

# KIC 008044516

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
008044516-01	OBS	No	387.848537	427.884080	1681.6	2.531	13.2	8.5	0.70	4755	2.90	0.26
008044516-03	OBS	No	418.837760	139.684182	1131.1	3.866	14.2	7.3	0.70	4755	2.26	0.23
008044516-04	OBS	No	472.424408	481.023406	1823.8	15.628	10.5	6.1	0.70	4755	2.87	0.20
008044516-05	OBS	No	457.289830	176.326717	1452.2	5.382	10.3	6.5	0.70	4755	2.63	0.21

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
008044516-01	OBS	FP	0.00	1	0	1	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—ALL_TRANS_CHASES—MOD_POS_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS—HALO_GHOST
008044516-03	OBS	FP	0.00	1	0	1	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—CENT_UNCERTAIN—HALO_GHOST
008044516-04	OBS	FP	0.00	1	0	0	0	LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—CENT_KIC_POS
008044516-05	OBS	FP	0.00	1	0	1	0	INDIV_TRANS_RUBBLE_CHASES_MARSHALL_SKYE—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV— INCONSISTENT_TRANS—HALO_GHOST

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

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

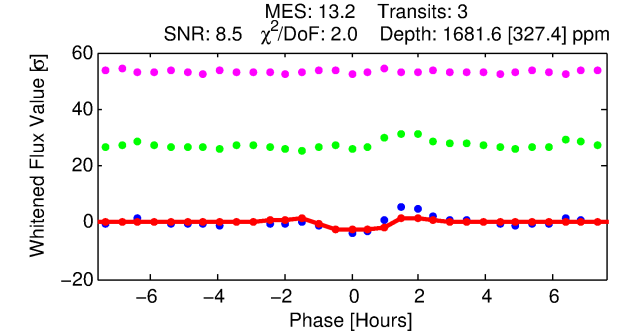
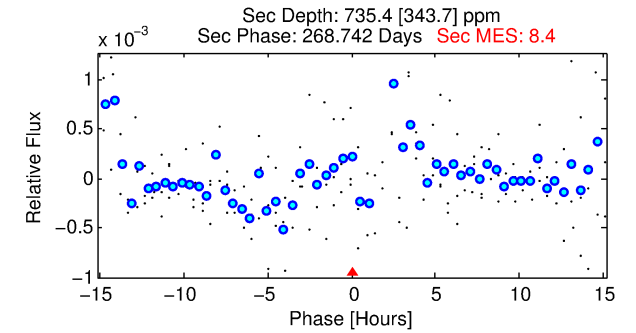
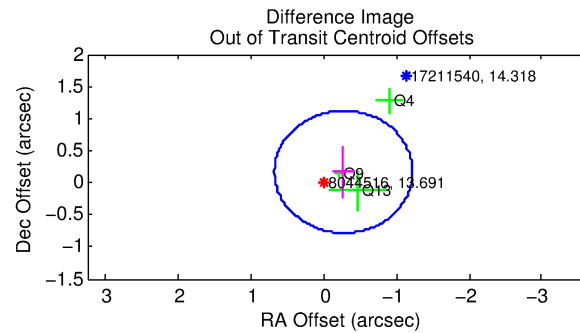
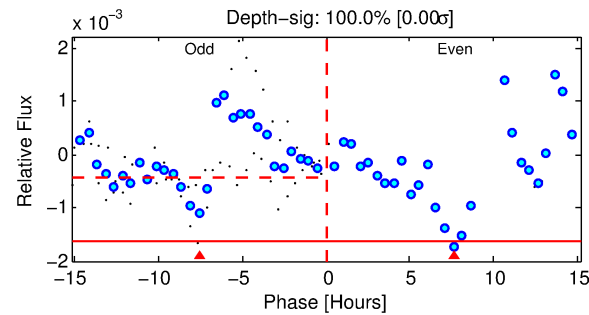
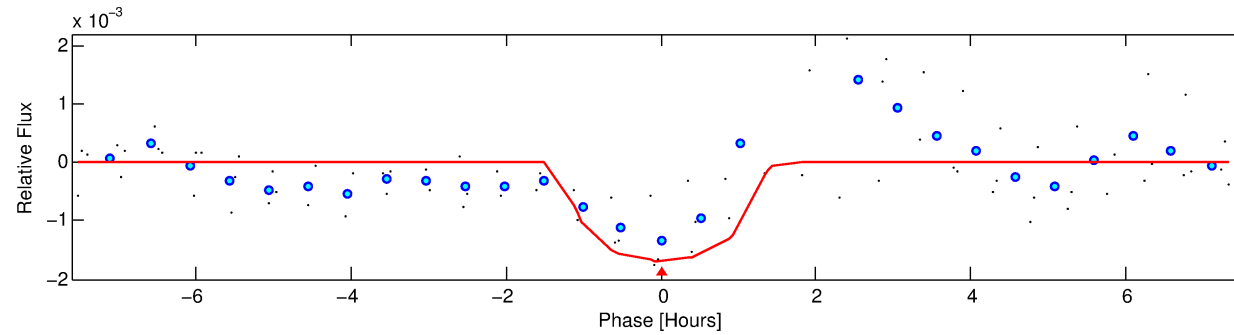
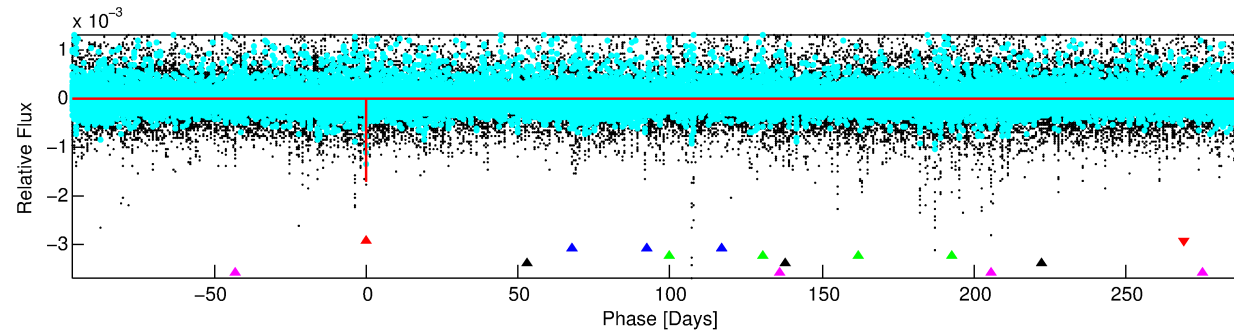
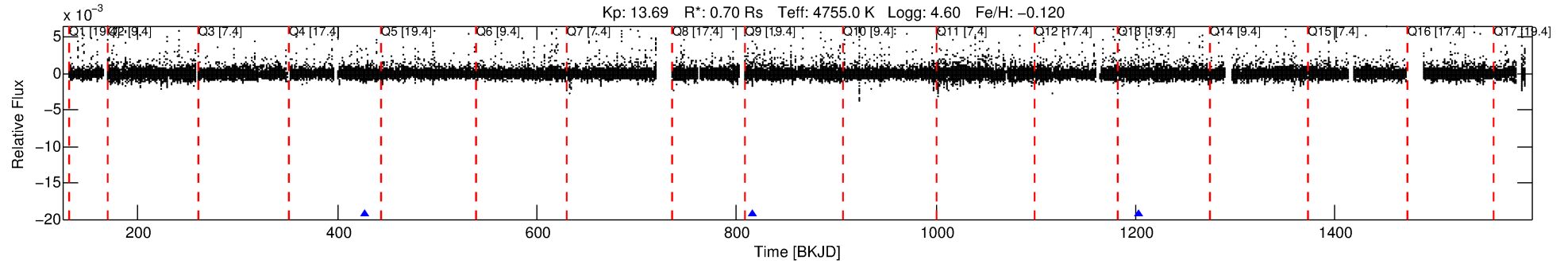
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 008044516-01

No Significant Match Found

# DV One-Page Summary

KIC: 8044516 Candidate: 1 of 5 Period: 387.849 d



## DV Fit Results:

Period = 387.84854 [0.00424] d  
Epoch = 427.8841 [0.0057] BKJD  
Rp/R\* = 0.0380 [0.0729]  
a/R\* = 1054.54 [6363.26]  
b = 0.52 [8.81]  
Seff = 0.26 [0.04]  
Teq = 182 [8] K  
Rp = 2.90 [5.57] Re  
a = 0.9299 [0.0641] AU  
Ag = 41698.96 [161277.72] [0.26σ]  
Teffp = 4018 [3887] K [0.99σ]

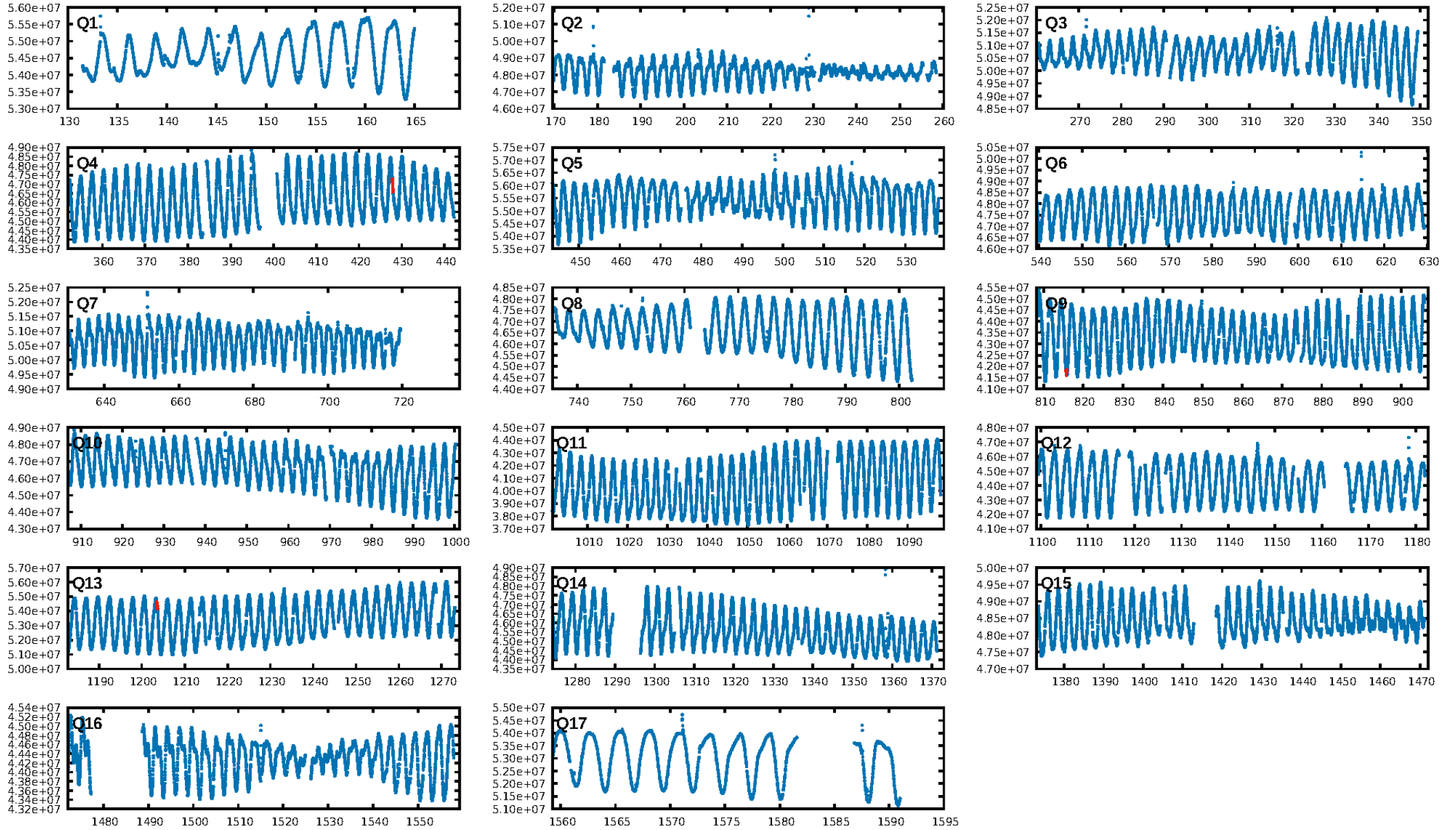
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 100.0% [84.20σ]  
ModelChiSquare2-sig: 0.0%  
ModelChiSquareGof-sig: 2.1%  
Bootstrap-pfa: 6.40e-10  
RollingBand-fgt: 1.00 [3/3]  
GhostDiagnostic-chr: -0.2499  
Centroid-sig: 90.6%  
Centroid-so: 0.776 arcsec [0.43σ]  
OotOffset-rm: 0.320 arcsec [1.01σ]  
OotOffset-st: 0/0/1/2 [3]  
KicOffset-rm: 2.054 arcsec [14.25σ]  
KicOffset-st: 0/0/1/2 [3]  
DiffImageQuality-fgm: 0.67 [2/3]  
DiffImageOverlap-fno: 1.00 [3/3]

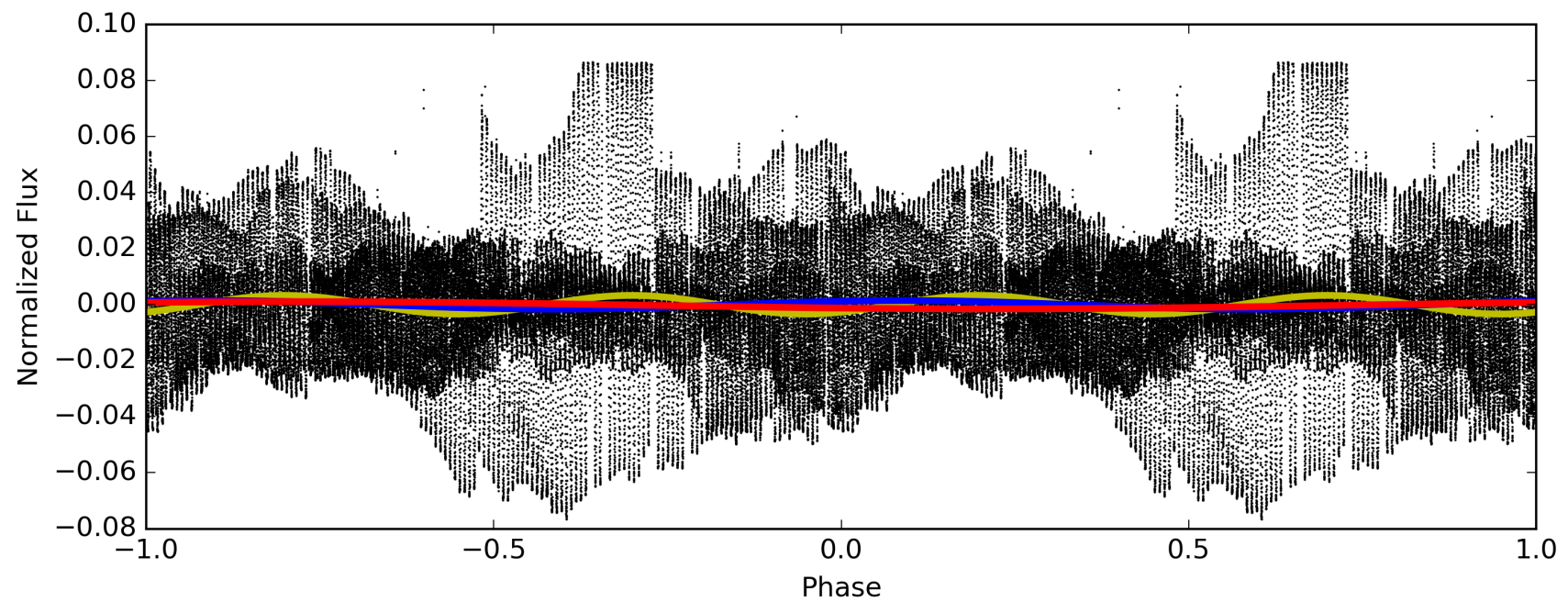
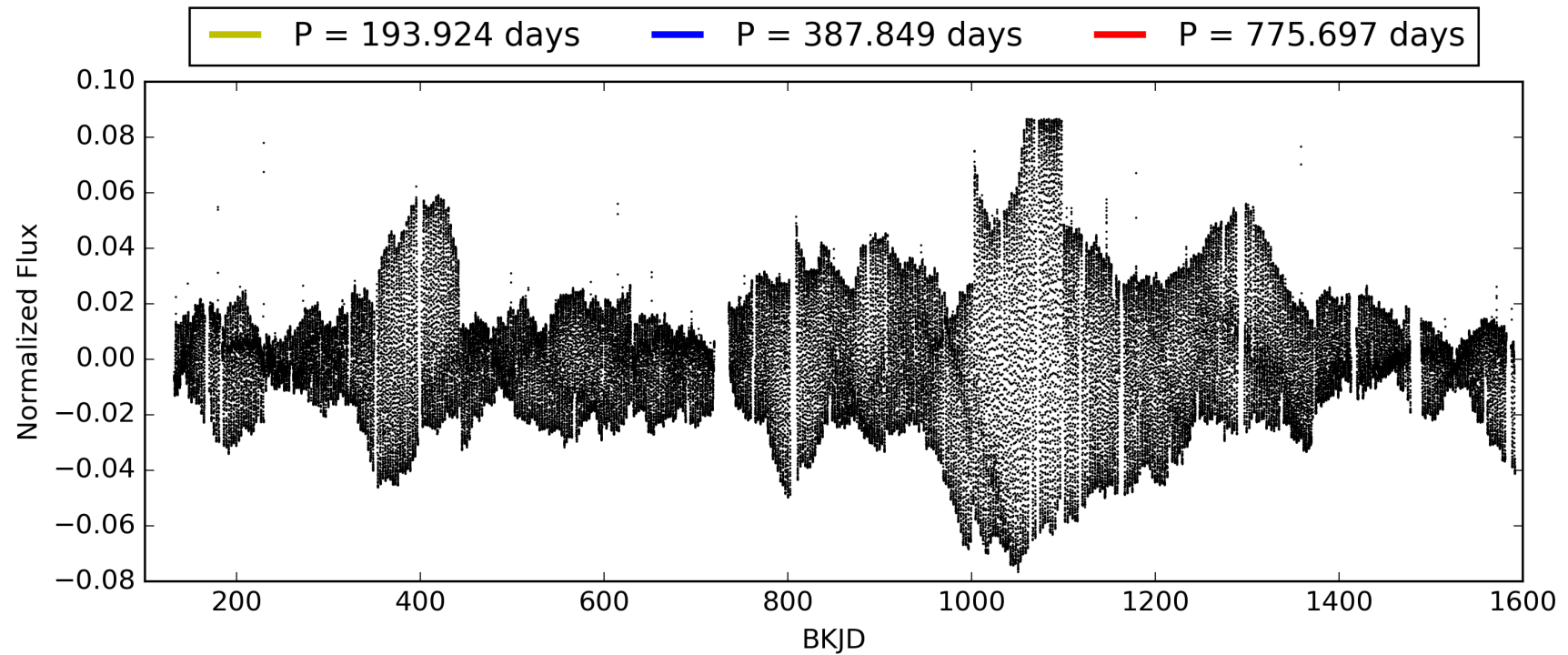
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 01-Feb-2016 05:26:26 Z

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

# TCE 008044516-01, PDC Light Curves



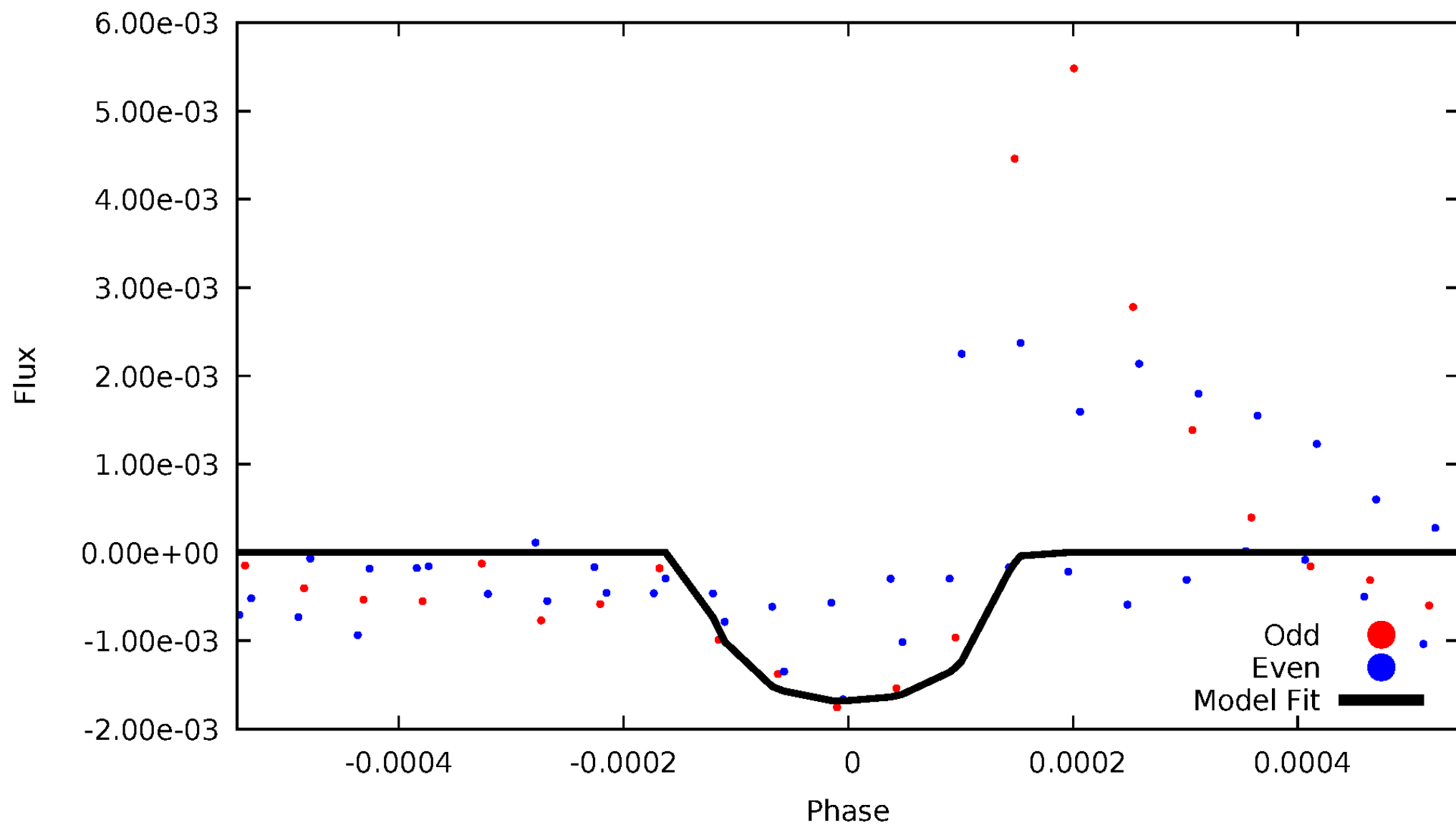
TCE 008044516-01





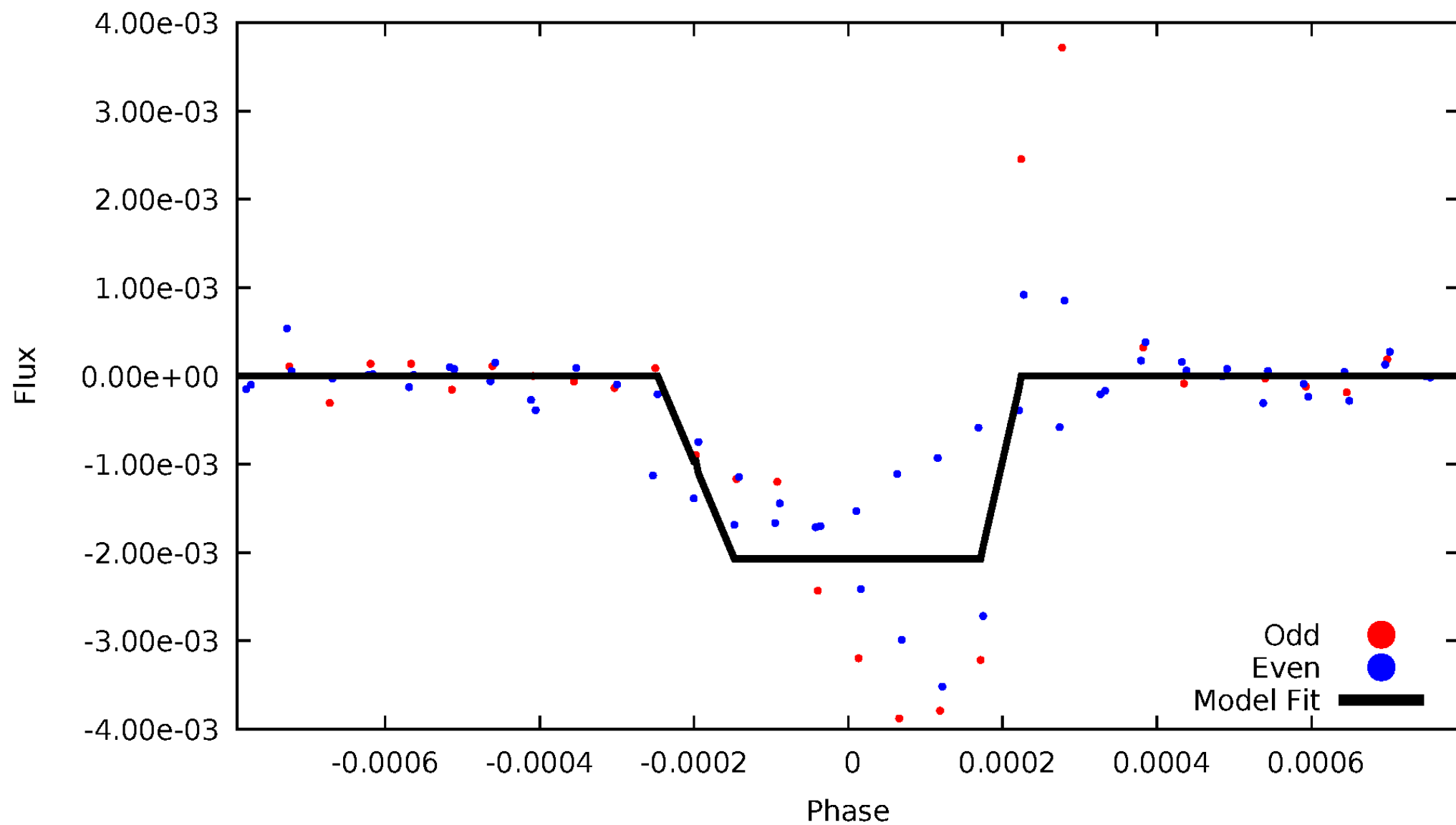
# DV Odd/Even

TCE 008044516-01



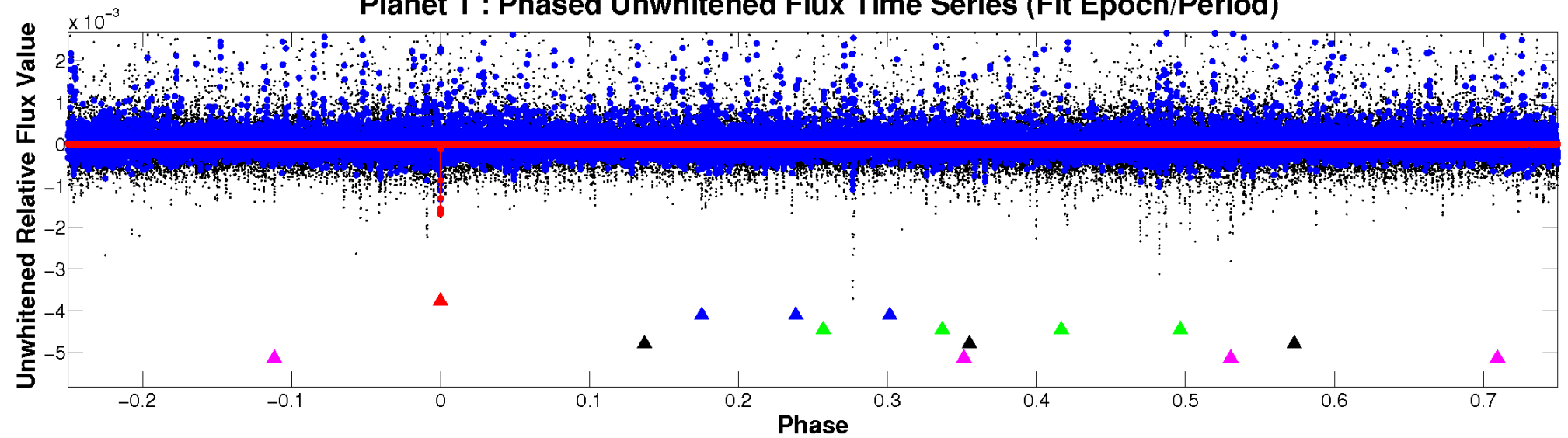
# ALT Odd/Even

TCE 008044516-01

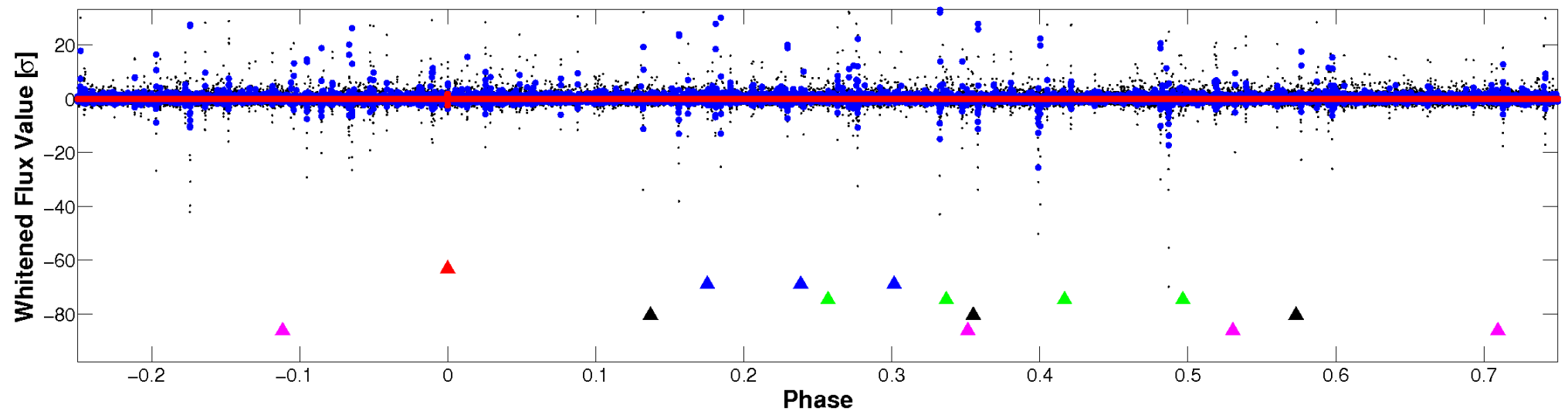


# Non-Whitened Vs. Whitened Light Curve

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

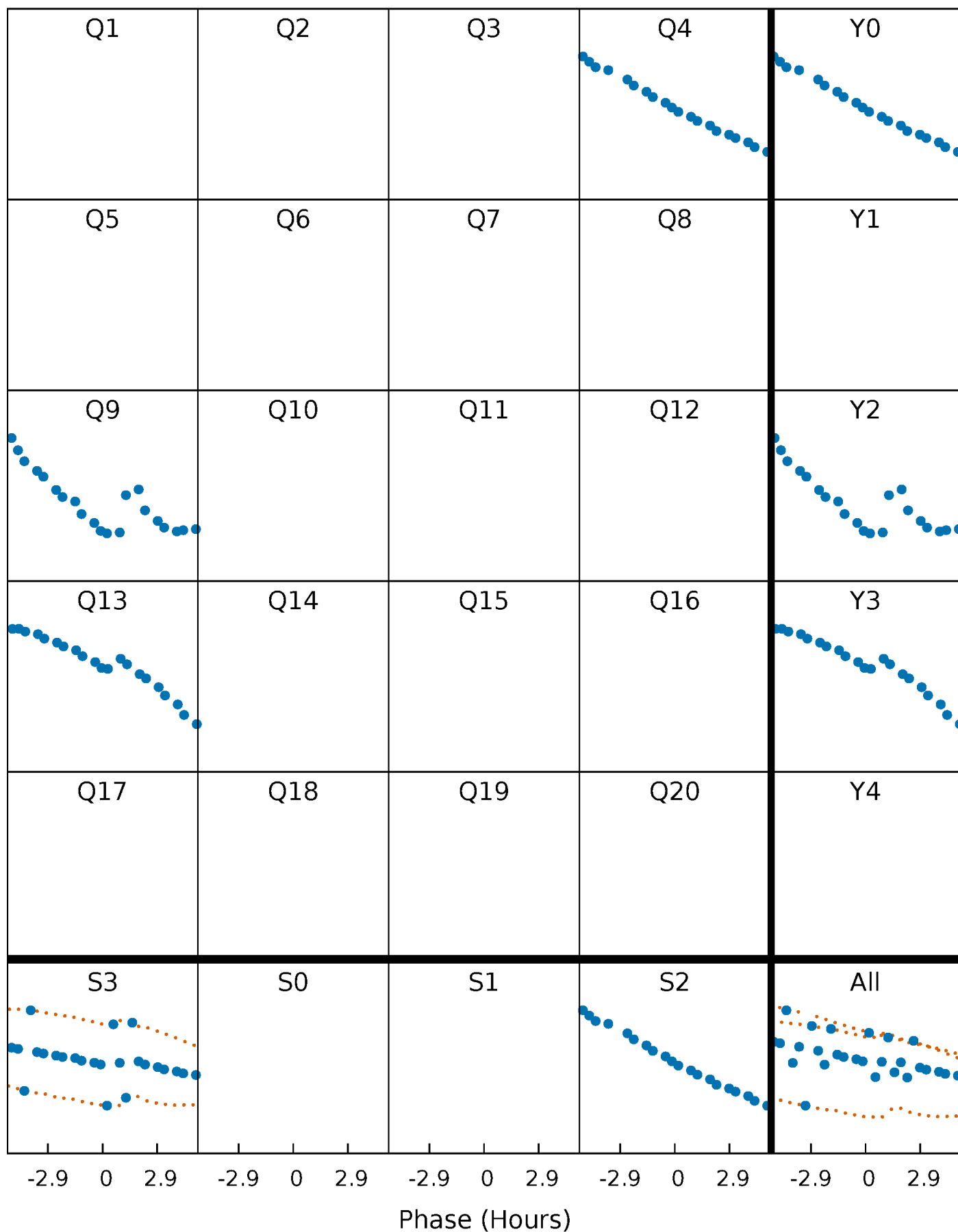


**Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)**



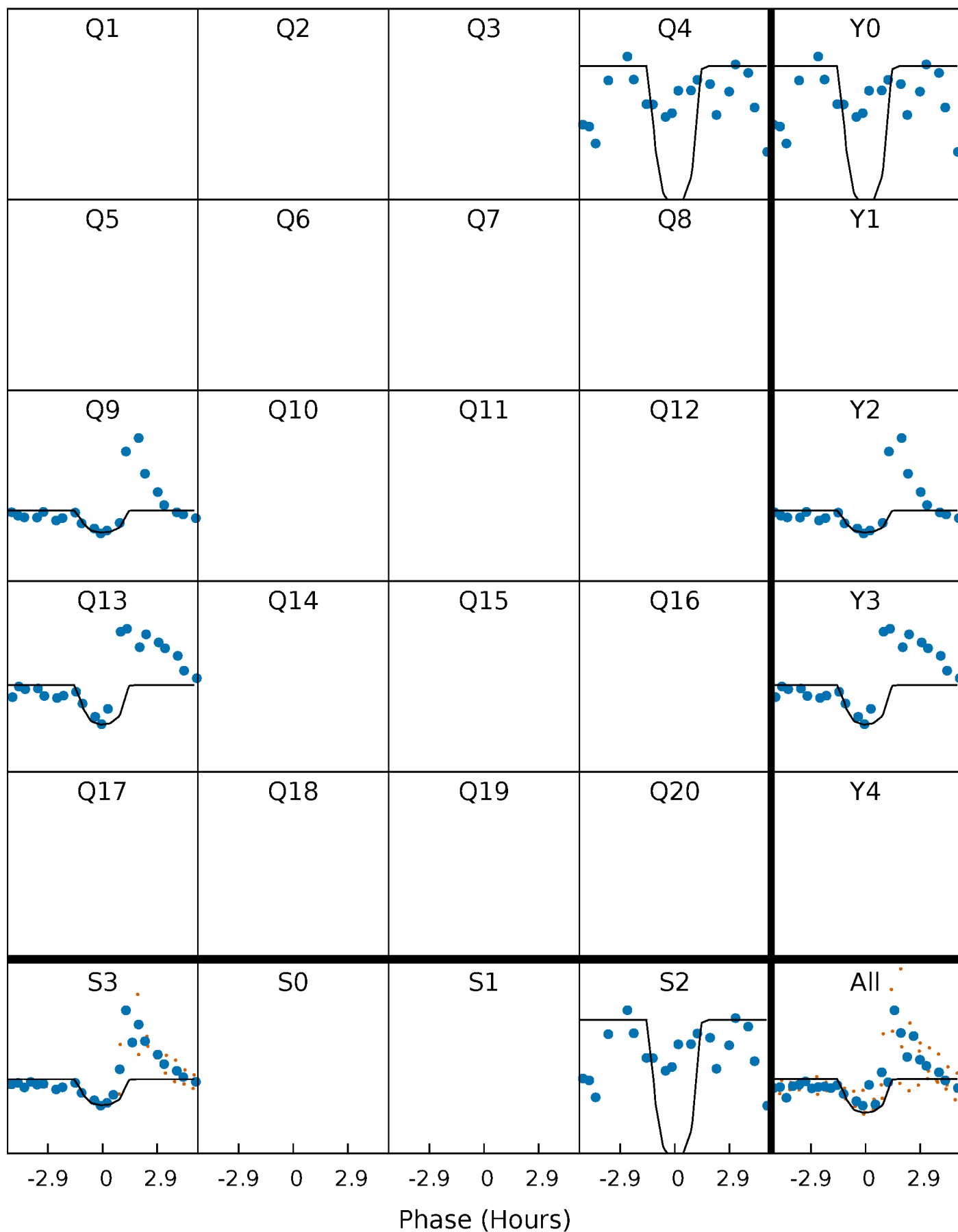
# PDC Quarter-Phased Transit Curves

TCE 008044516-01 P=387.848537 Days  $T_0=427.884080$  (BKJD)



