

# KIC 009541094

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
009541094-01	OBS	7944.01	0.536651	131.706848	29.7	2.993	12.9	15.0	1.00	5887	0.65	6614.61
009541094-02	OBS	No	126.730611	154.943803	353.8	1.746	7.4	7.5	1.00	5887	1.88	4.53

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009541094-01	OBS	FP	0.00	1	0	1	1	LPP_DV—CENT_UNRESOLVED_OFFSET—HALO_GHOST—EPHEM_MATCH
009541094-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_CHASES—TRANS_GAPPED—MOD_NONUNIQ_DV—MOD_NONUNIQ_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.

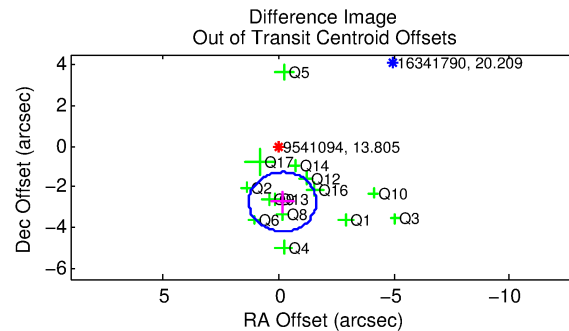
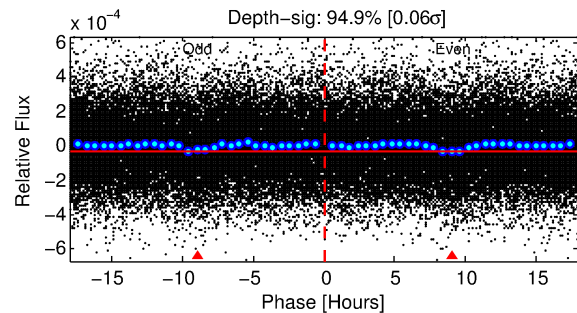
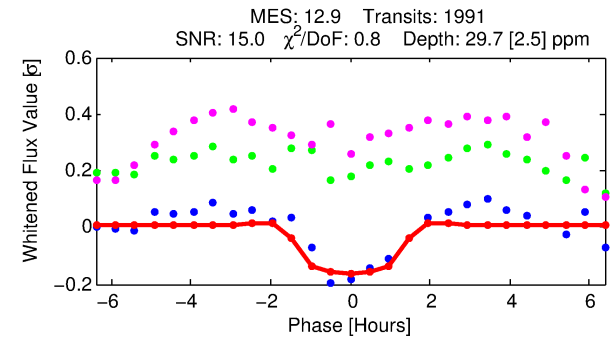
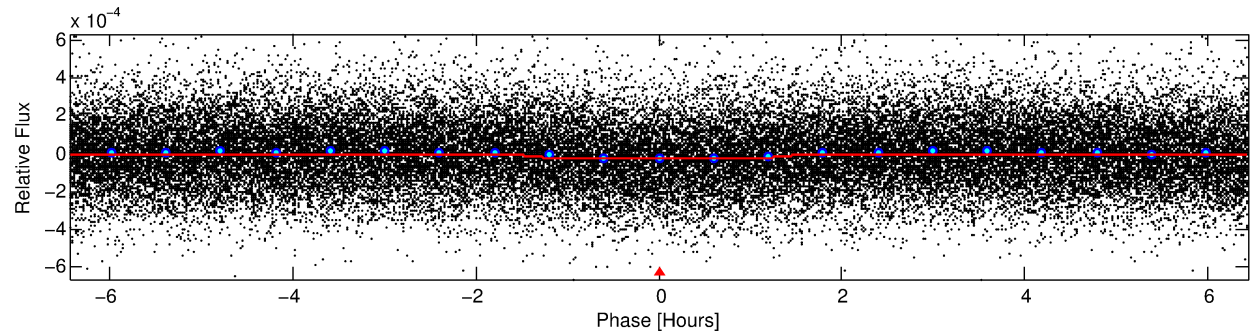
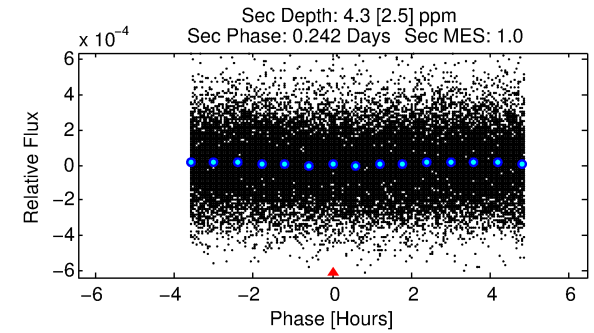
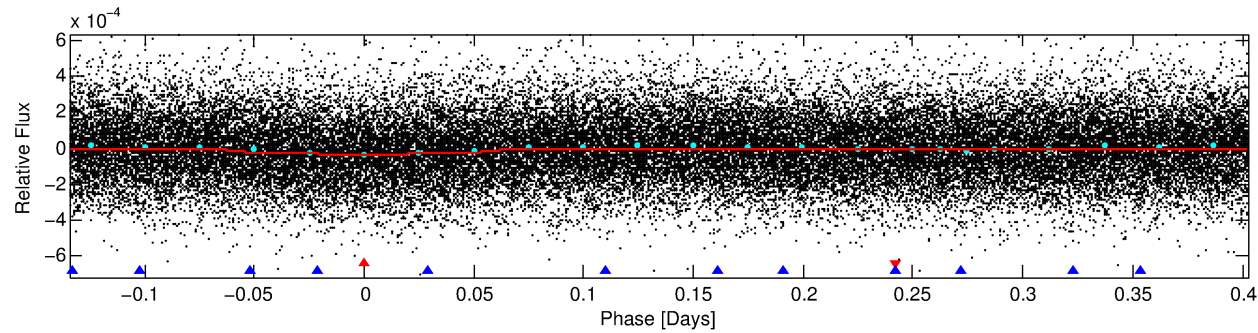
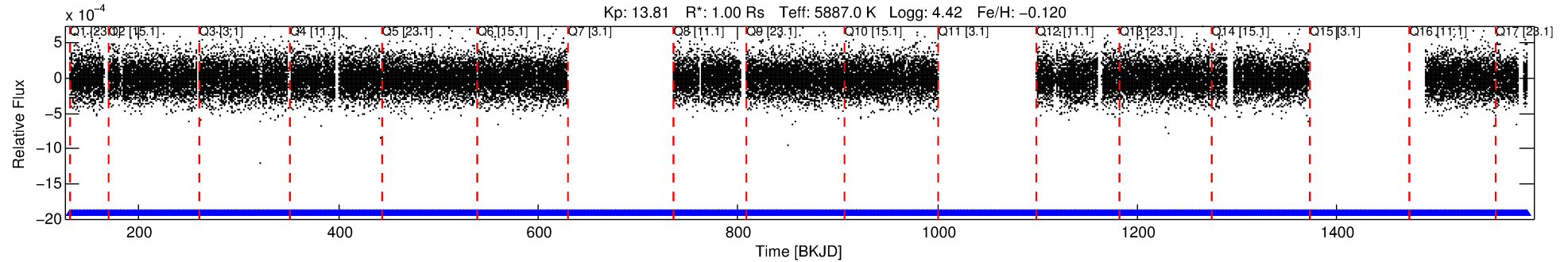
## Ephemeris Match Information For 009541094-01

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	$\sigma_P$	$\sigma_T$
009541094-01	9541094	009541127-pri	9541127	1:1	56.6	1	14	12.56	13.81	12403.00	Direct-PRF	0	0.05	0.10

**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: 9541094 Candidate: 1 of 2 Period: 0.537 d



## DV Fit Results:

Period = 0.53665 [0.00001] d  
Epoch = 131.7068 [0.0023] BKJD  
Rp/R\* = 0.0059 [0.0031]  
a/R\* = 1.12 [0.62]  
b = 0.90 [0.56]  
Seff = 6614.61 [2535.47]  
Teq = 2300 [220] K  
Rp = 0.65 [0.39] Re  
a = 0.0128 [0.0031] AU  
Ag = 0.93 [1.17] [-0.06σ]  
Teffp = 3492 [1053] K [1.11σ]

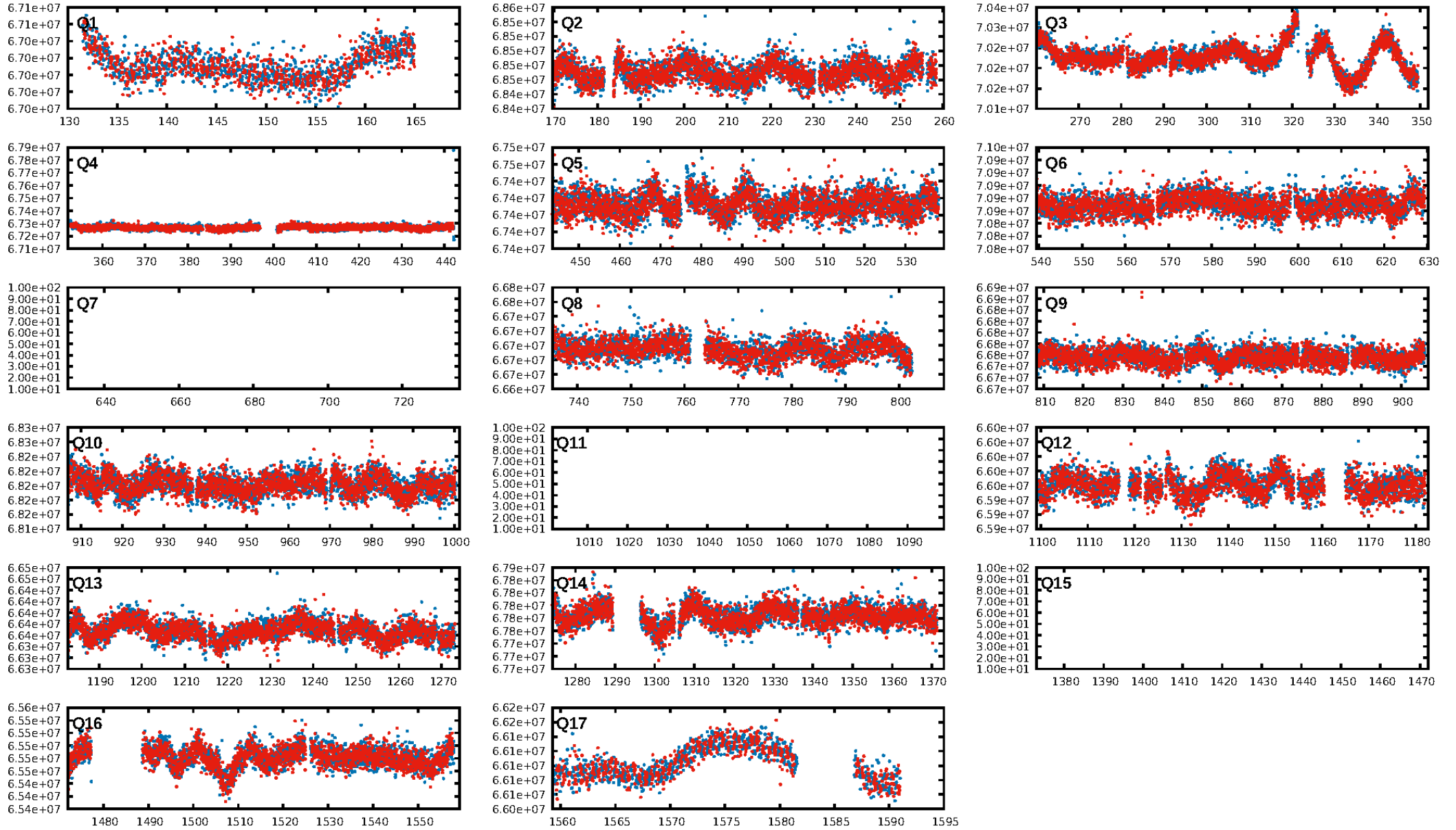
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 100.0% [873.93σ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: 4.09e-25  
RollingBand-fgt: 1.00 [1878/1878]  
GhostDiagnostic-chr: 0.06339  
Centroid-sig: 0.0%  
Centroid-so: 2.804 arcsec [3.64σ]  
OotOffset-rm: 2.732 arcsec [5.63σ]  
KicOffset-rm: 2.545 arcsec [4.83σ]  
OotOffset-st: 4/1/4/5 [14]  
KicOffset-st: 4/1/4/5 [14]  
DiffImageQuality-fgm: 0.00 [0/14]  
DiffImageOverlap-fno: 1.00 [14/14]

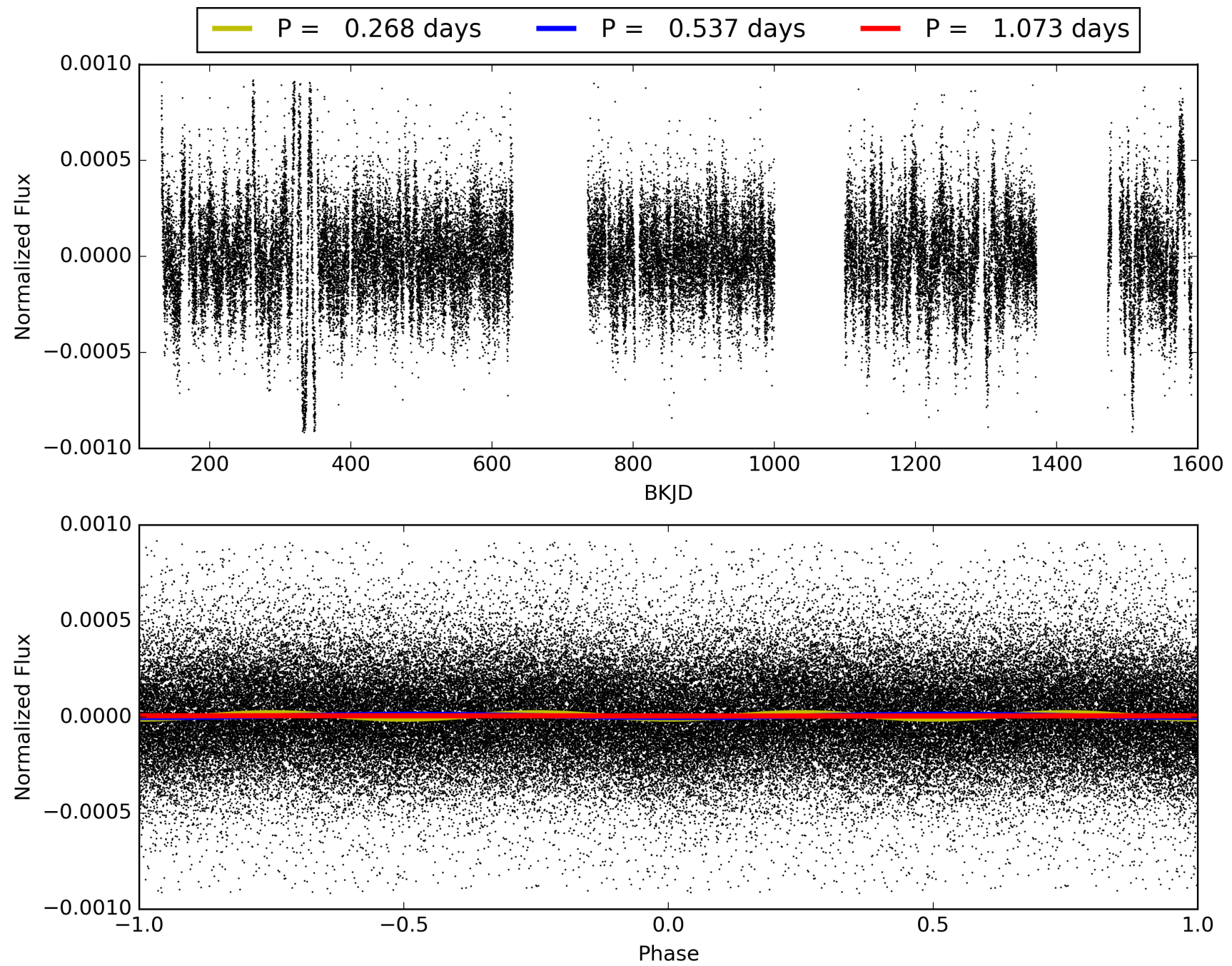
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 31-Jan-2016 14:44:41 Z

