

# KIC 008077137

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
008077137-01	OBS	0274.01	15.089609	145.780021	49.1	6.353	15.0	15.8	1.61	6063	1.18	207.89
008077137-02	OBS	0274.02	22.803083	153.373016	45.8	5.202	10.0	11.3	1.61	6063	1.30	119.88

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
008077137-01	OBS	PC	1.00	0	0	0	0	CENT_SATURATED
008077137-02	OBS	PC	1.00	0	0	0	0	CENT_SATURATED

**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.

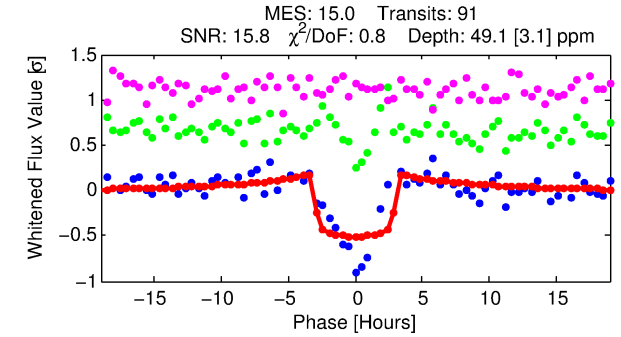
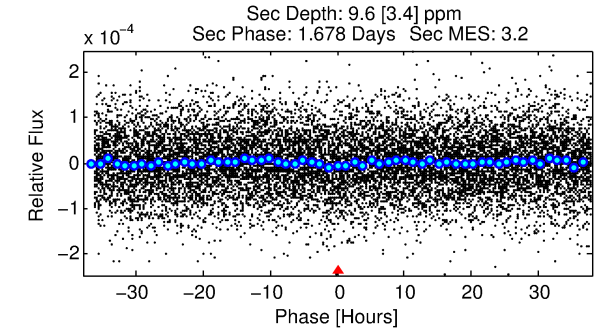
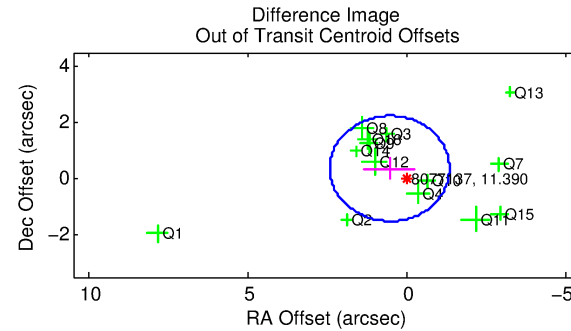
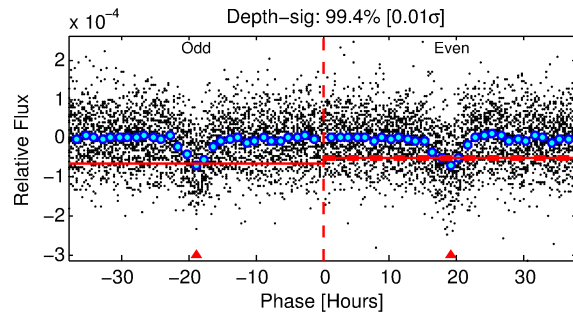
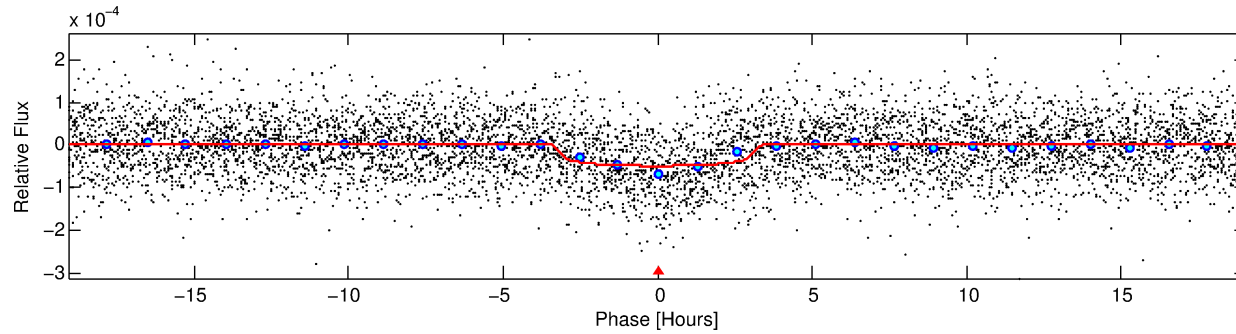
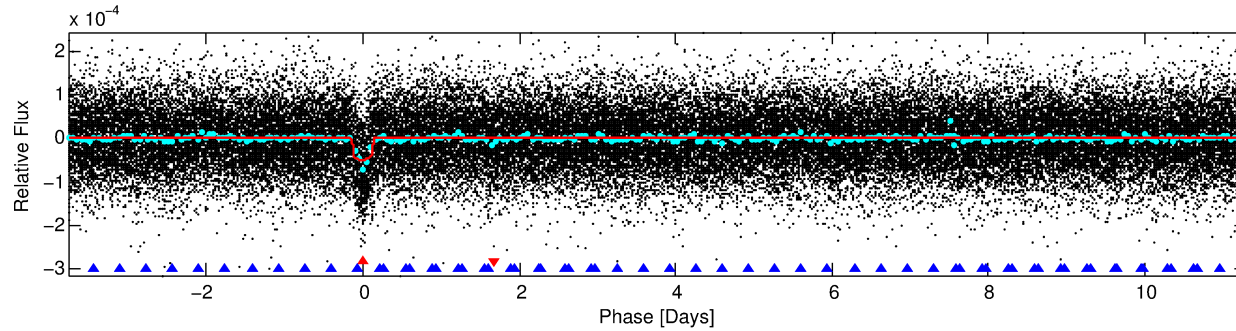
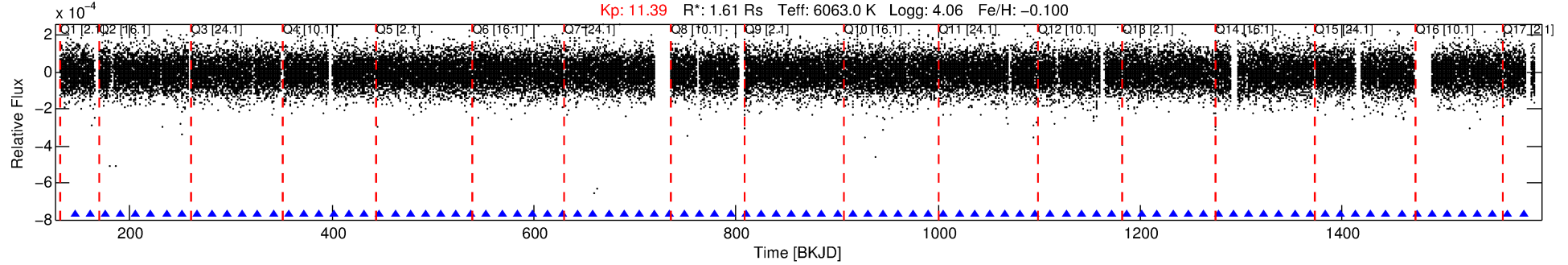
## Ephemeris Match Information For 008077137-01

No Significant Match Found

# DV One-Page Summary

KIC: 8077137 Candidate: 1 of 2 Period: 15.090 d  
KOI: K00274.01 Name: Kepler-128b Corr: 0.814

Kp: 11.39 R\*: 1.61 Rs Teff: 6063.0 K Logg: 4.06 Fe/H: -0.100



## DV Fit Results:

Period = 15.08961 [0.00010] d  
Epoch = 145.7800 [0.0055] BKJD  
Rp/R\* = 0.0067 [0.0016]  
a/R\* = 14.50 [17.14]  
b = 0.61 [1.22]  
Seff = 207.89 [17.28]  
Teq = 968 [20] K  
Rp = 1.18 [0.30] Re  
a = 0.1231 [0.0057] AU  
Ag = 57.37 [34.80] [1.62σ]  
Teff = 4120 [624] K [5.05σ]

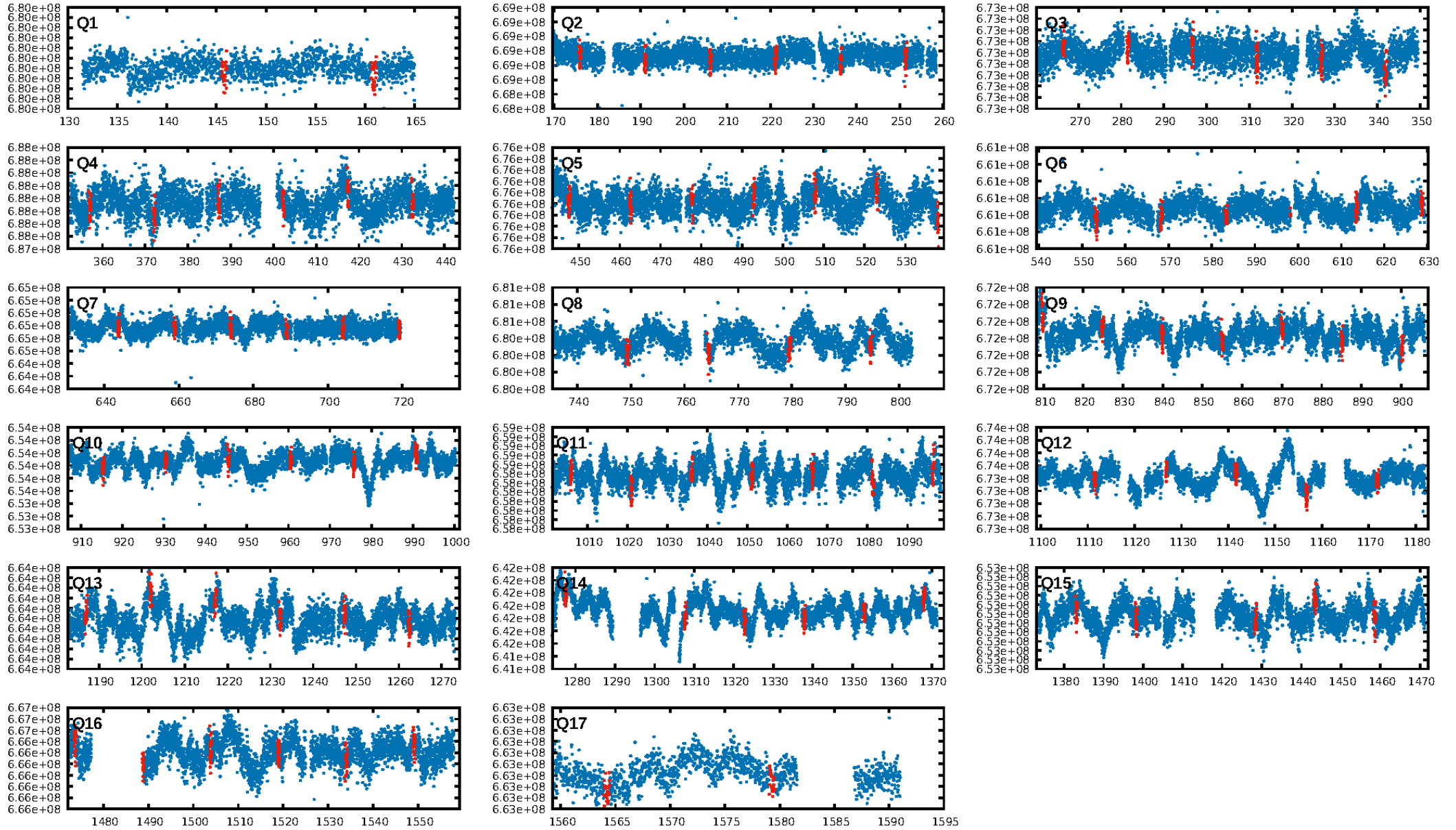
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 100.0% [22.55σ]  
ModelChiSquare2-sig: 99.4%  
ModelChiSquareGof-sig: 100.0%  
Bootstrap-pfa: 3.30e-47  
RollingBand-fgt: 1.00 [87/87]  
GhostDiagnostic-chr: 1.901  
Centroid-sig: 65.5%  
Centroid-so: 0.408 arcsec [0.81σ]  
OotOffset-rm: 0.656 arcsec [1.05σ]  
KicOffset-rm: 0.859 arcsec [1.46σ]  
OotOffset-st: 3/4/4/3 [14]  
KicOffset-st: 3/4/4/3 [14]  
DiffImageQuality-fgm: 0.71 [10/14]  
DiffImageOverlap-fno: 1.00 [17/17]

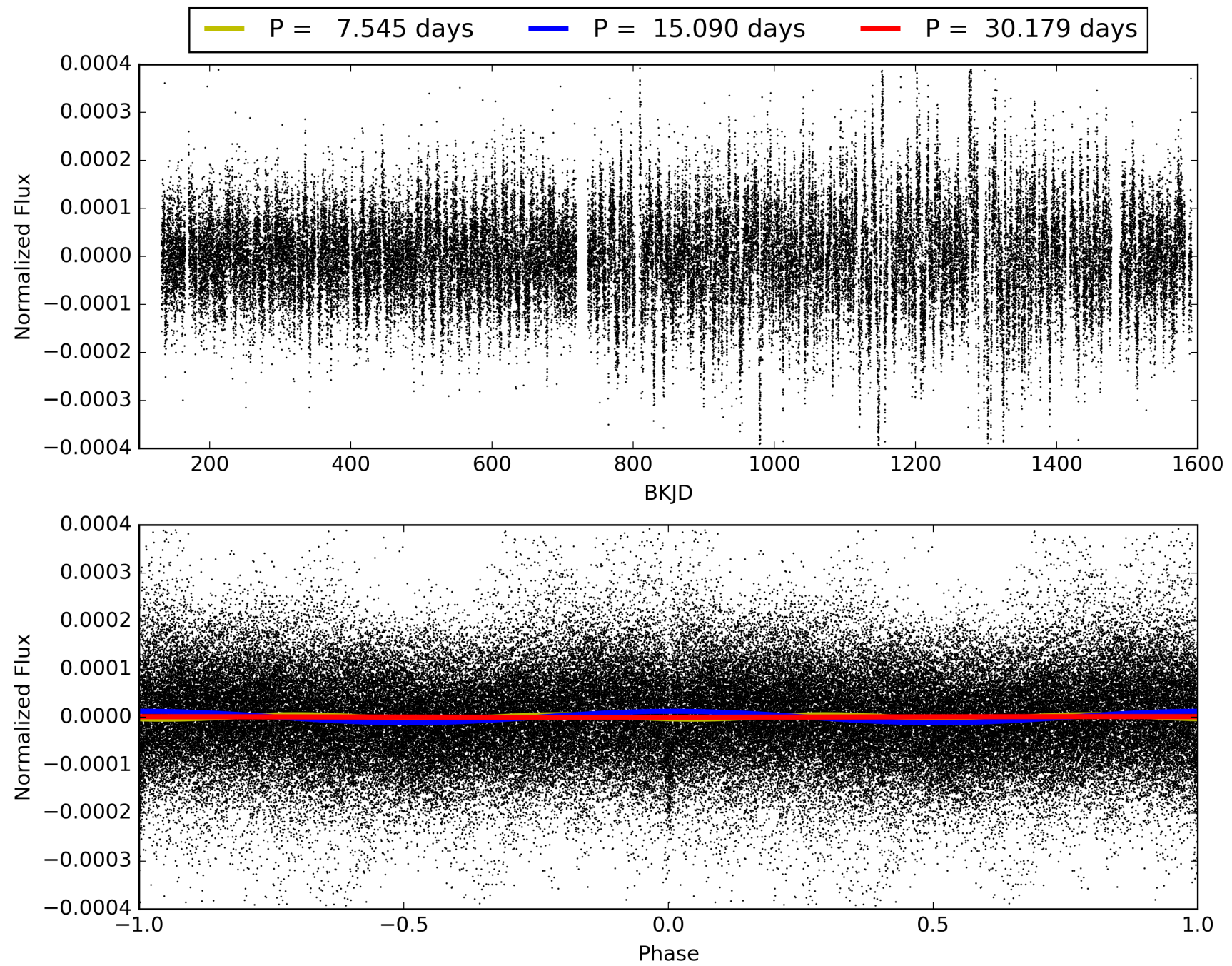
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 01-Feb-2016 04:28:09 Z

