

# KIC 009024857

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
009024857-01	OBS	7124.01	35.026567	160.601939	119776.1	2.912	1828.4	1628.7	0.81	5546	35.73	13.59
009024857-02	OBS	7124.02	379.149320	267.599769	1415.0	12.311	8.1	8.4	0.81	5546	3.08	0.57

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009024857-01	OBS	FP	0.00	0	1	0	0	DEEP_V_SHAPED
009024857-02	OBS	FP	0.01	1	0	0	0	ALL_TRANS_CHASES—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.

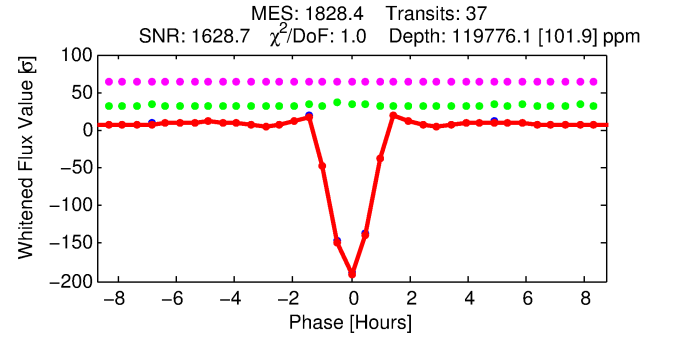
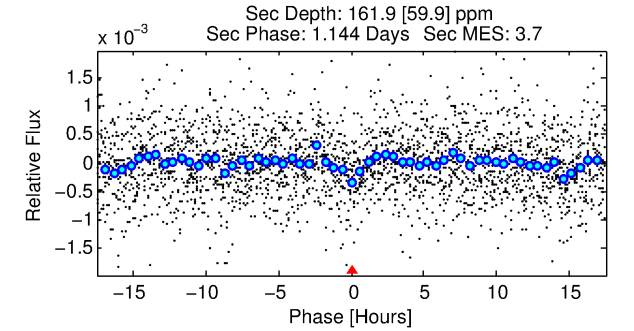
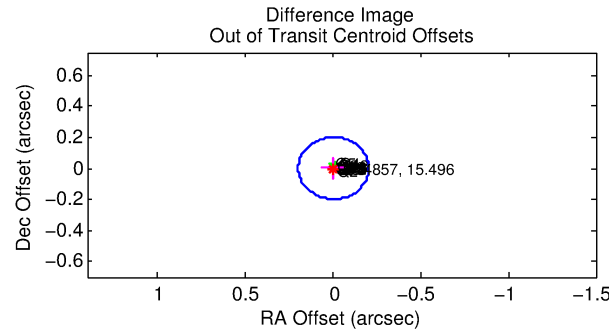
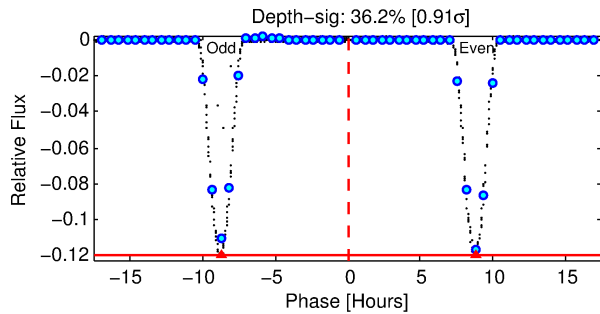
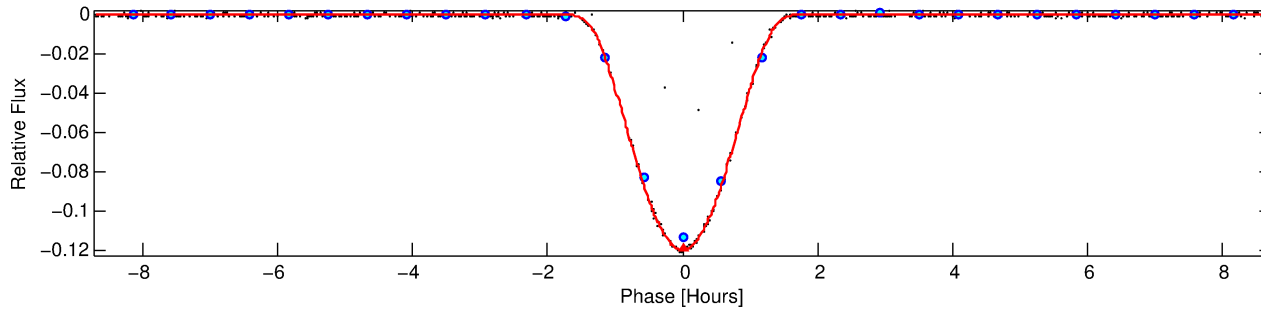
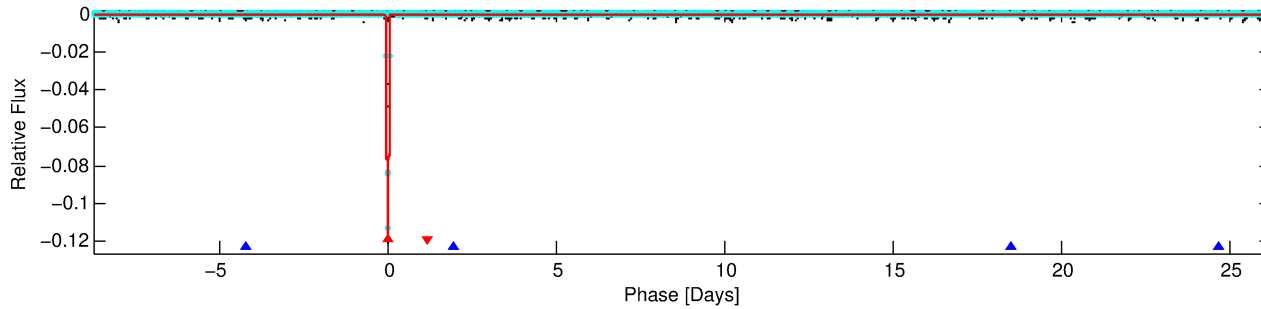
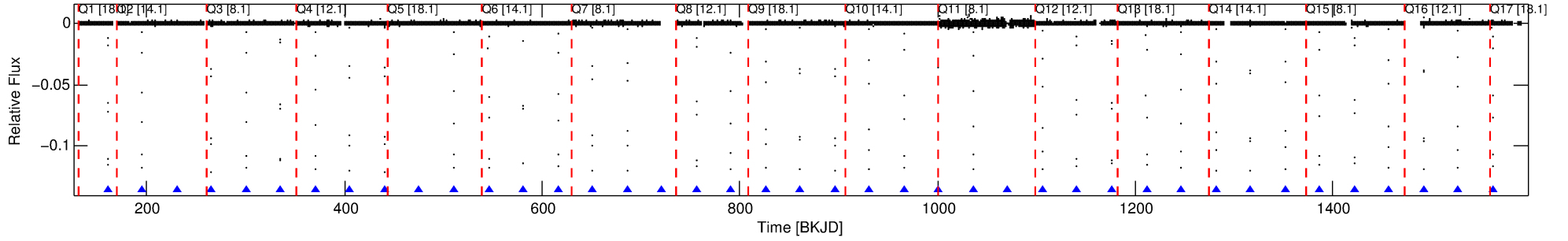
## Ephemeris Match Information For 009024857-01

No Significant Match Found

# DV One-Page Summary

KIC: 9024857 Candidate: 1 of 2 Period: 35.027 d  
KOI: K07124.01 Corr: 0.998

Kp: 15.50 R\*: 0.81 Rs Teff: 5546.0 K Logg: 4.58 Fe/H: -0.140



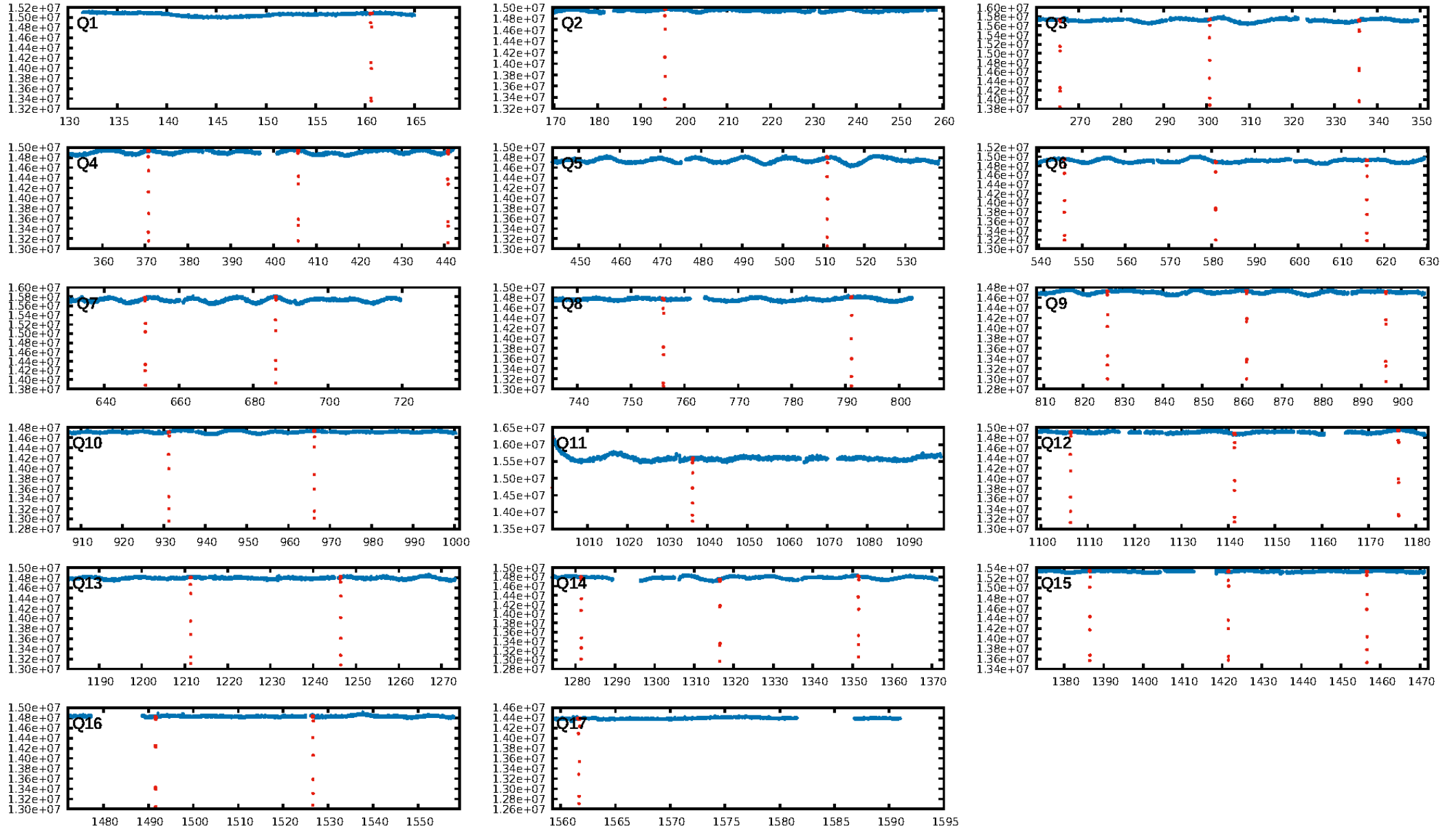
## DV Fit Results:

Period = 35.02657 [0.00000] d  
Epoch = 160.6019 [0.0000] BKJD  
Rp/R\* = 0.4043 [0.0092]  
a/R\* = 106.31 [0.11]  
b = 0.80 [0.02]  
Seff = 13.59 [4.14]  
Teq = 490 [37] K  
Rp = 35.73 [8.33] Re  
a = 0.2023 [0.0392] AU  
Ag = 2.85 [1.33] [1.39σ]  
Teffp = 984 [96] K [4.78σ]

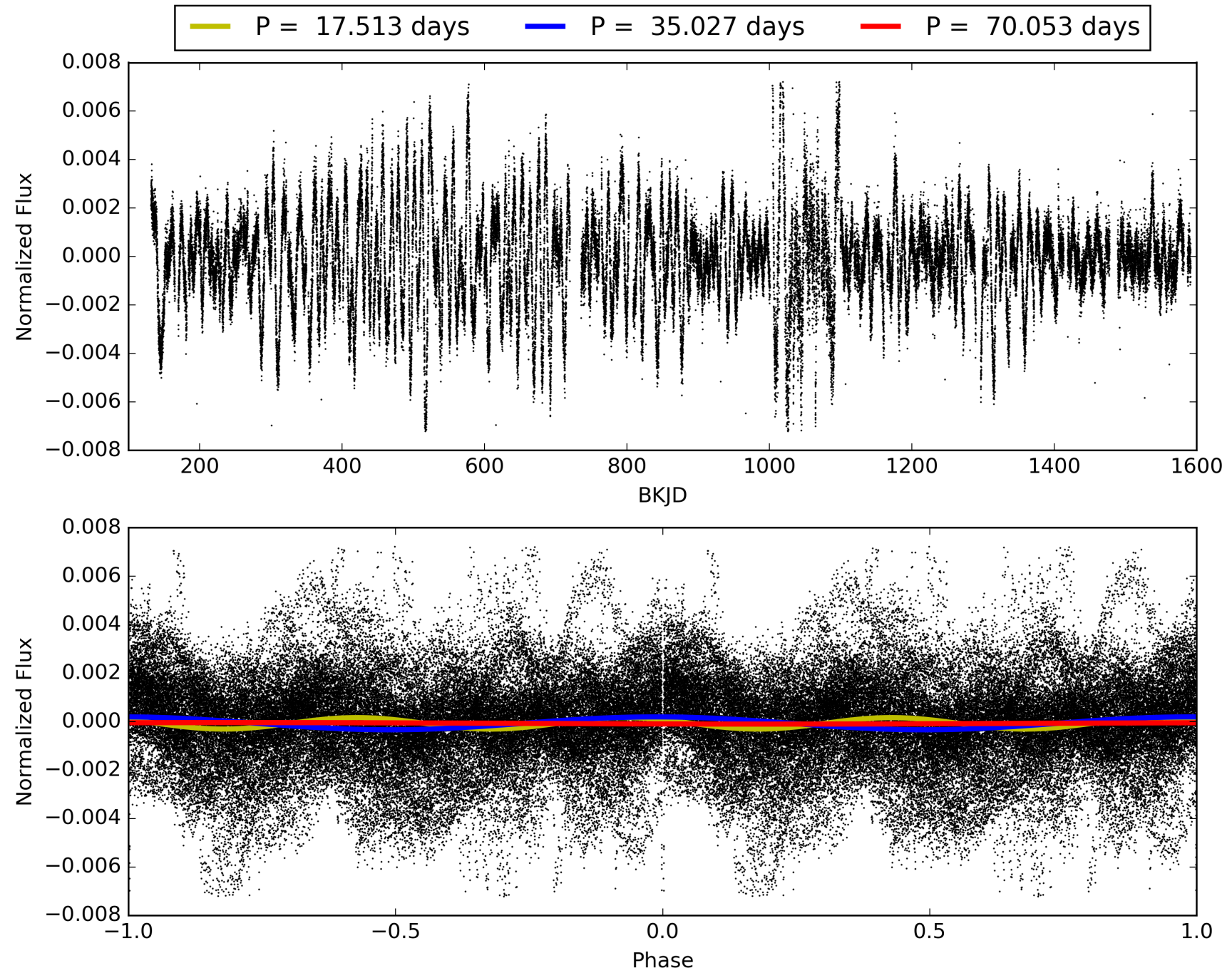
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 100.0% [652.87σ]  
ModelChiSquare2-sig: 0.0%  
ModelChiSquareGof-sig: 99.9%  
Bootstrap-pfa: 0.00e+00  
RollingBand-fgt: 1.00 [35/35]  
GhostDiagnostic-chr: 3.64  
Centroid-sig: N/A  
Centroid-so: 0.274 arcsec [38.85σ]  
OotOffset-rm: 0.004 arcsec [0.05σ]  
KicOffset-rm: 0.180 arcsec [2.54σ]  
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 009024857-01, PDC Light Curves

