

# KIC 004358494

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
004358494-01	OBS	No	1.110437	132.478626	66.9	5.659	8.8	10.2	0.61	4837	0.51	542.71
004358494-02	OBS	No	168.988173	248.360149	623.3	3.891	8.5	4.6	0.61	4837	1.85	0.67

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
004358494-01	OBS	FP	0.00	1	0	0	0	LPP_DV
004358494-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_MARSHALL_TRACKER—TRANS_GAPPED—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—CENT_FEW_DIFS

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

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

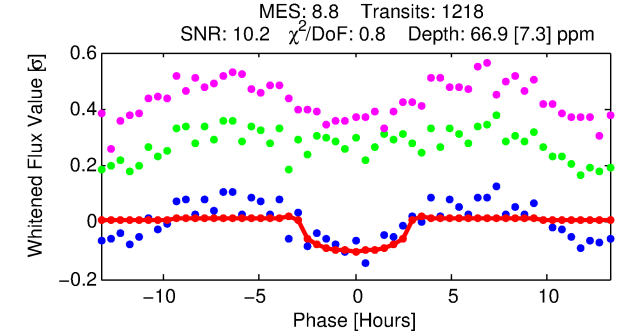
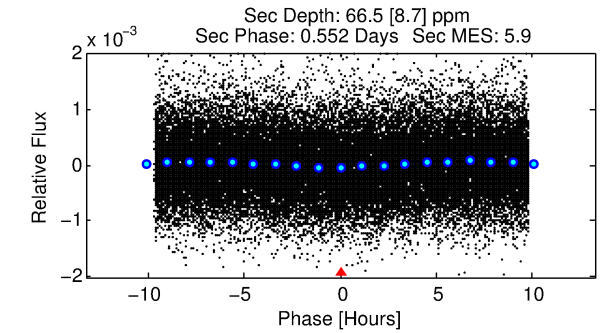
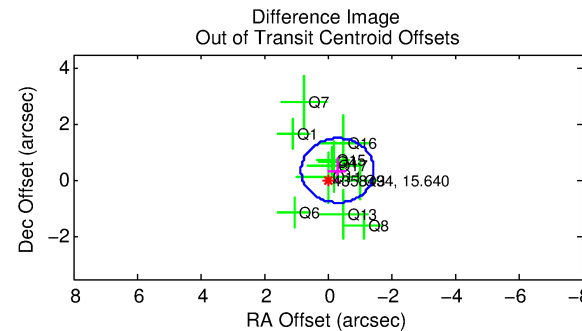
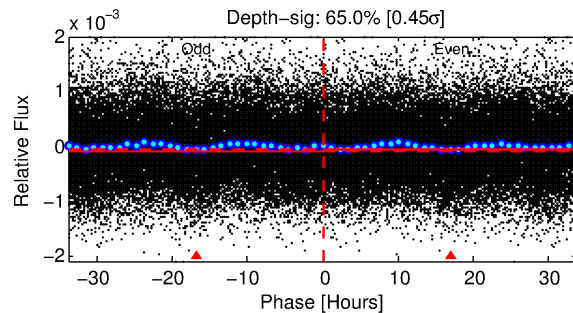
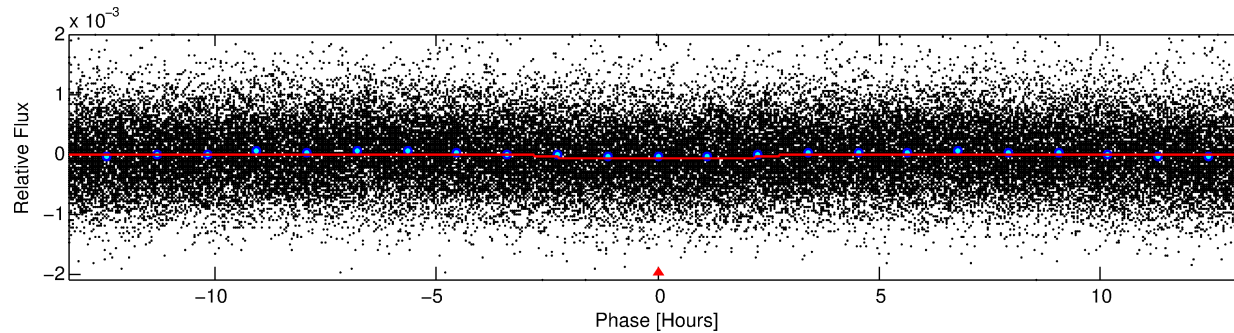
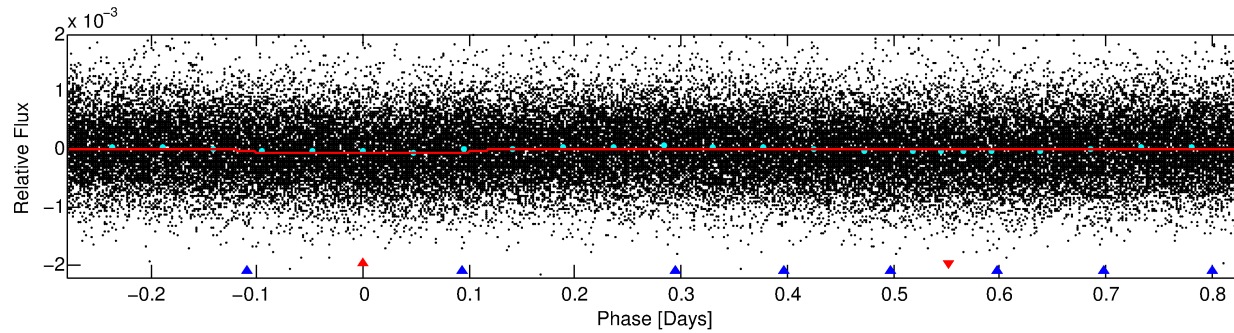
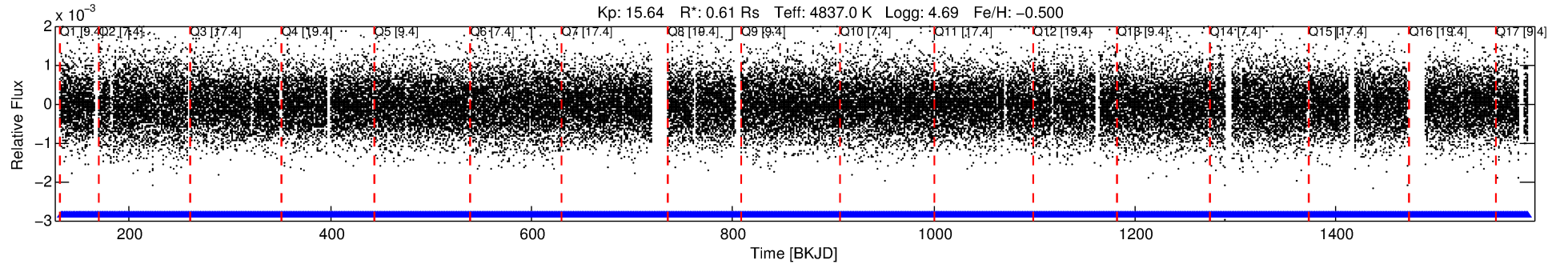
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 004358494-01

No Significant Match Found

# DV One-Page Summary

KIC: 4358494 Candidate: 1 of 2 Period: 1.110 d



## DV Fit Results:

Period = 1.11044 [0.00001] d  
Epoch = 132.4786 [0.0057] BKJD  
Rp/R\* = 0.0077 [0.0068]  
a/R\* = 1.46 [2.37]  
b = 0.57 [3.73]  
Seff = 542.71 [94.26]  
Teq = 1231 [53] K  
Rp = 0.51 [0.46] Re  
a = 0.0184 [0.0017] AU  
Ag = 47.16 [84.01] [0.55 $\sigma$ ]  
Teffp = 4987 [2220] K [1.69 $\sigma$ ]

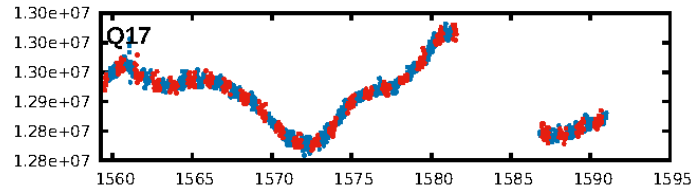
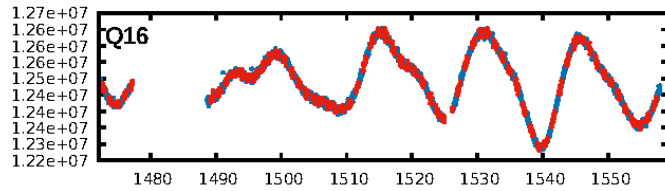
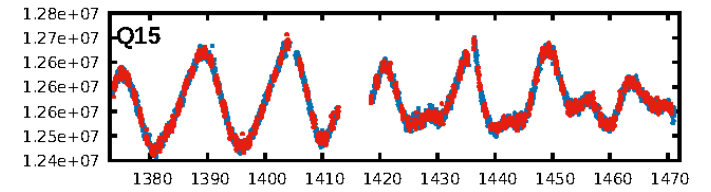
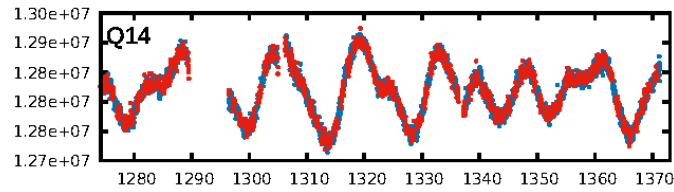
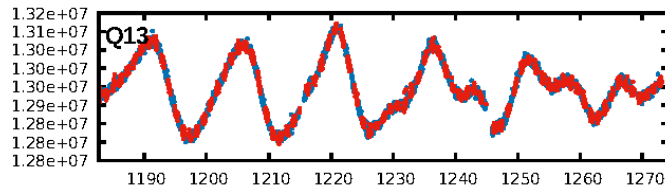
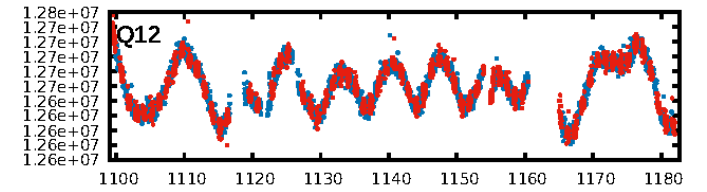
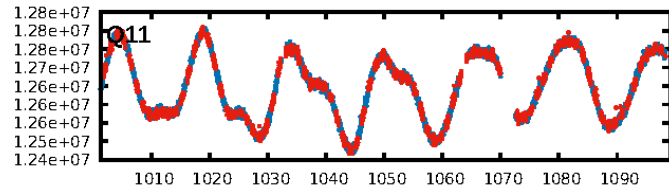
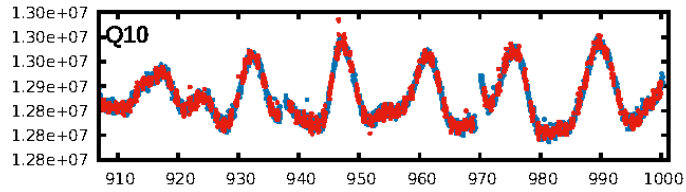
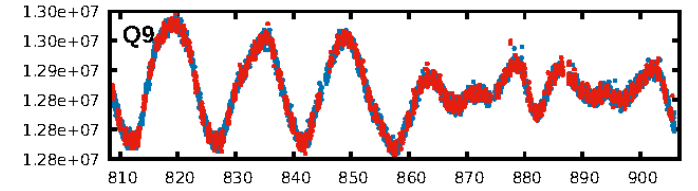
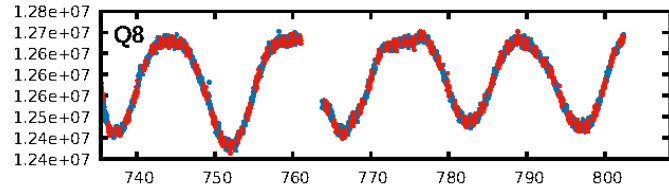
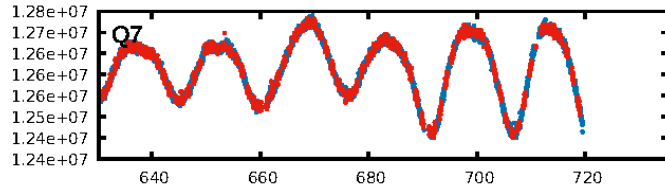
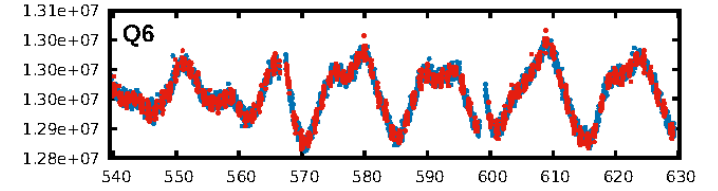
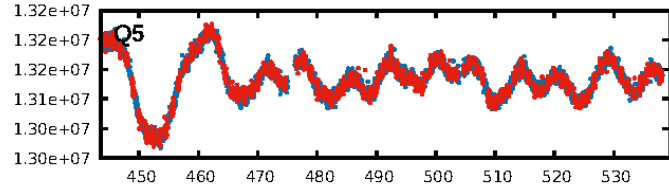
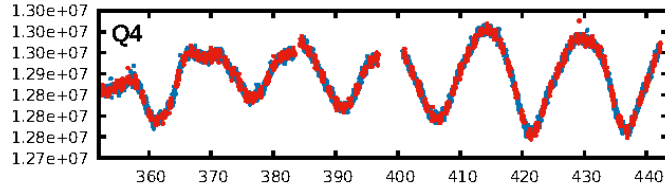
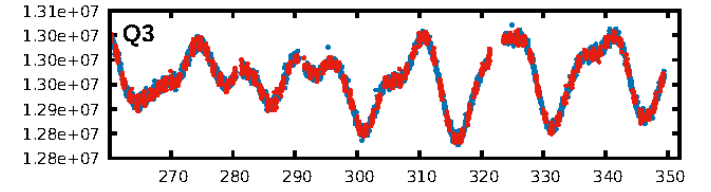
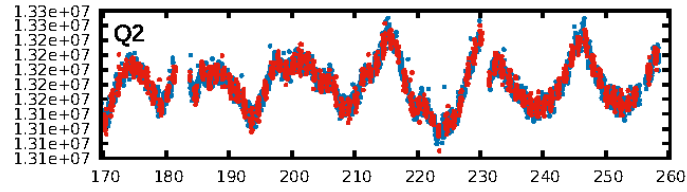
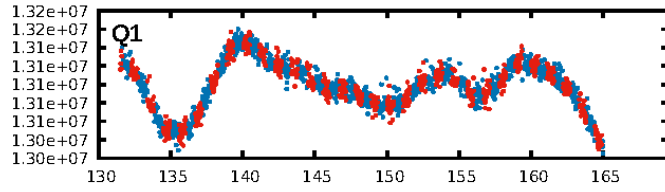
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 100.0% [586.69 $\sigma$ ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: 7.38e-16  
RollingBand-fgt: 1.00 [1163/1163]  
GhostDiagnostic-chr: 1.138  
Centroid-sig: 10.0%  
Centroid-so: 1.251 arcsec [1.12 $\sigma$ ]  
OotOffset-rm: 0.478 arcsec [1.25 $\sigma$ ]  
KicOffset-rm: 0.452 arcsec [1.21 $\sigma$ ]  
OotOffset-st: 1/4/3/3 [11]  
KicOffset-st: 1/4/3/3 [11]  
DiffImageQuality-fgm: 0.64 [7/11]  
DiffImageOverlap-fno: 1.00 [17/17]

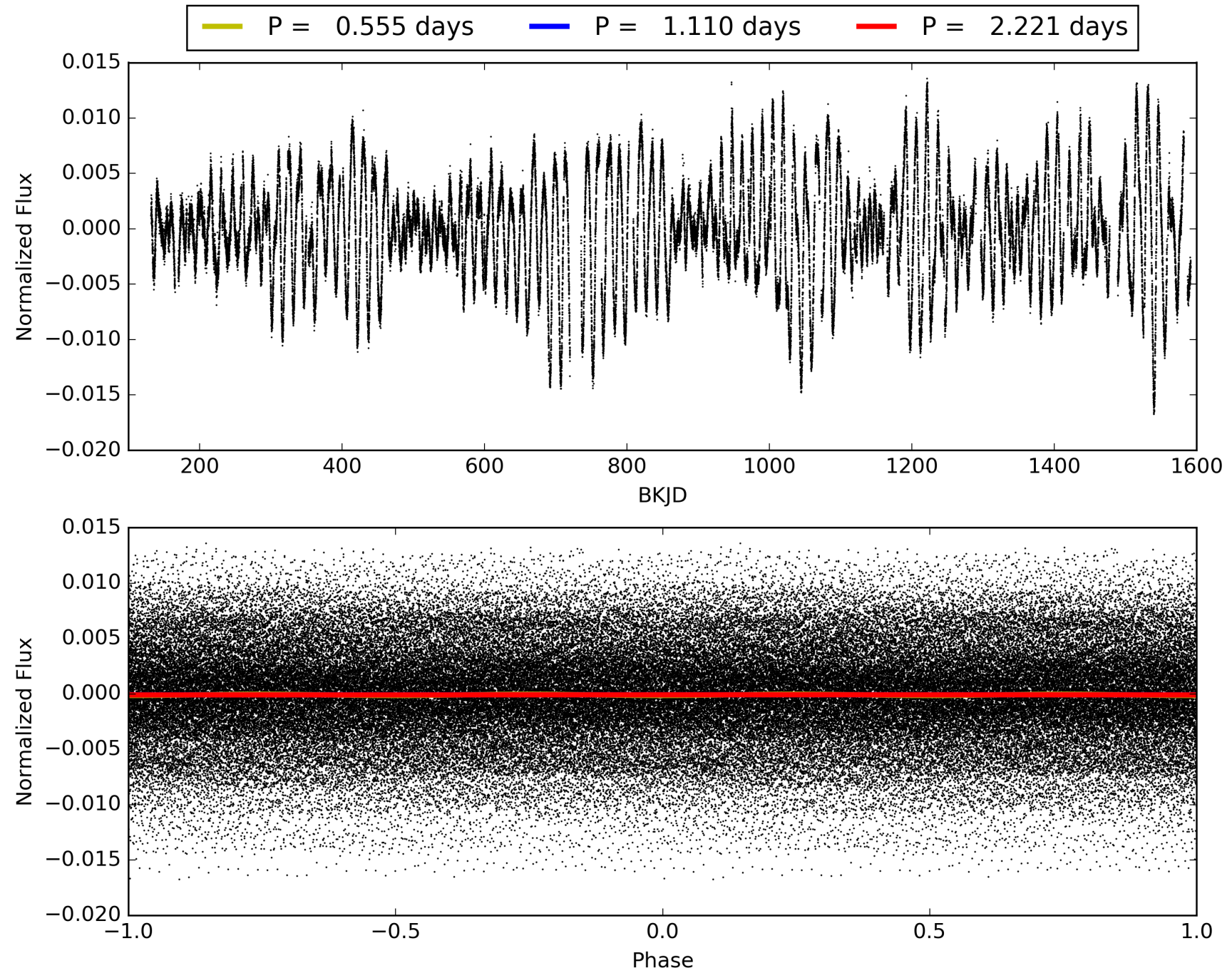
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 31-Jan-2016 21:38:07 Z