# DV Quarter-Phased Transit Curves

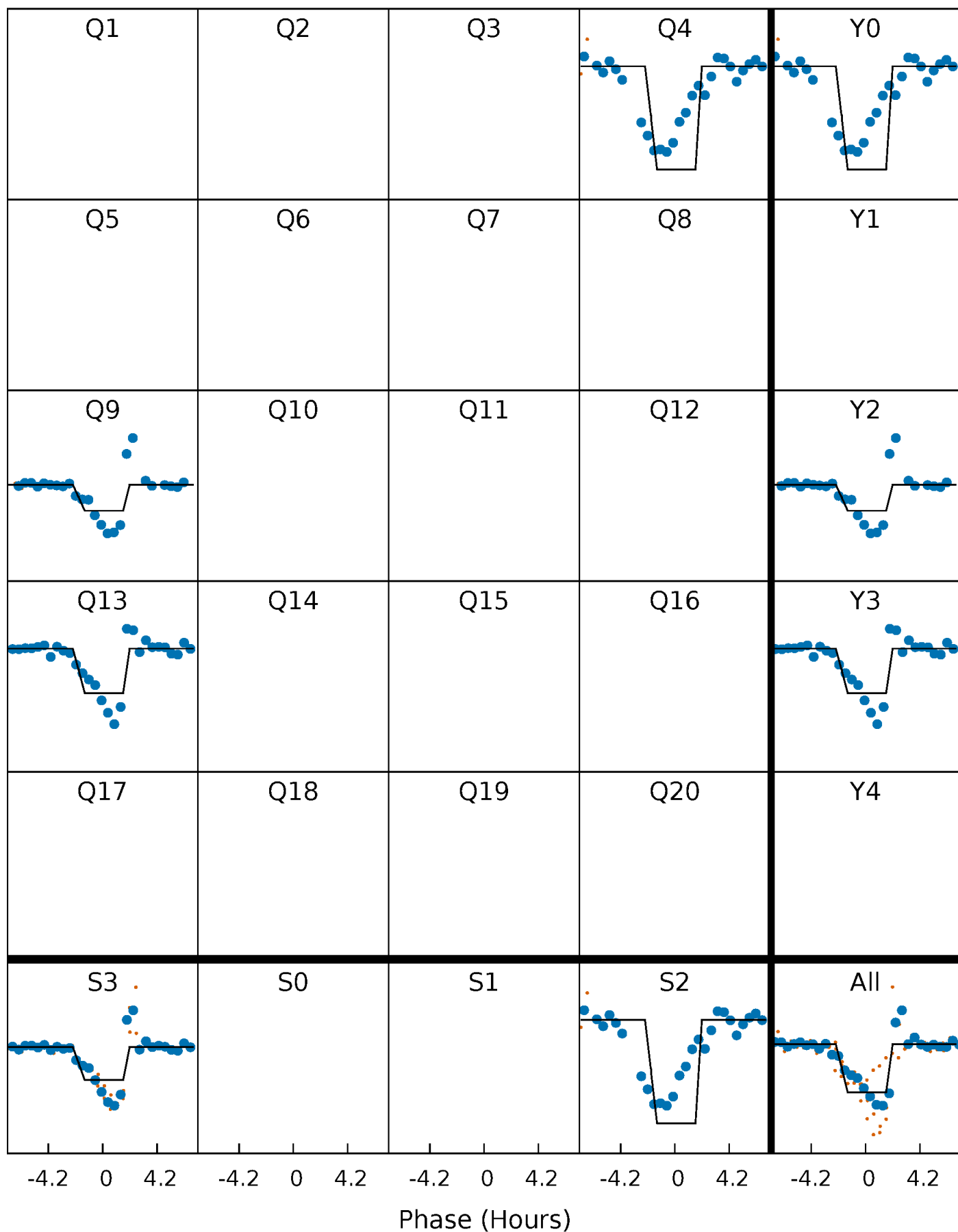
TCE 008044516-01 P=387.848537 Days  $T_0=427.884080$  (BKJD)





# Alt. Detrend Quarter-Phased Transit Curves

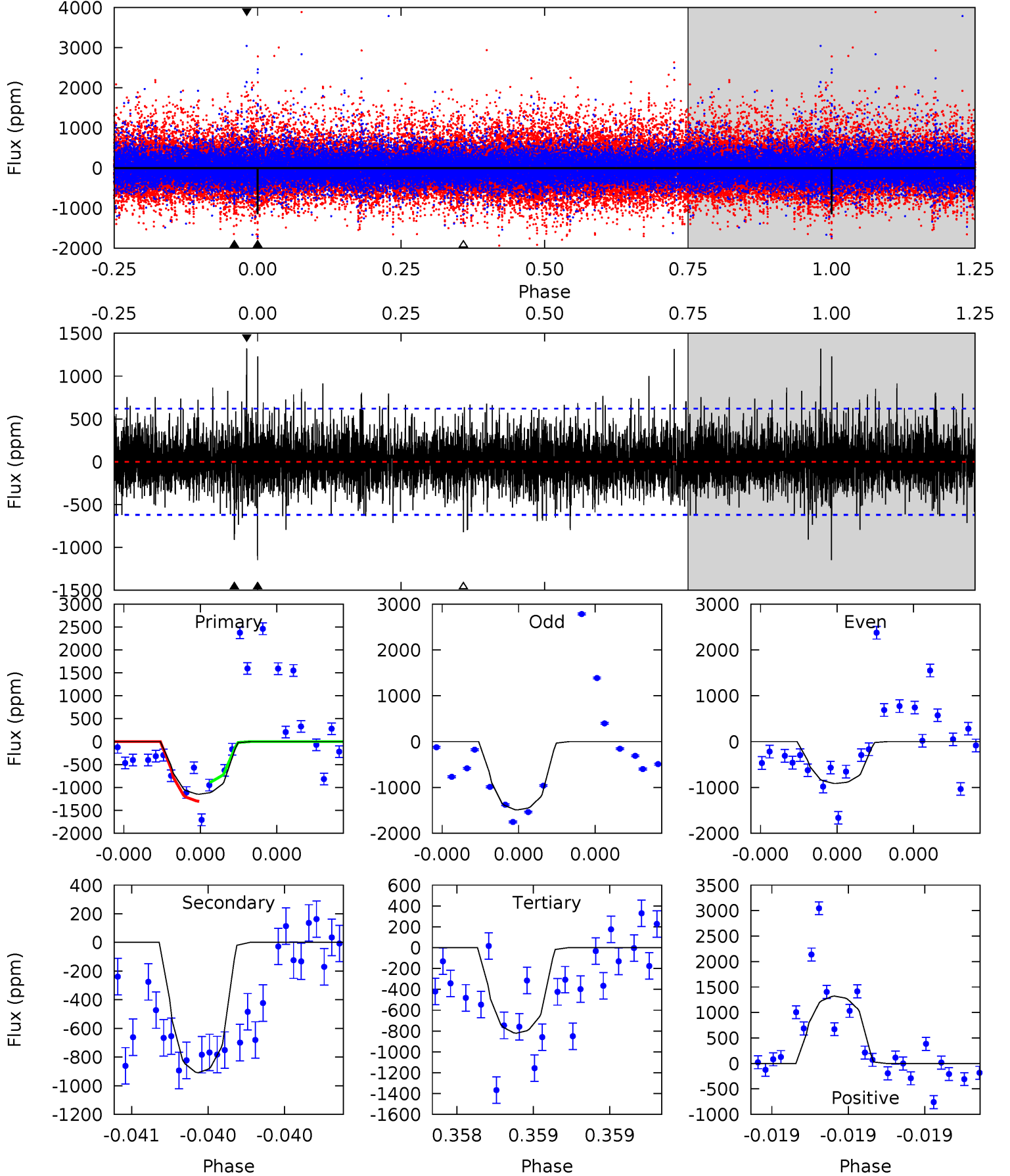
TCE 008044516-01 P=387.828969 Days  $T_0=427.874177$  (BKJD)



# DV Model-Shift Uniqueness Test

008044516-01,  $P = 387.848537$  Days,  $E = 40.035543$  Days

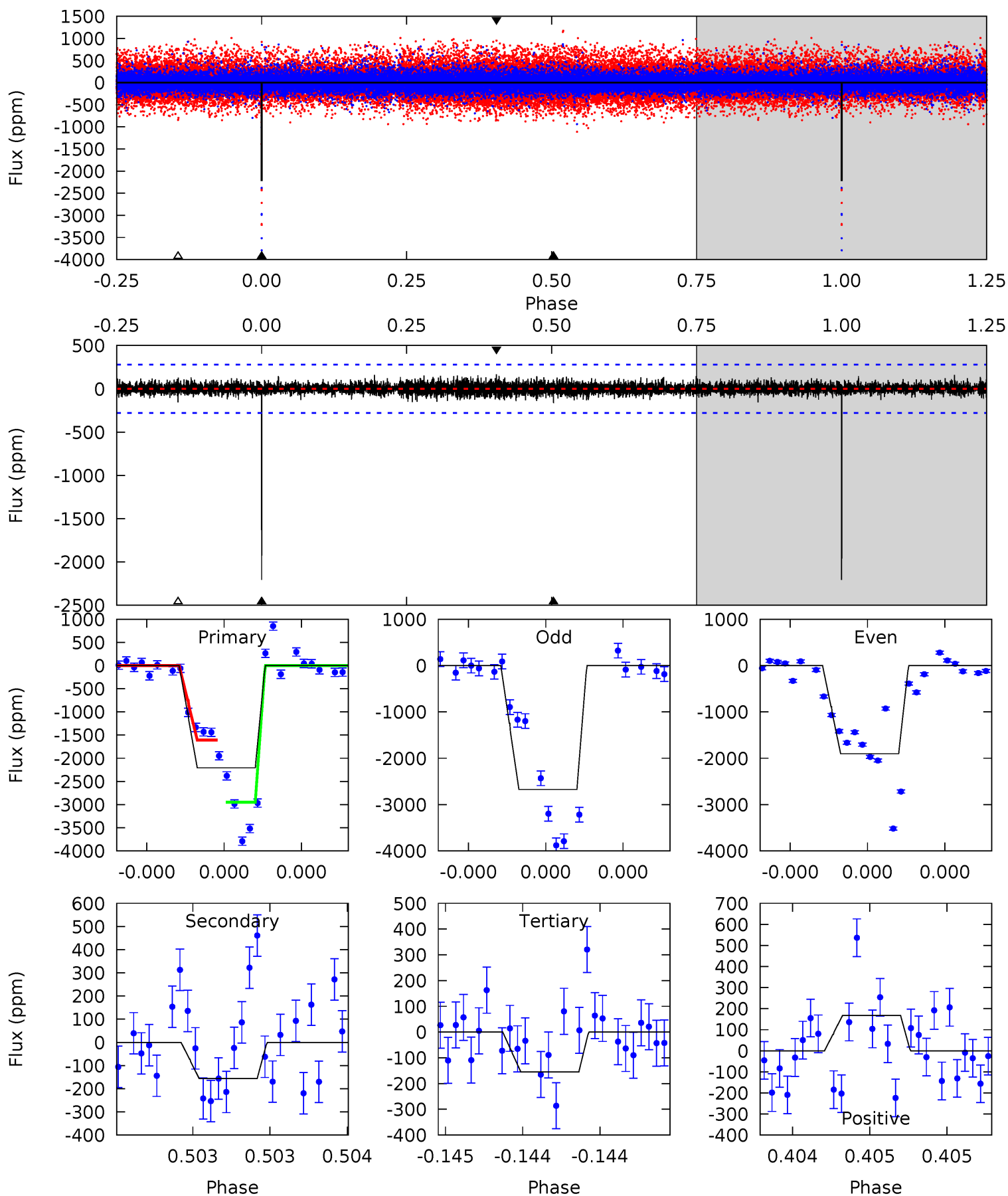
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
10.5	8.28	7.48	12.0	5.66	3.61	1.78	2.99	-1.57	0.81	-3.75	1.70	1.26	0.53	1.91



# Alt Model-Shift Uniqueness Test

008044516-01, P = 387.828969 Days, E = 40.045208 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
44.3	3.13	3.11	3.36	5.60	3.52	0.72	41.2	40.9	0.02	-0.24	7.39	0.93	0.07	13.5



### Stellar Parameters For KIC 008044516

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (g \cdot \text{cm}^{-3})$
	$4755^{+170}_{-170}$	$4.602^{+0.044}_{-0.040}$	$-0.120^{+0.300}_{-0.300}$	$0.699^{+0.063}_{-0.057}$	$0.713^{+0.072}_{-0.065}$	$2.937^{+0.616}_{-0.467}$
	+4%/-4%	+1%/-1%	+250%/-250%	+9%/-8%	+10%/-9%	+21%/-16%
Source	PHO54	PHO54	PHO54	DSEP		

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

### Secondary Eclipse Parameters for KIC 008044516-01 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-909 \pm 110$	$4.94^{+4.83}_{-3.38}$	$253^{+11}_{-10}$	$3600^{+2061}_{-669}$	$18061^{+162012}_{-13688}$
Alt.	$-156 \pm 50$	$5.23^{+4.53}_{-3.47}$	$254^{+9}_{-11}$	$2717^{+1048}_{-390}$	$2683^{+20781}_{-1975}$

$T_{max}$  = 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

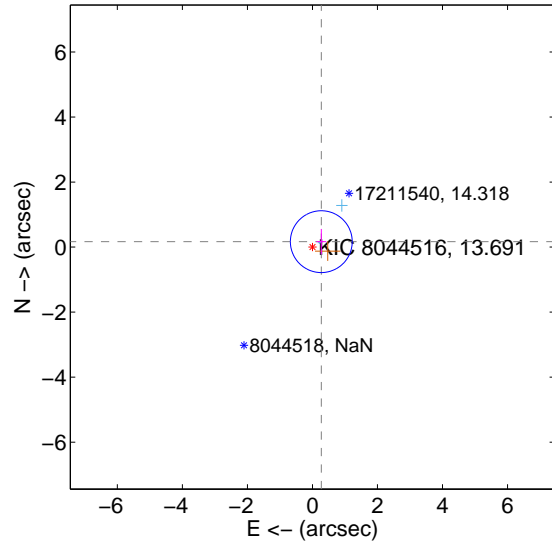
Supplemental centroid analysis for 008044516-01. Kepler magnitude: 13.69. Transit SNR 8.52

There are 2 quarters with good PRF difference image offsets

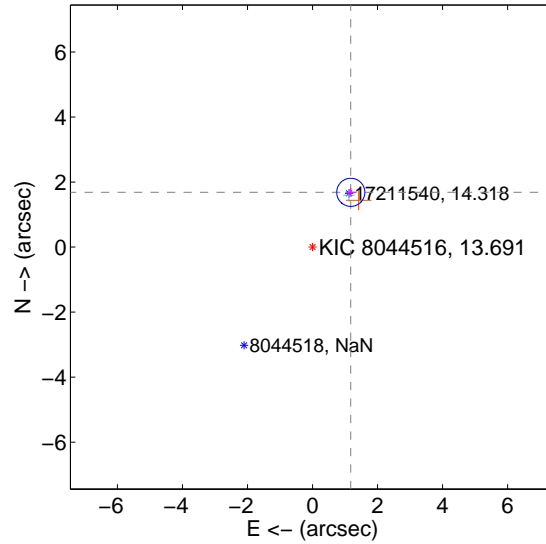
The direct PRF centroid is offset from the target star catalog position by about 1.83 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.320 \pm 0.317$	1.01	$-0.272 \pm 0.151$	$0.167 \pm 0.390$
PRF-fit source offset from KIC position	$2.054 \pm 0.144$	14.25	$-1.176 \pm 0.158$	$1.684 \pm 0.137$
photometric centroid source offset	$0.78 \pm 1.81$	0.43	$-0.63 \pm 1.66$	$0.45 \pm 2.07$

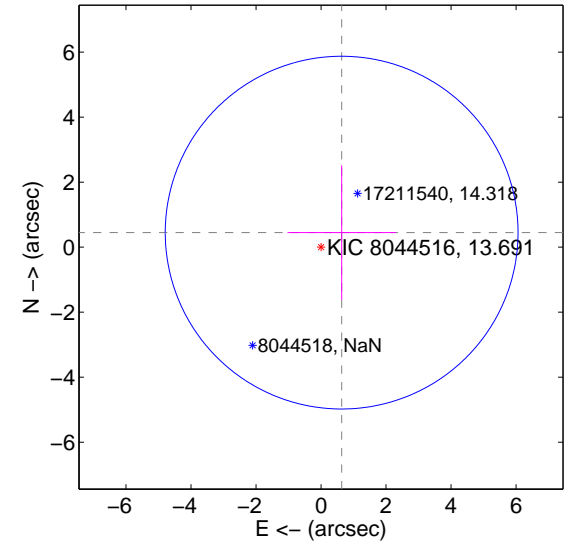
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position



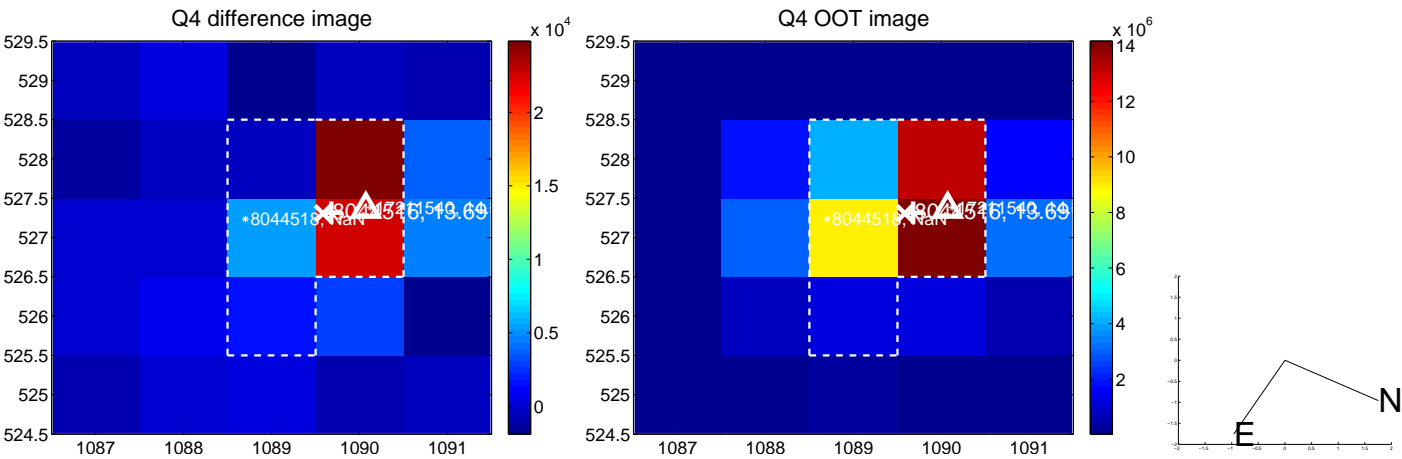
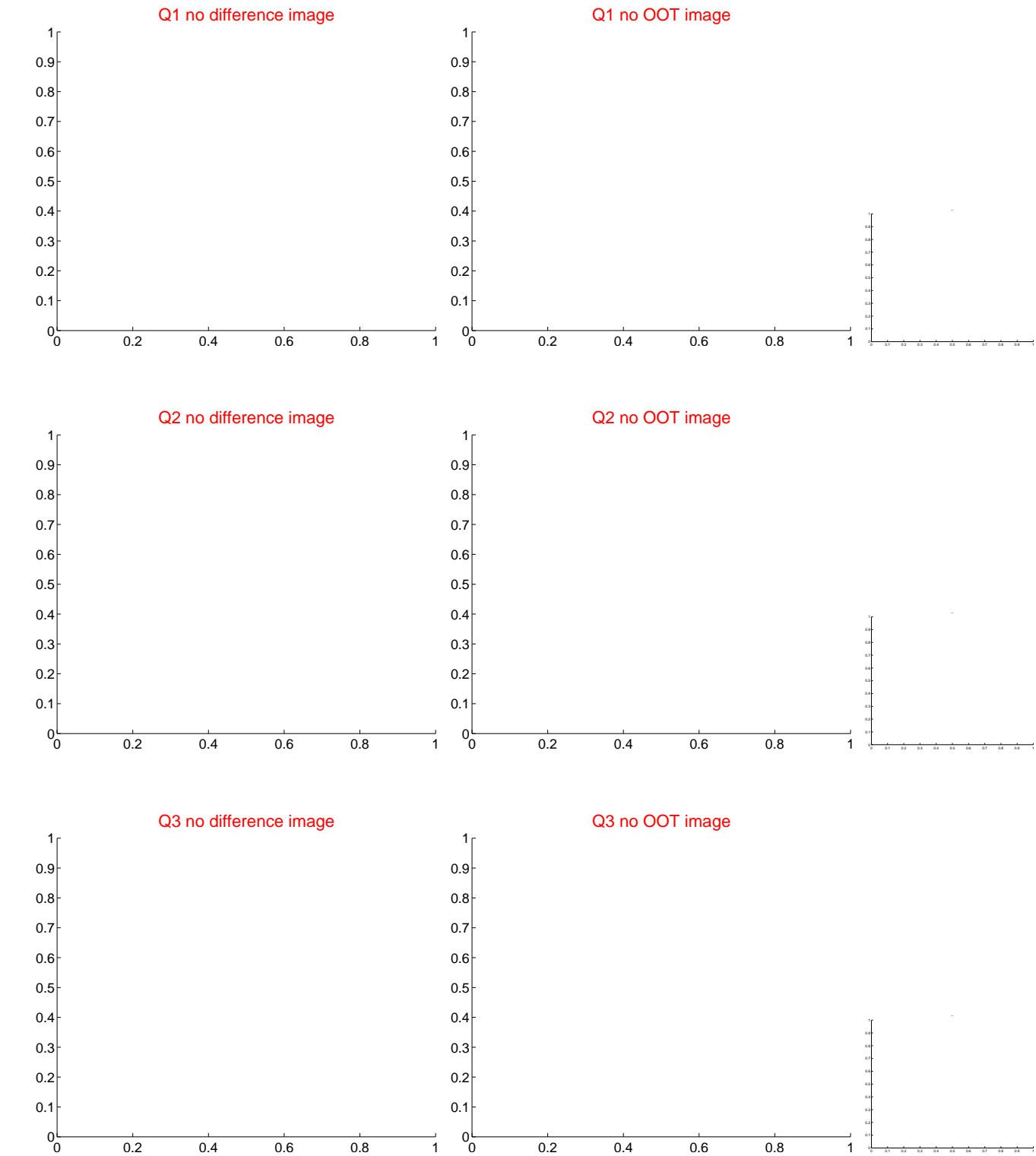
offset from photometric centroids



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.



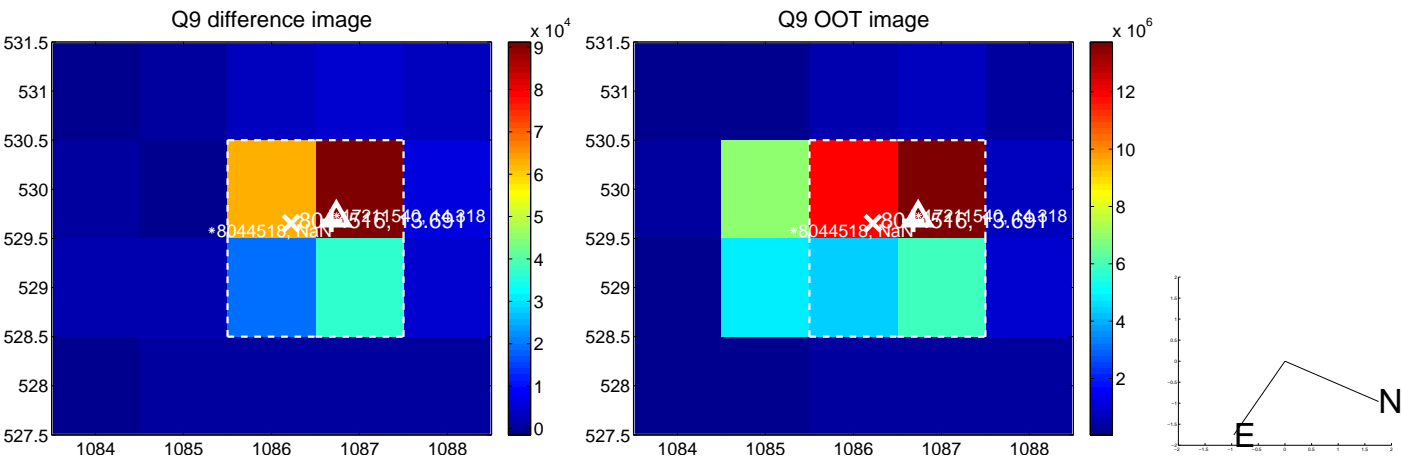
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



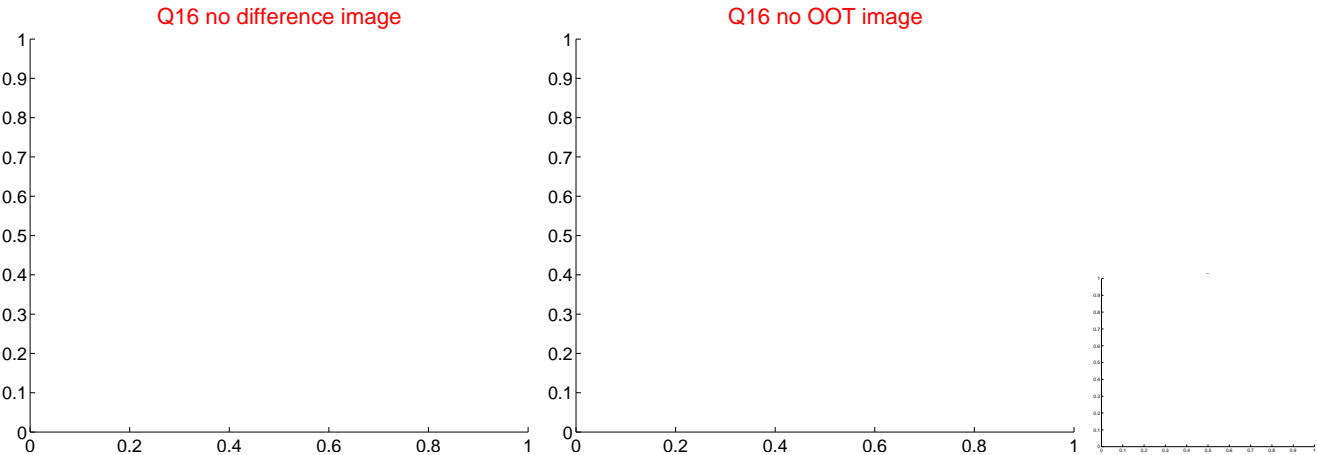
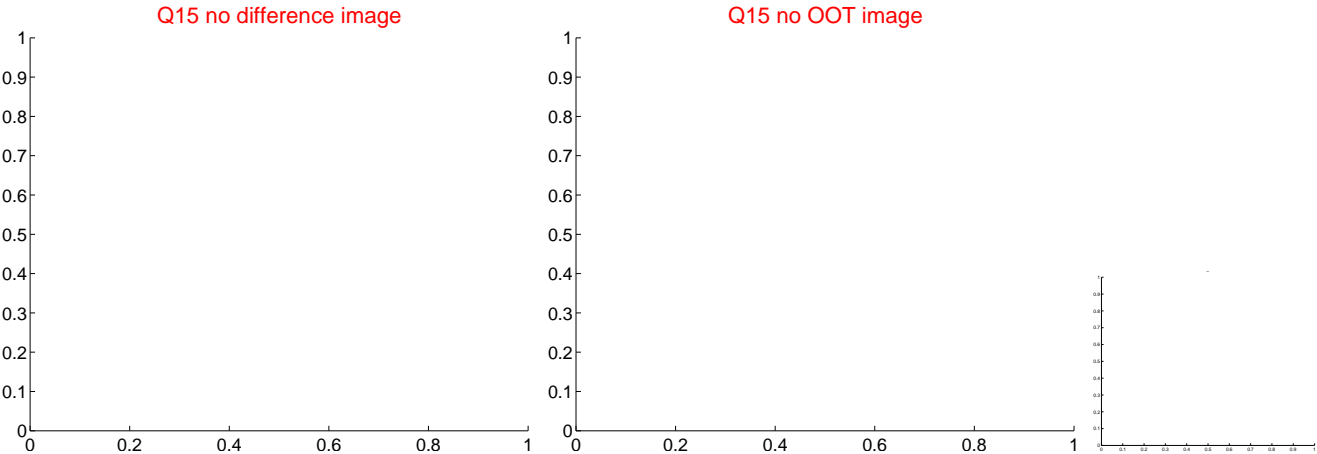
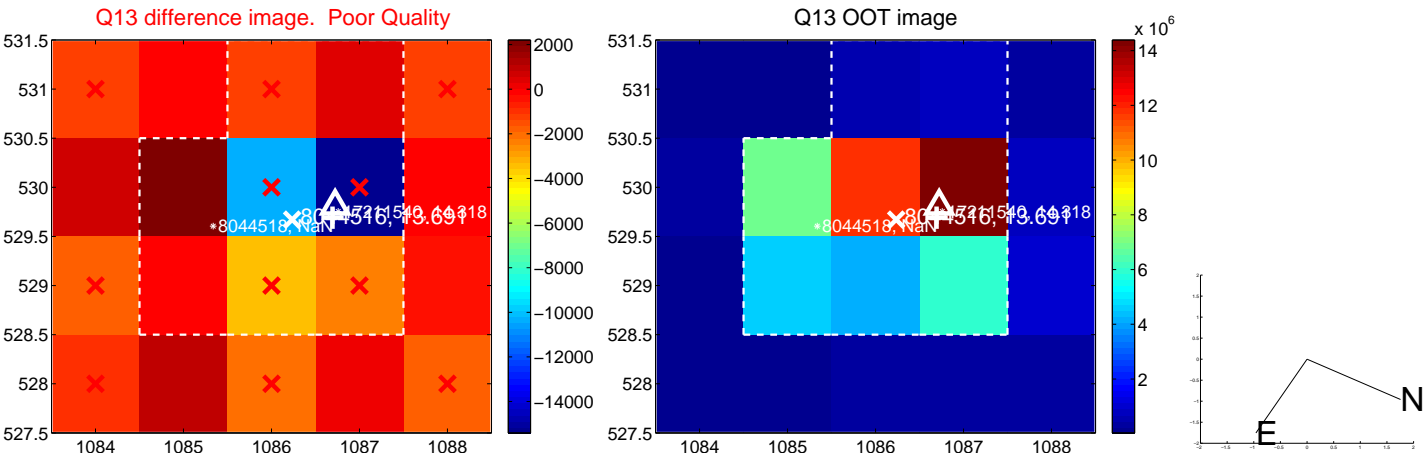
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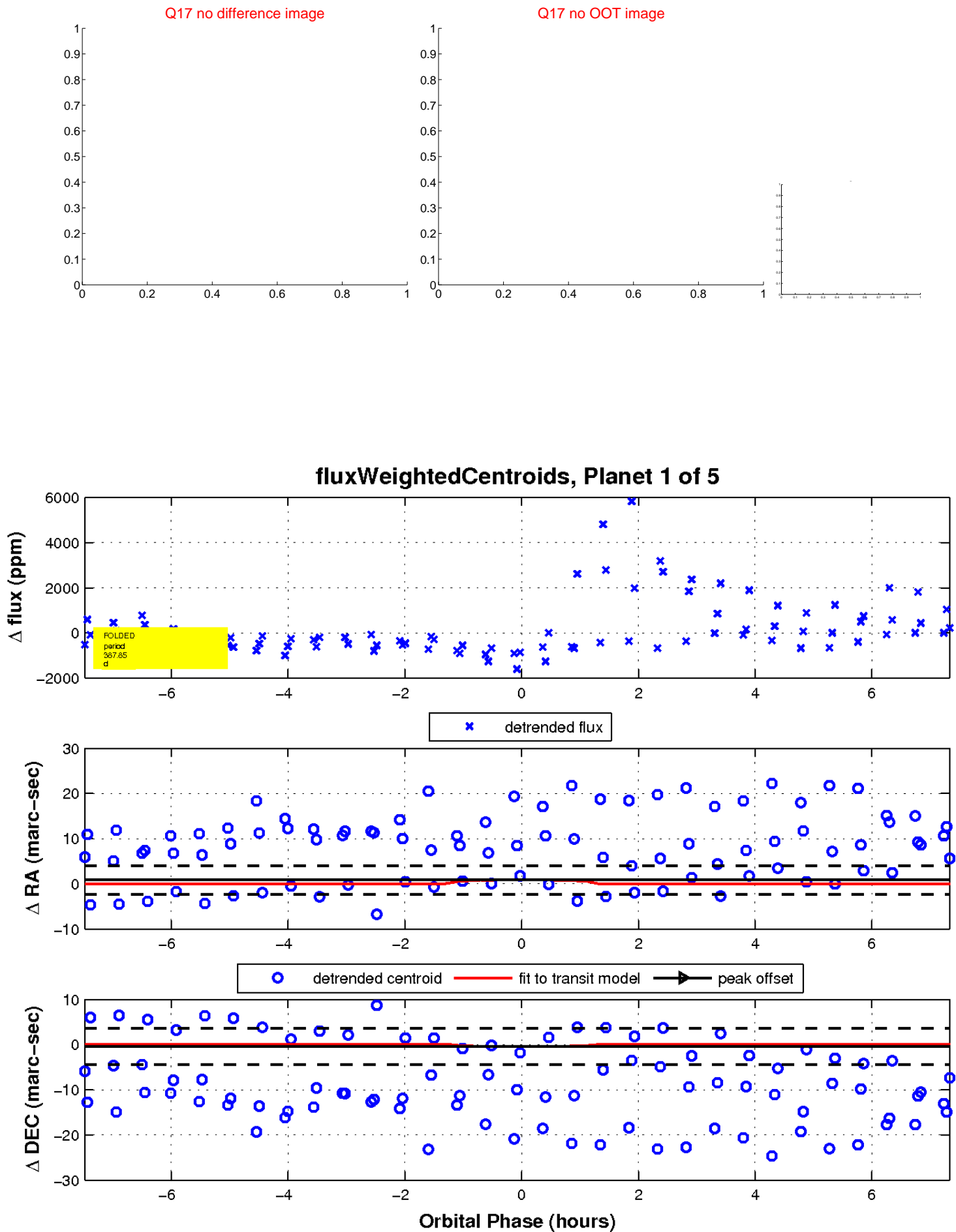
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white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



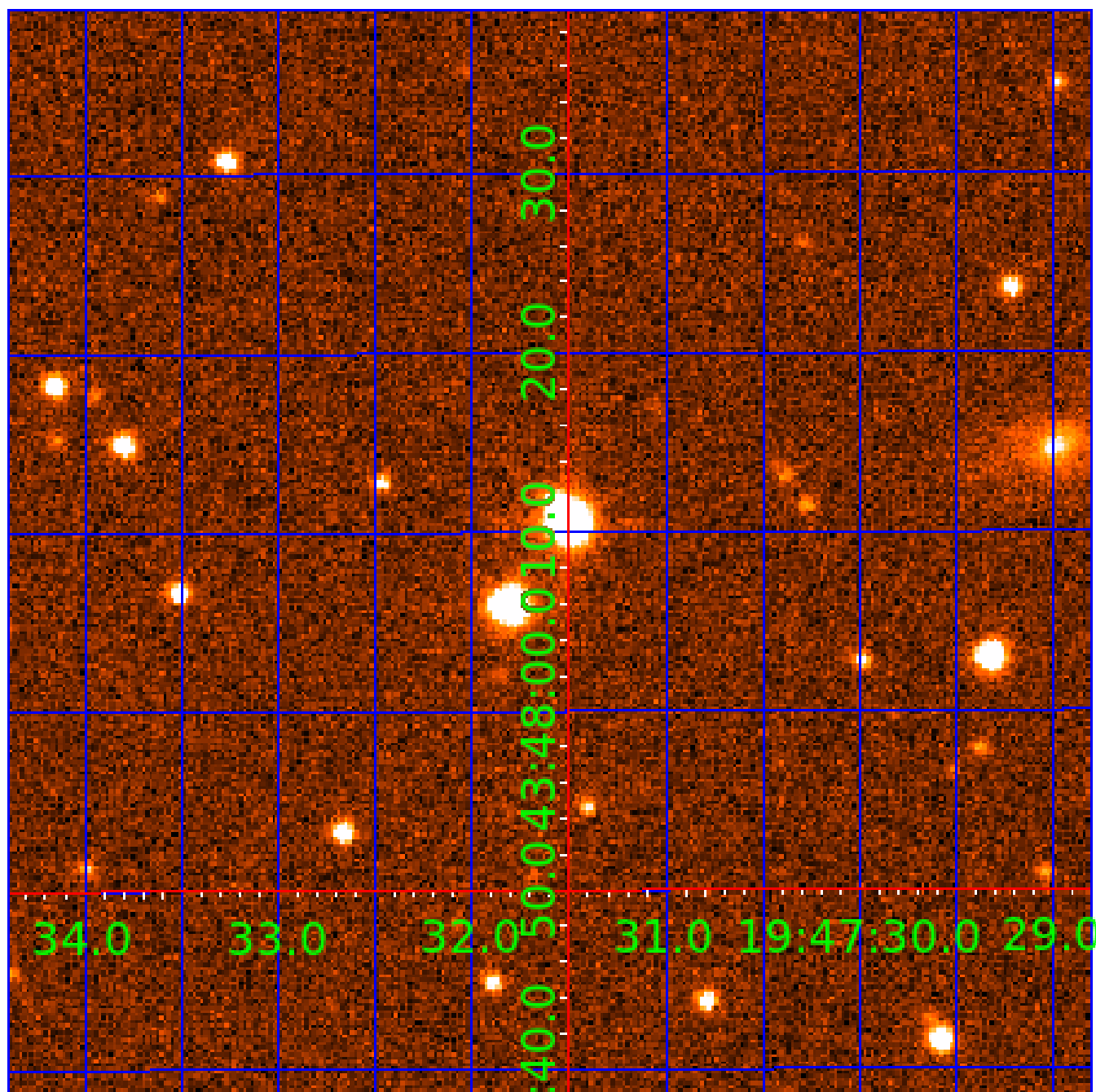
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.





