

# KIC 007509496

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
007509496-01	OBS	No	327.306835	452.264932	679.2	9.919	14.5	6.7	0.66	4301	1.74	0.21
007509496-02	OBS	No	422.863424	177.821431	629.7	10.106	11.0	7.3	0.66	4301	1.91	0.15

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
007509496-01	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_MARSHALL—LPP_DV—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—CENT_FEW_DIFFS
007509496-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—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.

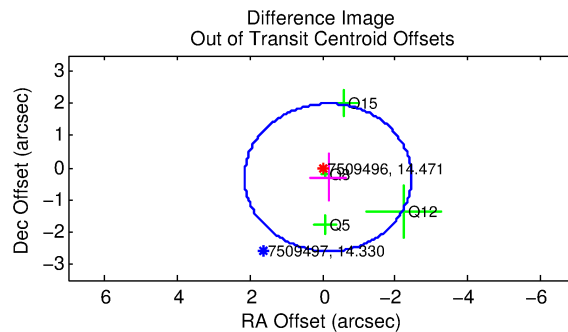
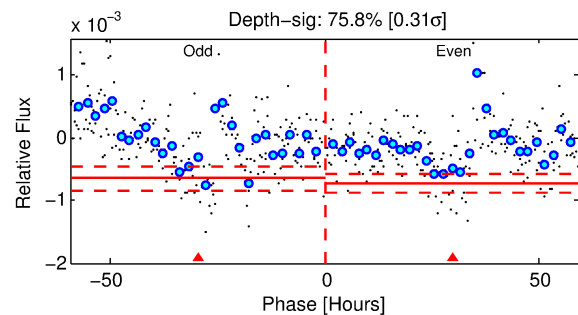
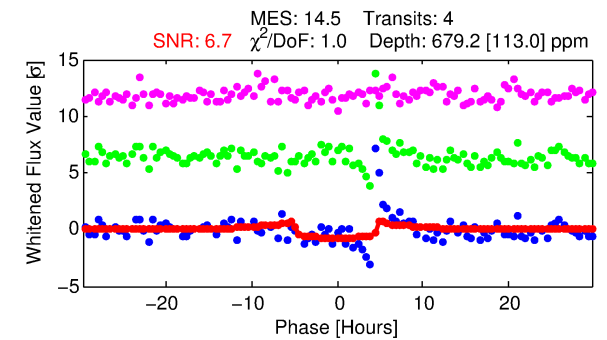
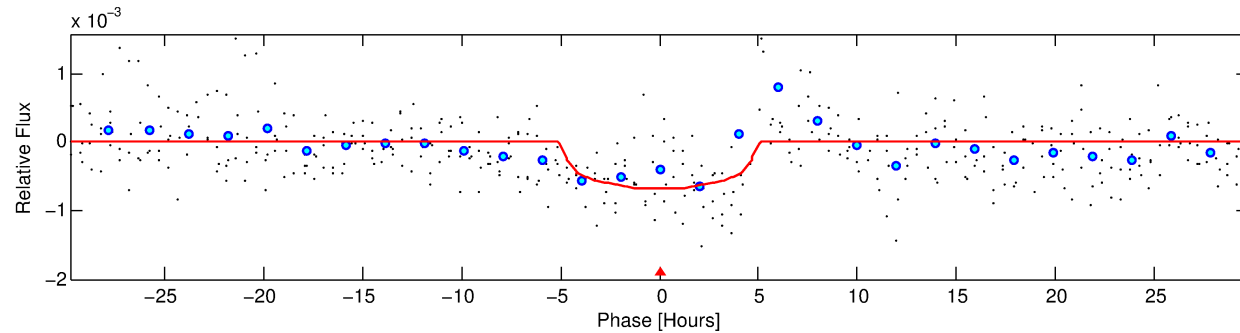
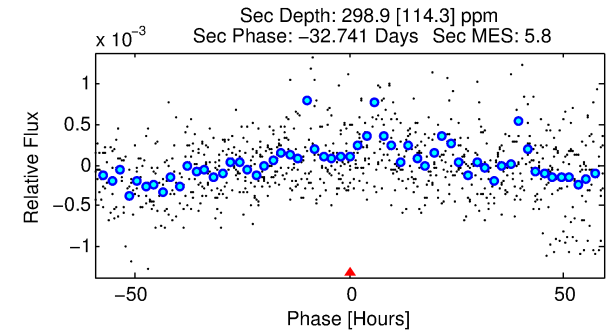
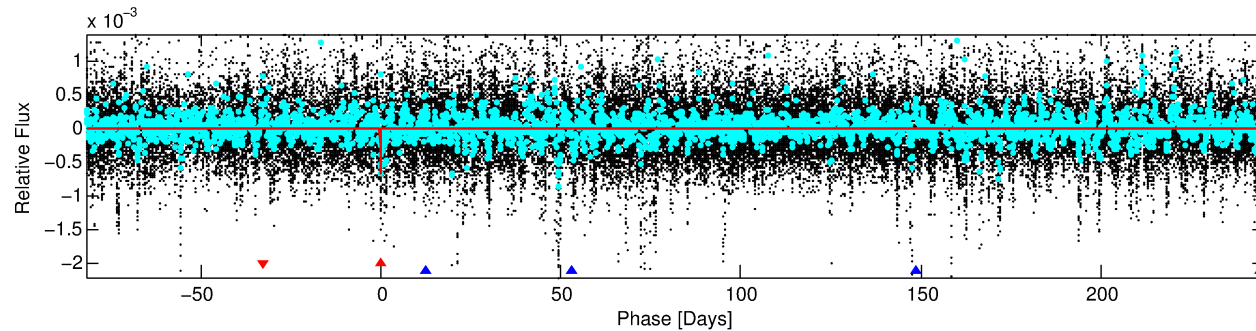
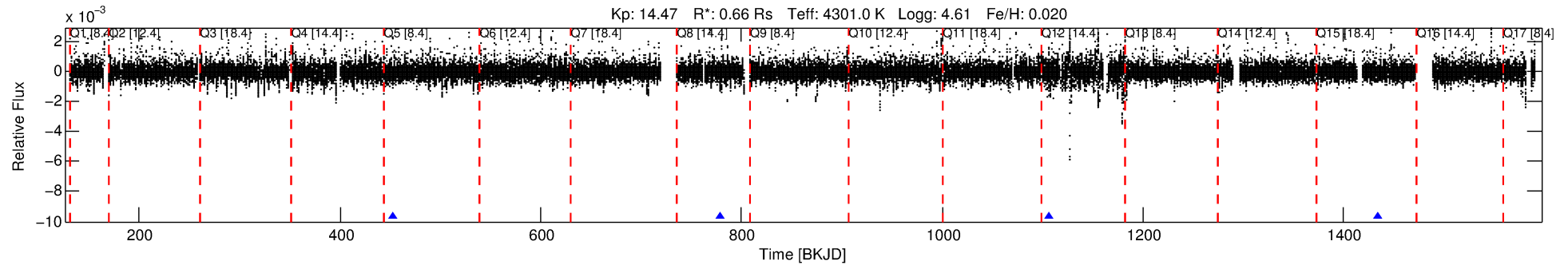
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Ephemeris Match Information For 007509496-01

No Significant Match Found

# DV One-Page Summary

KIC: 7509496 Candidate: 1 of 2 Period: 327.307 d



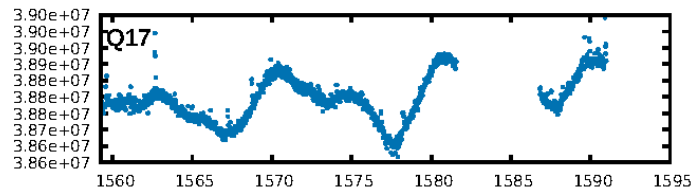
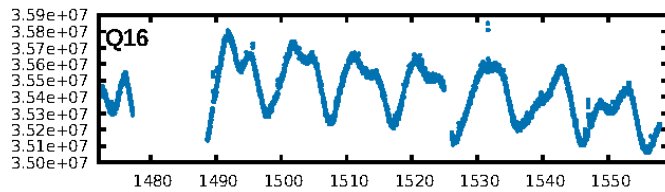
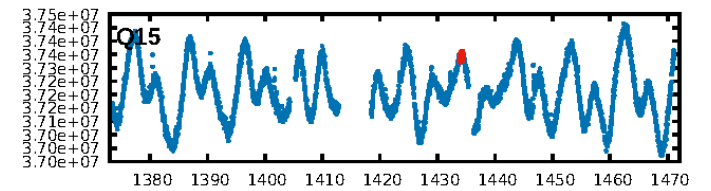
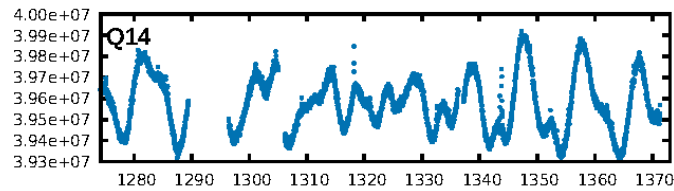
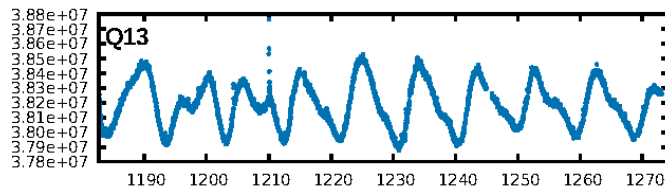
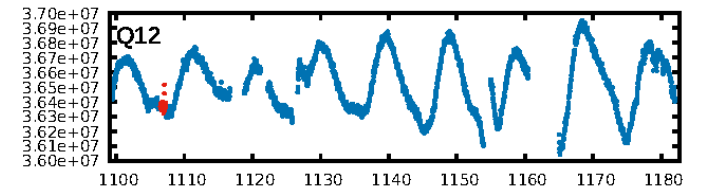
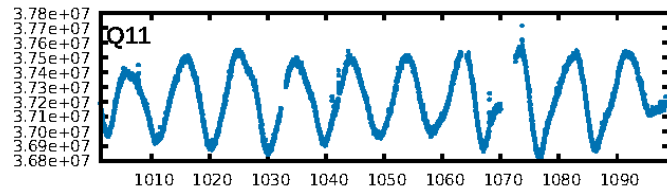
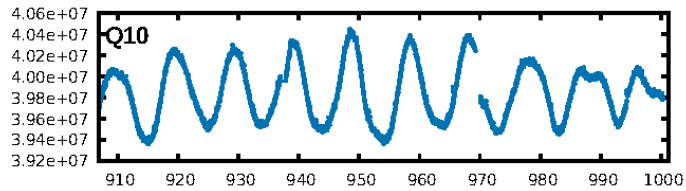
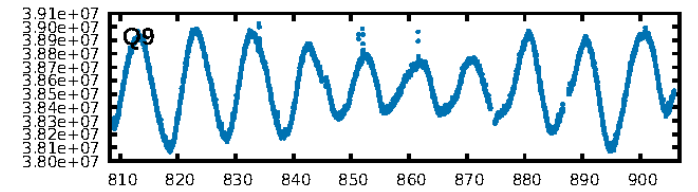
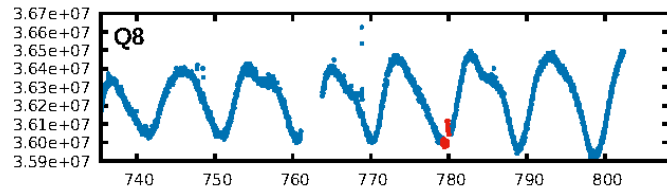
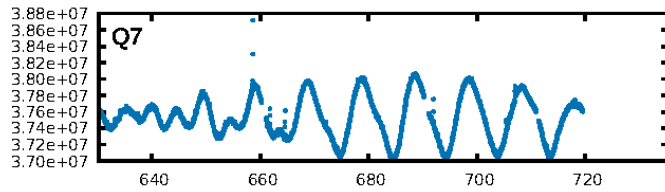
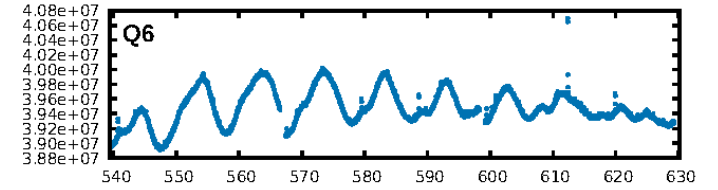
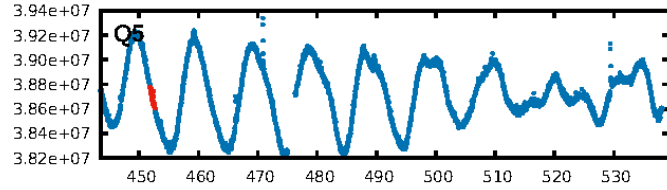
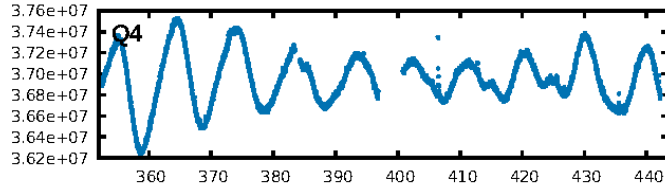
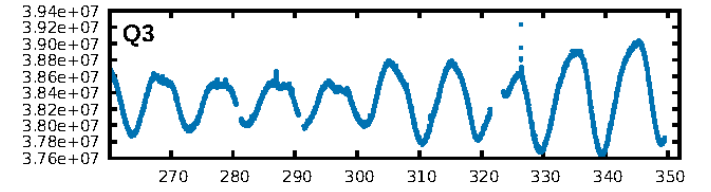
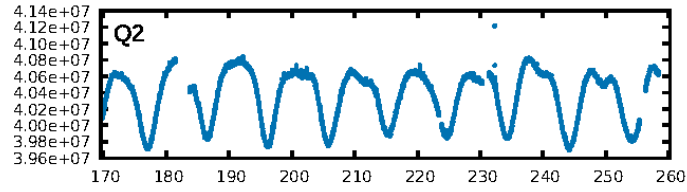
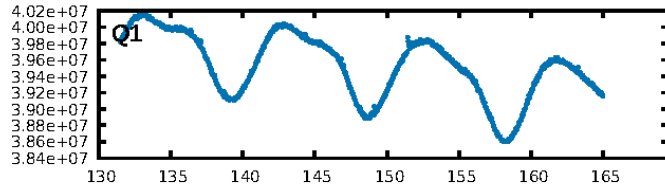
## DV Fit Results:

Period = 327.30683 [0.00574] d  
Epoch = 452.2649 [0.0113] BKJD  
Rp/R\* = 0.0241 [0.0167]  
a/R\* = 221.13 [461.68]  
b = 0.53 [2.89]  
Seff = 0.21 [0.03]  
Teq = 172 [7] K  
Rp = 1.74 [1.22] Re  
a = 0.8058 [0.0611] AU  
Ag = 35328.33 [51115.04] [0.69 $\sigma$ ]  
Teffp = 3645 [1320] K [2.63 $\sigma$ ]

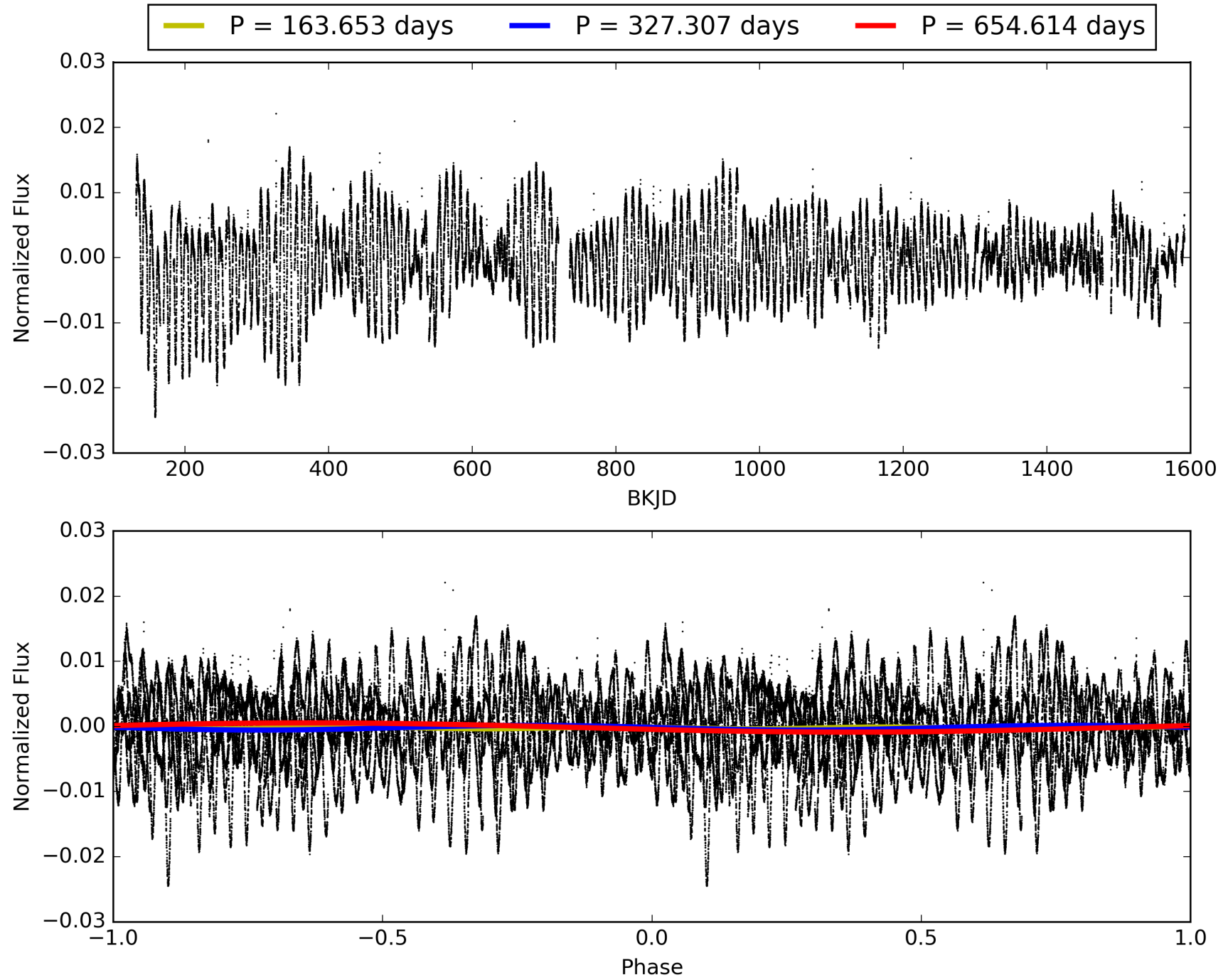
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 100.0% [161.96 $\sigma$ ]  
ModelChiSquare2-sig: 1.8%  
ModelChiSquareGof-sig: 98.5%  
Bootstrap-pfa: 8.85e-20  
RollingBand-fgt: 1.00 [4/4]  
**GhostDiagnostic-chr: 0.6267**  
Centroid-sig: 10.0%  
Centroid-so: 0.774 arcsec [0.93 $\sigma$ ]  
OotOffset-rm: 0.343 arcsec [0.45 $\sigma$ ]  
KicOffset-rm: 0.323 arcsec [0.84 $\sigma$ ]  
OotOffset-st: 0/1/2/1 [4]  
KicOffset-st: 0/1/2/1 [4]  
DiffImageQuality-fgm: 0.75 [3/4]  
DiffImageOverlap-fno: 1.00 [4/4]

