

# KIC 010068030

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
010068030-01	OBS	0529.01	2.023113	132.076811	1119.9	1.360	69.4	82.0	0.80	5559	3.23	608.13
010068030-02	OBS	No	2.023119	133.087165	279.6	1.225	16.6	20.8	0.80	5559	1.61	608.13

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
010068030-01	OBS	FP	0.00	0	1	0	0	MOD_SEC_DV—MOD_SEC_ALT—HAS_SEC_TCE—CENT_KIC_POS
010068030-02	OBS	FP	0.00	1	1	0	0	IS_SEC_TCE—CENT_KIC_POS

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

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

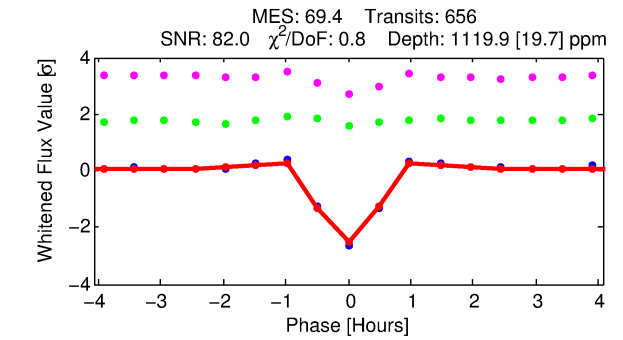
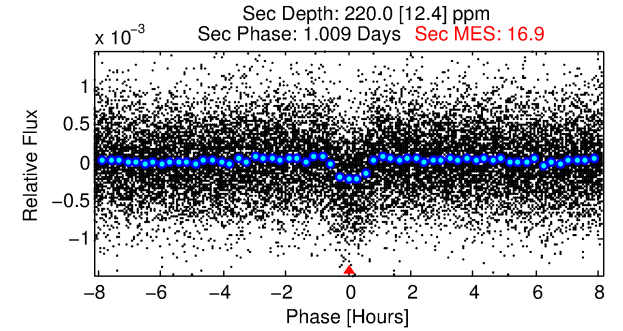
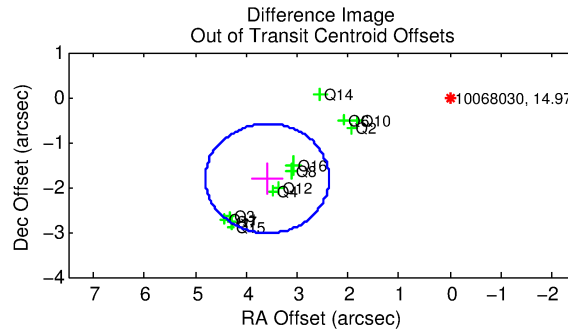
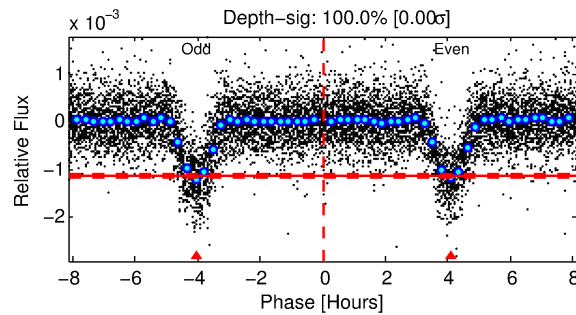
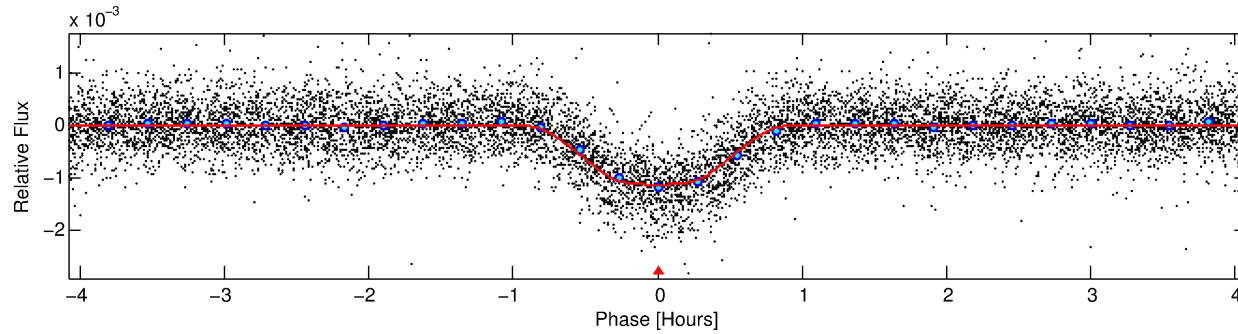
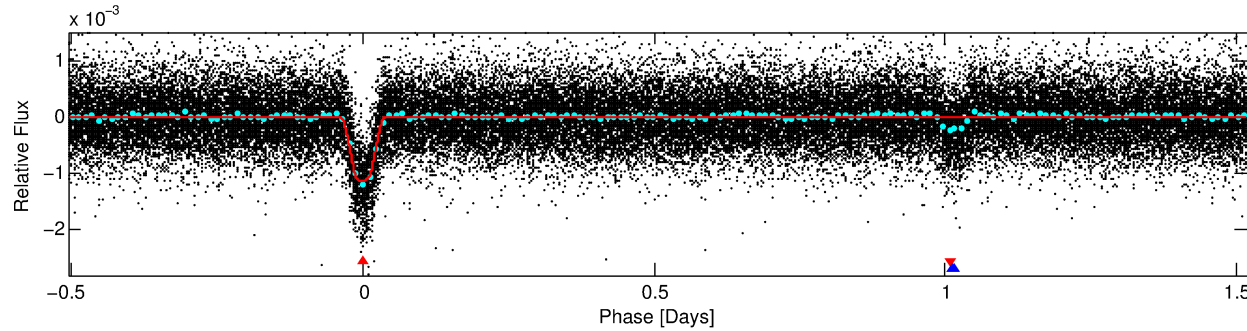
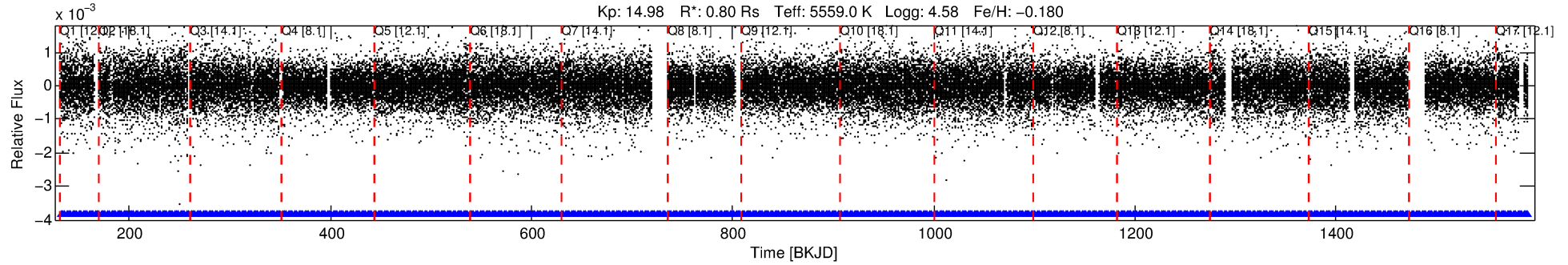
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 010068030-01

No Significant Match Found

# DV One-Page Summary

KIC: 10068030 Candidate: 1 of 2 Period: 2.023 d  
KOI: K00529.01 Corr: 0.950



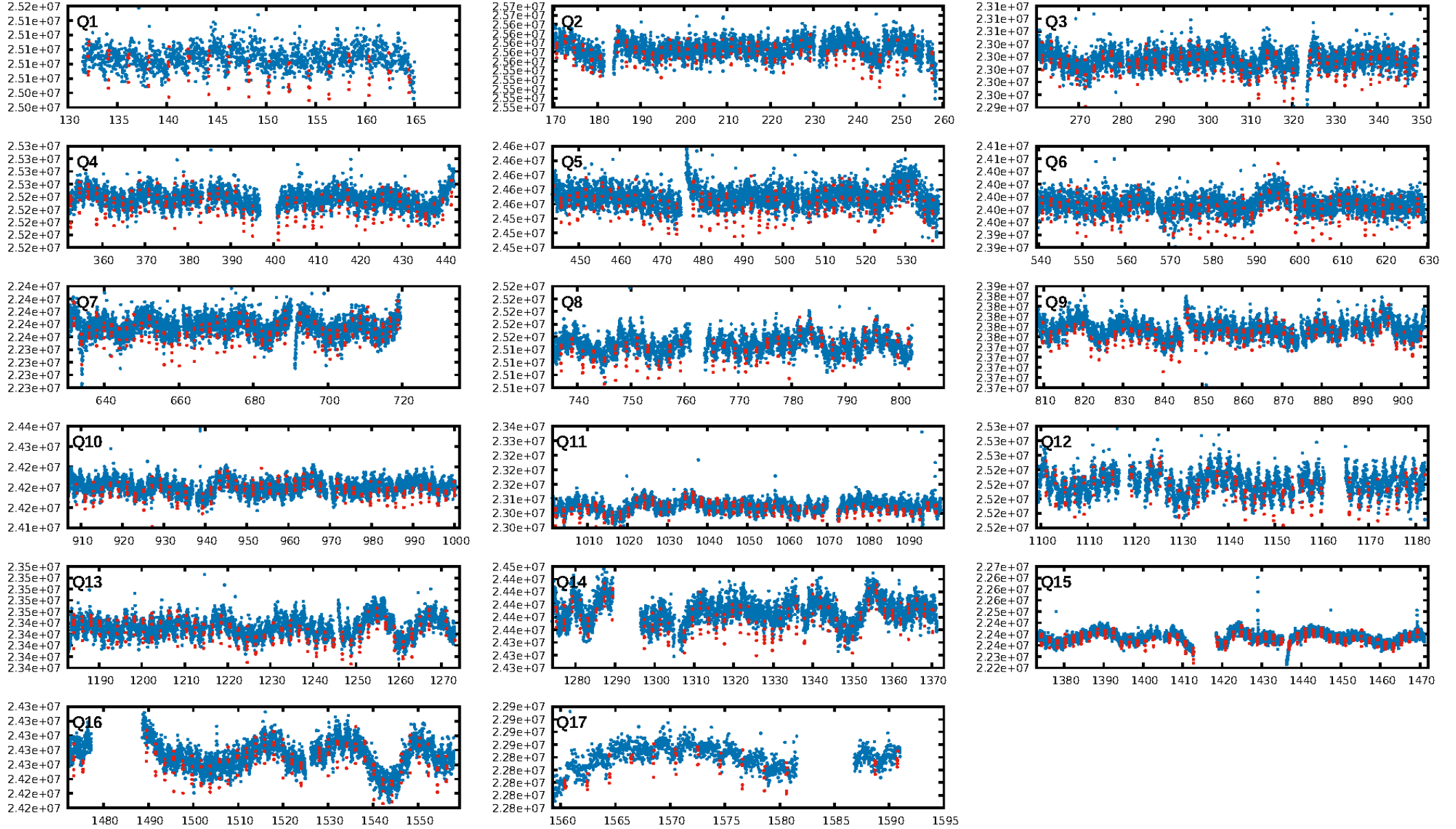
## DV Fit Results:

Period = 2.02311 [0.00000] d  
Epoch = 132.0768 [0.0002] BKJD  
Rp/R\* = 0.0369 [0.0018]  
a/R\* = 5.93 [1.15]  
b = 0.90 [0.04]  
Seff = 608.13 [173.73]  
Teq = 1266 [90] K  
Rp = 3.23 [0.68] Re  
a = 0.0301 [0.0052] AU  
Ag = 10.51 [2.87] [3.32 $\sigma$ ]  
Teffp = 3525 [157] K [12.46 $\sigma$ ]

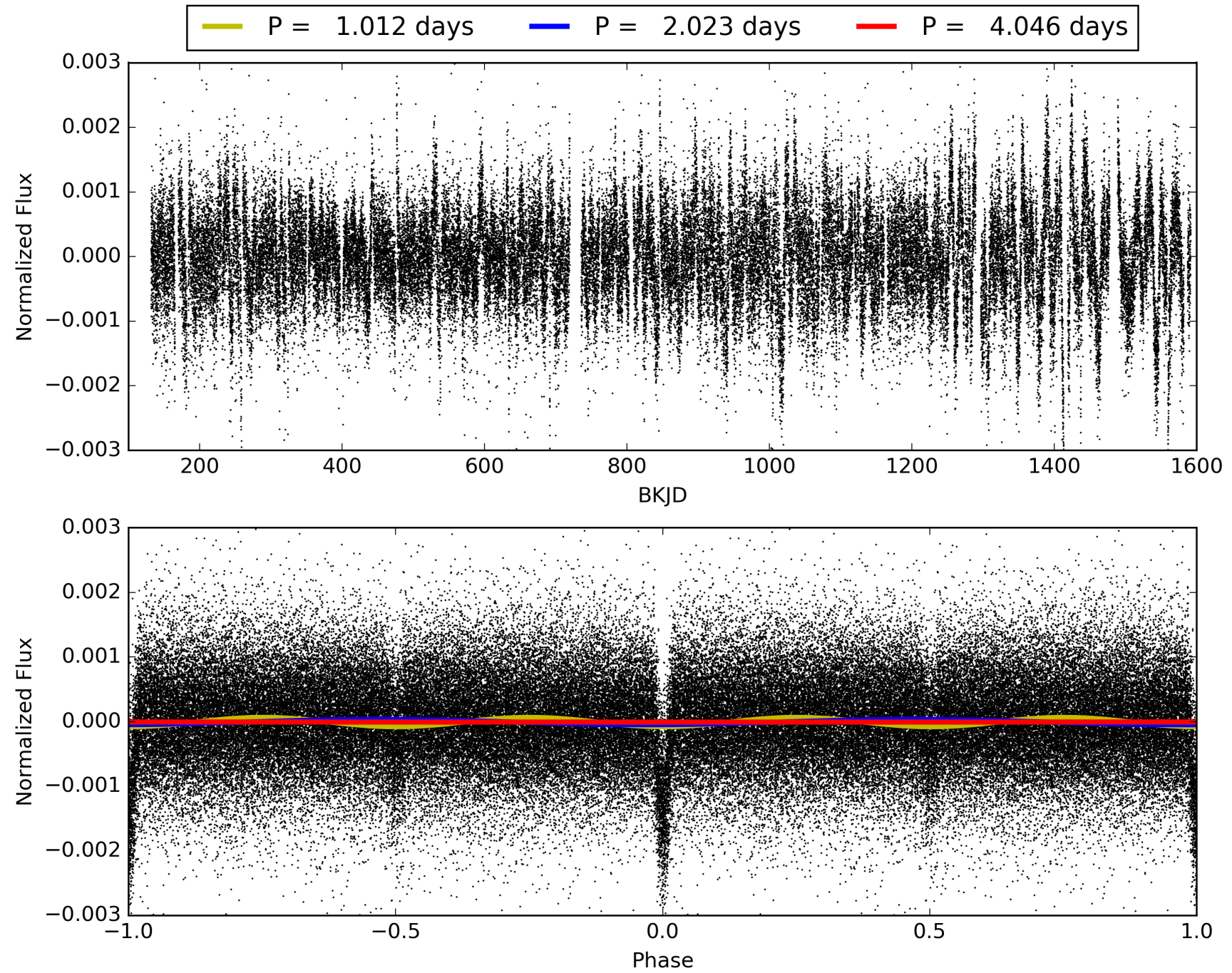
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 0.0% [0.00 $\sigma$ ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: 0.00e+00  
RollingBand-fgt: 1.00 [626/626]  
GhostDiagnostic-chr: 3.992  
Centroid-sig: 0.0%  
Centroid-so: 1.735 arcsec [44.80 $\sigma$ ]  
OotOffset-rm: 4.019 arcsec [9.91 $\sigma$ ]  
KicOffset-rm: 0.171 arcsec [1.81 $\sigma$ ]  
OotOffset-st: 4/4/4/0 [12]  
KicOffset-st: 4/4/4/5 [17]  
DiffImageQuality-fgm: 1.00 [17/17]  
DiffImageOverlap-fno: 1.00 [17/17]

