

# KIC 009641008

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
009641008-01	OBS	3860.01	2.178111	132.038478	332.5	2.297	43.5	47.9	0.71	5515	1.55	459.15
009641008-02	OBS	No	0.544250	131.777242	5.2	3.394	7.2	1.6	0.71	5515	0.19	2917.41
009641008-03	OBS	No	56.098222	166.841626	926.3	2.889	10.2	8.2	0.71	5515	2.28	6.04
009641008-05	OBS	No	26.545781	153.620285	149.8	6.955	7.6	2.8	0.71	5515	0.93	16.37

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009641008-01	OBS	FP	0.00	0	1	1	1	MOD_SEC_ALT—CENT_RESOLVED_OFFSET—HALO_GHOST—EPHEM_MATCH
009641008-02	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—CENT_FEW_DIFFS
009641008-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—ALL_TRANS_CHASES—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—CENT_FEW_DIFFS
009641008-05	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_SKYE_TRACKER—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—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.

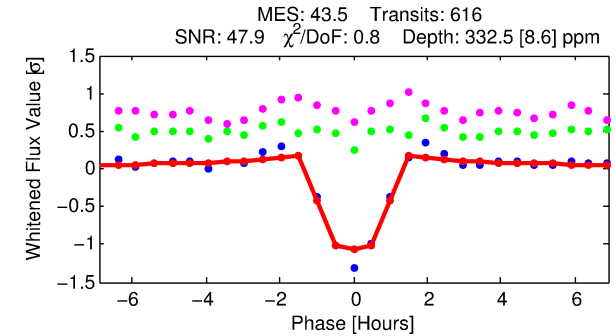
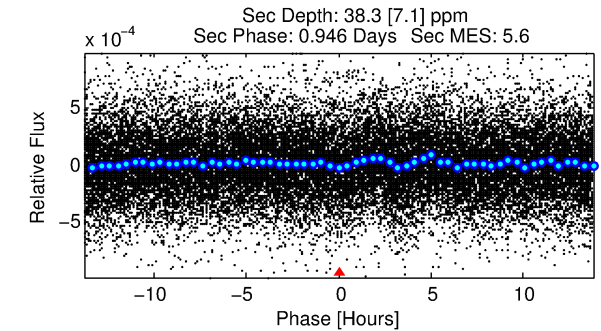
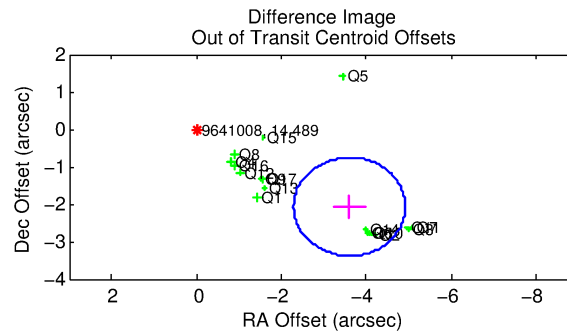
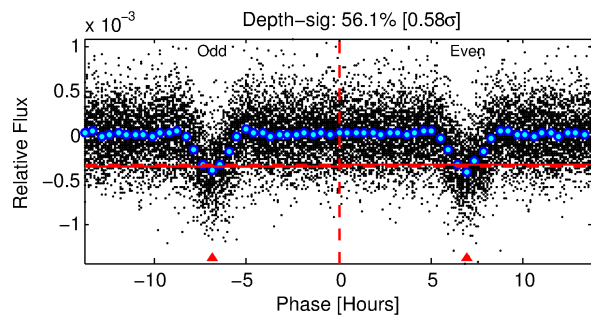
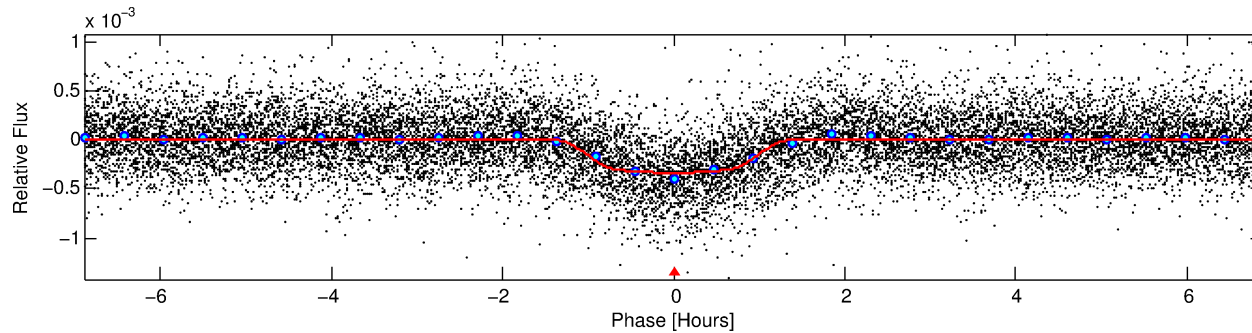
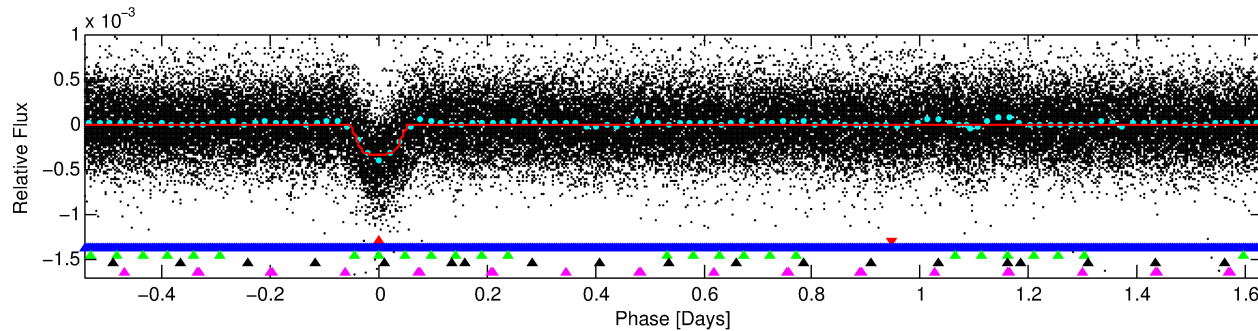
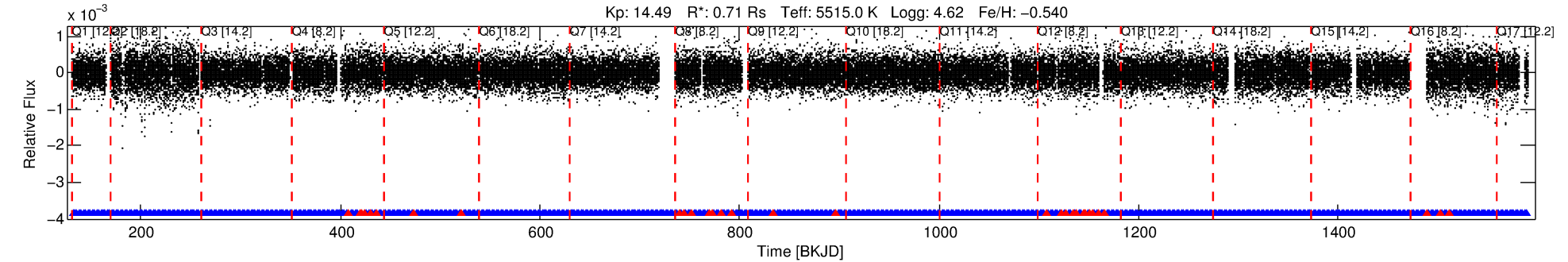
## Ephemeris Match Information For 009641008-01

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	$\sigma_P$	$\sigma_T$
009641008-01	9641008	FL-Lyr-pri	9641031	1:1	70.0	-10	-14	9.18	14.49	1306.50	Direct-PRF	0	1.35	0.93

**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: 9641008 Candidate: 1 of 5 Period: 2.178 d  
KOI: K03860.01 Corr: 0.809



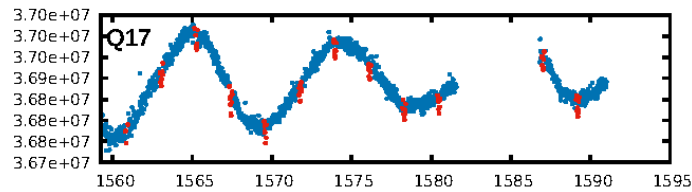
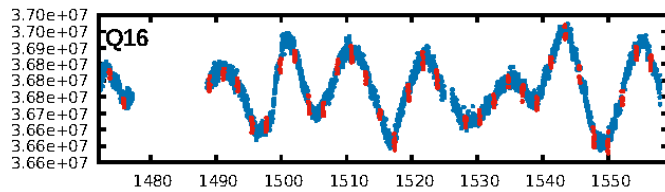
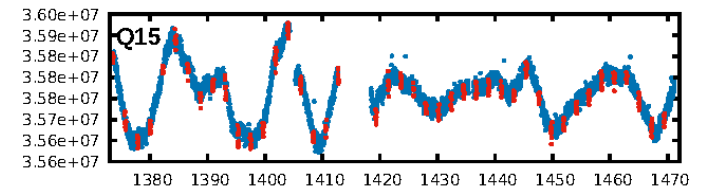
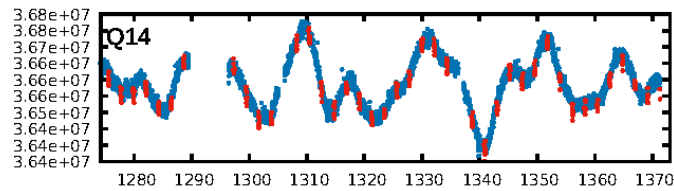
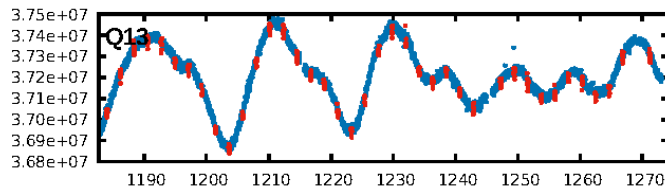
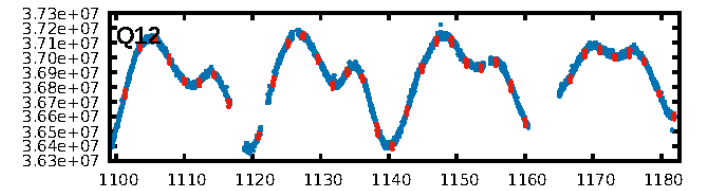
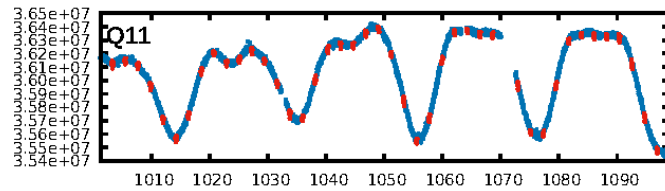
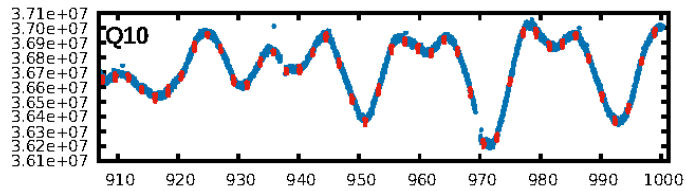
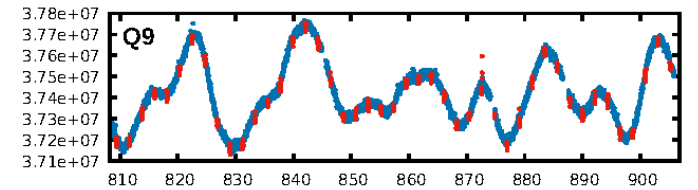
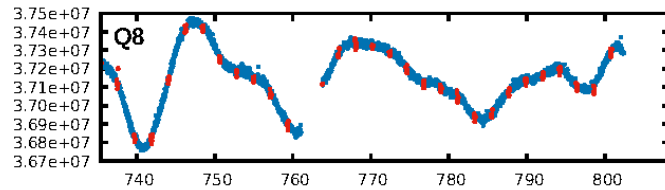
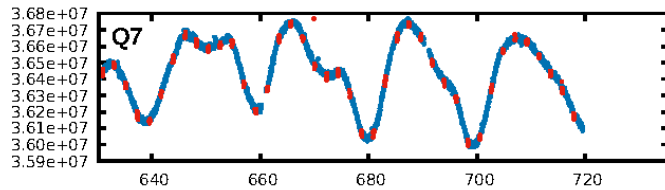
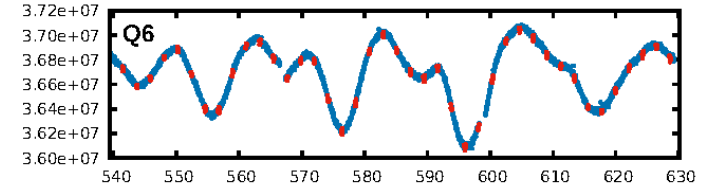
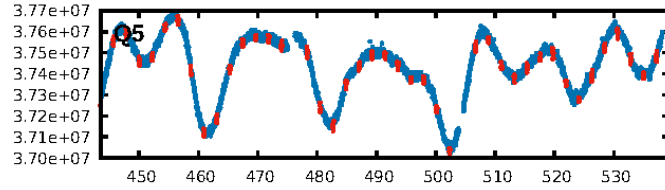
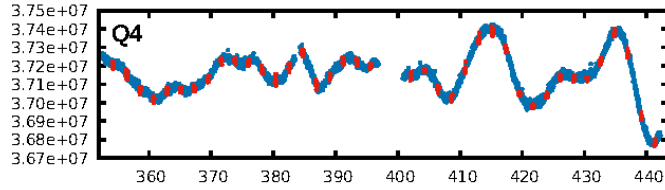
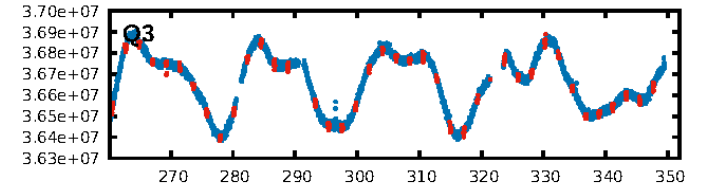
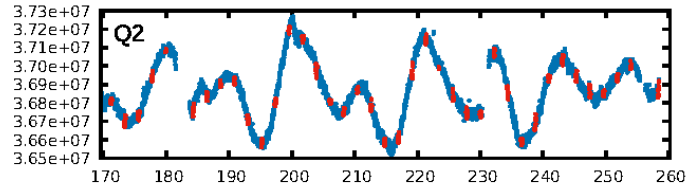
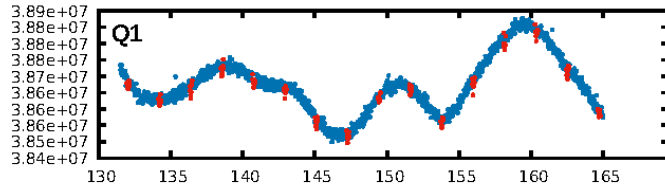
## DV Fit Results:

Period = 2.17811 [0.00000] d  
Epoch = 132.0385 [0.0007] BKJD  
Rp/R\* = 0.0199 [0.0019]  
a/R\* = 3.59 [1.50]  
b = 0.90 [0.10]  
Seff = 459.15 [104.66]  
Teq = 1180 [67] K  
Rp = 1.55 [0.30] Re  
a = 0.0303 [0.0041] AU  
Ag = 8.07 [2.68] [2.64 $\sigma$ ]  
Teffp = 3076 [226] K [8.04 $\sigma$ ]

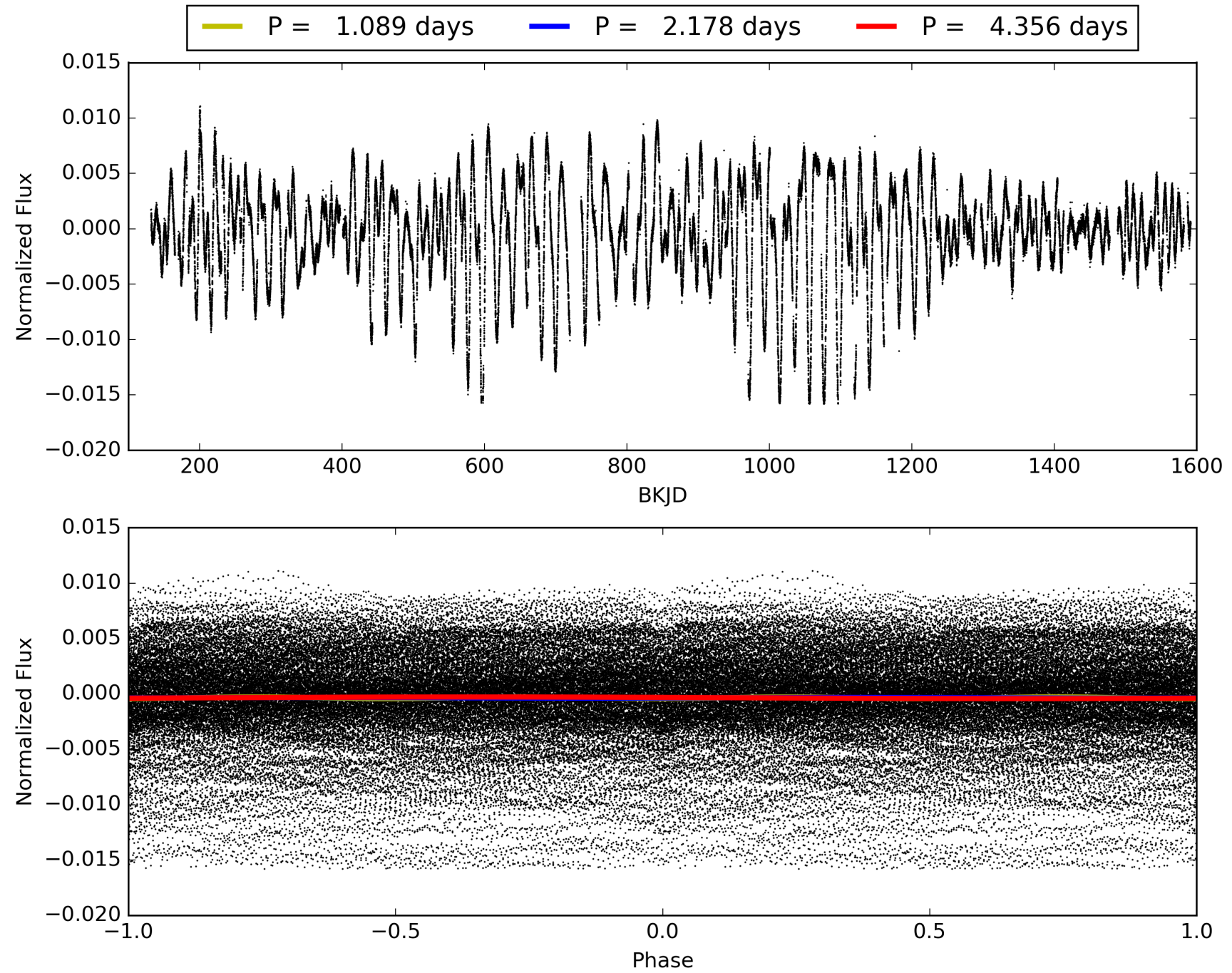
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [9.57 $\sigma$ ]  
LongPeriod-sig: 100.0% [79.84 $\sigma$ ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: 3.53e-285  
RollingBand-fgt: 0.95 [557/588]  
GhostDiagnostic-chr: 0.1238  
Centroid-sig: 0.0%  
Centroid-so: 5.163 arcsec [20.91 $\sigma$ ]  
OotOffset-rm: 4.159 arcsec [9.49 $\sigma$ ]  
KicOffset-rm: 4.211 arcsec [10.16 $\sigma$ ]  
OotOffset-st: 4/4/4/5 [17]  
KicOffset-st: 4/4/4/5 [17]  
DiffImageQuality-fgm: 0.00 [0/17]  
DiffImageOverlap-fno: 0.00 [0/17]

# TCE 009641008-01, PDC Light Curves



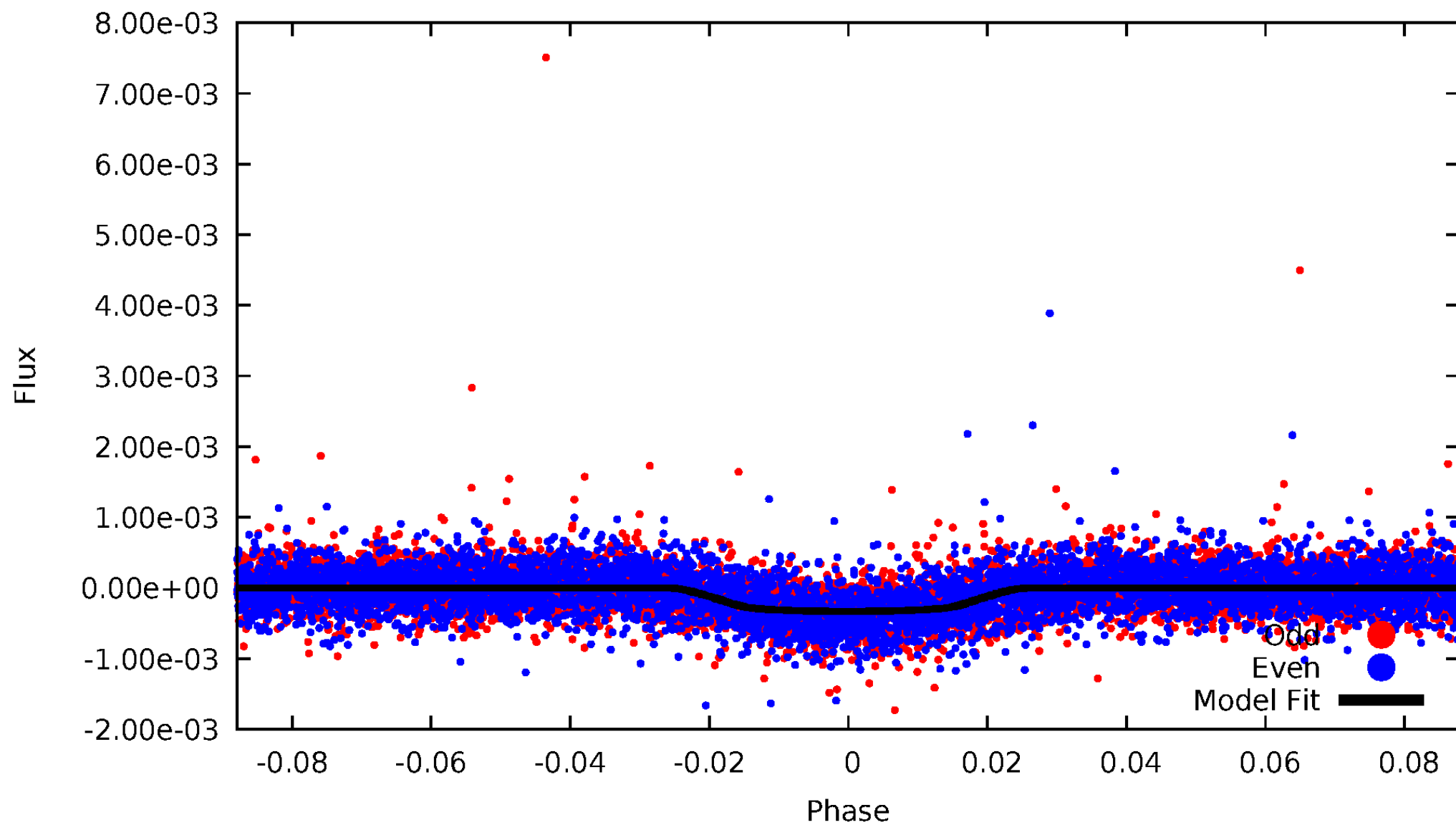
TCE 009641008-01





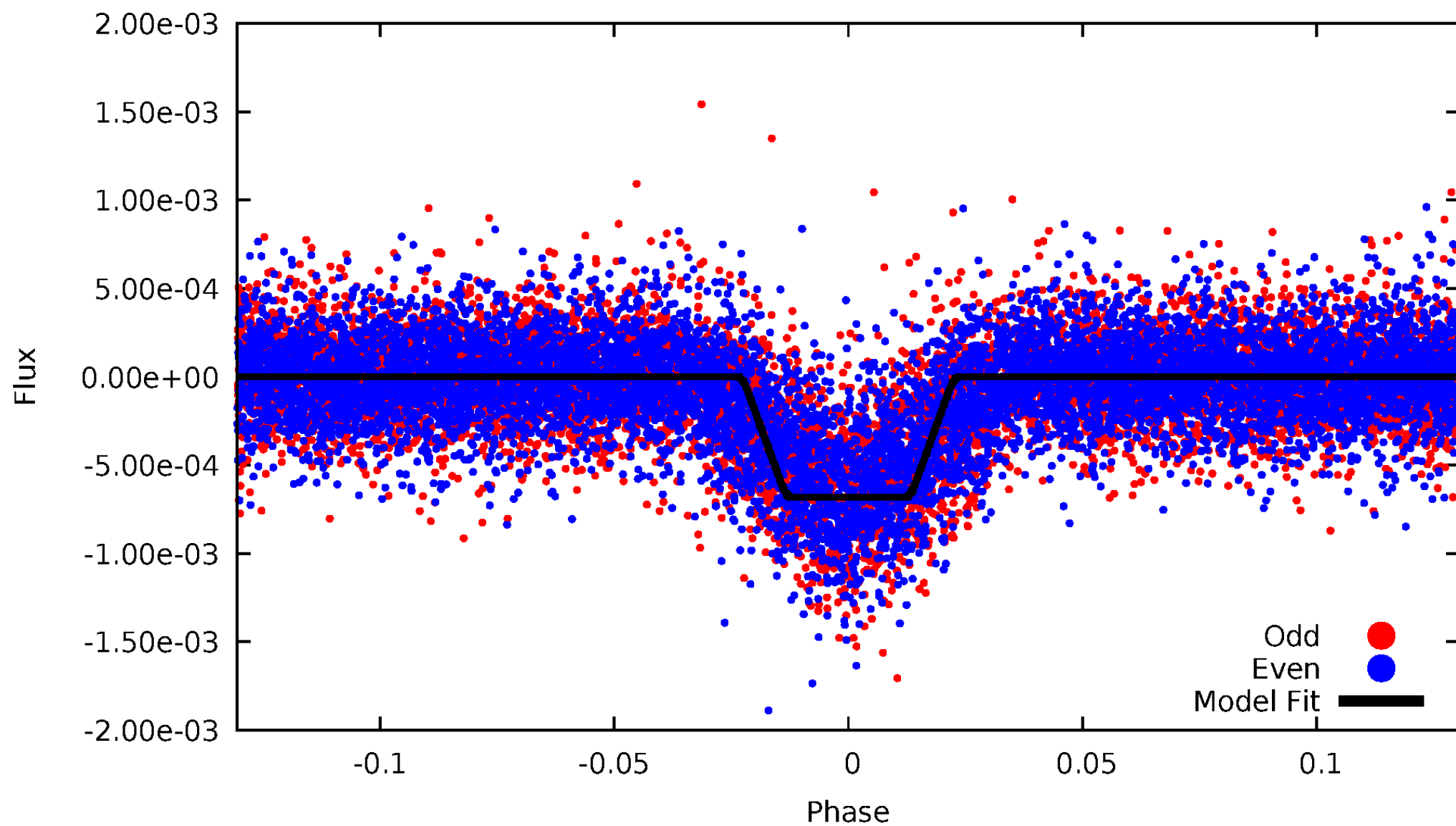
# DV Odd/Even

TCE 009641008-01



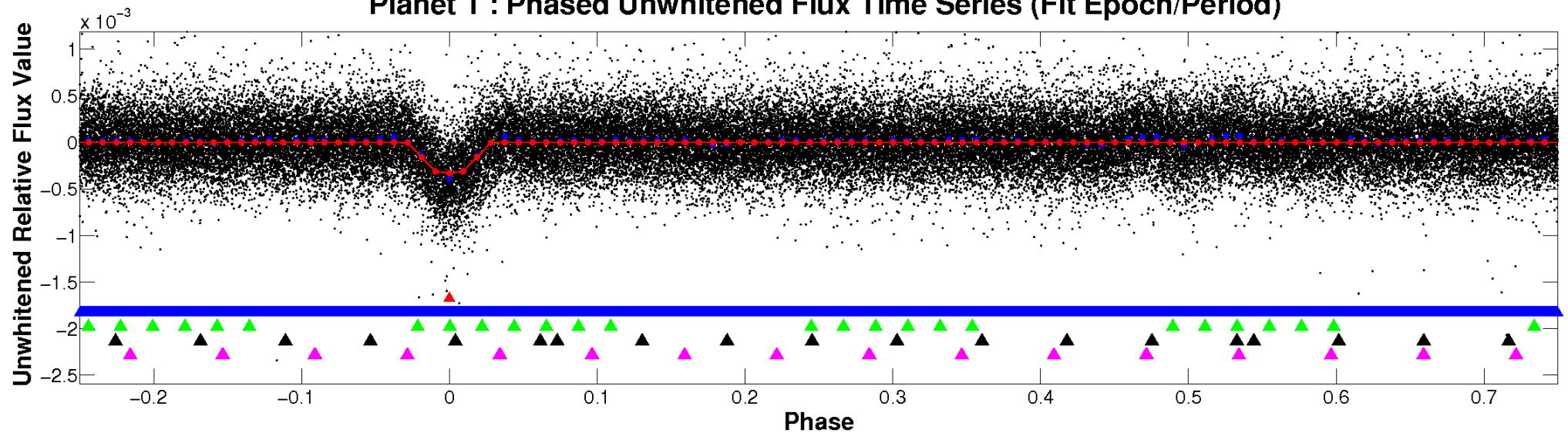
# ALT Odd/Even

TCE 009641008-01

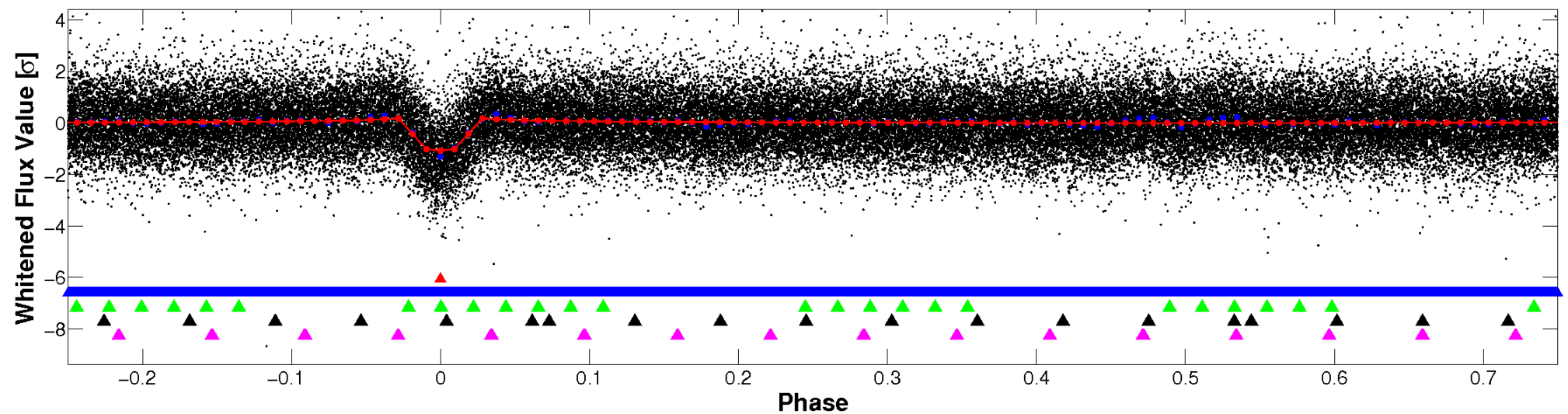


# Non-Whitened Vs. Whitened Light Curve

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

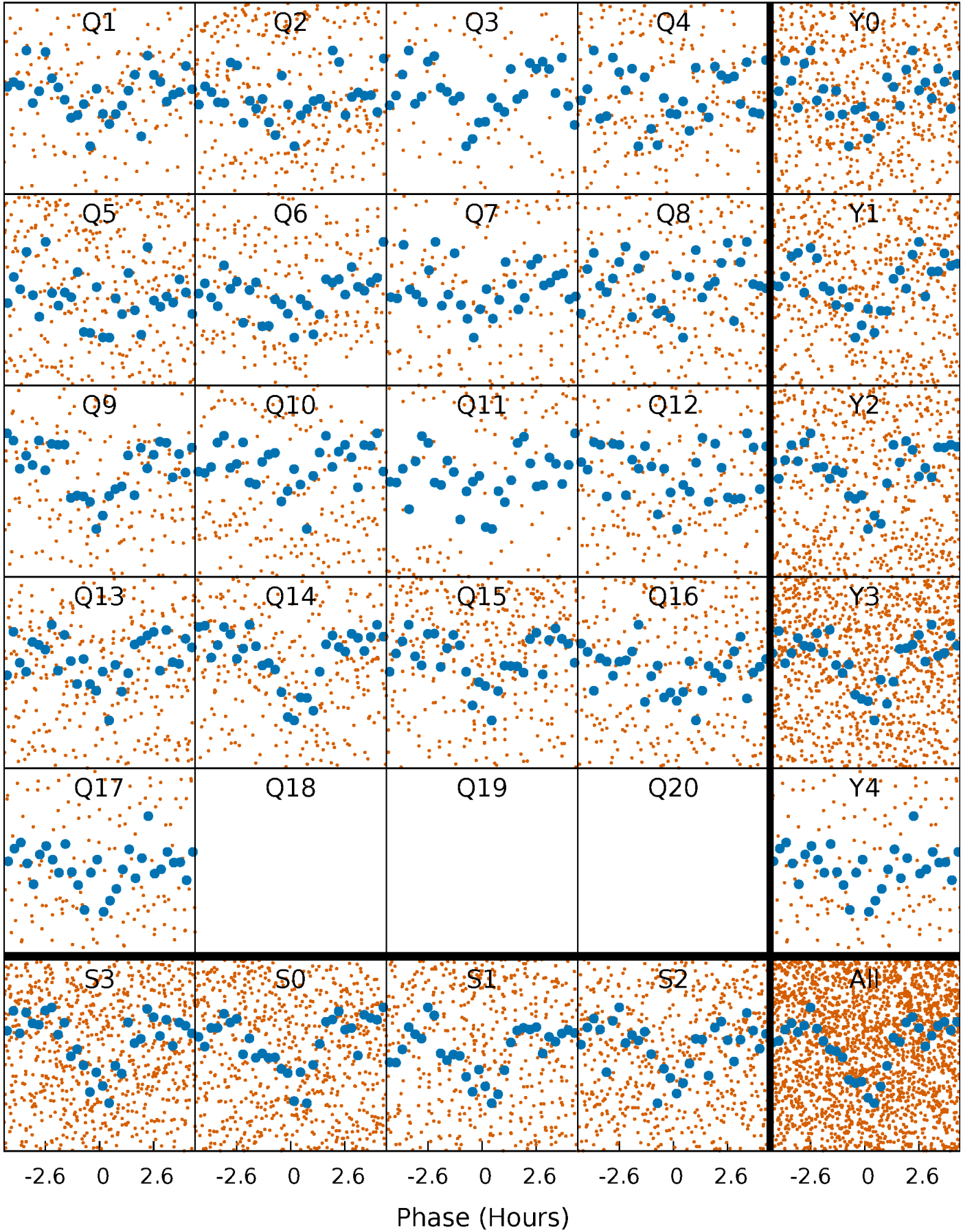


## Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)



# PDC Quarter-Phased Transit Curves

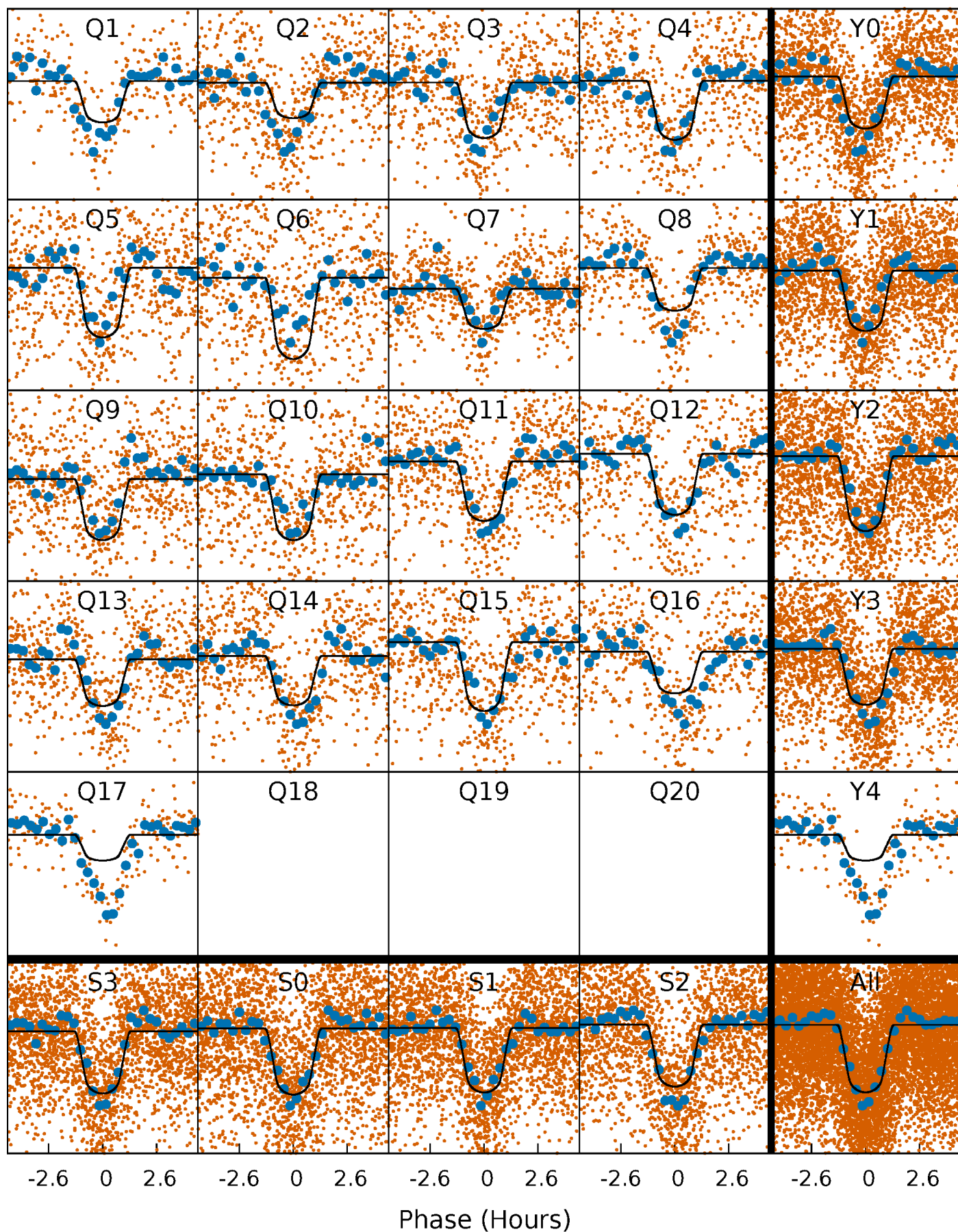
TCE 009641008-01 P= 2.178111 Days  $T_0=132.038478$  (BKJD)





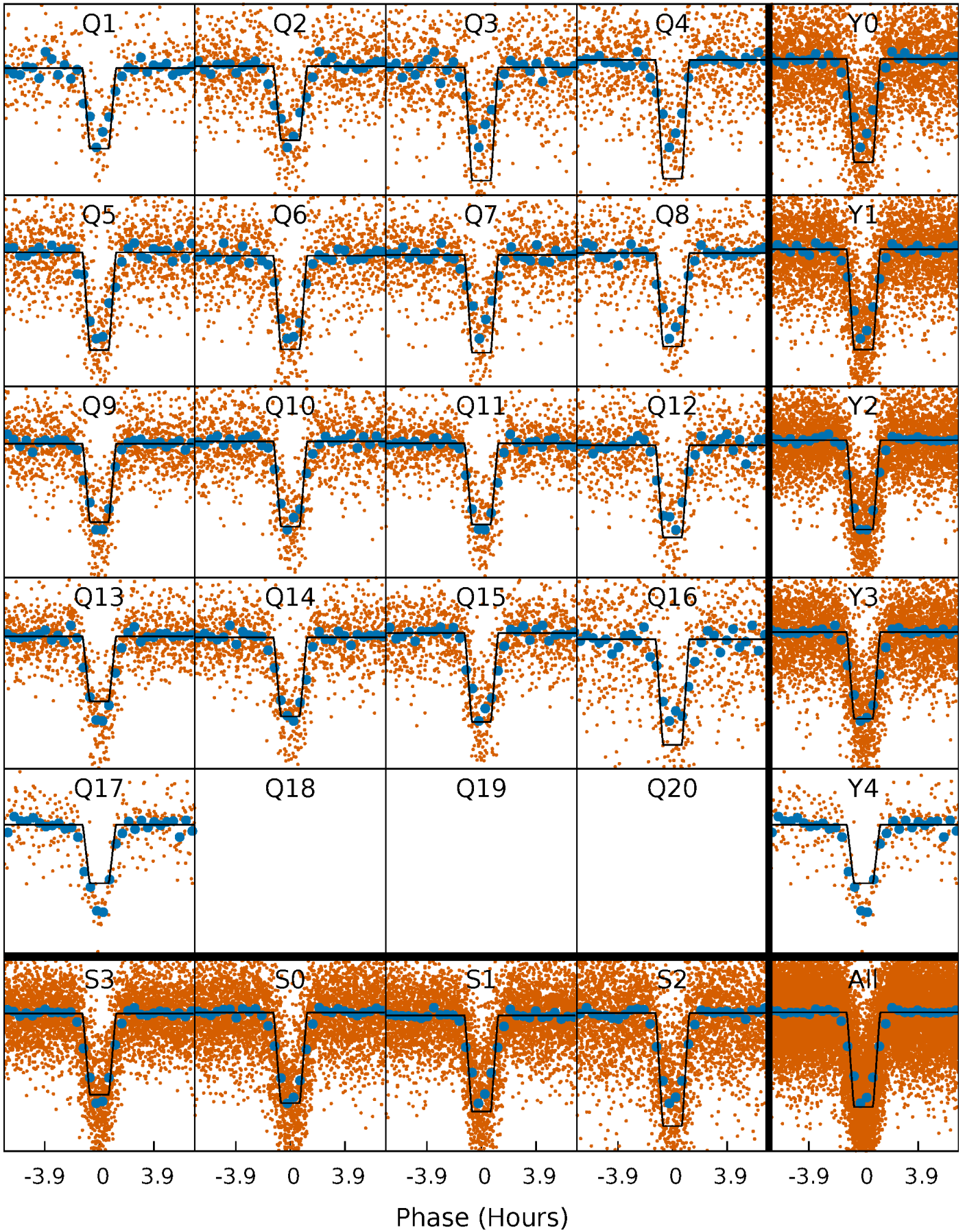
# DV Quarter-Phased Transit Curves

TCE 009641008-01 P= 2.178111 Days  $T_0=132.038478$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

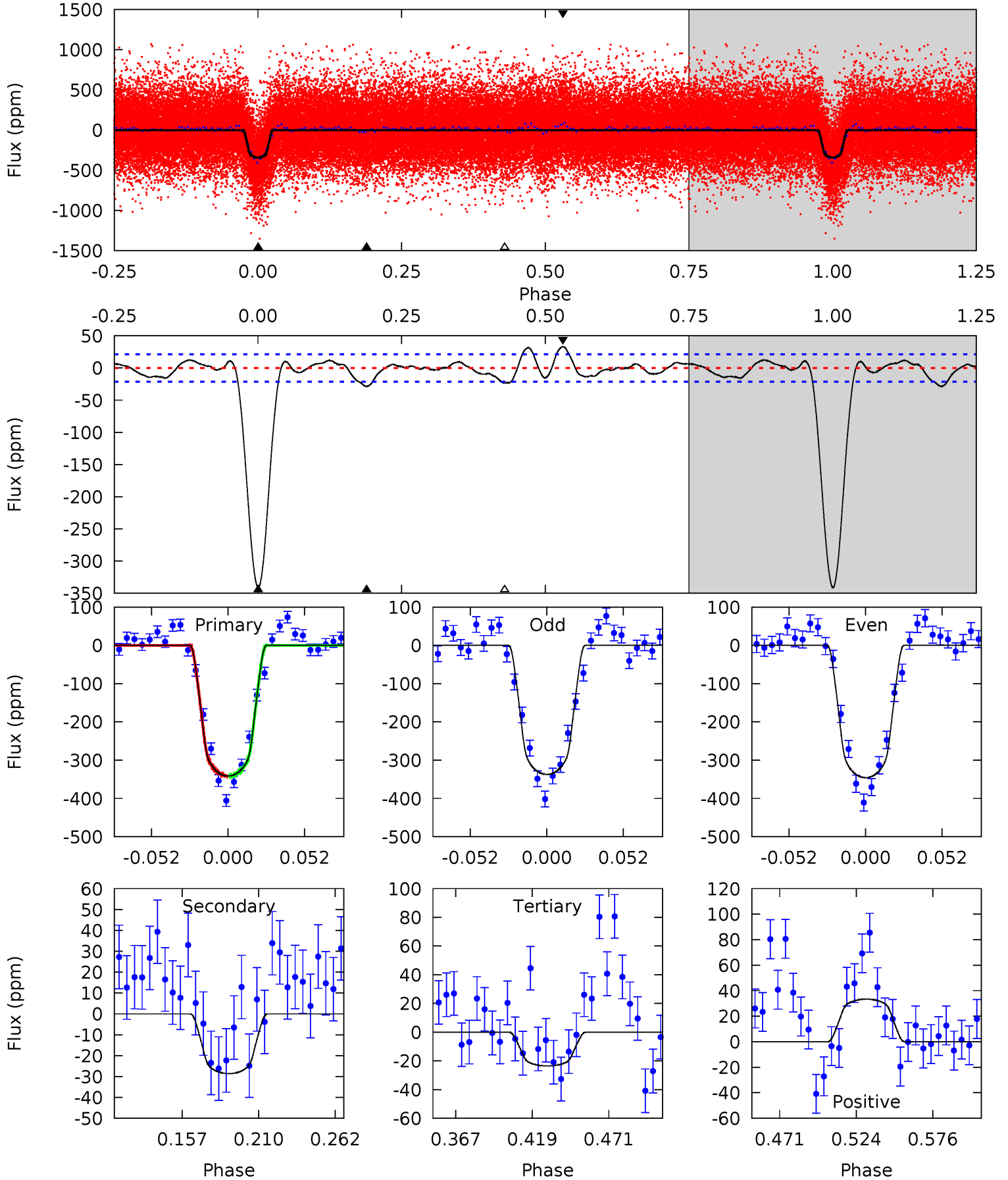
TCE 009641008-01 P= 2.178142 Days  $T_0=132.029170$  (BKJD)



