

# KIC 007269974

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
007269974-01	OBS	0456.01	13.699387	144.083099	1258.1	5.038	99.6	101.3	1.09	5541	4.68	83.75
007269974-02	OBS	0456.02	4.309374	134.035600	249.8	3.114	29.8	32.1	1.09	5541	2.05	391.48

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
007269974-01	OBS	PC	1.00	0	0	0	0	NO_COMMENT
007269974-02	OBS	PC	1.00	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.

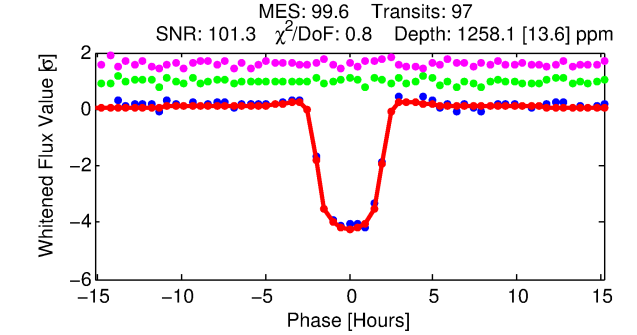
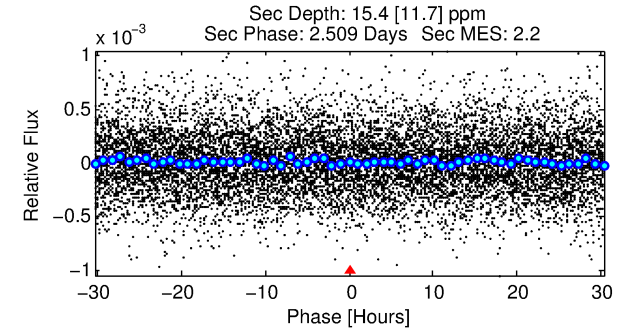
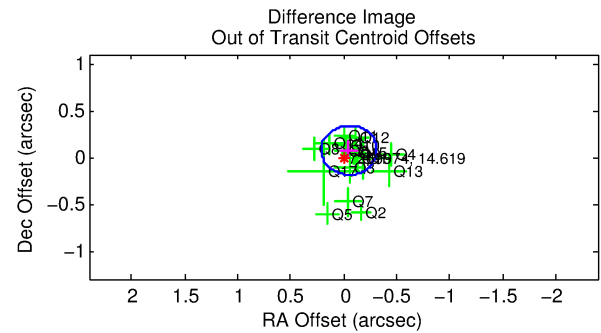
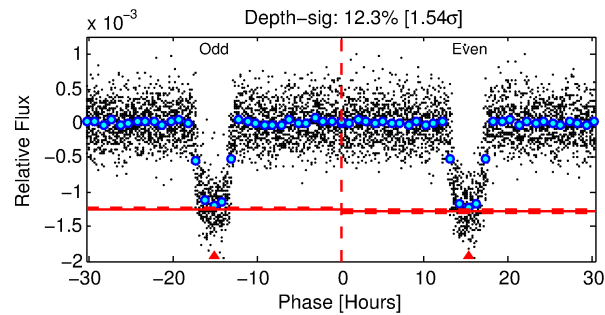
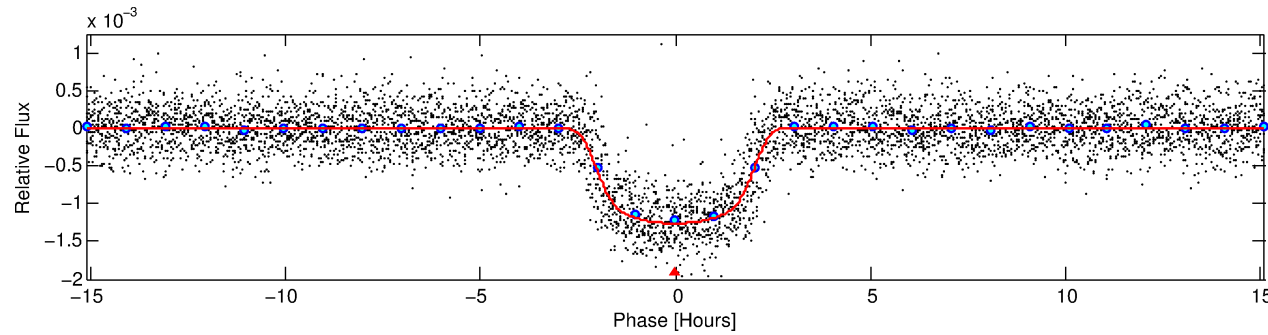
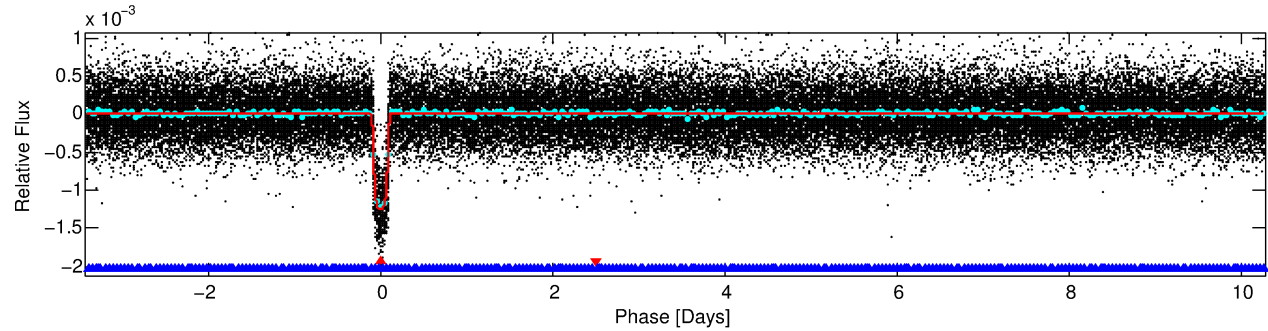
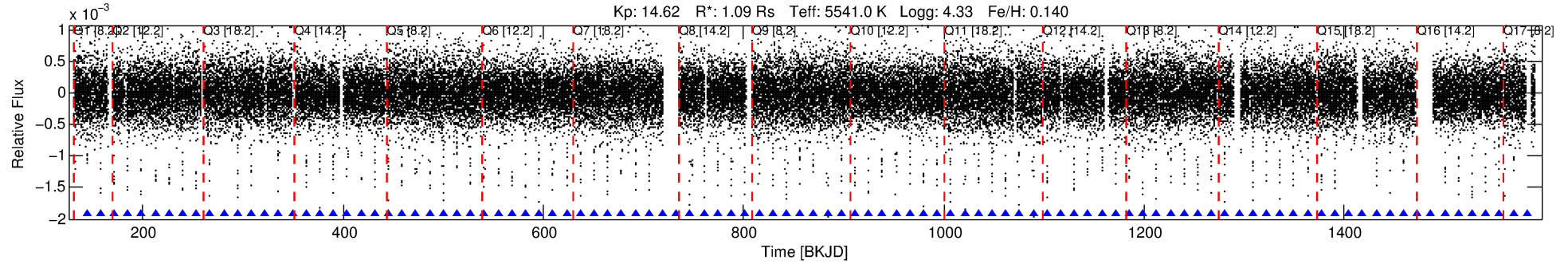
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 007269974-01

No Significant Match Found

# DV One-Page Summary

KIC: 7269974 Candidate: 1 of 2 Period: 13.699 d  
KOI: K00456.01 Name: Kepler-160c Corr: 0.928



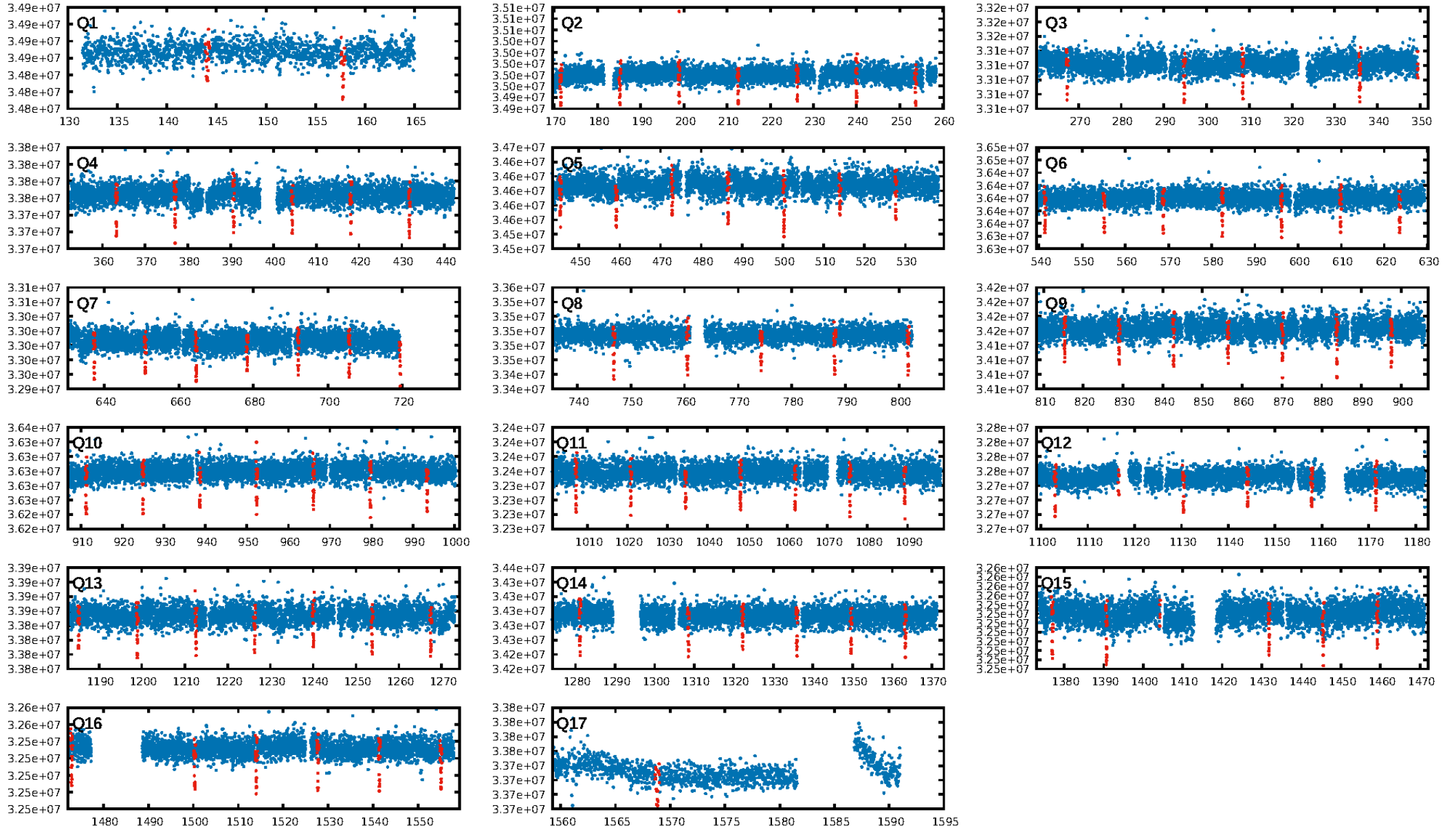
## DV Fit Results:

Period = 13.69939 [0.00002] d  
Epoch = 144.0831 [0.0011] BKJD  
Rp/R\* = 0.0394 [0.0005]  
a/R\* = 10.51 [0.47]  
b = 0.91 [0.01]  
Seff = 83.75 [19.96]  
Teq = 771 [46] K  
Rp = 4.69 [0.70] Re  
a = 0.1094 [0.0158] AU  
Ag = 4.62 [3.68] [0.98 $\sigma$ ]  
Teffp = 1748 [334] K [2.89 $\sigma$ ]

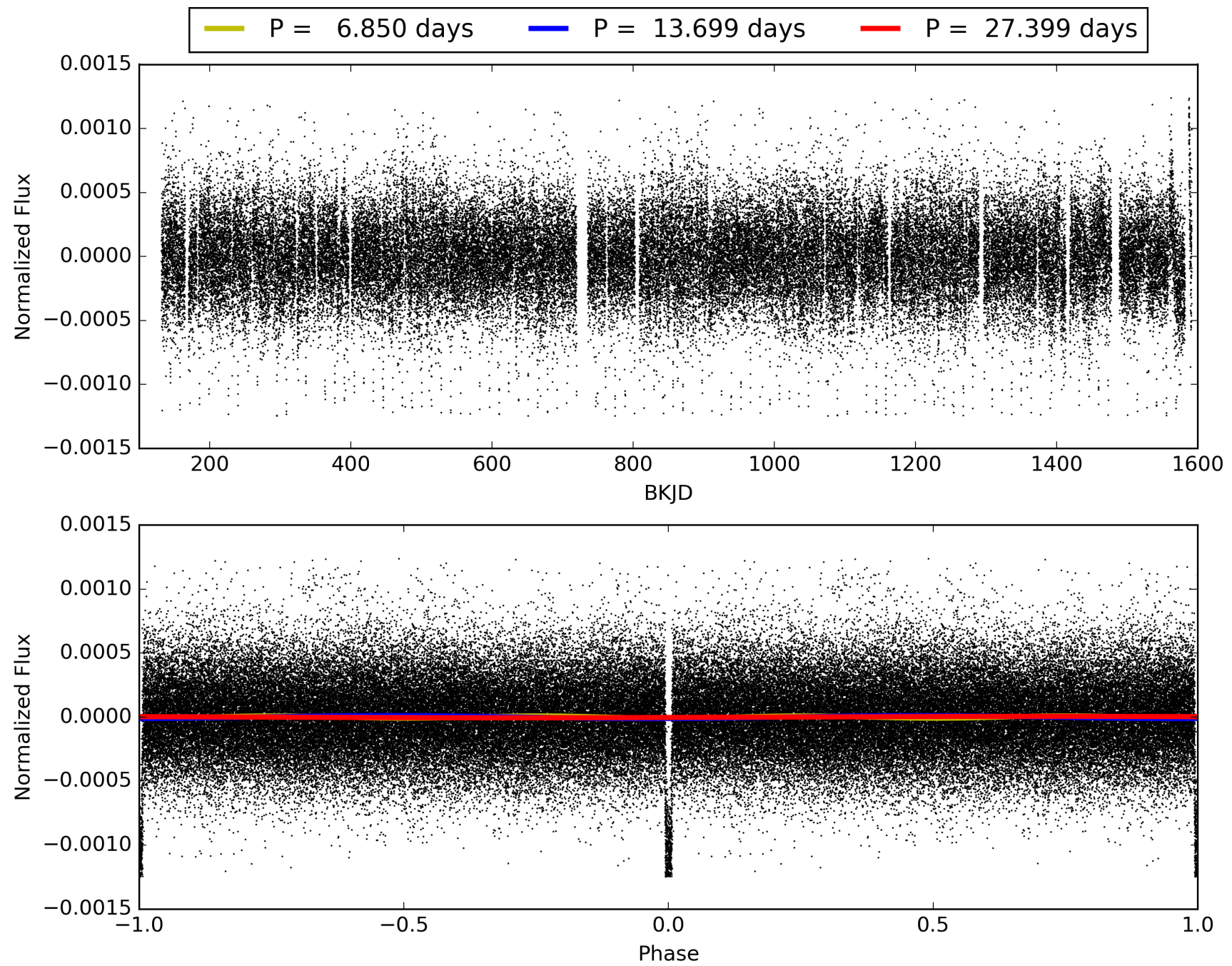
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [38.05 $\sigma$ ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: 83.8%  
ModelChiSquareGof-sig: 100.0%  
Bootstrap-pfa: 0.00e+00  
RollingBand-fgt: 1.00 [94/94]  
GhostDiagnostic-chr: 7.382  
Centroid-sig: 70.6%  
Centroid-so: 0.348 arcsec [2.81 $\sigma$ ]  
OotOffset-rm: 0.091 arcsec [1.04 $\sigma$ ]  
KicOffset-rm: 0.244 arcsec [2.65 $\sigma$ ]  
OotOffset-st: 4/4/4/5 [17]  
KicOffset-st: 4/4/4/5 [17]  
DiffImageQuality-fgm: 1.00 [17/17]  
DiffImageOverlap-fno: 0.94 [16/17]