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

# TCE 008077137-01, PDC Light Curves



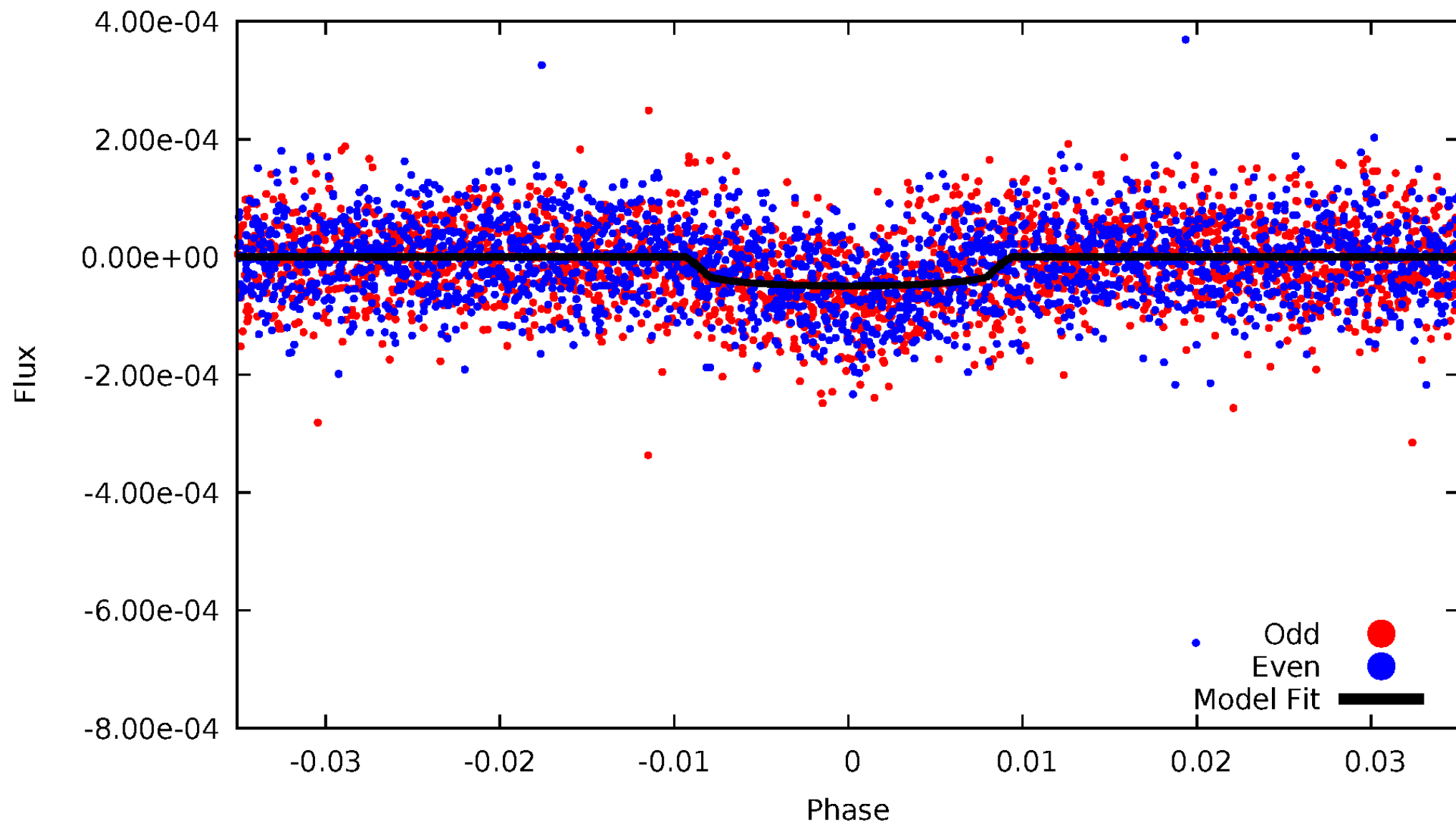
TCE 008077137-01





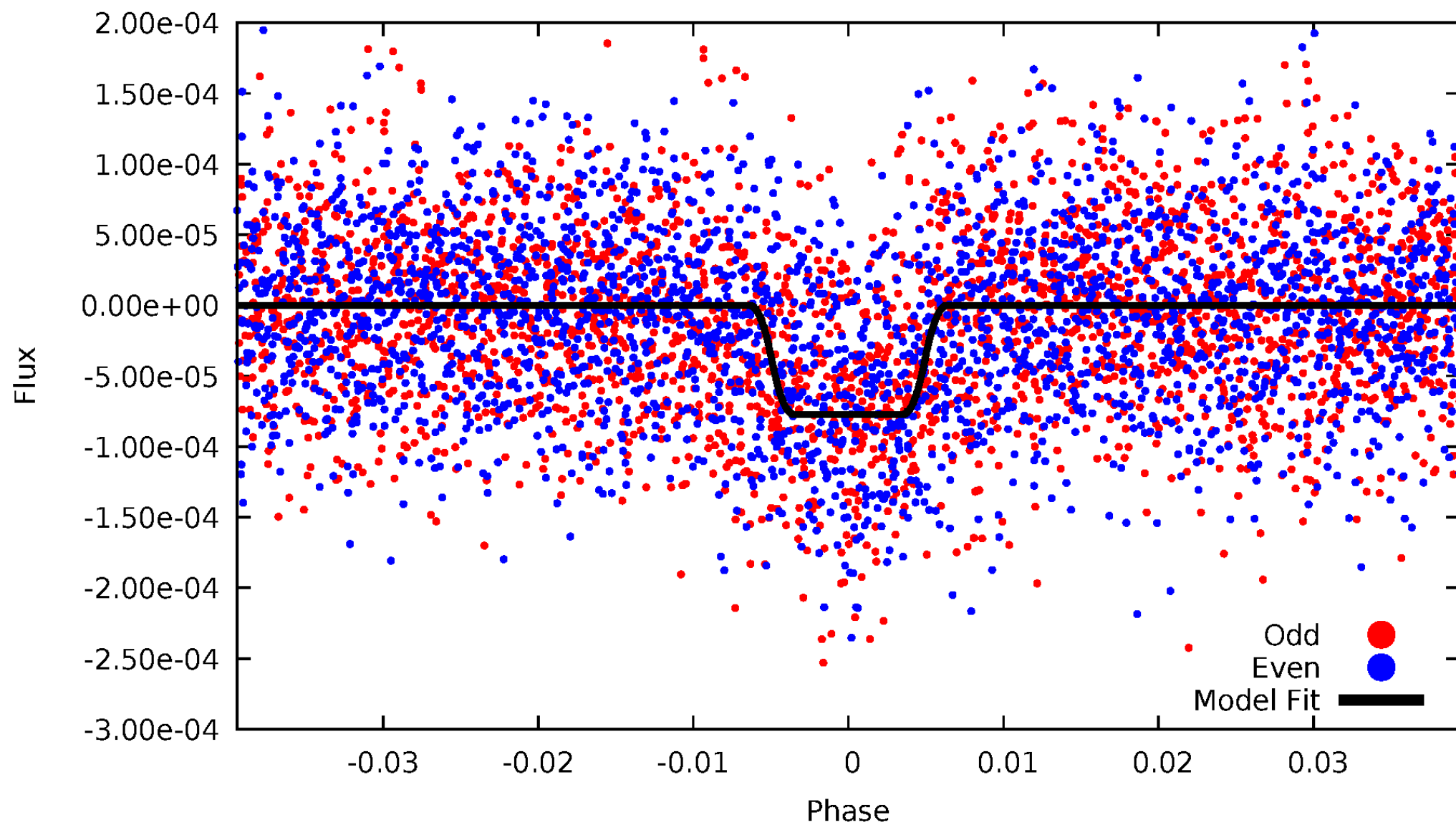
# DV Odd/Even

TCE 008077137-01



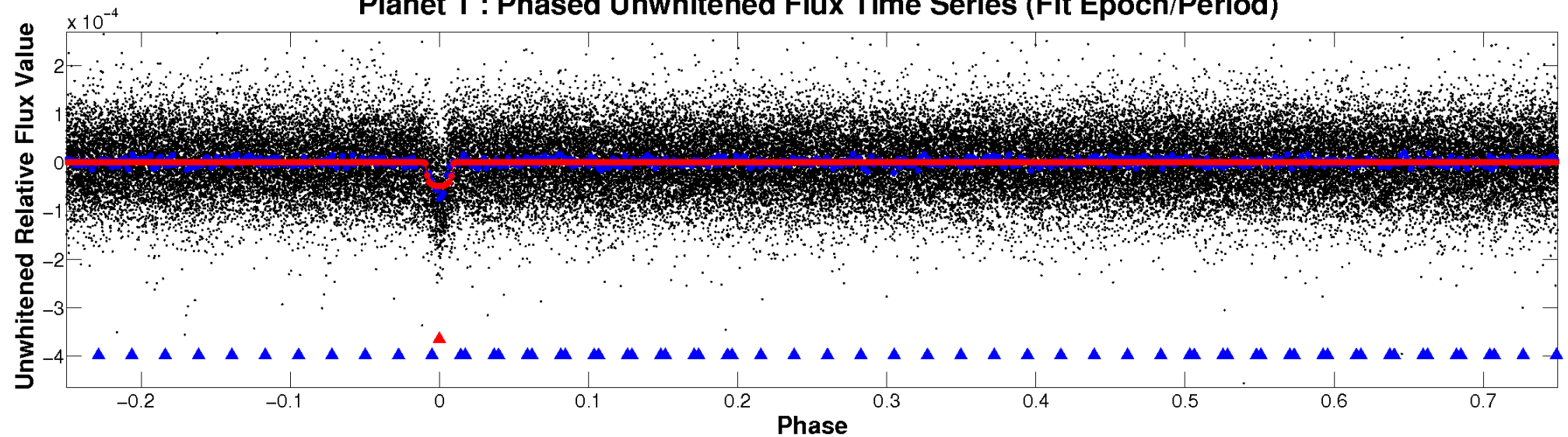
# ALT Odd/Even

TCE 008077137-01

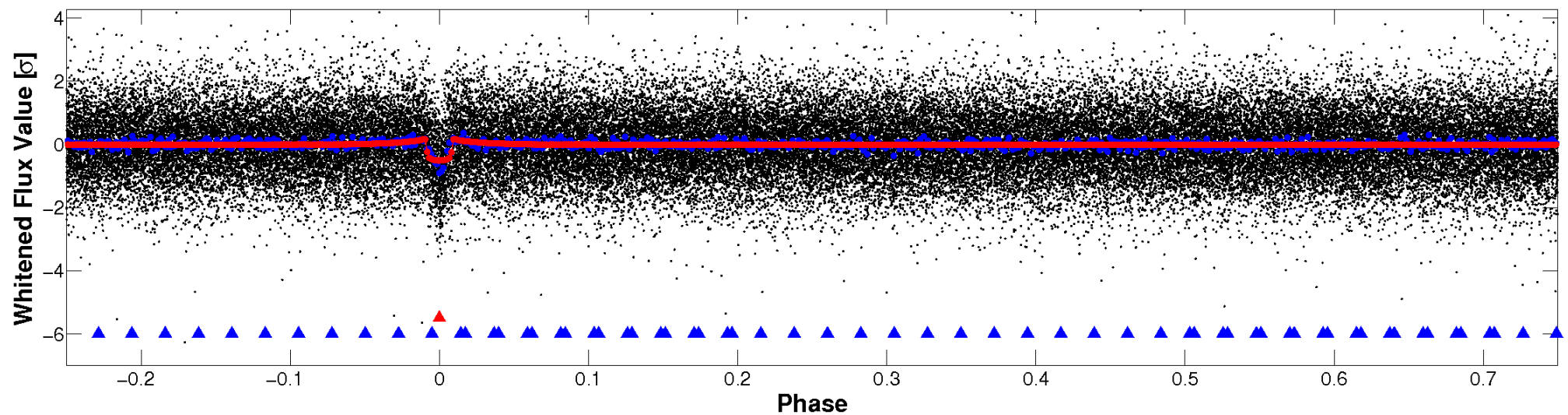


# Non-Whitened Vs. Whitened Light Curve

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

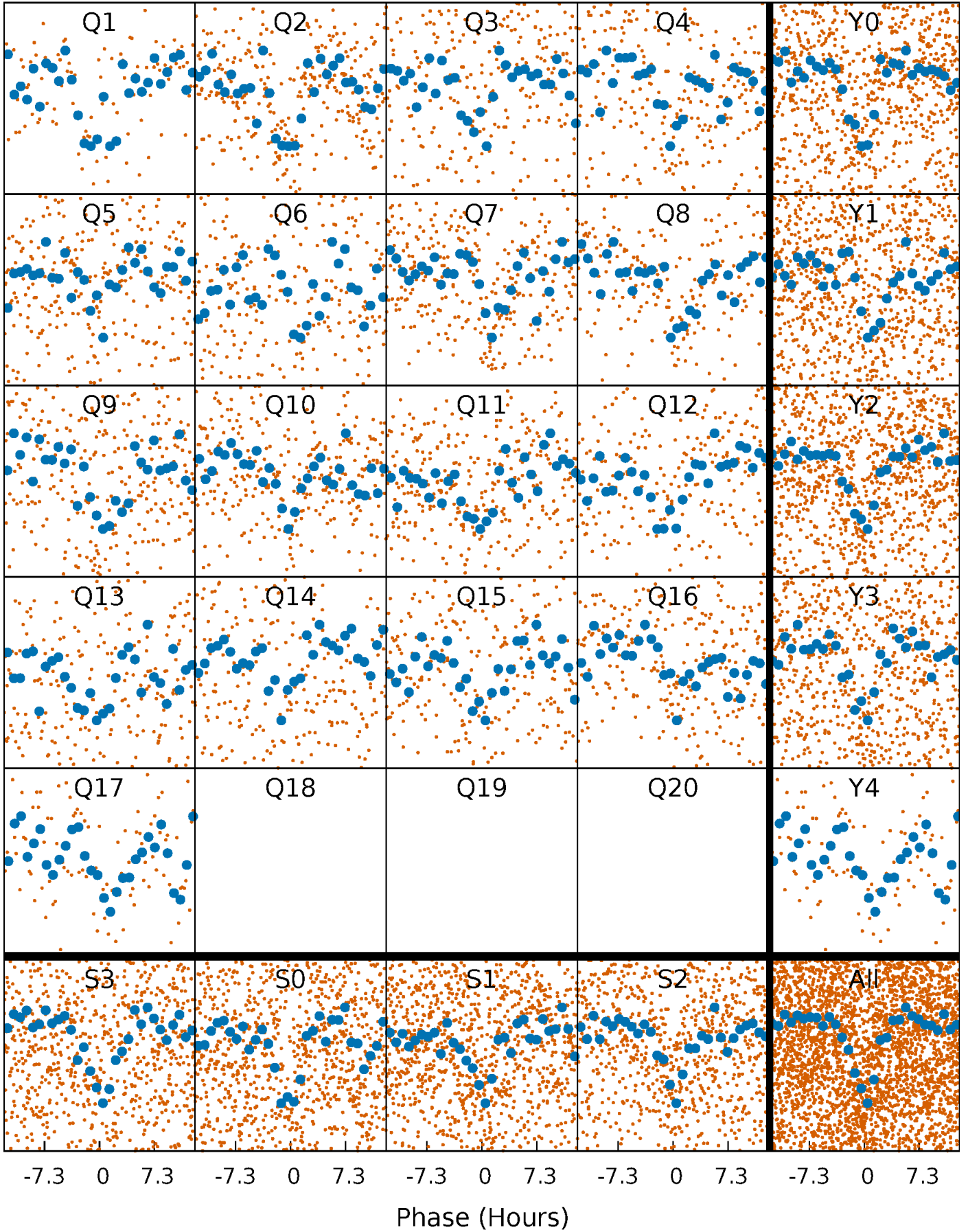


Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)



# PDC Quarter-Phased Transit Curves

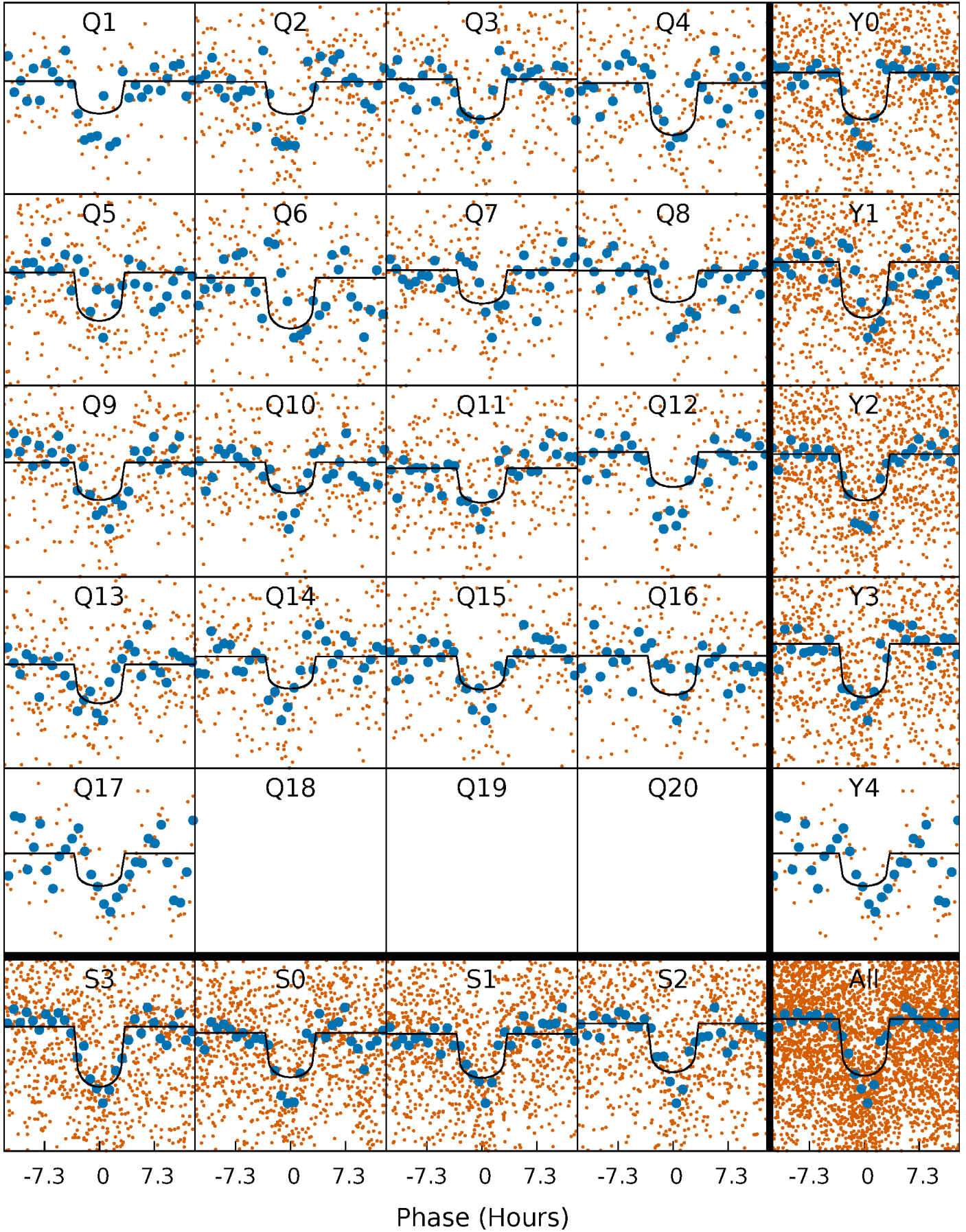
TCE 008077137-01 P= 15.089609 Days  $T_0=145.780021$  (BKJD)





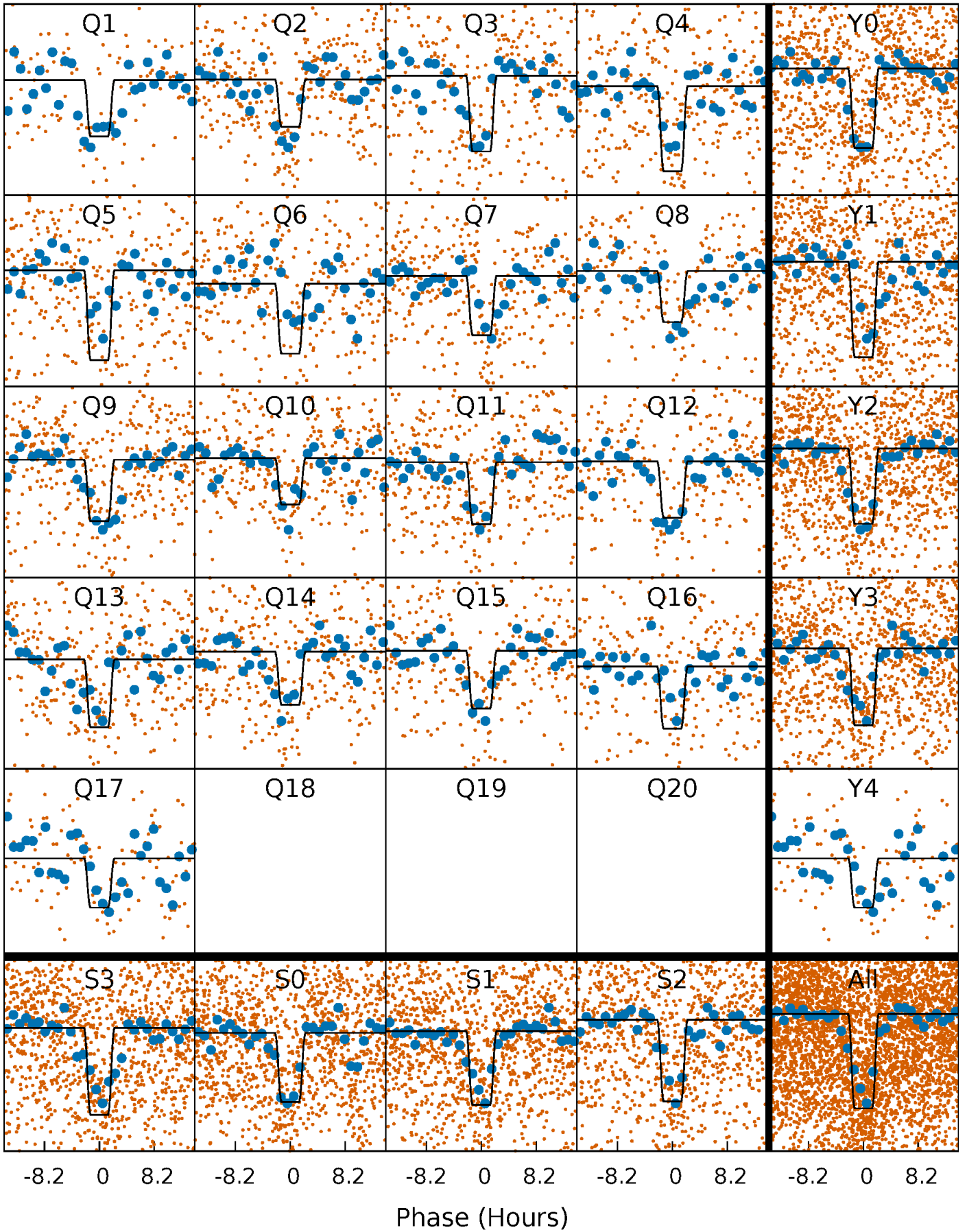
# DV Quarter-Phased Transit Curves

TCE 008077137-01 P= 15.089609 Days  $T_0=145.780021$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

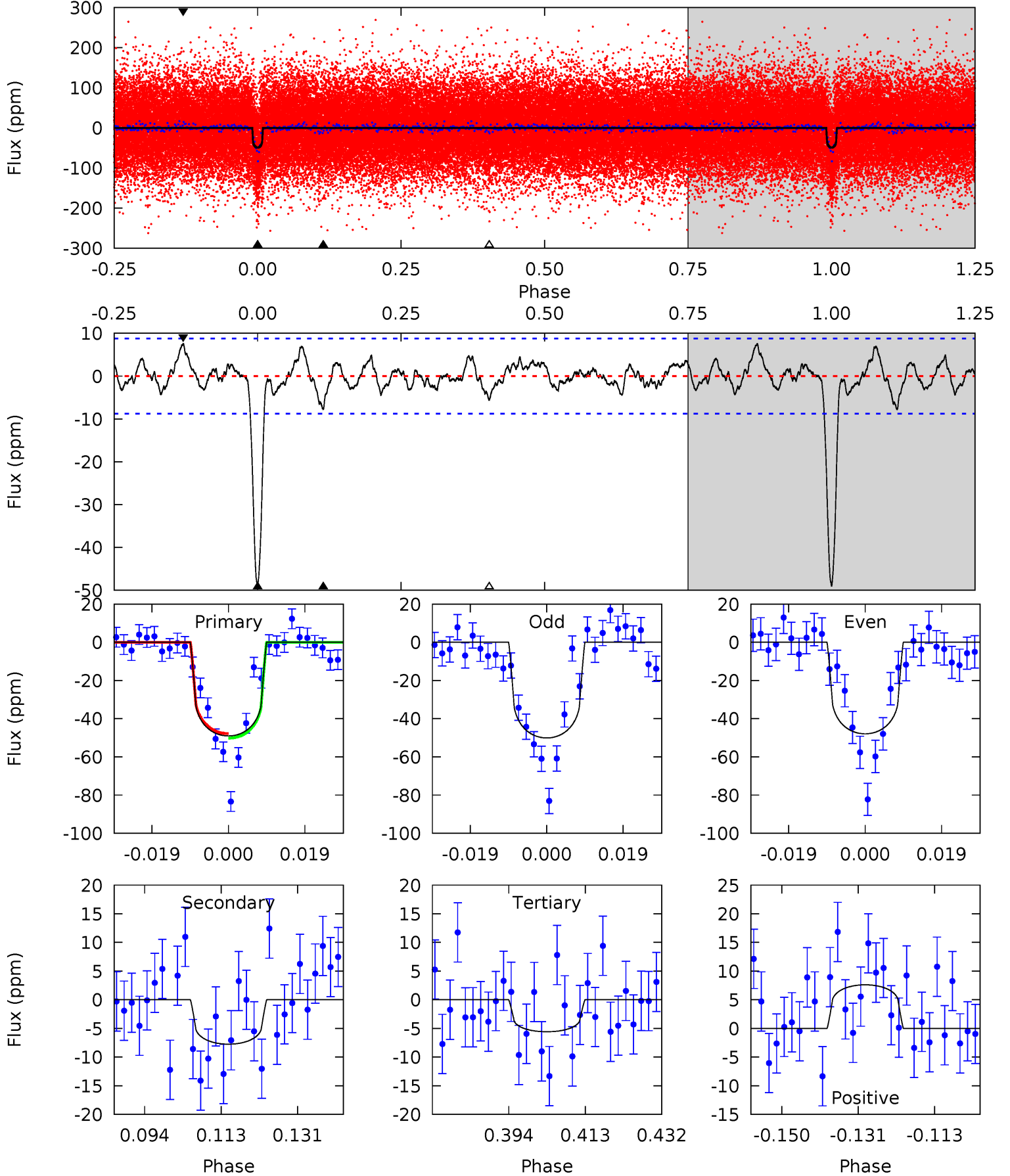
TCE 008077137-01 P= 15.089571 Days  $T_0=145.784078$  (BKJD)