# DV Model-Shift Uniqueness Test

009641008-01, P = 2.178111 Days, E = 129.860367 Days

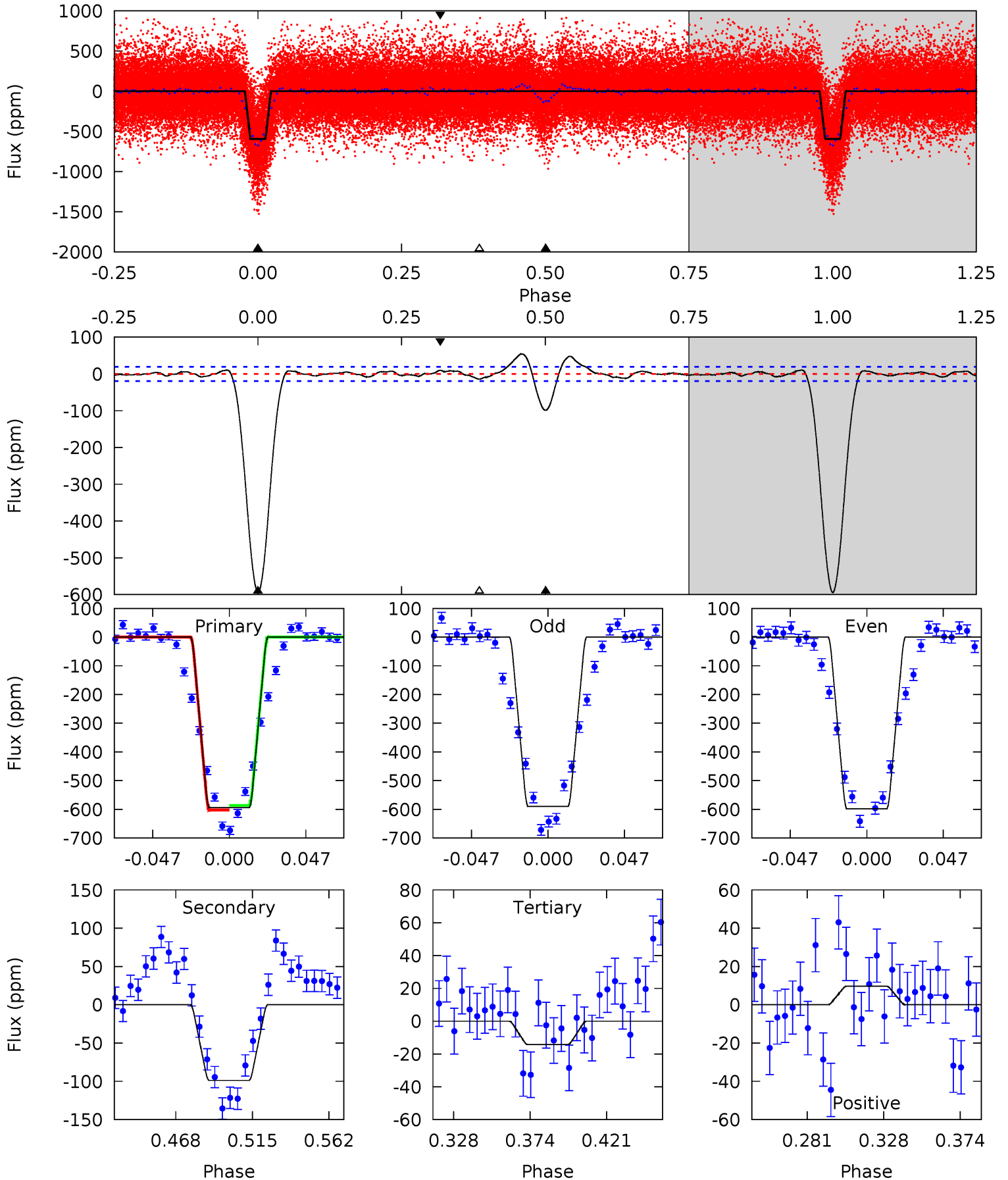
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
75.3	6.31	5.19	7.36	4.70	1.94	2.35	70.1	67.9	1.12	-1.05	0.95	1.06	0.09	0.08



# Alt Model-Shift Uniqueness Test

009641008-01, P = 2.178142 Days, E = 129.851028 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
143.3	23.8	3.45	2.34	4.72	1.99	2.20	139.8	140.9	20.4	21.5	0.97	0.99	0.08	1.94





### Stellar Parameters For KIC 009641008

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R$ ( $R_{\odot}$ )	$M(M_{\odot})$	$p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ )
	$5515^{+163}_{-147}$	$4.624^{+0.035}_{-0.105}$	$-0.540^{+0.300}_{-0.300}$	$0.712^{+0.117}_{-0.050}$	$0.785^{+0.073}_{-0.073}$	$3.065^{+0.523}_{-0.996}$
	+3%/-3%	+1%/-2%	+56%/-56%	+16%/-7%	+9%/-9%	+17%/-32%
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 009641008-01 / KOI 3860.01

Detrend	Depth (ppm)	$R_p$ ( $R_{\oplus}$ )	$T_{\text{max}}$ (K)	$T_{\text{obs}}$ (K)	$A_{\text{obs}}$
DV	$-29 \pm 5$	$1.58^{+0.20}_{-0.19}$	$1675^{+62}_{-64}$	$3346^{+168}_{-147}$	$5.627^{+1.960}_{-1.255}$
Alt.	$-99 \pm 4$	$2.07^{+0.22}_{-0.19}$	$1670^{+68}_{-61}$	$3762^{+127}_{-122}$	$12^{+2}_{-2}$

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

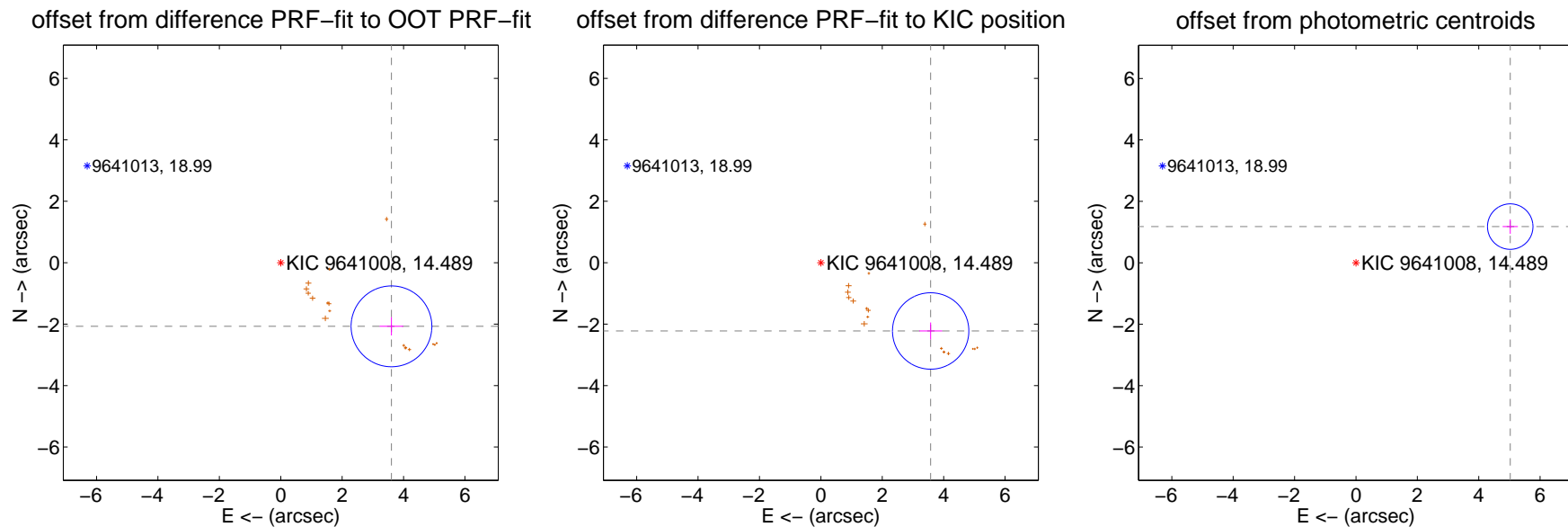
## DV Centroid Data

Supplemental centroid analysis for 009641008-01. Kepler magnitude: 14.49. Transit SNR 47.87

There are 0 quarters with good PRF difference image offsets

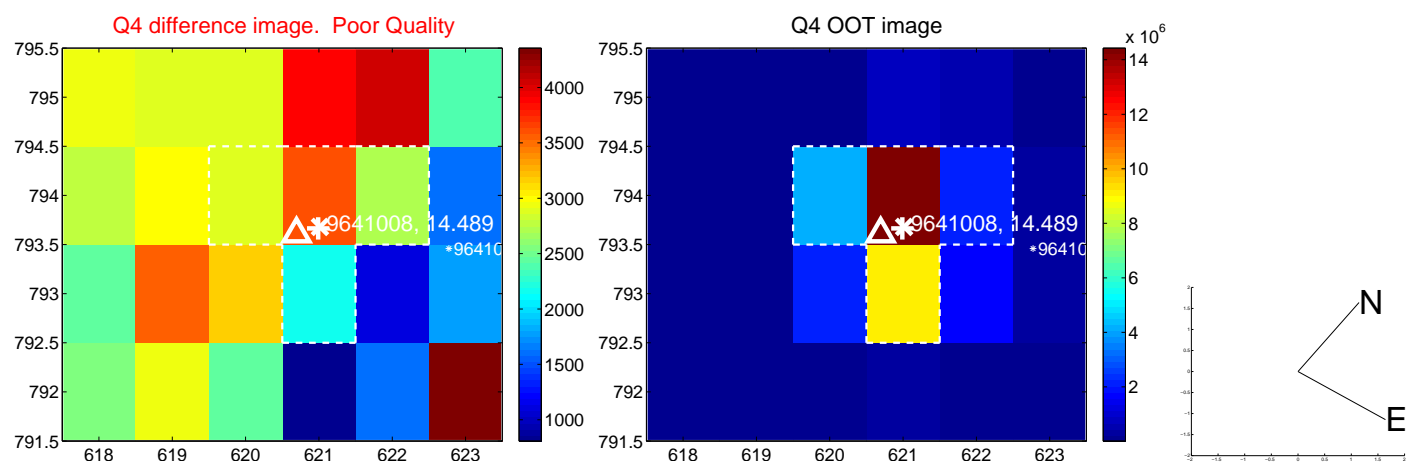
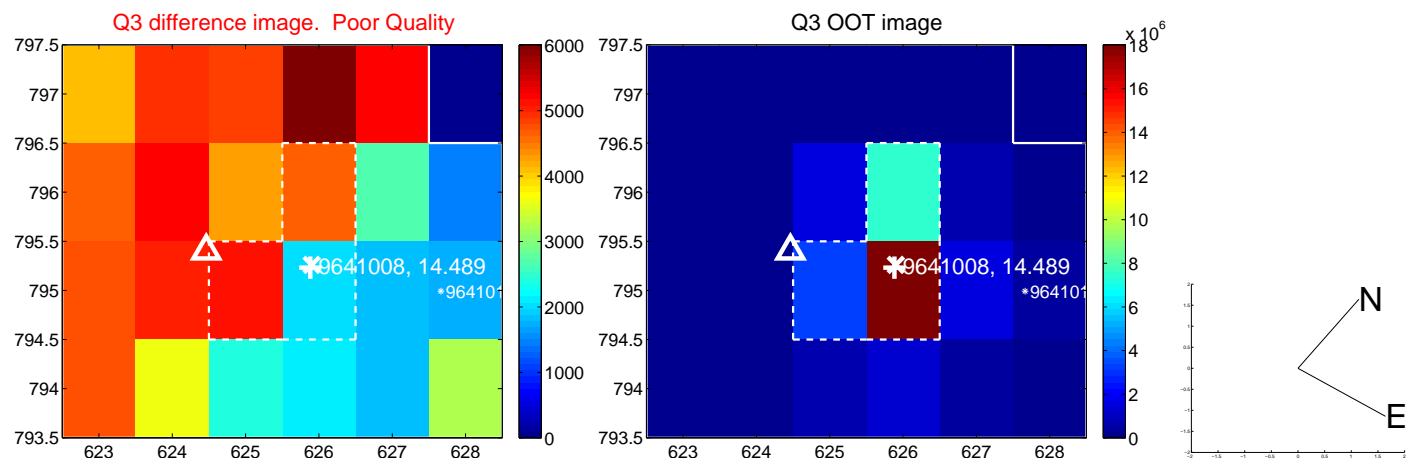
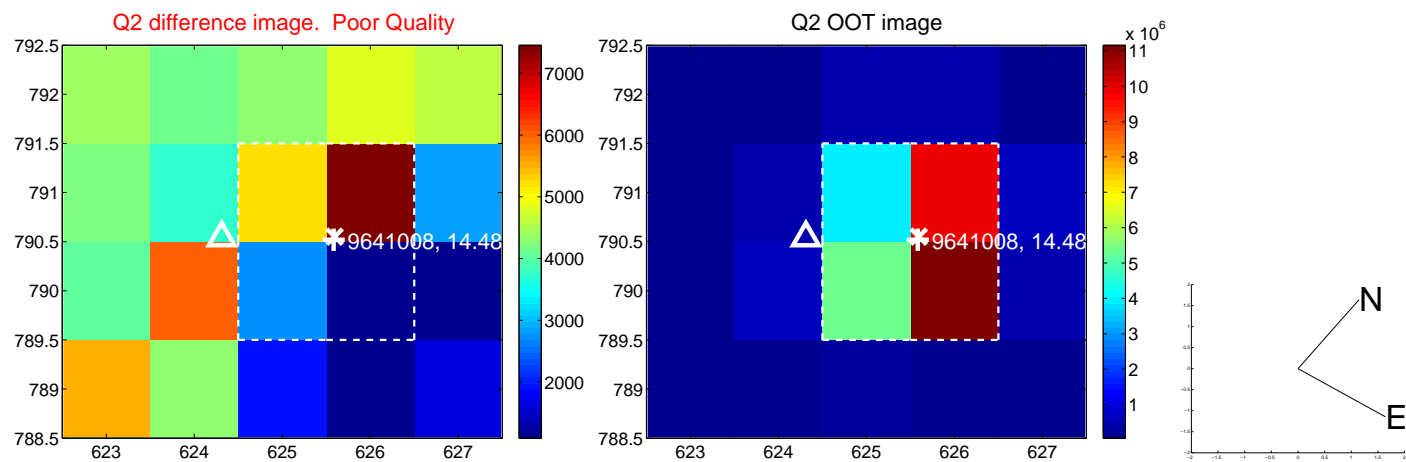
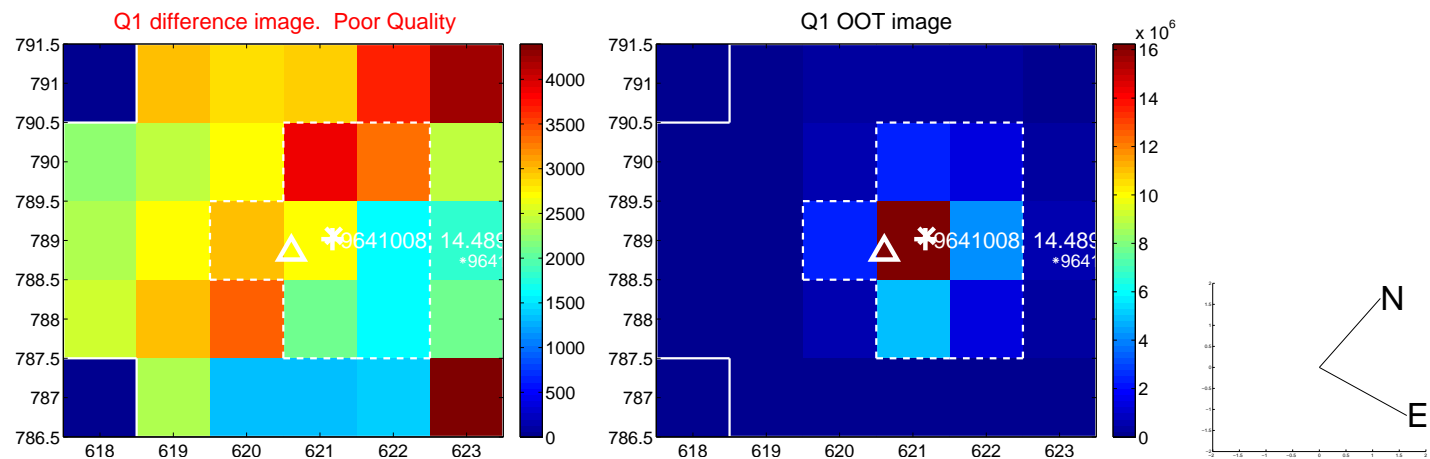
The direct PRF centroid is offset from the target star catalog position by about 0.21 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$4.159 \pm 0.438$	9.49	$-3.607 \pm 0.385$	$-2.072 \pm 0.299$
PRF-fit source offset from KIC position	$4.211 \pm 0.415$	10.16	$-3.577 \pm 0.374$	$-2.223 \pm 0.275$
photometric centroid source offset	$5.16 \pm 0.25$	20.91	$-5.03 \pm 0.25$	$1.18 \pm 0.23$

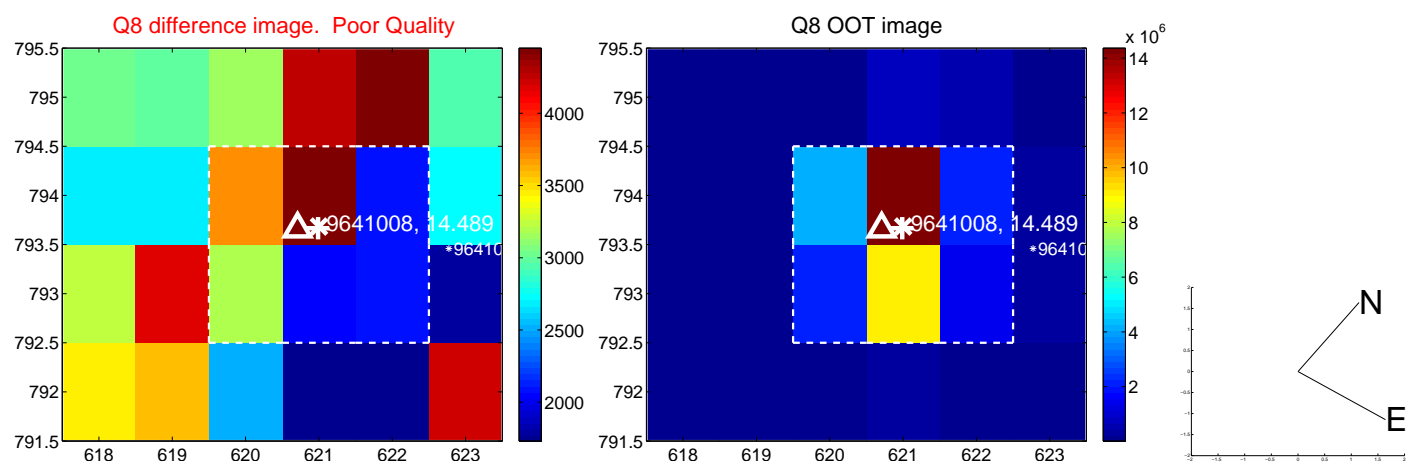
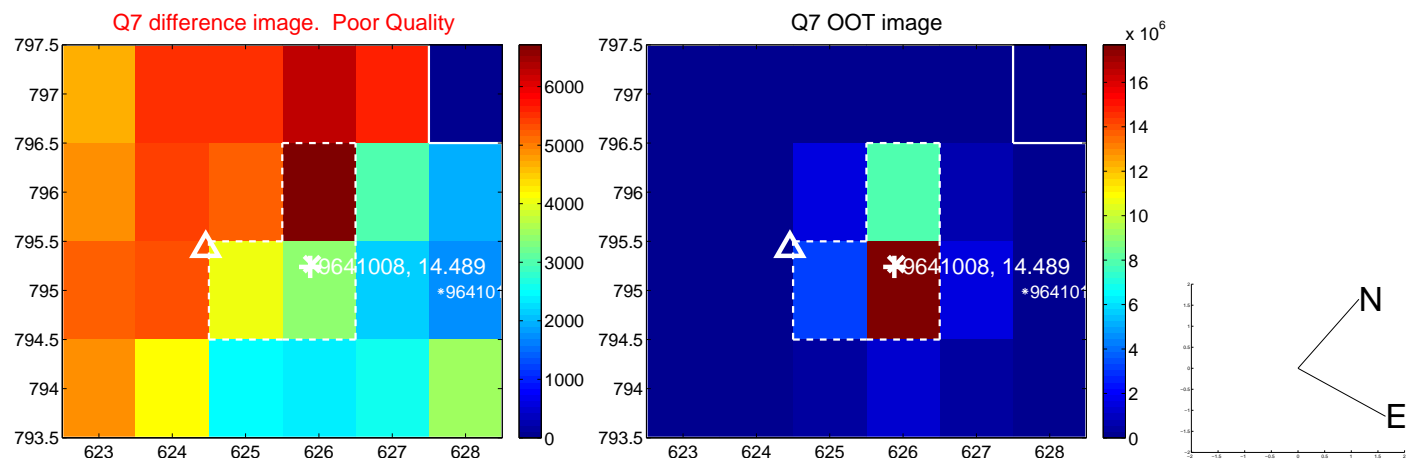
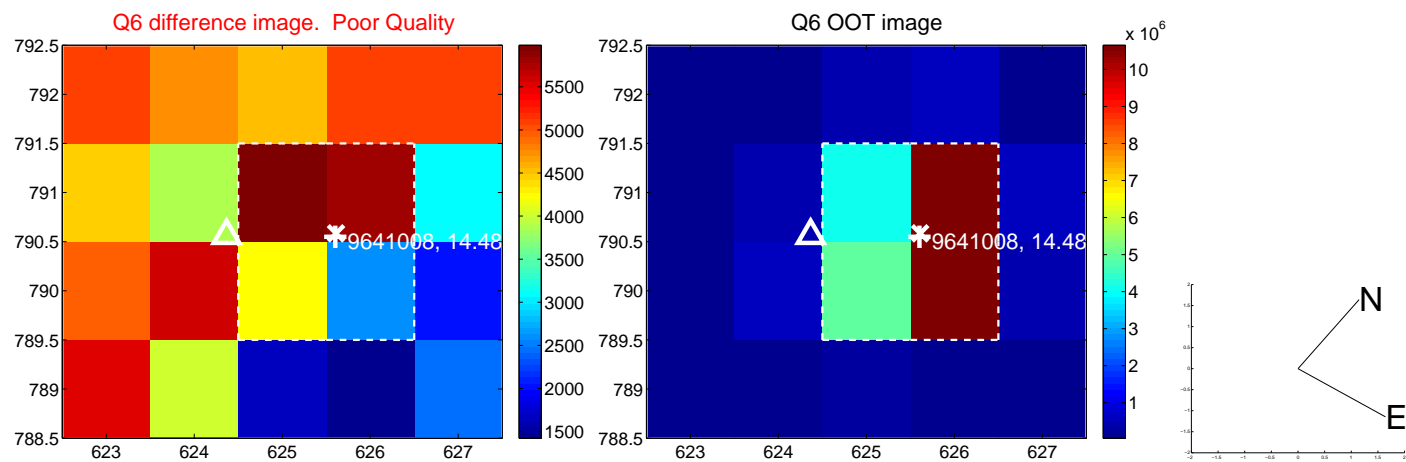
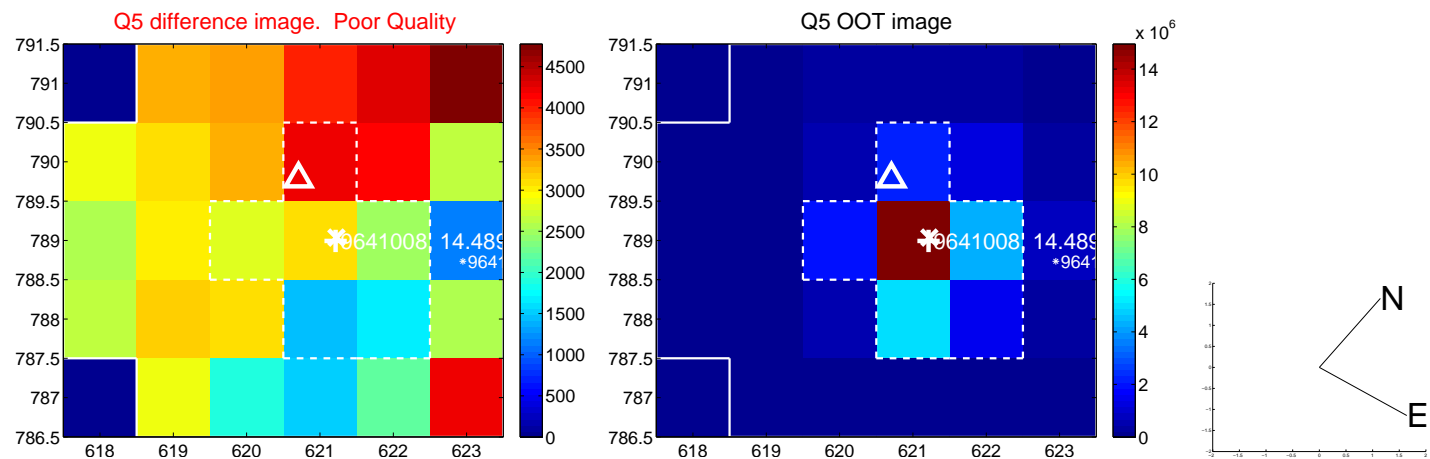


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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

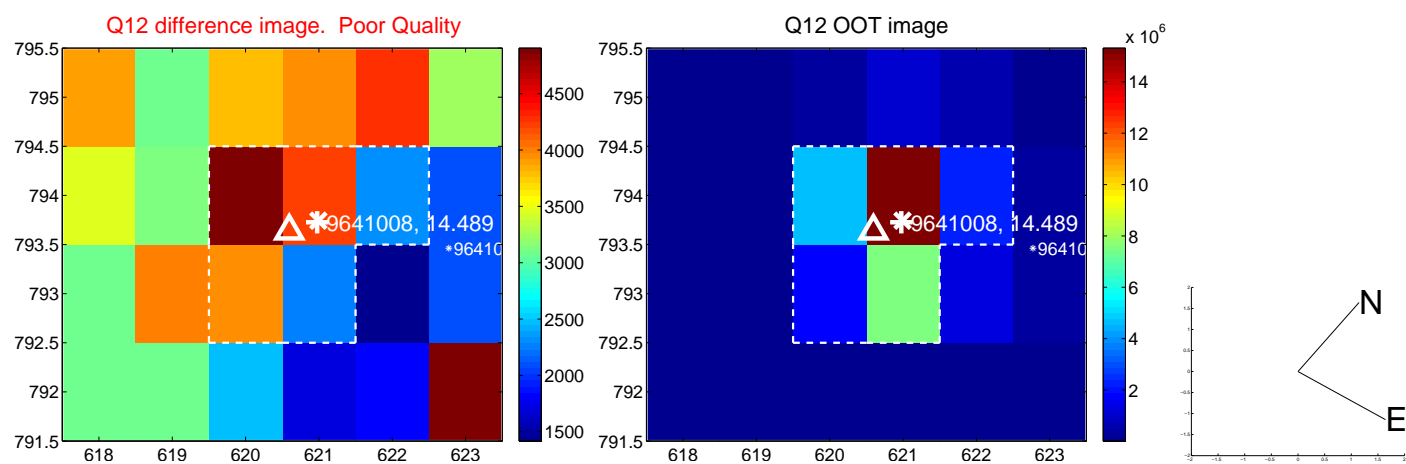
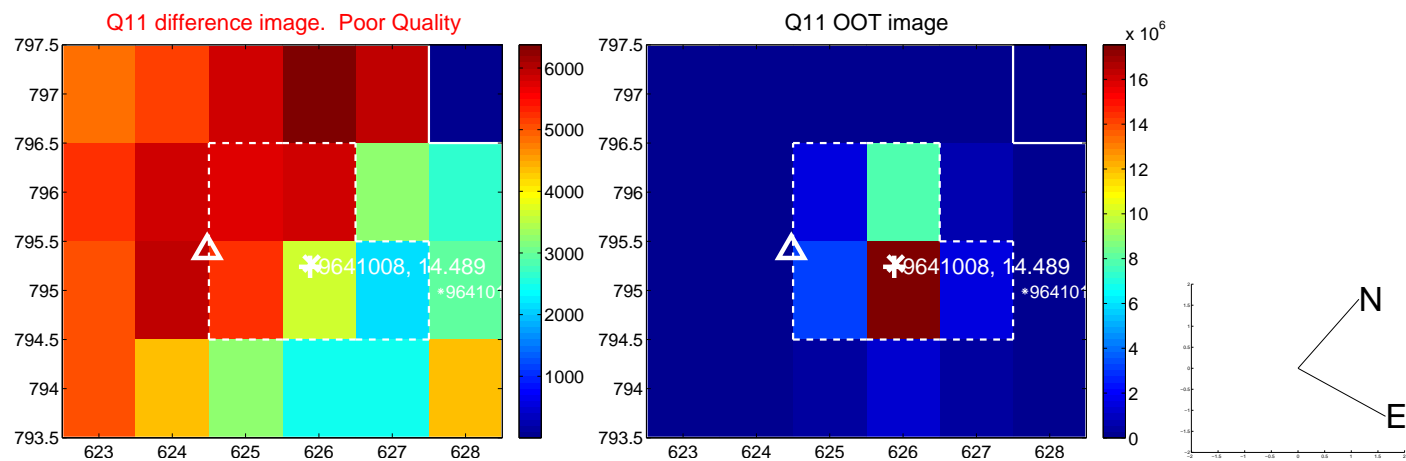
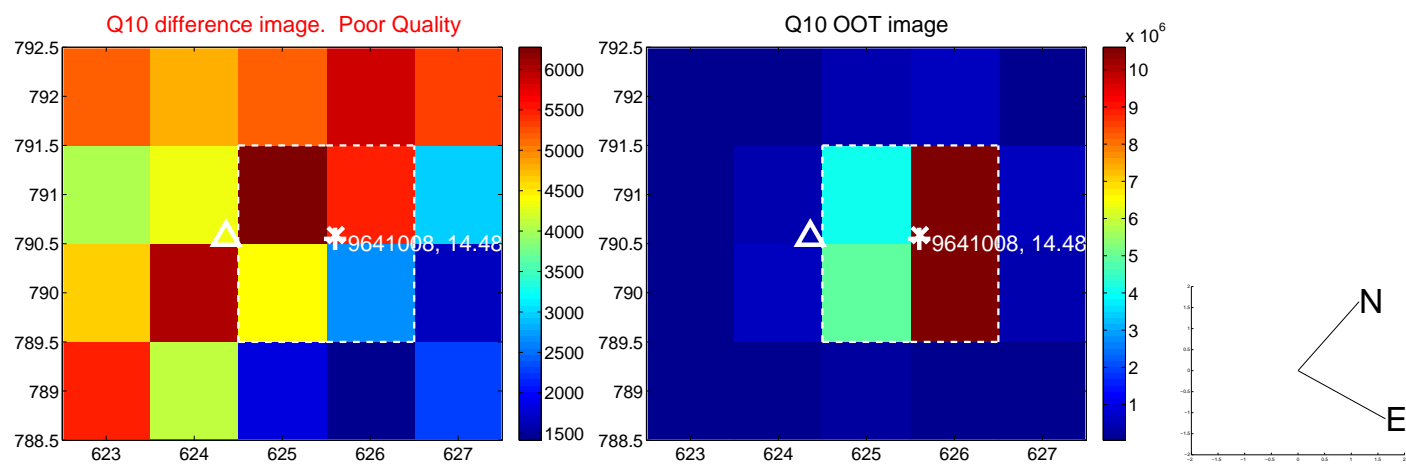
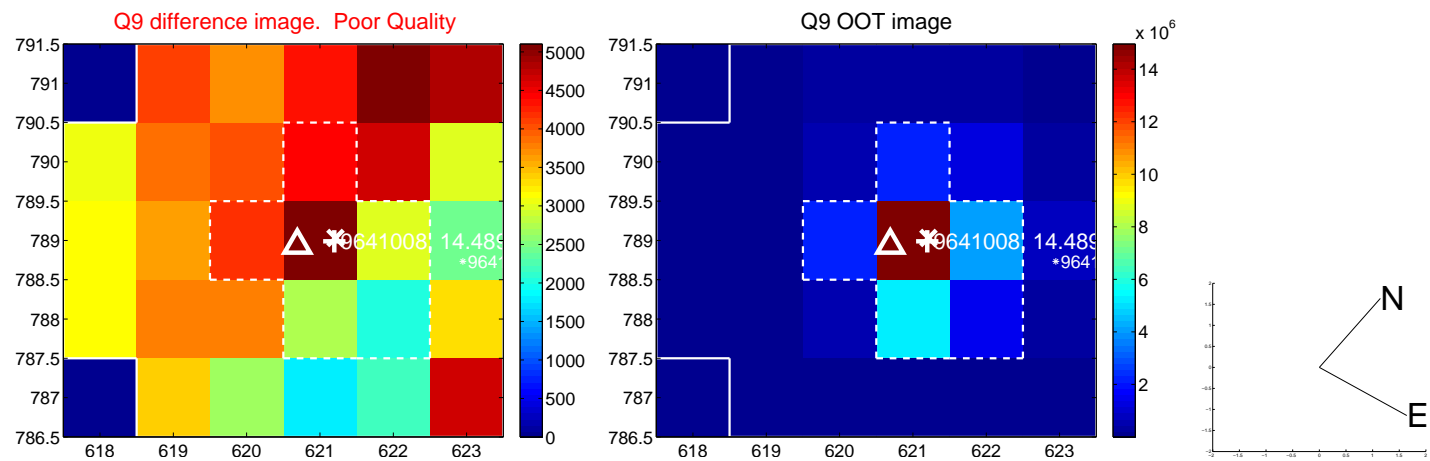


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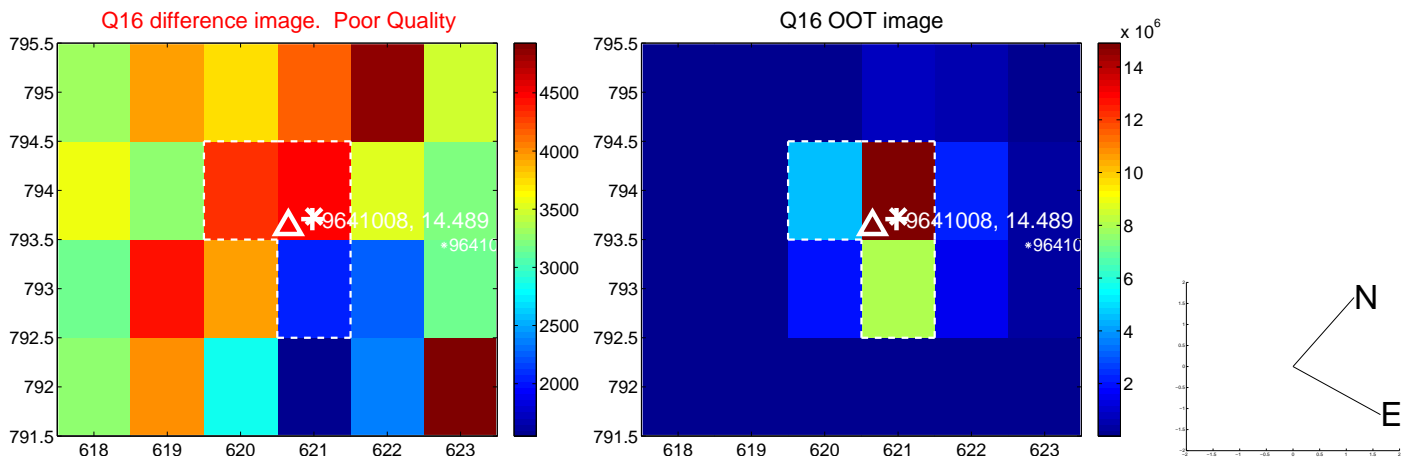
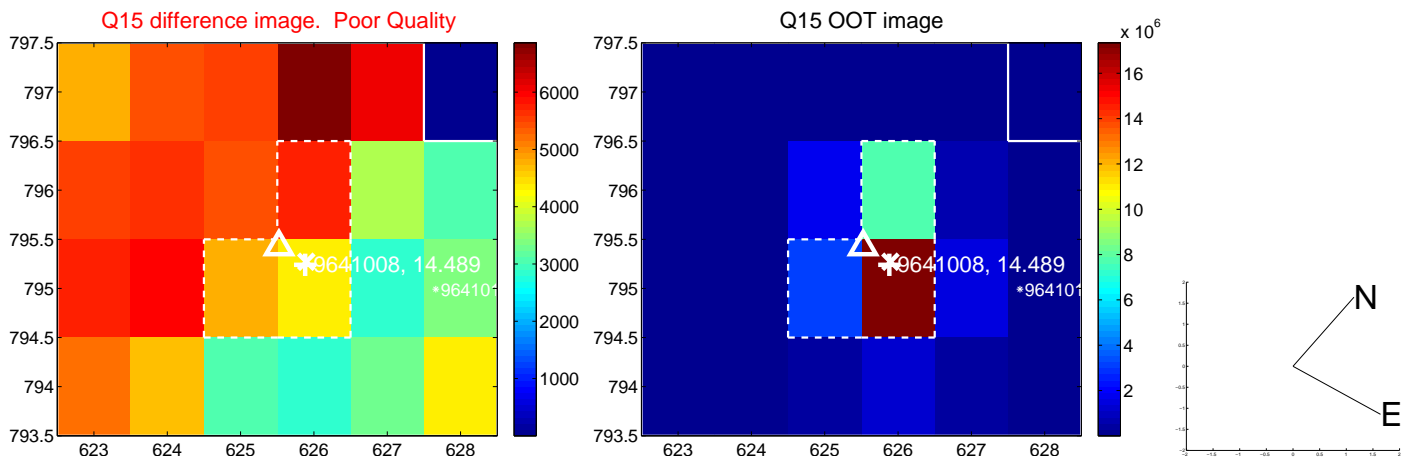
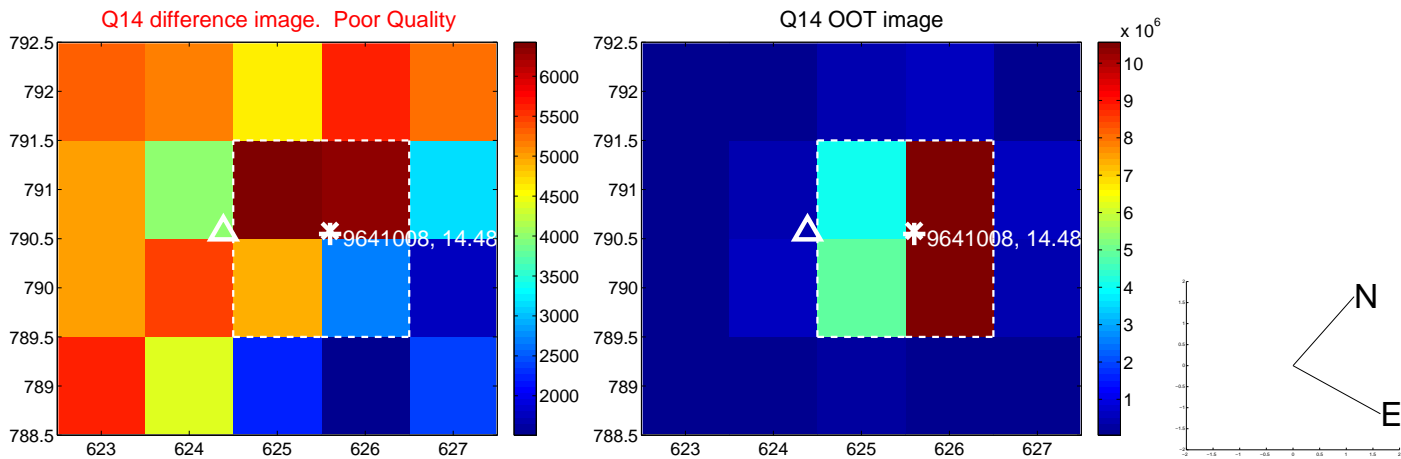
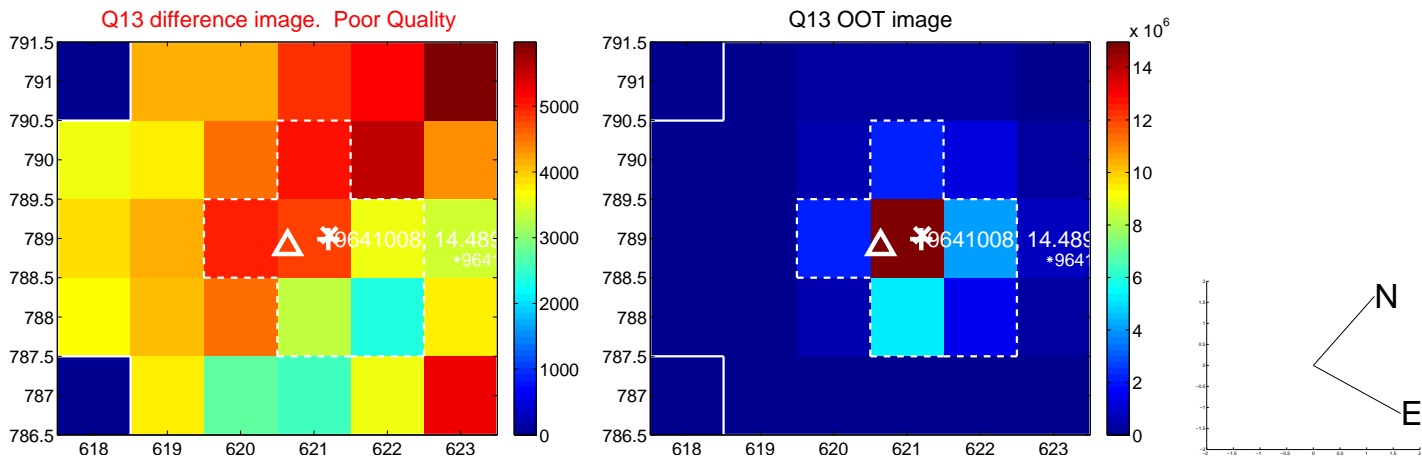




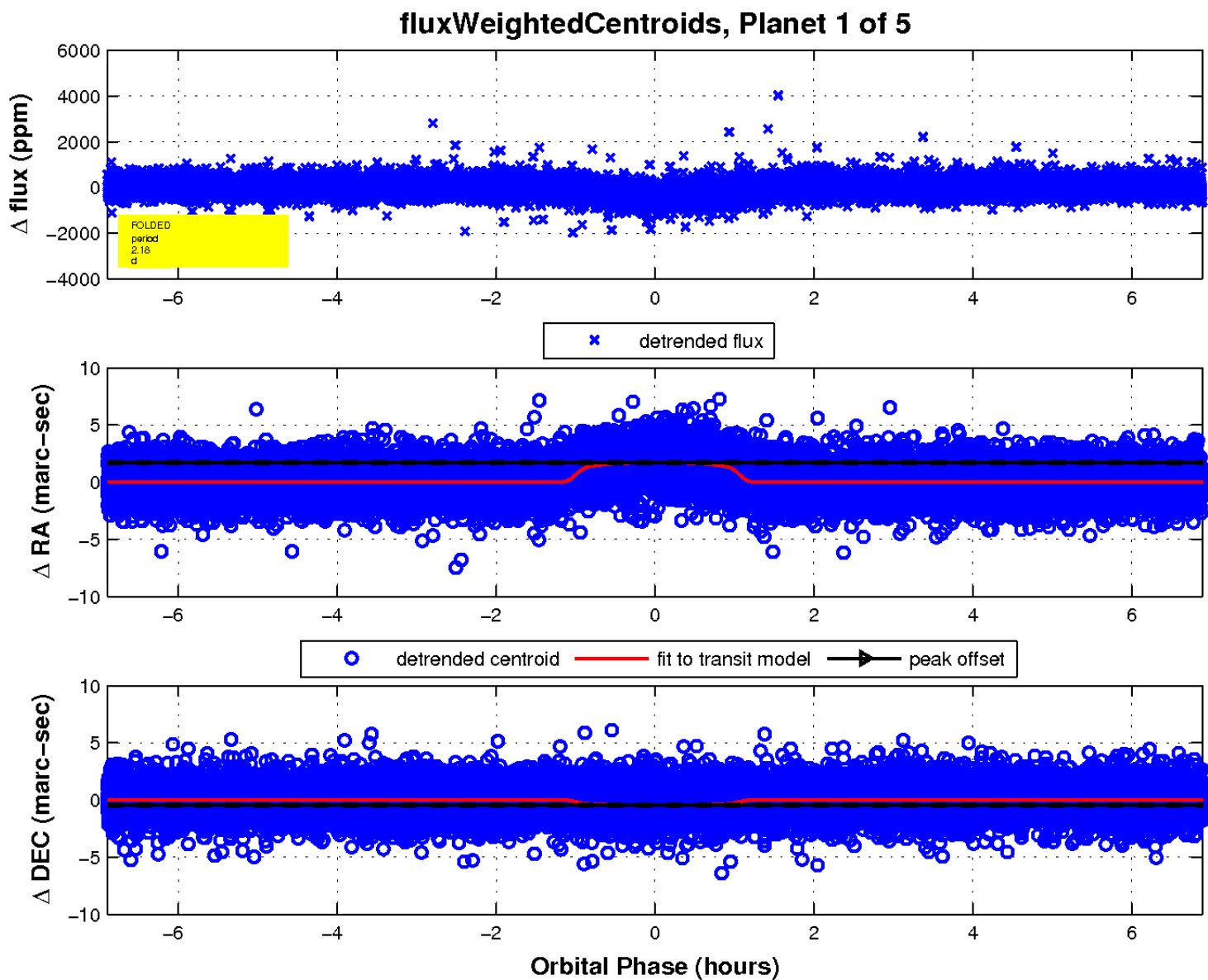
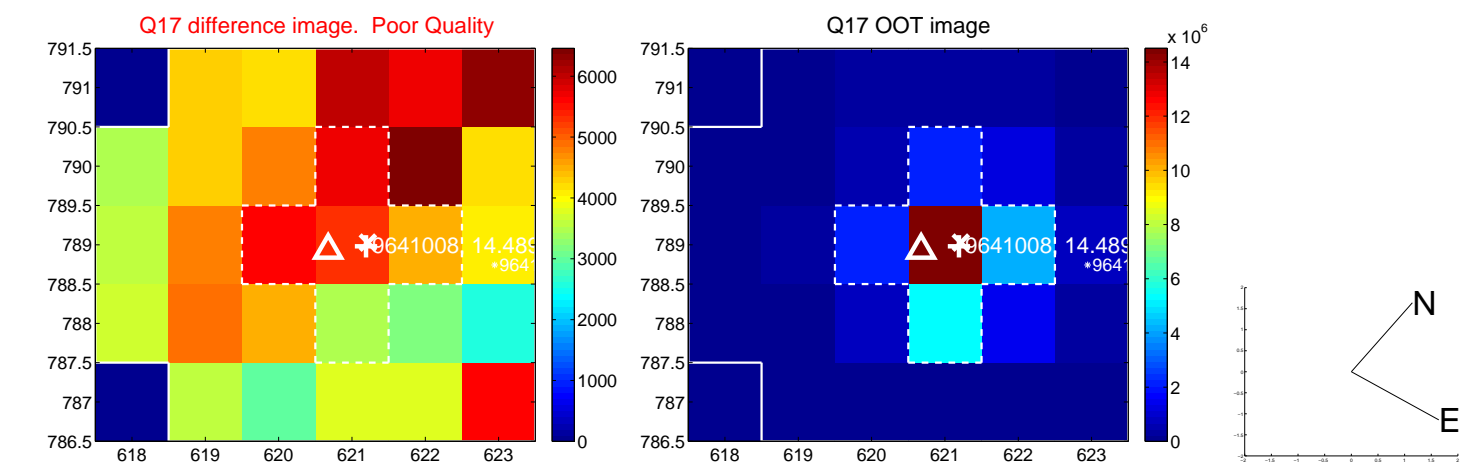
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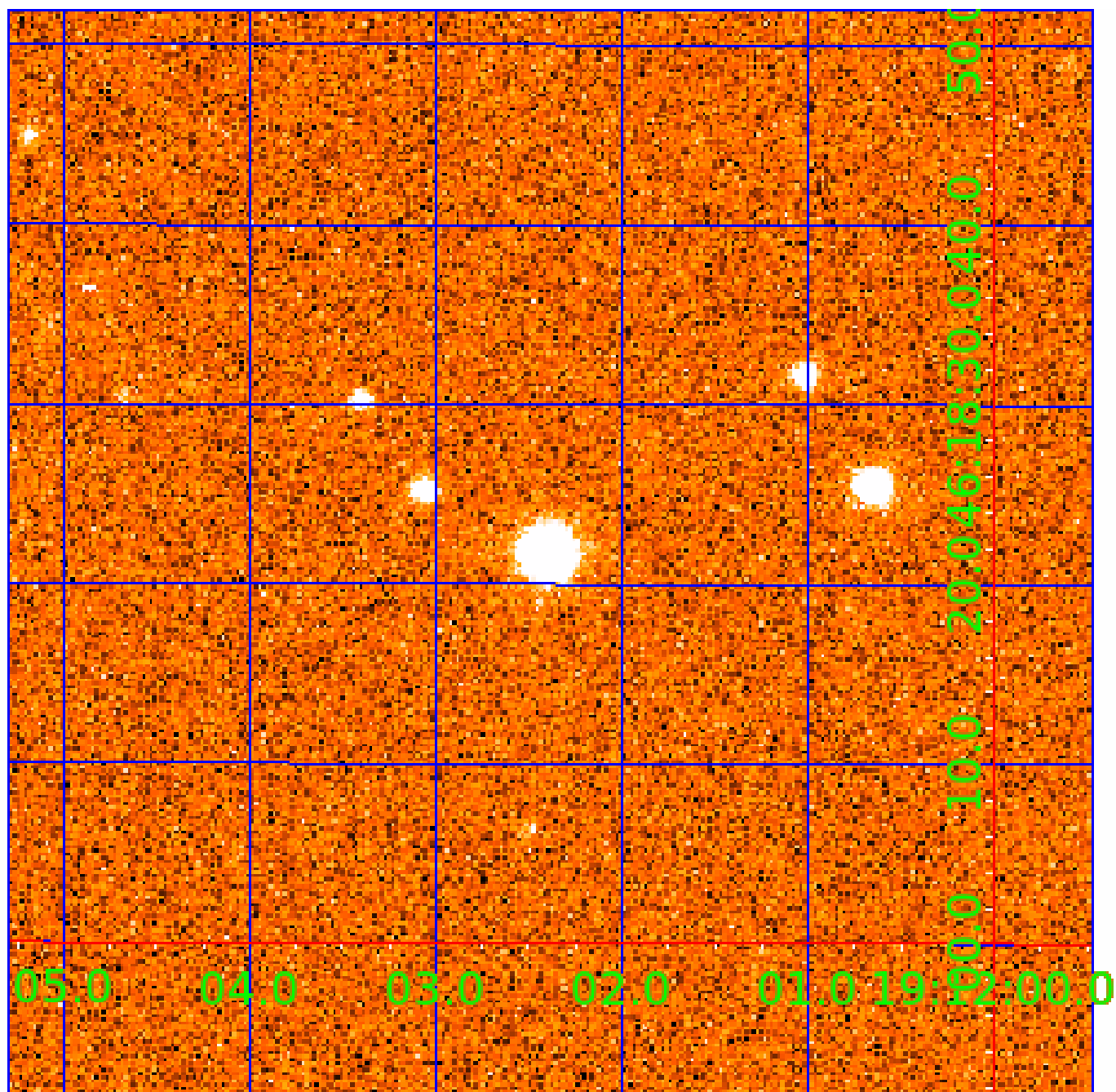