# TCE 007269974-01, PDC Light Curves

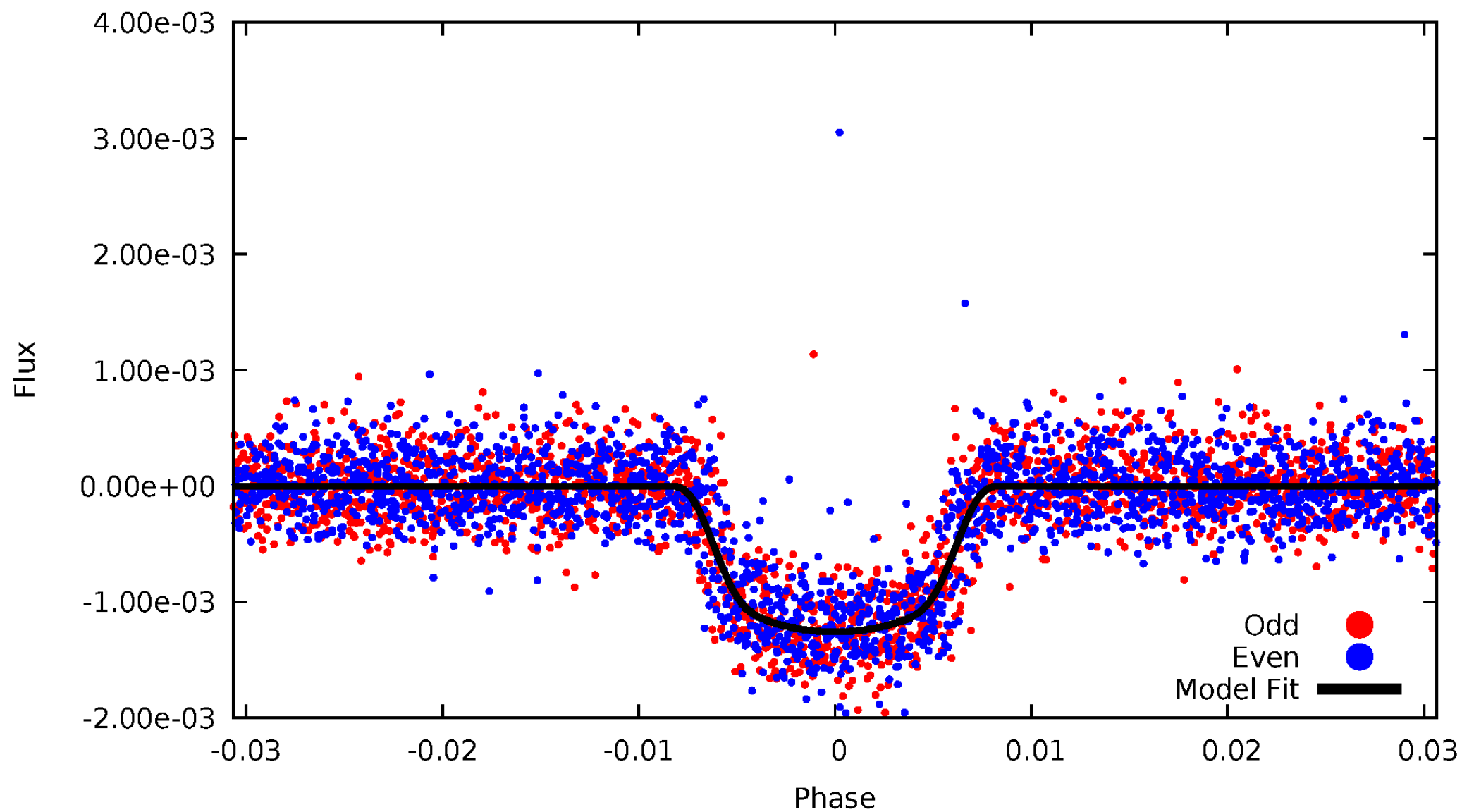


TCE 007269974-01



# DV Odd/Even

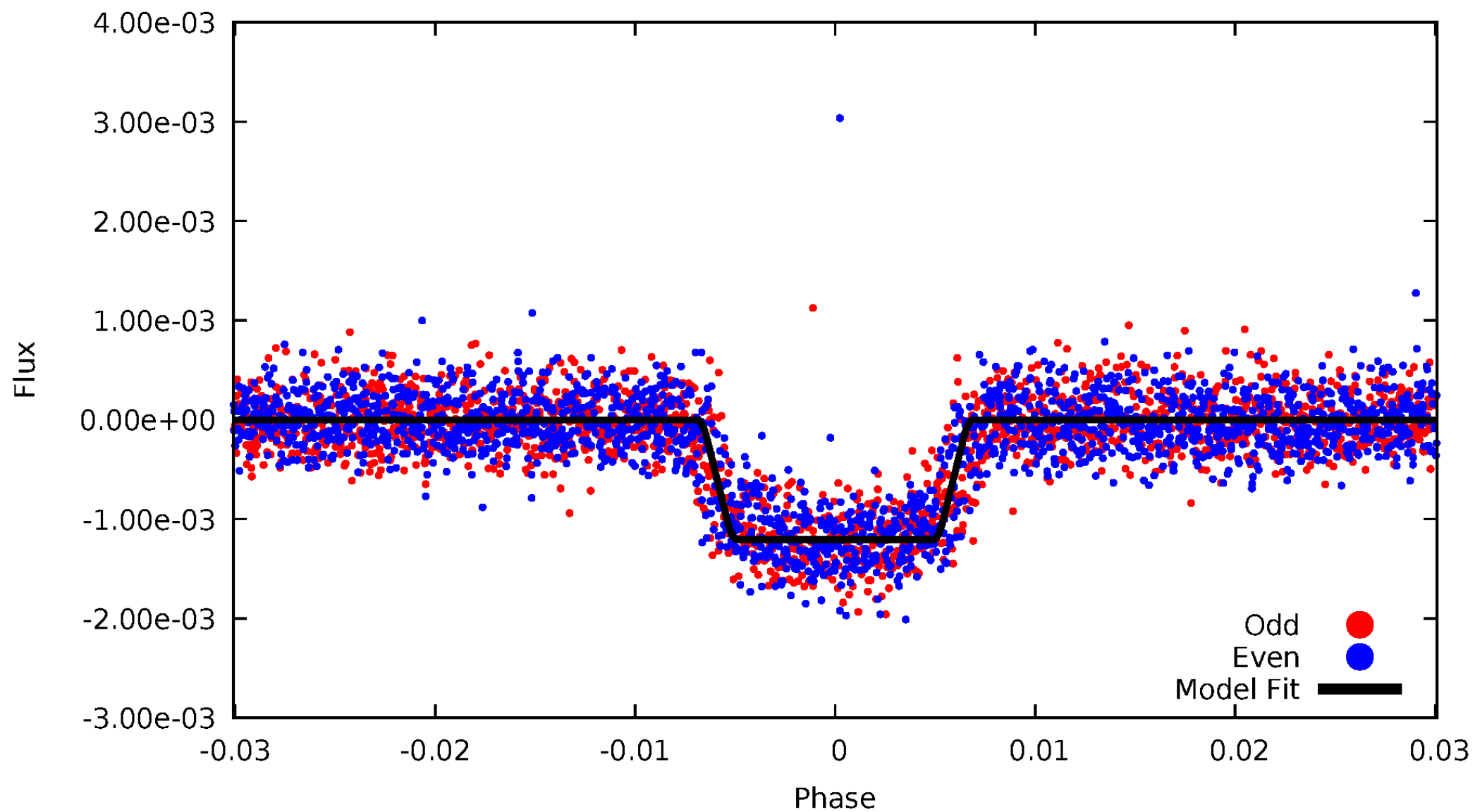
TCE 007269974-01





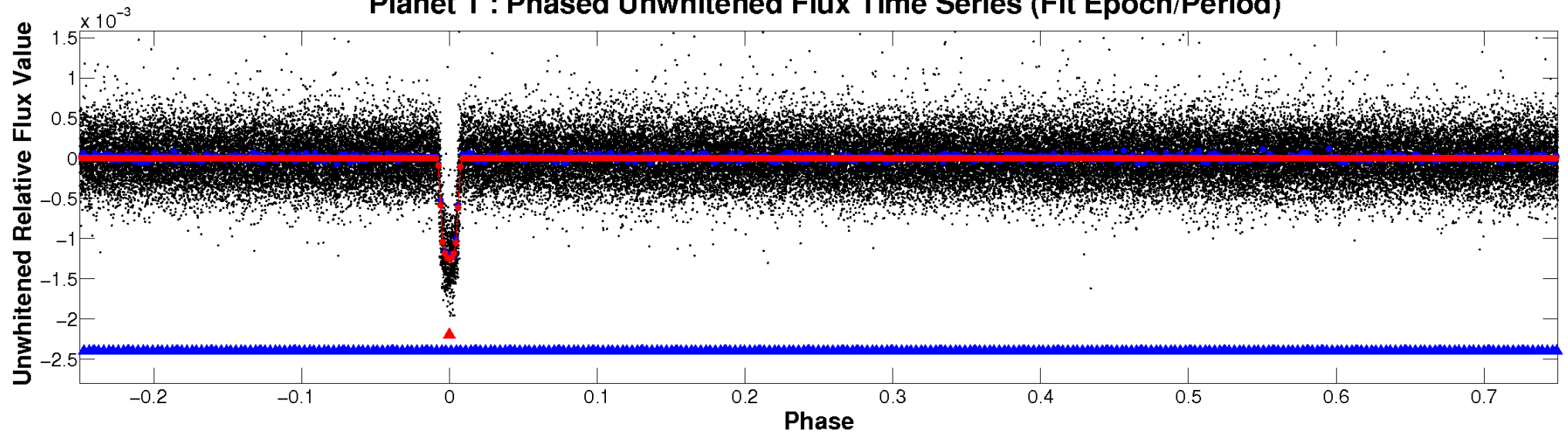
# ALT Odd/Even

TCE 007269974-01

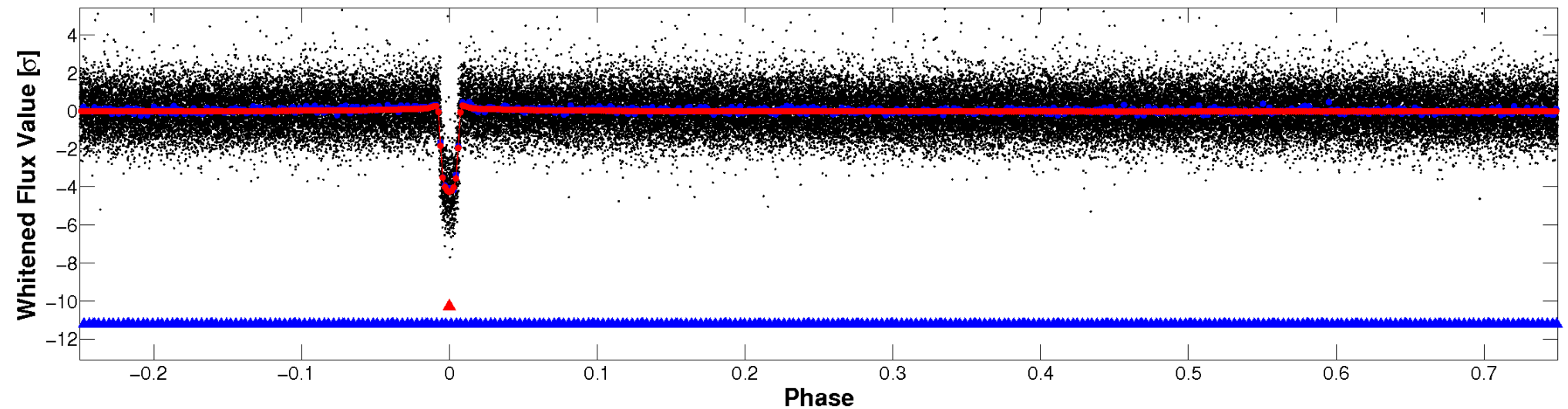


# Non-Whitened Vs. Whitened Light Curve

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

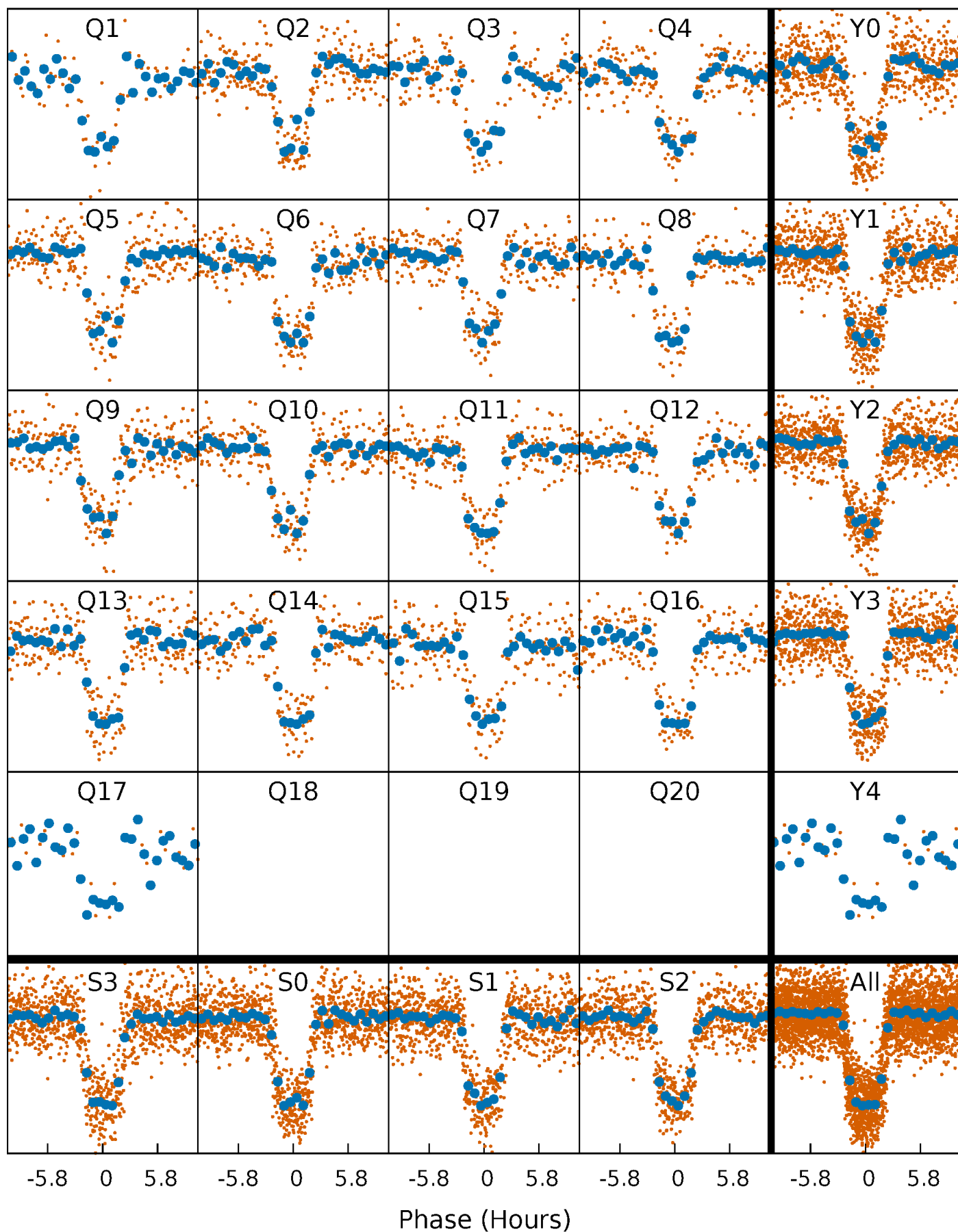


**Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)**



# PDC Quarter-Phased Transit Curves

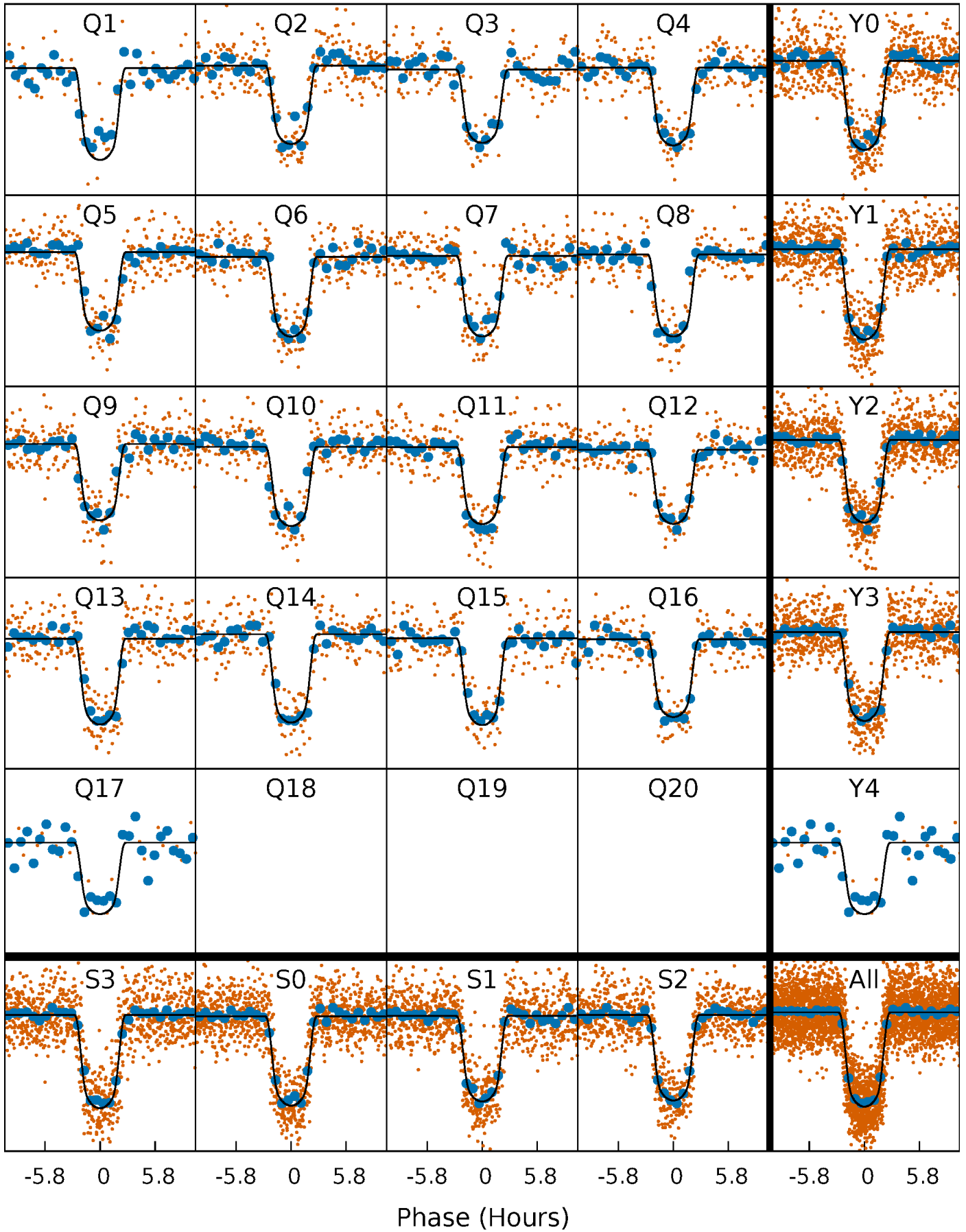
TCE 007269974-01 P= 13.699387 Days  $T_0=144.083099$  (BKJD)





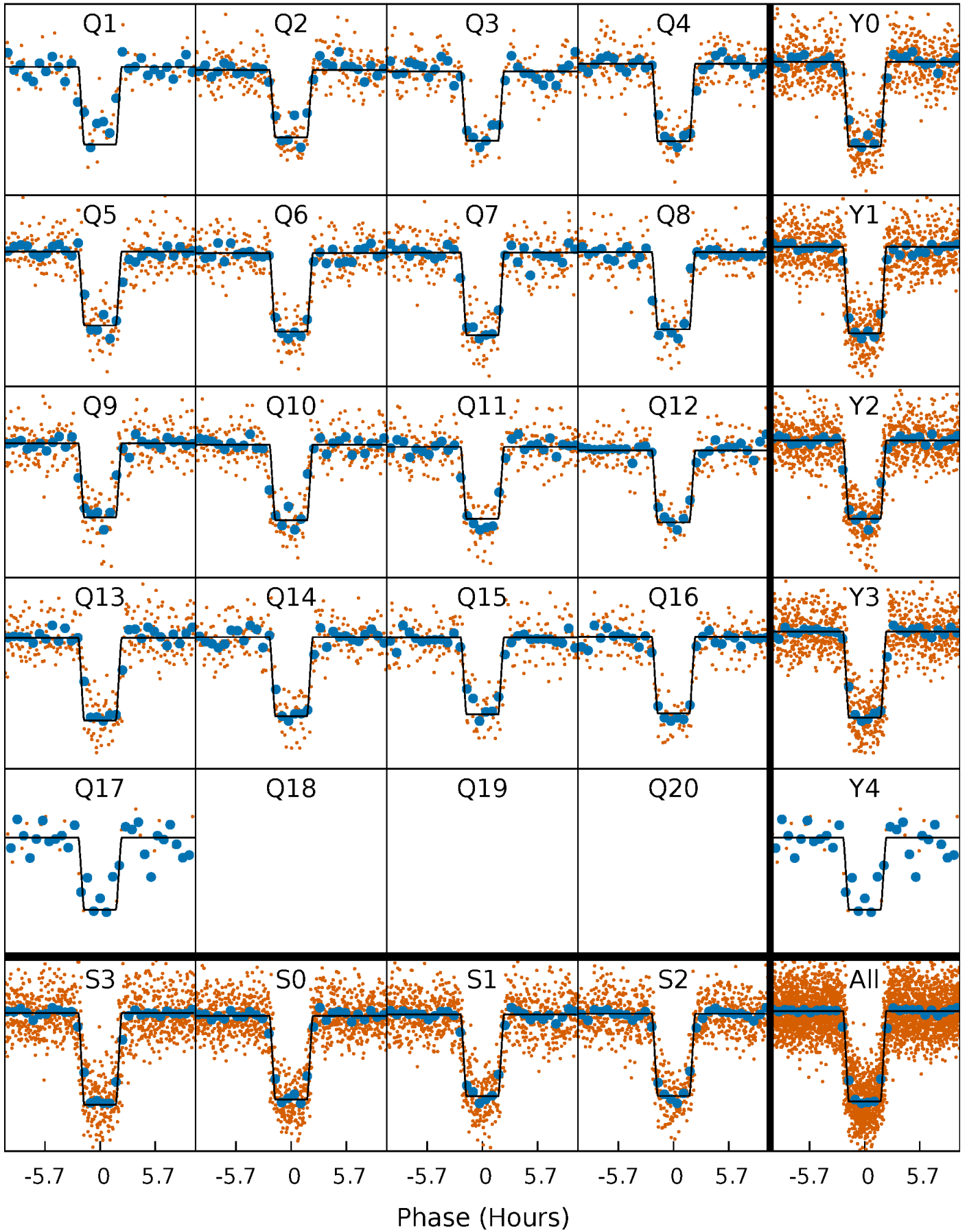
# DV Quarter-Phased Transit Curves

TCE 007269974-01 P= 13.699387 Days  $T_0=144.083099$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

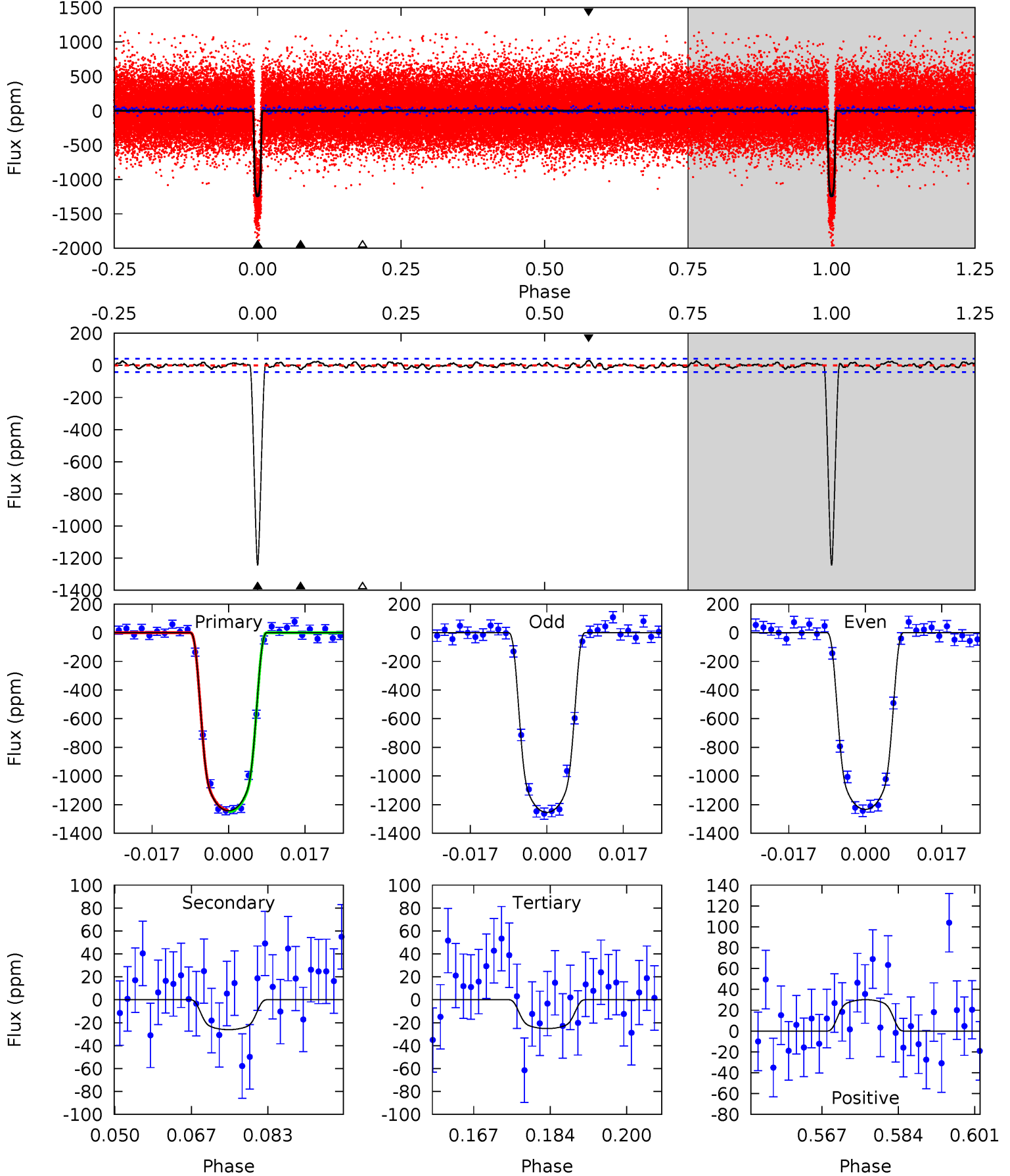
TCE 007269974-01 P= 13.699391 Days  $T_0=144.083068$  (BKJD)