# DV Model-Shift Uniqueness Test

008077137-01, P = 15.089609 Days, E = 130.690412 Days

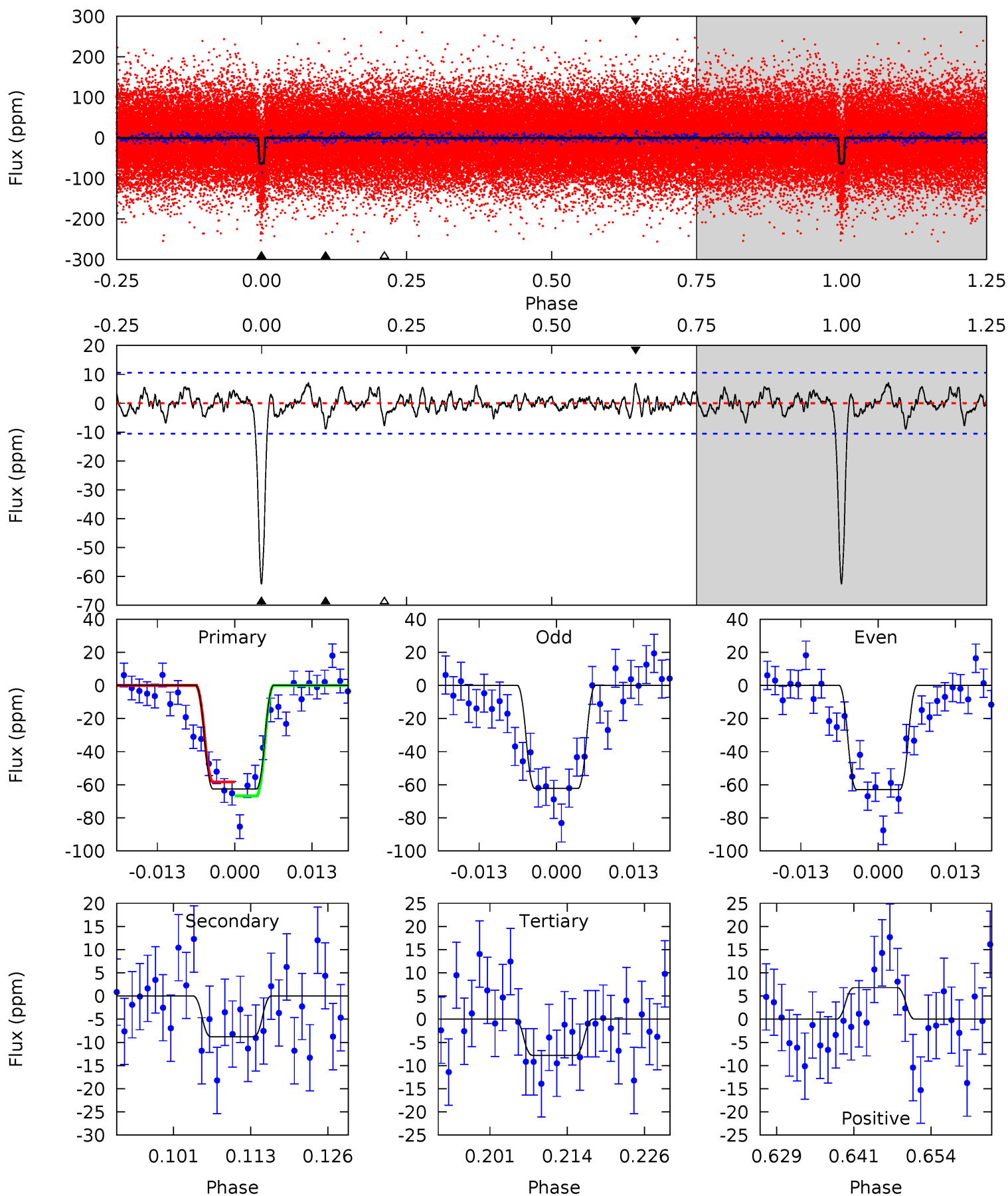
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
27.4	4.33	3.12	4.25	4.90	2.35	1.30	24.3	23.2	1.21	0.08	0.61	1.03	0.13	0.66



# Alt Model-Shift Uniqueness Test

008077137-01,  $P = 15.089571$  Days,  $E = 130.694507$  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
29.5	4.15	3.68	3.21	4.98	2.50	1.13	25.8	26.3	0.47	0.94	0.18	1.01	0.10	1.99





### Stellar Parameters For KIC 008077137

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$6063^{+85}_{-73}$	$4.061^{+0.030}_{-0.030}$	$-0.100^{+0.100}_{-0.100}$	$1.613^{+0.098}_{-0.074}$	$1.092^{+0.078}_{-0.050}$	$0.366^{+0.044}_{-0.043}$
	+1%/-1%	+1%/-1%	+100%/-100%	+6%/-5%	+7%/-5%	+12%/-12%
Source	SPE8	AST69	SPE69	DSEP		

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

### Secondary Eclipse Parameters for KIC 008077137-01 / KOI 0274.01

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-8 \pm 2$	$1.19^{+0.29}_{-0.29}$	$1353^{+26}_{-24}$	$4159^{+500}_{-370}$	$45^{+37}_{-18}$
Alt.	$-9 \pm 2$	$1.53^{+0.32}_{-0.29}$	$1353^{+25}_{-24}$	$3871^{+363}_{-282}$	$31^{+18}_{-11}$

$T_{max}$  = 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

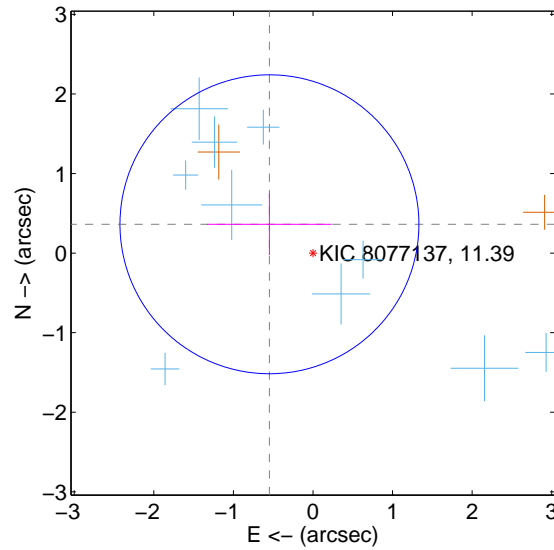
Supplemental centroid analysis for 008077137-01. **Kepler magnitude: 11.39.** Transit SNR 15.82

There are 10 quarters with good PRF difference image offsets

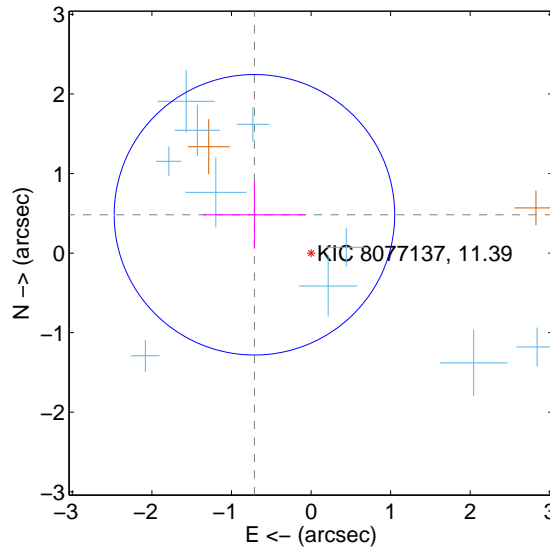
The direct PRF centroid is offset from the target star catalog position by about 0.24 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.656 \pm 0.626$	1.05	$0.547 \pm 0.783$	$0.362 \pm 0.388$
PRF-fit source offset from KIC position	$0.859 \pm 0.587$	1.46	$0.712 \pm 0.648$	$0.482 \pm 0.427$
photometric centroid source offset	$0.41 \pm 0.50$	0.81	$0.01 \pm 0.73$	$0.41 \pm 0.50$

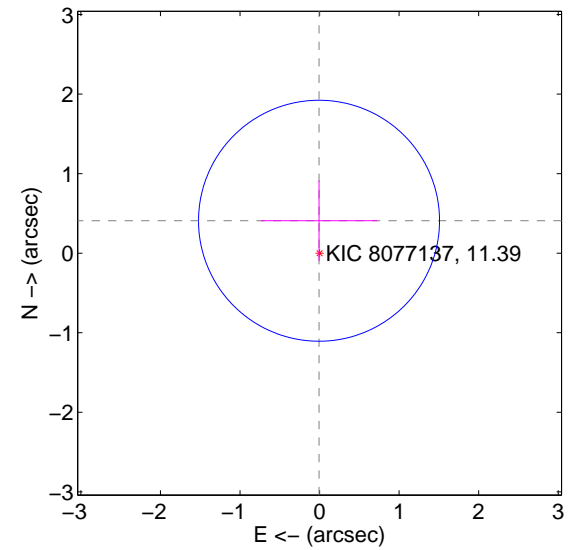
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position

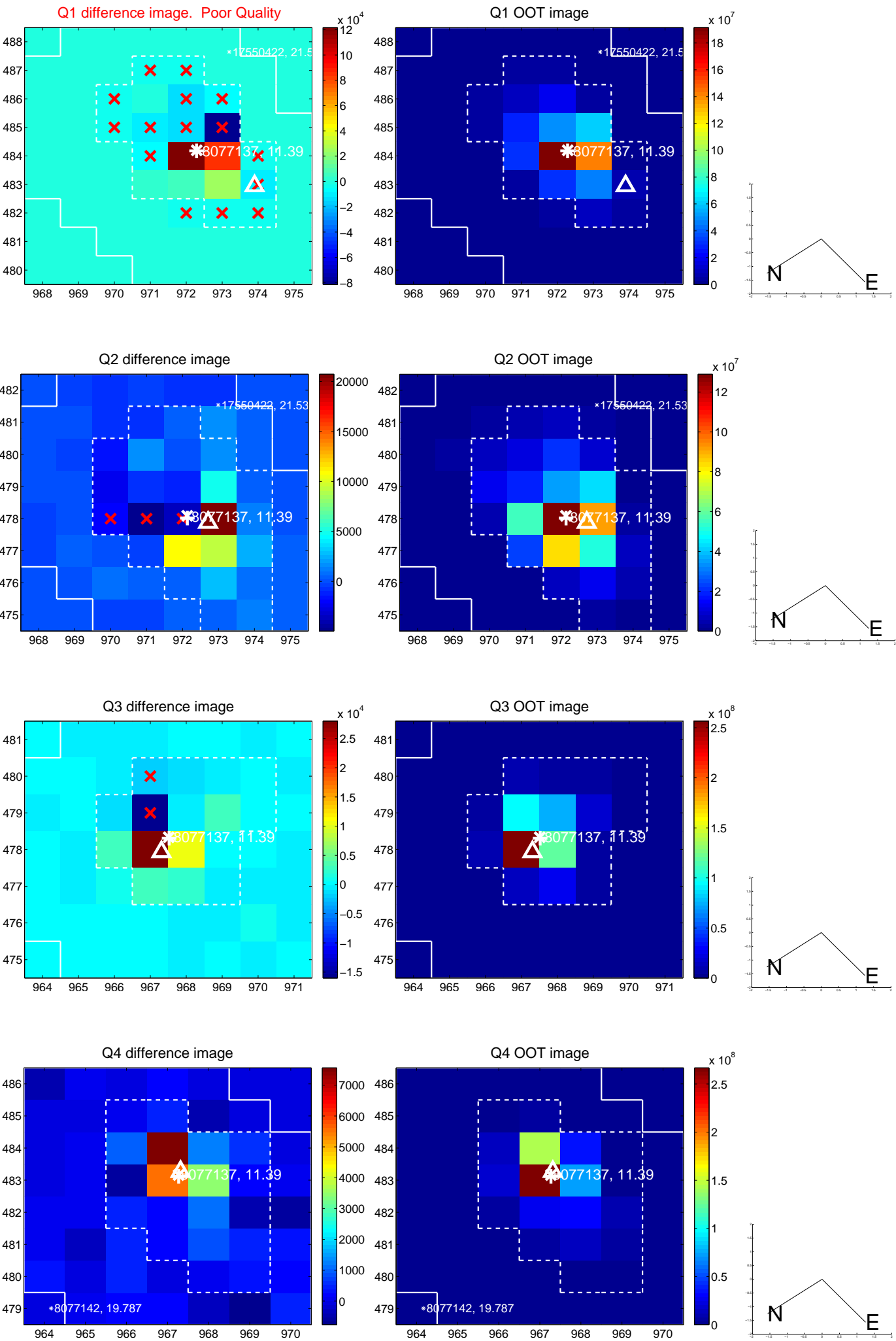


offset from photometric centroids

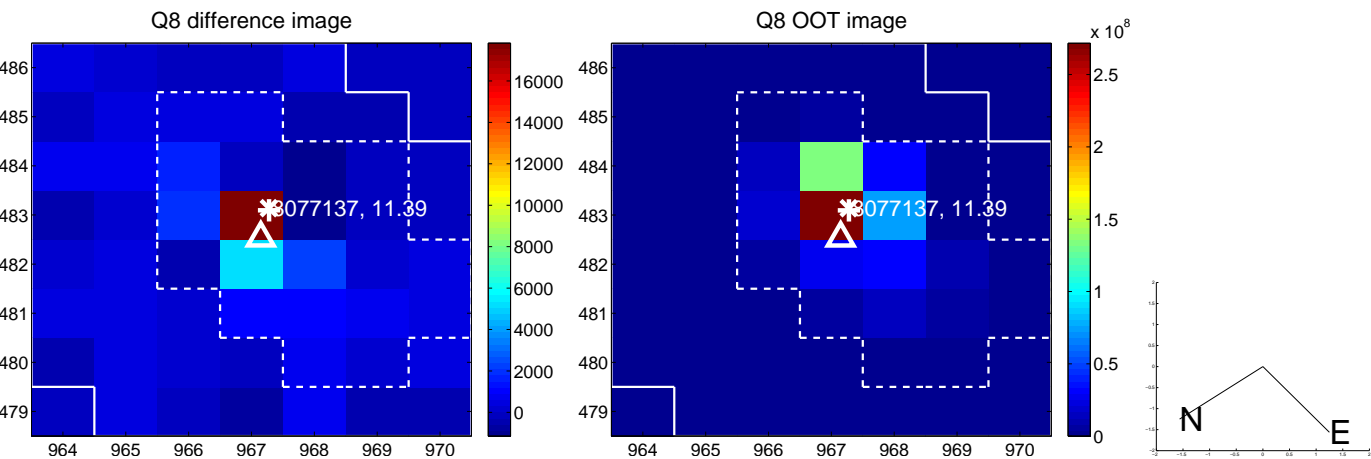
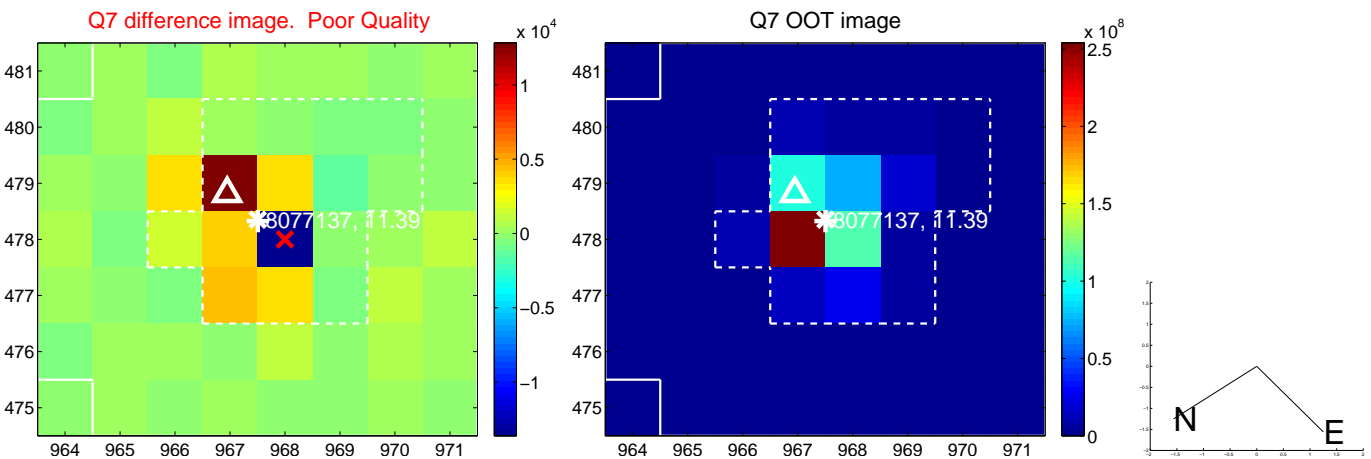
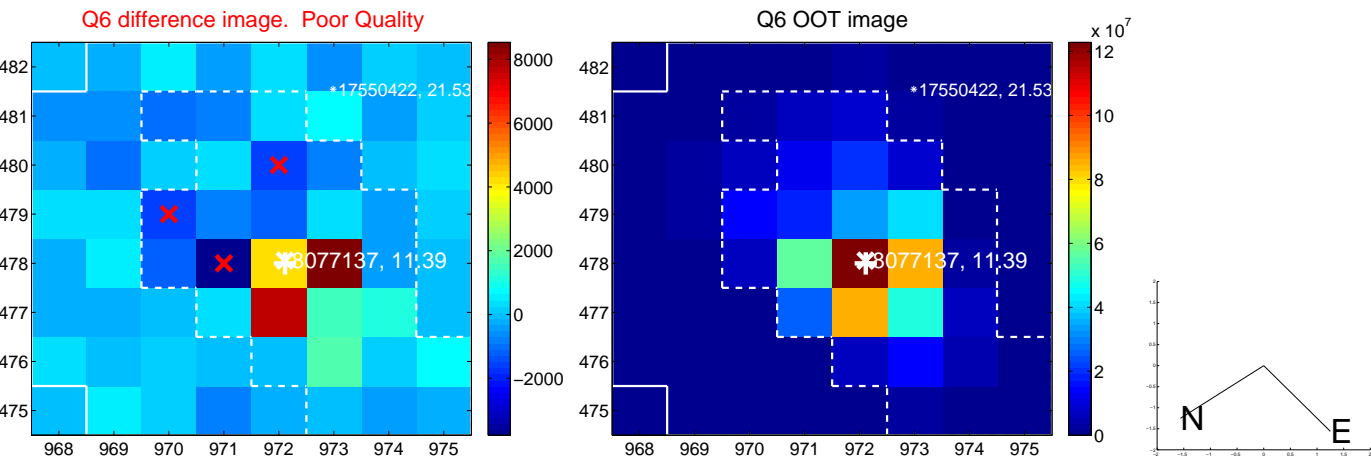
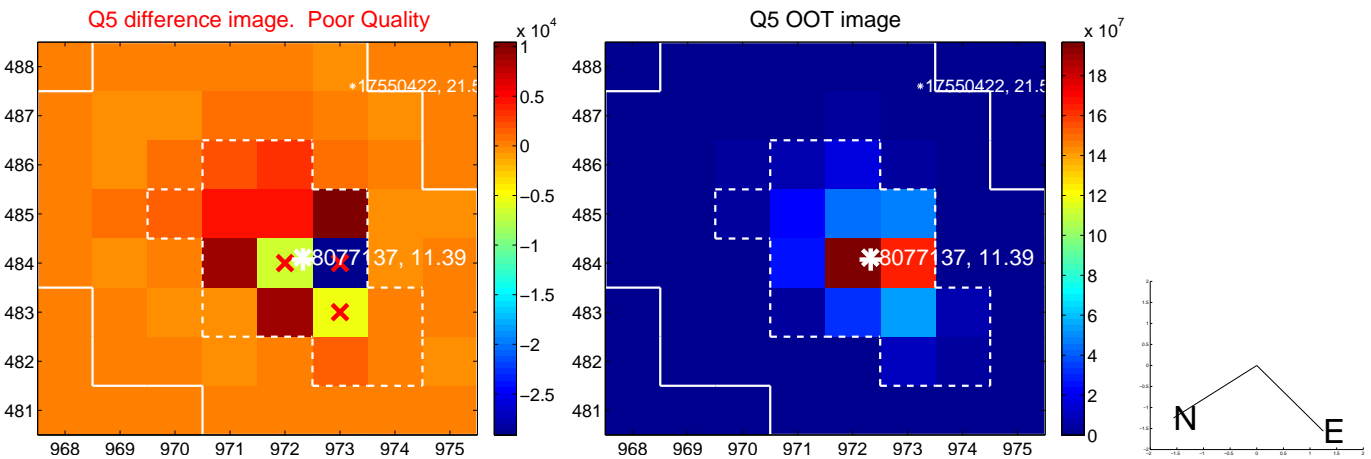


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets;** magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