UKIRT Image

Declination



# KIC 008044516

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
008044516-01	OBS	No	387.848537	427.884080	1681.6	2.531	13.2	8.5	0.70	4755	2.90	0.26
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008044516-05	OBS	No	457.289830	176.326717	1452.2	5.382	10.3	6.5	0.70	4755	2.63	0.21

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
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008044516-03	OBS	FP	0.00	1	0	1	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—CENT_UNCERTAIN—HALO_GHOST
008044516-04	OBS	FP	0.00	1	0	0	0	LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—CENT_KIC_POS
008044516-05	OBS	FP	0.00	1	0	1	0	INDIV_TRANS_RUBBLE_CHASES_MARSHALL_SKYE—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV— INCONSISTENT_TRANS—HALO_GHOST

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

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

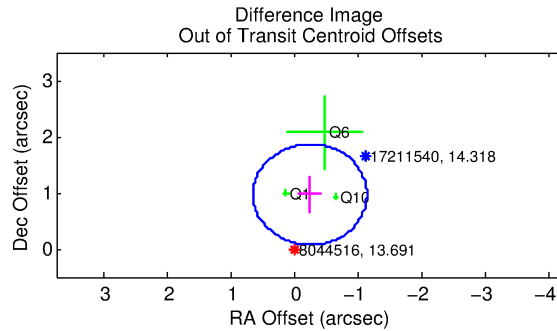
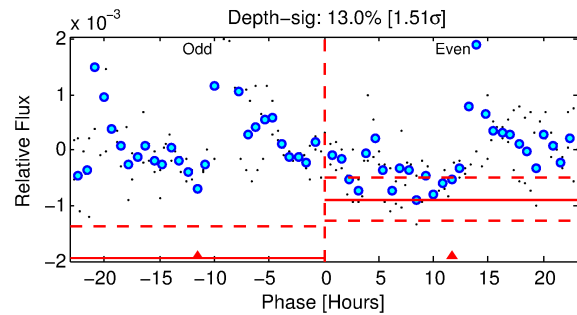
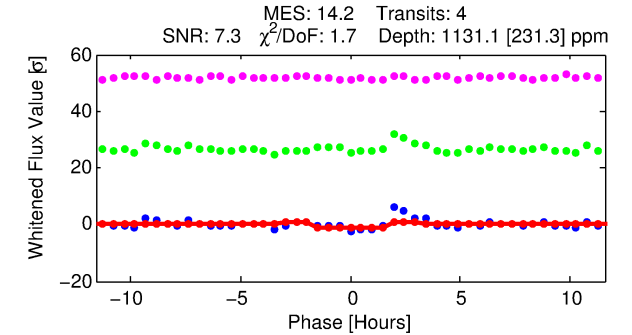
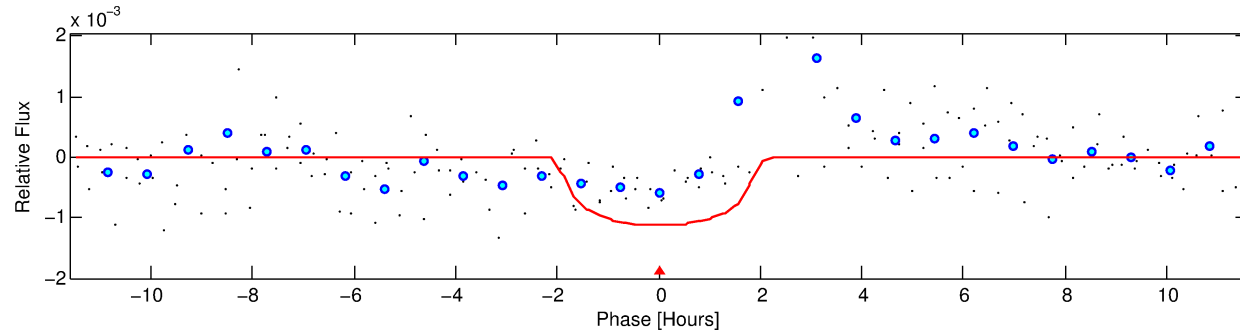
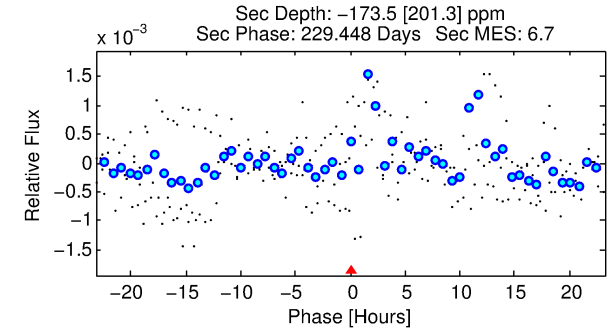
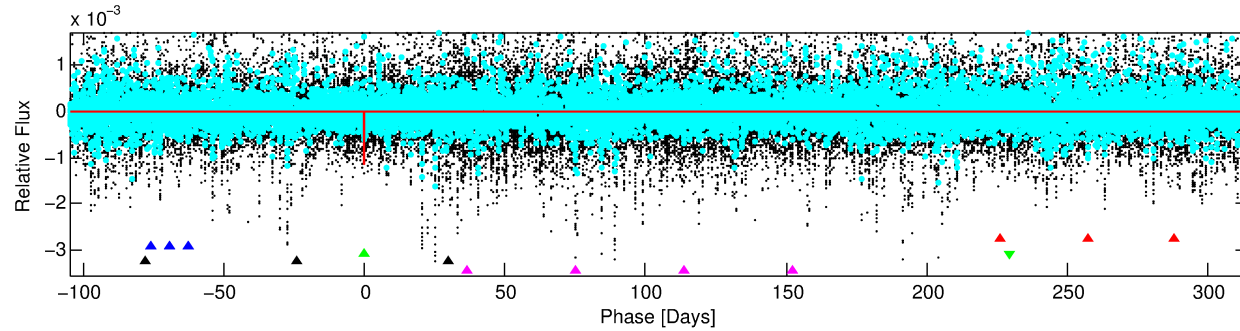
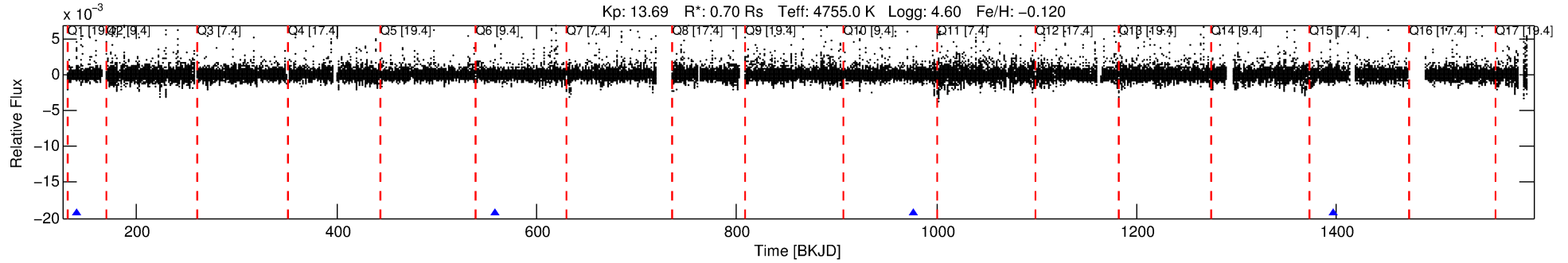
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 008044516-03

No Significant Match Found

# DV One-Page Summary

KIC: 8044516 Candidate: 3 of 5 Period: 418.838 d



## DV Fit Results:

Period = 418.83776 [0.00359] d  
Epoch = 139.6842 [0.0067] BKJD  
Rp/R\* = 0.0296 [0.0615]  
a/R\* = 851.87 [5593.42]  
b = 0.03 [219.91]  
Seff = 0.23 [0.04]  
Teq = 177 [7] K  
Rp = 2.26 [4.70] Re  
a = 0.9788 [0.0675] AU  
Ag = N/A  
Teffp = N/A

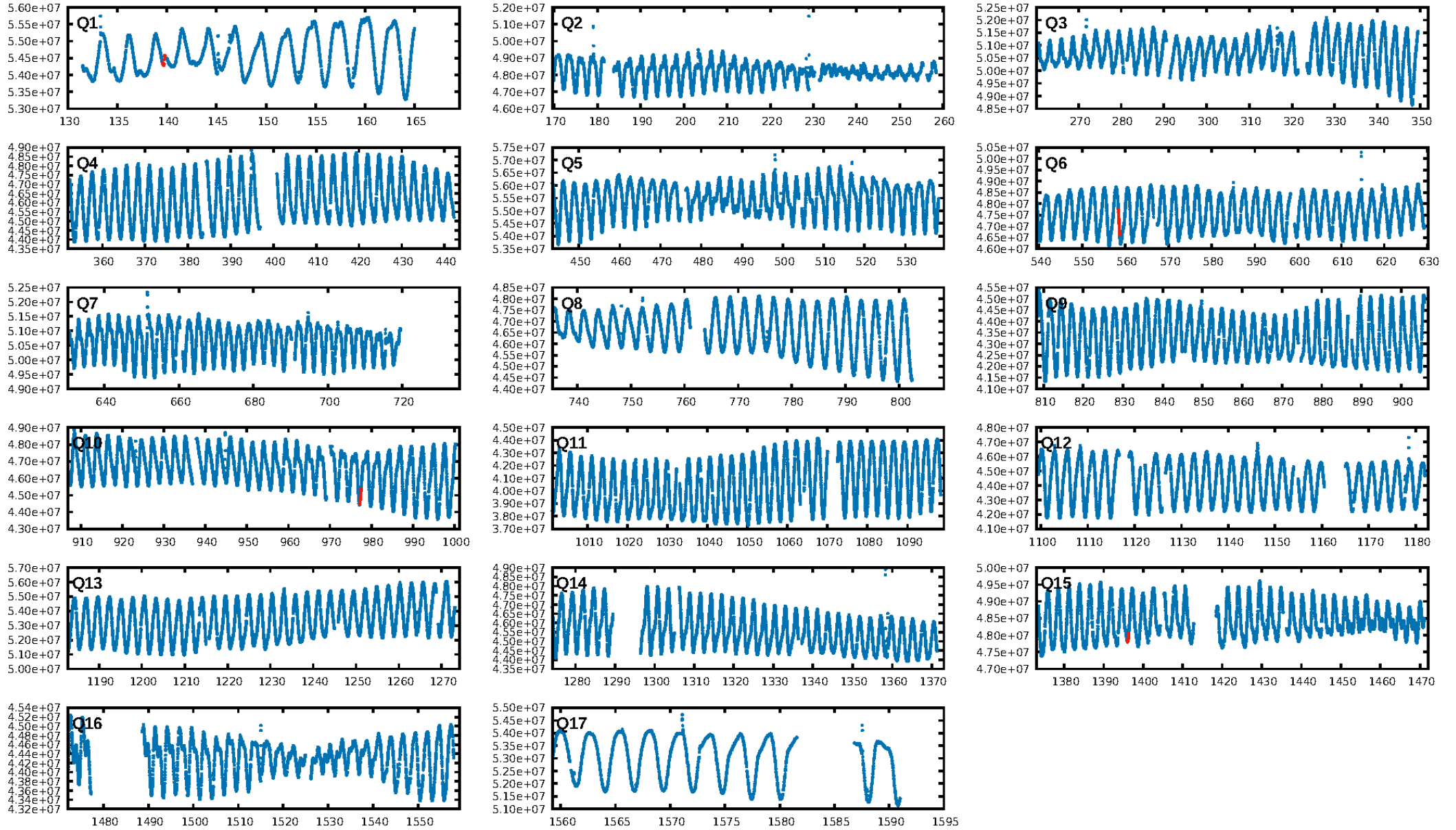
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [20.66 $\sigma$ ]  
LongPeriod-sig: 100.0% [139.27 $\sigma$ ]  
ModelChiSquare2-sig: 17.4%  
ModelChiSquareGof-sig: 80.0%  
**Bootstrap-pfa: 1.54e-11**  
RollingBand-fgt: 1.00 [3/3]  
**GhostDiagnostic-chr: -0.1444**  
Centroid-sig: 74.4%  
Centroid-so: 0.829 arcsec [0.34 $\sigma$ ]  
**OotOffset-rm: 0.997 arcsec [3.34 $\sigma$ ]**  
**KicOffset-rm: 2.390 arcsec [8.29 $\sigma$ ]**  
OotOffset-st: 2/0/0/1 [3]  
KicOffset-st: 2/0/0/1 [3]  
DiffImageQuality-fgm: 1.00 [3/3]  
DiffImageOverlap-fno: 1.00 [3/3]

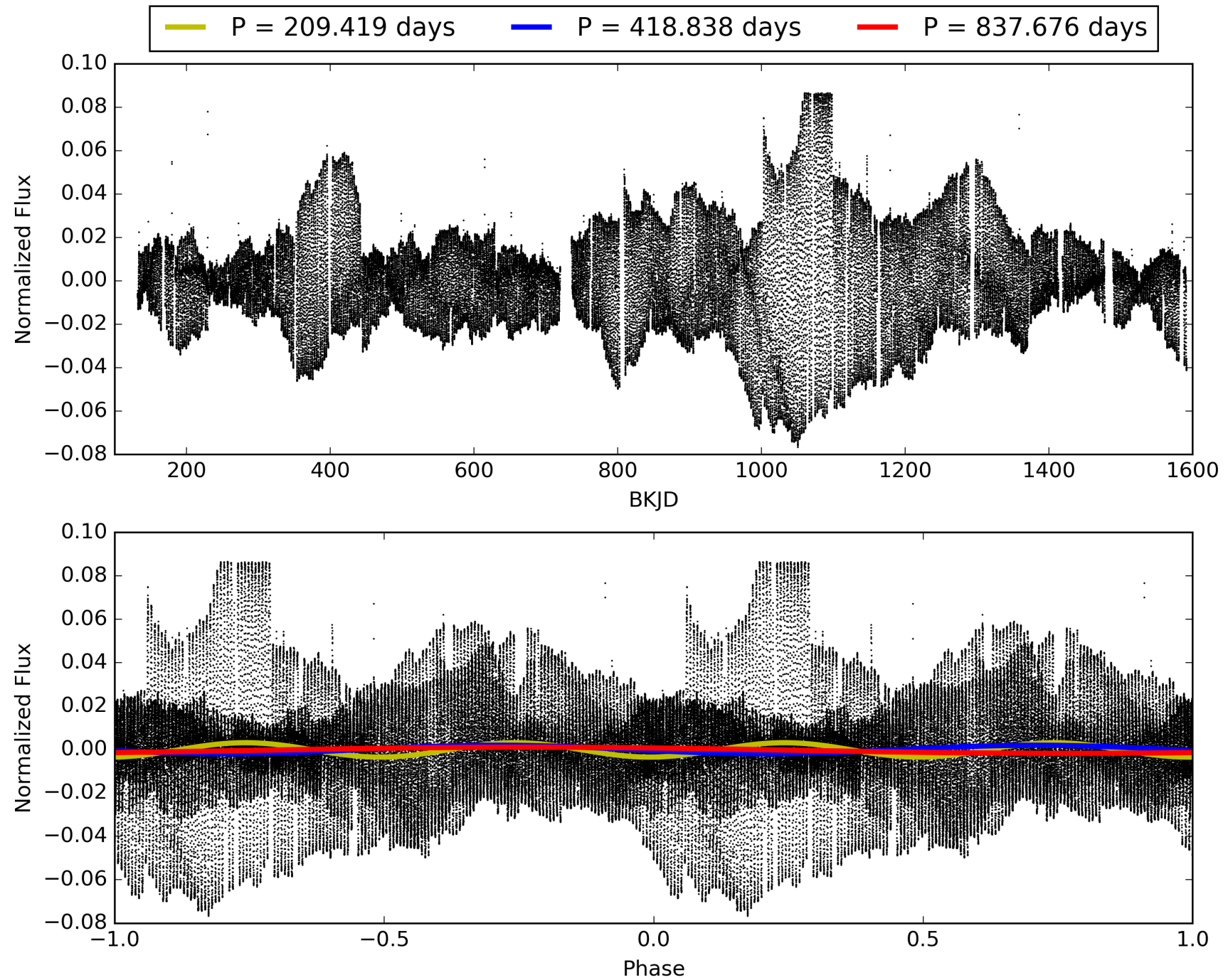
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 01-Feb-2016 05:26:54 Z

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

# TCE 008044516-03, PDC Light Curves



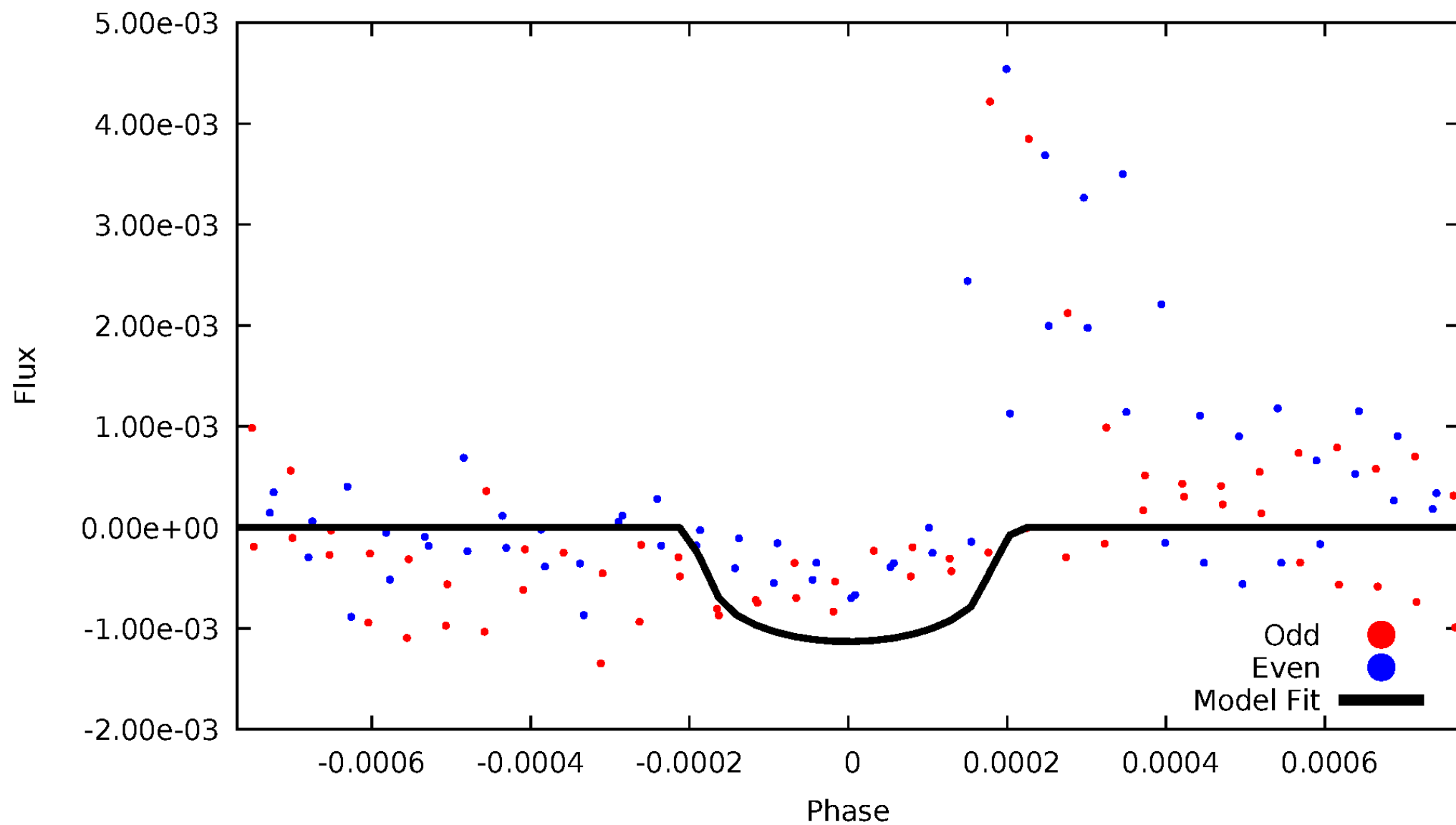
TCE 008044516-03





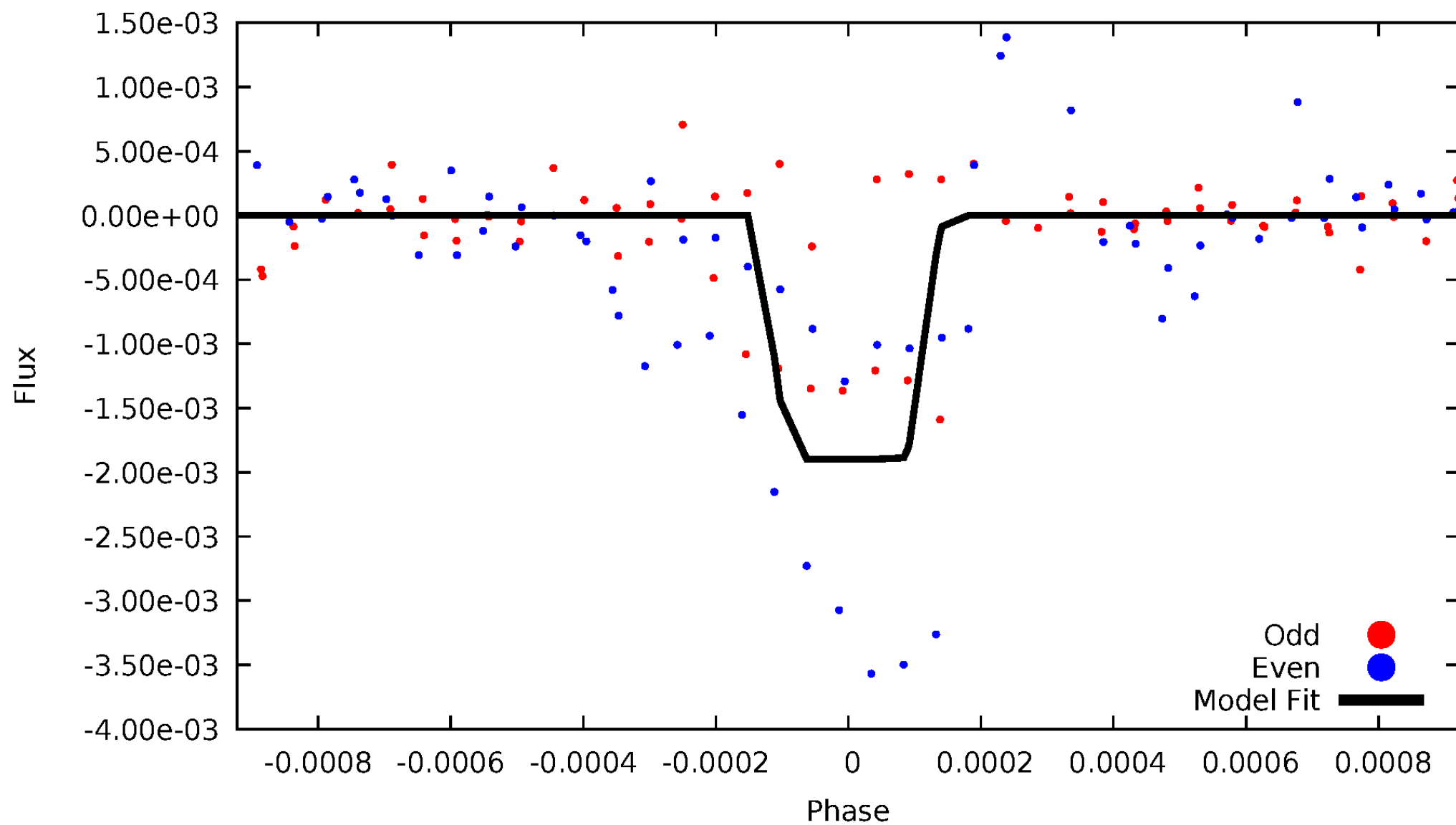
# DV Odd/Even

TCE 008044516-03



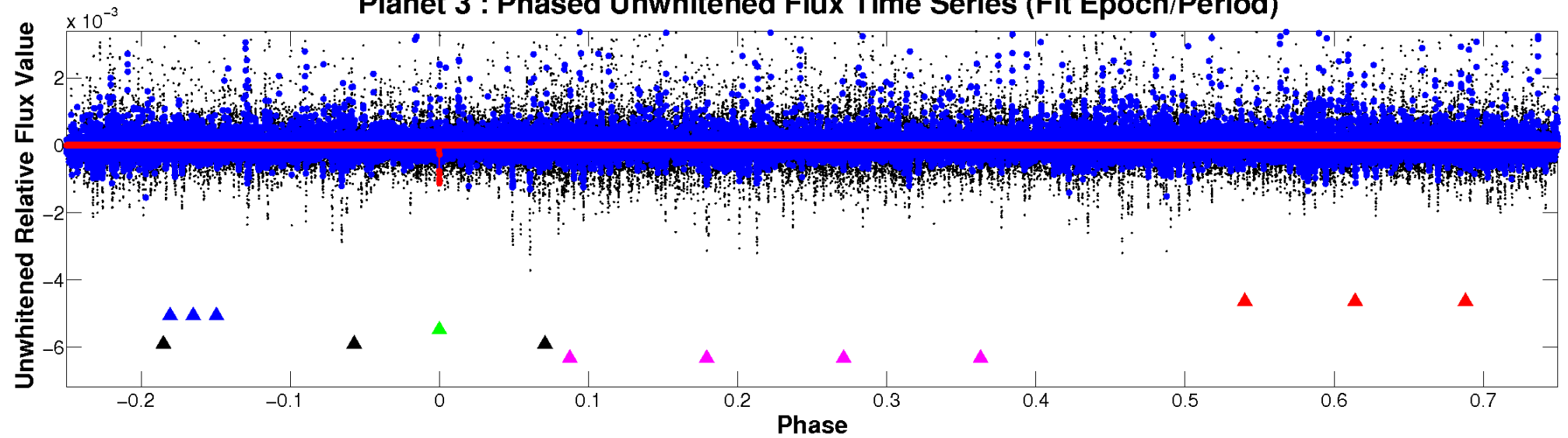
# ALT Odd/Even

TCE 008044516-03

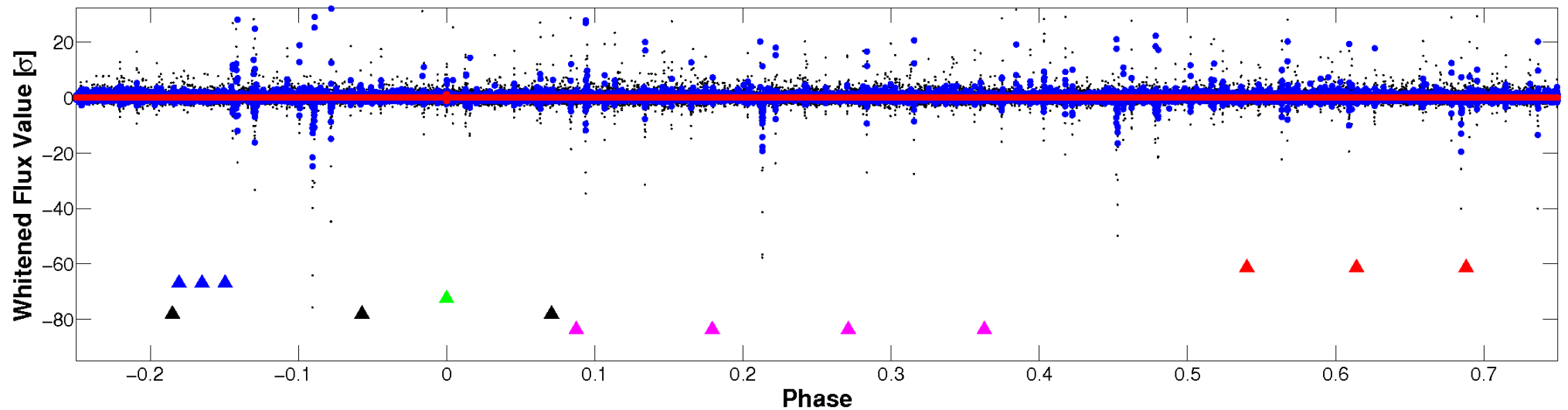


# Non-Whitened Vs. Whitened Light Curve

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

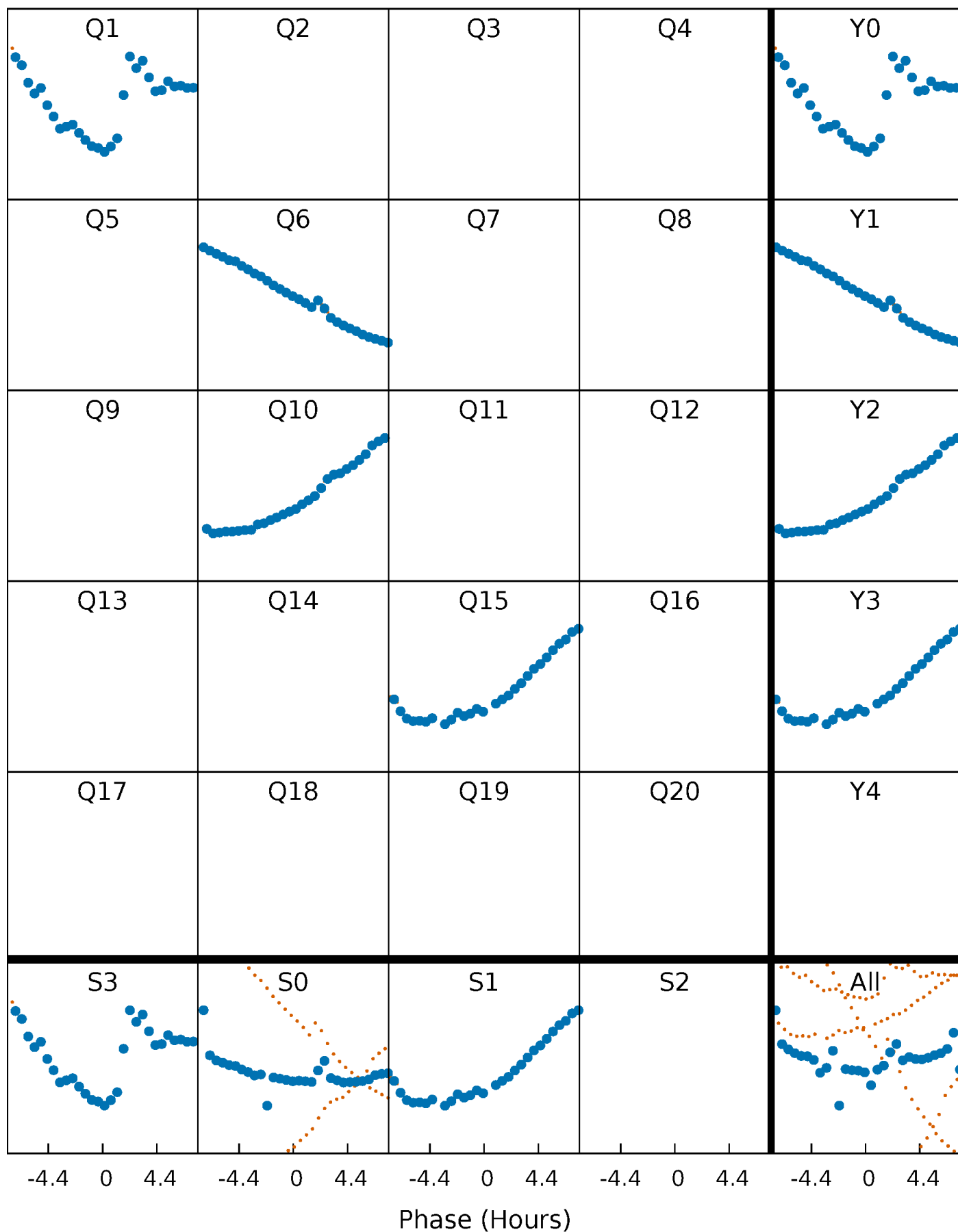


Planet 3 : Phased Whitened Flux Time Series (Fit Epoch/Period)



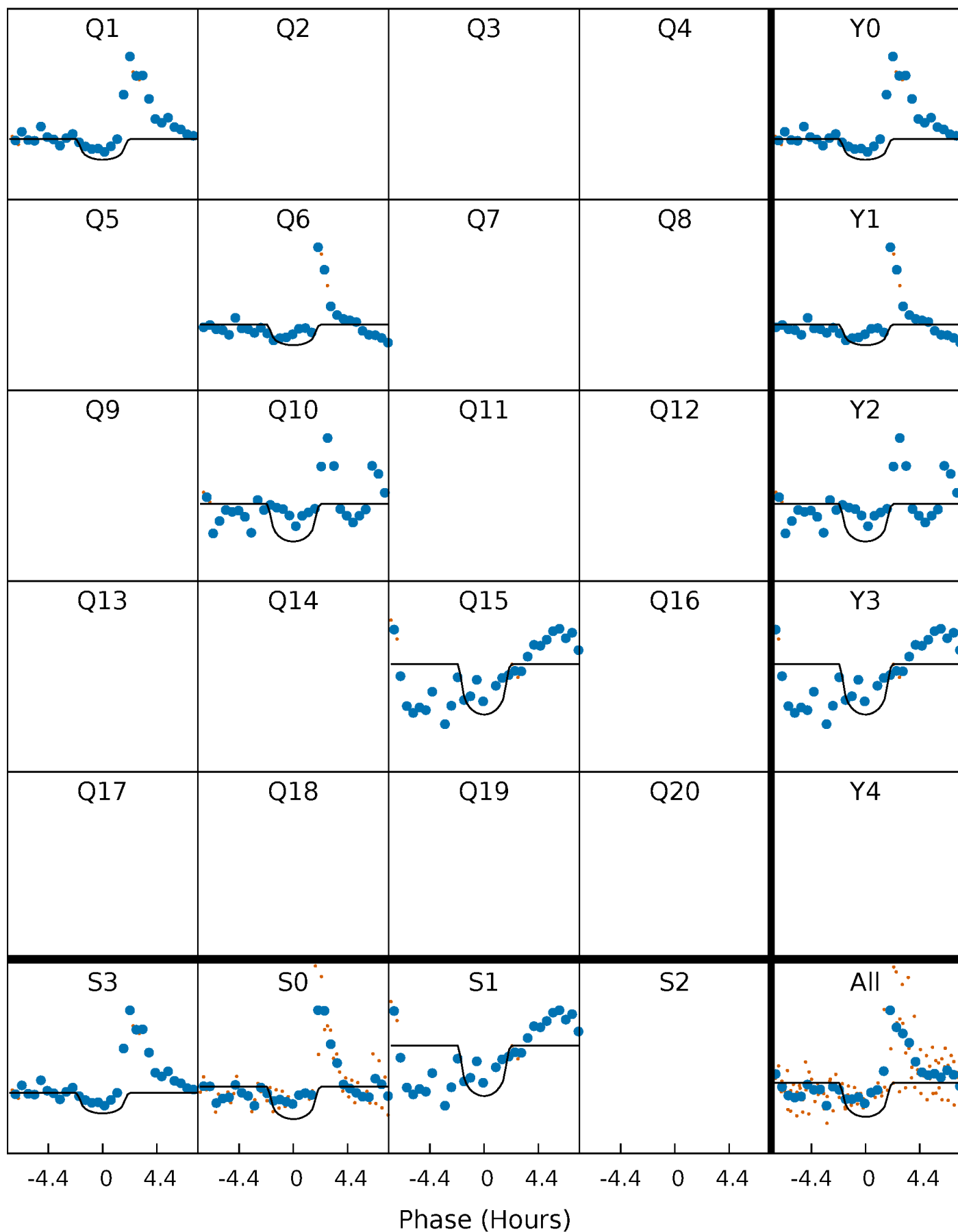
# PDC Quarter-Phased Transit Curves

TCE 008044516-03 P=418.837760 Days  $T_0=139.684181$  (BKJD)



