

# KIC 011669239

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
011669239-01	OBS	0542.01	41.885516	136.806917	648.3	6.728	39.0	41.0	1.03	5735	3.13	20.09
011669239-02	OBS	0542.02	13.817361	135.032776	206.0	3.894	17.7	18.8	1.03	5735	1.72	88.13

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
011669239-01	OBS	PC	1.00	0	0	0	0	NO_COMMENT
011669239-02	OBS	PC	0.99	0	0	0	0	NO_COMMENT

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

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

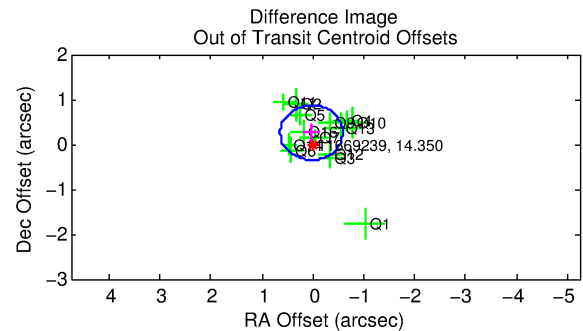
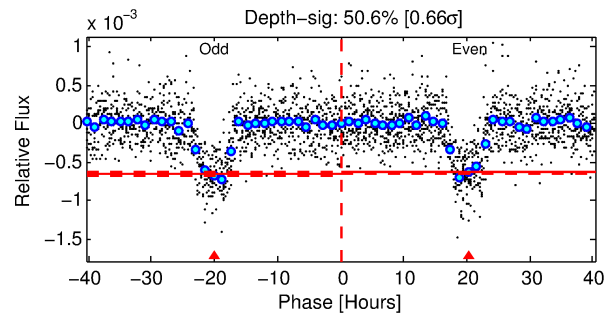
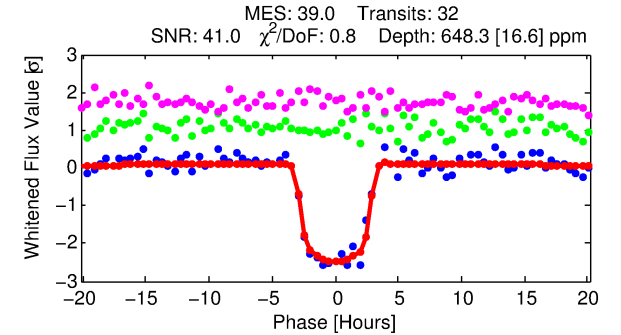
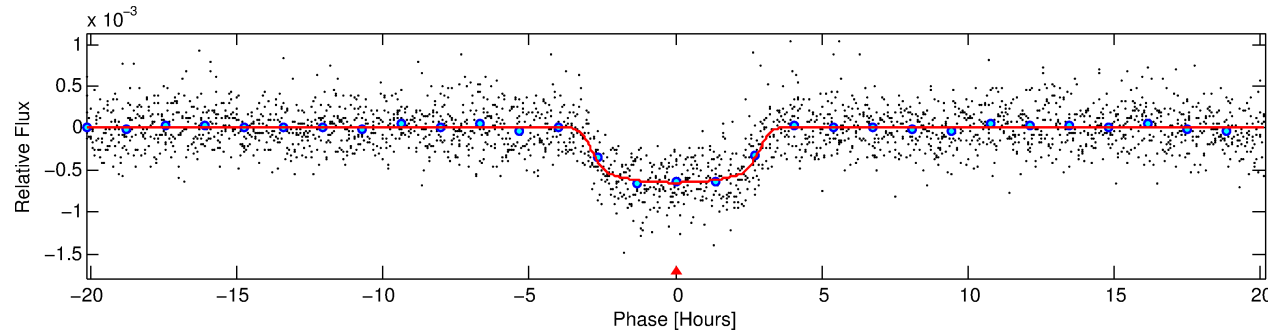
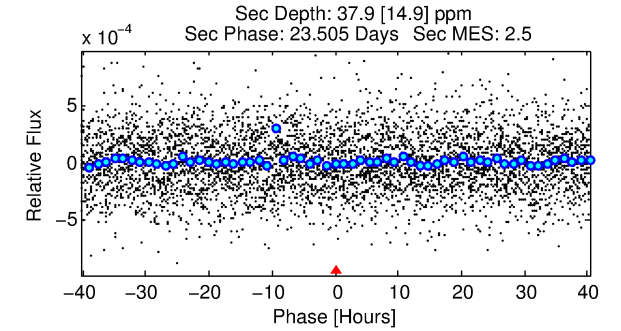
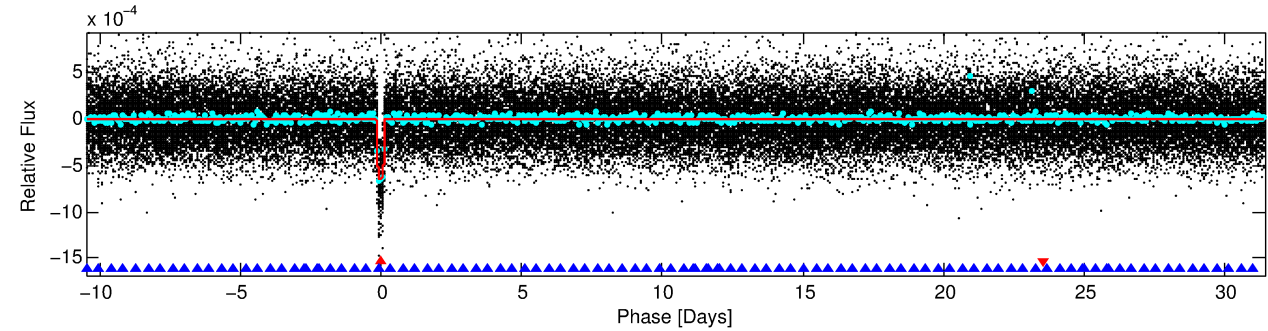
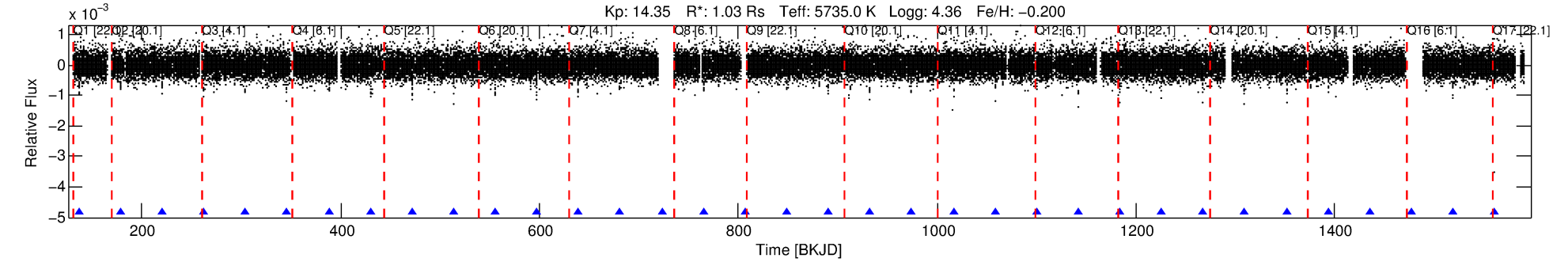
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 011669239-01

No Significant Match Found

# DV One-Page Summary

KIC: 11669239 Candidate: 1 of 2 Period: 41.886 d  
KOI: K00542.01 Name: Kepler-180c Corr: 0.952



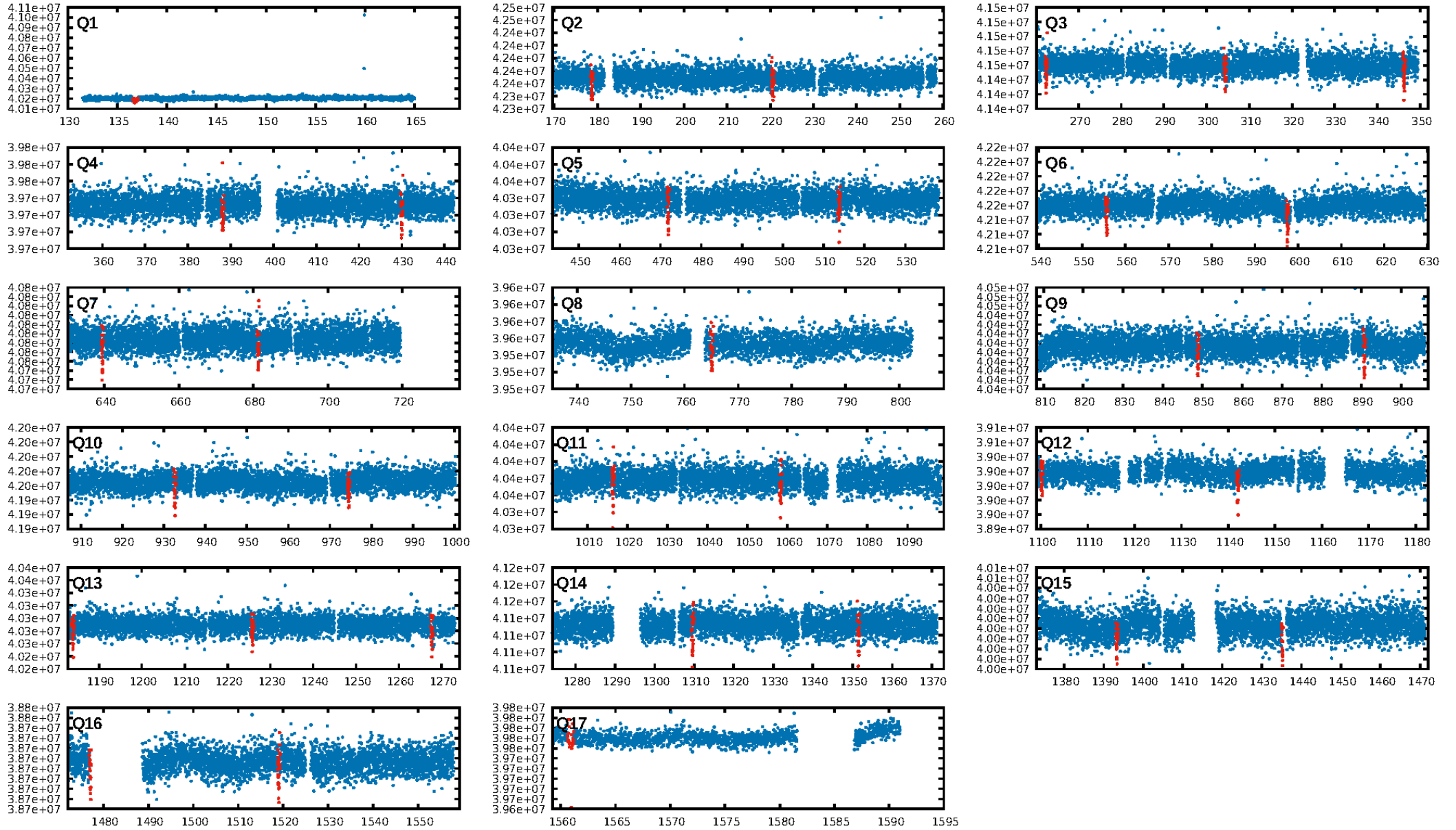
## DV Fit Results:

Period = 41.88552 [0.00017] d  
Epoch = 136.8069 [0.0034] BKJD  
Rp/R\* = 0.0279 [0.0009]  
a/R\* = 22.91 [3.02]  
b = 0.91 [0.03]  
Seff = 20.09 [7.30]  
Teq = 540 [49] K  
Rp = 3.13 [0.86] Re  
a = 0.2258 [0.0528] AU  
Ag = 108.15 [57.25] [1.87σ]  
Teffp = 2692 [279] K [7.61σ]

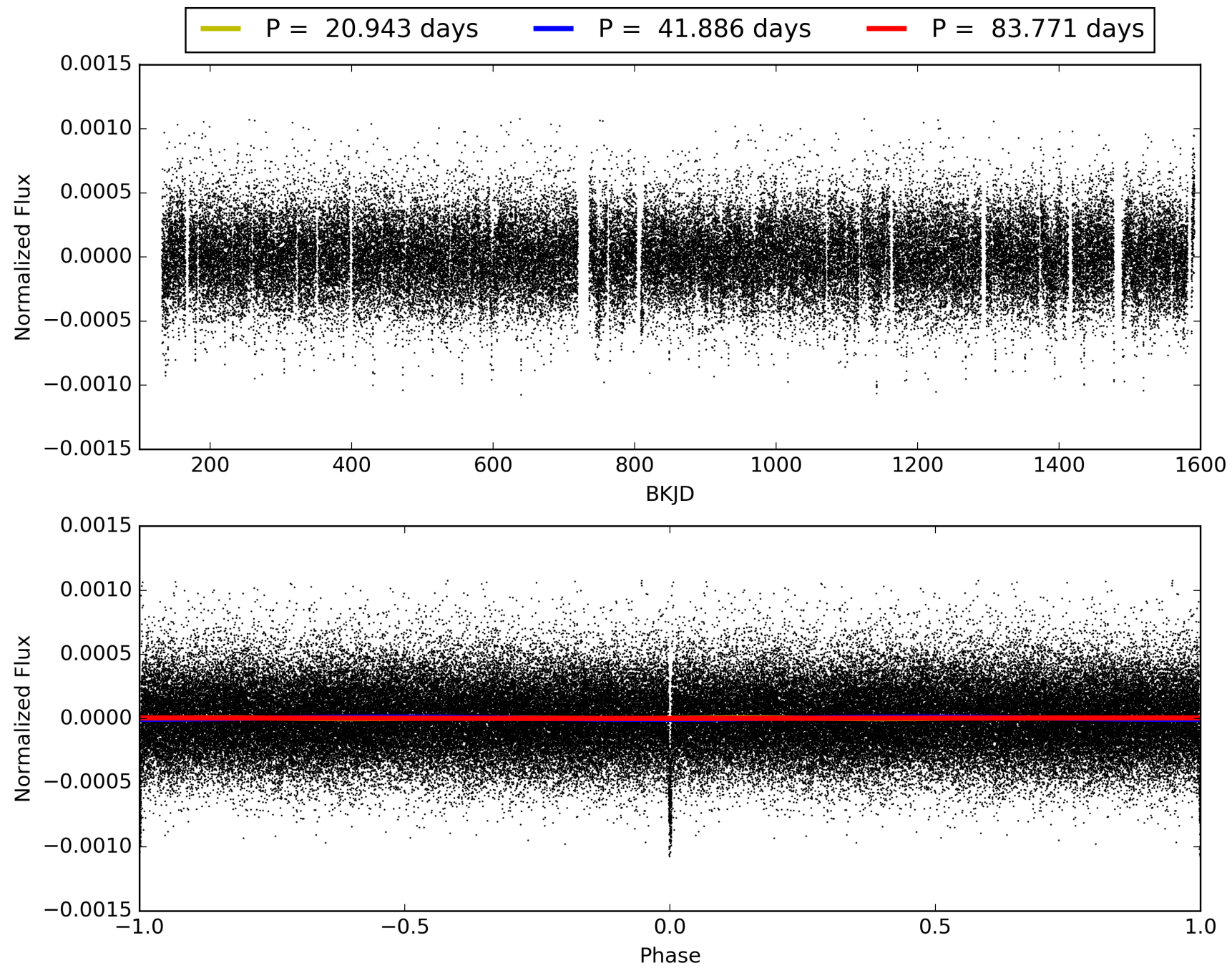
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [86.66σ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: 15.2%  
ModelChiSquareGof-sig: 100.0%  
Bootstrap-pfa: 0.00e+00  
RollingBand-fgt: 1.00 [30/30]  
GhostDiagnostic-chr: 4.293  
Centroid-sig: 5.1%  
Centroid-so: 0.800 arcsec [2.46σ]  
OotOffset-rm: 0.257 arcsec [1.26σ]  
KicOffset-rm: 0.165 arcsec [0.95σ]  
OotOffset-st: 4/3/3/4 [14]  
KicOffset-st: 4/3/3/4 [14]  
DiffImageQuality-fgm: 1.00 [14/14]  
DiffImageOverlap-fno: 0.93 [13/14]