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

# TCE 009541094-01, PDC Light Curves



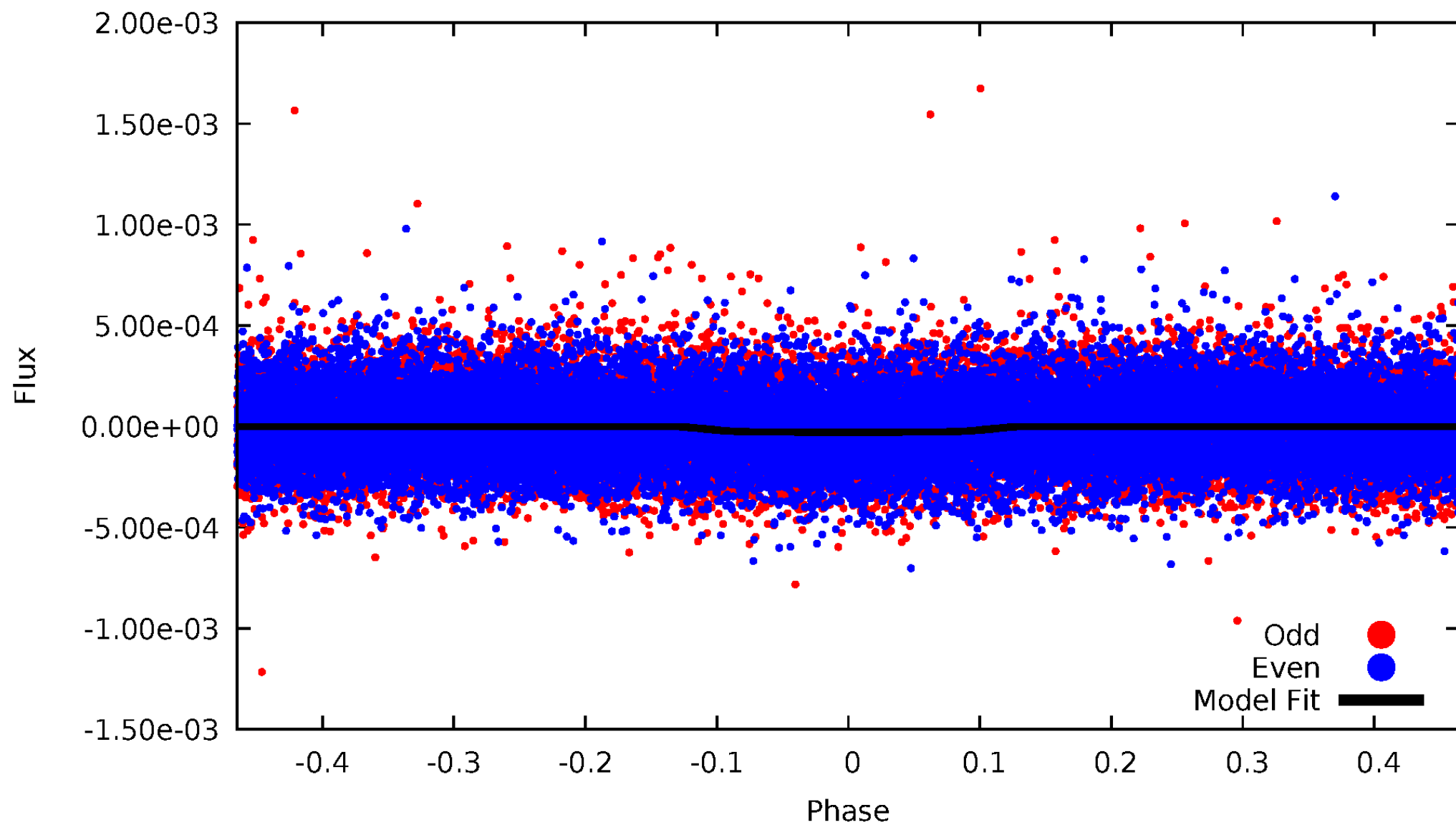
TCE 009541094-01





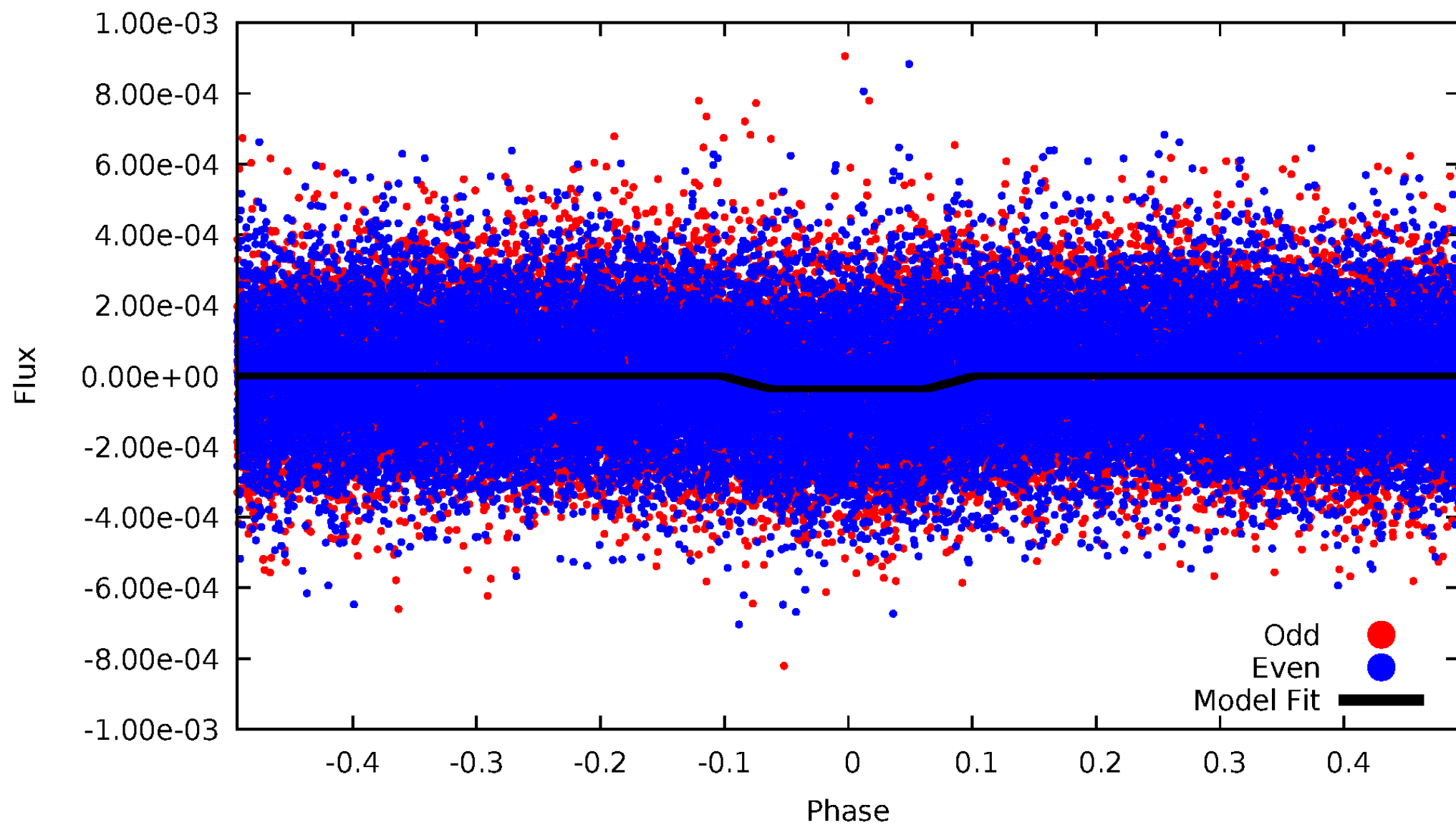
# DV Odd/Even

TCE 009541094-01



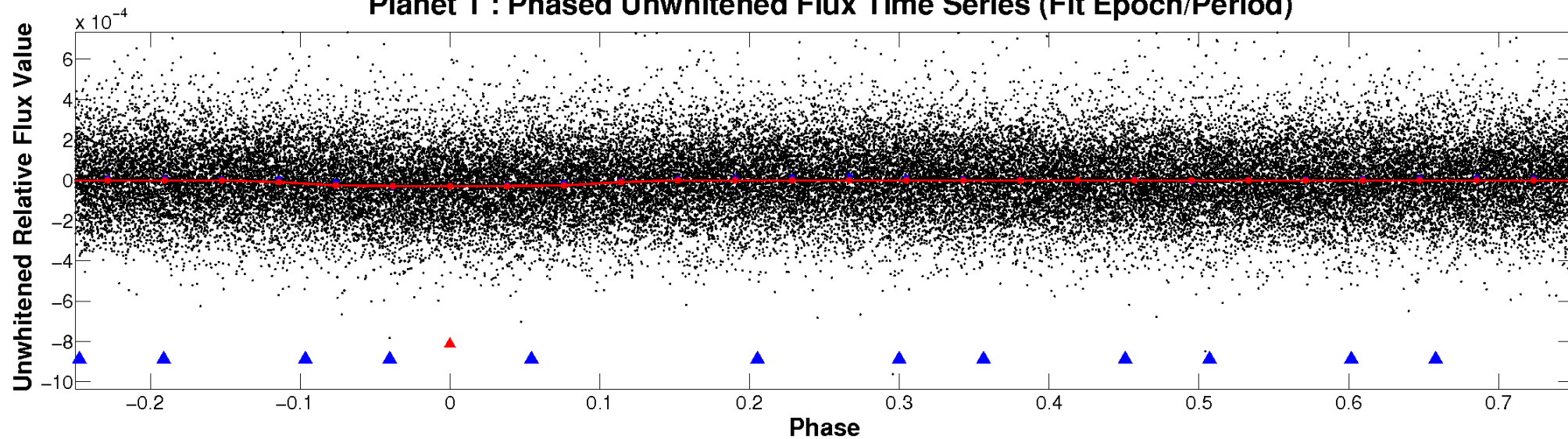
# ALT Odd/Even

TCE 009541094-01

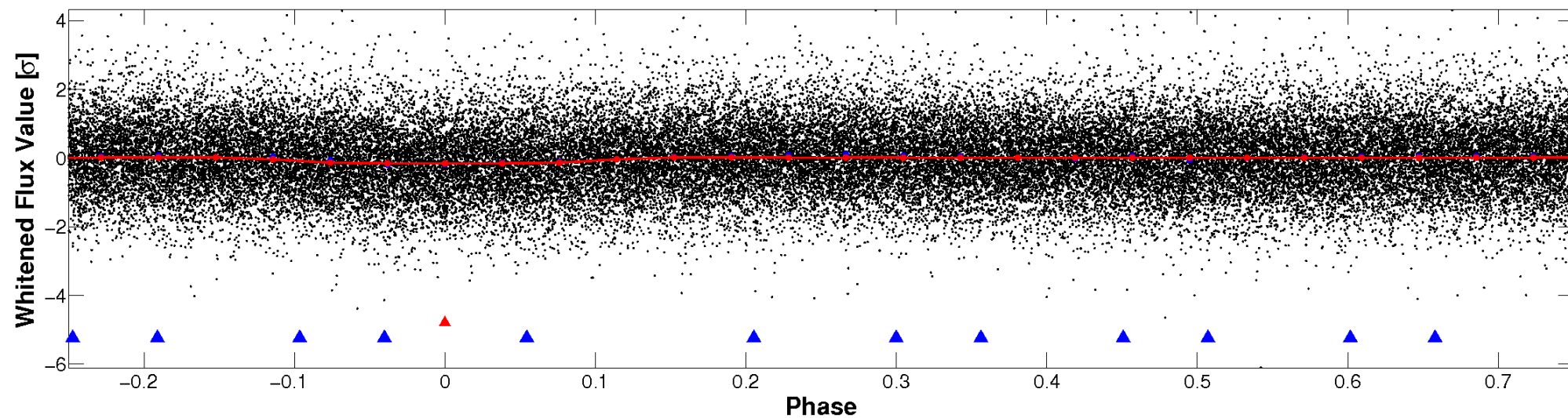


# Non-Whitened Vs. Whitened Light Curve

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

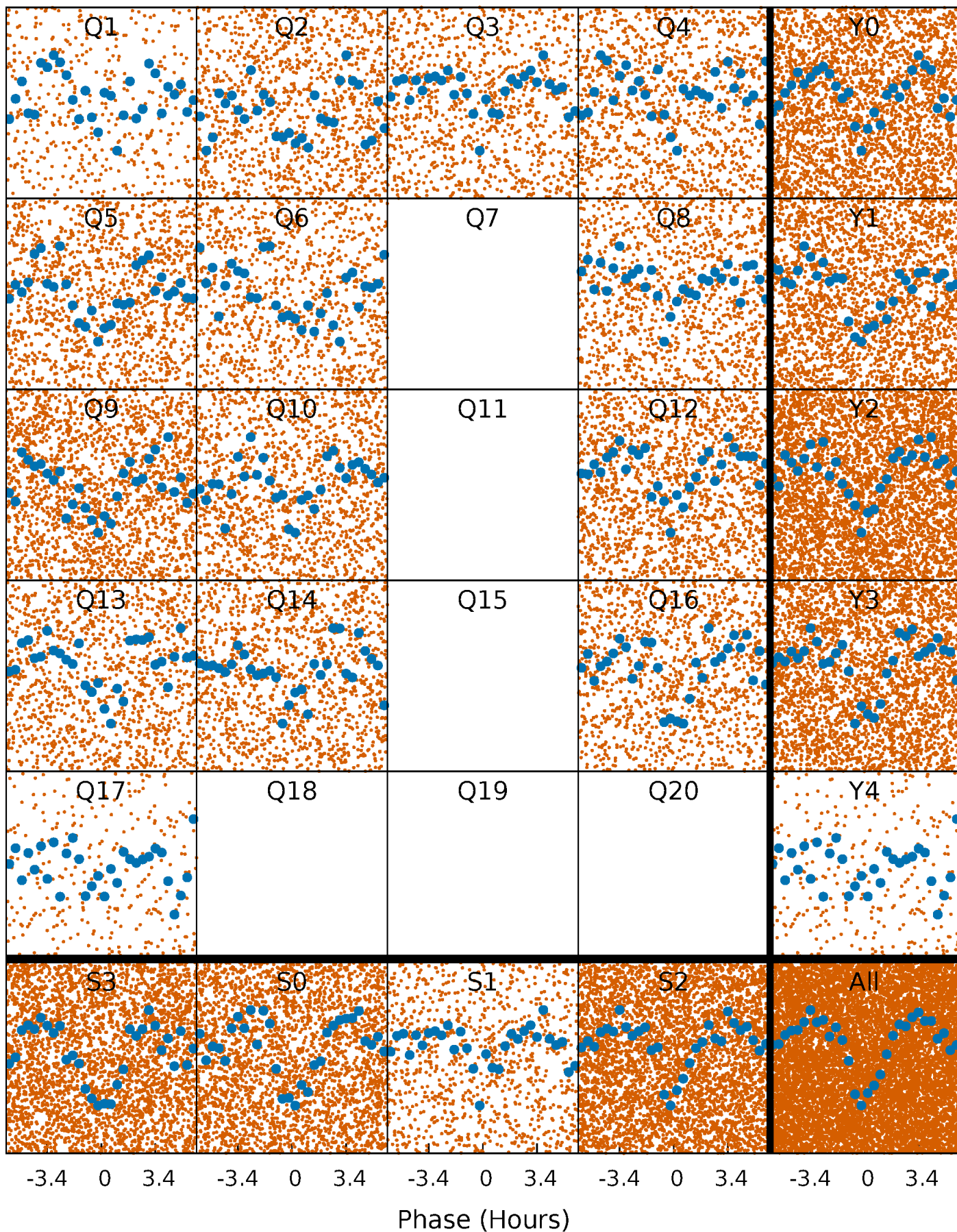


**Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)**



# PDC Quarter-Phased Transit Curves

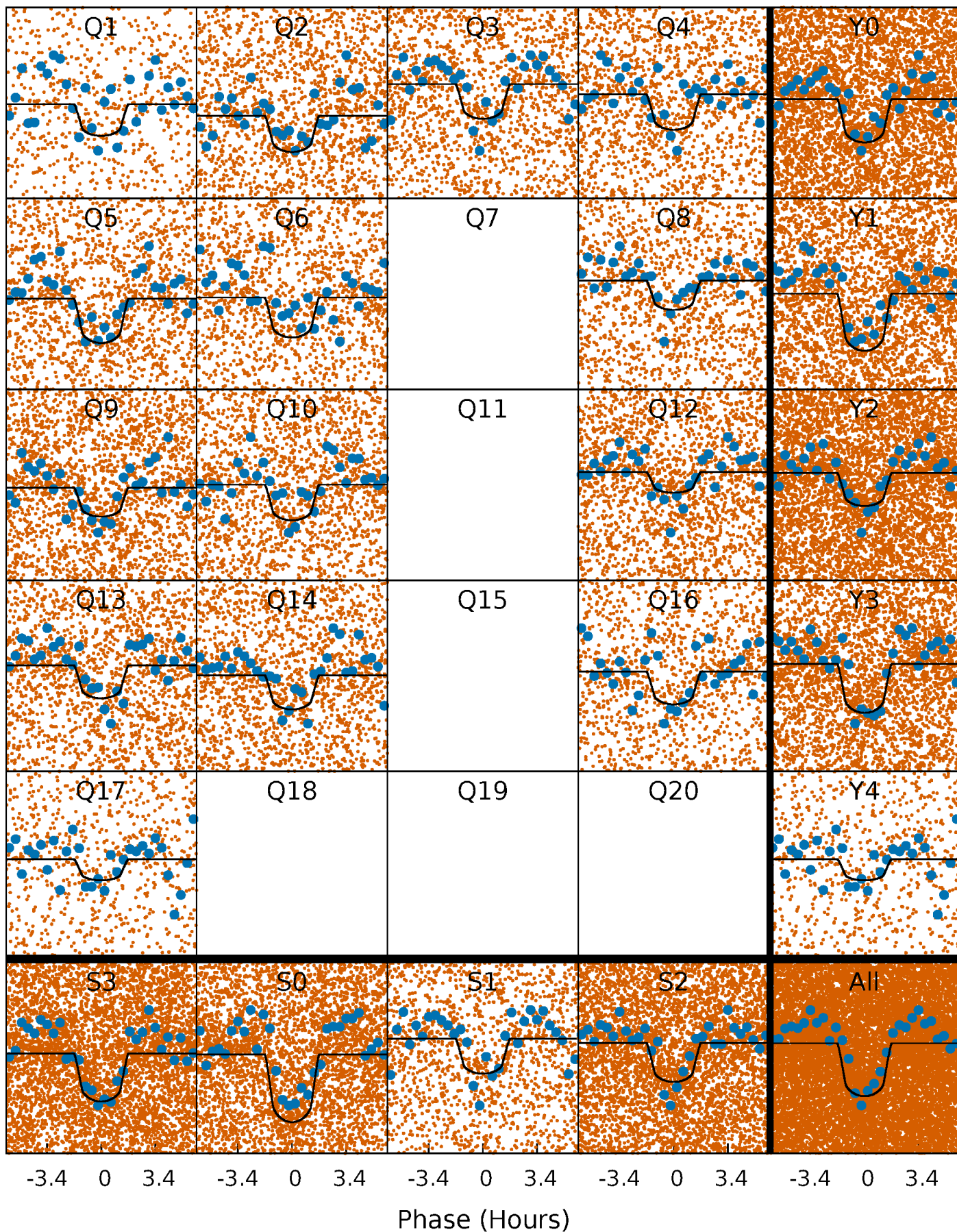
TCE 009541094-01 P= 0.536651 Days  $T_0=131.706848$  (BKJD)





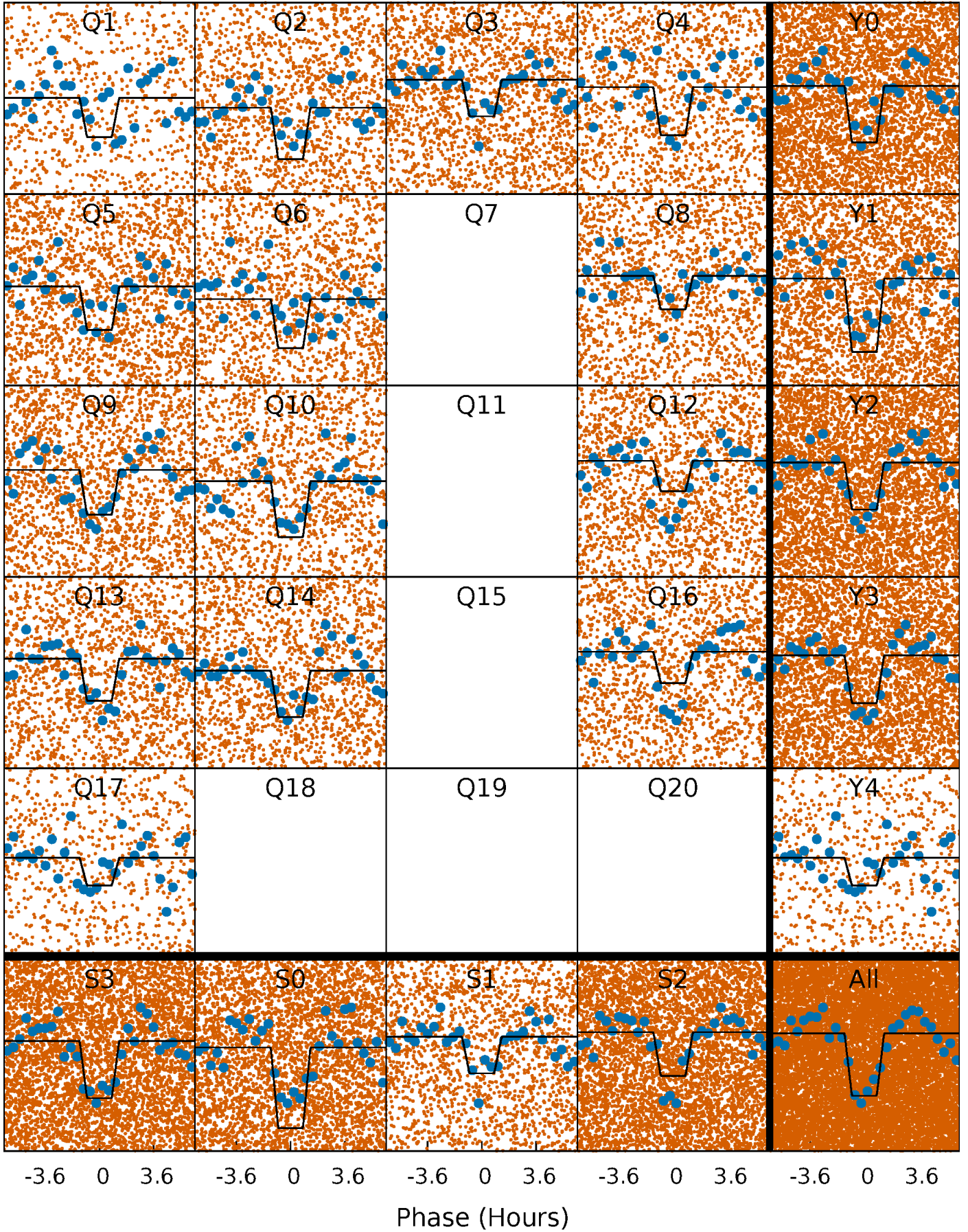
# DV Quarter-Phased Transit Curves

TCE 009541094-01 P= 0.536651 Days  $T_0=131.706848$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

TCE 009541094-01 P= 0.536655 Days  $T_0=131.705563$  (BKJD)