# TCE 007509496-01, PDC Light Curves

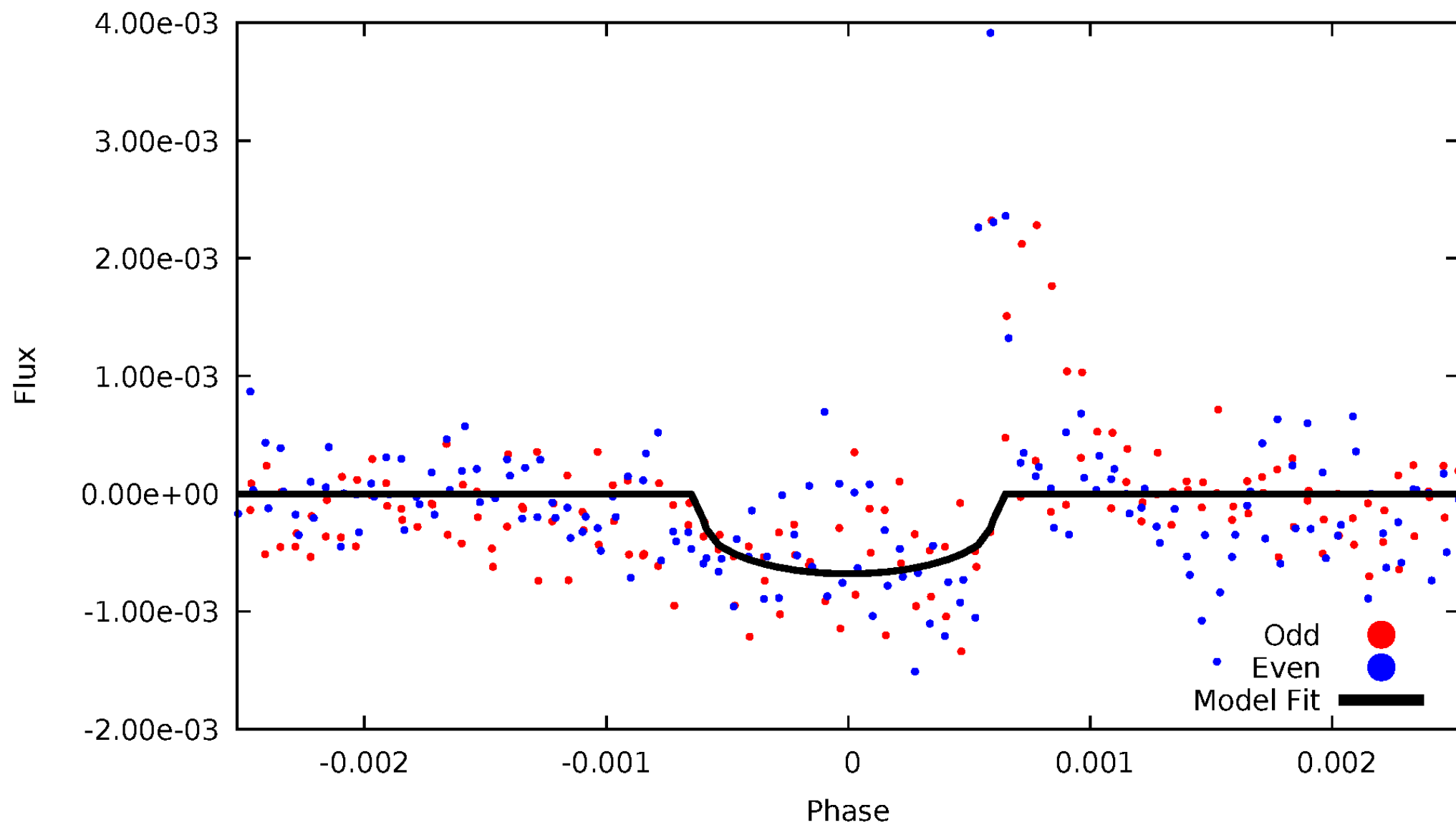


TCE 007509496-01



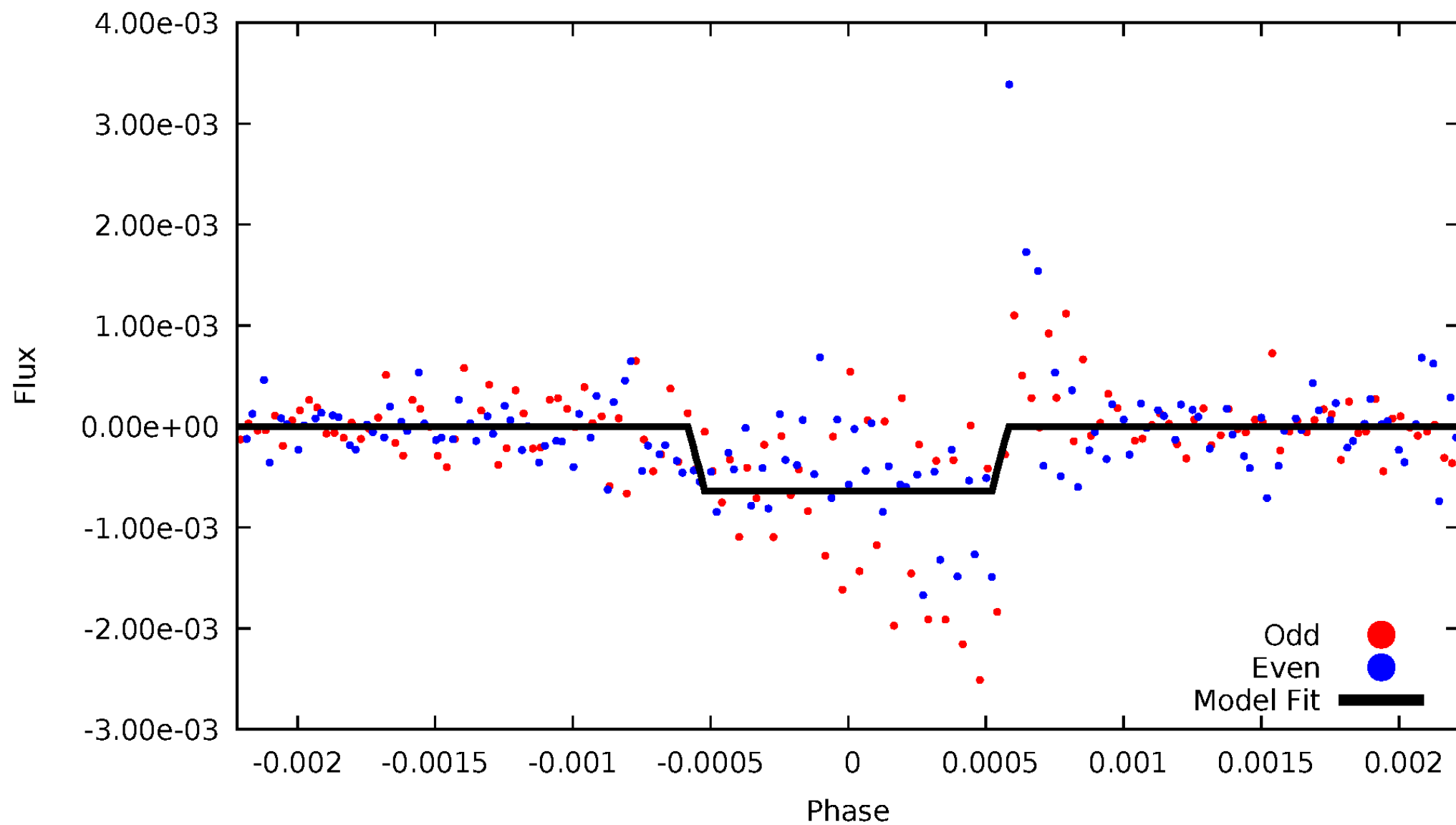
# DV Odd/Even

TCE 007509496-01



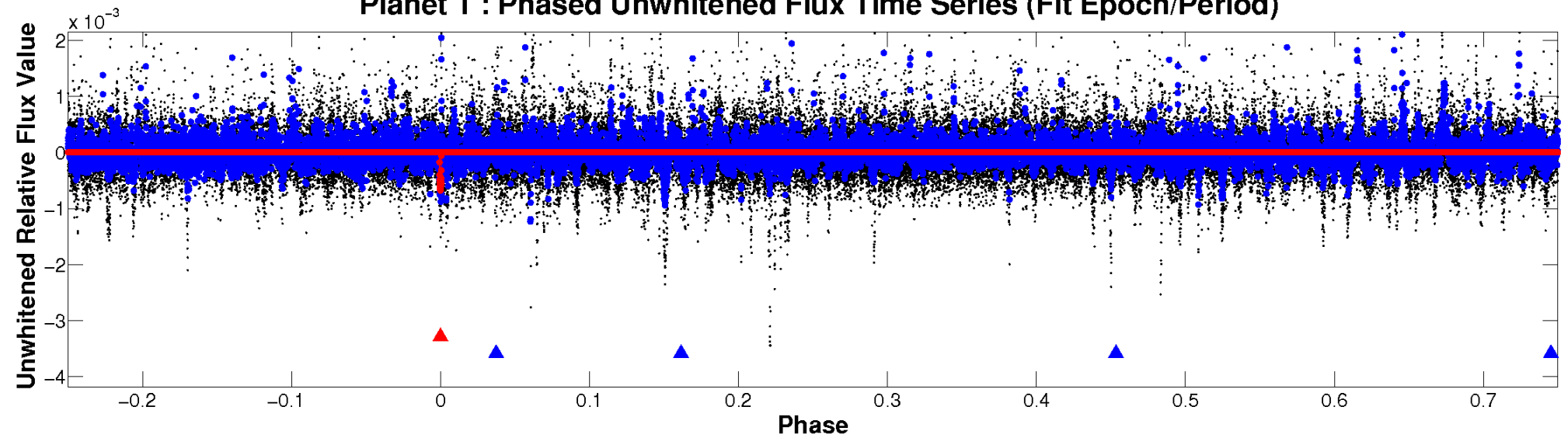
# ALT Odd/Even

TCE 007509496-01

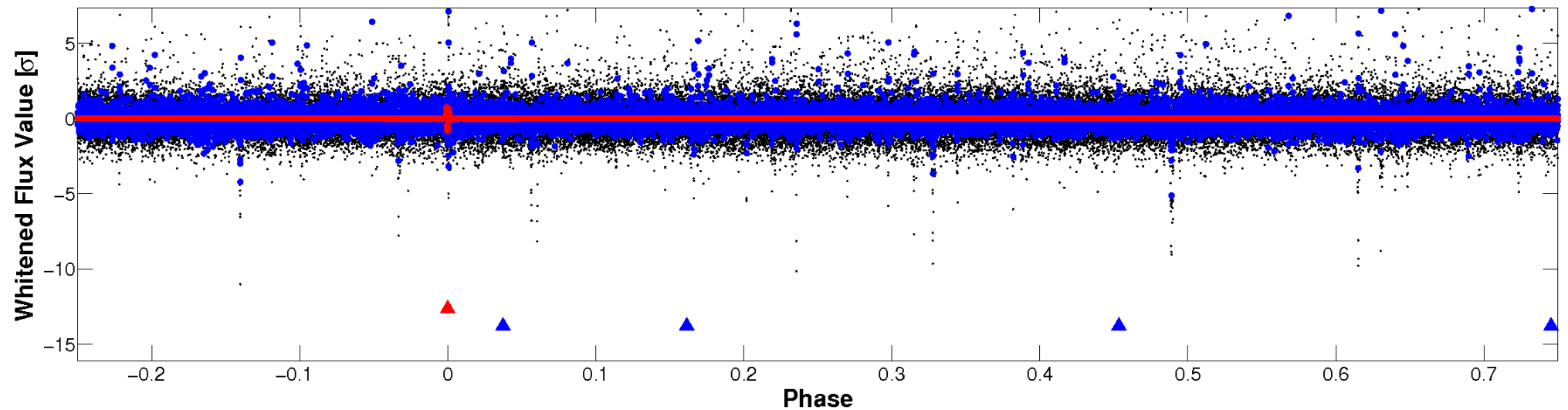


# Non-Whitened Vs. Whitened Light Curve

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

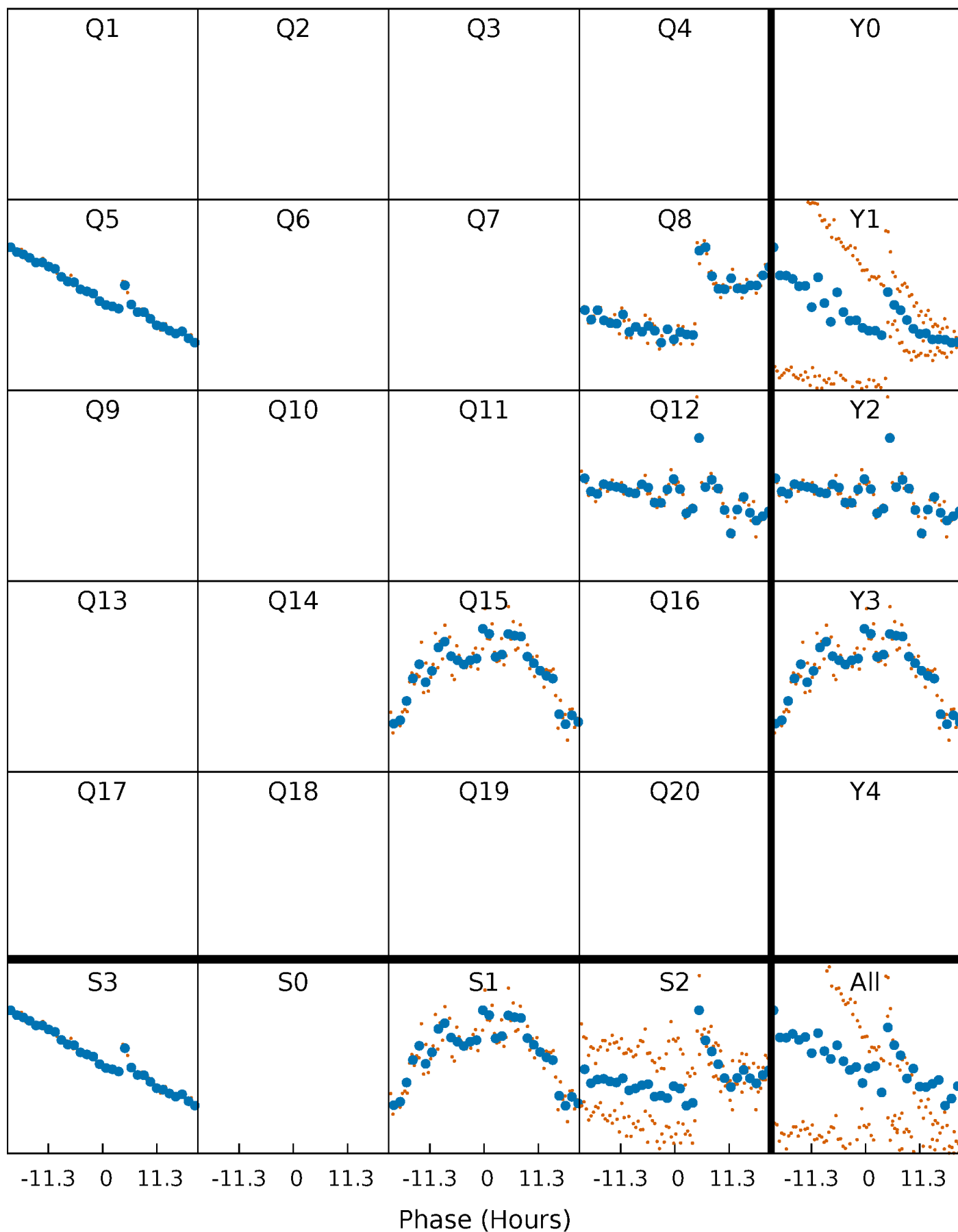


**Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)**



# PDC Quarter-Phased Transit Curves

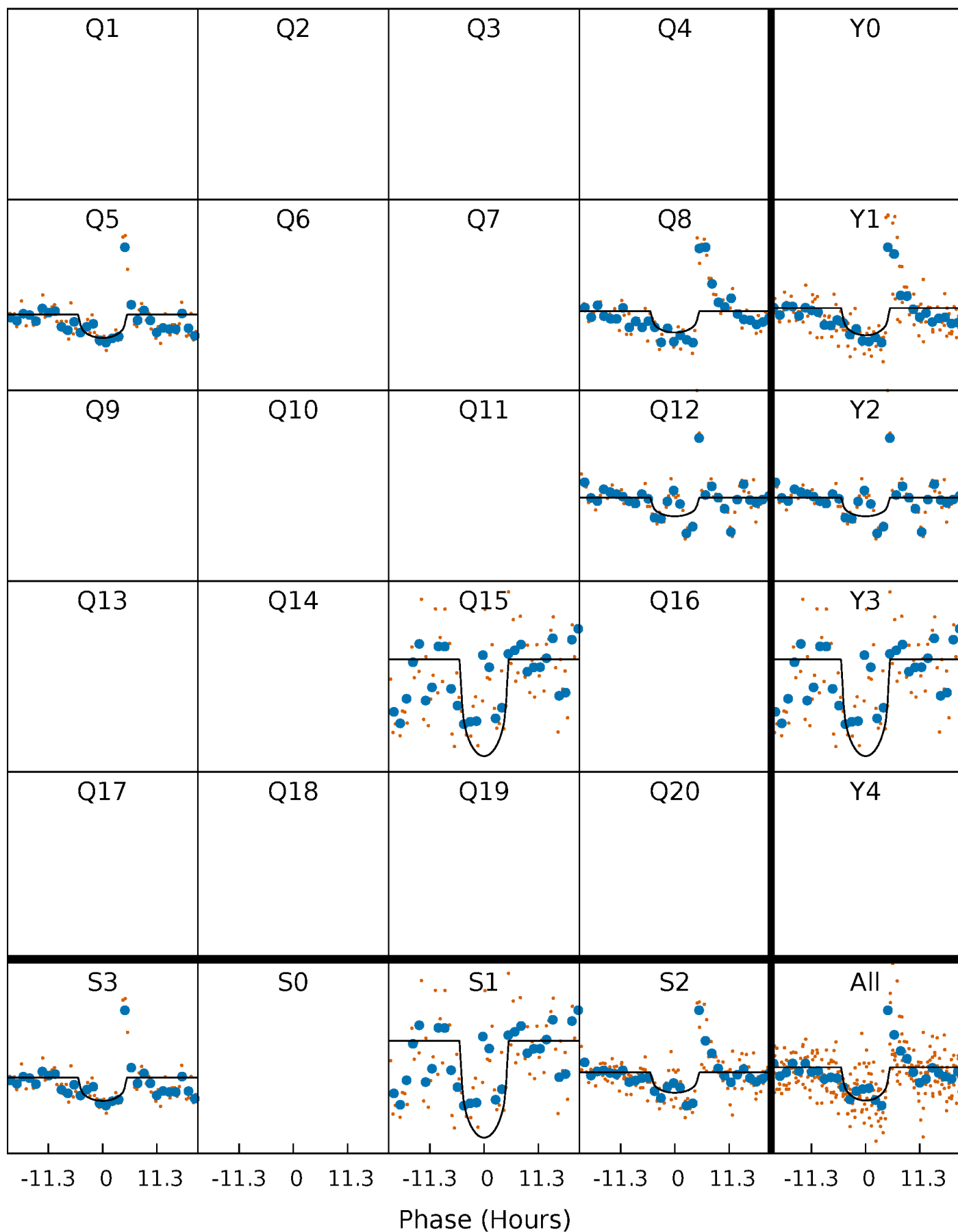
TCE 007509496-01 P=327.306835 Days  $T_0=452.264932$  (BKJD)





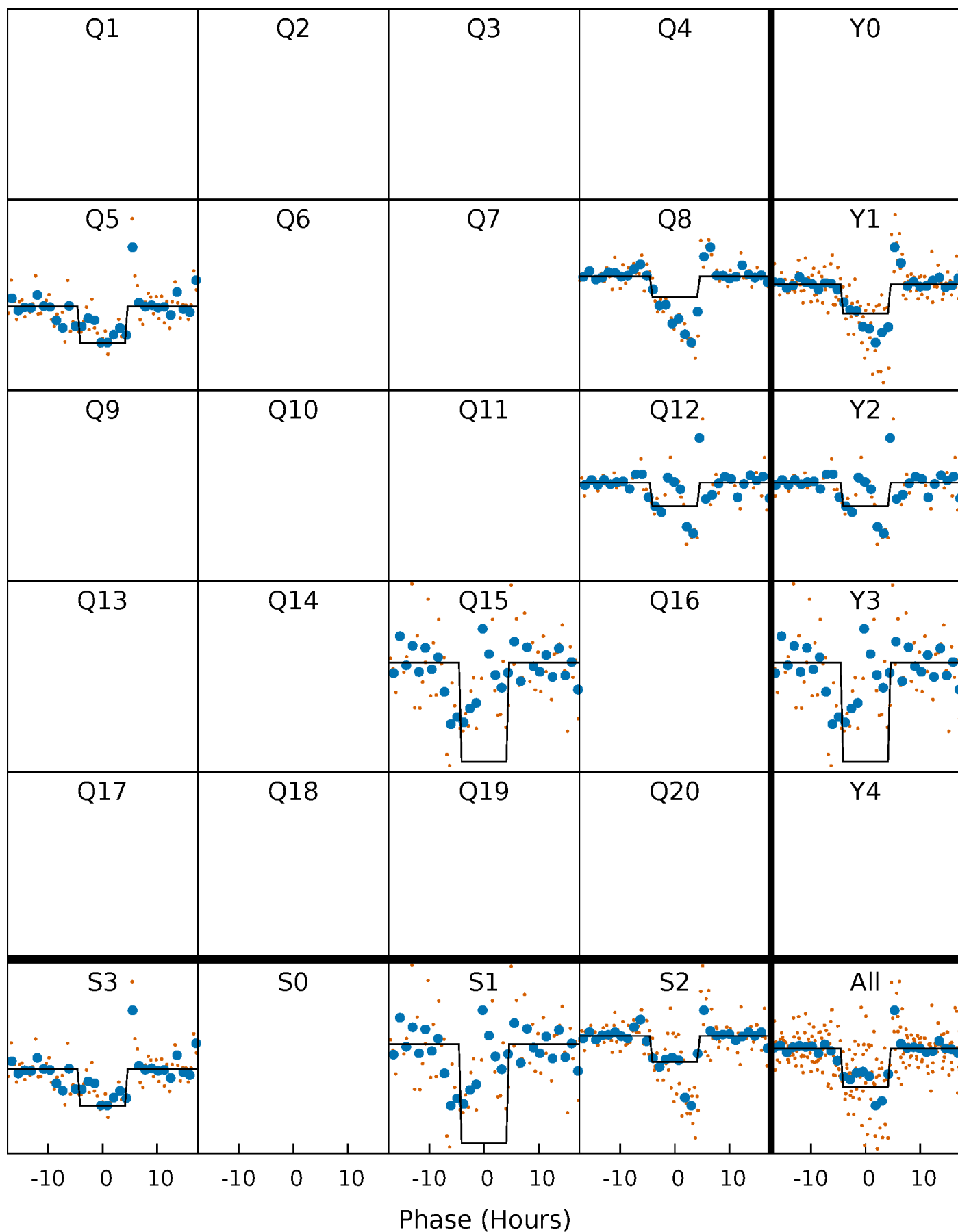
# DV Quarter-Phased Transit Curves

TCE 007509496-01 P=327.306835 Days  $T_0=452.264932$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

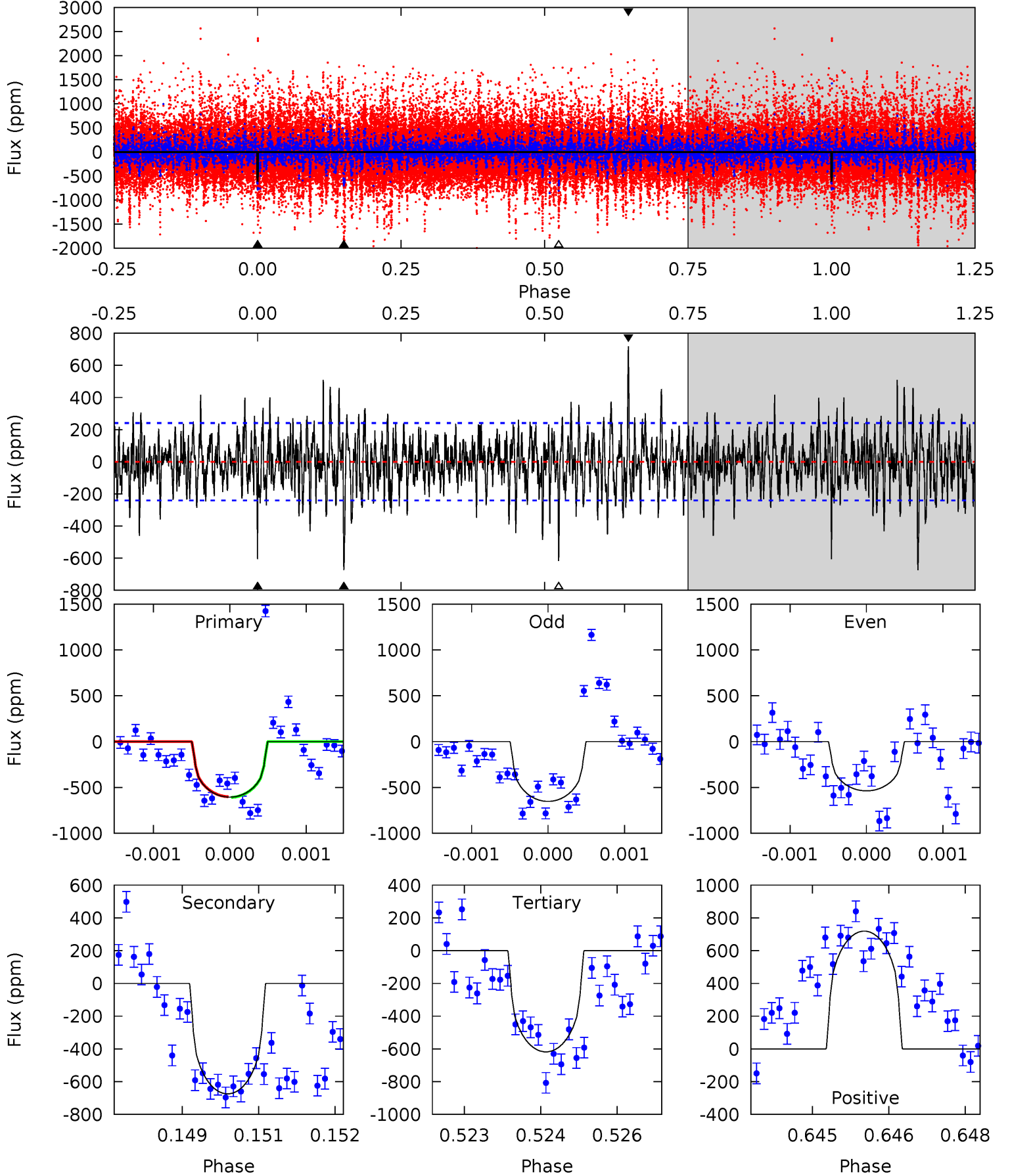
TCE 007509496-01 P=327.311575 Days  $T_0=452.256618$  (BKJD)



