

# KIC 009636569

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
009636569-01	OBS	0527.01	10.636296	139.783425	170.6	4.137	22.4	19.3	0.77	5834	1.20	77.19
009636569-02	OBS	No	10.728489	137.511834	39.6	30.608	8.3	9.7	0.77	5834	0.52	76.30

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009636569-01	OBS	FP	0.00	0	1	1	1	MOD_SEC_DV—MOD_SEC_ALT—CENT_RESOLVED_OFFSET—EPHEM_MATCH
009636569-02	OBS	FP	0.00	1	0	0	0	LPP_DV

**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.

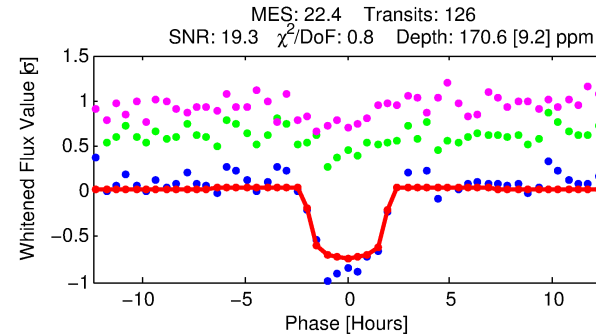
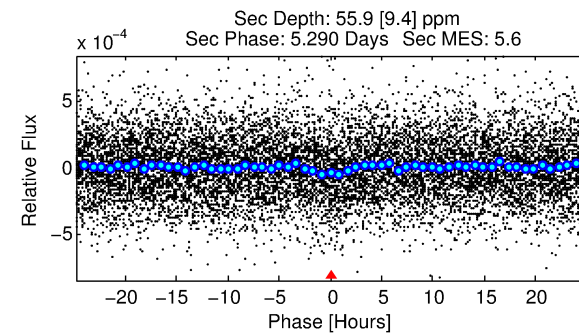
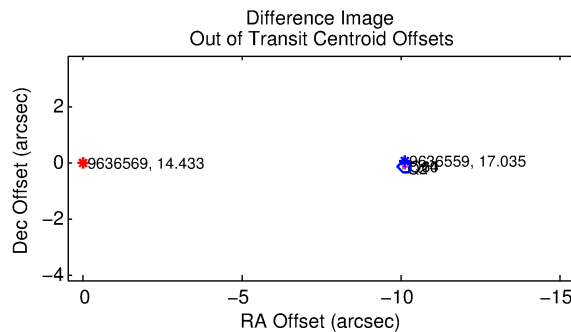
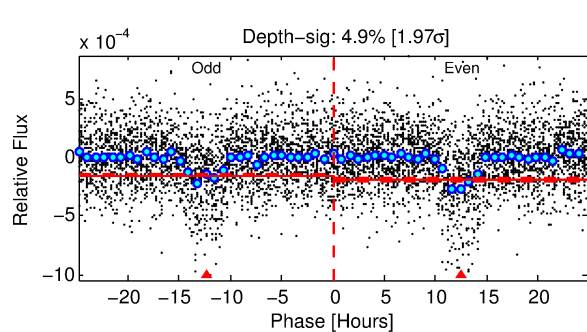
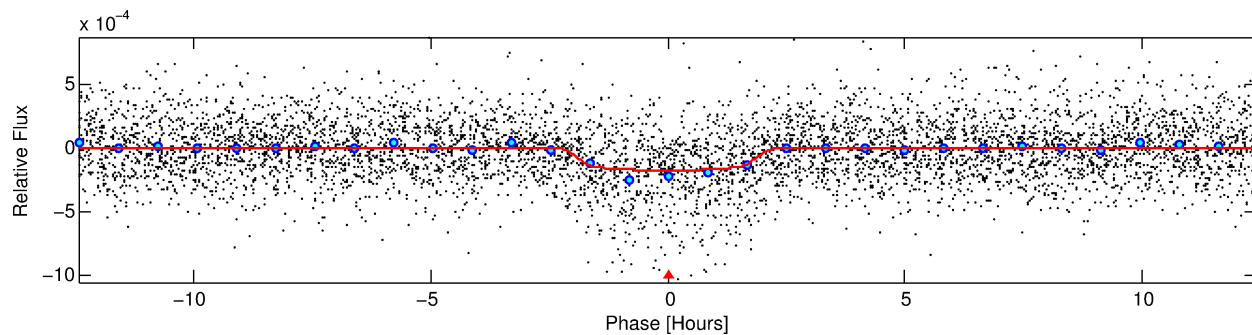
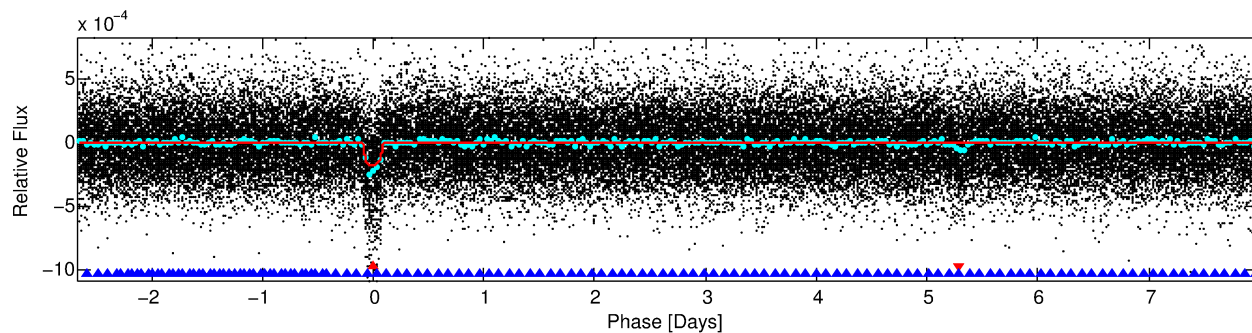
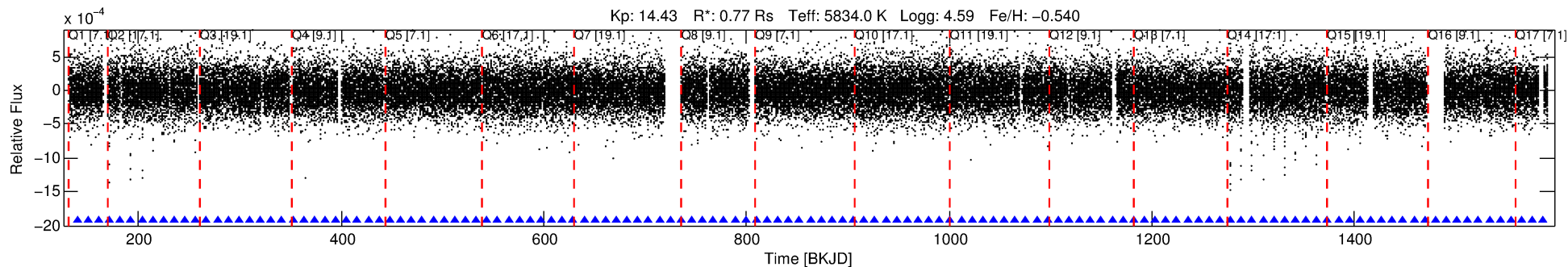
## Ephemeris Match Information For 009636569-01

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	$\sigma_P$	$\sigma_T$
009636569-01	9636569	3618.01	9636559	1:1	10.1	-2	2	17.04	14.44	1478.90	Direct-PRF	0	0.02	0.01

**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: 9636569 Candidate: 1 of 2 Period: 10.636 d  
KOI: K00527.01 Corr: 0.904



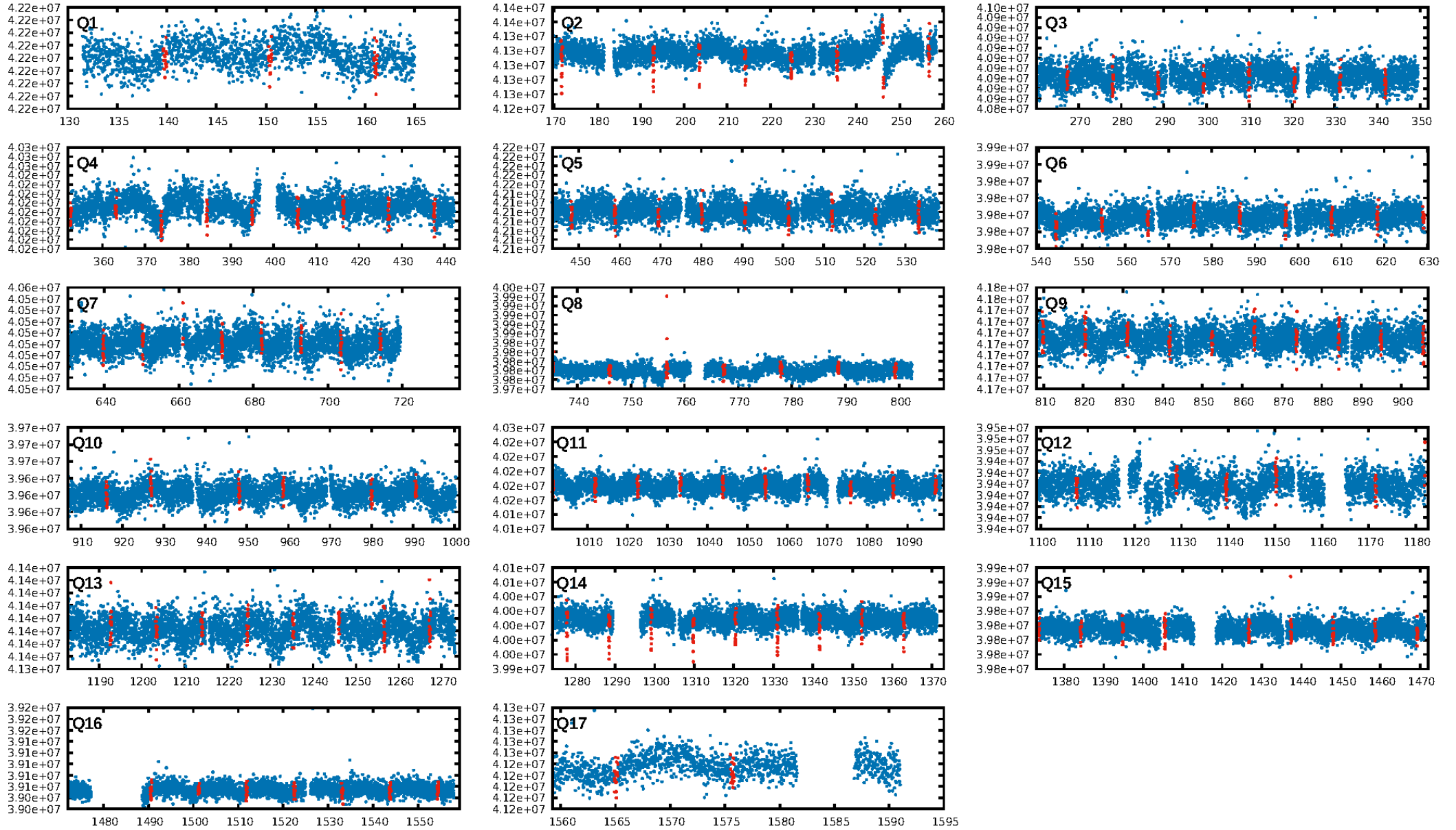
## DV Fit Results:

Period = 10.63630 [0.00006] d  
Epoch = 139.7834 [0.0042] BKJD  
Rp/R\* = 0.0142 [0.0028]  
a/R\* = 9.08 [9.26]  
b = 0.90 [0.21]  
Seff = 77.19 [24.27]  
Teq = 756 [59] K  
Rp = 1.20 [0.38] Re  
a = 0.0898 [0.0183] AU  
Ag = 173.34 [91.23] [1.89 $\sigma$ ]  
Teff = 4240 [476] K [7.27 $\sigma$ ]

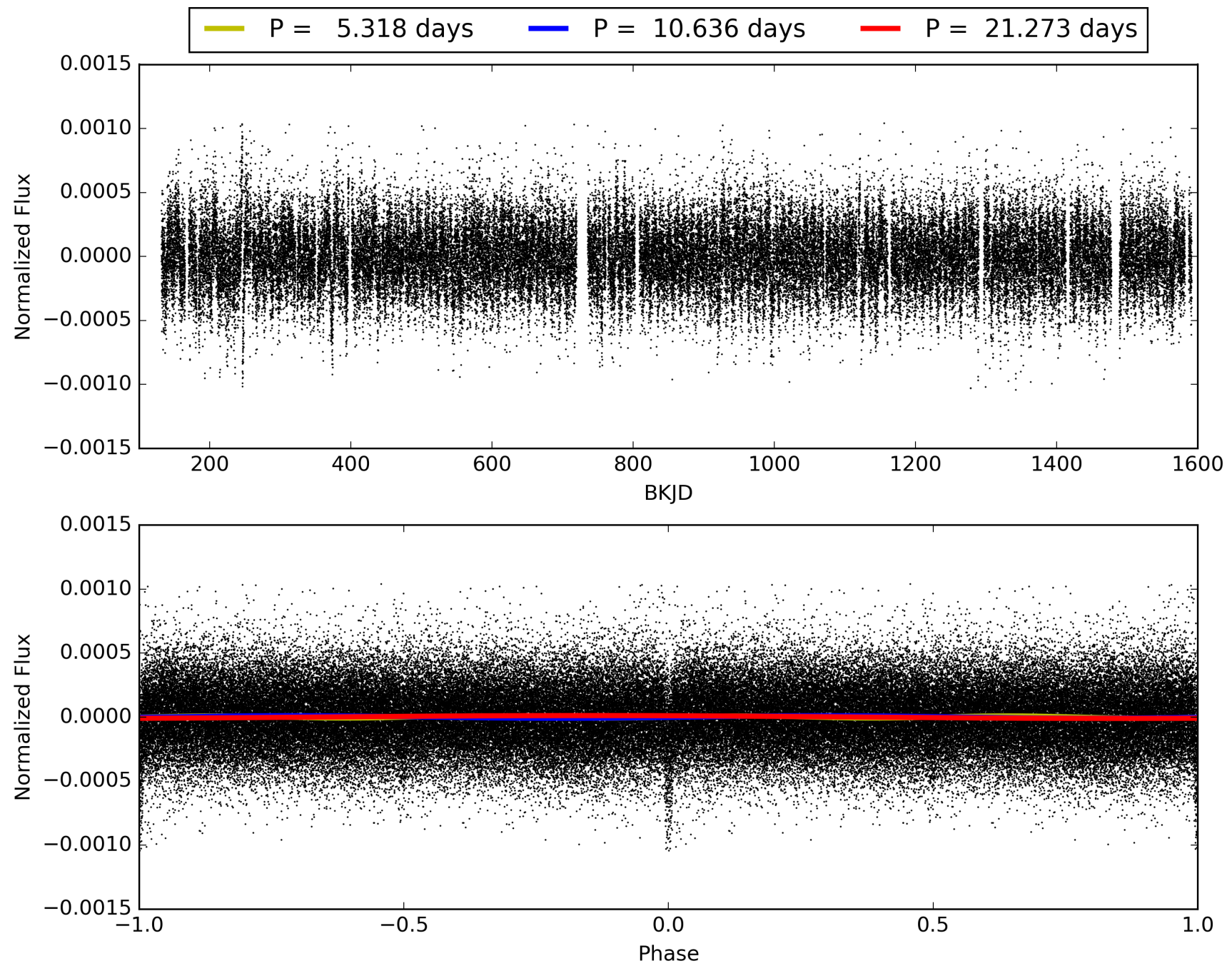
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 5.7% [0.07 $\sigma$ ]  
ModelChiSquare2-sig: 0.0%  
ModelChiSquareGof-sig: 100.0%  
Bootstrap-pfa: 3.00e-103  
RollingBand-fgt: 1.00 [121/121]  
GhostDiagnostic-chr: -0.4554  
Centroid-sig: N/A  
Centroid-so: 231.438 arcsec [366.57 $\sigma$ ]  
OotOffset-rm: 10.116 arcsec [149.14 $\sigma$ ]  
KicOffset-rm: 10.096 arcsec [141.28 $\sigma$ ]  
OotOffset-st: 4/0/0/0 [4]  
KicOffset-st: 4/0/0/0 [4]  
DiffImageQuality-fgm: 1.00 [4/4]  
DiffImageOverlap-fno: 0.88 [15/17]