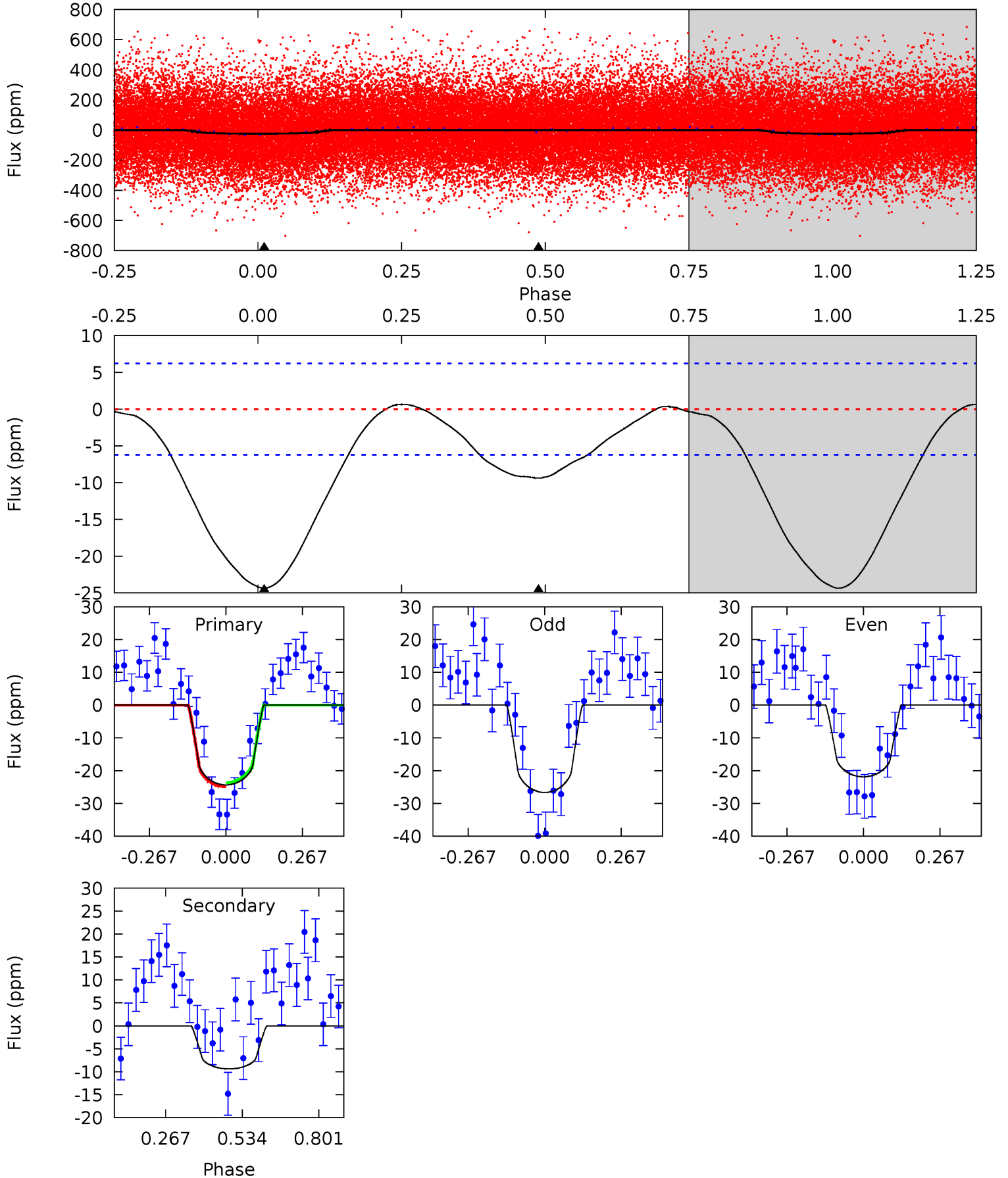




# DV Model-Shift Uniqueness Test

009541094-01, P = 0.536651 Days, E = 131.170197 Days

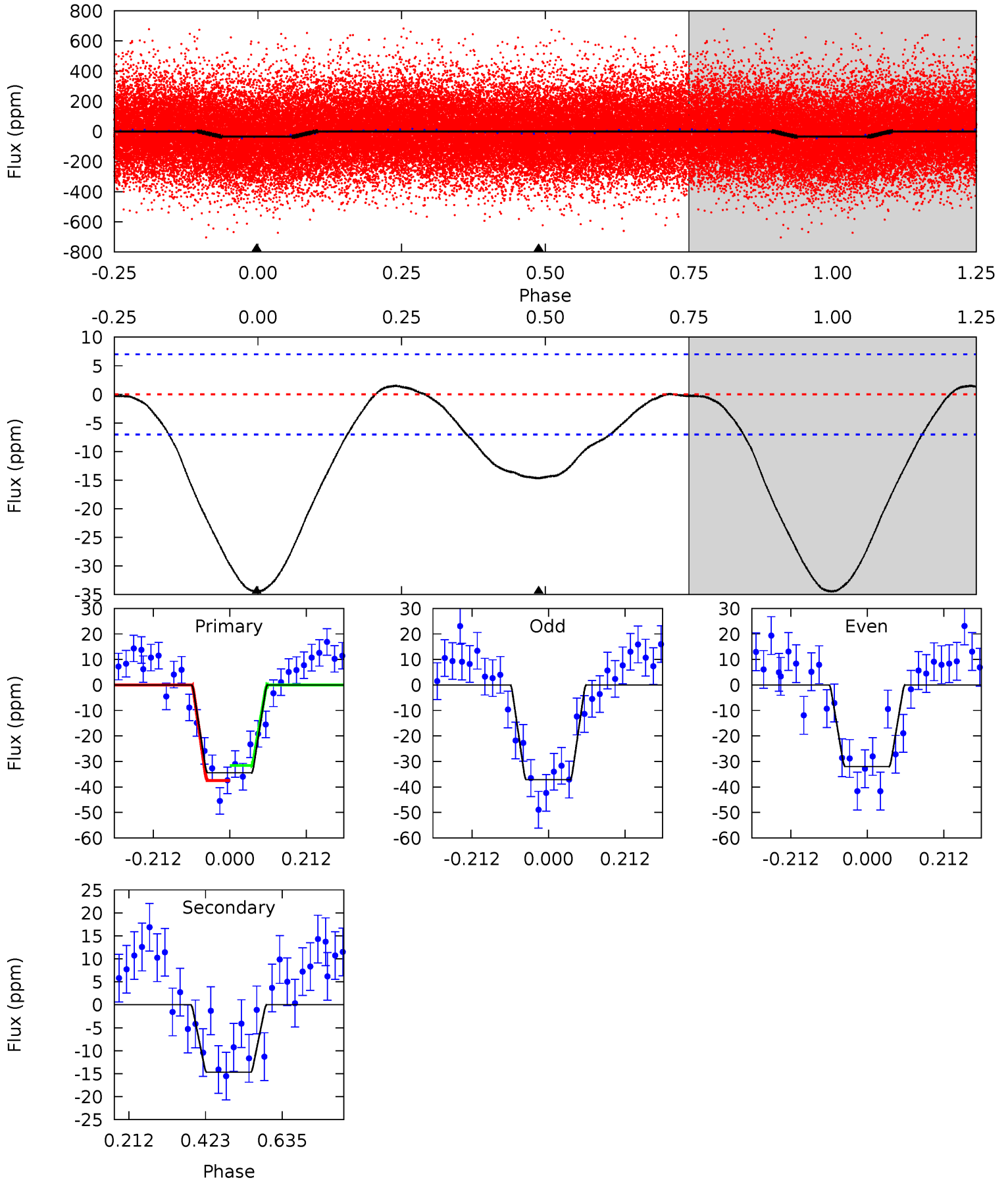
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
17.1	6.58	0	0	4.35	1.11	0.36	17.1	17.1	6.58	6.58	1.69	0.89	0.03	0.39



# Alt Model-Shift Uniqueness Test

009541094-01, P = 0.536655 Days, E = 131.168908 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
21.7	9.24	0	0	4.40	1.25	0.45	21.7	21.7	9.24	9.24	1.63	0.95	0.04	1.87





### Stellar Parameters For KIC 009541094

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$5887^{+146}_{-176}$	$4.421^{+0.087}_{-0.203}$	$-0.120^{+0.300}_{-0.300}$	$1.001^{+0.283}_{-0.131}$	$0.965^{+0.128}_{-0.105}$	$1.354^{+0.595}_{-0.659}$
	+2%/-3%	+2%/-5%	+250%/-250%	+28%/-13%	+13%/-11%	+44%/-49%
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 009541094-01 / KOI 7944.01

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-9 \pm 1$	$0.67^{+0.35}_{-0.33}$	$3248^{+232}_{-174}$	$4269^{+1461}_{-730}$	$1.838^{+5.430}_{-1.050}$
Alt.	$-15 \pm 2$	$0.69^{+0.37}_{-0.35}$	$3258^{+236}_{-157}$	$4667^{+1971}_{-796}$	$2.676^{+8.842}_{-1.514}$

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

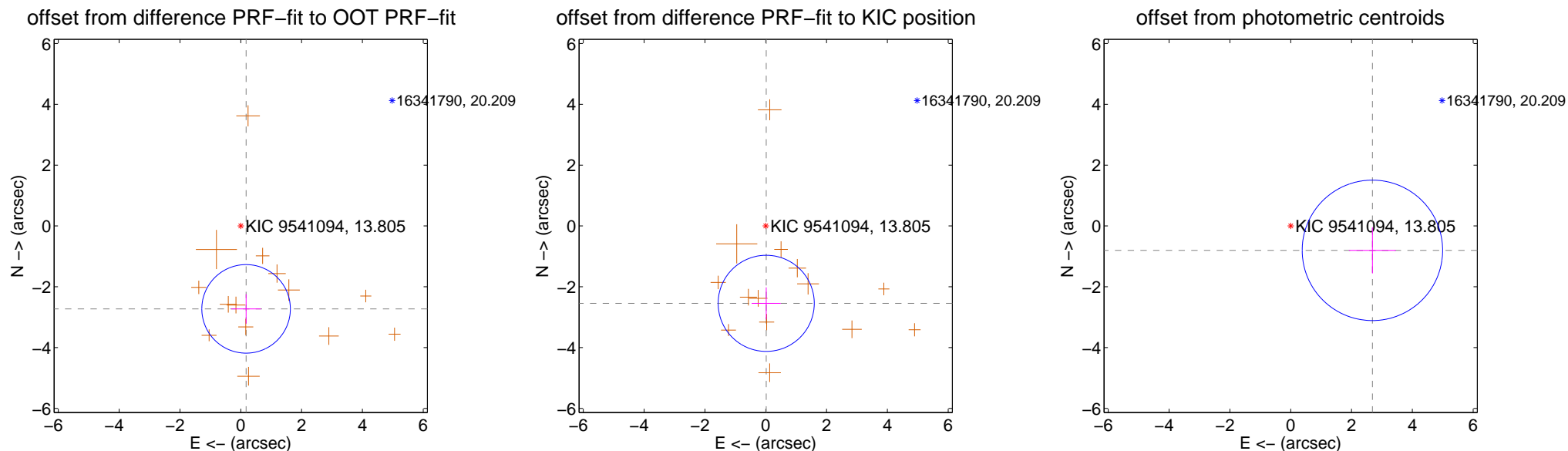
## DV Centroid Data

Supplemental centroid analysis for 009541094-01. Kepler magnitude: 13.80. Transit SNR 15.00

There are 0 quarters with good PRF difference image offsets

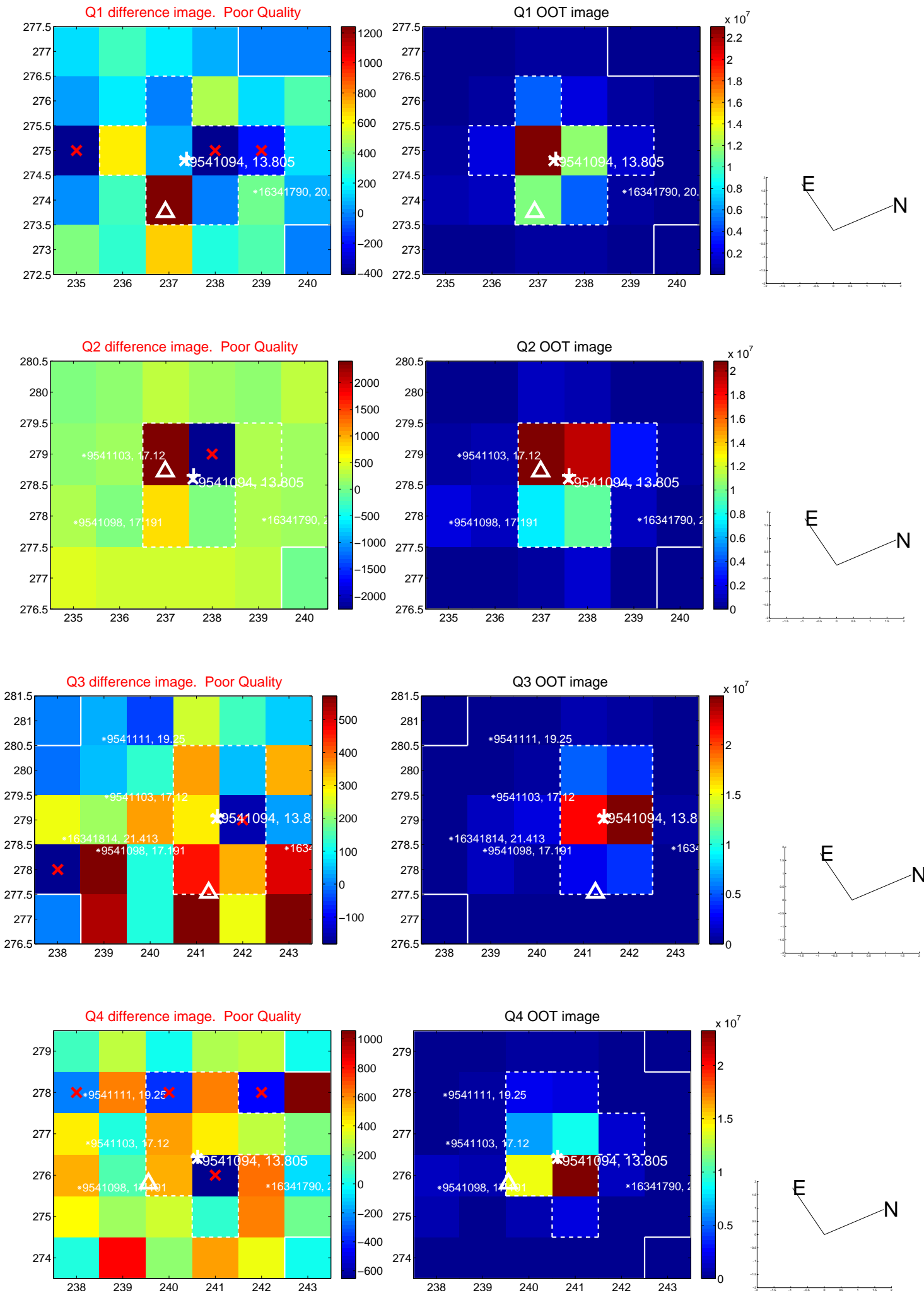
The direct PRF centroid is offset from the target star catalog position by about 0.24 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$2.732 \pm 0.485$	5.63	$-0.175 \pm 0.489$	$-2.727 \pm 0.482$
PRF-fit source offset from KIC position	$2.545 \pm 0.527$	4.83	$-0.015 \pm 0.480$	$-2.544 \pm 0.526$
photometric centroid source offset	$2.80 \pm 0.77$	3.64	$-2.69 \pm 0.77$	$-0.80 \pm 0.76$

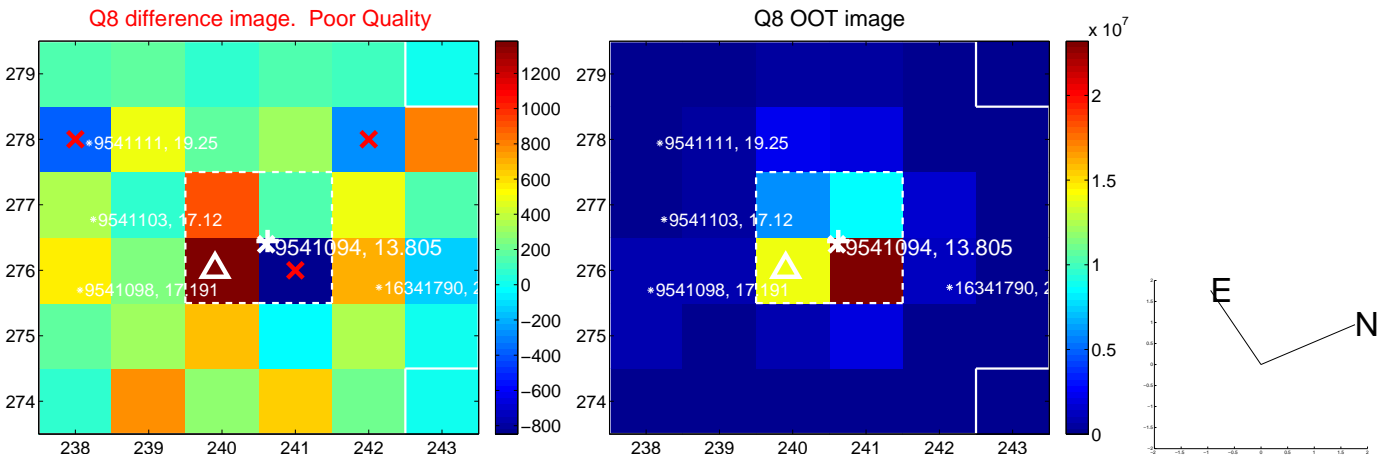
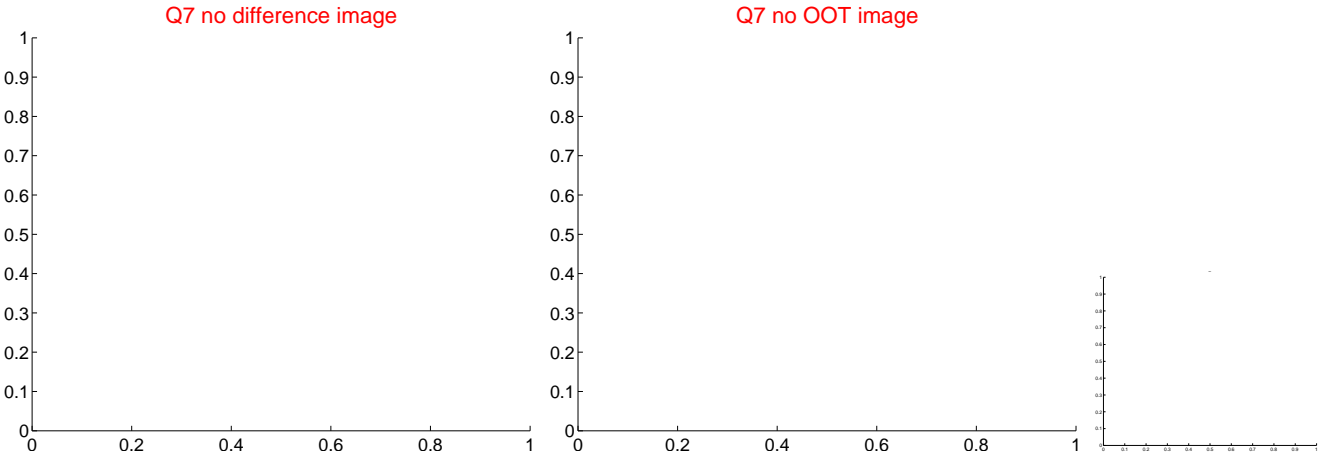
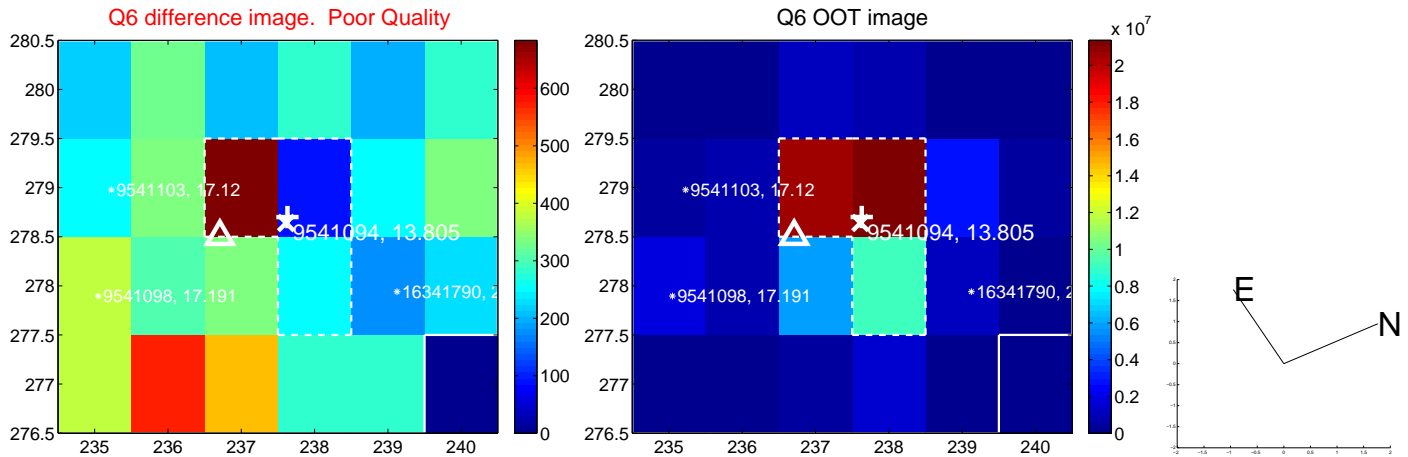
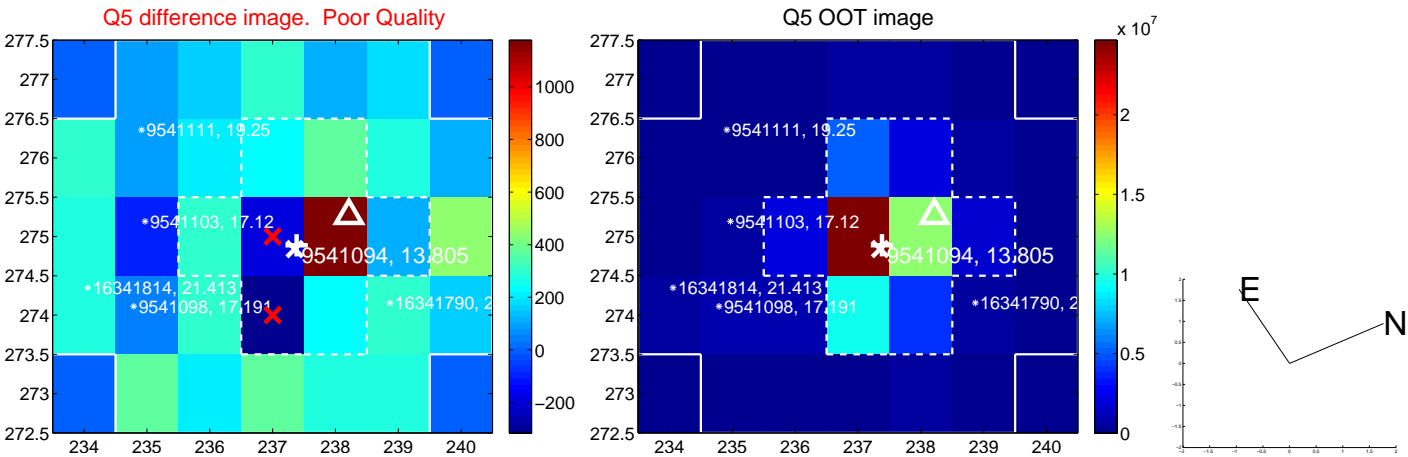


