

# KIC 010661721

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
010661721-01	OBS	No	3.908000	135.184811	20.2	14.403	10.8	6.9	1.49	6868	0.68	1588.08
010661721-02	OBS	No	5.860792	131.967692	51.4	22.258	8.3	10.0	1.49	6868	1.48	925.13

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
010661721-01	OBS	FP	0.00	1	0	0	0	SWEET_NTL—LPP_DV—MOD_NONUNIQ_DV
010661721-02	OBS	FP	0.00	1	0	0	0	TRANS_GAPPED—LPP_DV—MOD_NONUNIQ_DV

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

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

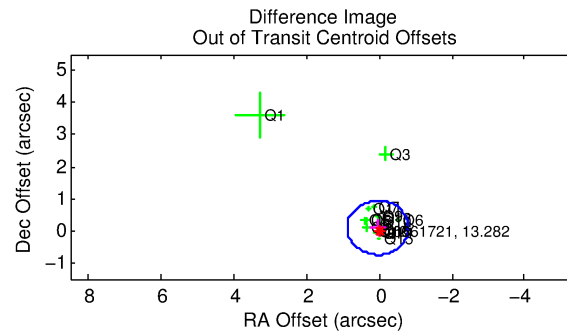
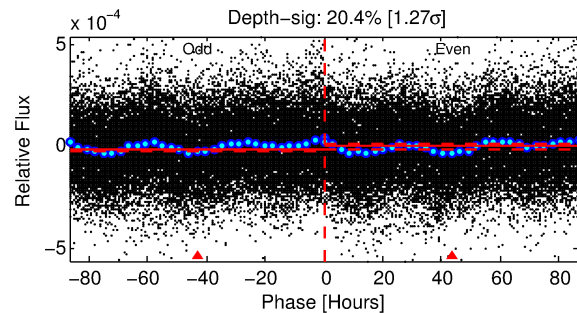
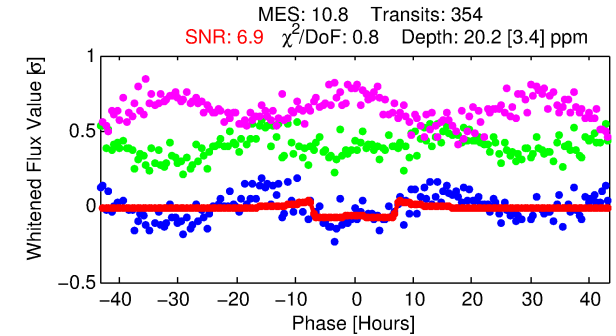
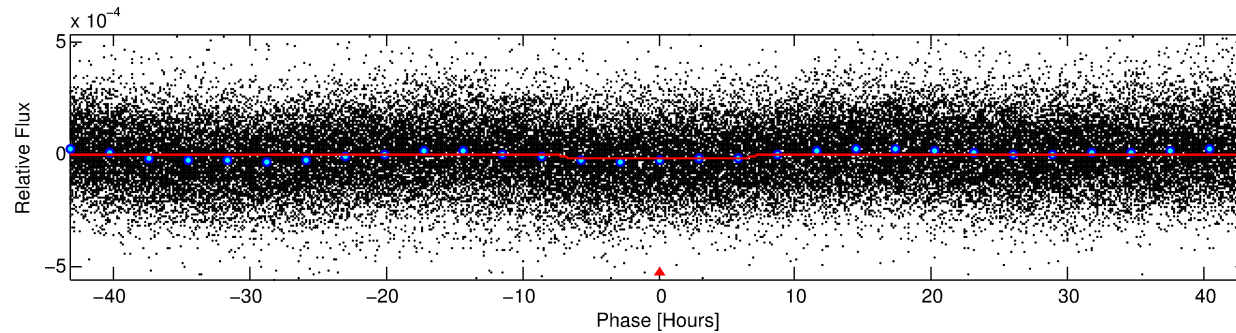
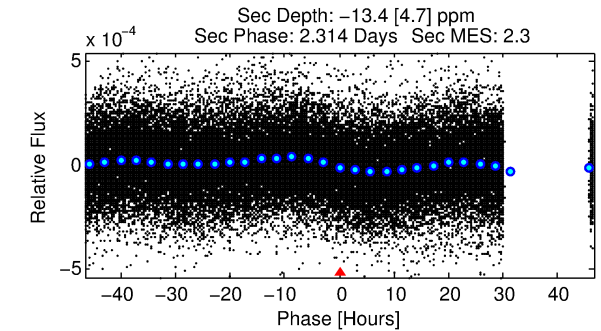
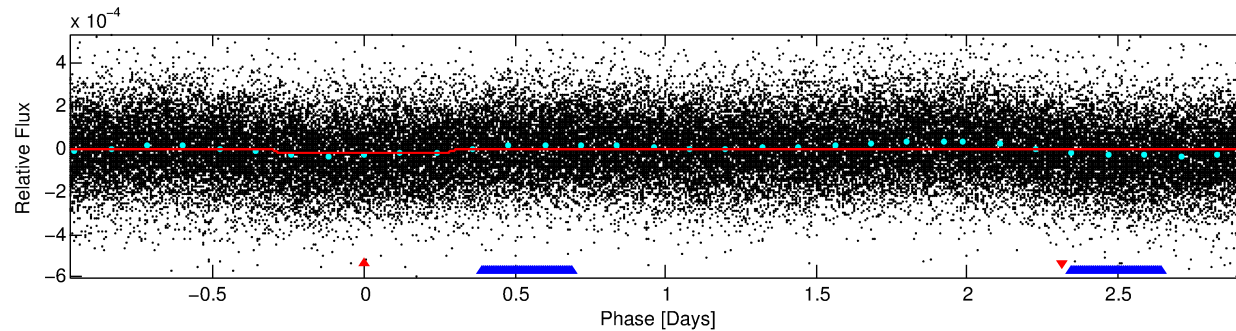
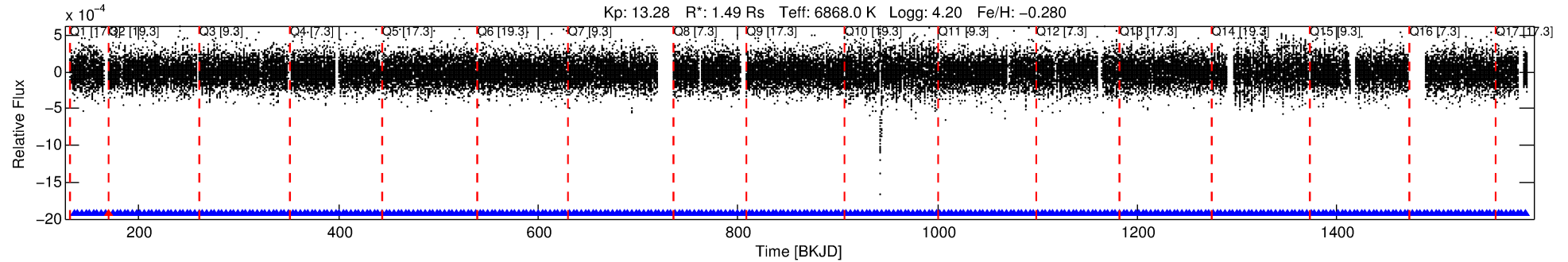
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 010661721-01

No Significant Match Found

# DV One-Page Summary

KIC: 10661721 Candidate: 1 of 2 Period: 3.908 d



## DV Fit Results:

Period = 3.90800 [0.00006] d  
Epoch = 135.1848 [0.0103] BKJD  
Rp/R\* = 0.0042 [0.0040]  
a/R\* = 2.16 [9.41]  
b = 0.01 [608.59]  
Seff = 1588.08 [462.32]  
Teq = 1610 [117] K  
Rp = 0.68 [0.67] Re  
a = 0.0528 [0.0090] AU  
Ag = N/A  
Teffp = N/A

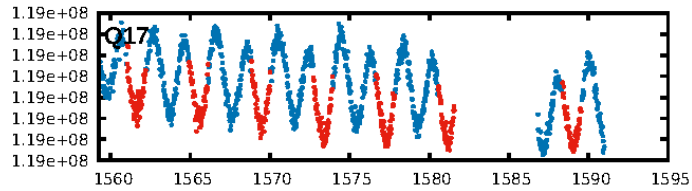
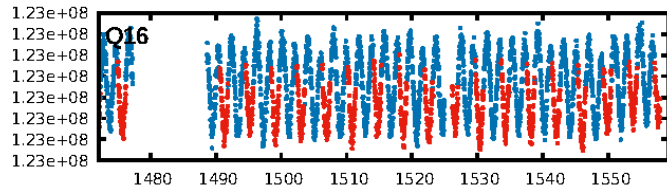
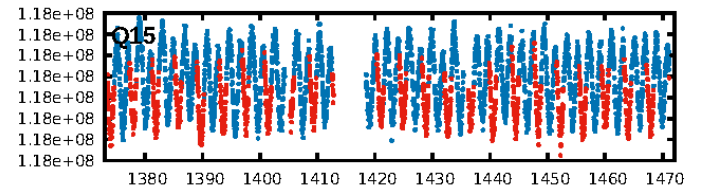
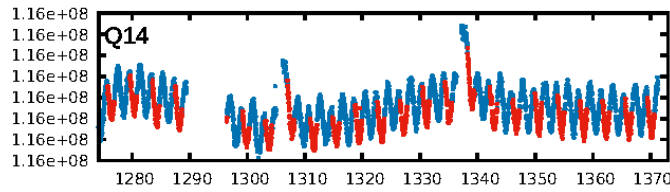
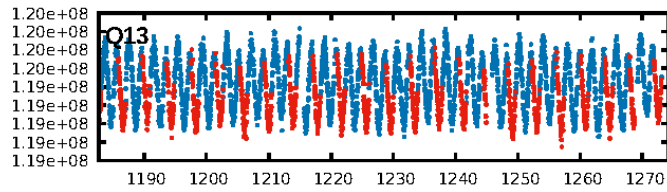
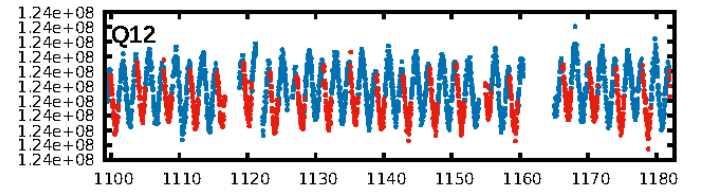
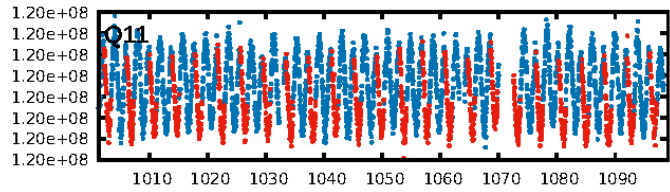
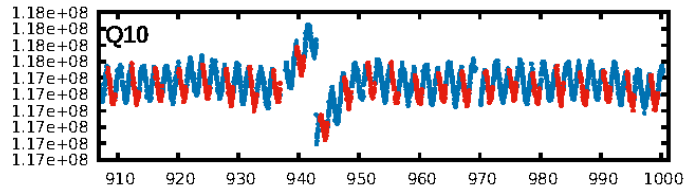
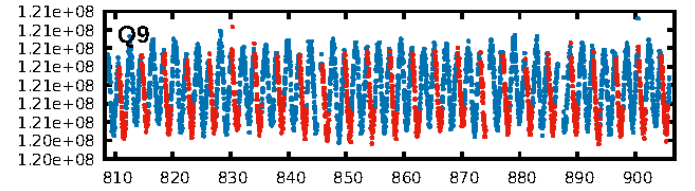
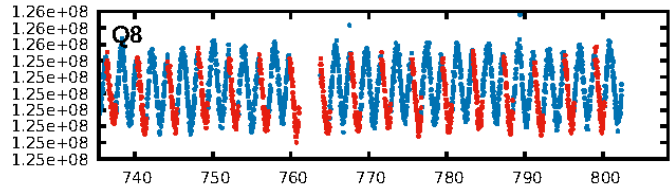
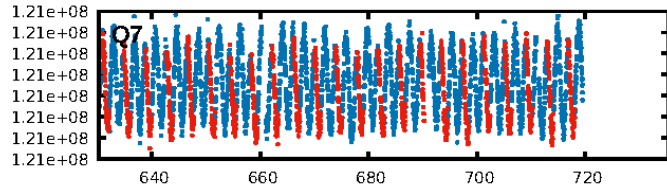
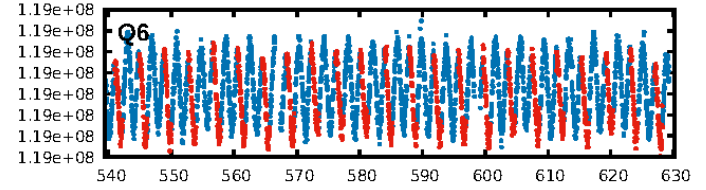
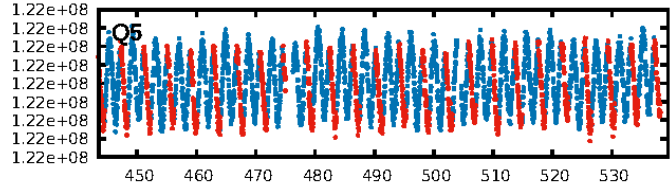
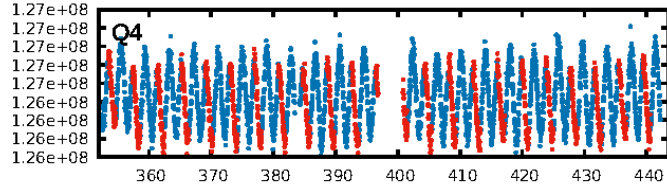
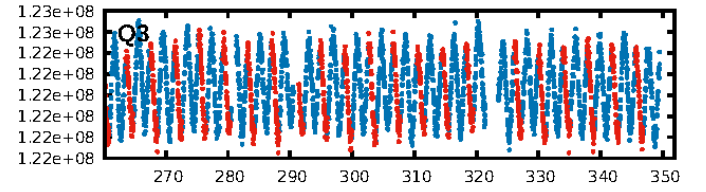
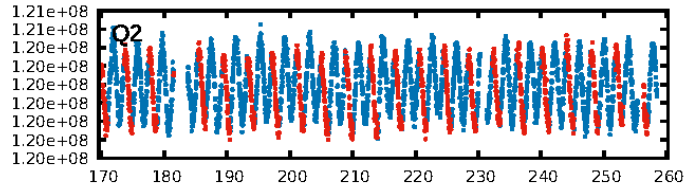
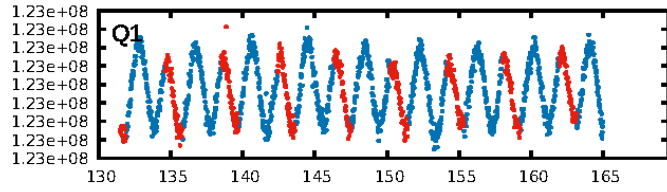
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 92.3% [1.77σ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGoF-sig: N/A  
Bootstrap-pfa: 2.99e-21  
RollingBand-fgt: 1.00 [337/338]  
GhostDiagnostic-chr: 2.194  
Centroid-sig: 0.0%  
Centroid-so: 2.988 arcsec [3.10σ]  
OotOffset-rm: 0.101 arcsec [0.36σ]  
KicOffset-rm: 0.164 arcsec [1.08σ]  
OotOffset-st: 3/4/4/5 [16]  
KicOffset-st: 3/4/4/5 [16]  
DiffImageQuality-fgm: 0.94 [15/16]  
DiffImageOverlap-fno: 1.00 [17/17]

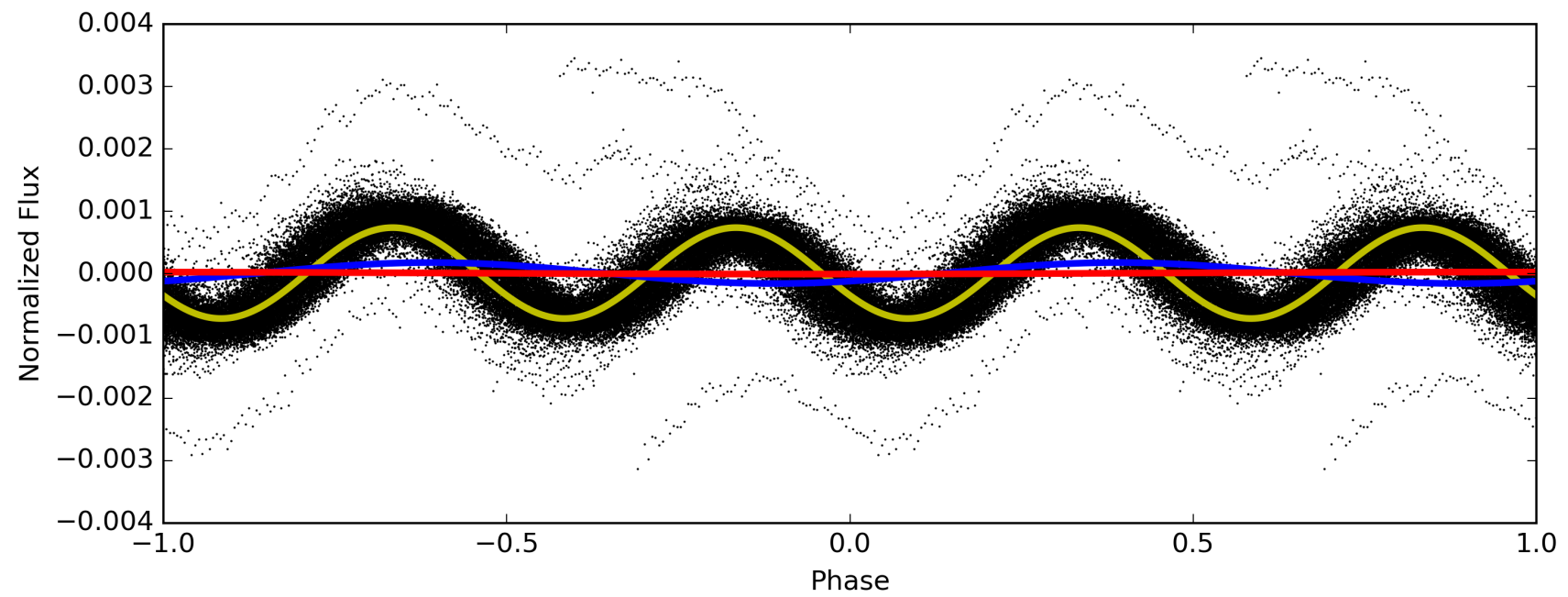
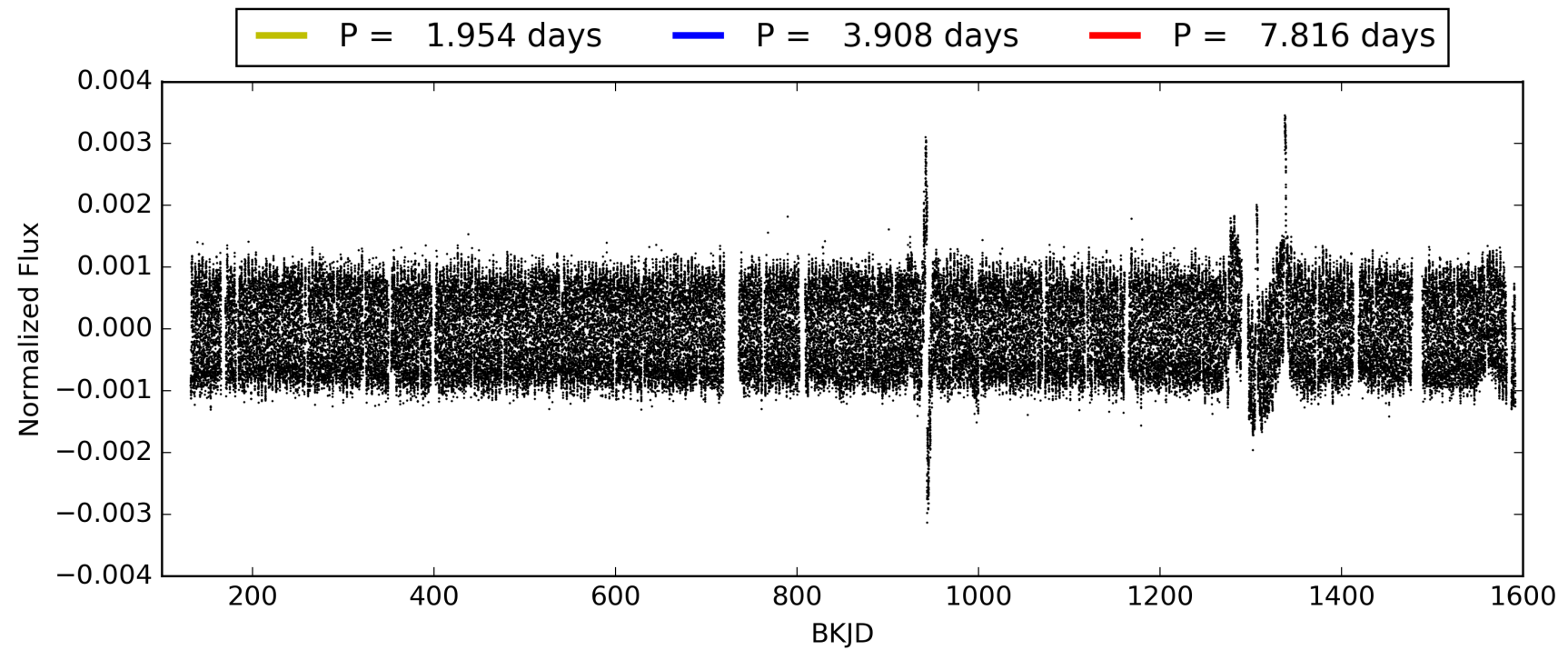
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 29-Jan-2016 03:50:51 Z