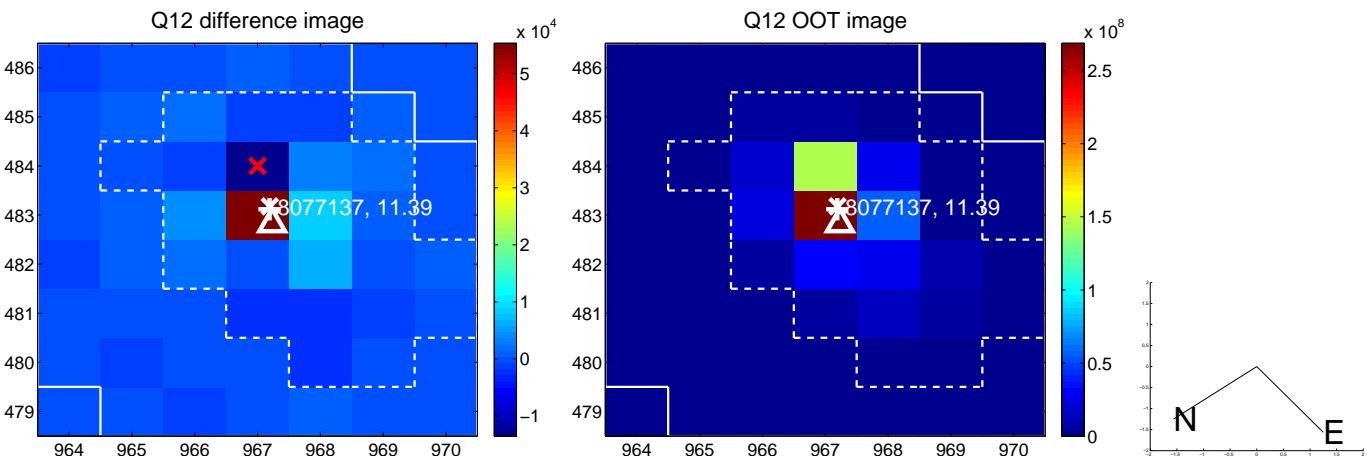
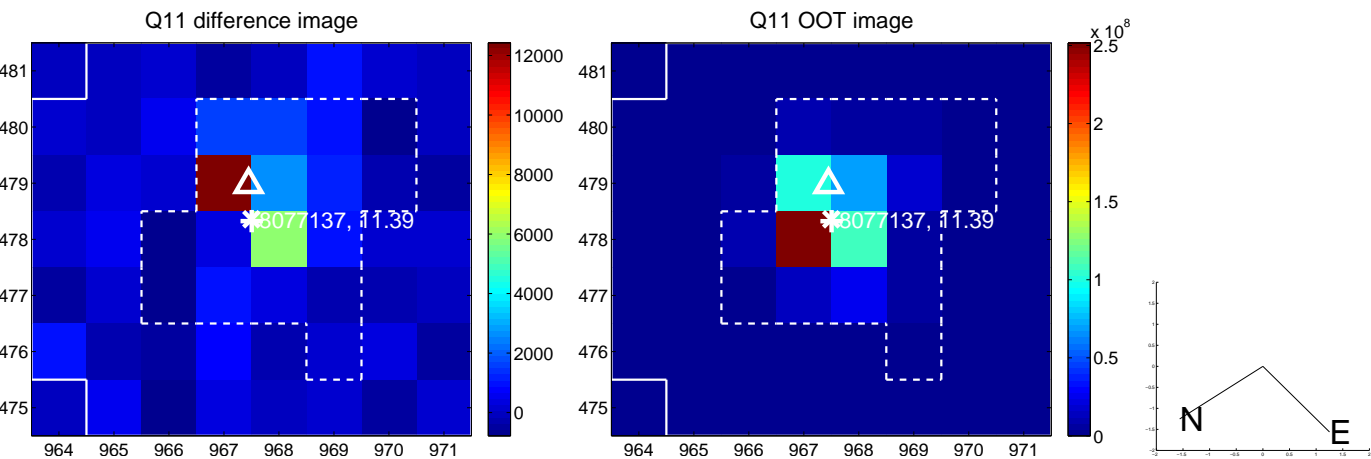
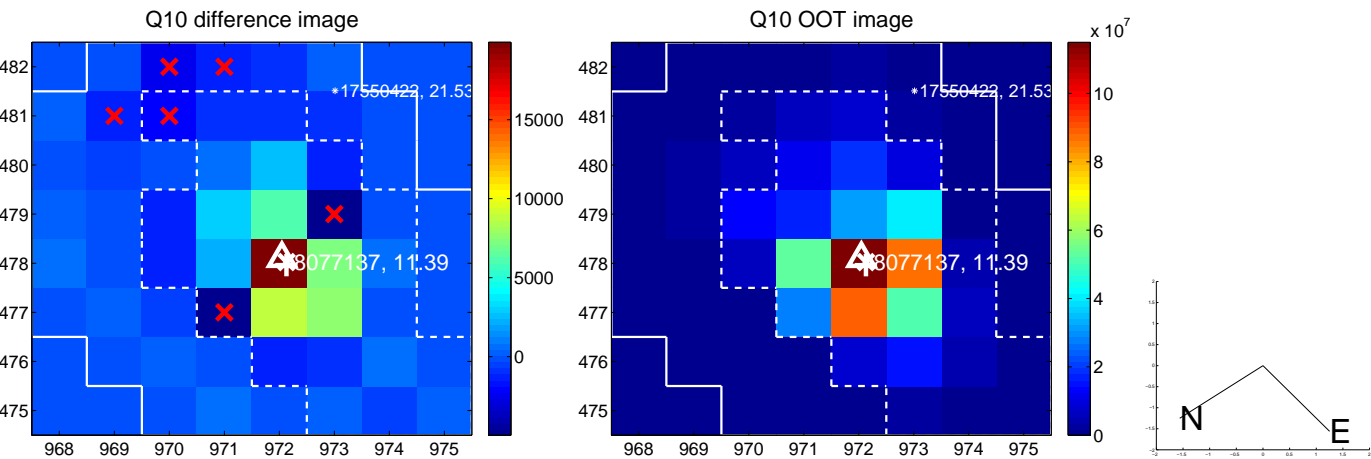
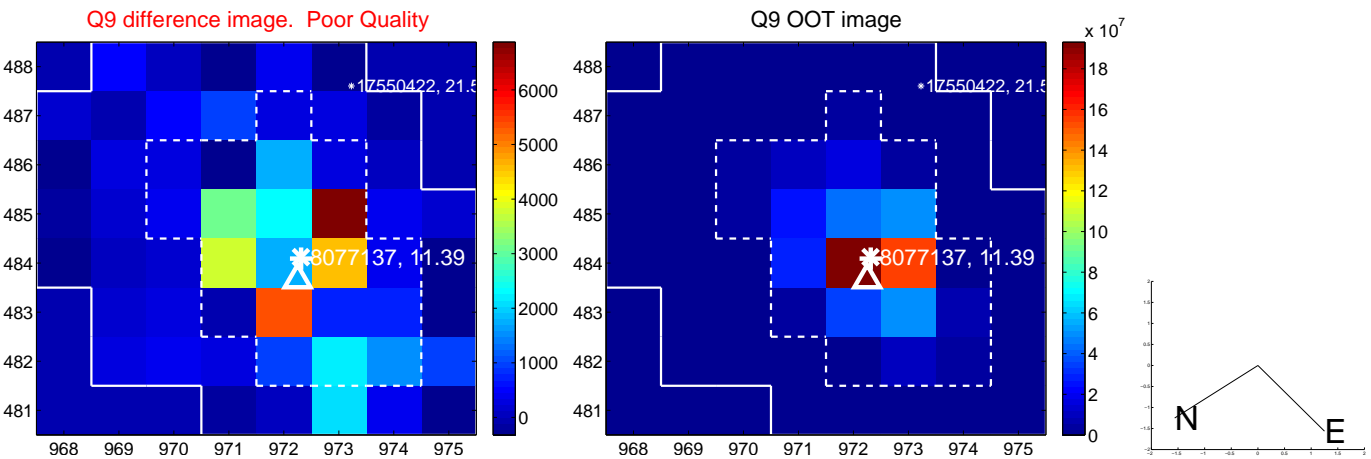


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

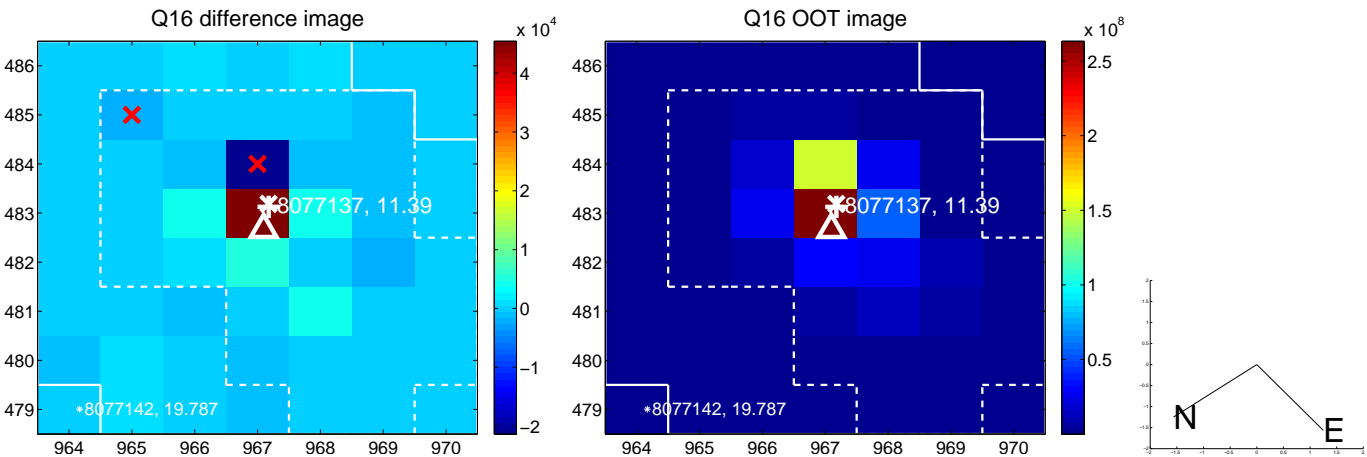
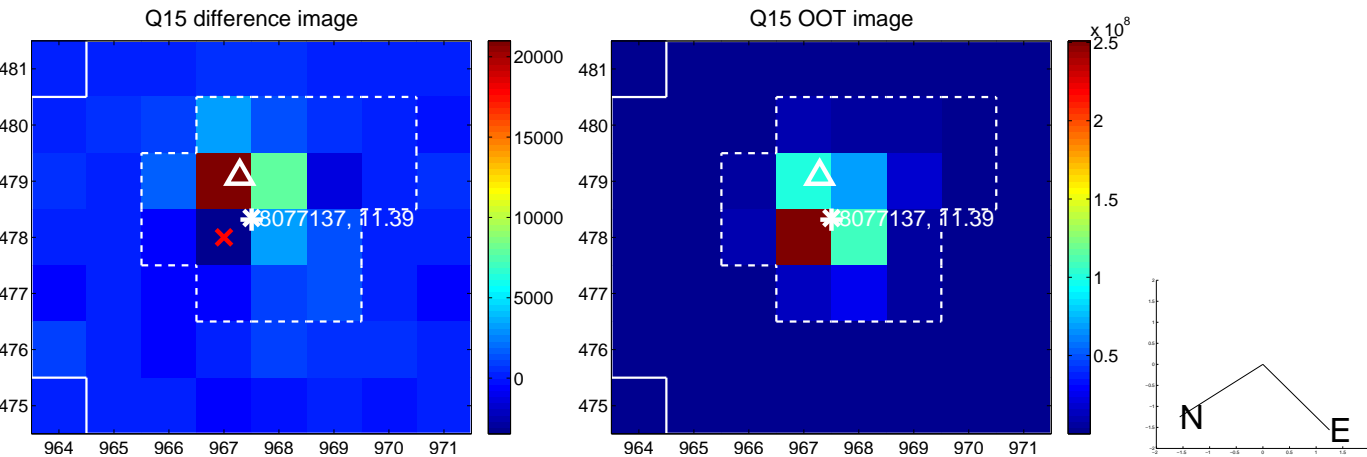
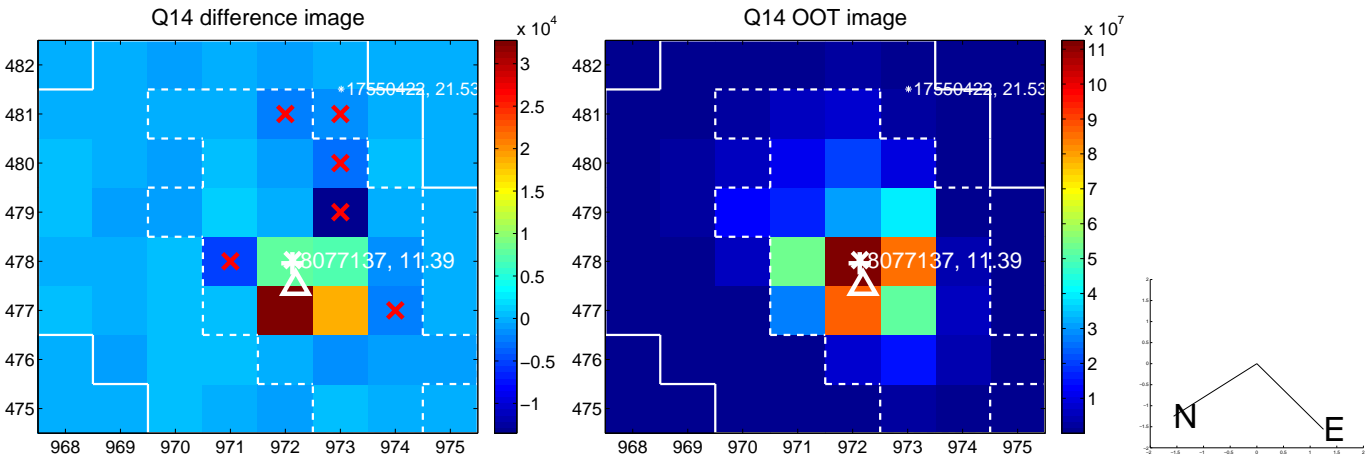
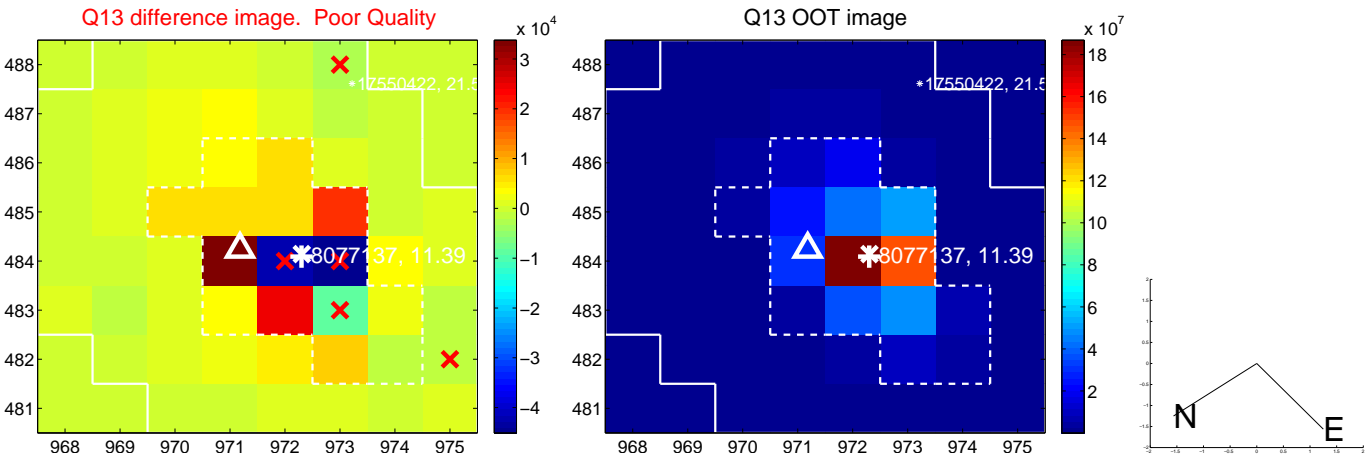




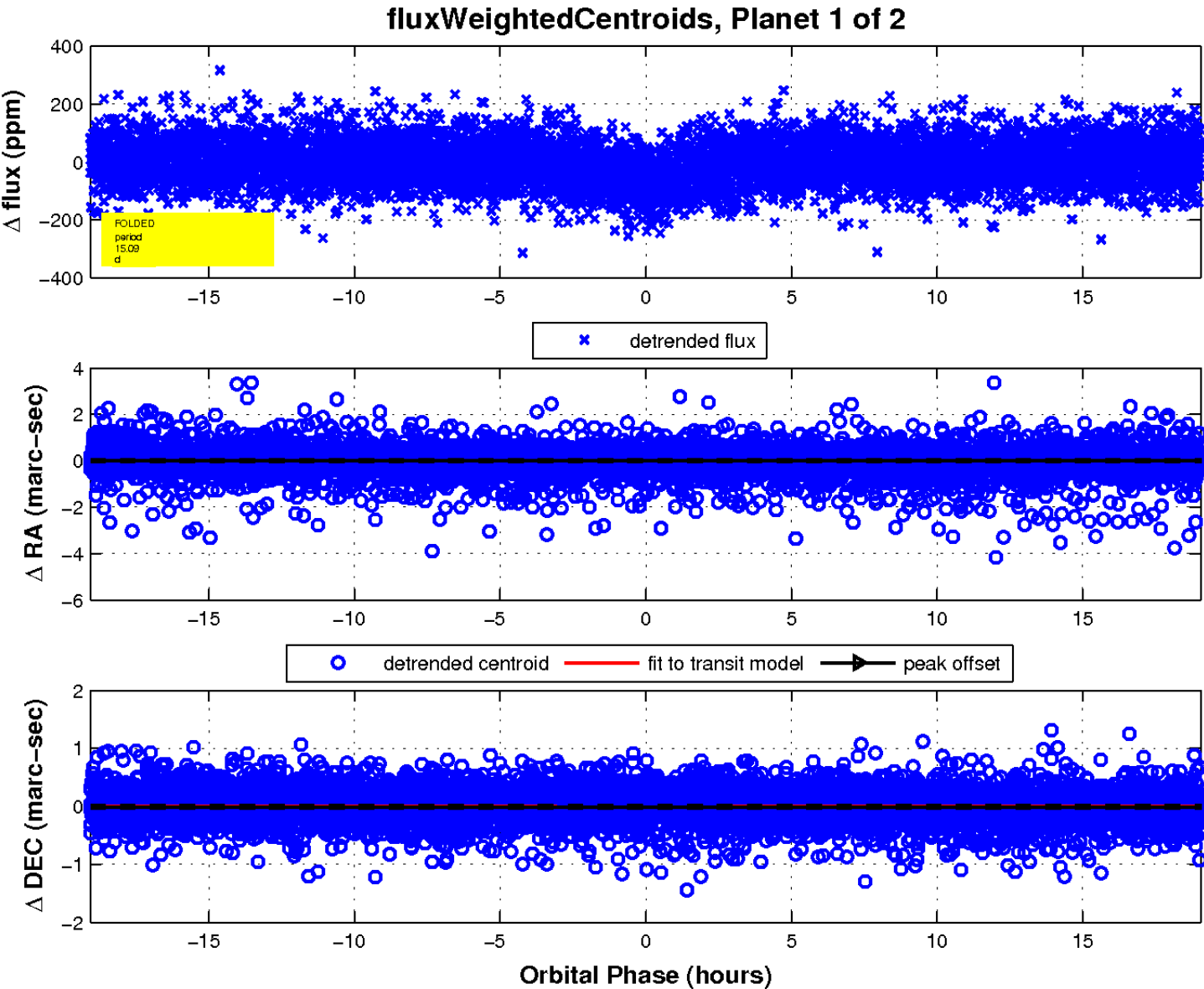
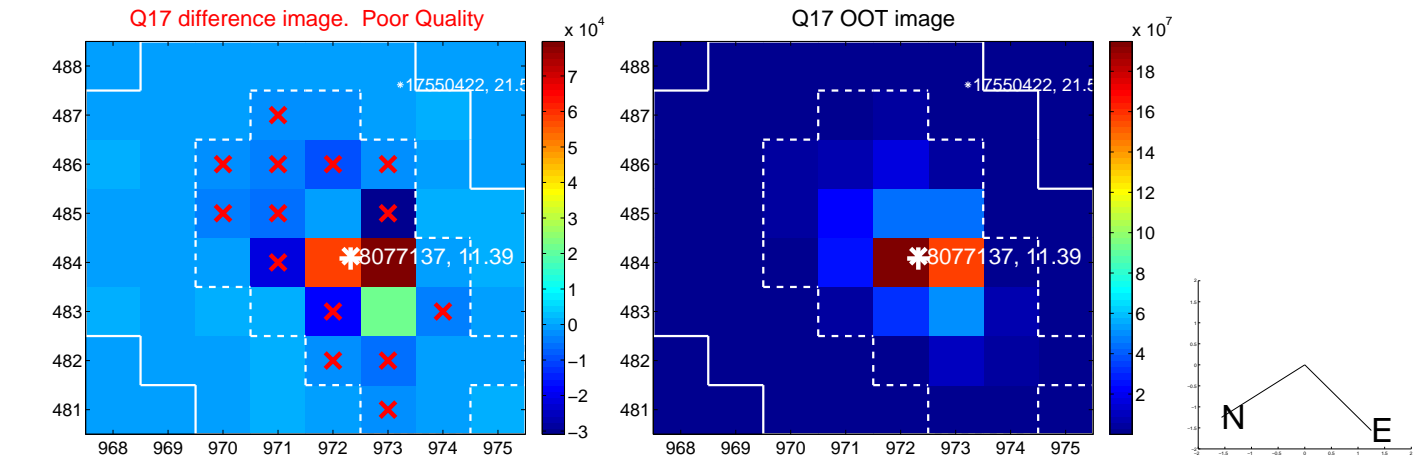
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

