

# KIC 011069176

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
011069176-01	OBS	2007.01	15.378869	143.409171	181.3	5.342	18.8	19.7	2.15	5817	3.82	276.16
011069176-02	OBS	2007.02	21.128556	149.275988	193.2	3.949	15.7	17.1	2.15	5817	3.52	180.81

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
011069176-01	OBS	PC	1.00	0	0	0	0	NO_COMMENT
011069176-02	OBS	PC	0.97	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.

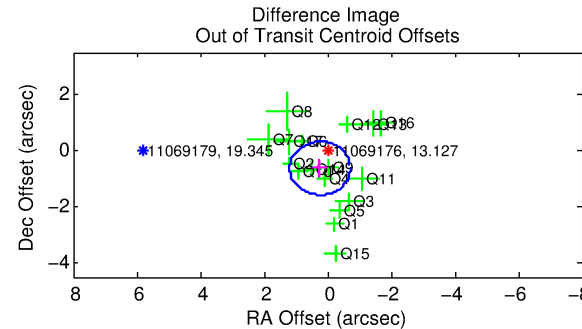
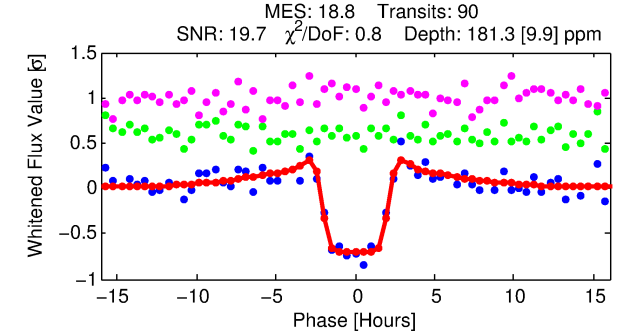
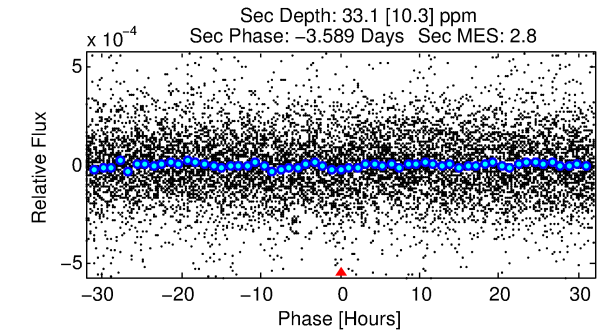
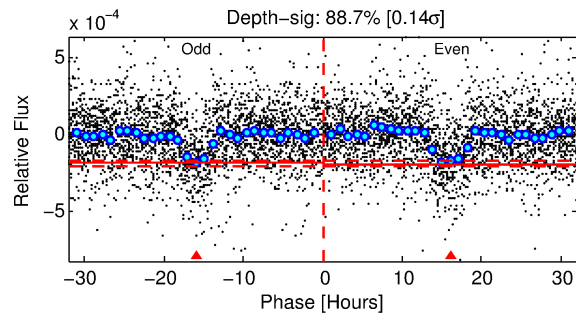
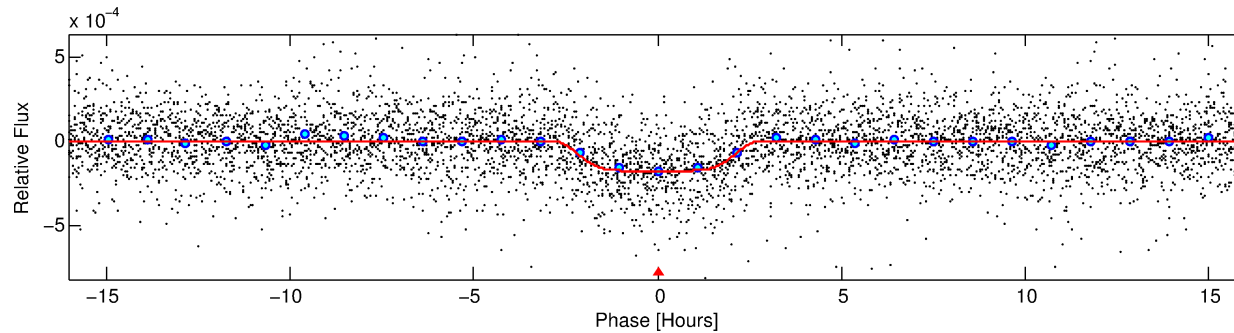
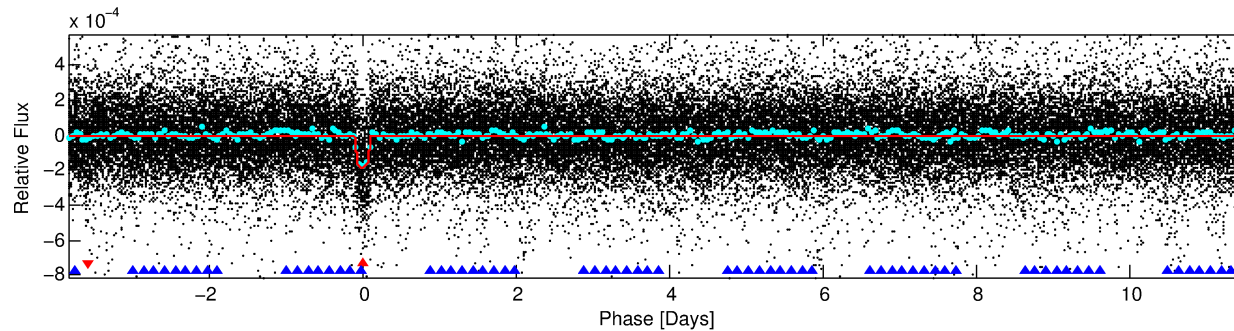
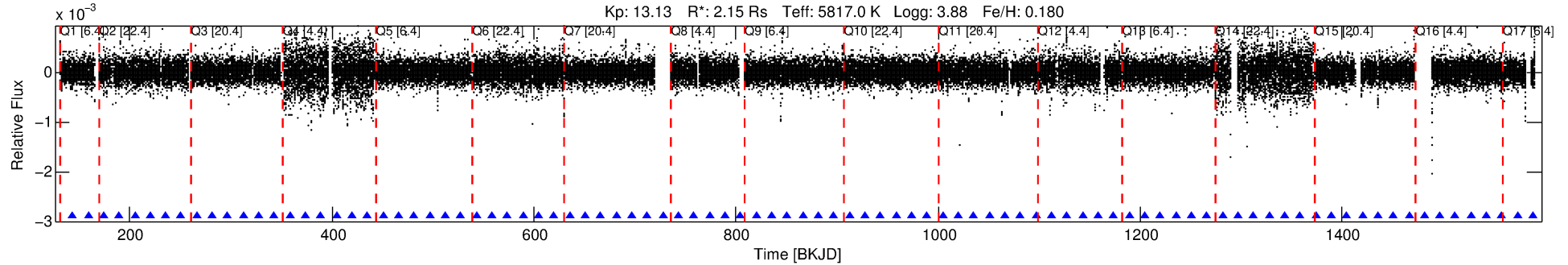
## Ephemeris Match Information For 011069176-01

No Significant Match Found

# DV One-Page Summary

KIC: 11069176 Candidate: 1 of 2 Period: 15.379 d

KOI: K02007.01 Corr: 0.905



## DV Fit Results:

Period = 15.37887 [0.00008] d  
Epoch = 143.4092 [0.0045] BKJD  
Rp/R\* = 0.0163 [0.0006]  
a/R\* = 6.96 [0.85]  
b = 0.97 [0.01]  
Seff = 276.16 [140.96]  
Teq = 1039 [133] K  
Rp = 3.82 [1.36] Re  
a = 0.1312 [0.0427] AU  
Ag = 21.50 [12.93] [1.59 $\sigma$ ]  
Teffp = 3461 [283] K [7.75 $\sigma$ ]

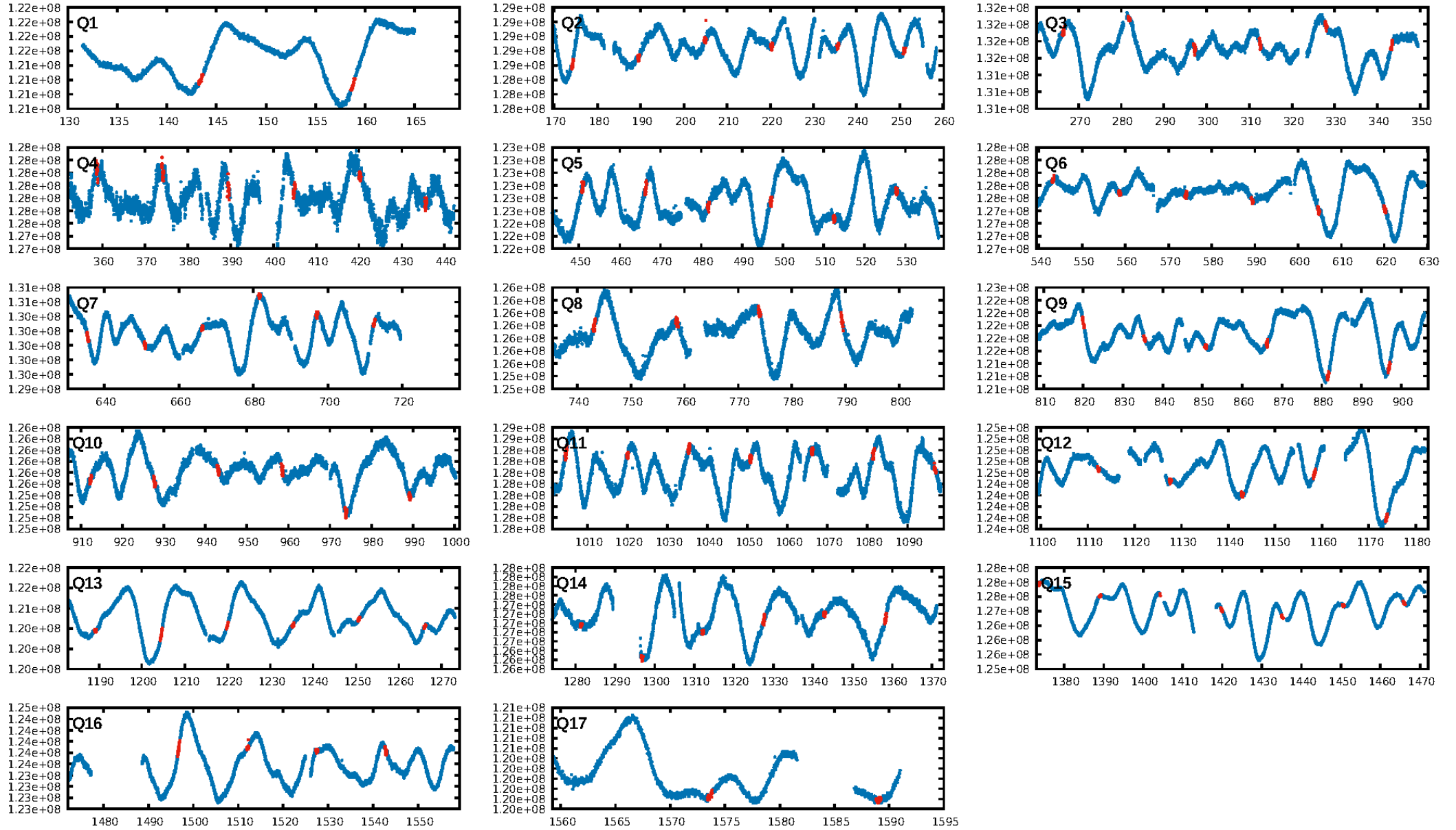
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 100.0% [20.77 $\sigma$ ]  
ModelChiSquare2-sig: 98.7%  
ModelChiSquareGof-sig: 100.0%  
Bootstrap-pfa: 1.01e-75  
RollingBand-fgt: 1.00 [86/86]  
GhostDiagnostic-chr: 3.818  
Centroid-sig: 0.9%  
Centroid-so: 1.331 arcsec [2.97 $\sigma$ ]  
OotOffset-rm: 0.673 arcsec [2.12 $\sigma$ ]  
KicOffset-rm: 0.589 arcsec [1.87 $\sigma$ ]  
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]

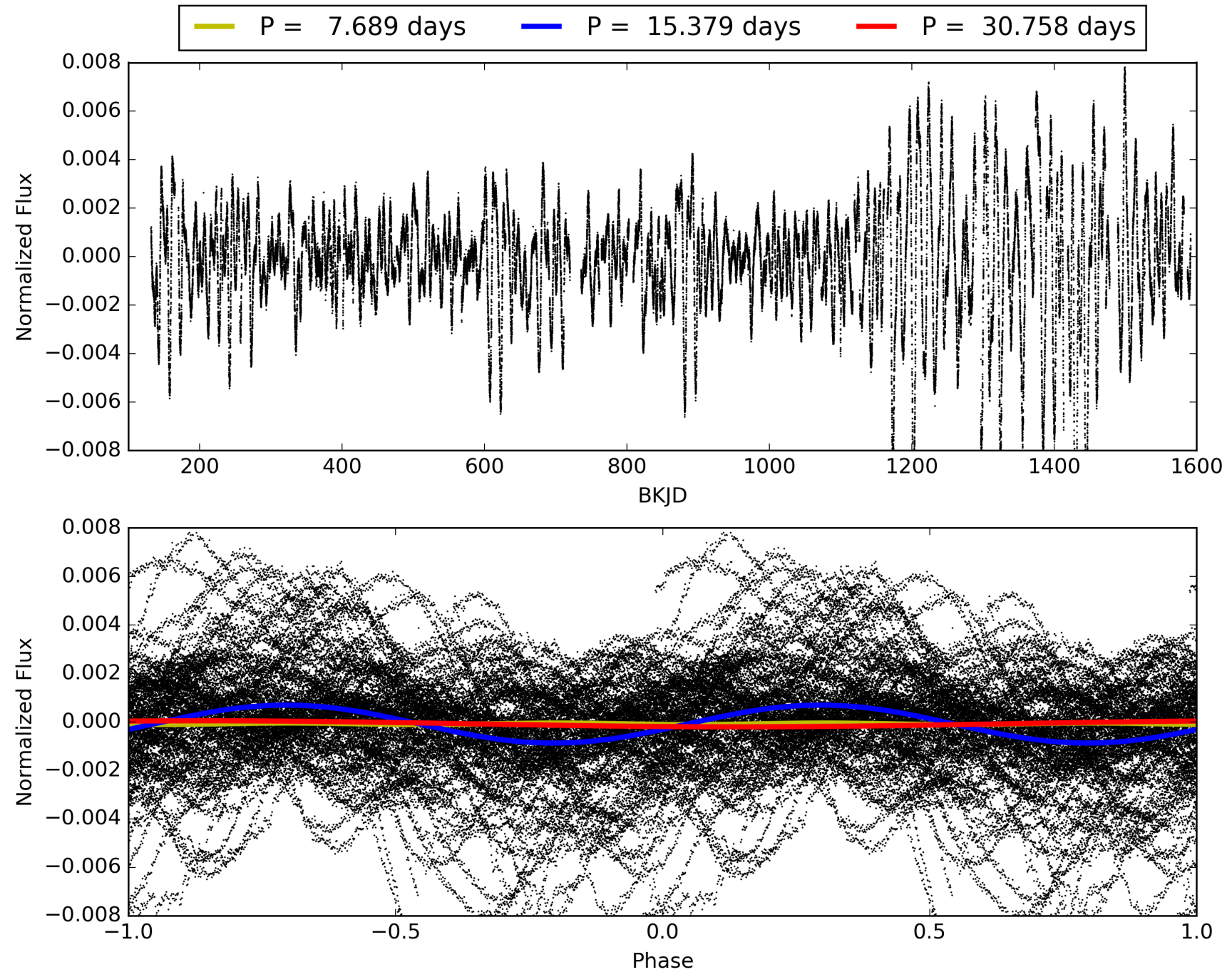
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 01-Feb-2016 05:33:26 Z