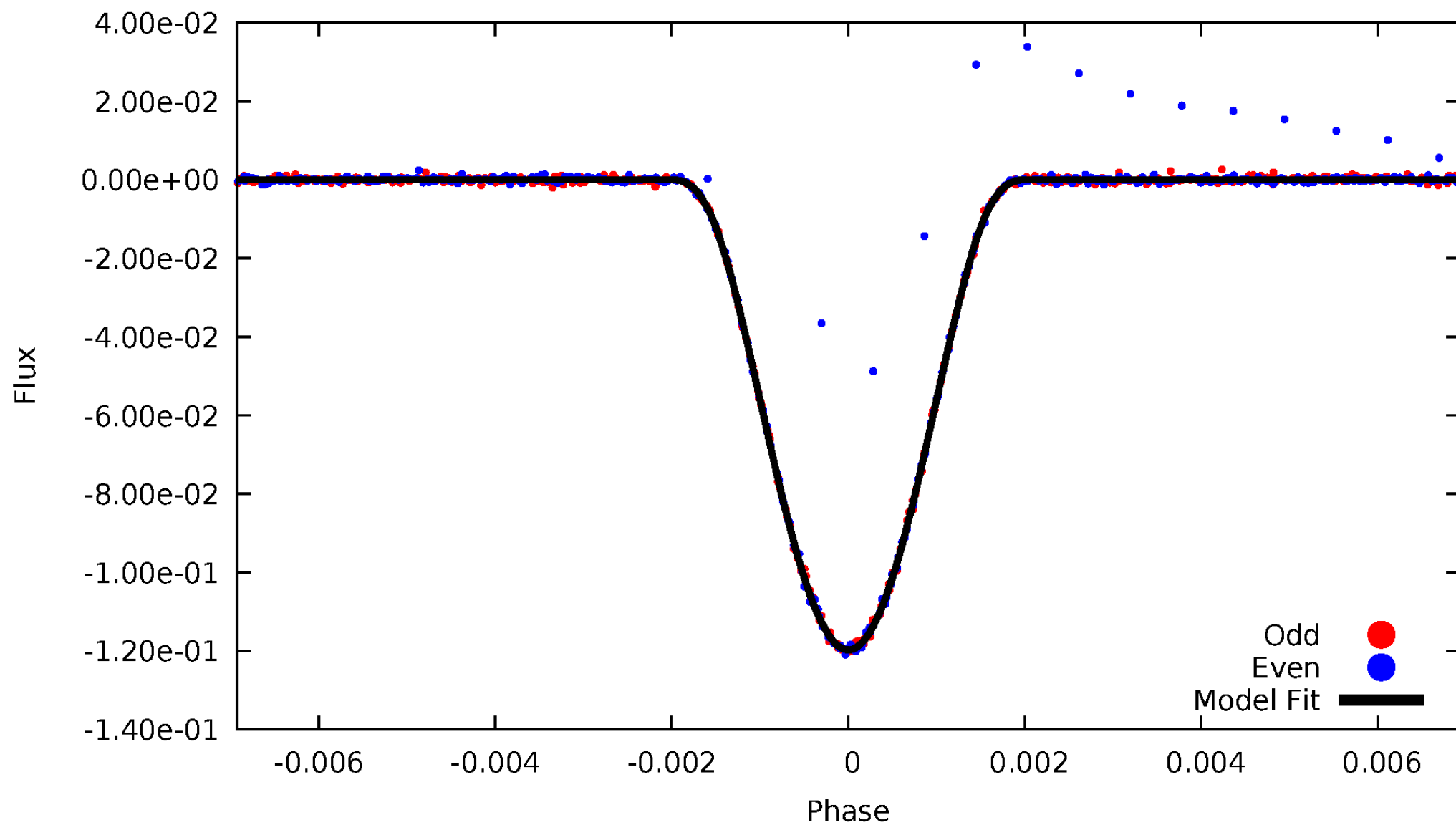


TCE 009024857-01



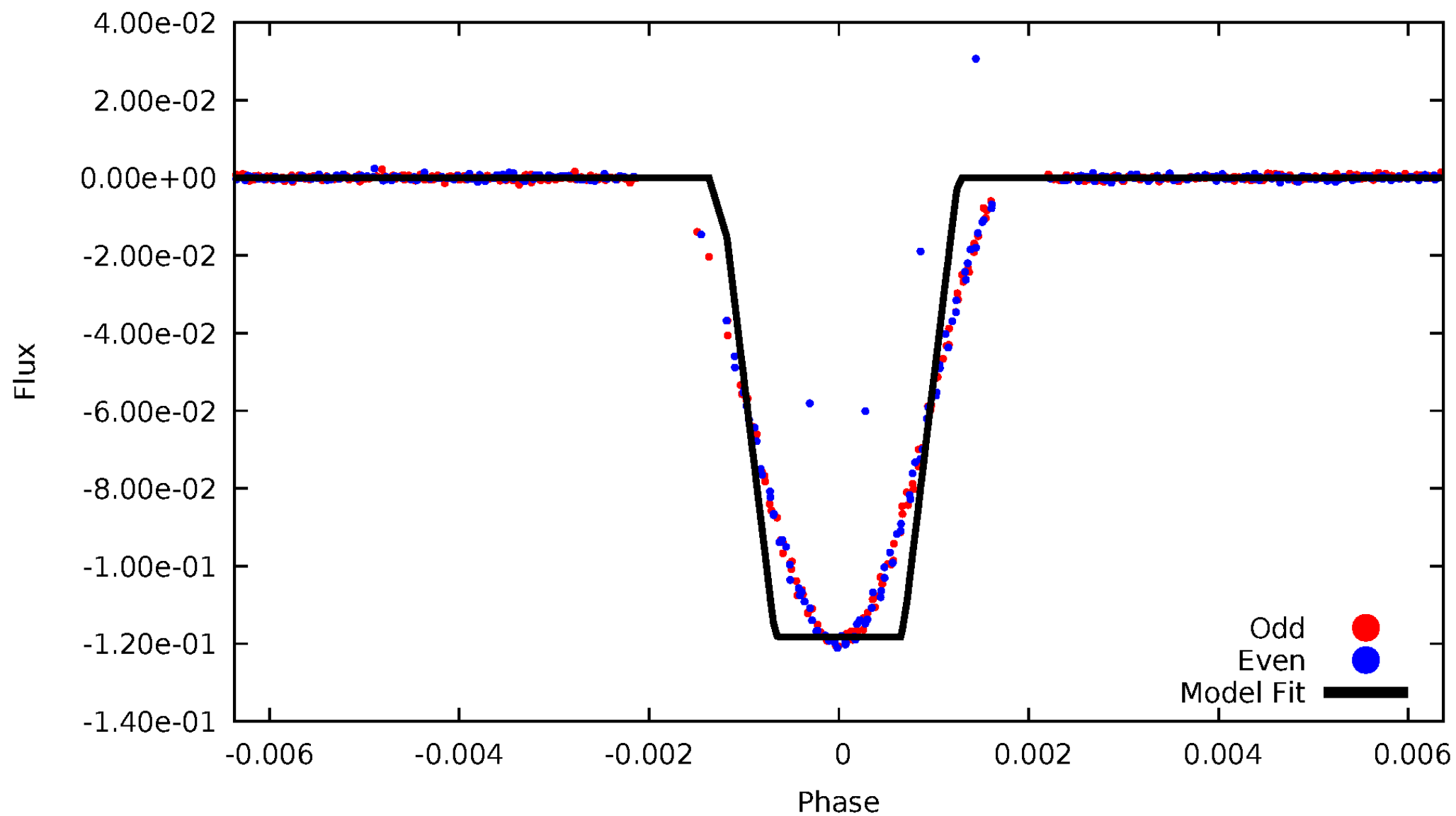
# DV Odd/Even

TCE 009024857-01



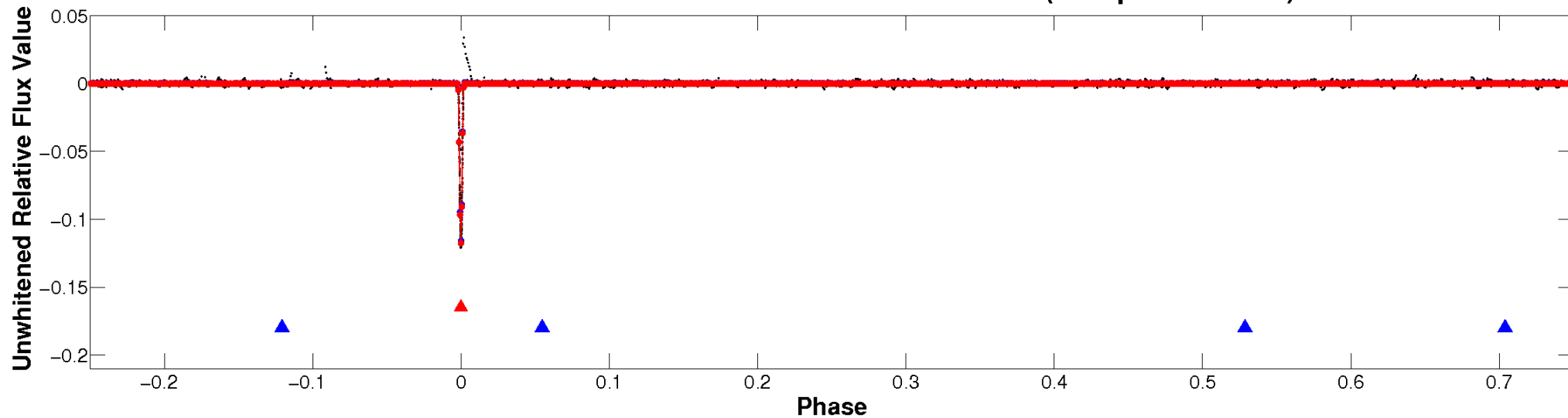
# ALT Odd/Even

TCE 009024857-01

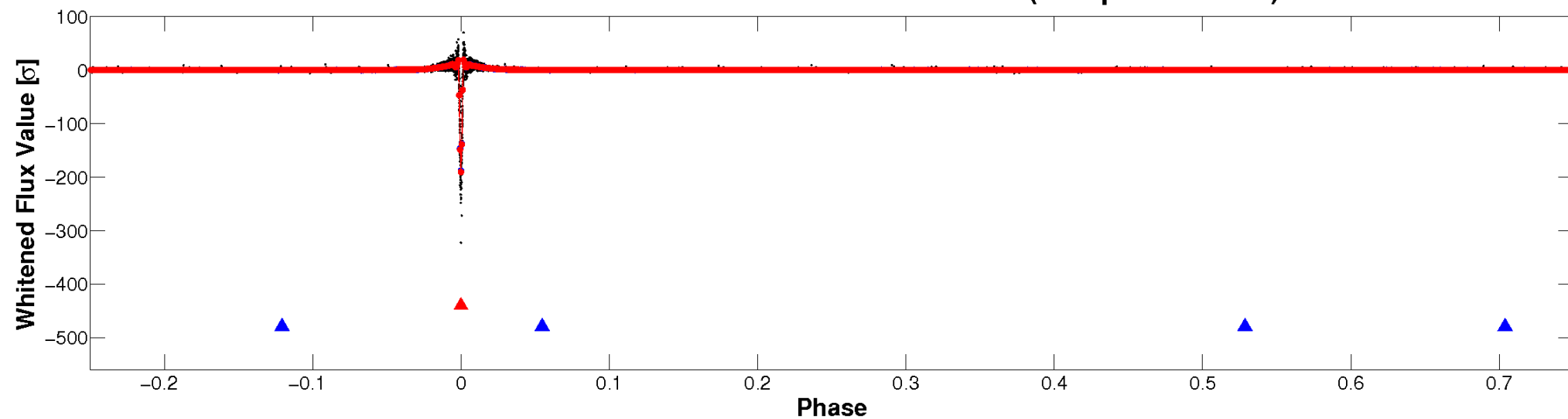


# Non-Whitened Vs. Whitened Light Curve

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

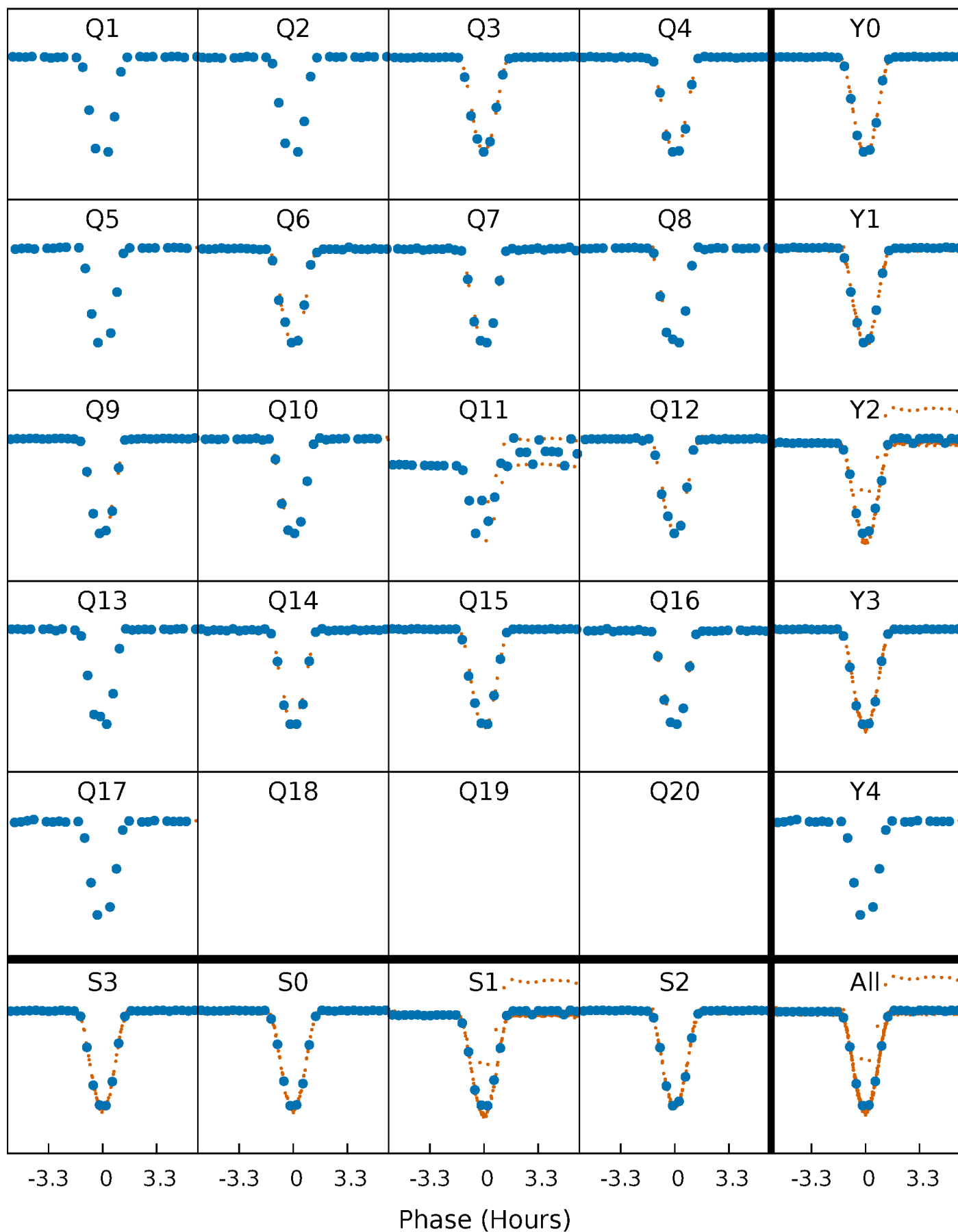


**Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)**



# PDC Quarter-Phased Transit Curves

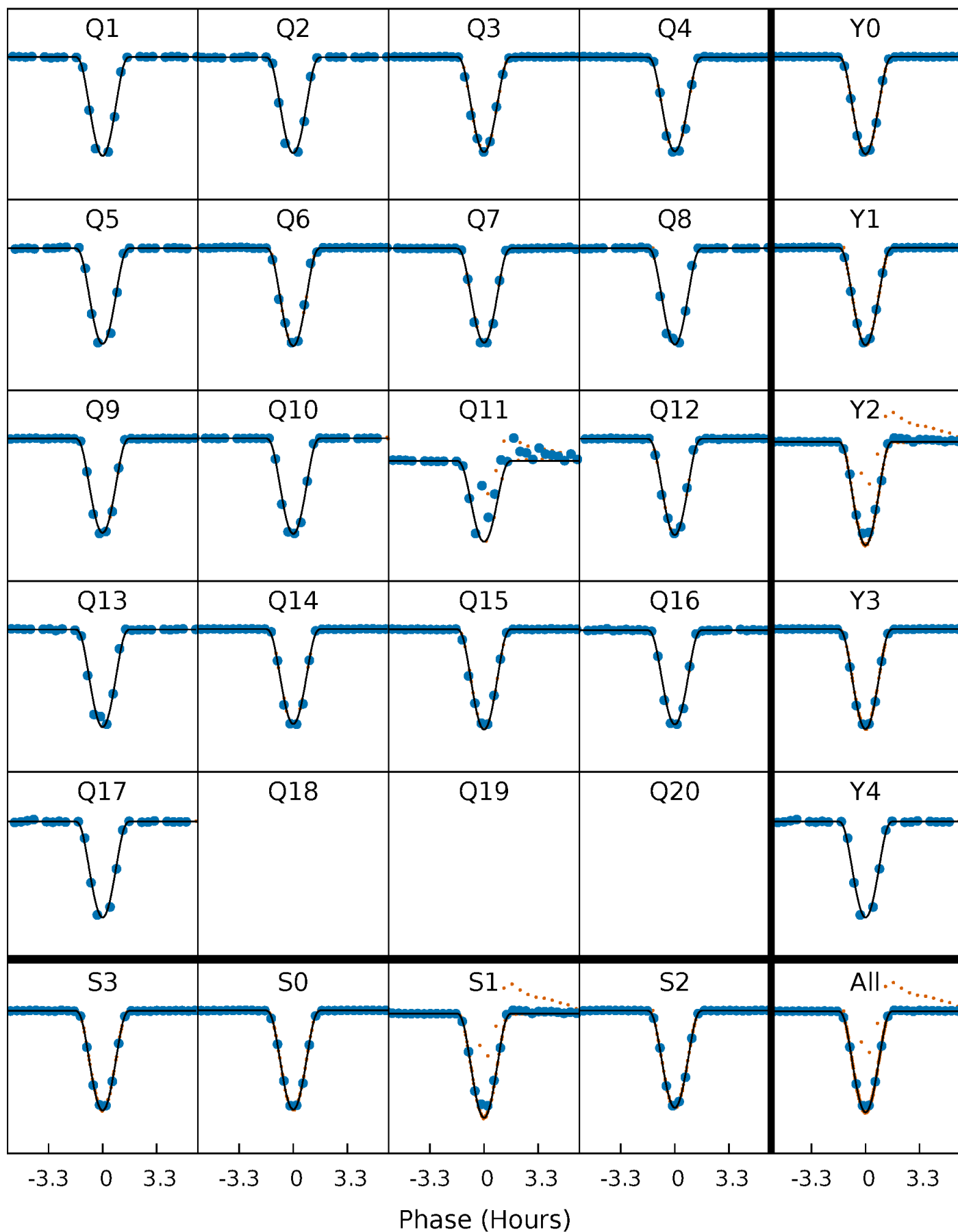
TCE 009024857-01 P= 35.026567 Days  $T_0=160.601939$  (BKJD)





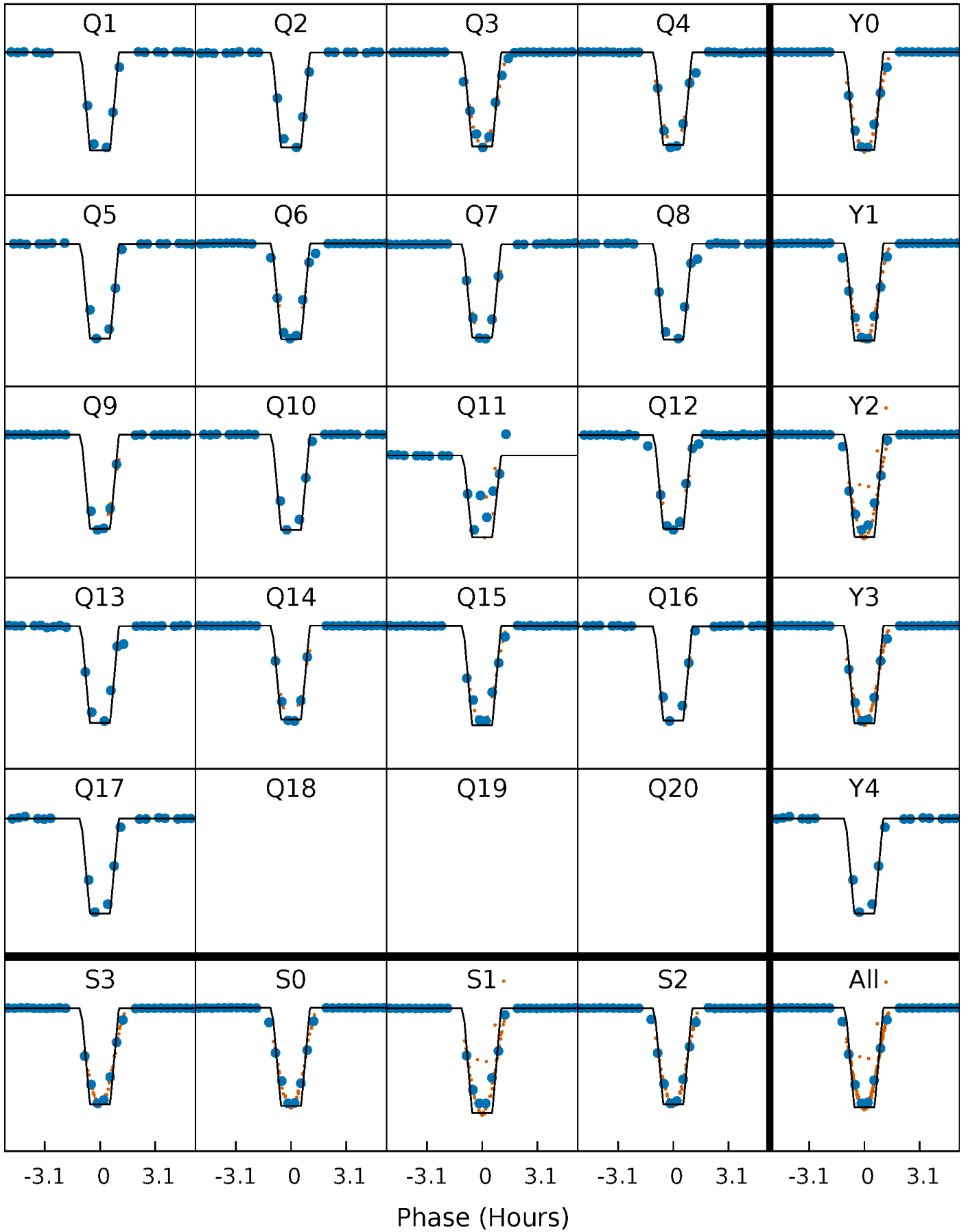
# DV Quarter-Phased Transit Curves

TCE 009024857-01 P= 35.026567 Days  $T_0=160.601939$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