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

## TCE 010661721-01, PDC Light Curves

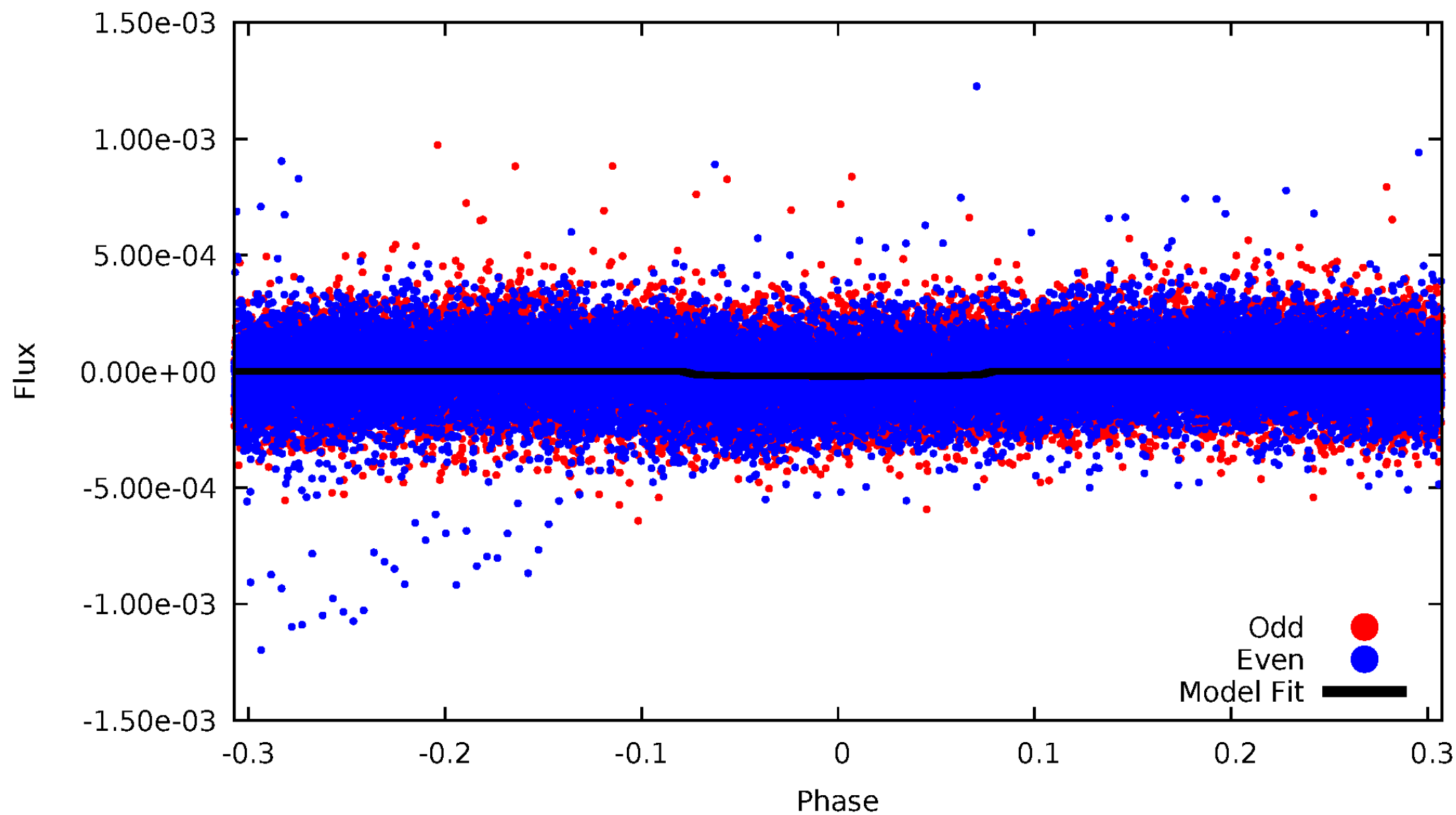


TCE 010661721-01



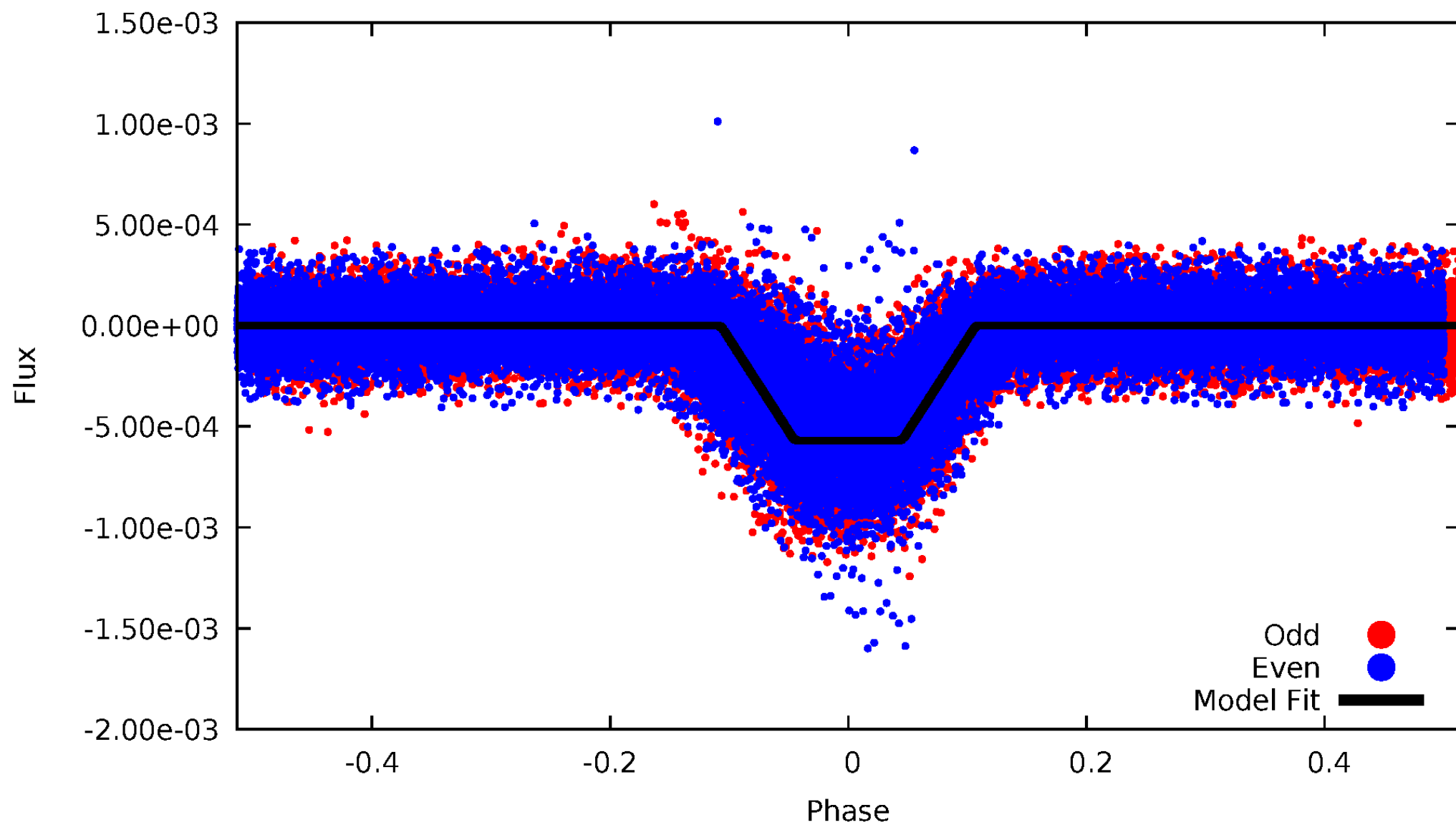
# DV Odd/Even

TCE 010661721-01



# ALT Odd/Even

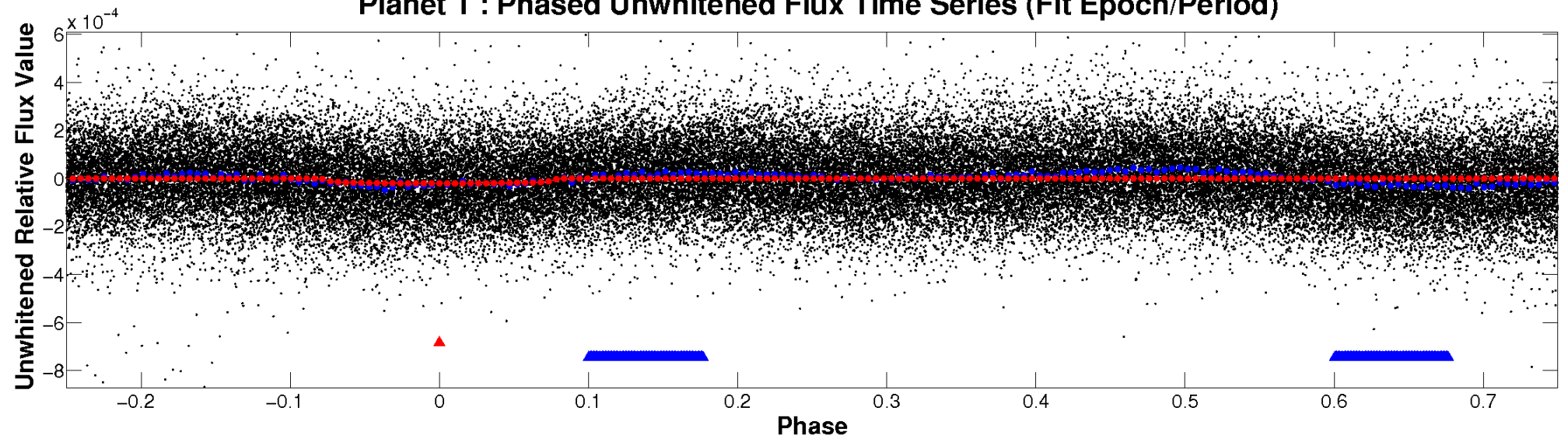
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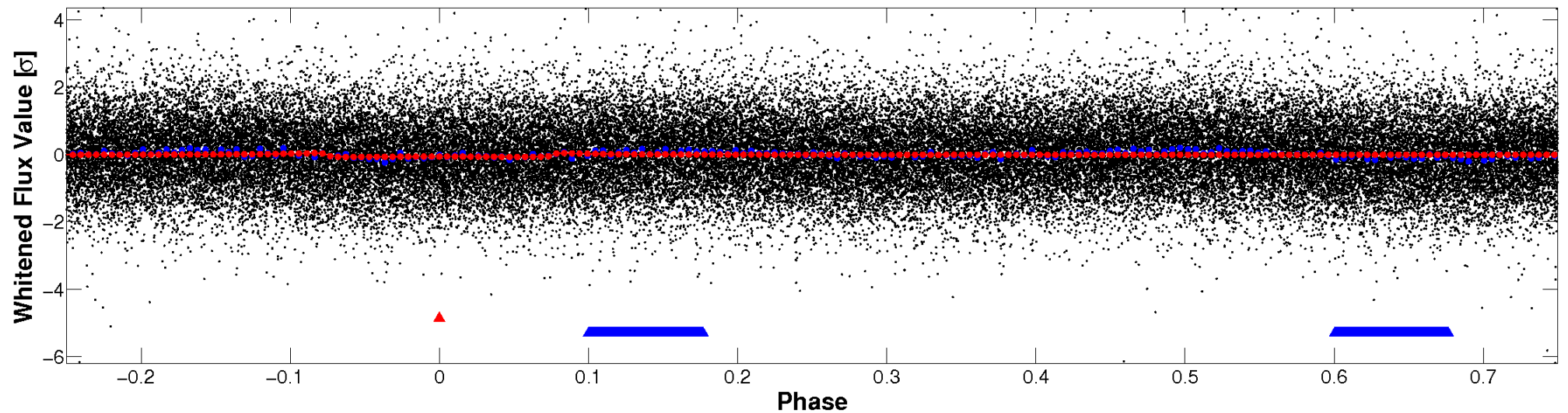


# Non-Whitened Vs. Whitened Light Curve

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

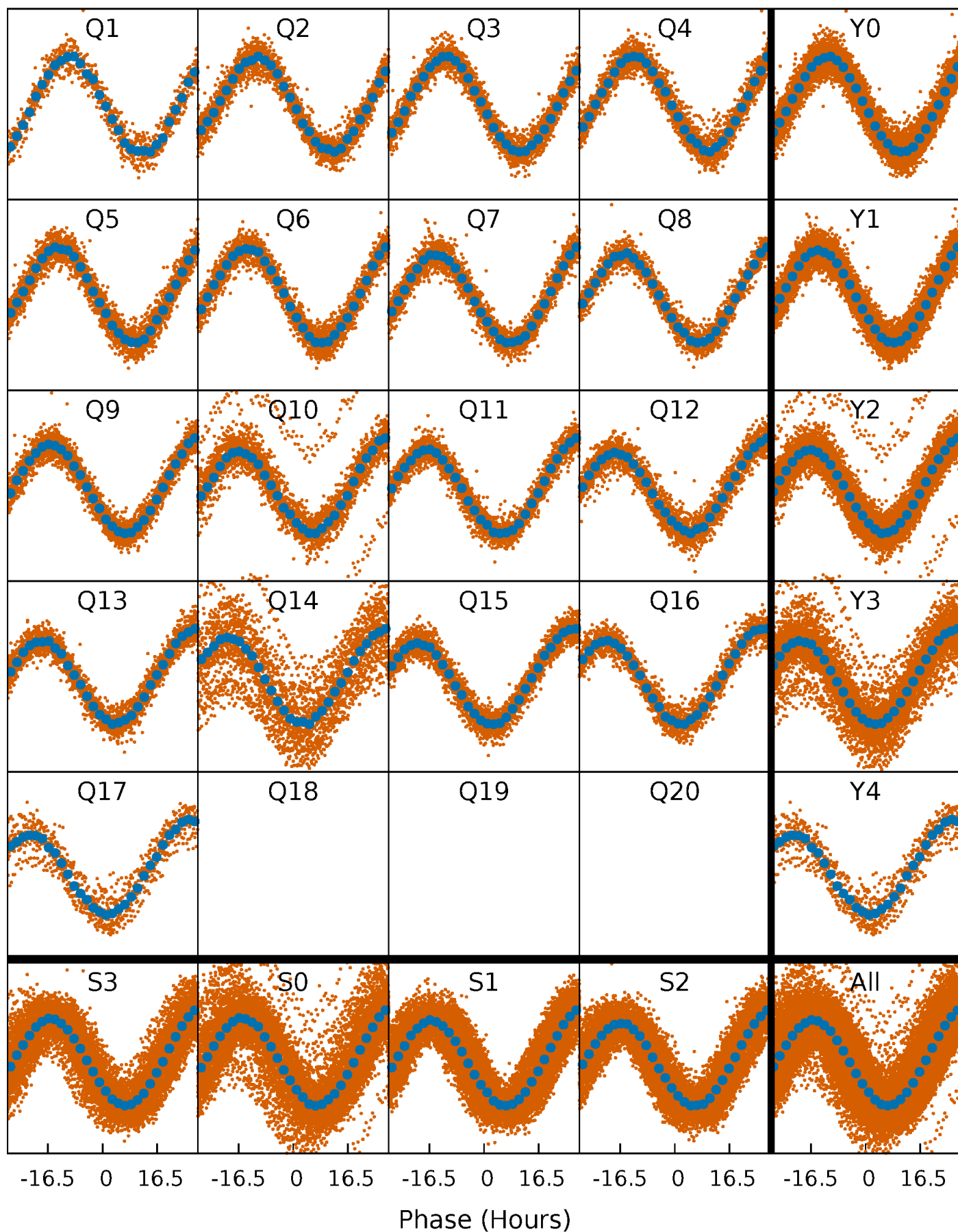


Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)



# PDC Quarter-Phased Transit Curves

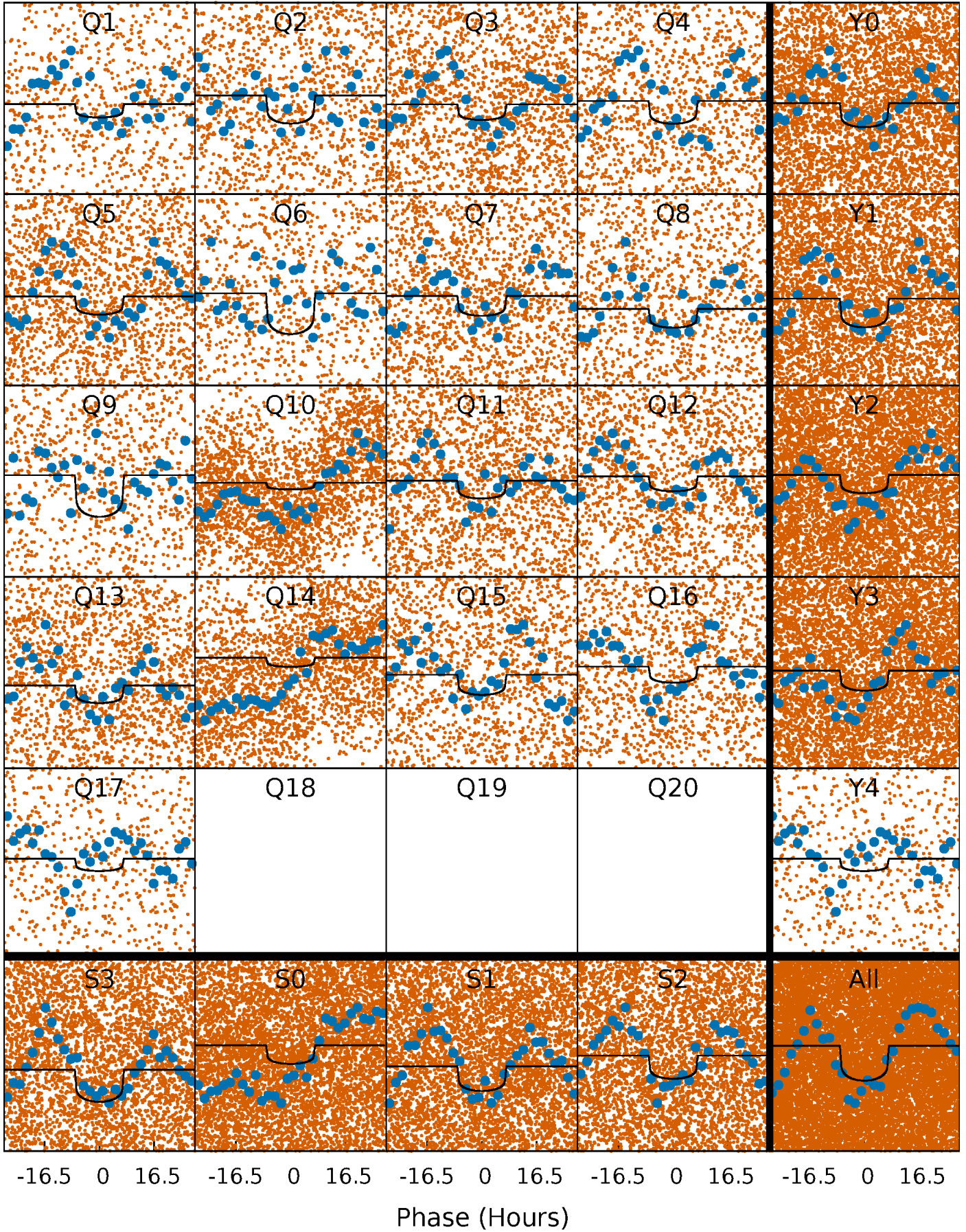
TCE 010661721-01 P= 3.908000 Days  $T_0=135.184811$  (BKJD)





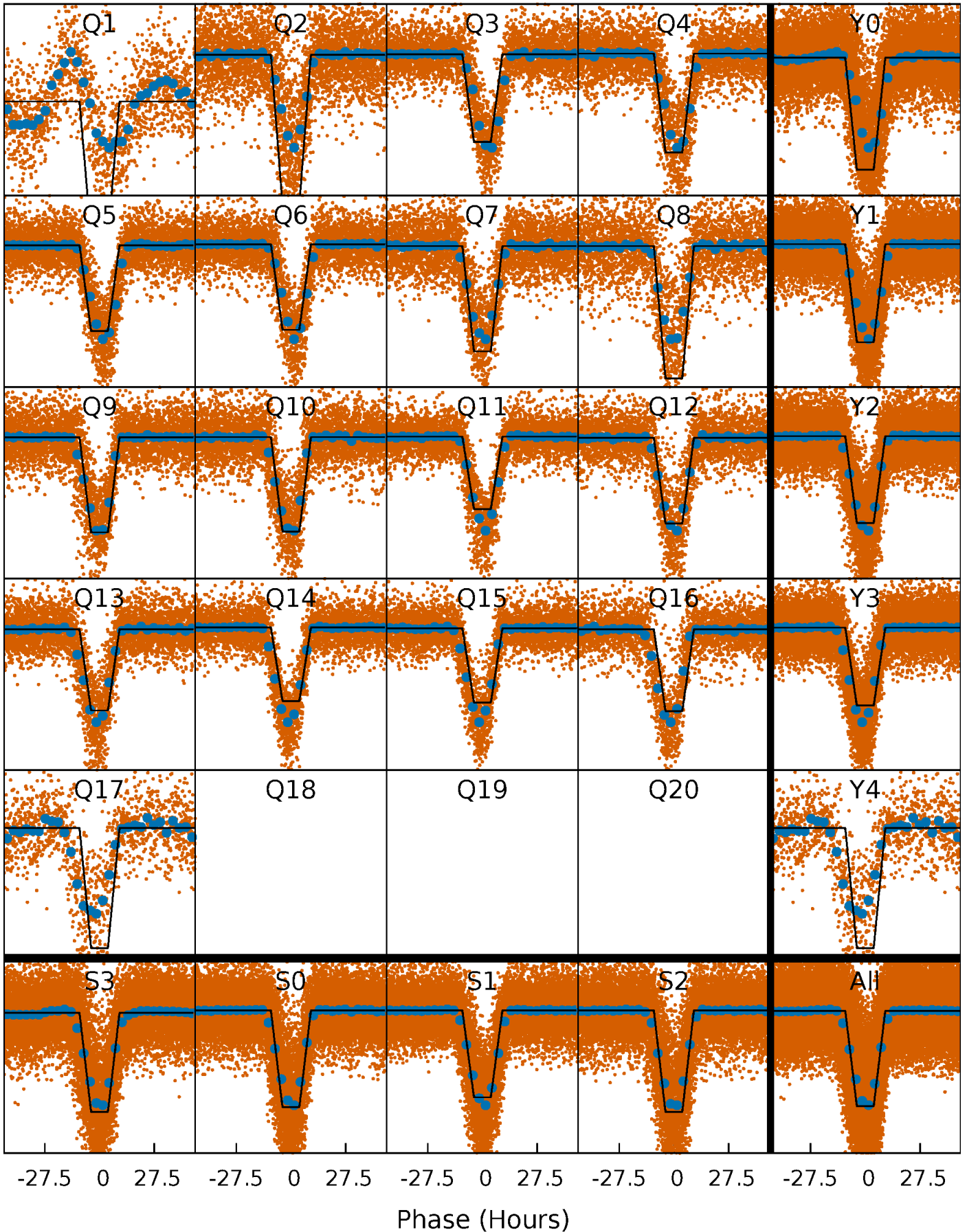
# DV Quarter-Phased Transit Curves

TCE 010661721-01 P= 3.908000 Days  $T_0=135.184811$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

