

# KIC 004252716

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
004252716-01	OBS	No	1.373172	132.088853	323.6	2.865	8.8	8.9	2.33	7507	4.86	18236.68
004252716-02	OBS	No	0.559861	131.651841	291.2	1.065	9.5	7.1	2.33	7507	4.63	60321.54
004252716-03	OBS	No	0.559866	131.836577	388.1	1.062	8.1	9.6	2.33	7507	5.35	60320.74
004252716-04	OBS	No	377.911277	238.409499	3547.9	4.123	7.2	7.6	2.33	7507	15.75	10.19

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
004252716-01	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT
004252716-02	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT
004252716-03	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—SAME_NTL_PERIOD
004252716-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—ALL_TRANS_CHASES—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—CENT_FEW_DIFFS

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

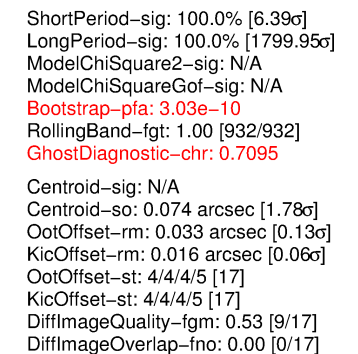
N = Not Transit-Like. S = Stellar Eclipse. C = Centroid Offset. E = Ephemeris Match.

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.

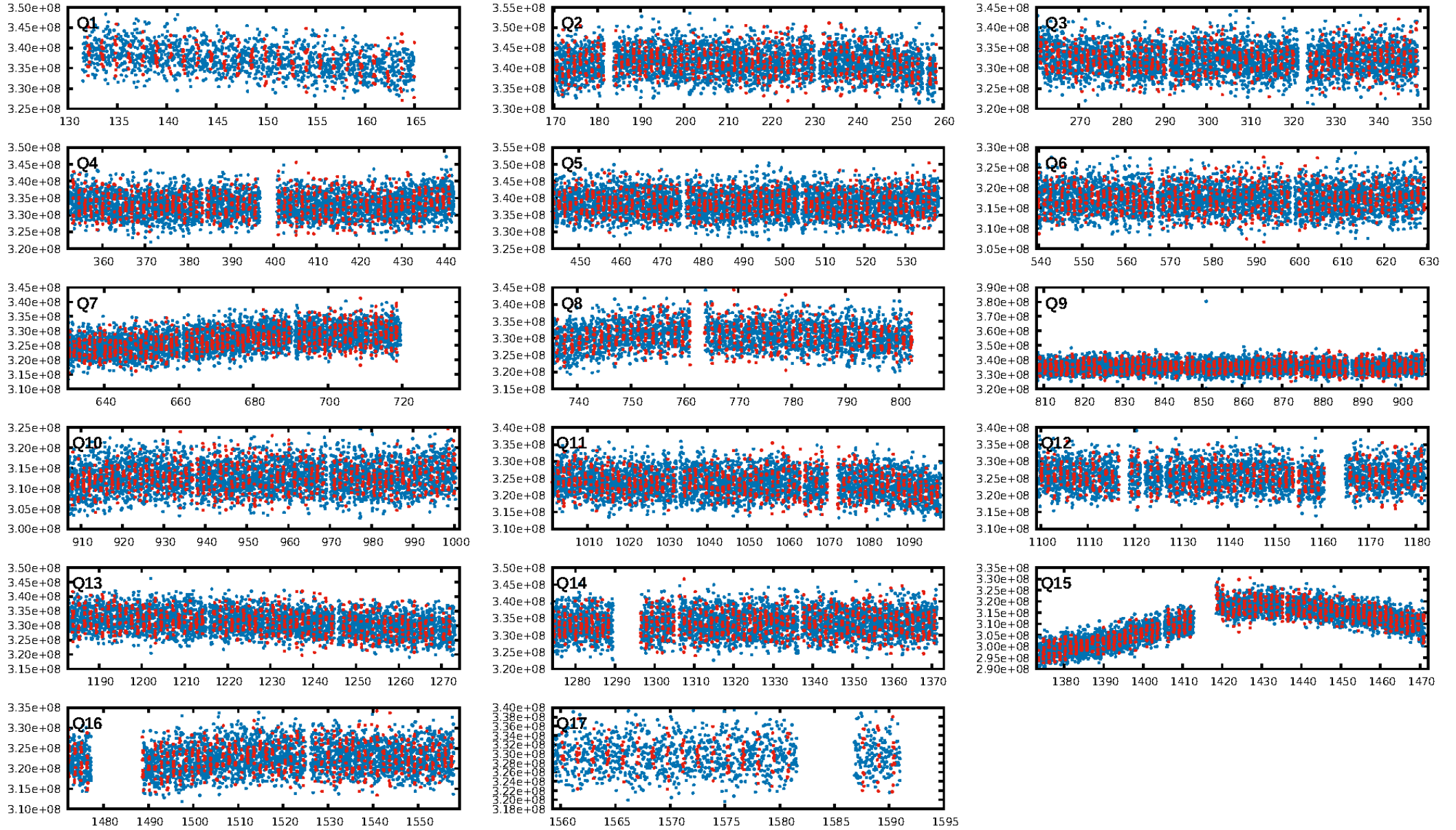
Ephemeris Match Information For 004252716-01

No Significant Match Found

## KIC: 4252716    Candidate: 1 of 4    Period: 1.373 d

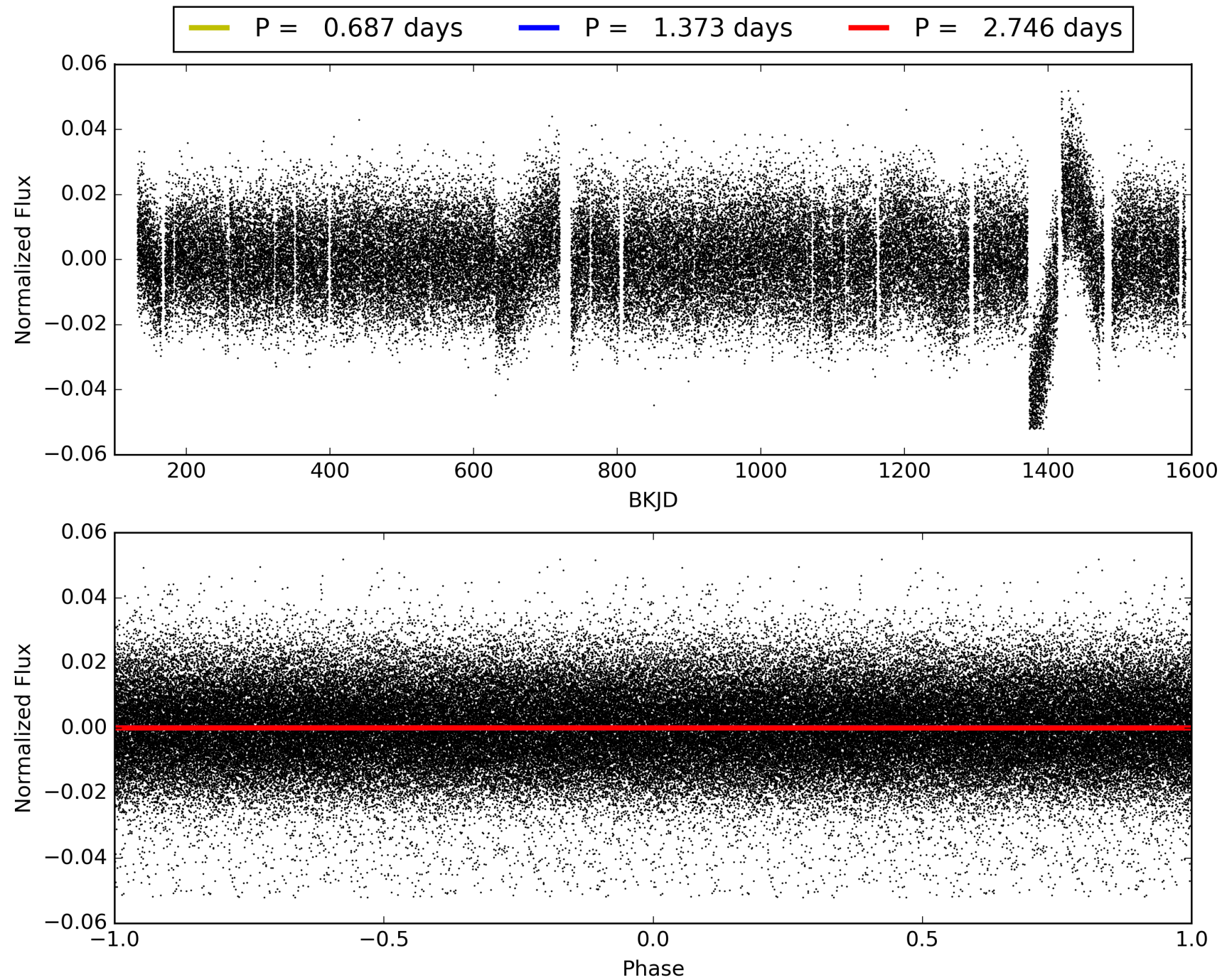


# TCE 004252716-01, PDC Light Curves





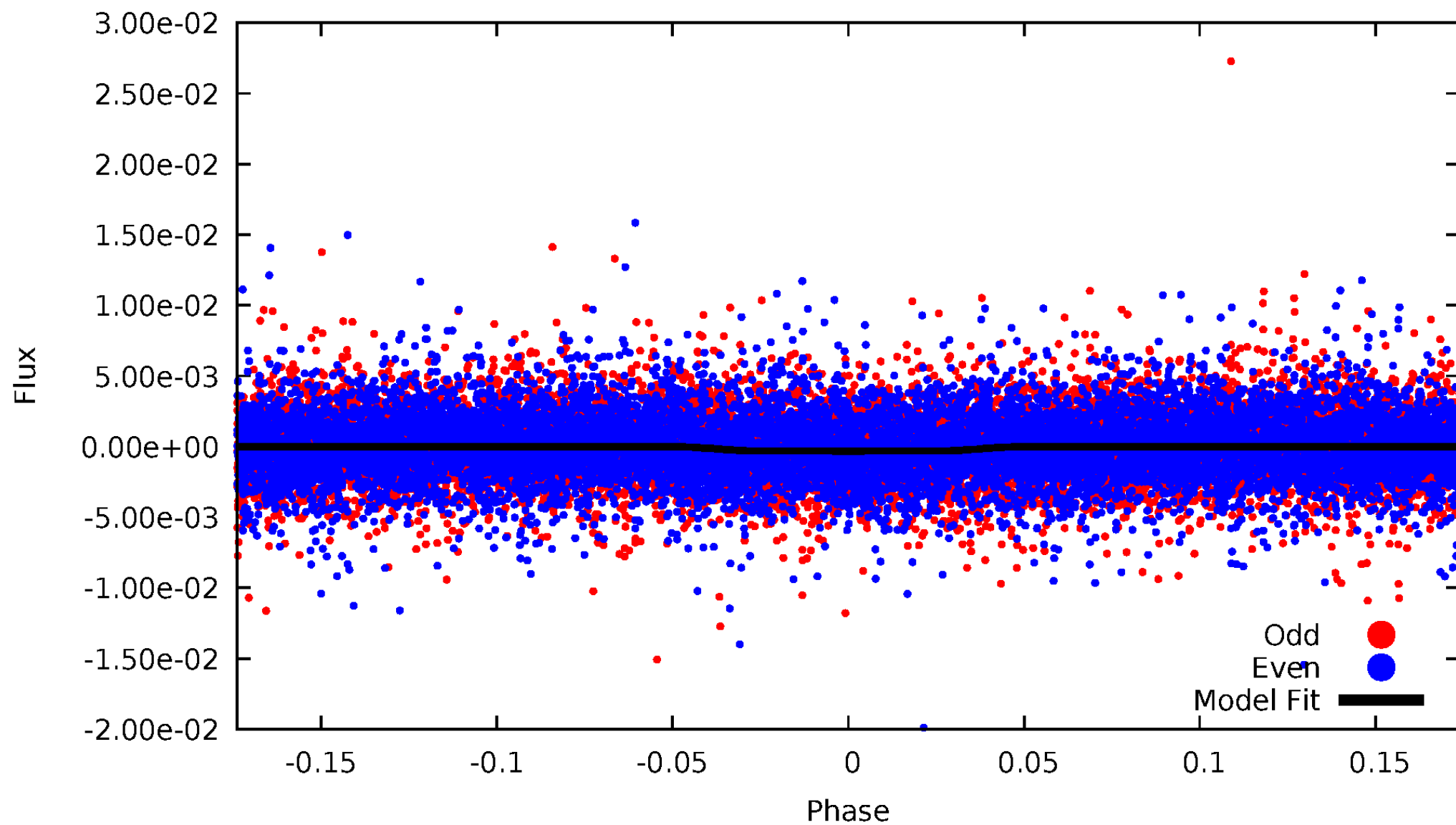
TCE 004252716-01





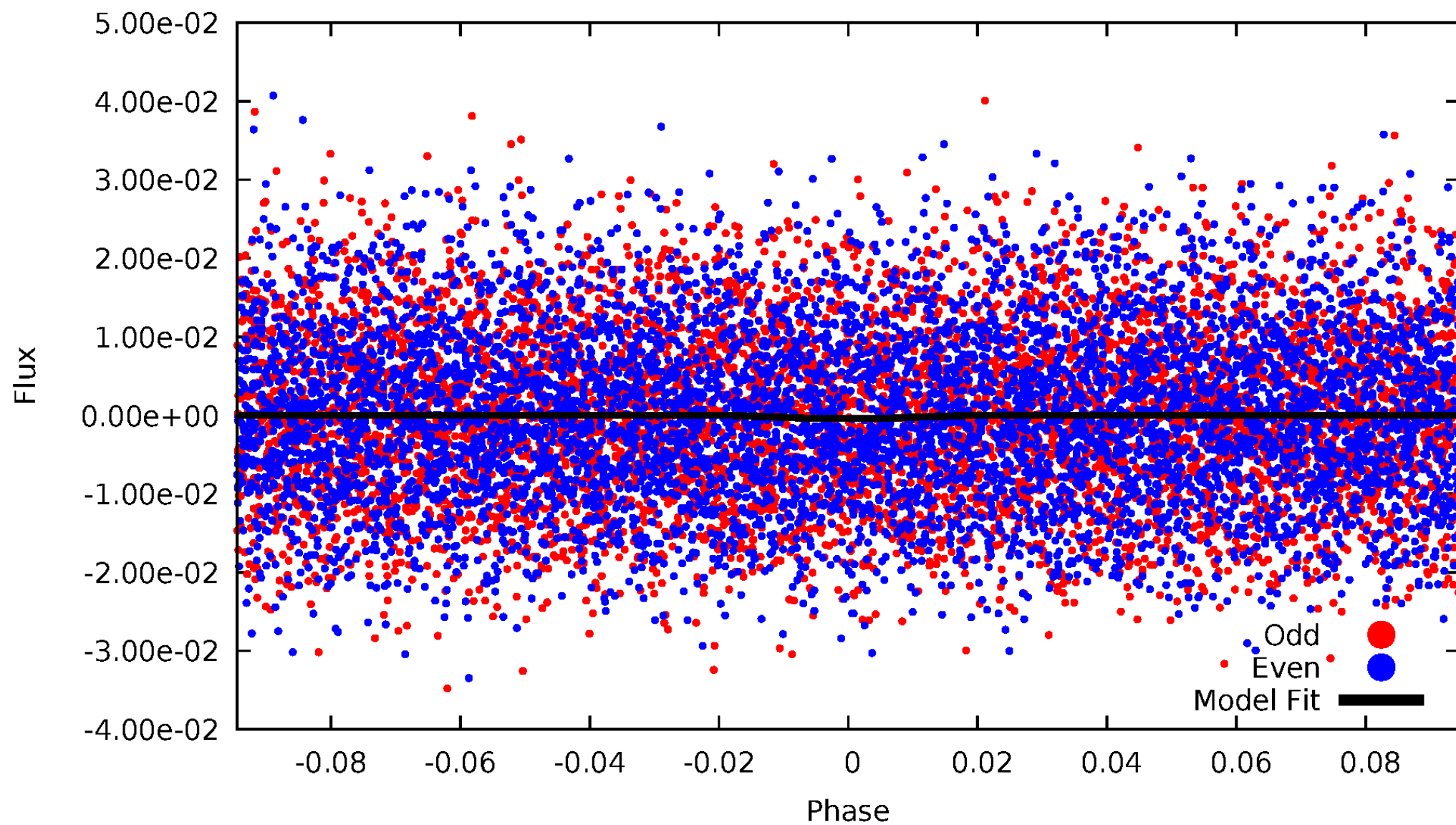
# DV Odd/Even

TCE 004252716-01

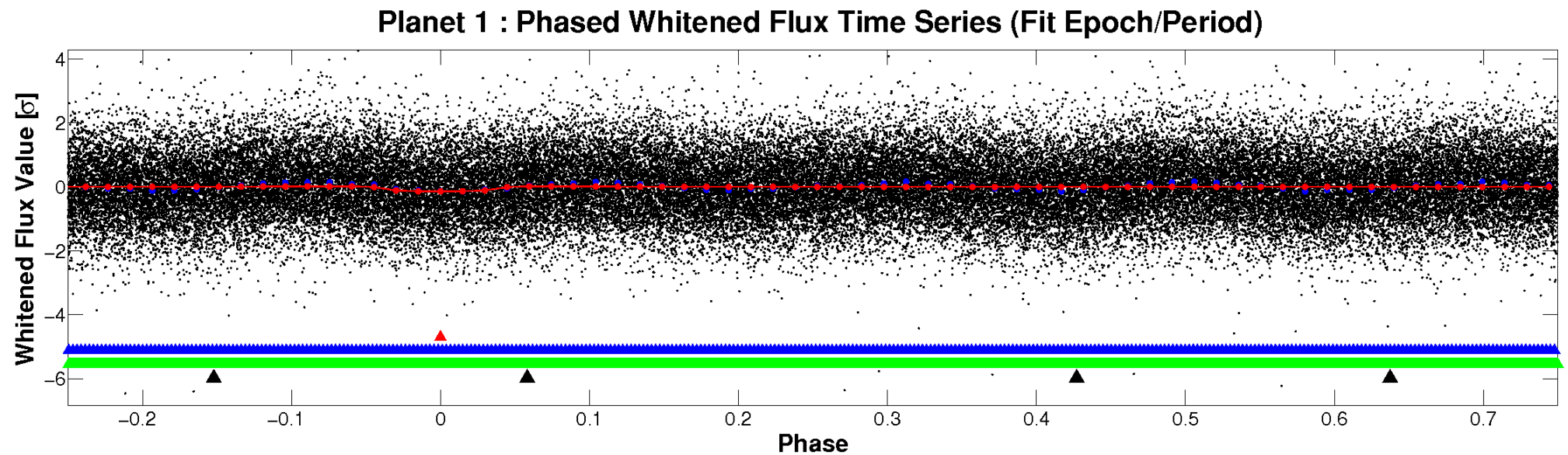
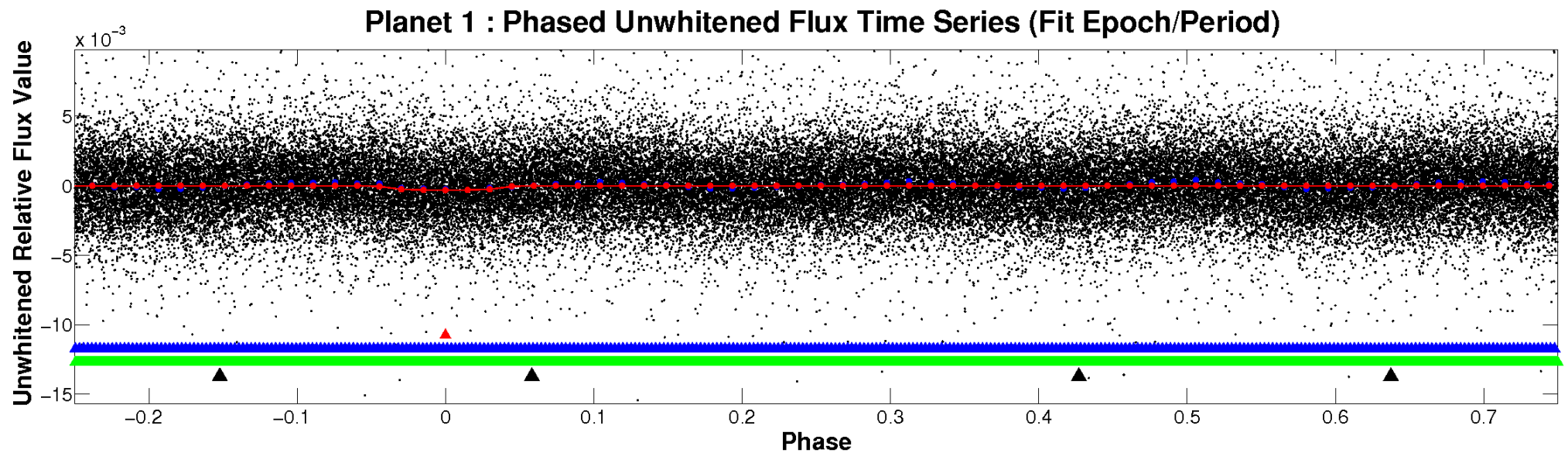


# ALT Odd/Even

TCE 004252716-01



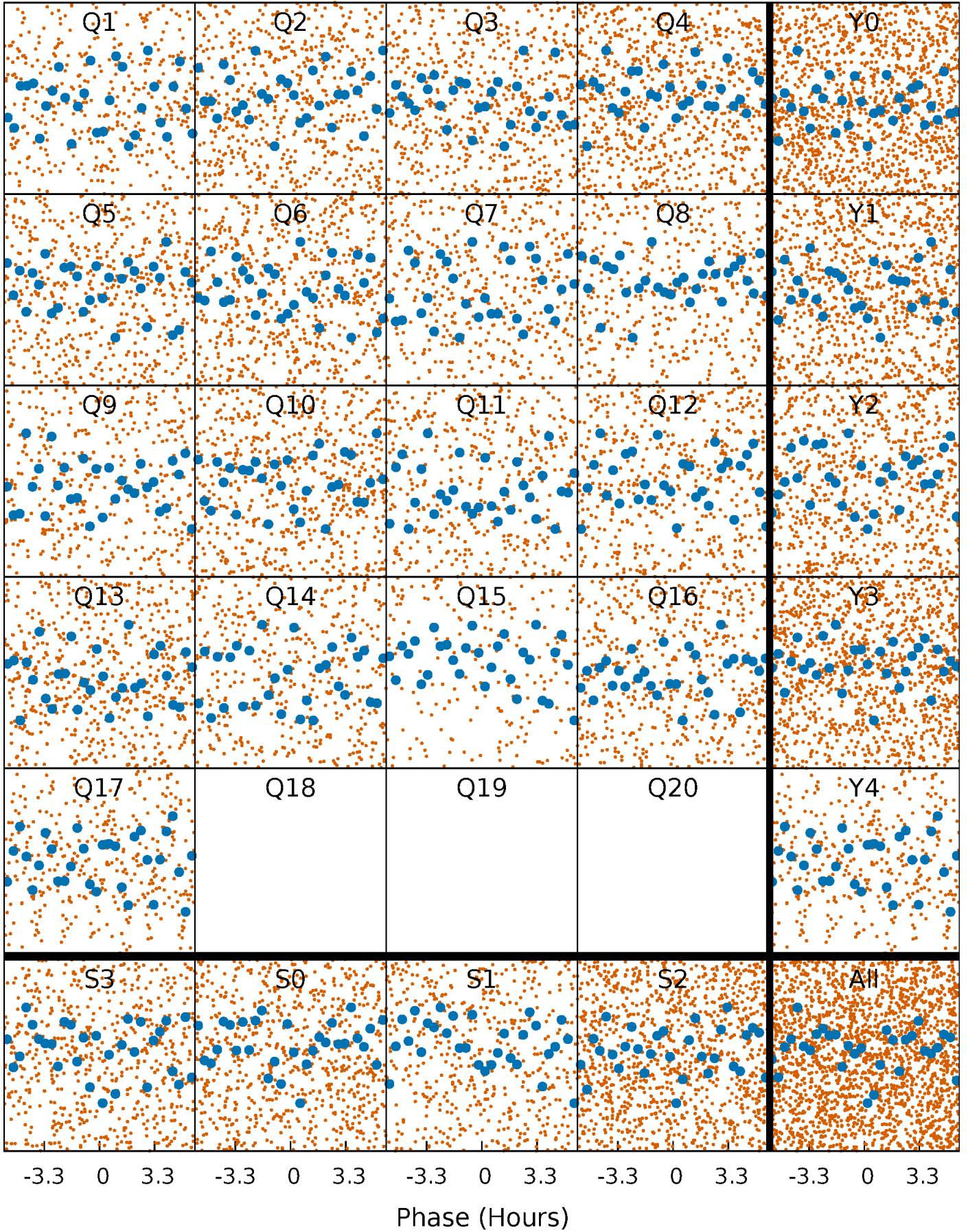
# Non-Whitened Vs. Whitened Light Curve





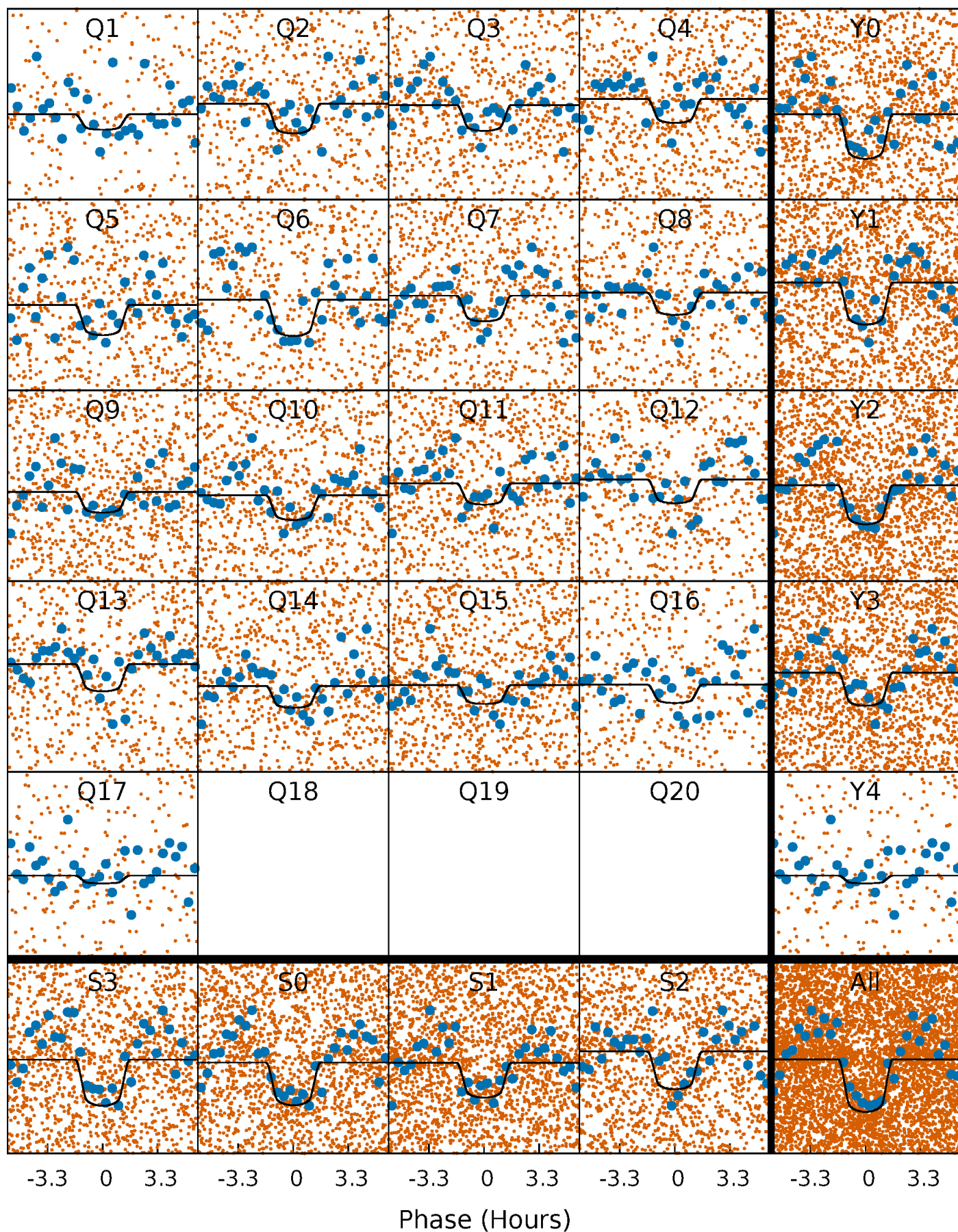
# PDC Quarter-Phased Transit Curves

TCE 004252716-01 P= 1.373172 Days  $T_0=132.088853$  (BKJD)



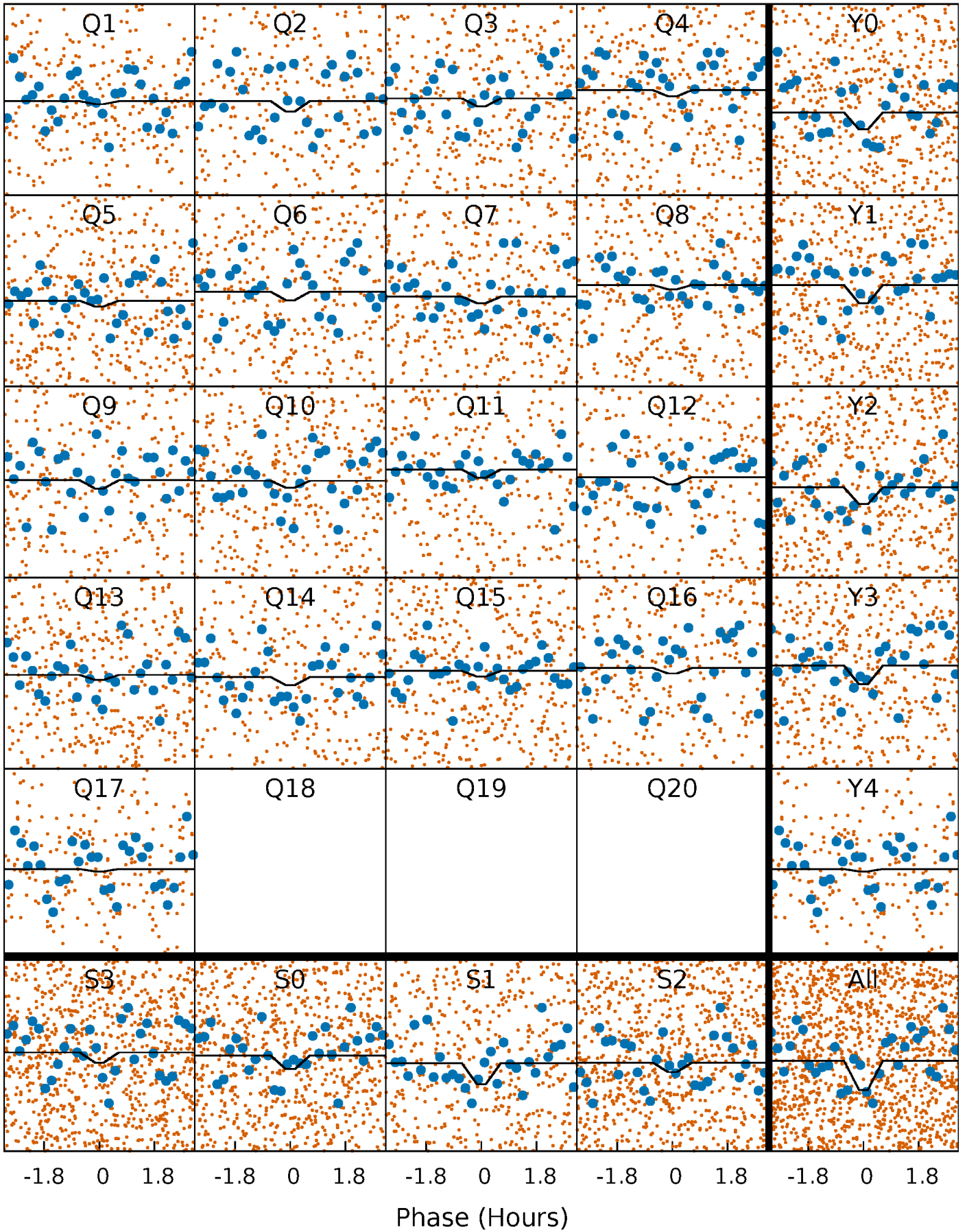
# DV Quarter-Phased Transit Curves

TCE 004252716-01 P= 1.373172 Days  $T_0=132.088853$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

TCE 004252716-01 P= 1.373220 Days  $T_0=132.087583$  (BKJD)

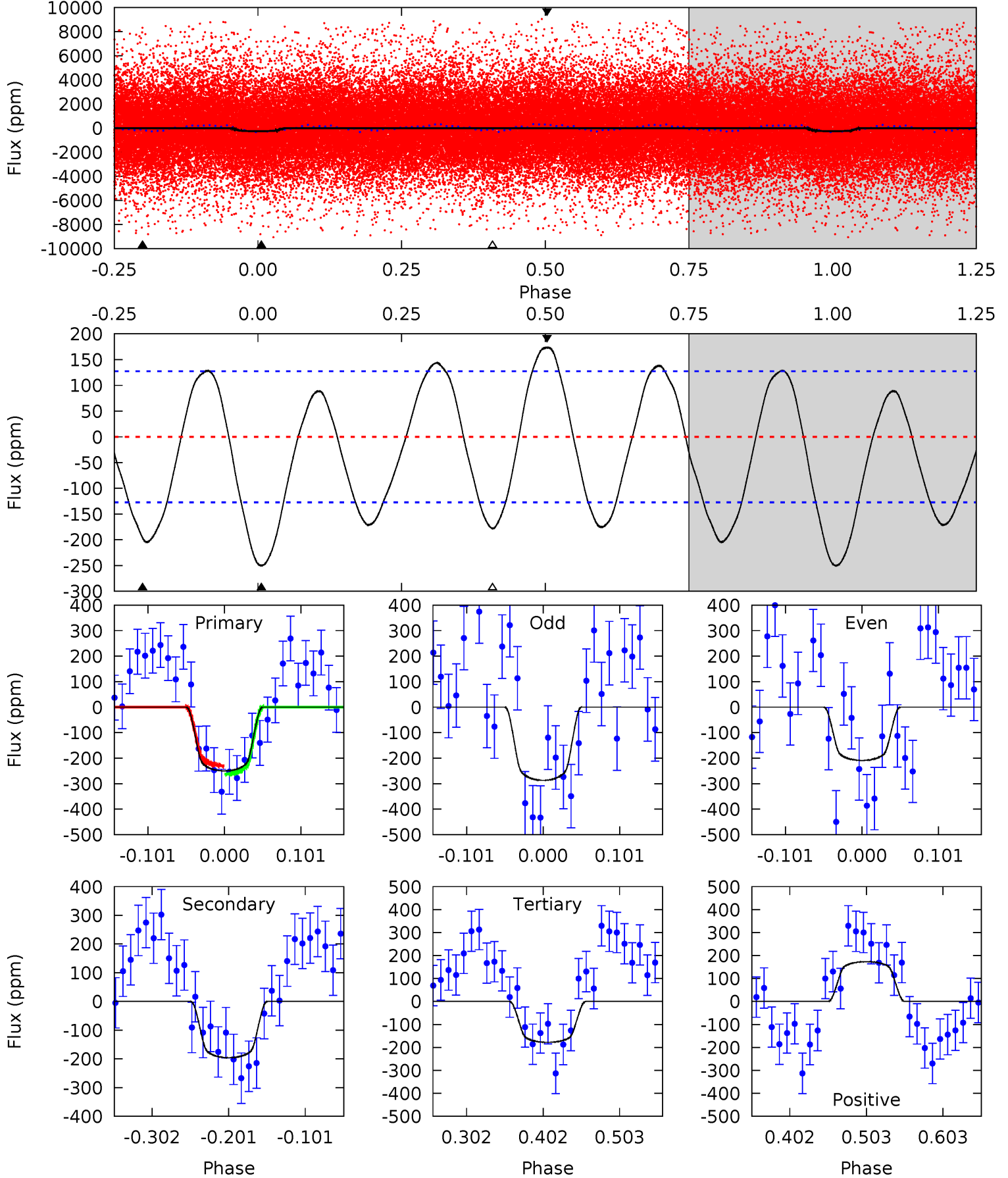




# DV Model-Shift Uniqueness Test

004252716-01, P = 1.373172 Days, E = 130.715681 Days

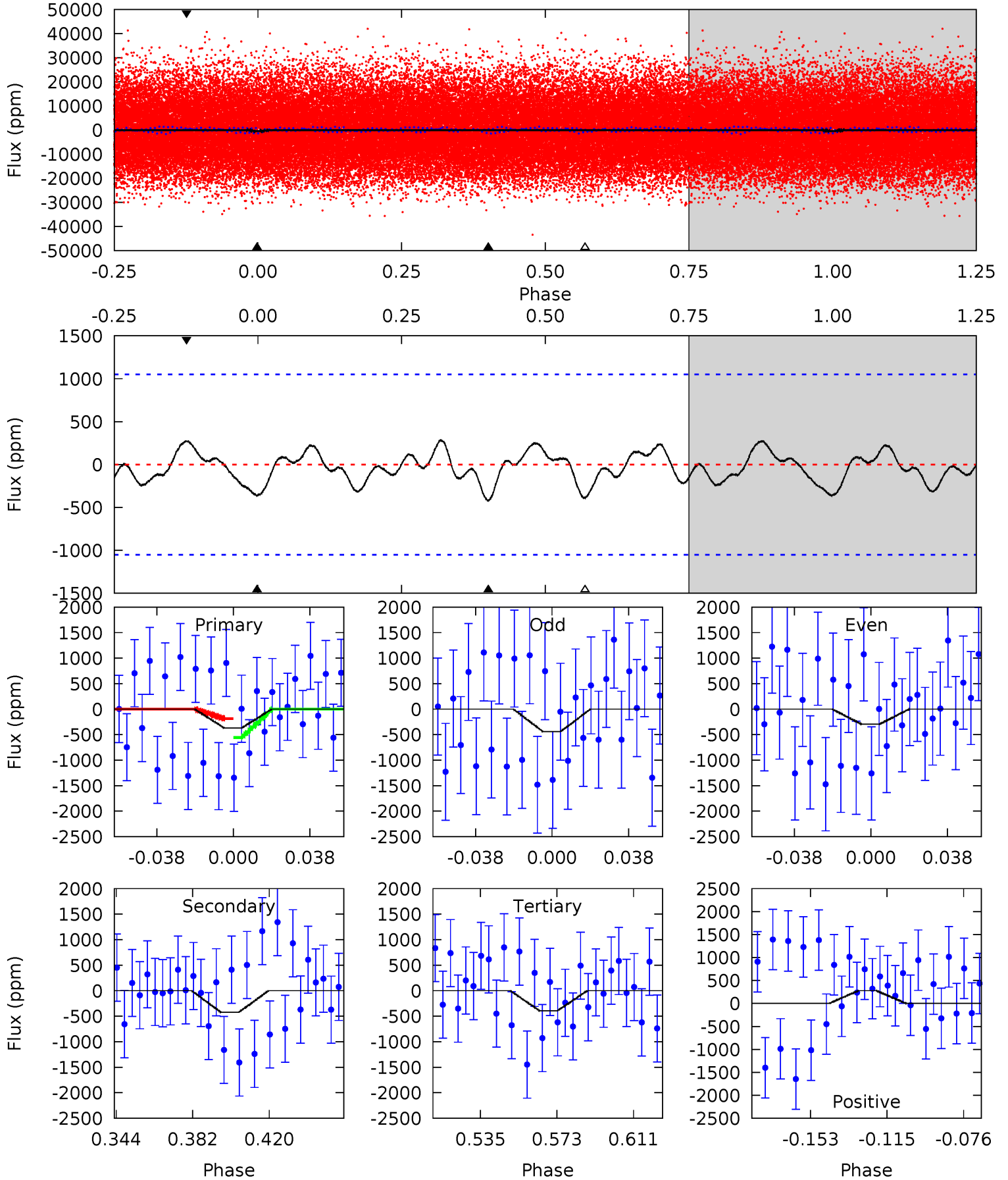
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
8.96	7.02	6.38	6.21	4.56	1.64	4.03	2.58	2.75	0.65	0.82	1.40	1.10	0.41	0.58



