

# KIC 009458613

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
009458613-01	OBS	0707.01	21.775671	146.087479	796.7	8.095	77.6	81.9	1.69	5900	5.08	125.40
009458613-02	OBS	0707.02	41.027810	131.555832	530.5	10.645	40.9	44.8	1.69	5900	4.59	53.89
009458613-03	OBS	0707.03	31.784855	135.867715	439.3	9.372	39.8	42.8	1.69	5900	4.16	75.73
009458613-04	OBS	0707.04	13.175544	143.678839	281.1	6.754	34.9	39.6	1.69	5900	3.11	245.03
009458613-05	OBS	0707.05	5.668163	131.887260	80.7	4.838	13.9	15.2	1.69	5900	1.69	754.49

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009458613-01	OBS	PC	1.00	0	0	0	0	NO_COMMENT
009458613-02	OBS	PC	1.00	0	0	0	0	NO_COMMENT
009458613-03	OBS	PC	1.00	0	0	0	0	NO_COMMENT
009458613-04	OBS	PC	1.00	0	0	0	0	NO_COMMENT
009458613-05	OBS	PC	1.00	0	0	0	0	NO_COMMENT

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

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

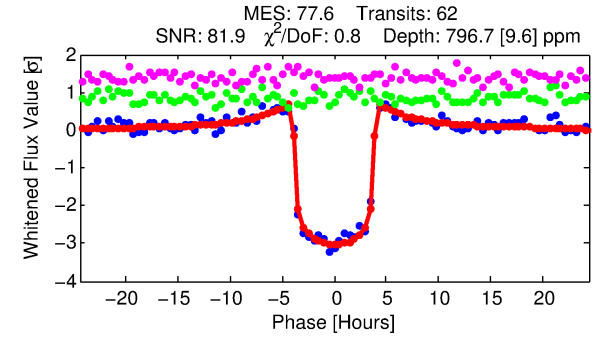
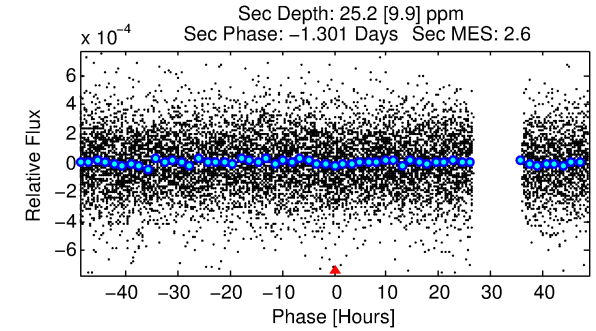
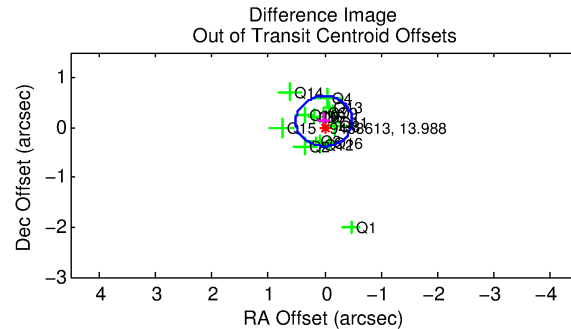
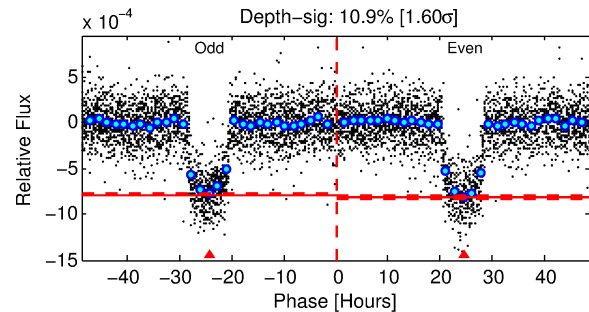
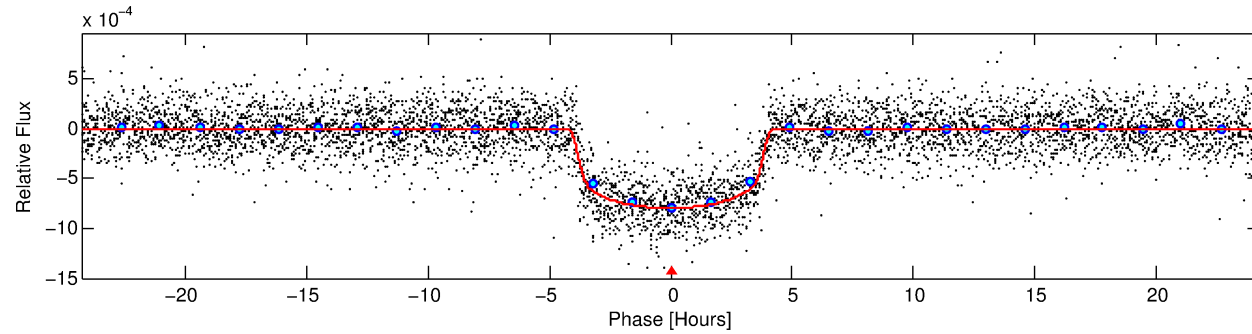
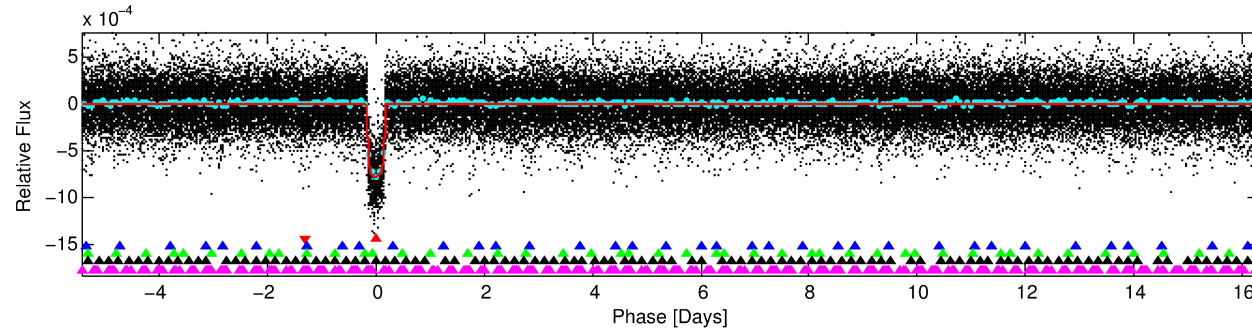
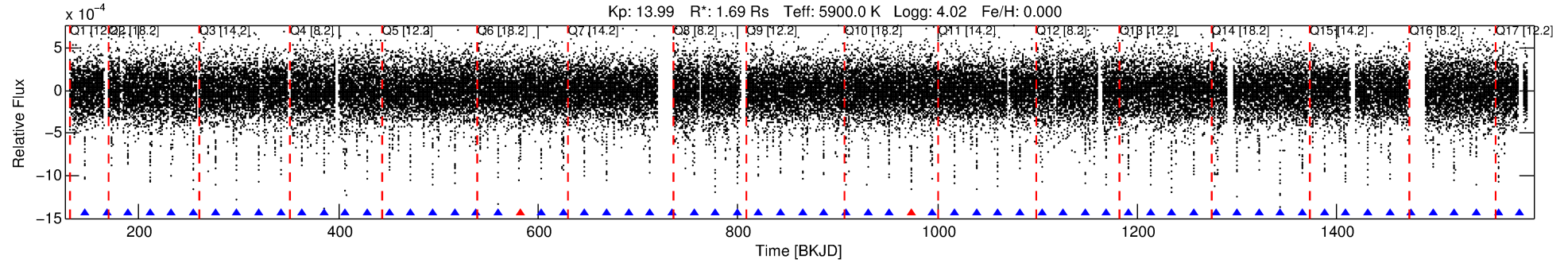
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 009458613-01

No Significant Match Found

# DV One-Page Summary

KIC: 9458613 Candidate: 1 of 5 Period: 21.776 d  
KOI: K00707.01 Name: Kepler-33d Corr: 0.991



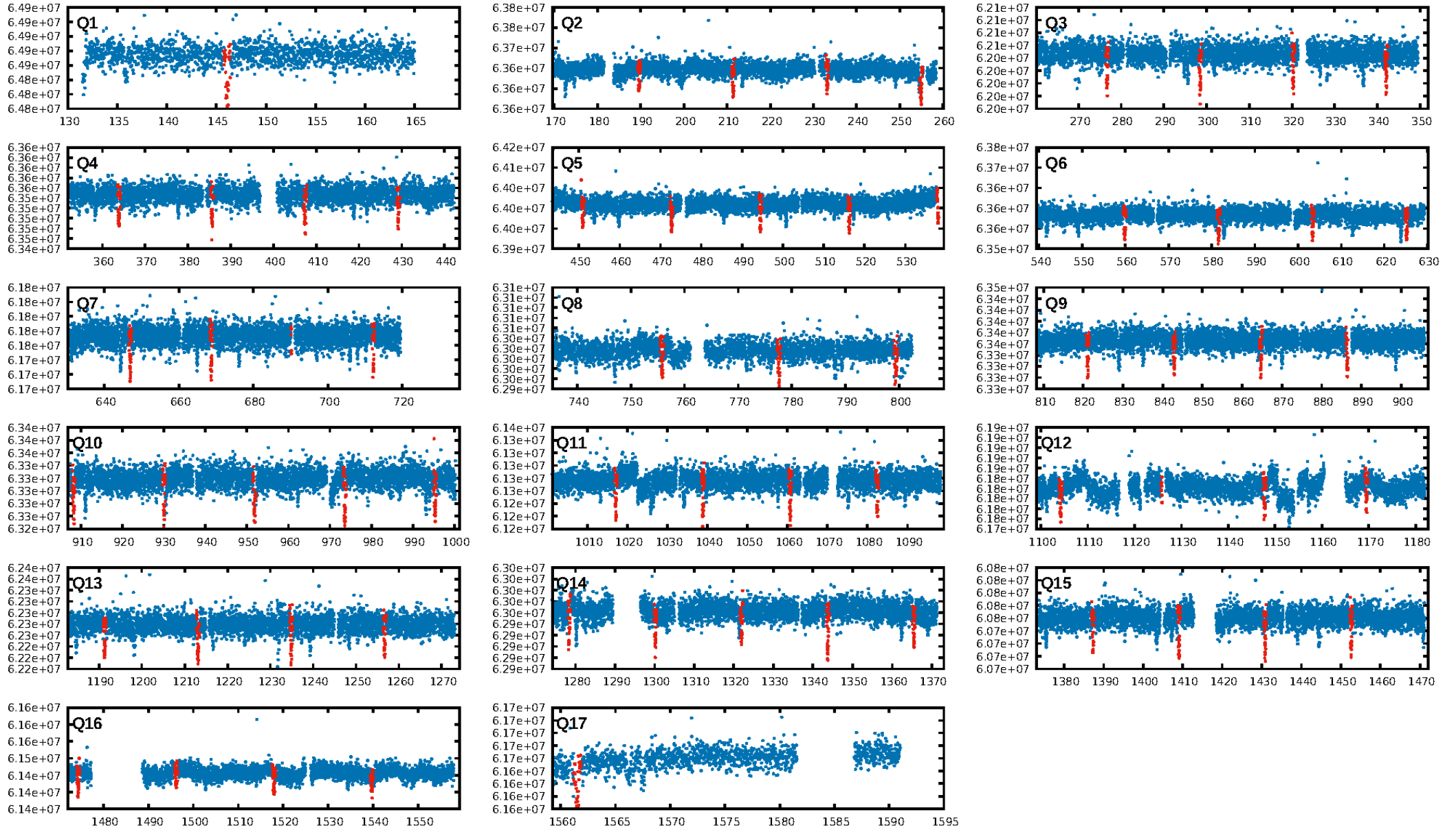
## DV Fit Results:

Period = 21.77567 [0.00004] d  
Epoch = 146.0875 [0.0014] BKJD  
Rp/R\* = 0.0275 [0.0013]  
a/R\* = 15.76 [3.33]  
b = 0.68 [0.17]  
Seff = 125.40 [43.97]  
Teff = 853 [75] K  
Rp = 5.08 [1.28] Re  
a = 0.1576 [0.0351] AU  
Ag = 13.30 [7.05] [1.74 $\sigma$ ]  
Teffp = 2519 [261] K [6.15 $\sigma$ ]

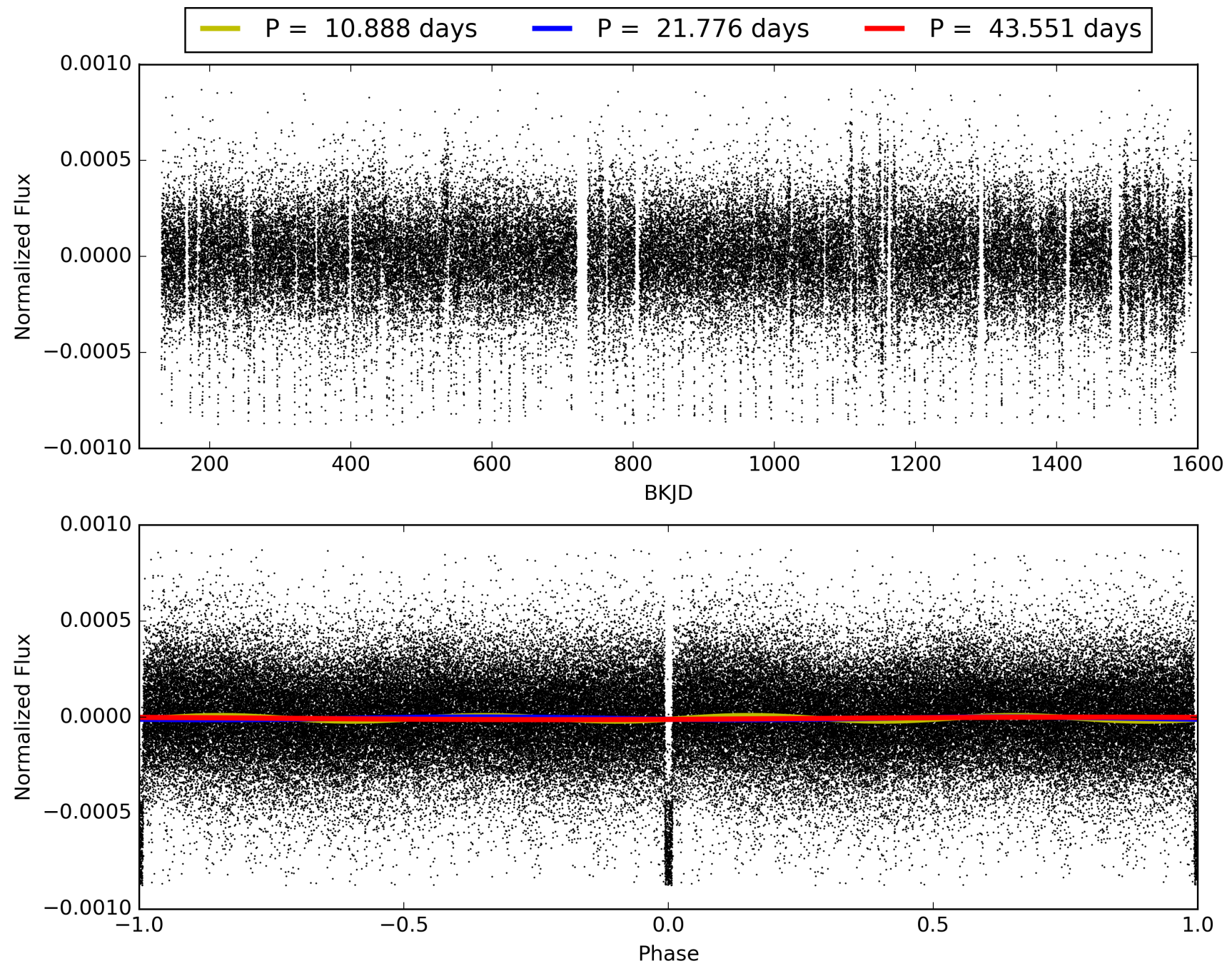
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [19.58 $\sigma$ ]  
LongPeriod-sig: 100.0% [19.40 $\sigma$ ]  
ModelChiSquare2-sig: 46.2%  
ModelChiSquareGof-sig: 100.0%  
Bootstrap-pfa: 0.00e+00  
RollingBand-fgt: 0.97 [58/60]  
GhostDiagnostic-chr: 3.876  
Centroid-sig: 67.6%  
Centroid-so: 0.062 arcsec [0.52 $\sigma$ ]  
OotOffset-rm: 0.124 arcsec [0.74 $\sigma$ ]  
KicOffset-rm: 0.099 arcsec [0.62 $\sigma$ ]  
OotOffset-st: 4/4/4/4 [16]  
KicOffset-st: 4/4/4/4 [16]  
DiffImageQuality-fgm: 1.00 [16/16]  
DiffImageOverlap-fno: 1.00 [16/16]

# TCE 009458613-01, PDC Light Curves



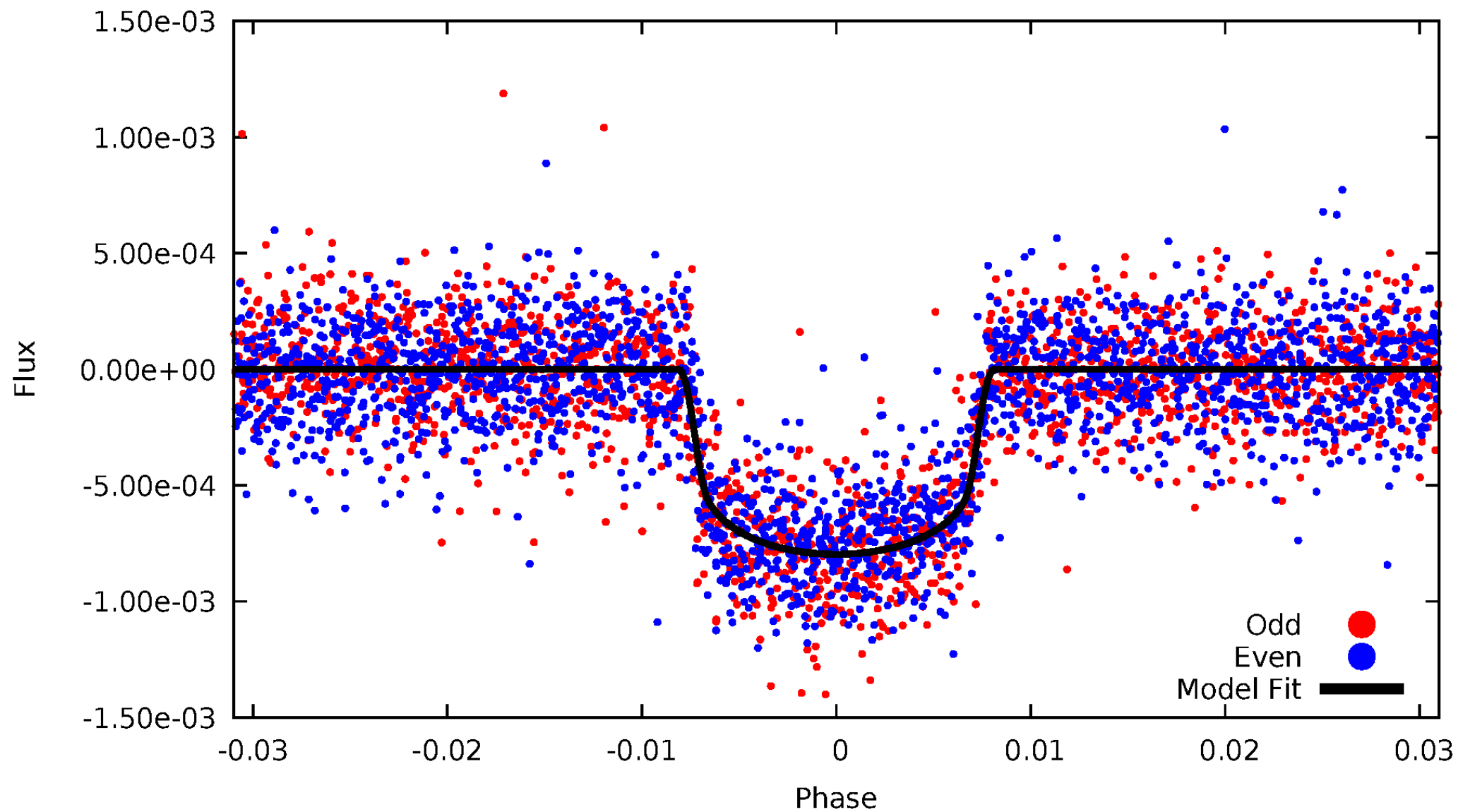
TCE 009458613-01





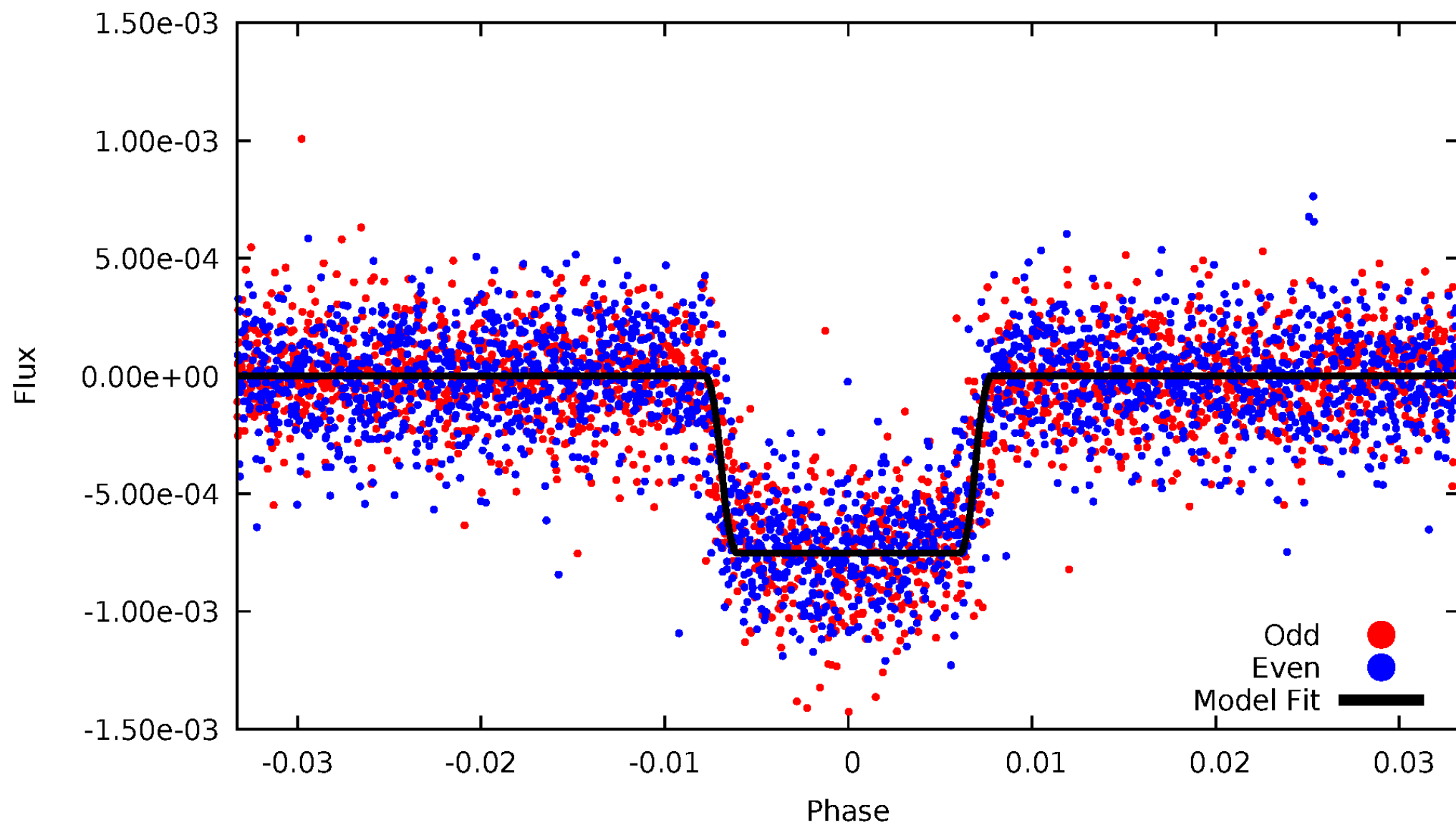
# DV Odd/Even

TCE 009458613-01



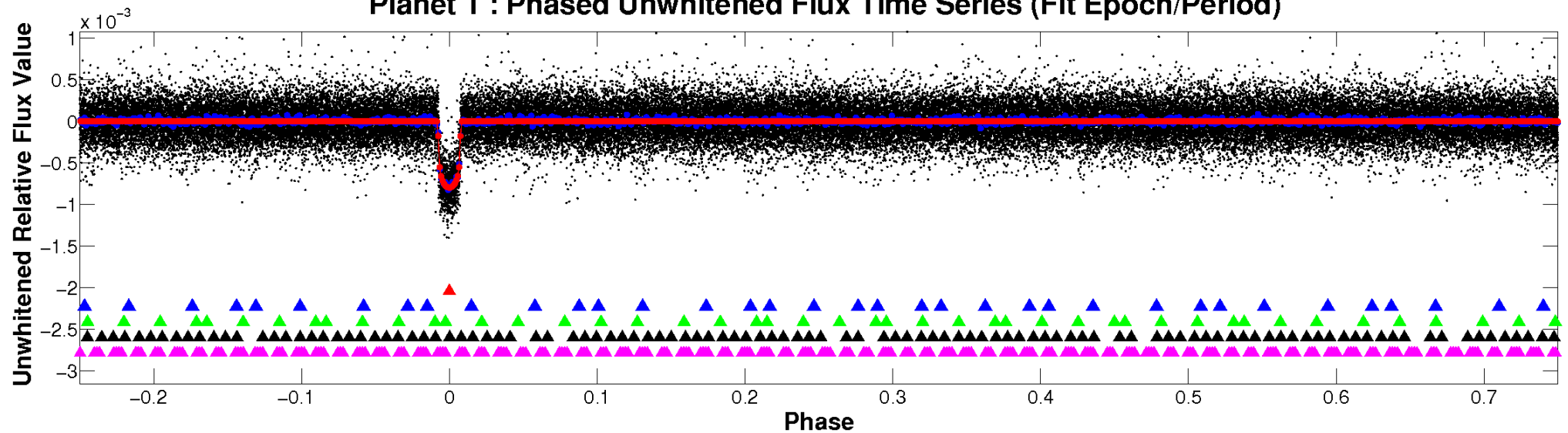
# ALT Odd/Even

TCE 009458613-01

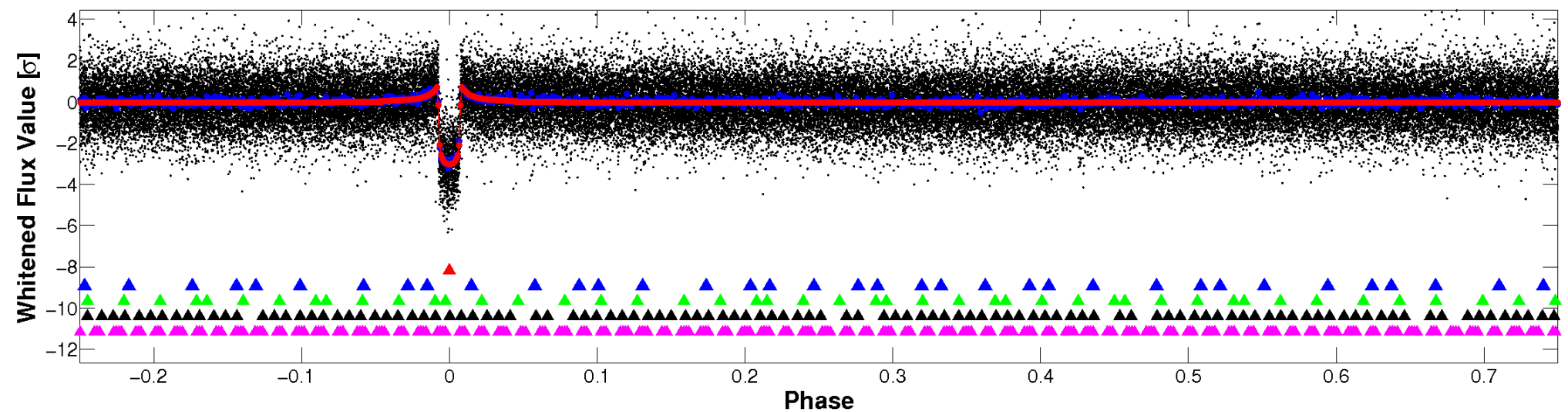


# Non-Whitened Vs. Whitened Light Curve

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

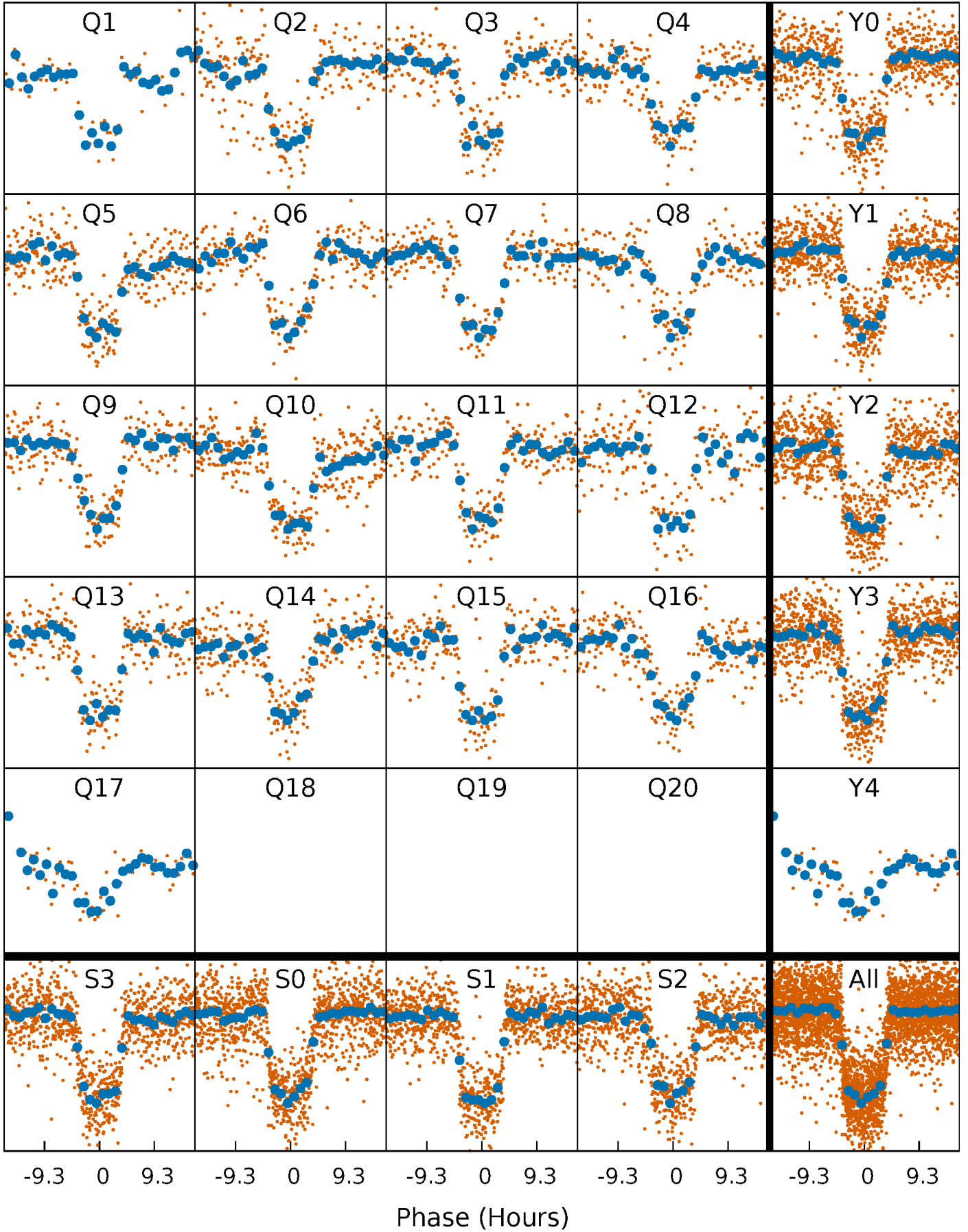


Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)



# PDC Quarter-Phased Transit Curves

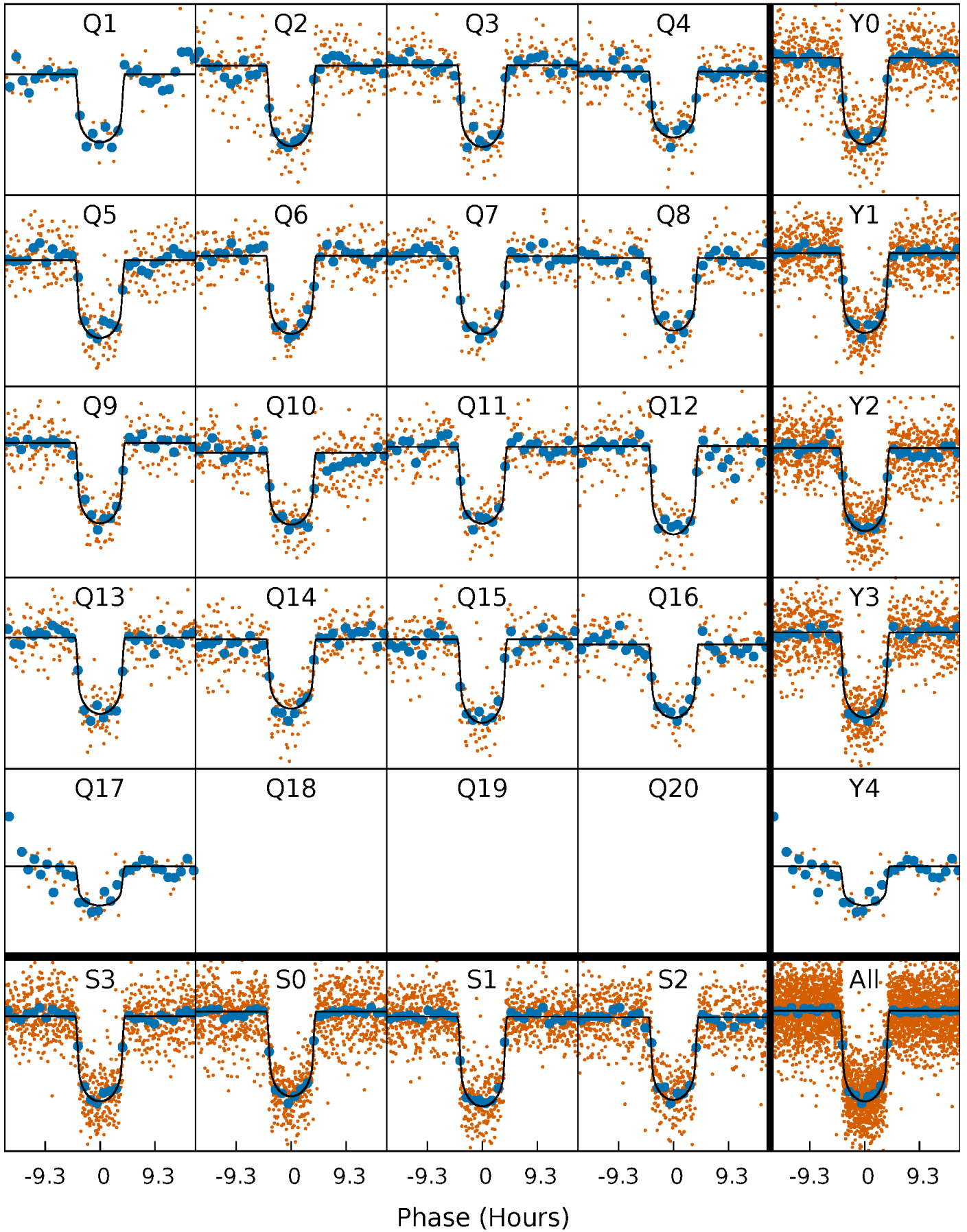
TCE 009458613-01 P= 21.775671 Days  $T_0=146.087479$  (BKJD)





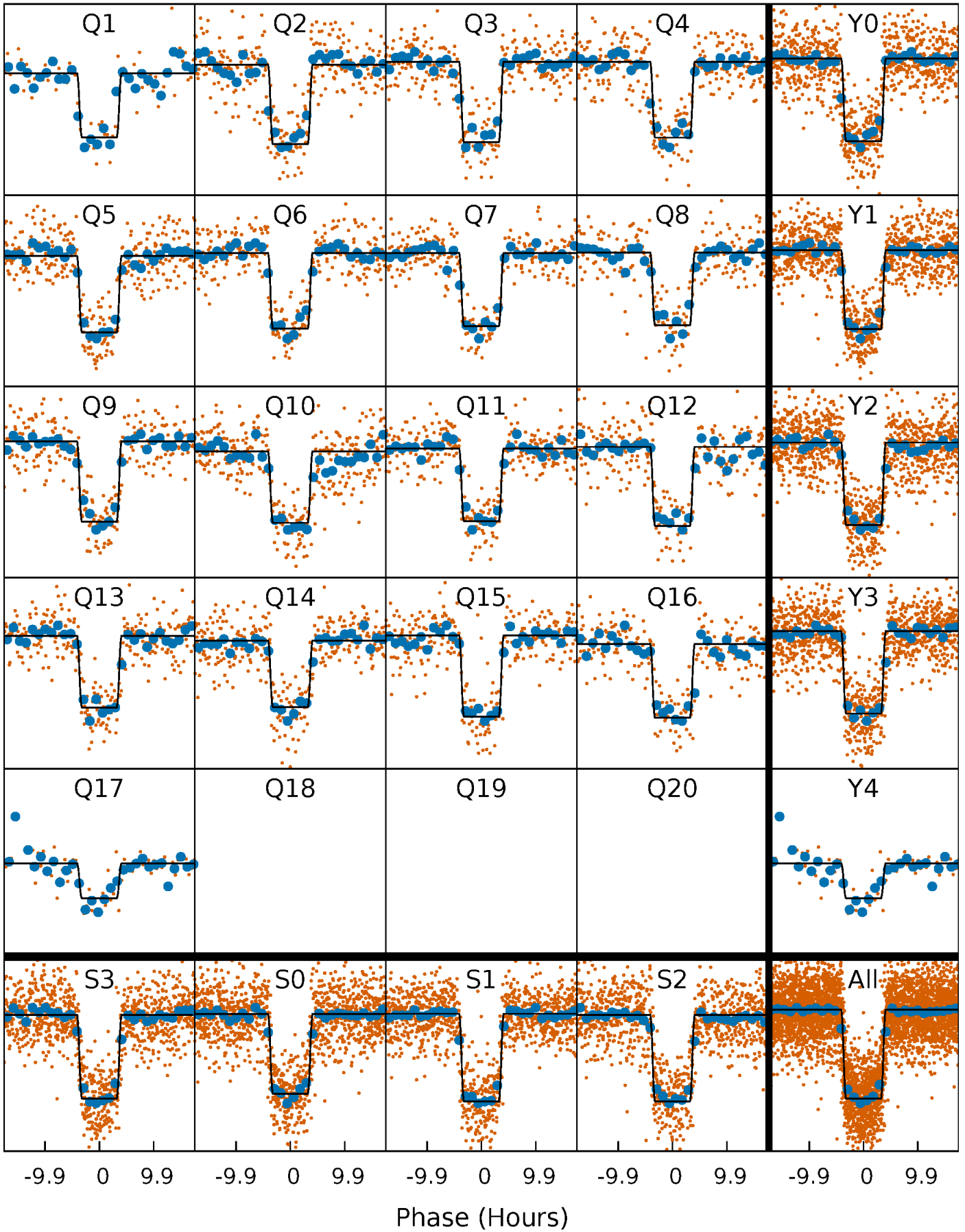
# DV Quarter-Phased Transit Curves

TCE 009458613-01 P= 21.775671 Days  $T_0=146.087479$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

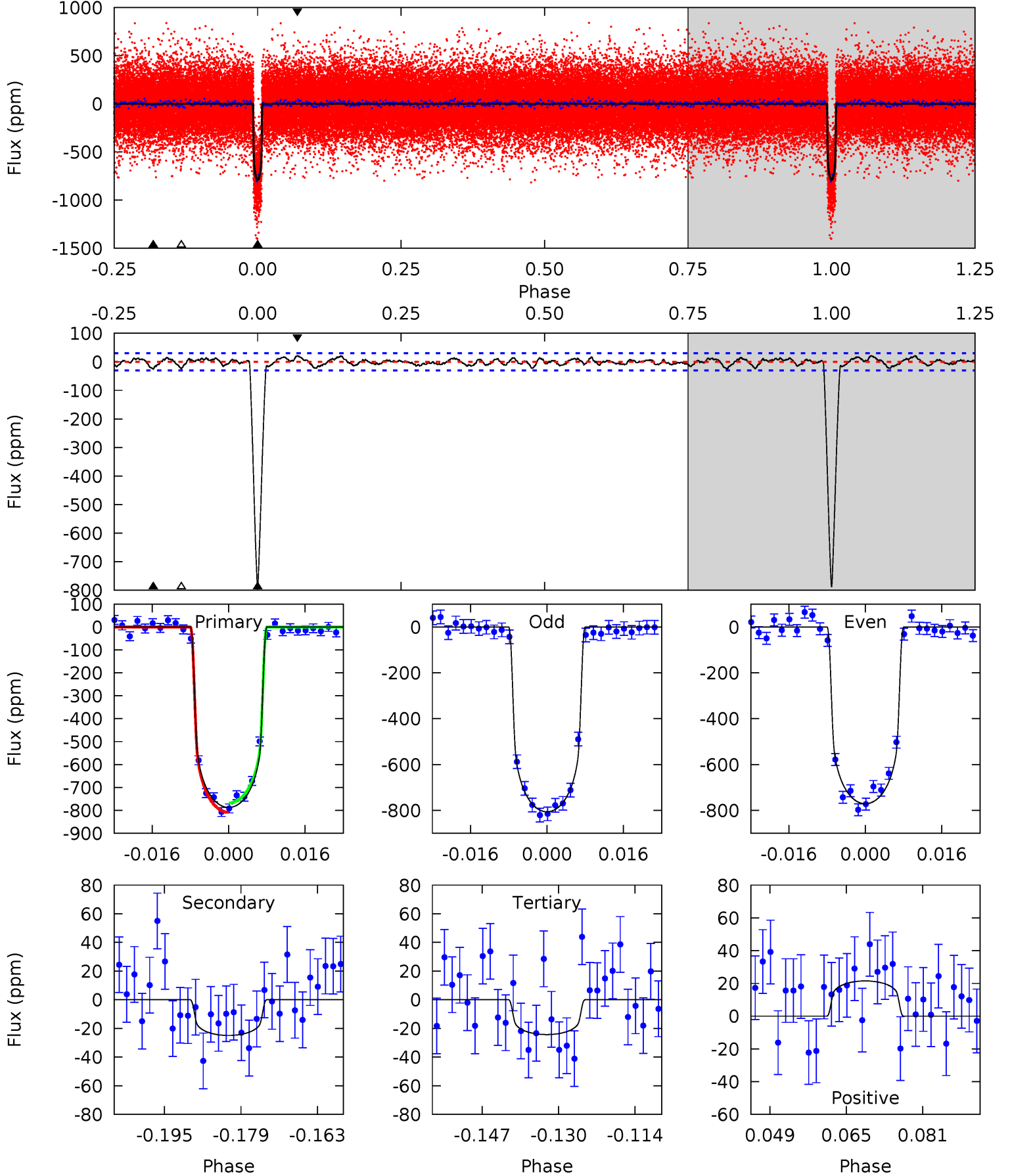
TCE 009458613-01 P= 21.775164 Days  $T_0=146.102915$  (BKJD)



# DV Model-Shift Uniqueness Test

009458613-01,  $P = 21.775671$  Days,  $E = 124.311808$  Days

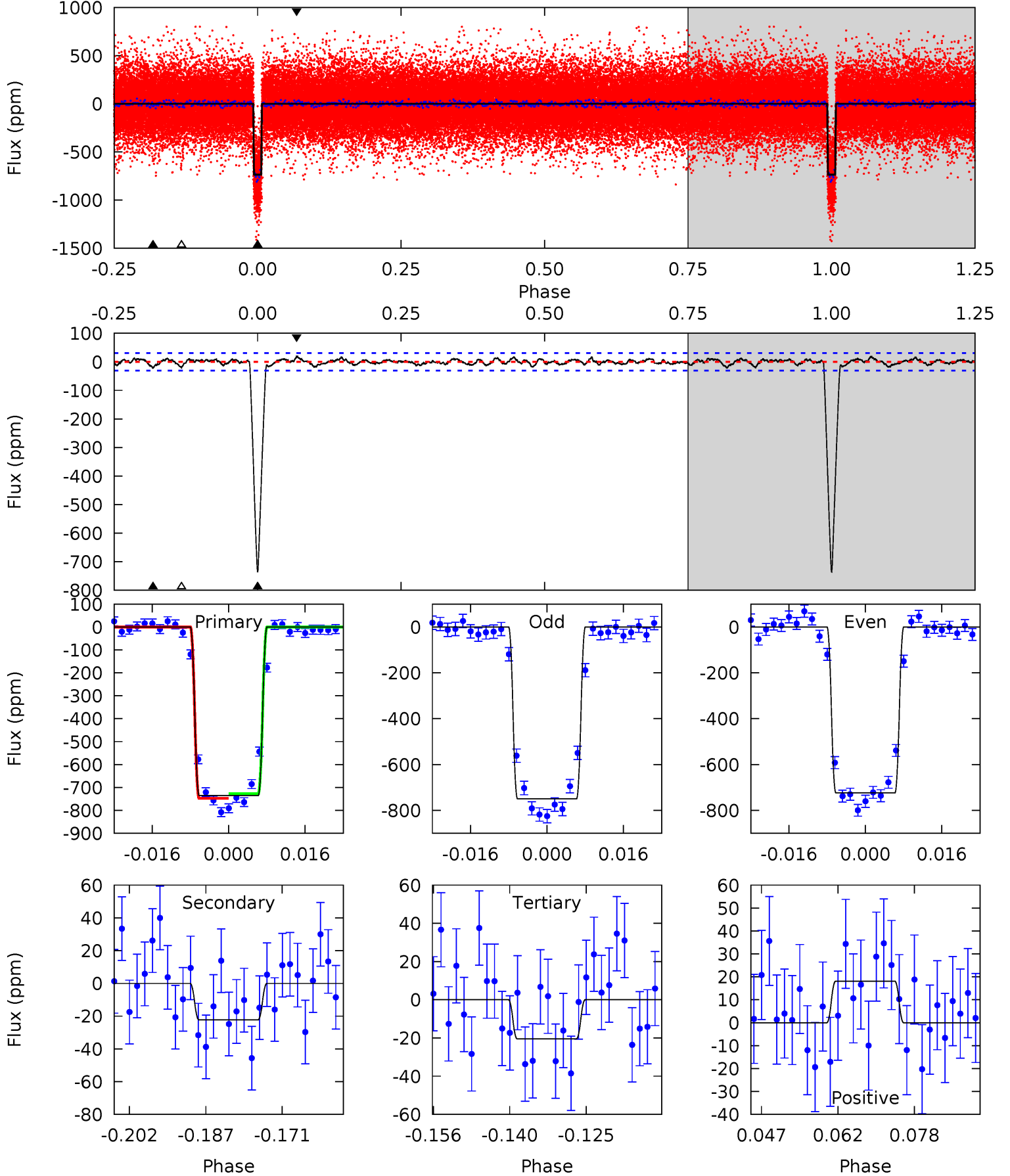
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
127.5	4.03	3.93	3.48	4.93	2.40	1.39	123.6	124.0	0.10	0.55	2.86	1.00	0.03	3.29



# Alt Model-Shift Uniqueness Test

009458613-01,  $P = 21.775164$  Days,  $E = 124.327751$  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
118.3	3.58	3.29	2.91	4.94	2.42	1.11	115.0	115.4	0.28	0.66	2.09	0.99	0.02	1.69





### Stellar Parameters For KIC 009458613

	$T_{\text{eff}} (K)$	$\log(g)$	$[\text{Fe}/\text{H}]$	$R (R_{\odot})$	$M (M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$5900^{+117}_{-117}$	$4.022^{+0.195}_{-0.090}$	$0.000^{+0.150}_{-0.150}$	$1.694^{+0.257}_{-0.418}$	$1.100^{+0.124}_{-0.112}$	$0.319^{+0.351}_{-0.086}$
	+2%/-2%	+5%/-2%	+inf%/-inf%	+15%/-25%	+11%/-10%	+110%/-27%
Source	SPE35	SPE35	SPE35	DSEP		