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

# TCE 004358494-01, PDC Light Curves

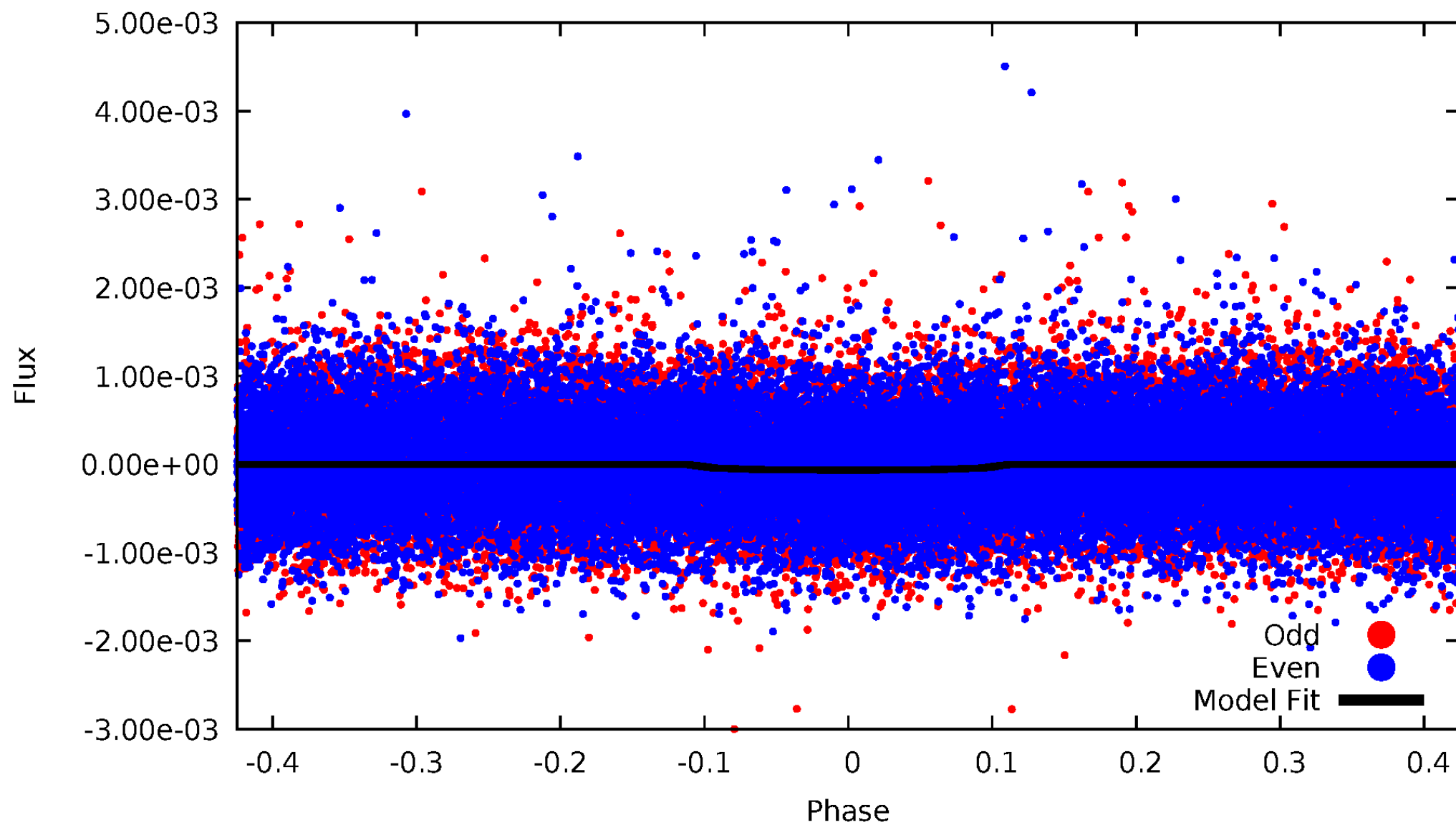


TCE 004358494-01



# DV Odd/Even

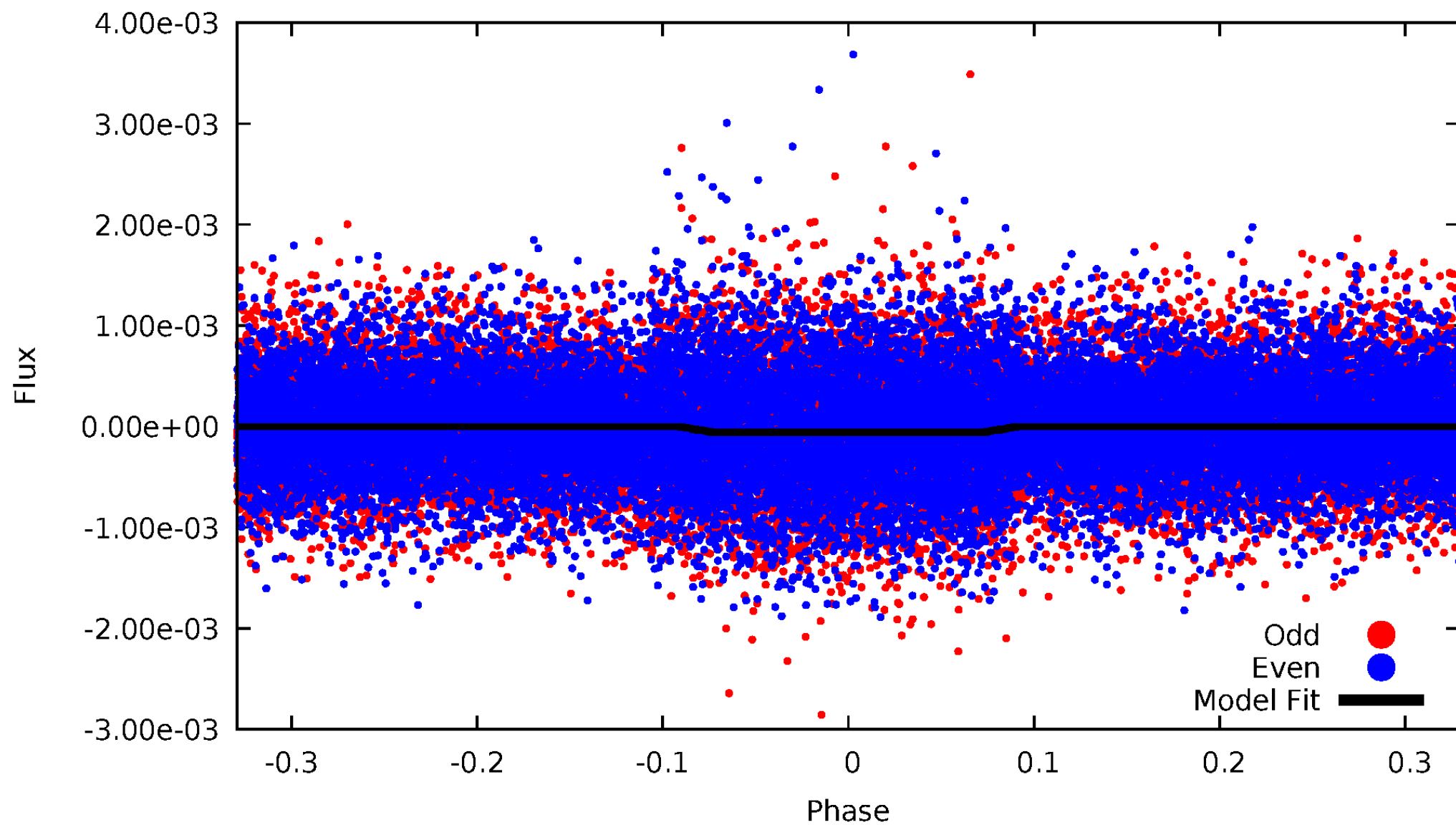
TCE 004358494-01





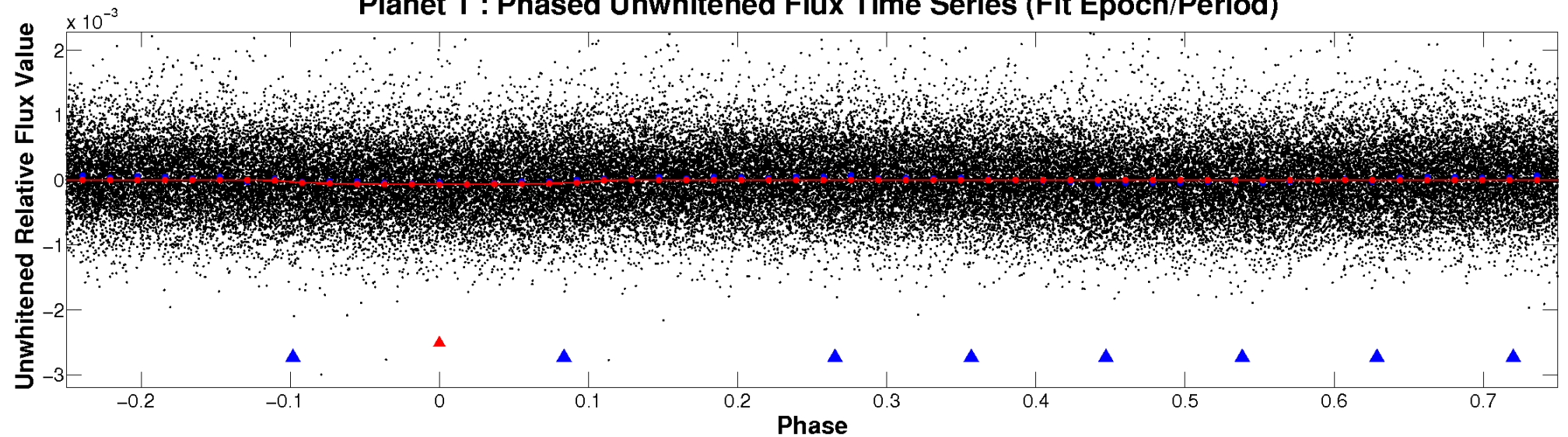
# ALT Odd/Even

TCE 004358494-01

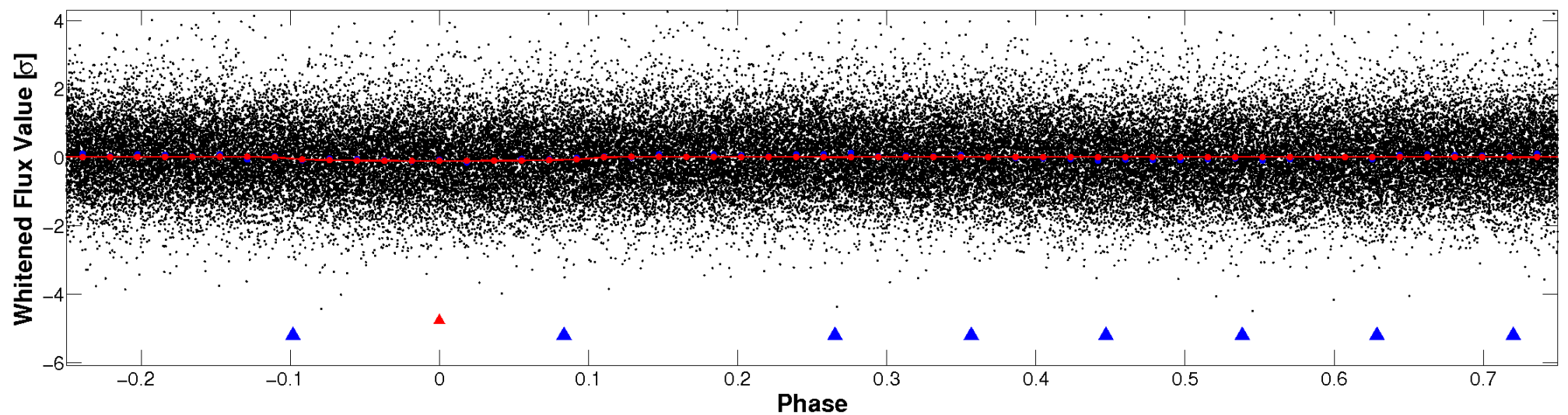


# Non-Whitened Vs. Whitened Light Curve

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

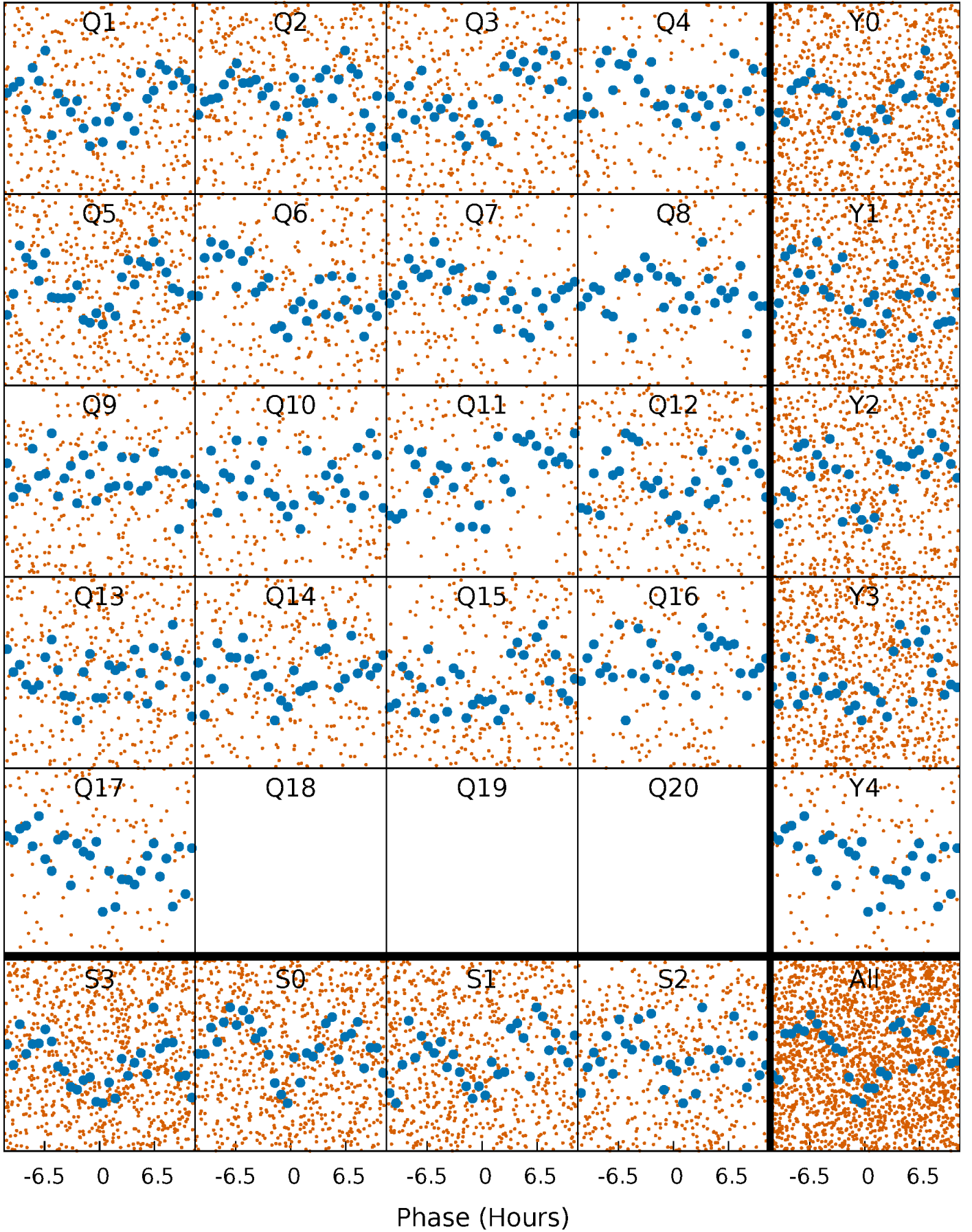


## Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)



# PDC Quarter-Phased Transit Curves

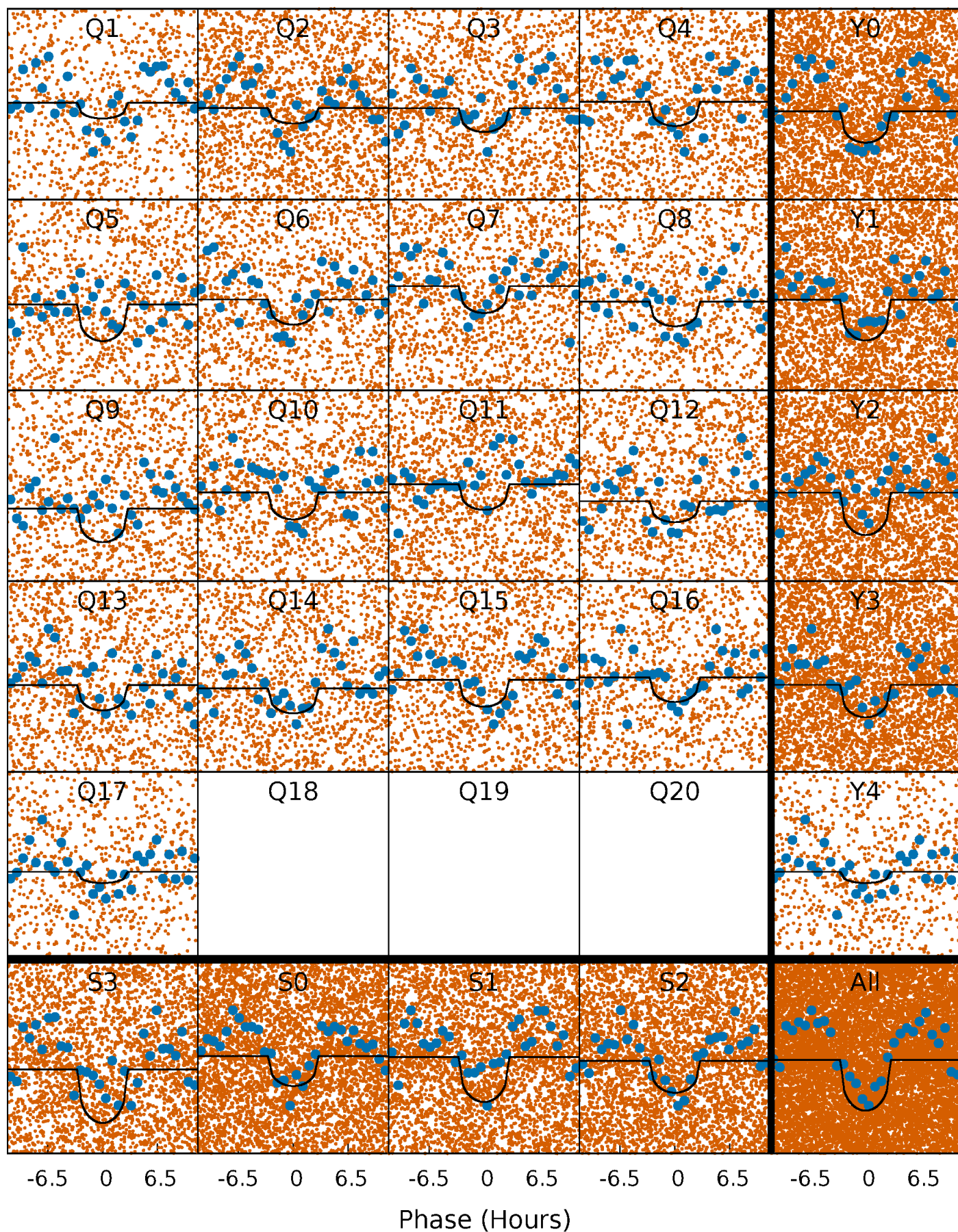
TCE 004358494-01   P= 1.110437 Days    $T_0=132.478626$  (BKJD)





# DV Quarter-Phased Transit Curves

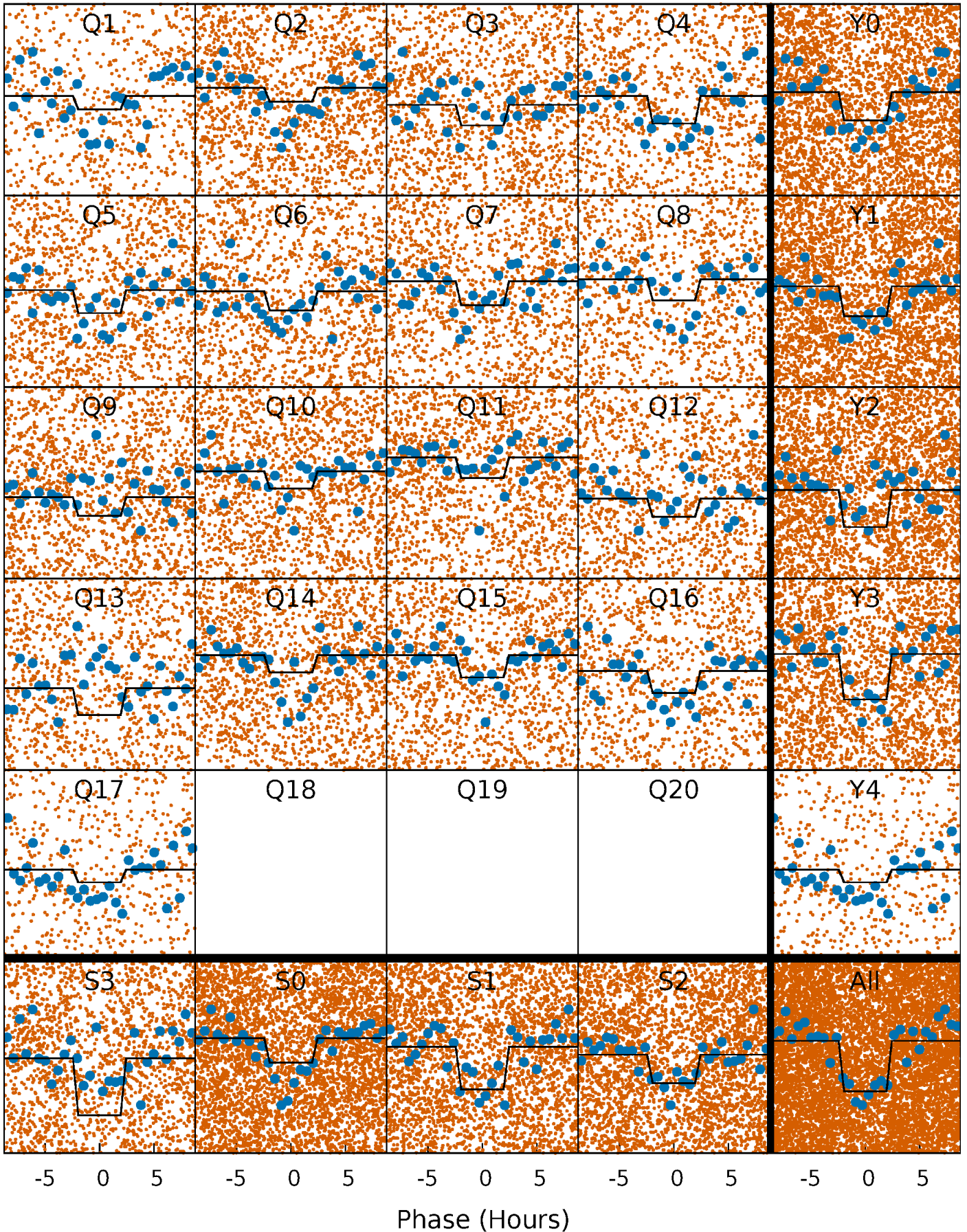
TCE 004358494-01 P= 1.110437 Days  $T_0=132.478626$  (BKJD)