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

# TCE 011069176-01, PDC Light Curves

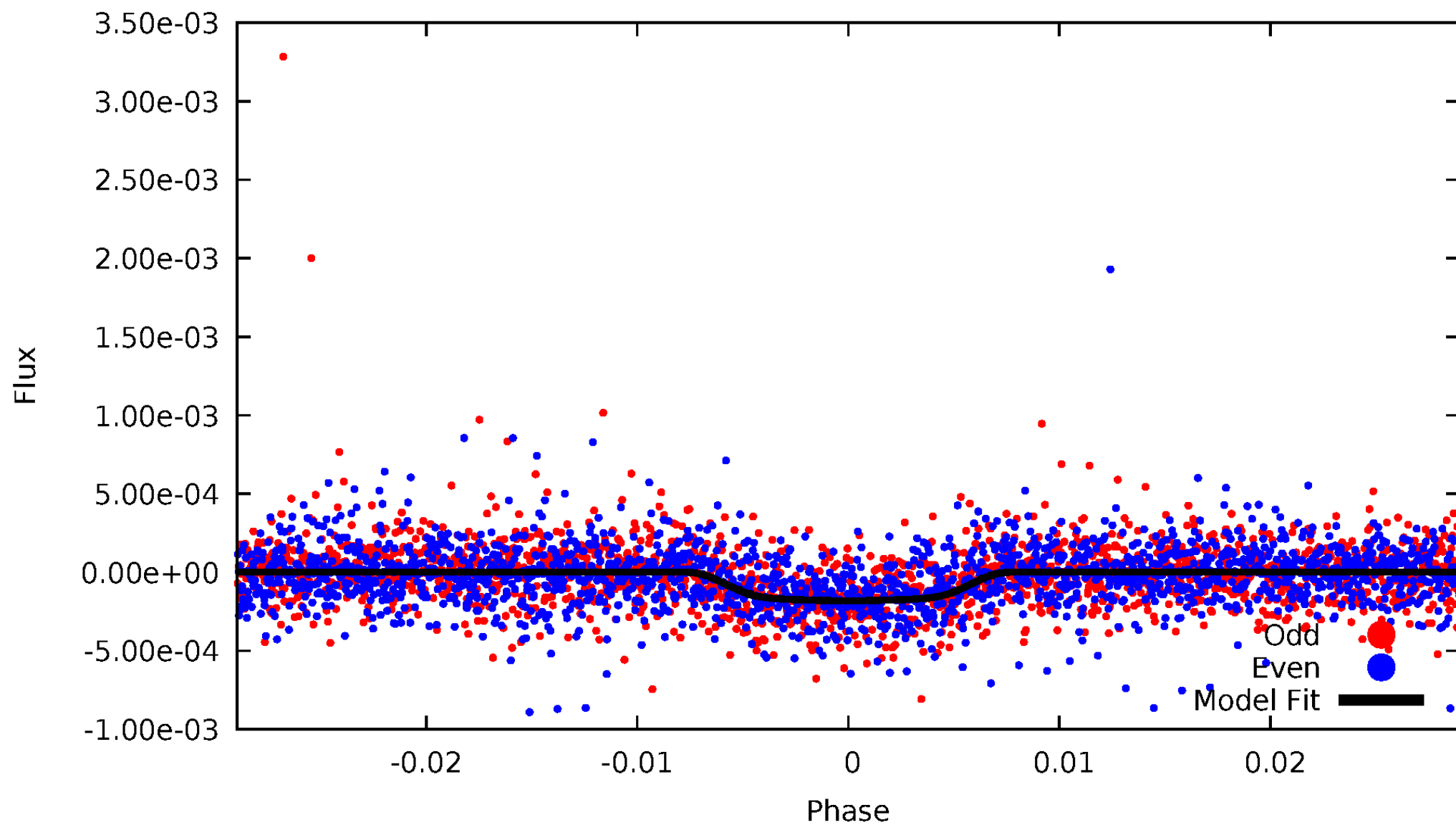


# TCE 011069176-01



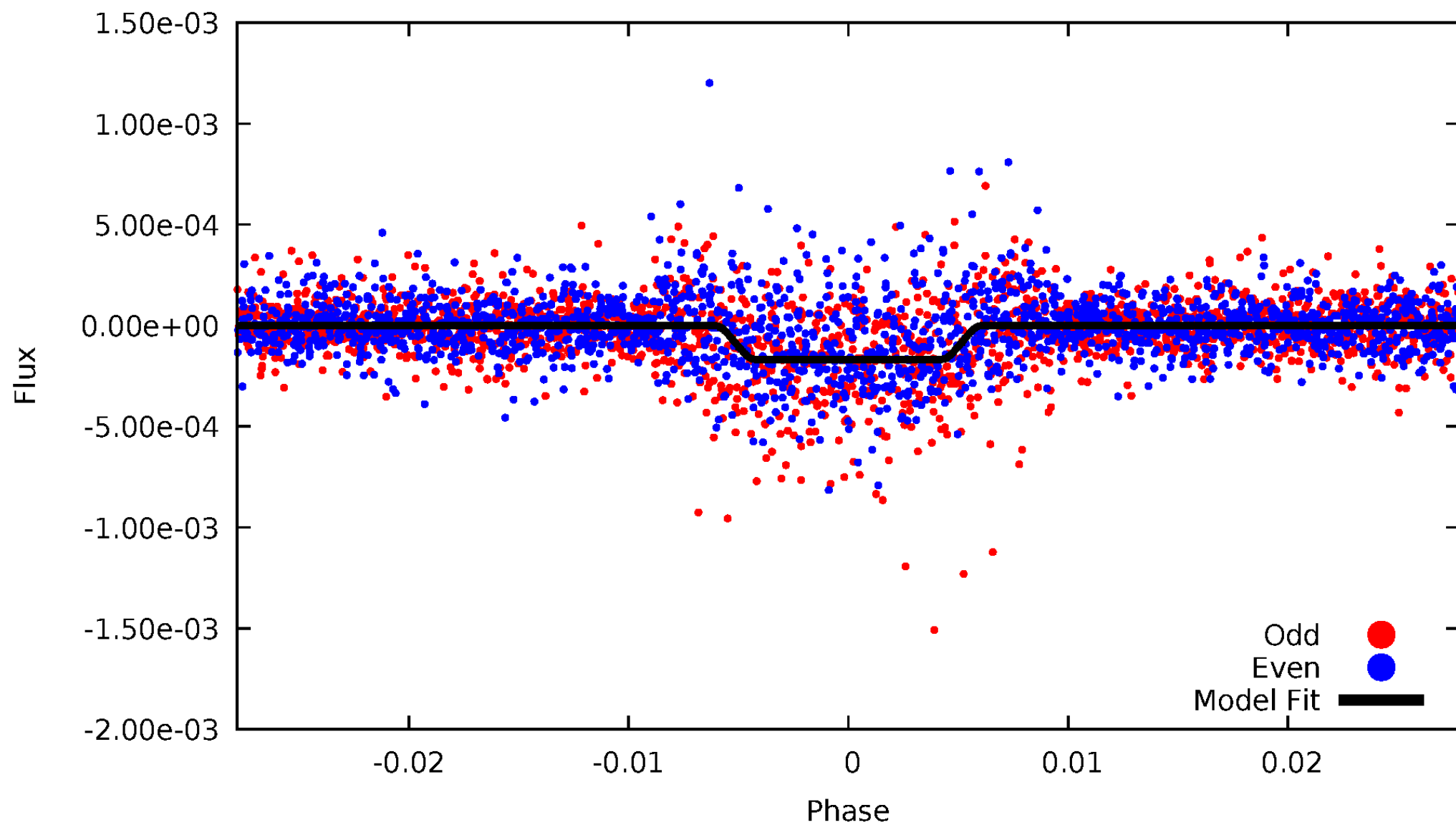
# DV Odd/Even

TCE 011069176-01



# ALT Odd/Even

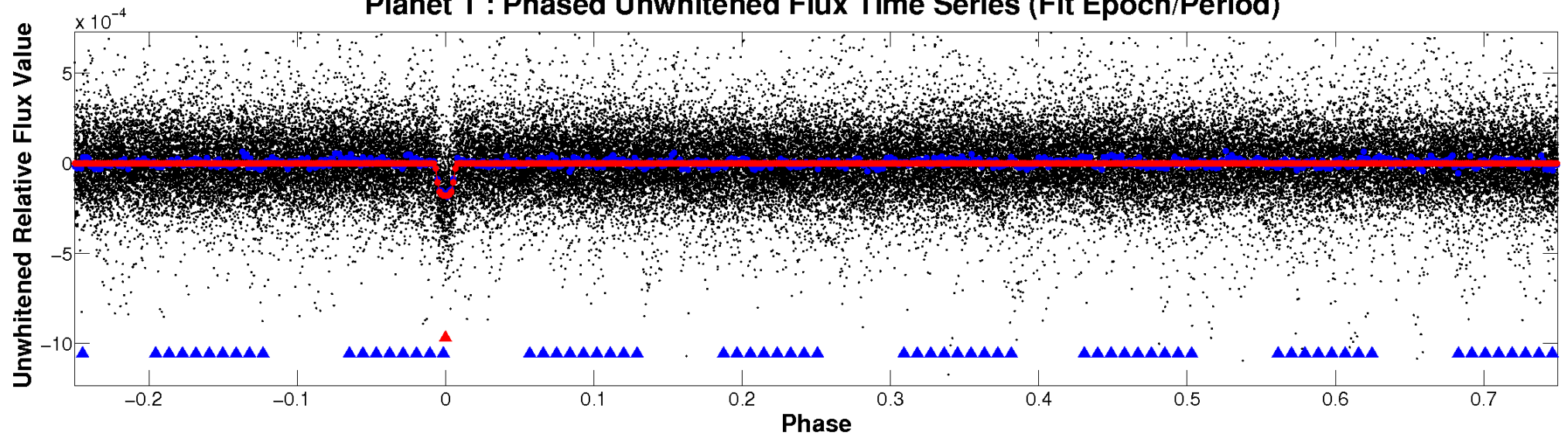
TCE 011069176-01



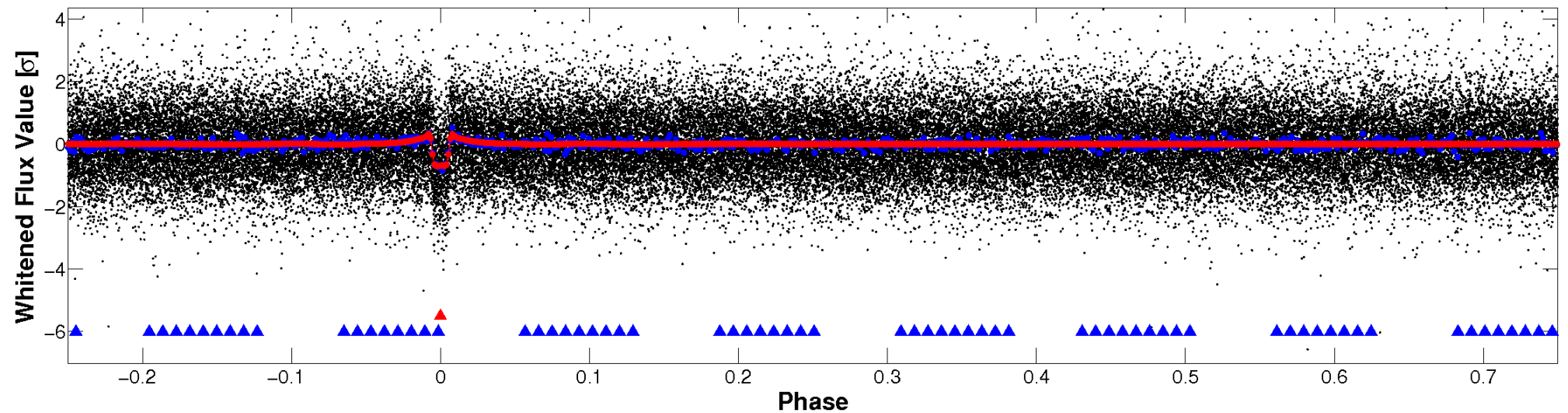


# Non-Whitened Vs. Whitened Light Curve

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

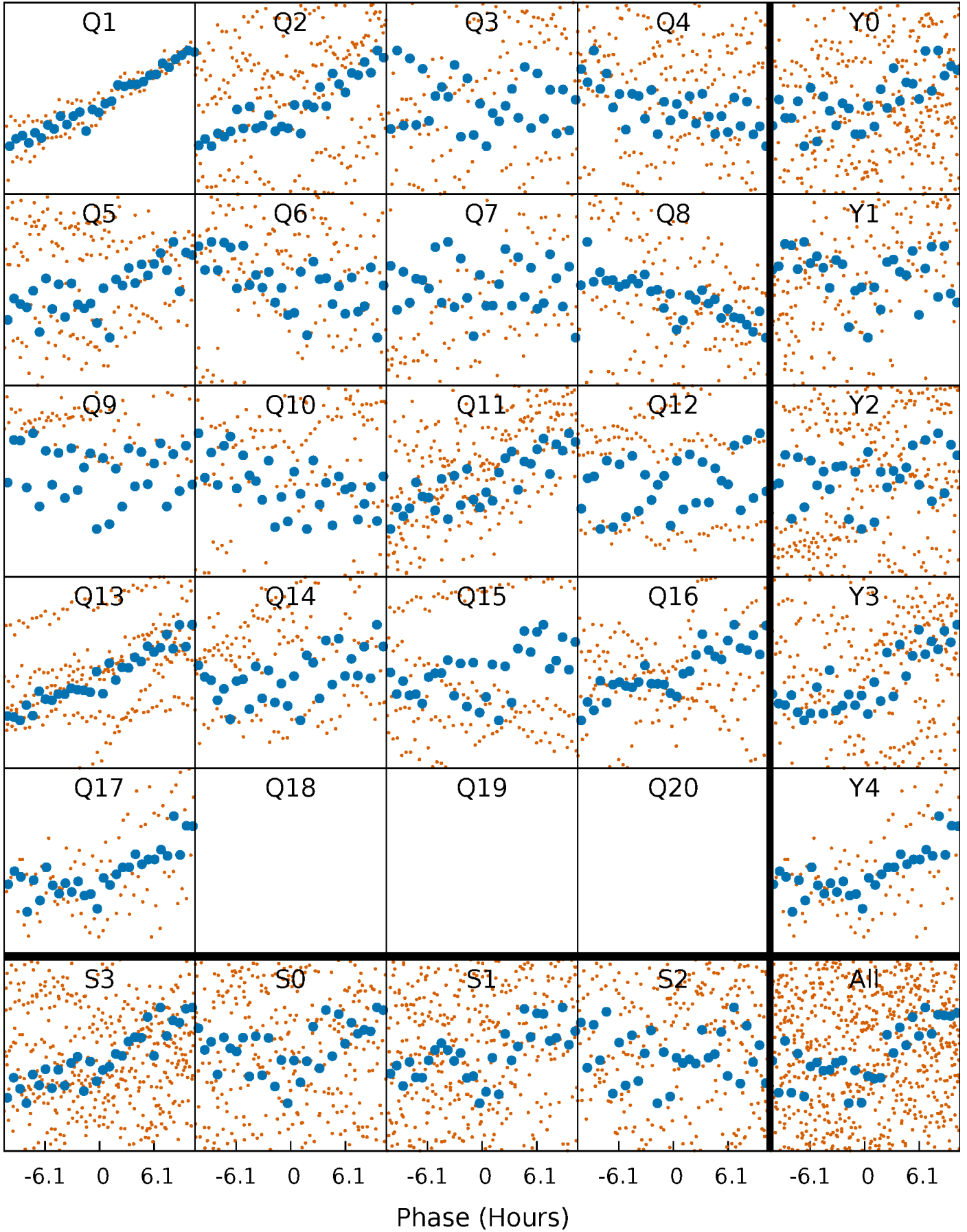


## Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)



# PDC Quarter-Phased Transit Curves

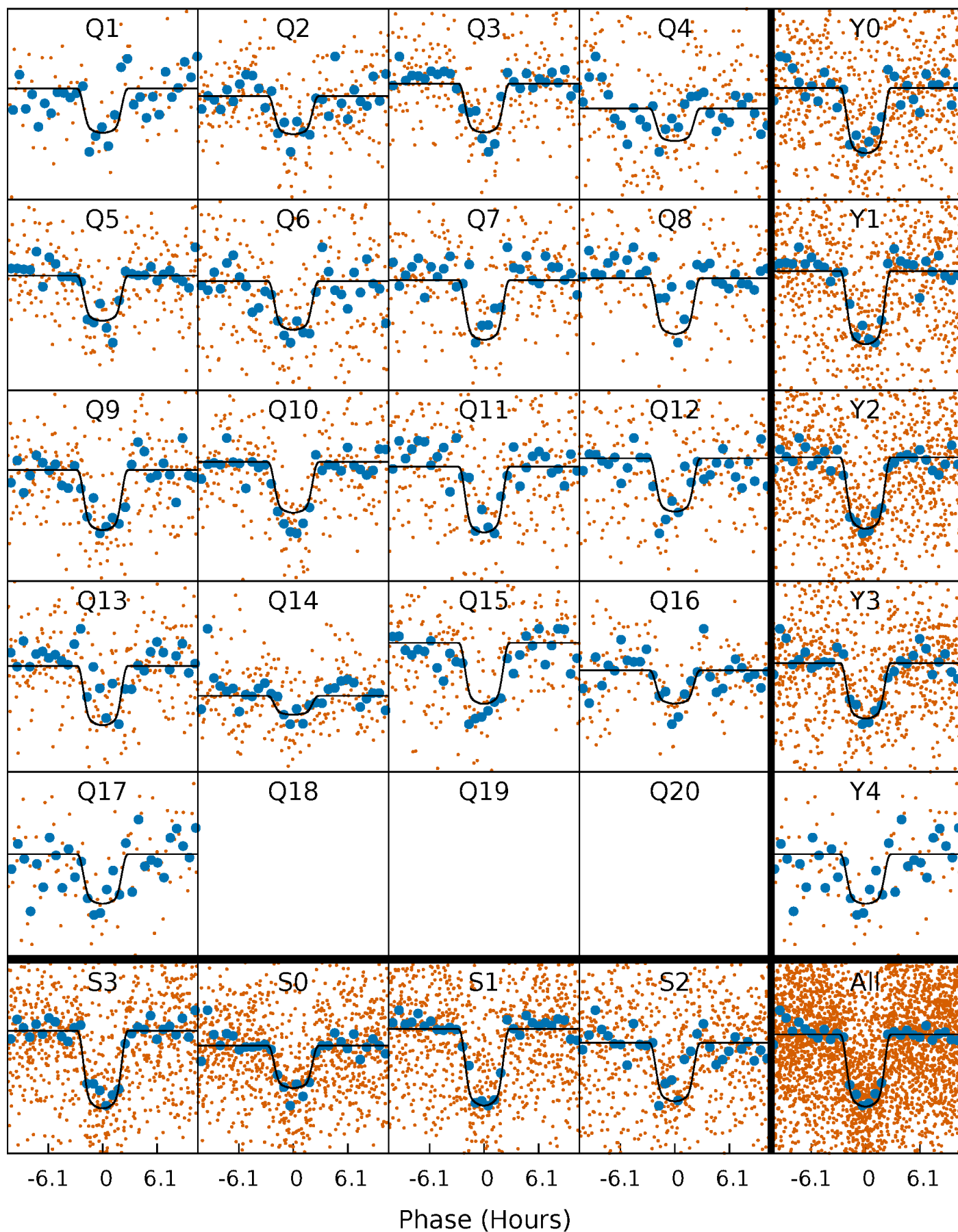
TCE 011069176-01 P= 15.378869 Days  $T_0=143.409171$  (BKJD)





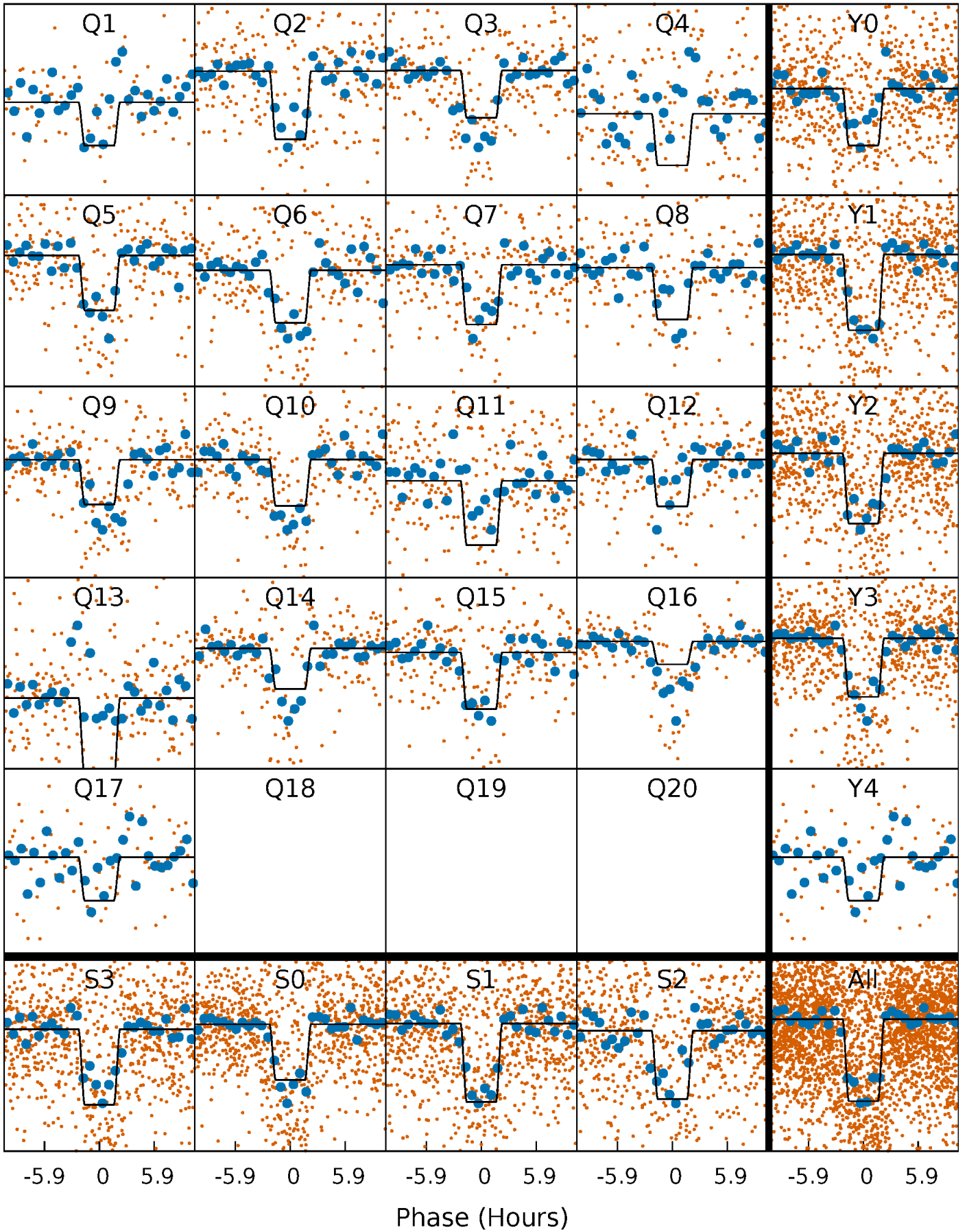
# DV Quarter-Phased Transit Curves

TCE 011069176-01 P= 15.378869 Days  $T_0=143.409171$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

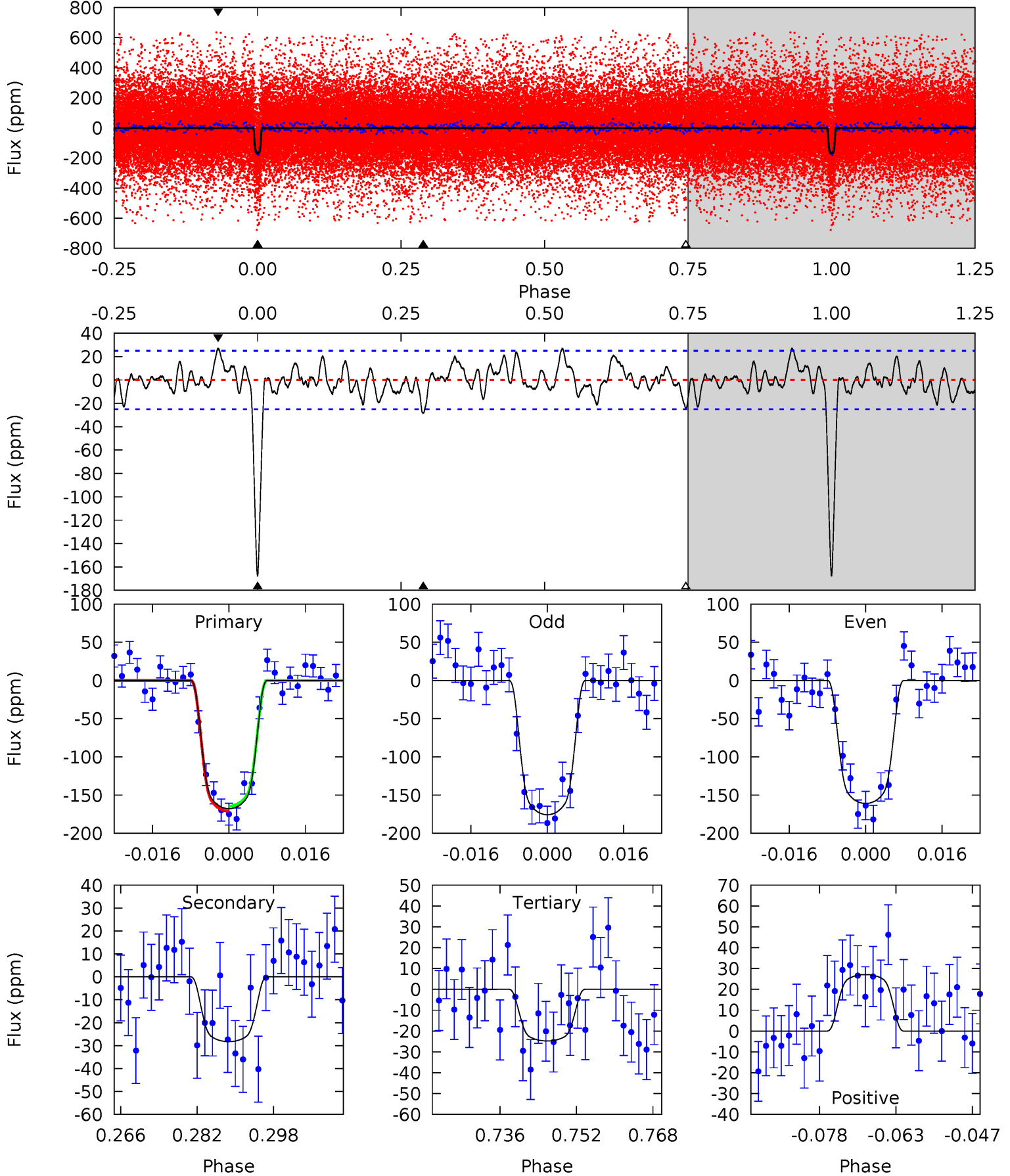
TCE 011069176-01 P= 15.378623 Days  $T_0=143.421054$  (BKJD)