# TCE 011669239-01, PDC Light Curves

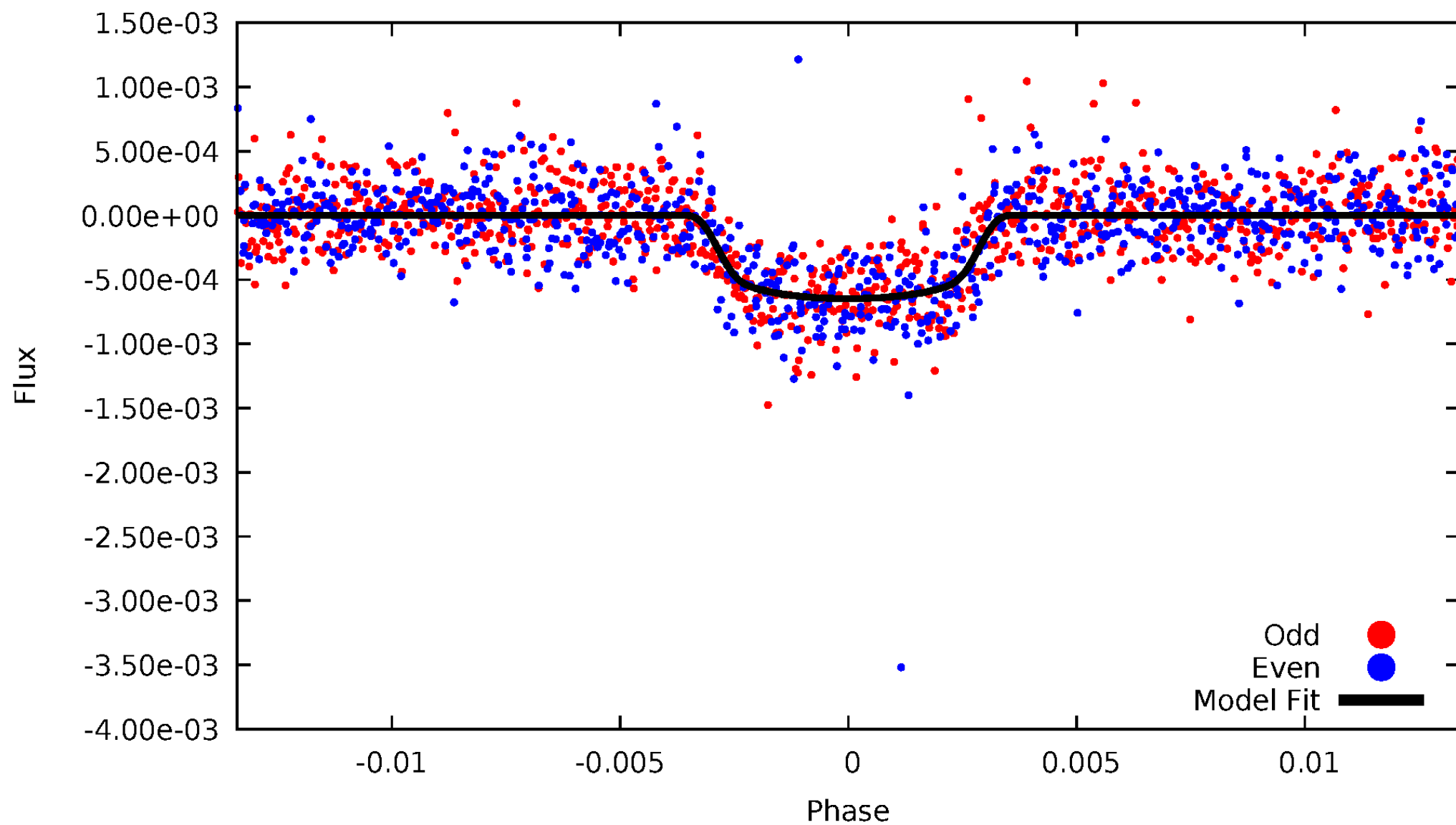


# TCE 011669239-01



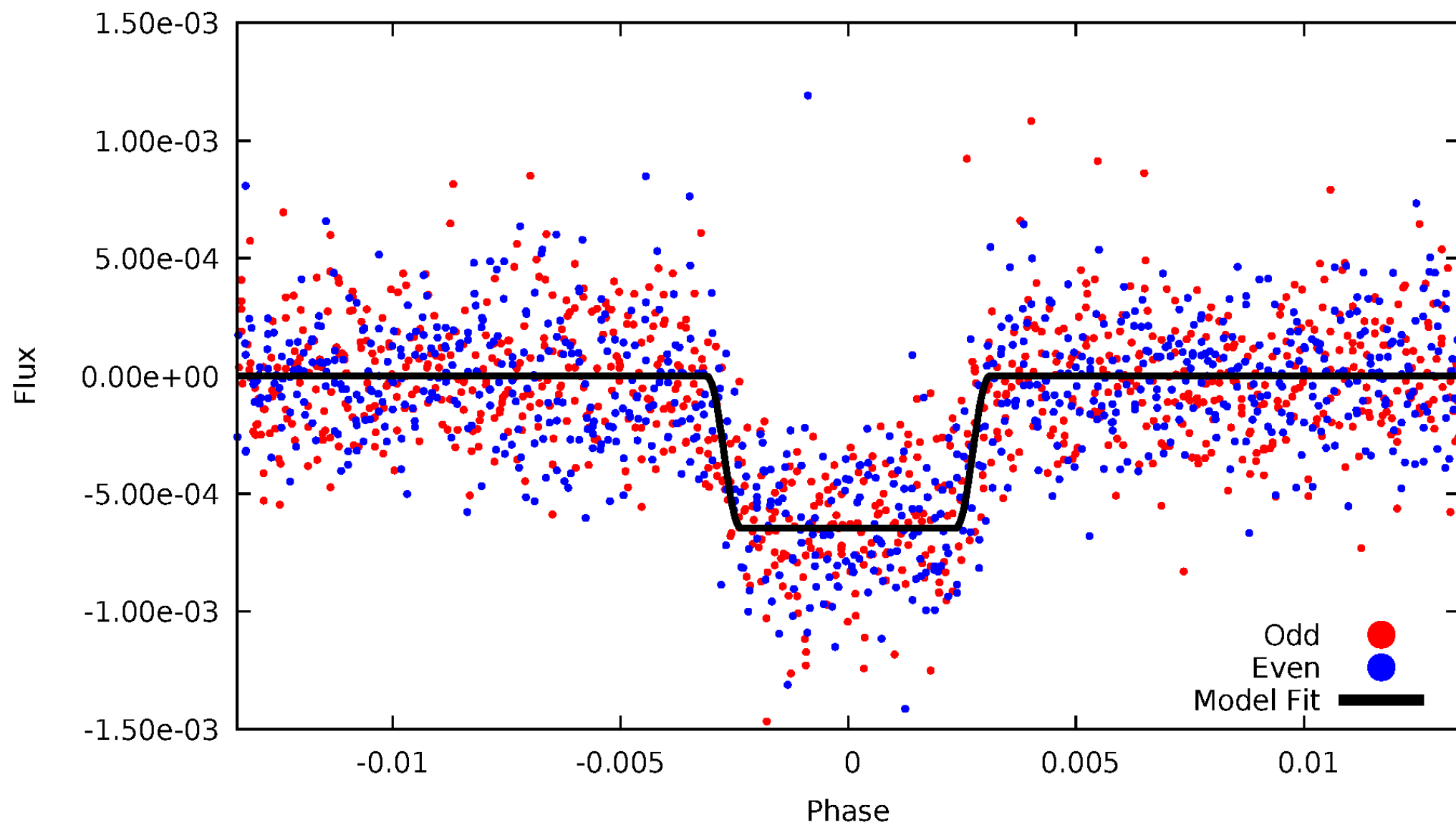
# DV Odd/Even

TCE 011669239-01



# ALT Odd/Even

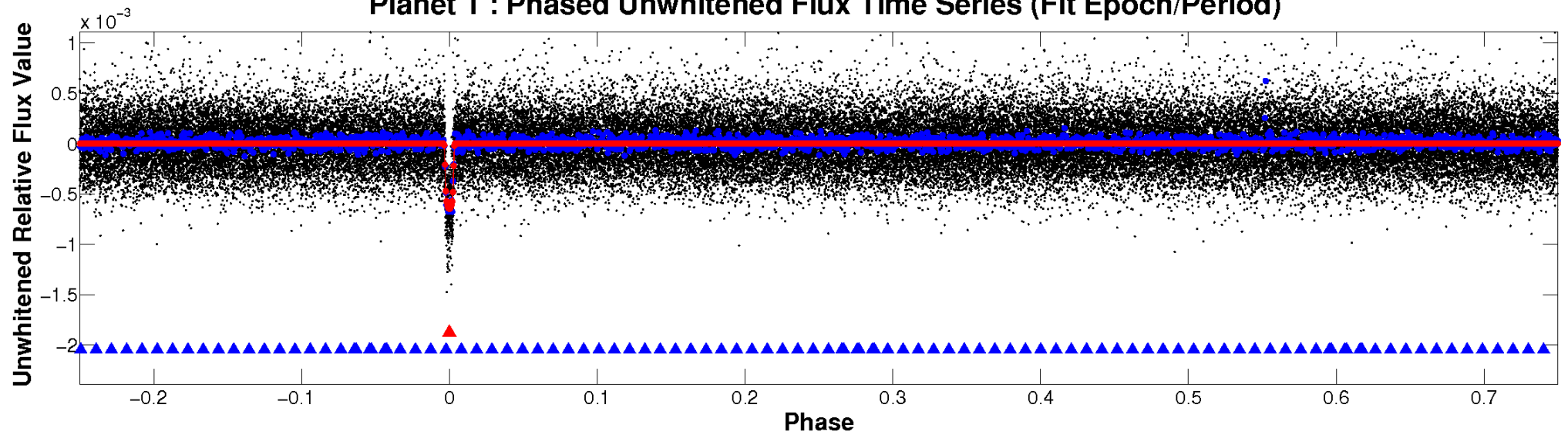
TCE 011669239-01



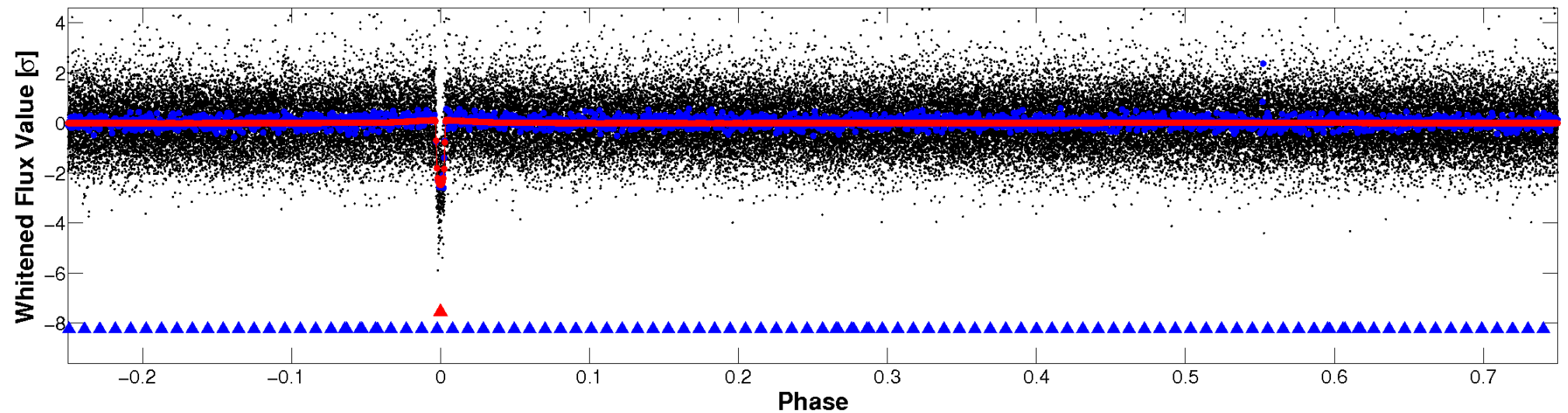


# Non-Whitened Vs. Whitened Light Curve

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

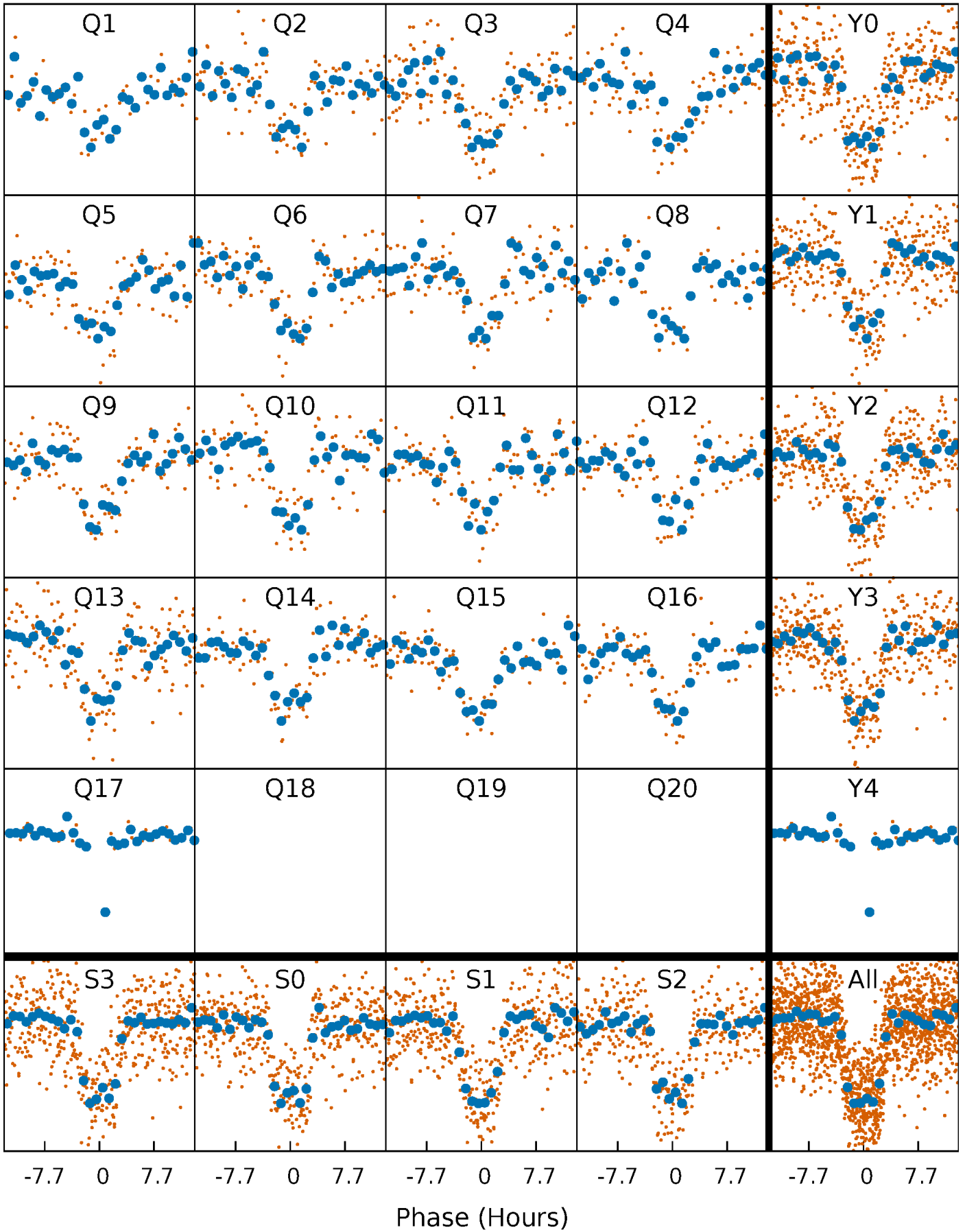


**Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)**



# PDC Quarter-Phased Transit Curves

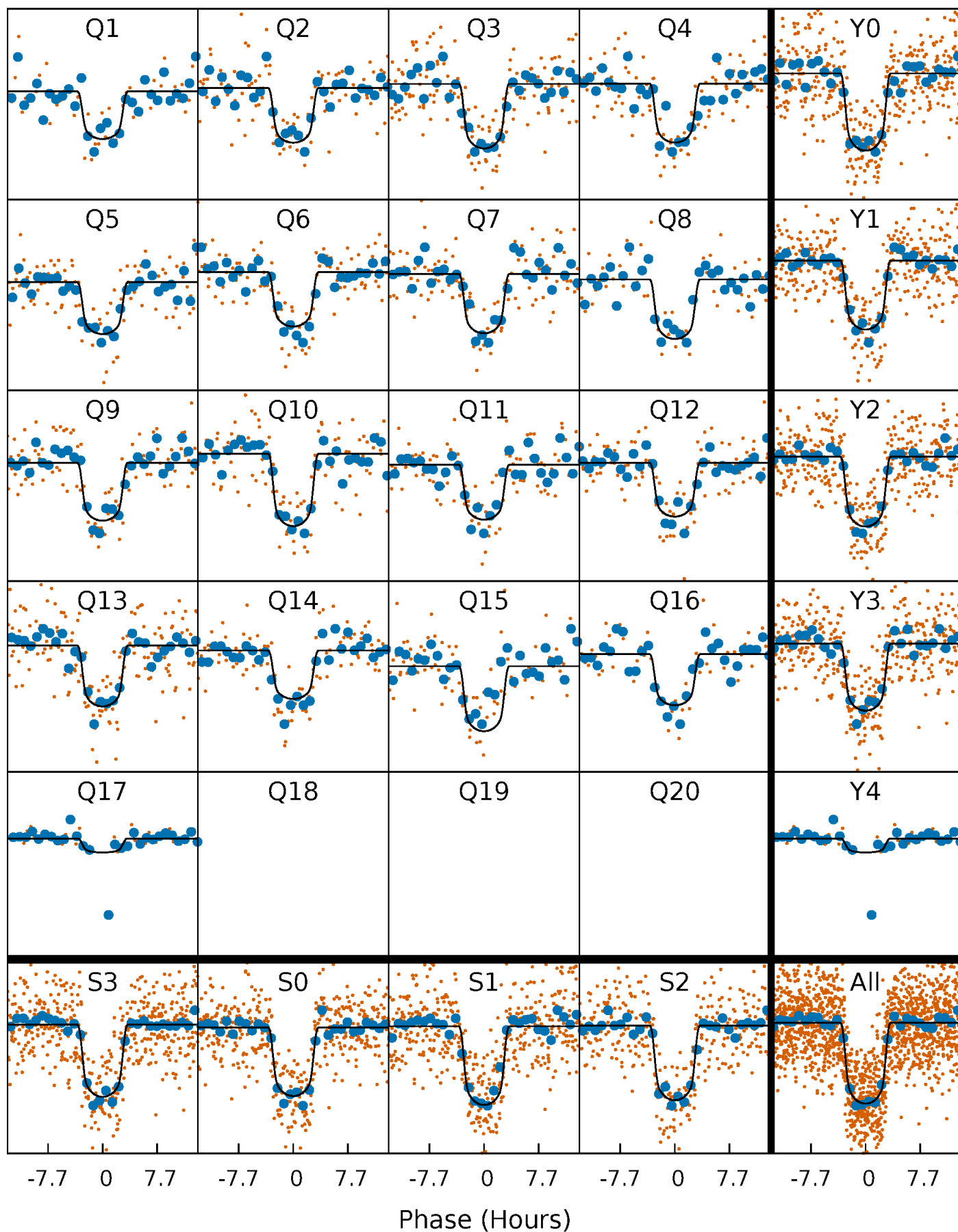
TCE 011669239-01 P= 41.885516 Days  $T_0=136.806917$  (BKJD)





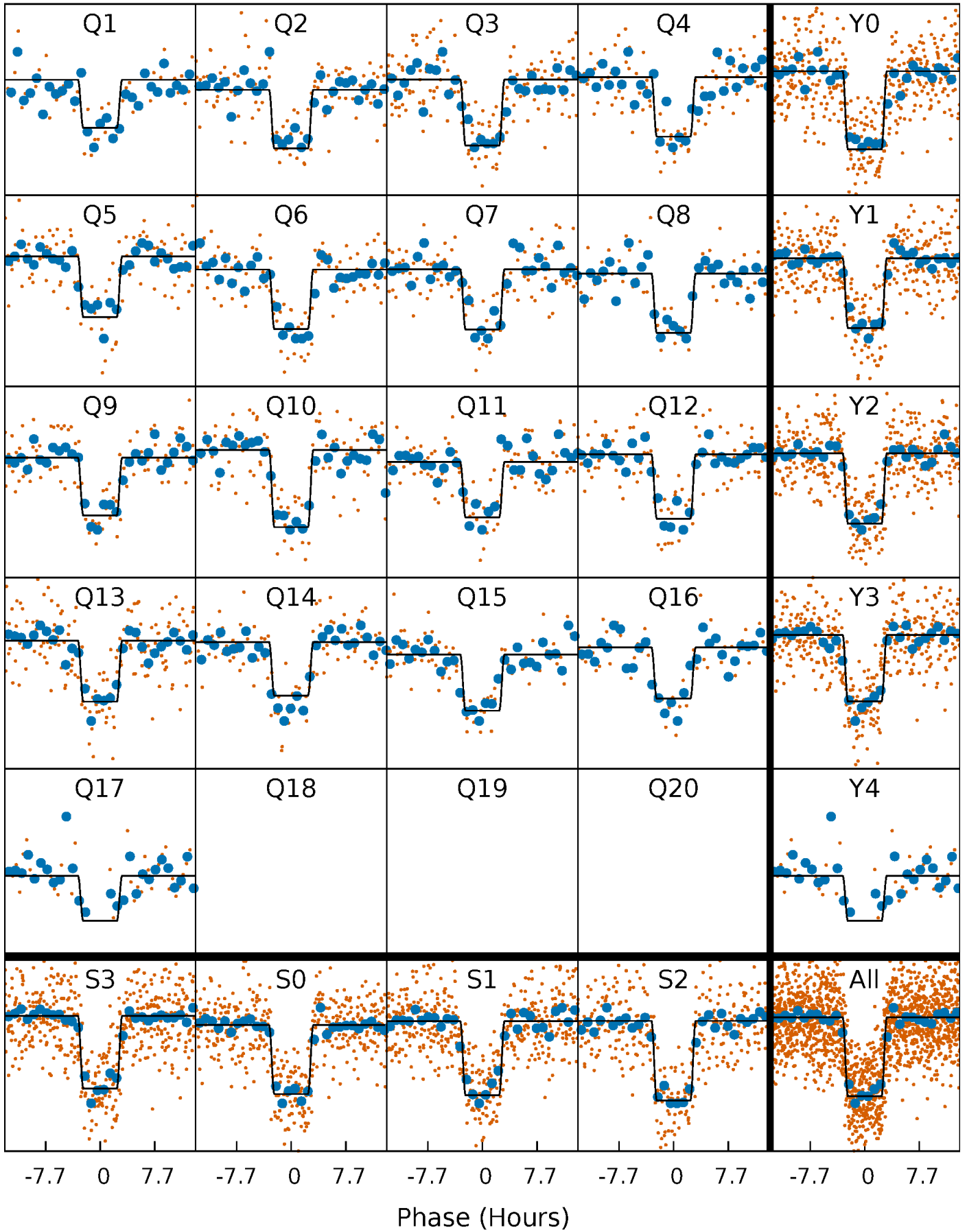
# DV Quarter-Phased Transit Curves

TCE 011669239-01 P= 41.885516 Days  $T_0=136.806917$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