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UKIRT Image

Declination





# KIC 009641008

## 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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TCE	Run Type	Disp	Score	N	S	C	E	Comments
009641008-01	OBS	FP	0.00	0	1	1	1	MOD_SEC_ALT—CENT_RESOLVED_OFFSET—HALO_GHOST—EPHEM_MATCH
009641008-02	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—CENT_FEW_DIFFS
009641008-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—ALL_TRANS_CHASES—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—CENT_FEW_DIFFS
009641008-05	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_SKYE_TRACKER—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—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 009641008-02

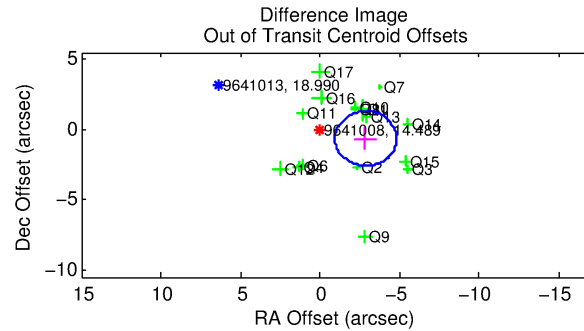
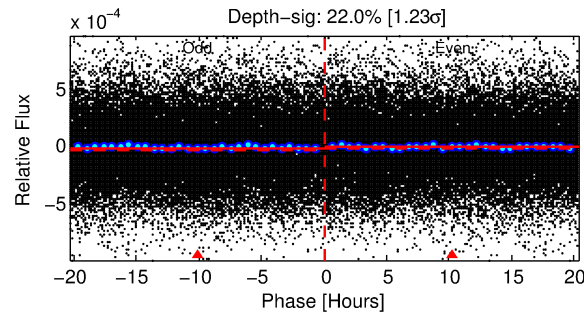
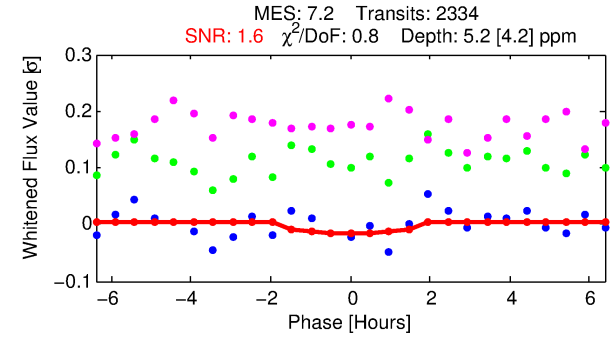
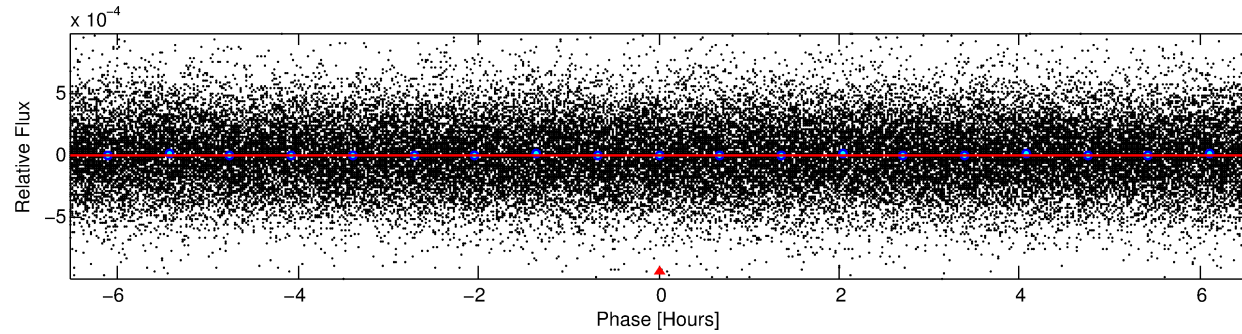
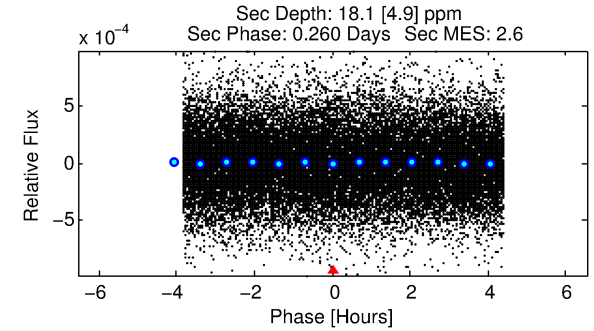
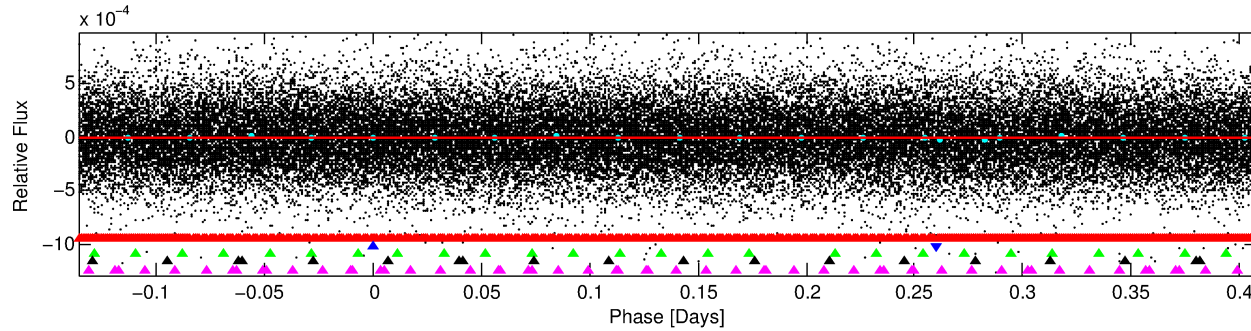
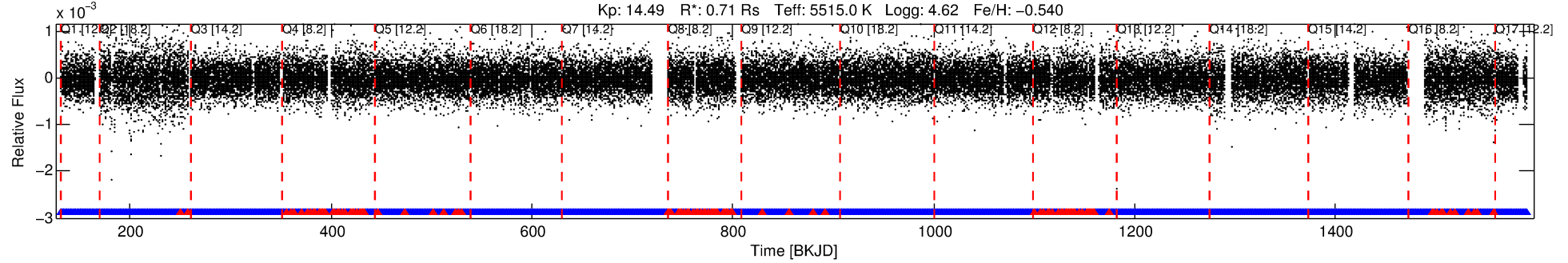
No Significant Match Found

# DV One-Page Summary

KIC: 9641008 Candidate: 2 of 5 Period: 0.544 d

KOI: K03860 Corr: No Ephemeris Match

Kp: 14.49 R\*: 0.71 Rs Teff: 5515.0 K Logg: 4.62 Fe/H: -0.540



## DV Fit Results:

Period = 0.54425 [0.00006] d  
Epoch = 131.7772 [0.0200] BKJD  
Rp/R\* = 0.0025 [0.0065]  
a/R\* = 1.08 [2.01]  
b = 0.90 [2.64]  
Seff = 2917.41 [665.00]  
Teq = 1874 [107] K  
Rp = 0.19 [0.51] Re  
a = 0.0120 [0.0016] AU  
Ag = 38.32 [201.27] [0.19σ]  
Teffp = 7209 [9463] K [0.56σ]

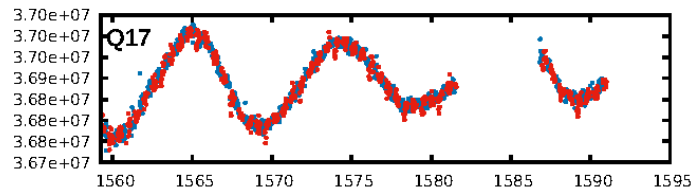
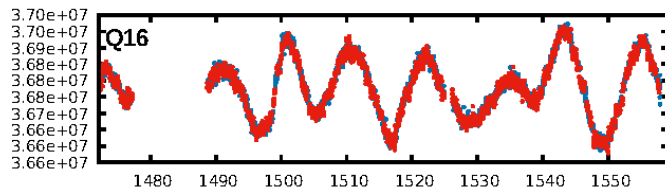
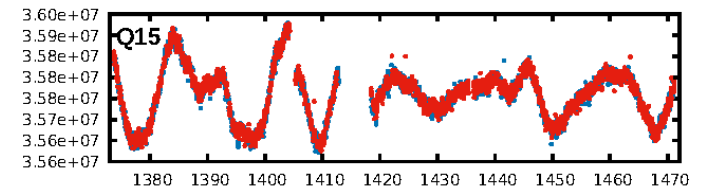
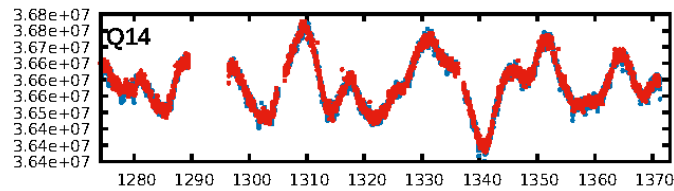
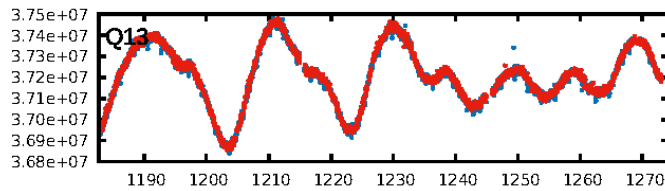
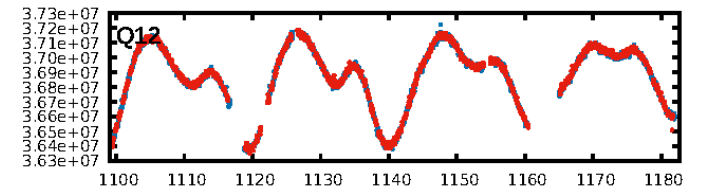
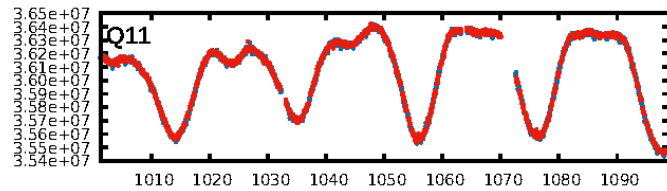
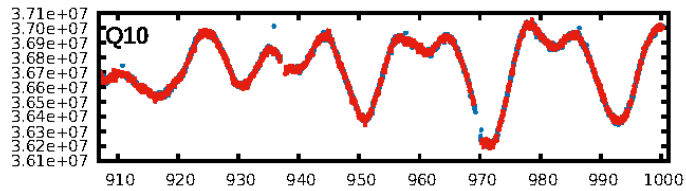
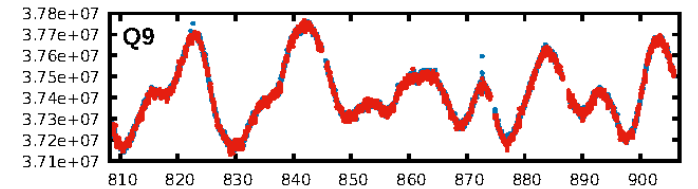
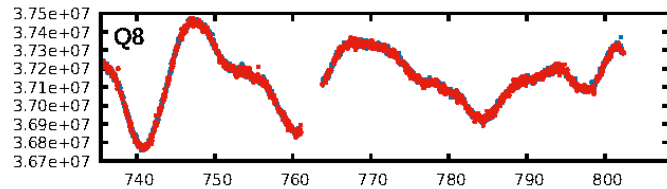
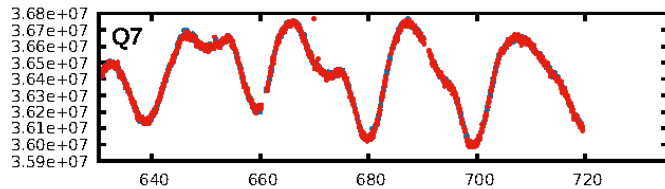
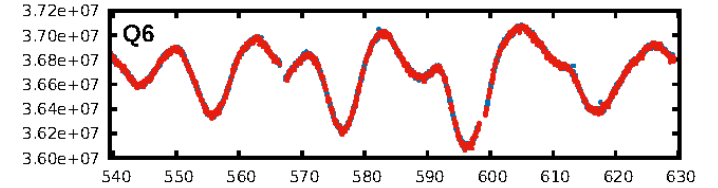
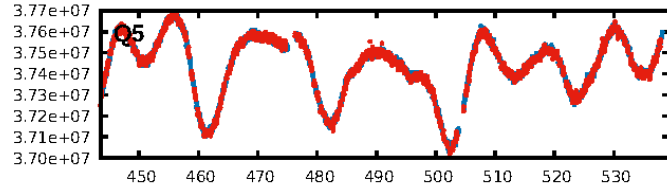
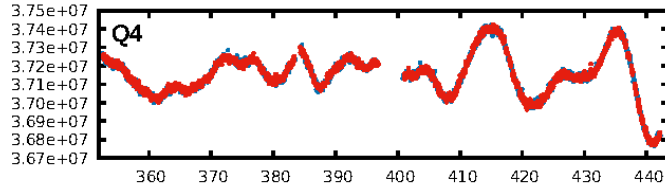
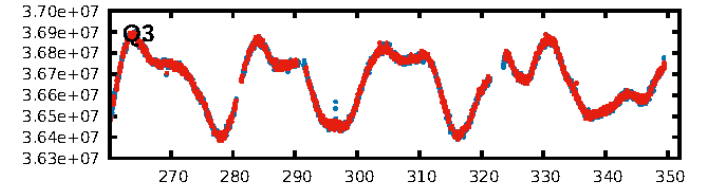
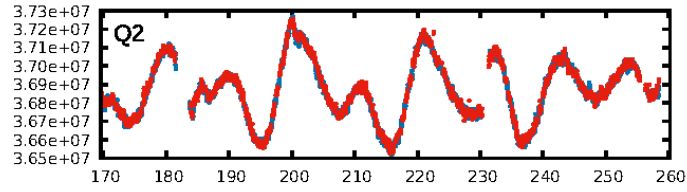
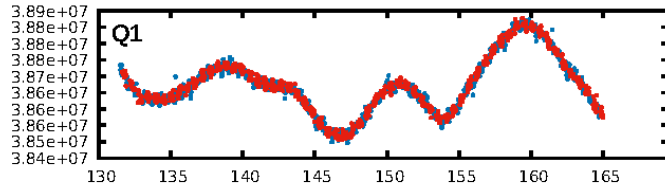
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 100.0% [9.57σ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
**Bootstrap-pfa: 1.51e-08**  
RollingBand-fgt: 0.95 [2105/2223]  
GhostDiagnostic-chr: 1.104  
Centroid-sig: 31.6%  
Centroid-so: 6.708 arcsec [1.06σ]  
**OotOffset-rm: 2.951 arcsec [4.56σ]**  
**KicOffset-rm: 2.969 arcsec [4.52σ]**  
OotOffset-st: 4/4/4/4 [16]  
KicOffset-st: 4/4/4/4 [16]  
DiffImageQuality-fgm: 0.06 [1/16]  
DiffImageOverlap-fno: 1.00 [17/17]

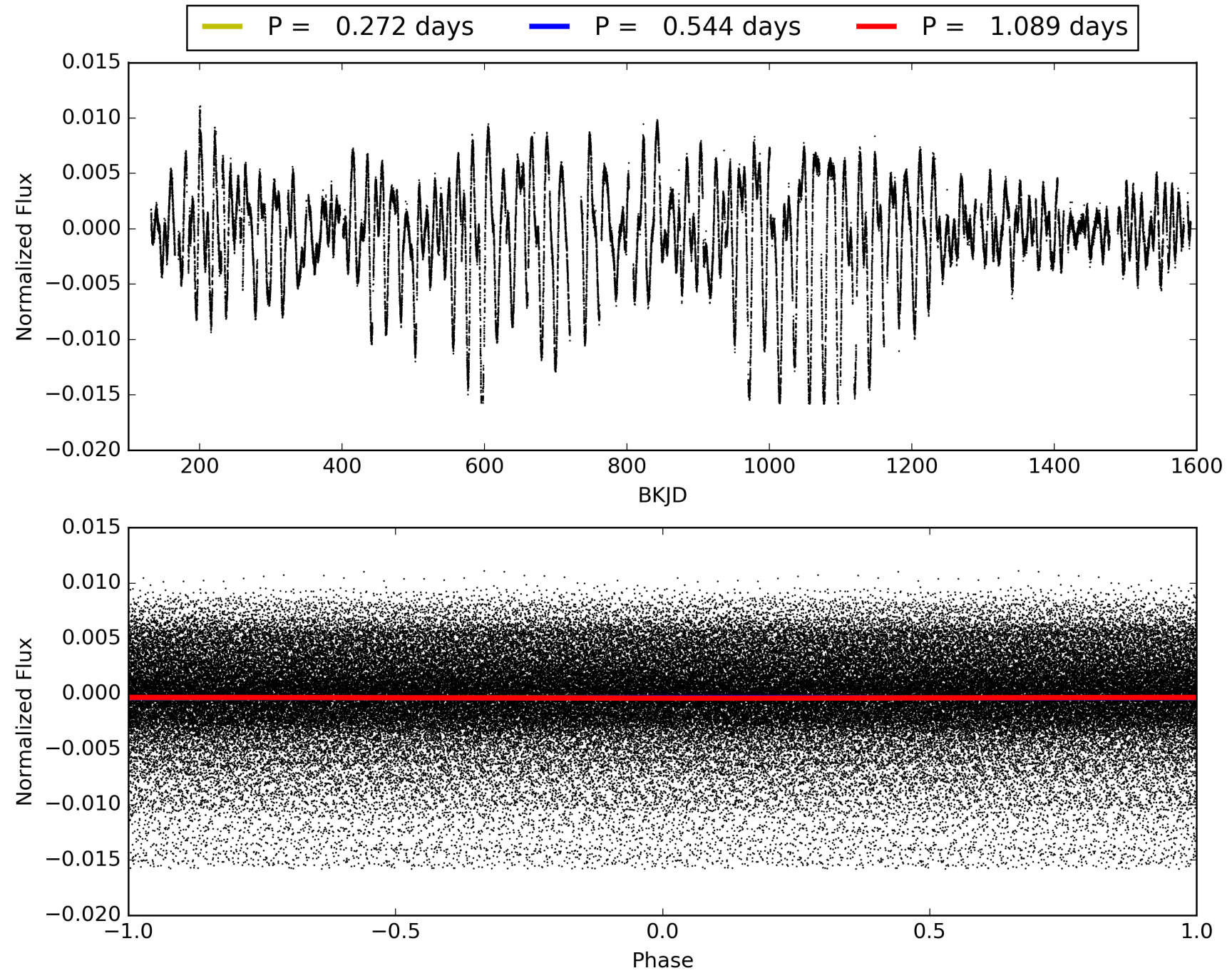
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 29-Jan-2016 23:08:14 Z

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

# TCE 009641008-02, PDC Light Curves

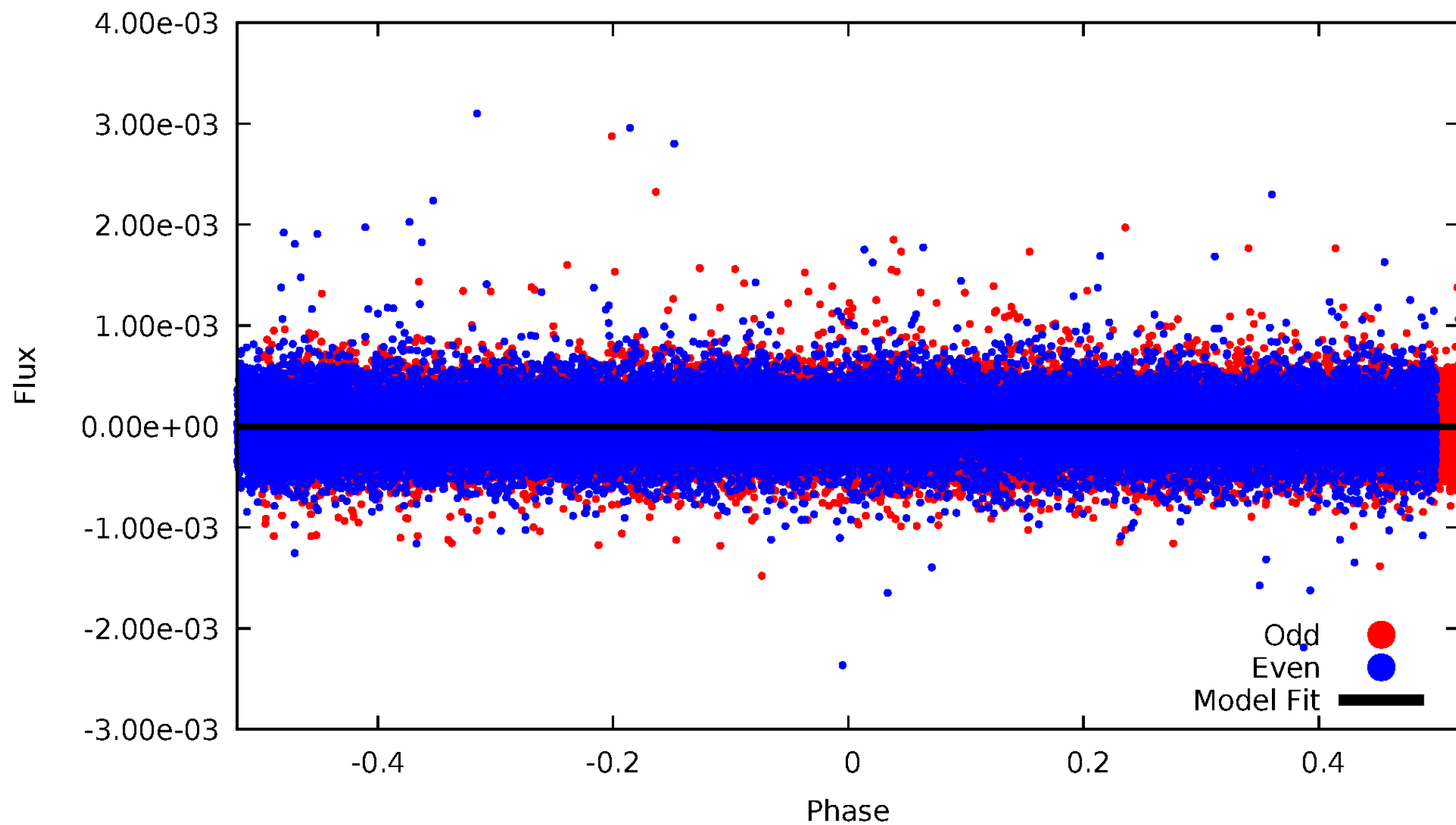


TCE 009641008-02



# DV Odd/Even

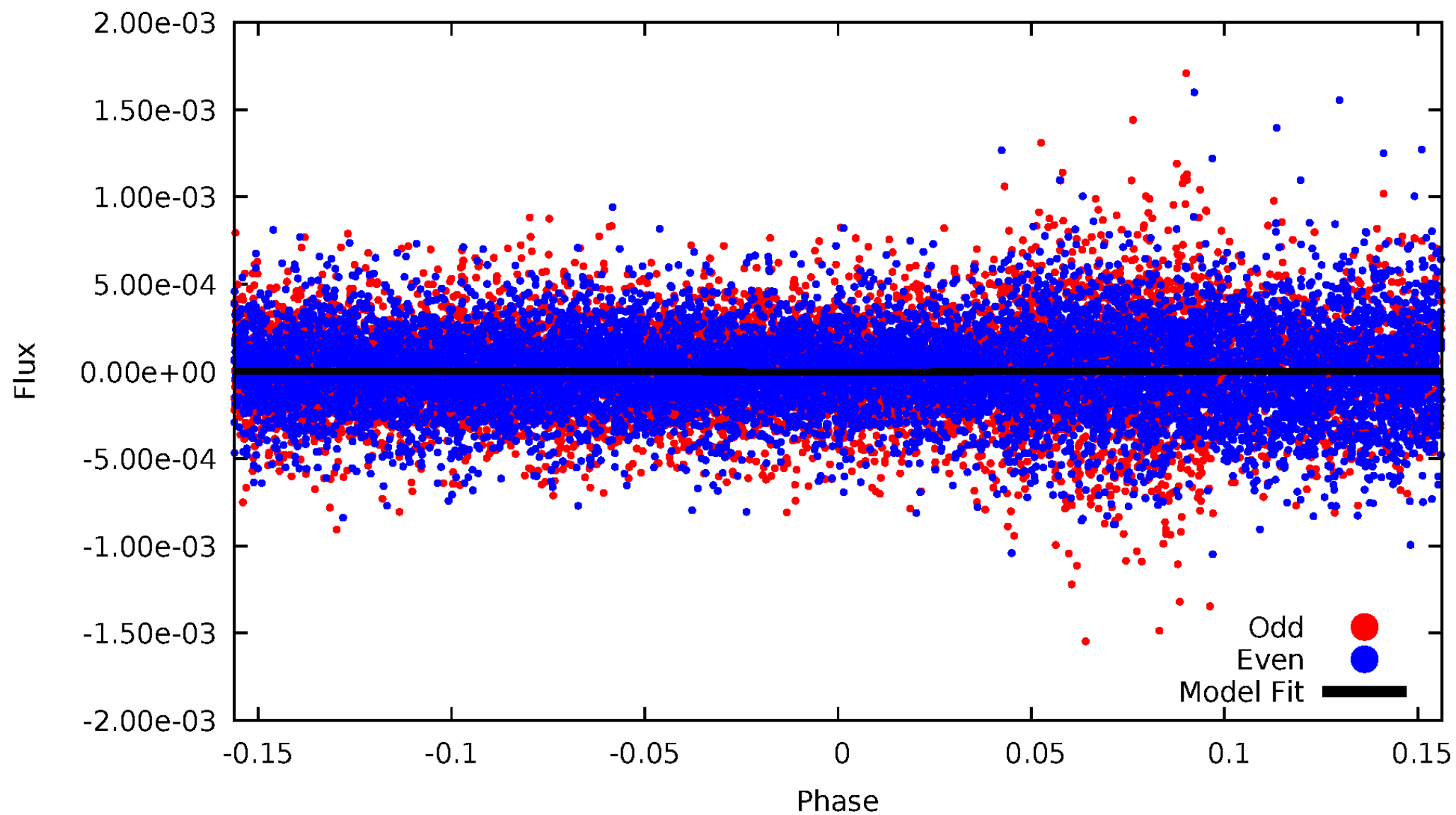
TCE 009641008-02





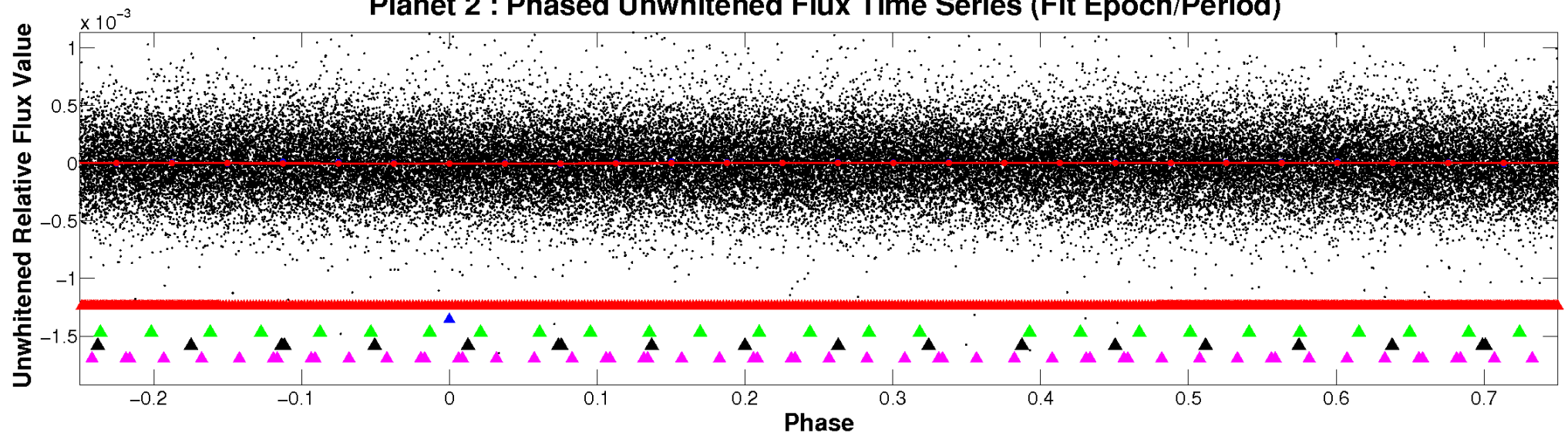
# ALT Odd/Even

TCE 009641008-02

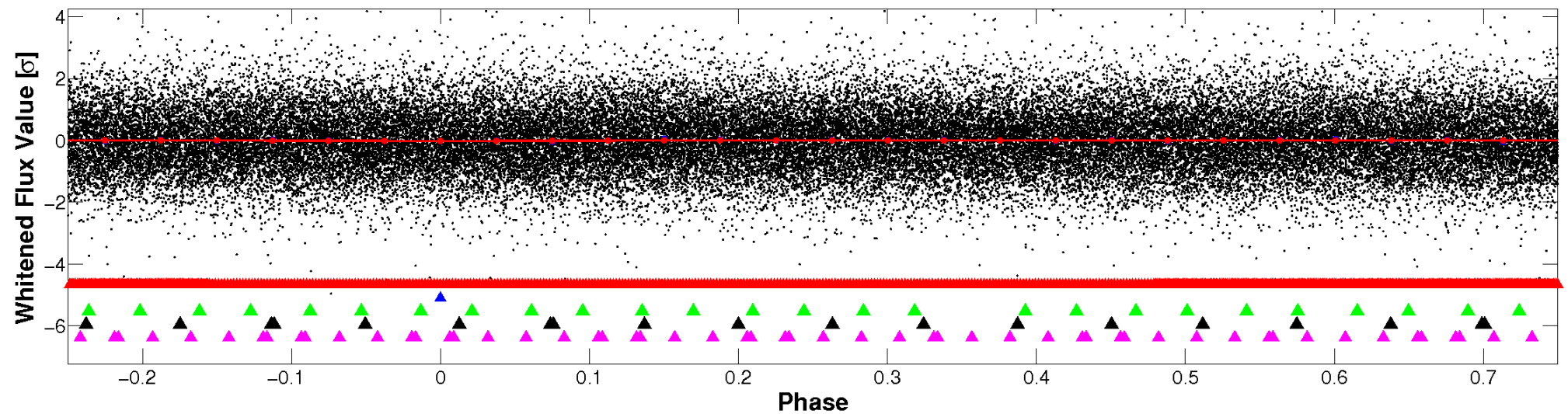


# Non-Whitened Vs. Whitened Light Curve

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



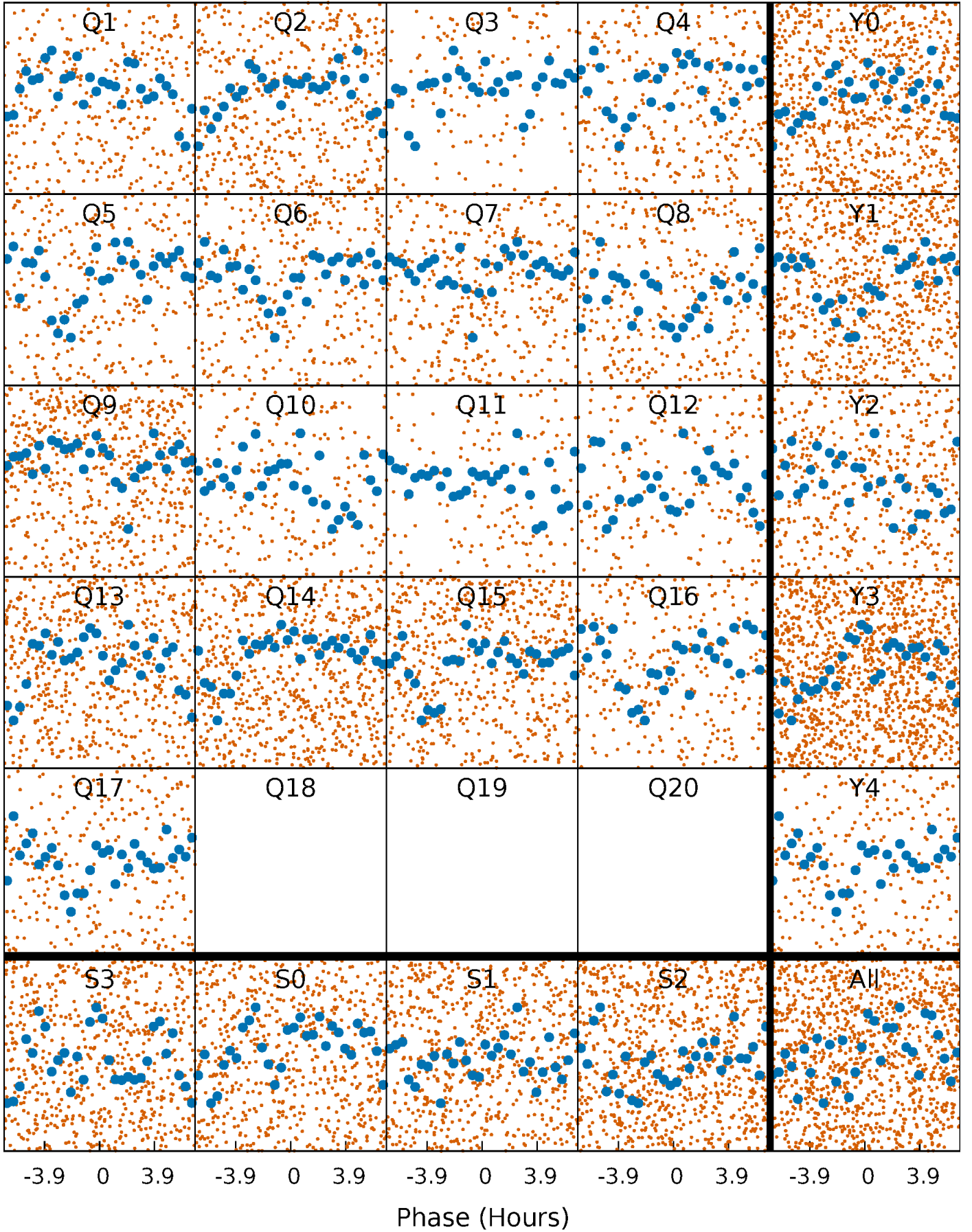
## Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)





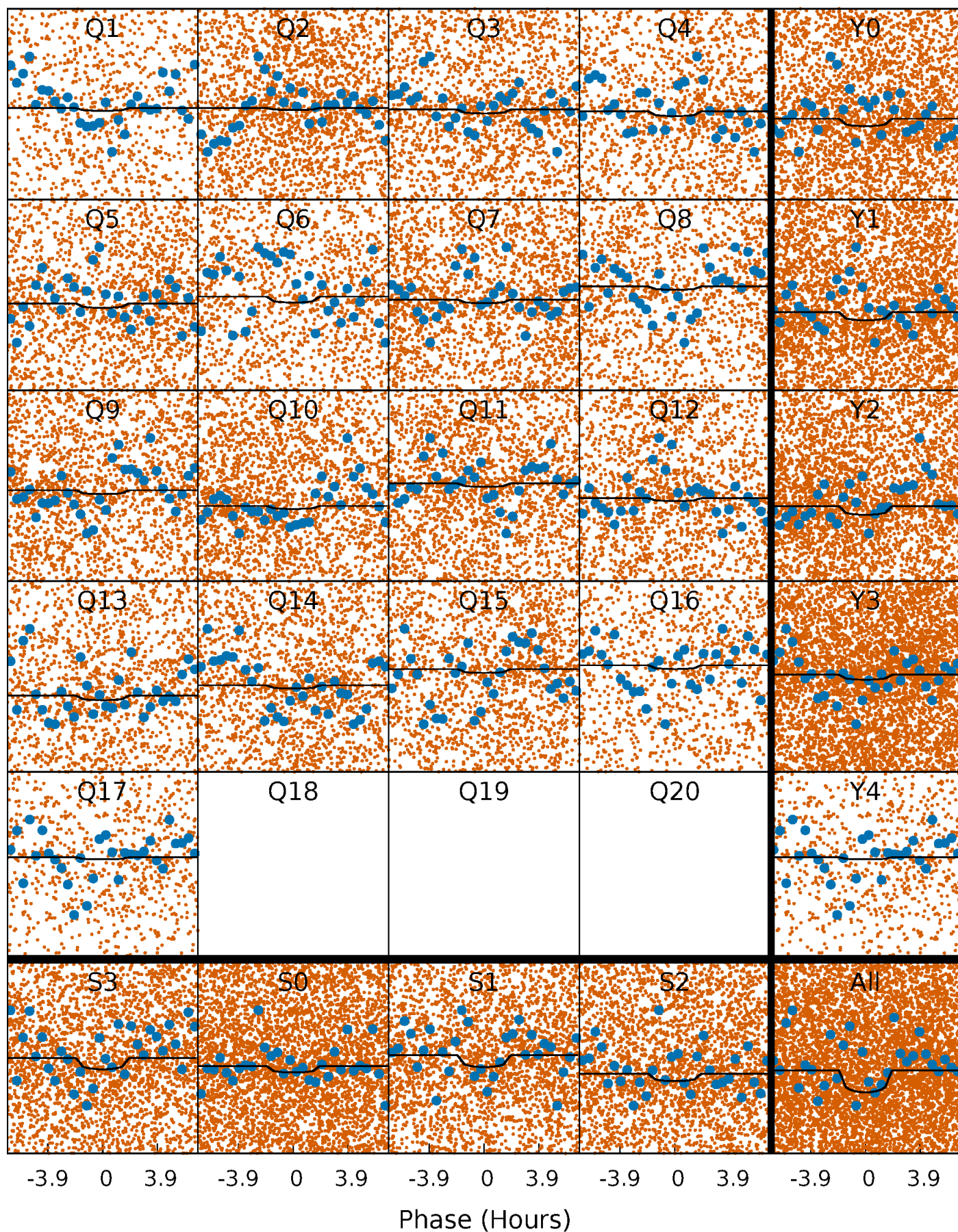
# PDC Quarter-Phased Transit Curves

TCE 009641008-02   P= 0.544250 Days    $T_0=131.777242$  (BKJD)



# DV Quarter-Phased Transit Curves

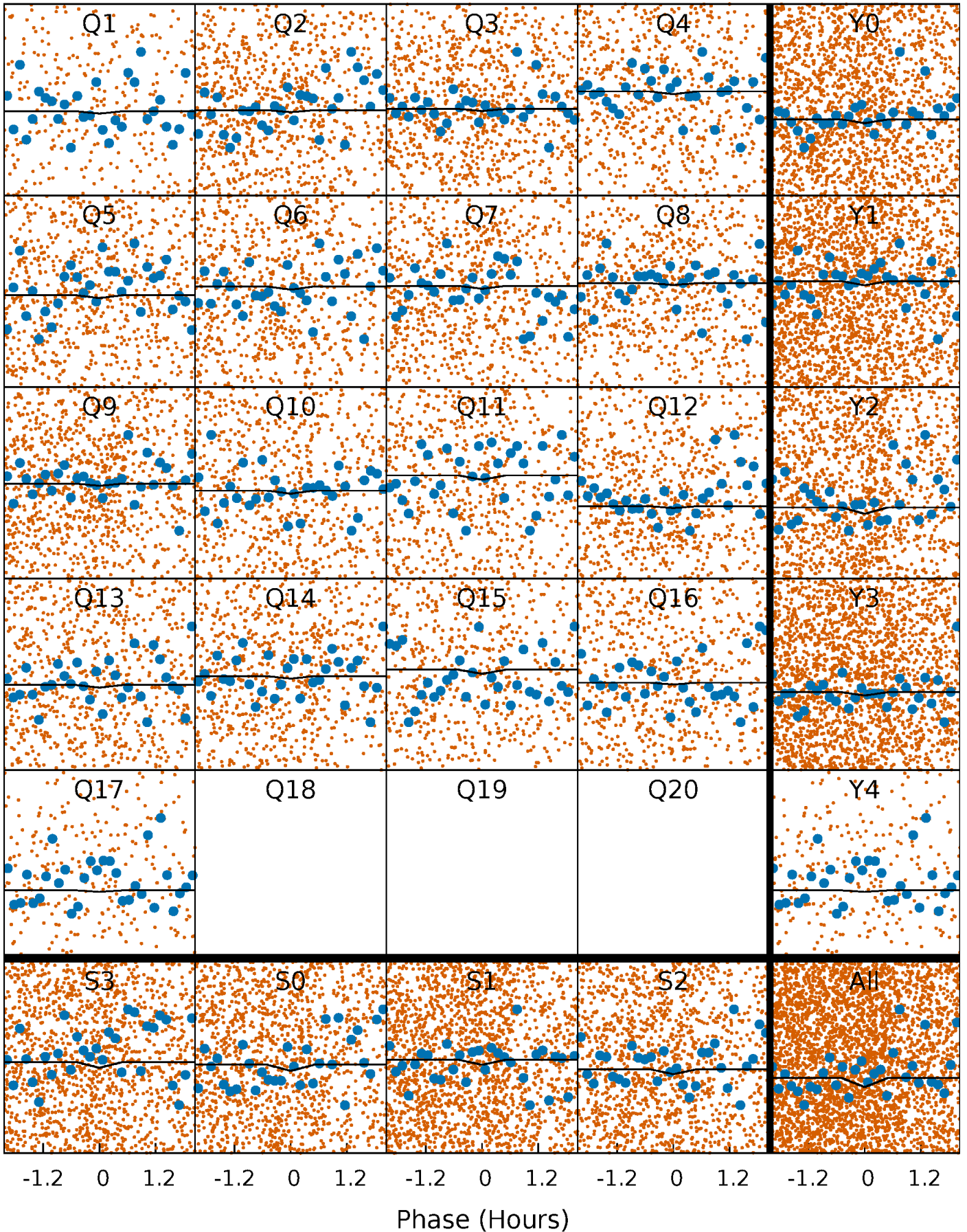
TCE 009641008-02 P= 0.544250 Days  $T_0=131.777242$  (BKJD)





# Alt. Detrend Quarter-Phased Transit Curves

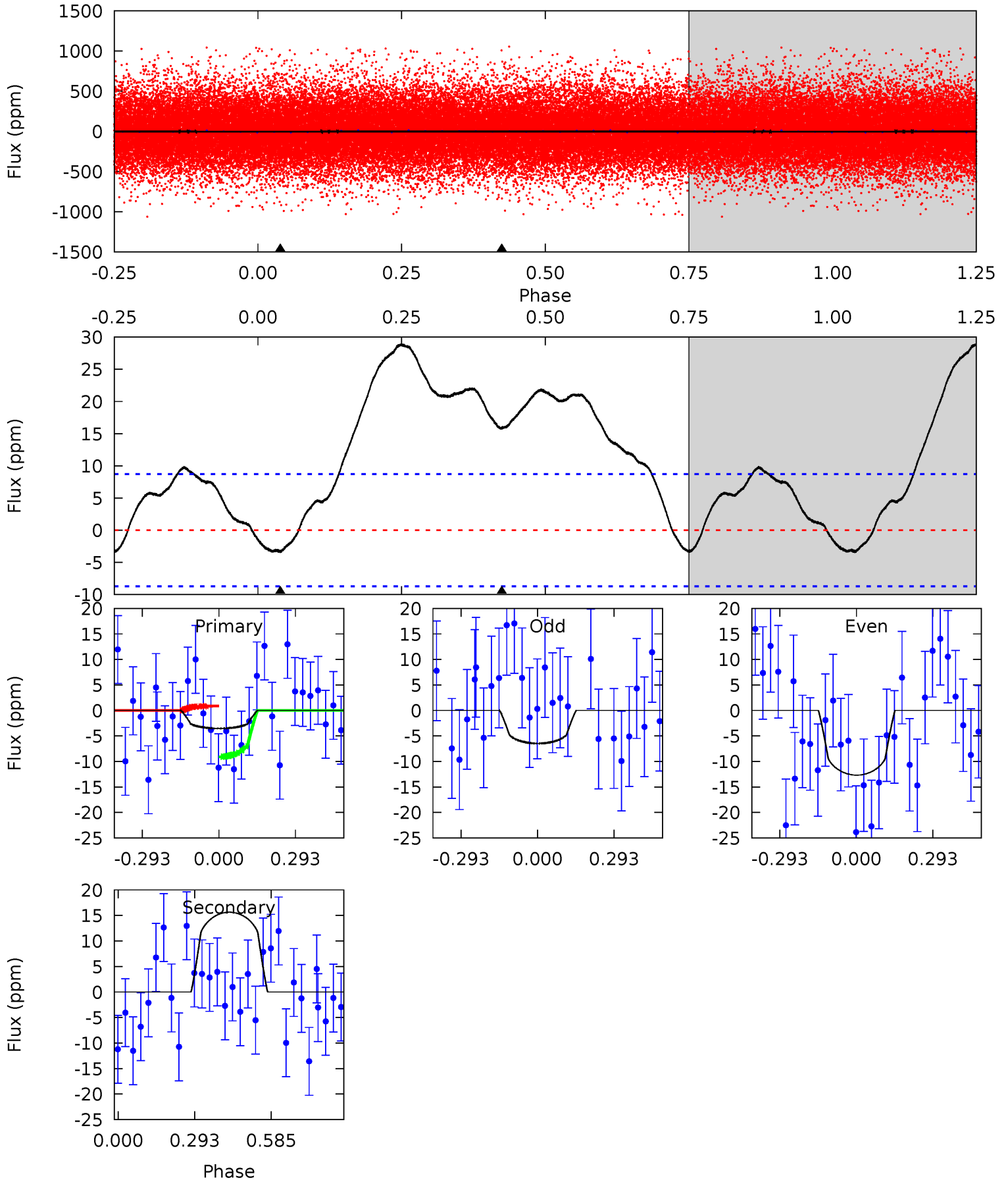
TCE 009641008-02     $P = 0.544529$  Days     $T_0 = 131.830747$  (BKJD)



