

# KIC 003441159

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
003441159-01	OBS	No	0.804996	132.207360	51.4	2.282	10.1	11.3	4.11	7234	3.42	87721.02
003441159-02	OBS	No	0.516240	131.959325	48.9	2.968	8.8	11.5	4.11	7234	3.33	0.00
003441159-03	OBS	No	60.003275	135.098380	517.9	1.717	8.9	5.8	4.11	7234	9.48	279.64
003441159-04	OBS	No	61.455669	162.032215	211.8	19.338	7.8	5.9	4.11	7234	6.54	270.86

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
003441159-01	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—CENT_SATURATED
003441159-02	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—CENT_SATURATED
003441159-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—CENT_SATURATED
003441159-04	OBS	FP	0.00	1	0	1	0	INDIV_TRANS_RUBBLE_SKYE—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—CENT_SATURATED—HALO_GHOST

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

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

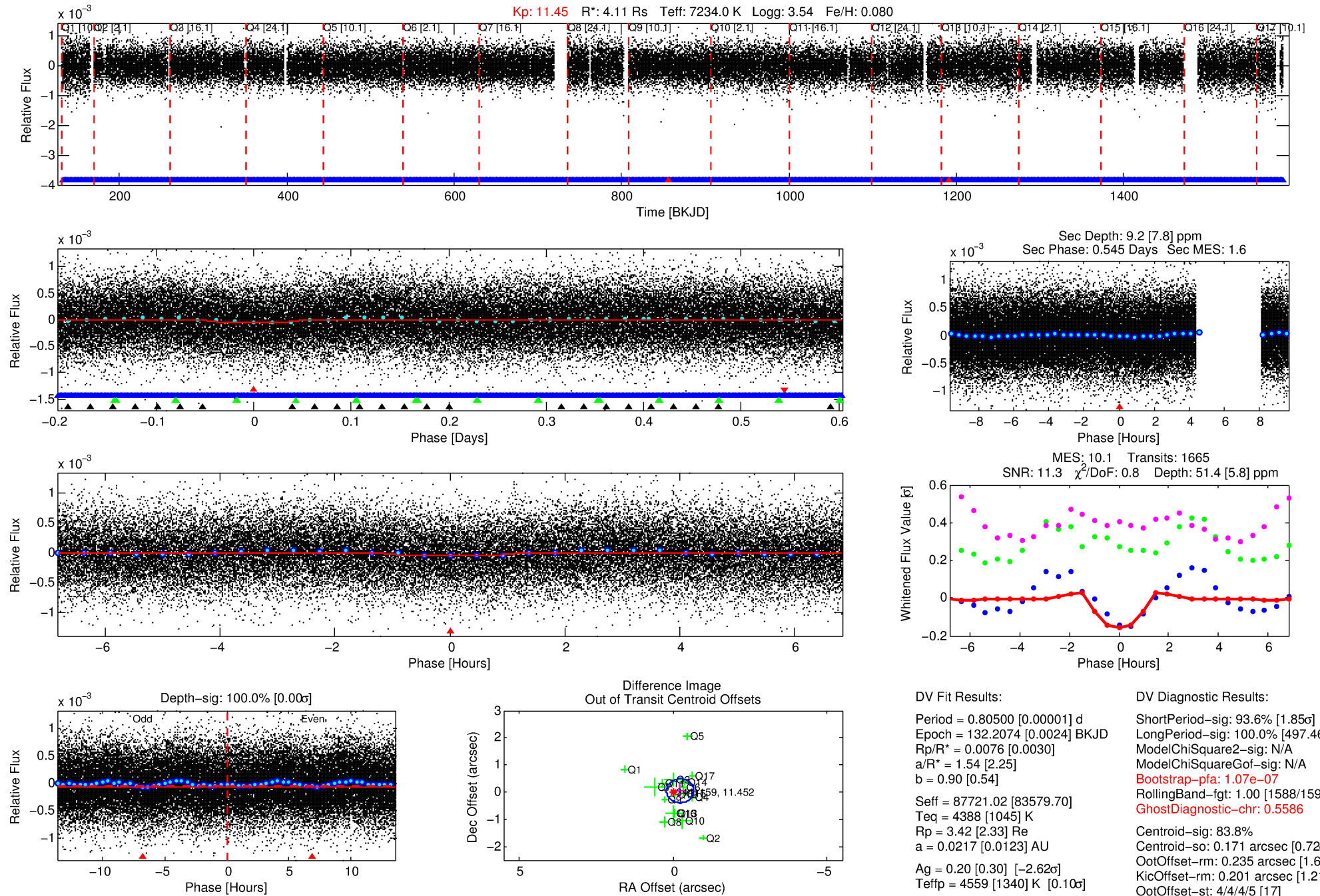
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 003441159-01

No Significant Match Found

# DV One-Page Summary

KIC: 3441159 Candidate: 1 of 4 Period: 0.805 d



## DV Fit Results:

Period = 0.80500 [0.00001] d  
Epoch = 132.2074 [0.0024] BKJD  
Rp/R\* = 0.0076 [0.0030]  
a/R\* = 1.54 [2.25]  
b = 0.90 [0.54]  
Seff = 87721.02 [83579.70]  
Teq = 4388 [1045] K  
Rp = 3.42 [2.33] Re  
a = 0.0217 [0.0123] AU  
Ag = 0.20 [0.30] [-2.62σ]  
Teffp = 4559 [1340] K [0.10σ]

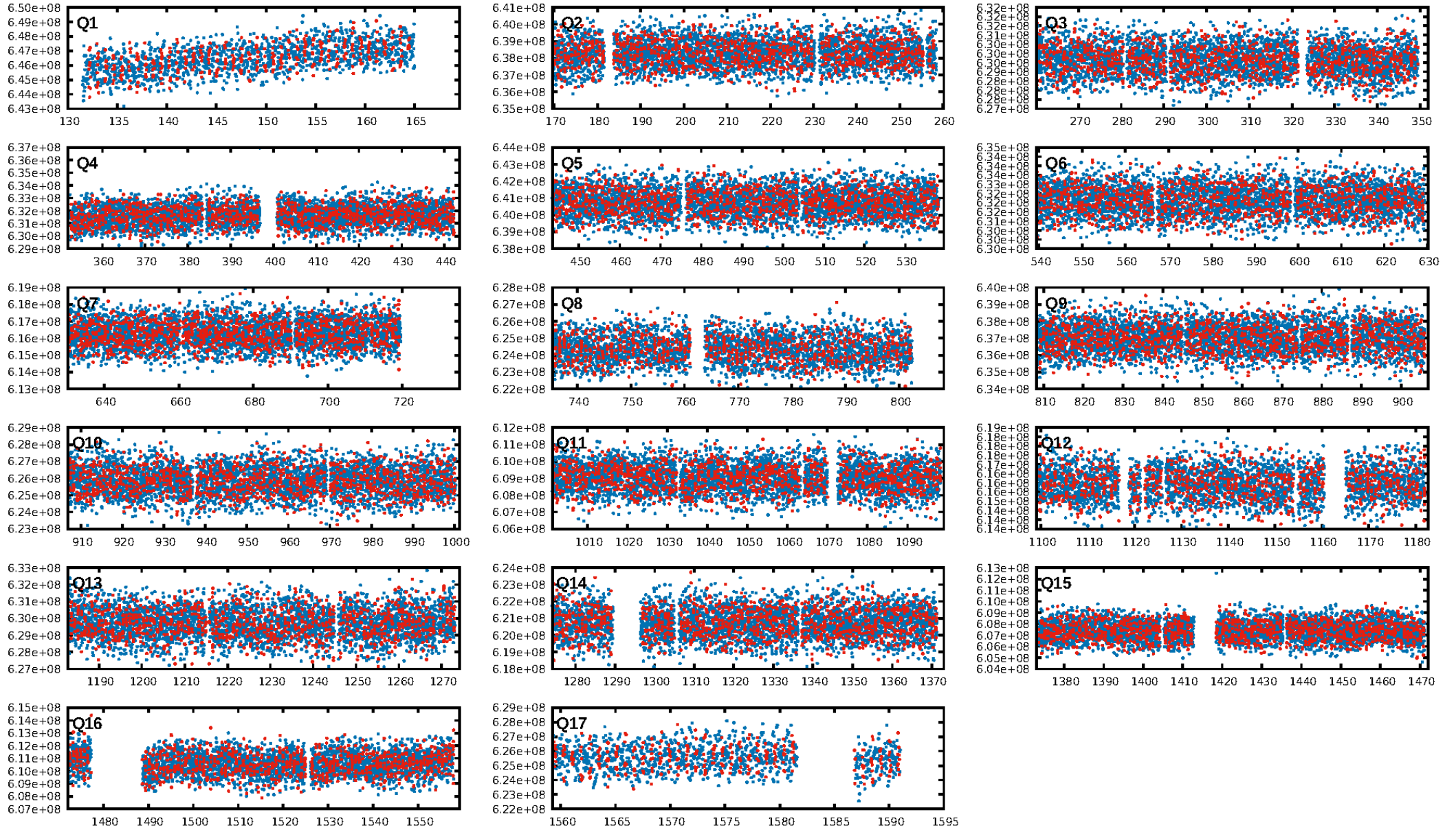
## DV Diagnostic Results:

ShortPeriod-sig: 93.6% [1.85σ]  
LongPeriod-sig: 100.0% [497.46σ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
**Bootstrap-pfa: 1.07e-07**  
RollingBand-fgt: 1.00 [1588/1590]  
**GhostDiagnostic-chr: 0.5586**  
Centroid-sig: 83.8%  
Centroid-so: 0.171 arcsec [0.72σ]  
OotOffset-rm: 0.235 arcsec [1.60σ]  
KicOffset-rm: 0.201 arcsec [1.21σ]  
OotOffset-st: 4/4/4/5 [17]  
KicOffset-st: 4/4/4/5 [17]  
DiffImageQuality-fgm: 1.00 [17/17]  
DiffImageOverlap-fno: 0.00 [0/17]

Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 31-Jan-2016 10:39:51 Z

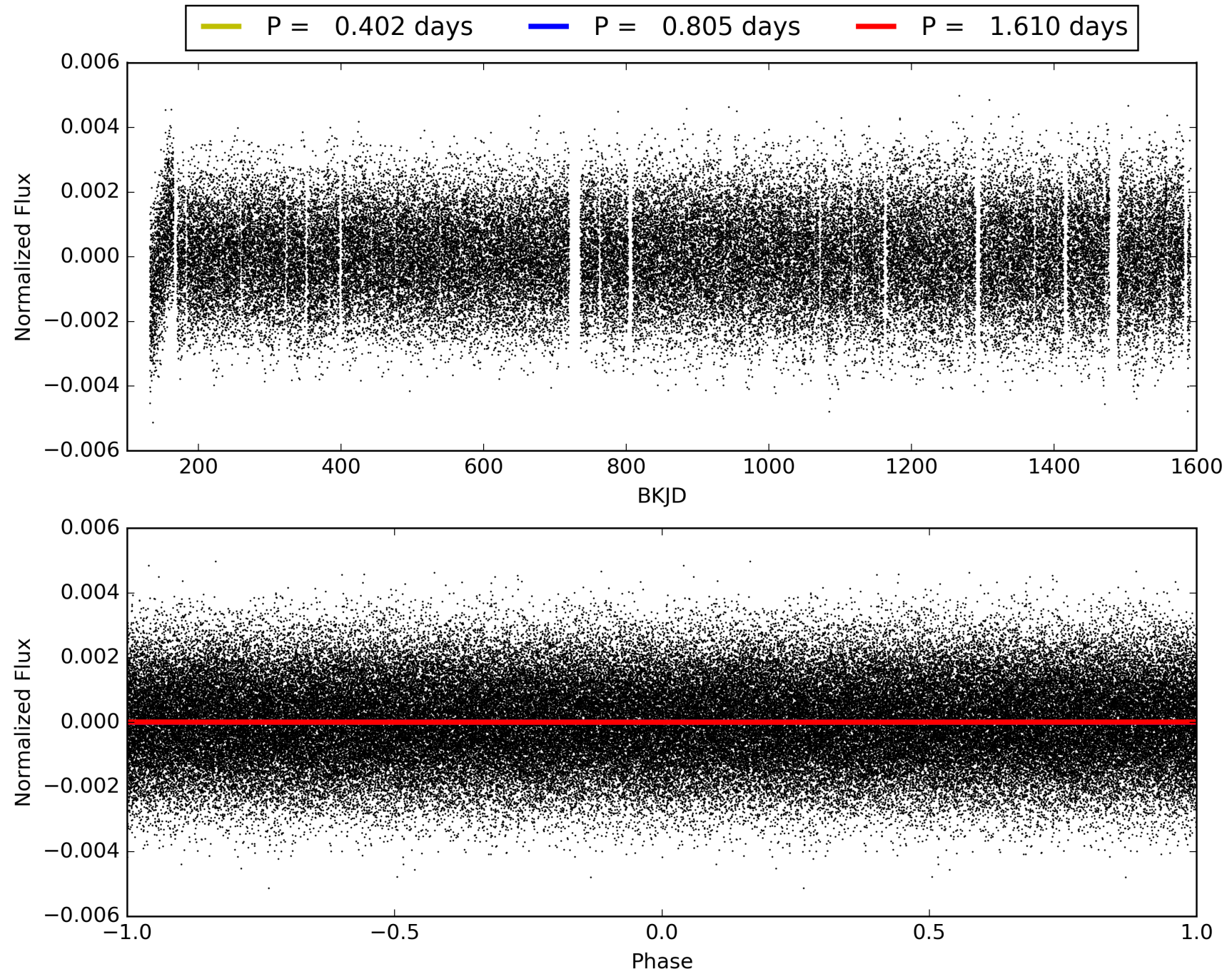
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

# TCE 003441159-01, PDC Light Curves





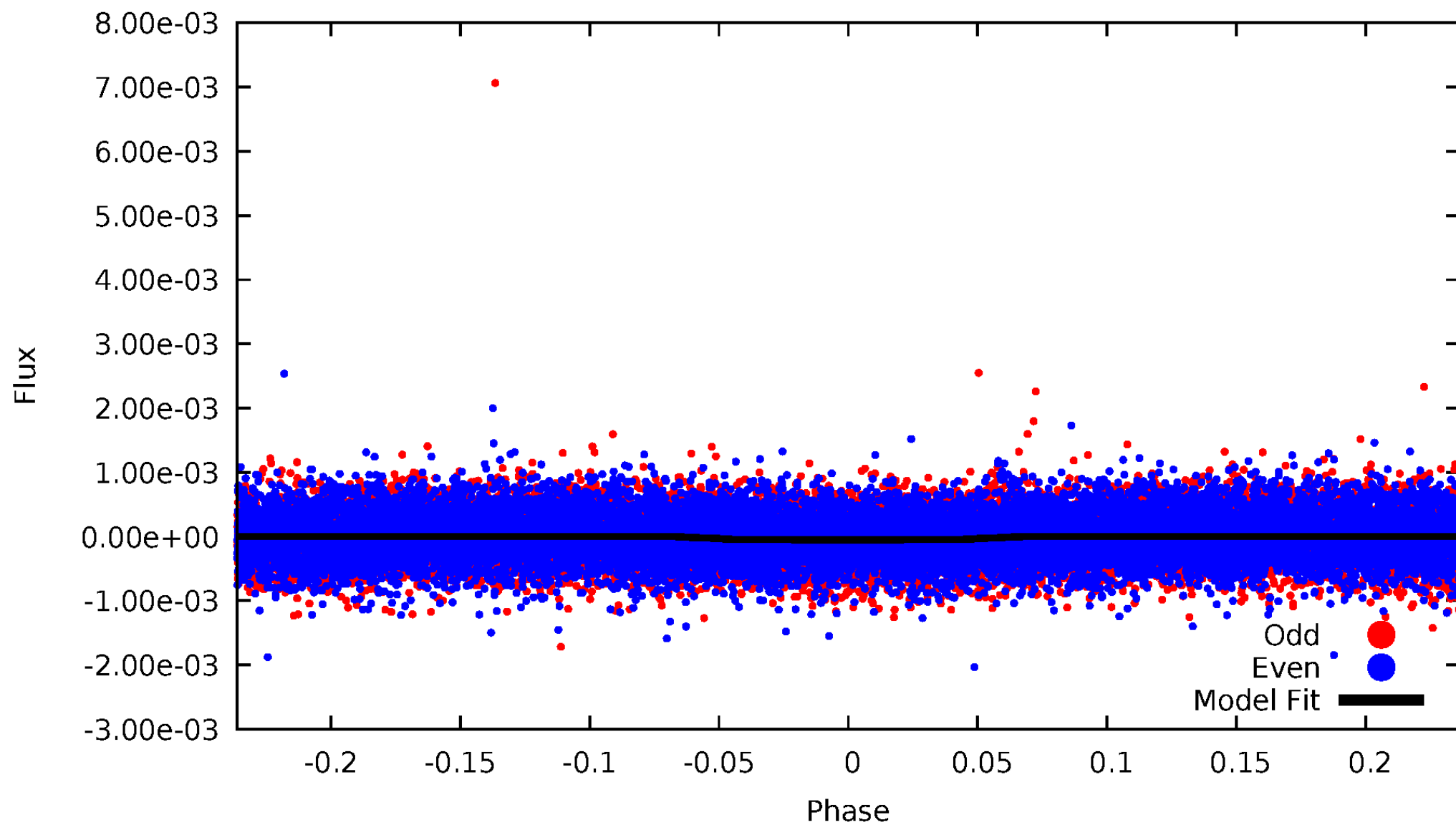
TCE 003441159-01





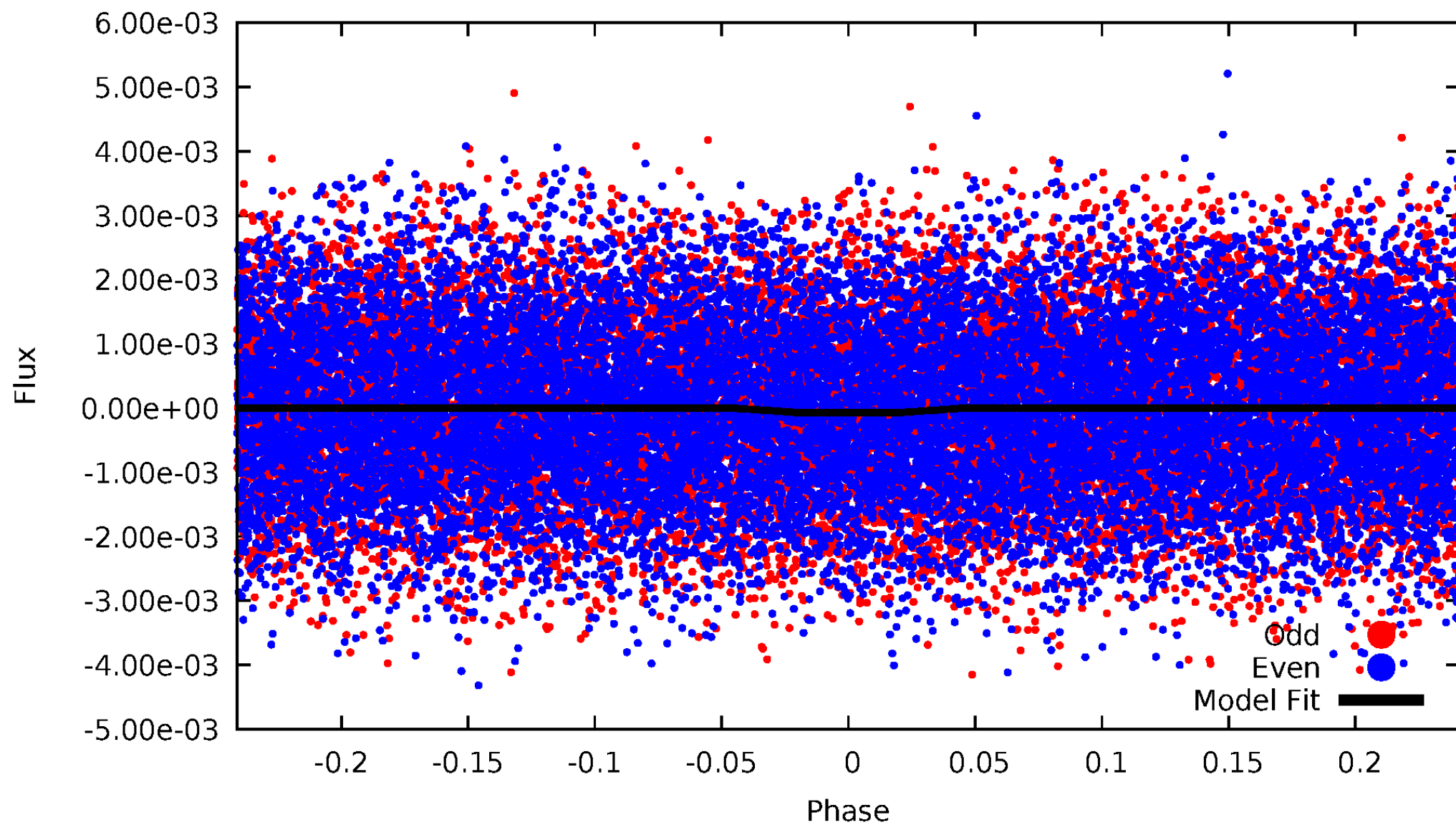
# DV Odd/Even

TCE 003441159-01



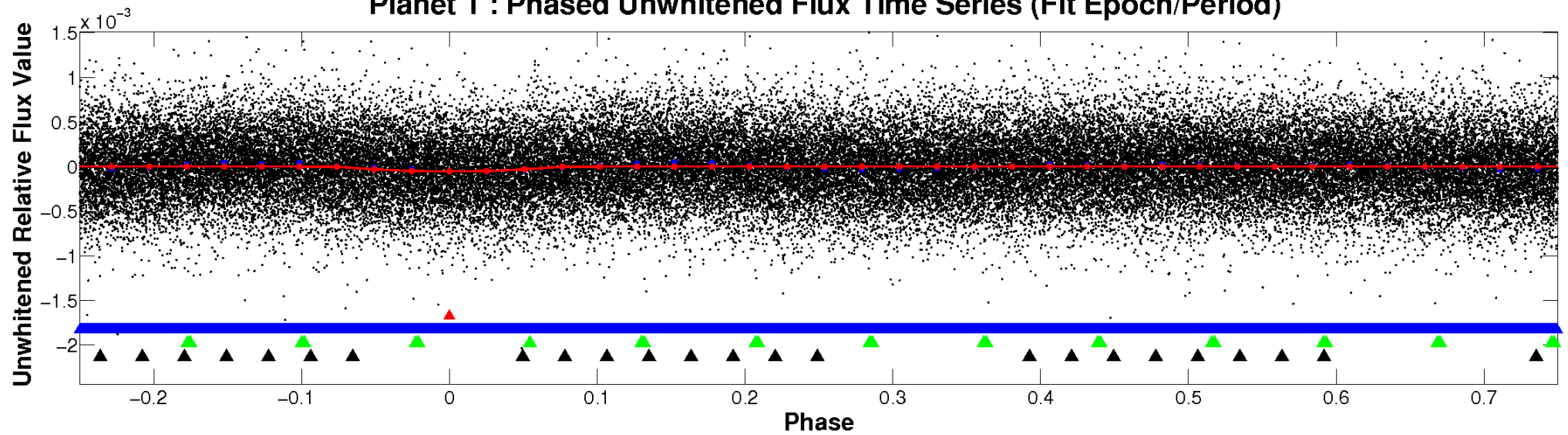
# ALT Odd/Even

TCE 003441159-01

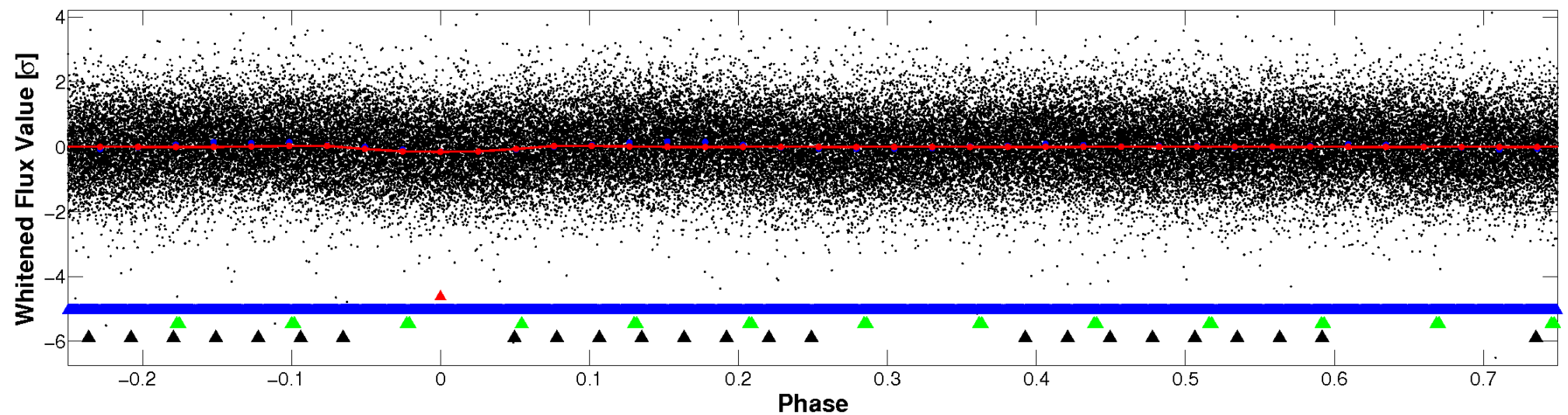


# Non-Whitened Vs. Whitened Light Curve

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



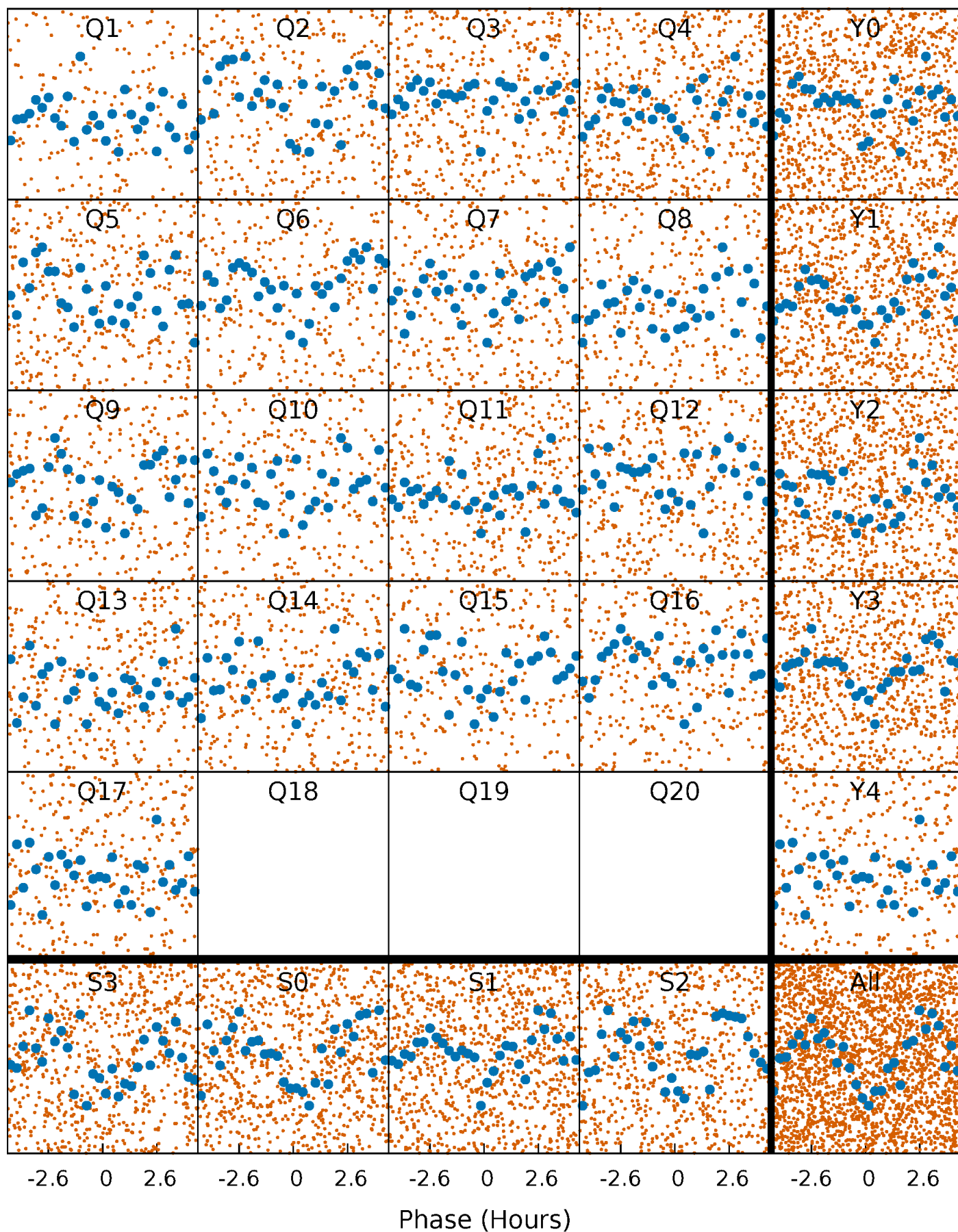
Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)





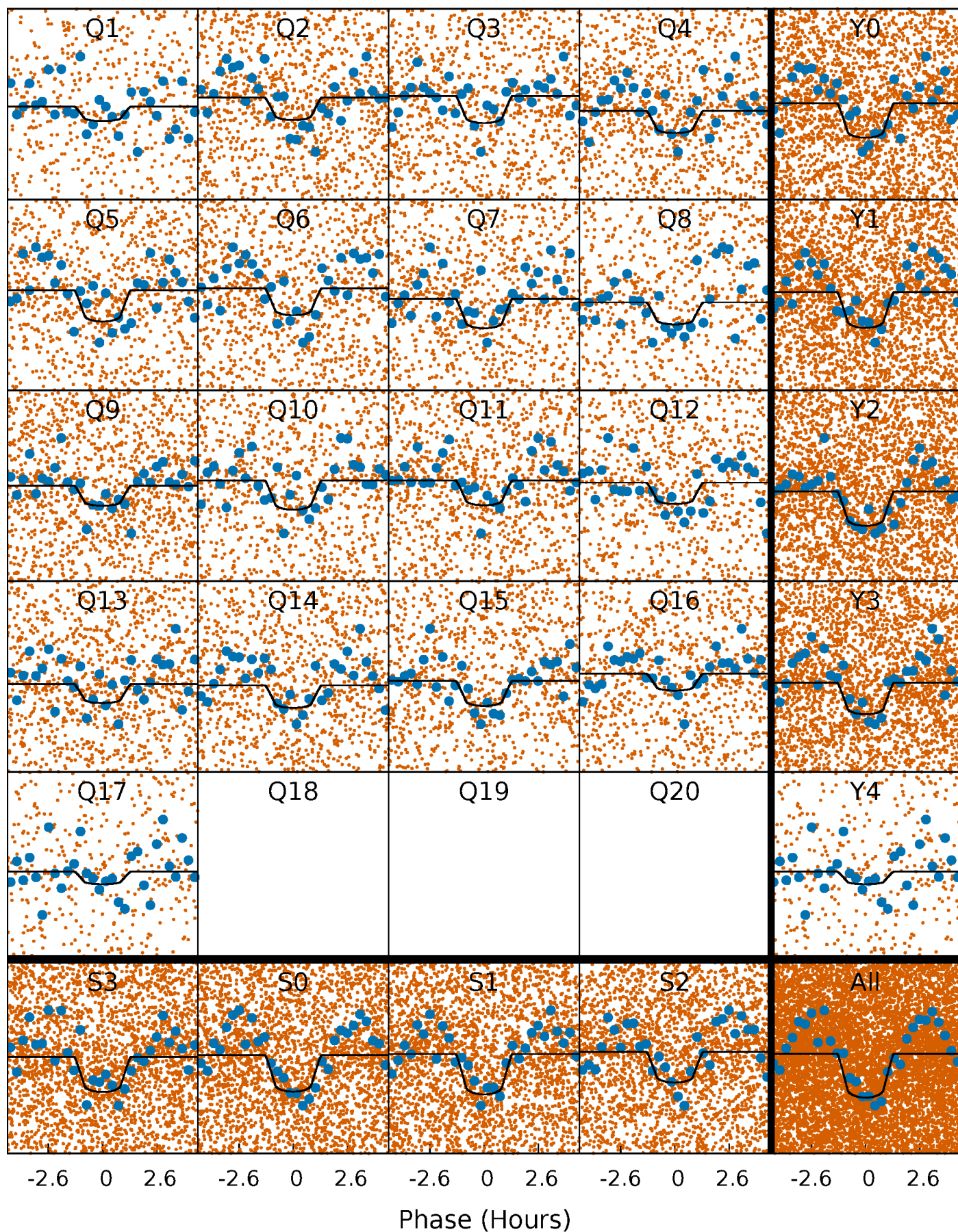
# PDC Quarter-Phased Transit Curves

TCE 003441159-01 P= 0.804996 Days  $T_0=132.207360$  (BKJD)



# DV Quarter-Phased Transit Curves

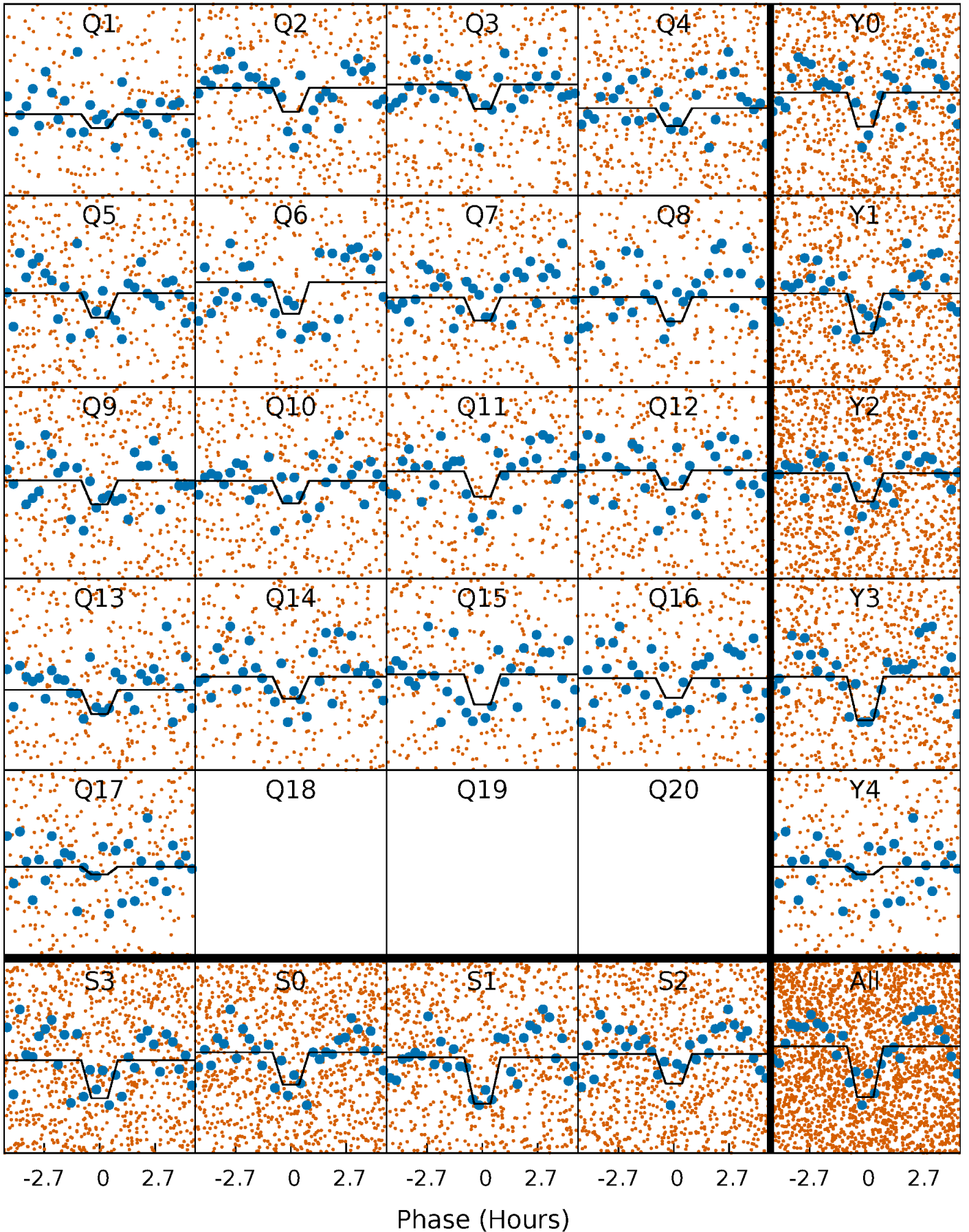
TCE 003441159-01 P= 0.804996 Days  $T_0=132.207360$  (BKJD)





# Alt. Detrend Quarter-Phased Transit Curves

TCE 003441159-01 P= 0.805005 Days  $T_0=132.206933$  (BKJD)