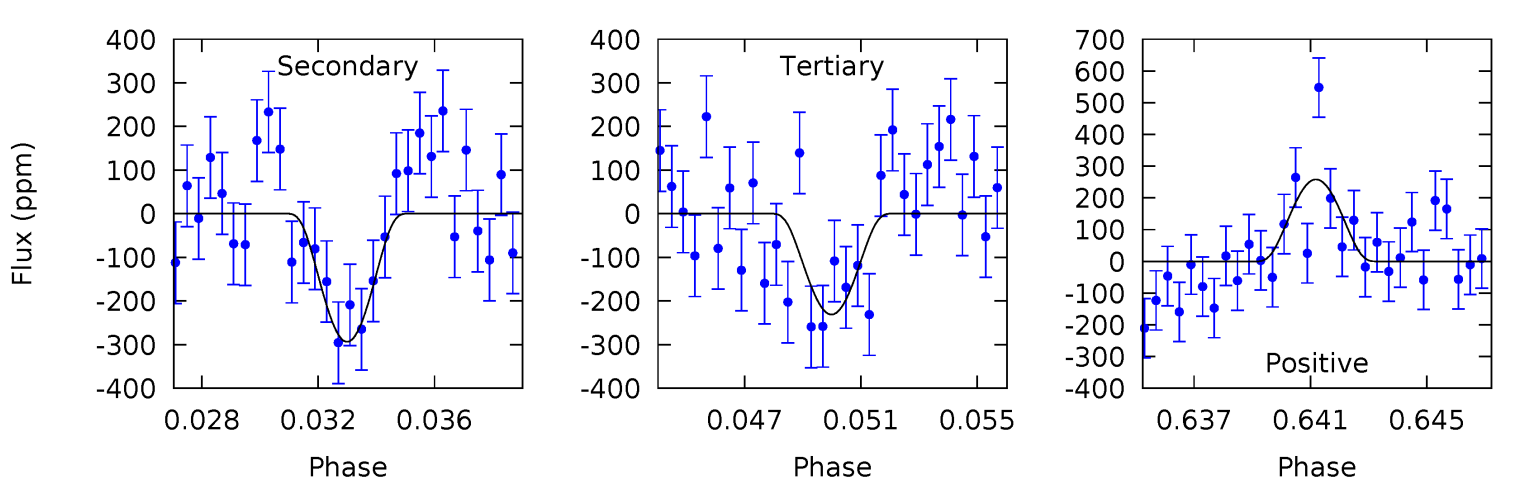
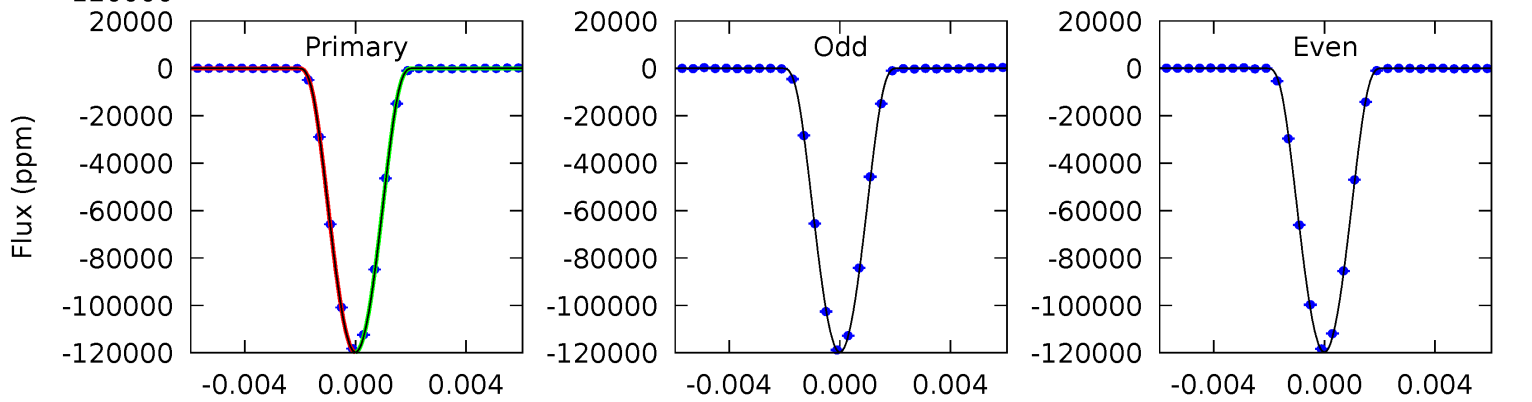
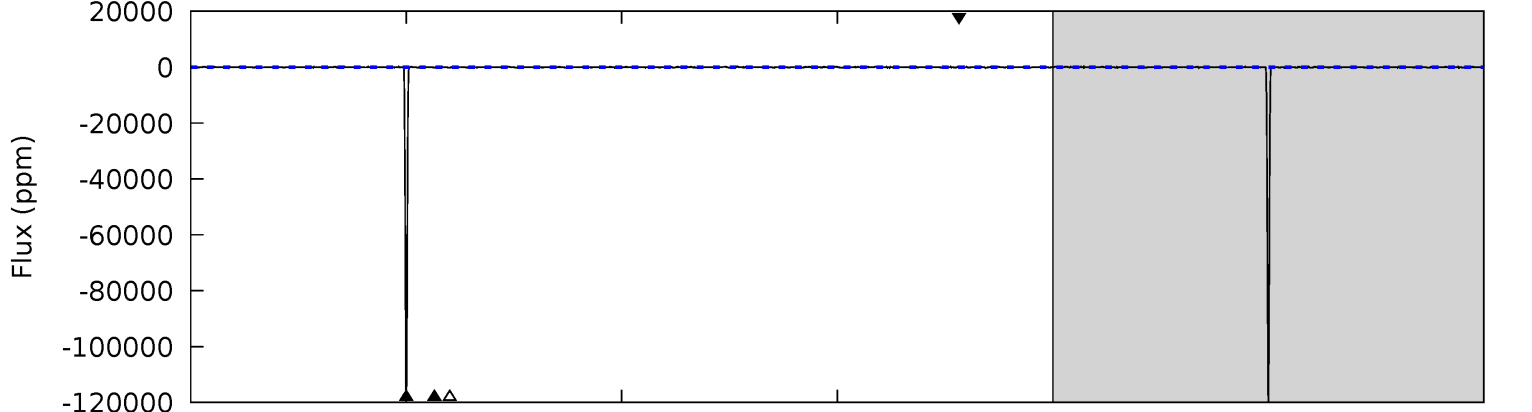
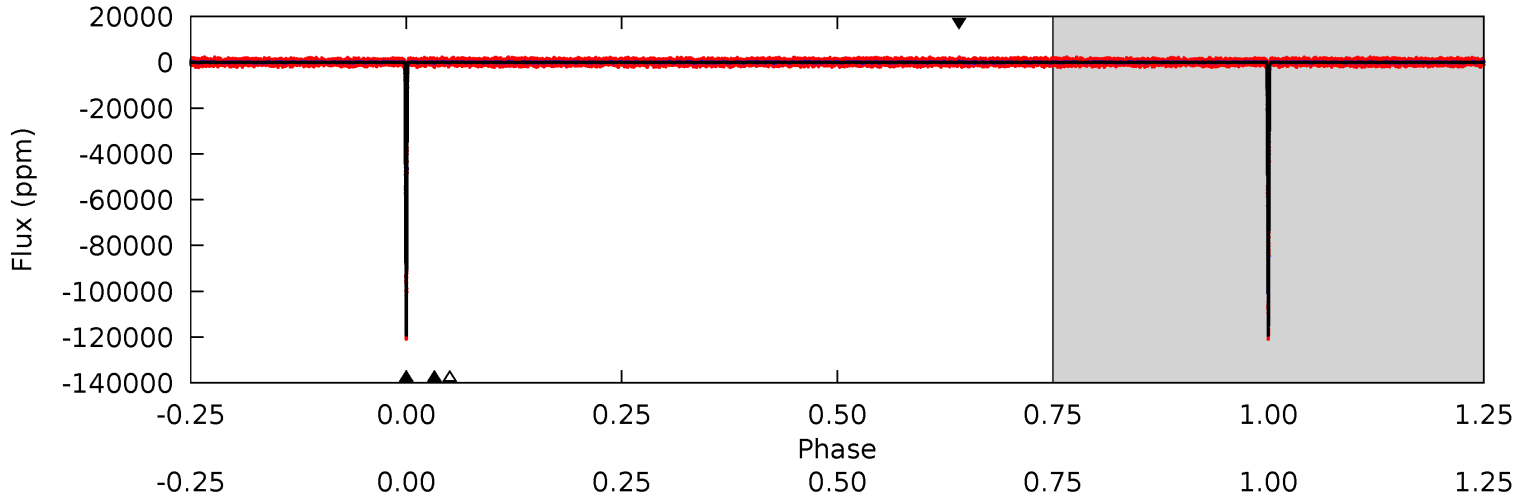
TCE 009024857-01 P= 35.026614 Days  $T_0=160.600909$  (BKJD)



# DV Model-Shift Uniqueness Test

009024857-01, P = 35.026567 Days, E = 125.575372 Days

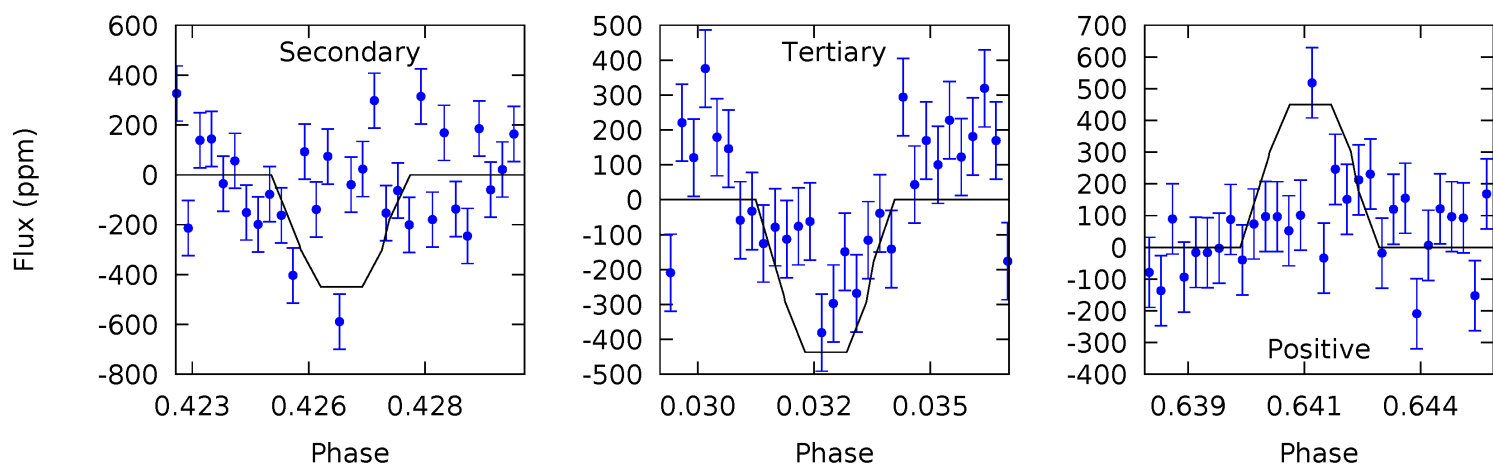
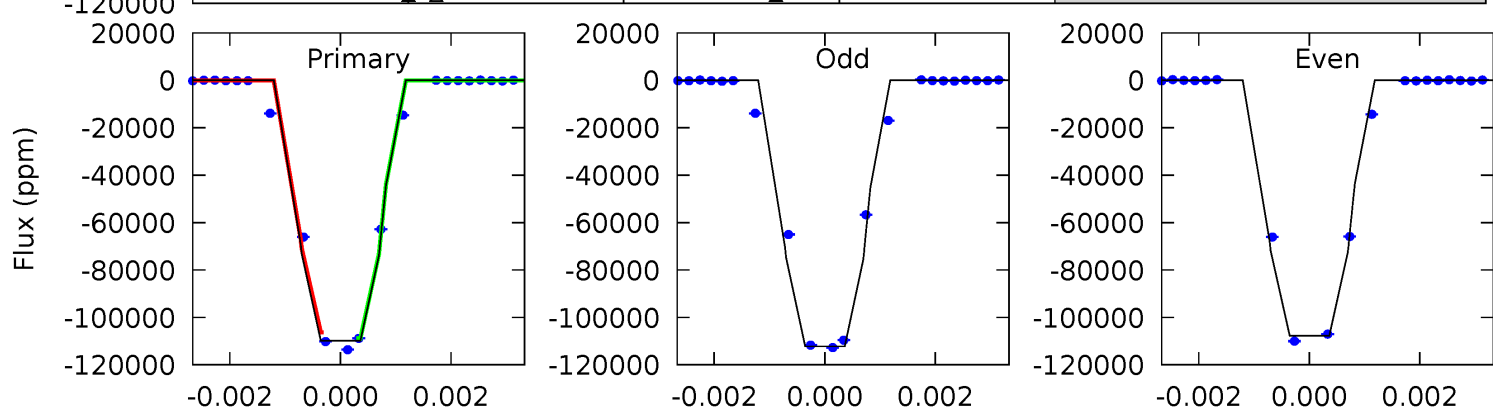
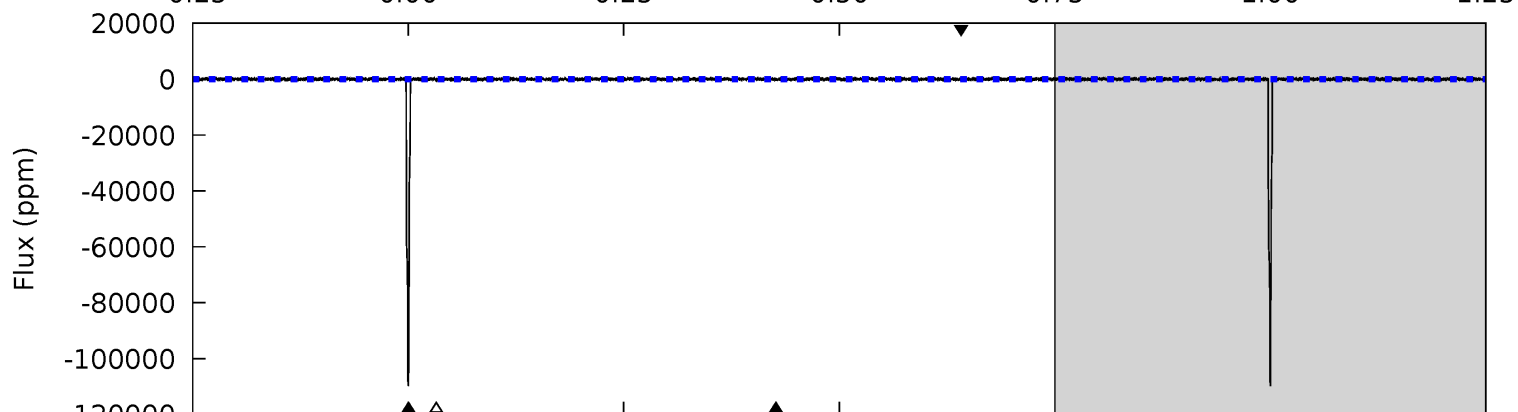
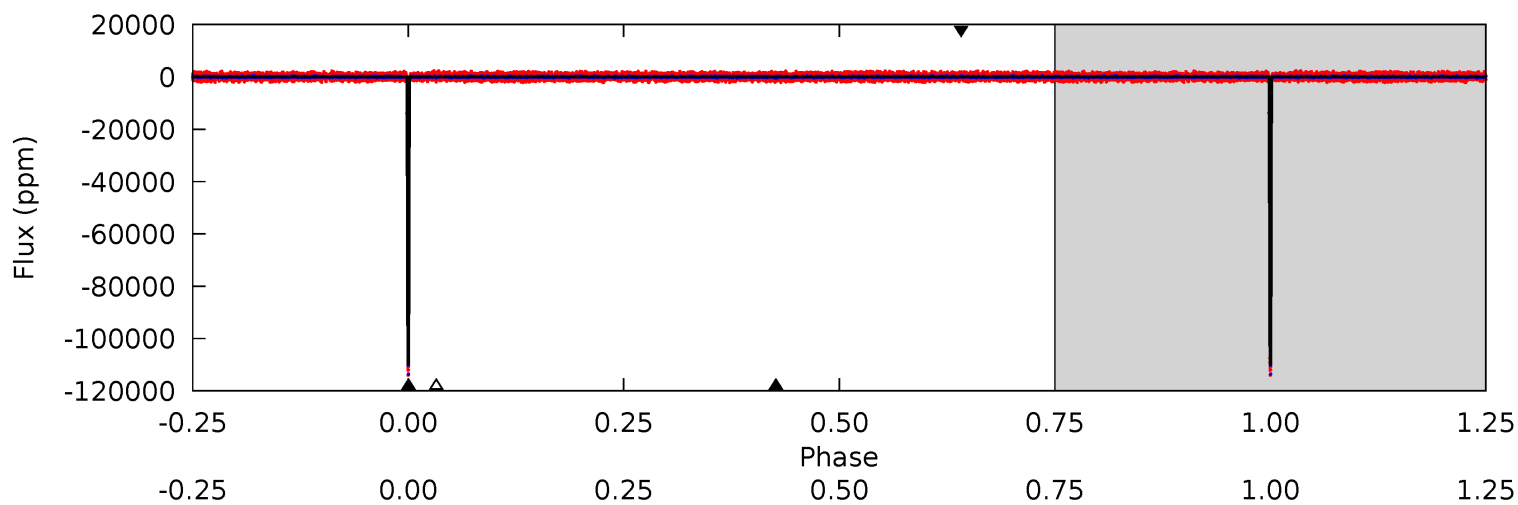
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
3340	8.19	6.44	7.20	5.20	2.88	2.14	3333	3332	1.74	0.99	0.23	0.98	0.00	1.15



# Alt Model-Shift Uniqueness Test

009024857-01, P = 35.026614 Days, E = 125.574295 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
1103	4.51	4.39	4.51	5.29	3.03	4.53	1099	1099	0.12	-0.00	19.6	0.99	0.00	0



### Stellar Parameters For KIC 009024857

	$T_{\text{eff}} (K)$	$\log(g)$	$[\text{Fe}/\text{H}]$	$R (R_{\odot})$	$M (M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$5546^{+166}_{-149}$	$4.575^{+0.038}_{-0.152}$	$-0.140^{+0.300}_{-0.300}$	$0.810^{+0.188}_{-0.063}$	$0.907^{+0.083}_{-0.102}$	$2.404^{+0.469}_{-1.043}$
	+3%/-3%	+1%/-3%	+214%/-214%	+23%/-8%	+9%/-11%	+19%/-43%
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 009024857-01 / KOI 7124.01

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$-294 \pm 36$	$36.33^{+4.58}_{-2.31}$	$696^{+43}_{-29}$	$2097^{+43}_{-45}$	$4.790^{+0.873}_{-1.004}$
Alt.	$-449 \pm 100$	$31.23^{+3.98}_{-2.34}$	$697^{+40}_{-27}$	$2290^{+68}_{-76}$	$10^{+3}_{-3}$

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

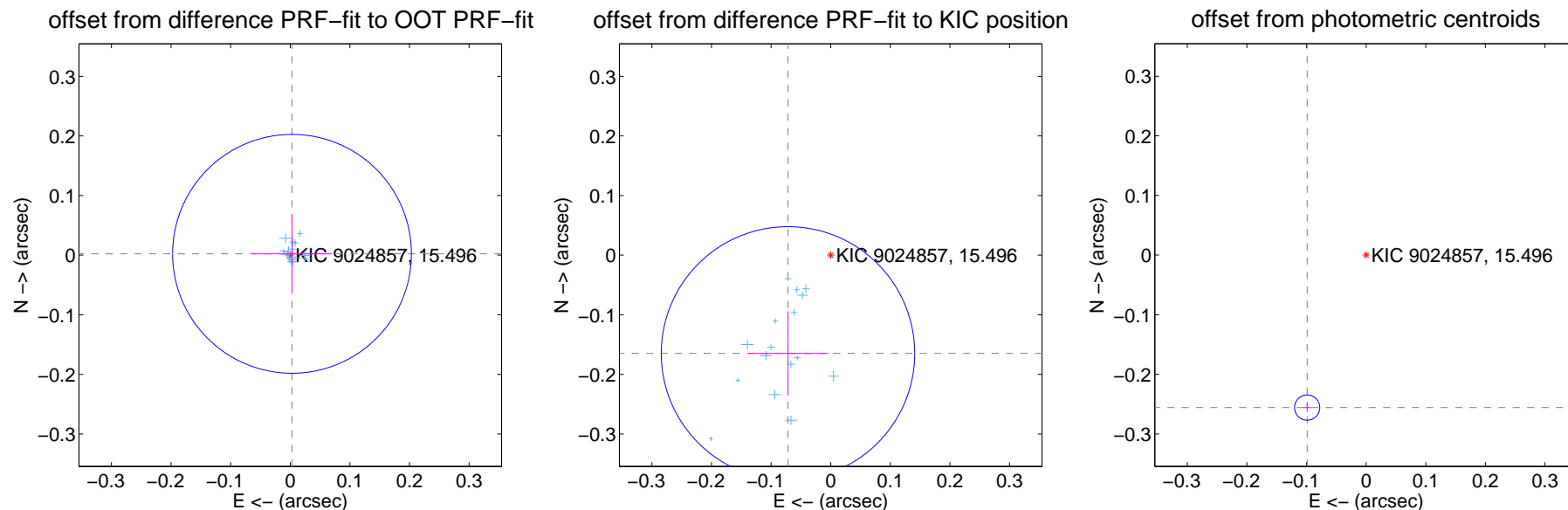
## DV Centroid Data

Supplemental centroid analysis for 009024857-01. Kepler magnitude: 15.50. Transit SNR 1628.68