# Alt Model-Shift Uniqueness Test

004252716-01, P = 1.373220 Days, E = 130.714363 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
1.67	1.92	1.79	1.26	4.76	2.07	0.68	-0.12	0.41	0.13	0.66	0.33	0.47	0.40	0.84



### Stellar Parameters For KIC 004252716

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$7507^{+75}_{-82}$	$3.945^{+0.143}_{-0.117}$	$-0.080^{+0.150}_{-0.150}$	$2.332^{+0.466}_{-0.466}$	$1.746^{+0.192}_{-0.154}$	$0.194^{+0.141}_{-0.070}$
	+1%/-1%	+4%/-3%	+188%/-188%	+20%/-20%	+11%/-9%	+73%/-36%
Source	SPE68	SPE68	SPE68	DSEP		

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

### Secondary Eclipse Parameters for KIC 004252716-01 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-196 \pm 28$	$4.75^{+1.75}_{-1.53}$	$4125^{+207}_{-195}$	$6238^{+1543}_{-917}$	$3.982^{+4.938}_{-1.888}$
Alt.	$-424 \pm 221$	$5.24^{+1.66}_{-1.51}$	$4141^{+205}_{-220}$	$7365^{+2128}_{-1635}$	$7.239^{+9.150}_{-4.321}$

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



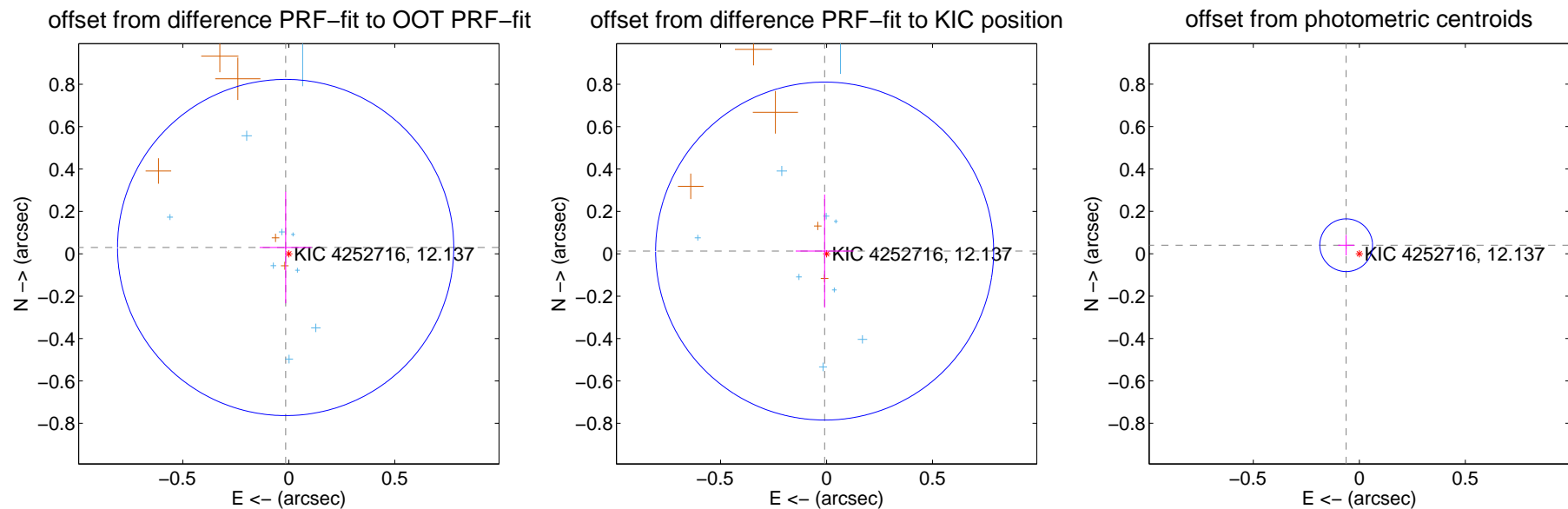
## DV Centroid Data

Supplemental centroid analysis for 004252716-01. Kepler magnitude: 12.14. Transit SNR 8.95

There are 9 quarters with good PRF difference image offsets

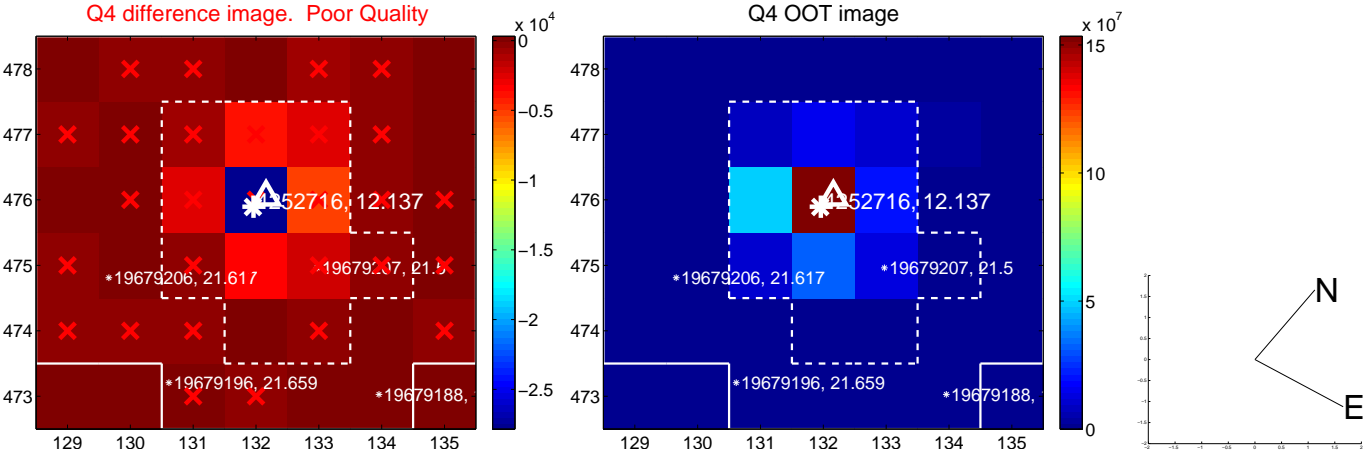
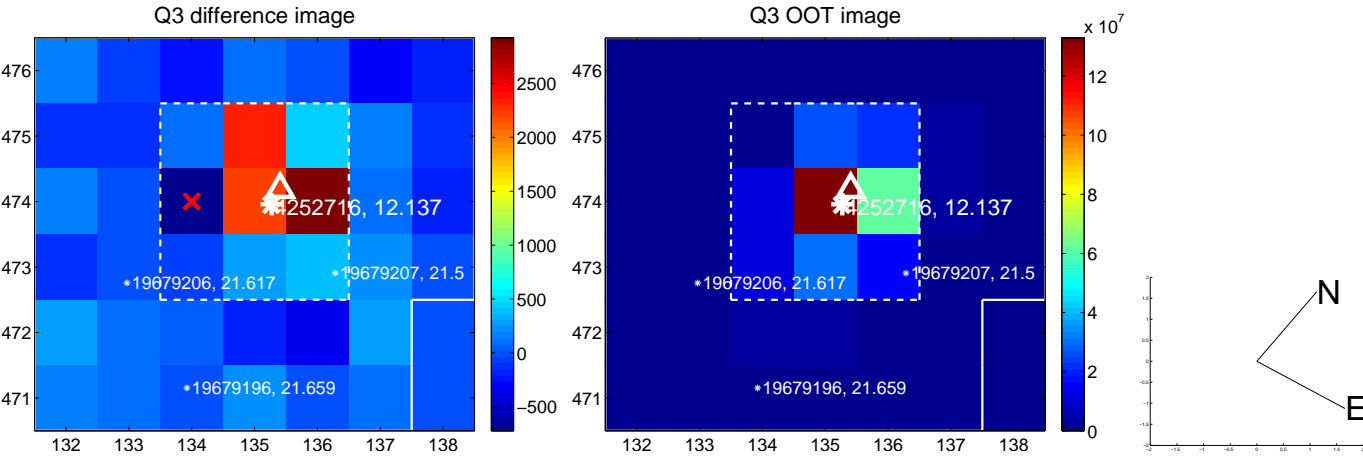
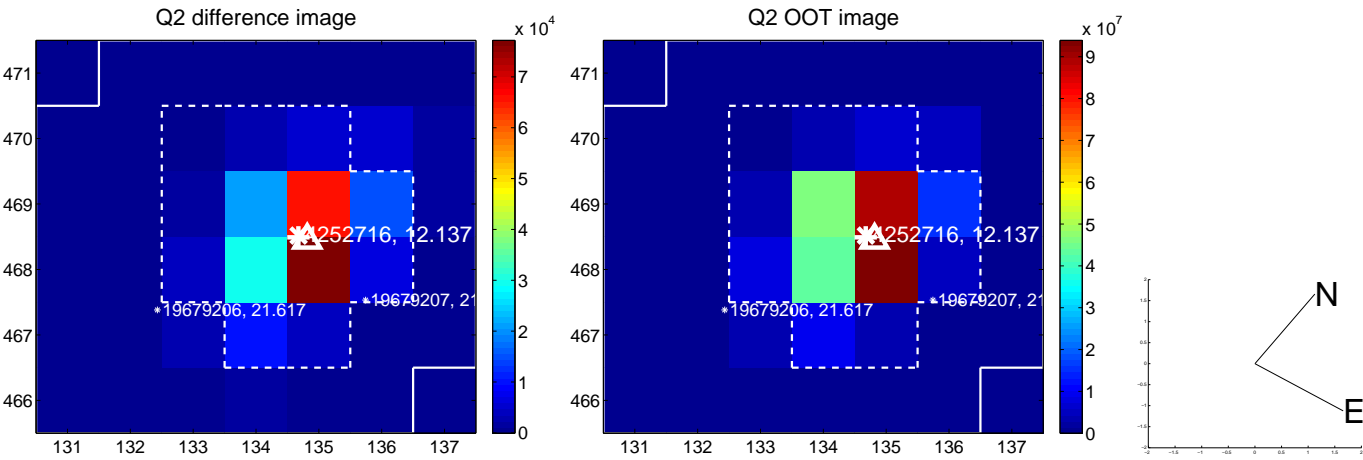
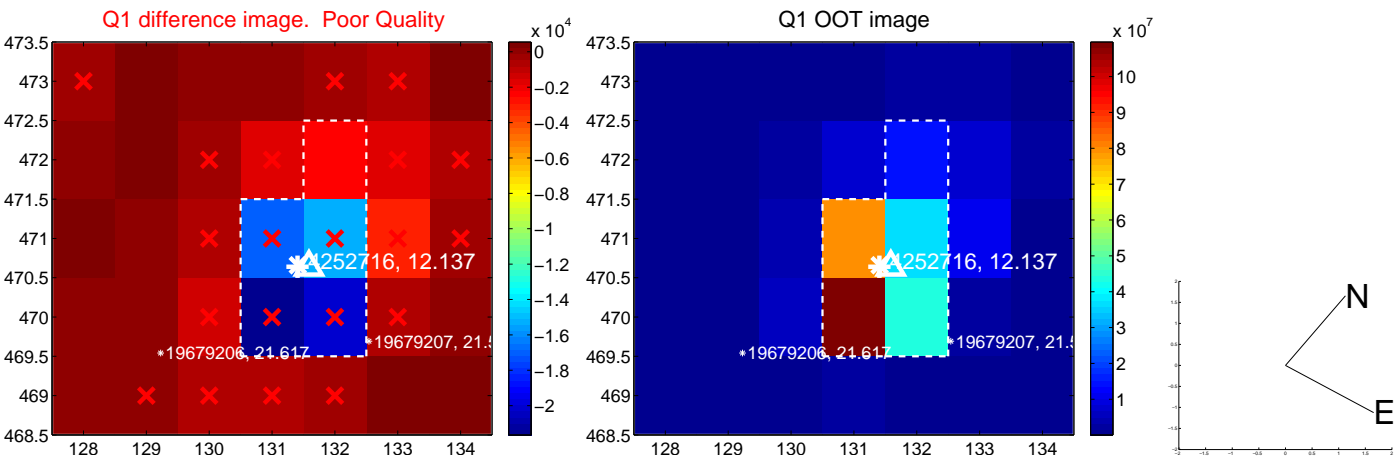
The direct PRF centroid is offset from the target star catalog position by about 0.06 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.033 \pm 0.264$	0.13	$0.015 \pm 0.123$	$0.030 \pm 0.263$
PRF-fit source offset from KIC position	$0.016 \pm 0.266$	0.06	$0.009 \pm 0.137$	$0.013 \pm 0.267$
photometric centroid source offset	$0.07 \pm 0.04$	1.78	$0.06 \pm 0.04$	$0.04 \pm 0.05$

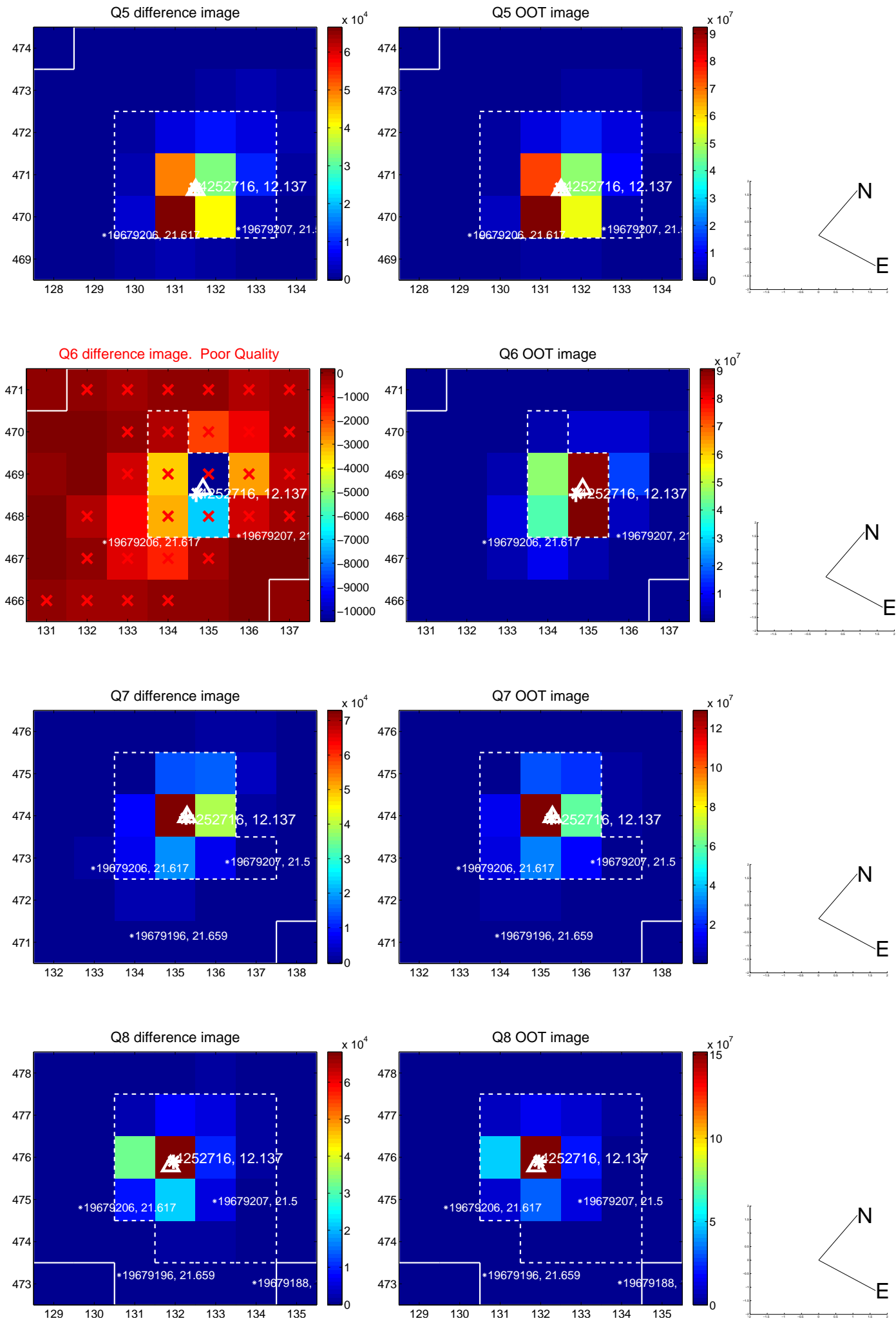


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses:** good quarterly centroid offsets; **Vermillion crosses:** bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

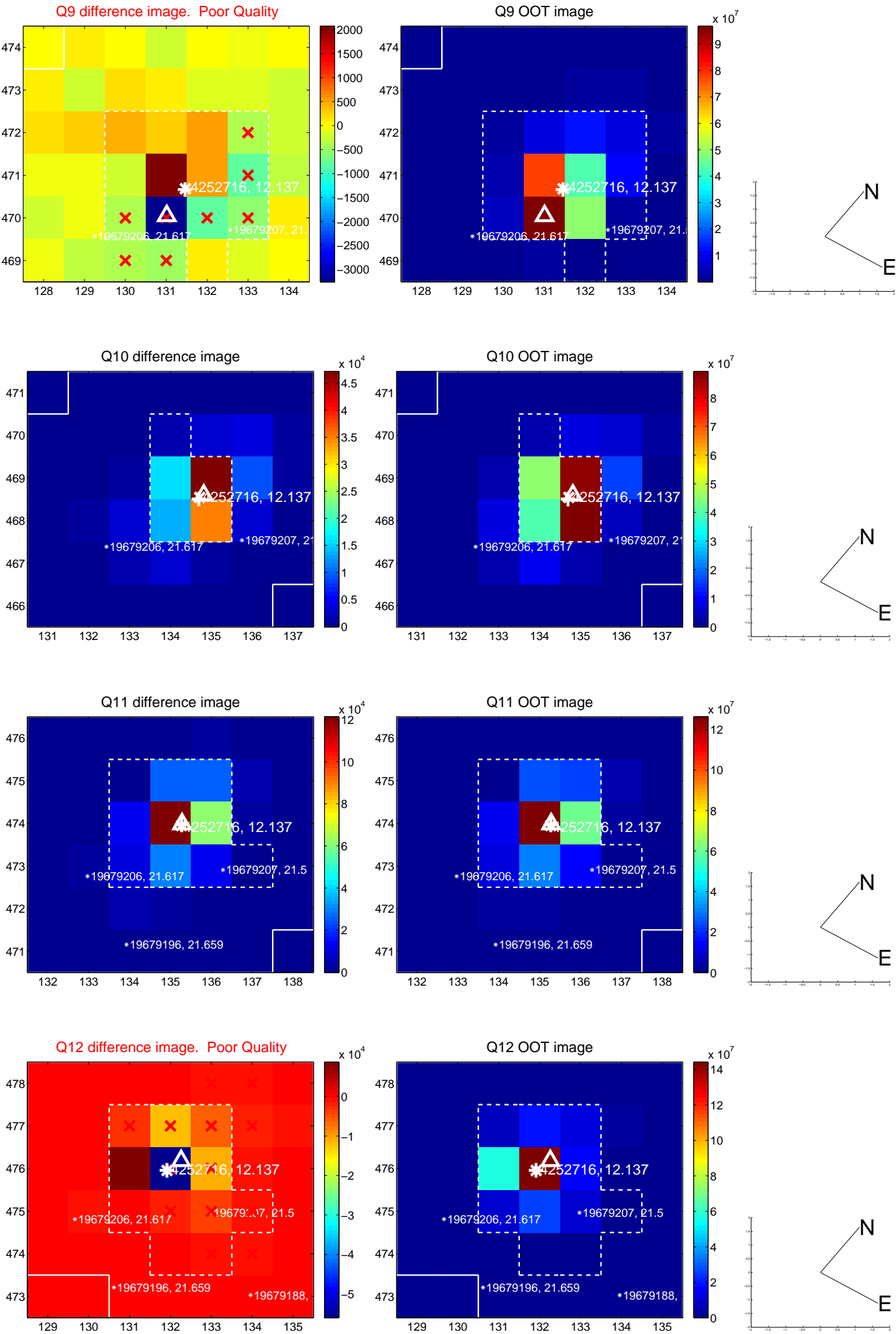
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

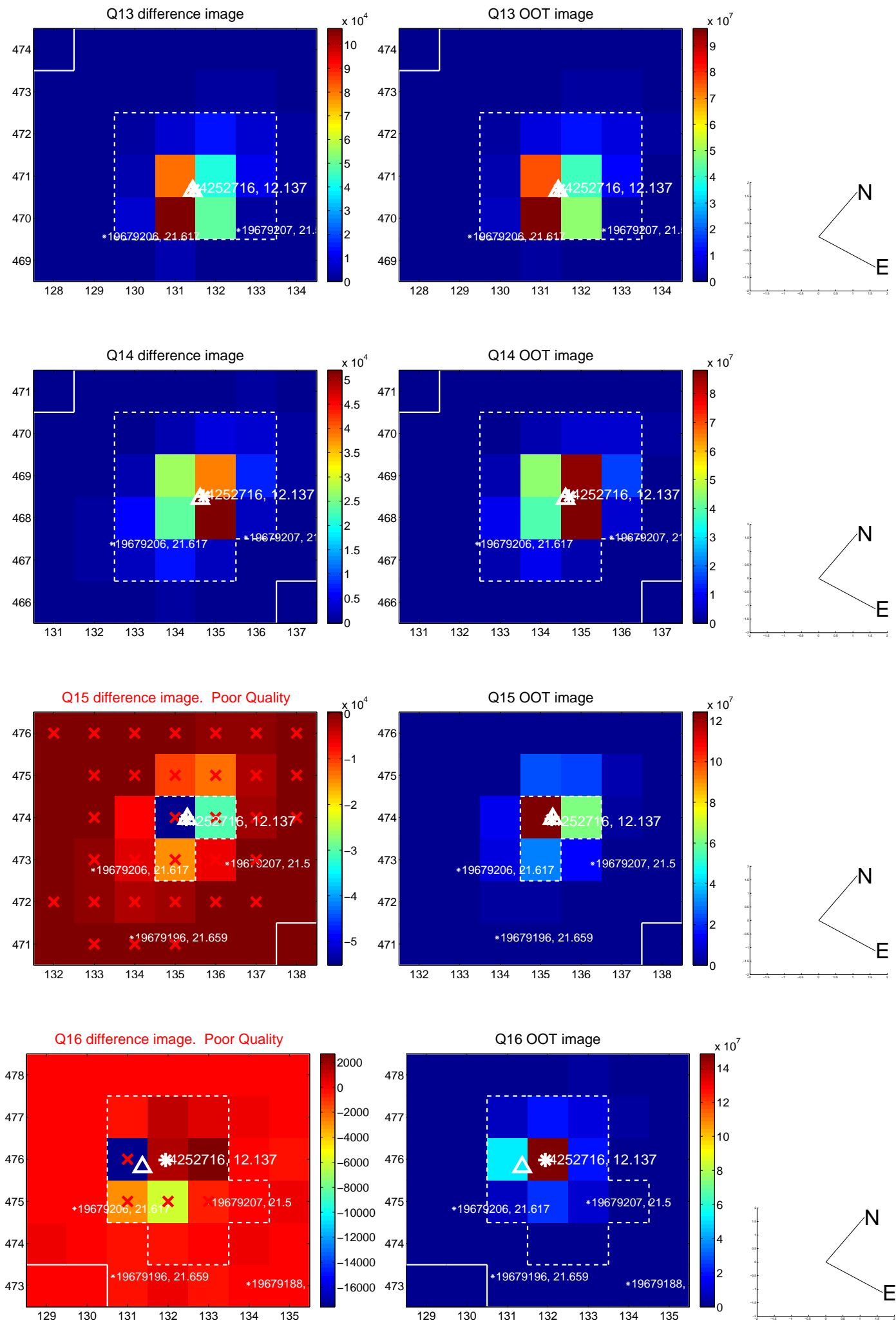


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

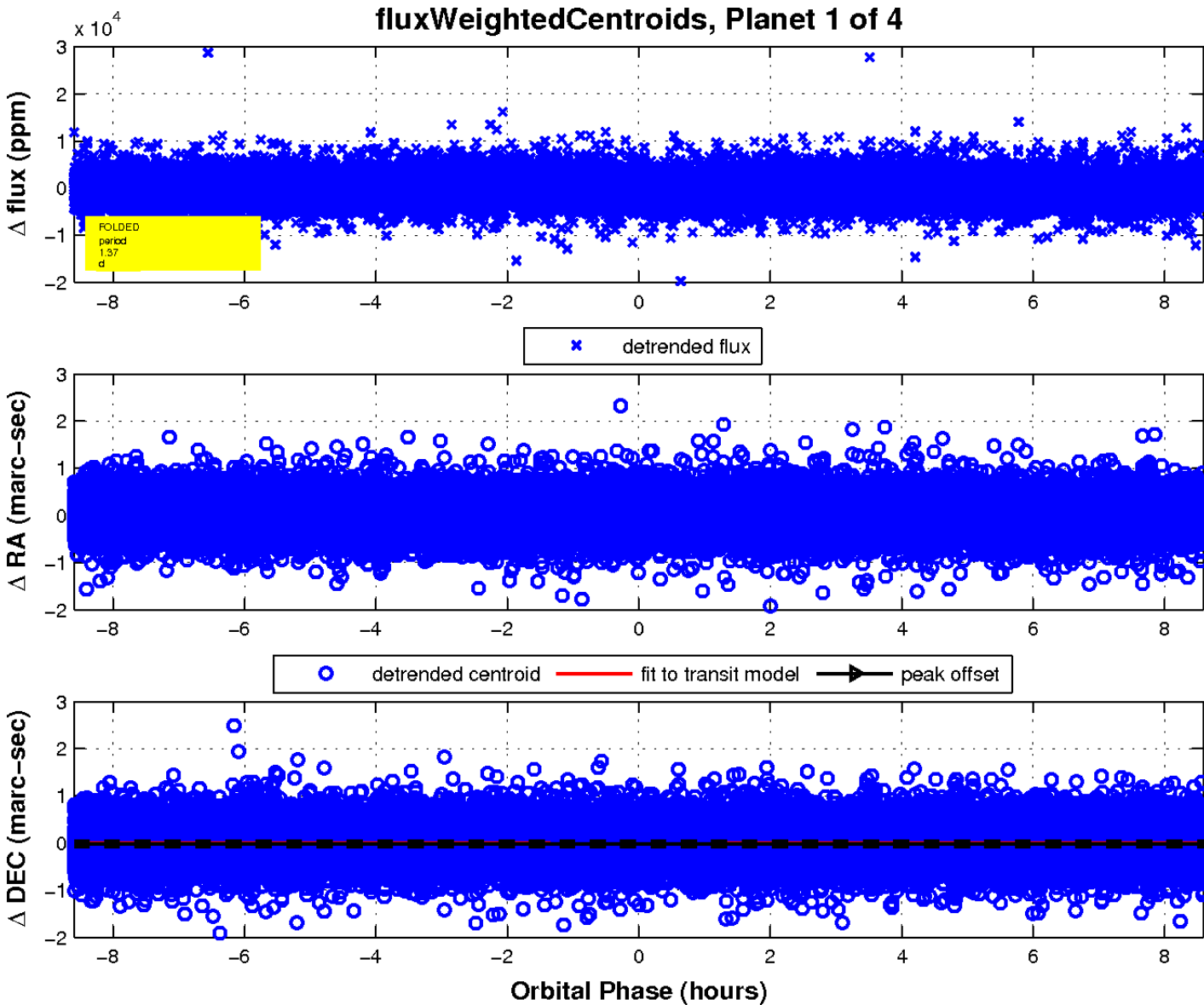
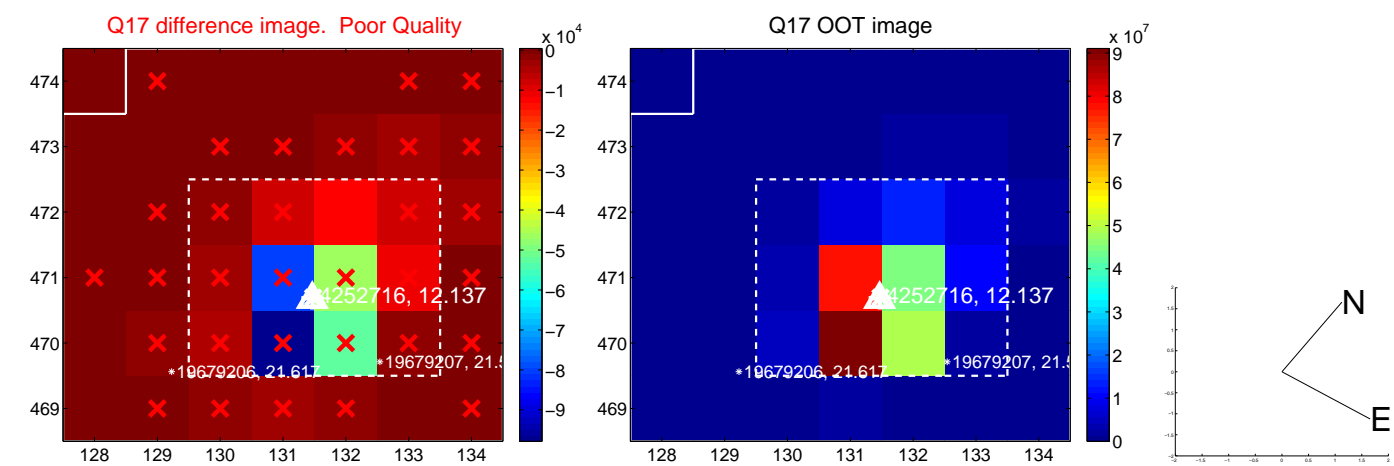




white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

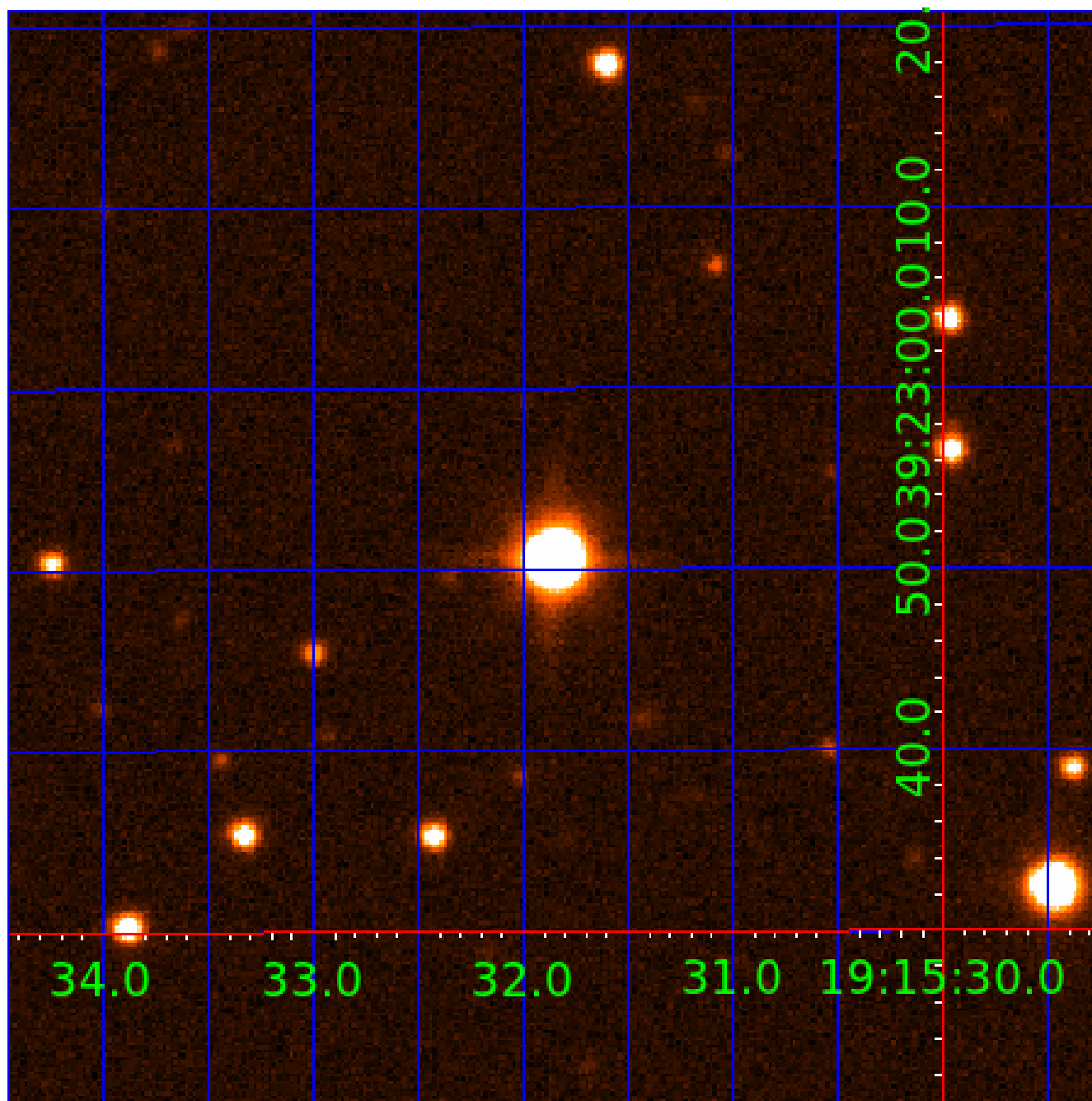


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination



# KIC 004252716

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
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004252716-04	OBS	No	377.911277	238.409499	3547.9	4.123	7.2	7.6	2.33	7507	15.75	10.19

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
004252716-01	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT
004252716-02	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT
004252716-03	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—SAME_NTL_PERIOD
004252716-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—ALL_TRANS_CHASES—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—CENT_FEW_DIFFS

**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.

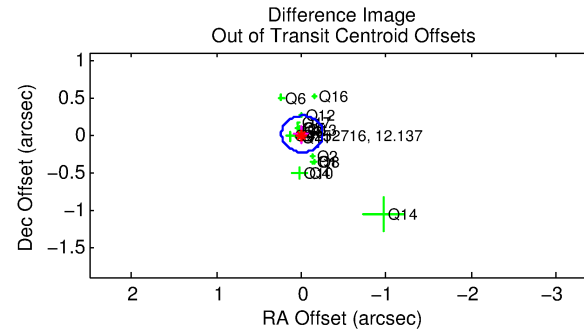
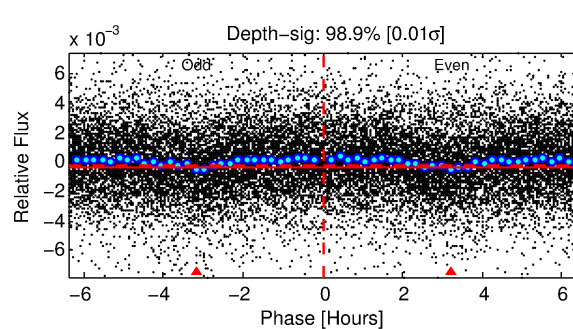
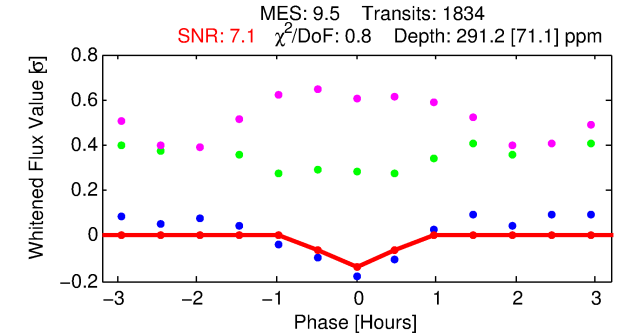
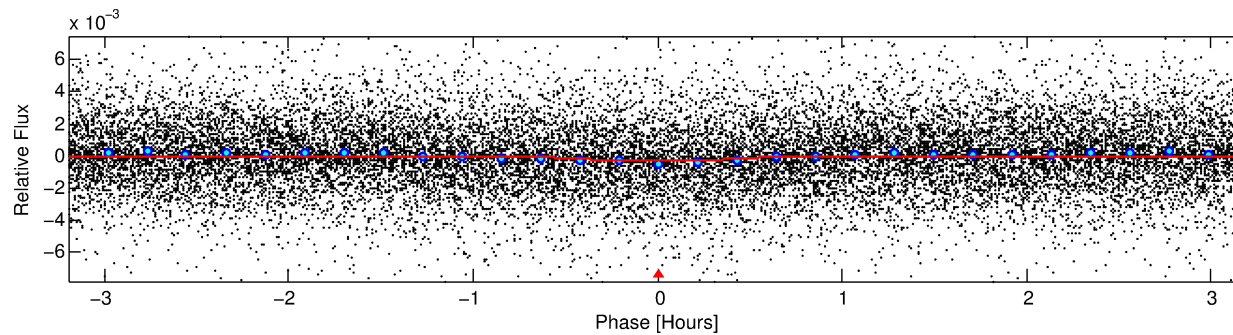
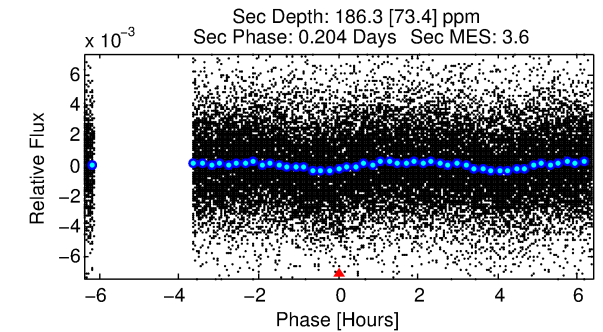
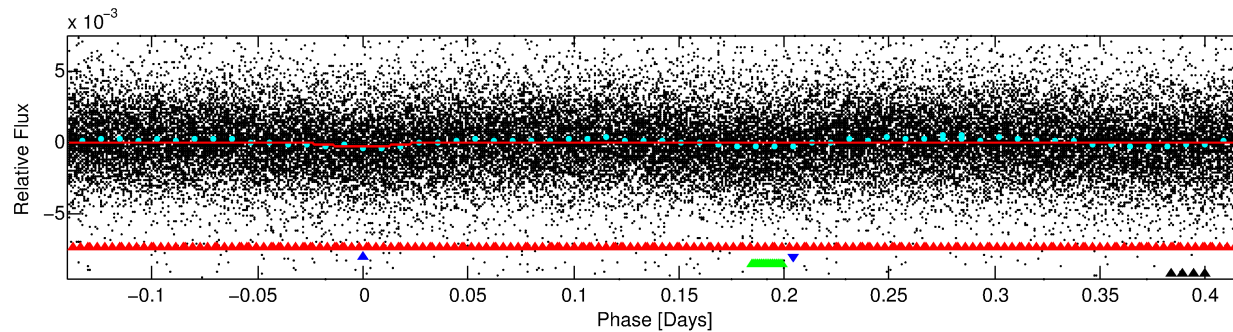
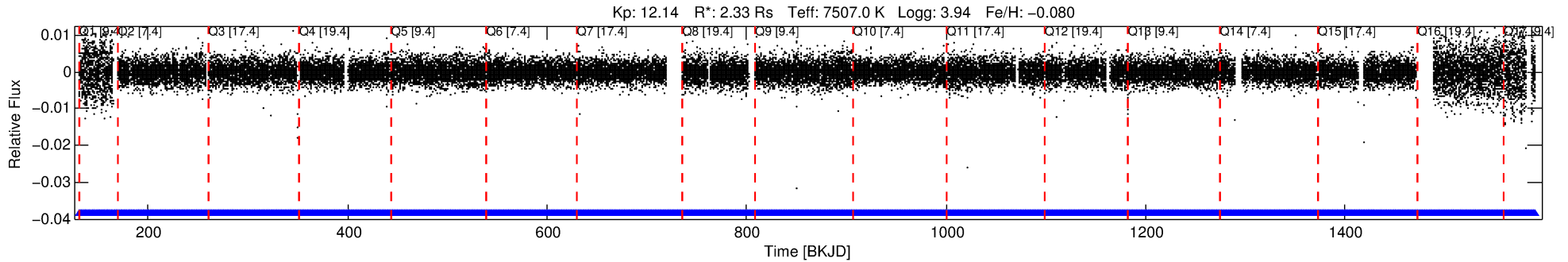
Ephemeris Match Information For 004252716-02