# DV Model-Shift Uniqueness Test

007269974-01, P = 13.699387 Days, E = 130.383712 Days

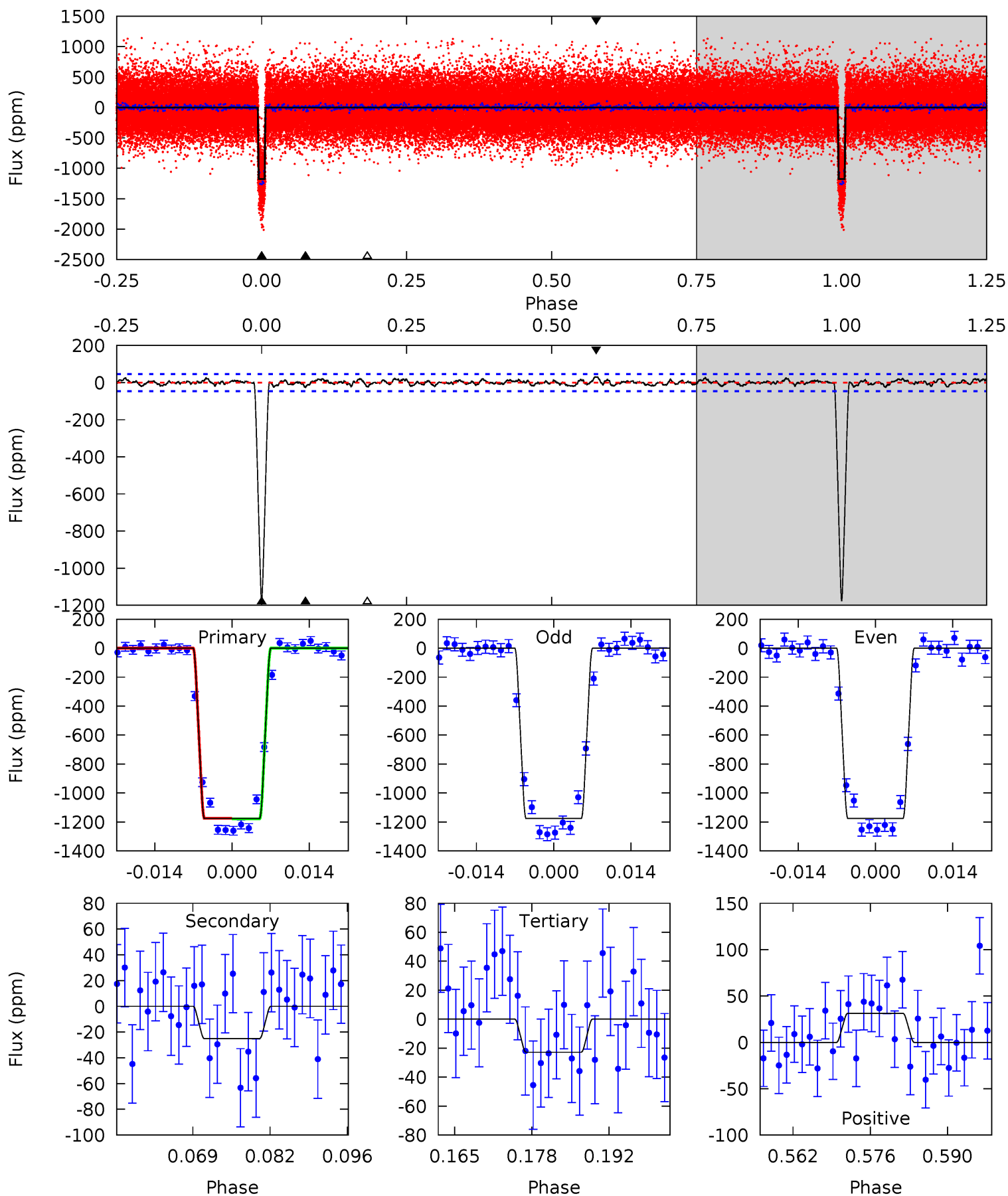
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
146.4	3.07	2.96	3.54	4.93	2.39	1.28	143.4	142.8	0.11	-0.47	1.23	0.98	0.02	0.61



# Alt Model-Shift Uniqueness Test

007269974-01,  $P = 13.699391$  Days,  $E = 130.383677$  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
126.4	2.70	2.45	3.37	4.97	2.46	1.04	124.0	123.1	0.25	-0.67	0.08	0.99	0.03	0.23



### Stellar Parameters For KIC 007269974

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$5541^{+74}_{-74}$	$4.332^{+0.137}_{-0.100}$	$0.140^{+0.150}_{-0.150}$	$1.089^{+0.161}_{-0.145}$	$0.929^{+0.067}_{-0.043}$	$1.013^{+0.616}_{-0.328}$
	+1%/-1%	+3%/-2%	+107%/-107%	+15%/-13%	+7%/-5%	+61%/-32%
Source	SPE90	SPE90	SPE90	DSEP		

KIC = Kepler Input Catalog; PHO = Photometry; SPE = Spectroscopy; AST = Asteroseismology  
 TRA = Transits; DESP = Dartmouth Models; MULT = Multiple Models

### Secondary Eclipse Parameters for KIC 007269974-01 / KOI 0456.01

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-26 \pm 8$	$4.66^{+0.40}_{-0.40}$	$1073^{+46}_{-47}$	$2735^{+121}_{-143}$	$7.908^{+3.146}_{-2.685}$
Alt.	$-25 \pm 9$	$4.11^{+0.33}_{-0.36}$	$1072^{+44}_{-47}$	$2823^{+134}_{-189}$	$9.856^{+4.603}_{-4.041}$

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



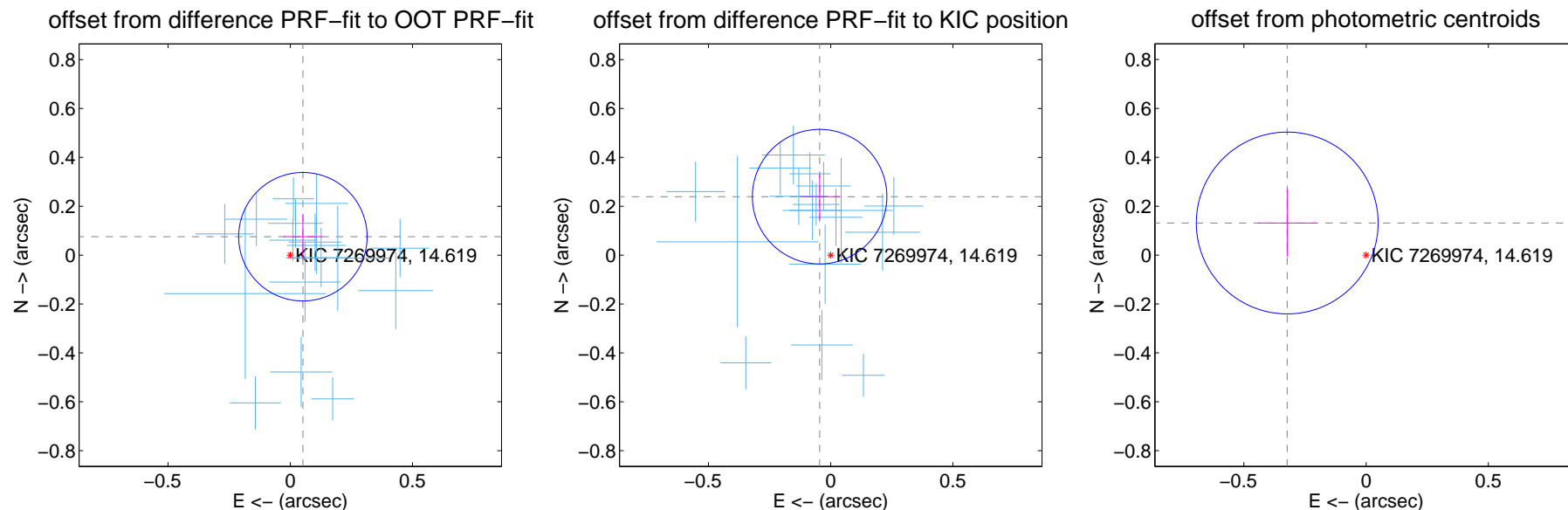
## DV Centroid Data

Supplemental centroid analysis for 007269974-01. Kepler magnitude: 14.62. Transit SNR 101.35

There are 17 quarters with good PRF difference image offsets

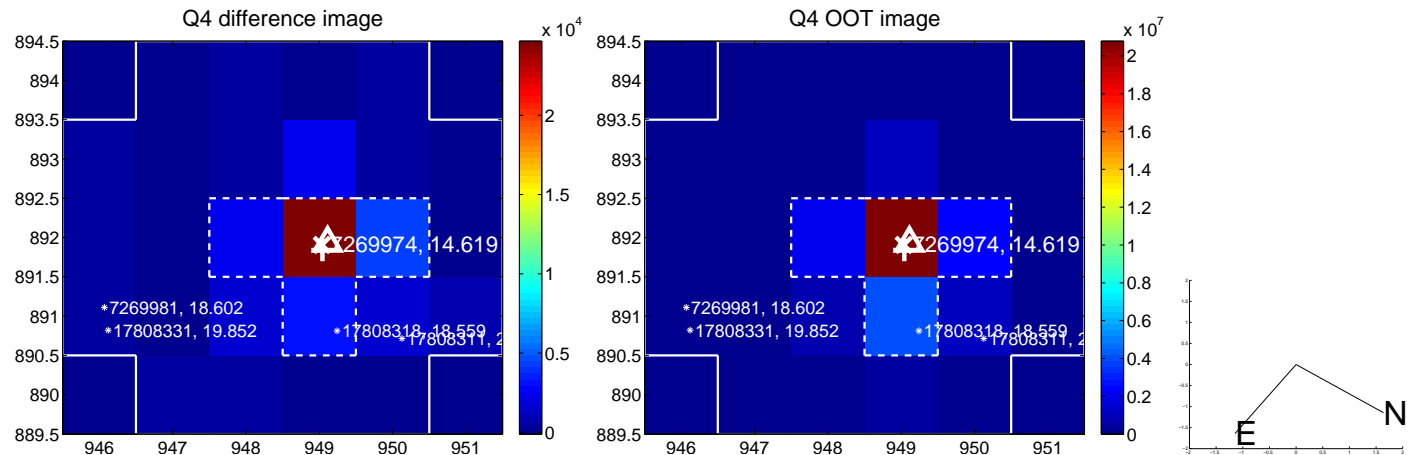
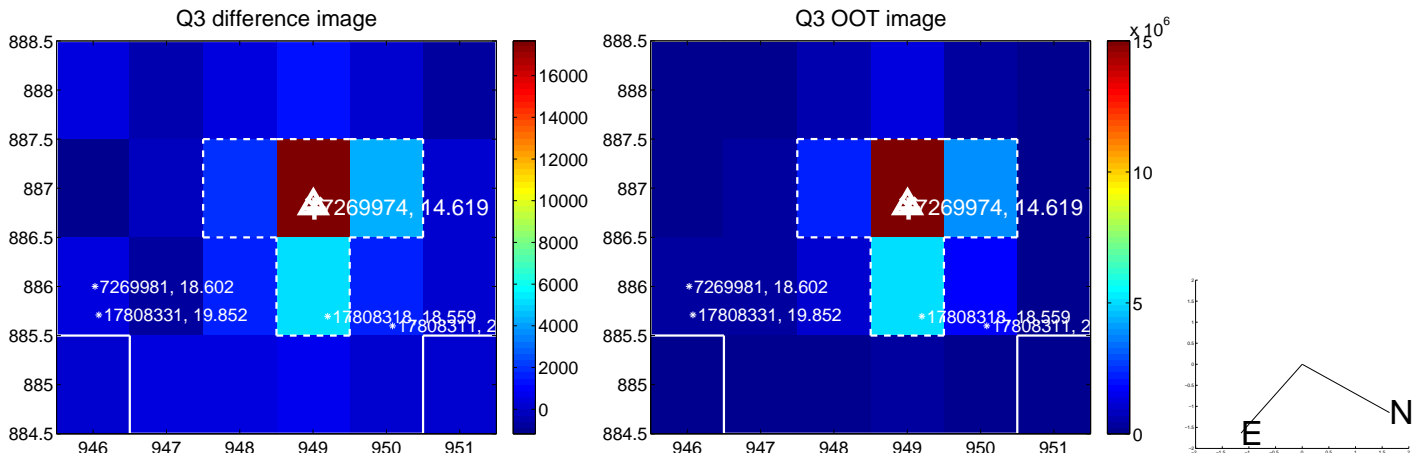
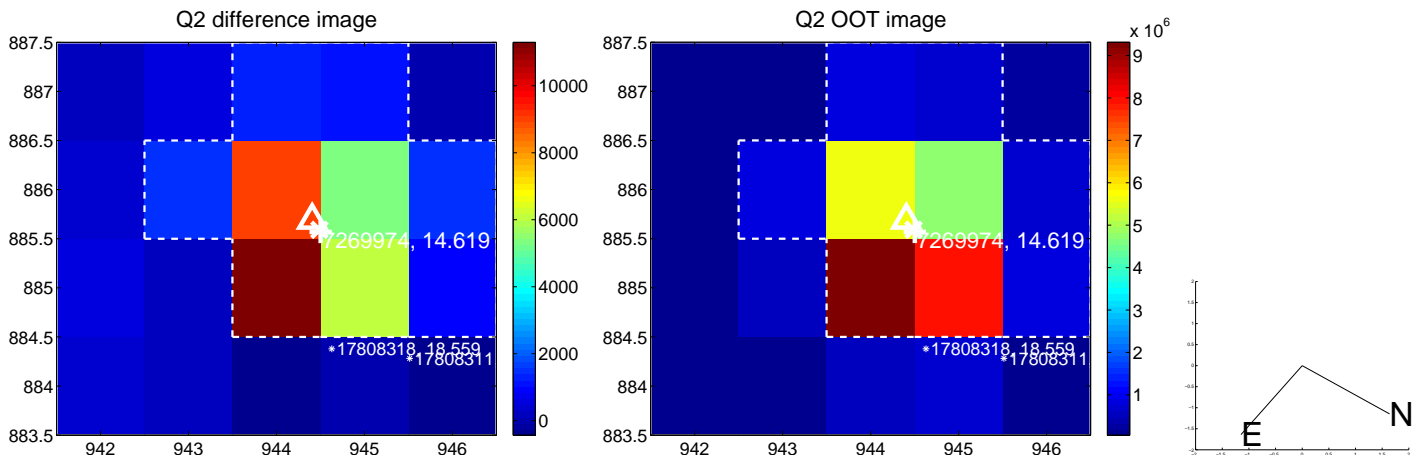
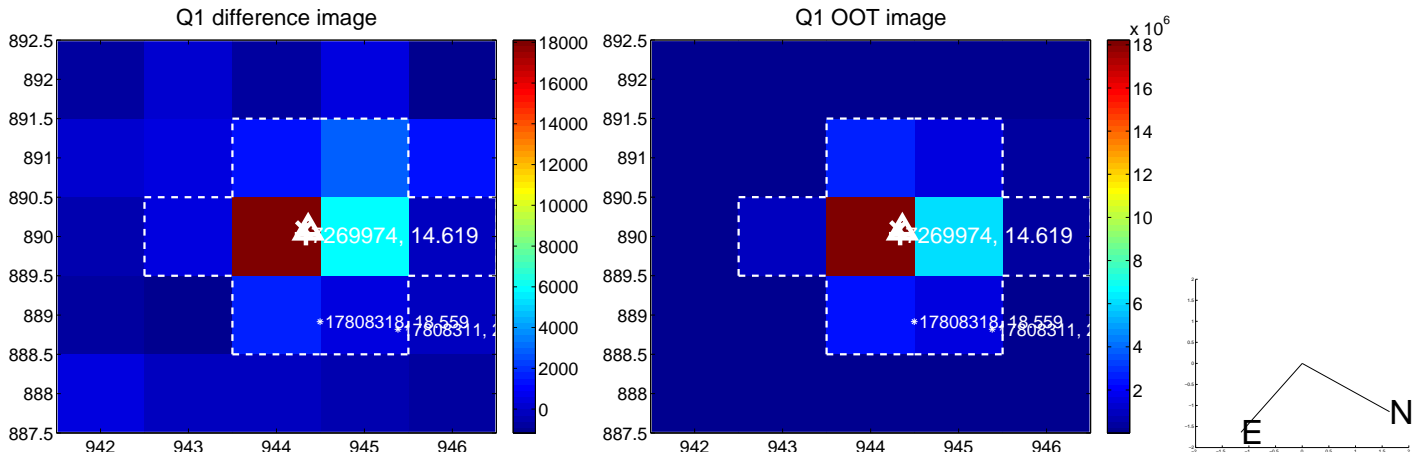
The direct PRF centroid is offset from the target star catalog position by about 0.29 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.091 \pm 0.088$	1.04	$-0.052 \pm 0.080$	$0.075 \pm 0.092$
PRF-fit source offset from KIC position	$0.244 \pm 0.092$	2.65	$0.045 \pm 0.082$	$0.239 \pm 0.092$
photometric centroid source offset	$0.35 \pm 0.12$	2.81	$0.32 \pm 0.12$	$0.13 \pm 0.14$

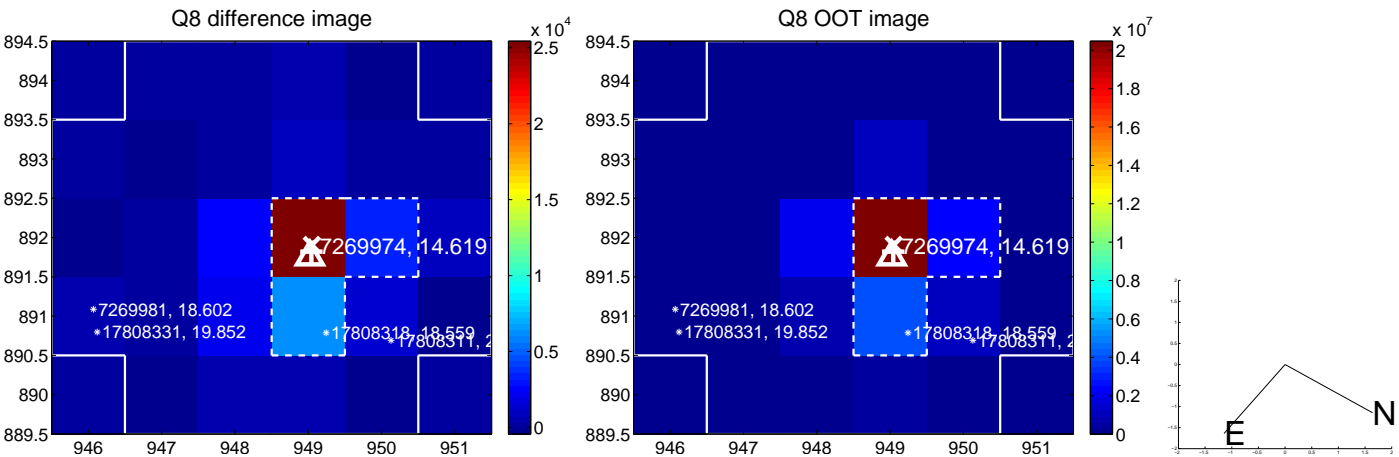
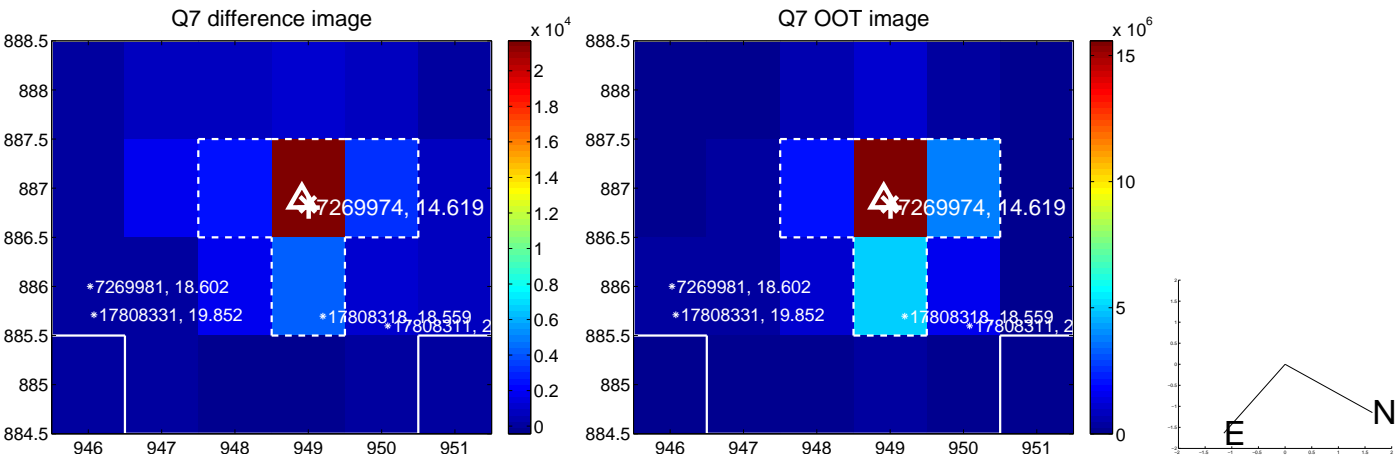
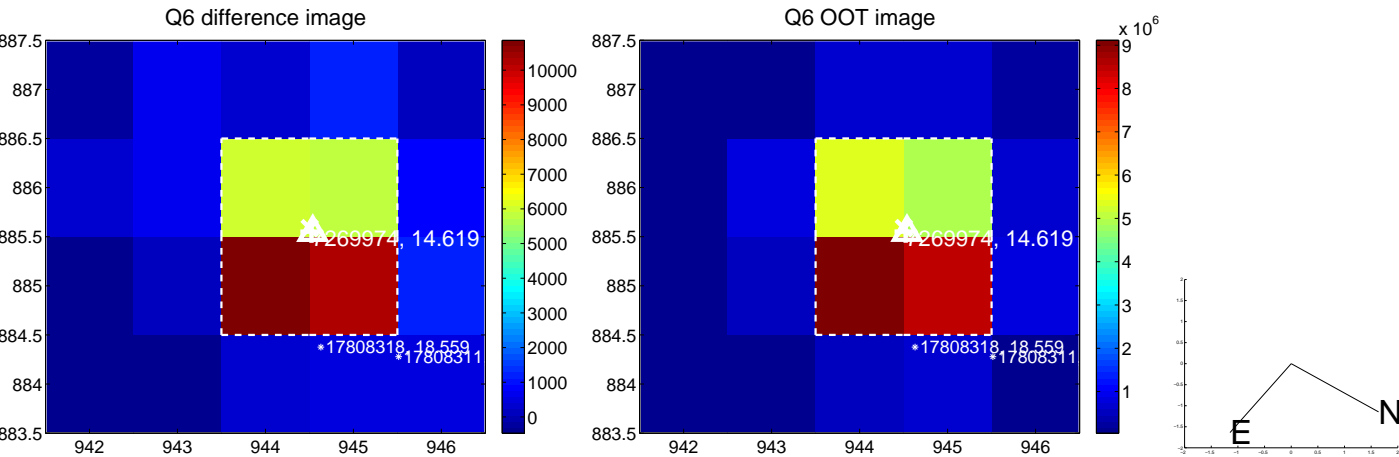
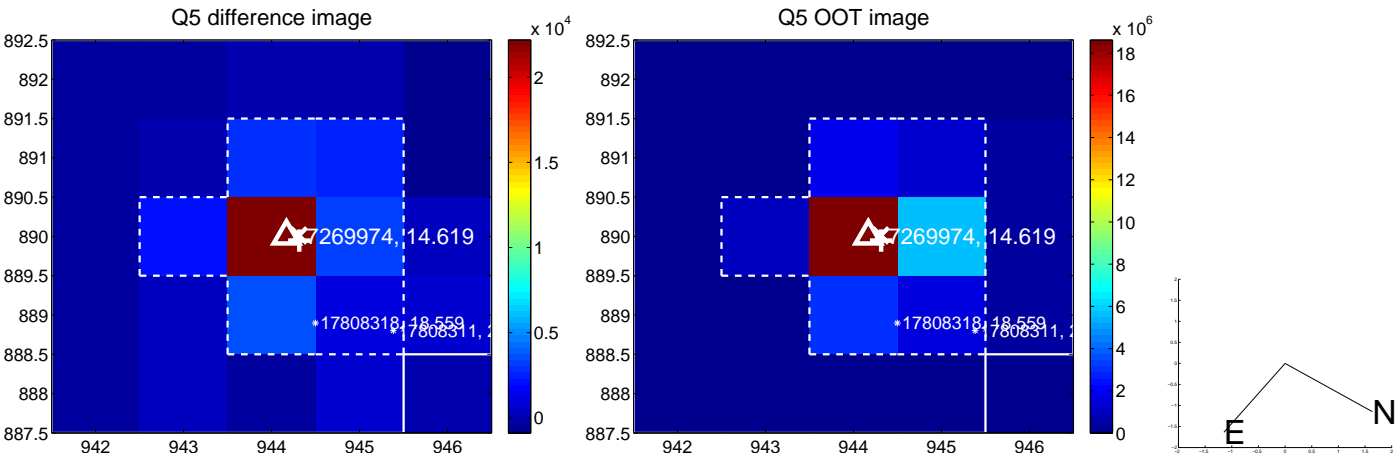