# TCE 010068030-01, PDC Light Curves



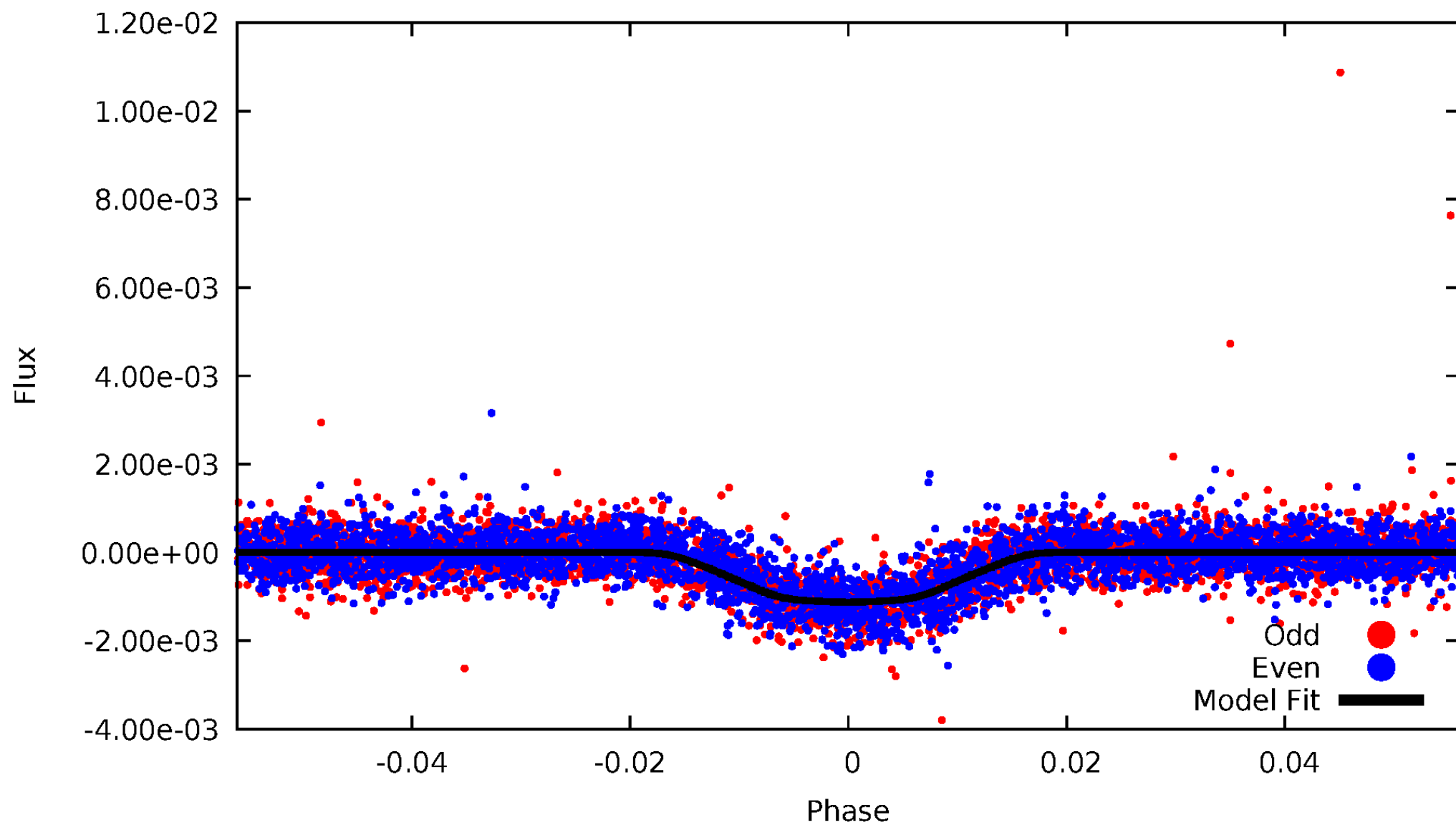
TCE 010068030-01





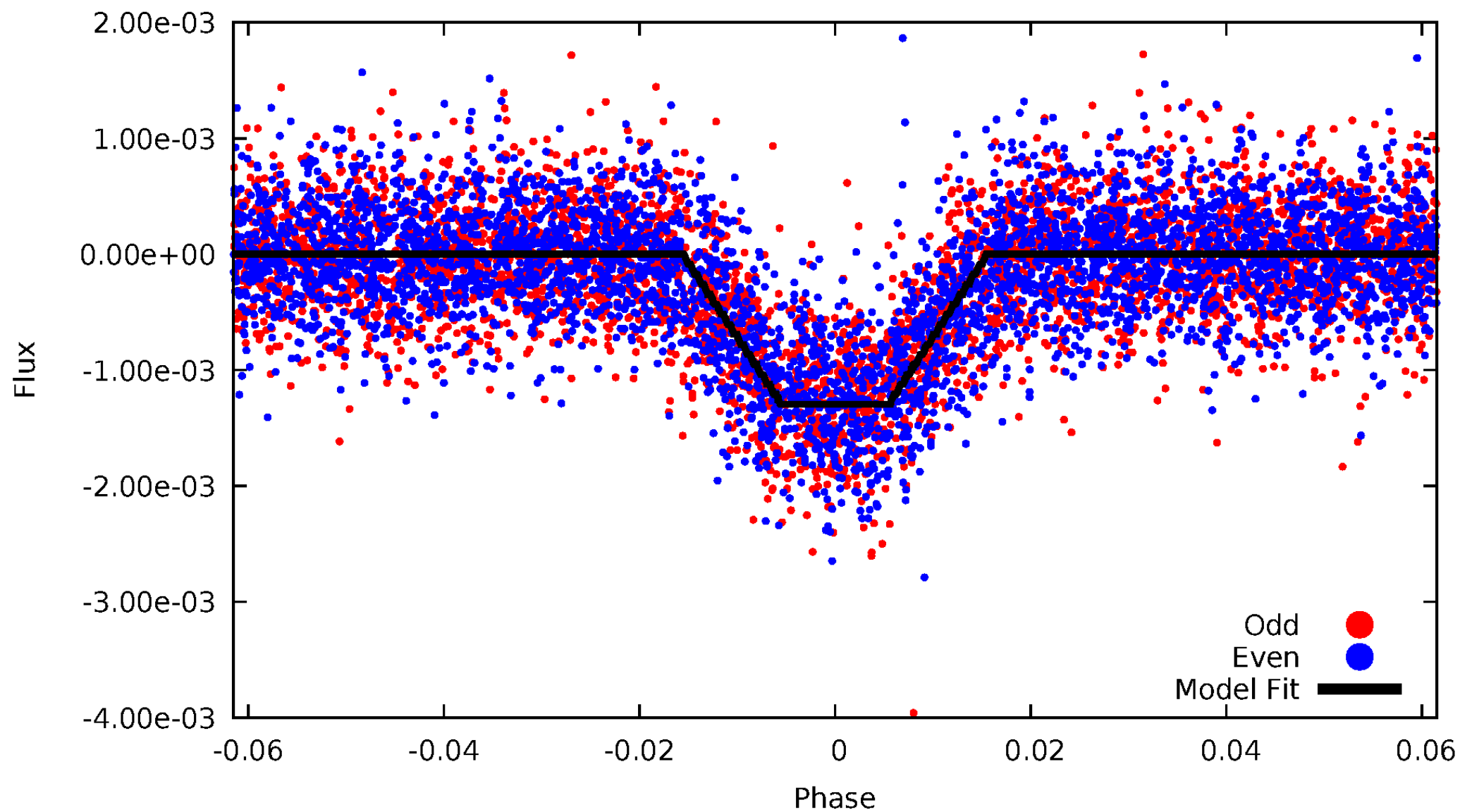
# DV Odd/Even

TCE 010068030-01



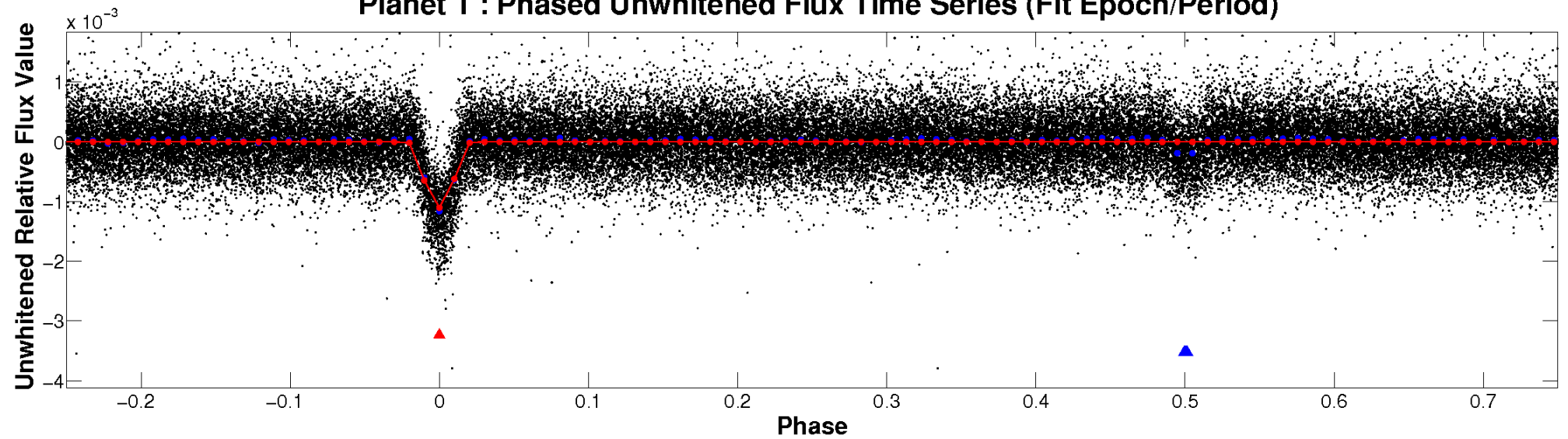
# ALT Odd/Even

TCE 010068030-01

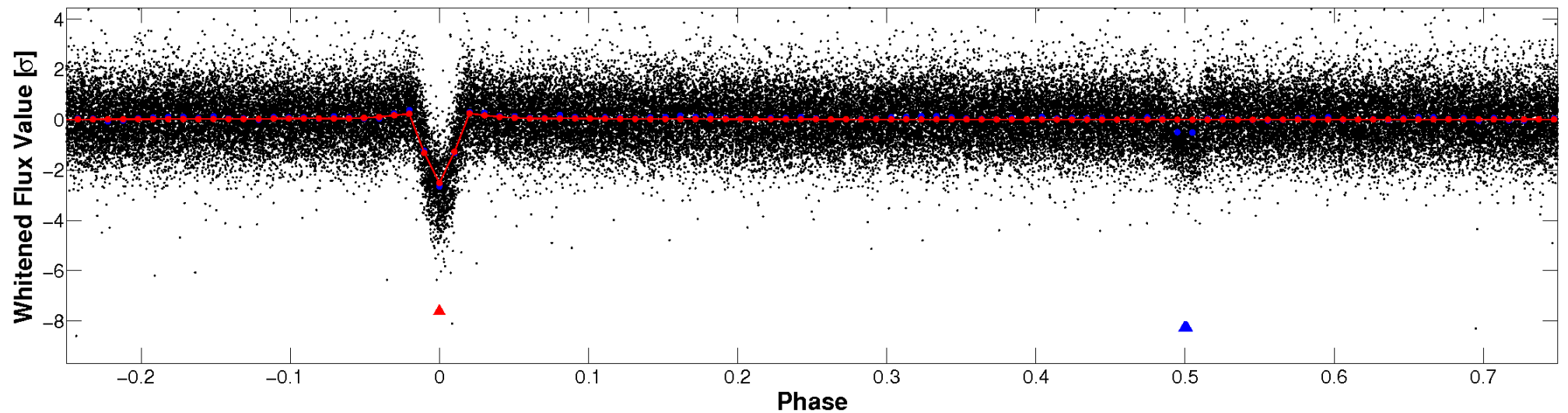


# Non-Whitened Vs. Whitened Light Curve

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

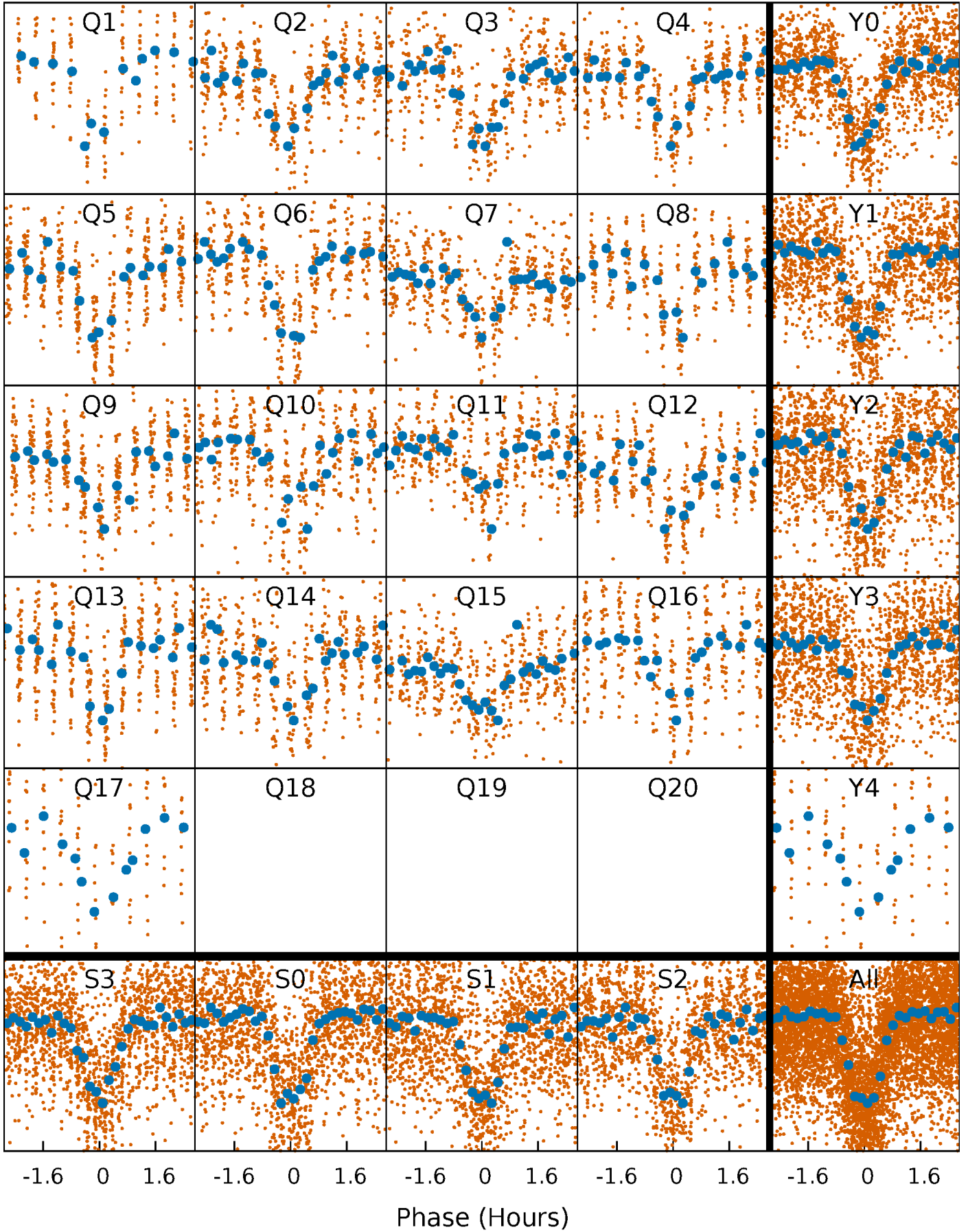


**Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)**



# PDC Quarter-Phased Transit Curves

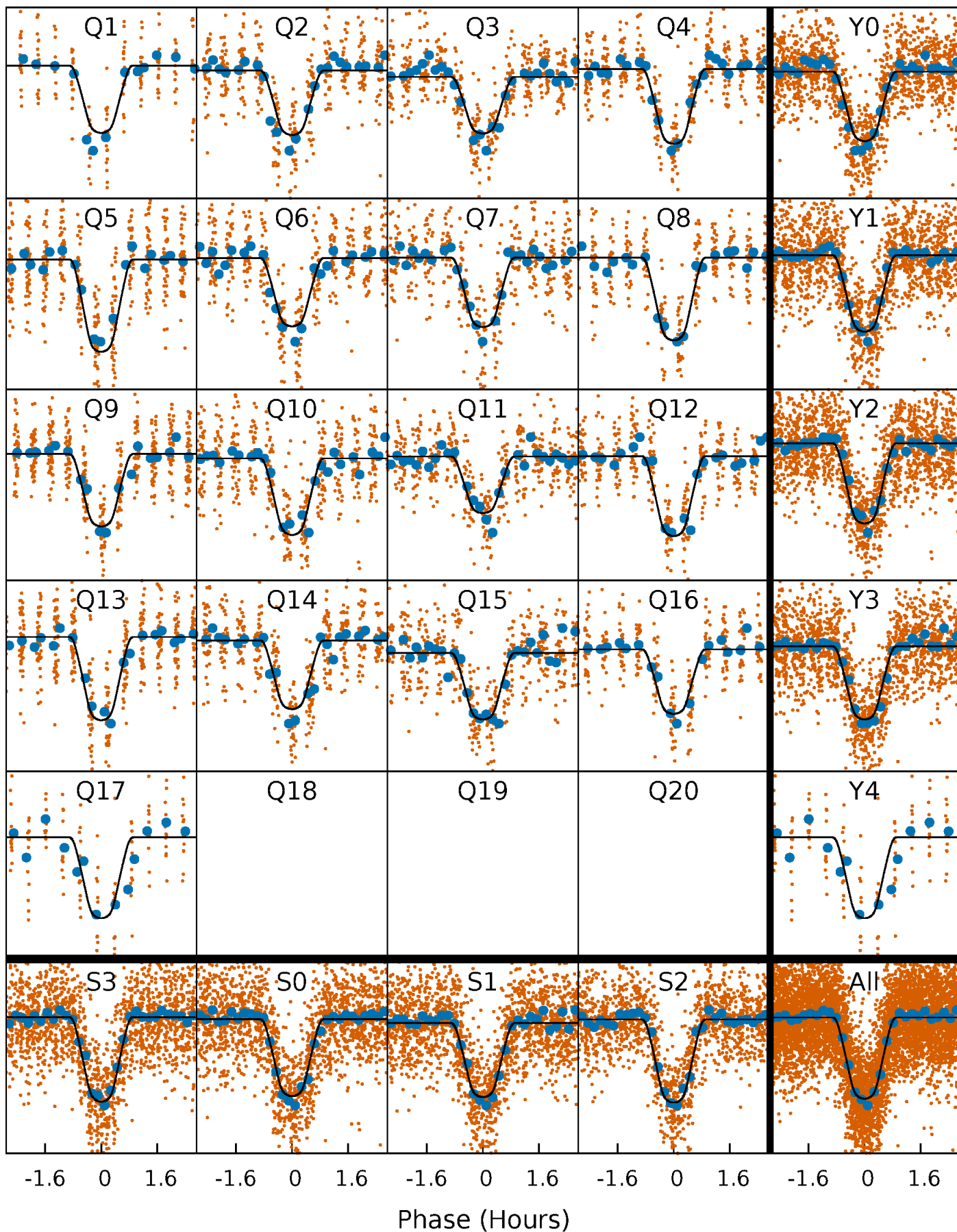
TCE 010068030-01   P= 2.023113 Days    $T_0=132.076810$  (BKJD)





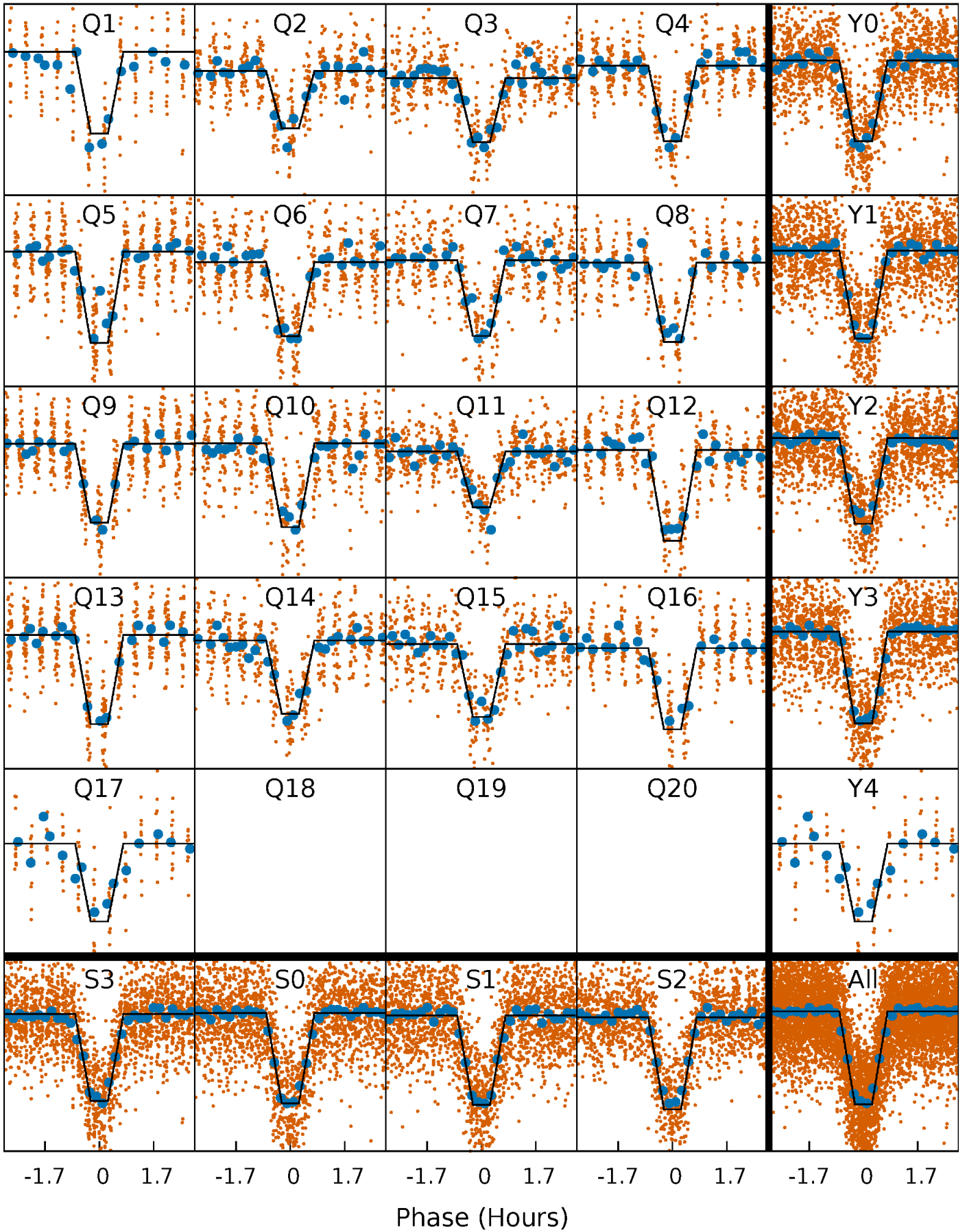
# DV Quarter-Phased Transit Curves

TCE 010068030-01 P= 2.023113 Days  $T_0=132.076810$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