# Alt. Detrend Quarter-Phased Transit Curves

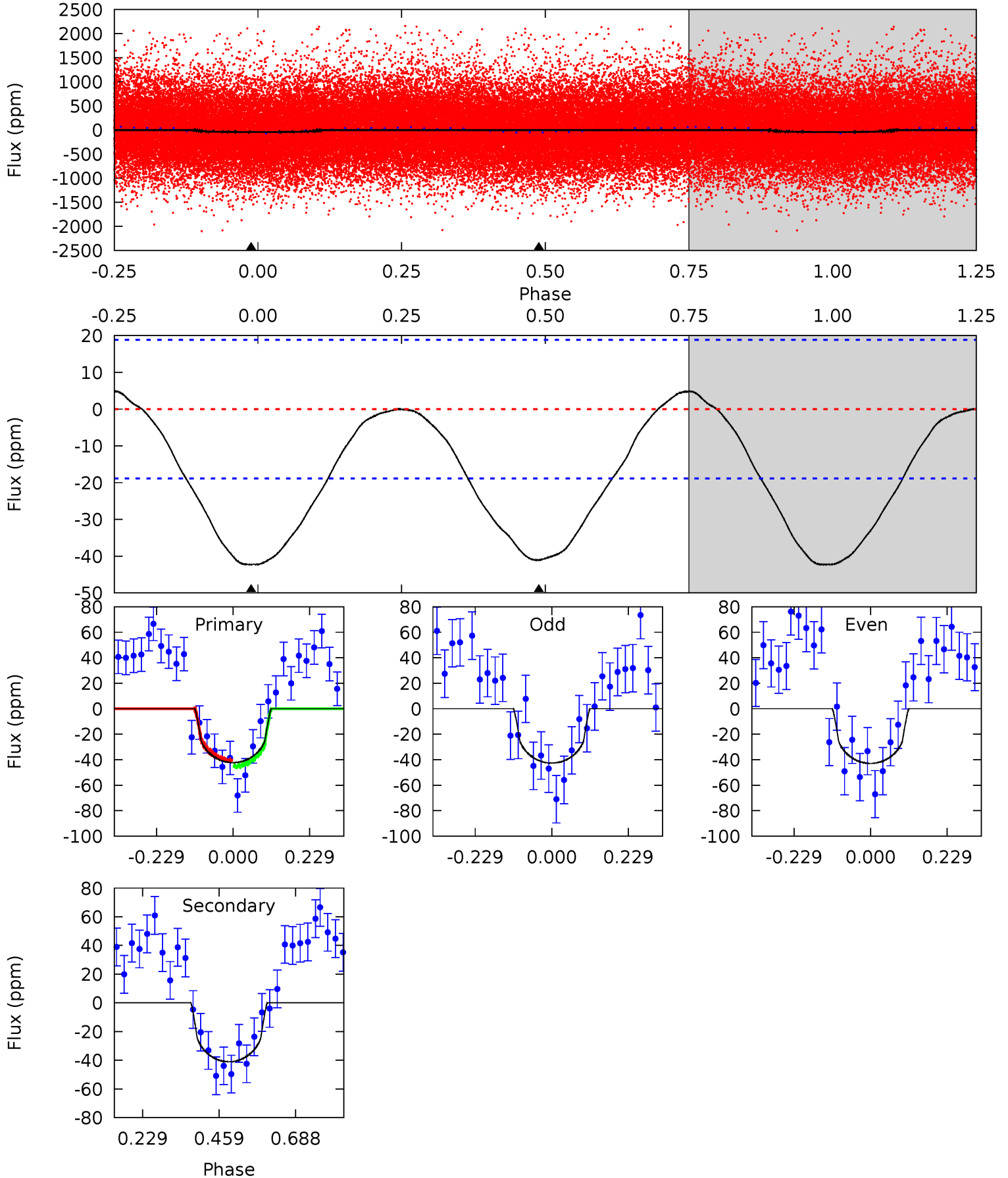
TCE 004358494-01 P= 1.110490 Days  $T_0=132.463157$  (BKJD)



# DV Model-Shift Uniqueness Test

004358494-01, P = 1.110437 Days, E = 131.368189 Days

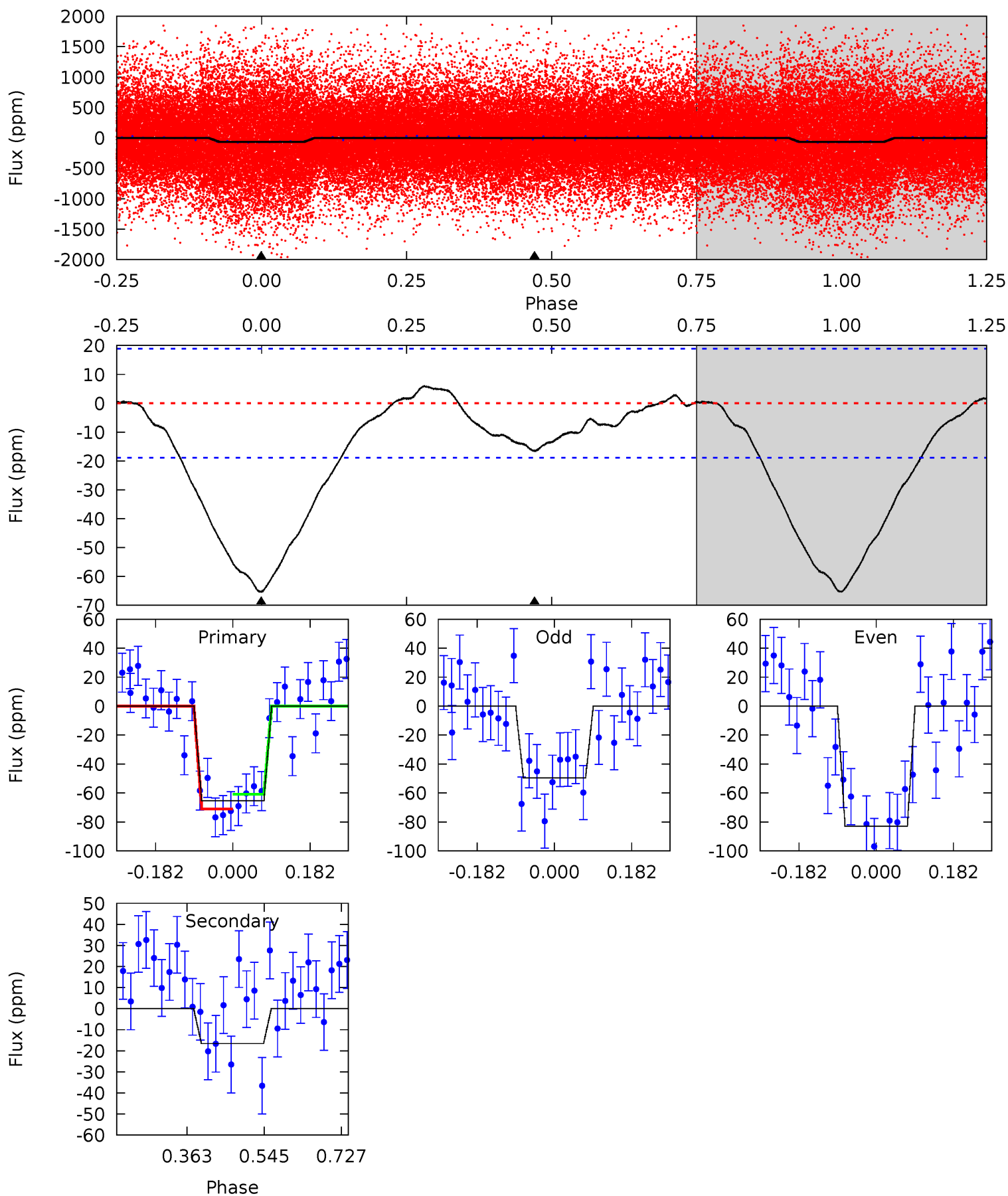
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
9.84	9.55	0	0	4.39	1.20	0.54	9.84	9.84	9.55	9.55	0.03	1.14	0.10	0.57



# Alt Model-Shift Uniqueness Test

004358494-01, P = 1.110490 Days, E = 131.352667 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
15.3	3.89	0	0	4.44	1.34	0.70	15.3	15.3	3.89	3.89	3.92	1.05	0.08	1.20



### Stellar Parameters For KIC 004358494

	$T_{\text{eff}} (K)$	$\log(g)$	$[\text{Fe}/\text{H}]$	$R (R_{\odot})$	$M (M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$4837^{+131}_{-145}$	$4.692^{+0.025}_{-0.065}$	$-0.500^{+0.300}_{-0.300}$	$0.611^{+0.070}_{-0.041}$	$0.673^{+0.060}_{-0.060}$	$4.153^{+0.482}_{-0.938}$
	+3%/-3%	+1%/-1%	+60%/-60%	+11%/-7%	+9%/-9%	+12%/-23%
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 004358494-01 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$-41 \pm 4$	$0.61^{+0.43}_{-0.37}$	$1733^{+57}_{-57}$	$4213^{+2273}_{-711}$	$20^{+112}_{-13}$
Alt.	$-17 \pm 4$	$0.61^{+0.39}_{-0.37}$	$1734^{+62}_{-59}$	$3600^{+1420}_{-555}$	$8.379^{+43.461}_{-5.572}$

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



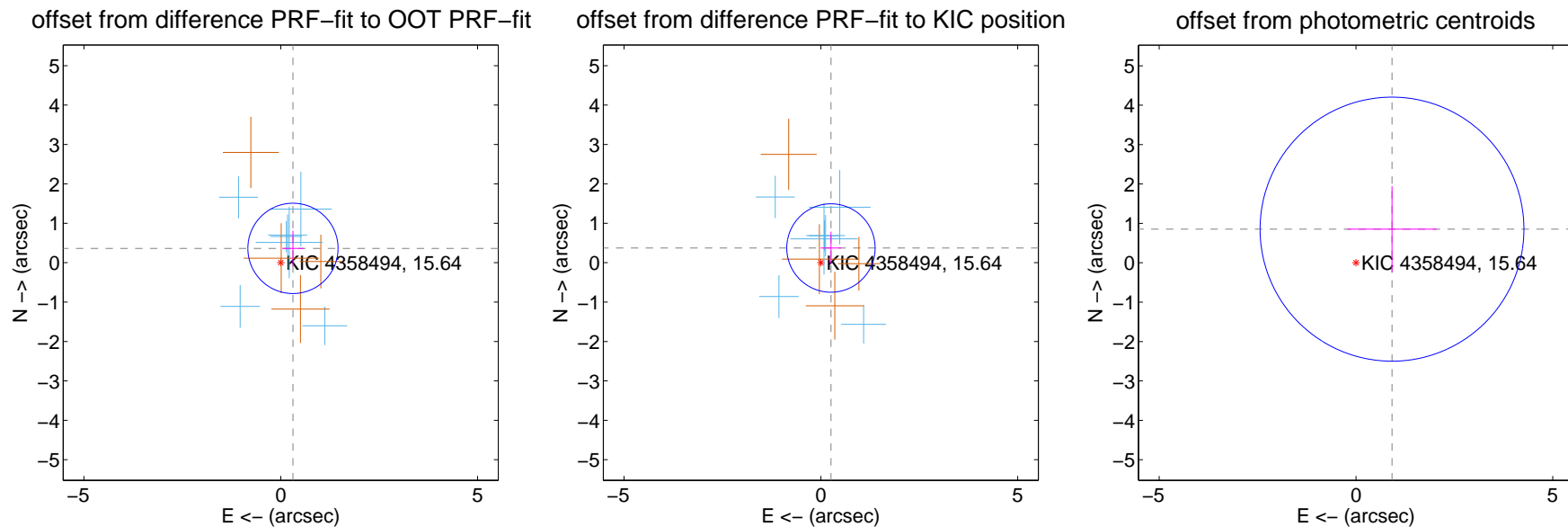
## DV Centroid Data

Supplemental centroid analysis for 004358494-01. Kepler magnitude: 15.64. Transit SNR 10.20

There are 7 quarters with good PRF difference image offsets

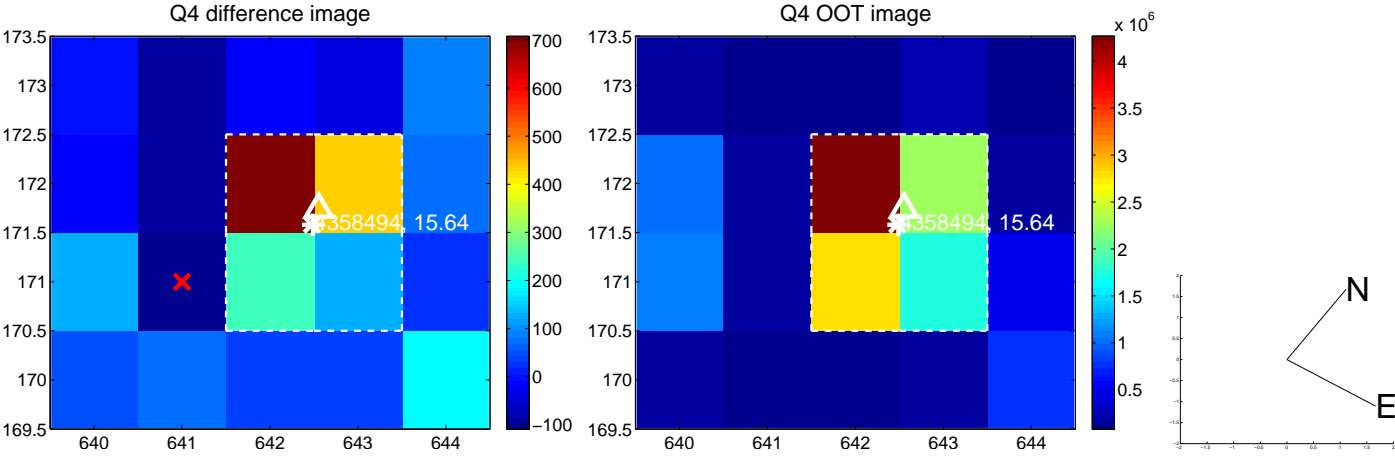
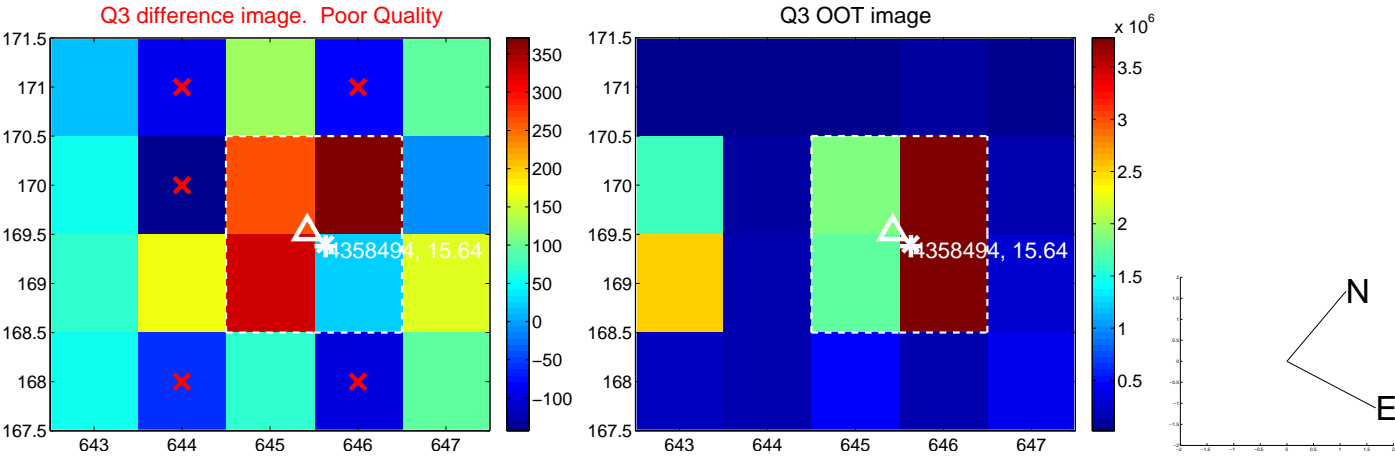
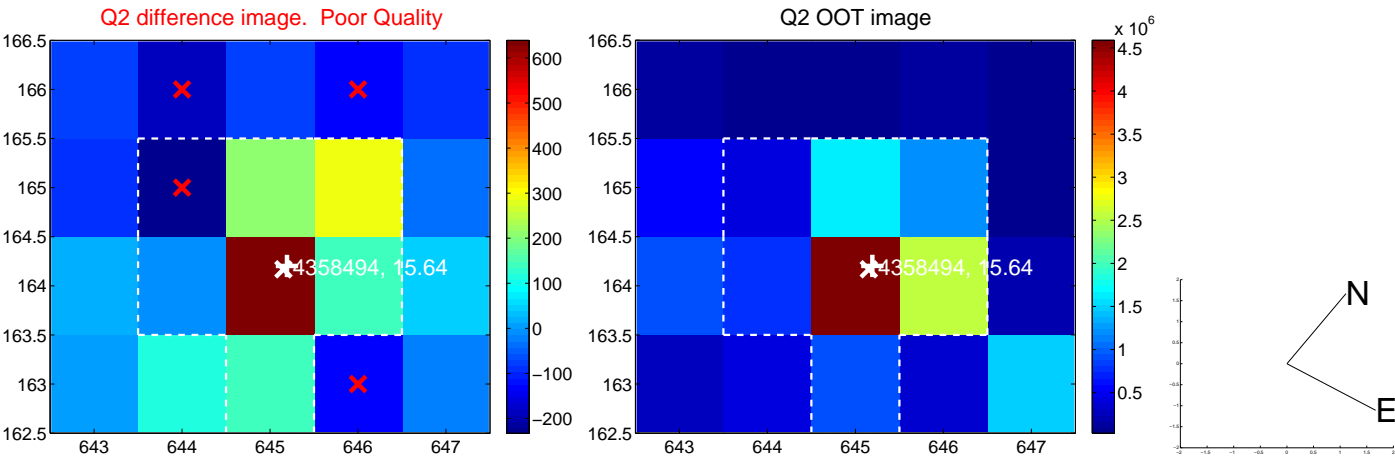
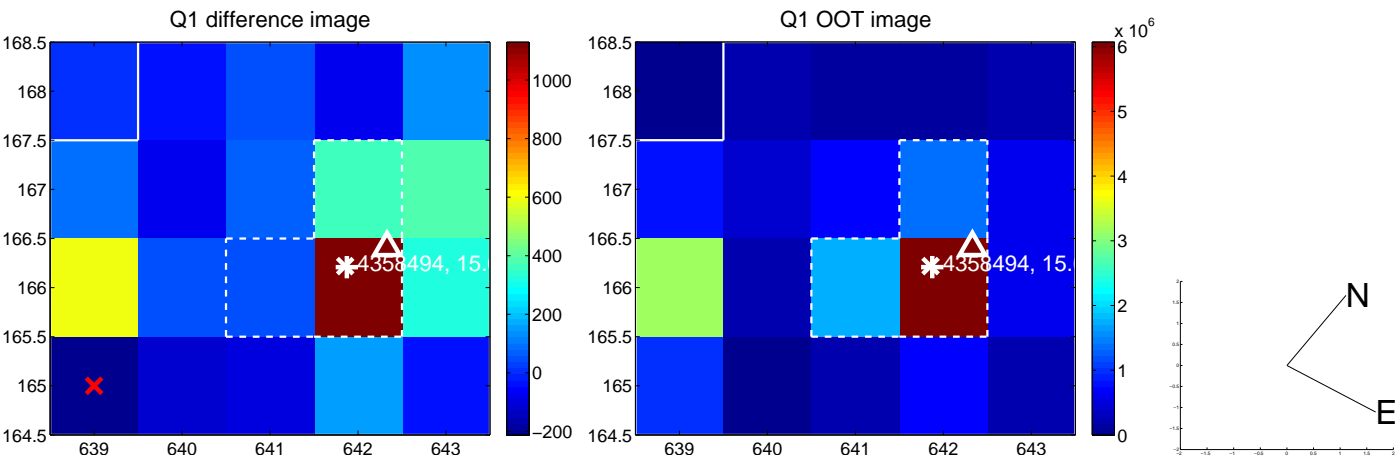
The direct PRF centroid is offset from the target star catalog position by about 0.16 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.478 \pm 0.382$	1.25	$-0.310 \pm 0.271$	$0.363 \pm 0.446$
PRF-fit source offset from KIC position	$0.452 \pm 0.374$	1.21	$-0.256 \pm 0.264$	$0.372 \pm 0.416$
photometric centroid source offset	$1.25 \pm 1.12$	1.12	$-0.92 \pm 1.14$	$0.85 \pm 1.09$