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses:** good quarterly centroid offsets; **Vermillion crosses:** bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

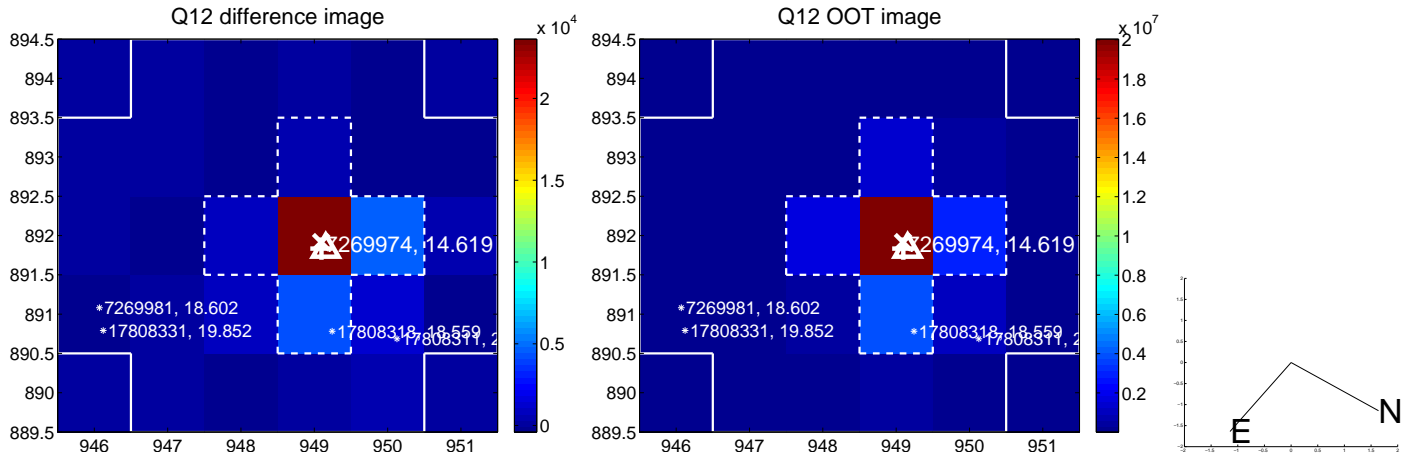
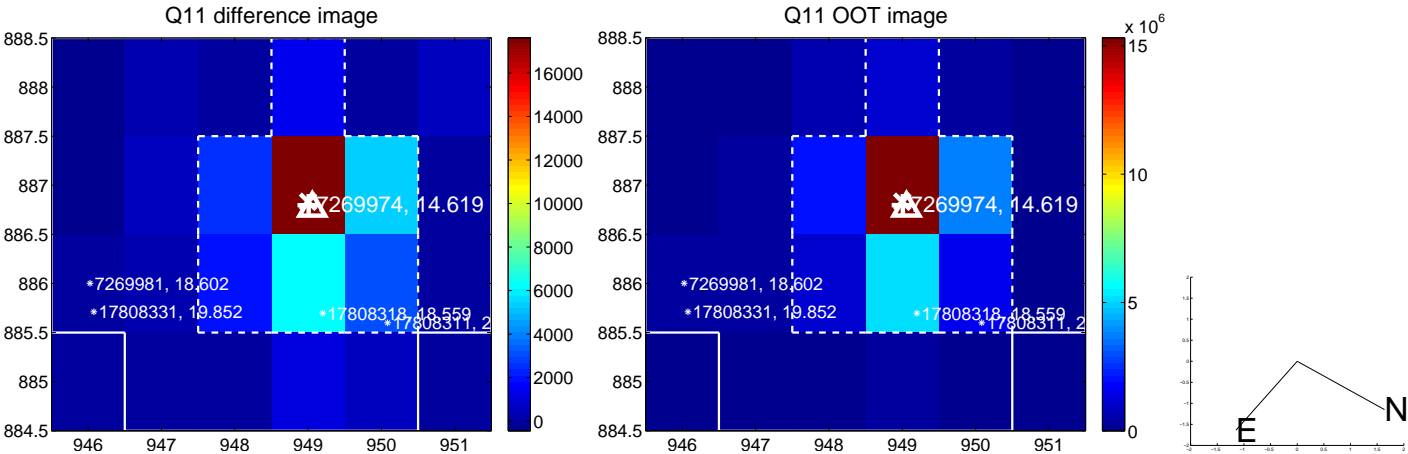
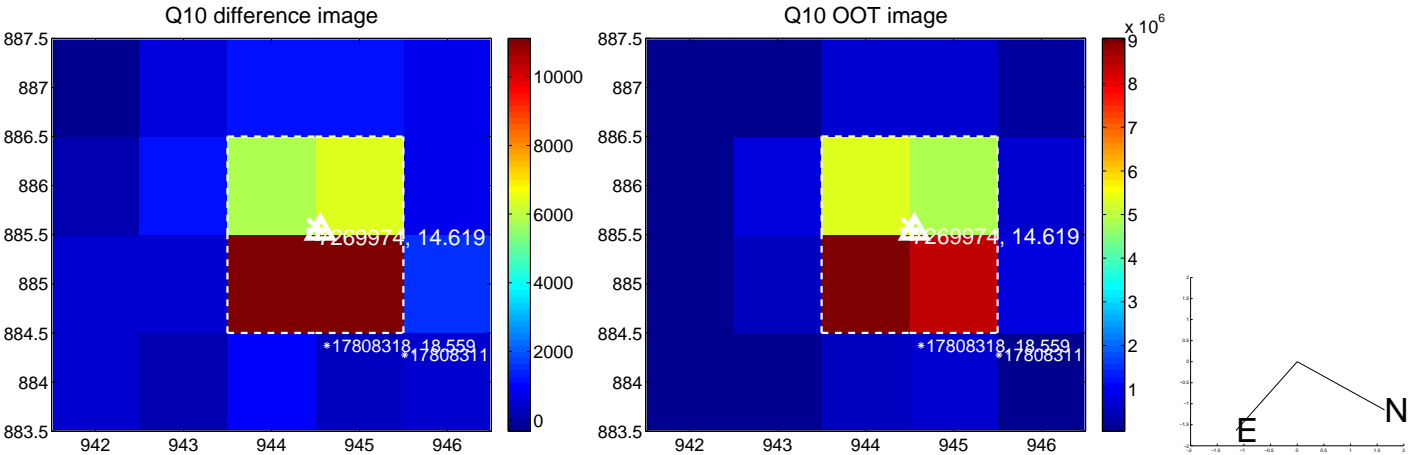
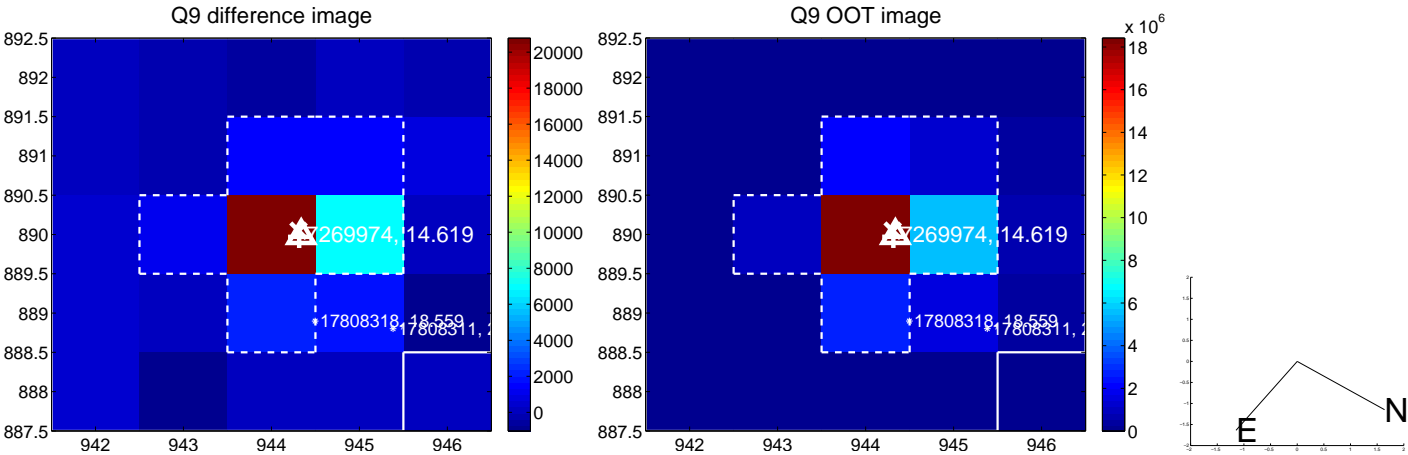
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



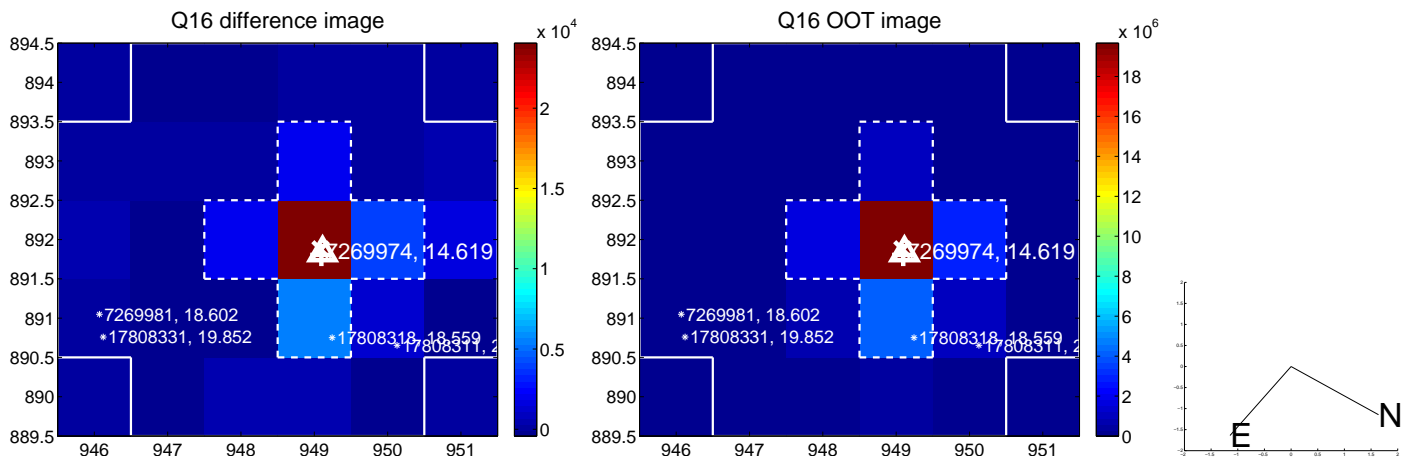
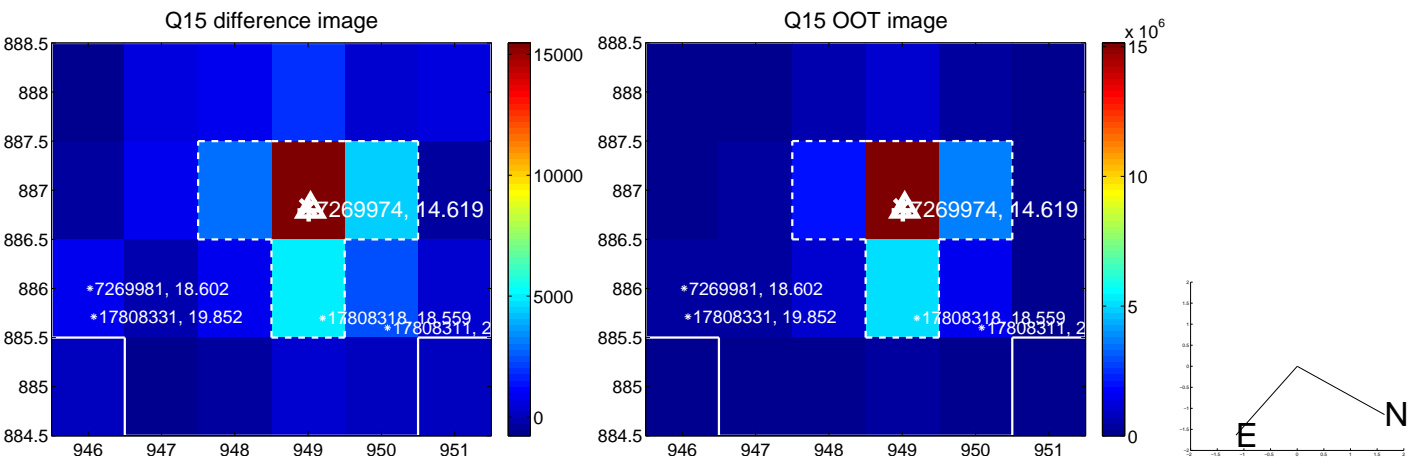
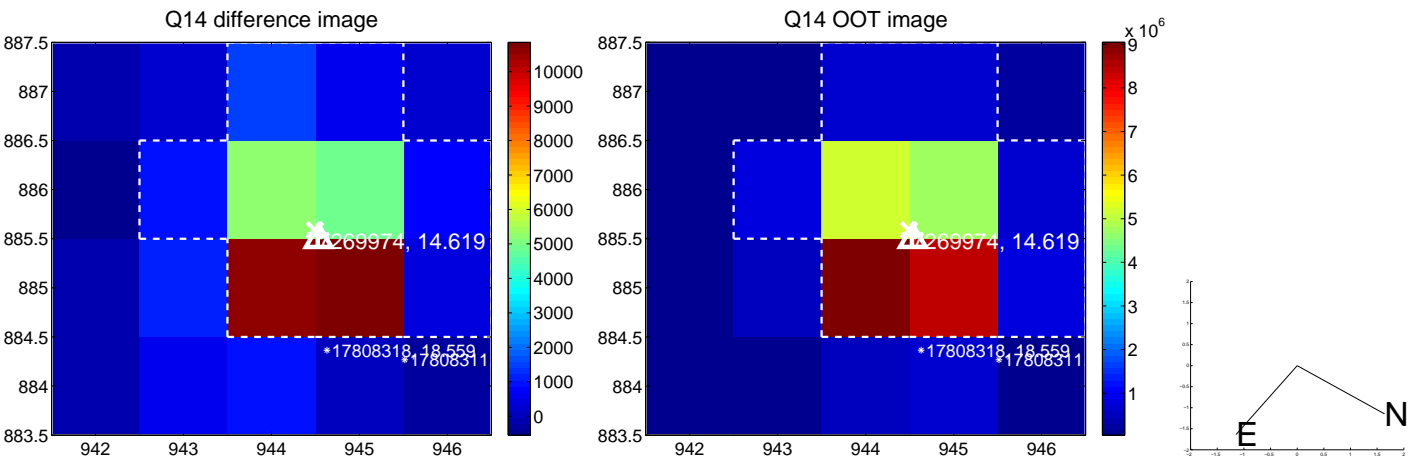
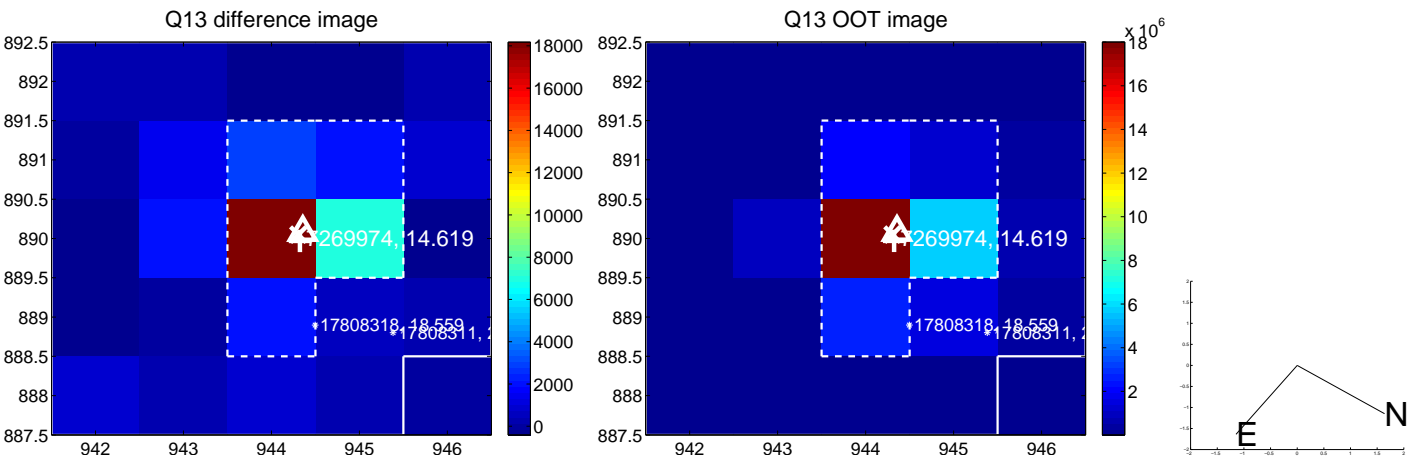
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

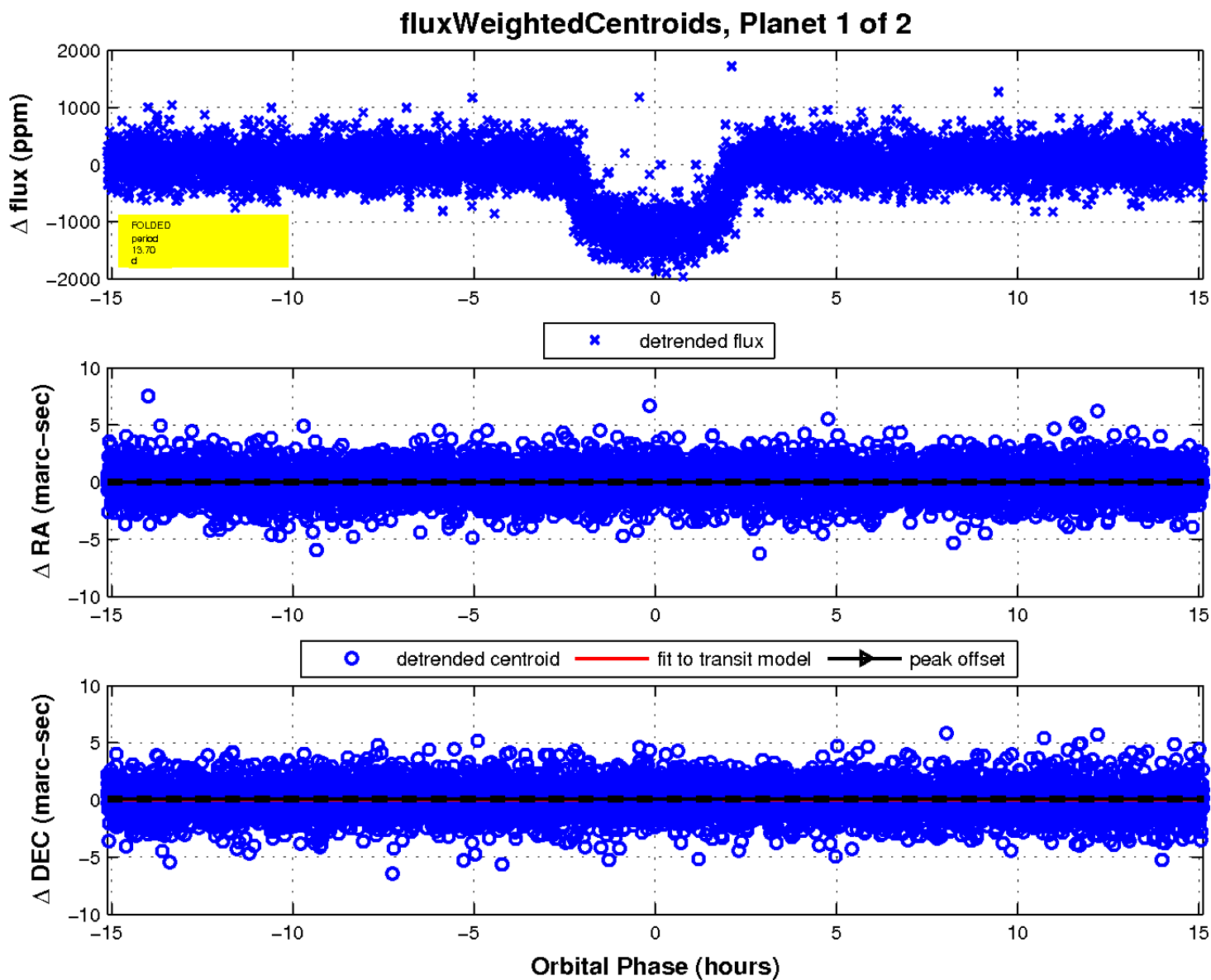
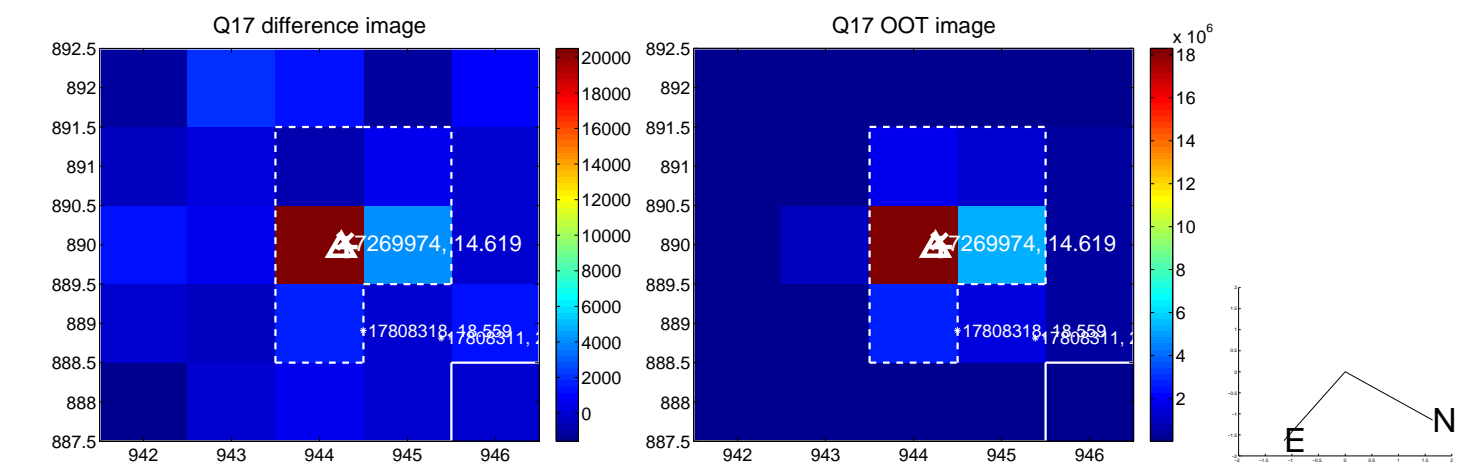