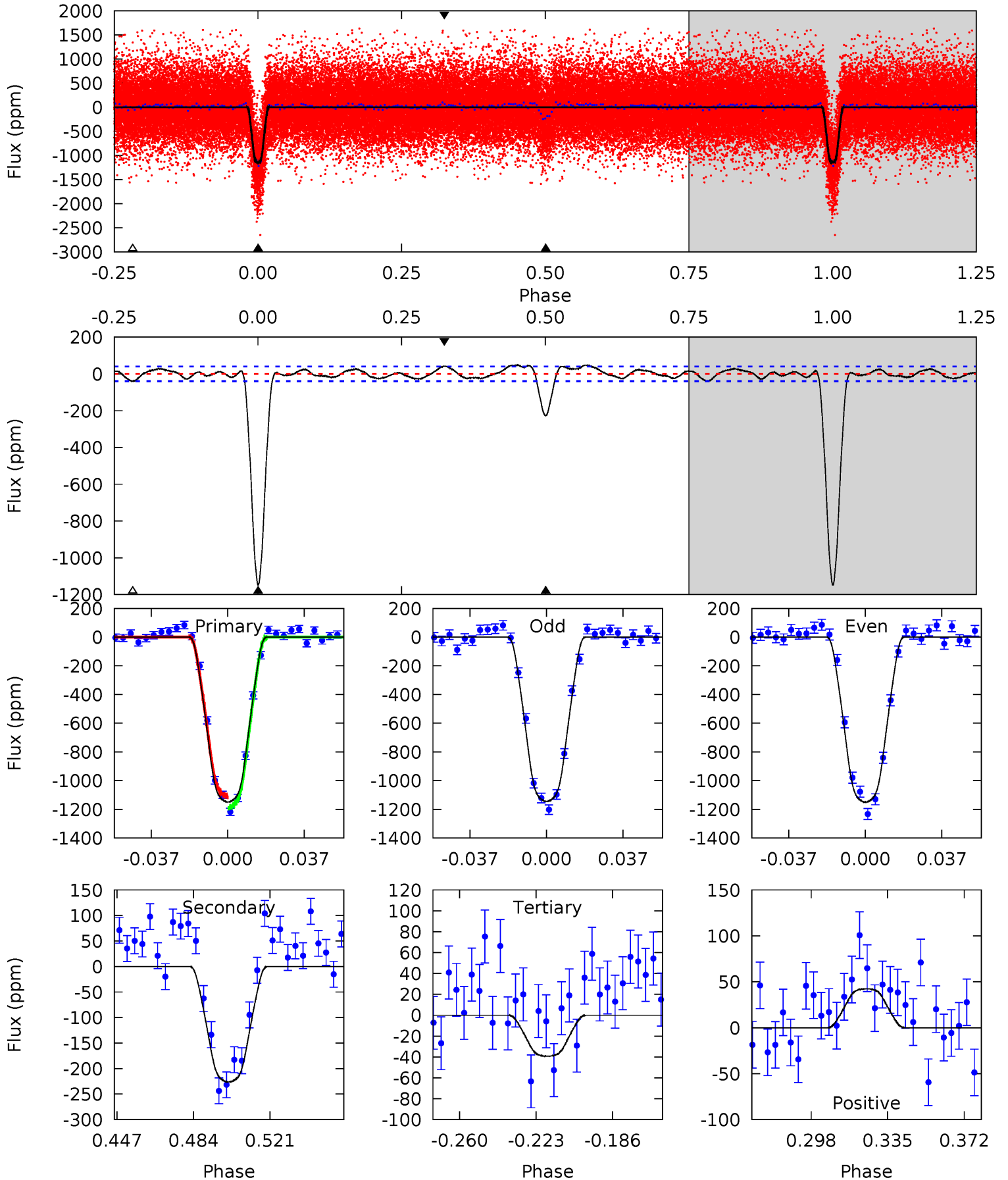
TCE 010068030-01 P= 2.023117 Days  $T_0=132.076591$  (BKJD)



# DV Model-Shift Uniqueness Test

010068030-01, P = 2.023113 Days, E = 130.053697 Days

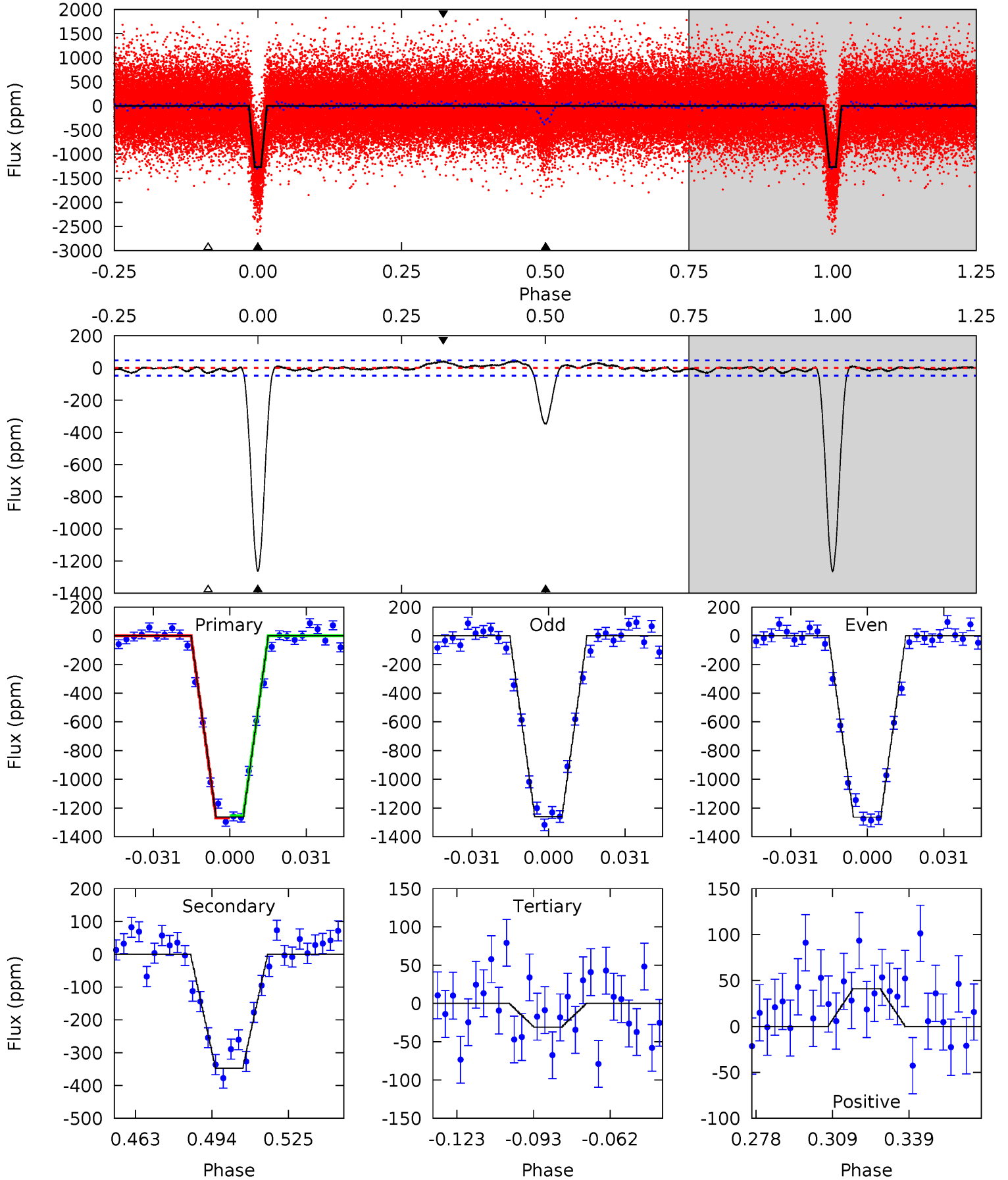
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
136.6	26.9	4.67	5.05	4.77	2.08	2.40	131.9	131.6	22.2	21.9	0.30	0.99	0.04	4.89



# Alt Model-Shift Uniqueness Test

010068030-01, P = 2.023117 Days, E = 130.053474 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
127.8	35.2	3.14	4.15	4.81	2.16	1.59	124.6	123.6	32.0	31.0	0.19	1.02	0.03	0.72



### Stellar Parameters For KIC 010068030

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$5559^{+194}_{-194}$	$4.578^{+0.034}_{-0.136}$	$-0.180^{+0.300}_{-0.300}$	$0.803^{+0.164}_{-0.070}$	$0.899^{+0.081}_{-0.112}$	$2.446^{+0.445}_{-0.914}$
	+3%/-3%	+1%/-3%	+167%/-167%	+20%/-9%	+9%/-12%	+18%/-37%
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 010068030-01 / KOI 0529.01

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$-226 \pm 8$	$3.35^{+0.36}_{-0.29}$	$1806^{+98}_{-79}$	$3875^{+119}_{-124}$	$10^{+2}_{-2}$
Alt.	$-347 \pm 10$	$3.23^{+0.40}_{-0.27}$	$1800^{+105}_{-84}$	$4220^{+156}_{-143}$	$16^{+3}_{-3}$

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



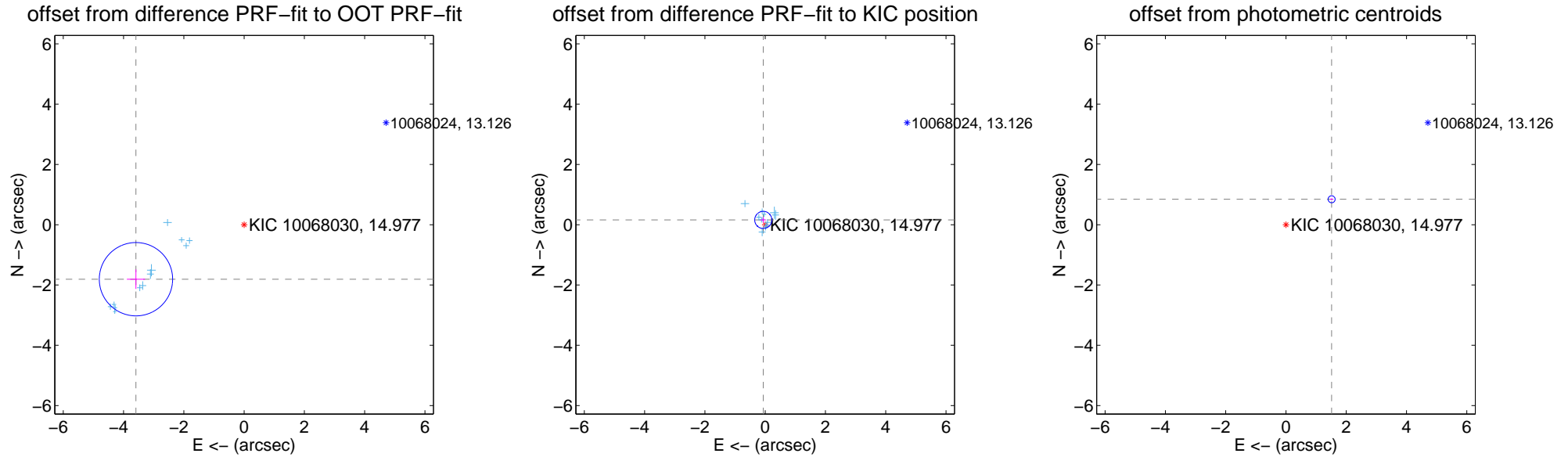
## DV Centroid Data

Supplemental centroid analysis for 010068030-01. Kepler magnitude: 14.98. Transit SNR 82.00

There are 17 quarters with good PRF difference image offsets

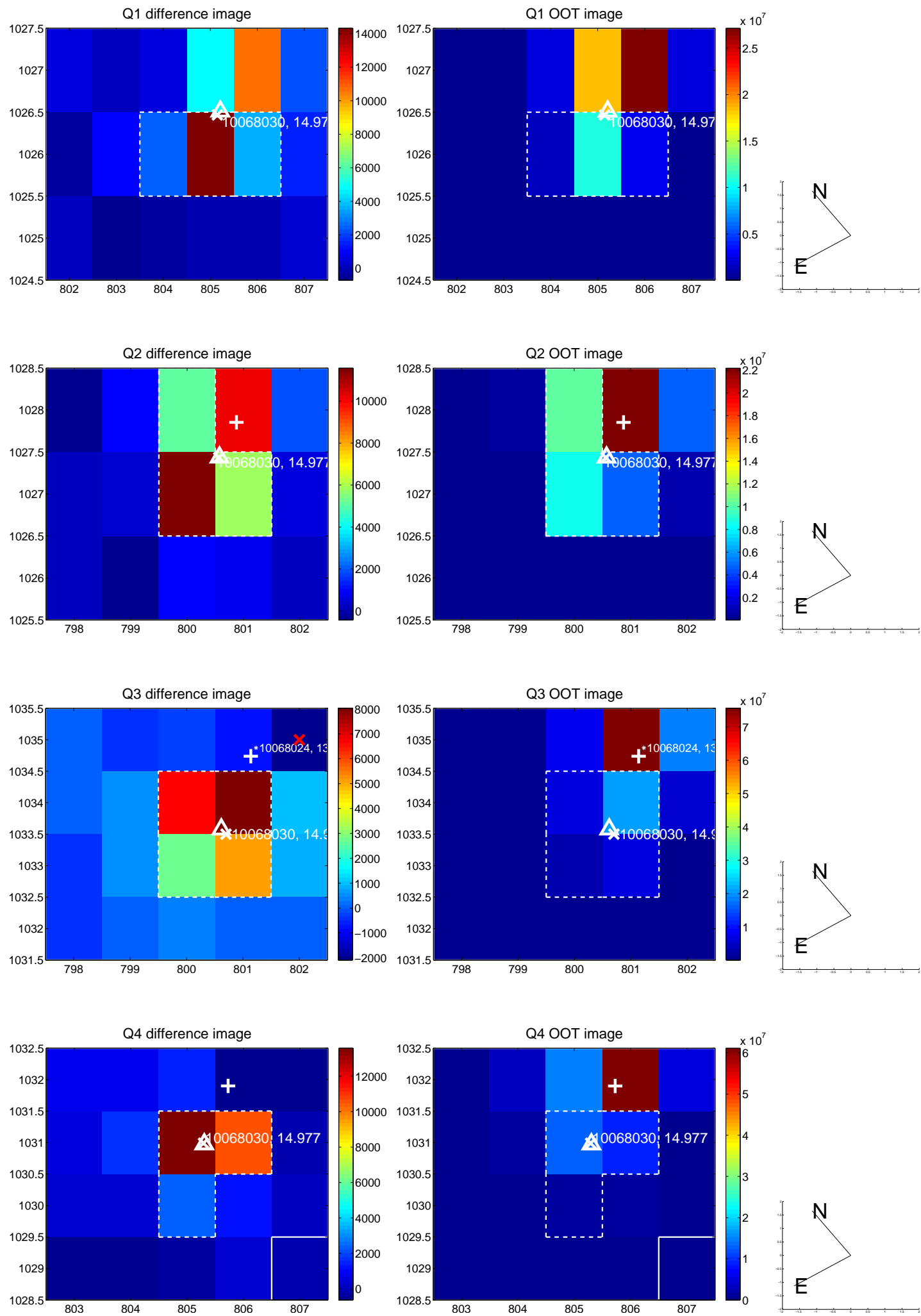
The OOT PRF centroid is offset from the target star catalog position by about 3.88 arcsec so the offset from difference PRF-fit to OOT-fit may be invalid.

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$4.019 \pm 0.406$	9.91	$3.589 \pm 0.301$	$-1.808 \pm 0.323$
PRF-fit source offset from KIC position	$0.171 \pm 0.095$	1.81	$0.063 \pm 0.095$	$0.159 \pm 0.093$
photometric centroid source offset	$1.74 \pm 0.04$	44.80	$-1.52 \pm 0.04$	$0.84 \pm 0.03$

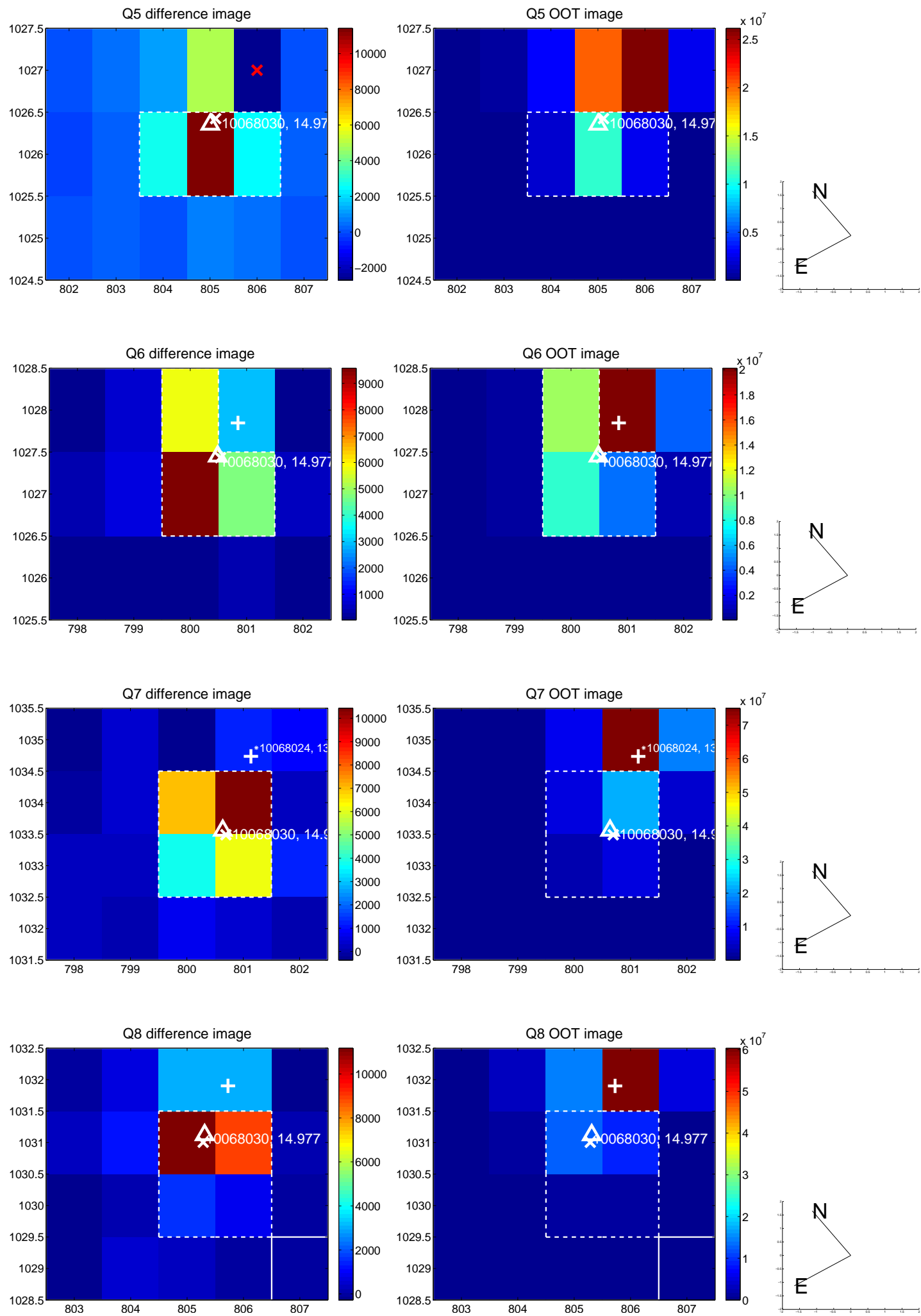


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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