# DV Model-Shift Uniqueness Test

011069176-01,  $P = 15.378869$  Days,  $E = 128.030302$  Days

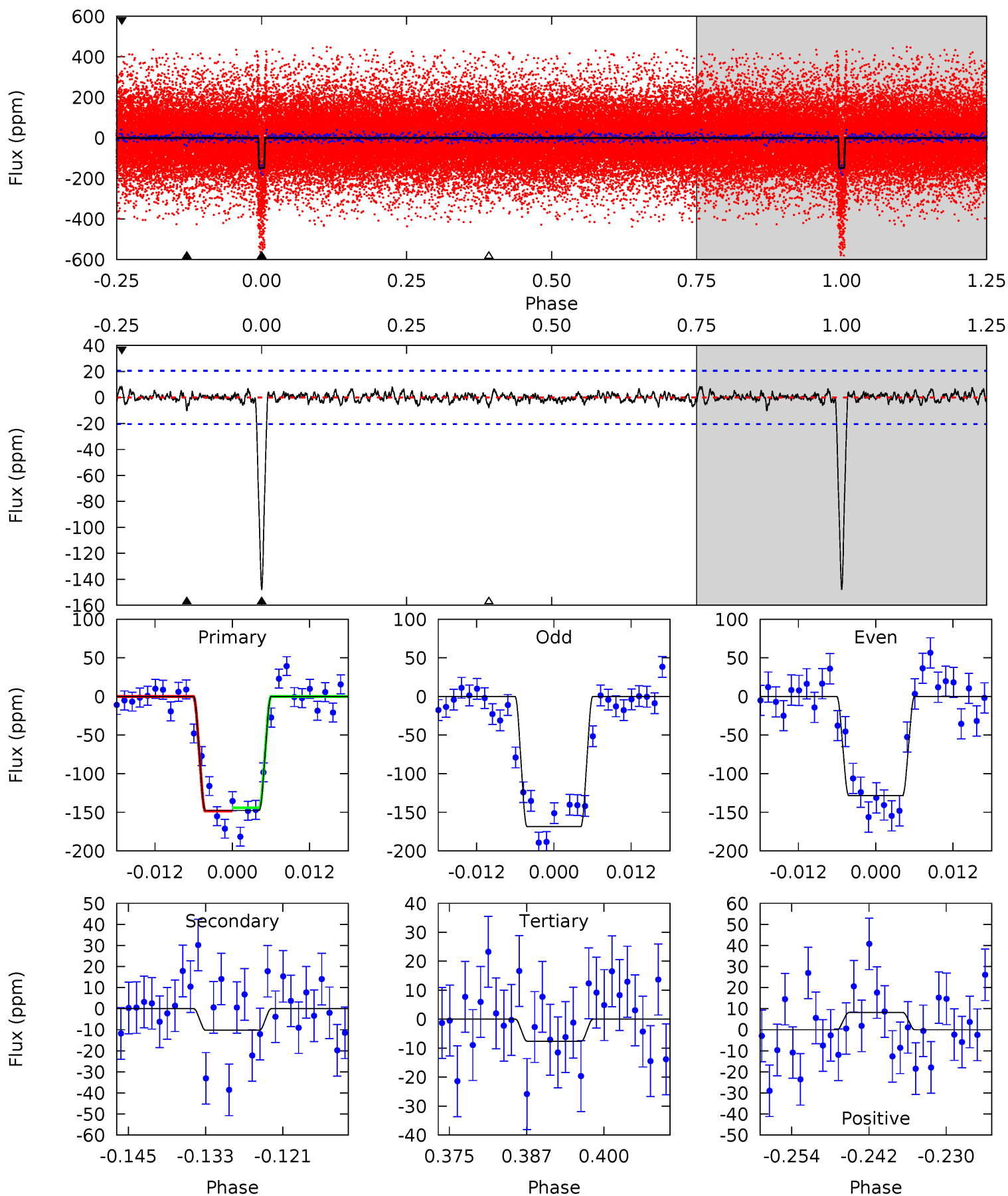
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
33.2	5.59	4.89	5.36	4.94	2.42	1.88	28.3	27.8	0.70	0.23	1.47	1.00	0.14	0.64



# Alt Model-Shift Uniqueness Test

011069176-01,  $P = 15.378623$  Days,  $E = 128.042431$  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
35.9	2.50	1.86	1.99	4.99	2.51	0.61	34.1	34.0	0.64	0.50	4.91	1.01	0.05	0.55



### Stellar Parameters For KIC 011069176

	$T_{\text{eff}} (K)$	$\log(g)$	$[\text{Fe}/\text{H}]$	$R (R_{\odot})$	$M (M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$5817^{+78}_{-78}$	$3.877^{+0.293}_{-0.098}$	$0.180^{+0.150}_{-0.150}$	$2.153^{+0.272}_{-0.760}$	$1.276^{+0.113}_{-0.210}$	$0.180^{+0.364}_{-0.056}$
	+1%/-1%	+8%/-3%	+83%/-83%	+13%/-35%	+9%/-16%	+202%/-31%
Source	SPE90	FLK73	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 011069176-01 / KOI 2007.01

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$-28 \pm 5$	$3.77^{+0.39}_{-0.68}$	$1441^{+65}_{-122}$	$3725^{+117}_{-141}$	$19^{+8}_{-5}$
Alt.	$-10 \pm 4$	$3.00^{+0.35}_{-0.54}$	$1445^{+69}_{-132}$	$3384^{+203}_{-264}$	$11^{+6}_{-5}$

$T_{\text{max}}$  = 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

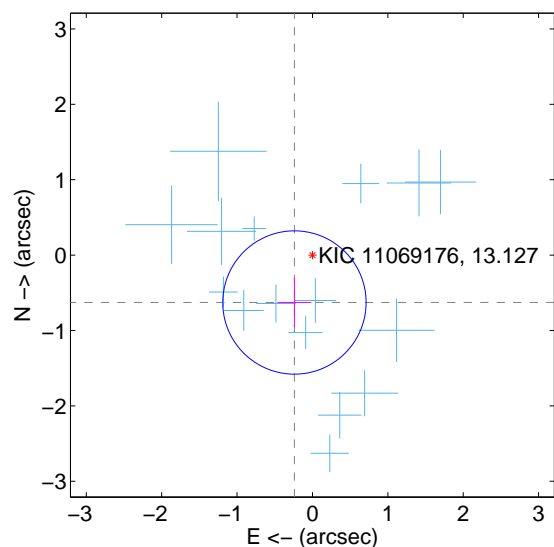
Supplemental centroid analysis for 011069176-01. Kepler magnitude: 13.13. Transit SNR 19.69

There are 17 quarters with good PRF difference image offsets

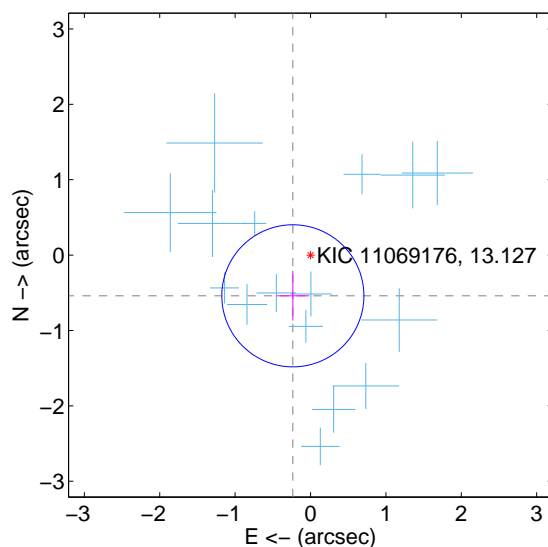
The direct PRF centroid is offset from the target star catalog position by about 0.14 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.673 \pm 0.317$	2.12	$0.239 \pm 0.225$	$-0.629 \pm 0.328$
PRF-fit source offset from KIC position	$0.589 \pm 0.314$	1.87	$0.234 \pm 0.217$	$-0.540 \pm 0.329$
photometric centroid source offset	$1.33 \pm 0.45$	2.97	$-1.29 \pm 0.45$	$0.32 \pm 0.44$

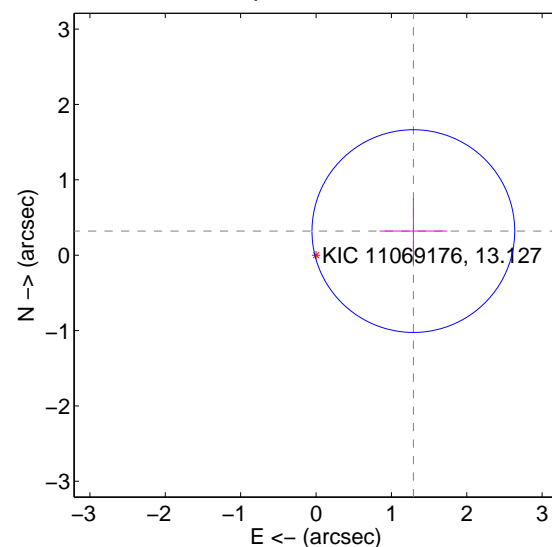
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position

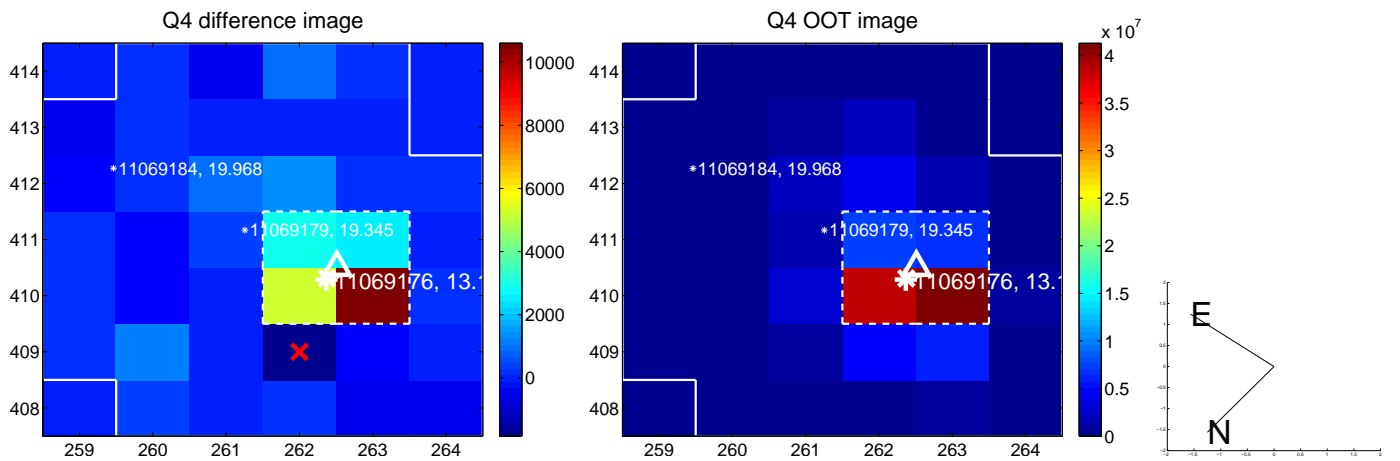
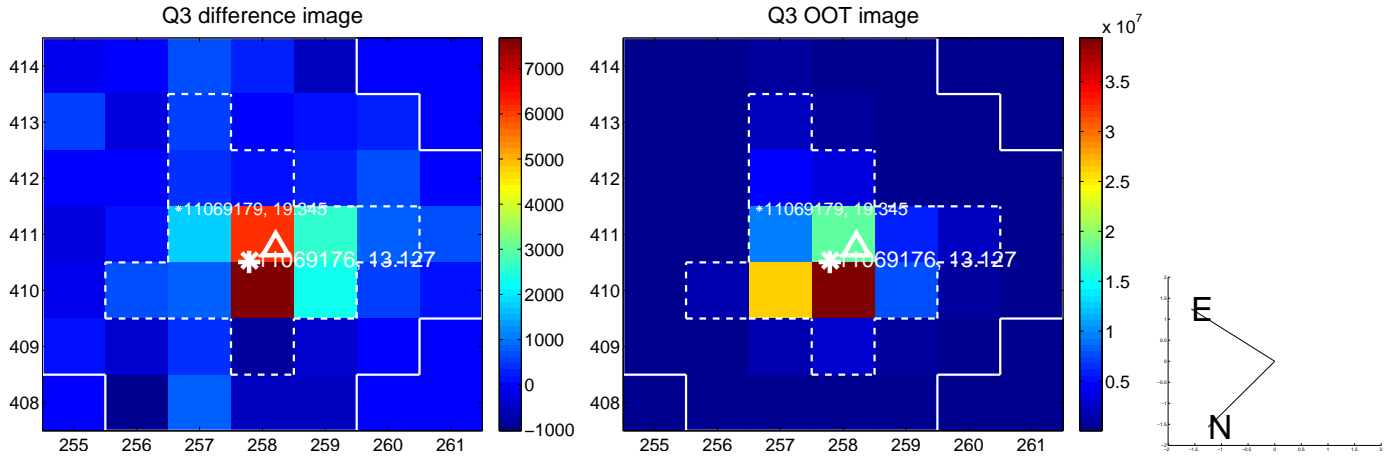
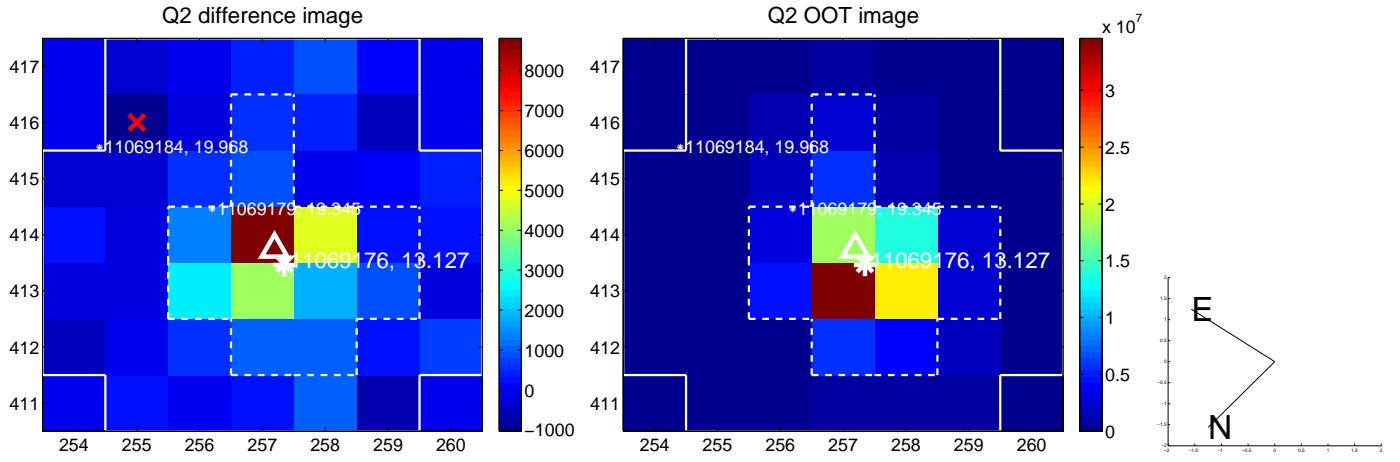
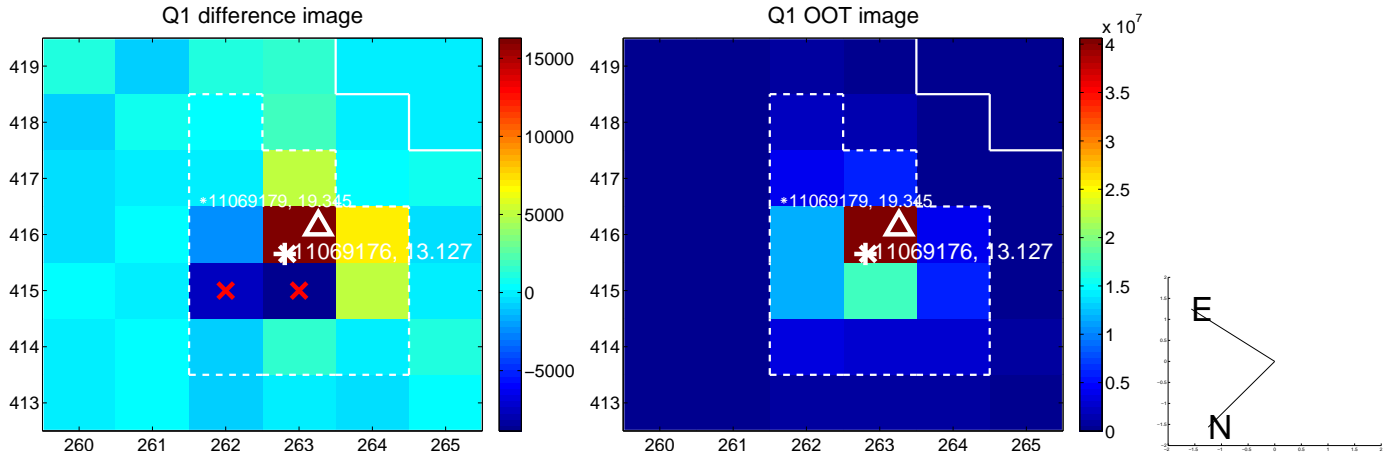


offset from photometric centroids

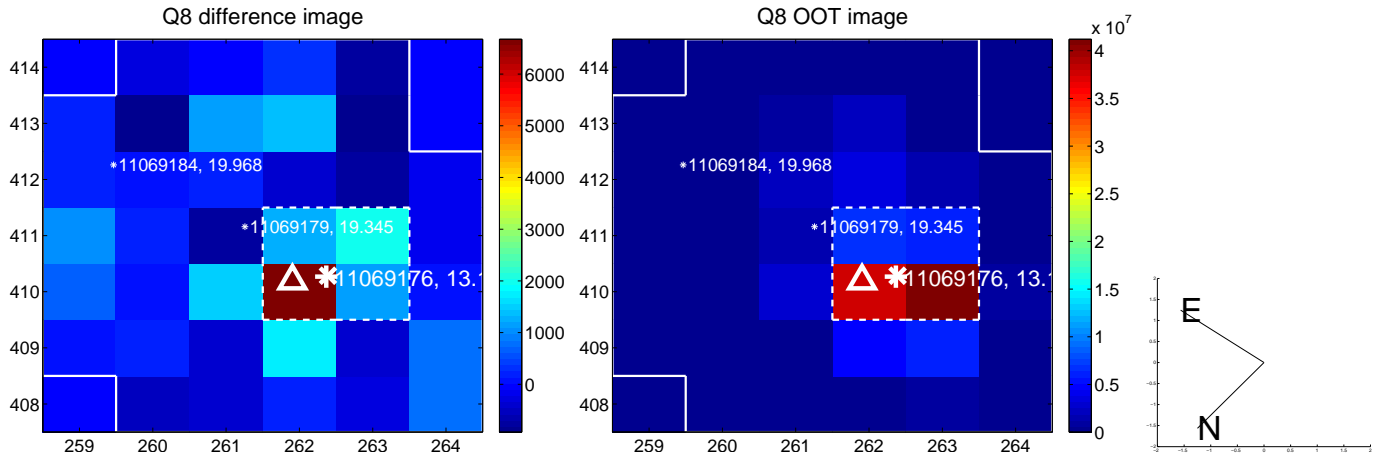
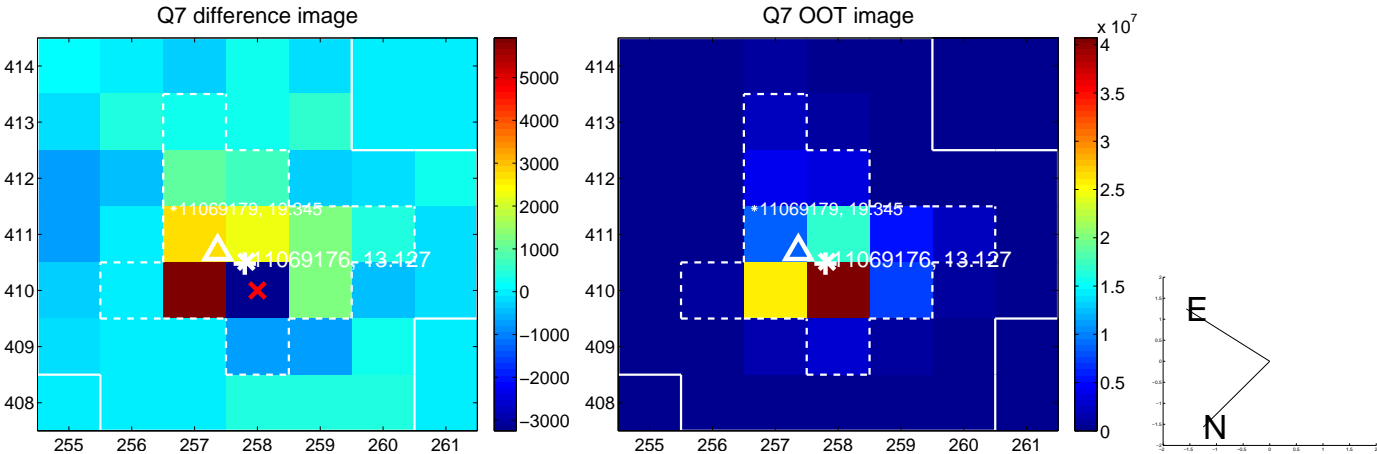
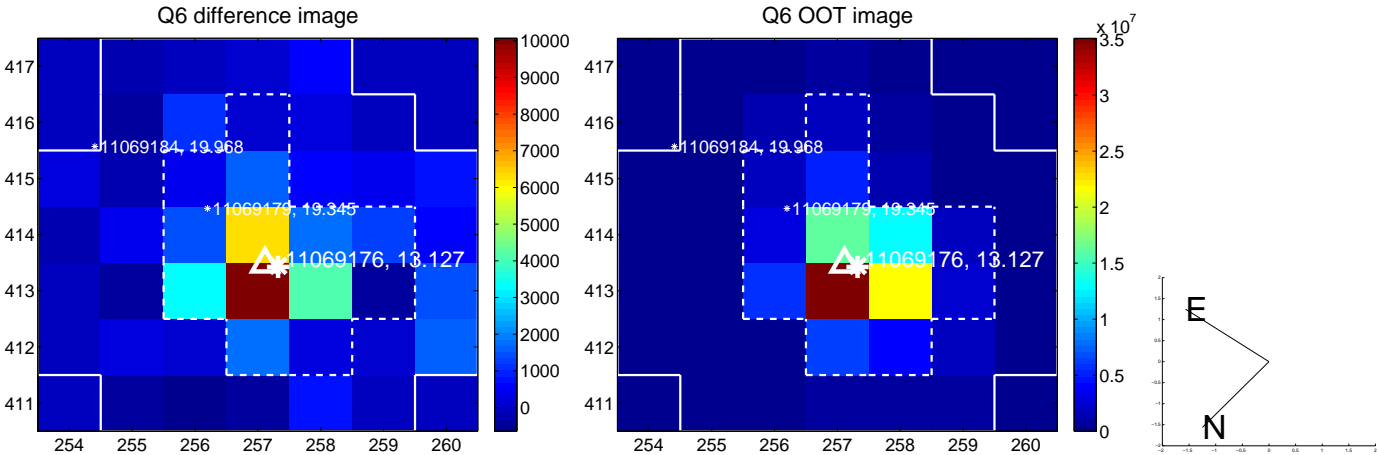
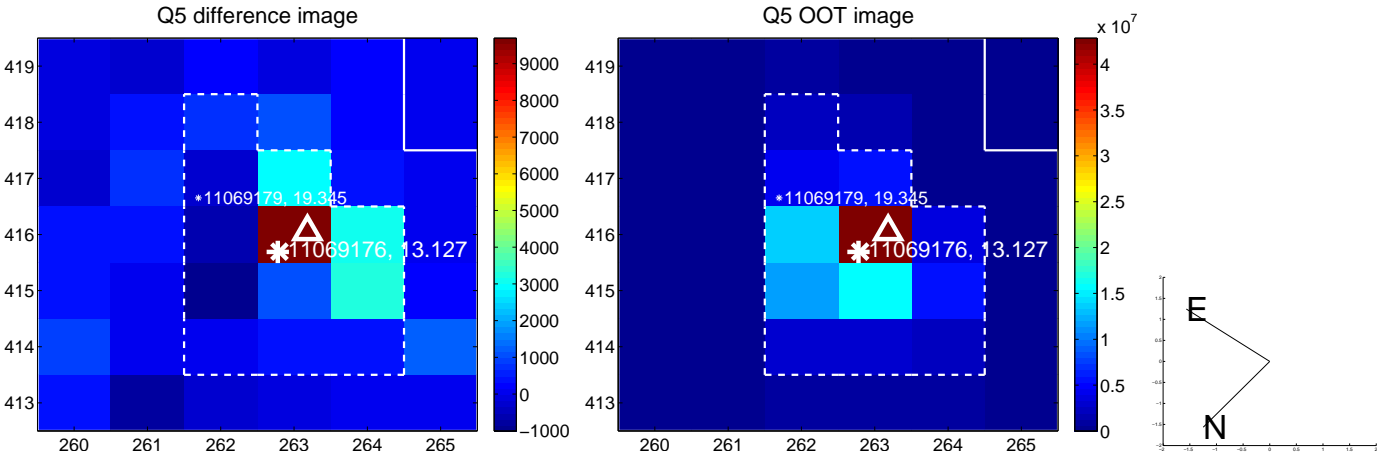