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



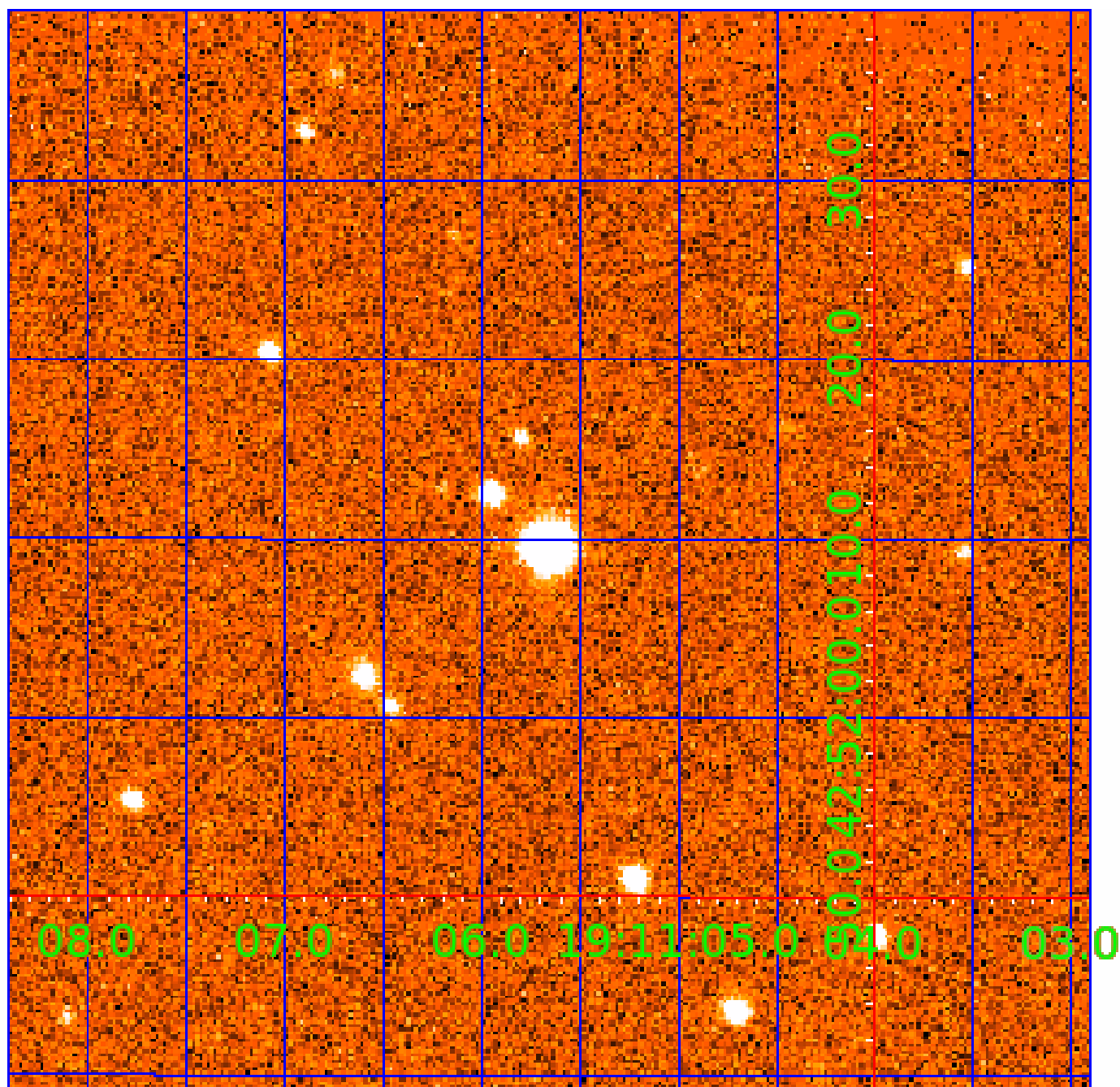


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



# UKIRT Image

Declination



# KIC 007269974

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
007269974-01	OBS	0456.01	13.699387	144.083099	1258.1	5.038	99.6	101.3	1.09	5541	4.68	83.75
007269974-02	OBS	0456.02	4.309374	134.035600	249.8	3.114	29.8	32.1	1.09	5541	2.05	391.48

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
007269974-01	OBS	PC	1.00	0	0	0	0	NO_COMMENT
007269974-02	OBS	PC	1.00	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.

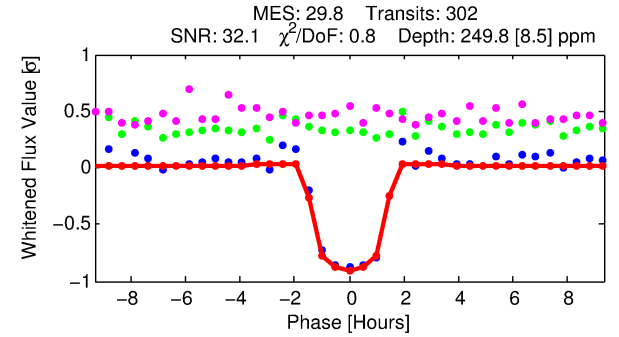
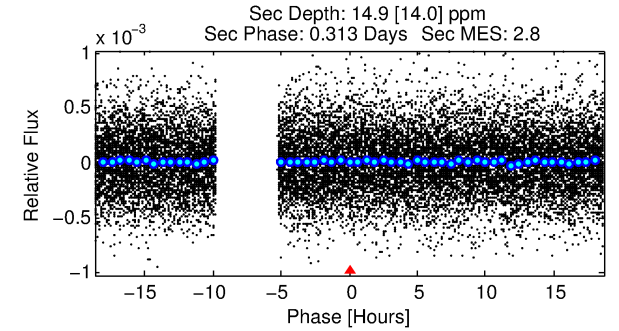
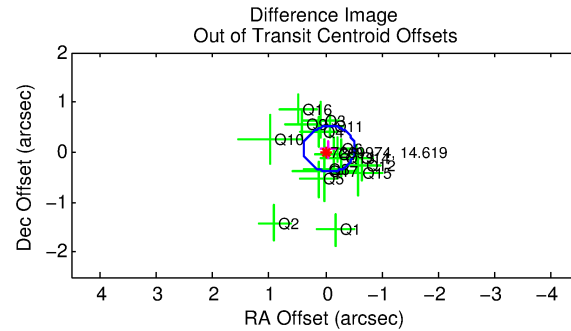
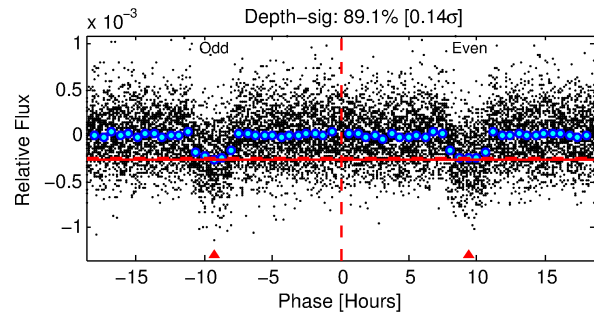
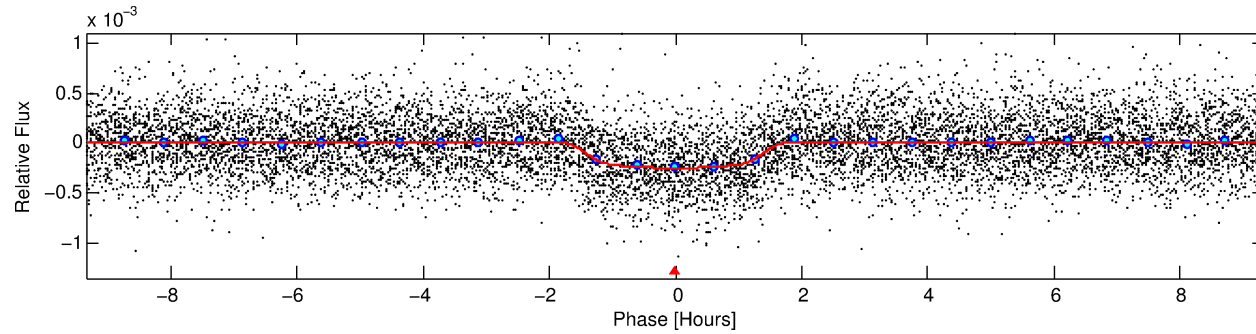
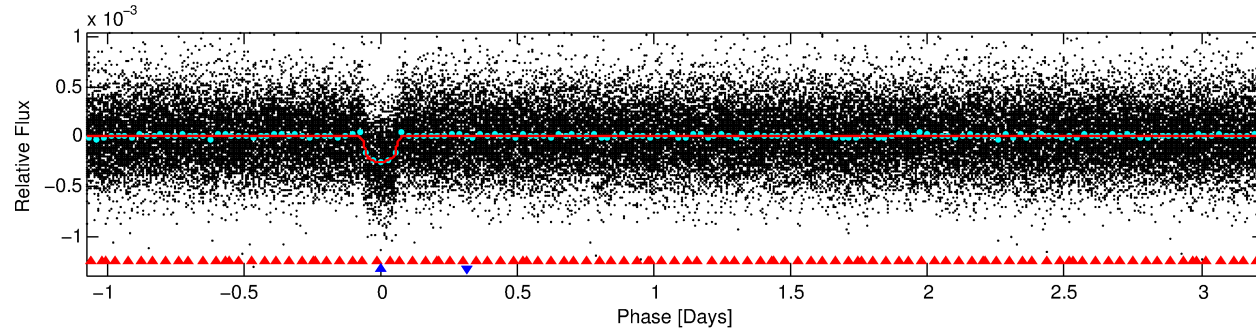
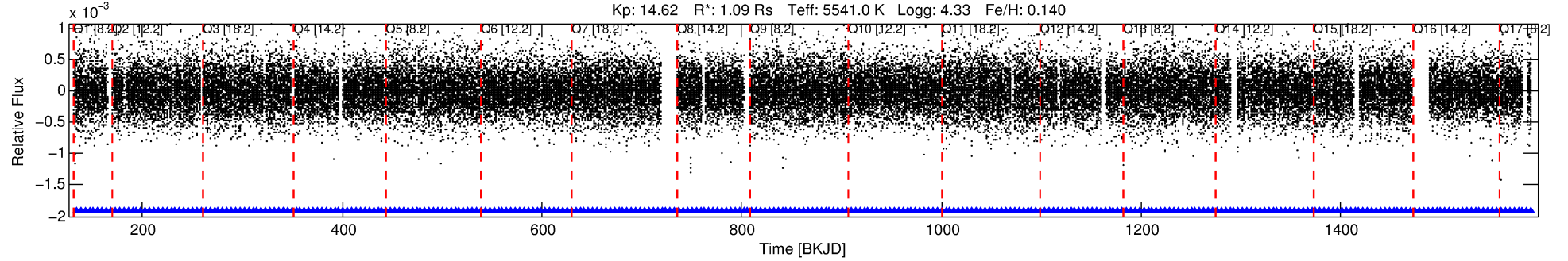
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 007269974-02

No Significant Match Found

# DV One-Page Summary

KIC: 7269974 Candidate: 2 of 2 Period: 4.309 d  
KOI: K00456 Name: Kepler-160 Corr: No Ephemeris Match



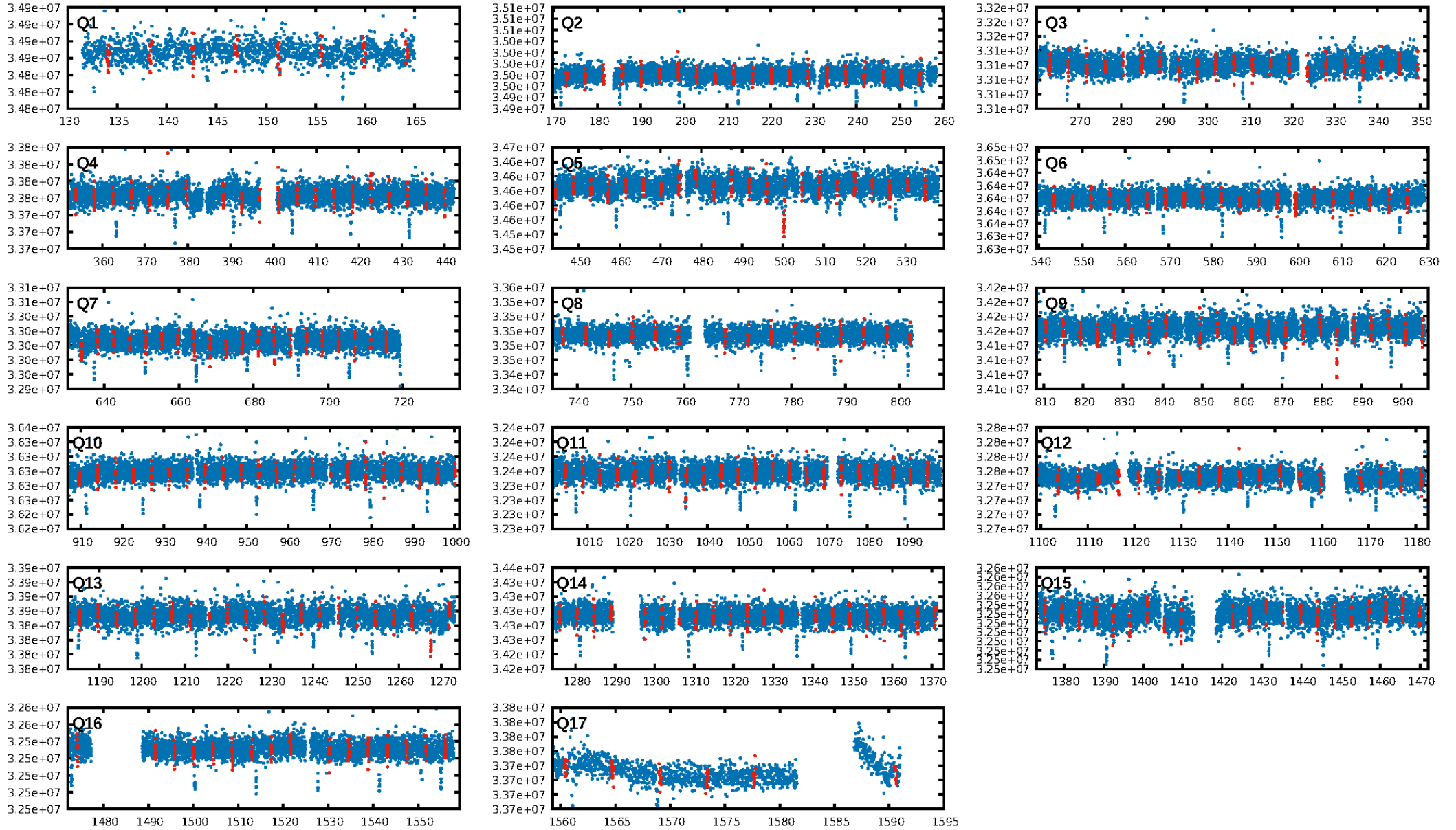
## DV Fit Results:

Period = 4.30937 [0.00001] d  
Epoch = 134.0356 [0.0017] BKJD  
Rp/R\* = 0.0173 [0.0034]  
a/R\* = 5.24 [4.39]  
b = 0.89 [0.20]  
Seff = 391.48 [93.30]  
Teq = 1134 [68] K  
Rp = 2.05 [0.51] Re  
a = 0.0506 [0.0073] AU  
Ag = 4.98 [5.23] [0.76 $\sigma$ ]  
Teffp = 2619 [672] K [2.20 $\sigma$ ]

## DV Diagnostic Results:

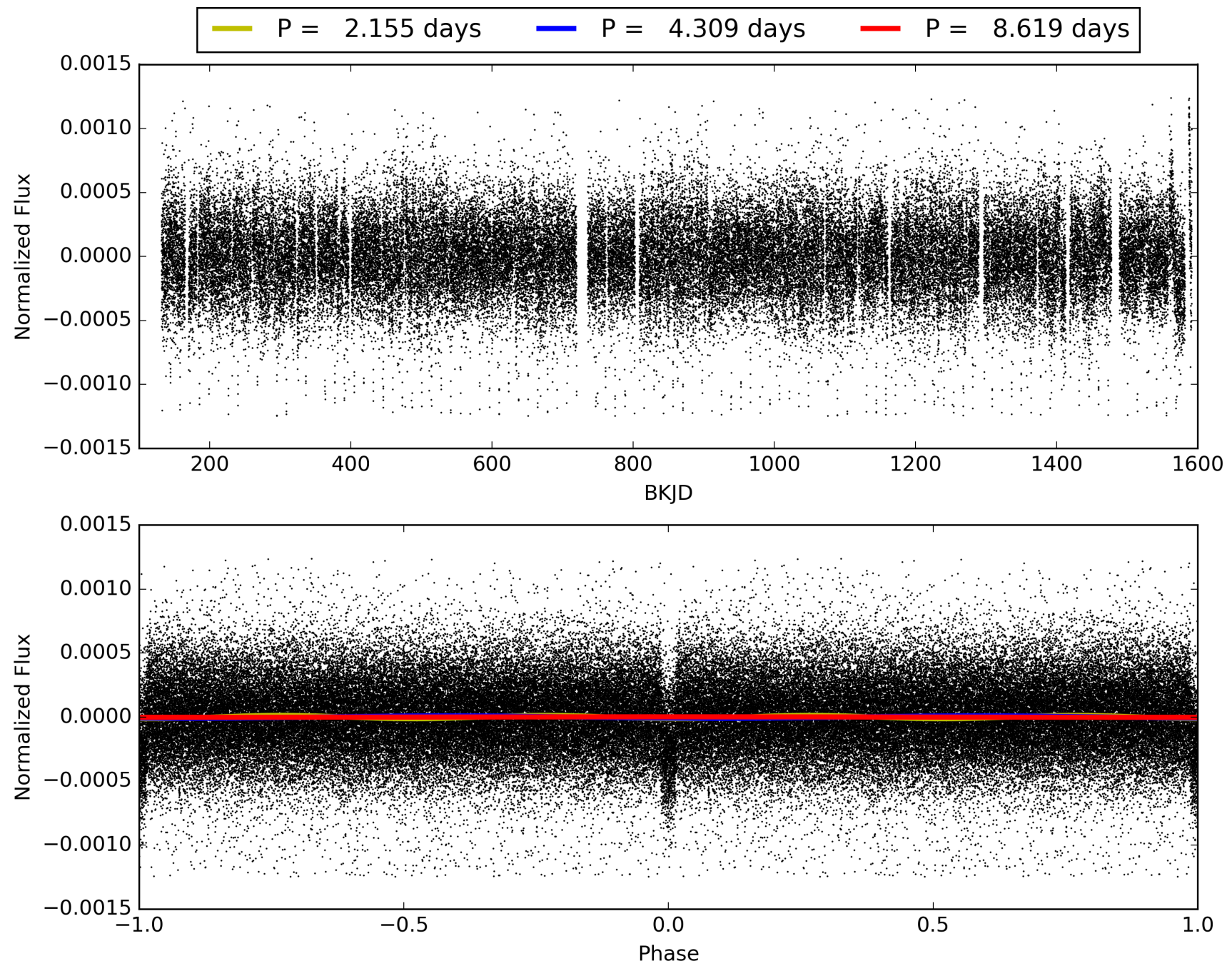
ShortPeriod-sig: N/A  
LongPeriod-sig: 100.0% [38.05 $\sigma$ ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: 1.74e-191  
RollingBand-fgt: 1.00 [289/289]  
GhostDiagnostic-chr: 5.86  
Centroid-sig: 1.4%  
Centroid-so: 1.065 arcsec [2.43 $\sigma$ ]  
OotOffset-rm: 0.094 arcsec [0.62 $\sigma$ ]  
KicOffset-rm: 0.238 arcsec [1.46 $\sigma$ ]  
OotOffset-st: 4/4/4/5 [17]  
KicOffset-st: 4/4/4/5 [17]  
DiffImageQuality-fgm: 1.00 [17/17]  
DiffImageOverlap-fno: 1.00 [17/17]