# DV Model-Shift Uniqueness Test

007509496-01, P = 327.306835 Days, E = 124.958097 Days

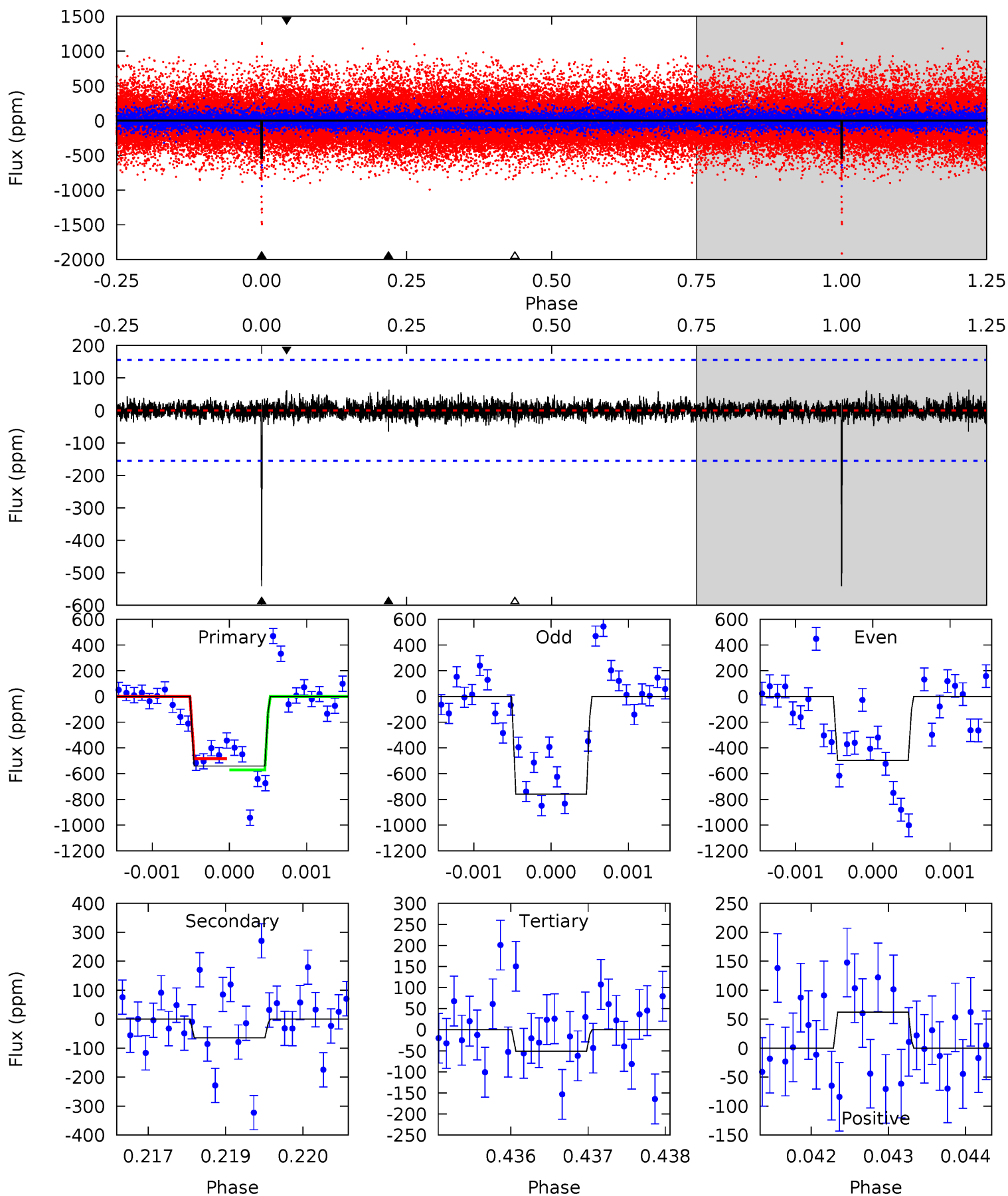
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
13.6	15.1	13.9	16.1	5.40	3.21	3.12	-0.29	-2.55	1.26	-1.00	1.21	1.14	0.52	0.08



# Alt Model-Shift Uniqueness Test

007509496-01, P = 327.311575 Days, E = 124.945043 Days

Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
18.9	2.25	1.79	2.16	5.43	3.25	0.48	17.1	16.7	0.47	0.09	4.80	1.22	0.11	0



### Stellar Parameters For KIC 007509496

	$T_{\text{eff}}(K)$	$\log(g)$	$[\text{Fe}/\text{H}]$	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$4301^{+116}_{-129}$	$4.610^{+0.056}_{-0.018}$	$0.020^{+0.250}_{-0.300}$	$0.662^{+0.031}_{-0.062}$	$0.652^{+0.057}_{-0.057}$	$3.160^{+0.740}_{-0.246}$
	+3%/-3%	+1%/-0%	+1250%/-1500%	+5%/-9%	+9%/-9%	+23%/-8%
Source	PHO1	KIC0	KIC0	DSEP		

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

### Secondary Eclipse Parameters for KIC 007509496-01 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$-674 \pm 45$	$1.93^{+1.08}_{-1.08}$	$239^{+7}_{-9}$	$4241^{+1824}_{-621}$	$65660^{+267880}_{-38128}$
Alt.	$-65 \pm 29$	$1.89^{+1.13}_{-1.02}$	$238^{+8}_{-8}$	$2902^{+791}_{-400}$	$6059^{+22664}_{-4148}$

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

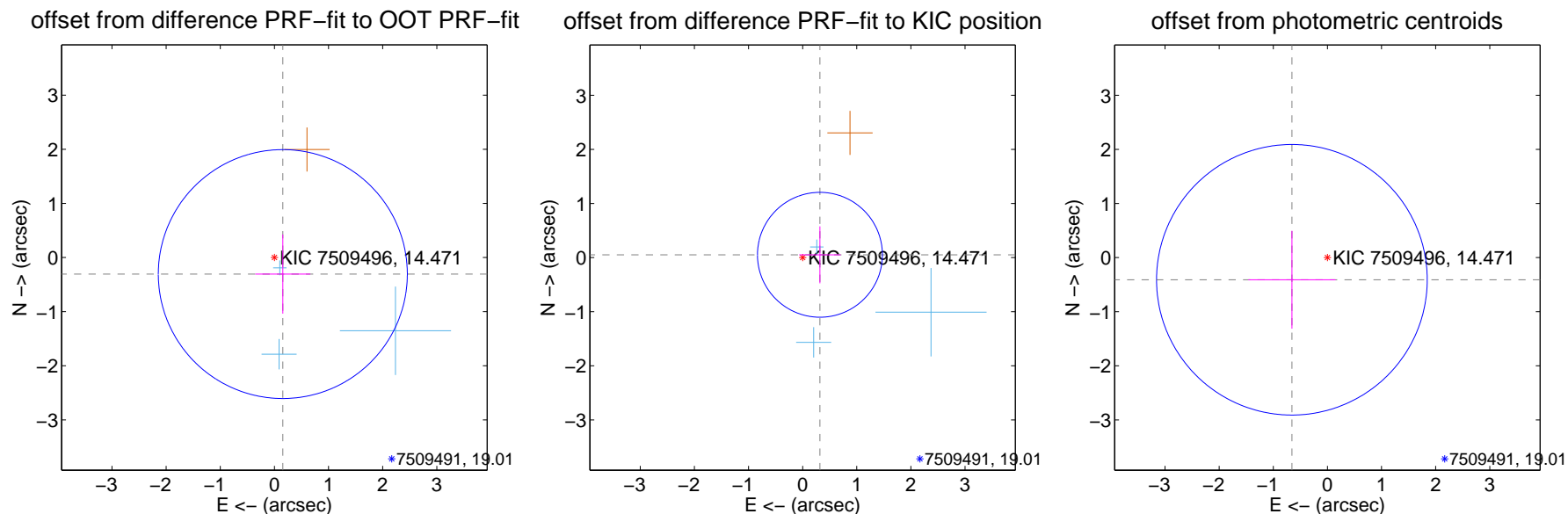
## DV Centroid Data

Supplemental centroid analysis for 007509496-01. Kepler magnitude: 14.47. Transit SNR 6.73

There are 3 quarters with good PRF difference image offsets

The direct PRF centroid is offset from the target star catalog position by about 0.41 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.343 \pm 0.766$	0.45	$-0.155 \pm 0.508$	$-0.306 \pm 0.731$
PRF-fit source offset from KIC position	$0.323 \pm 0.385$	0.84	$-0.319 \pm 0.383$	$0.052 \pm 0.526$
photometric centroid source offset	$0.77 \pm 0.83$	0.93	$0.66 \pm 0.80$	$-0.41 \pm 0.90$