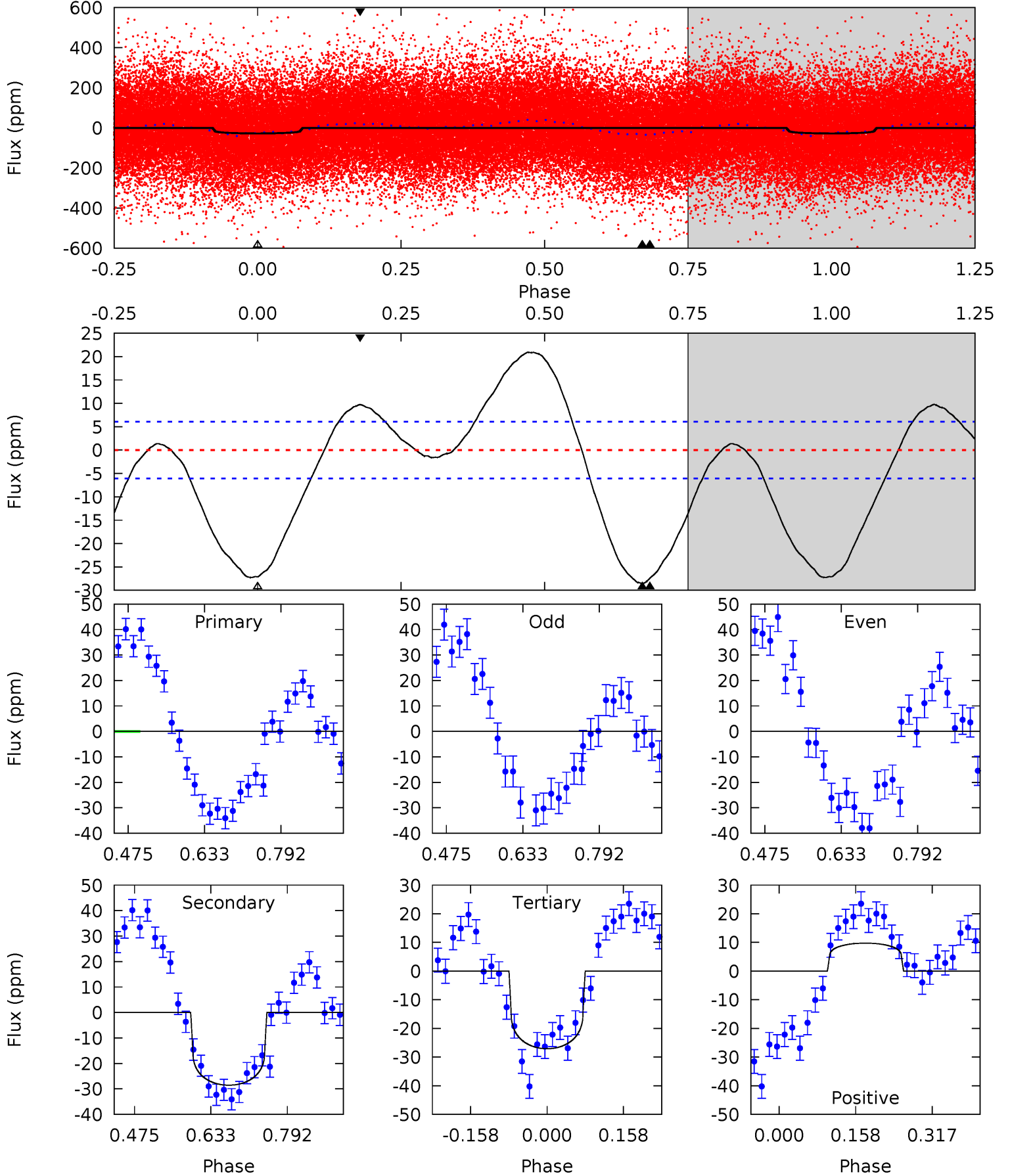
TCE 010661721-01   P= 3.907587 Days    $T_0=135.368804$  (BKJD)



# DV Model-Shift Uniqueness Test

010661721-01, P = 3.908000 Days, E = 131.276811 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
20.1	21.0	19.9	7.16	4.47	1.41	10.2	0.23	13.0	1.07	13.8	2.82	1.01	0.42	3.01

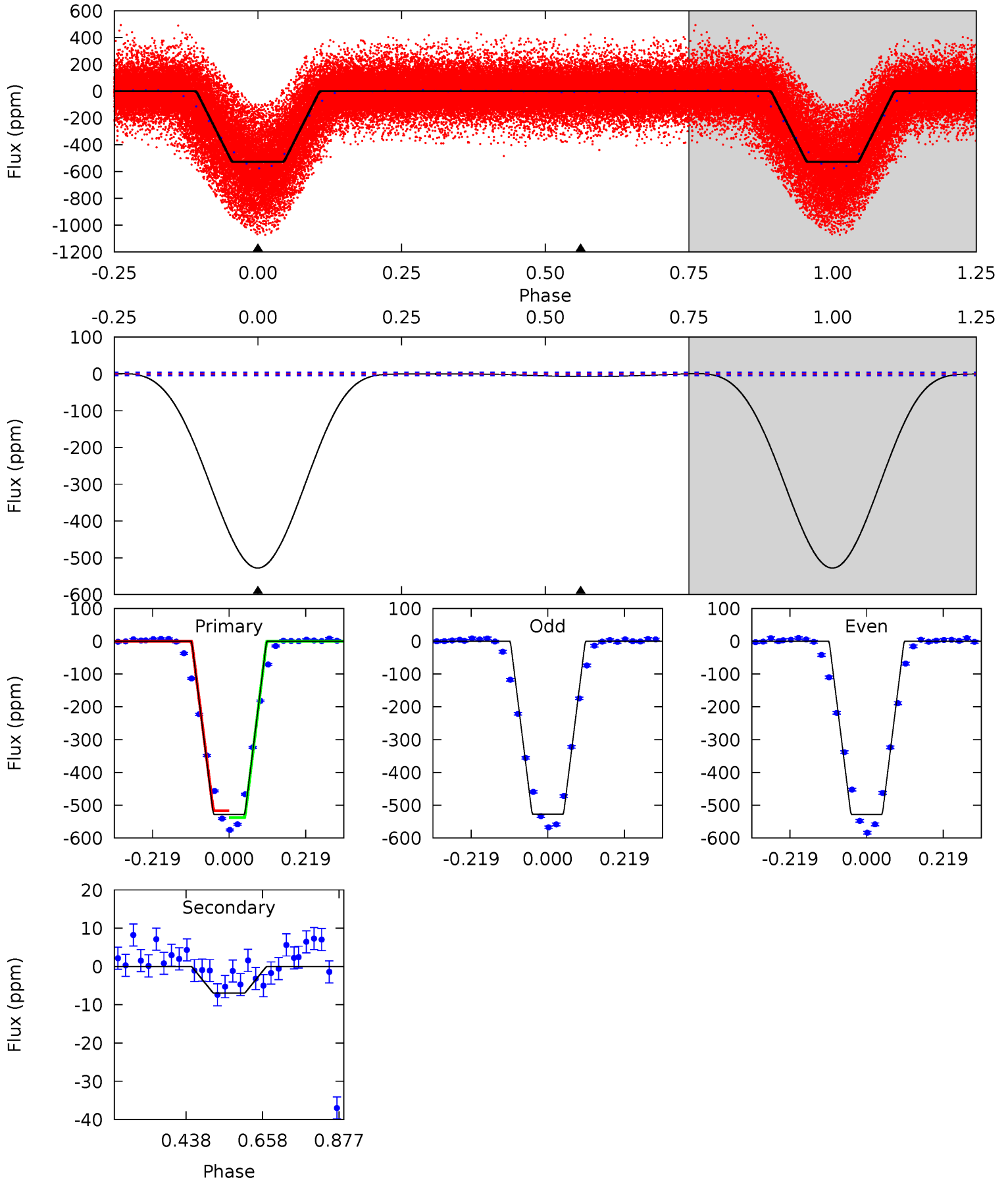




# Alt Model-Shift Uniqueness Test

010661721-01, P = 3.907587 Days, E = 131.461217 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
579.5	7.64	0	0	4.40	1.23	0.42	579.5	579.5	7.64	7.64	0.48	0.97	0.00	11.7



### Stellar Parameters For KIC 010661721

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R$ ( $R_{\odot}$ )	$M$ ( $M_{\odot}$ )	$p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ )
	$6868^{+168}_{-264}$	$4.200^{+0.135}_{-0.135}$	$-0.280^{+0.250}_{-0.300}$	$1.489^{+0.301}_{-0.271}$	$1.292^{+0.154}_{-0.206}$	$0.551^{+0.356}_{-0.215}$
	+2%/-4%	+3%/-3%	+89%/-107%	+20%/-18%	+12%/-16%	+65%/-39%
Source	PHO1	FLK73	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 010661721-01 / KOI

Detrend	Depth (ppm)	$R_p$ ( $R_{\oplus}$ )	$T_{\text{max}}$ (K)	$T_{\text{obs}}$ (K)	$A_{\text{obs}}$
DV	$-29 \pm 1$	$0.84^{+0.61}_{-0.55}$	$2256^{+135}_{-145}$	$7026^{+8008}_{-1691}$	$62^{+471}_{-40}$
Alt.	$-7 \pm 1$	$3.82^{+0.84}_{-0.71}$	$2231^{+139}_{-120}$	$2736^{+242}_{-258}$	$0.722^{+0.361}_{-0.247}$

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



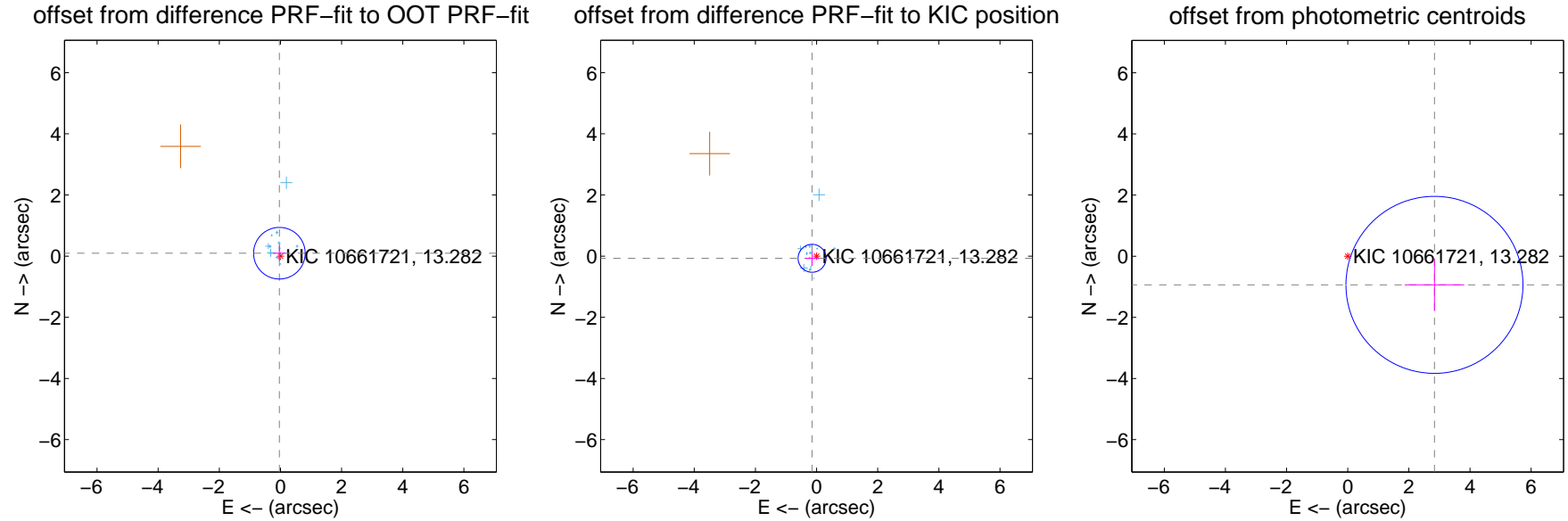
## DV Centroid Data

Supplemental centroid analysis for 010661721-01. Kepler magnitude: 13.28. Transit SNR 6.94

There are 15 quarters with good PRF difference image offsets

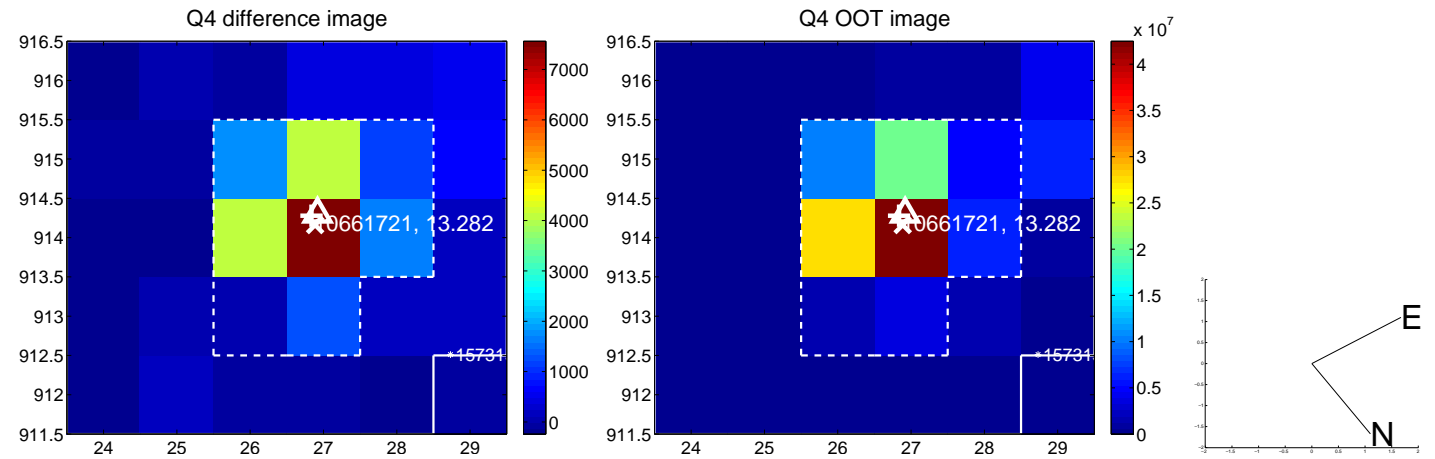
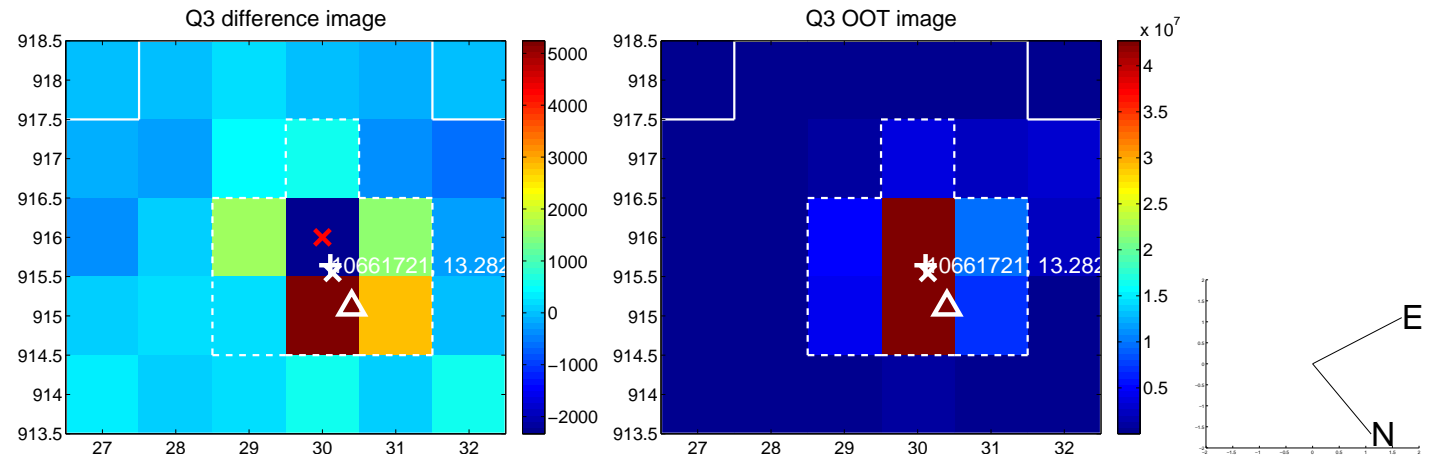
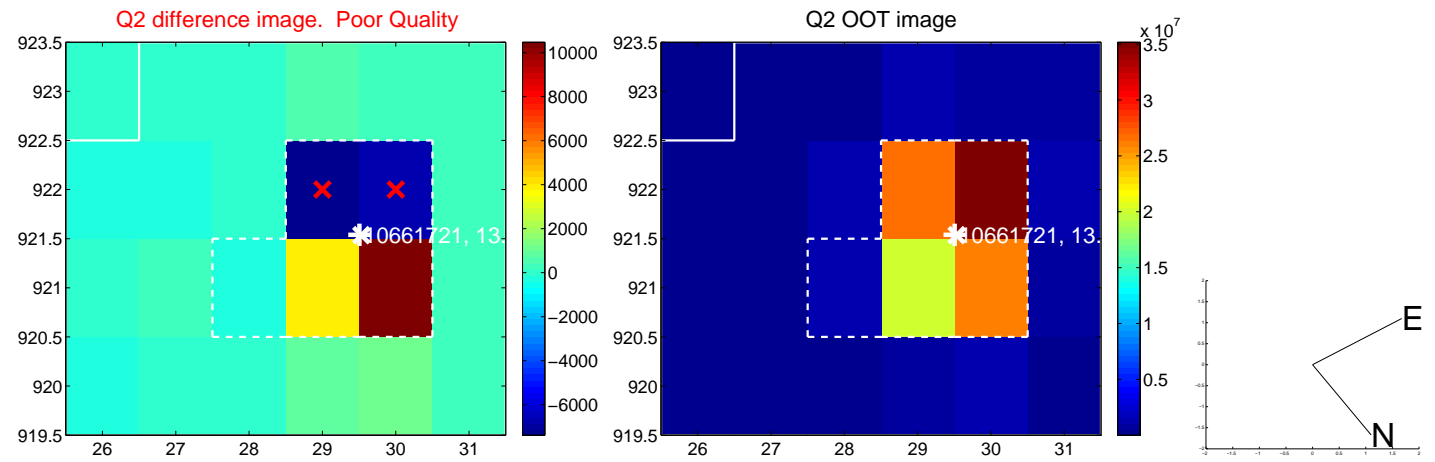
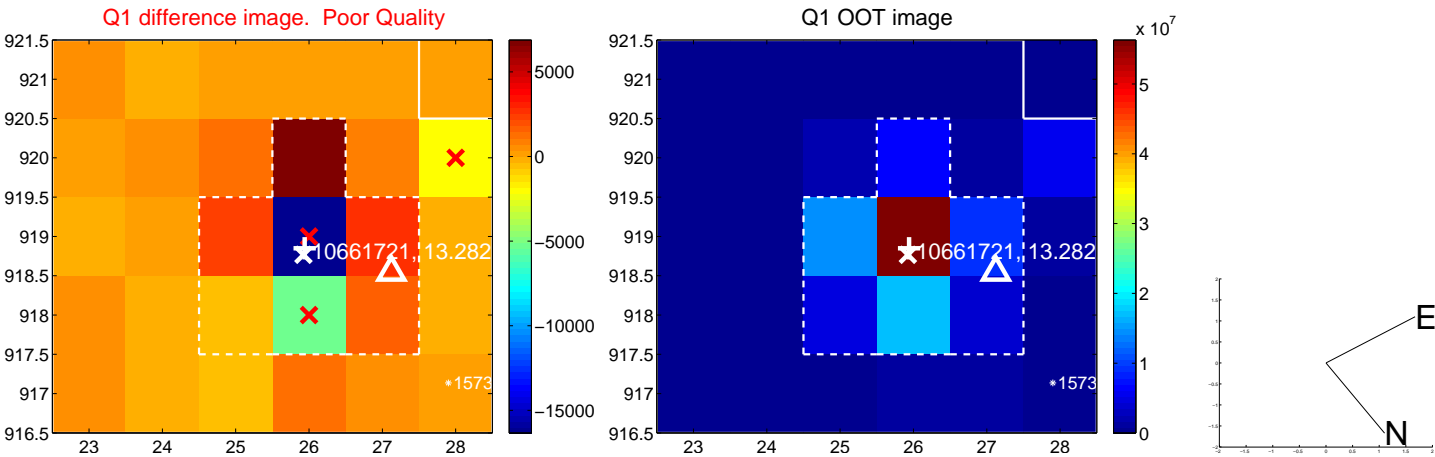
The direct PRF centroid is offset from the target star catalog position by about 0.43 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.101 \pm 0.281$	0.36	$0.035 \pm 0.201$	$0.095 \pm 0.243$
PRF-fit source offset from KIC position	$0.164 \pm 0.152$	1.08	$0.148 \pm 0.221$	$-0.071 \pm 0.242$
photometric centroid source offset	$2.99 \pm 0.96$	3.10	$-2.84 \pm 0.98$	$-0.94 \pm 0.86$