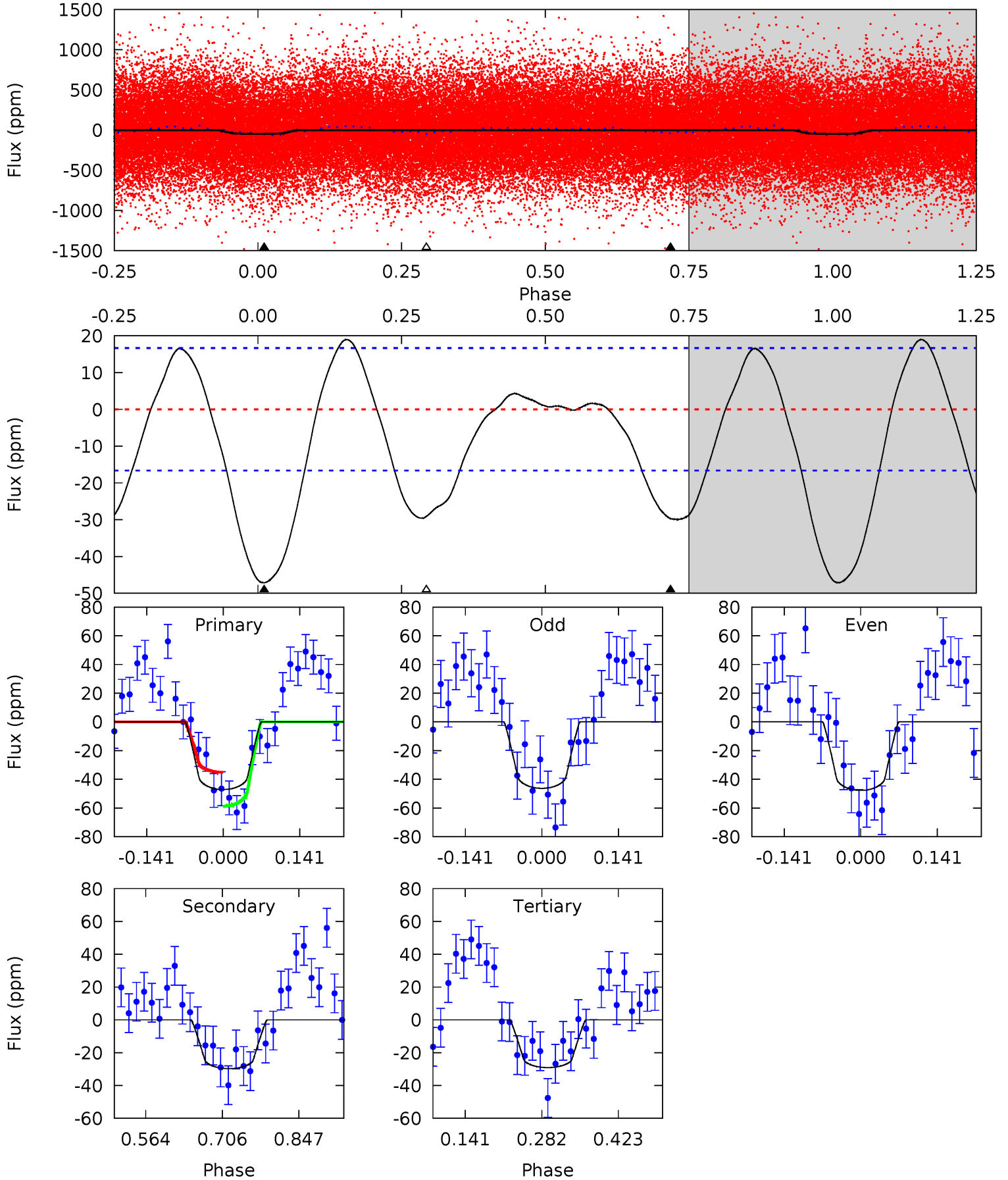




# DV Model-Shift Uniqueness Test

003441159-01, P = 0.804996 Days, E = 131.402364 Days

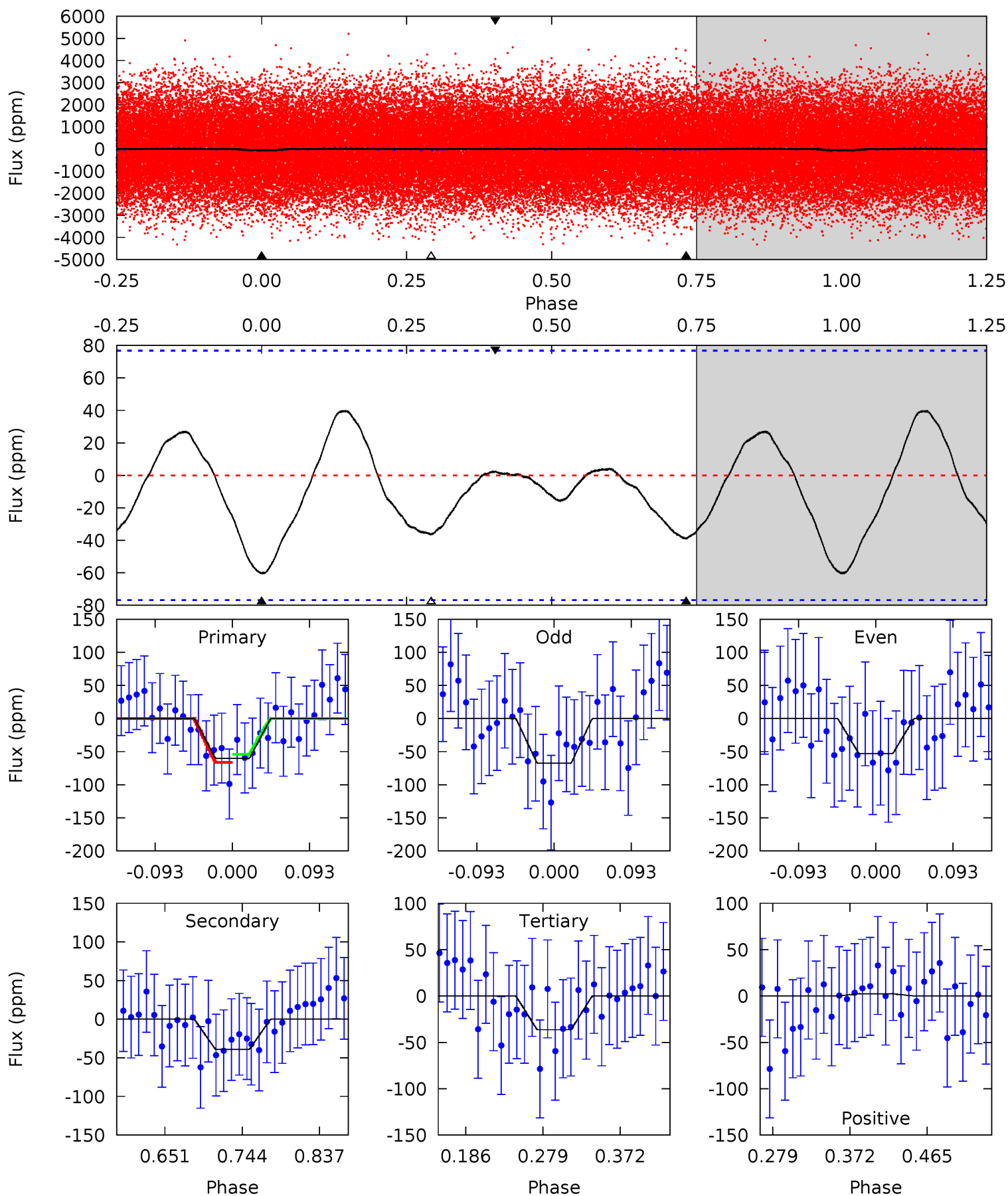
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
12.7	8.02	7.85	0	4.49	1.47	3.68	4.87	12.7	0.17	8.02	0.19	0.86	0.29	3.21



# Alt Model-Shift Uniqueness Test

003441159-01, P = 0.805005 Days, E = 131.401928 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
3.59	2.32	2.16	0.14	4.58	1.68	1.16	1.43	3.45	0.16	2.18	0.44	0.85	0.40	0.36



### Stellar Parameters For KIC 003441159

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R$ ( $R_{\odot}$ )	$M(M_{\odot})$	$\rho_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ )
	$7234^{+200}_{-325}$	$3.535^{+0.560}_{-0.059}$	$0.080^{+0.200}_{-0.300}$	$4.108^{+0.402}_{-2.277}$	$2.108^{+0.206}_{-0.617}$	$0.043^{+0.287}_{-0.009}$
	+3%/-4%	+16%/-2%	+250%/-375%	+10%/-55%	+10%/-29%	+670%/-20%
Source	KIC0	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 003441159-01 / KOI

Detrend	Depth (ppm)	$R_p$ ( $R_{\oplus}$ )	$T_{\text{max}}$ (K)	$T_{\text{obs}}$ (K)	$A_{\text{obs}}$
DV	$-30 \pm 4$	$2.86^{+1.61}_{-1.17}$	$5824^{+442}_{-811}$	$5386^{+2069}_{-1458}$	$0.941^{+1.771}_{-0.560}$
Alt.	$-39 \pm 17$	$3.15^{+1.41}_{-1.31}$	$5834^{+434}_{-842}$	$5542^{+2219}_{-1830}$	$0.928^{+1.994}_{-0.560}$

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



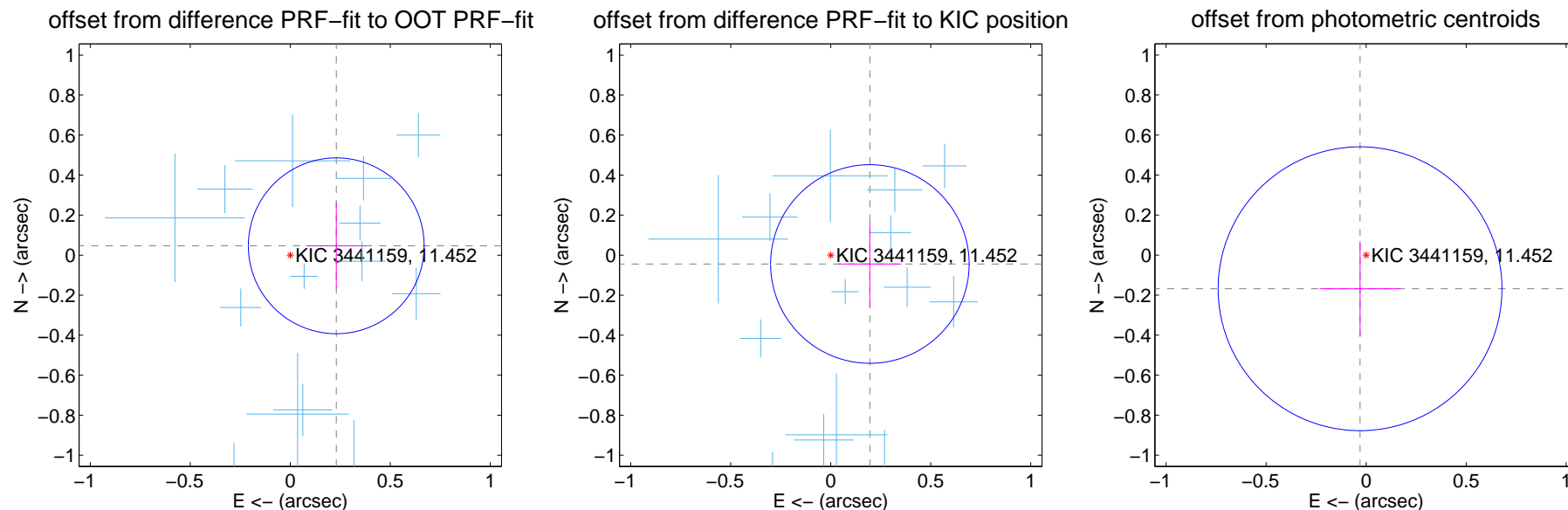
## DV Centroid Data

Supplemental centroid analysis for 003441159-01. **Kepler magnitude: 11.45.** Transit SNR 11.28

There are 17 quarters with good PRF difference image offsets

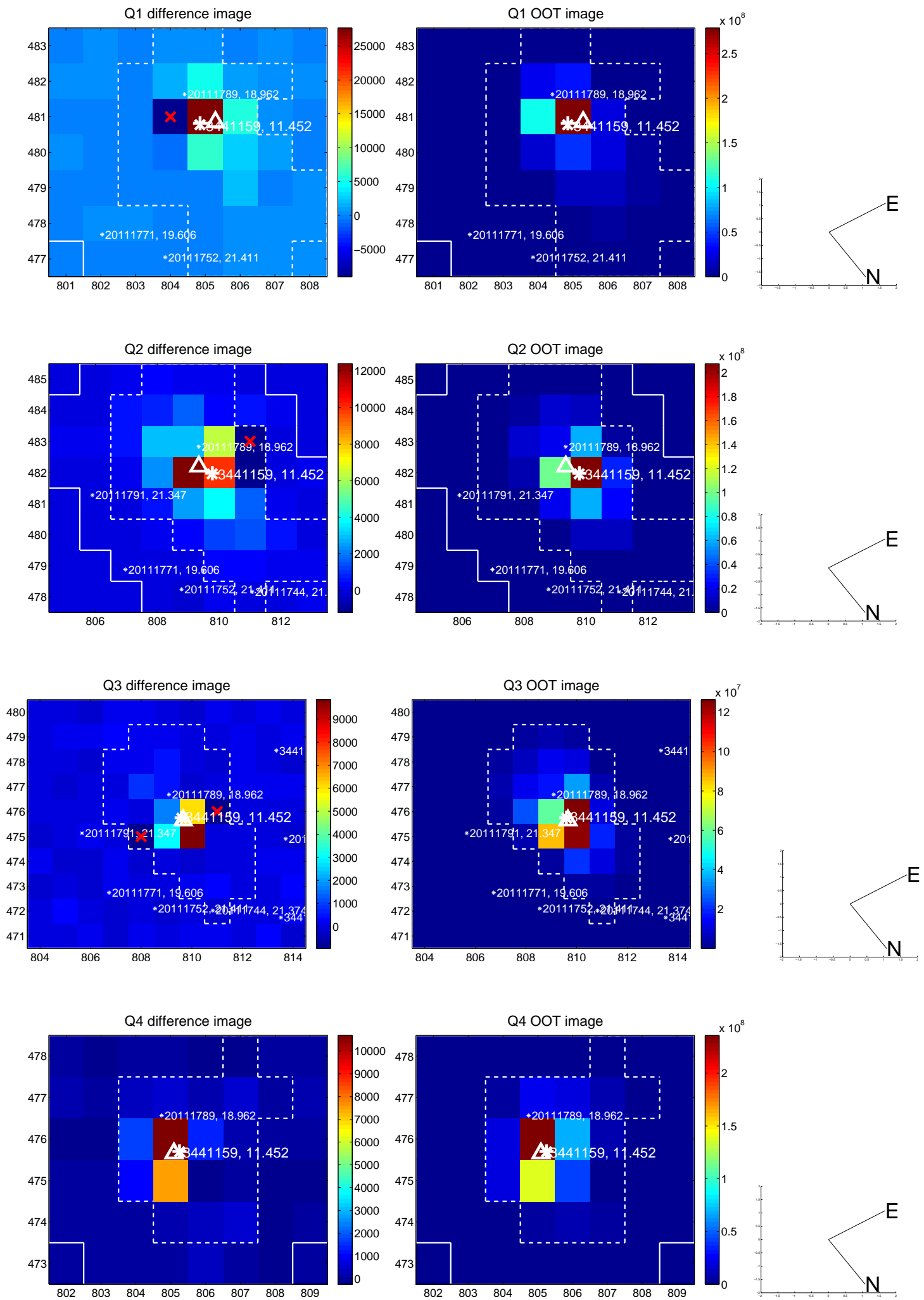
The direct PRF centroid is offset from the target star catalog position by about 0.17 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.235 \pm 0.146$	1.60	$-0.230 \pm 0.150$	$0.047 \pm 0.214$
PRF-fit source offset from KIC position	$0.201 \pm 0.165$	1.21	$-0.196 \pm 0.157$	$-0.044 \pm 0.216$
photometric centroid source offset	$0.17 \pm 0.24$	0.72	$0.03 \pm 0.20$	$-0.17 \pm 0.24$

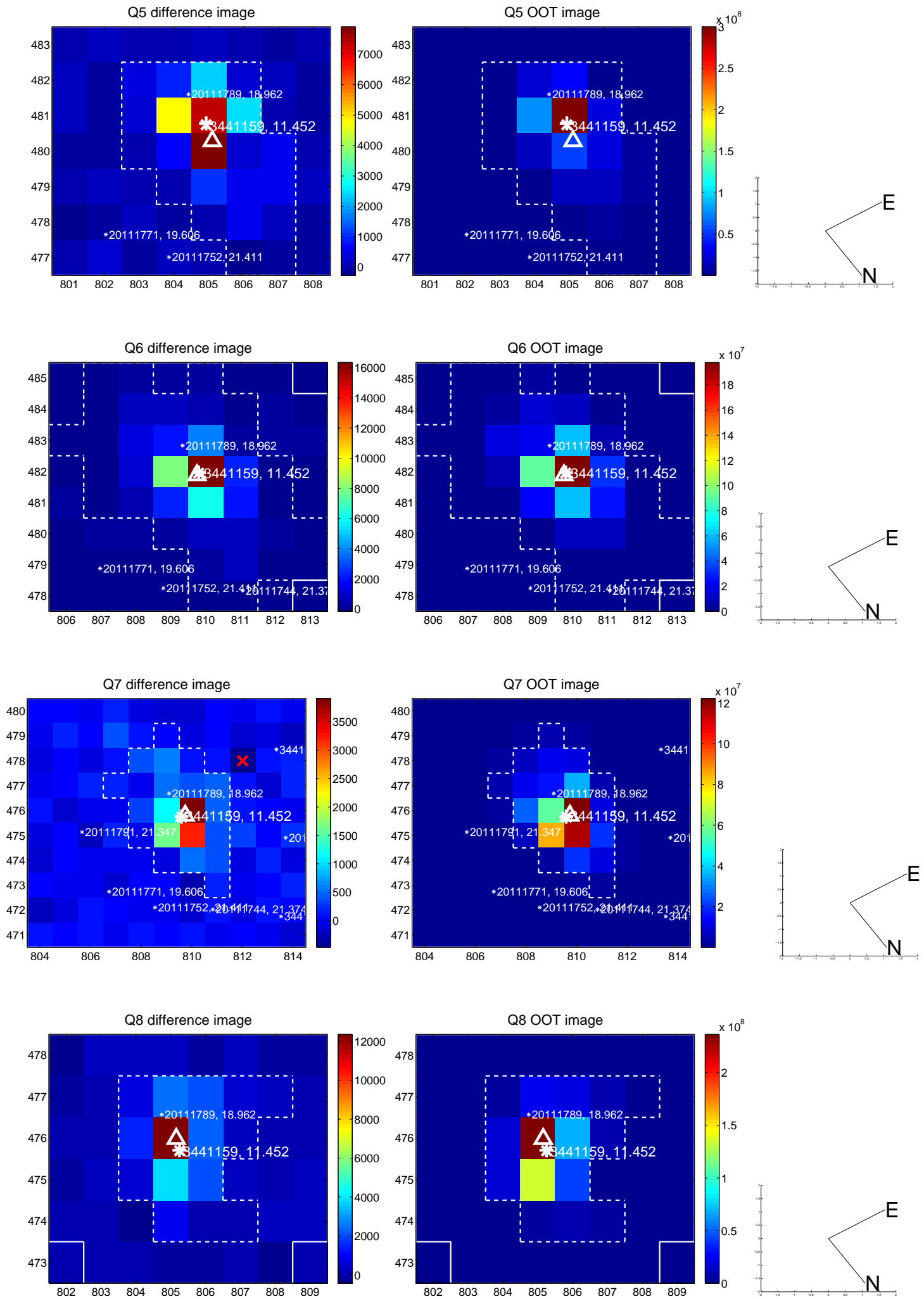


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets;** magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

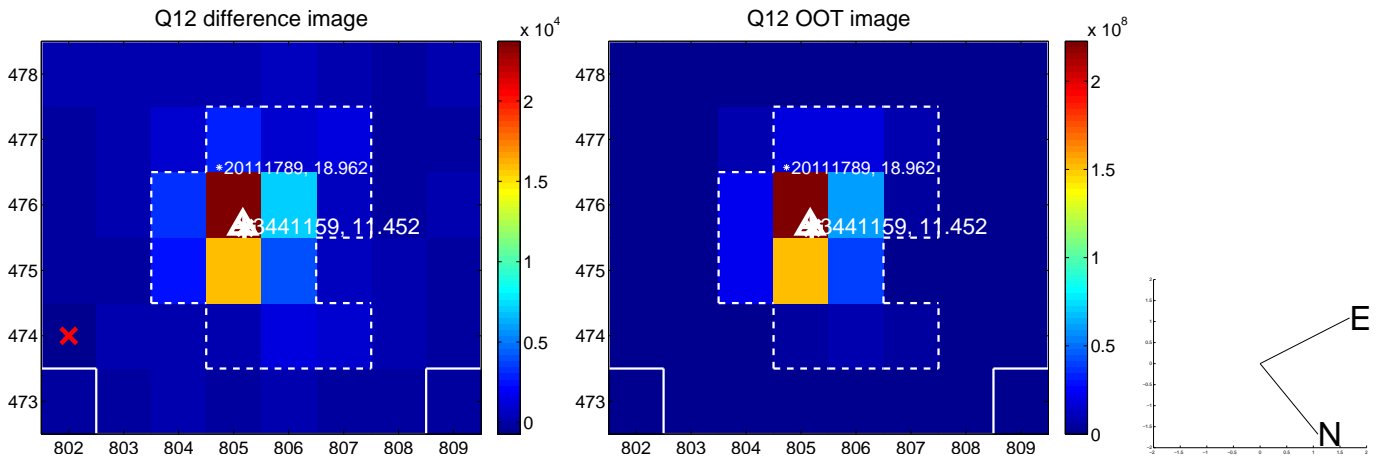
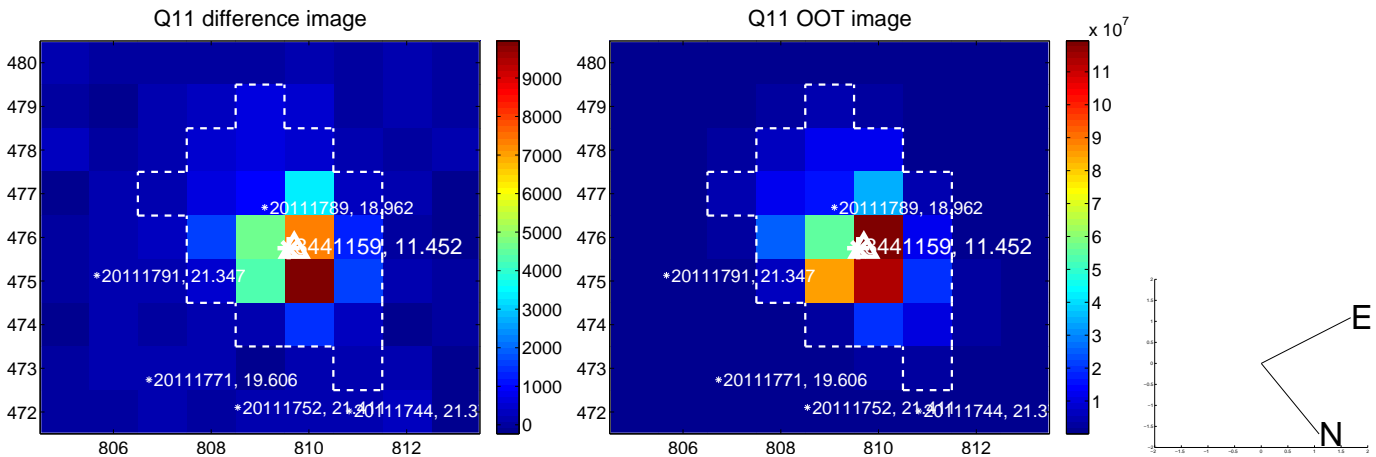
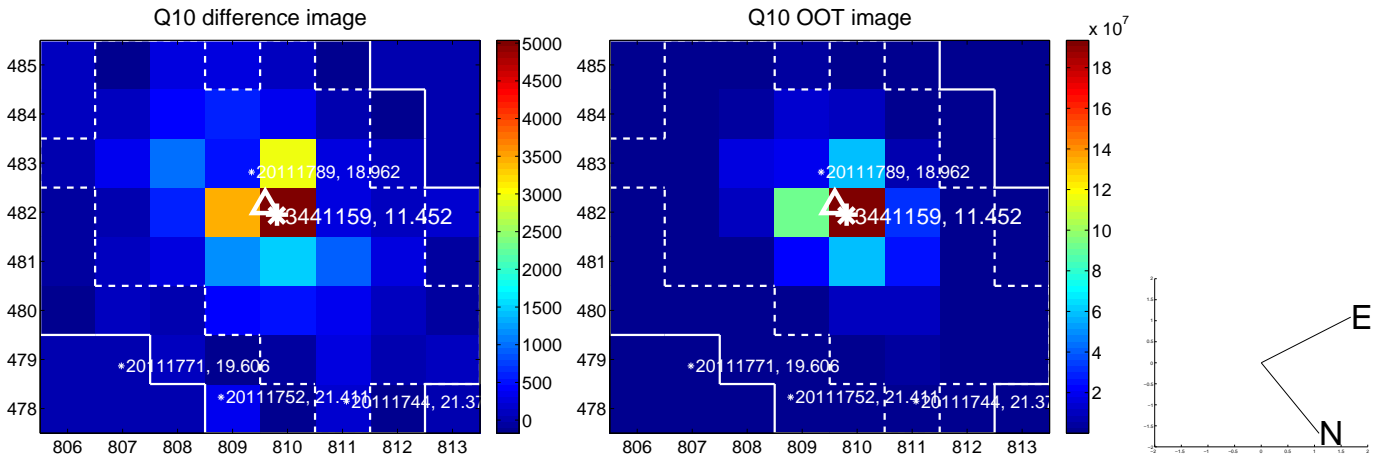
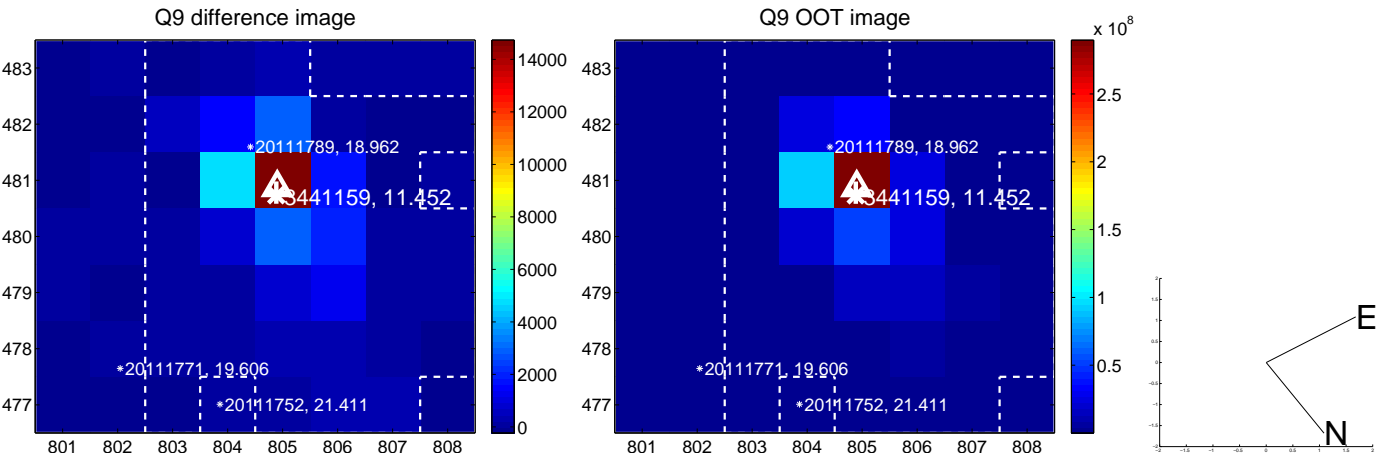


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



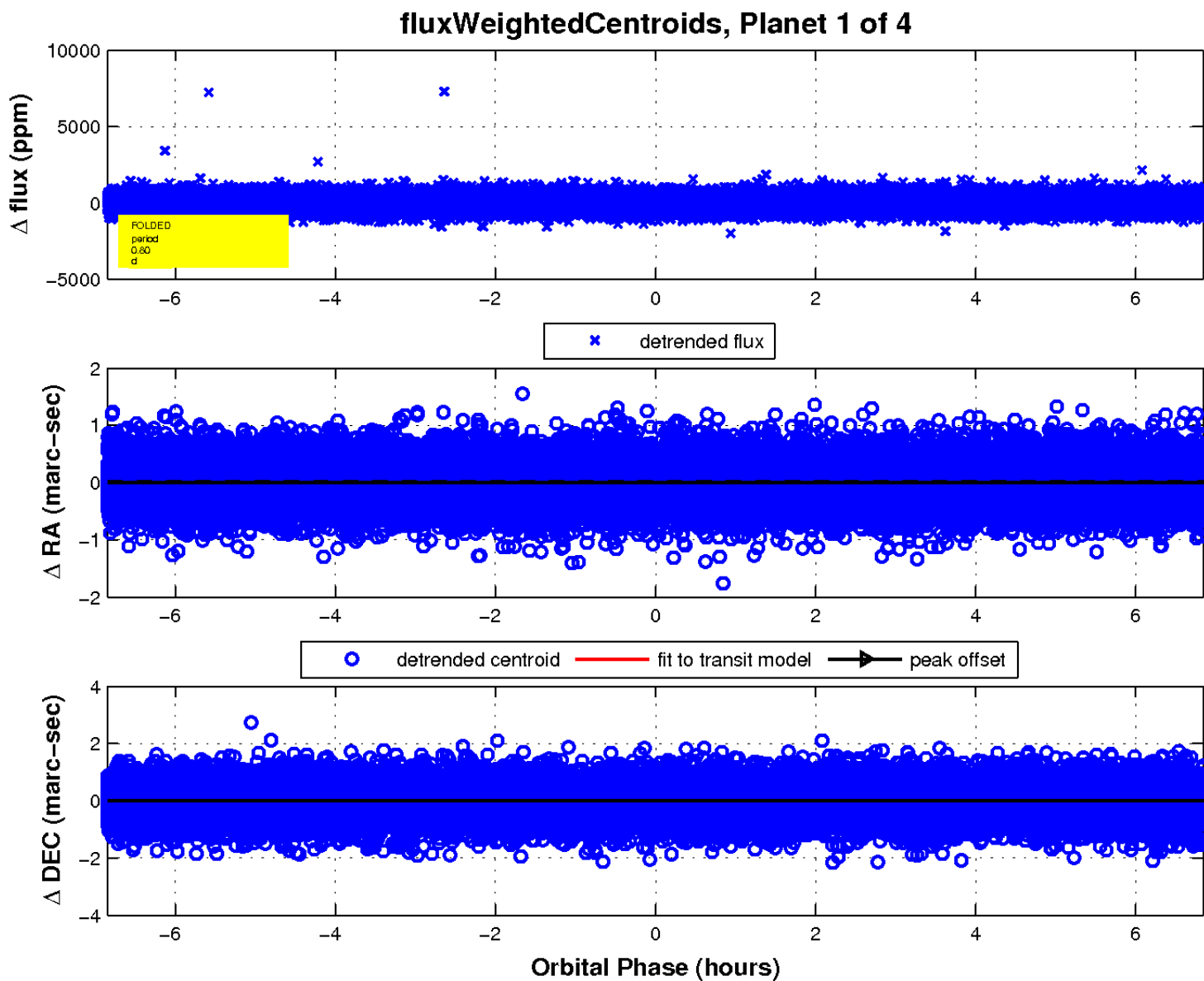
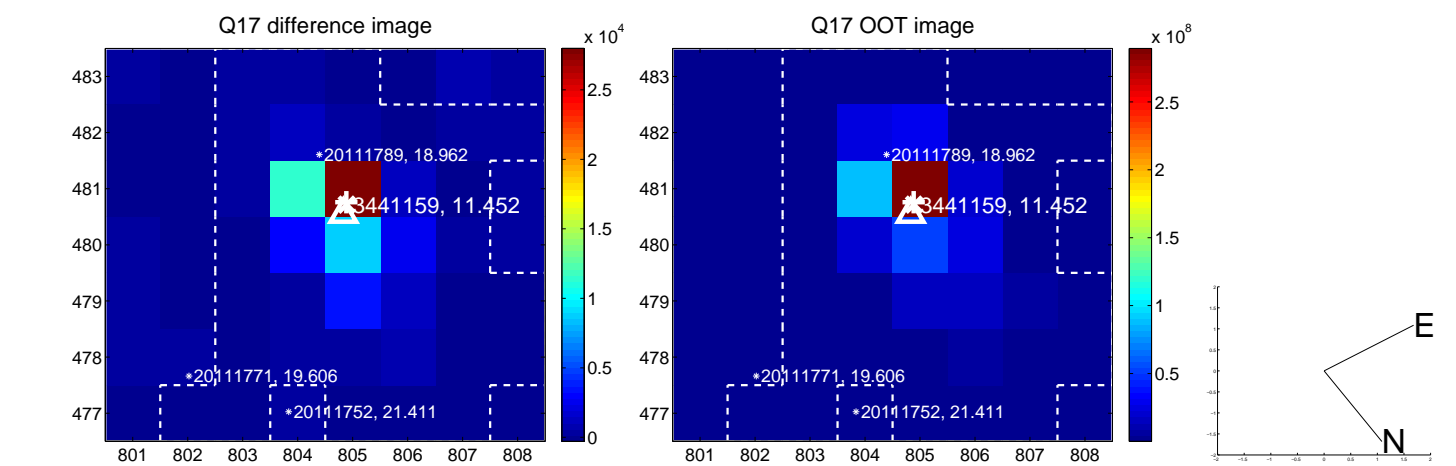


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



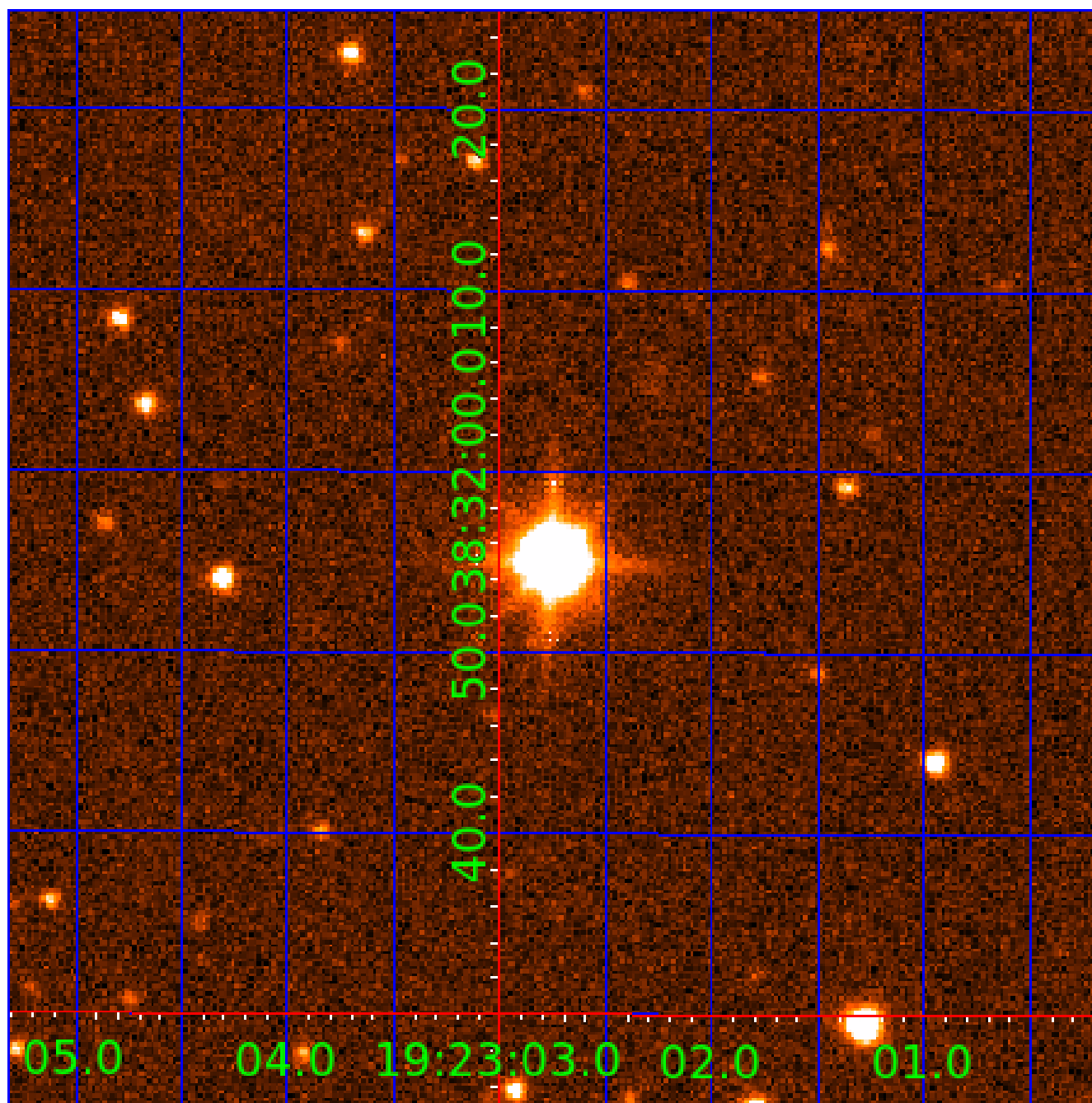


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination



# KIC 003441159

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
003441159-01	OBS	No	0.804996	132.207360	51.4	2.282	10.1	11.3	4.11	7234	3.42	87721.02
003441159-02	OBS	No	0.516240	131.959325	48.9	2.968	8.8	11.5	4.11	7234	3.33	0.00
003441159-03	OBS	No	60.003275	135.098380	517.9	1.717	8.9	5.8	4.11	7234	9.48	279.64
003441159-04	OBS	No	61.455669	162.032215	211.8	19.338	7.8	5.9	4.11	7234	6.54	270.86

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
003441159-01	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—CENT_SATURATED
003441159-02	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—CENT_SATURATED
003441159-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—CENT_SATURATED
003441159-04	OBS	FP	0.00	1	0	1	0	INDIV_TRANS_RUBBLE_SKYE—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—CENT_SATURATED—HALO_GHOST

**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.

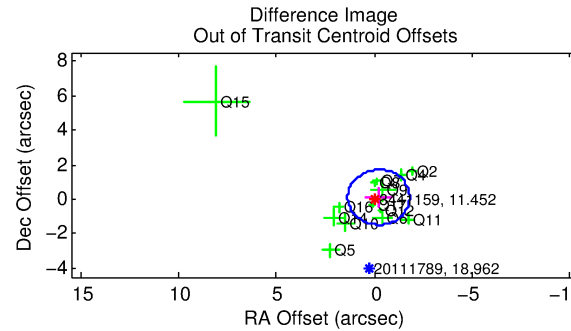
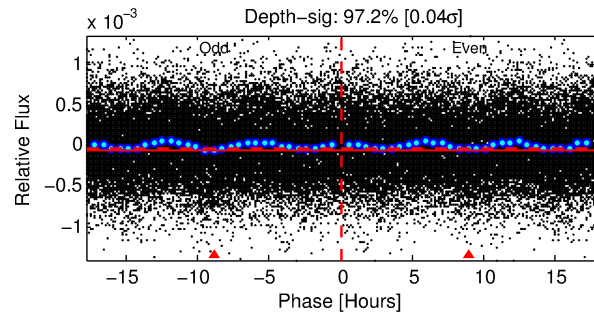
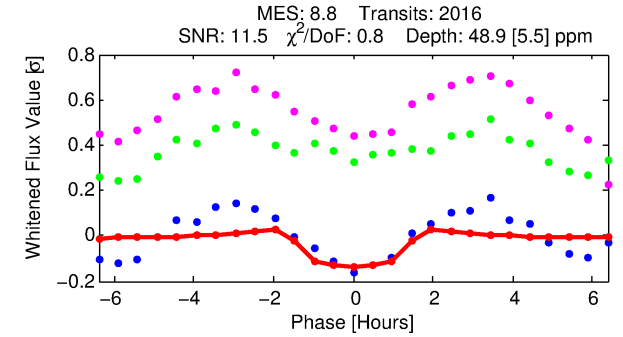
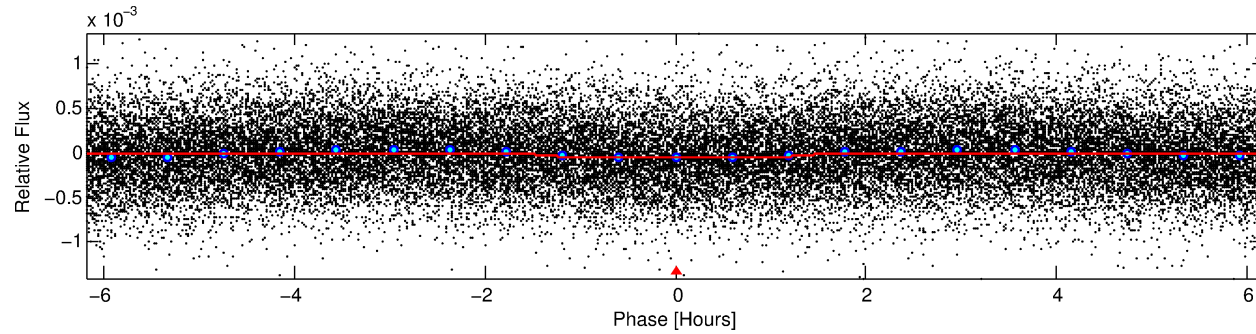
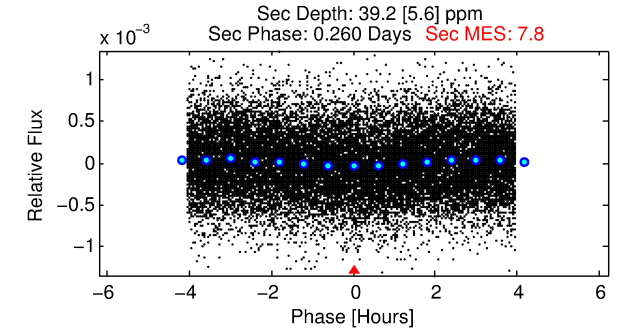
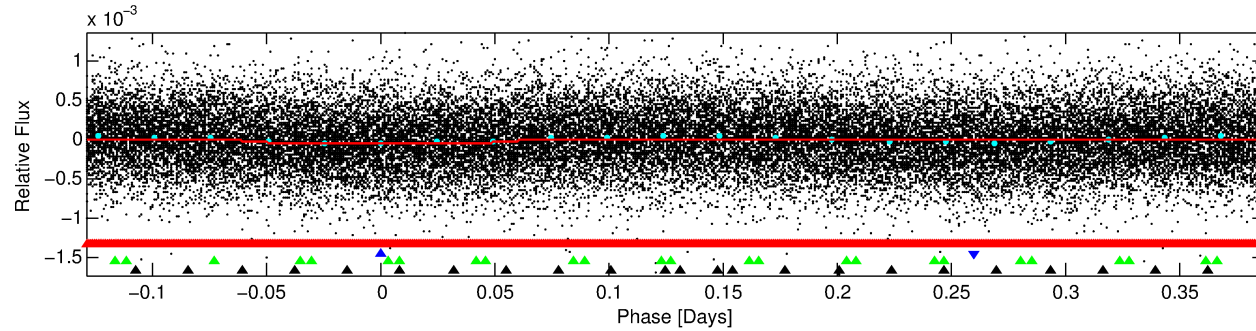
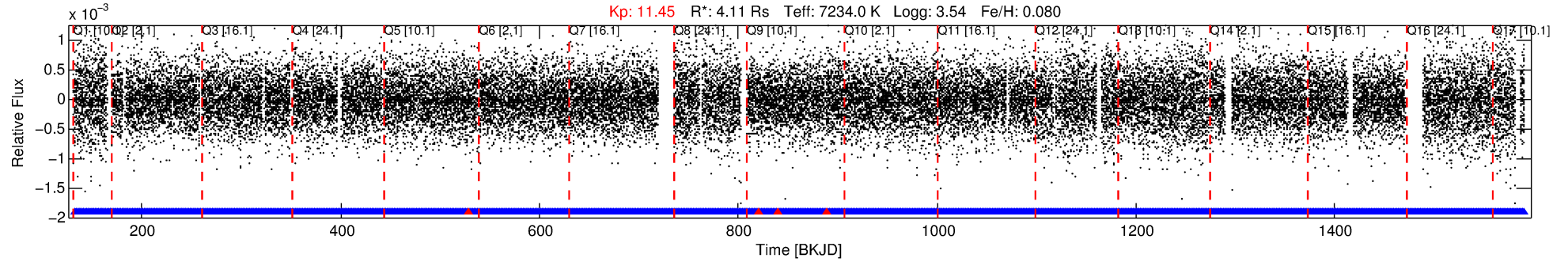
## Ephemeris Match Information For 003441159-02

