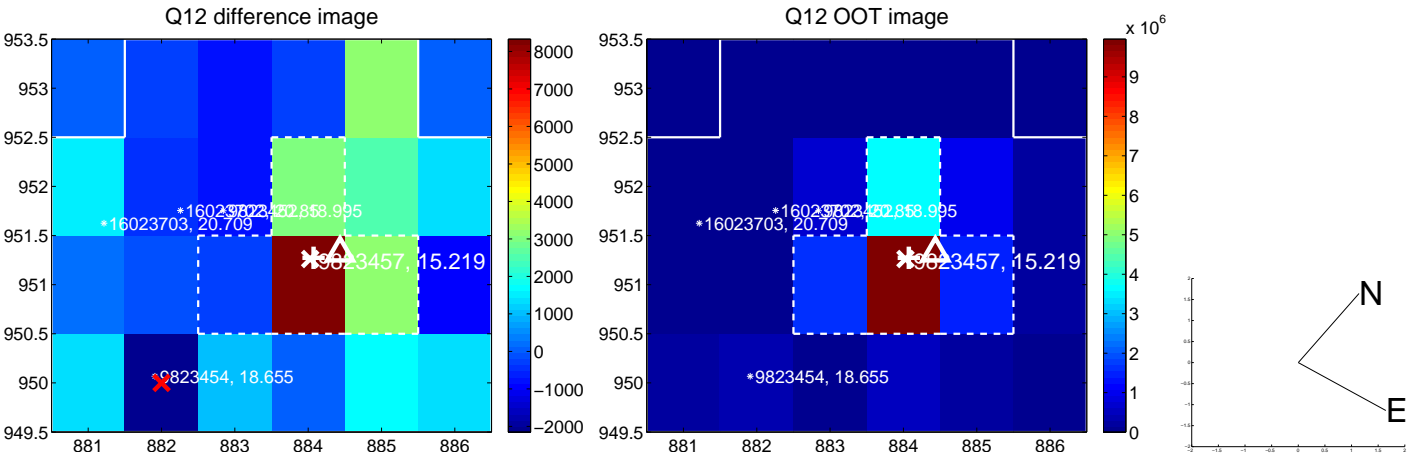
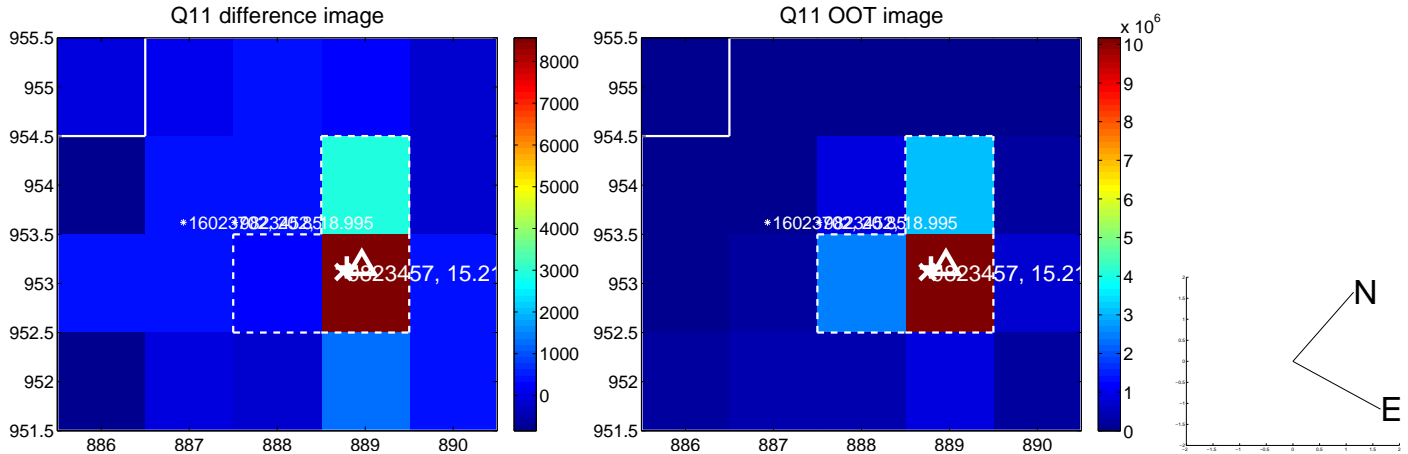
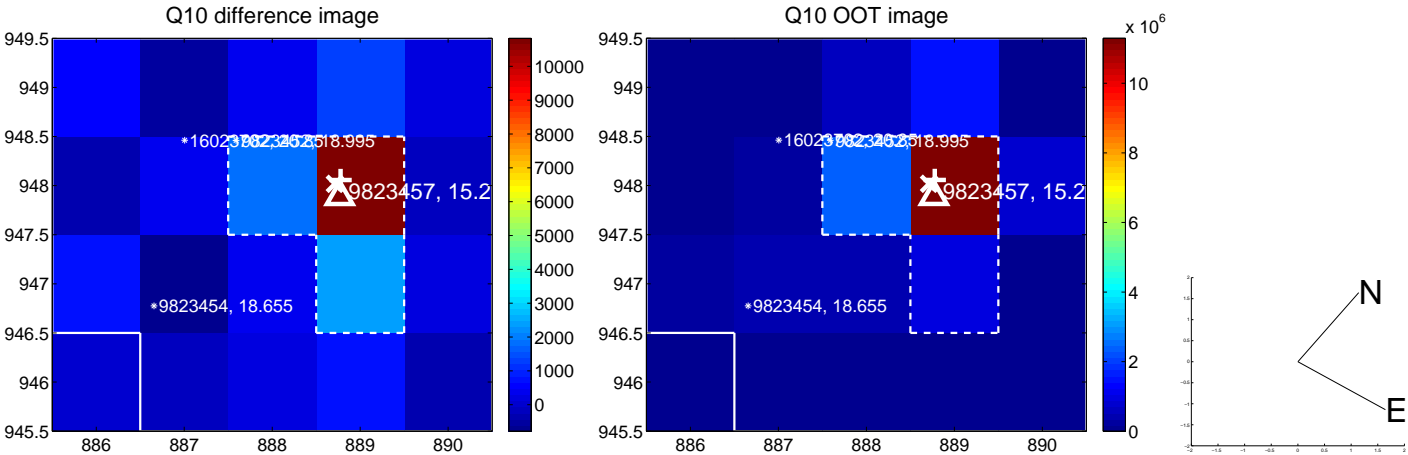