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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

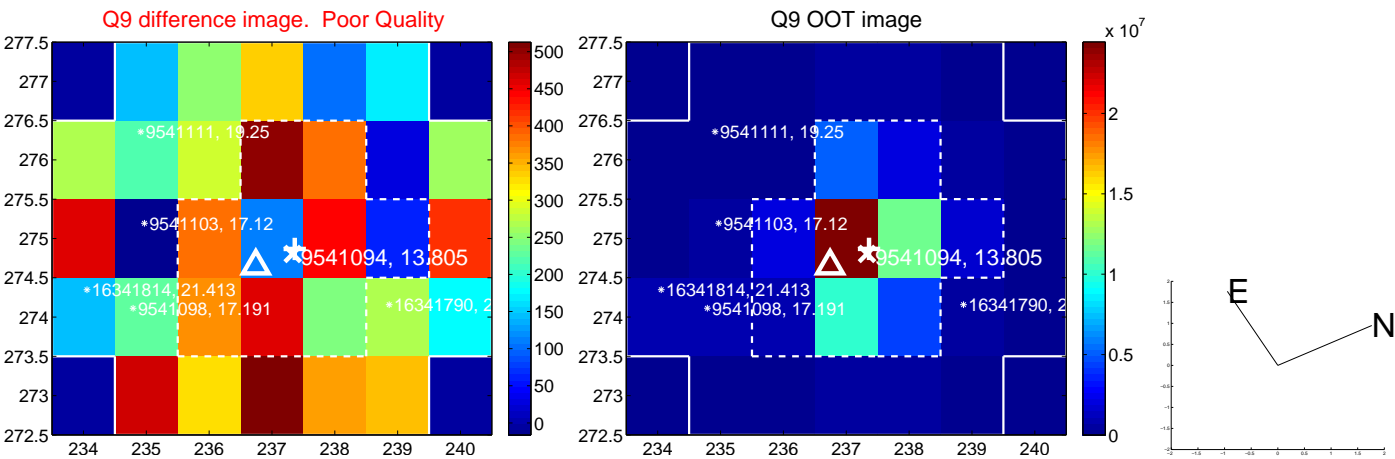


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

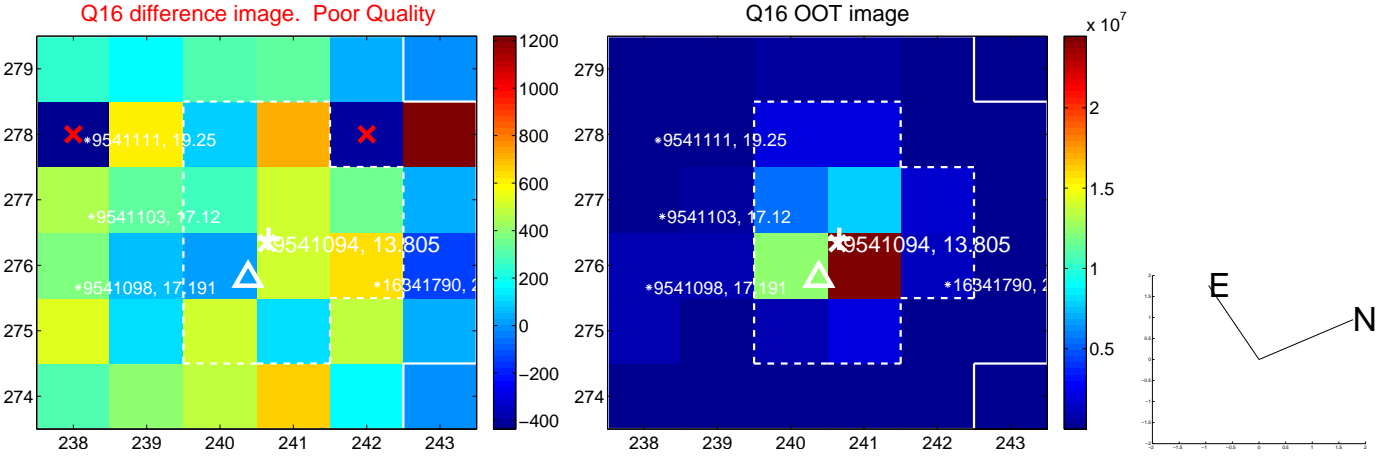
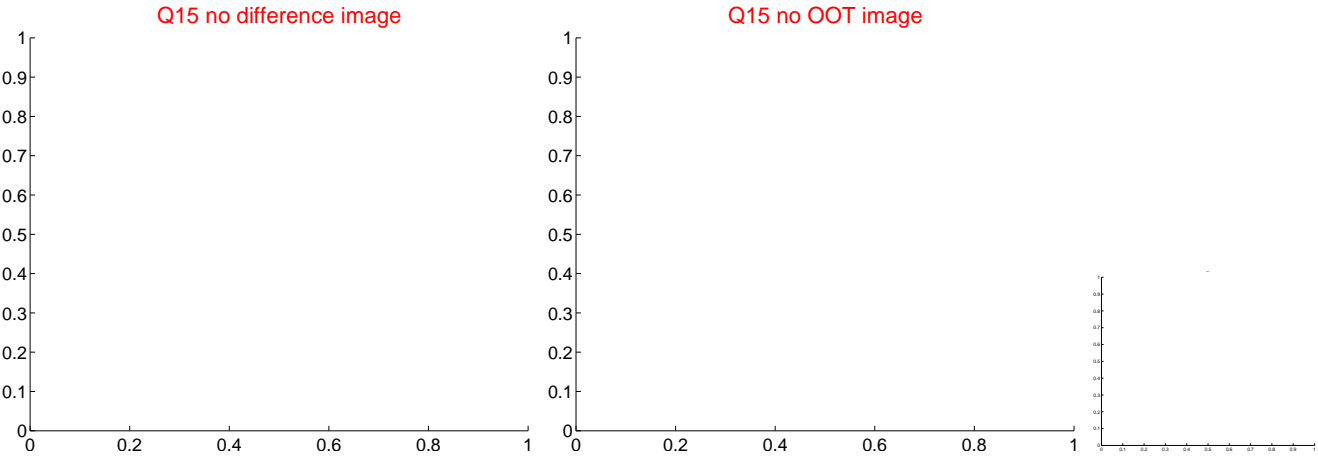
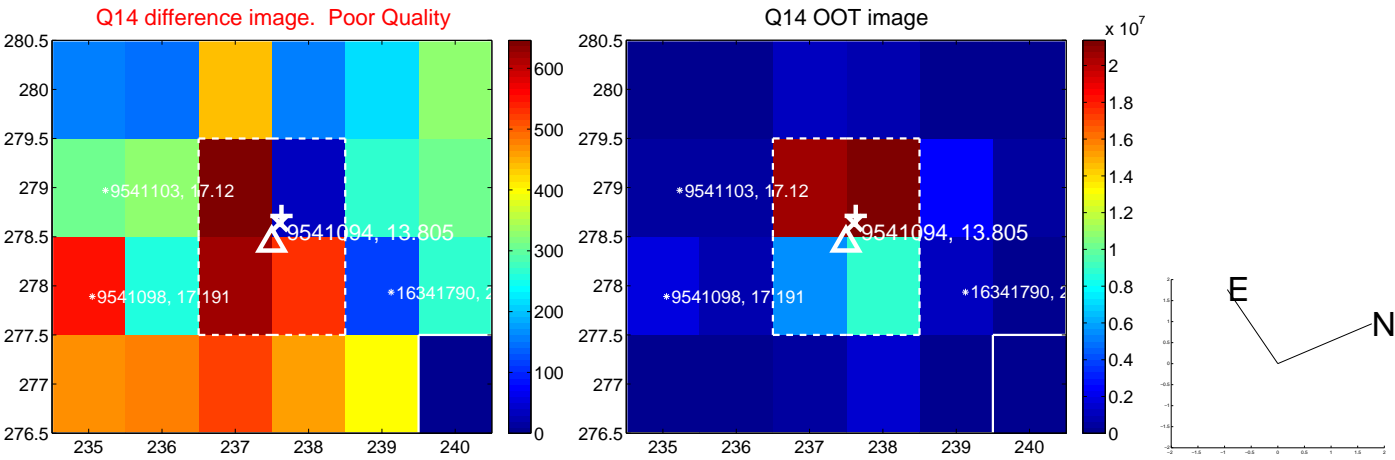
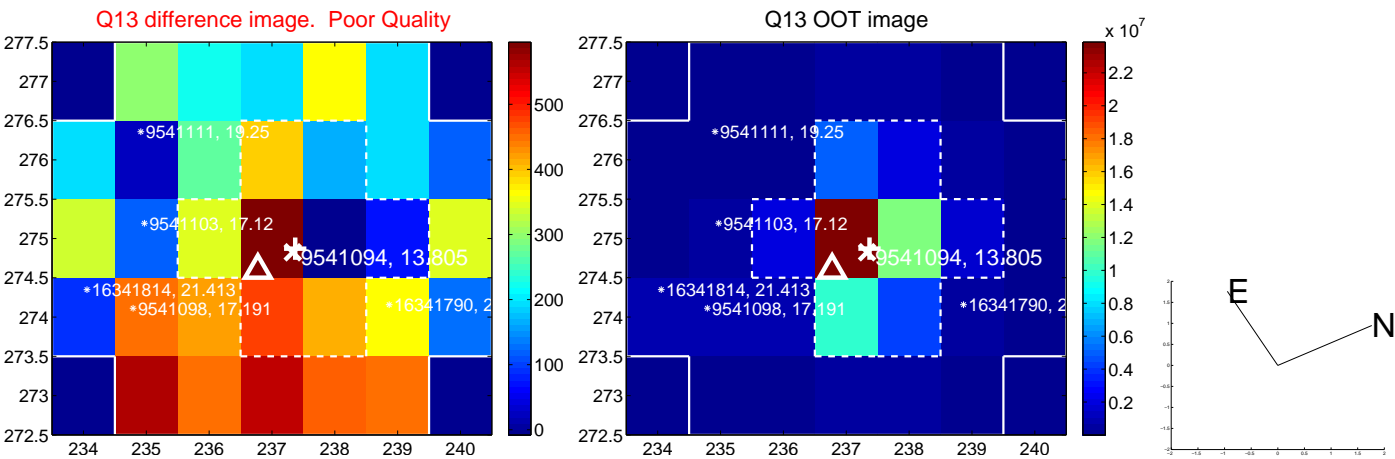




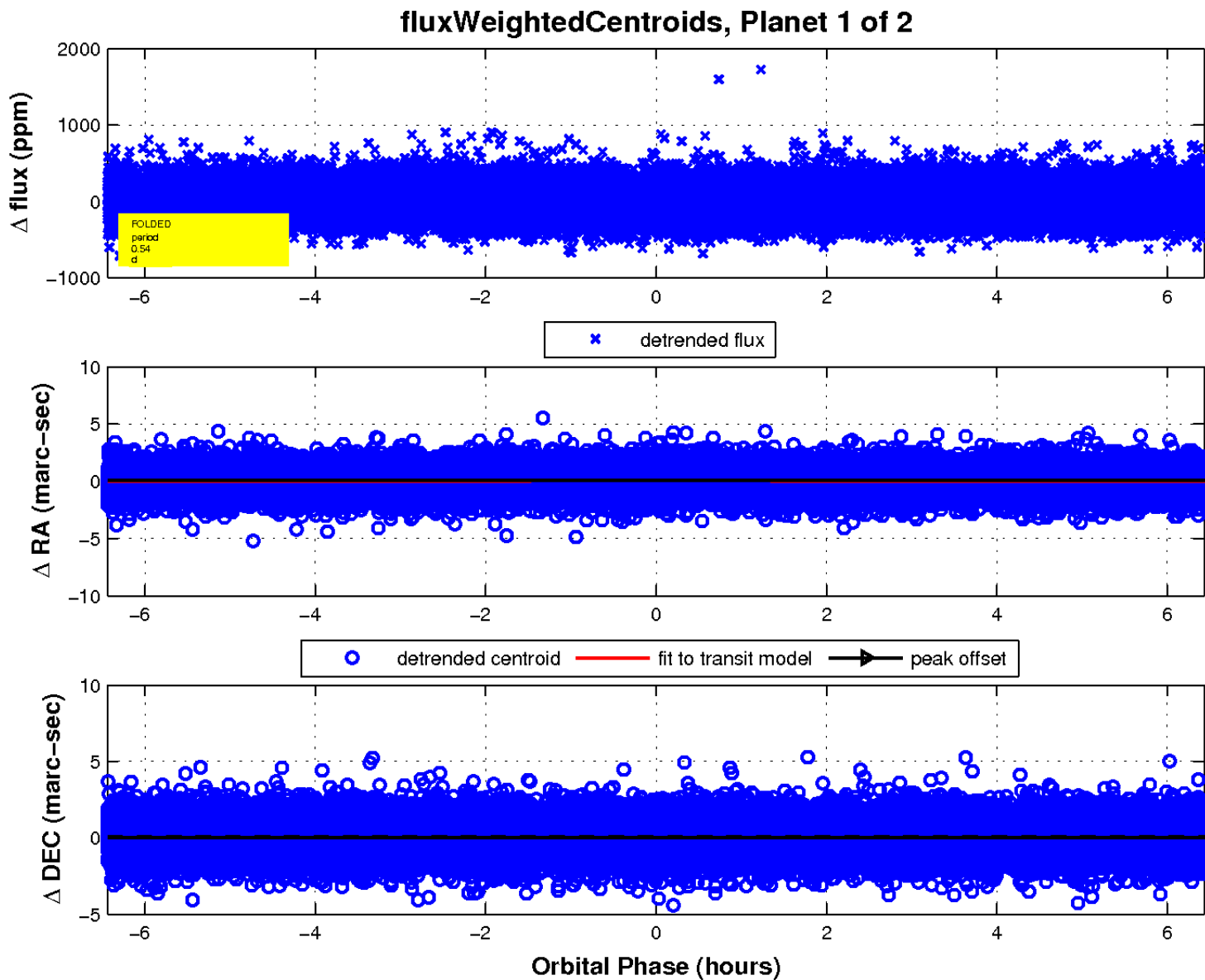
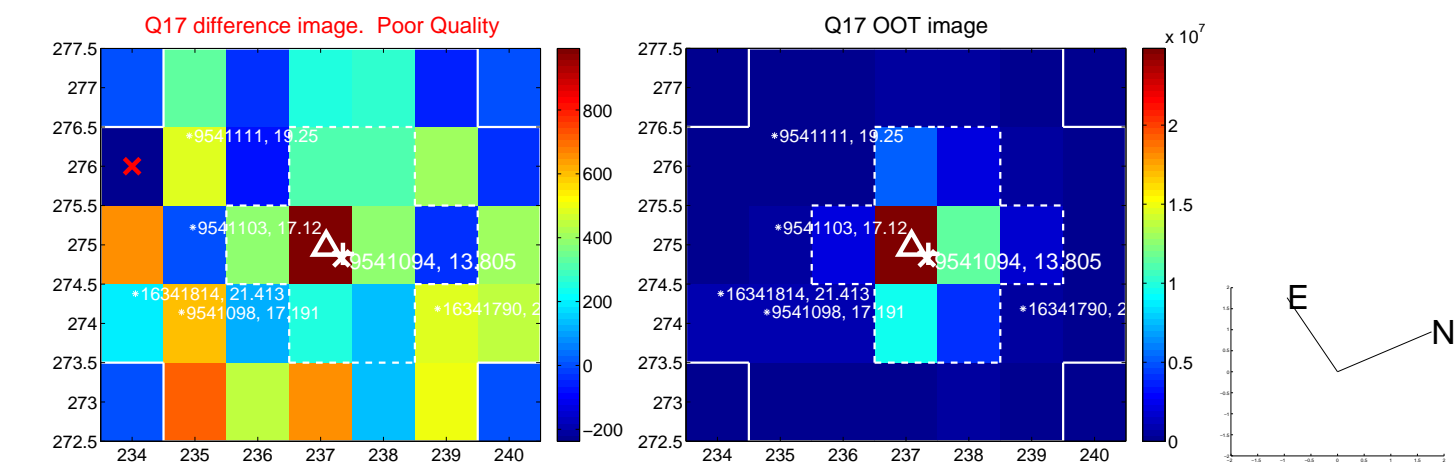
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