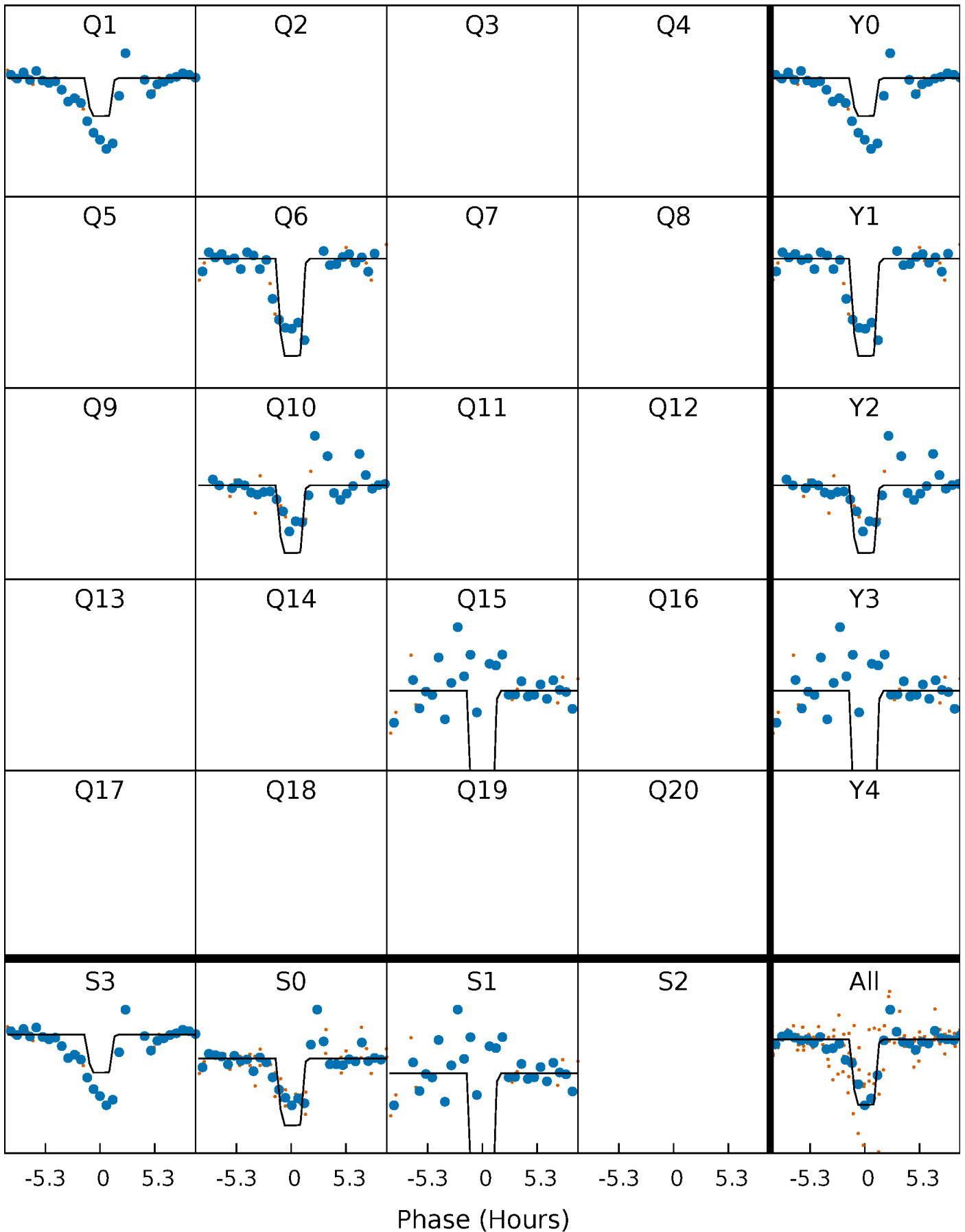
# DV Quarter-Phased Transit Curves

TCE 008044516-03 P=418.837760 Days  $T_0=139.684181$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

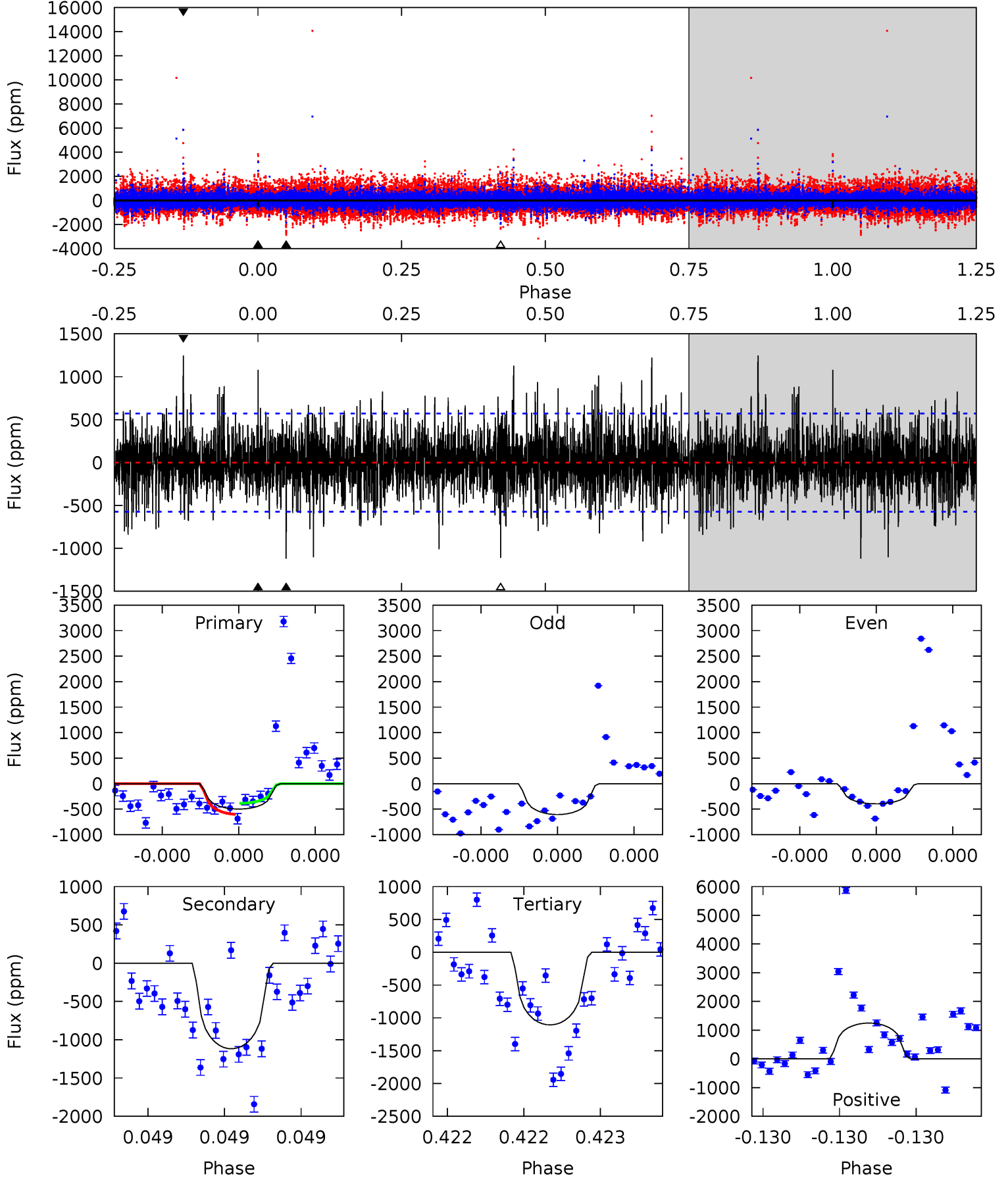
TCE 008044516-03 P=418.847113 Days  $T_0=139.671220$  (BKJD)



# DV Model-Shift Uniqueness Test

008044516-03, P = 418.837760 Days, E = 139.684181 Days

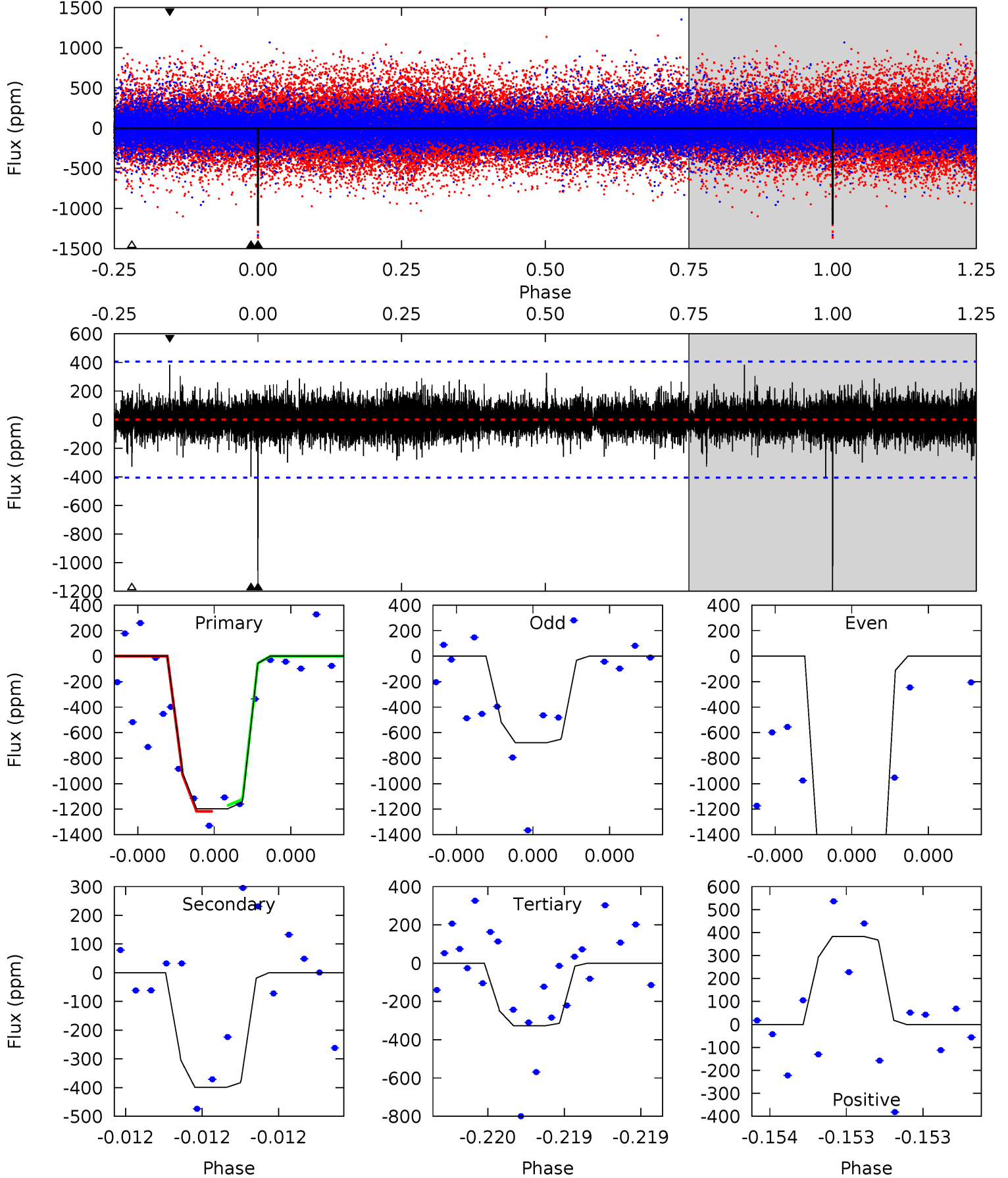
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
4.88	10.9	10.8	12.2	5.61	3.53	2.49	-5.96	-7.34	0.10	-1.27	0.72	1.07	0.53	1.06



# Alt Model-Shift Uniqueness Test

008044516-03, P = 418.847113 Days, E = 139.671220 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
16.8	5.61	4.60	5.39	5.69	3.67	0.90	12.2	11.4	1.01	0.23	14.1	1.15	0.24	0.32





### Stellar Parameters For KIC 008044516

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (g \cdot \text{cm}^{-3})$
	$4755^{+170}_{-170}$	$4.602^{+0.044}_{-0.040}$	$-0.120^{+0.300}_{-0.300}$	$0.699^{+0.063}_{-0.057}$	$0.713^{+0.072}_{-0.065}$	$2.937^{+0.616}_{-0.467}$
	+4%/-4%	+1%/-1%	+250%/-250%	+9%/-8%	+10%/-9%	+21%/-16%
Source	PHO54	PHO54	PHO54	DSEP		

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

### Secondary Eclipse Parameters for KIC 008044516-03 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-1118 \pm 102$	$4.44^{+4.11}_{-2.79}$	$247^{+9}_{-9}$	$3867^{+1946}_{-722}$	$30217^{+195554}_{-22036}$
Alt.	$-400 \pm 71$	$4.62^{+4.19}_{-3.07}$	$247^{+10}_{-10}$	$3222^{+1539}_{-528}$	$10012^{+74222}_{-7373}$

$T_{max}$  = 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

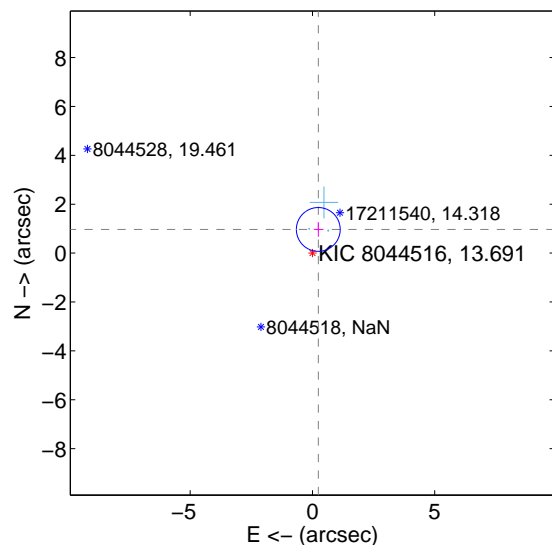
Supplemental centroid analysis for 008044516-03. Kepler magnitude: 13.69. Transit SNR 7.29

There are 3 quarters with good PRF difference image offsets

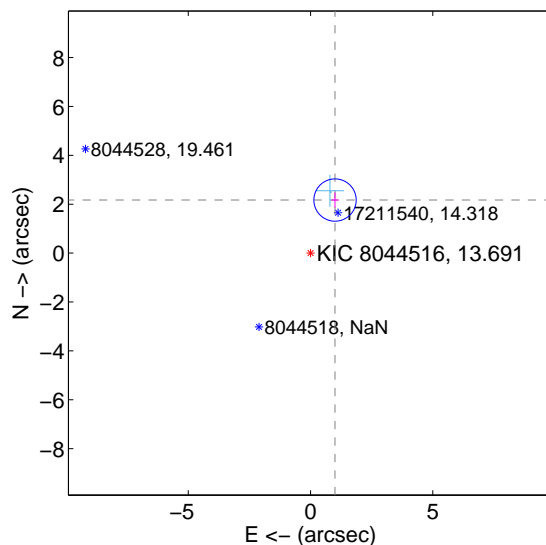
The direct PRF centroid is offset from the target star catalog position by about 0.94 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.997 \pm 0.299$	3.34	$-0.239 \pm 0.184$	$0.968 \pm 0.301$
PRF-fit source offset from KIC position	$2.390 \pm 0.288$	8.29	$-1.002 \pm 0.154$	$2.170 \pm 0.310$
photometric centroid source offset	$0.83 \pm 2.47$	0.34	$0.42 \pm 2.12$	$-0.72 \pm 2.58$

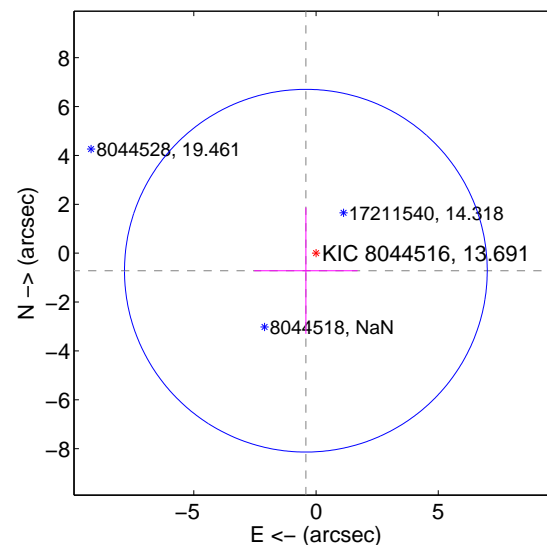
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position

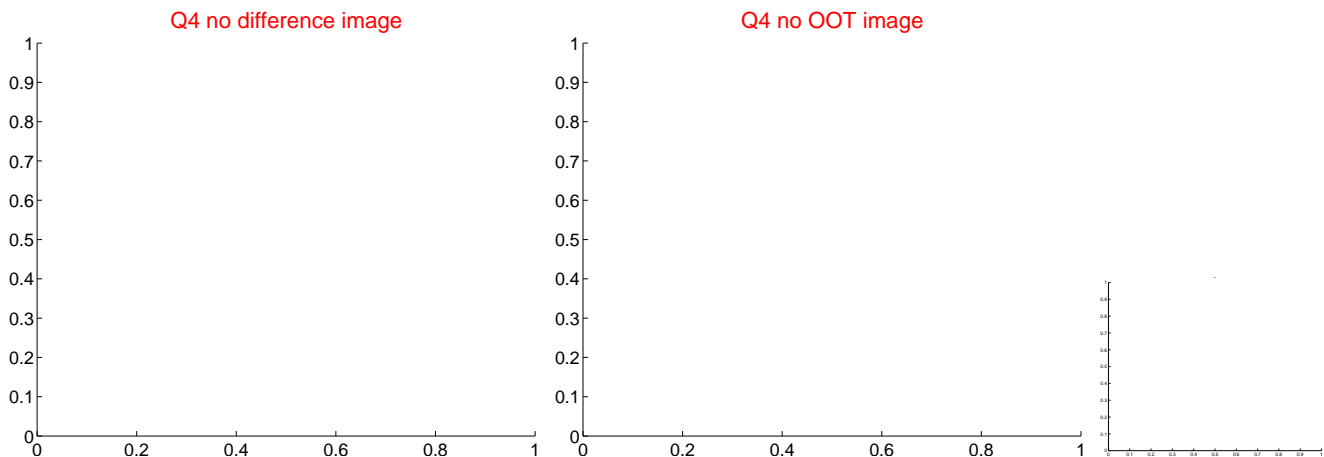
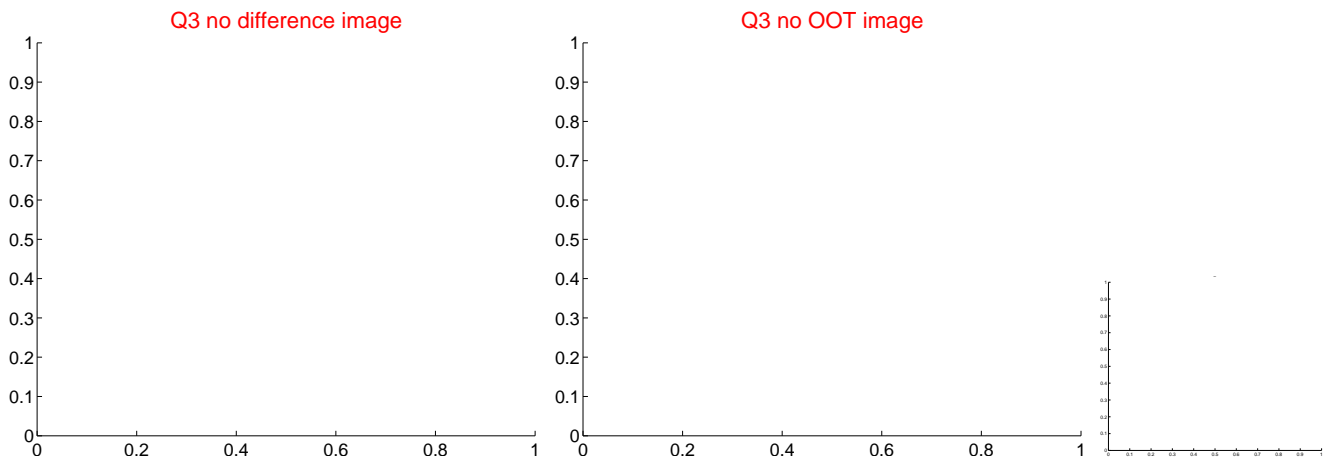
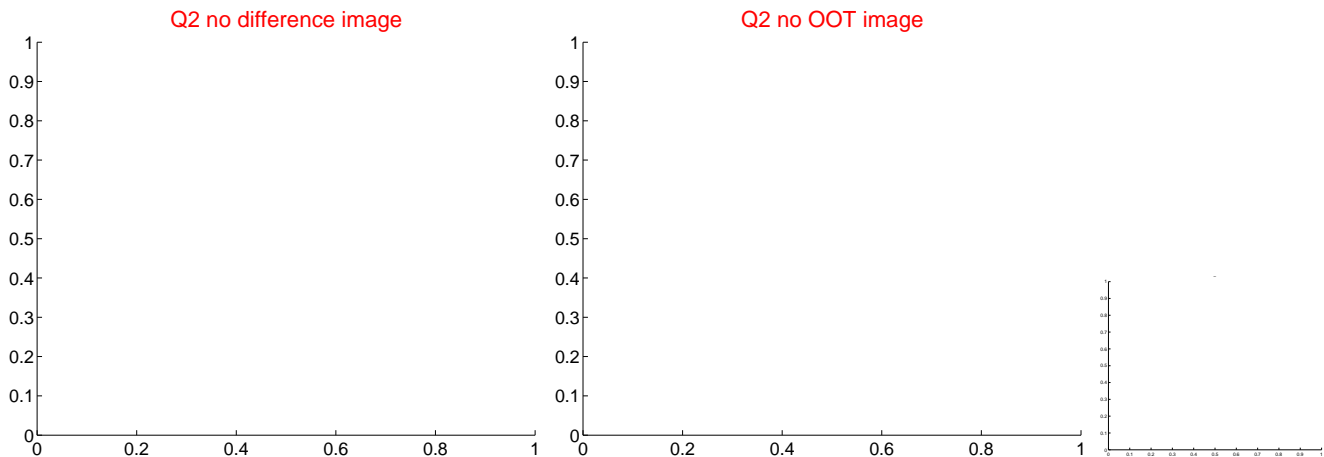
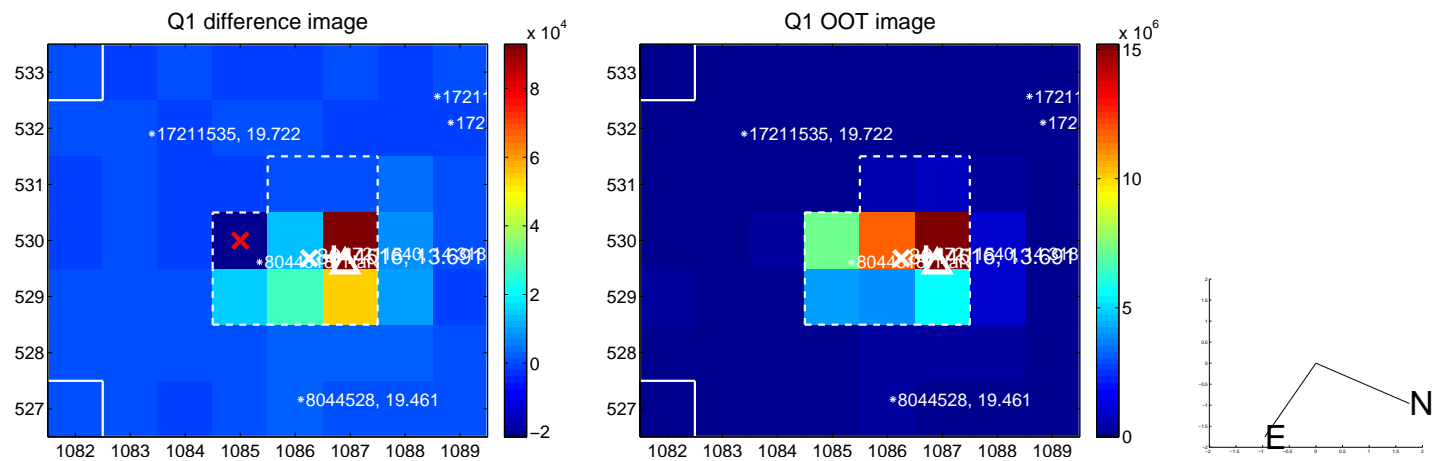


offset from photometric centroids

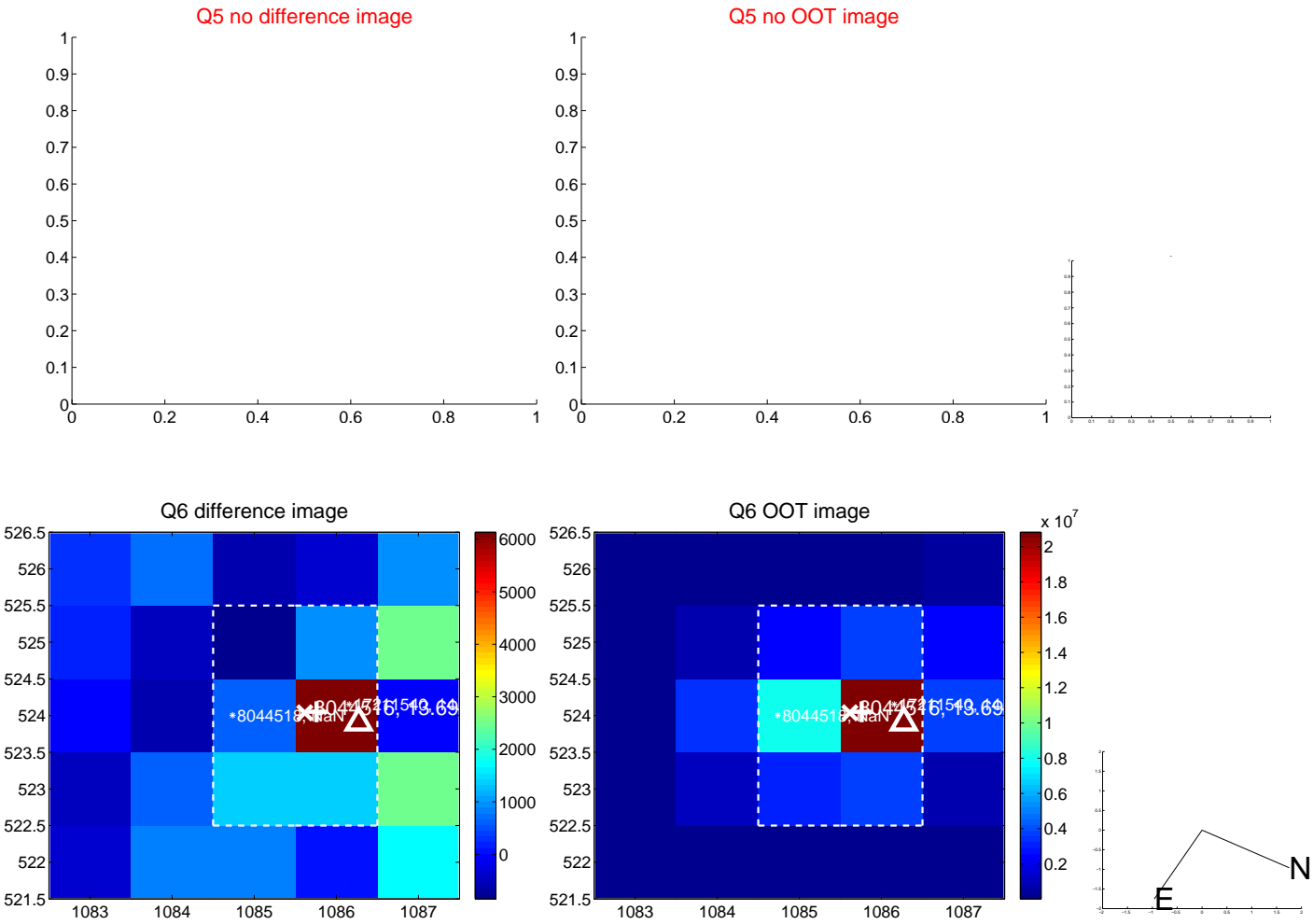


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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

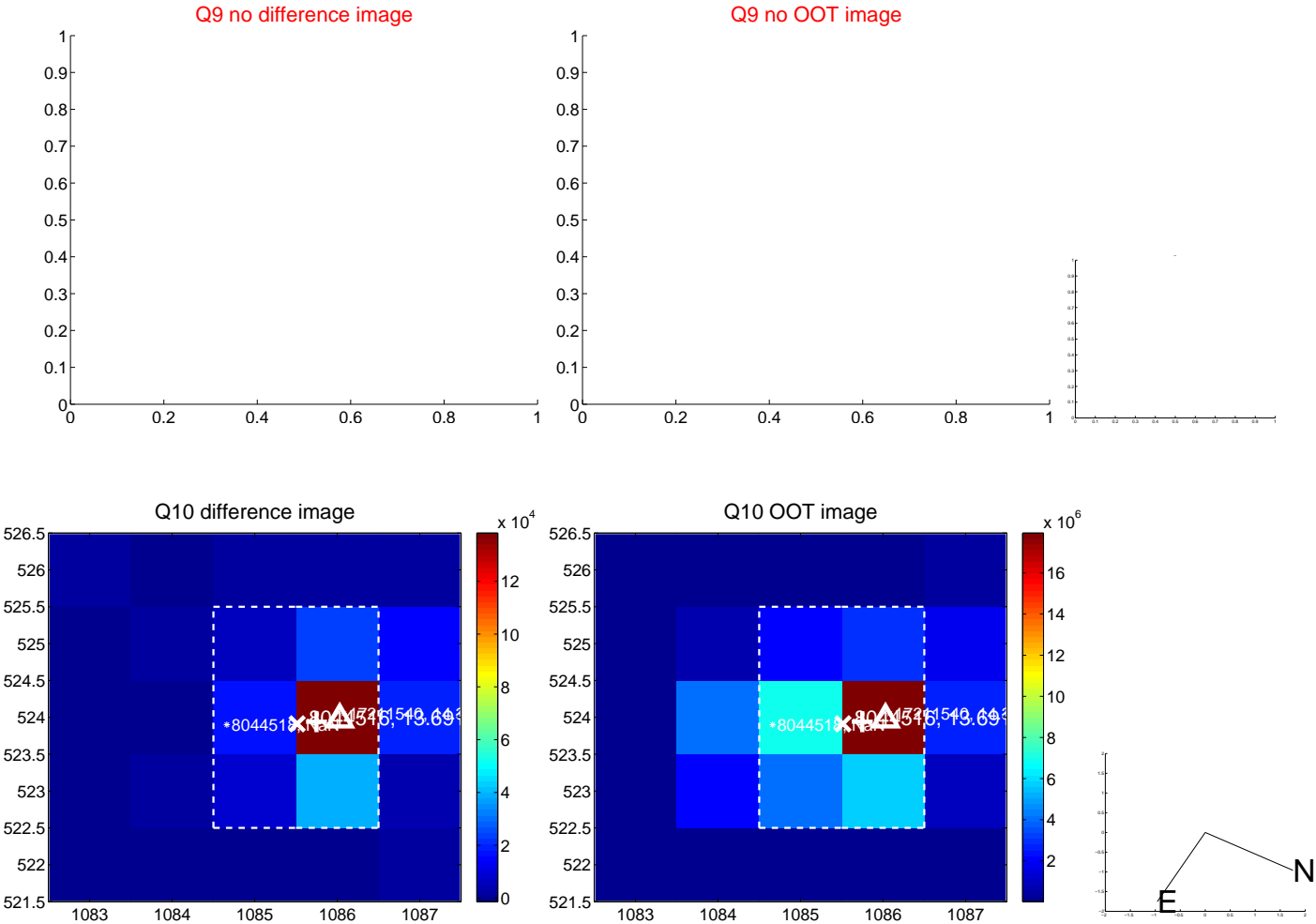
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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



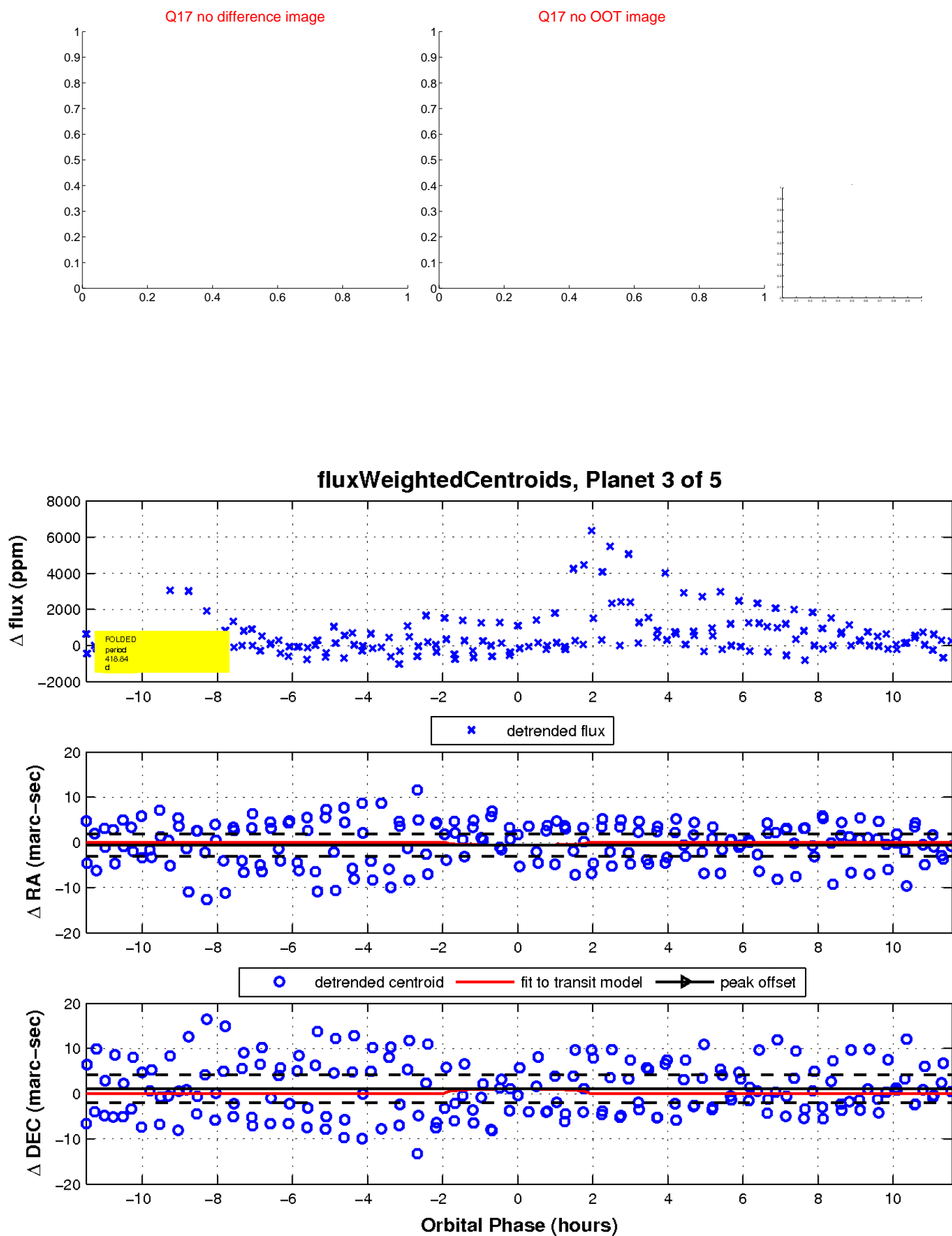
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