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses:** good quarterly centroid offsets; **Vermillion crosses:** bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

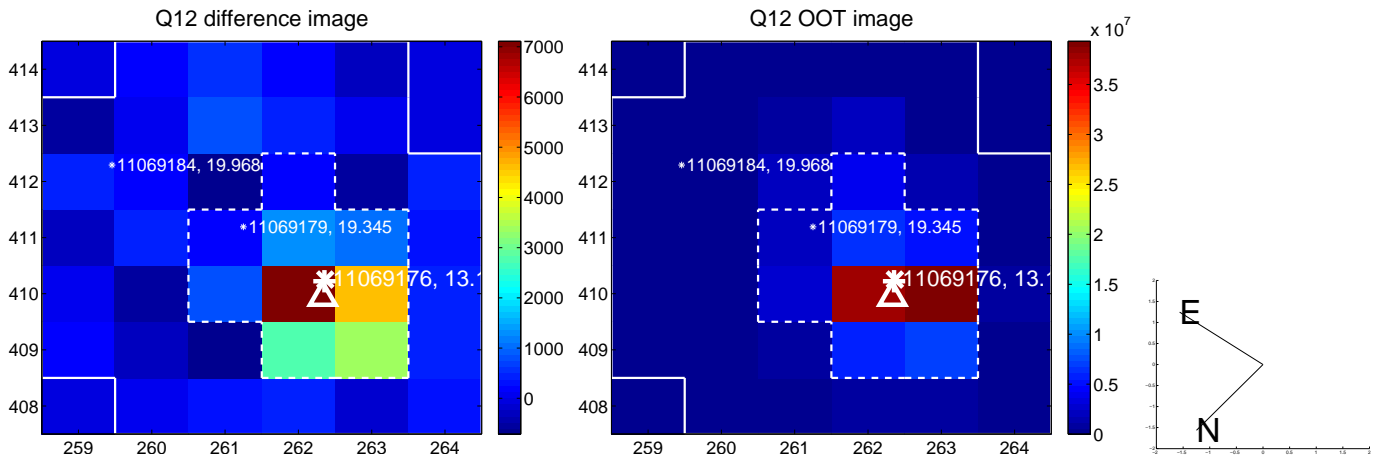
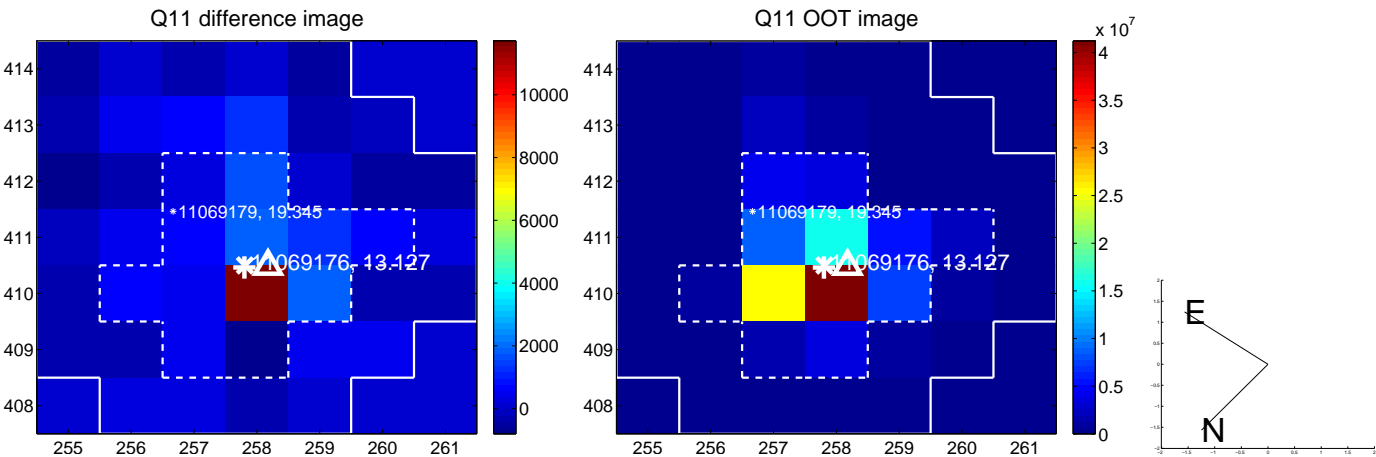
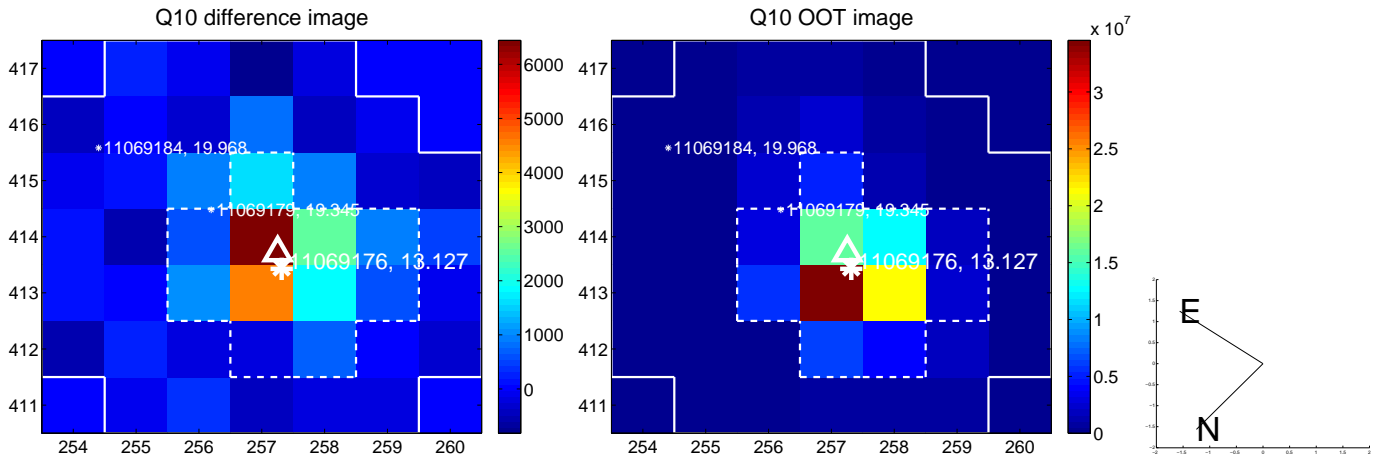
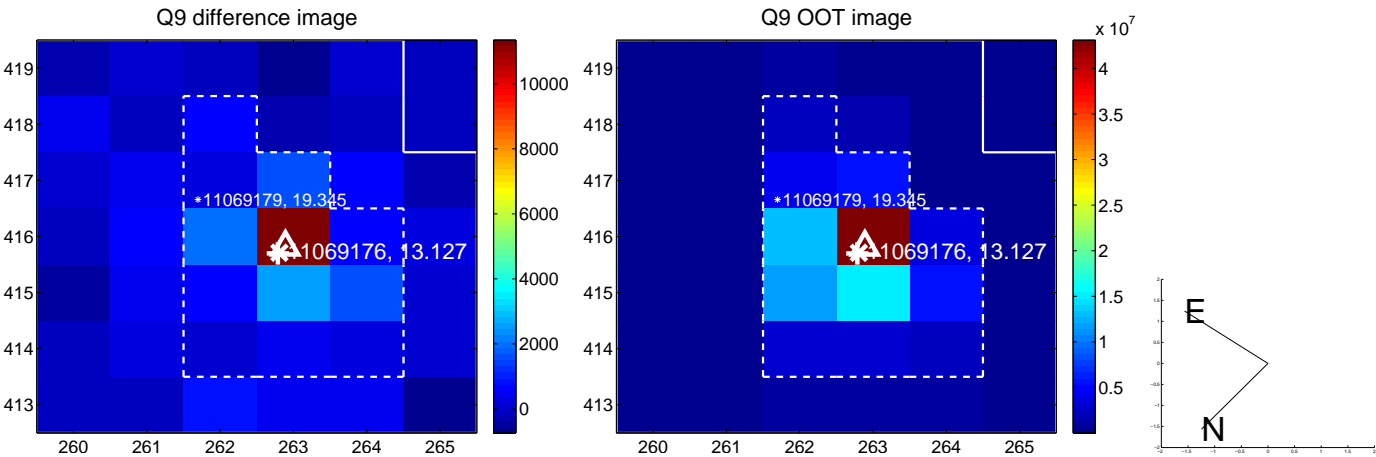
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



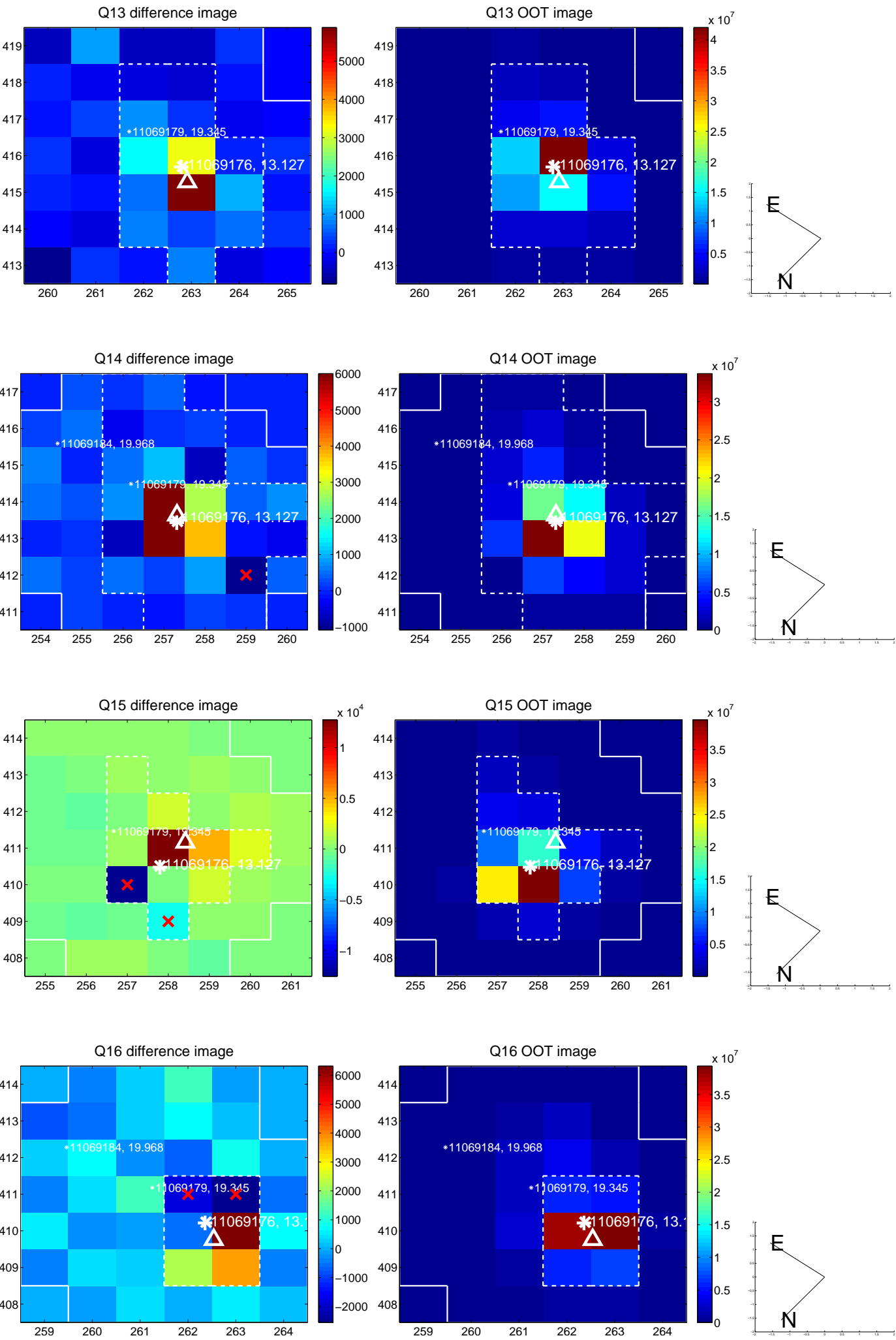
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

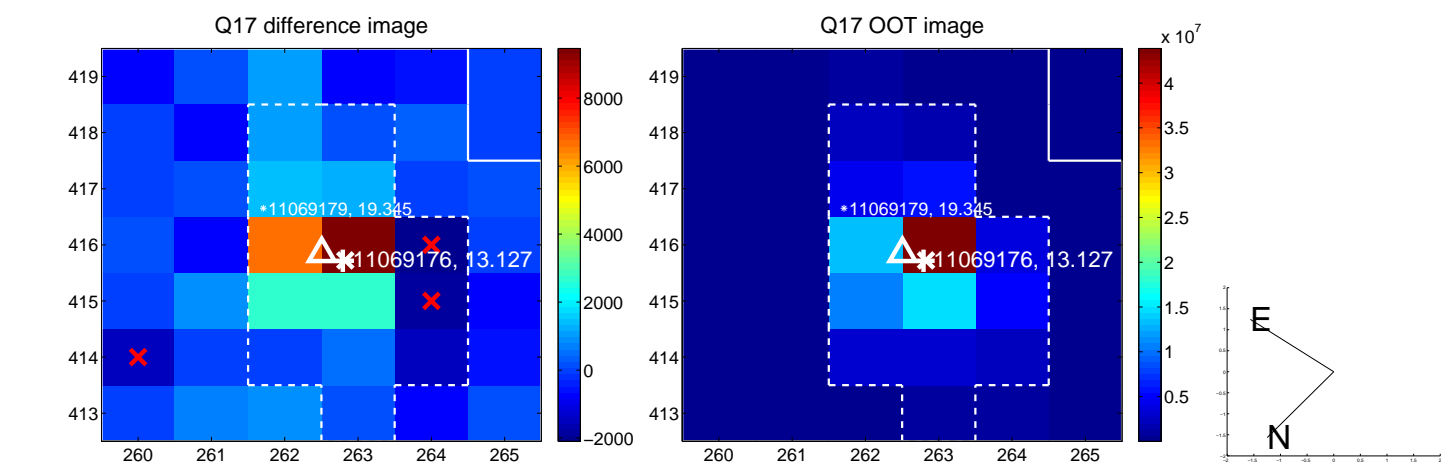


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

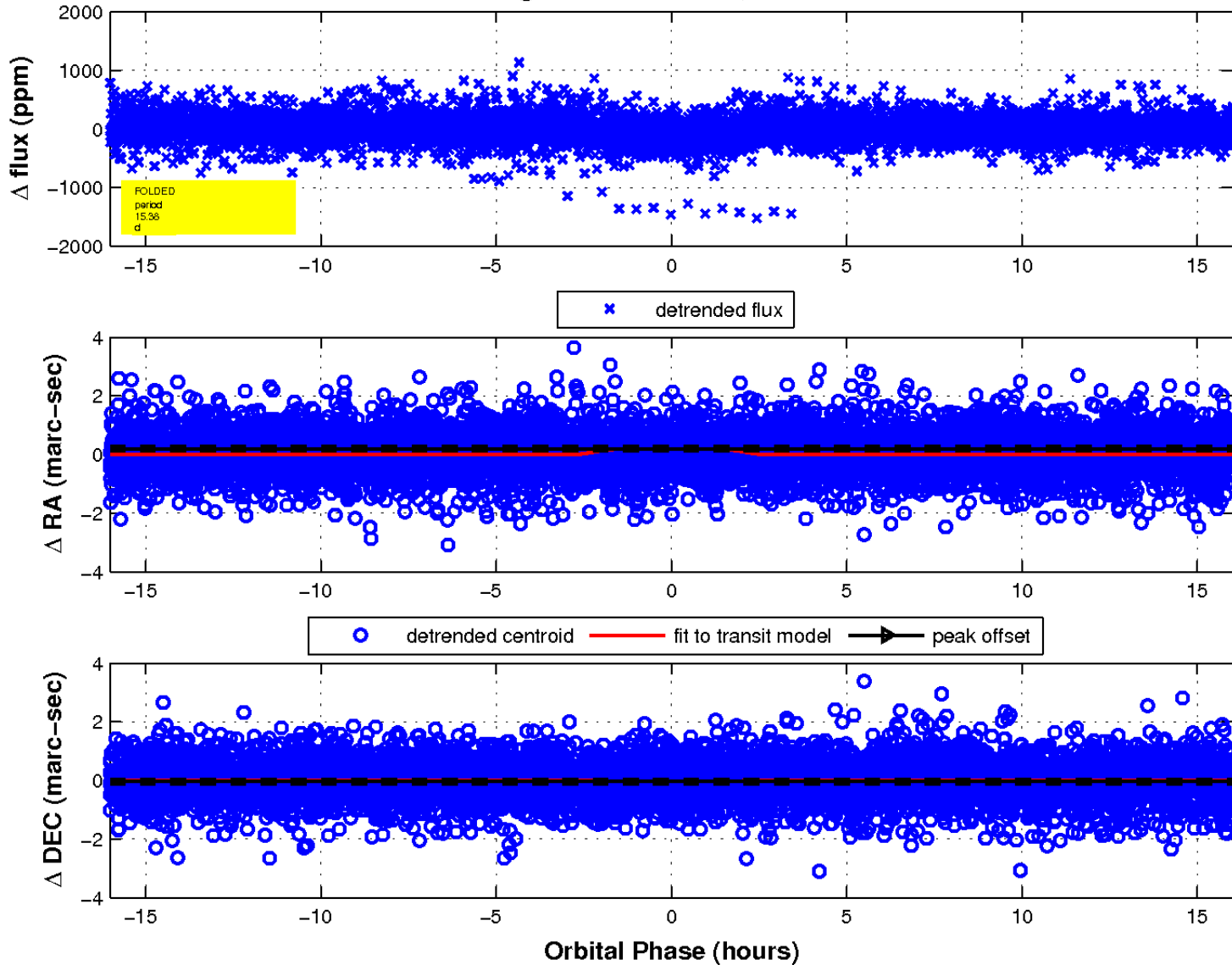




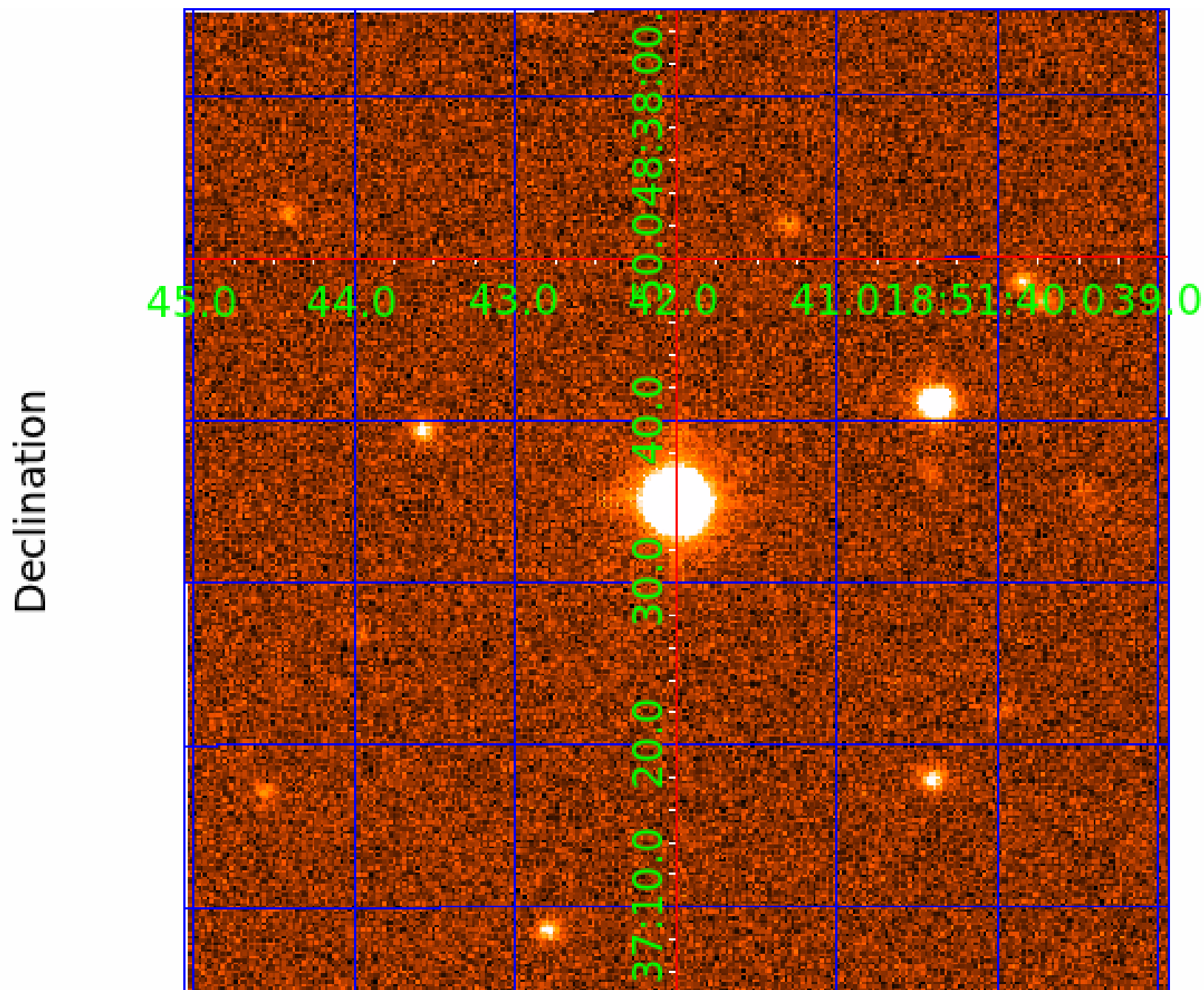
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\Delta$ : difference centroid. red  $\times$ : large negative pixel value.



fluxWeightedCentroids, Planet 1 of 2



UKIRT Image



# KIC 011069176

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
011069176-01	OBS	2007.01	15.378869	143.409171	181.3	5.342	18.8	19.7	2.15	5817	3.82	276.16
011069176-02	OBS	2007.02	21.128556	149.275988	193.2	3.949	15.7	17.1	2.15	5817	3.52	180.81

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
011069176-01	OBS	PC	1.00	0	0	0	0	NO_COMMENT
011069176-02	OBS	PC	0.97	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.