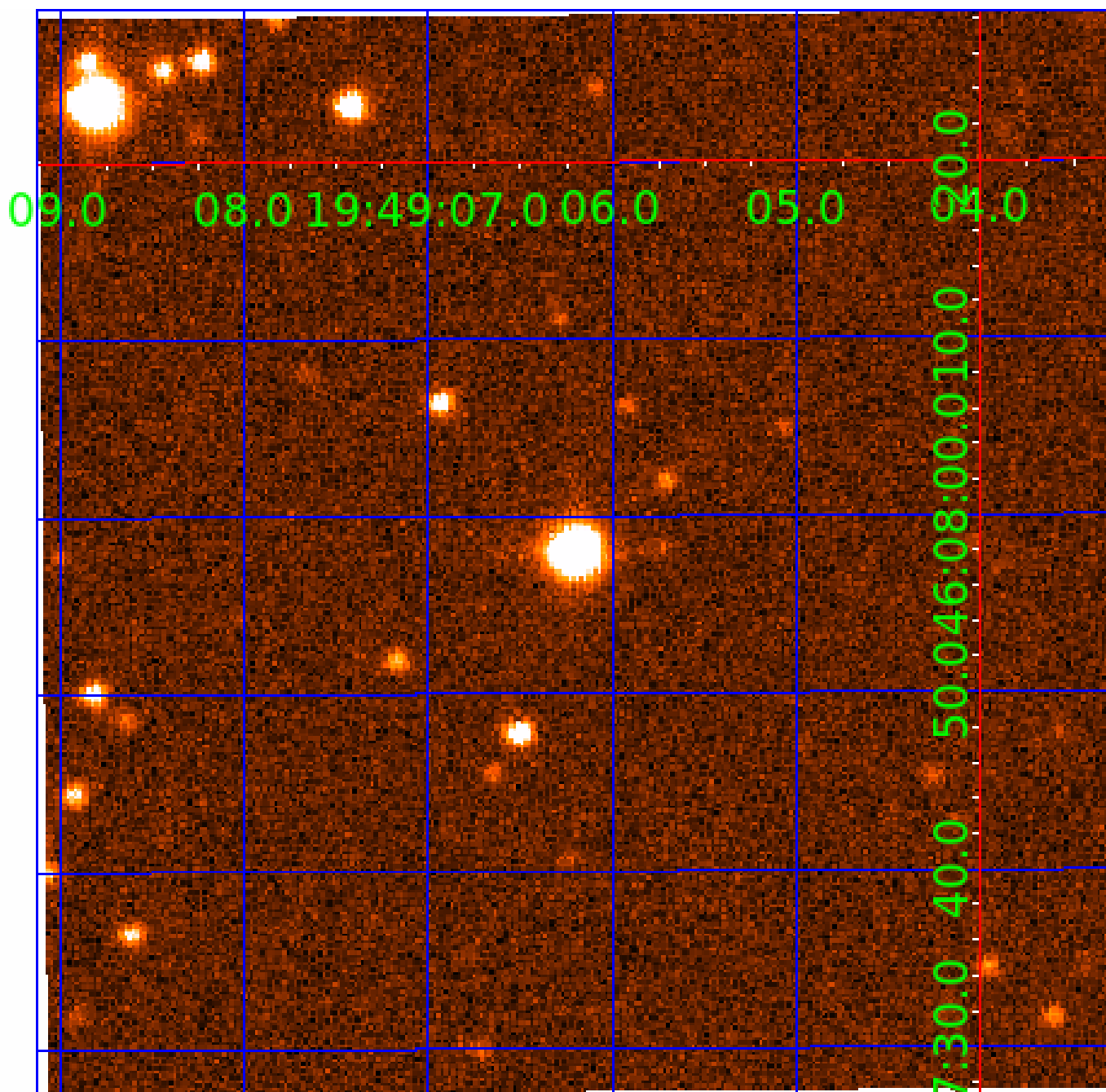


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\Delta$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination





# KIC 009541094

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
009541094-01	OBS	7944.01	0.536651	131.706848	29.7	2.993	12.9	15.0	1.00	5887	0.65	6614.61
009541094-02	OBS	No	126.730611	154.943803	353.8	1.746	7.4	7.5	1.00	5887	1.88	4.53

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009541094-01	OBS	FP	0.00	1	0	1	1	LPP_DV—CENT_UNRESOLVED_OFFSET—HALO_GHOST—EPHEM_MATCH
009541094-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_CHASES—TRANS_GAPPED—MOD_NONUNIQ_DV—MOD_NONUNIQ_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.

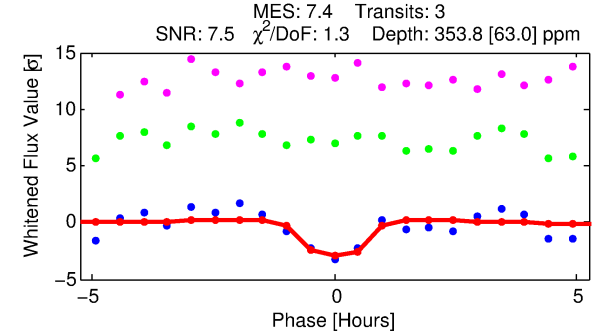
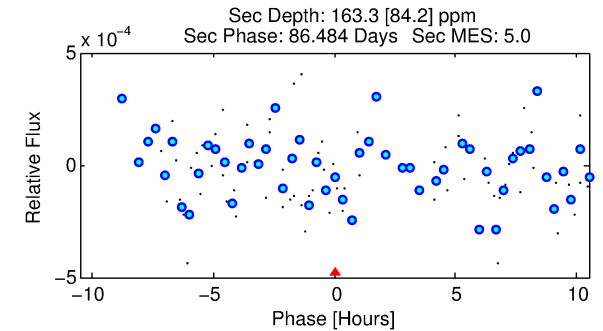
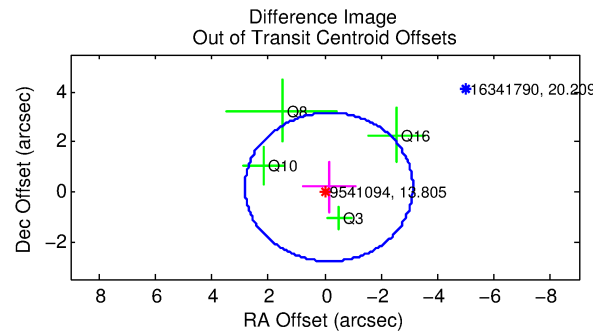
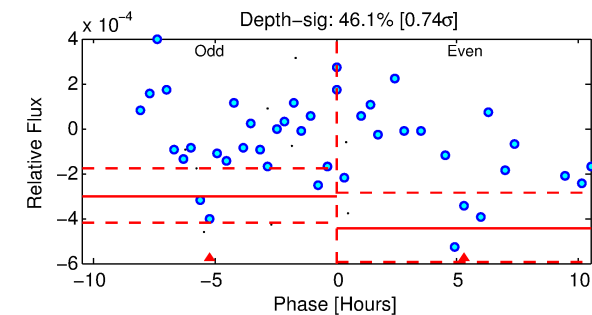
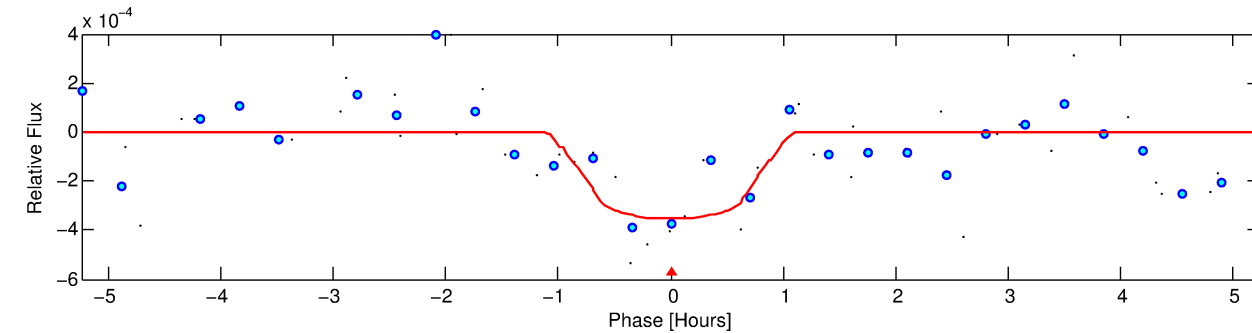
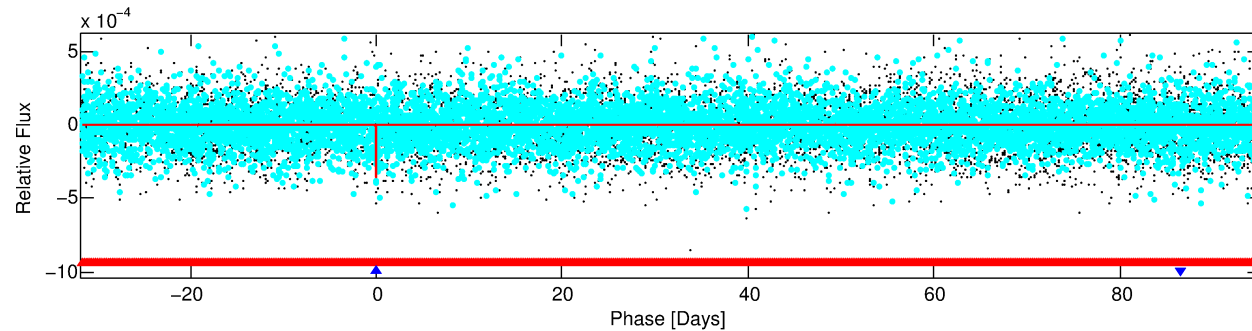
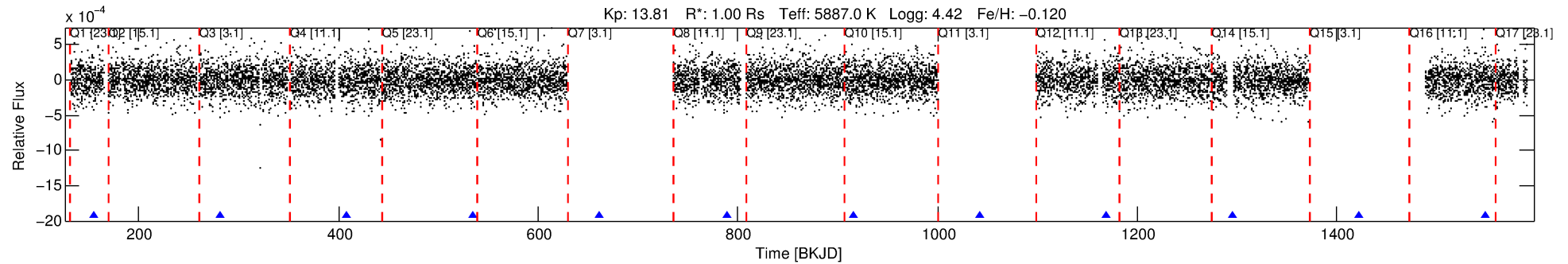
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 009541094-02

No Significant Match Found

# DV One-Page Summary

KIC: 9541094 Candidate: 2 of 2 Period: 126.731 d



## DV Fit Results:

Period = 126.73061 [0.00161] d  
Epoch = 154.9438 [0.0096] BKJD  
Rp/R\* = 0.0172 [0.0551]  
a/R\* = 562.90 [8394.28]  
b = 0.06 [249.66]  
Seff = 4.53 [1.74]  
Teq = 372 [36] K  
Rp = 1.88 [6.04] Re  
a = 0.4878 [0.1193] AU  
Ag = 6073.05 [39173.20] [0.16σ]  
Teffp = 5078 [8177] K [0.58σ]

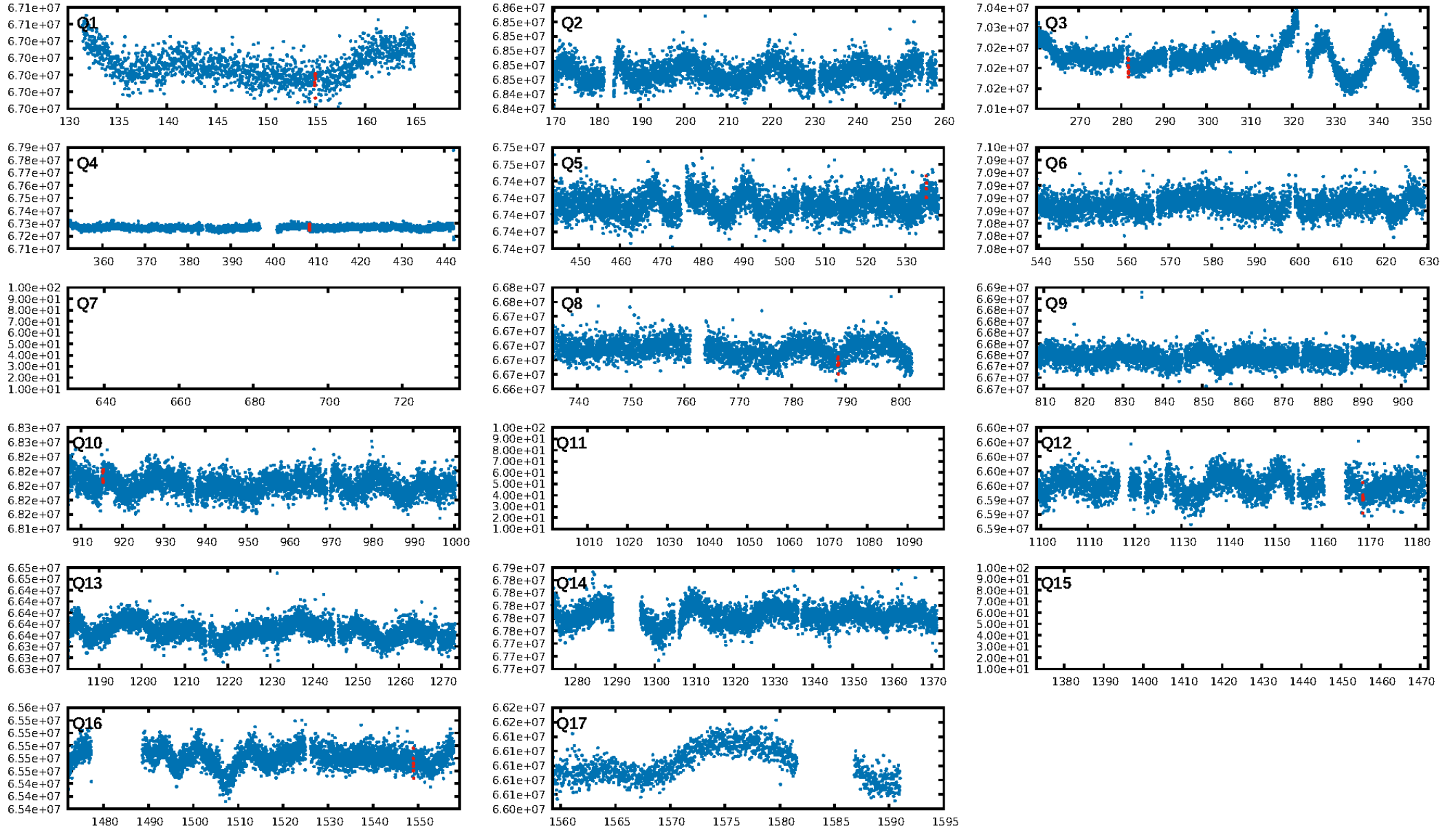
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [873.93σ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: 29.3%  
ModelChiSquareGof-sig: 90.0%  
**Bootstrap-pfa: 6.60e-09**  
RollingBand-fgt: 1.00 [3/3]  
GhostDiagnostic-chr: 42.2  
Centroid-sig: 50.4%  
Centroid-so: 1.031 arcsec [0.68σ]  
OotOffset-rm: 0.240 arcsec [0.24σ]  
KicOffset-rm: 0.377 arcsec [0.36σ]  
OotOffset-st: 1/1/2/0 [4]  
KicOffset-st: 1/1/2/0 [4]  
DiffImageQuality-fgm: 0.25 [1/4]  
DiffImageOverlap-fno: 0.00 [0/8]

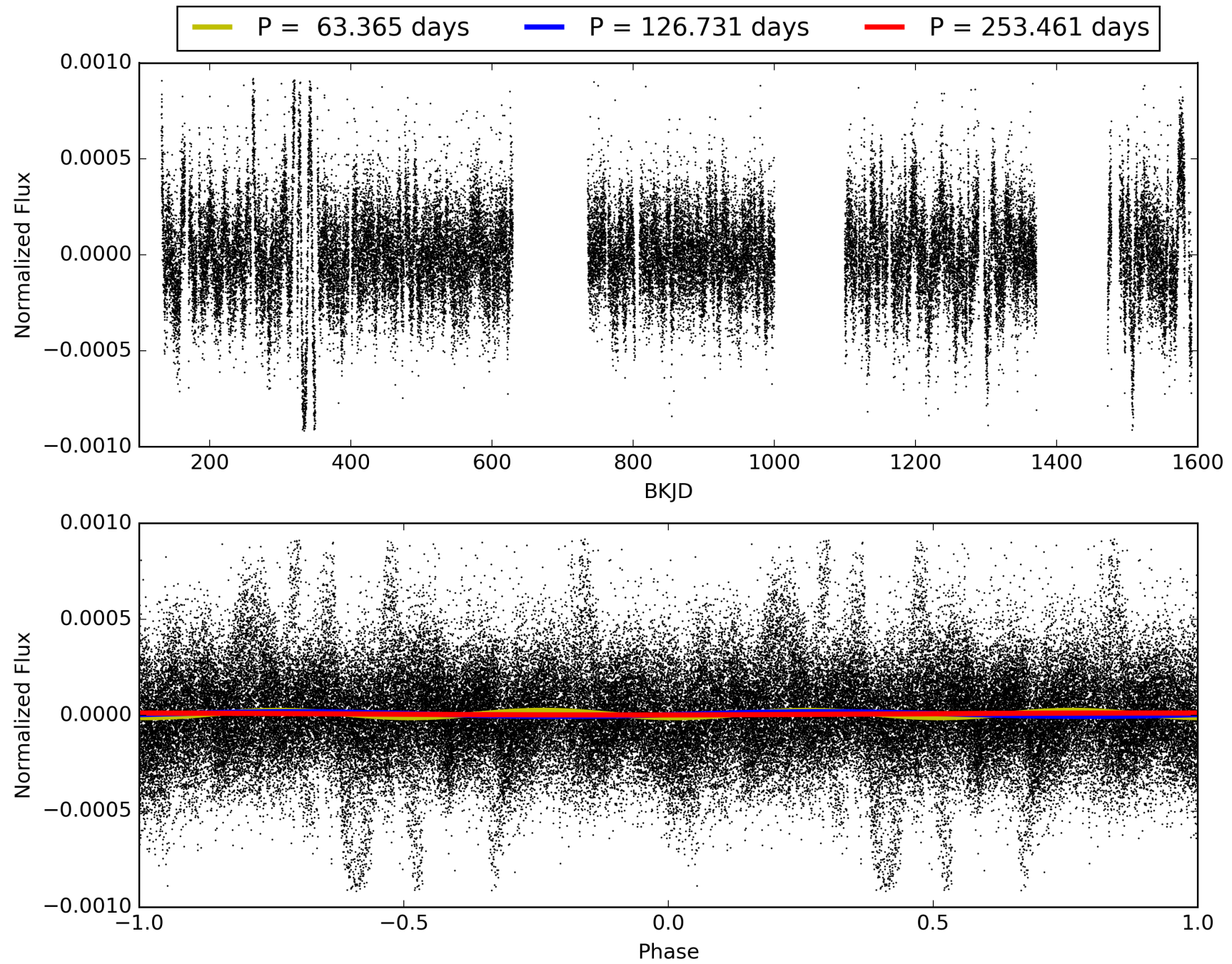
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 31-Jan-2016 14:44:52 Z