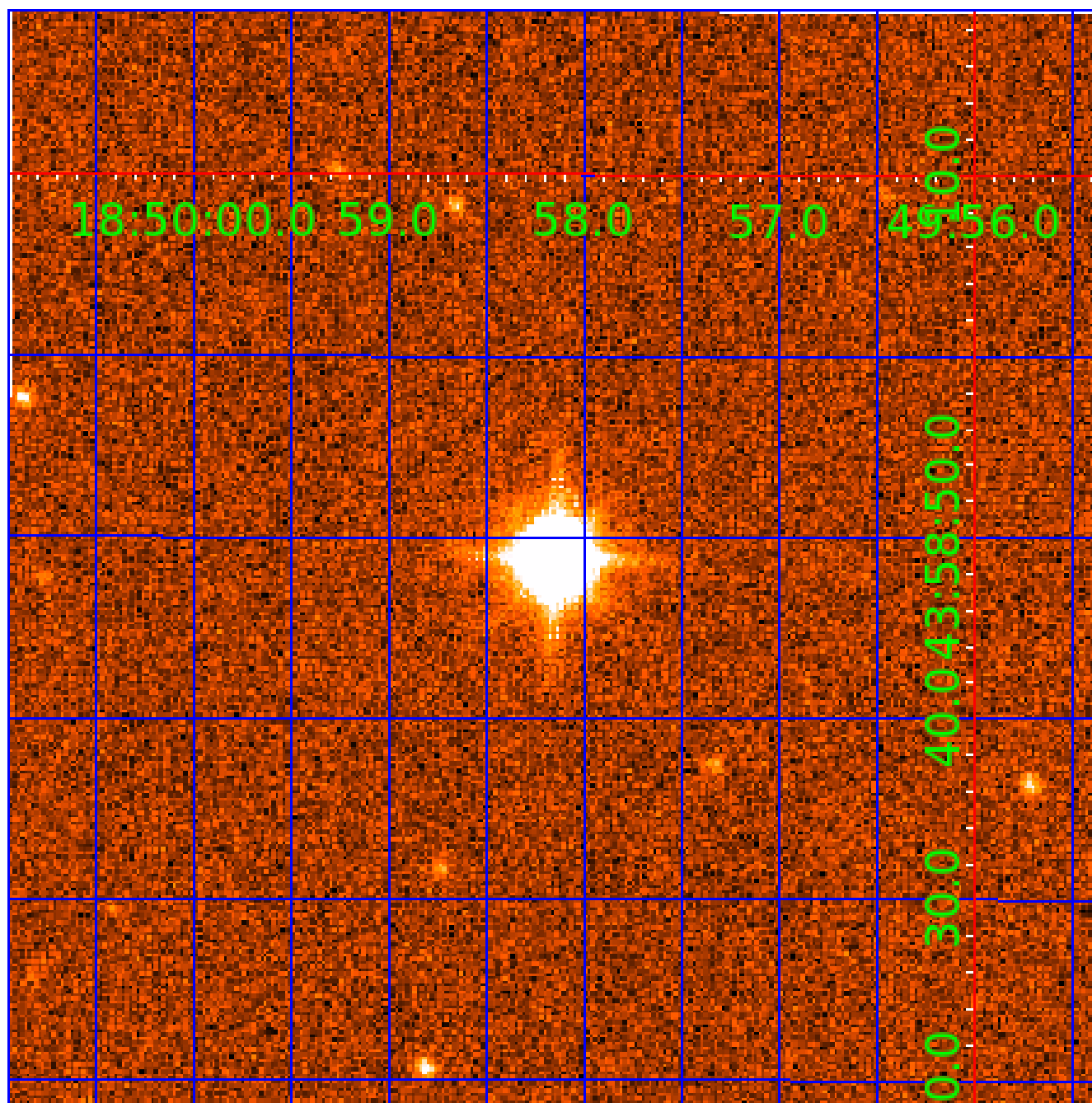


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination





# KIC 008077137

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
008077137-01	OBS	0274.01	15.089609	145.780021	49.1	6.353	15.0	15.8	1.61	6063	1.18	207.89
008077137-02	OBS	0274.02	22.803083	153.373016	45.8	5.202	10.0	11.3	1.61	6063	1.30	119.88

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
008077137-01	OBS	PC	1.00	0	0	0	0	CENT_SATURATED
008077137-02	OBS	PC	1.00	0	0	0	0	CENT_SATURATED

**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.

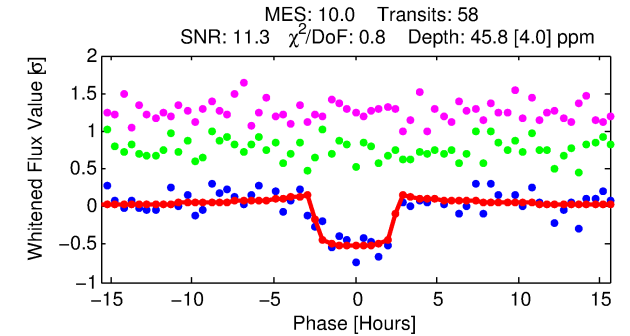
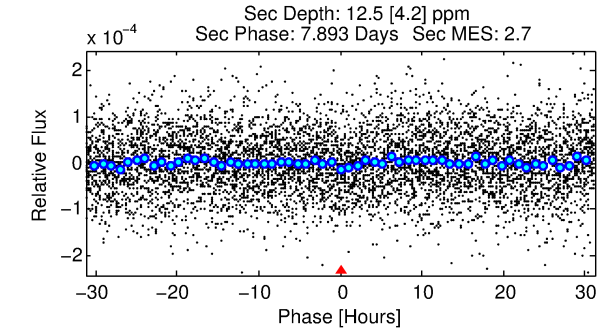
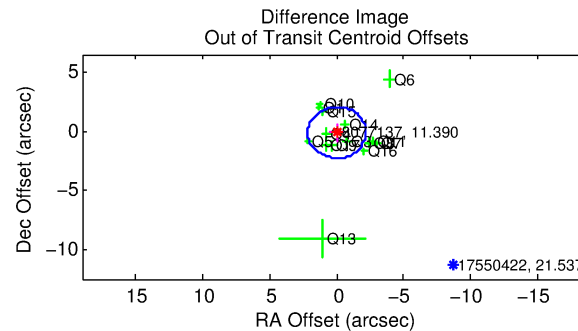
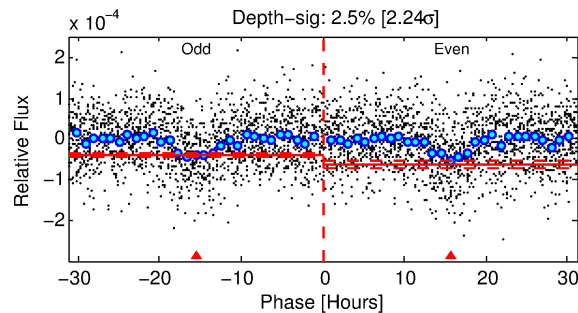
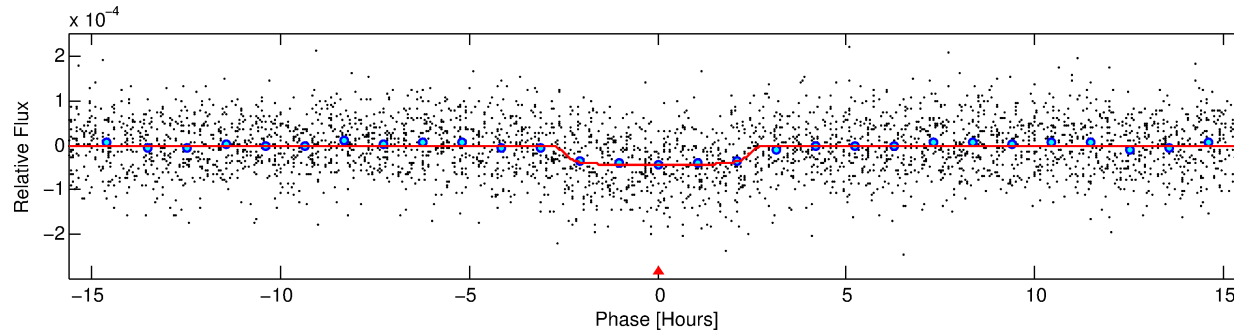
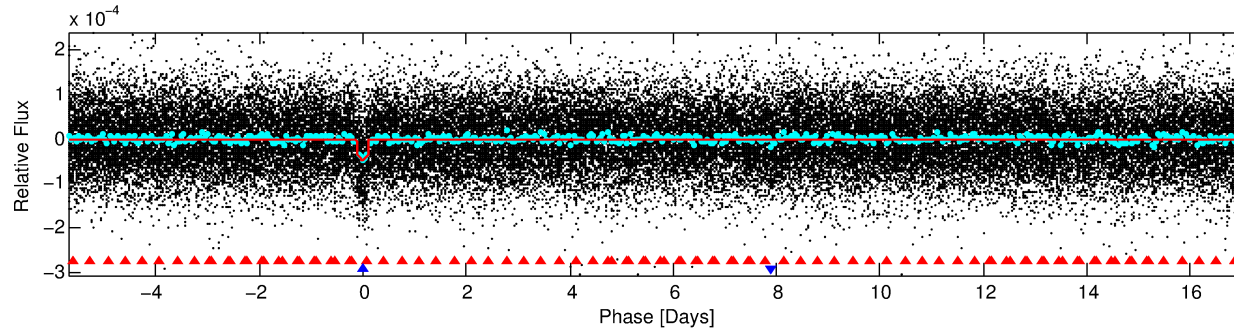
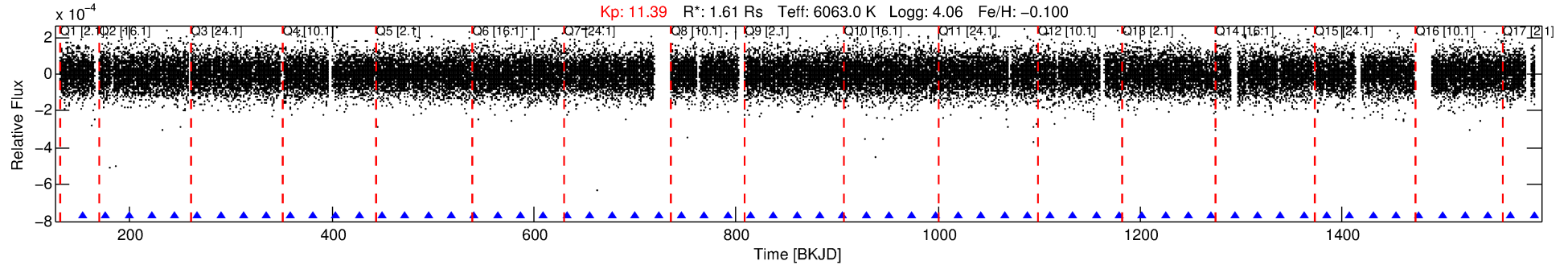
## Ephemeris Match Information For 008077137-02

No Significant Match Found

# DV One-Page Summary

KIC: 8077137 Candidate: 2 of 2 Period: 22.803 d  
KOI: K00274.02 Name: Kepler-128c Corr: 0.979

Kp: 11.39 R\*: 1.61 Rs Teff: 6063.0 K Logg: 4.06 Fe/H: -0.100



## DV Fit Results:

Period = 22.80308 [0.00020] d  
Epoch = 153.3730 [0.0071] BKJD  
Rp/R\* = 0.0074 [0.0019]  
a/R\* = 14.10 [19.08]  
b = 0.92 [0.24]  
Seff = 119.88 [9.96]  
Teq = 844 [18] K  
Rp = 1.30 [0.34] Re  
a = 0.1621 [0.0076] AU  
Ag = 106.14 [65.22] [1.61σ]  
Teff = 4187 [643] K [5.20σ]

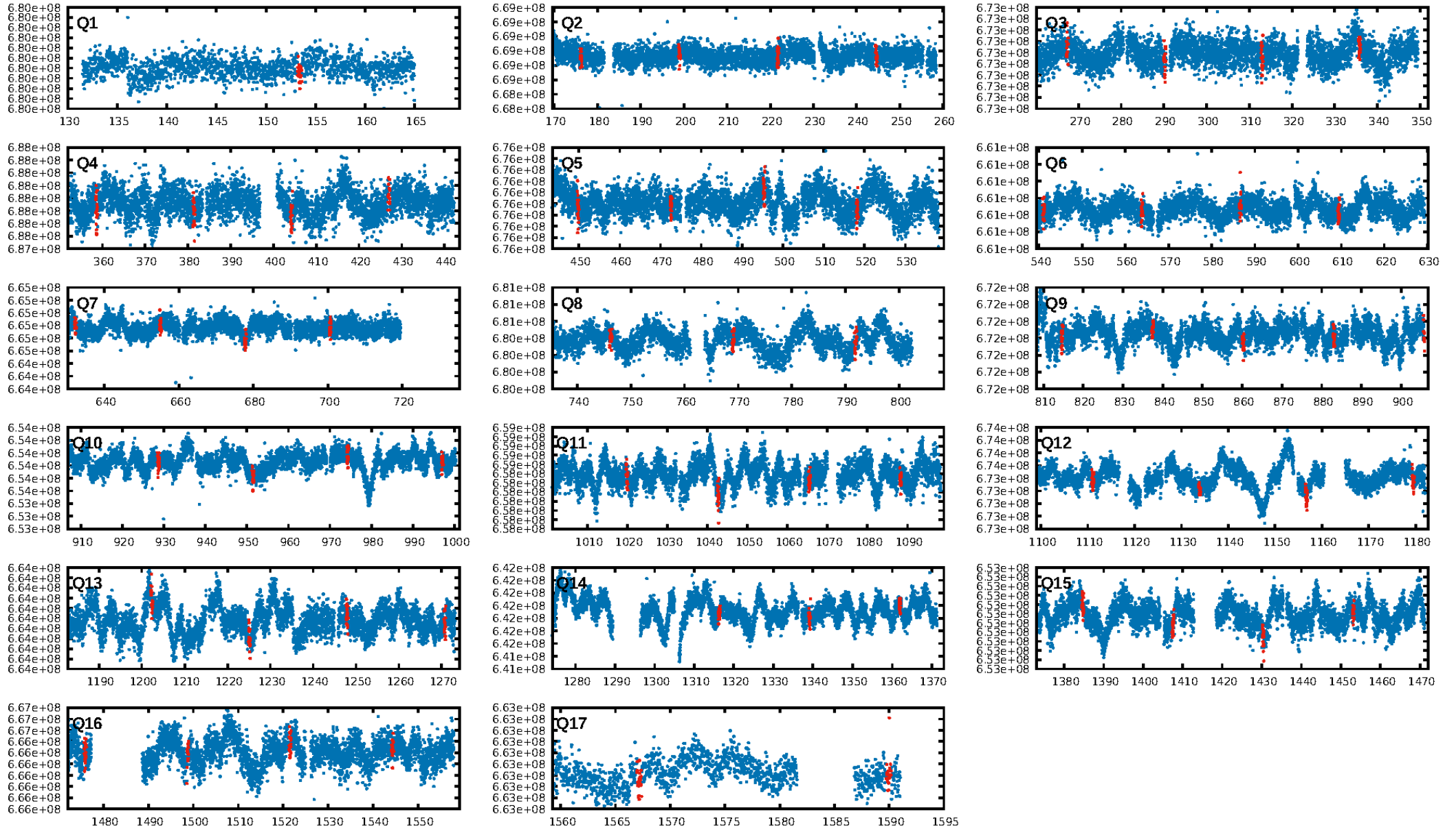
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [22.55σ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: 87.2%  
ModelChiSquareGof-sig: 100.0%  
Bootstrap-pfa: 3.43e-22  
RollingBand-fgt: 1.00 [55/55]  
GhostDiagnostic-chr: 1.731  
Centroid-sig: 1.2%  
Centroid-so: 1.018 arcsec [1.40σ]  
OotOffset-rm: 0.109 arcsec [0.15σ]  
KicOffset-rm: 0.113 arcsec [0.22σ]  
OotOffset-st: 3/4/3/5 [15]  
KicOffset-st: 3/4/3/5 [15]  
DiffImageQuality-fgm: 0.87 [13/15]  
DiffImageOverlap-fno: 1.00 [17/17]

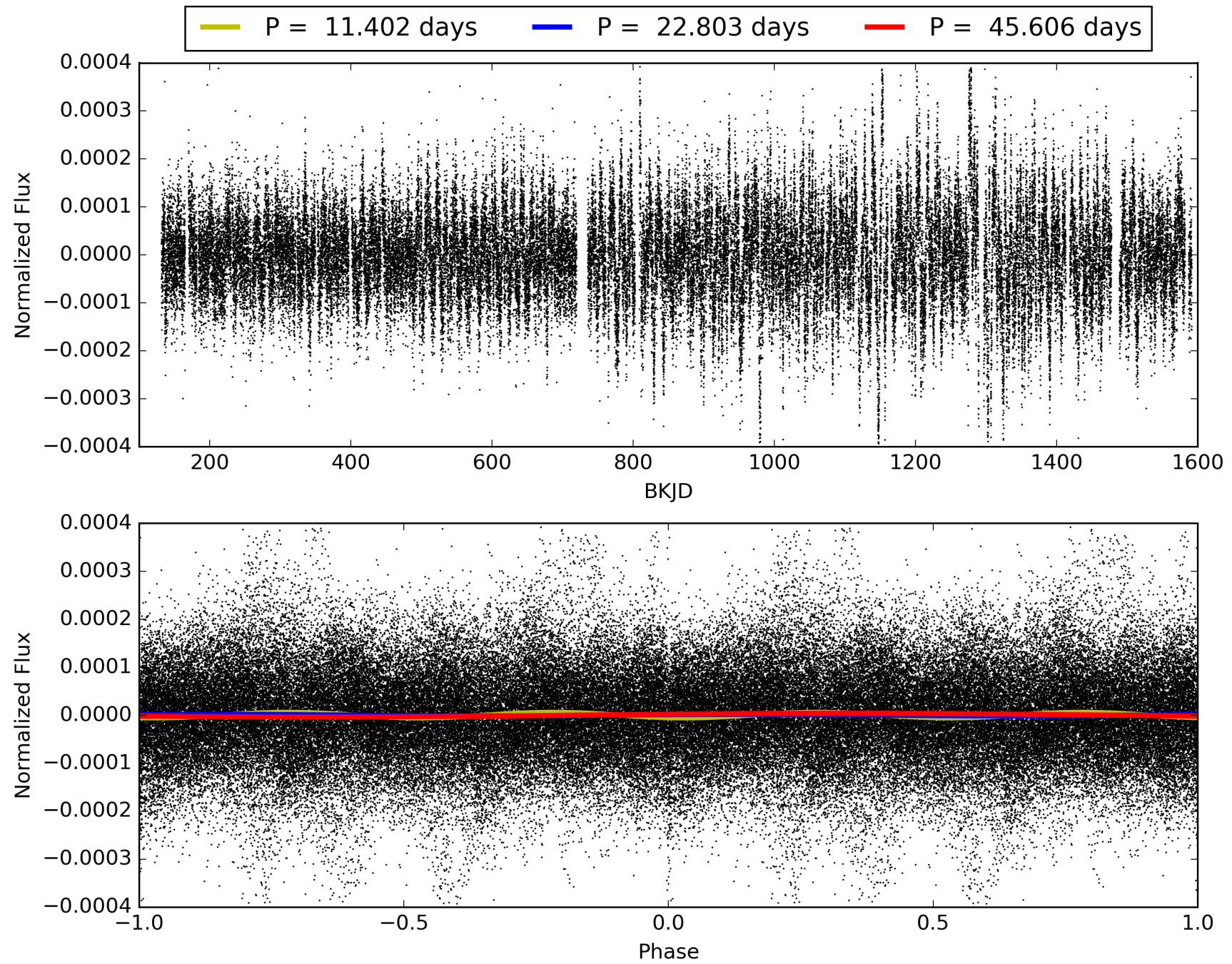
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 01-Feb-2016 04:28:17 Z