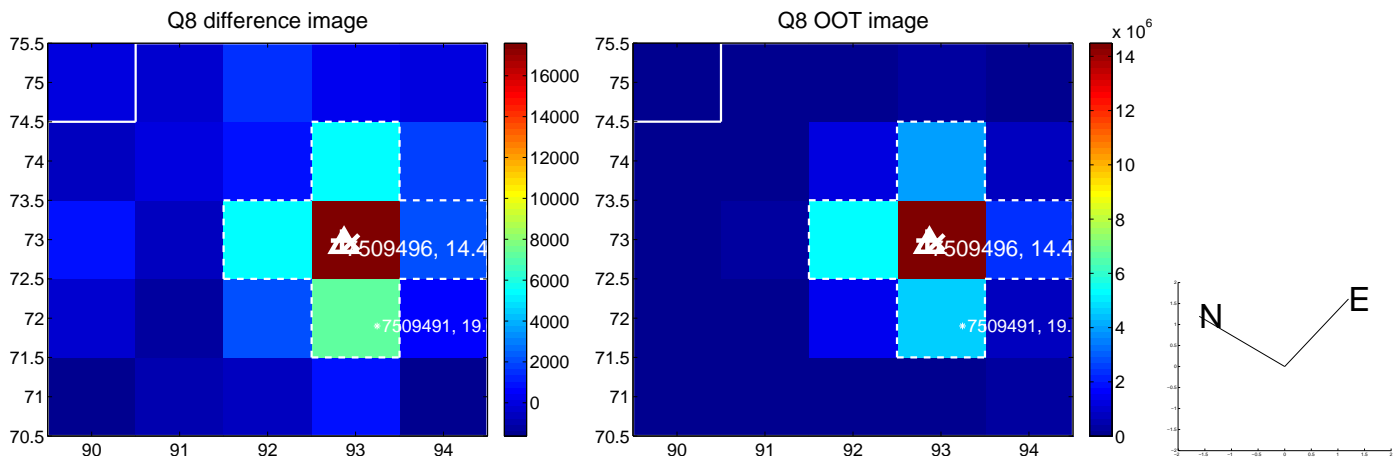
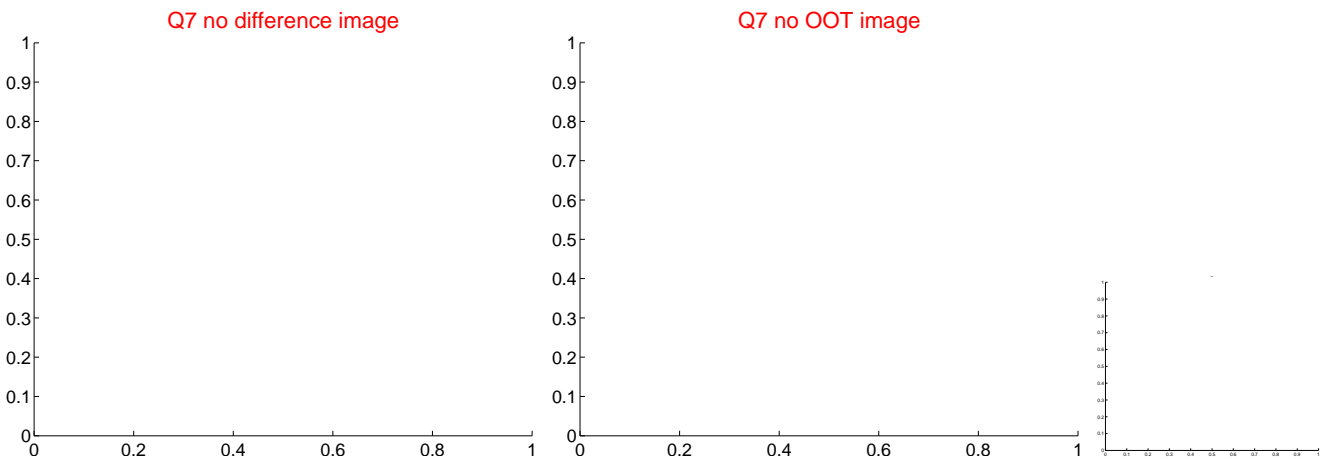
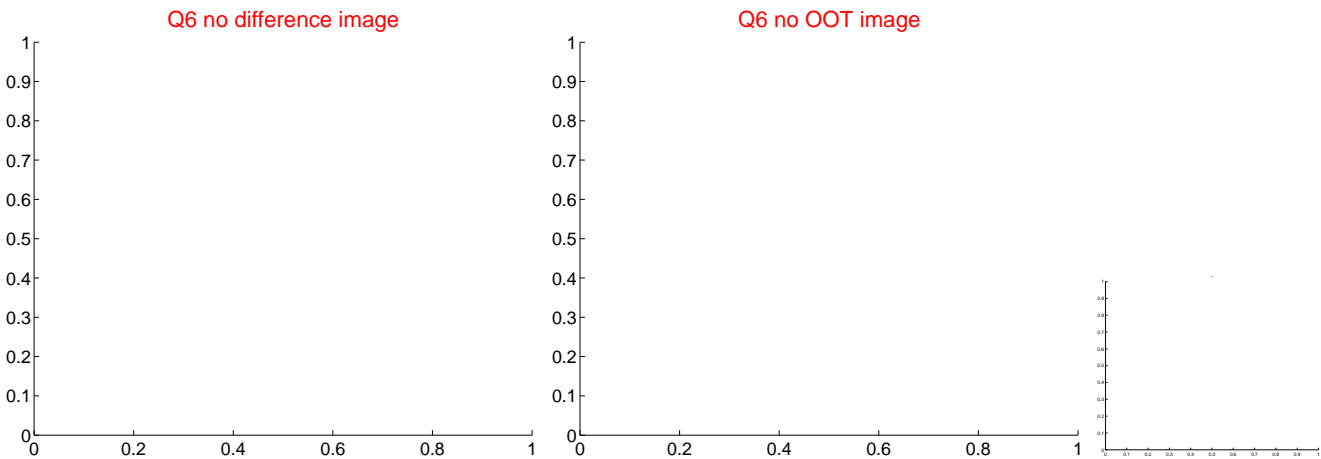
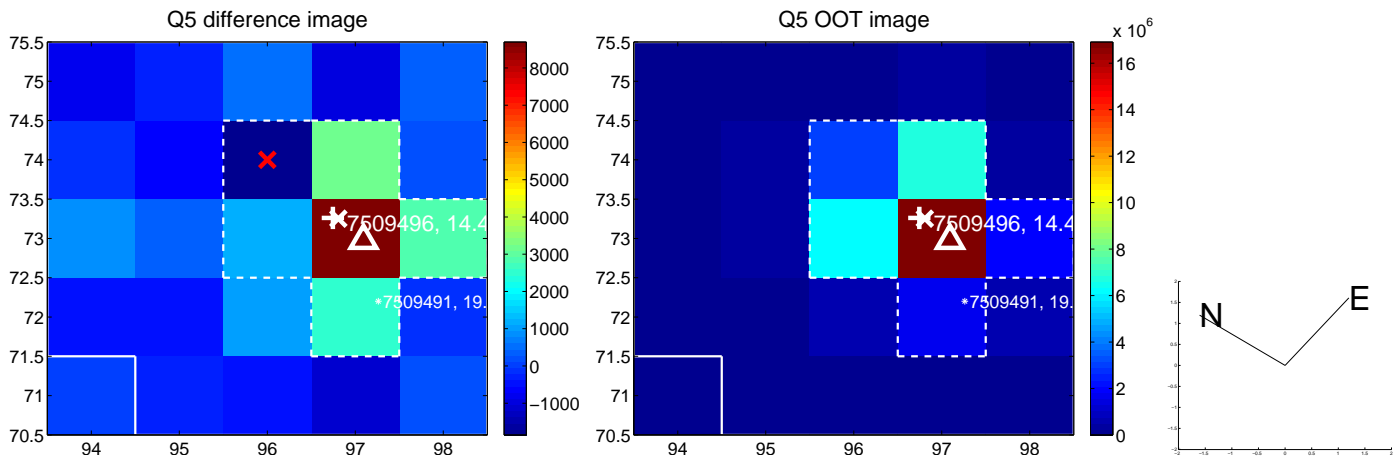


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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

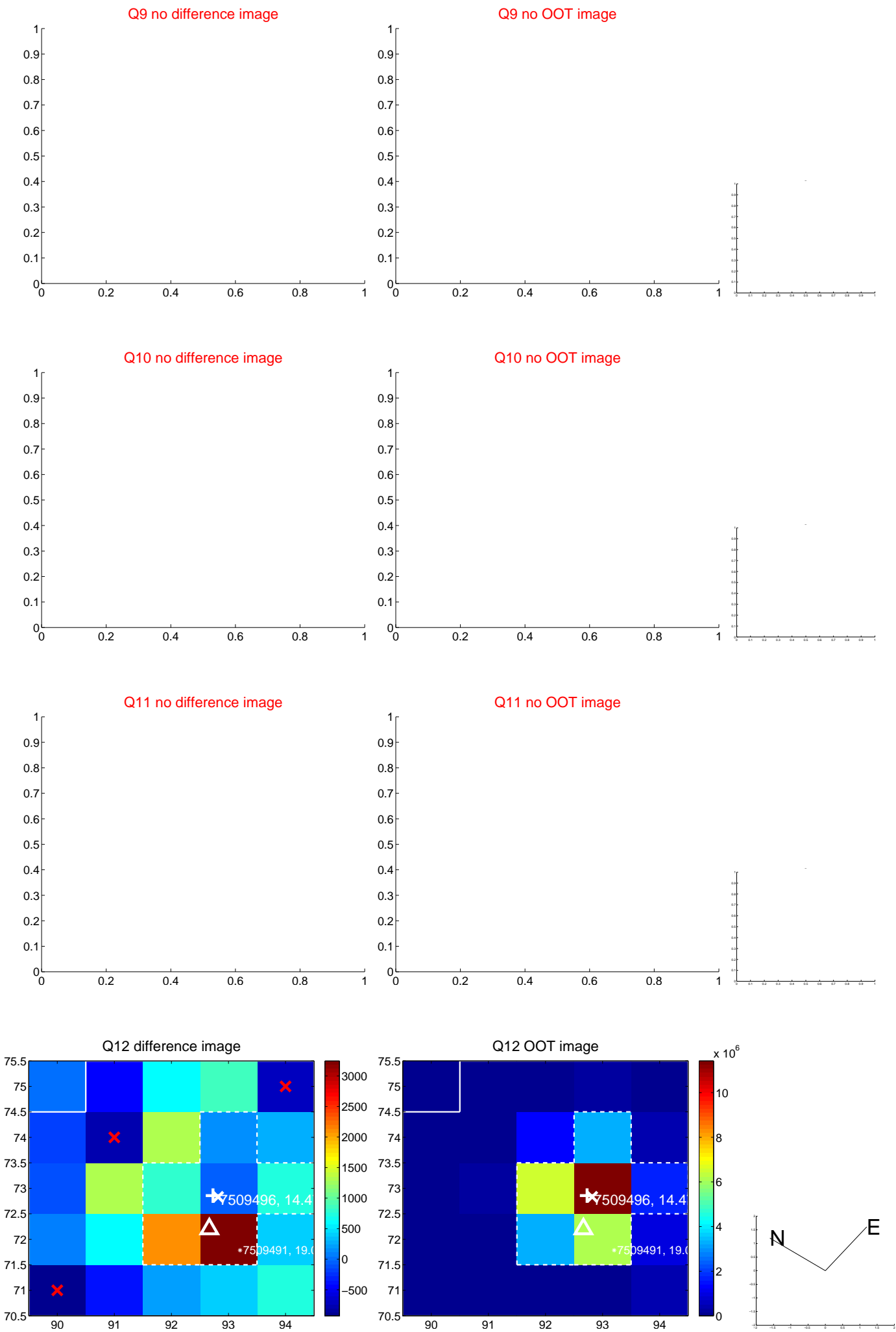


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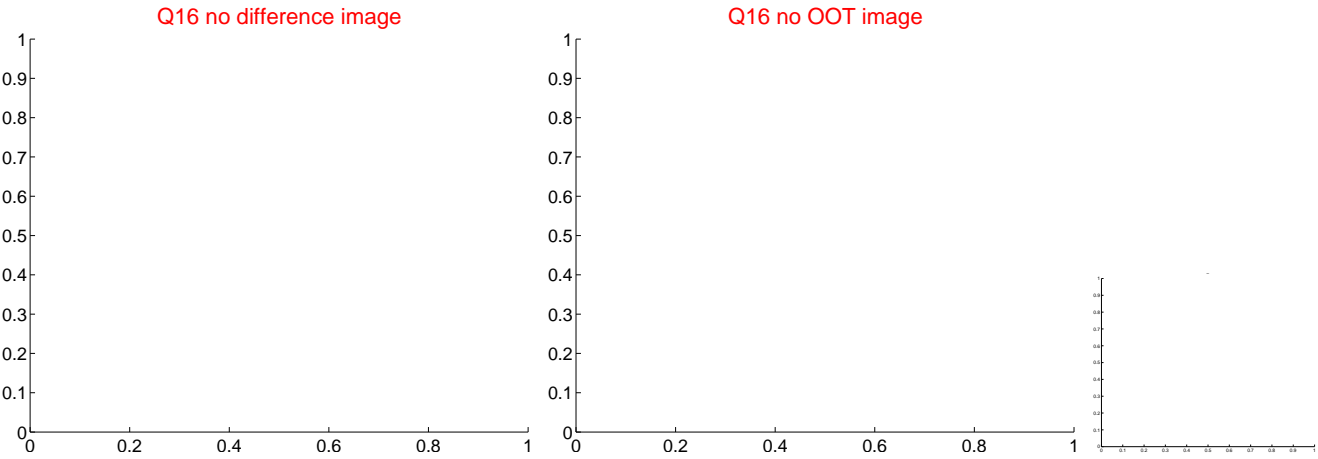
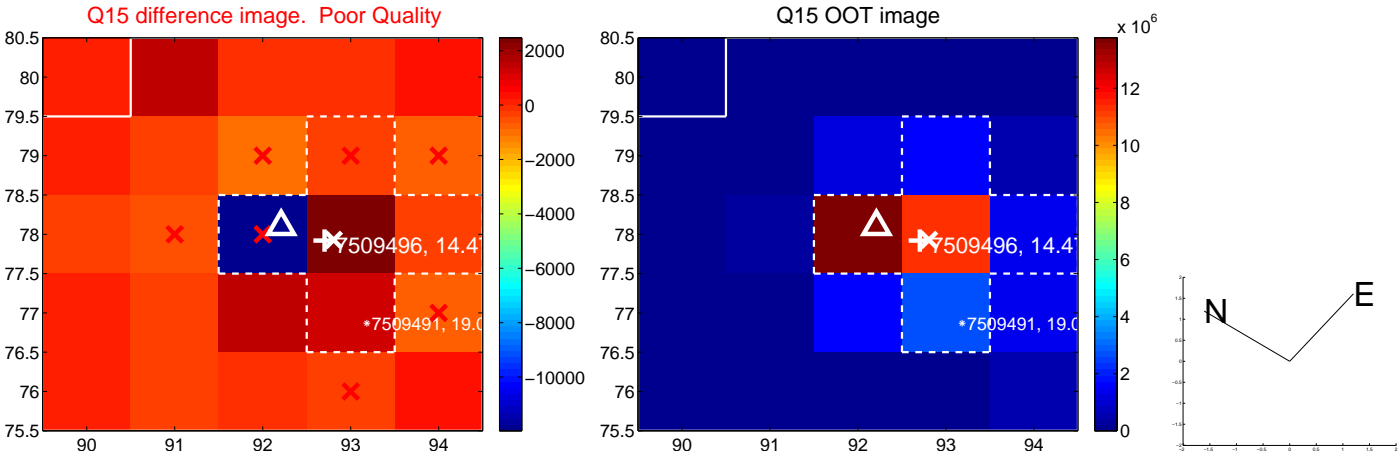