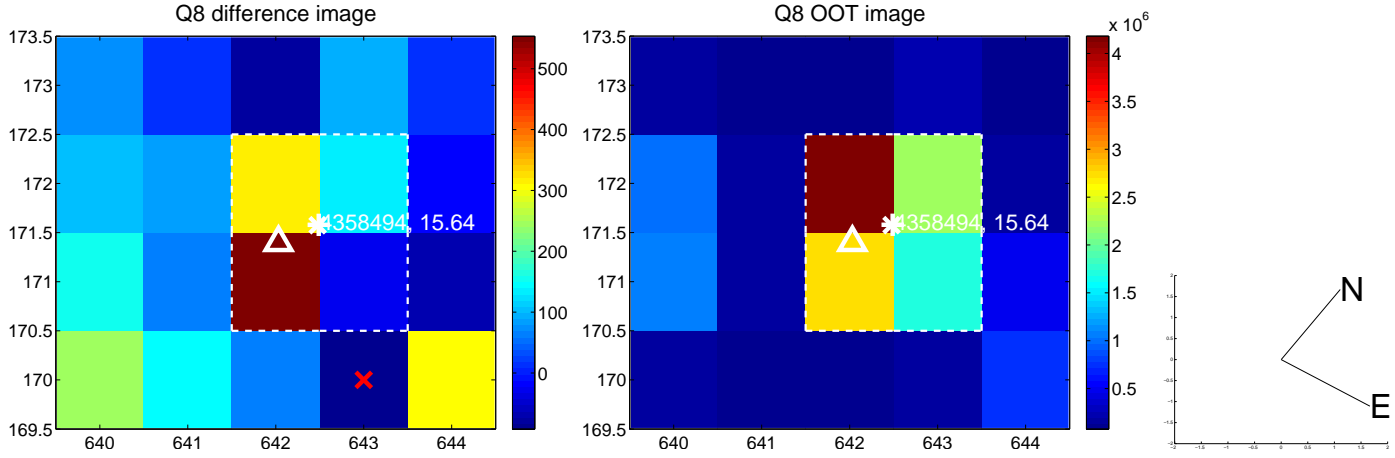
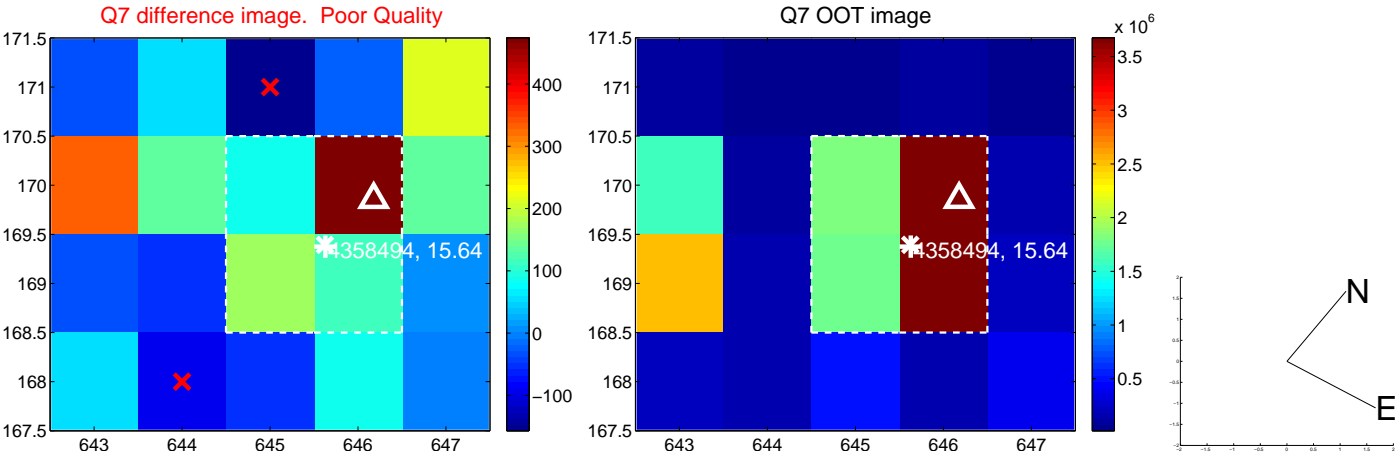
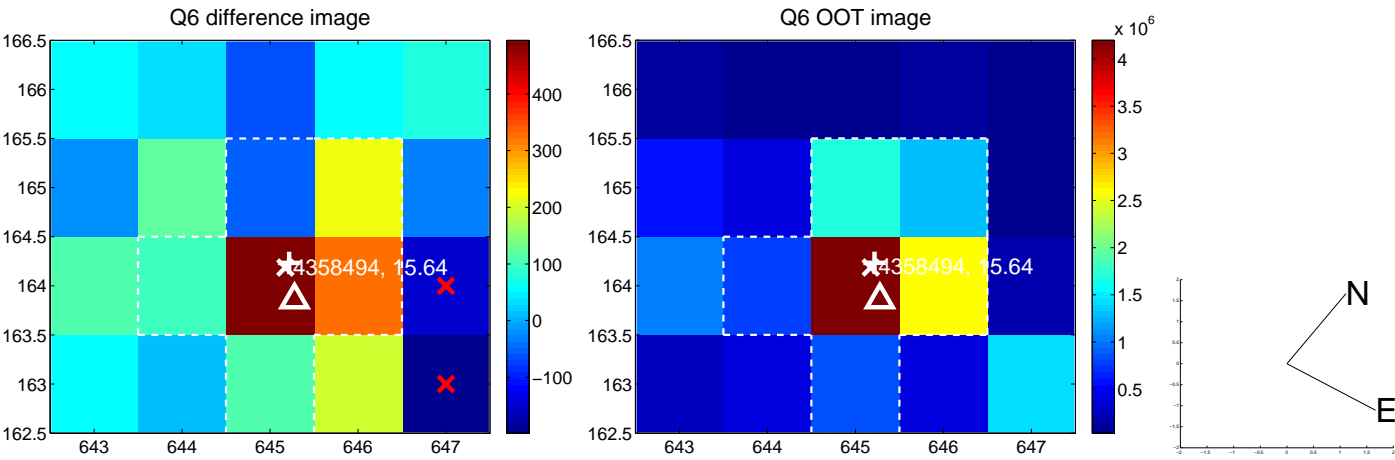
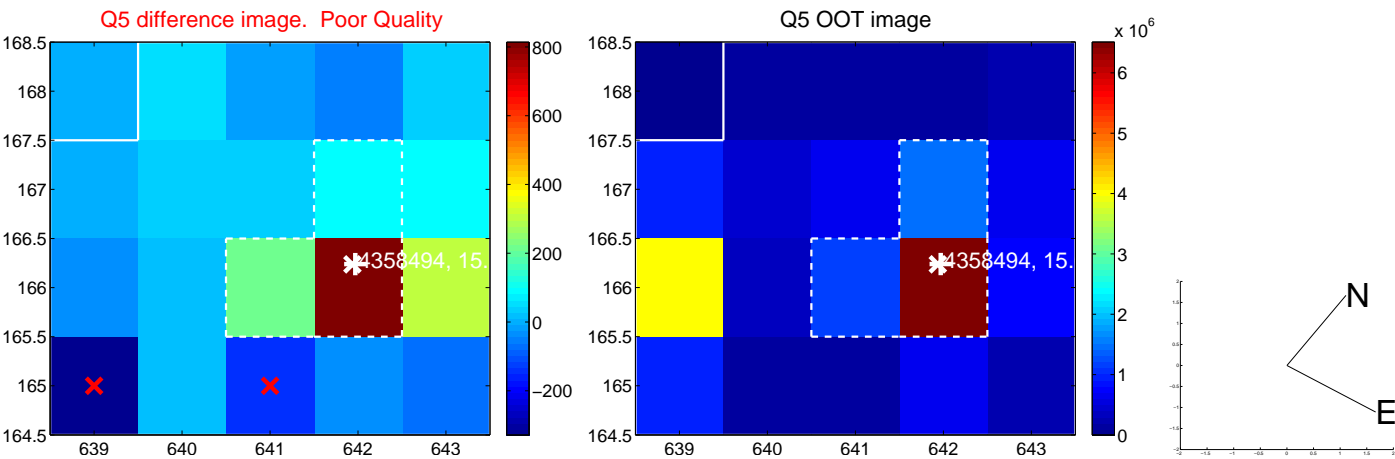


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets**; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

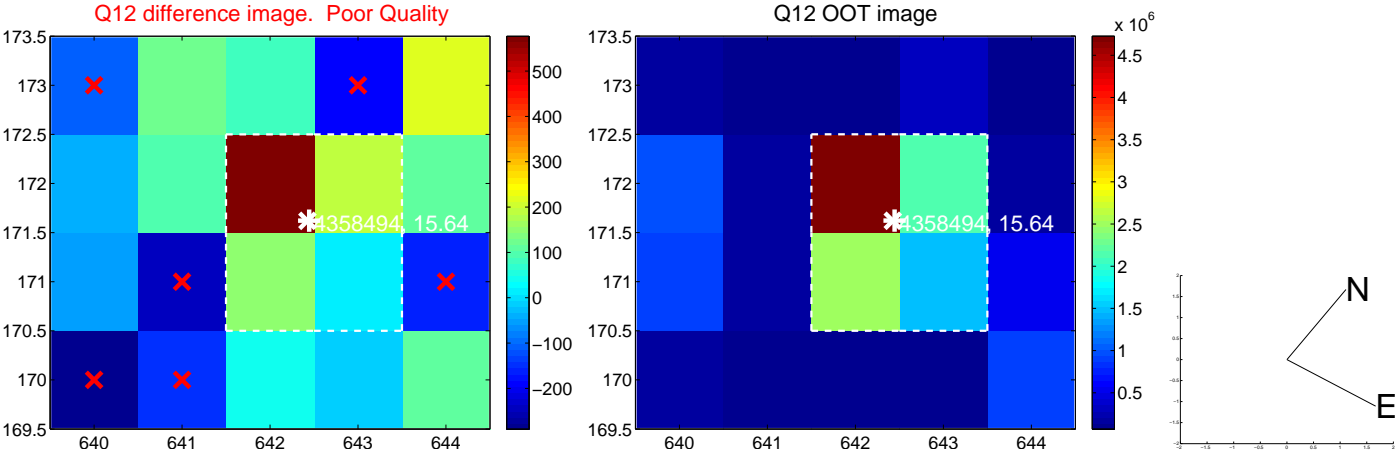
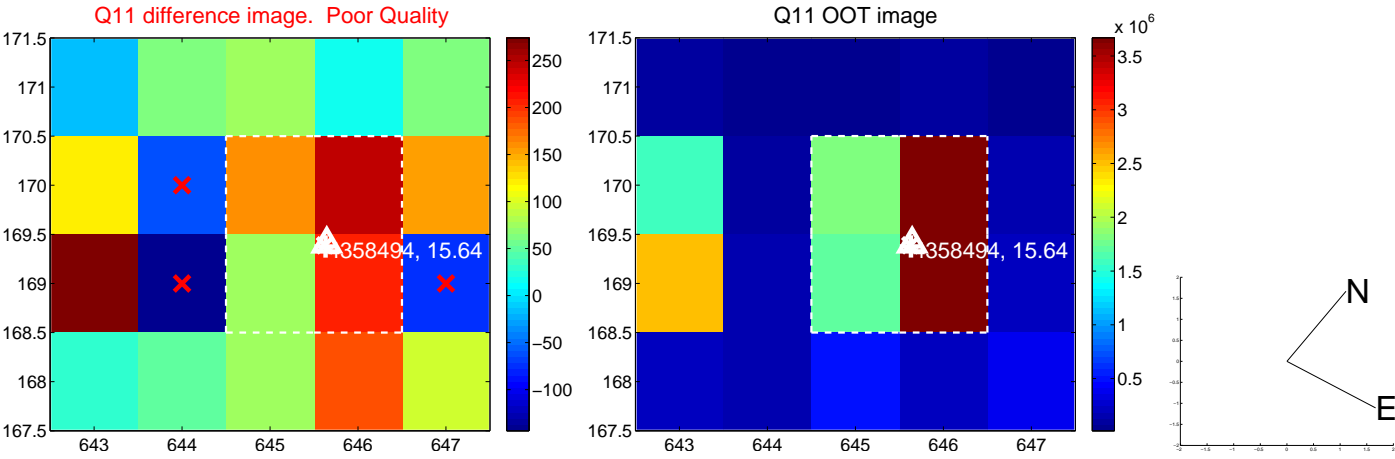
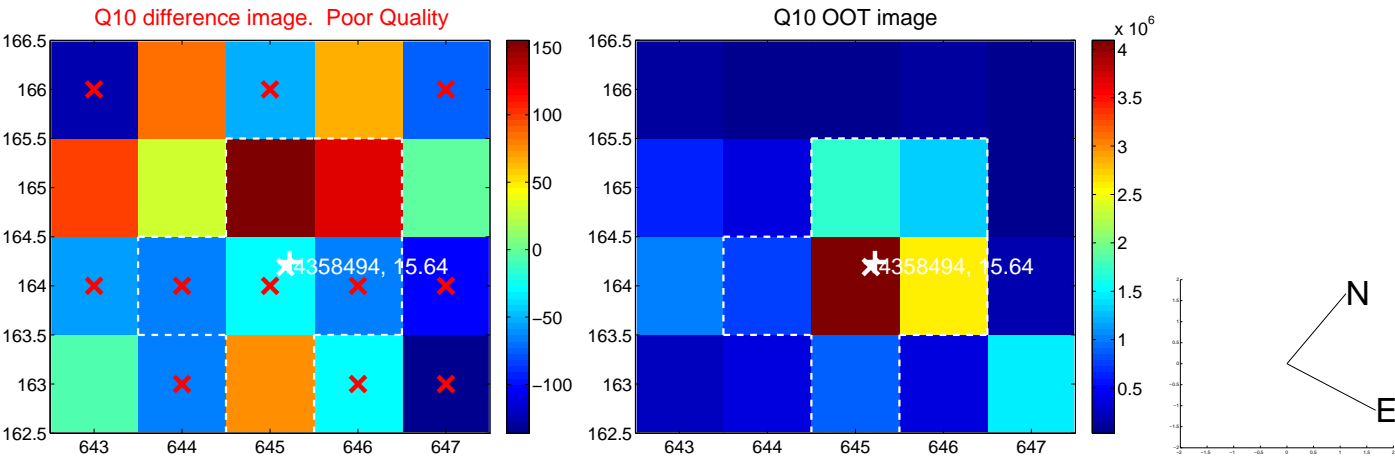
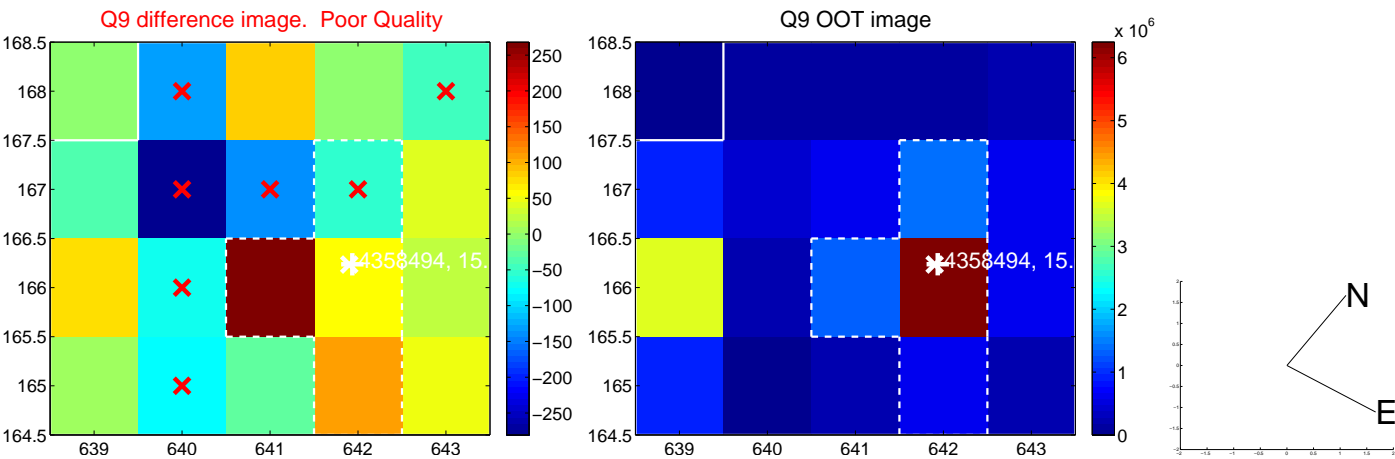
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



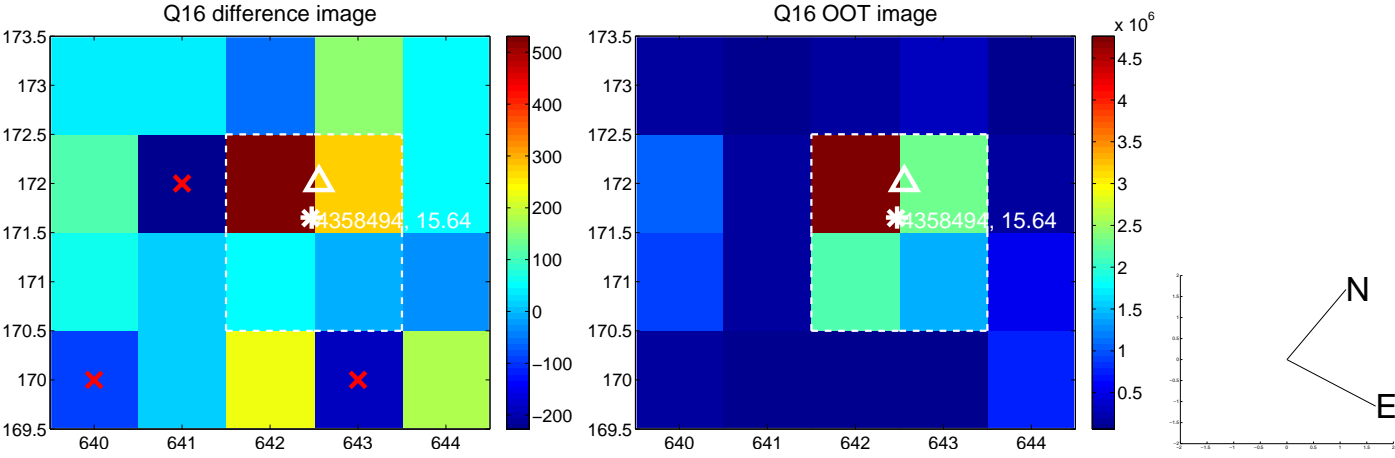
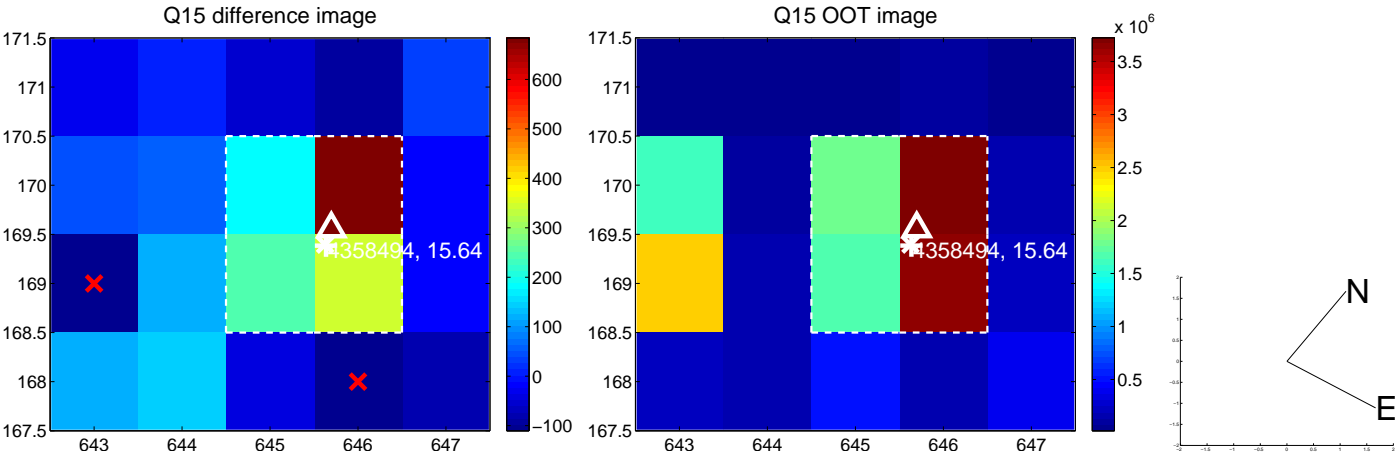
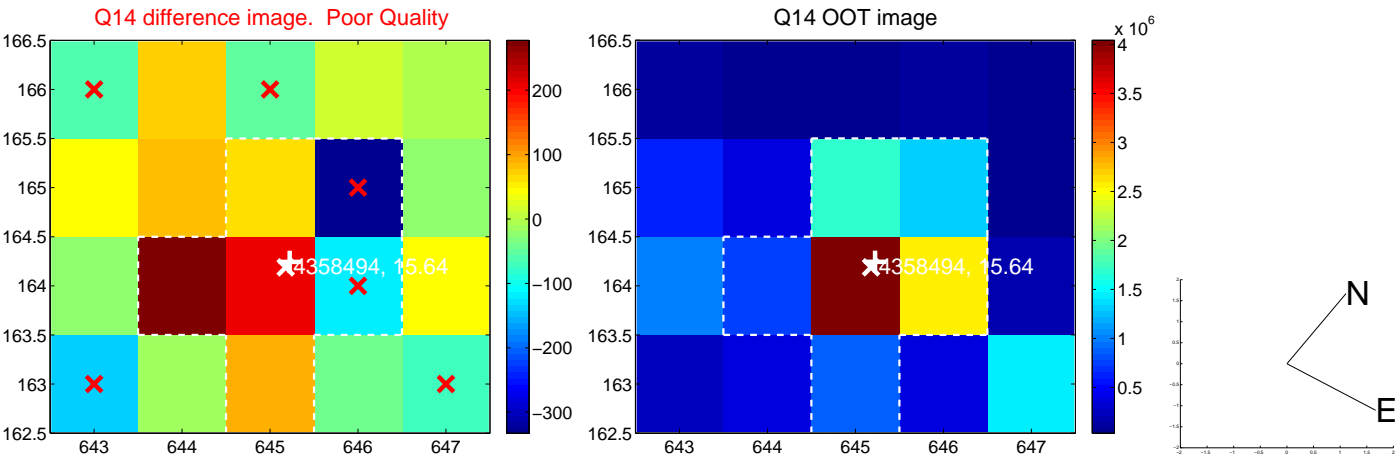
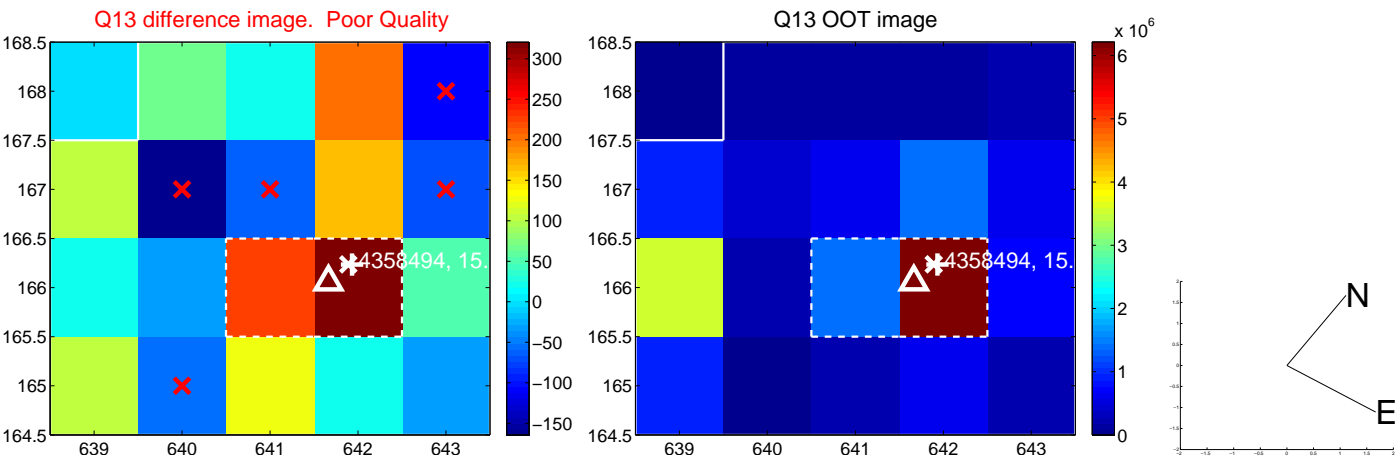
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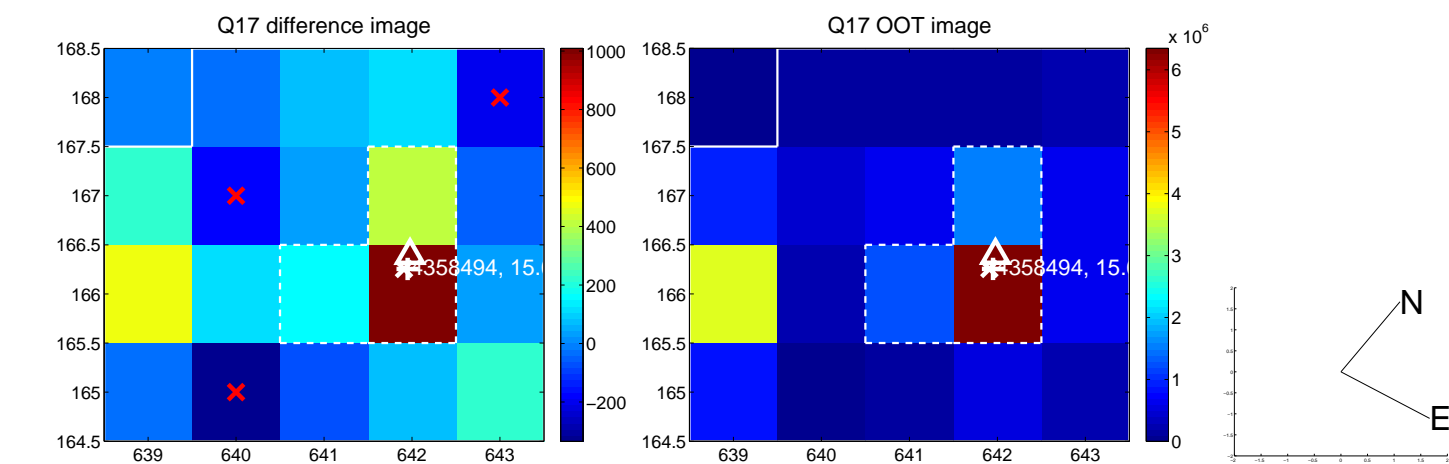