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

### Secondary Eclipse Parameters for KIC 009458613-01 / KOI 0707.01

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$-25 \pm 6$	$5.03^{+0.59}_{-0.64}$	$1182^{+56}_{-73}$	$3112^{+132}_{-132}$	$14^{+6}_{-4}$
Alt.	$-22 \pm 6$	$5.03^{+0.54}_{-0.63}$	$1185^{+53}_{-67}$	$3071^{+124}_{-162}$	$12^{+5}_{-4}$

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

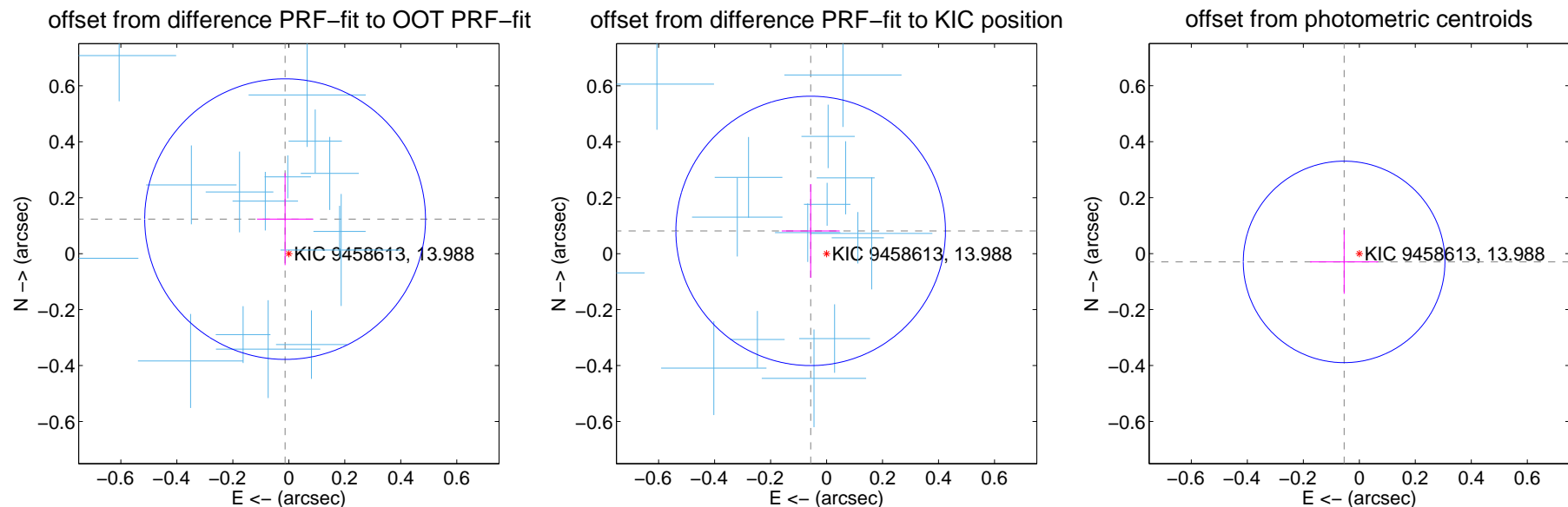
## DV Centroid Data

Supplemental centroid analysis for 009458613-01. Kepler magnitude: 13.99. Transit SNR 81.89

There are 16 quarters with good PRF difference image offsets

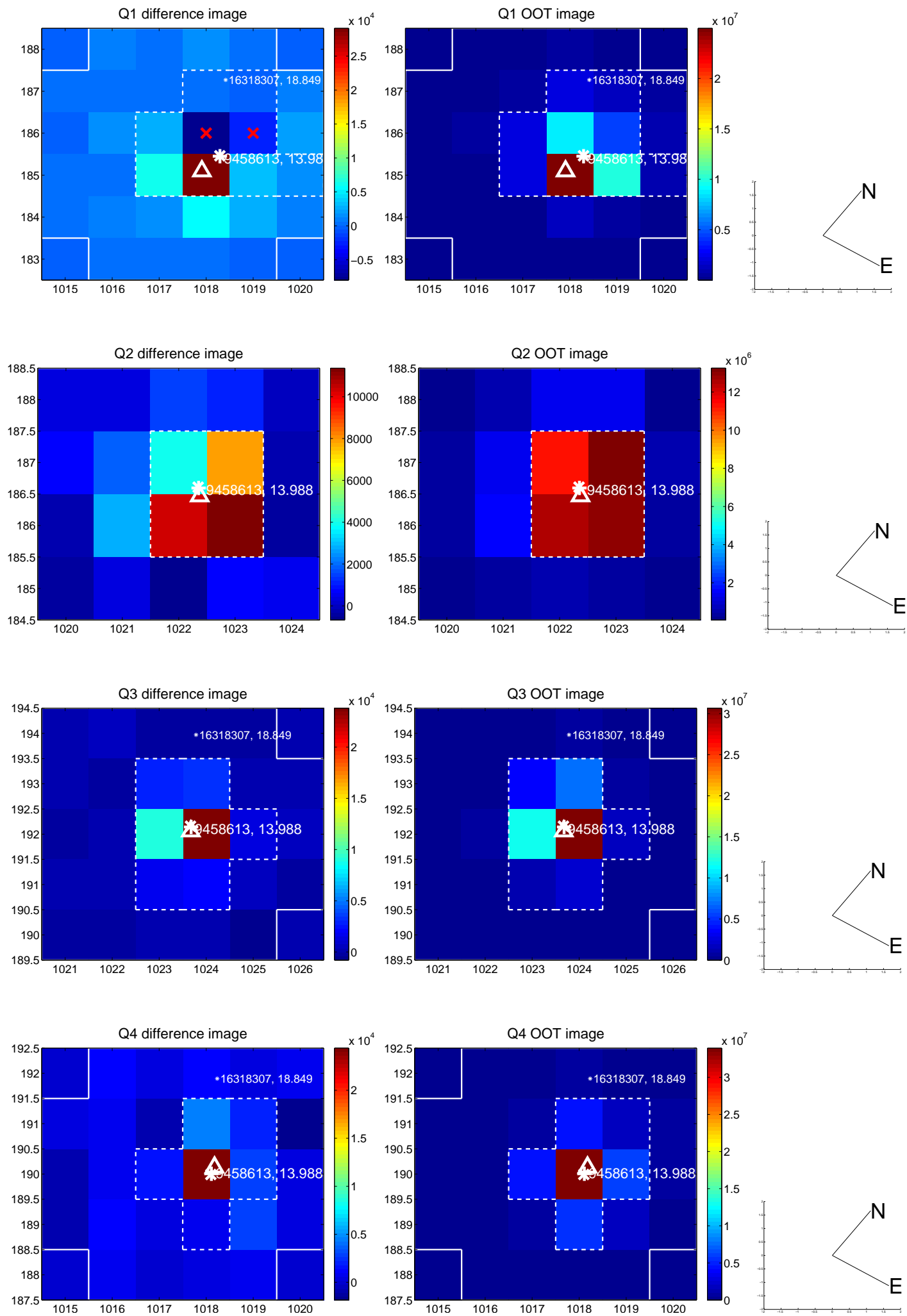
The direct PRF centroid is offset from the target star catalog position by about 0.06 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.124 \pm 0.167$	0.74	$0.013 \pm 0.100$	$0.123 \pm 0.164$
PRF-fit source offset from KIC position	$0.099 \pm 0.160$	0.62	$0.057 \pm 0.103$	$0.081 \pm 0.168$
photometric centroid source offset	$0.06 \pm 0.12$	0.52	$0.05 \pm 0.12$	$-0.03 \pm 0.11$

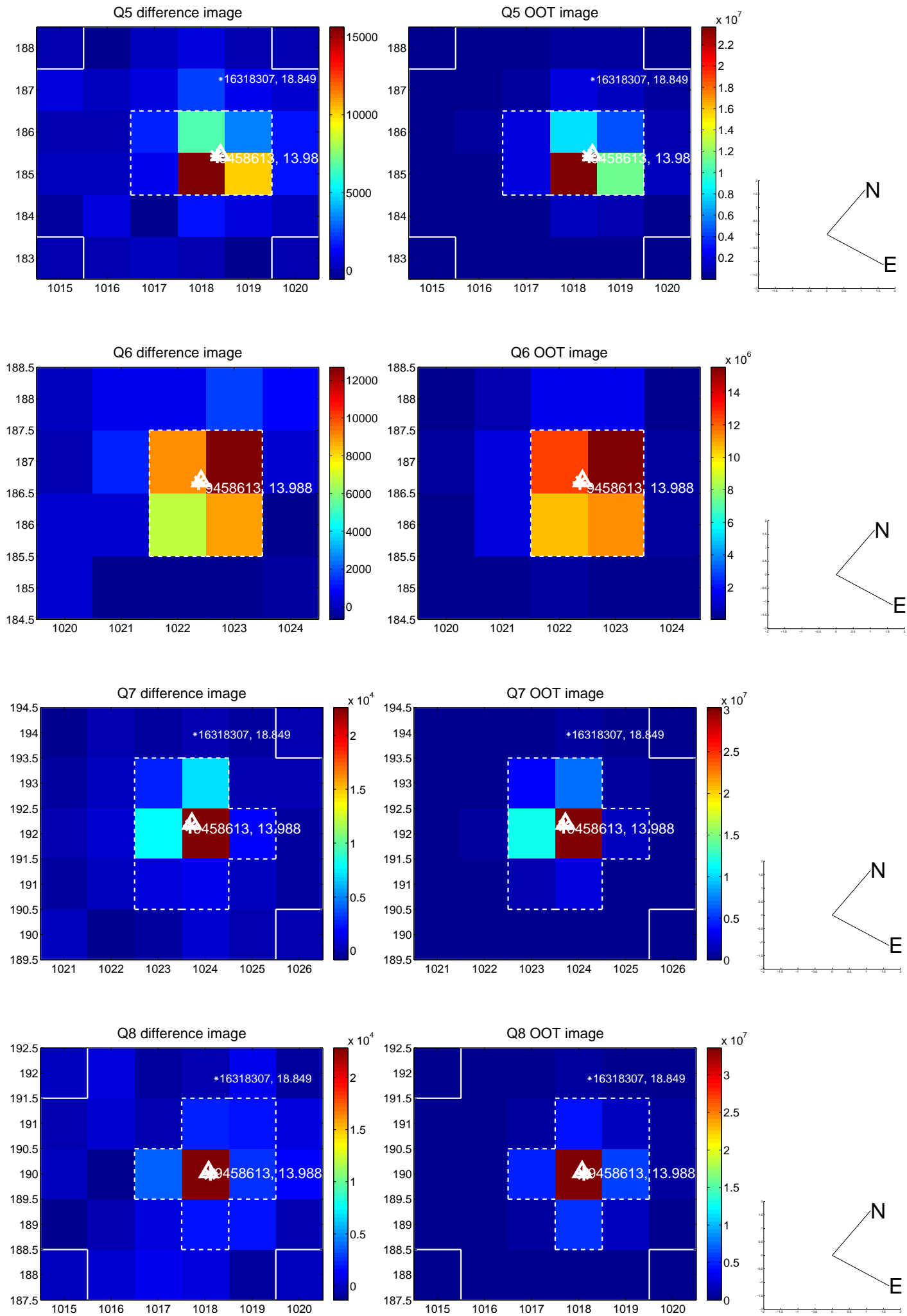


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets**; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

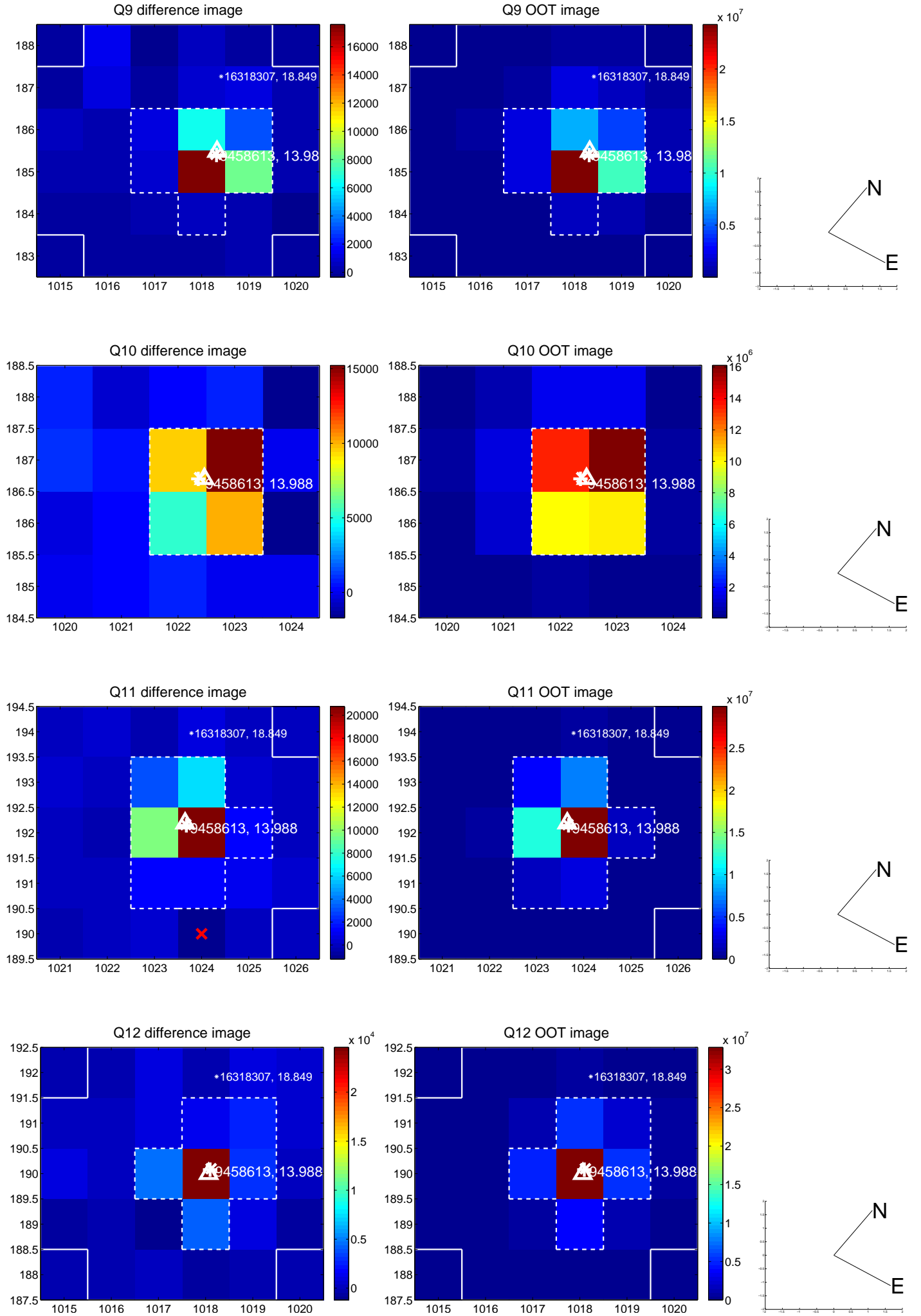


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

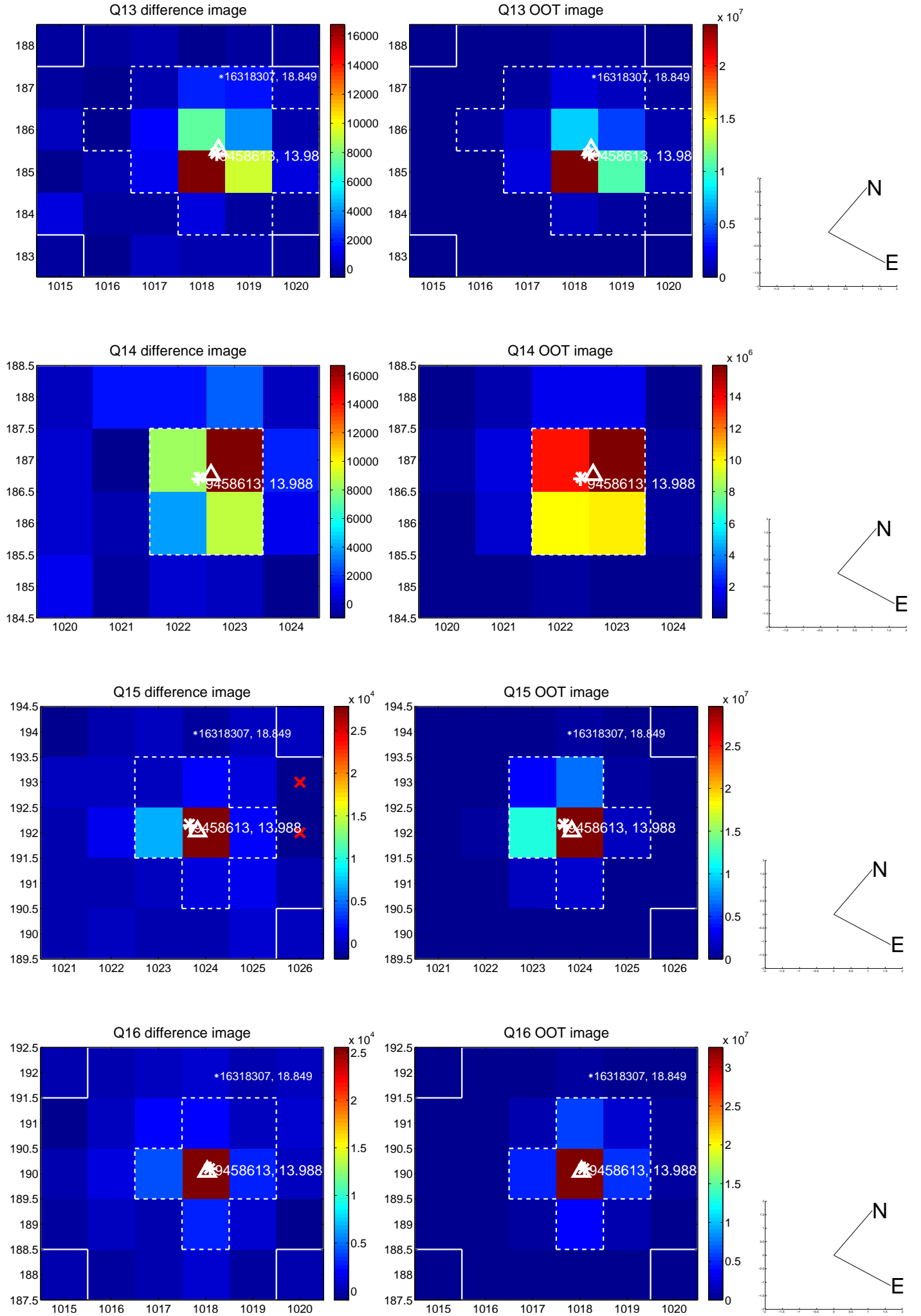




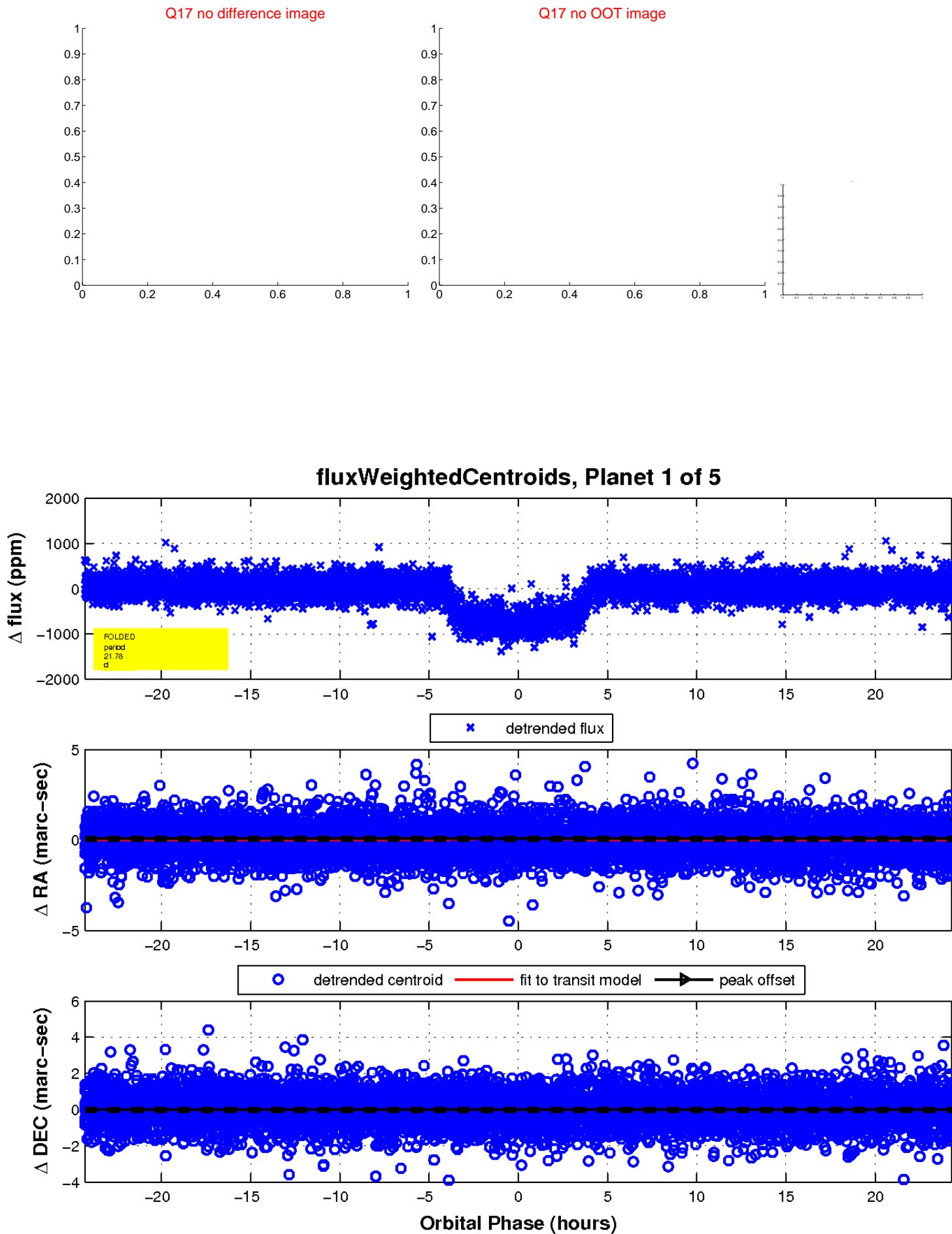
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

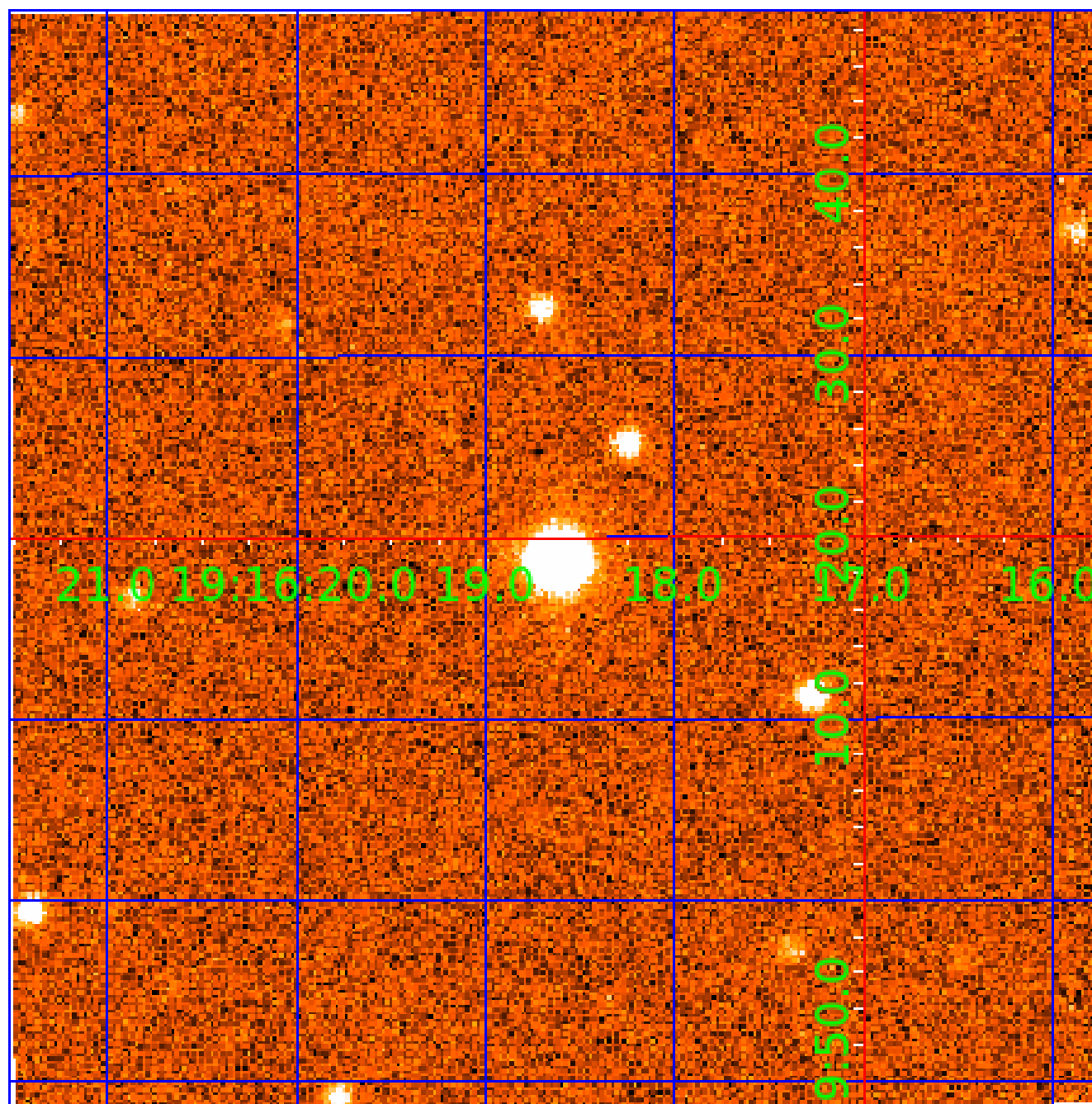


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination





# KIC 009458613

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
009458613-01	OBS	0707.01	21.775671	146.087479	796.7	8.095	77.6	81.9	1.69	5900	5.08	125.40
009458613-02	OBS	0707.02	41.027810	131.555832	530.5	10.645	40.9	44.8	1.69	5900	4.59	53.89
009458613-03	OBS	0707.03	31.784855	135.867715	439.3	9.372	39.8	42.8	1.69	5900	4.16	75.73
009458613-04	OBS	0707.04	13.175544	143.678839	281.1	6.754	34.9	39.6	1.69	5900	3.11	245.03
009458613-05	OBS	0707.05	5.668163	131.887260	80.7	4.838	13.9	15.2	1.69	5900	1.69	754.49

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009458613-01	OBS	PC	1.00	0	0	0	0	NO_COMMENT
009458613-02	OBS	PC	1.00	0	0	0	0	NO_COMMENT
009458613-03	OBS	PC	1.00	0	0	0	0	NO_COMMENT
009458613-04	OBS	PC	1.00	0	0	0	0	NO_COMMENT
009458613-05	OBS	PC	1.00	0	0	0	0	NO_COMMENT

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

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

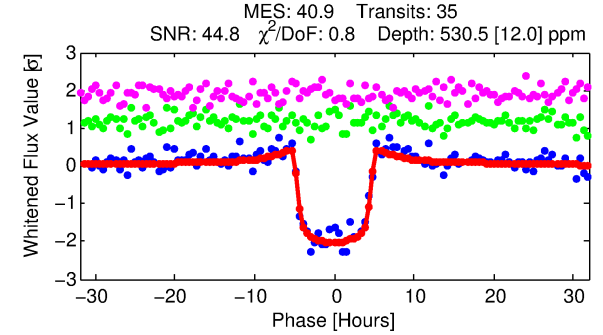
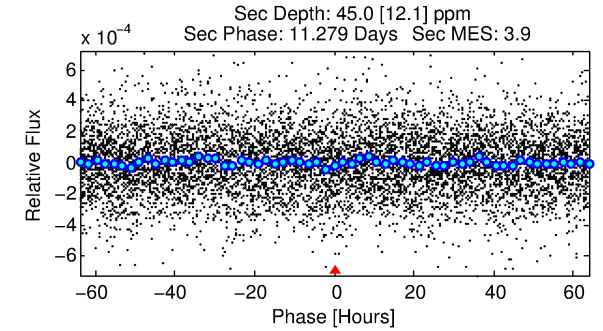
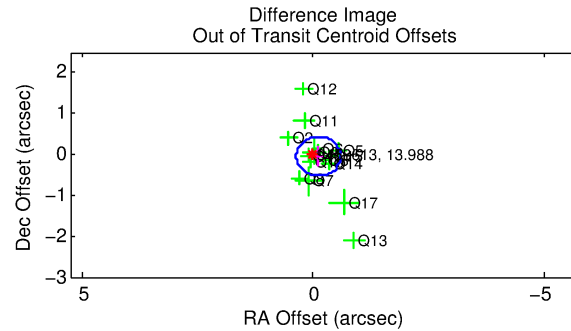
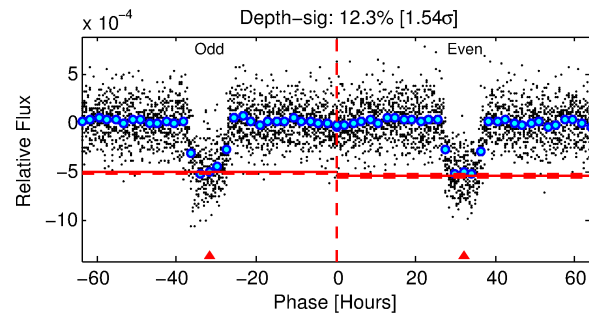
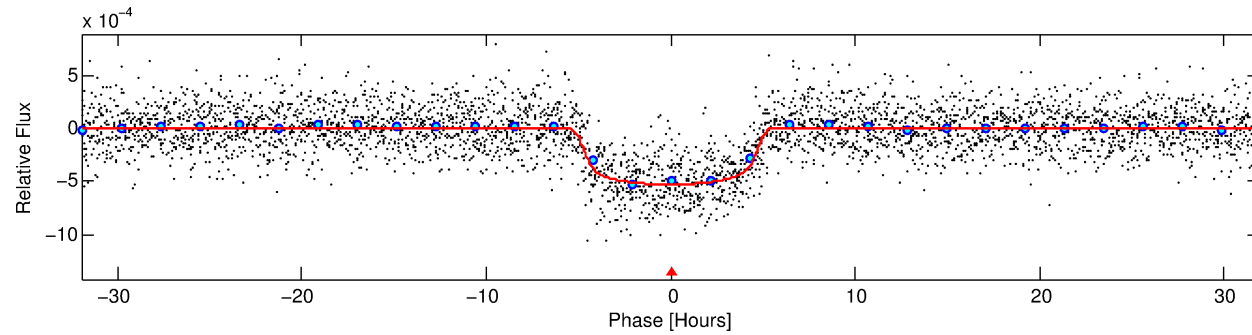
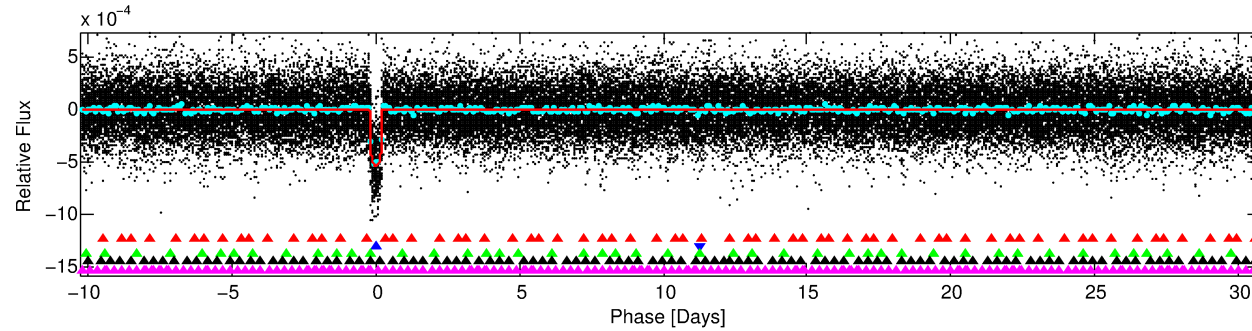
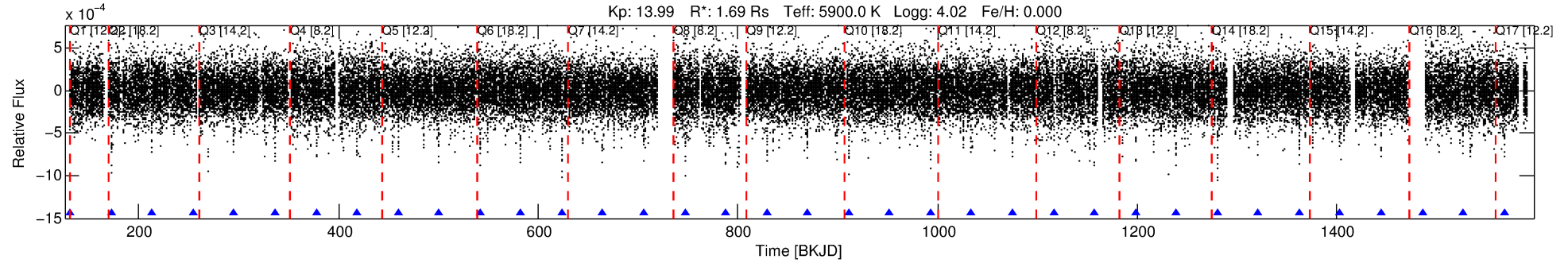
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 009458613-02

No Significant Match Found

# DV One-Page Summary

KIC: 9458613 Candidate: 2 of 5 Period: 41.028 d  
KOI: K00707.02 Name: Kepler-33f Corr: 0.966



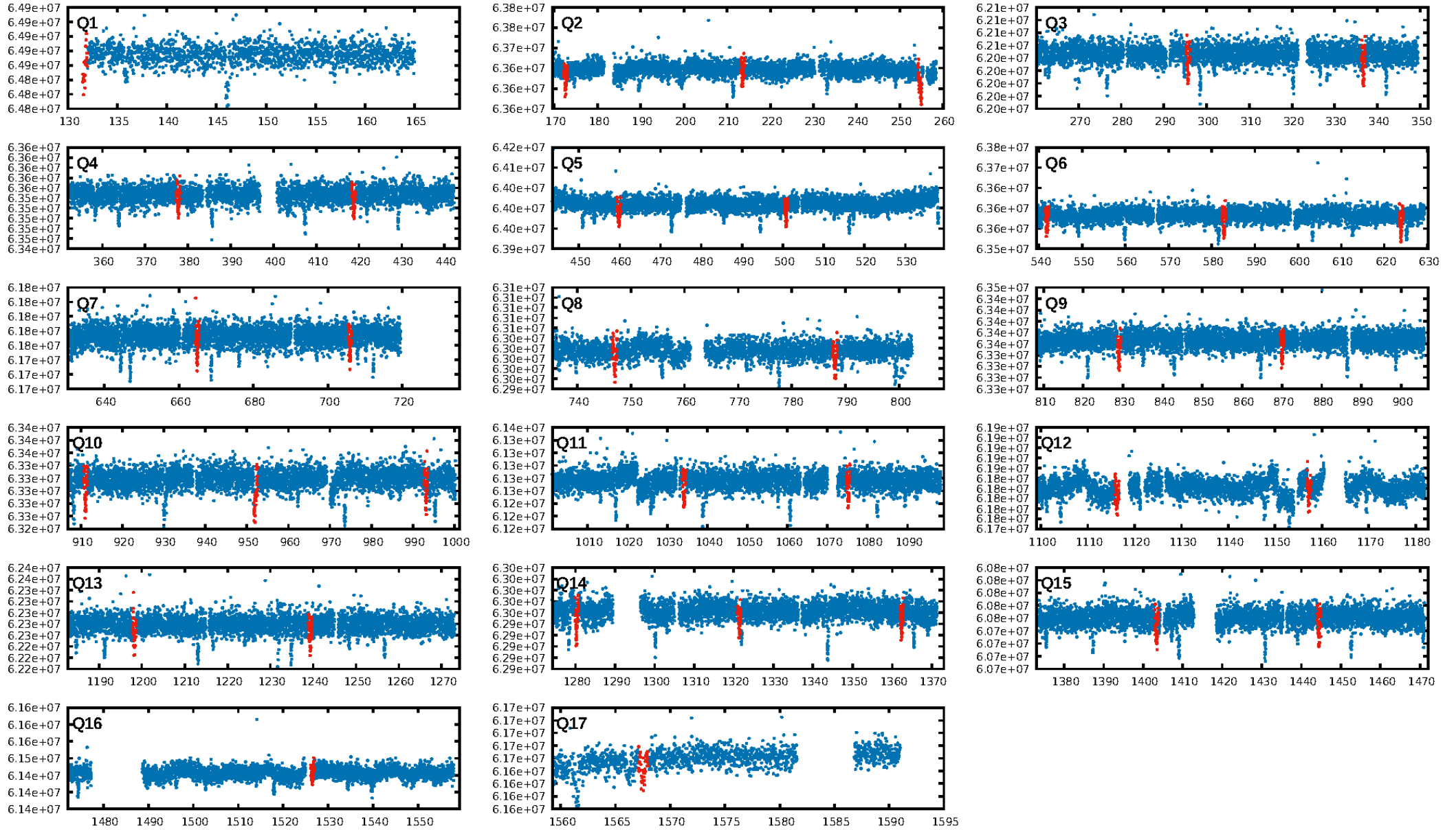
## DV Fit Results:

Period = 41.02781 [0.00020] d  
Epoch = 131.5558 [0.0039] BKJD  
Rp/R\* = 0.0248 [0.0006]  
a/R\* = 14.83 [1.53]  
b = 0.89 [0.02]  
Seff = 53.89 [18.89]  
Teff = 691 [61] K  
Rp = 4.59 [1.14] Re  
a = 0.2405 [0.0535] AU  
Ag = 67.93 [29.76] [2.25 $\sigma$ ]  
Teffp = 3067 [219] K [10.46 $\sigma$ ]

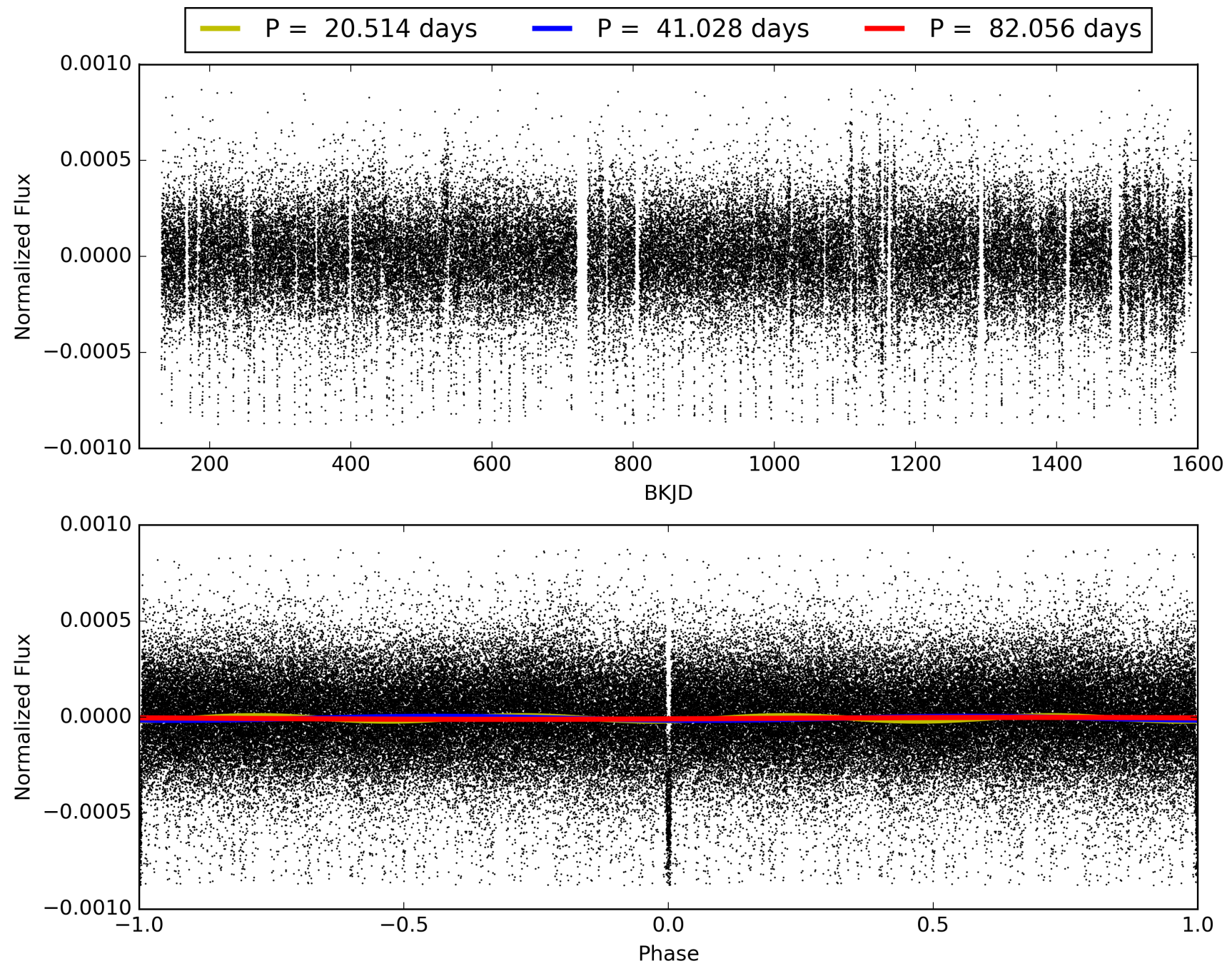
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [15.64 $\sigma$ ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: 61.7%  
ModelChiSquareGof-sig: 100.0%  
Bootstrap-pfa: 0.00e+00  
RollingBand-fgt: 1.00 [33/33]  
GhostDiagnostic-chr: 5.365  
Centroid-sig: 98.8%  
Centroid-so: 0.126 arcsec [0.58 $\sigma$ ]  
OotOffset-rm: 0.127 arcsec [0.79 $\sigma$ ]  
KicOffset-rm: 0.119 arcsec [0.53 $\sigma$ ]  
OotOffset-st: 4/4/3/4 [15]  
KicOffset-st: 4/4/3/4 [15]  
DiffImageQuality-fgm: 1.00 [15/15]  
DiffImageOverlap-fno: 0.67 [10/15]