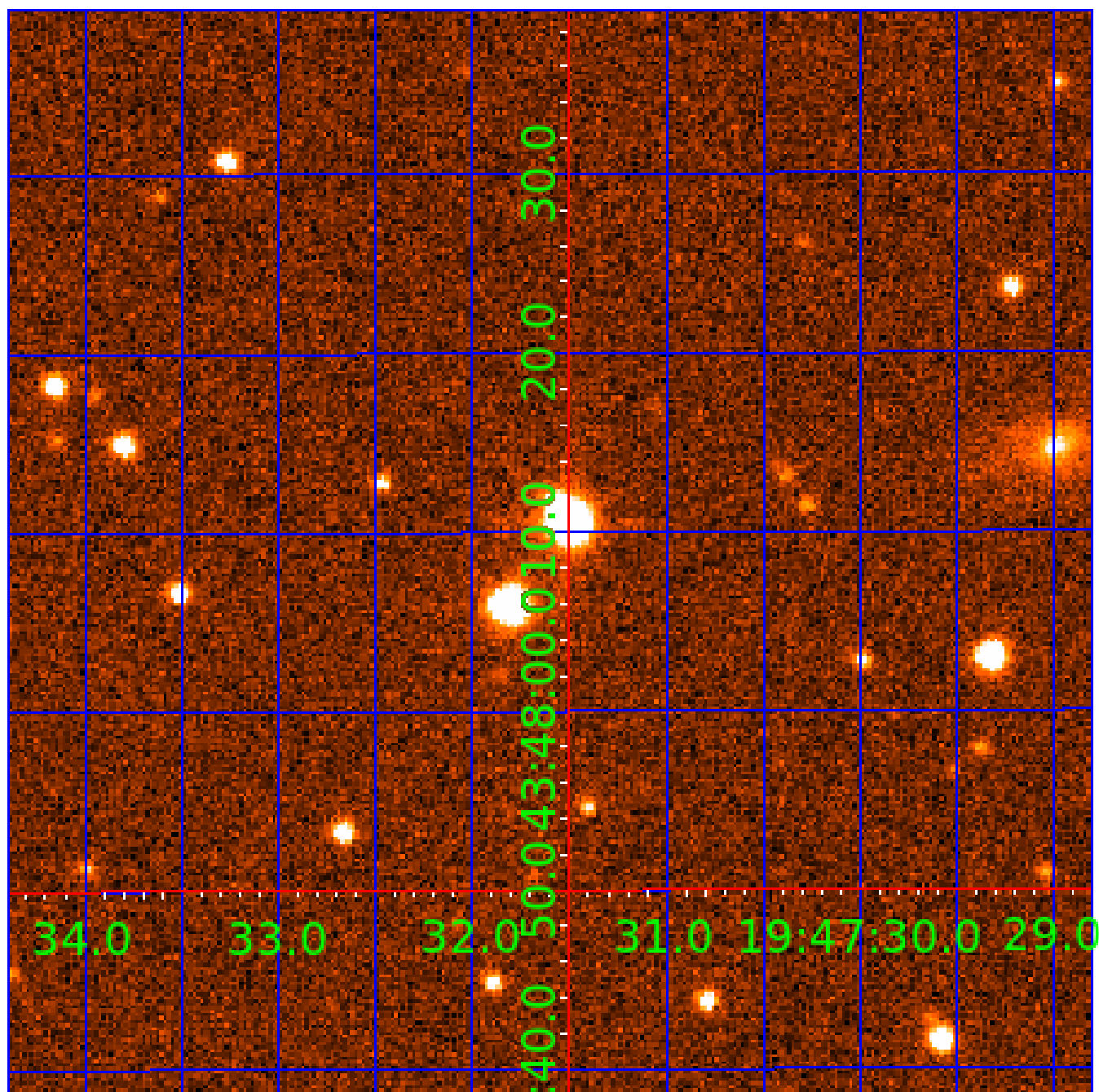


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination





# KIC 008044516

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
008044516-01	OBS	No	387.848537	427.884080	1681.6	2.531	13.2	8.5	0.70	4755	2.90	0.26
008044516-03	OBS	No	418.837760	139.684182	1131.1	3.866	14.2	7.3	0.70	4755	2.26	0.23
008044516-04	OBS	No	472.424408	481.023406	1823.8	15.628	10.5	6.1	0.70	4755	2.87	0.20
008044516-05	OBS	No	457.289830	176.326717	1452.2	5.382	10.3	6.5	0.70	4755	2.63	0.21

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
008044516-01	OBS	FP	0.00	1	0	1	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—ALL_TRANS_CHASES—MOD_POS_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS—HALO_GHOST
008044516-03	OBS	FP	0.00	1	0	1	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—CENT_UNCERTAIN—HALO_GHOST
008044516-04	OBS	FP	0.00	1	0	0	0	LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—CENT_KIC_POS
008044516-05	OBS	FP	0.00	1	0	1	0	INDIV_TRANS_RUBBLE_CHASES_MARSHALL_SKYE—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—HALO_GHOST

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

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

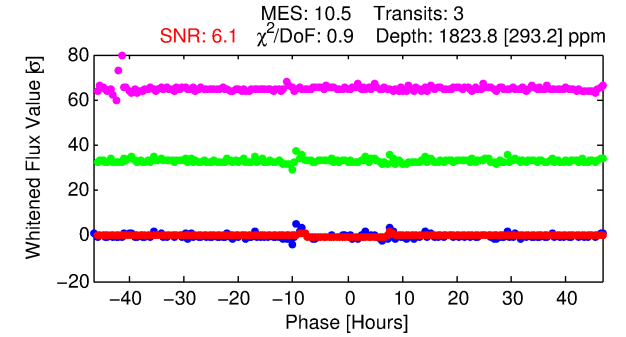
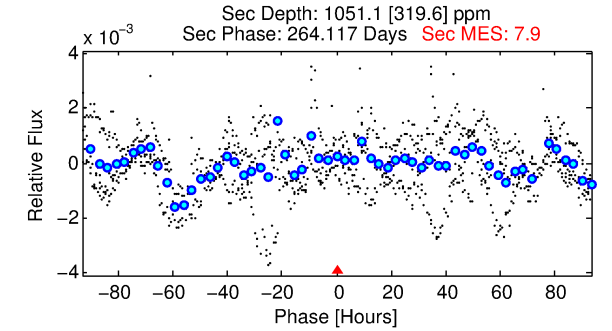
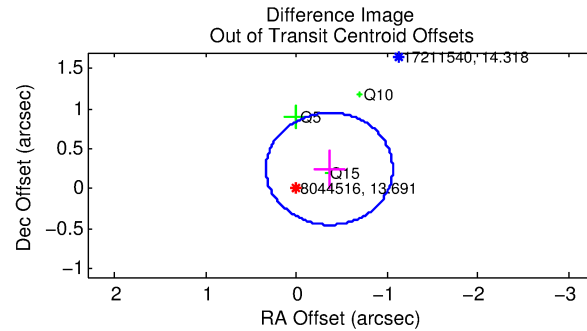
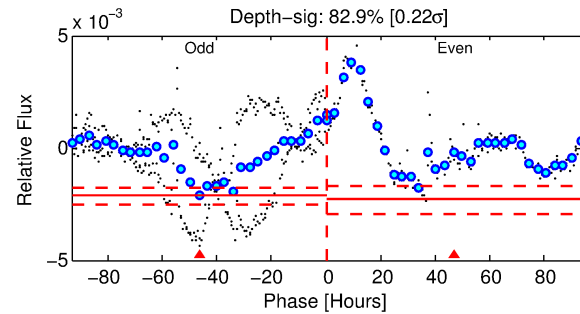
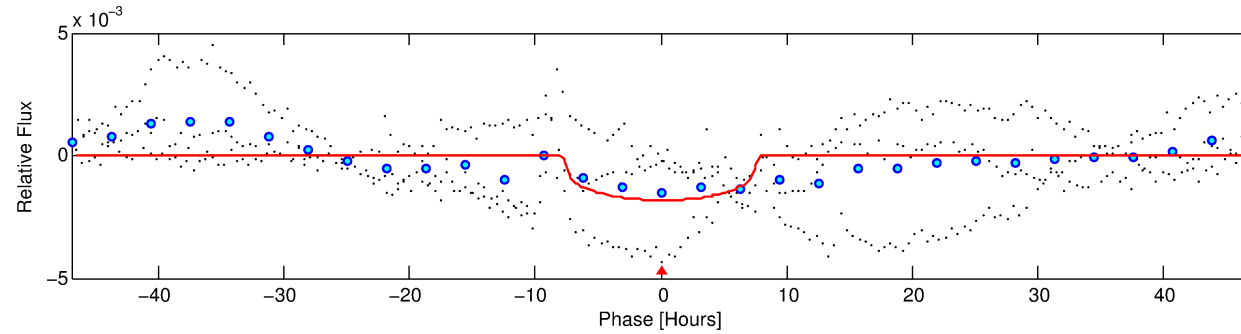
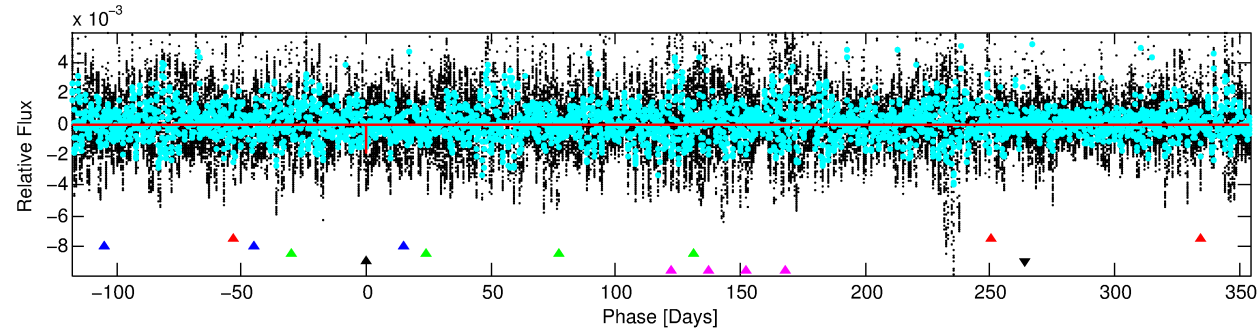
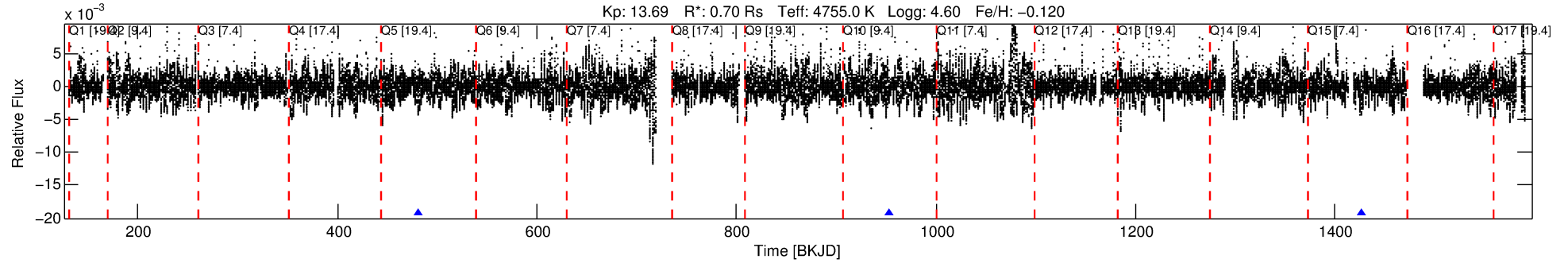
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 008044516-04

No Significant Match Found

# DV One-Page Summary

KIC: 8044516 Candidate: 4 of 5 Period: 472.424 d



## DV Fit Results:

Period = 472.42441 [0.00519] d  
Epoch = 481.0234 [0.0066] BKJD  
Rp/R\* = 0.0376 [0.0089]  
a/R\* = 239.62 [163.64]  
b = 0.00 [453.06]  
Seff = 0.20 [0.03]  
Teq = 170 [7] K  
Rp = 2.87 [0.72] Re  
a = 1.0606 [0.0731] AU  
Ag = 79114.54 [44924.72] [1.76 $\sigma$ ]  
Teffp = 4416 [639] K [6.65 $\sigma$ ]

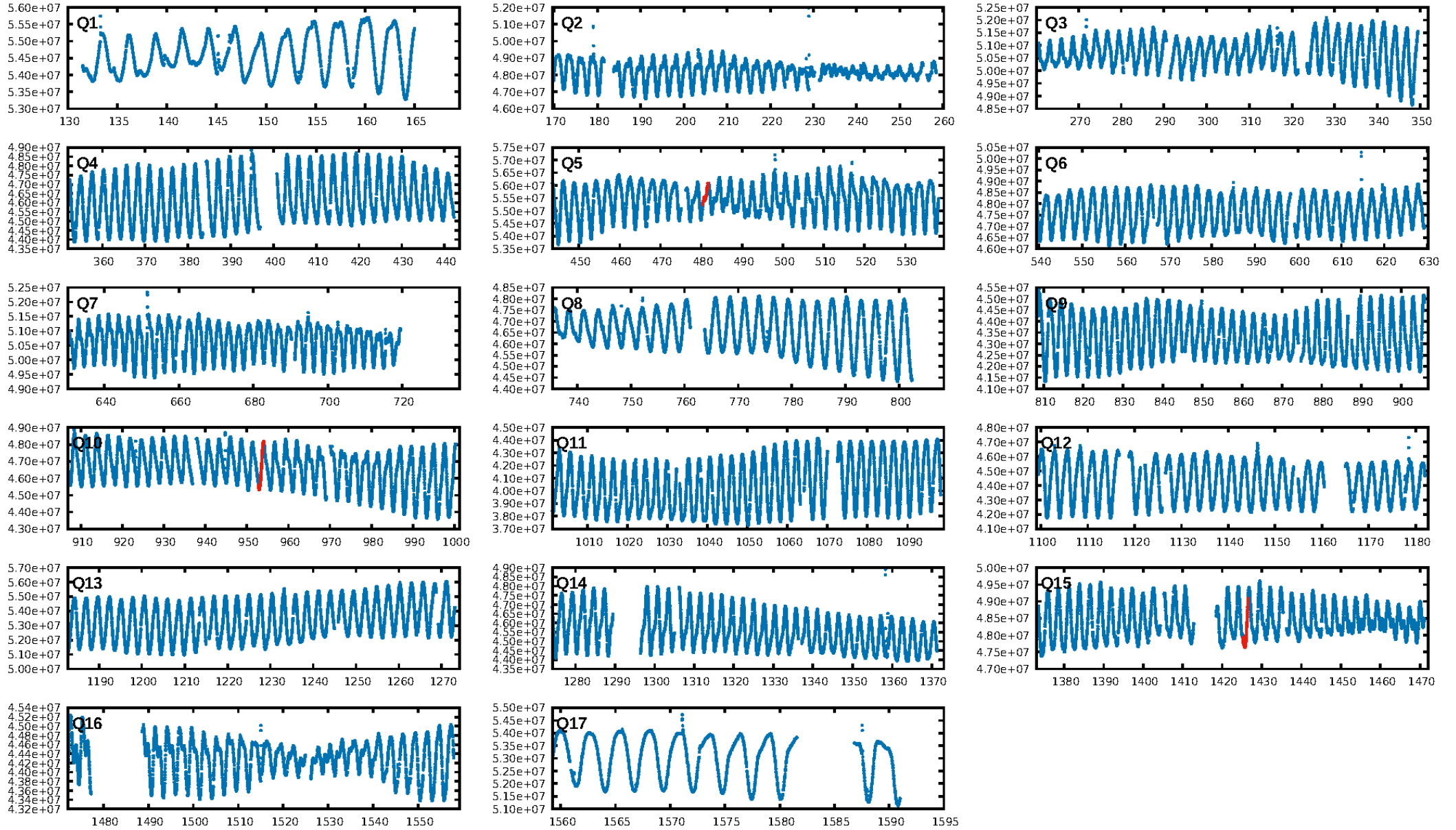
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [21.98 $\sigma$ ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: 46.8%  
ModelChiSquareGof-sig: 100.0%  
Bootstrap-pfa: 6.42e-08  
RollingBand-fgt: 1.00 [3/3]  
GhostDiagnostic-chr: -78.08  
Centroid-sig: 0.1%  
Centroid-so: 4.203 arcsec [2.08 $\sigma$ ]  
OotOffset-rm: 0.439 arcsec [1.89 $\sigma$ ]  
OotOffset-st: 1/1/0/1 [3]  
KicOffset-rm: 2.055 arcsec [15.73 $\sigma$ ]  
KicOffset-st: 1/1/0/1 [3]  
DiffImageQuality-fgm: 1.00 [3/3]  
DiffImageOverlap-fno: 1.00 [3/3]

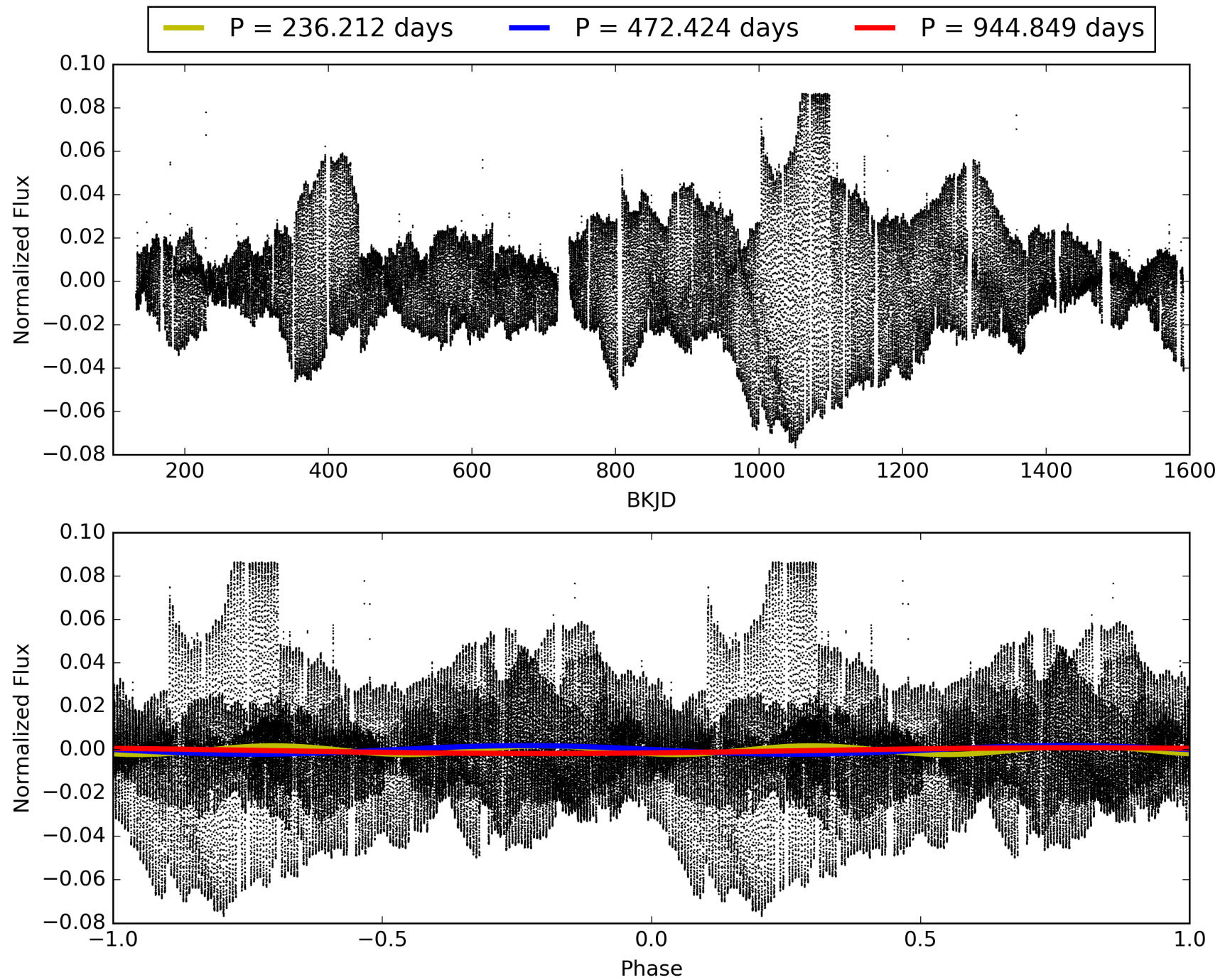
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 01-Feb-2016 05:27:03 Z

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

# TCE 008044516-04, PDC Light Curves

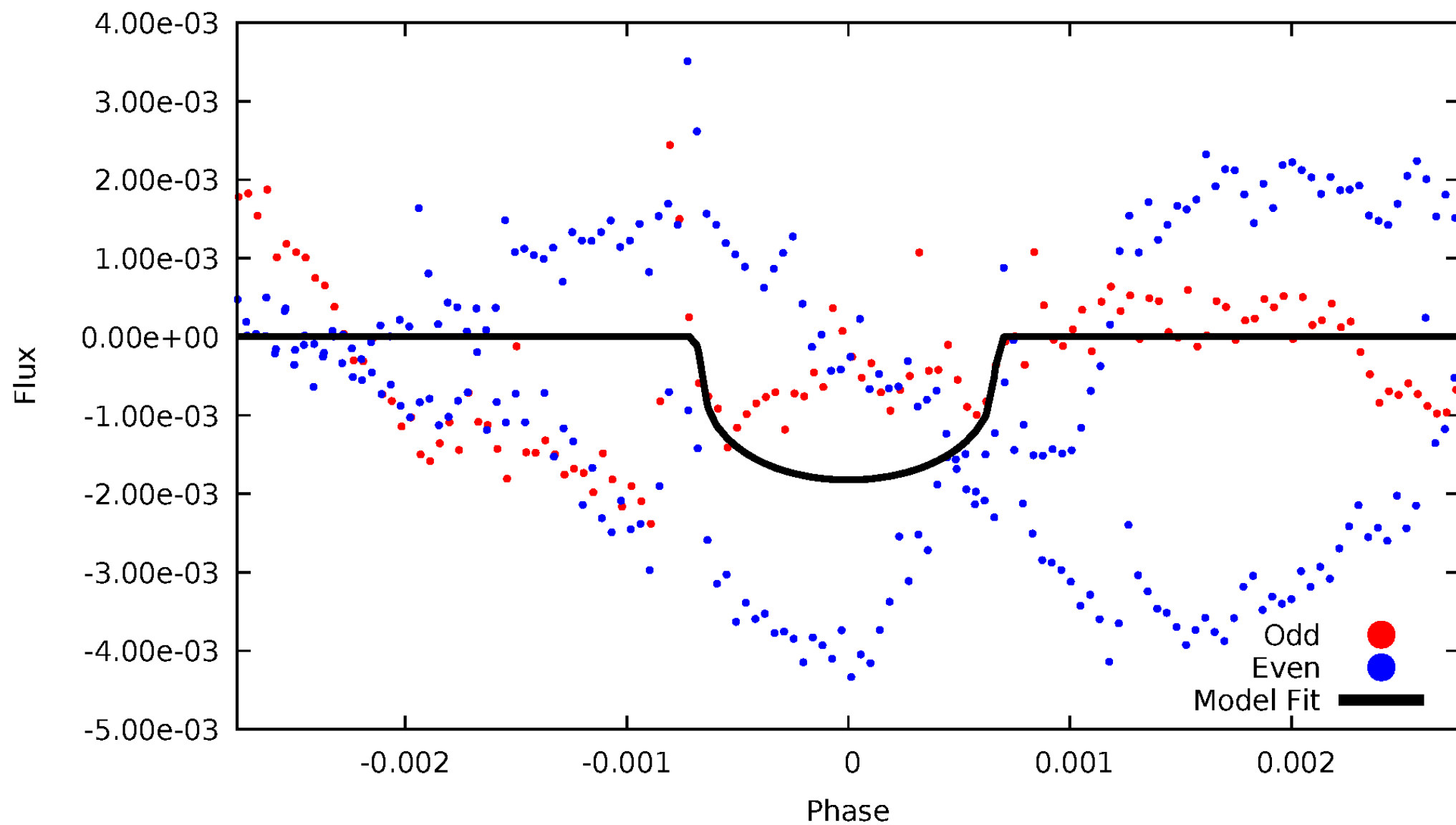


TCE 008044516-04



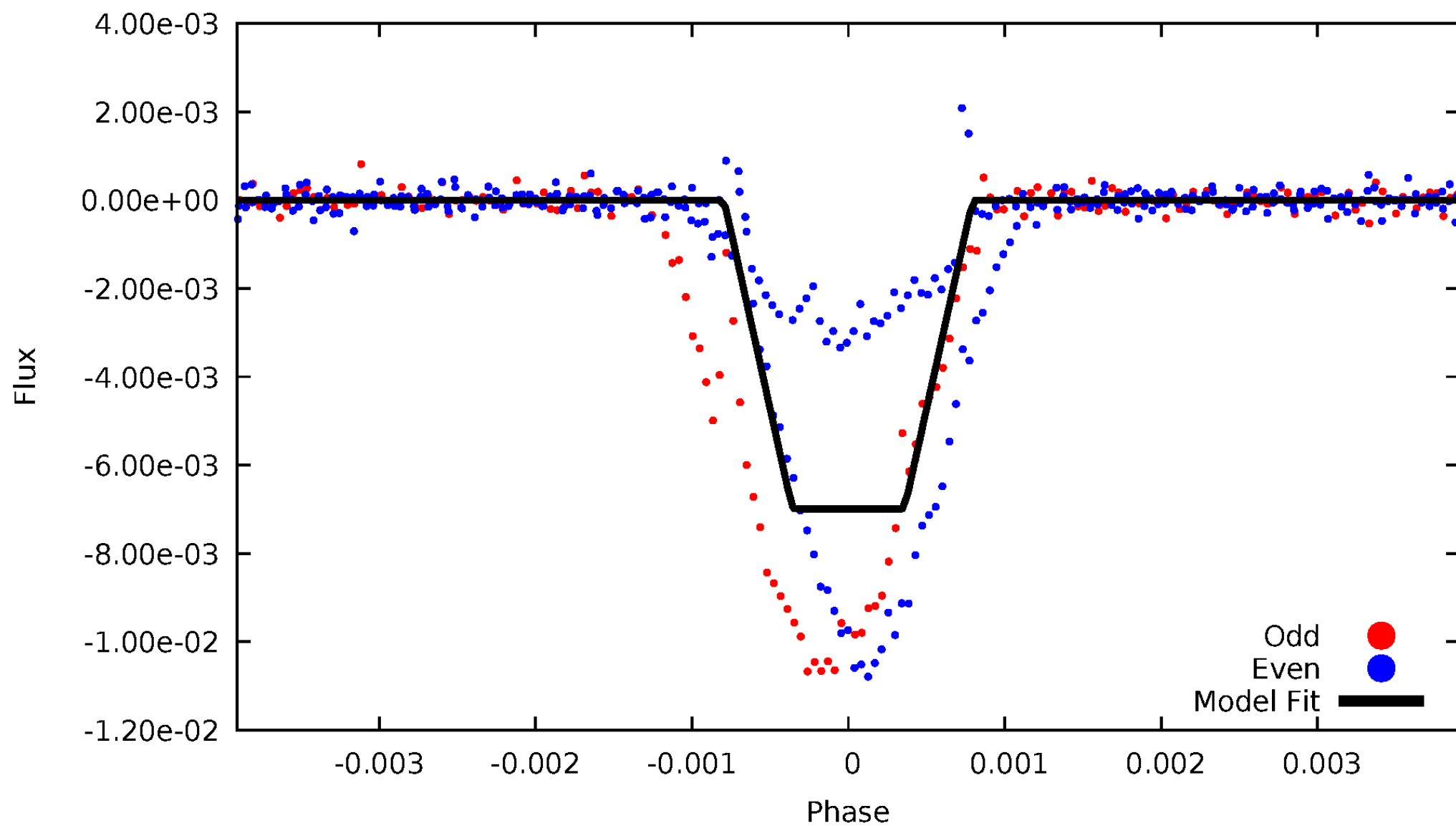
# DV Odd/Even

TCE 008044516-04



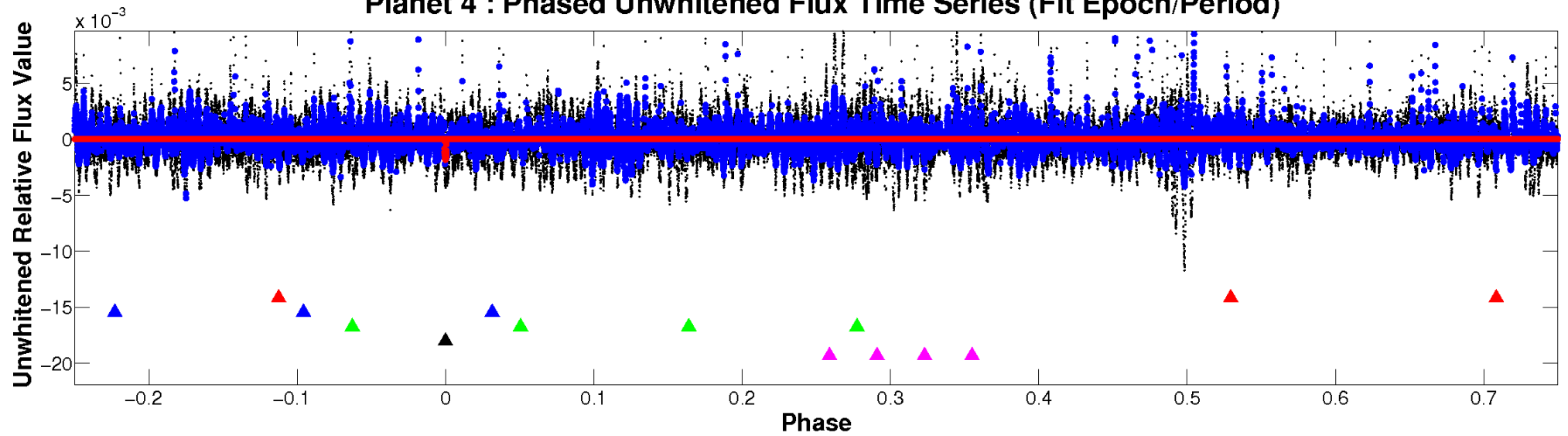
# ALT Odd/Even

TCE 008044516-04

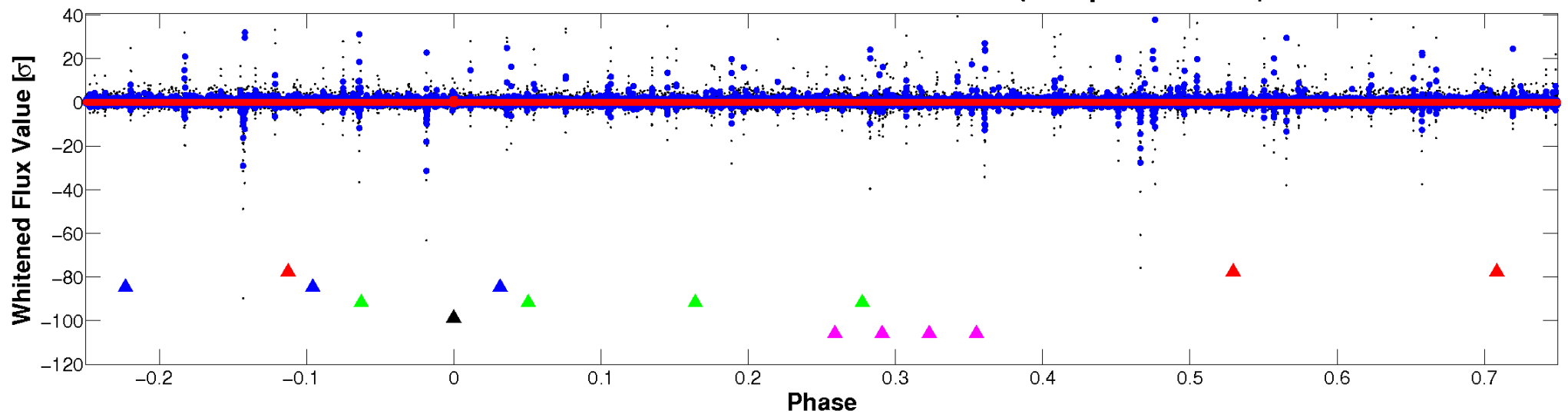


# Non-Whitened Vs. Whitened Light Curve

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



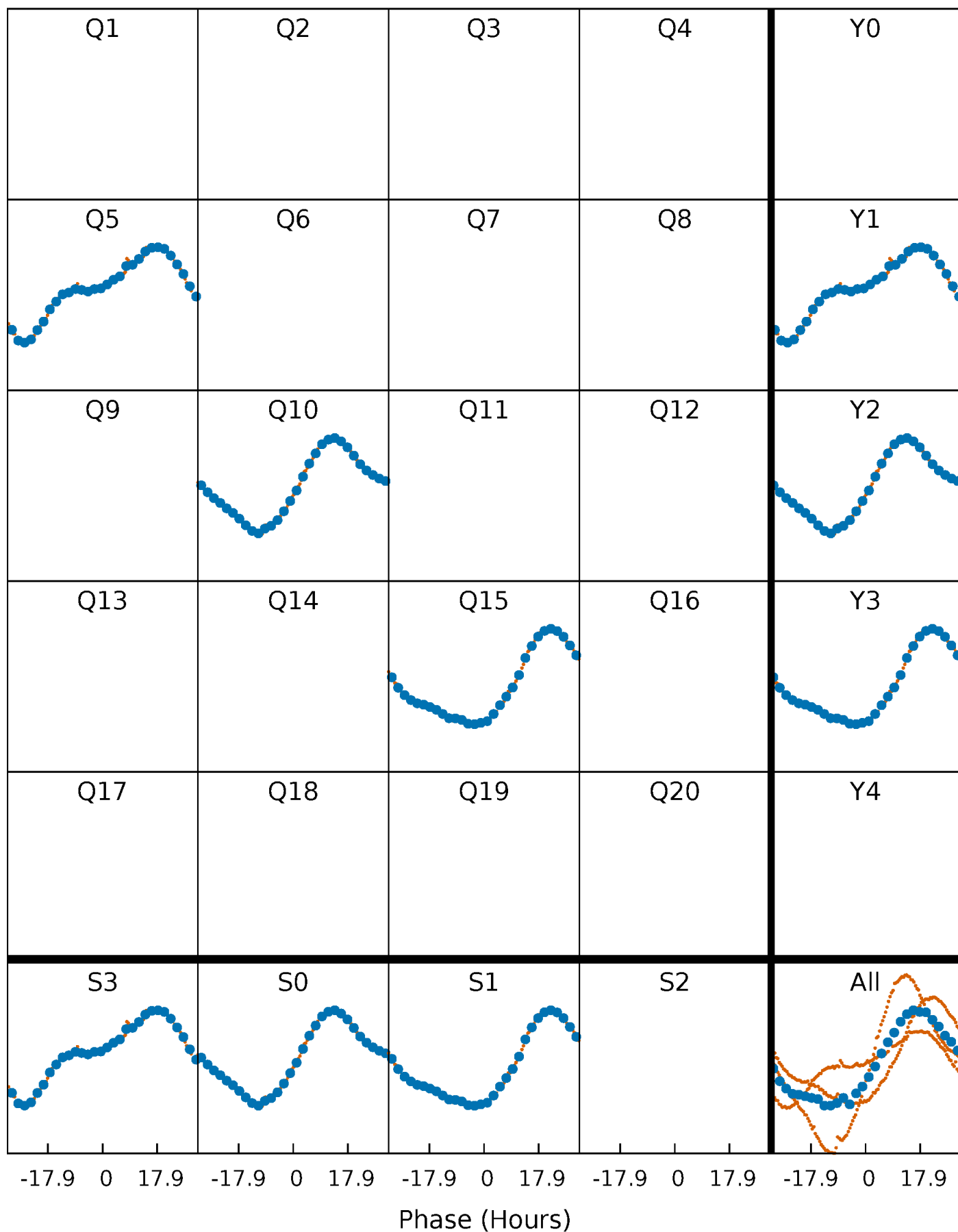
## Planet 4 : Phased Whitened Flux Time Series (Fit Epoch/Period)





# PDC Quarter-Phased Transit Curves

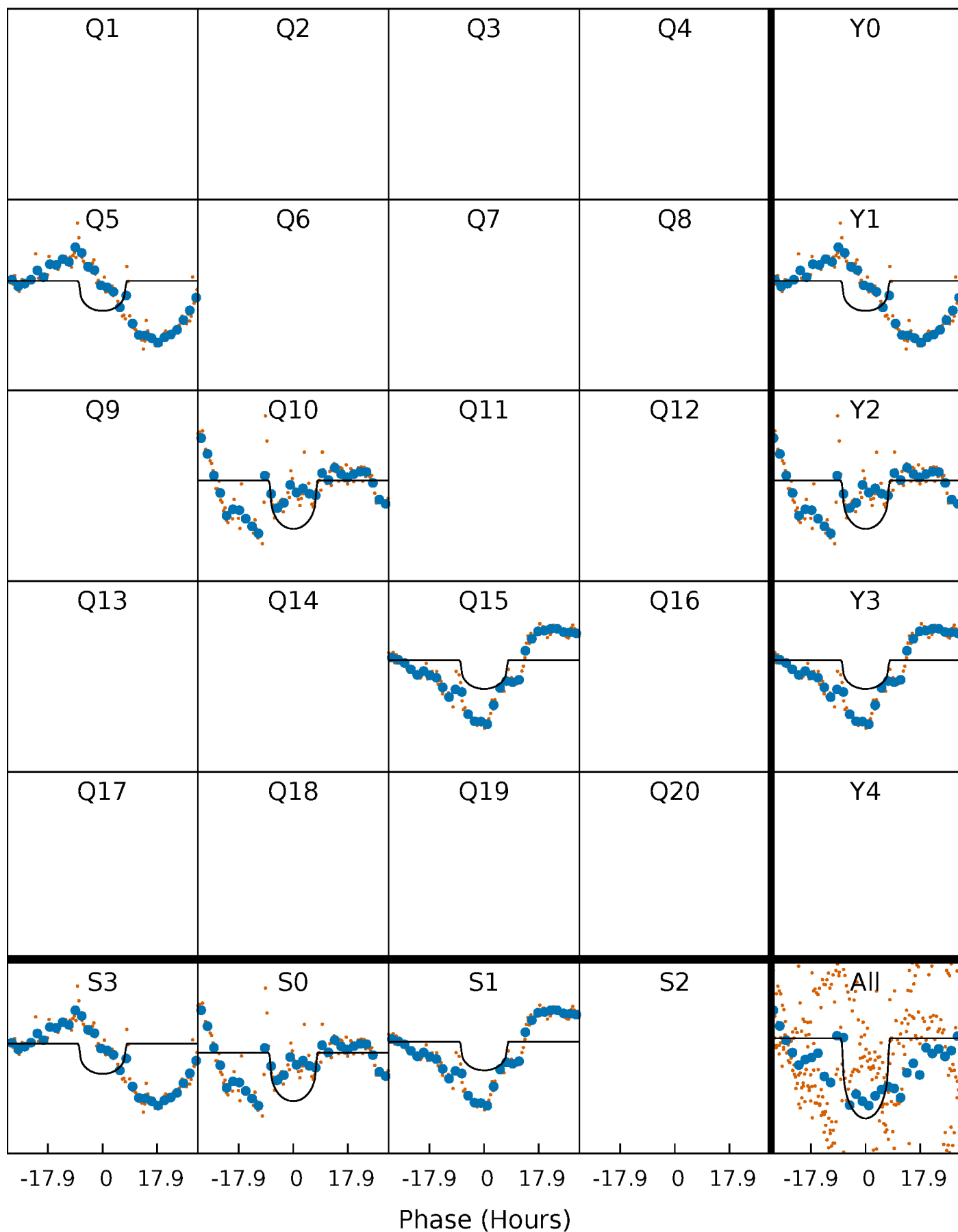
TCE 008044516-04 P=472.424408 Days  $T_0=481.023406$  (BKJD)