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

# TCE 008077137-02, PDC Light Curves



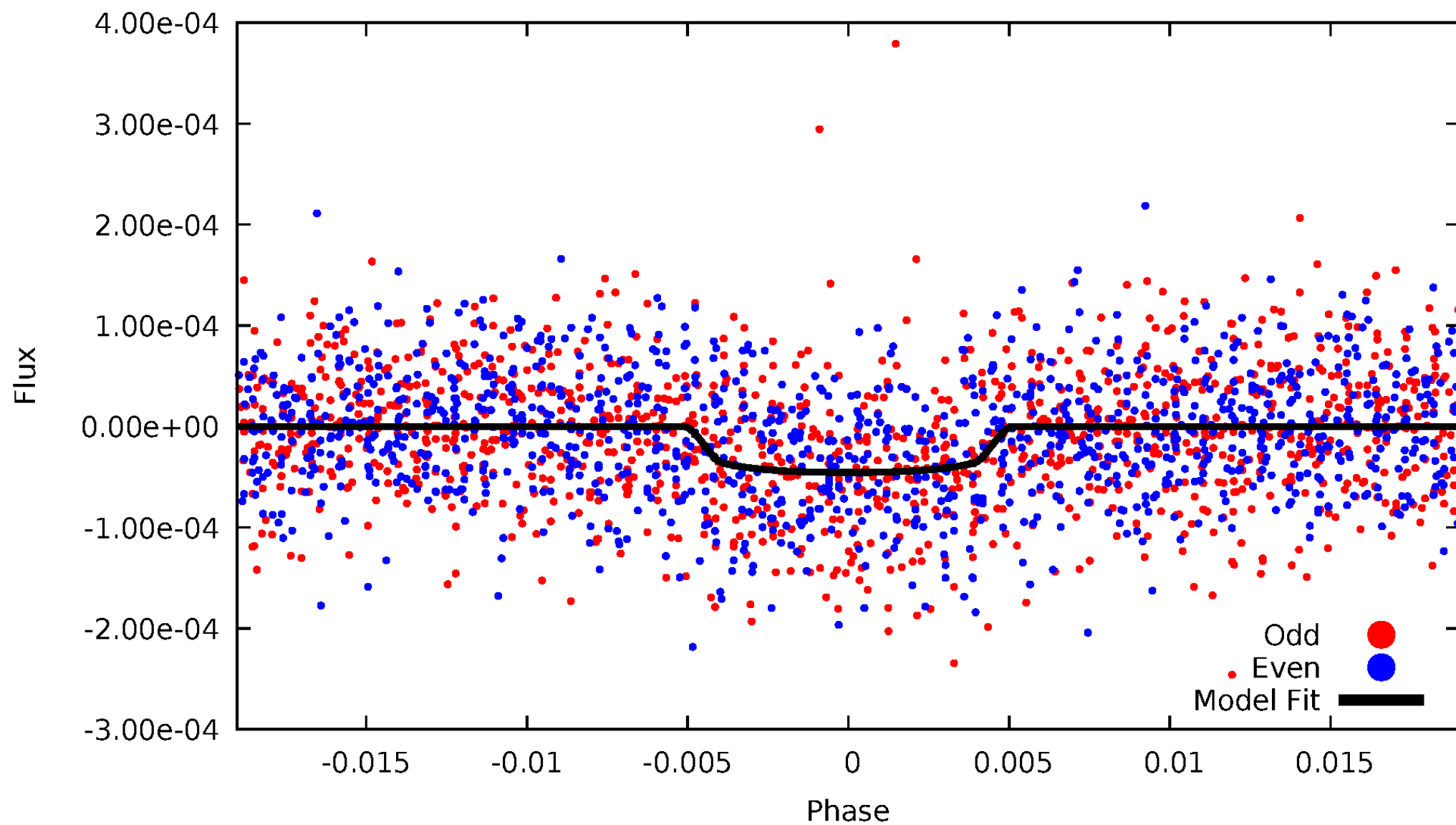
TCE 008077137-02





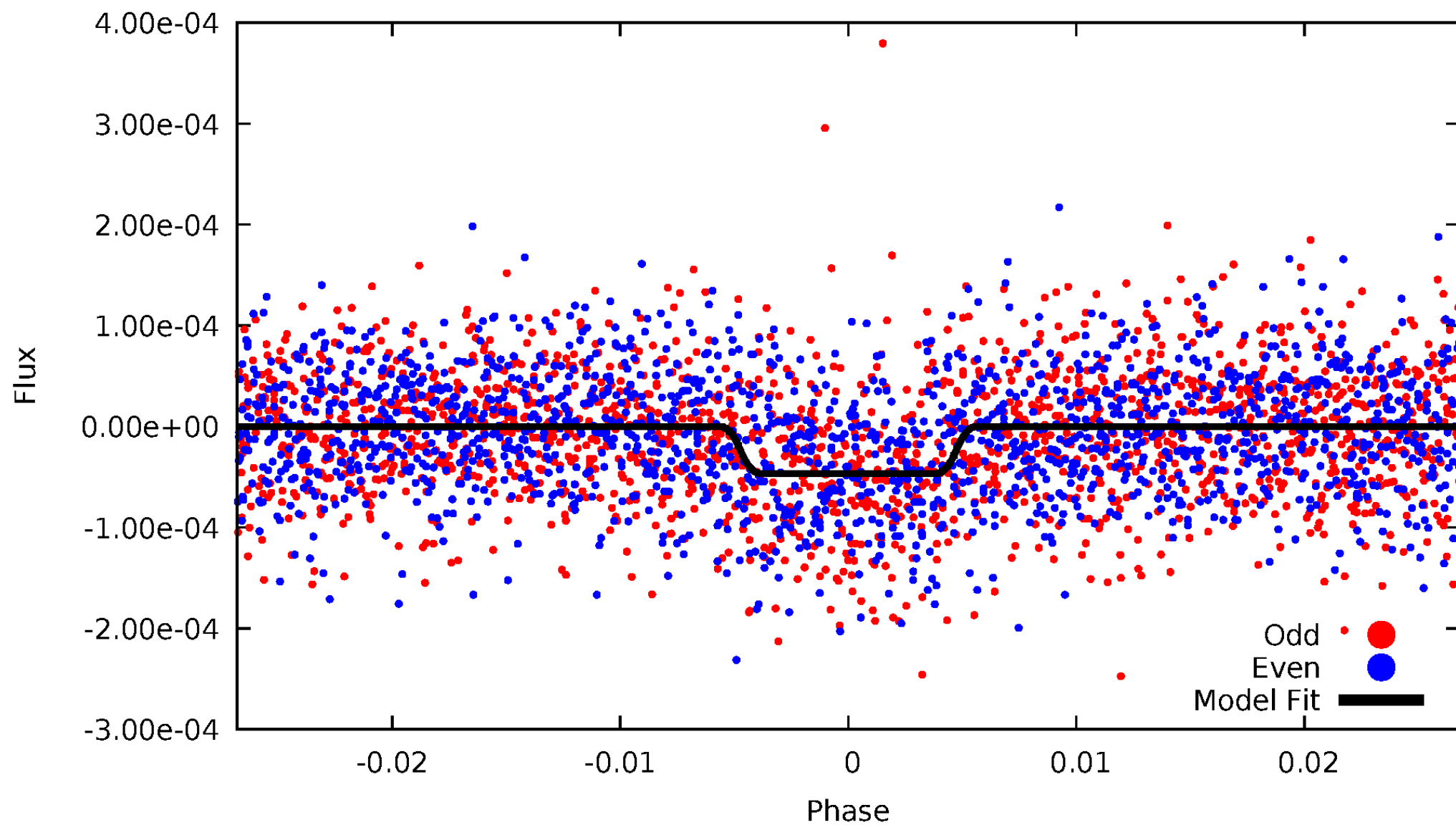
# DV Odd/Even

TCE 008077137-02



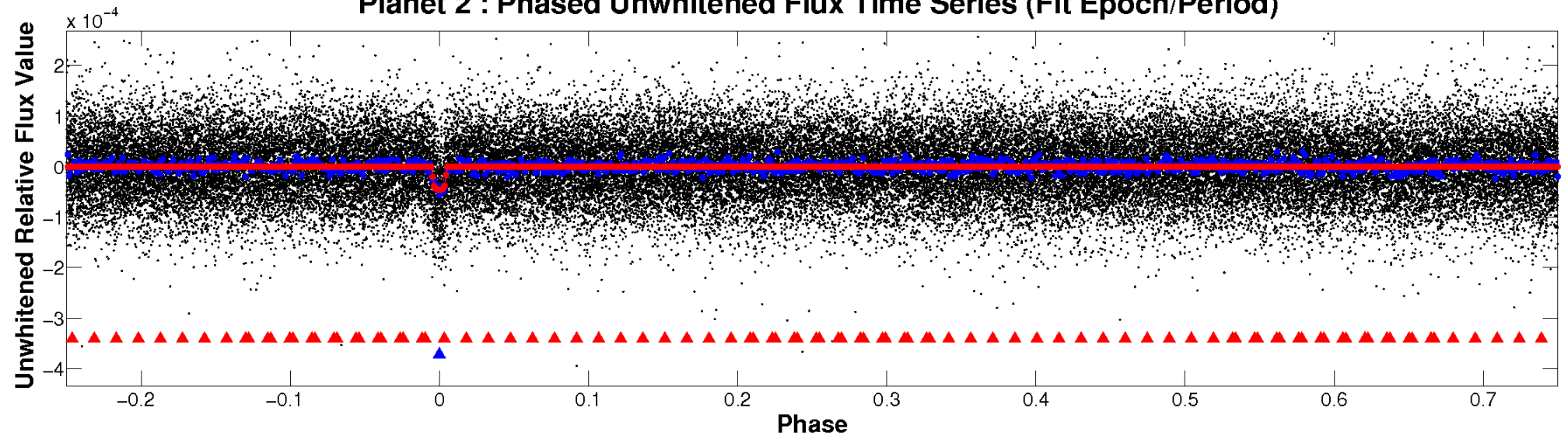
# ALT Odd/Even

TCE 008077137-02

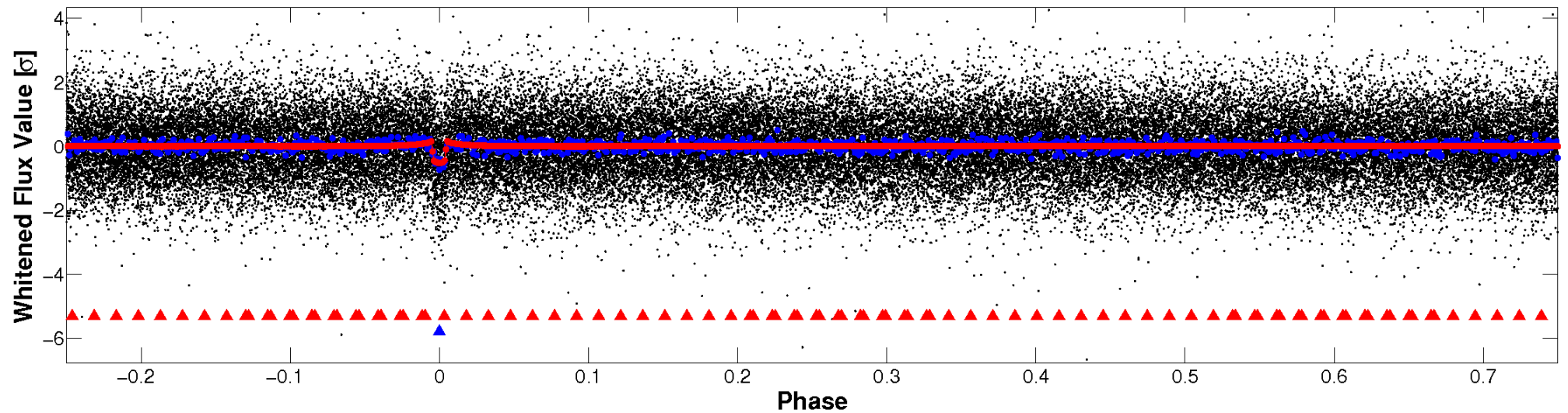


# Non-Whitened Vs. Whitened Light Curve

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

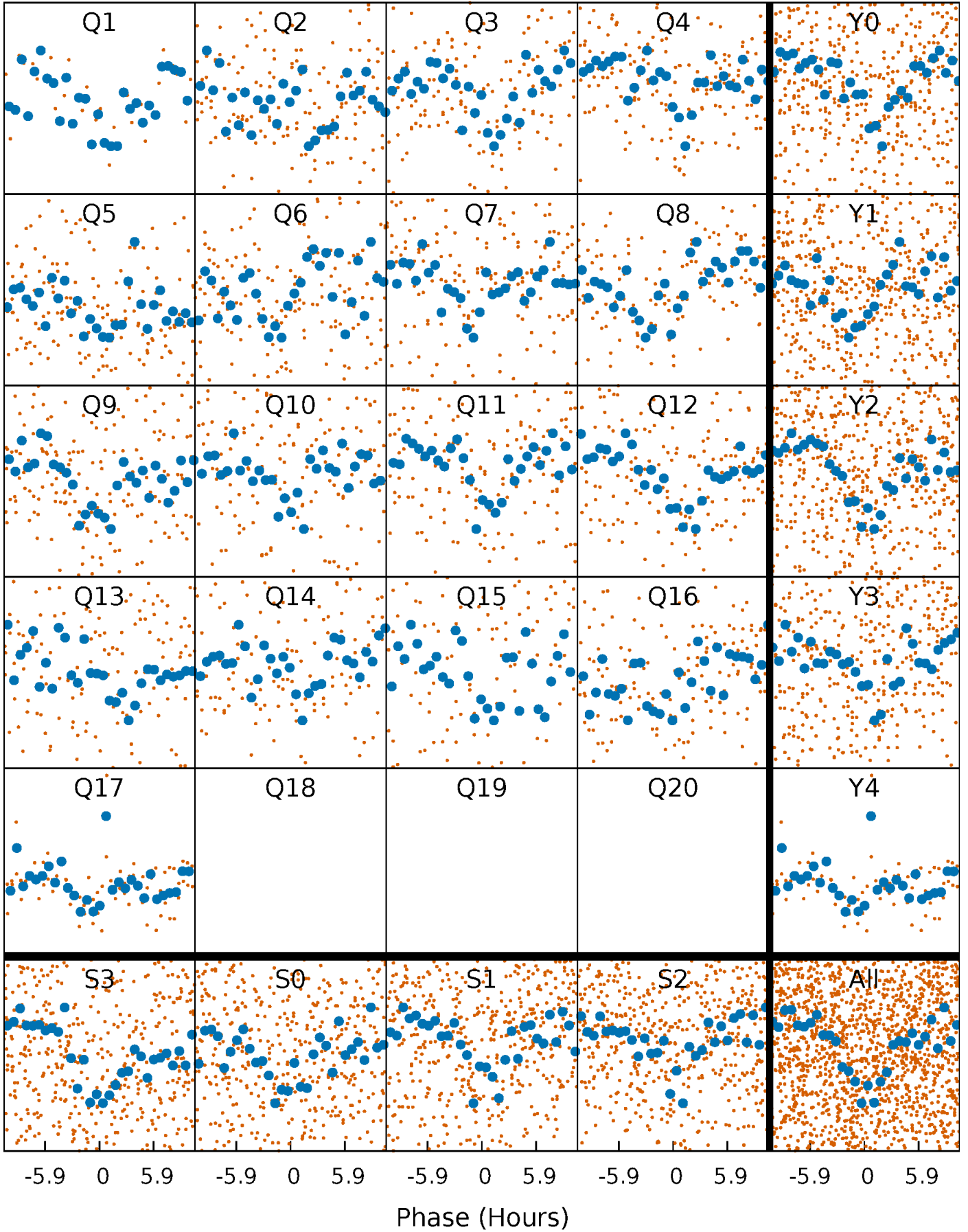


## Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



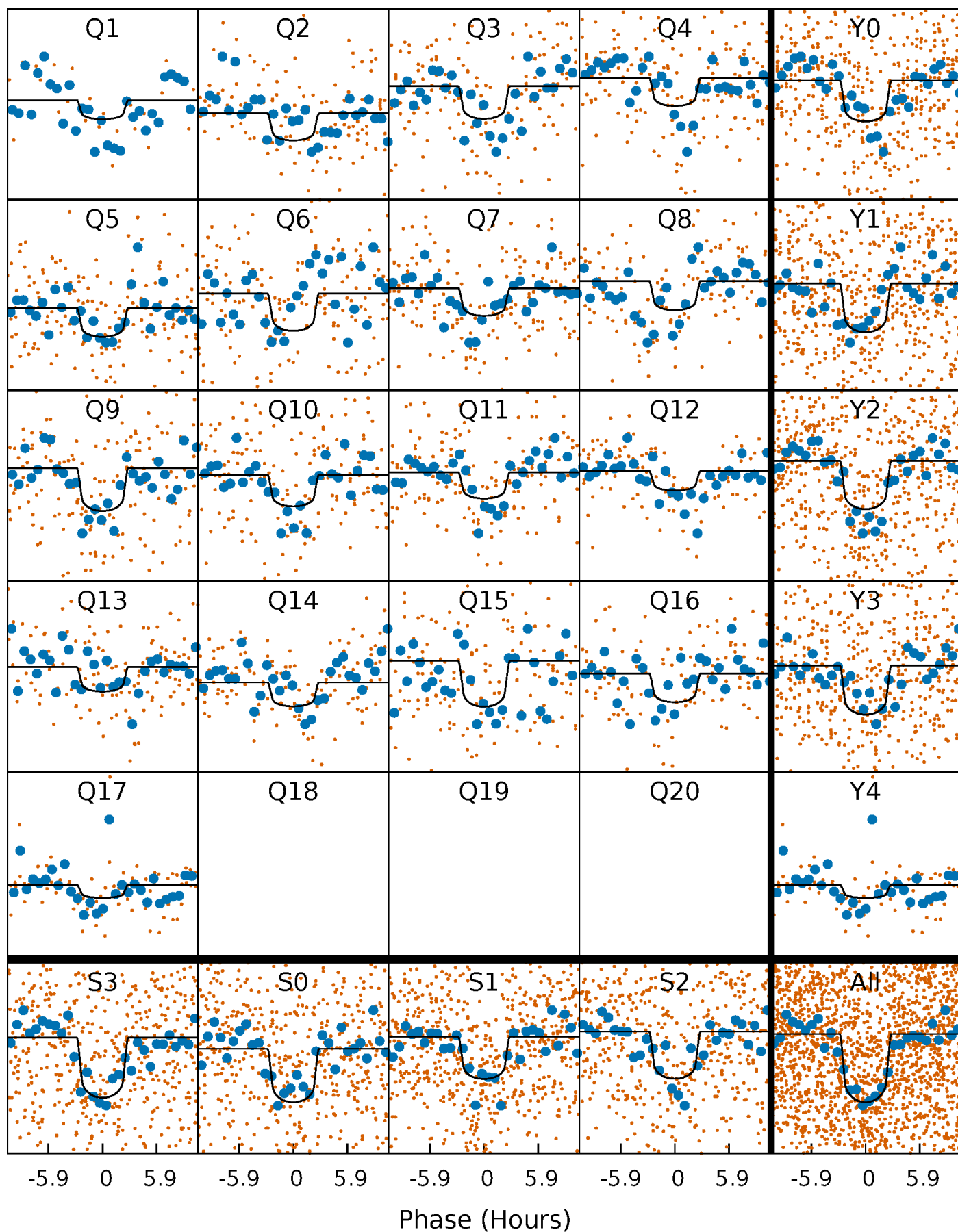
# PDC Quarter-Phased Transit Curves

TCE 008077137-02 P= 22.803083 Days  $T_0=153.373016$  (BKJD)



# DV Quarter-Phased Transit Curves

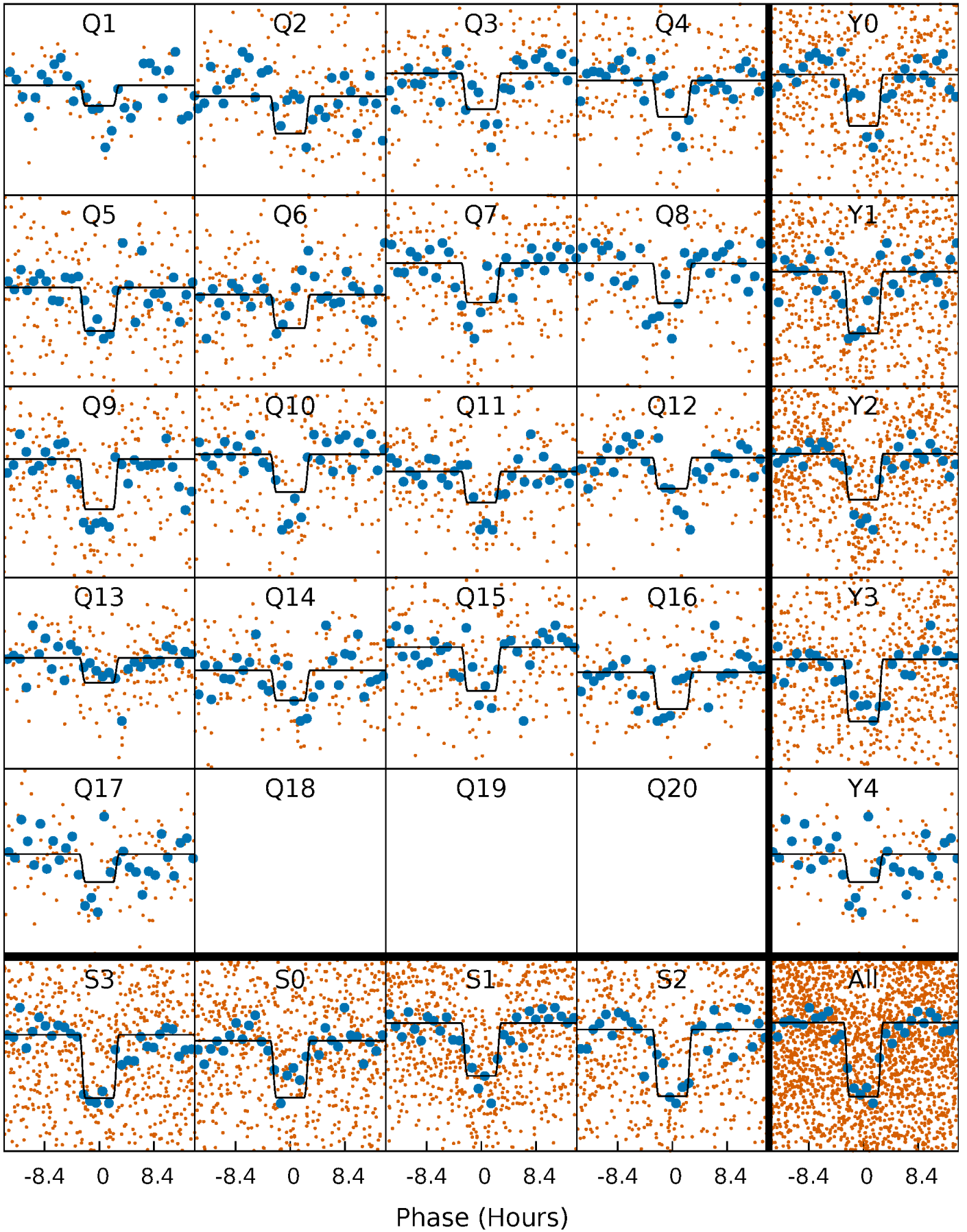
TCE 008077137-02 P= 22.803083 Days  $T_0=153.373016$  (BKJD)