# TCE 009458613-02, PDC Light Curves

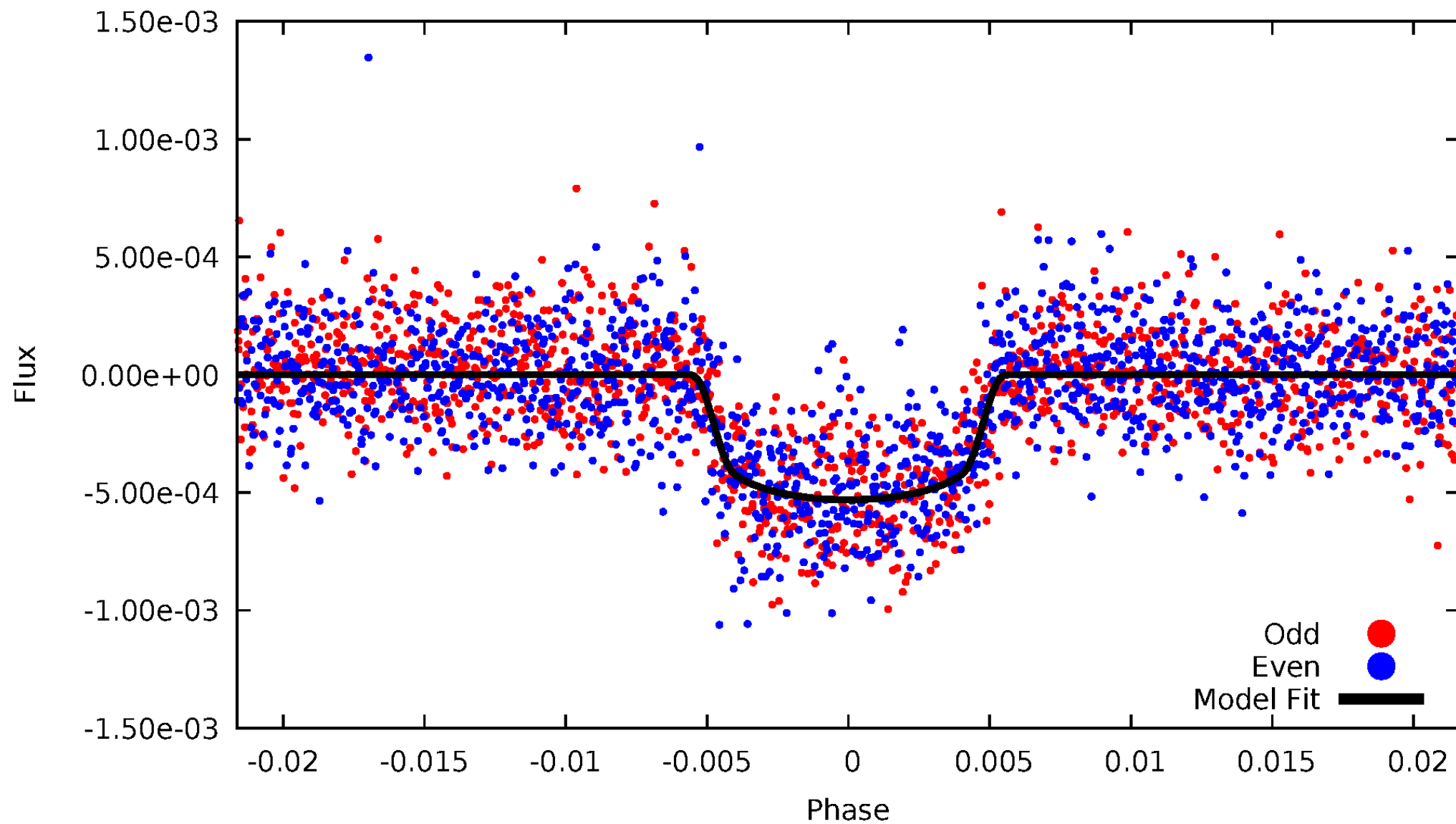


TCE 009458613-02



# DV Odd/Even

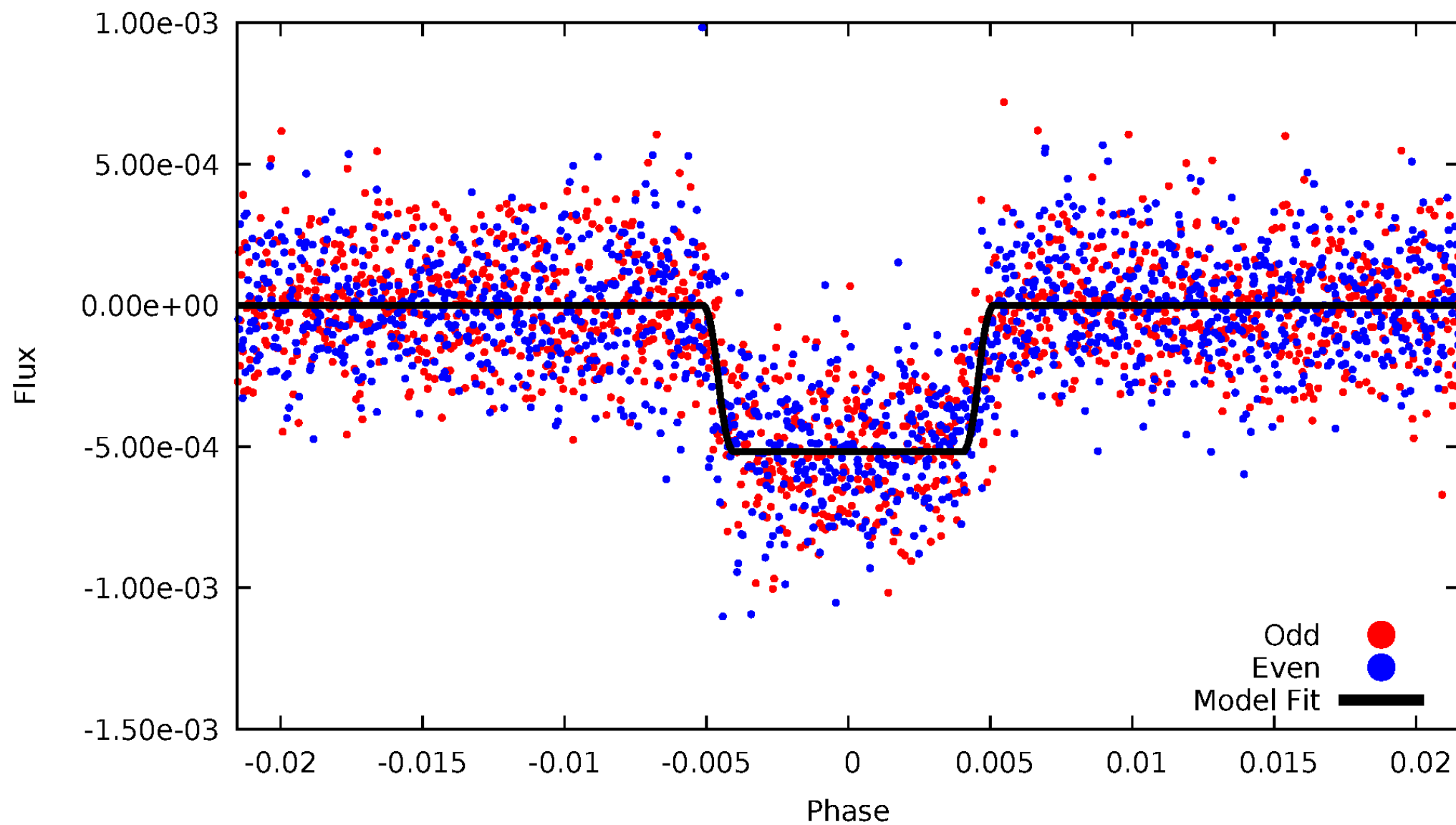
TCE 009458613-02





# ALT Odd/Even

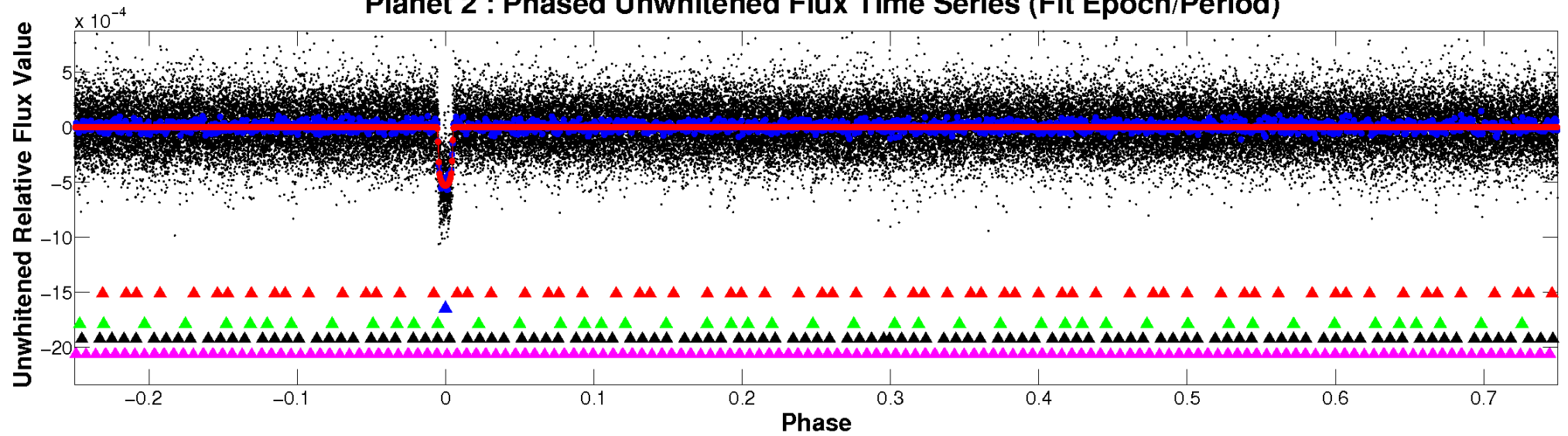
TCE 009458613-02



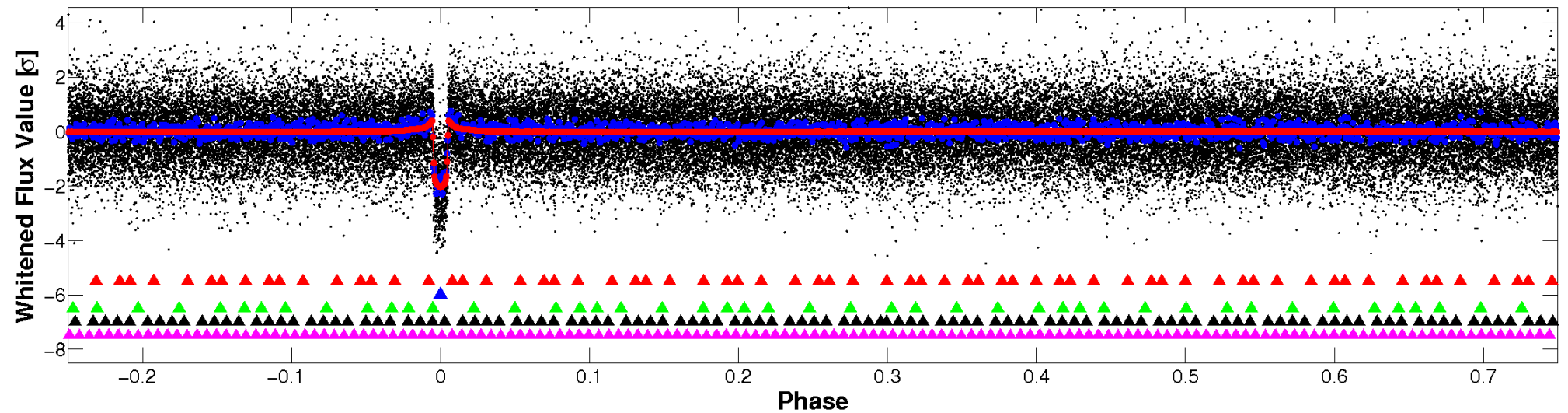


# Non-Whitened Vs. Whitened Light Curve

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

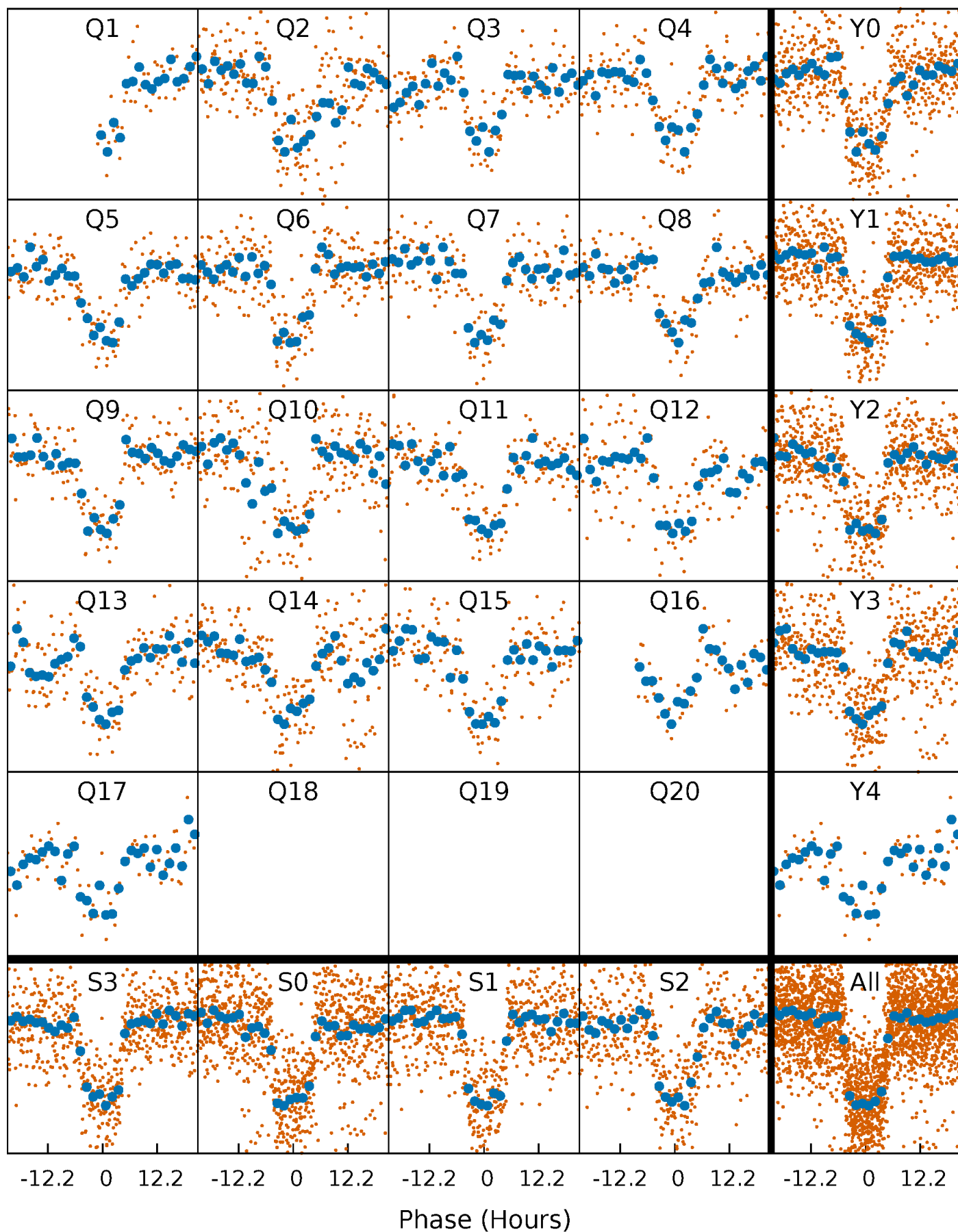


## Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



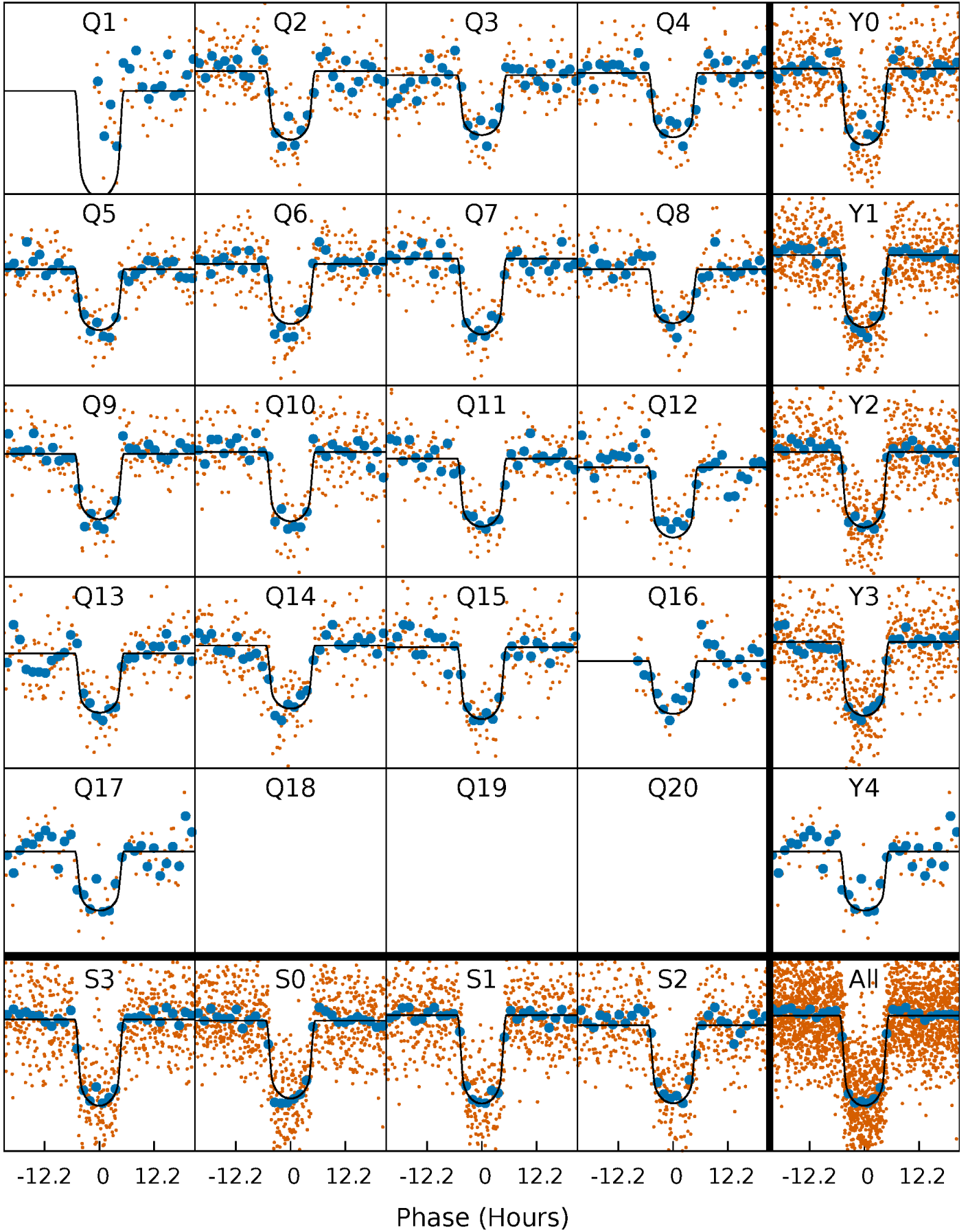
# PDC Quarter-Phased Transit Curves

TCE 009458613-02 P= 41.027810 Days  $T_0=131.555832$  (BKJD)



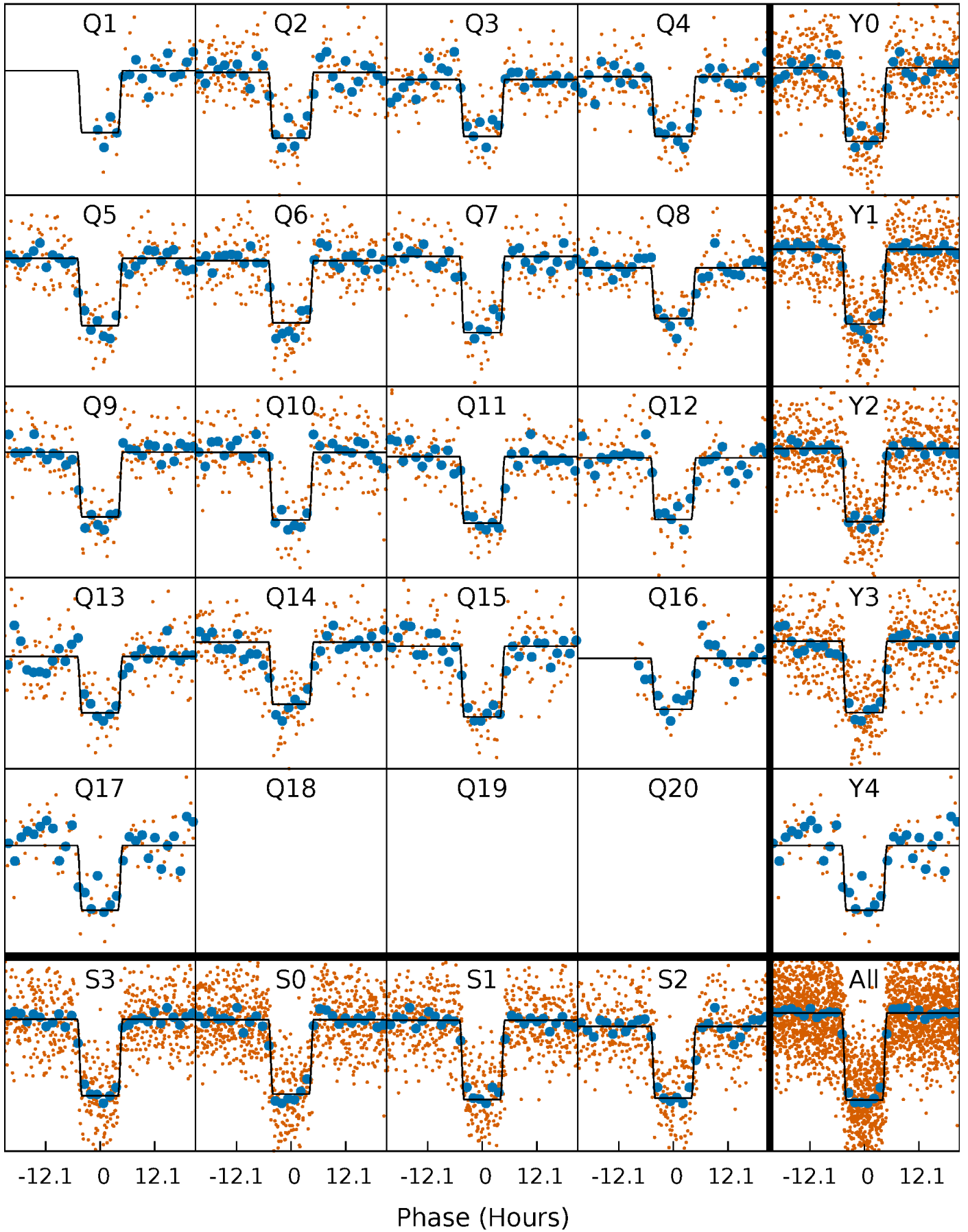
# DV Quarter-Phased Transit Curves

TCE 009458613-02 P= 41.027810 Days  $T_0=131.555832$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

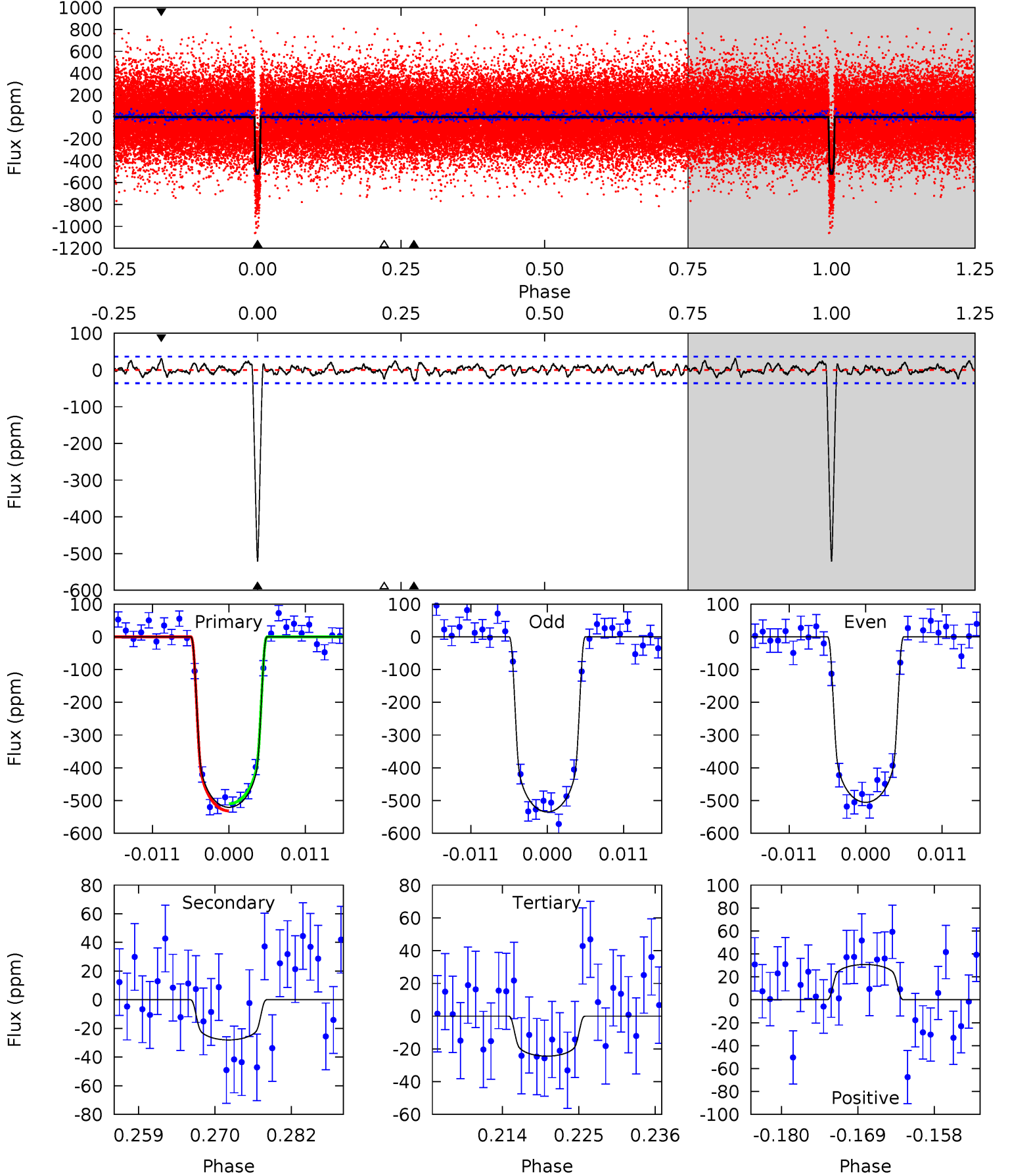
TCE 009458613-02   P= 41.027345 Days    $T_0=131.562975$  (BKJD)



# DV Model-Shift Uniqueness Test

009458613-02, P = 41.027810 Days, E = 90.528022 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
72.1	3.88	3.38	4.26	5.00	2.53	1.27	68.7	67.8	0.50	-0.37	2.03	0.89	0.06	1.51

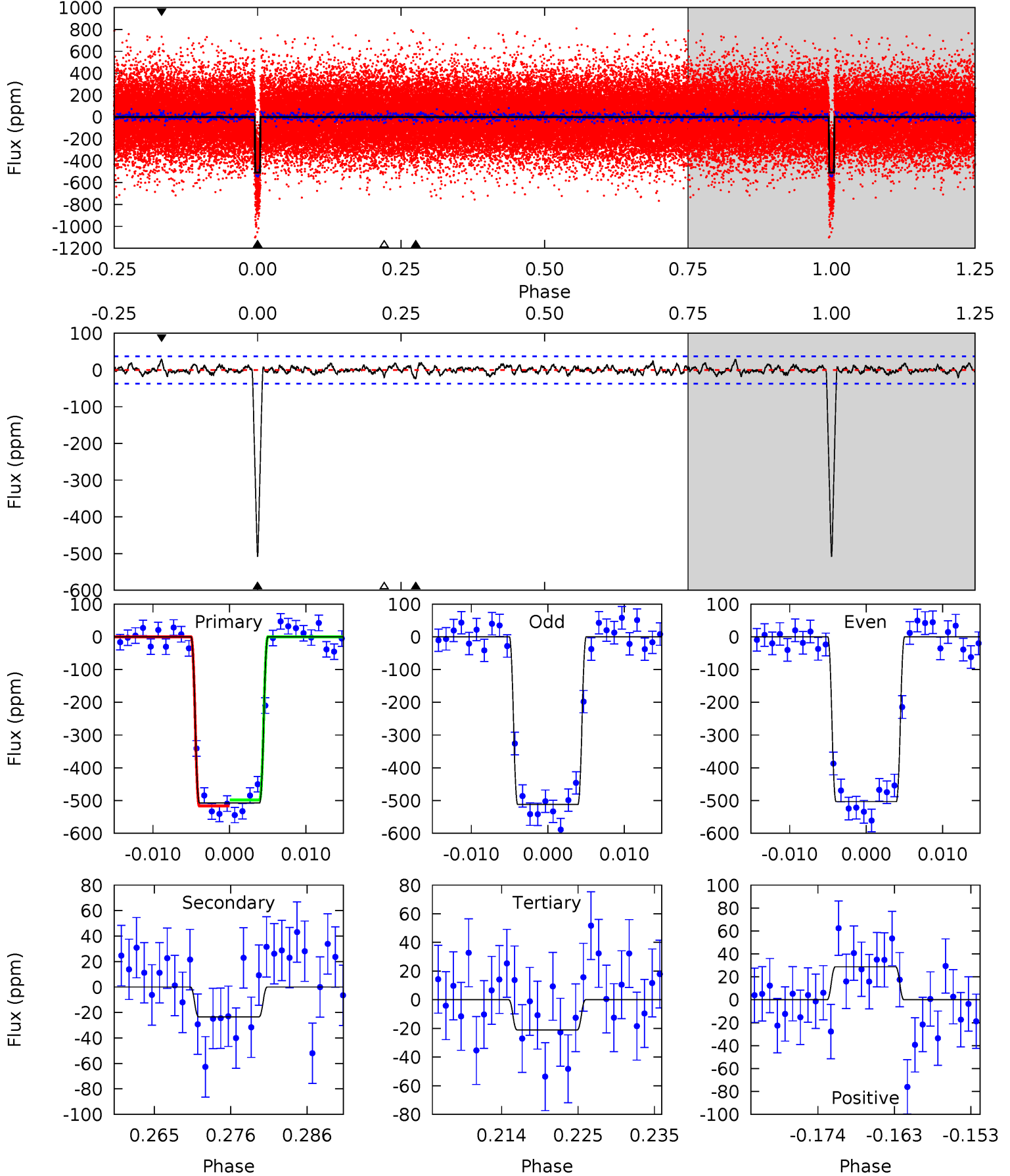




# Alt Model-Shift Uniqueness Test

009458613-02, P = 41.027345 Days, E = 90.535630 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
68.2	3.15	2.83	3.87	5.02	2.57	0.99	65.4	64.4	0.33	-0.71	0.58	0.98	0.05	1.20





### Stellar Parameters For KIC 009458613

	$T_{\text{eff}} (K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M (M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$5900^{+117}_{-117}$	$4.022^{+0.195}_{-0.090}$	$0.000^{+0.150}_{-0.150}$	$1.694^{+0.257}_{-0.418}$	$1.100^{+0.124}_{-0.112}$	$0.319^{+0.351}_{-0.086}$
	+2%/-2%	+5%/-2%	+inf%/-inf%	+15%/-25%	+11%/-10%	+110%/-27%
Source	SPE35	SPE35	SPE35	DSEP		

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

### Secondary Eclipse Parameters for KIC 009458613-02 / KOI 0707.02

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-28 \pm 7$	$4.56^{+0.45}_{-0.50}$	$960^{+47}_{-58}$	$3276^{+134}_{-140}$	$44^{+16}_{-12}$
Alt.	$-23 \pm 7$	$4.17^{+0.39}_{-0.51}$	$959^{+42}_{-57}$	$3277^{+152}_{-198}$	$43^{+19}_{-16}$

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

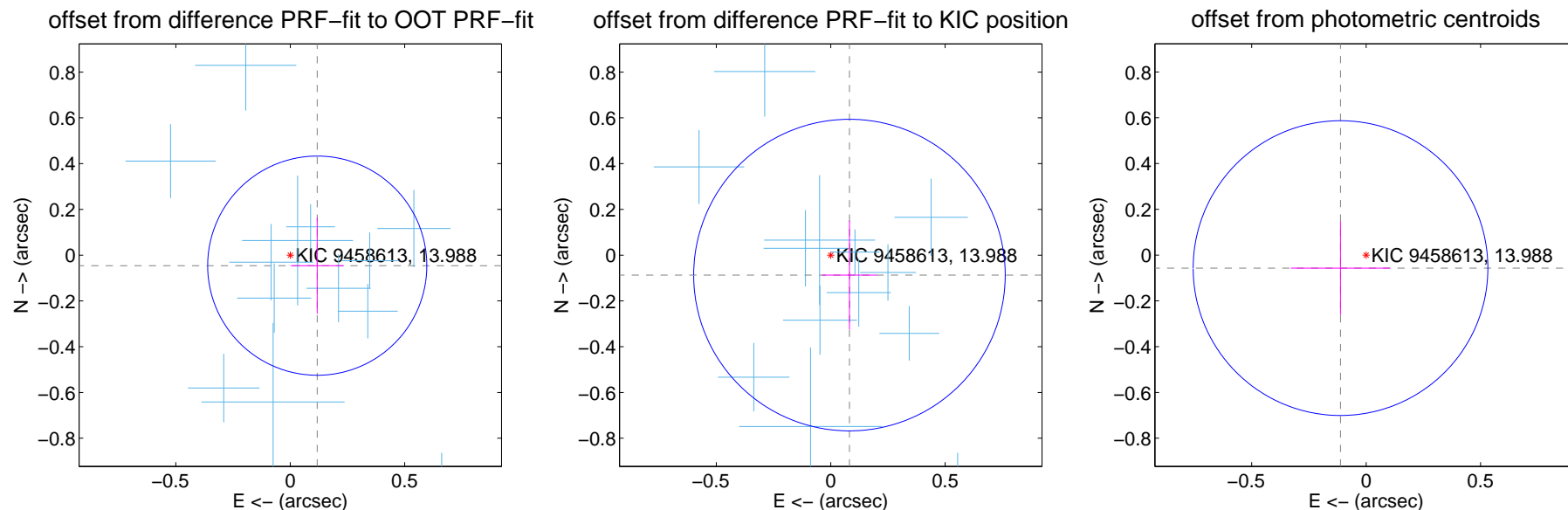
## DV Centroid Data

Supplemental centroid analysis for 009458613-02. Kepler magnitude: 13.99. Transit SNR 44.75

There are 15 quarters with good PRF difference image offsets

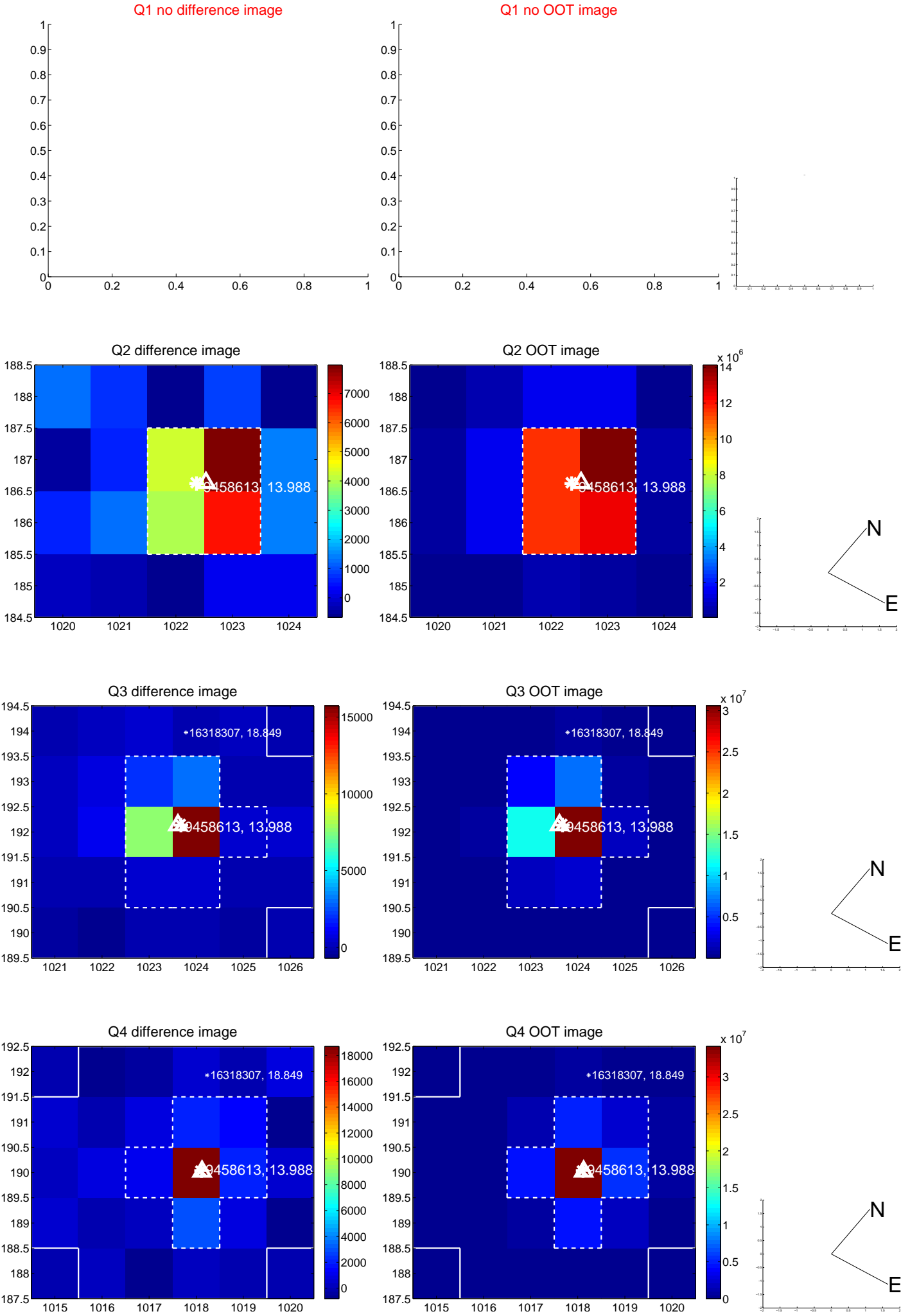
The direct PRF centroid is offset from the target star catalog position by about 0.11 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.127 \pm 0.160$	0.79	$-0.118 \pm 0.116$	$-0.046 \pm 0.210$
PRF-fit source offset from KIC position	$0.119 \pm 0.227$	0.53	$-0.082 \pm 0.120$	$-0.087 \pm 0.238$
photometric centroid source offset	$0.13 \pm 0.21$	0.58	$0.11 \pm 0.22$	$-0.06 \pm 0.20$

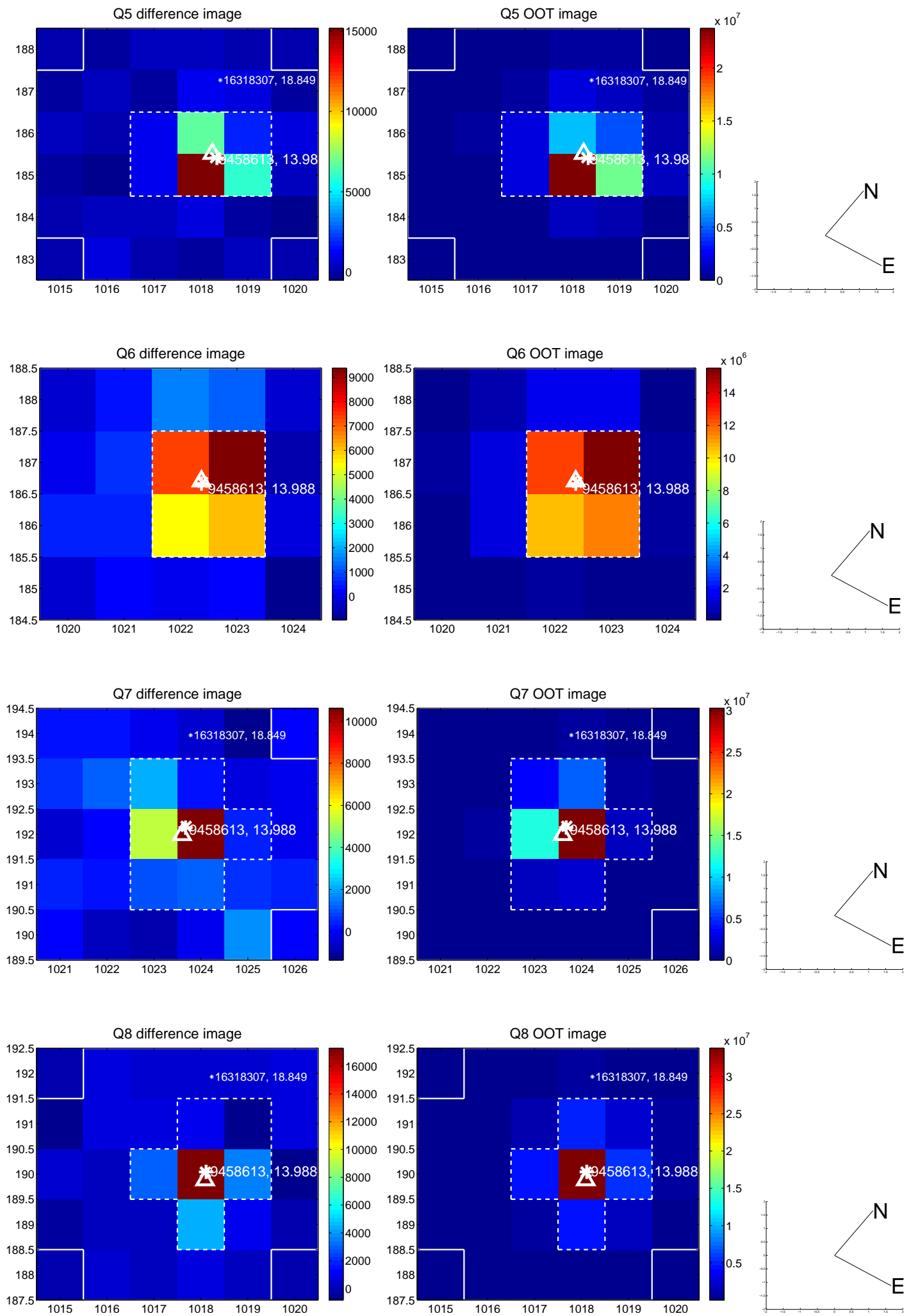


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses:** good quarterly centroid offsets; **Vermillion crosses:** bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

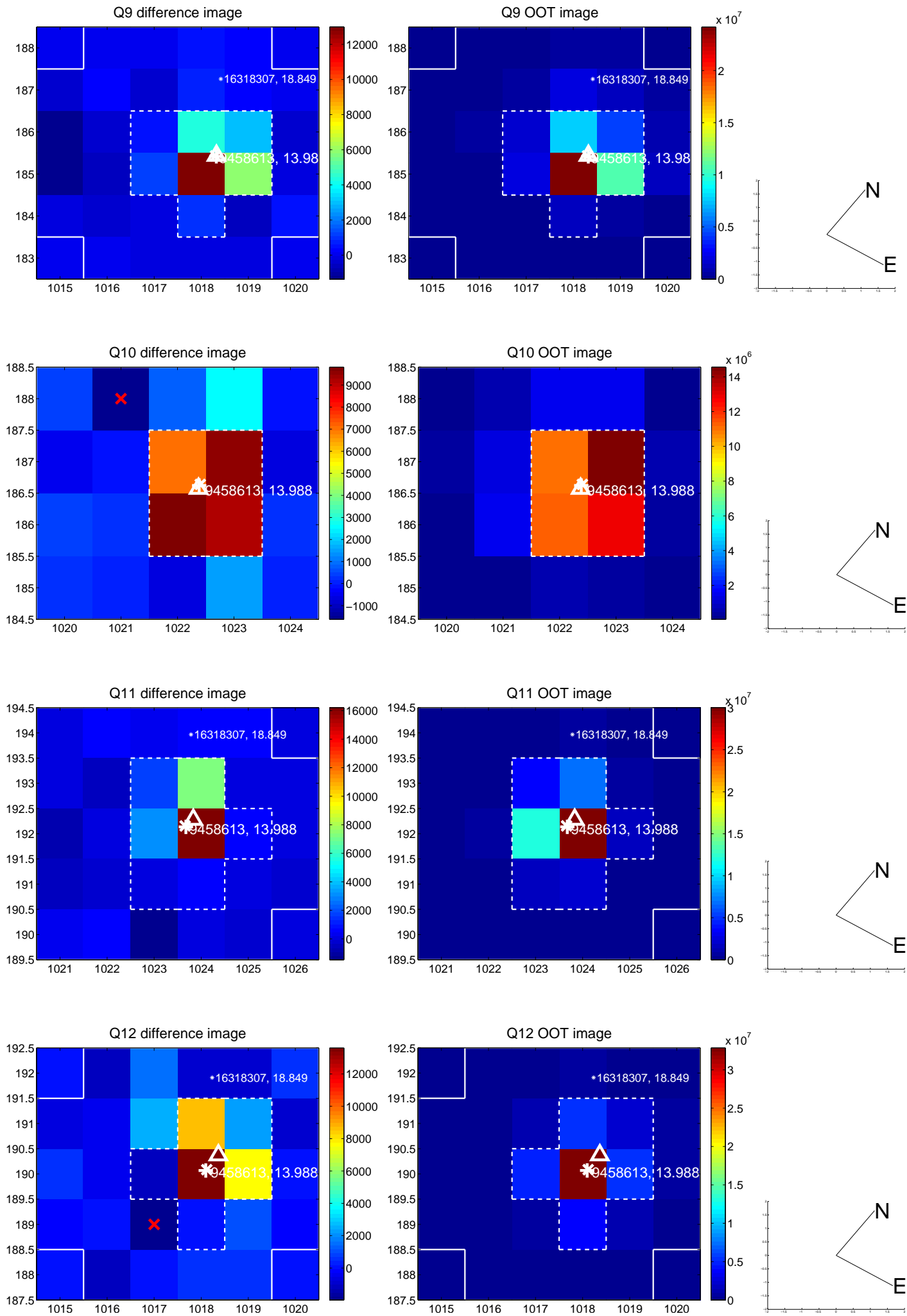
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



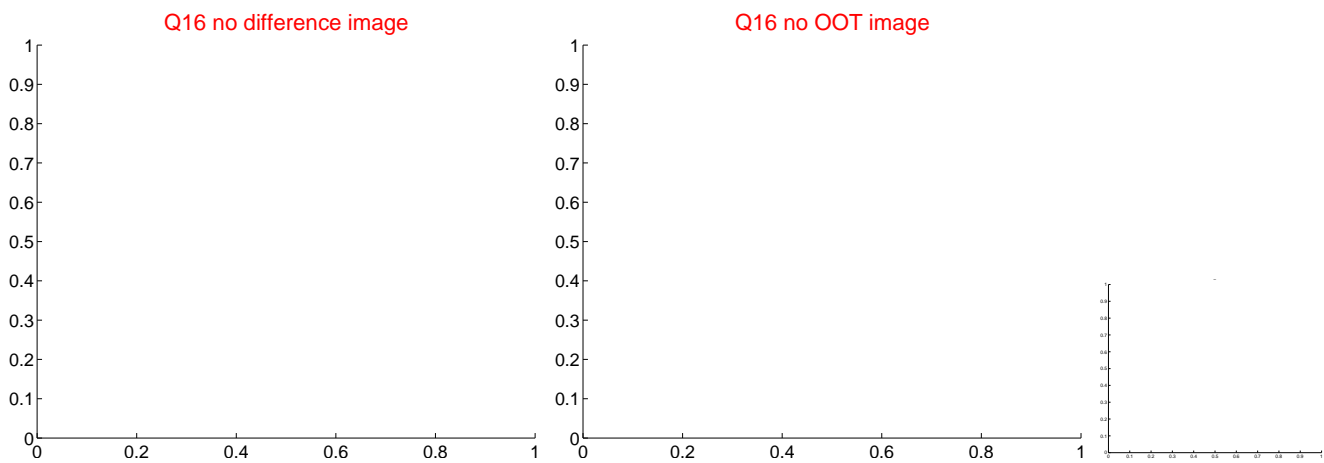
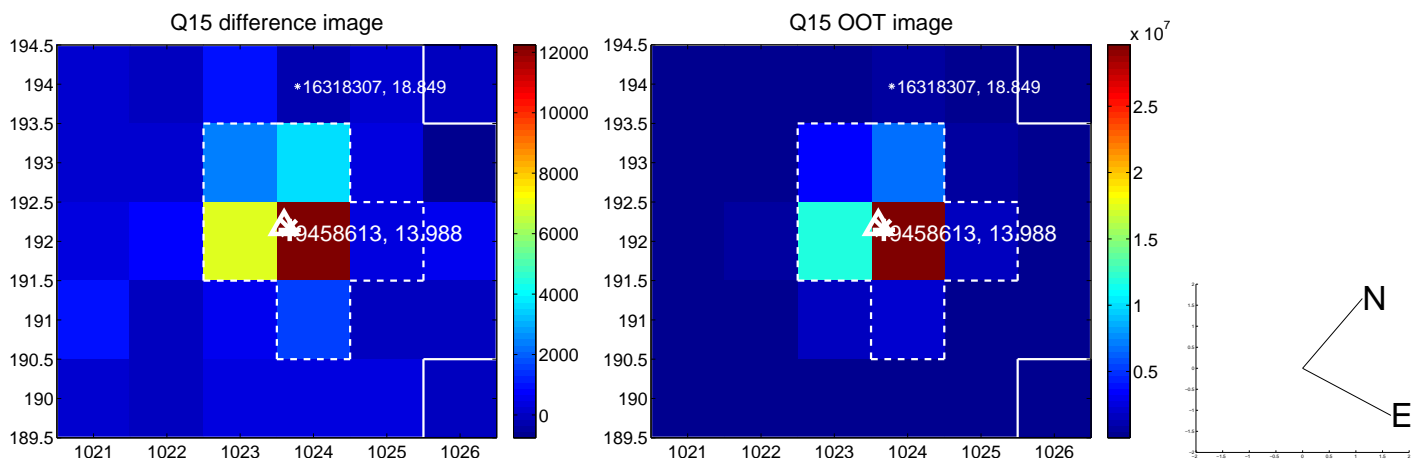
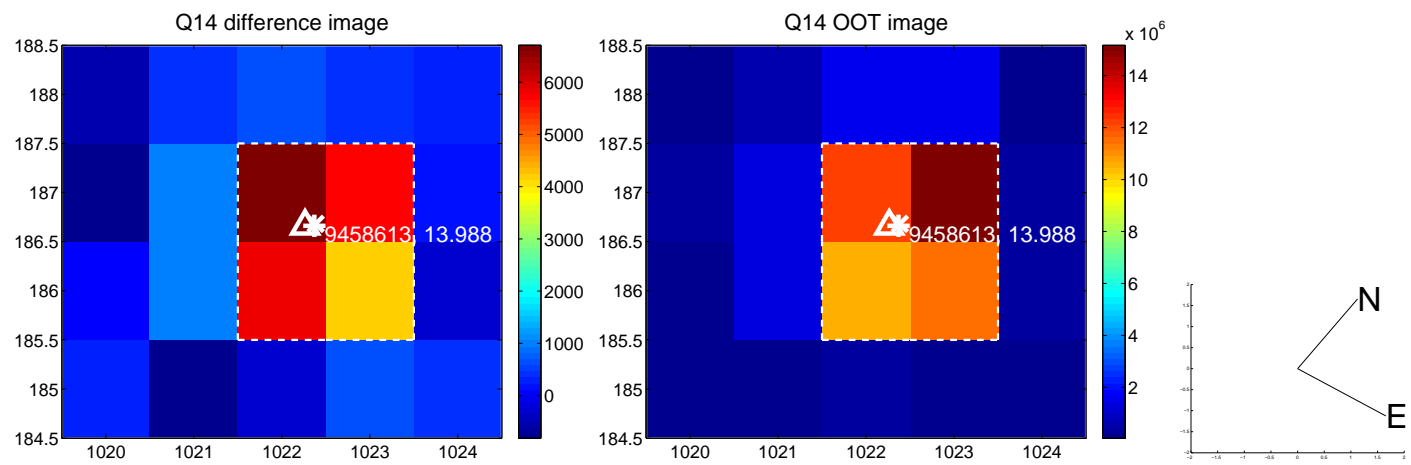
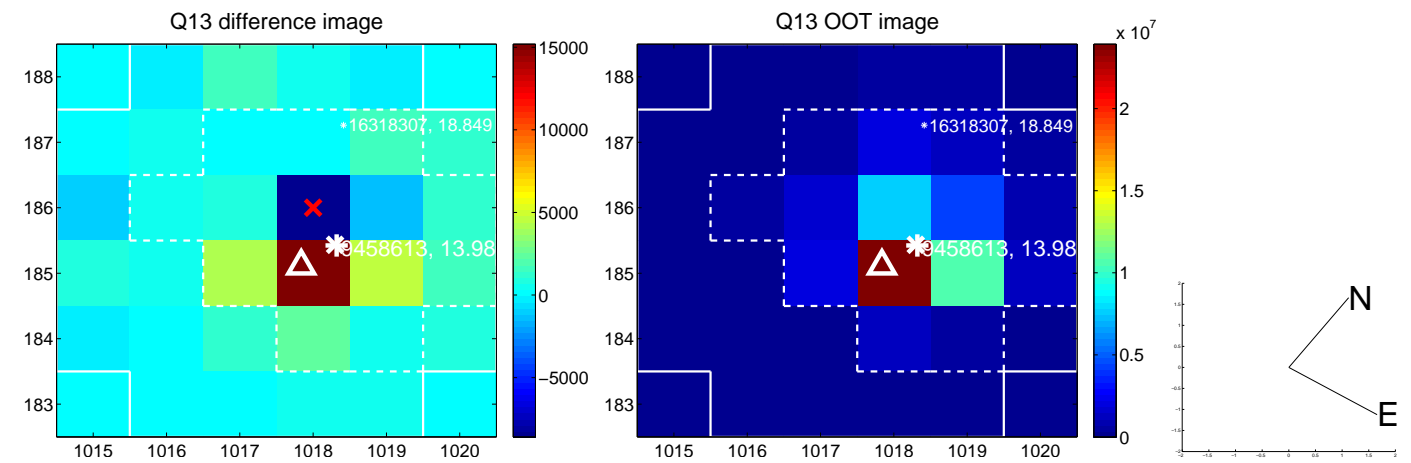
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