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

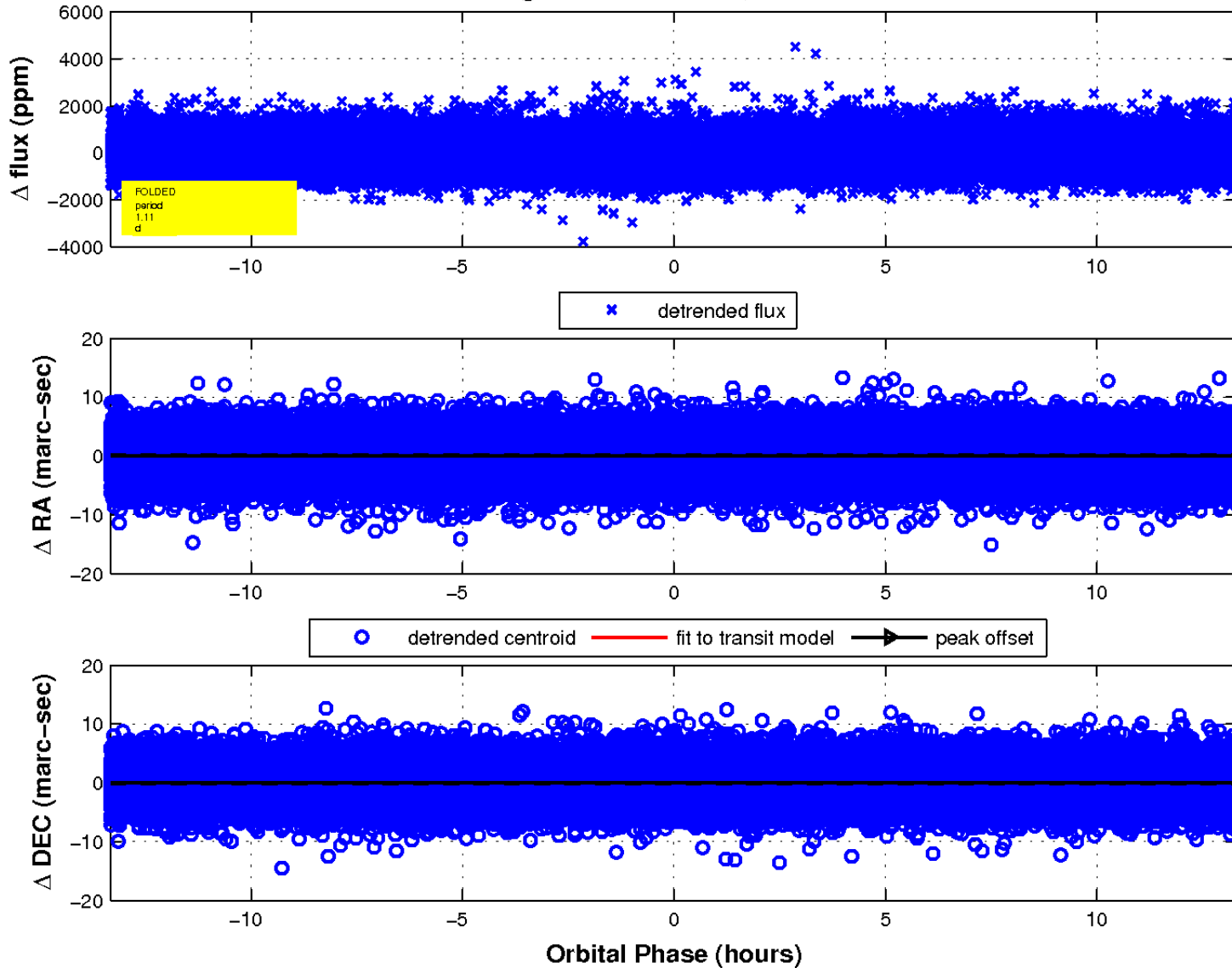




white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

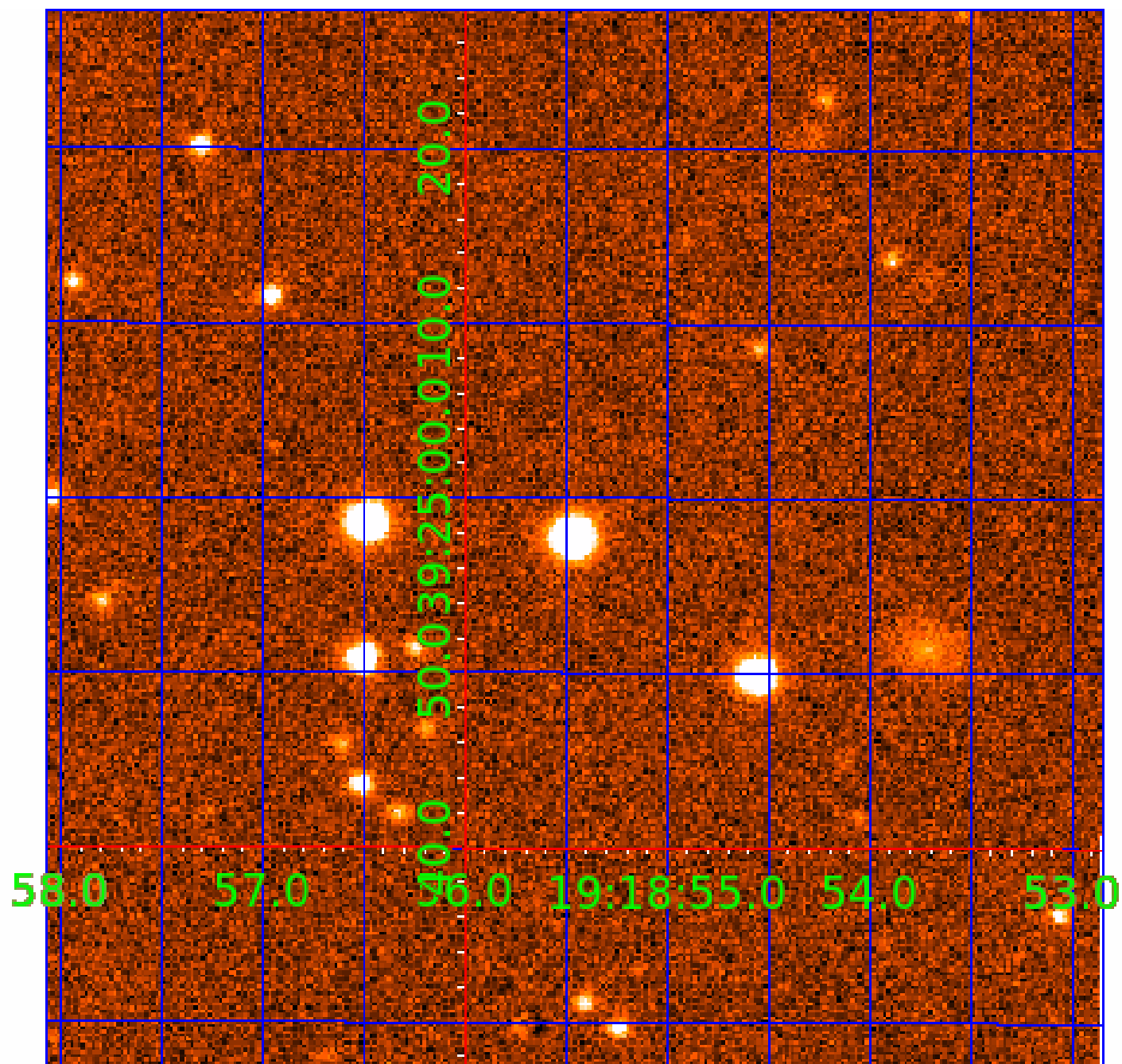


fluxWeightedCentroids, Planet 1 of 2



# UKIRT Image

Declination



# KIC 004358494

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
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## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
004358494-01	OBS	FP	0.00	1	0	0	0	LPP_DV
004358494-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_MARSHALL_TRACKER—TRANS_GAPPED—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—CENT_FEW_DIFS

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

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

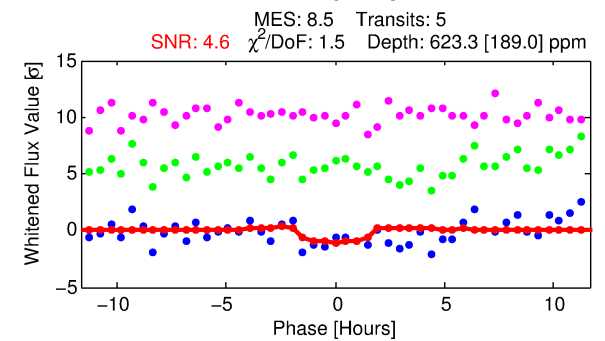
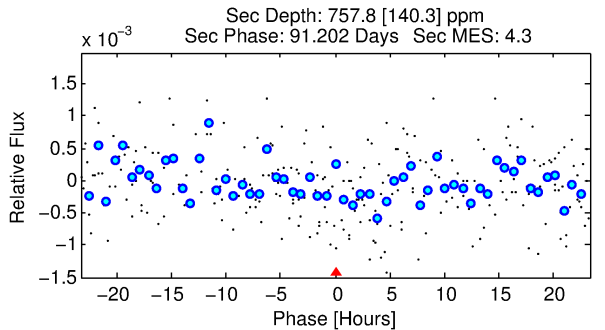
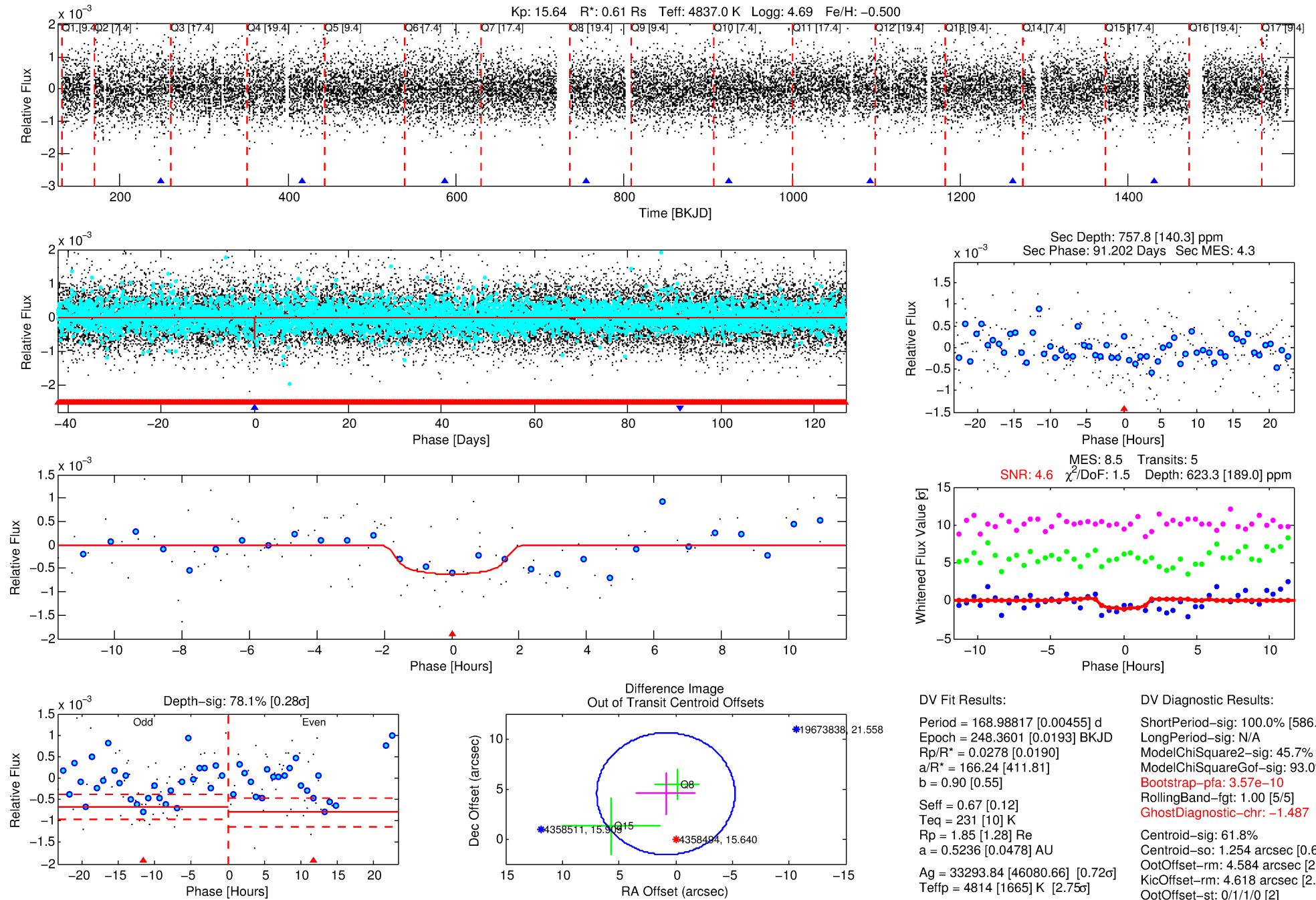
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 004358494-02

No Significant Match Found

# DV One-Page Summary

KIC: 4358494 Candidate: 2 of 2 Period: 168.988 d



## DV Fit Results:

Period = 168.98817 [0.00455] d  
Epoch = 248.3601 [0.0193] BKJD  
Rp/R\* = 0.0278 [0.0190]  
a/R\* = 166.24 [411.81]  
b = 0.90 [0.55]  
Seff = 0.67 [0.12]  
Teff = 231 [10] K  
Rp = 1.85 [1.28] Re  
a = 0.5236 [0.0478] AU  
Ag = 33293.84 [46080.66] [0.72σ]  
Teffp = 4814 [1665] K [2.75σ]