# Alt. Detrend Quarter-Phased Transit Curves

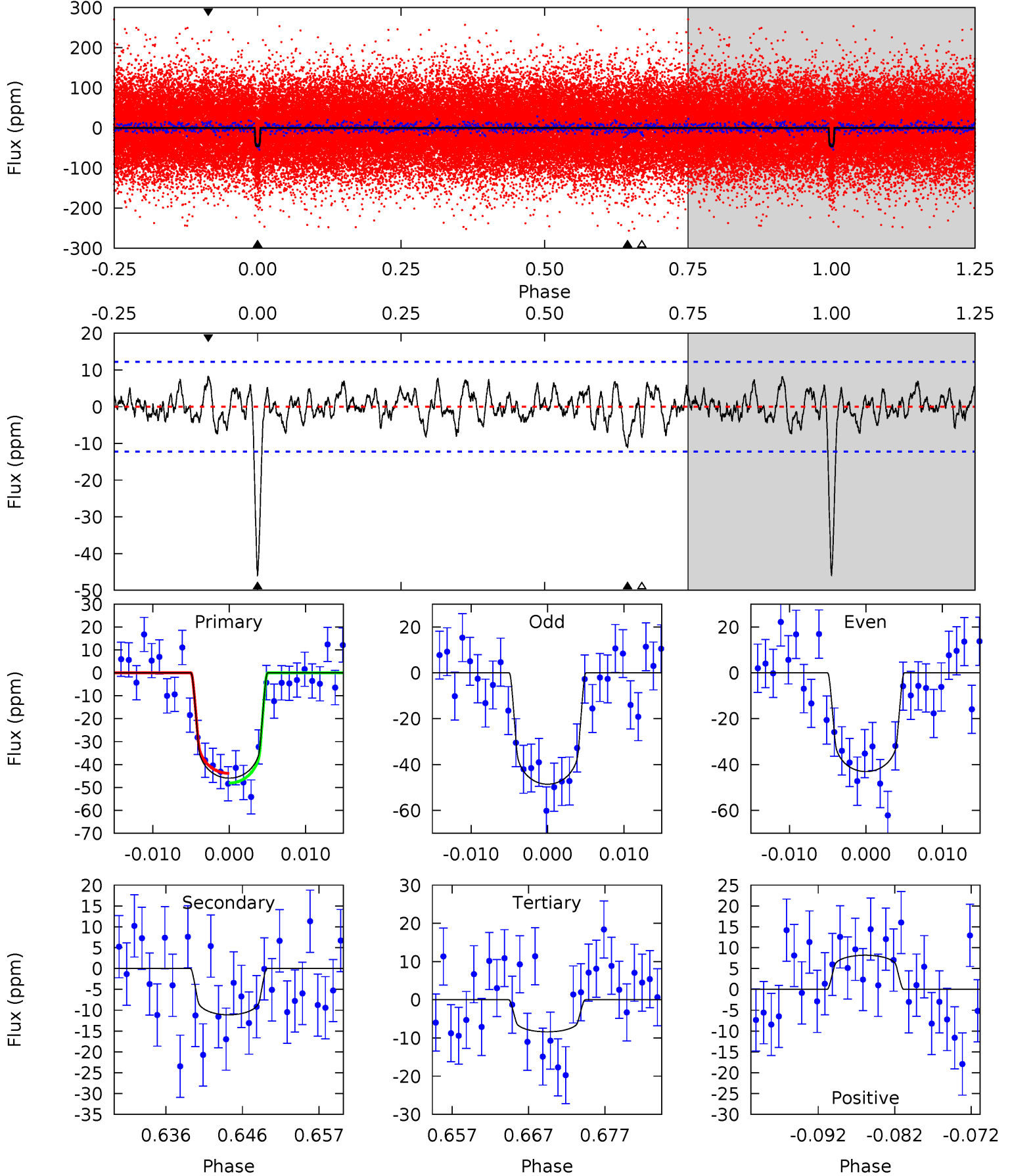
TCE 008077137-02 P= 22.802993 Days  $T_0=153.377693$  (BKJD)



# DV Model-Shift Uniqueness Test

008077137-02, P = 22.803083 Days, E = 130.569933 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
18.9	4.57	3.45	3.36	5.02	2.57	1.30	15.4	15.5	1.12	1.21	1.13	1.01	0.15	0.87

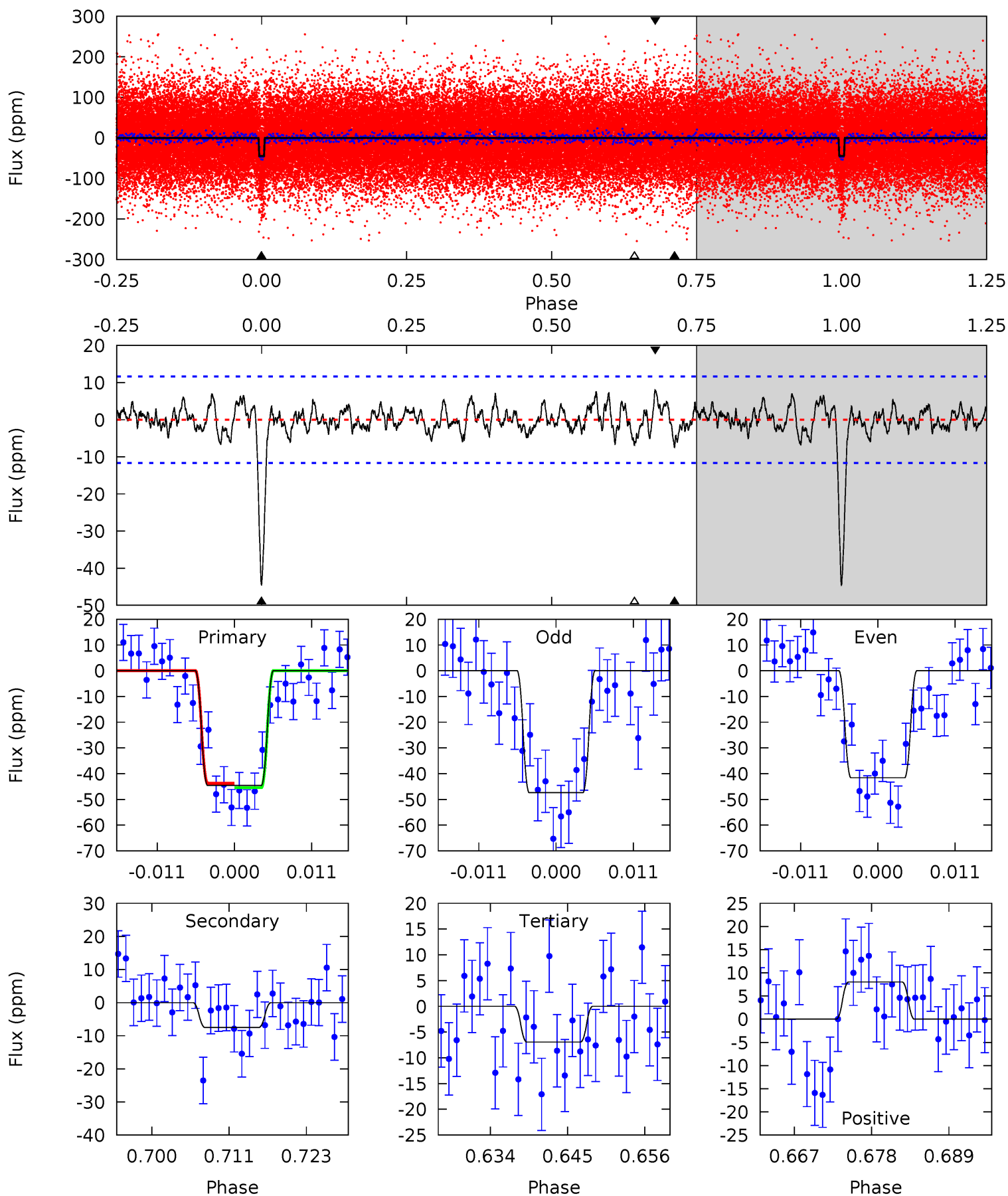




# Alt Model-Shift Uniqueness Test

008077137-02, P = 22.802993 Days, E = 130.574700 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
19.2	3.23	2.98	3.45	5.01	2.54	1.18	16.2	15.7	0.25	-0.22	1.25	0.91	0.15	0.37



### Stellar Parameters For KIC 008077137

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$6063^{+85}_{-73}$	$4.061^{+0.030}_{-0.030}$	$-0.100^{+0.100}_{-0.100}$	$1.613^{+0.098}_{-0.074}$	$1.092^{+0.078}_{-0.050}$	$0.366^{+0.044}_{-0.043}$
	+1%/-1%	+1%/-1%	+100%/-100%	+6%/-5%	+7%/-5%	+12%/-12%
Source	SPE8	AST69	SPE69	DSEP		

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

### Secondary Eclipse Parameters for KIC 008077137-02 / KOI 0274.02

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-11 \pm 2$	$1.31^{+0.33}_{-0.32}$	$1181^{+21}_{-21}$	$4284^{+527}_{-375}$	$92^{+73}_{-36}$
Alt.	$-8 \pm 2$	$1.20^{+0.34}_{-0.32}$	$1180^{+23}_{-20}$	$4108^{+575}_{-404}$	$73^{+68}_{-32}$

$T_{max}$  = 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

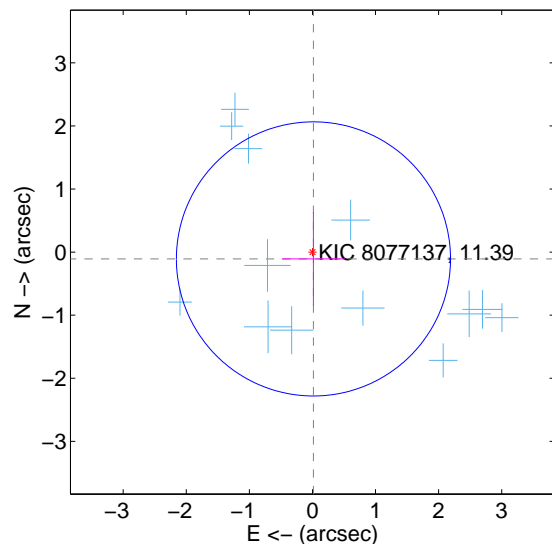
Supplemental centroid analysis for 008077137-02. **Kepler magnitude: 11.39.** Transit SNR 11.33

There are 13 quarters with good PRF difference image offsets

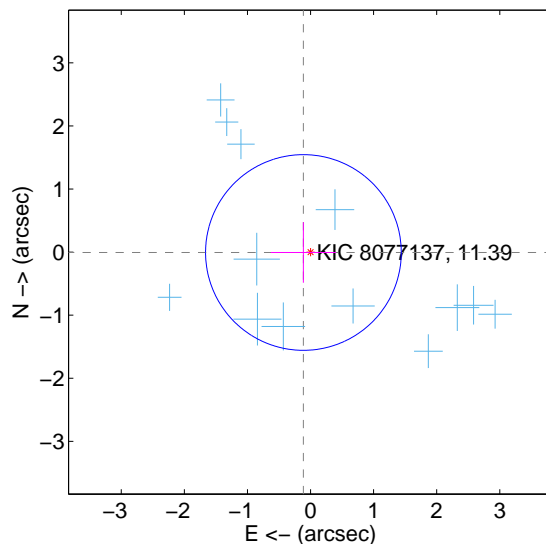
The direct PRF centroid is offset from the target star catalog position by about 0.18 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.109 \pm 0.724$	0.15	$-0.016 \pm 0.499$	$-0.108 \pm 0.745$
PRF-fit source offset from KIC position	$0.113 \pm 0.517$	0.22	$0.113 \pm 0.517$	$-0.006 \pm 0.479$
photometric centroid source offset	$1.02 \pm 0.73$	1.40	$0.26 \pm 1.01$	$-0.98 \pm 0.70$

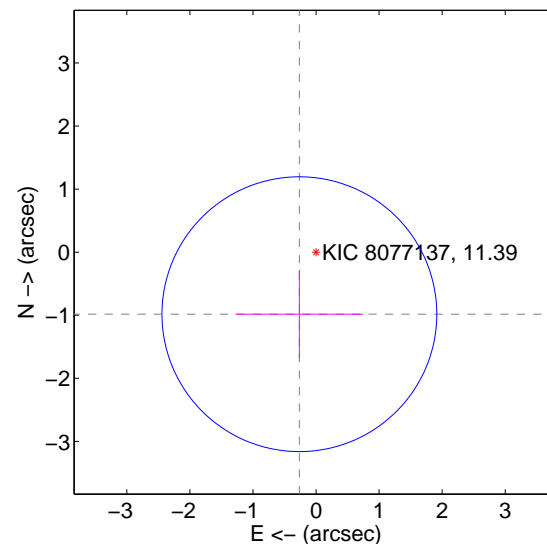
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position

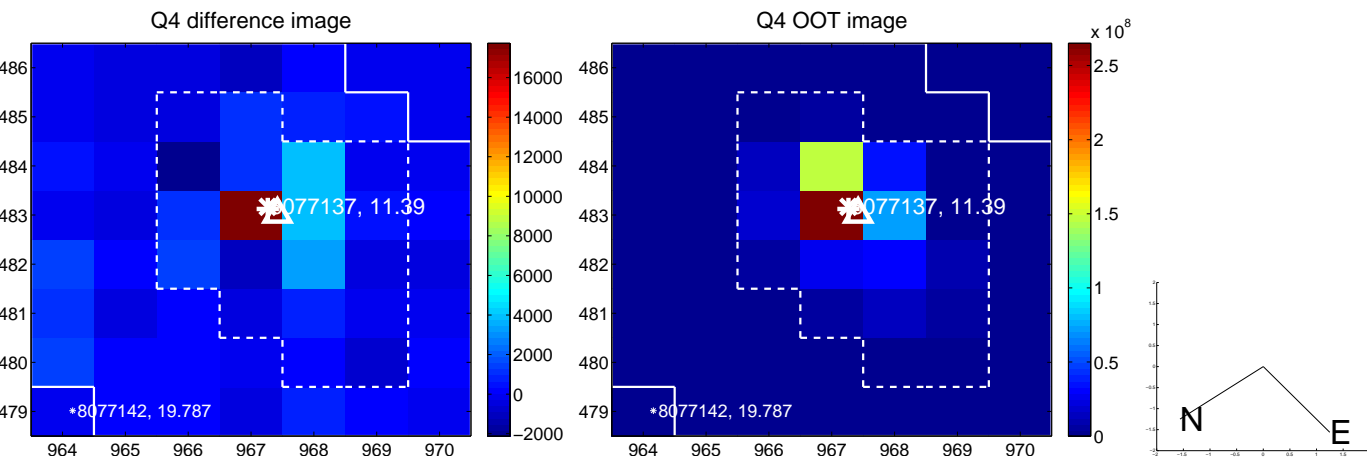
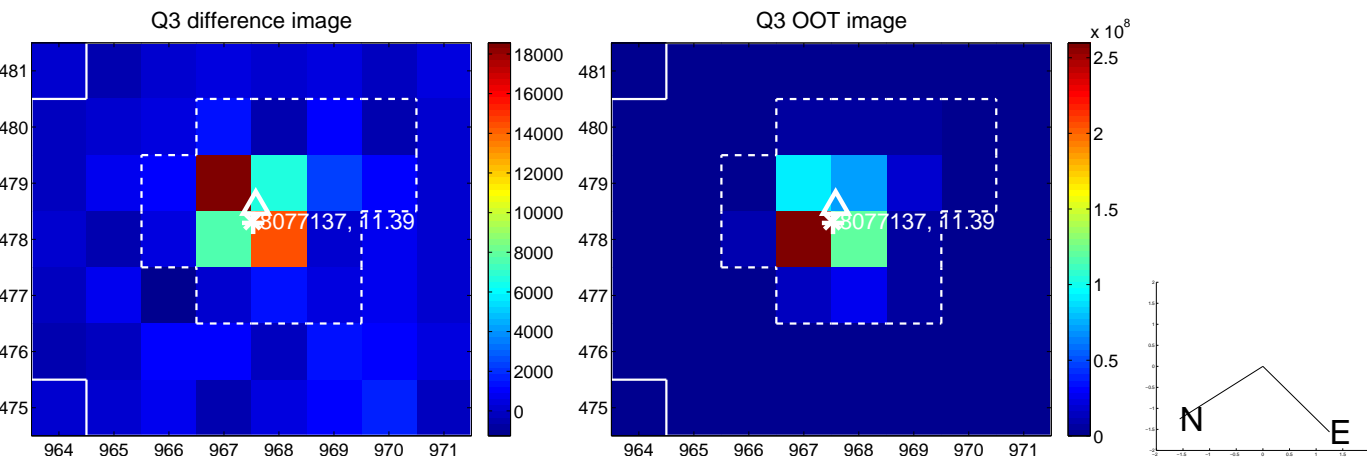
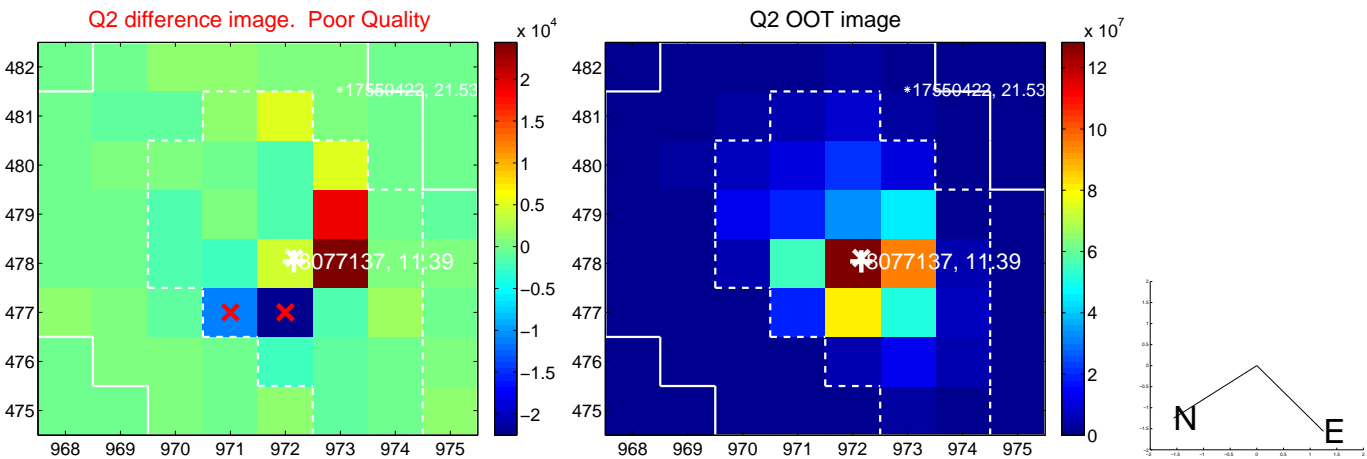
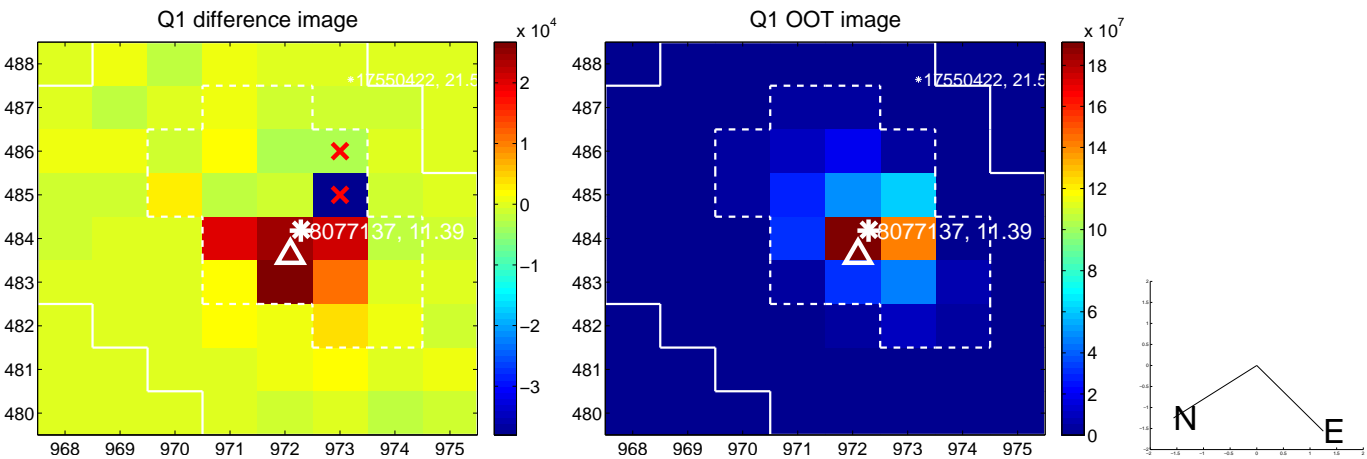