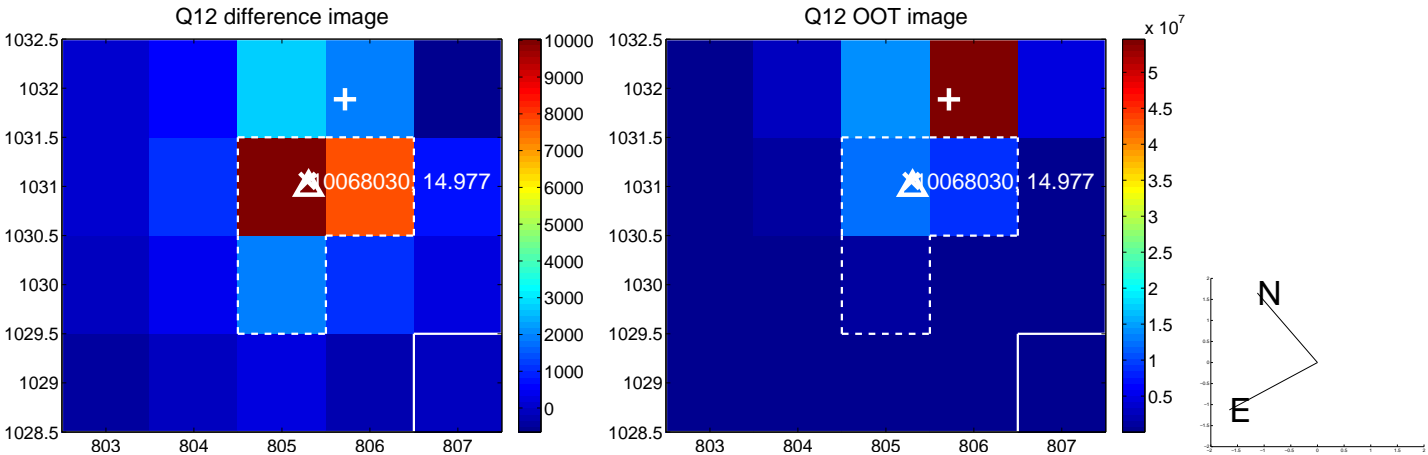
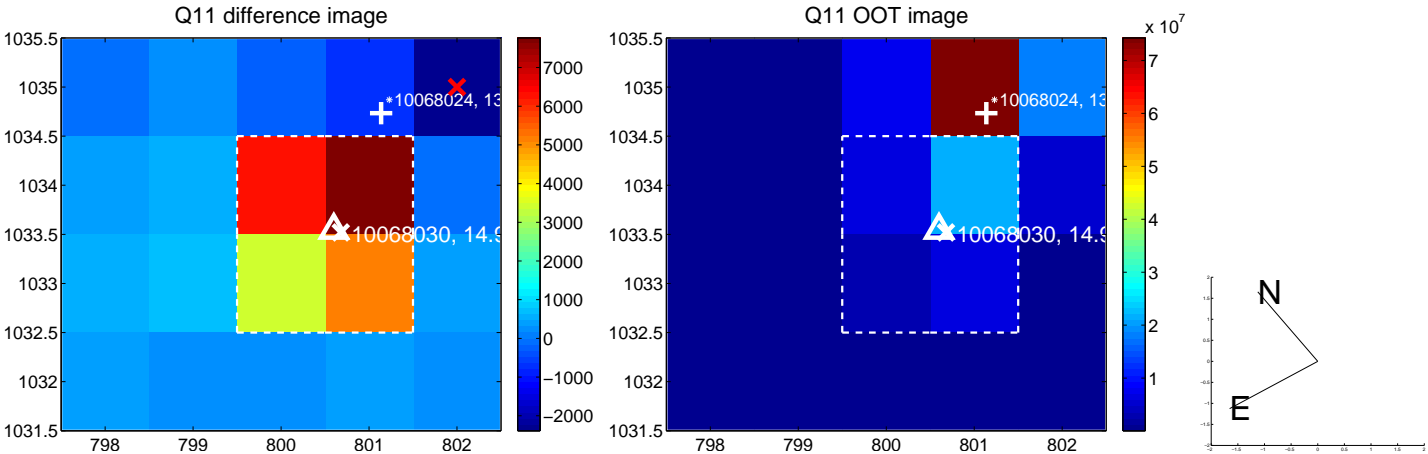
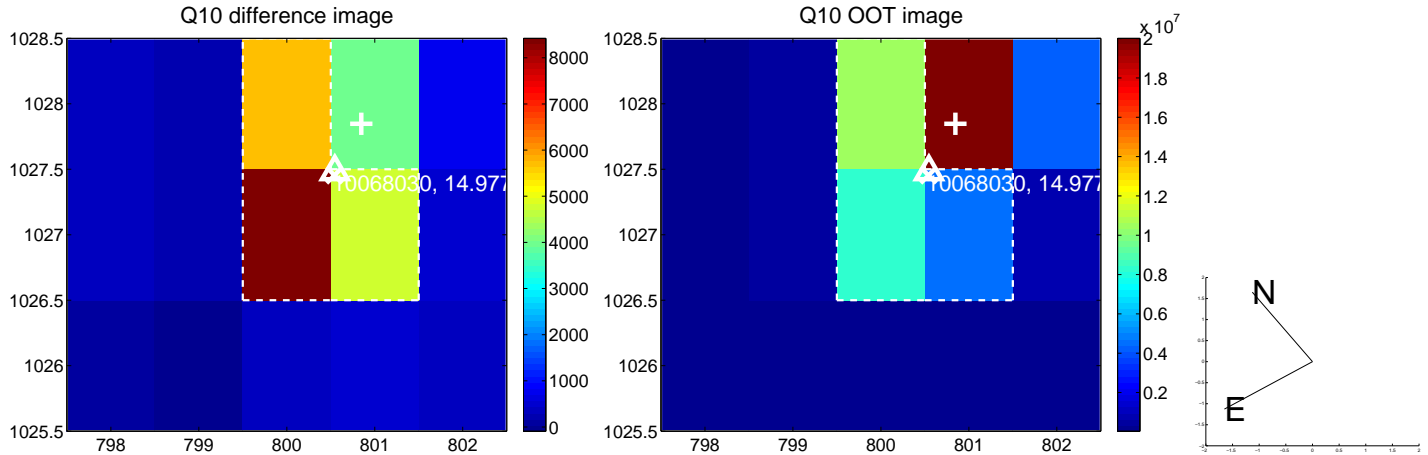
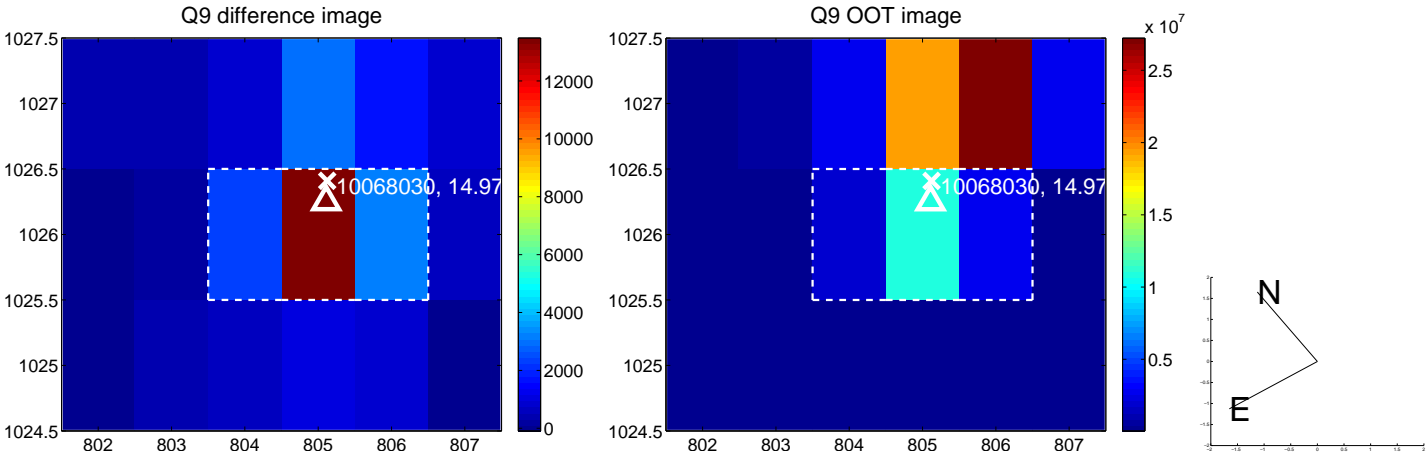
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



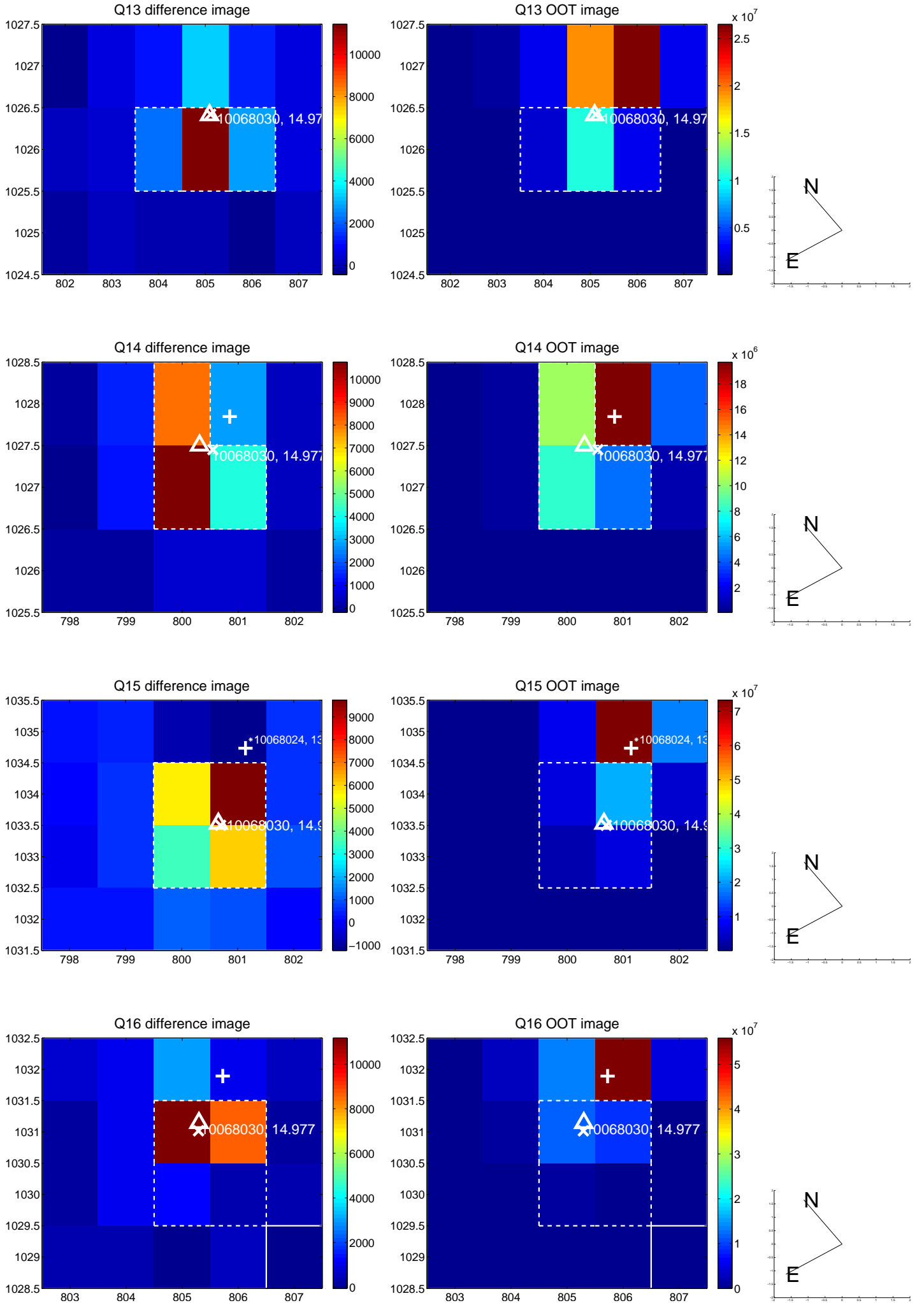
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