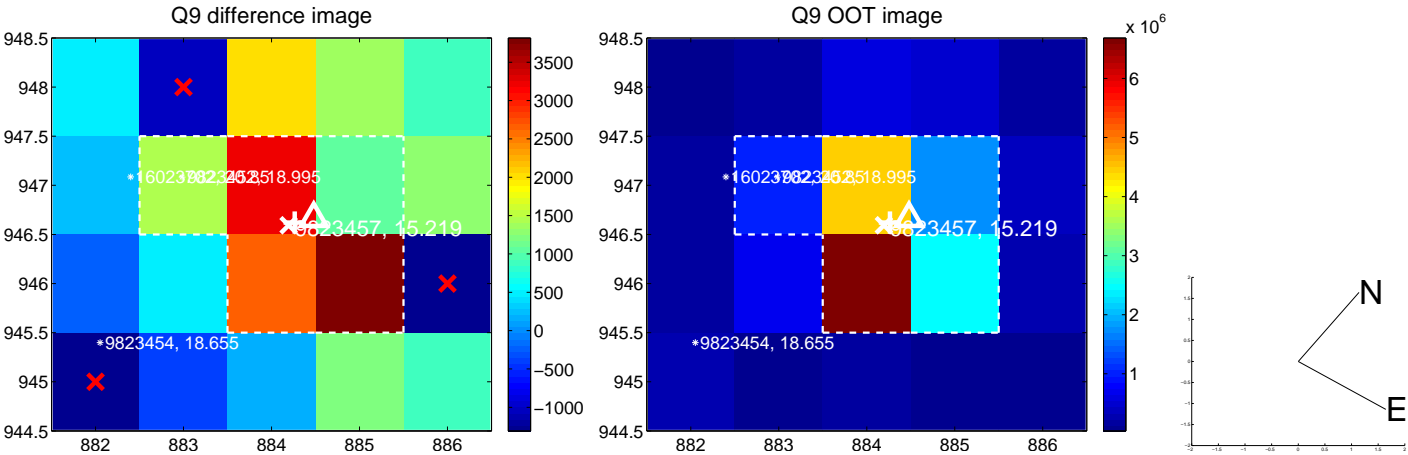
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