No Significant Match Found



# DV One-Page Summary

KIC: 4252716 Candidate: 2 of 4 Period: 0.560 d



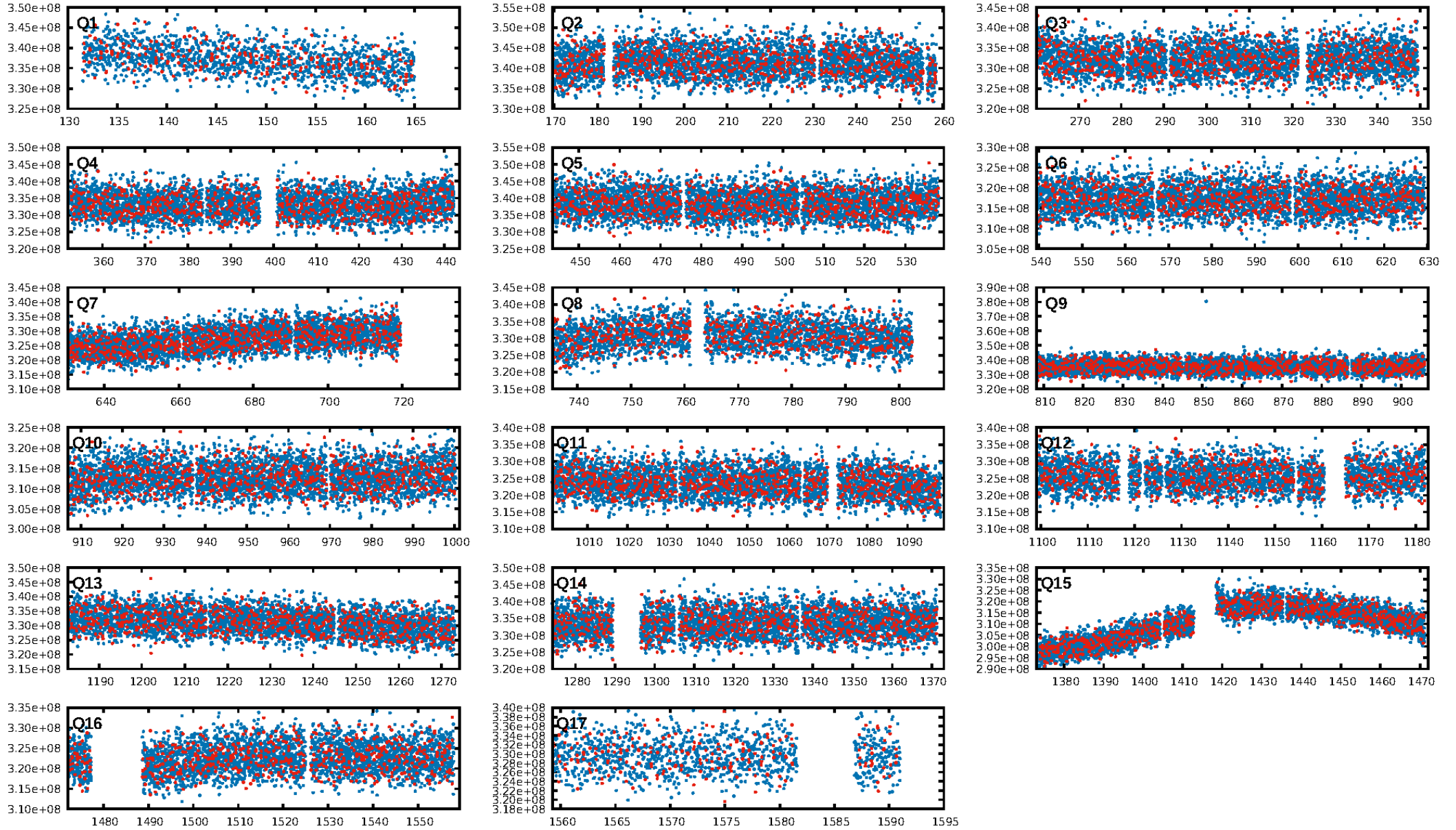
## DV Fit Results:

Period = 0.55986 [0.00002] d  
Epoch = 131.6518 [0.0026] BKJD  
Rp/R\* = 0.0182 [0.0132]  
a/R\* = 2.14 [7.55]  
b = 0.90 [0.98]  
Seff = 60321.54 [15711.69]  
Teff = 3996 [260] K  
Rp = 4.63 [3.47] Re  
a = 0.0160 [0.0028] AU  
Ag = 1.22 [1.86] [0.12 $\sigma$ ]  
Teffp = 6500 [2435] K [1.02 $\sigma$ ]

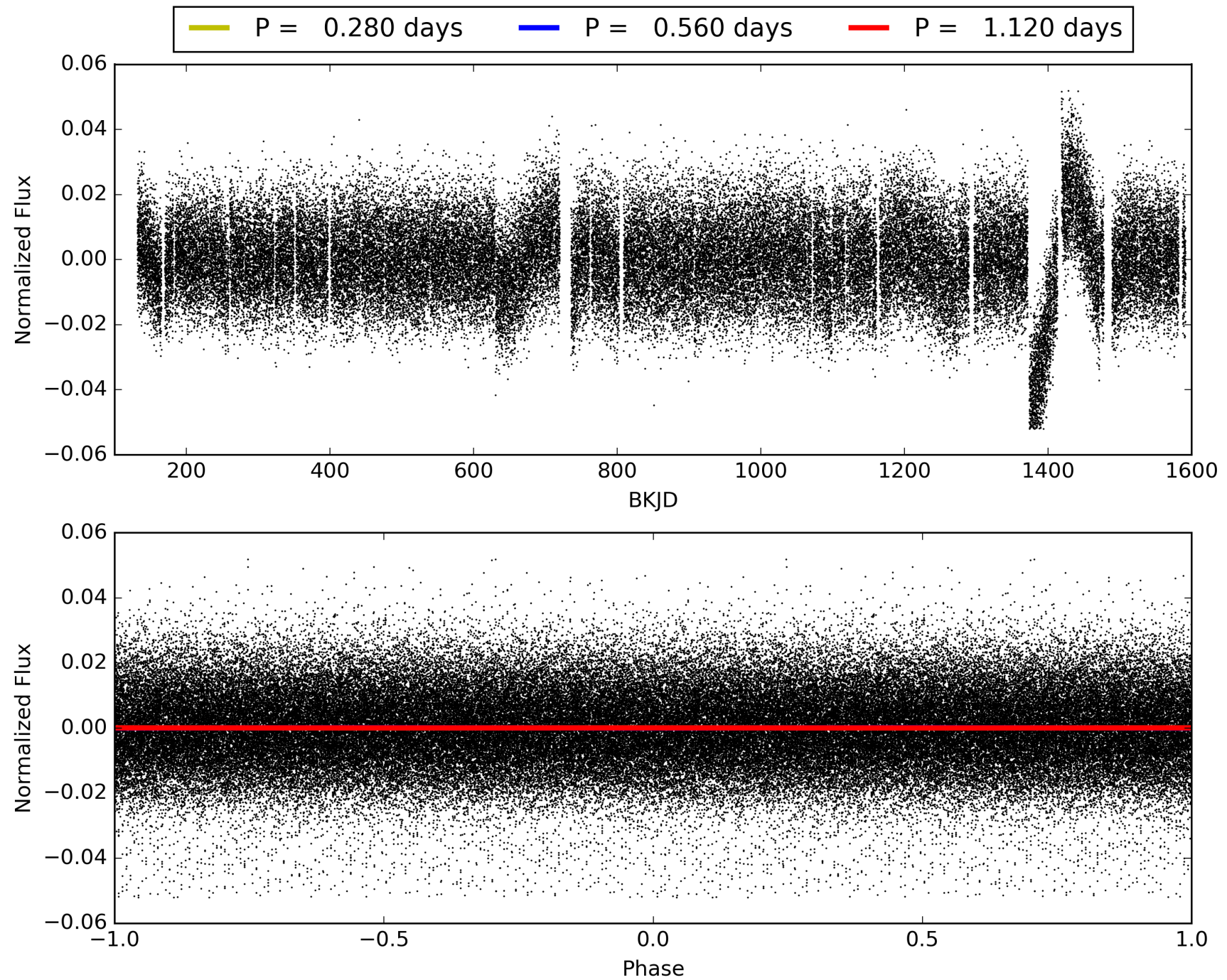
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 0.0% [0.00 $\sigma$ ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: 7.72e-14  
RollingBand-fgt: 1.00 [1750/1750]  
GhostDiagnostic-chr: 0.8718  
Centroid-sig: N/A  
Centroid-so: 0.101 arcsec [2.08 $\sigma$ ]  
OotOffset-rm: 0.014 arcsec [0.17 $\sigma$ ]  
KicOffset-rm: 0.034 arcsec [0.27 $\sigma$ ]  
OotOffset-st: 4/4/4/5 [17]  
KicOffset-st: 4/4/4/5 [17]  
DiffImageQuality-fgm: 0.82 [14/17]  
DiffImageOverlap-fno: 0.00 [0/17]

# TCE 004252716-02, PDC Light Curves



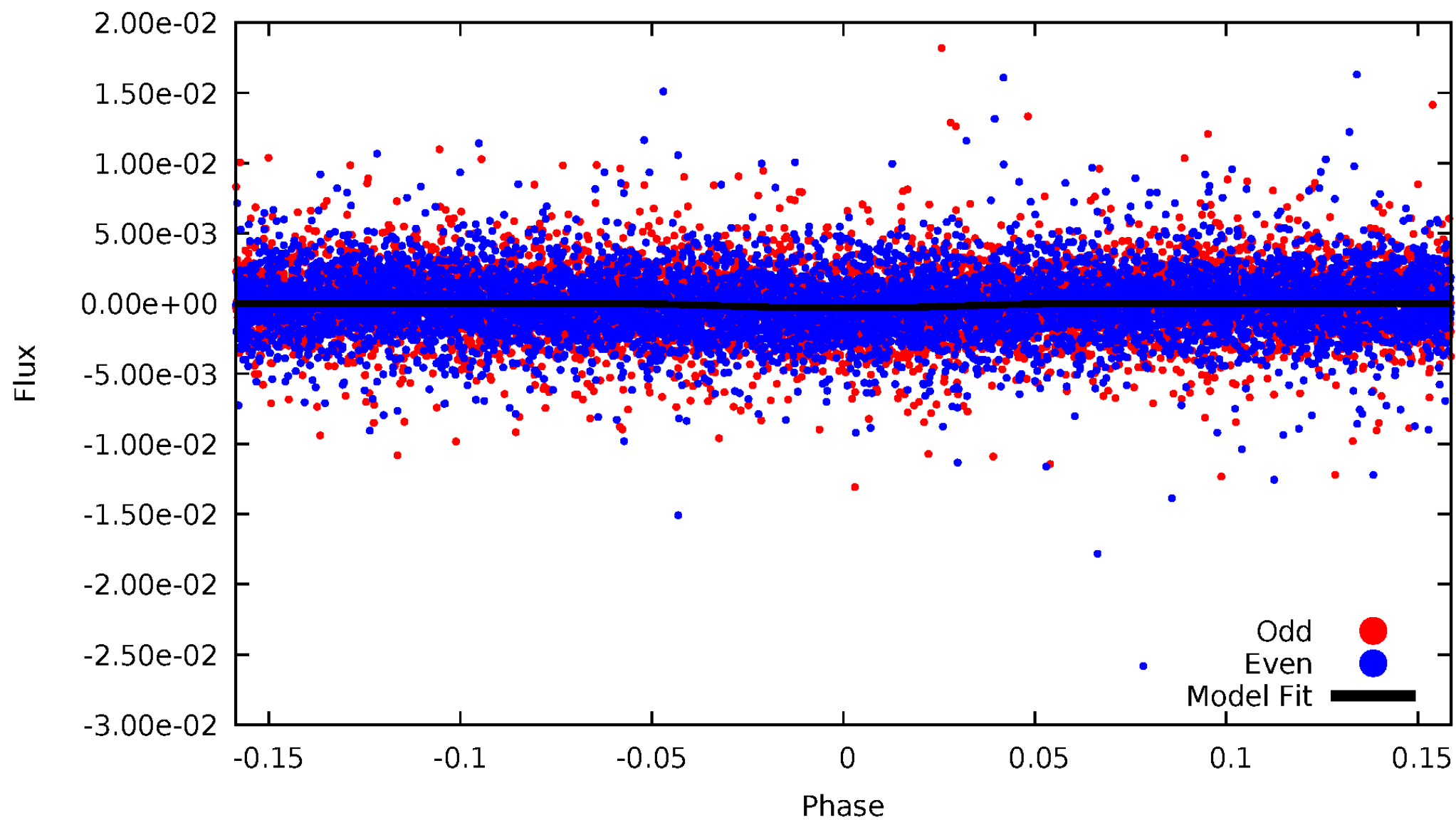
TCE 004252716-02





DV Odd/Even

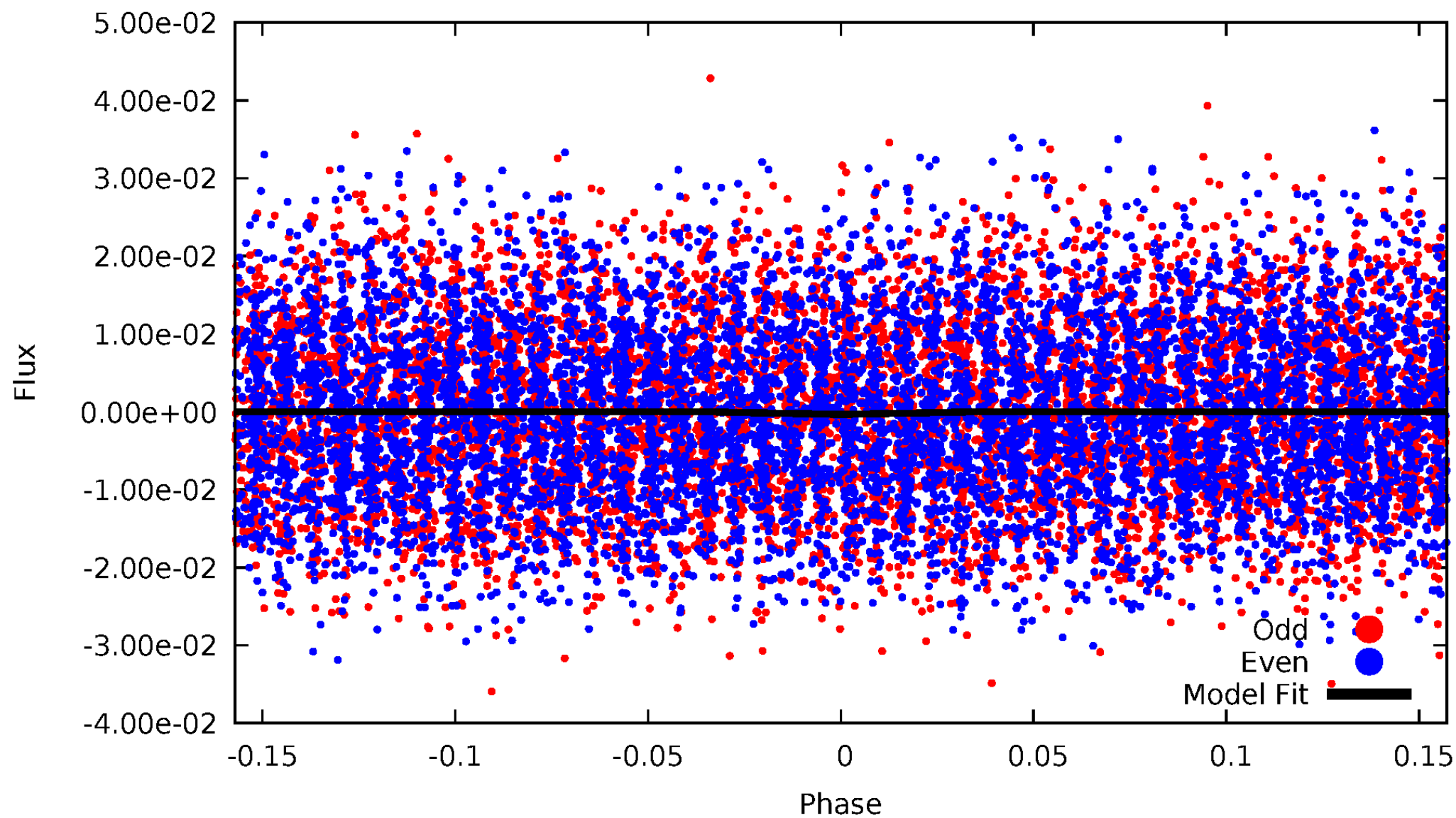
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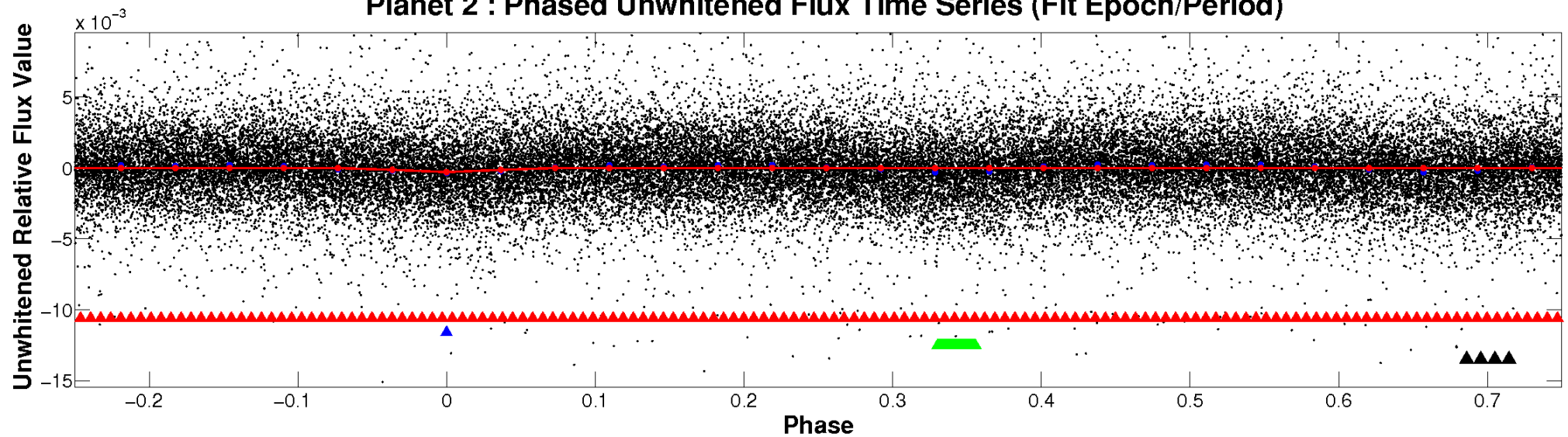
# ALT Odd/Even

TCE 004252716-02

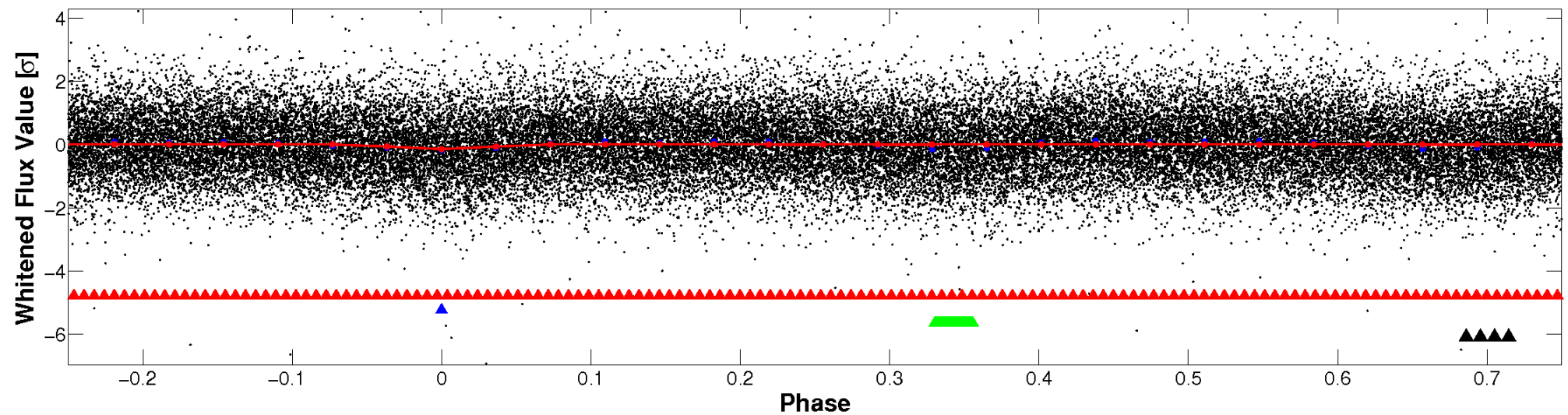


# Non-Whitened Vs. Whitened Light Curve

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

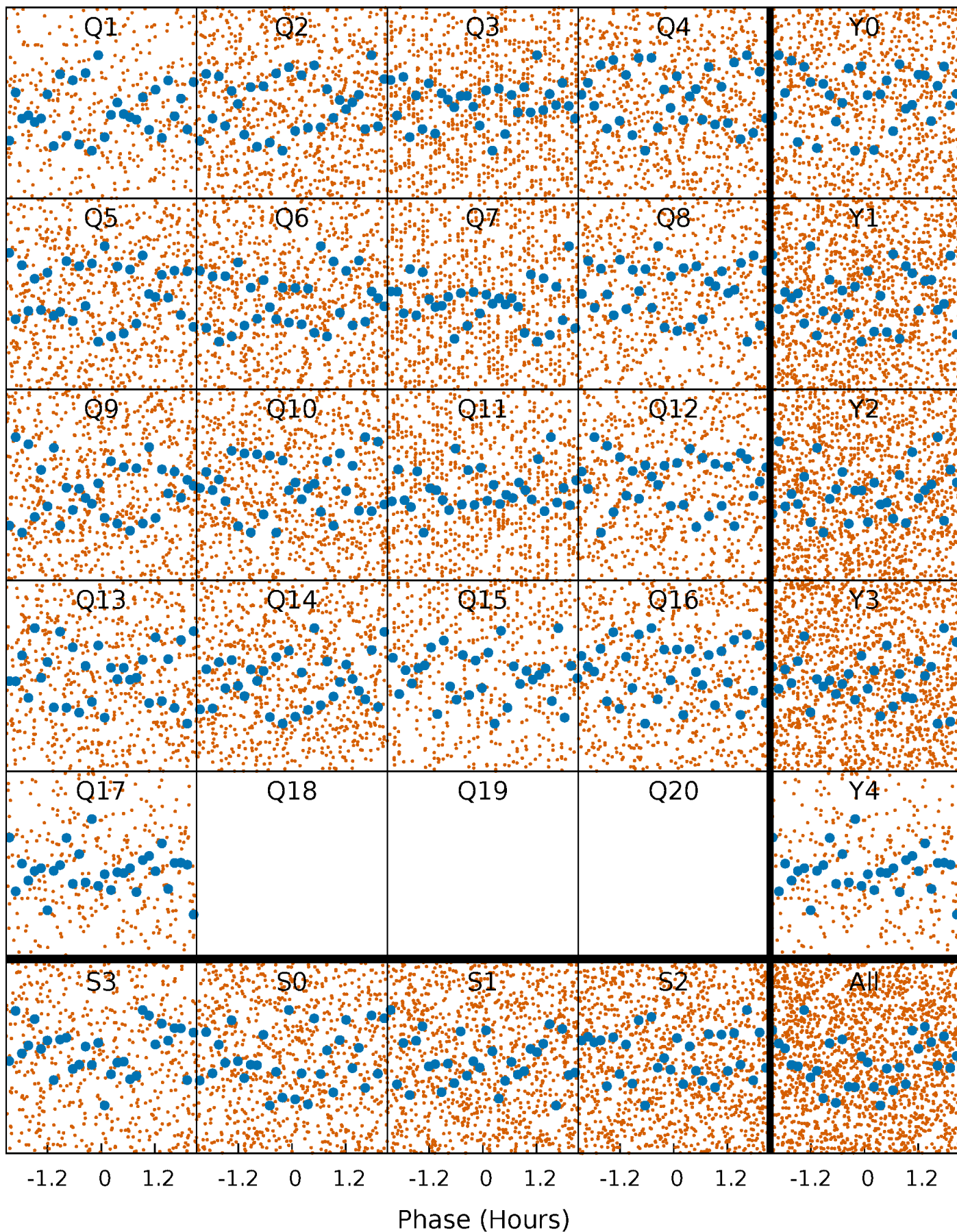


## Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



# PDC Quarter-Phased Transit Curves

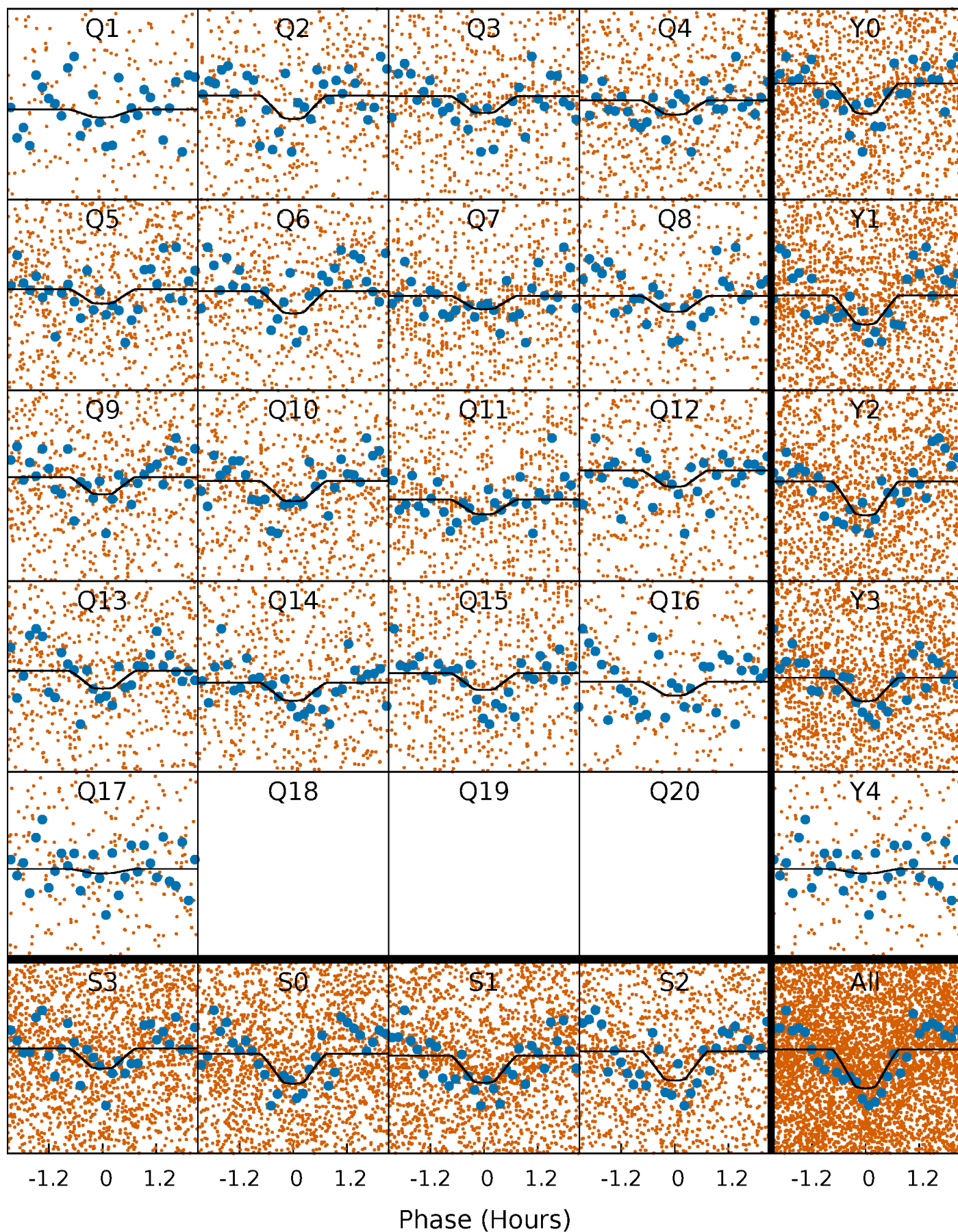
TCE 004252716-02 P= 0.559861 Days  $T_0=131.651841$  (BKJD)





# DV Quarter-Phased Transit Curves

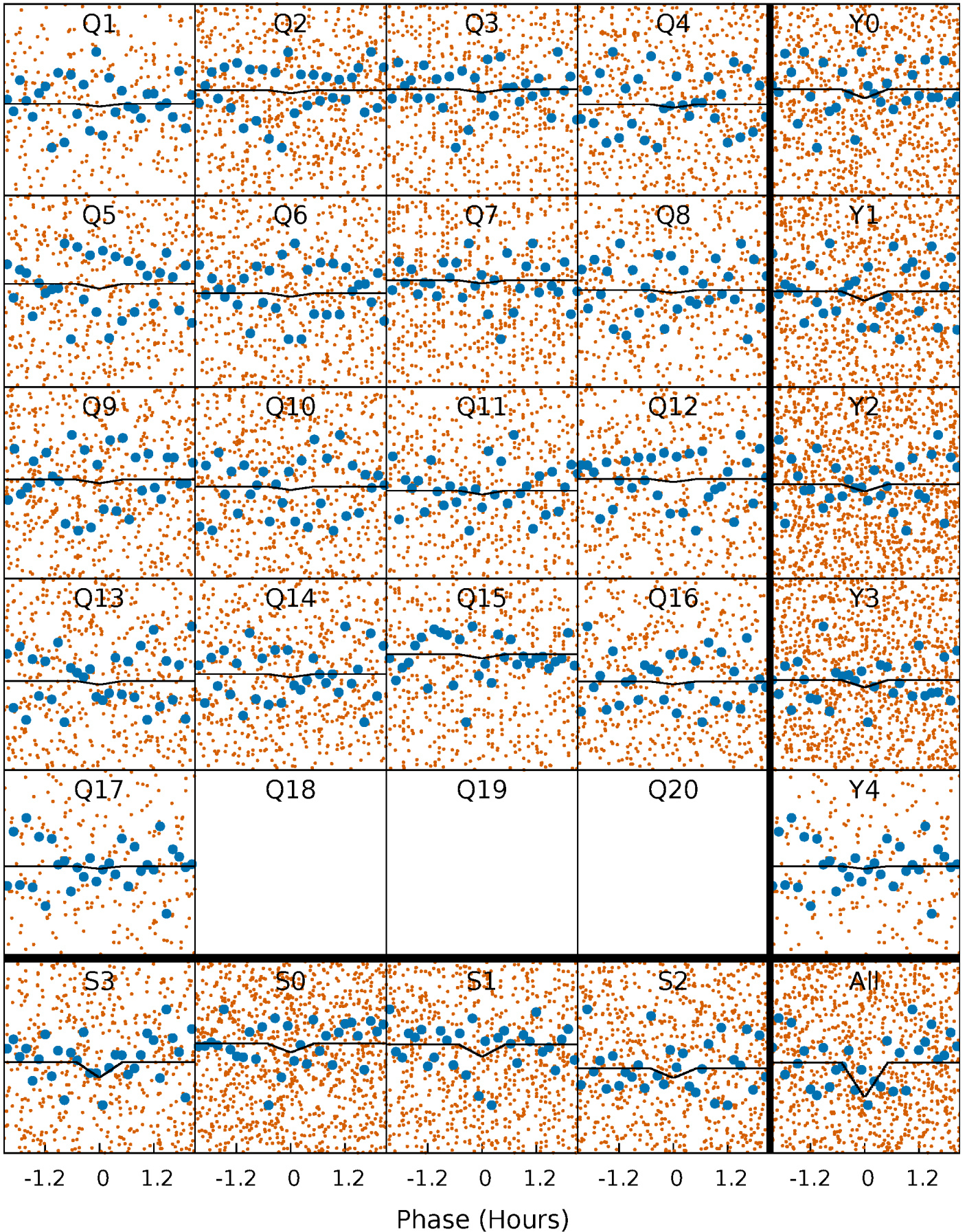
TCE 004252716-02 P= 0.559861 Days  $T_0=131.651841$  (BKJD)





# Alt. Detrend Quarter-Phased Transit Curves

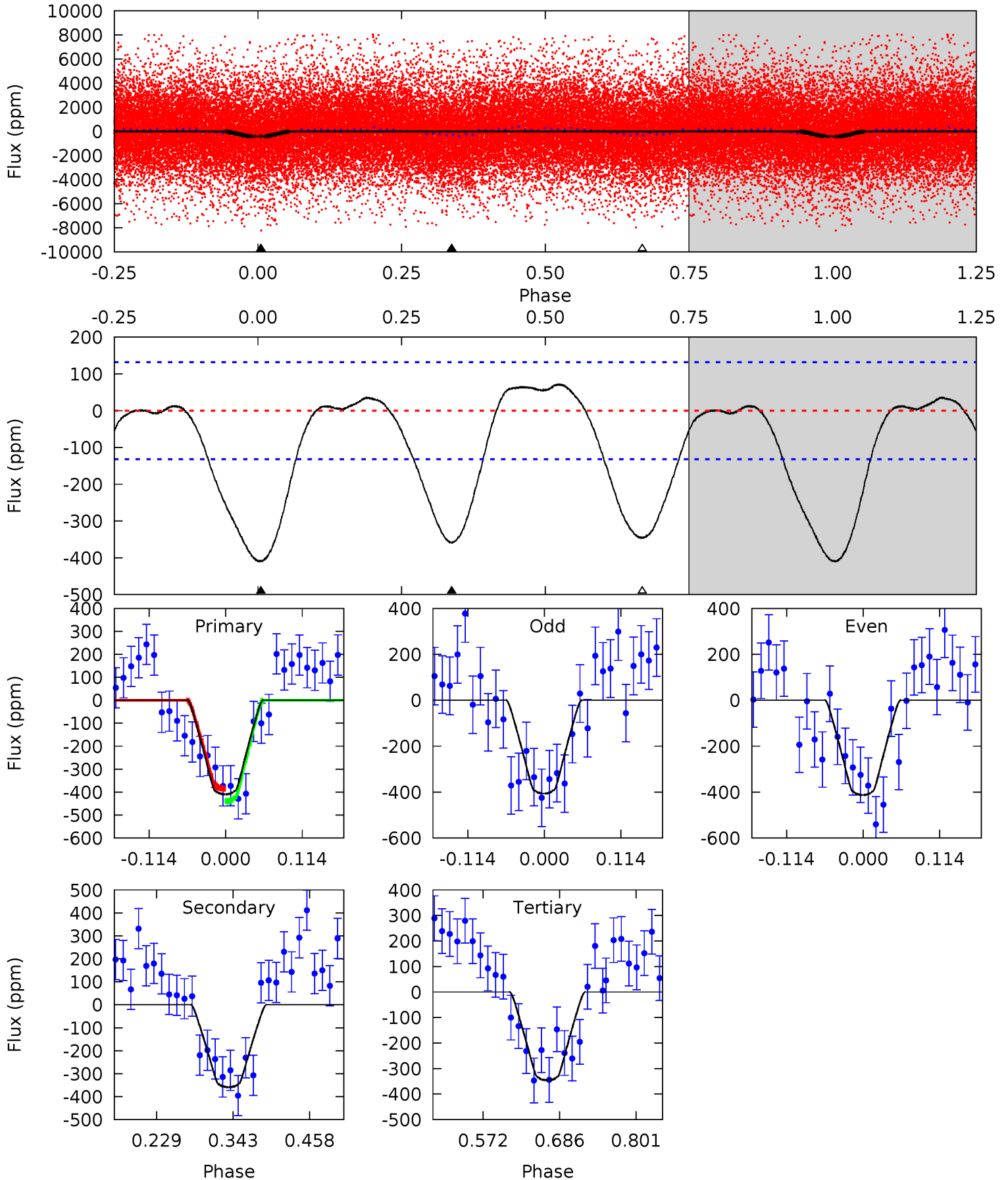
TCE 004252716-02   P= 0.559862 Days    $T_0=131.651843$  (BKJD)