# TCE 009636569-01, PDC Light Curves

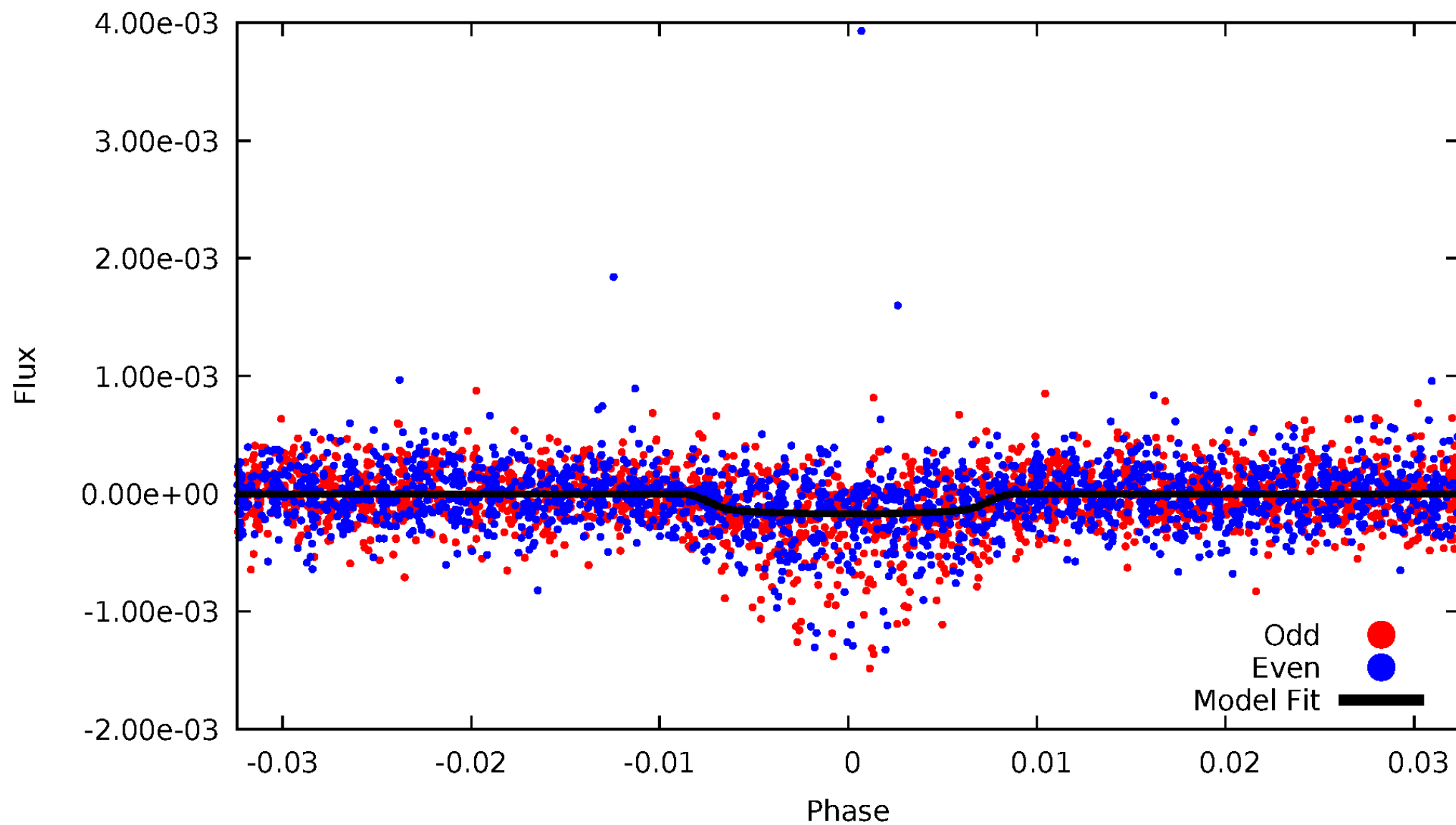


TCE 009636569-01



# DV Odd/Even

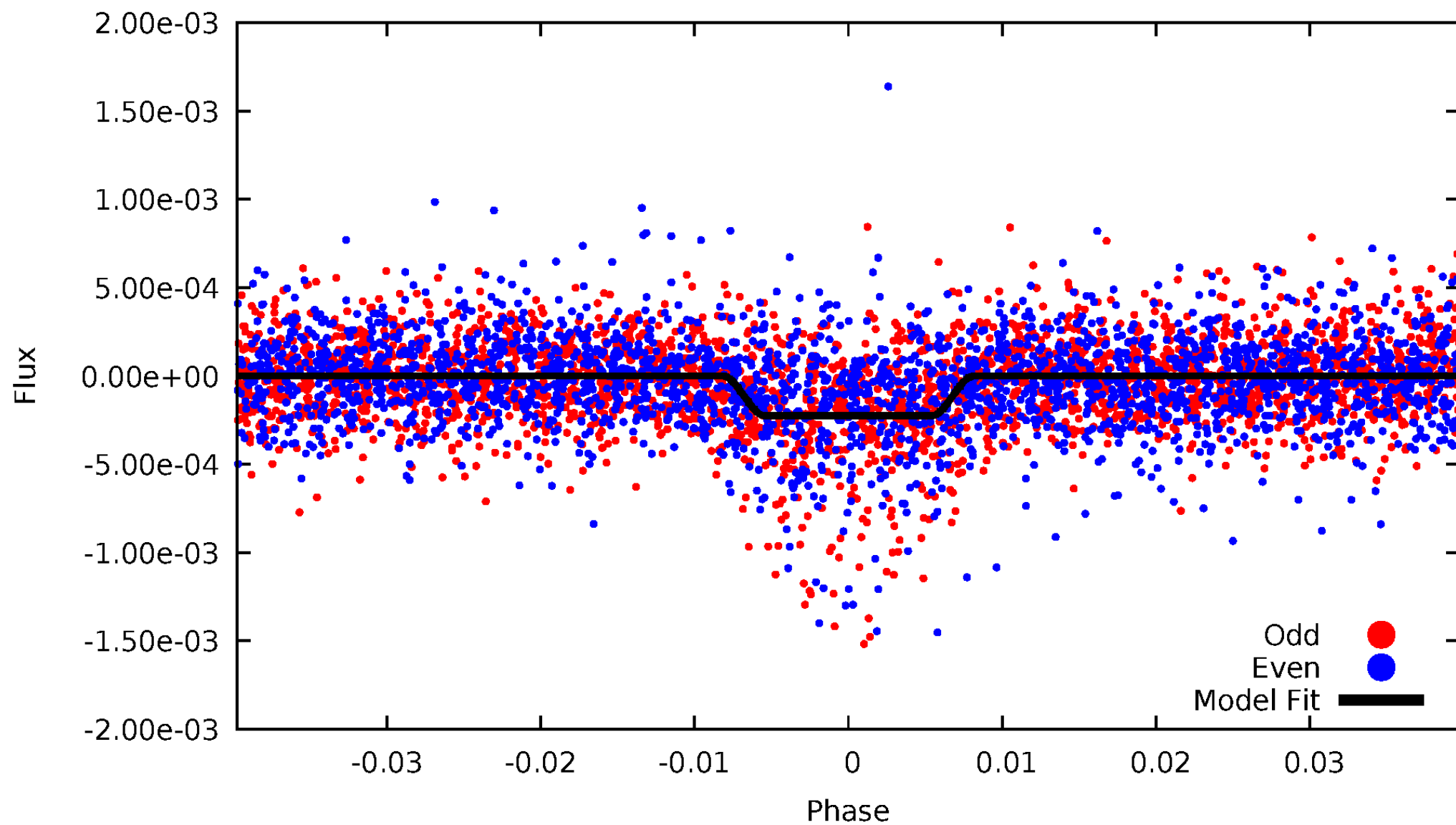
TCE 009636569-01





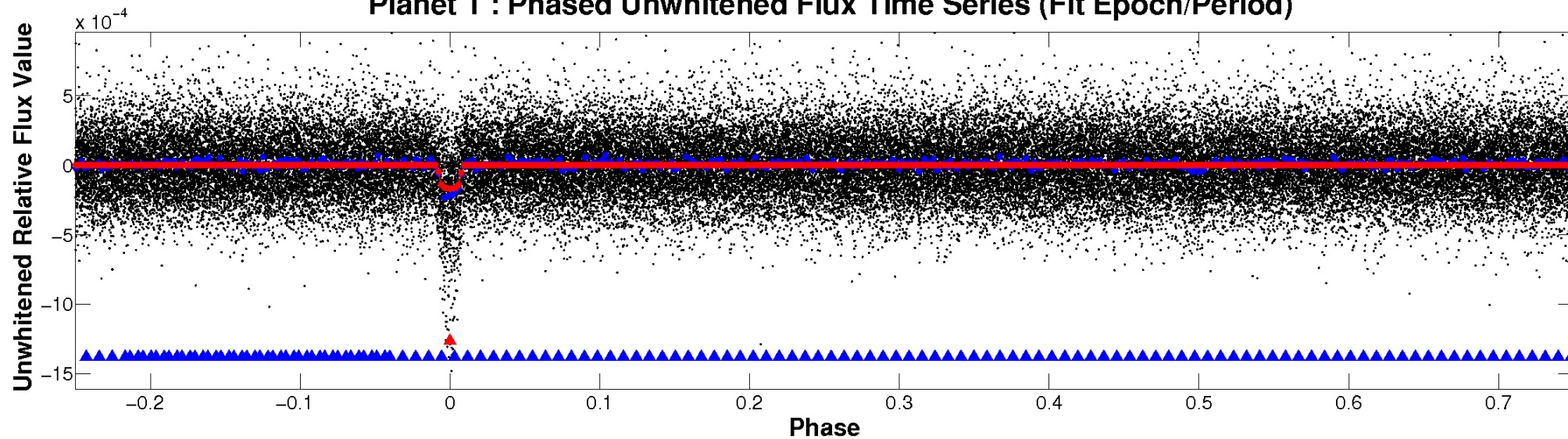
# ALT Odd/Even

TCE 009636569-01

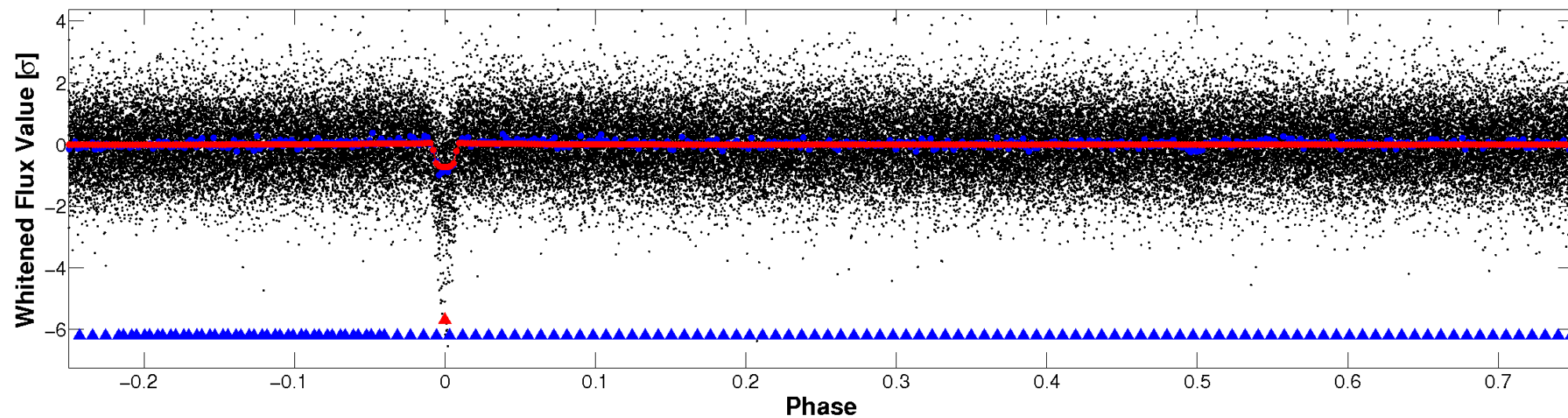


# Non-Whitened Vs. Whitened Light Curve

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

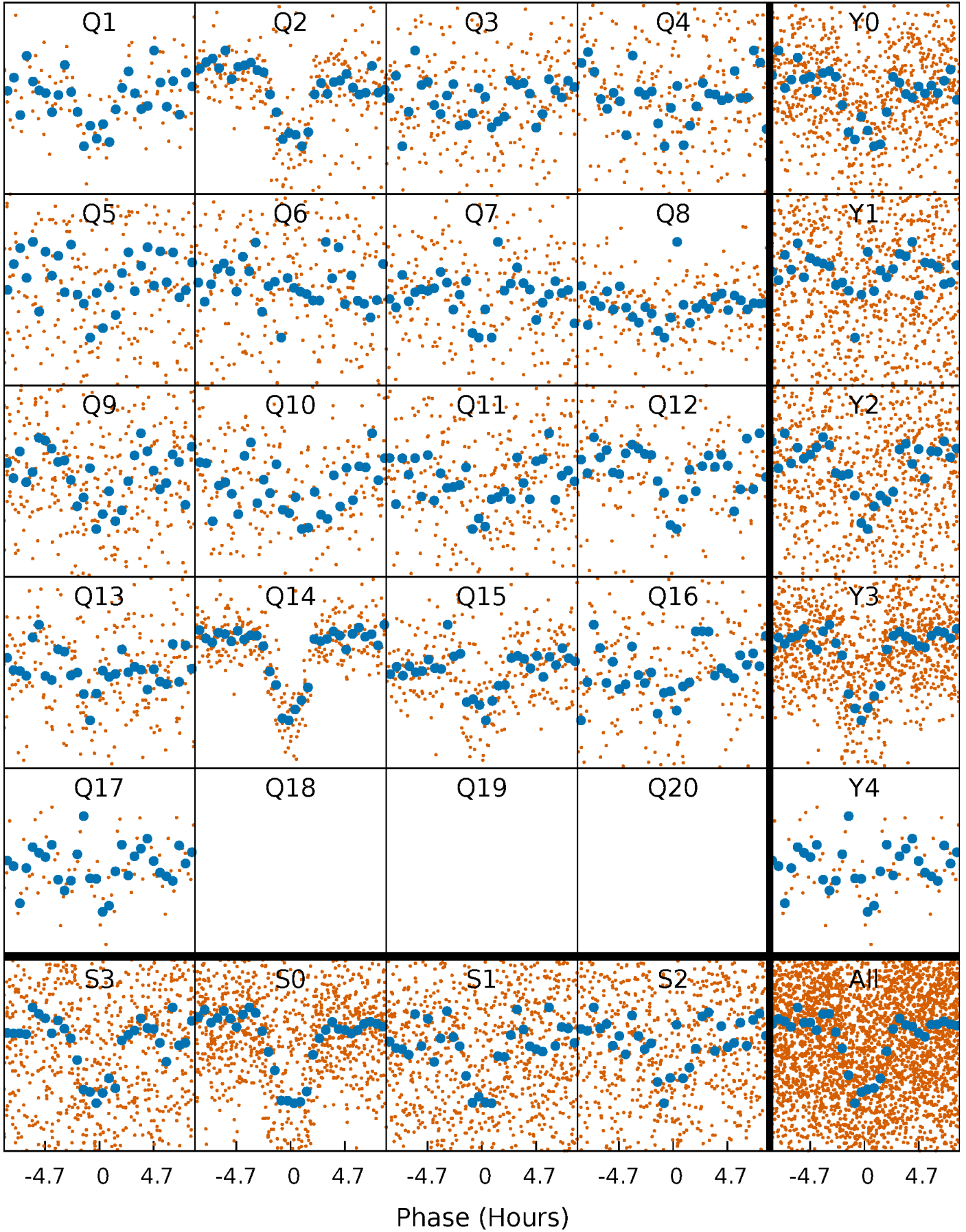


Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)



# PDC Quarter-Phased Transit Curves

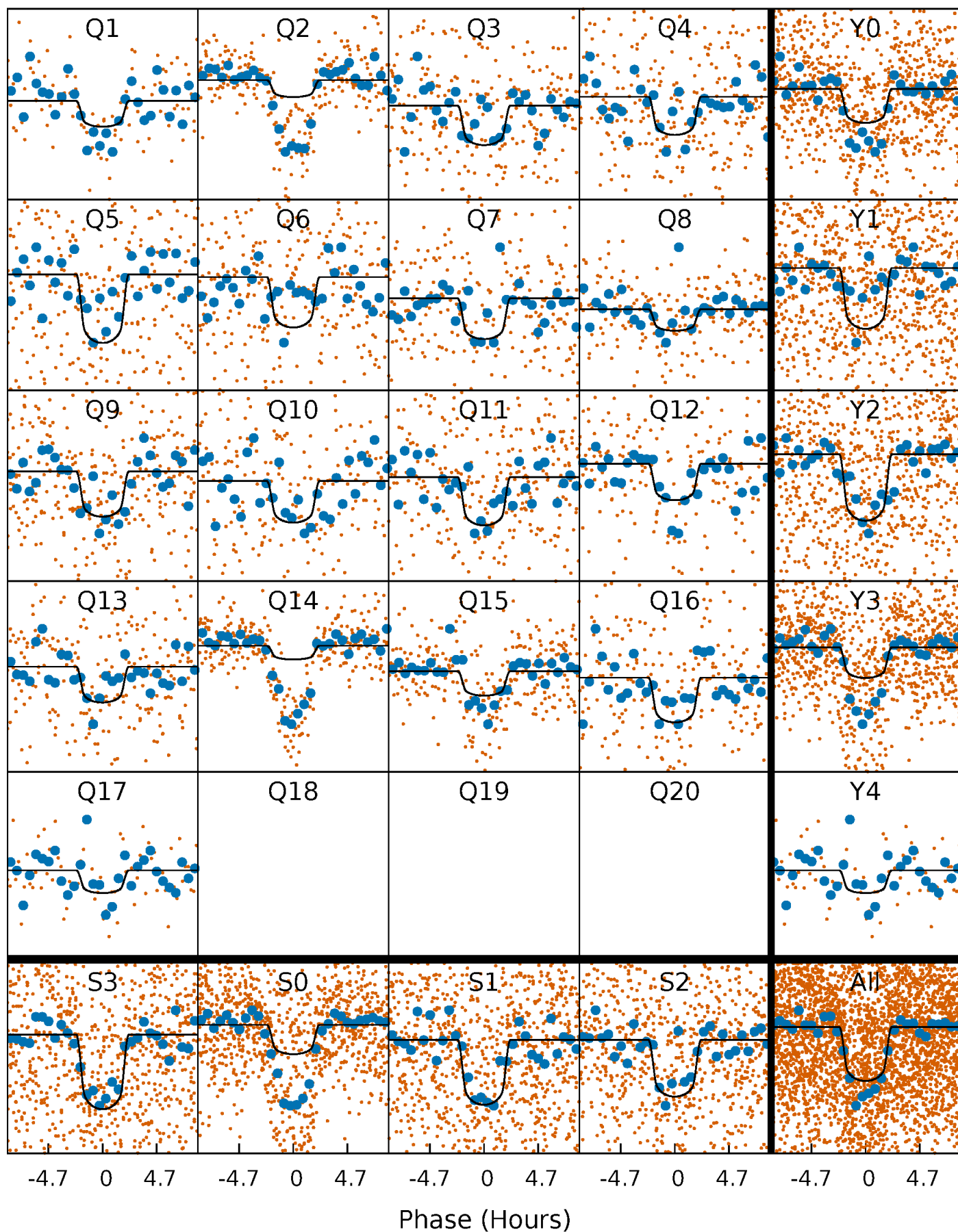
TCE 009636569-01 P= 10.636296 Days  $T_0=139.783425$  (BKJD)





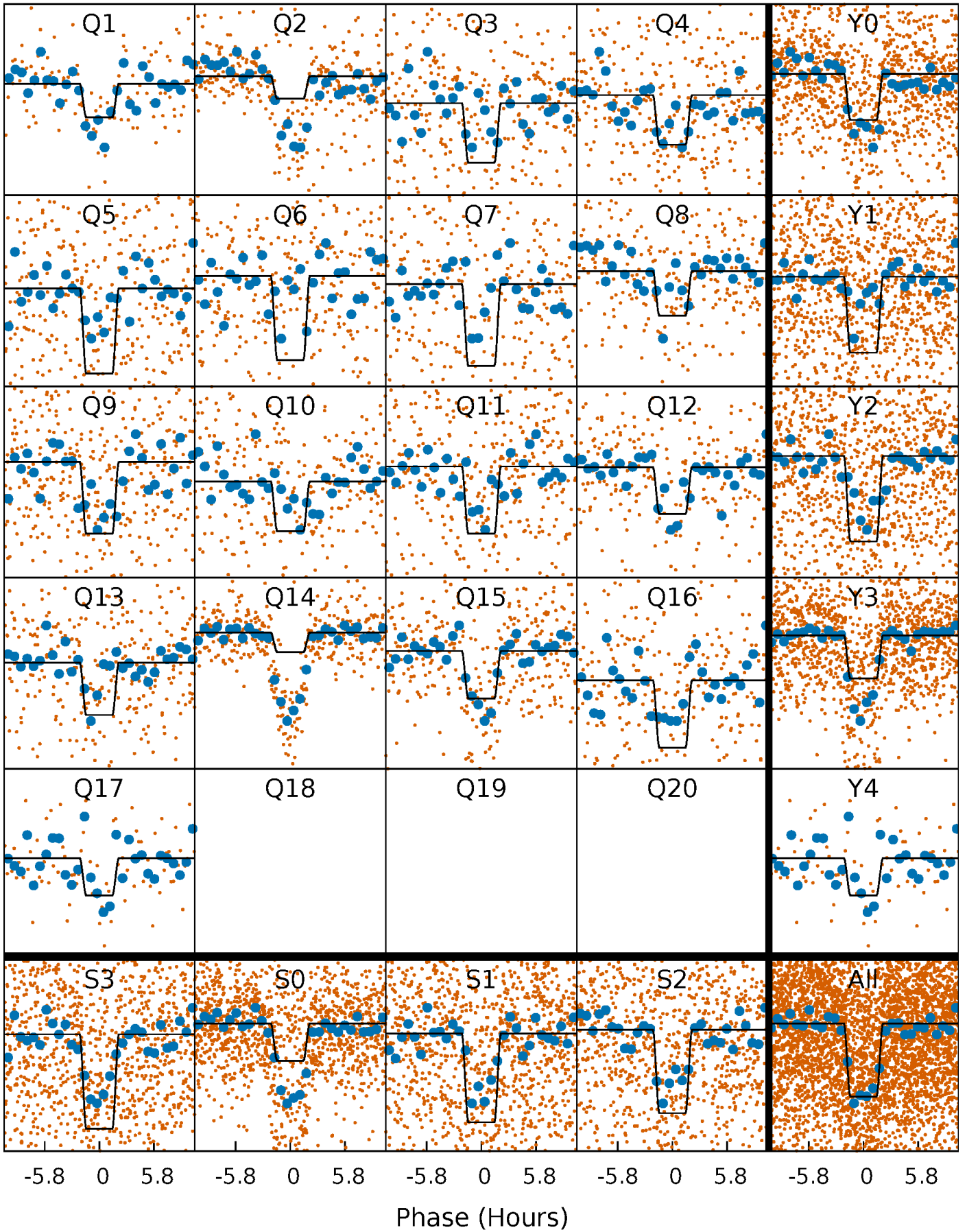
# DV Quarter-Phased Transit Curves

TCE 009636569-01 P= 10.636296 Days  $T_0=139.783425$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

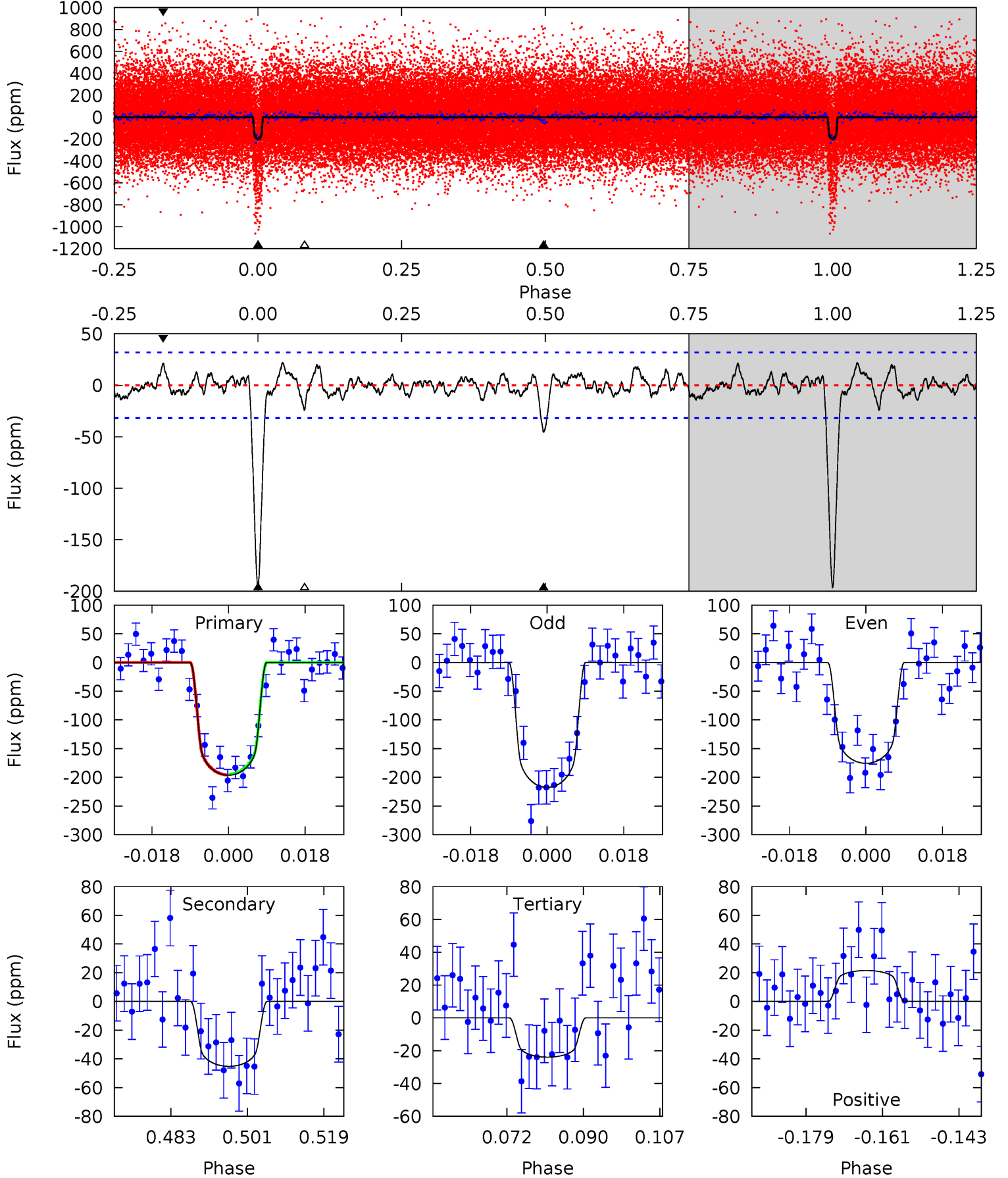
TCE 009636569-01 P= 10.636315 Days  $T_0=139.782544$  (BKJD)



# DV Model-Shift Uniqueness Test

009636569-01, P = 10.636296 Days, E = 129.147129 Days

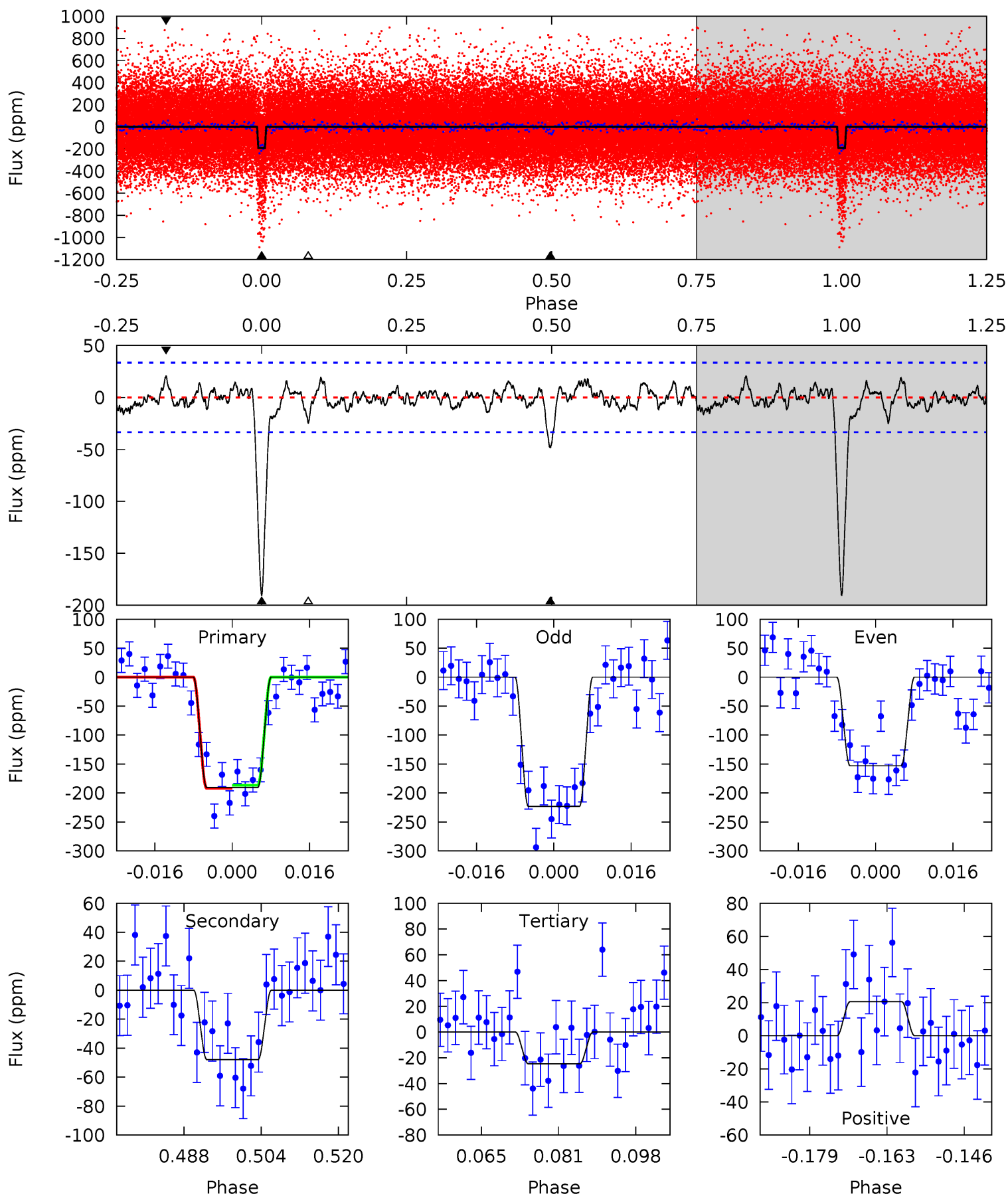
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
30.3	6.98	3.70	3.33	4.91	2.37	1.14	26.6	27.0	3.28	3.65	3.23	1.37	0.10	0.11