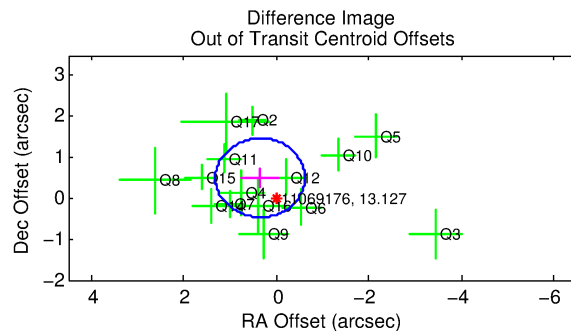
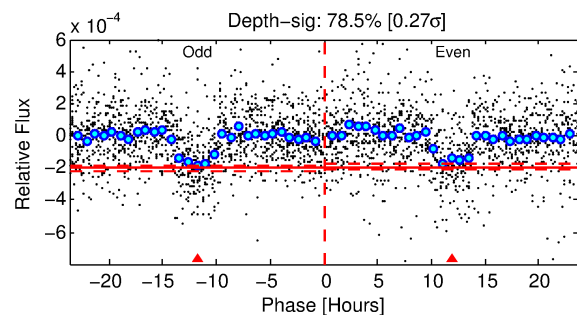
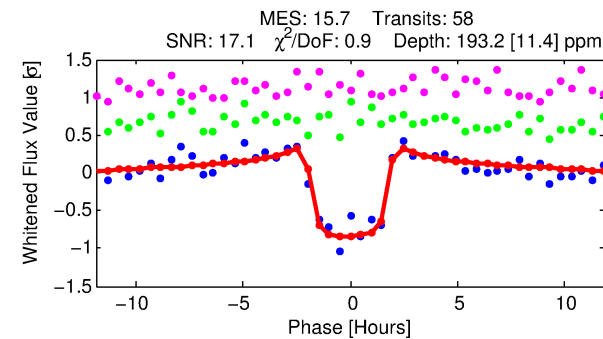
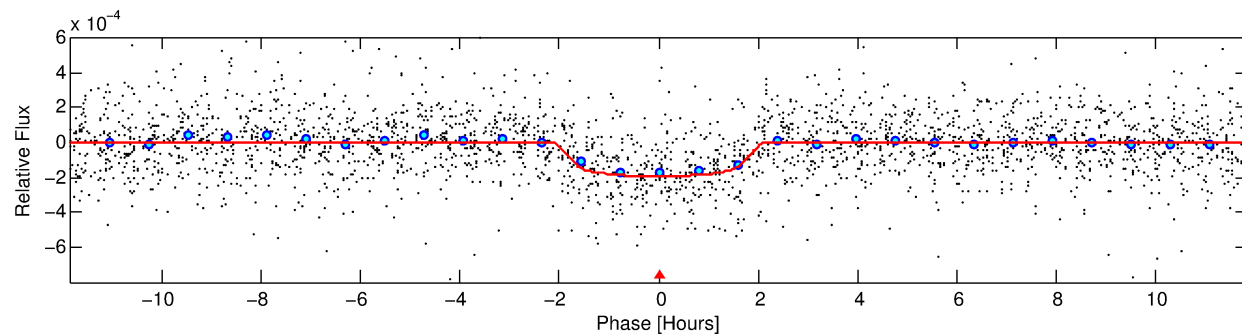
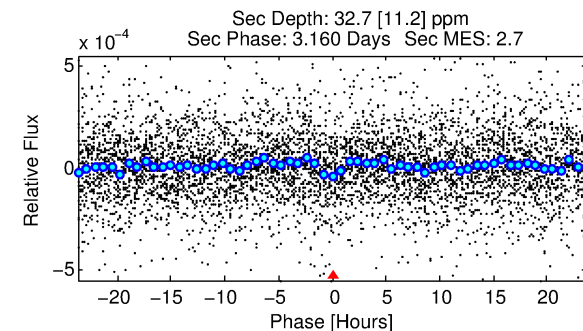
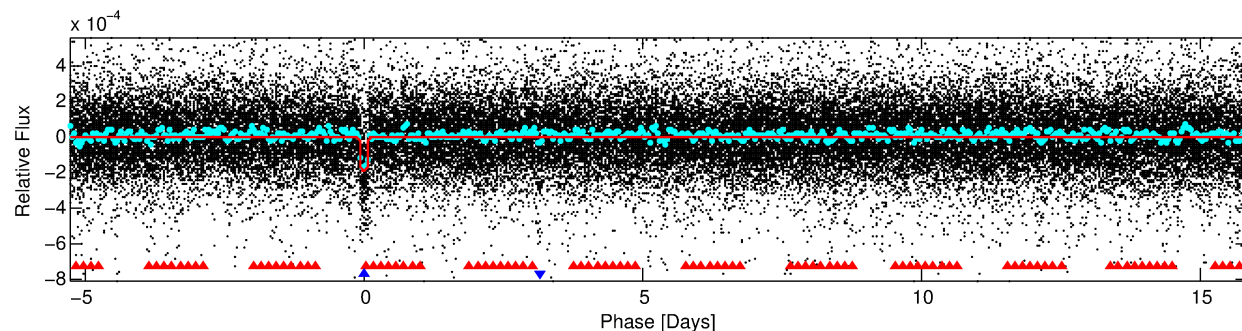
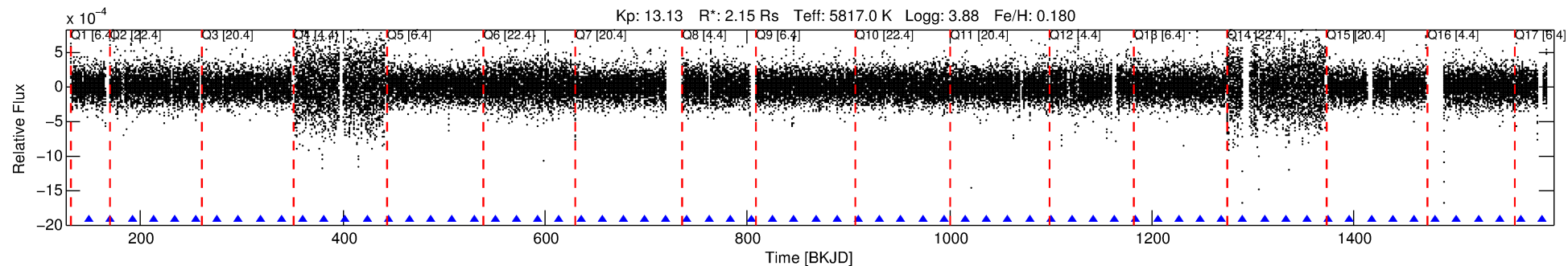
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 011069176-02

No Significant Match Found

# DV One-Page Summary

KIC: 11069176 Candidate: 2 of 2 Period: 21.129 d  
KOI: K02007.02 Corr: 0.979



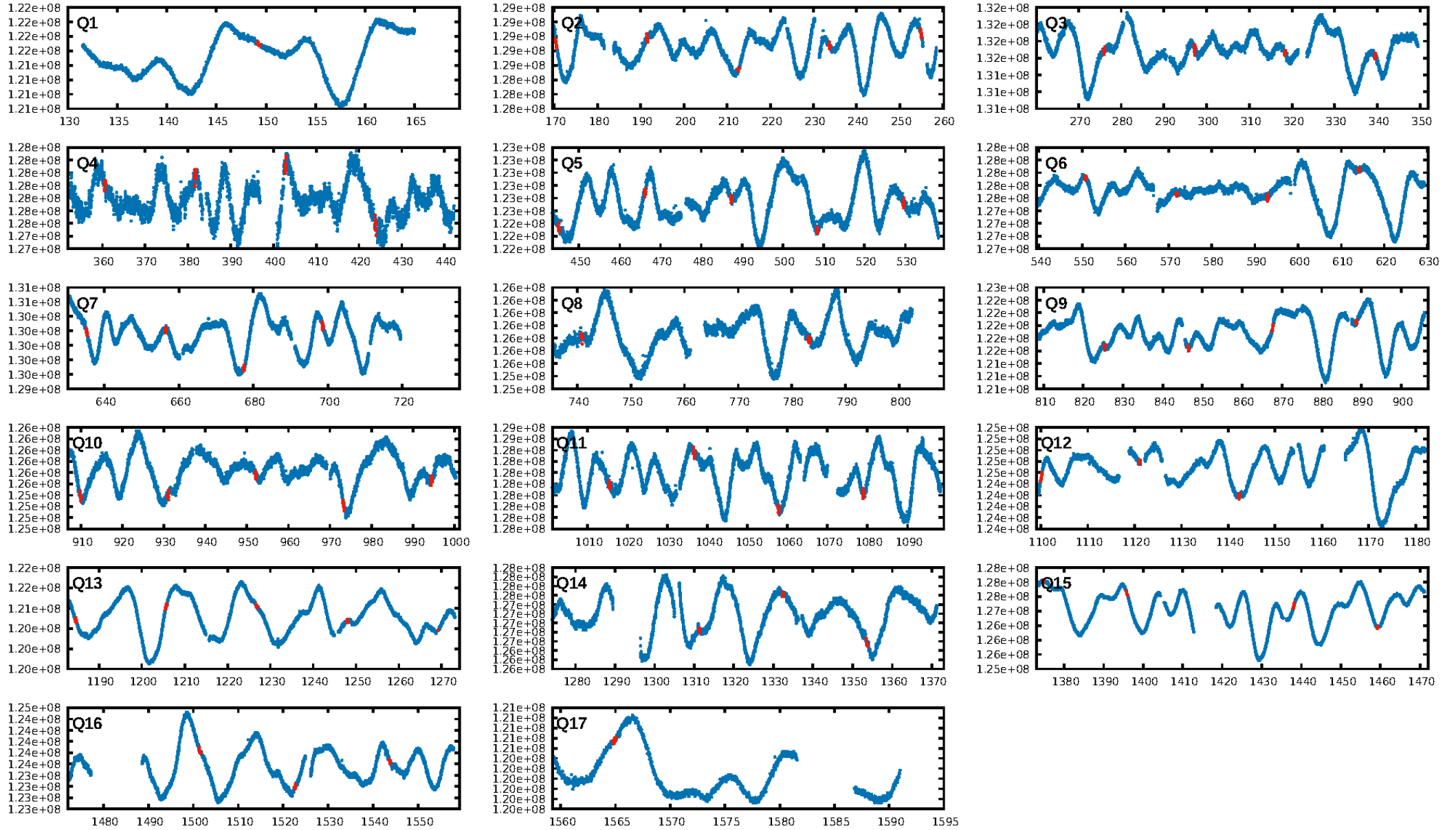
## DV Fit Results:

Period = 21.12856 [0.00010] d  
Epoch = 149.2760 [0.0035] BKJD  
Rp/R\* = 0.0150 [0.0031]  
a/R\* = 20.06 [19.48]  
b = 0.89 [0.23]  
Seff = 180.81 [92.29]  
Teq = 935 [119] K  
Rp = 3.52 [1.44] Re  
a = 0.1622 [0.0528] AU  
Ag = 38.17 [28.32] [1.31σ]  
Teffp = 3593 [488] K [5.29σ]

## DV Diagnostic Results:

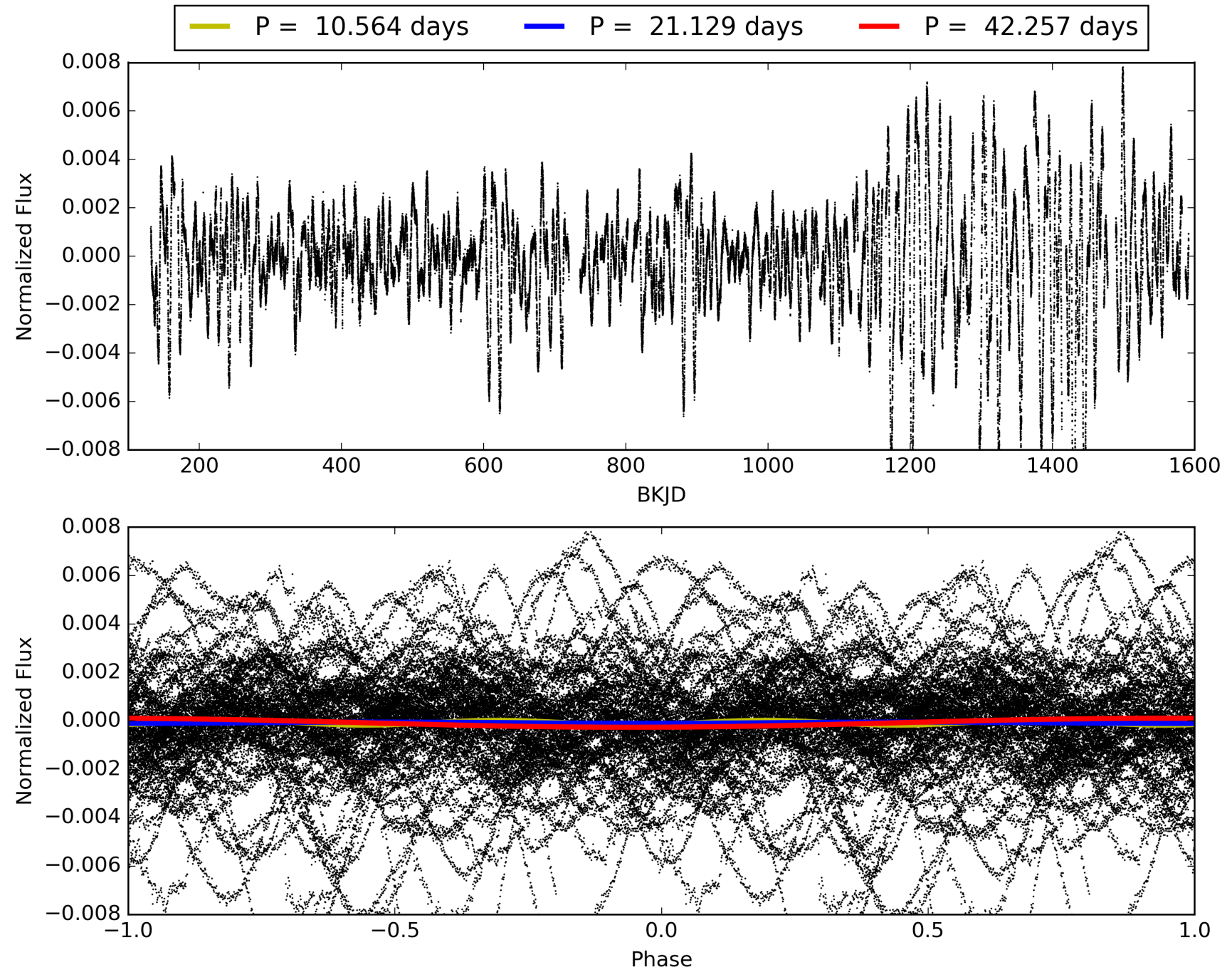
ShortPeriod-sig: 100.0% [20.77σ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: 89.7%  
ModelChiSquareGof-sig: 100.0%  
Bootstrap-pfa: 1.13e-48  
RollingBand-fgt: 1.00 [56/56]  
**GhostDiagnostic-chr: 0.8945**  
Centroid-sig: 29.8%  
Centroid-so: 0.578 arcsec [1.04σ]  
OotOffset-rm: 0.613 arcsec [1.90σ]  
OotOffset-st: 4/4/4/3 [15]  
KicOffset-rm: 0.689 arcsec [2.21σ]  
KicOffset-st: 4/4/4/3 [15]  
DiffImageQuality-fgm: 0.93 [14/15]  
DiffImageOverlap-fno: 1.00 [17/17]