# DV Model-Shift Uniqueness Test

004252716-02, P = 0.559861 Days, E = 131.091980 Days

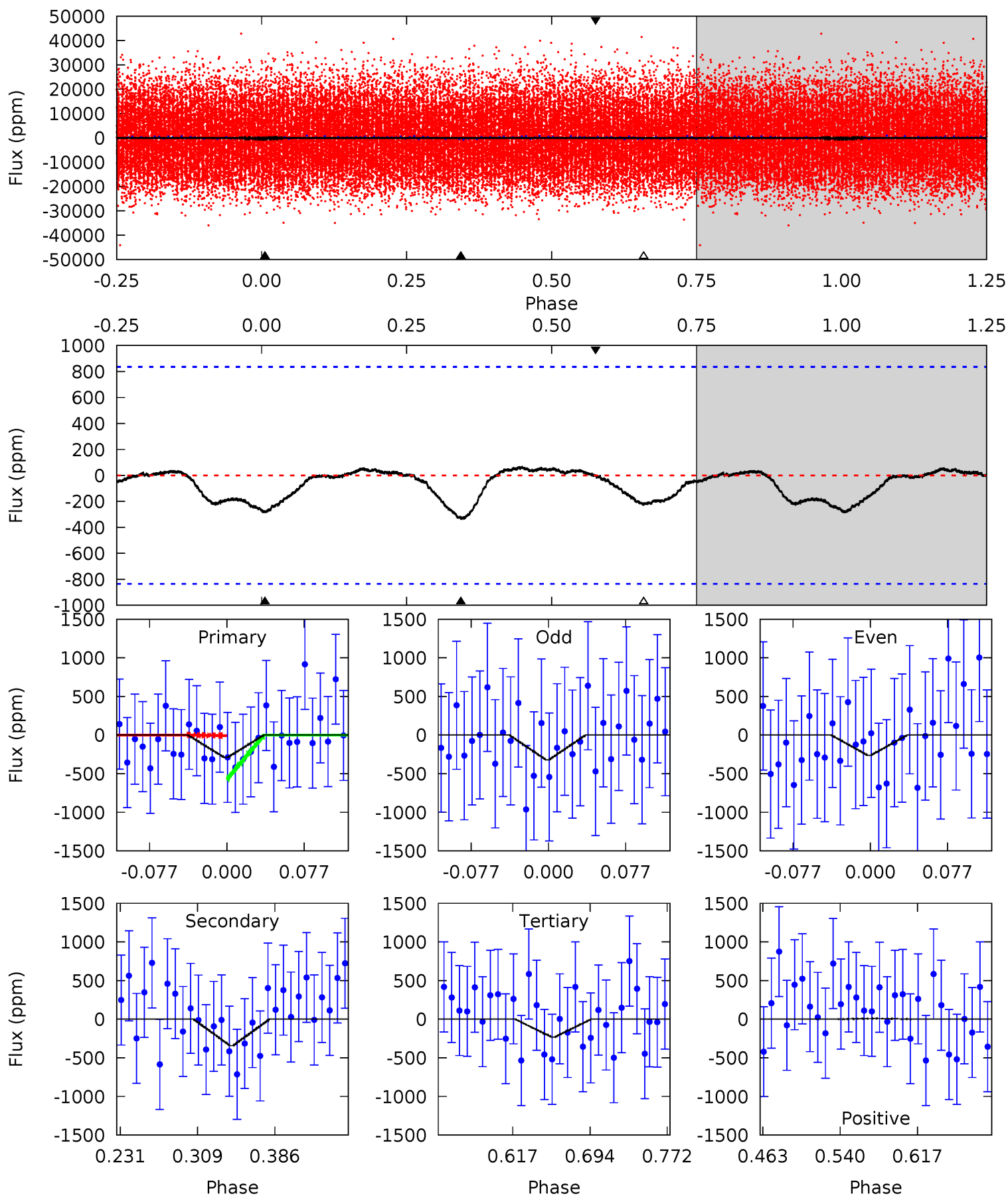
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
14.1	12.3	11.9	0	4.54	1.58	4.38	2.19	14.1	0.45	12.3	0.11	0.98	0.15	0.95



# Alt Model-Shift Uniqueness Test

004252716-02, P = 0.559862 Days, E = 131.091981 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
1.61	1.90	1.28	0.05	4.62	1.77	0.46	0.33	1.57	0.61	1.85	0.16	1.05	0.17	1.56



### Stellar Parameters For KIC 004252716

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$7507^{+75}_{-82}$	$3.945^{+0.143}_{-0.117}$	$-0.080^{+0.150}_{-0.150}$	$2.332^{+0.466}_{-0.466}$	$1.746^{+0.192}_{-0.154}$	$0.194^{+0.141}_{-0.070}$
	+1%/-1%	+4%/-3%	+188%/-188%	+20%/-20%	+11%/-9%	+73%/-36%
Source	SPE68	SPE68	SPE68	DSEP		

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

### Secondary Eclipse Parameters for KIC 004252716-02 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-359 \pm 29$	$4.74^{+3.23}_{-2.69}$	$5561^{+287}_{-271}$	$7148^{+6551}_{-1969}$	$2.249^{+9.933}_{-1.459}$
Alt.	$-343 \pm 181$	$4.68^{+3.27}_{-2.77}$	$5579^{+279}_{-273}$	$6967^{+6428}_{-2571}$	$1.994^{+9.334}_{-1.475}$

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

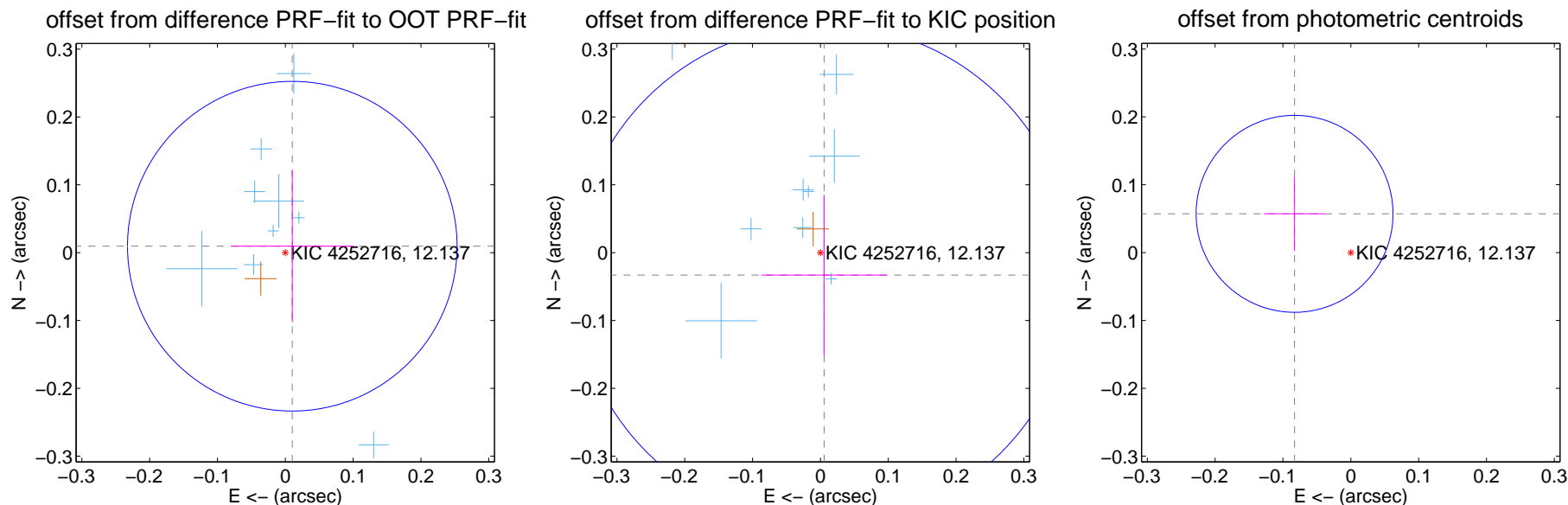
## DV Centroid Data

Supplemental centroid analysis for 004252716-02. Kepler magnitude: 12.14. Transit SNR 7.05

There are 14 quarters with good PRF difference image offsets

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

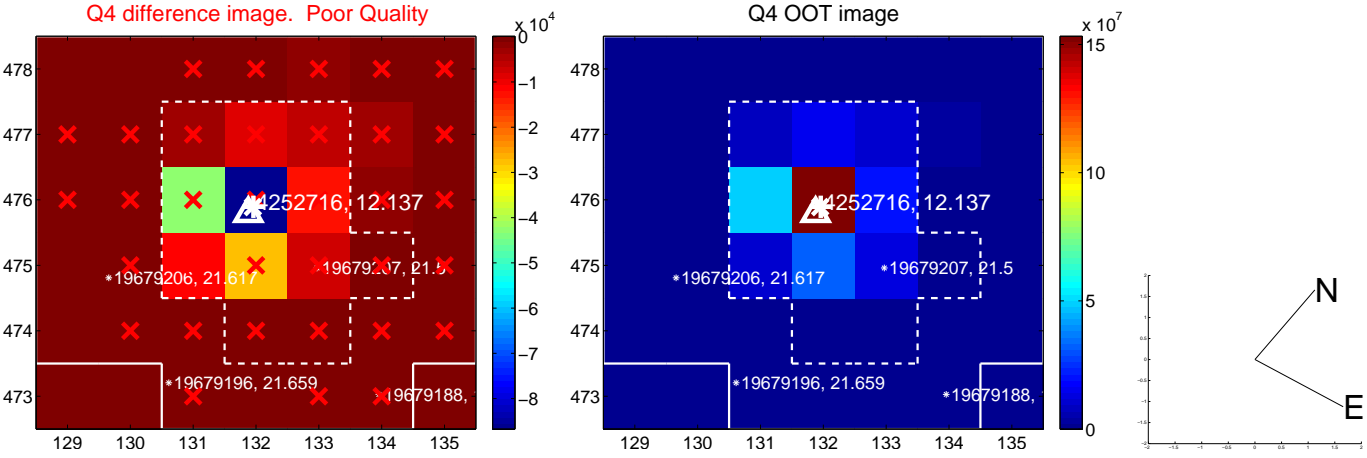
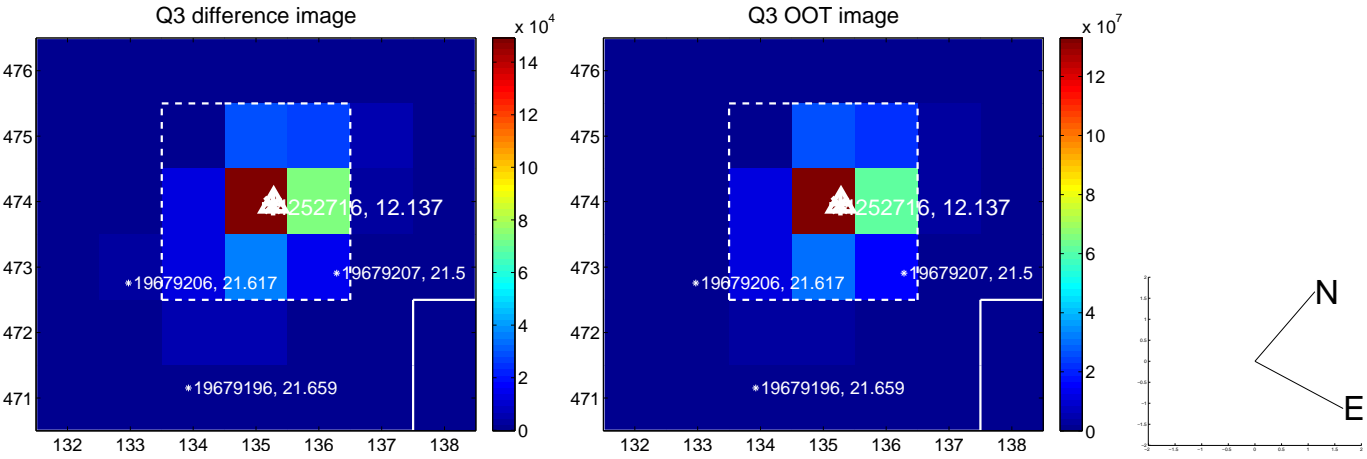
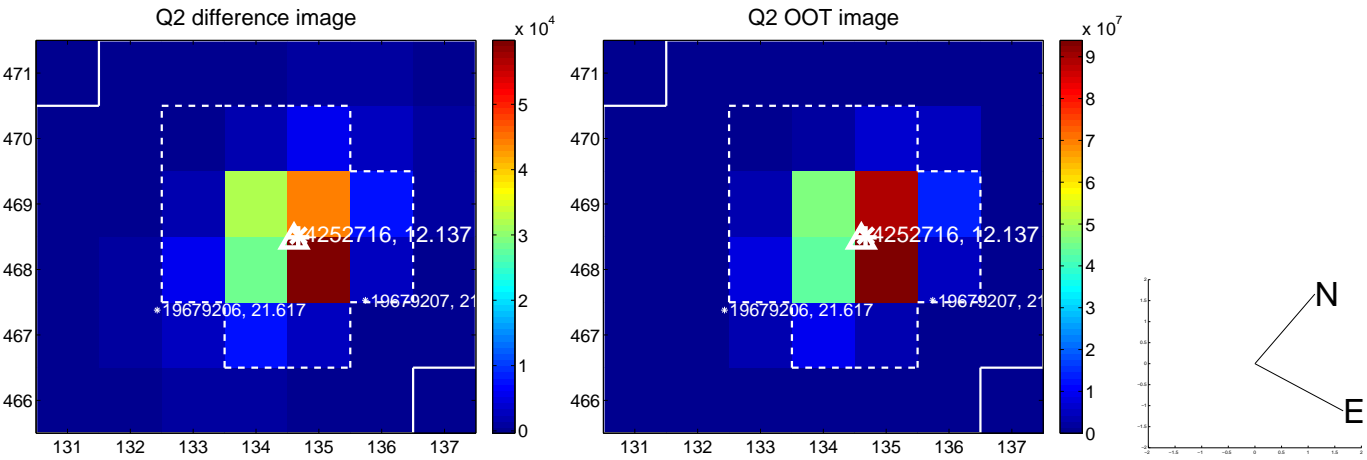
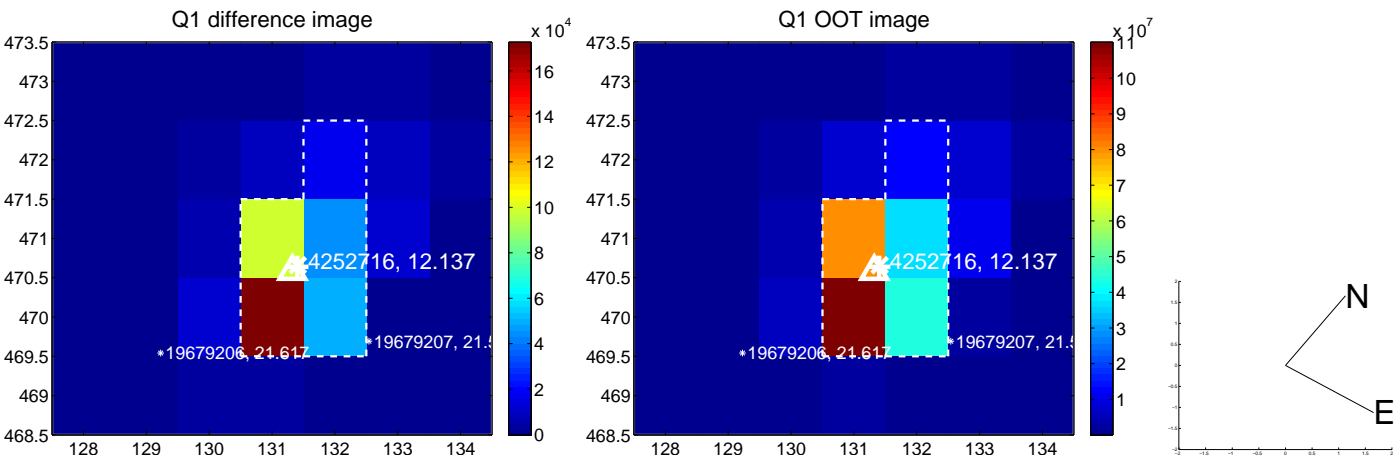
	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.014 \pm 0.081$	0.17	$-0.010 \pm 0.090$	$0.010 \pm 0.112$
PRF-fit source offset from KIC position	$0.034 \pm 0.123$	0.27	$-0.005 \pm 0.093$	$-0.033 \pm 0.118$
photometric centroid source offset	$0.10 \pm 0.05$	2.08	$0.08 \pm 0.05$	$0.06 \pm 0.05$



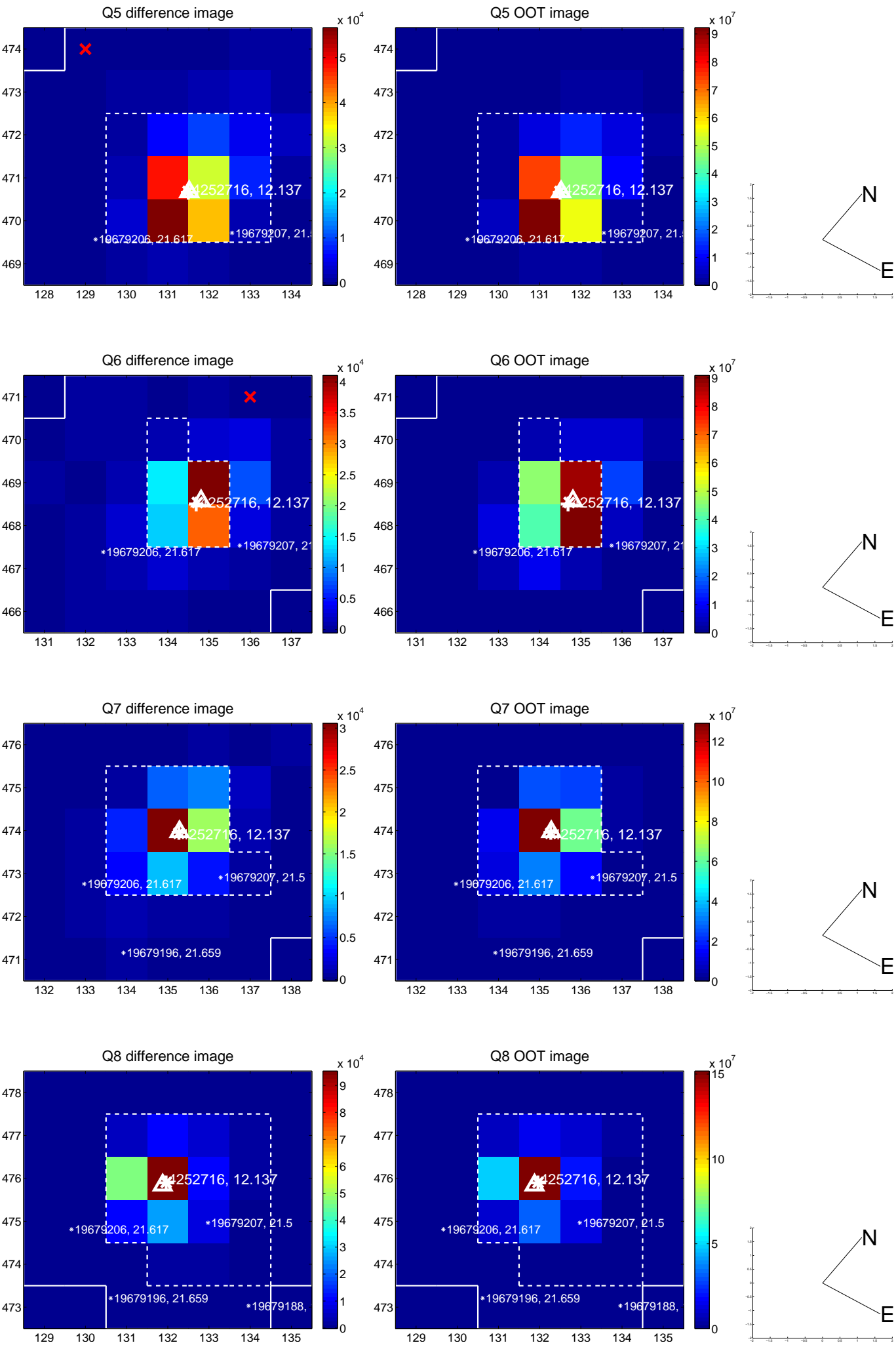
Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets**; **Vermillion crosses: bad quarterly centroid offsets**; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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



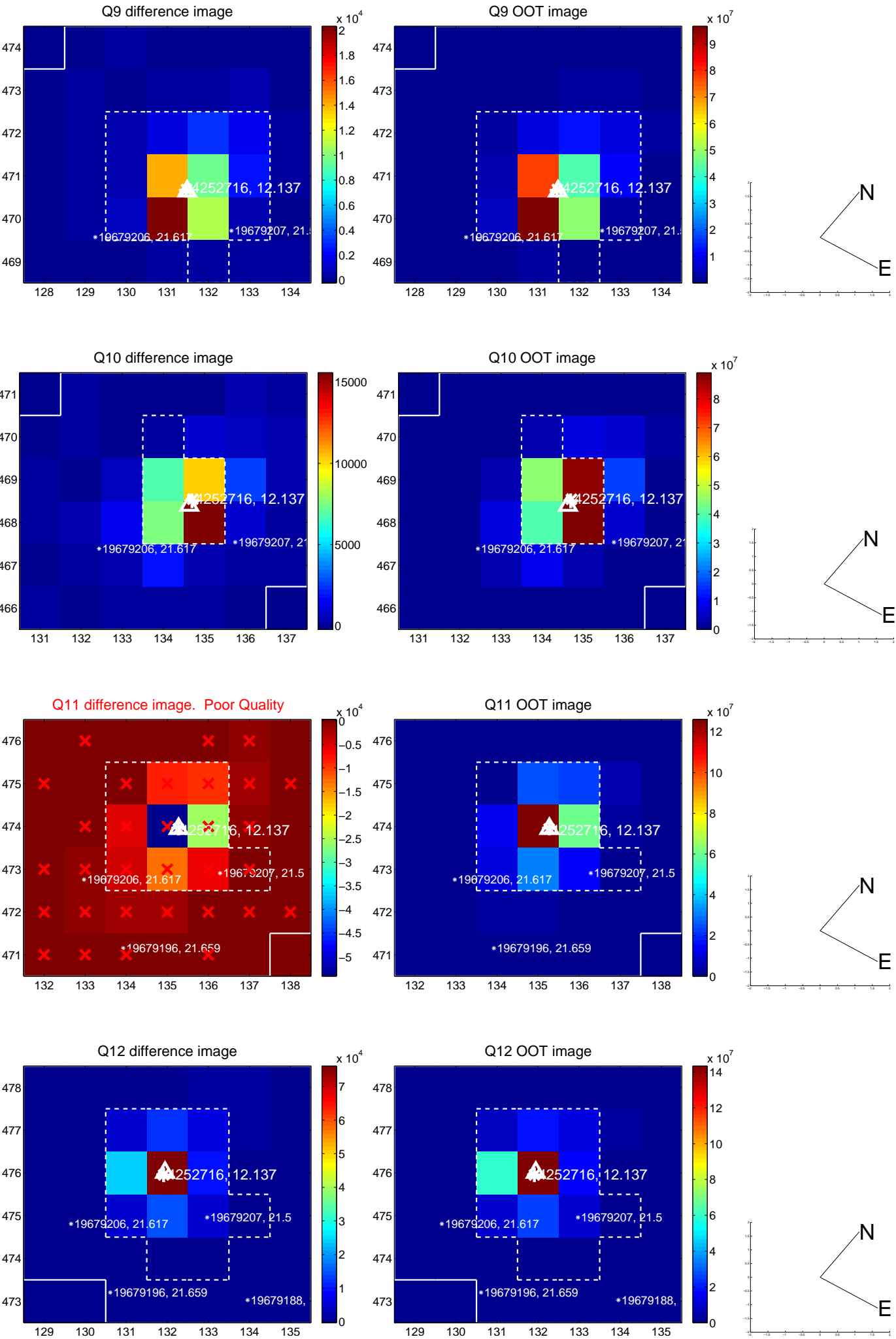
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



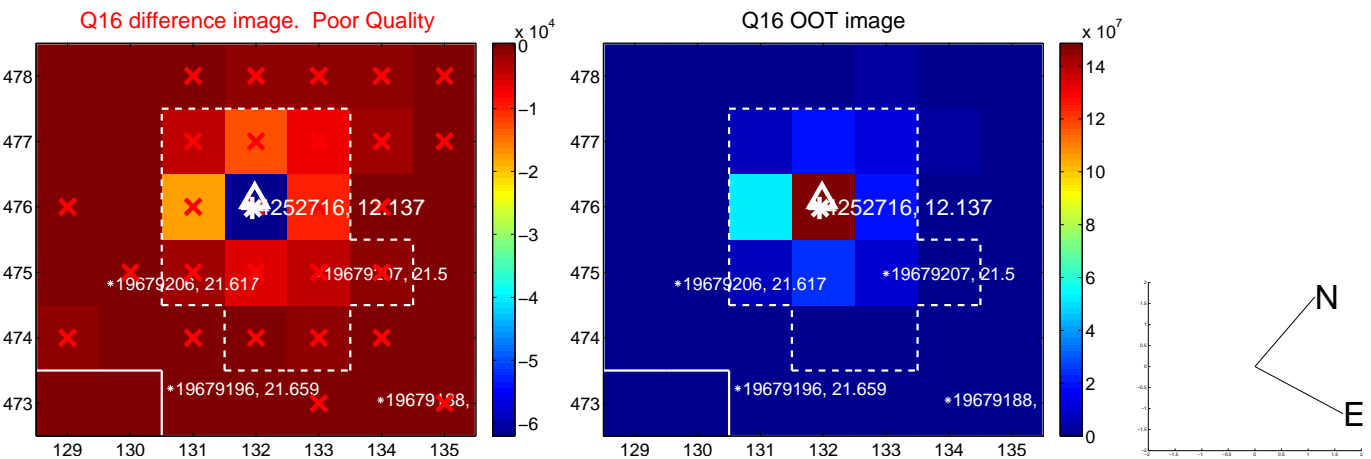
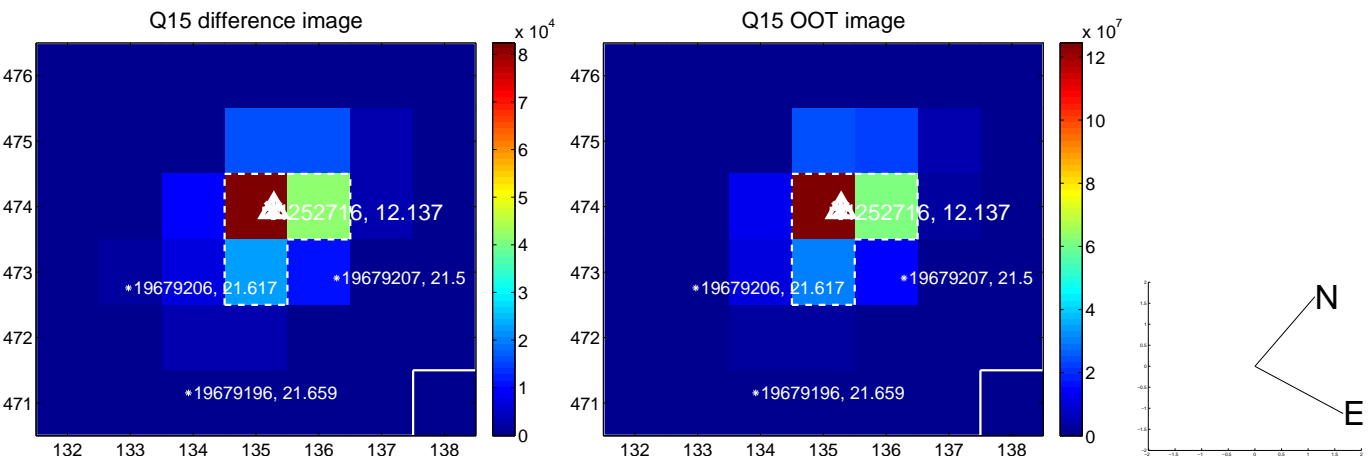
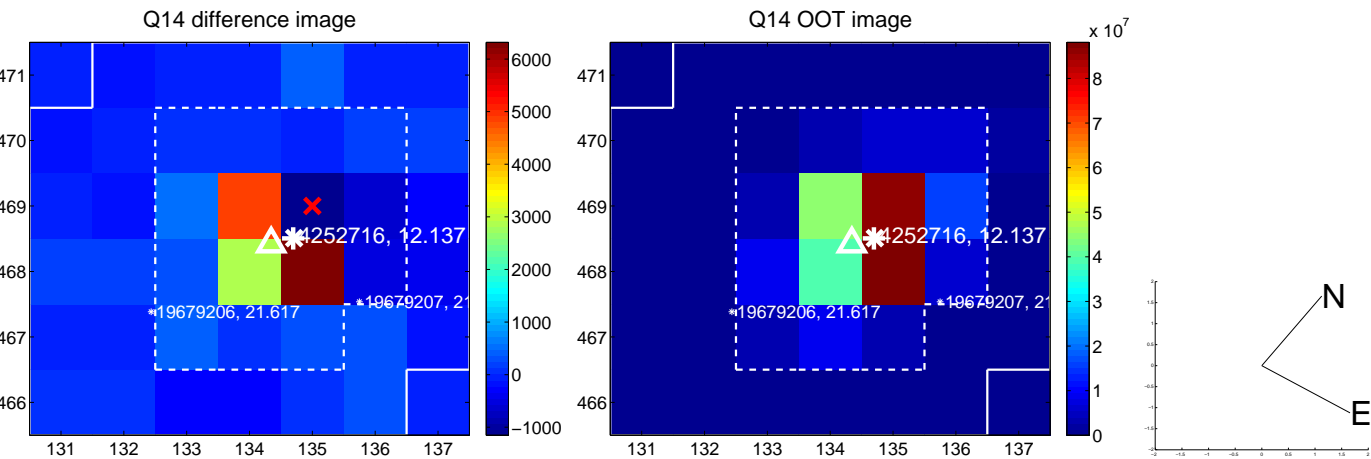
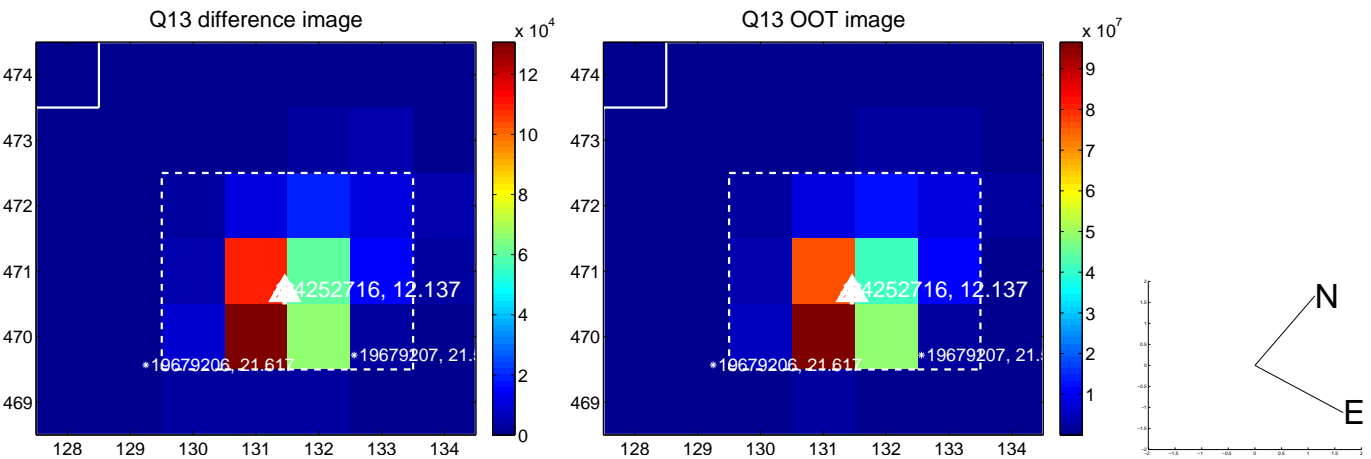
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



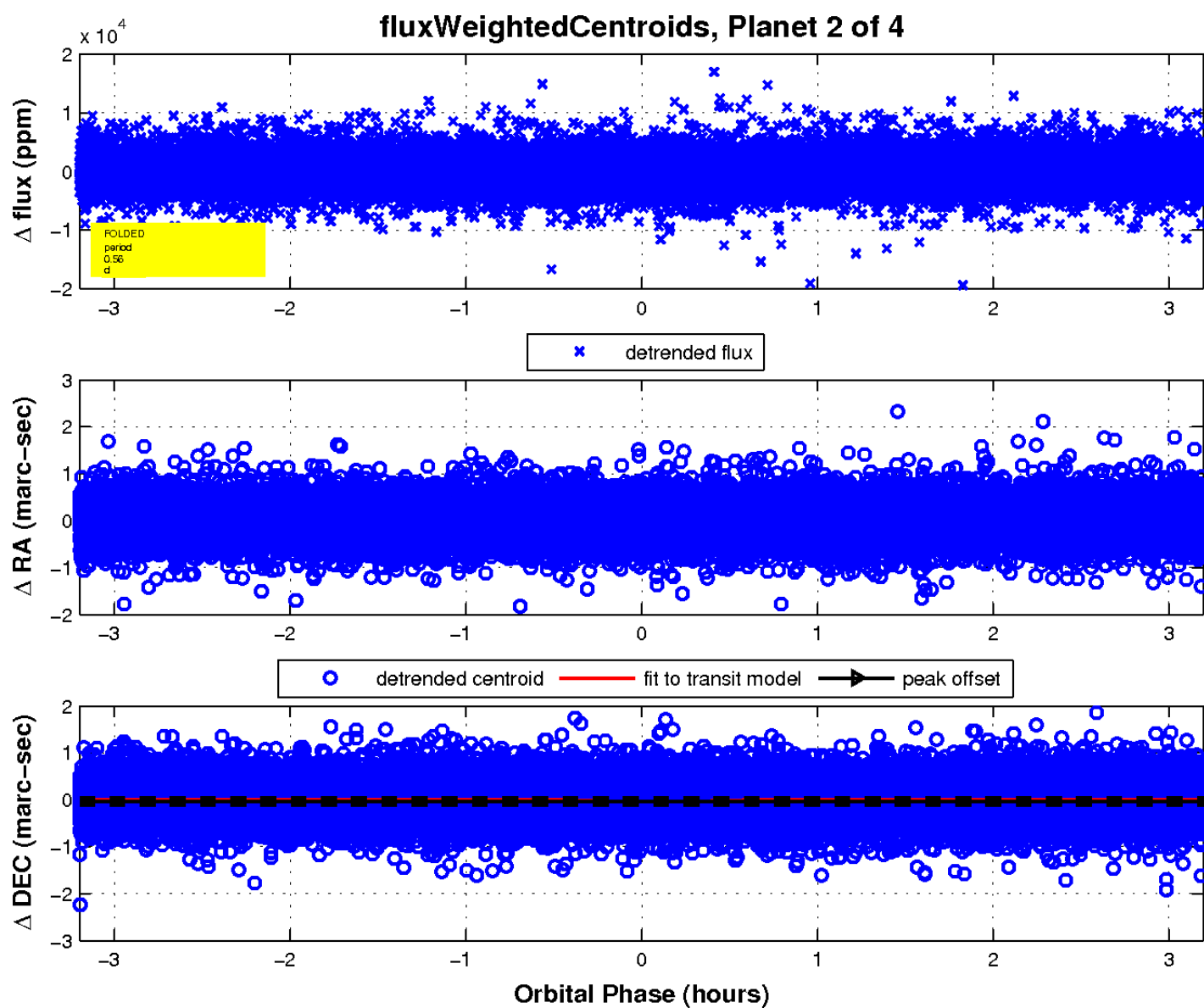
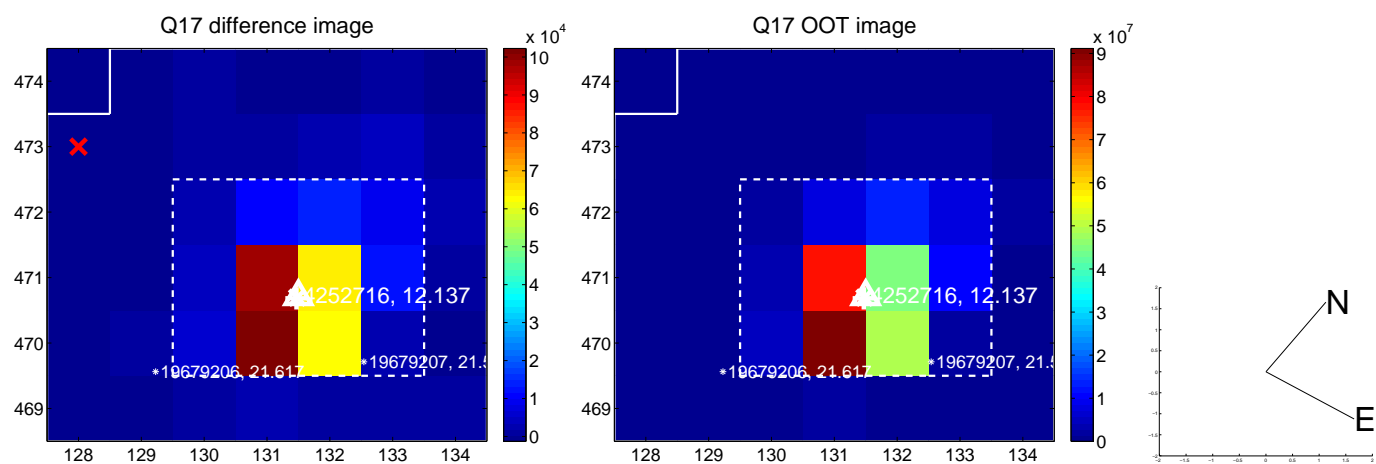
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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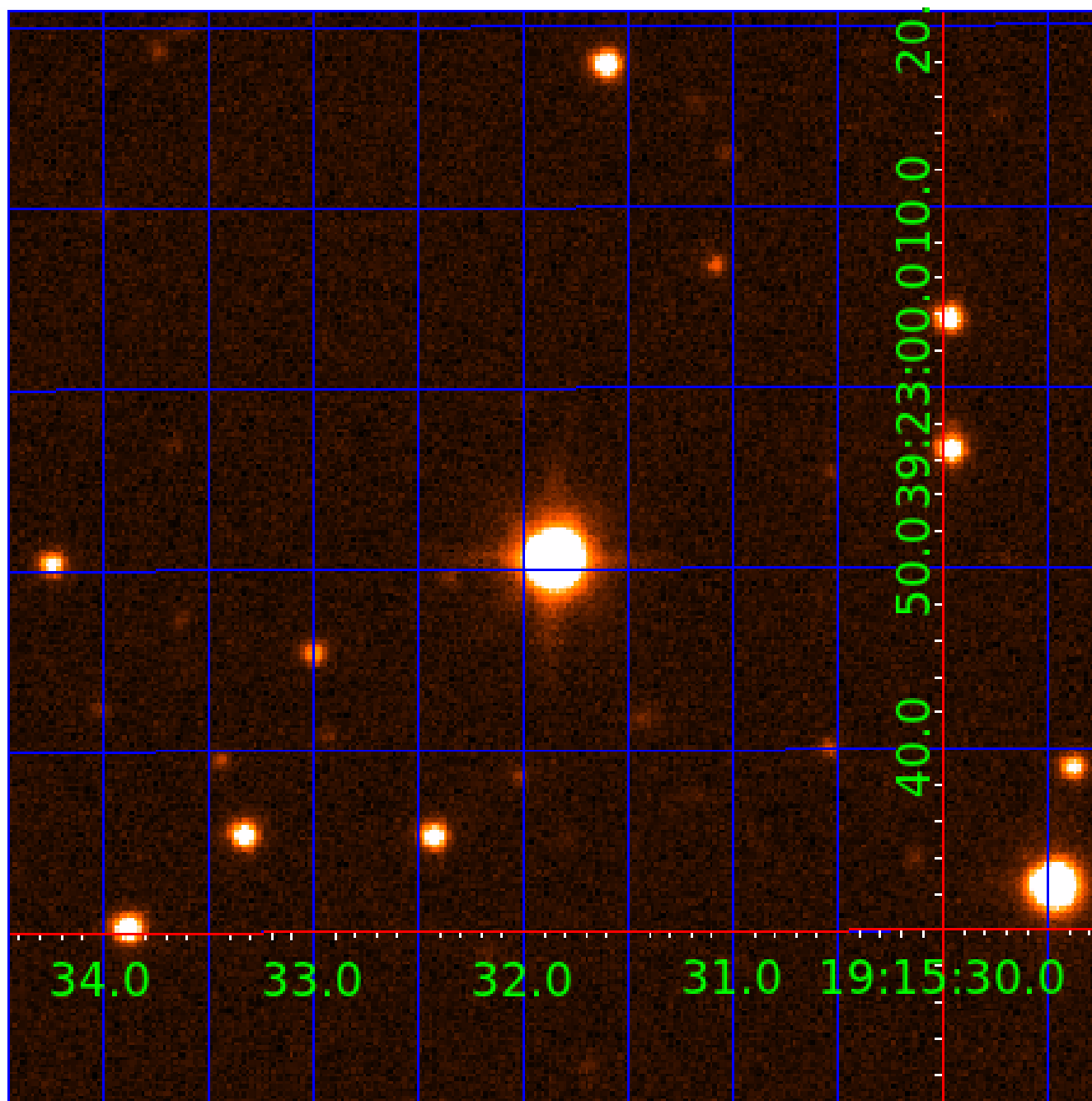
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.