# TCE 007269974-02, PDC Light Curves



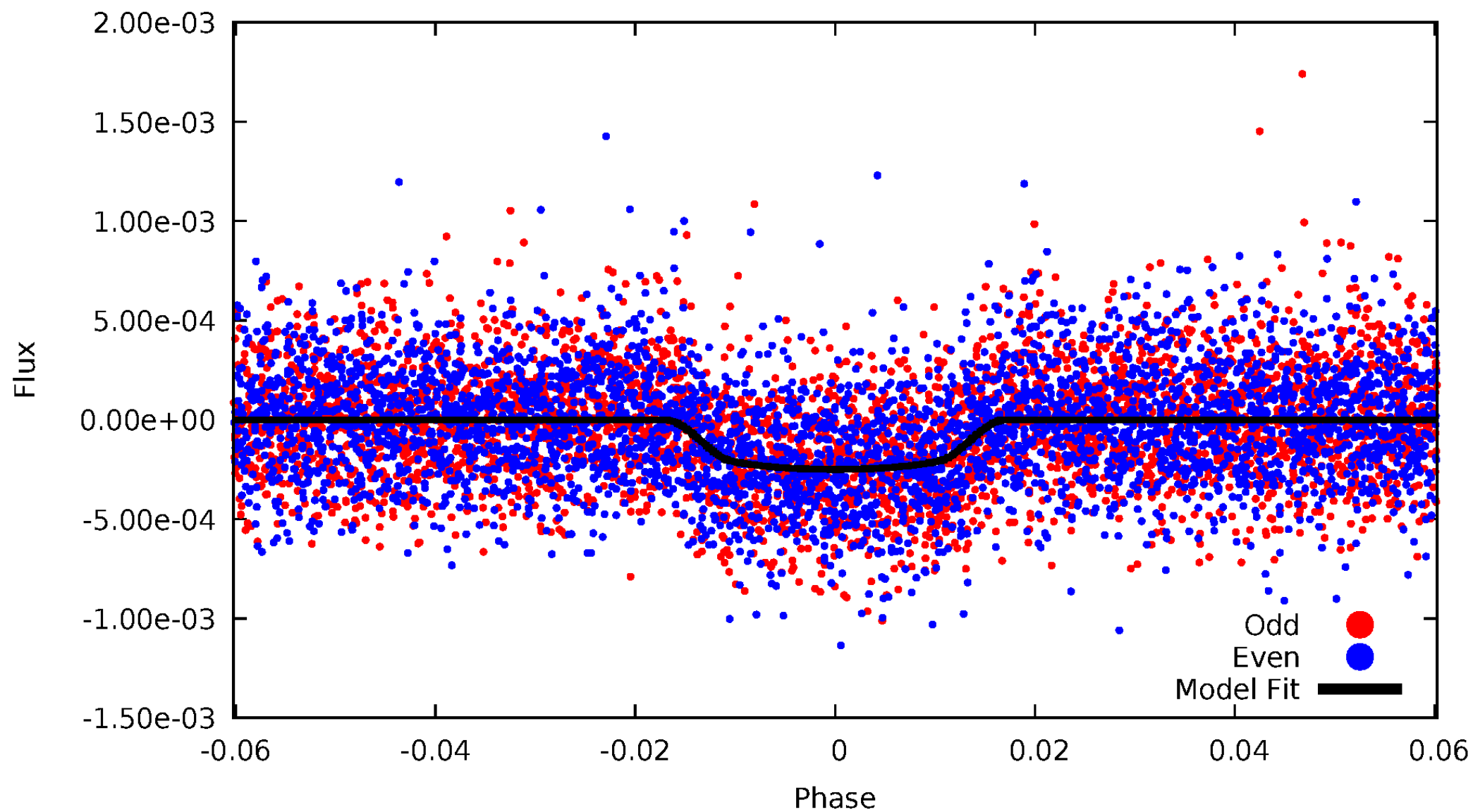


TCE 007269974-02



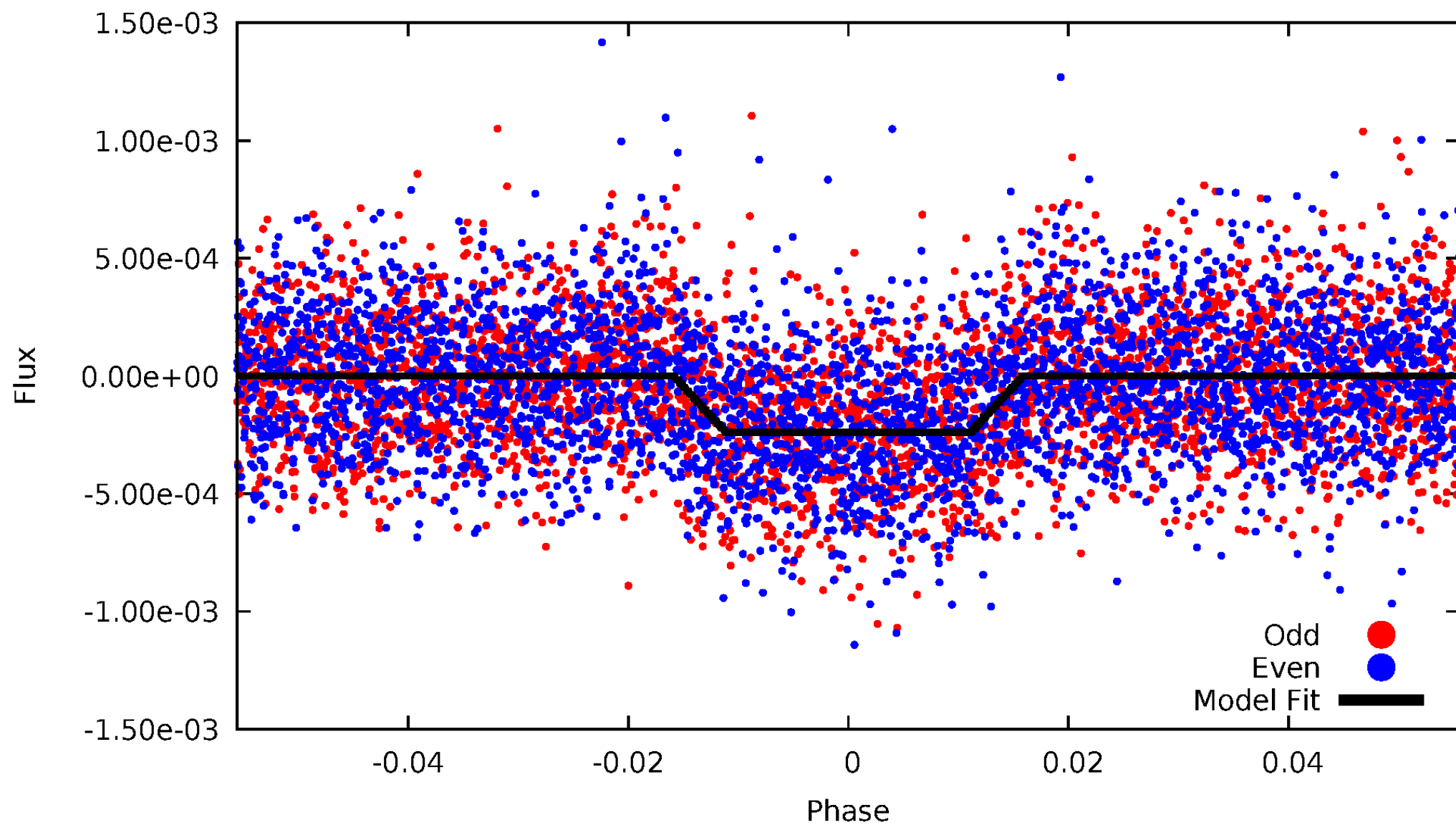
# DV Odd/Even

TCE 007269974-02



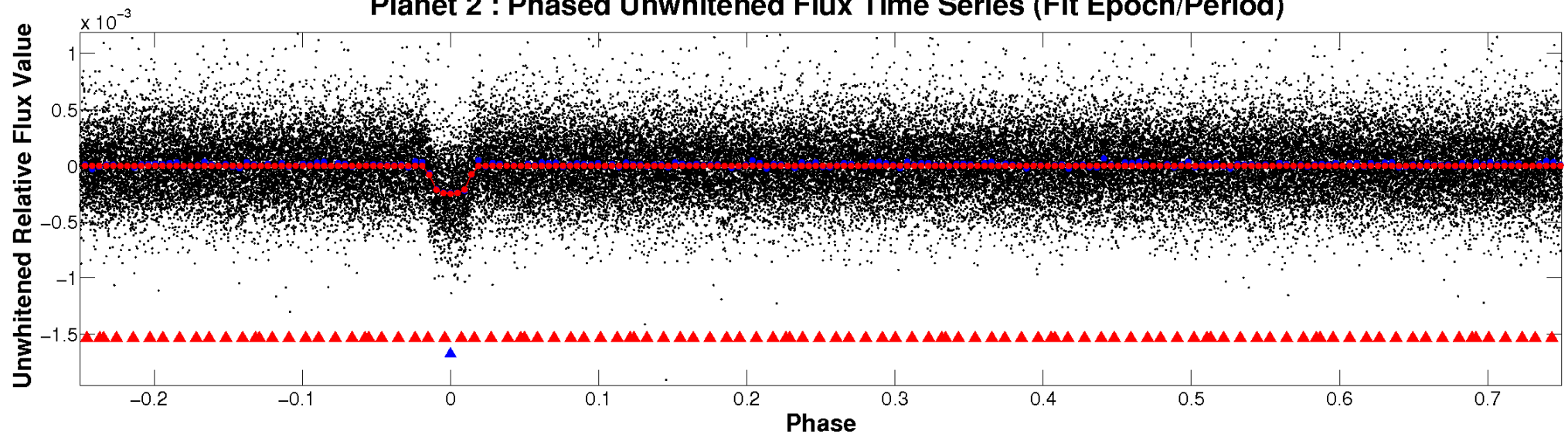
# ALT Odd/Even

TCE 007269974-02

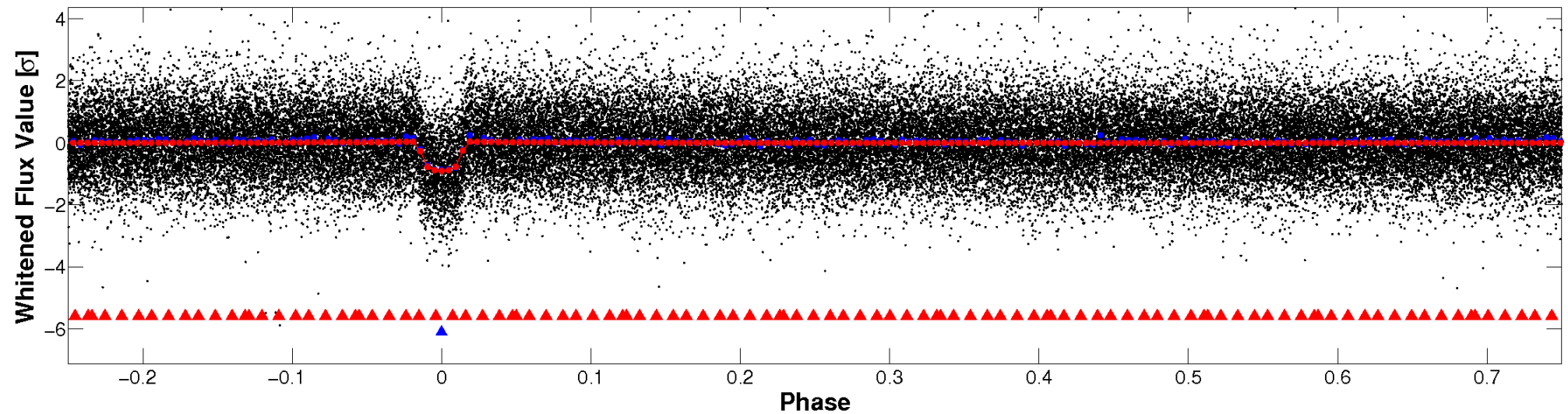


# Non-Whitened Vs. Whitened Light Curve

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



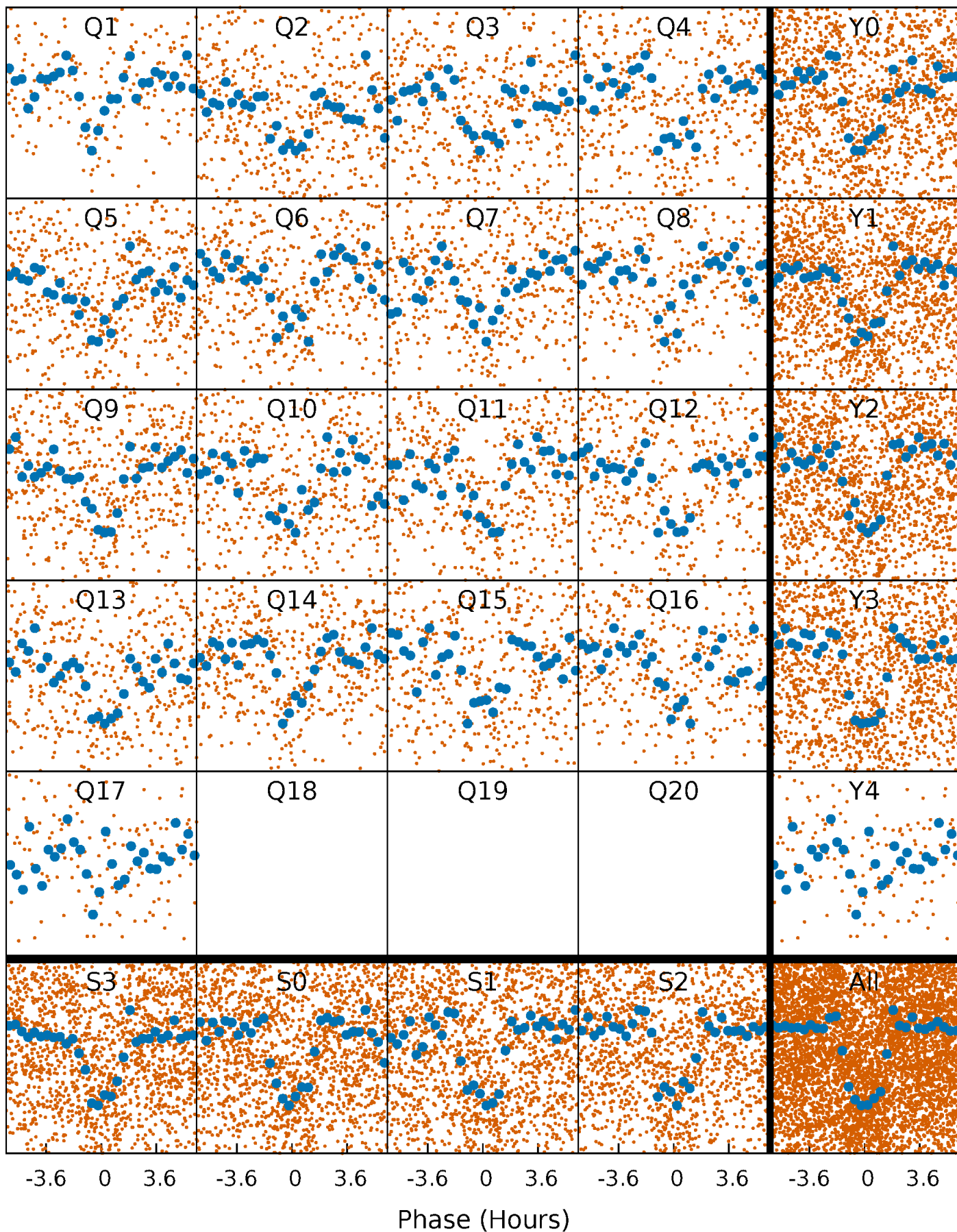
## Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)





# PDC Quarter-Phased Transit Curves

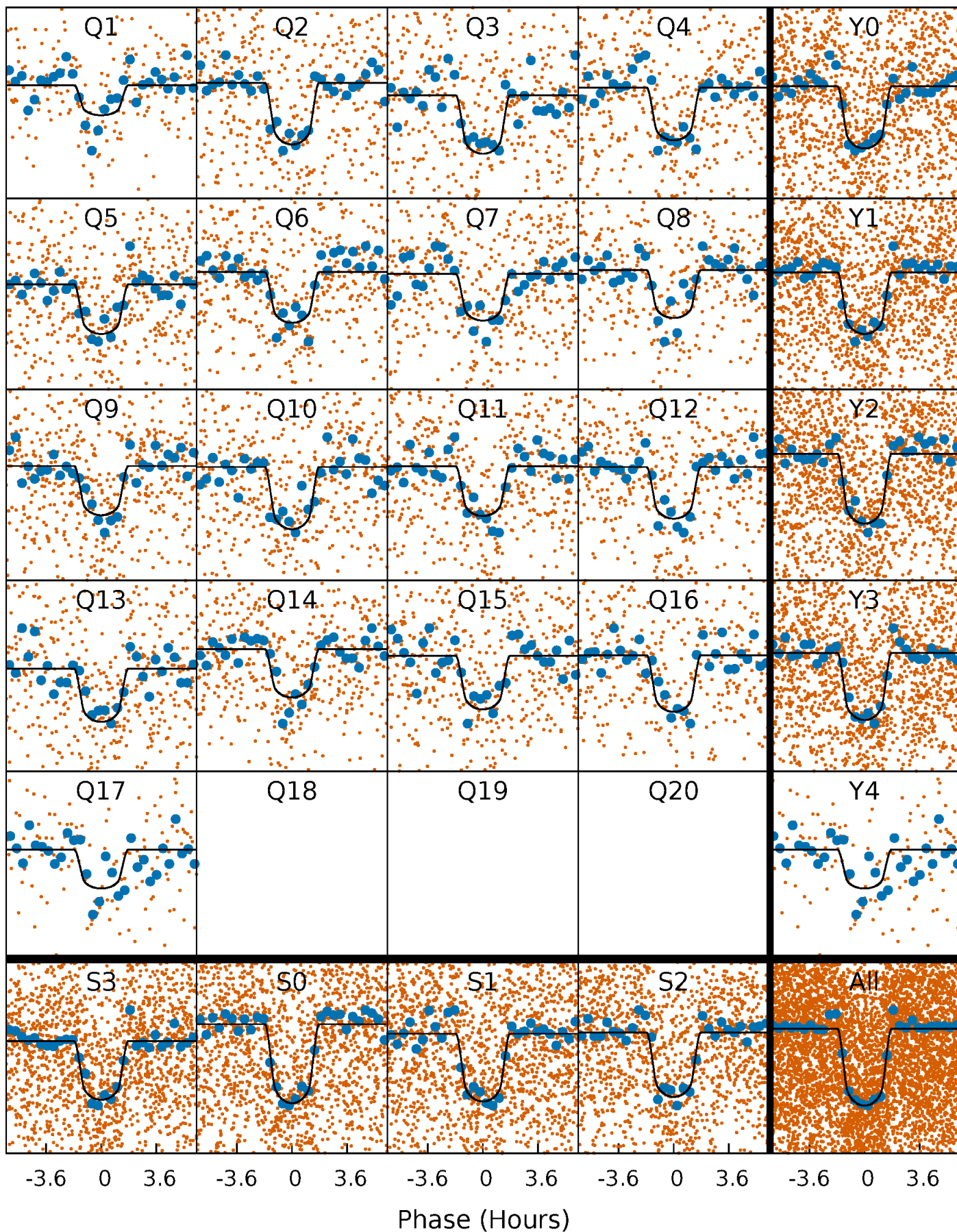
TCE 007269974-02   P= 4.309374 Days    $T_0=134.035600$  (BKJD)





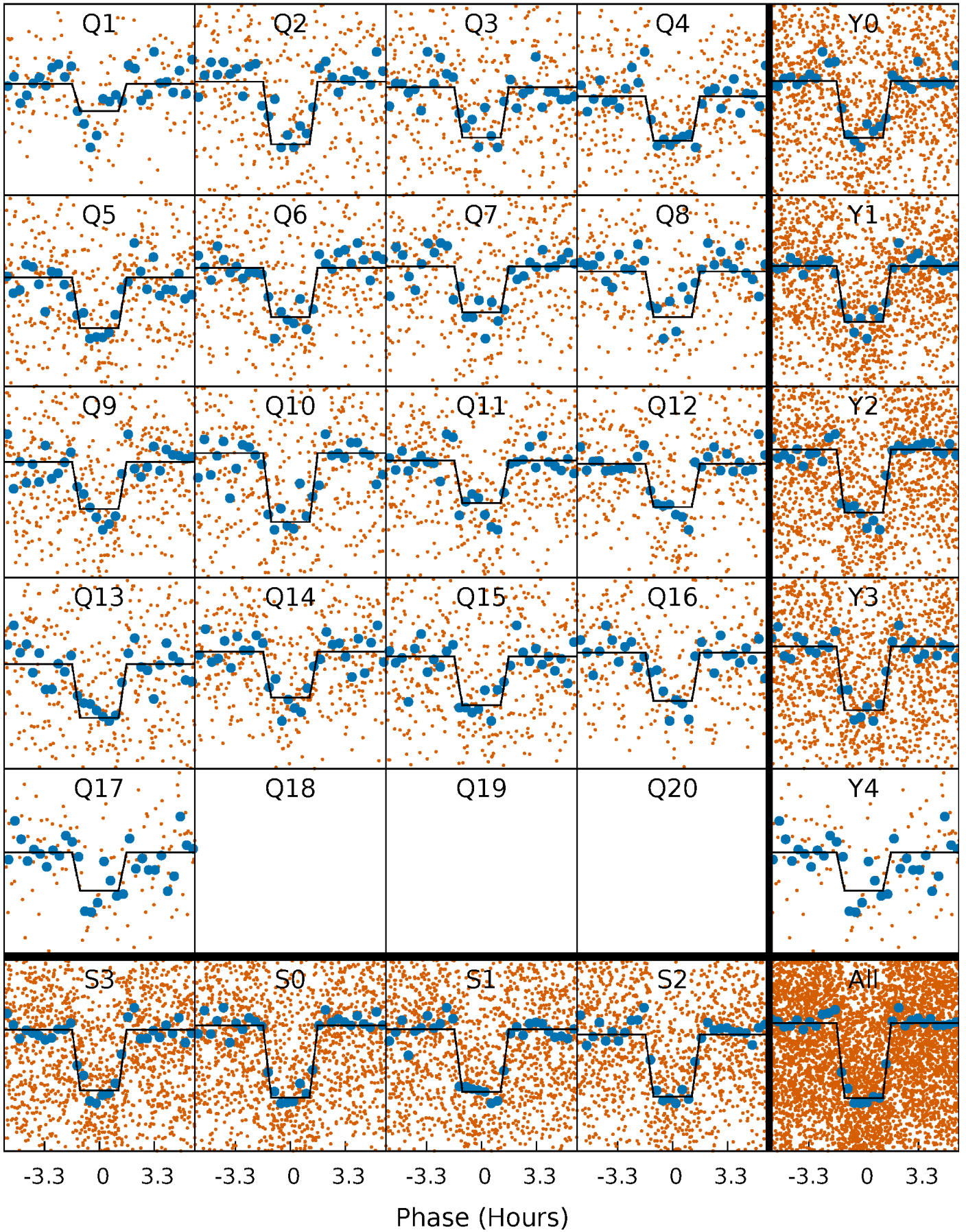
# DV Quarter-Phased Transit Curves

TCE 007269974-02   P= 4.309374 Days    $T_0=134.035600$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