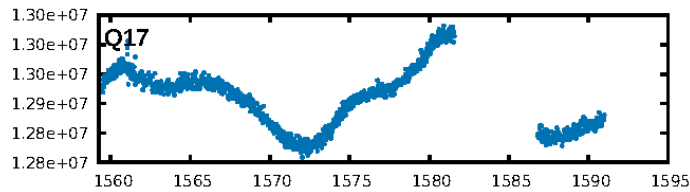
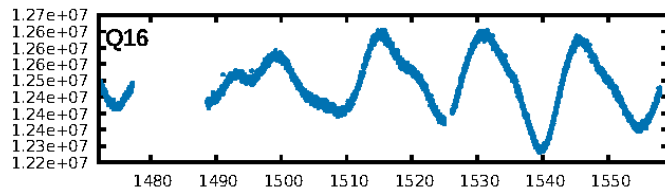
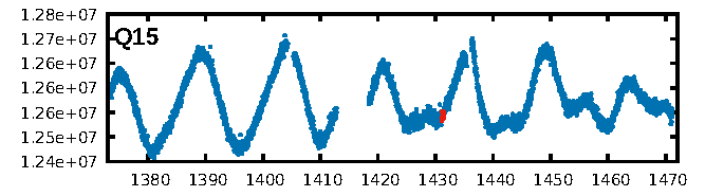
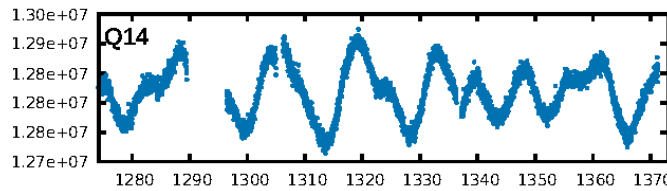
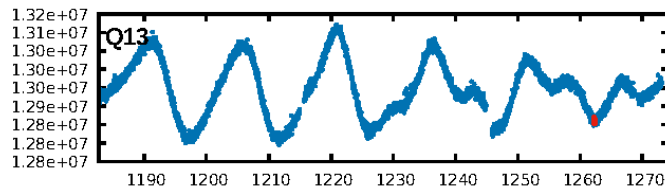
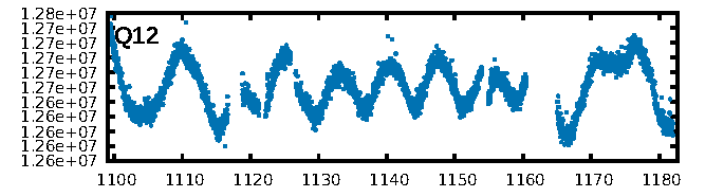
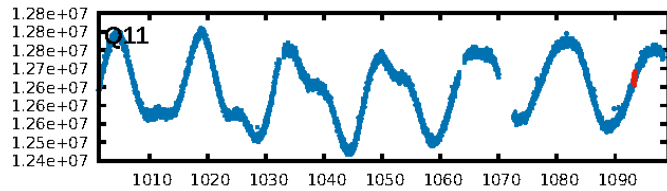
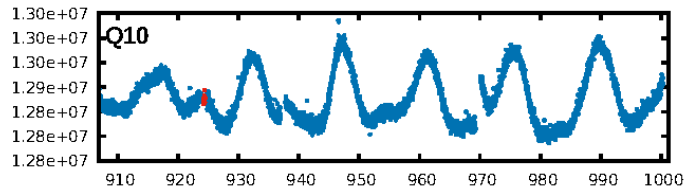
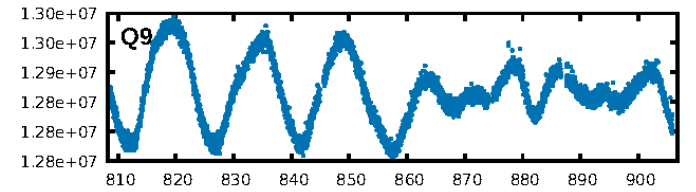
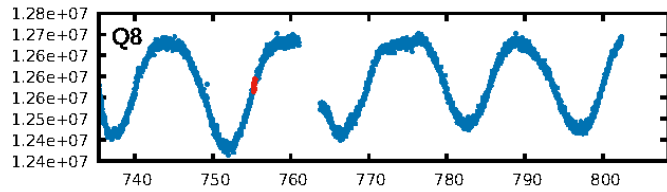
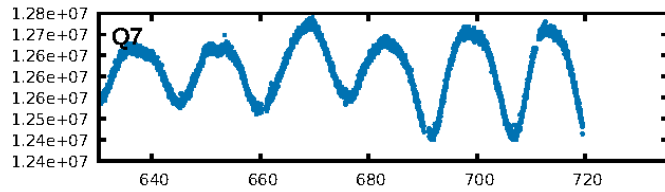
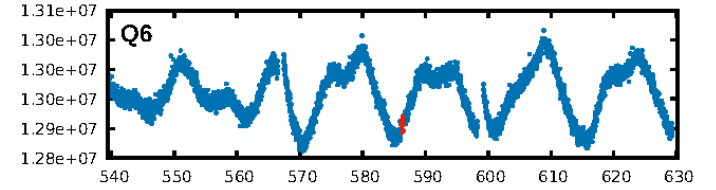
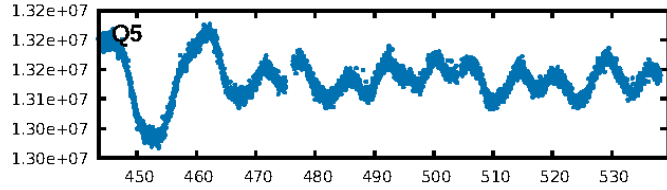
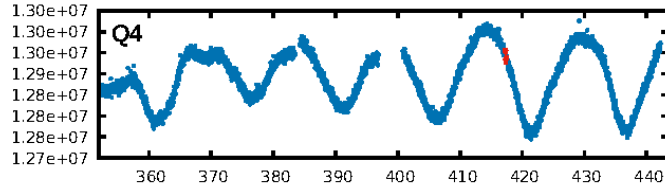
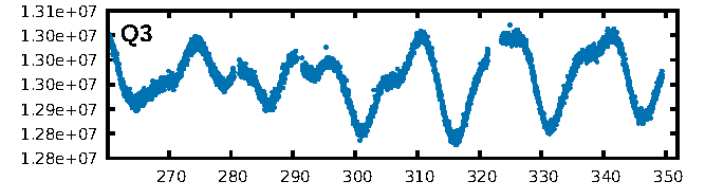
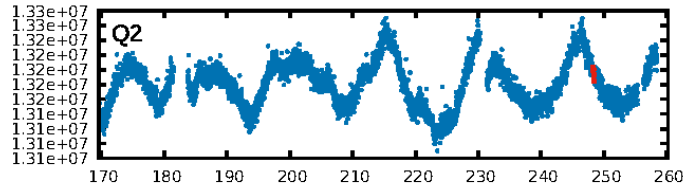
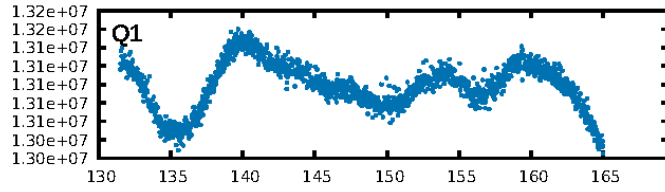
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [586.69σ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: 45.7%  
ModelChiSquareGof-sig: 93.0%  
**Bootstrap-pfa: 3.57e-10**  
RollingBand-fgt: 1.00 [5/5]  
**GhostDiagnostic-chr: -1.487**  
Centroid-sig: 61.8%  
Centroid-so: 1.254 arcsec [0.63σ]  
OotOffset-rm: 4.584 arcsec [2.26σ]  
OotOffset-st: 0/1/1/0 [2]  
KicOffset-rm: 4.618 arcsec [2.25σ]  
KicOffset-st: 0/1/1/0 [2]  
DiffImageQuality-fgm: 0.00 [0/2]  
DiffImageOverlap-fno: 0.14 [1/7]

Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 31-Jan-2016 21:38:20 Z

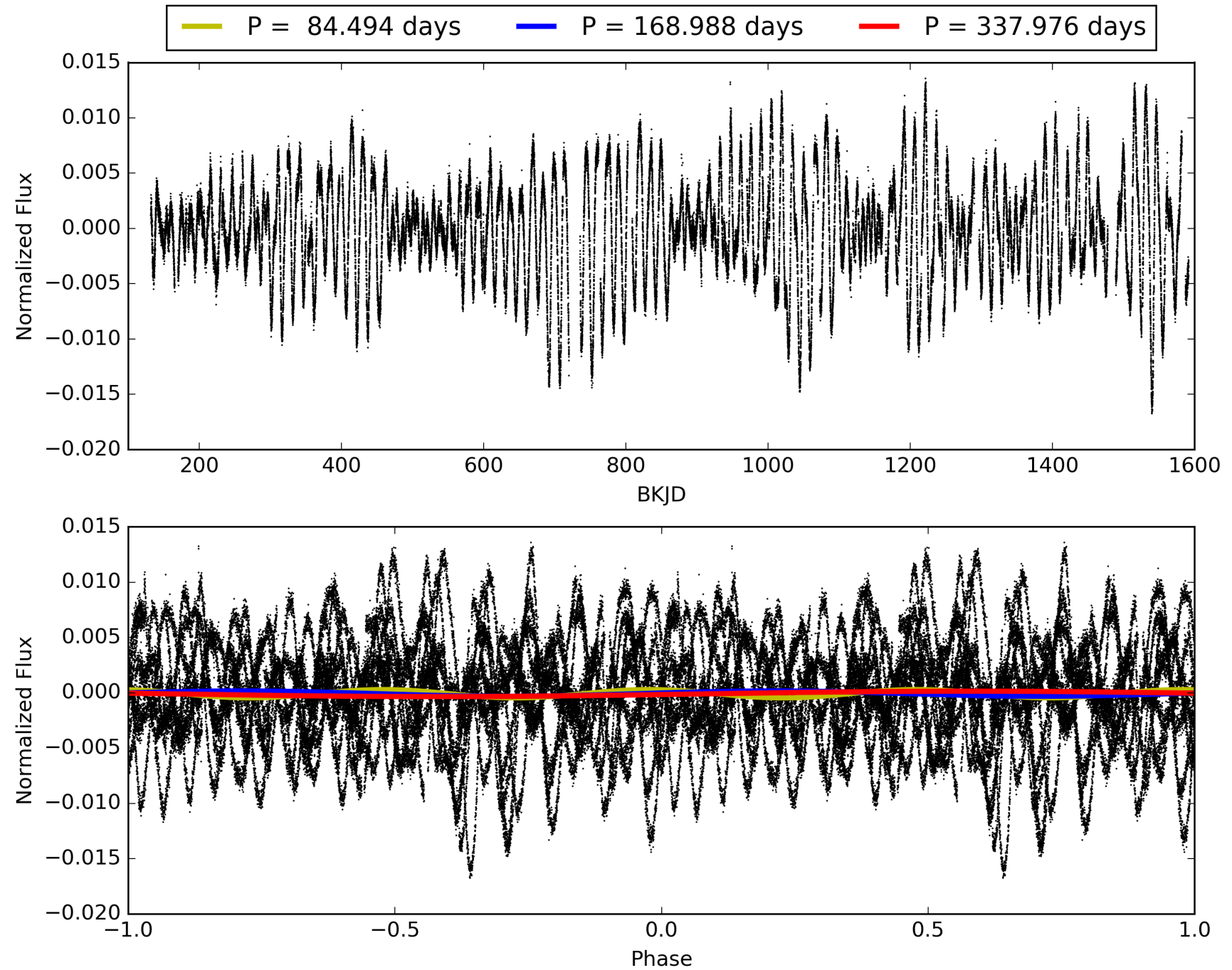
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