No Significant Match Found



# DV One-Page Summary

KIC: 3441159 Candidate: 2 of 4 Period: 0.516 d



## DV Fit Results:

Period = 0.51624 [0.00001] d  
Epoch = 131.9593 [0.0028] BKJD  
 $R_p/R^* = 0.0074$  [0.0037]  
 $a/R^* = 1.12$  [0.71]  
 $b = 0.90$  [0.68]  
 $\text{Seff} = \text{N/A}$   
 $\text{Teq} = \text{N/A}$   
 $R_p = 3.33$  [2.48]  $R_e$   
 $a = \text{N/A}$   
 $\text{Ag} = \text{N/A}$   
 $\text{Teffp} = \text{N/A}$

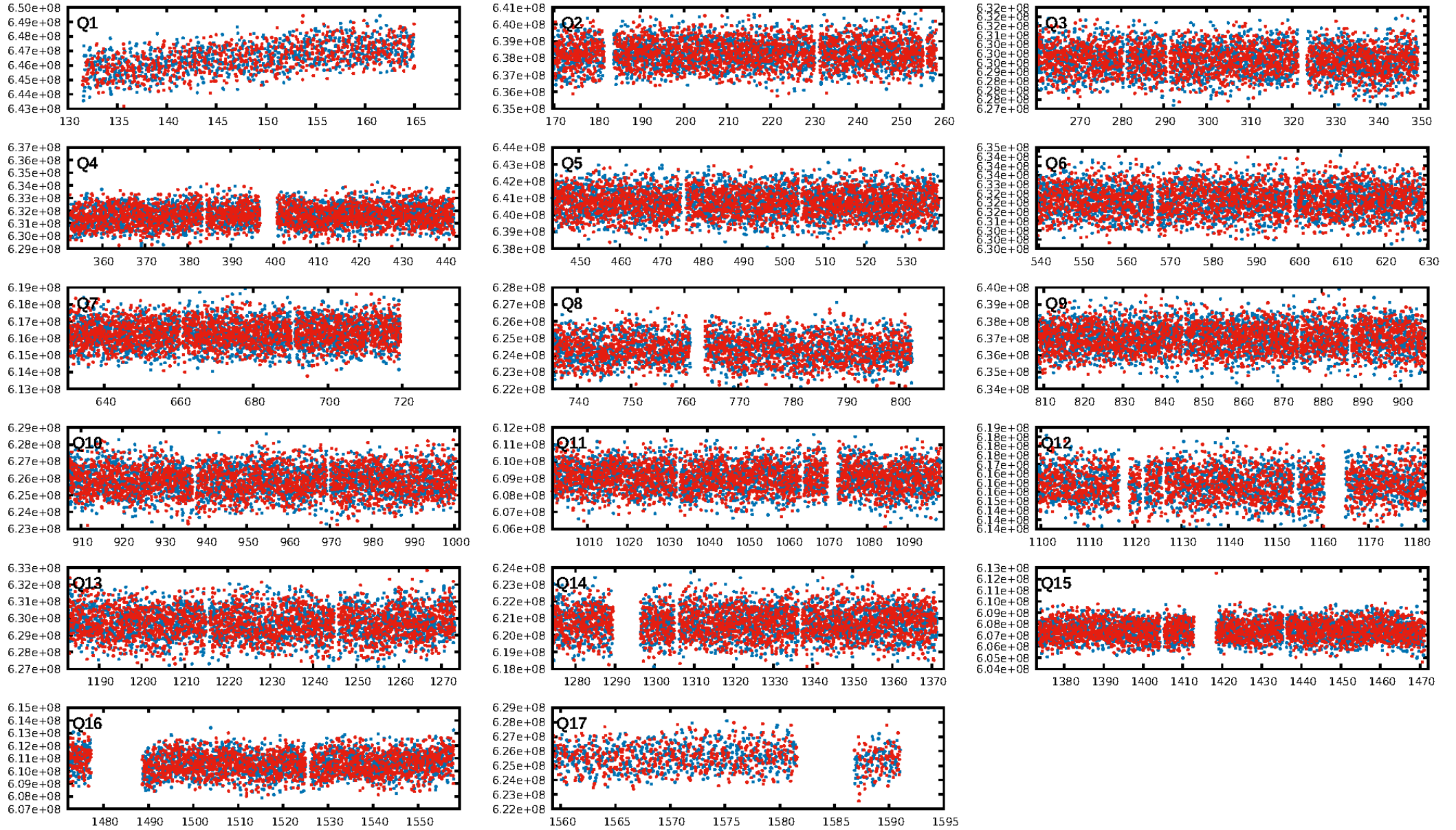
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 93.6% [1.85σ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
**Bootstrap-pfa: 1.79e-06**  
RollingBand-fgt: 1.00 [1918/1922]  
GhostDiagnostic-chr: 1.442  
Centroid-sig: 70.7%  
Centroid-so: 0.154 arcsec [0.99σ]  
OotOffset-rm: 0.244 arcsec [0.46σ]  
KicOffset-rm: 0.207 arcsec [0.33σ]  
OotOffset-st: 4/3/4/3 [14]  
KicOffset-st: 4/3/4/3 [14]  
DiffImageQuality-fgm: 0.43 [6/14]  
DiffImageOverlap-fno: 1.00 [17/17]

Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 31-Jan-2016 10:40:04 Z

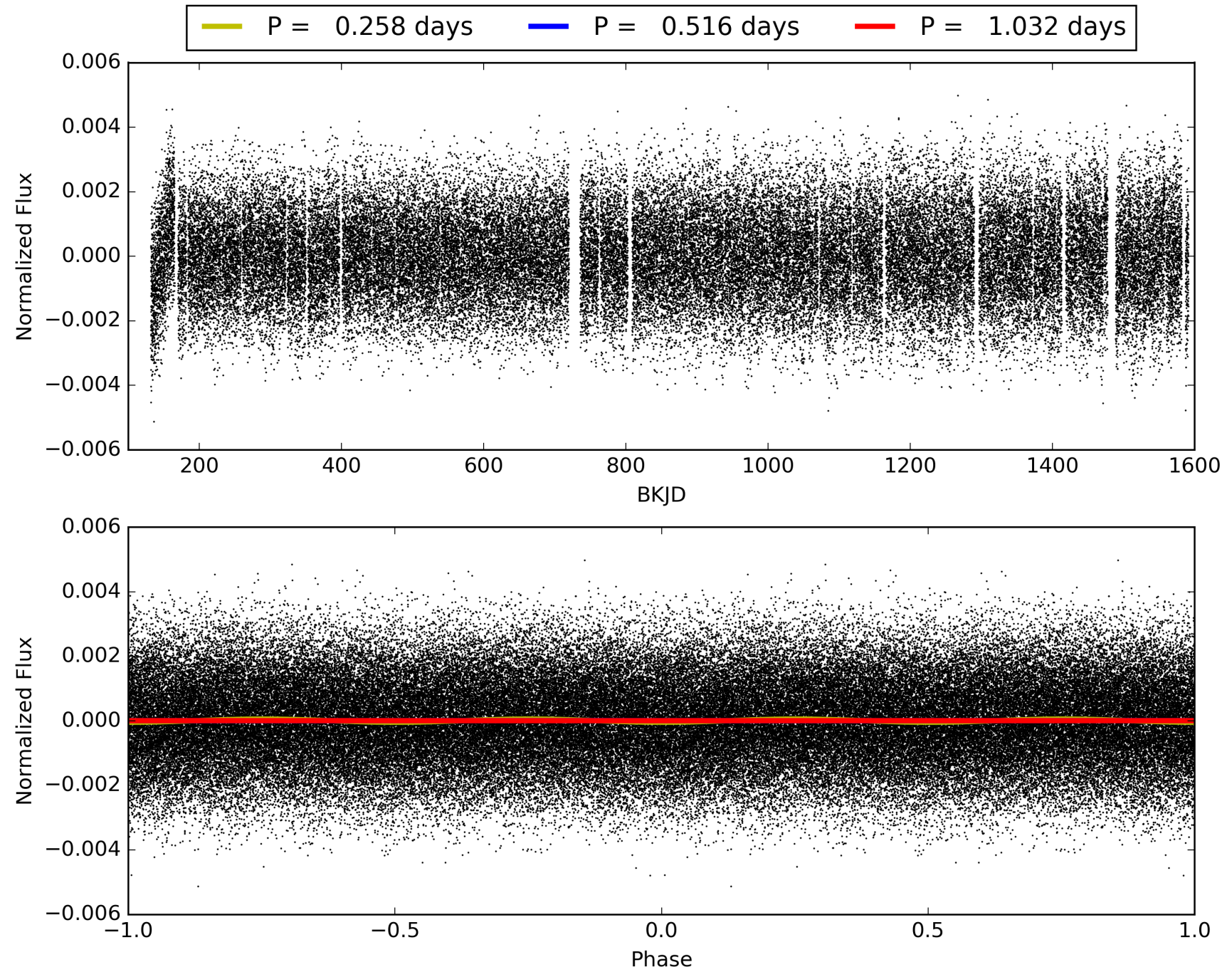
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

# TCE 003441159-02, PDC Light Curves



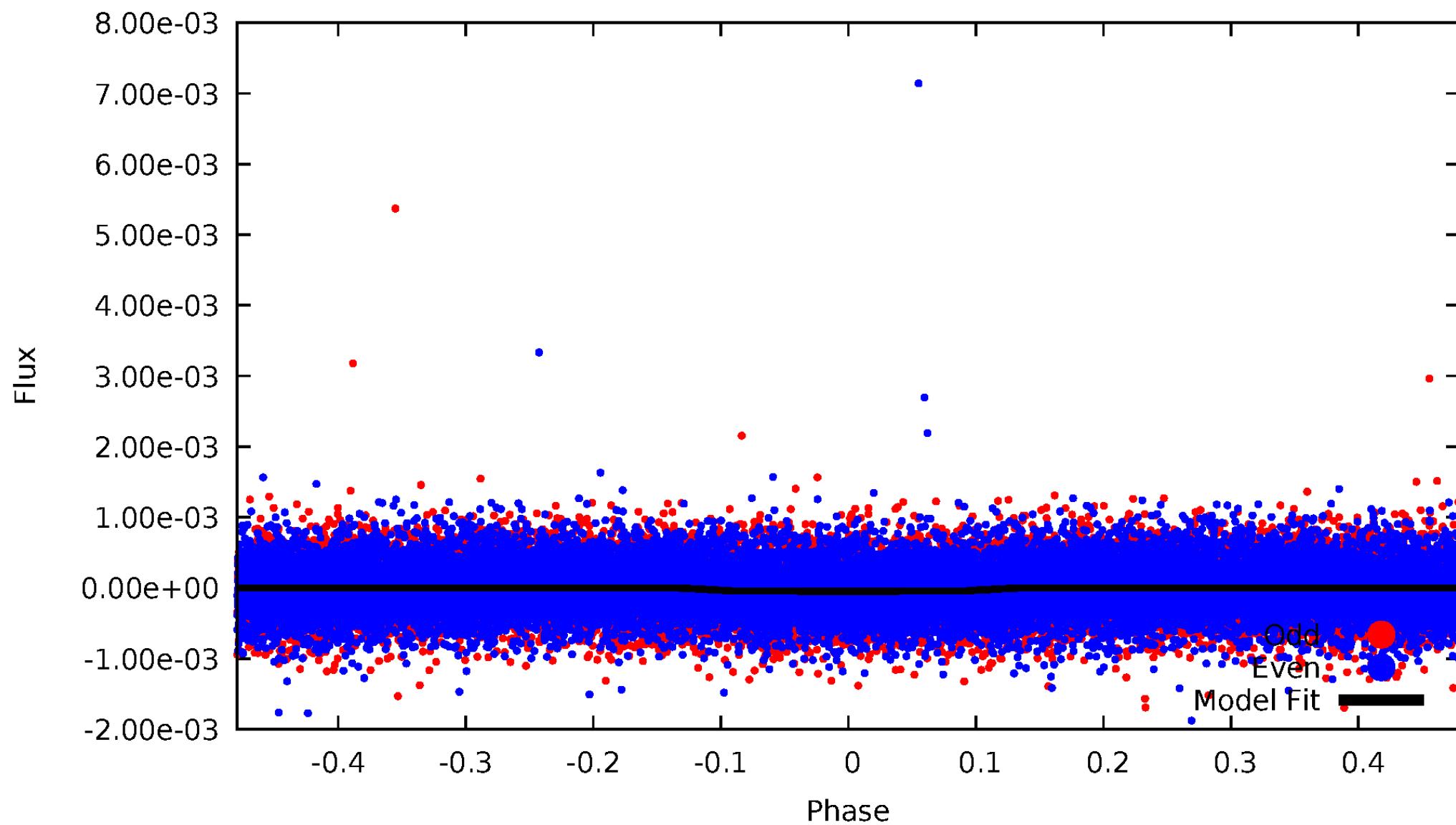


# TCE 003441159-02



# DV Odd/Even

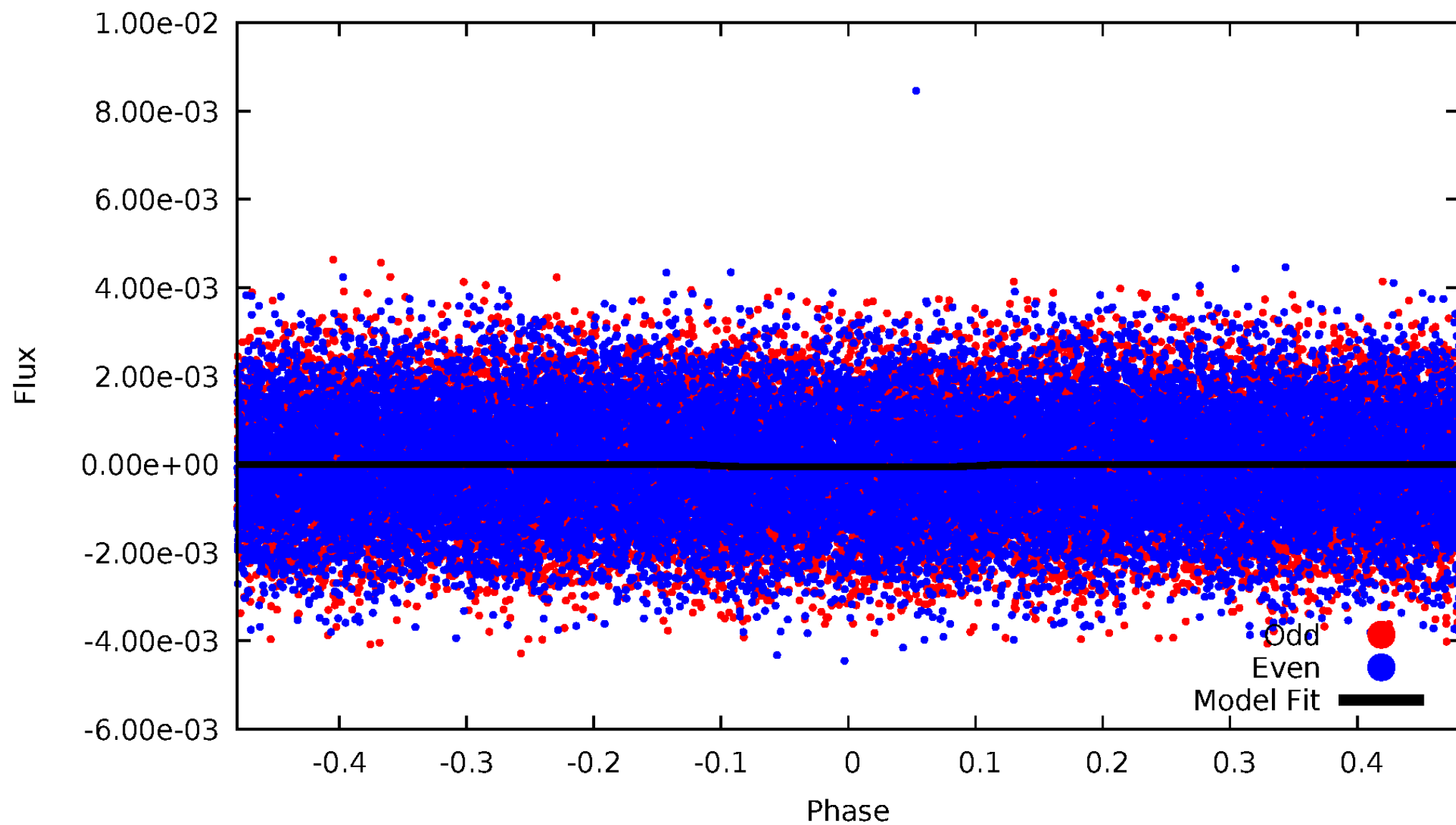
TCE 003441159-02





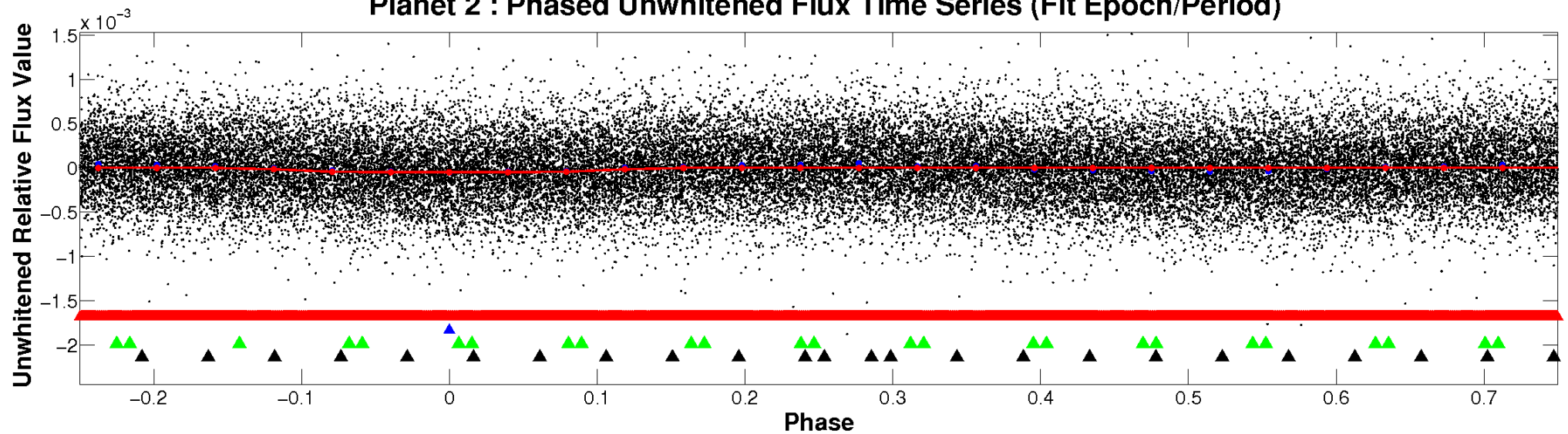
# ALT Odd/Even

TCE 003441159-02

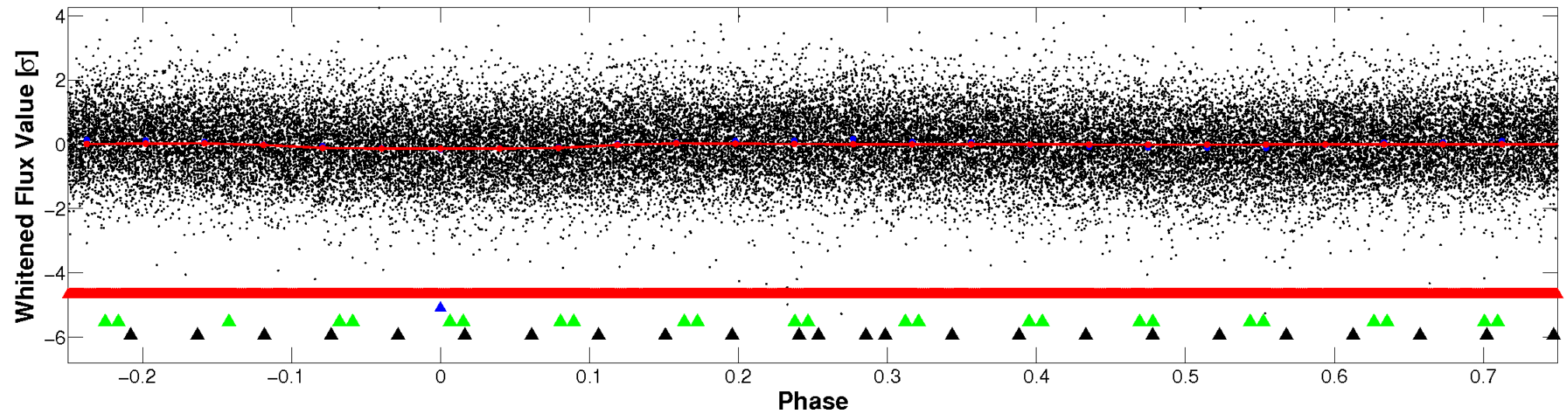


# Non-Whitened Vs. Whitened Light Curve

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

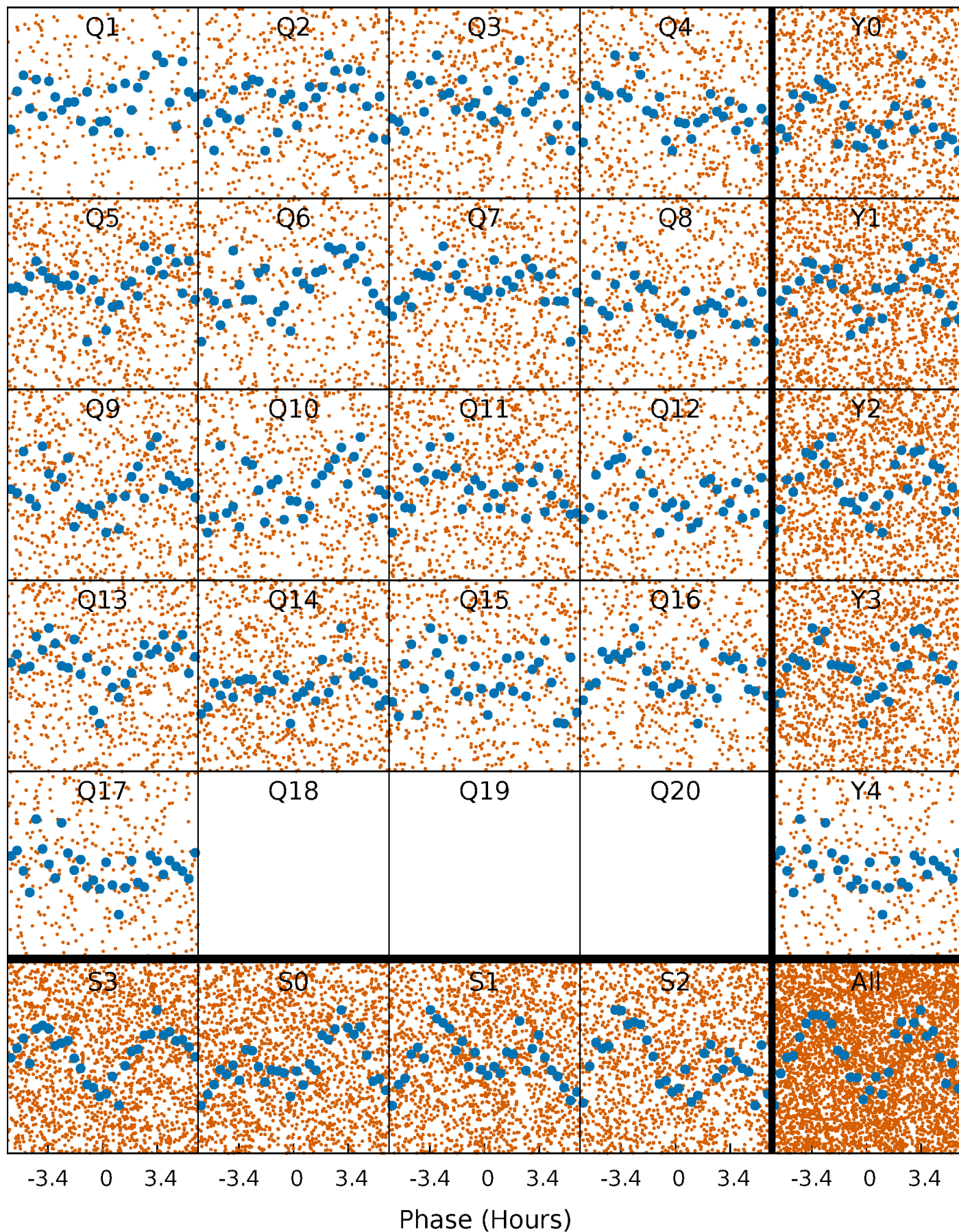


## Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



# PDC Quarter-Phased Transit Curves

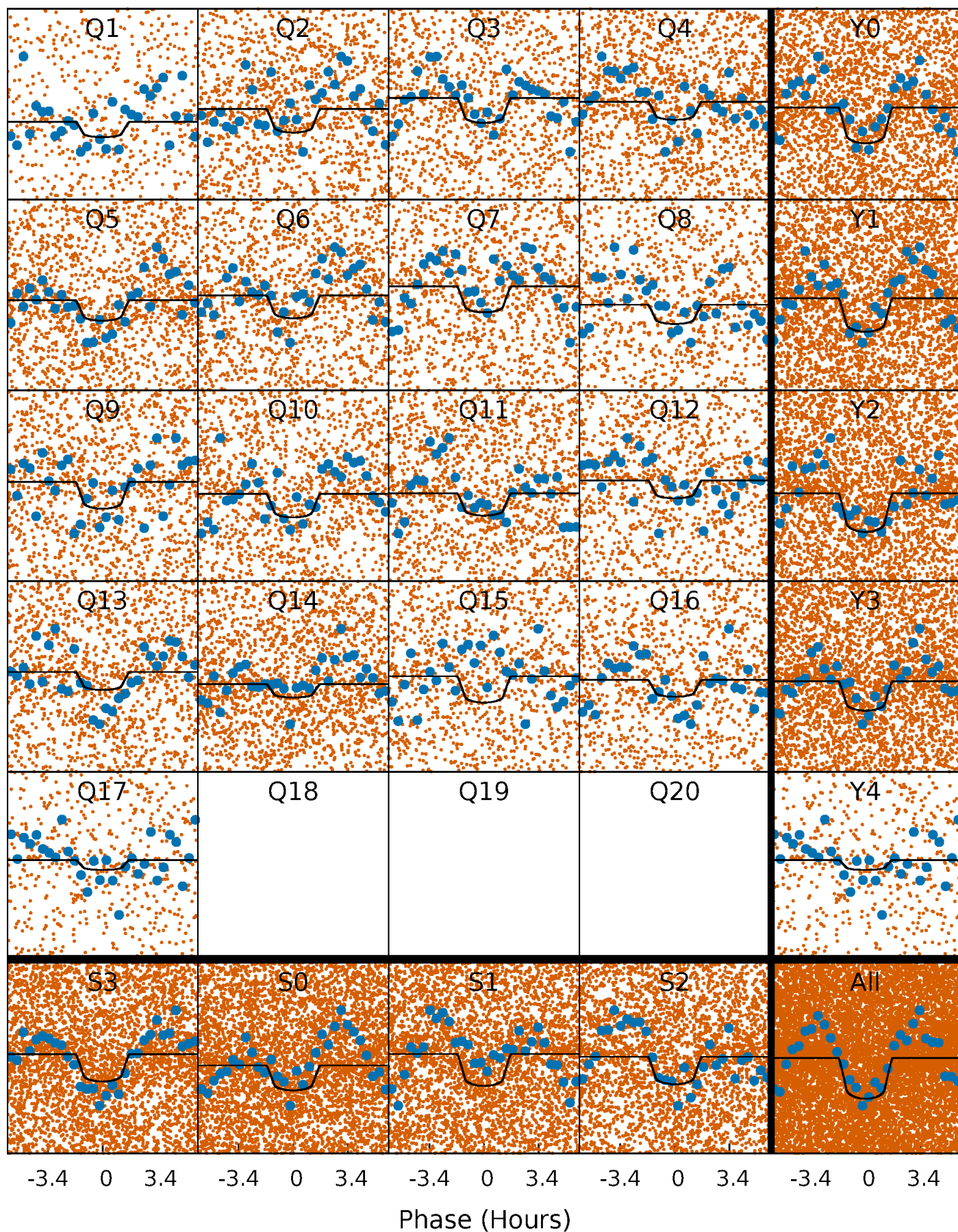
TCE 003441159-02 P= 0.516240 Days  $T_0=131.959325$  (BKJD)





# DV Quarter-Phased Transit Curves

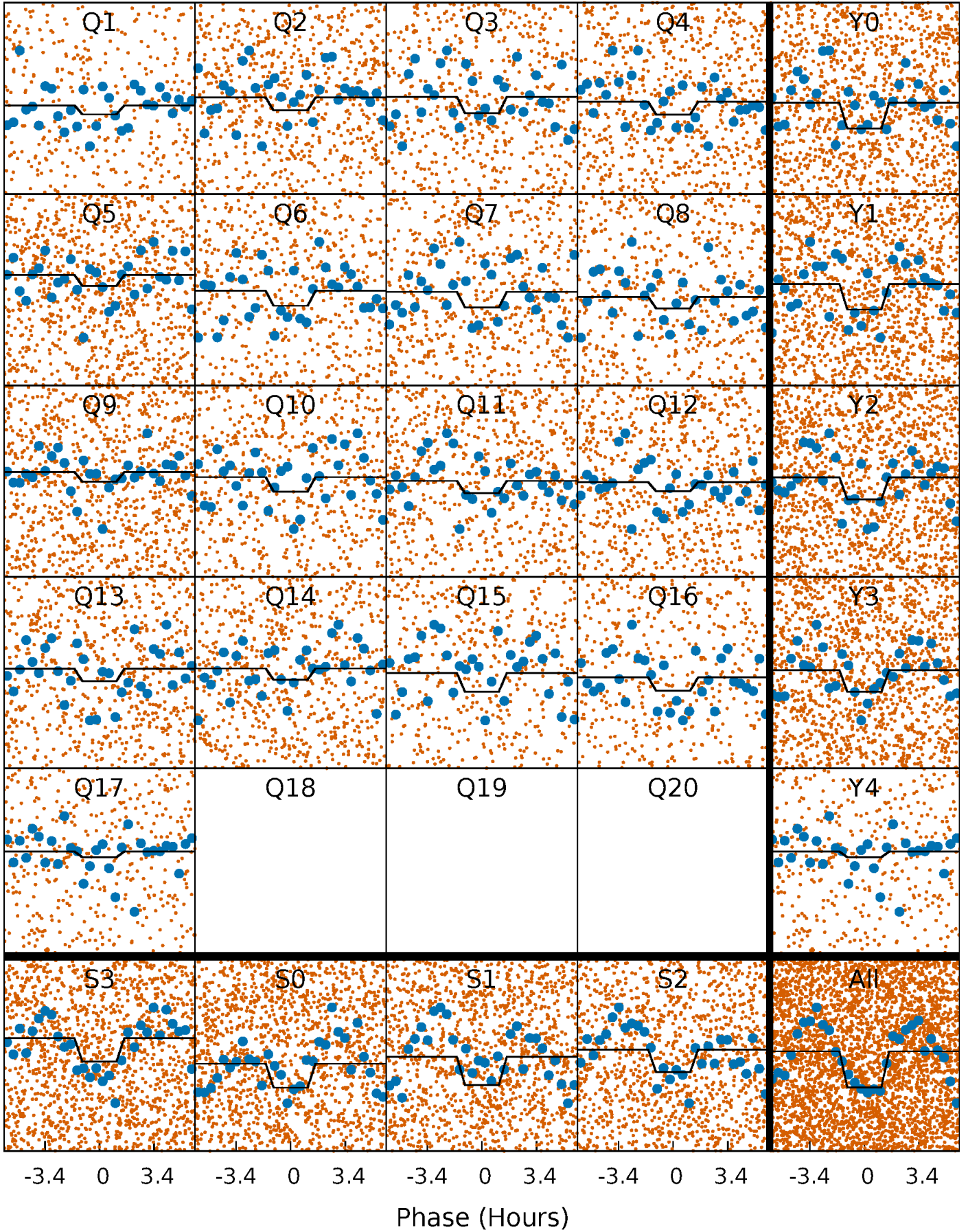
TCE 003441159-02 P= 0.516240 Days  $T_0=131.959325$  (BKJD)





# Alt. Detrend Quarter-Phased Transit Curves

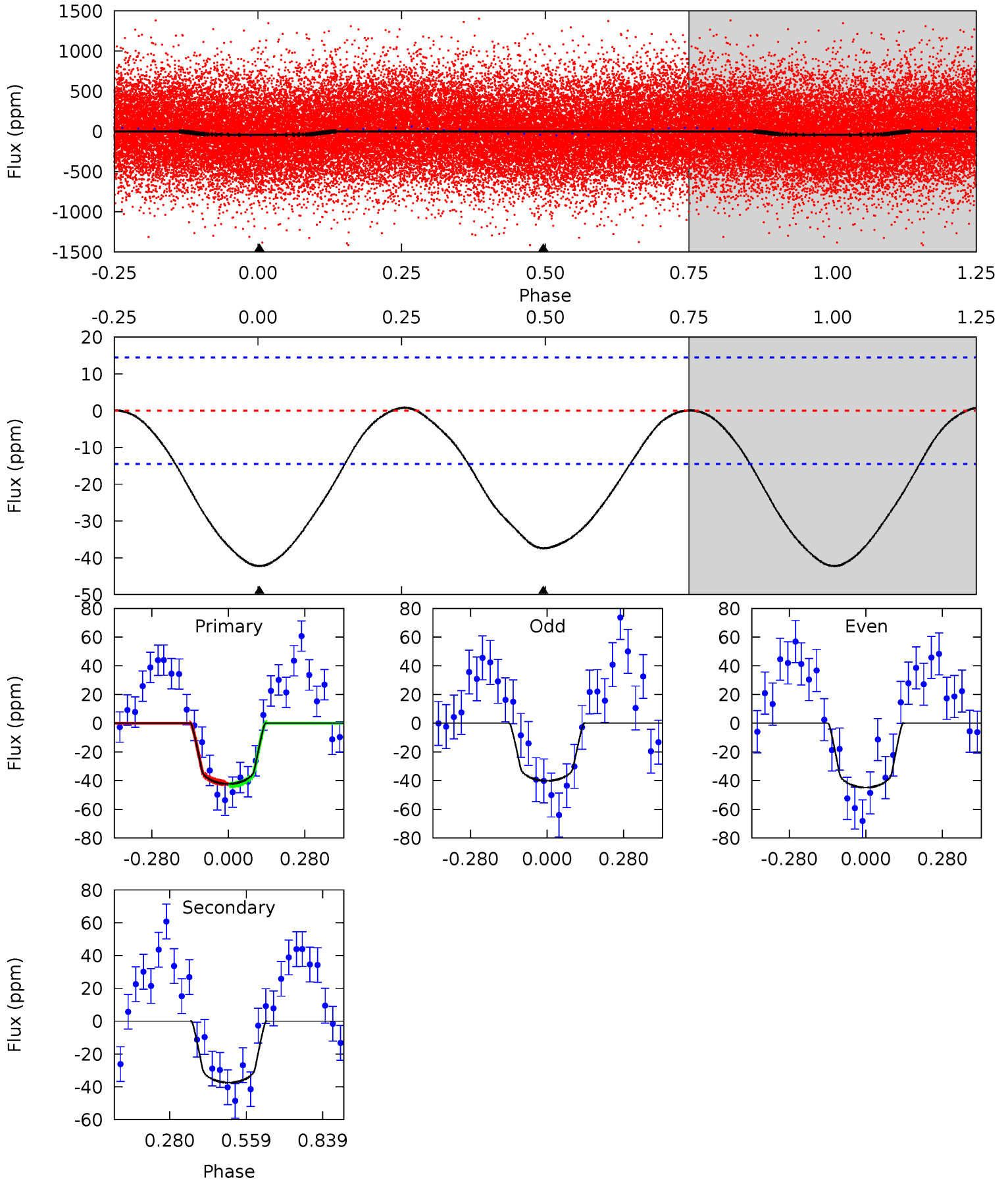
TCE 003441159-02 P= 0.516241 Days  $T_0=131.959546$  (BKJD)