There are 17 quarters with good PRF difference image offsets

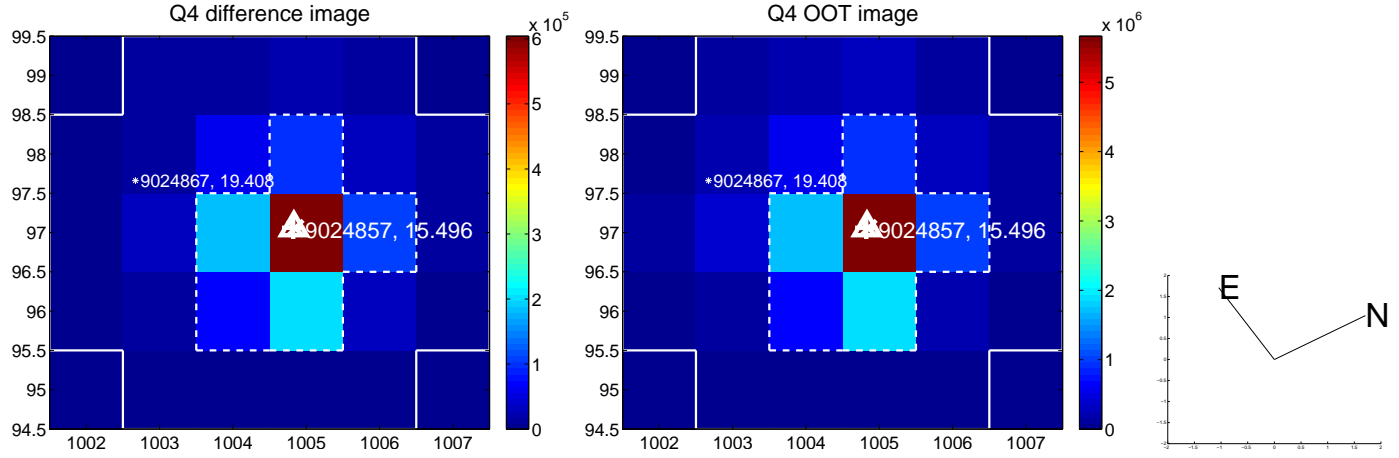
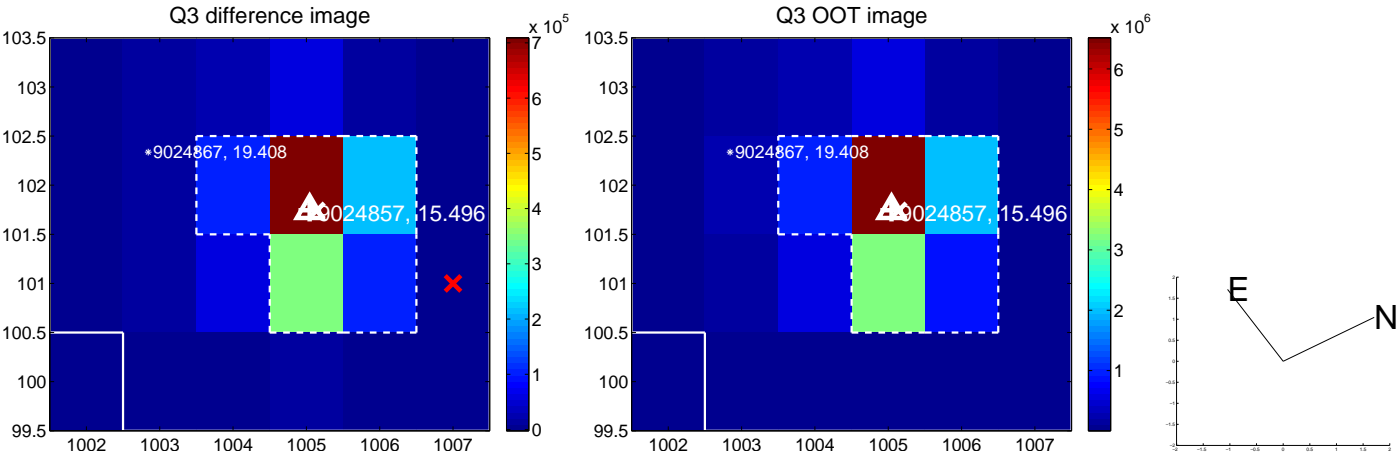
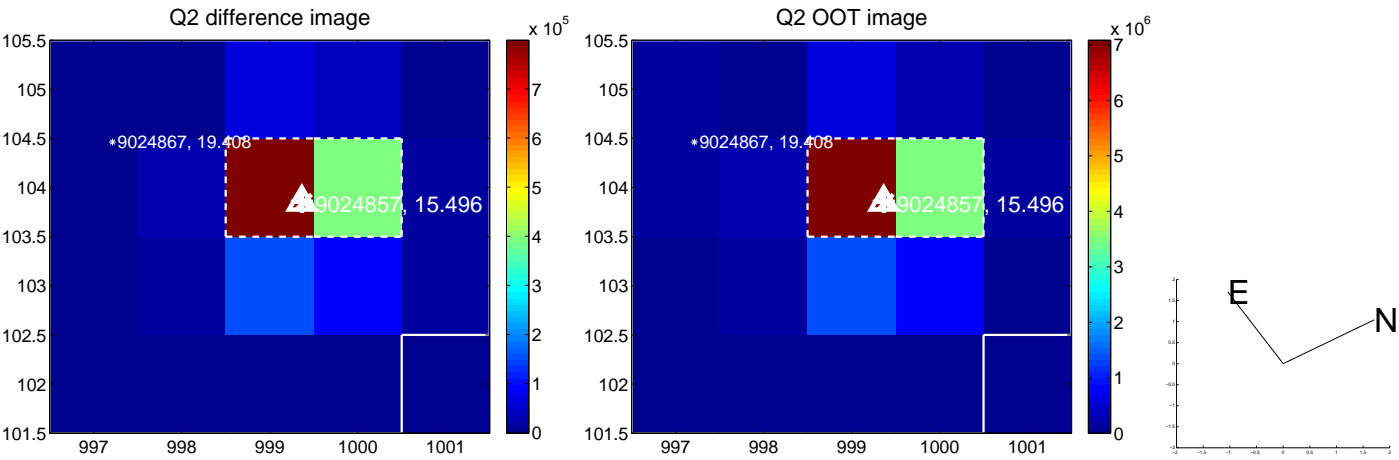
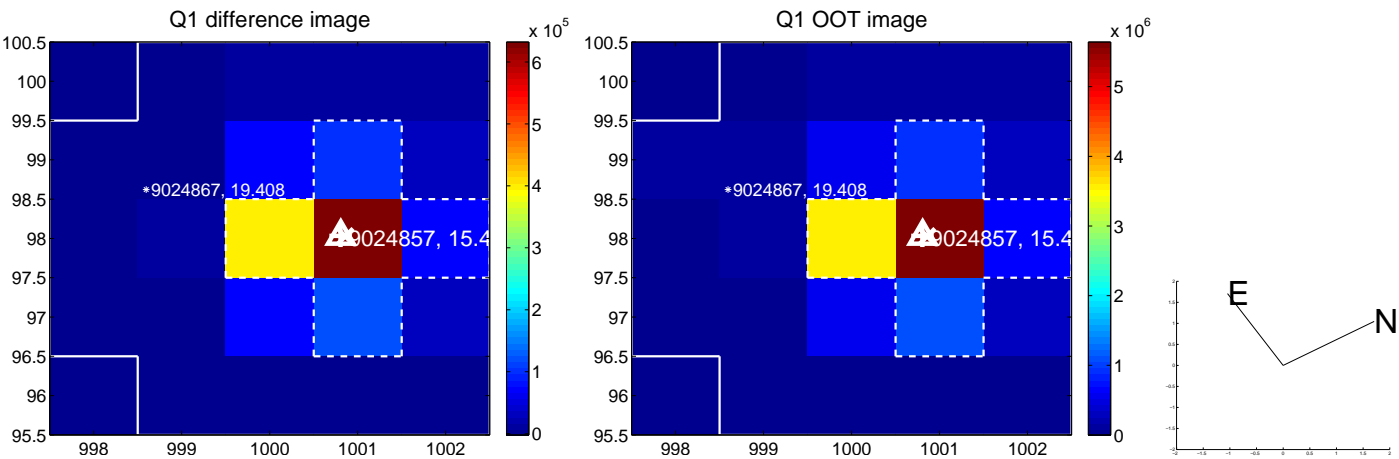
The direct PRF centroid is offset from the target star catalog position by about 0.26 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.004 \pm 0.067$	0.05	$-0.003 \pm 0.067$	$0.002 \pm 0.067$
PRF-fit source offset from KIC position	$0.180 \pm 0.071$	2.54	$0.072 \pm 0.068$	$-0.165 \pm 0.070$
photometric centroid source offset	$0.27 \pm 0.01$	38.85	$0.10 \pm 0.01$	$-0.26 \pm 0.01$

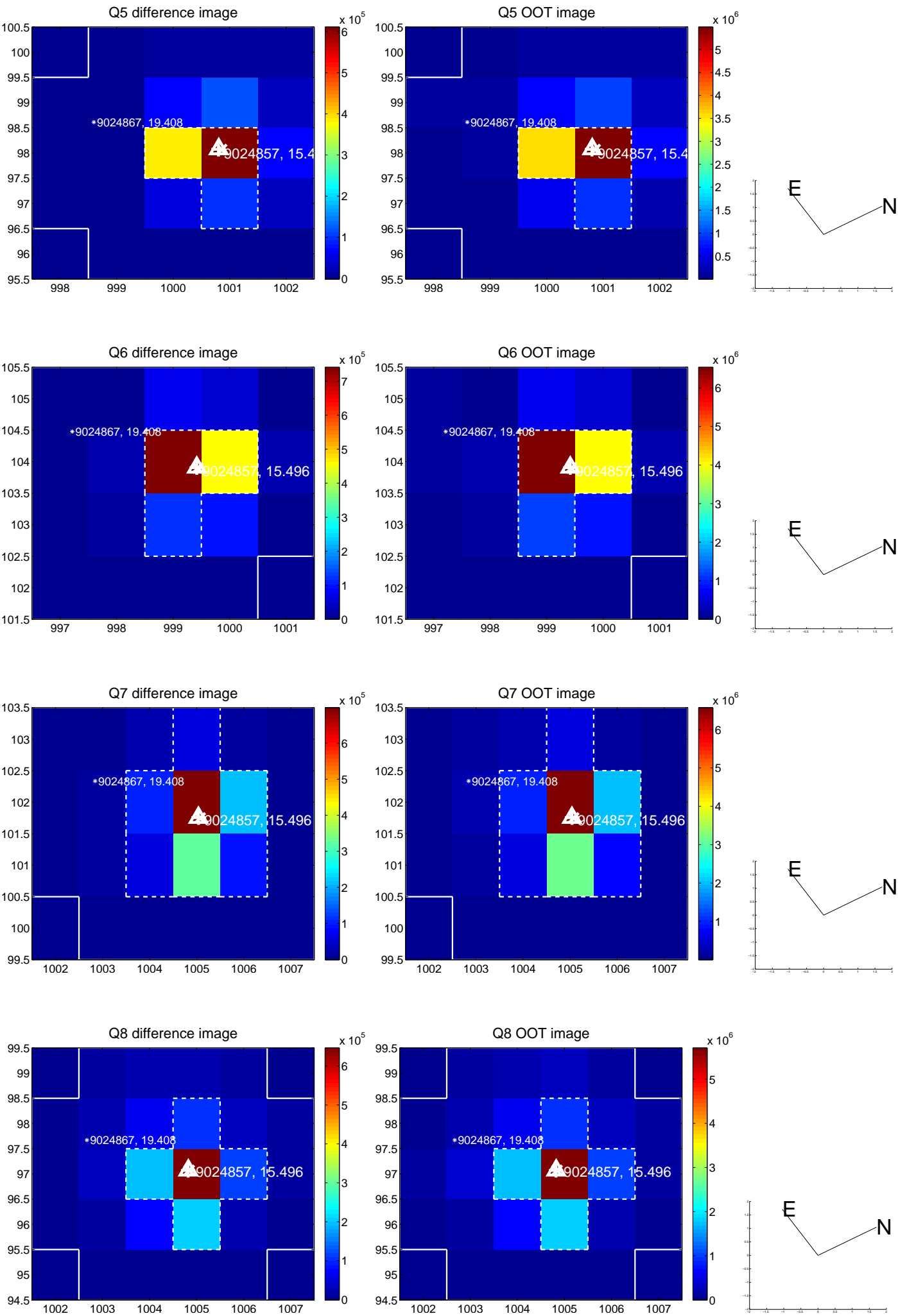


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses:** good quarterly centroid offsets; **Vermillion crosses:** bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three- $\sigma$ . Red \*: target star. Blue \*: Other stars. Text next to a star gives its KIC ID and kepmag. KIC IDs > 15,000,000 are from the UKIRT catalog.

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

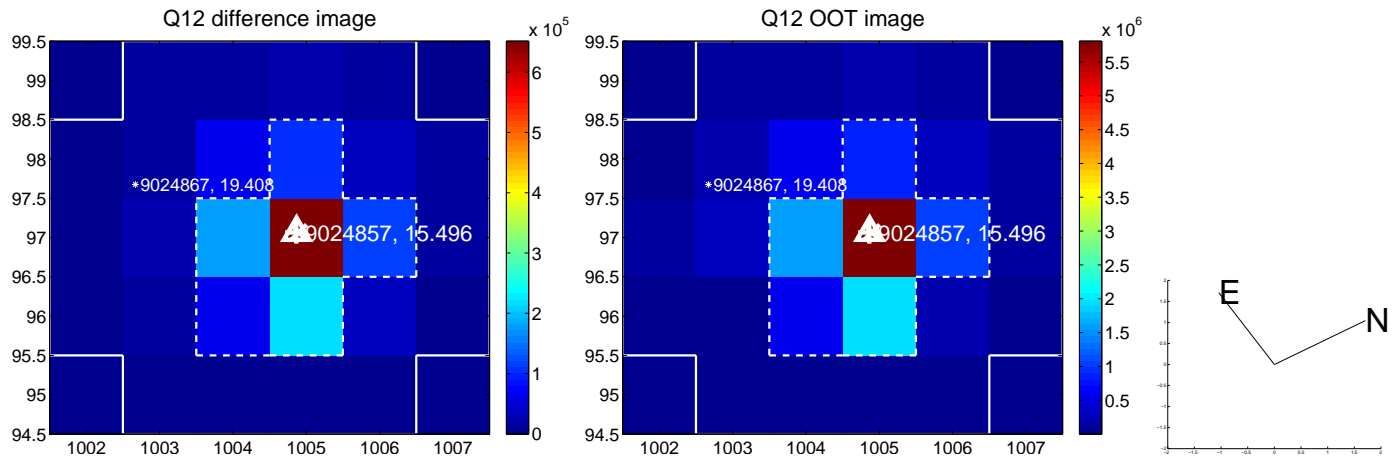
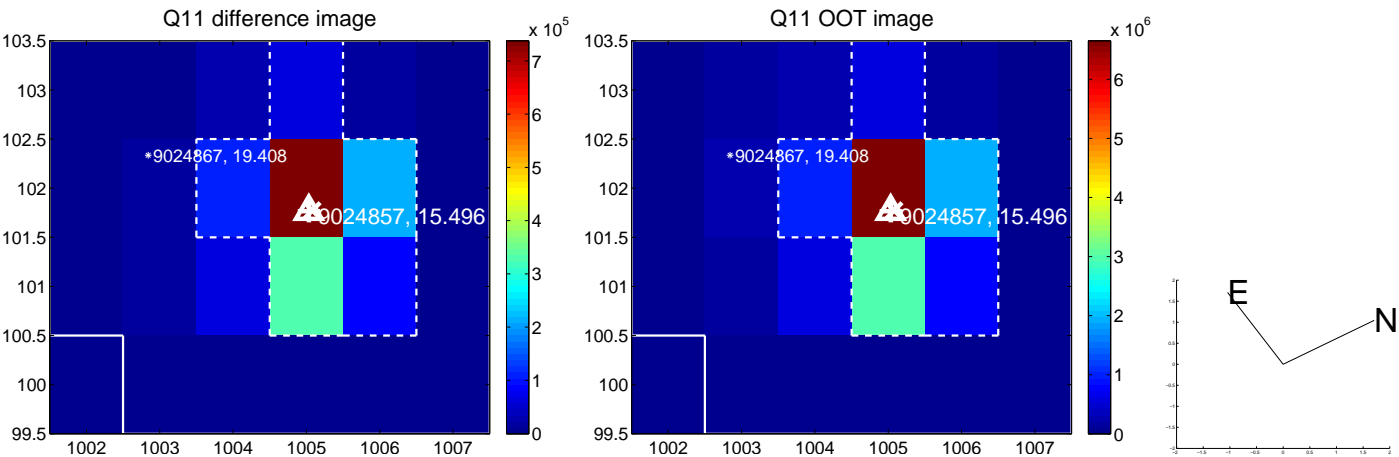
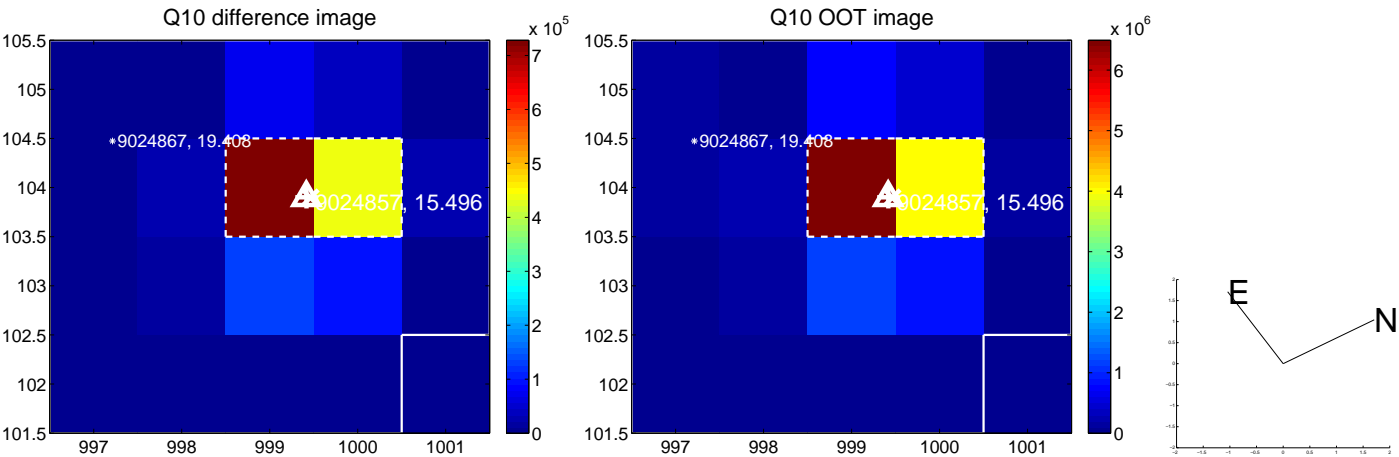
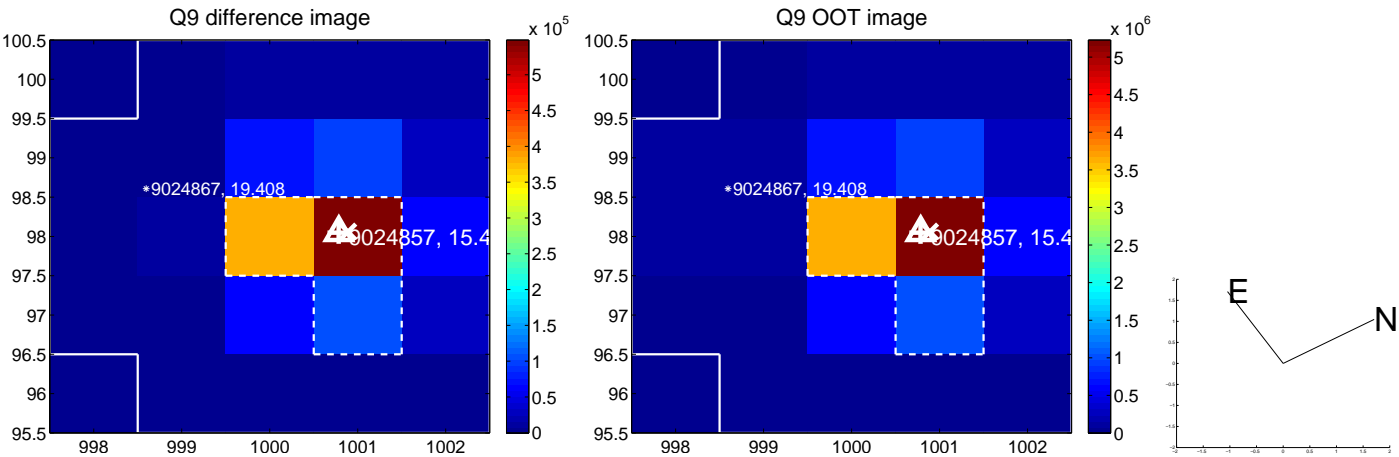