# DV Model-Shift Uniqueness Test

009641008-02, P = 0.544250 Days, E = 131.232992 Days

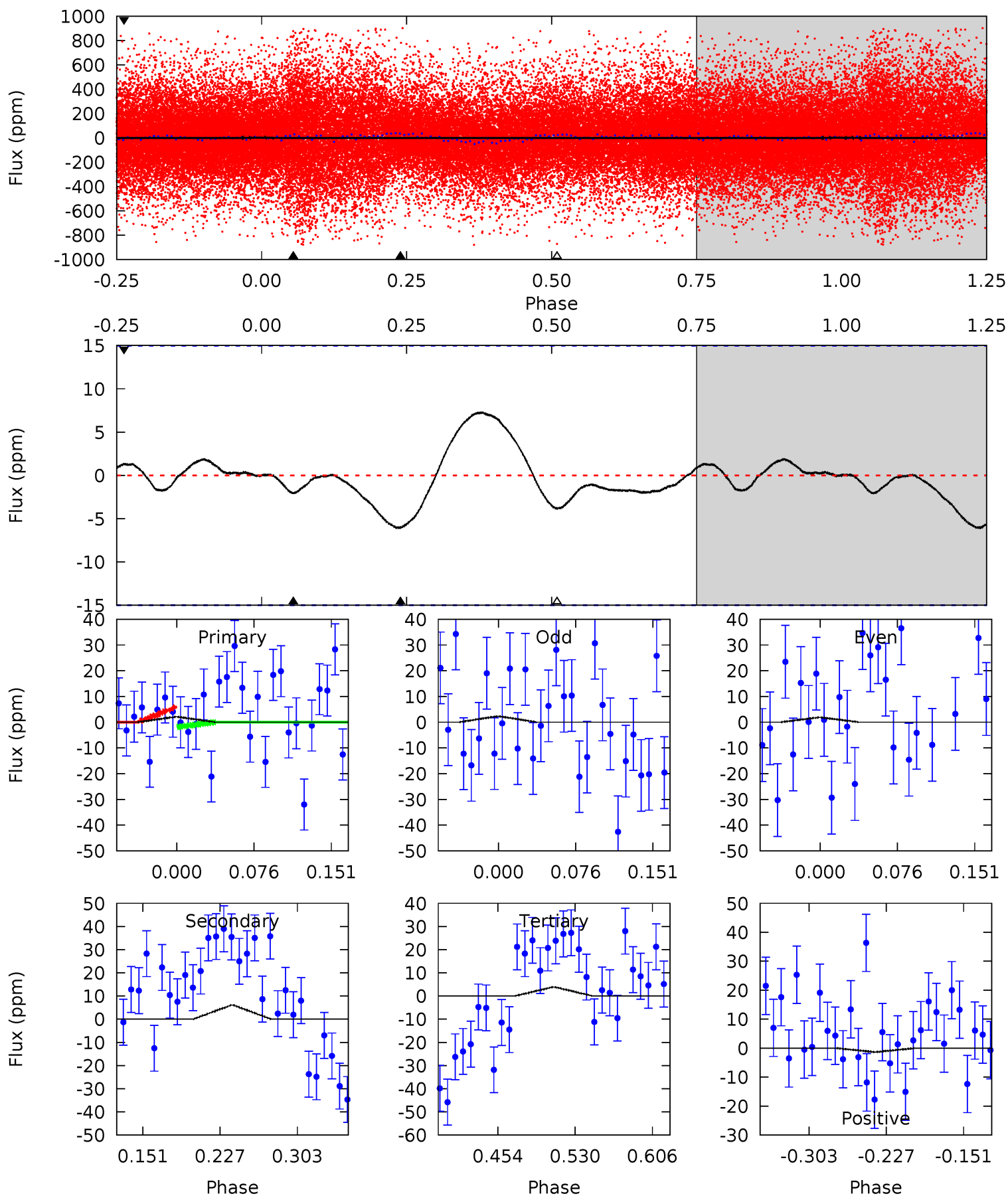
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
1.75	-7.78	0	0	4.33	1.05	1.99	1.75	1.75	-7.78	-7.78	1.53	0.45	0.89	2.00



# Alt Model-Shift Uniqueness Test

009641008-02, P = 0.544529 Days, E = 131.286218 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
0.65	1.88	1.19	0.41	4.62	1.78	0.83	-0.54	0.23	0.69	1.47	0.07	0.84	0.54	0.62



### Stellar Parameters For KIC 009641008

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R$ ( $R_{\odot}$ )	$M(M_{\odot})$	$p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ )
	$5515^{+163}_{-147}$	$4.624^{+0.035}_{-0.105}$	$-0.540^{+0.300}_{-0.300}$	$0.712^{+0.117}_{-0.050}$	$0.785^{+0.073}_{-0.073}$	$3.065^{+0.523}_{-0.996}$
	+3%/-3%	+1%/-2%	+56%/-56%	+16%/-7%	+9%/-9%	+17%/-32%
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 009641008-02 / KOI

Detrend	Depth (ppm)	$R_p$ ( $R_{\oplus}$ )	$T_{\text{max}}$ (K)	$T_{\text{obs}}$ (K)	$A_{\text{obs}}$
DV	$16 \pm 2$	$0.45^{+0.44}_{-0.31}$	$2651^{+121}_{-94}$	$-4850^{+1061}_{-3990}$	$-6.416^{+4.886}_{-65.998}$
Alt.	$-6 \pm 3$	$0.41^{+0.42}_{-0.30}$	$2654^{+119}_{-100}$	$3875^{+3247}_{-1114}$	$2.416^{+32.369}_{-1.907}$

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



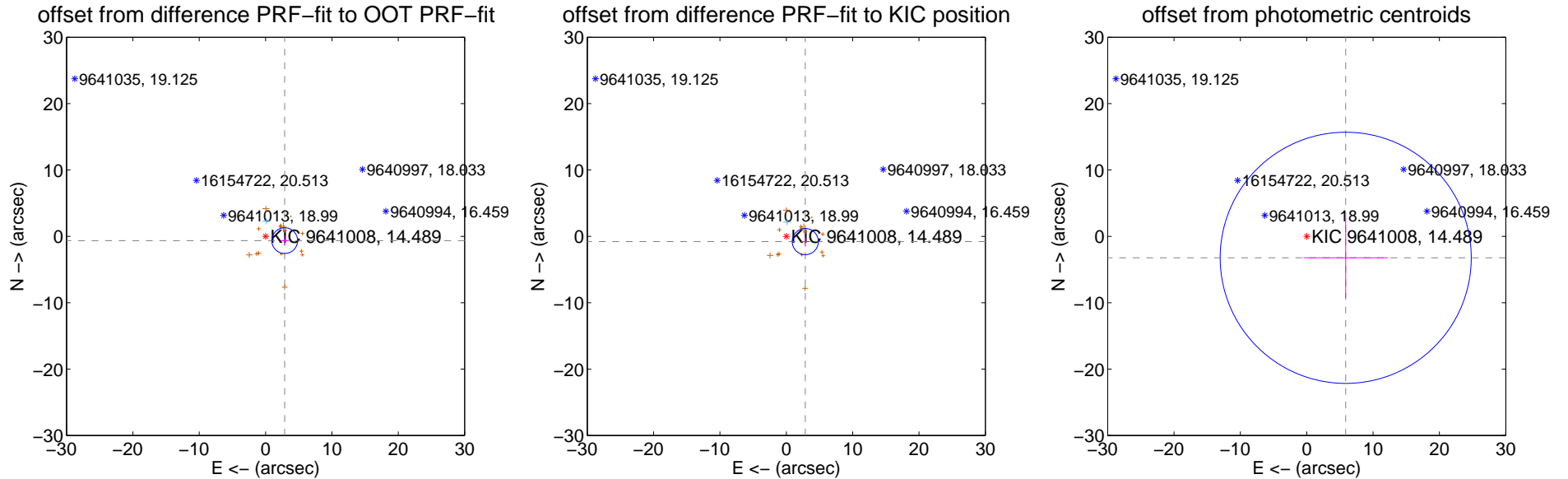
## DV Centroid Data

Supplemental centroid analysis for 009641008-02. Kepler magnitude: 14.49. Transit SNR 1.65

There are 1 quarters with good PRF difference image offsets

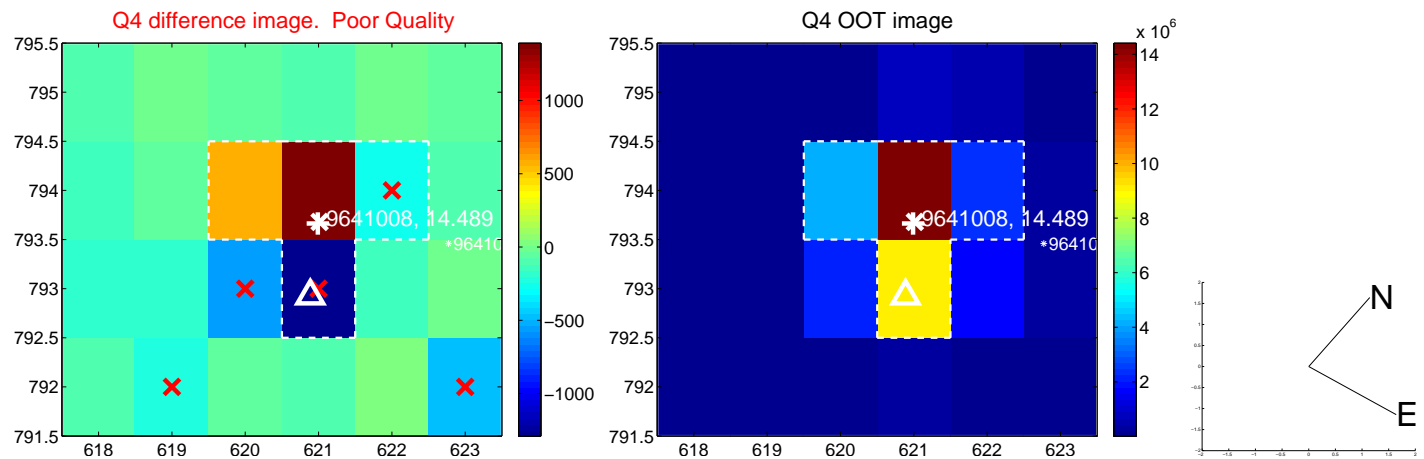
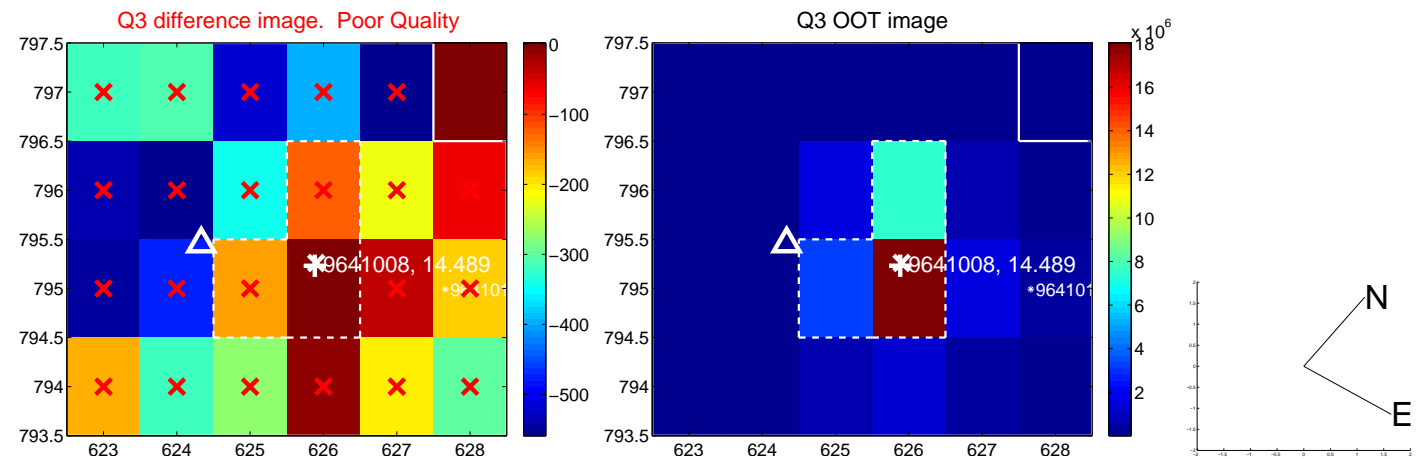
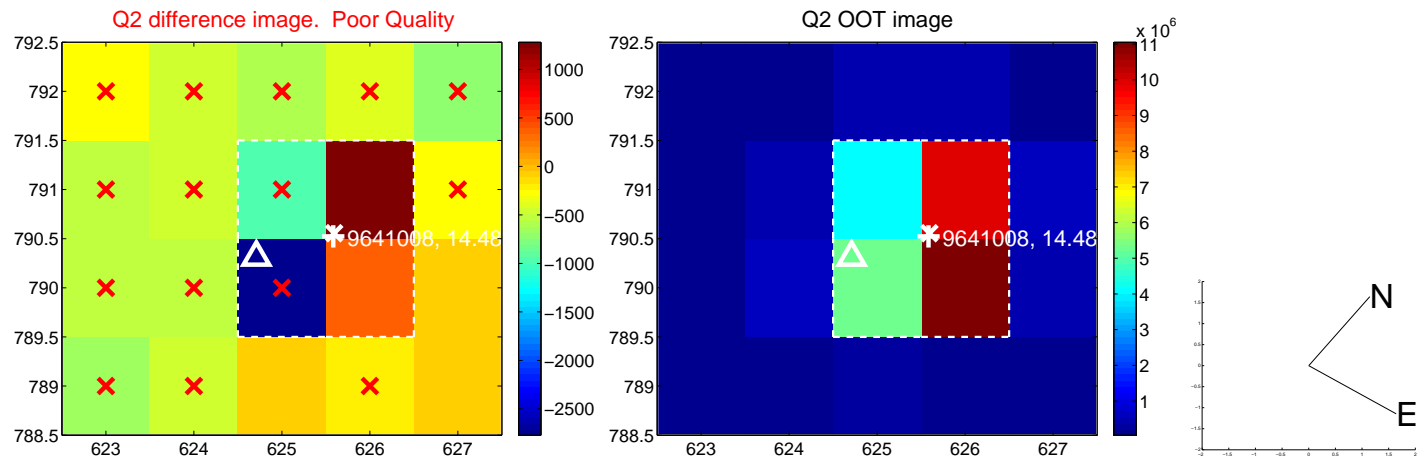
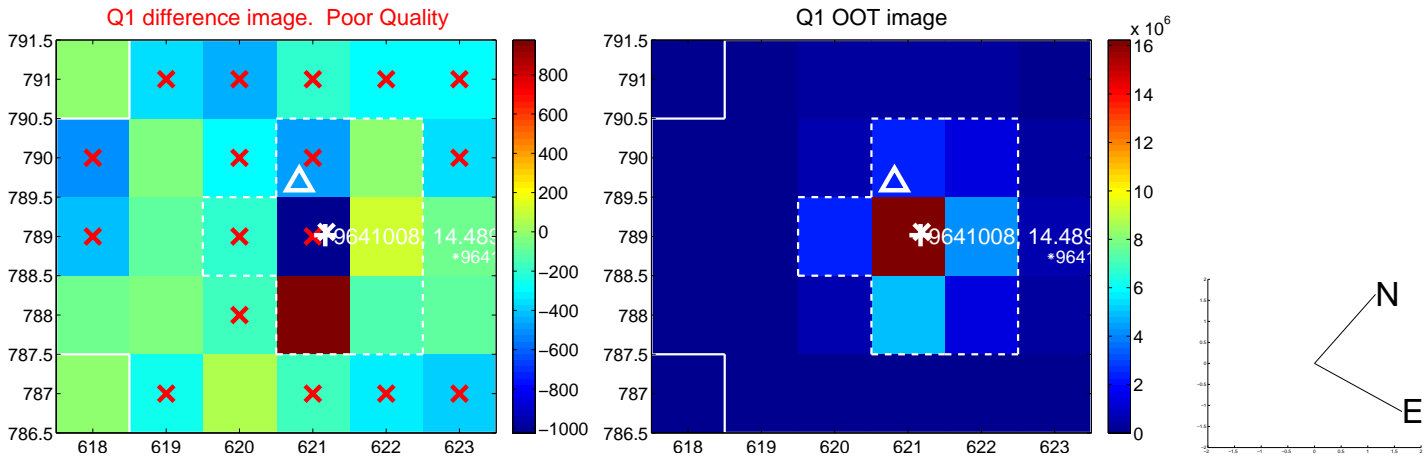
The direct PRF centroid is offset from the target star catalog position by about 0.22 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$2.951 \pm 0.647$	4.56	$-2.880 \pm 0.635$	$-0.643 \pm 0.734$
PRF-fit source offset from KIC position	$2.969 \pm 0.656$	4.52	$-2.863 \pm 0.665$	$-0.789 \pm 0.748$
photometric centroid source offset	$6.71 \pm 6.31$	1.06	$-5.88 \pm 6.38$	$-3.23 \pm 6.04$

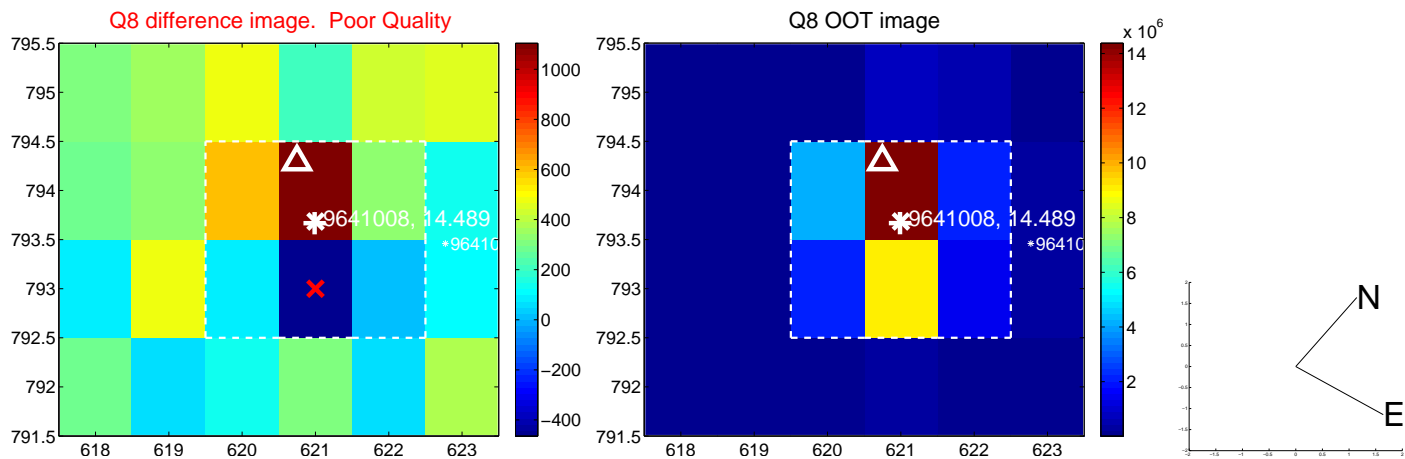
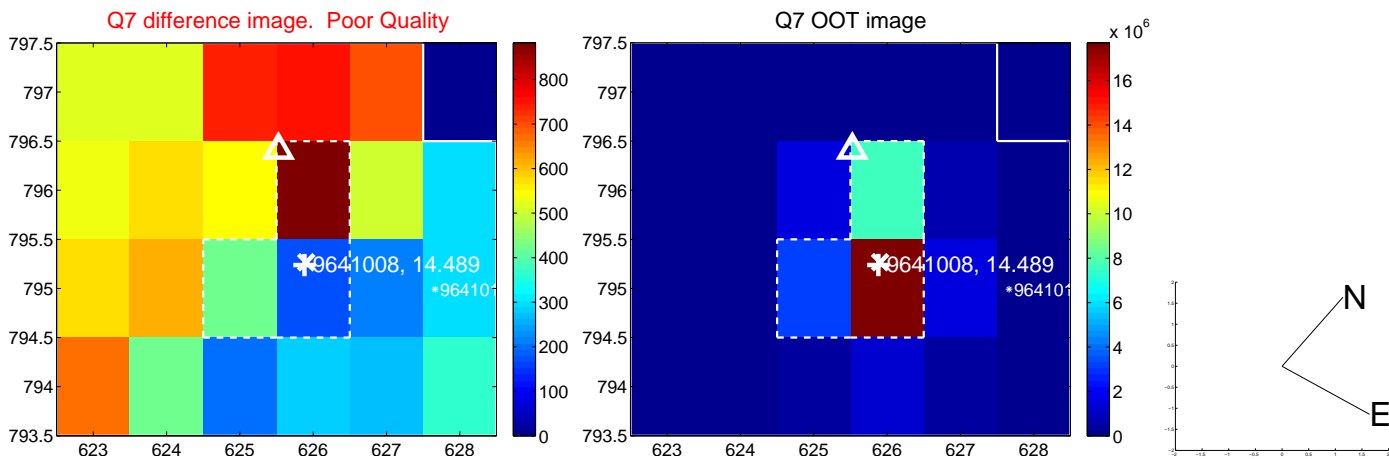
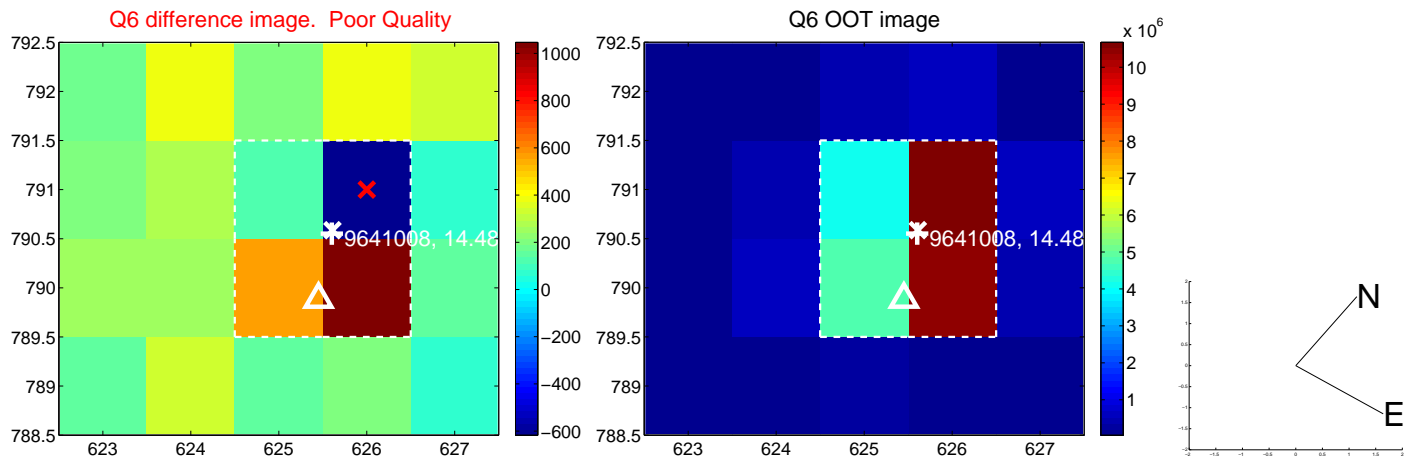
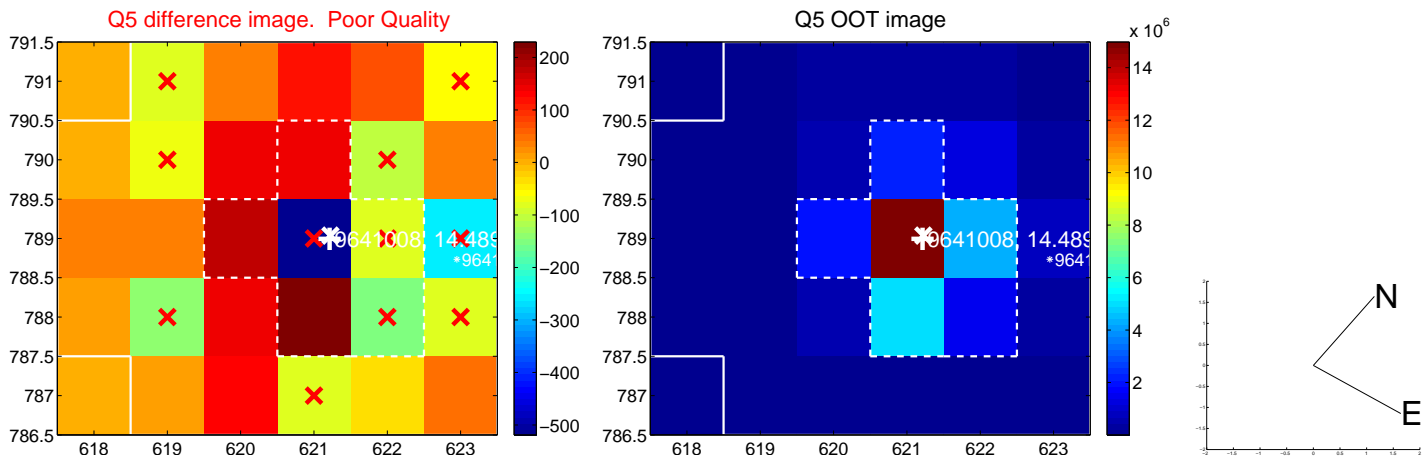


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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

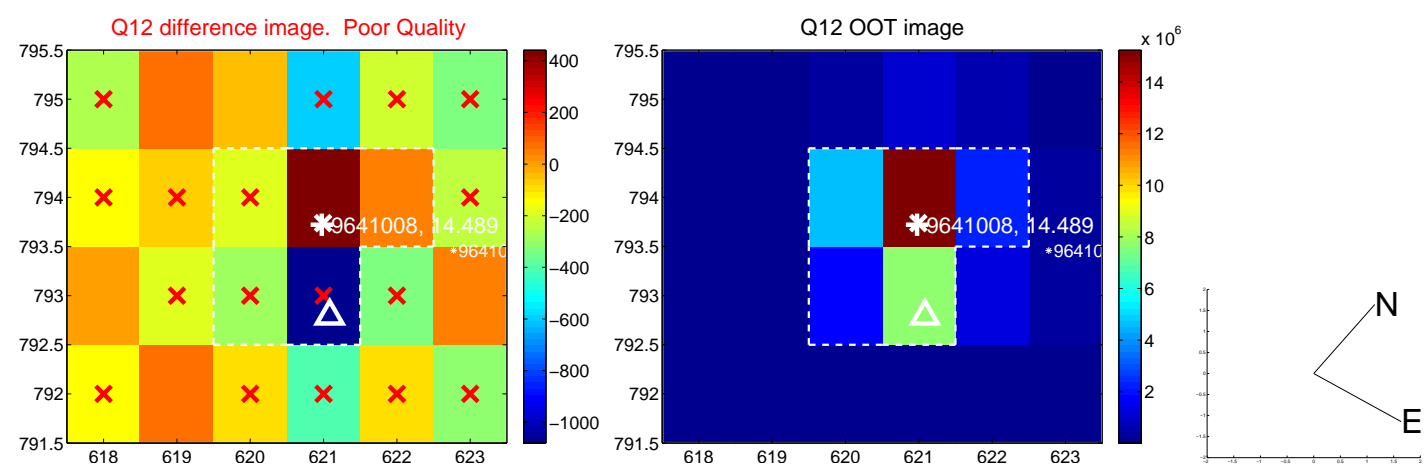
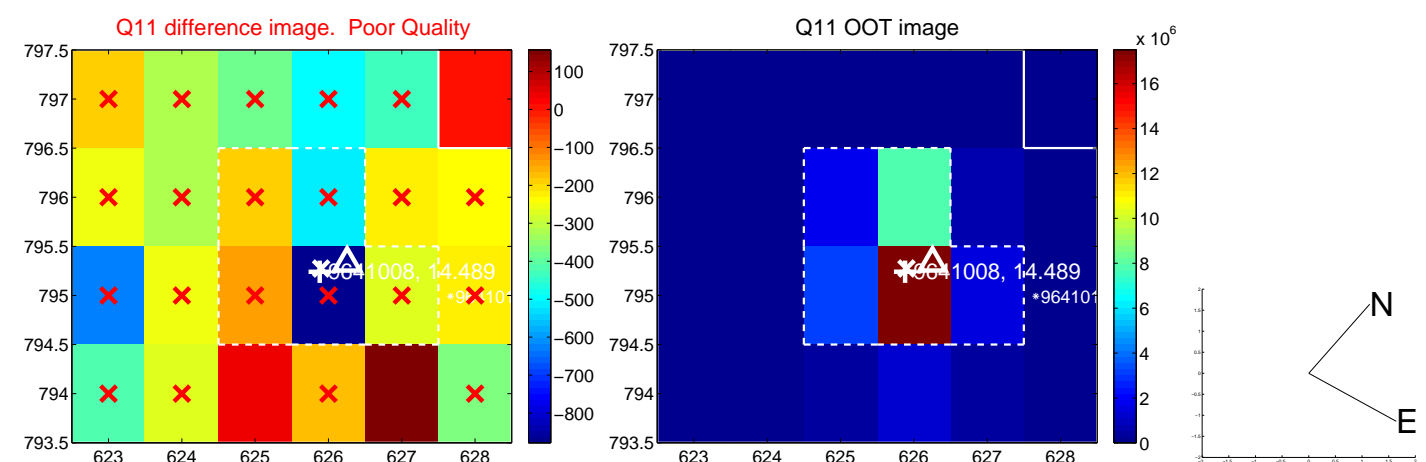
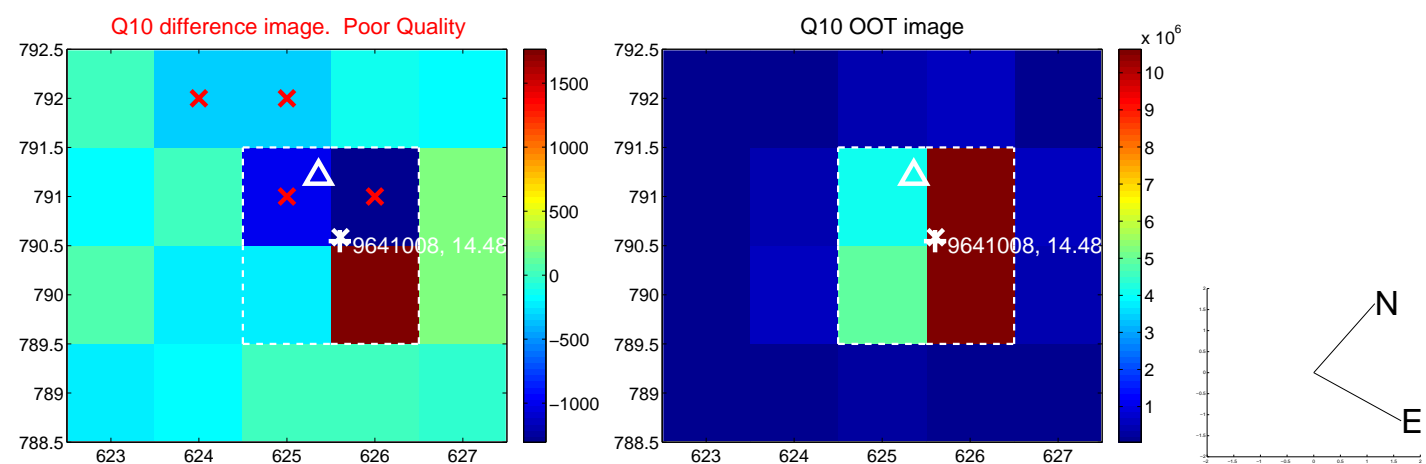
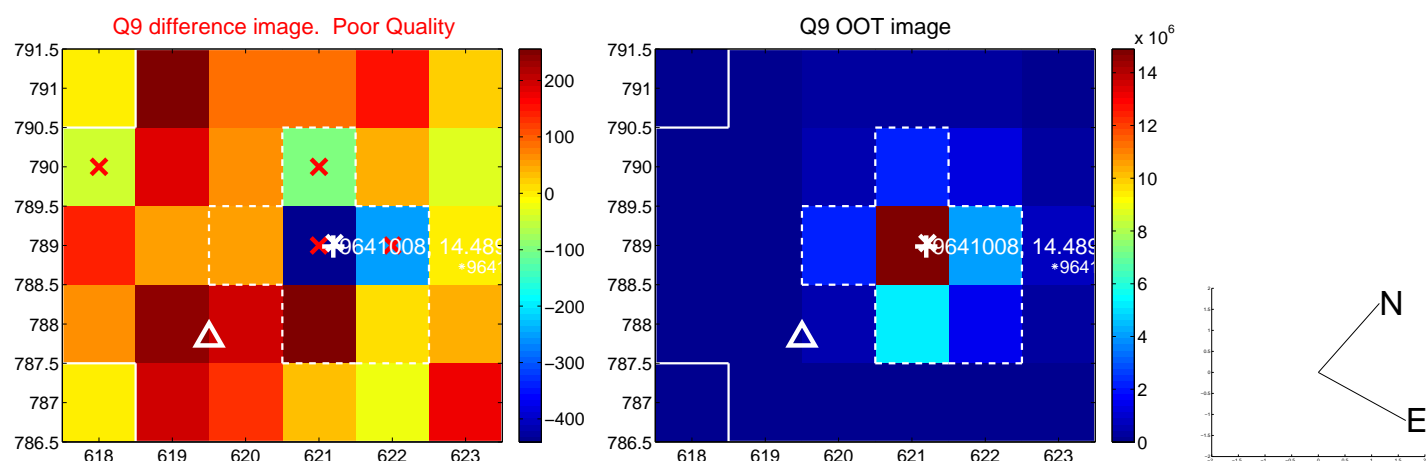
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



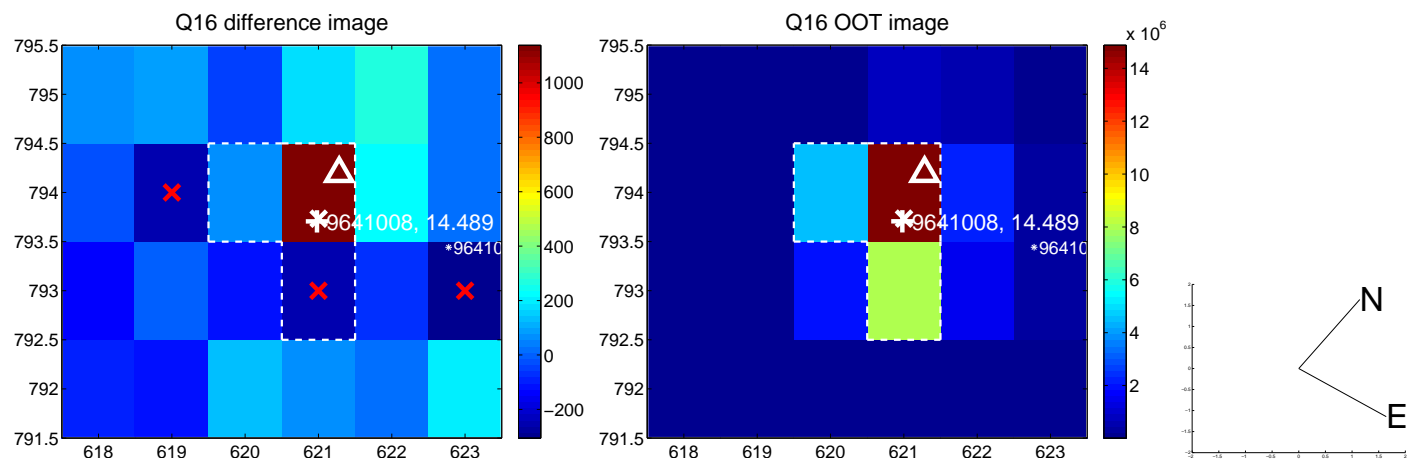
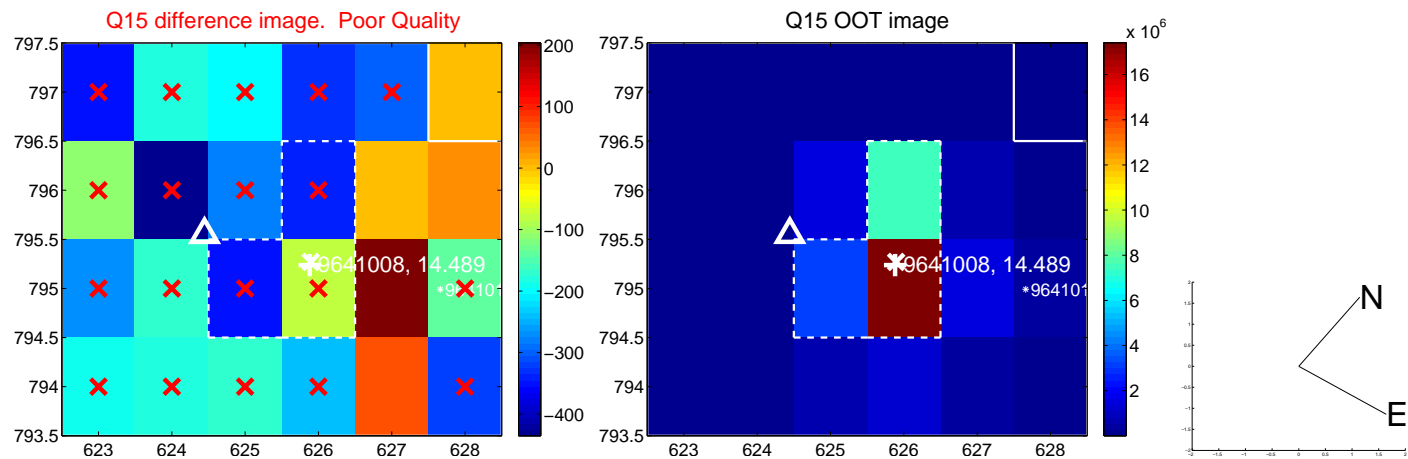
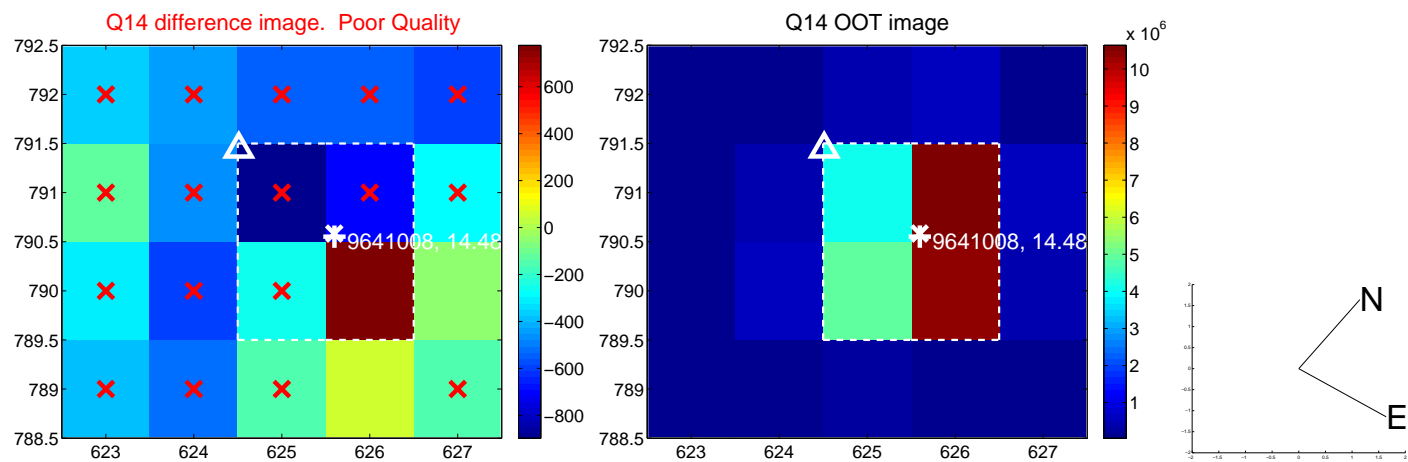
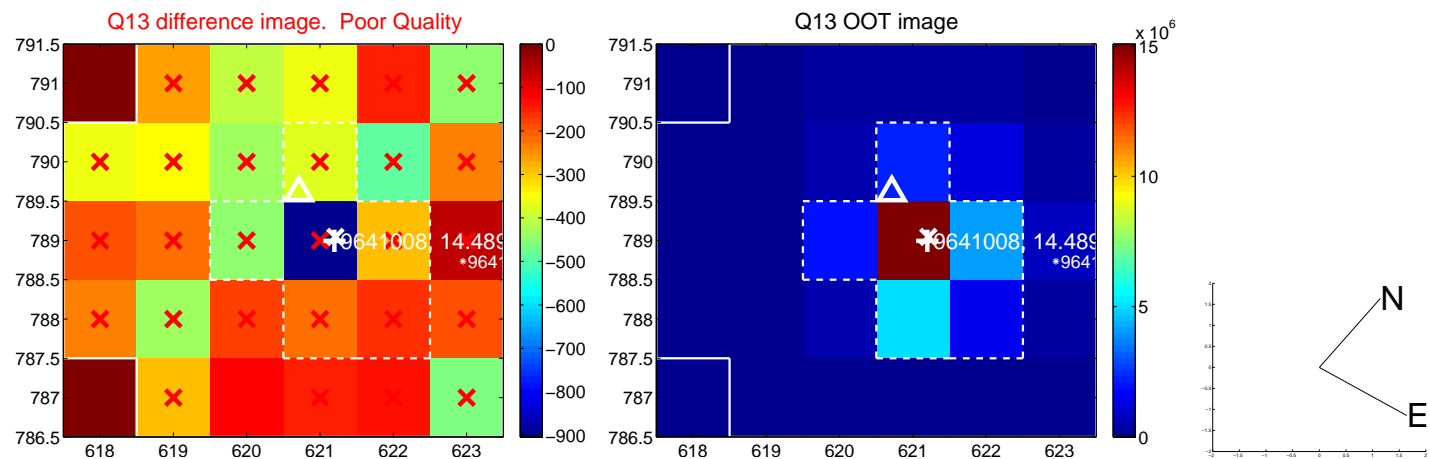
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



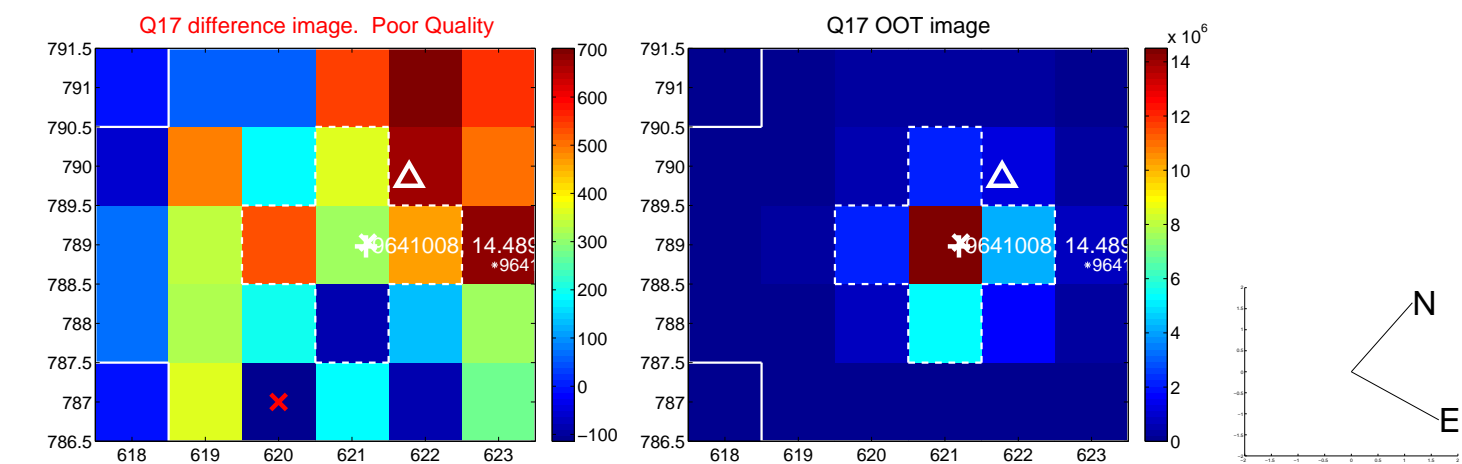
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



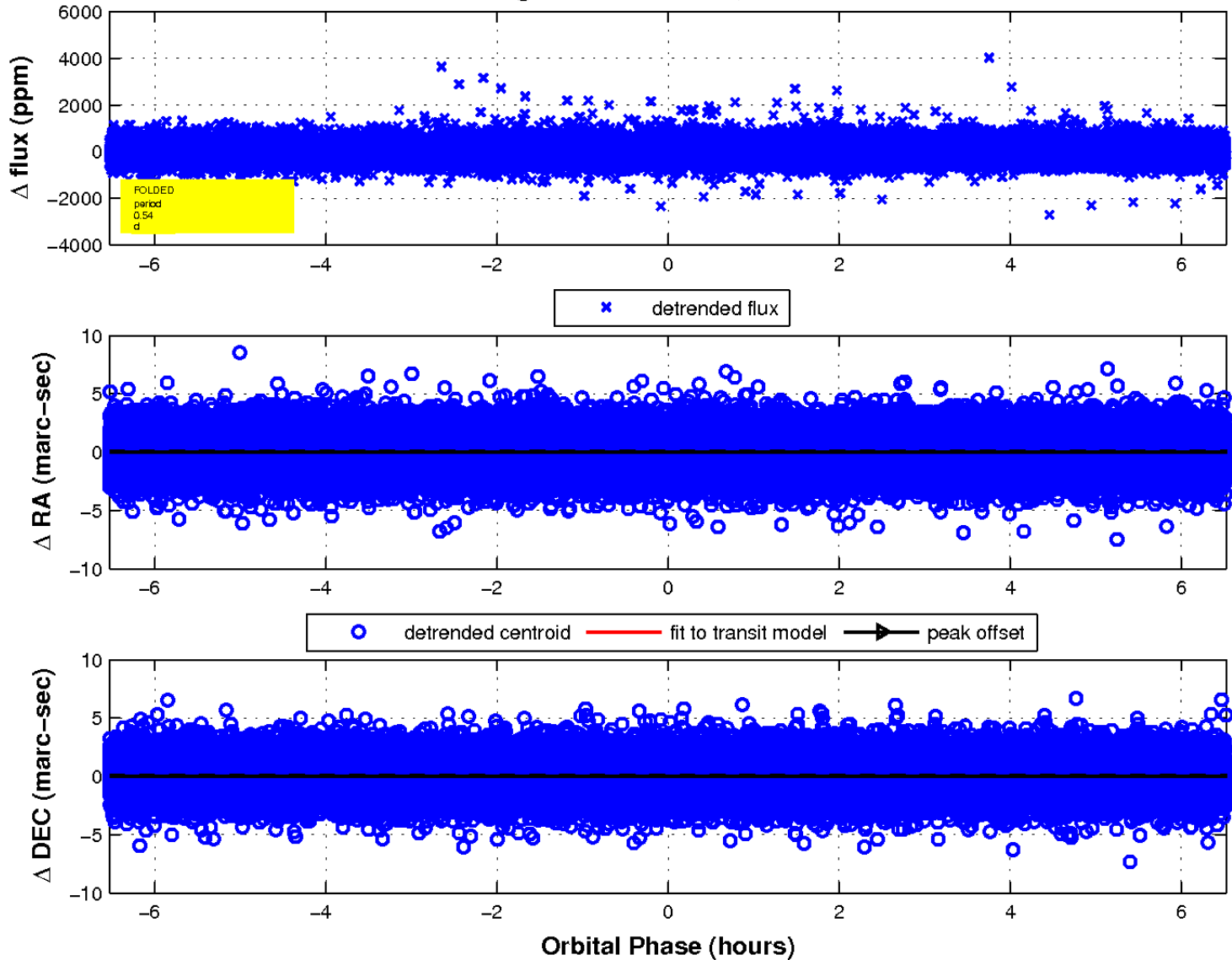
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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



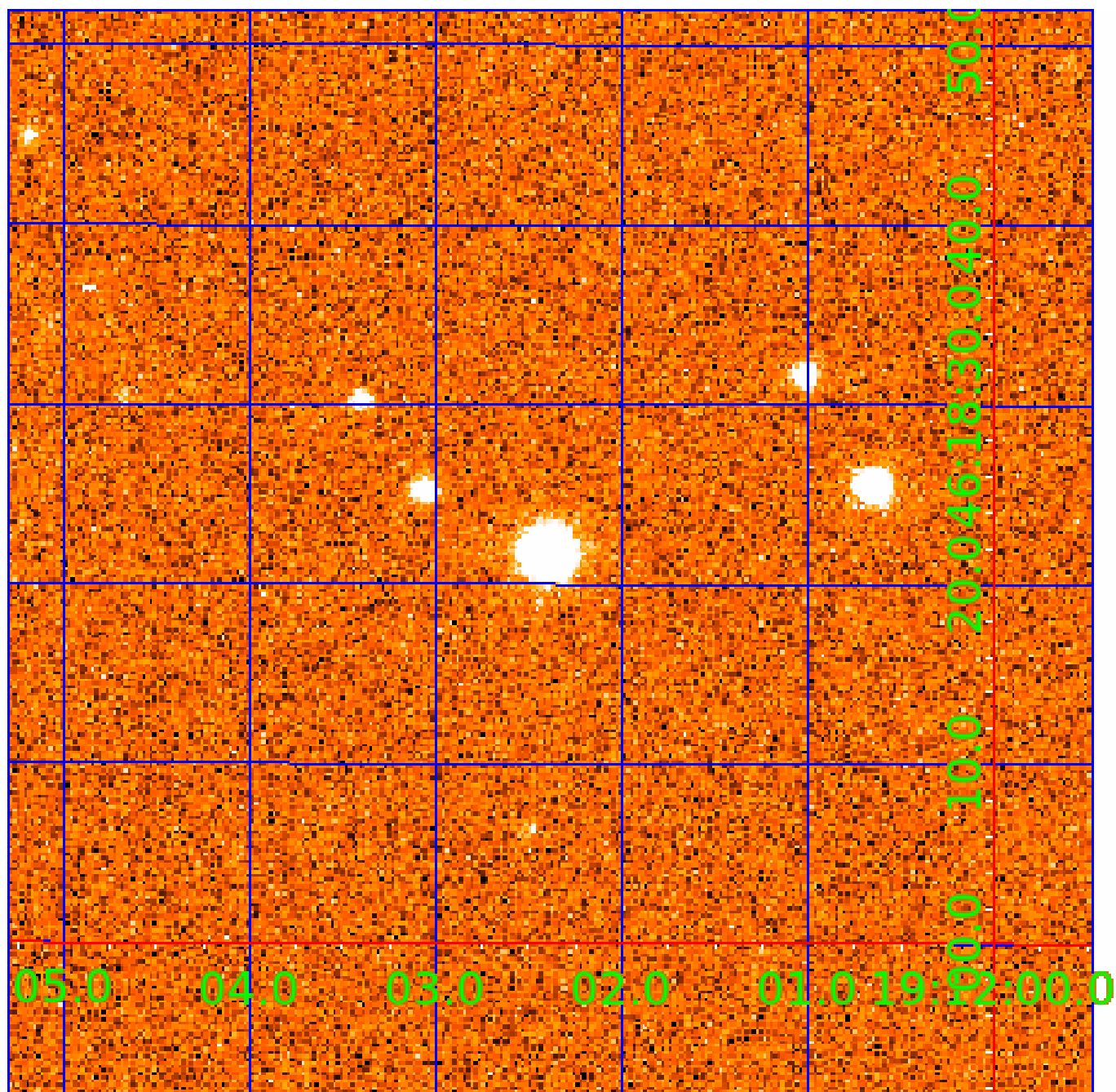
fluxWeightedCentroids, Planet 2 of 5





# UKIRT Image

Declination



# KIC 009641008

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
009641008-01	OBS	3860.01	2.178111	132.038478	332.5	2.297	43.5	47.9	0.71	5515	1.55	459.15
009641008-02	OBS	No	0.544250	131.777242	5.2	3.394	7.2	1.6	0.71	5515	0.19	2917.41
009641008-03	OBS	No	56.098222	166.841626	926.3	2.889	10.2	8.2	0.71	5515	2.28	6.04
009641008-05	OBS	No	26.545781	153.620285	149.8	6.955	7.6	2.8	0.71	5515	0.93	16.37

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009641008-01	OBS	FP	0.00	0	1	1	1	MOD_SEC_ALT—CENT_RESOLVED_OFFSET—HALO_GHOST—EPHEM_MATCH
009641008-02	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—CENT_FEW_DIFFS
009641008-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—ALL_TRANS_CHASES—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—CENT_FEW_DIFFS
009641008-05	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_SKYE_TRACKER—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—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.