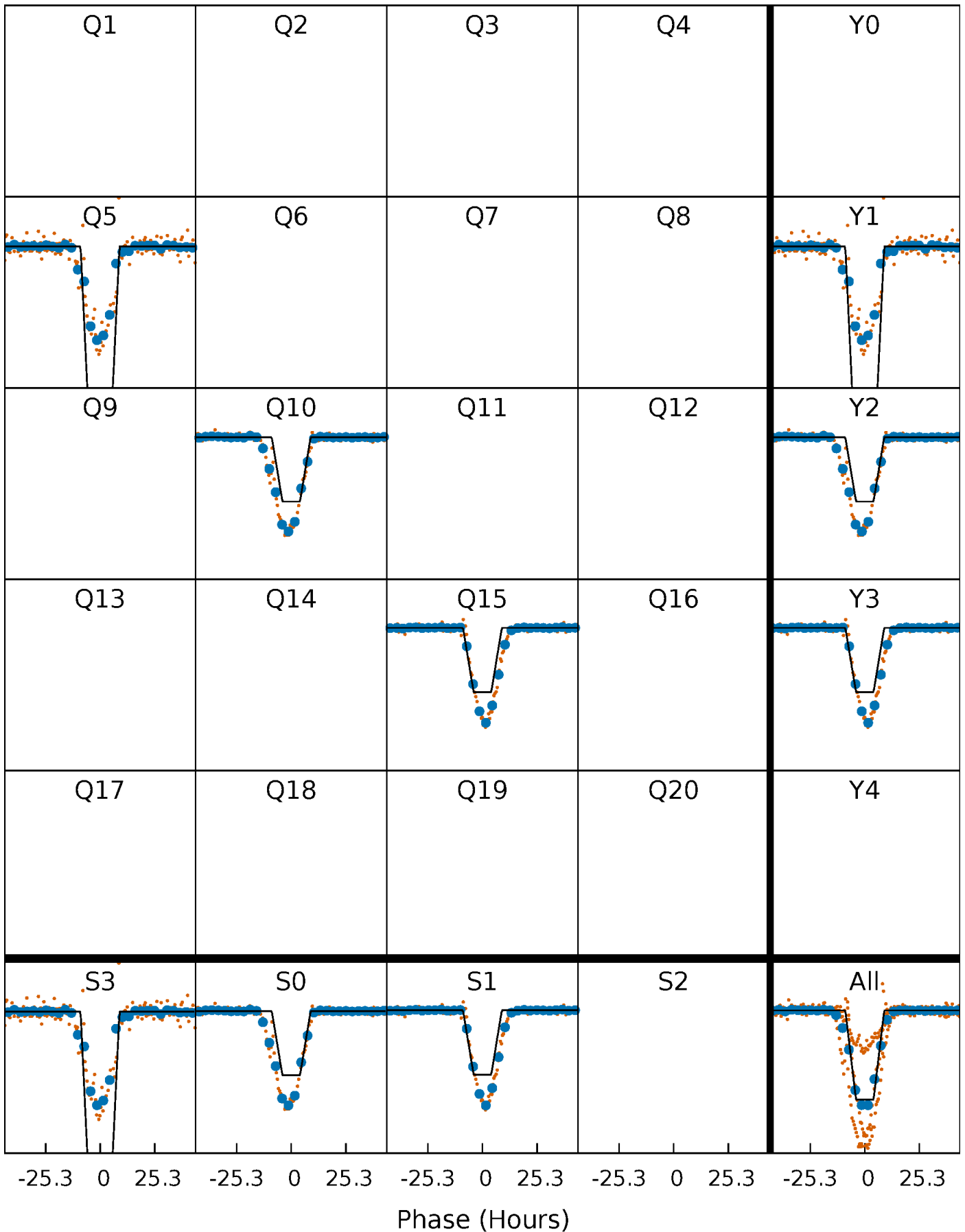
# DV Quarter-Phased Transit Curves

TCE 008044516-04 P=472.424408 Days  $T_0=481.023406$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

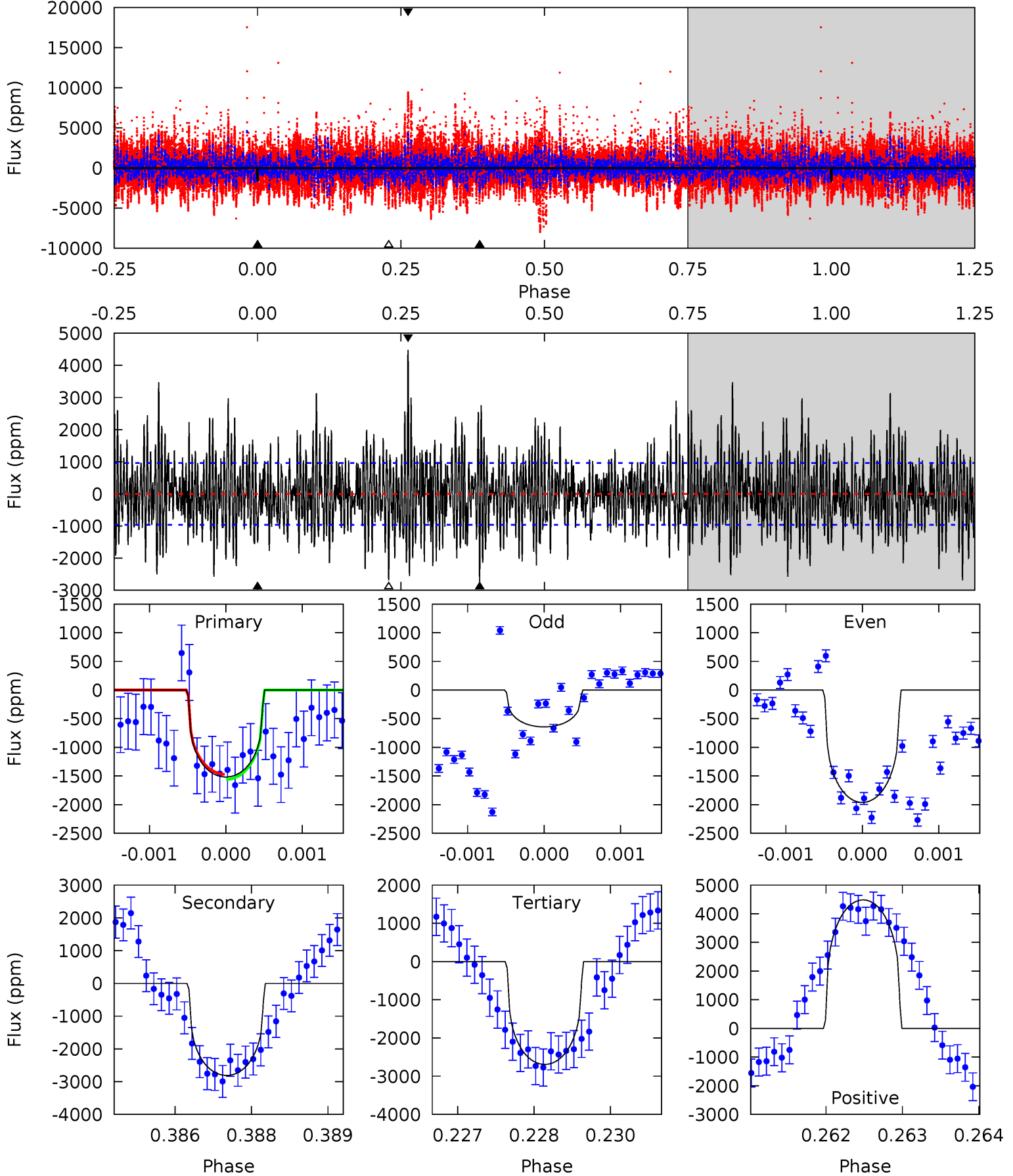
TCE 008044516-04 P=472.423907 Days  $T_0=481.011924$  (BKJD)



# DV Model-Shift Uniqueness Test

008044516-04, P = 472.424408 Days, E = 8.598998 Days

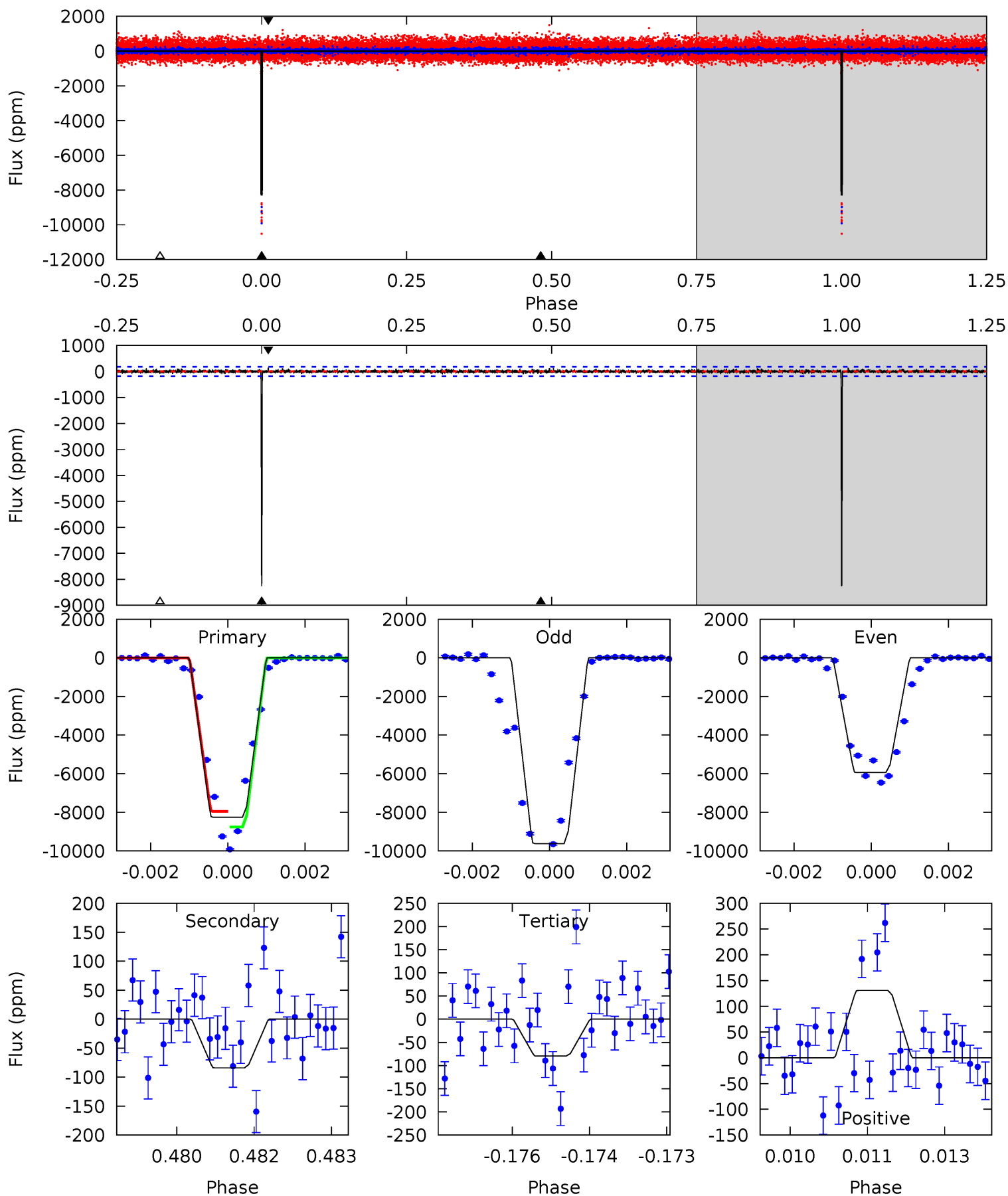
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
8.50	15.7	15.1	25.1	5.39	3.20	5.25	-6.58	-16.6	0.67	-9.37	2.99	2.34	0.61	0.25



# Alt Model-Shift Uniqueness Test

008044516-04, P = 472.423907 Days, E = 8.588017 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
239.9	2.45	2.31	3.80	5.37	3.16	0.62	237.6	236.1	0.13	-1.36	70.6	0.78	0.02	11.9



### Stellar Parameters For KIC 008044516

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R$ ( $R_{\odot}$ )	$M(M_{\odot})$	$p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ )
	$4755^{+170}_{-170}$	$4.602^{+0.044}_{-0.040}$	$-0.120^{+0.300}_{-0.300}$	$0.699^{+0.063}_{-0.057}$	$0.713^{+0.072}_{-0.065}$	$2.937^{+0.616}_{-0.467}$
	+4%/-4%	+1%/-1%	+250%/-250%	+9%/-8%	+10%/-9%	+21%/-16%
Source	PHO54	PHO54	PHO54	DSEP		

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

### Secondary Eclipse Parameters for KIC 008044516-04 / KOI

Detrend	Depth (ppm)	$R_p$ ( $R_{\oplus}$ )	$T_{\text{max}}$ (K)	$T_{\text{obs}}$ (K)	$A_{\text{obs}}$
DV	$-2810 \pm 178$	$2.88^{+0.73}_{-0.69}$	$237^{+10}_{-10}$	$5496^{+828}_{-494}$	$210811^{+160250}_{-72327}$
Alt.	$-84 \pm 34$	$6.38^{+0.76}_{-0.79}$	$238^{+10}_{-9}$	$2403^{+141}_{-155}$	$1242^{+654}_{-526}$

$T_{\text{max}}$  = 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

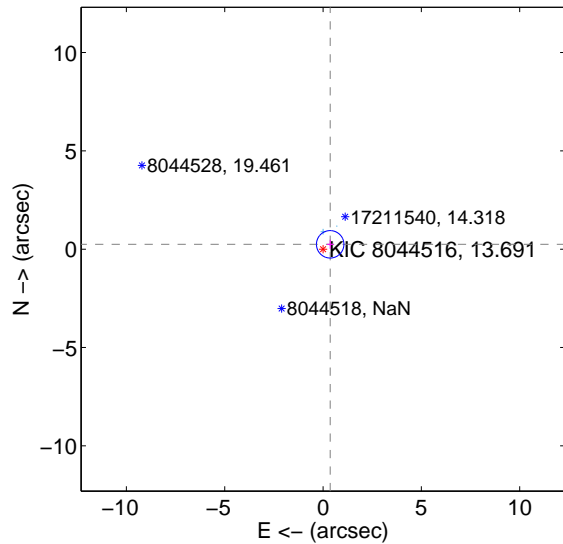
Supplemental centroid analysis for 008044516-04. Kepler magnitude: 13.69. Transit SNR 6.13

There are 3 quarters with good PRF difference image offsets

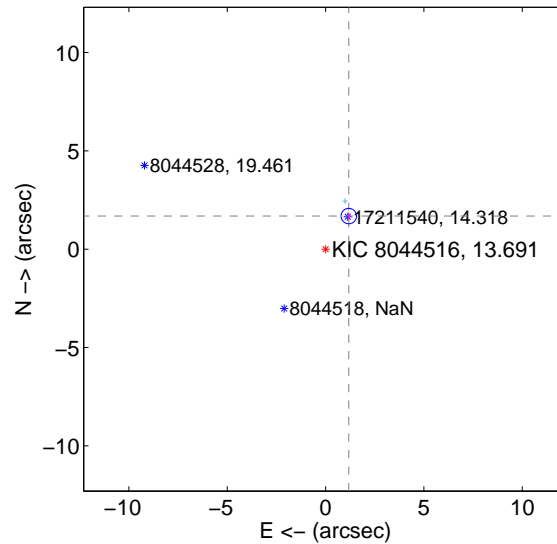
The direct PRF centroid is offset from the target star catalog position by about 1.71 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.439 \pm 0.233$	1.89	$-0.363 \pm 0.169$	$0.247 \pm 0.232$
PRF-fit source offset from KIC position	$2.055 \pm 0.131$	15.73	$-1.180 \pm 0.079$	$1.683 \pm 0.179$
photometric centroid source offset	$4.20 \pm 2.02$	2.08	$-2.24 \pm 1.66$	$3.55 \pm 2.14$

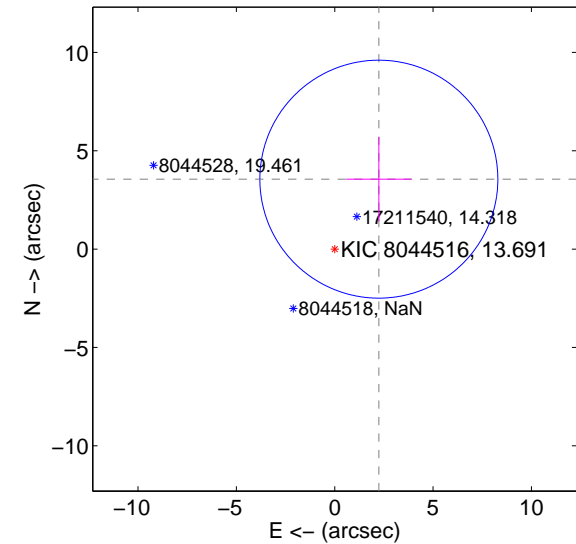
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position



offset from photometric centroids

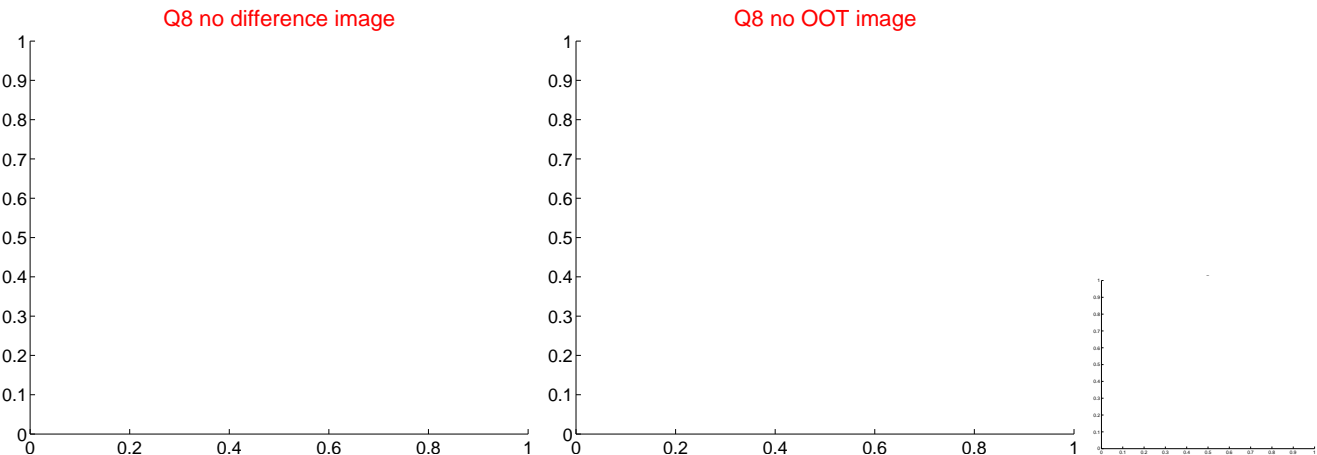
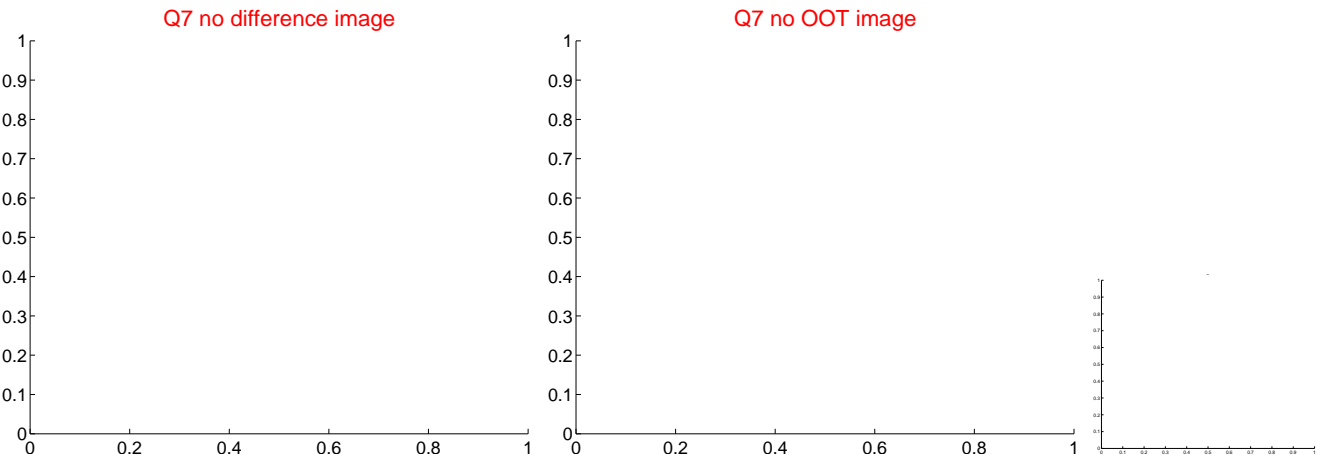
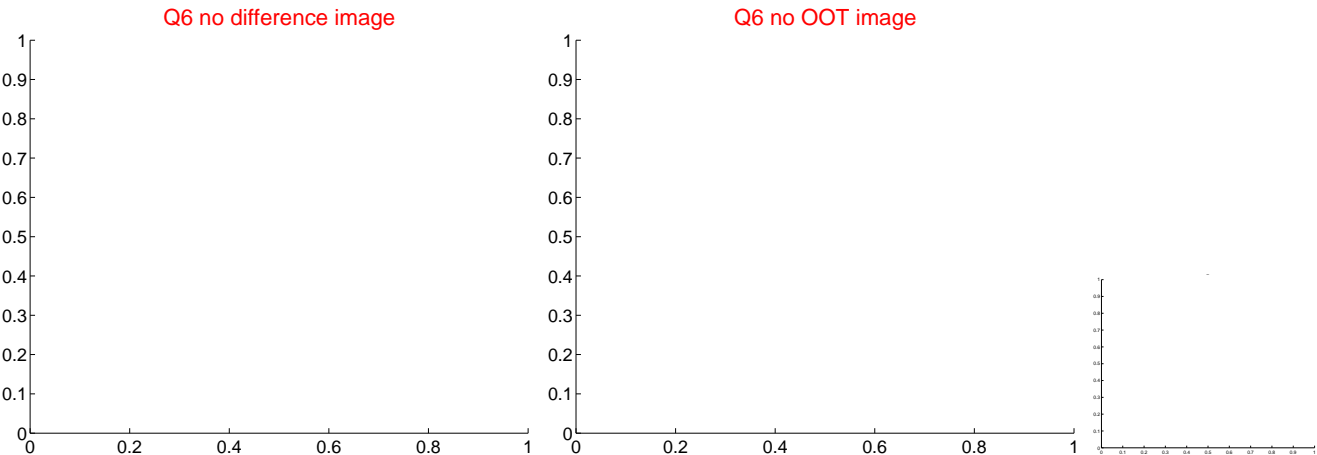
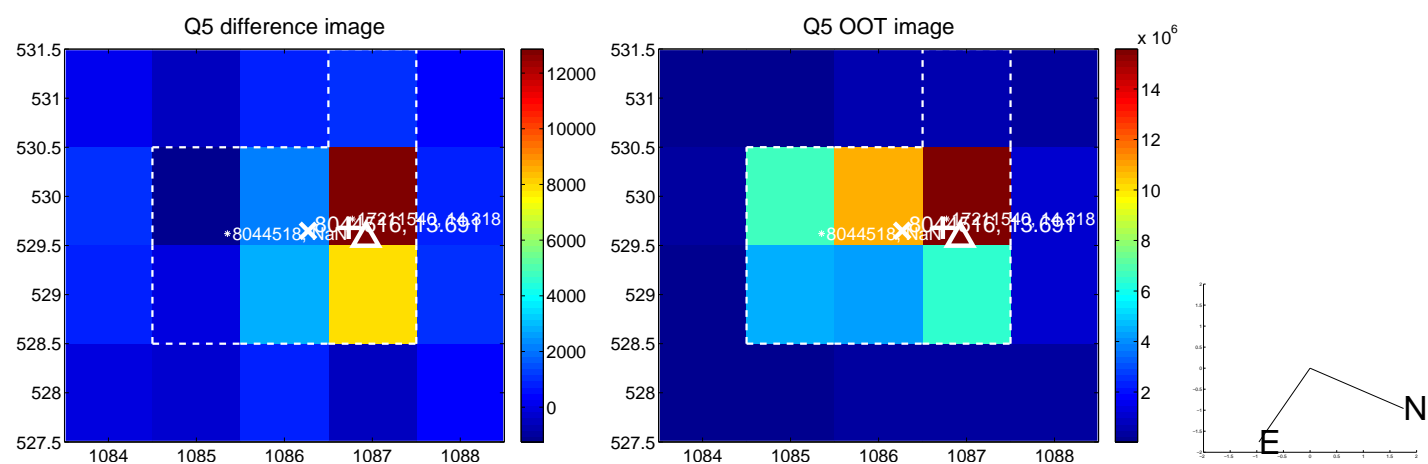


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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

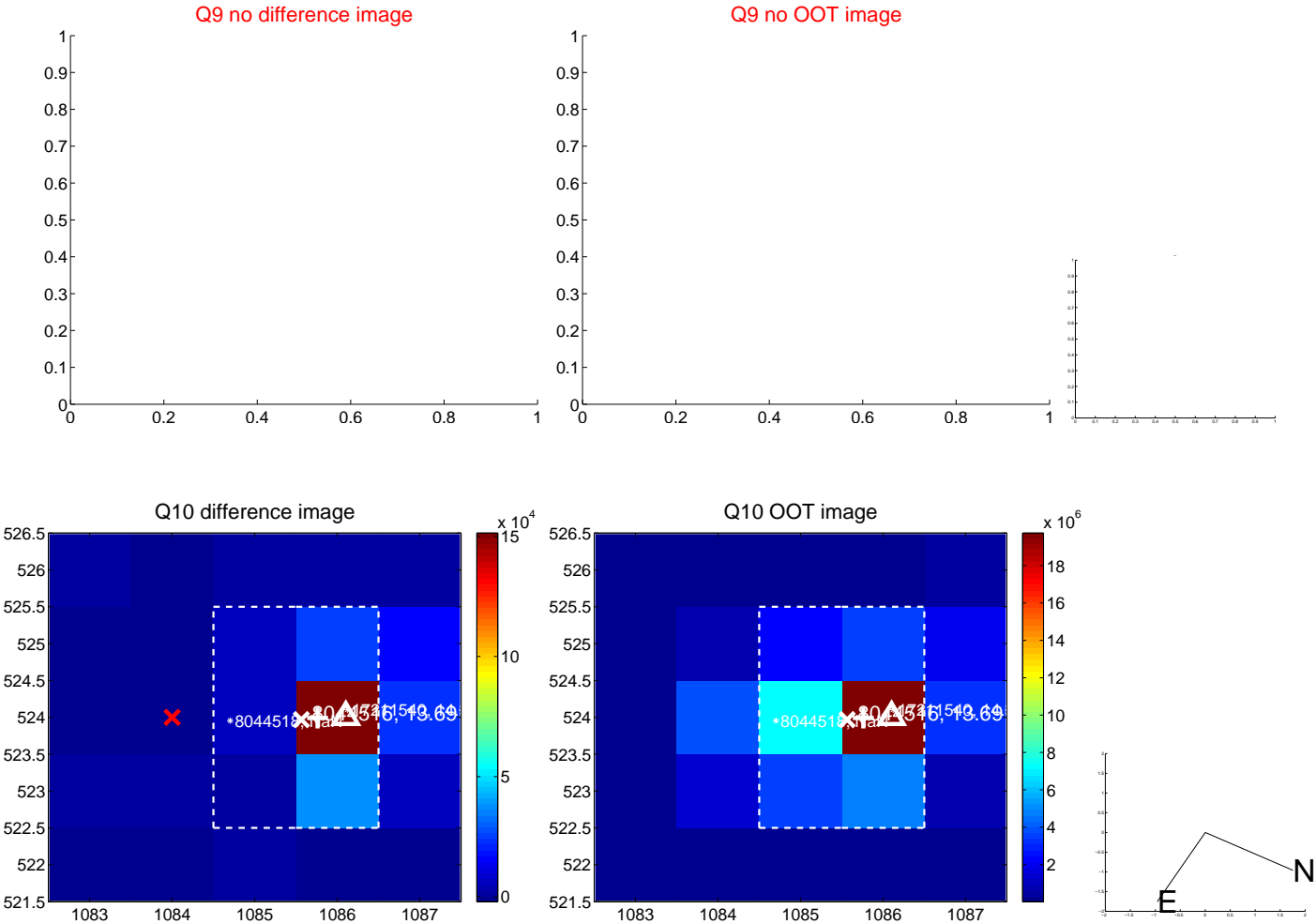


white ×: KIC target position; +: OOT centroid; △: difference centroid. red ×: large negative pixel value.

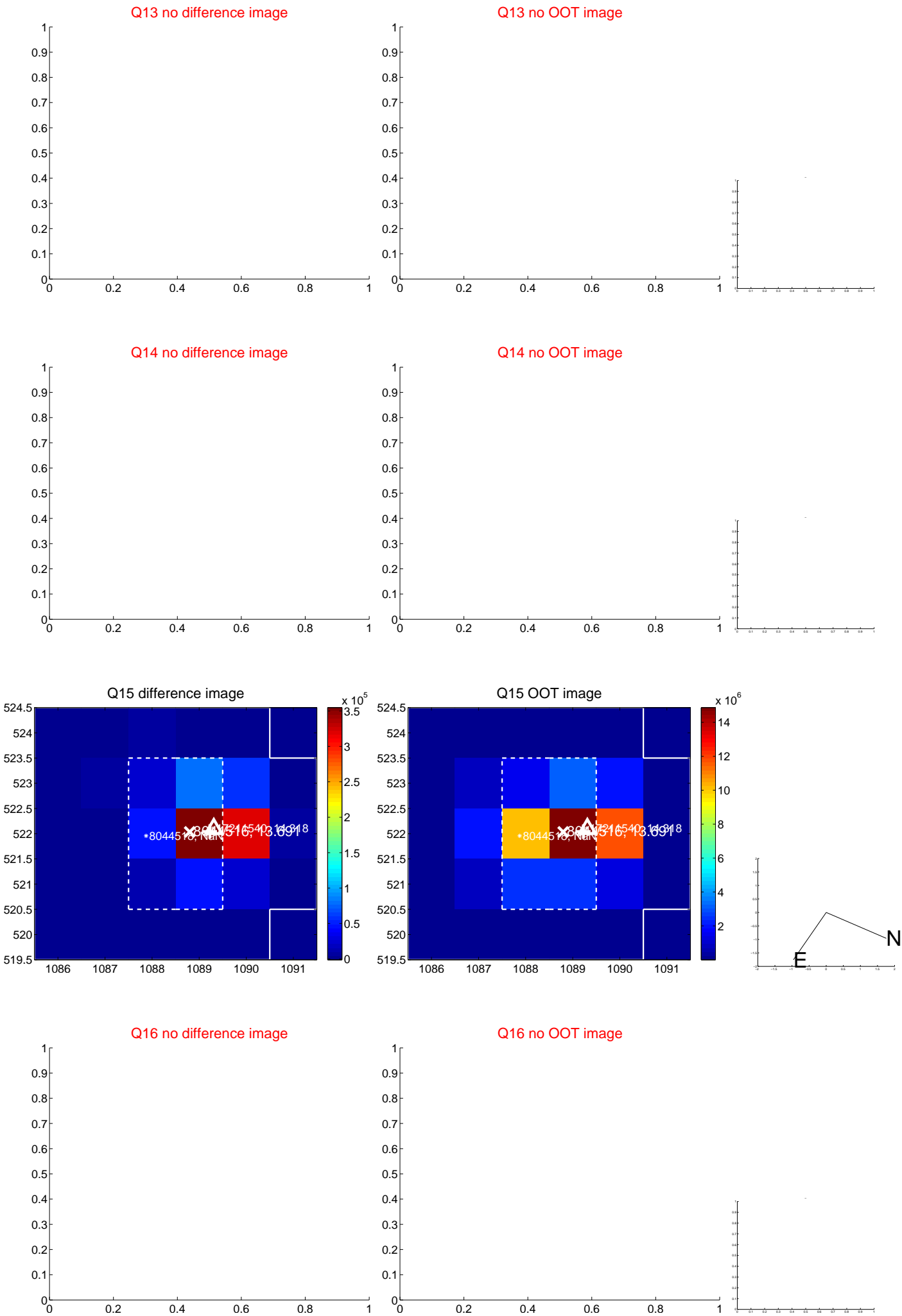




white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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



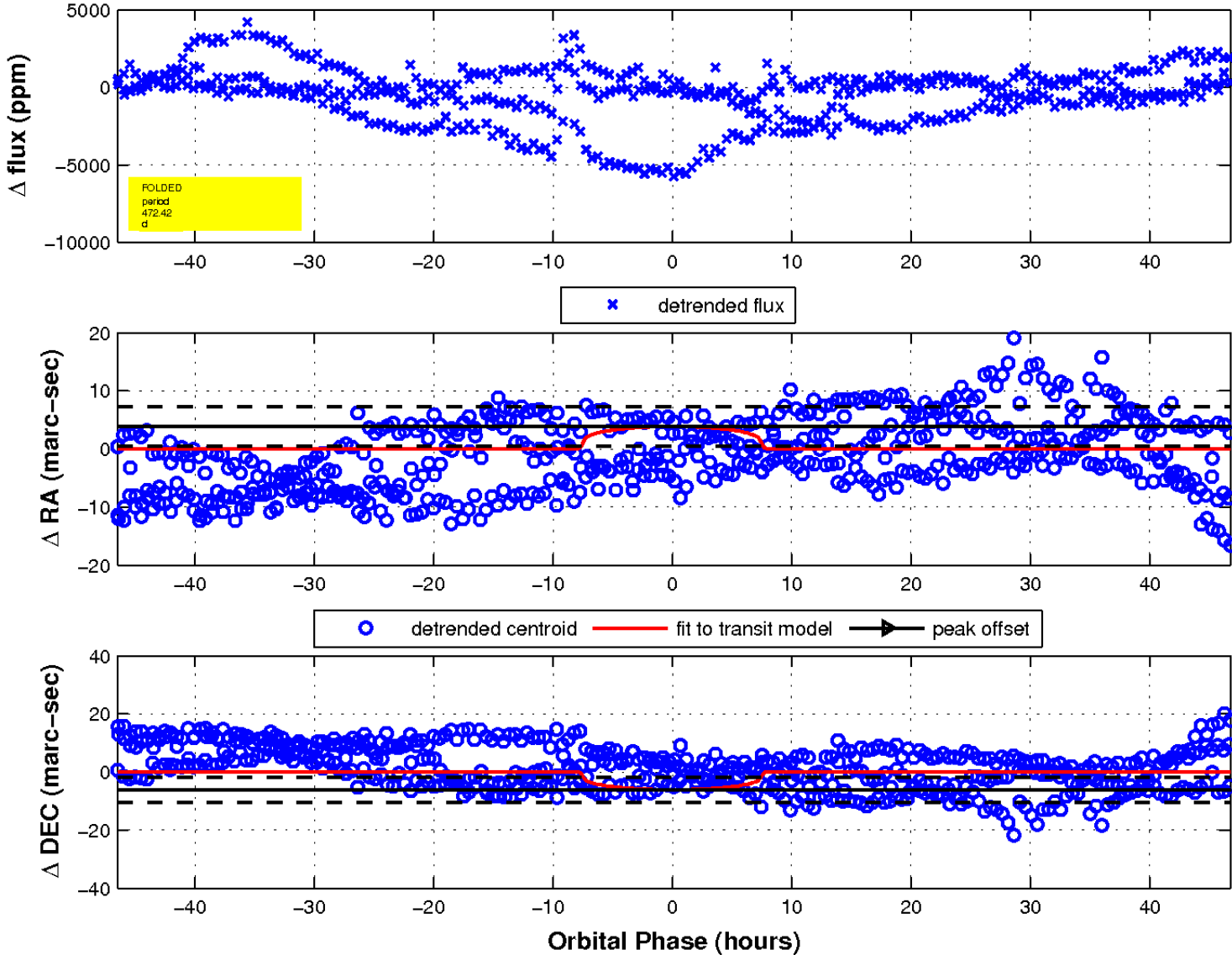
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