# TCE 011069176-02, PDC Light Curves



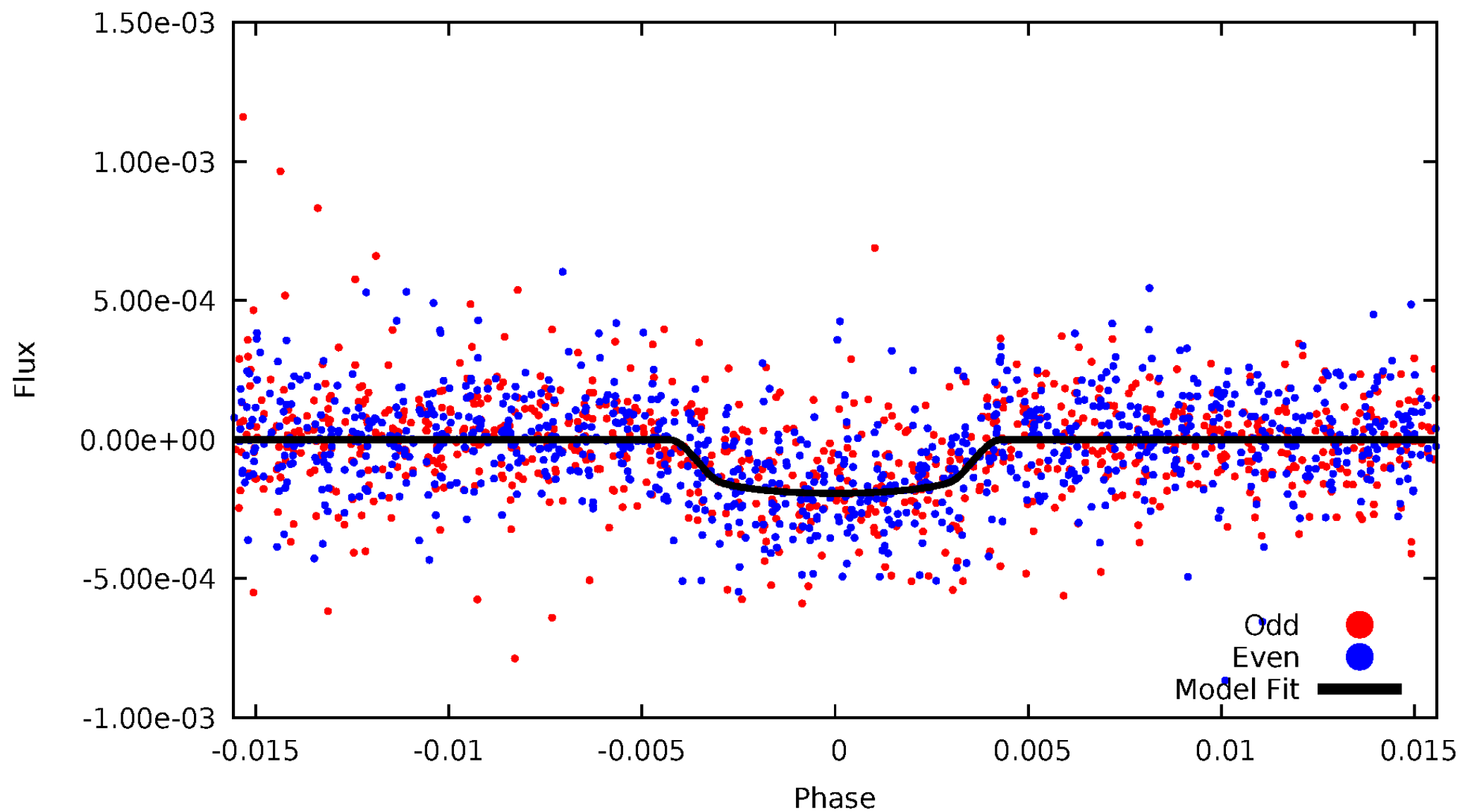


# TCE 011069176-02



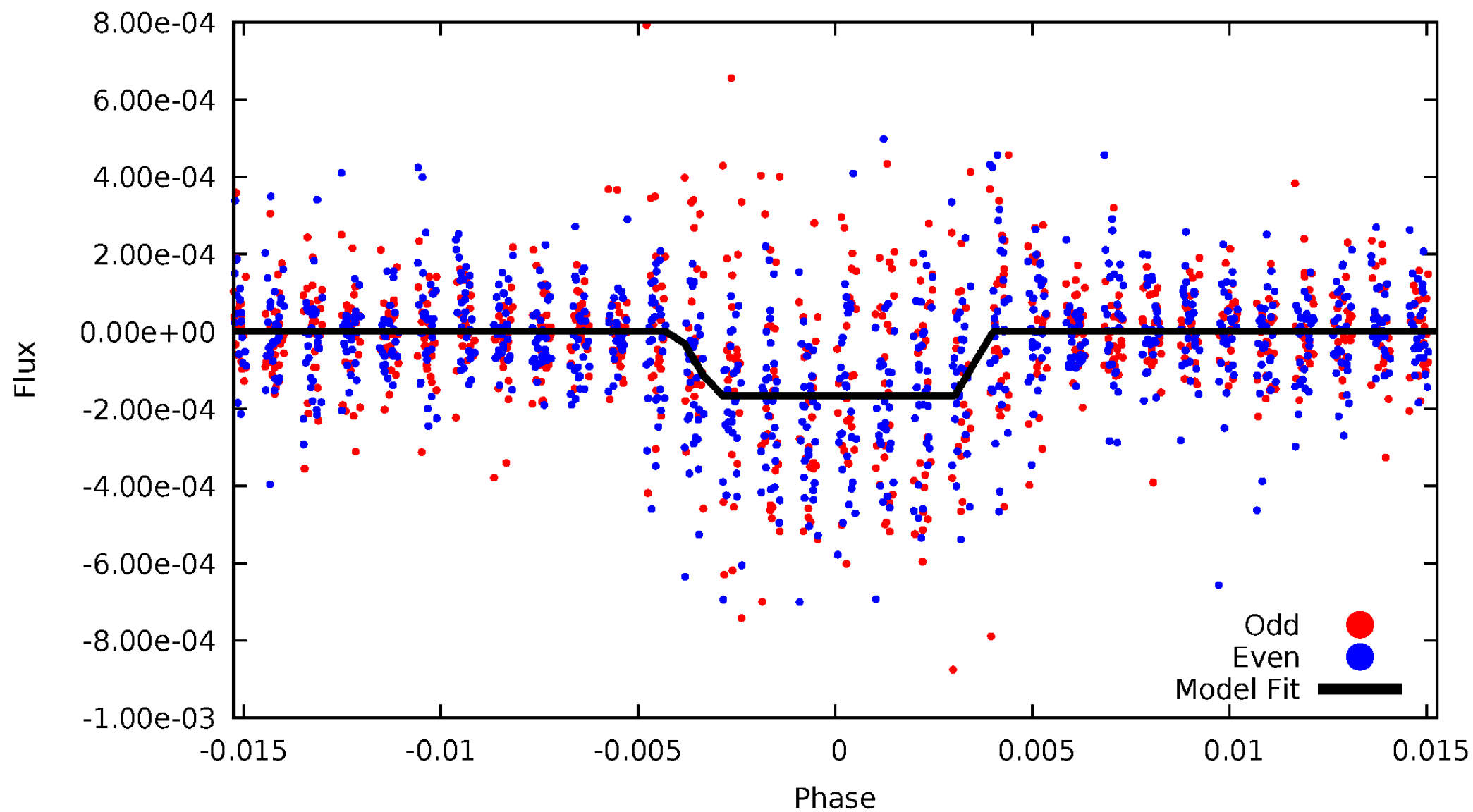
# DV Odd/Even

TCE 011069176-02



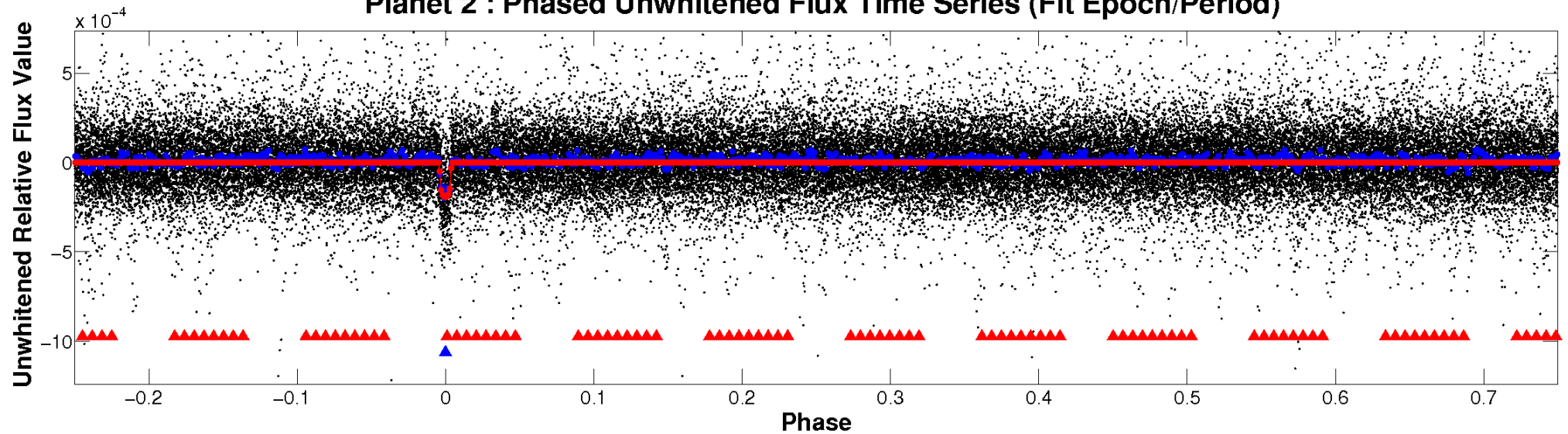
# ALT Odd/Even

TCE 011069176-02

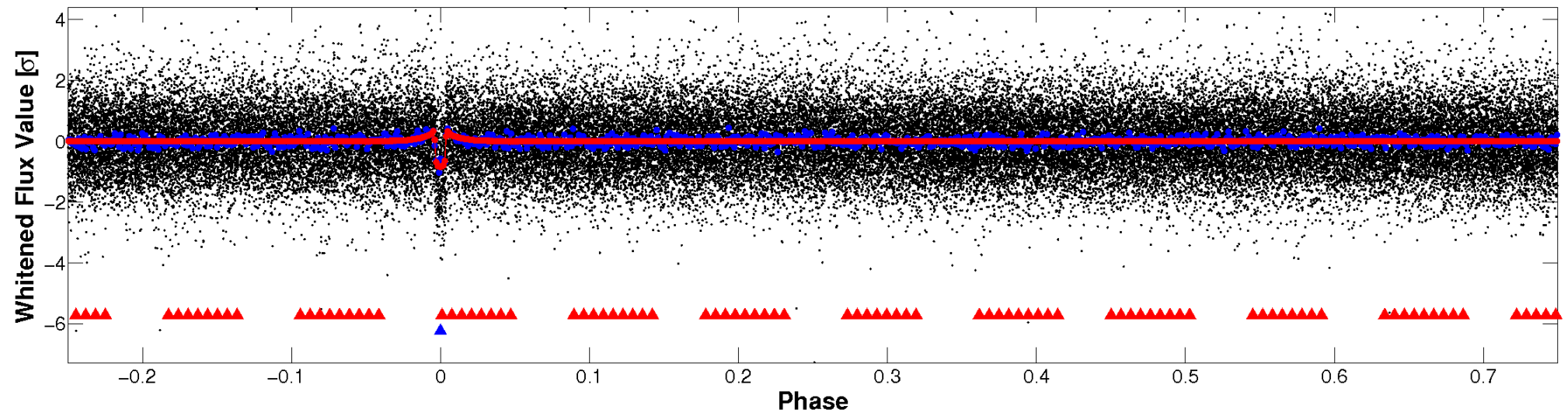


# Non-Whitened Vs. Whitened Light Curve

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

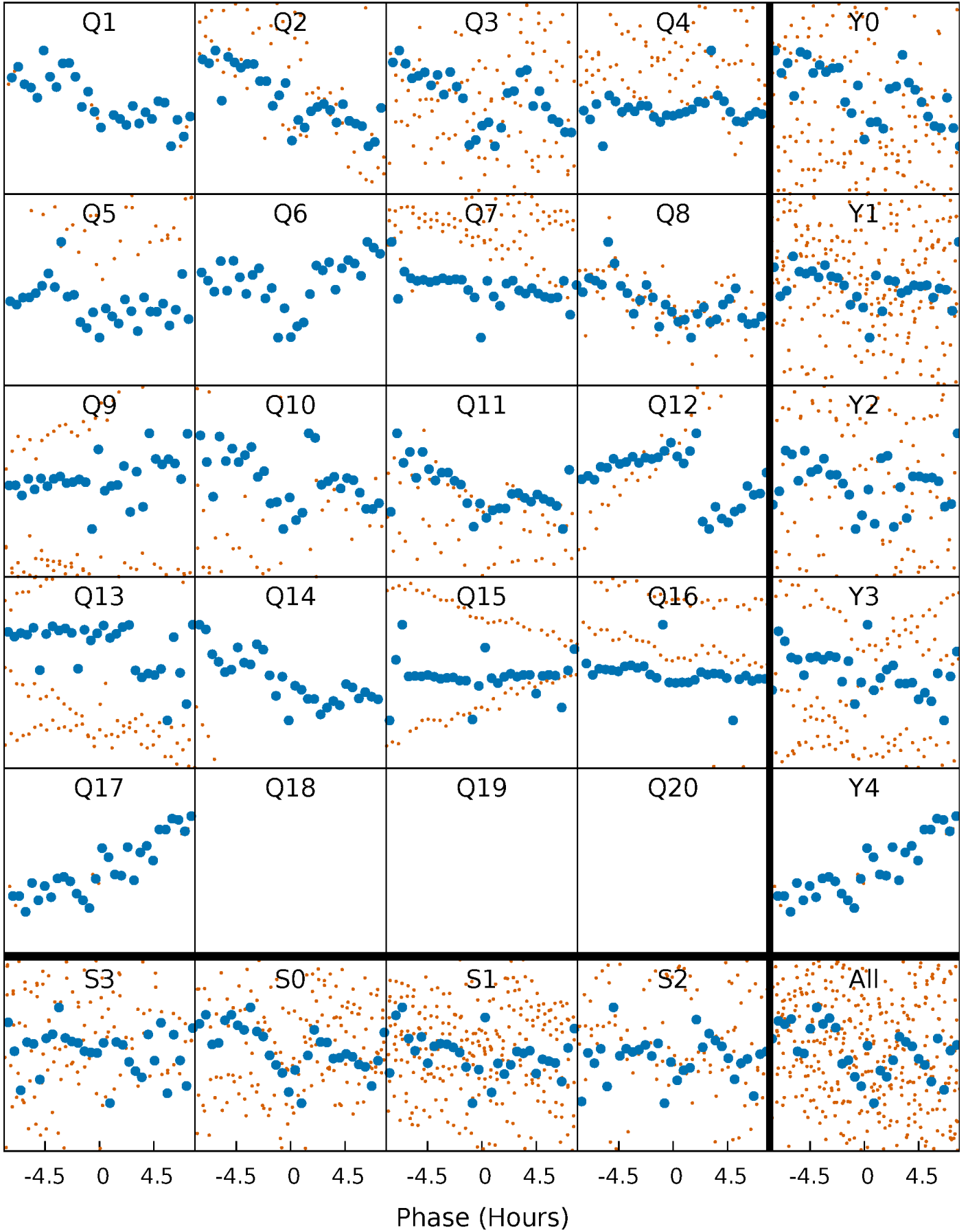


## Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



# PDC Quarter-Phased Transit Curves

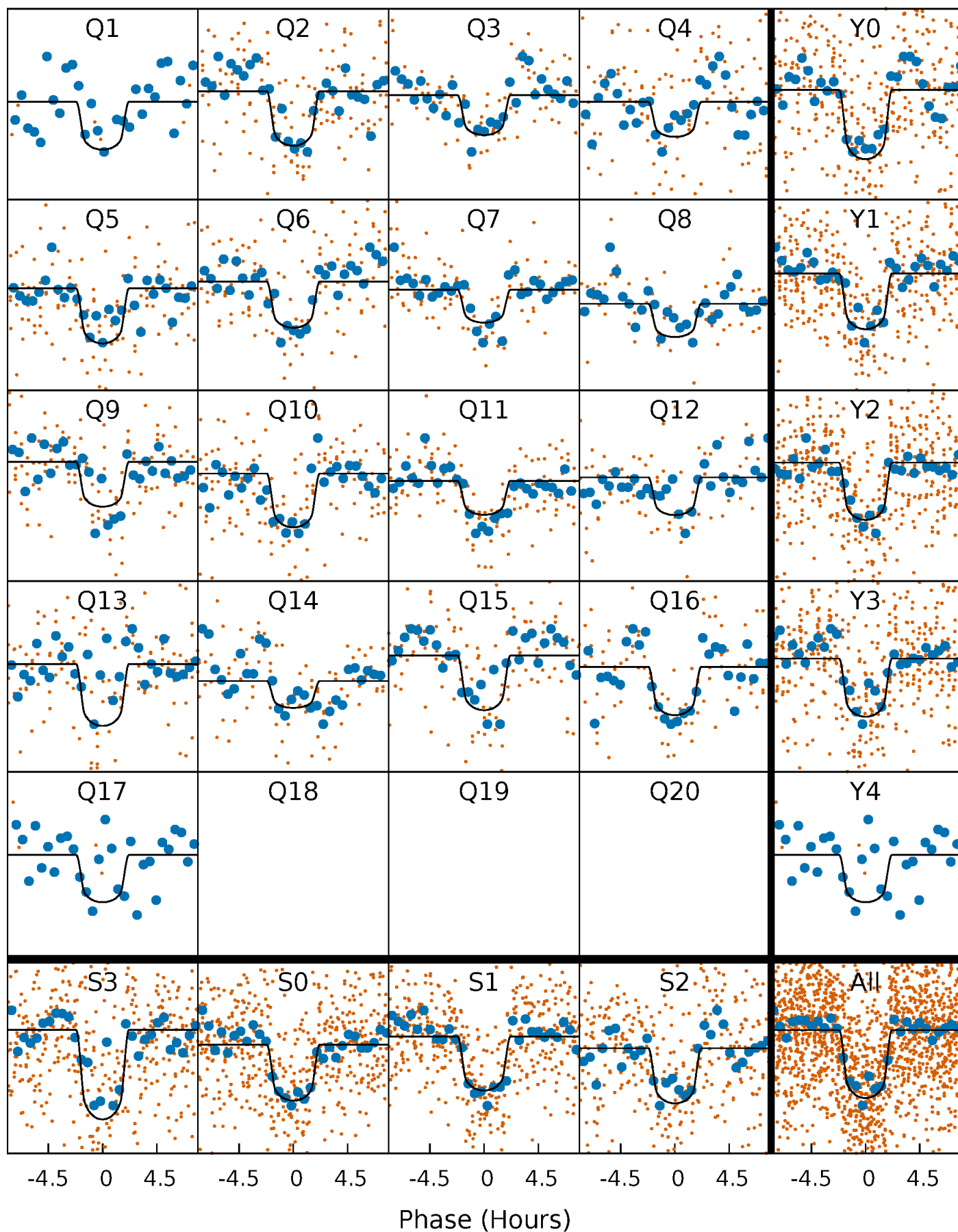
TCE 011069176-02   P= 21.128556 Days    $T_0=149.275988$  (BKJD)





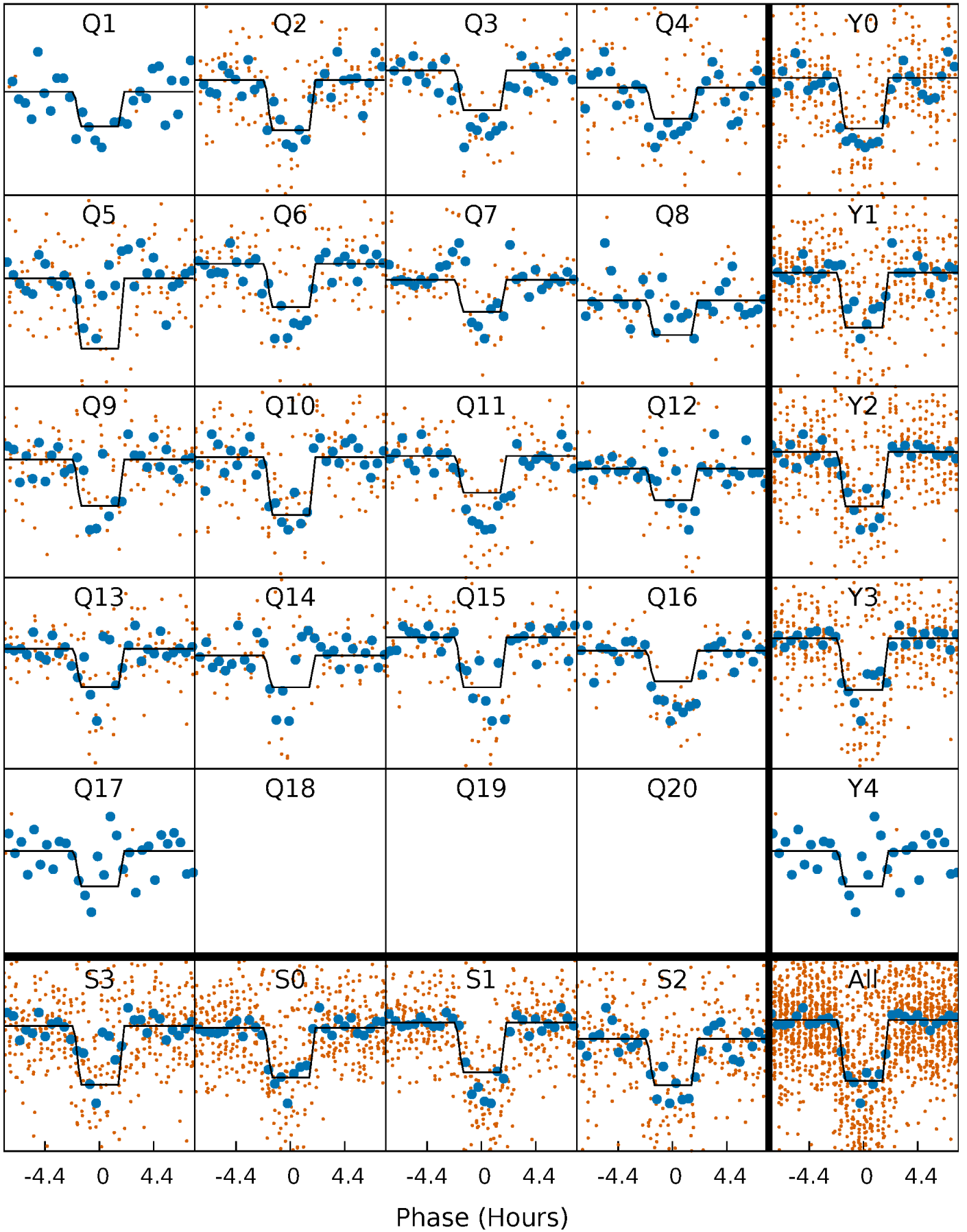
# DV Quarter-Phased Transit Curves

TCE 011069176-02 P= 21.128556 Days  $T_0=149.275988$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

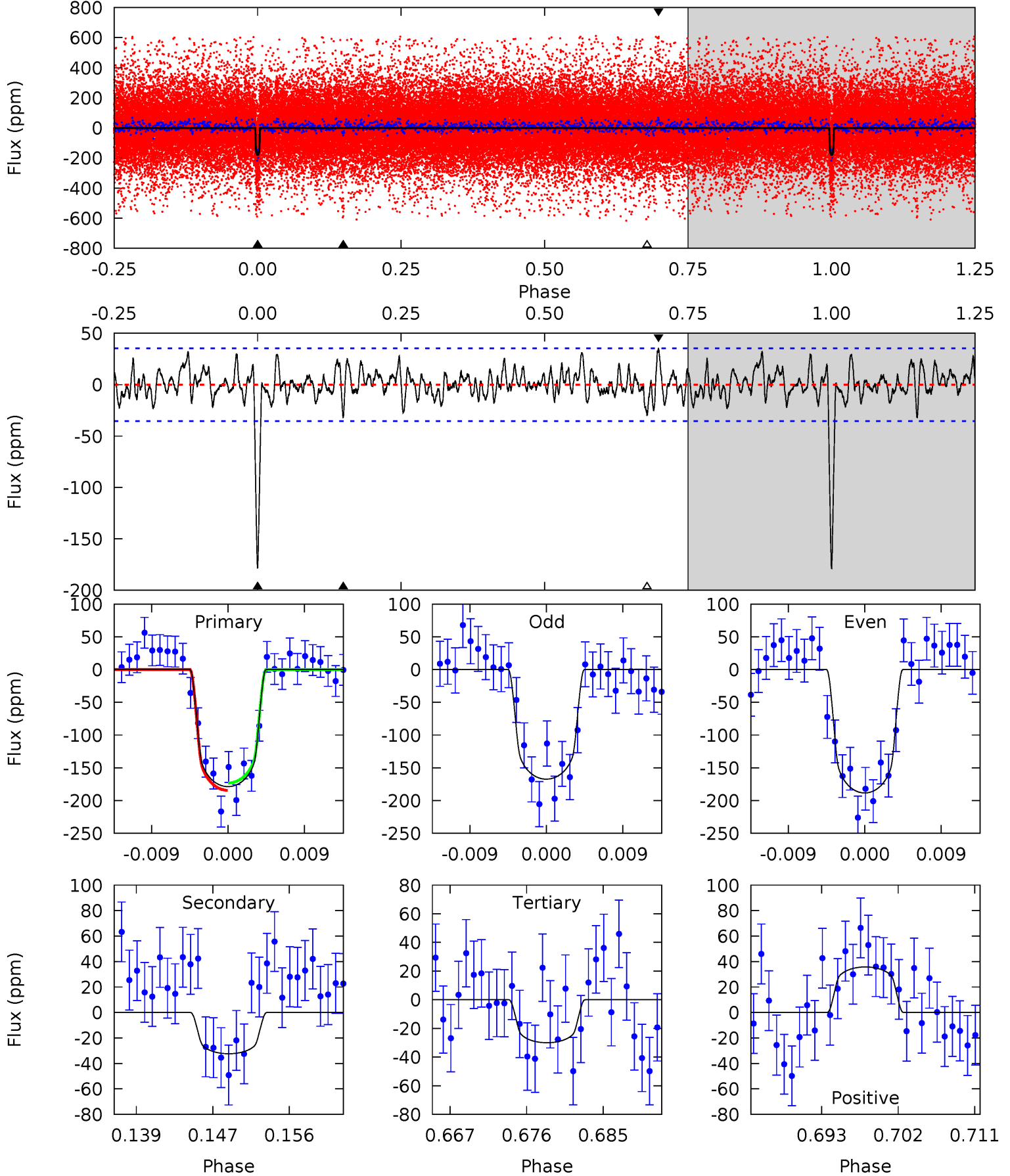
TCE 011069176-02 P= 21.128201 Days  $T_0=149.287513$  (BKJD)