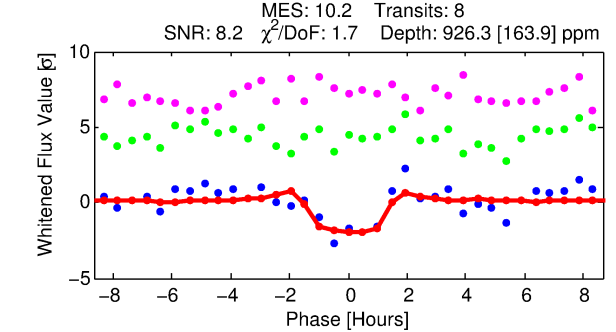
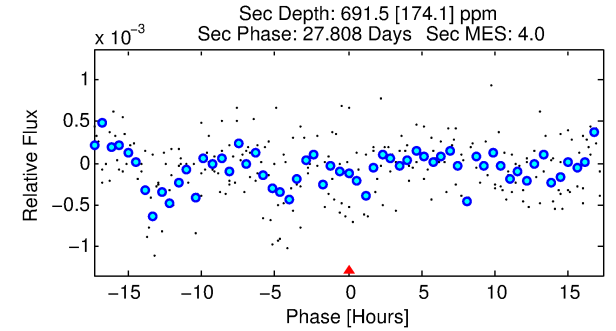
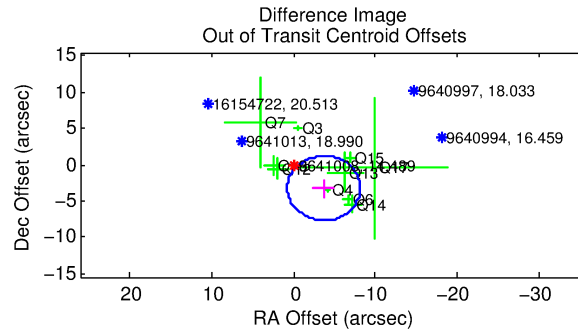
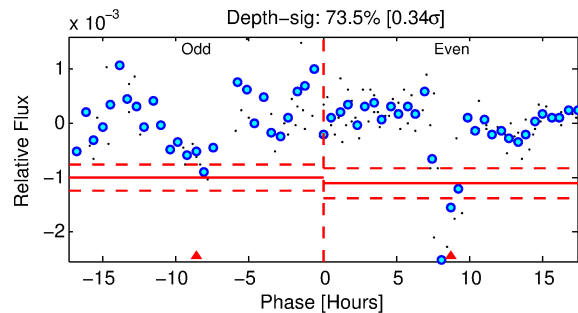
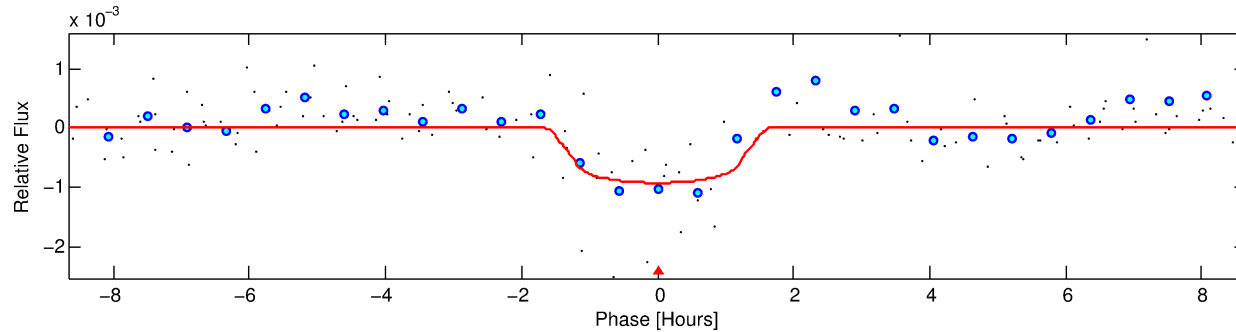
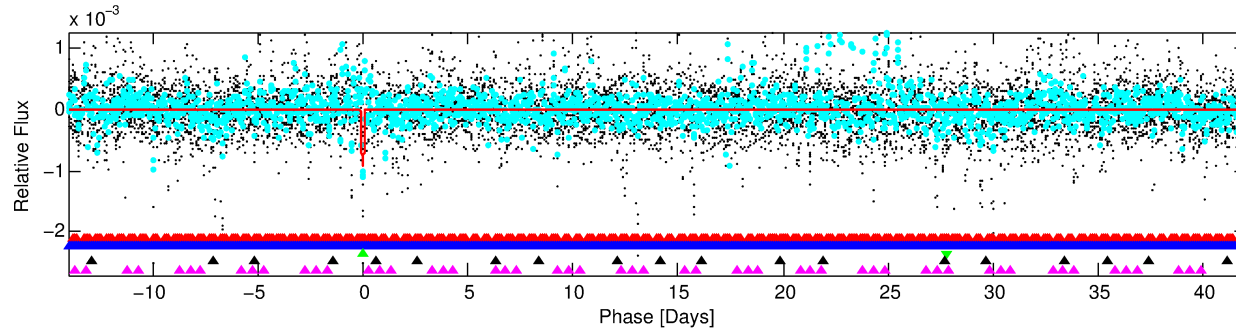
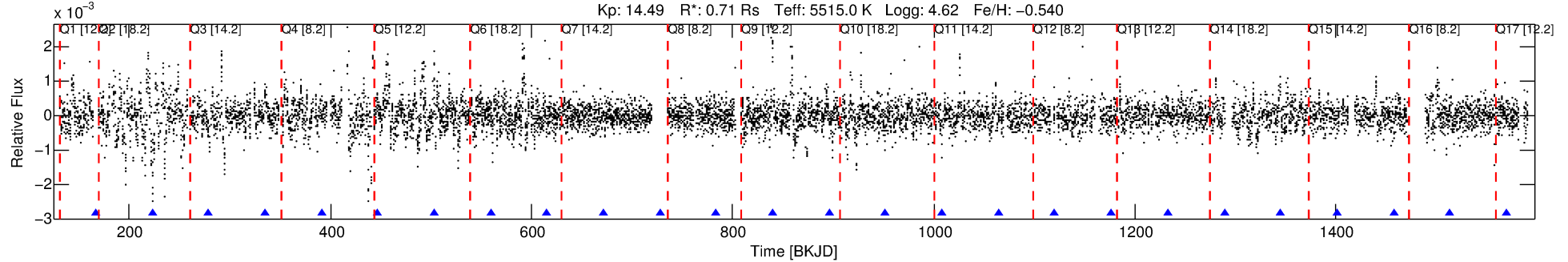
## Ephemeris Match Information For 009641008-03

No Significant Match Found

# DV One-Page Summary

KIC: 9641008 Candidate: 3 of 5 Period: 56.098 d  
KOI: K03860 Corr: No Ephemeris Match

Kp: 14.49 R\*: 0.71 Rs Teff: 5515.0 K Logg: 4.62 Fe/H: -0.540



## DV Fit Results:

Period = 56.09822 [0.00062] d  
Epoch = 166.8416 [0.0082] BKJD  
Rp/R\* = 0.0293 [0.0431]  
a/R\* = 119.40 [762.07]  
b = 0.64 [5.94]  
Seff = 6.04 [1.38]  
Teq = 400 [23] K  
Rp = 2.28 [3.37] Re  
a = 0.2638 [0.0359] AU  
Ag = 5099.84 [15063.26] [0.34σ]  
Teffp = 5222 [3851] K [1.25σ]

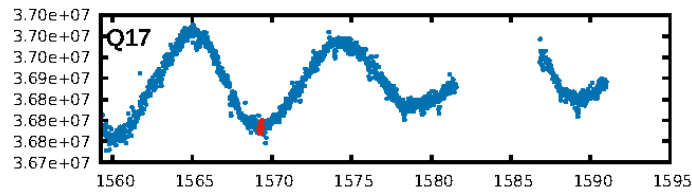
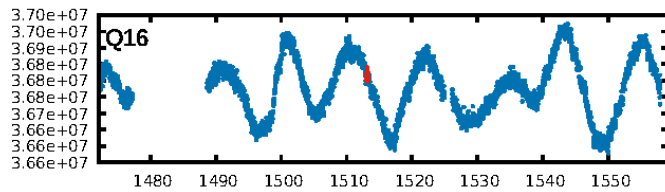
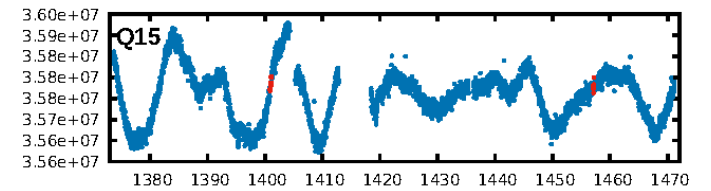
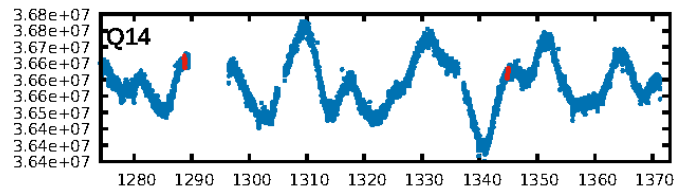
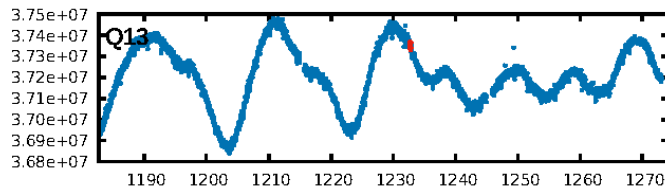
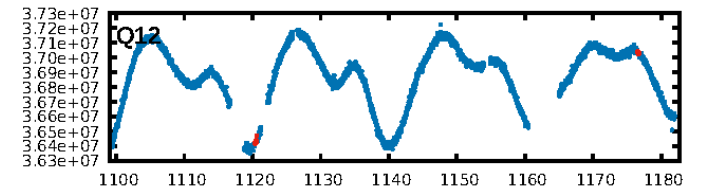
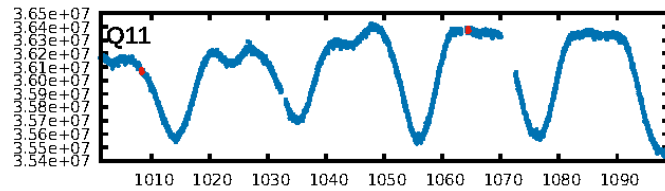
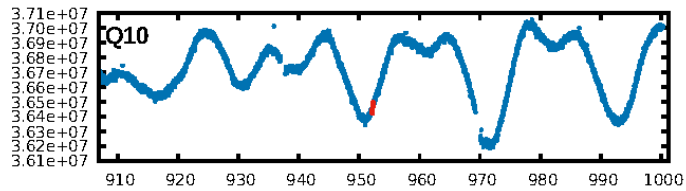
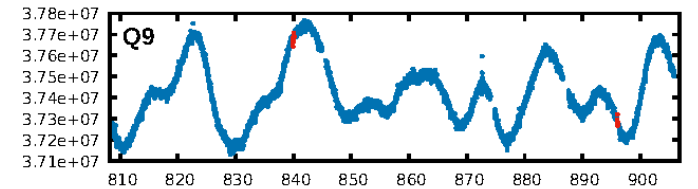
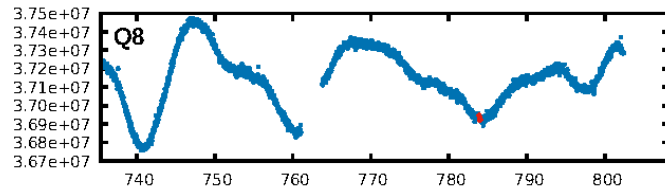
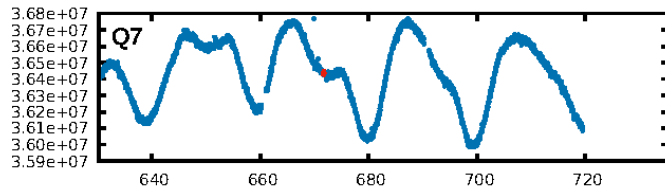
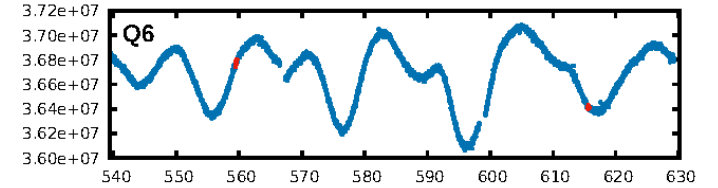
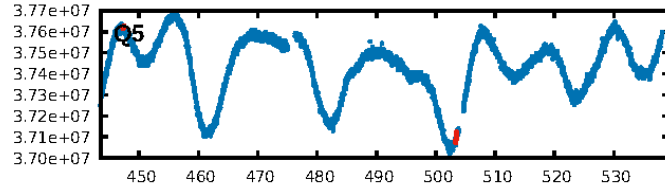
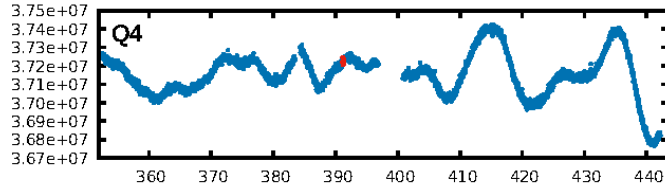
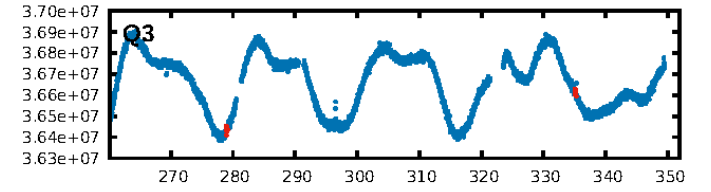
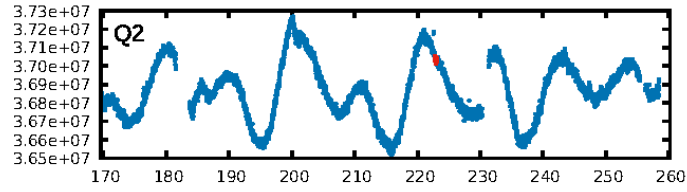
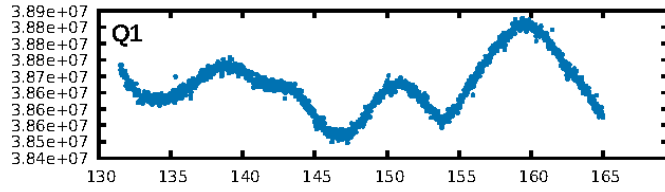
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [94.17σ]  
LongPeriod-sig: 100.0% [88.78σ]  
ModelChiSquare2-sig: 1.1%  
ModelChiSquareGof-sig: 99.9%  
Bootstrap-pfa: 4.14e-19  
RollingBand-fgt: 1.00 [8/8]  
GhostDiagnostic-chr: 2.165  
Centroid-sig: 46.8%  
Centroid-so: 0.377 arcsec [0.97σ]  
OotOffset-rm: 4.916 arcsec [3.32σ]  
KicOffset-rm: 4.999 arcsec [3.16σ]  
OotOffset-st: 2/3/3/2 [10]  
KicOffset-st: 2/3/3/2 [10]  
DiffImageQuality-fgm: 0.00 [0/10]  
DiffImageOverlap-fno: 0.00 [0/15]

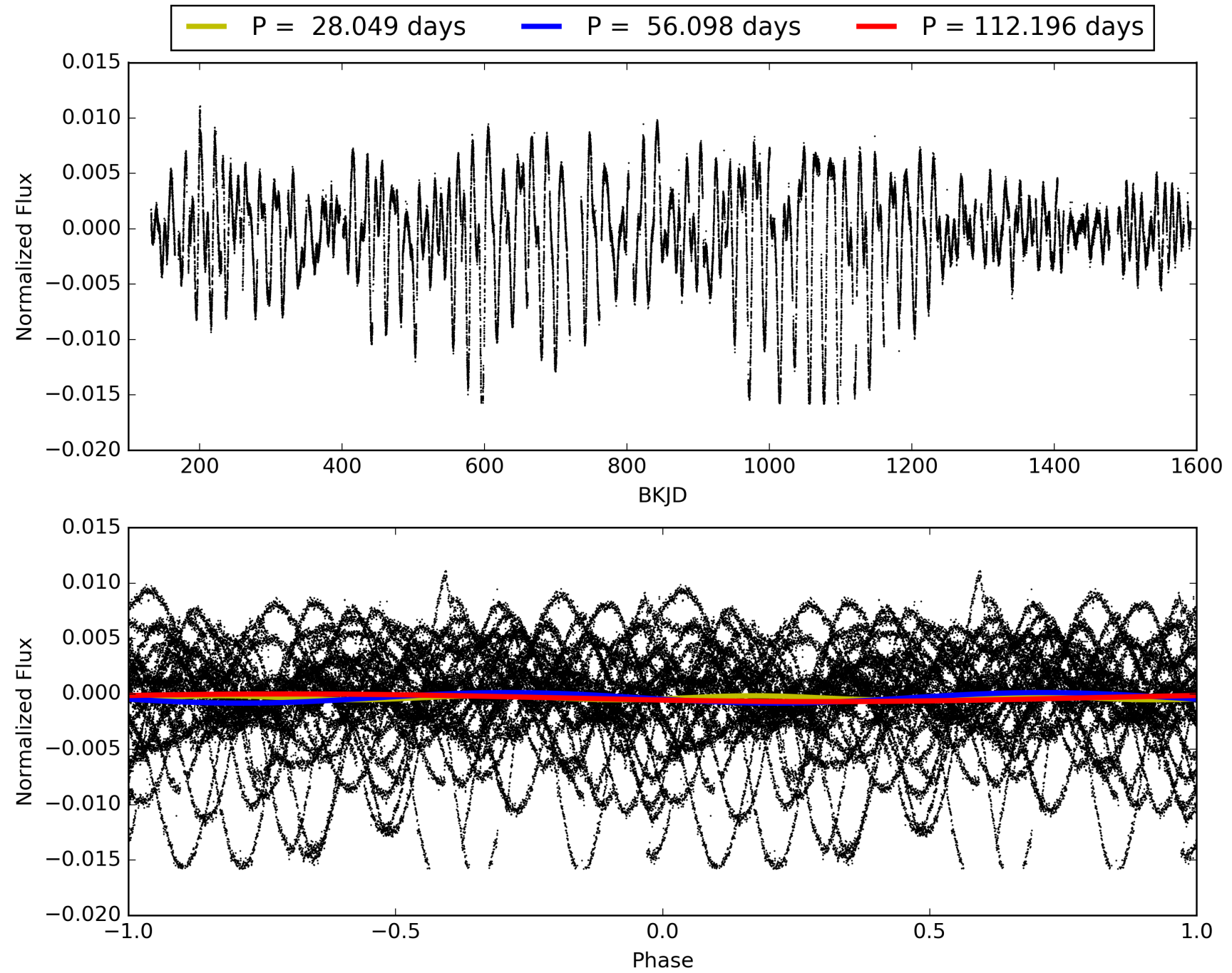
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 29-Jan-2016 23:08:24 Z

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

# TCE 009641008-03, PDC Light Curves

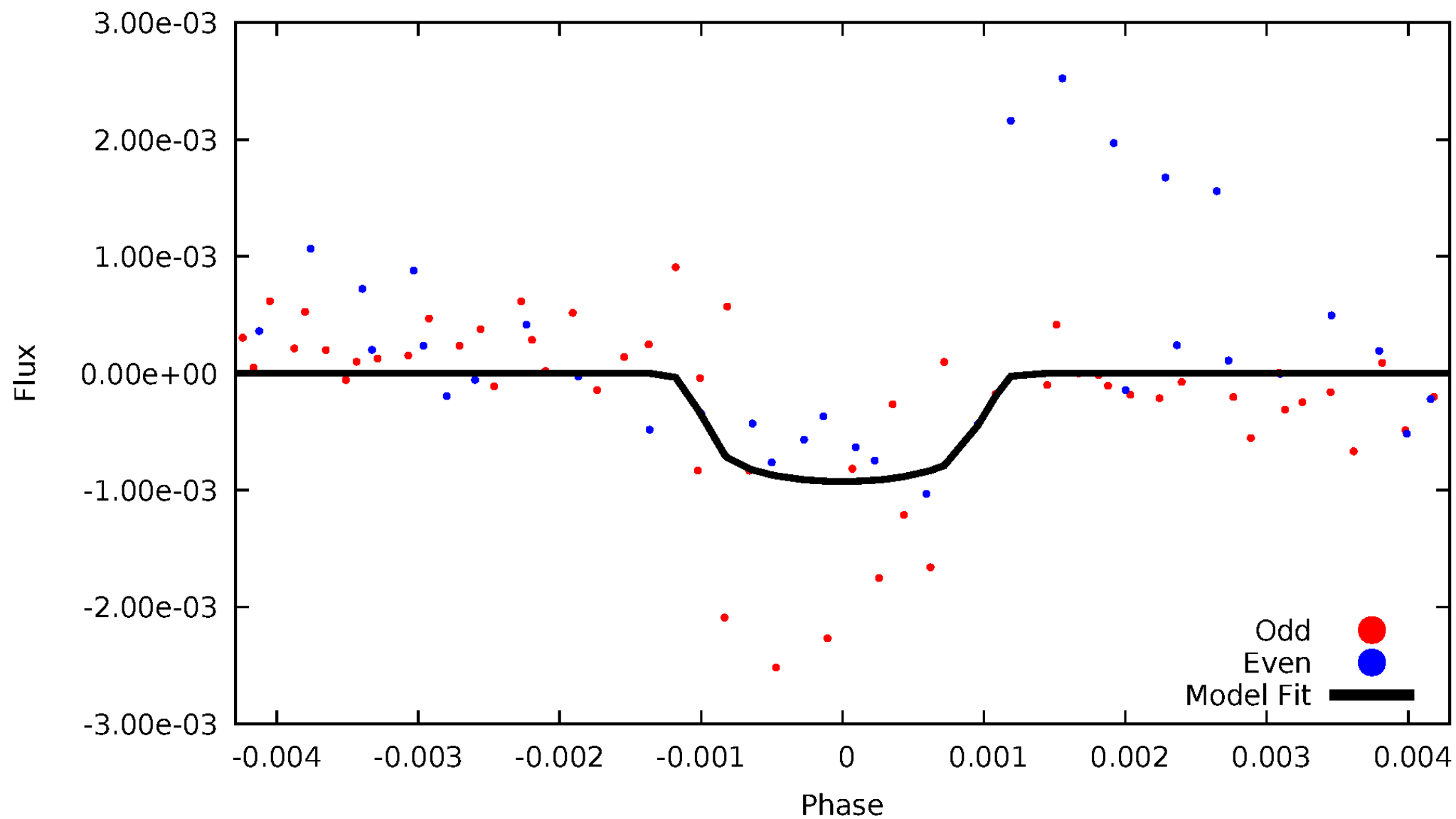


# TCE 009641008-03



# DV Odd/Even

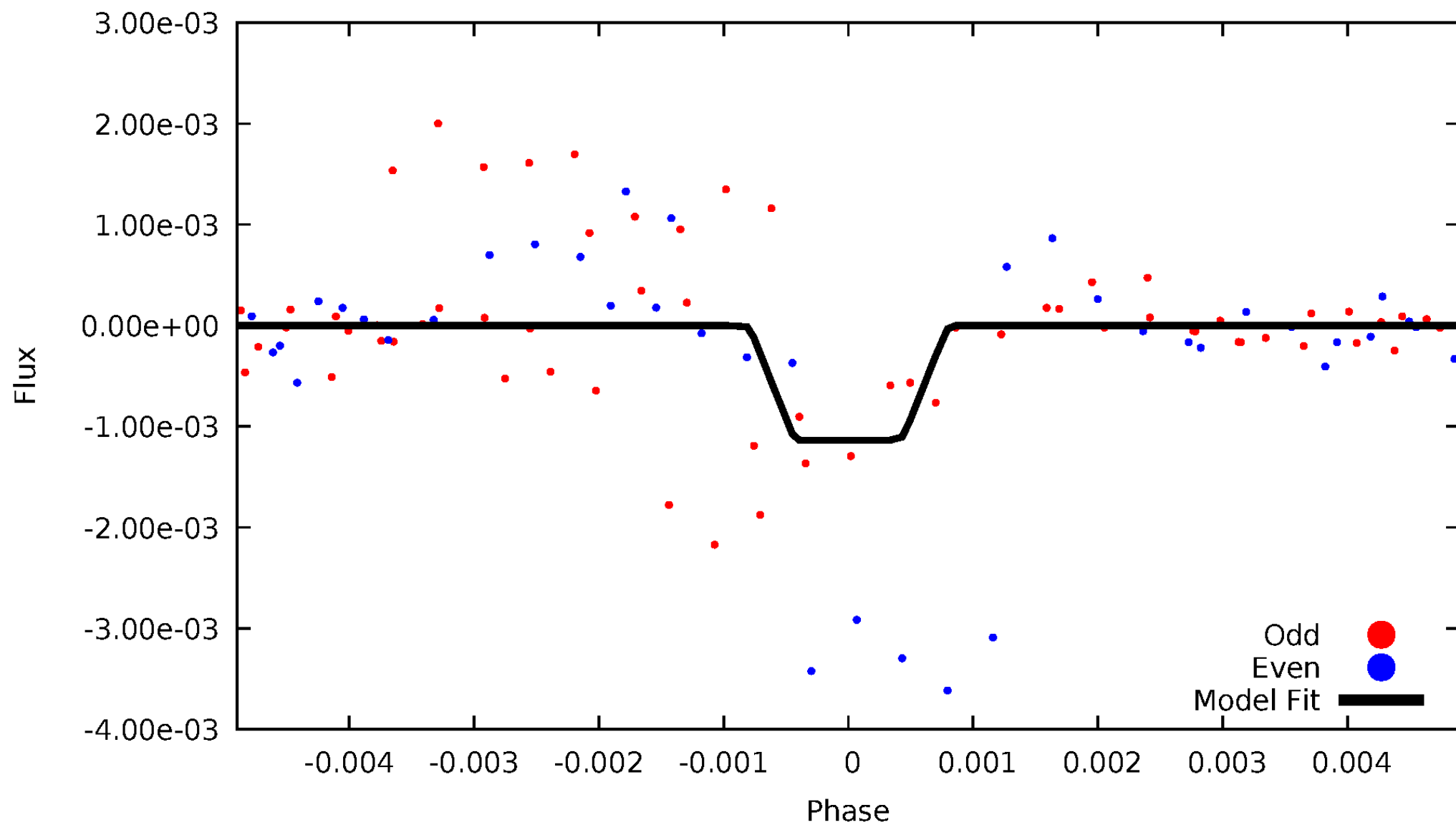
TCE 009641008-03





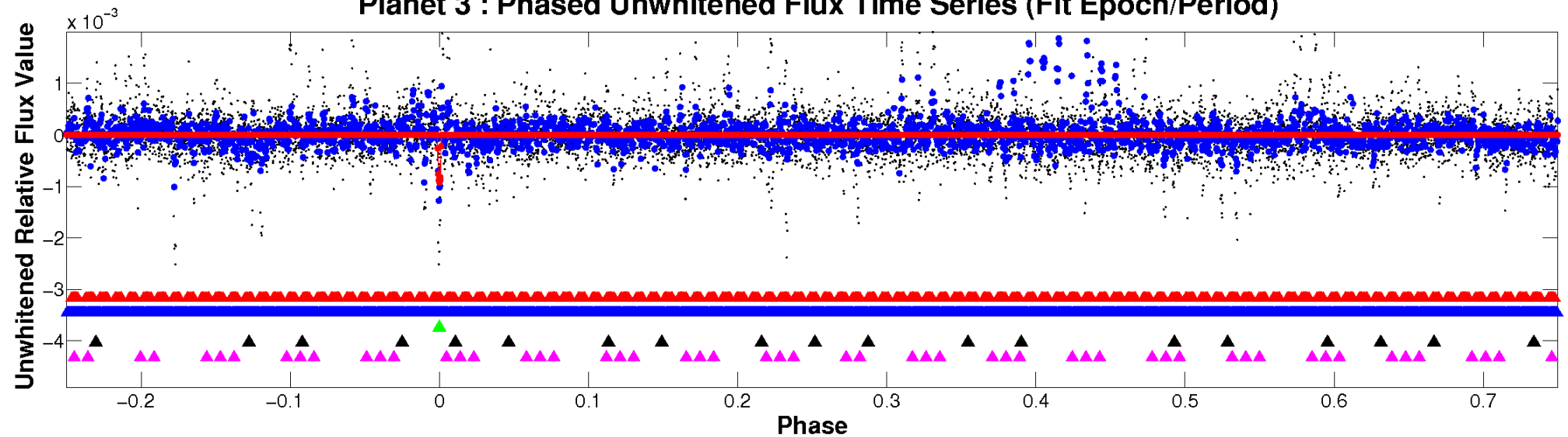
# ALT Odd/Even

TCE 009641008-03

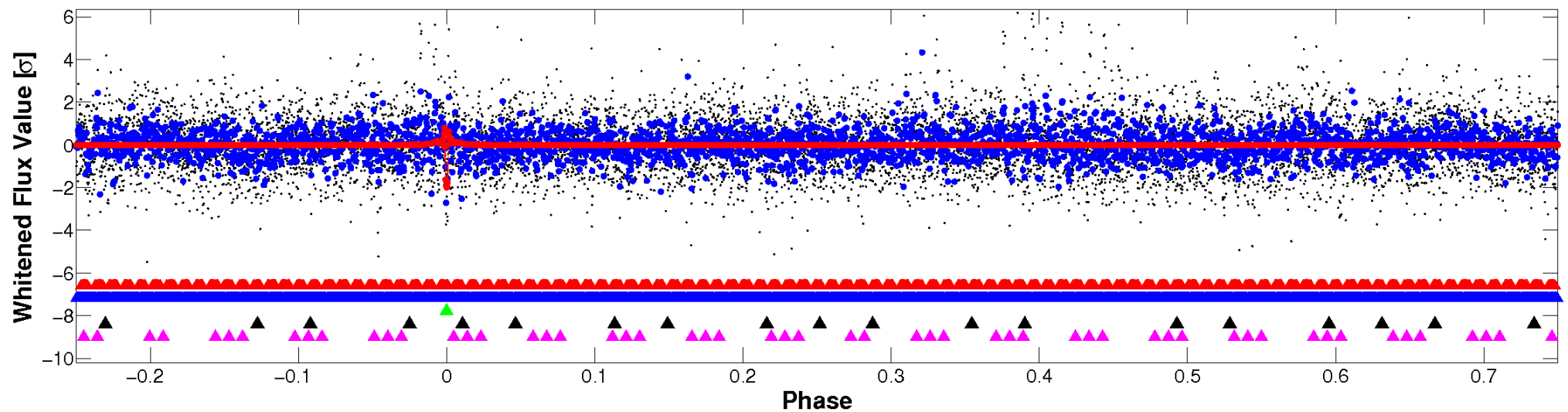


# Non-Whitened Vs. Whitened Light Curve

Planet 3 : Phased Unwhitened Flux Time Series (Fit Epoch/Period)

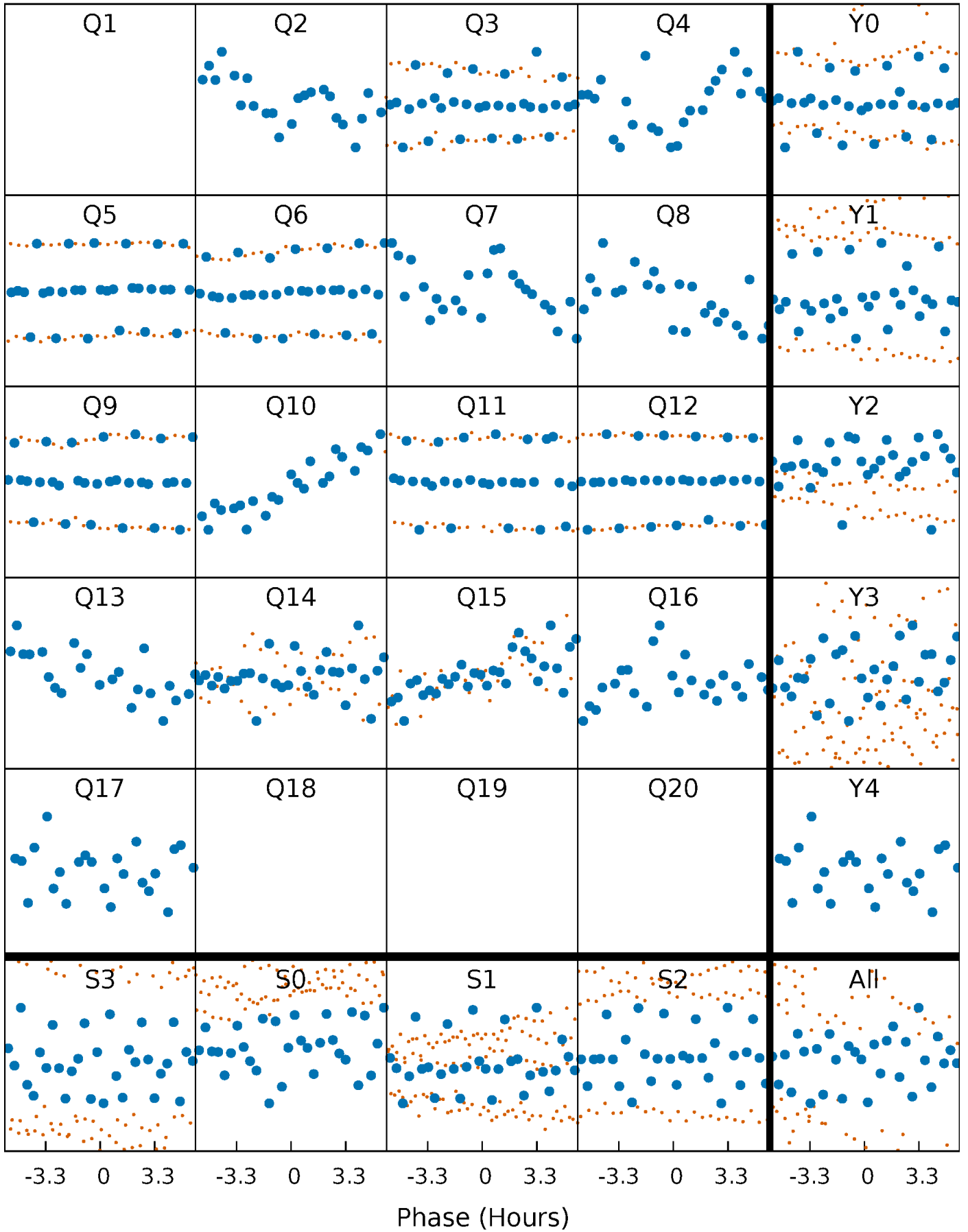


Planet 3 : Phased Whitened Flux Time Series (Fit Epoch/Period)



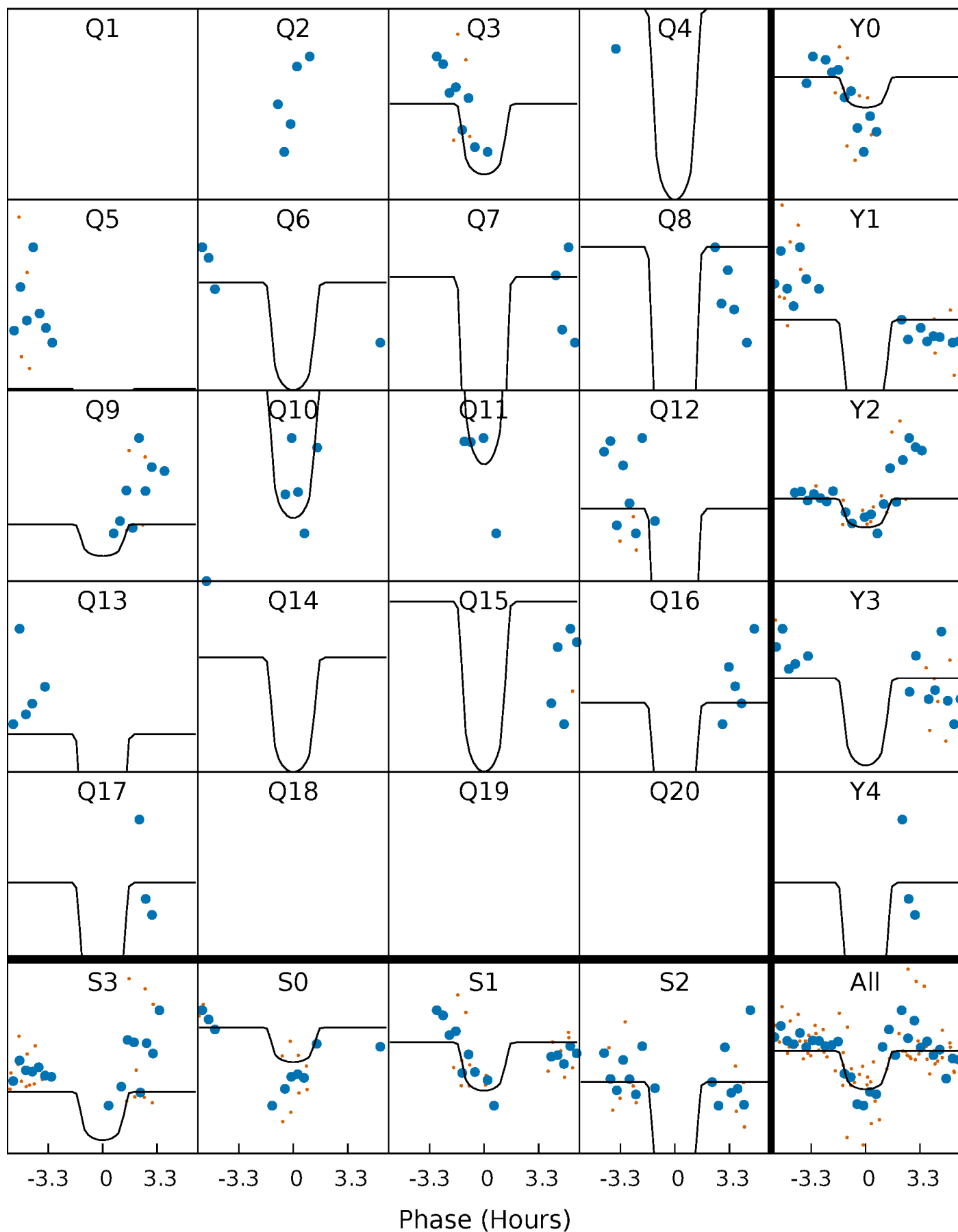
# PDC Quarter-Phased Transit Curves

TCE 009641008-03 P= 56.098222 Days  $T_0=166.841626$  (BKJD)



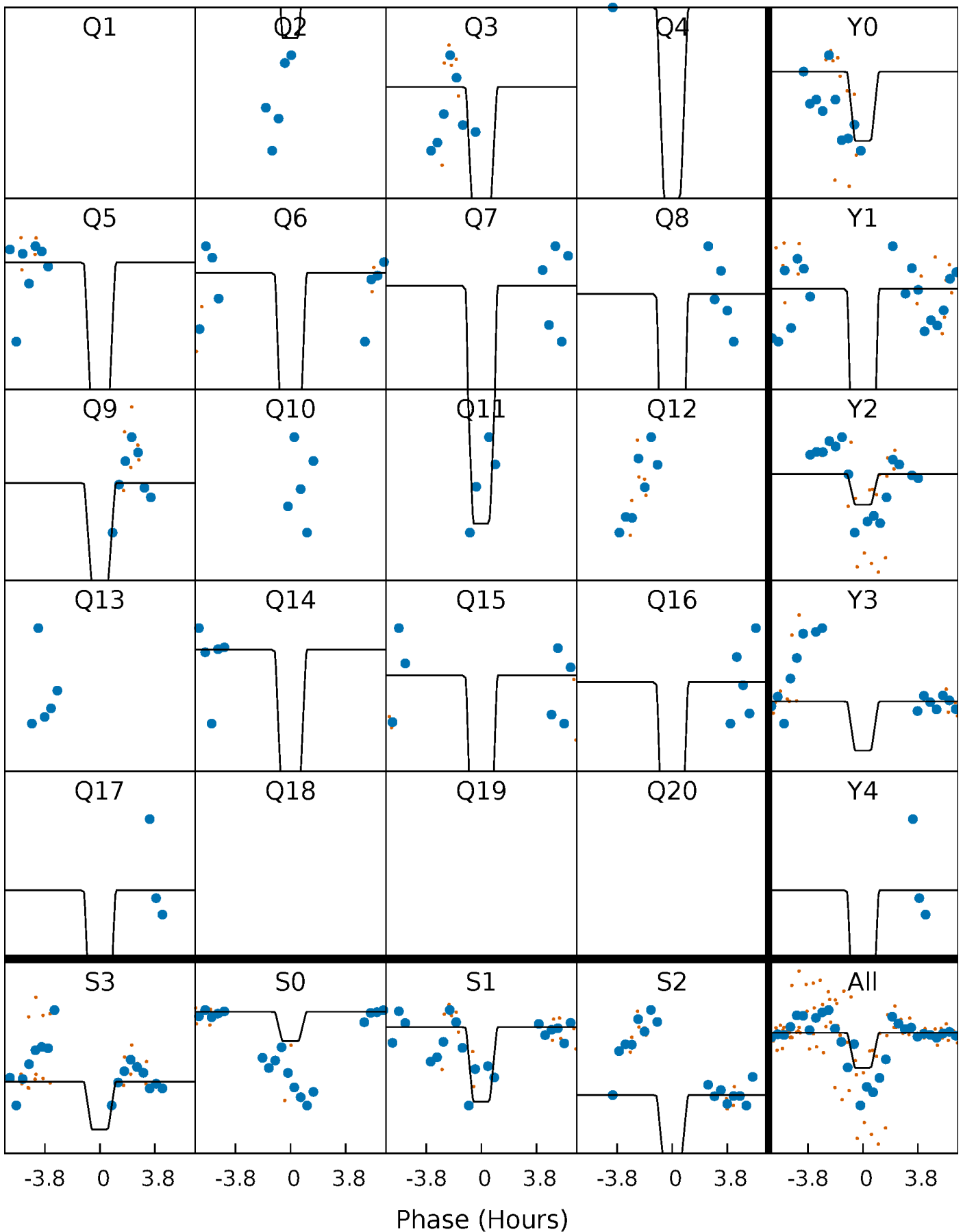
# DV Quarter-Phased Transit Curves

TCE 009641008-03     $P = 56.098222$  Days     $T_0 = 166.841626$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