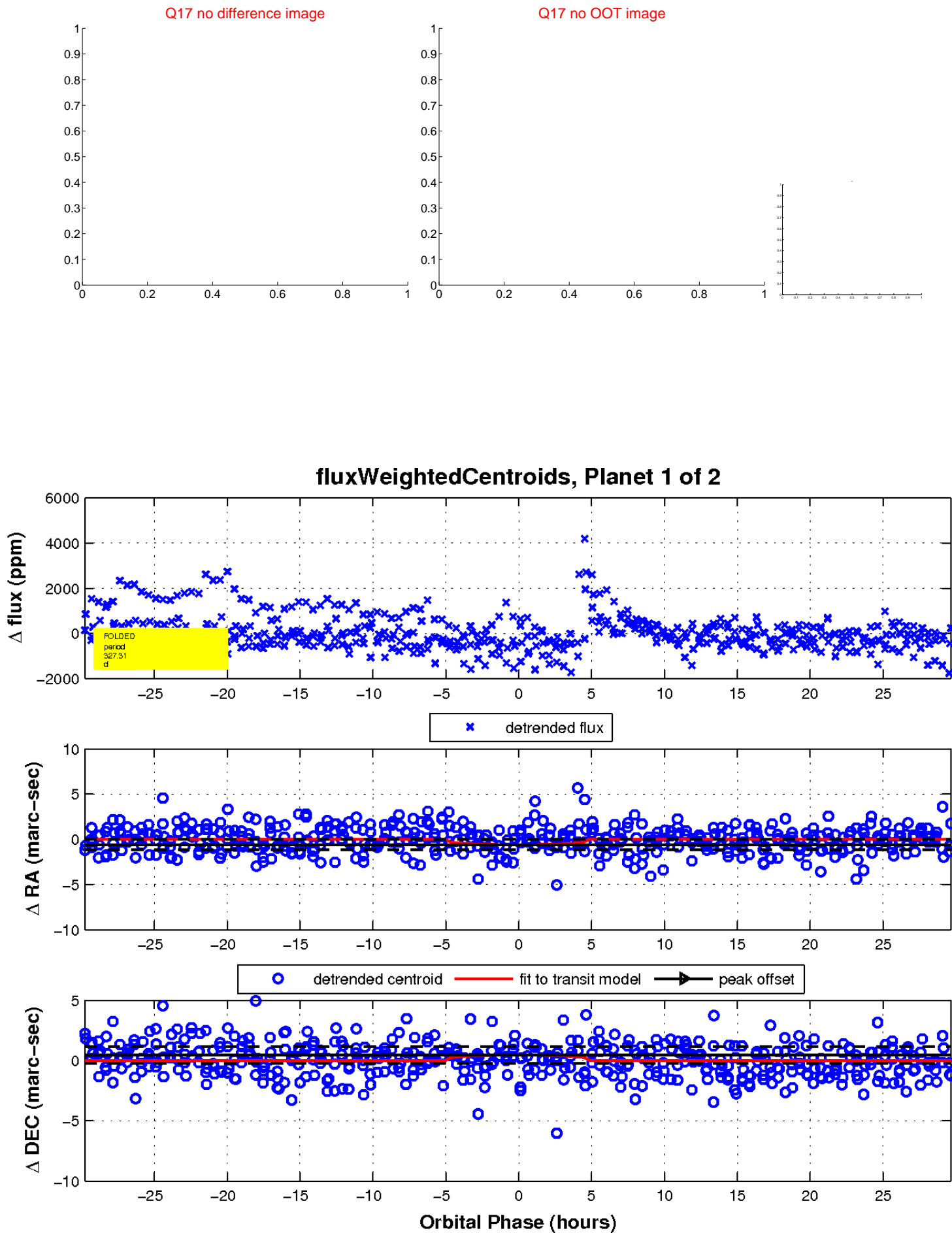
white ×: KIC target position; +: OOT centroid; △: difference centroid. red ✕: large negative pixel value.



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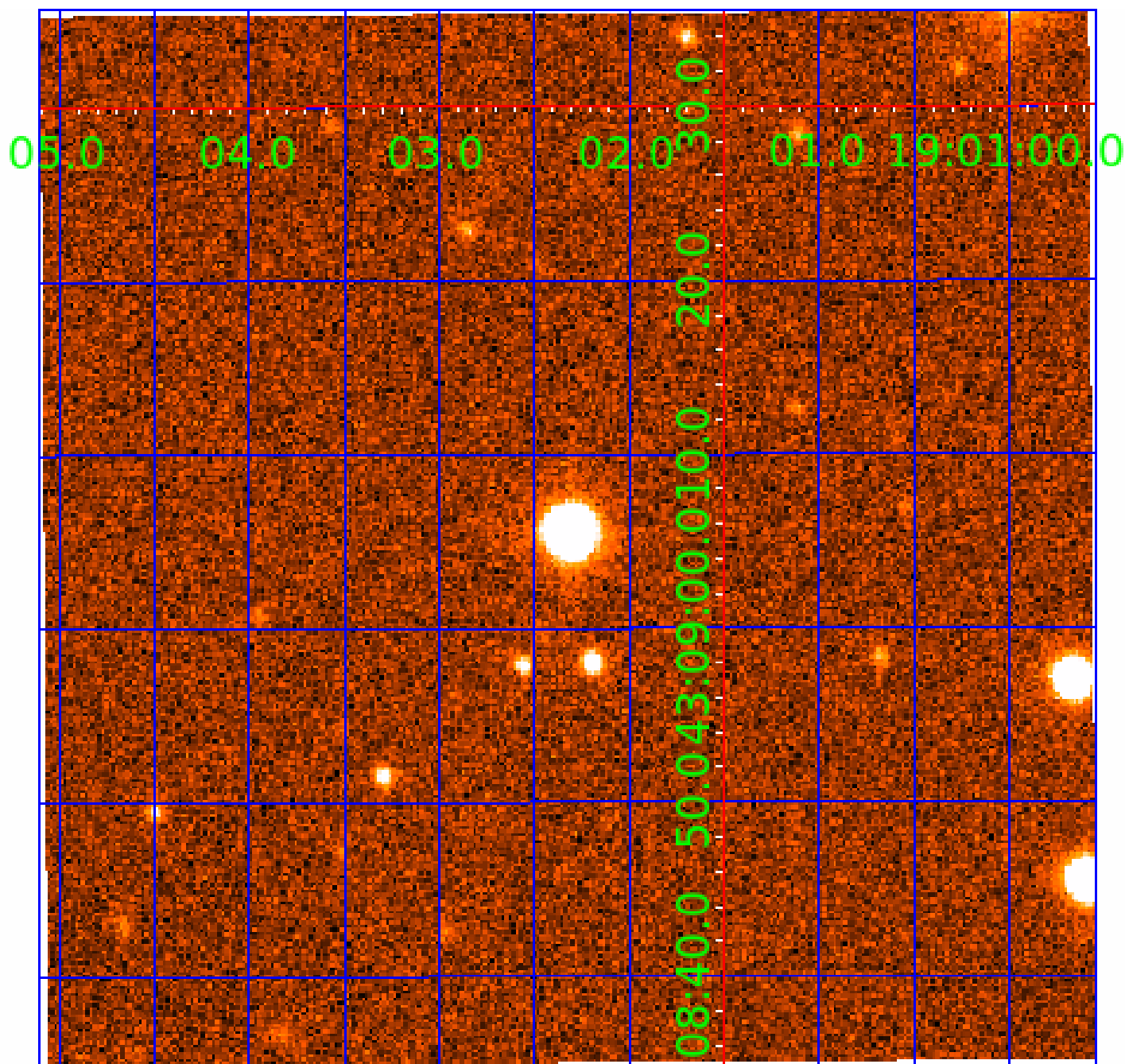


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UKIRT Image

Declination



# KIC 007509496

## Q1-17 DR25 TCE Parameters

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007509496-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS

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

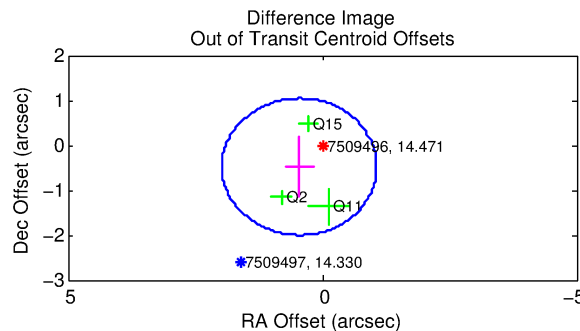
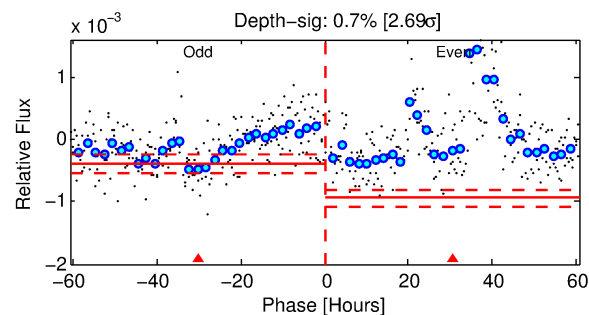
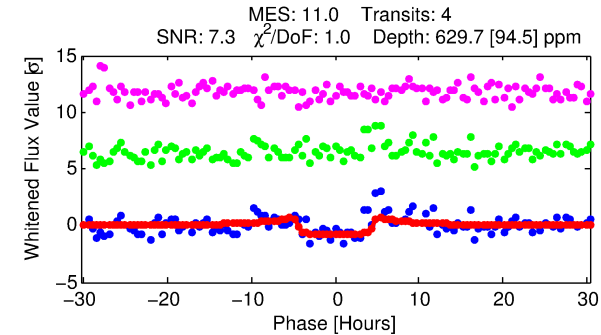
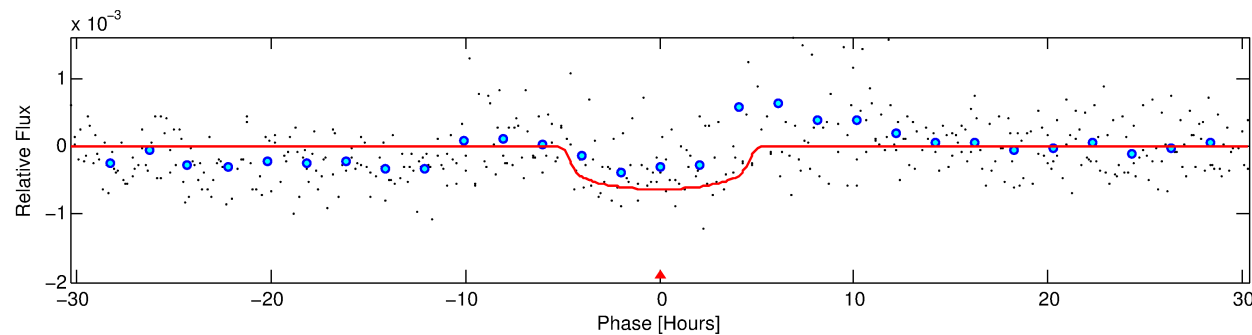
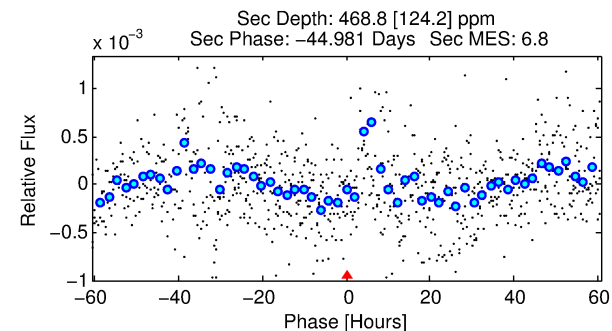
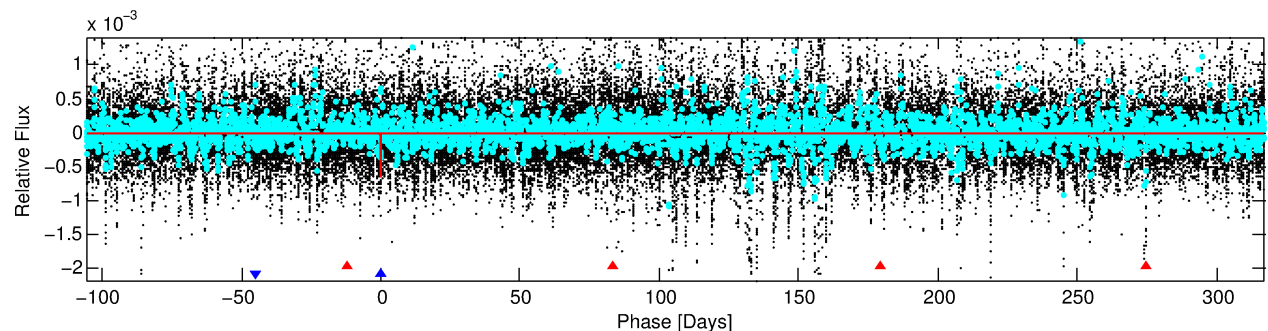
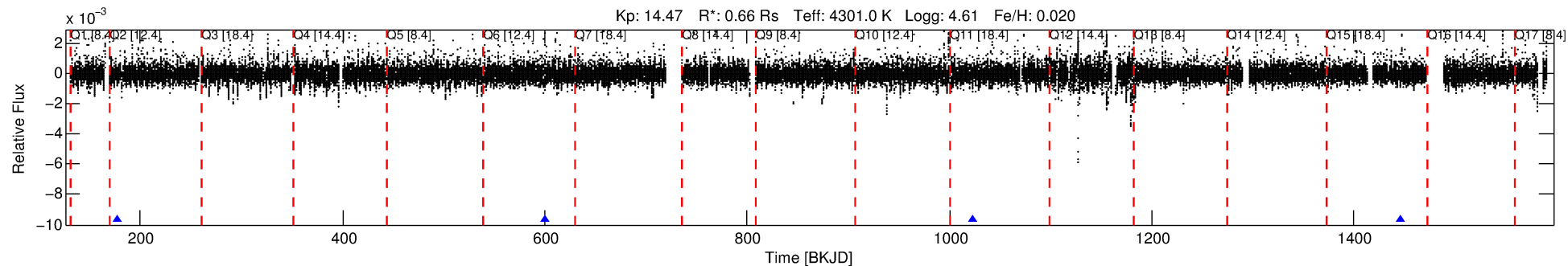
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 007509496-02