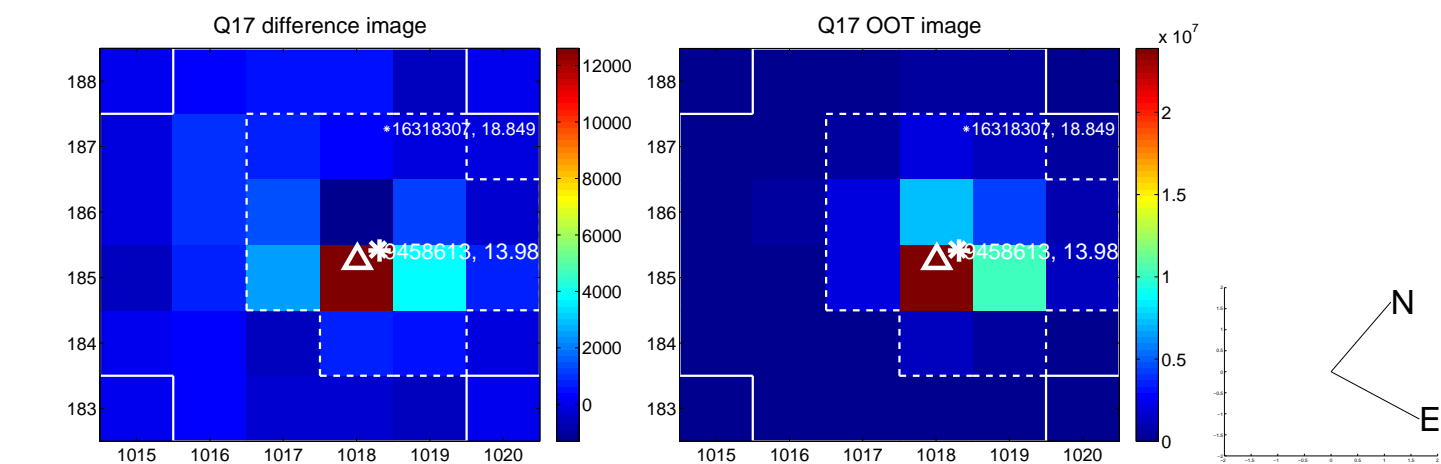
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



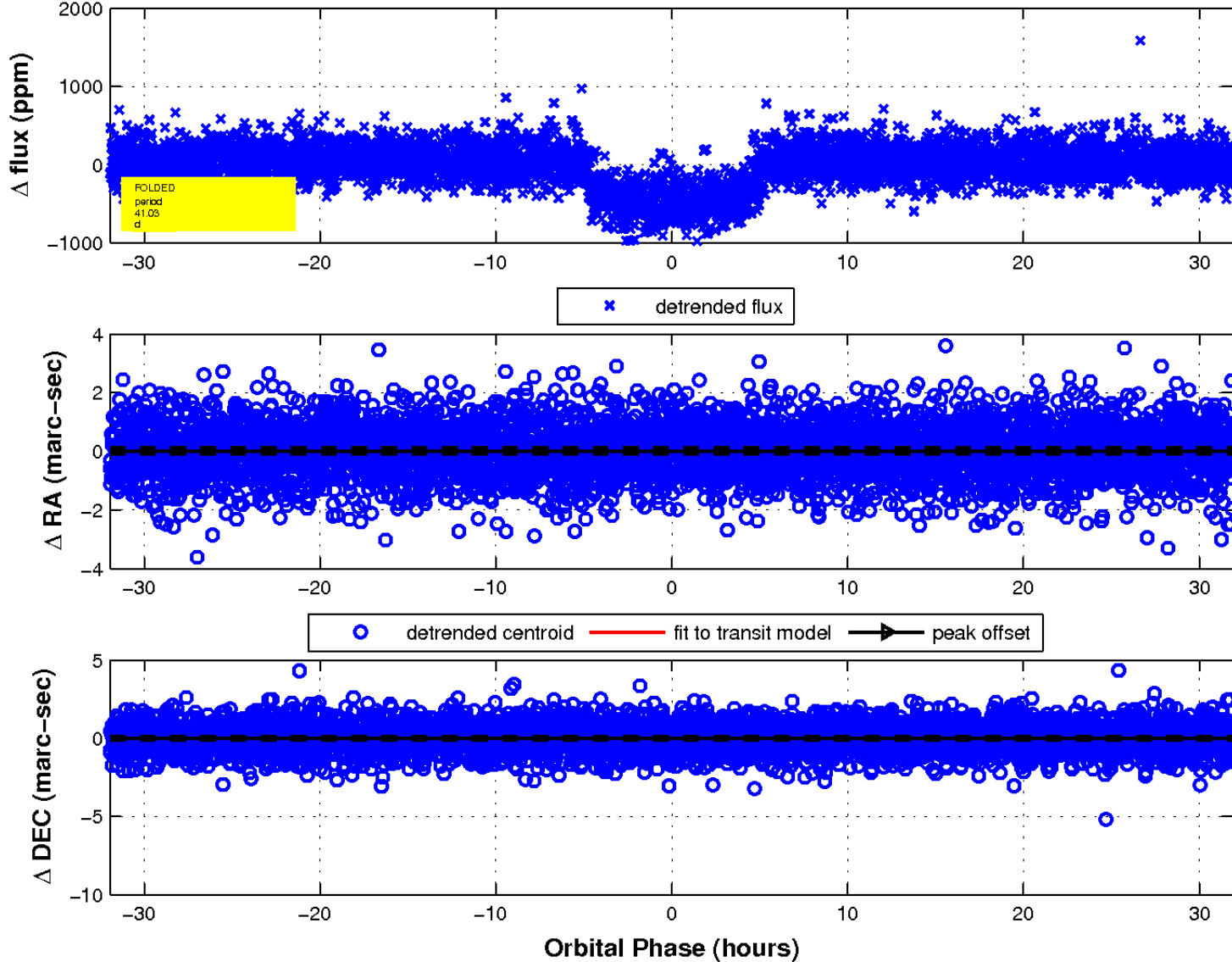
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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



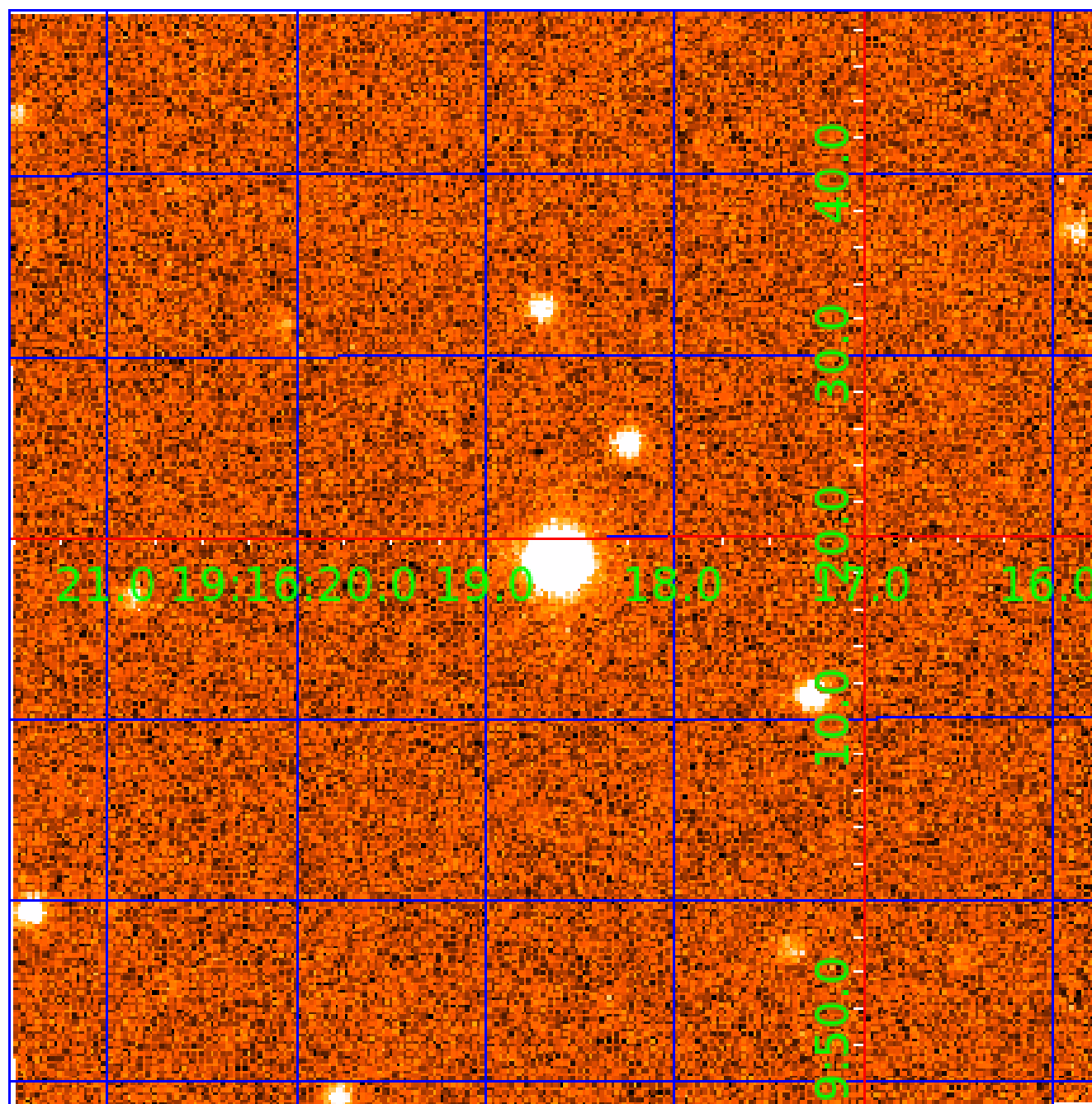
fluxWeightedCentroids, Planet 2 of 5





# UKIRT Image

Declination



# KIC 009458613

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
009458613-01	OBS	0707.01	21.775671	146.087479	796.7	8.095	77.6	81.9	1.69	5900	5.08	125.40
009458613-02	OBS	0707.02	41.027810	131.555832	530.5	10.645	40.9	44.8	1.69	5900	4.59	53.89
009458613-03	OBS	0707.03	31.784855	135.867715	439.3	9.372	39.8	42.8	1.69	5900	4.16	75.73
009458613-04	OBS	0707.04	13.175544	143.678839	281.1	6.754	34.9	39.6	1.69	5900	3.11	245.03
009458613-05	OBS	0707.05	5.668163	131.887260	80.7	4.838	13.9	15.2	1.69	5900	1.69	754.49

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009458613-01	OBS	PC	1.00	0	0	0	0	NO_COMMENT
009458613-02	OBS	PC	1.00	0	0	0	0	NO_COMMENT
009458613-03	OBS	PC	1.00	0	0	0	0	NO_COMMENT
009458613-04	OBS	PC	1.00	0	0	0	0	NO_COMMENT
009458613-05	OBS	PC	1.00	0	0	0	0	NO_COMMENT

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

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

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

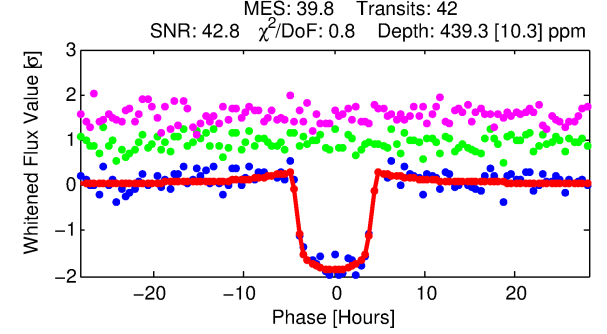
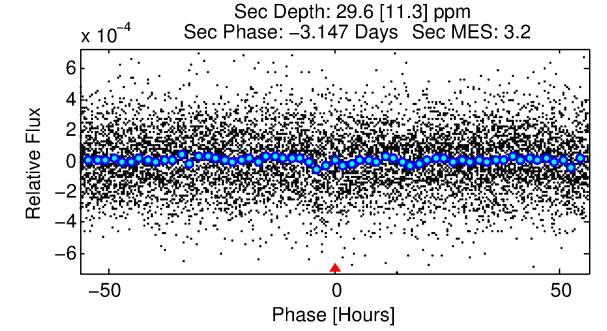
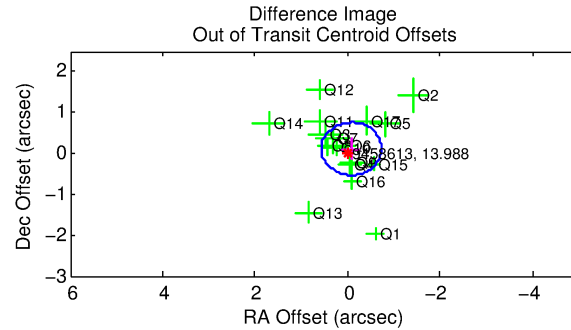
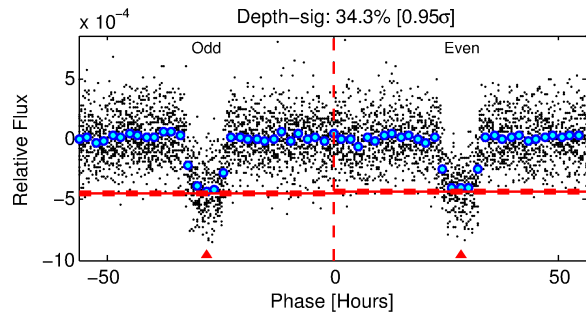
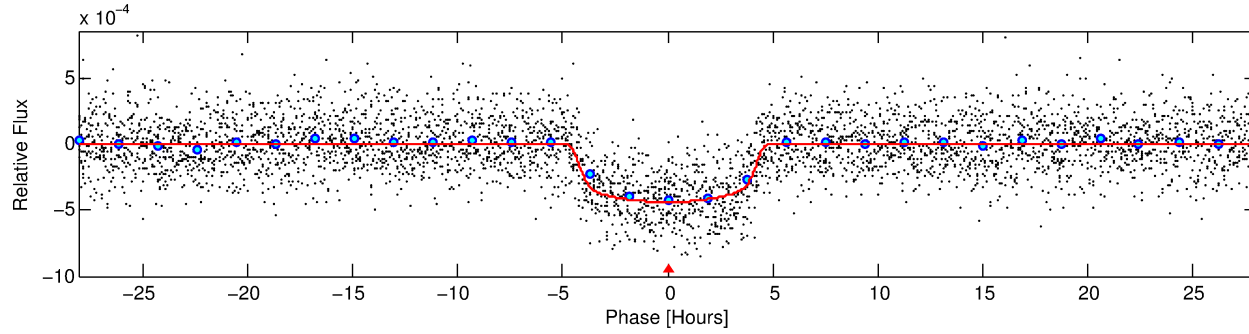
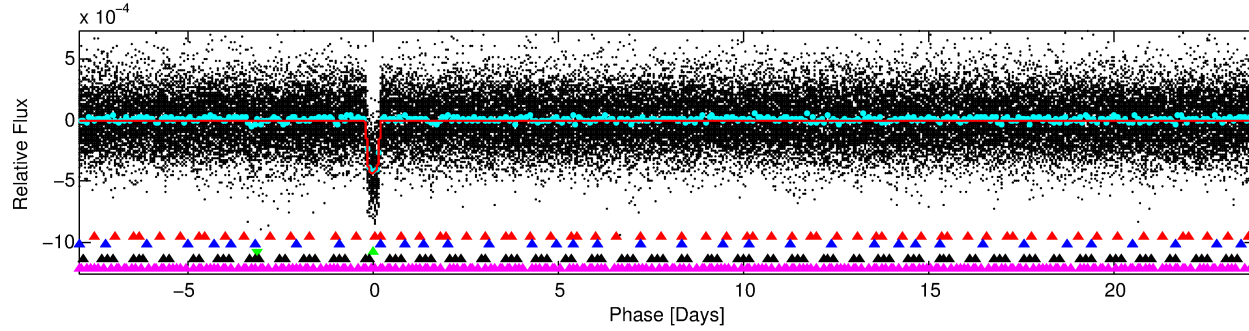
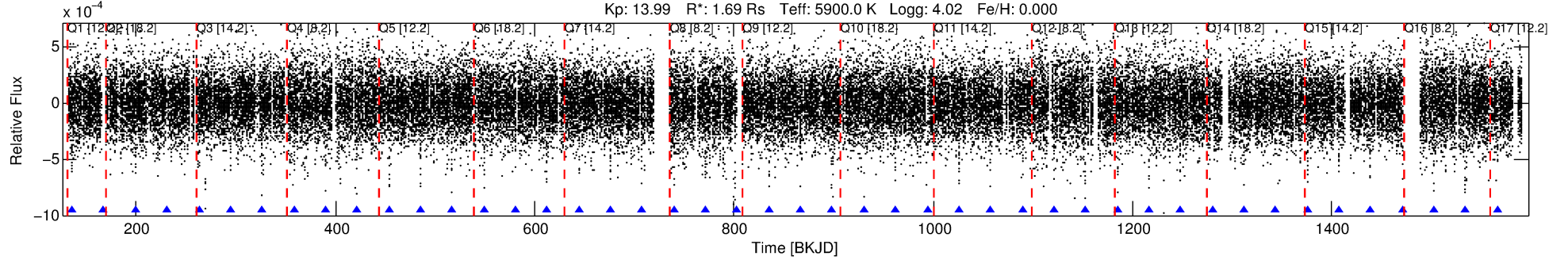
## Ephemeris Match Information For 009458613-03

No Significant Match Found

# DV One-Page Summary

KIC: 9458613 Candidate: 3 of 5 Period: 31.785 d  
KOI: K00707.03 Name: Kepler-33e Corr: 0.969

Kp: 13.99 R\*: 1.69 Rs Teff: 5900.0 K Logg: 4.02 Fe/H: 0.000



## DV Fit Results:

Period = 31.78486 [0.00014] d  
Epoch = 135.8677 [0.0036] BKJD  
Rp/R\* = 0.0225 [0.0007]  
a/R\* = 13.17 [1.82]  
b = 0.89 [0.03]  
Seff = 75.73 [26.56]  
Teq = 752 [66] K  
Rp = 4.16 [1.03] Re  
a = 0.2028 [0.0451] AU  
Ag = 38.77 [20.03] [1.89σ]  
Teffp = 2902 [287] K [7.30σ]

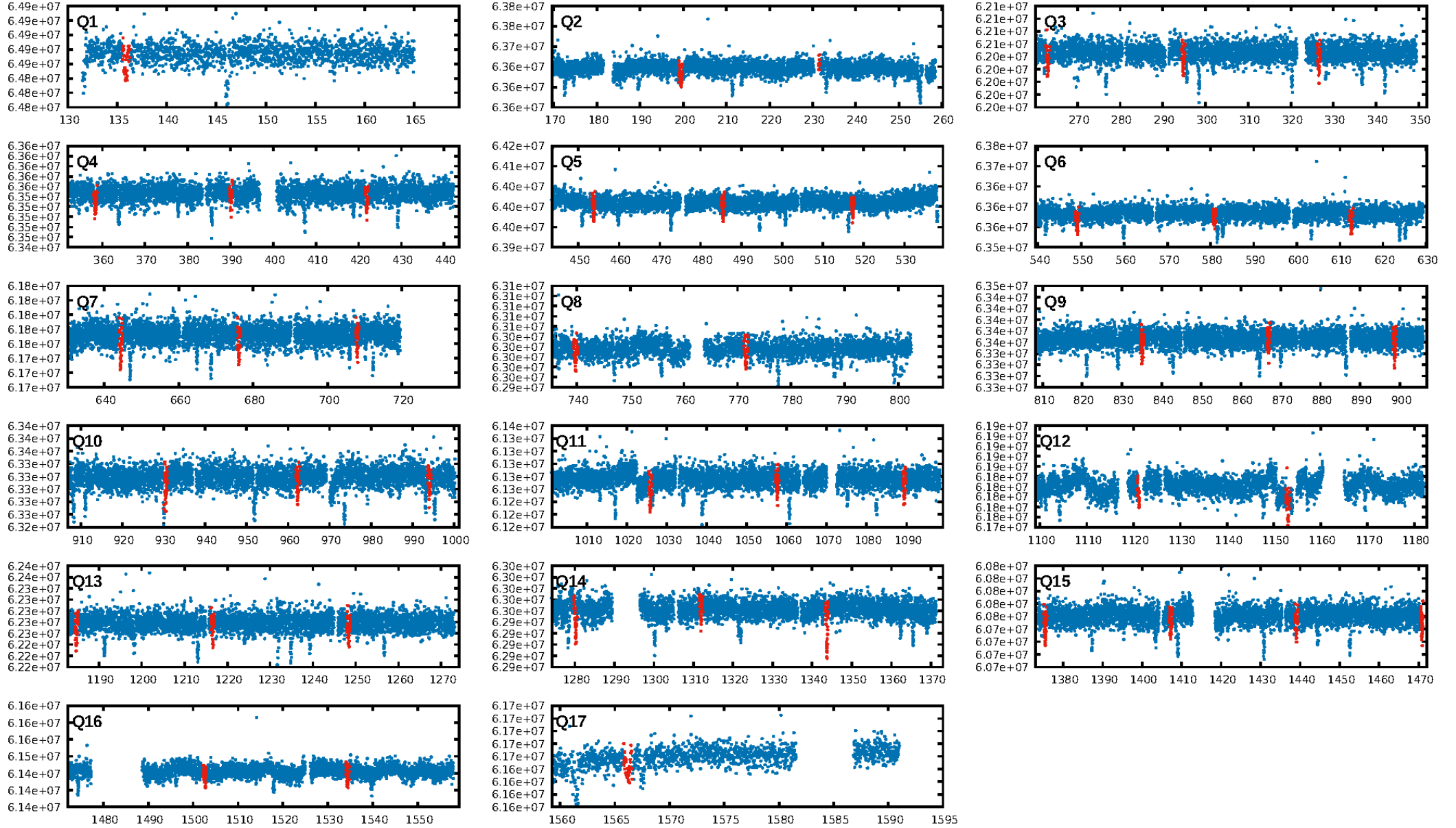
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [19.40σ]  
LongPeriod-sig: 100.0% [15.64σ]  
ModelChiSquare2-sig: 53.7%  
ModelChiSquareGof-sig: 100.0%  
Bootstrap-pfa: 0.00e+00  
RollingBand-fgt: 1.00 [40/40]  
GhostDiagnostic-chr: 4.341  
Centroid-sig: 0.0%  
Centroid-so: 0.839 arcsec [3.41σ]  
OotOffset-rm: 0.137 arcsec [0.63σ]  
KicOffset-rm: 0.086 arcsec [0.40σ]  
OotOffset-st: 4/4/4/5 [17]  
KicOffset-st: 4/4/4/5 [17]  
DiffImageQuality-fgm: 1.00 [17/17]  
DiffImageOverlap-fno: 0.82 [14/17]

Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 29-Jan-2016 17:09:23 Z

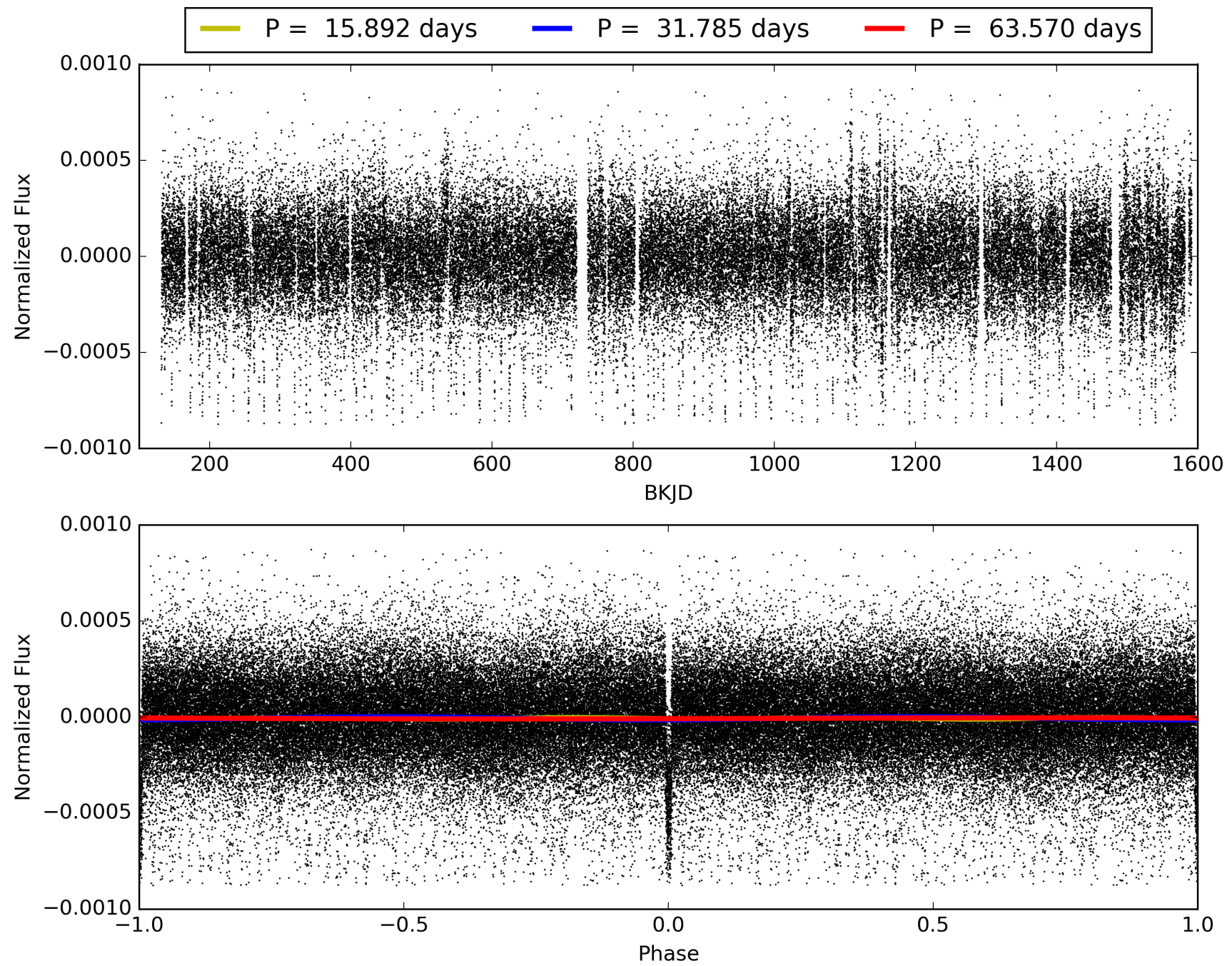
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

# TCE 009458613-03, PDC Light Curves



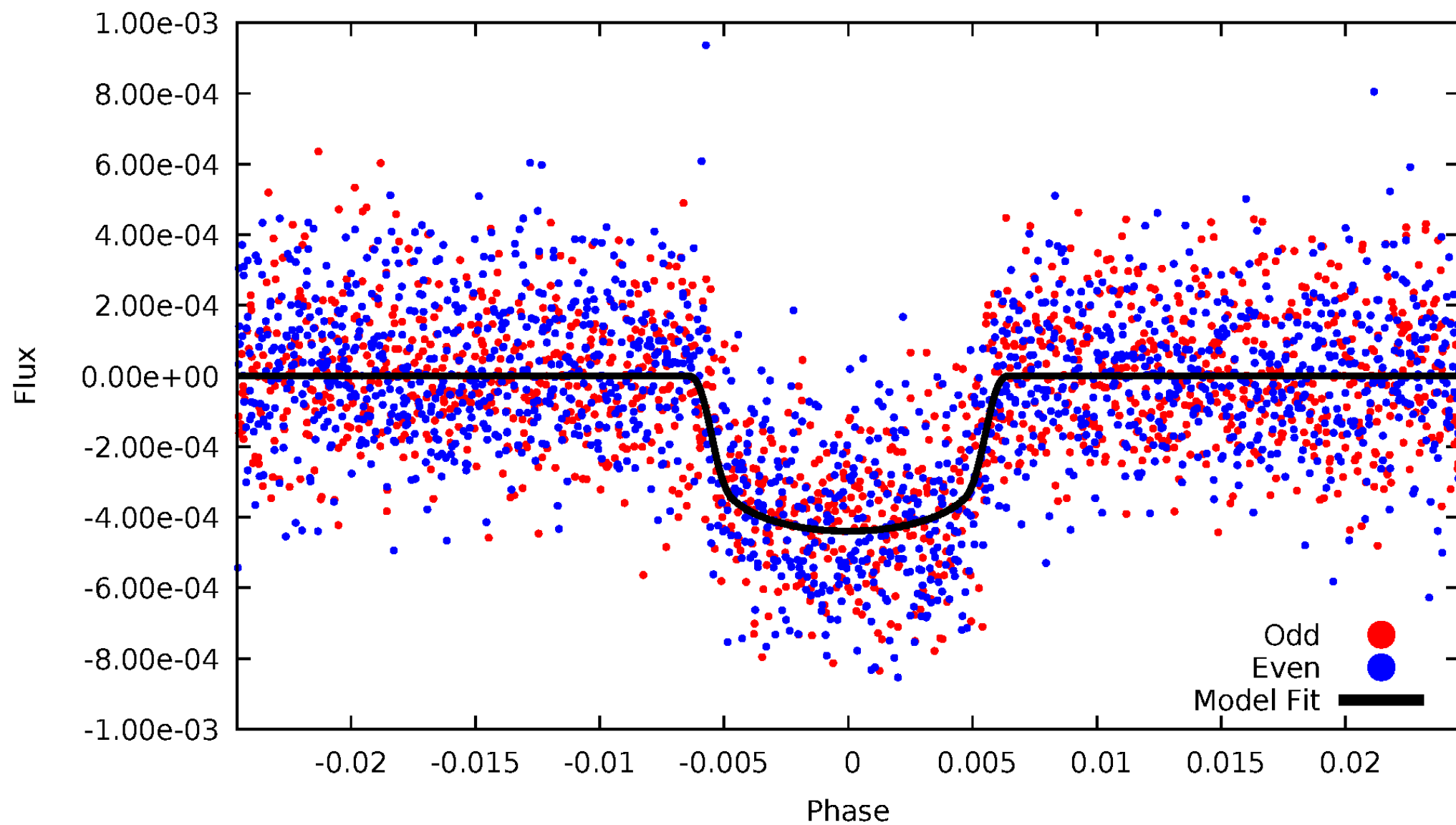


TCE 009458613-03



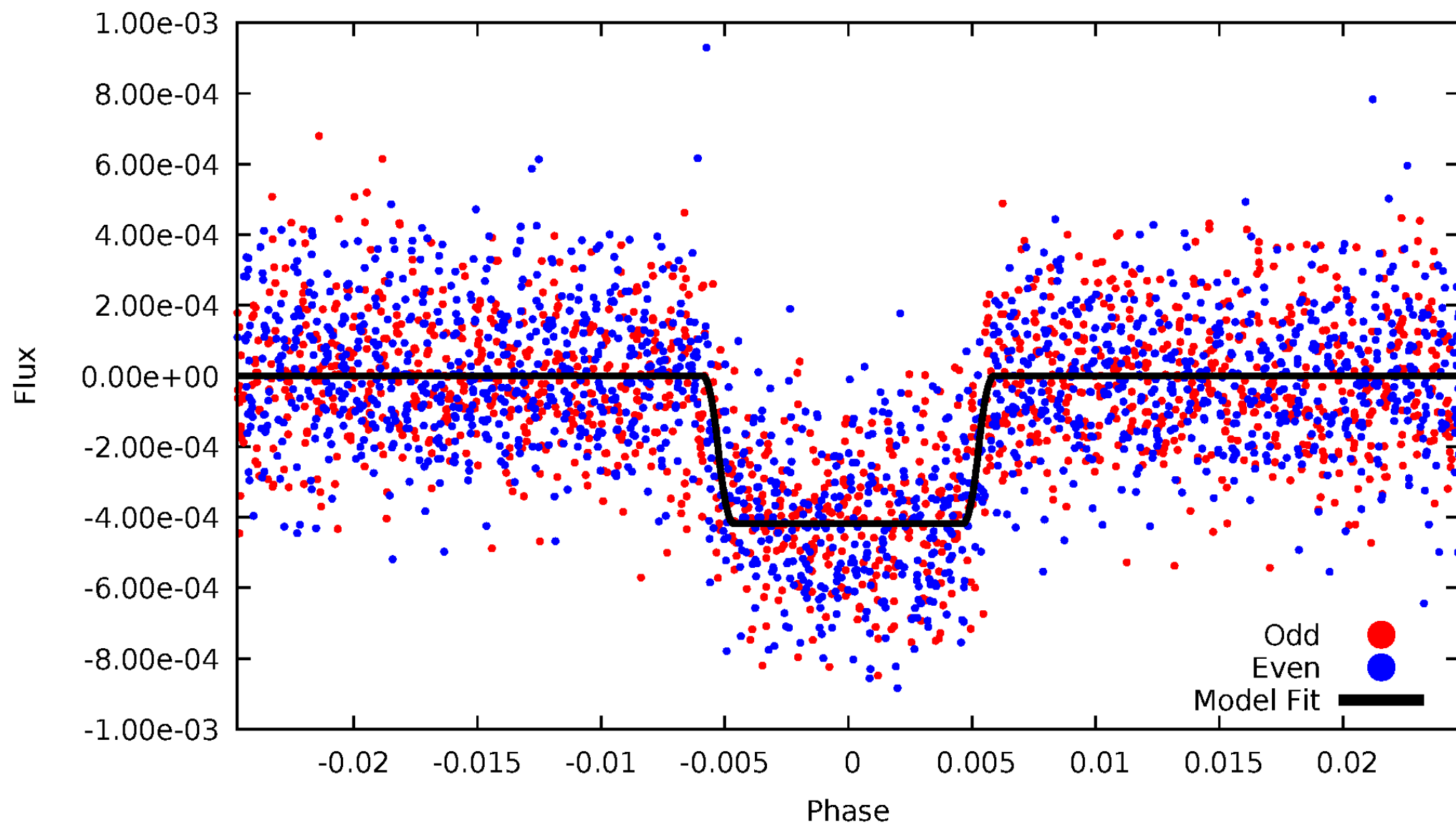
# DV Odd/Even

TCE 009458613-03



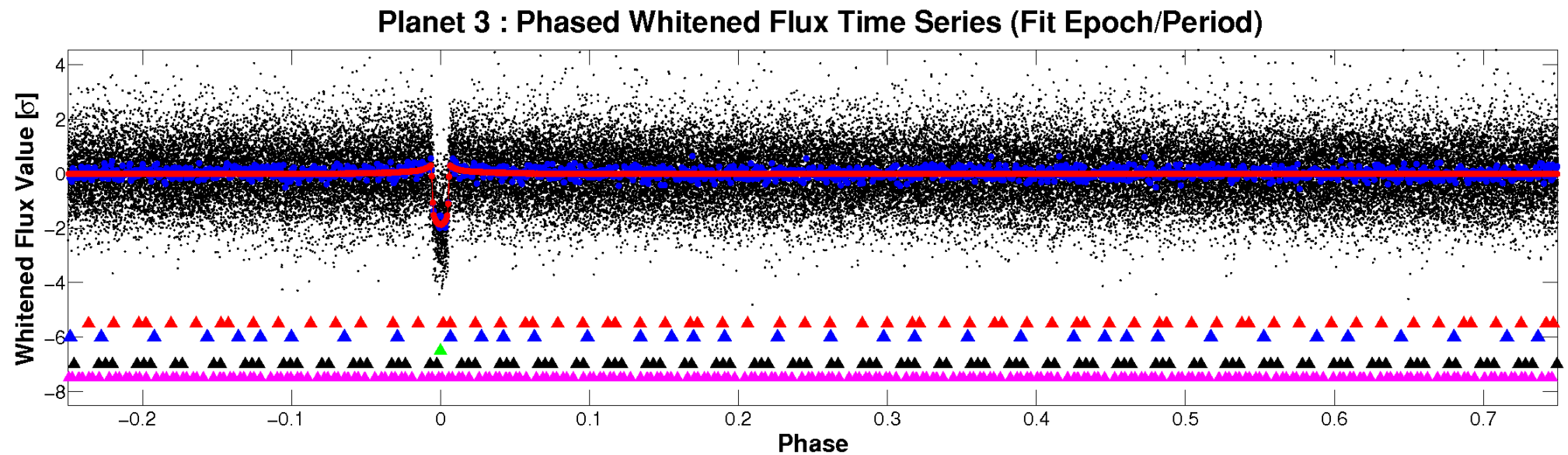
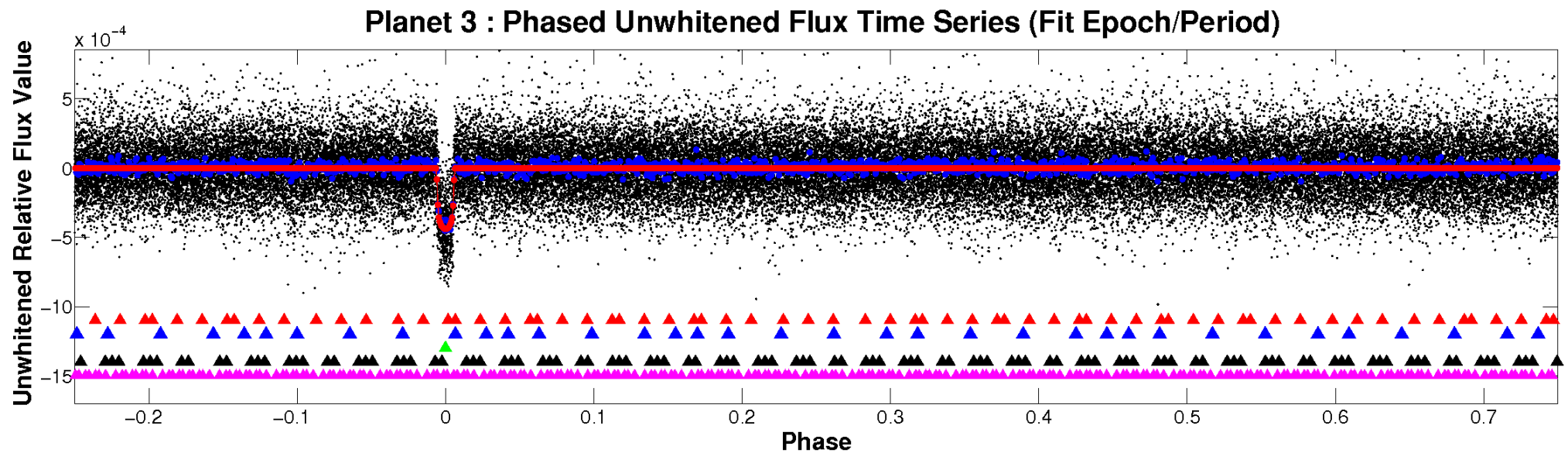
# ALT Odd/Even

TCE 009458613-03



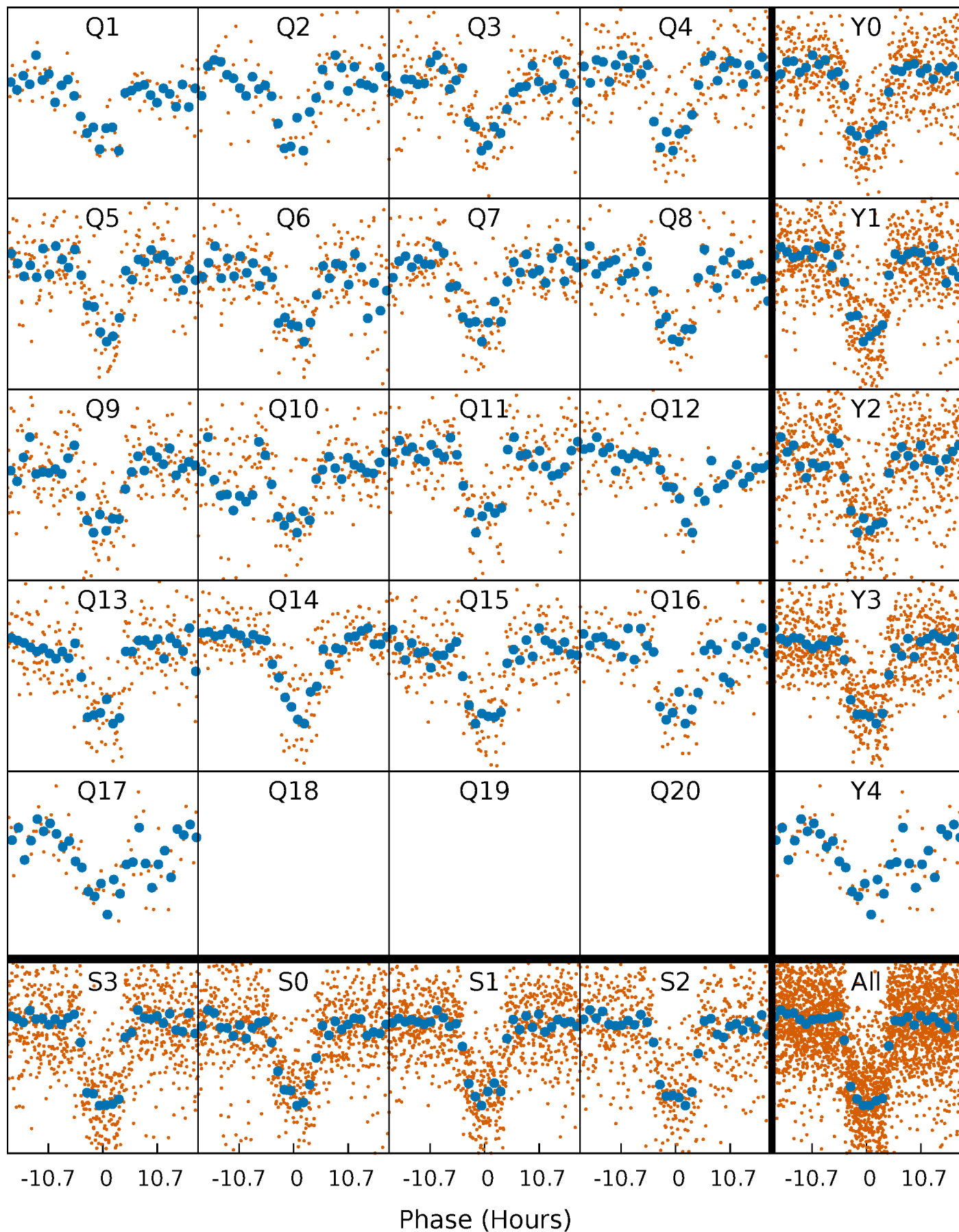


# Non-Whitened Vs. Whitened Light Curve



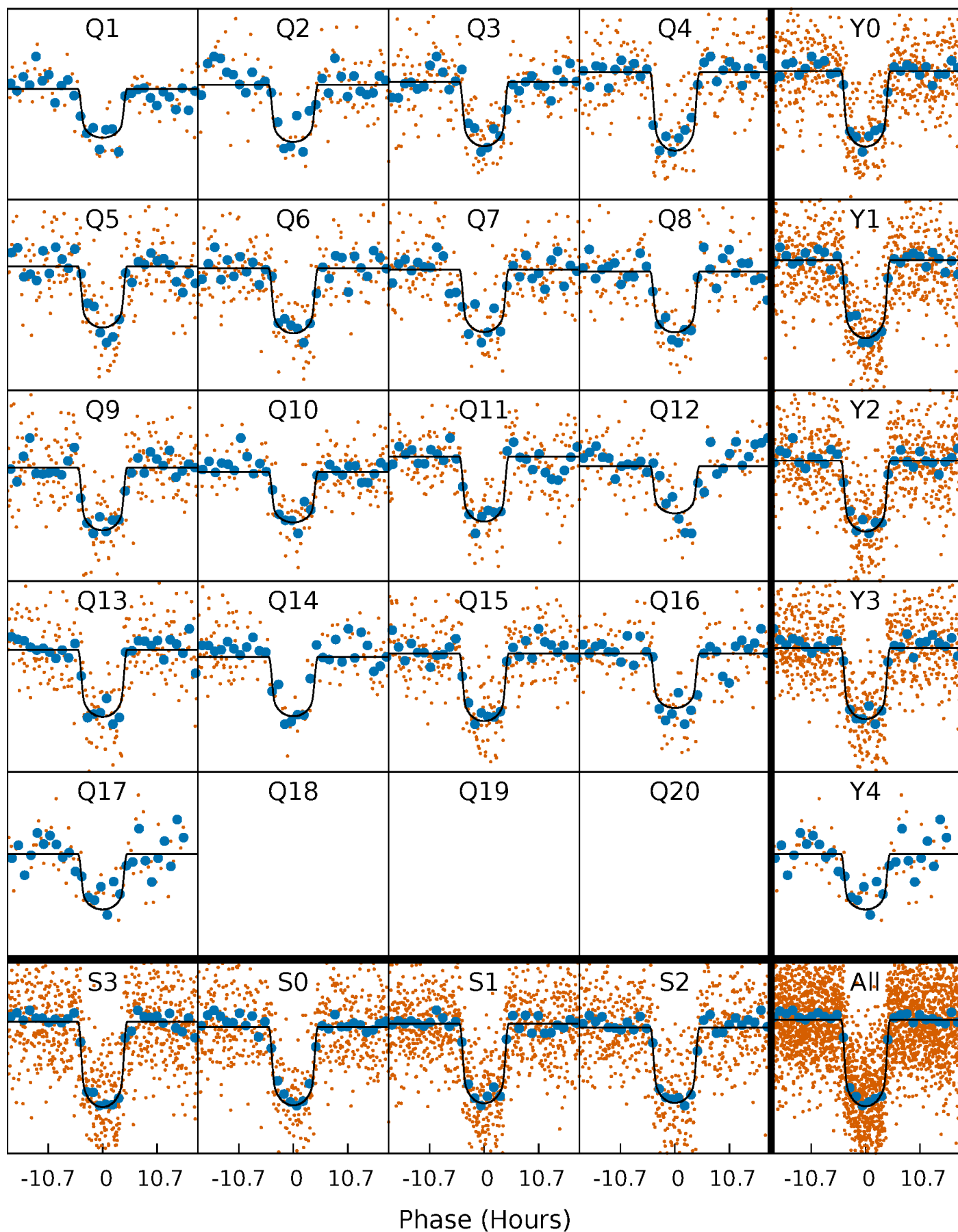
# PDC Quarter-Phased Transit Curves

TCE 009458613-03 P= 31.784855 Days  $T_0=135.867715$  (BKJD)



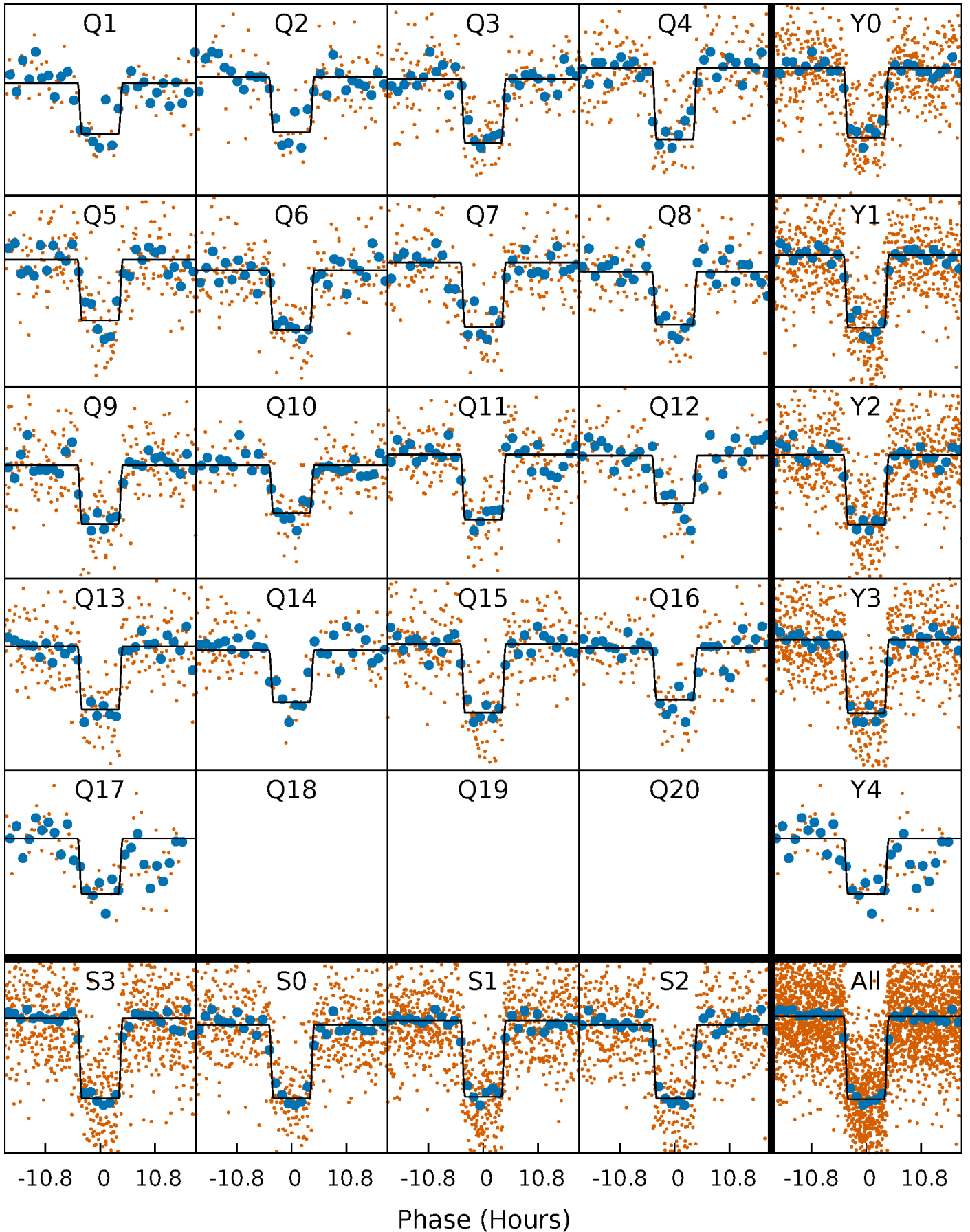
# DV Quarter-Phased Transit Curves

TCE 009458613-03 P= 31.784855 Days  $T_0=135.867715$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