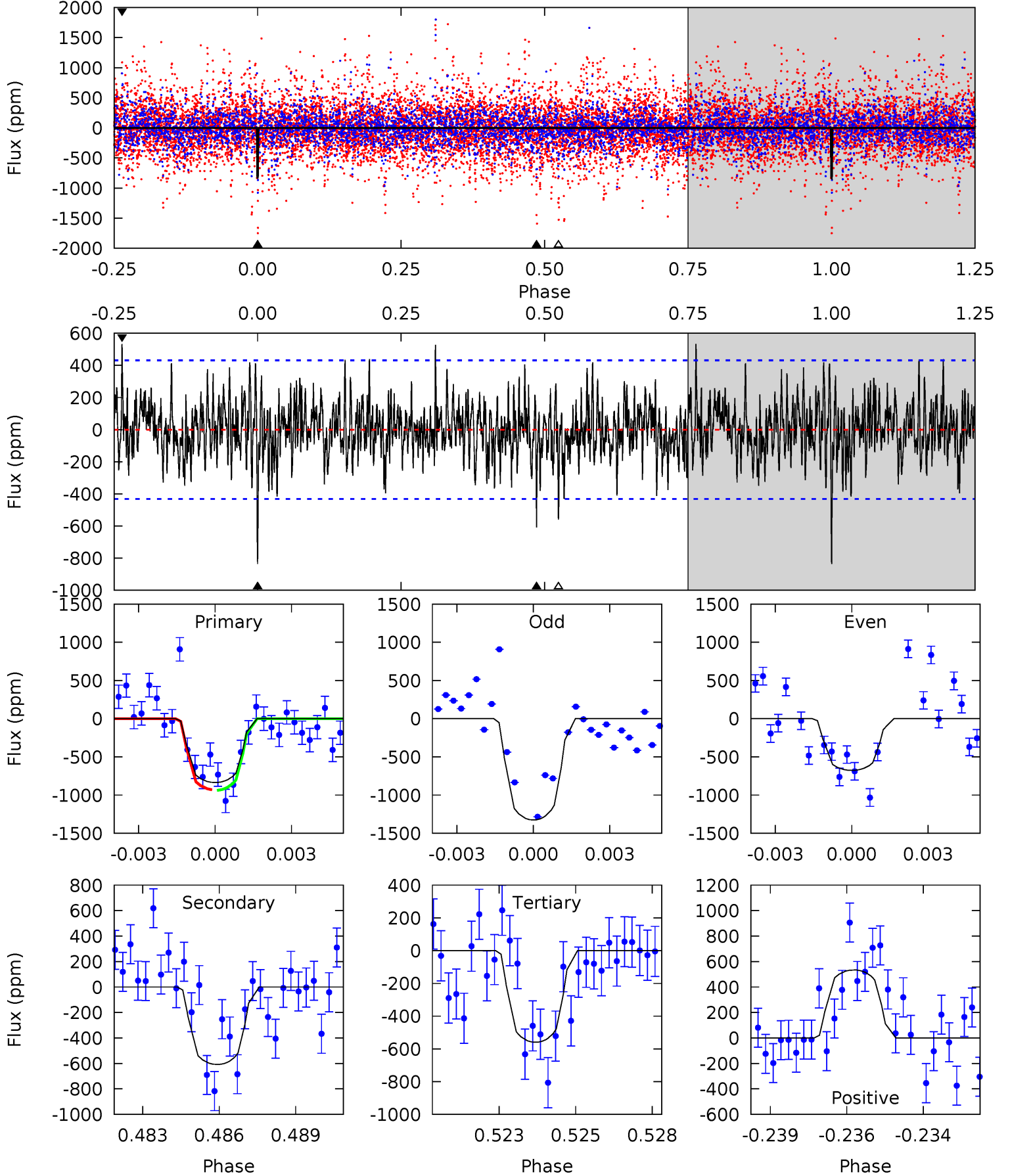
TCE 009641008-03 P= 56.094745 Days  $T_0=166.878887$  (BKJD)



# DV Model-Shift Uniqueness Test

009641008-03, P = 56.098222 Days, E = 110.743404 Days

Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
10.2	7.44	6.84	6.53	5.28	3.01	1.72	3.37	3.69	0.60	0.91	3.57	0.98	0.39	0.05

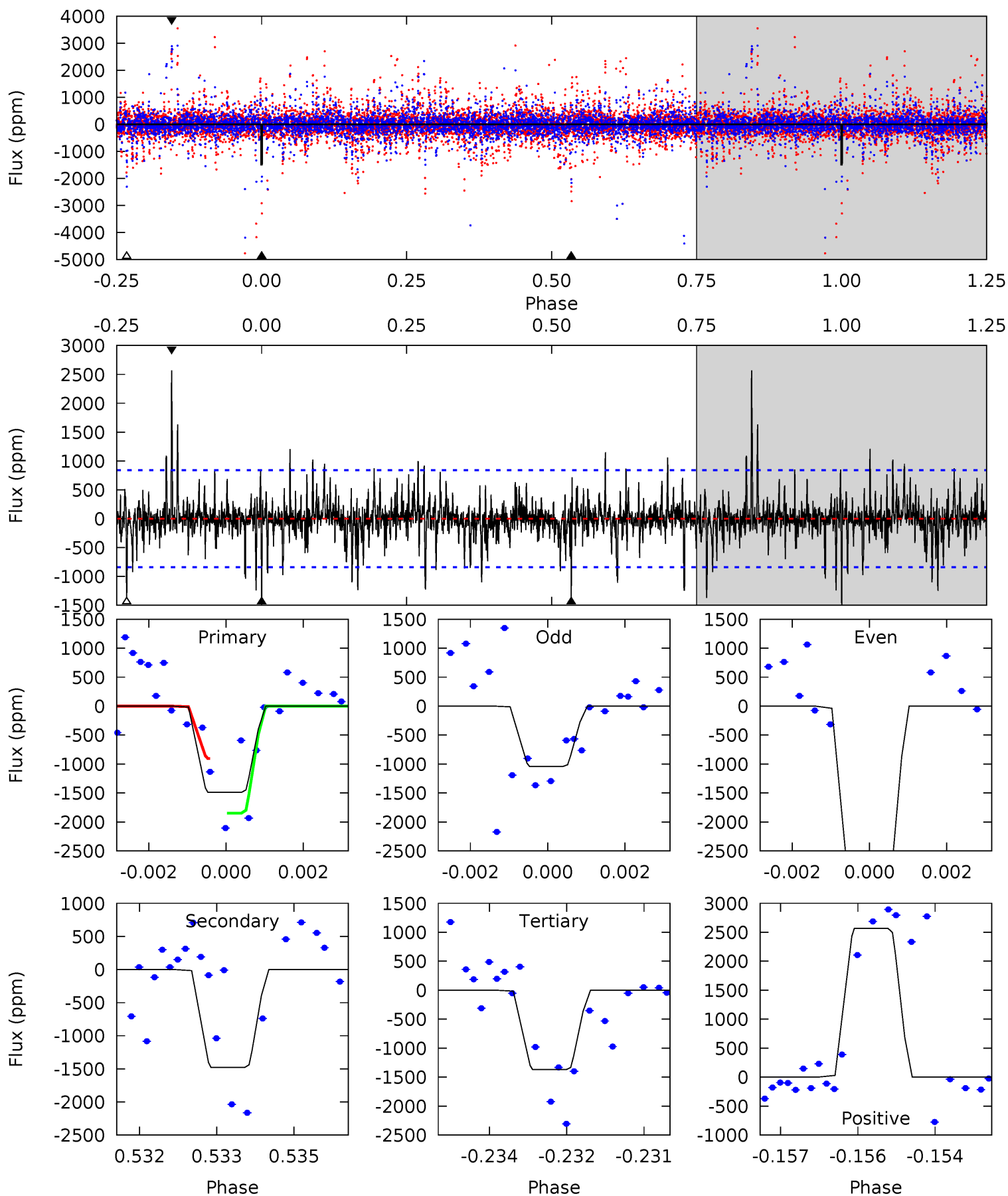




# Alt Model-Shift Uniqueness Test

009641008-03, P = 56.094745 Days, E = 110.784142 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
9.48	9.42	8.72	16.3	5.36	3.14	1.57	0.76	-6.86	0.70	-6.92	5.35	1.27	0.63	0



### Stellar Parameters For KIC 009641008

	$T_{\text{eff}}(K)$	$\log(g)$	$[\text{Fe}/\text{H}]$	$R$ ( $R_{\odot}$ )	$M$ ( $M_{\odot}$ )	$p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ )
	$5515^{+163}_{-147}$	$4.624^{+0.035}_{-0.105}$	$-0.540^{+0.300}_{-0.300}$	$0.712^{+0.117}_{-0.050}$	$0.785^{+0.073}_{-0.073}$	$3.065^{+0.523}_{-0.996}$
	+3%/-3%	+1%/-2%	+56%/-56%	+16%/-7%	+9%/-9%	+17%/-32%
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 009641008-03 / KOI

Detrend	Depth (ppm)	$R_p$ ( $R_{\oplus}$ )	$T_{\text{max}}$ (K)	$T_{\text{obs}}$ (K)	$A_{\text{obs}}$
DV	$-608 \pm 82$	$3.42^{+3.01}_{-2.31}$	$566^{+24}_{-21}$	$4376^{+3098}_{-849}$	$1929^{+17751}_{-1374}$
Alt.	$-1479 \pm 157$	$3.85^{+2.65}_{-2.40}$	$566^{+23}_{-22}$	$5016^{+3394}_{-949}$	$3754^{+24239}_{-2437}$

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

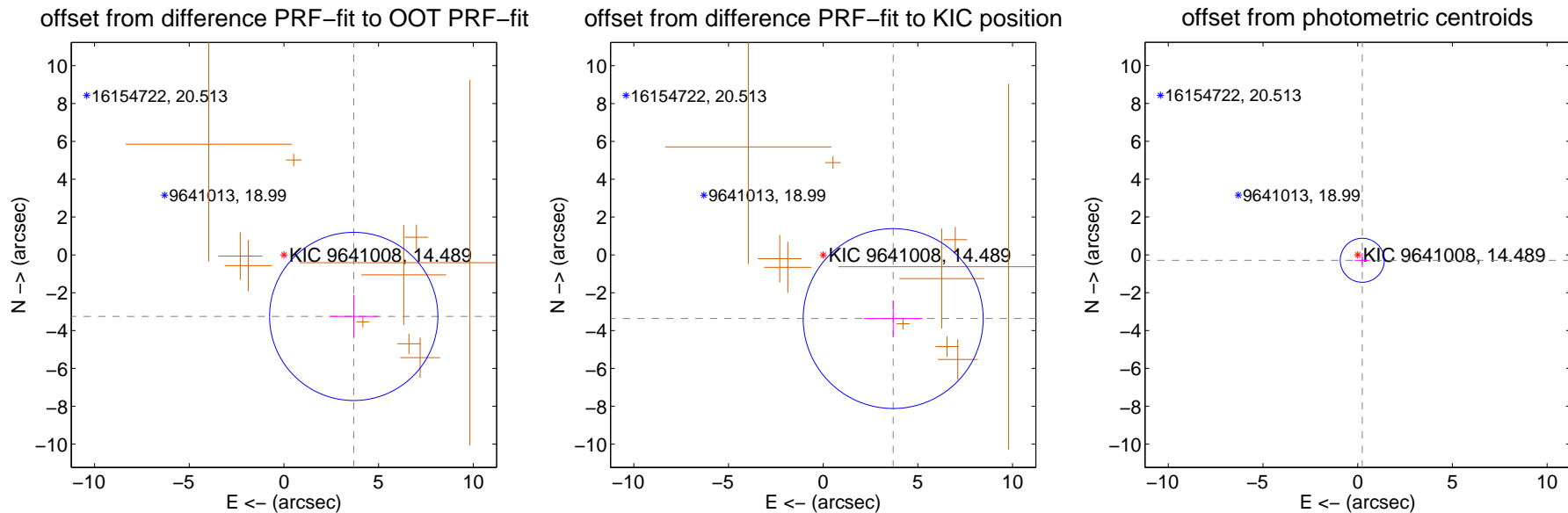
## DV Centroid Data

Supplemental centroid analysis for 009641008-03. Kepler magnitude: 14.49. Transit SNR 8.23

There are 0 quarters with good PRF difference image offsets

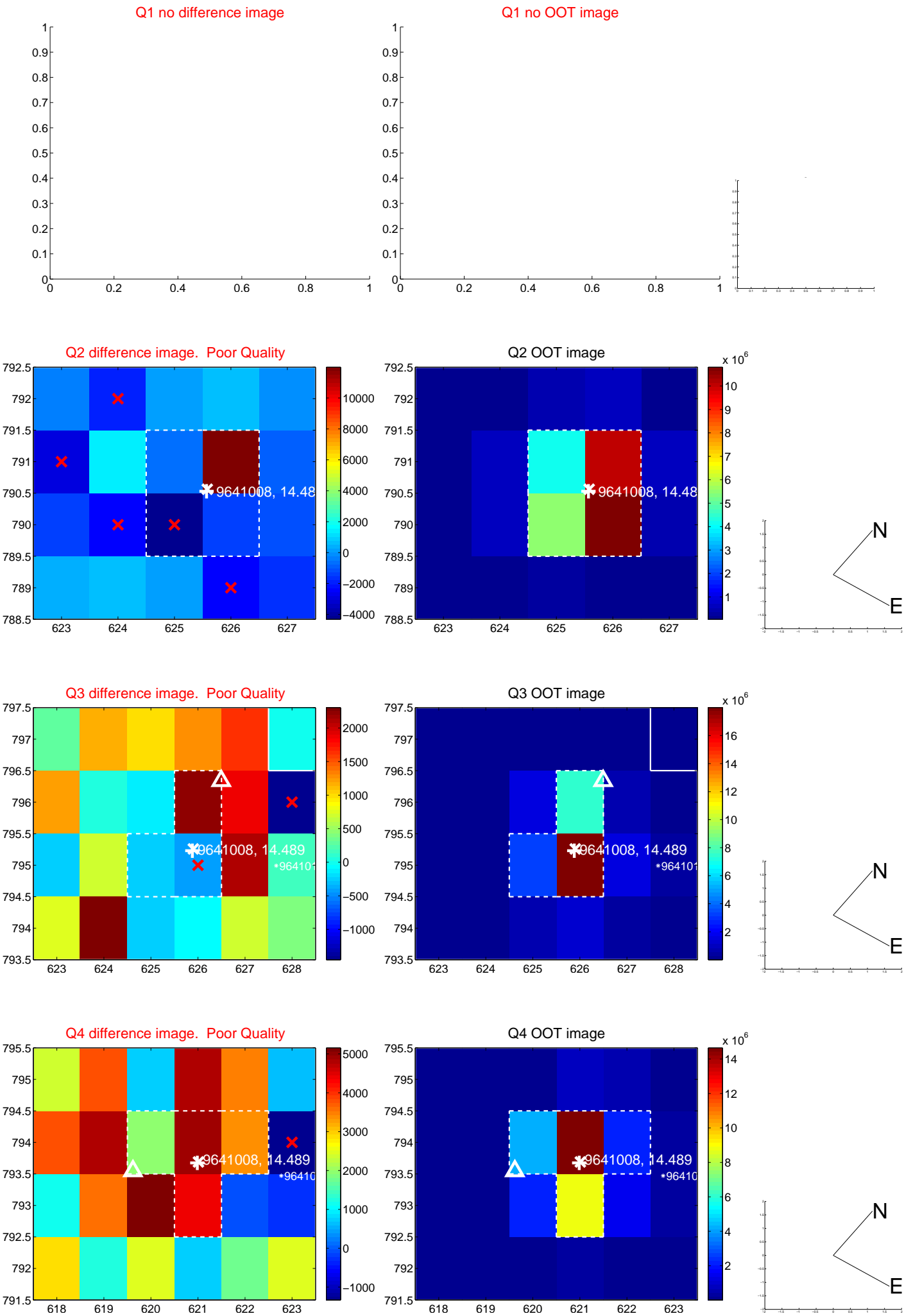
The direct PRF centroid is offset from the target star catalog position by about 0.21 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$4.916 \pm 1.481$	3.32	$-3.687 \pm 1.289$	$-3.252 \pm 1.141$
PRF-fit source offset from KIC position	$4.999 \pm 1.584$	3.16	$-3.697 \pm 1.542$	$-3.365 \pm 0.958$
photometric centroid source offset	$0.38 \pm 0.39$	0.97	$-0.24 \pm 0.40$	$-0.29 \pm 0.38$

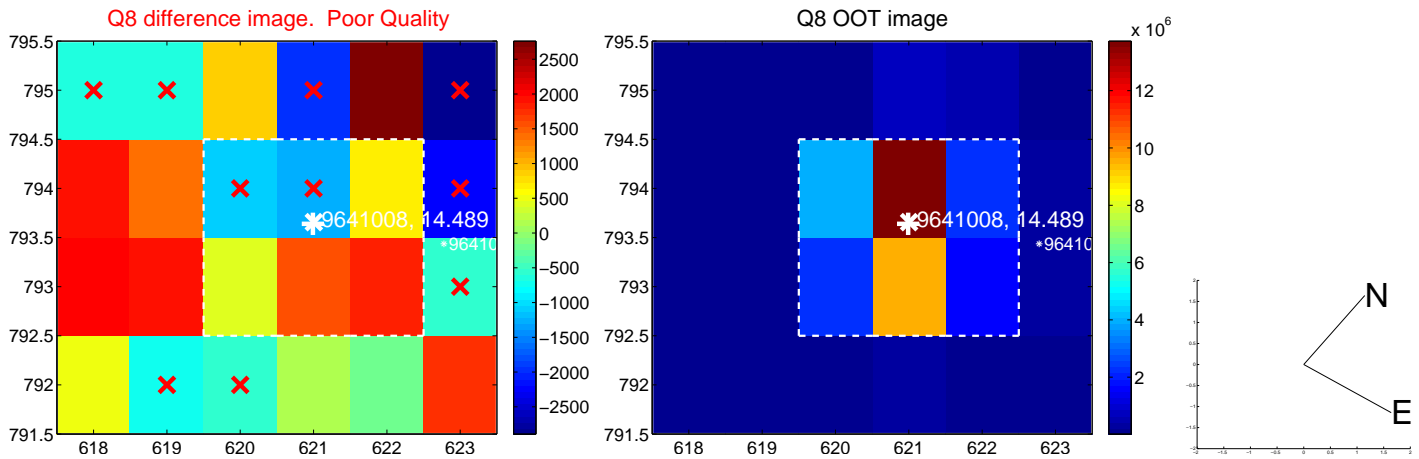
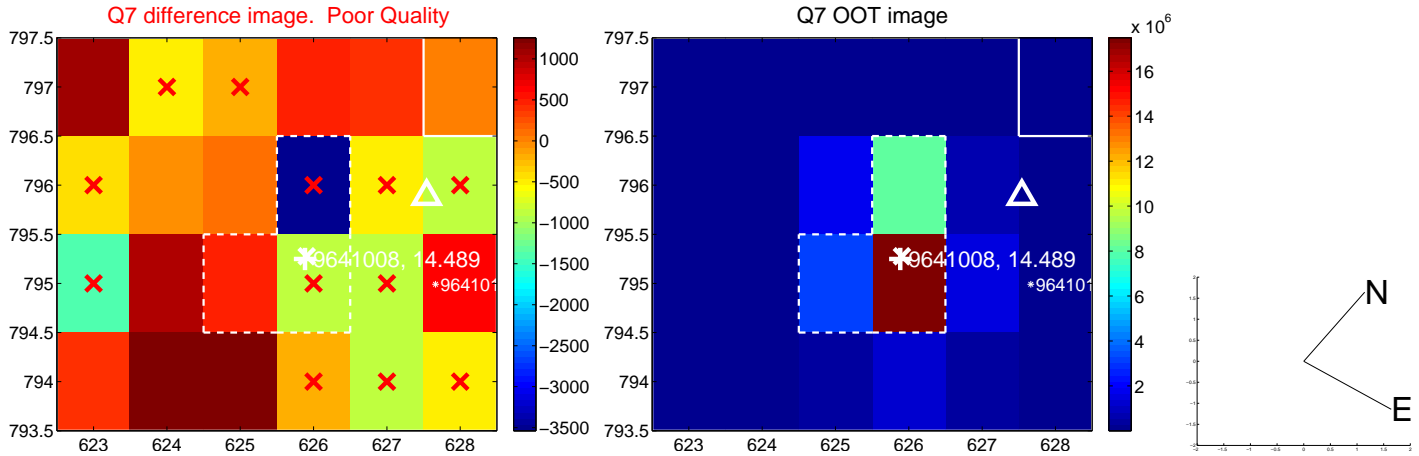
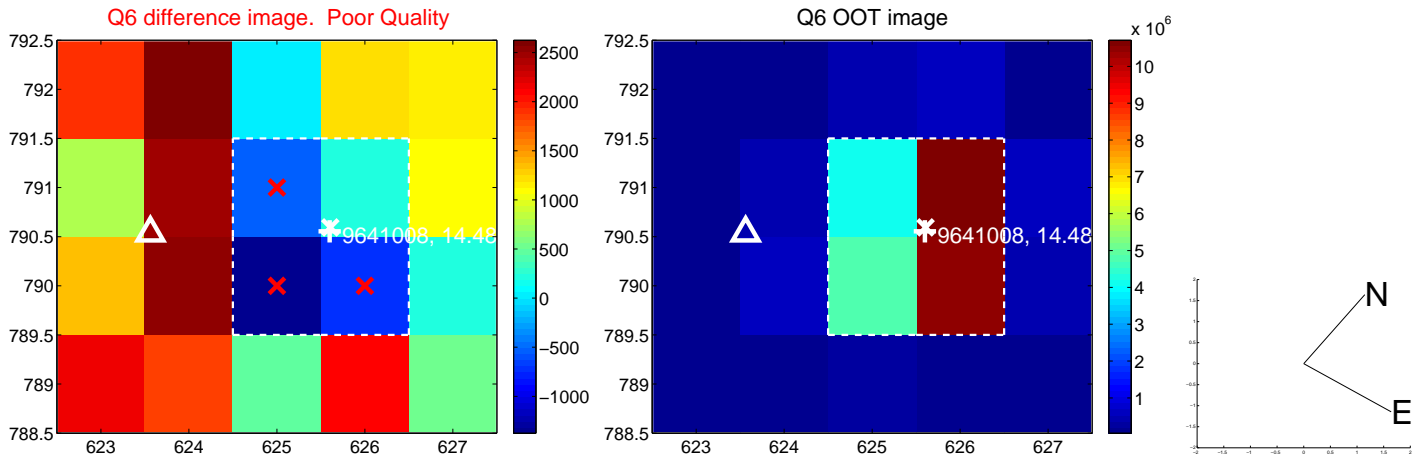
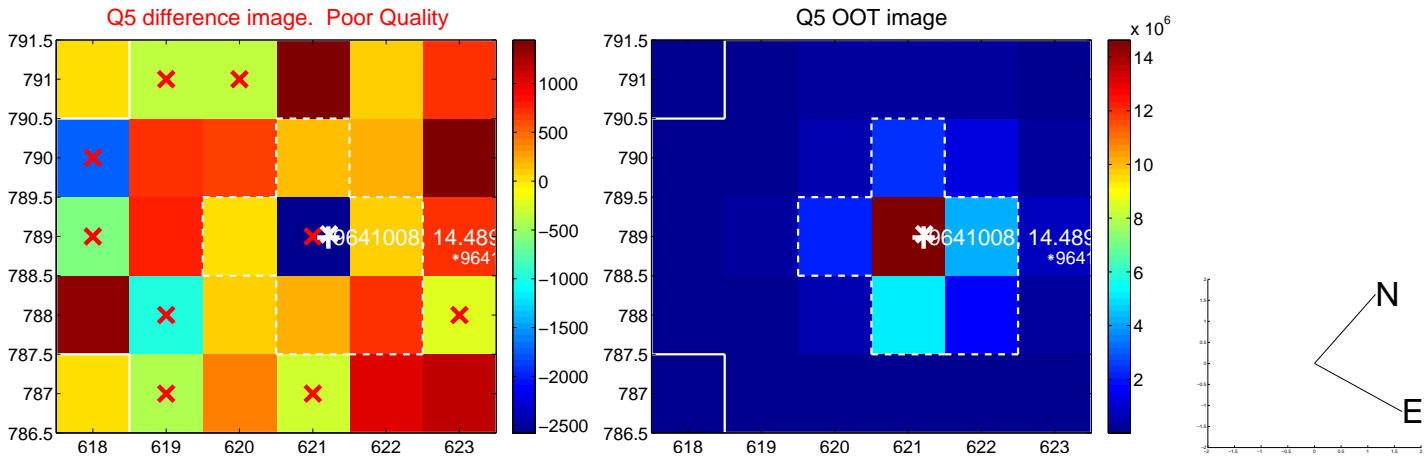


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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

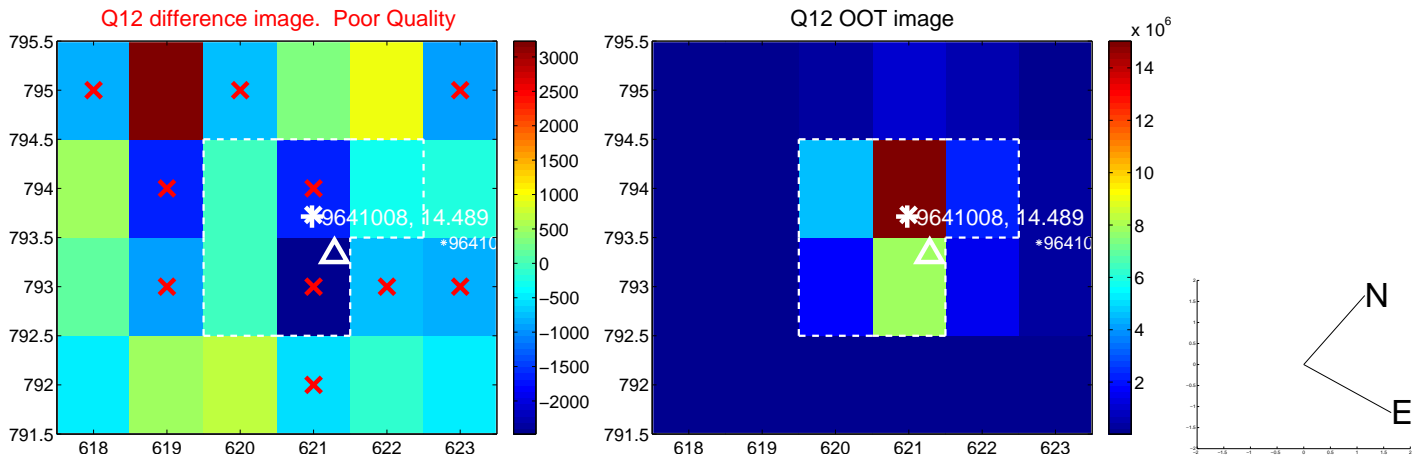
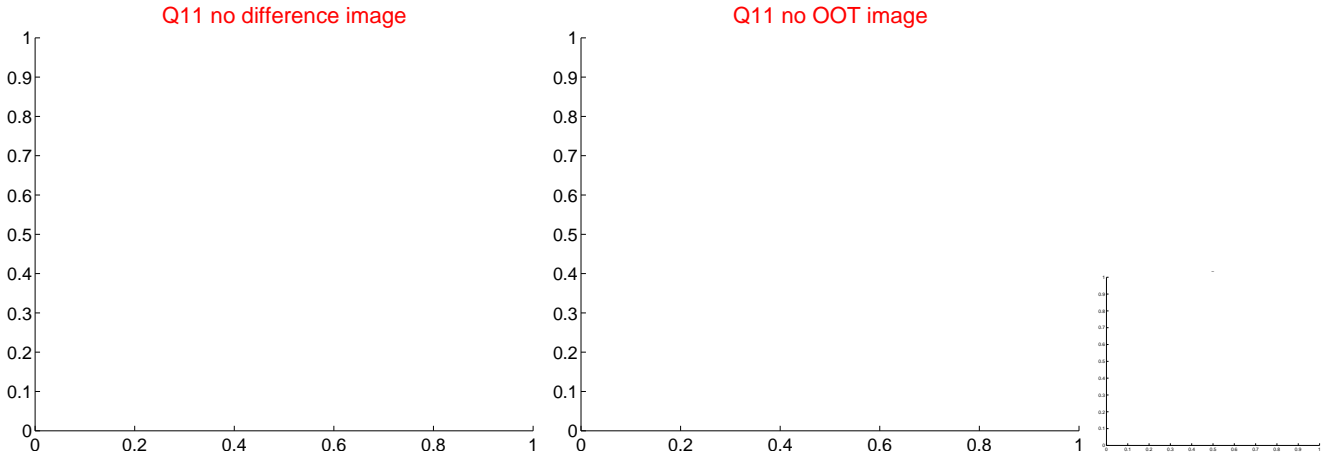
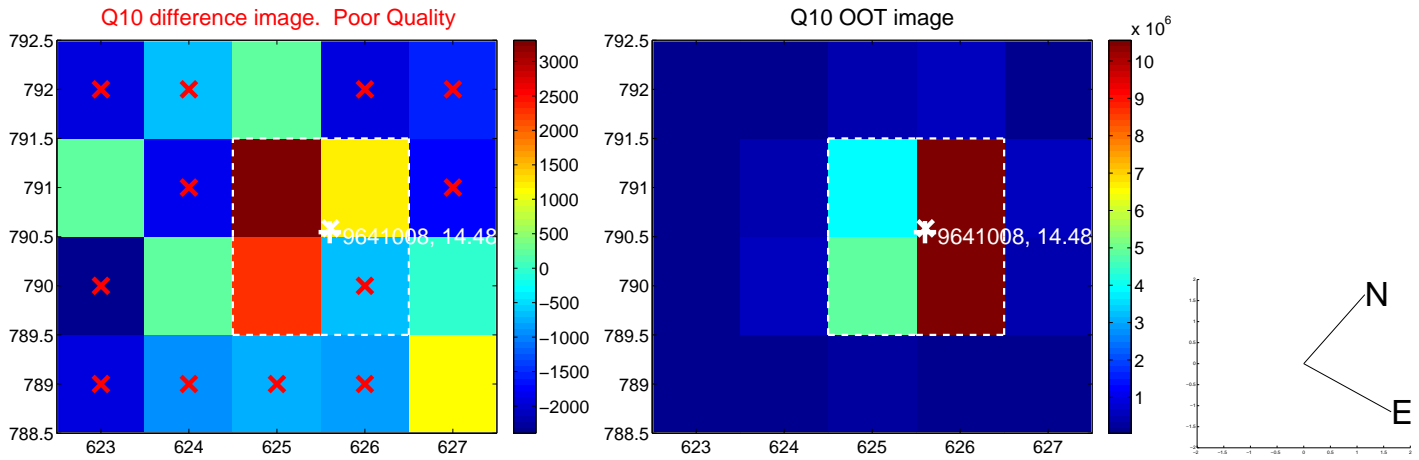
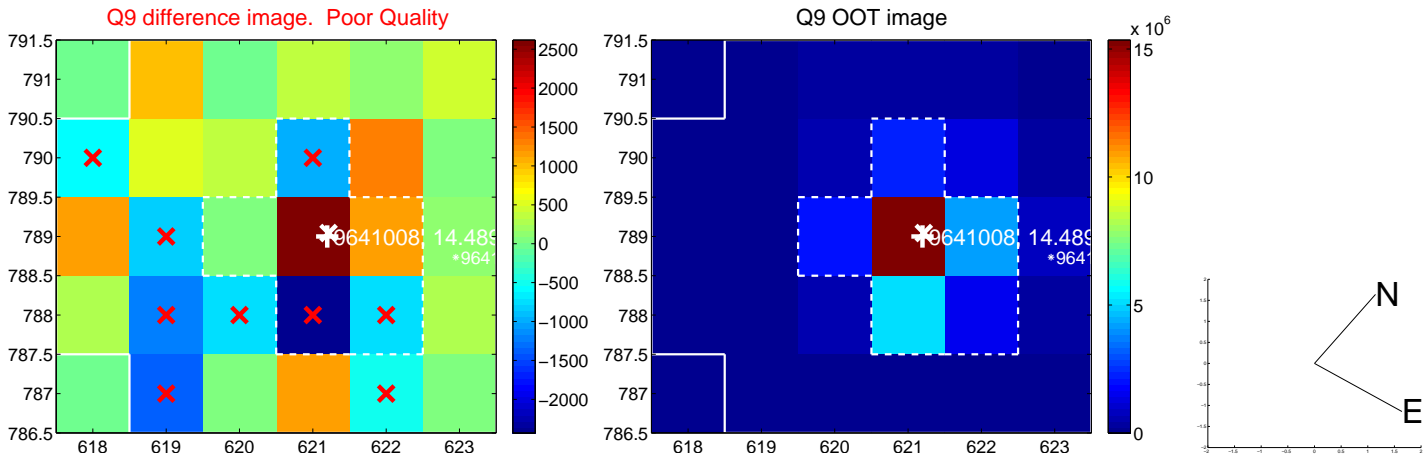
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



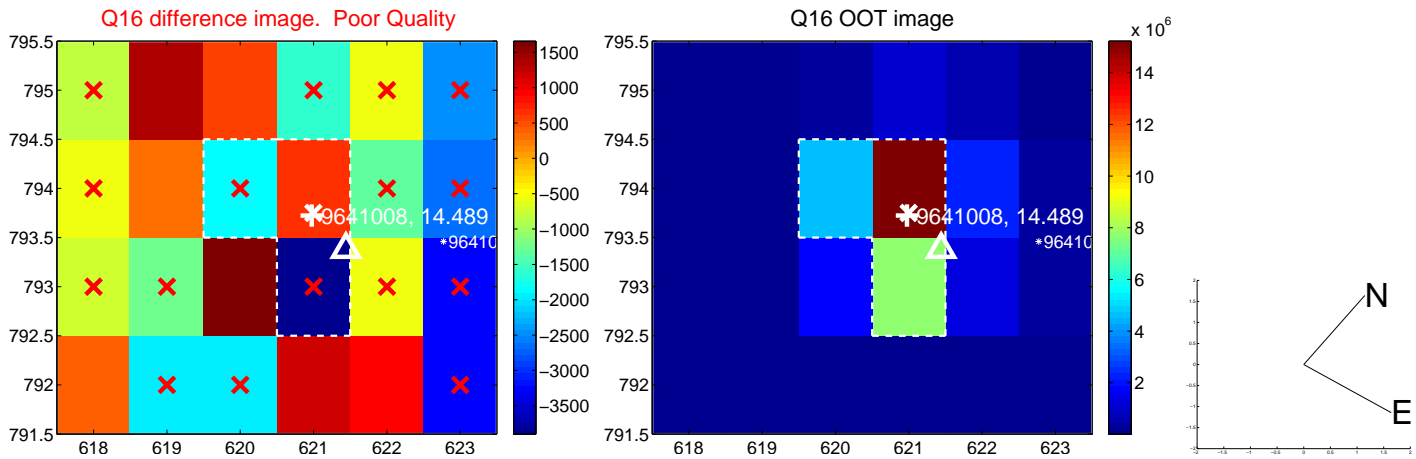
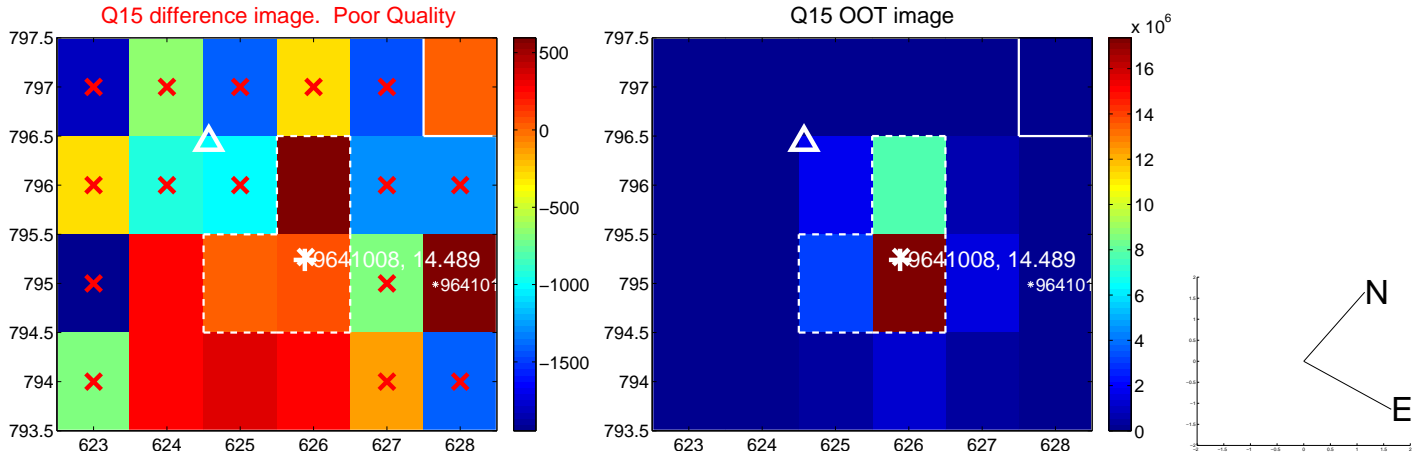
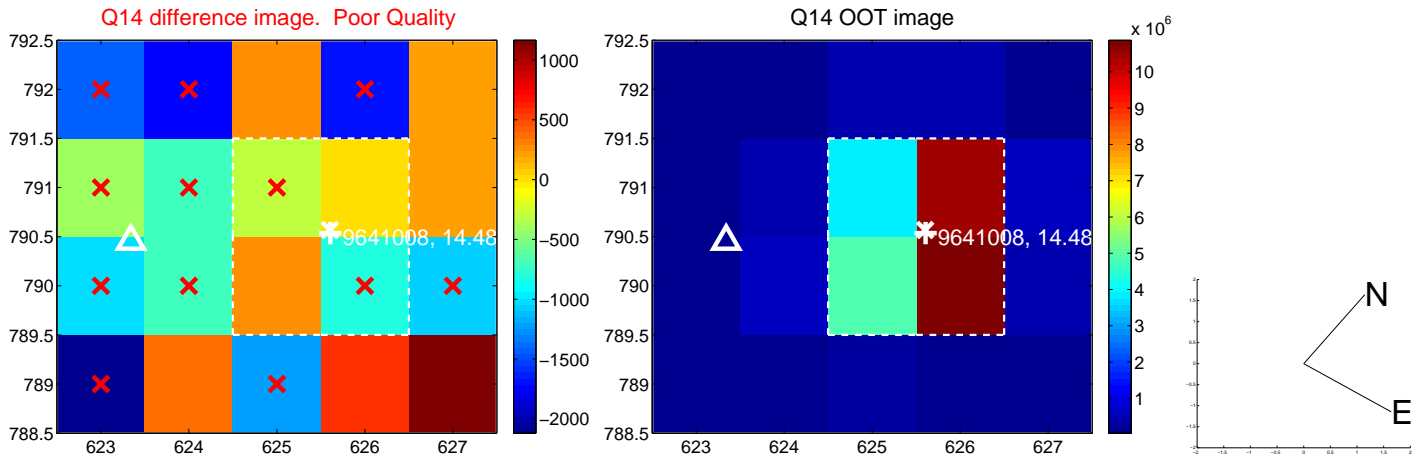
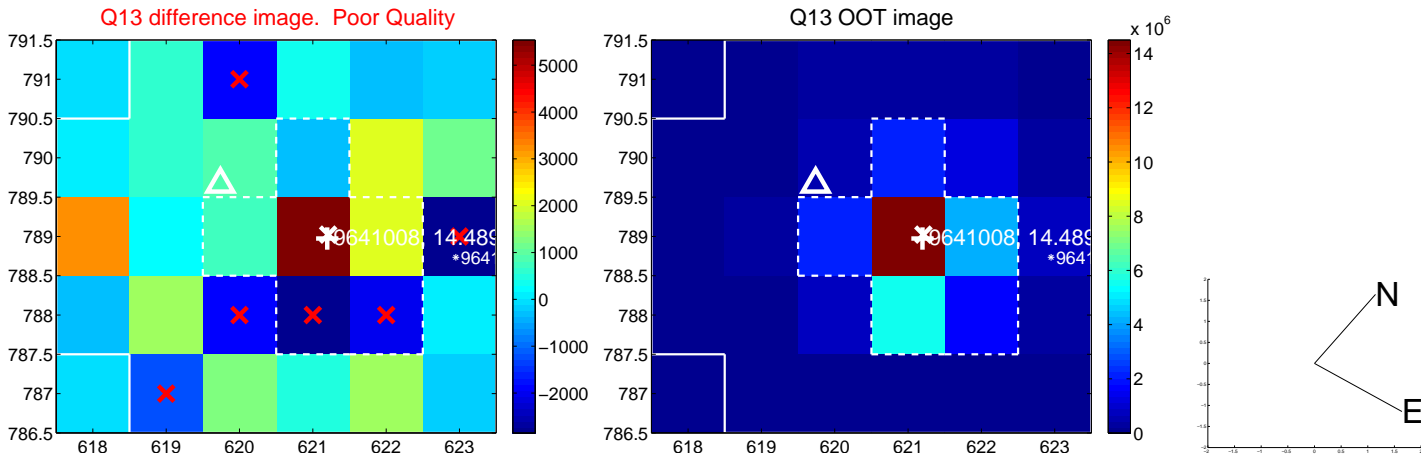
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

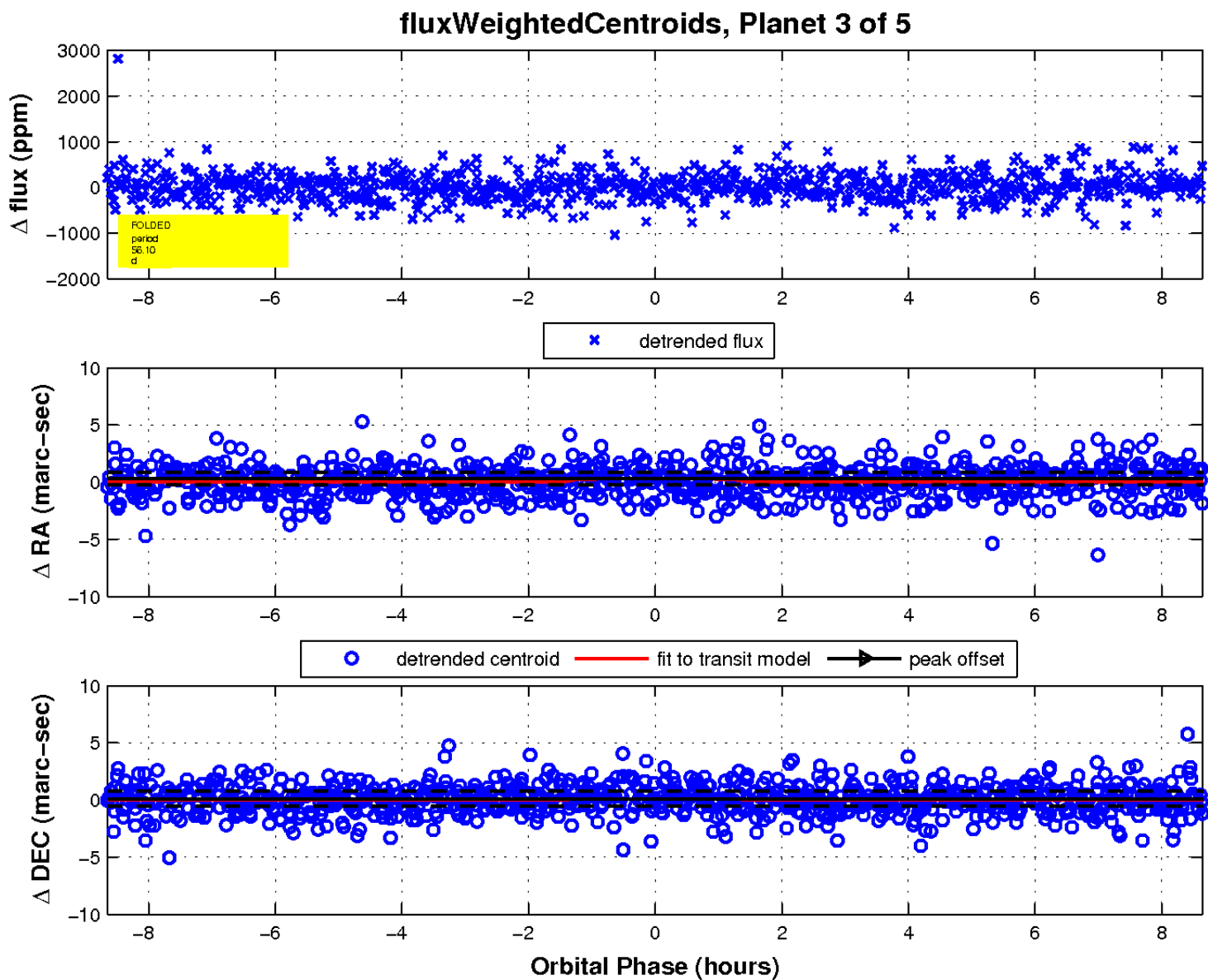
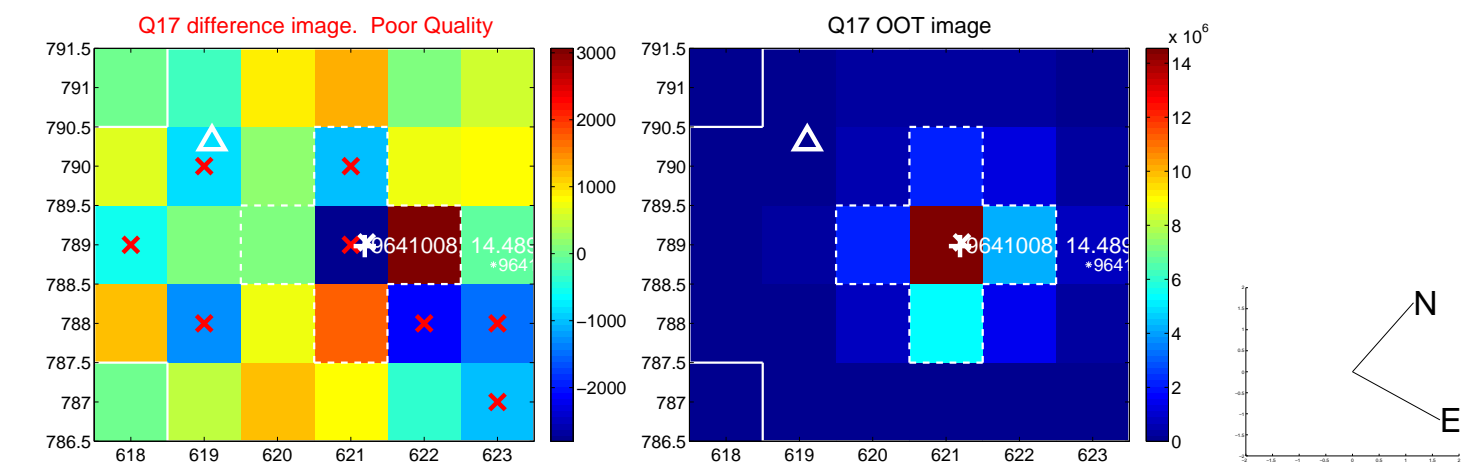