# Alt Model-Shift Uniqueness Test

009636569-01, P = 10.636315 Days, E = 129.146229 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
28.0	7.05	3.64	3.04	4.93	2.40	1.10	24.4	25.0	3.42	4.01	5.17	1.33	0.10	0.36



### Stellar Parameters For KIC 009636569

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$5834^{+157}_{-157}$	$4.591^{+0.038}_{-0.161}$	$-0.540^{+0.300}_{-0.300}$	$0.774^{+0.188}_{-0.063}$	$0.862^{+0.085}_{-0.094}$	$2.621^{+0.411}_{-1.153}$
	+3%/-3%	+1%/-4%	+56%/-56%	+24%/-8%	+10%/-11%	+16%/-44%
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 009636569-01 / KOI 0527.01

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$-45 \pm 6$	$1.21^{+0.33}_{-0.25}$	$1075^{+58}_{-40}$	$4281^{+422}_{-315}$	$132^{+77}_{-48}$
Alt.	$-48 \pm 7$	$1.32^{+0.29}_{-0.26}$	$1079^{+61}_{-42}$	$4207^{+397}_{-276}$	$118^{+67}_{-41}$

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



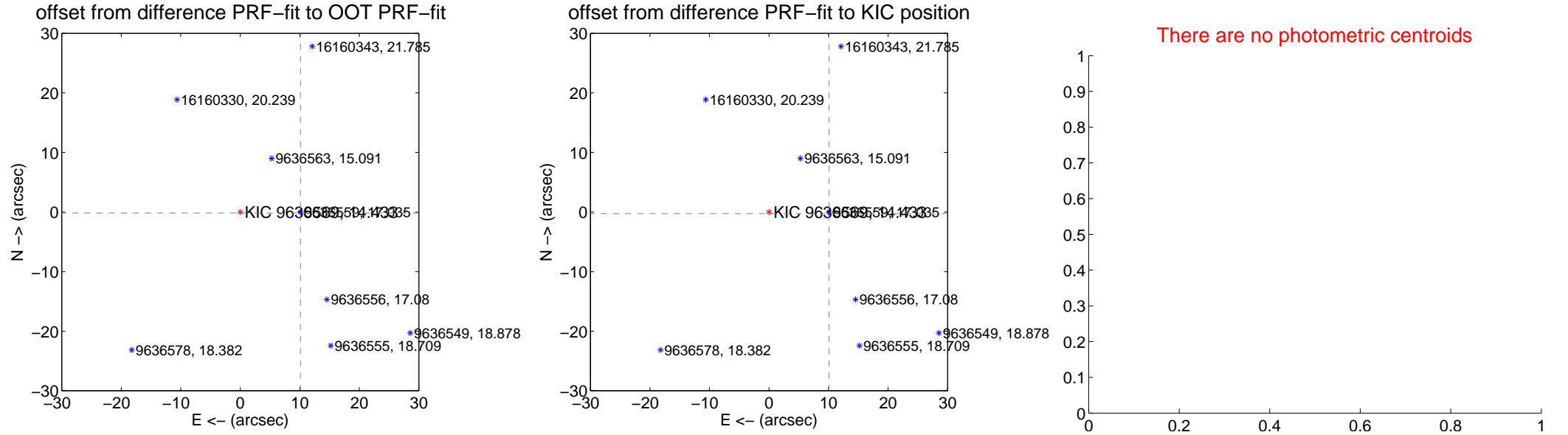
## DV Centroid Data

Supplemental centroid analysis for 009636569-01. Kepler magnitude: 14.43. Transit SNR 19.29

There are 4 quarters with good PRF difference image offsets

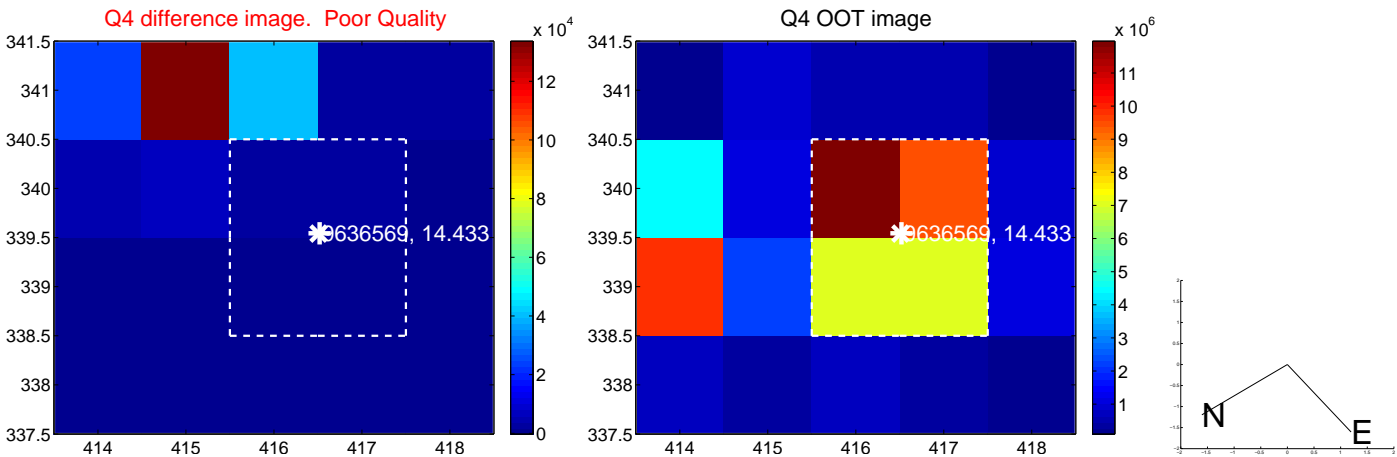
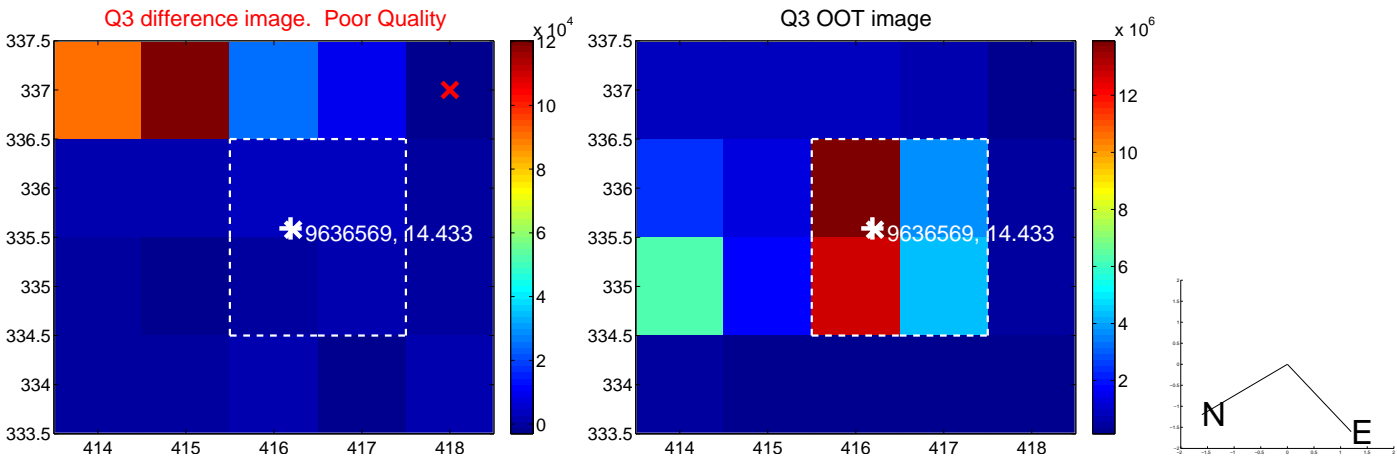
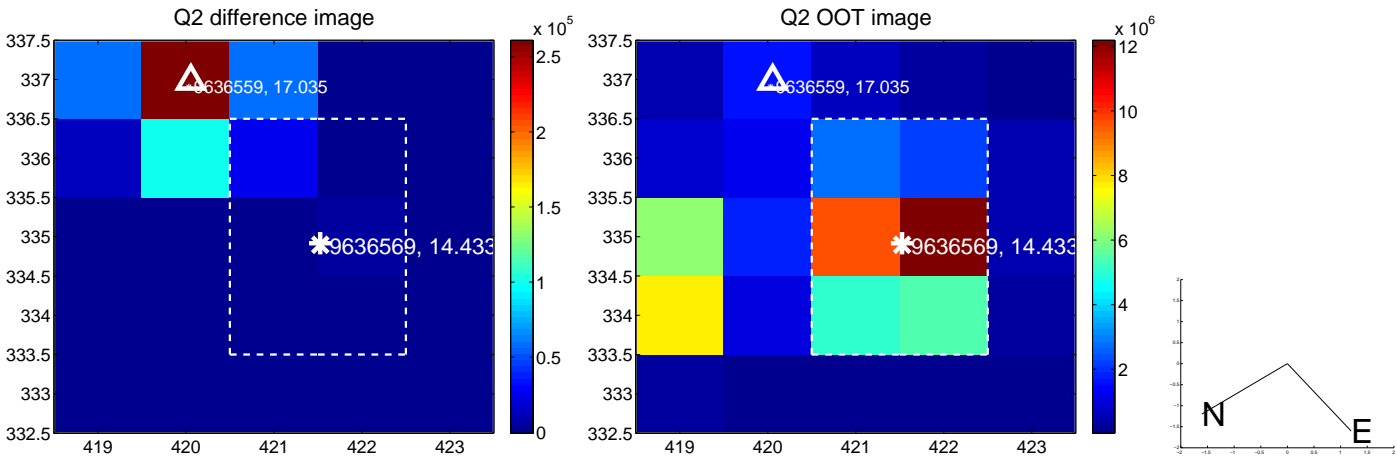
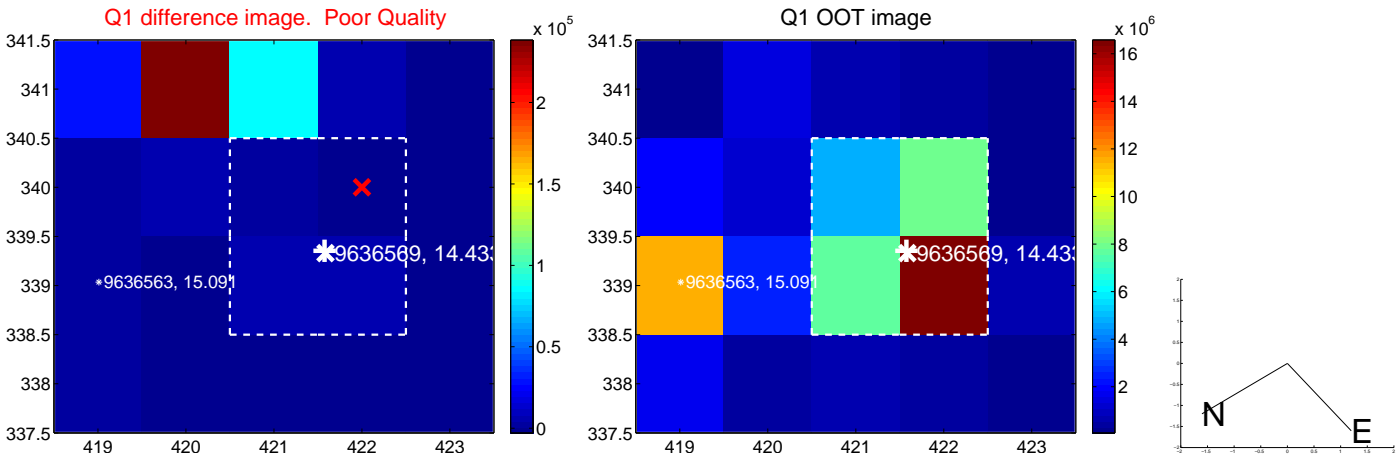
The direct PRF centroid is offset from the target star catalog position by about 0.12 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	10.116 $\pm$ 0.068	149.14	-10.115 $\pm$ 0.068	-0.160 $\pm$ 0.069
PRF-fit source offset from KIC position	10.096 $\pm$ 0.071	141.28	-10.093 $\pm$ 0.071	-0.259 $\pm$ 0.068
photometric centroid source offset	—	—	—	—

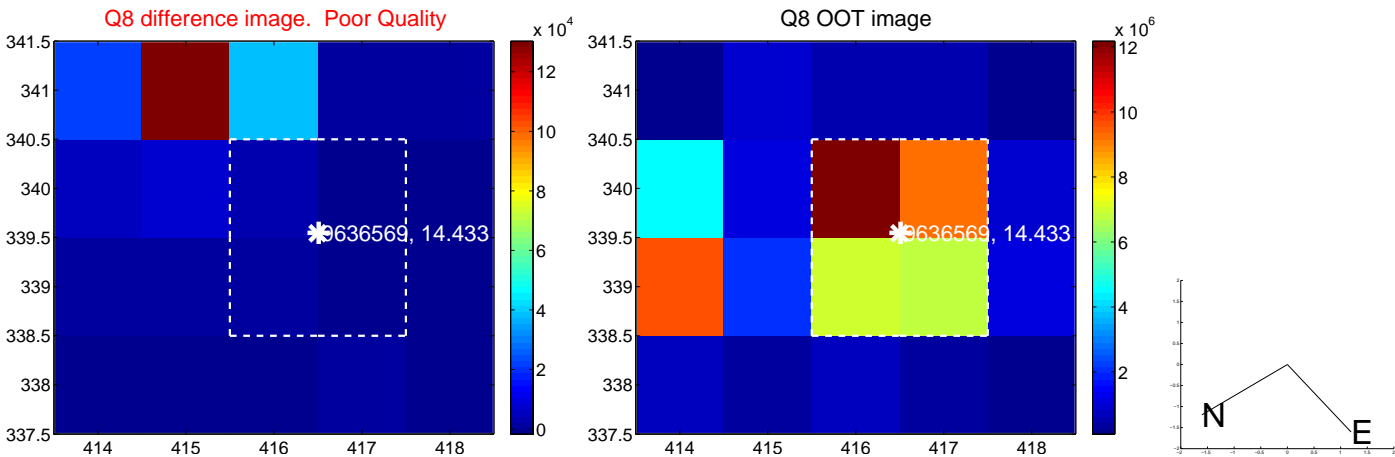
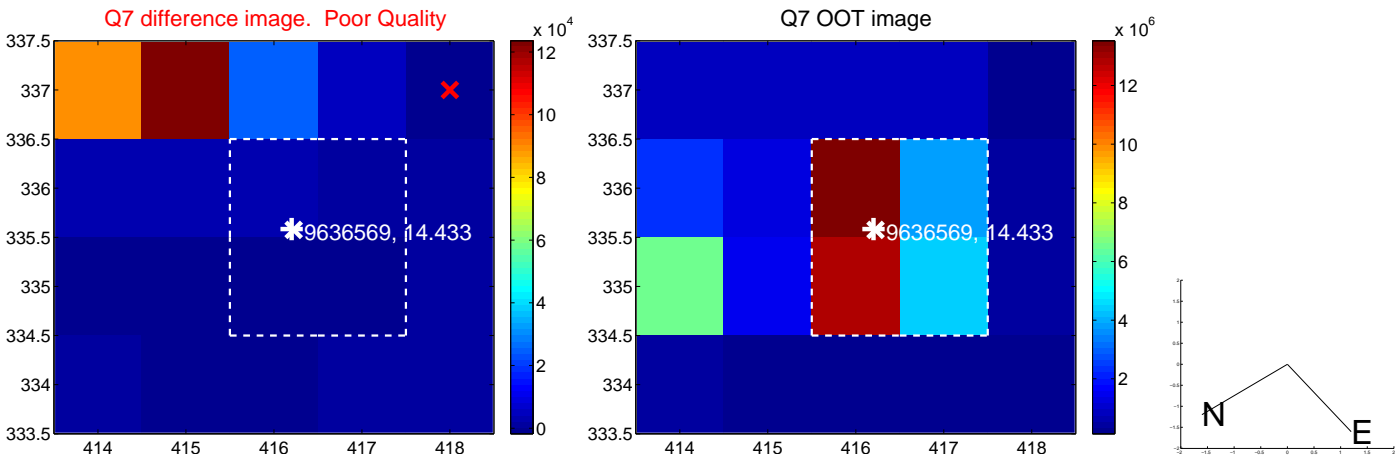
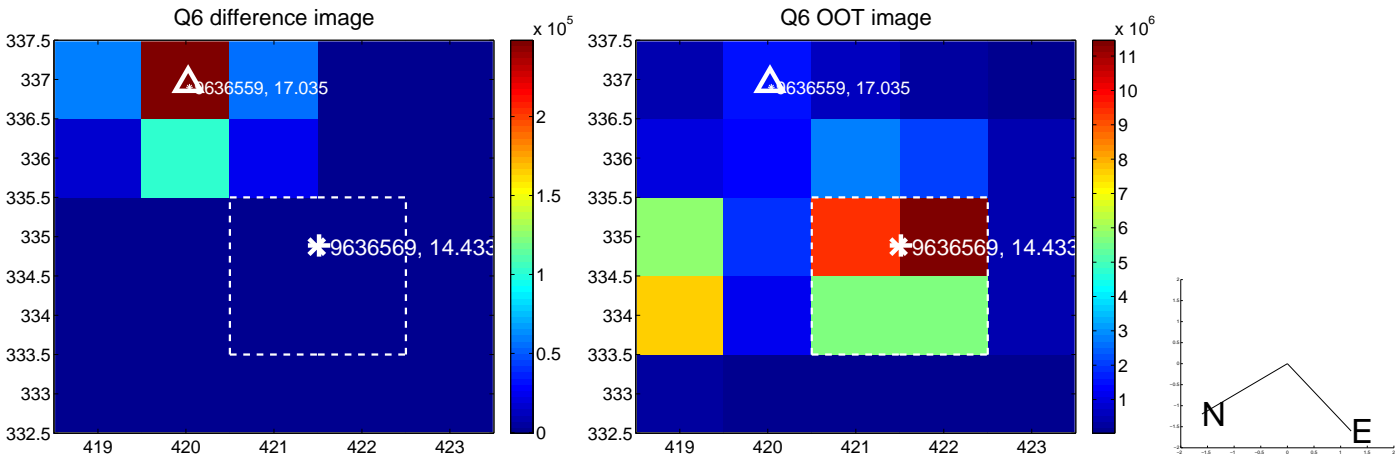
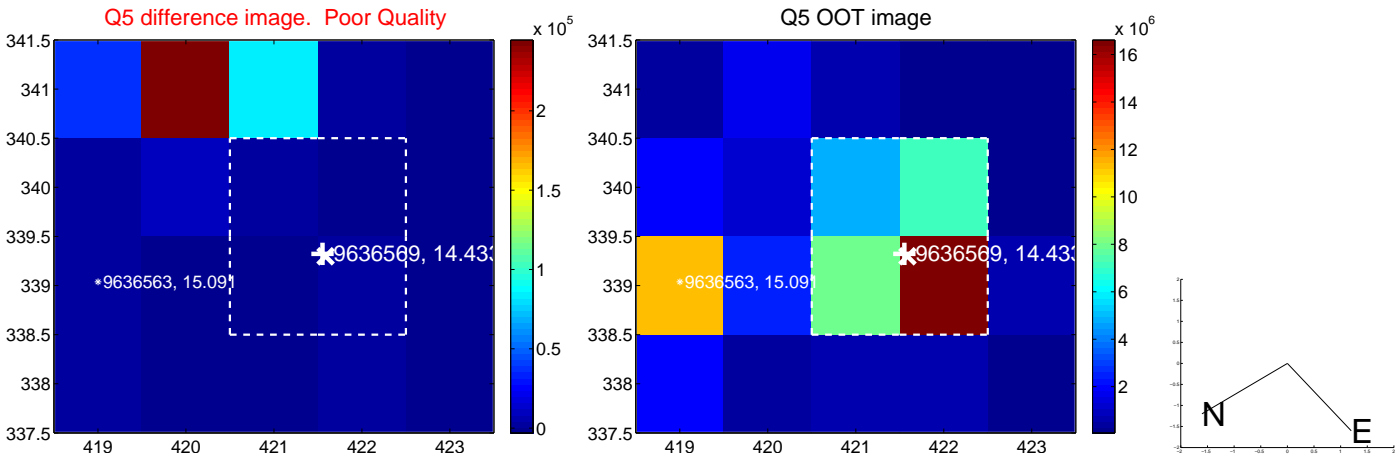


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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