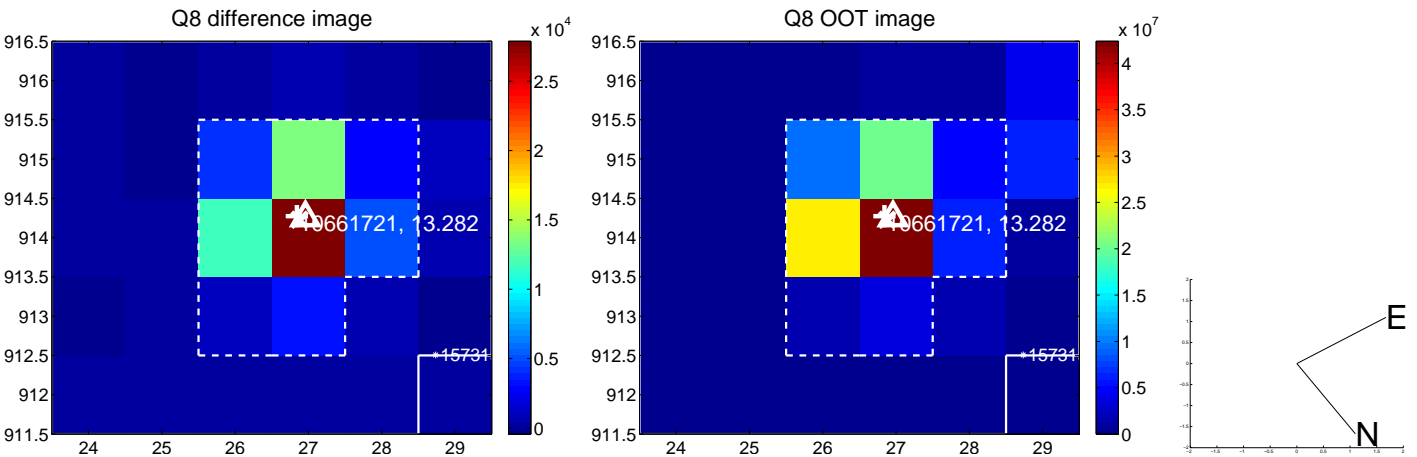
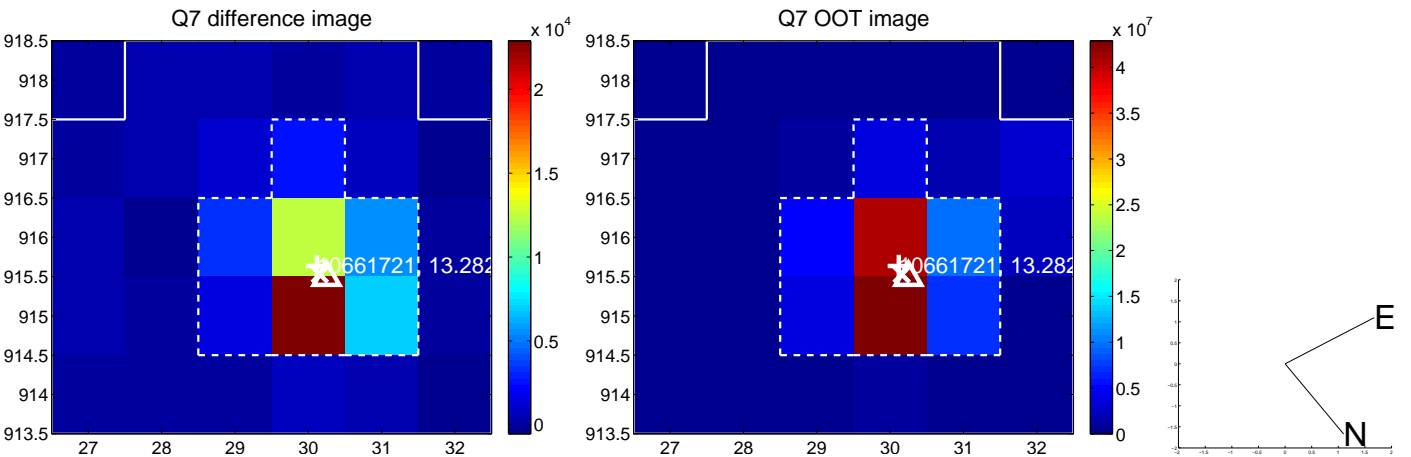
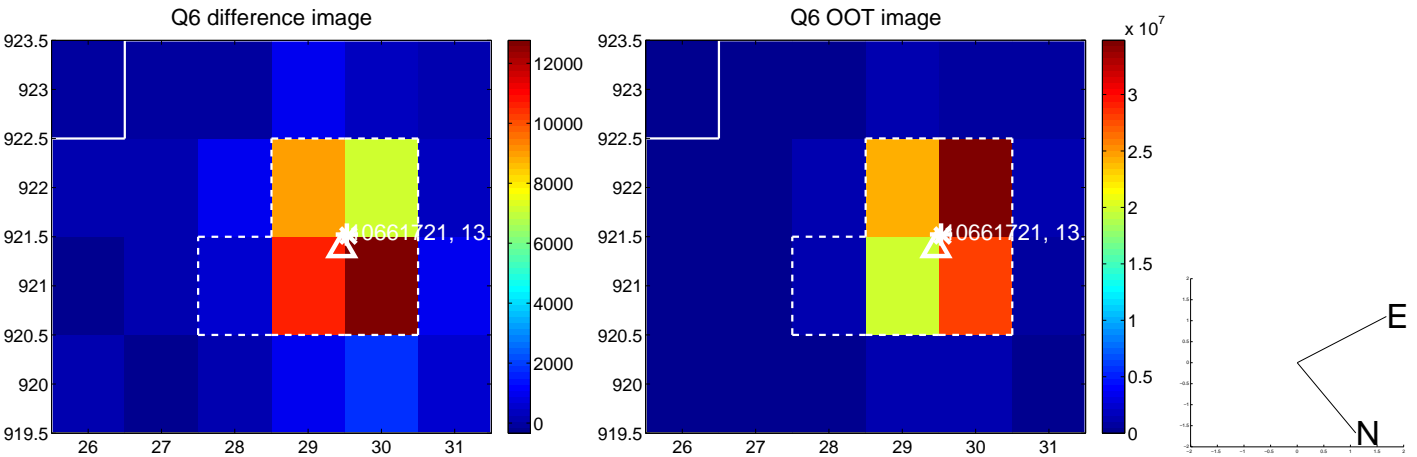
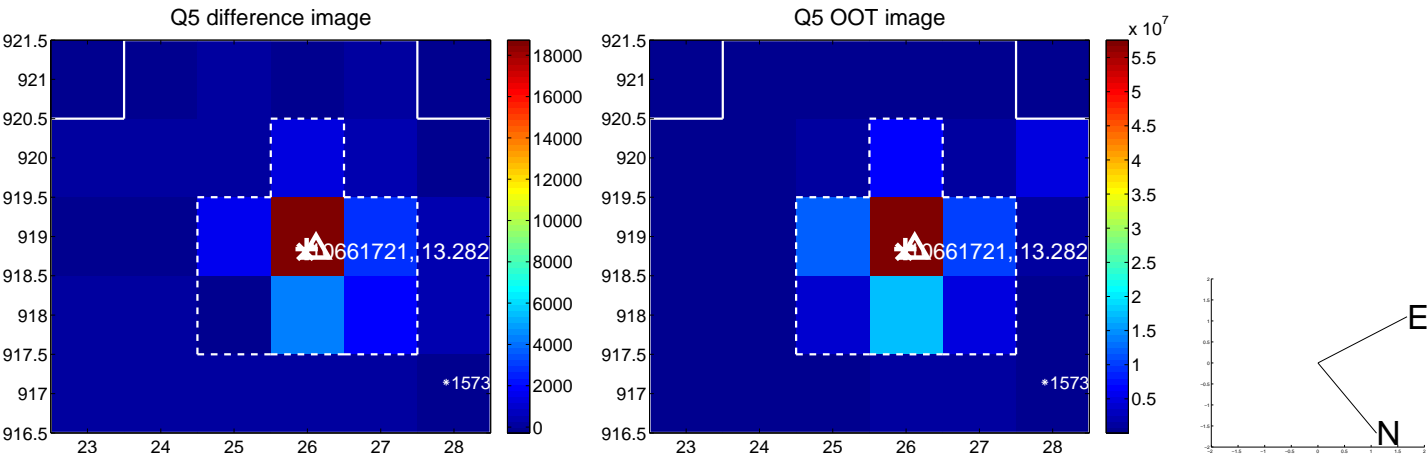


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets**; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

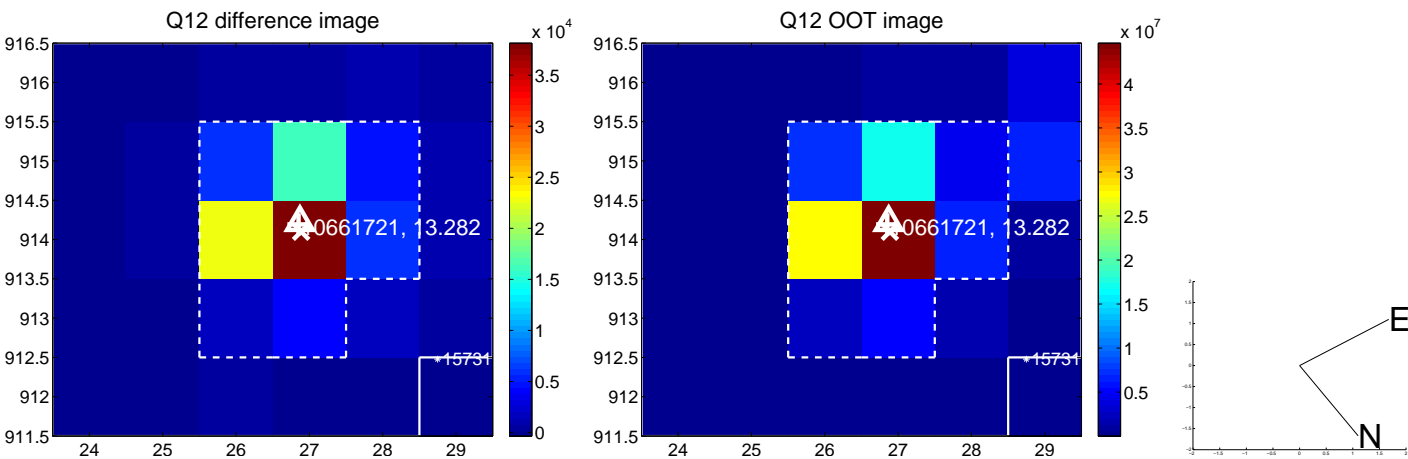
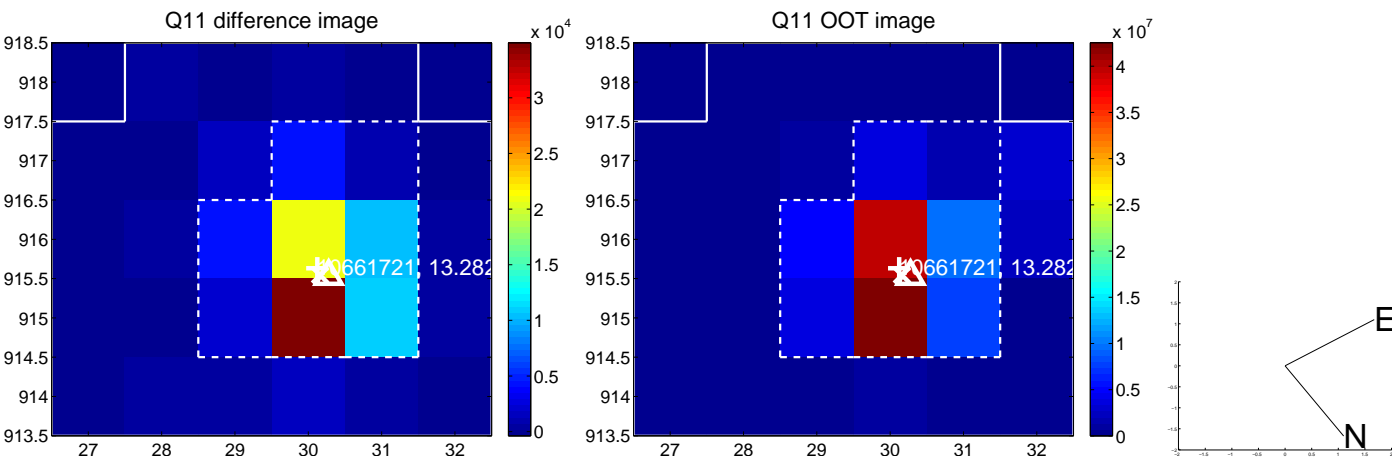
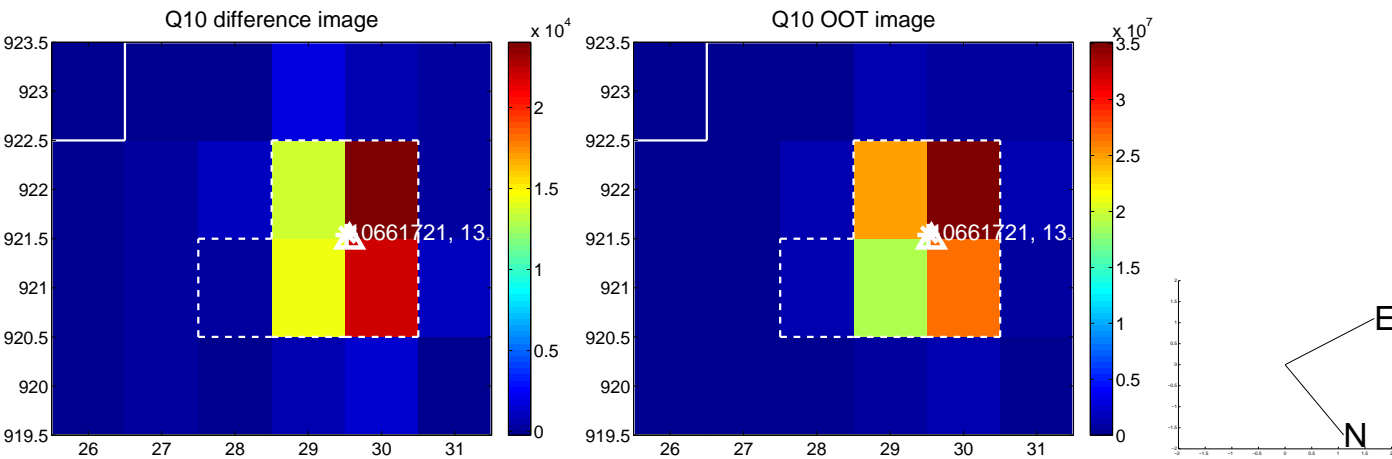
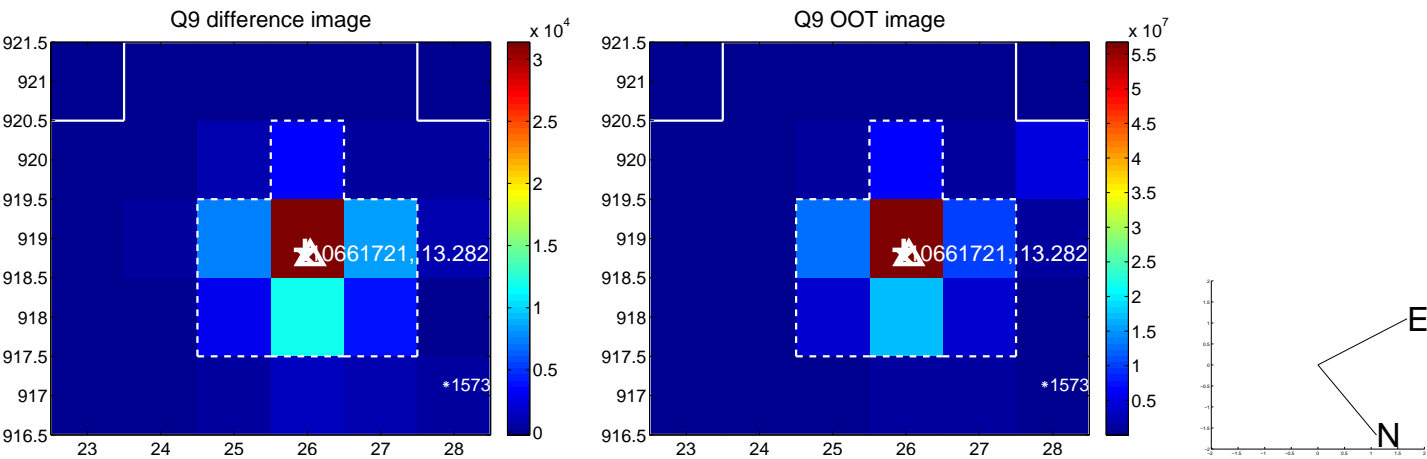
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



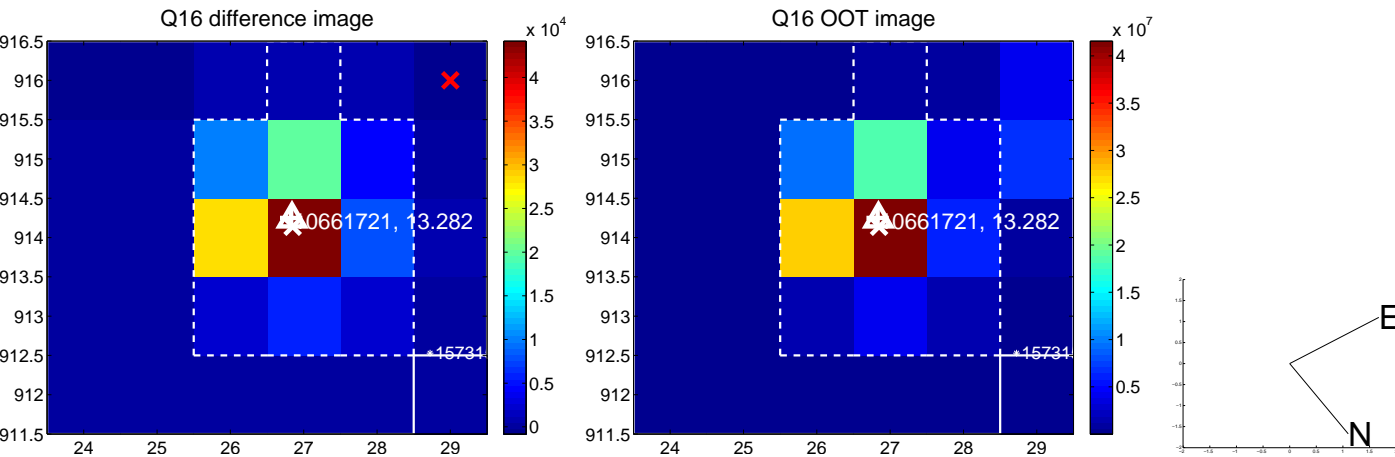
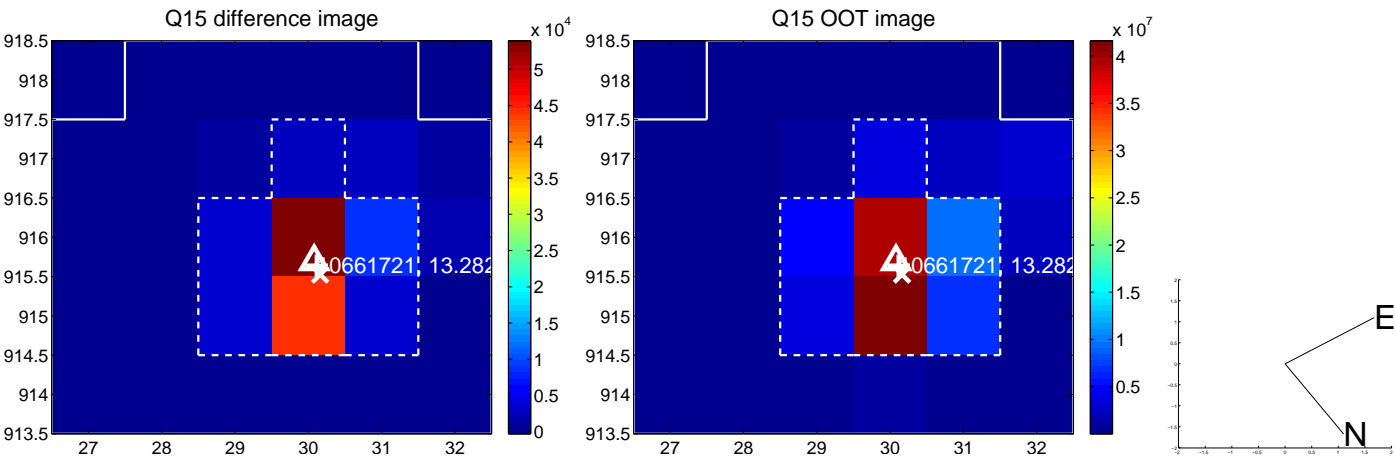
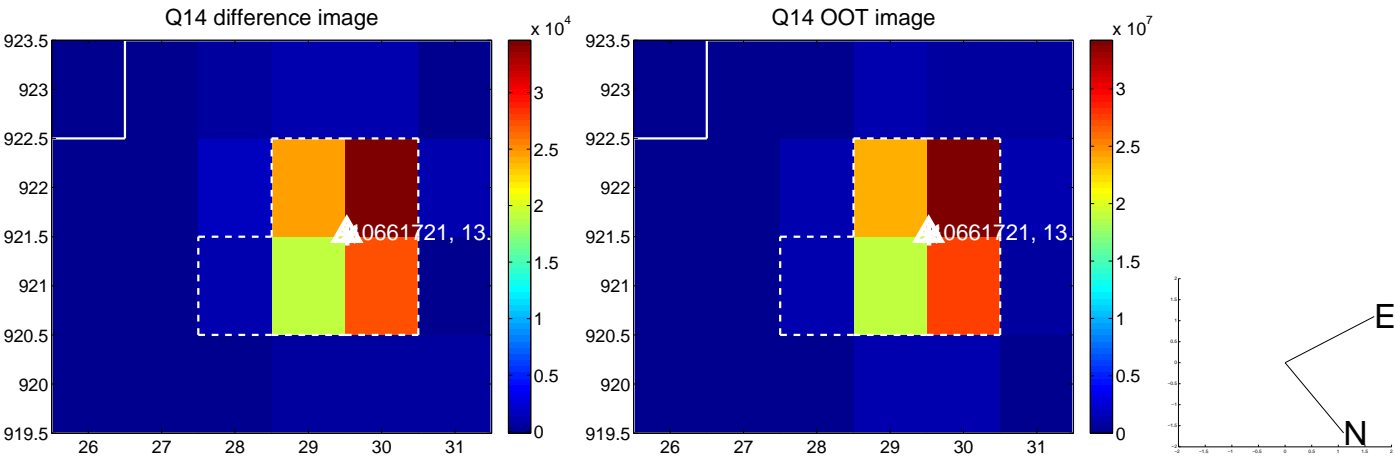
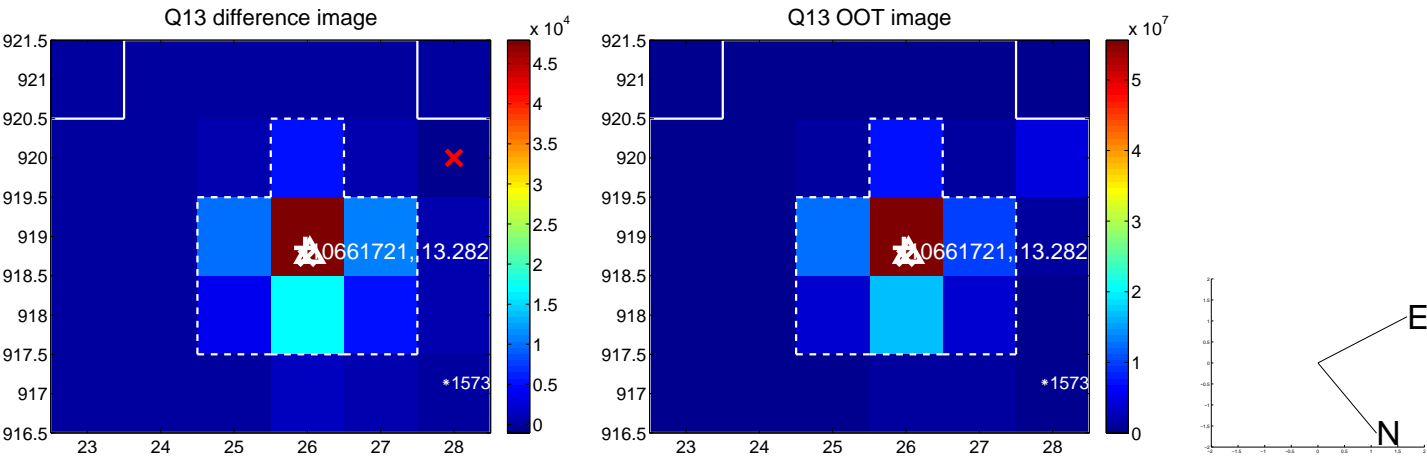
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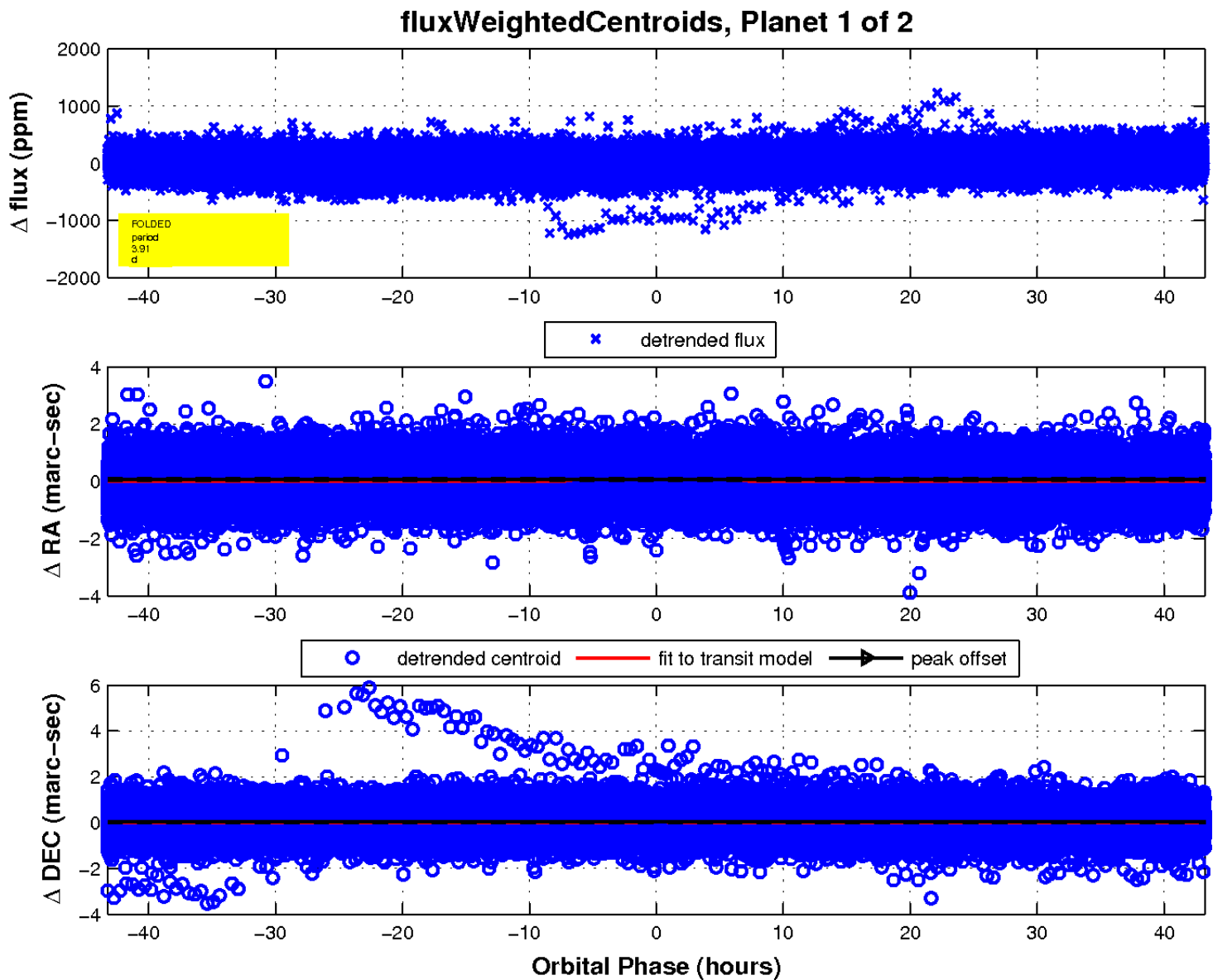
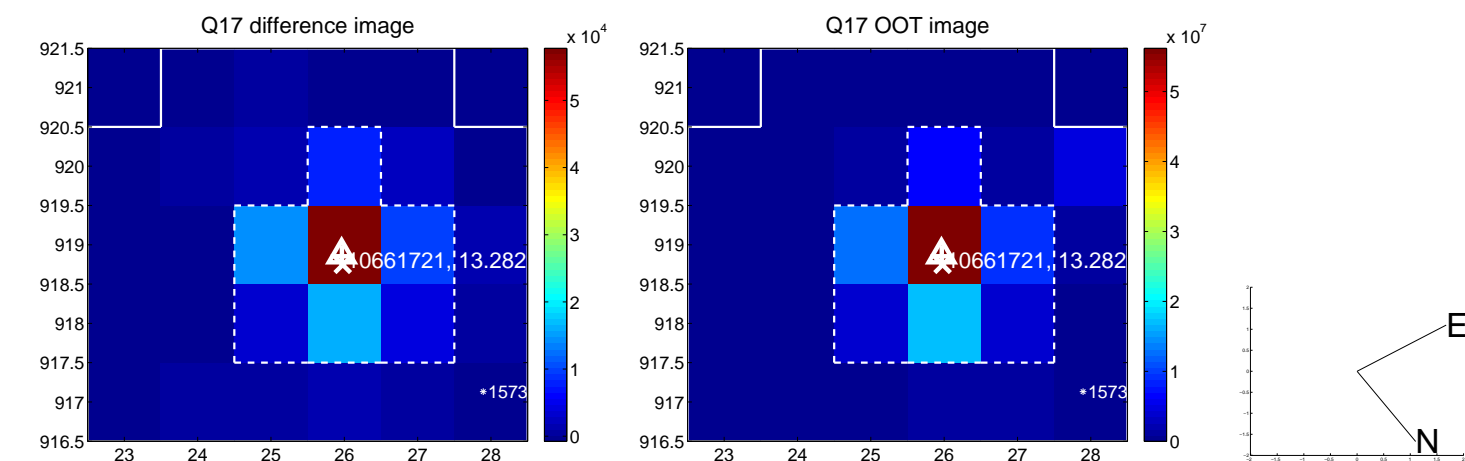