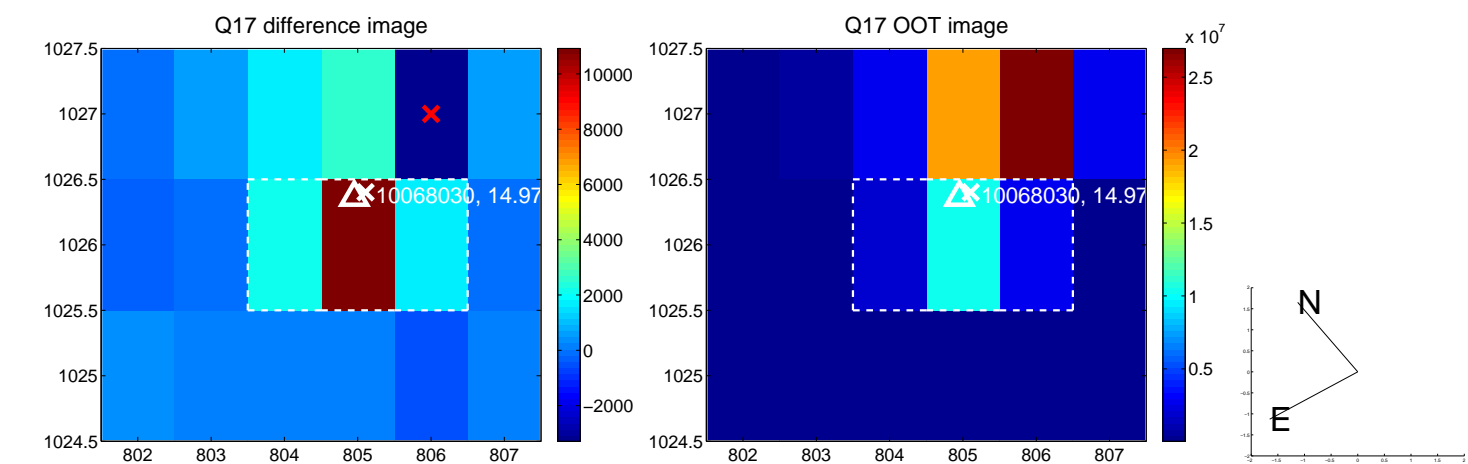


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

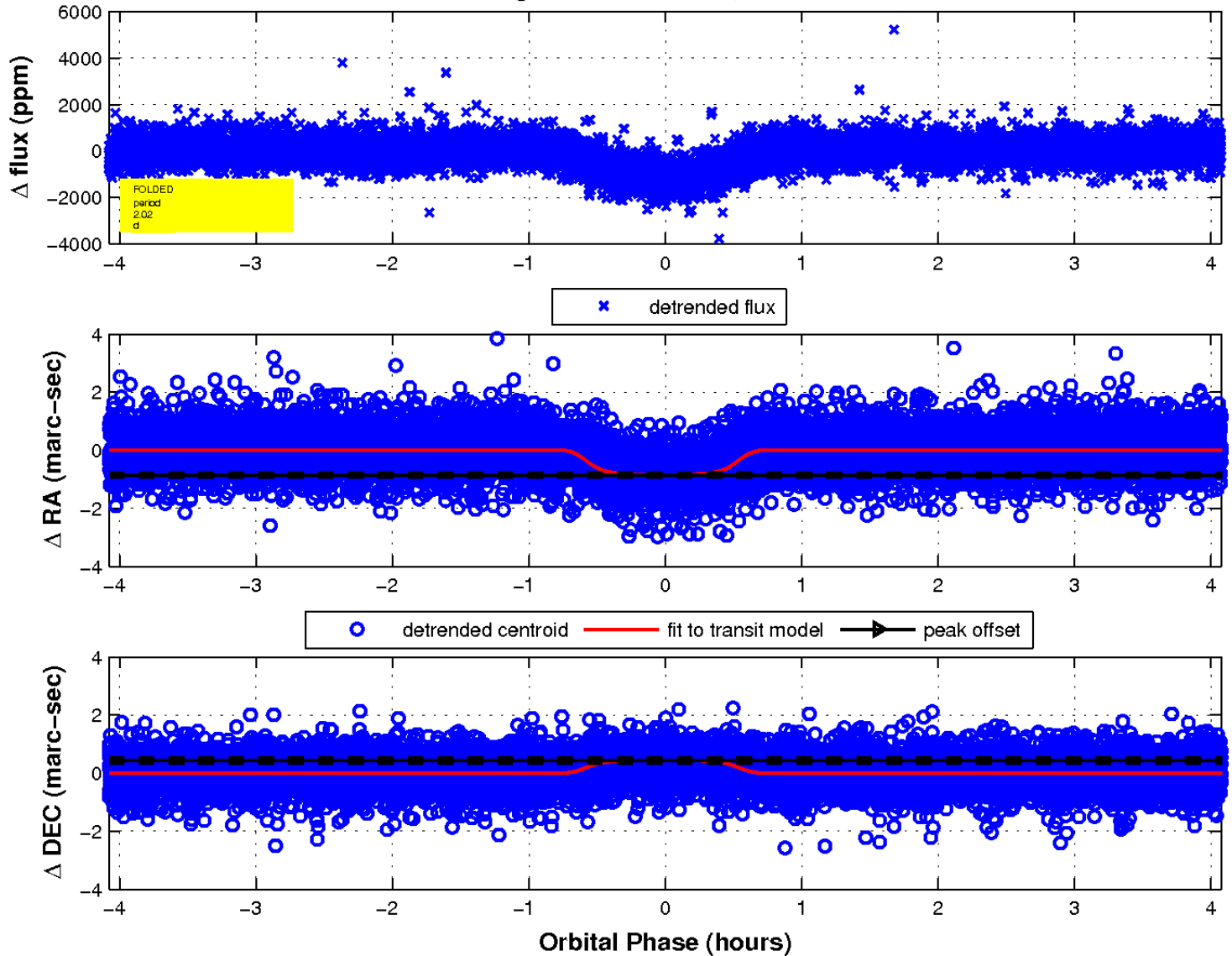




white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

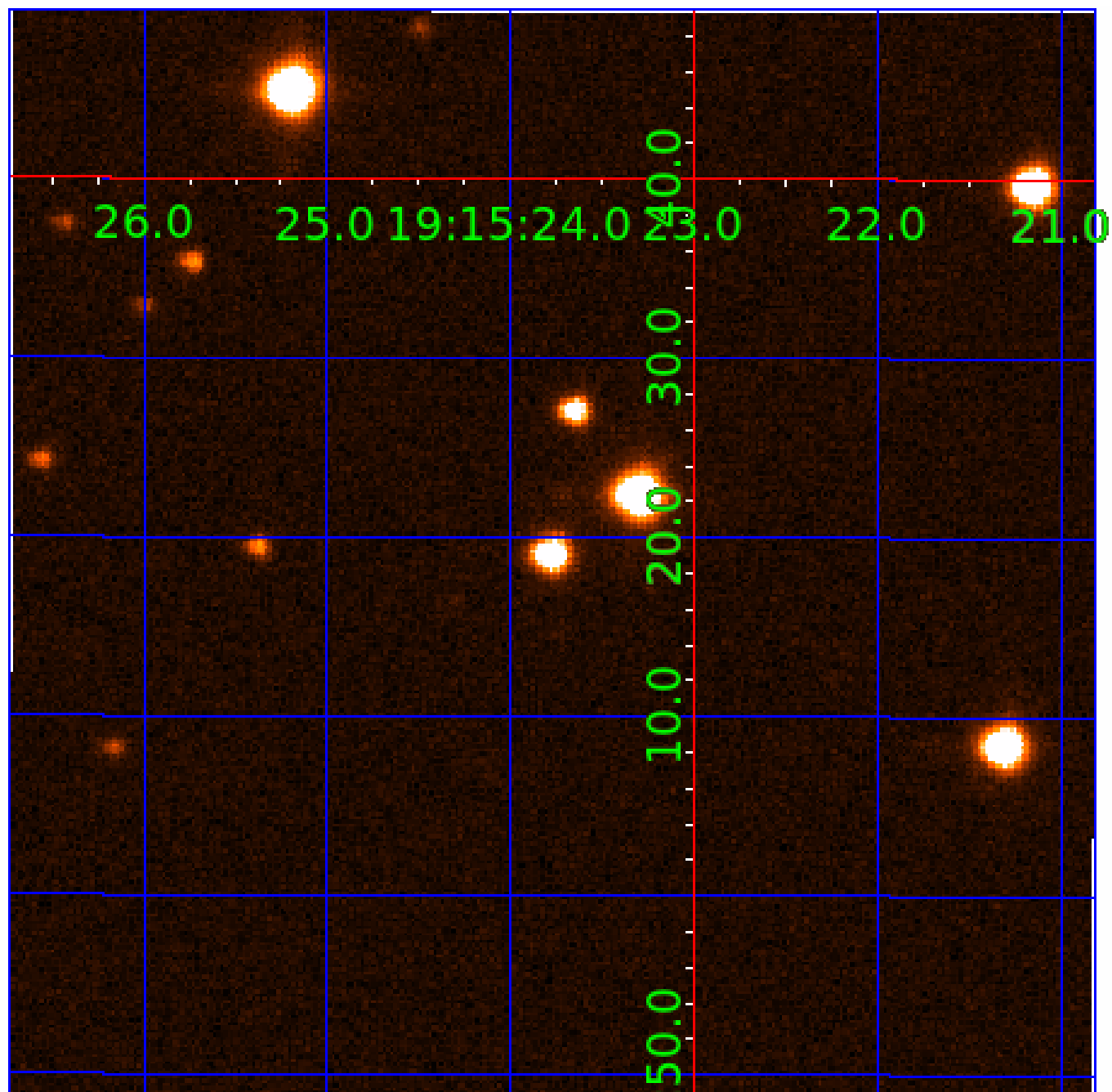


fluxWeightedCentroids, Planet 1 of 2



UKIRT Image

Declination



# KIC 010068030

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
010068030-01	OBS	0529.01	2.023113	132.076811	1119.9	1.360	69.4	82.0	0.80	5559	3.23	608.13
010068030-02	OBS	No	2.023119	133.087165	279.6	1.225	16.6	20.8	0.80	5559	1.61	608.13

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
010068030-01	OBS	FP	0.00	0	1	0	0	MOD_SEC_DV—MOD_SEC_ALT—HAS_SEC_TCE—CENT_KIC_POS
010068030-02	OBS	FP	0.00	1	1	0	0	IS_SEC_TCE—CENT_KIC_POS

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

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

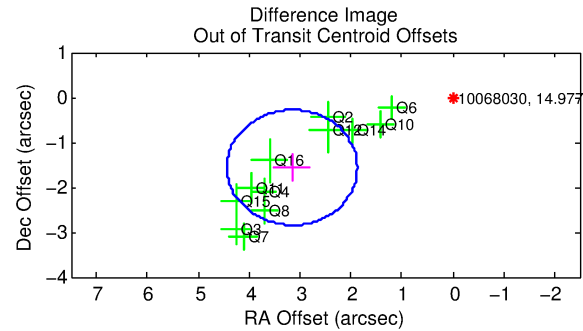
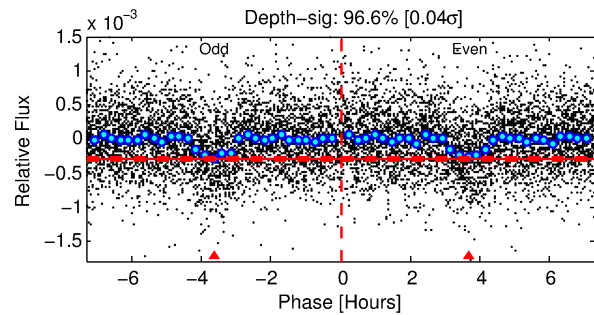
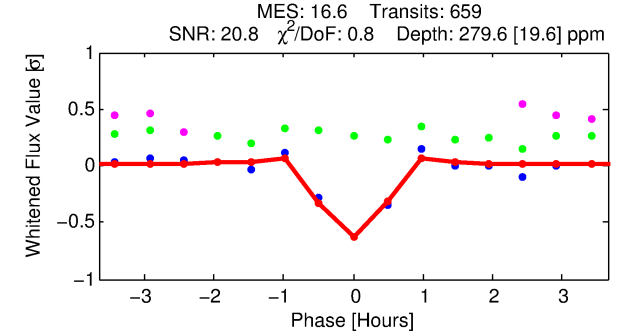
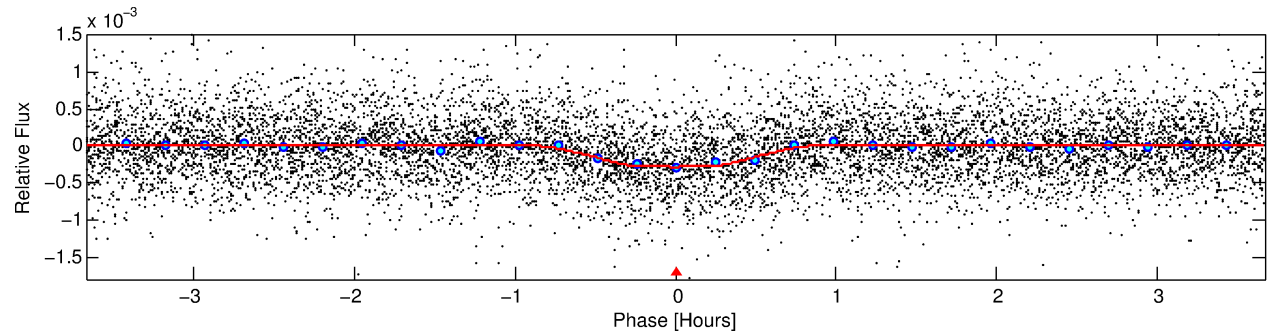
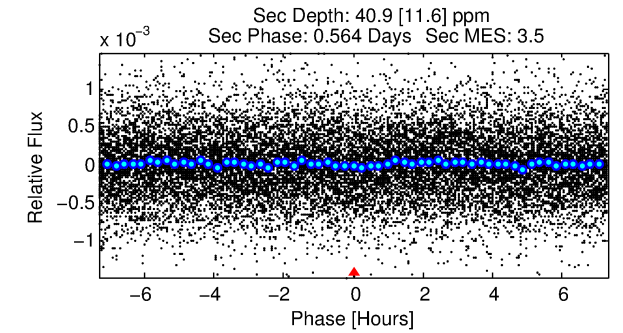
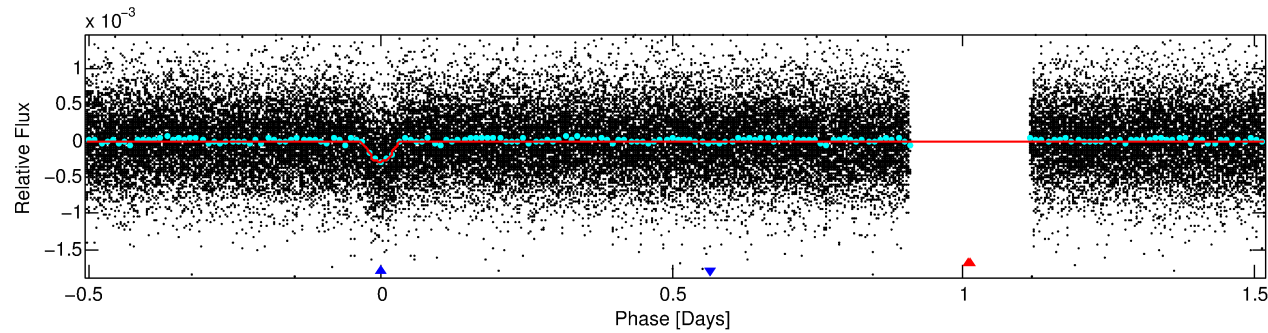
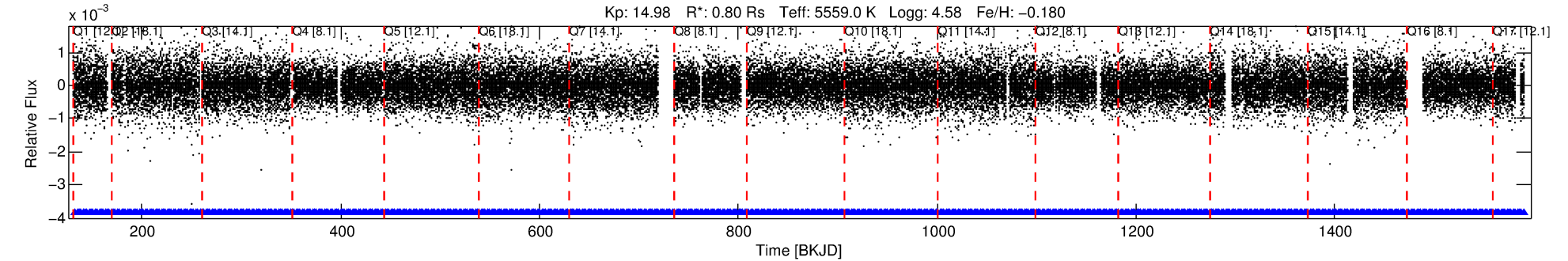
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 010068030-02

No Significant Match Found

# DV One-Page Summary

KIC: 10068030 Candidate: 2 of 2 Period: 2.023 d  
KOI: K00529 Corr: No Ephemeris Match



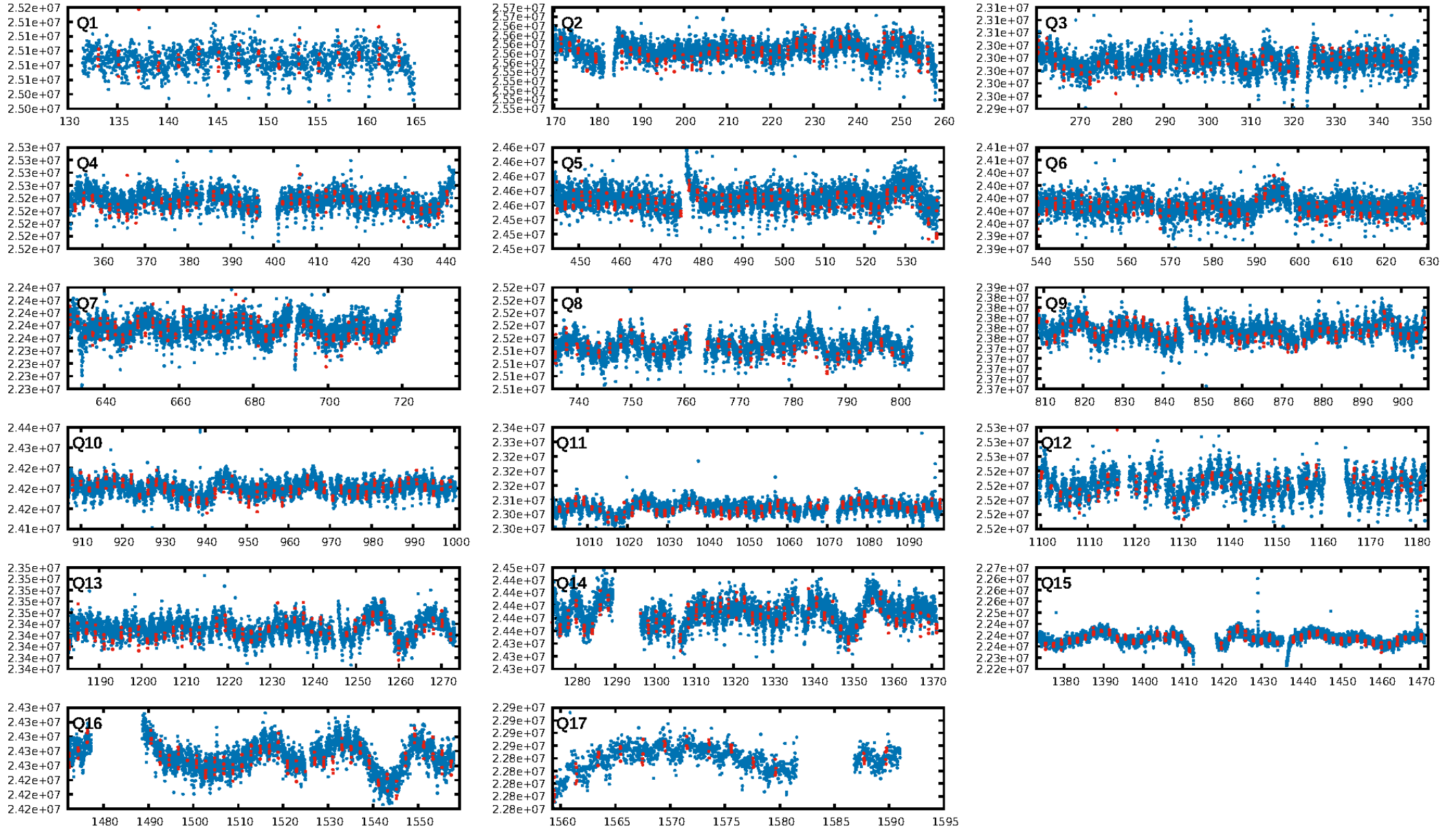
## DV Fit Results:

Period = 2.02312 [0.00001] d  
Epoch = 133.0872 [0.0009] BKJD  
Rp/R\* = 0.0184 [0.0074]  
a/R\* = 6.11 [10.84]  
b = 0.90 [0.40]  
Seff = 608.13 [173.73]  
Teff = 1266 [90] K  
Rp = 1.61 [0.73] Re  
a = 0.0301 [0.0052] AU  
Ag = 7.86 [7.00] [0.98σ]  
Teffp = 3278 [710] K [2.81σ]

## DV Diagnostic Results:

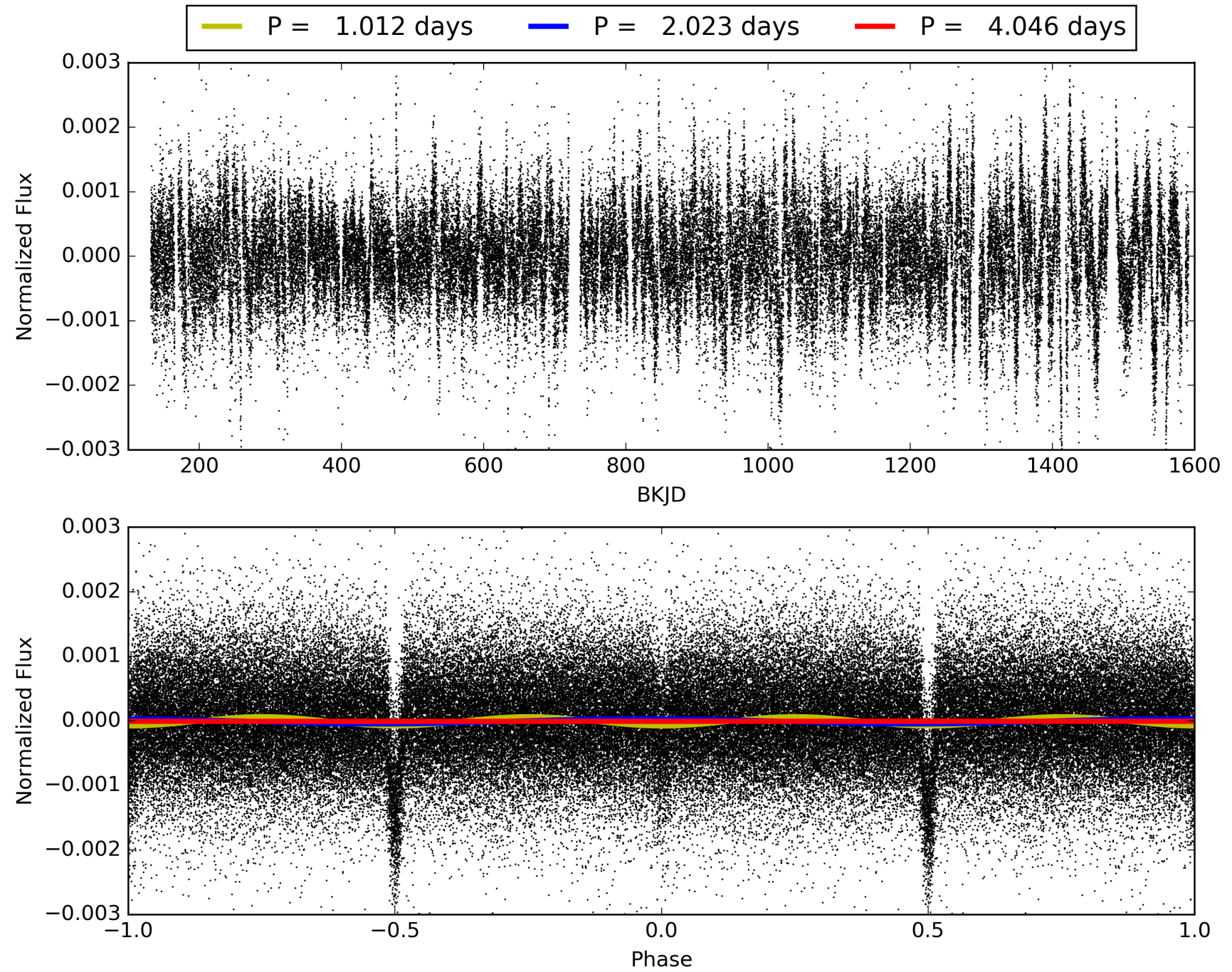
ShortPeriod-sig: 0.0% [0.00σ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: 1.94e-56  
RollingBand-fgt: 1.00 [630/630]  
GhostDiagnostic-chr: 3.475  
Centroid-sig: 0.0%  
Centroid-so: 1.979 arcsec [12.91σ]  
OotOffset-rm: 3.522 arcsec [8.24σ]  
KicOffset-rm: 0.244 arcsec [1.73σ]  
OotOffset-st: 4/4/4/0 [12]  
KicOffset-st: 4/4/4/5 [17]  
DiffImageQuality-fgm: 0.94 [16/17]  
DiffImageOverlap-fno: 1.00 [17/17]