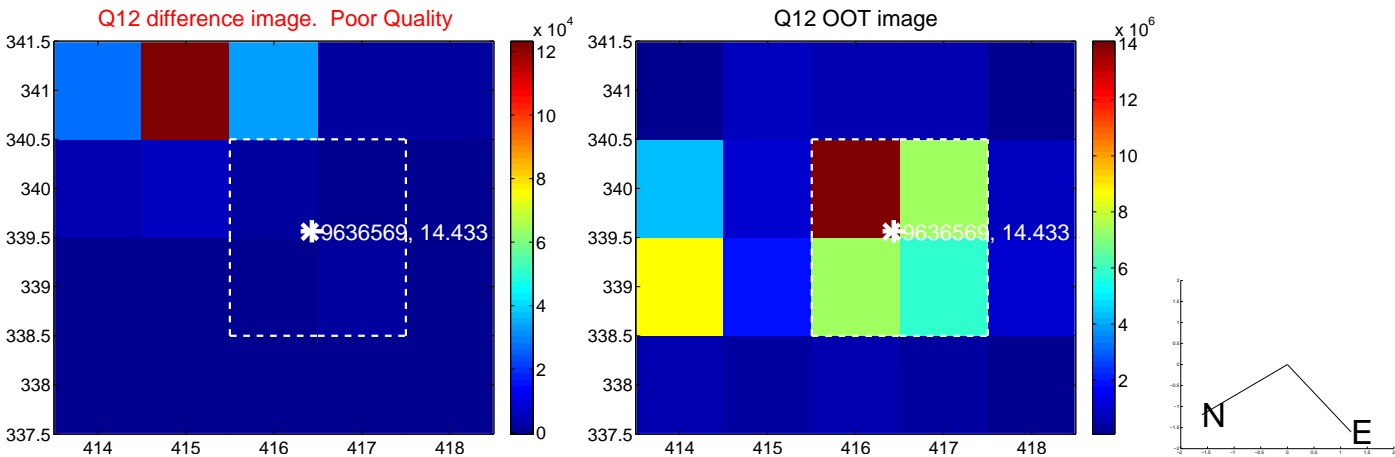
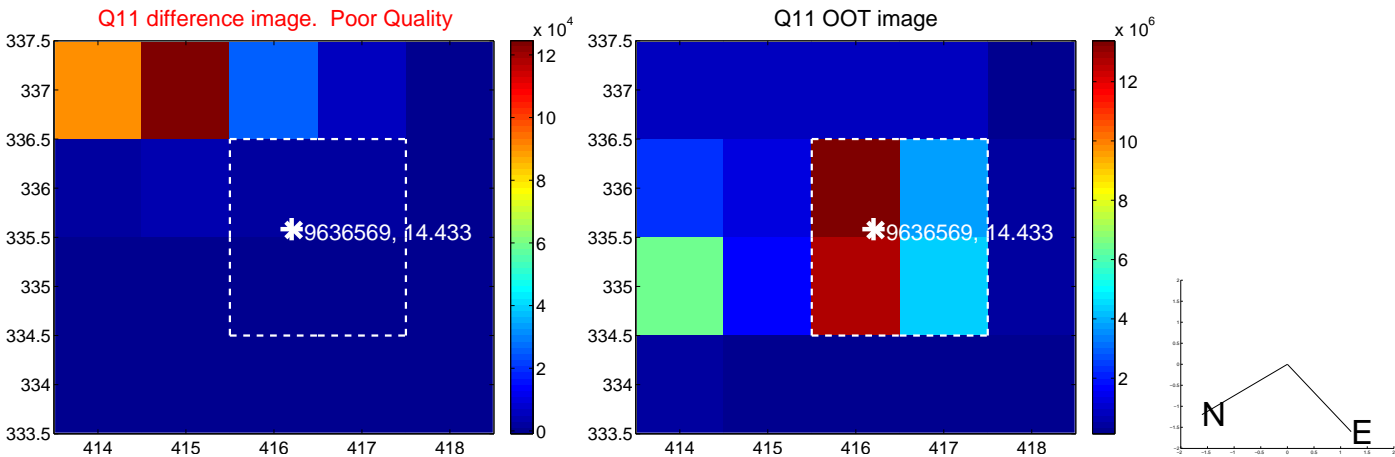
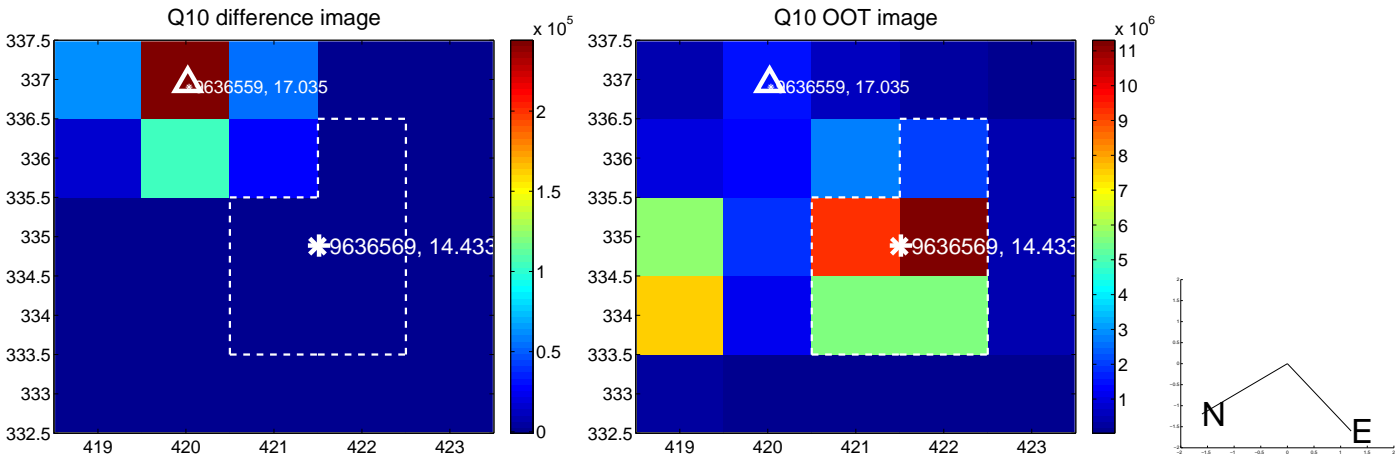
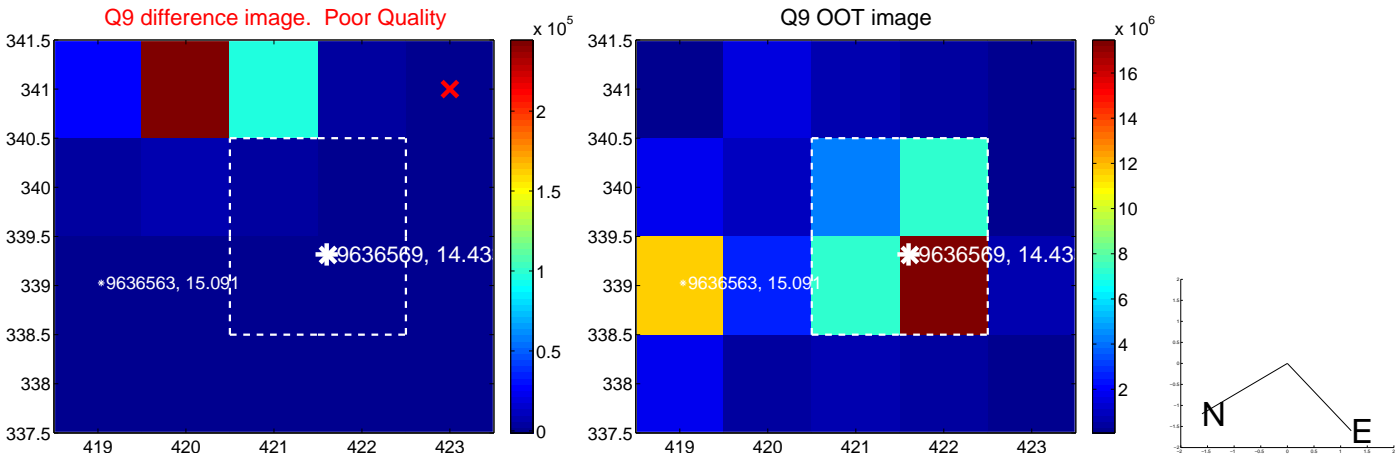
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



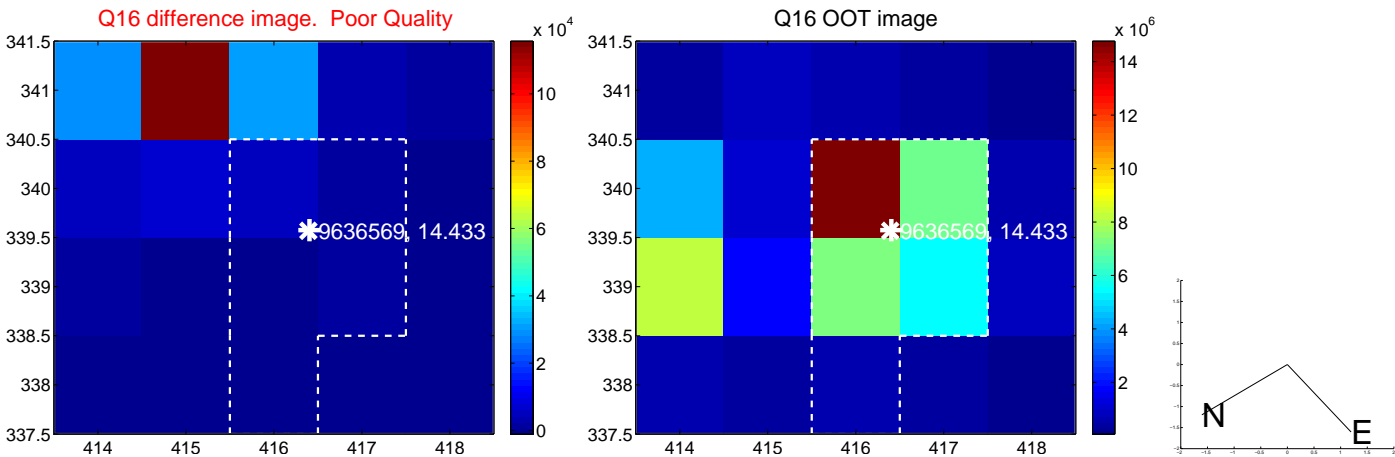
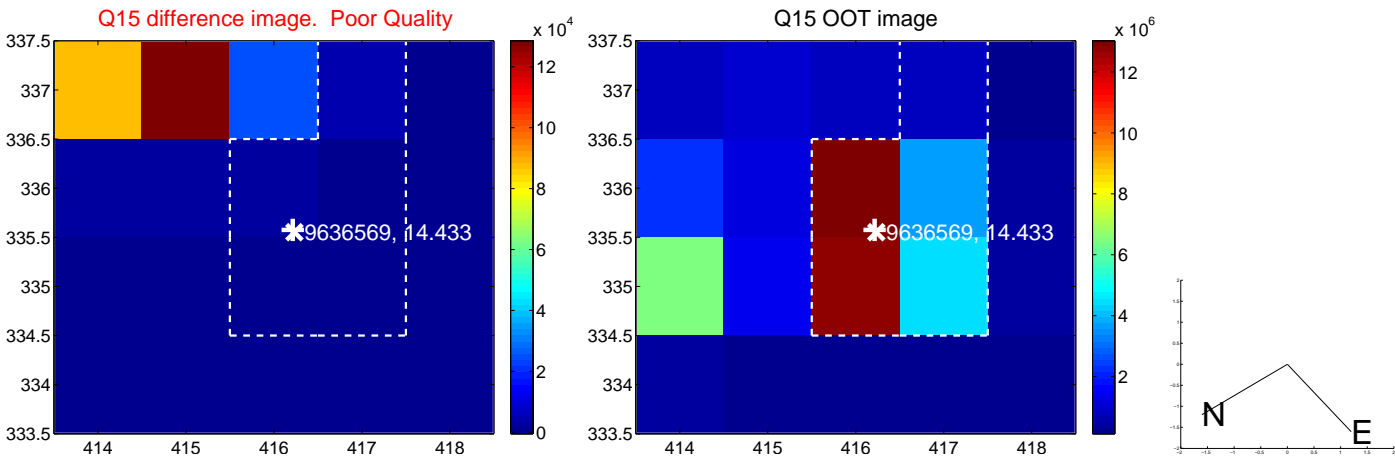
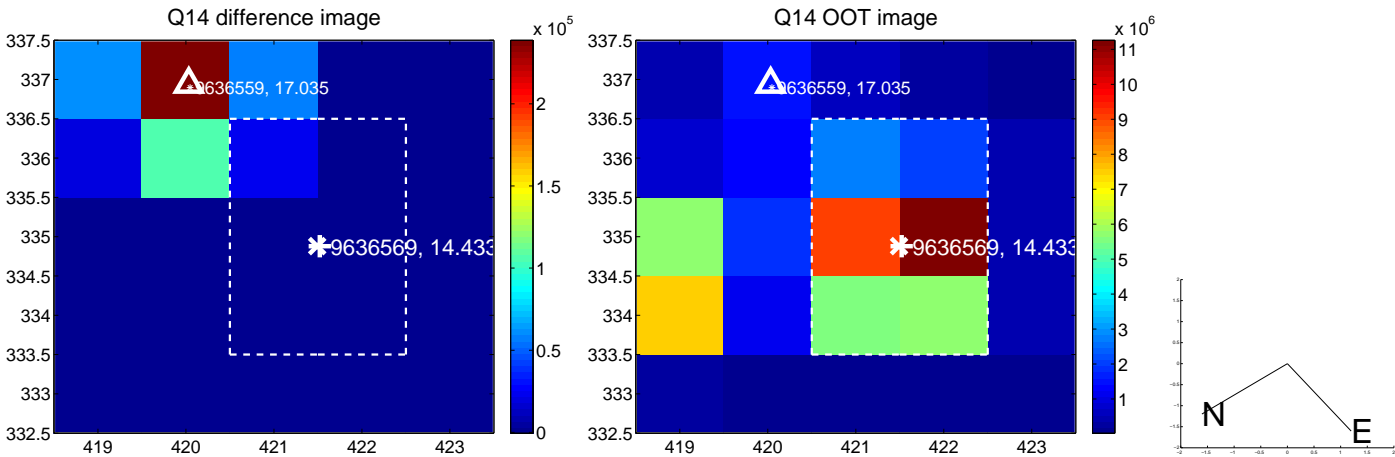
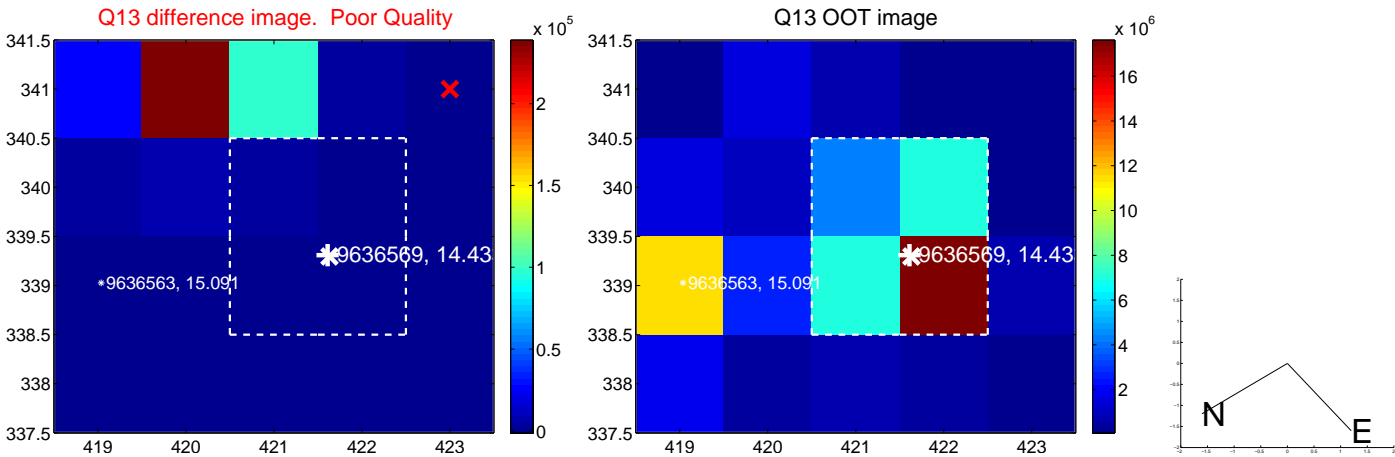
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

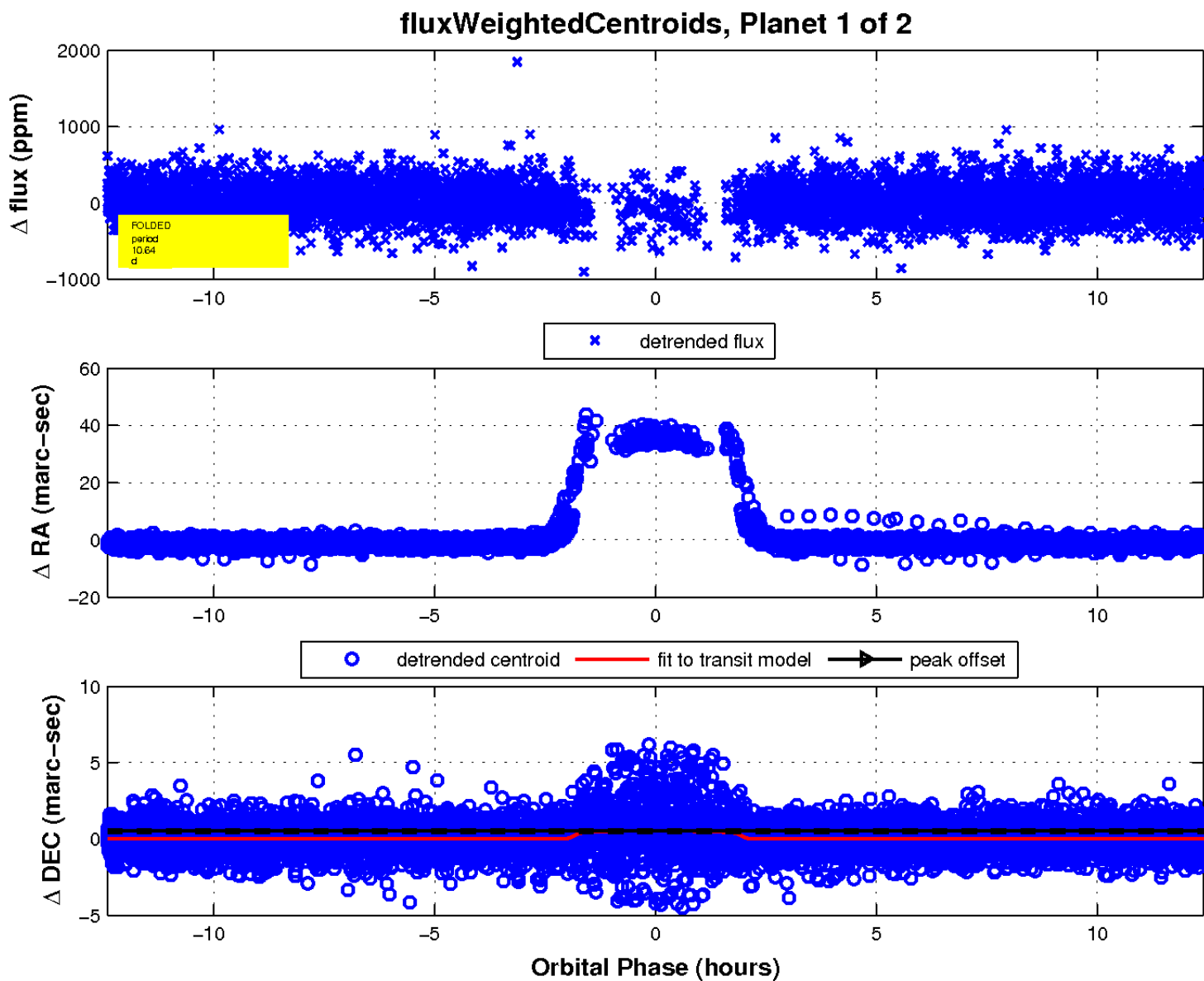
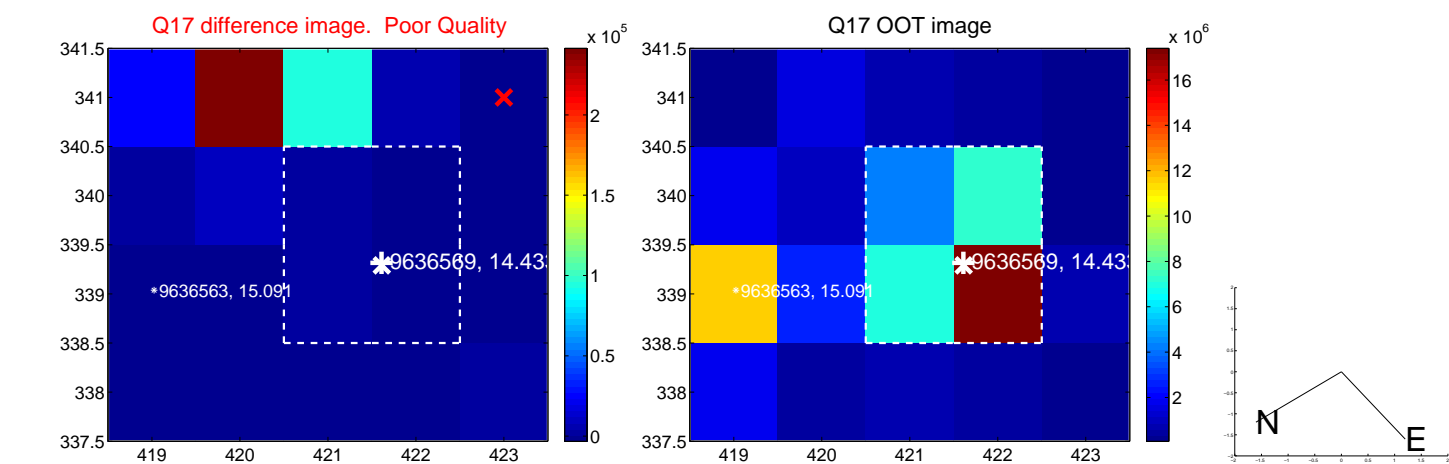


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



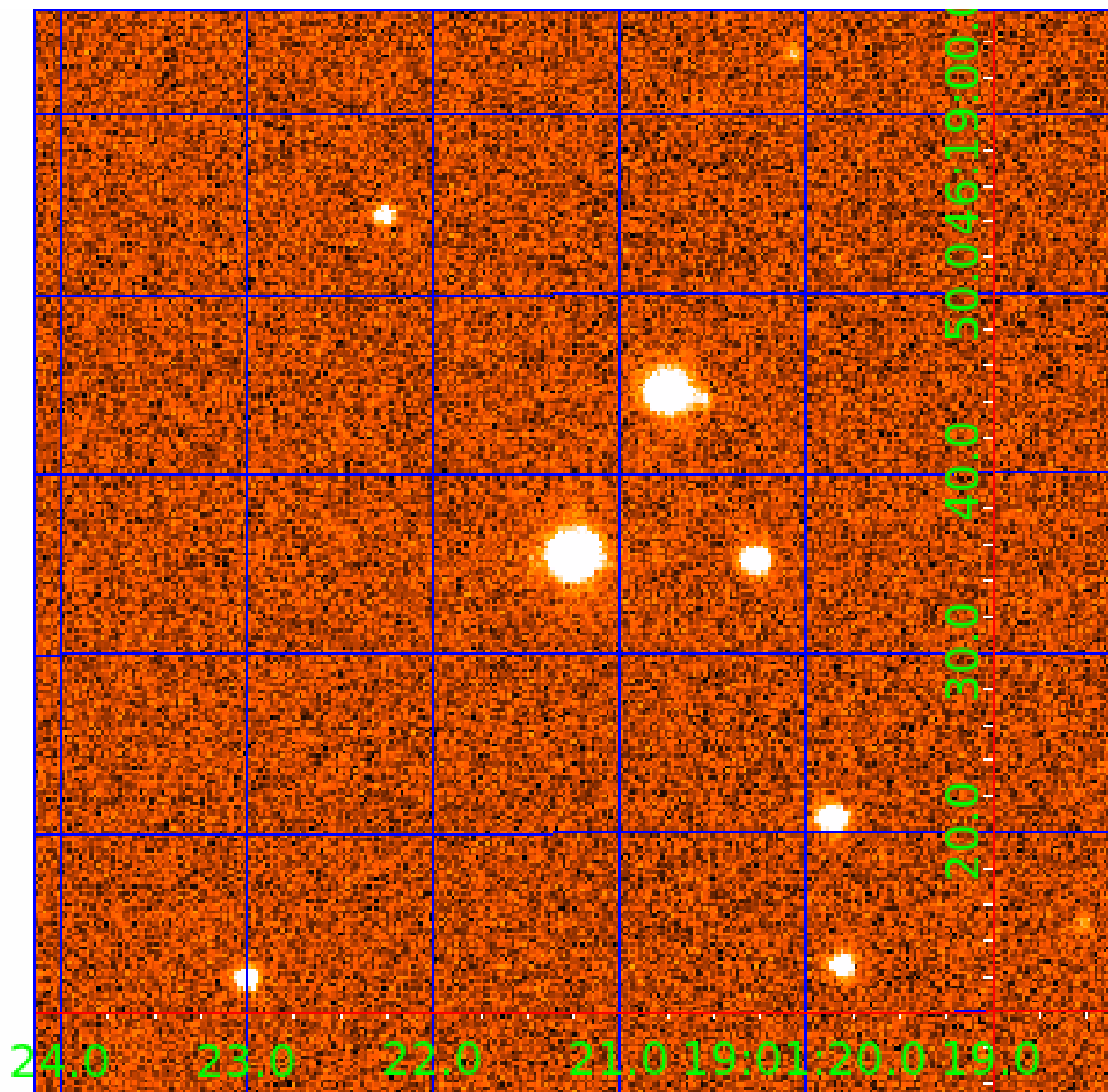


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination



# KIC 009636569

## 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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009636569-02	OBS	No	10.728489	137.511834	39.6	30.608	8.3	9.7	0.77	5834	0.52	76.30