# DV Model-Shift Uniqueness Test

003441159-02, P = 0.516240 Days, E = 131.443085 Days

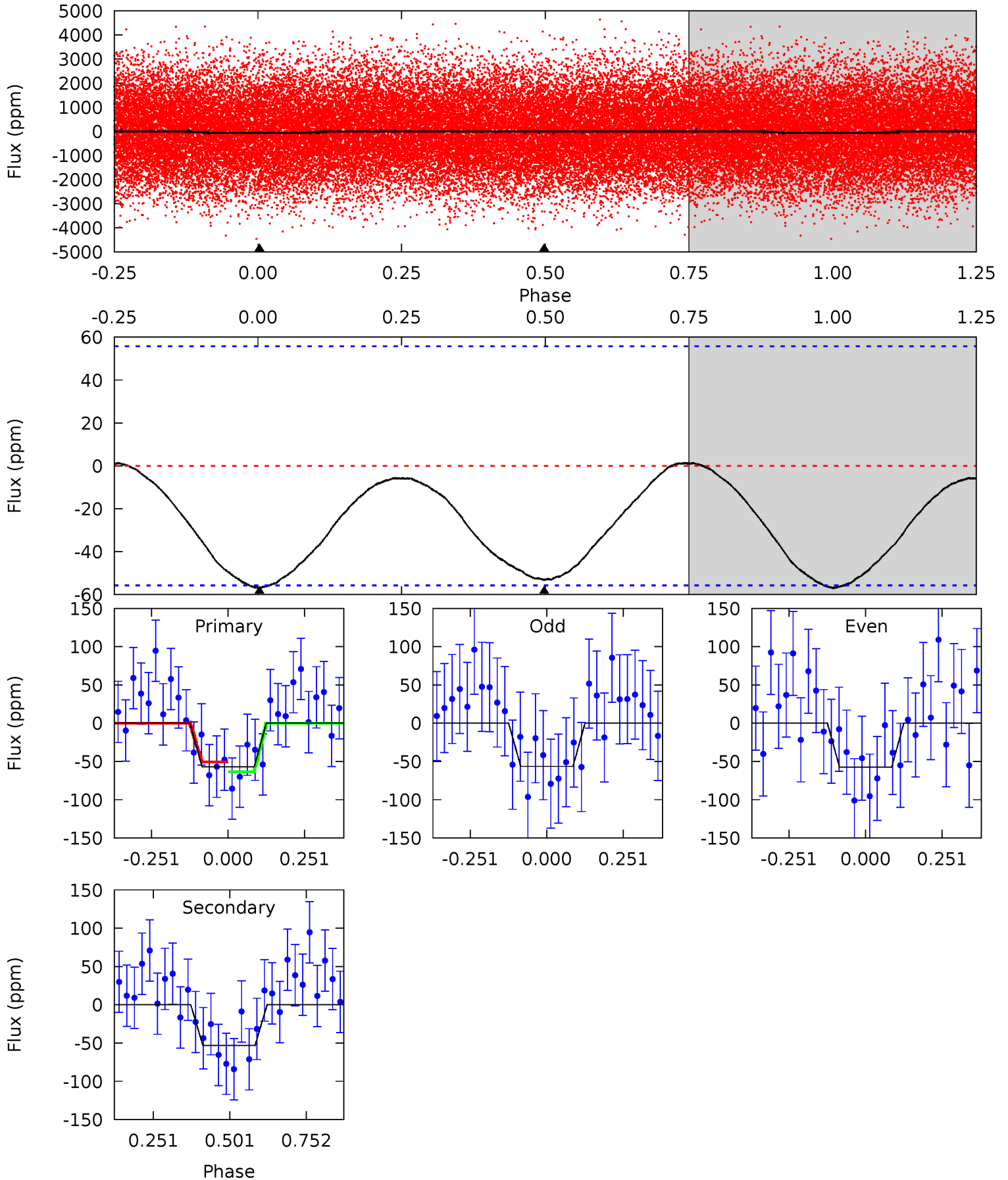
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
12.7	11.2	0	0	4.34	1.08	0.15	12.7	12.7	11.2	11.2	0.70	0.96	0.02	0.22



# Alt Model-Shift Uniqueness Test

003441159-02, P = 0.516241 Days, E = 131.443305 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
4.46	4.16	0	0	4.37	1.15	0.27	4.46	4.46	4.16	4.16	0.03	1.10	0.02	0.50



### Stellar Parameters For KIC 003441159

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R$ ( $R_{\odot}$ )	$M(M_{\odot})$	$p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ )
	$7234^{+200}_{-325}$	$3.535^{+0.560}_{-0.059}$	$0.080^{+0.200}_{-0.300}$	$4.108^{+0.402}_{-2.277}$	$2.108^{+0.206}_{-0.617}$	$0.043^{+0.287}_{-0.009}$
	+3%/-4%	+16%/-2%	+250%/-375%	+10%/-55%	+10%/-29%	+670%/-20%
Source	KIC0	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 003441159-02 / KOI

Detrend	Depth (ppm)	$R_p$ ( $R_{\oplus}$ )	$T_{\text{max}}$ (K)	$T_{\text{obs}}$ (K)	$A_{\text{obs}}$
DV	$-37 \pm 3$	$2.84^{+1.76}_{-1.48}$	$6816^{+470}_{-1032}$	$5377^{+3735}_{-9269}$	$0.652^{+2.044}_{-0.397}$
Alt.	$-53 \pm 13$	$2.88^{+1.69}_{-1.46}$	$6839^{+453}_{-867}$	$6277^{+3804}_{-2463}$	$0.887^{+2.637}_{-0.539}$

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



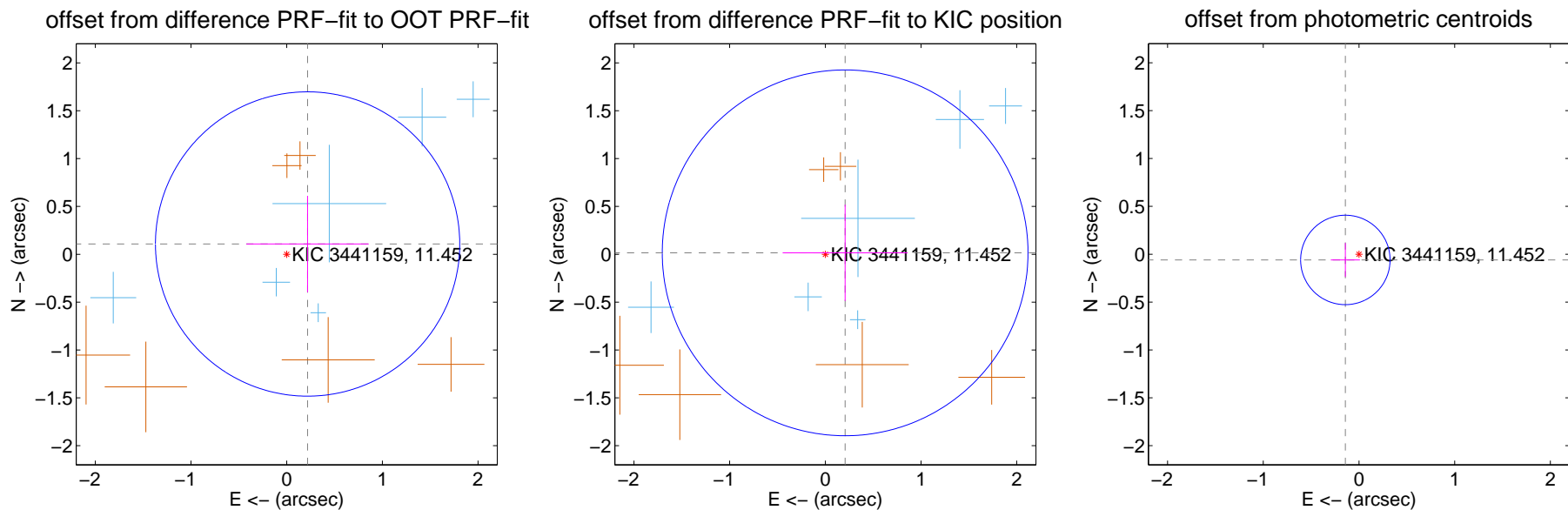
## DV Centroid Data

Supplemental centroid analysis for 003441159-02. **Kepler magnitude: 11.45.** Transit SNR 11.48

There are 6 quarters with good PRF difference image offsets

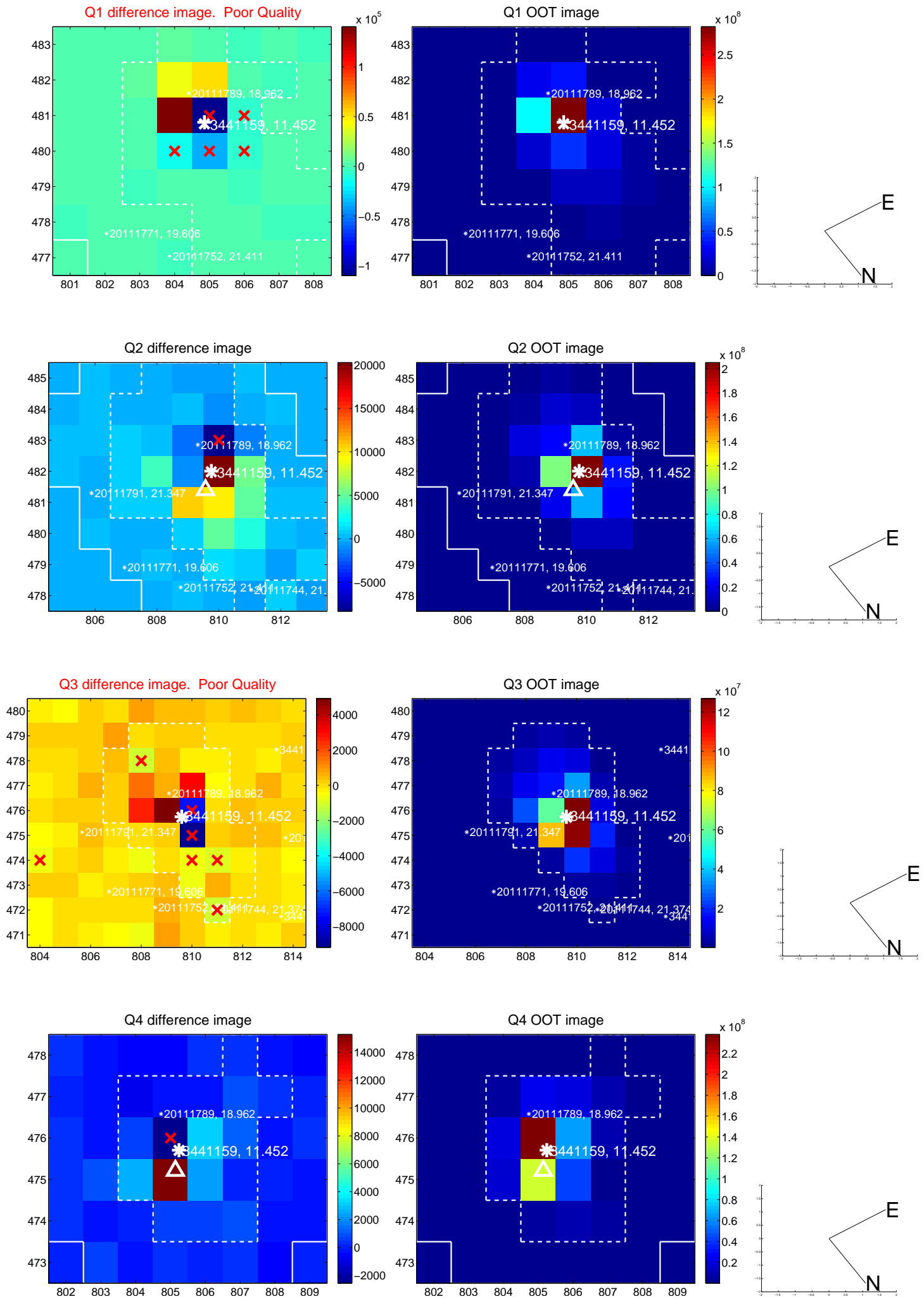
The direct PRF centroid is offset from the target star catalog position by about 0.17 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.244 \pm 0.530$	0.46	$-0.219 \pm 0.639$	$0.108 \pm 0.504$
PRF-fit source offset from KIC position	$0.207 \pm 0.637$	0.33	$-0.207 \pm 0.654$	$0.015 \pm 0.504$
photometric centroid source offset	$0.15 \pm 0.16$	0.99	$0.14 \pm 0.15$	$-0.06 \pm 0.18$

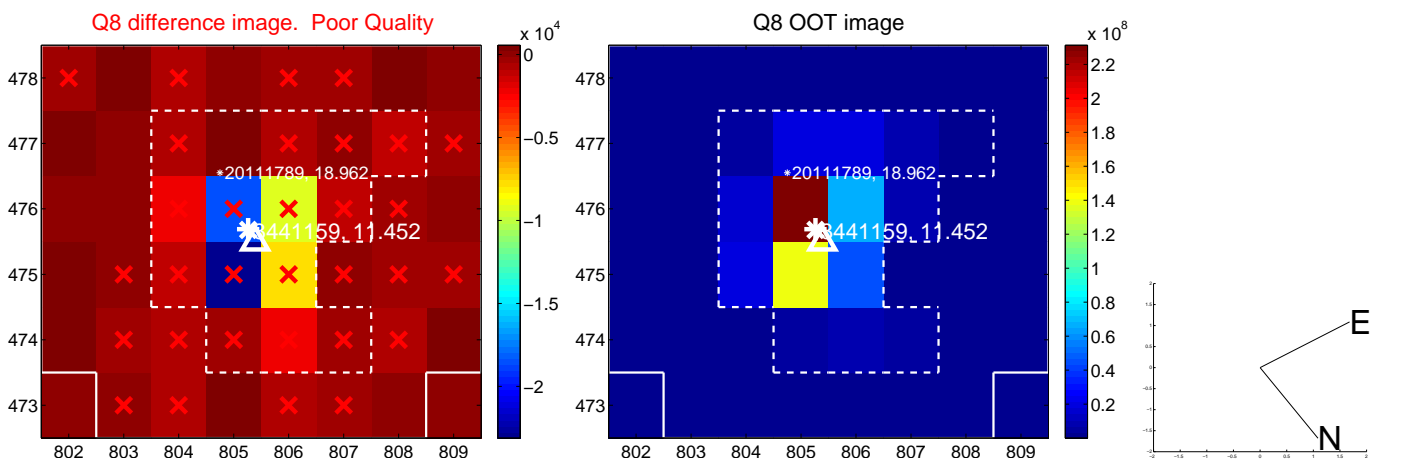
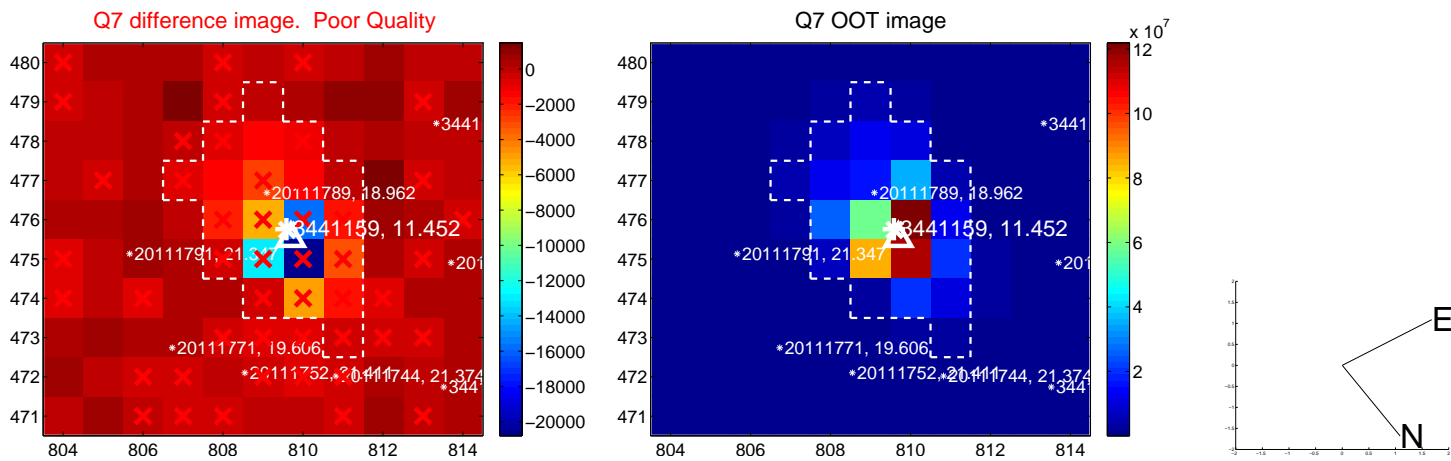
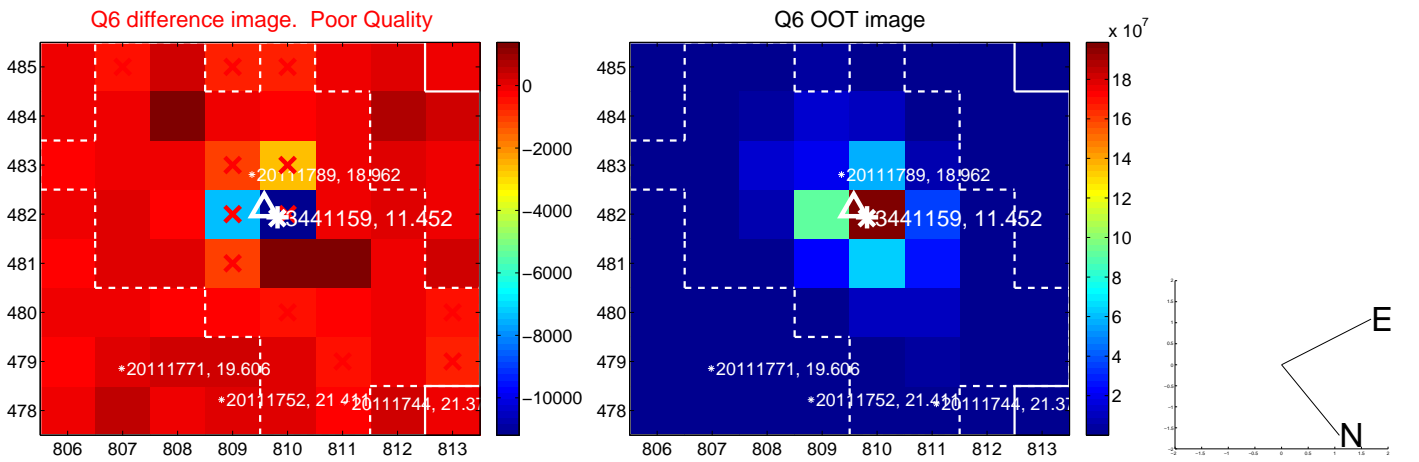
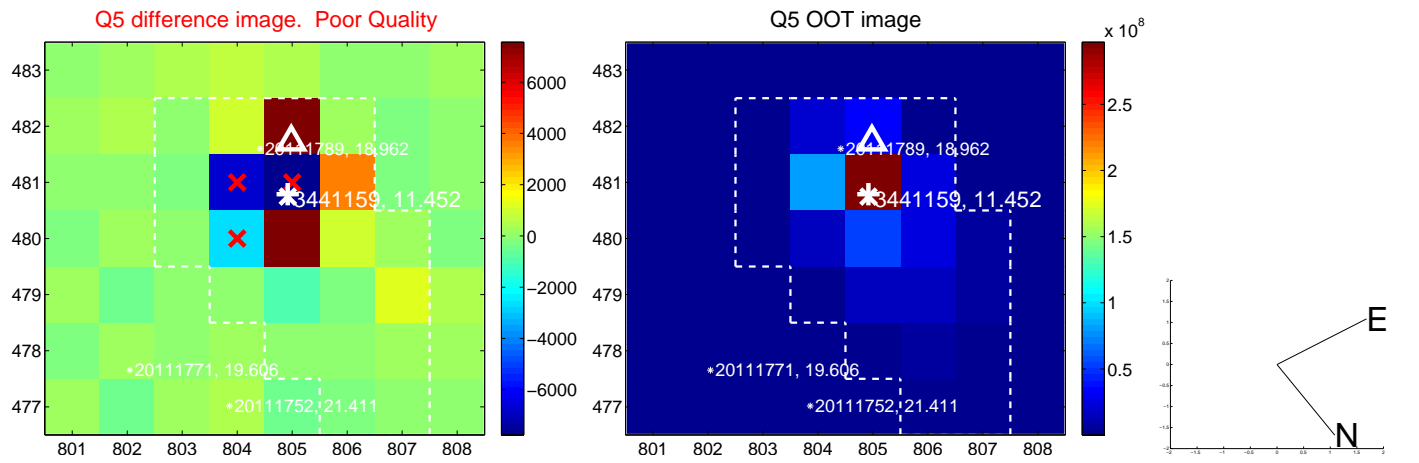


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets;** magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

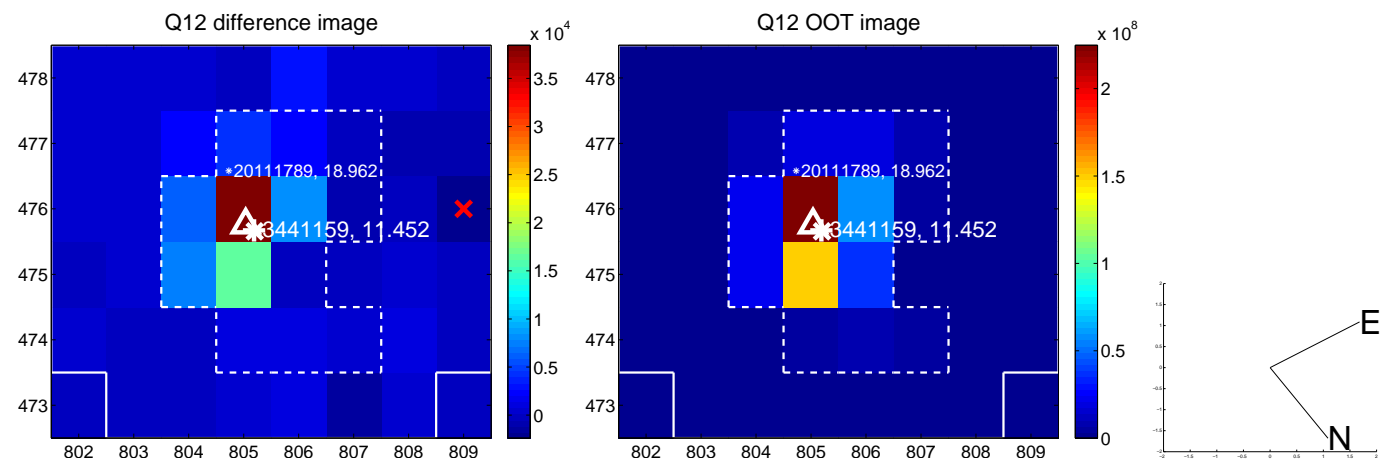
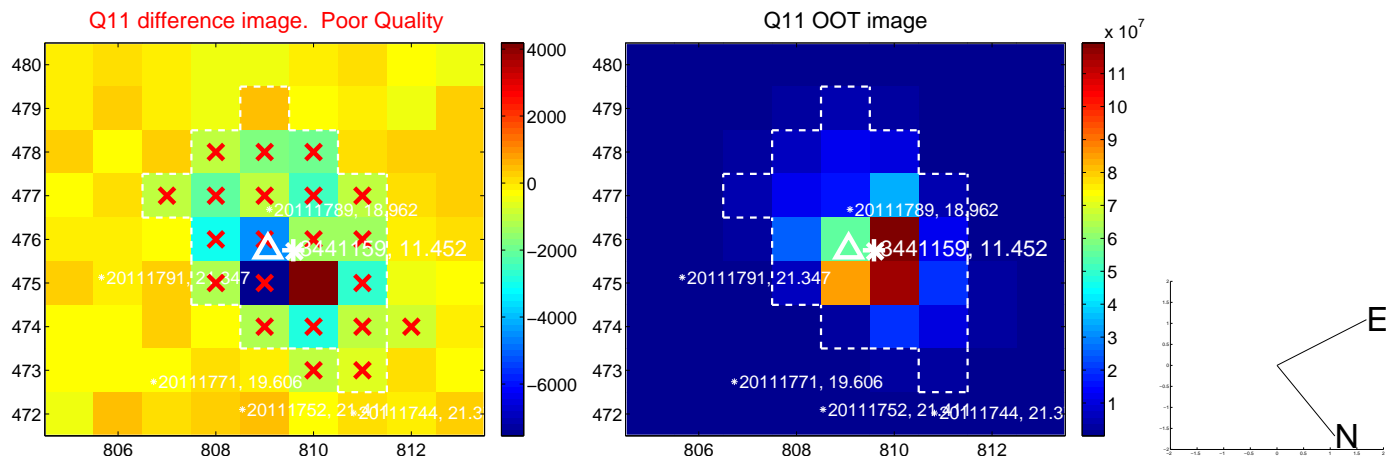
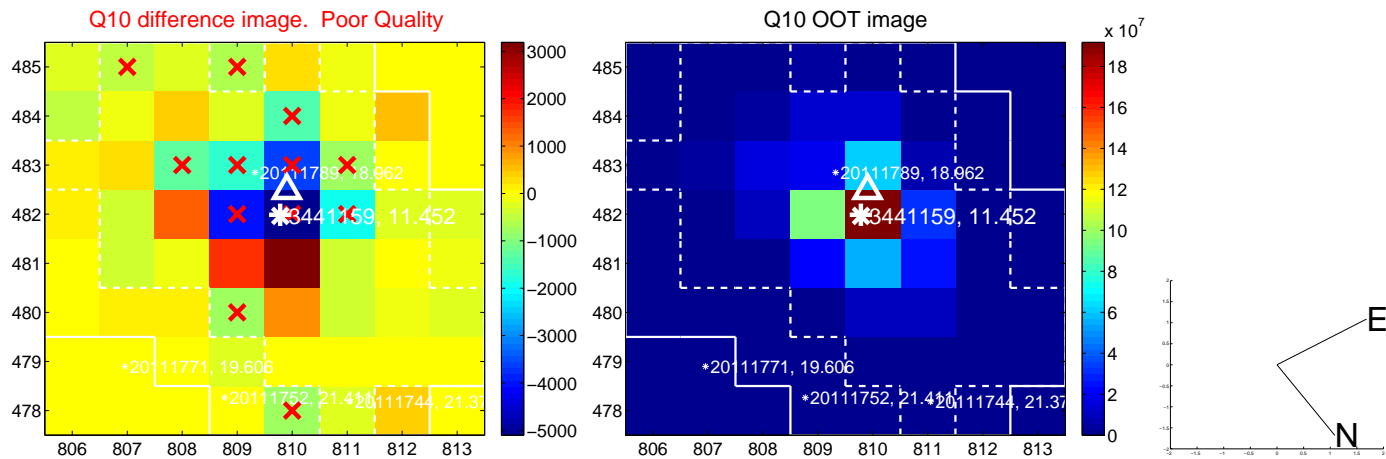
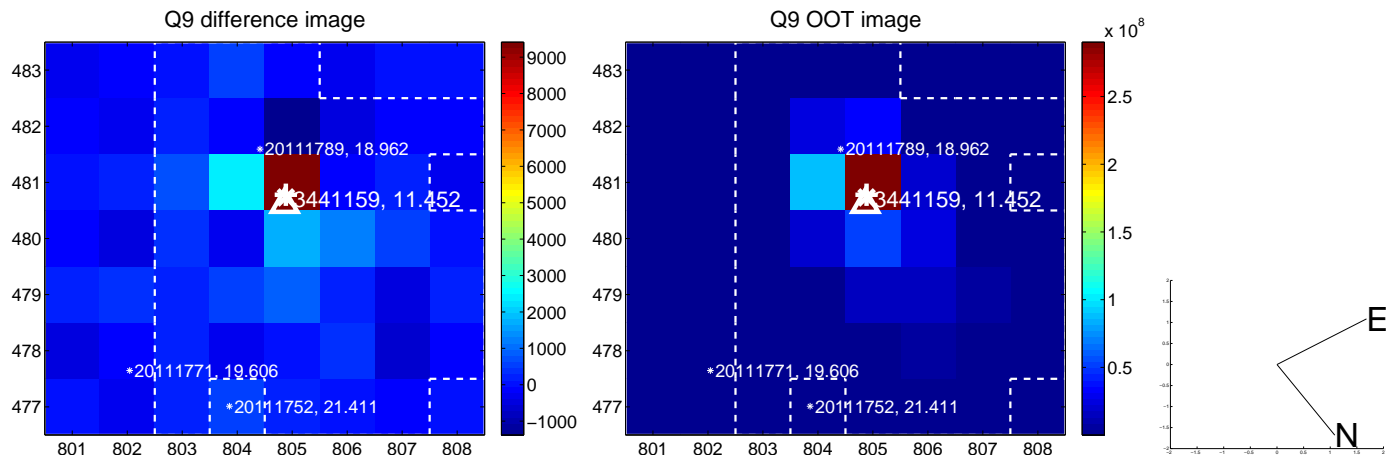
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



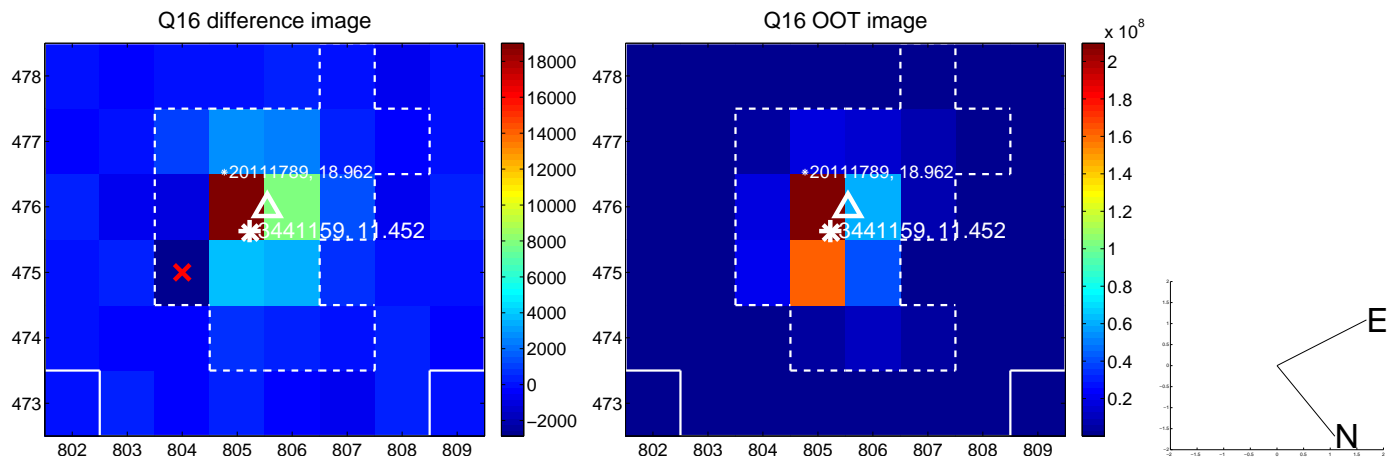
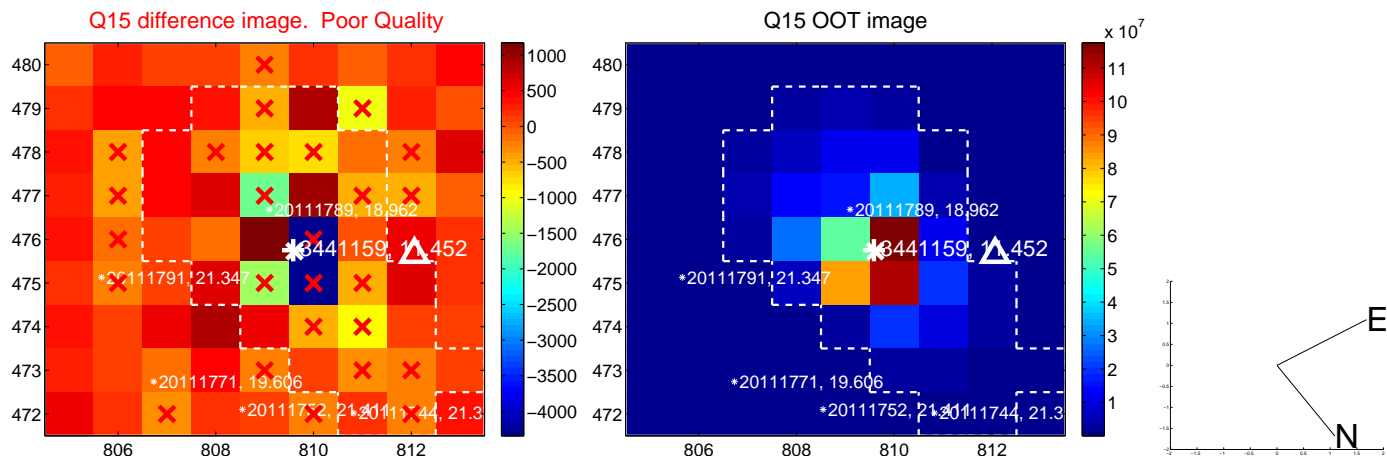
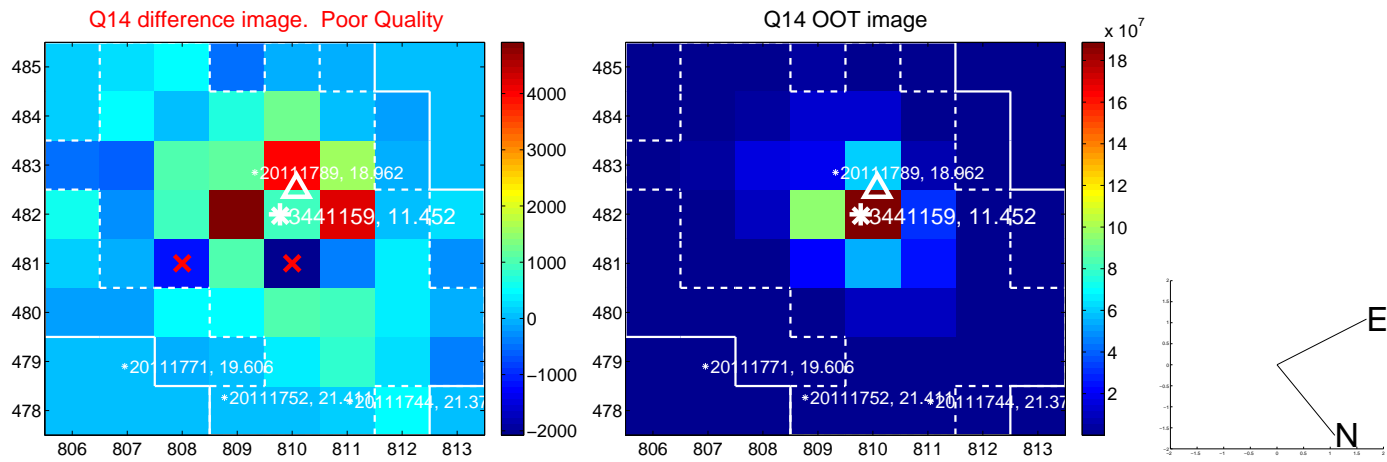
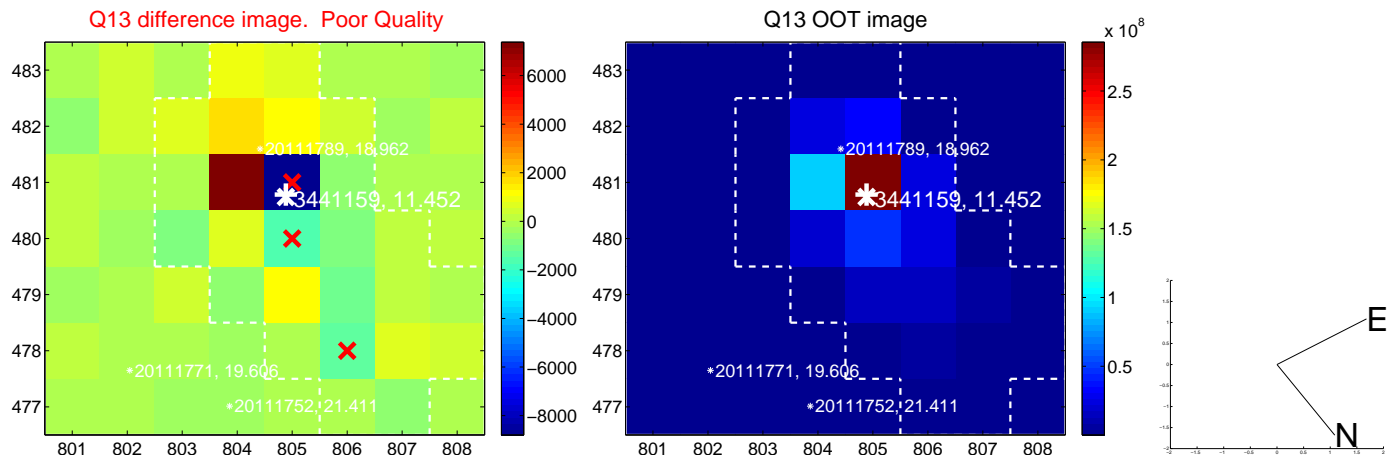
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