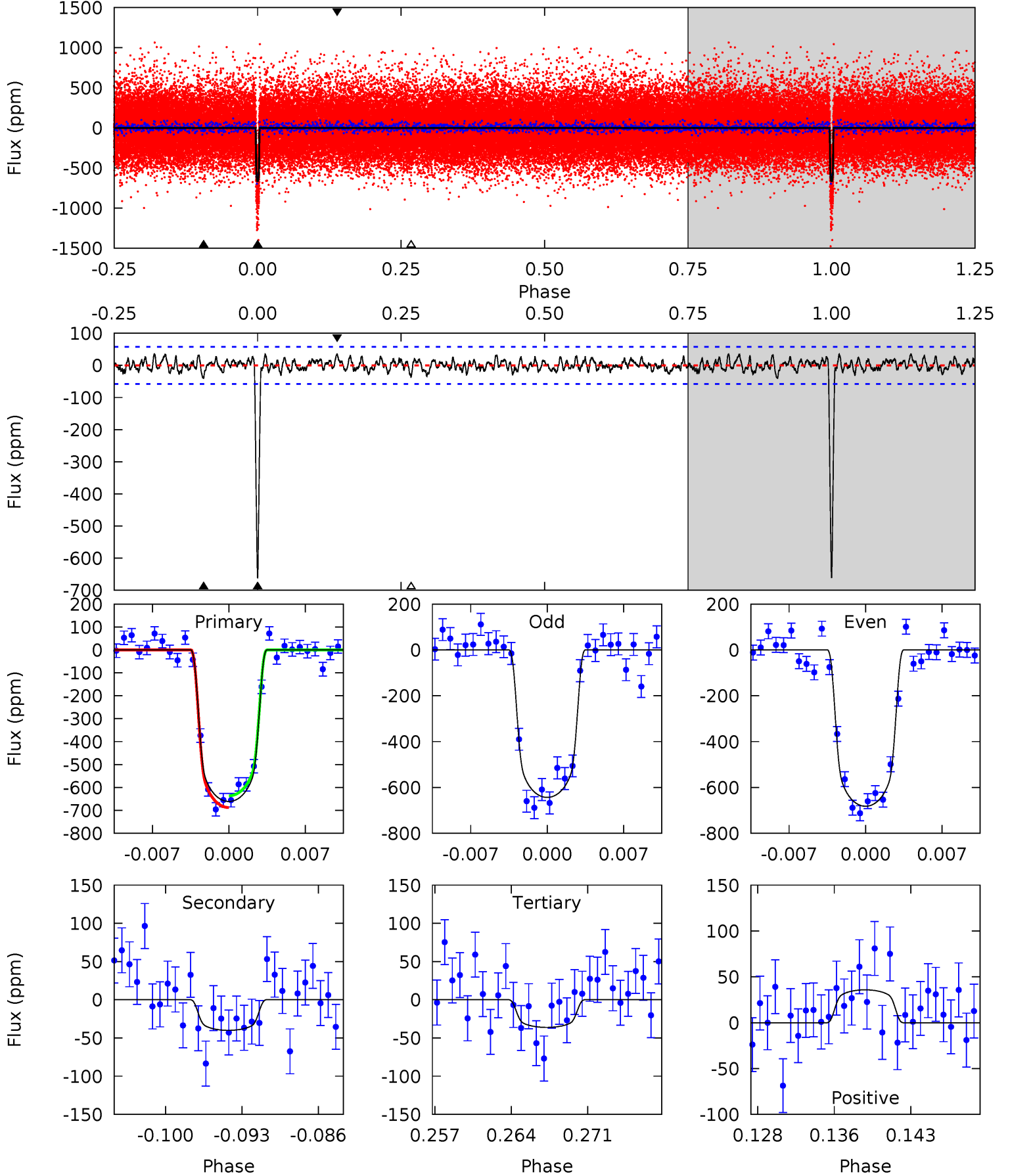
TCE 011669239-01 P= 41.886181 Days  $T_0=136.794080$  (BKJD)



# DV Model-Shift Uniqueness Test

011669239-01, P = 41.885516 Days, E = 94.921401 Days

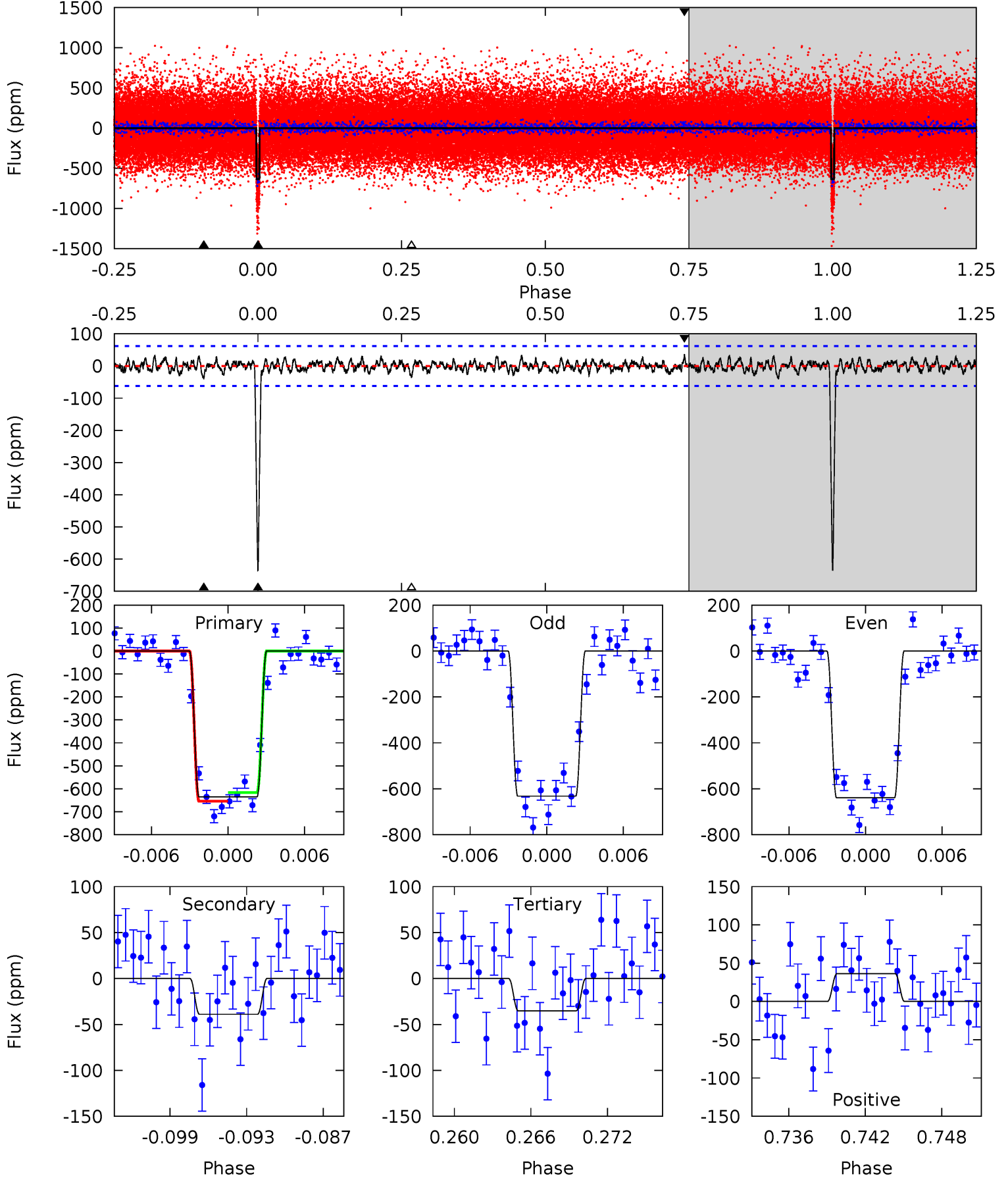
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
58.2	3.53	3.18	3.15	5.09	2.69	1.16	55.0	55.1	0.34	0.37	1.70	1.04	0.05	2.27



# Alt Model-Shift Uniqueness Test

011669239-01, P = 41.886181 Days, E = 94.907899 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
52.4	3.21	2.90	3.00	5.12	2.74	0.98	49.5	49.4	0.31	0.22	0.29	1.01	0.05	1.56



### Stellar Parameters For KIC 011669239

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$5735^{+155}_{-155}$	$4.356^{+0.175}_{-0.193}$	$-0.200^{+0.300}_{-0.300}$	$1.028^{+0.279}_{-0.186}$	$0.875^{+0.130}_{-0.080}$	$1.135^{+0.835}_{-0.552}$
	+3%/-3%	+4%/-4%	+150%/-150%	+27%/-18%	+15%/-9%	+74%/-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 011669239-01 / KOI 0542.01

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-40 \pm 11$	$3.17^{+0.52}_{-0.38}$	$756^{+55}_{-46}$	$3286^{+138}_{-172}$	$109^{+49}_{-36}$
Alt.	$-39 \pm 12$	$2.86^{+0.44}_{-0.33}$	$756^{+53}_{-51}$	$3366^{+156}_{-187}$	$132^{+63}_{-47}$

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

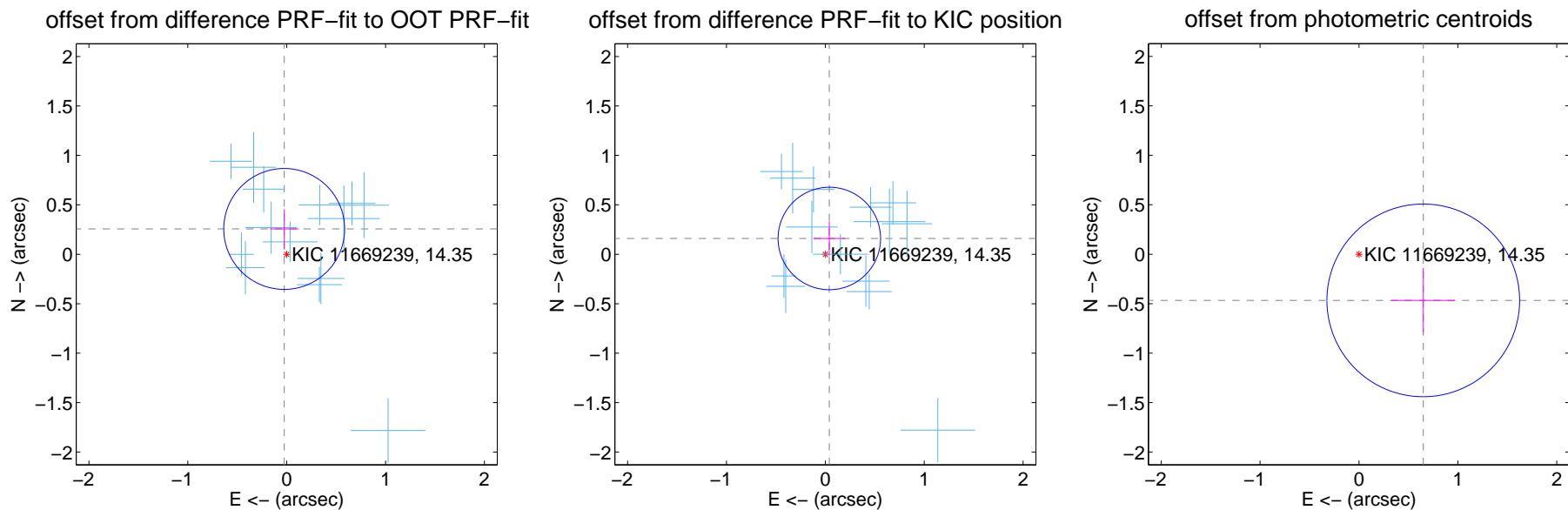
## DV Centroid Data

Supplemental centroid analysis for 011669239-01. Kepler magnitude: 14.35. Transit SNR 41.01

There are 14 quarters with good PRF difference image offsets

The direct PRF centroid is offset from the target star catalog position by about 0.02 arcsec

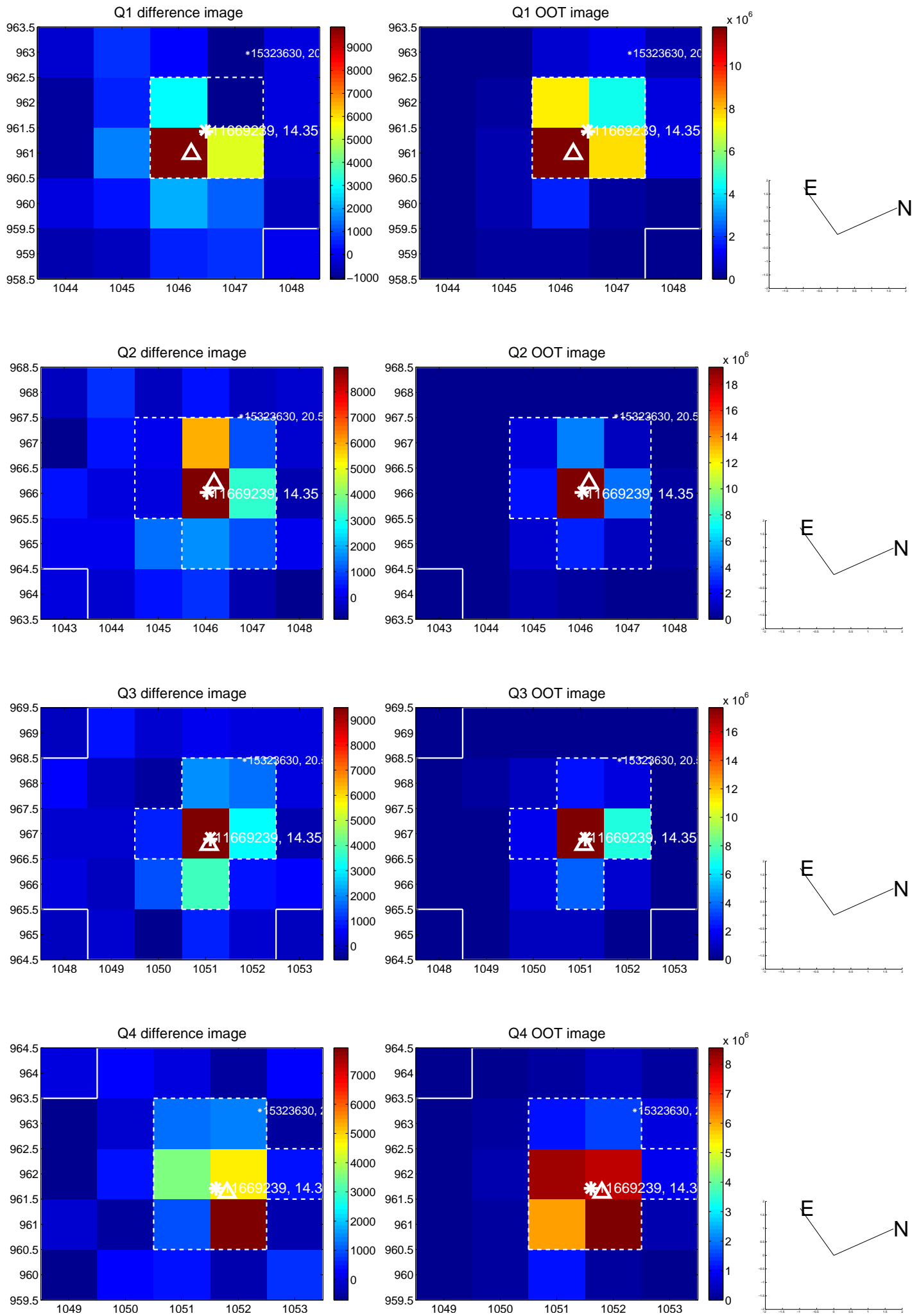
	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.257 \pm 0.204$	1.26	$0.025 \pm 0.144$	$0.256 \pm 0.199$
PRF-fit source offset from KIC position	$0.165 \pm 0.173$	0.95	$-0.040 \pm 0.160$	$0.160 \pm 0.174$
photometric centroid source offset	$0.80 \pm 0.32$	2.46	$-0.65 \pm 0.32$	$-0.47 \pm 0.33$



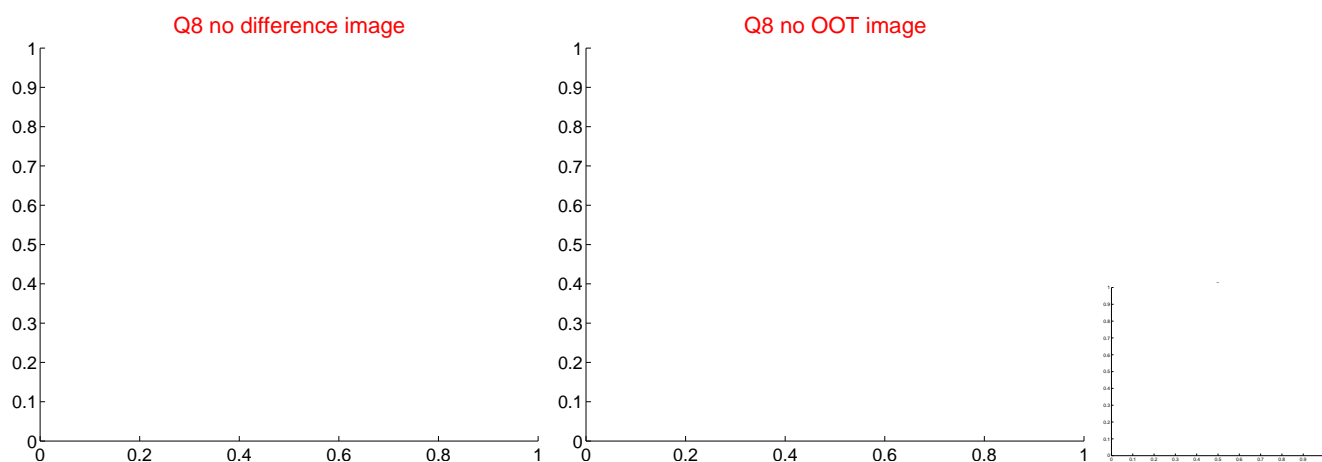
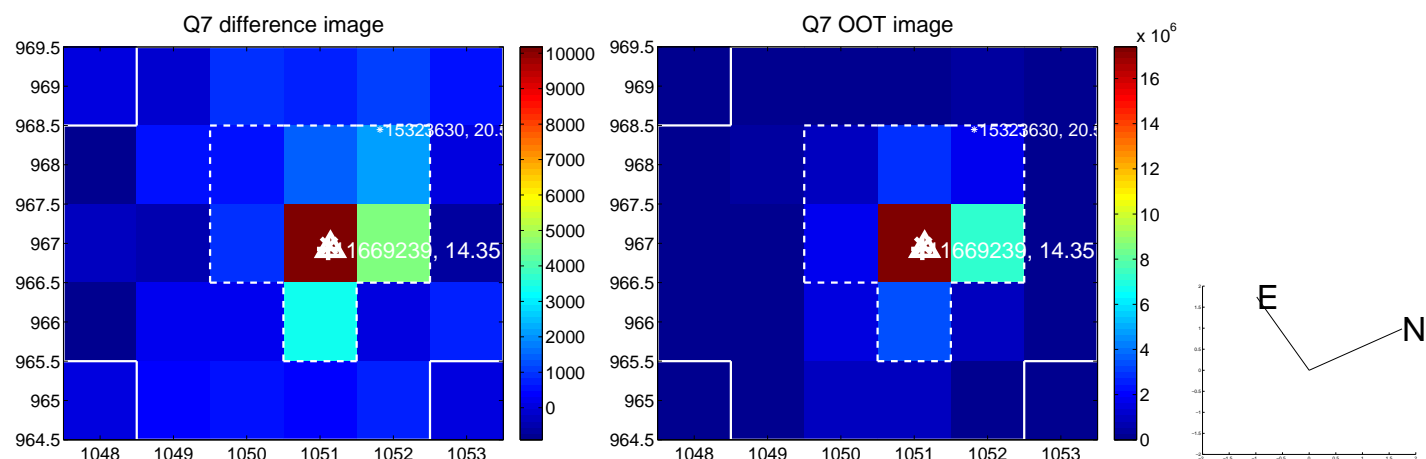
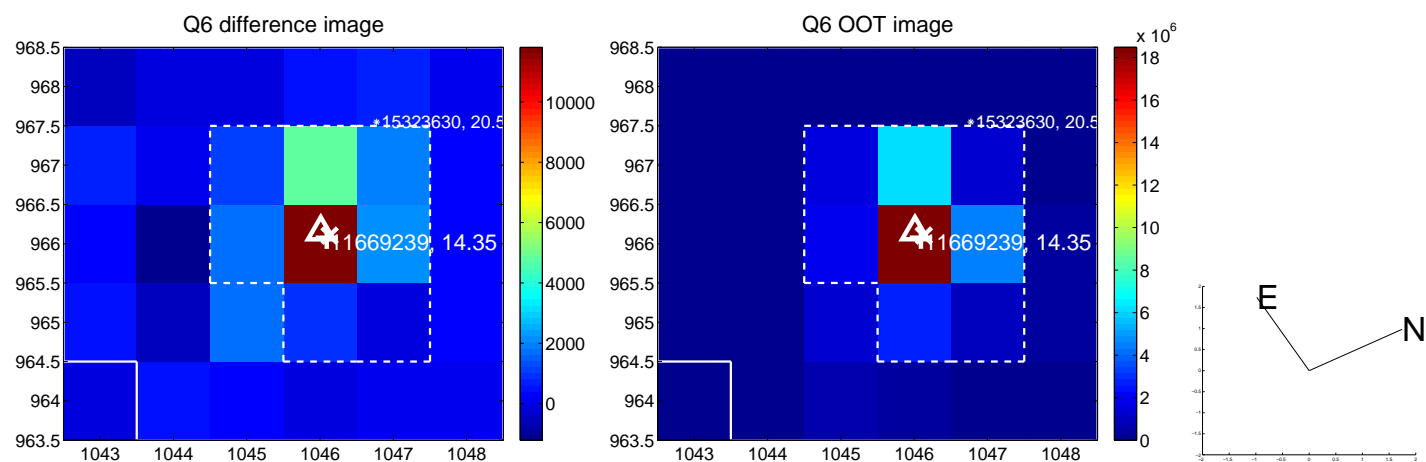
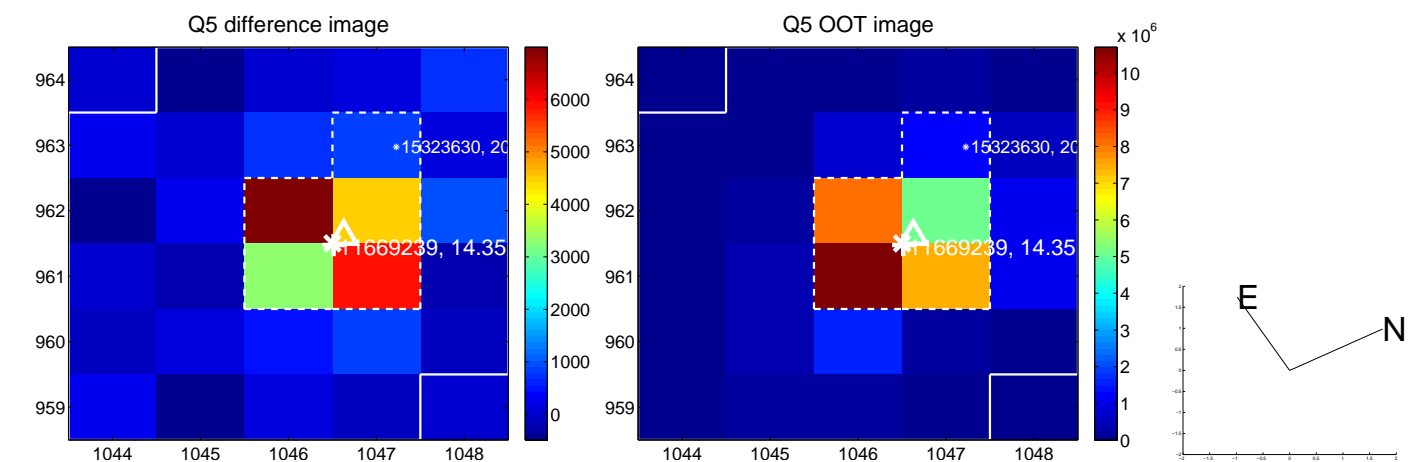
Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses:** good quarterly centroid offsets; **Vermillion crosses:** bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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