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009636569-01	OBS	FP	0.00	0	1	1	1	MOD_SEC_DV—MOD_SEC_ALT—CENT_RESOLVED_OFFSET—EPHEM_MATCH
009636569-02	OBS	FP	0.00	1	0	0	0	LPP_DV

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

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

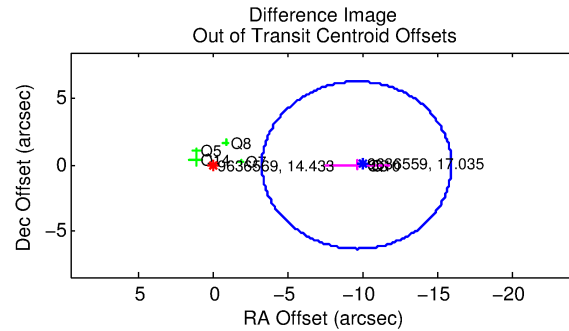
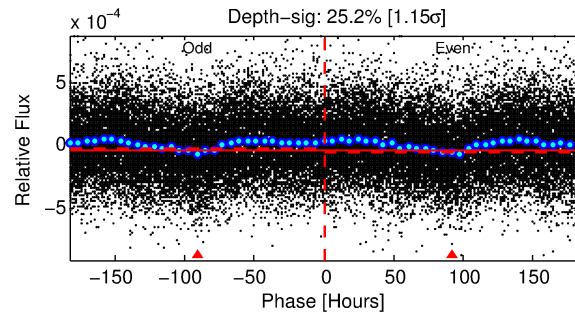
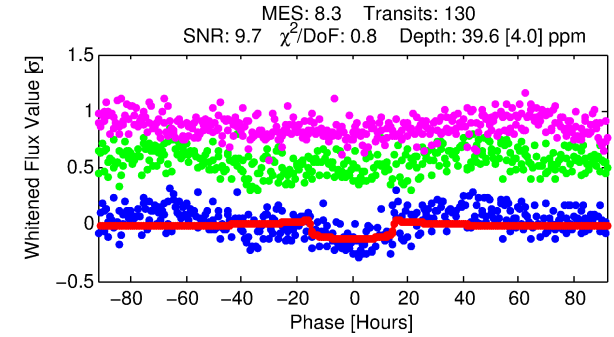
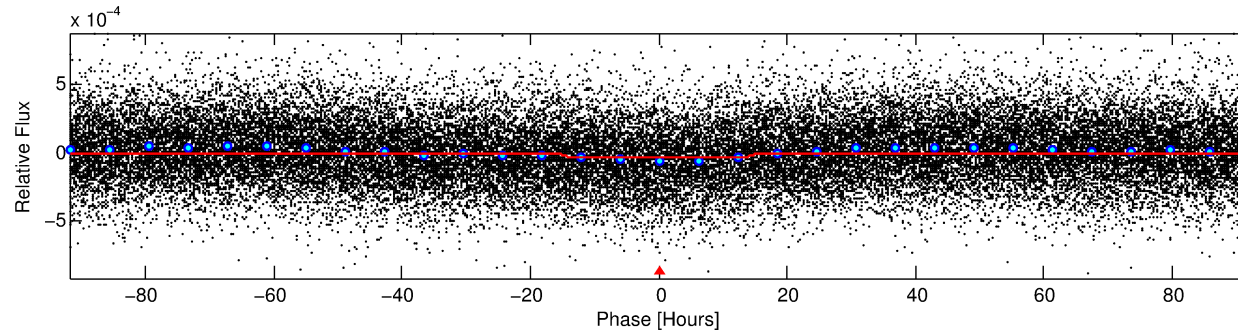
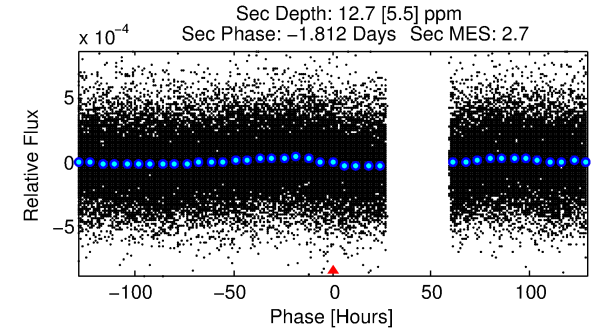
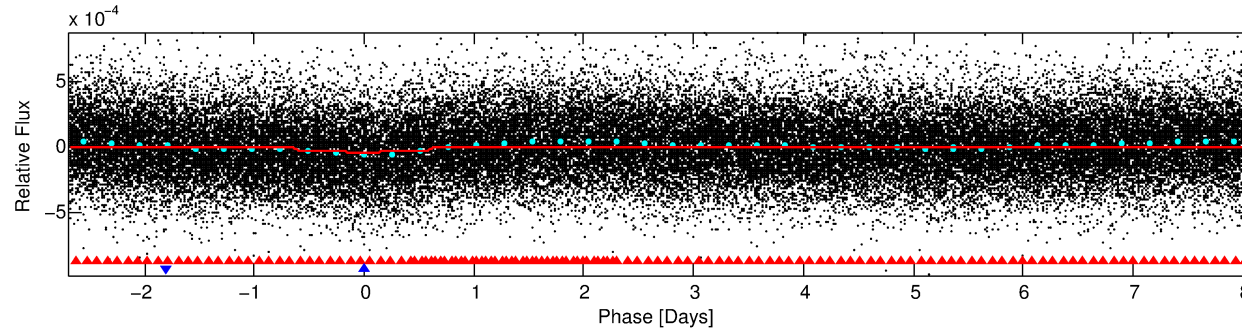
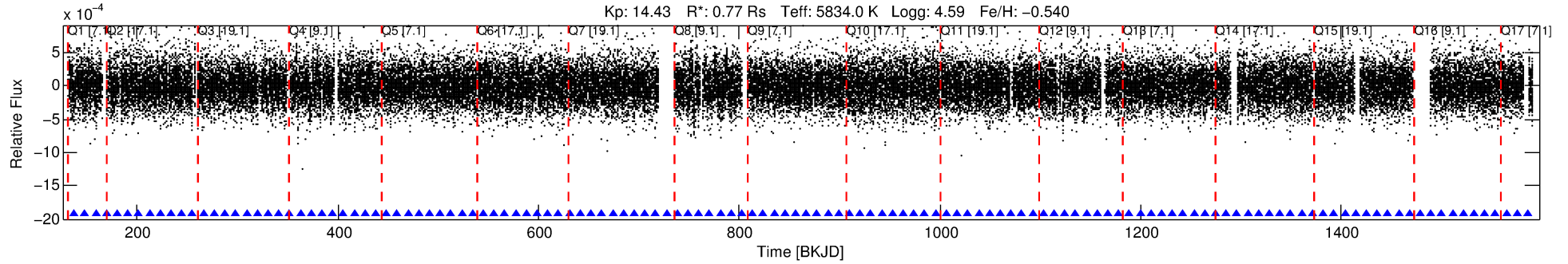
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 009636569-02

No Significant Match Found

# DV One-Page Summary

KIC: 9636569 Candidate: 2 of 2 Period: 10.728 d  
KOI: K00527 Corr: No Ephemeris Match



## DV Fit Results:

Period = 10.72849 [0.00039] d  
Epoch = 137.5118 [0.0289] BKJD  
Rp/R\* = 0.0062 [0.0015]  
a/R\* = 2.10 [1.93]  
b = 0.70 [0.87]  
Seff = 76.30 [23.99]  
Teq = 754 [59] K  
Rp = 0.52 [0.18] Re  
a = 0.0903 [0.0184] AU  
Ag = 210.93 [150.87] [1.39σ]  
Teffp = 4441 [733] K [5.01σ]

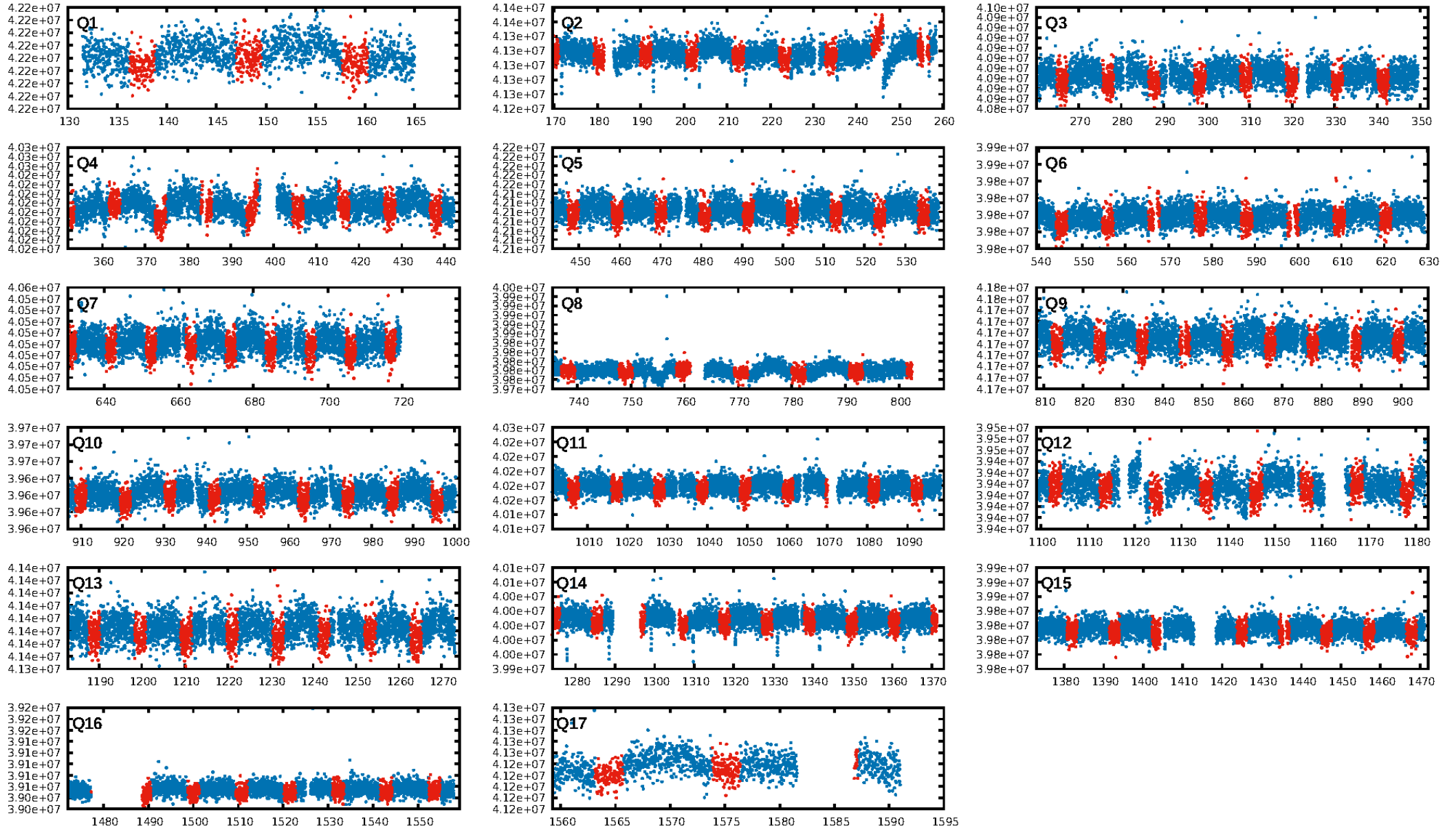
## DV Diagnostic Results:

ShortPeriod-sig: 5.7% [0.07σ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: 99.7%  
ModelChiSquareGof-sig: 100.0%  
Bootstrap-pfa: 8.57e-16  
RollingBand-fgt: 1.00 [125/125]  
GhostDiagnostic-chr: 1.382  
Centroid-sig: N/A  
Centroid-so: 1.228 arcsec [1.27σ]  
OotOffset-rm: 9.646 arcsec [4.57σ]  
KicOffset-rm: 9.627 arcsec [4.75σ]  
OotOffset-st: 3/1/1/1 [6]  
KicOffset-st: 3/1/1/1 [6]  
DiffImageQuality-fgm: 0.67 [4/6]  
DiffImageOverlap-fno: 0.59 [10/17]

Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 29-Jan-2016 02:20:38 Z

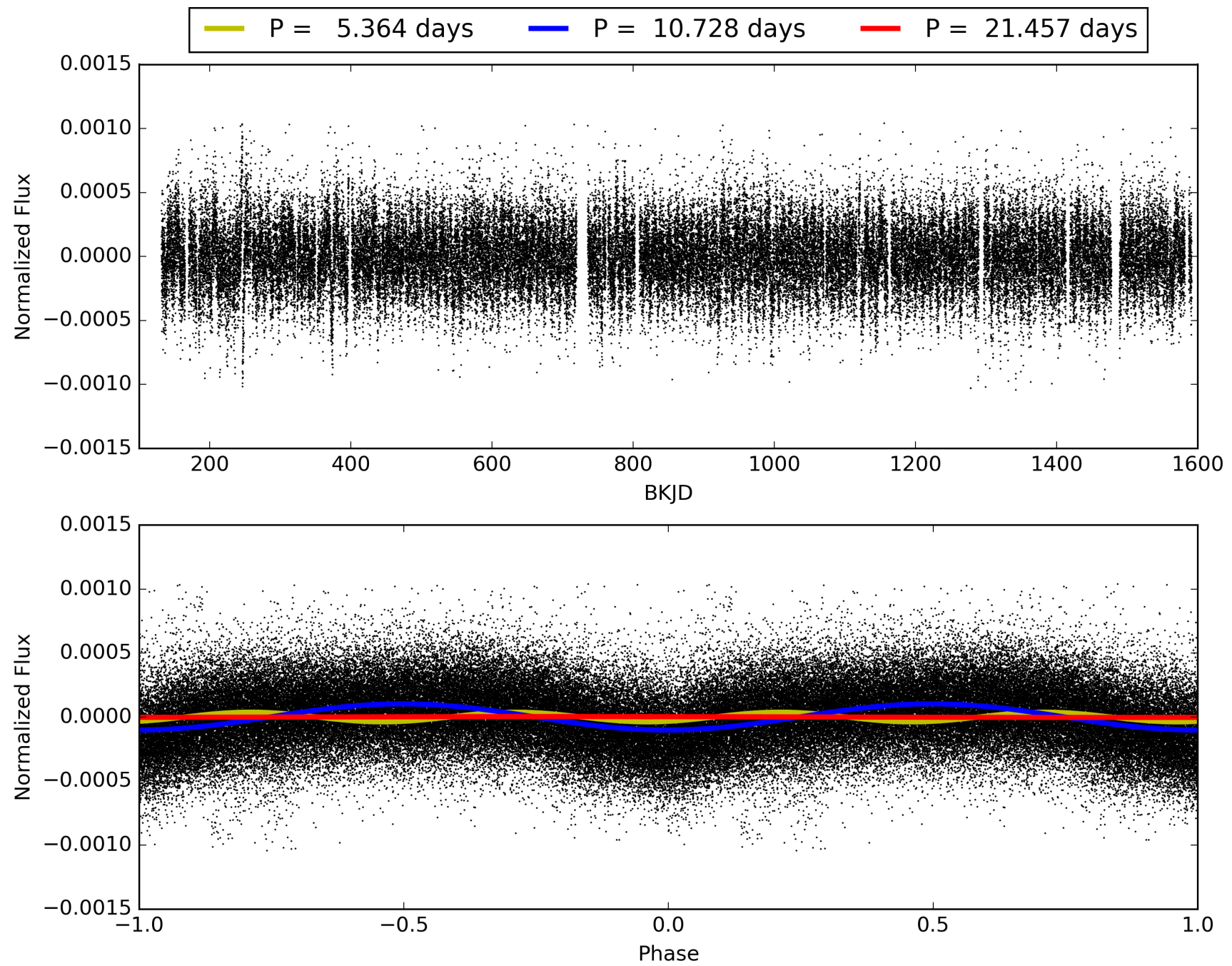
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