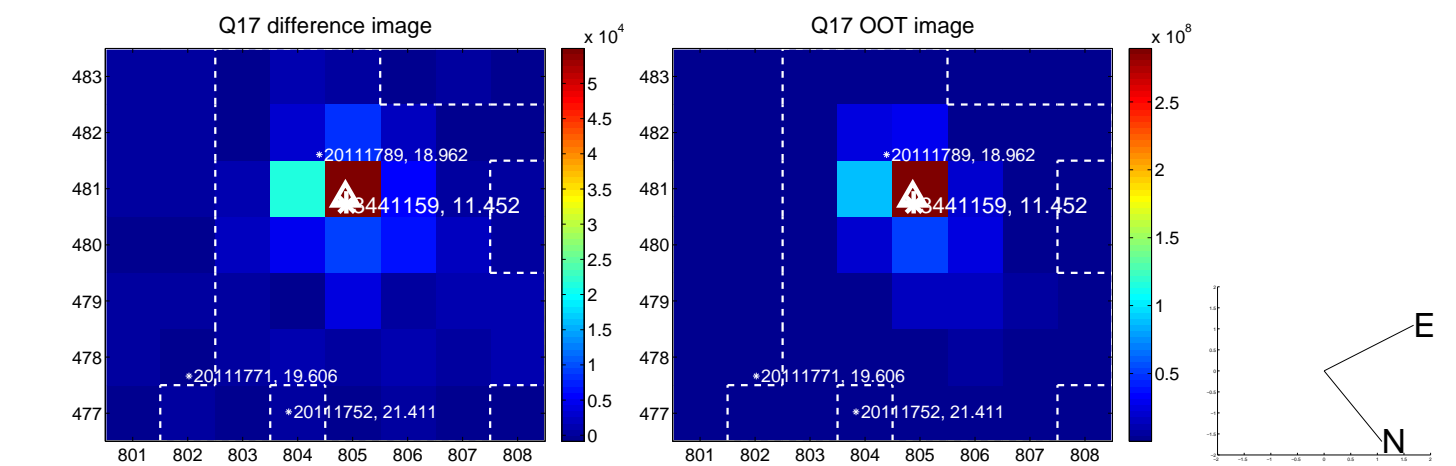


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

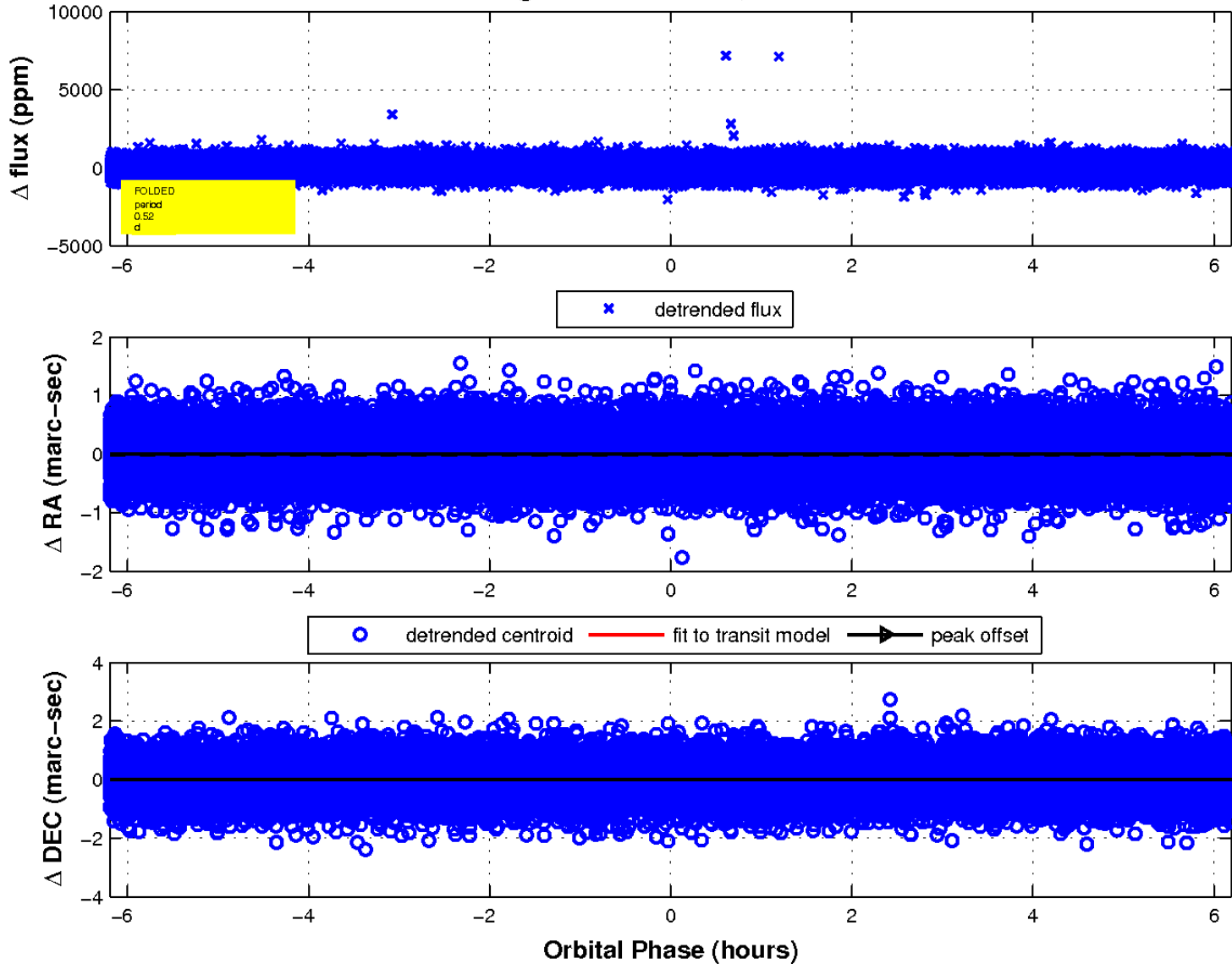




white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

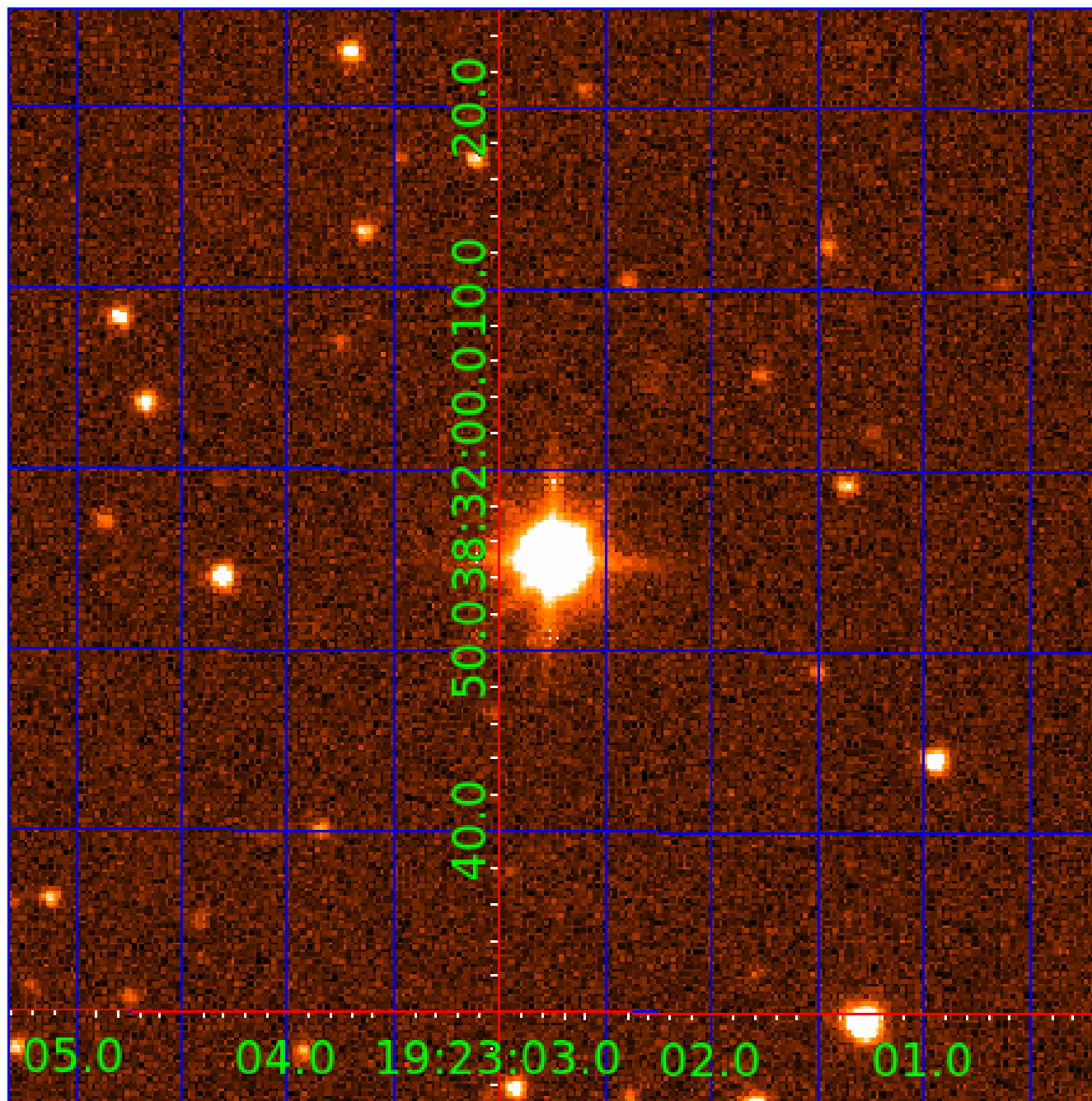


fluxWeightedCentroids, Planet 2 of 4



UKIRT Image

Declination



# KIC 003441159

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
003441159-01	OBS	No	0.804996	132.207360	51.4	2.282	10.1	11.3	4.11	7234	3.42	87721.02
003441159-02	OBS	No	0.516240	131.959325	48.9	2.968	8.8	11.5	4.11	7234	3.33	0.00
003441159-03	OBS	No	60.003275	135.098380	517.9	1.717	8.9	5.8	4.11	7234	9.48	279.64
003441159-04	OBS	No	61.455669	162.032215	211.8	19.338	7.8	5.9	4.11	7234	6.54	270.86

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
003441159-01	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—CENT_SATURATED
003441159-02	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—CENT_SATURATED
003441159-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—CENT_SATURATED
003441159-04	OBS	FP	0.00	1	0	1	0	INDIV_TRANS_RUBBLE_SKYE—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—CENT_SATURATED—HALO_GHOST

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

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

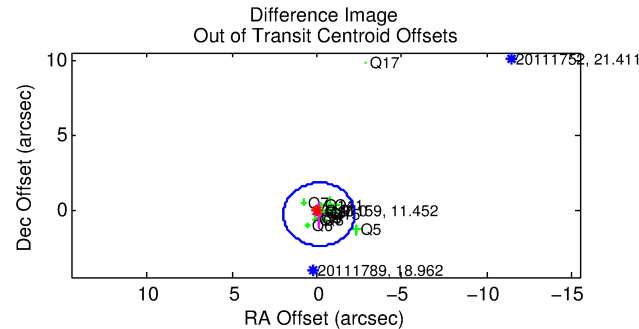
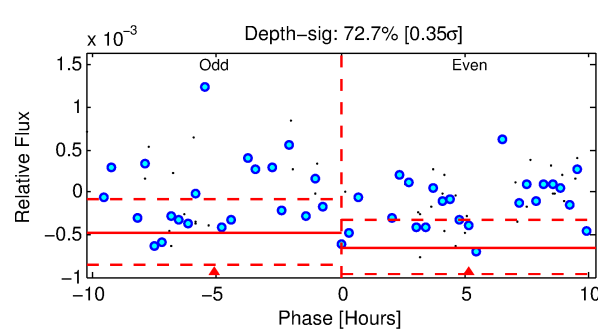
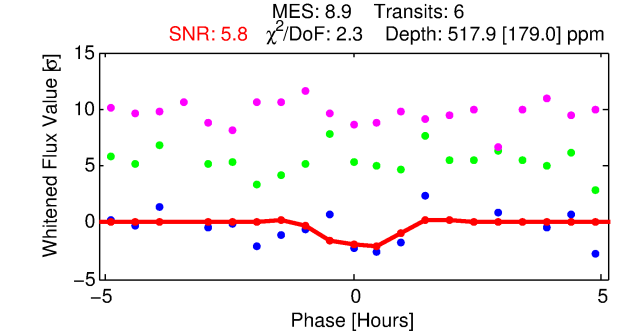
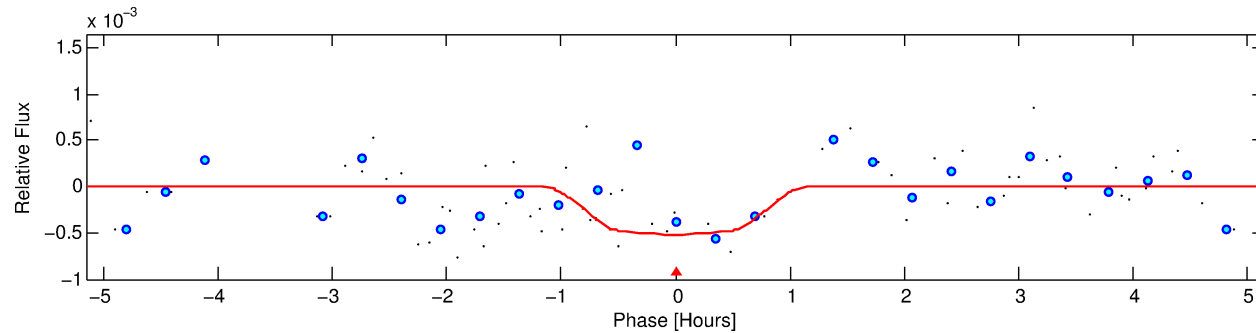
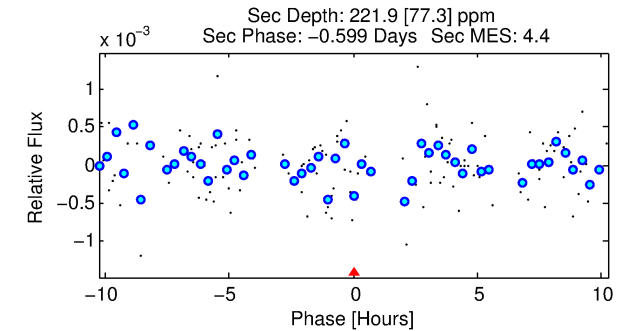
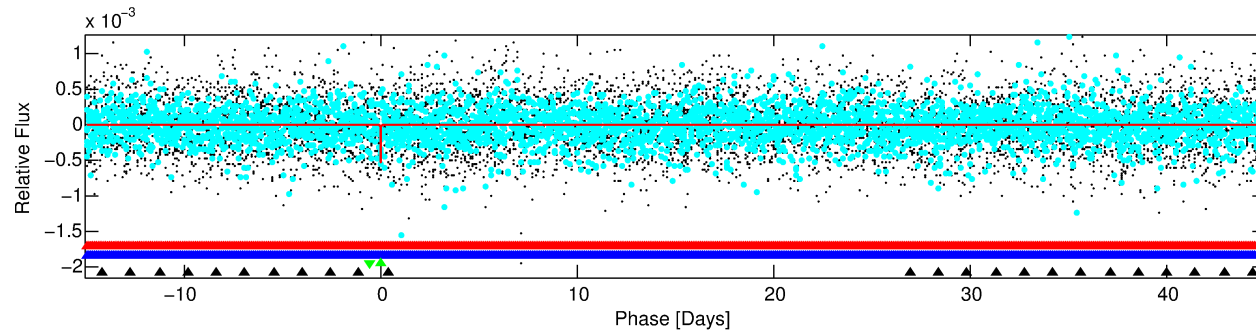
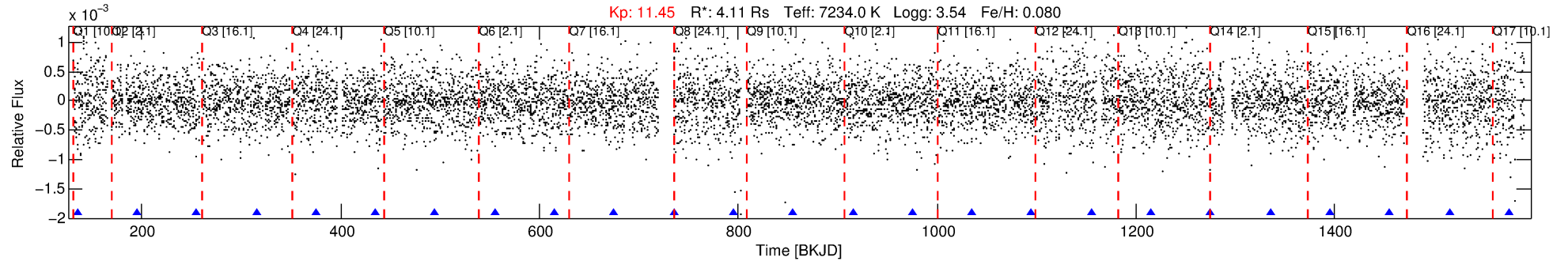
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 003441159-03

No Significant Match Found

# DV One-Page Summary

KIC: 3441159 Candidate: 3 of 4 Period: 60.003 d



## DV Fit Results:

Period = 60.00328 [0.00094] d  
Epoch = 135.0984 [0.0110] BKJD  
 $R_p/R^*$  = 0.0211 [0.0607]  
 $a/R^*$  = 272.43 [4446.79]  
 $b$  = 0.04 [408.17]  
 $S_{\text{eff}}$  = 279.64 [266.44]  
 $T_{\text{eq}}$  = 1043 [248] K  
 $R_p$  = 9.48 [27.72]  $R_e$   
 $a$  = 0.3848 [0.2181] AU  
 $A_g$  = 201.09 [1172.02] [0.17 $\sigma$ ]  
 $T_{\text{eff}}$  = 6071 [8735] K [0.58 $\sigma$ ]

## DV Diagnostic Results:

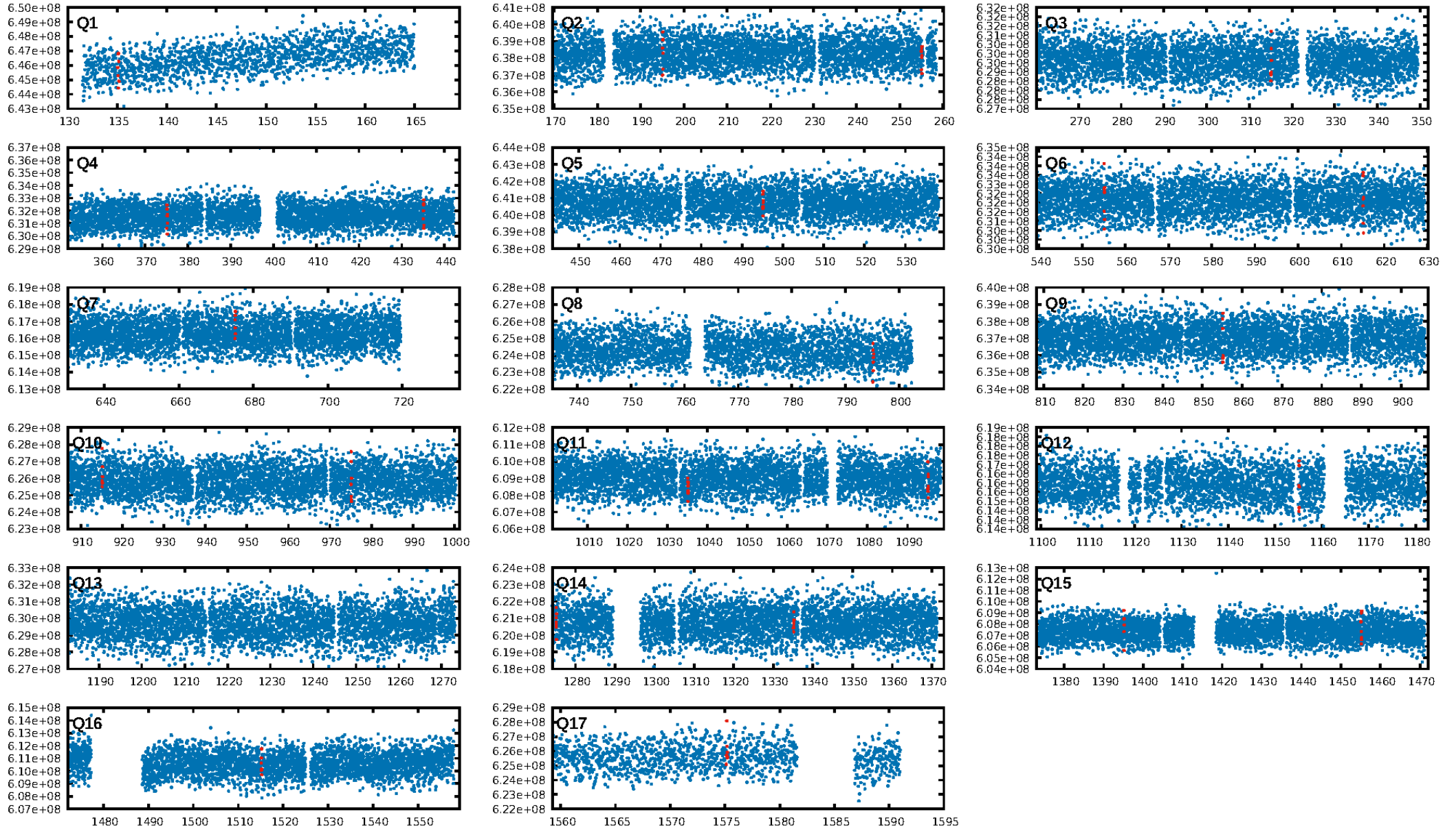
ShortPeriod-sig: 100.0% [497.46 $\sigma$ ]  
LongPeriod-sig: 92.7% [1.80 $\sigma$ ]  
ModelChiSquare2-sig: 2.5%  
ModelChiSquareGof-sig: 87.5%  
**Bootstrap-pfa: 1.25e-12**  
RollingBand-fgt: 1.00 [5/5]  
GhostDiagnostic-chr: -5.883  
Centroid-sig: 36.6%  
Centroid-so: 0.302 arcsec [1.31 $\sigma$ ]  
OotOffset-rm: 0.339 arcsec [0.48 $\sigma$ ]  
KicOffset-rm: 0.441 arcsec [0.60 $\sigma$ ]  
OotOffset-st: 3/4/3/3 [13]  
KicOffset-st: 3/4/3/3 [13]  
DiffImageQuality-fgm: 0.38 [5/13]  
DiffImageOverlap-fno: 0.00 [0/15]

Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 31-Jan-2016 10:40:13 Z

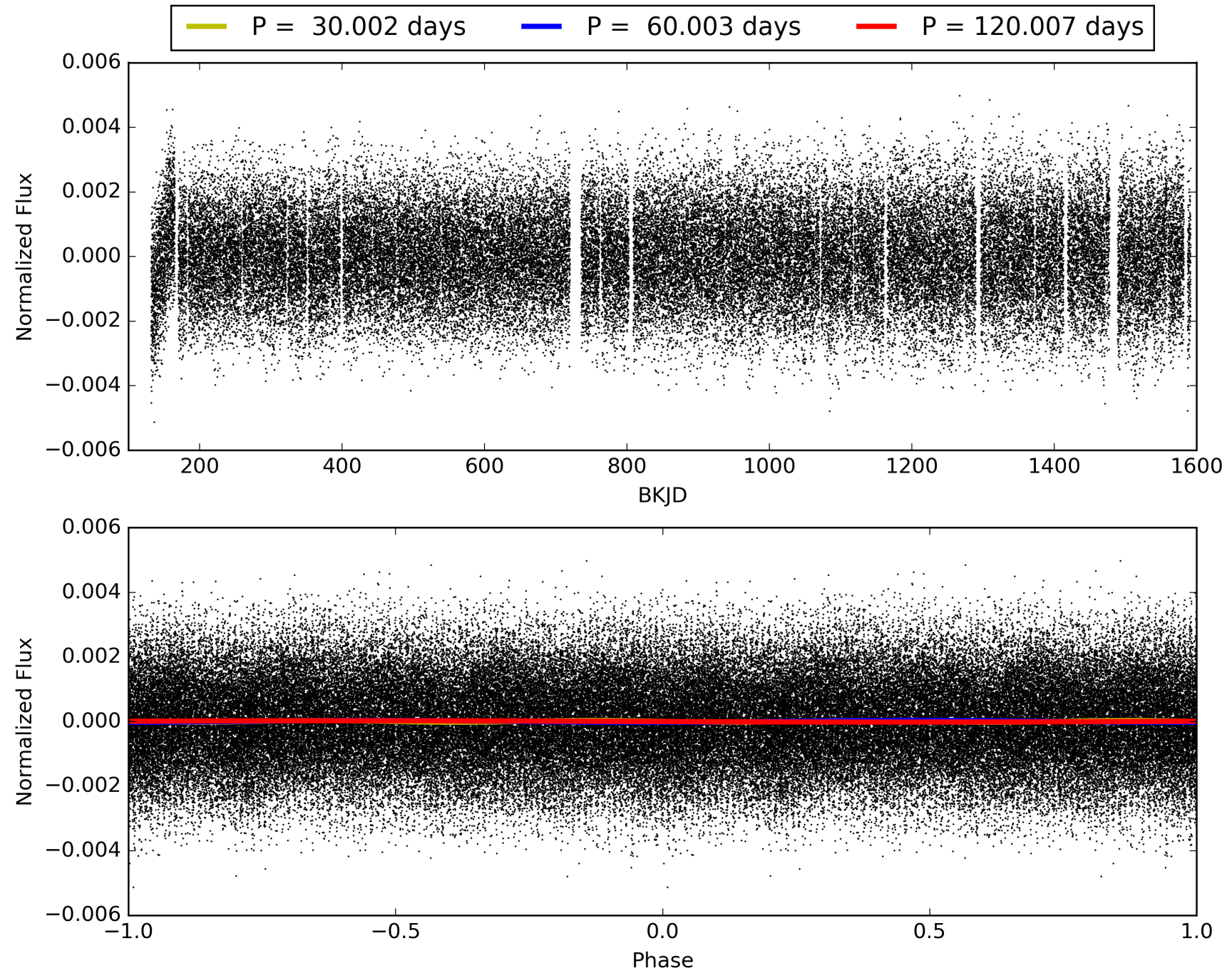
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center



# TCE 003441159-03, PDC Light Curves

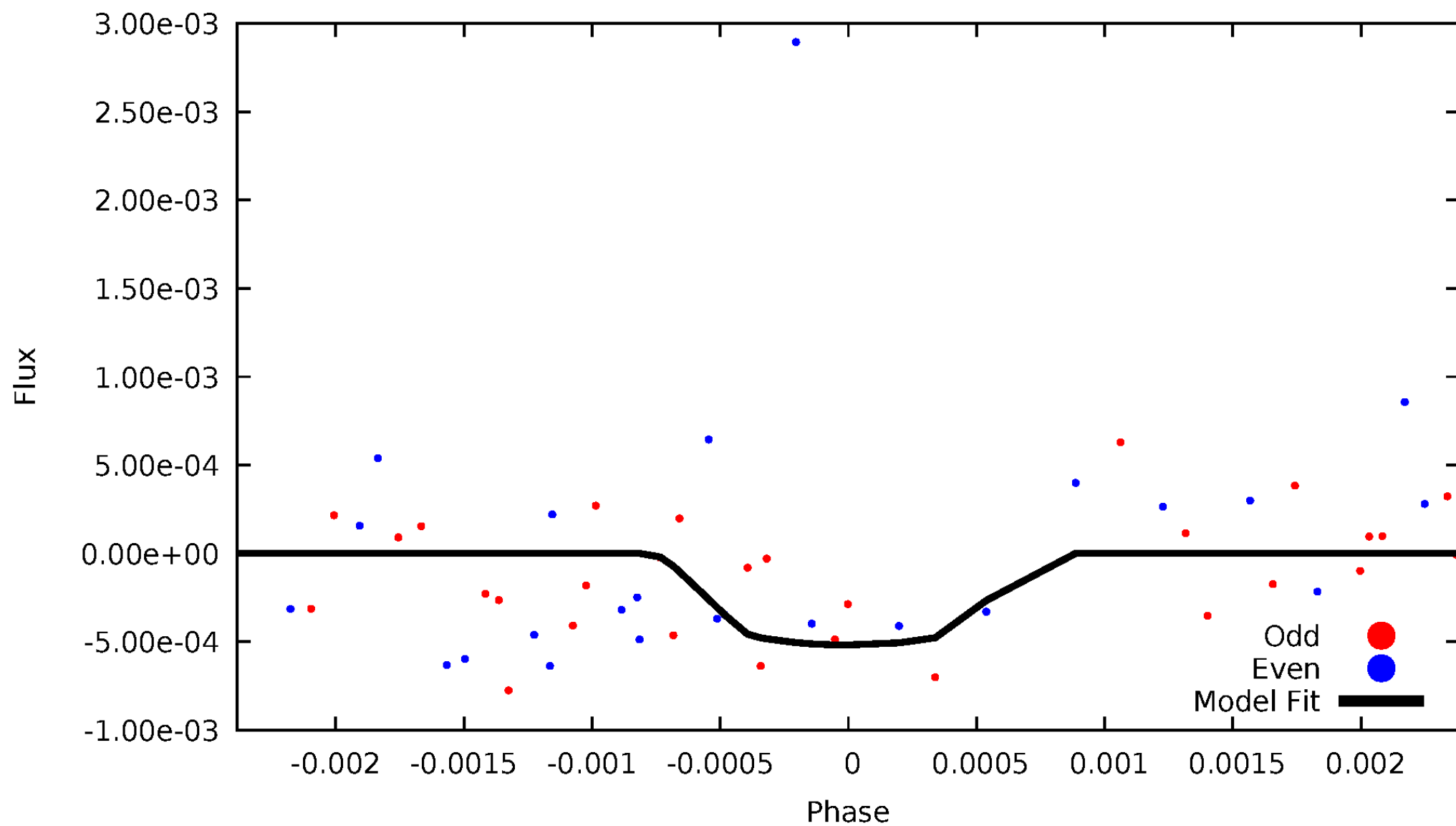


# TCE 003441159-03



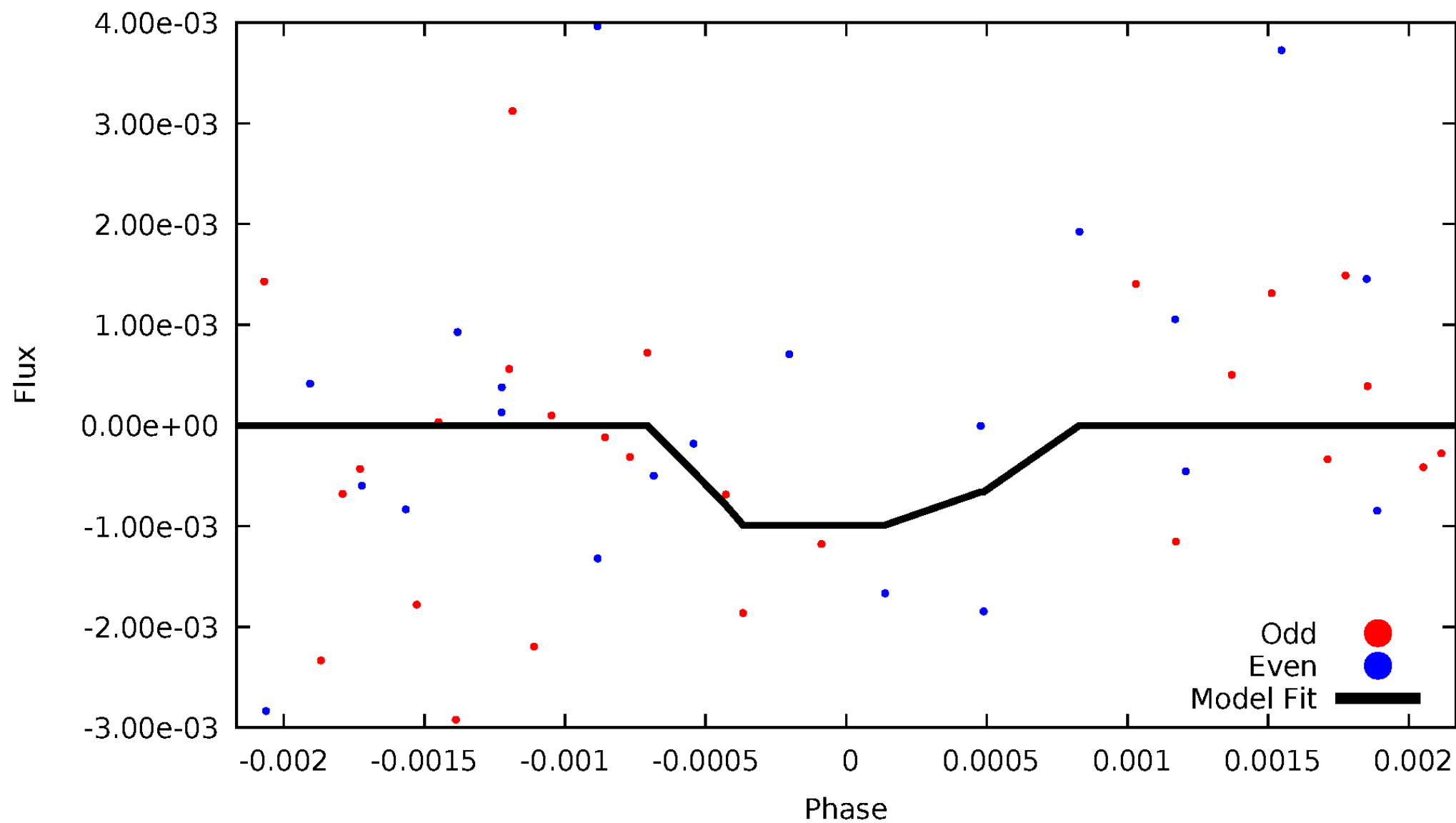
# DV Odd/Even

TCE 003441159-03



# ALT Odd/Even

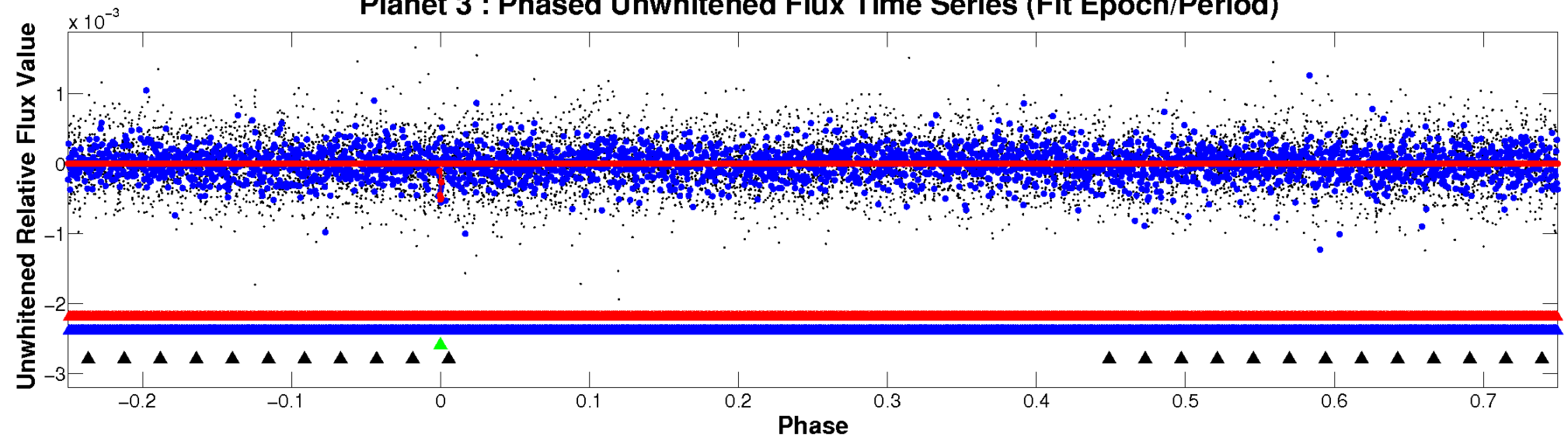
TCE 003441159-03



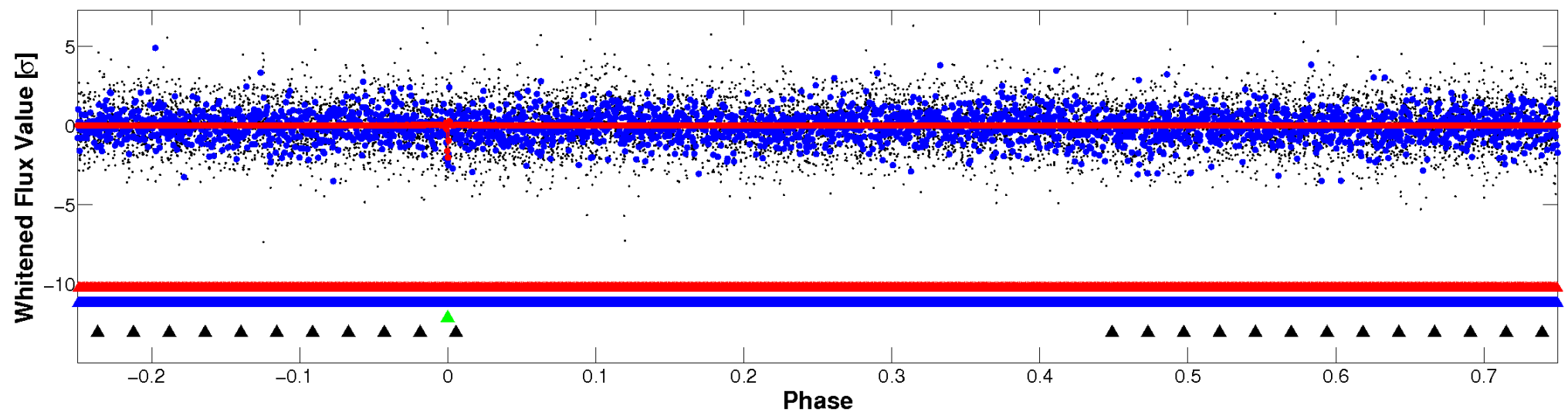


# Non-Whitened Vs. Whitened Light Curve

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

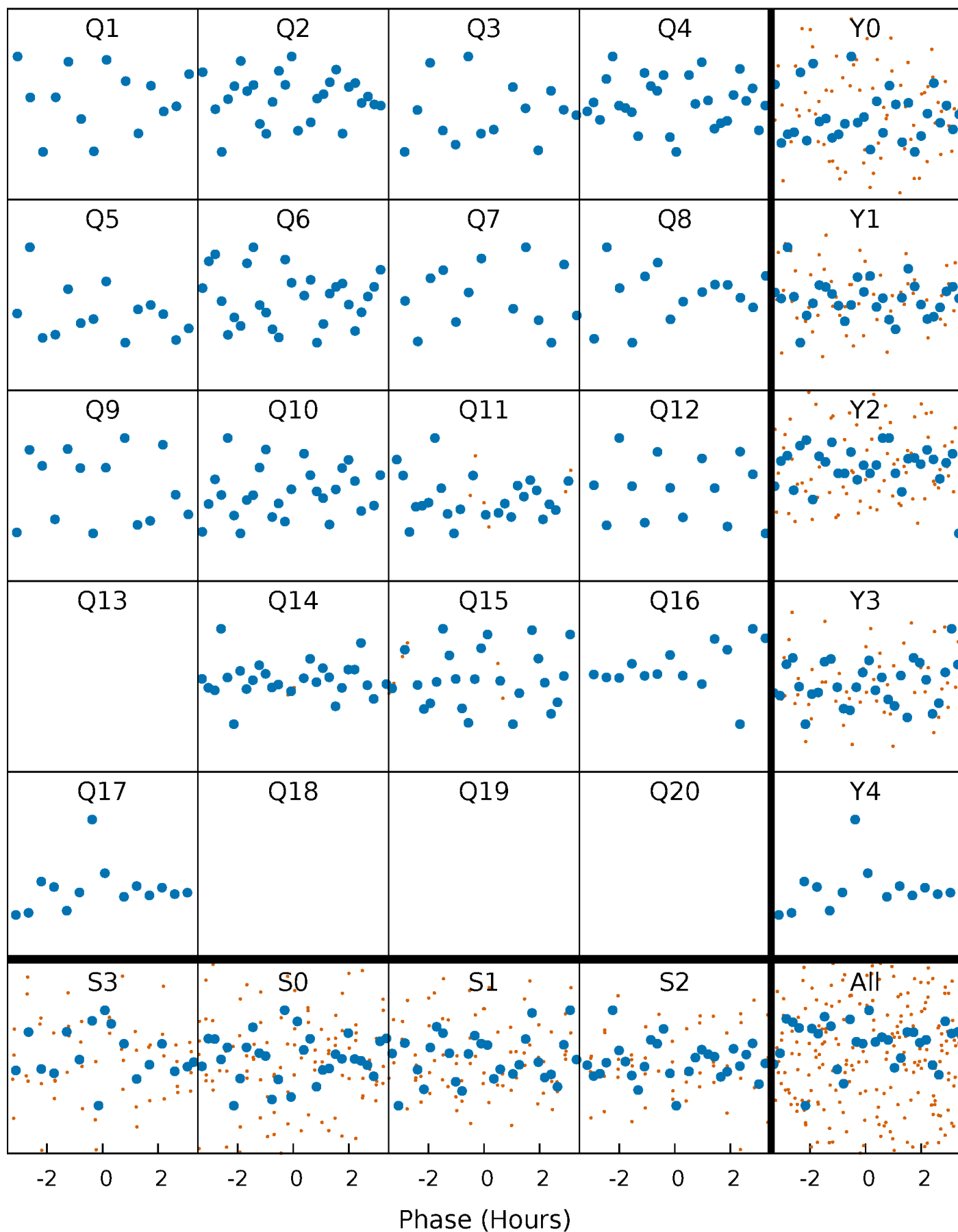


Planet 3 : Phased Whitened Flux Time Series (Fit Epoch/Period)



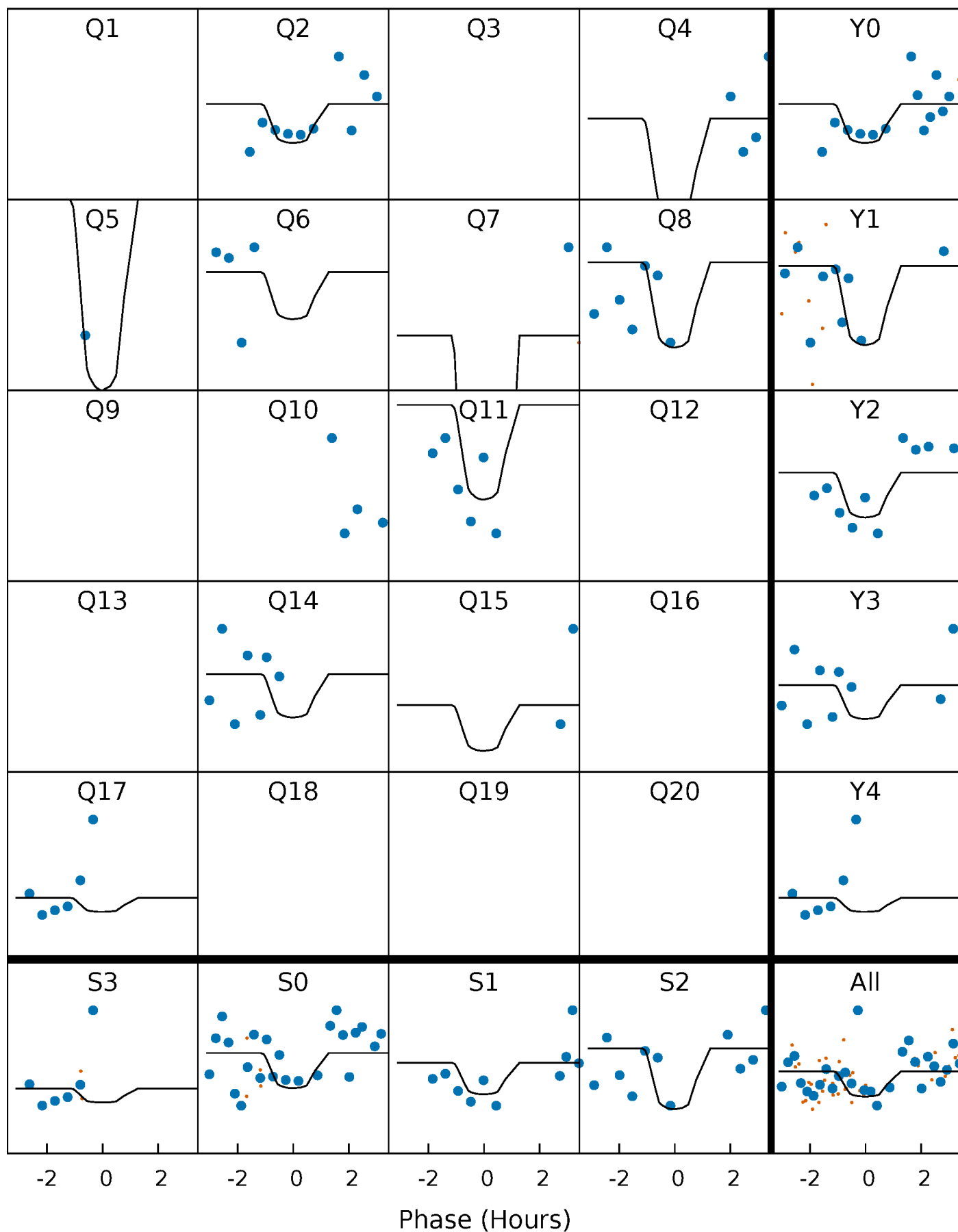
# PDC Quarter-Phased Transit Curves

TCE 003441159-03     $P = 60.003275$  Days     $T_0 = 135.098380$  (BKJD)