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

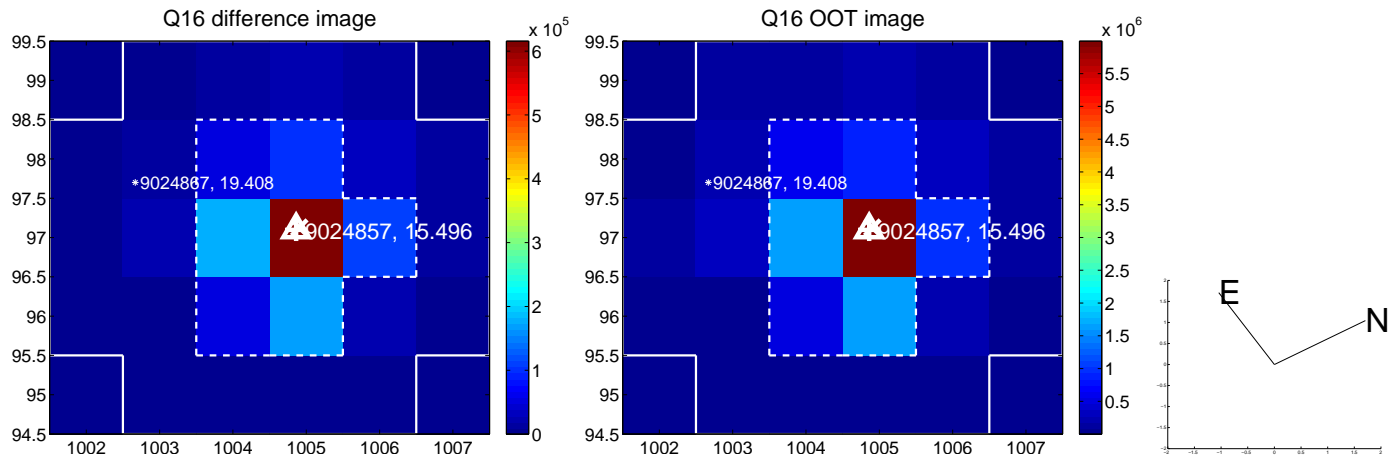
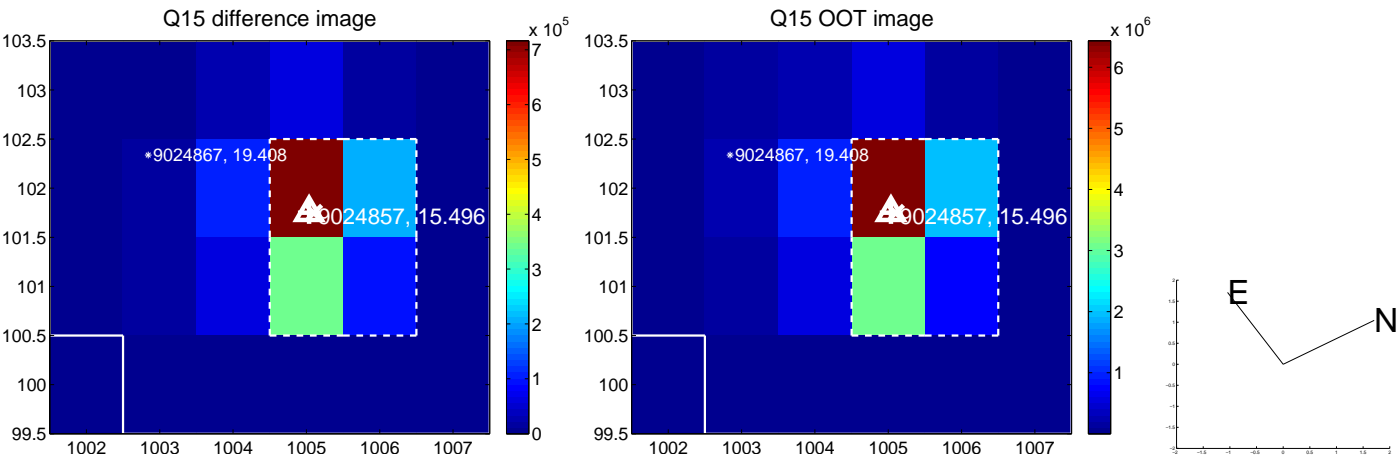
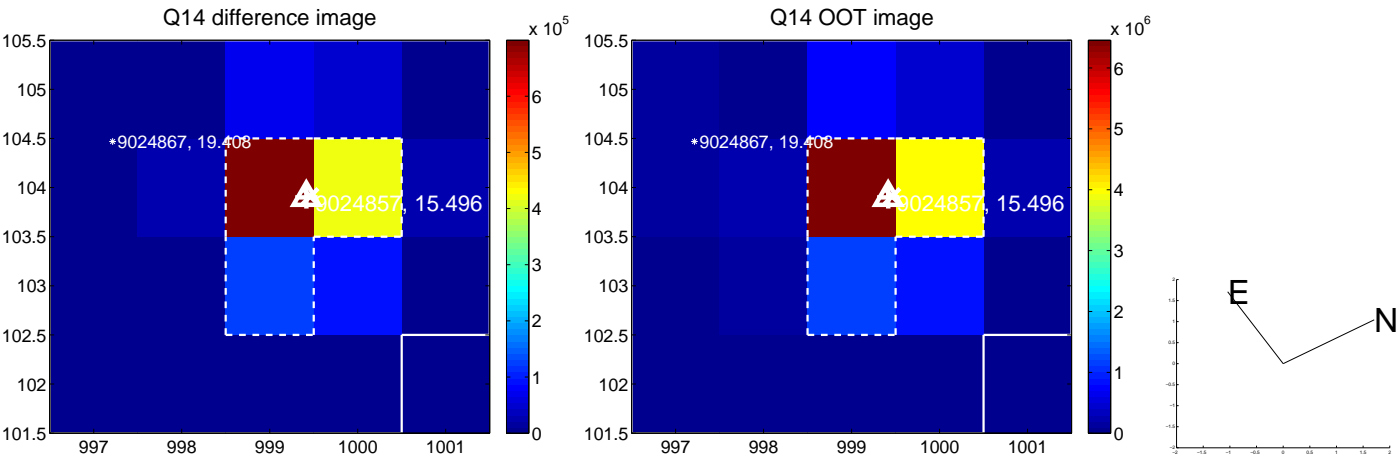
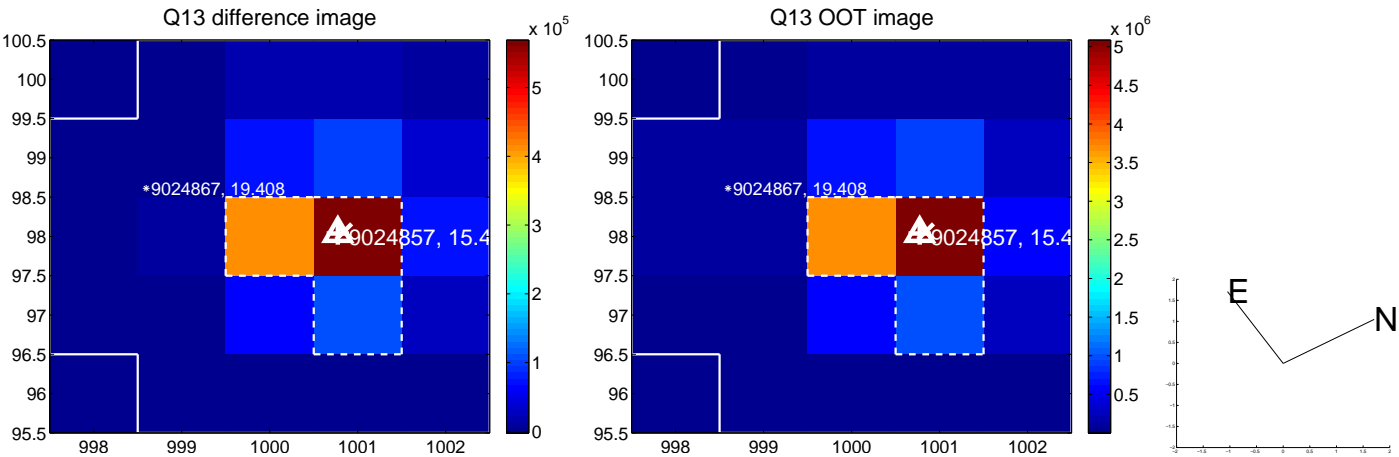




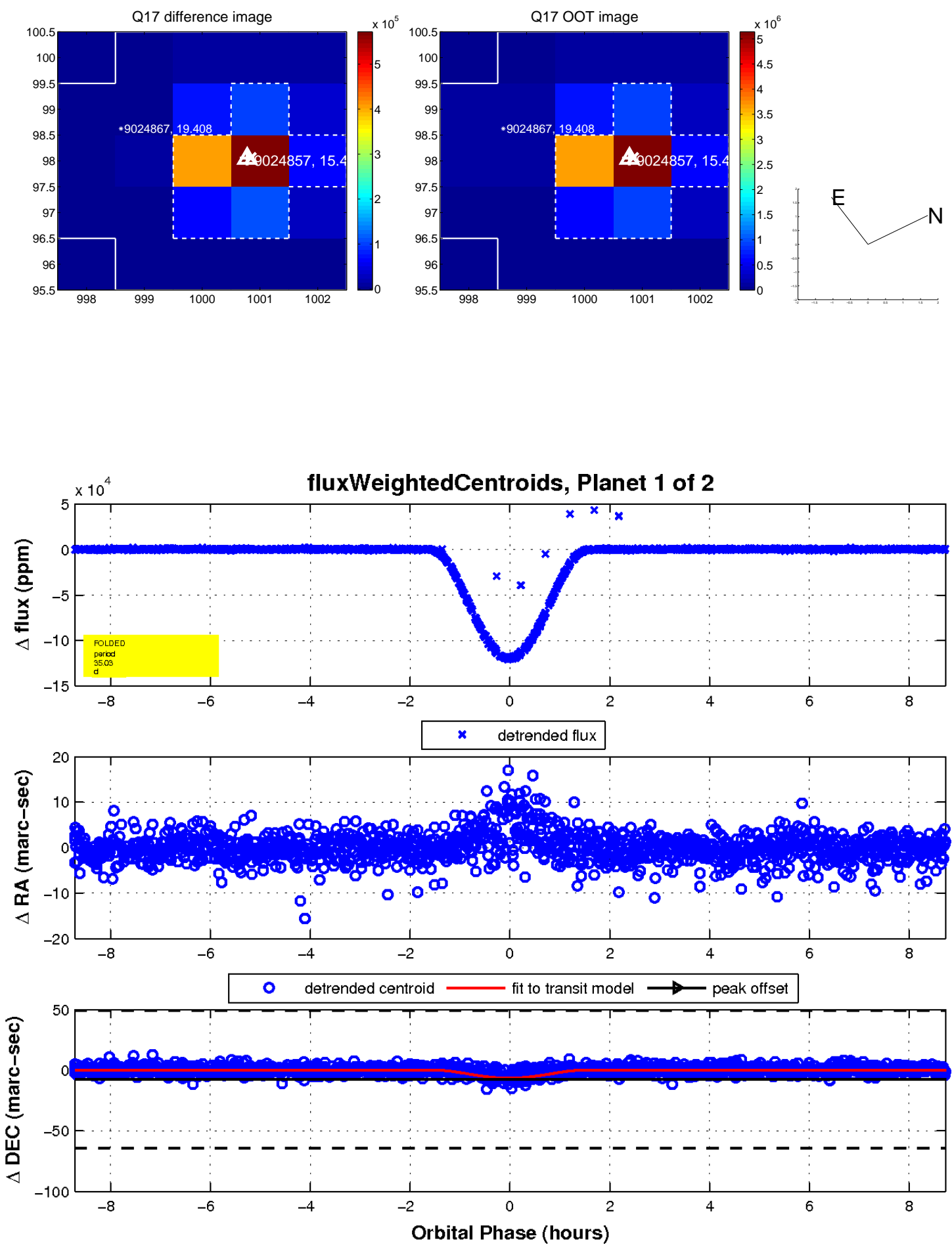
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

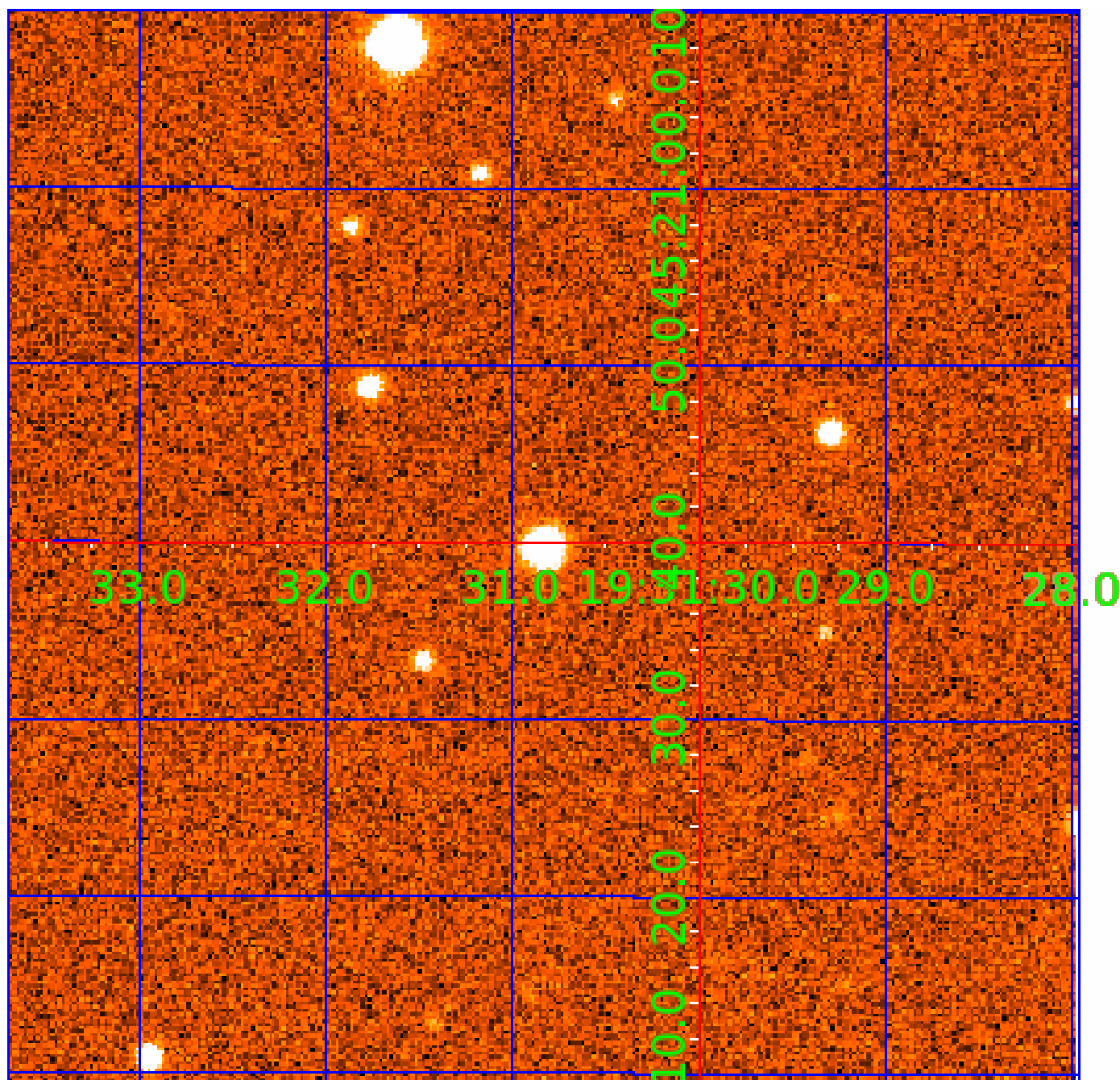


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



# UKIRT Image

Declination



# KIC 009024857

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
009024857-01	OBS	7124.01	35.026567	160.601939	119776.1	2.912	1828.4	1628.7	0.81	5546	35.73	13.59
009024857-02	OBS	7124.02	379.149320	267.599769	1415.0	12.311	8.1	8.4	0.81	5546	3.08	0.57

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009024857-01	OBS	FP	0.00	0	1	0	0	DEEP_V_SHAPED
009024857-02	OBS	FP	0.01	1	0	0	0	ALL_TRANS_CHASES—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.