# TCE 009636569-02, PDC Light Curves



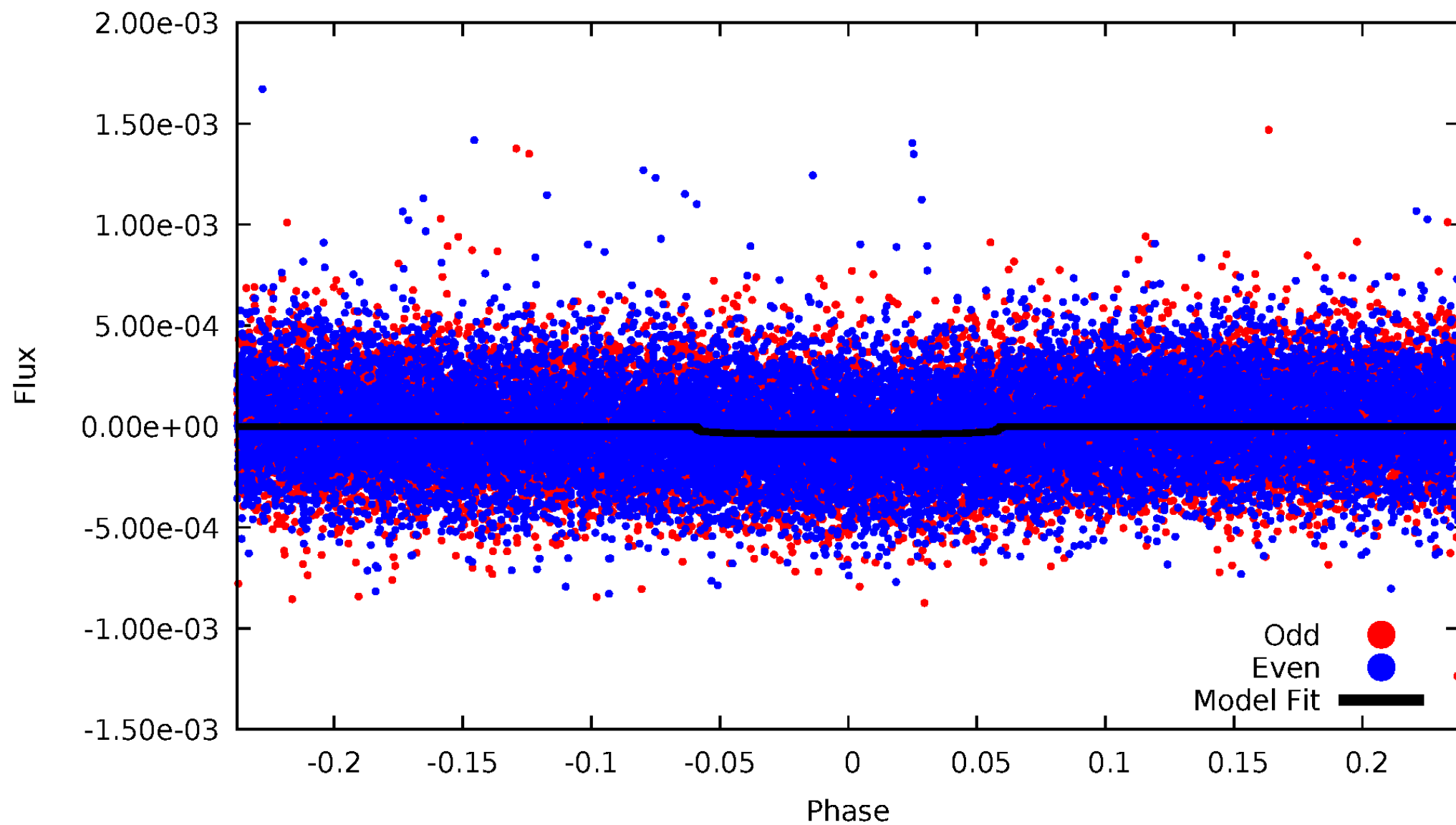


TCE 009636569-02



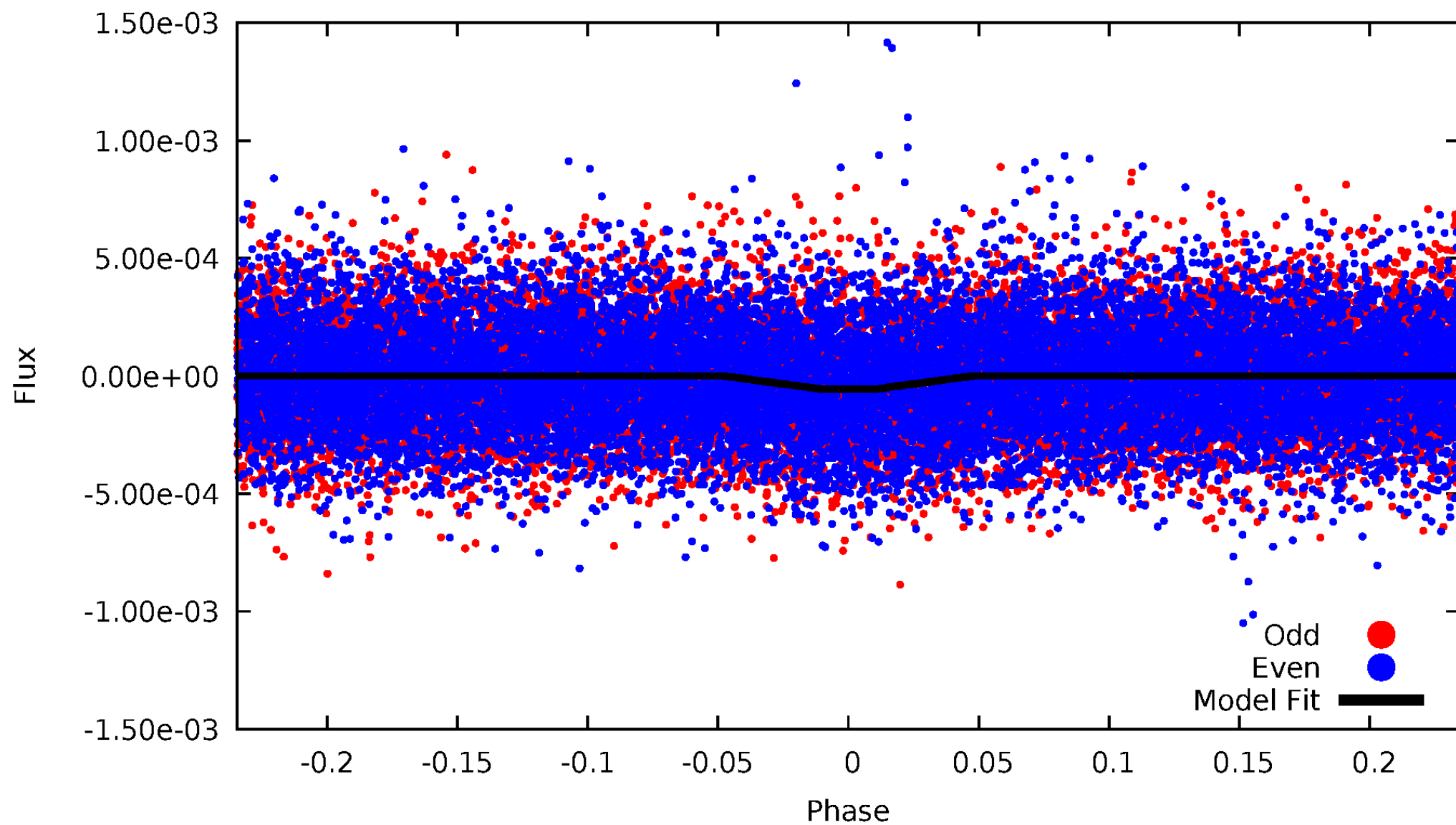
# DV Odd/Even

TCE 009636569-02



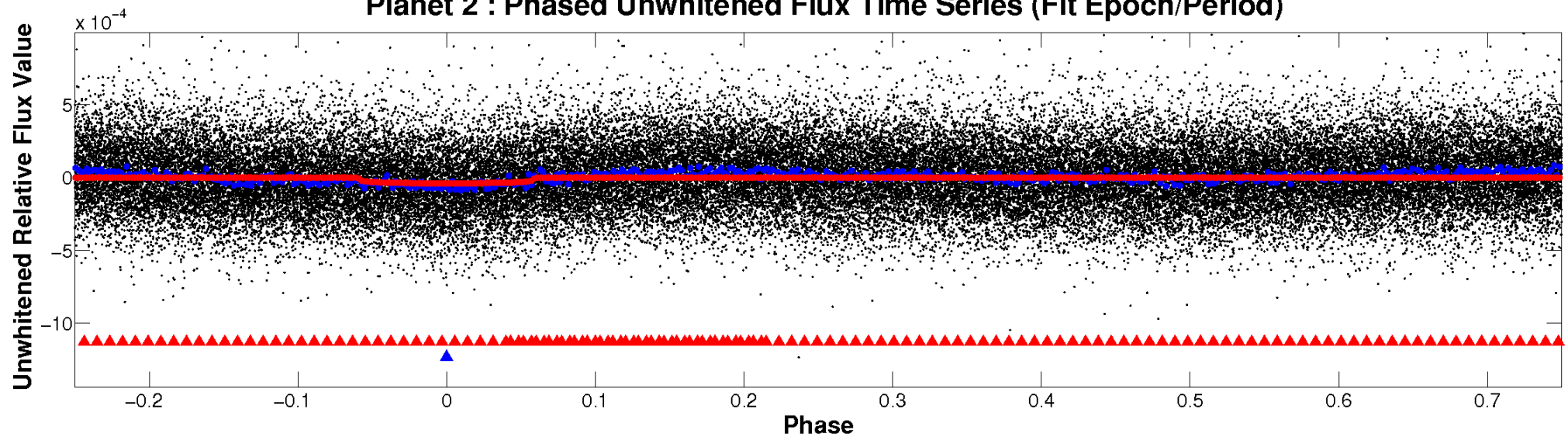
# ALT Odd/Even

TCE 009636569-02

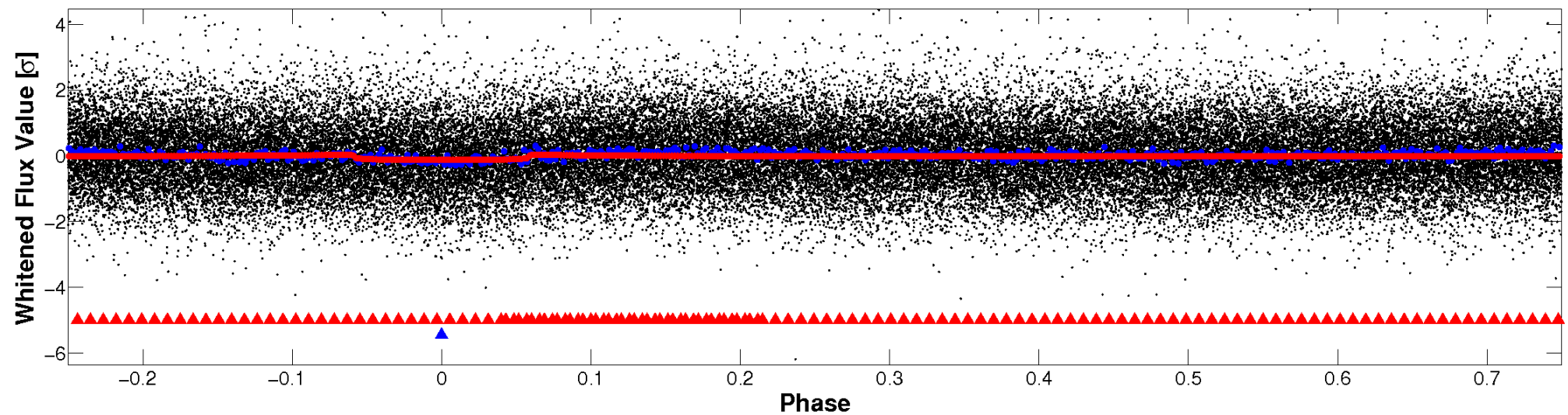


# Non-Whitened Vs. Whitened Light Curve

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



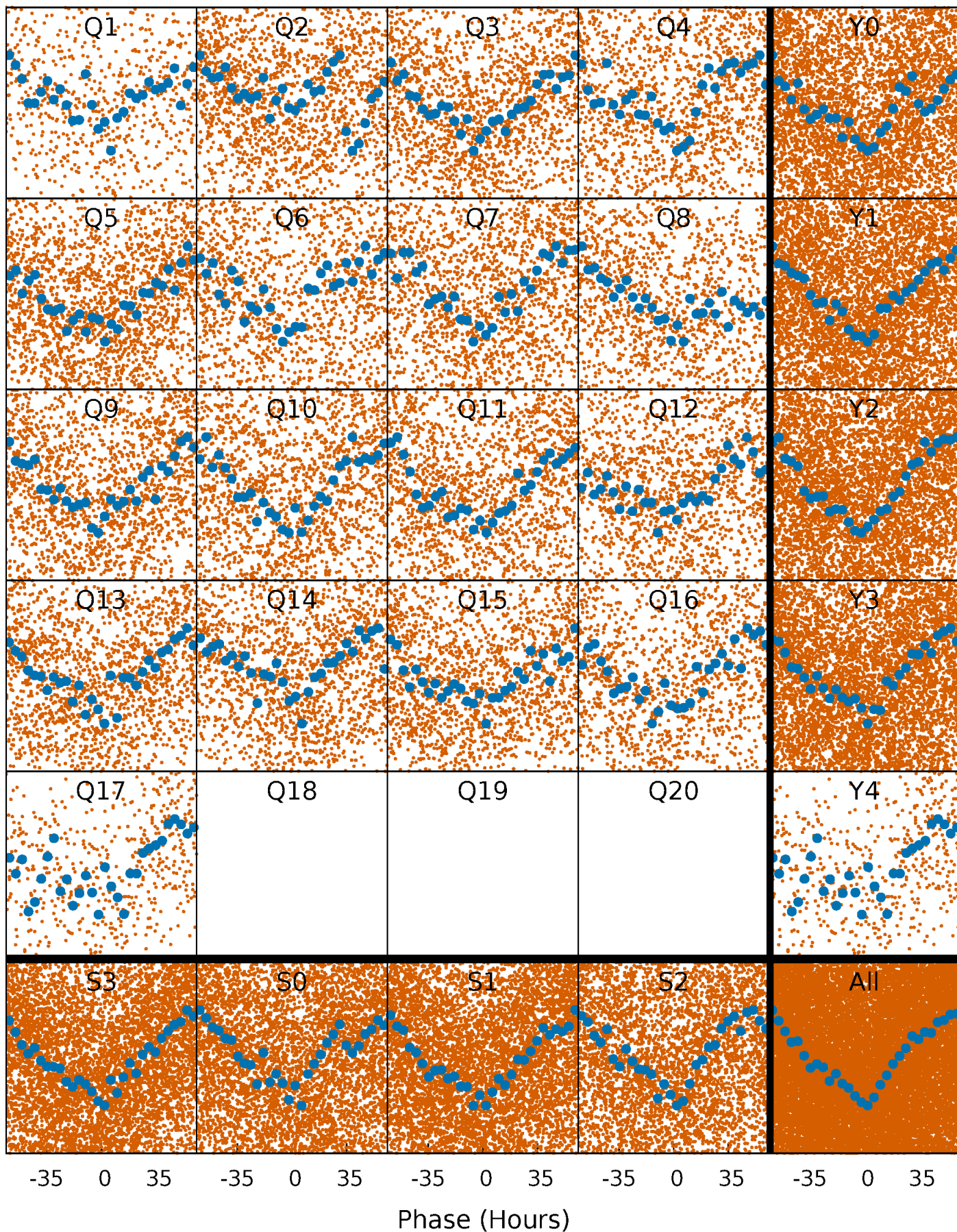
## Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)





# PDC Quarter-Phased Transit Curves

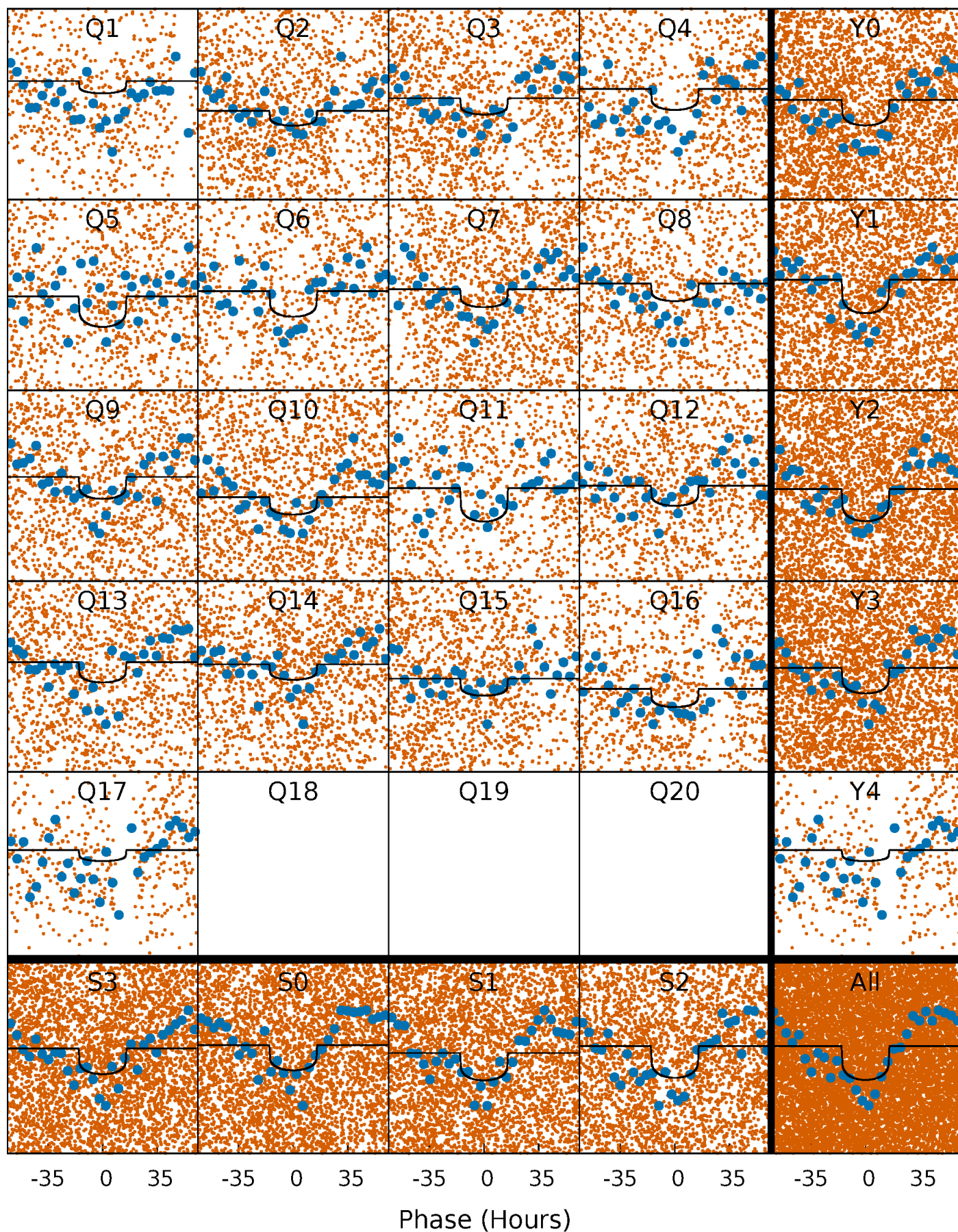
TCE 009636569-02 P= 10.728489 Days  $T_0=137.511834$  (BKJD)





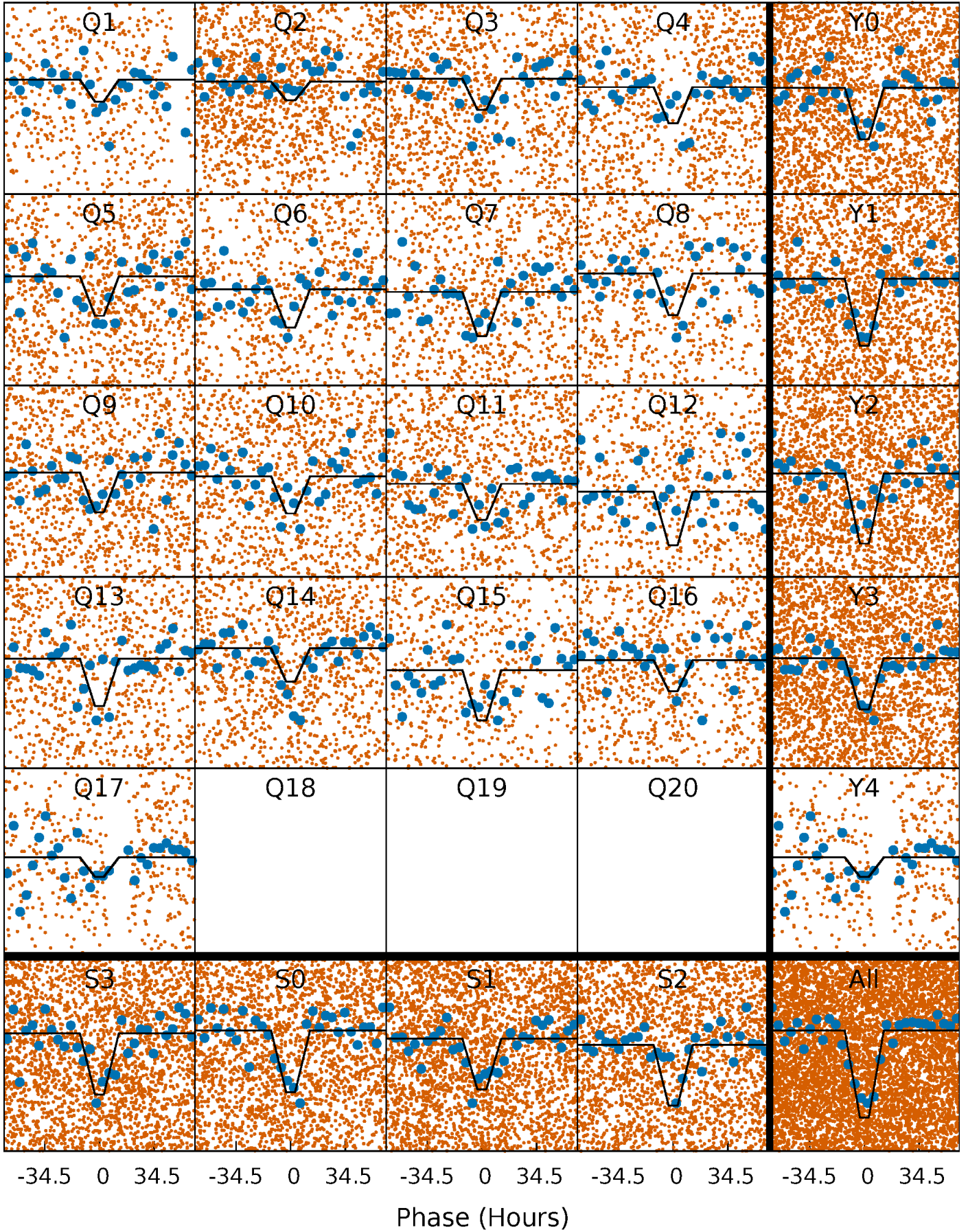
# DV Quarter-Phased Transit Curves

TCE 009636569-02 P= 10.728489 Days  $T_0=137.511834$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

TCE 009636569-02 P= 10.728996 Days  $T_0=137.556818$  (BKJD)

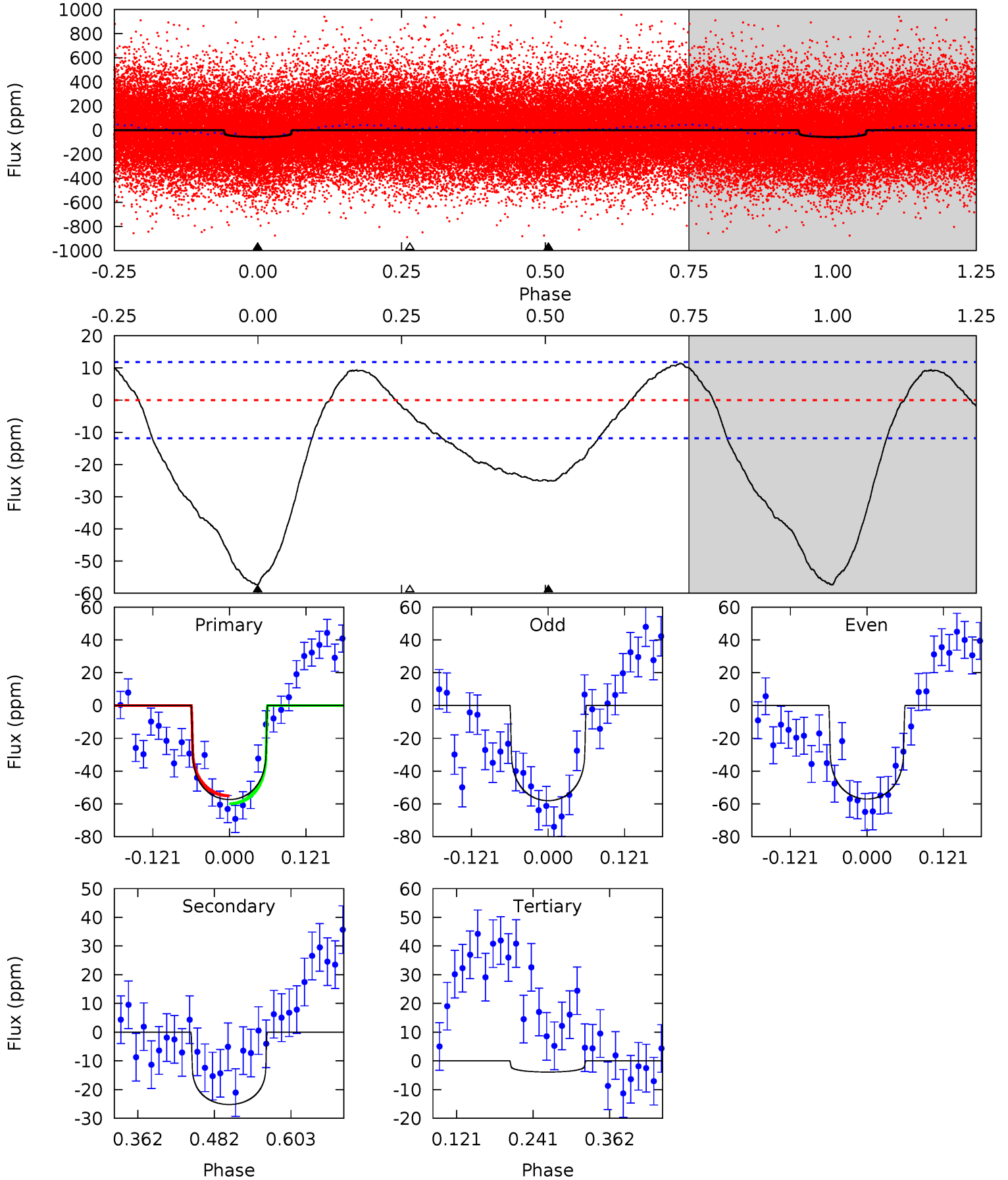




# DV Model-Shift Uniqueness Test

009636569-02, P = 10.728489 Days, E = 126.783345 Days

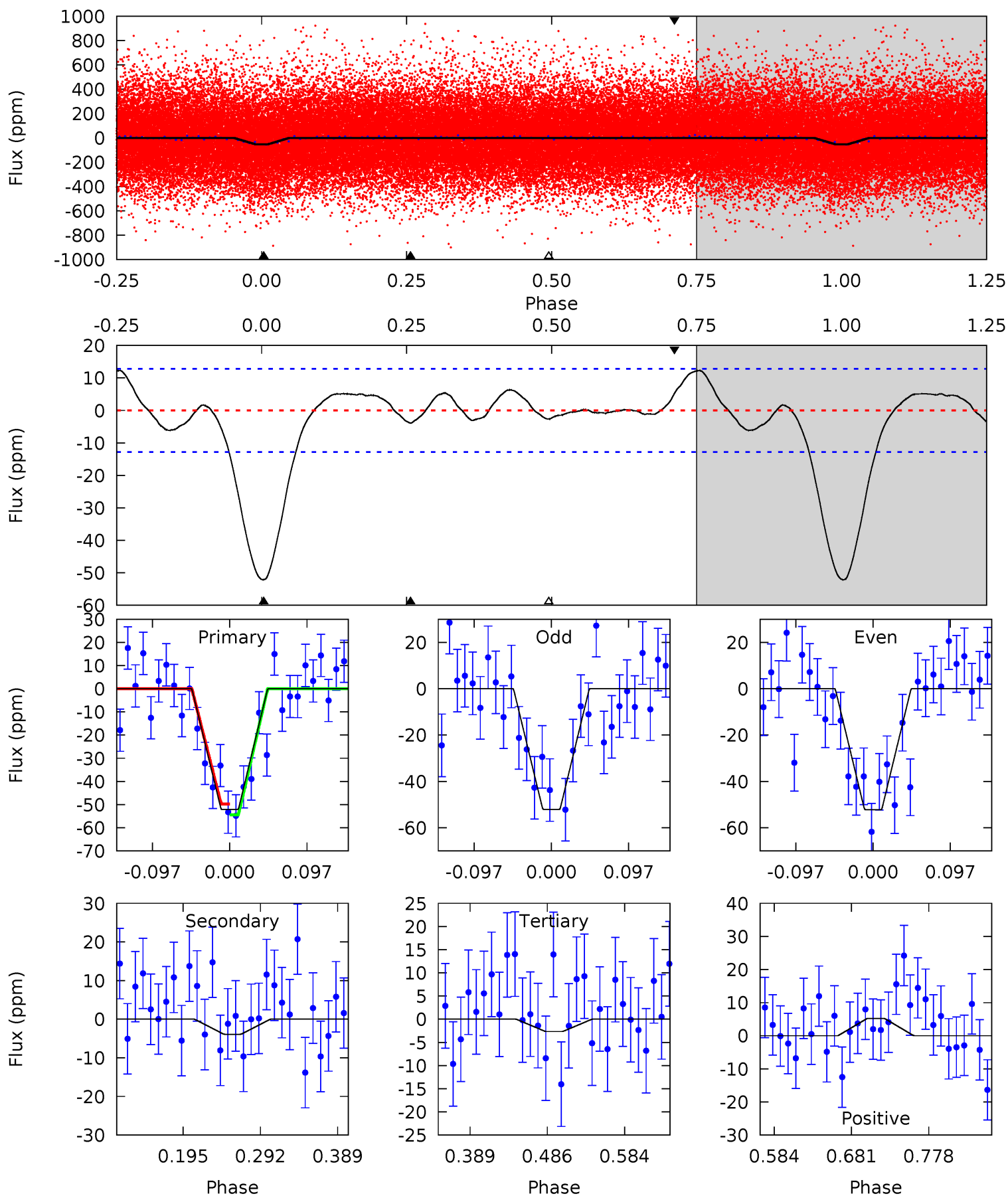
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
21.9	9.62	1.48	0	4.53	1.55	4.26	20.4	21.9	8.14	9.62	0.19	1.05	0.17	0.93