# TCE 010068030-02, PDC Light Curves



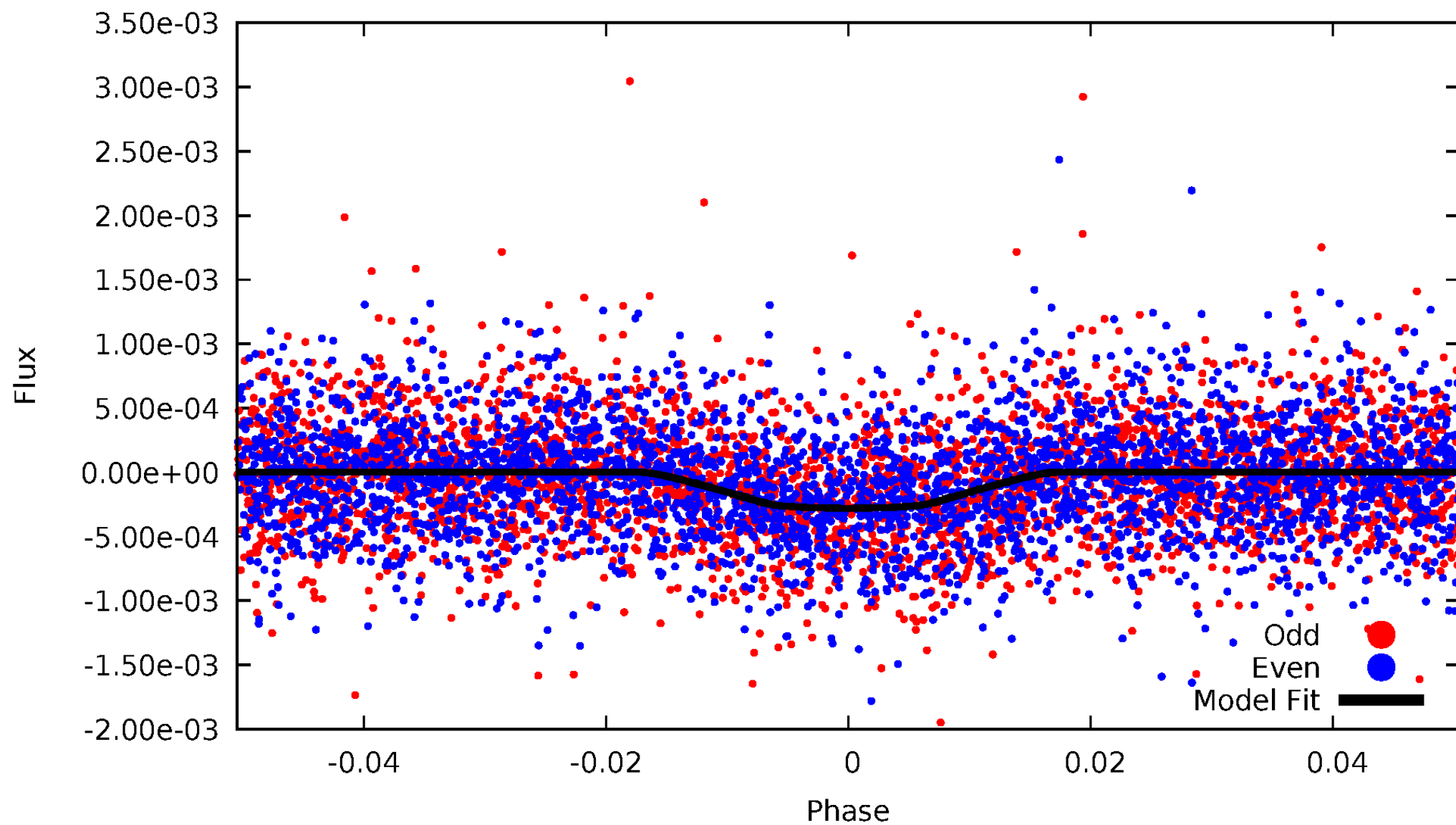


# TCE 010068030-02



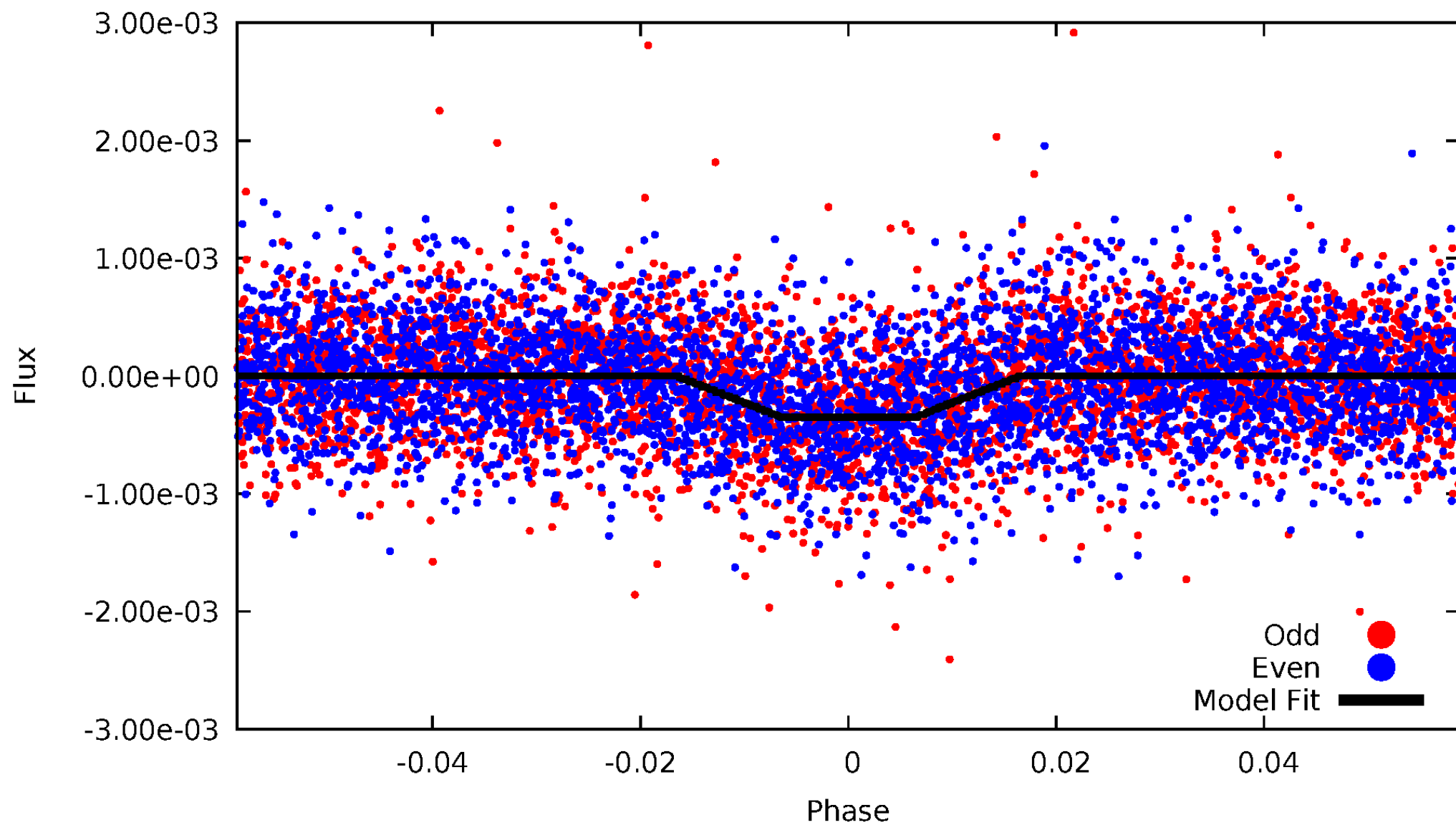
# DV Odd/Even

TCE 010068030-02



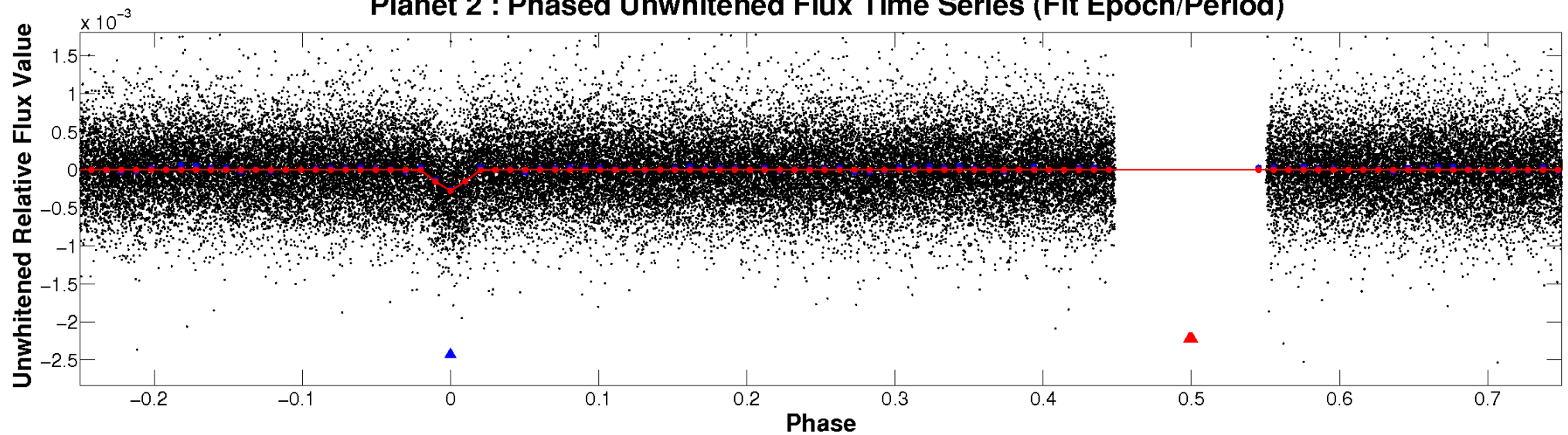
# ALT Odd/Even

TCE 010068030-02

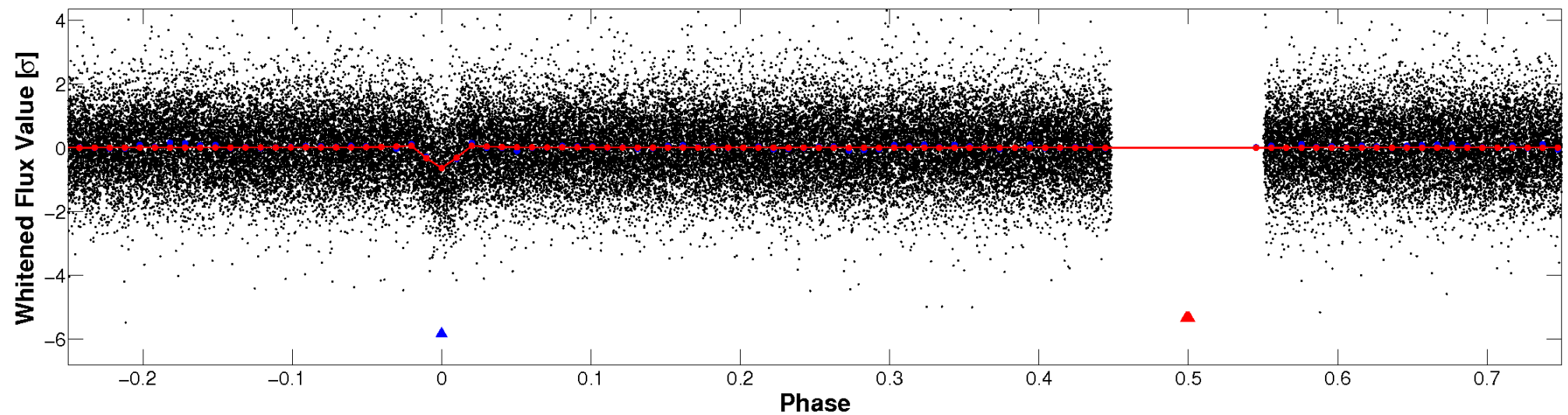


# Non-Whitened Vs. Whitened Light Curve

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



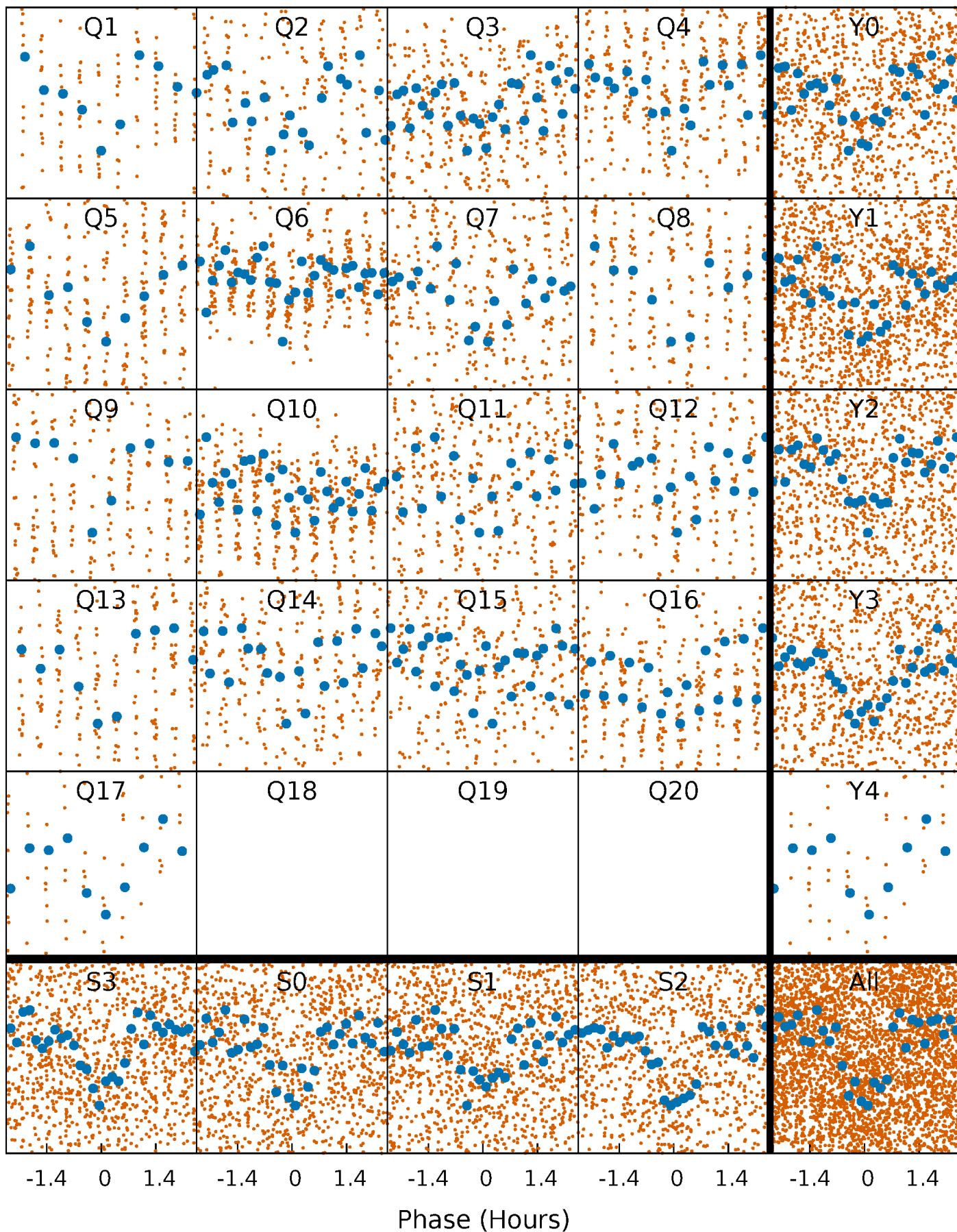
## Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)





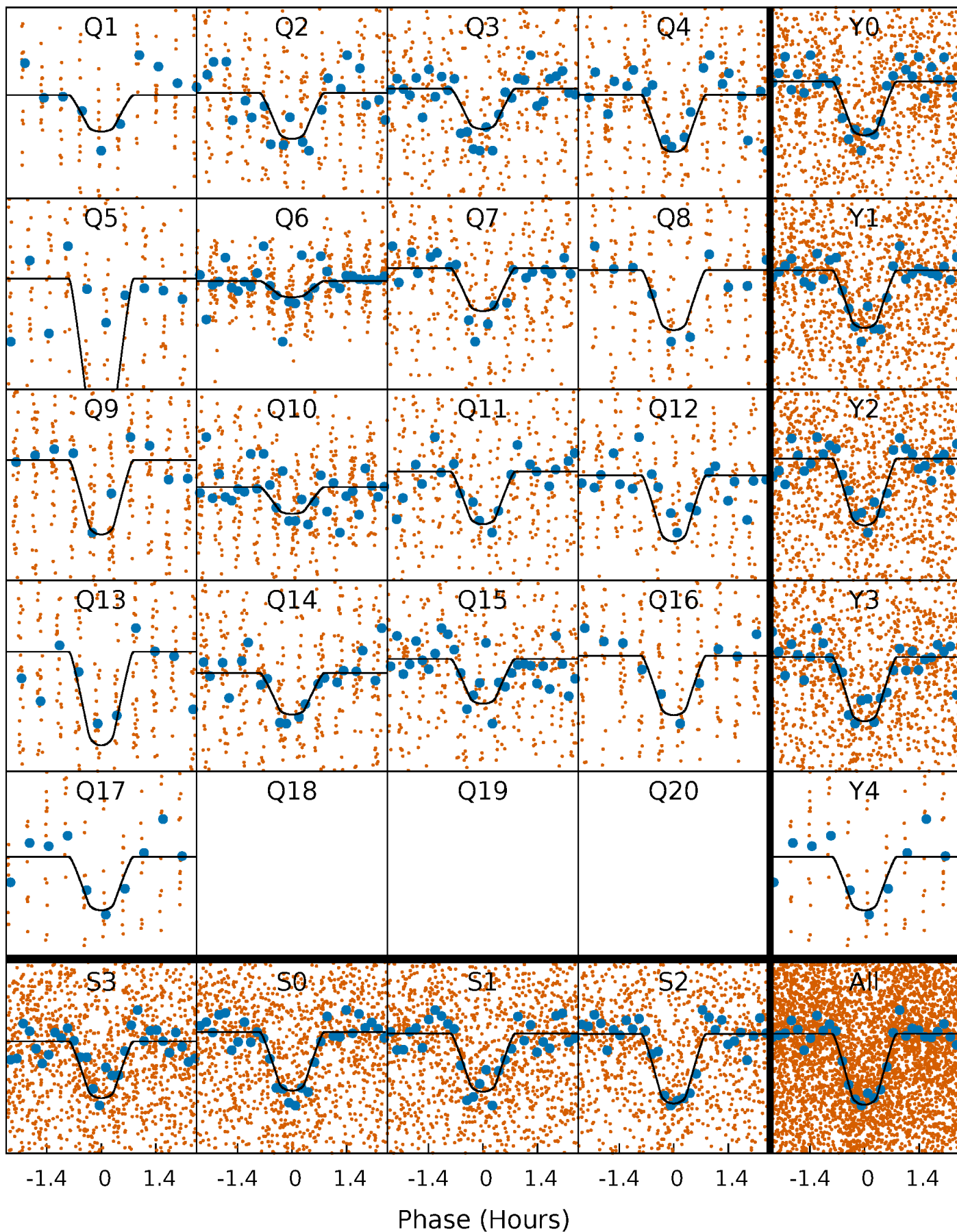
# PDC Quarter-Phased Transit Curves

TCE 010068030-02 P= 2.023119 Days  $T_0=133.087165$  (BKJD)