UKIRT Image

Declination



# KIC 004252716

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
004252716-01	OBS	No	1.373172	132.088853	323.6	2.865	8.8	8.9	2.33	7507	4.86	18236.68
004252716-02	OBS	No	0.559861	131.651841	291.2	1.065	9.5	7.1	2.33	7507	4.63	60321.54
004252716-03	OBS	No	0.559866	131.836577	388.1	1.062	8.1	9.6	2.33	7507	5.35	60320.74
004252716-04	OBS	No	377.911277	238.409499	3547.9	4.123	7.2	7.6	2.33	7507	15.75	10.19

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
004252716-01	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT
004252716-02	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT
004252716-03	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—SAME_NTL_PERIOD
004252716-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—ALL_TRANS_CHASES—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—CENT_FEW_DIFFS

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

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

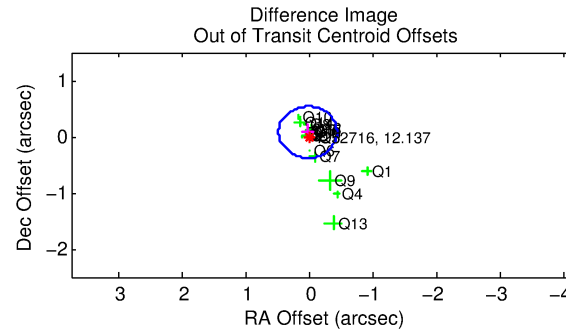
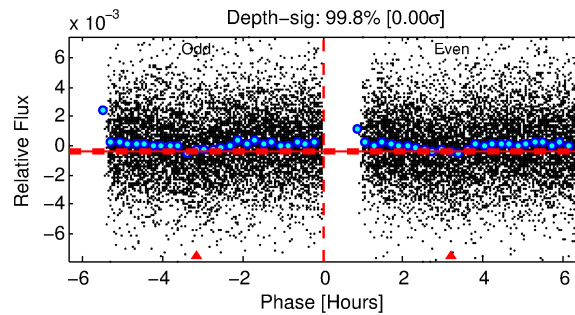
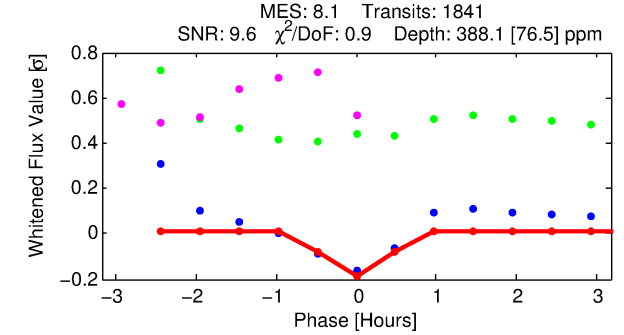
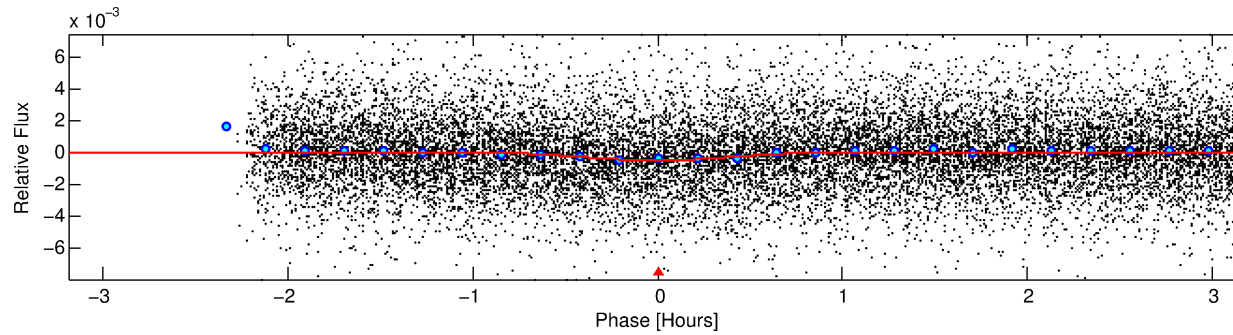
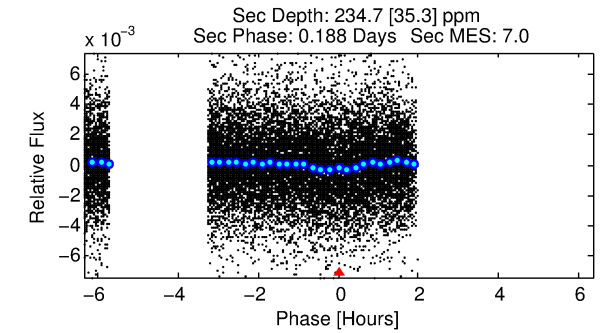
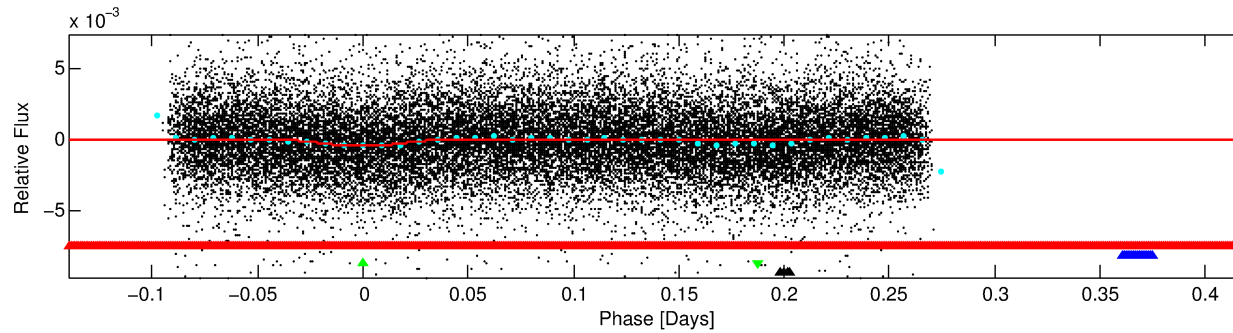
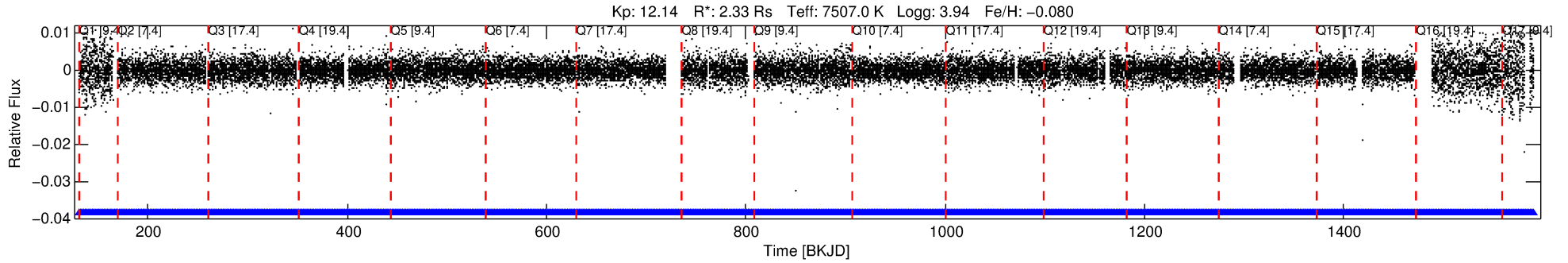
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 004252716-03

No Significant Match Found

# DV One-Page Summary

KIC: 4252716 Candidate: 3 of 4 Period: 0.560 d



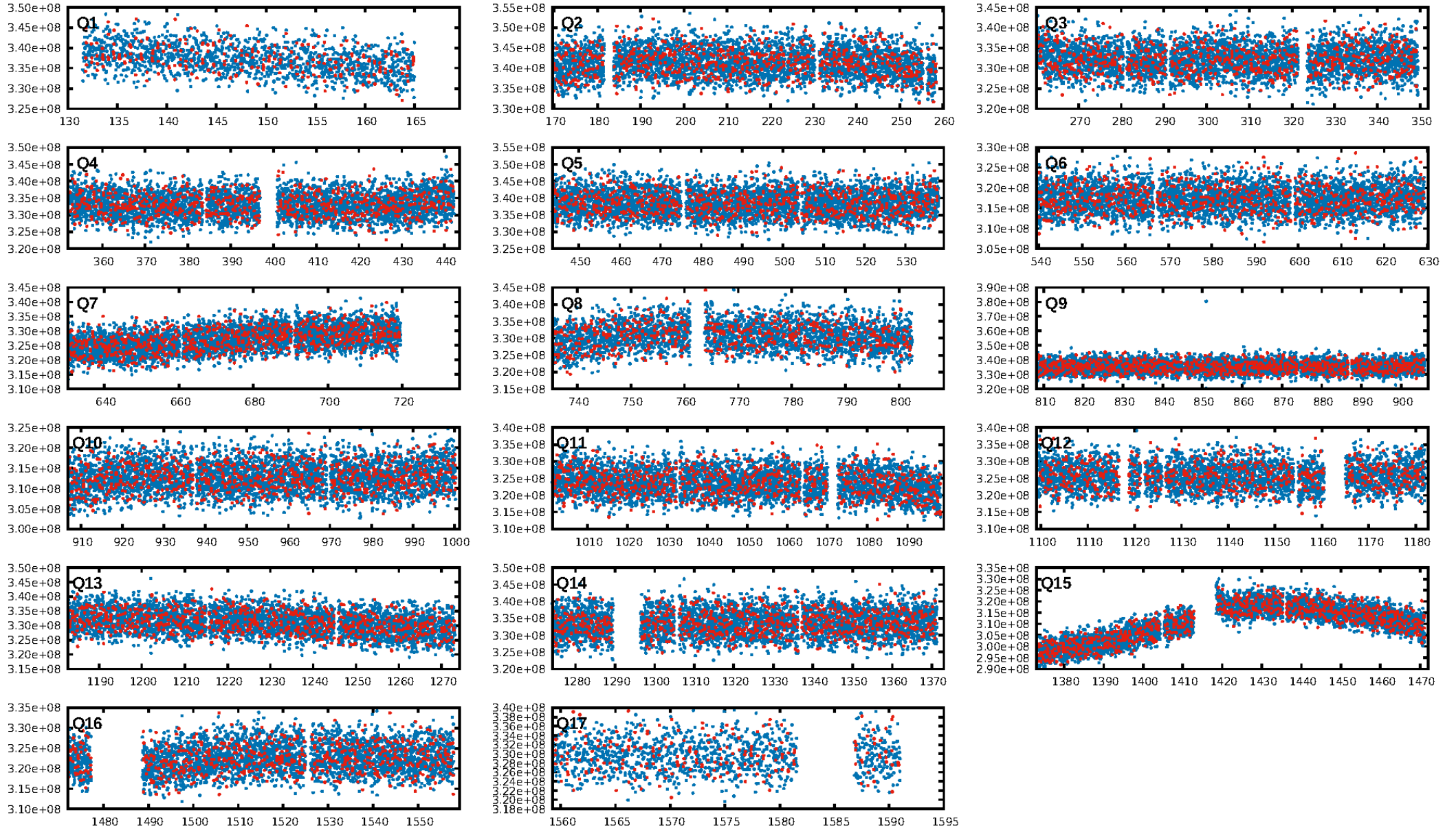
## DV Fit Results:

Period = 0.55987 [0.00001] d  
Epoch = 131.8366 [0.0019] BKJD  
Rp/R\* = 0.0210 [0.0135]  
a/R\* = 2.16 [6.77]  
b = 0.90 [0.86]  
Seff = 60320.74 [15711.48]  
Teq = 3996 [260] K  
Rp = 5.35 [3.59] Re  
a = 0.0160 [0.0028] AU  
Ag = 1.16 [1.52] [0.10 $\sigma$ ]  
Teffp = 6406 [2066] K [1.16 $\sigma$ ]

## DV Diagnostic Results:

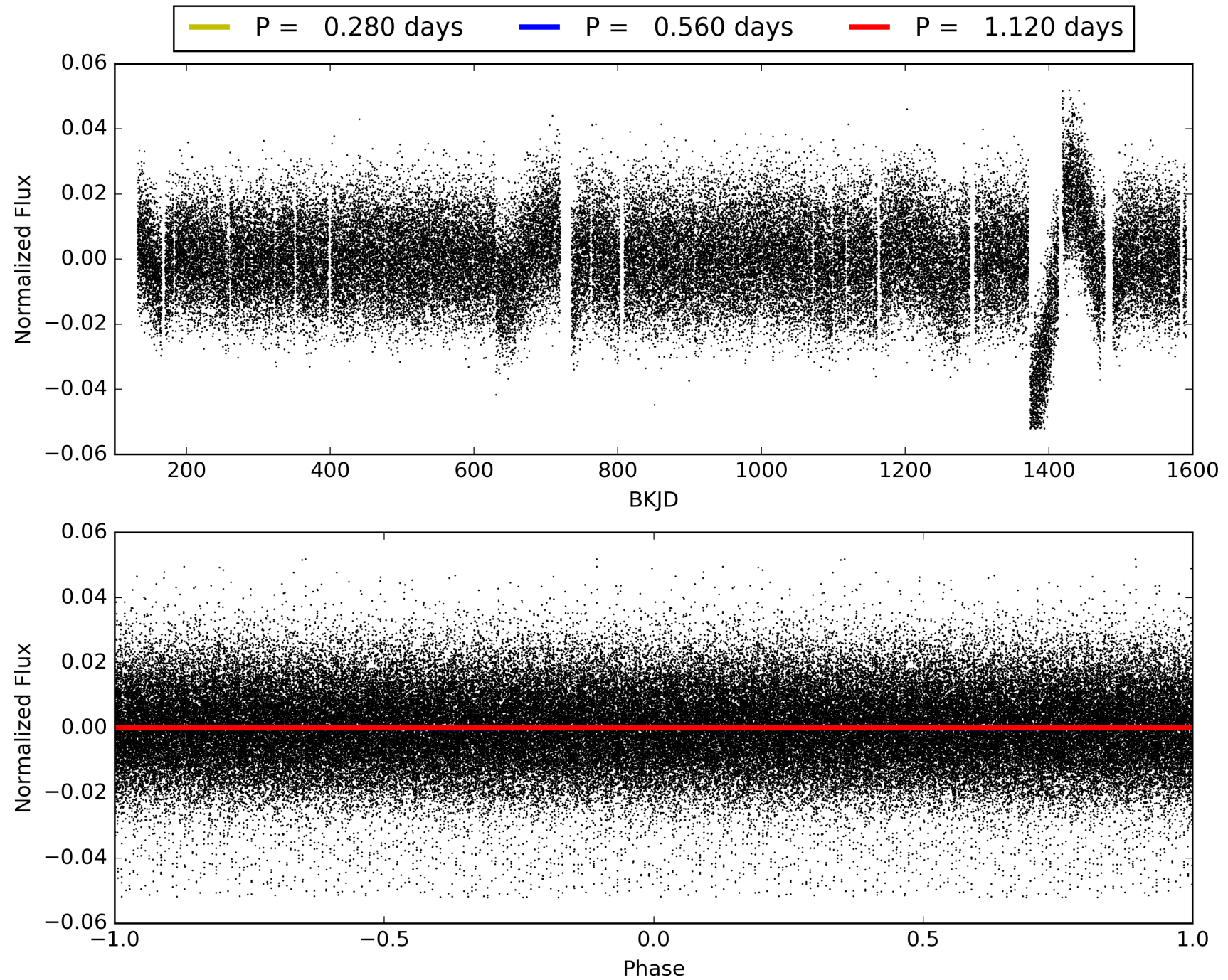
ShortPeriod-sig: 0.0% [0.00 $\sigma$ ]  
LongPeriod-sig: 100.0% [6.39 $\sigma$ ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: 4.67e-12  
RollingBand-fgt: 1.00 [1758/1758]  
GhostDiagnostic-chr: 3.534  
Centroid-sig: N/A  
Centroid-so: 0.068 arcsec [1.67 $\sigma$ ]  
OotOffset-rm: 0.085 arcsec [0.56 $\sigma$ ]  
KicOffset-rm: 0.058 arcsec [0.36 $\sigma$ ]  
OotOffset-st: 4/4/4/5 [17]  
KicOffset-st: 4/4/4/5 [17]  
DiffImageQuality-fgm: 0.88 [15/17]  
DiffImageOverlap-fno: 0.00 [0/17]

# TCE 004252716-03, PDC Light Curves





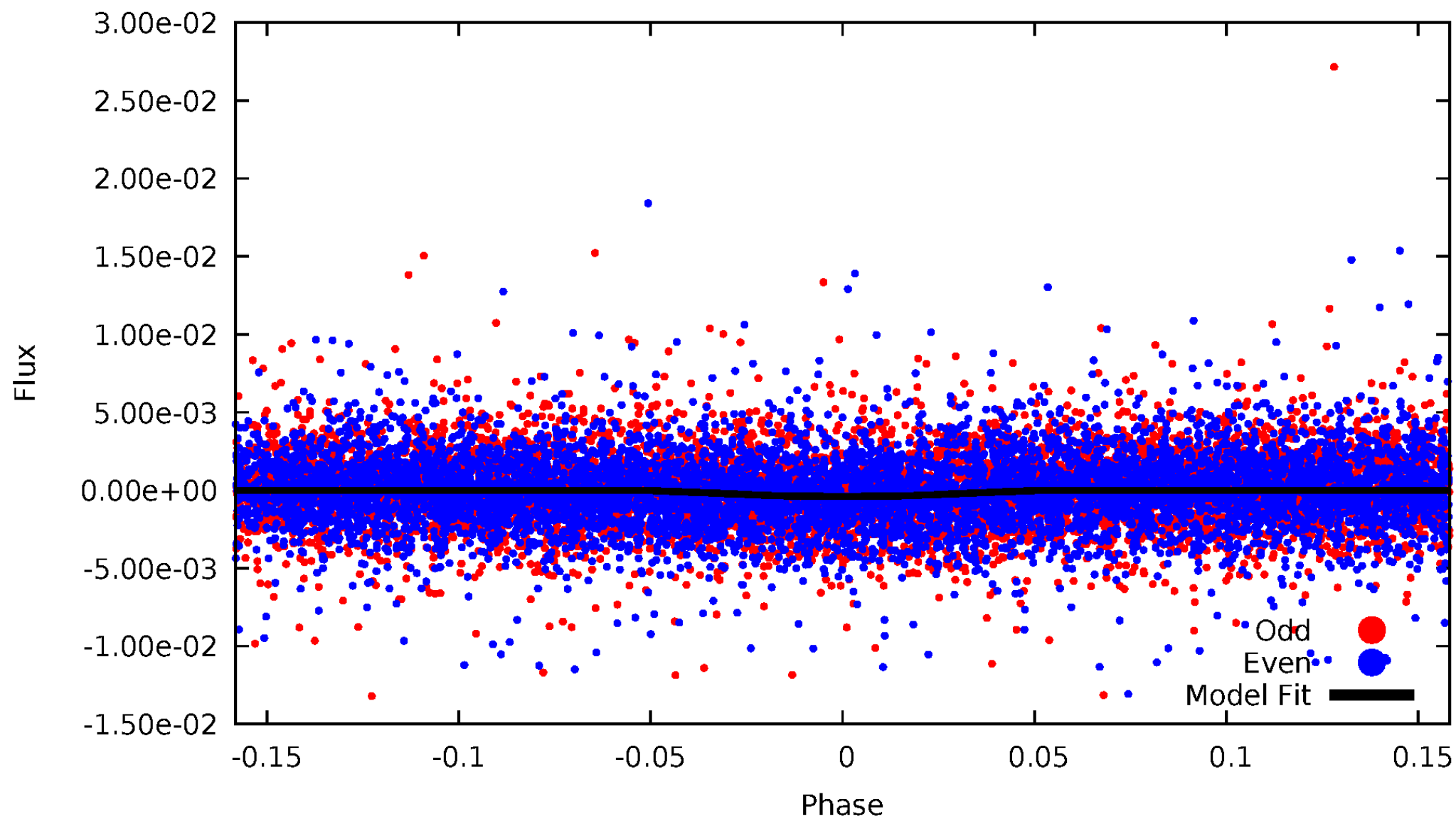
TCE 004252716-03





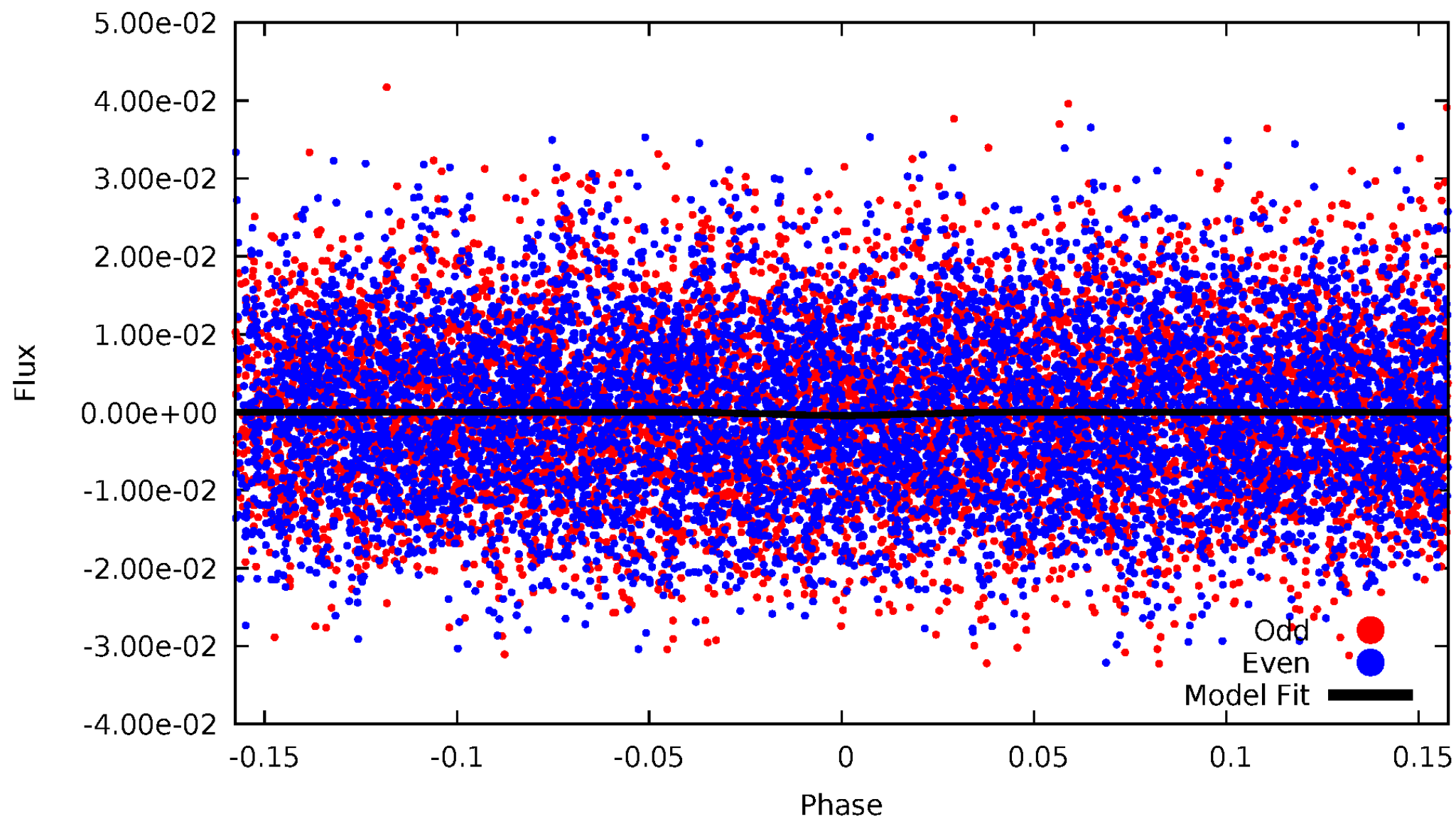
# DV Odd/Even

TCE 004252716-03



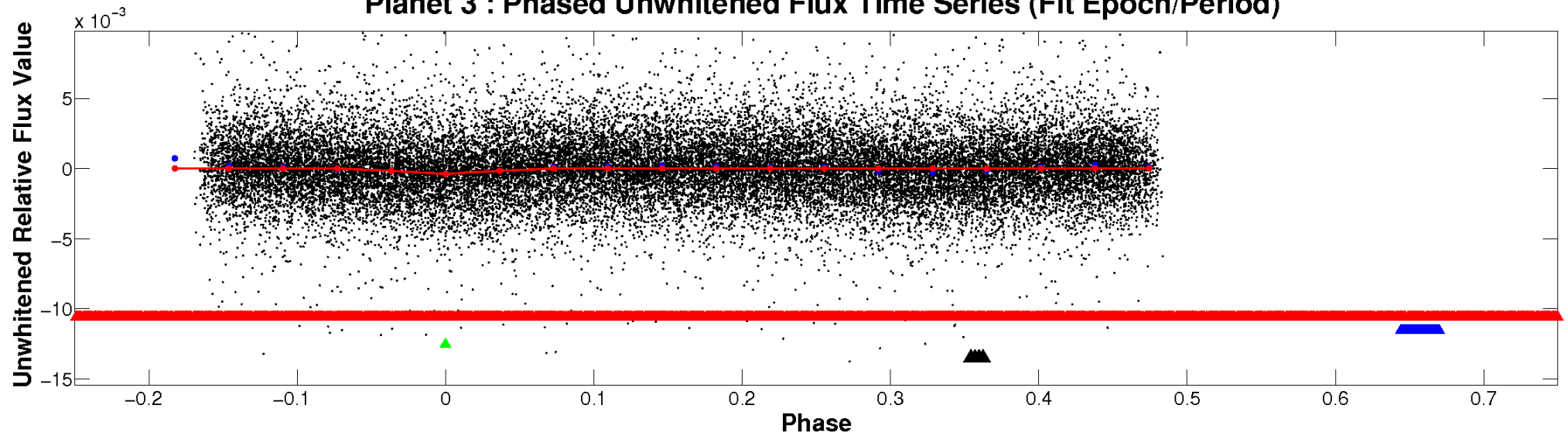
# ALT Odd/Even

TCE 004252716-03

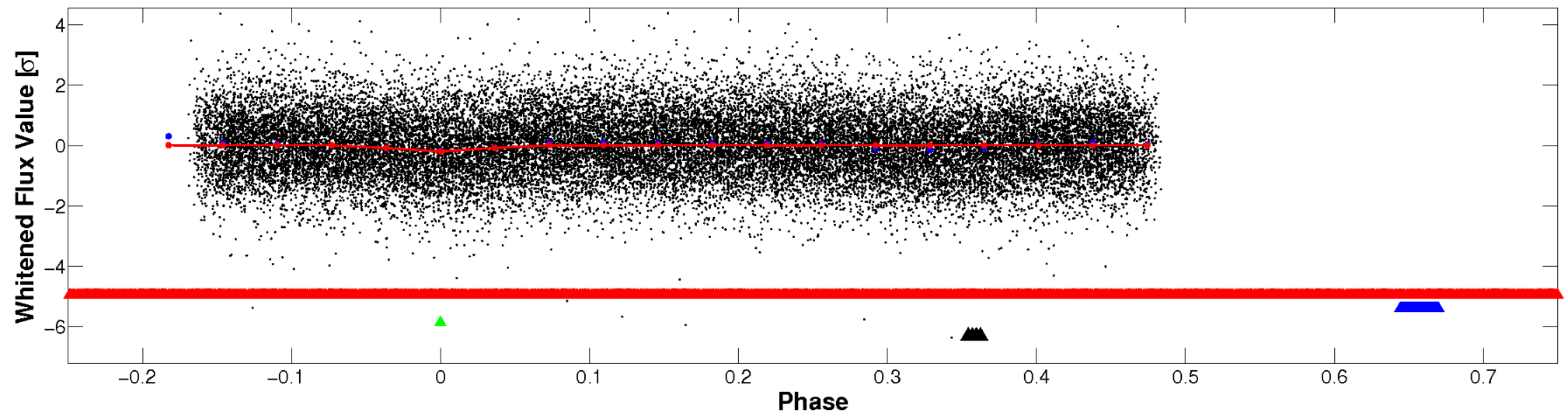


# Non-Whitened Vs. Whitened Light Curve

**Planet 3 : Phased Unwhitened Flux Time Series (Fit Epoch/Period)**

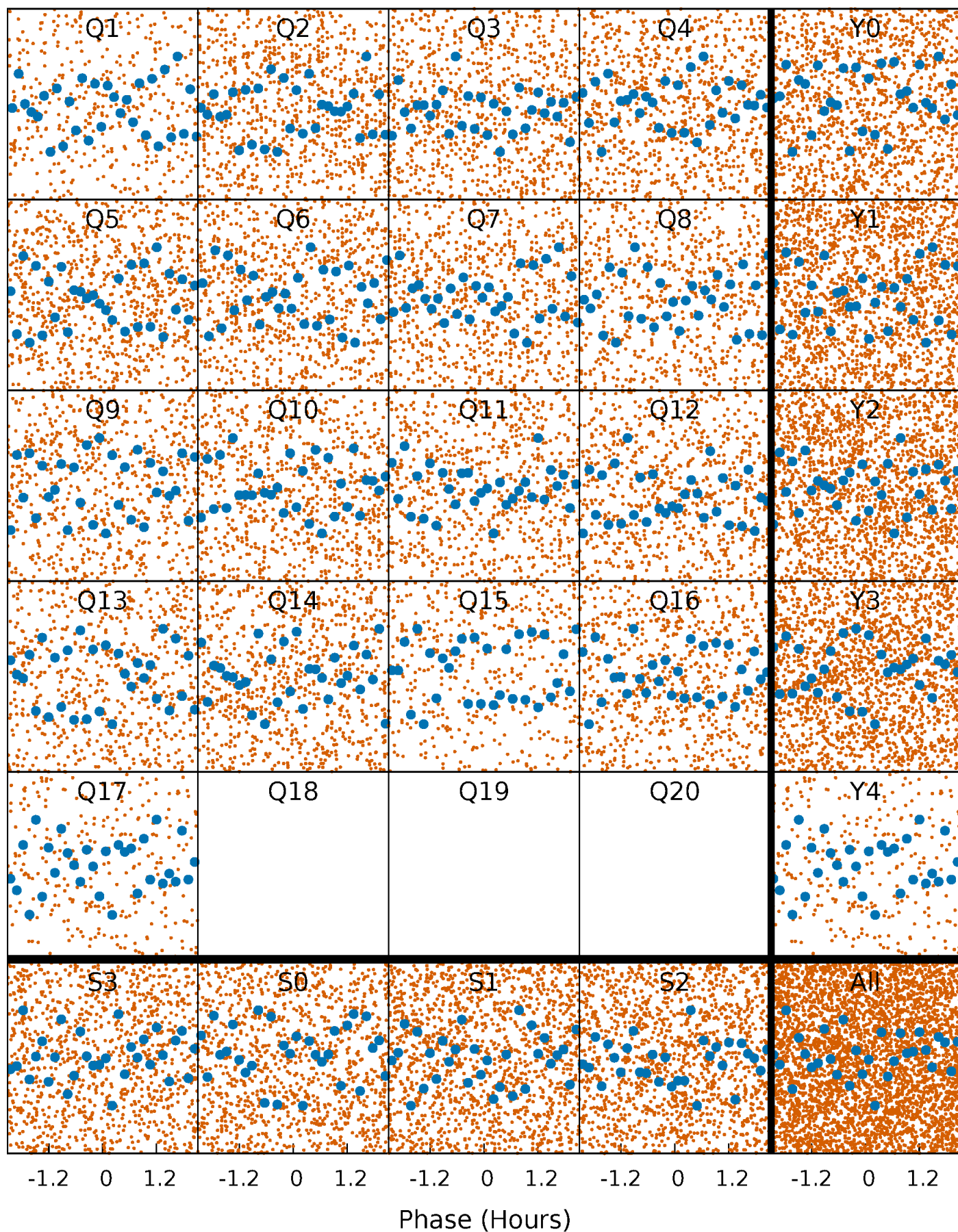


**Planet 3 : Phased Whitened Flux Time Series (Fit Epoch/Period)**



# PDC Quarter-Phased Transit Curves

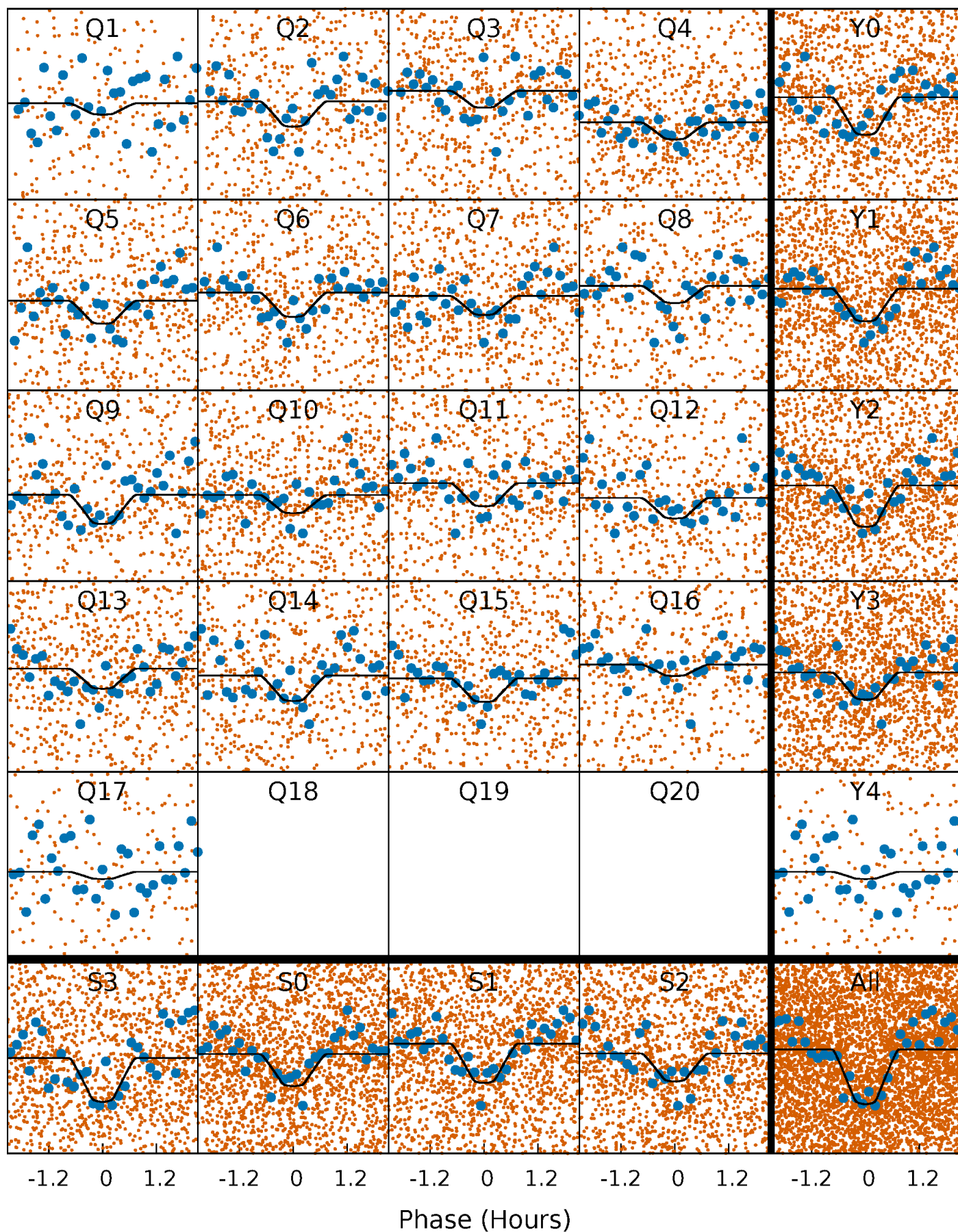
TCE 004252716-03 P= 0.559866 Days  $T_0=131.836577$  (BKJD)





# DV Quarter-Phased Transit Curves

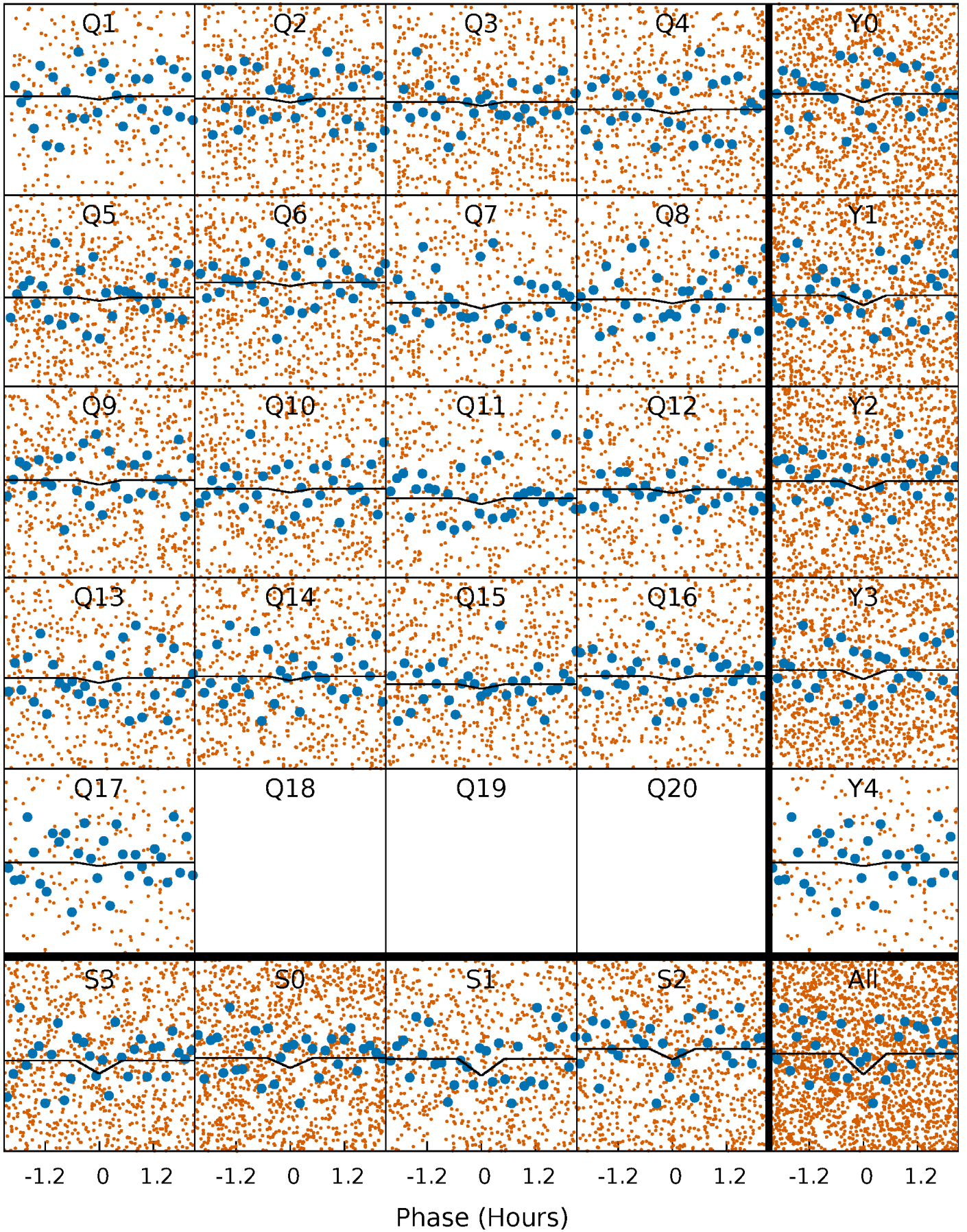
TCE 004252716-03 P= 0.559866 Days  $T_0=131.836577$  (BKJD)