# Alt Model-Shift Uniqueness Test

009636569-02, P = 10.728996 Days, E = 126.827822 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
18.6	1.39	0.95	1.87	4.57	1.66	1.51	17.6	16.7	0.44	-0.48	0.02	0.83	0.19	0.83



### Stellar Parameters For KIC 009636569

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$5834^{+157}_{-157}$	$4.591^{+0.038}_{-0.161}$	$-0.540^{+0.300}_{-0.300}$	$0.774^{+0.188}_{-0.063}$	$0.862^{+0.085}_{-0.094}$	$2.621^{+0.411}_{-1.153}$
	+3%/-3%	+1%/-4%	+56%/-56%	+24%/-8%	+10%/-11%	+16%/-44%
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 009636569-02 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-25 \pm 3$	$0.54^{+0.15}_{-0.14}$	$1075^{+58}_{-46}$	$5297^{+814}_{-524}$	$381^{+300}_{-150}$
Alt.	$-4 \pm 3$	$0.66^{+0.15}_{-0.14}$	$1078^{+62}_{-47}$	$3473^{+511}_{-580}$	$39^{+47}_{-28}$

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

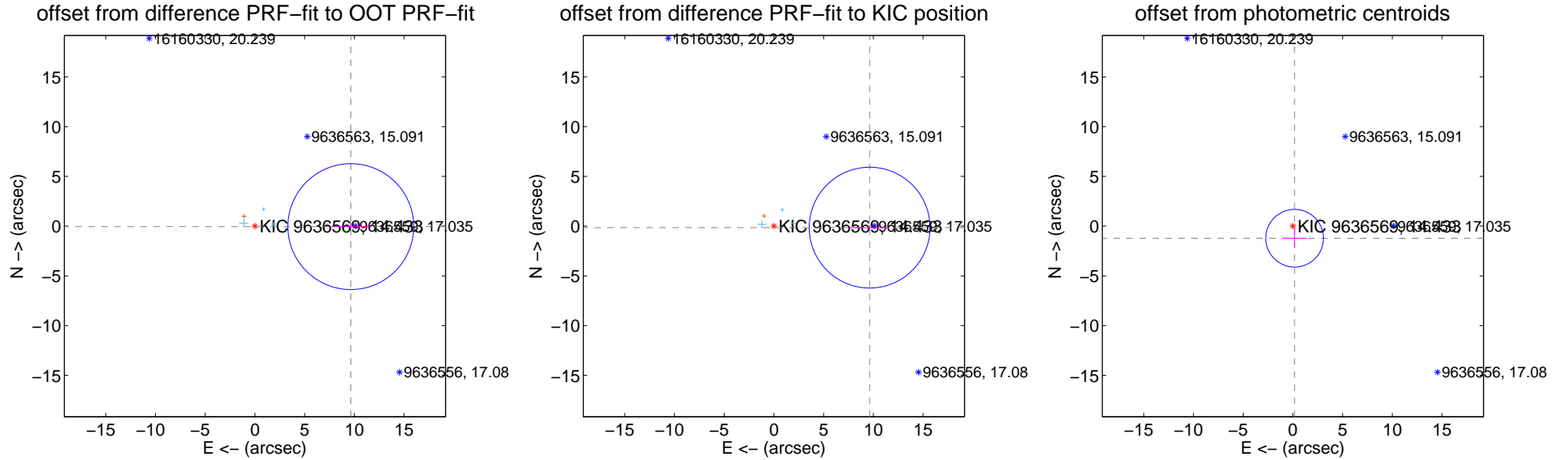
## DV Centroid Data

Supplemental centroid analysis for 009636569-02. Kepler magnitude: 14.43. Transit SNR 9.65

There are 4 quarters with good PRF difference image offsets

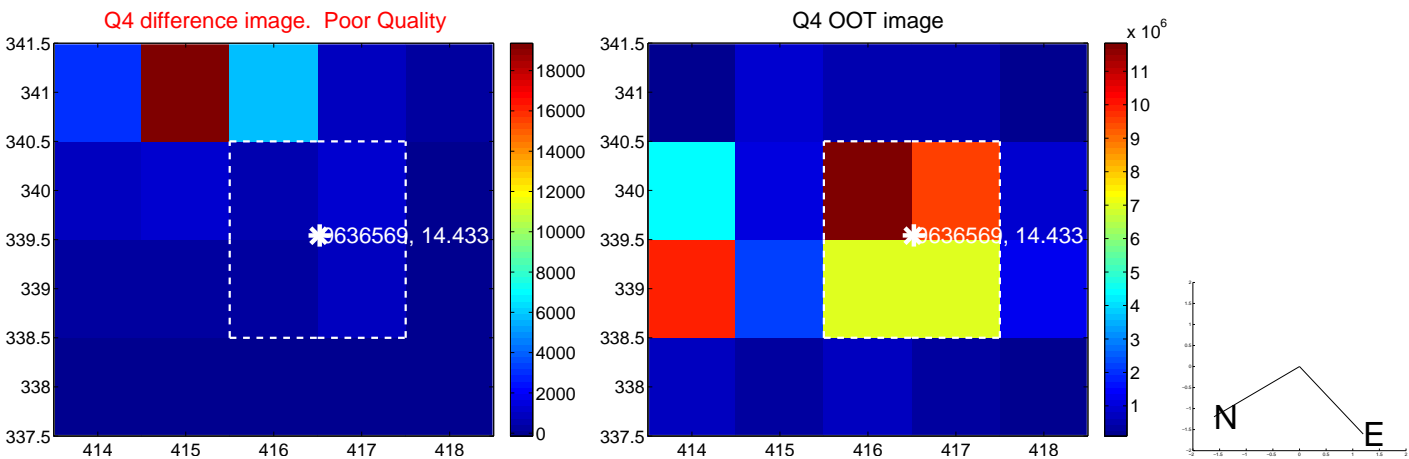
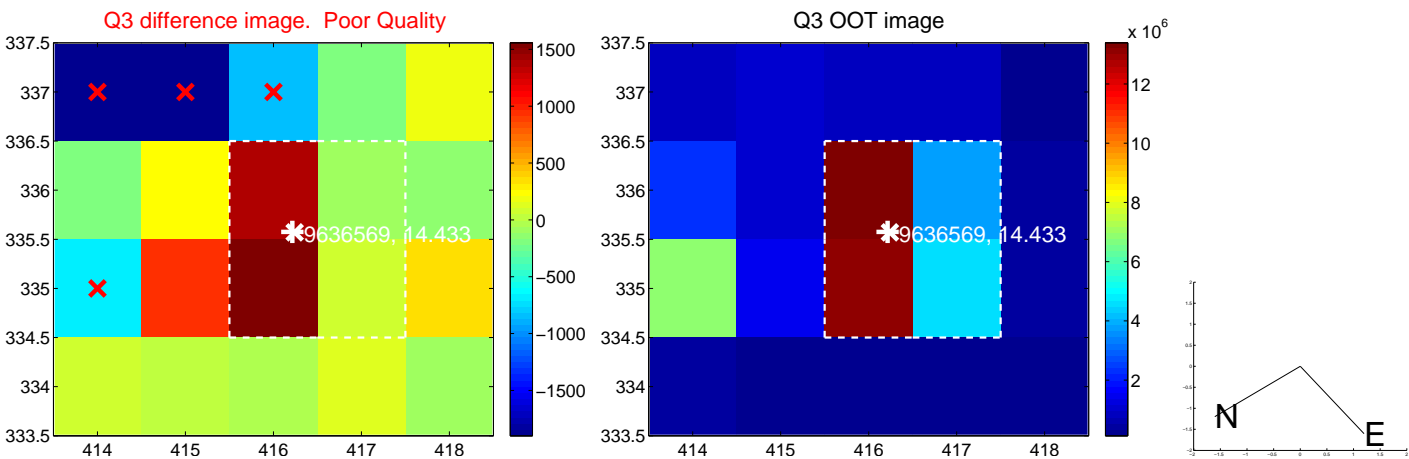
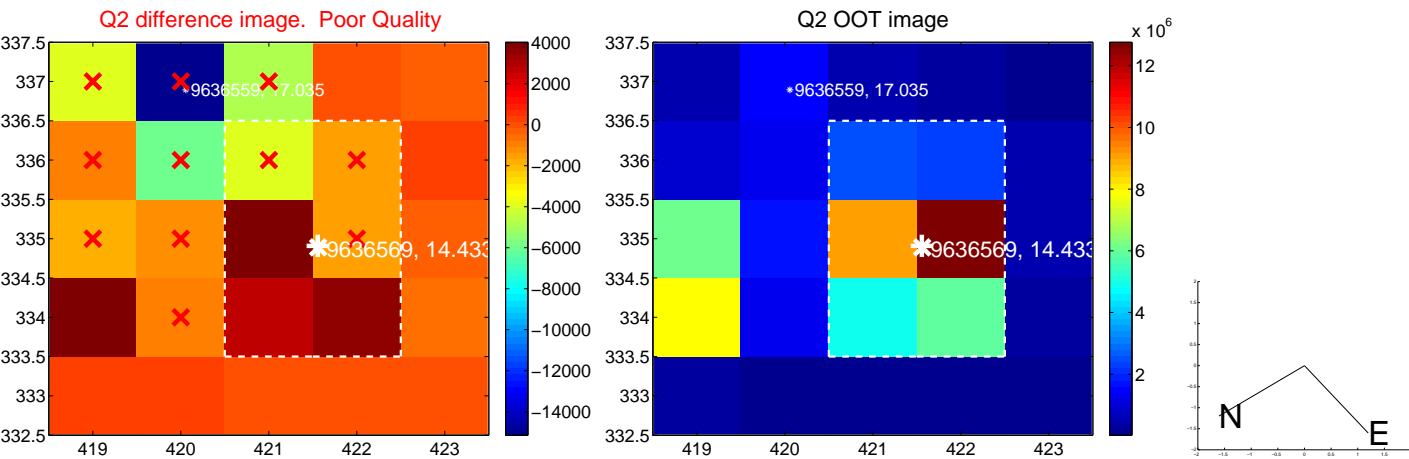
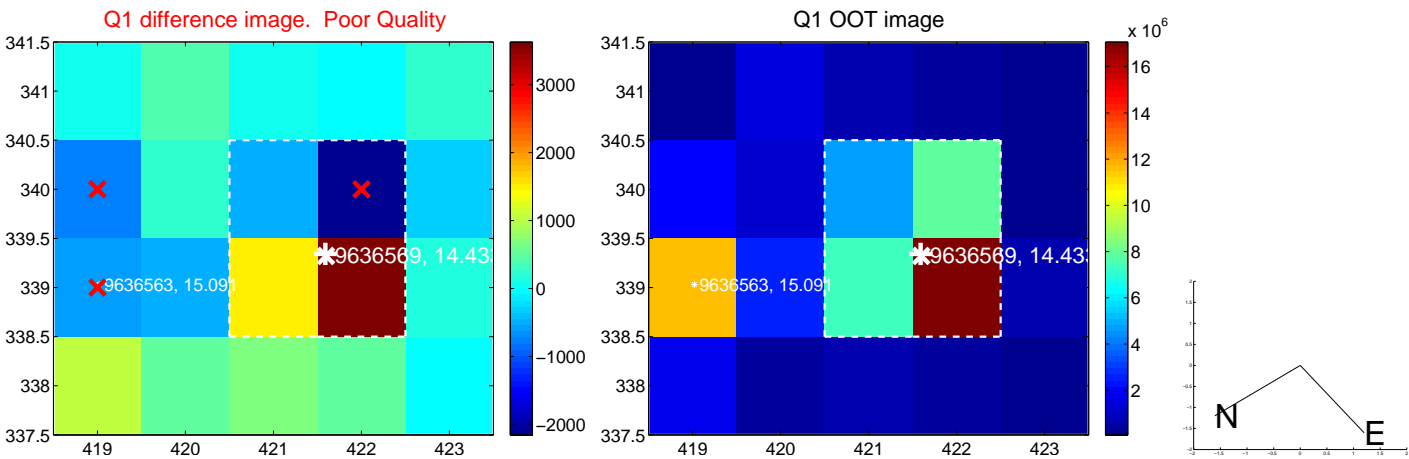
The direct PRF centroid is offset from the target star catalog position by about 0.12 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$9.646 \pm 2.109$	4.57	$-9.646 \pm 2.108$	$-0.047 \pm 0.368$
PRF-fit source offset from KIC position	$9.627 \pm 2.025$	4.75	$-9.626 \pm 2.022$	$-0.149 \pm 0.257$
photometric centroid source offset	$1.23 \pm 0.97$	1.27	$-0.17 \pm 1.22$	$-1.22 \pm 0.96$



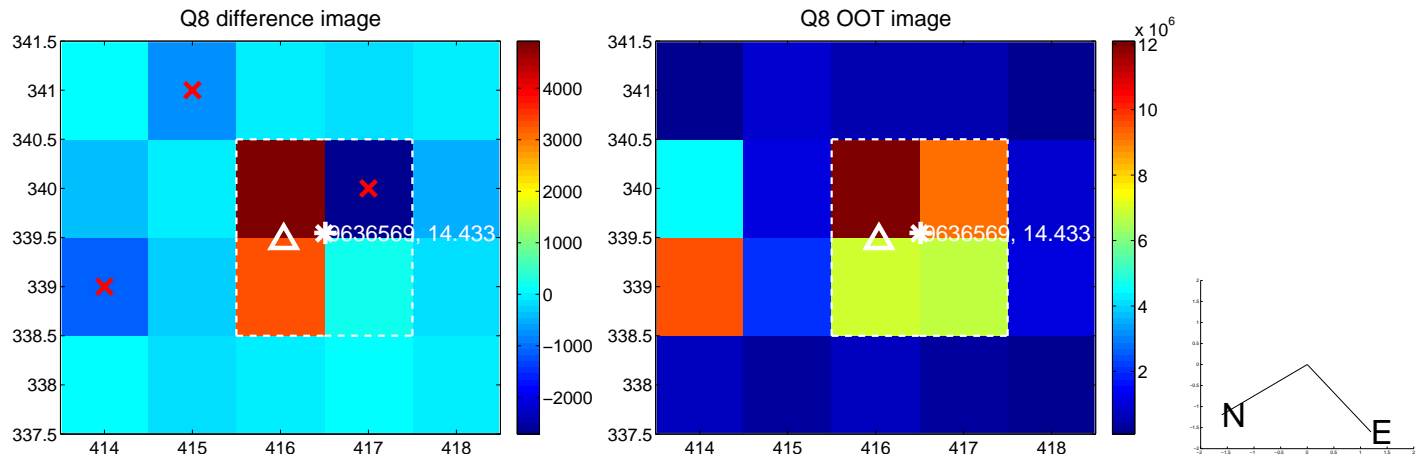
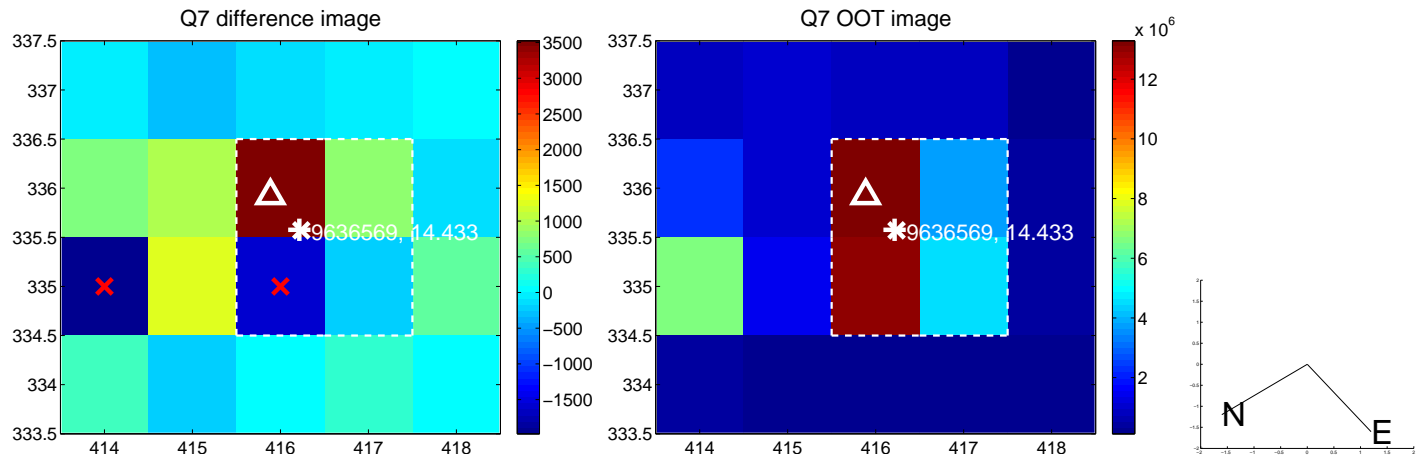
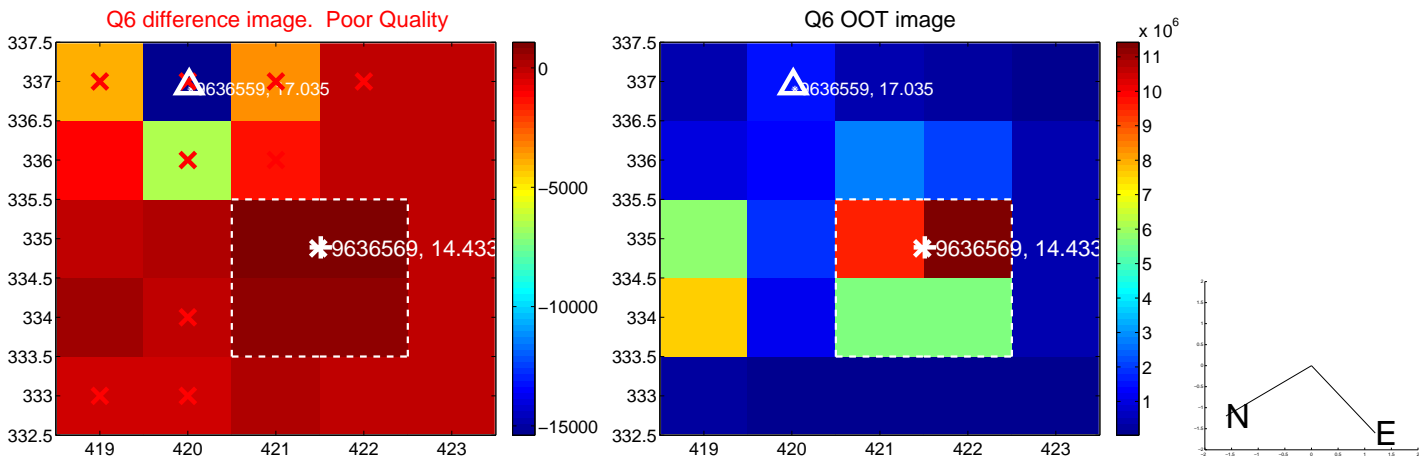
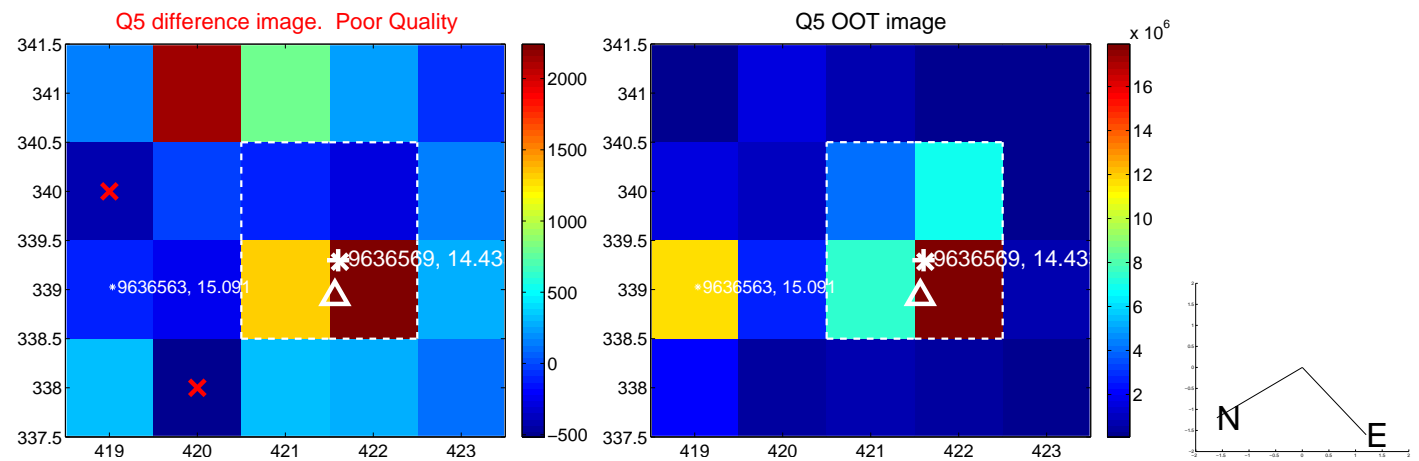
Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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