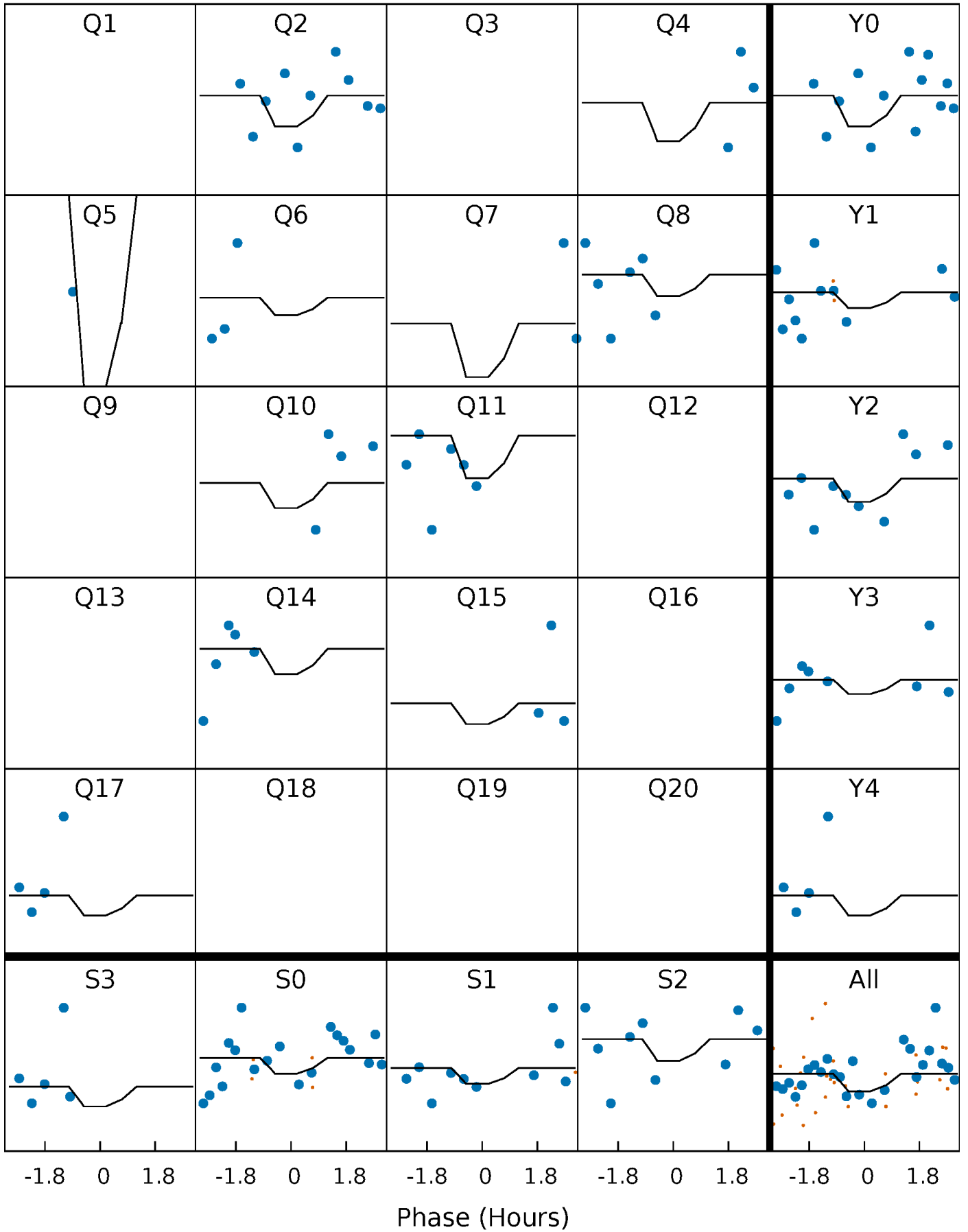
# DV Quarter-Phased Transit Curves

TCE 003441159-03 P= 60.003275 Days  $T_0=135.098380$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

TCE 003441159-03 P= 60.004968 Days  $T_0=135.098580$  (BKJD)

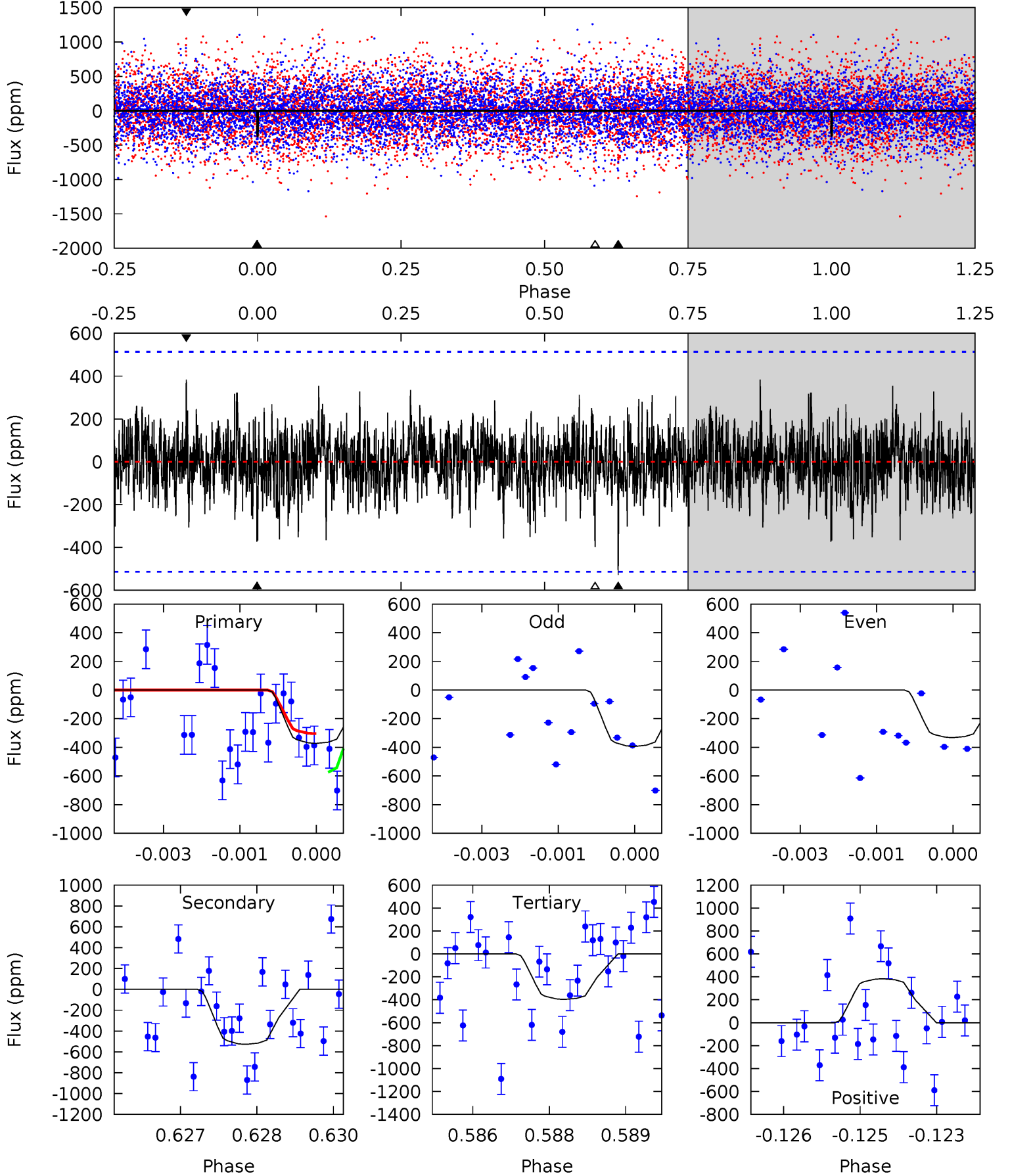




# DV Model-Shift Uniqueness Test

003441159-03, P = 60.003275 Days, E = 75.095105 Days

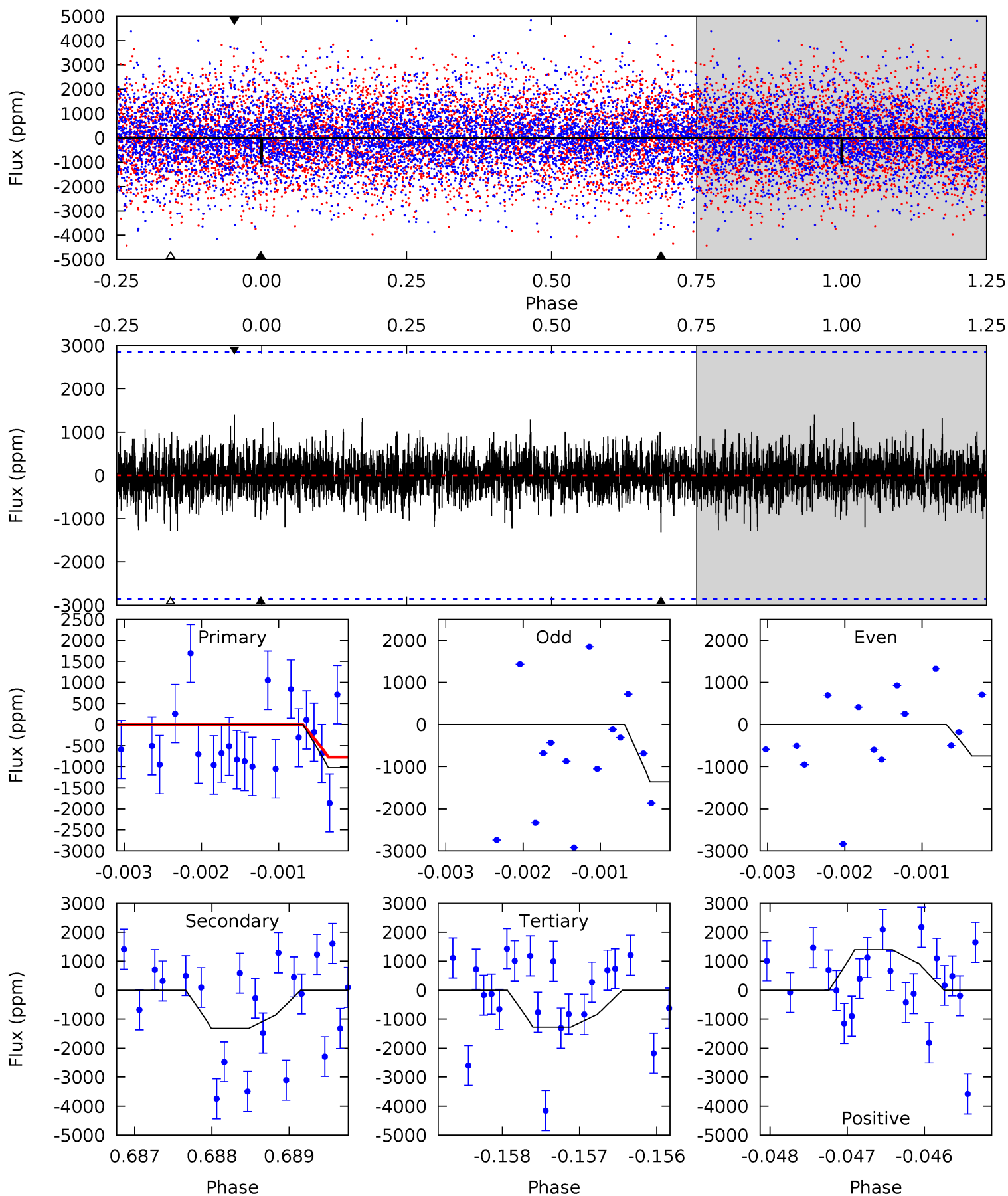
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
3.92	5.56	4.18	4.03	5.41	3.22	1.12	-0.26	-0.11	1.38	1.53	0.34	-0.82	0.42	1.02



# Alt Model-Shift Uniqueness Test

003441159-03, P = 60.004968 Days, E = 75.093612 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
1.96	2.50	2.44	2.67	5.45	3.28	0.66	-0.48	-0.71	0.06	-0.17	0.59	1.00	0.52	0.69



### Stellar Parameters For KIC 003441159

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R$ ( $R_{\odot}$ )	$M(M_{\odot})$	$p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ )
	$7234^{+200}_{-325}$	$3.535^{+0.560}_{-0.059}$	$0.080^{+0.200}_{-0.300}$	$4.108^{+0.402}_{-2.277}$	$2.108^{+0.206}_{-0.617}$	$0.043^{+0.287}_{-0.009}$
	+3%/-4%	+16%/-2%	+250%/-375%	+10%/-55%	+10%/-29%	+670%/-20%
Source	KIC0	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 003441159-03 / KOI

Detrend	Depth (ppm)	$R_p$ ( $R_{\oplus}$ )	$T_{max}$ (K)	$T_{obs}$ (K)	$A_{obs}$
DV	$-528 \pm 95$	$19.03^{+21.33}_{-13.23}$	$1408^{+83}_{-192}$	$4871^{+4146}_{-1080}$	$113^{+1160}_{-87}$
Alt.	$-1311 \pm 523$	$21.00^{+23.10}_{-14.01}$	$1385^{+110}_{-195}$	$5629^{+5177}_{-1418}$	$210^{+1674}_{-159}$

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

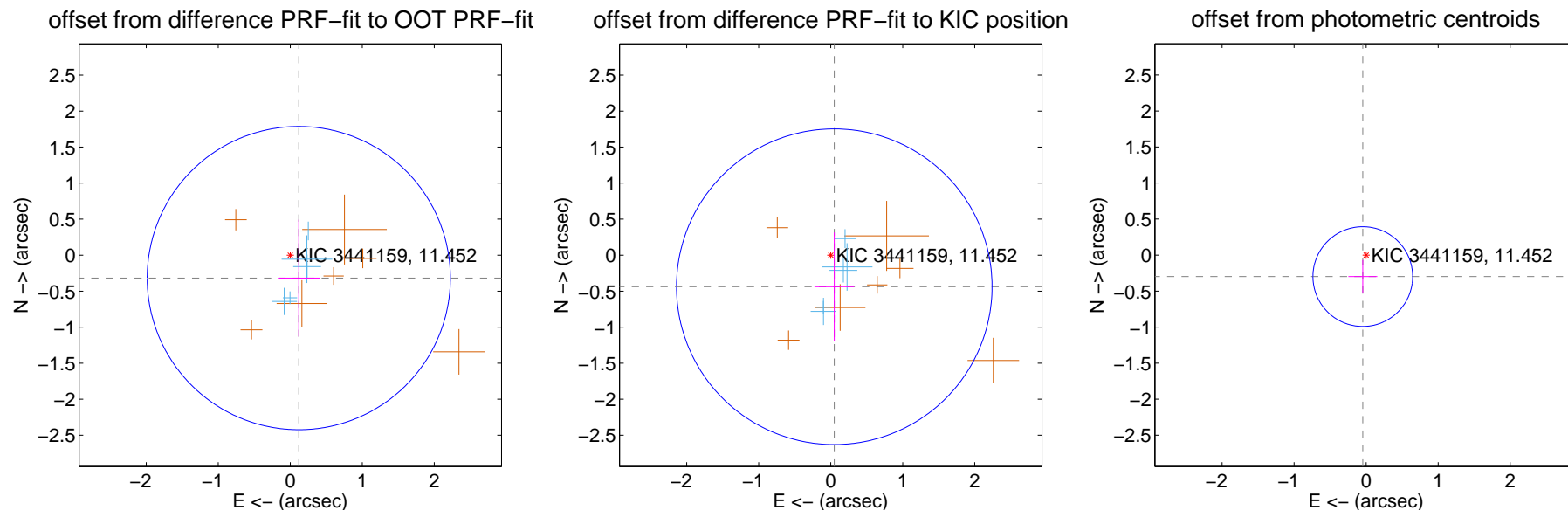
## DV Centroid Data

Supplemental centroid analysis for 003441159-03. **Kepler magnitude: 11.45.** Transit SNR 5.83

There are 5 quarters with good PRF difference image offsets

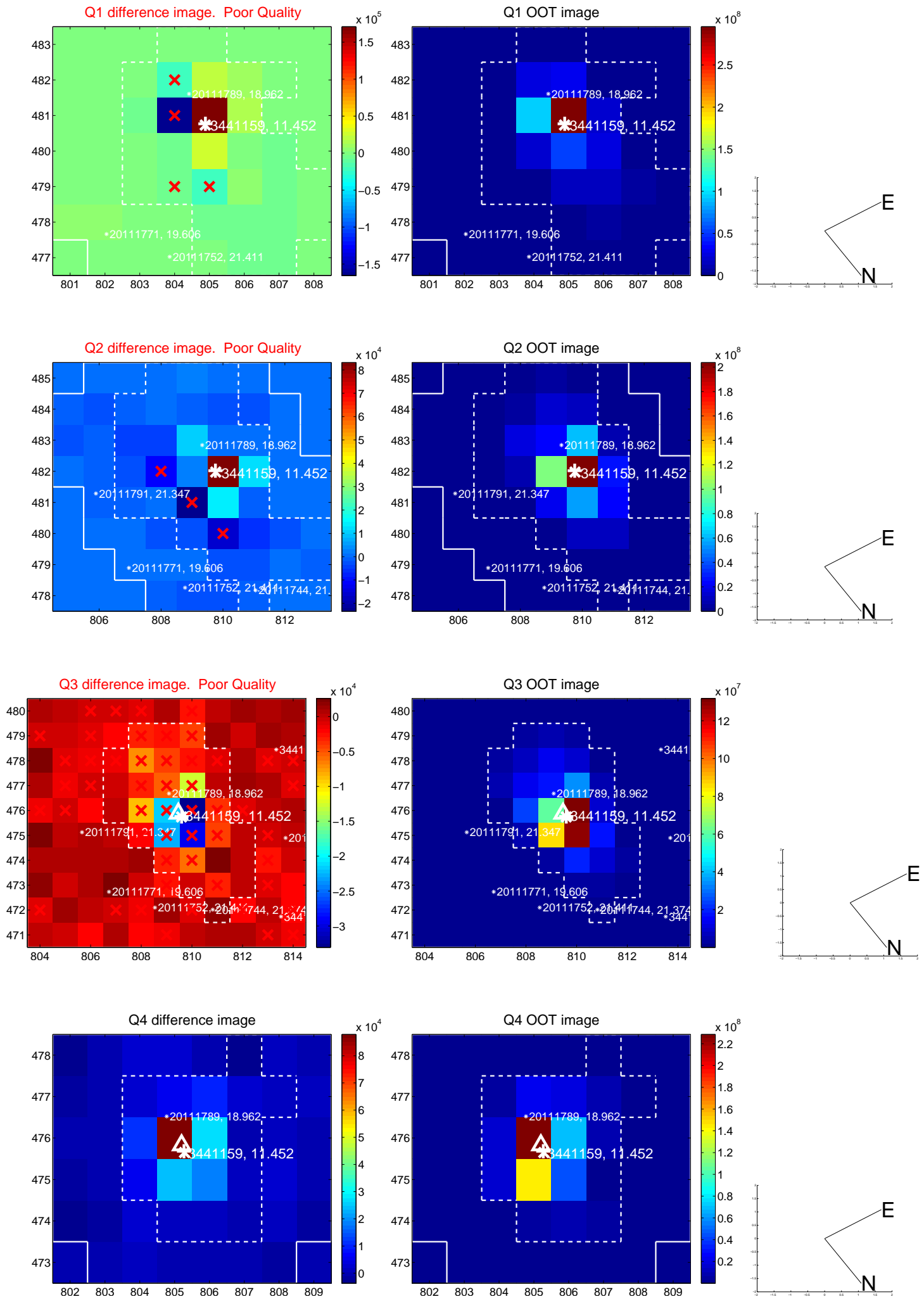
The direct PRF centroid is offset from the target star catalog position by about 0.17 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.339 \pm 0.702$	0.48	$-0.118 \pm 0.289$	$-0.318 \pm 0.811$
PRF-fit source offset from KIC position	$0.441 \pm 0.730$	0.60	$-0.049 \pm 0.274$	$-0.438 \pm 0.752$
photometric centroid source offset	$0.30 \pm 0.23$	1.31	$0.05 \pm 0.20$	$-0.30 \pm 0.23$



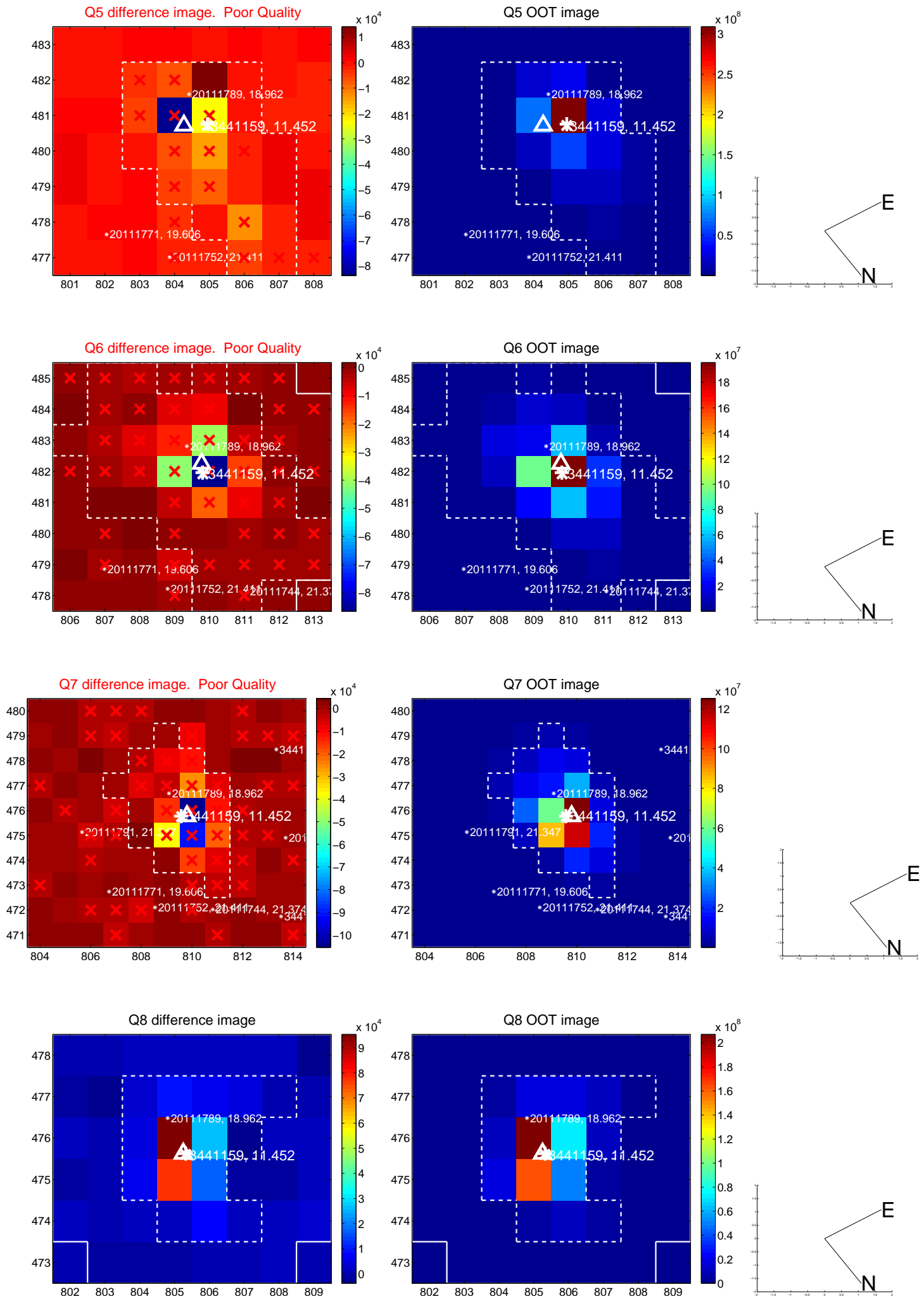
Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets;** magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

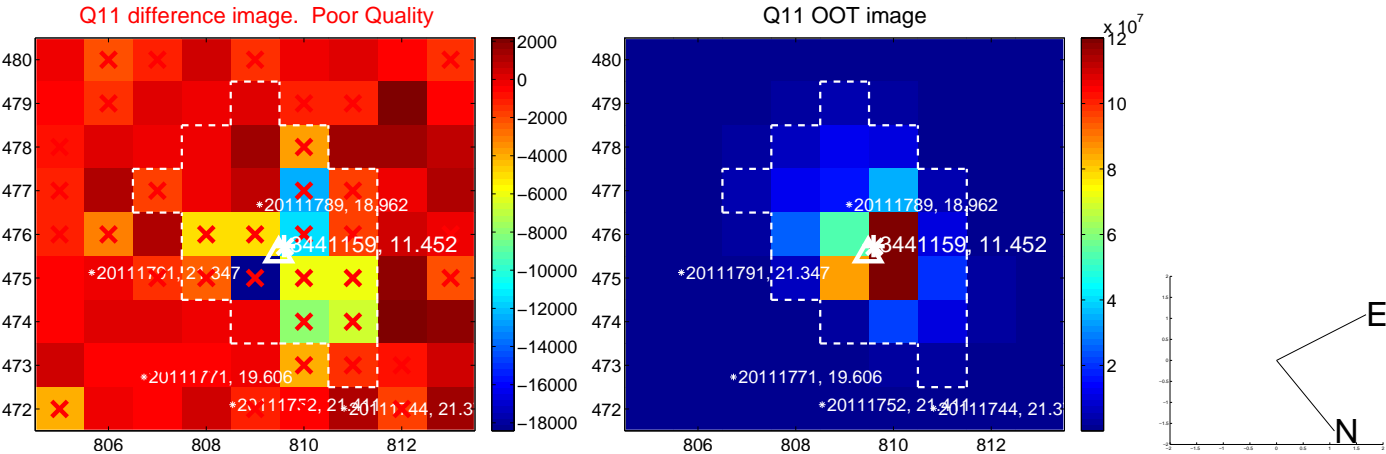
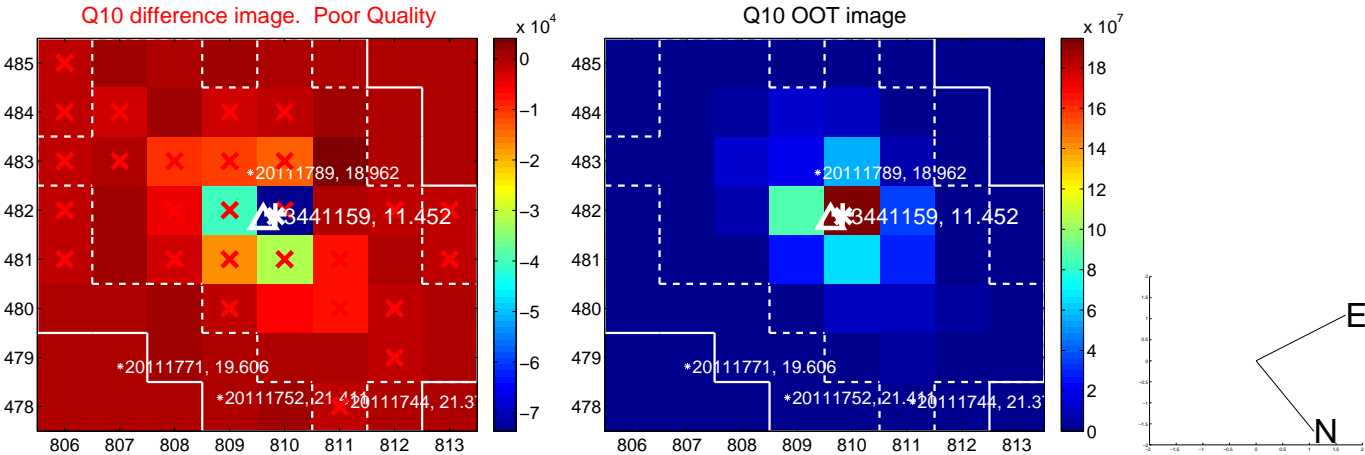
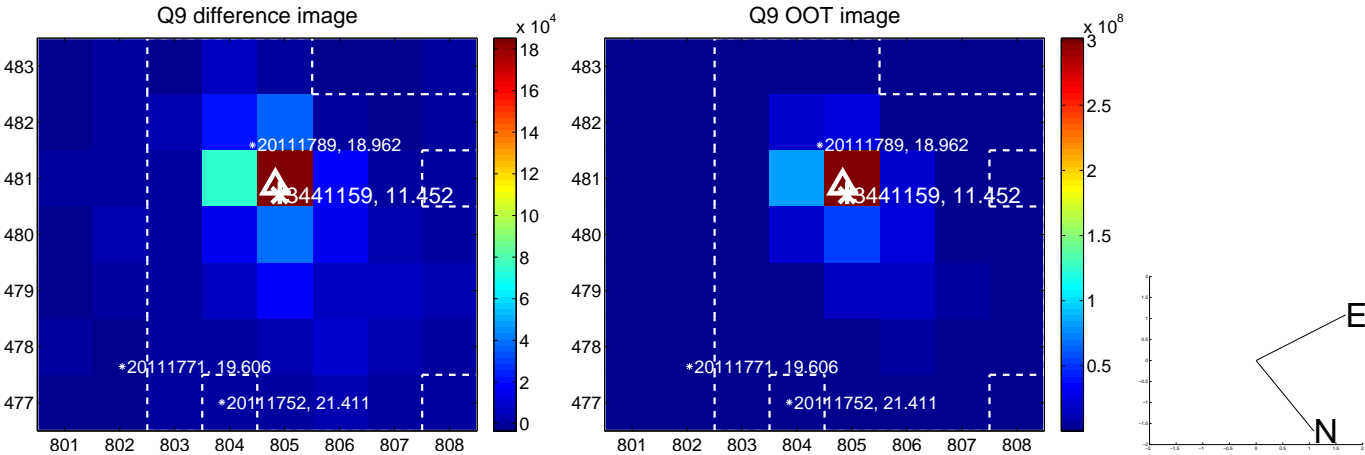




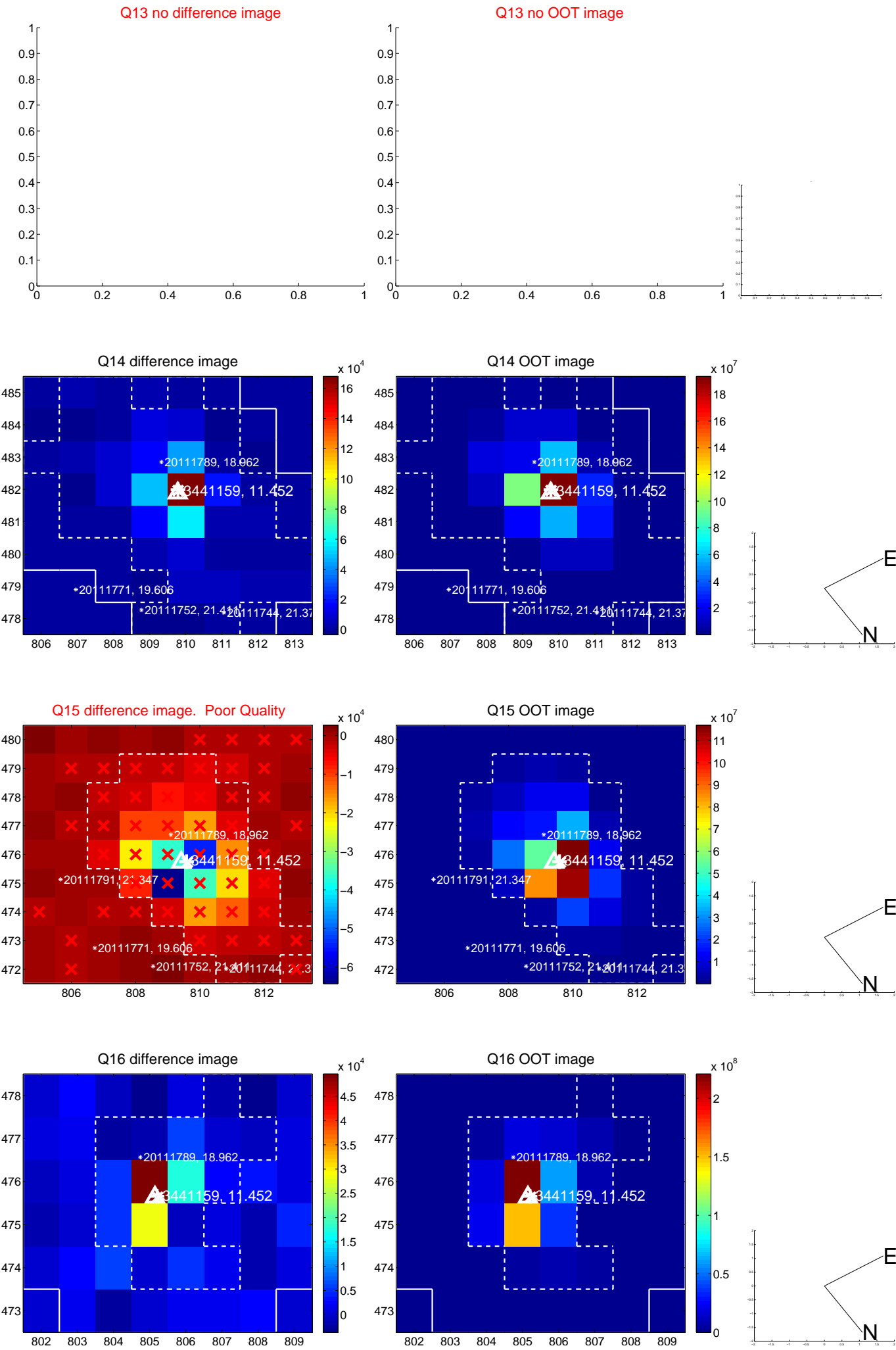
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



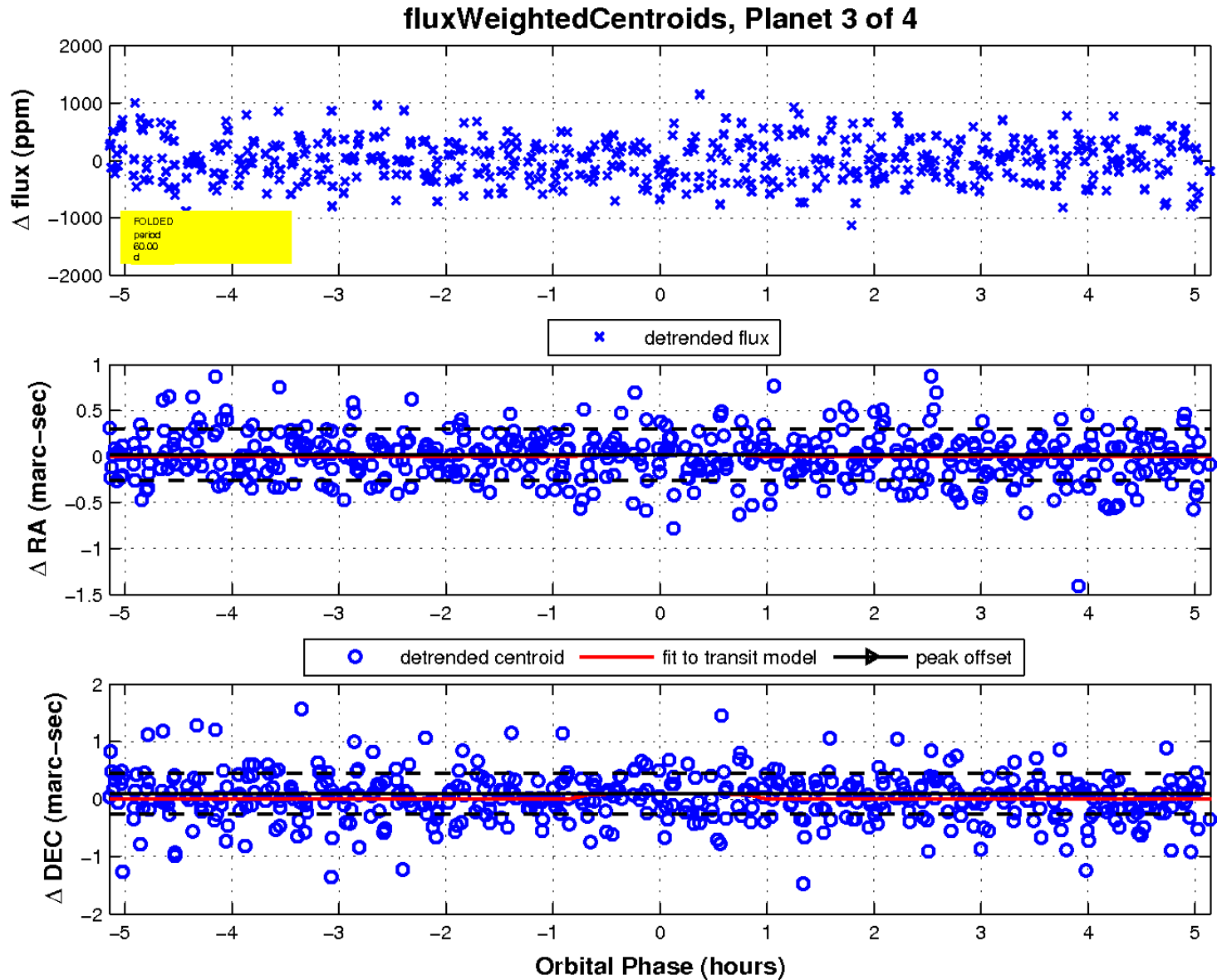
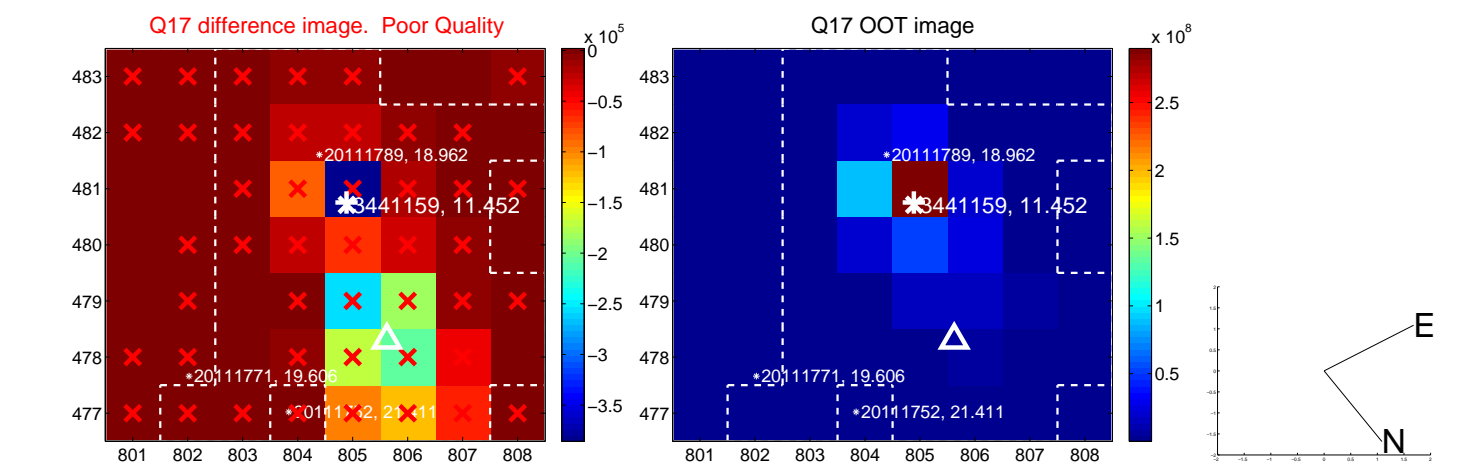
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