# Alt. Detrend Quarter-Phased Transit Curves

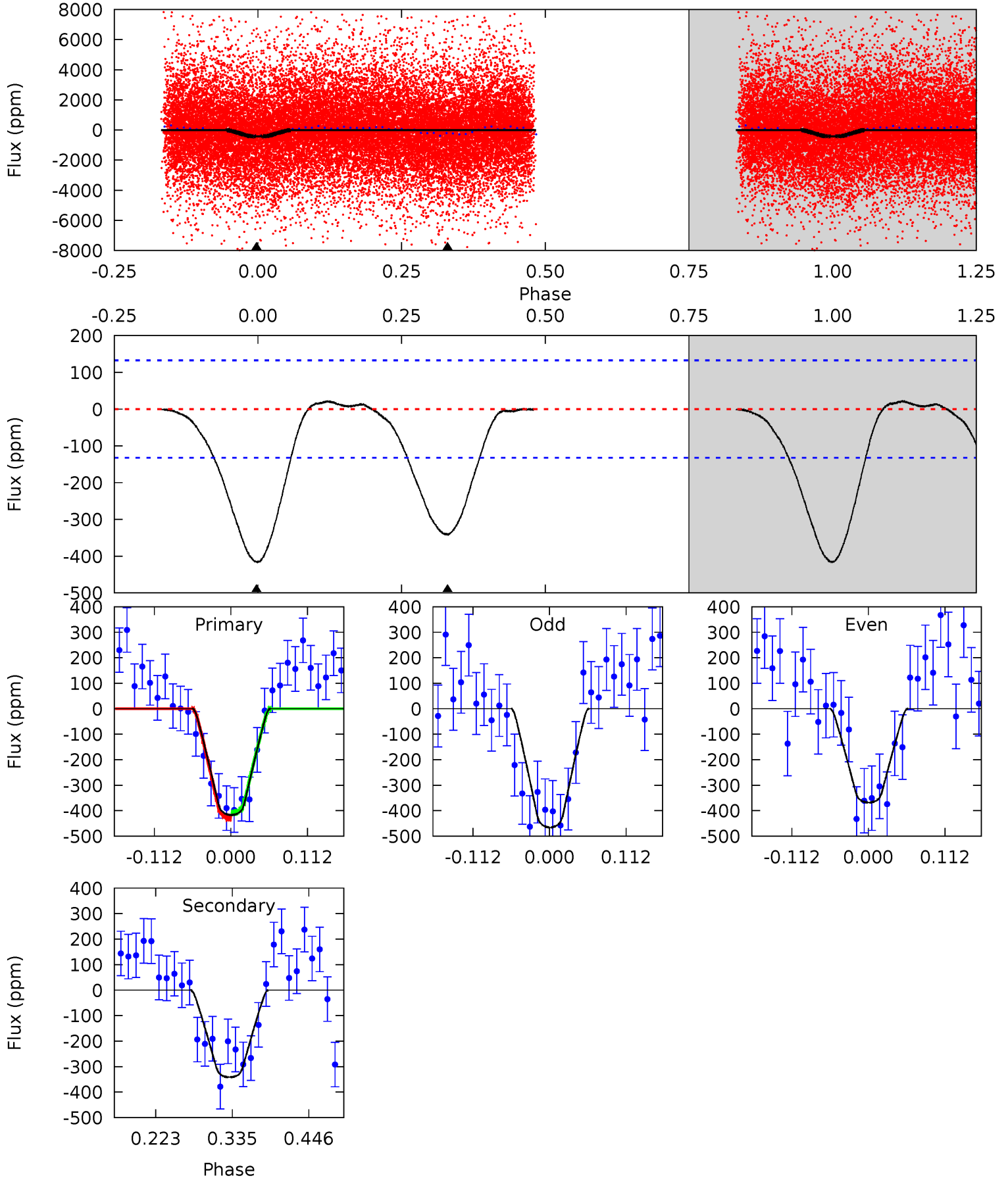
TCE 004252716-03 P= 0.559867 Days  $T_0=131.836644$  (BKJD)



# DV Model-Shift Uniqueness Test

004252716-03, P = 0.559866 Days, E = 131.276711 Days

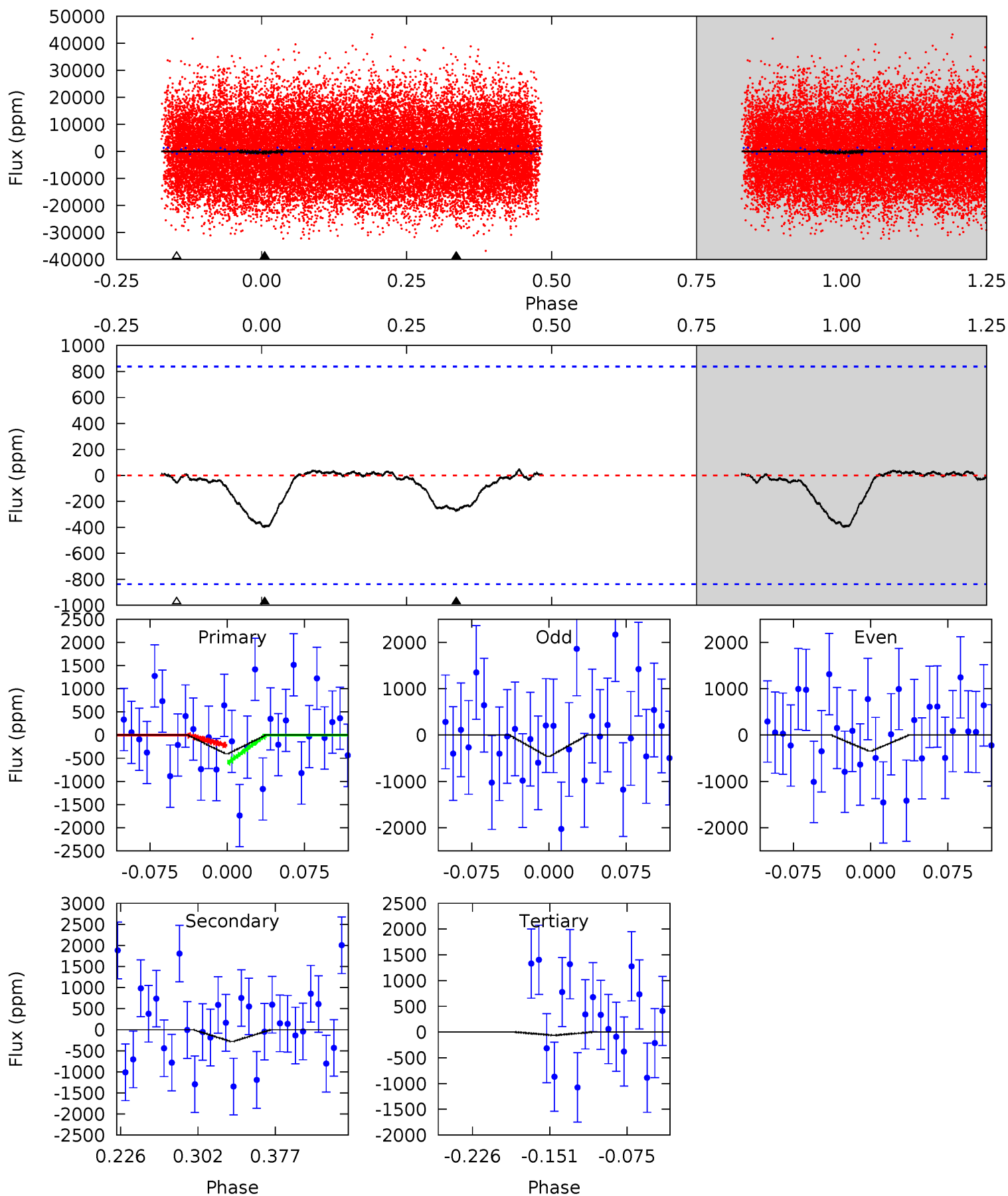
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
14.3	11.7	0	0	4.54	1.59	0.44	14.3	14.3	11.7	11.7	1.68	0.91	0.05	0.36



# Alt Model-Shift Uniqueness Test

004252716-03, P = 0.559867 Days, E = 131.276777 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
2.22	1.54	0.34	0	4.62	1.78	0.13	1.88	2.22	1.20	1.54	0.32	0.47	0.11	1.05



### Stellar Parameters For KIC 004252716

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$7507^{+75}_{-82}$	$3.945^{+0.143}_{-0.117}$	$-0.080^{+0.150}_{-0.150}$	$2.332^{+0.466}_{-0.466}$	$1.746^{+0.192}_{-0.154}$	$0.194^{+0.141}_{-0.070}$
	+1%/-1%	+4%/-3%	+188%/-188%	+20%/-20%	+11%/-9%	+73%/-36%
Source	SPE68	SPE68	SPE68	DSEP		

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

### Secondary Eclipse Parameters for KIC 004252716-03 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-342 \pm 29$	$5.49^{+3.56}_{-3.09}$	$5559^{+293}_{-252}$	$6494^{+5253}_{-1880}$	$1.630^{+6.701}_{-1.039}$
Alt.	$-279 \pm 181$	$5.43^{+3.51}_{-3.01}$	$5581^{+251}_{-247}$	$5814^{+4457}_{-8844}$	$1.130^{+5.079}_{-0.858}$

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

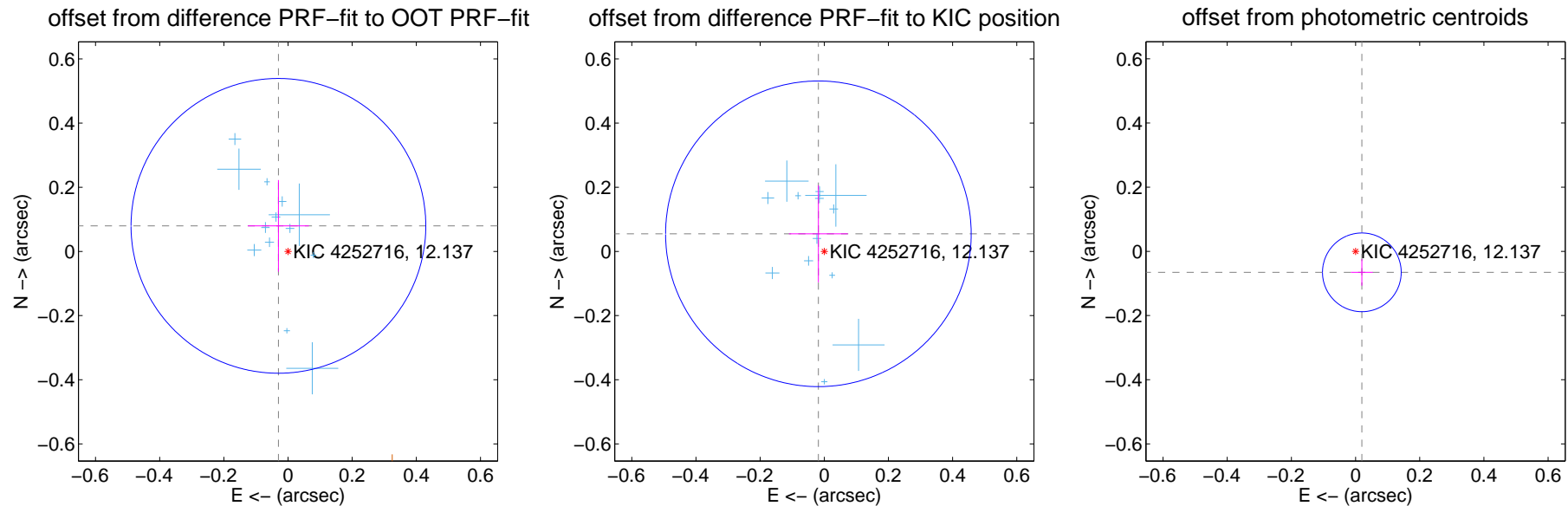
## DV Centroid Data

Supplemental centroid analysis for 004252716-03. Kepler magnitude: 12.14. Transit SNR 9.61

There are 15 quarters with good PRF difference image offsets

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

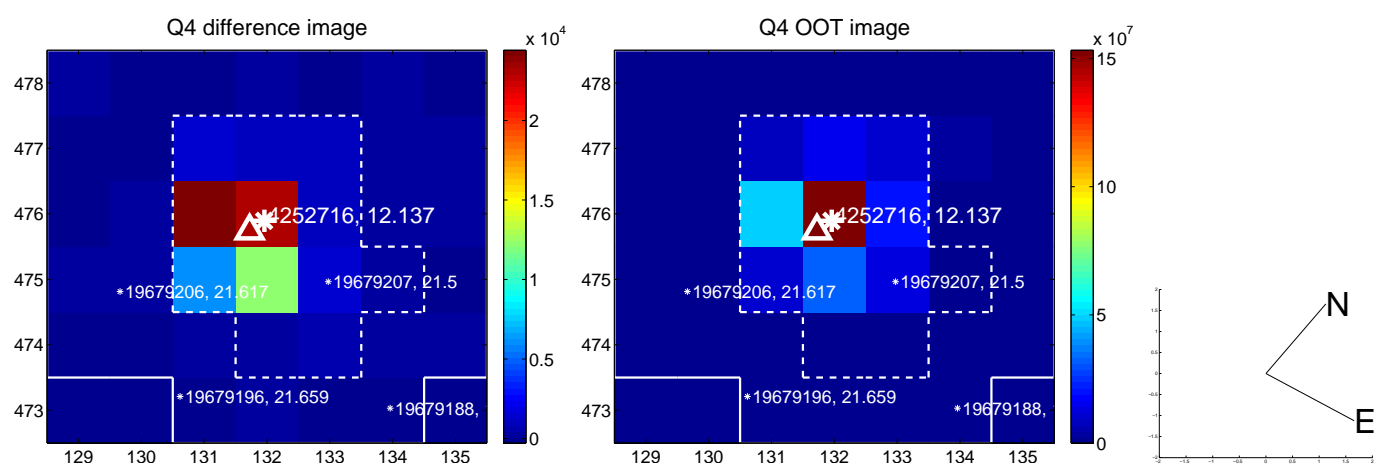
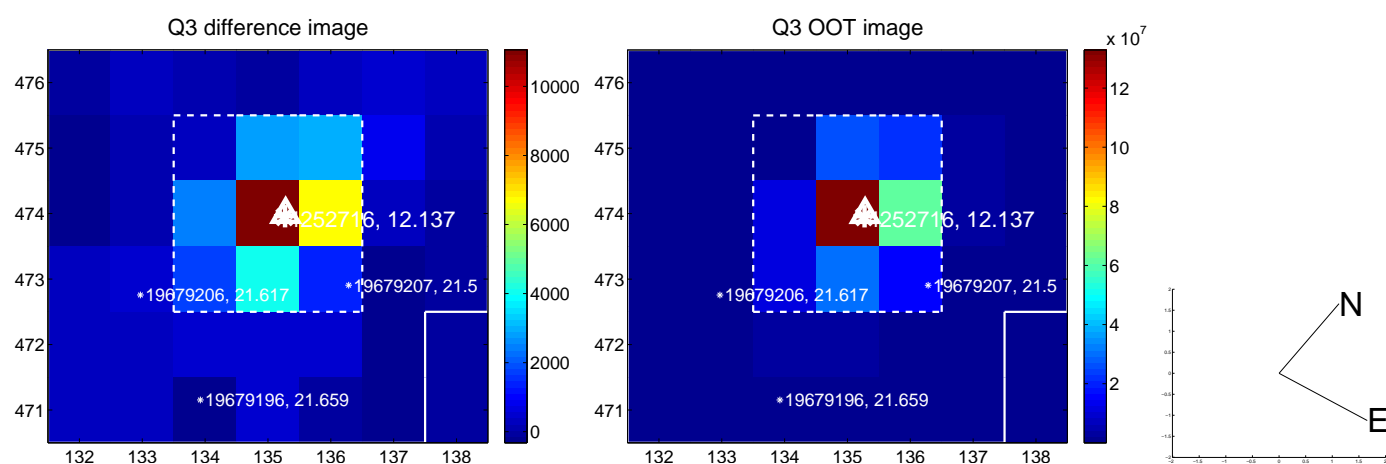
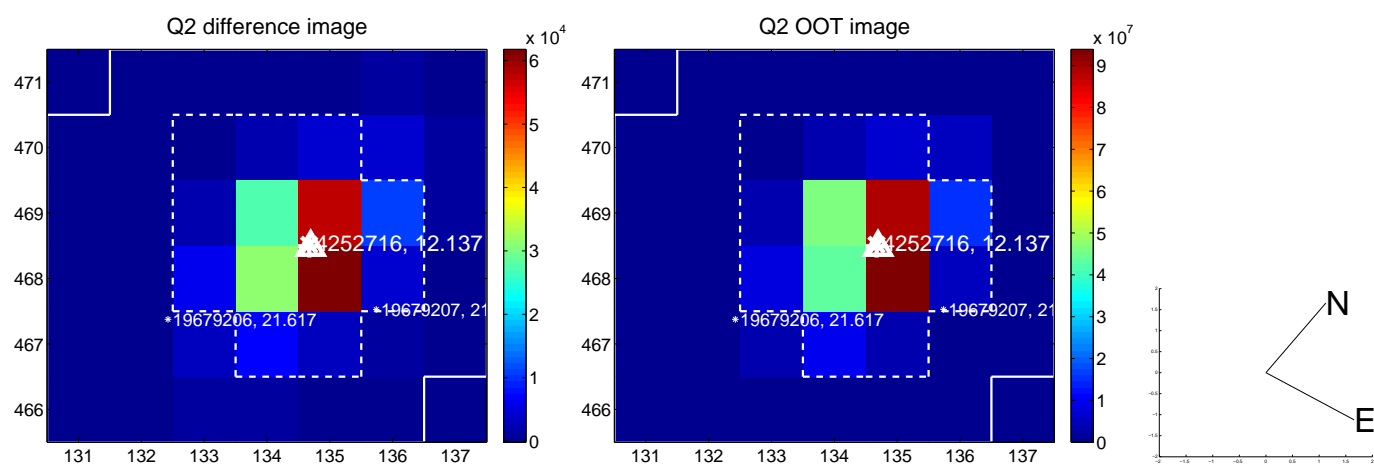
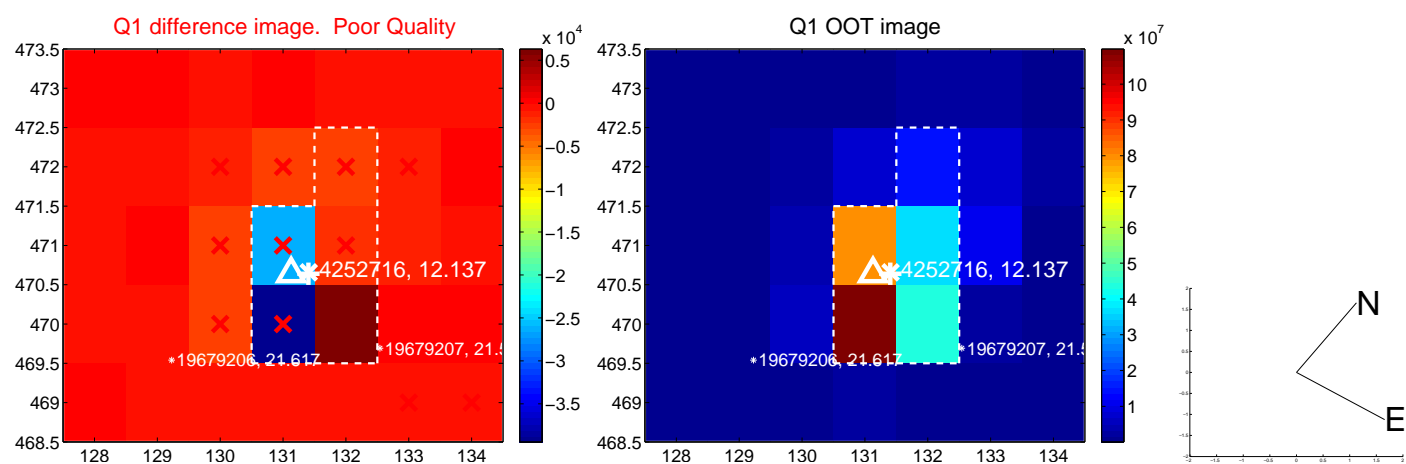
	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.085 \pm 0.153$	0.56	$0.030 \pm 0.095$	$0.080 \pm 0.143$
PRF-fit source offset from KIC position	$0.058 \pm 0.159$	0.36	$0.018 \pm 0.092$	$0.055 \pm 0.151$
photometric centroid source offset	$0.07 \pm 0.04$	1.67	$-0.02 \pm 0.03$	$-0.07 \pm 0.04$



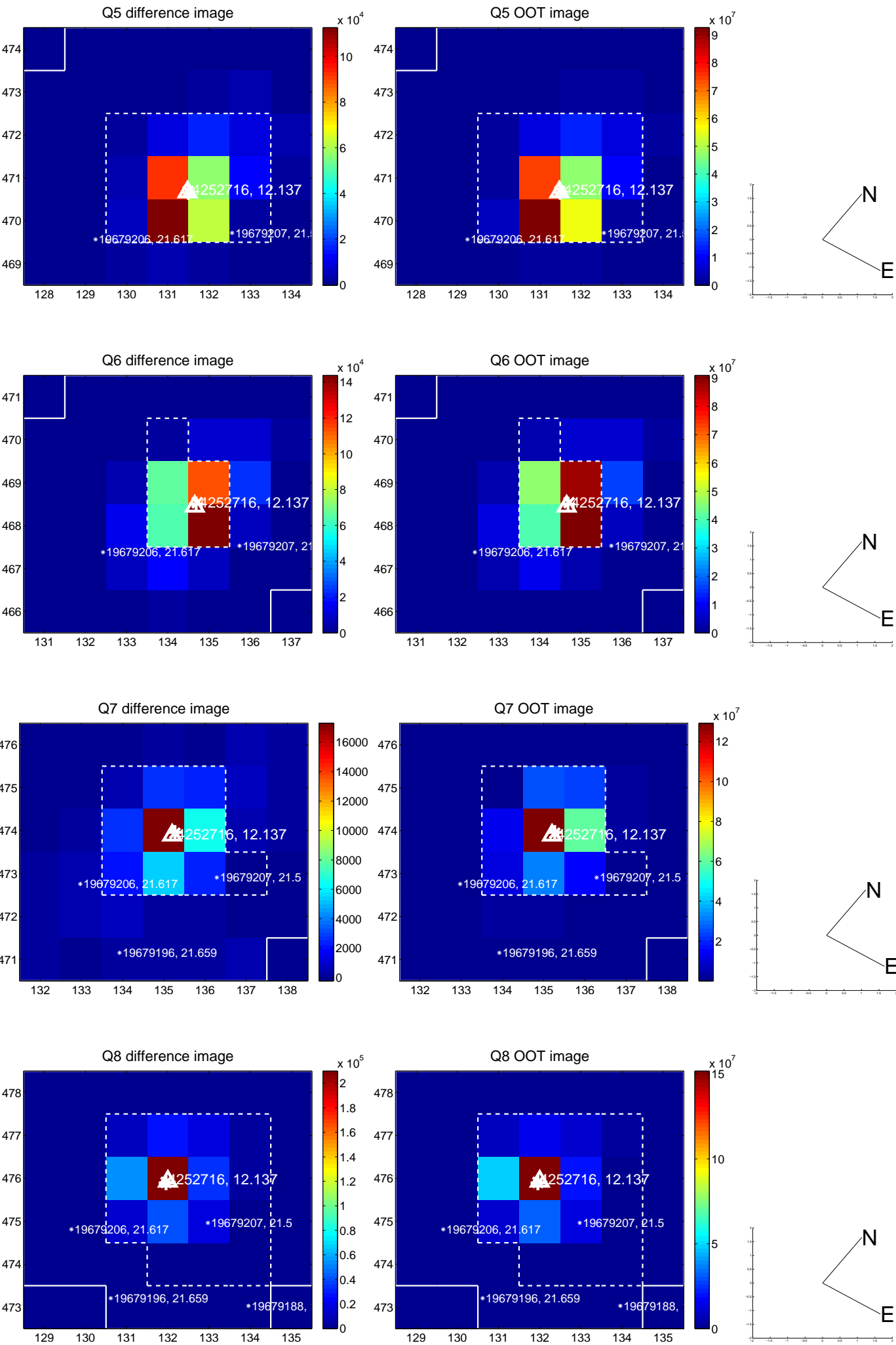
Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets;** magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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



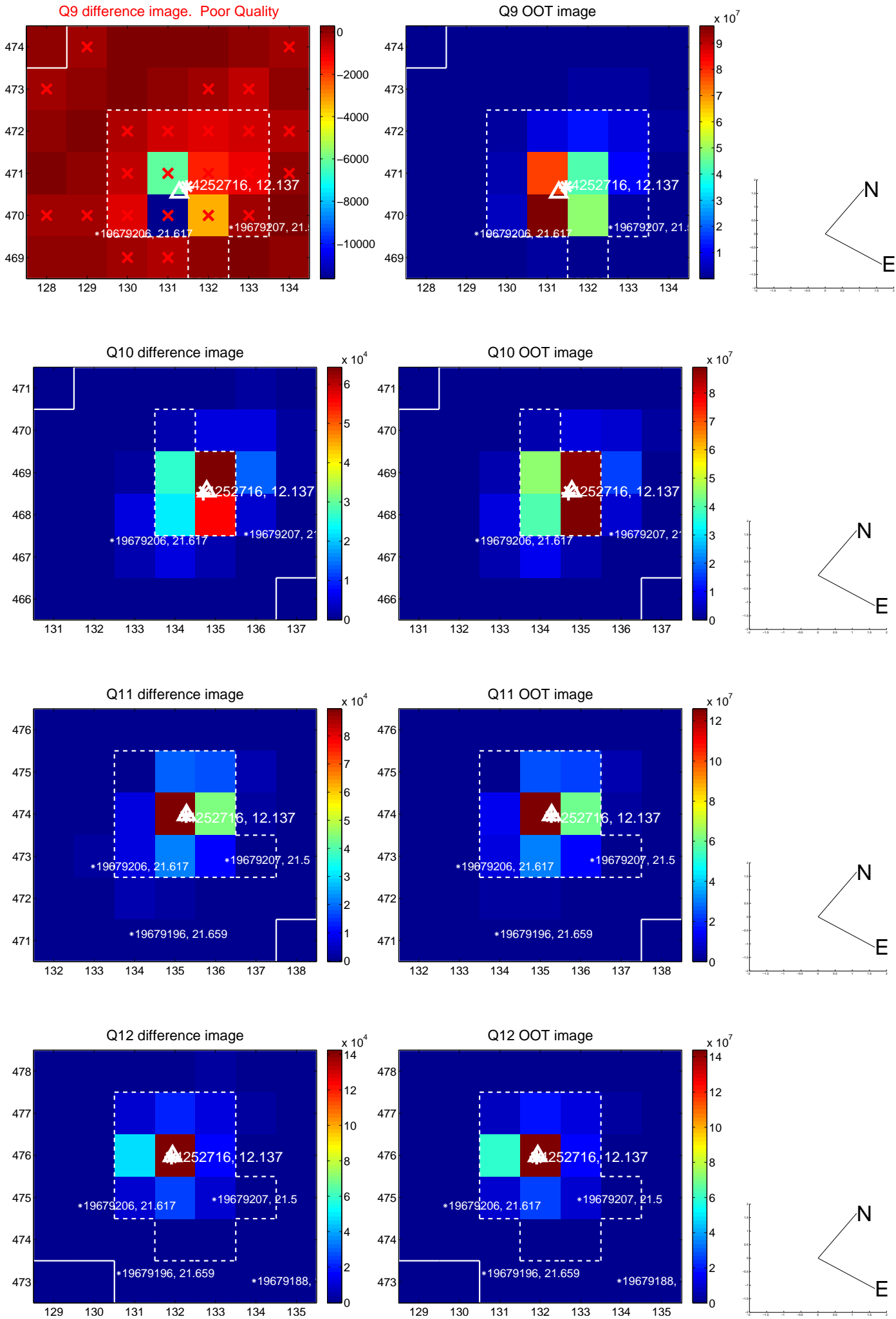
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



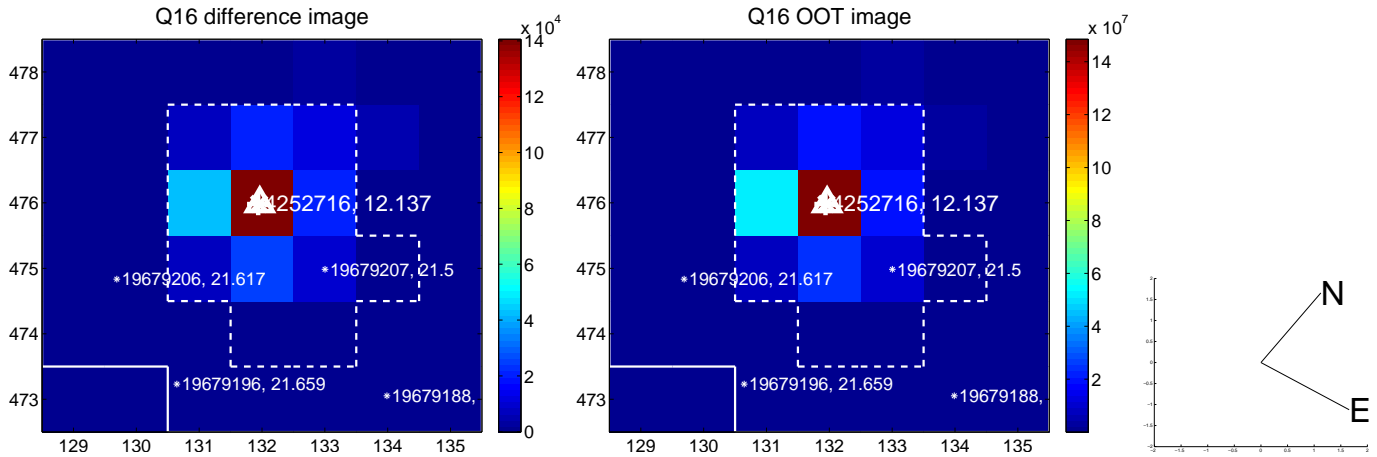
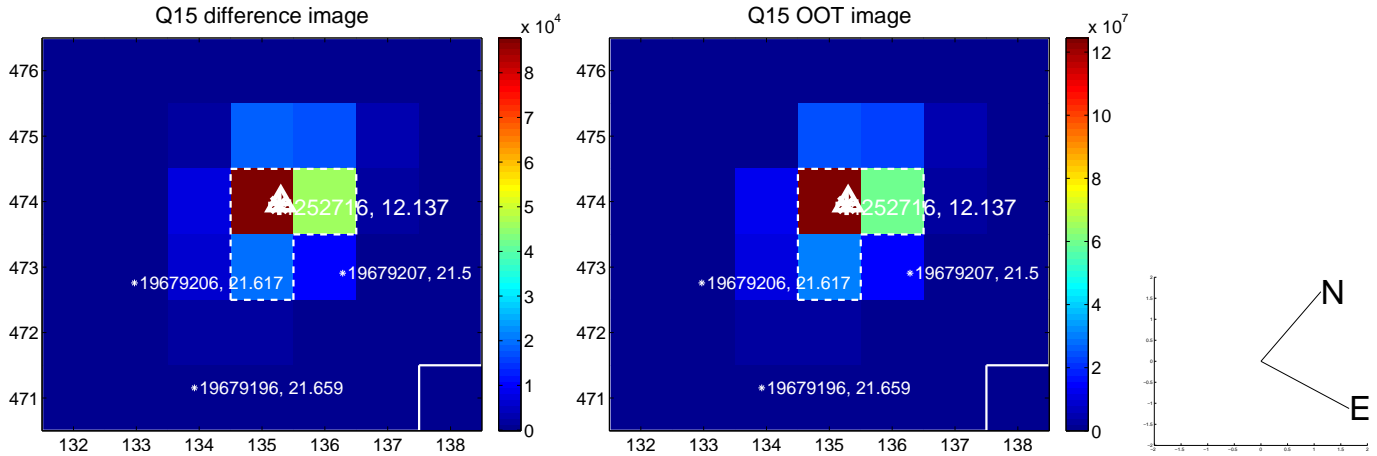
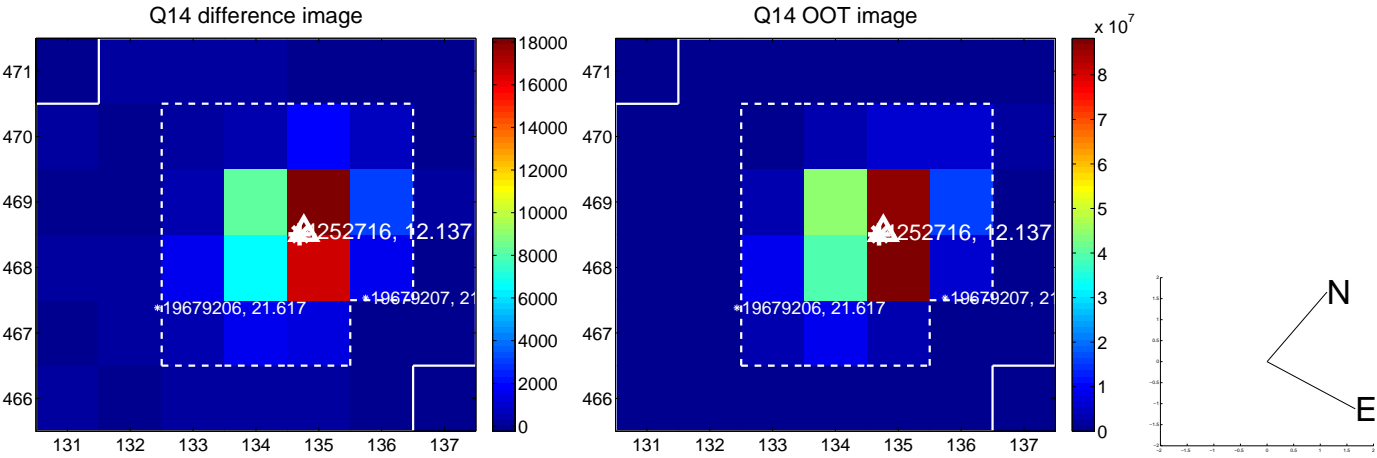
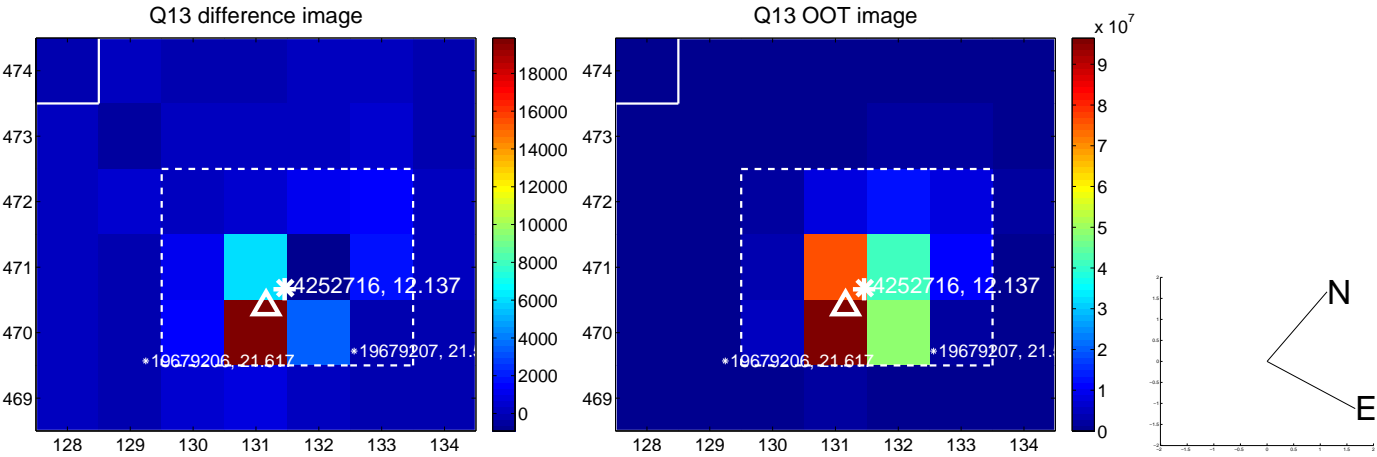
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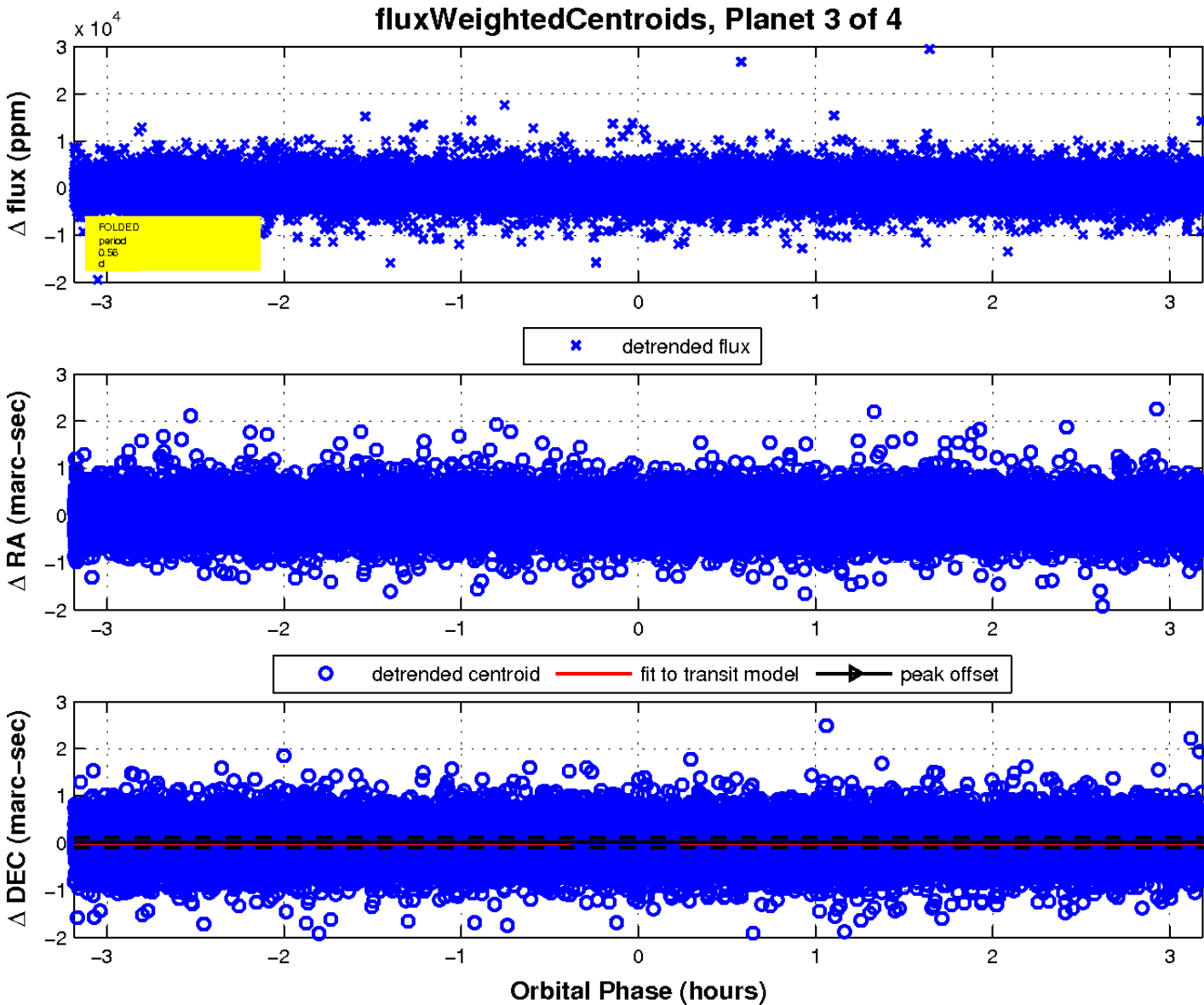
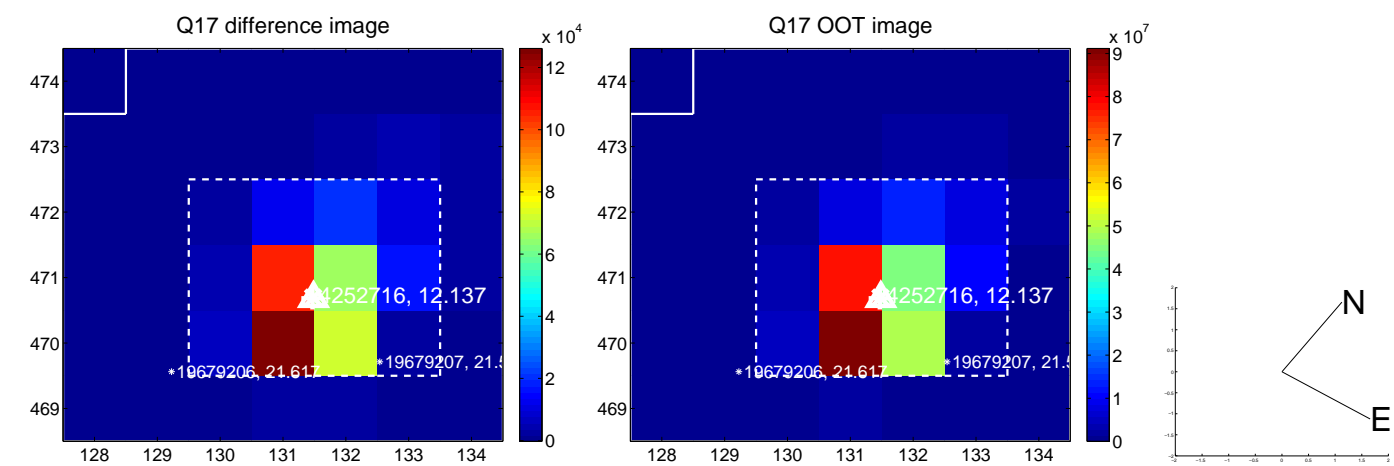
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white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