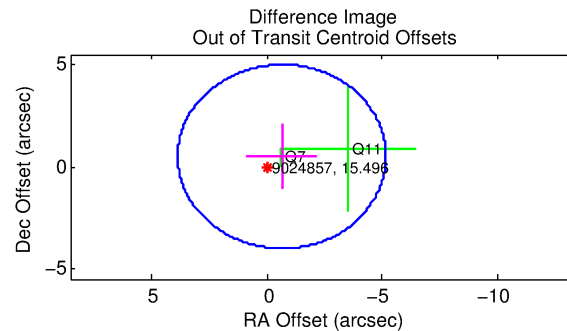
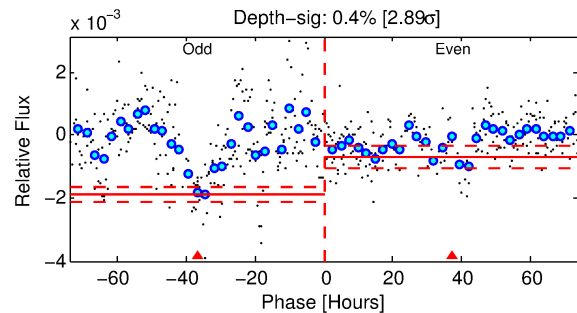
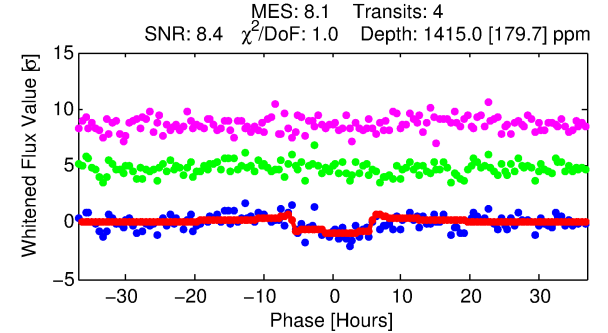
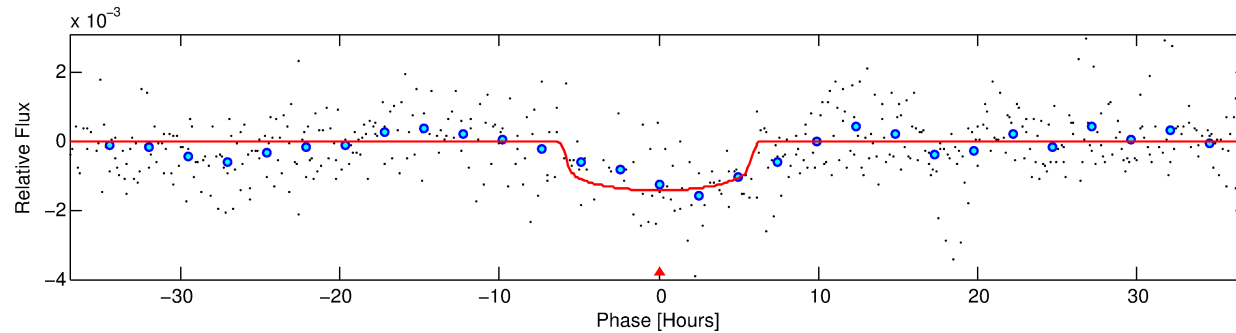
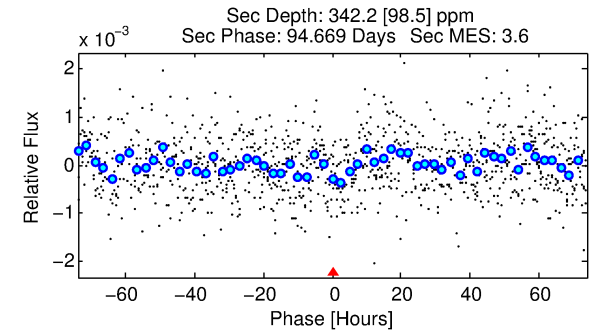
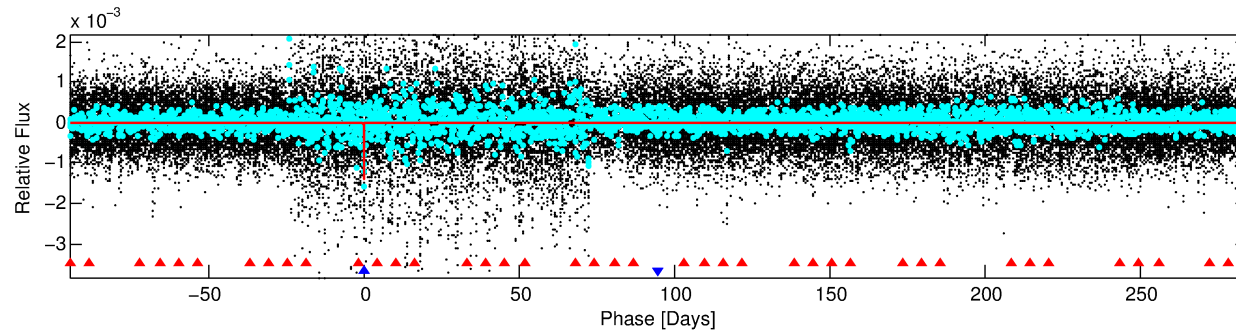
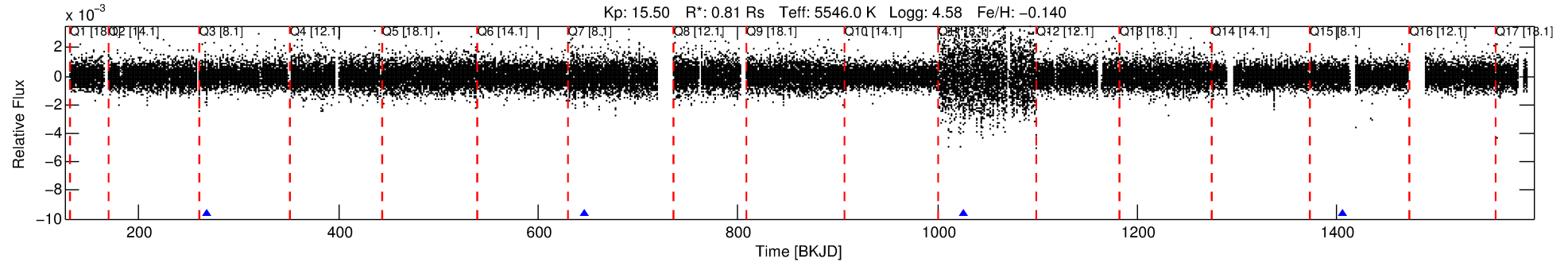
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 009024857-02

No Significant Match Found

# DV One-Page Summary

KIC: 9024857 Candidate: 2 of 2 Period: 379.149 d  
KOI: K07124 Corr: No Ephemeris Match



## DV Fit Results:

Period = 379.14932 [0.00746] d  
Epoch = 267.5998 [0.0092] BKJD  
Rp/R\* = 0.0349 [0.0119]  
a/R\* = 218.76 [297.00]  
b = 0.45 [2.40]  
Seff = 0.57 [0.17]  
Teq = 221 [17] K  
Rp = 3.08 [1.27] Re  
a = 0.9898 [0.1918] AU  
Ag = 19396.17 [15347.35] [1.26σ]  
Teffp = 4038 [757] K [5.04σ]

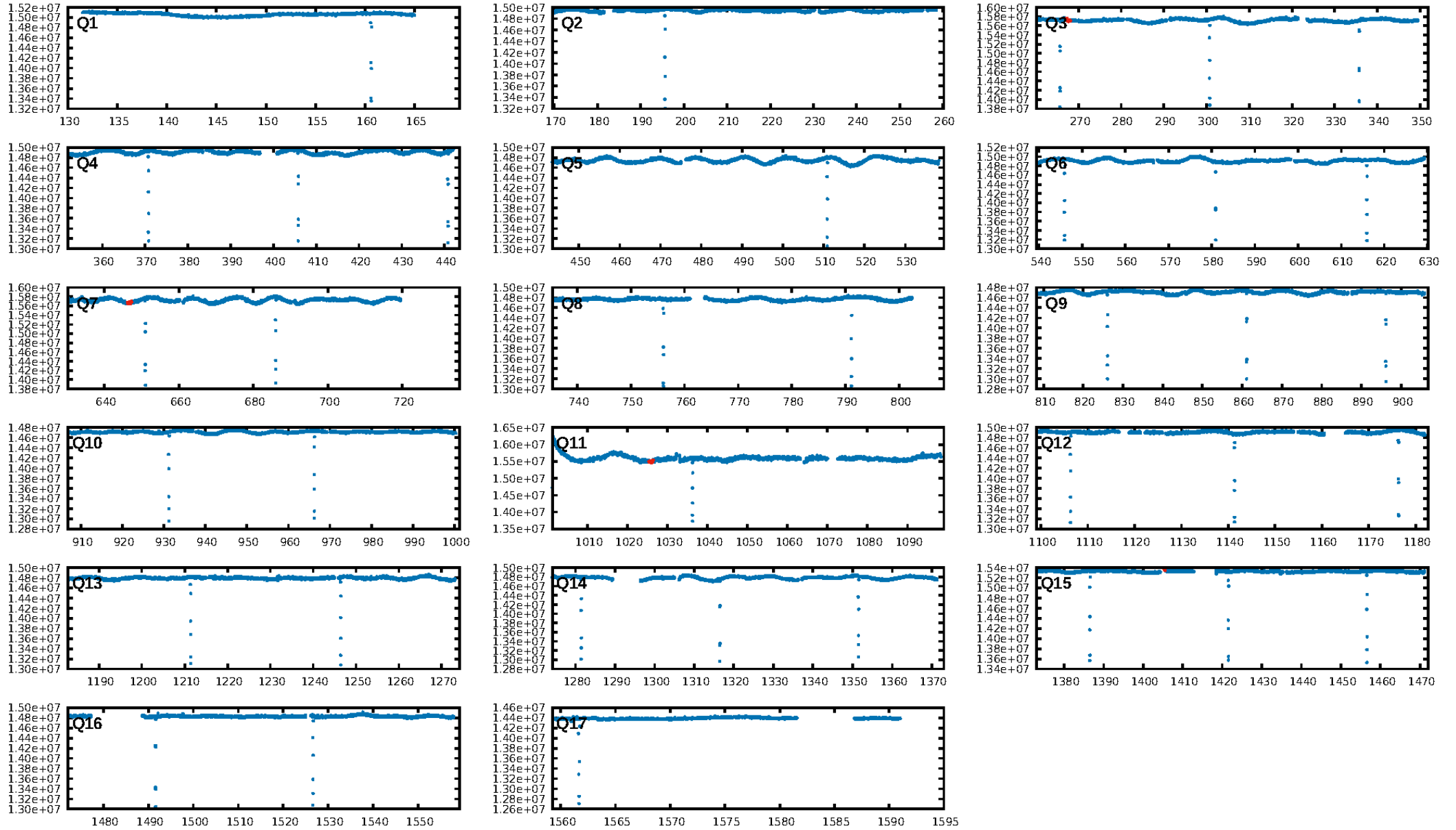
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [652.87σ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: 14.1%  
ModelChiSquareGof-sig: 100.0%  
**Bootstrap-pfa: 4.96e-09**  
RollingBand-fgt: 1.00 [4/4]  
GhostDiagnostic-chr: -13.61  
Centroid-sig: N/A  
Centroid-so: 0.103 arcsec [0.13σ]  
OotOffset-rm: 0.814 arcsec [0.54σ]  
OotOffset-st: 0/2/0/0 [2]  
KicOffset-rm: 0.681 arcsec [0.45σ]  
KicOffset-st: 0/2/0/0 [2]  
DiffImageQuality-fgm: 0.50 [1/2]  
DiffImageOverlap-fno: 1.00 [2/2]

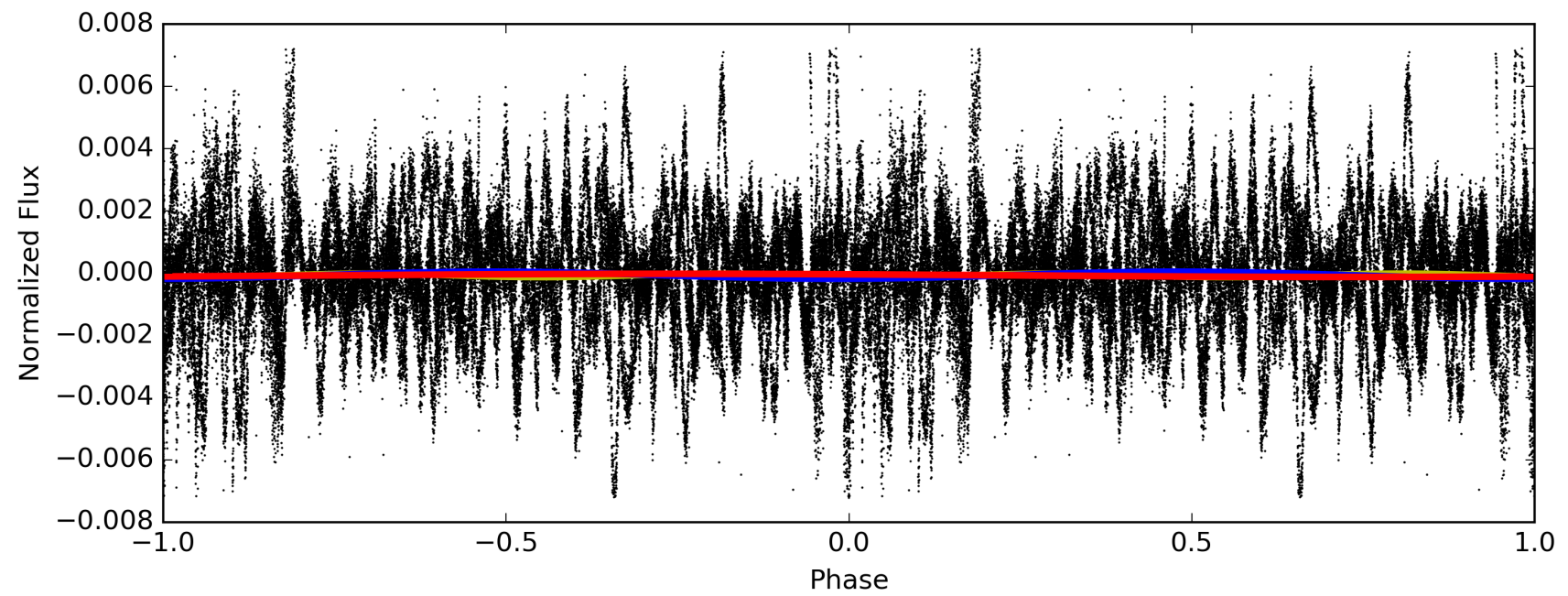
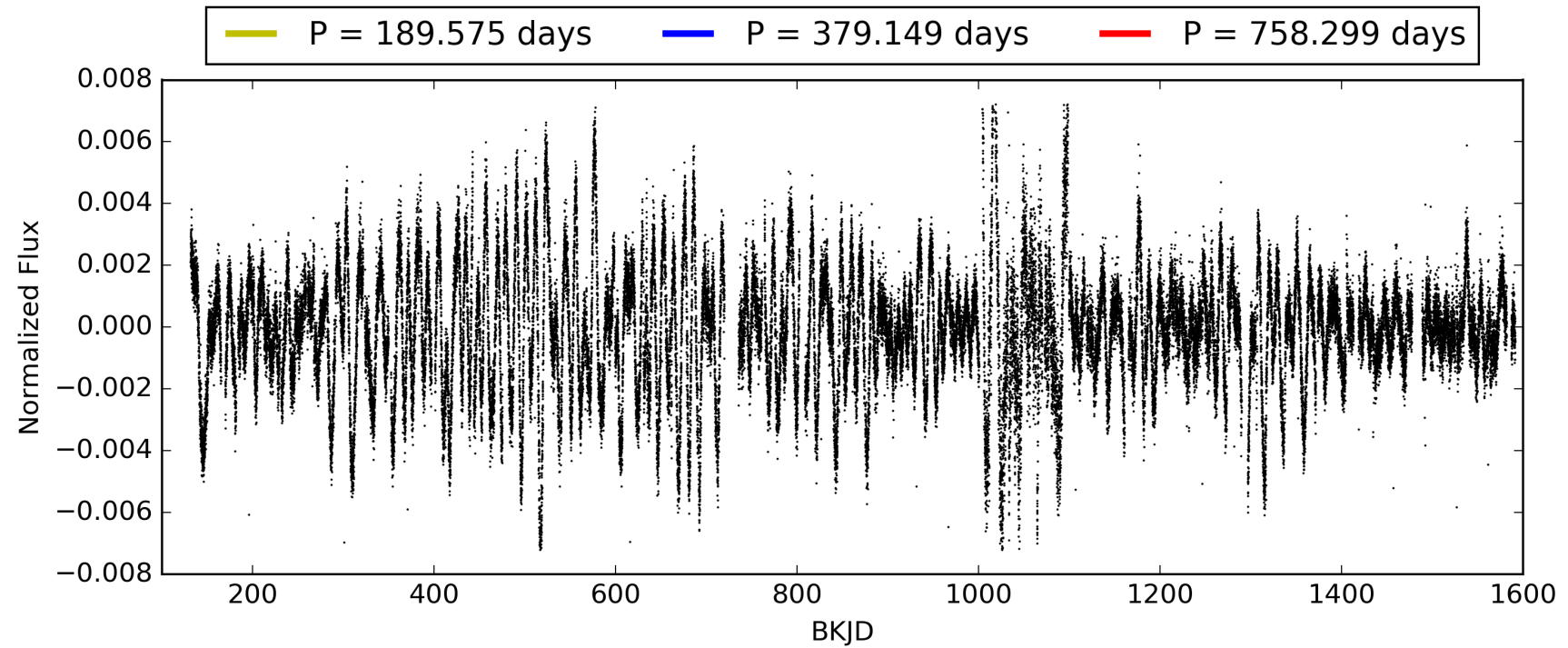
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 01-Feb-2016 10:52:08 Z