# TCE 004358494-02, PDC Light Curves



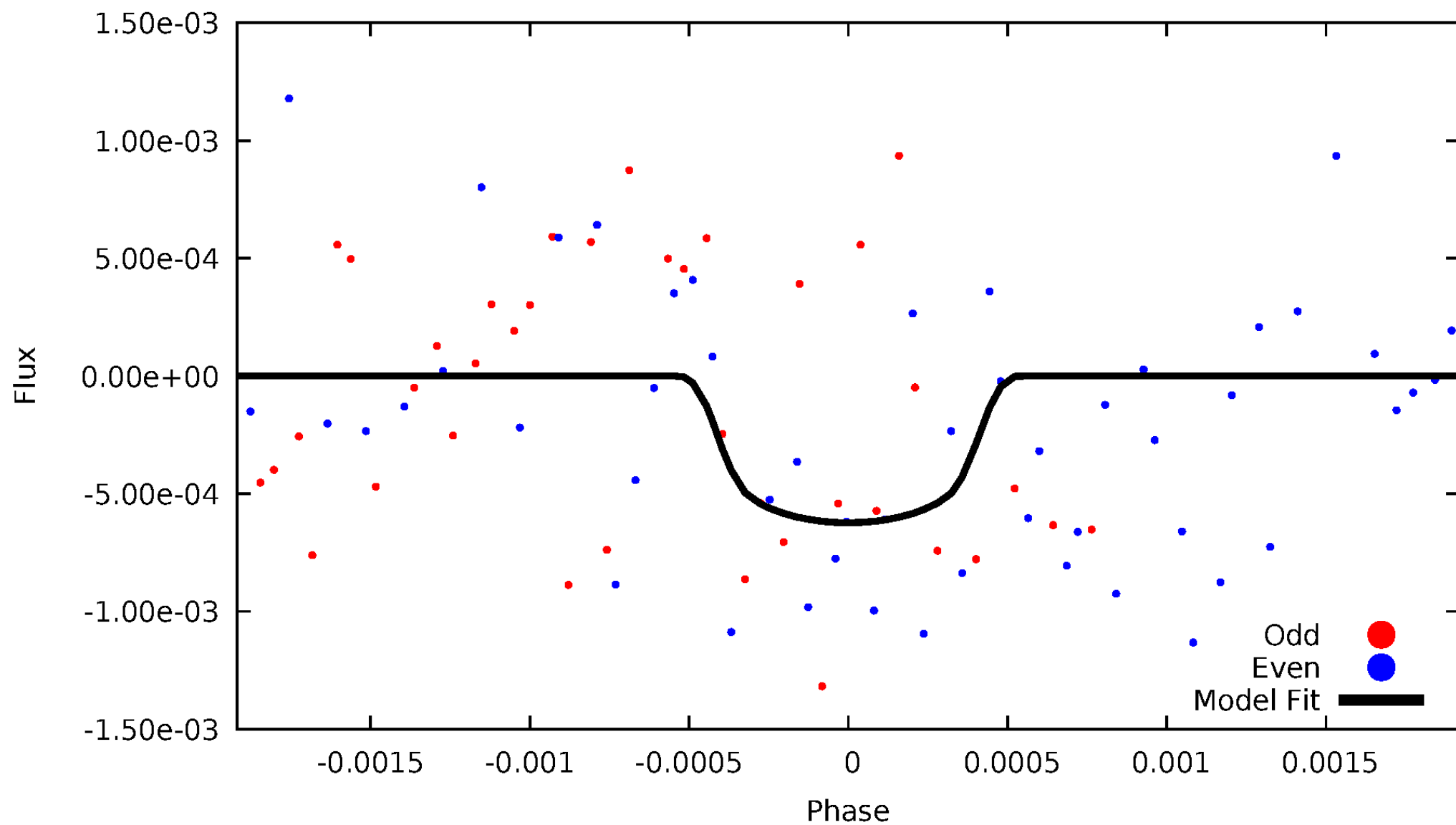


# TCE 004358494-02



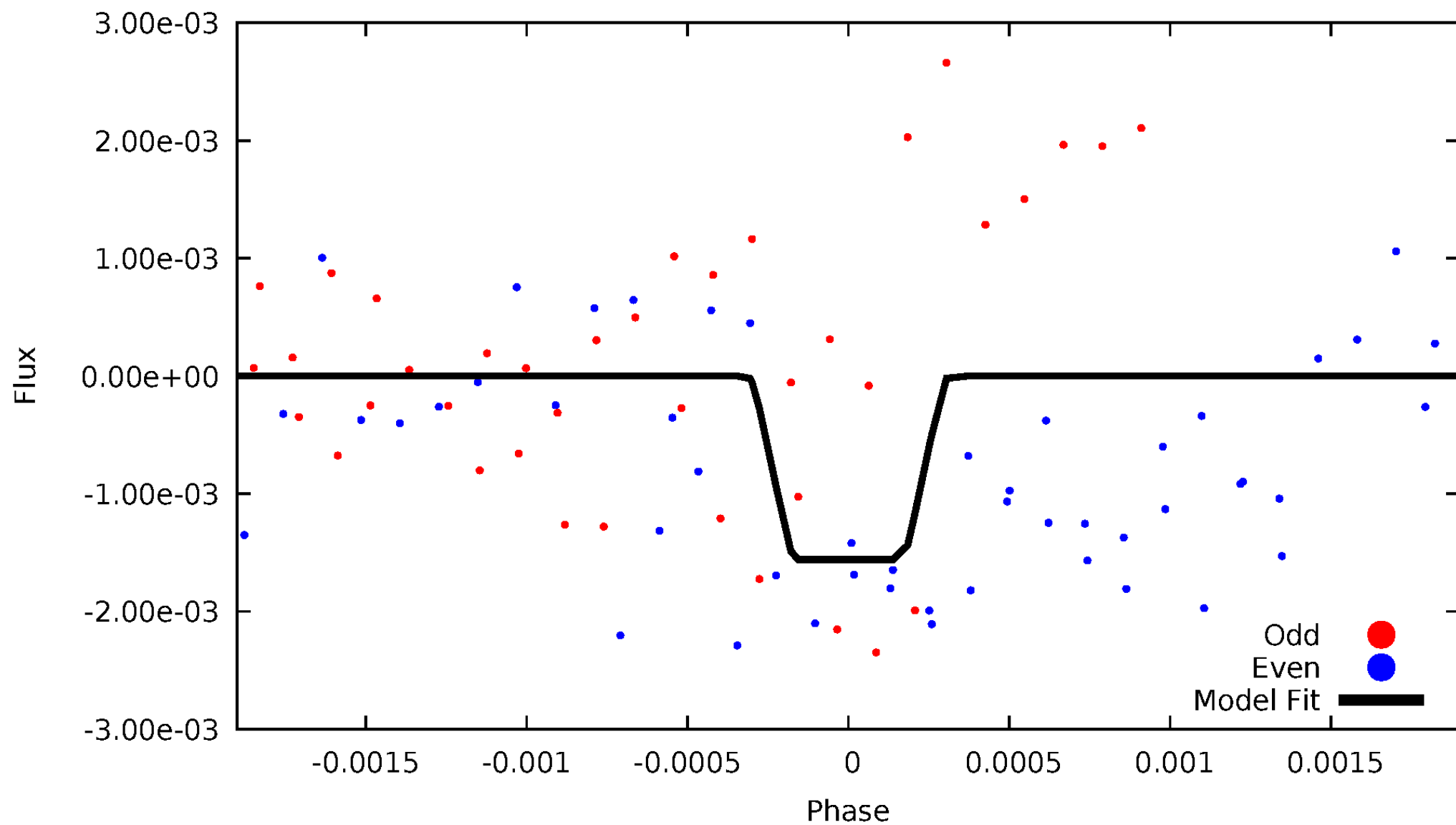
# DV Odd/Even

TCE 004358494-02



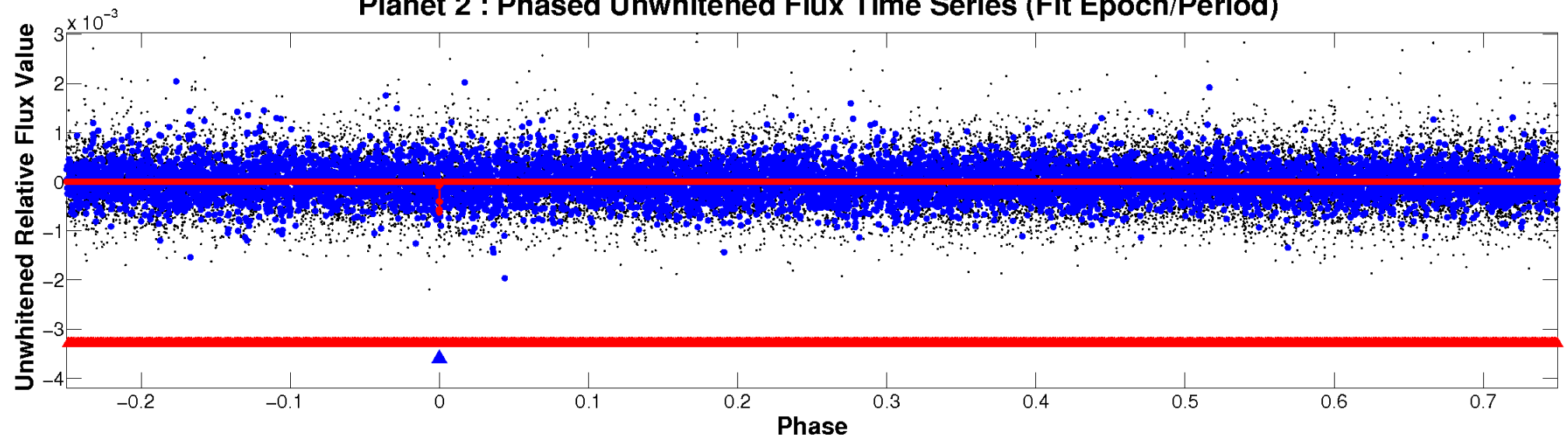
# ALT Odd/Even

TCE 004358494-02

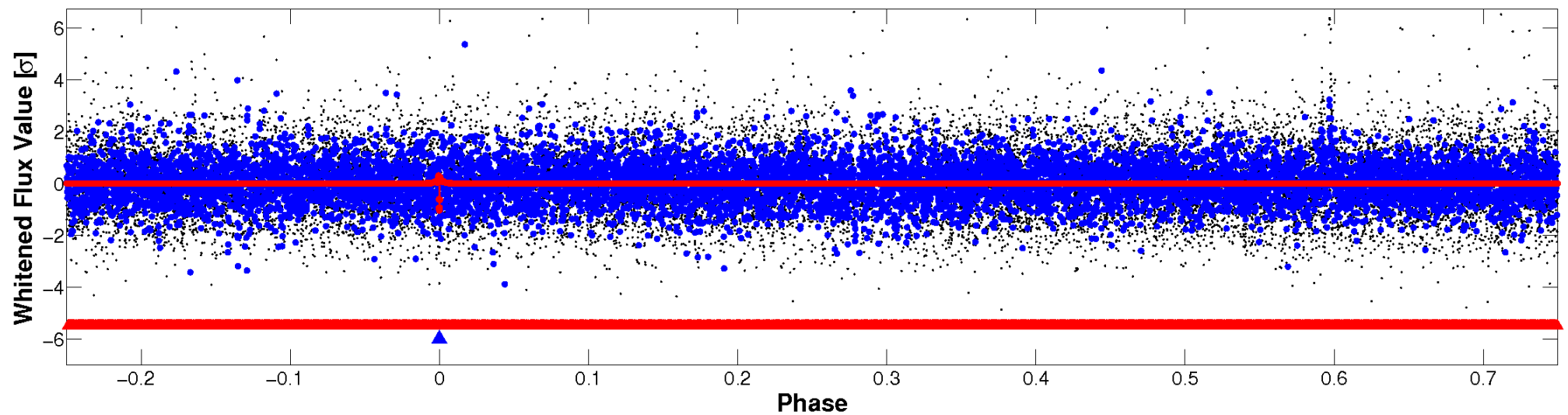


# Non-Whitened Vs. Whitened Light Curve

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

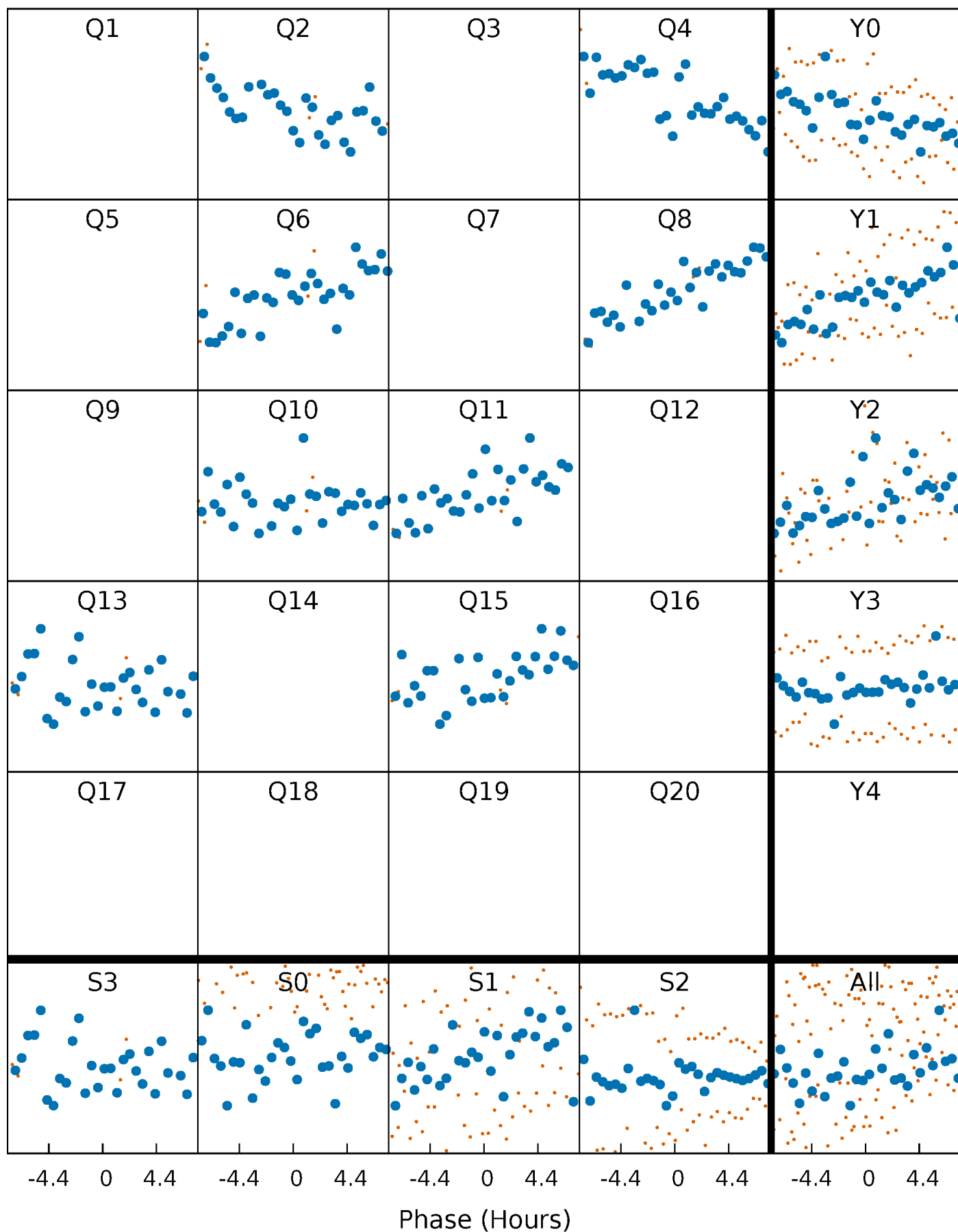


**Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)**



# PDC Quarter-Phased Transit Curves

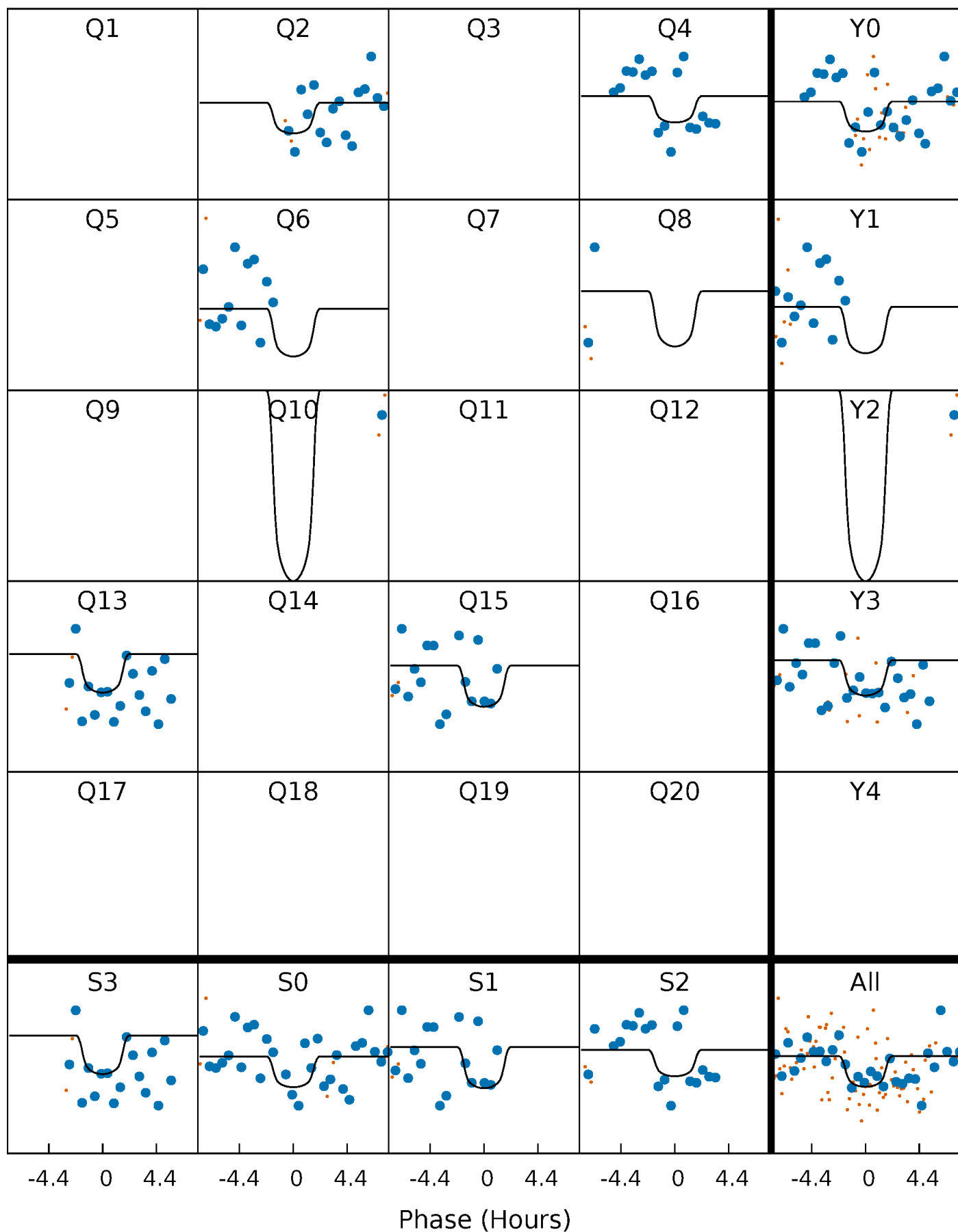
TCE 004358494-02 P=168.988173 Days  $T_0=248.360149$  (BKJD)





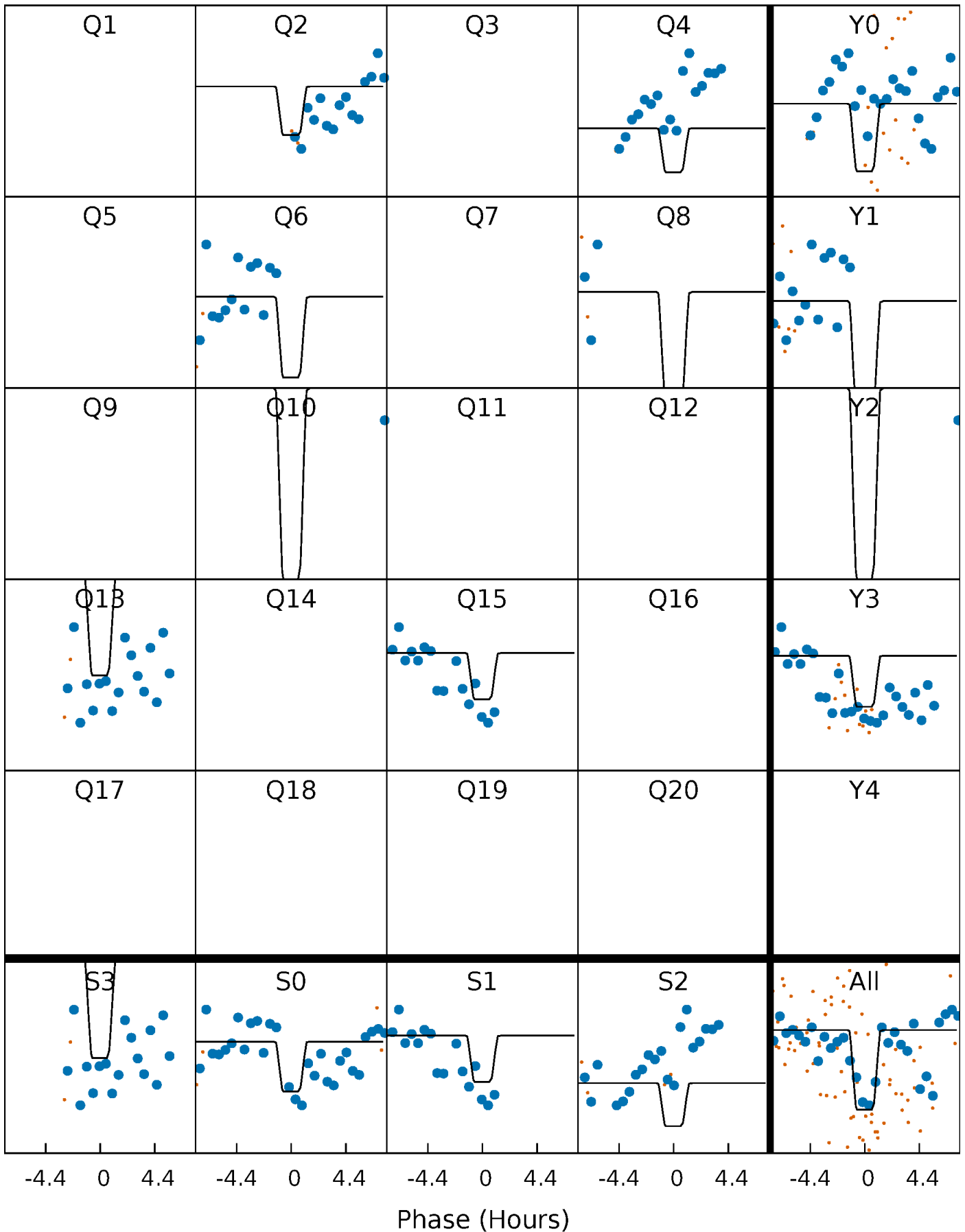
# DV Quarter-Phased Transit Curves

TCE 004358494-02 P=168.988173 Days  $T_0=248.360149$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

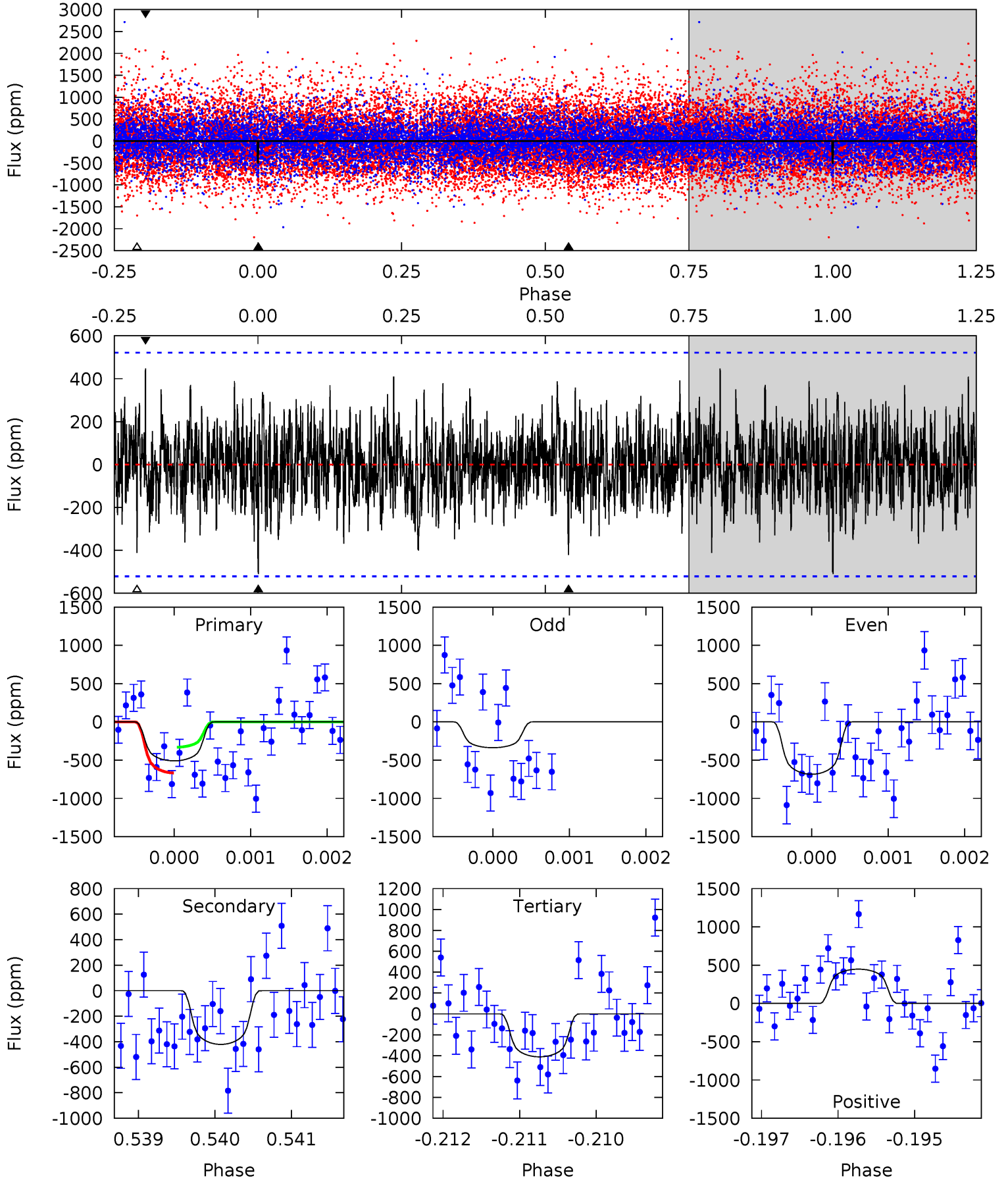
TCE 004358494-02 P=168.992352 Days  $T_0=248.331255$  (BKJD)



# DV Model-Shift Uniqueness Test

004358494-02, P = 168.988173 Days, E = 79.371976 Days

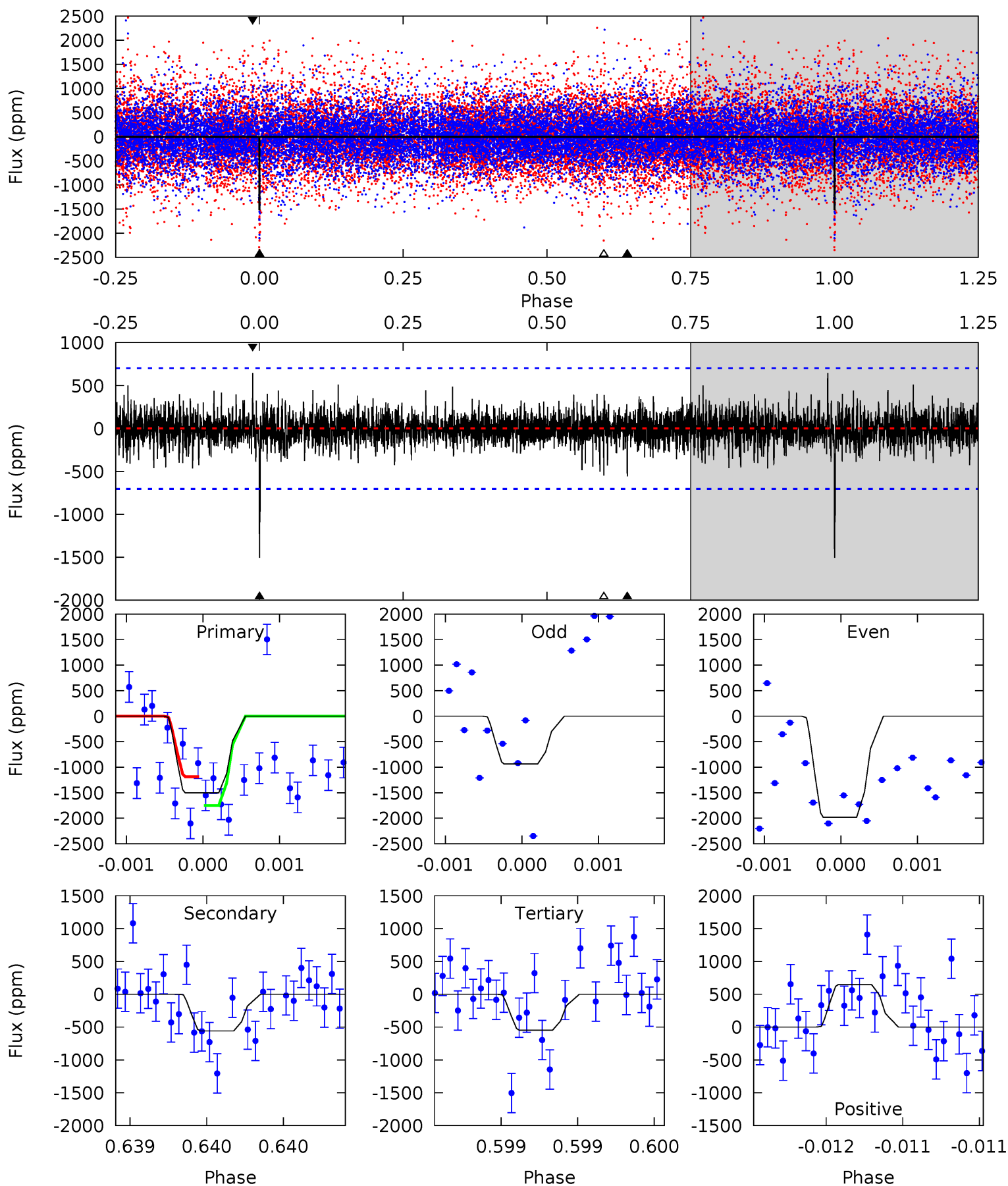
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
5.32	4.40	4.29	4.67	5.44	3.28	1.32	1.02	0.64	0.10	-0.28	1.80	1.22	0.47	1.75



# Alt Model-Shift Uniqueness Test

004358494-02, P = 168.992352 Days, E = 79.338903 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
11.8	4.38	4.29	5.08	5.52	3.40	1.00	7.52	6.72	0.10	-0.70	4.08	0.69	0.30	2.20



### Stellar Parameters For KIC 004358494

	$T_{\text{eff}}(K)$	$\log(g)$	$[\text{Fe}/\text{H}]$	$R$ ( $R_{\odot}$ )	$M(M_{\odot})$	$p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ )
	$4837^{+131}_{-145}$	$4.692^{+0.025}_{-0.065}$	$-0.500^{+0.300}_{-0.300}$	$0.611^{+0.070}_{-0.041}$	$0.673^{+0.060}_{-0.060}$	$4.153^{+0.482}_{-0.938}$
	+3%/-3%	+1%/-1%	+60%/-60%	+11%/-7%	+9%/-9%	+12%/-23%
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 004358494-02 / KOI

Detrend	Depth (ppm)	$R_p$ ( $R_{\oplus}$ )	$T_{\text{max}}$ (K)	$T_{\text{obs}}$ (K)	$A_{\text{obs}}$
DV	$-421 \pm 96$	$2.00^{+1.33}_{-1.07}$	$325^{+12}_{-10}$	$4182^{+1565}_{-686}$	$15396^{+55748}_{-9886}$
Alt.	$-558 \pm 127$	$2.67^{+1.38}_{-1.26}$	$325^{+11}_{-11}$	$3960^{+1091}_{-511}$	$11400^{+28901}_{-6538}$