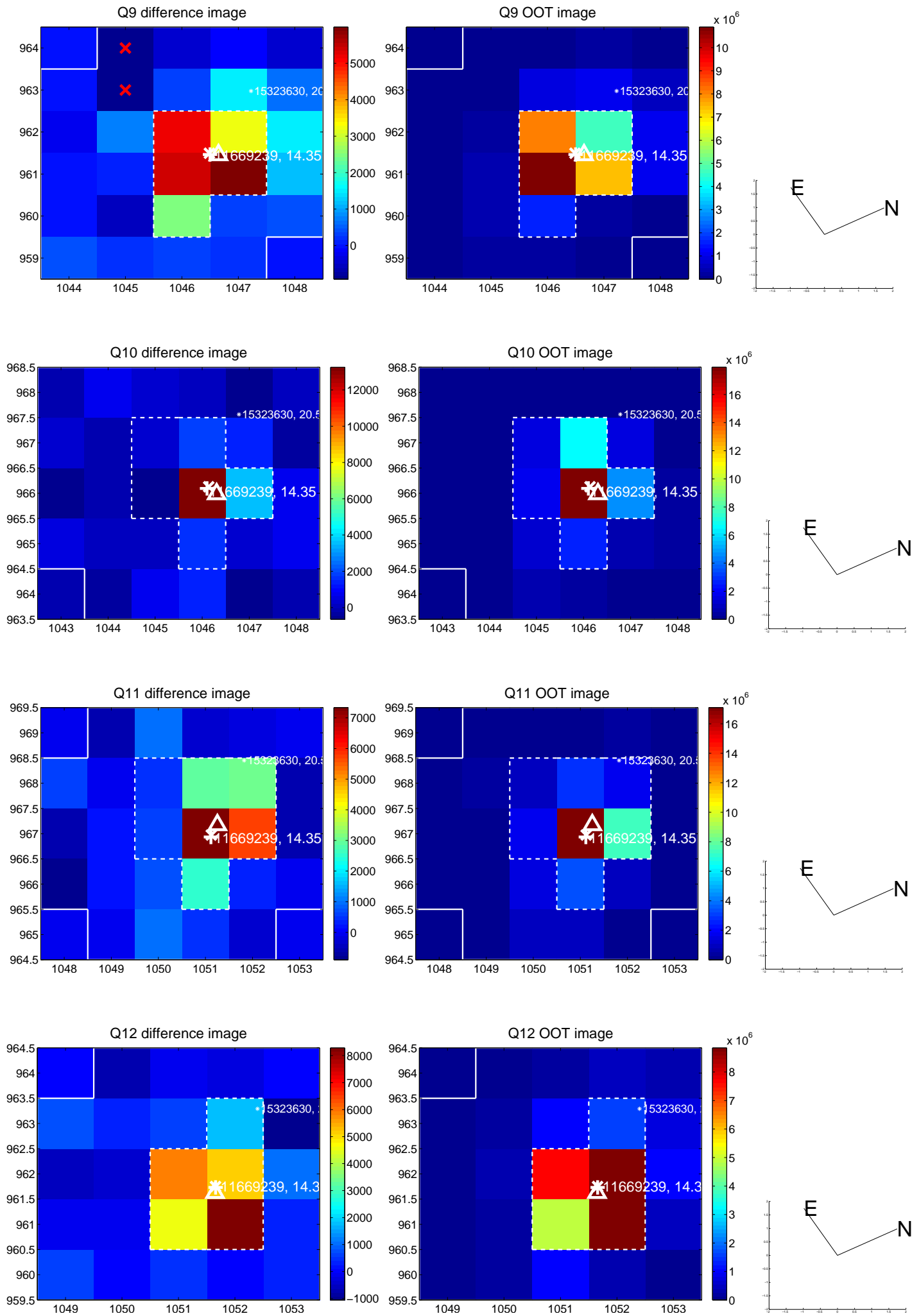
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



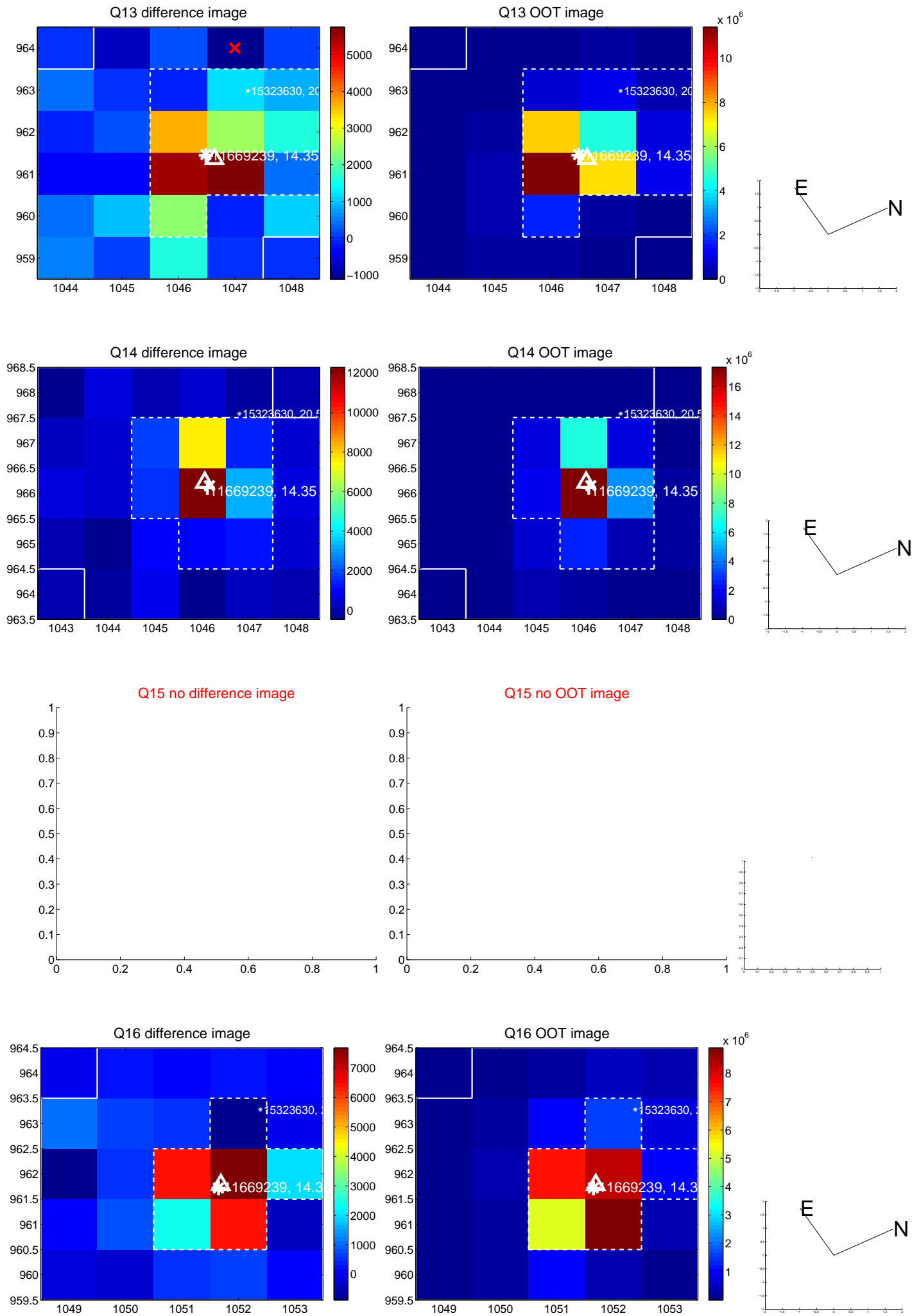
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value



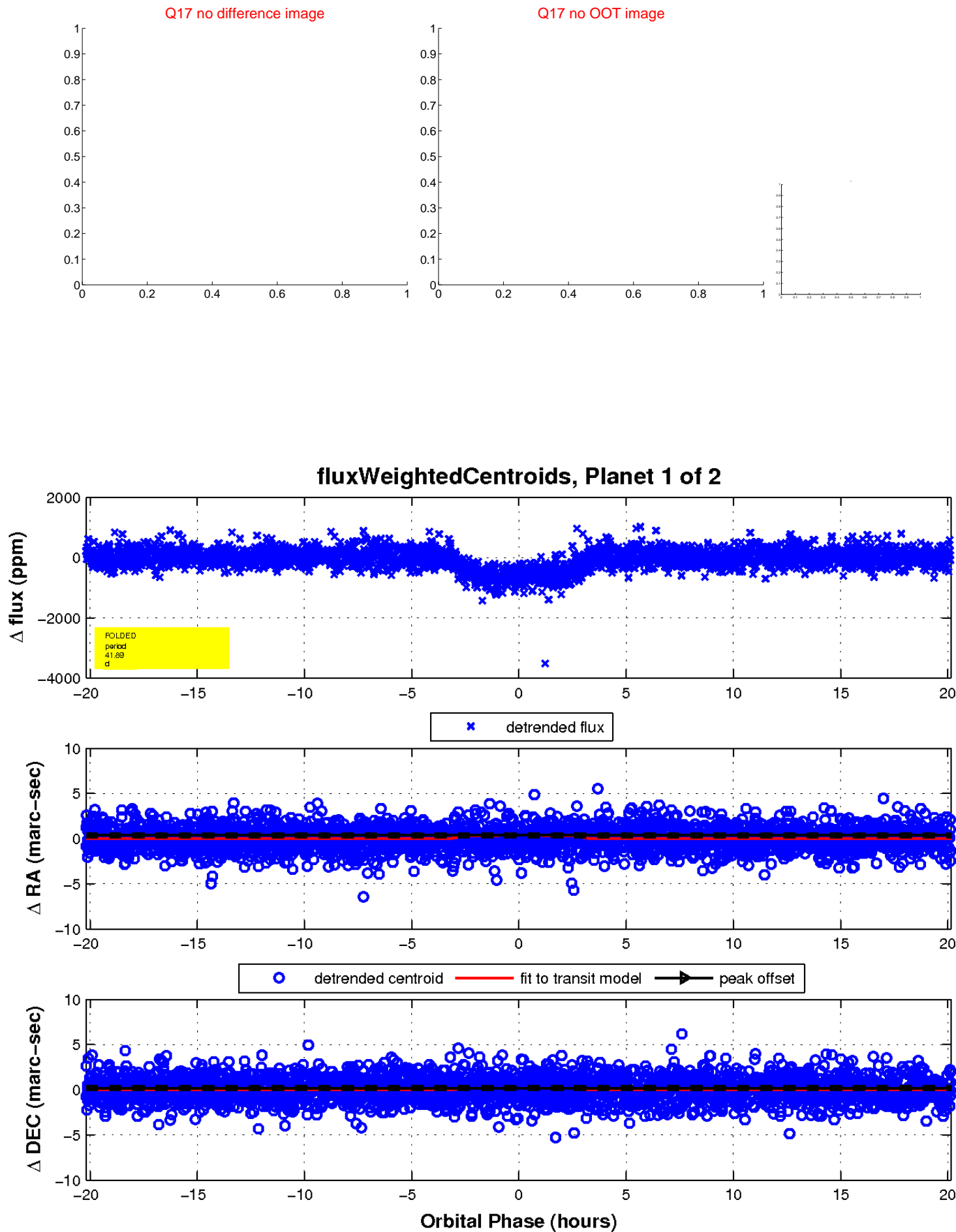
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

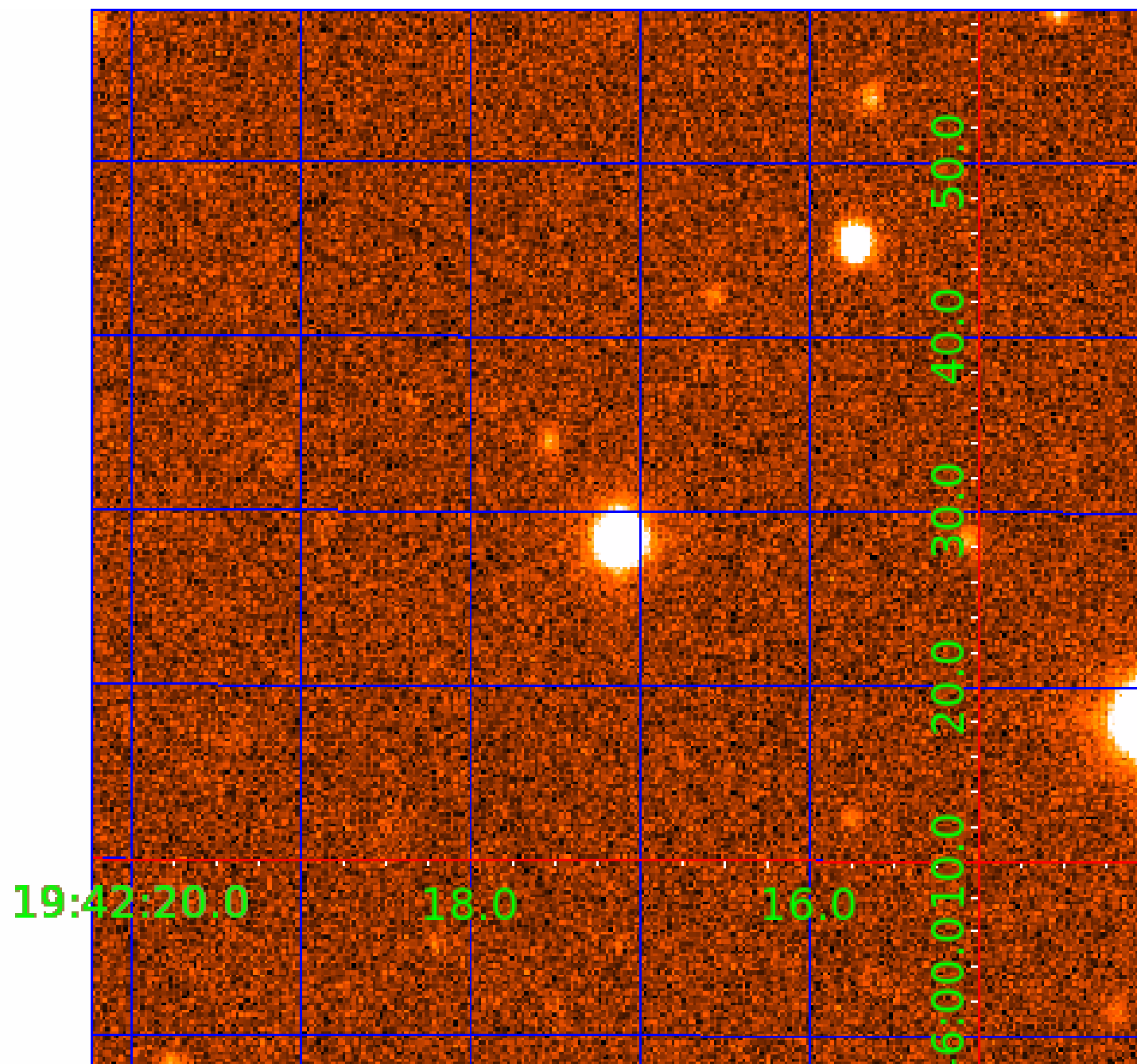


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination





# KIC 011669239

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
011669239-01	OBS	0542.01	41.885516	136.806917	648.3	6.728	39.0	41.0	1.03	5735	3.13	20.09
011669239-02	OBS	0542.02	13.817361	135.032776	206.0	3.894	17.7	18.8	1.03	5735	1.72	88.13

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
011669239-01	OBS	PC	1.00	0	0	0	0	NO_COMMENT
011669239-02	OBS	PC	0.99	0	0	0	0	NO_COMMENT