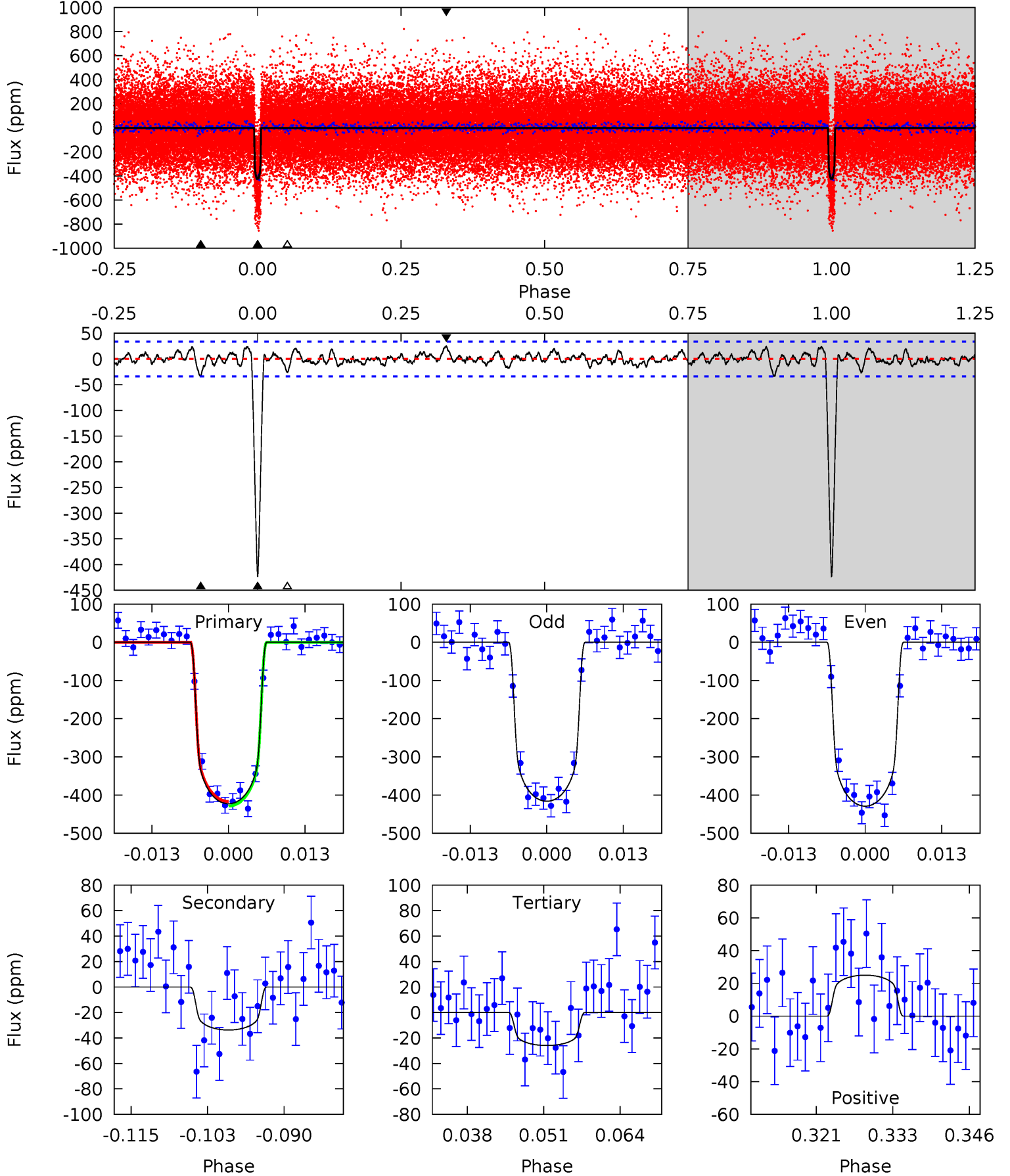
TCE 009458613-03 P= 31.784648 Days  $T_0=135.874623$  (BKJD)



# DV Model-Shift Uniqueness Test

009458613-03, P = 31.784855 Days, E = 104.082860 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
62.3	4.97	3.82	3.68	4.98	2.49	1.22	58.5	58.6	1.16	1.29	0.95	0.97	0.06	0.90

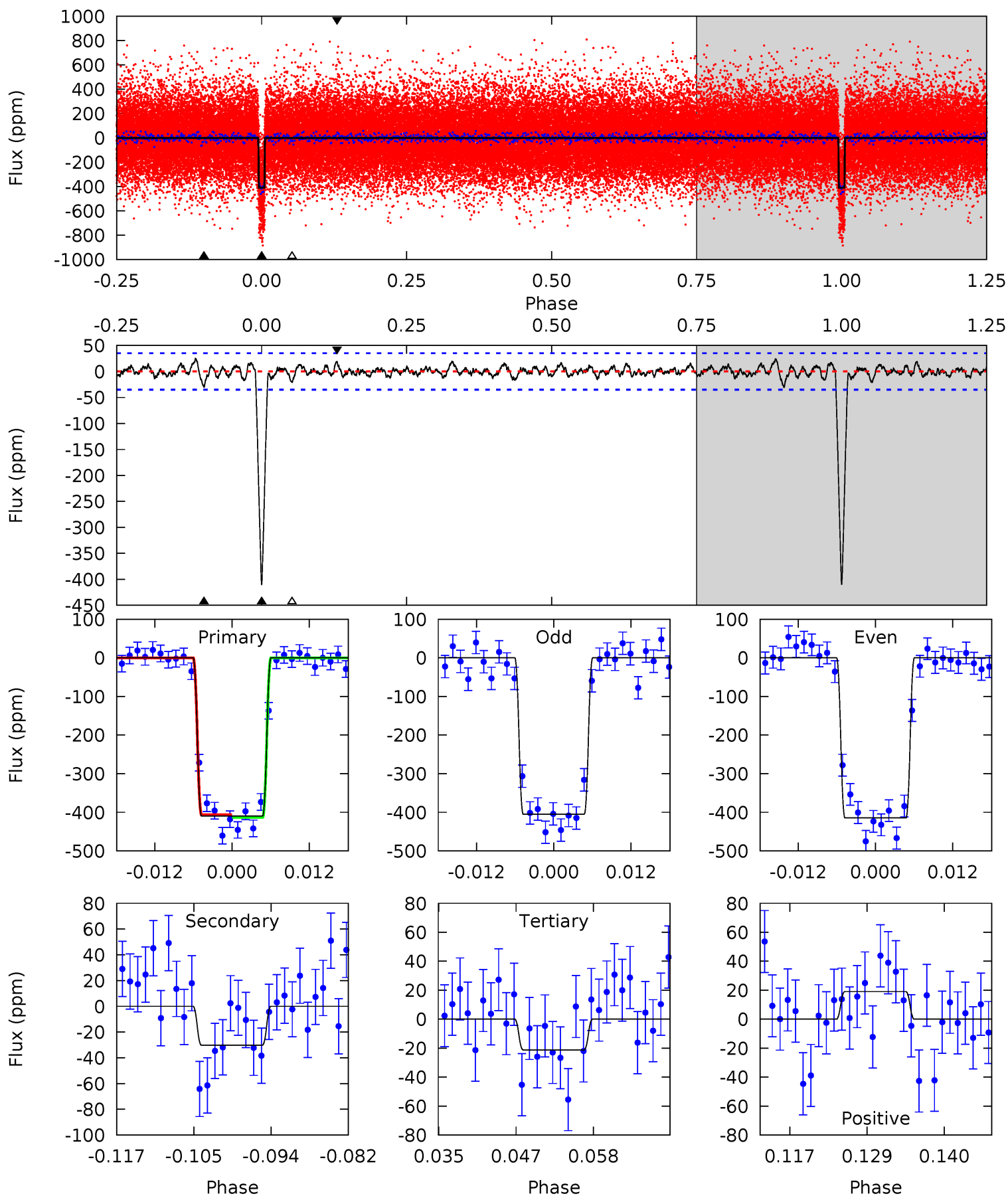




# Alt Model-Shift Uniqueness Test

009458613-03,  $P = 31.784648$  Days,  $E = 104.089975$  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
58.3	4.29	3.01	2.72	5.00	2.52	0.99	55.3	55.6	1.28	1.58	0.69	1.00	0.06	0.46



### Stellar Parameters For KIC 009458613

	$T_{\text{eff}} (K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M (M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$5900^{+117}_{-117}$	$4.022^{+0.195}_{-0.090}$	$0.000^{+0.150}_{-0.150}$	$1.694^{+0.257}_{-0.418}$	$1.100^{+0.124}_{-0.112}$	$0.319^{+0.351}_{-0.086}$
	+2%/-2%	+5%/-2%	+inf%/-inf%	+15%/-25%	+11%/-10%	+110%/-27%
Source	SPE35	SPE35	SPE35	DSEP		

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

### Secondary Eclipse Parameters for KIC 009458613-03 / KOI 0707.03

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-34 \pm 7$	$4.14^{+0.38}_{-0.51}$	$1042^{+49}_{-54}$	$3477^{+115}_{-143}$	$45^{+14}_{-12}$
Alt.	$-30 \pm 7$	$3.78^{+0.35}_{-0.50}$	$1047^{+46}_{-69}$	$3526^{+137}_{-159}$	$49^{+20}_{-14}$

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



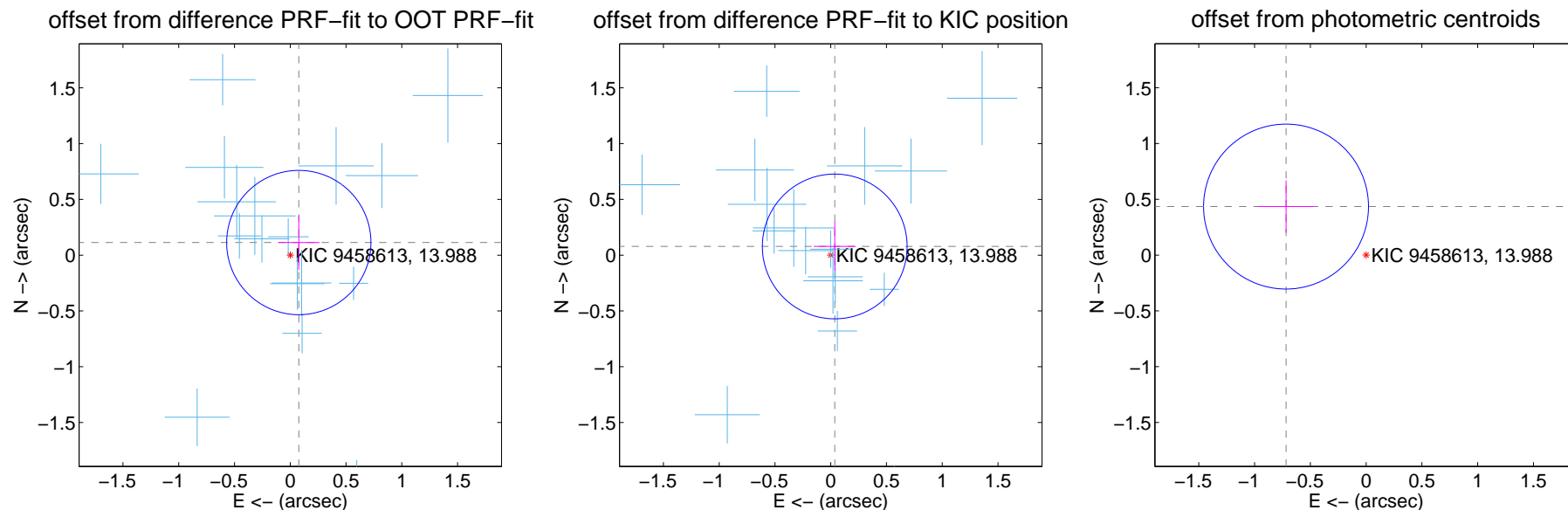
## DV Centroid Data

Supplemental centroid analysis for 009458613-03. Kepler magnitude: 13.99. Transit SNR 42.79

There are 17 quarters with good PRF difference image offsets

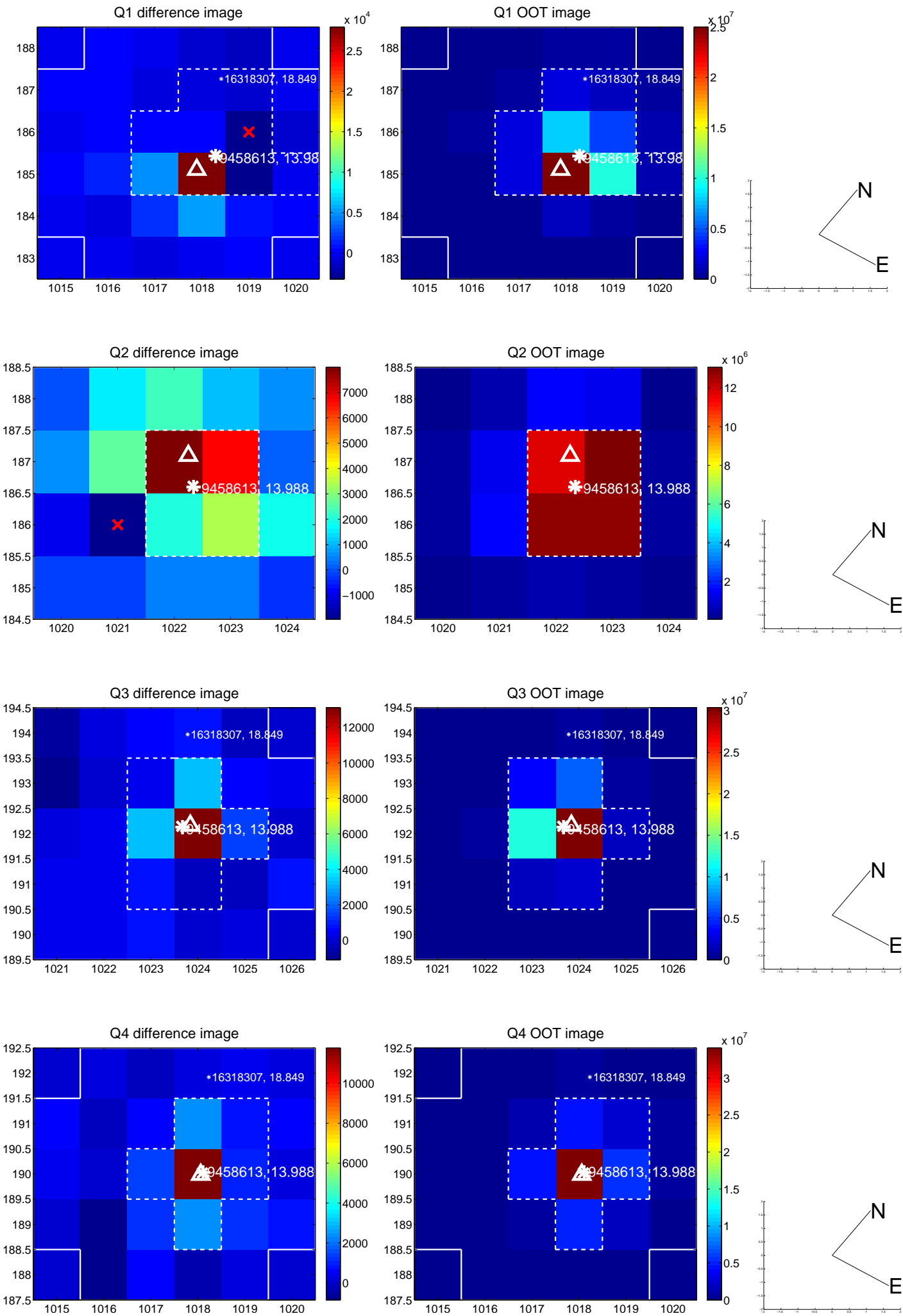
The direct PRF centroid is offset from the target star catalog position by about 0.11 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.137 \pm 0.216$	0.63	$-0.077 \pm 0.185$	$0.113 \pm 0.243$
PRF-fit source offset from KIC position	$0.086 \pm 0.216$	0.40	$-0.036 \pm 0.187$	$0.078 \pm 0.223$
photometric centroid source offset	$0.84 \pm 0.25$	3.41	$0.72 \pm 0.25$	$0.43 \pm 0.23$

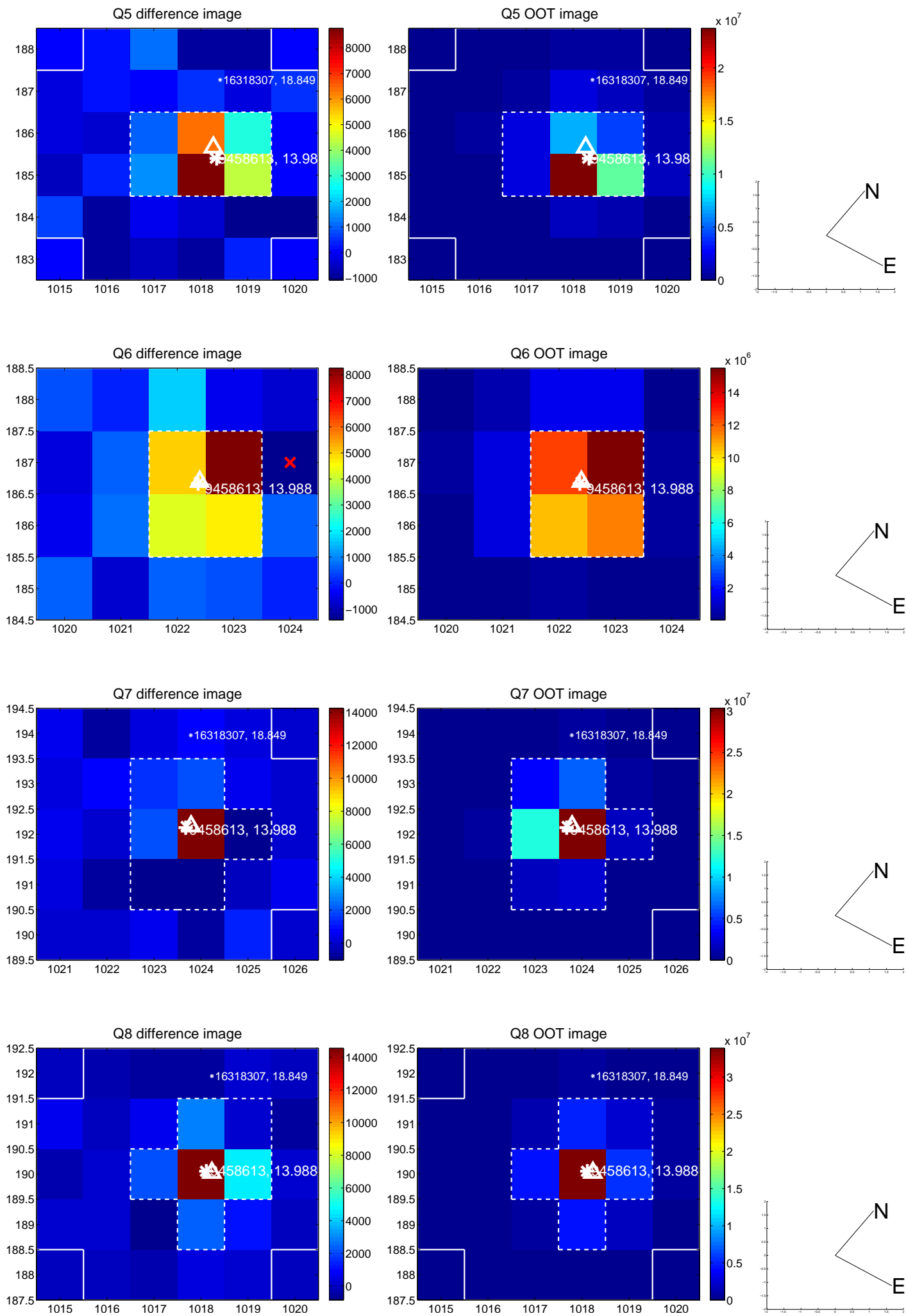


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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

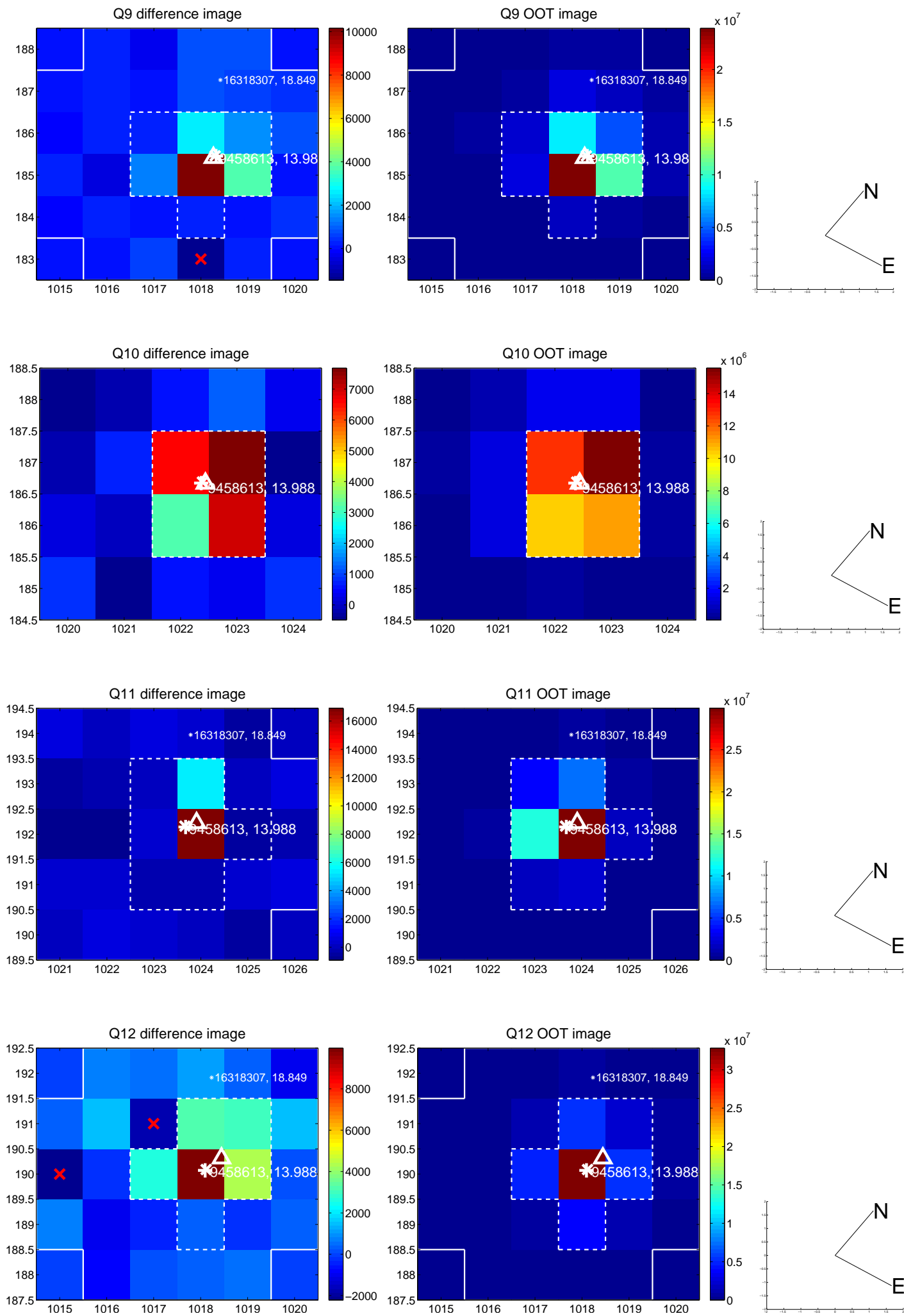
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



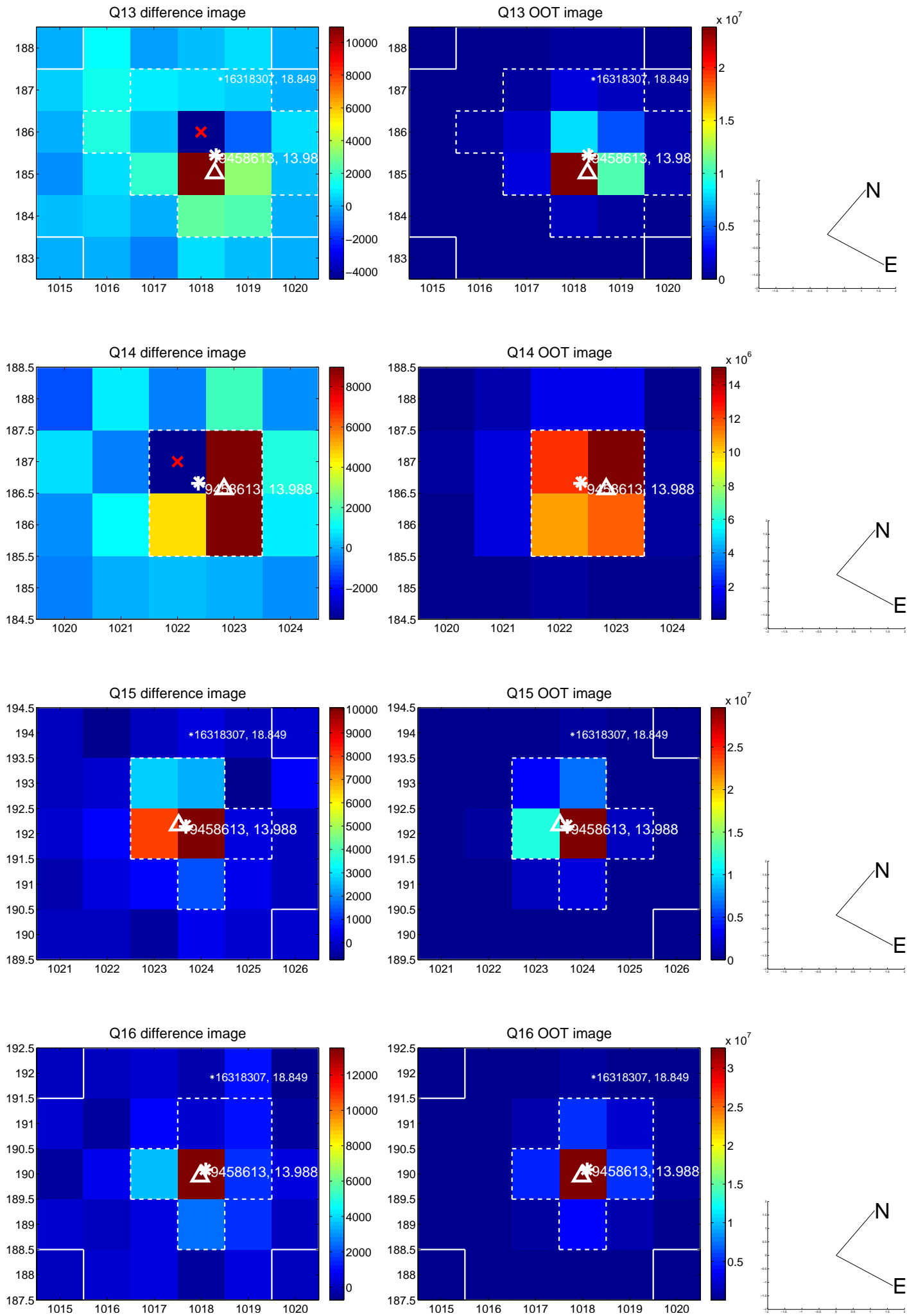
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



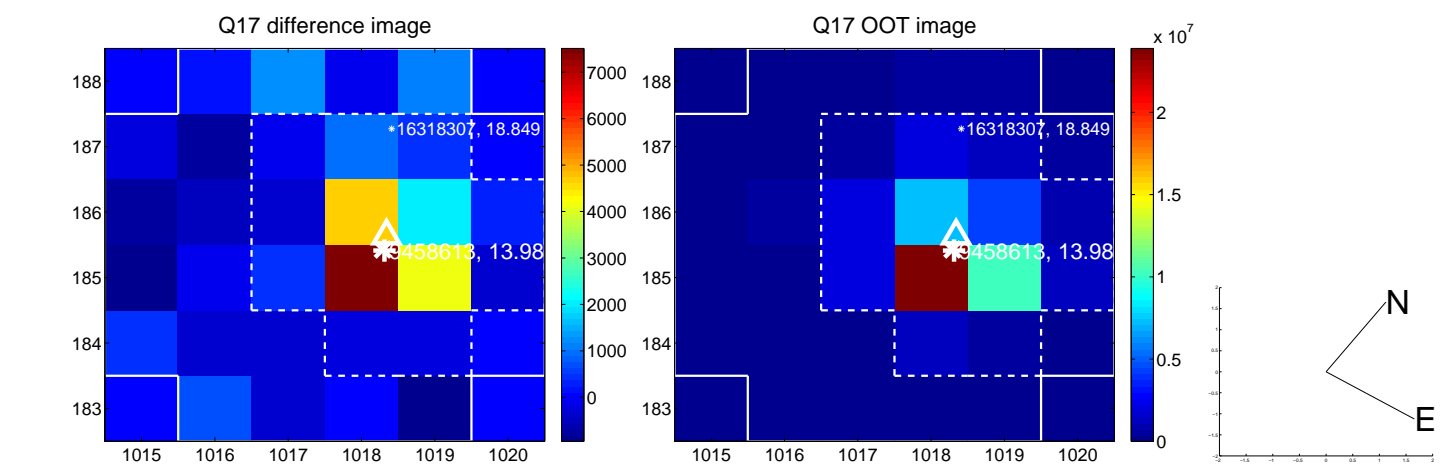
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



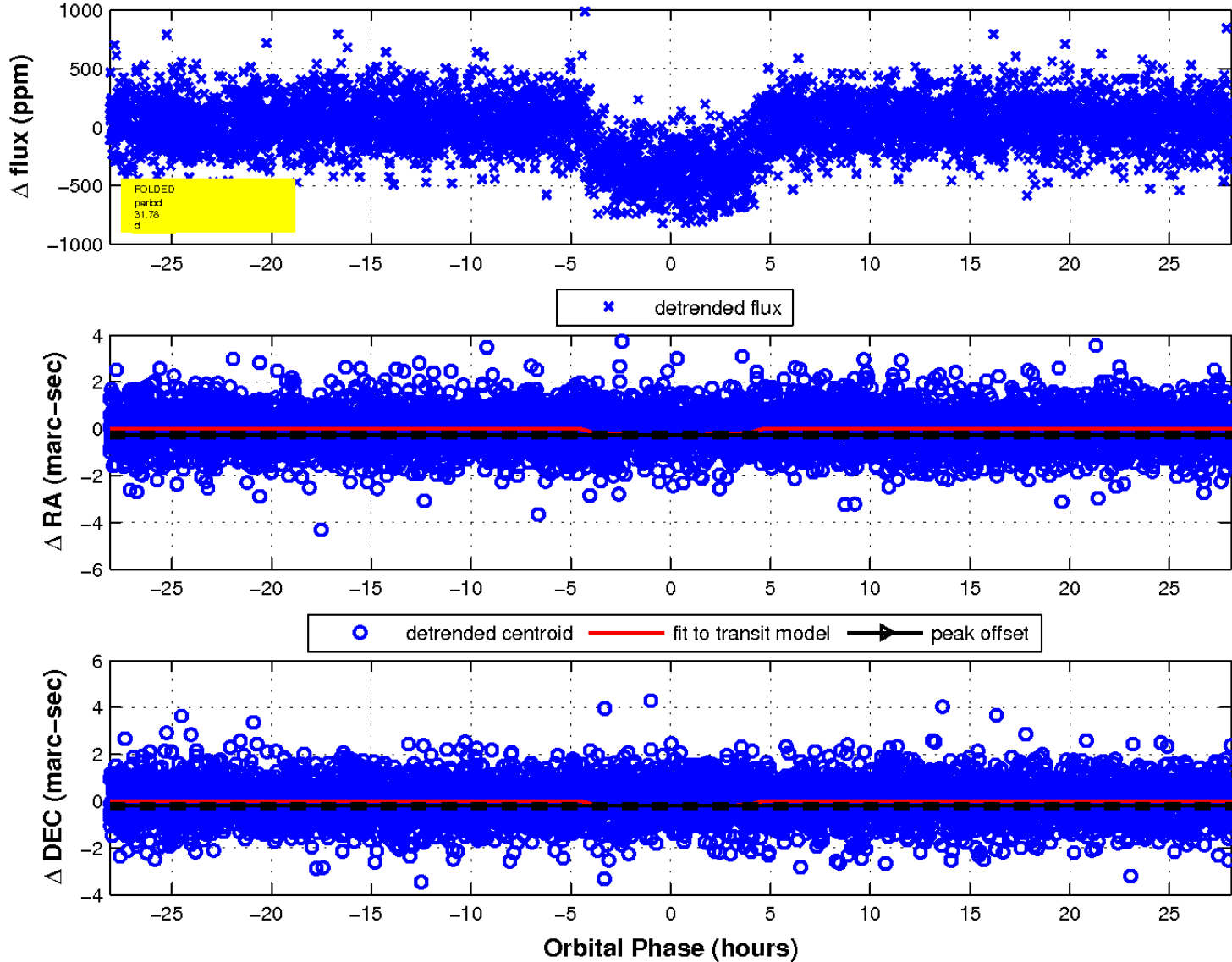
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

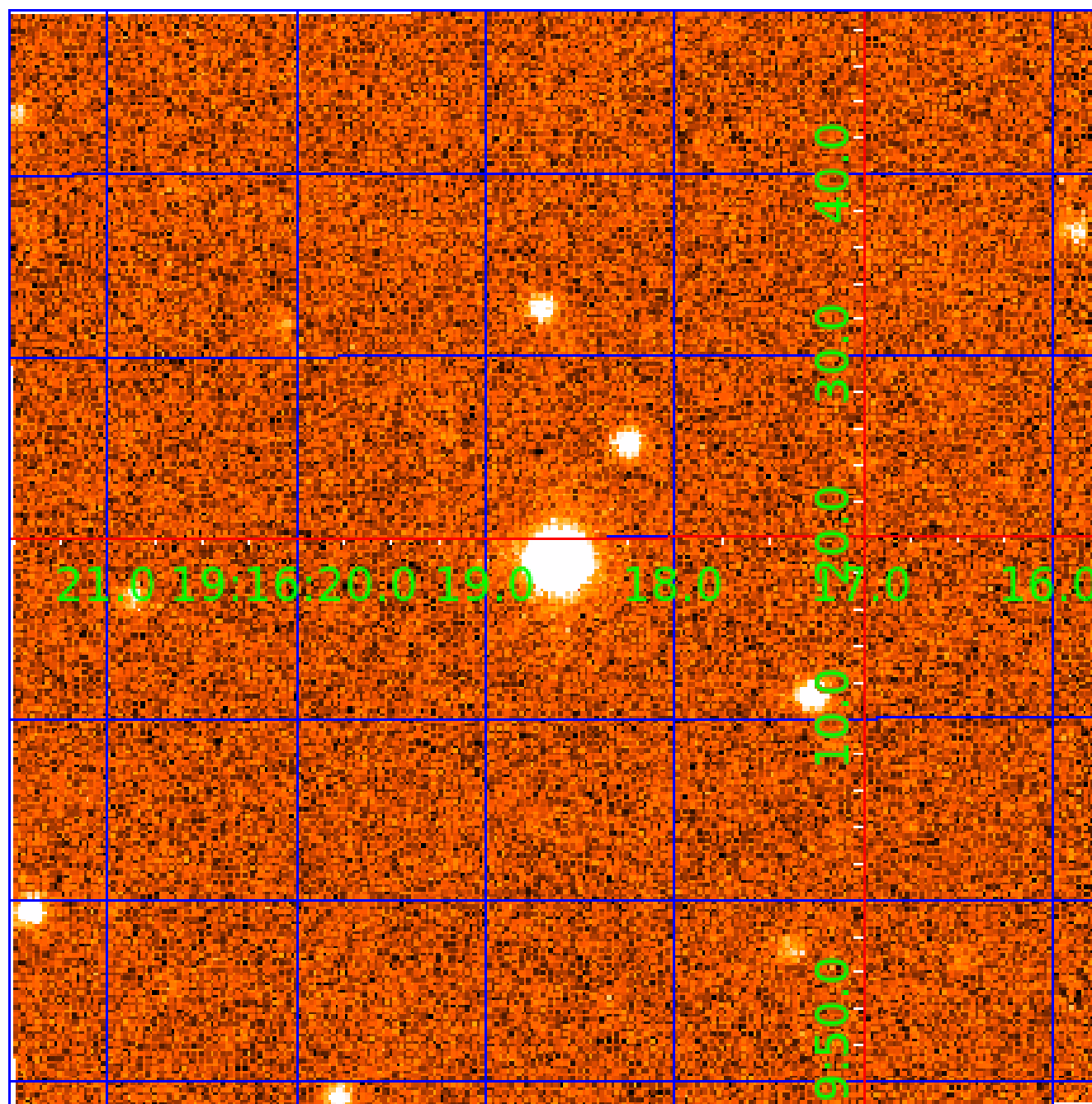


fluxWeightedCentroids, Planet 3 of 5



# UKIRT Image

Declination





# KIC 009458613

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
009458613-01	OBS	0707.01	21.775671	146.087479	796.7	8.095	77.6	81.9	1.69	5900	5.08	125.40
009458613-02	OBS	0707.02	41.027810	131.555832	530.5	10.645	40.9	44.8	1.69	5900	4.59	53.89
009458613-03	OBS	0707.03	31.784855	135.867715	439.3	9.372	39.8	42.8	1.69	5900	4.16	75.73
009458613-04	OBS	0707.04	13.175544	143.678839	281.1	6.754	34.9	39.6	1.69	5900	3.11	245.03
009458613-05	OBS	0707.05	5.668163	131.887260	80.7	4.838	13.9	15.2	1.69	5900	1.69	754.49

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009458613-01	OBS	PC	1.00	0	0	0	0	NO_COMMENT
009458613-02	OBS	PC	1.00	0	0	0	0	NO_COMMENT
009458613-03	OBS	PC	1.00	0	0	0	0	NO_COMMENT
009458613-04	OBS	PC	1.00	0	0	0	0	NO_COMMENT
009458613-05	OBS	PC	1.00	0	0	0	0	NO_COMMENT

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

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

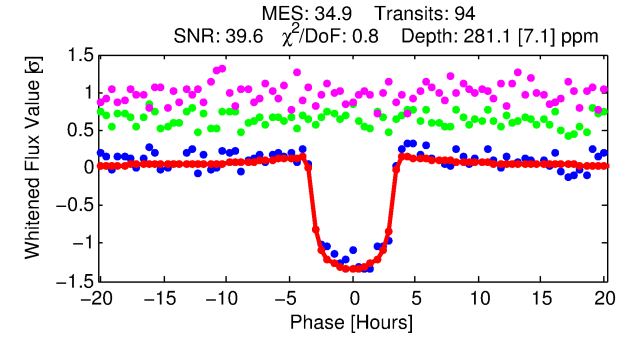
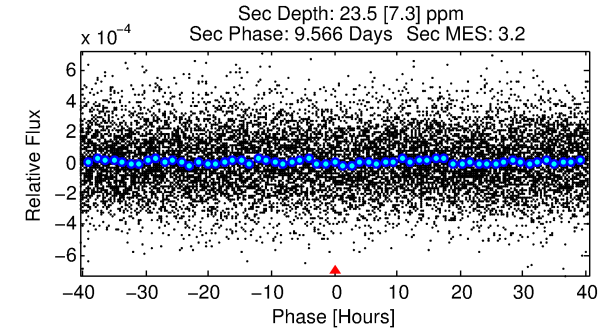
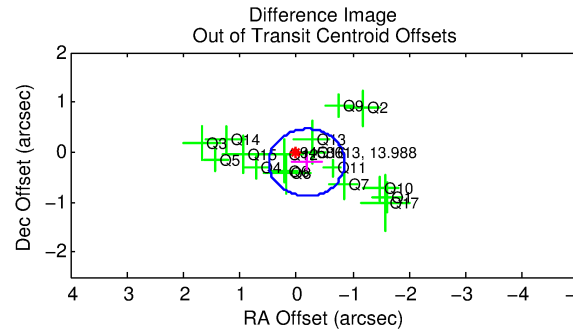
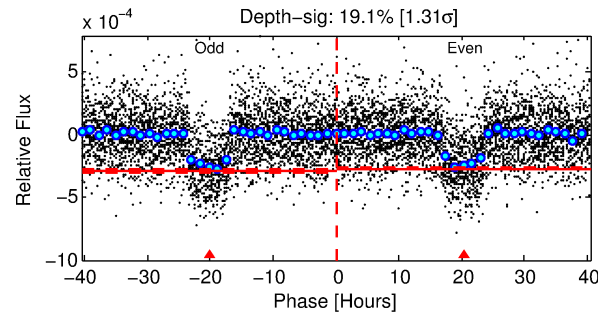
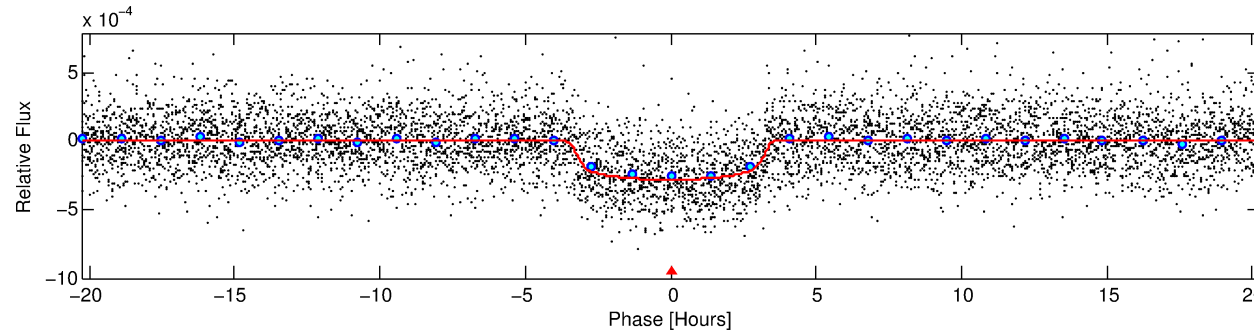
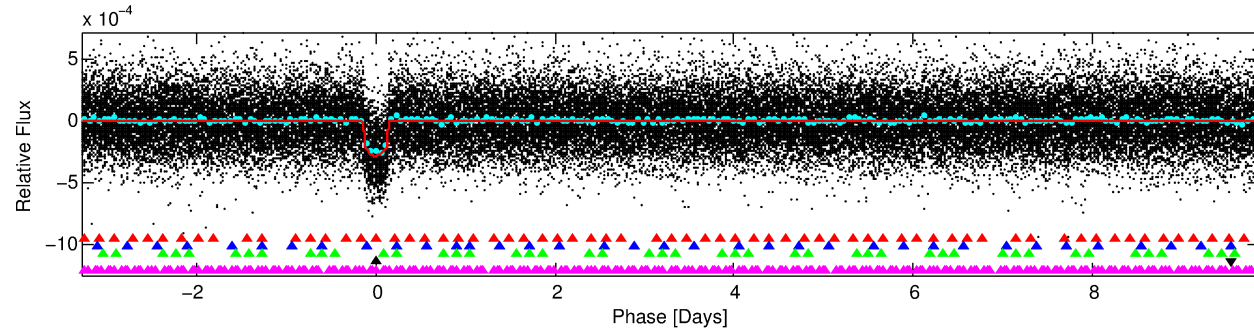
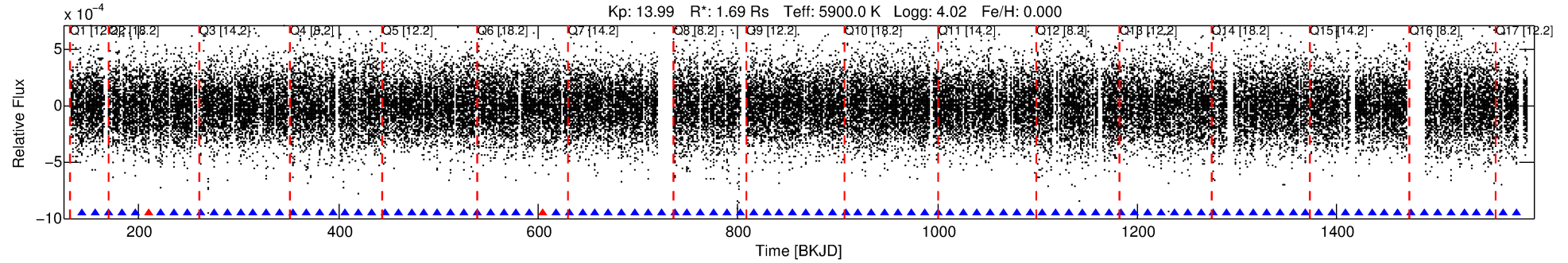
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 009458613-04

No Significant Match Found

# DV One-Page Summary

KIC: 9458613 Candidate: 4 of 5 Period: 13.176 d  
KOI: K00707.04 Name: Kepler-33c Corr: 0.988



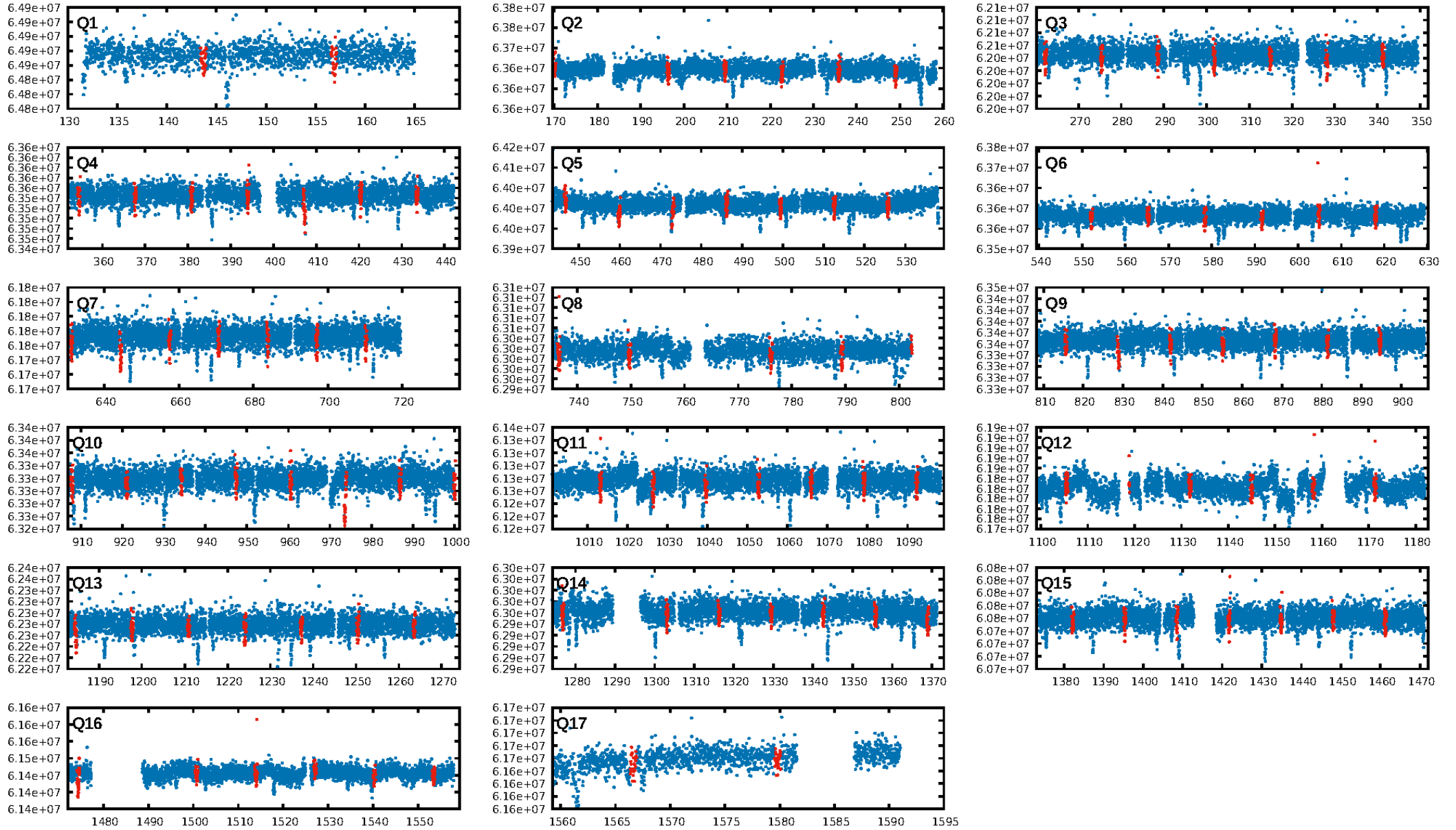
## DV Fit Results:

Period = 13.17554 [0.00005] d  
Epoch = 143.6788 [0.0029] BKJD  
Rp/R\* = 0.0168 [0.0025]  
a/R\* = 9.89 [6.90]  
b = 0.77 [0.37]  
Seff = 245.03 [85.92]  
Teq = 1009 [88] K  
Rp = 3.11 [0.90] Re  
a = 0.1128 [0.0251] AU  
Ag = 16.95 [9.34] [1.71 $\sigma$ ]  
Teffp = 3165 [348] K [6.01 $\sigma$ ]

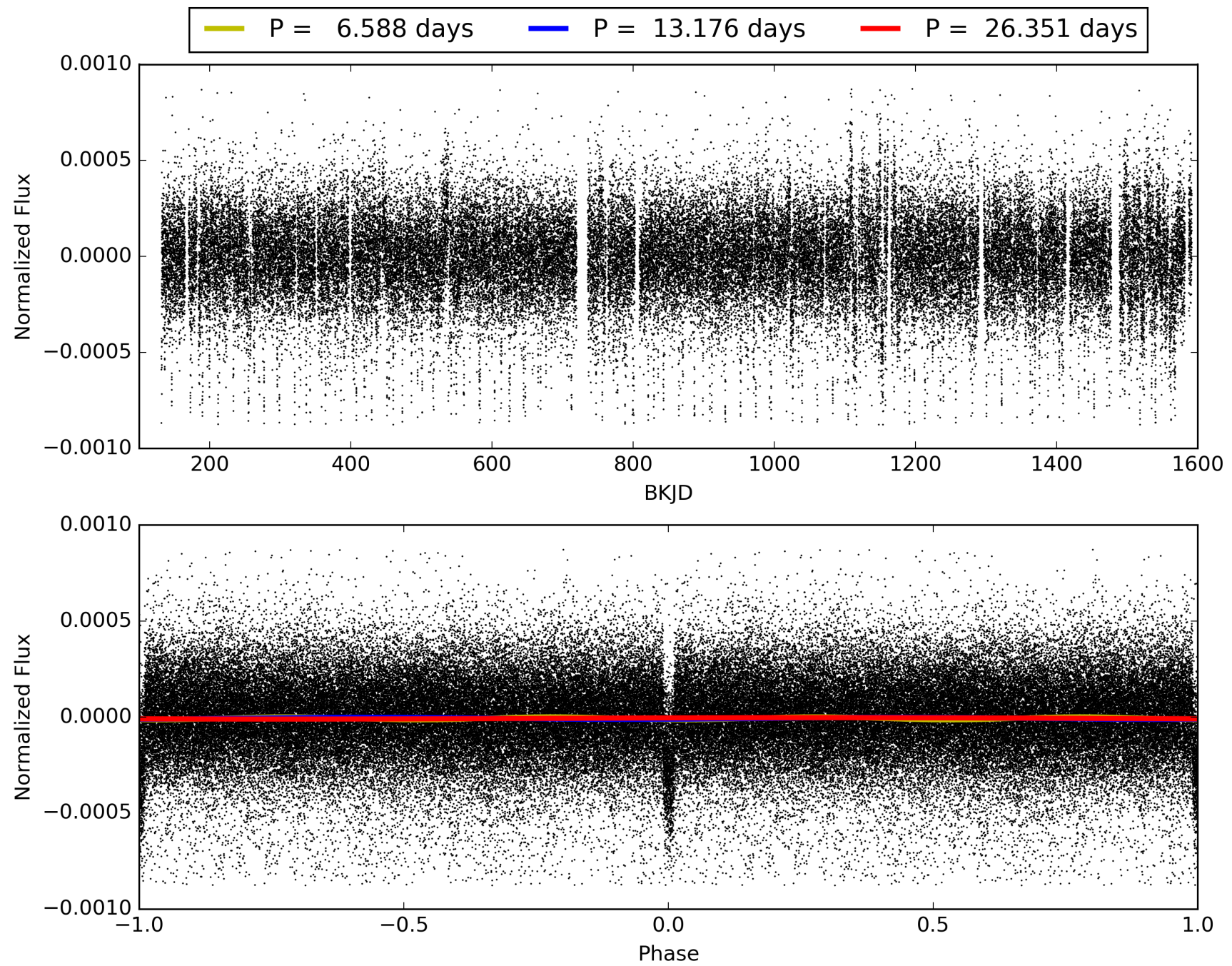
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [21.69 $\sigma$ ]  
LongPeriod-sig: 100.0% [19.58 $\sigma$ ]  
ModelChiSquare2-sig: 97.0%  
ModelChiSquareGof-sig: 100.0%  
Bootstrap-pfa: 2.29e-254  
RollingBand-fgt: 0.98 [88/90]  
GhostDiagnostic-chr: 3.336  
Centroid-sig: 0.7%  
Centroid-so: 0.503 arcsec [1.84 $\sigma$ ]  
OotOffset-rm: 0.276 arcsec [1.23 $\sigma$ ]  
KicOffset-rm: 0.259 arcsec [1.20 $\sigma$ ]  
OotOffset-st: 4/4/4/5 [17]  
KicOffset-st: 4/4/4/5 [17]  
DiffImageQuality-fgm: 1.00 [17/17]  
DiffImageOverlap-fno: 1.00 [17/17]

# TCE 009458613-04, PDC Light Curves



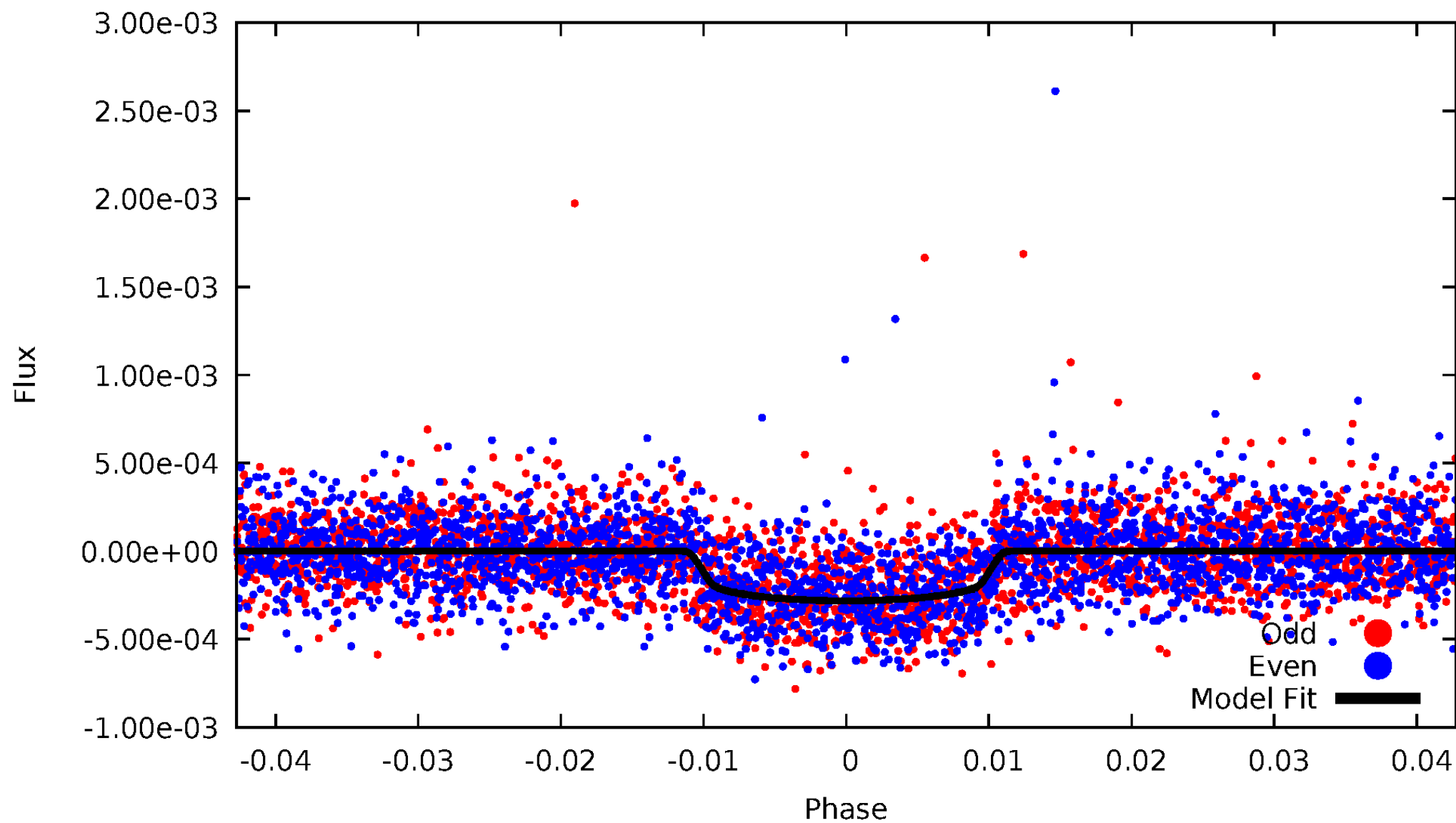
TCE 009458613-04





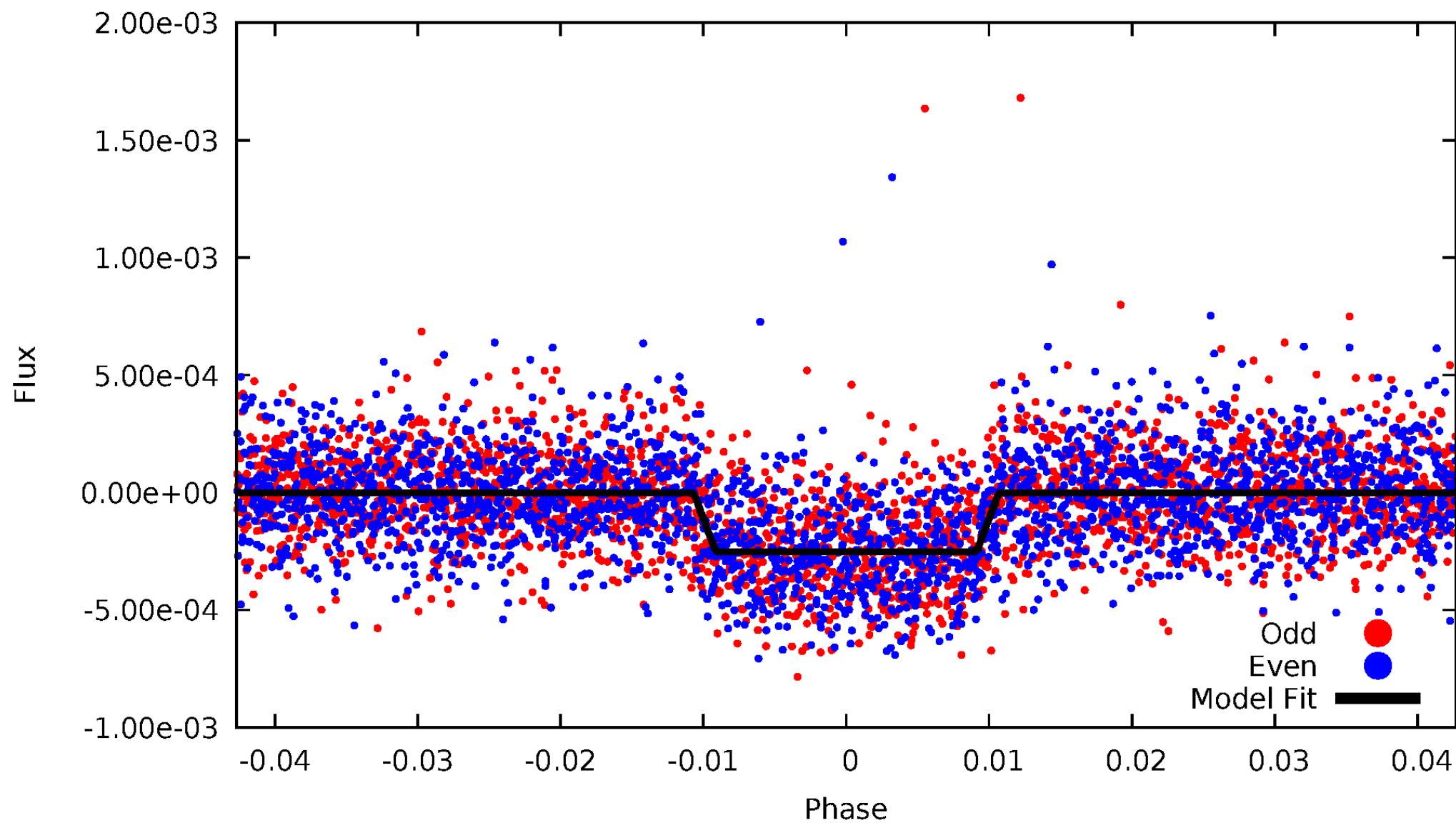
# DV Odd/Even

TCE 009458613-04



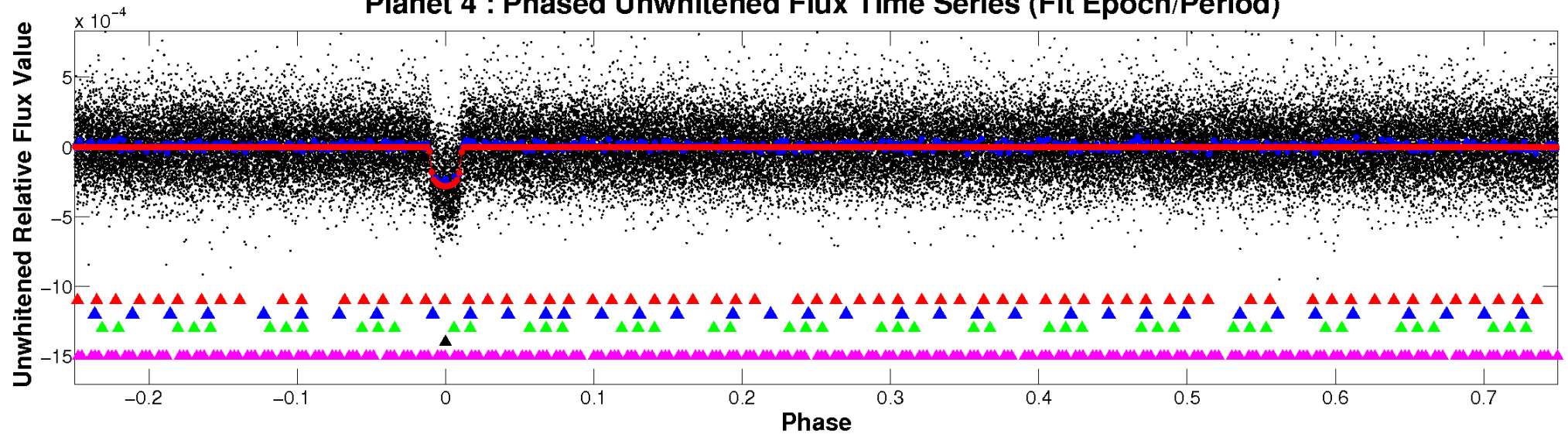
# ALT Odd/Even

TCE 009458613-04

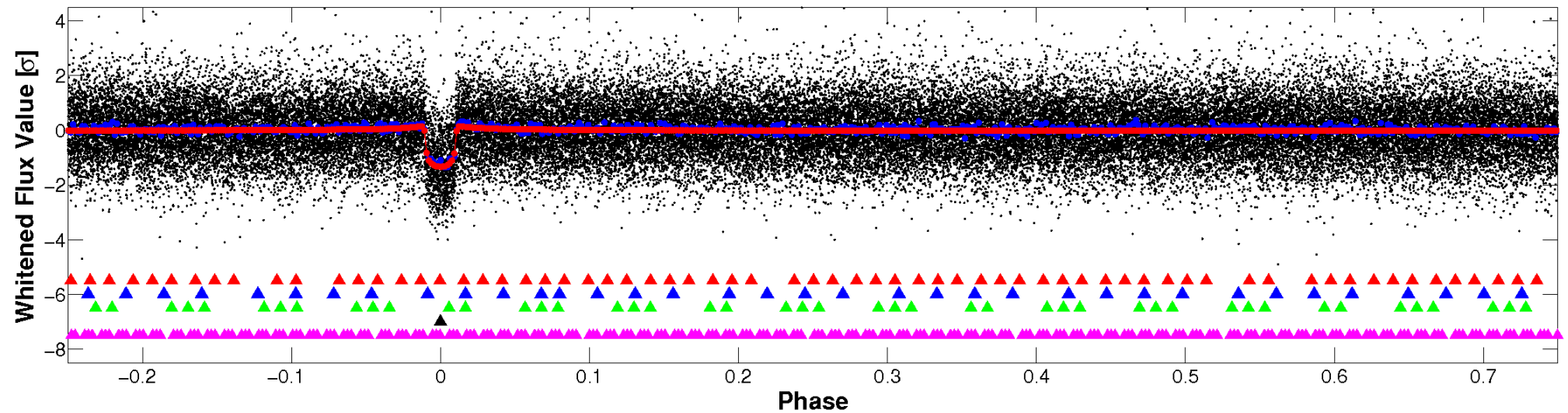


# Non-Whitened Vs. Whitened Light Curve

## Planet 4 : Phased Unwhitened Flux Time Series (Fit Epoch/Period)



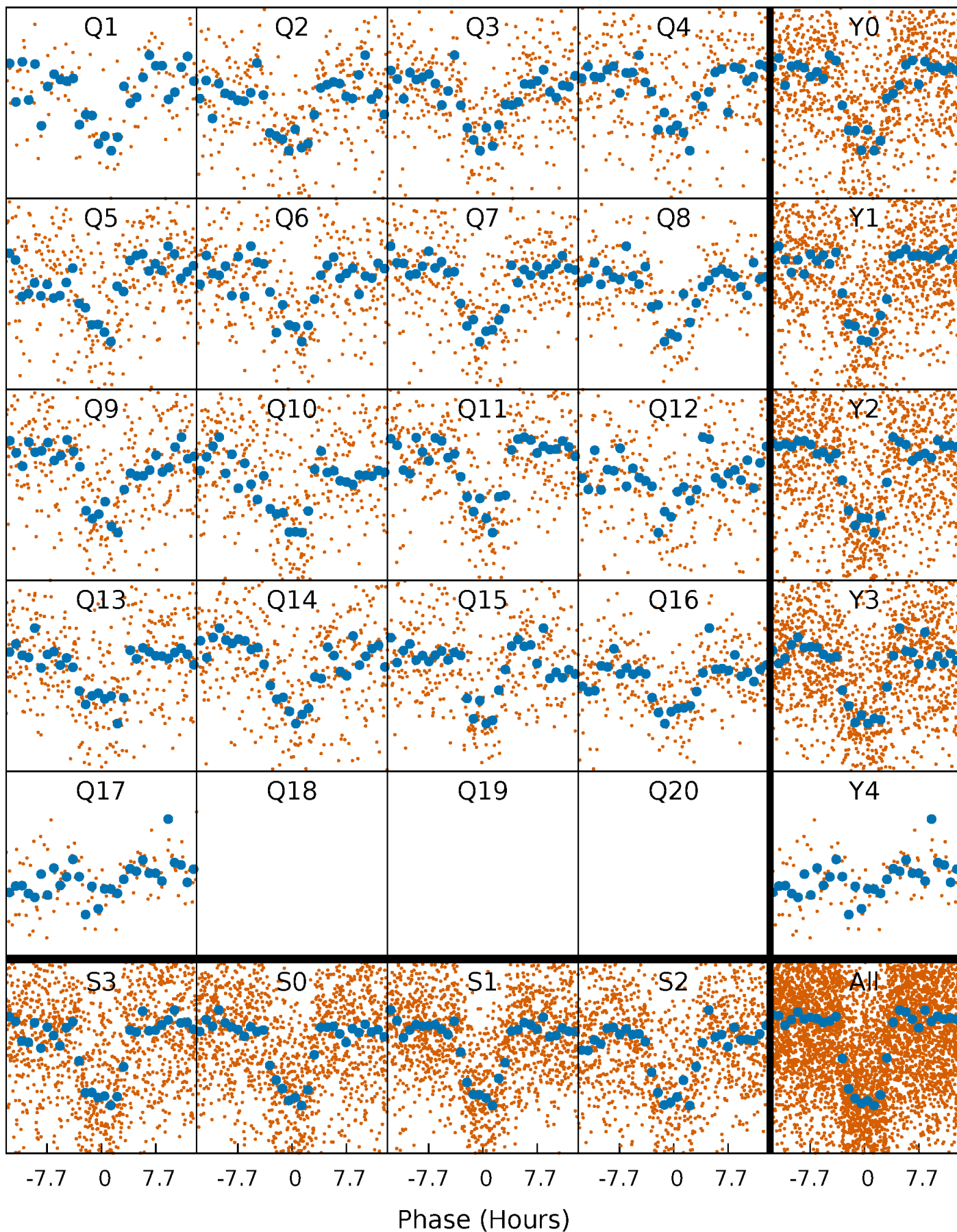
## Planet 4 : Phased Whitened Flux Time Series (Fit Epoch/Period)





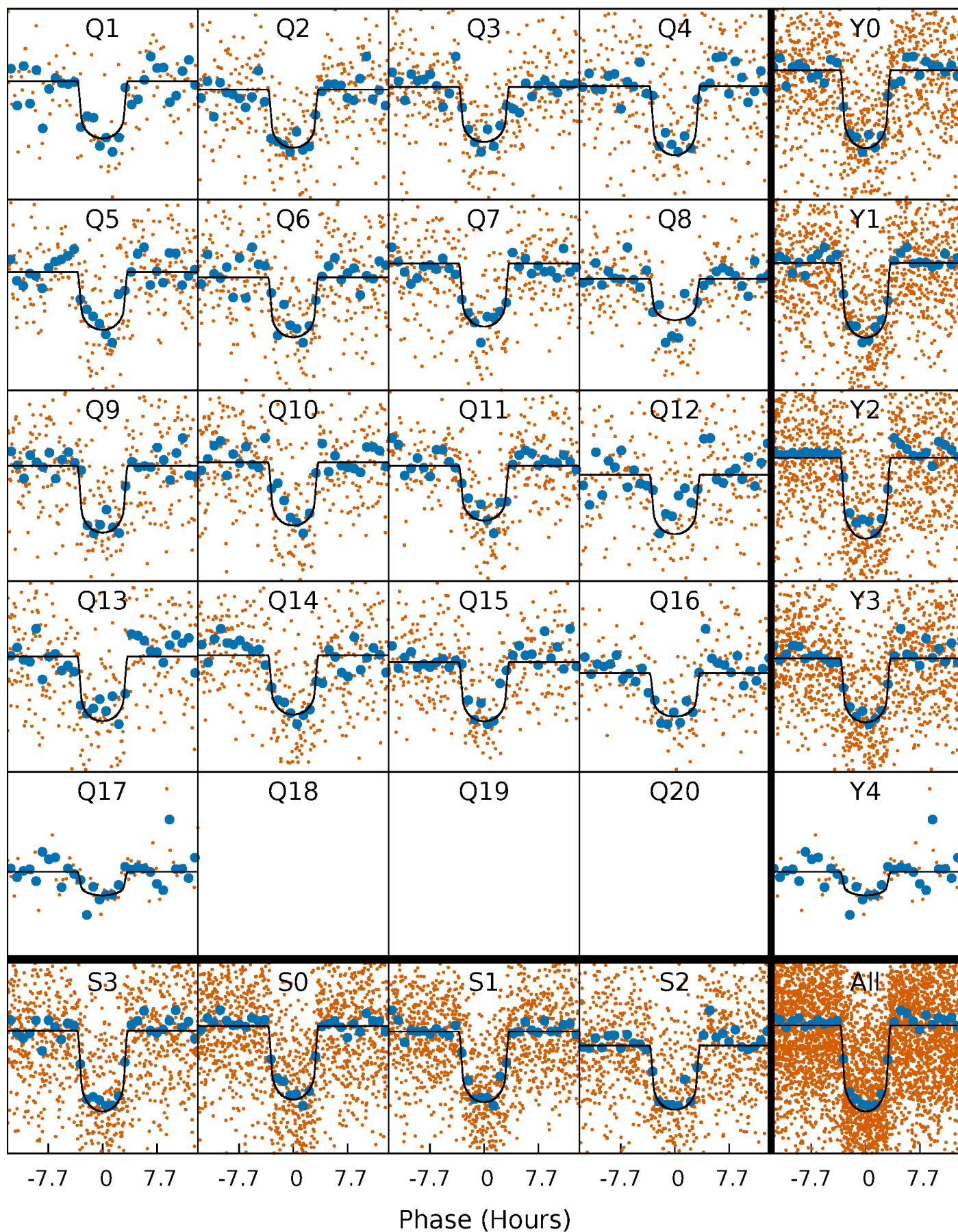
# PDC Quarter-Phased Transit Curves

TCE 009458613-04 P= 13.175544 Days  $T_0=143.678839$  (BKJD)



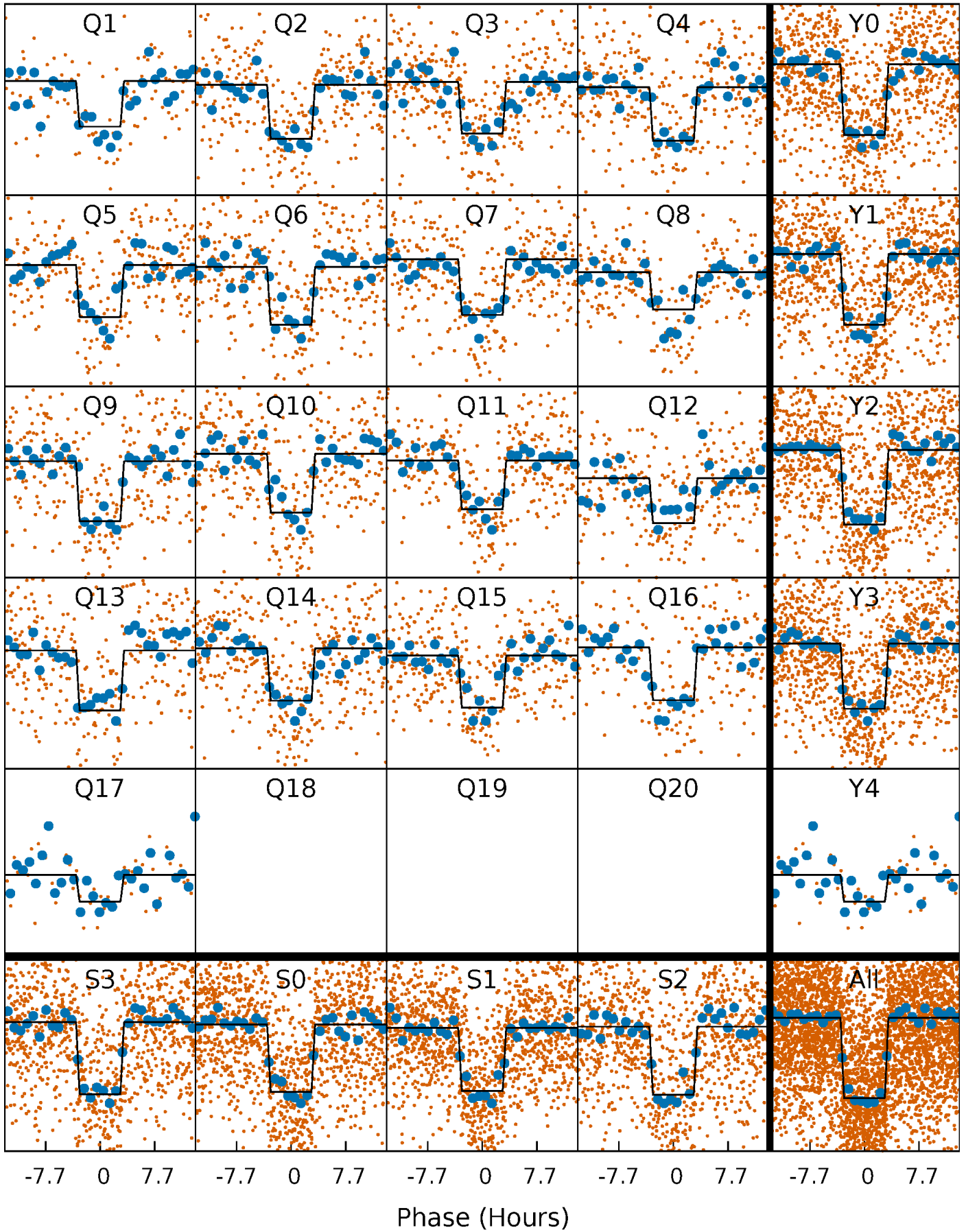
# DV Quarter-Phased Transit Curves

TCE 009458613-04 P= 13.175544 Days  $T_0=143.678839$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

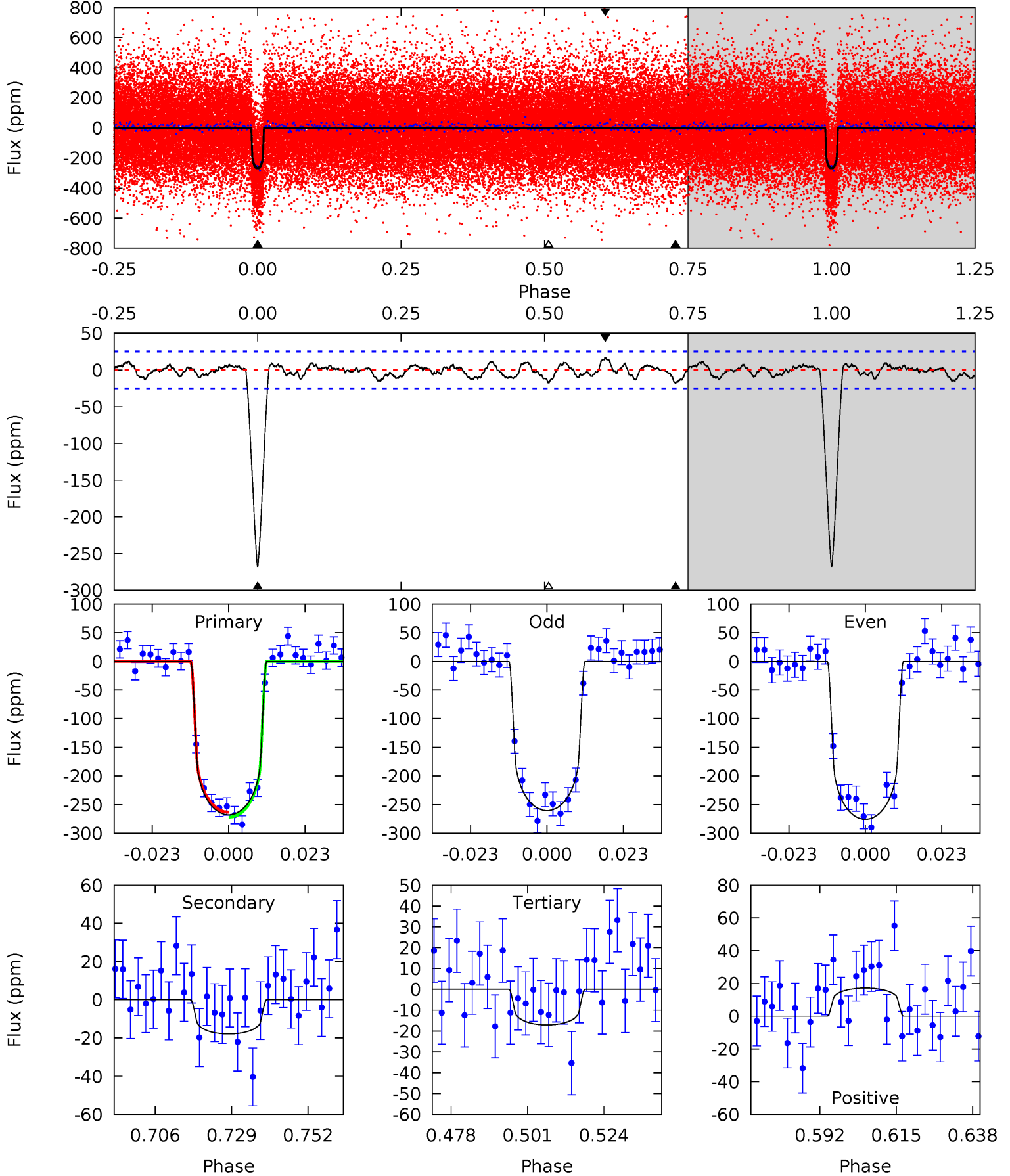
TCE 009458613-04 P= 13.175630 Days  $T_0=143.674942$  (BKJD)



# DV Model-Shift Uniqueness Test

009458613-04, P = 13.175544 Days, E = 130.503295 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
51.7	3.45	3.30	3.31	4.87	2.28	1.26	48.4	48.4	0.15	0.14	1.48	0.97	0.06	0.83

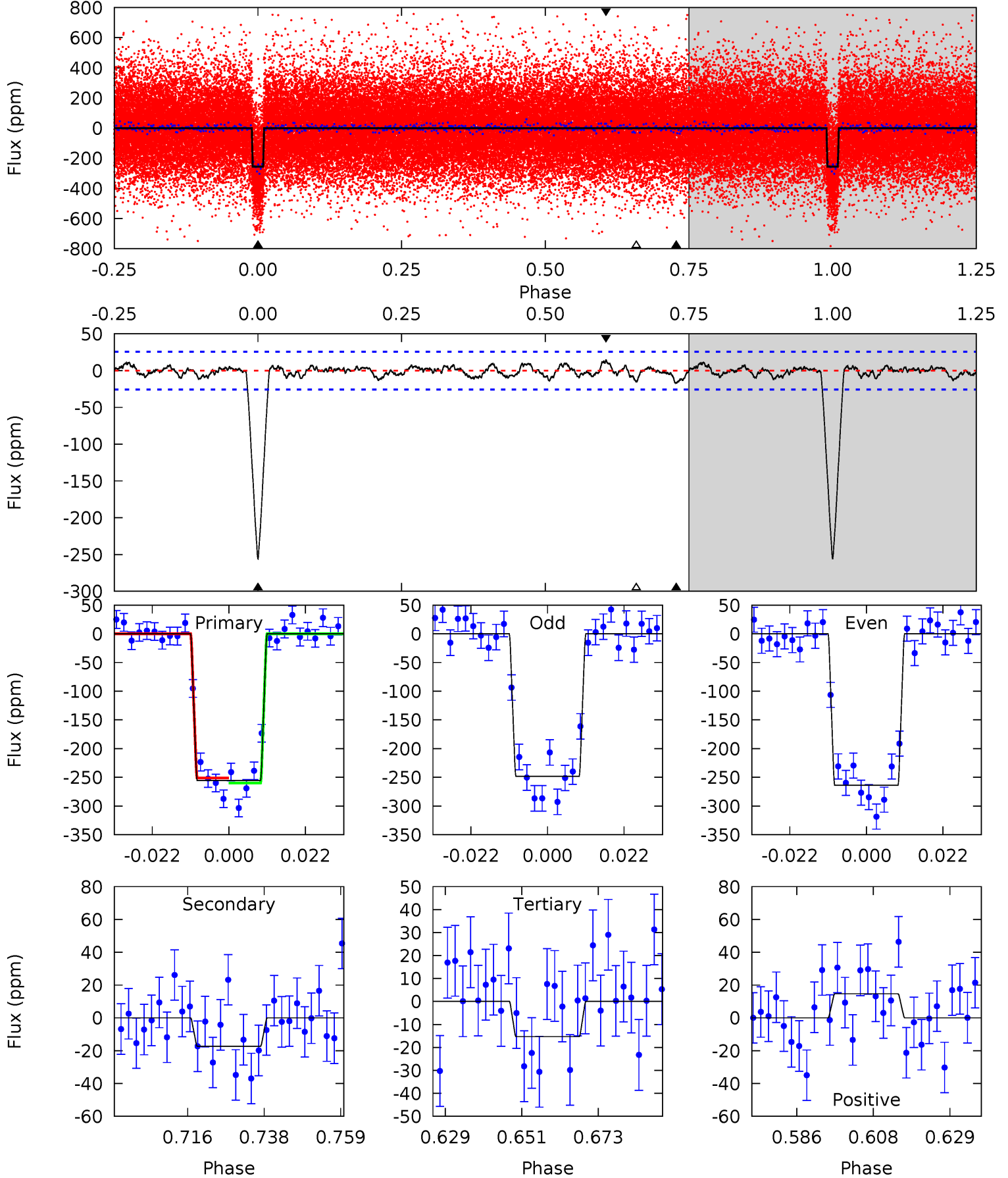




# Alt Model-Shift Uniqueness Test

009458613-04, P = 13.175630 Days, E = 130.499312 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
48.5	3.28	2.90	2.79	4.88	2.30	1.02	45.6	45.7	0.37	0.49	1.51	0.99	0.05	0.86



### Stellar Parameters For KIC 009458613

	$T_{\text{eff}} (K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M (M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$5900^{+117}_{-117}$	$4.022^{+0.195}_{-0.090}$	$0.000^{+0.150}_{-0.150}$	$1.694^{+0.257}_{-0.418}$	$1.100^{+0.124}_{-0.112}$	$0.319^{+0.351}_{-0.086}$
	+2%/-2%	+5%/-2%	+inf%/-inf%	+15%/-25%	+11%/-10%	+110%/-27%
Source	SPE35	SPE35	SPE35	DSEP		

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

### Secondary Eclipse Parameters for KIC 009458613-04 / KOI 0707.04

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$-18 \pm 5$	$3.00^{+0.63}_{-0.53}$	$1403^{+68}_{-84}$	$3455^{+253}_{-240}$	$14^{+8}_{-6}$
Alt.	$-17 \pm 5$	$2.85^{+0.56}_{-0.56}$	$1401^{+62}_{-86}$	$3484^{+264}_{-247}$	$15^{+9}_{-6}$

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

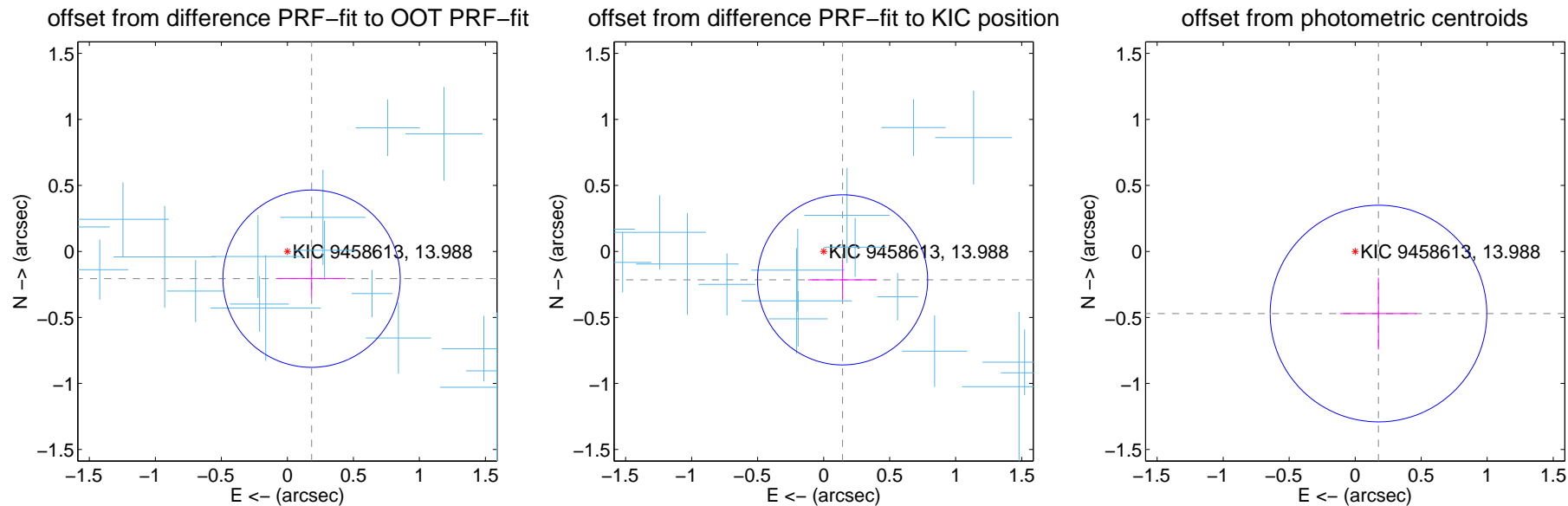
## DV Centroid Data

Supplemental centroid analysis for 009458613-04. Kepler magnitude: 13.99. Transit SNR 39.64

There are 17 quarters with good PRF difference image offsets

The direct PRF centroid is offset from the target star catalog position by about 0.11 arcsec

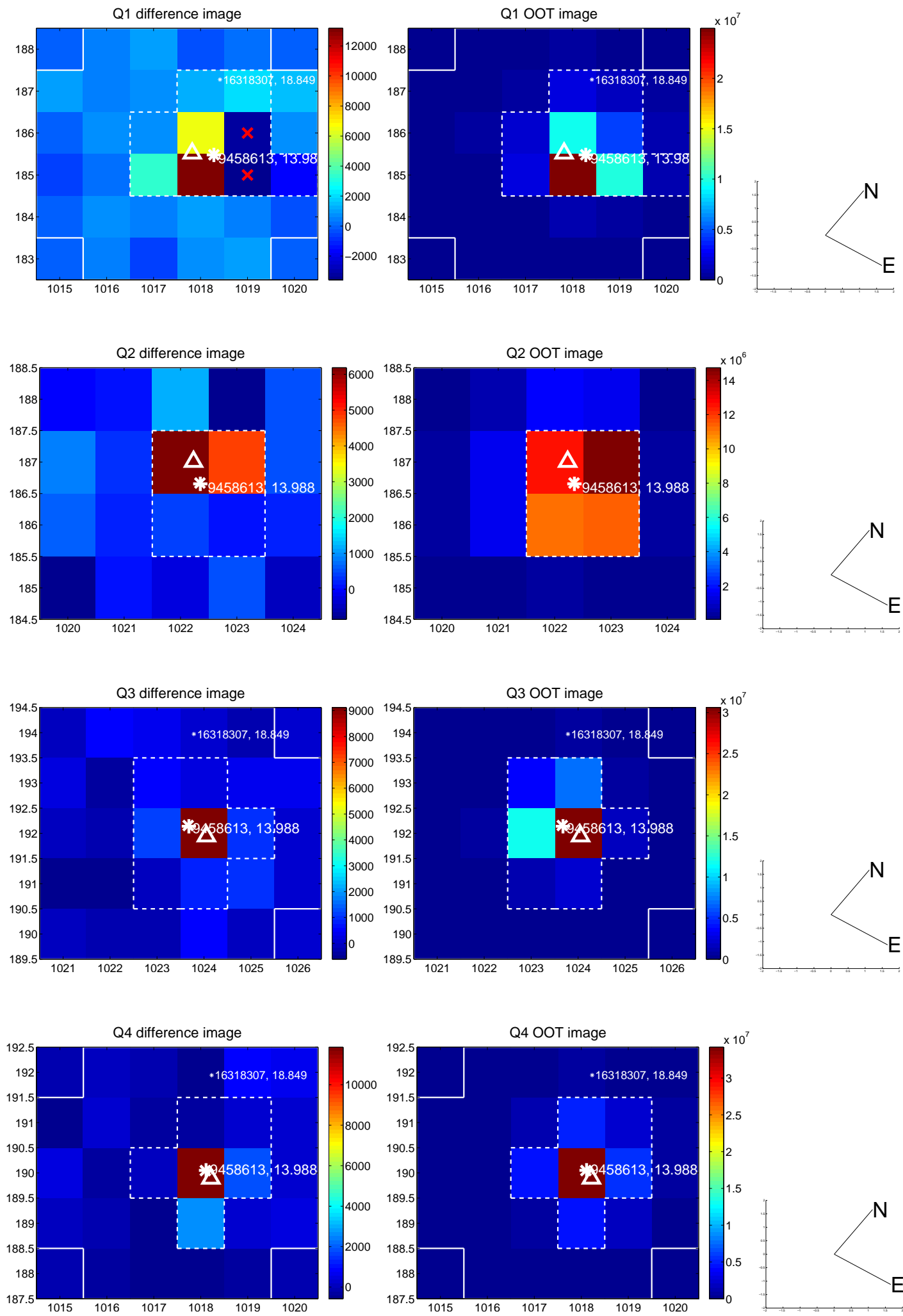
	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.276 \pm 0.224$	1.23	$-0.183 \pm 0.258$	$-0.207 \pm 0.138$
PRF-fit source offset from KIC position	$0.259 \pm 0.215$	1.20	$-0.143 \pm 0.260$	$-0.215 \pm 0.149$
photometric centroid source offset	$0.50 \pm 0.27$	1.84	$-0.18 \pm 0.29$	$-0.47 \pm 0.27$



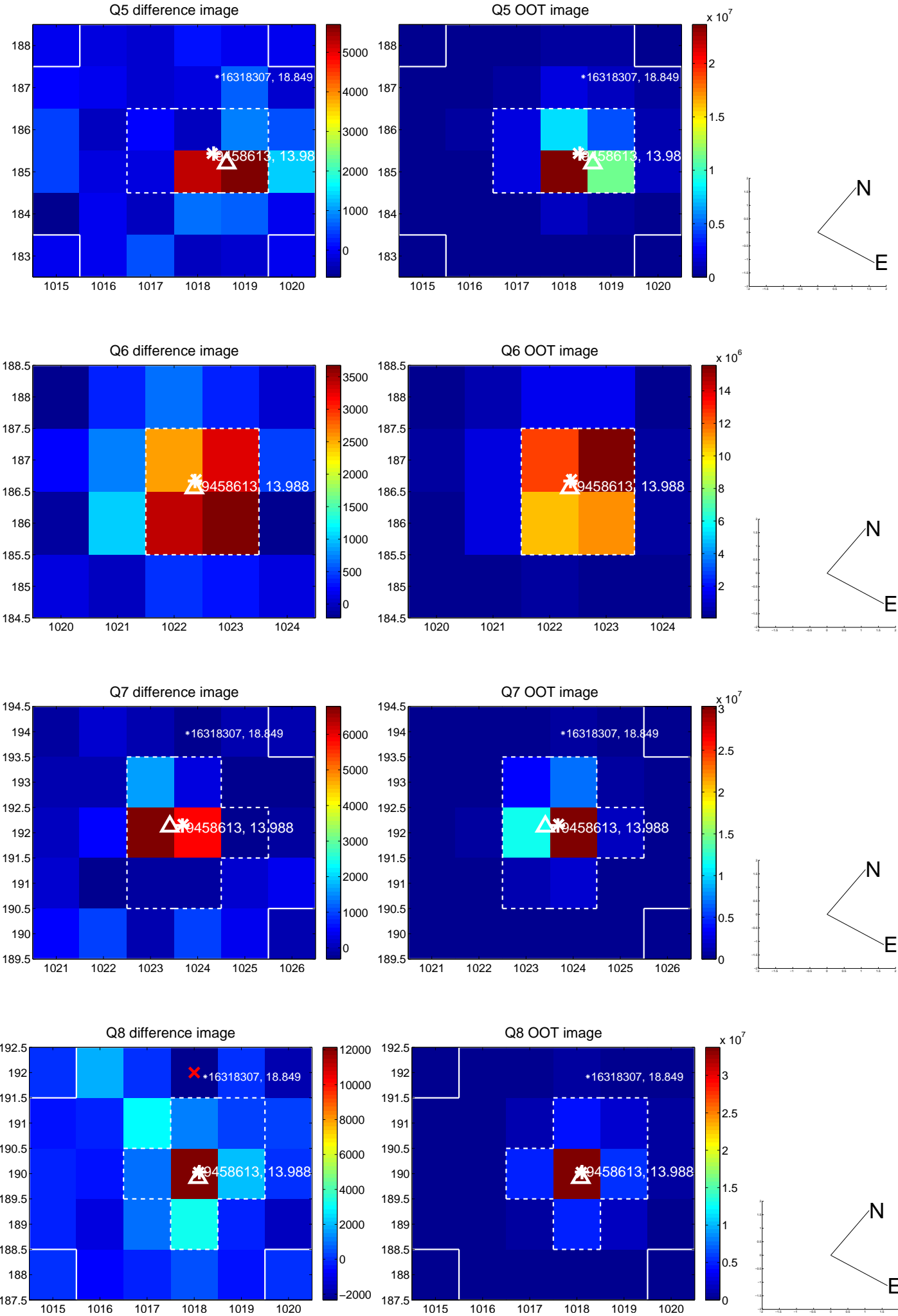
Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses:** good quarterly centroid offsets; **Vermillion crosses:** bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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