# DV Quarter-Phased Transit Curves

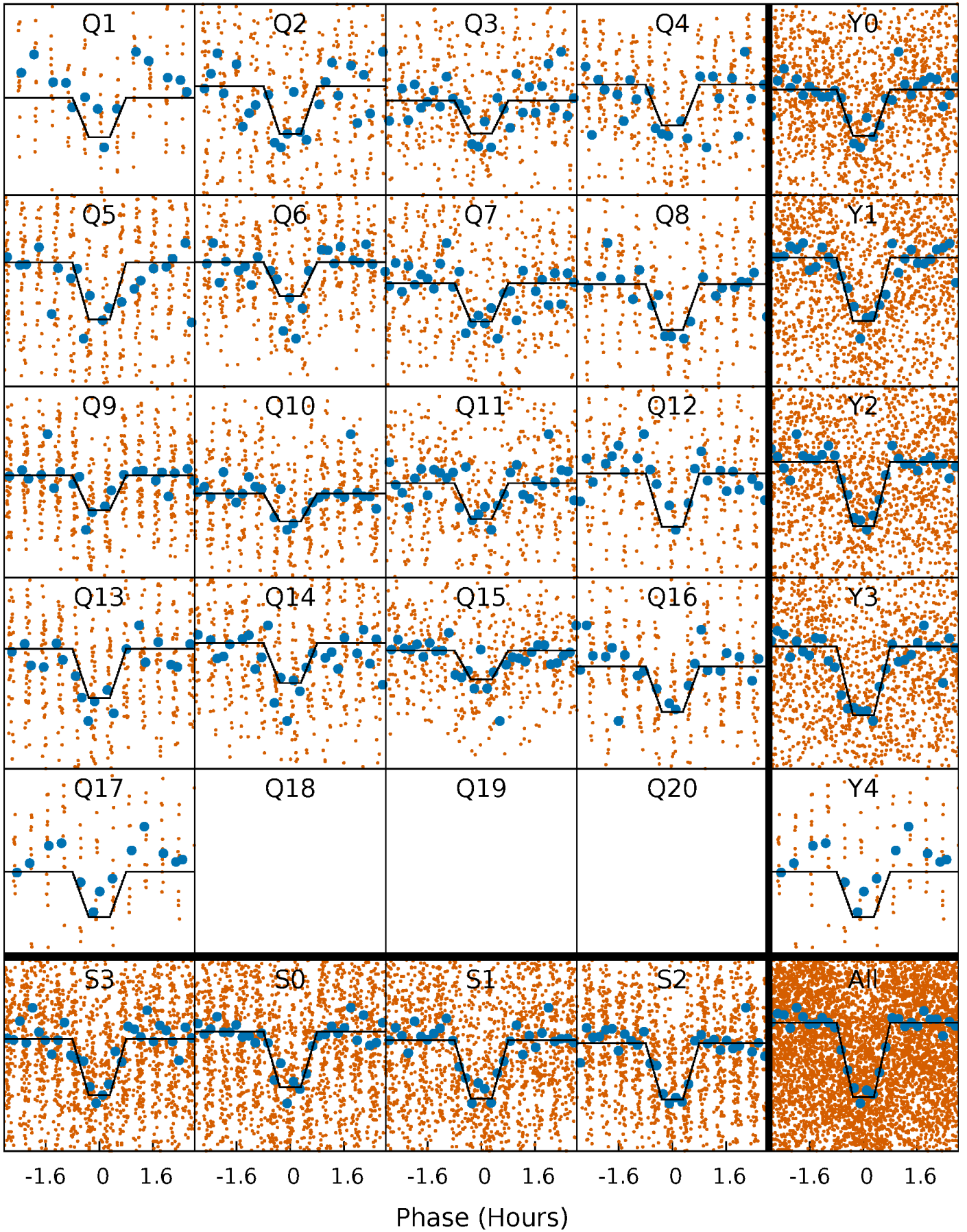
TCE 010068030-02 P= 2.023119 Days  $T_0=133.087165$  (BKJD)





# Alt. Detrend Quarter-Phased Transit Curves

TCE 010068030-02   P= 2.023134 Days    $T_0=133.082454$  (BKJD)

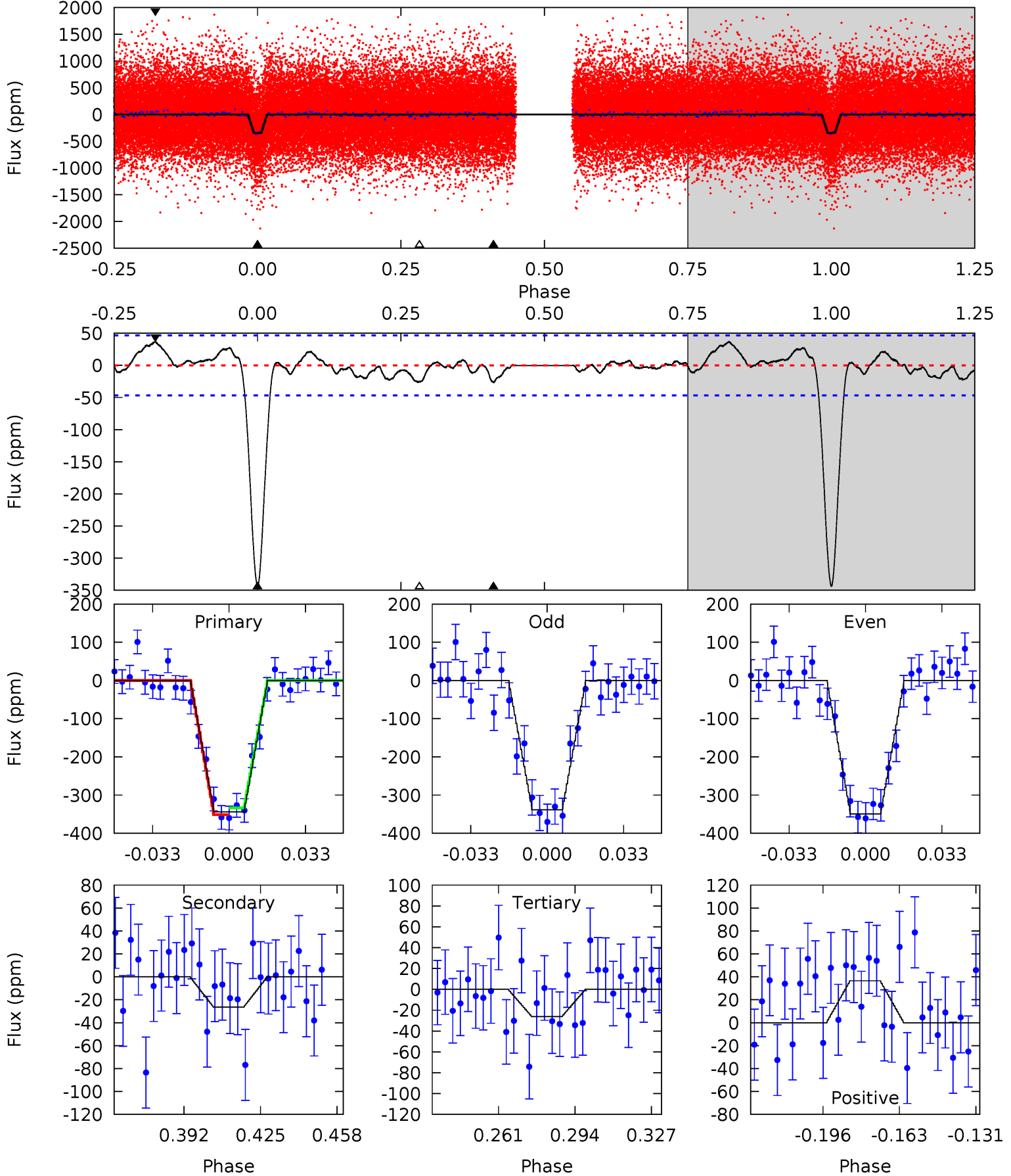




# Alt Model-Shift Uniqueness Test

010068030-02, P = 2.023134 Days, E = 131.059320 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
35.3	2.71	2.68	3.75	4.79	2.14	1.29	32.6	31.5	0.03	-1.04	0.56	1.05	0.10	0.93



### Stellar Parameters For KIC 010068030

	$T_{\text{eff}} (K)$	$\log(g)$	$[\text{Fe}/\text{H}]$	$R (R_{\odot})$	$M (M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$5559^{+194}_{-194}$	$4.578^{+0.034}_{-0.136}$	$-0.180^{+0.300}_{-0.300}$	$0.803^{+0.164}_{-0.070}$	$0.899^{+0.081}_{-0.112}$	$2.446^{+0.445}_{-0.914}$
	+3%/-3%	+1%/-3%	+167%/-167%	+20%/-9%	+9%/-12%	+18%/-37%
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 010068030-02 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$-36 \pm 9$	$1.67^{+0.70}_{-0.66}$	$1804^{+102}_{-86}$	$3576^{+698}_{-430}$	$6.294^{+10.272}_{-3.359}$
Alt.	$-26 \pm 10$	$1.66^{+0.71}_{-0.61}$	$1799^{+99}_{-74}$	$3390^{+575}_{-437}$	$4.582^{+7.328}_{-2.634}$

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

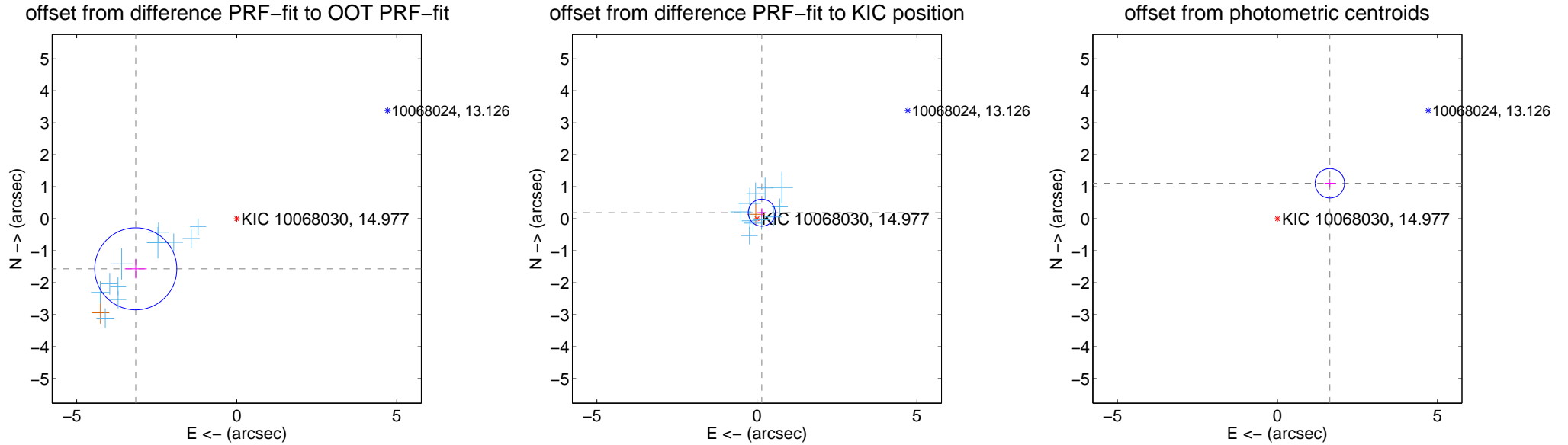
## DV Centroid Data

Supplemental centroid analysis for 010068030-02. Kepler magnitude: 14.98. Transit SNR 20.84

There are 16 quarters with good PRF difference image offsets

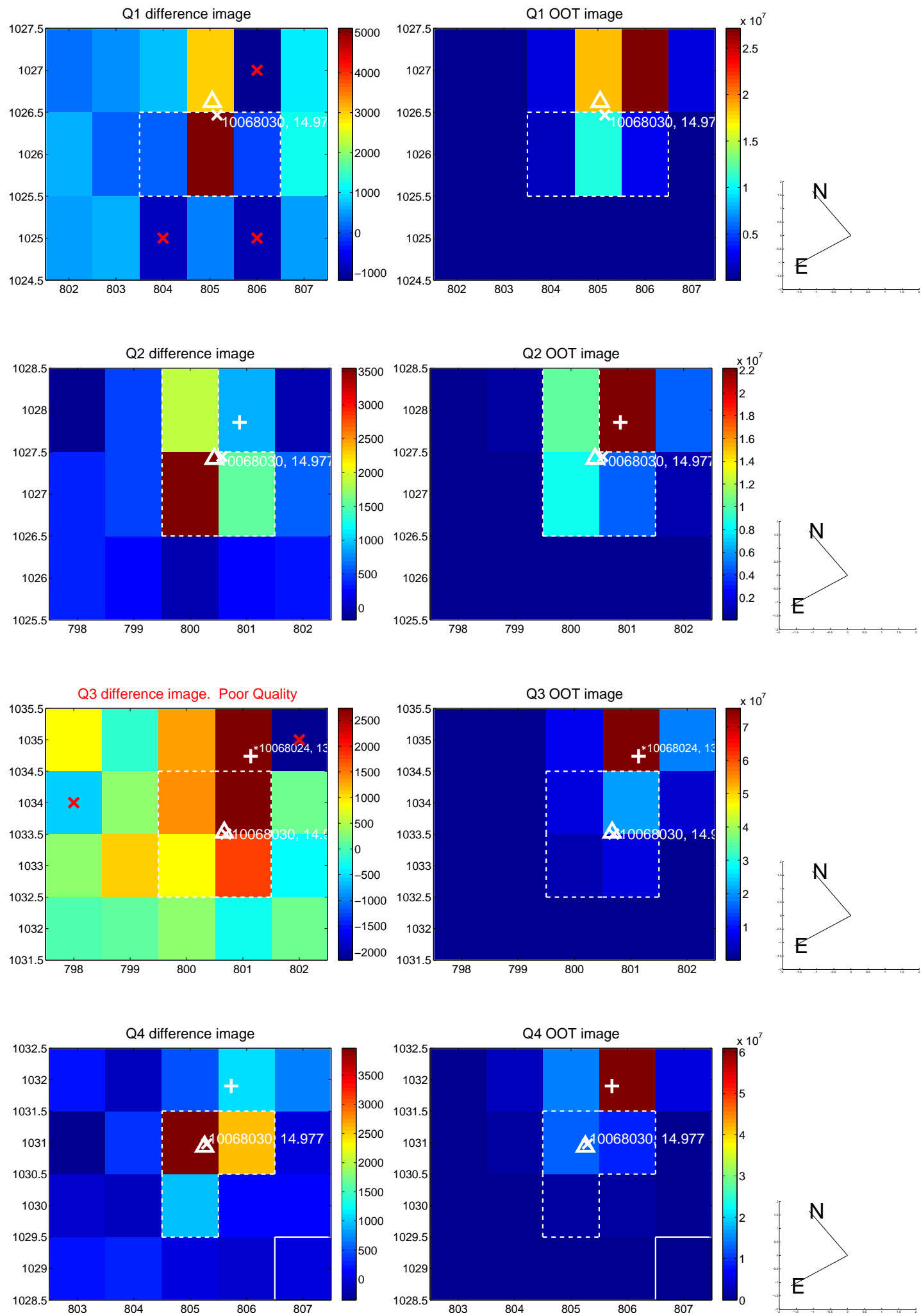
The OOT PRF centroid is offset from the target star catalog position by about 3.87 arcsec so the offset from difference PRF-fit to OOT-fit may be invalid.

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$3.522 \pm 0.428$	8.24	$3.155 \pm 0.343$	$-1.564 \pm 0.298$
PRF-fit source offset from KIC position	$0.244 \pm 0.141$	1.73	$-0.151 \pm 0.150$	$0.191 \pm 0.131$
photometric centroid source offset	$1.98 \pm 0.15$	12.91	$-1.64 \pm 0.16$	$1.11 \pm 0.13$



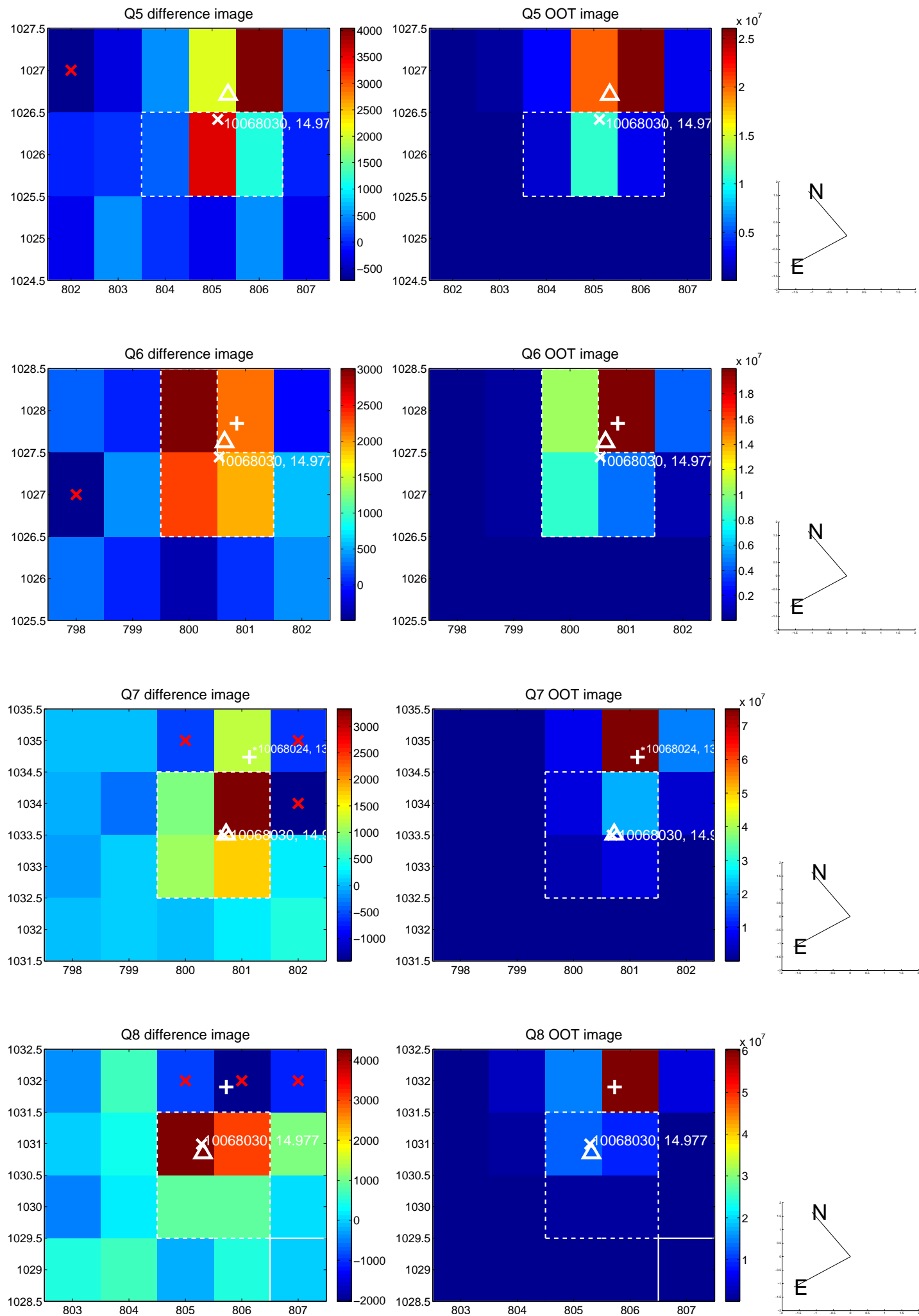
Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses:** good quarterly centroid offsets; **Vermillion crosses:** bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