**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.

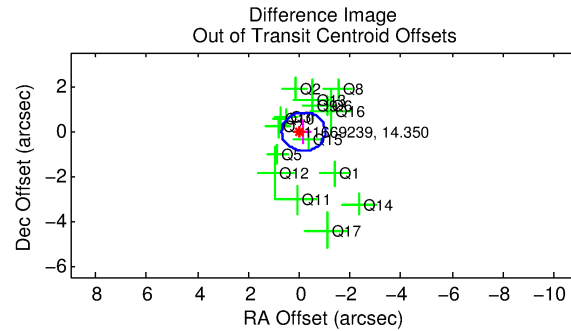
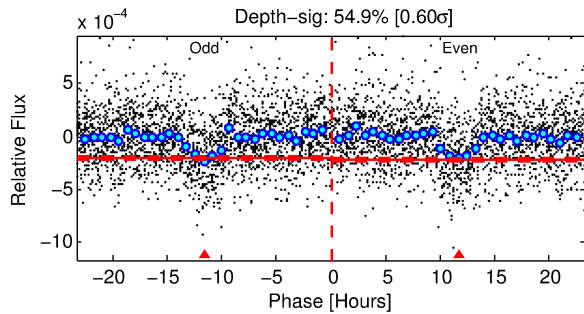
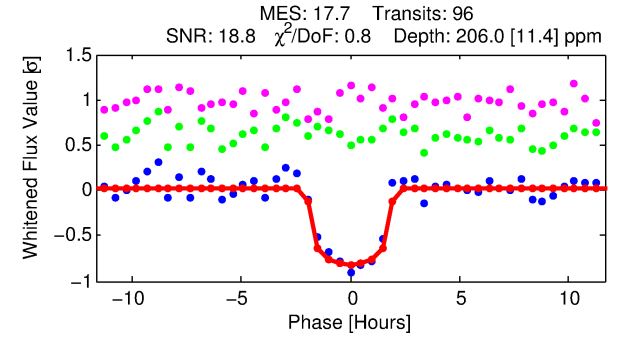
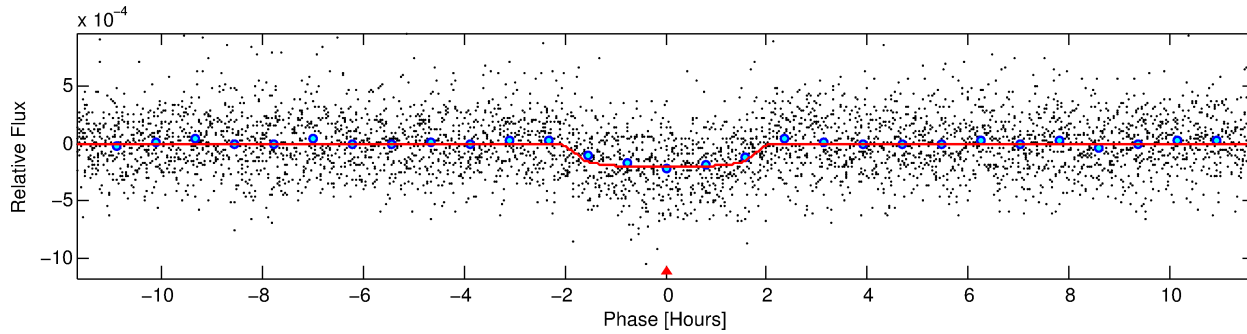
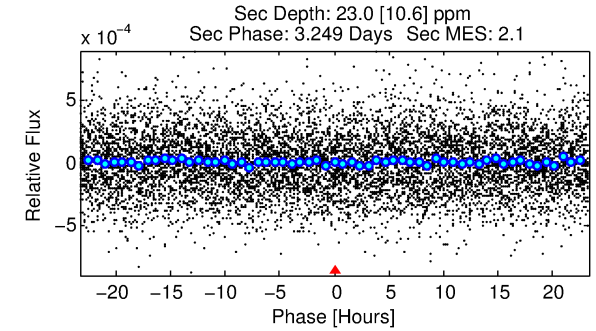
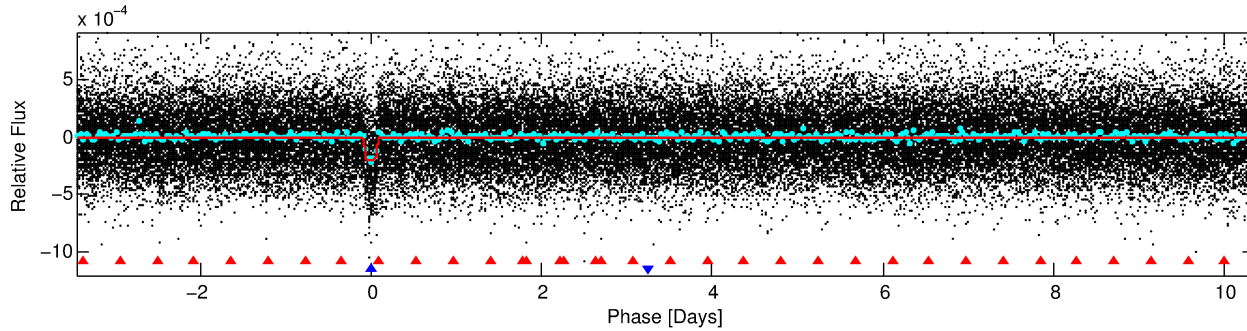
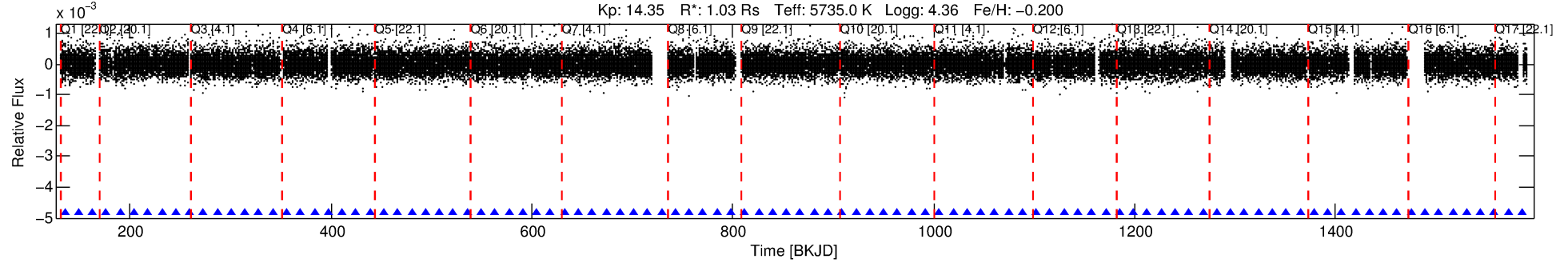
## Ephemeris Match Information For 011669239-02

No Significant Match Found

# DV One-Page Summary

KIC: 11669239 Candidate: 2 of 2 Period: 13.817 d  
KOI: K00542.02 Name: Kepler-180b Corr: 0.985

Kp: 14.35 R\*: 1.03 Rs Teff: 5735.0 K Logg: 4.36 Fe/H: -0.200



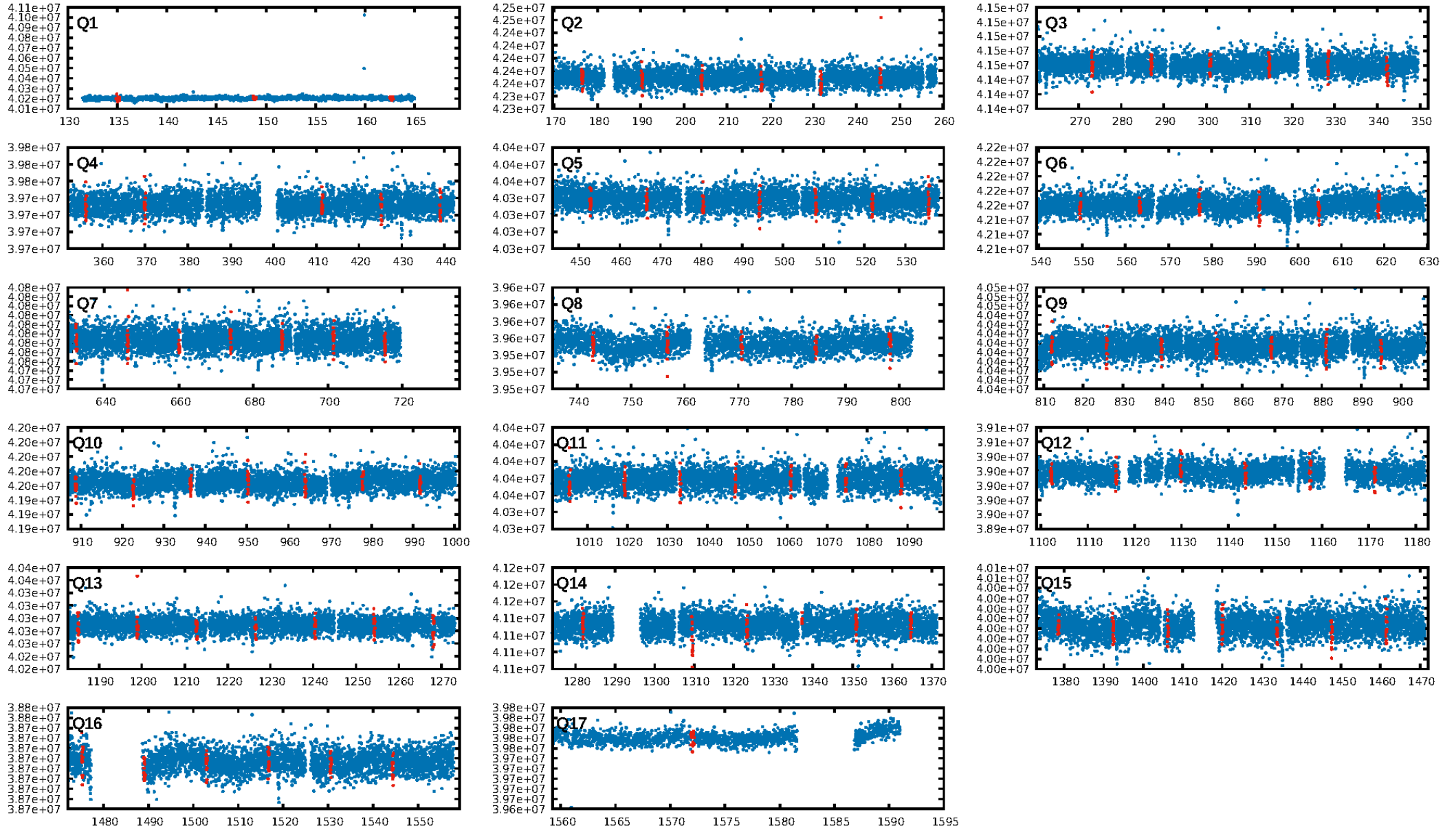
## DV Fit Results:

Period = 13.81736 [0.00008] d  
Epoch = 135.0328 [0.0045] BKJD  
Rp/R\* = 0.0153 [0.0046]  
a/R\* = 13.82 [19.62]  
b = 0.88 [0.38]  
Seff = 88.13 [32.04]  
Teff = 781 [71] K  
Rp = 1.72 [0.70] Re  
a = 0.1078 [0.0252] AU  
Ag = 49.73 [41.44] [1.18σ]  
Teffp = 3208 [614] K [3.93σ]

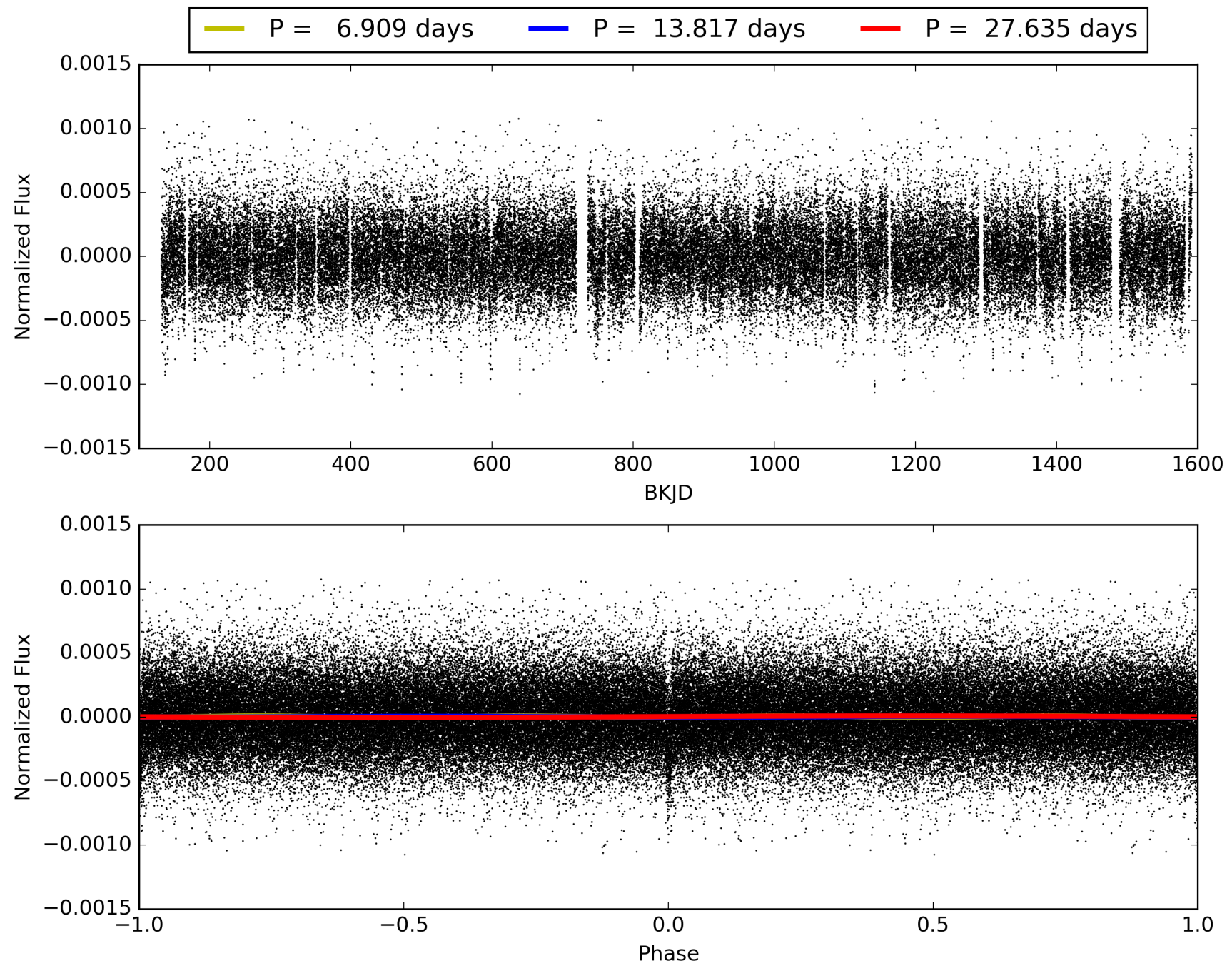
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 100.0% [86.66σ]  
ModelChiSquare2-sig: 100.0%  
ModelChiSquareGof-sig: 100.0%  
Bootstrap-pfa: 2.29e-70  
RollingBand-fgt: 1.00 [92/92]  
GhostDiagnostic-chr: 3.445  
Centroid-sig: 33.9%  
Centroid-so: 1.025 arcsec [1.42σ]  
OotOffset-rm: 0.161 arcsec [0.57σ]  
KicOffset-rm: 0.253 arcsec [0.77σ]  
OotOffset-st: 4/4/3/5 [16]  
KicOffset-st: 4/4/3/5 [16]  
DiffImageQuality-fgm: 0.81 [13/16]  
DiffImageOverlap-fno: 1.00 [17/17]