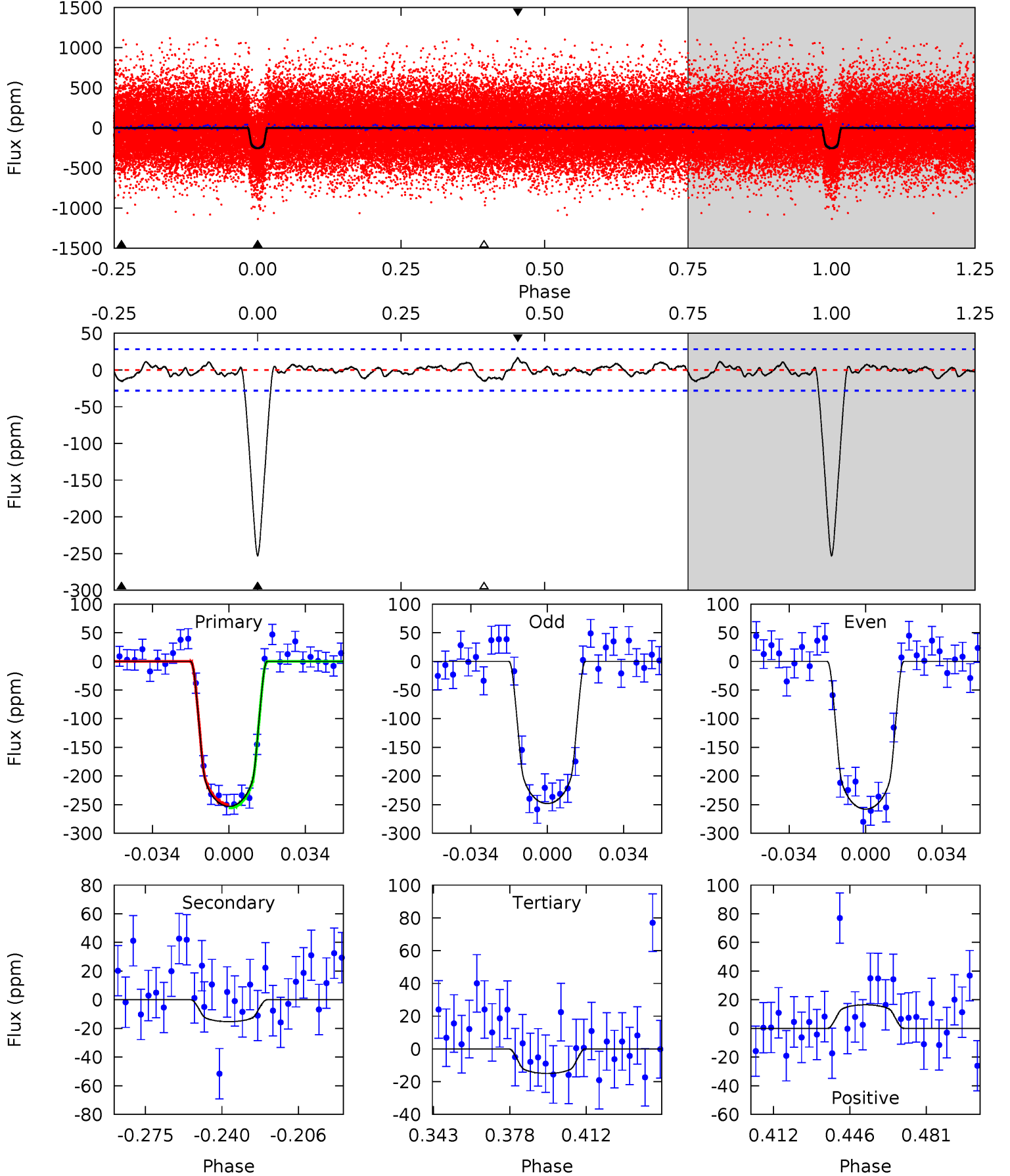
TCE 007269974-02 P= 4.309397 Days  $T_0=134.032004$  (BKJD)



# DV Model-Shift Uniqueness Test

007269974-02, P = 4.309374 Days, E = 129.726226 Days

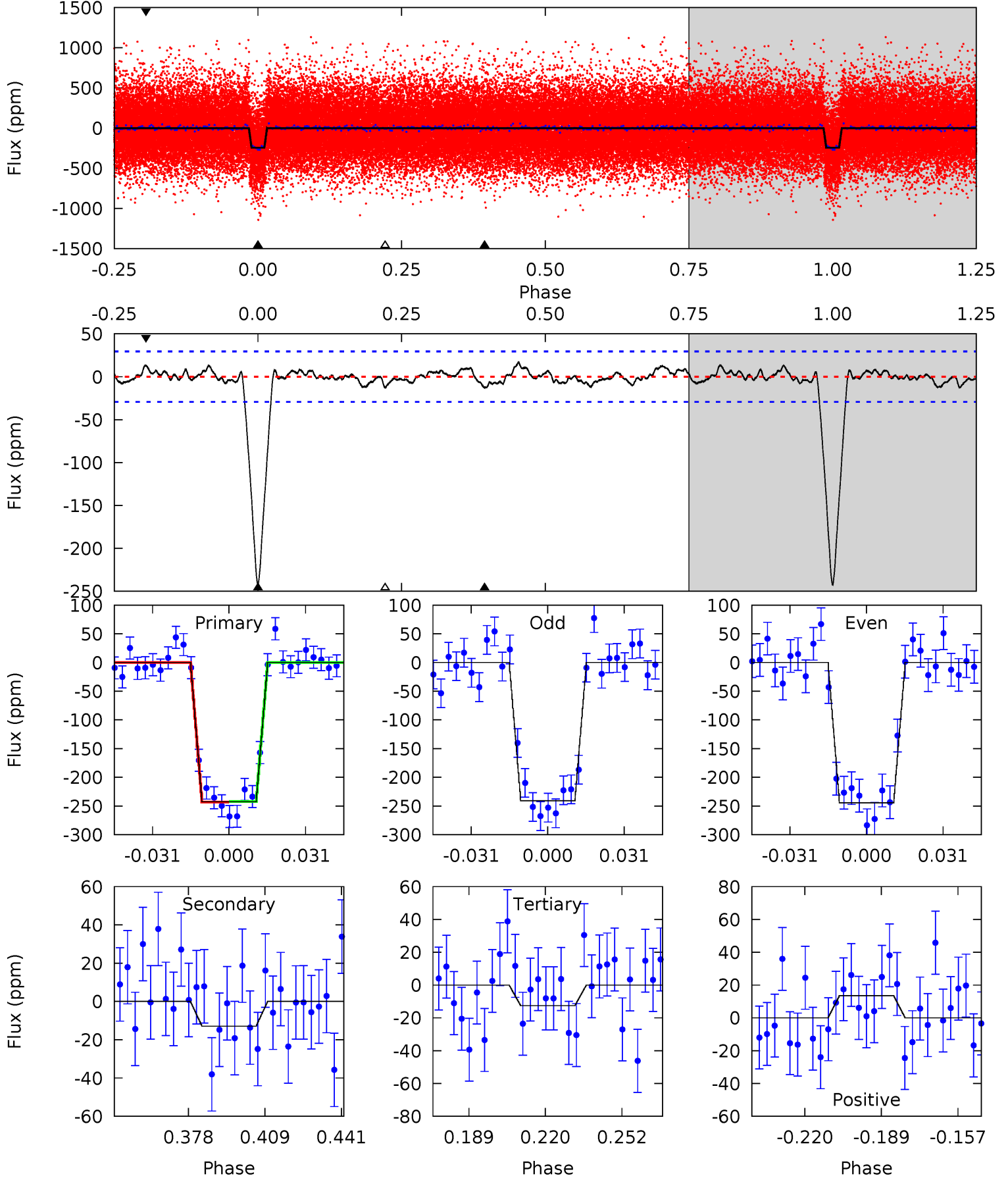
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
42.9	2.59	2.54	2.79	4.78	2.12	0.96	40.3	40.1	0.05	-0.20	0.82	1.01	0.06	0.46



# Alt Model-Shift Uniqueness Test

007269974-02, P = 4.309397 Days, E = 129.722607 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
39.7	2.11	2.06	2.21	4.80	2.15	0.91	37.6	37.4	0.05	-0.10	0.30	1.01	0.07	0.09



### Stellar Parameters For KIC 007269974

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$5541^{+74}_{-74}$	$4.332^{+0.137}_{-0.100}$	$0.140^{+0.150}_{-0.150}$	$1.089^{+0.161}_{-0.145}$	$0.929^{+0.067}_{-0.043}$	$1.013^{+0.616}_{-0.328}$
	+1%/-1%	+3%/-2%	+107%/-107%	+15%/-13%	+7%/-5%	+61%/-32%
Source	SPE90	SPE90	SPE90	DSEP		

KIC = Kepler Input Catalog; PHO = Photometry; SPE = Spectroscopy; AST = Asteroseismology  
 TRA = Transits; DESP = Dartmouth Models; MULT = Multiple Models

### Secondary Eclipse Parameters for KIC 007269974-02 / KOI 0456.02

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-15 \pm 6$	$2.03^{+0.44}_{-0.39}$	$1578^{+64}_{-62}$	$3175^{+298}_{-285}$	$5.115^{+3.815}_{-2.413}$
Alt.	$-13 \pm 6$	$1.81^{+0.46}_{-0.41}$	$1575^{+67}_{-65}$	$3214^{+349}_{-356}$	$5.486^{+4.849}_{-3.023}$

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



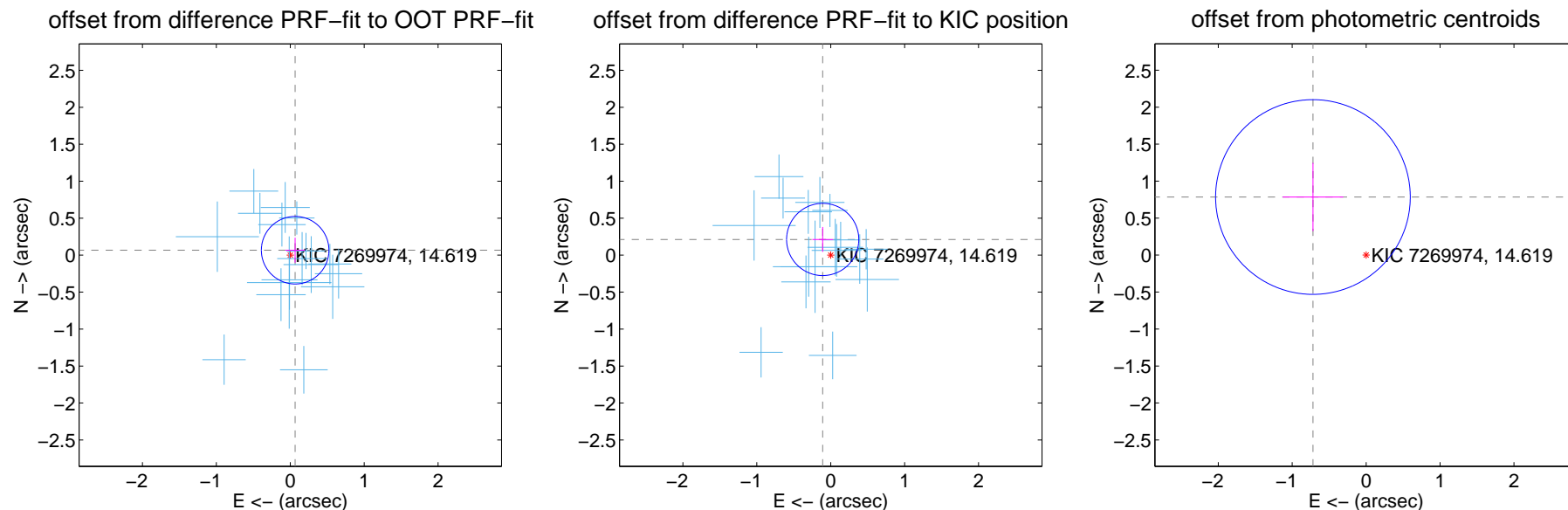
## DV Centroid Data

Supplemental centroid analysis for 007269974-02. Kepler magnitude: 14.62. Transit SNR 32.15

There are 17 quarters with good PRF difference image offsets

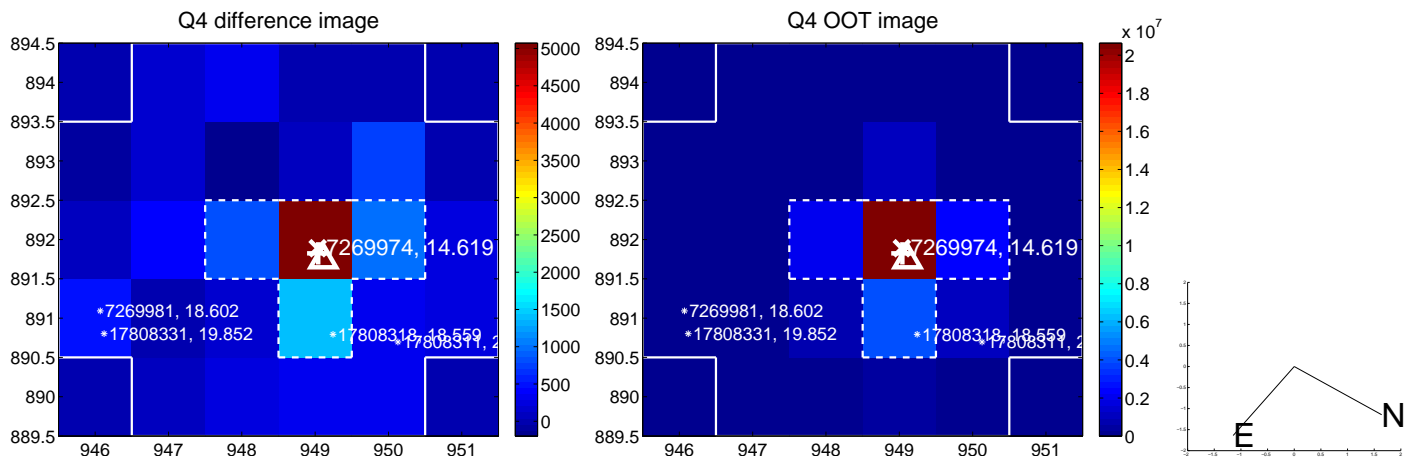
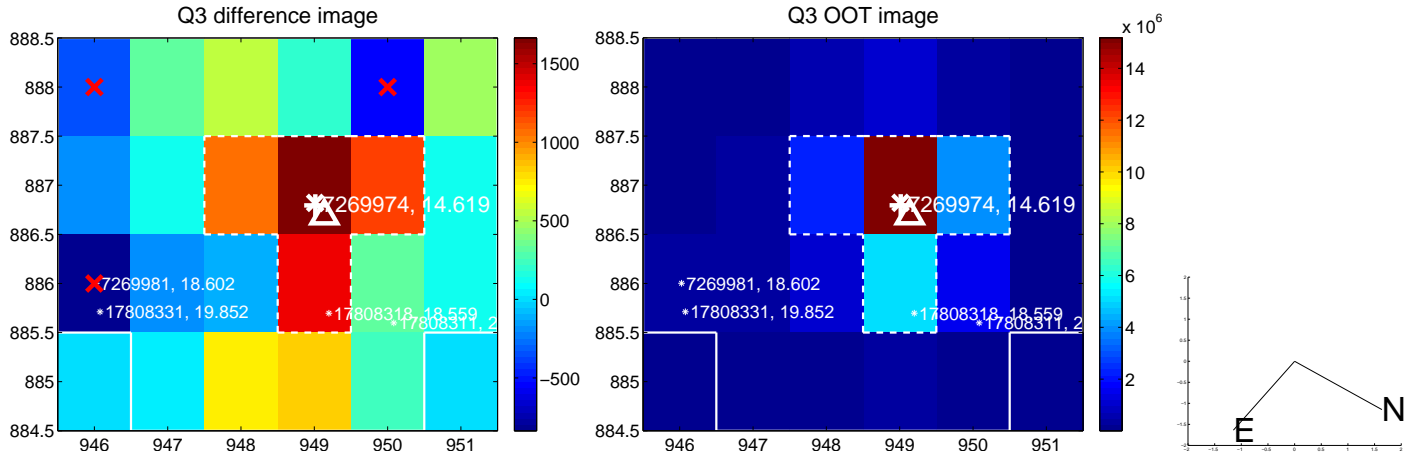
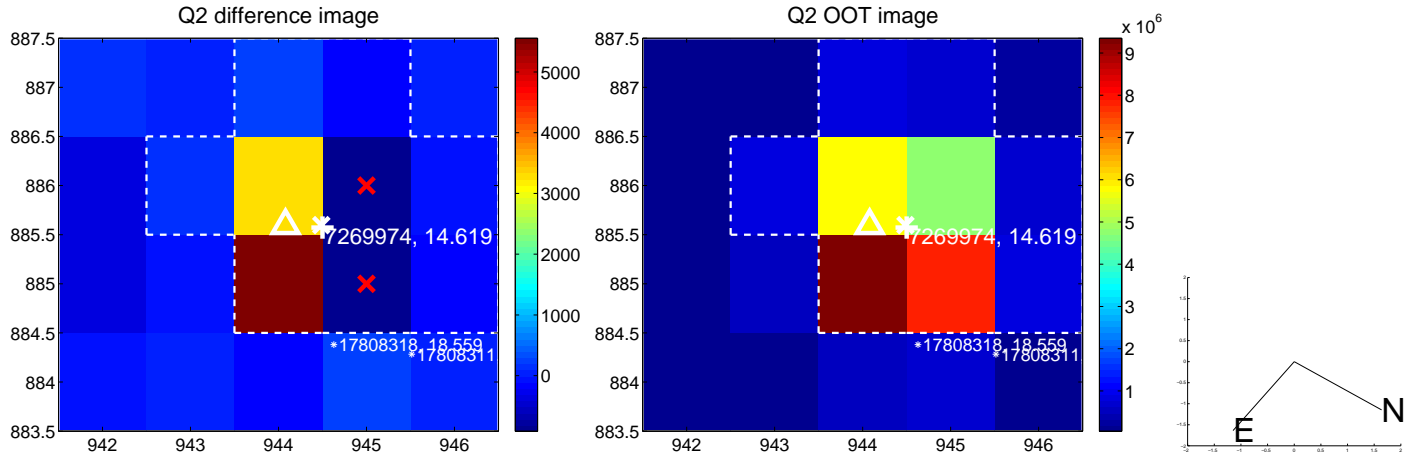
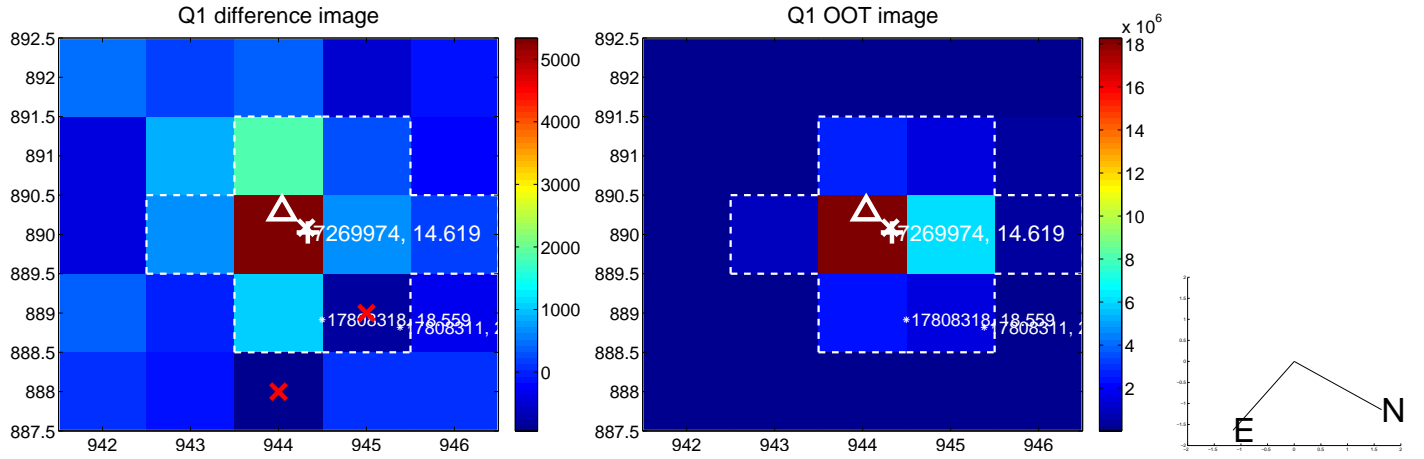
The direct PRF centroid is offset from the target star catalog position by about 0.29 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.094 \pm 0.152$	0.62	$-0.066 \pm 0.132$	$0.067 \pm 0.169$
PRF-fit source offset from KIC position	$0.238 \pm 0.163$	1.46	$0.109 \pm 0.141$	$0.212 \pm 0.168$
photometric centroid source offset	$1.07 \pm 0.44$	2.43	$0.72 \pm 0.41$	$0.79 \pm 0.46$



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.