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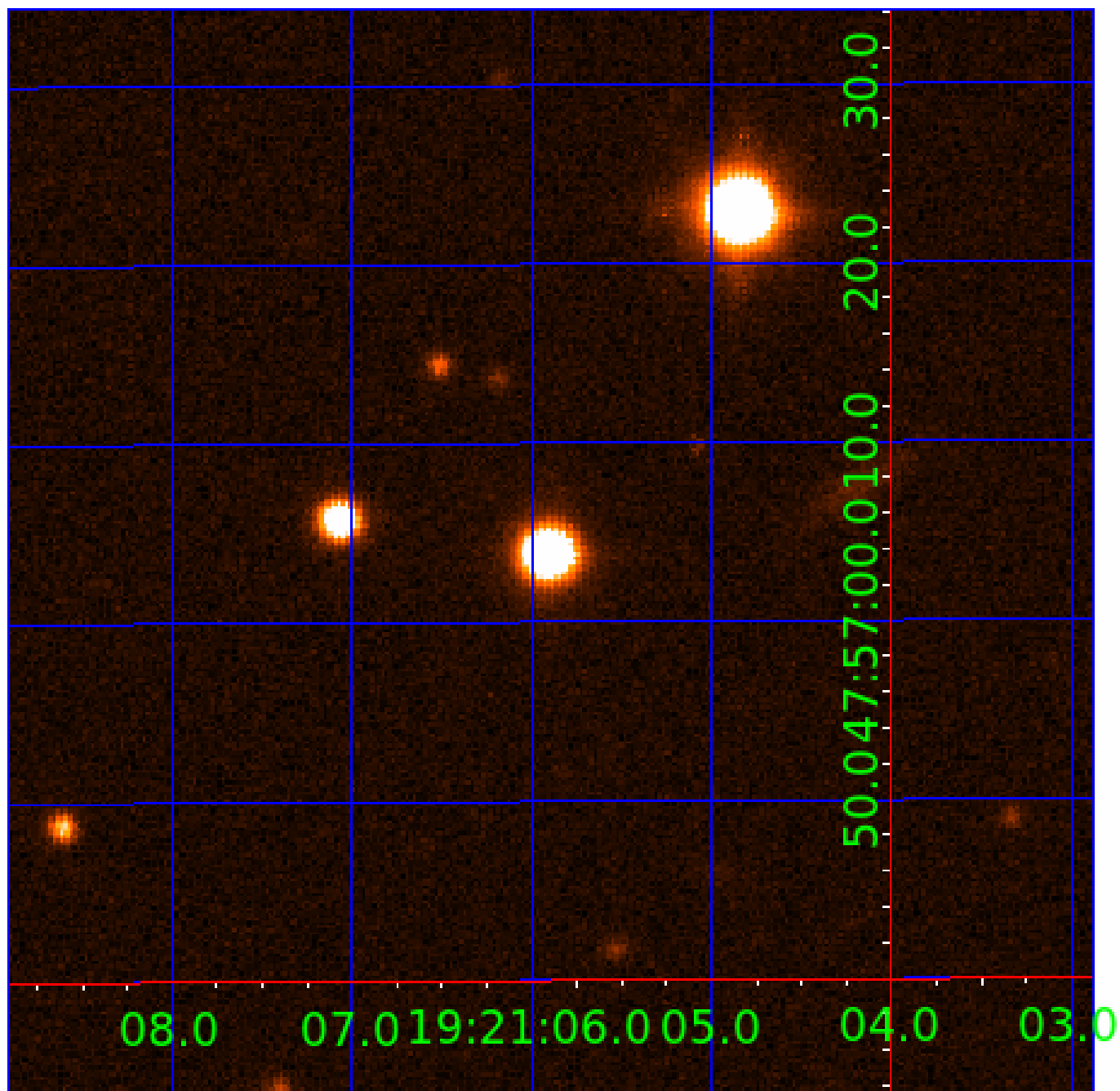


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UKIRT Image

Declination



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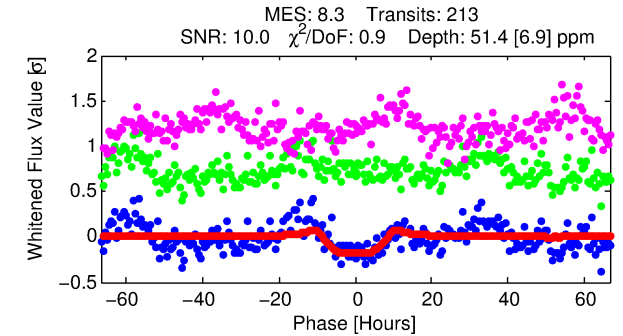
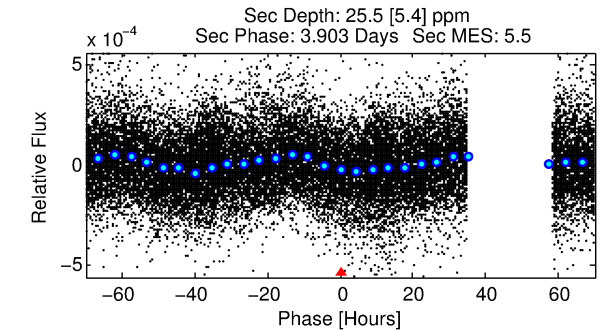
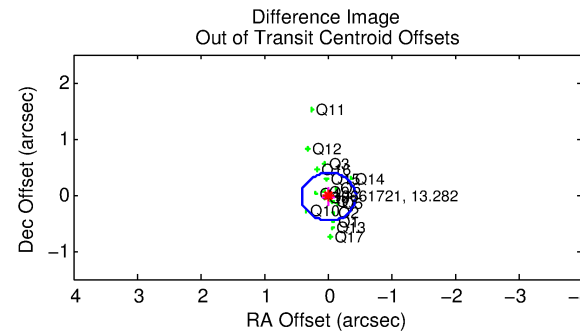
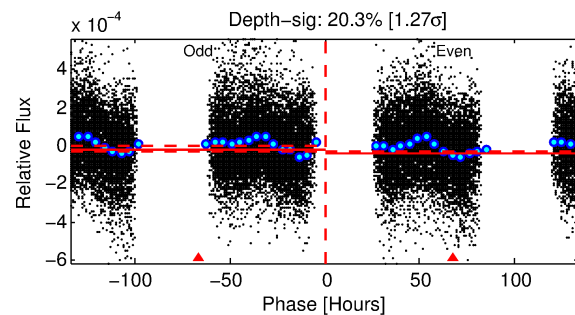
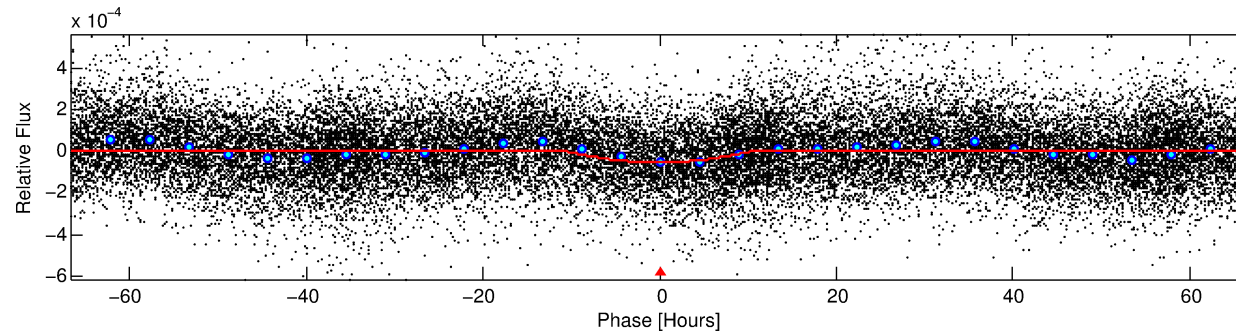
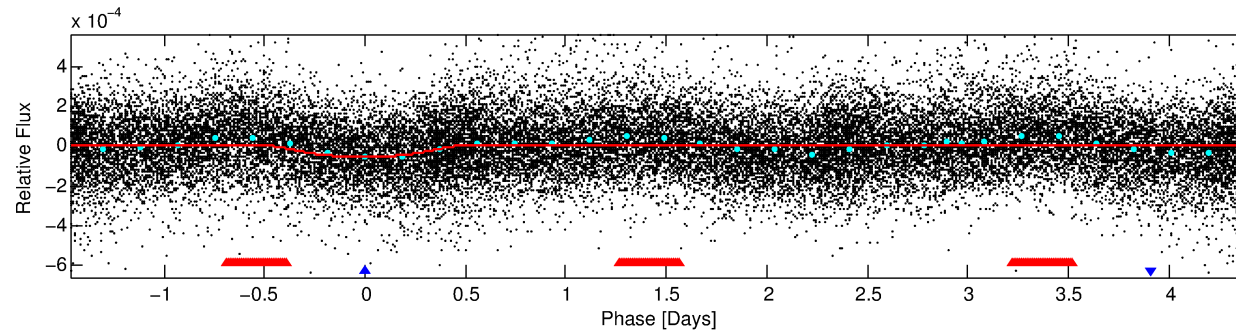
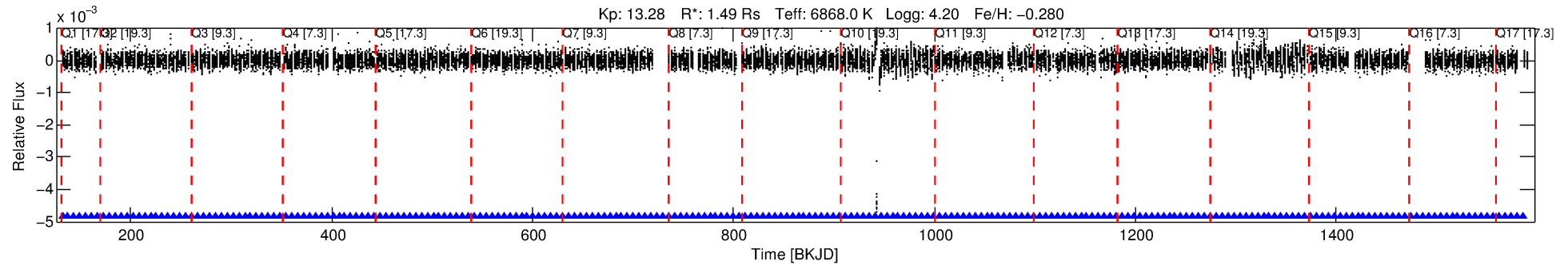
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 010661721-02

No Significant Match Found

# DV One-Page Summary

KIC: 10661721 Candidate: 2 of 2 Period: 5.861 d



## DV Fit Results:

Period = 5.86079 [0.00026] d  
Epoch = 131.9677 [0.0342] BKJD  
Rp/R\* = 0.0091 [0.0007]  
a/R\* = 1.07 [0.01]  
b = 0.99 [0.00]  
Seff = 925.13 [269.32]  
Teq = 1406 [102] K  
Rp = 1.48 [0.32] Re  
a = 0.0691 [0.0117] AU  
Ag = 30.74 [11.11] [2.68 $\sigma$ ]  
Teffp = 5120 [391] K [9.20 $\sigma$ ]

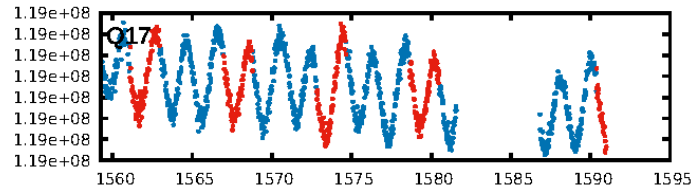
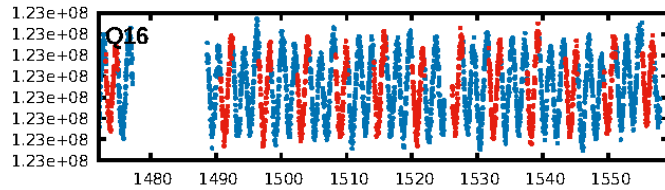
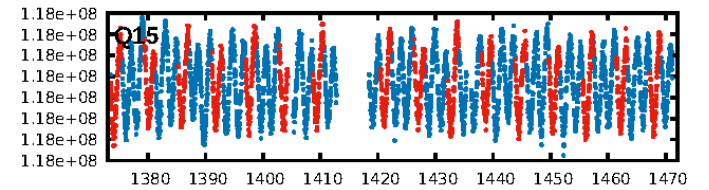
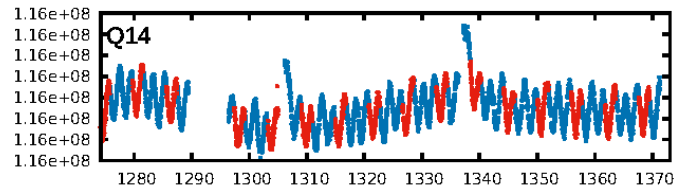
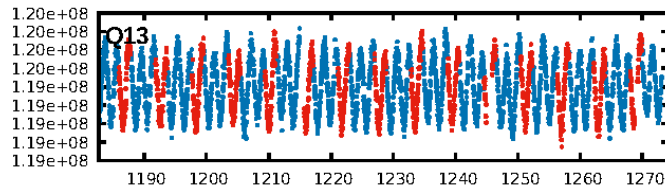
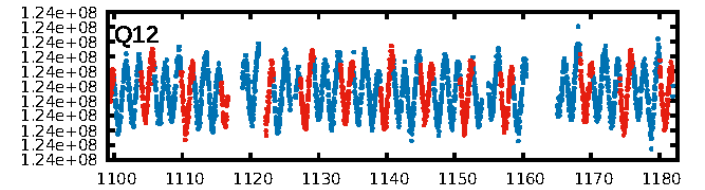
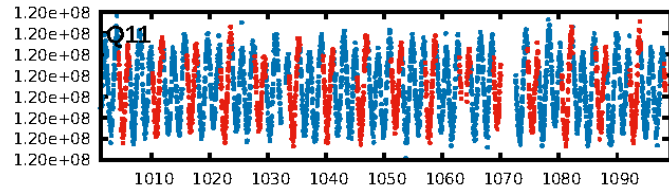
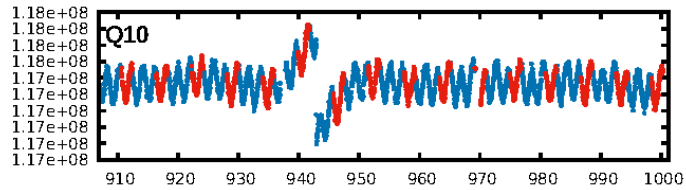
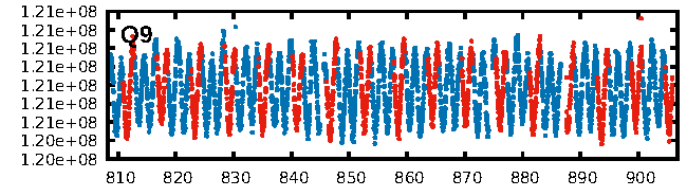
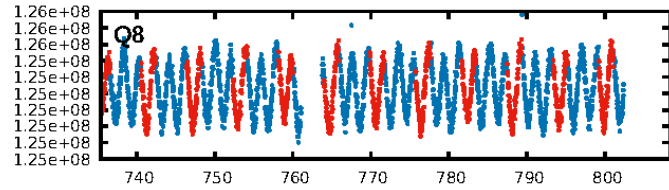
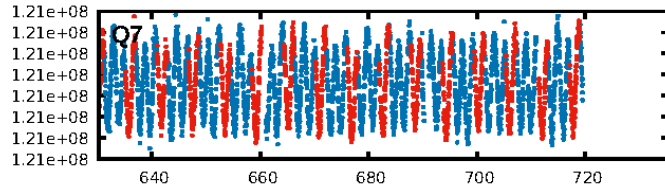
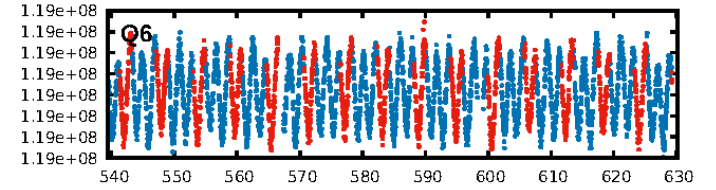
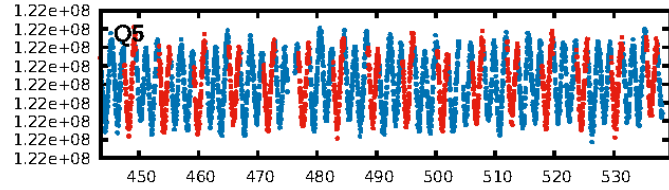
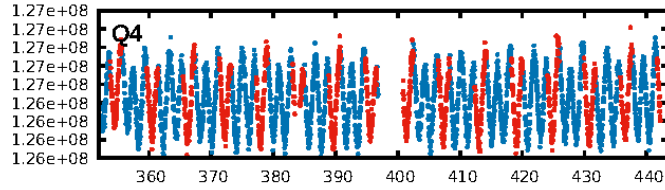
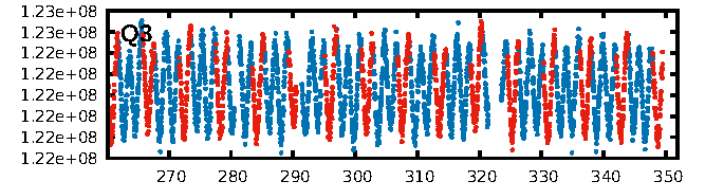
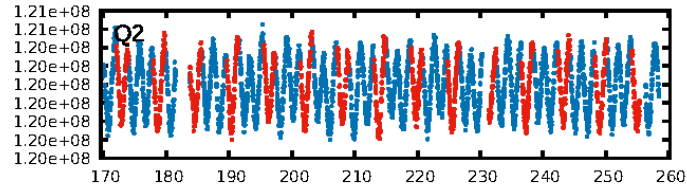
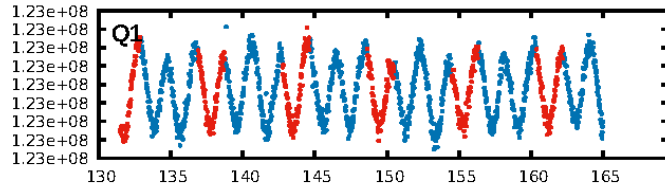
## DV Diagnostic Results:

ShortPeriod-sig: 92.3% [1.77 $\sigma$ ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: 3.92e-14  
RollingBand-fgt: 1.00 [204/204]  
GhostDiagnostic-chr: 2.383  
Centroid-sig: 4.1%  
Centroid-so: 0.762 arcsec [1.75 $\sigma$ ]  
OotOffset-rm: 0.041 arcsec [0.29 $\sigma$ ]  
KicOffset-rm: 0.271 arcsec [1.91 $\sigma$ ]  
OotOffset-st: 4/4/4/5 [17]  
KicOffset-st: 4/4/4/5 [17]  
DiffImageQuality-fgm: 1.00 [17/17]  
DiffImageOverlap-fno: 0.00 [0/17]

Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 29-Jan-2016 03:51:04 Z

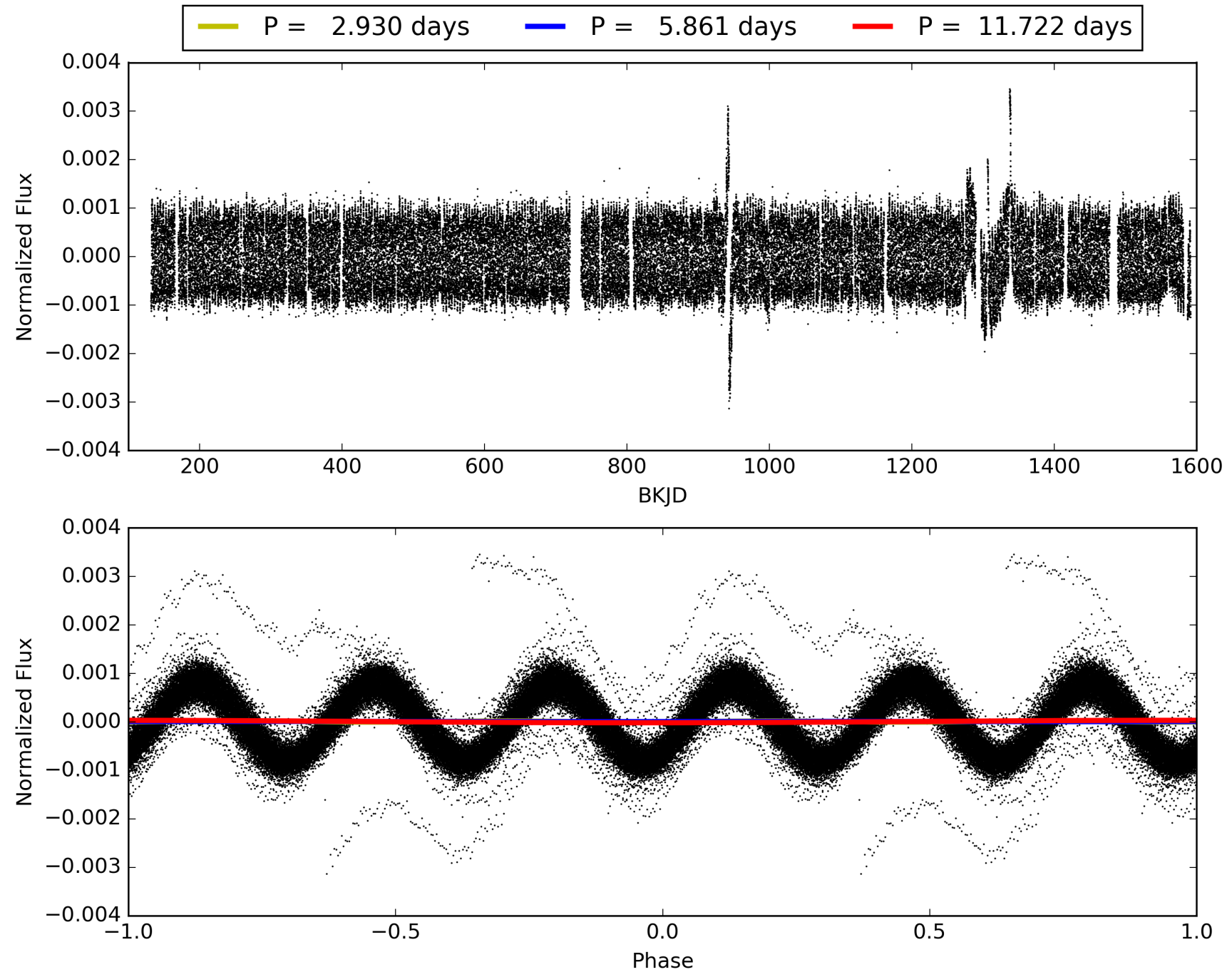
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

## TCE 010661721-02, PDC Light Curves



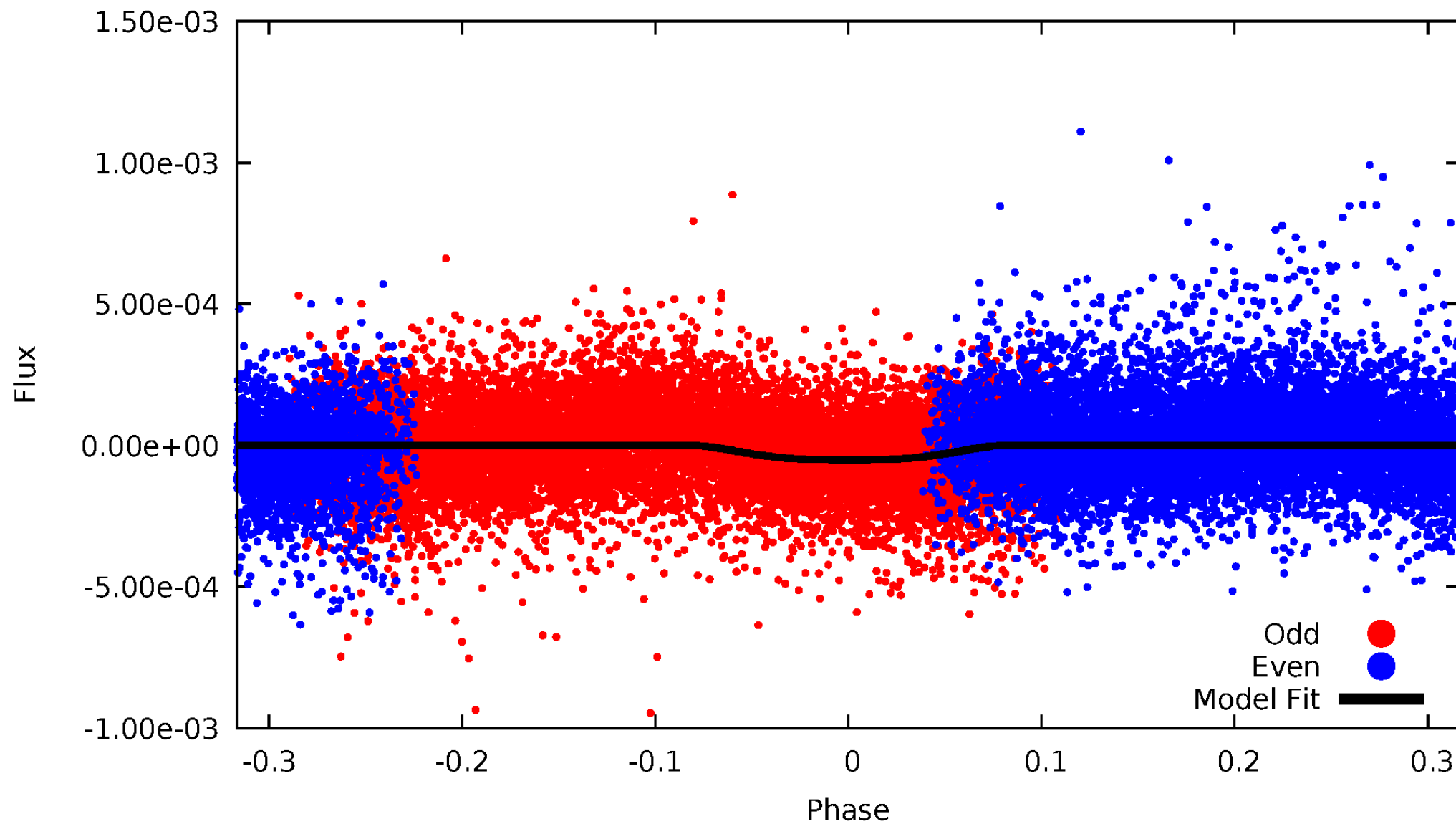


# TCE 010661721-02



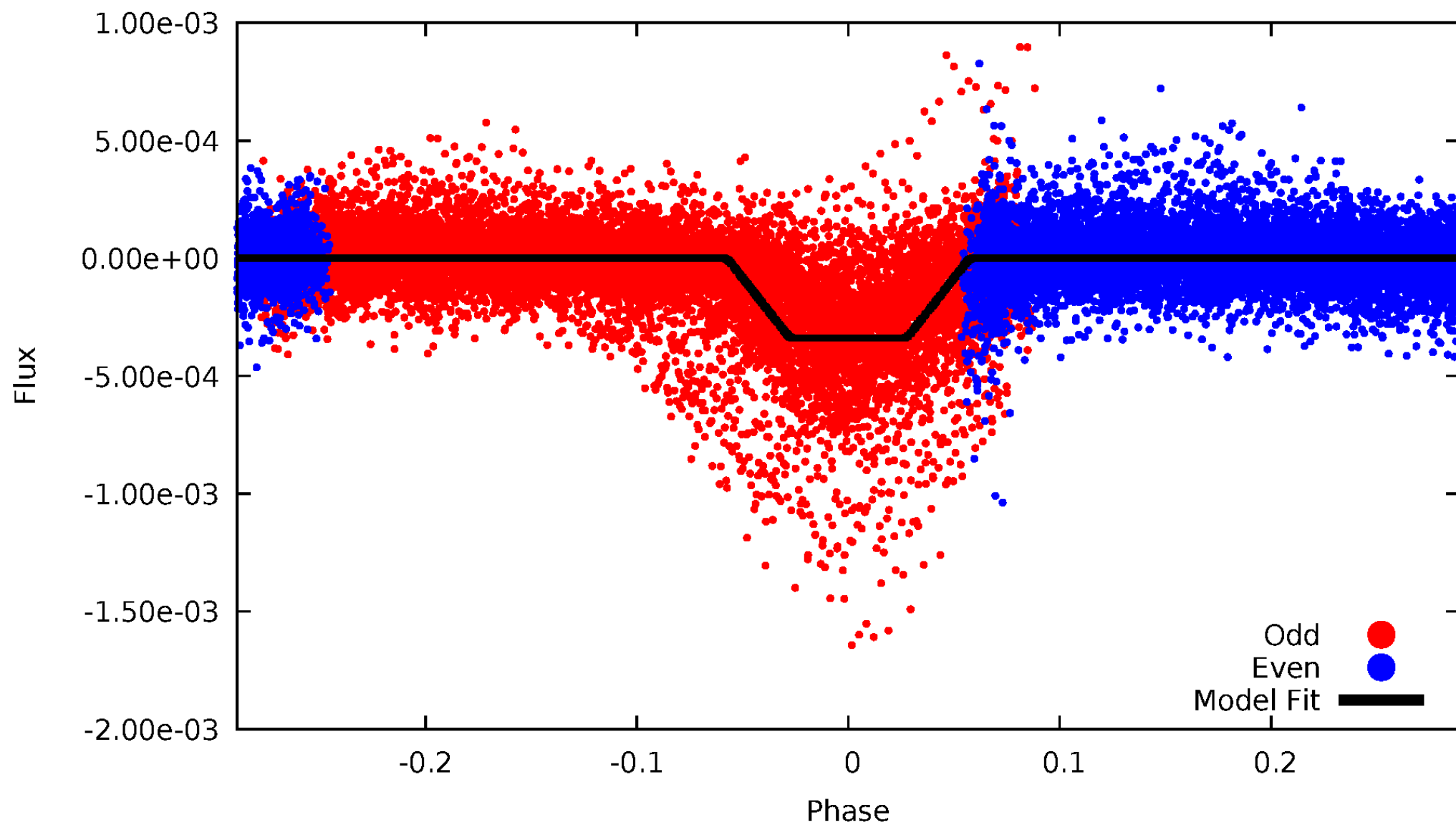
# DV Odd/Even

TCE 010661721-02



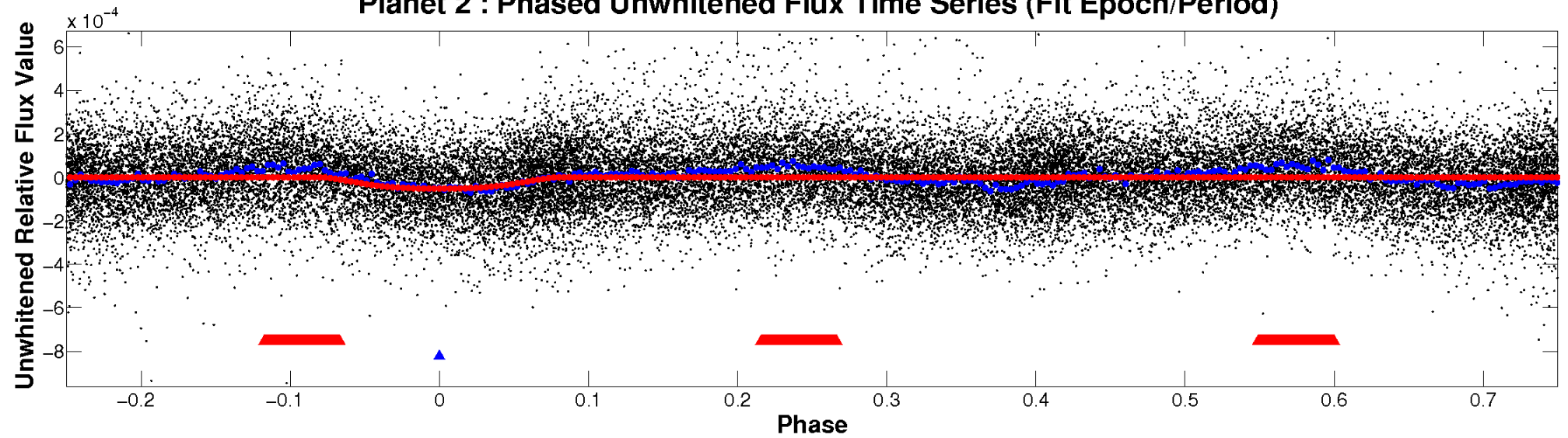
# ALT Odd/Even

TCE 010661721-02

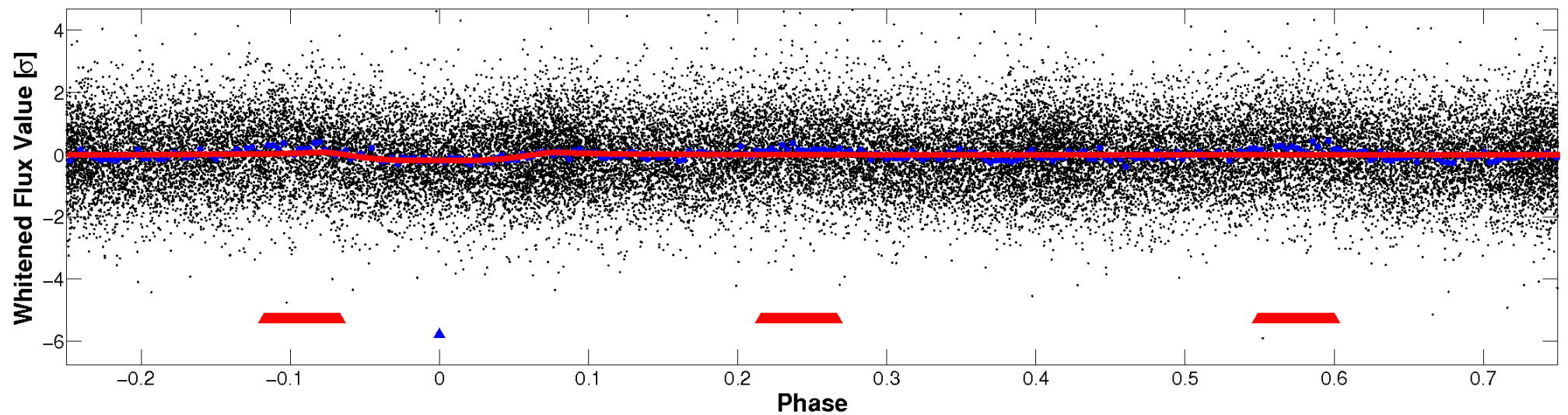


# Non-Whitened Vs. Whitened Light Curve

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

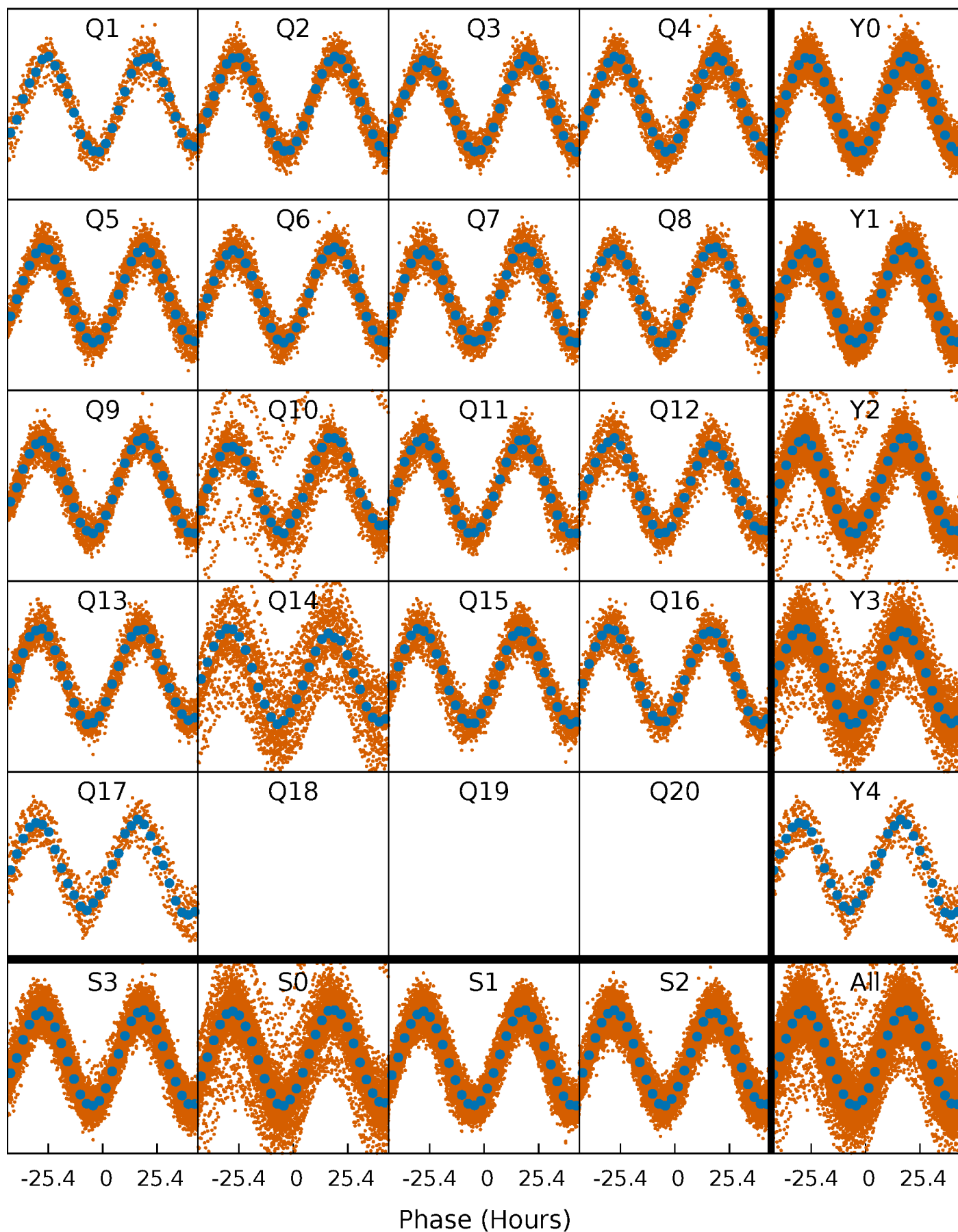


## Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



# PDC Quarter-Phased Transit Curves

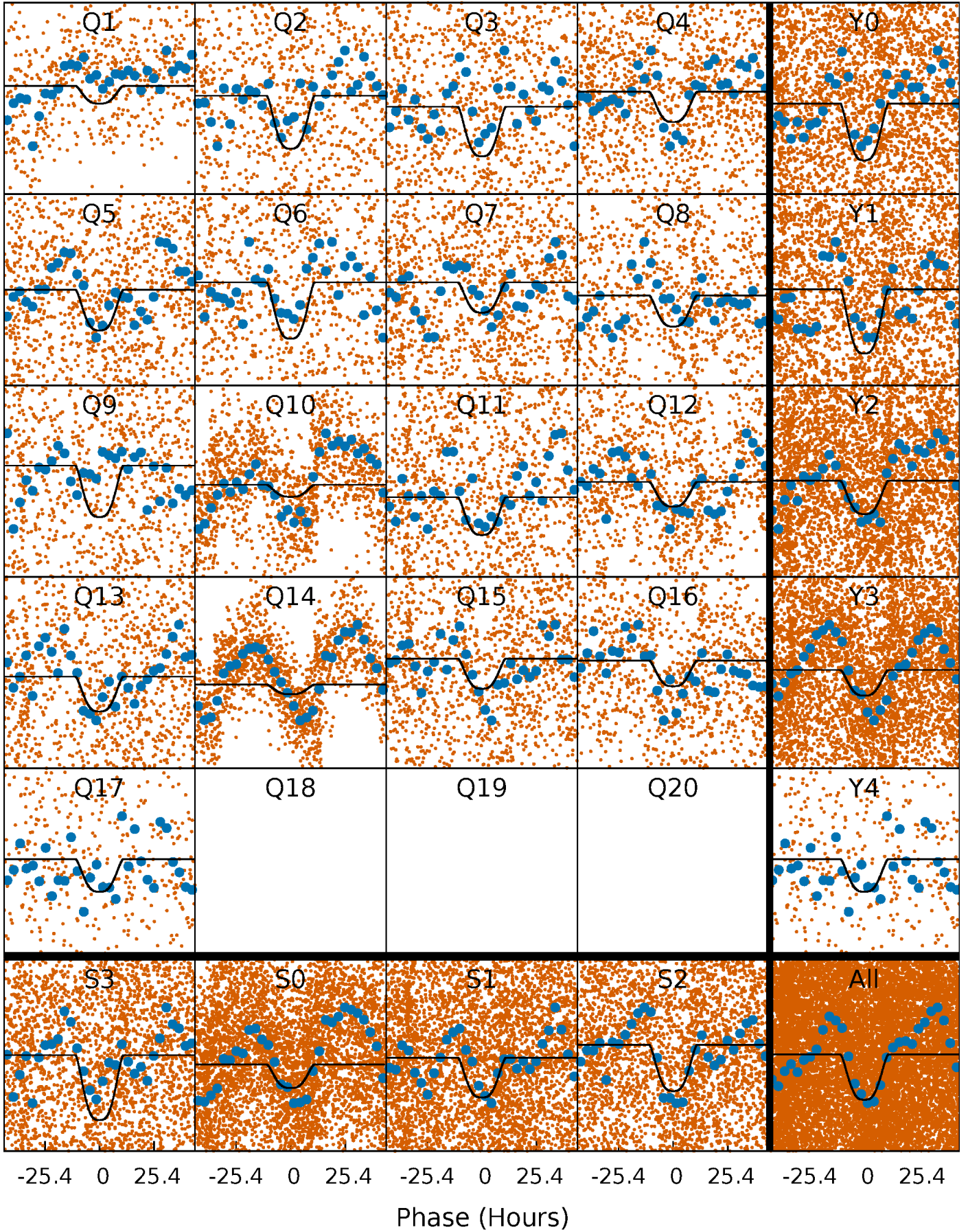
TCE 010661721-02 P= 5.860792 Days  $T_0=131.967692$  (BKJD)