Q17 no difference image

Q17 no OOT image

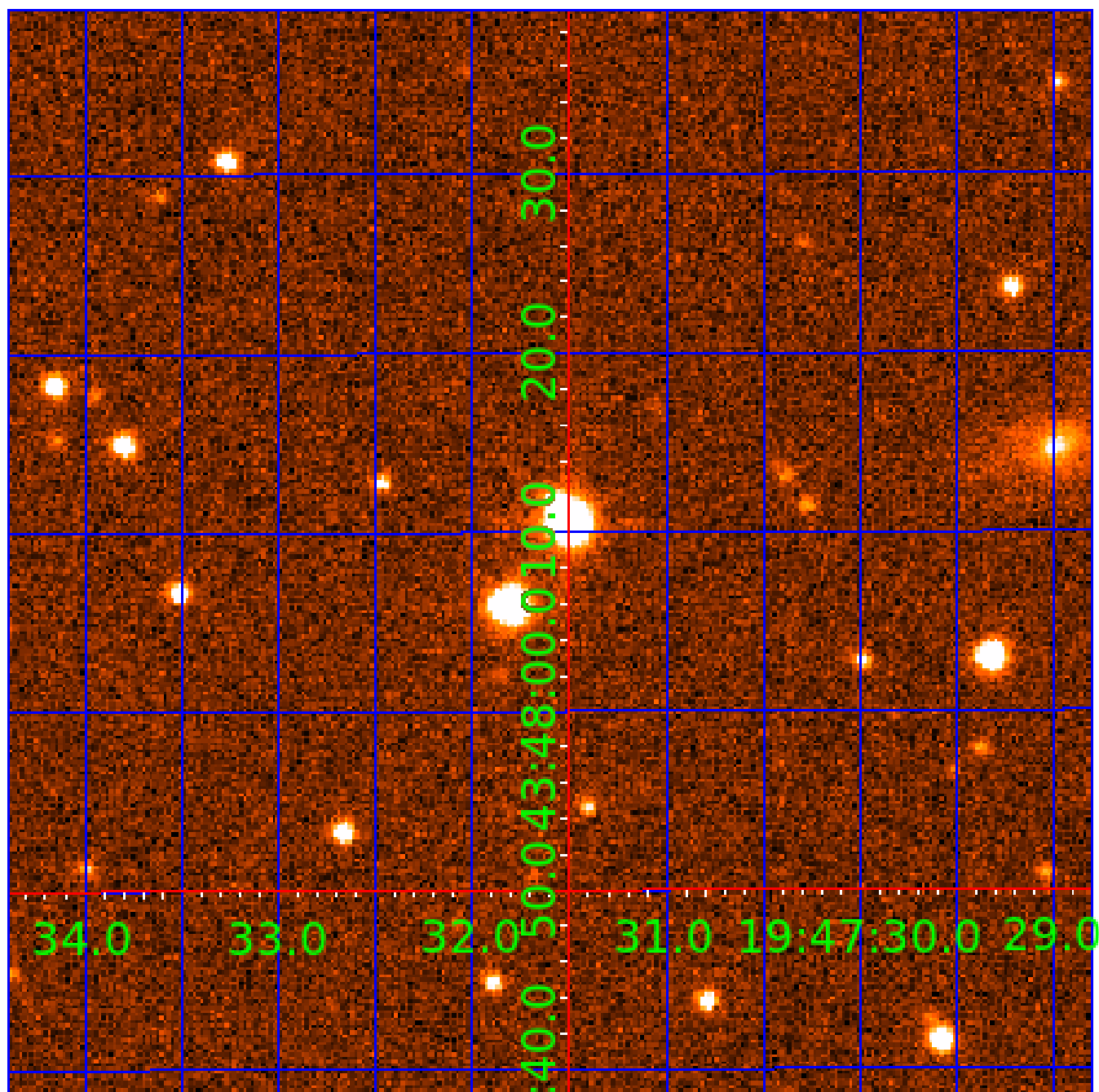


fluxWeightedCentroids, Planet 4 of 5



UKIRT Image

Declination



# KIC 008044516

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
008044516-01	OBS	No	387.848537	427.884080	1681.6	2.531	13.2	8.5	0.70	4755	2.90	0.26
008044516-03	OBS	No	418.837760	139.684182	1131.1	3.866	14.2	7.3	0.70	4755	2.26	0.23
008044516-04	OBS	No	472.424408	481.023406	1823.8	15.628	10.5	6.1	0.70	4755	2.87	0.20
008044516-05	OBS	No	457.289830	176.326717	1452.2	5.382	10.3	6.5	0.70	4755	2.63	0.21

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
008044516-01	OBS	FP	0.00	1	0	1	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—ALL_TRANS_CHASES—MOD_POS_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS—HALO_GHOST
008044516-03	OBS	FP	0.00	1	0	1	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—CENT_UNCERTAIN—HALO_GHOST
008044516-04	OBS	FP	0.00	1	0	0	0	LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—CENT_KIC_POS
008044516-05	OBS	FP	0.00	1	0	1	0	INDIV_TRANS_RUBBLE_CHASES_MARSHALL_SKYE—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV— INCONSISTENT_TRANS—HALO_GHOST

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

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

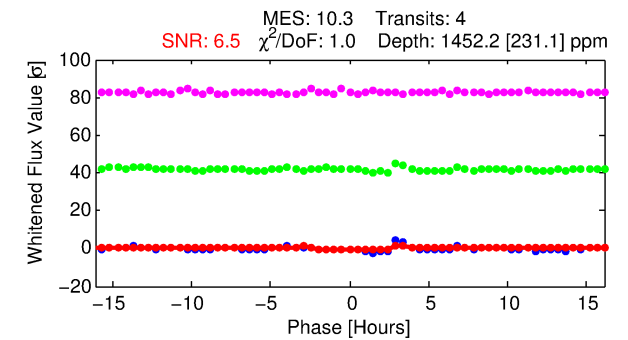
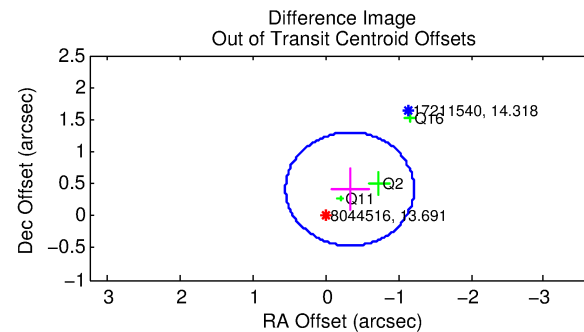
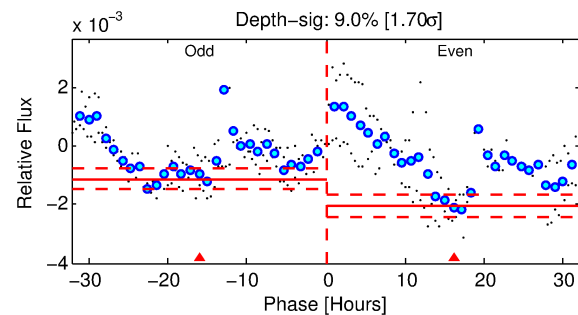
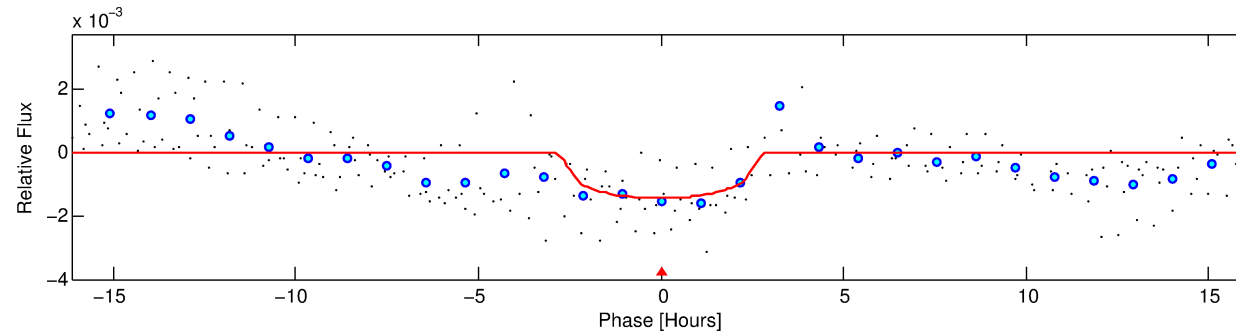
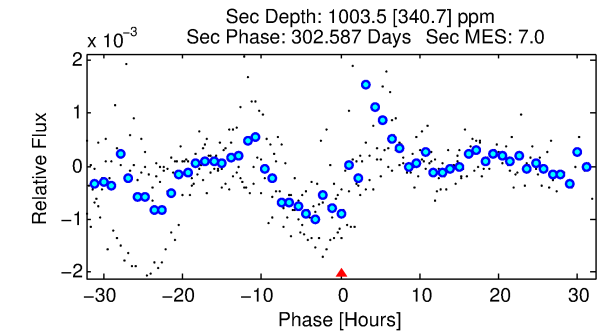
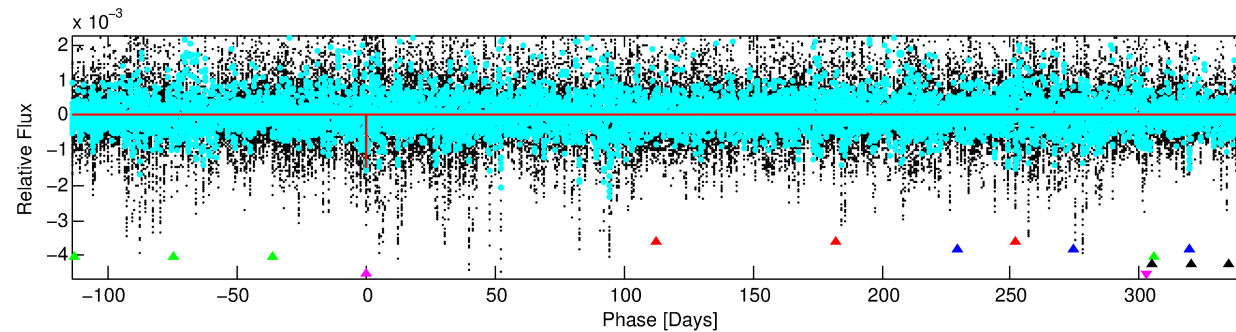
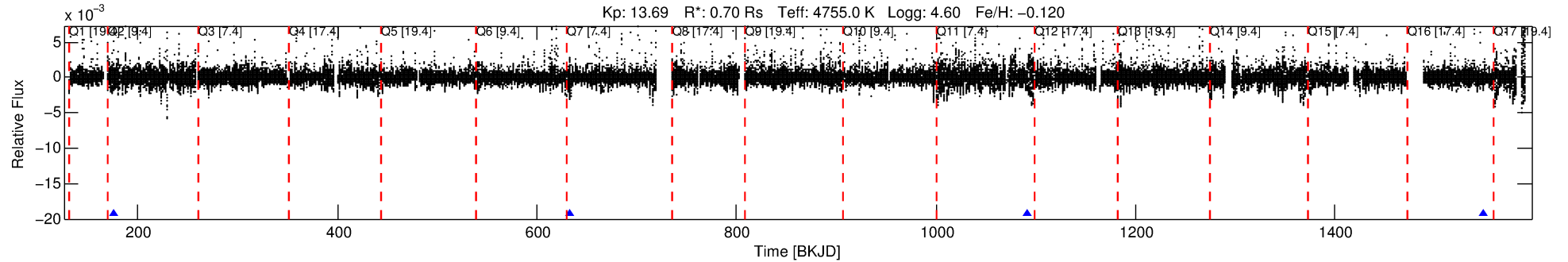
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 008044516-05

No Significant Match Found

# DV One-Page Summary

KIC: 8044516 Candidate: 5 of 5 Period: 457.290 d



## DV Fit Results:

Period = 457.28983 [0.00319] d  
Epoch = 176.3267 [0.0067] BKJD  
Rp/R\* = 0.0345 [0.0315]  
a/R\* = 620.84 [1792.28]  
b = 0.39 [6.30]  
Seff = 0.21 [0.04]  
Teq = 172 [7] K  
Rp = 2.63 [2.42] Re  
a = 1.0379 [0.0715] AU  
Ag = 86084.85 [160494.40] [0.54 $\sigma$ ]  
Teffp = 4559 [2129] K [2.06 $\sigma$ ]

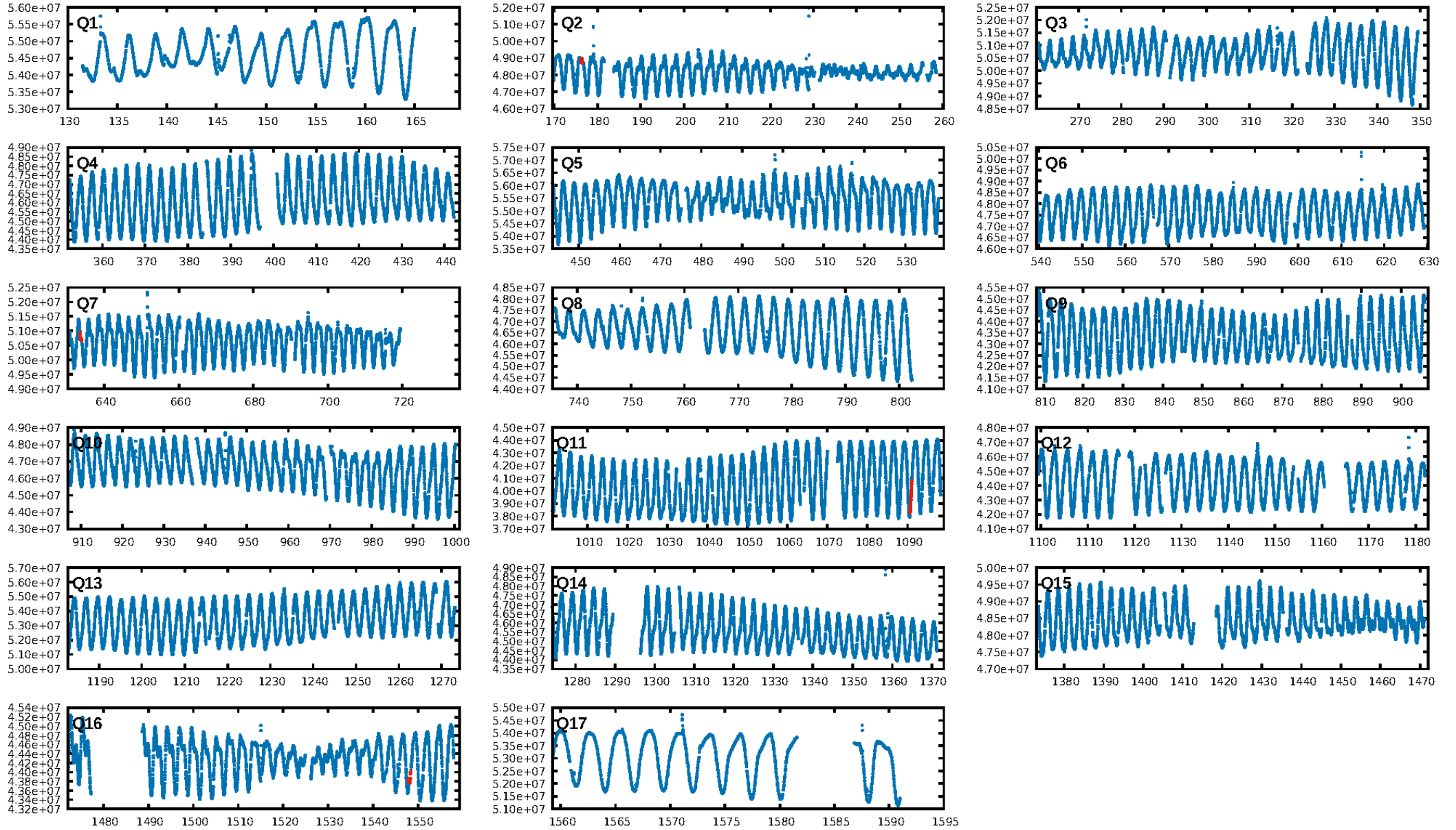
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [139.27 $\sigma$ ]  
LongPeriod-sig: 100.0% [21.98 $\sigma$ ]  
ModelChiSquare2-sig: 85.8%  
ModelChiSquareGof-sig: 99.9%  
**Bootstrap-pfa: 7.29e-08**  
RollingBand-fgt: 1.00 [4/4]  
**GhostDiagnostic-chr: 0.08645**  
Centroid-sig: 99.9%  
Centroid-so: 0.224 arcsec [0.14 $\sigma$ ]  
OotOffset-rm: 0.533 arcsec [1.81 $\sigma$ ]  
OotOffset-st: 1/1/1/0 [3]  
KicOffset-rm: **1.945 arcsec [17.75 $\sigma$ ]**  
KicOffset-st: 1/1/1/0 [3]  
DiffImageQuality-fgm: 1.00 [3/3]  
DiffImageOverlap-fno: 1.00 [3/3]

Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 01-Feb-2016 05:27:17 Z

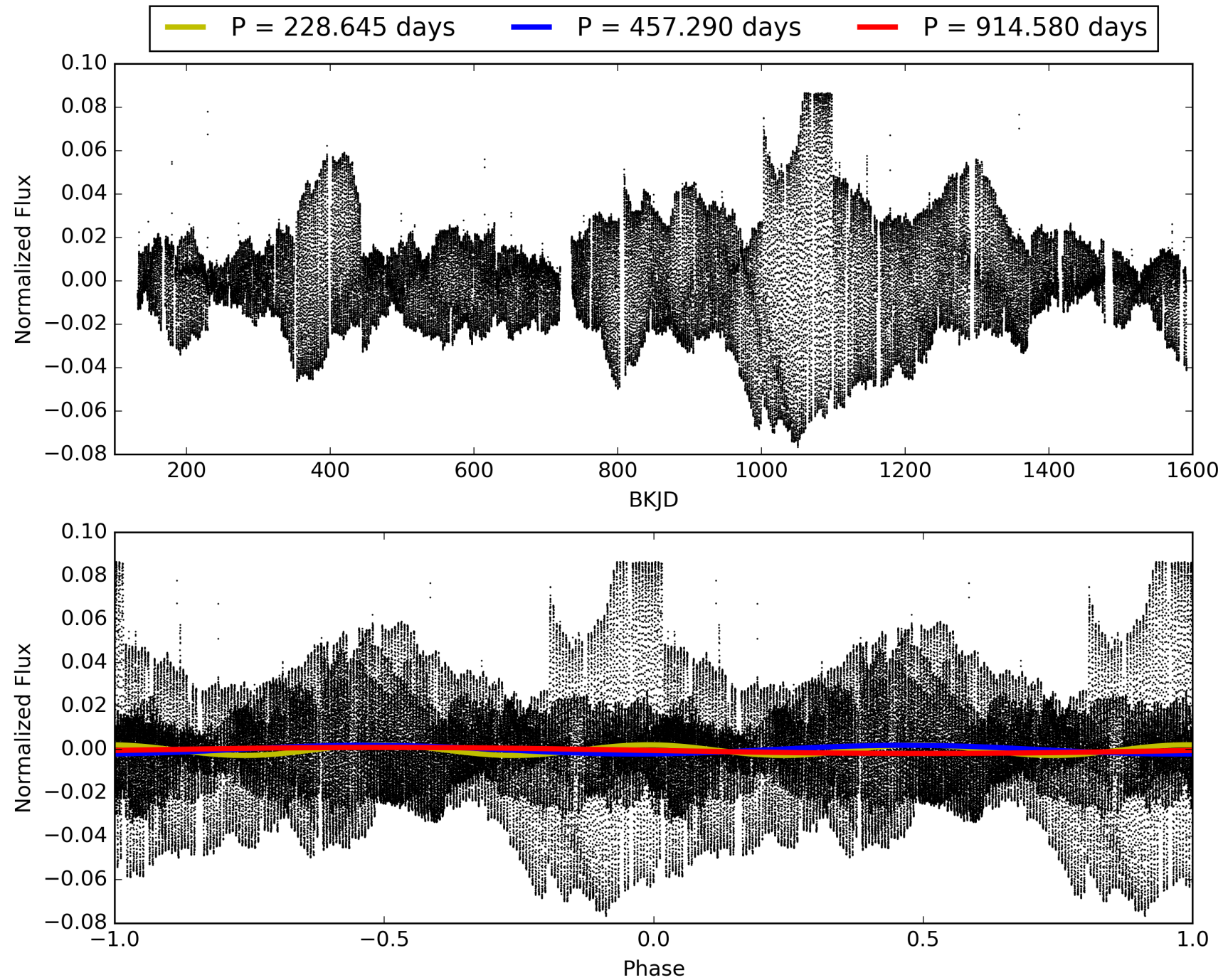
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

# TCE 008044516-05, PDC Light Curves





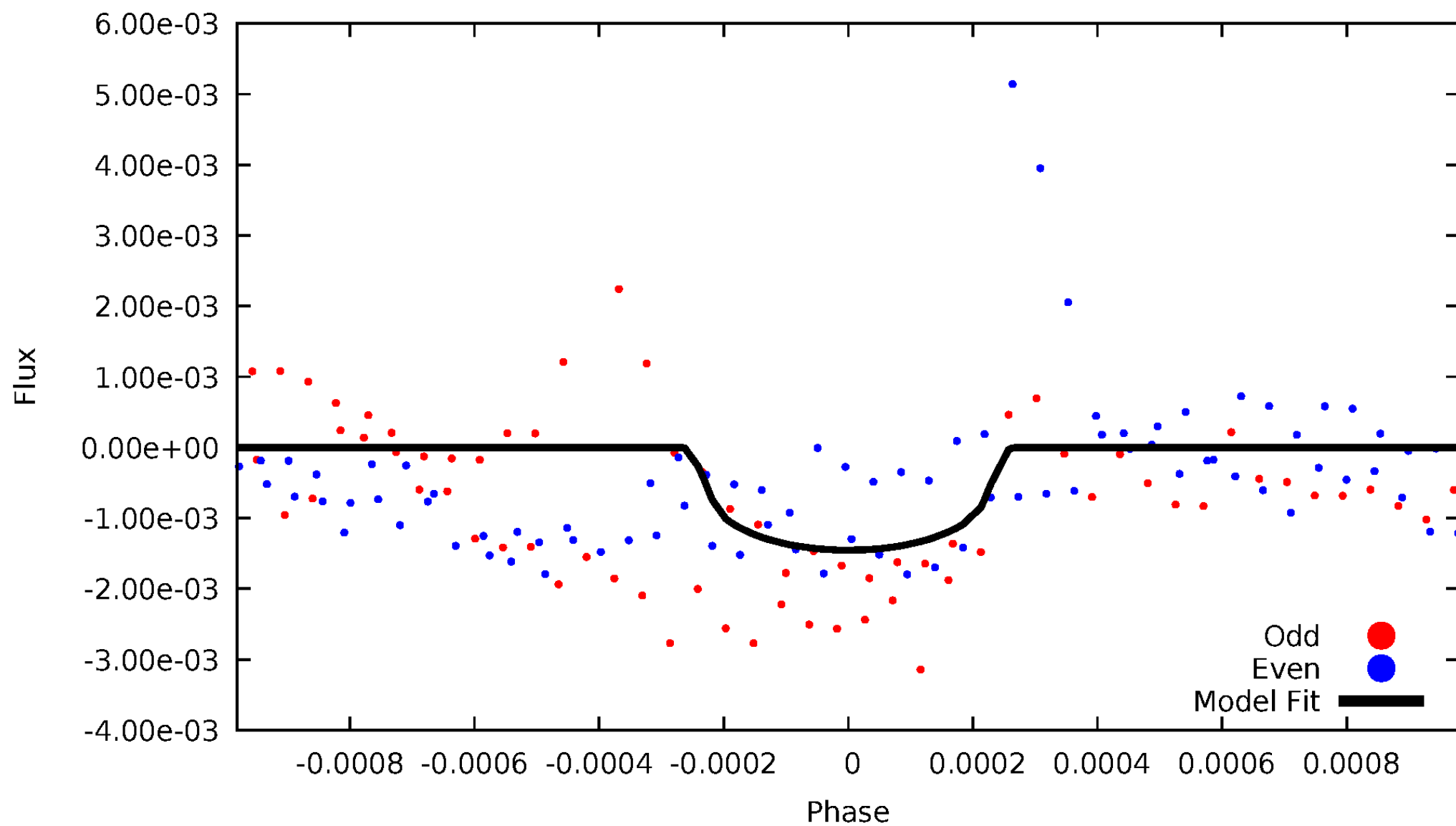
TCE 008044516-05





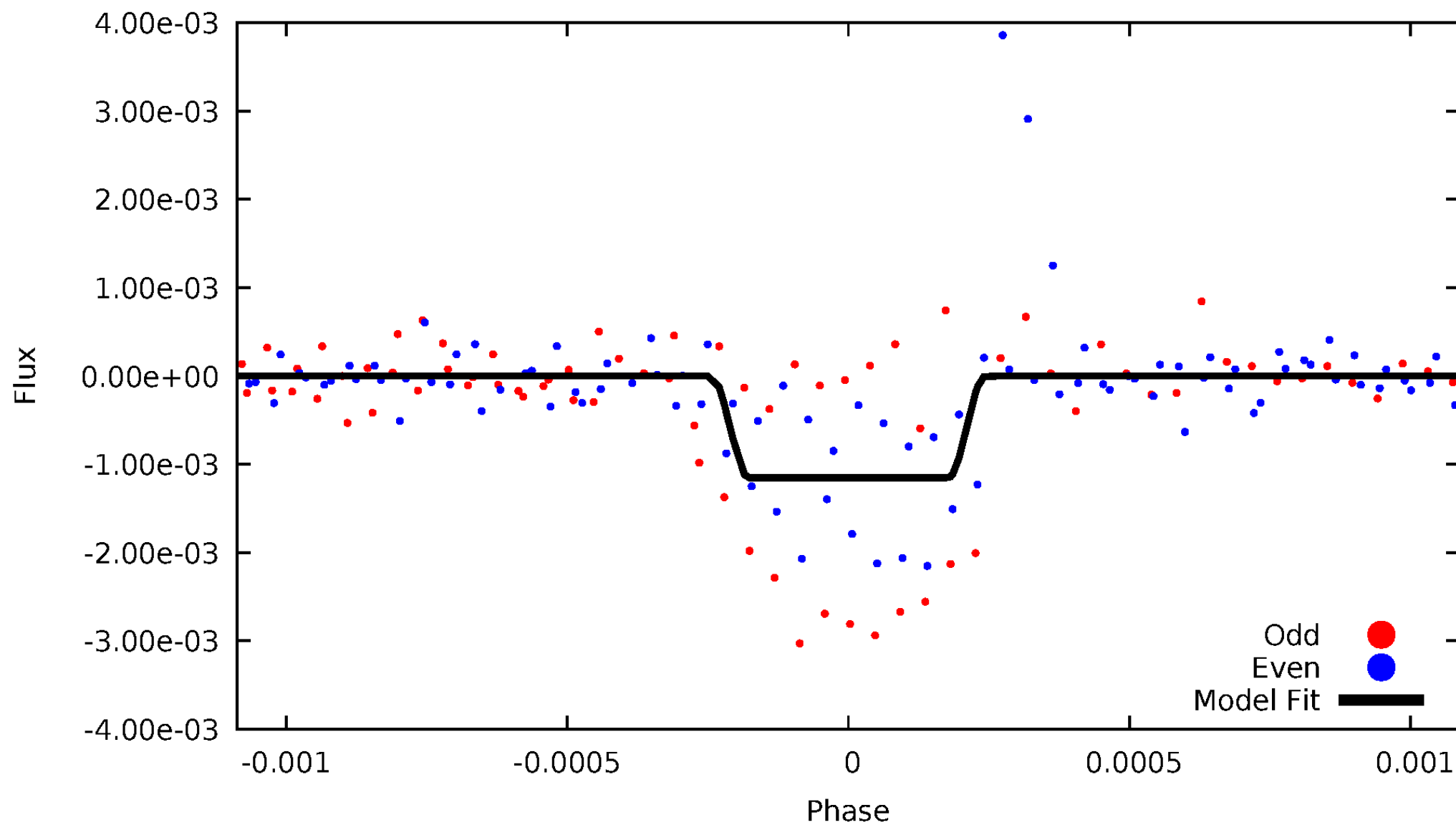
# DV Odd/Even

TCE 008044516-05

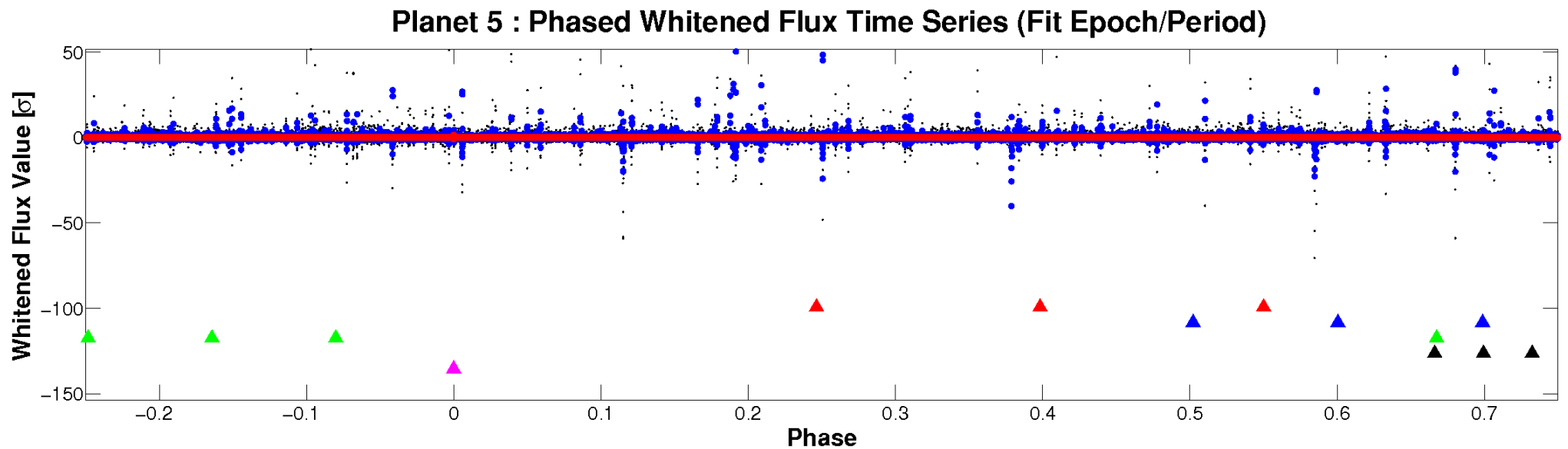
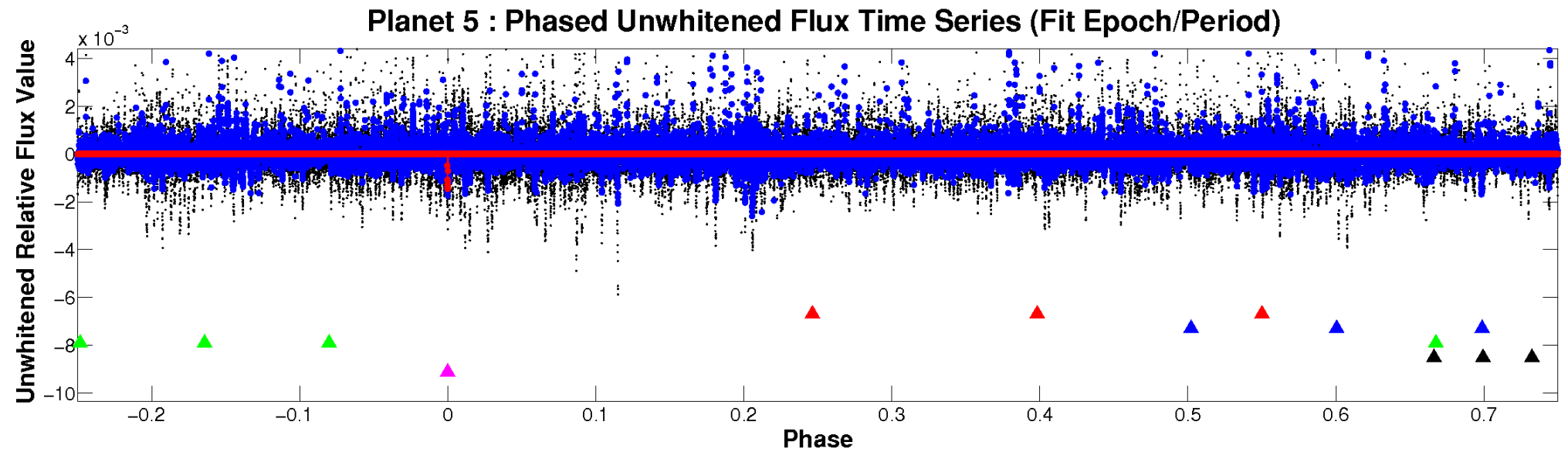


# ALT Odd/Even

TCE 008044516-05

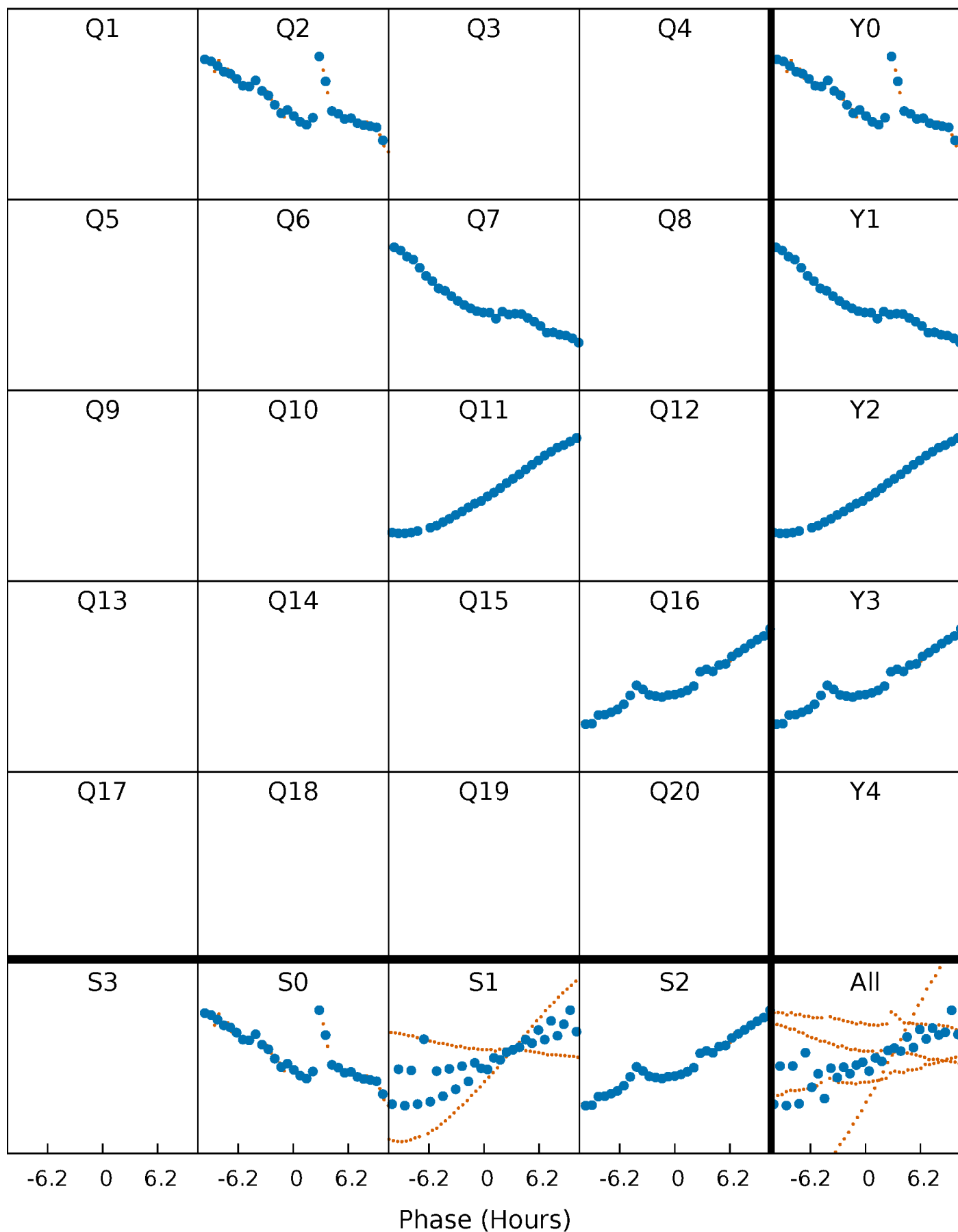


# Non-Whitened Vs. Whitened Light Curve



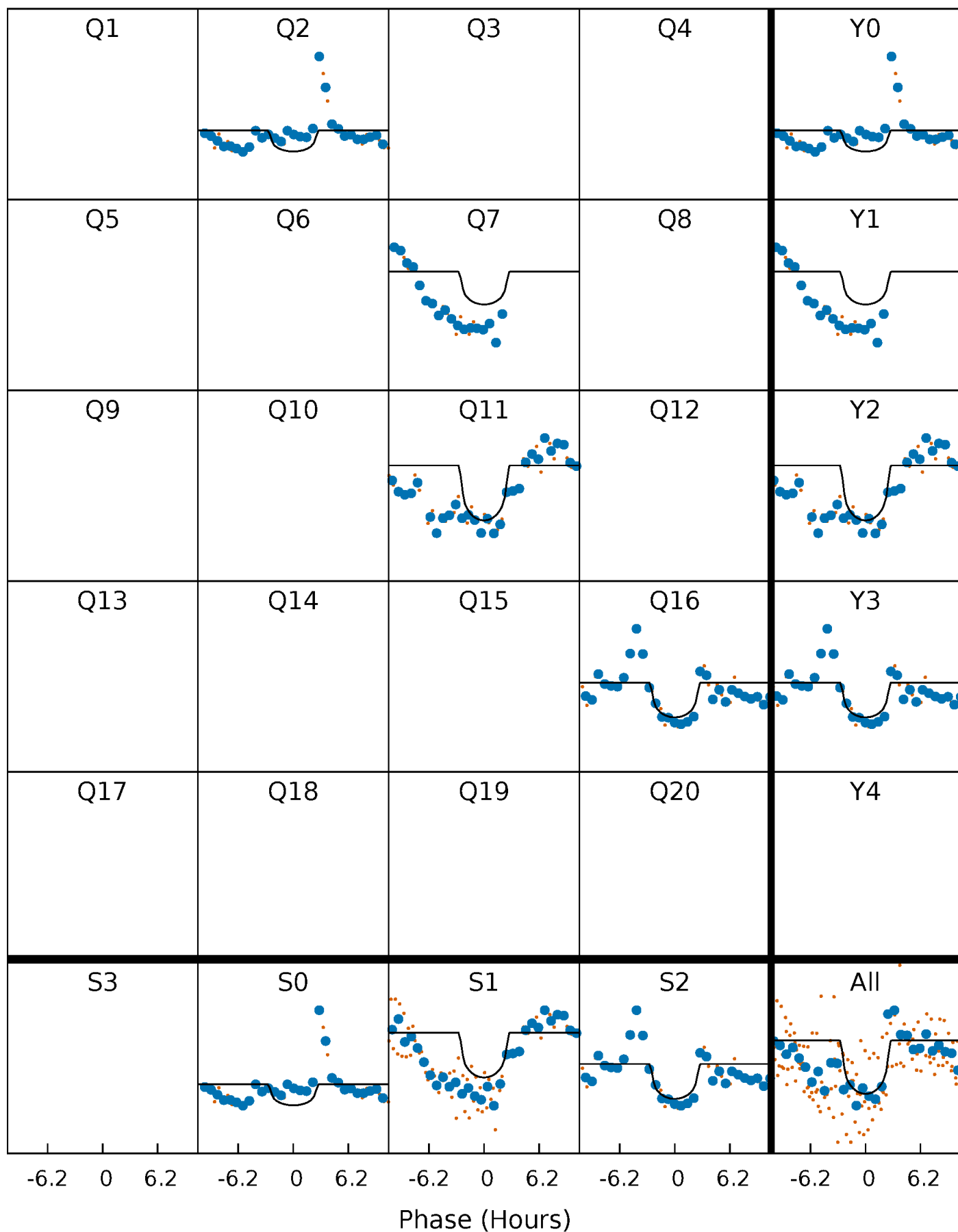
# PDC Quarter-Phased Transit Curves

TCE 008044516-05 P=457.289830 Days  $T_0=176.326717$  (BKJD)