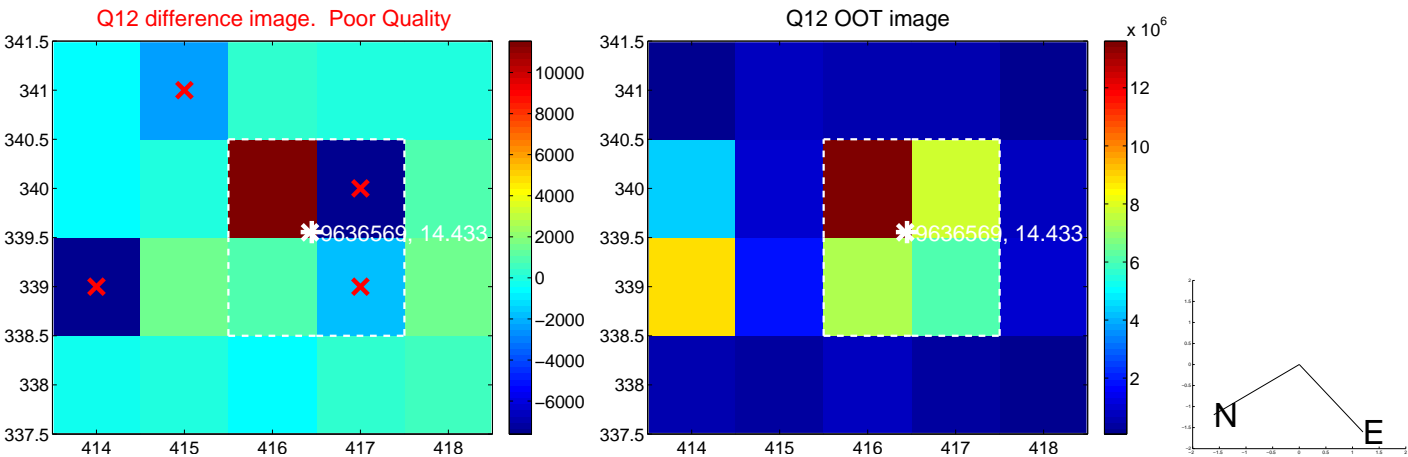
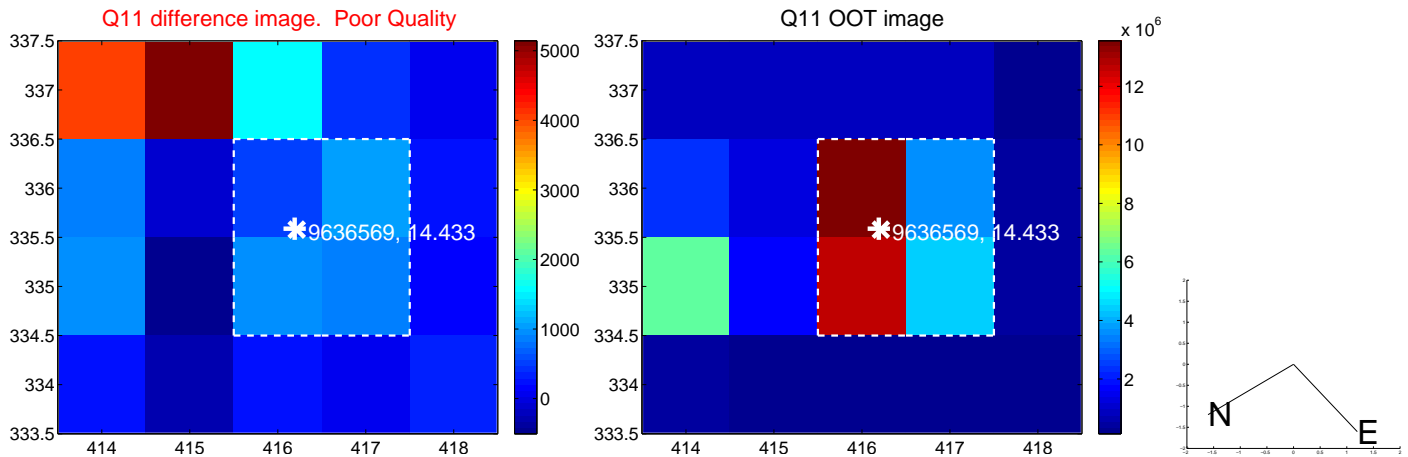
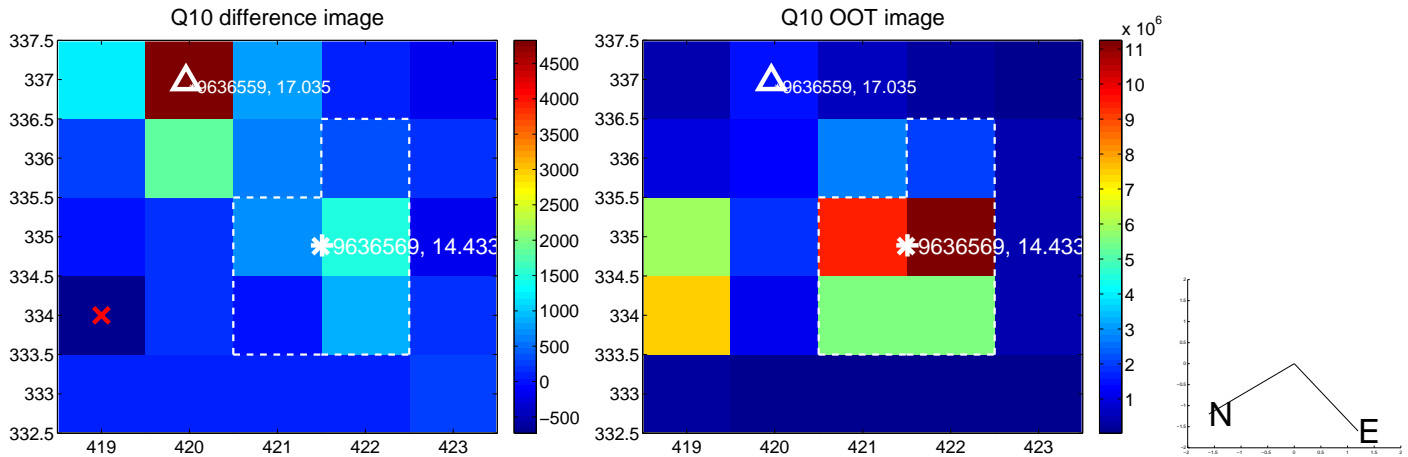
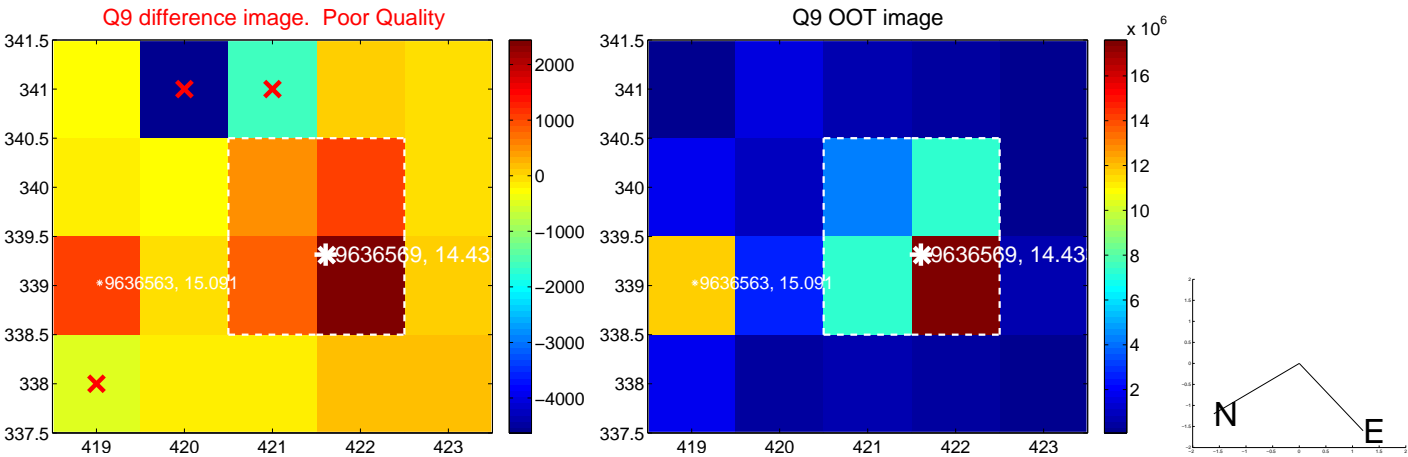




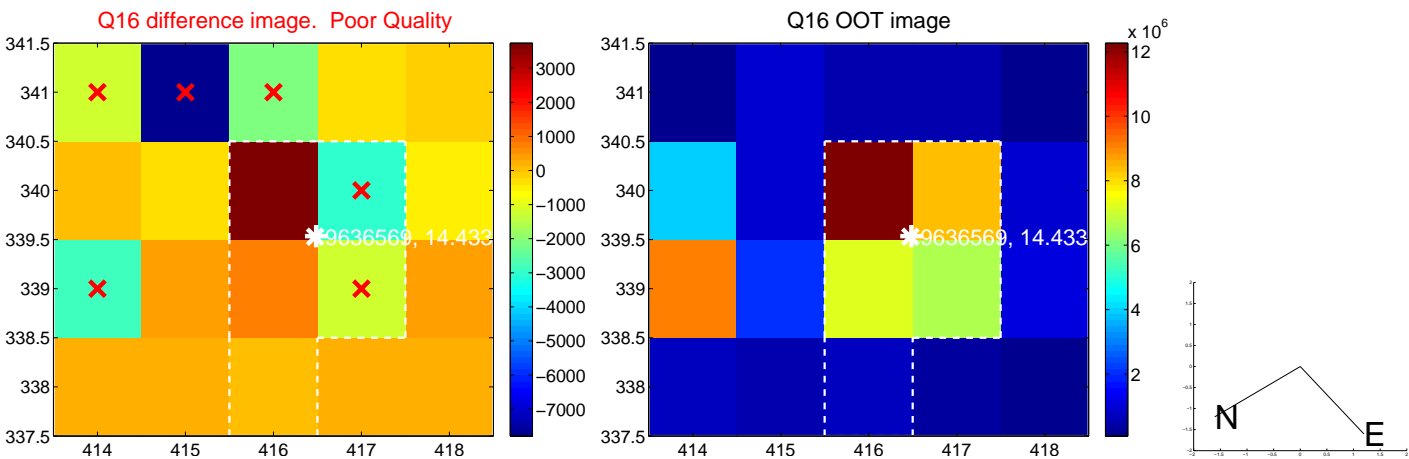
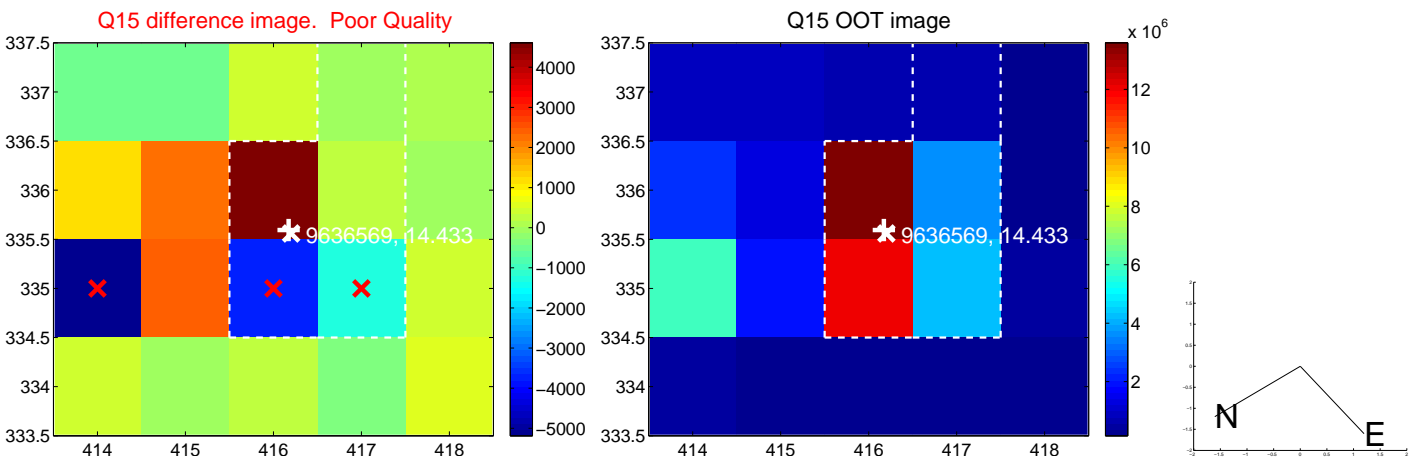
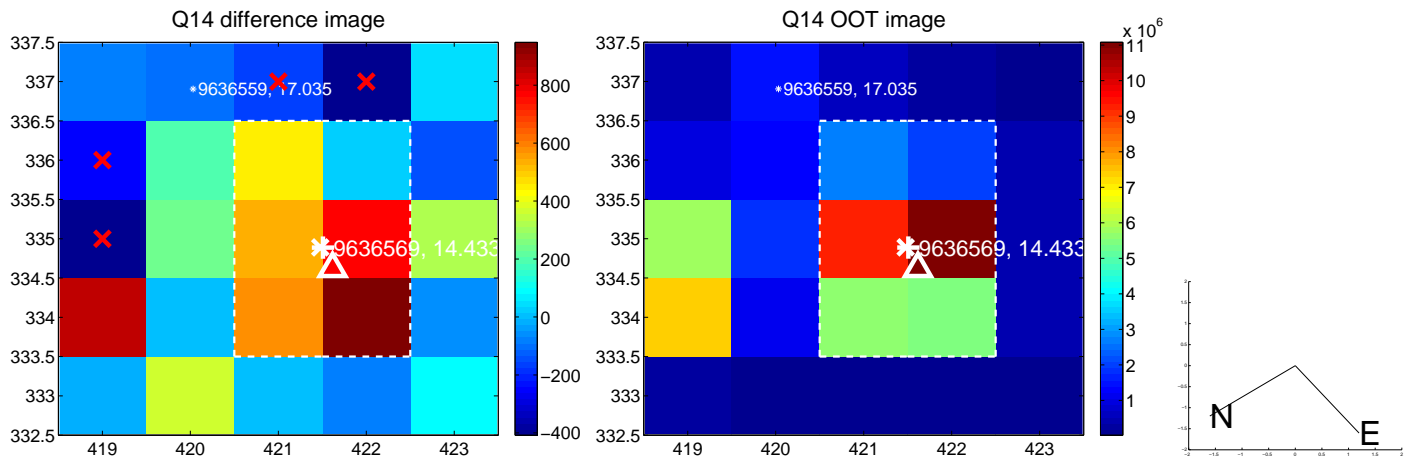
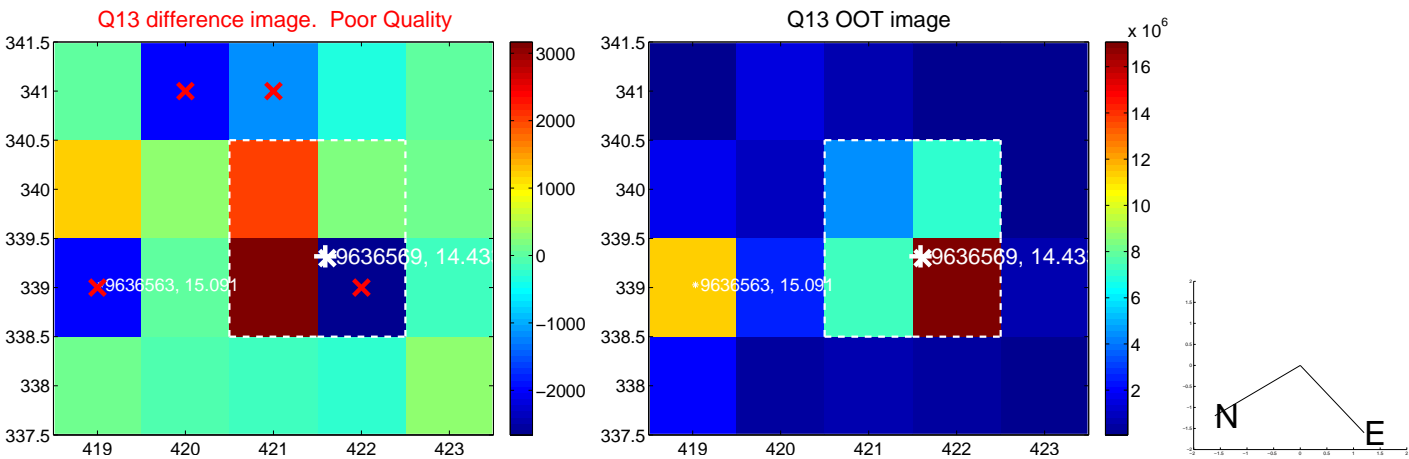
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



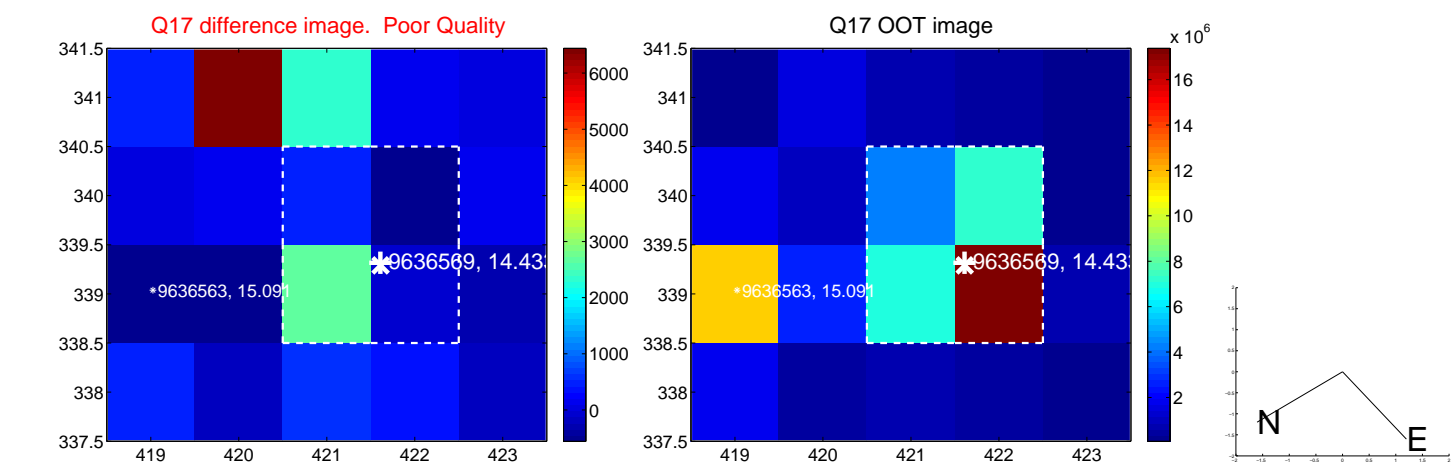
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



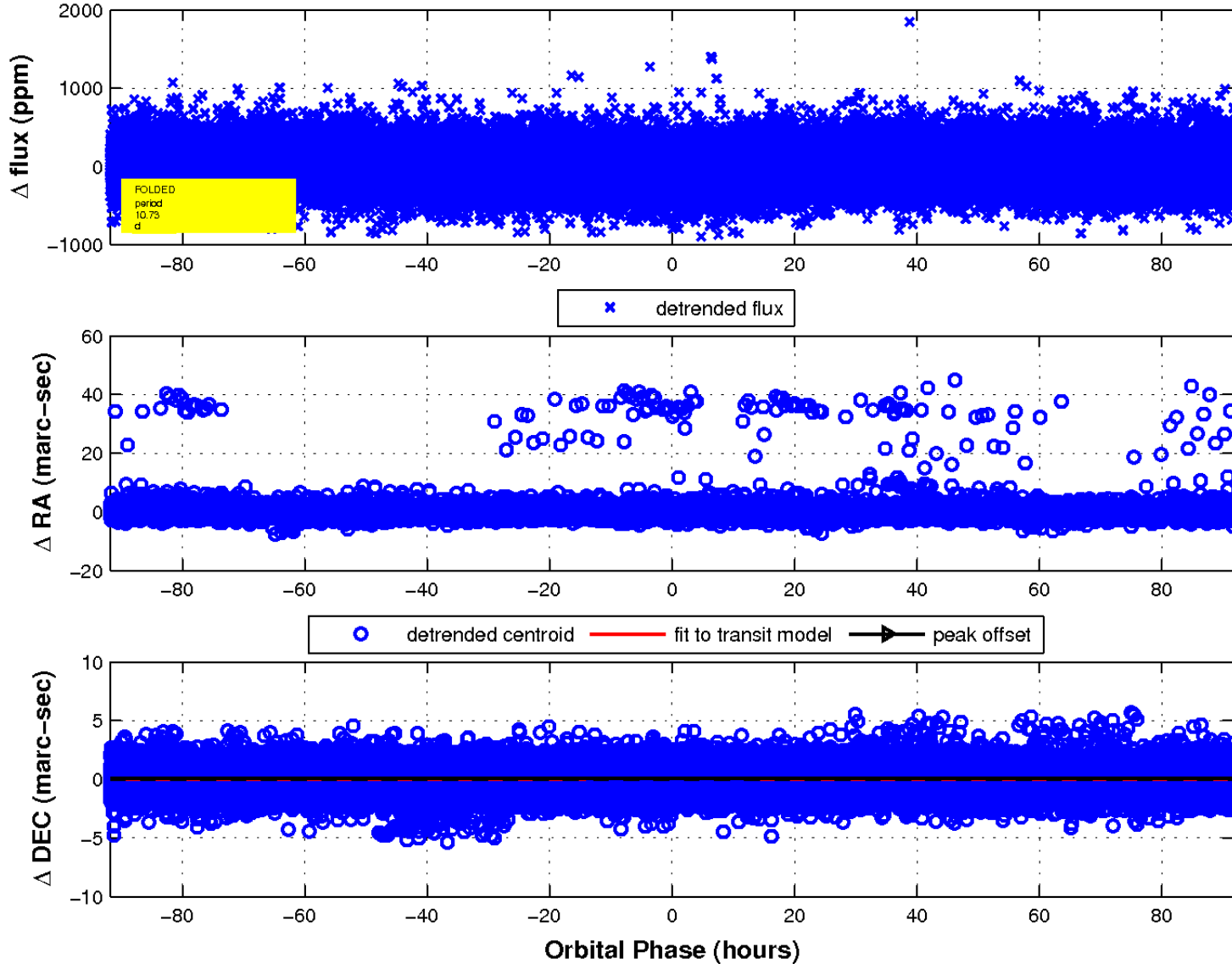
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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



fluxWeightedCentroids, Planet 2 of 2



UKIRT Image

Declination