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



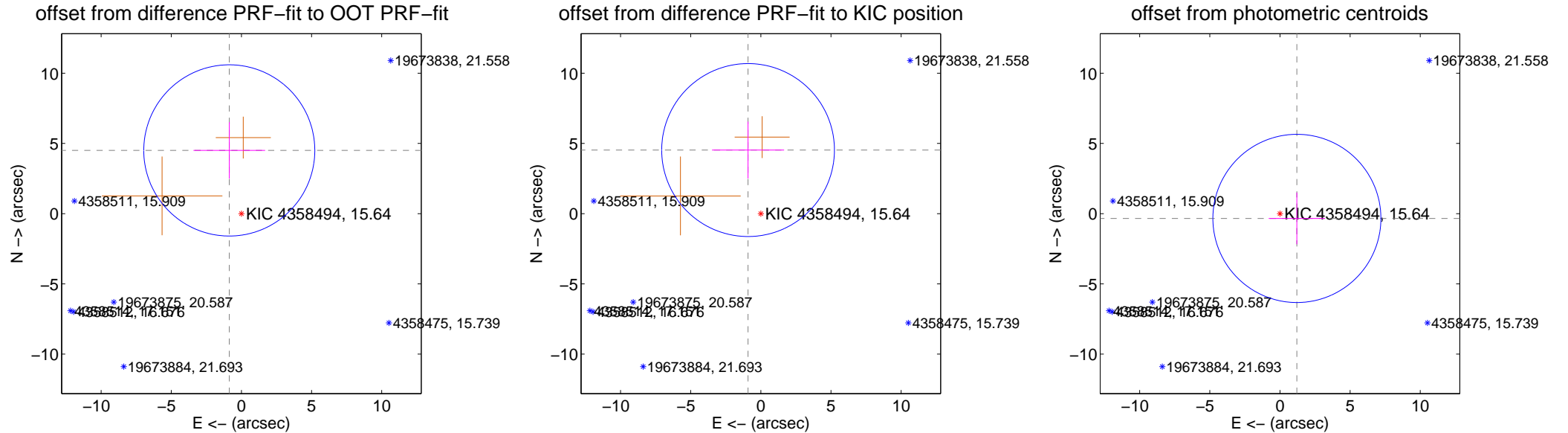
## DV Centroid Data

Supplemental centroid analysis for 004358494-02. Kepler magnitude: 15.64. Transit SNR 4.61

There are 0 quarters with good PRF difference image offsets

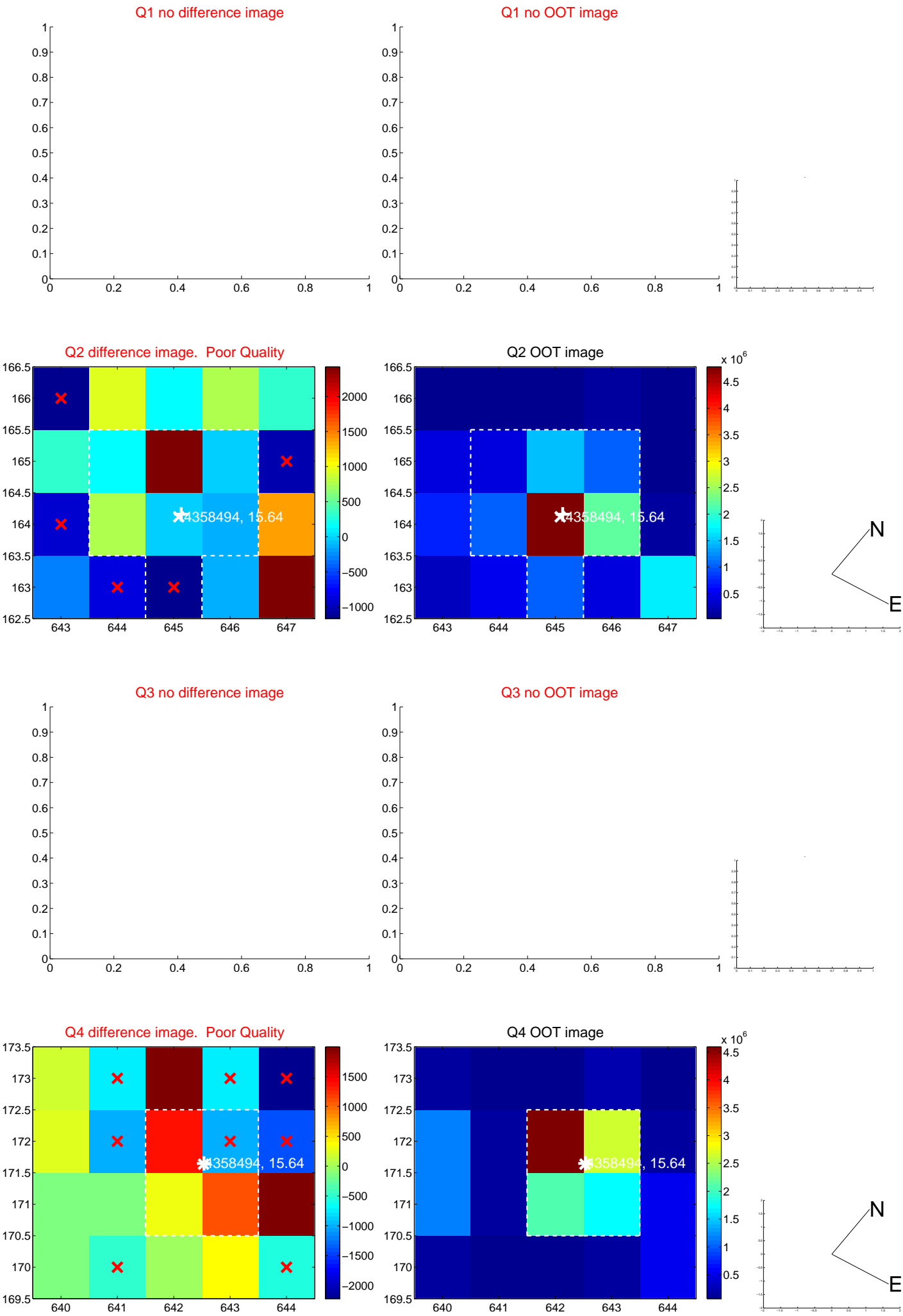
The direct PRF centroid is offset from the target star catalog position by about 0.08 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$4.584 \pm 2.032$	2.26	$0.866 \pm 2.554$	$4.502 \pm 2.010$
PRF-fit source offset from KIC position	$4.618 \pm 2.052$	2.25	$0.910 \pm 2.571$	$4.527 \pm 2.028$
photometric centroid source offset	$1.25 \pm 2.00$	0.63	$-1.21 \pm 2.01$	$-0.34 \pm 1.84$

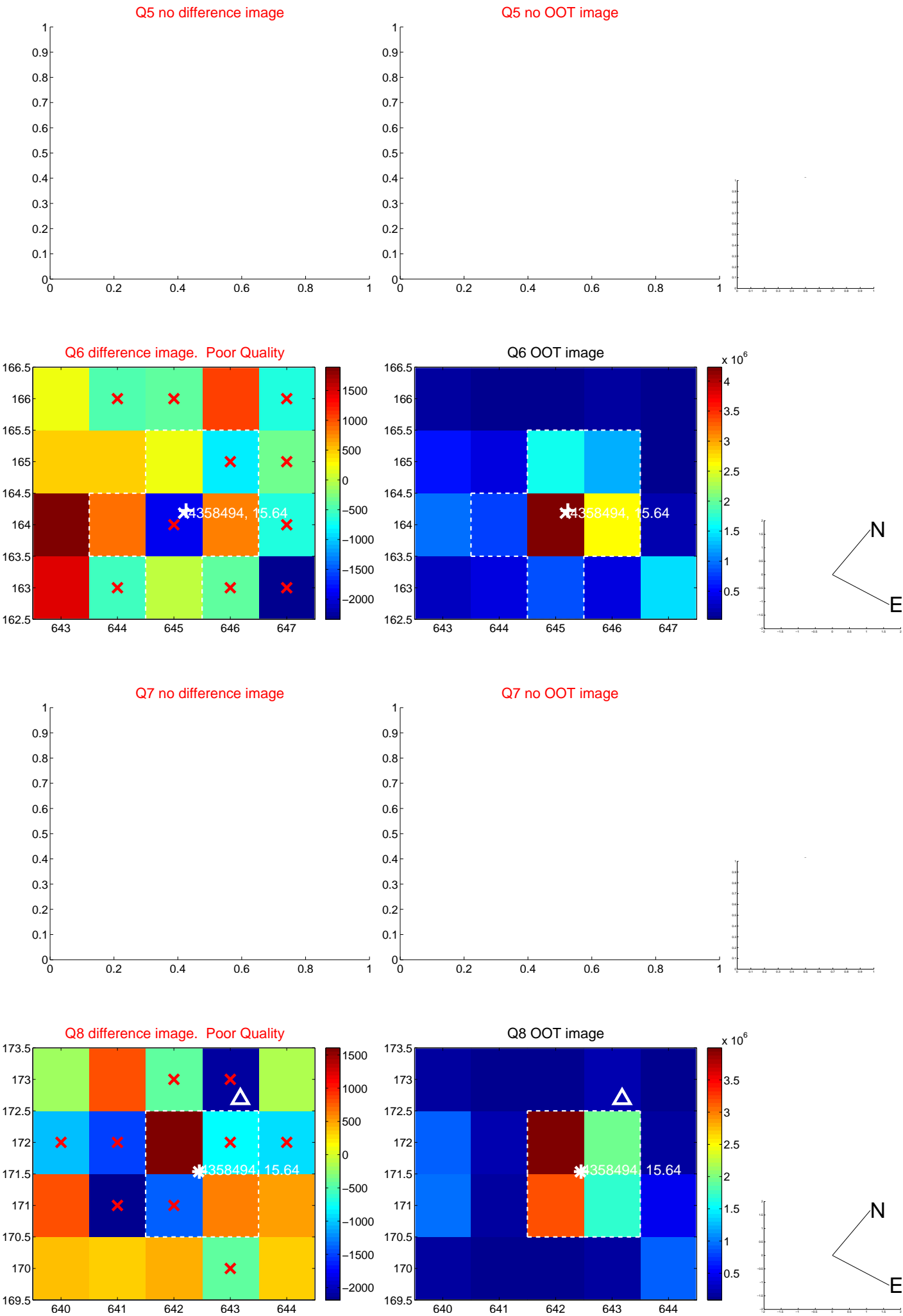


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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

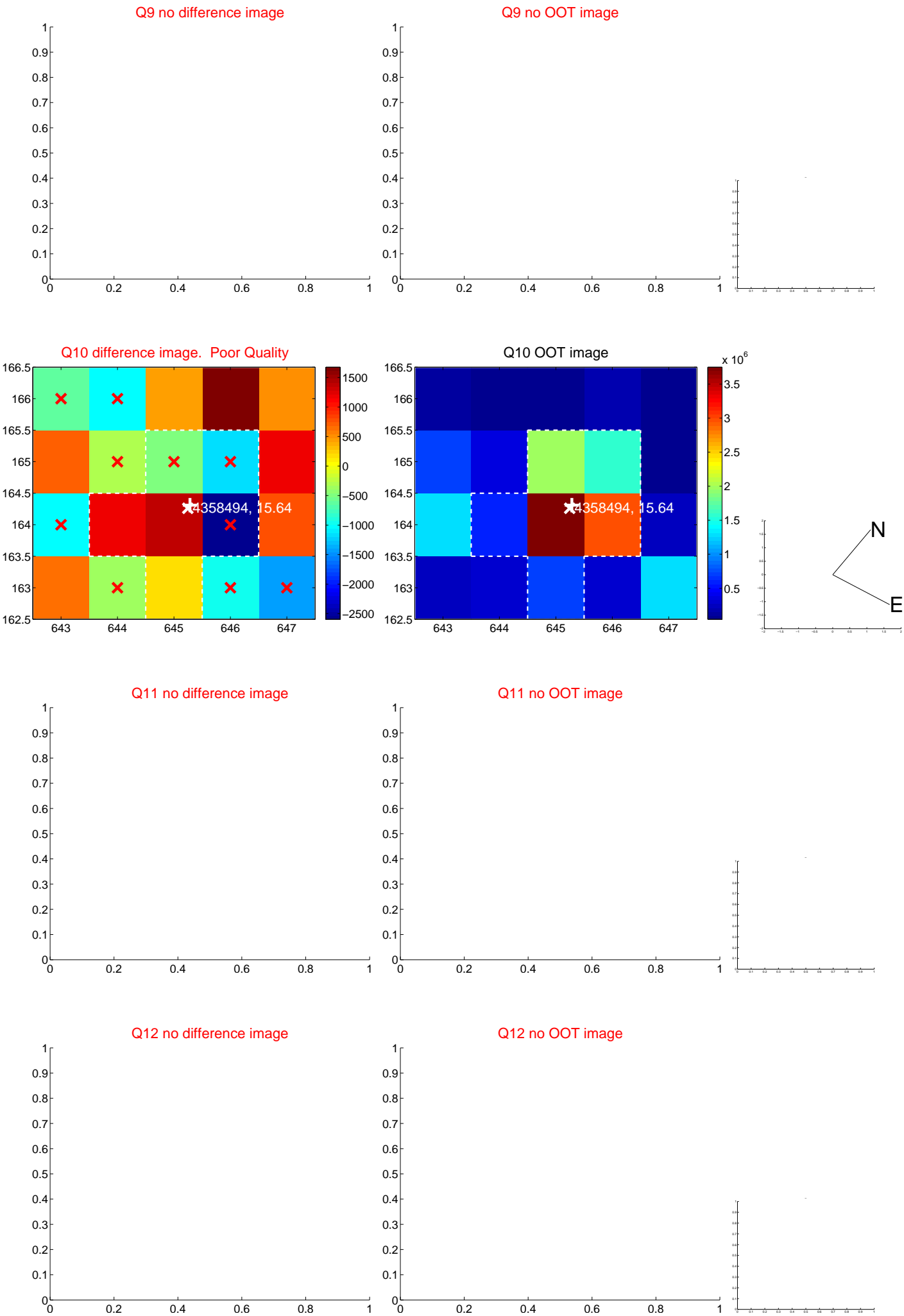
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



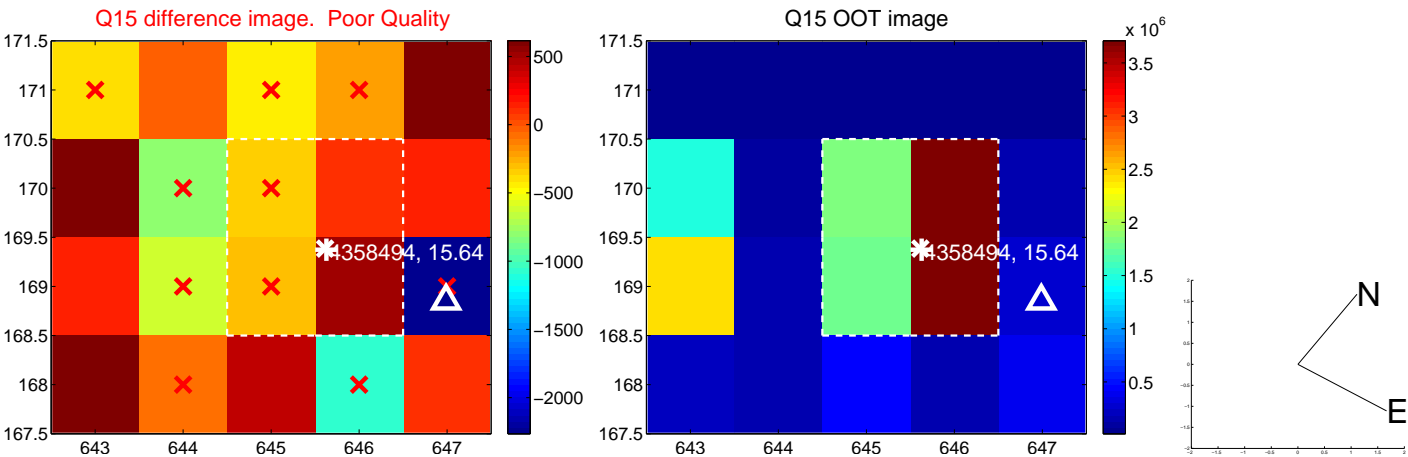
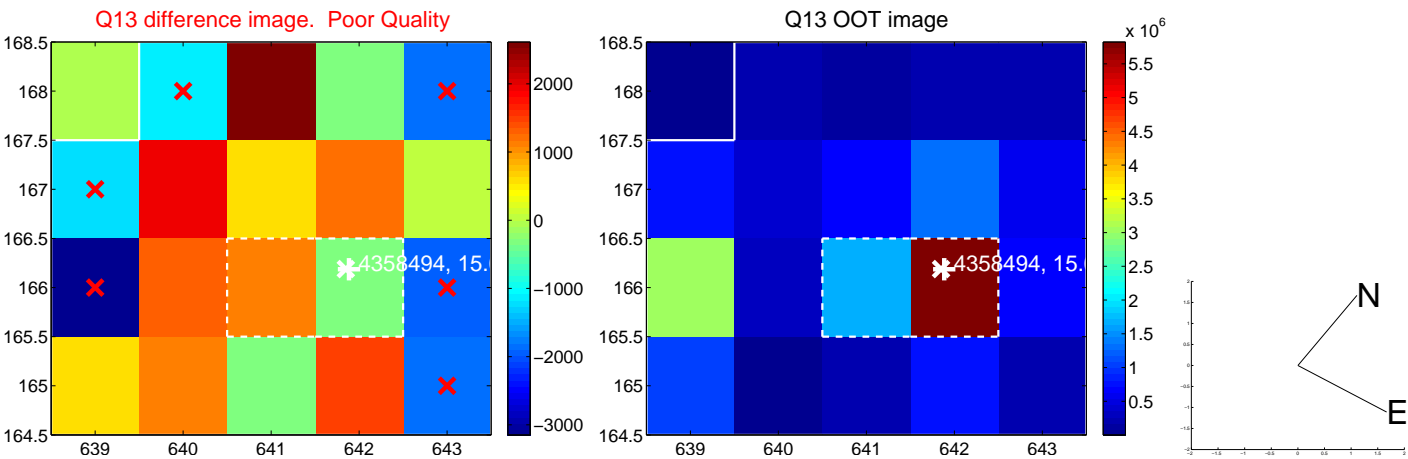
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

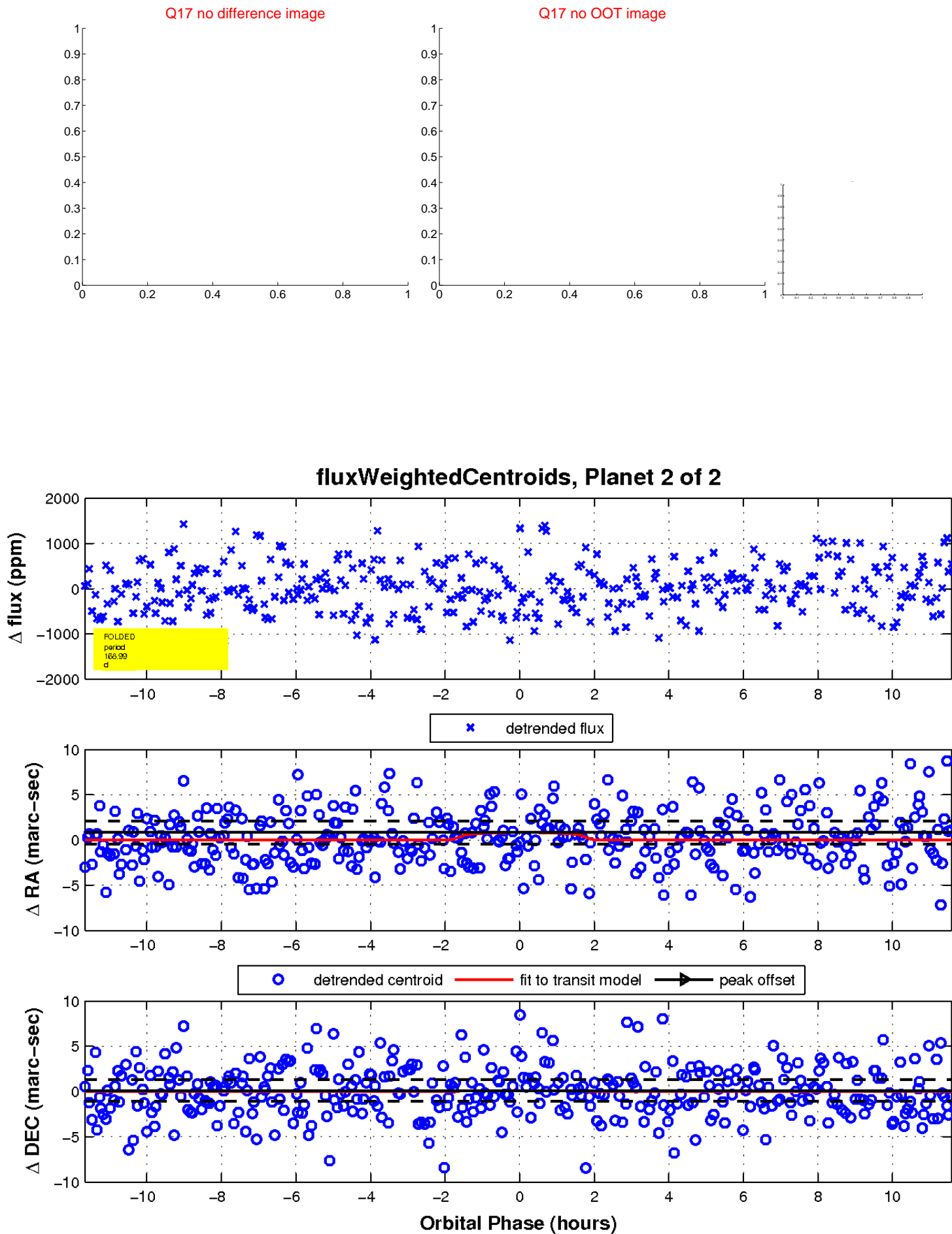


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.





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



UKIRT Image