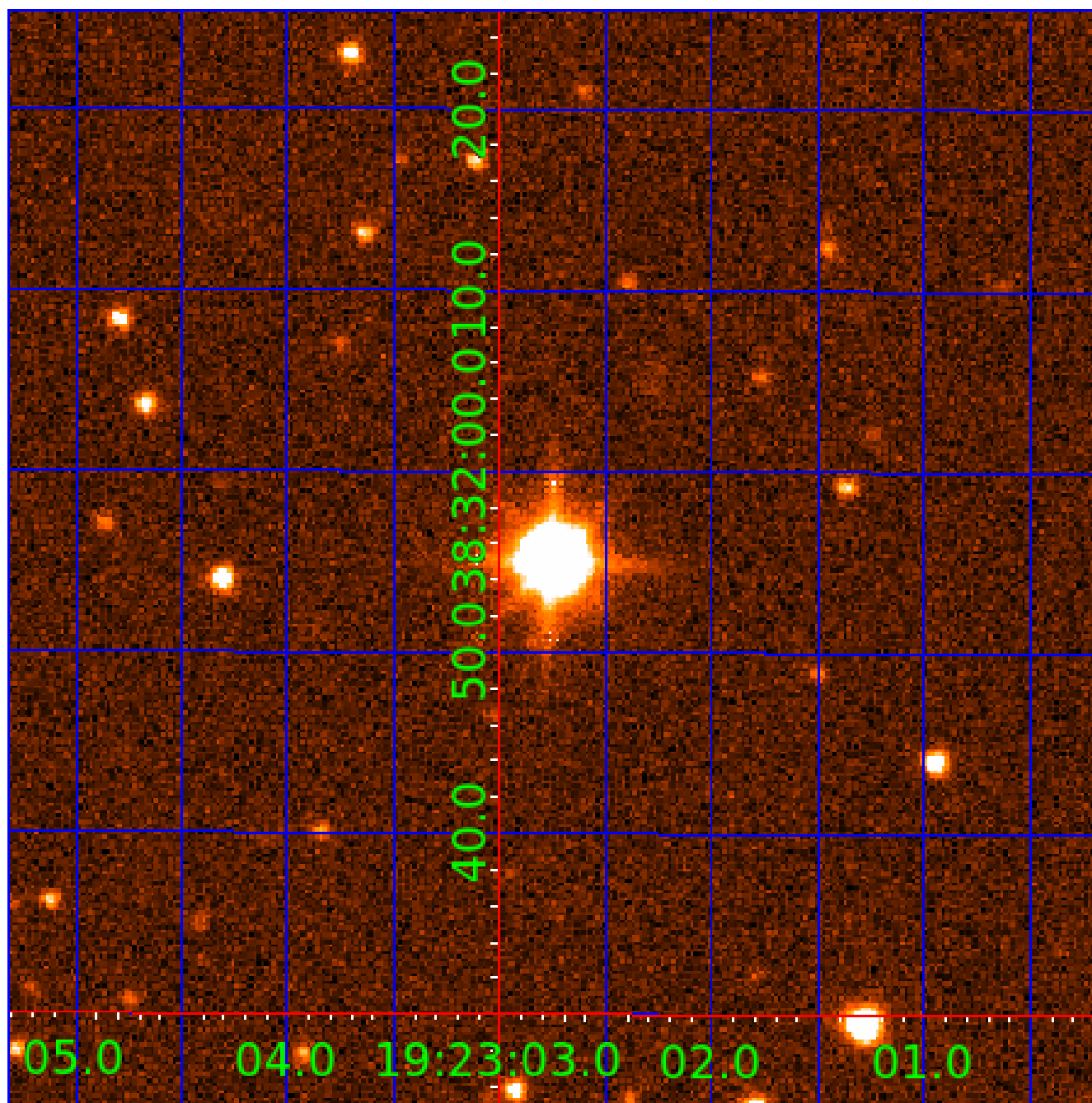


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination





# KIC 003441159

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
003441159-01	OBS	No	0.804996	132.207360	51.4	2.282	10.1	11.3	4.11	7234	3.42	87721.02
003441159-02	OBS	No	0.516240	131.959325	48.9	2.968	8.8	11.5	4.11	7234	3.33	0.00
003441159-03	OBS	No	60.003275	135.098380	517.9	1.717	8.9	5.8	4.11	7234	9.48	279.64
003441159-04	OBS	No	61.455669	162.032215	211.8	19.338	7.8	5.9	4.11	7234	6.54	270.86

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
003441159-01	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—CENT_SATURATED
003441159-02	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—CENT_SATURATED
003441159-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—CENT_SATURATED
003441159-04	OBS	FP	0.00	1	0	1	0	INDIV_TRANS_RUBBLE_SKYE—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—CENT_SATURATED—HALO_GHOST

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

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

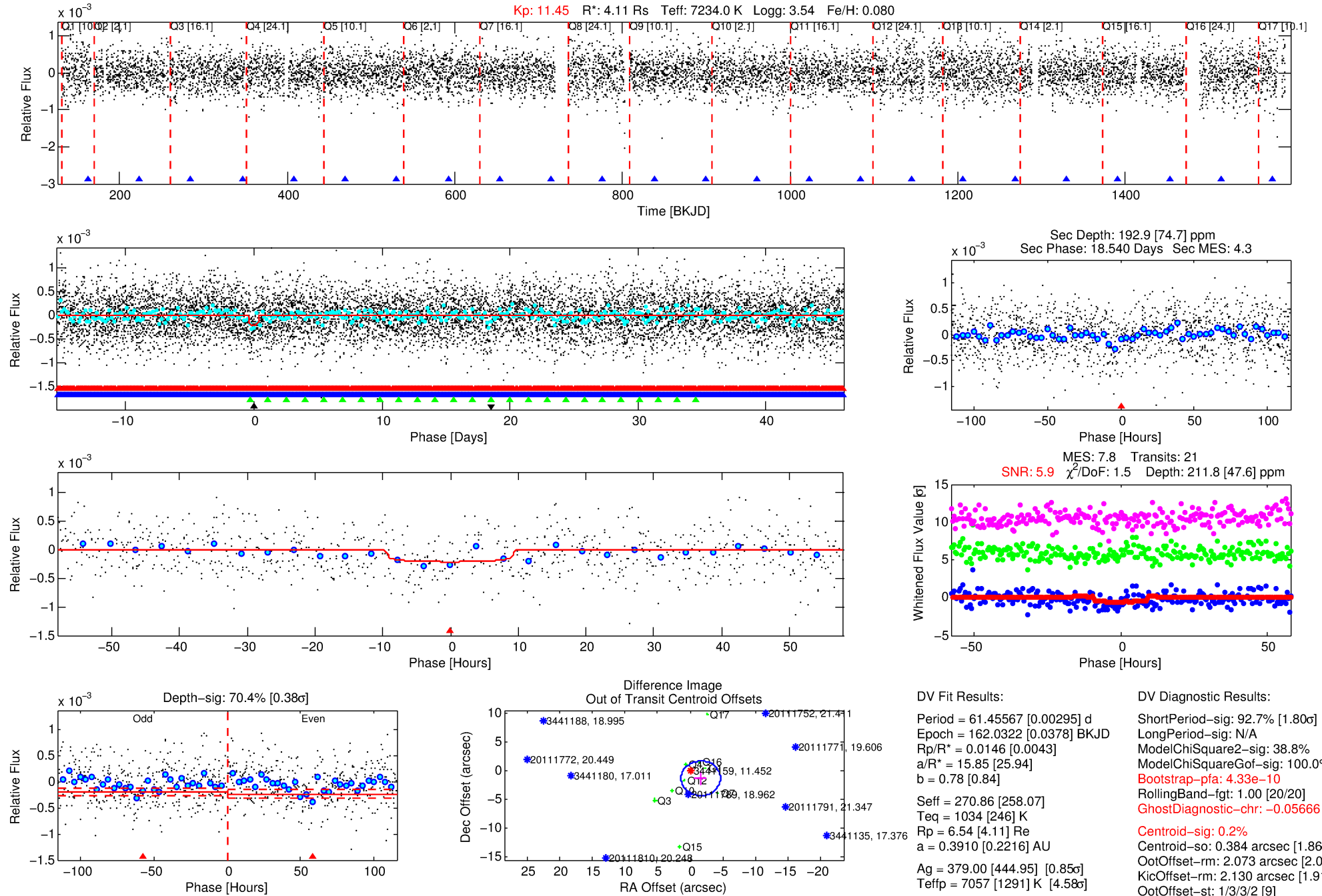
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 003441159-04

No Significant Match Found

# DV One-Page Summary

KIC: 3441159 Candidate: 4 of 4 Period: 61.456 d



## DV Fit Results:

Period = 61.45567 [0.00295] d  
Epoch = 162.0322 [0.0378] BKJD  
 $R_p/R^* = 0.0146$  [0.0043]  
 $a/R^* = 15.85$  [25.94]  
 $b = 0.78$  [0.84]  
 $S_{\text{eff}} = 270.86$  [258.07]  
 $T_{\text{eq}} = 1034$  [246] K  
 $R_p = 6.54$  [4.11]  $R_{\oplus}$   
 $a = 0.3910$  [0.2216] AU  
 $A_g = 379.00$  [444.95] [0.85]  
 $T_{\text{eff}} = 7057$  [1291] K [4.58]

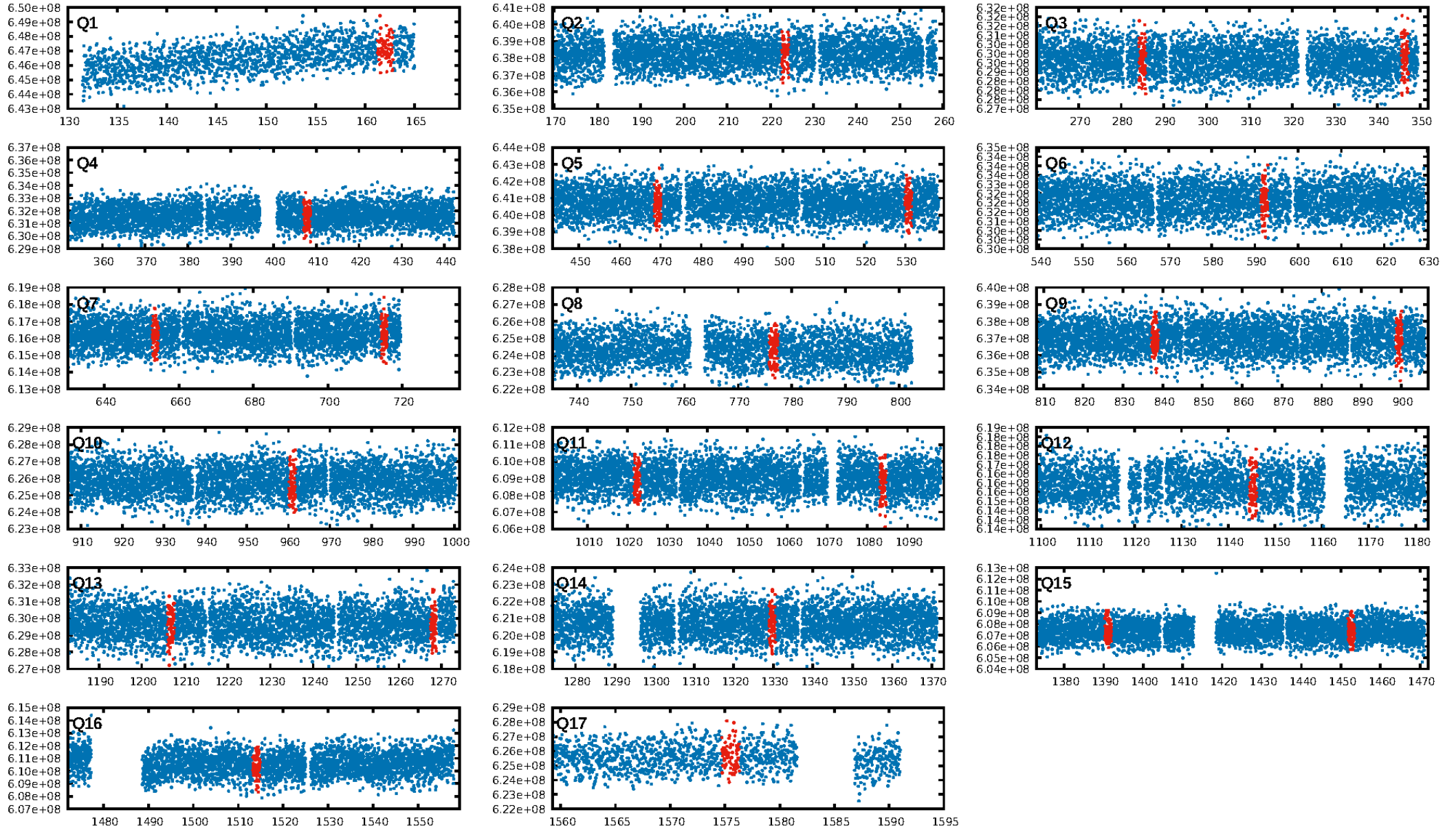
## DV Diagnostic Results:

ShortPeriod-sig: 92.7% [1.80]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: 38.8%  
ModelChiSquareGof-sig: 100.0%  
**Bootstrap-pfa: 4.33e-10**  
RollingBand-fgt: 1.00 [20/20]  
**GhostDiagnostic-chr: -0.05666**  
Centroid-sig: 0.2%  
Centroid-so: 0.384 arcsec [1.86]  
OotOffset-rm: 2.073 arcsec [2.06]  
KicOffset-rm: 2.130 arcsec [1.91]  
OotOffset-st: 1/3/3/2 [9]  
KicOffset-st: 1/3/3/2 [9]  
DiffImageQuality-fgm: 0.22 [2/9]  
DiffImageOverlap-fno: 0.00 [0/14]

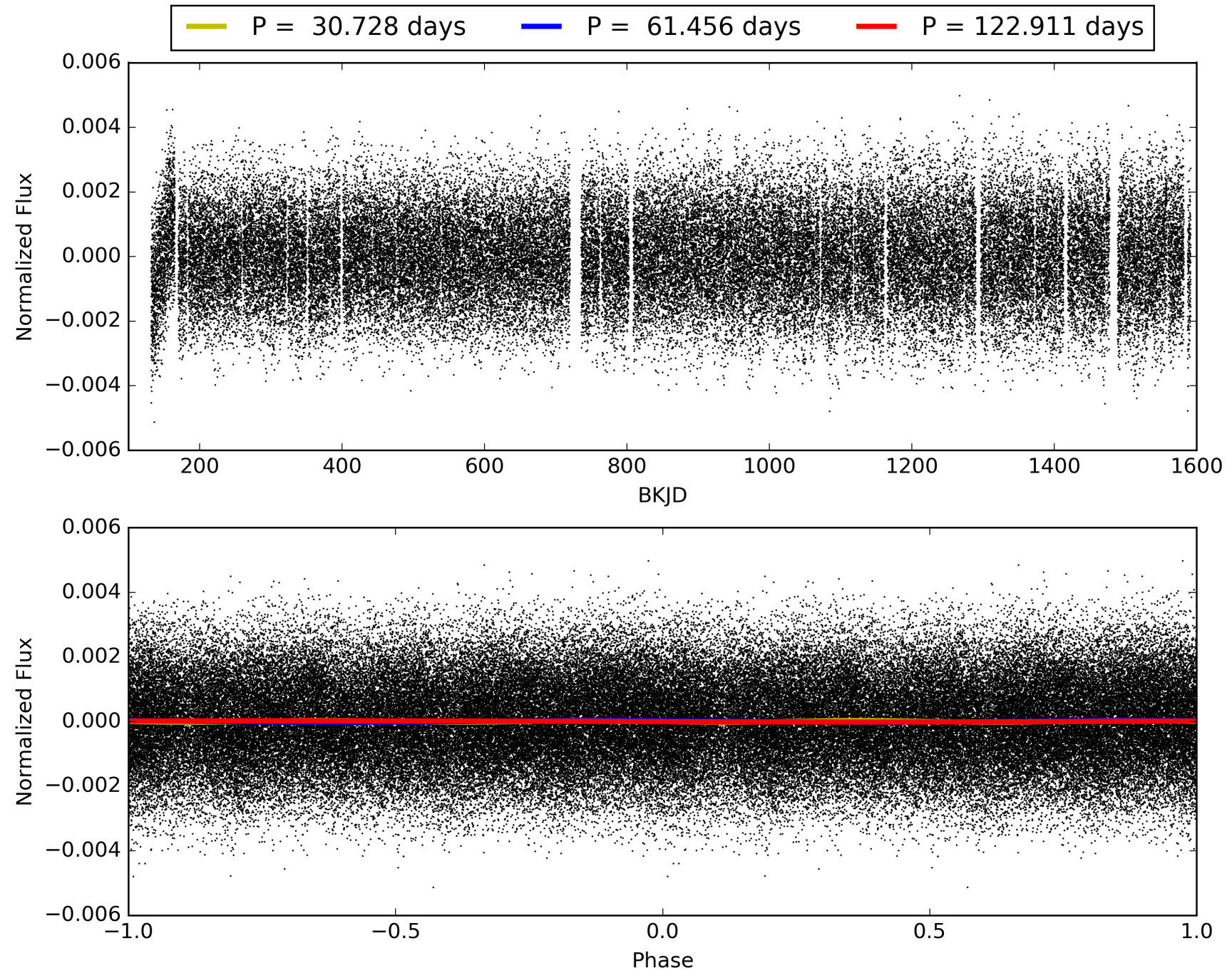
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 31-Jan-2016 10:40:18 Z

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

# TCE 003441159-04, PDC Light Curves

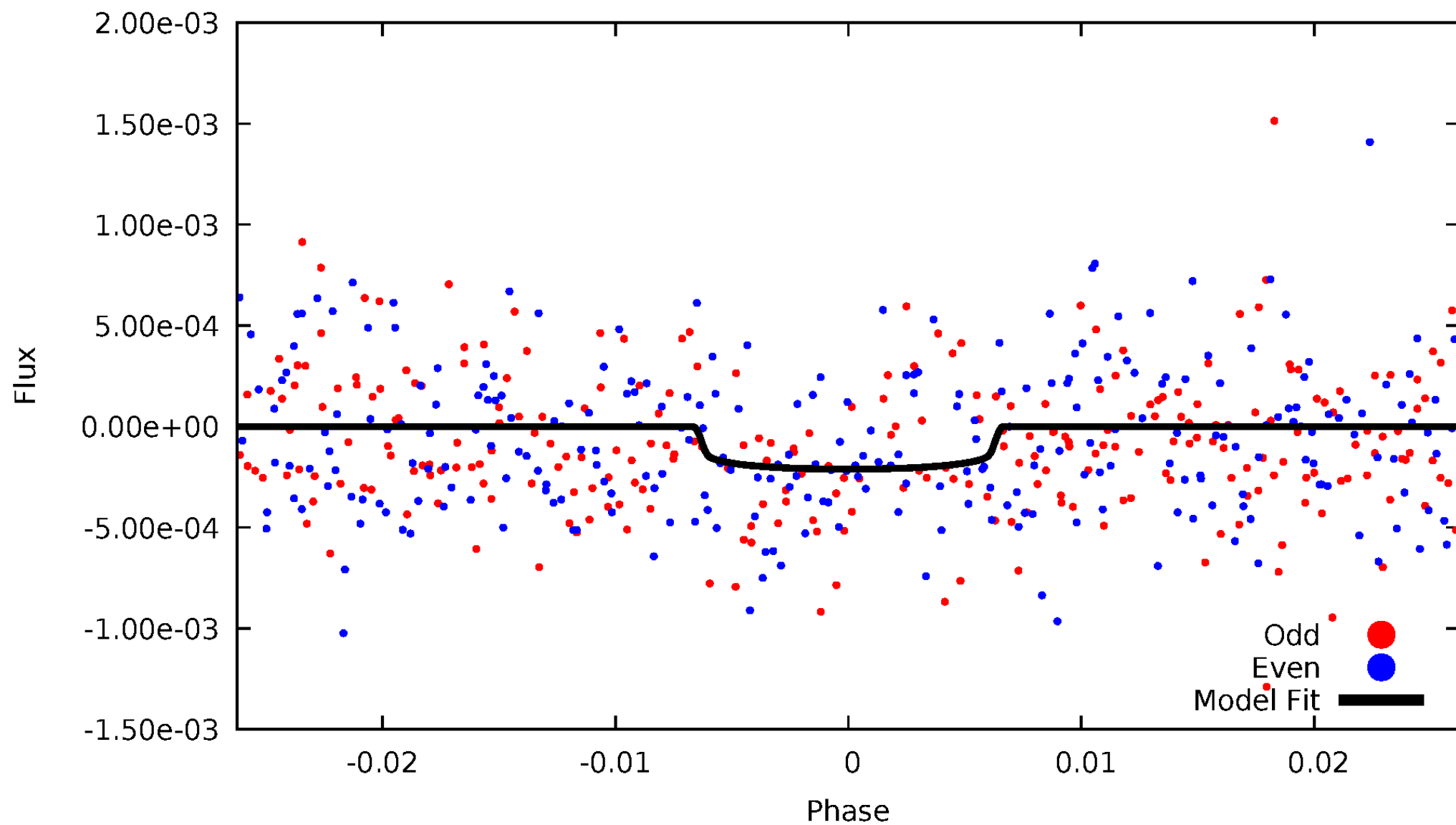


TCE 003441159-04



# DV Odd/Even

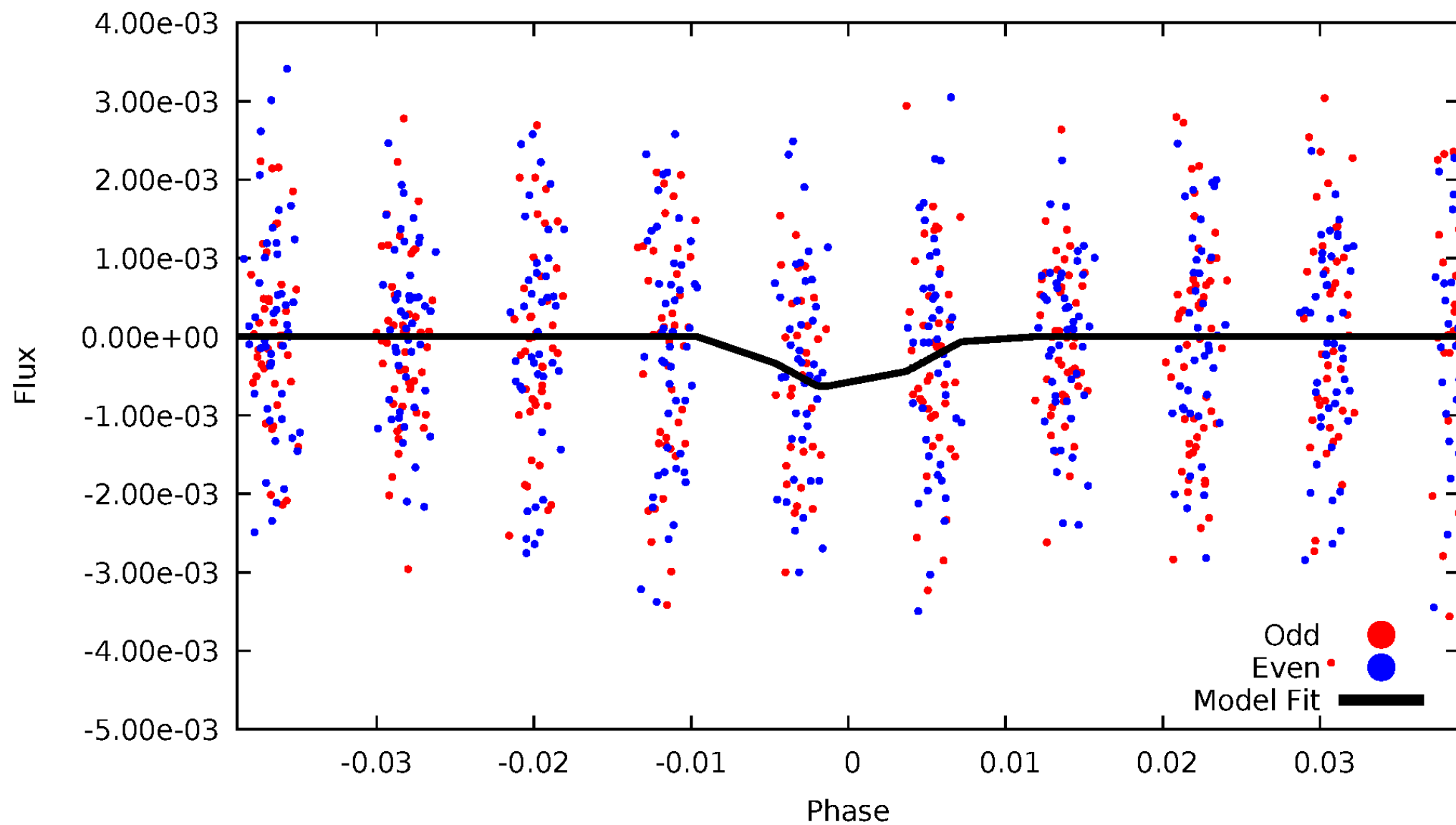
TCE 003441159-04





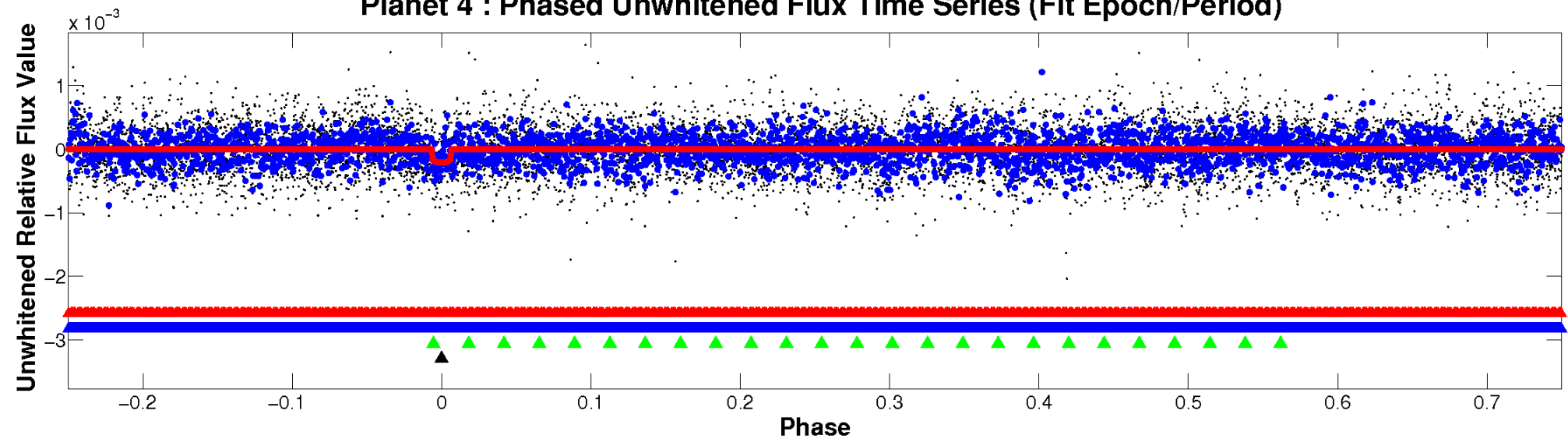
# ALT Odd/Even

TCE 003441159-04

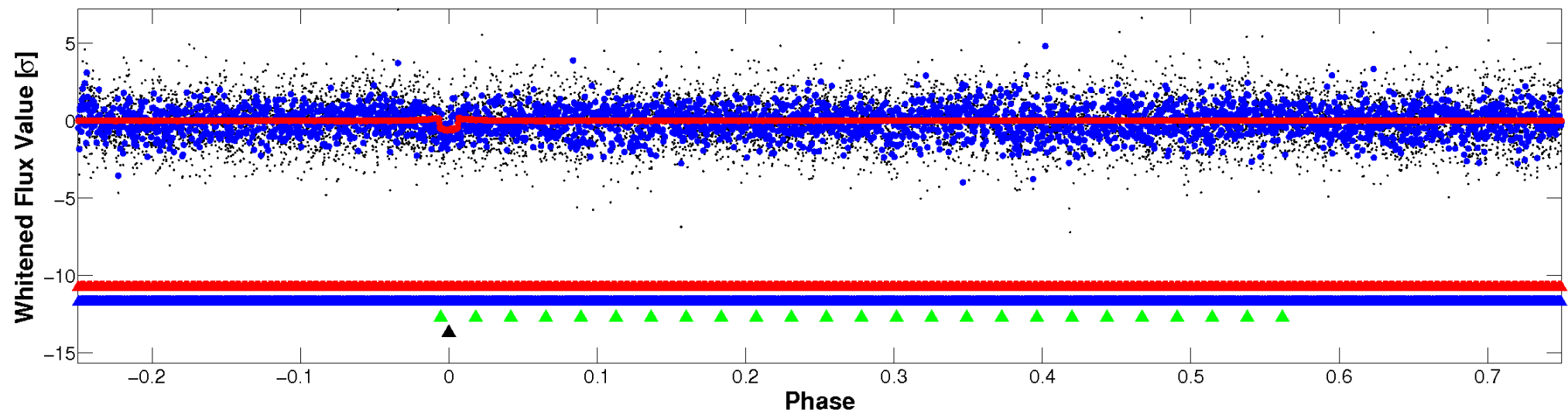


# Non-Whitened Vs. Whitened Light Curve

## Planet 4 : Phased Unwhitened Flux Time Series (Fit Epoch/Period)

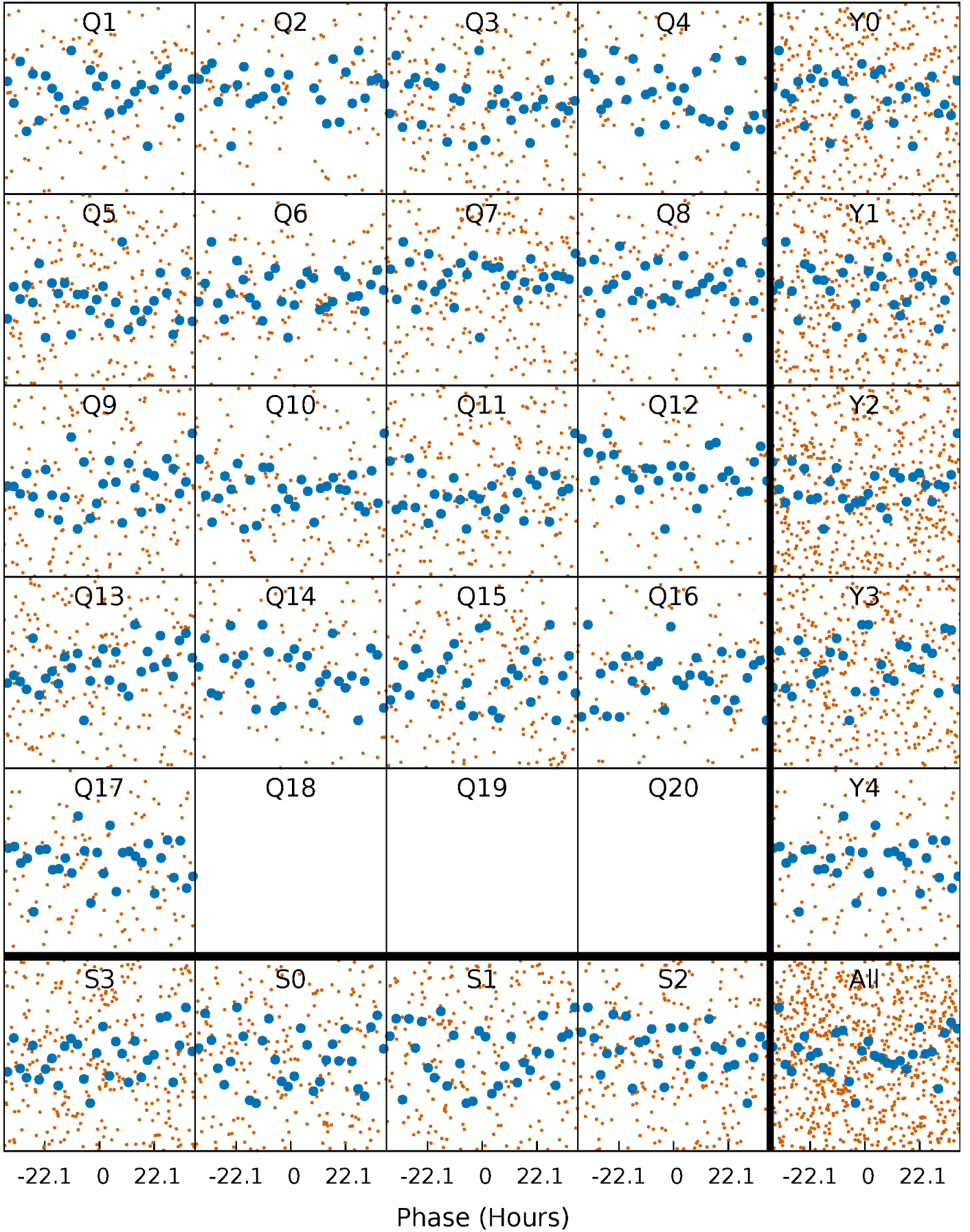


## Planet 4 : Phased Whitened Flux Time Series (Fit Epoch/Period)



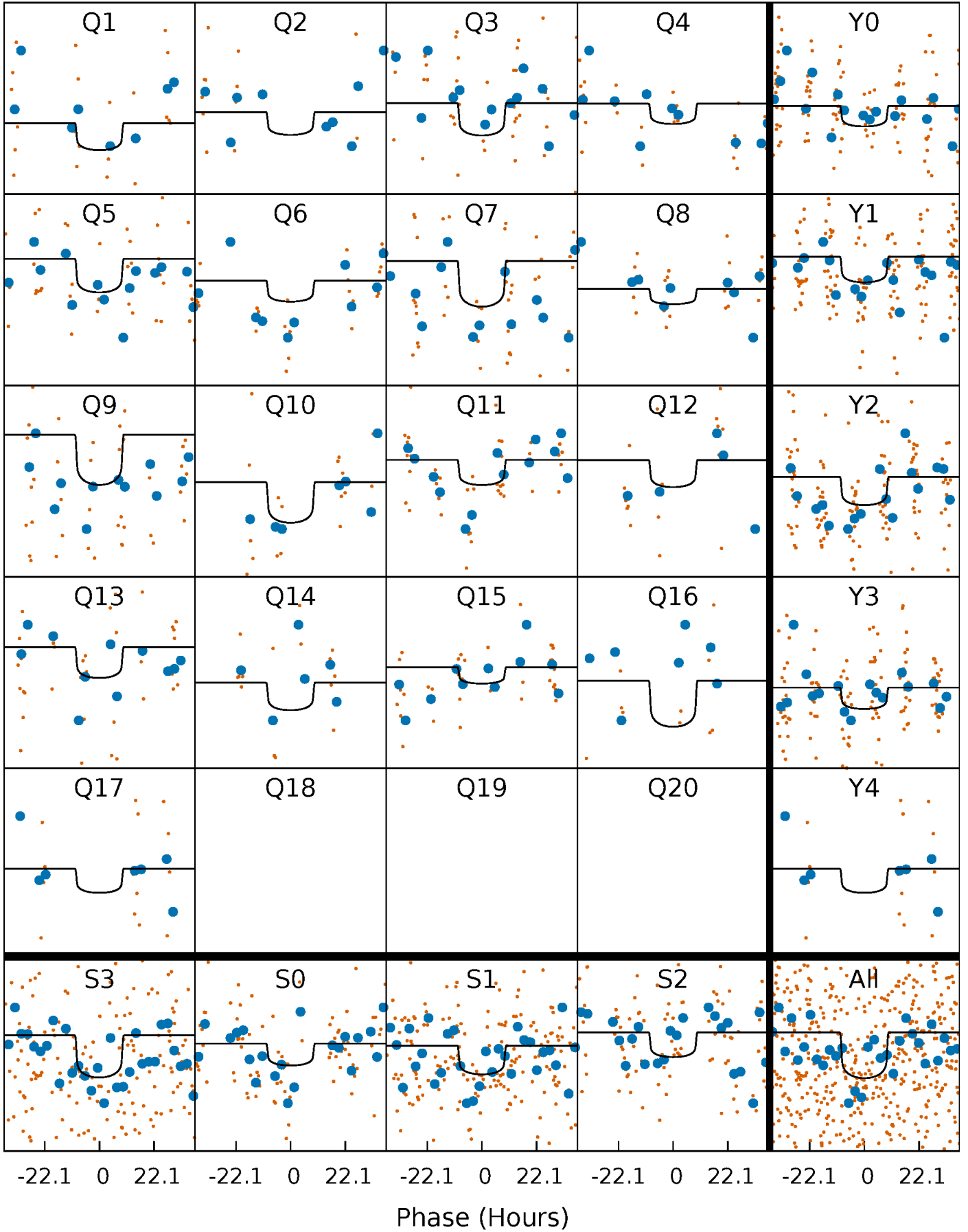
# PDC Quarter-Phased Transit Curves

TCE 003441159-04   P= 61.455669 Days    $T_0=162.032215$  (BKJD)