# TCE 011669239-02, PDC Light Curves

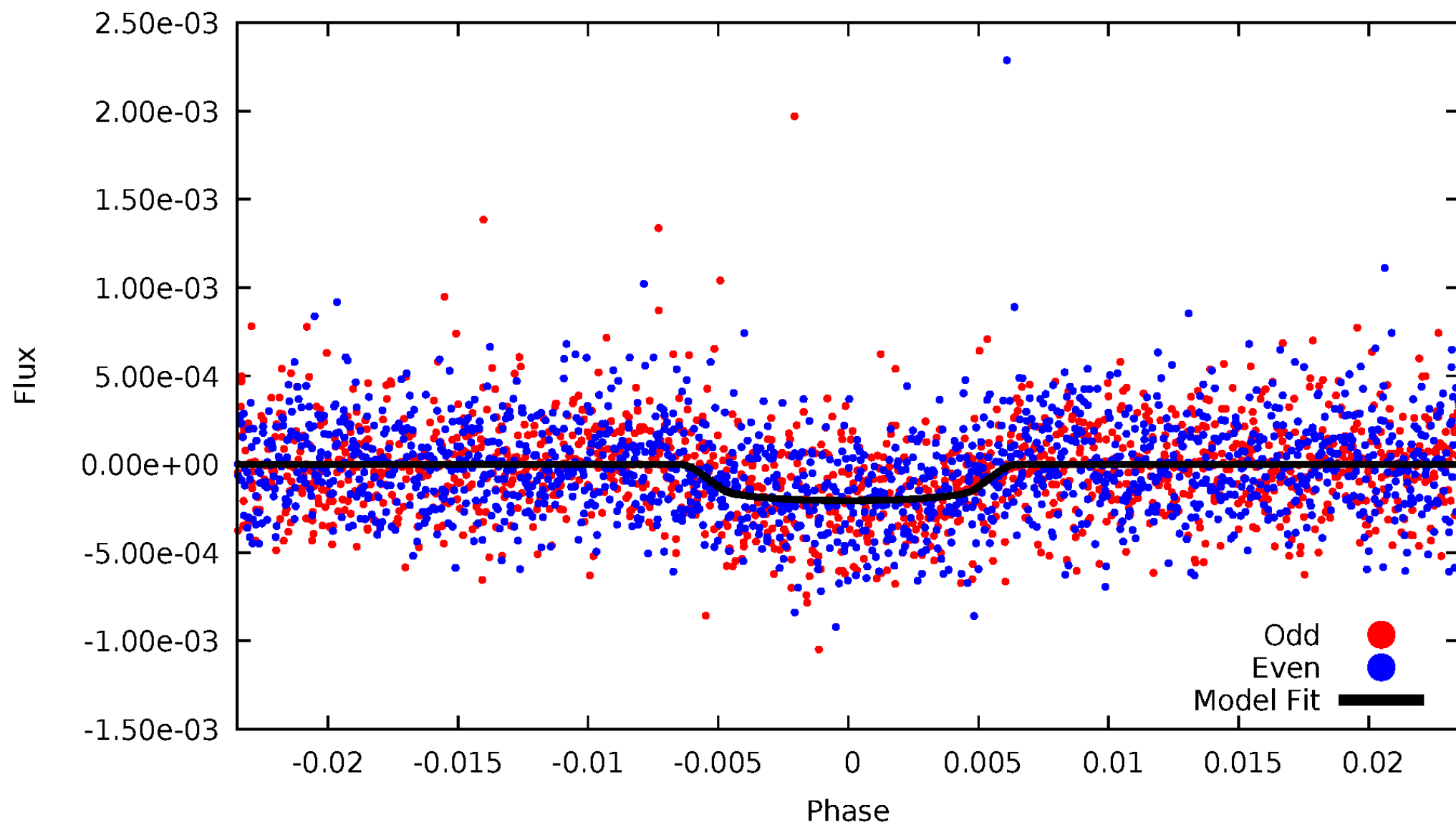


TCE 011669239-02



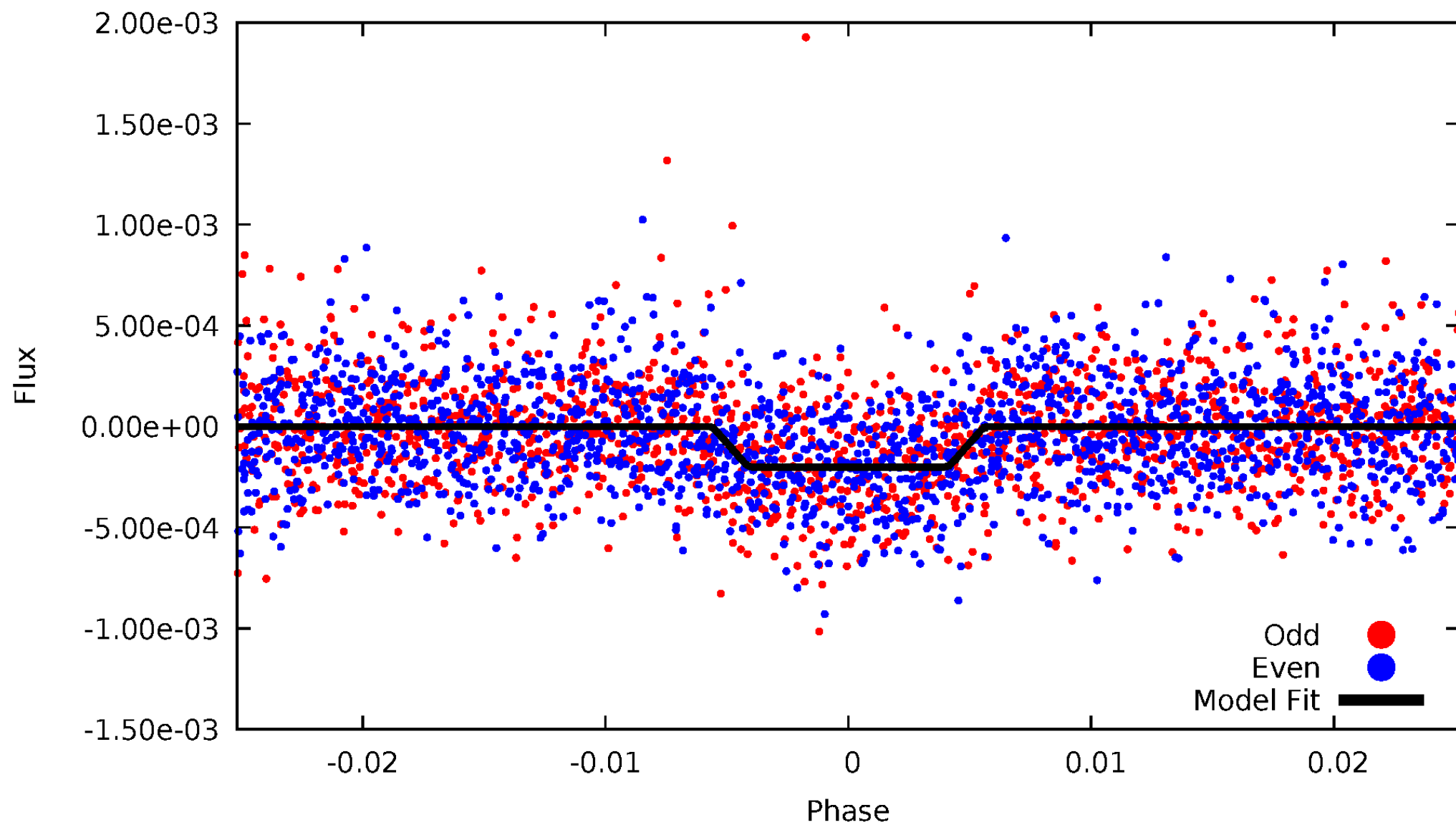
# DV Odd/Even

TCE 011669239-02



# ALT Odd/Even

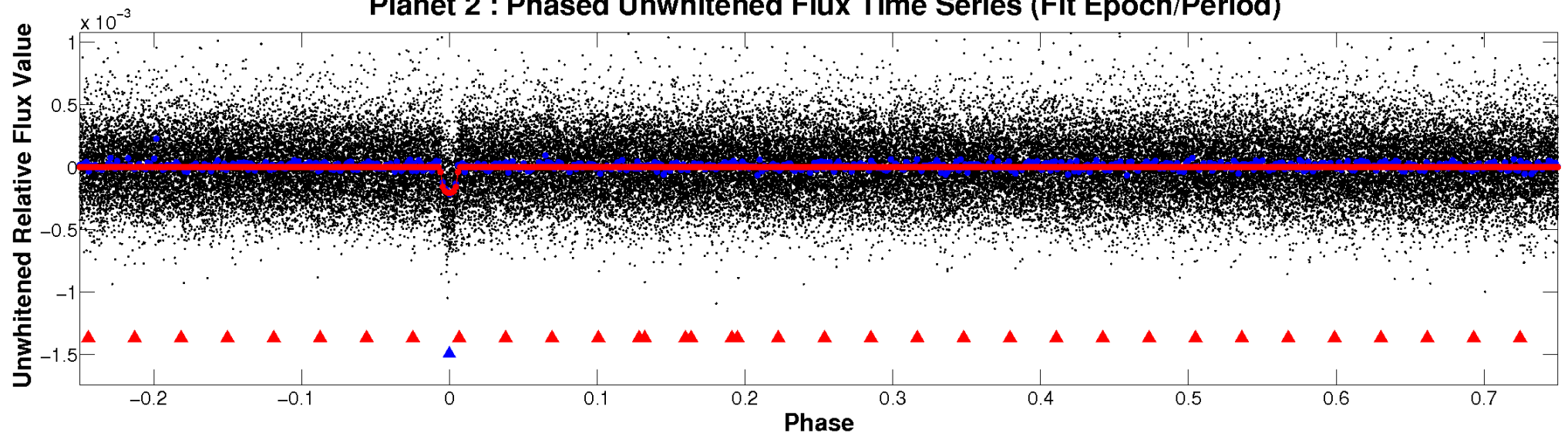
TCE 011669239-02



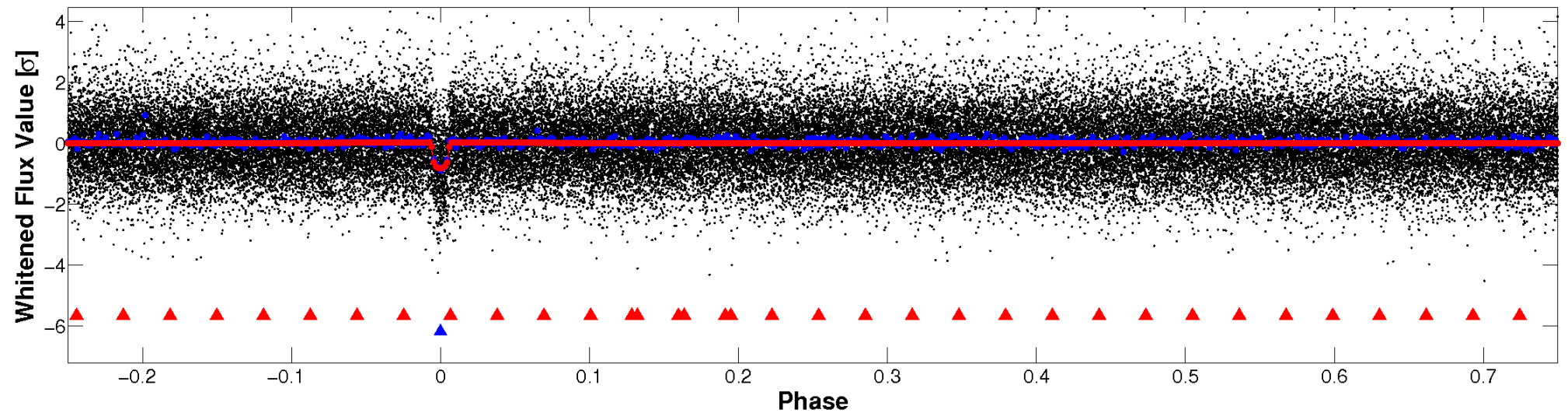


# Non-Whitened Vs. Whitened Light Curve

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

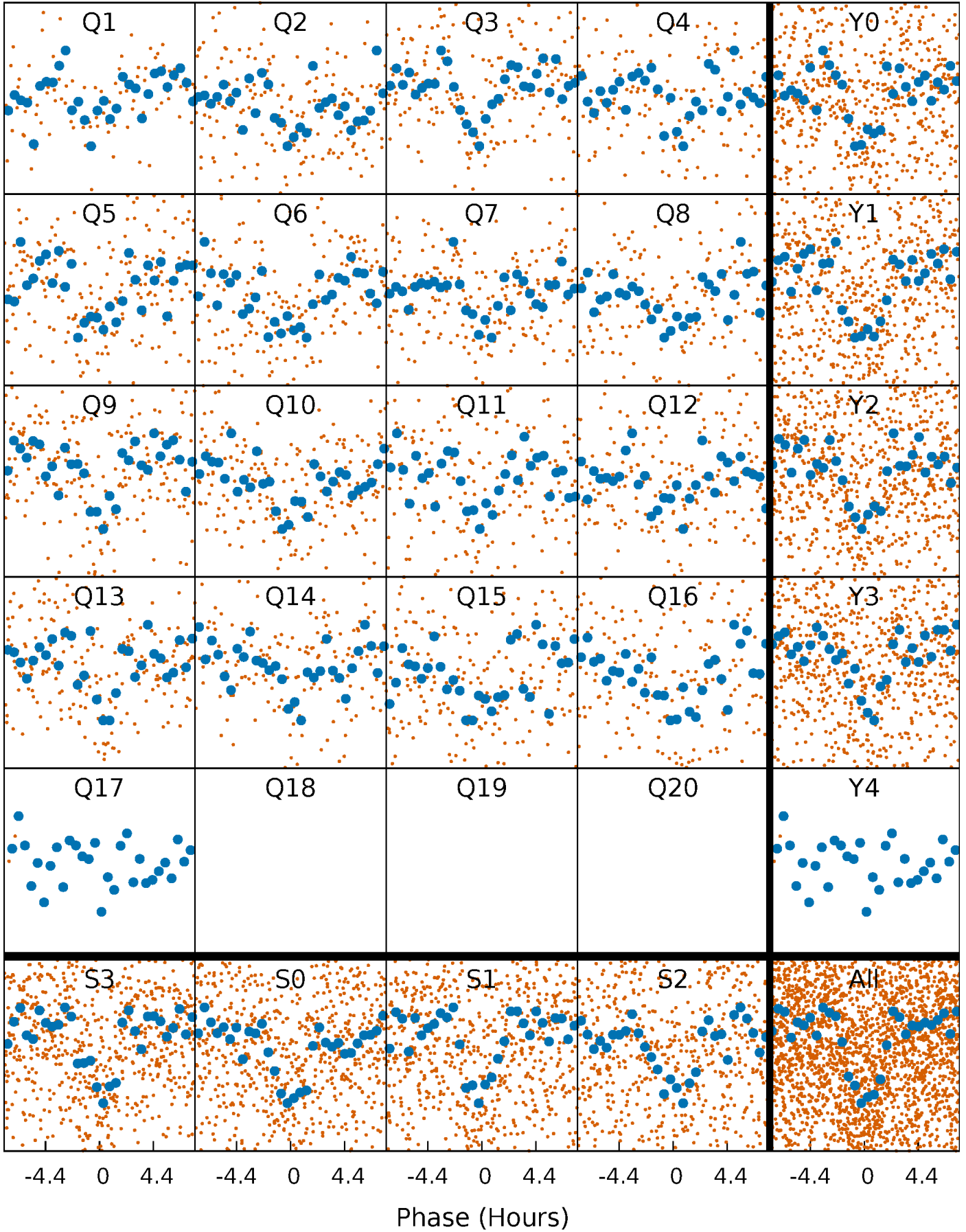


## Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



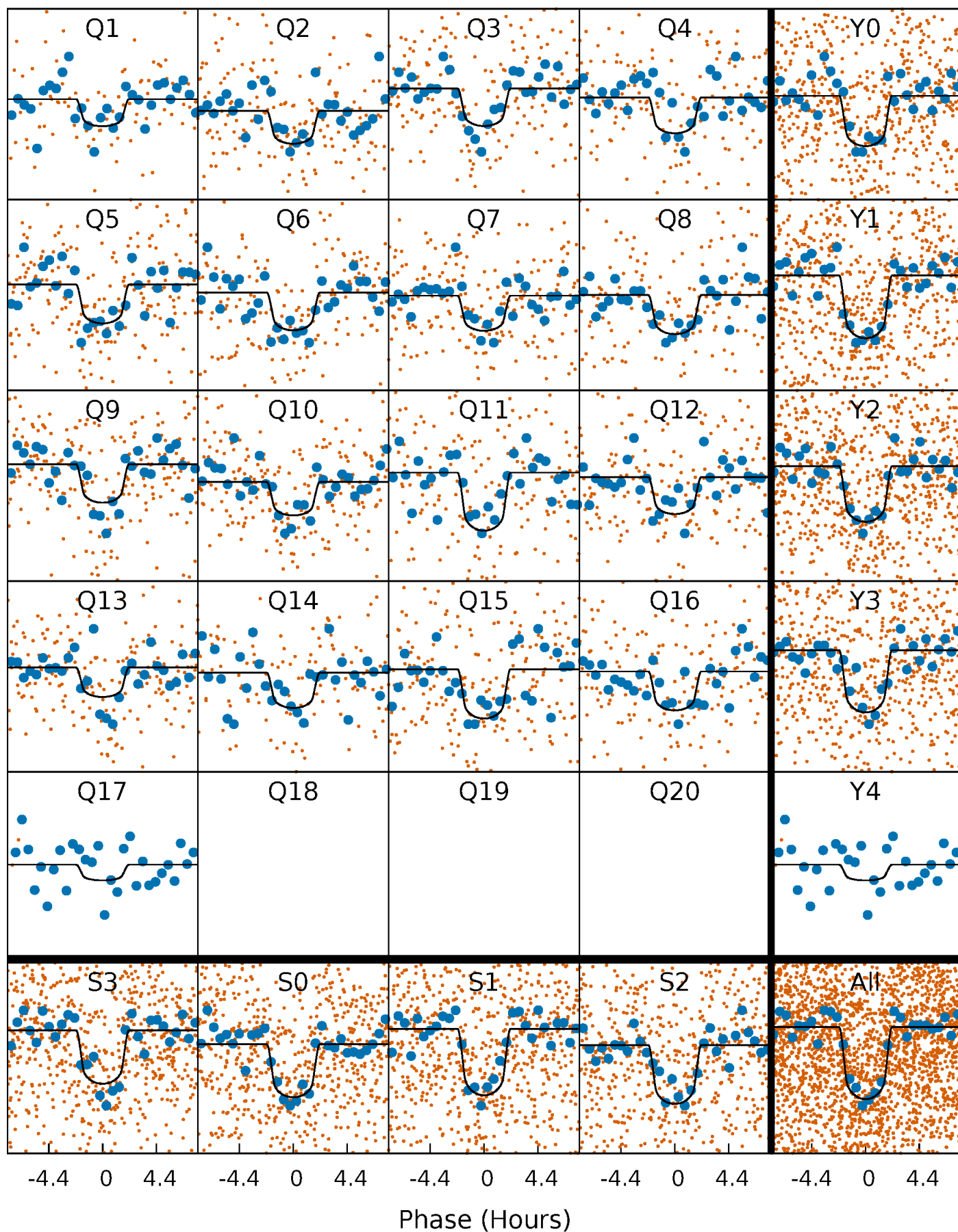
# PDC Quarter-Phased Transit Curves

TCE 011669239-02 P= 13.817361 Days  $T_0=135.032776$  (BKJD)



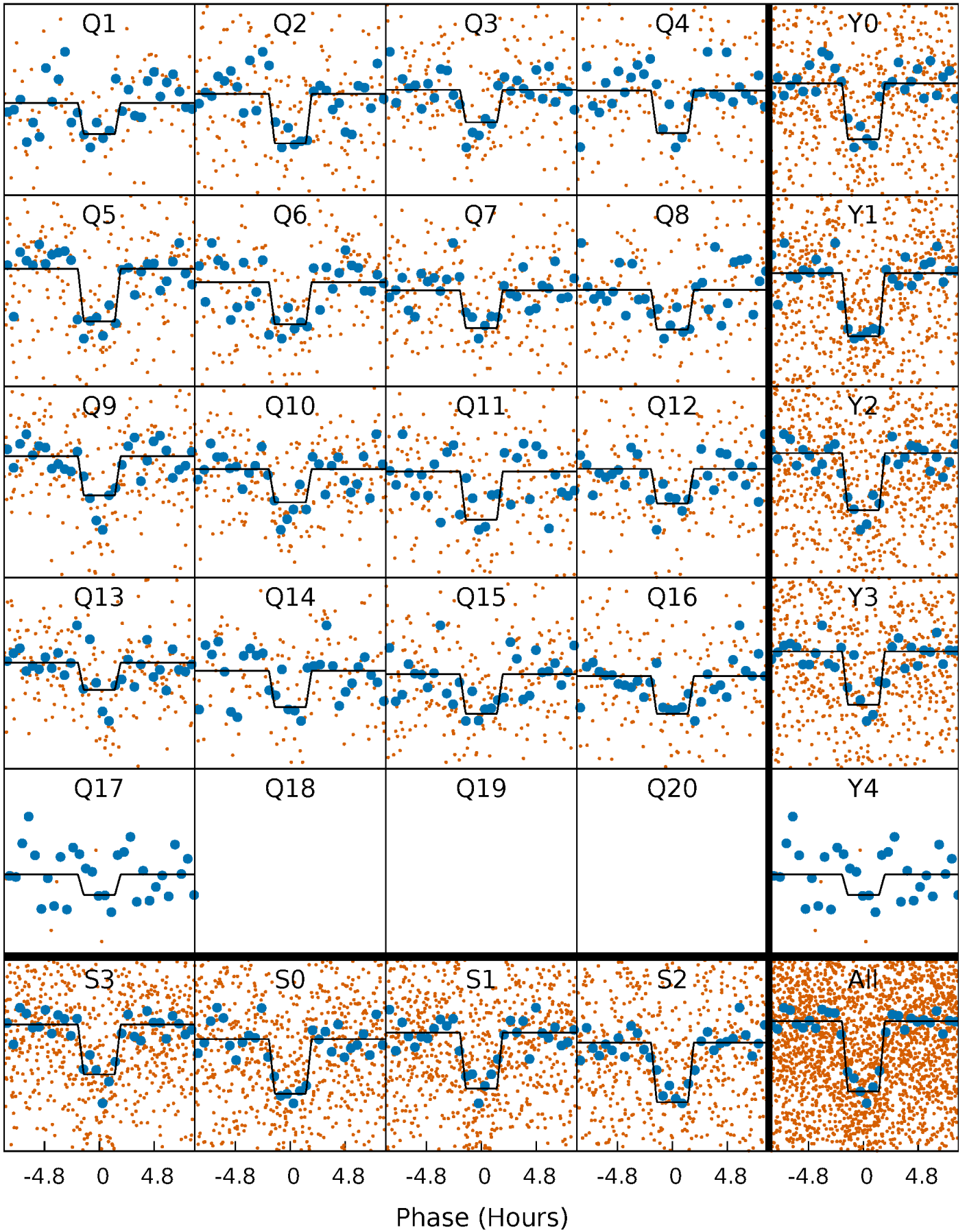
# DV Quarter-Phased Transit Curves

TCE 011669239-02 P= 13.817361 Days  $T_0=135.032776$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

TCE 011669239-02 P= 13.817193 Days  $T_0=135.041345$  (BKJD)