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



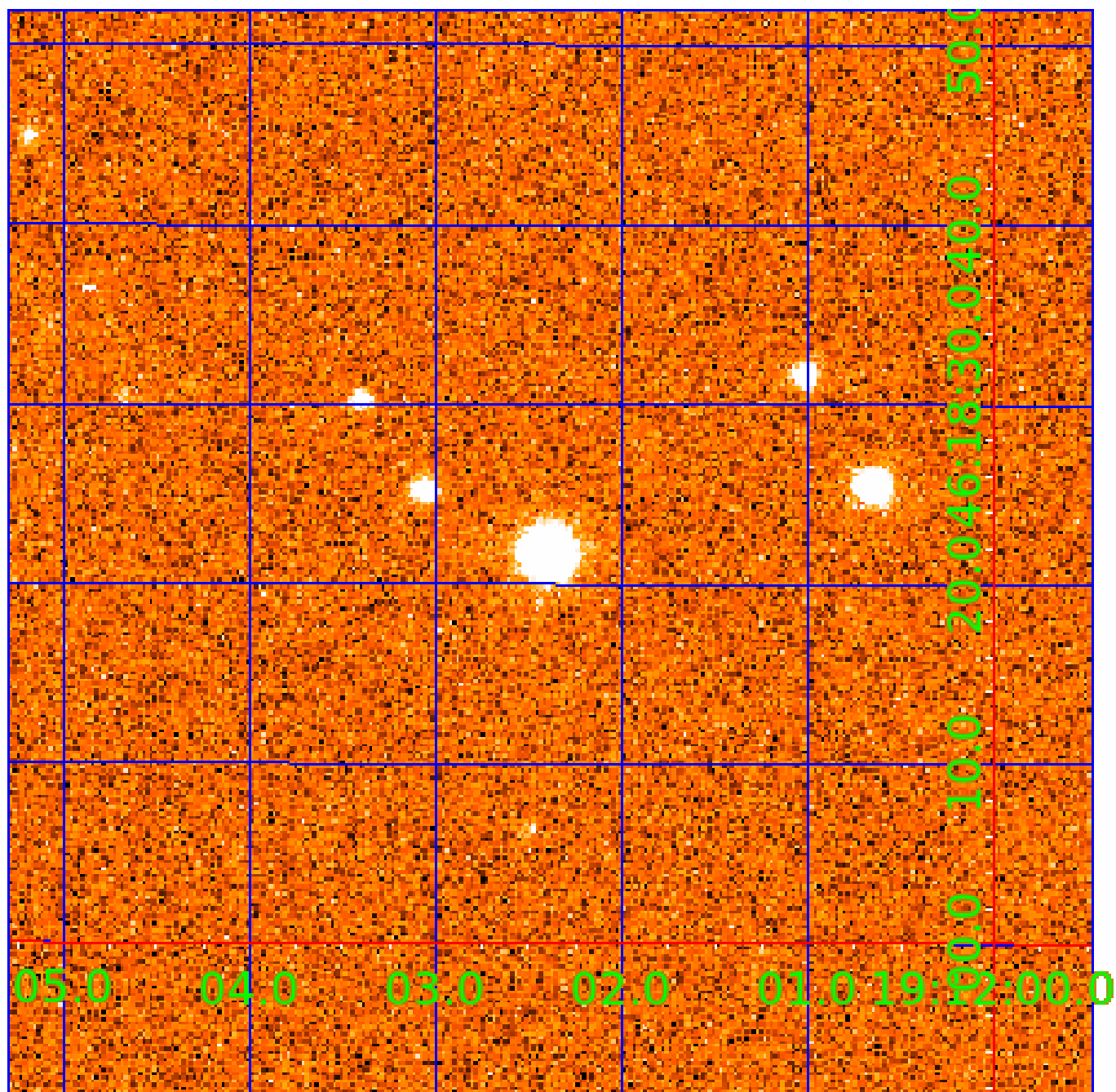


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination



# KIC 009641008

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
009641008-01	OBS	3860.01	2.178111	132.038478	332.5	2.297	43.5	47.9	0.71	5515	1.55	459.15
009641008-02	OBS	No	0.544250	131.777242	5.2	3.394	7.2	1.6	0.71	5515	0.19	2917.41
009641008-03	OBS	No	56.098222	166.841626	926.3	2.889	10.2	8.2	0.71	5515	2.28	6.04
009641008-05	OBS	No	26.545781	153.620285	149.8	6.955	7.6	2.8	0.71	5515	0.93	16.37

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009641008-01	OBS	FP	0.00	0	1	1	1	MOD_SEC_ALT—CENT_RESOLVED_OFFSET—HALO_GHOST—EPHEM_MATCH
009641008-02	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—CENT_FEW_DIFFS
009641008-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—ALL_TRANS_CHASES—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—CENT_FEW_DIFFS
009641008-05	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_SKYE_TRACKER—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—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 009641008-05

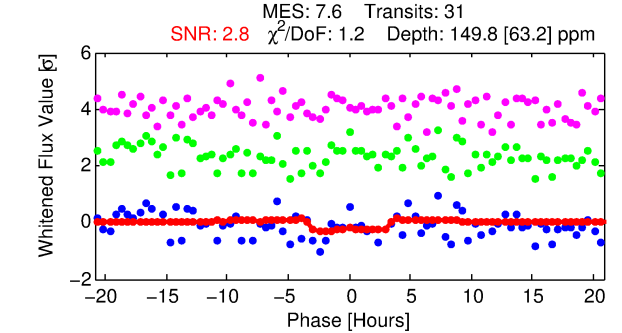
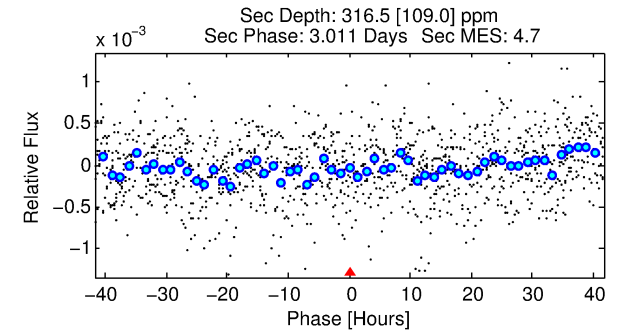
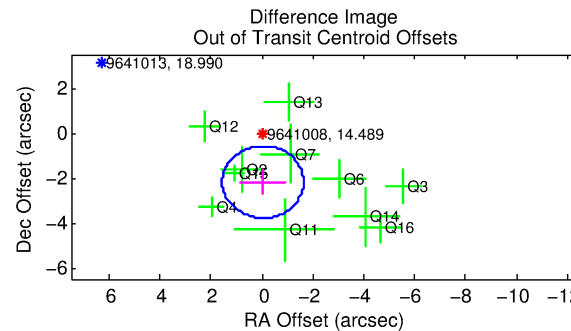
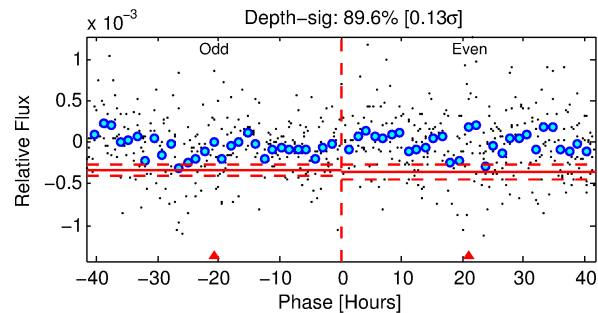
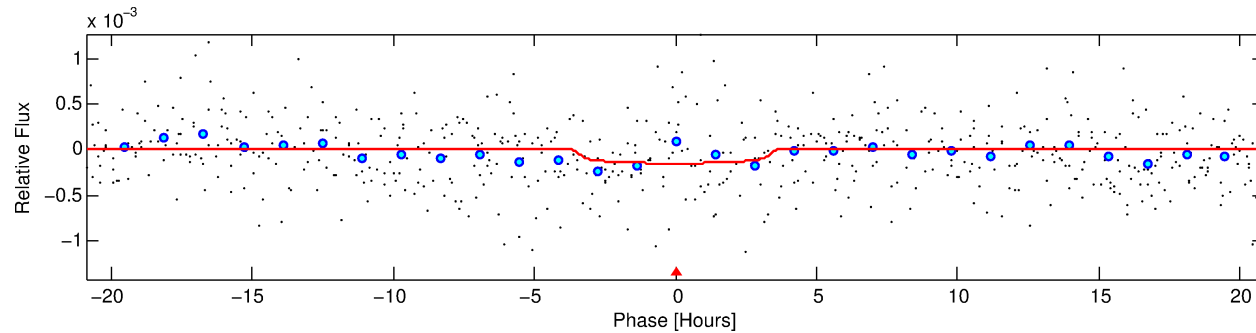
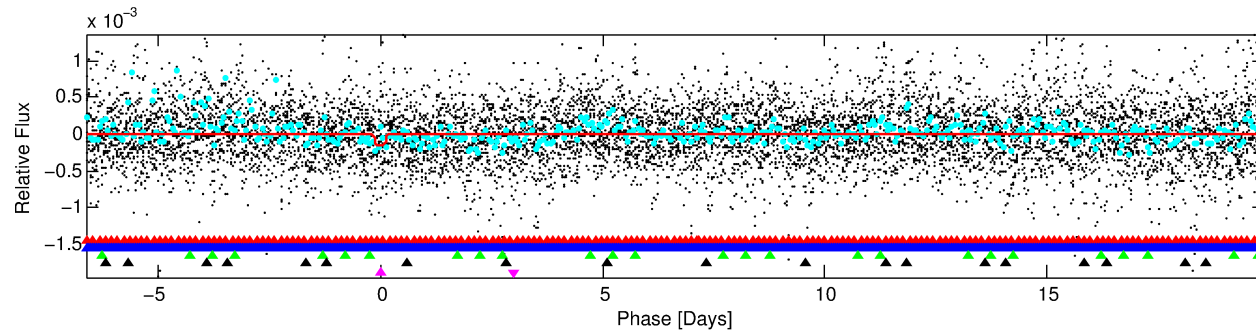
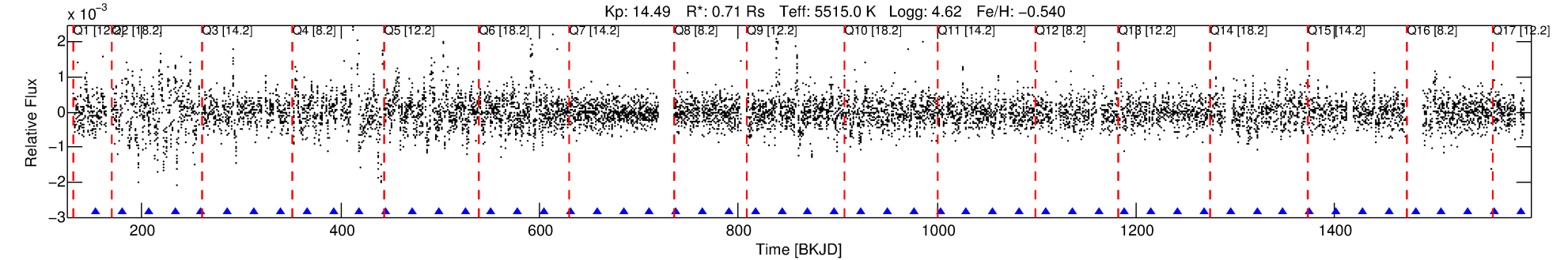
No Significant Match Found

# DV One-Page Summary

KIC: 9641008 Candidate: 5 of 5 Period: 26.546 d

KOI: K03860 Corr: No Ephemeris Match

Kp: 14.49 R\*: 0.71 Rs Teff: 5515.0 K Logg: 4.62 Fe/H: -0.540



## DV Fit Results:

Period = 26.54578 [0.00116] d  
Epoch = 153.6203 [0.0403] BKJD  
Rp/R\* = 0.0120 [0.0266]  
a/R\* = 21.45 [215.02]  
b = 0.70 [7.52]  
Seff = 16.37 [3.73]  
Teff = 513 [29] K  
Rp = 0.93 [2.07] Re  
a = 0.1602 [0.0218] AU  
Ag = 5180.45 [23158.78] [0.22σ]  
Teffp = 6728 [7515] K [0.83σ]

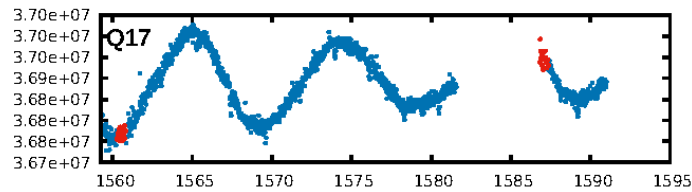
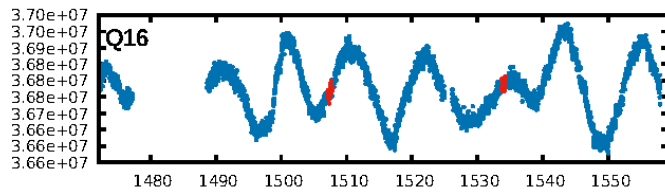
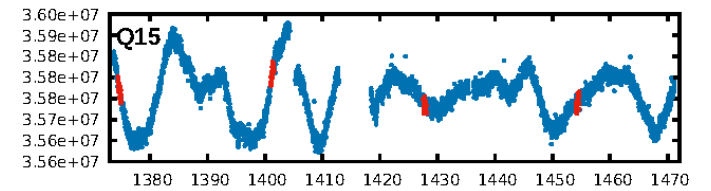
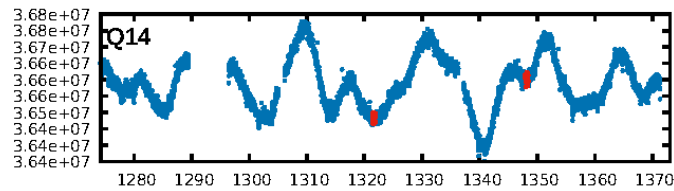
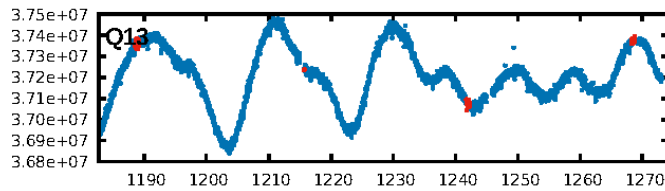
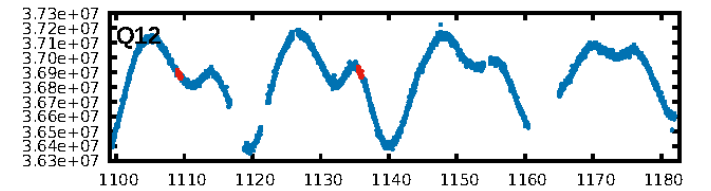
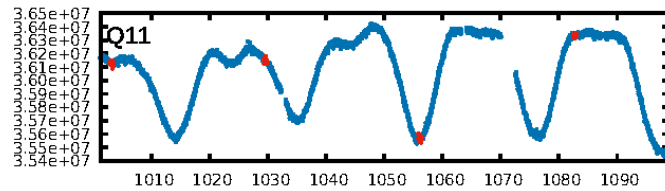
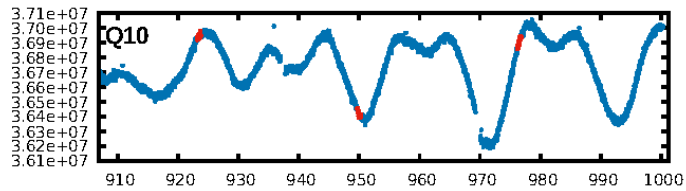
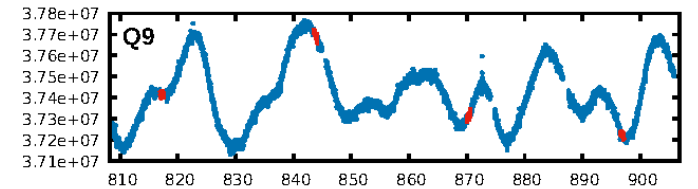
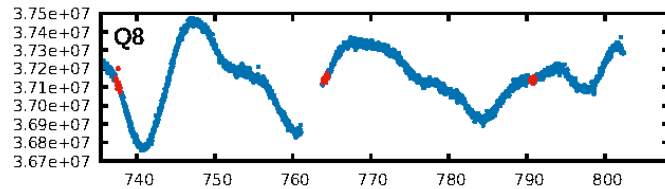
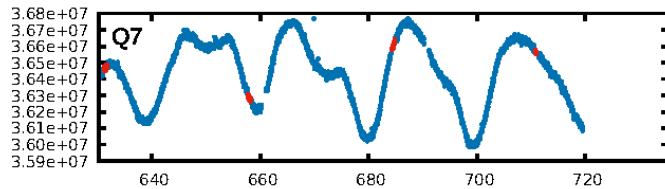
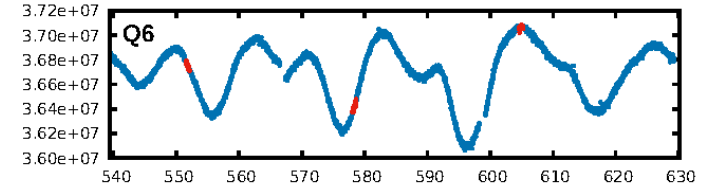
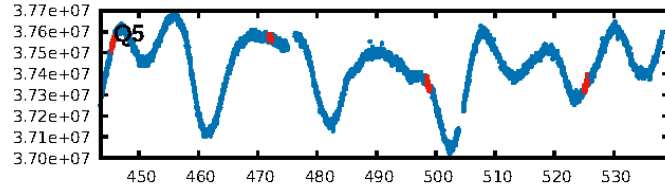
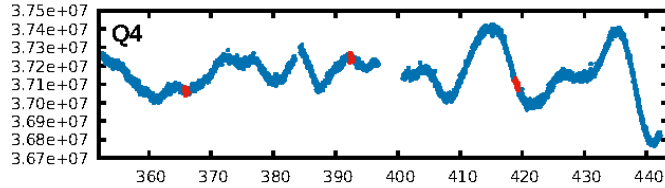
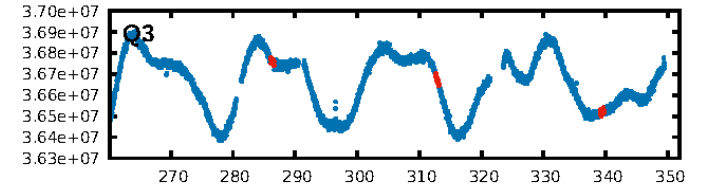
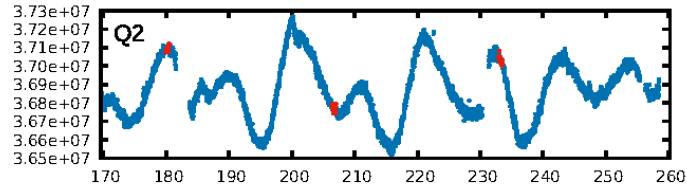
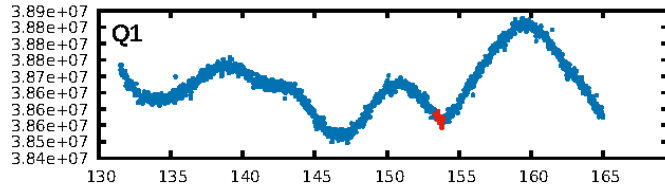
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [79.84σ]  
LongPeriod-sig: 100.0% [94.17σ]  
ModelChiSquare2-sig: 4.0%  
ModelChiSquareGof-sig: 100.0%  
Bootstrap-pfa: 2.95e-11  
RollingBand-fgt: 1.00 [30/30]  
GhostDiagnostic-chr: 1.126  
Centroid-sig: 1.2%  
Centroid-so: 1.873 arcsec [1.75σ]  
OotOffset-rm: 2.185 arcsec [4.10σ]  
KicOffset-rm: 2.313 arcsec [4.12σ]  
OotOffset-st: 3/4/3/1 [11]  
KicOffset-st: 3/4/3/1 [11]  
DiffImageQuality-fgm: 0.00 [0/11]  
DiffImageOverlap-fno: 0.00 [0/16]

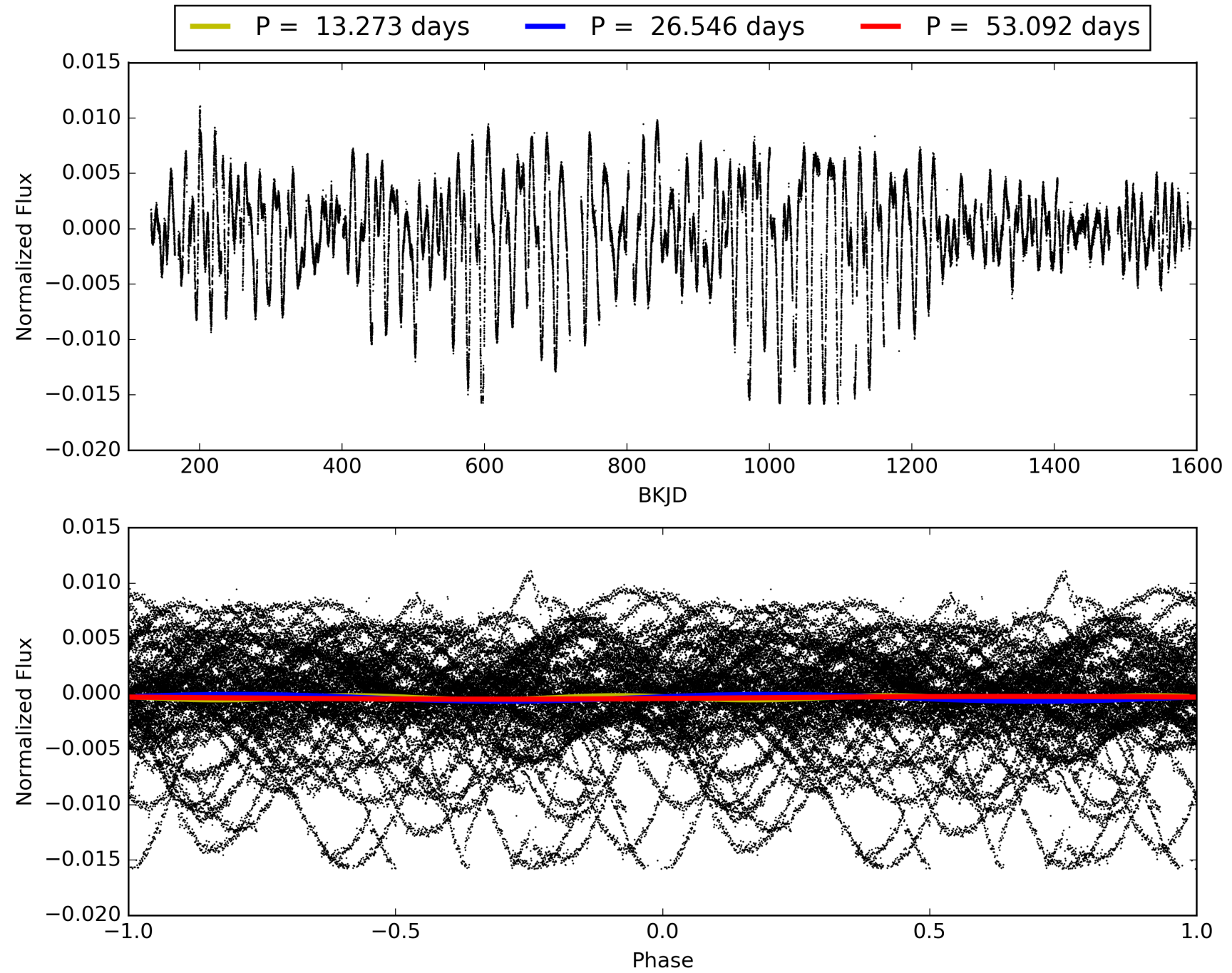
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 29-Jan-2016 23:08:31 Z

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

# TCE 009641008-05, PDC Light Curves



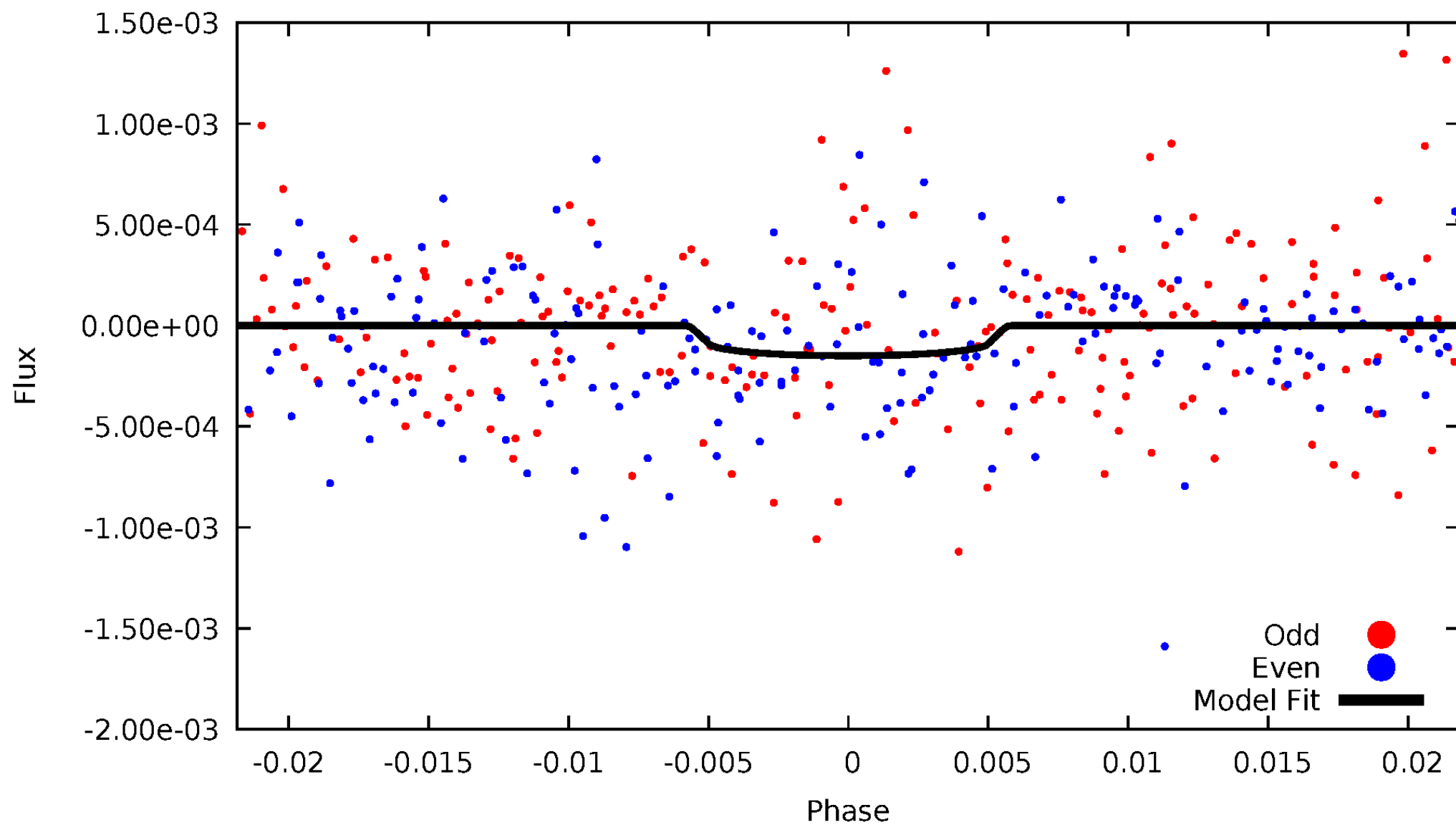
TCE 009641008-05





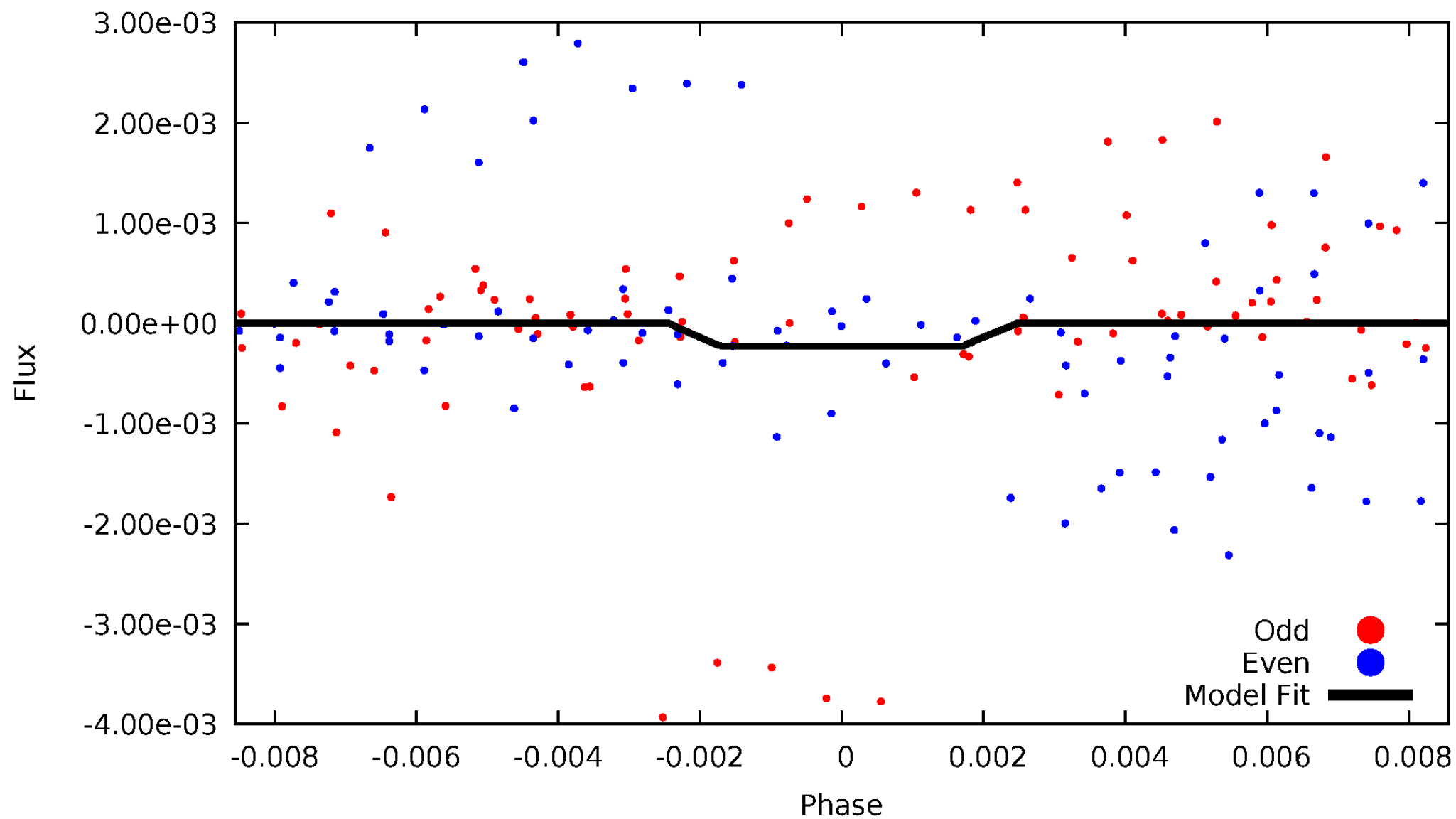
# DV Odd/Even

TCE 009641008-05



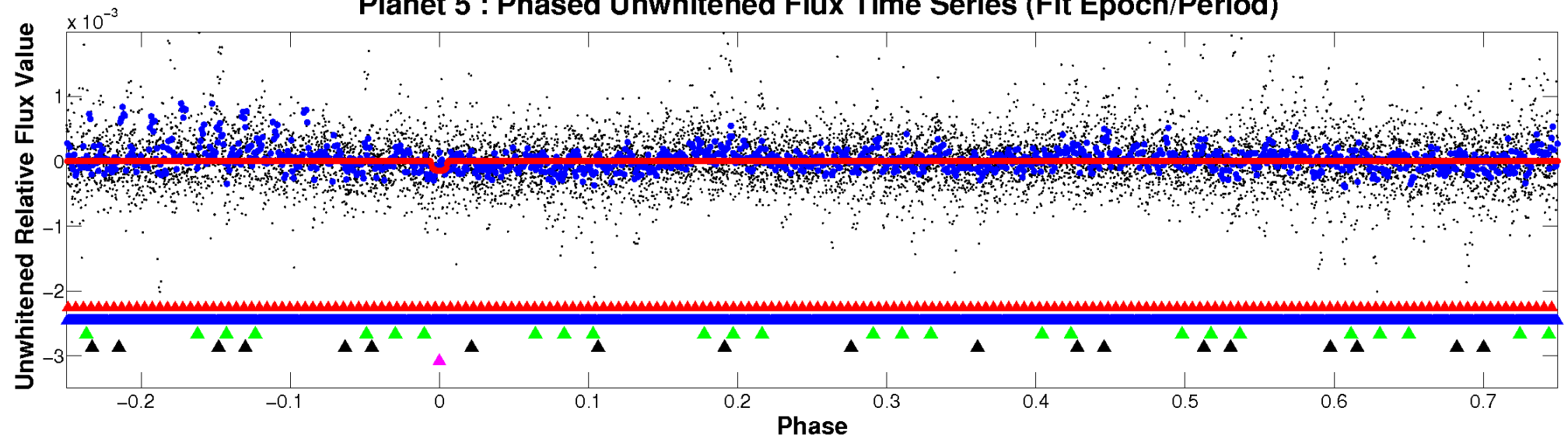
# ALT Odd/Even

TCE 009641008-05

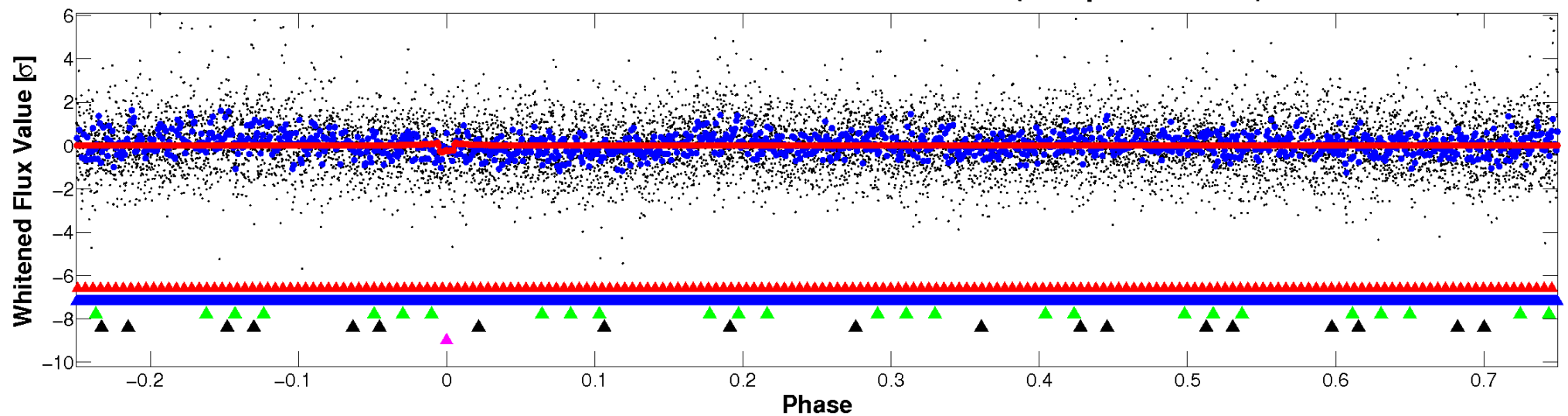


# Non-Whitened Vs. Whitened Light Curve

## Planet 5 : Phased Unwhitened Flux Time Series (Fit Epoch/Period)

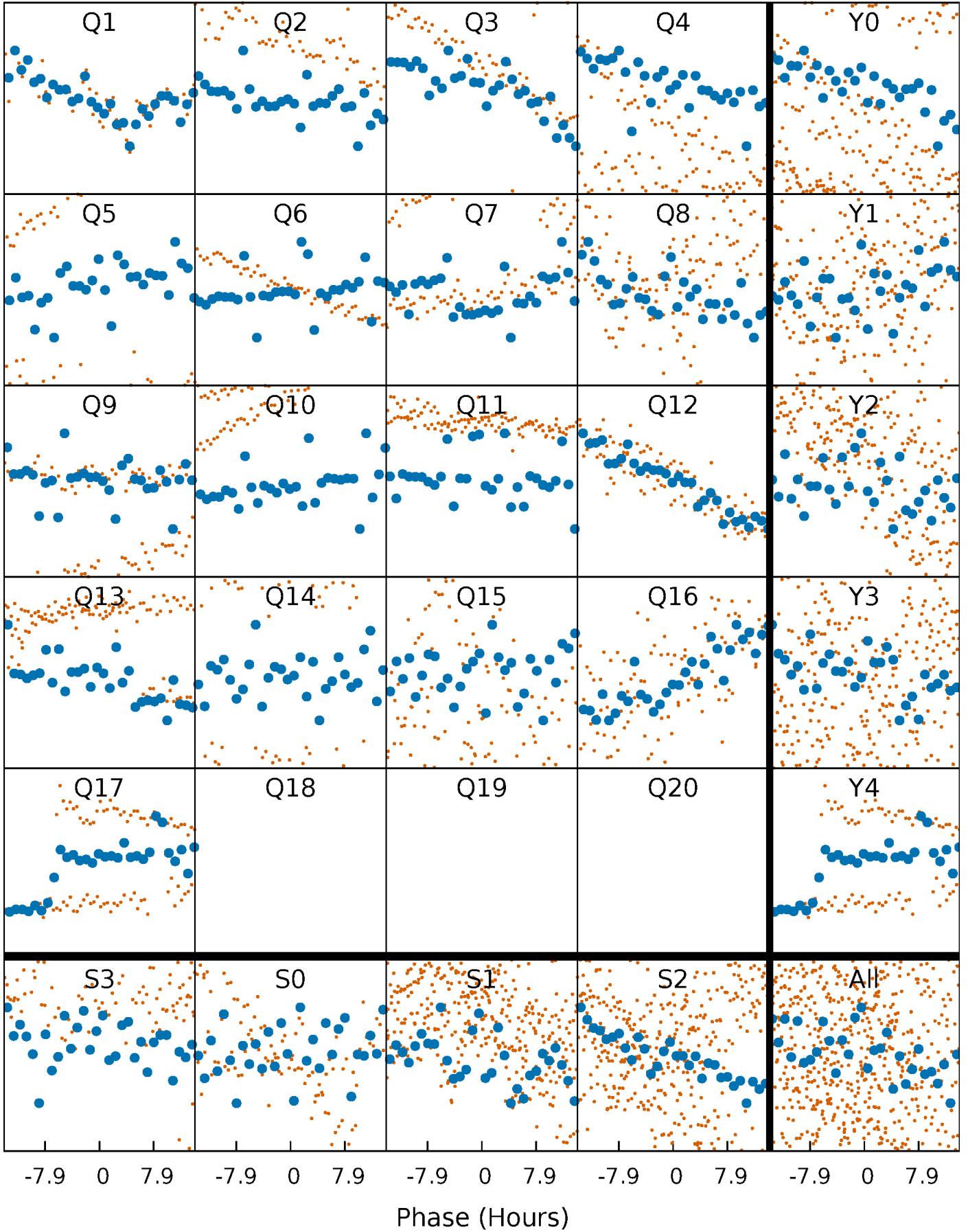


## Planet 5 : Phased Whitened Flux Time Series (Fit Epoch/Period)



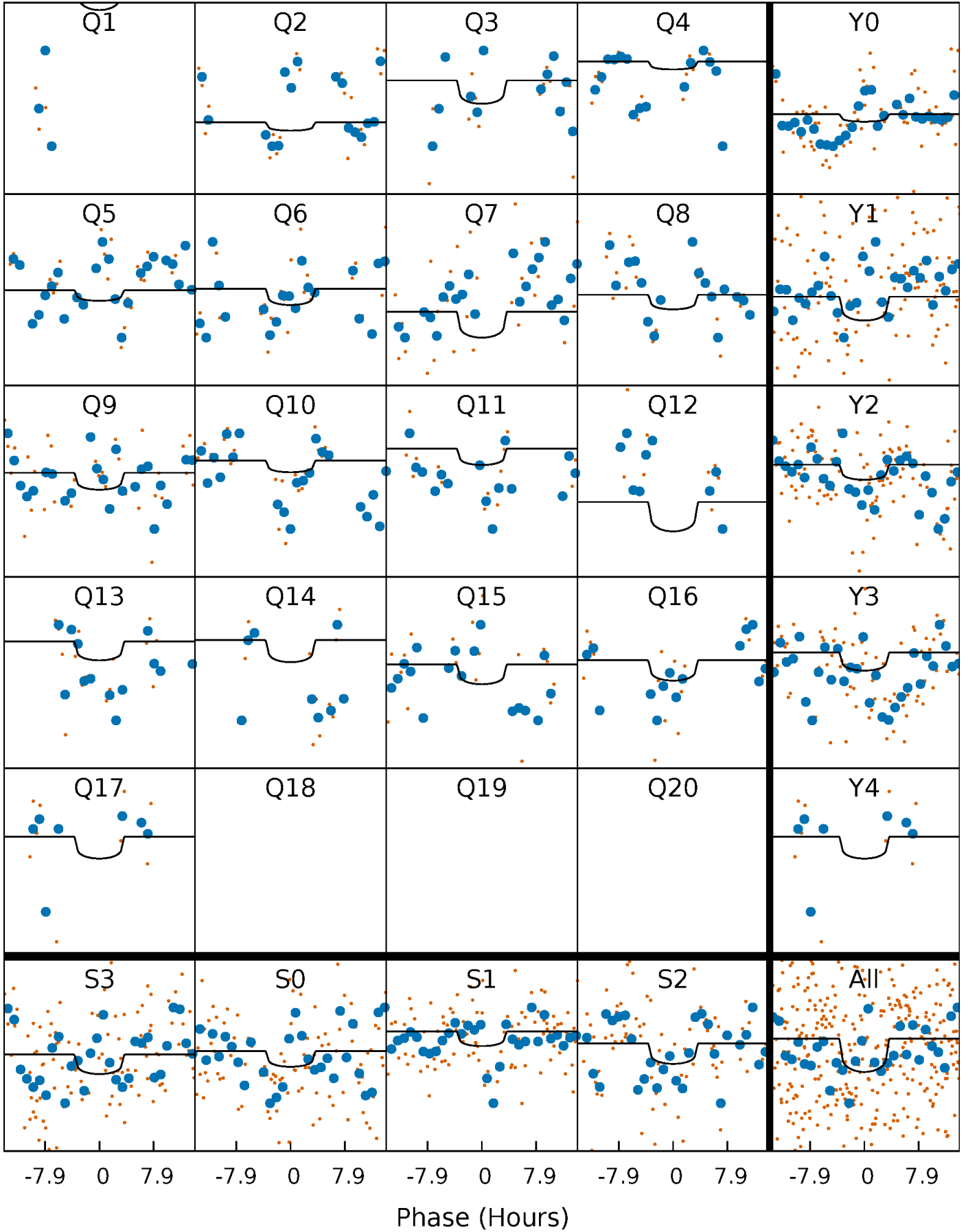
# PDC Quarter-Phased Transit Curves

TCE 009641008-05   P= 26.545781 Days    $T_0=153.620285$  (BKJD)



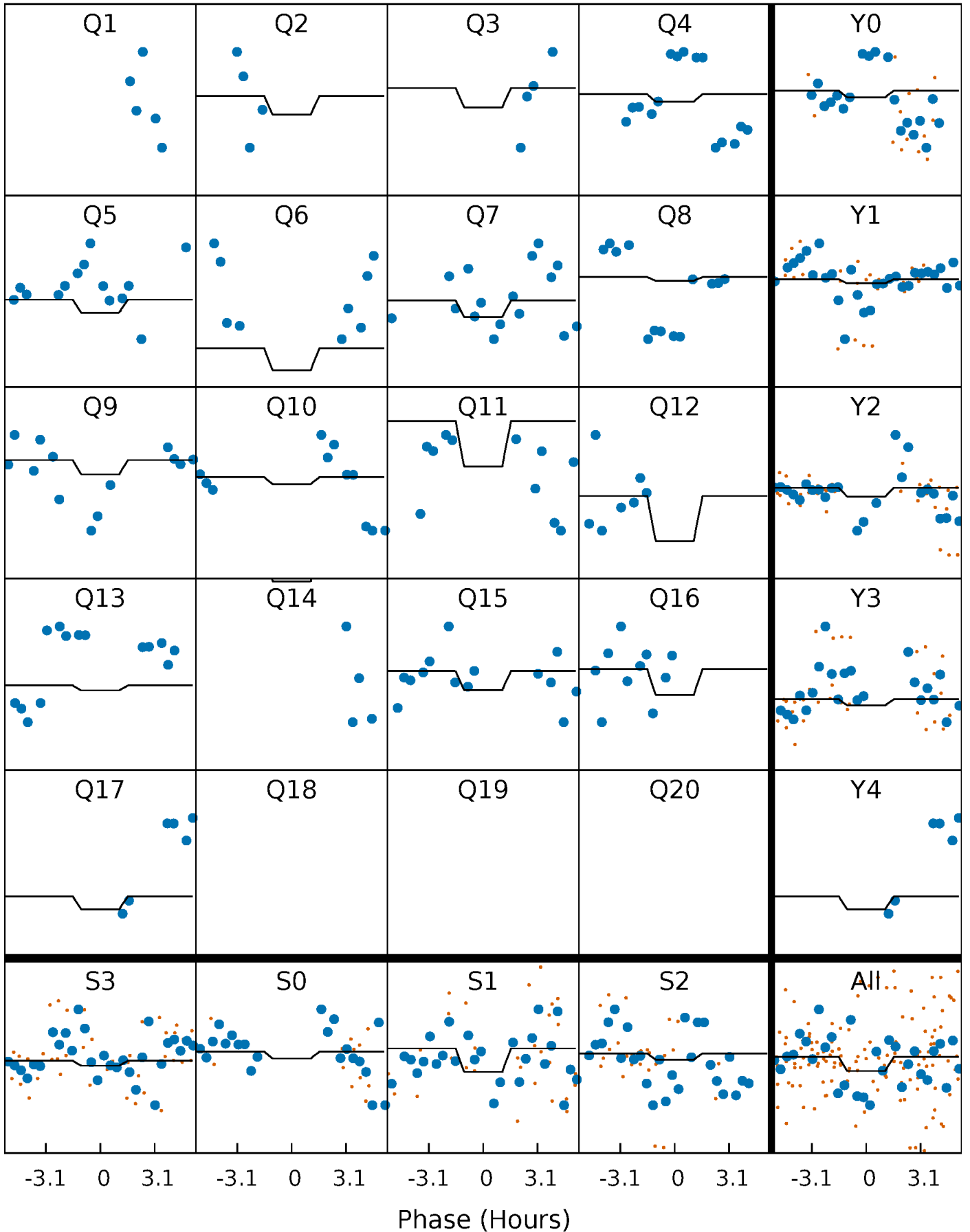
# DV Quarter-Phased Transit Curves

TCE 009641008-05     $P = 26.545781$  Days     $T_0 = 153.620285$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

TCE 009641008-05     $P = 26.555863$  Days     $T_0 = 153.170729$  (BKJD)