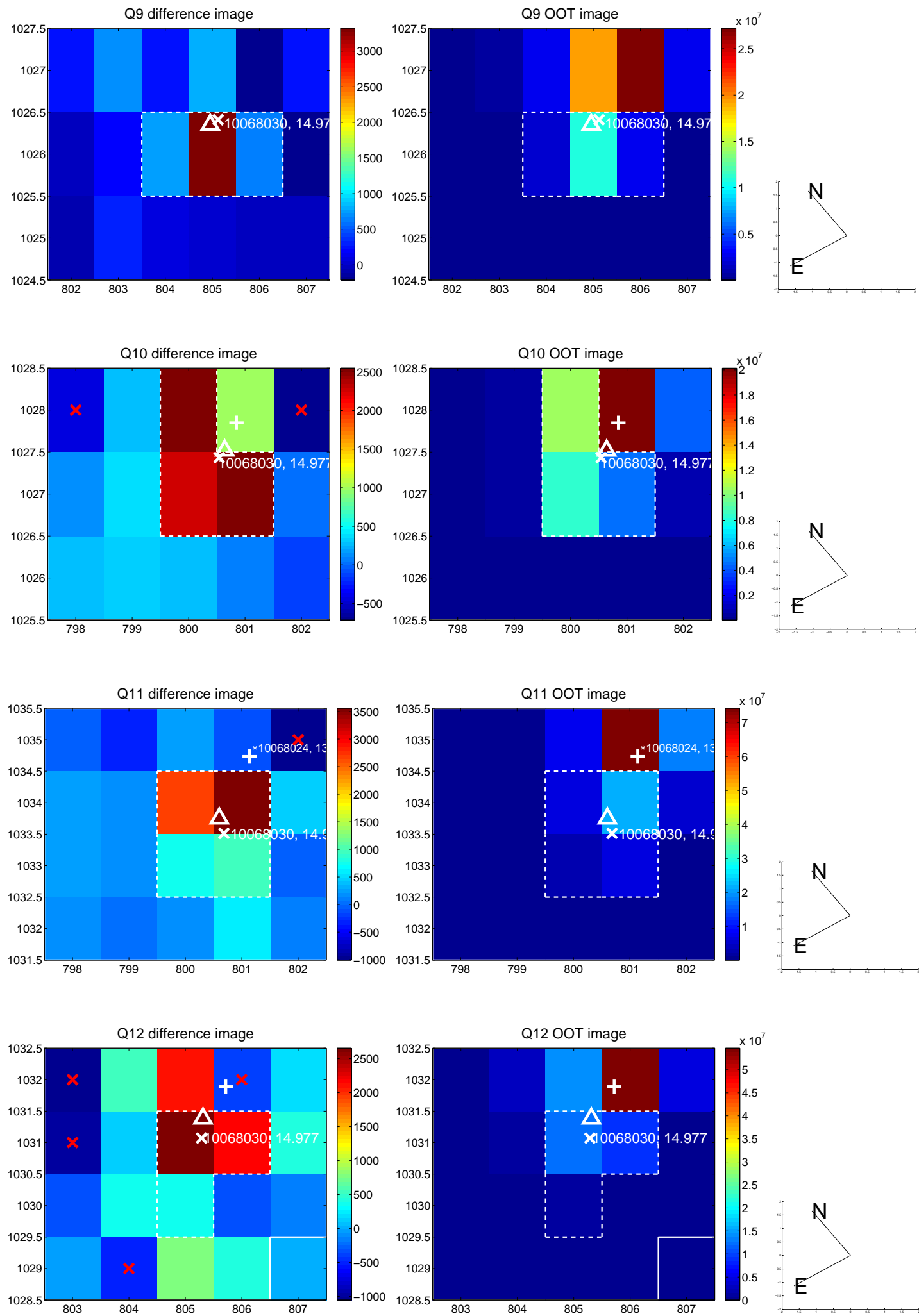




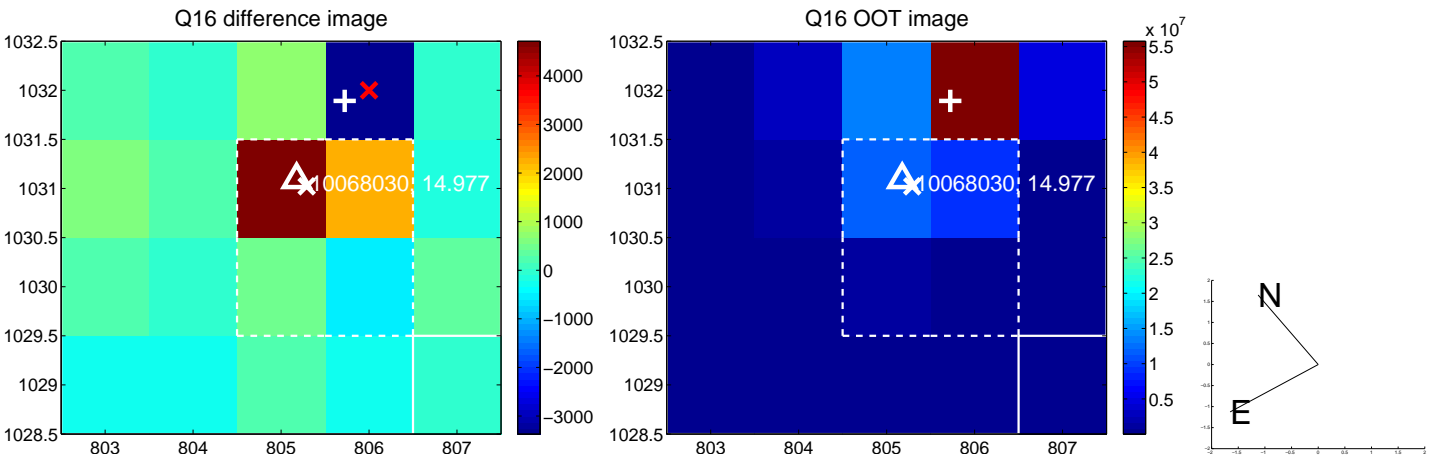
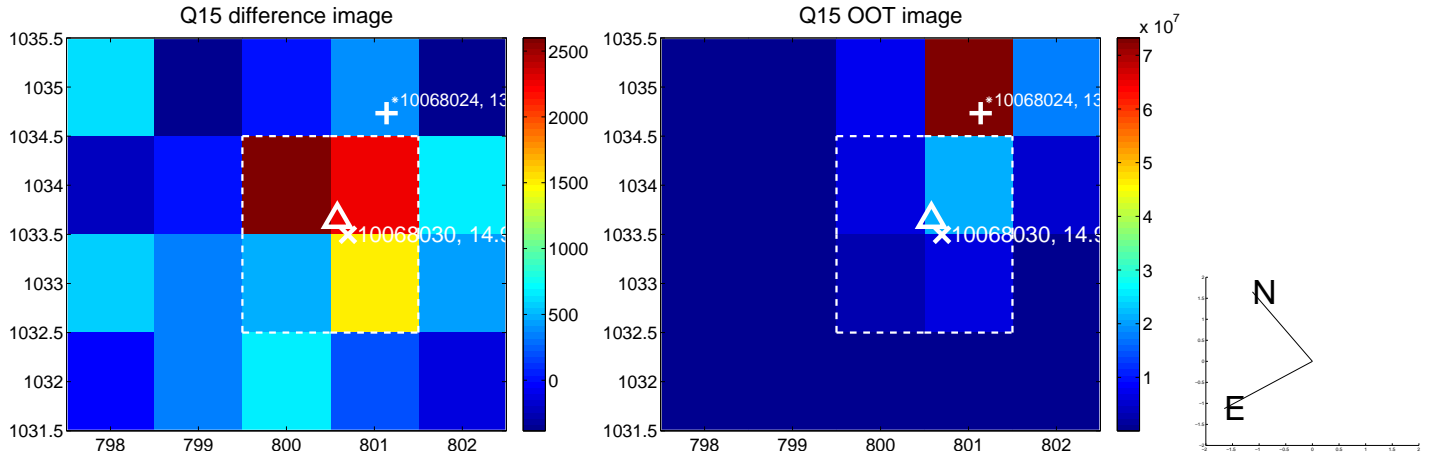
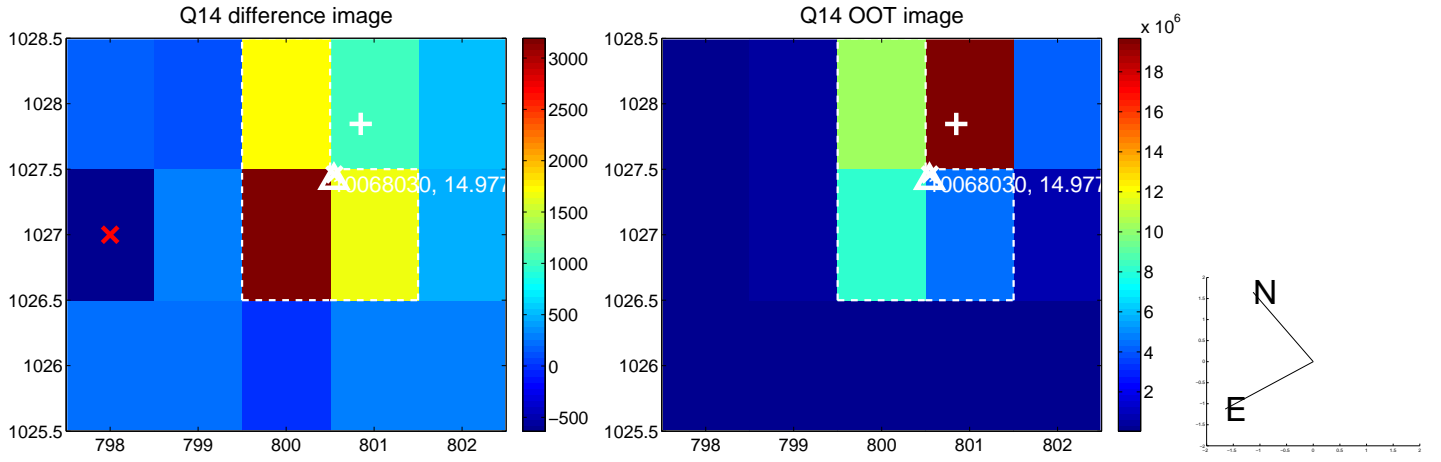
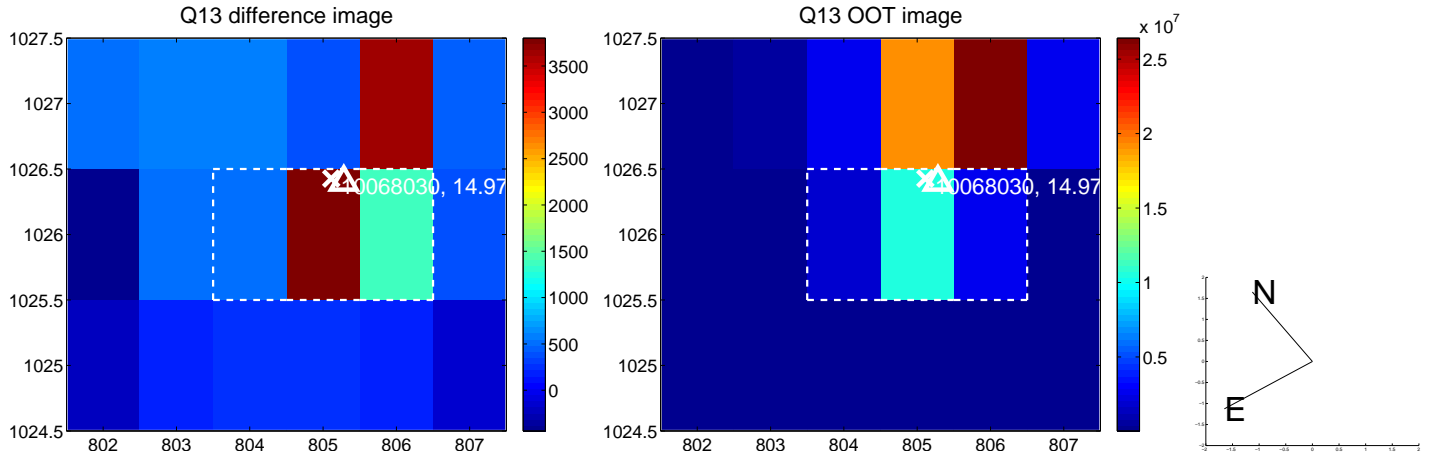
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



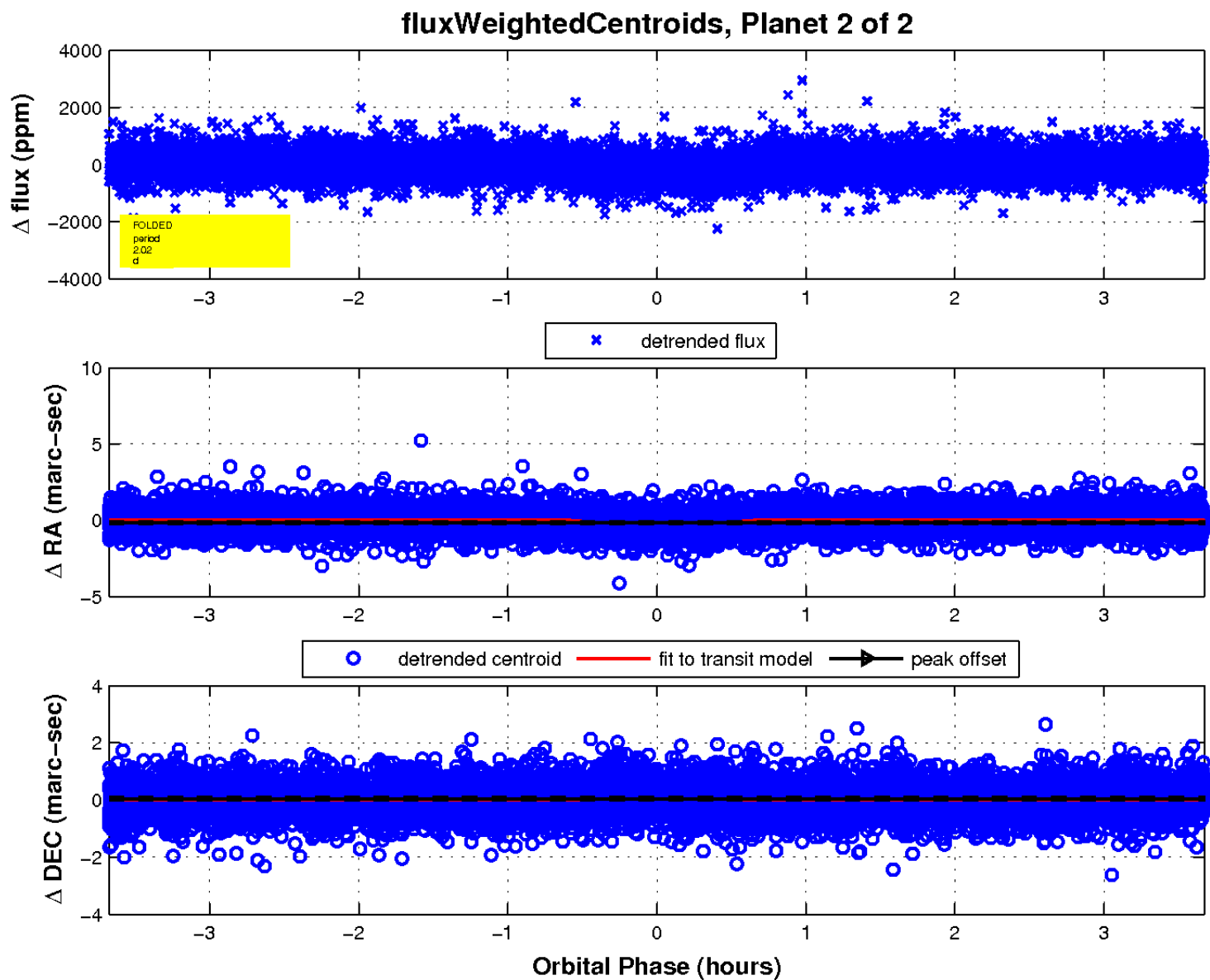
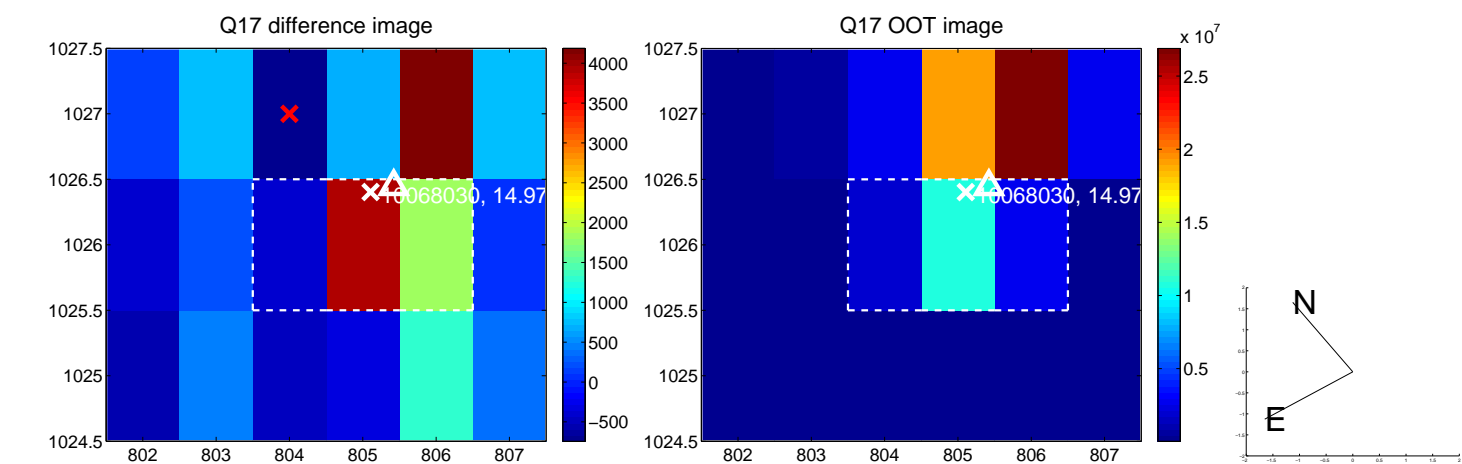
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