offset from photometric centroids

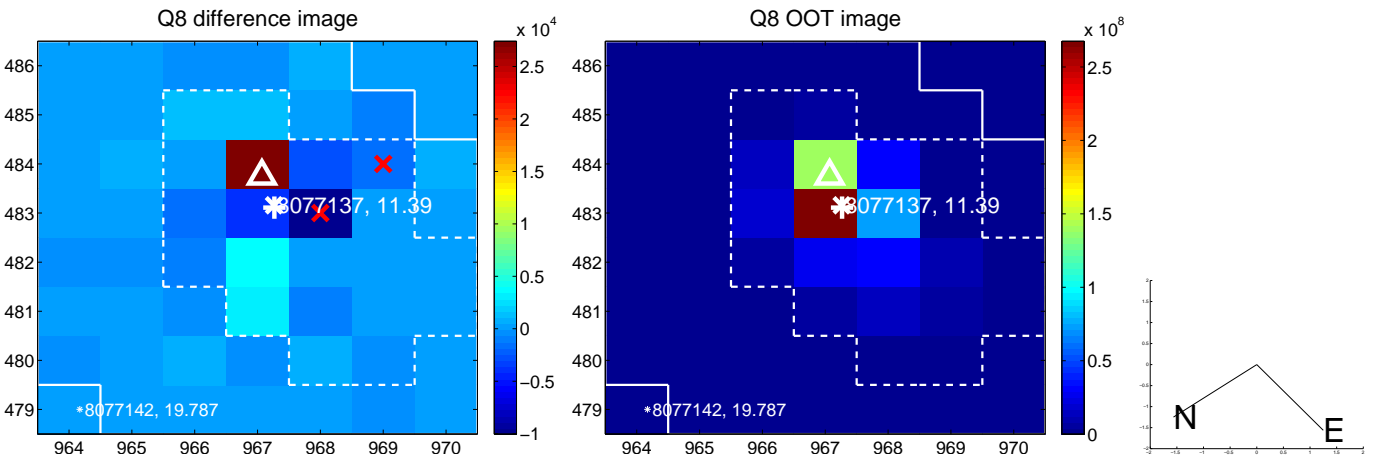
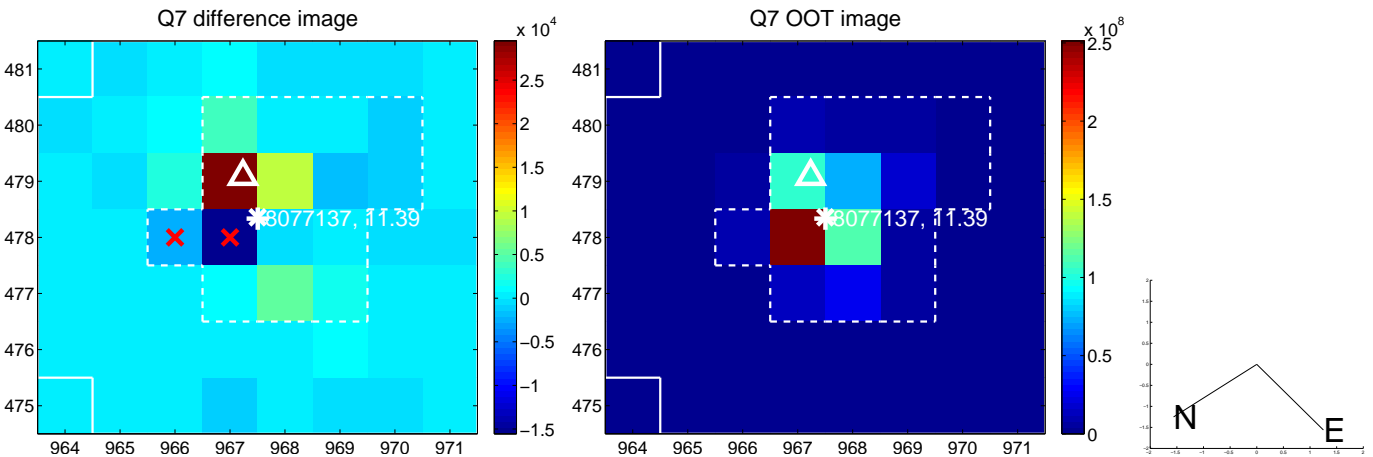
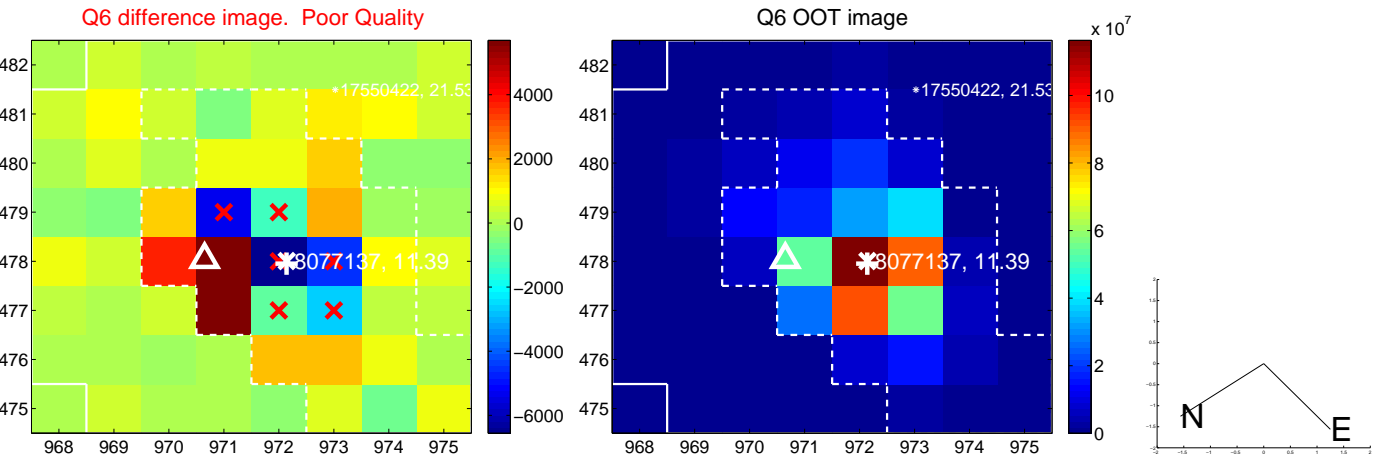
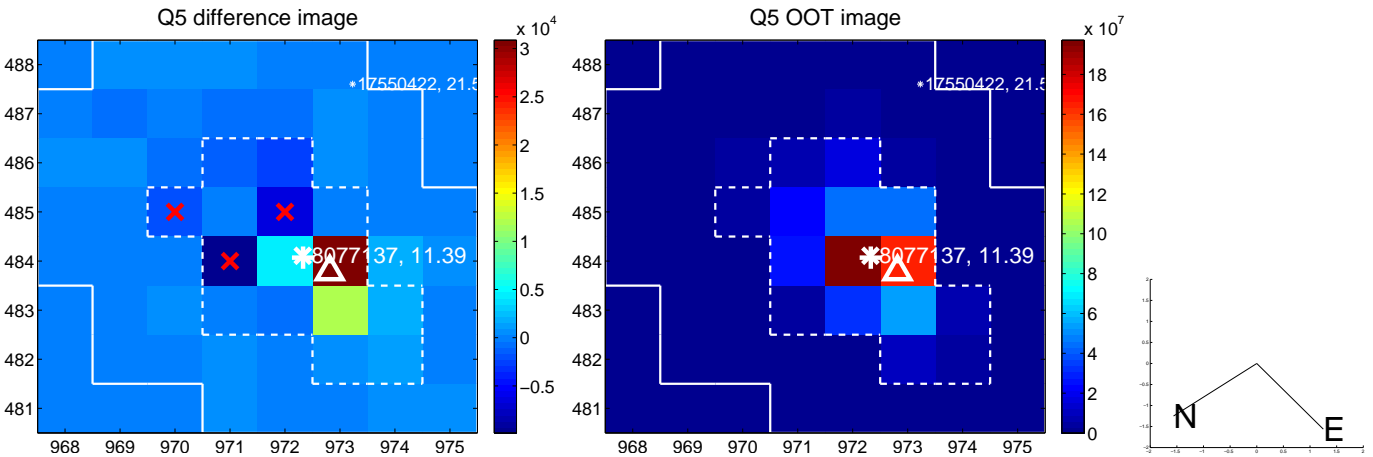


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets;** magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

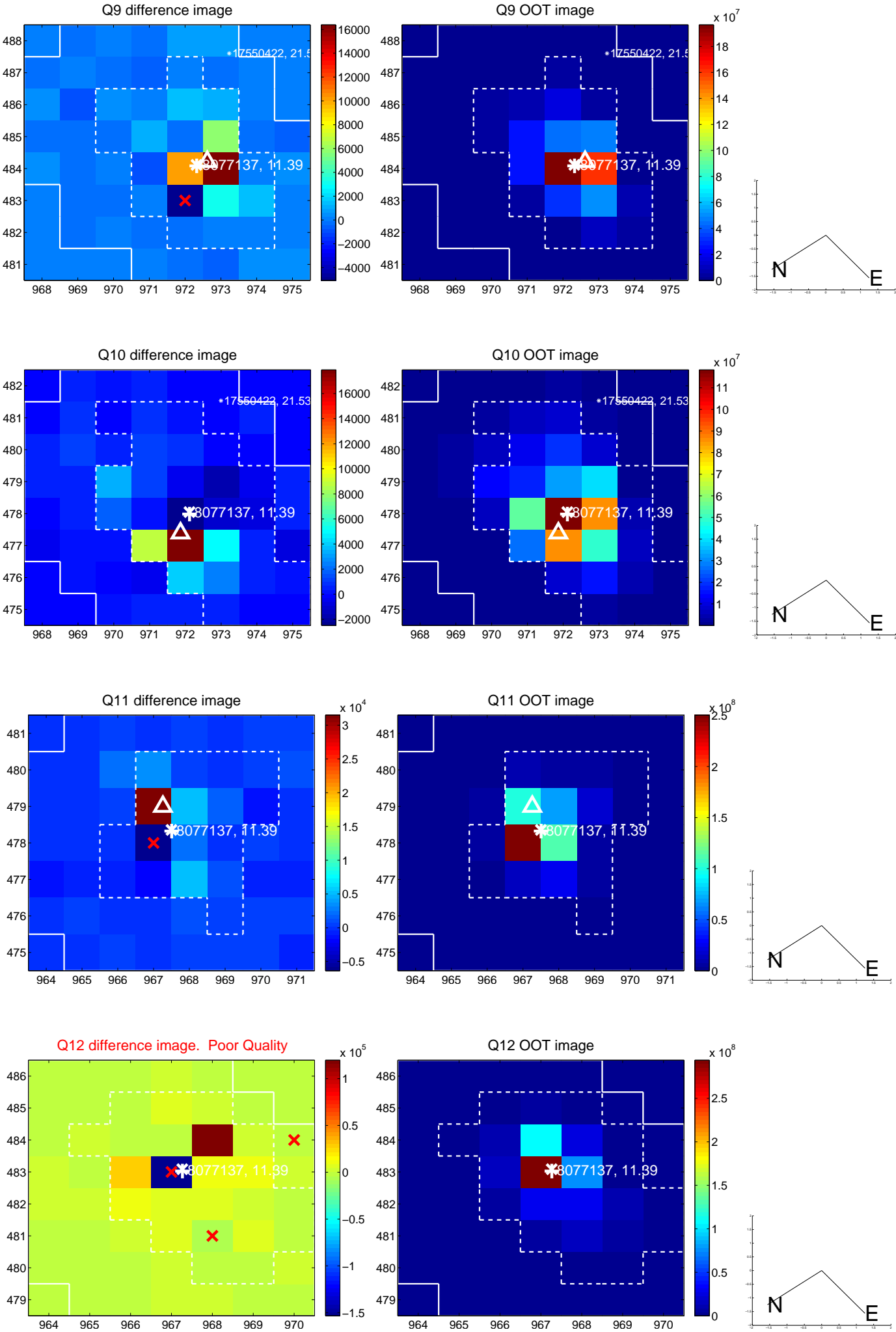
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



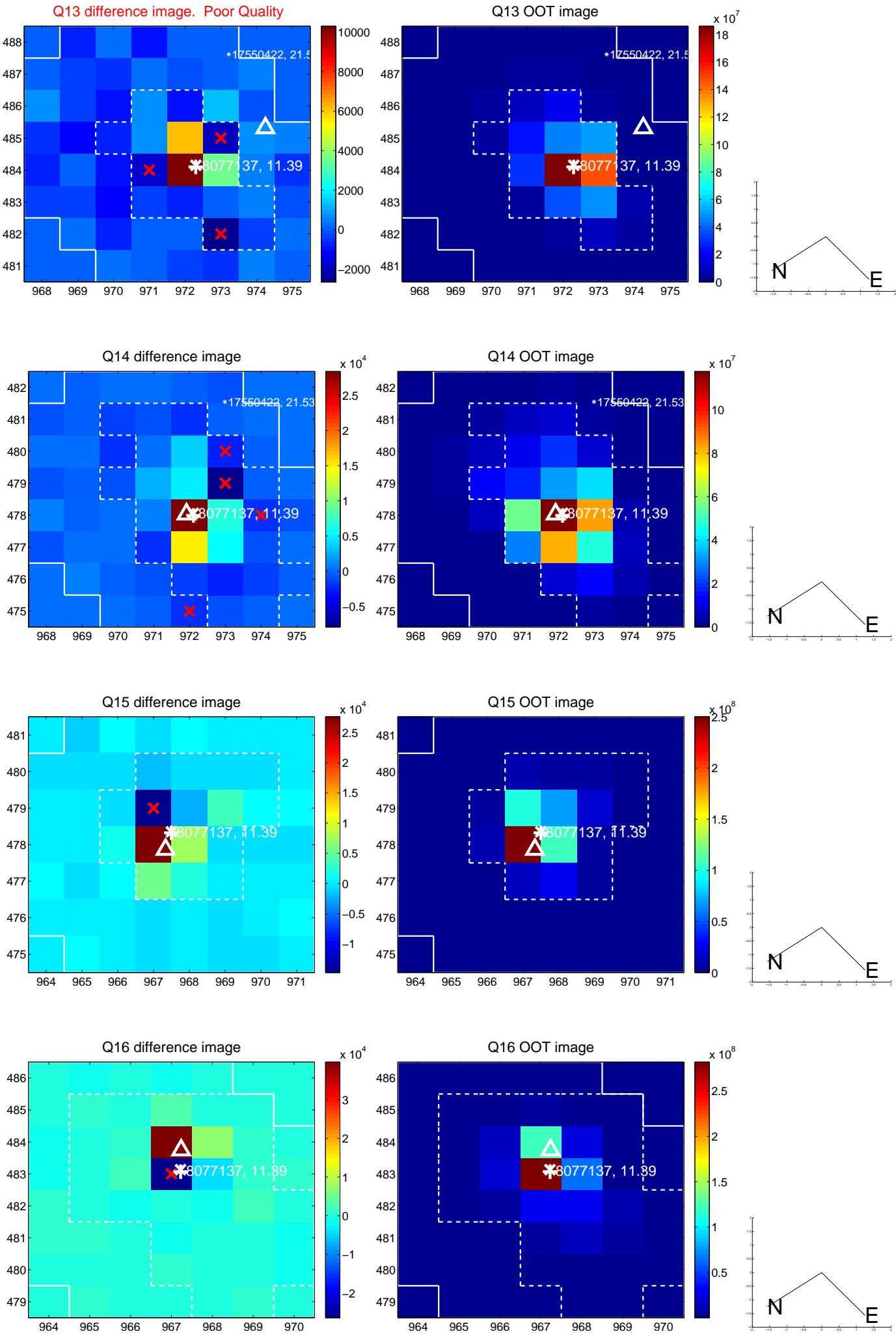
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

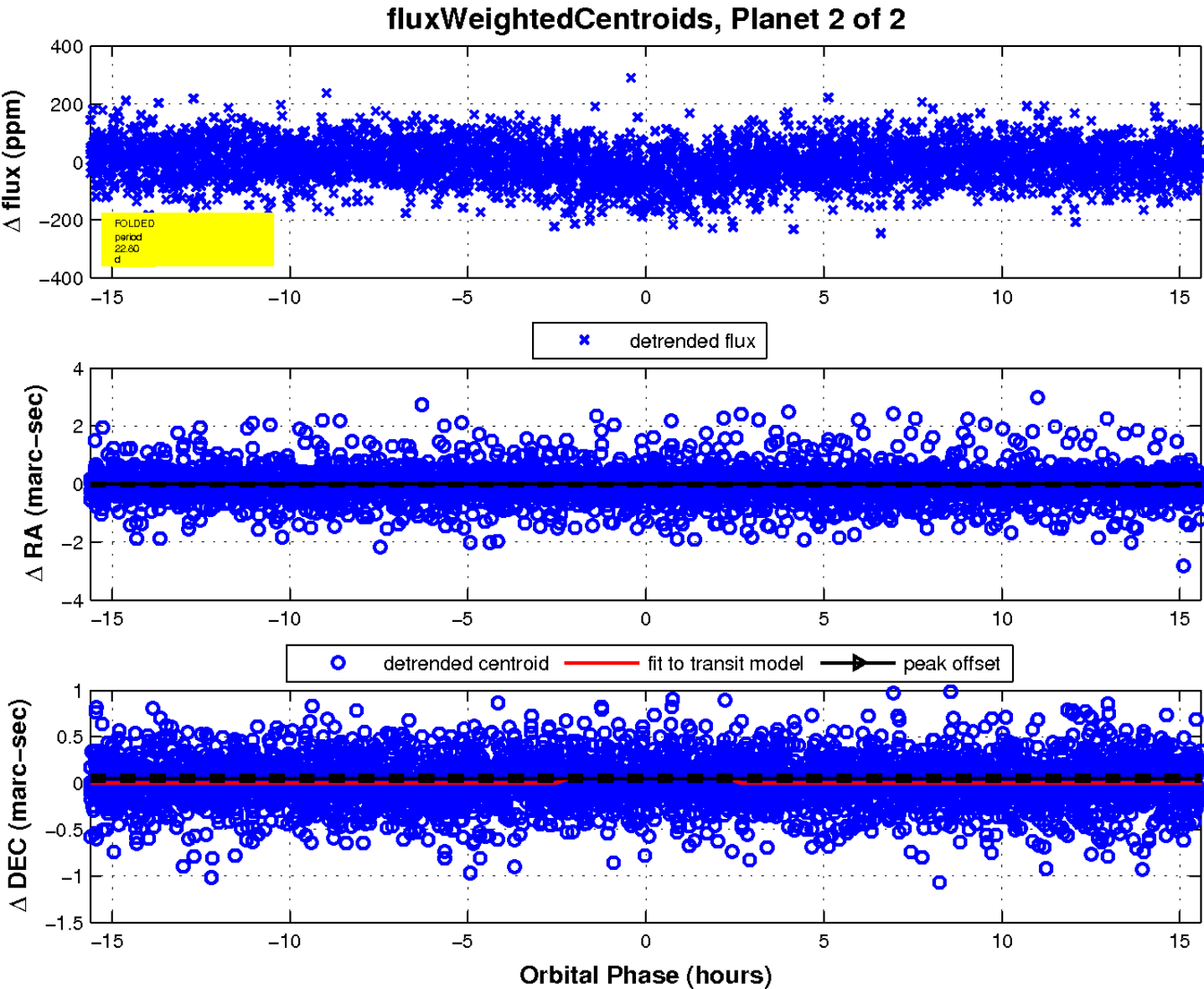
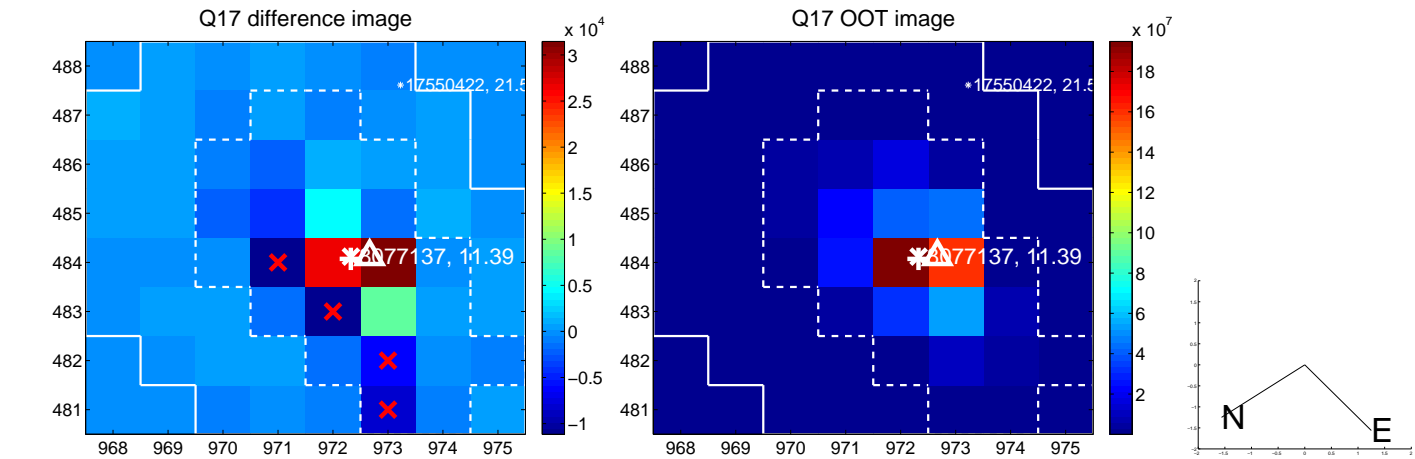


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.





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



UKIRT Image

Declination