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

# TCE 009024857-02, PDC Light Curves



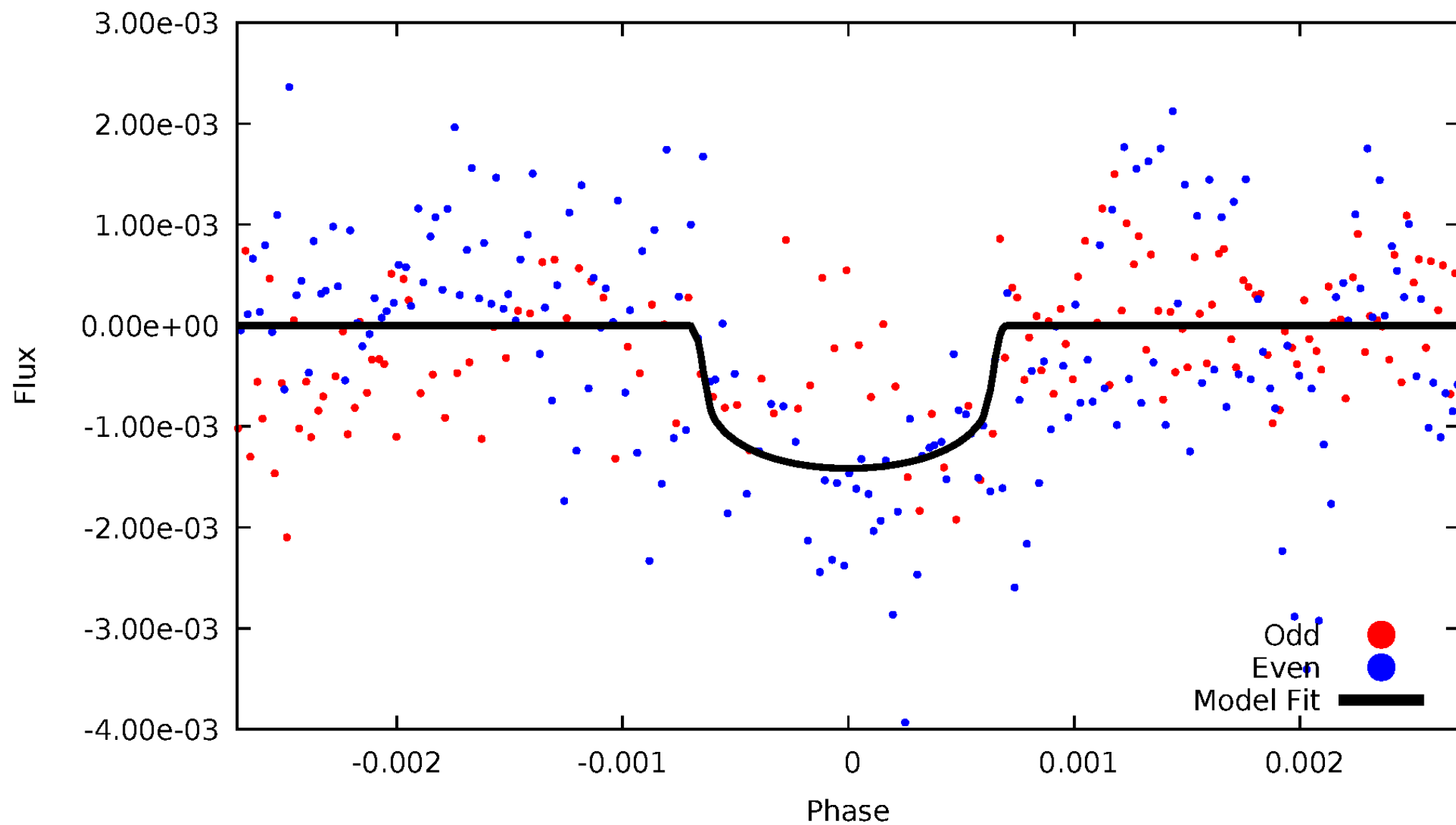
TCE 009024857-02





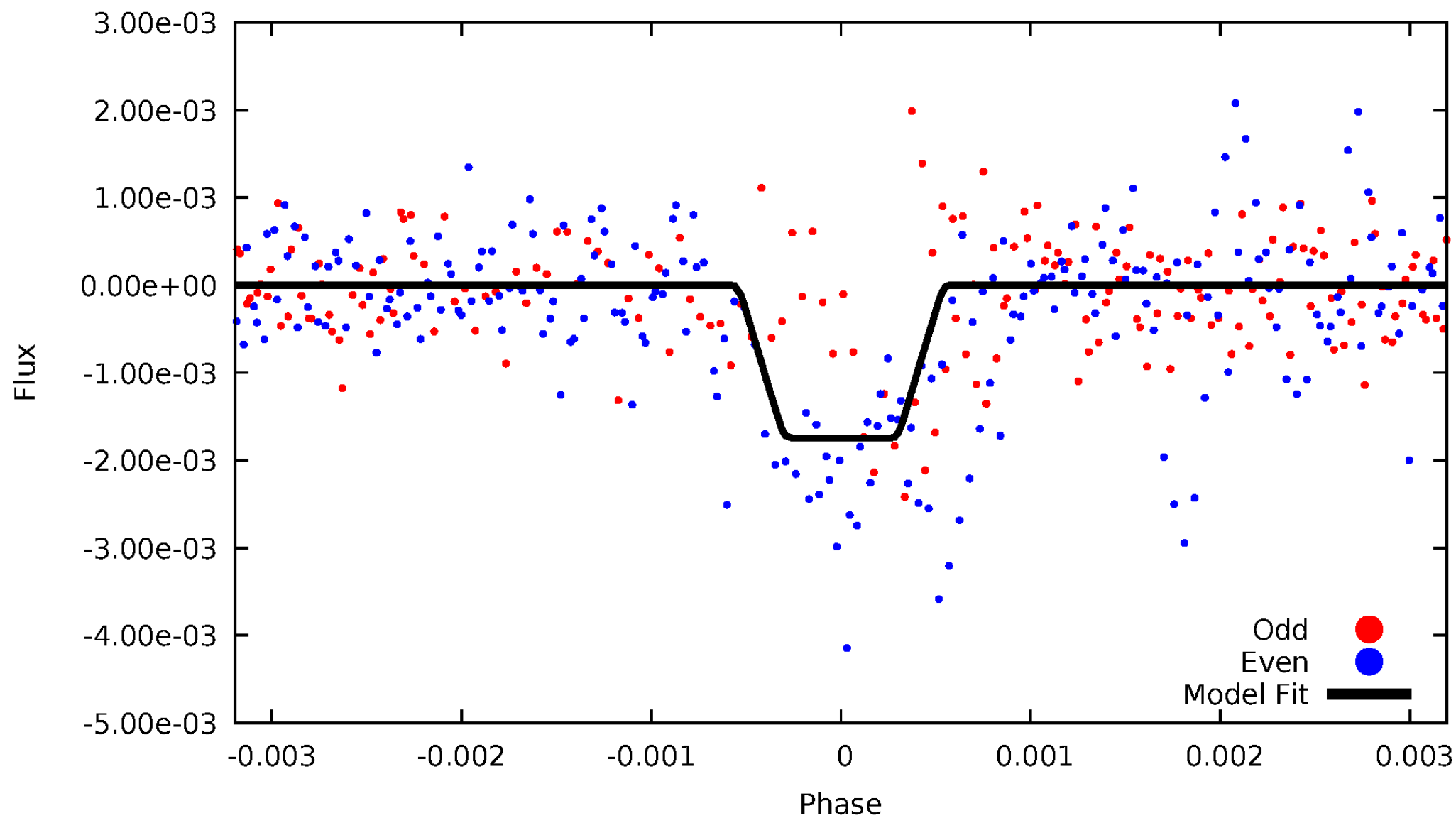
# DV Odd/Even

TCE 009024857-02



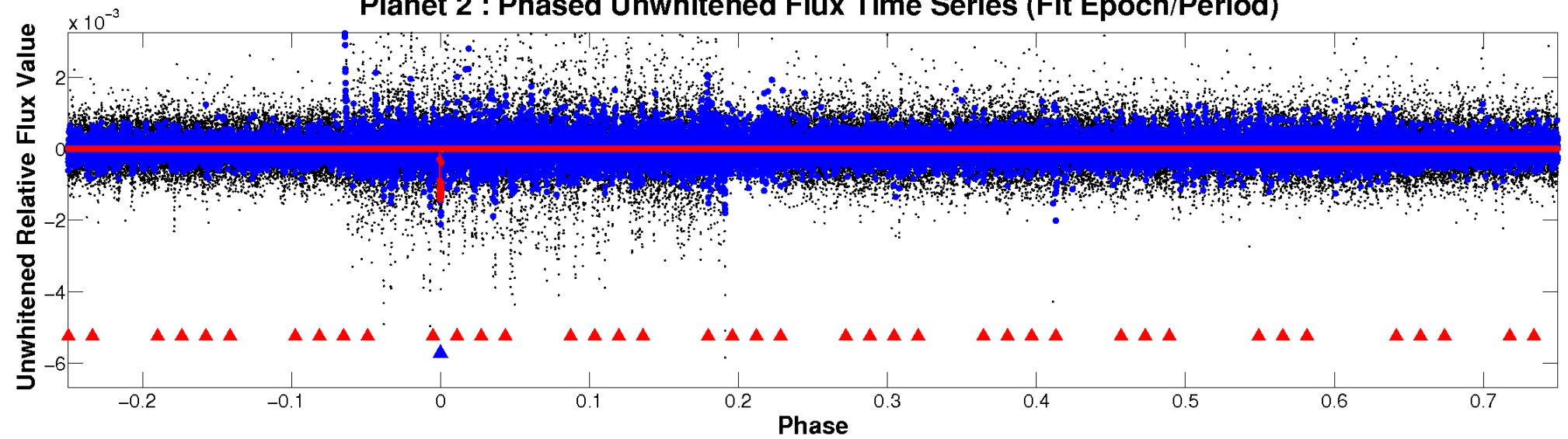
# ALT Odd/Even

TCE 009024857-02

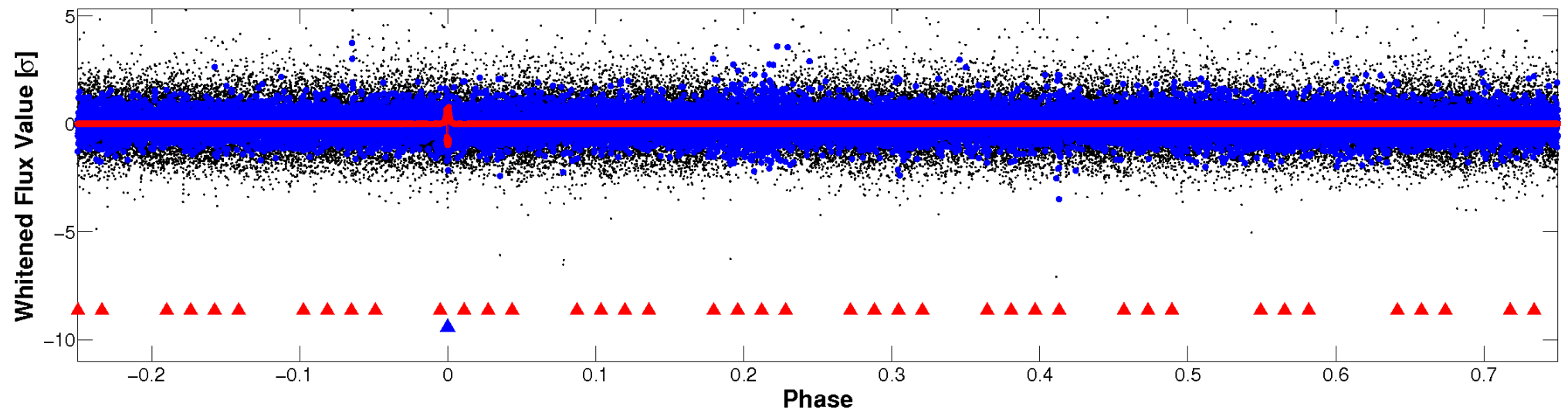


# Non-Whitened Vs. Whitened Light Curve

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

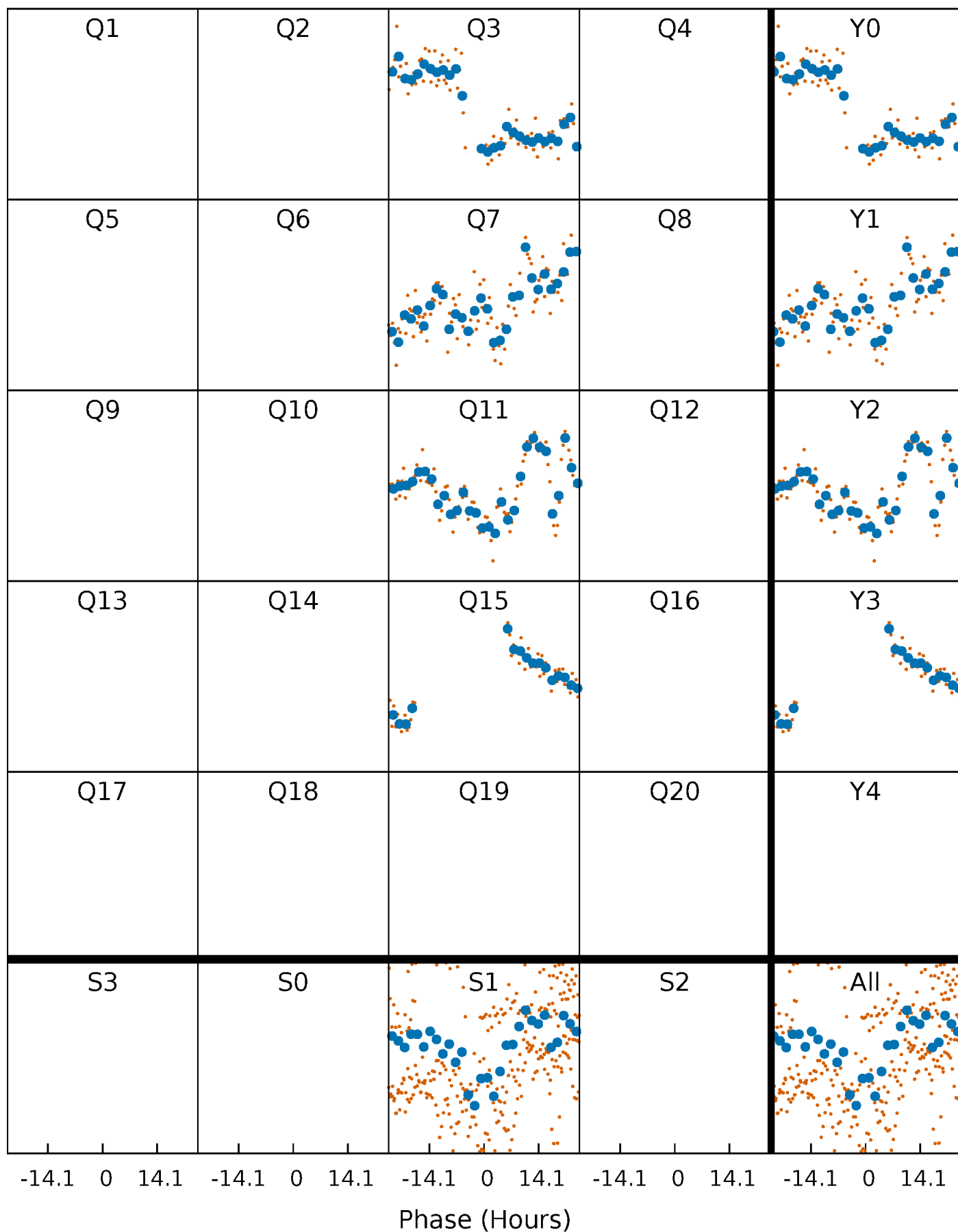


## Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



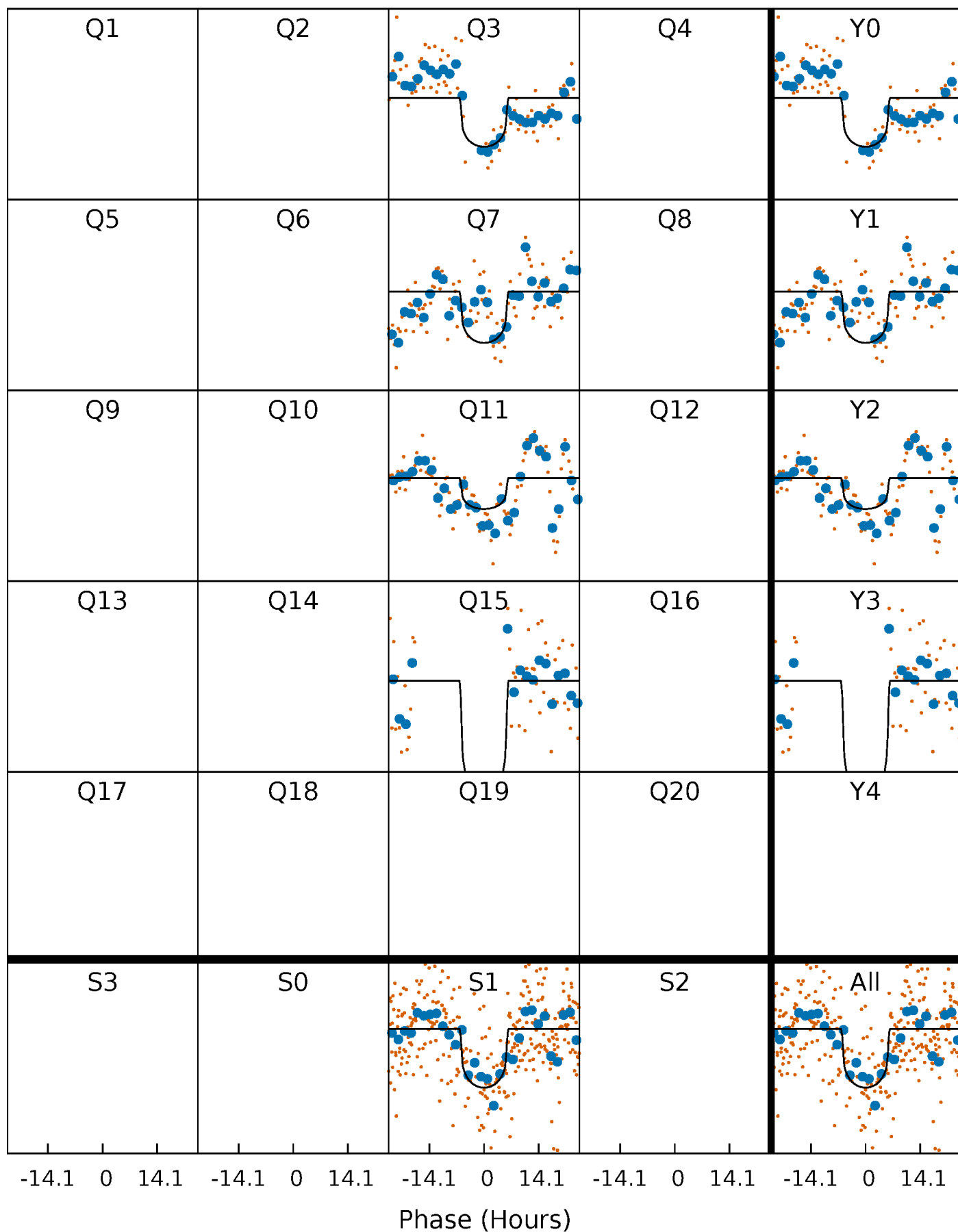
# PDC Quarter-Phased Transit Curves

TCE 009024857-02     $P=379.149320$  Days     $T_0=267.599769$  (BKJD)



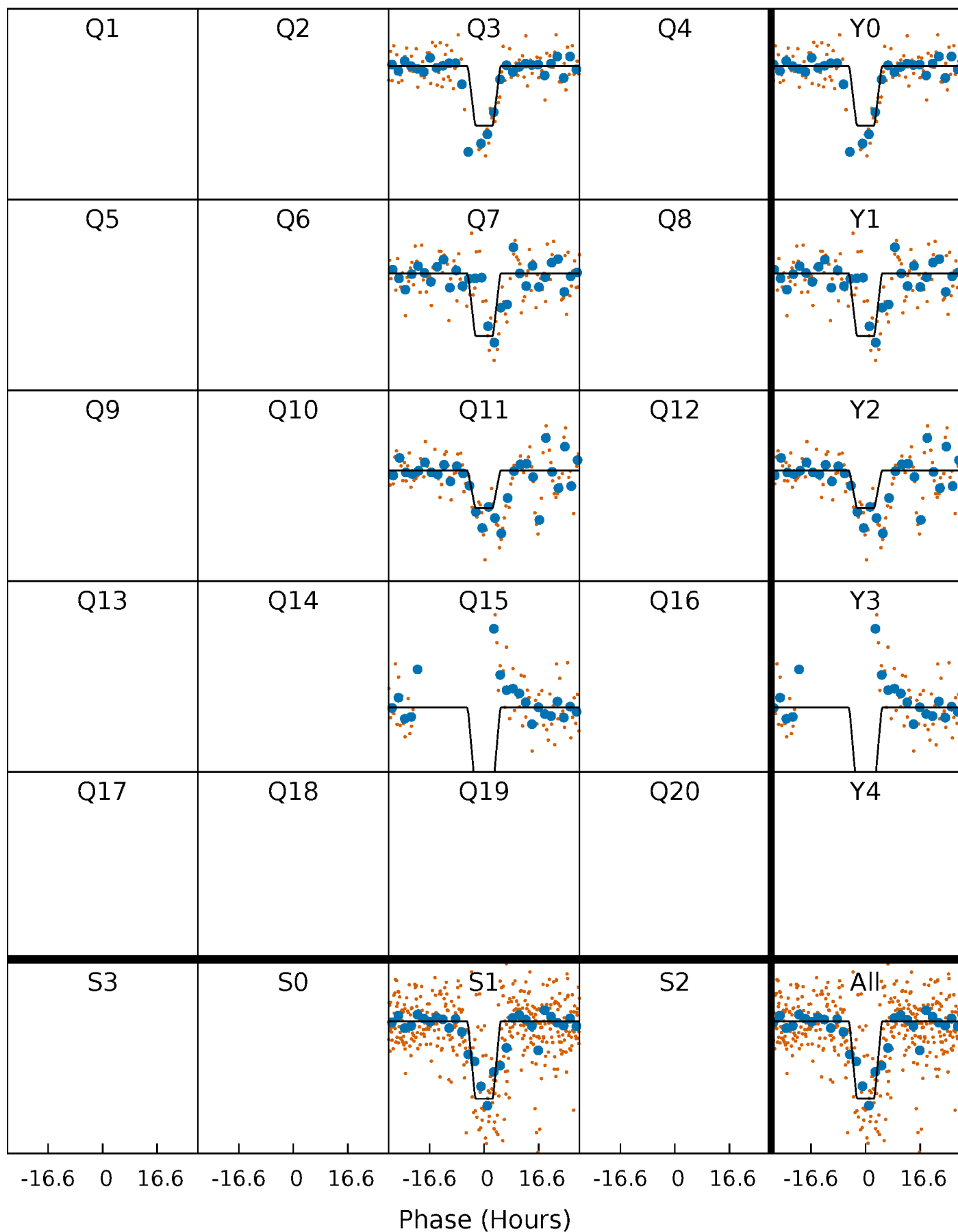
# DV Quarter-Phased Transit Curves

TCE 009024857-02 P=379.149320 Days  $T_0=267.599769$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