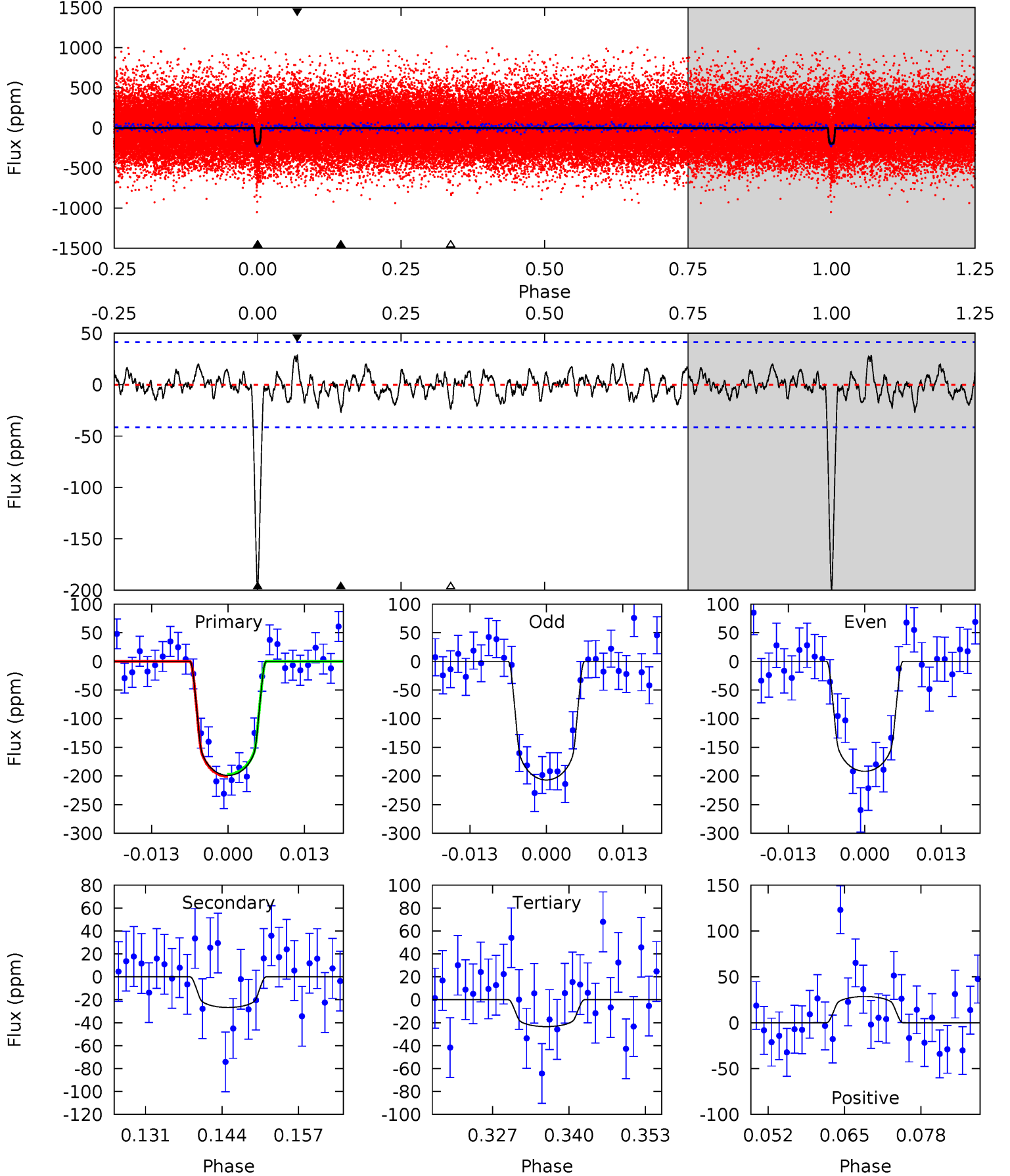




# DV Model-Shift Uniqueness Test

011669239-02, P = 13.817361 Days, E = 121.215415 Days

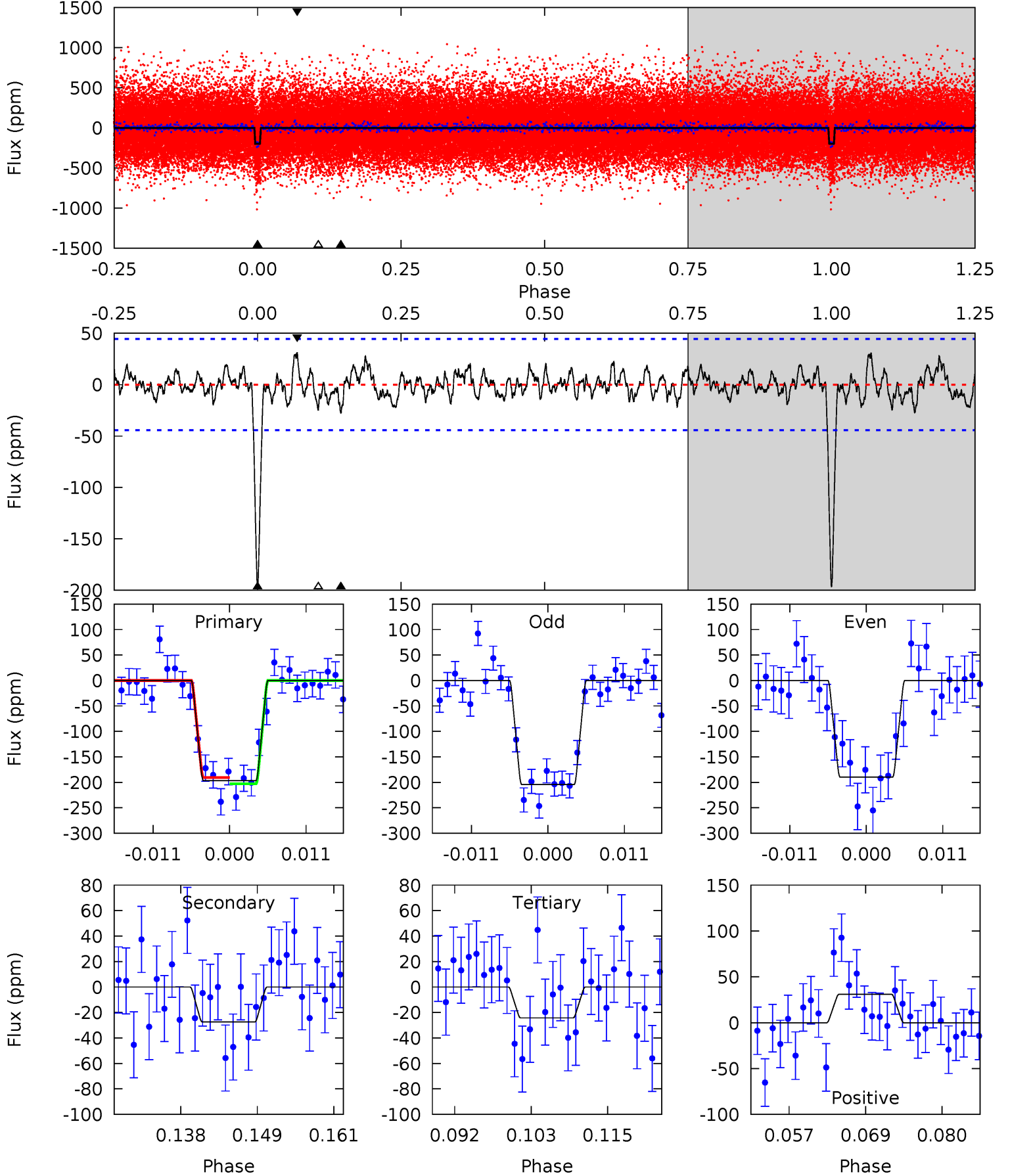
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
23.9	3.21	2.81	3.42	4.97	2.48	1.06	21.0	20.4	0.40	-0.21	0.90	0.96	0.13	0.21



# Alt Model-Shift Uniqueness Test

011669239-02,  $P = 13.817193$  Days,  $E = 121.224152$  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
22.2	3.09	2.74	3.49	5.00	2.53	1.08	19.4	18.7	0.35	-0.40	0.82	1.03	0.14	0.68





### Stellar Parameters For KIC 011669239

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R$ ( $R_{\odot}$ )	$M(M_{\odot})$	$p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ )
	$5735^{+155}_{-155}$	$4.356^{+0.175}_{-0.193}$	$-0.200^{+0.300}_{-0.300}$	$1.028^{+0.279}_{-0.186}$	$0.875^{+0.130}_{-0.080}$	$1.135^{+0.835}_{-0.552}$
	+3%/-3%	+4%/-4%	+150%/-150%	+27%/-18%	+15%/-9%	+74%/-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 011669239-02 / KOI 0542.02

Detrend	Depth (ppm)	$R_p$ ( $R_{\oplus}$ )	$T_{max}$ (K)	$T_{obs}$ (K)	$A_{obs}$
DV	$-27 \pm 8$	$1.70^{+0.58}_{-0.55}$	$1094^{+77}_{-62}$	$3740^{+561}_{-410}$	$59^{+77}_{-31}$
Alt.	$-27 \pm 9$	$1.61^{+0.61}_{-0.51}$	$1090^{+82}_{-64}$	$3819^{+596}_{-419}$	$66^{+84}_{-34}$

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

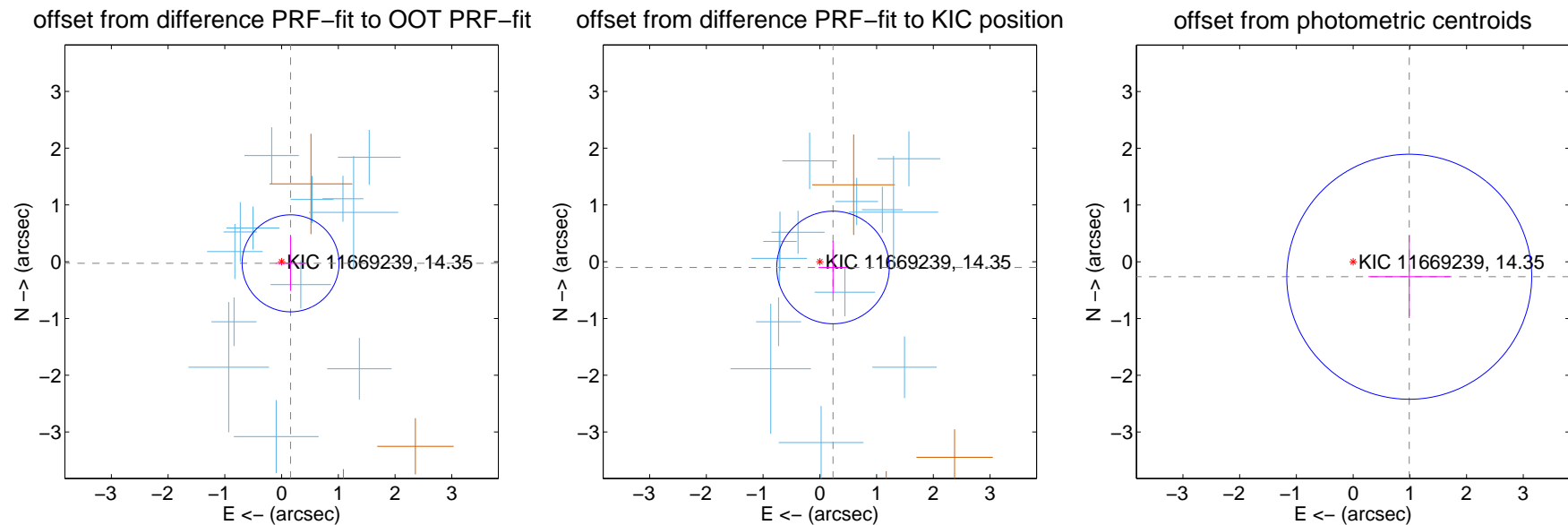
## DV Centroid Data

Supplemental centroid analysis for 011669239-02. Kepler magnitude: 14.35. Transit SNR 18.82

There are 13 quarters with good PRF difference image offsets

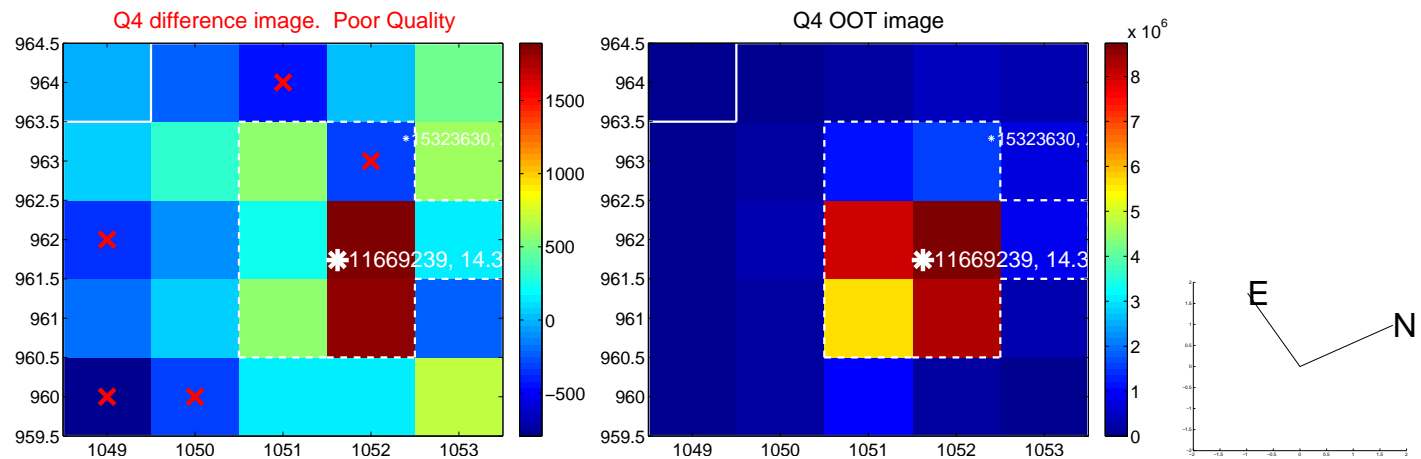
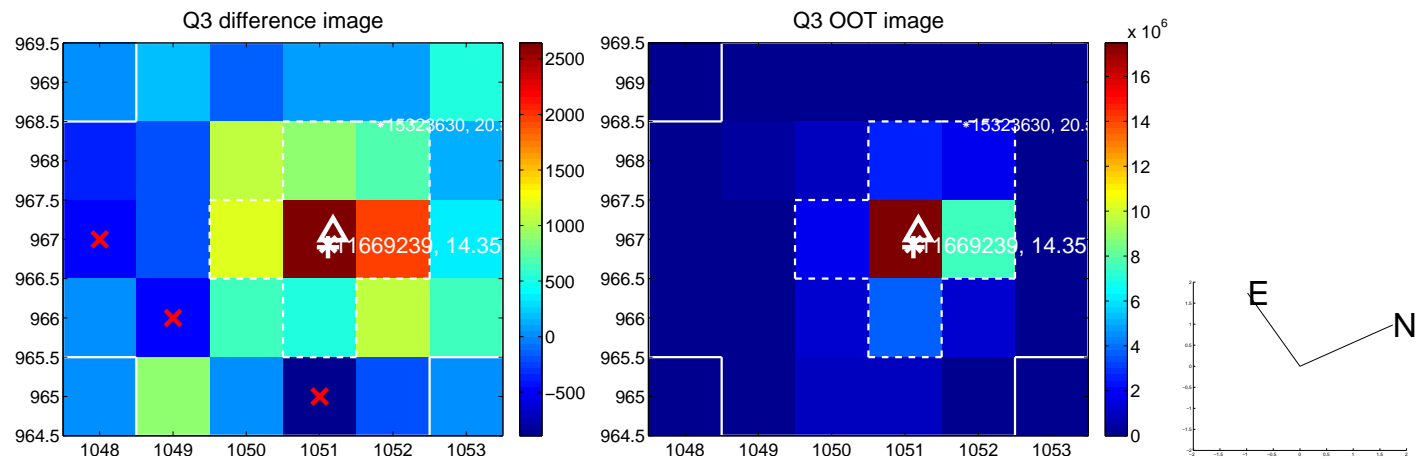
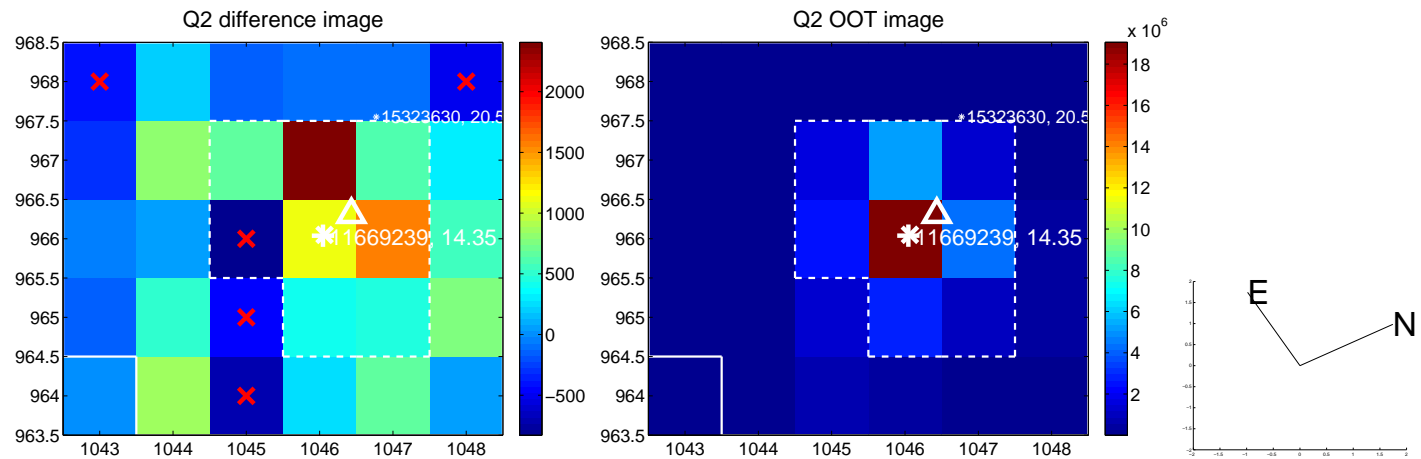
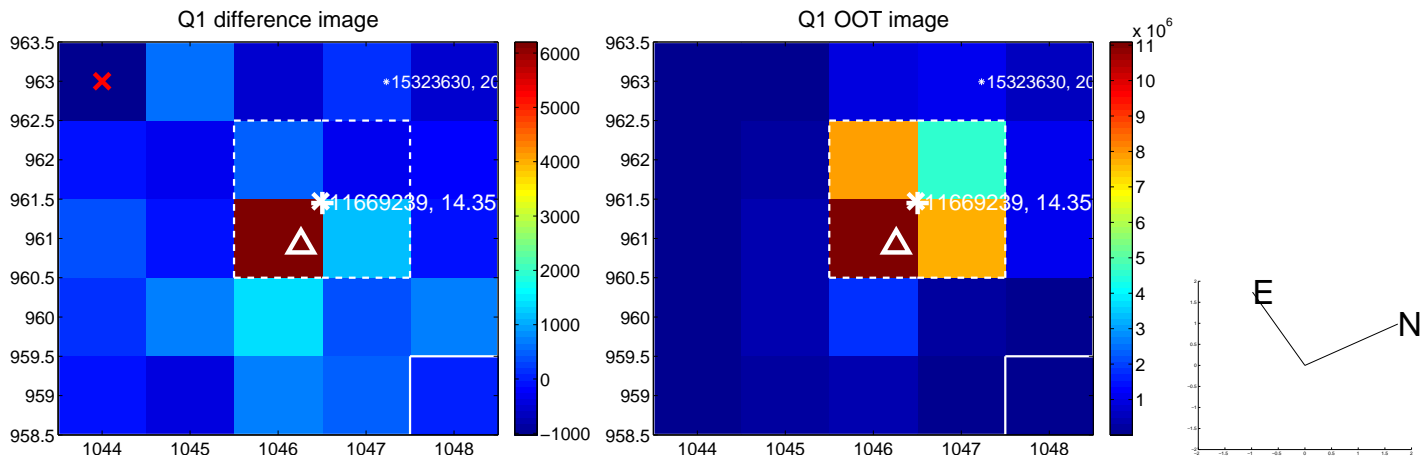
The direct PRF centroid is offset from the target star catalog position by about 0.09 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.161 \pm 0.285$	0.57	$-0.159 \pm 0.264$	$-0.029 \pm 0.486$
PRF-fit source offset from KIC position	$0.253 \pm 0.331$	0.77	$-0.232 \pm 0.254$	$-0.102 \pm 0.467$
photometric centroid source offset	$1.02 \pm 0.72$	1.42	$-0.99 \pm 0.72$	$-0.26 \pm 0.73$