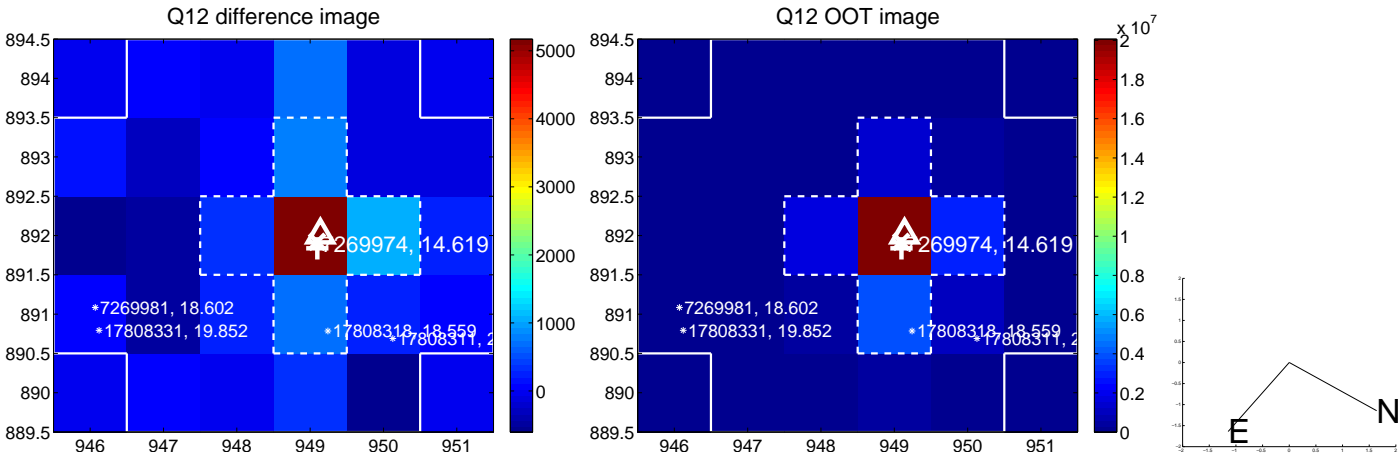
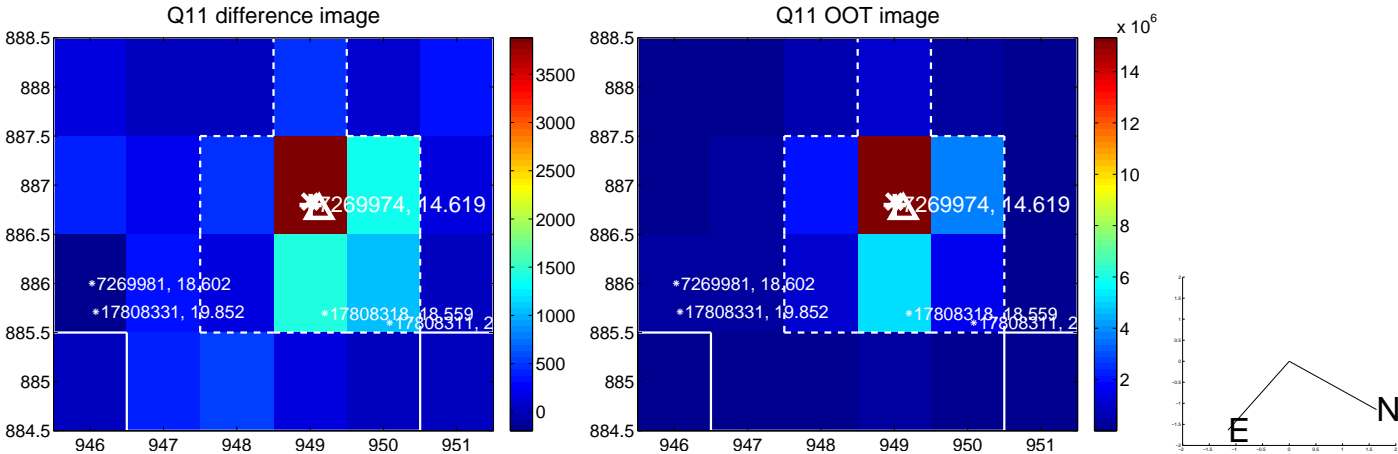
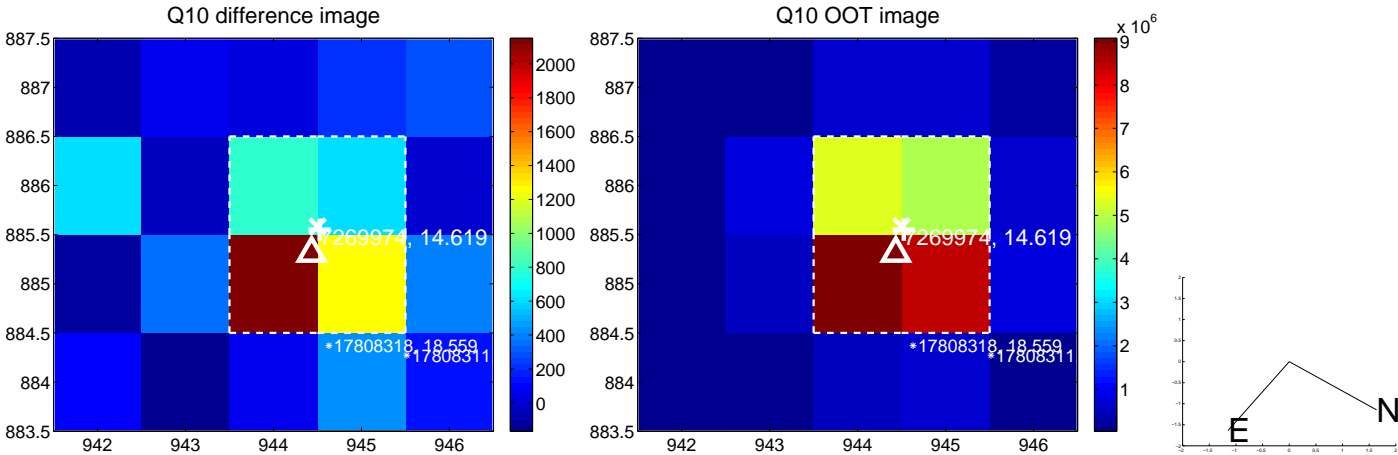
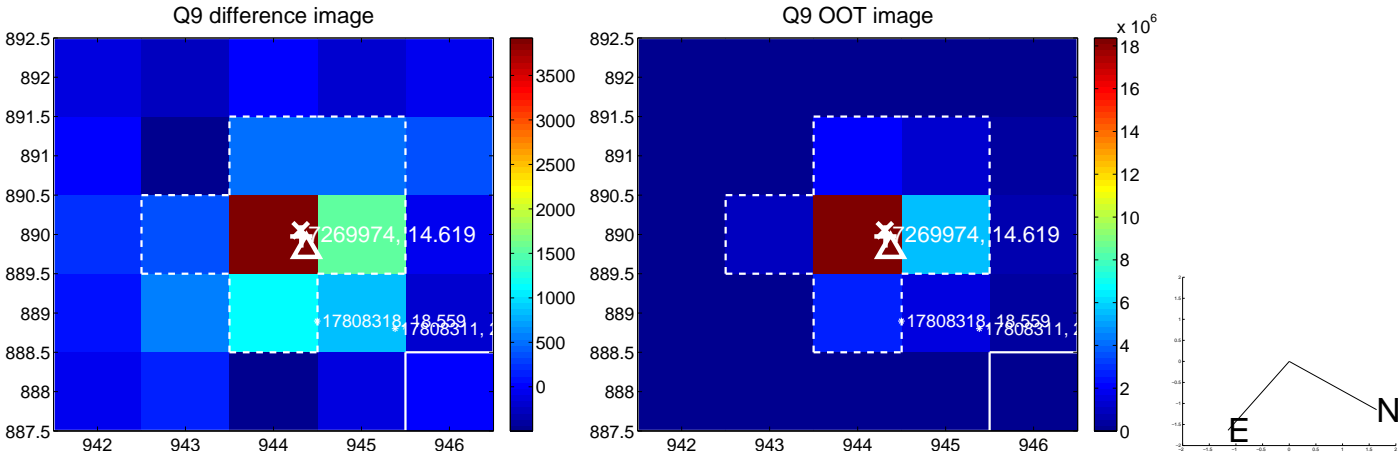
white  $\times$ : KIC target position; +: OOT centroid;  $\Delta$ : difference centroid. red  $\times$ : large negative pixel value.



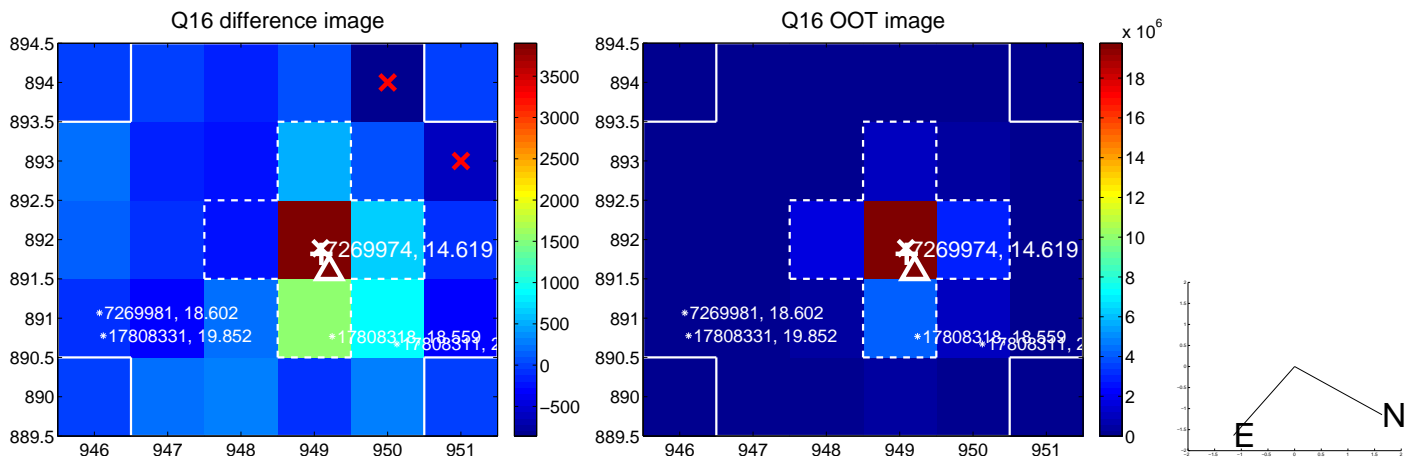
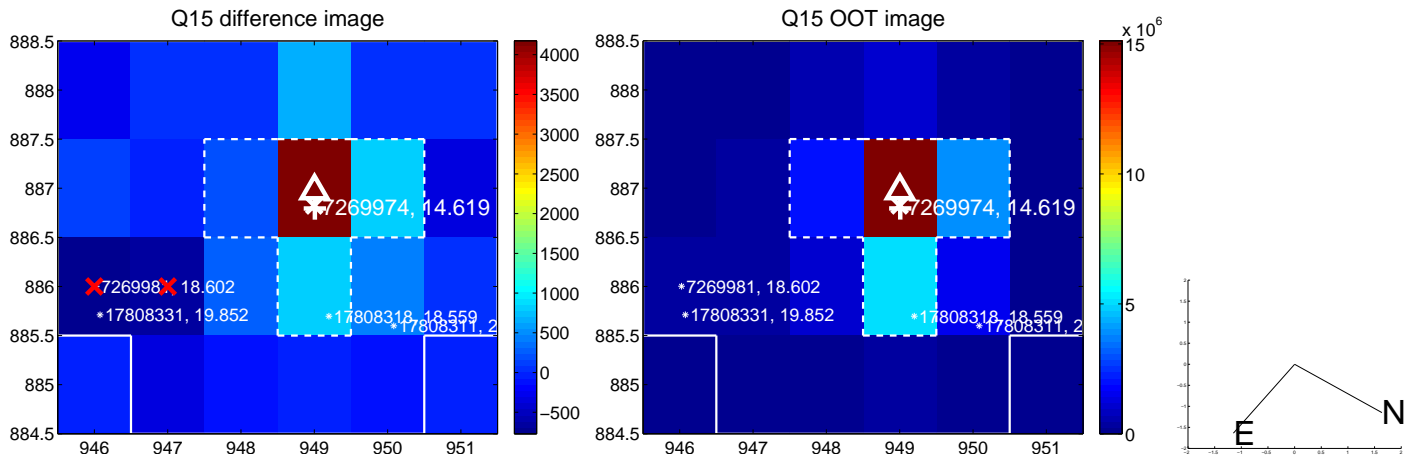
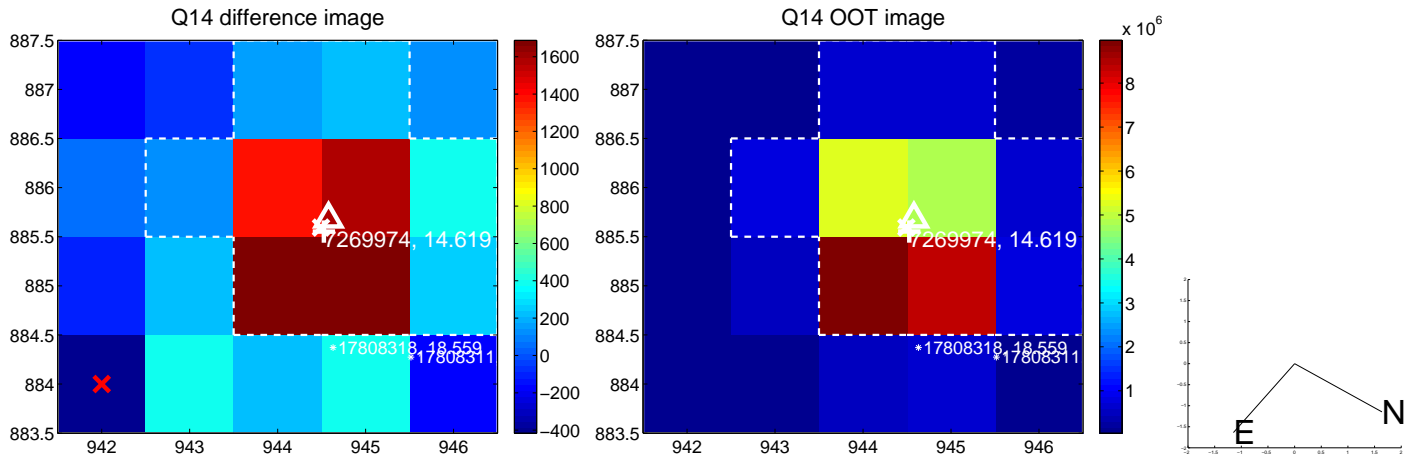
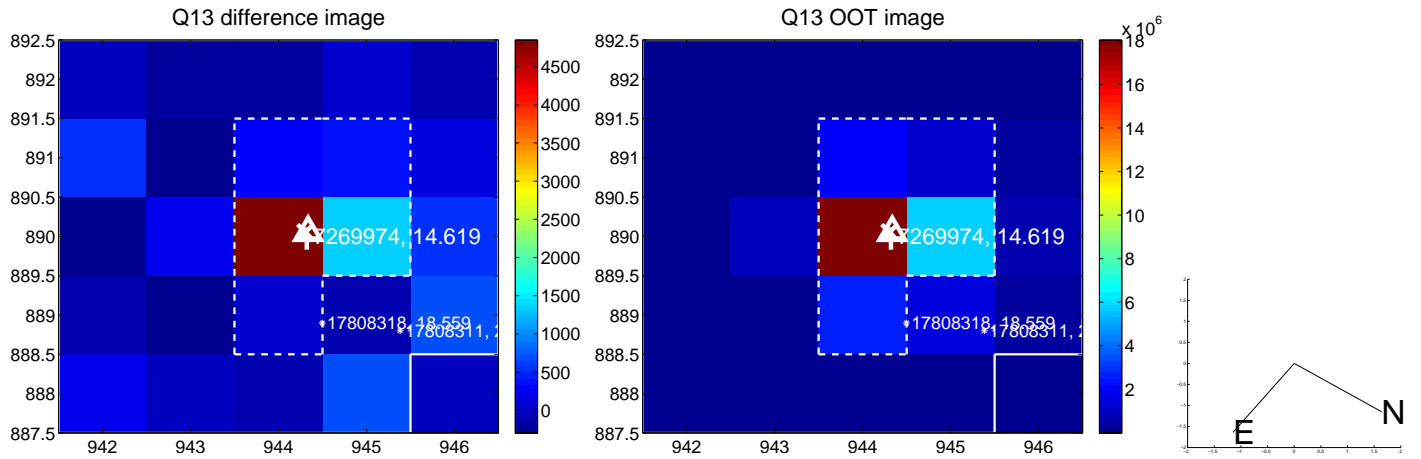




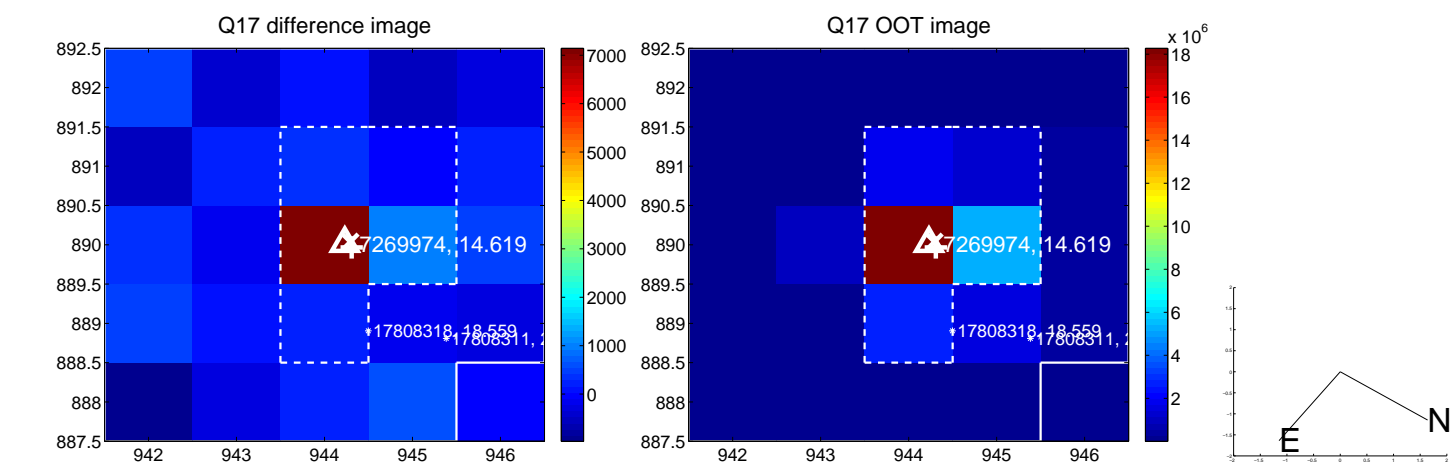
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



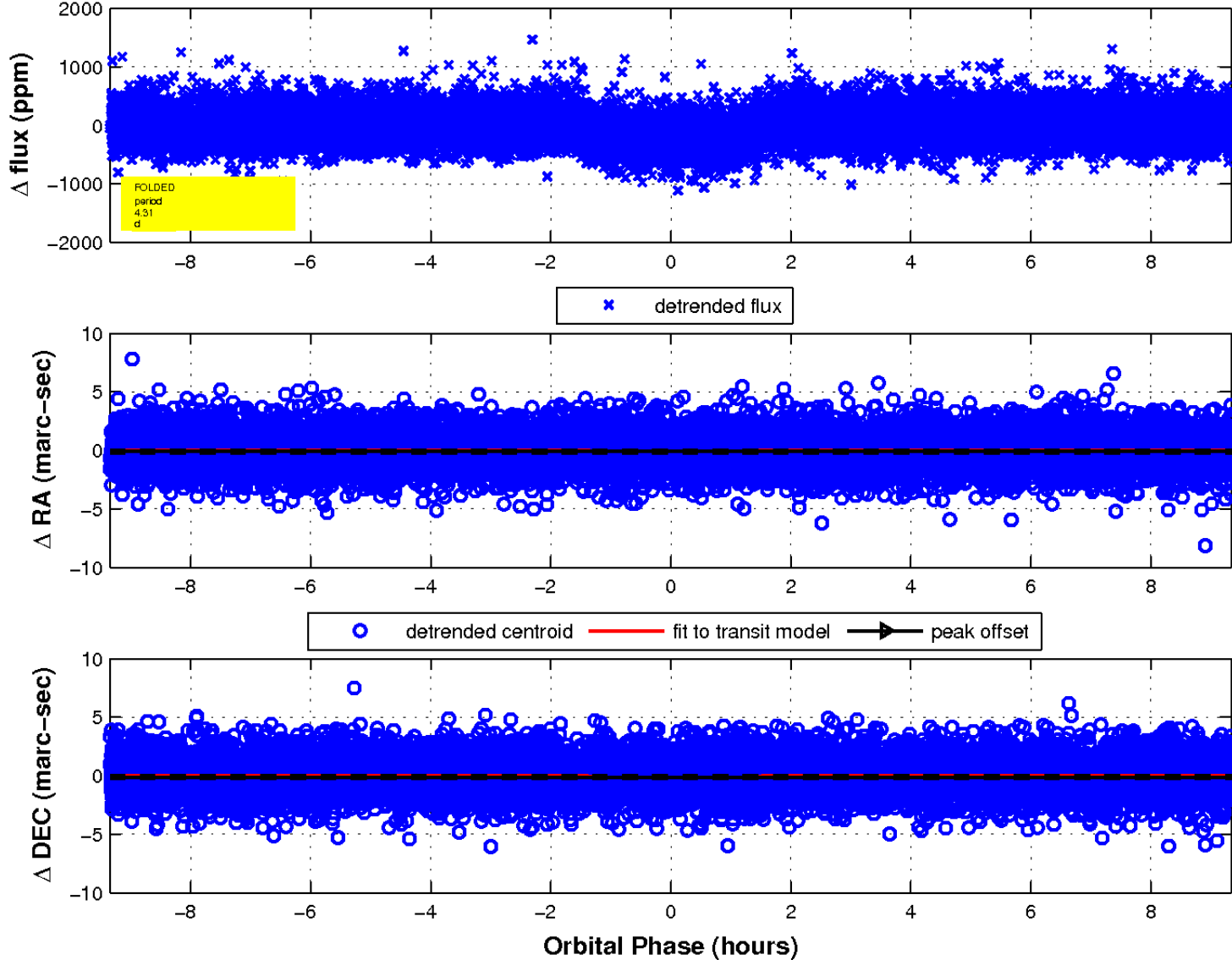
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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



fluxWeightedCentroids, Planet 2 of 2



# UKIRT Image

Declination