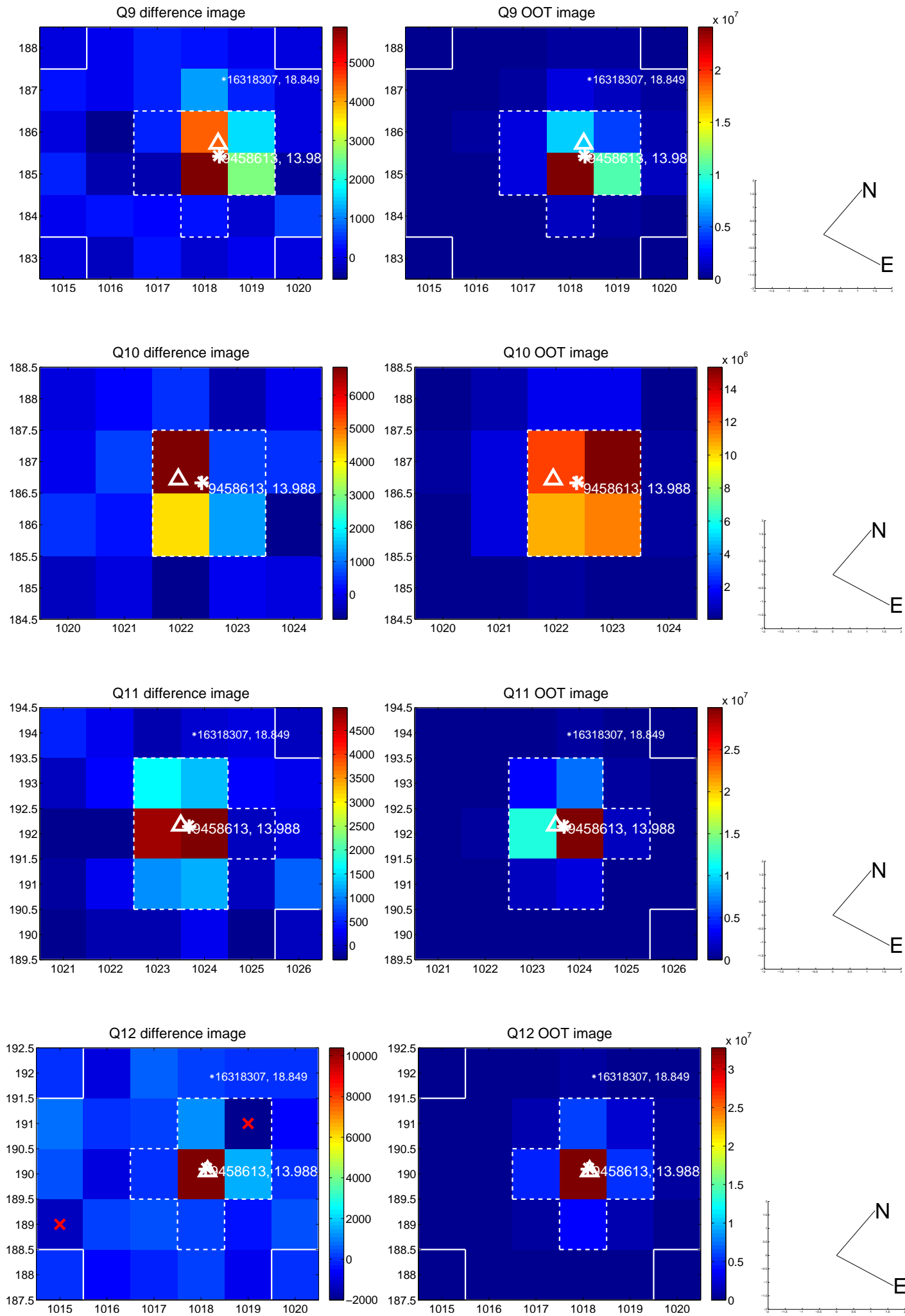
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



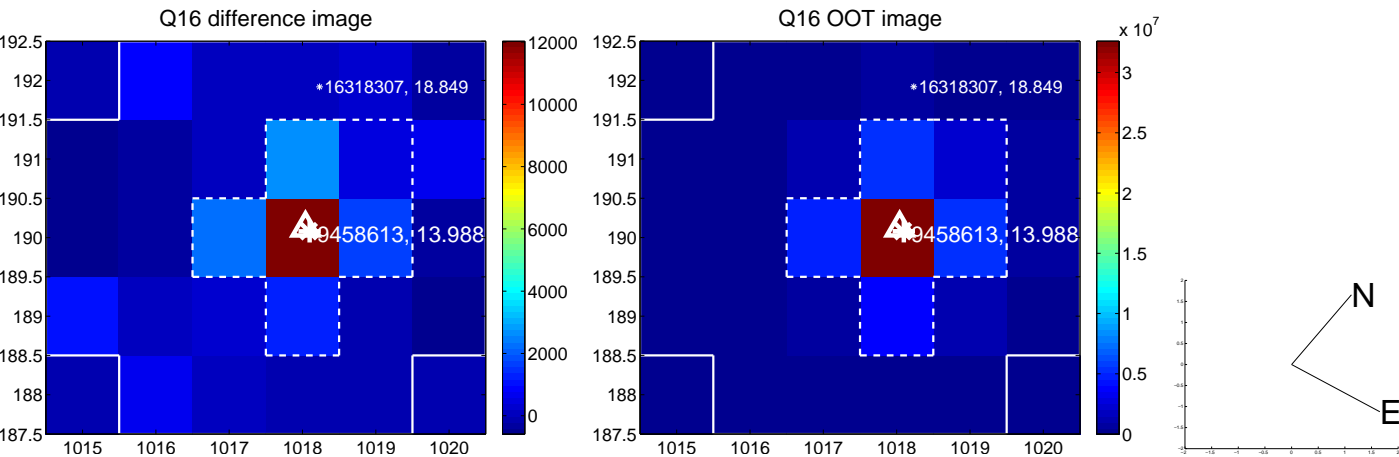
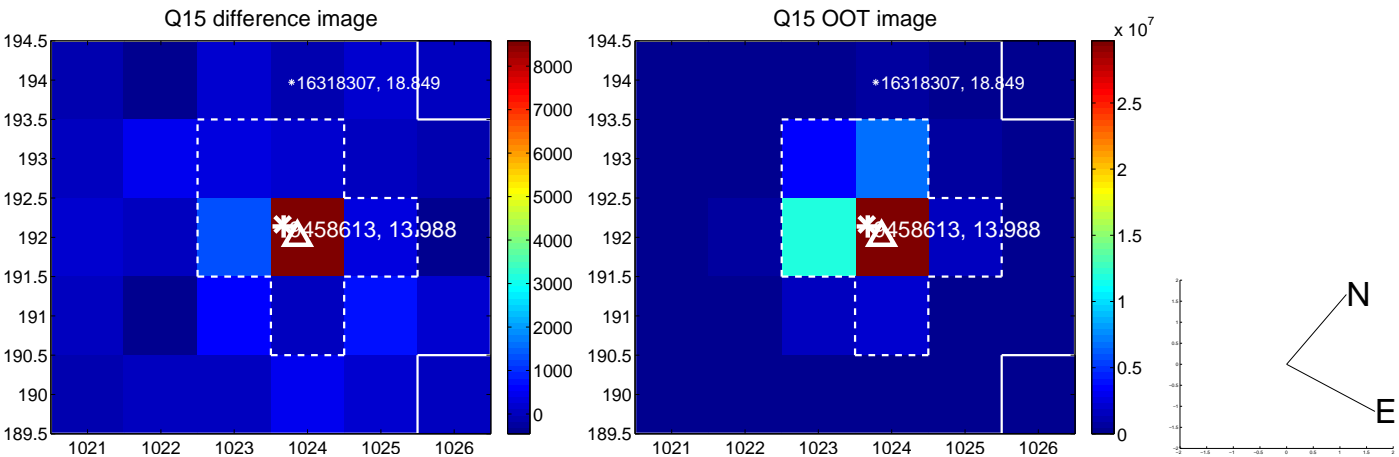
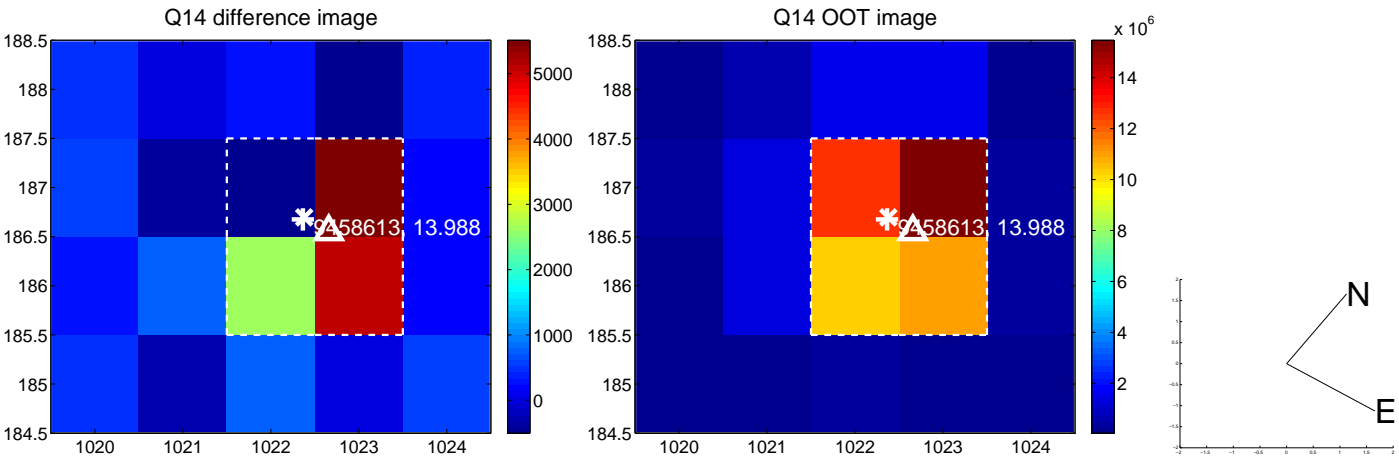
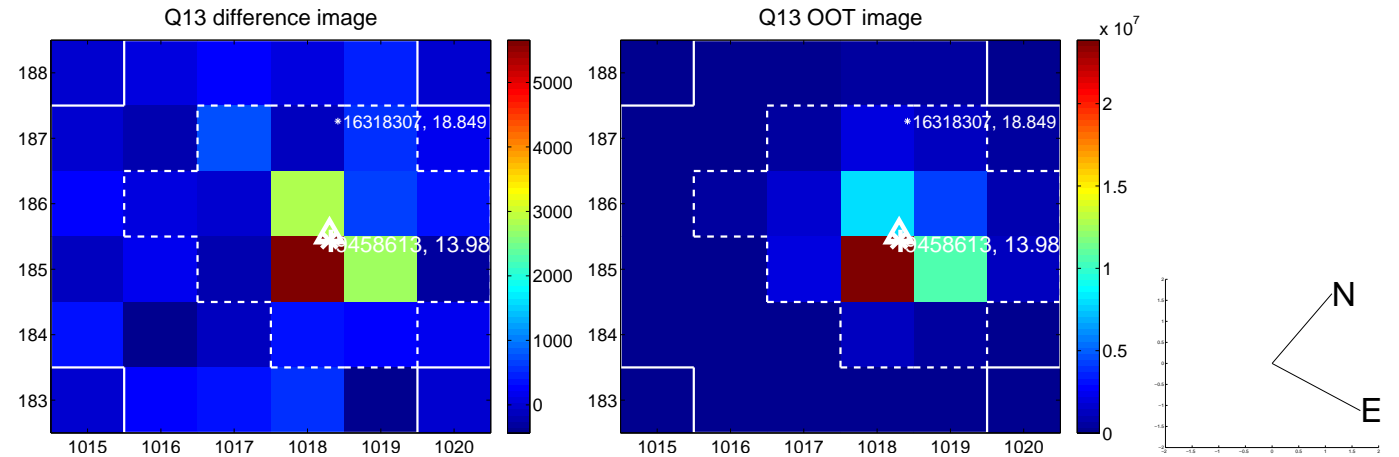
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



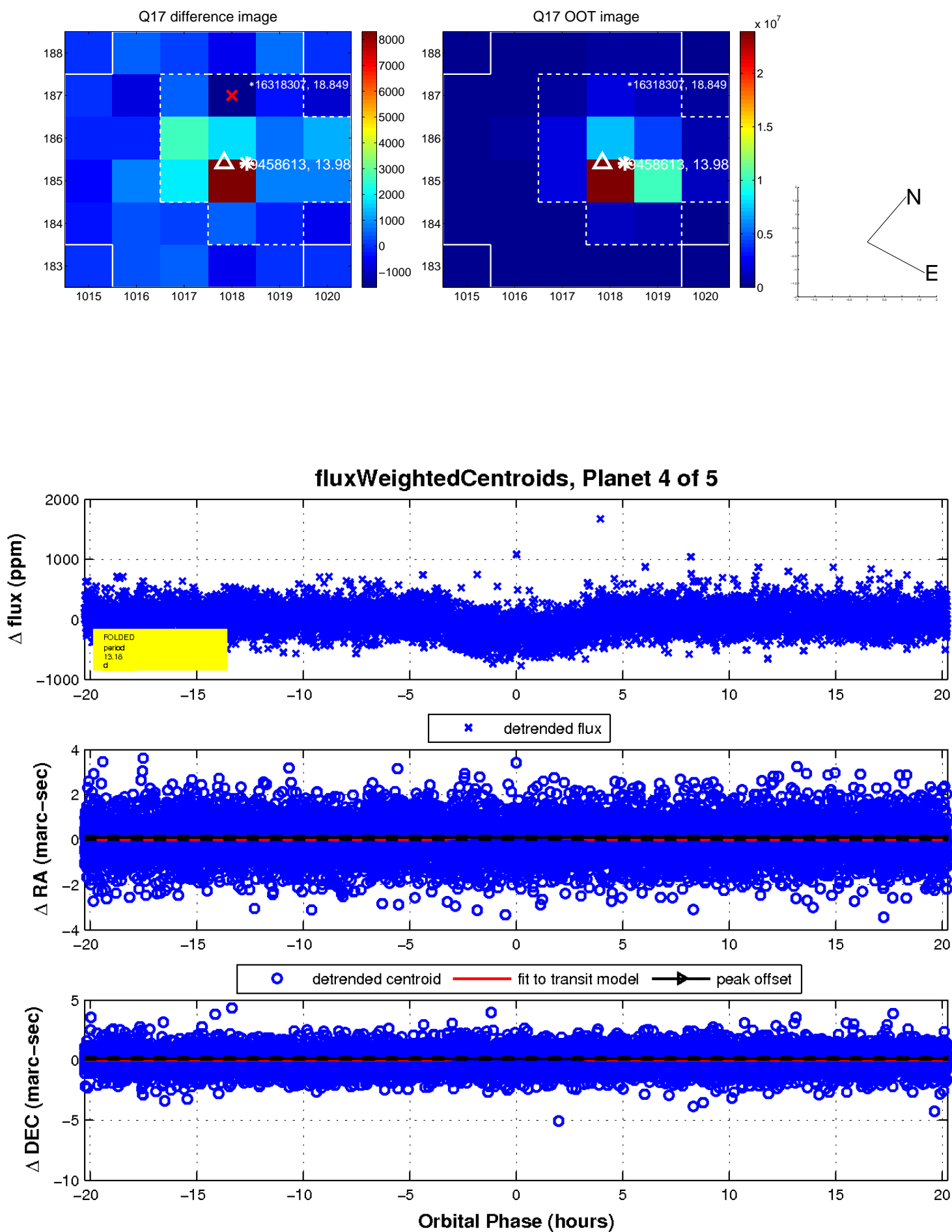
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

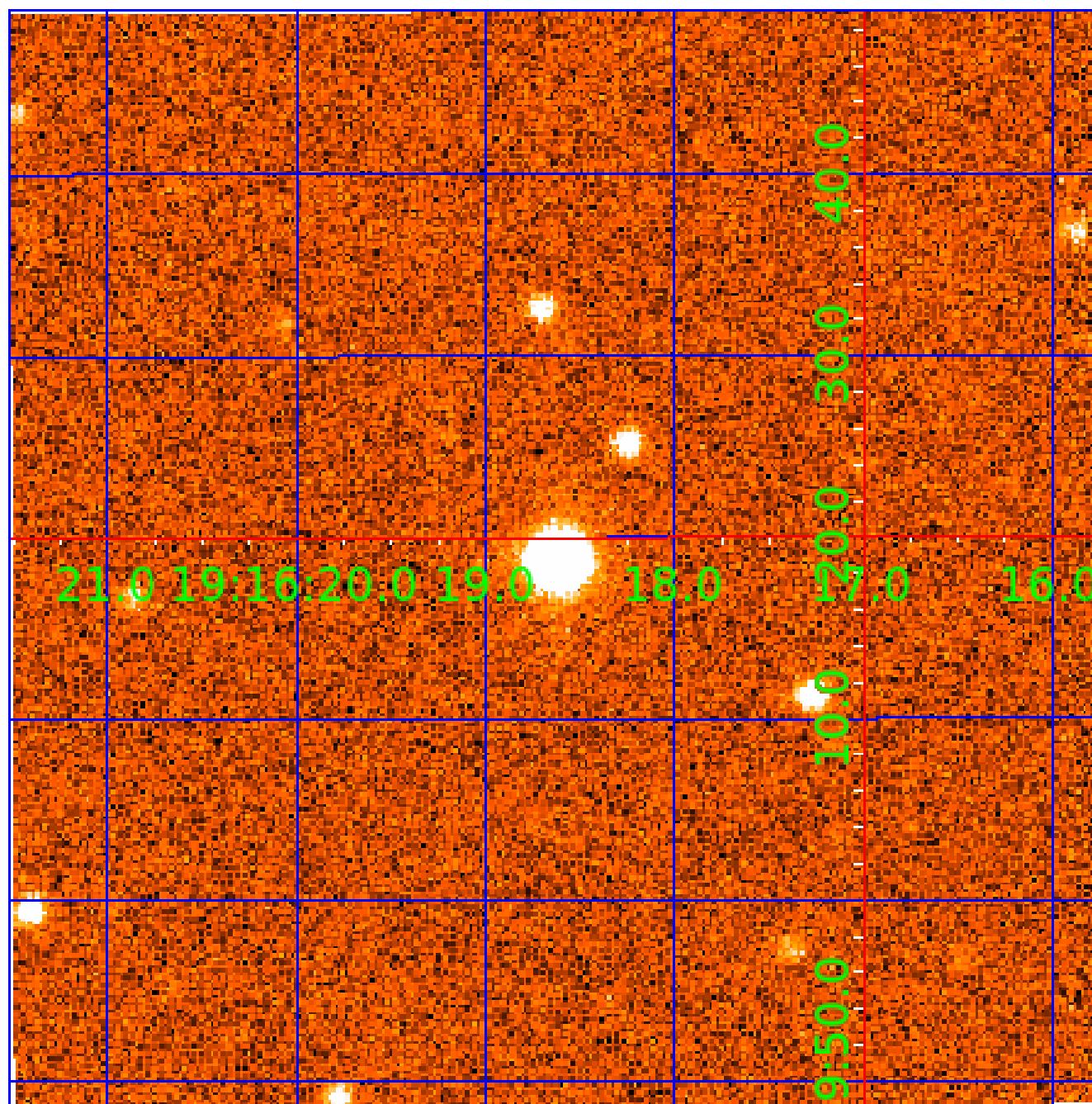


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination



# KIC 009458613

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
009458613-01	OBS	0707.01	21.775671	146.087479	796.7	8.095	77.6	81.9	1.69	5900	5.08	125.40
009458613-02	OBS	0707.02	41.027810	131.555832	530.5	10.645	40.9	44.8	1.69	5900	4.59	53.89
009458613-03	OBS	0707.03	31.784855	135.867715	439.3	9.372	39.8	42.8	1.69	5900	4.16	75.73
009458613-04	OBS	0707.04	13.175544	143.678839	281.1	6.754	34.9	39.6	1.69	5900	3.11	245.03
009458613-05	OBS	0707.05	5.668163	131.887260	80.7	4.838	13.9	15.2	1.69	5900	1.69	754.49

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009458613-01	OBS	PC	1.00	0	0	0	0	NO_COMMENT
009458613-02	OBS	PC	1.00	0	0	0	0	NO_COMMENT
009458613-03	OBS	PC	1.00	0	0	0	0	NO_COMMENT
009458613-04	OBS	PC	1.00	0	0	0	0	NO_COMMENT
009458613-05	OBS	PC	1.00	0	0	0	0	NO_COMMENT

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

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

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

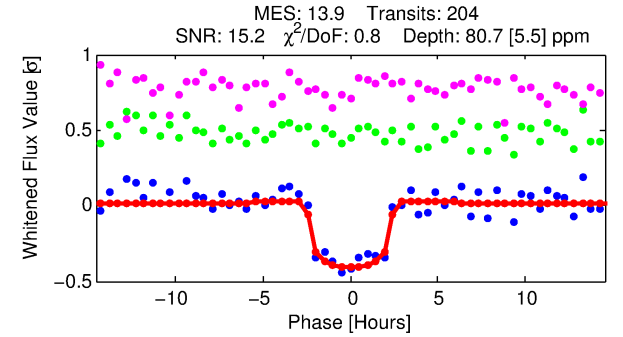
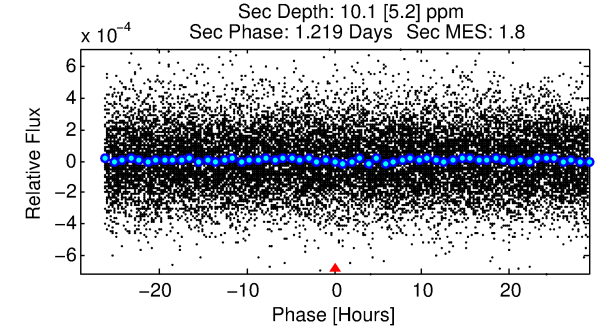
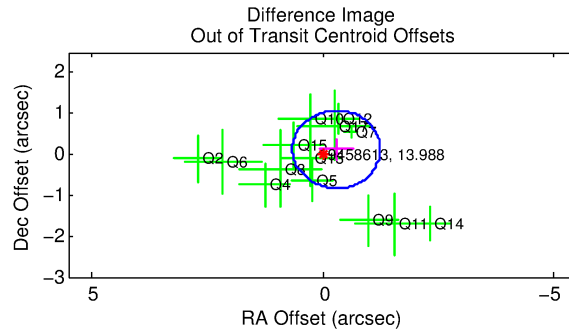
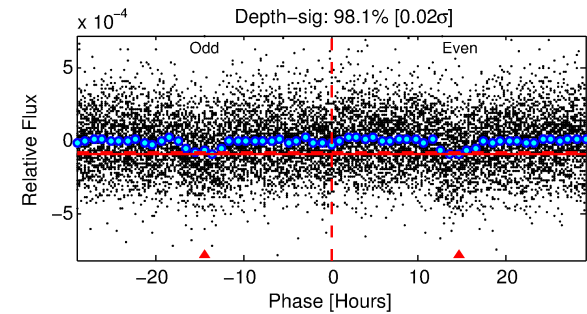
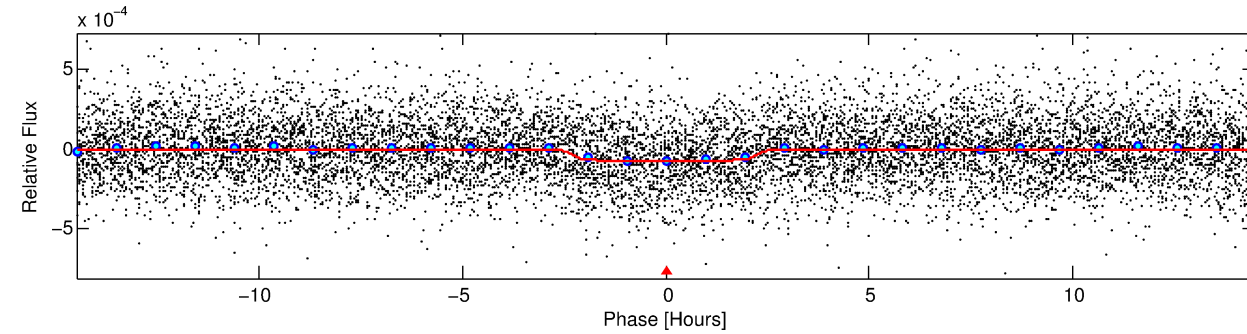
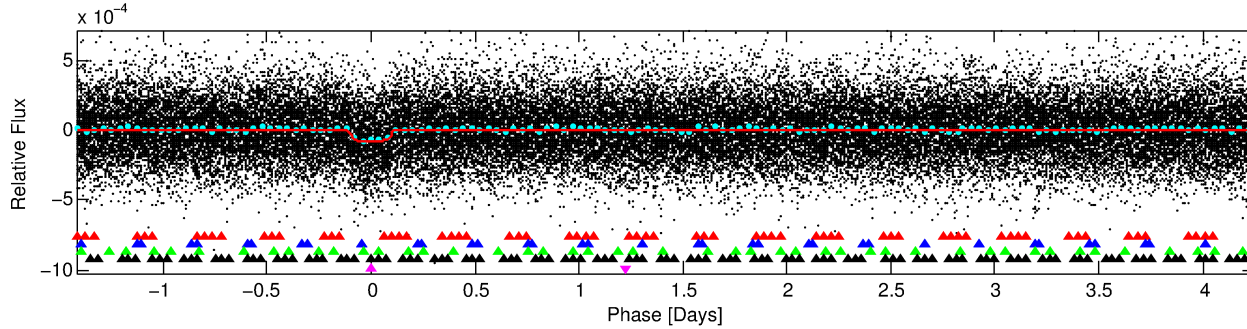
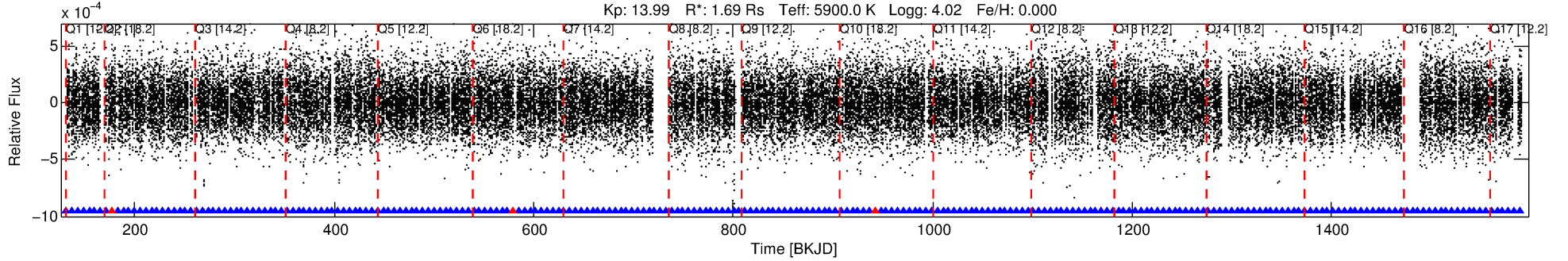
## Ephemeris Match Information For 009458613-05

No Significant Match Found



# DV One-Page Summary

KIC: 9458613 Candidate: 5 of 5 Period: 5.668 d  
KOI: K00707.05 Name: Kepler-33b Corr: 0.995



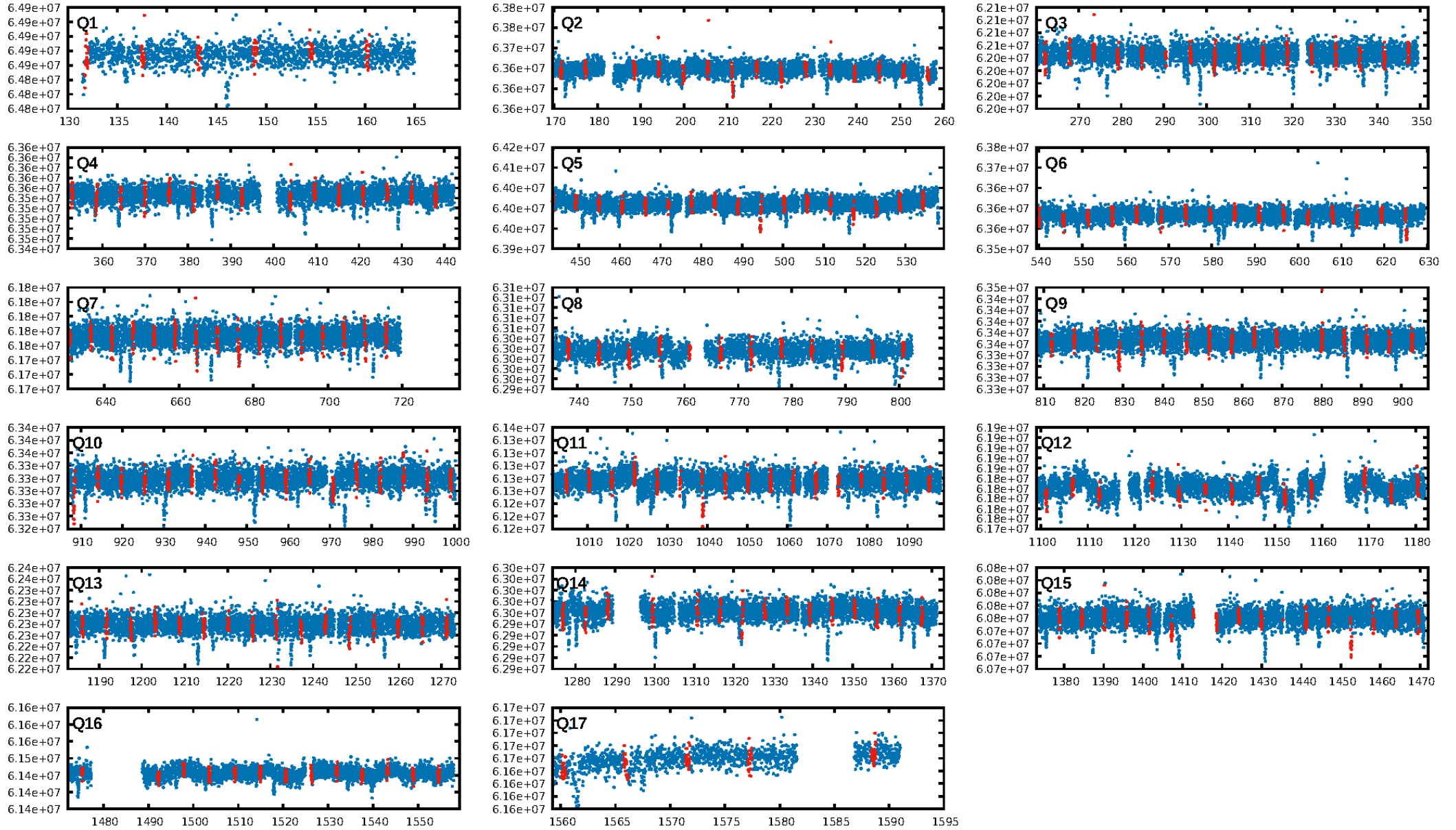
## DV Fit Results:

Period = 5.66816 [0.00004] d  
Epoch = 131.8873 [0.0052] BKJD  
Rp/R\* = 0.0091 [0.0038]  
a/R\* = 5.52 [10.51]  
b = 0.80 [0.87]  
Seff = 754.49 [264.56]  
T<sub>eq</sub> = 1336 [117] K  
Rp = 1.69 [0.81] Re  
a = 0.0643 [0.0143] AU  
Ag = 8.06 [8.31] [0.85 $\sigma$ ]  
T<sub>effp</sub> = 3482 [849] K [2.50 $\sigma$ ]

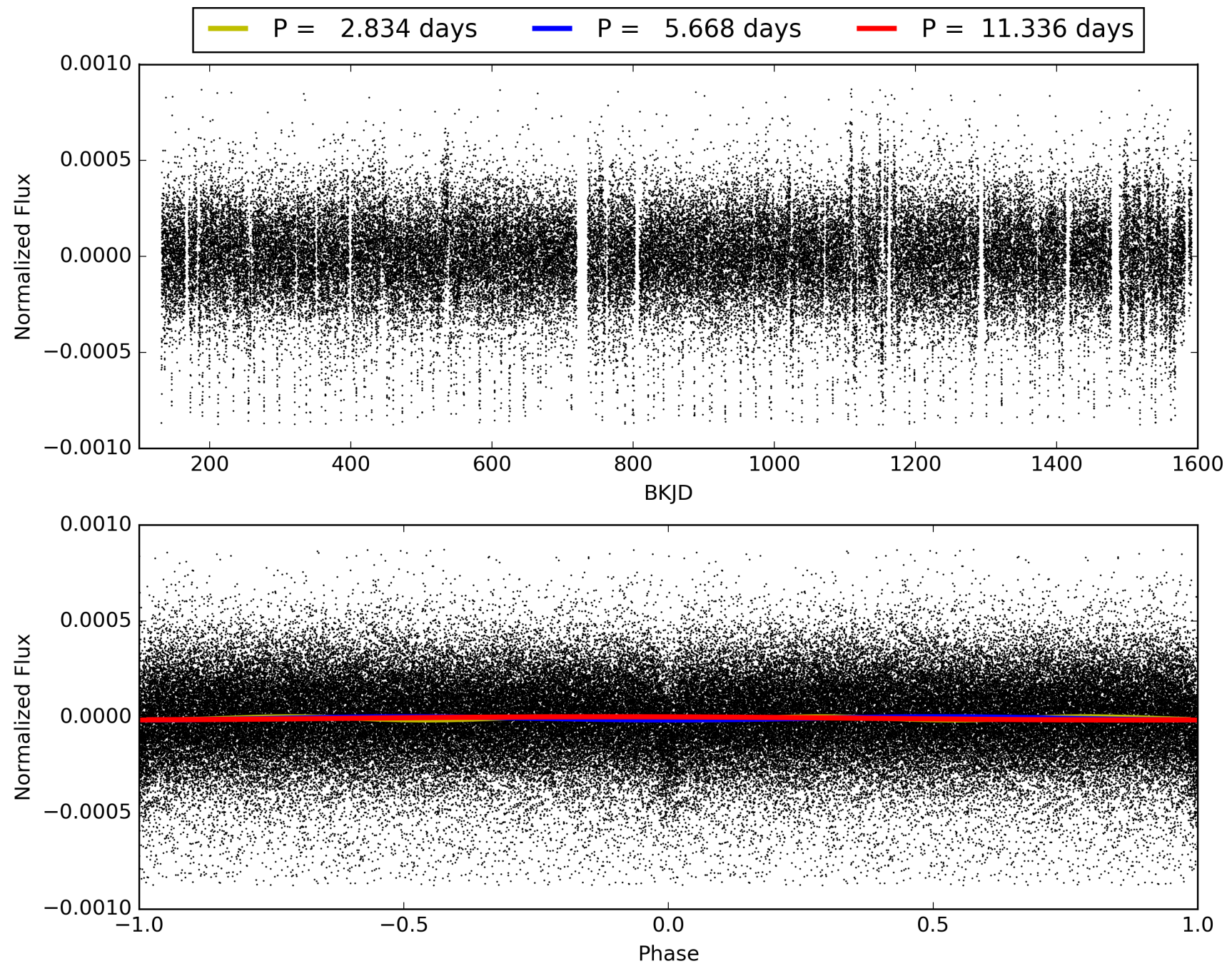
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 100.0% [21.69 $\sigma$ ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: 8.33e-44  
RollingBand-fgt: 0.98 [192/195]  
GhostDiagnostic-chr: 2.495  
Centroid-sig: 11.2%  
Centroid-so: 1.045 arcsec [1.38 $\sigma$ ]  
OotOffset-rm: 0.319 arcsec [1.01 $\sigma$ ]  
KicOffset-rm: 0.283 arcsec [0.90 $\sigma$ ]  
OotOffset-st: 4/3/3/4 [14]  
KicOffset-st: 4/3/3/4 [14]  
DiffImageQuality-fgm: 1.00 [14/14]  
DiffImageOverlap-fno: 1.00 [17/17]

# TCE 009458613-05, PDC Light Curves



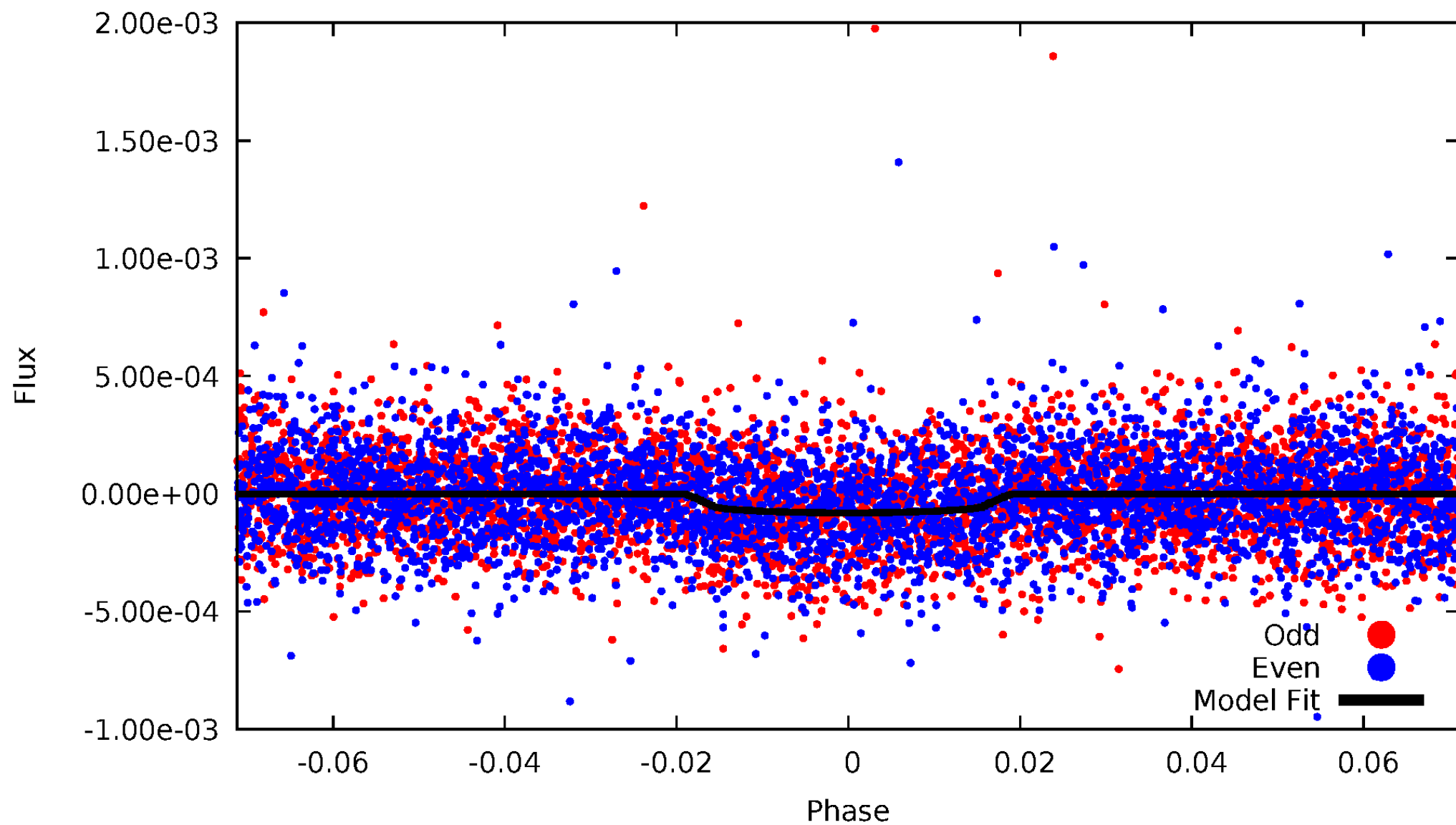
TCE 009458613-05





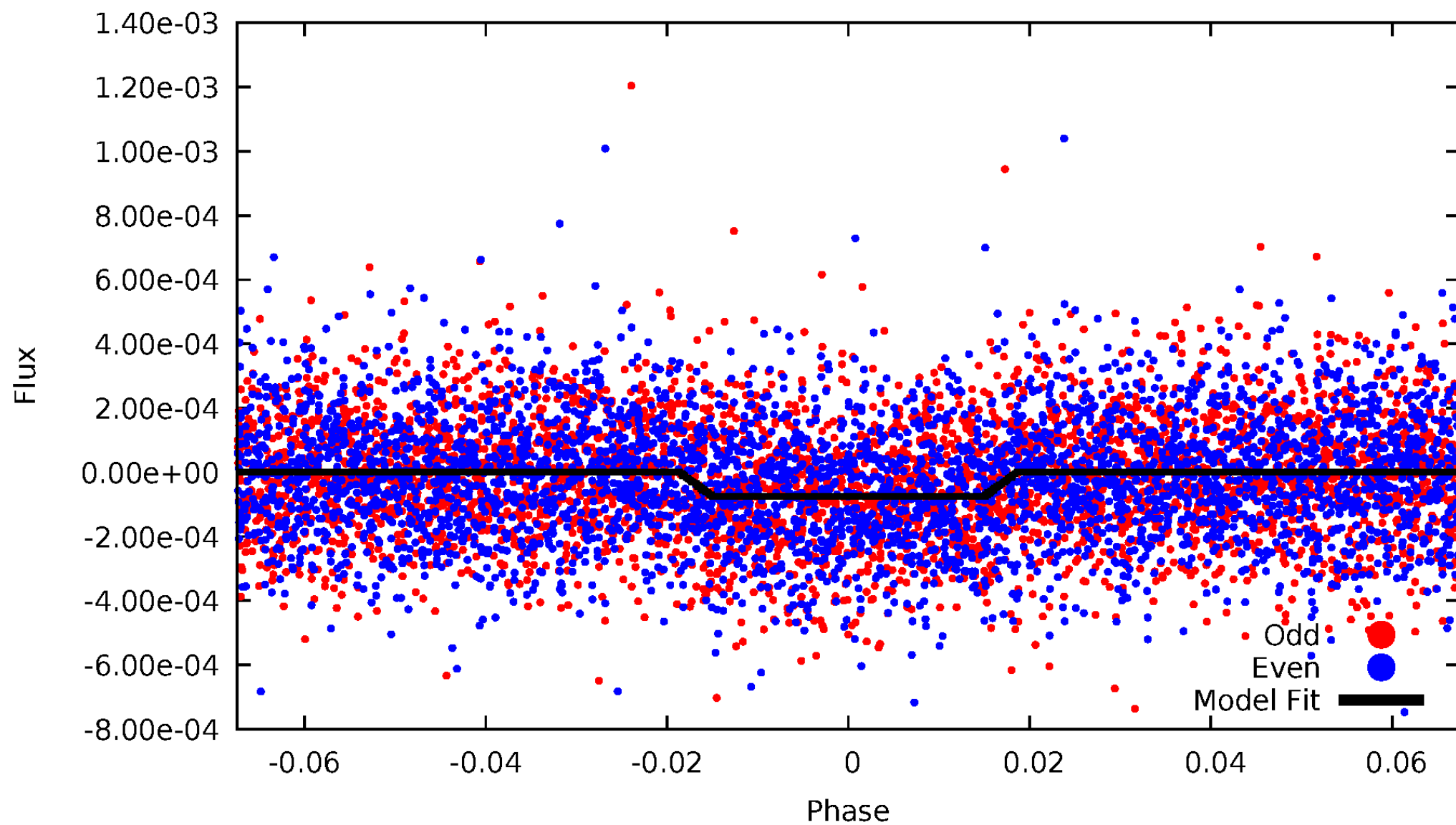
# DV Odd/Even

TCE 009458613-05



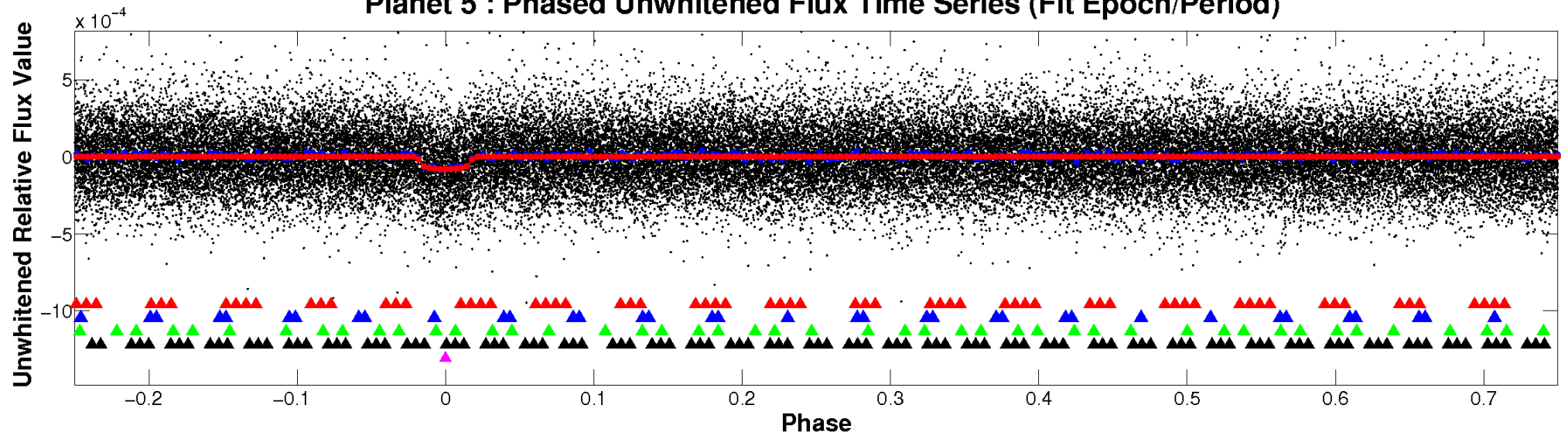
# ALT Odd/Even

TCE 009458613-05

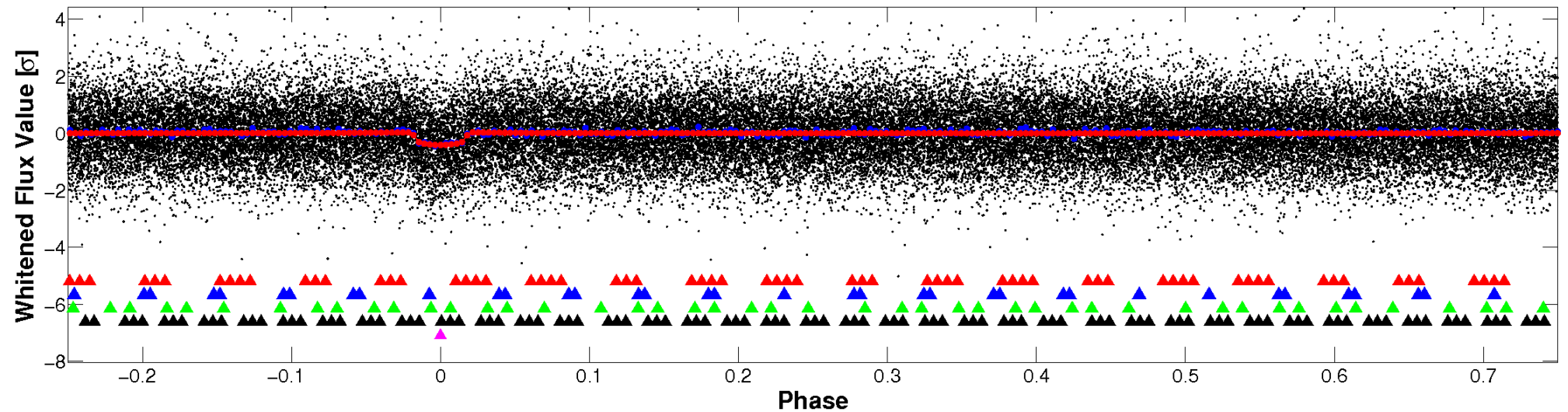


# Non-Whitened Vs. Whitened Light Curve

## Planet 5 : Phased Unwhitened Flux Time Series (Fit Epoch/Period)



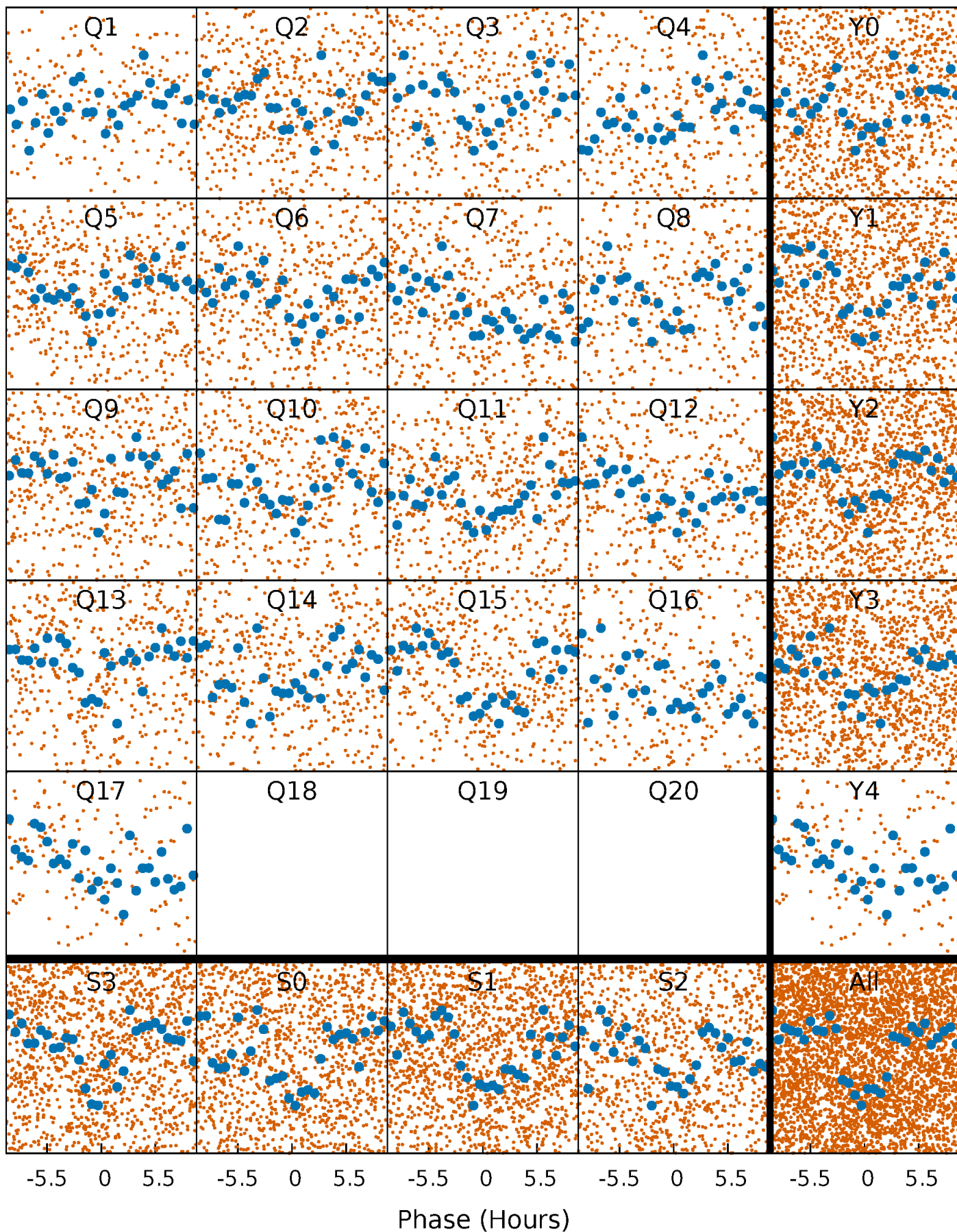
## Planet 5 : Phased Whitened Flux Time Series (Fit Epoch/Period)