# DV Model-Shift Uniqueness Test

011069176-02,  $P = 21.128556$  Days,  $E = 128.147432$  Days

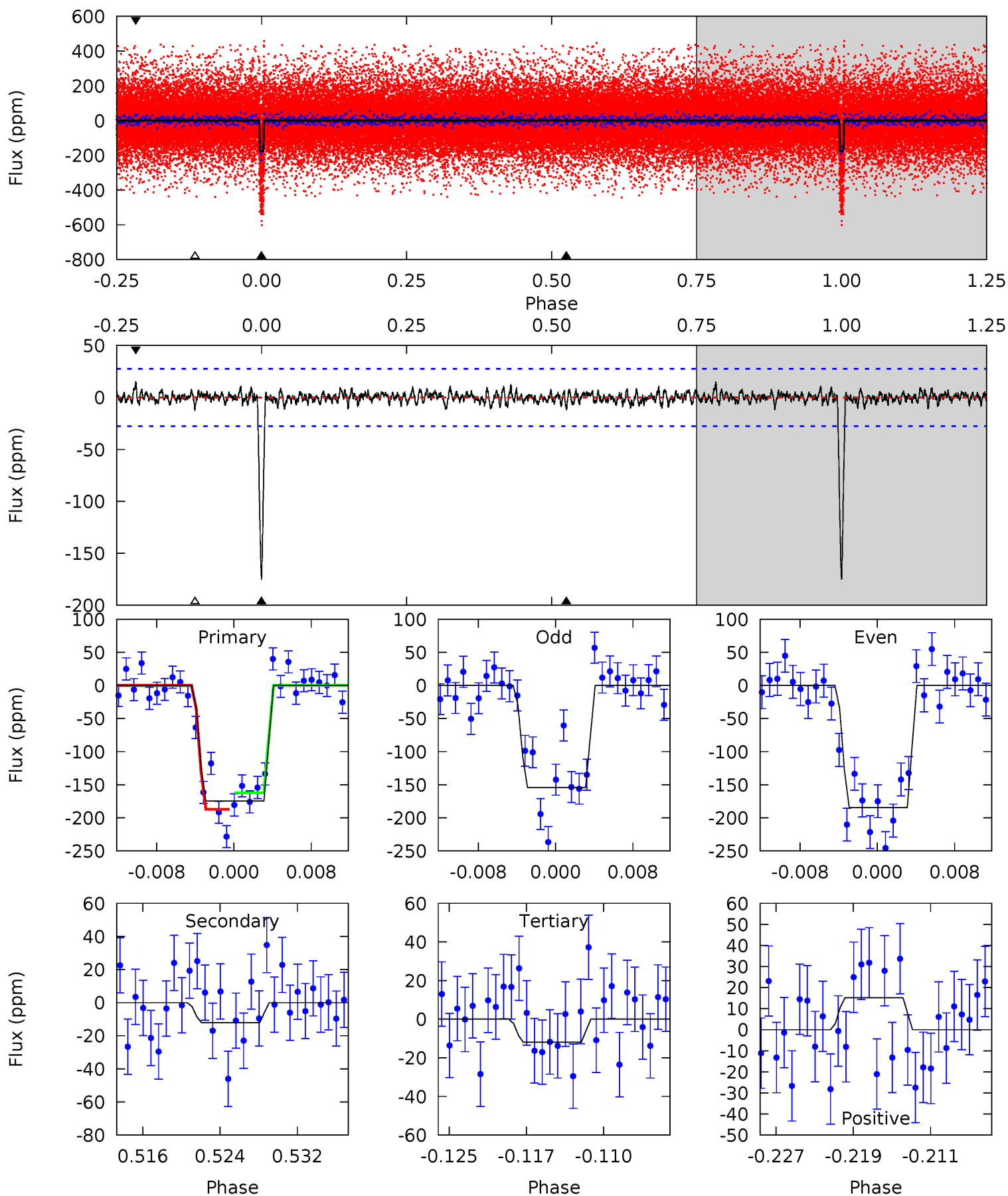
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
25.5	4.62	4.28	5.10	5.05	2.62	1.53	21.2	20.4	0.34	-0.48	1.50	0.99	0.17	0.80



# Alt Model-Shift Uniqueness Test

011069176-02,  $P = 21.128201$  Days,  $E = 128.159312$  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
32.1	2.24	2.20	2.79	5.07	2.66	0.72	29.9	29.3	0.04	-0.55	2.78	0.84	0.08	2.29



### Stellar Parameters For KIC 011069176

	$T_{\text{eff}} (K)$	$\log(g)$	$[\text{Fe}/\text{H}]$	$R (R_{\odot})$	$M (M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$5817^{+78}_{-78}$	$3.877^{+0.293}_{-0.098}$	$0.180^{+0.150}_{-0.150}$	$2.153^{+0.272}_{-0.760}$	$1.276^{+0.113}_{-0.210}$	$0.180^{+0.364}_{-0.056}$
	+1%/-1%	+8%/-3%	+83%/-83%	+13%/-35%	+9%/-16%	+202%/-31%
Source	SPE90	FLK73	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 011069176-02 / KOI 2007.02

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$-32 \pm 7$	$3.32^{+0.89}_{-0.83}$	$1296^{+57}_{-118}$	$3909^{+387}_{-258}$	$41^{+37}_{-16}$
Alt.	$-12 \pm 5$	$2.83^{+0.88}_{-0.79}$	$1296^{+57}_{-111}$	$3494^{+392}_{-380}$	$21^{+23}_{-11}$

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

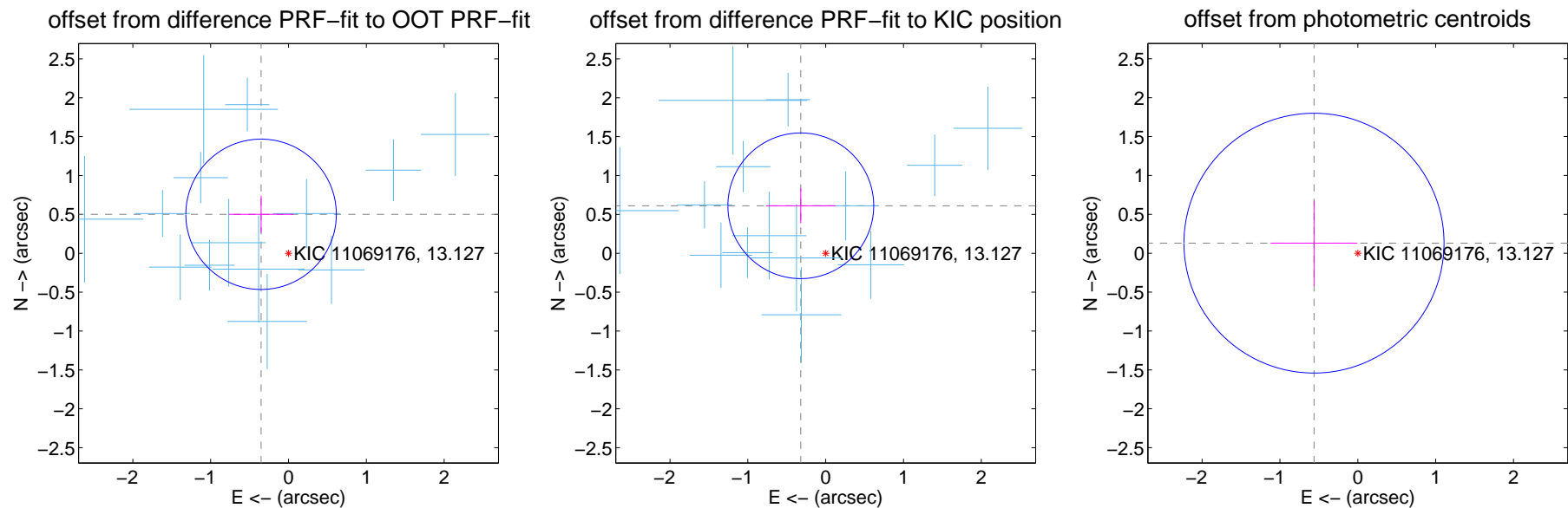
## DV Centroid Data

Supplemental centroid analysis for 011069176-02. Kepler magnitude: 13.13. Transit SNR 17.06

There are 14 quarters with good PRF difference image offsets

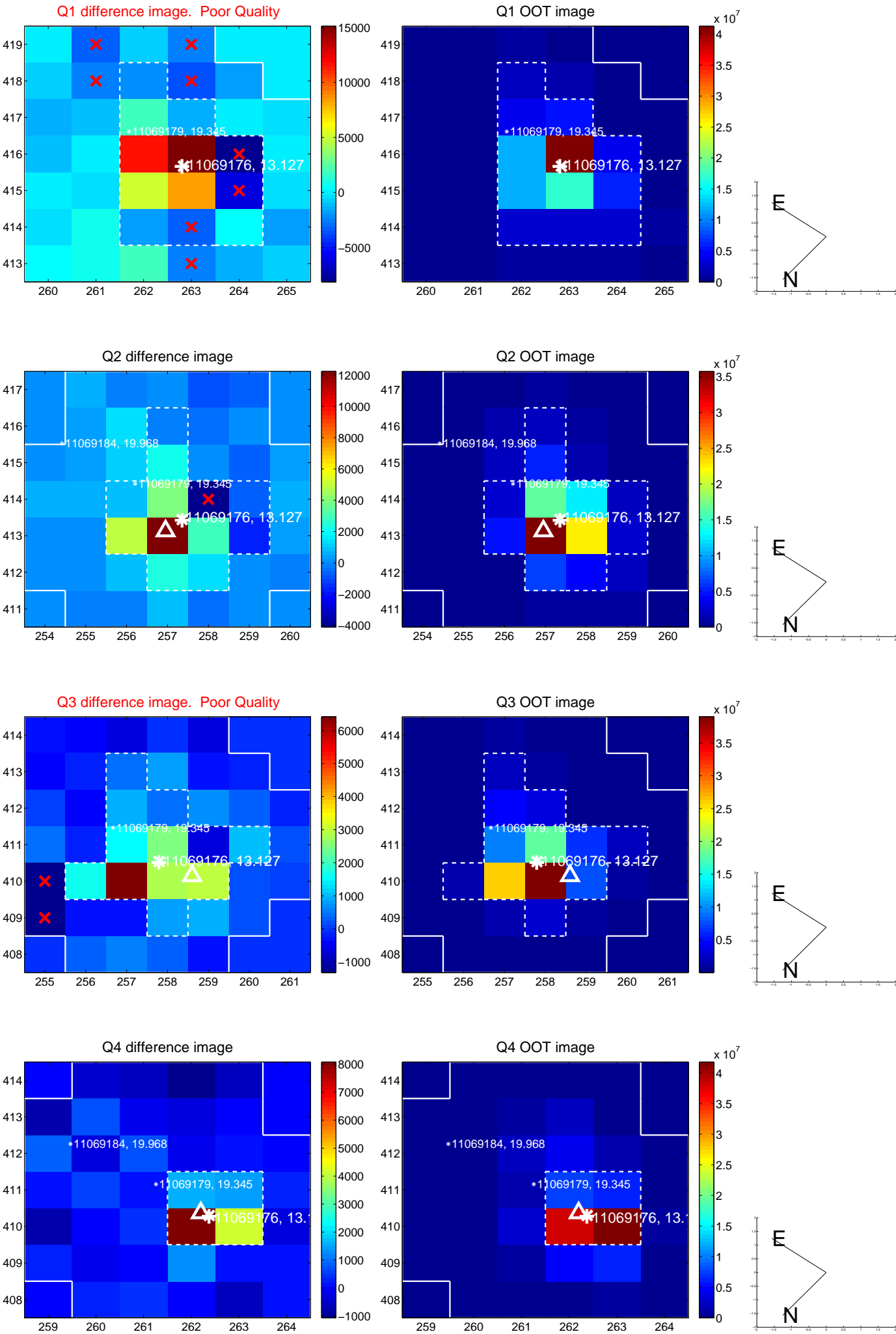
The direct PRF centroid is offset from the target star catalog position by about 0.15 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.613 \pm 0.322$	1.90	$0.352 \pm 0.414$	$0.501 \pm 0.238$
PRF-fit source offset from KIC position	$0.689 \pm 0.312$	2.21	$0.319 \pm 0.446$	$0.611 \pm 0.225$
photometric centroid source offset	$0.58 \pm 0.56$	1.04	$0.56 \pm 0.56$	$0.13 \pm 0.55$



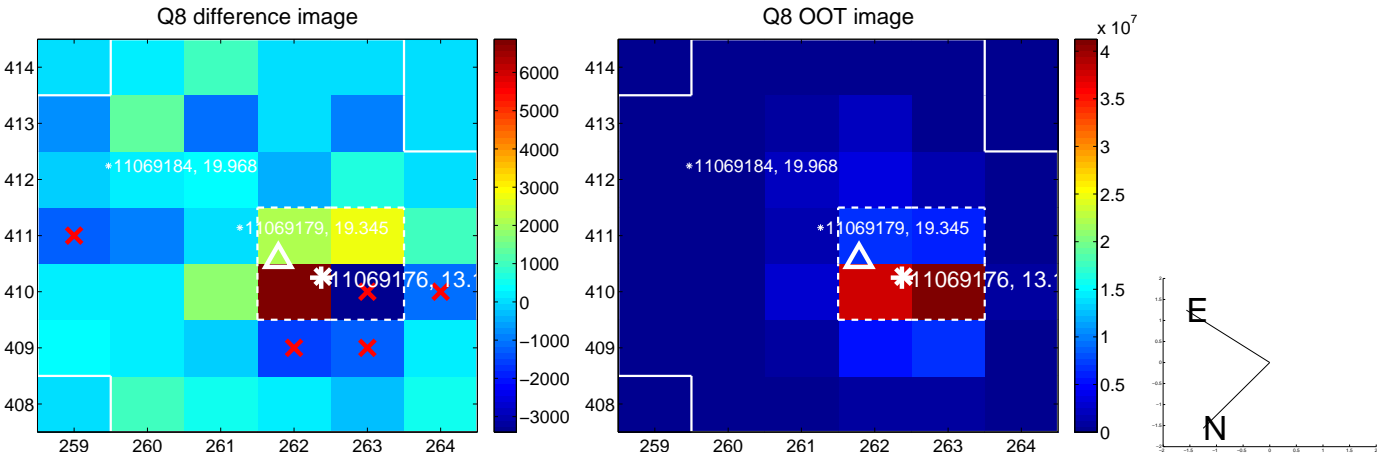
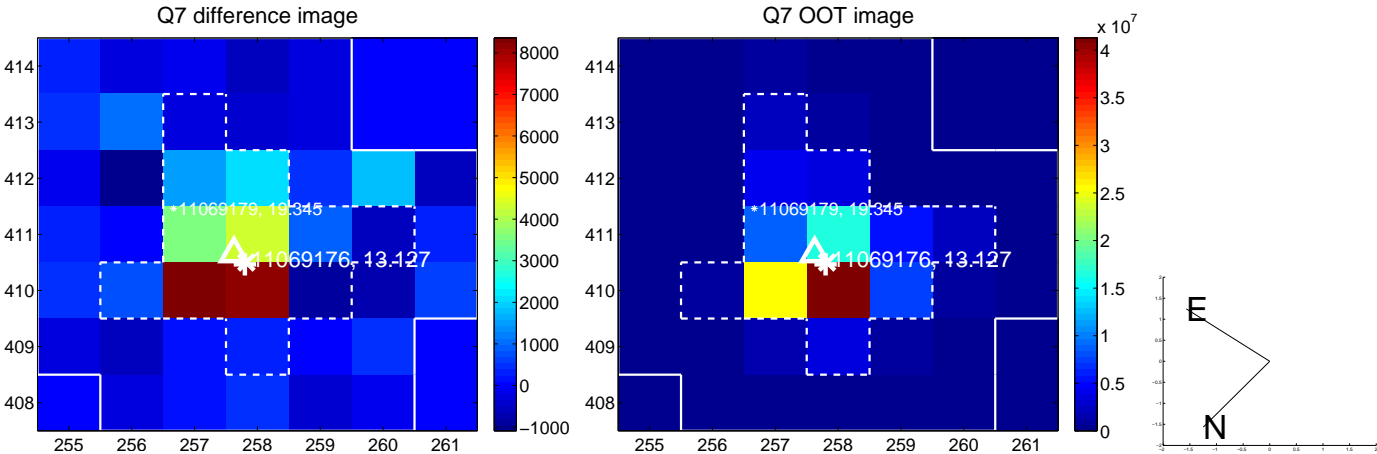
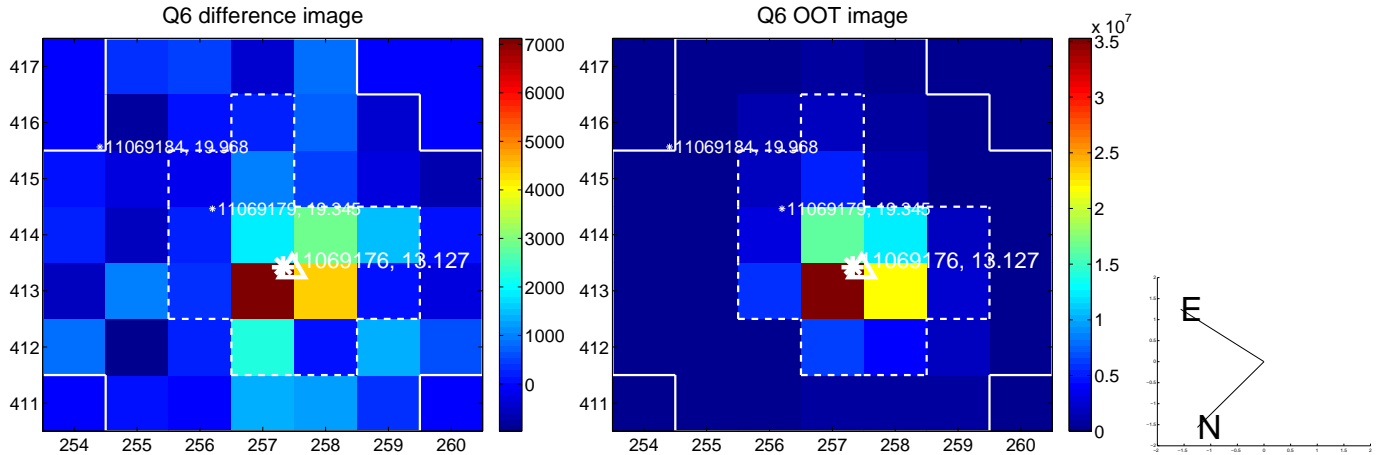
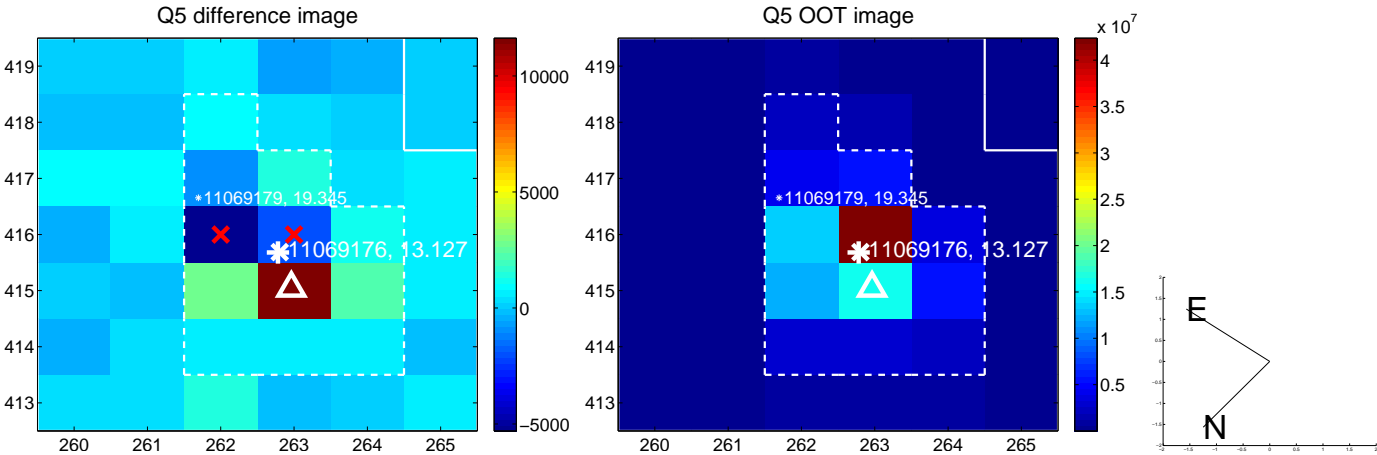
Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses:** good quarterly centroid offsets; **Vermillion crosses:** bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