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

# TCE 009541094-02, PDC Light Curves



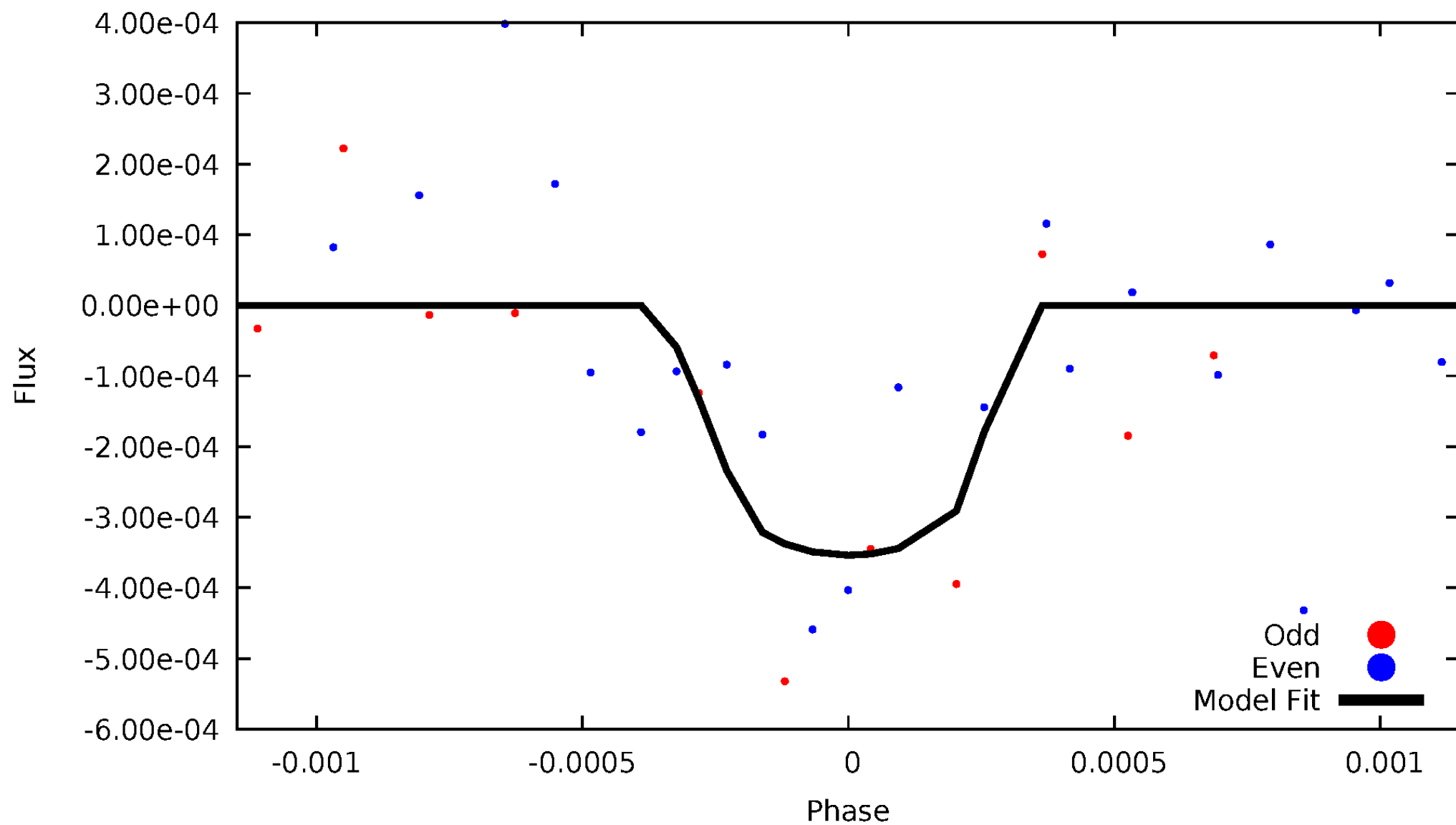
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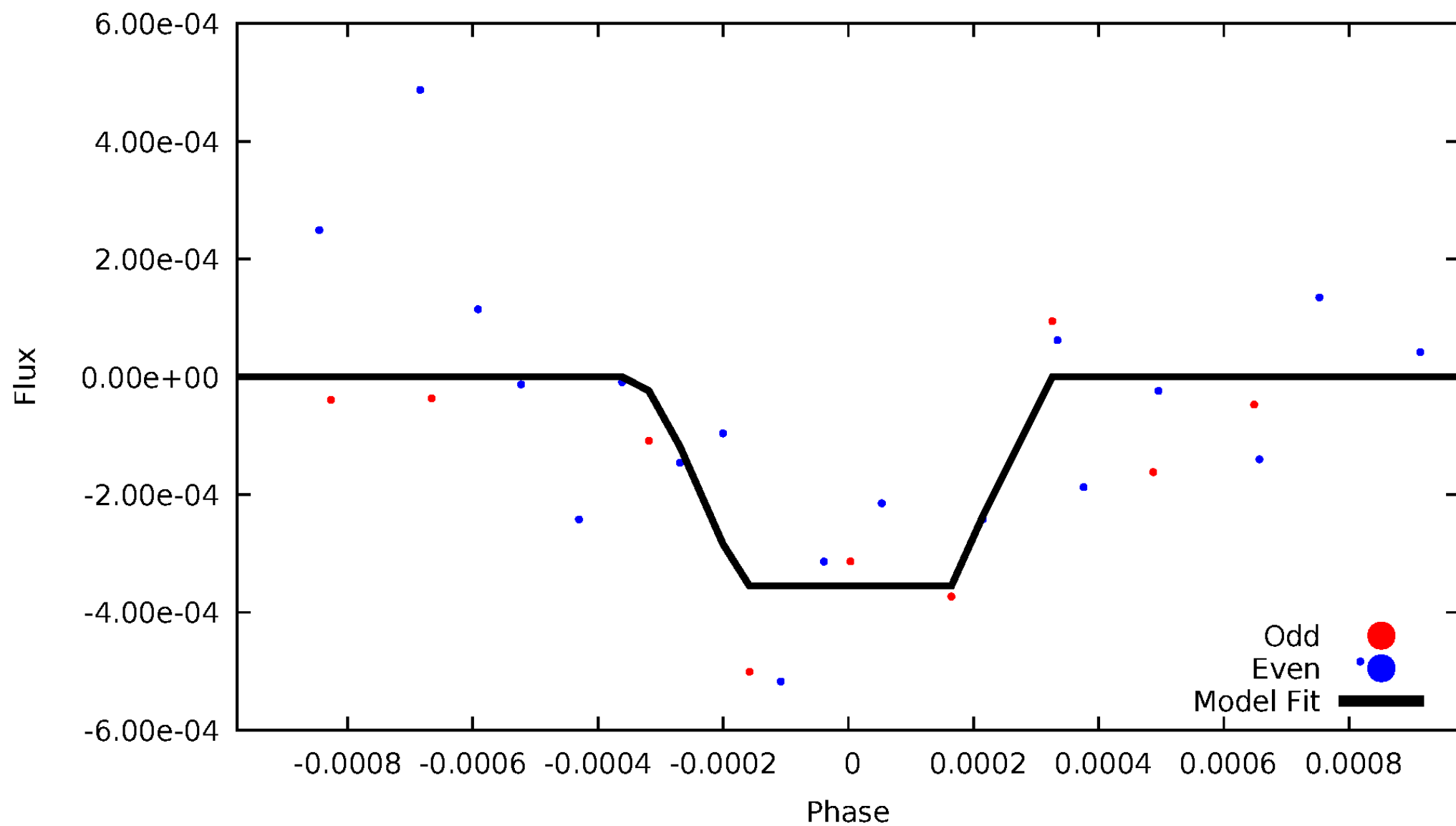
# DV Odd/Even

TCE 009541094-02



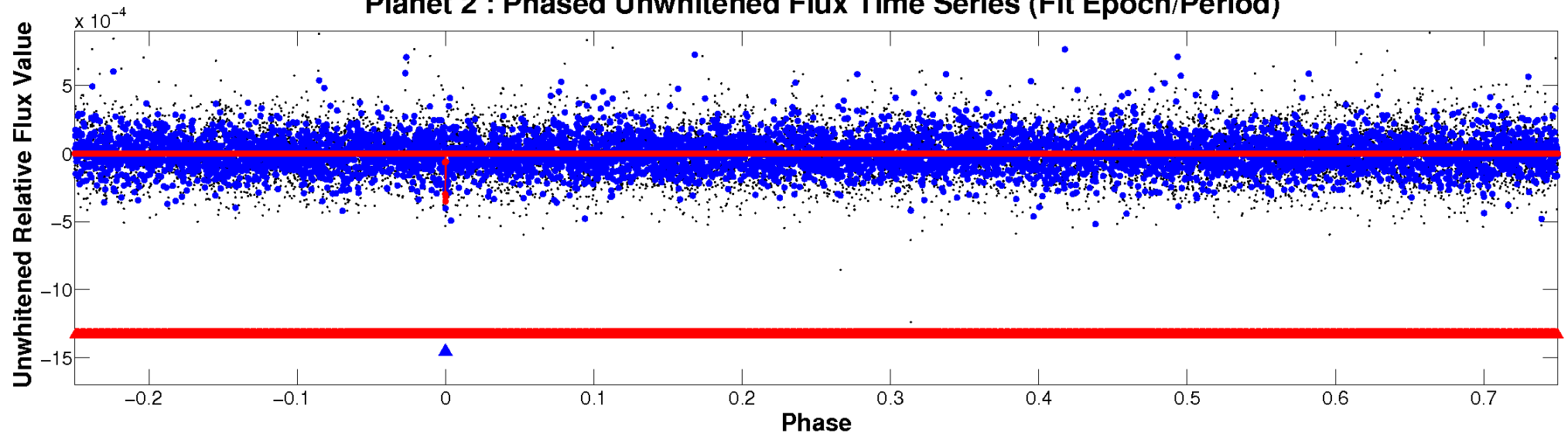
# ALT Odd/Even

TCE 009541094-02

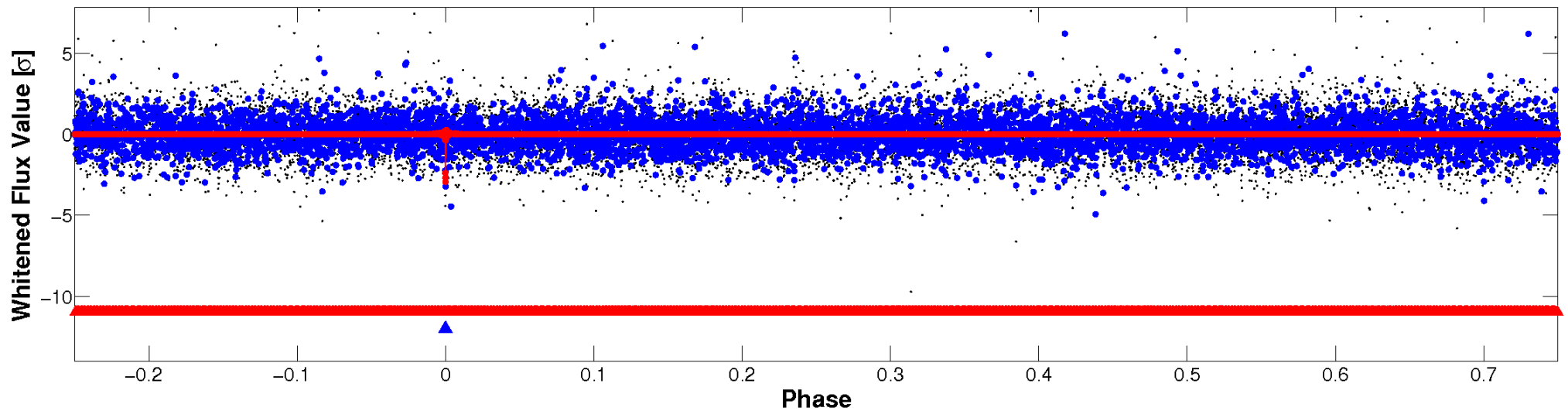


# Non-Whitened Vs. Whitened Light Curve

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

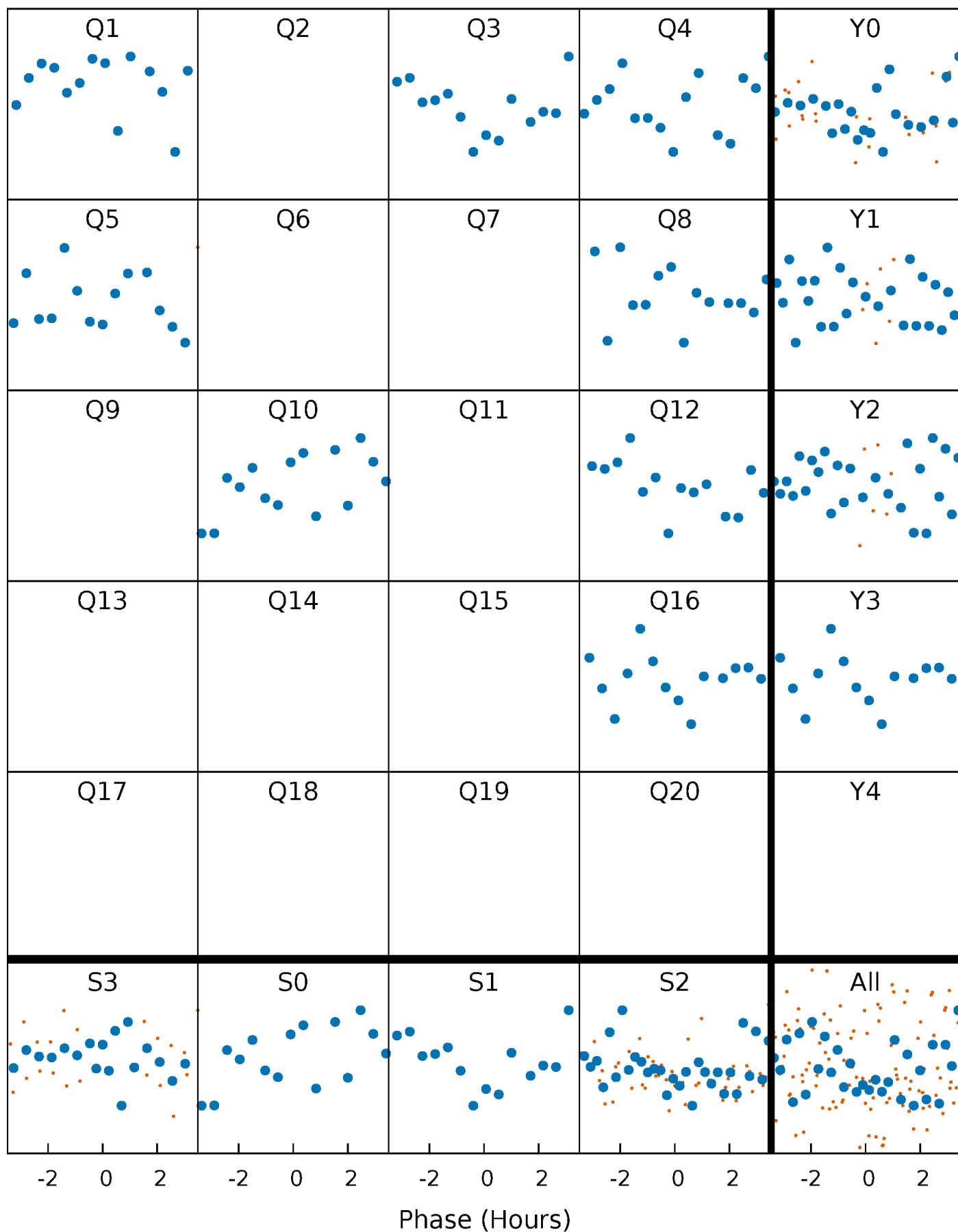


**Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)**



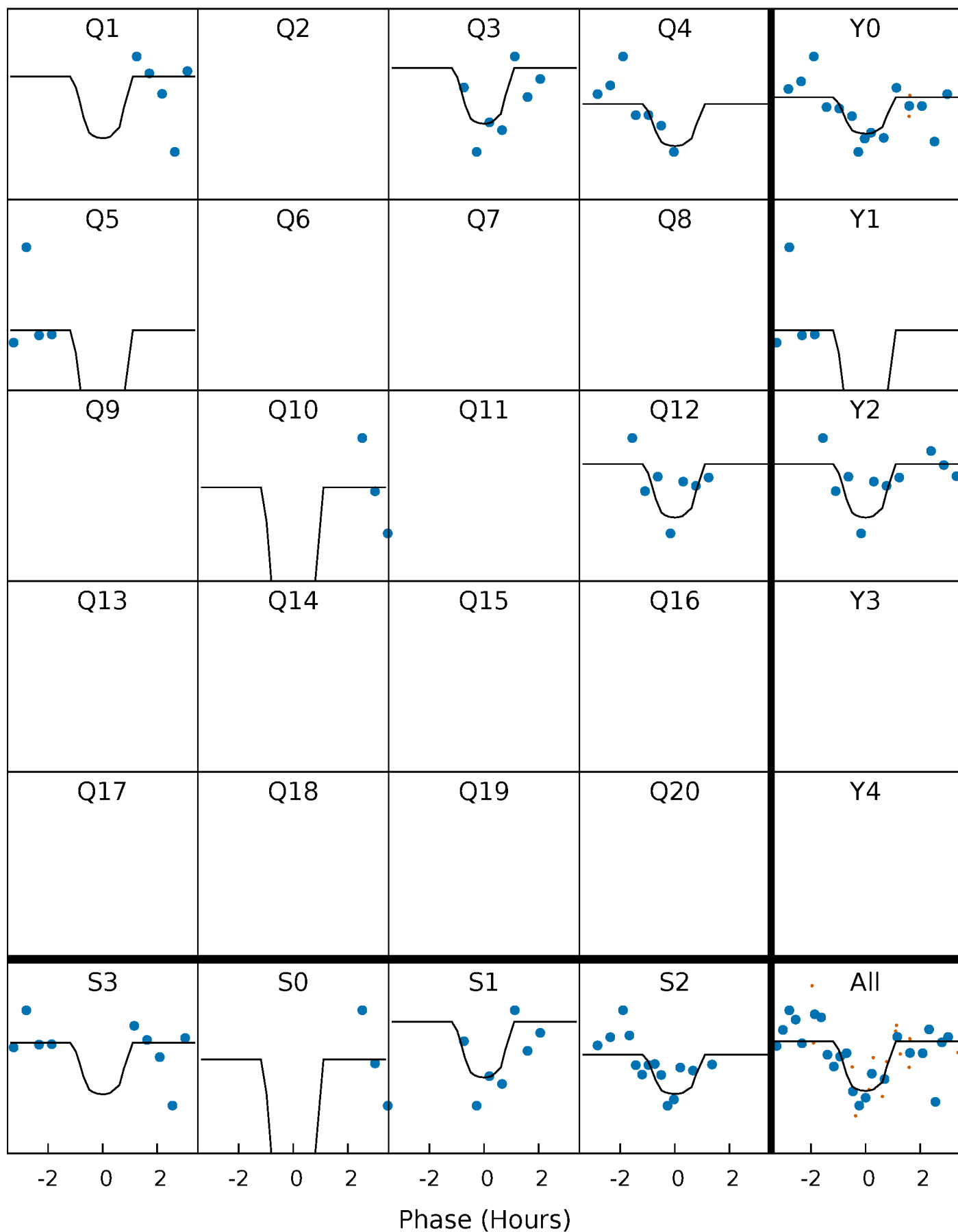
# PDC Quarter-Phased Transit Curves

TCE 009541094-02     $P=126.730611$  Days     $T_0=154.943803$  (BKJD)