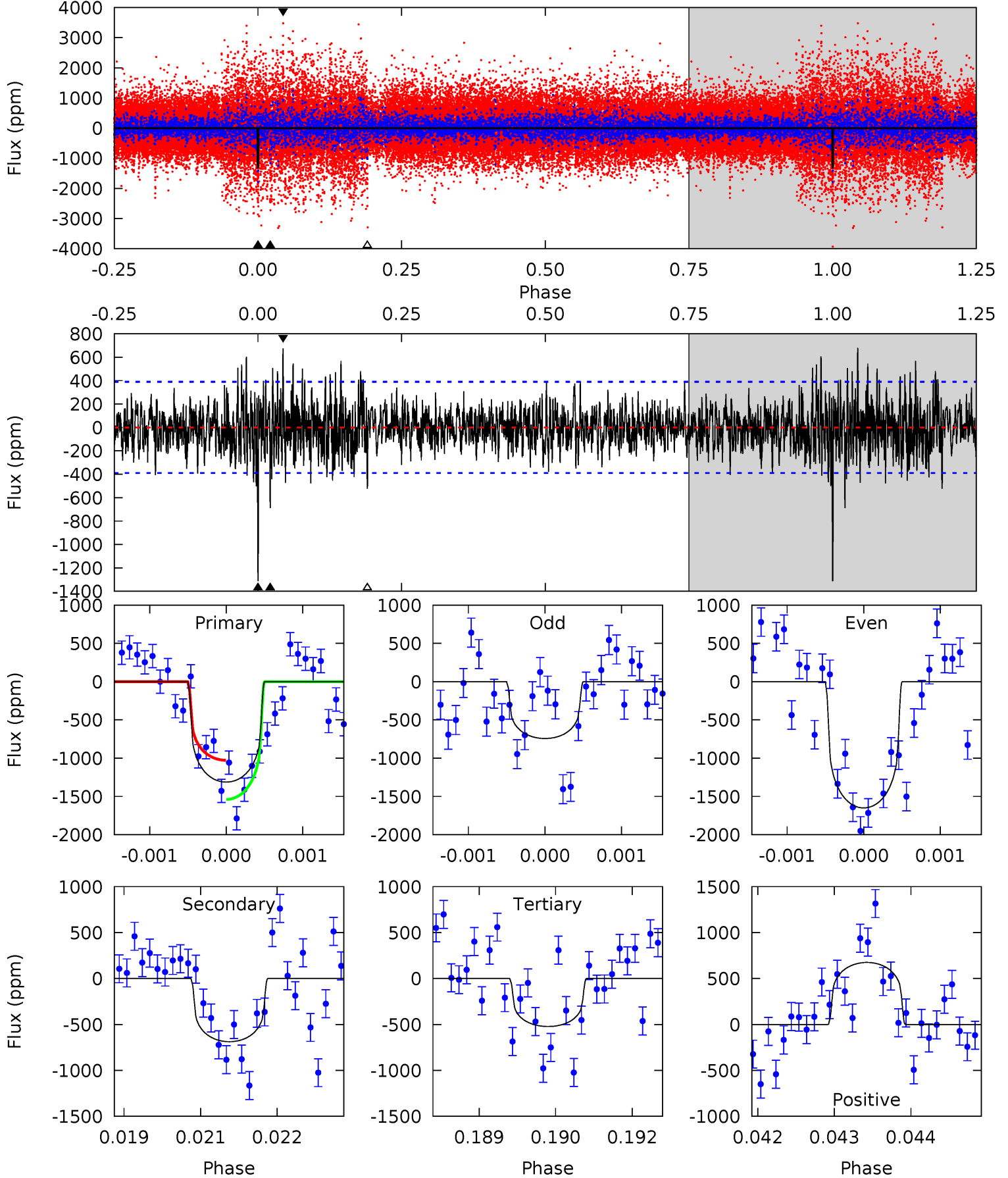
TCE 009024857-02     $P=379.178762$  Days     $T_0=267.624102$  (BKJD)



# DV Model-Shift Uniqueness Test

009024857-02, P = 379.149320 Days, E = 267.599769 Days

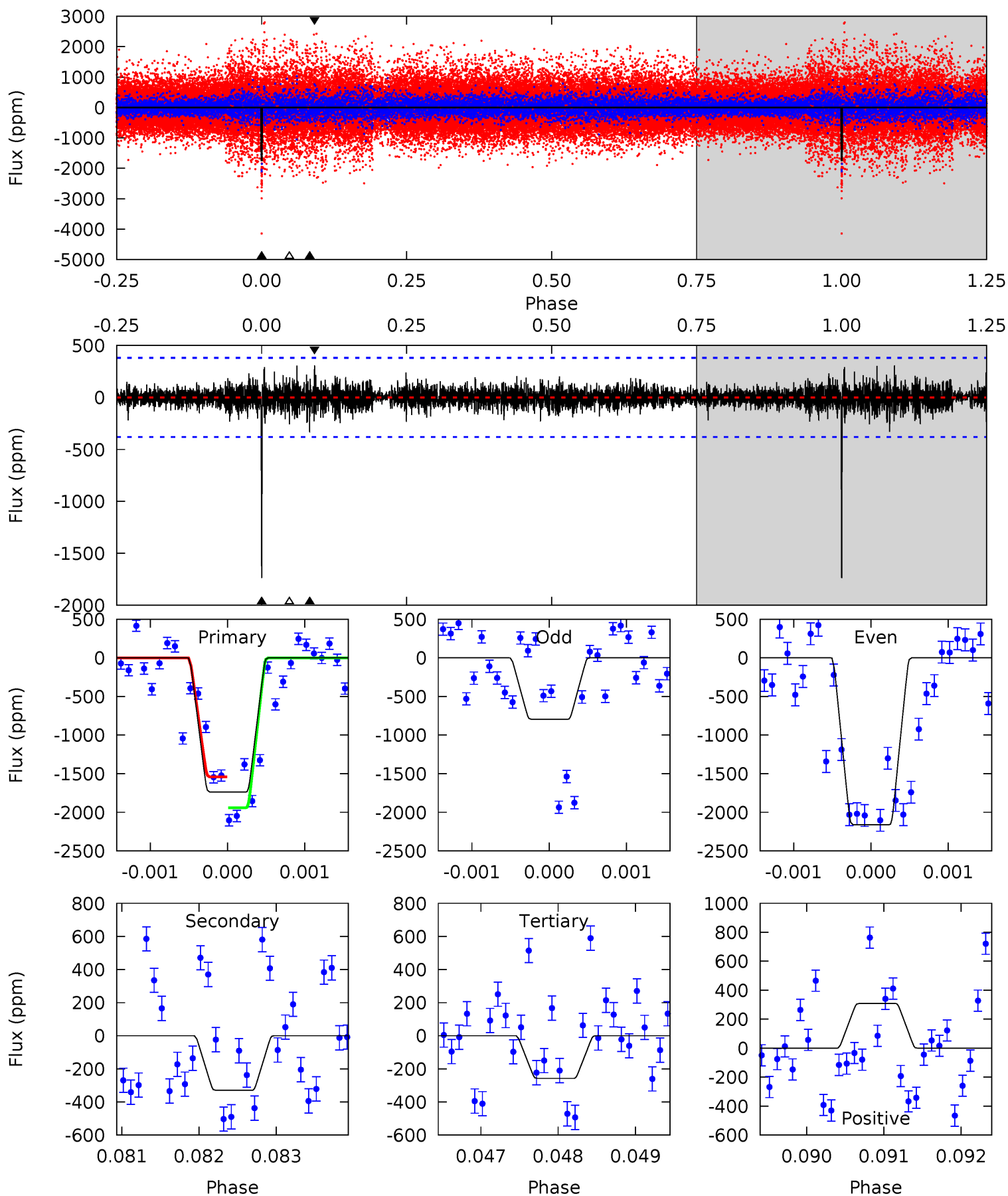
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
18.1	9.51	7.22	9.32	5.39	3.20	1.96	10.9	8.82	2.29	0.19	5.70	0.92	0.34	3.55



# Alt Model-Shift Uniqueness Test

009024857-02,  $P = 379.178762$  Days,  $E = 267.624102$  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
24.8	4.70	3.67	4.40	5.43	3.26	0.91	21.1	20.4	1.03	0.31	6.36	0.40	0.15	2.81





### Stellar Parameters For KIC 009024857

	$T_{\text{eff}} (K)$	$\log(g)$	$[\text{Fe}/\text{H}]$	$R (R_{\odot})$	$M (M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$5546^{+166}_{-149}$	$4.575^{+0.038}_{-0.152}$	$-0.140^{+0.300}_{-0.300}$	$0.810^{+0.188}_{-0.063}$	$0.907^{+0.083}_{-0.102}$	$2.404^{+0.469}_{-1.043}$
	+3%/-3%	+1%/-3%	+214%/-214%	+23%/-8%	+9%/-11%	+19%/-43%
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 009024857-02 / KOI 7124.02

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$-688 \pm 72$	$3.25^{+1.16}_{-1.03}$	$315^{+18}_{-13}$	$4868^{+969}_{-542}$	$34522^{+39715}_{-15388}$
Alt.	$-330 \pm 70$	$3.80^{+1.21}_{-1.06}$	$316^{+16}_{-13}$	$3977^{+580}_{-392}$	$12266^{+12395}_{-5686}$

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

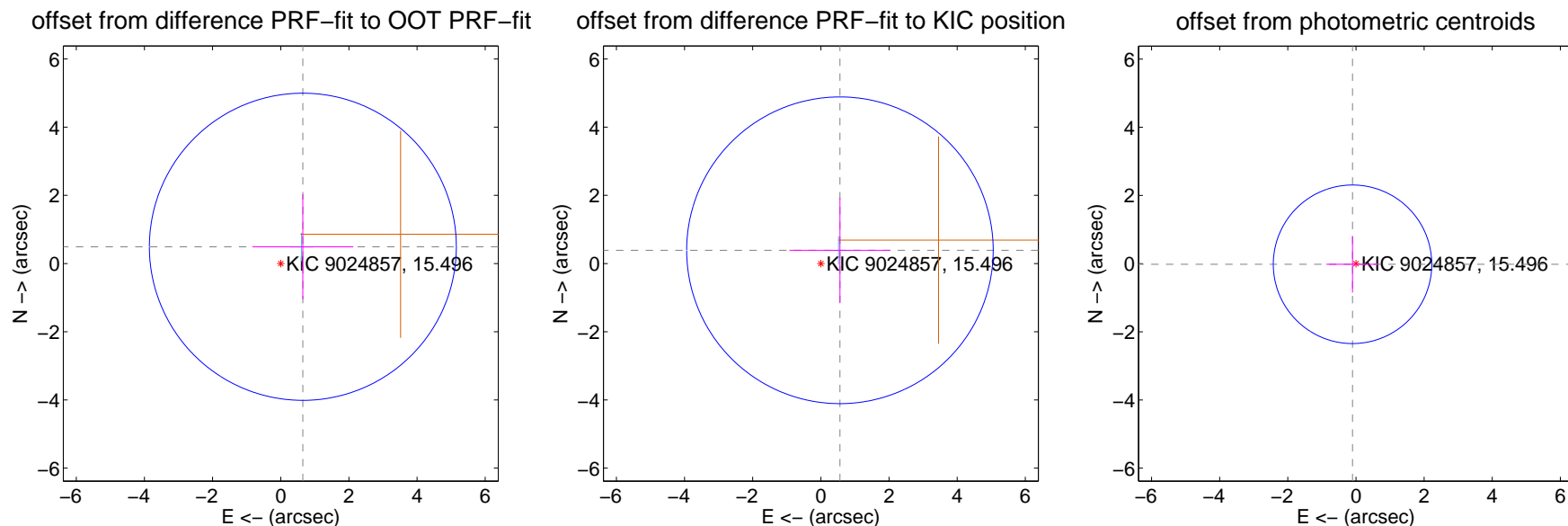
## DV Centroid Data

Supplemental centroid analysis for 009024857-02. Kepler magnitude: 15.50. Transit SNR 8.40

There are 1 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	$0.814 \pm 1.501$	0.54	$-0.649 \pm 1.482$	$0.492 \pm 1.535$
PRF-fit source offset from KIC position	$0.681 \pm 1.499$	0.45	$-0.560 \pm 1.482$	$0.389 \pm 1.535$
photometric centroid source offset	$0.10 \pm 0.78$	0.13	$0.10 \pm 0.77$	$-0.02 \pm 0.83$



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



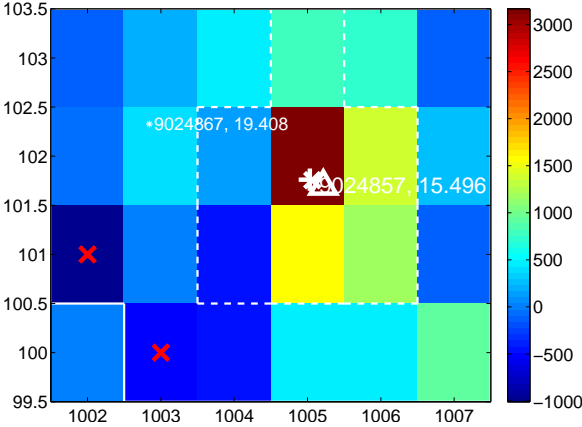
Q6 no difference image



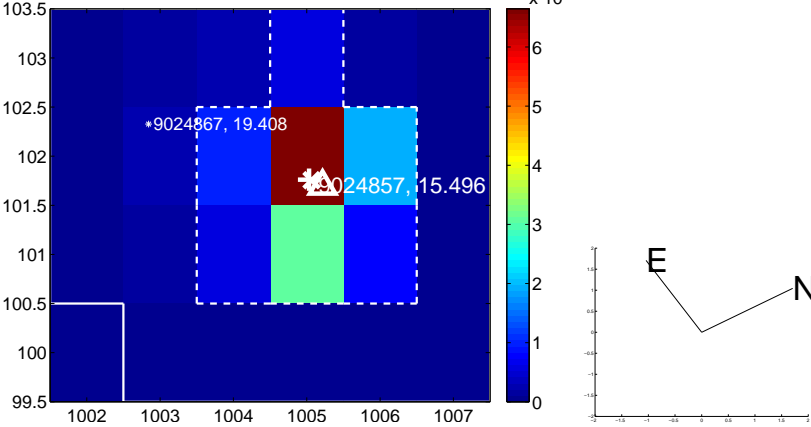
Q6 no OOT image



Q7 difference image



Q7 OOT image



Q8 no difference image



Q8 no OOT image



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

Q9 no difference image



Q9 no OOT image



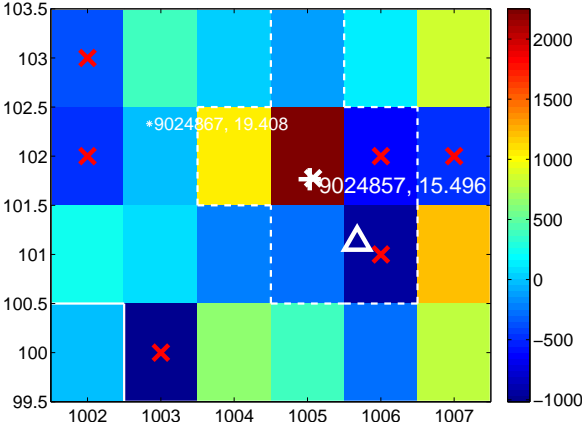
Q10 no difference image



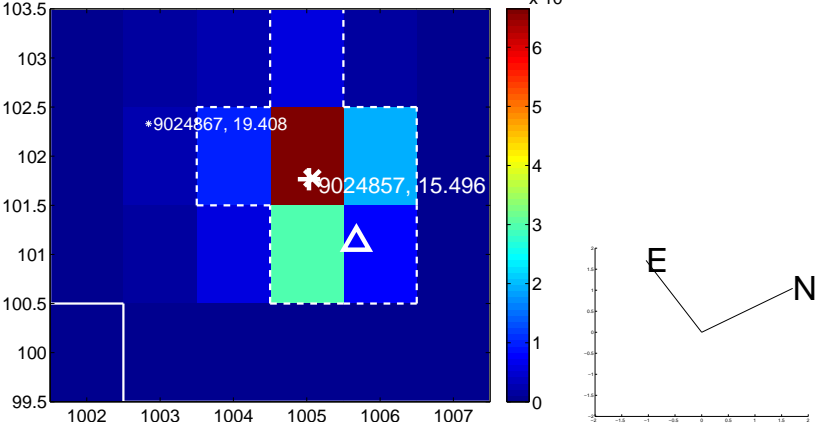
Q10 no OOT image



Q11 difference image. Poor Quality



Q11 OOT image



Q12 no difference image



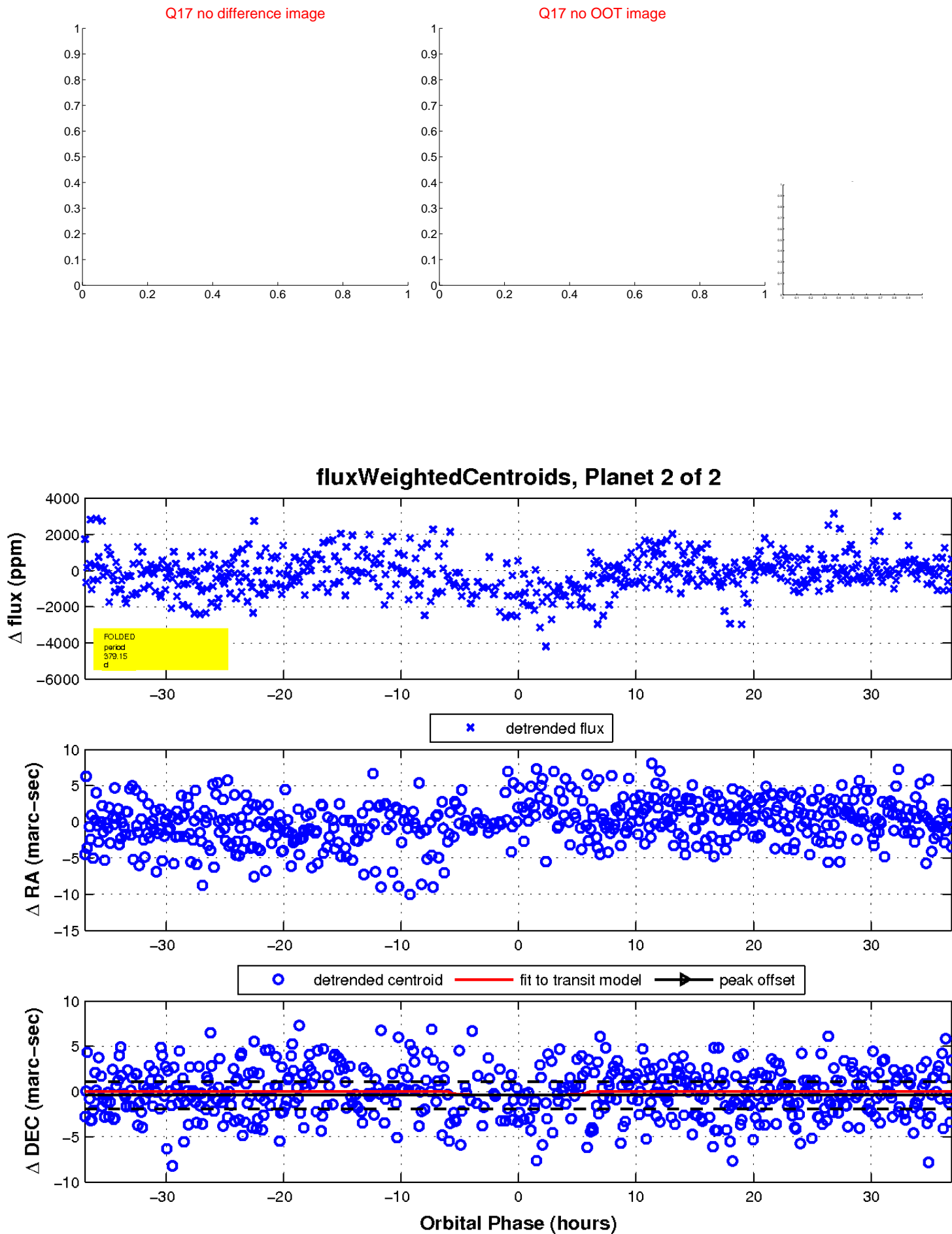
Q12 no OOT image



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.



# UKIRT Image

Declination