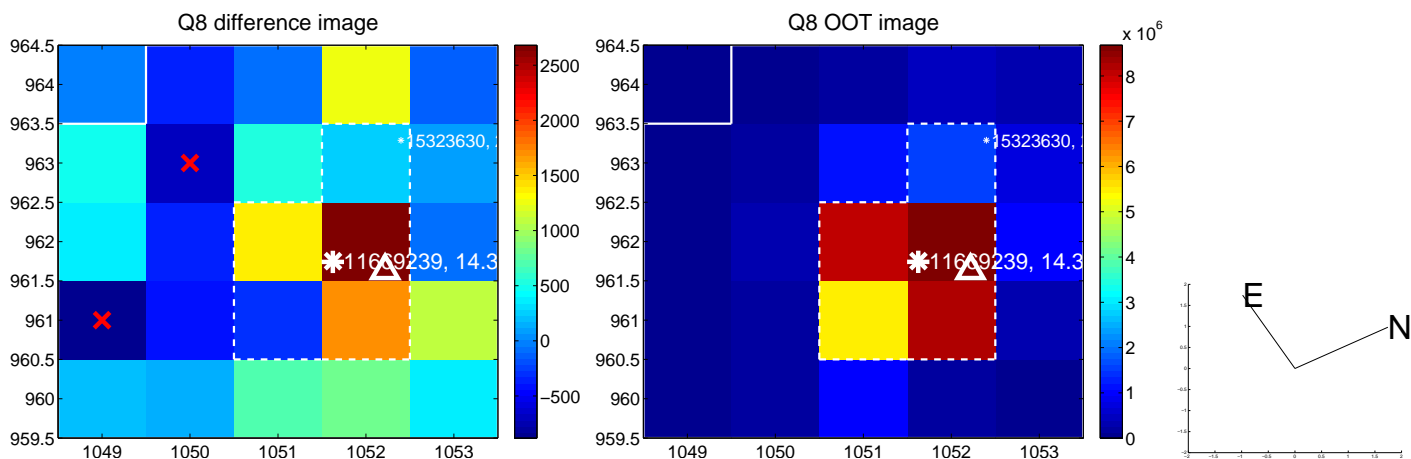
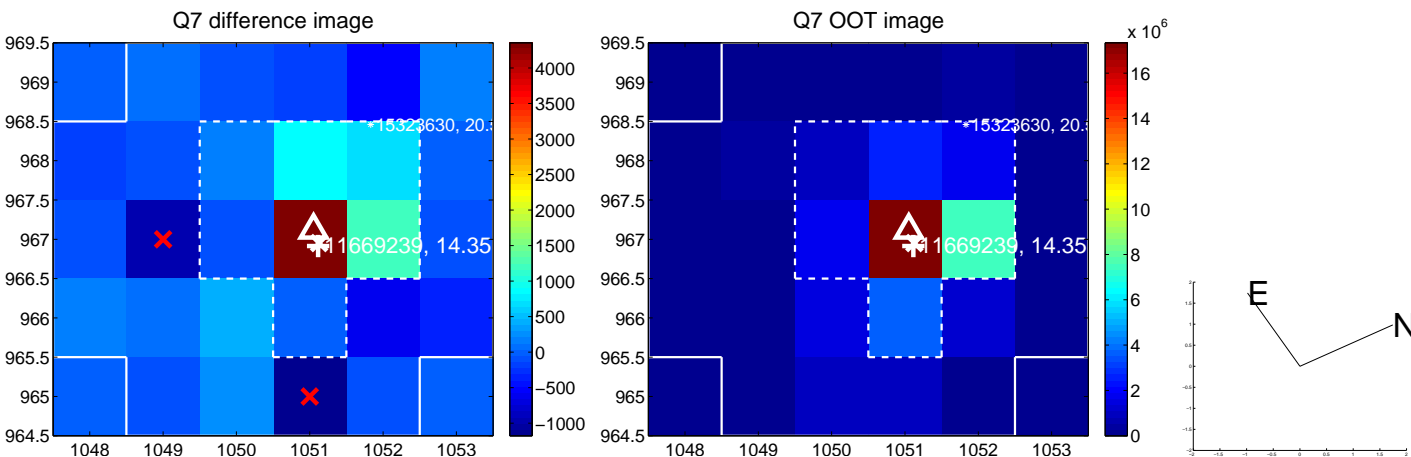
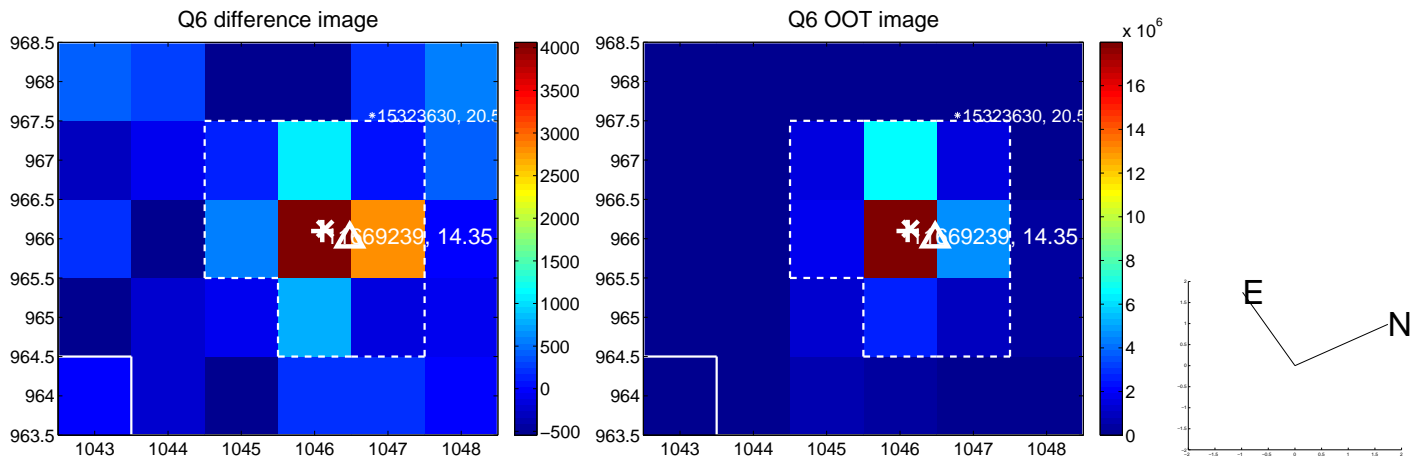
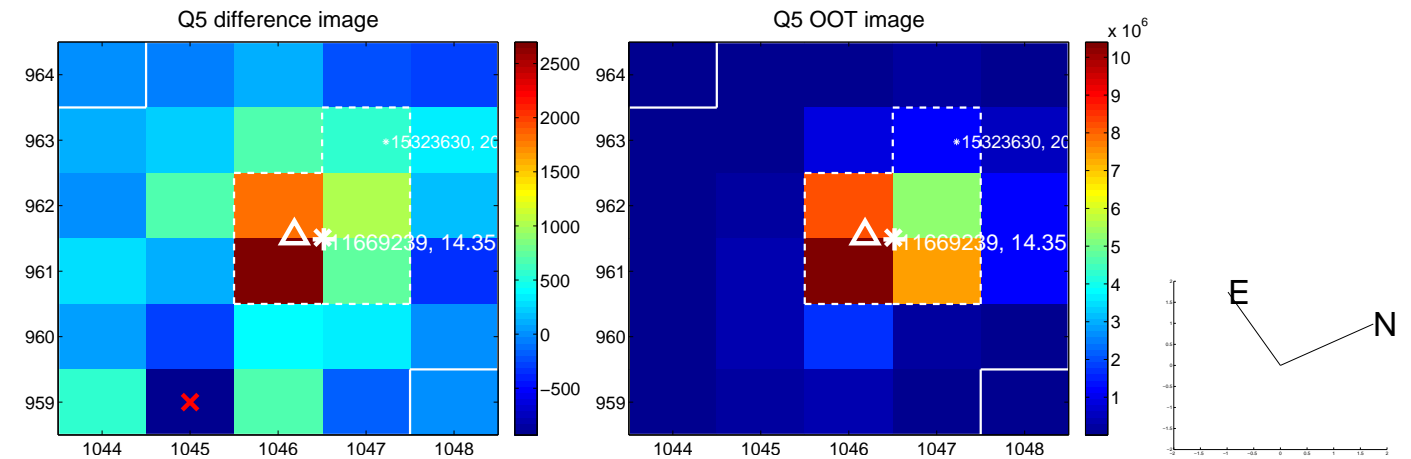


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets**; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three- $\sigma$ . Red \*: target star. Blue \*: Other stars. Text next to a star gives its KIC ID and kepmag. KIC IDs > 15,000,000 are from the UKIRT catalog.

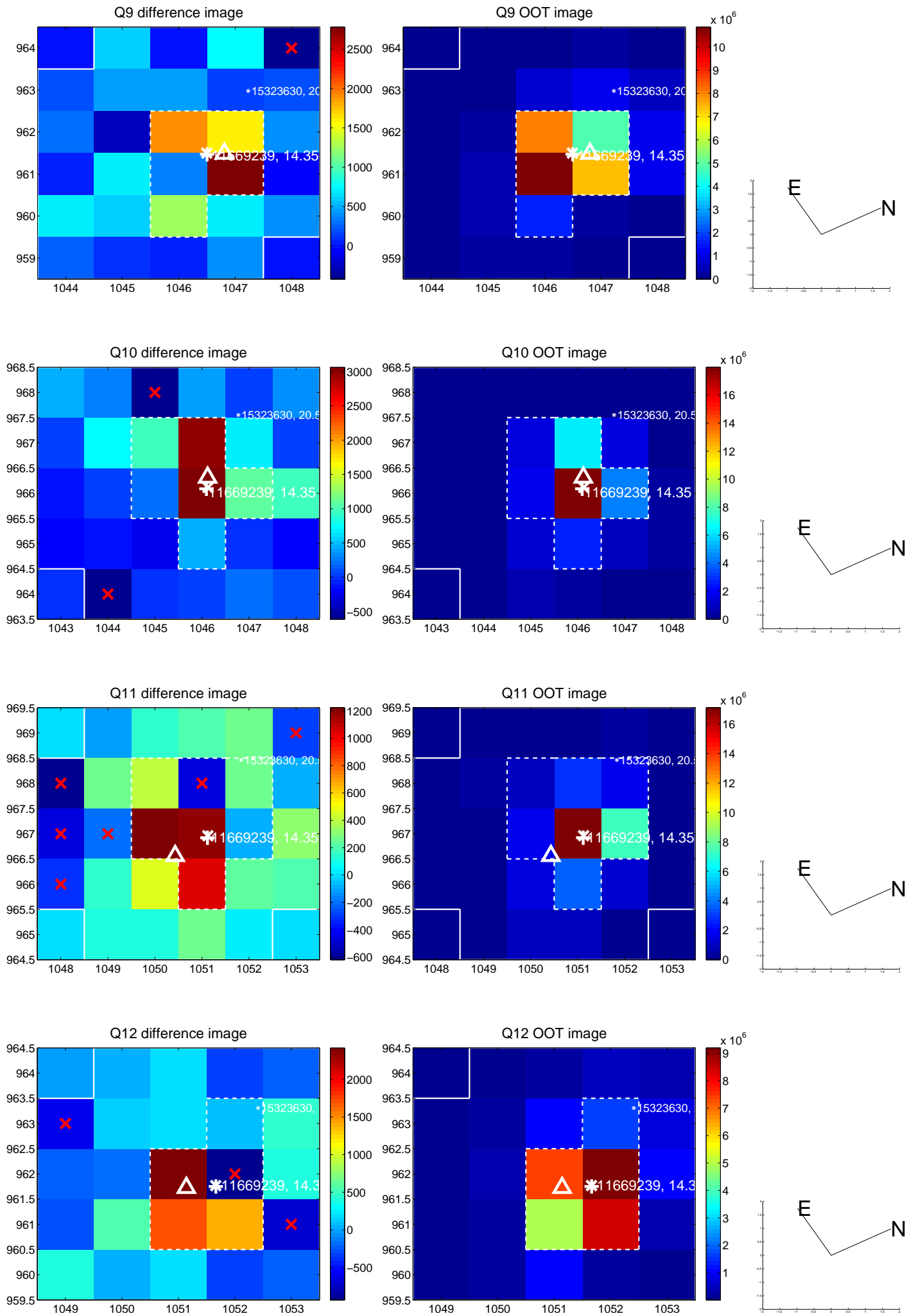
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



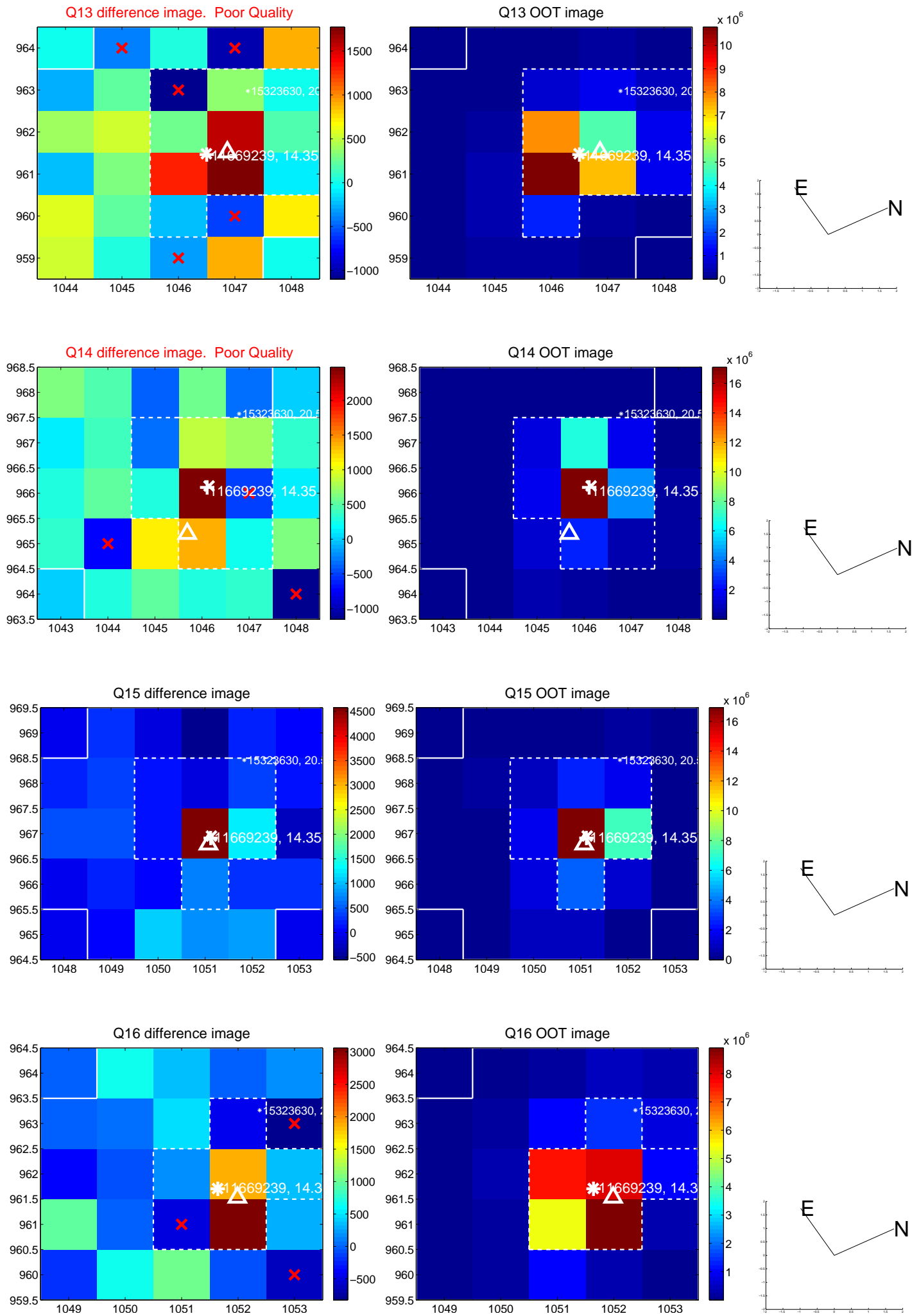
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

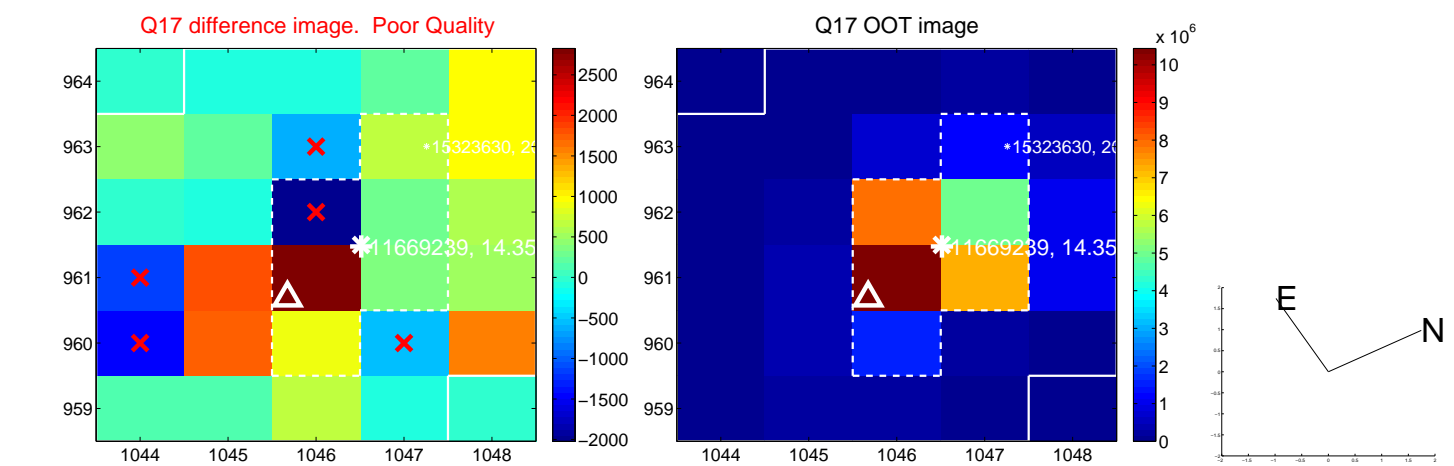


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

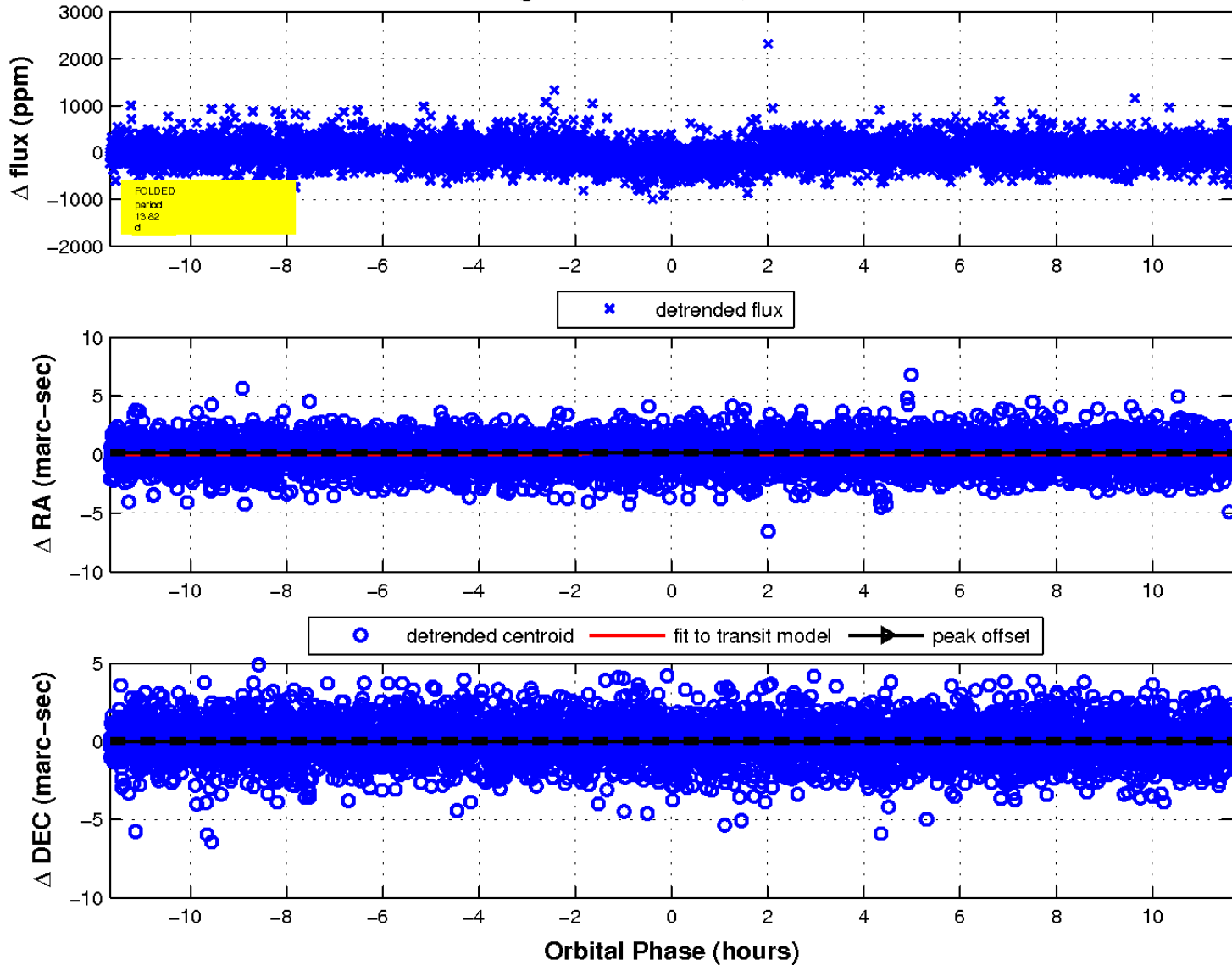




white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



fluxWeightedCentroids, Planet 2 of 2



UKIRT Image

Declination