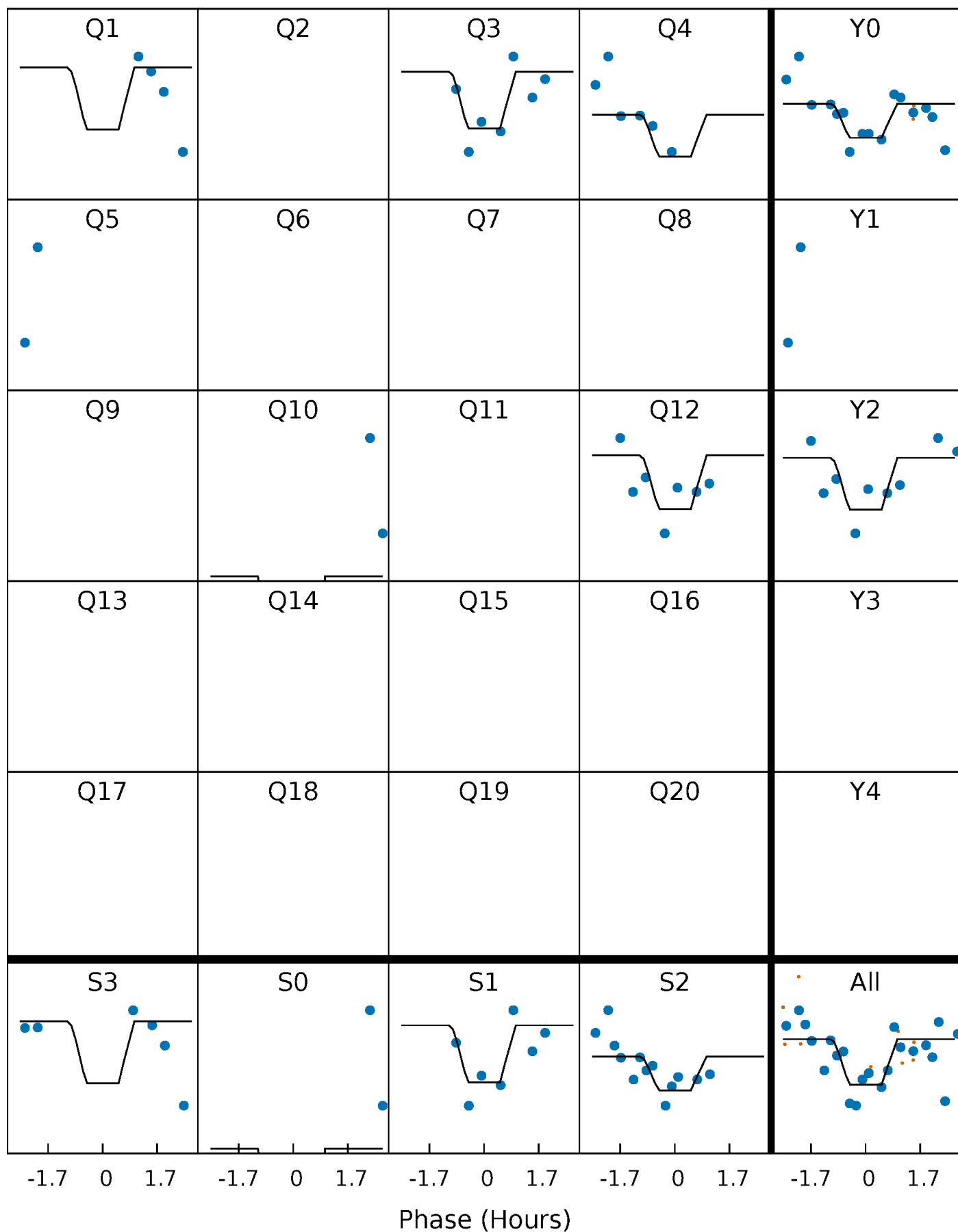
# DV Quarter-Phased Transit Curves

TCE 009541094-02 P=126.730611 Days  $T_0=154.943803$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

TCE 009541094-02 P=126.730658 Days  $T_0=154.948611$  (BKJD)

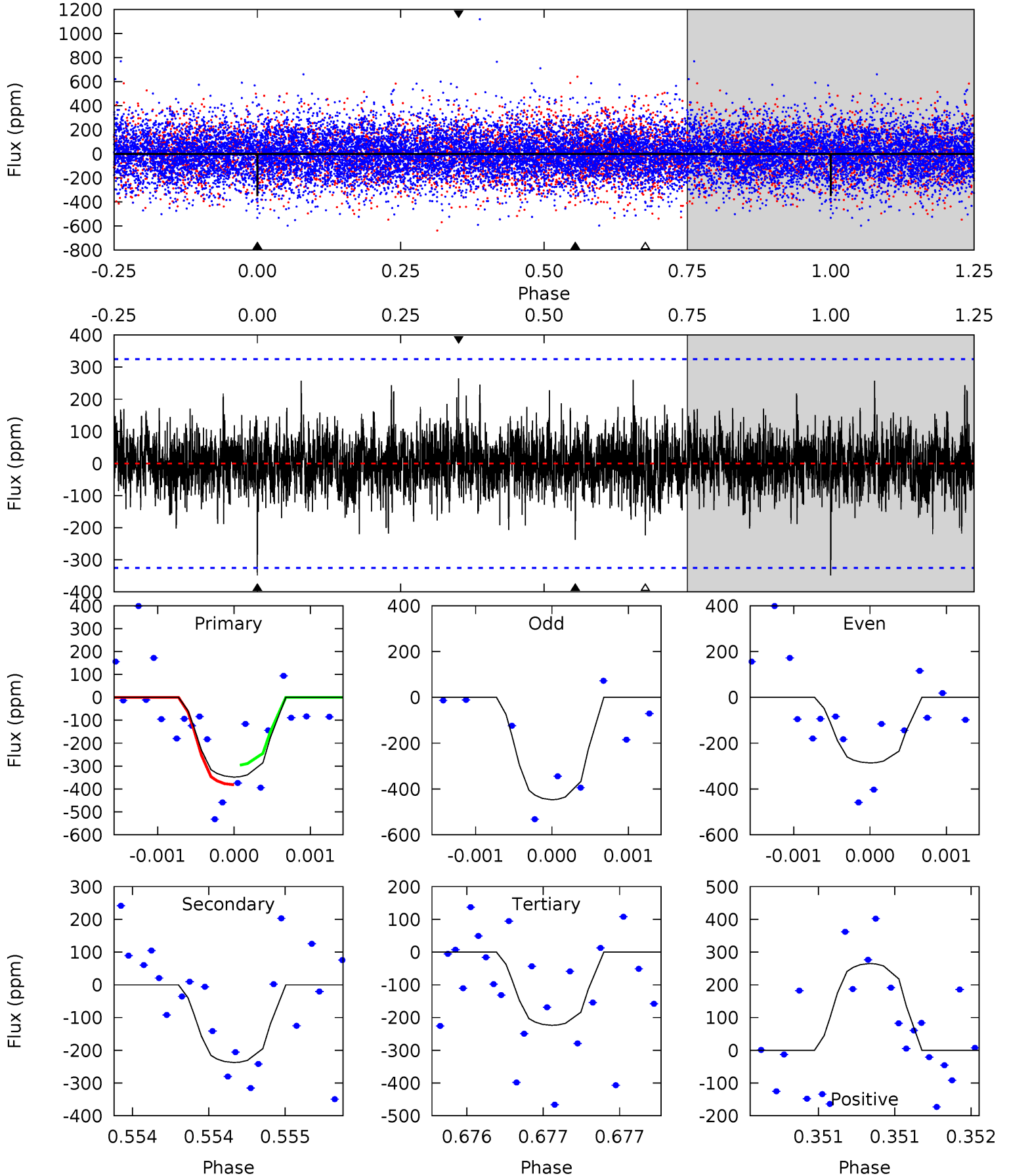




# DV Model-Shift Uniqueness Test

009541094-02, P = 126.730611 Days, E = 28.213192 Days

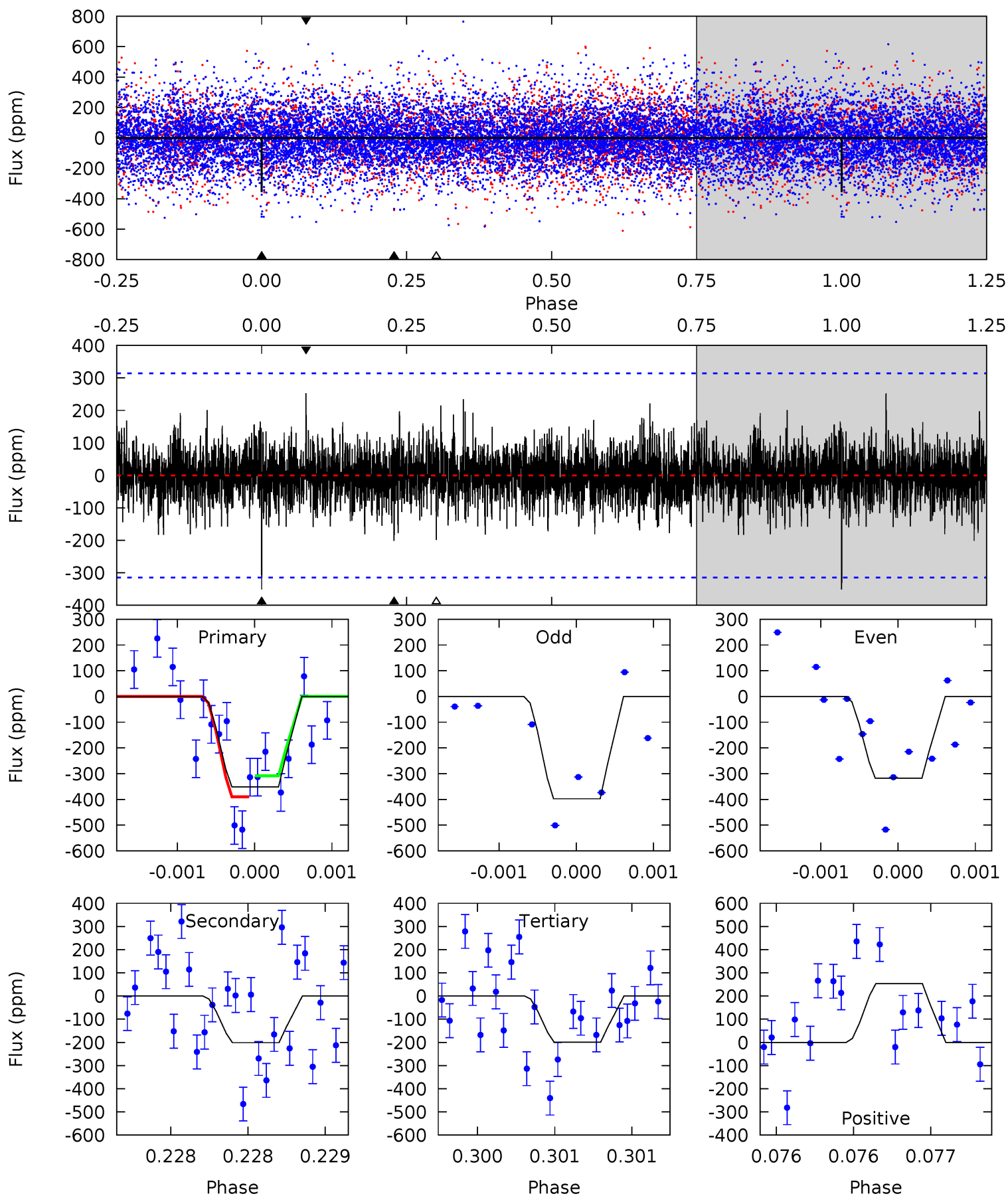
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
5.96	4.06	3.83	4.54	5.56	3.46	1.08	2.13	1.42	0.23	-0.47	1.38	1.09	0.43	0.71



# Alt Model-Shift Uniqueness Test

009541094-02,  $P = 126.730658$  Days,  $E = 28.217953$  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
6.21	3.56	3.52	4.47	5.56	3.46	1.02	2.69	1.73	0.04	-0.92	0.69	0.91	0.42	0.70



### Stellar Parameters For KIC 009541094

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$5887^{+146}_{-176}$	$4.421^{+0.087}_{-0.203}$	$-0.120^{+0.300}_{-0.300}$	$1.001^{+0.283}_{-0.131}$	$0.965^{+0.128}_{-0.105}$	$1.354^{+0.595}_{-0.659}$
	+2%/-3%	+2%/-5%	+250%/-250%	+28%/-13%	+13%/-11%	+44%/-49%
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 009541094-02 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$-237 \pm 58$	$5.11^{+4.33}_{-3.44}$	$527^{+38}_{-26}$	$3819^{+2077}_{-720}$	$1176^{+9008}_{-862}$
Alt.	$-201 \pm 57$	$5.10^{+5.38}_{-3.32}$	$525^{+37}_{-26}$	$3687^{+1934}_{-714}$	$1011^{+7774}_{-781}$

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

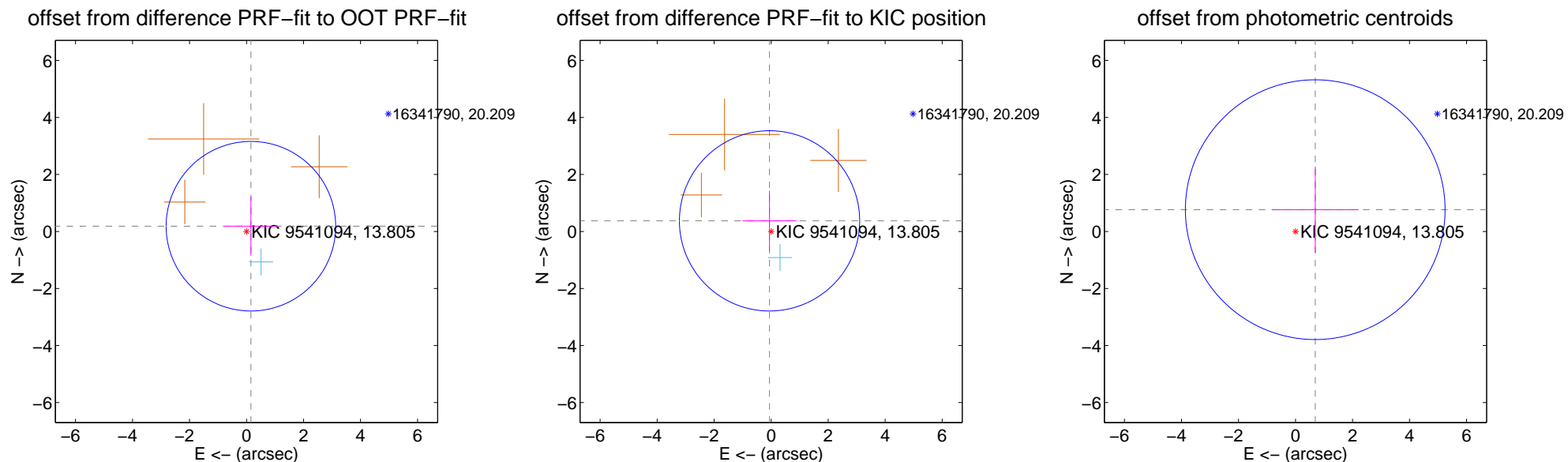
## DV Centroid Data

Supplemental centroid analysis for 009541094-02. Kepler magnitude: 13.80. Transit SNR 7.52

There are 1 quarters with good PRF difference image offsets

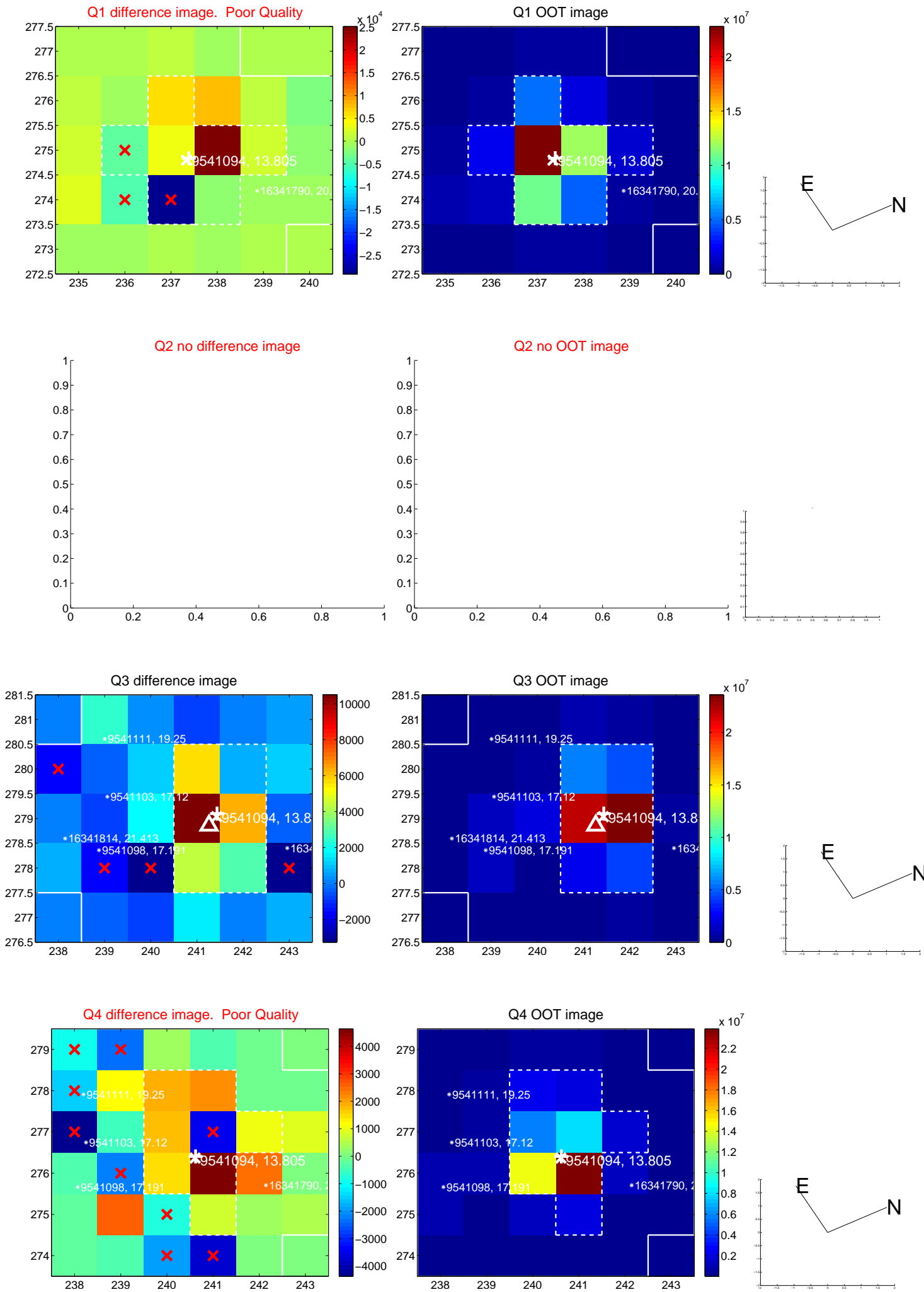
The direct PRF centroid is offset from the target star catalog position by about 0.29 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.240 \pm 0.991$	0.24	$-0.153 \pm 0.929$	$0.184 \pm 1.032$
PRF-fit source offset from KIC position	$0.377 \pm 1.054$	0.36	$0.057 \pm 0.947$	$0.372 \pm 1.056$
photometric centroid source offset	$1.03 \pm 1.52$	0.68	$-0.69 \pm 1.53$	$0.76 \pm 1.51$