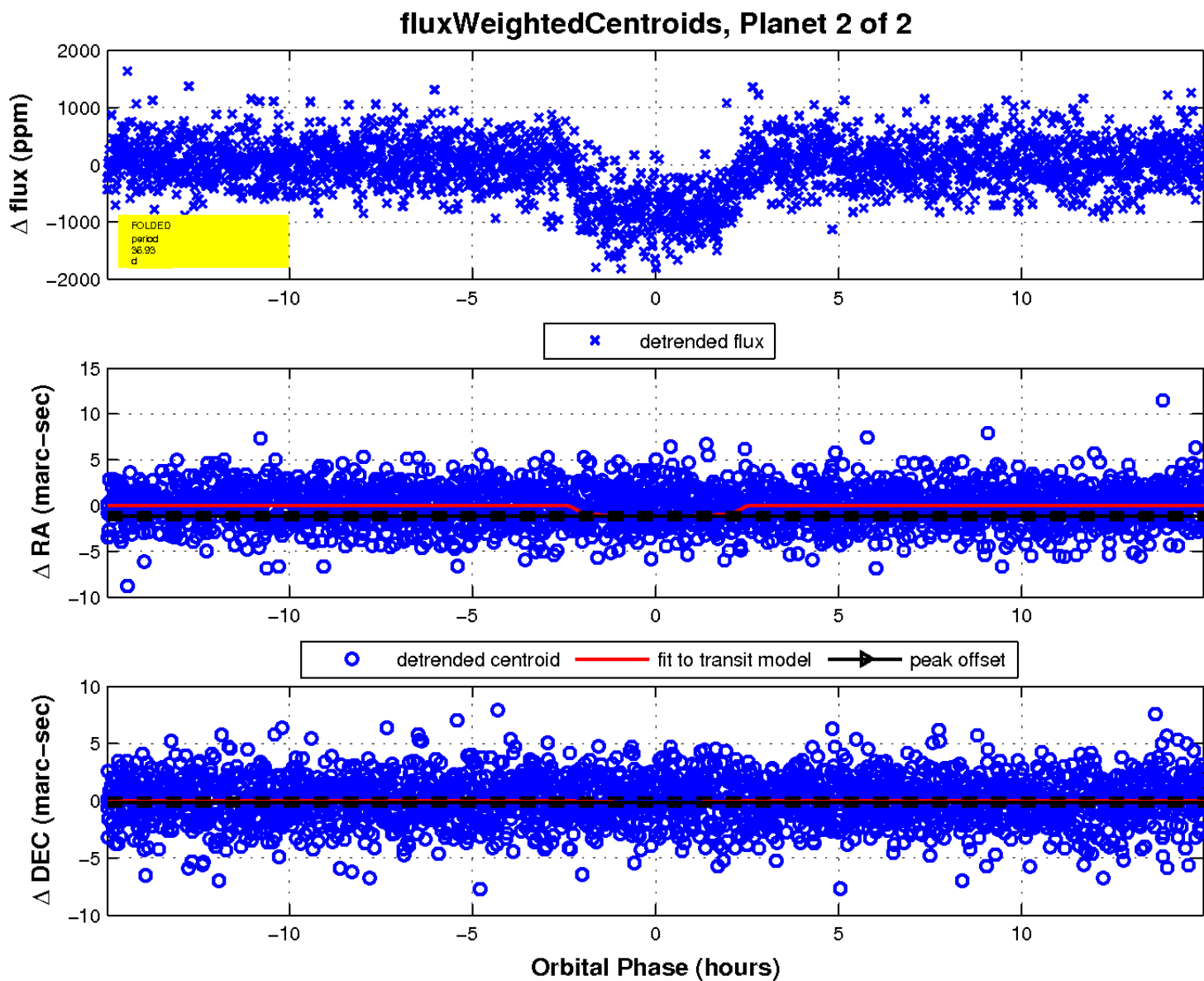
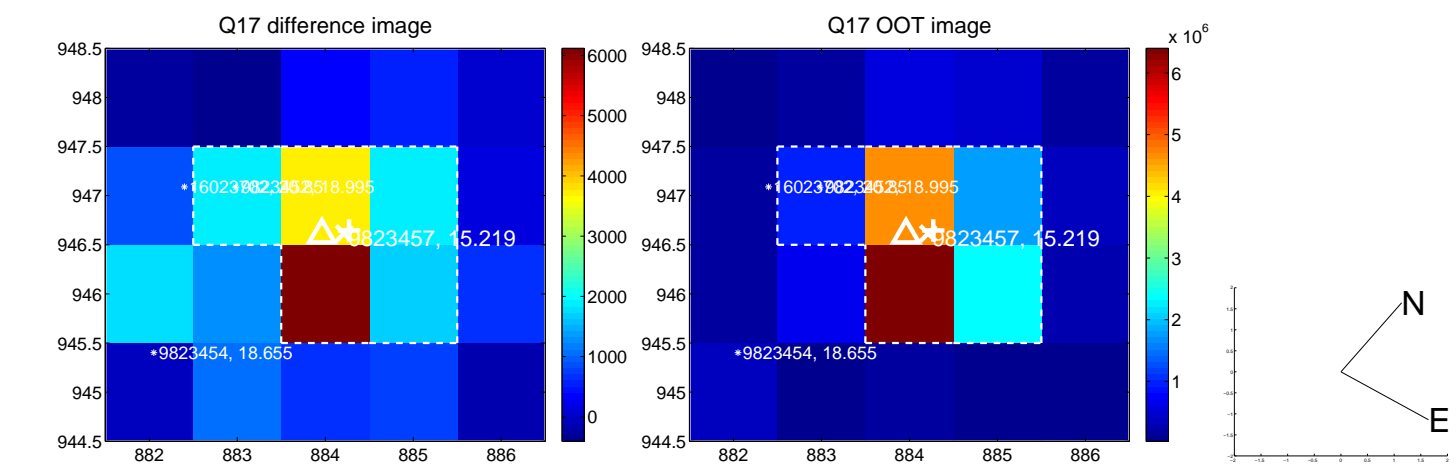


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.





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



# UKIRT Image

Declination