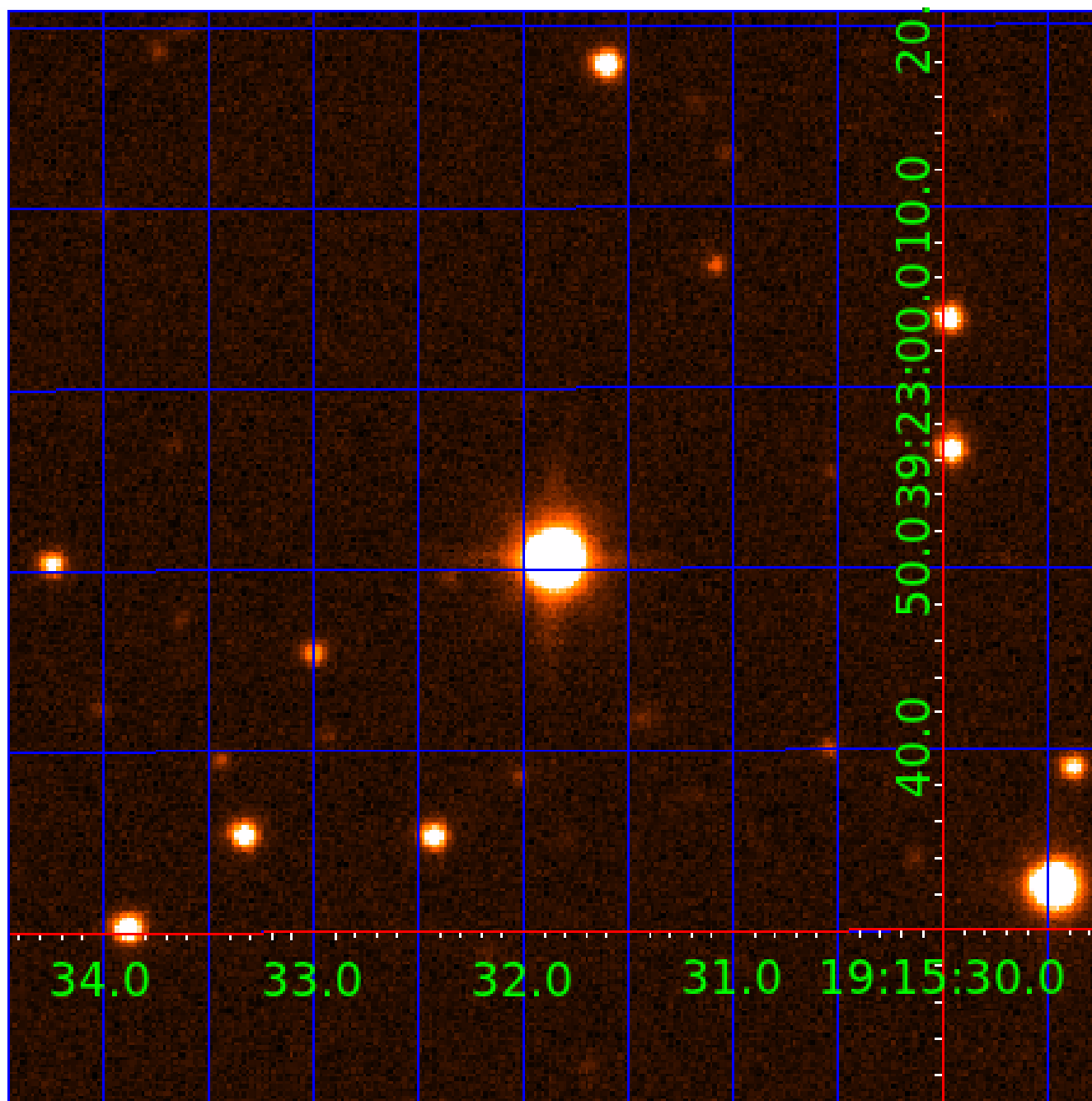
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.





UKIRT Image

Declination



# KIC 004252716

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
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004252716-02	OBS	No	0.559861	131.651841	291.2	1.065	9.5	7.1	2.33	7507	4.63	60321.54
004252716-03	OBS	No	0.559866	131.836577	388.1	1.062	8.1	9.6	2.33	7507	5.35	60320.74
004252716-04	OBS	No	377.911277	238.409499	3547.9	4.123	7.2	7.6	2.33	7507	15.75	10.19

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
004252716-01	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT
004252716-02	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT
004252716-03	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—SAME_NTL_PERIOD
004252716-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—ALL_TRANS_CHASES—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—CENT_FEW_DIFFS

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

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

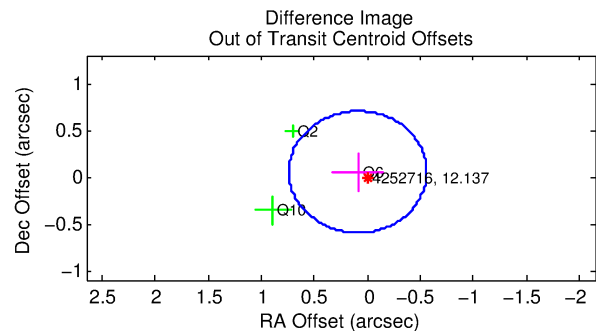
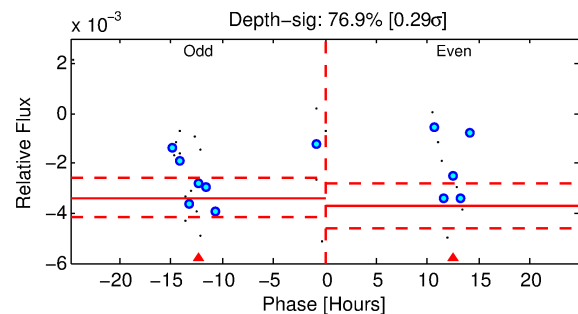
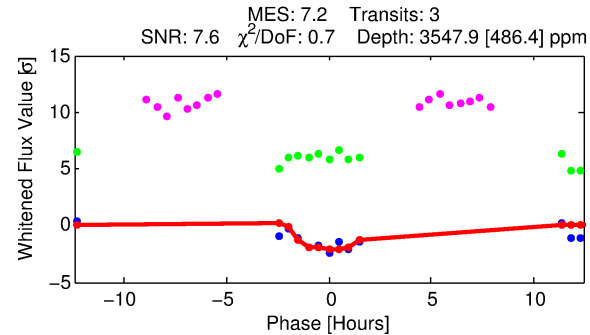
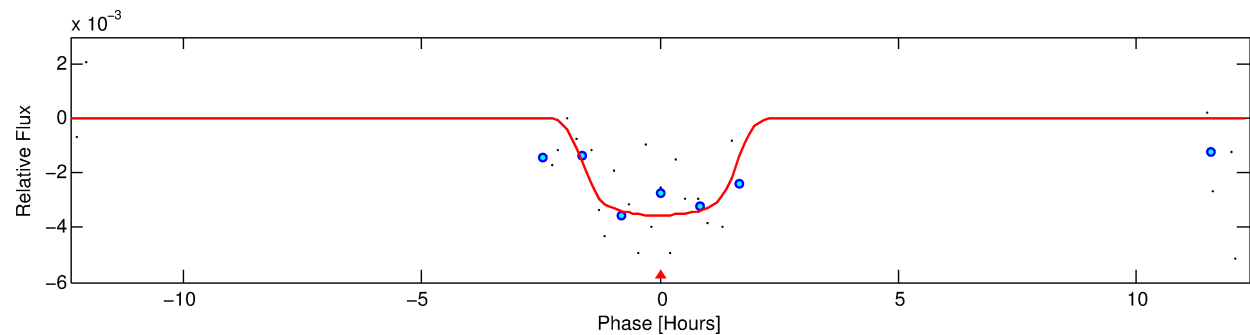
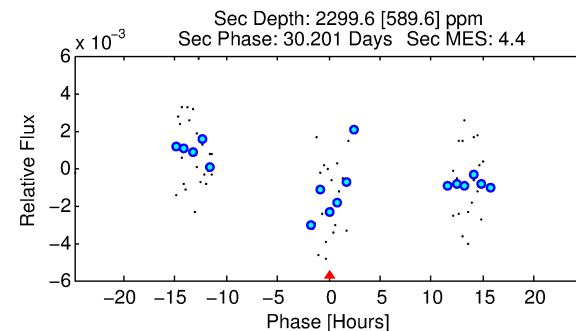
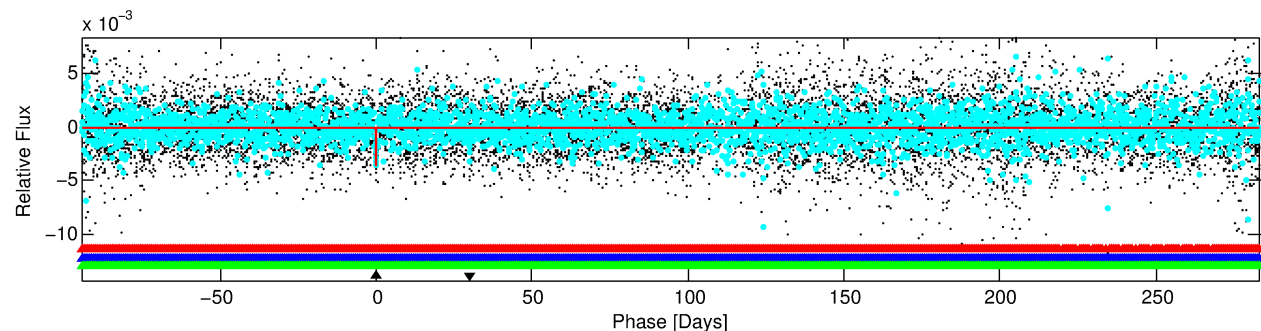
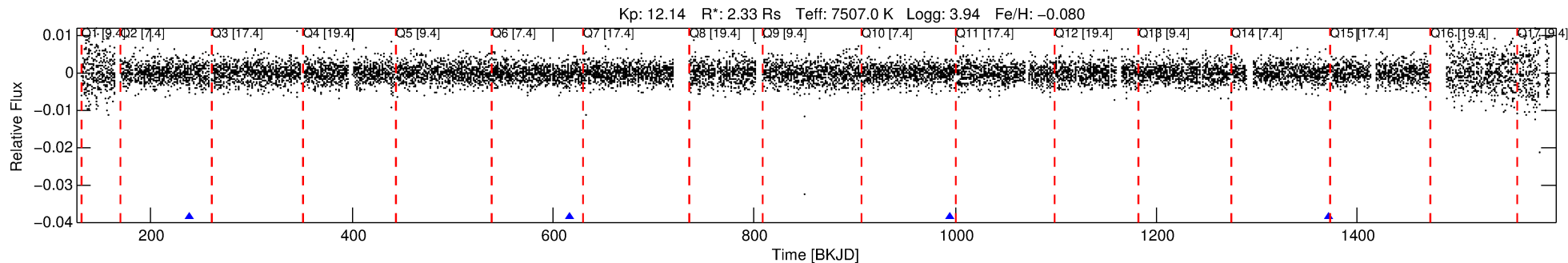
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 004252716-04

No Significant Match Found

# DV One-Page Summary

KIC: 4252716 Candidate: 4 of 4 Period: 377.911 d



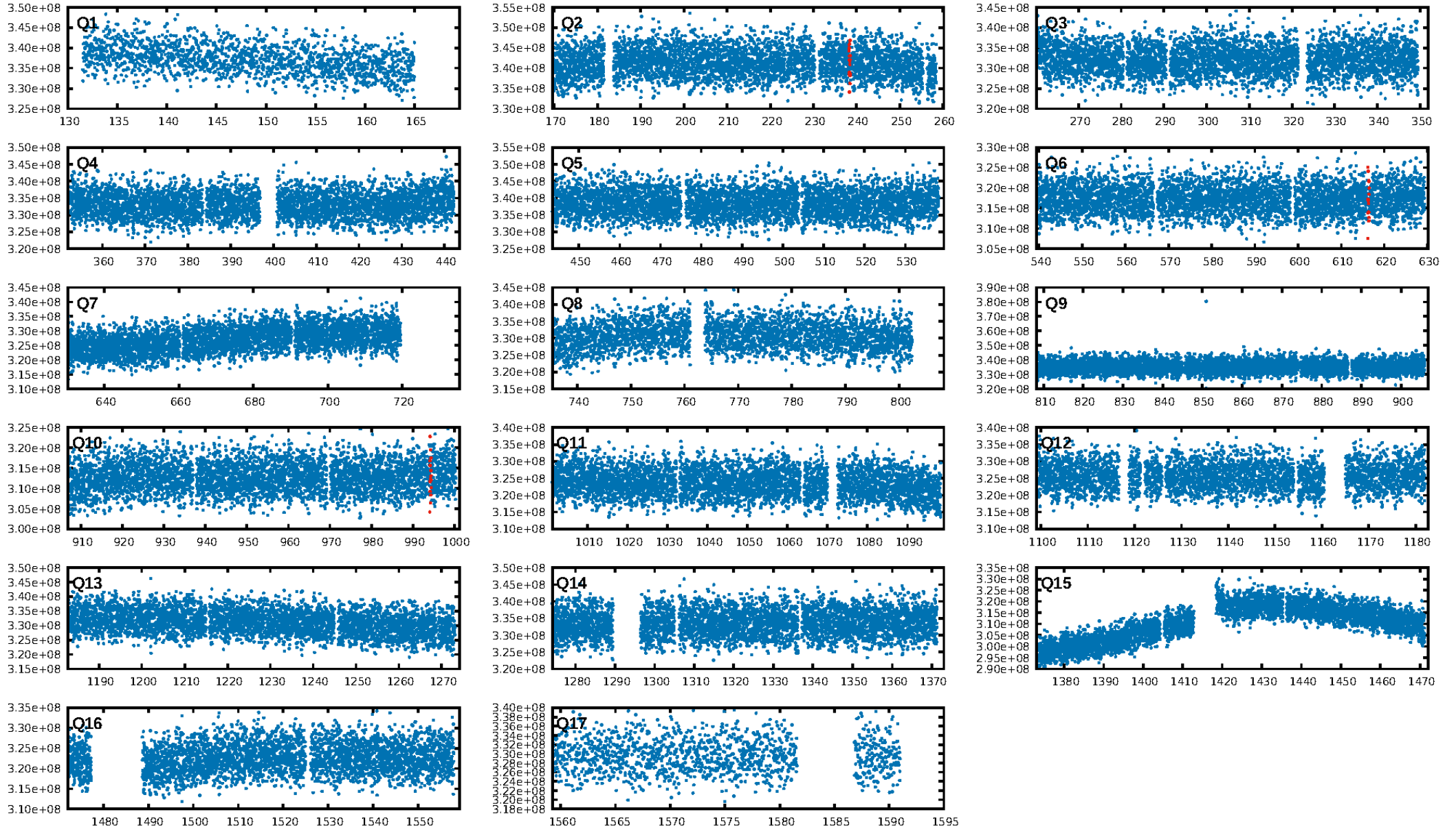
## DV Fit Results:

Period = 377.91128 [0.00978] d  
Epoch = 238.4095 [0.0120] BKJD  
Rp/R\* = 0.0619 [0.0097]  
a/R\* = 433.49 [336.50]  
b = 0.86 [0.22]  
Seff = 10.19 [2.65]  
Teq = 456 [30] K  
Rp = 15.75 [4.00] Re  
a = 1.2325 [0.2127] AU  
Ag = 7745.37 [3717.55] [2.08σ]  
Teffp = 6608 [674] K [9.12σ]

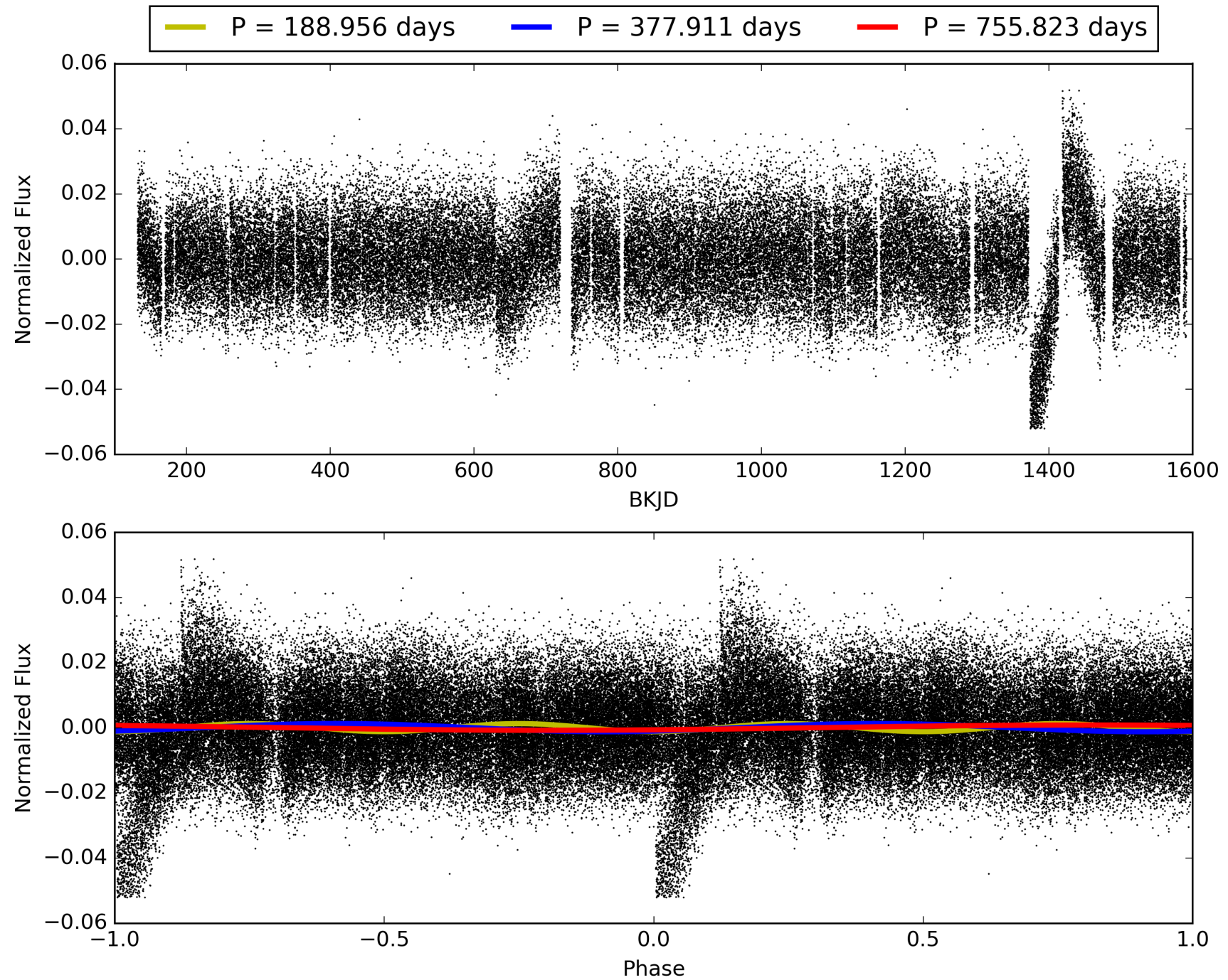
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [1799.95σ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: 94.4%  
ModelChiSquareGof-sig: 100.0%  
**Bootstrap-pfa: 3.65e-09**  
RollingBand-fgt: 1.00 [3/3]  
**GhostDiagnostic-chr: 0.4695**  
Centroid-sig: N/A  
Centroid-so: 0.111 arcsec [1.80σ]  
OotOffset-rm: 0.106 arcsec [0.49σ]  
KicOffset-rm: 0.146 arcsec [0.66σ]  
OotOffset-st: 3/0/0/0 [3]  
KicOffset-st: 3/0/0/0 [3]  
DiffImageQuality-fgm: 0.33 [1/3]  
DiffImageOverlap-fno: 0.00 [0/3]

# TCE 004252716-04, PDC Light Curves



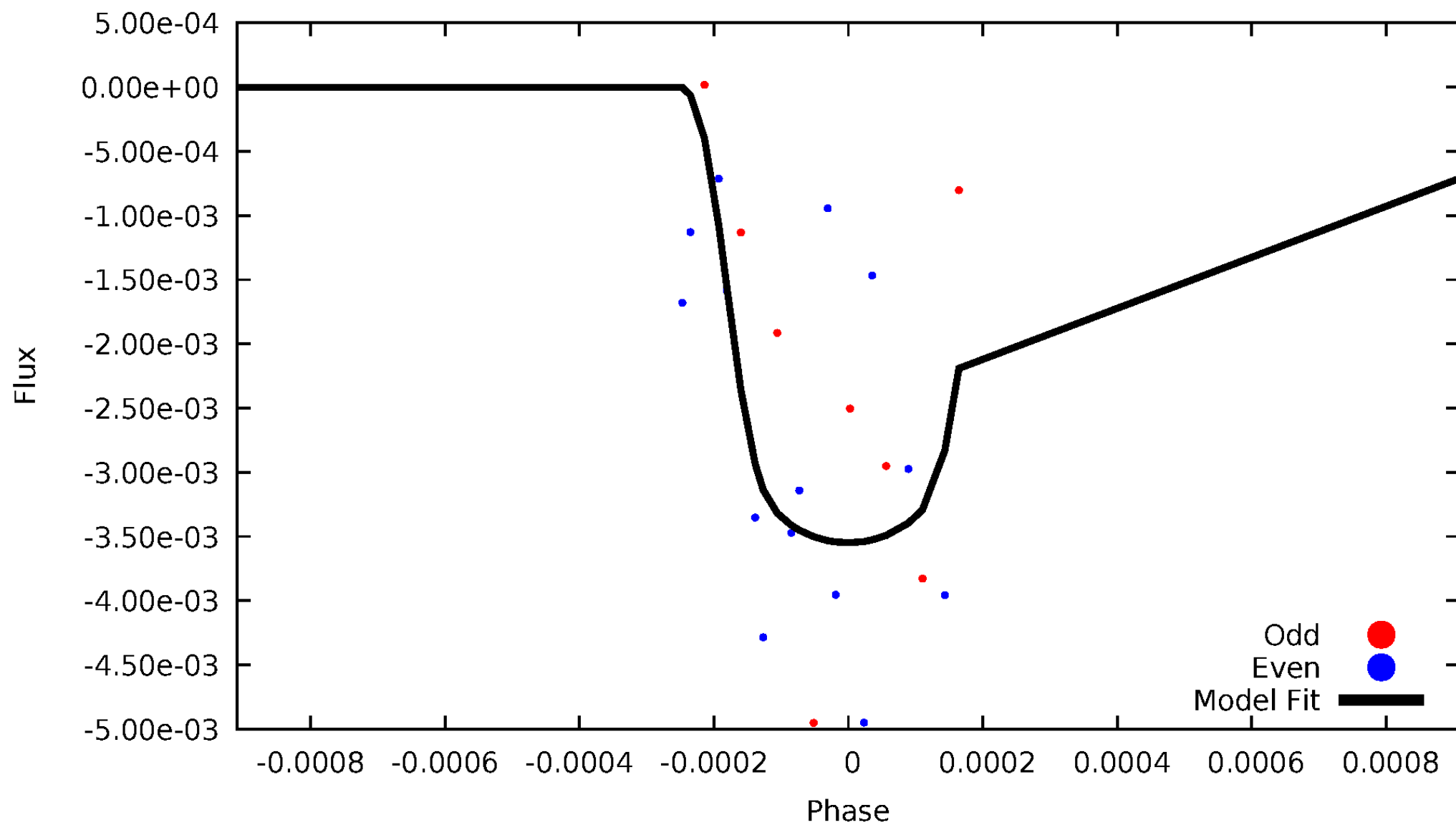
# TCE 004252716-04





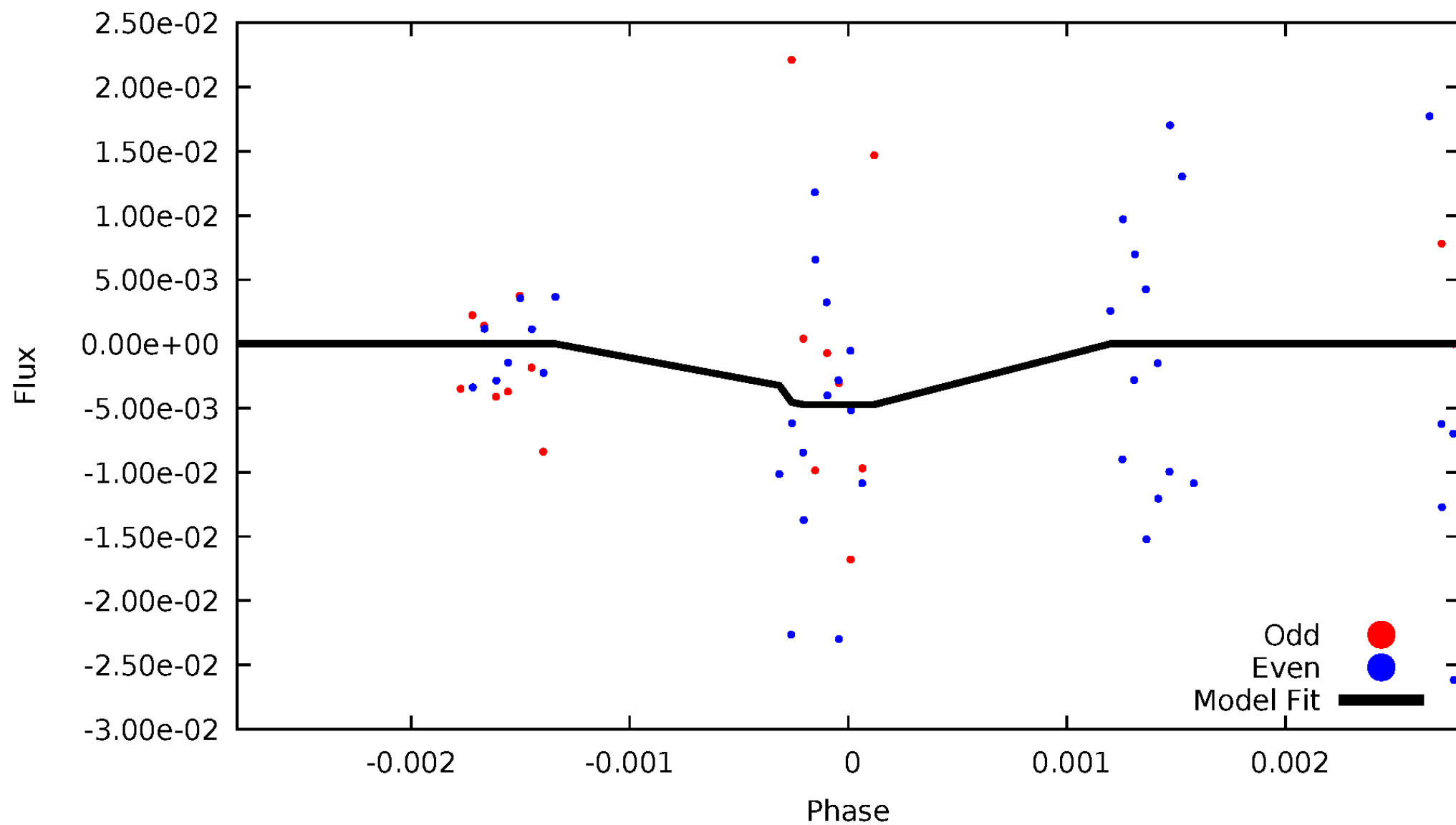
# DV Odd/Even

TCE 004252716-04



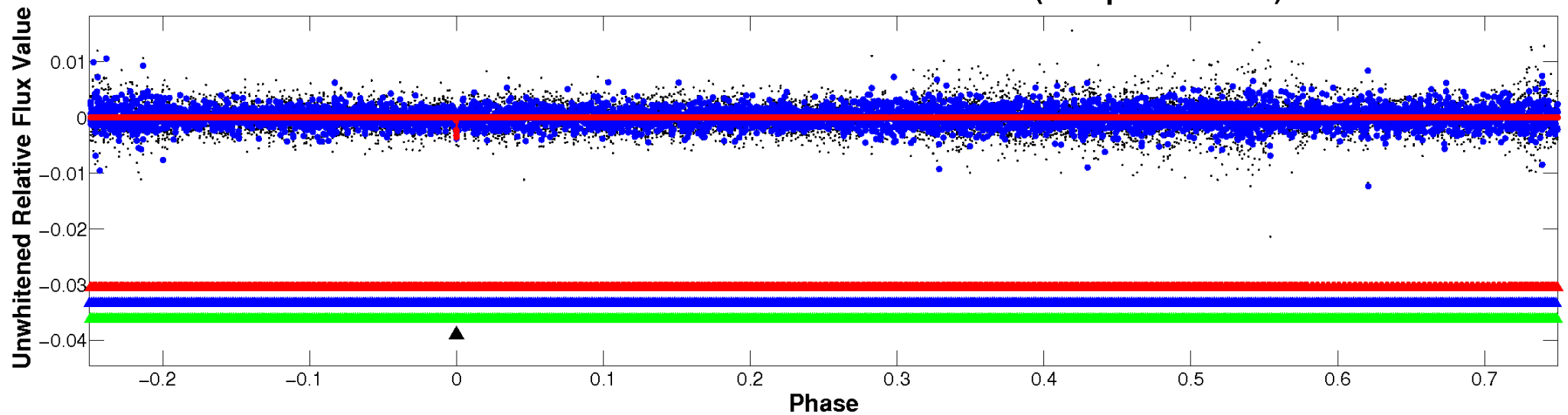
# ALT Odd/Even

TCE 004252716-04

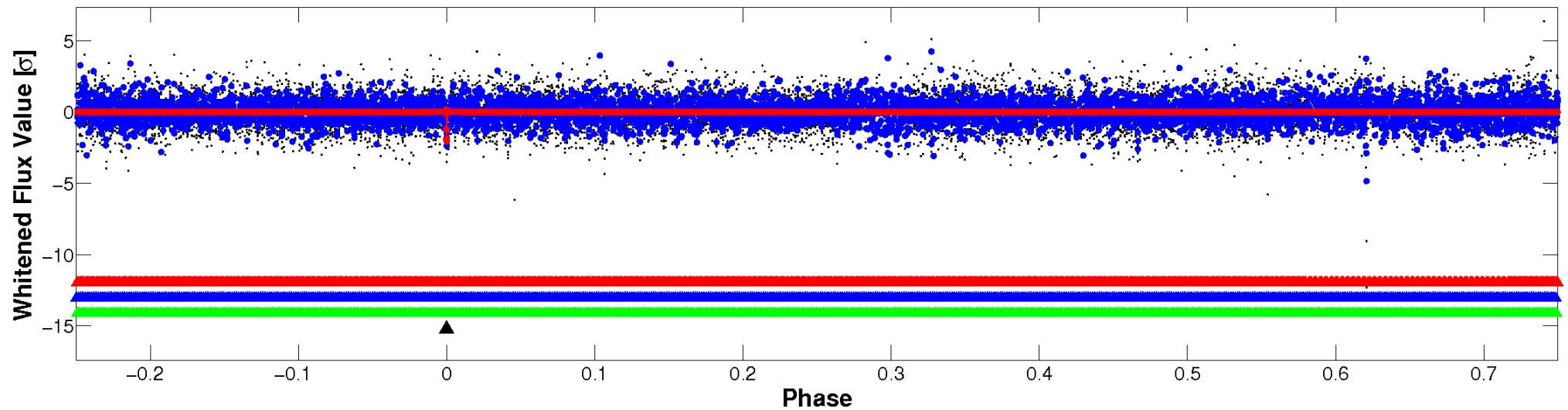


# Non-Whitened Vs. Whitened Light Curve

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



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



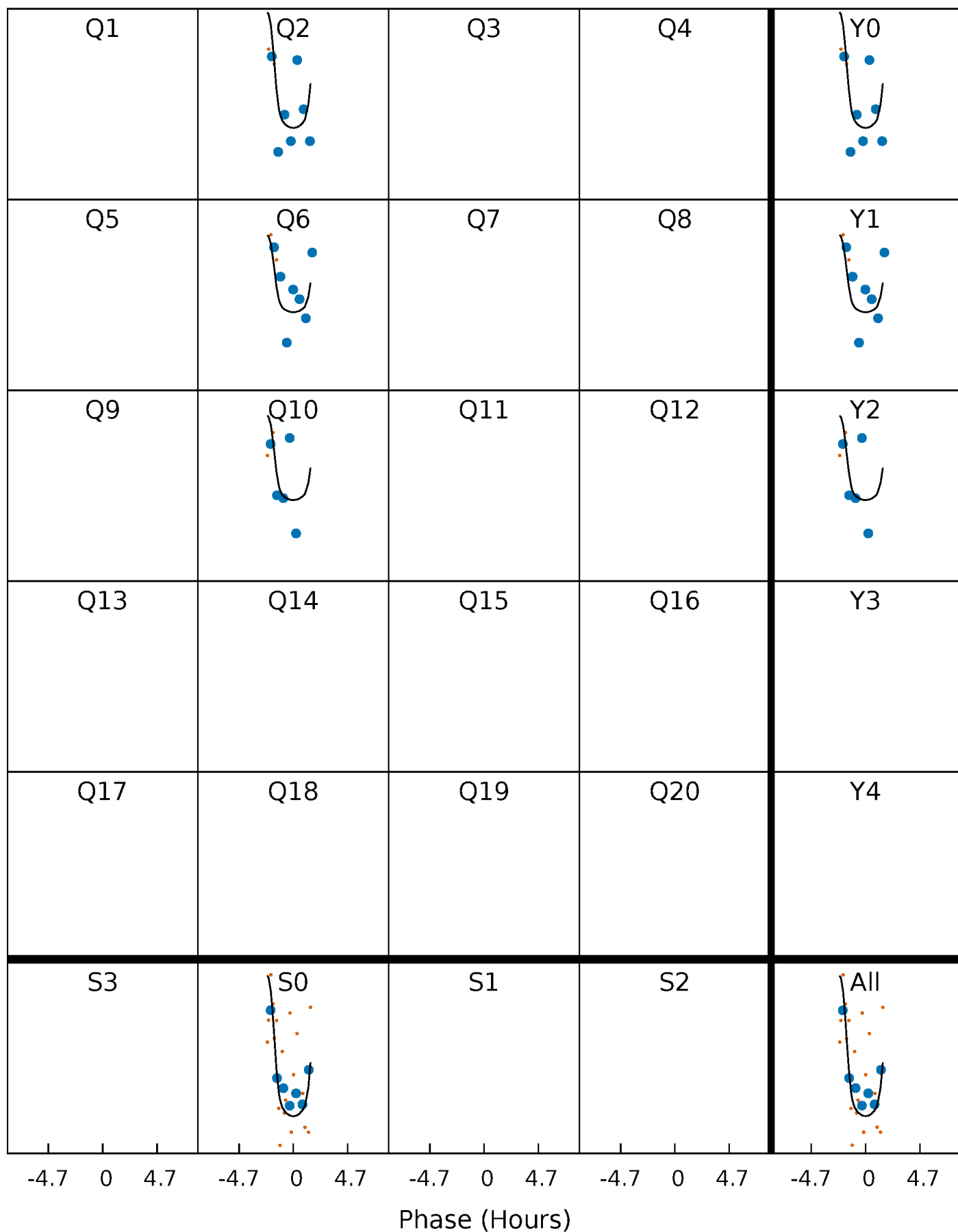
# PDC Quarter-Phased Transit Curves

TCE 004252716-04     $P=377.911277$  Days     $T_0=238.409499$  (BKJD)