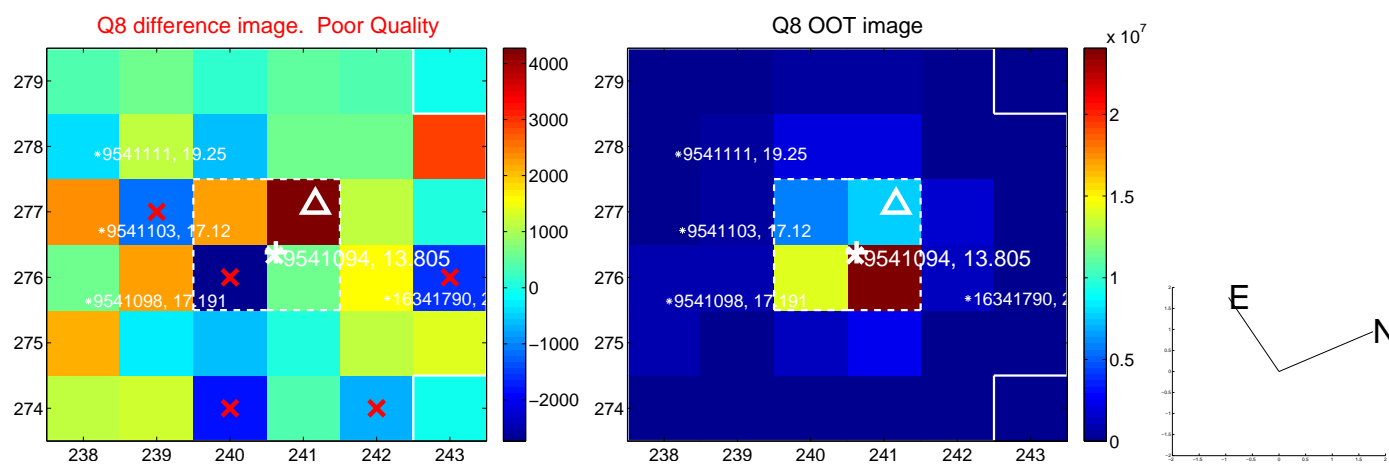
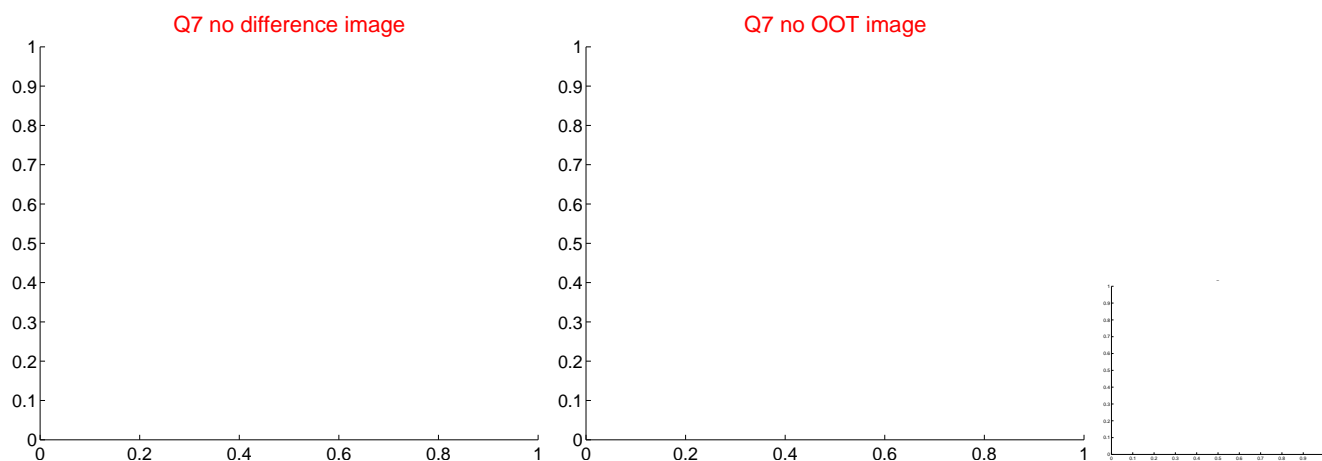
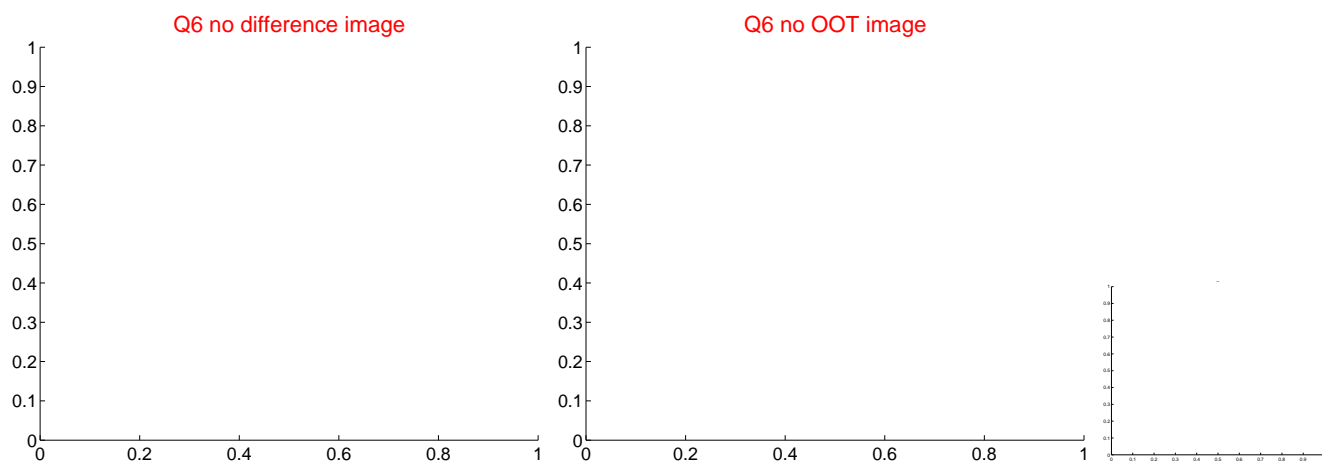
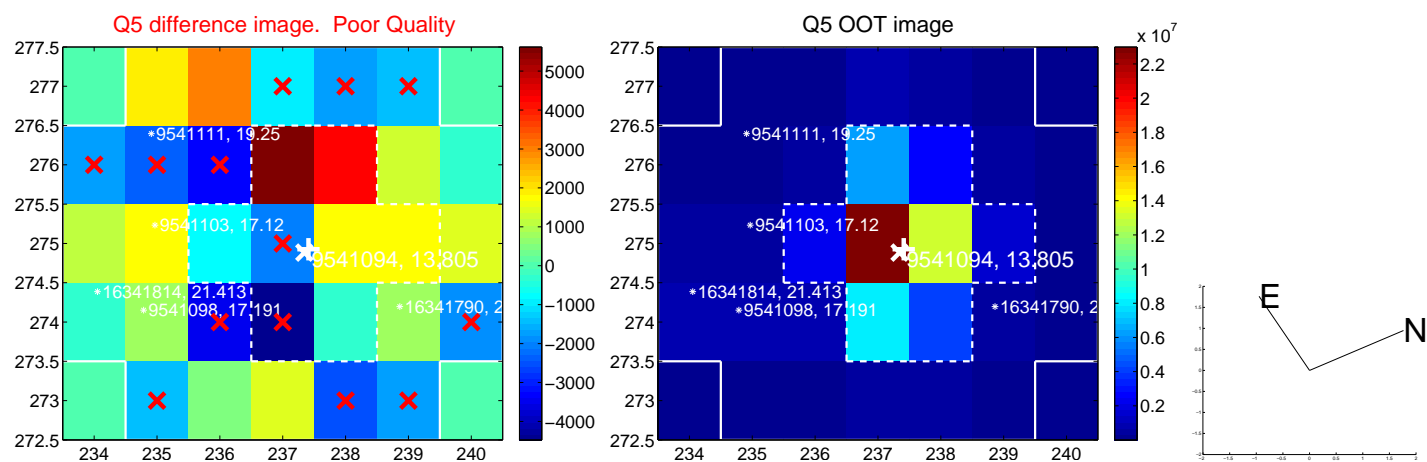


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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

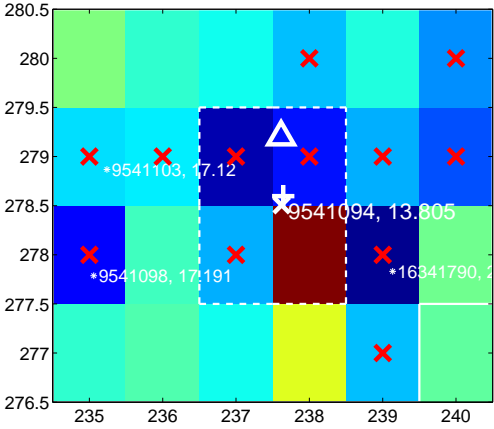
Q9 no difference image



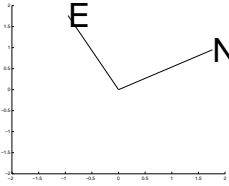
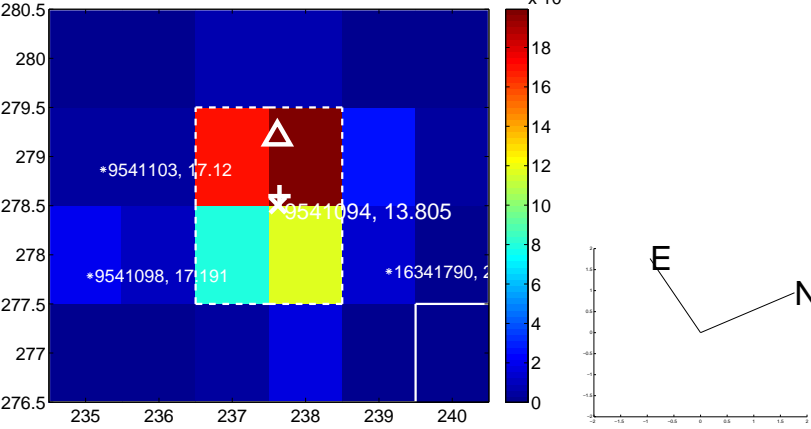
Q9 no OOT image



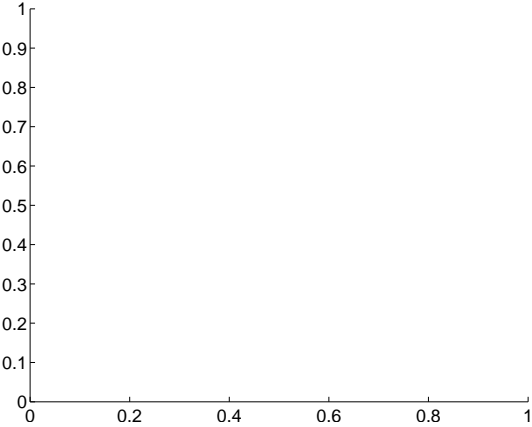
Q10 difference image. Poor Quality



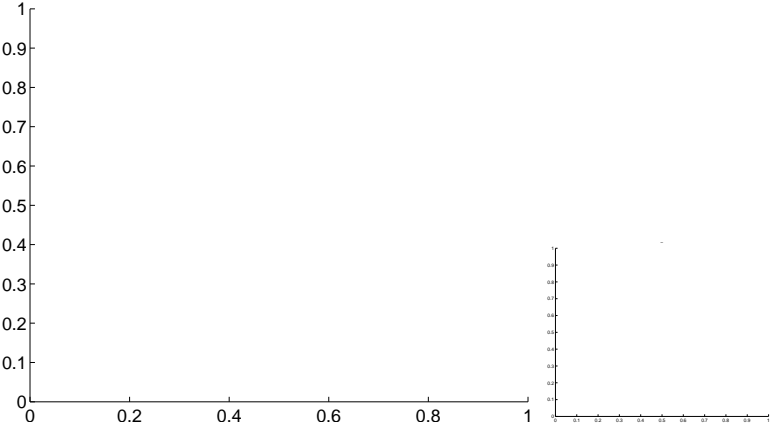
Q10 OOT image



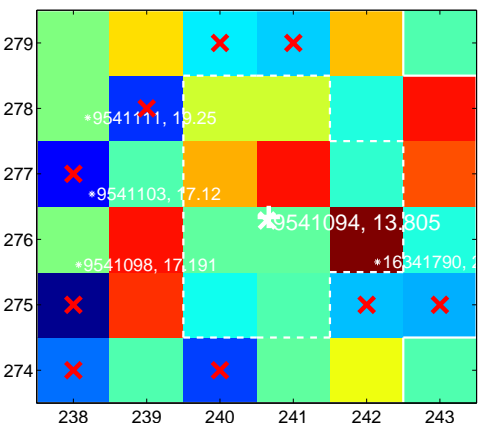
Q11 no difference image



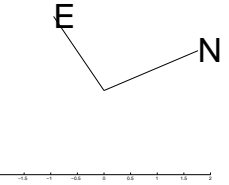
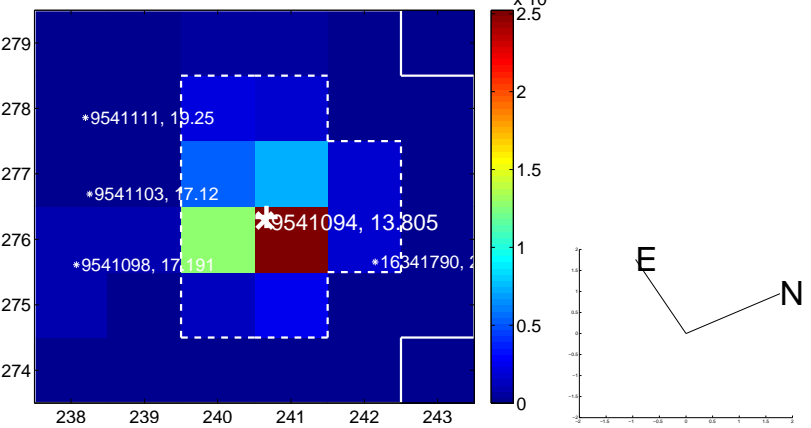
Q11 no OOT image



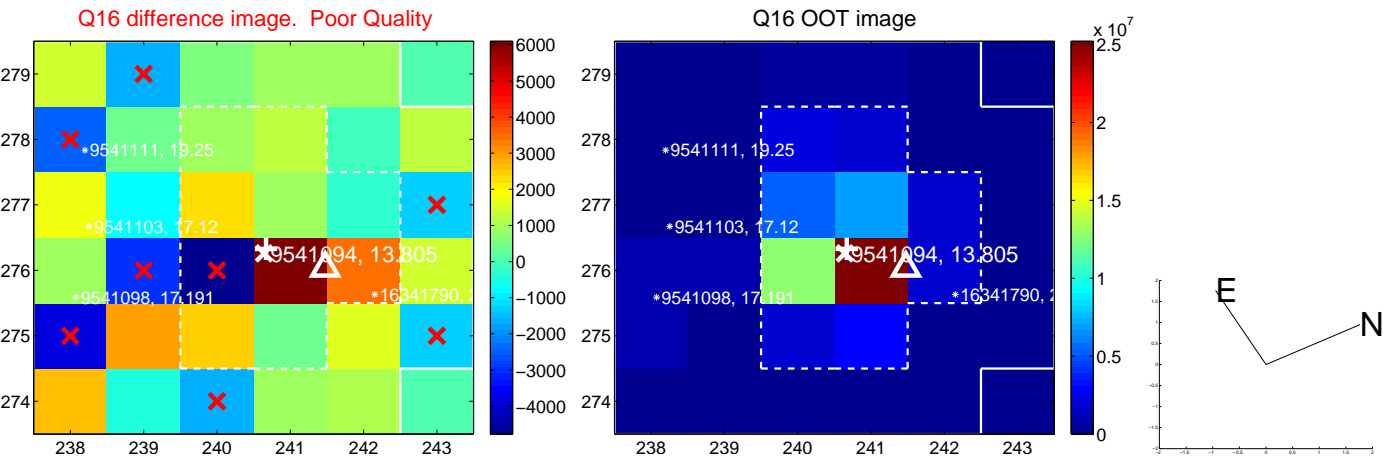
Q12 difference image. Poor Quality



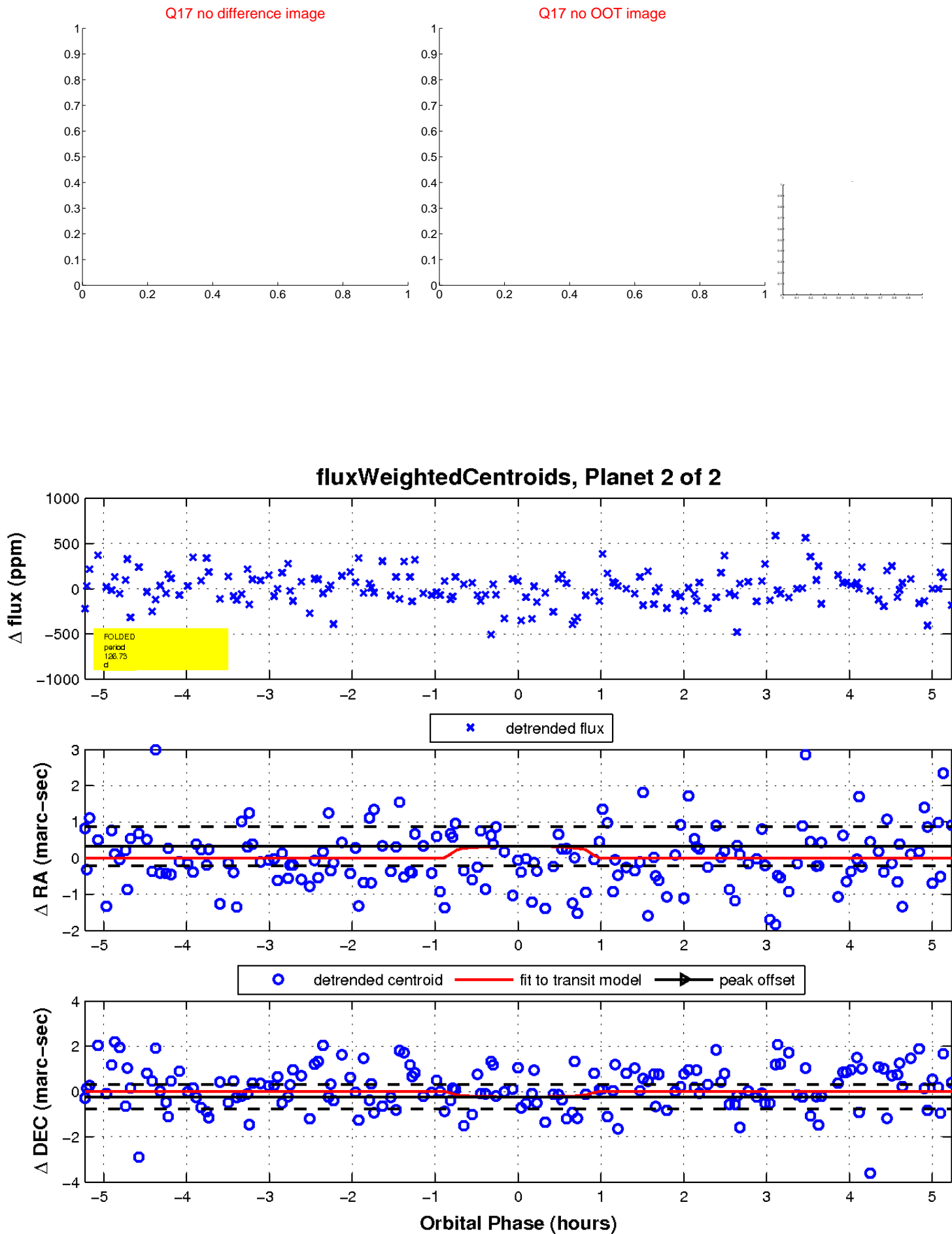
Q12 OOT image



white ×: KIC target position; +: OOT centroid; △: difference centroid. red ✕: large negative pixel value.



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



UKIRT Image

Declination