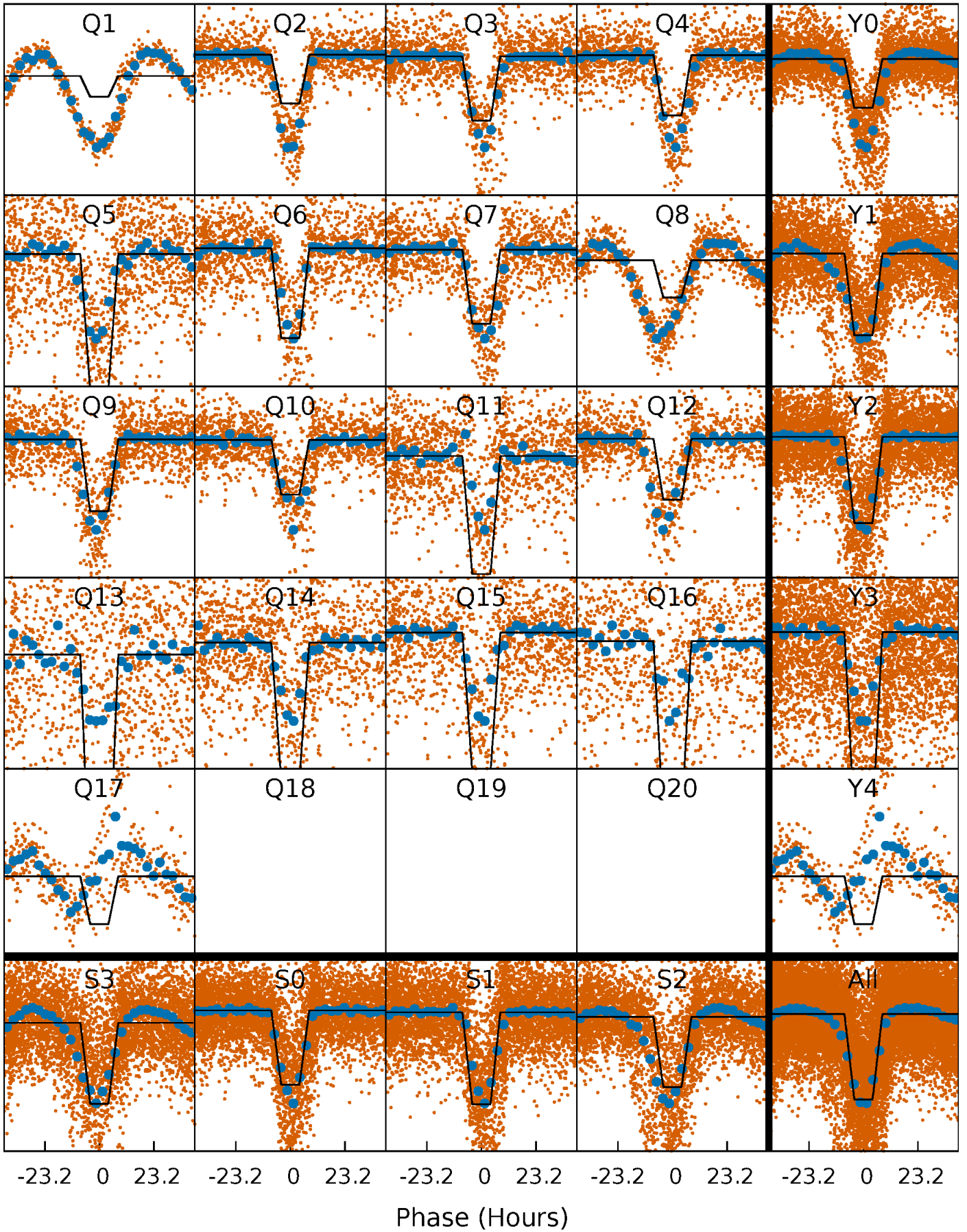
# DV Quarter-Phased Transit Curves

TCE 010661721-02   P= 5.860792 Days    $T_0=131.967692$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

TCE 010661721-02 P= 5.861689 Days  $T_0=131.877845$  (BKJD)

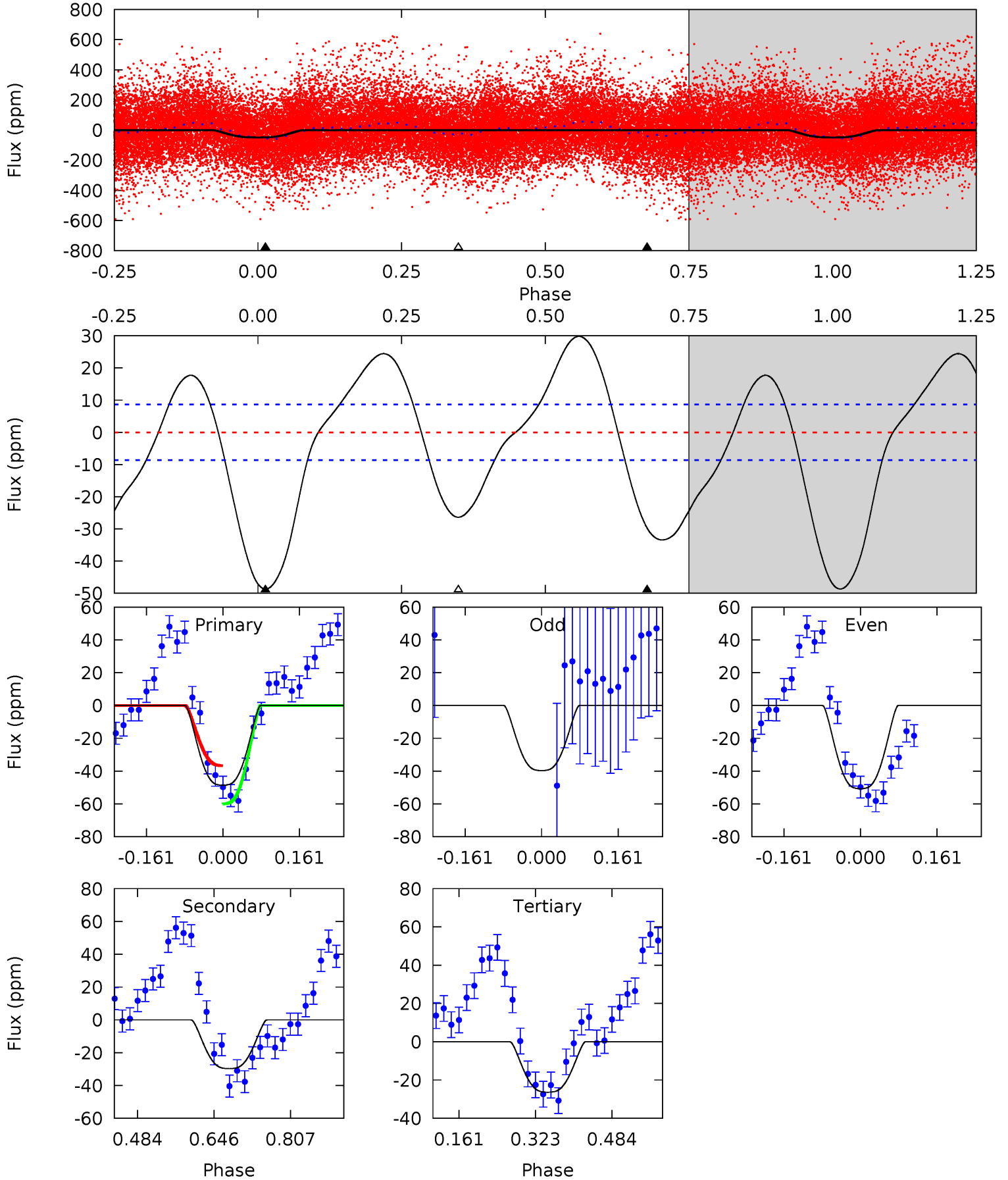




# DV Model-Shift Uniqueness Test

010661721-02, P = 5.860792 Days, E = 131.967692 Days

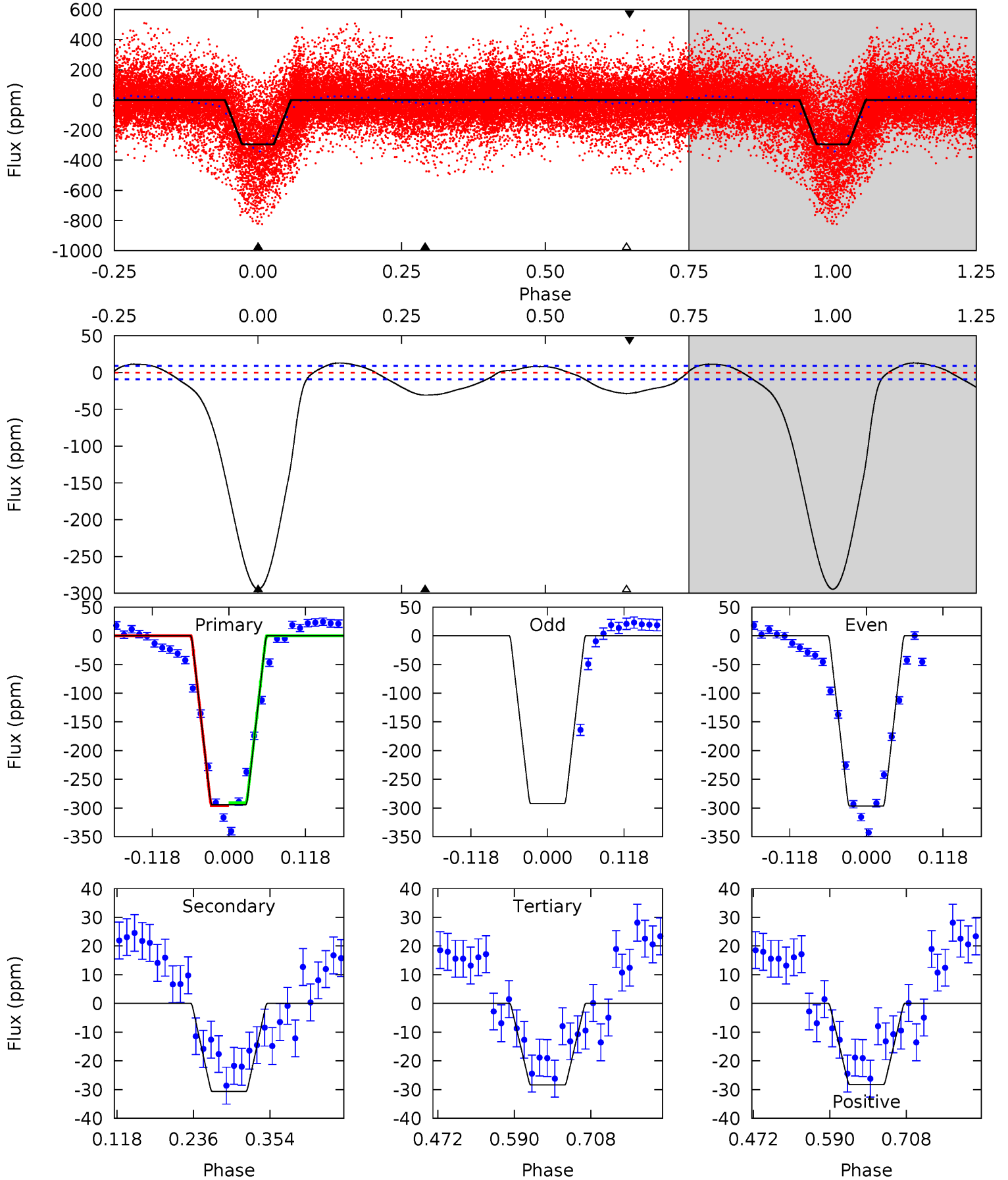
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
25.1	15.4	13.6	0	4.46	1.40	8.46	11.5	25.1	1.74	15.4	1.67	0.47	0.38	6.01



# Alt Model-Shift Uniqueness Test

010661721-02, P = 5.861689 Days, E = 131.877845 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	15.2	14.1	-14.1	4.53	1.56	6.59	132.3	160.5	1.10	29.3	0.25	1.51	0.04	1.28



### Stellar Parameters For KIC 010661721

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R$ ( $R_{\odot}$ )	$M$ ( $M_{\odot}$ )	$p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ )
	$6868^{+168}_{-264}$	$4.200^{+0.135}_{-0.135}$	$-0.280^{+0.250}_{-0.300}$	$1.489^{+0.301}_{-0.271}$	$1.292^{+0.154}_{-0.206}$	$0.551^{+0.356}_{-0.215}$
	+2%/-4%	+3%/-3%	+89%/-107%	+20%/-18%	+12%/-16%	+65%/-39%
Source	PHO1	FLK73	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 010661721-02 / KOI

Detrend	Depth (ppm)	$R_p$ ( $R_{\oplus}$ )	$T_{\text{max}}$ (K)	$T_{\text{obs}}$ (K)	$A_{\text{obs}}$
DV	$-30 \pm 2$	$1.47^{+0.22}_{-0.19}$	$1955^{+111}_{-108}$	$5299^{+271}_{-250}$	$36^{+11}_{-9}$
Alt.	$-31 \pm 2$	$3.01^{+0.35}_{-0.35}$	$1957^{+114}_{-113}$	$4016^{+112}_{-120}$	$8.950^{+2.053}_{-1.817}$

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

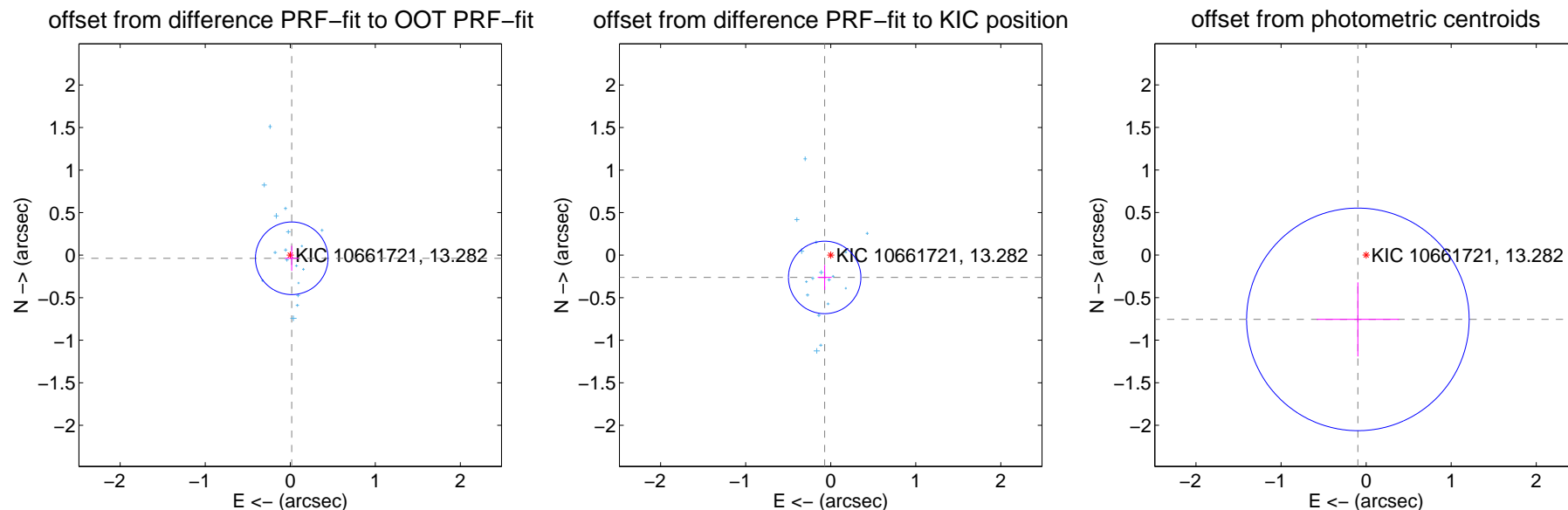
## DV Centroid Data

Supplemental centroid analysis for 010661721-02. Kepler magnitude: 13.28. Transit SNR 10.03

There are 17 quarters with good PRF difference image offsets

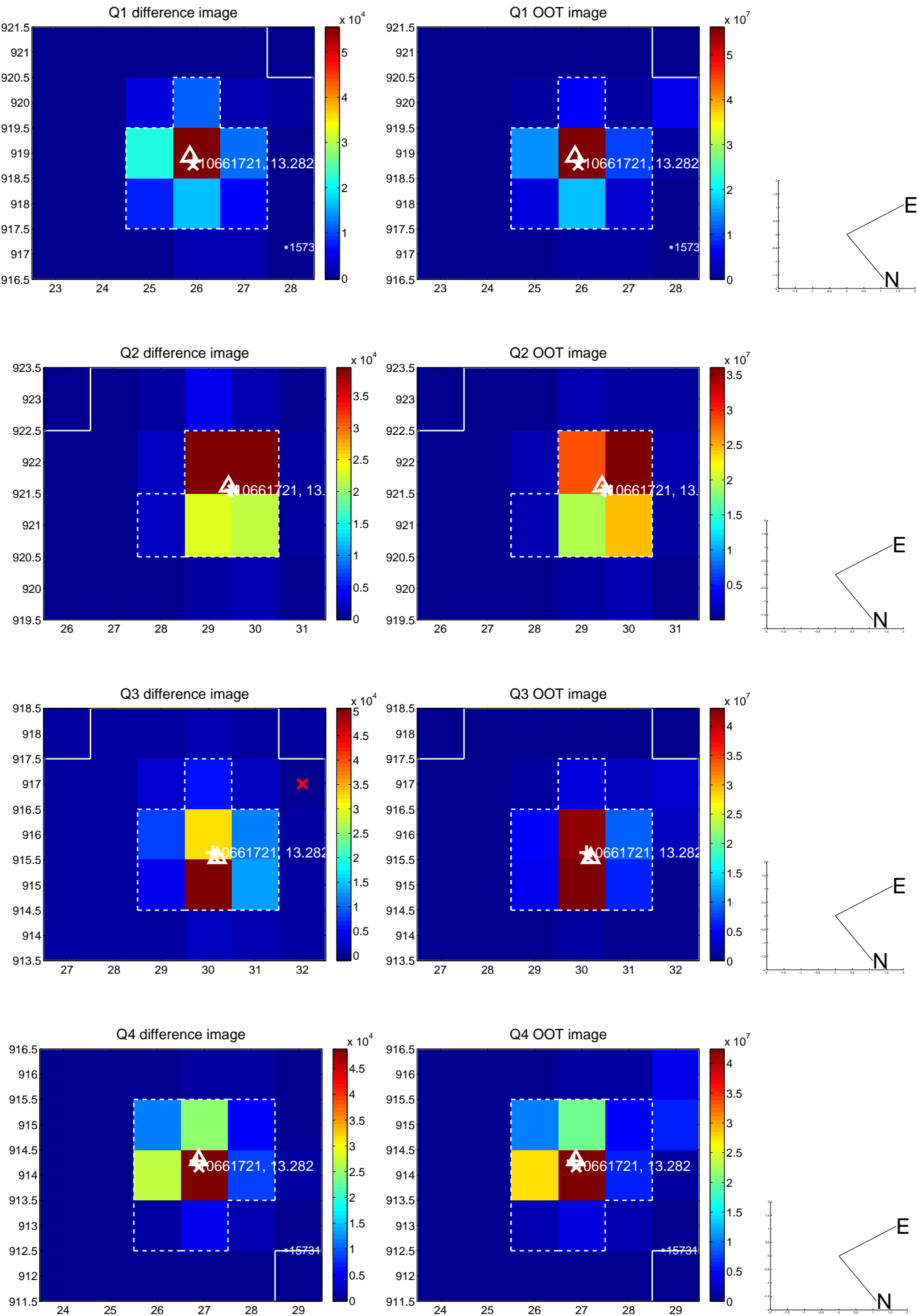
The direct PRF centroid is offset from the target star catalog position by about 0.43 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.041 \pm 0.142$	0.29	$-0.017 \pm 0.079$	$-0.037 \pm 0.147$
PRF-fit source offset from KIC position	$0.271 \pm 0.142$	1.91	$0.071 \pm 0.082$	$-0.262 \pm 0.146$
photometric centroid source offset	$0.76 \pm 0.44$	1.75	$0.10 \pm 0.48$	$-0.76 \pm 0.44$