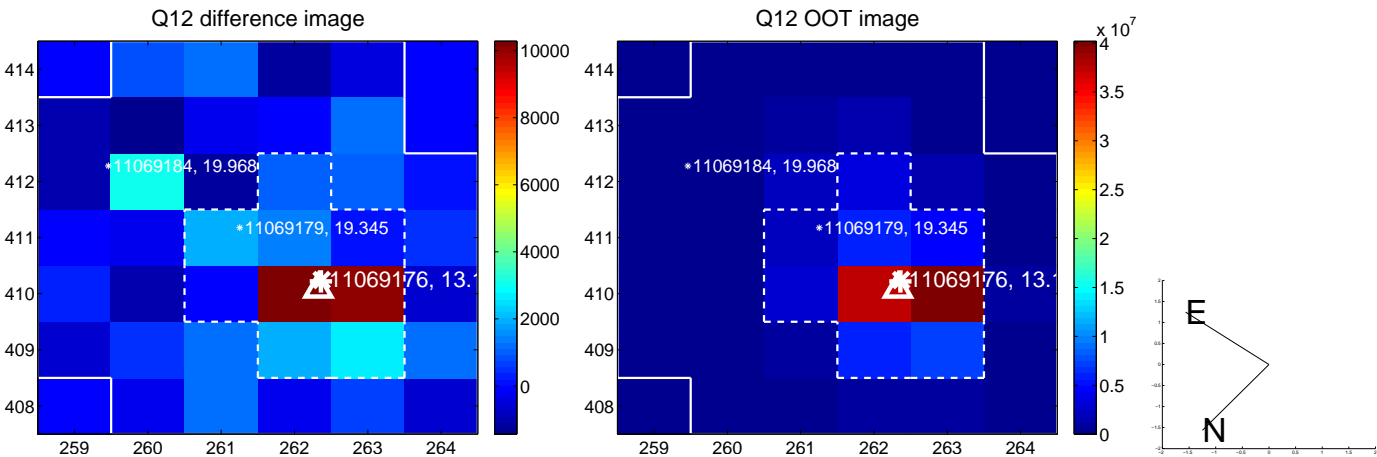
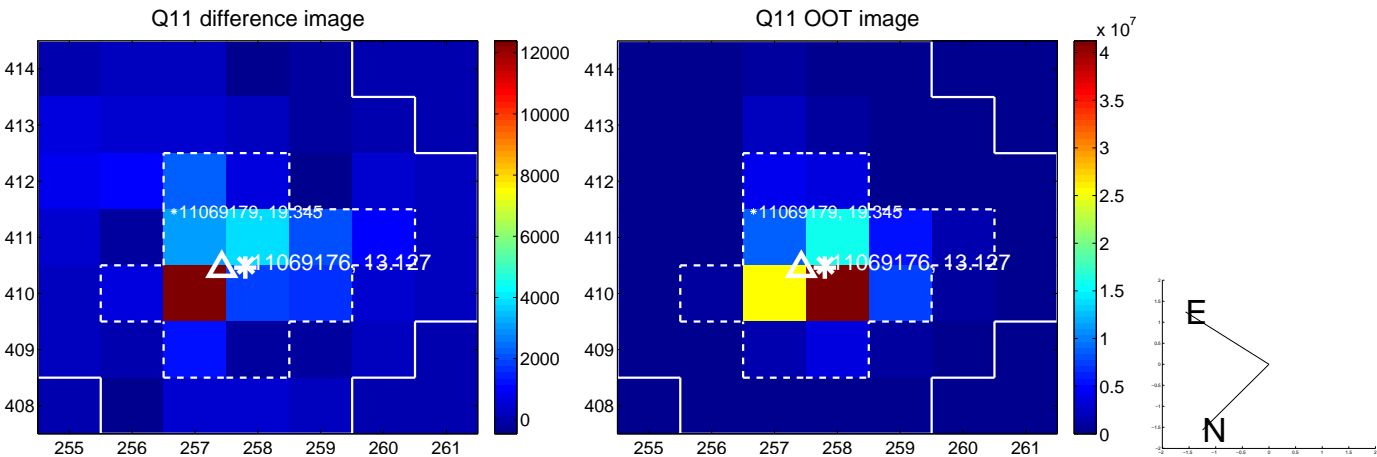
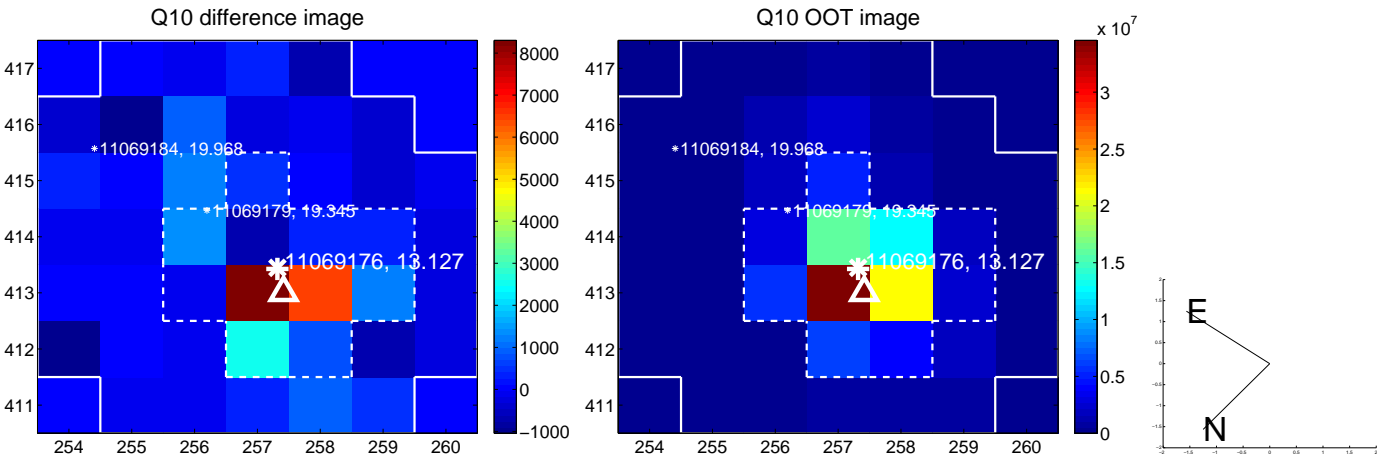
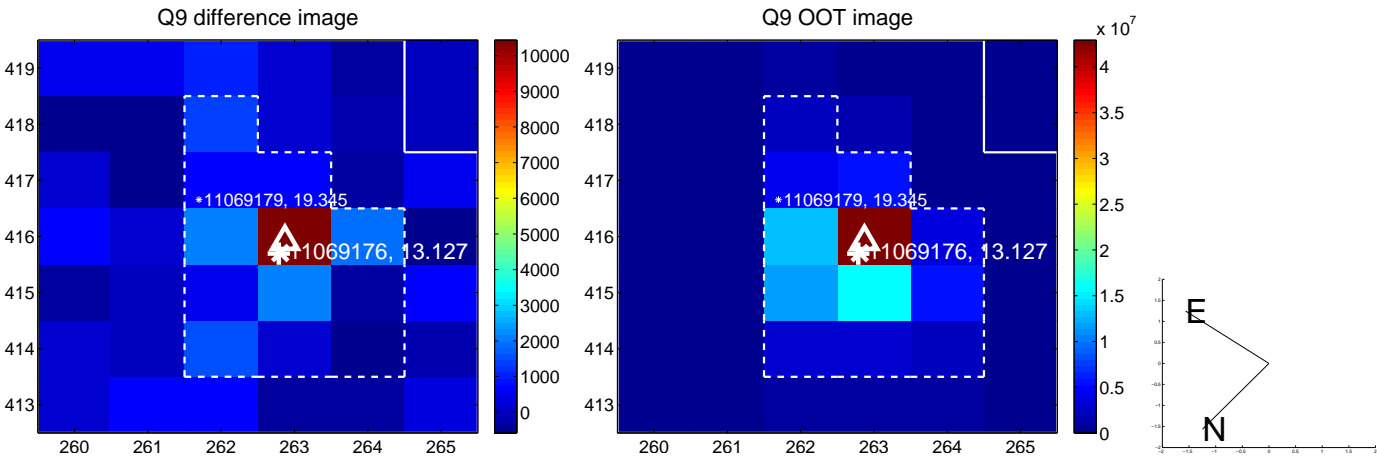




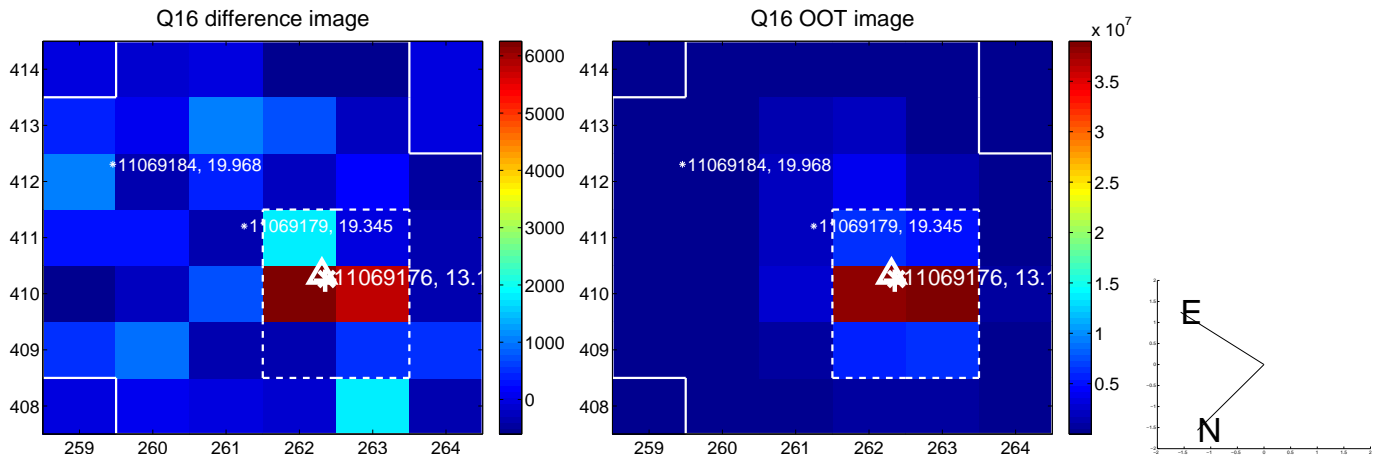
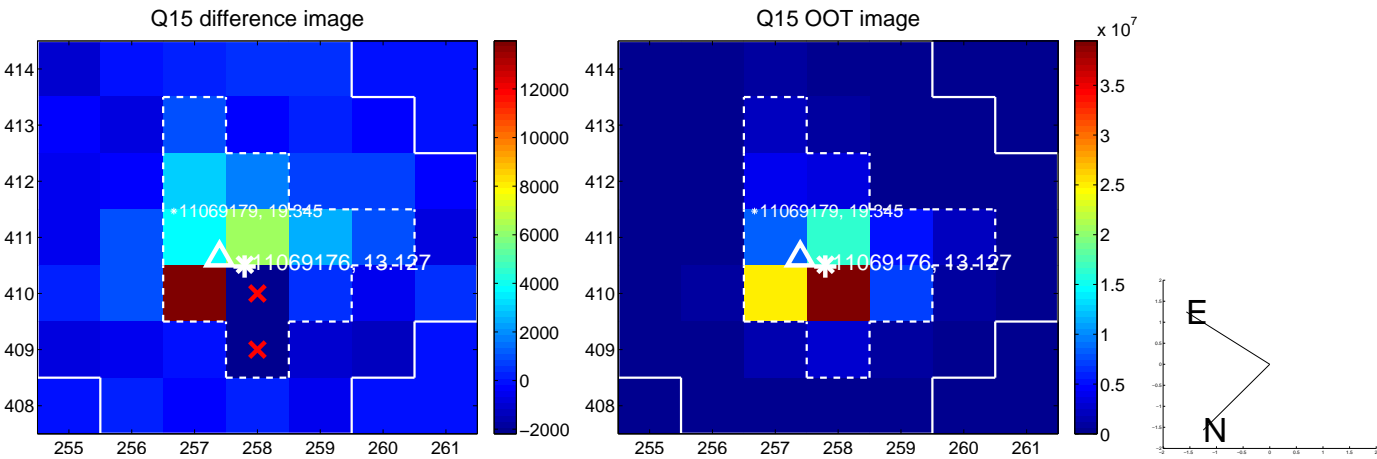
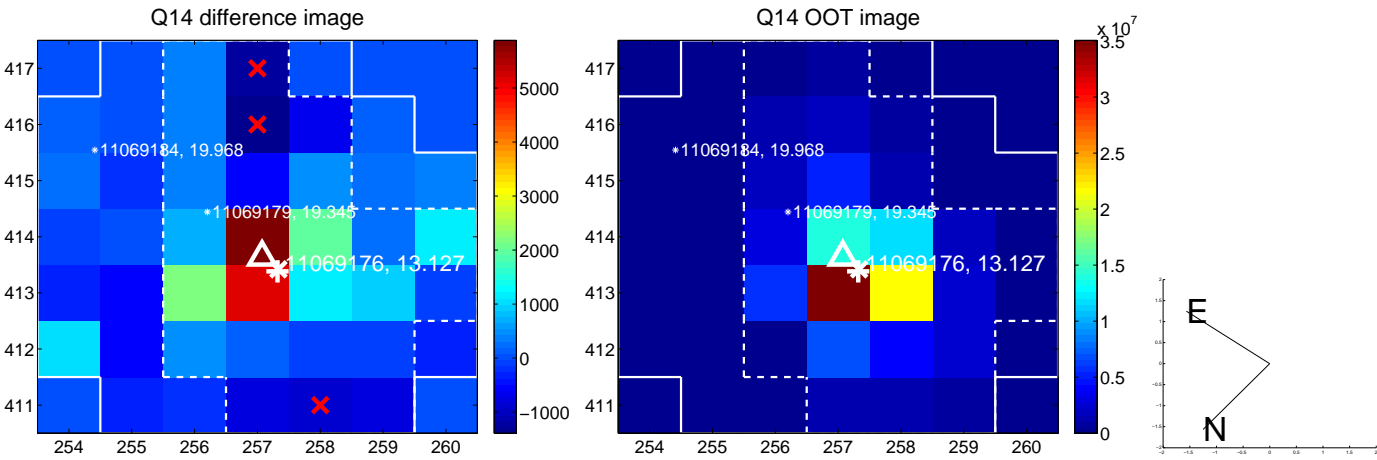
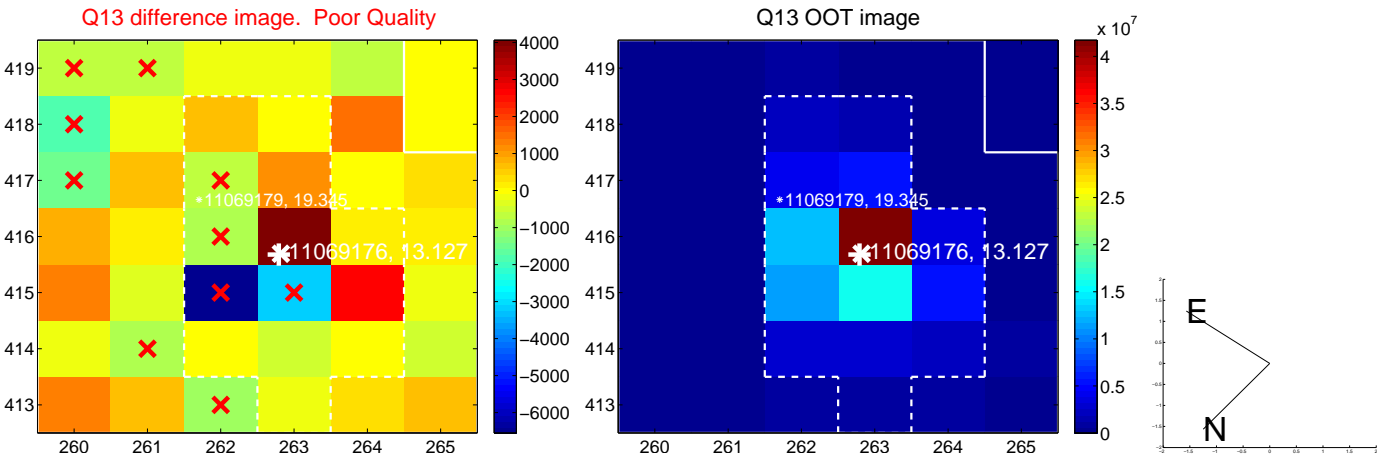
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



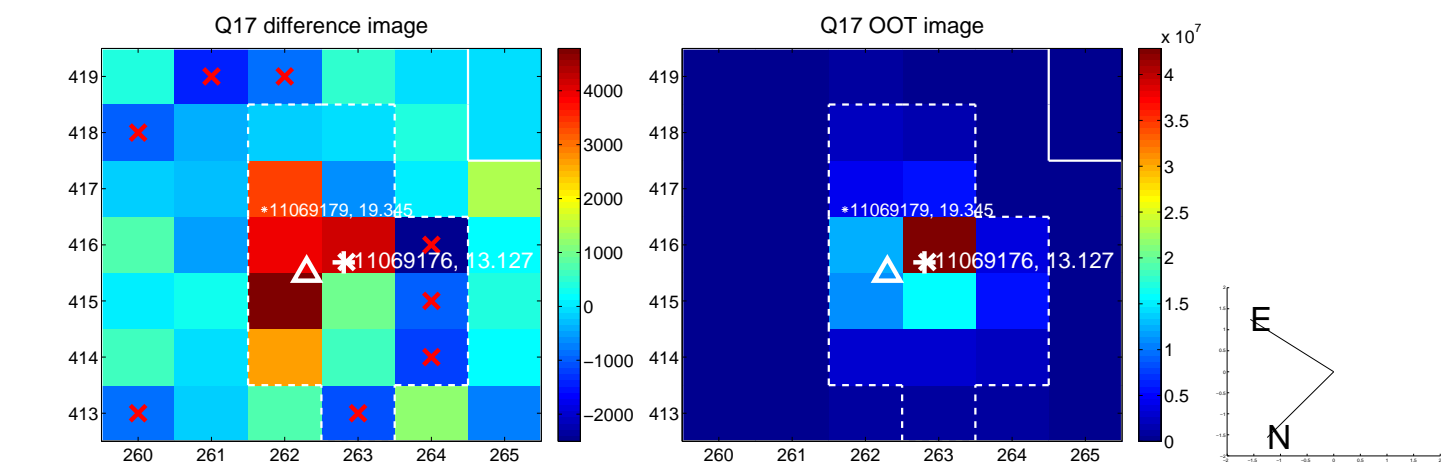
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



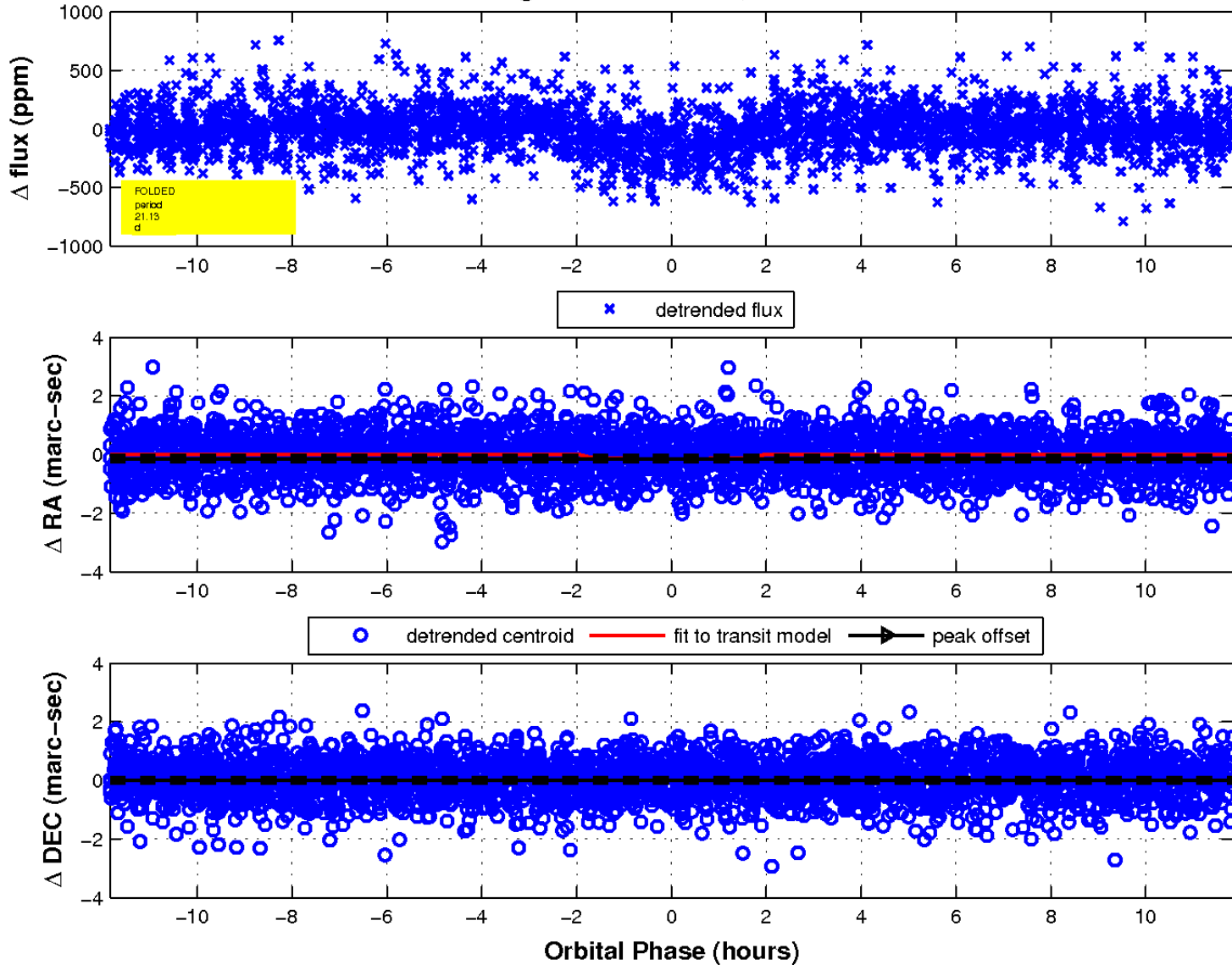
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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



fluxWeightedCentroids, Planet 2 of 2



UKIRT Image