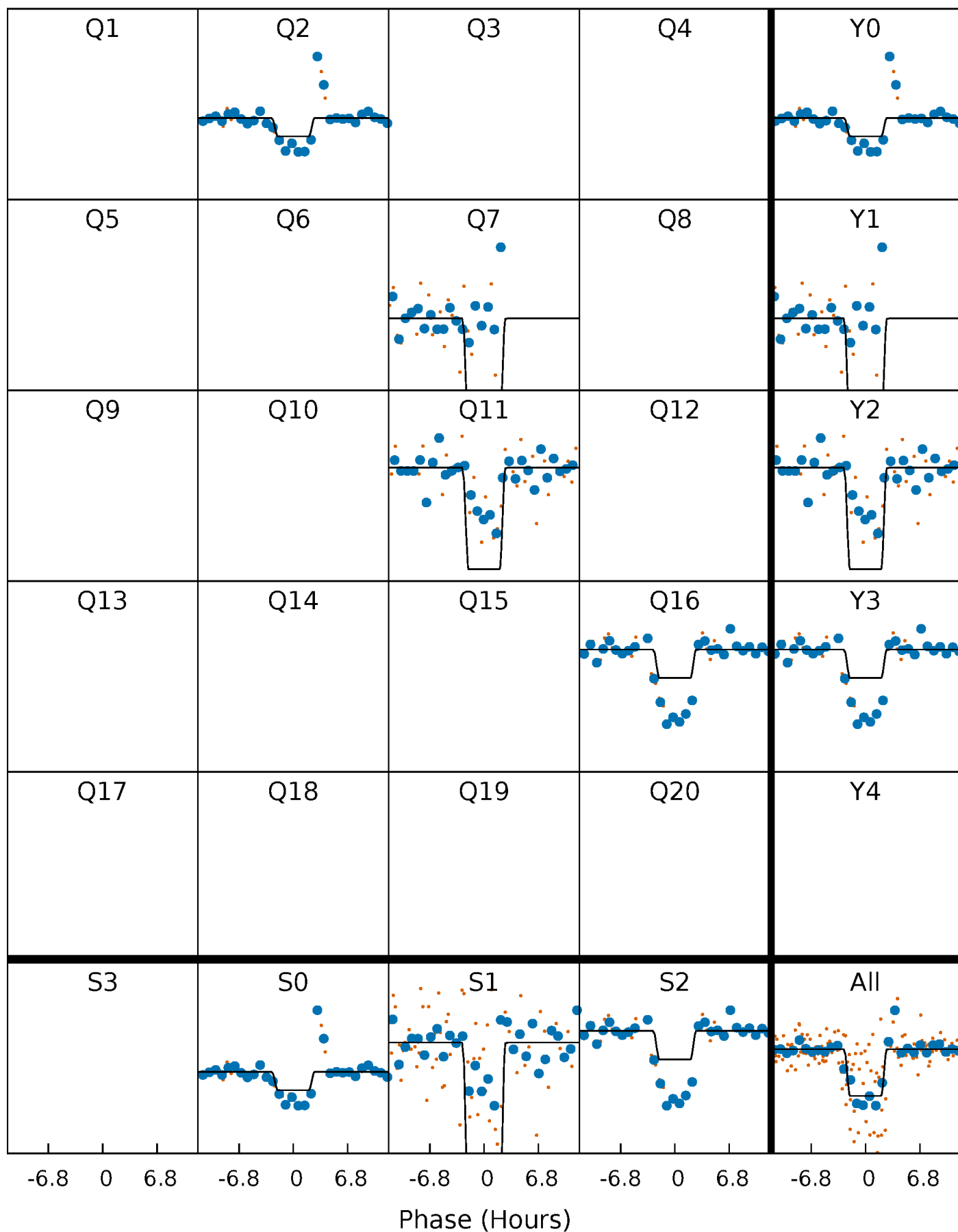
# DV Quarter-Phased Transit Curves

TCE 008044516-05     $P=457.289830$  Days     $T_0=176.326717$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

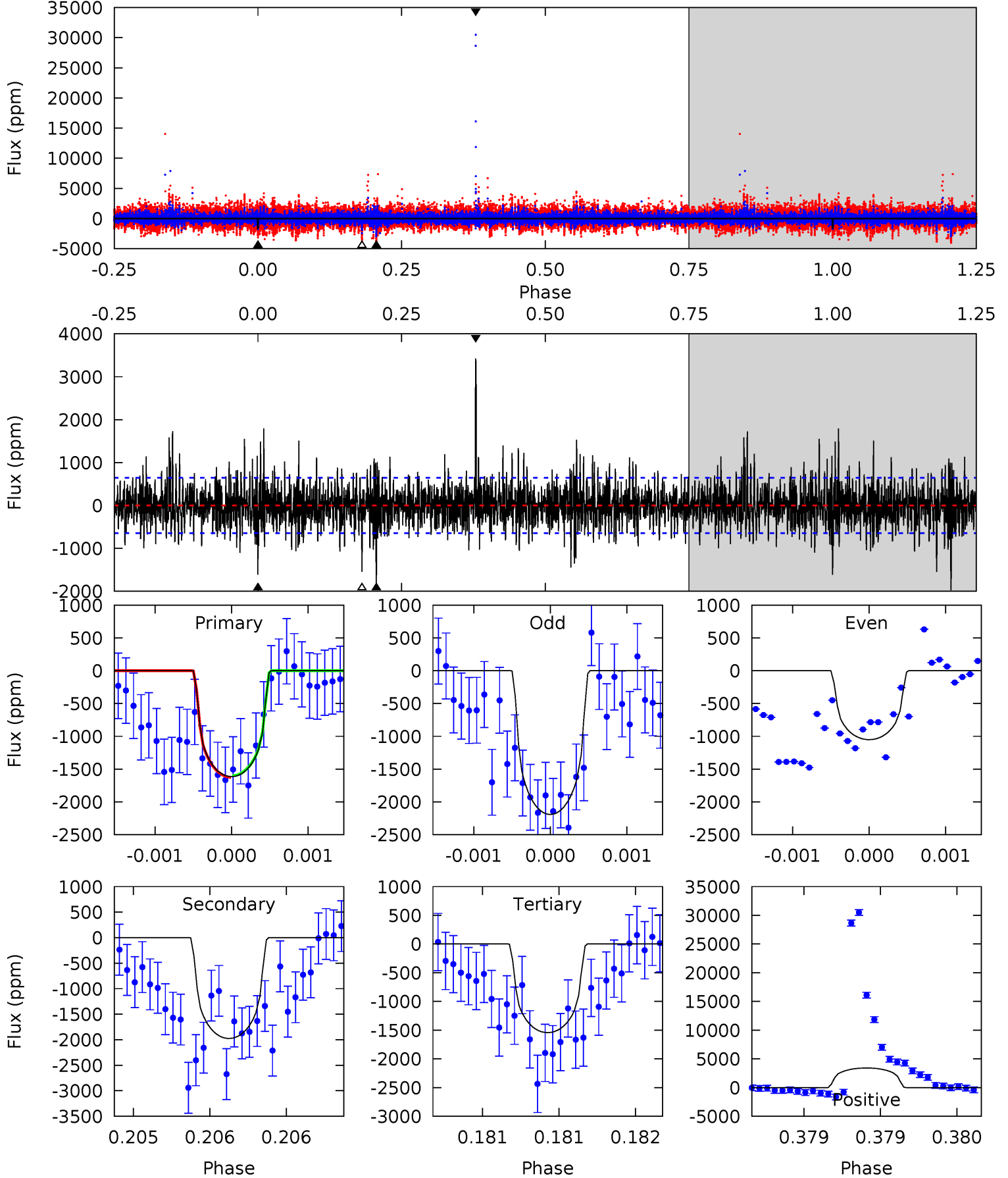
TCE 008044516-05 P=457.289450 Days  $T_0=176.321577$  (BKJD)



# DV Model-Shift Uniqueness Test

008044516-05, P = 457.289830 Days, E = 176.326717 Days

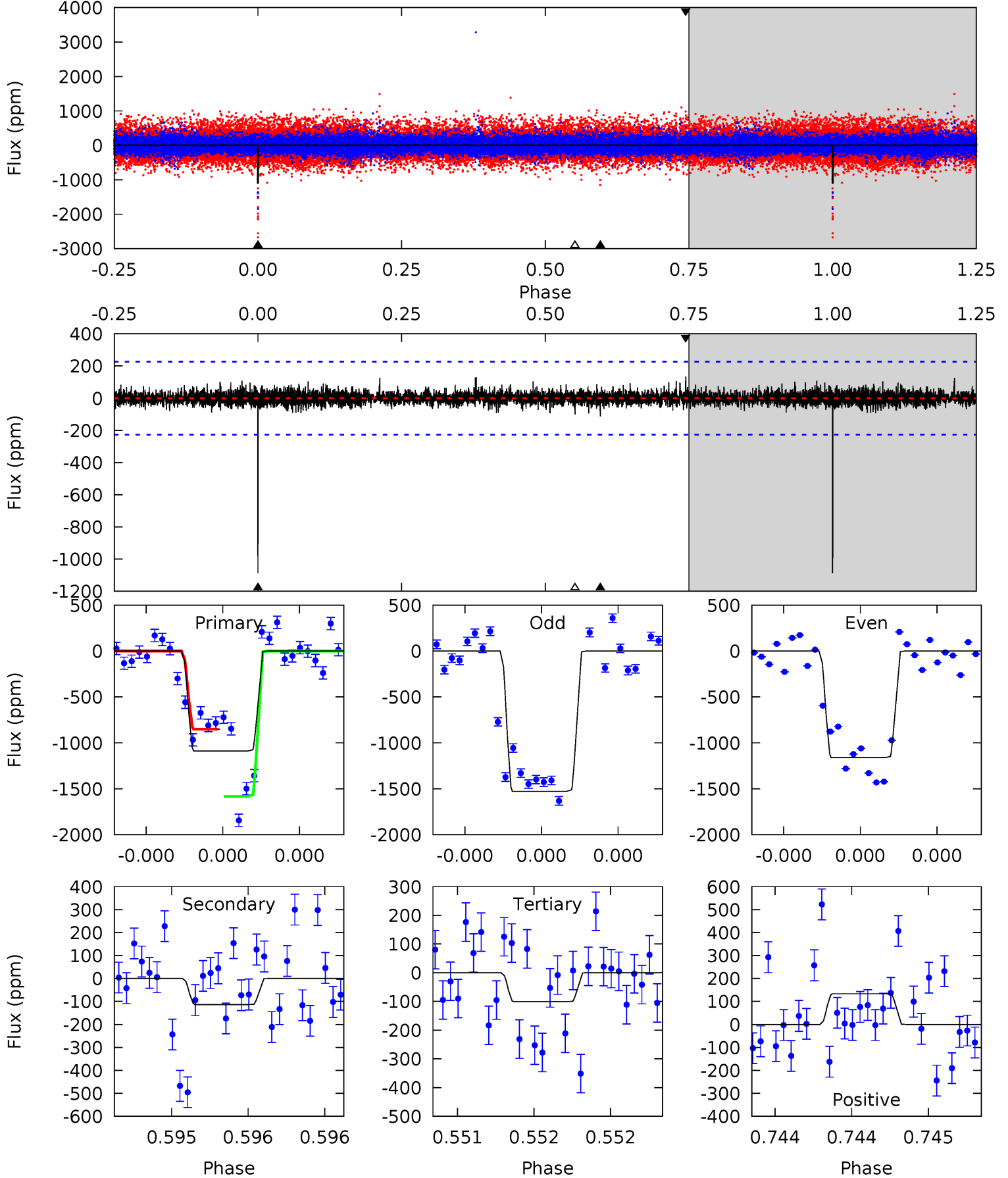
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
13.9	17.0	13.3	29.4	5.56	3.47	3.27	0.62	-15.5	3.72	-12.4	3.70	0.97	0.63	0.10



# Alt Model-Shift Uniqueness Test

008044516-05, P = 457.289450 Days, E = 176.321577 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
26.8	2.79	2.48	3.29	5.59	3.50	0.58	24.3	23.5	0.32	-0.49	4.75	1.06	0.11	0





### Stellar Parameters For KIC 008044516

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (g \cdot \text{cm}^{-3})$
	$4755^{+170}_{-170}$	$4.602^{+0.044}_{-0.040}$	$-0.120^{+0.300}_{-0.300}$	$0.699^{+0.063}_{-0.057}$	$0.713^{+0.072}_{-0.065}$	$2.937^{+0.616}_{-0.467}$
	+4%/-4%	+1%/-1%	+250%/-250%	+9%/-8%	+10%/-9%	+21%/-16%
Source	PHO54	PHO54	PHO54	DSEP		

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

### Secondary Eclipse Parameters for KIC 008044516-05 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$-1975 \pm 116$	$3.02^{+2.25}_{-1.78}$	$240^{+10}_{-10}$	$5026^{+2801}_{-1003}$	$128758^{+673344}_{-85671}$
Alt.	$-113 \pm 41$	$3.01^{+2.12}_{-1.99}$	$241^{+10}_{-10}$	$3039^{+1296}_{-449}$	$7205^{+54594}_{-4868}$

$T_{\text{max}}$  = 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

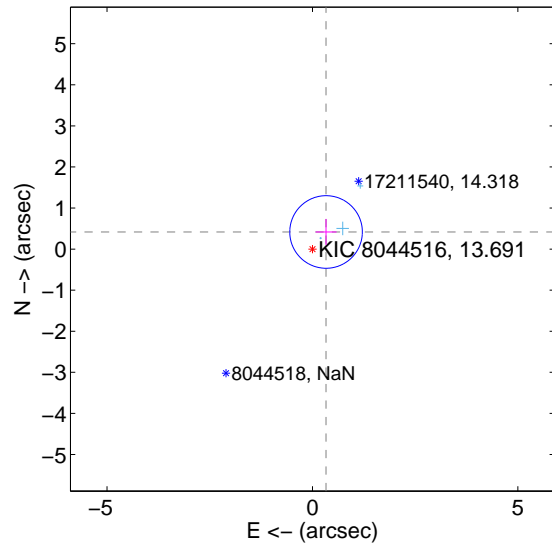
Supplemental centroid analysis for 008044516-05. Kepler magnitude: 13.69. Transit SNR 6.55

There are 3 quarters with good PRF difference image offsets

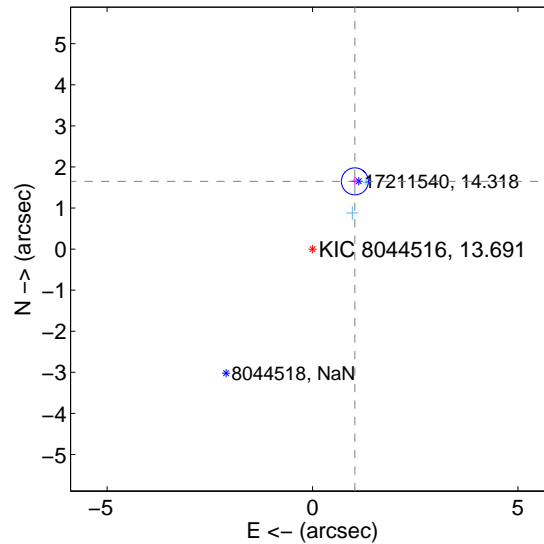
The direct PRF centroid is offset from the target star catalog position by about 0.16 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.533 \pm 0.295$	1.81	$-0.332 \pm 0.255$	$0.417 \pm 0.317$
PRF-fit source offset from KIC position	$1.945 \pm 0.110$	17.75	$-1.031 \pm 0.102$	$1.649 \pm 0.112$
photometric centroid source offset	$0.22 \pm 1.56$	0.14	$-0.09 \pm 1.31$	$0.20 \pm 1.61$

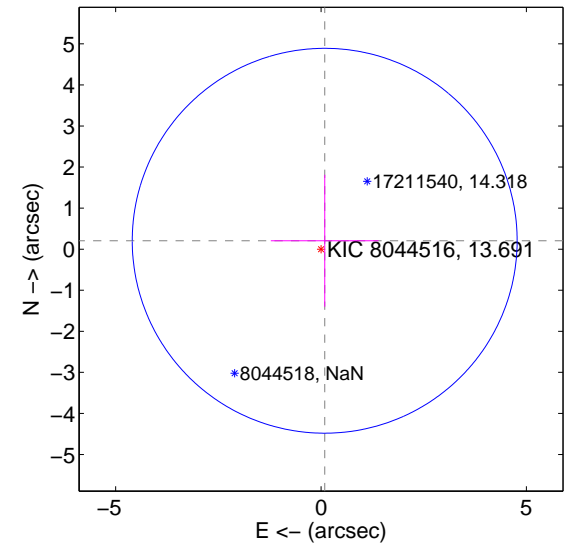
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position

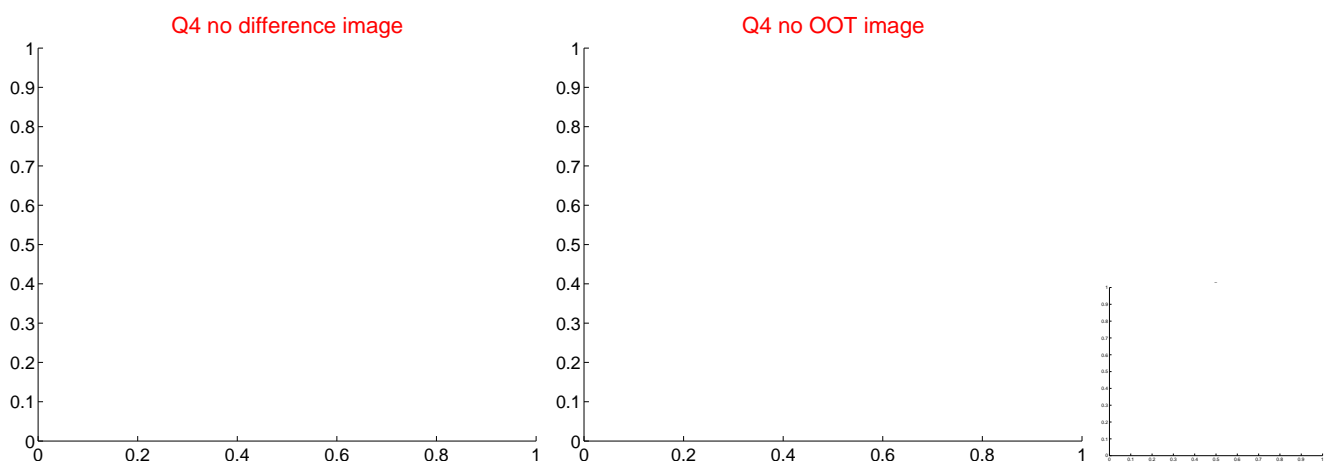
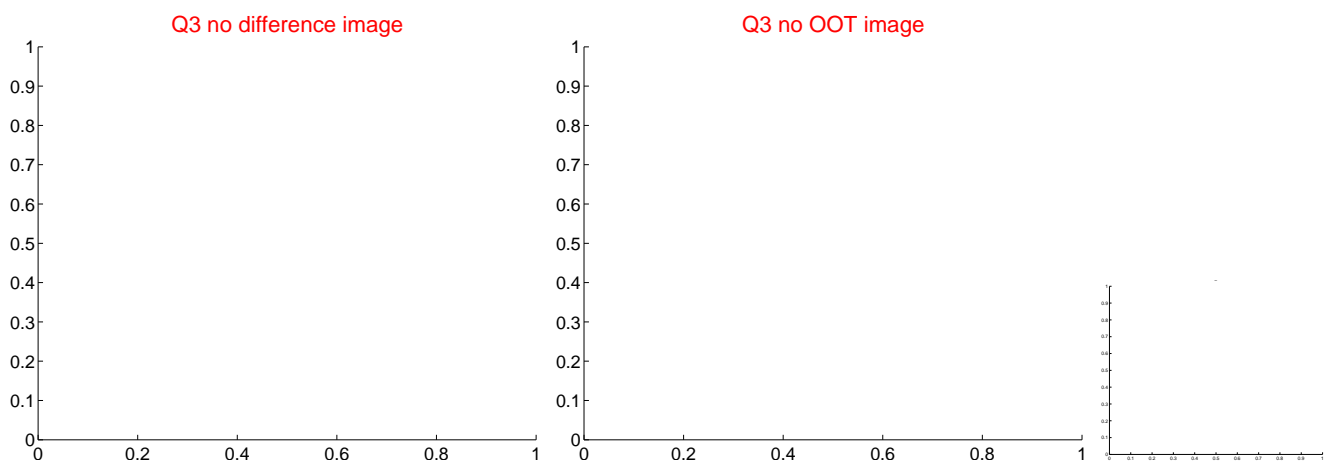
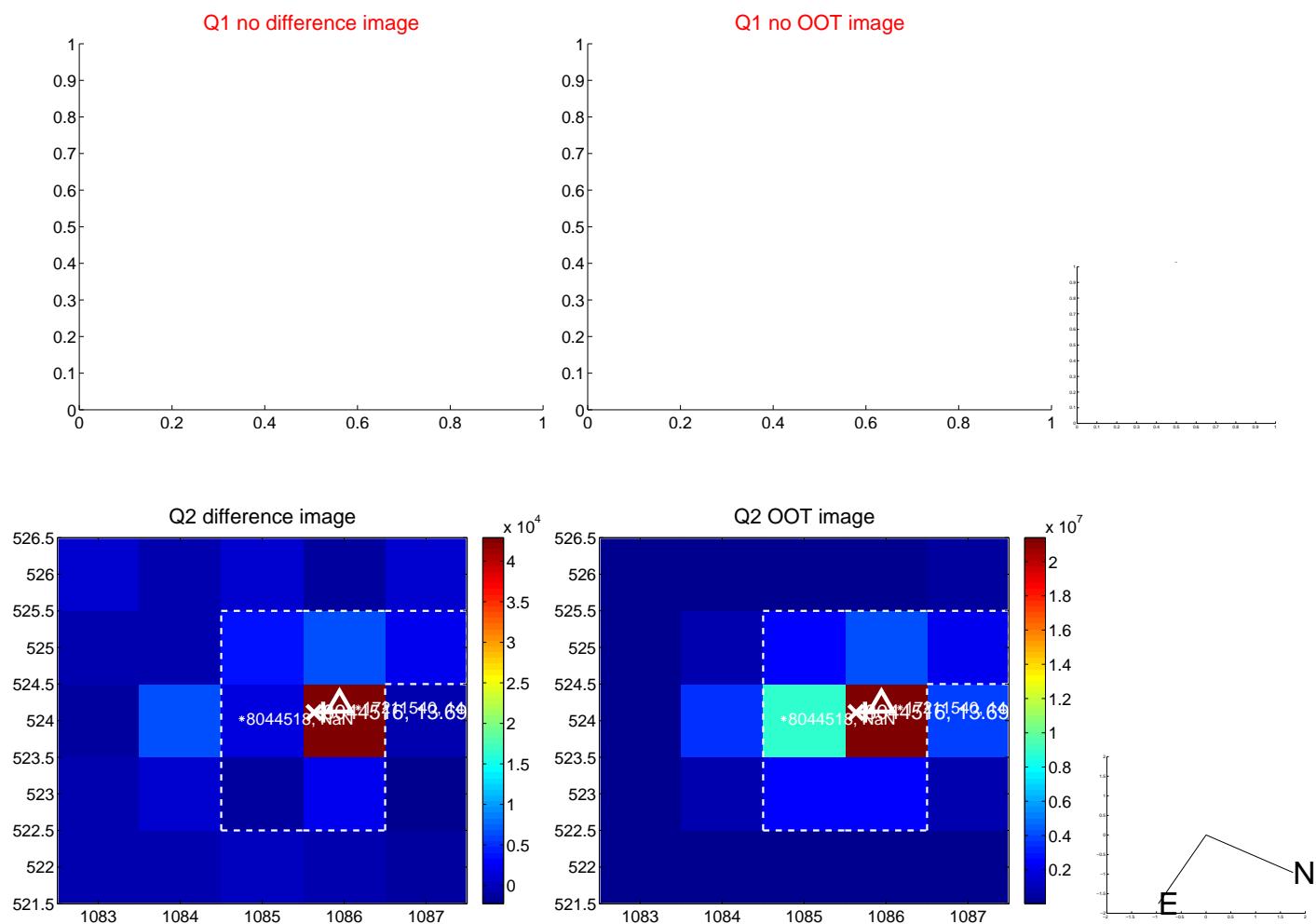


offset from photometric centroids



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.

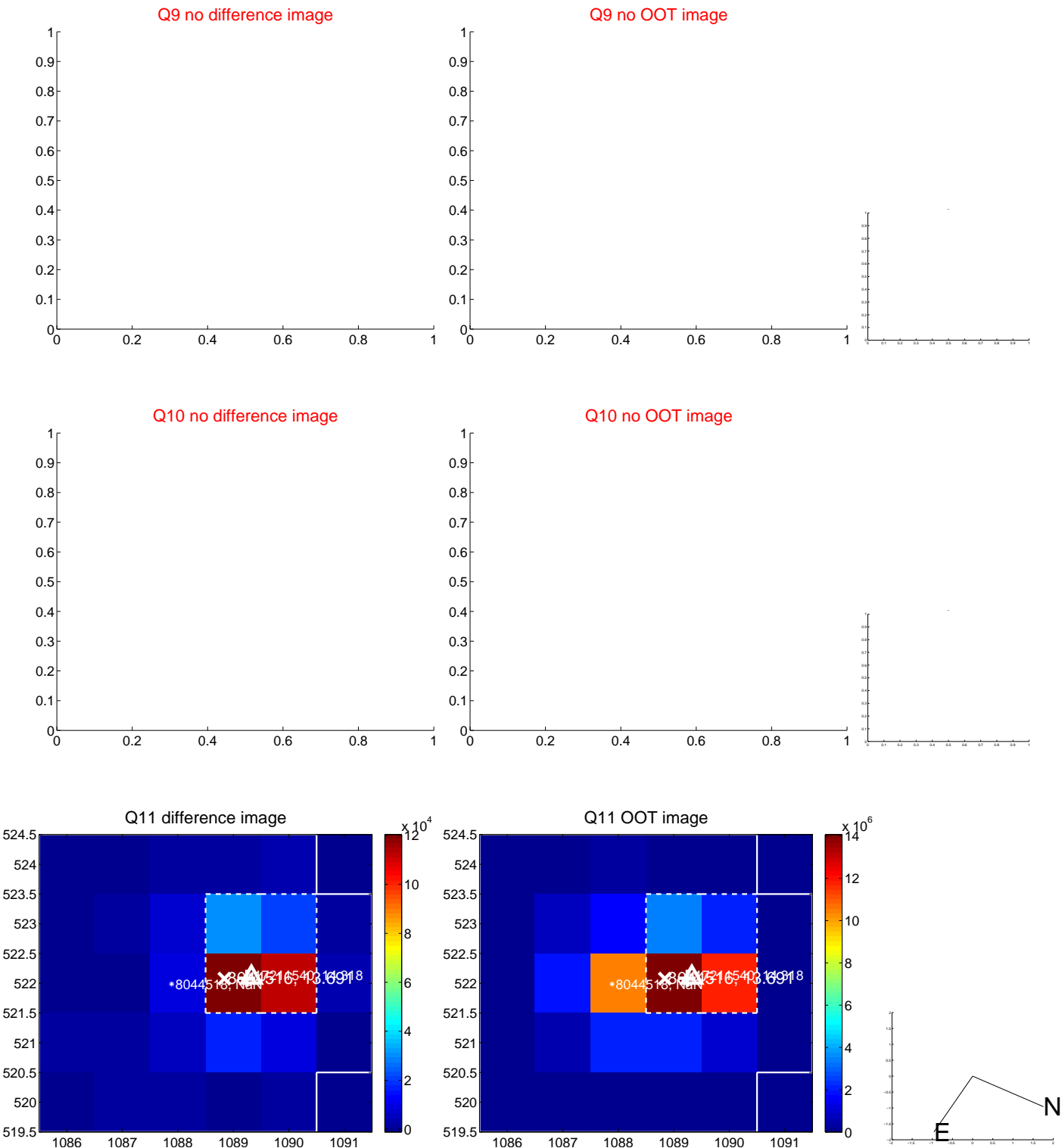
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value



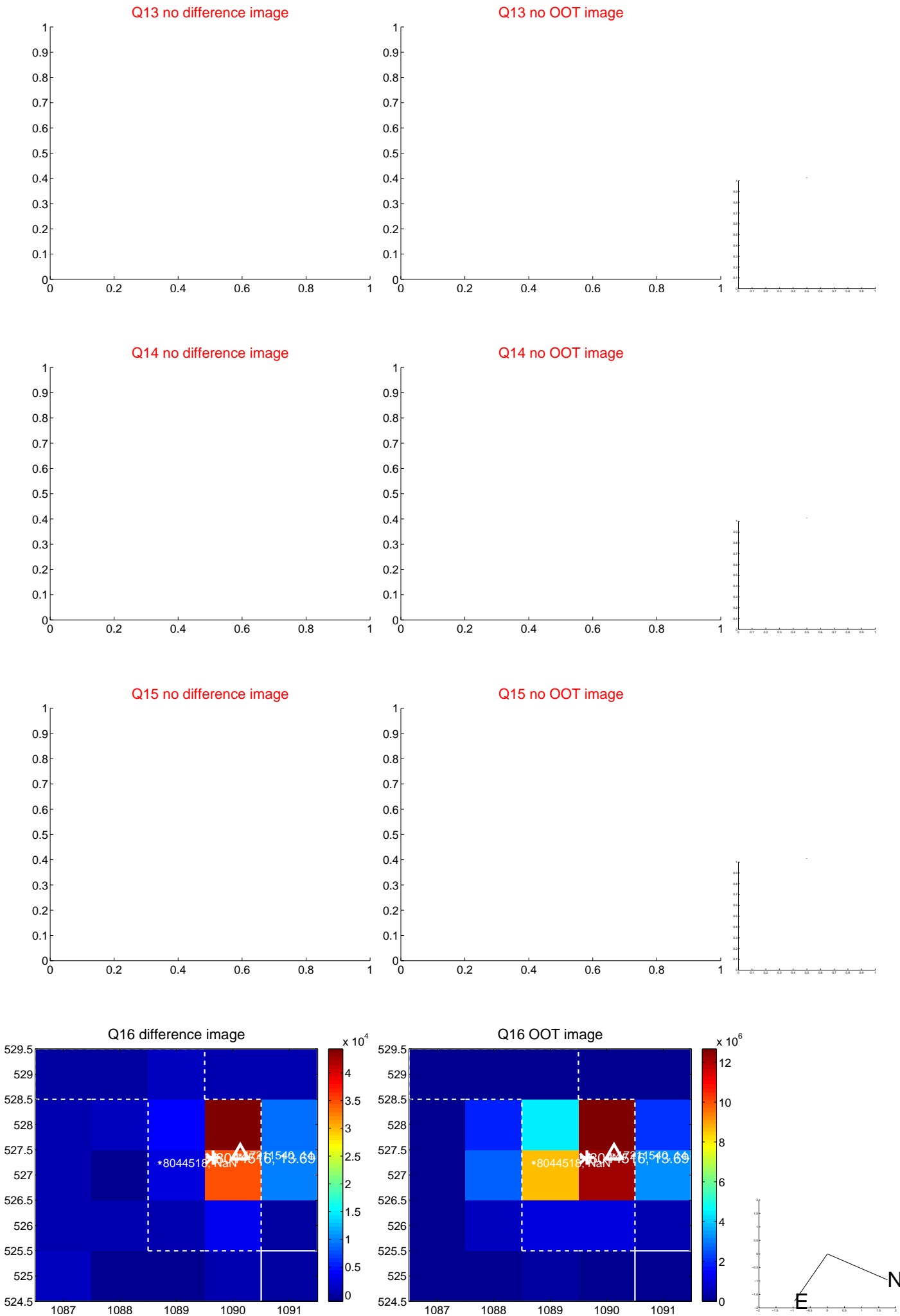
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



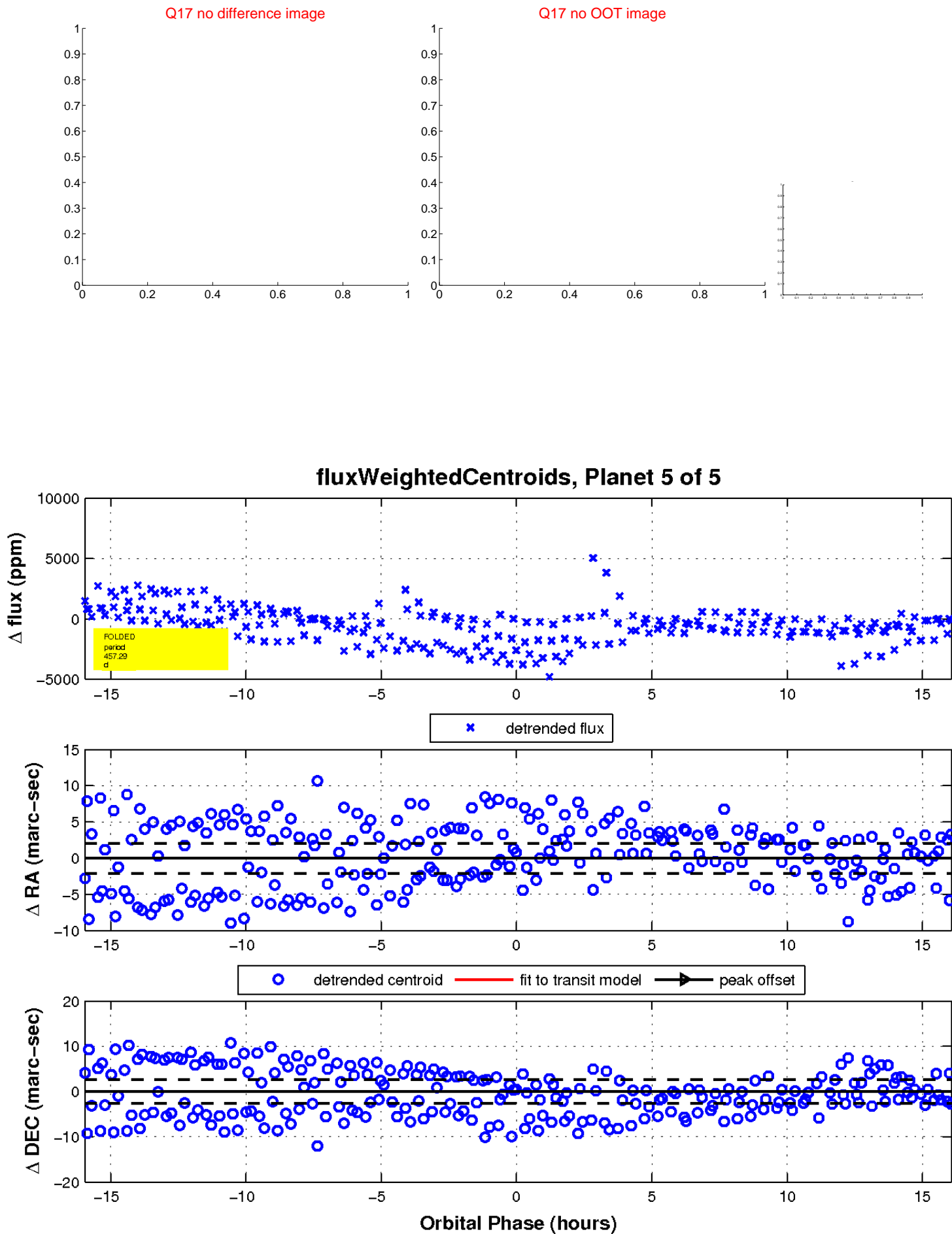
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



white ×: KIC target position; +: OOT centroid; △: difference centroid. red ✕: large negative pixel value.



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



UKIRT Image

Declination