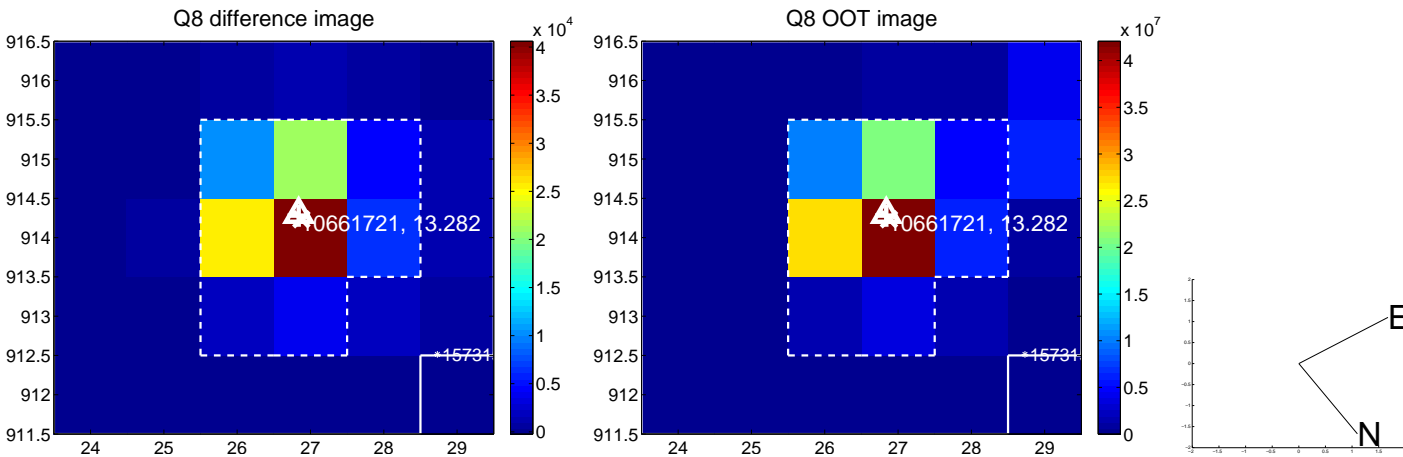
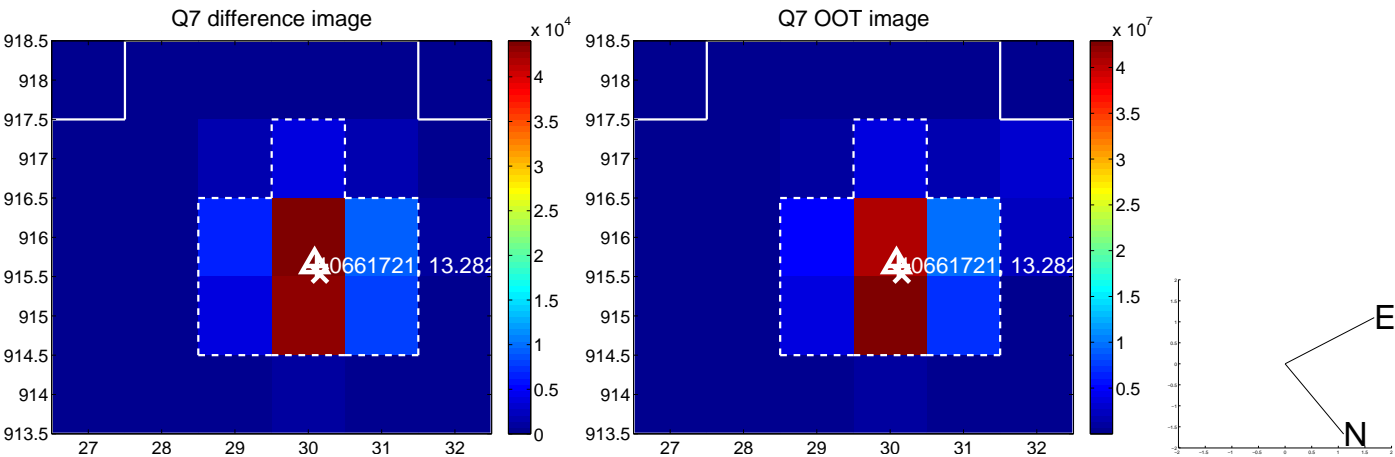
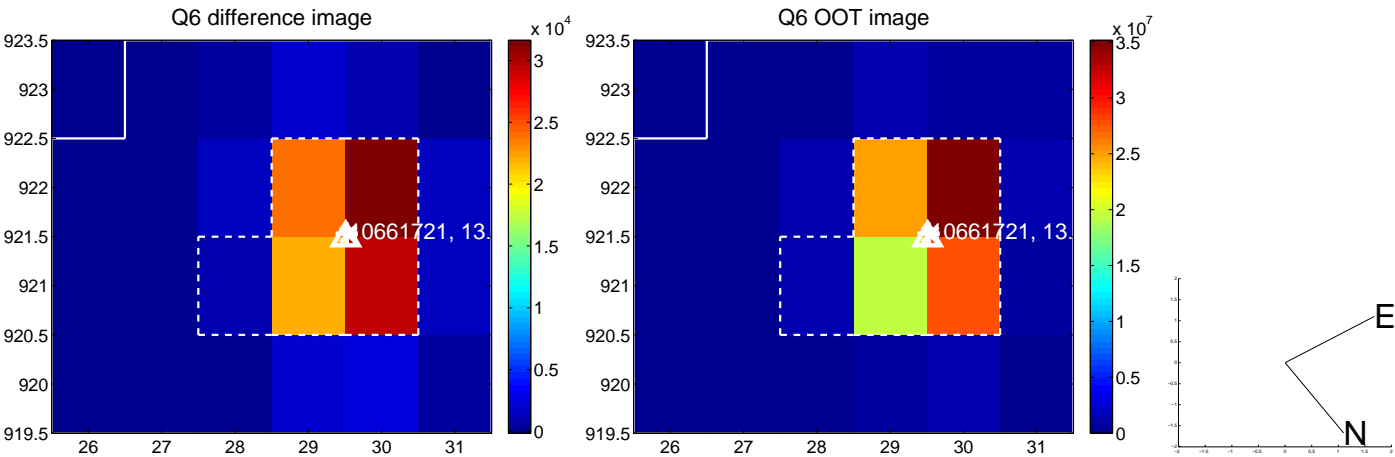
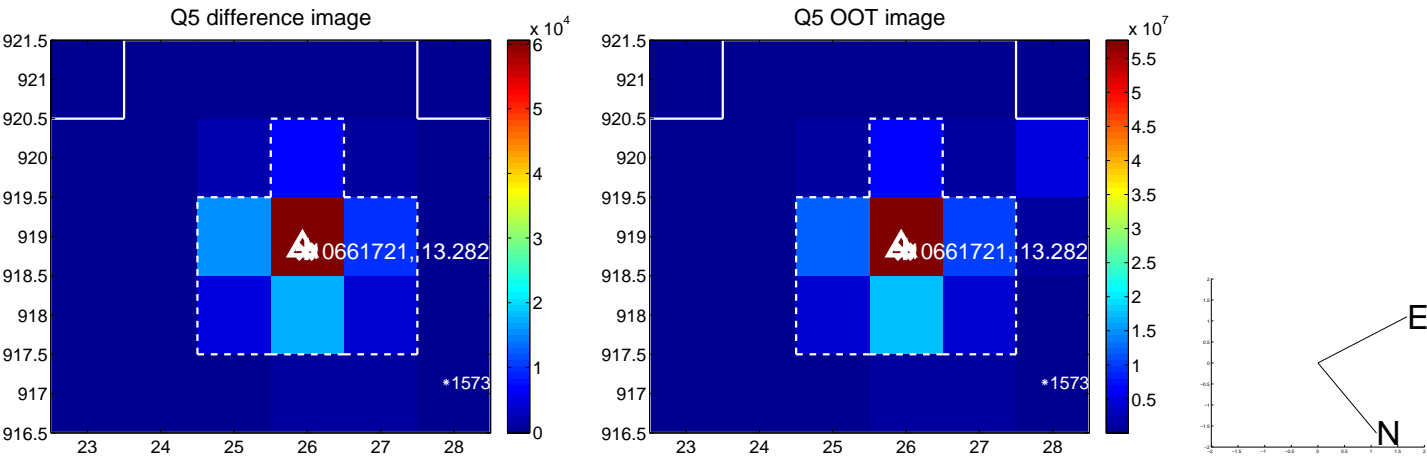


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses:** good quarterly centroid offsets; **Vermillion crosses:** bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

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

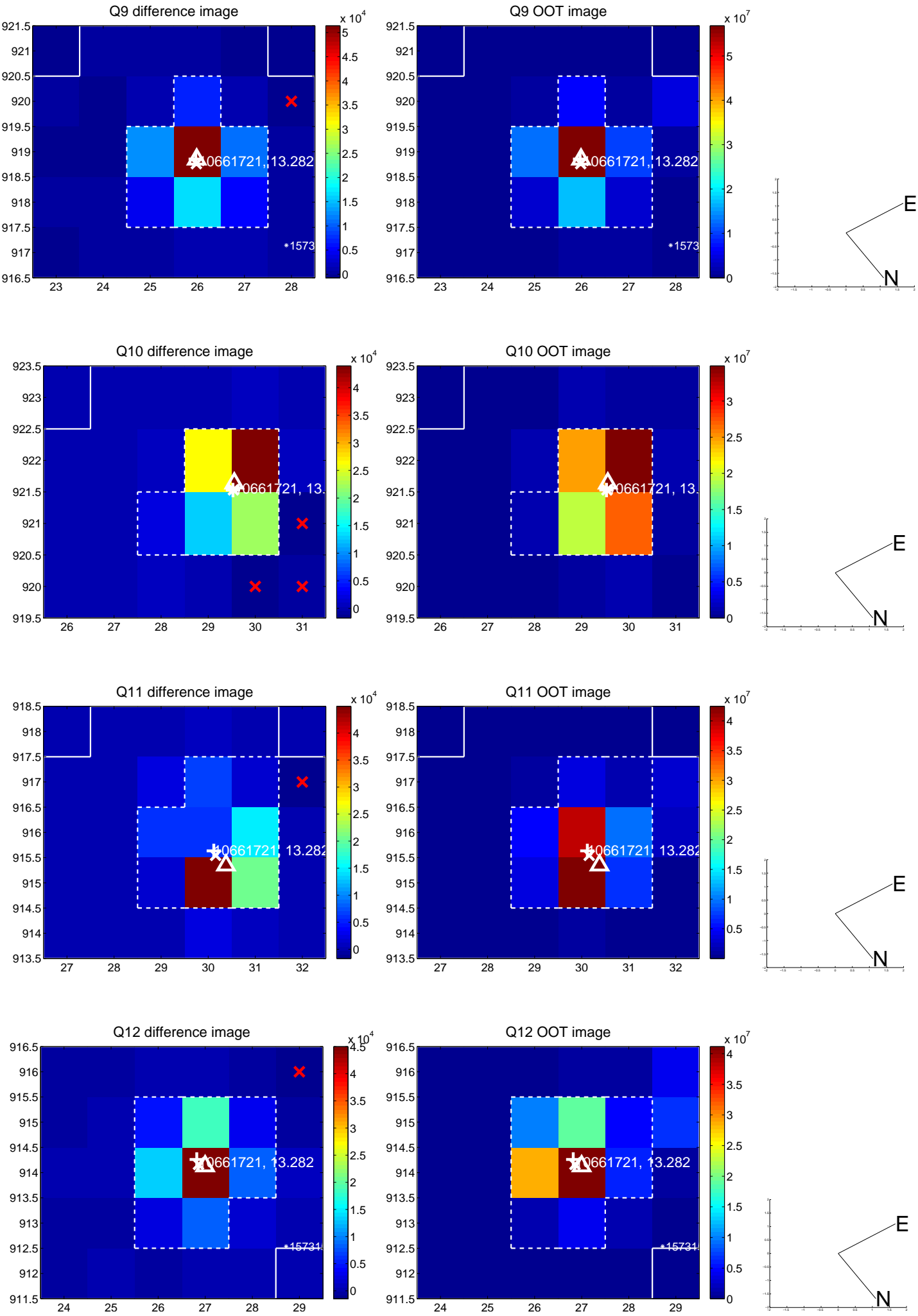


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

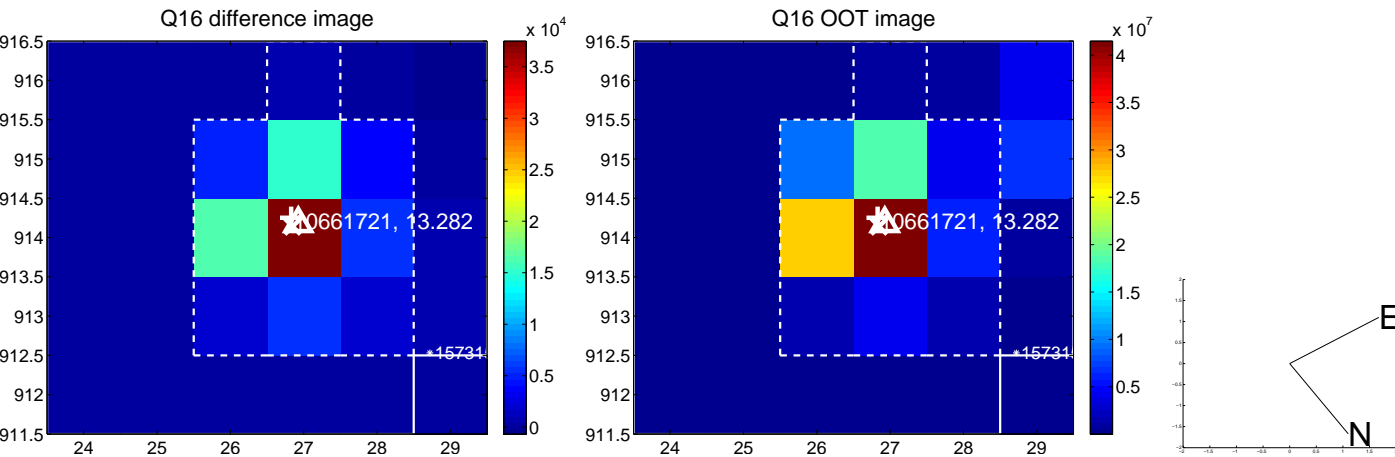
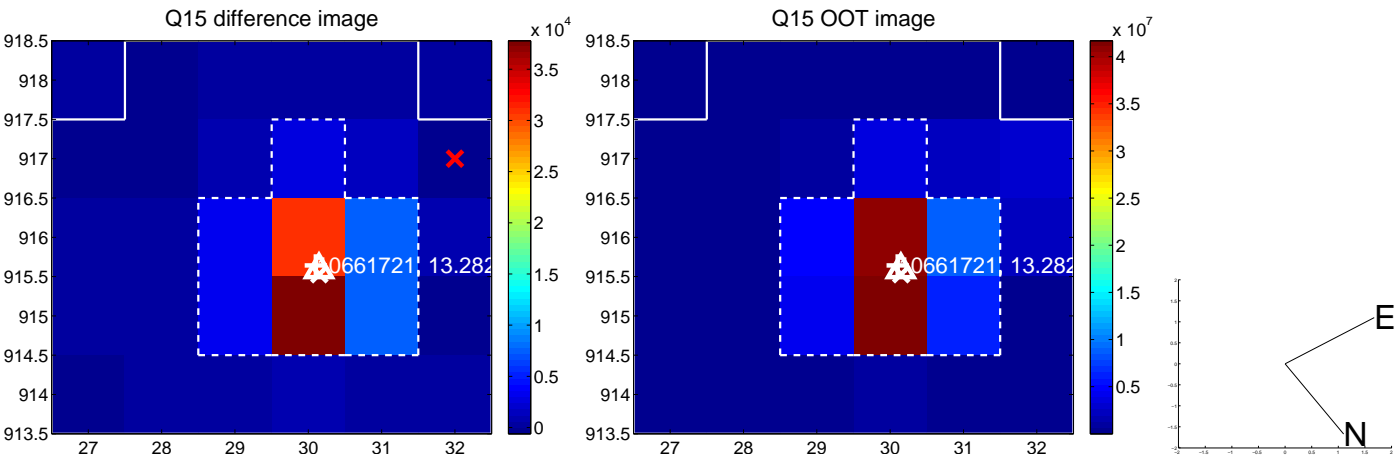
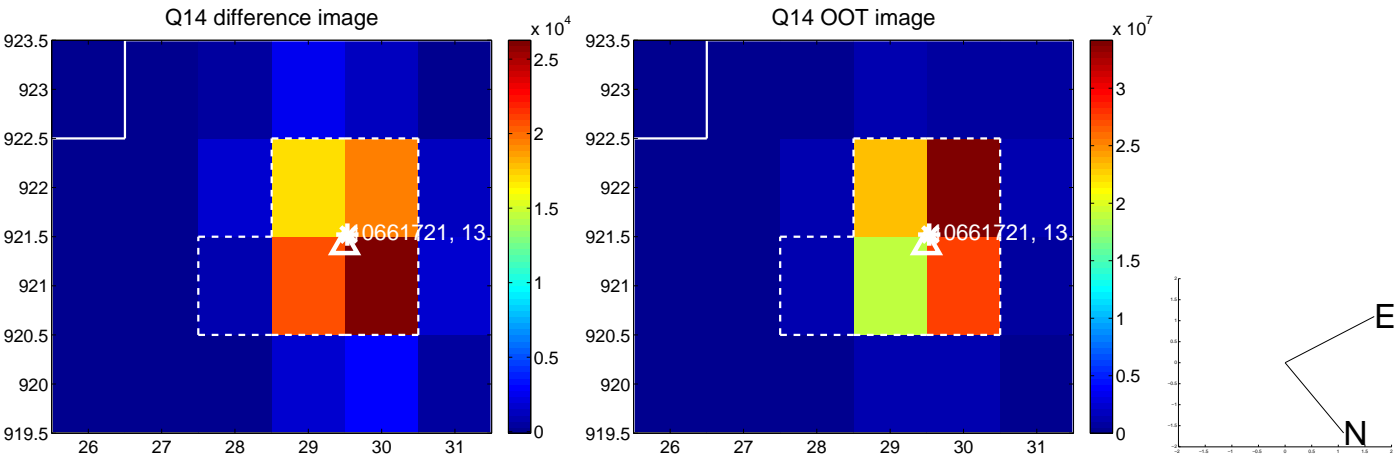
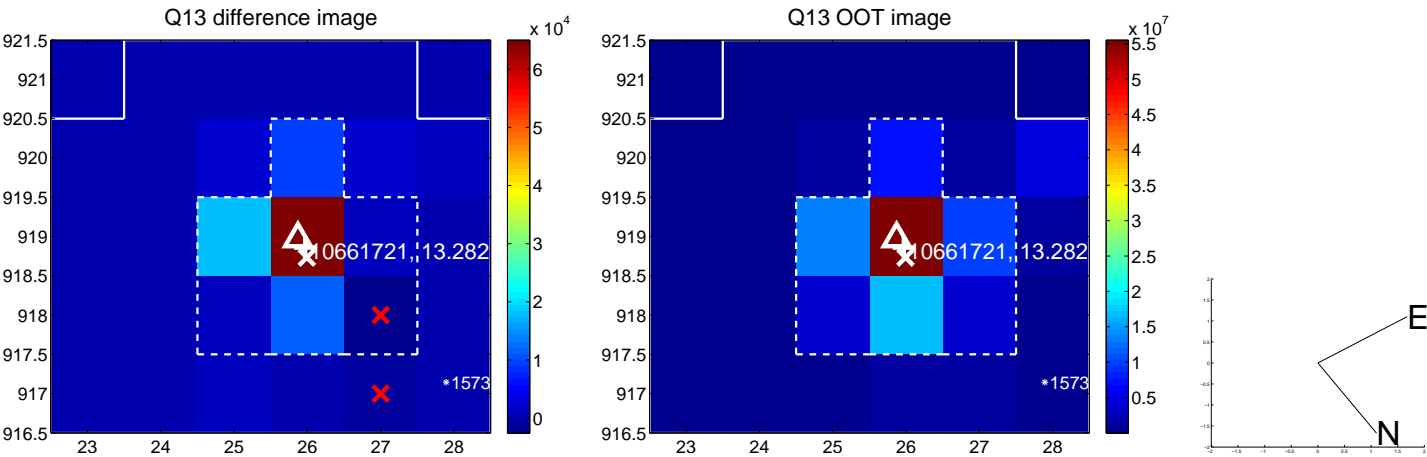




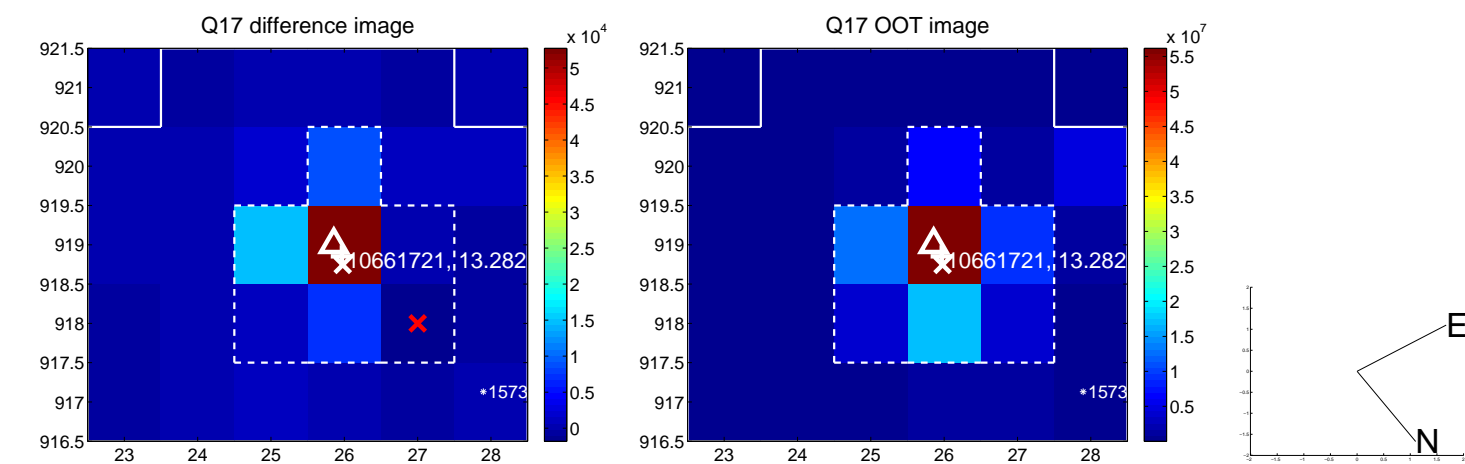
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



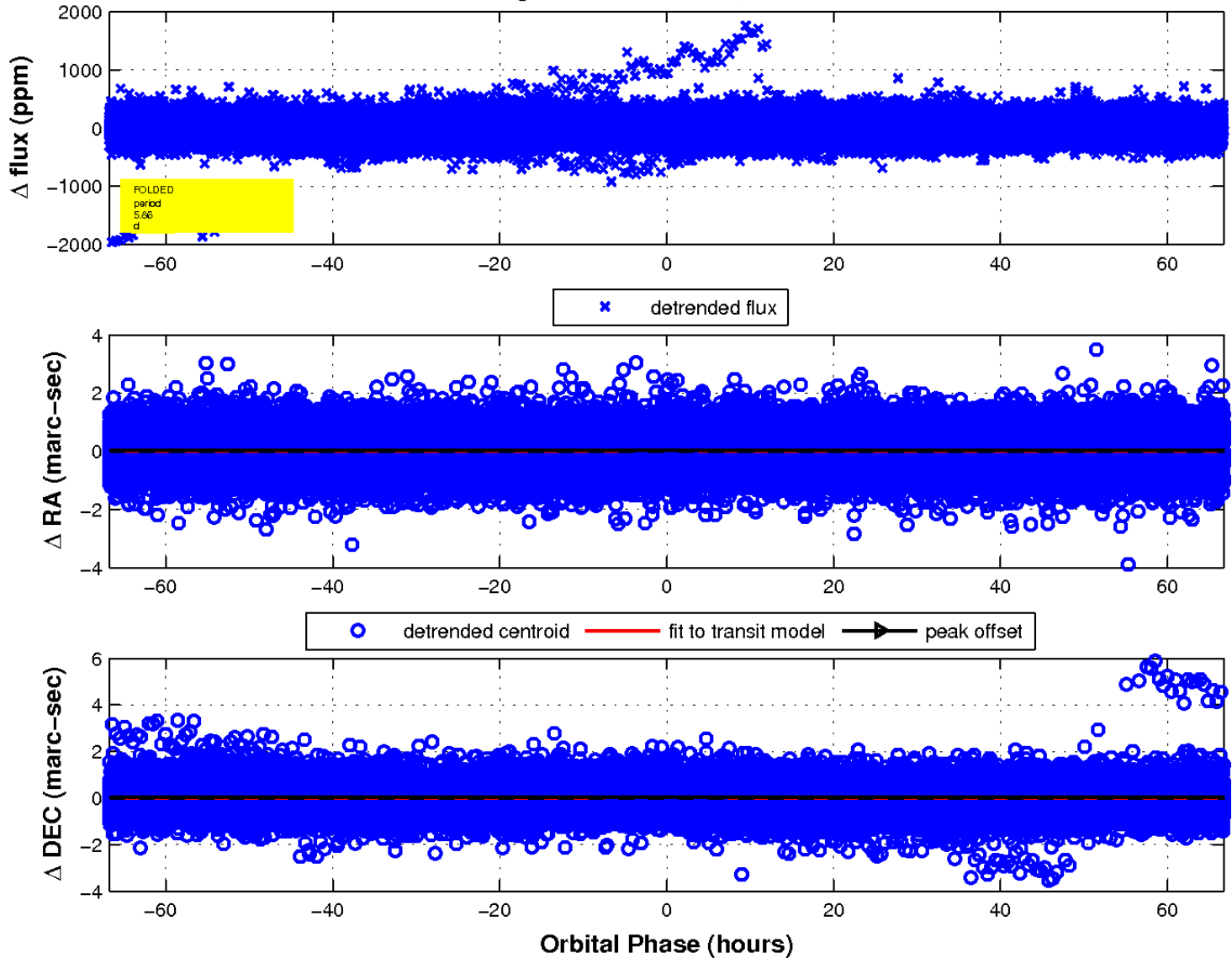
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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



fluxWeightedCentroids, Planet 2 of 2



UKIRT Image

Declination