# DV Quarter-Phased Transit Curves

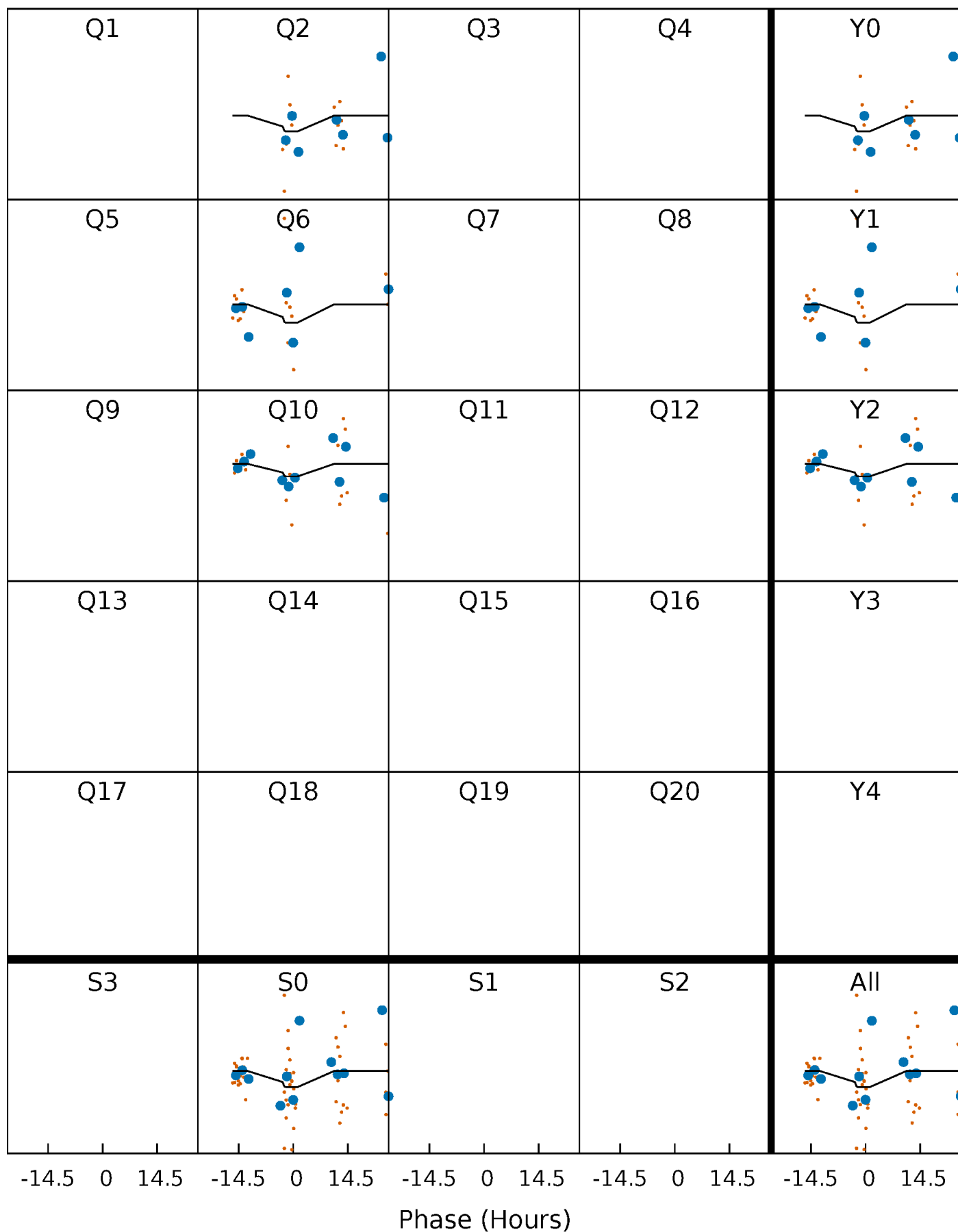
TCE 004252716-04 P=377.911277 Days  $T_0=238.409499$  (BKJD)





# Alt. Detrend Quarter-Phased Transit Curves

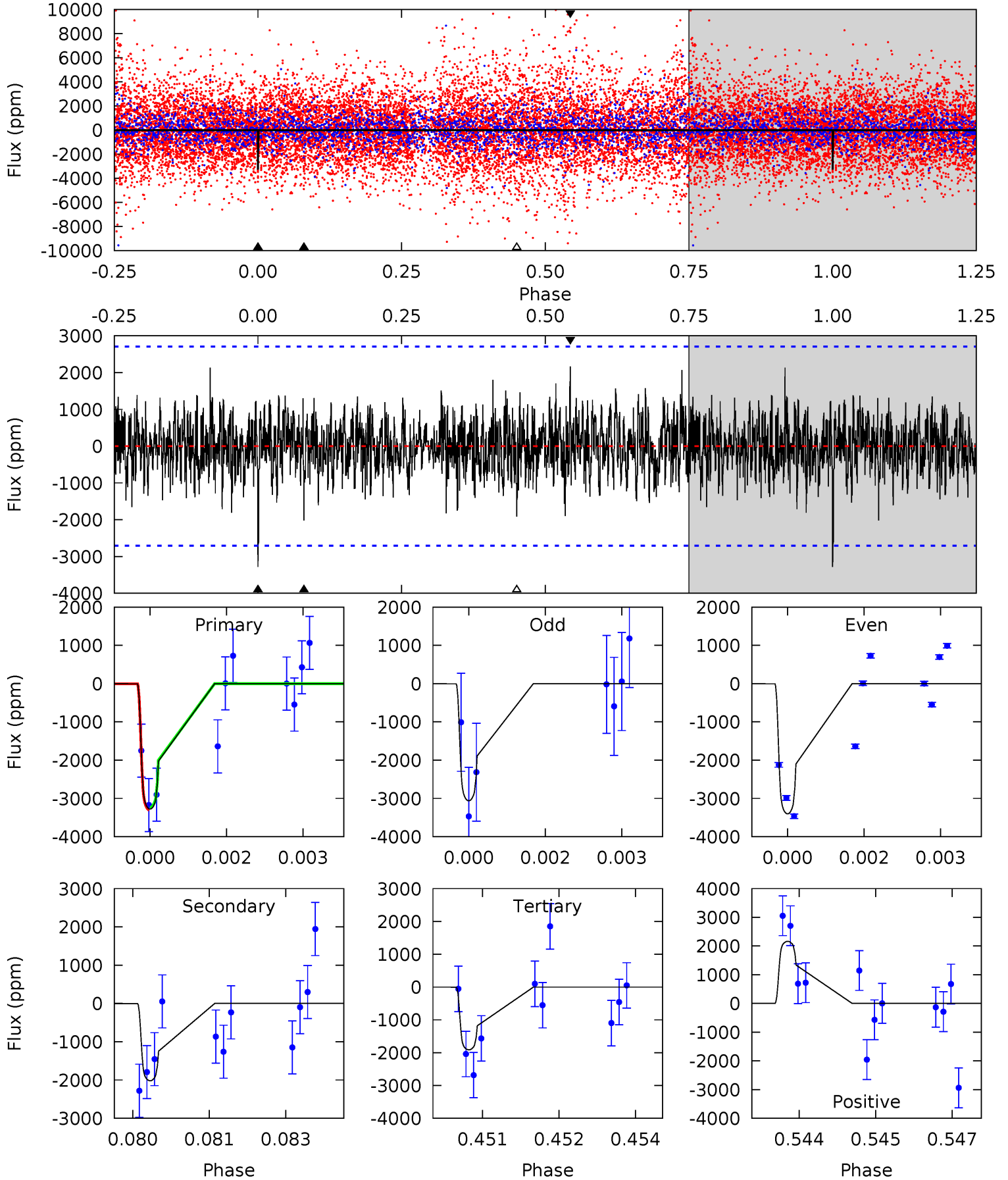
TCE 004252716-04 P=377.898259 Days  $T_0=238.439840$  (BKJD)



# DV Model-Shift Uniqueness Test

004252716-04, P = 377.911277 Days, E = 238.409499 Days

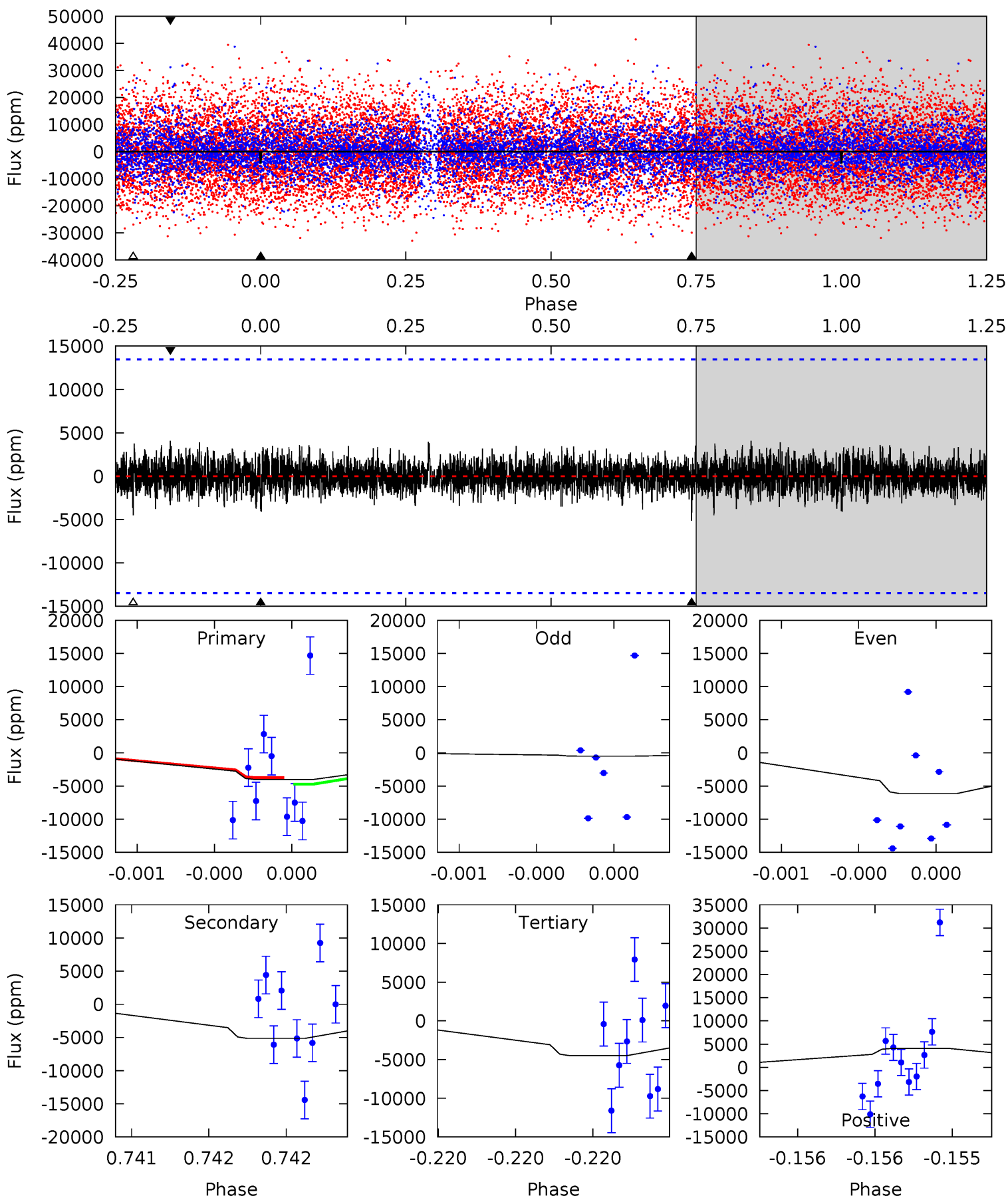
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
6.51	4.01	3.80	4.30	5.38	3.17	1.14	2.71	2.21	0.21	-0.29	0.34	0.99	0.40	0.07



# Alt Model-Shift Uniqueness Test

004252716-04, P = 377.898259 Days, E = 238.439840 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
1.67	2.13	1.86	1.69	5.60	3.52	0.46	-0.19	-0.02	0.27	0.45	1.11	0.89	0.44	0.18



### Stellar Parameters For KIC 004252716

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R$ ( $R_{\odot}$ )	$M(M_{\odot})$	$p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ )
	$7507^{+75}_{-82}$	$3.945^{+0.143}_{-0.117}$	$-0.080^{+0.150}_{-0.150}$	$2.332^{+0.466}_{-0.466}$	$1.746^{+0.192}_{-0.154}$	$0.194^{+0.141}_{-0.070}$
	+1%/-1%	+4%/-3%	+188%/-188%	+20%/-20%	+11%/-9%	+73%/-36%
Source	SPE68	SPE68	SPE68	DSEP		

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

### Secondary Eclipse Parameters for KIC 004252716-04 / KOI

Detrend	Depth (ppm)	$R_p$ ( $R_{\oplus}$ )	$T_{\text{max}}$ (K)	$T_{\text{obs}}$ (K)	$A_{\text{obs}}$
DV	$-2020 \pm 503$	$15.65^{+3.06}_{-2.91}$	$636^{+31}_{-32}$	$6294^{+730}_{-576}$	$6891^{+4064}_{-2562}$
Alt.	$-5137 \pm 2408$	$17.29^{+3.52}_{-2.98}$	$636^{+29}_{-31}$	$7676^{+1401}_{-1401}$	$14011^{+10461}_{-7341}$

$T_{\text{max}}$  = 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

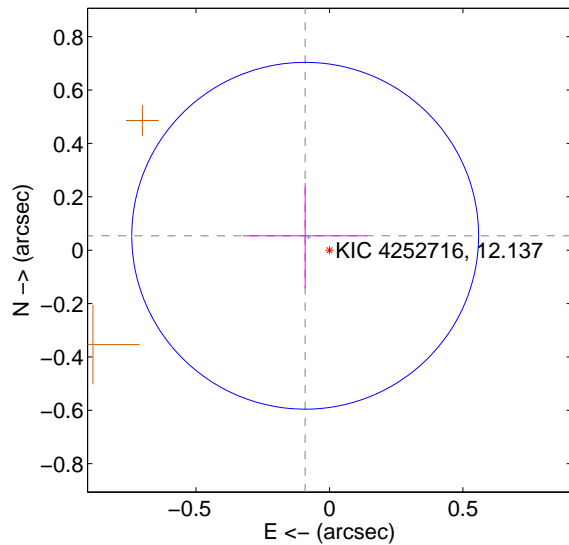
Supplemental centroid analysis for 004252716-04. Kepler magnitude: 12.14. Transit SNR 7.60

There are 1 quarters with good PRF difference image offsets

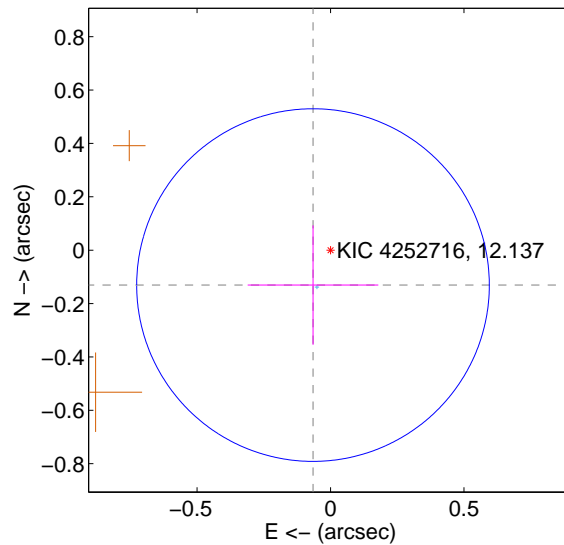
The direct PRF centroid is offset from the target star catalog position by about 0.18 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.106 \pm 0.217$	0.49	$0.091 \pm 0.232$	$0.054 \pm 0.197$
PRF-fit source offset from KIC position	$0.146 \pm 0.220$	0.66	$0.066 \pm 0.245$	$-0.131 \pm 0.224$
photometric centroid source offset	$0.11 \pm 0.06$	1.80	$0.11 \pm 0.06$	$-0.01 \pm 0.08$

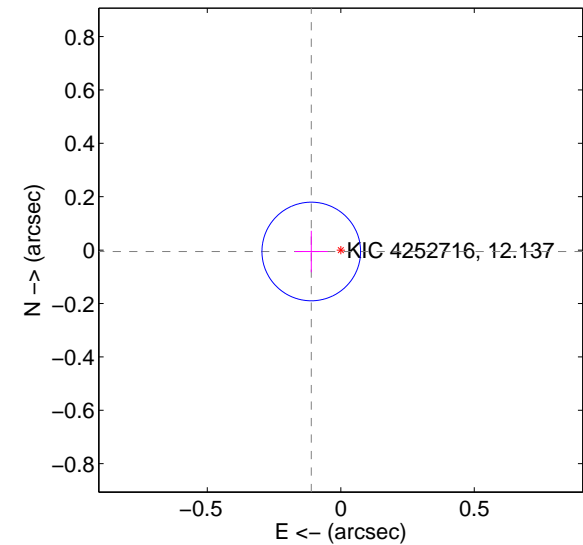
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position



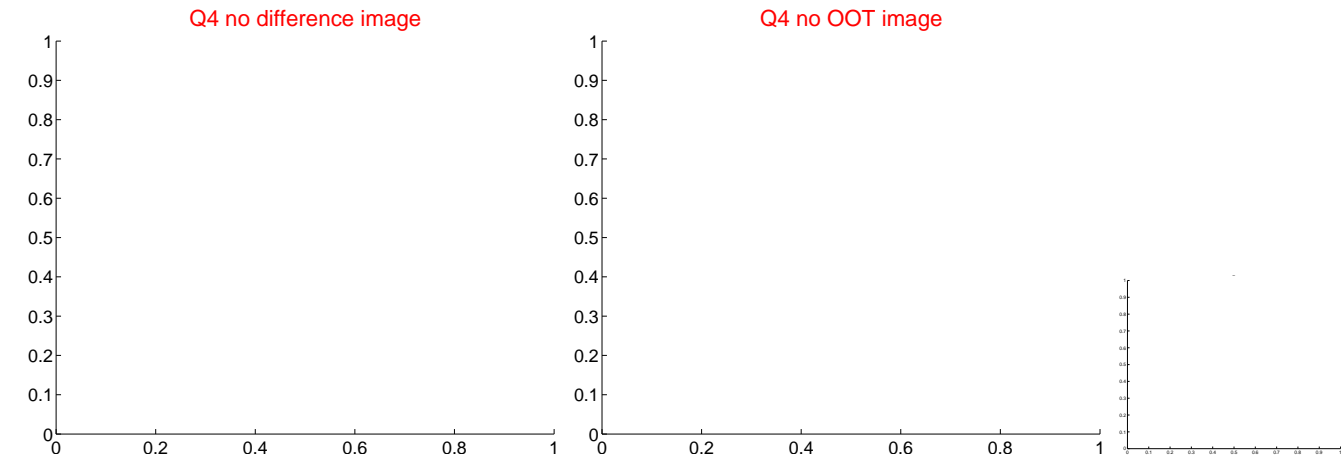
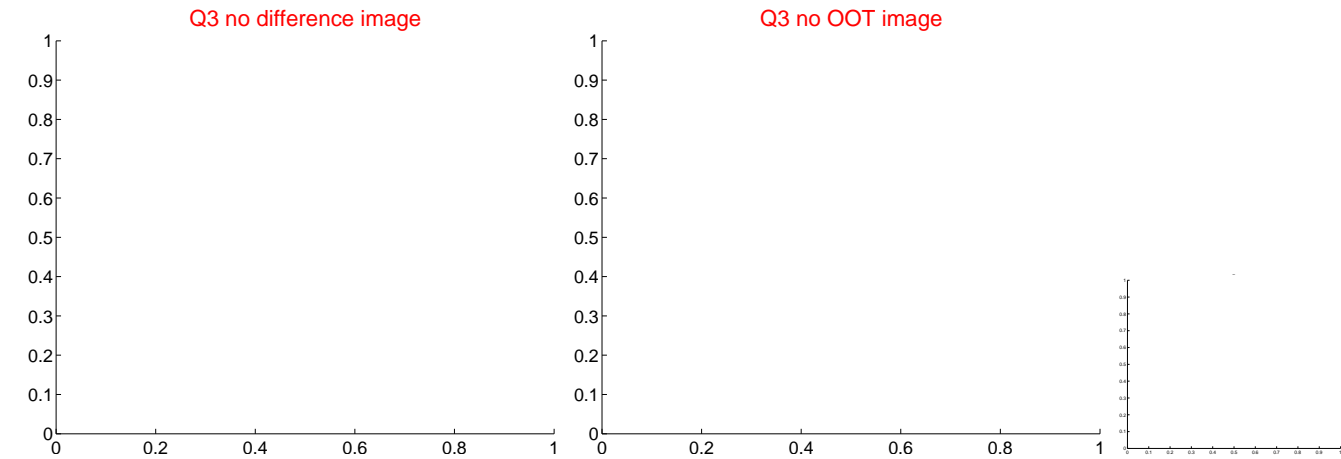
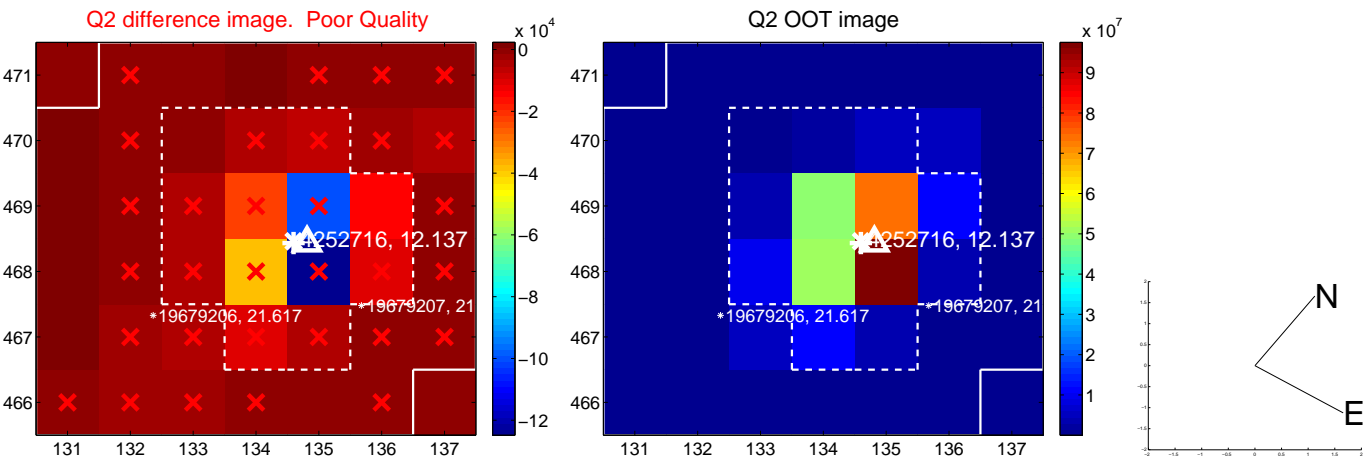
offset from photometric centroids



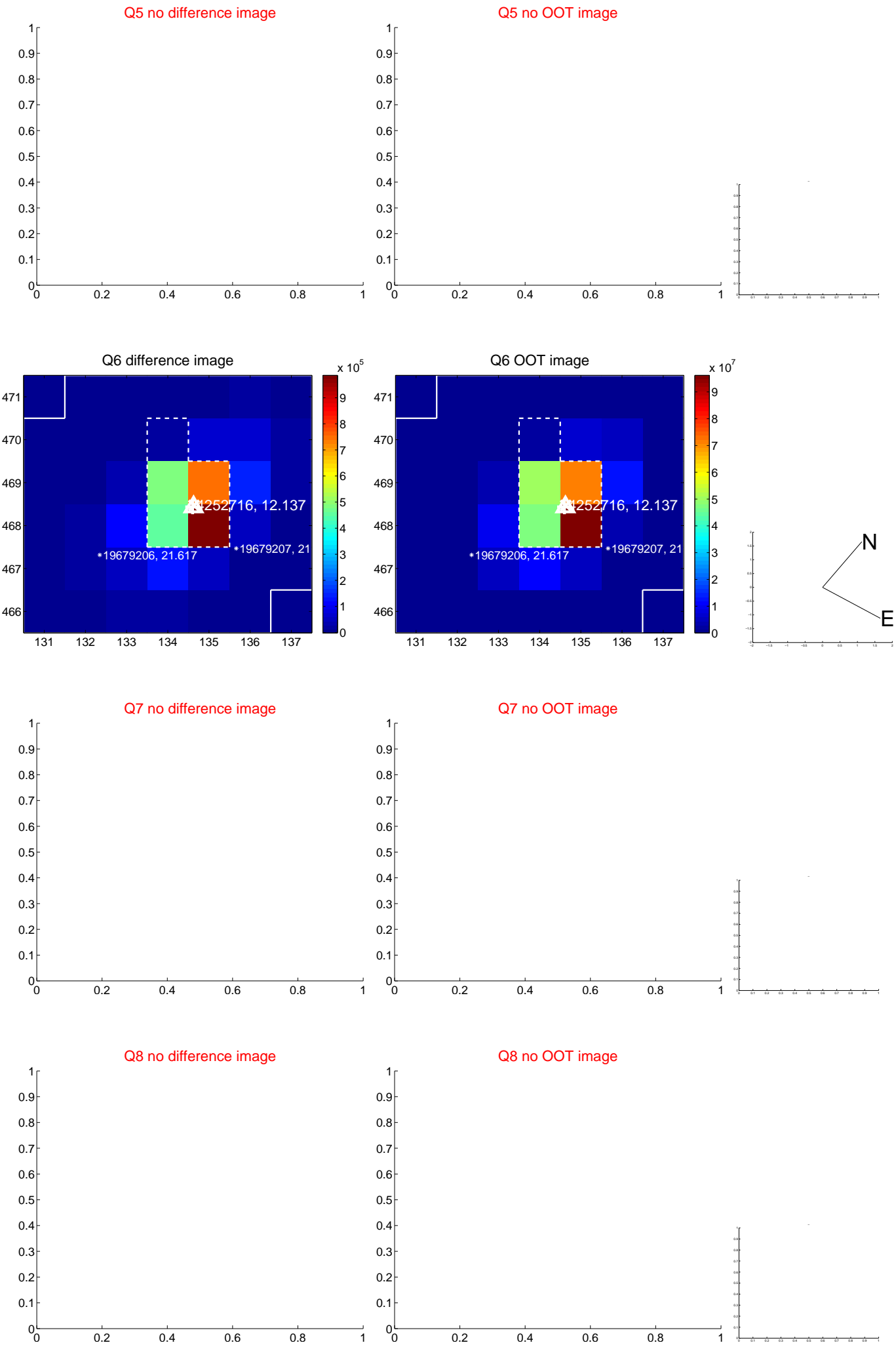
Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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



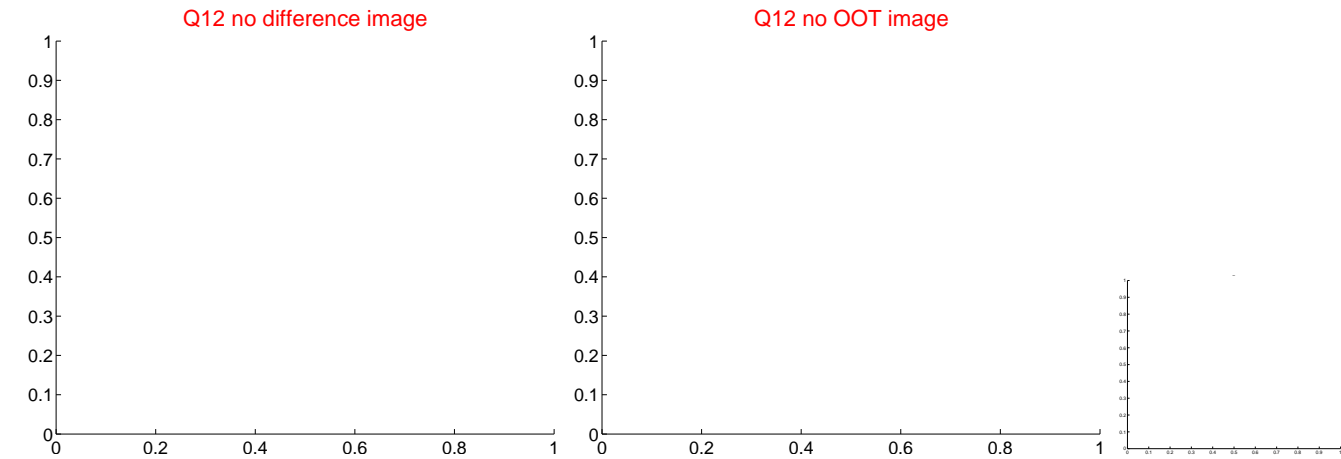
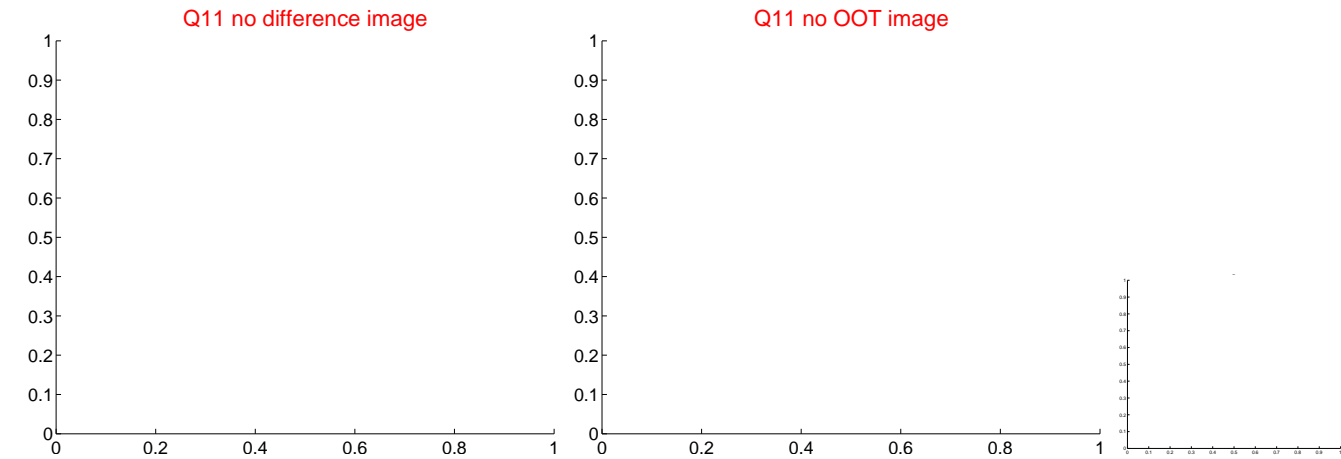
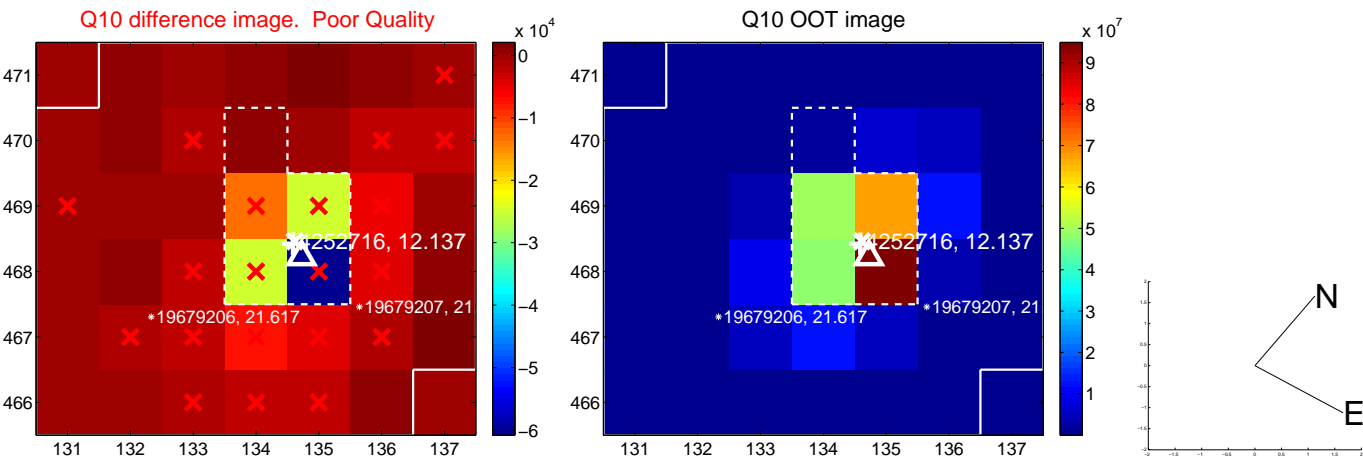
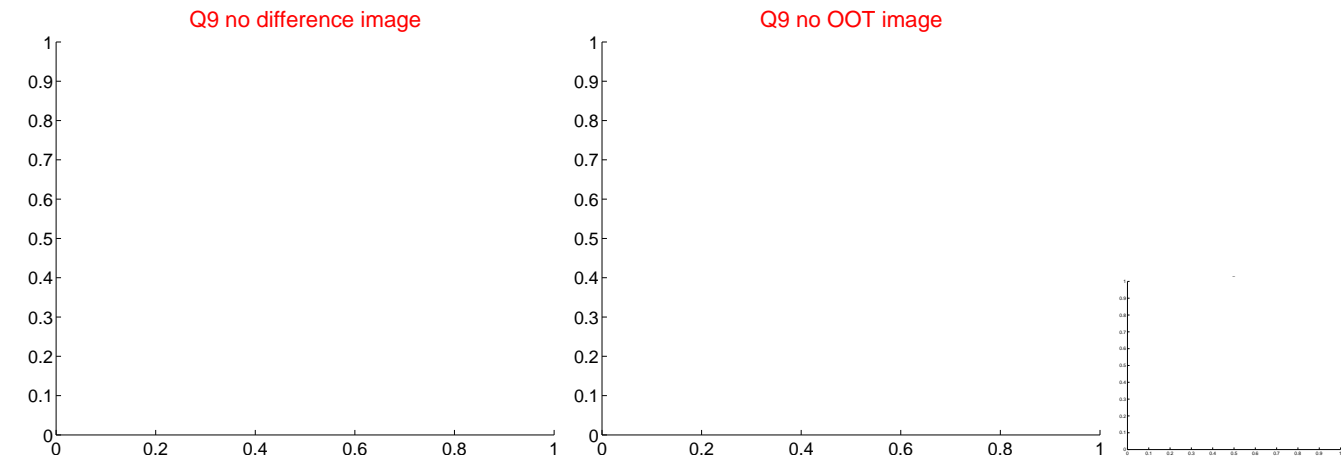
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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



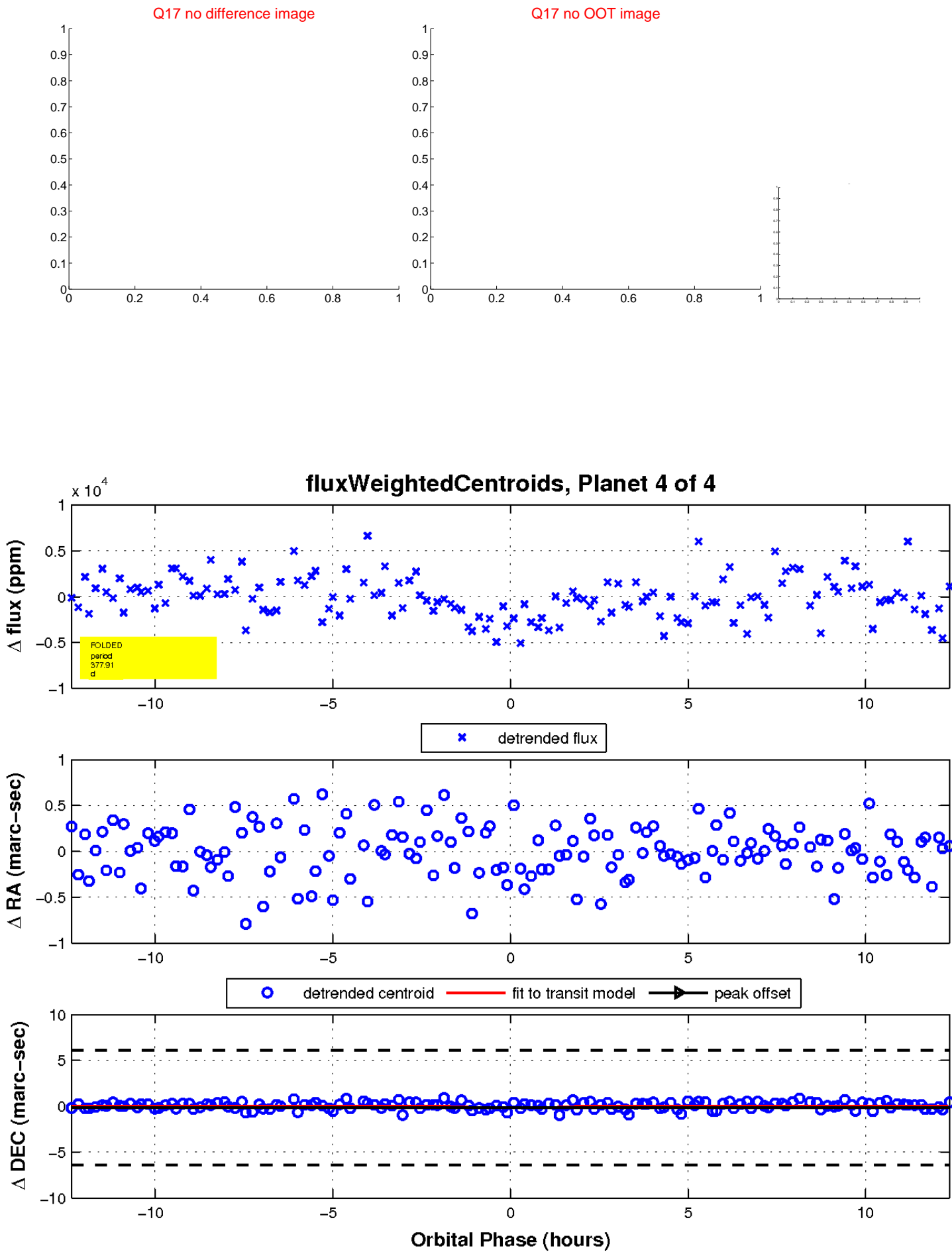
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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



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





UKIRT Image

Declination