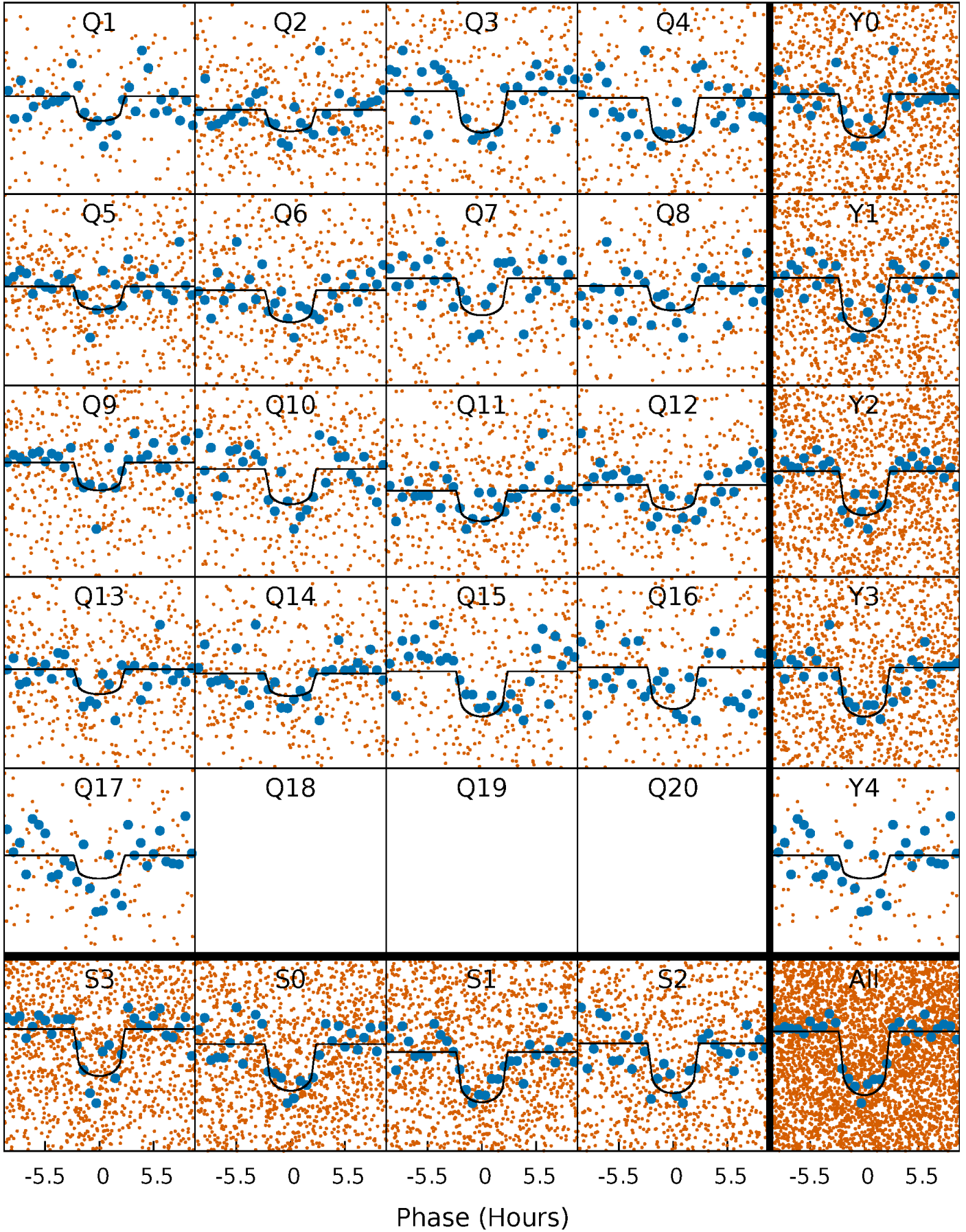
# PDC Quarter-Phased Transit Curves

TCE 009458613-05 P= 5.668163 Days  $T_0=131.887260$  (BKJD)



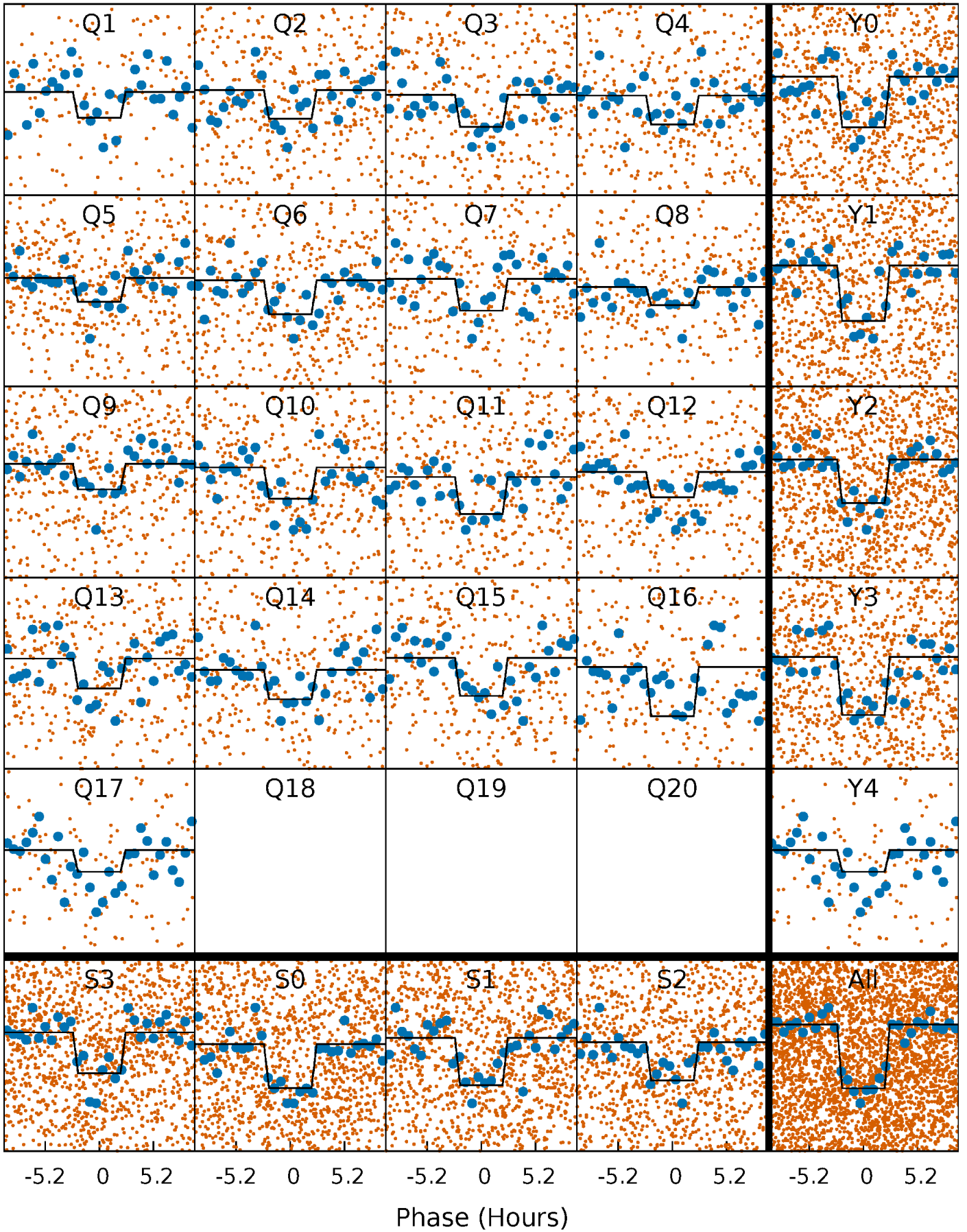
# DV Quarter-Phased Transit Curves

TCE 009458613-05   P= 5.668163 Days    $T_0=131.887260$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

TCE 009458613-05   P= 5.668154 Days    $T_0=131.888097$  (BKJD)

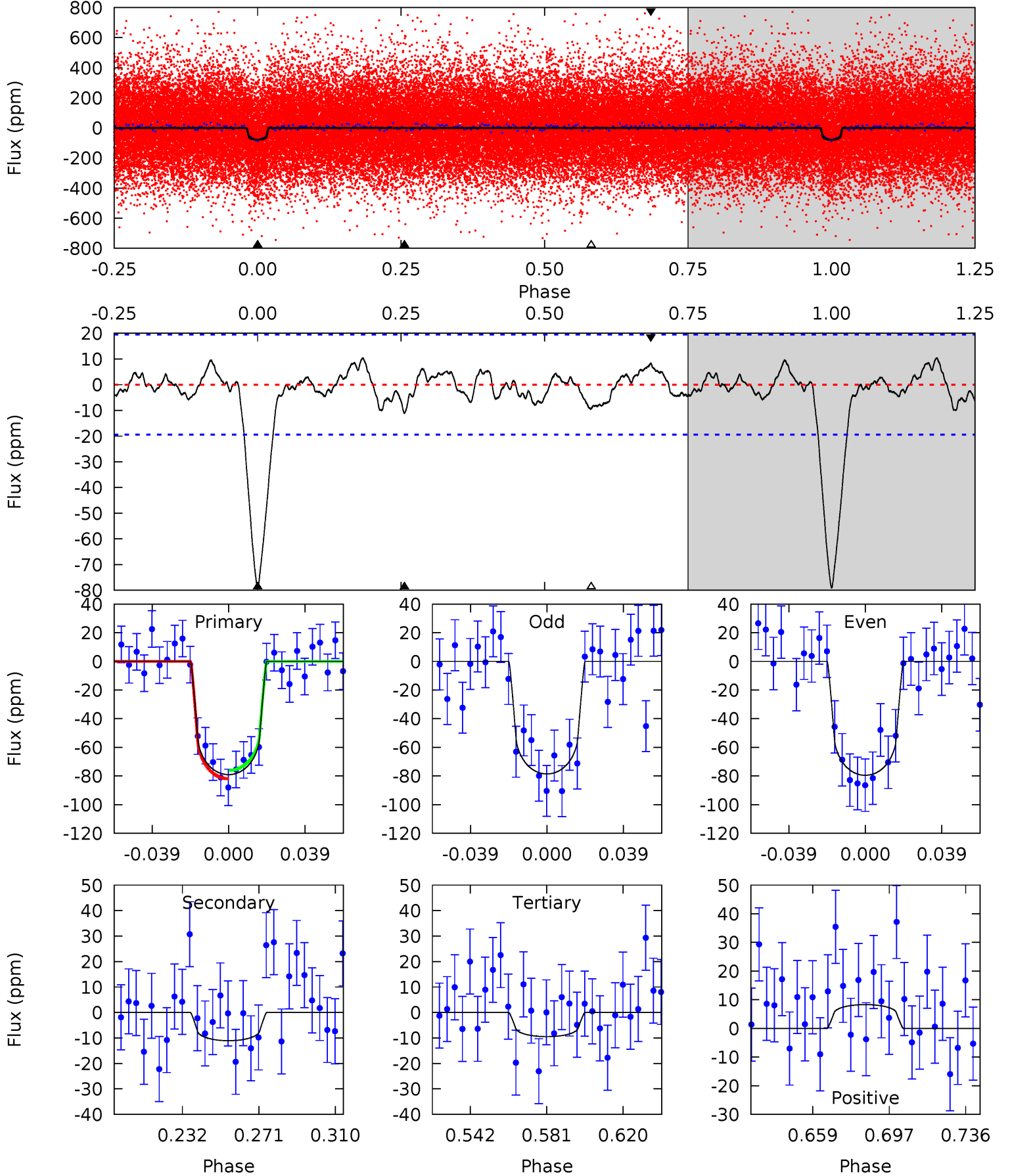




# DV Model-Shift Uniqueness Test

009458613-05, P = 5.668163 Days, E = 131.887260 Days

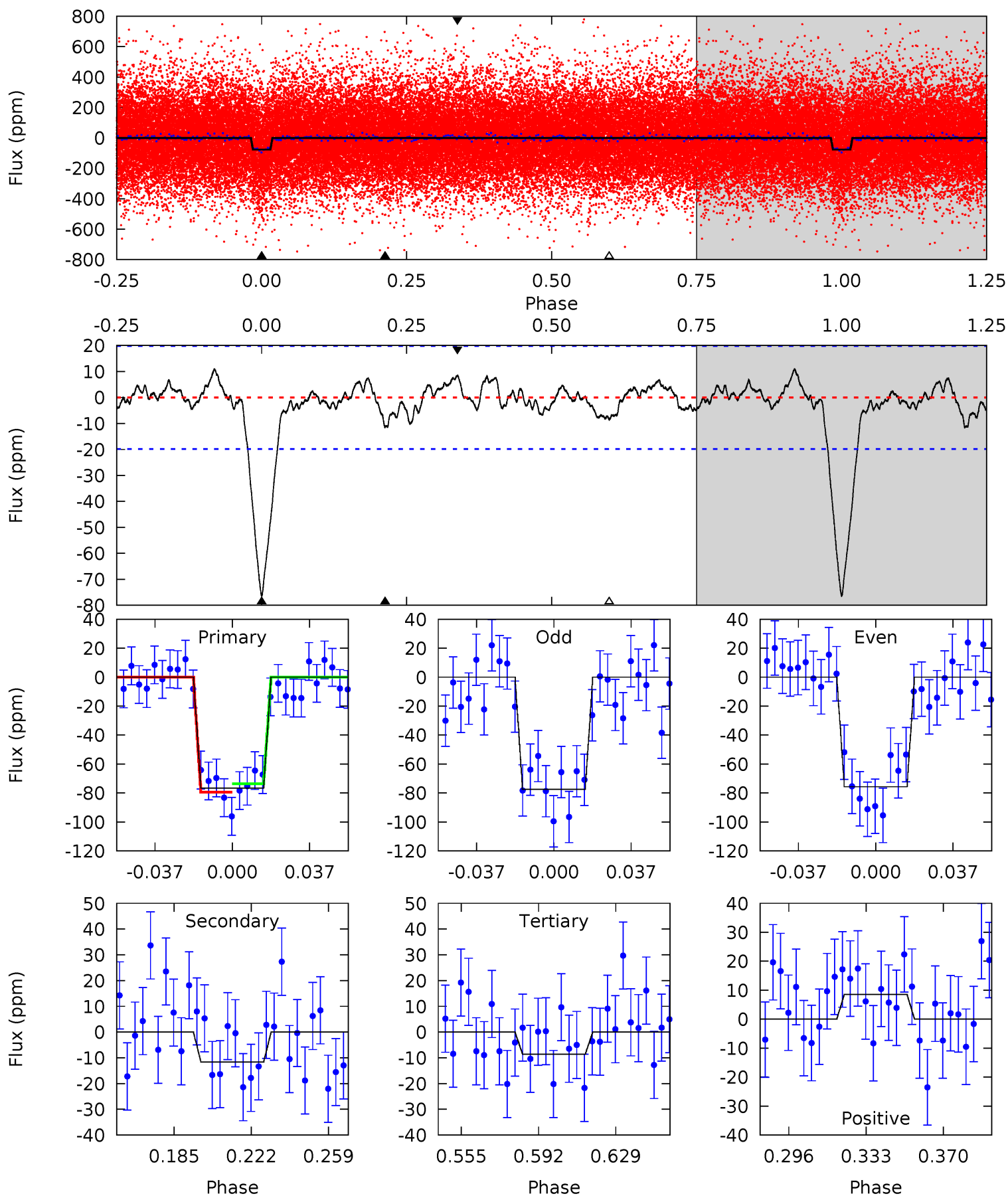
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
19.3	2.71	2.32	2.03	4.76	2.07	1.05	17.0	17.3	0.39	0.68	0.12	0.99	0.12	0.70



# Alt Model-Shift Uniqueness Test

009458613-05, P = 5.668154 Days, E = 131.888097 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
18.4	2.80	2.07	2.06	4.77	2.09	0.95	16.3	16.3	0.73	0.74	0.21	1.07	0.13	0.71



### Stellar Parameters For KIC 009458613

	$T_{\text{eff}} (K)$	$\log(g)$	$[\text{Fe}/\text{H}]$	$R (R_{\odot})$	$M (M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$5900^{+117}_{-117}$	$4.022^{+0.195}_{-0.090}$	$0.000^{+0.150}_{-0.150}$	$1.694^{+0.257}_{-0.418}$	$1.100^{+0.124}_{-0.112}$	$0.319^{+0.351}_{-0.086}$
	+2%/-2%	+5%/-2%	+inf%/-inf%	+15%/-25%	+11%/-10%	+110%/-27%
Source	SPE35	SPE35	SPE35	DSEP		

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

### Secondary Eclipse Parameters for KIC 009458613-05 / KOI 0707.05

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$-11 \pm 4$	$1.68^{+0.71}_{-0.69}$	$1860^{+87}_{-111}$	$3859^{+824}_{-488}$	$9.009^{+17.251}_{-5.250}$
Alt.	$-12 \pm 4$	$1.59^{+0.65}_{-0.67}$	$1854^{+85}_{-108}$	$3991^{+869}_{-530}$	$11^{+21}_{-6}$

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



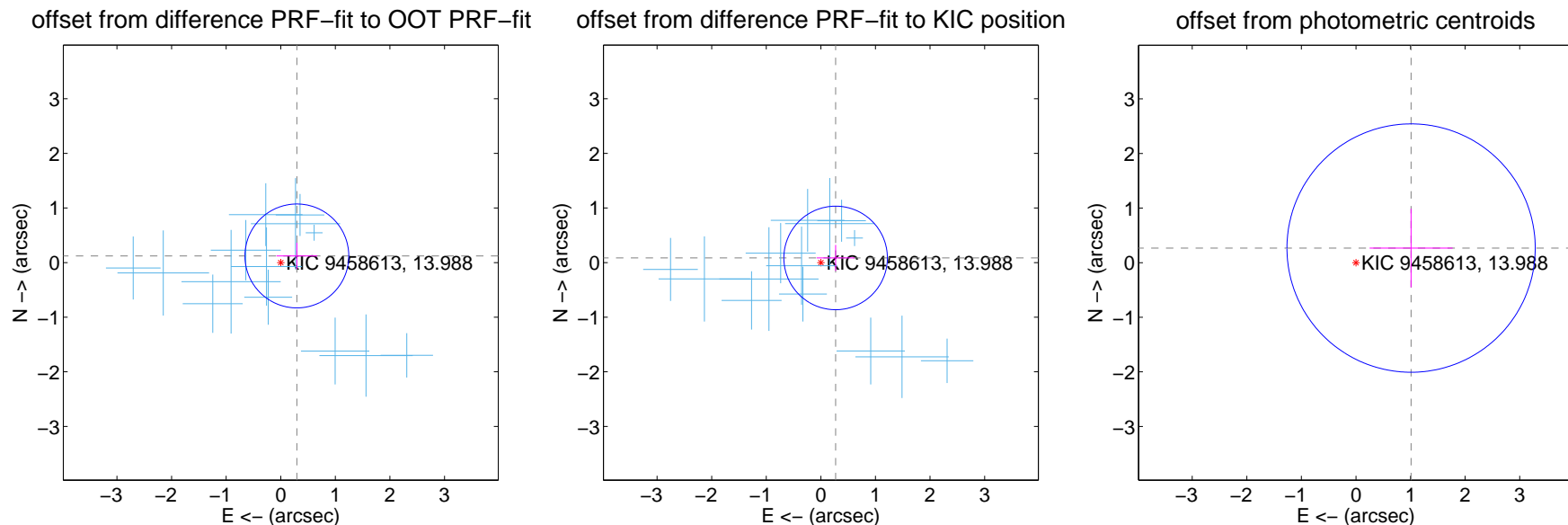
## DV Centroid Data

Supplemental centroid analysis for 009458613-05. Kepler magnitude: 13.99. Transit SNR 15.15

There are 14 quarters with good PRF difference image offsets

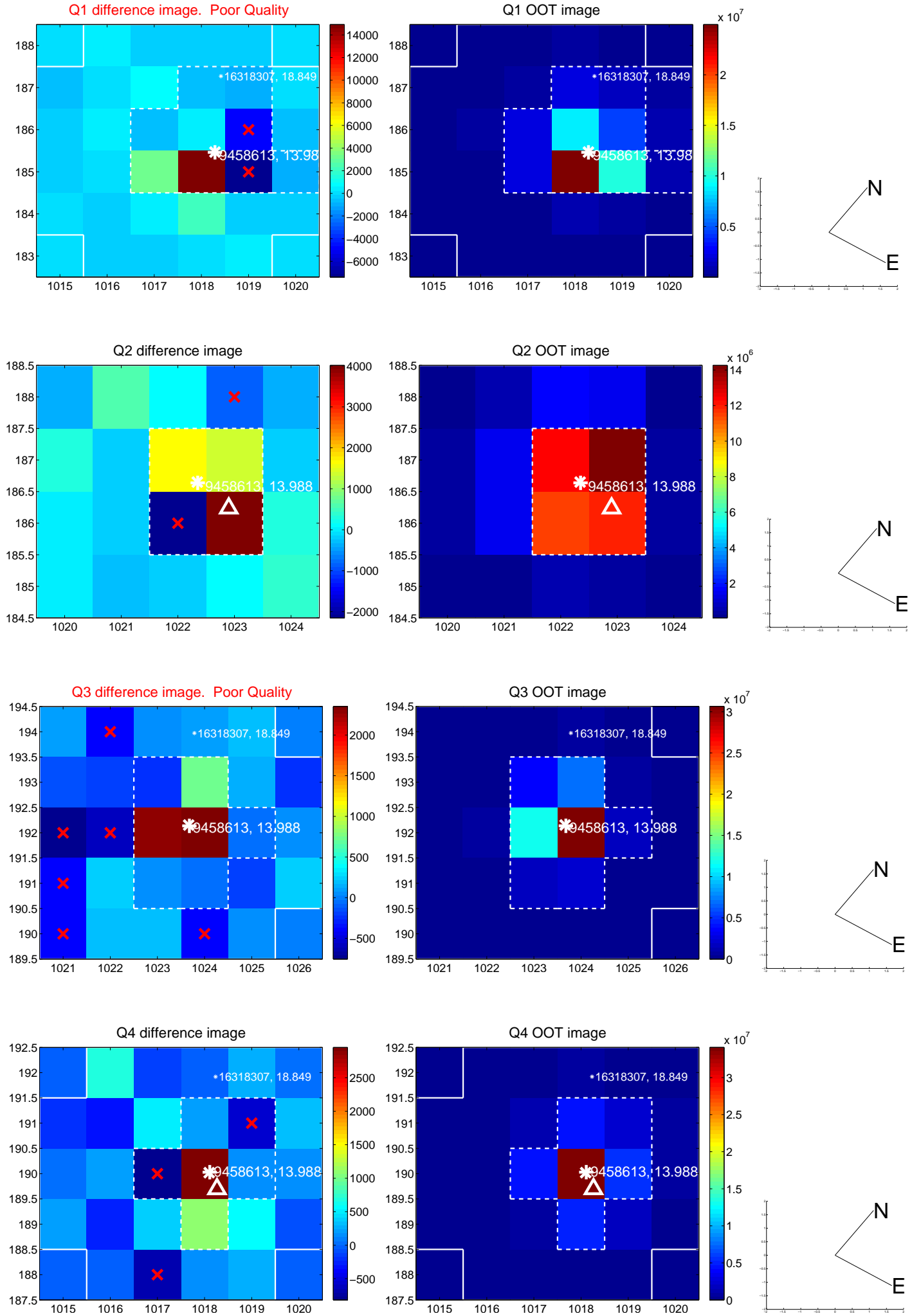
The direct PRF centroid is offset from the target star catalog position by about 0.11 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.319 \pm 0.317$	1.01	$-0.295 \pm 0.373$	$0.122 \pm 0.241$
PRF-fit source offset from KIC position	$0.283 \pm 0.316$	0.90	$-0.270 \pm 0.346$	$0.085 \pm 0.237$
photometric centroid source offset	$1.05 \pm 0.76$	1.38	$-1.01 \pm 0.76$	$0.27 \pm 0.72$

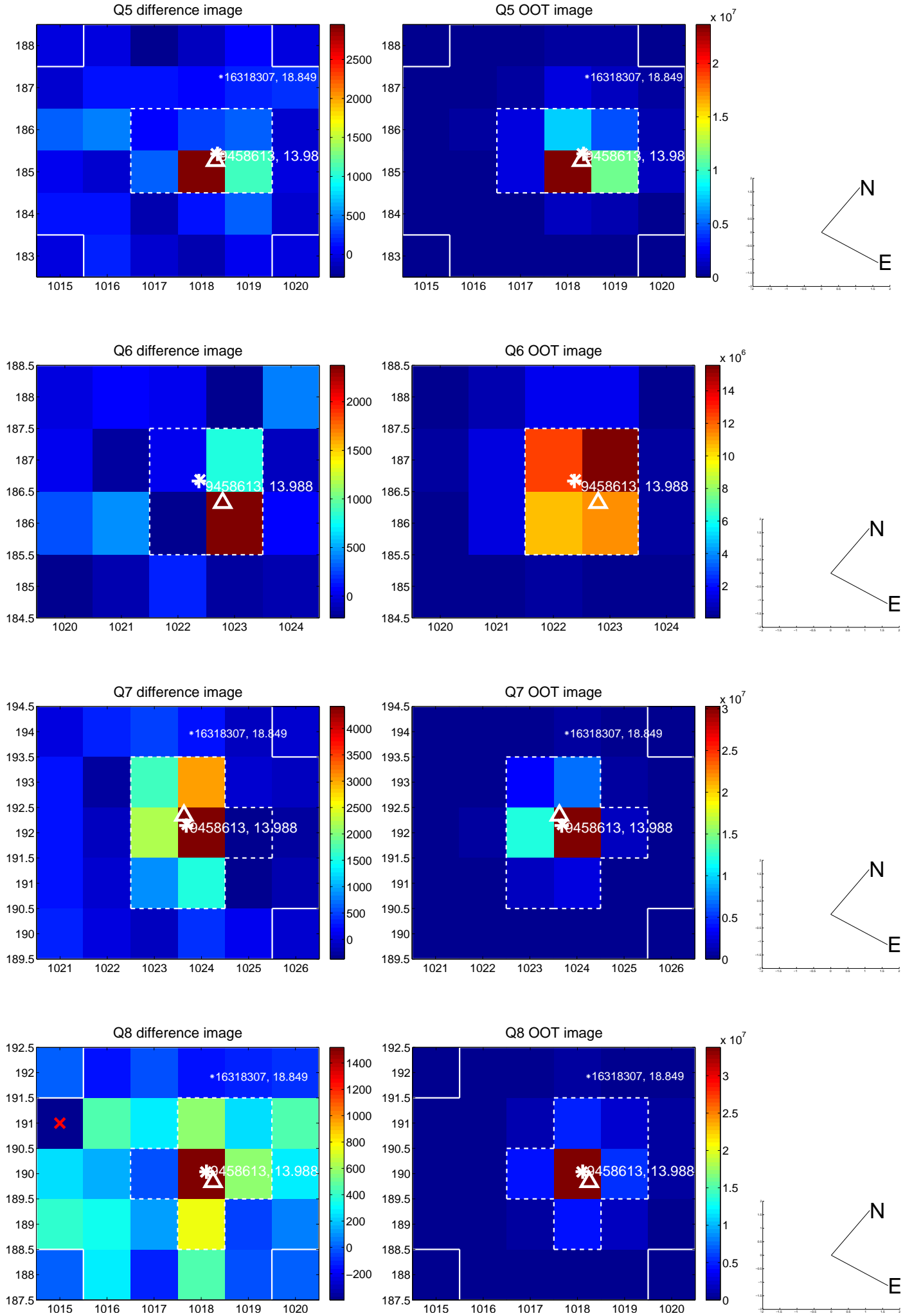


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses:** good quarterly centroid offsets; **Vermillion crosses:** bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

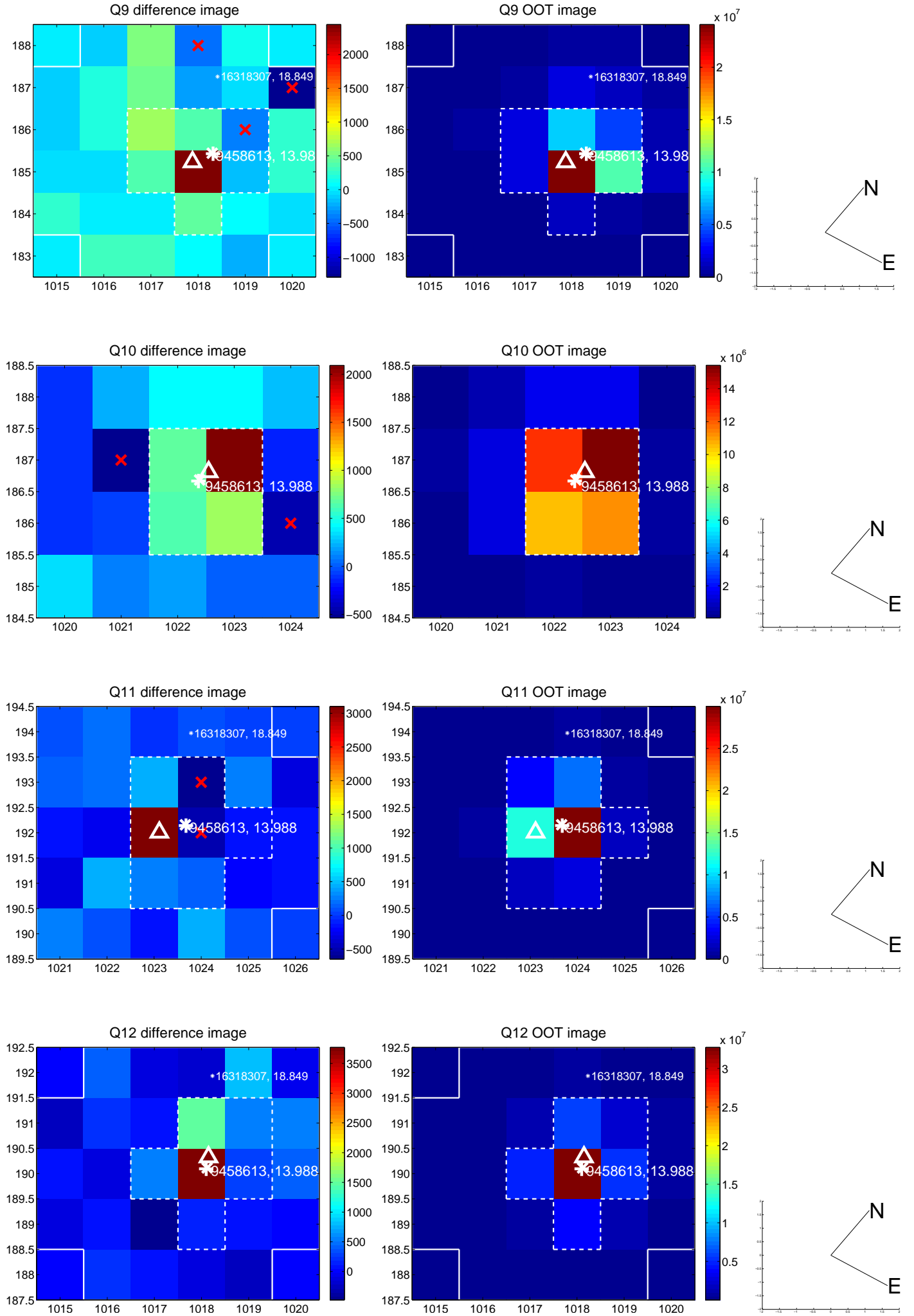
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



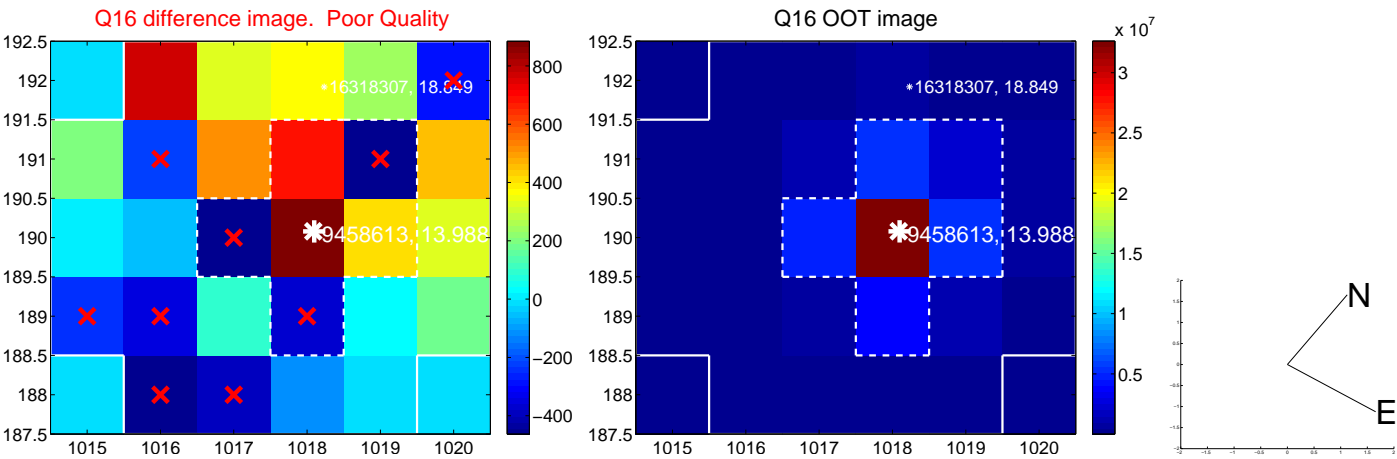
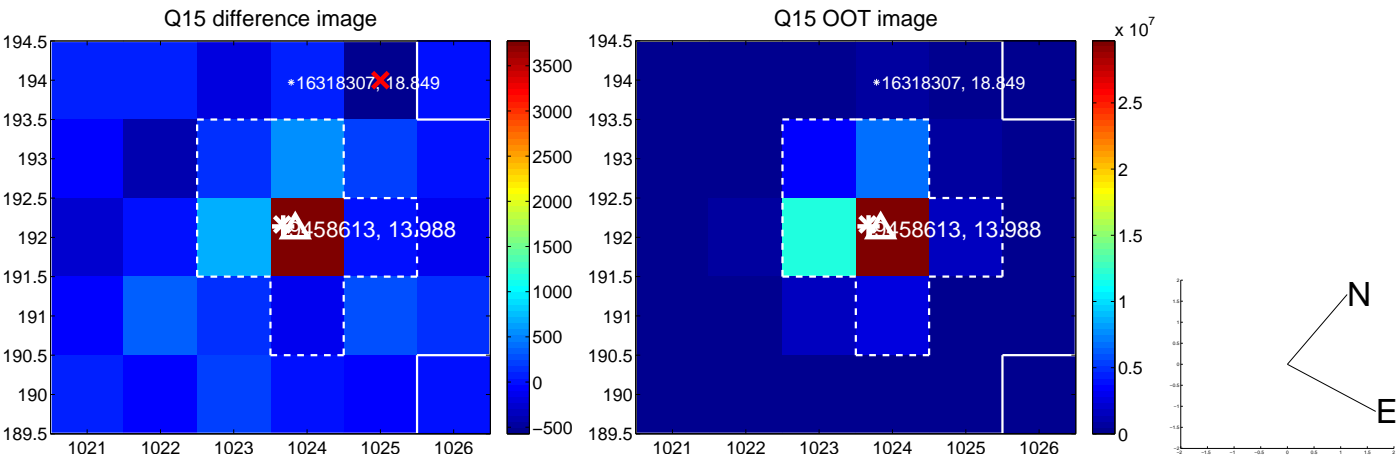
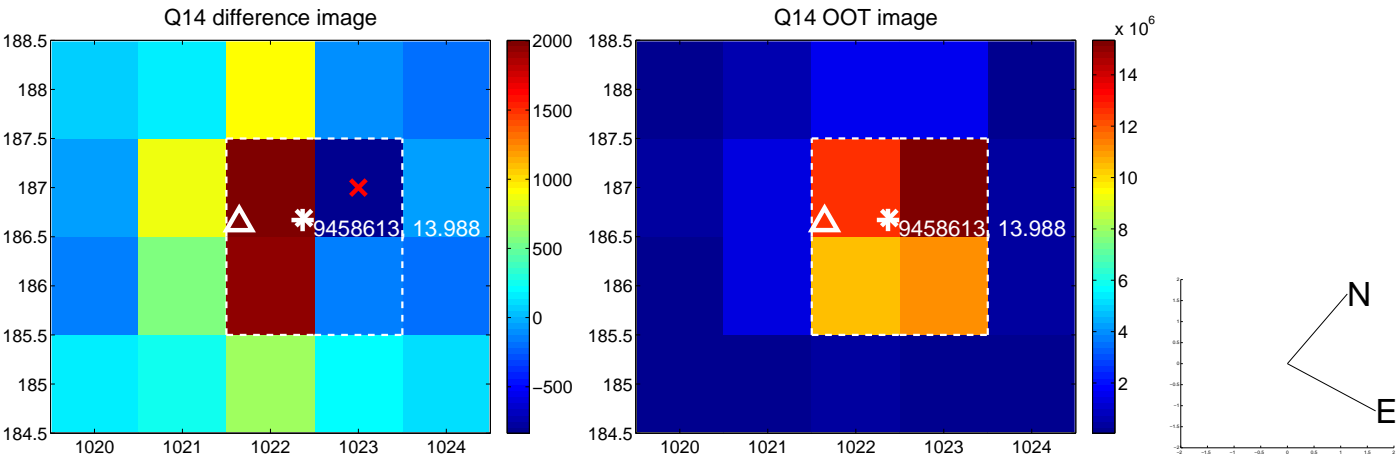
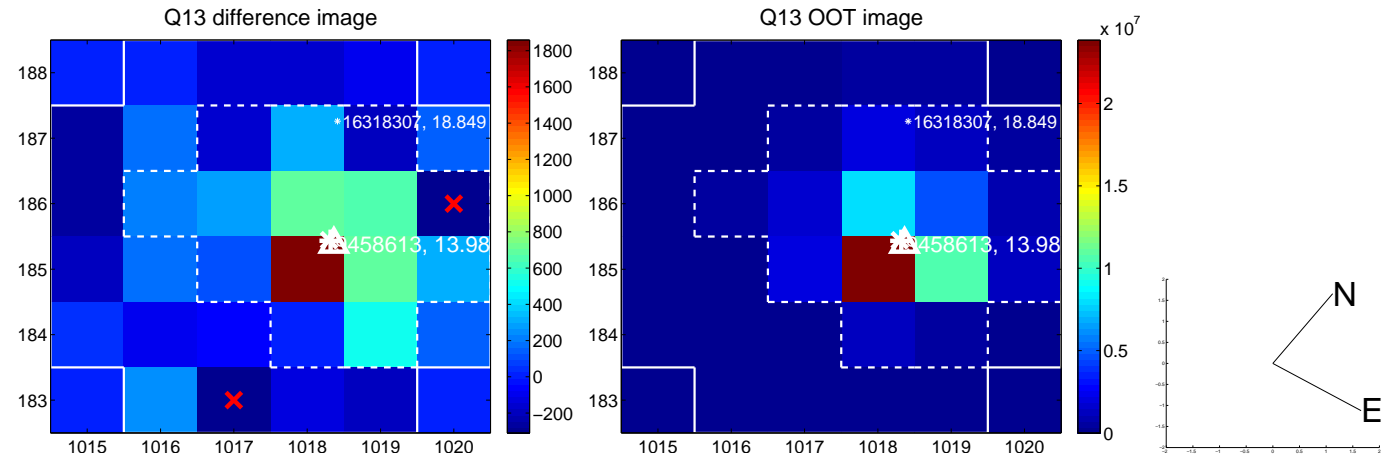
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



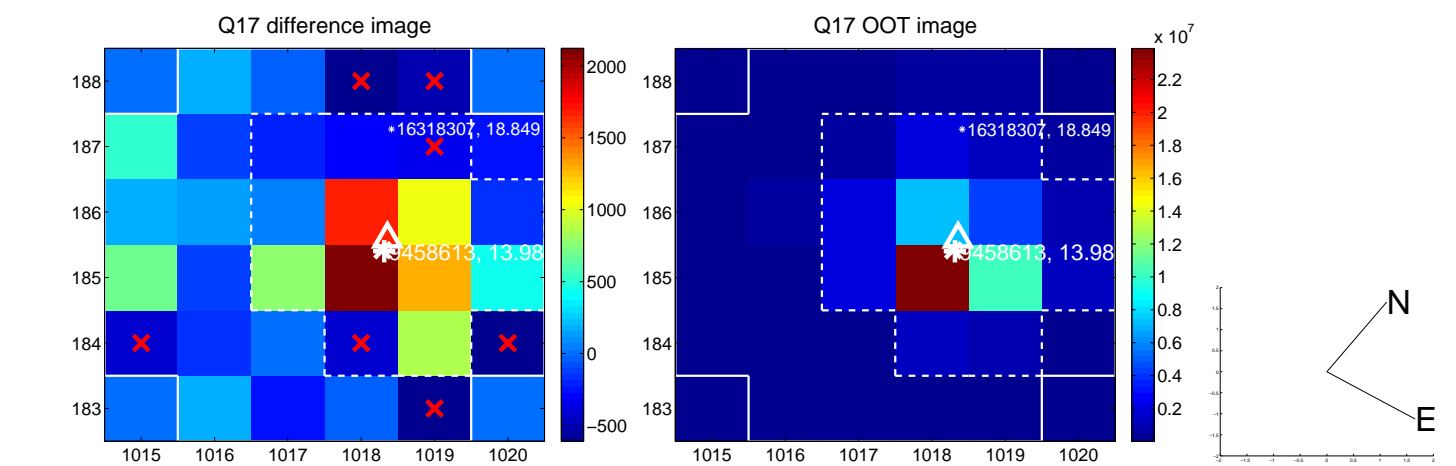
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



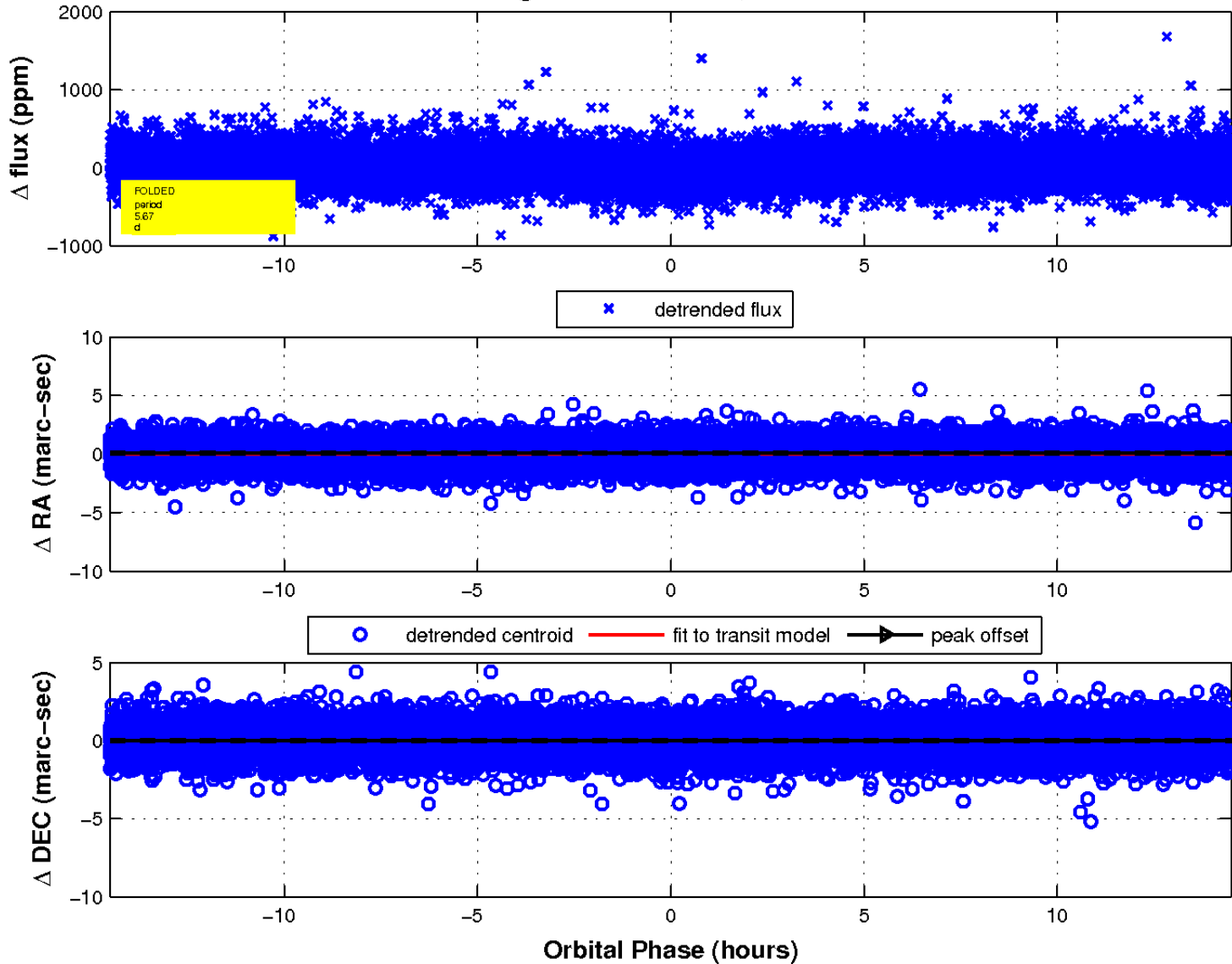
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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



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# UKIRT Image

Declination