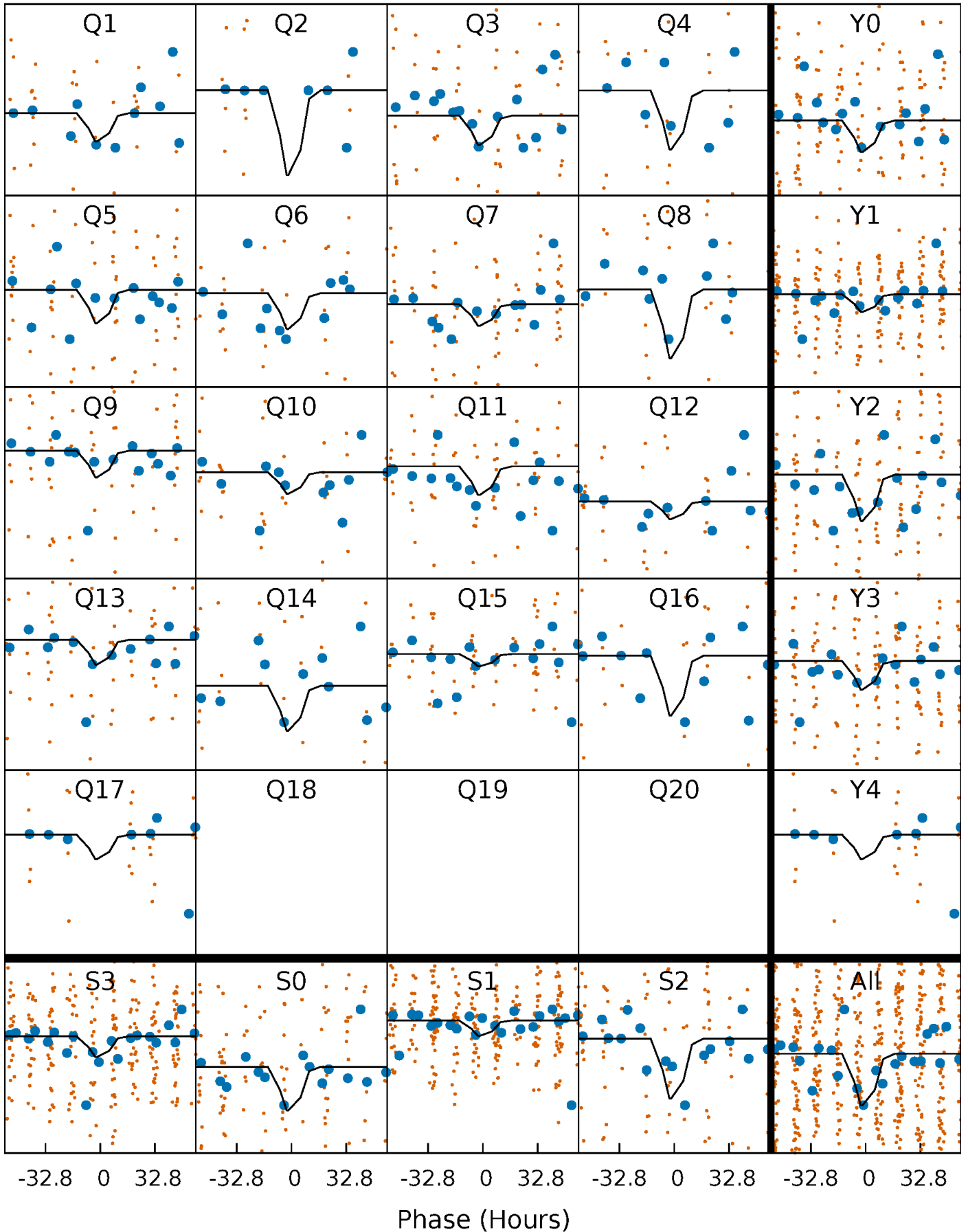
# DV Quarter-Phased Transit Curves

TCE 003441159-04 P= 61.455669 Days  $T_0=162.032215$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

TCE 003441159-04 P= 61.437784 Days  $T_0=162.284982$  (BKJD)

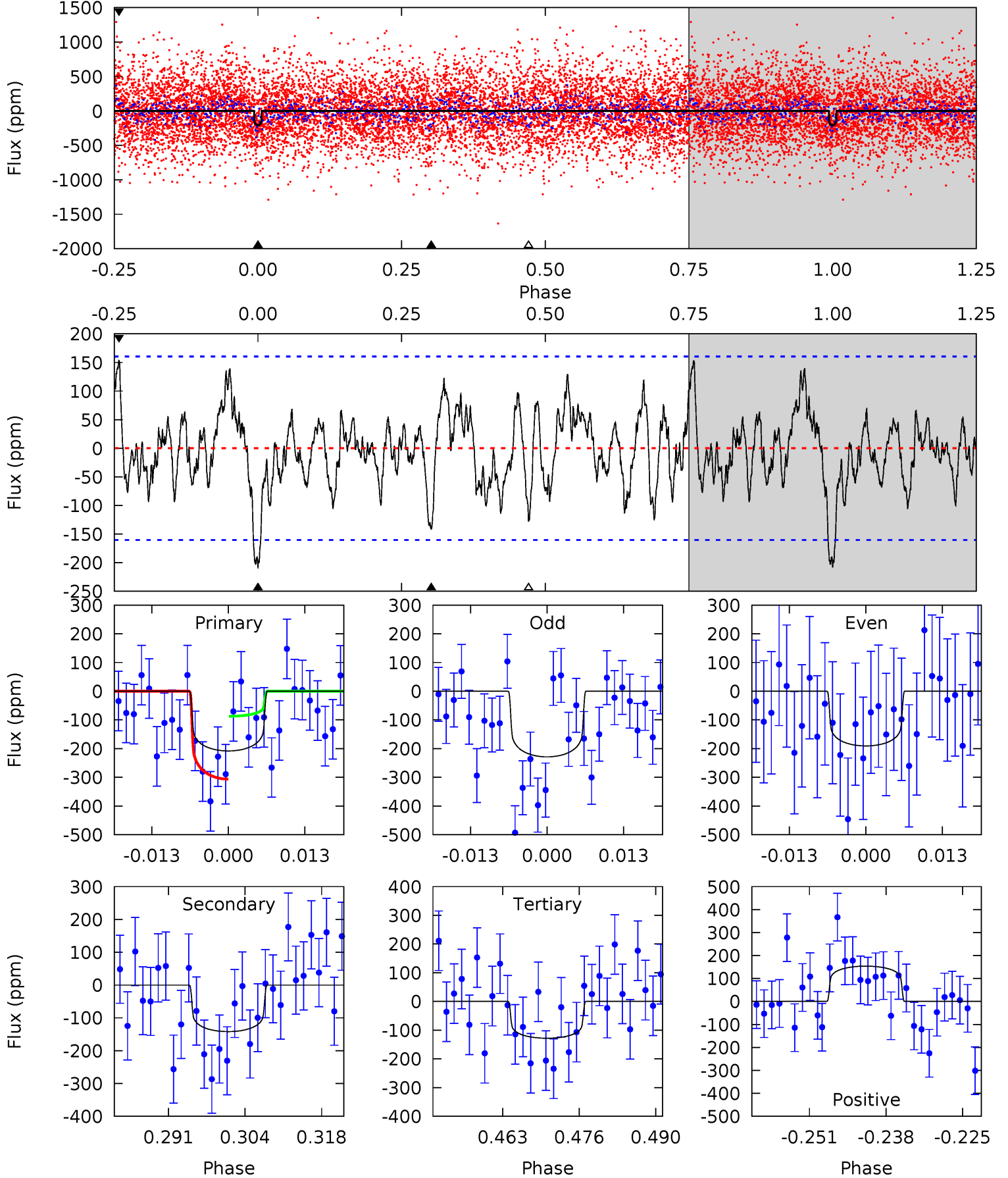




# DV Model-Shift Uniqueness Test

003441159-04, P = 61.455669 Days, E = 100.576546 Days

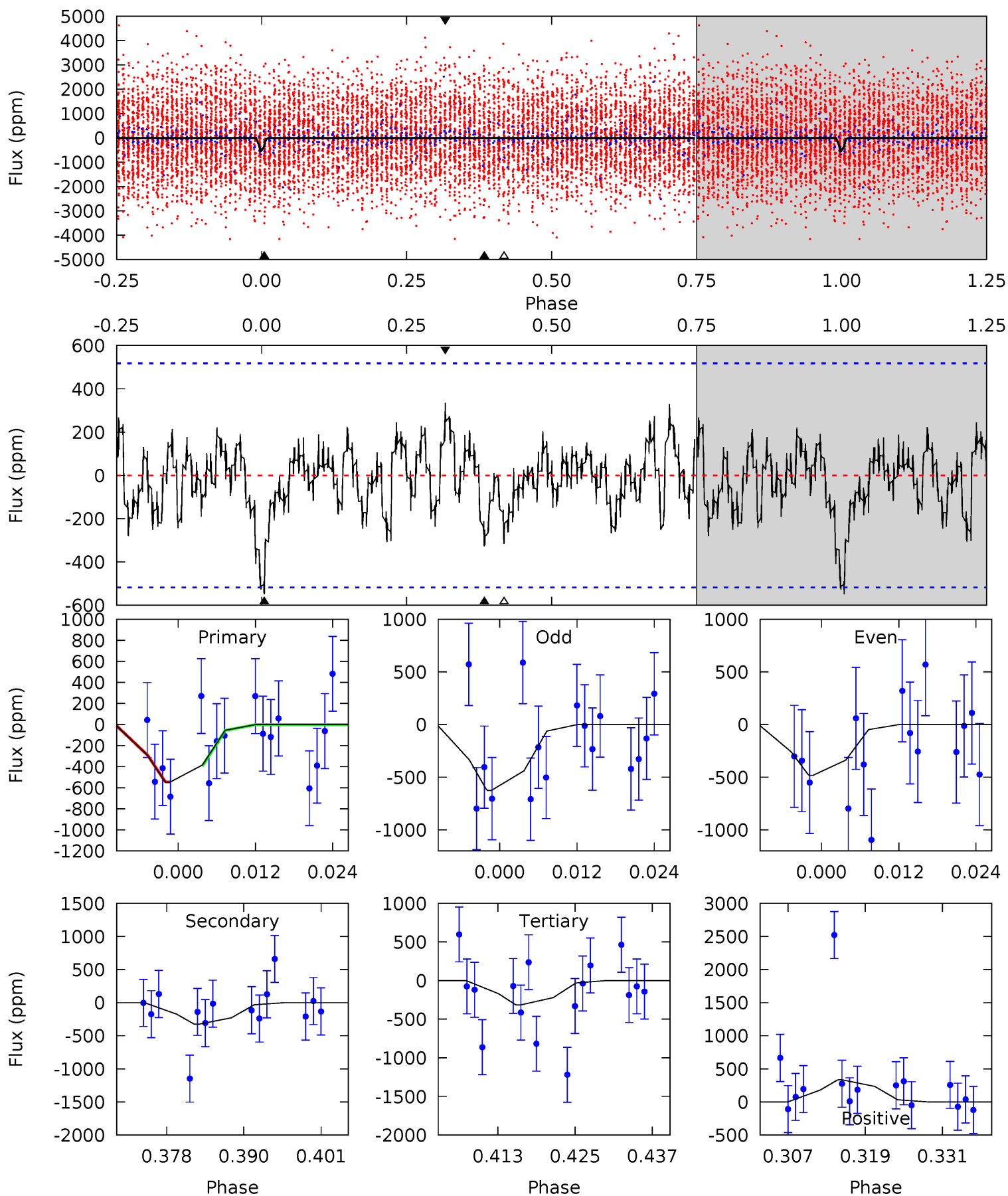
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
6.45	4.40	3.97	4.77	4.97	2.48	1.66	2.48	1.68	0.43	-0.37	0.59	0.83	0.42	3.39



# Alt Model-Shift Uniqueness Test

003441159-04, P = 61.437784 Days, E = 100.847198 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
5.29	3.15	3.05	3.22	4.99	2.52	1.16	2.24	2.07	0.10	-0.07	0.70	1.20	0.38	0.72



### Stellar Parameters For KIC 003441159

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R$ ( $R_{\odot}$ )	$M(M_{\odot})$	$p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ )
	$7234^{+200}_{-325}$	$3.535^{+0.560}_{-0.059}$	$0.080^{+0.200}_{-0.300}$	$4.108^{+0.402}_{-2.277}$	$2.108^{+0.206}_{-0.617}$	$0.043^{+0.287}_{-0.009}$
	+3%/-4%	+16%/-2%	+250%/-375%	+10%/-55%	+10%/-29%	+670%/-20%
Source	KIC0	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 003441159-04 / KOI

Detrend	Depth (ppm)	$R_p$ ( $R_{\oplus}$ )	$T_{\text{max}}$ (K)	$T_{\text{obs}}$ (K)	$A_{\text{obs}}$
DV	$-142 \pm 32$	$5.71^{+2.34}_{-2.02}$	$1395^{+84}_{-198}$	$6466^{+1480}_{-934}$	$372^{+486}_{-198}$
Alt.	$-327 \pm 104$	$9.85^{+2.84}_{-3.07}$	$1377^{+105}_{-207}$	$6017^{+816}_{-624}$	$271^{+294}_{-116}$

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

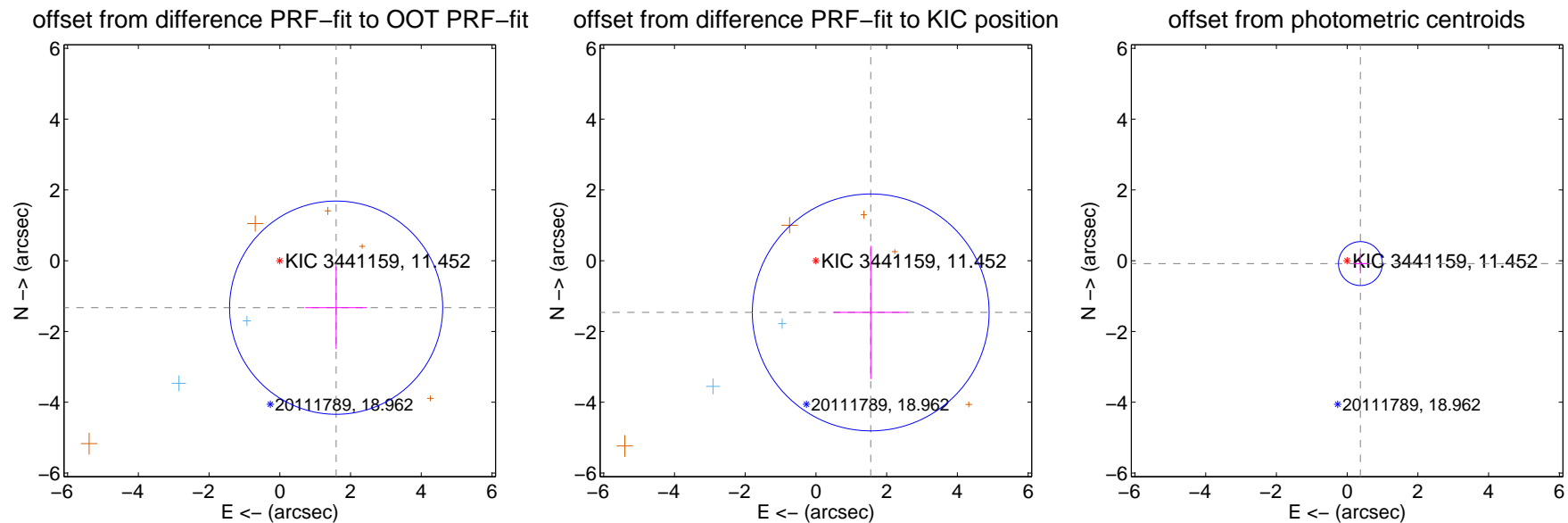
## DV Centroid Data

Supplemental centroid analysis for 003441159-04. **Kepler magnitude: 11.45.** Transit SNR 5.95

**There are 2 quarters with good PRF difference image offsets**

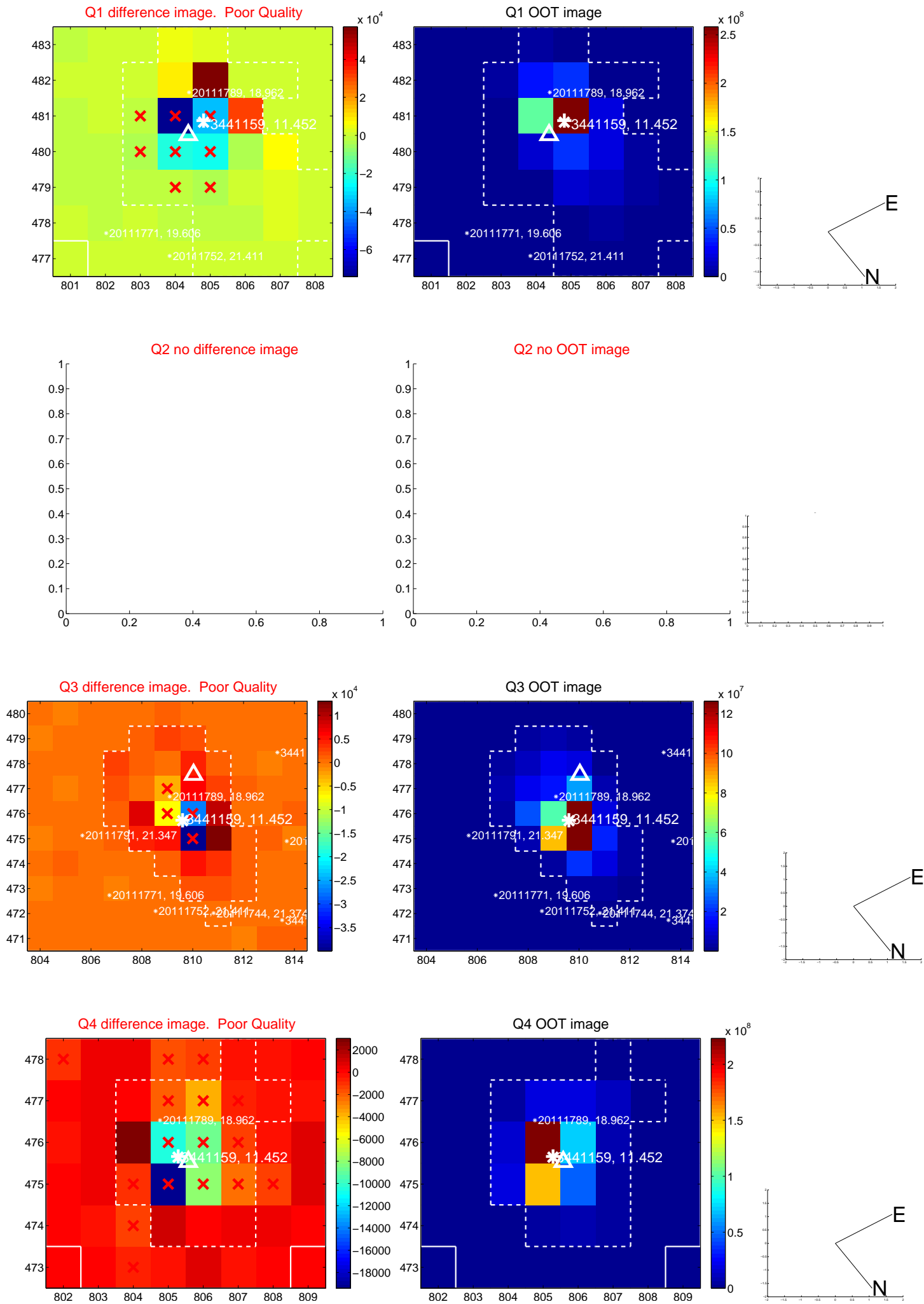
The direct PRF centroid is offset from the target star catalog position by about 0.17 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$2.073 \pm 1.004$	2.06	$-1.593 \pm 0.871$	$-1.327 \pm 1.169$
PRF-fit source offset from KIC position	$2.130 \pm 1.116$	1.91	$-1.549 \pm 1.052$	$-1.461 \pm 1.881$
photometric centroid source offset	$0.38 \pm 0.21$	1.86	$-0.38 \pm 0.20$	$-0.08 \pm 0.28$

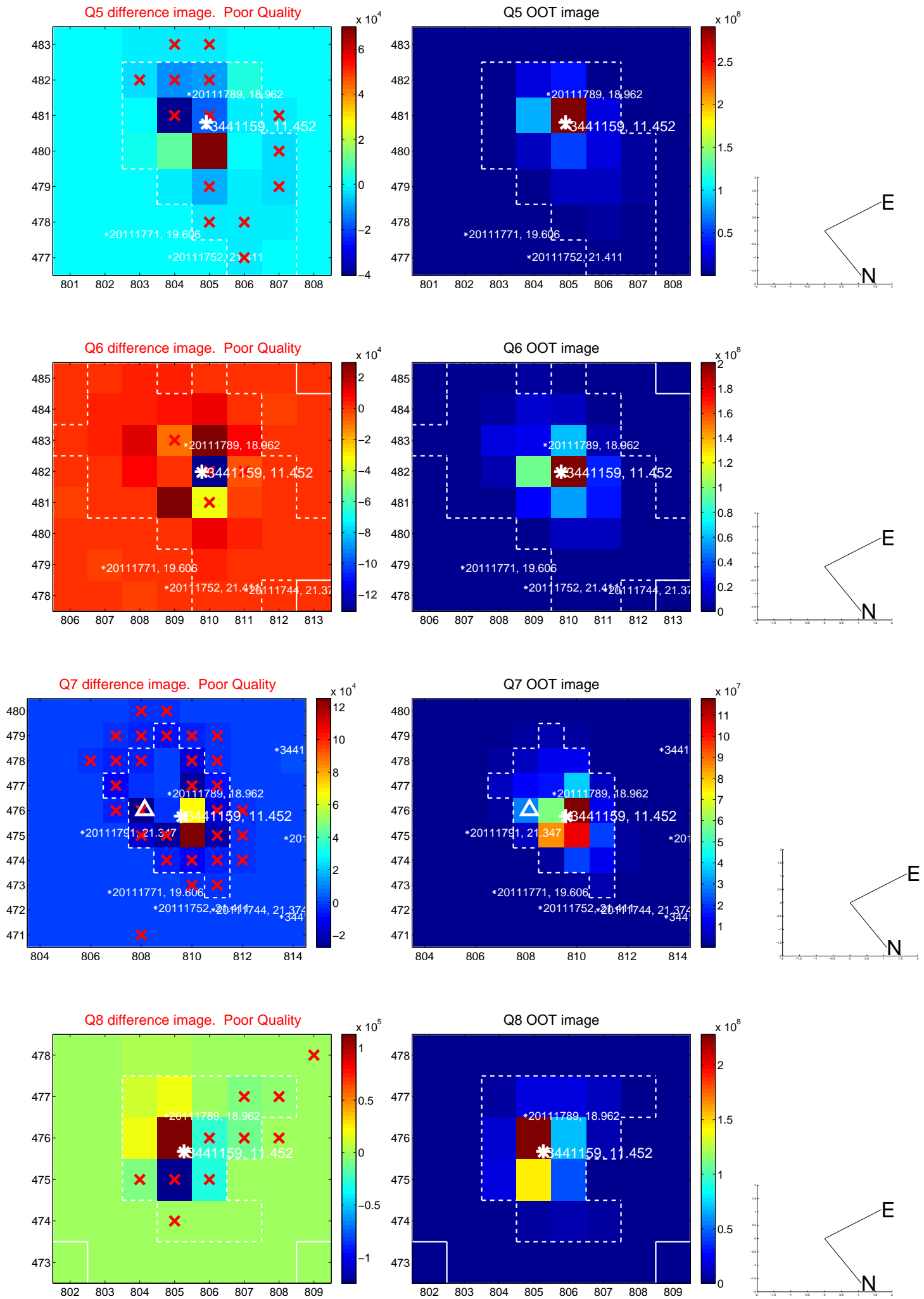


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets;** magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

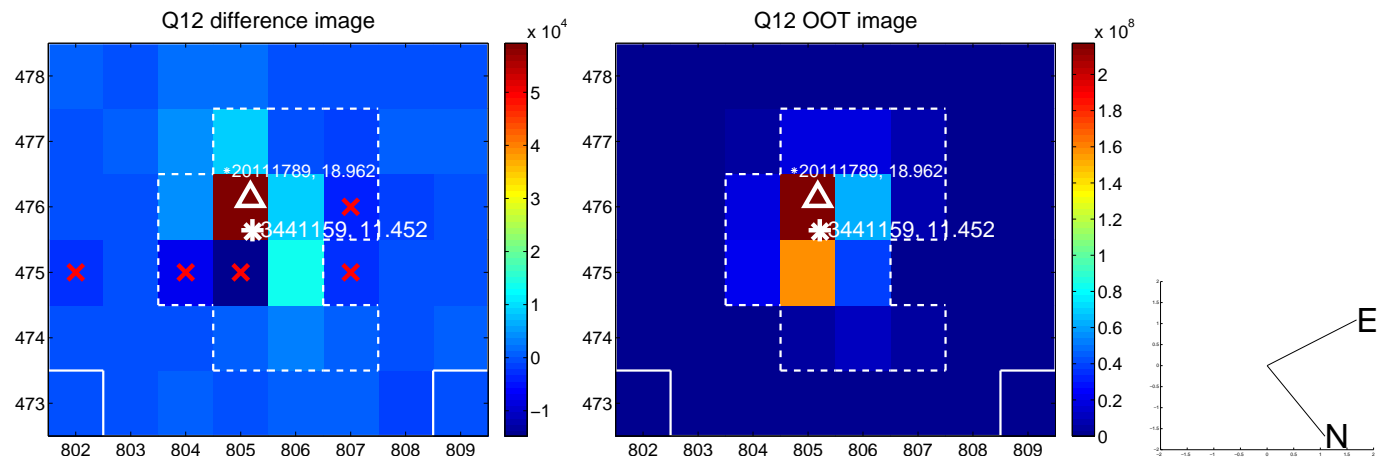
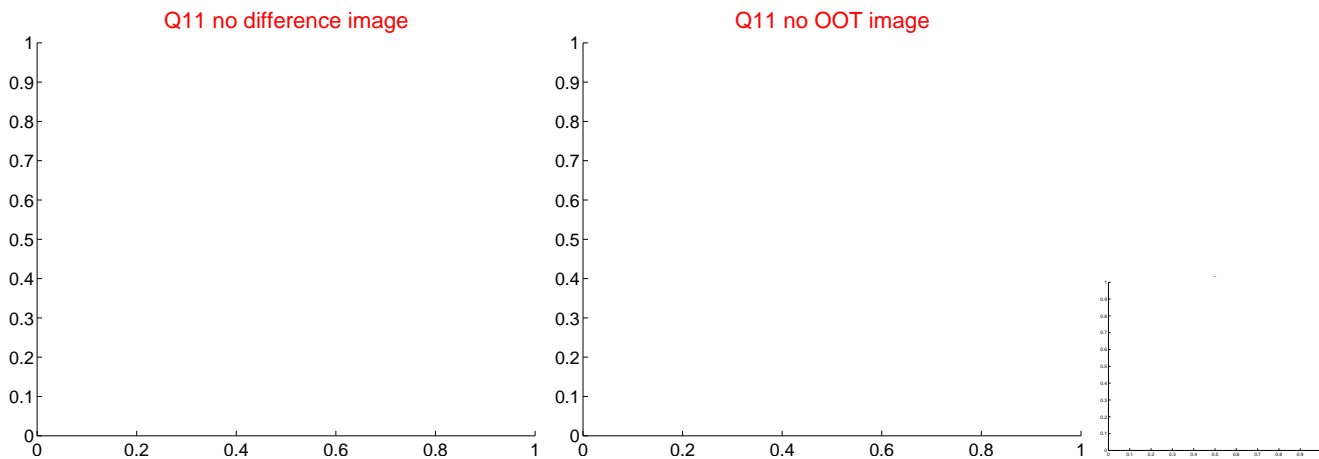
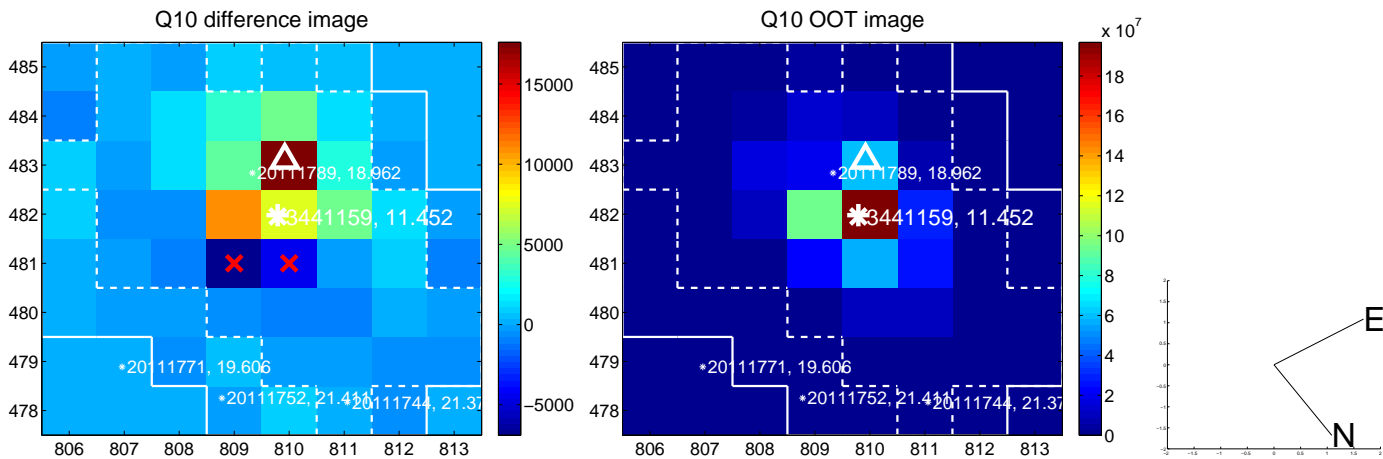
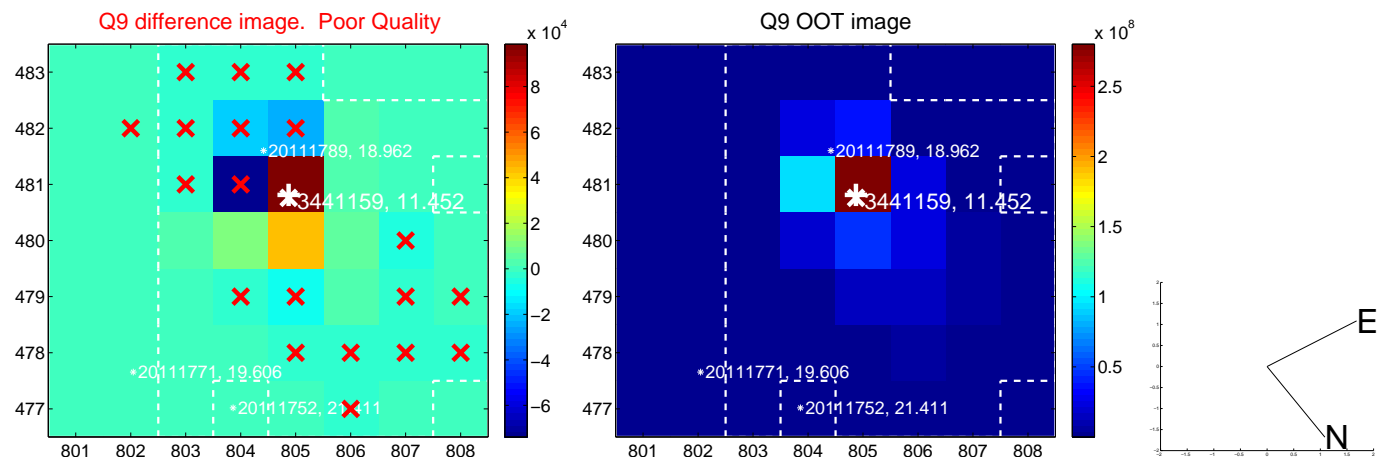


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

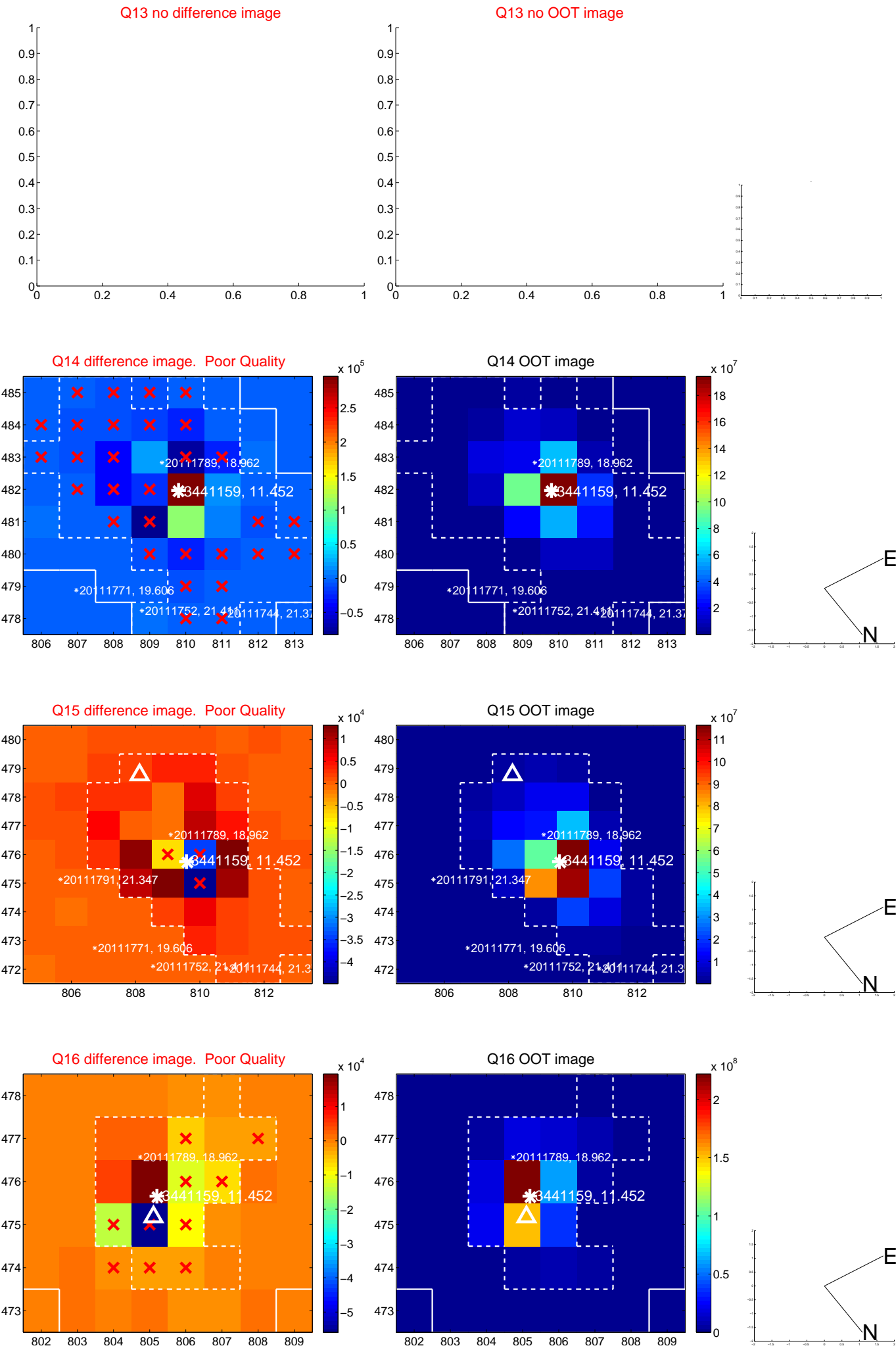




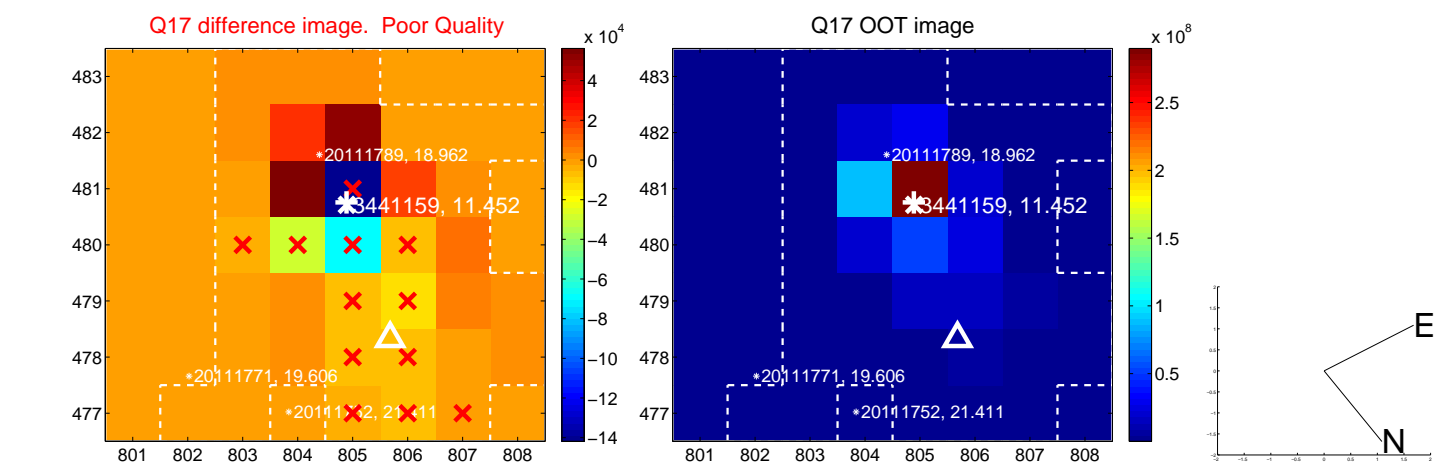
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



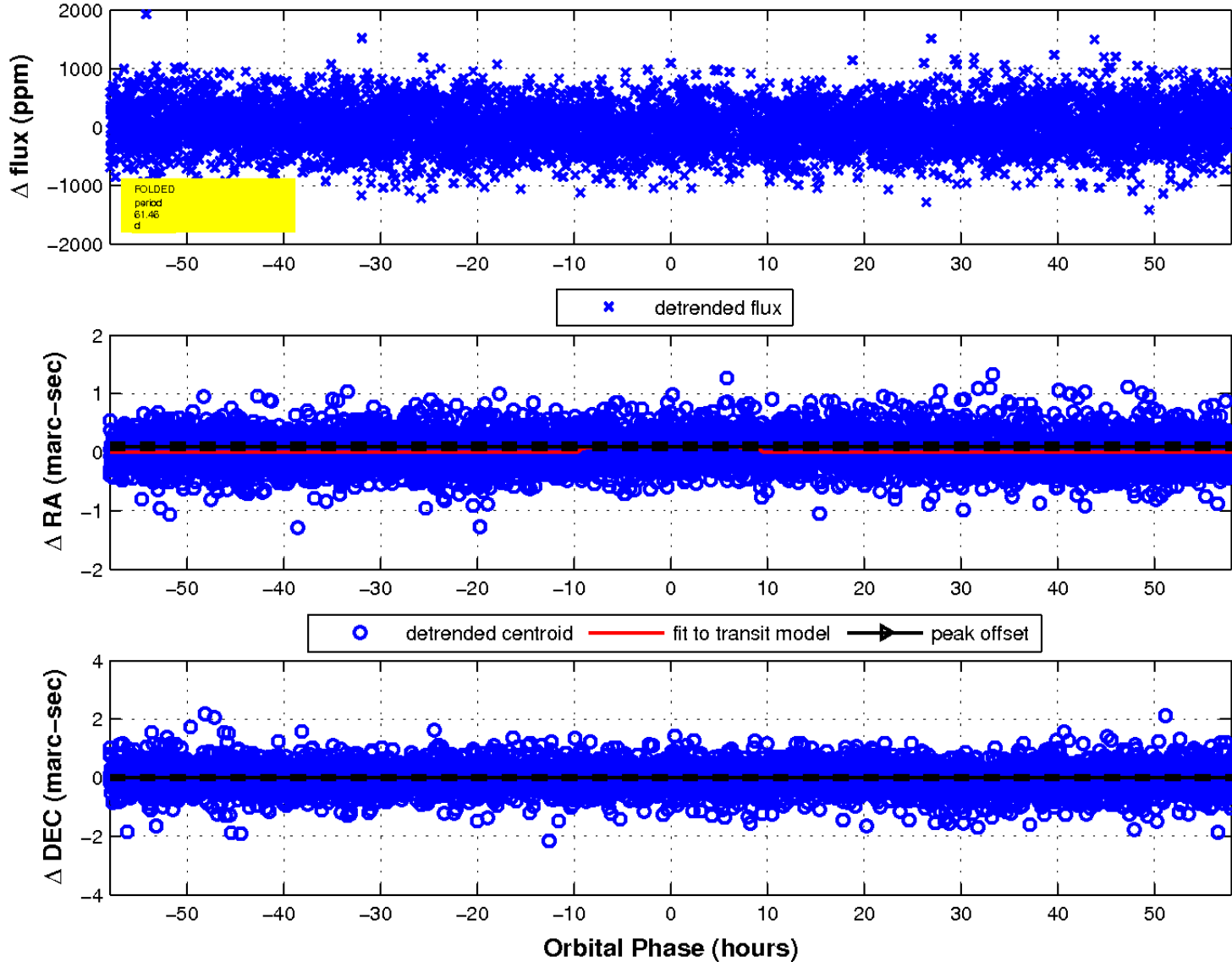
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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



fluxWeightedCentroids, Planet 4 of 4



UKIRT Image

Declination