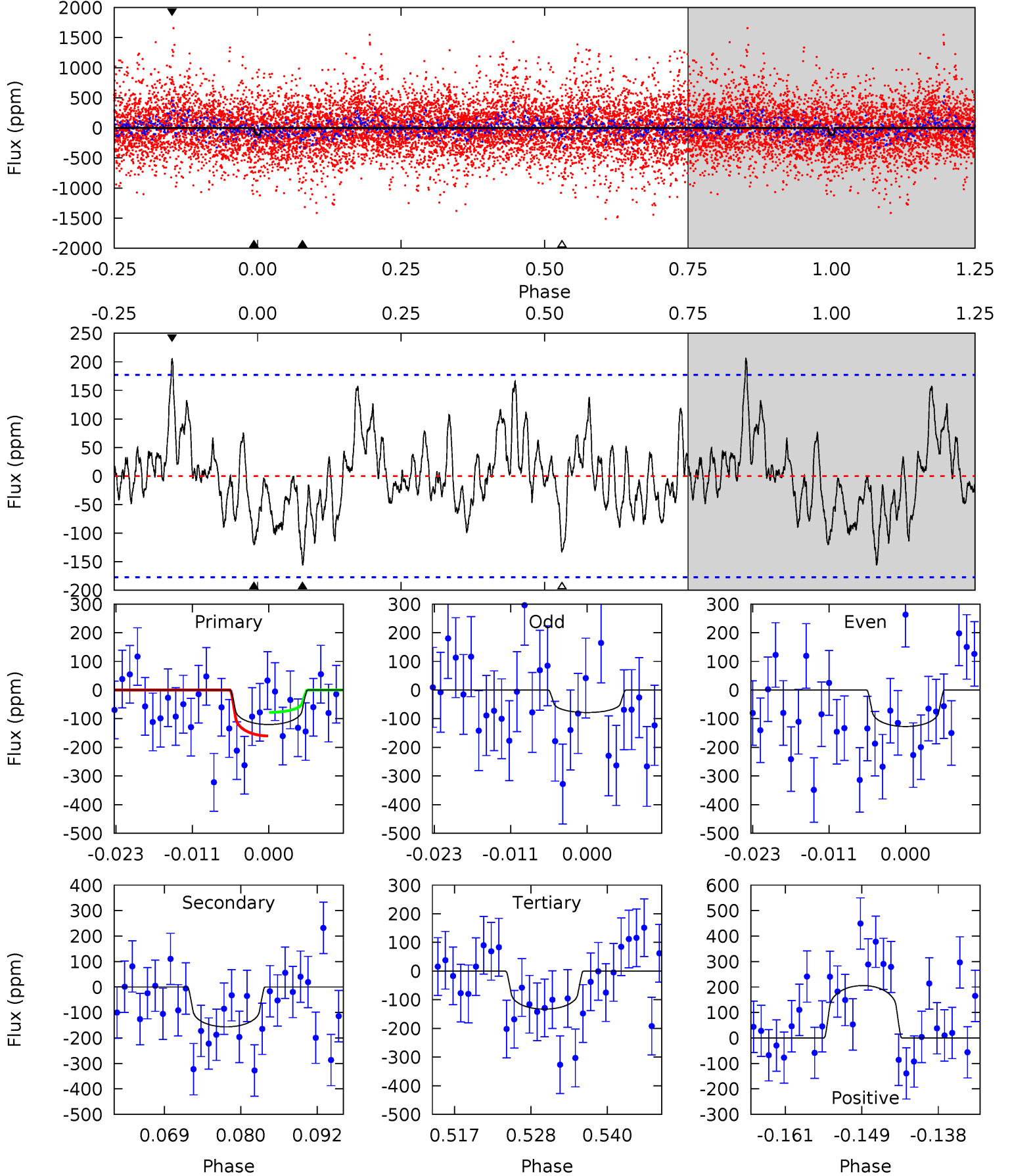




# DV Model-Shift Uniqueness Test

009641008-05, P = 26.545781 Days, E = 127.074504 Days

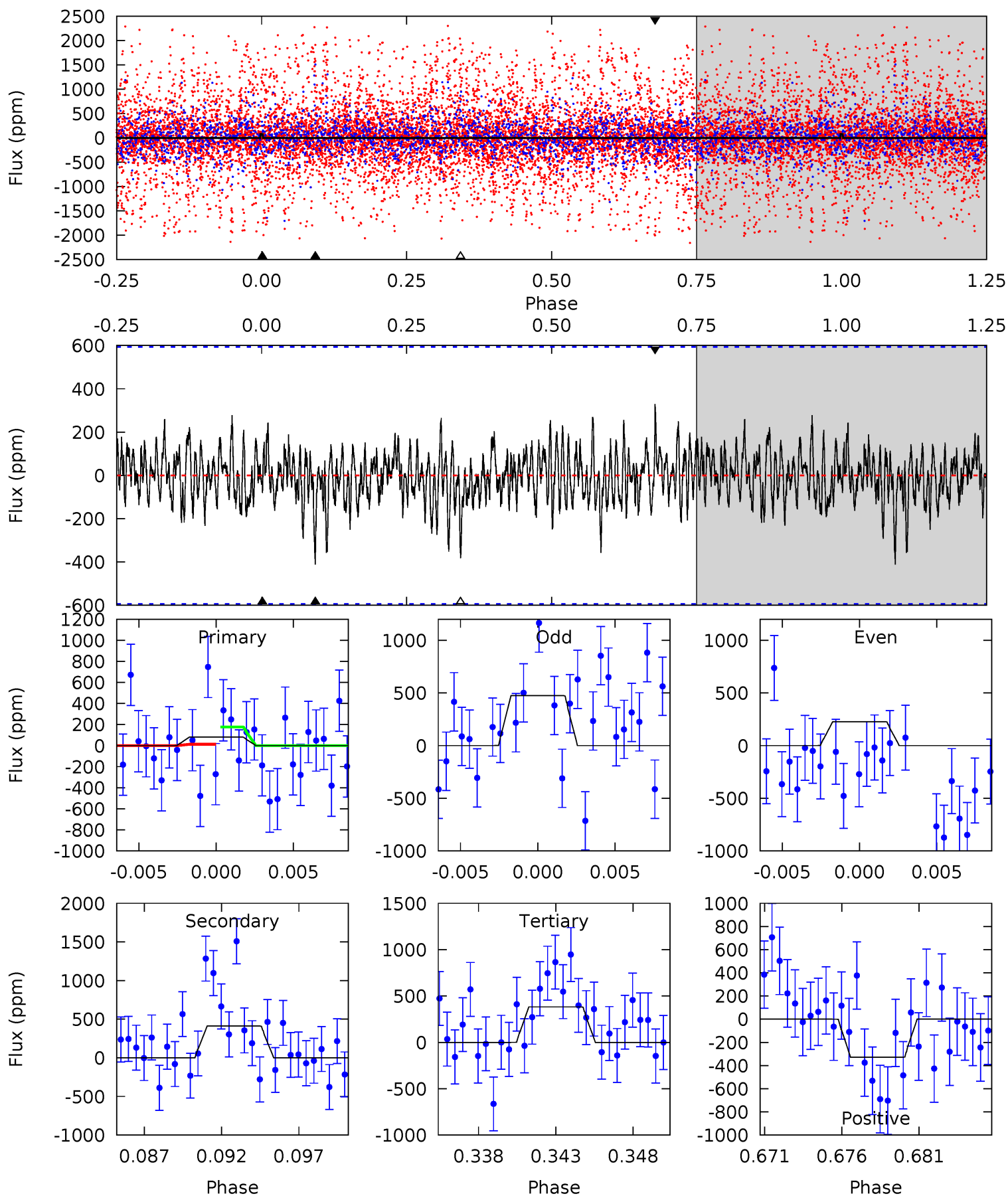
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
3.40	4.41	3.75	5.80	5.00	2.53	1.58	-0.35	-2.41	0.66	-1.39	0.68	0.63	0.57	1.17



# Alt Model-Shift Uniqueness Test

009641008-05, P = 26.555863 Days, E = 126.614866 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
0.70	3.58	3.33	2.86	5.16	2.82	0.90	-2.63	-2.16	0.25	0.72	1.02	0.32	0.44	0.71



### Stellar Parameters For KIC 009641008

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R$ ( $R_{\odot}$ )	$M(M_{\odot})$	$p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ )
	$5515^{+163}_{-147}$	$4.624^{+0.035}_{-0.105}$	$-0.540^{+0.300}_{-0.300}$	$0.712^{+0.117}_{-0.050}$	$0.785^{+0.073}_{-0.073}$	$3.065^{+0.523}_{-0.996}$
	+3%/-3%	+1%/-2%	+56%/-56%	+16%/-7%	+9%/-9%	+17%/-32%
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 009641008-05 / KOI

Detrend	Depth (ppm)	$R_p$ ( $R_{\oplus}$ )	$T_{max}$ (K)	$T_{obs}$ (K)	$A_{obs}$
DV	$-156 \pm 35$	$1.86^{+1.69}_{-1.21}$	$726^{+30}_{-27}$	$4255^{+2549}_{-849}$	$623^{+4394}_{-457}$
Alt.	$-412 \pm 115$	$1.80^{+1.84}_{-1.19}$	$727^{+31}_{-27}$	$5202^{+4492}_{-1235}$	$1751^{+13682}_{-1314}$

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

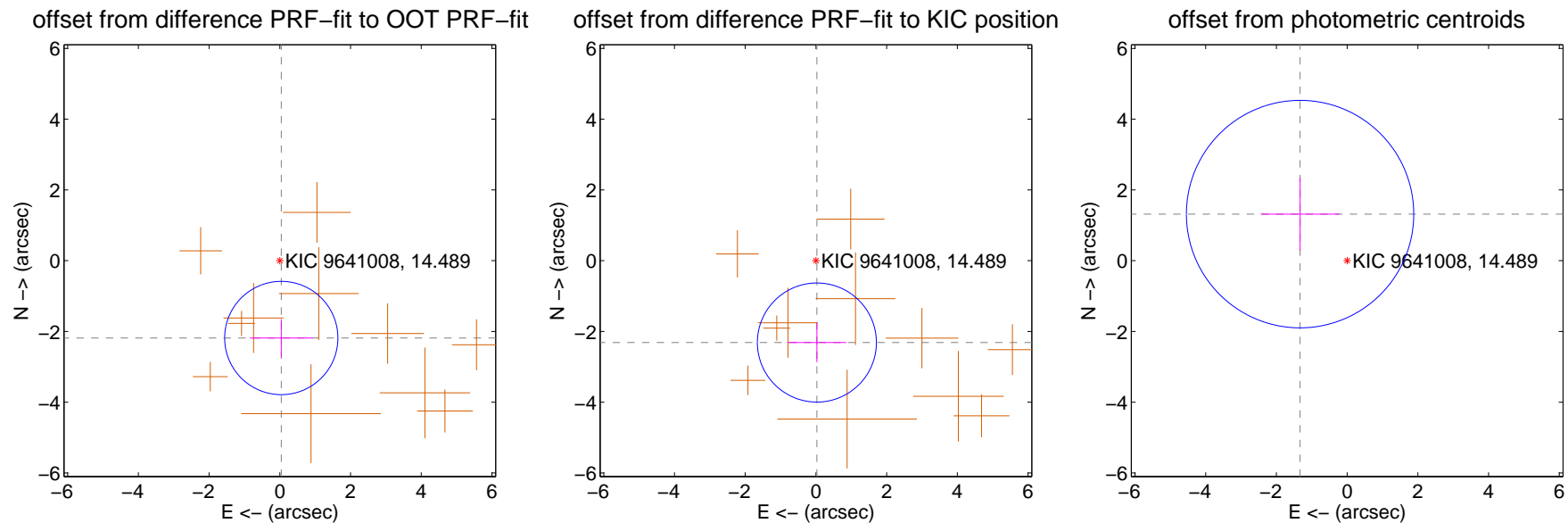
## DV Centroid Data

Supplemental centroid analysis for 009641008-05. Kepler magnitude: 14.49. Transit SNR 2.76

There are 0 quarters with good PRF difference image offsets

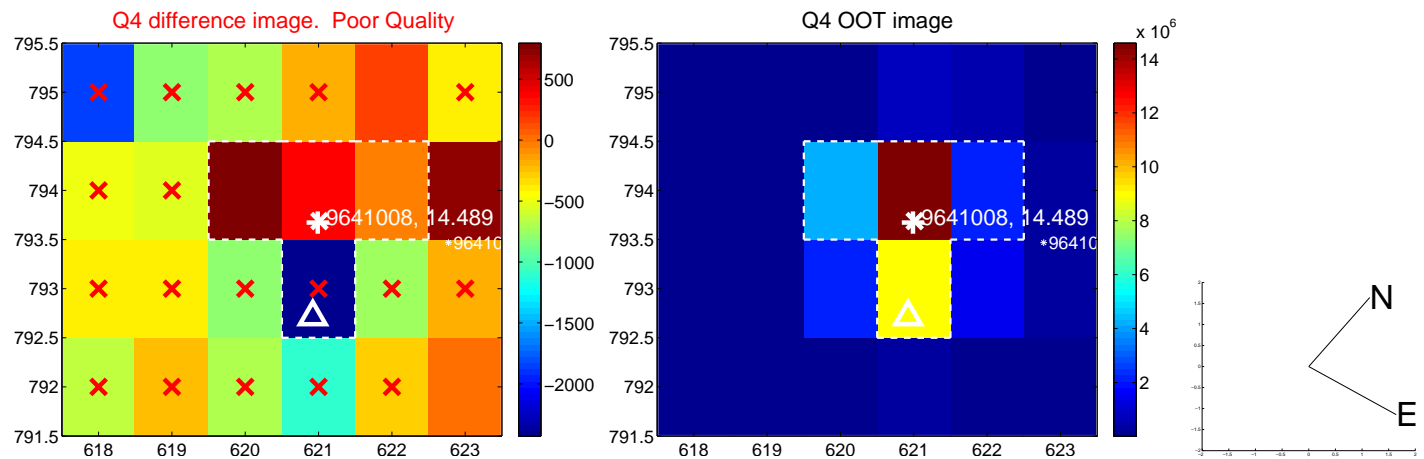
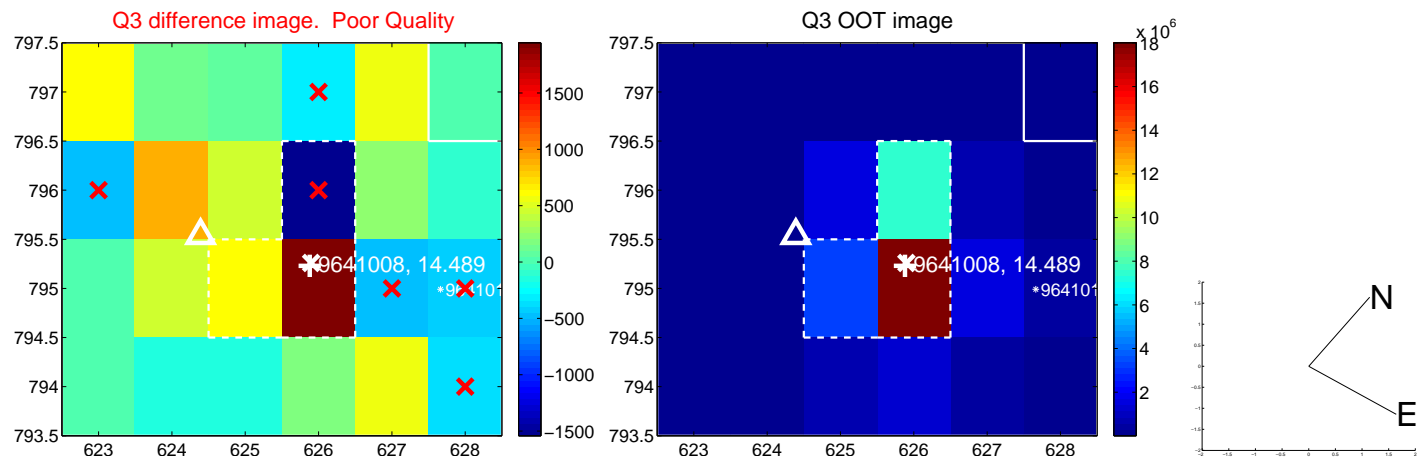
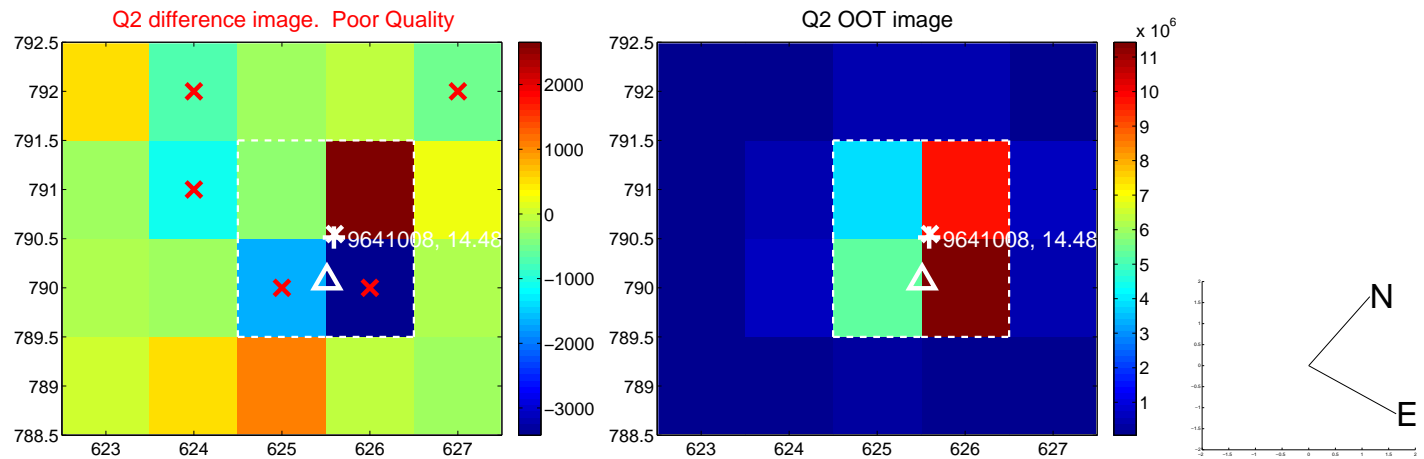
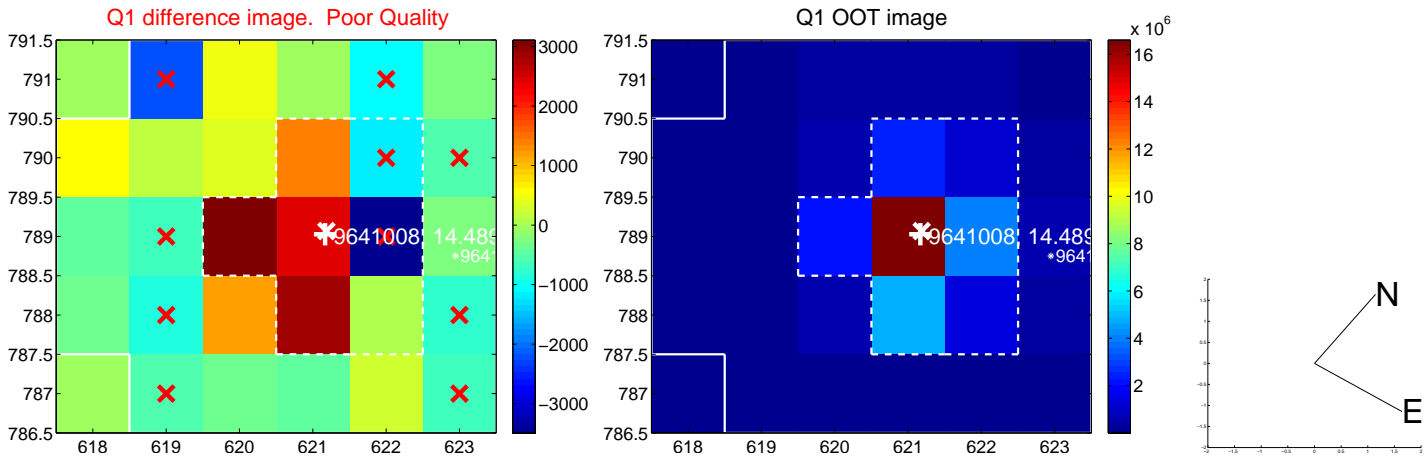
The direct PRF centroid is offset from the target star catalog position by about 0.14 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$2.185 \pm 0.534$	4.10	$-0.042 \pm 0.891$	$-2.185 \pm 0.533$
PRF-fit source offset from KIC position	$2.313 \pm 0.561$	4.12	$-0.027 \pm 0.834$	$-2.313 \pm 0.558$
photometric centroid source offset	$1.87 \pm 1.07$	1.75	$1.33 \pm 1.11$	$1.32 \pm 1.03$

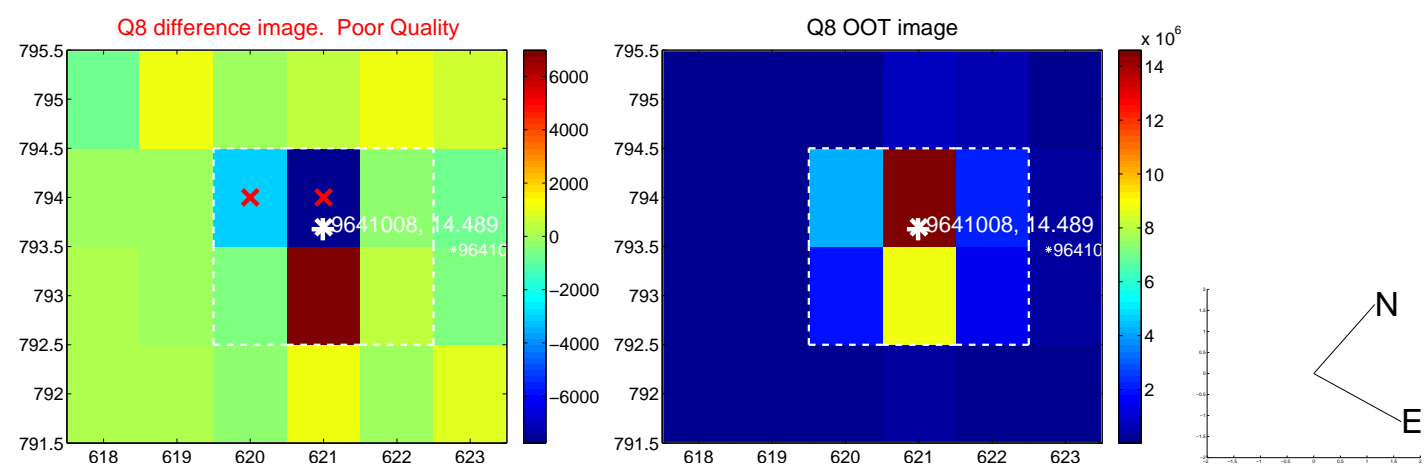
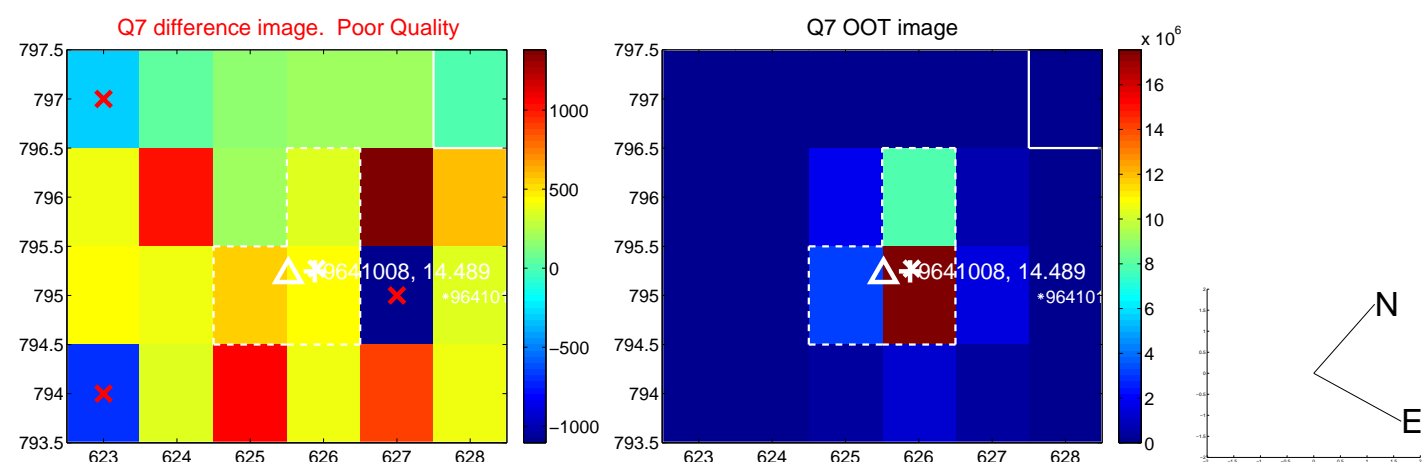
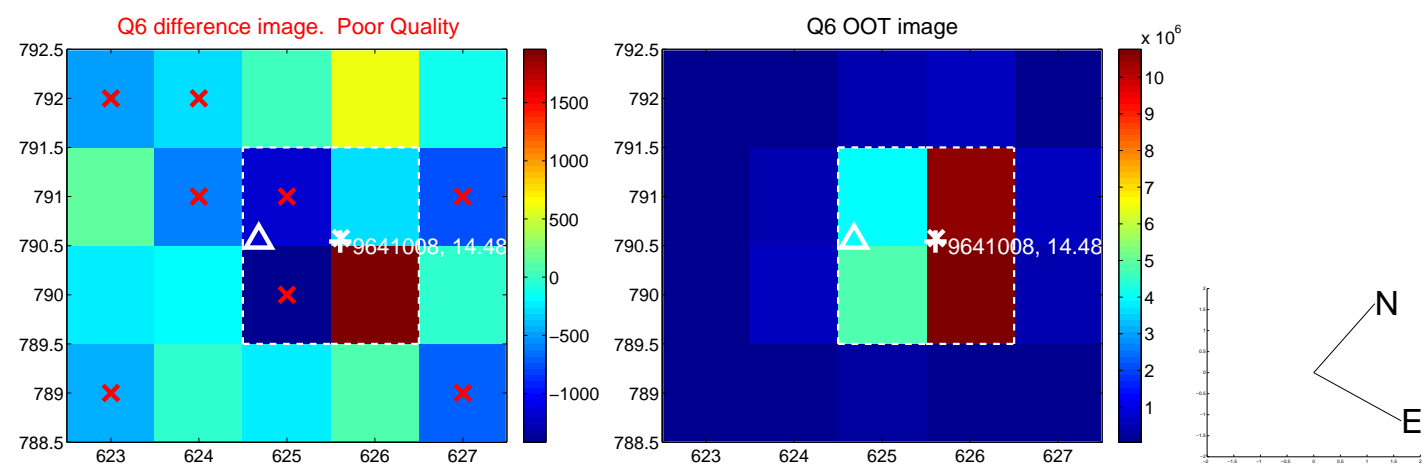
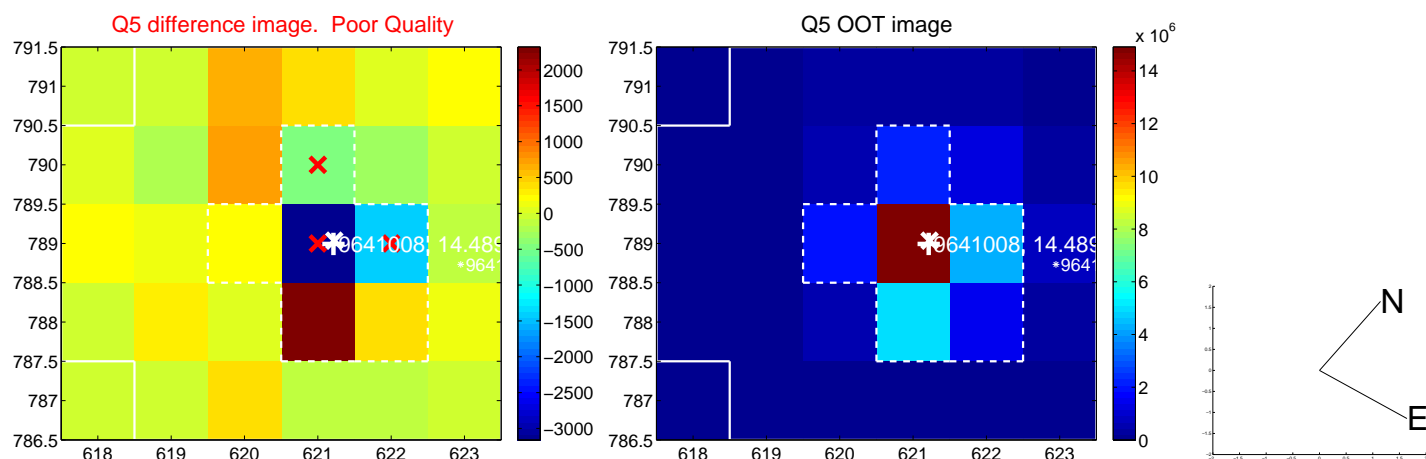


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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

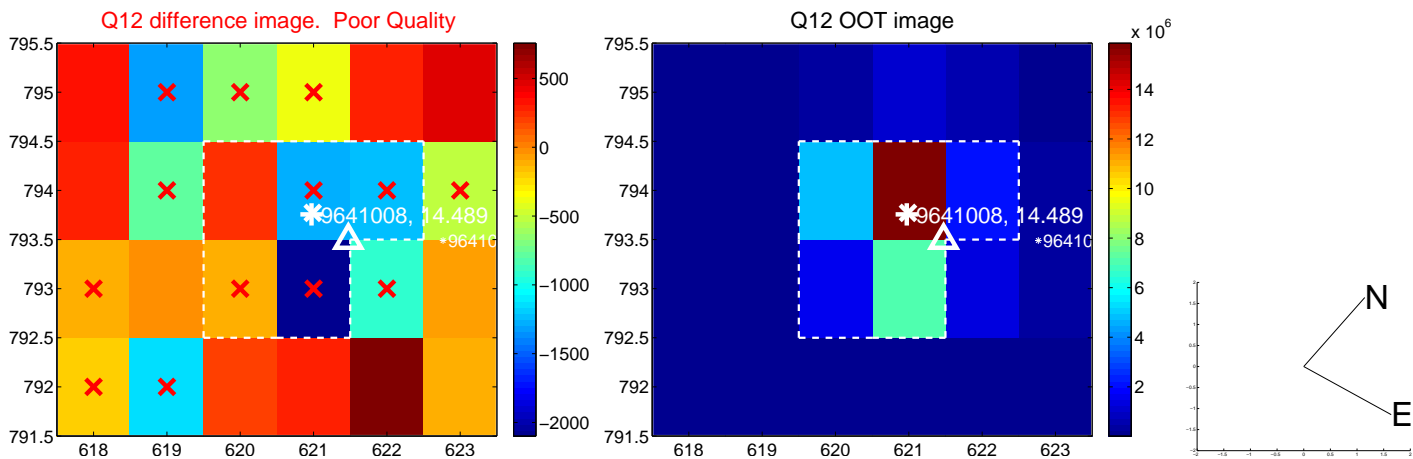
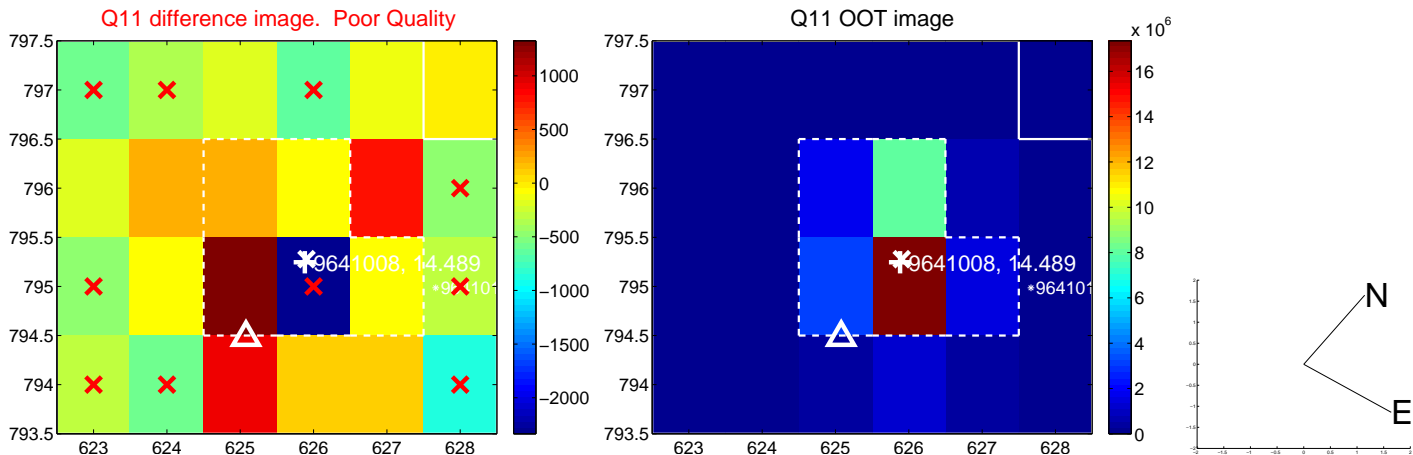
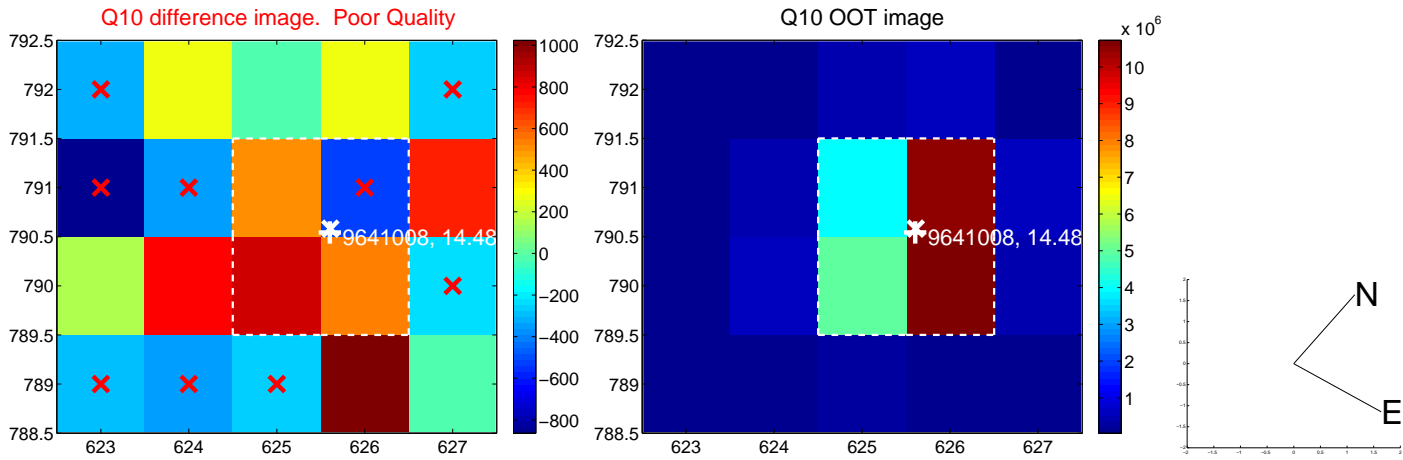
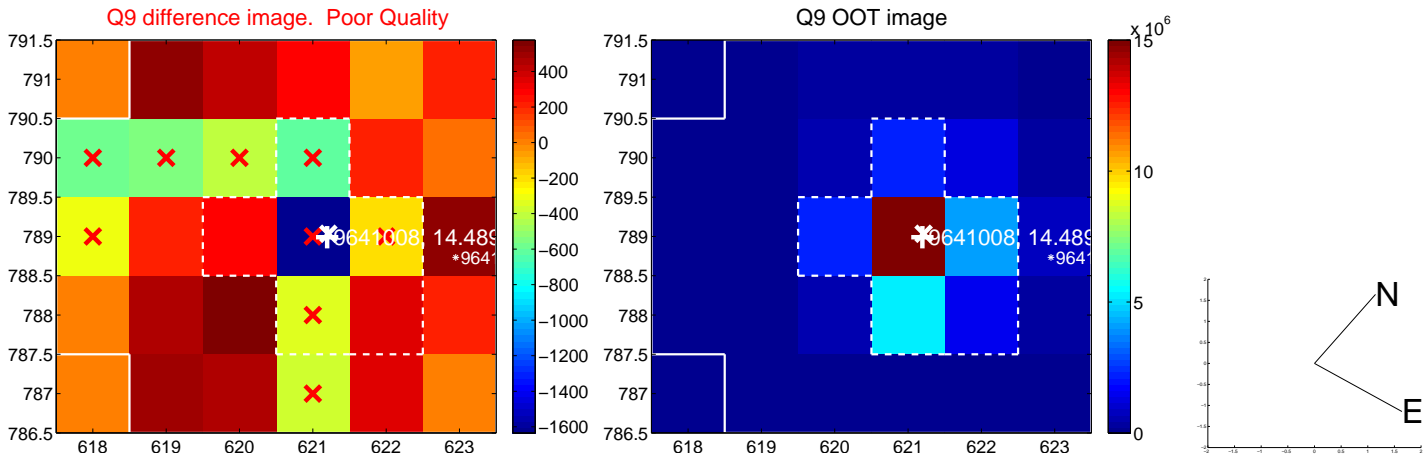
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

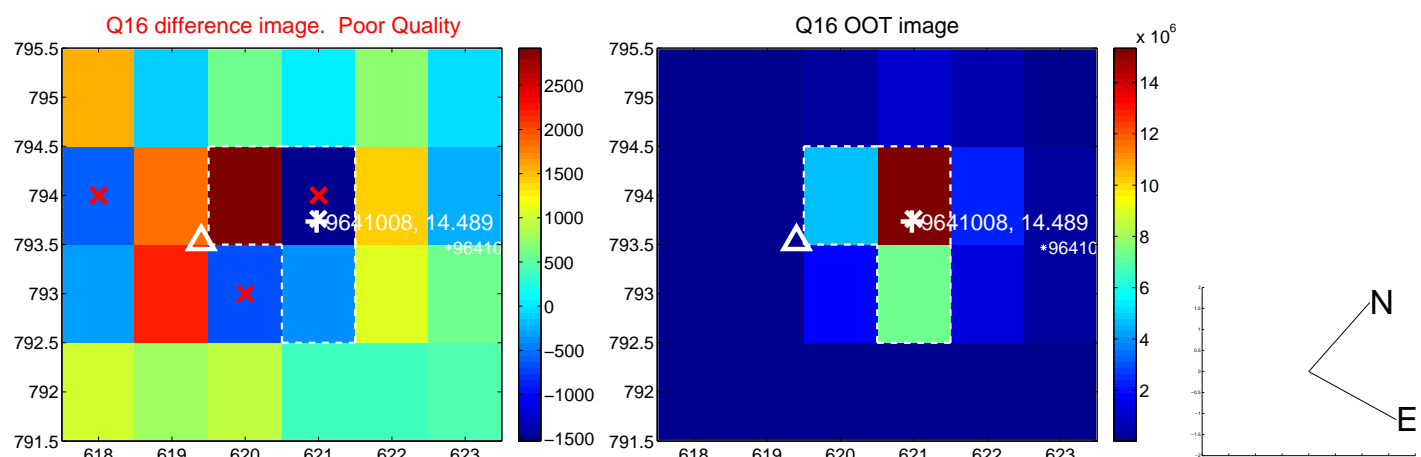
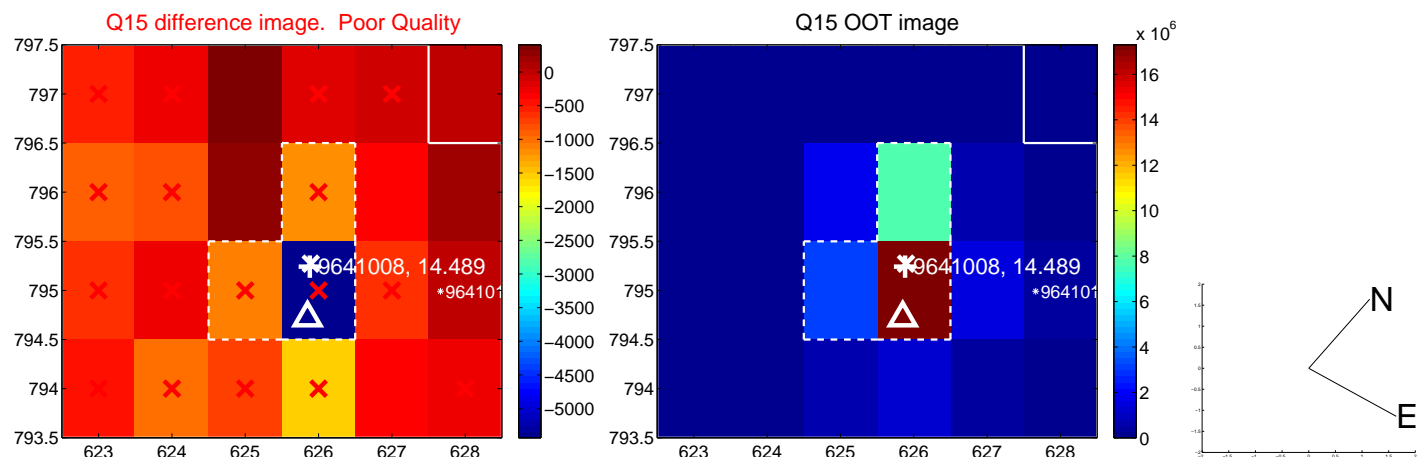
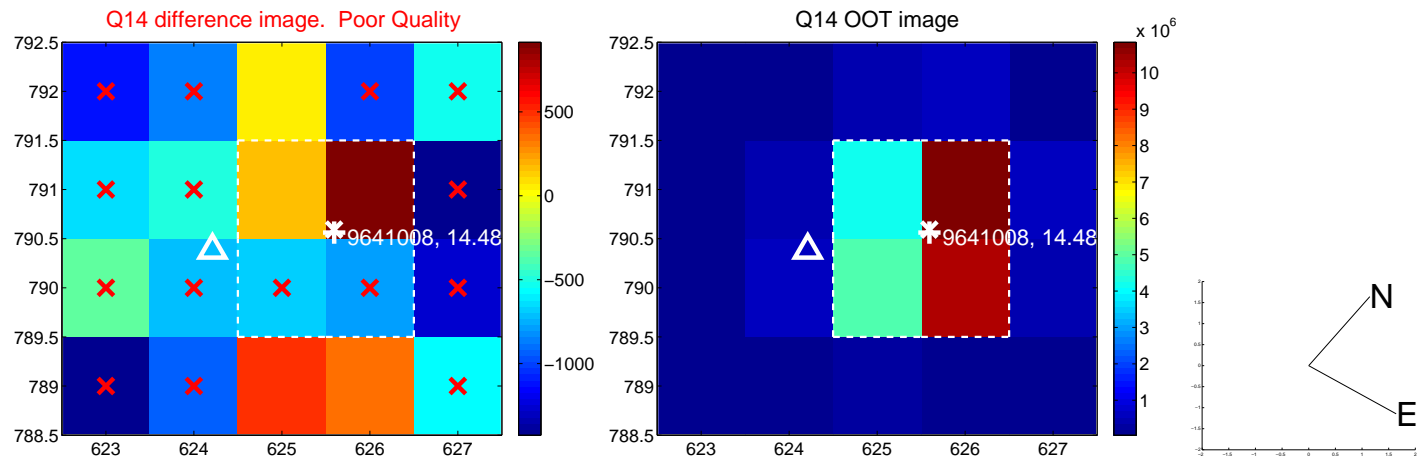
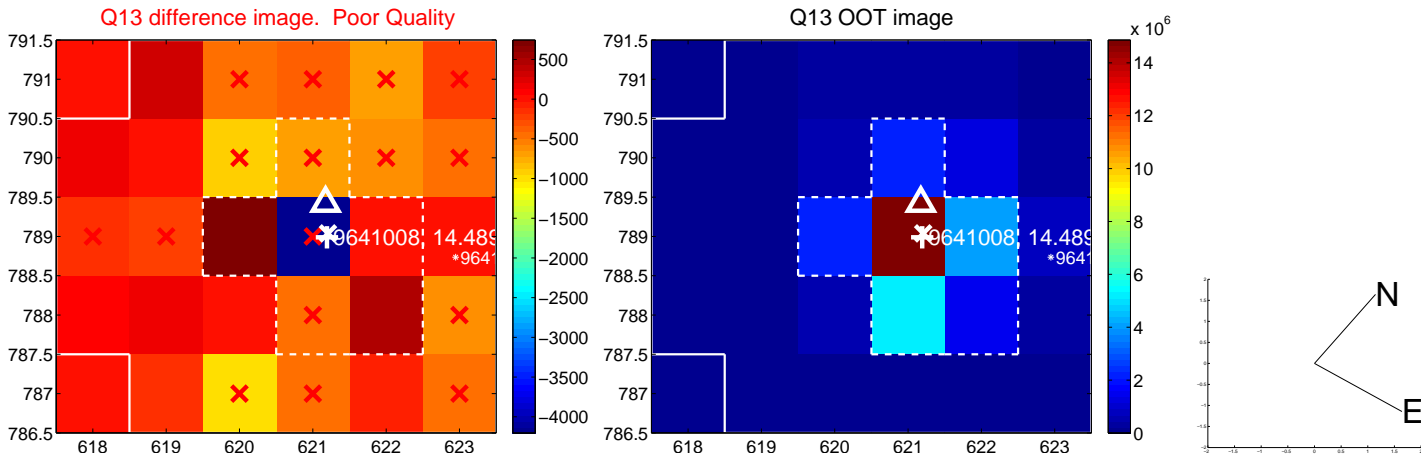


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

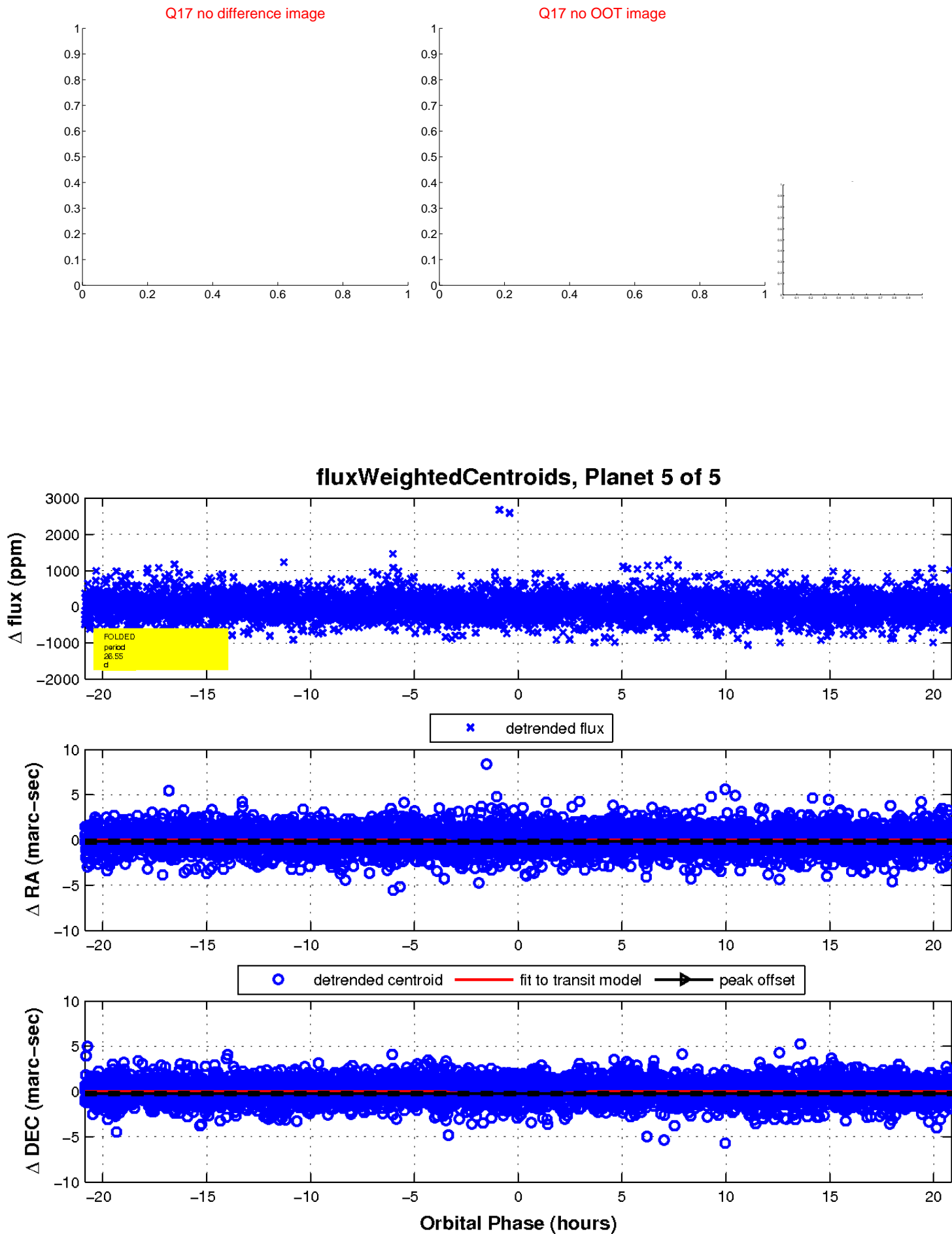




white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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



UKIRT Image

Declination