No Significant Match Found

# DV One-Page Summary

KIC: 7509496 Candidate: 2 of 2 Period: 422.863 d



## DV Fit Results:

Period = 422.86342 [0.00755] d  
Epoch = 177.8214 [0.0142] BKJD  
Rp/R\* = 0.0265 [0.0058]  
a/R\* = 193.23 [131.04]  
b = 0.83 [0.26]  
Seff = 0.15 [0.02]  
Teq = 158 [6] K  
Rp = 1.91 [0.46] Re  
a = 0.9559 [0.0725] AU  
Ag = 64406.49 [33774.21] [1.91 $\sigma$ ]  
Teffp = 3889 [513] K [7.28 $\sigma$ ]

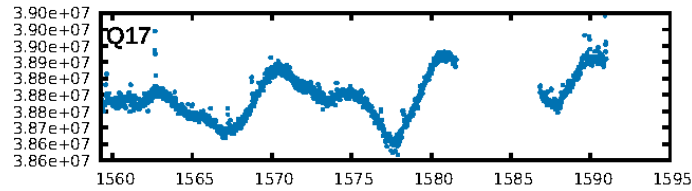
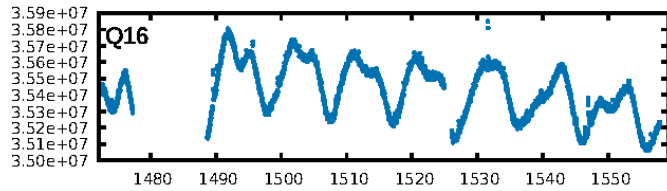
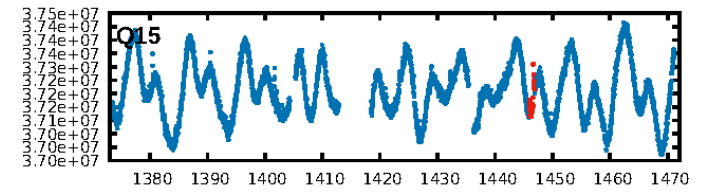
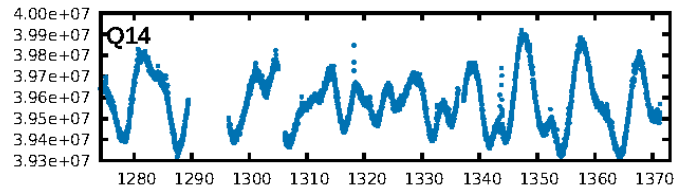
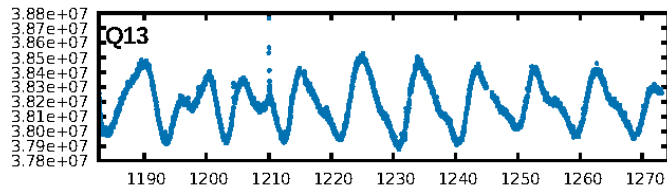
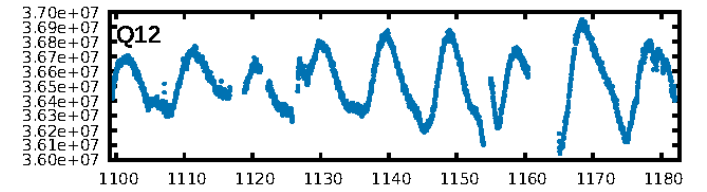
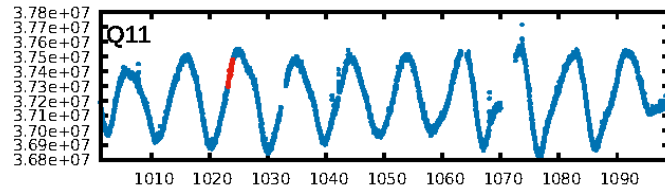
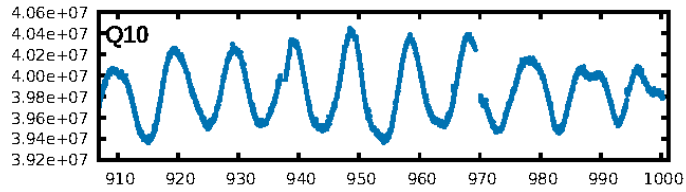
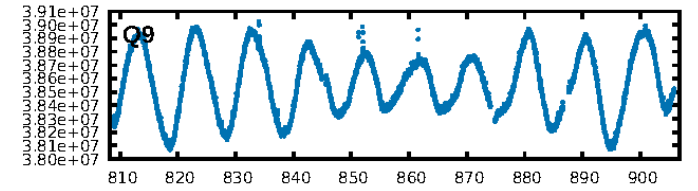
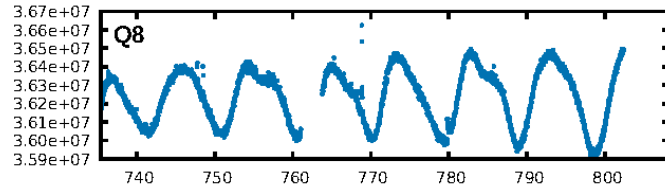
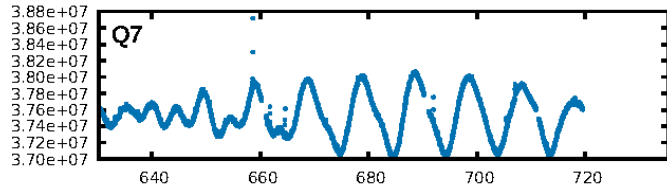
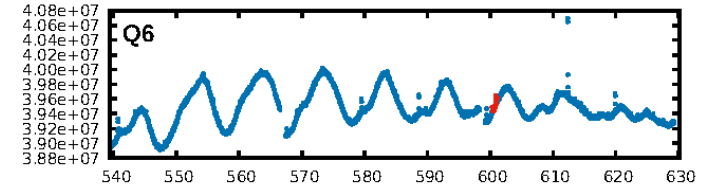
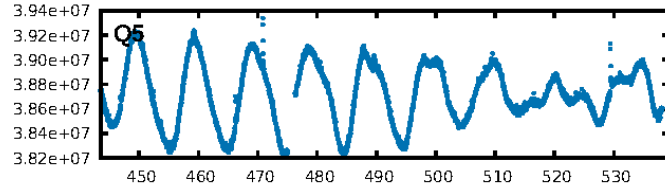
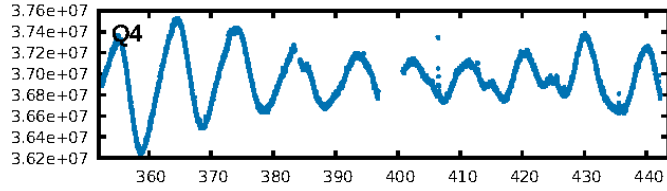
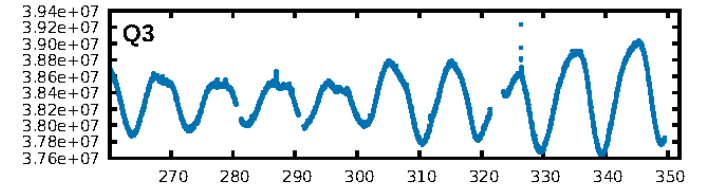
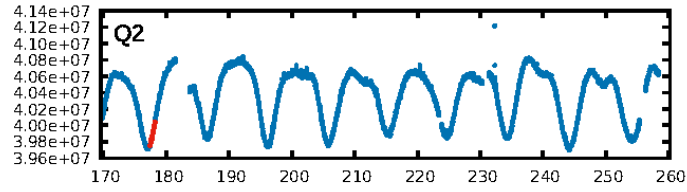
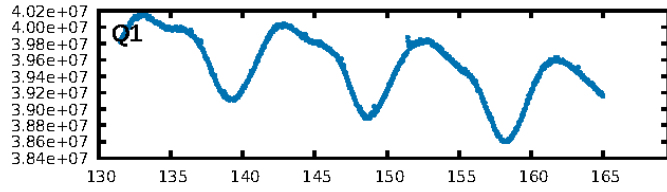
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [161.96 $\sigma$ ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: 12.0%  
ModelChiSquareGof-sig: 99.5%  
**Bootstrap-pfa: 9.04e-12**  
RollingBand-fgt: 1.00 [4/4]  
GhostDiagnostic-chr: -20.77  
Centroid-sig: 9.9%  
Centroid-so: 1.616 arcsec [1.94 $\sigma$ ]  
OotOffset-rm: 0.662 arcsec [1.30 $\sigma$ ]  
KicOffset-rm: 0.286 arcsec [0.48 $\sigma$ ]  
OotOffset-st: 1/2/0/0 [3]  
KicOffset-st: 1/2/0/0 [3]  
DiffImageQuality-fgm: 0.67 [2/3]  
DiffImageOverlap-fno: 1.00 [3/3]

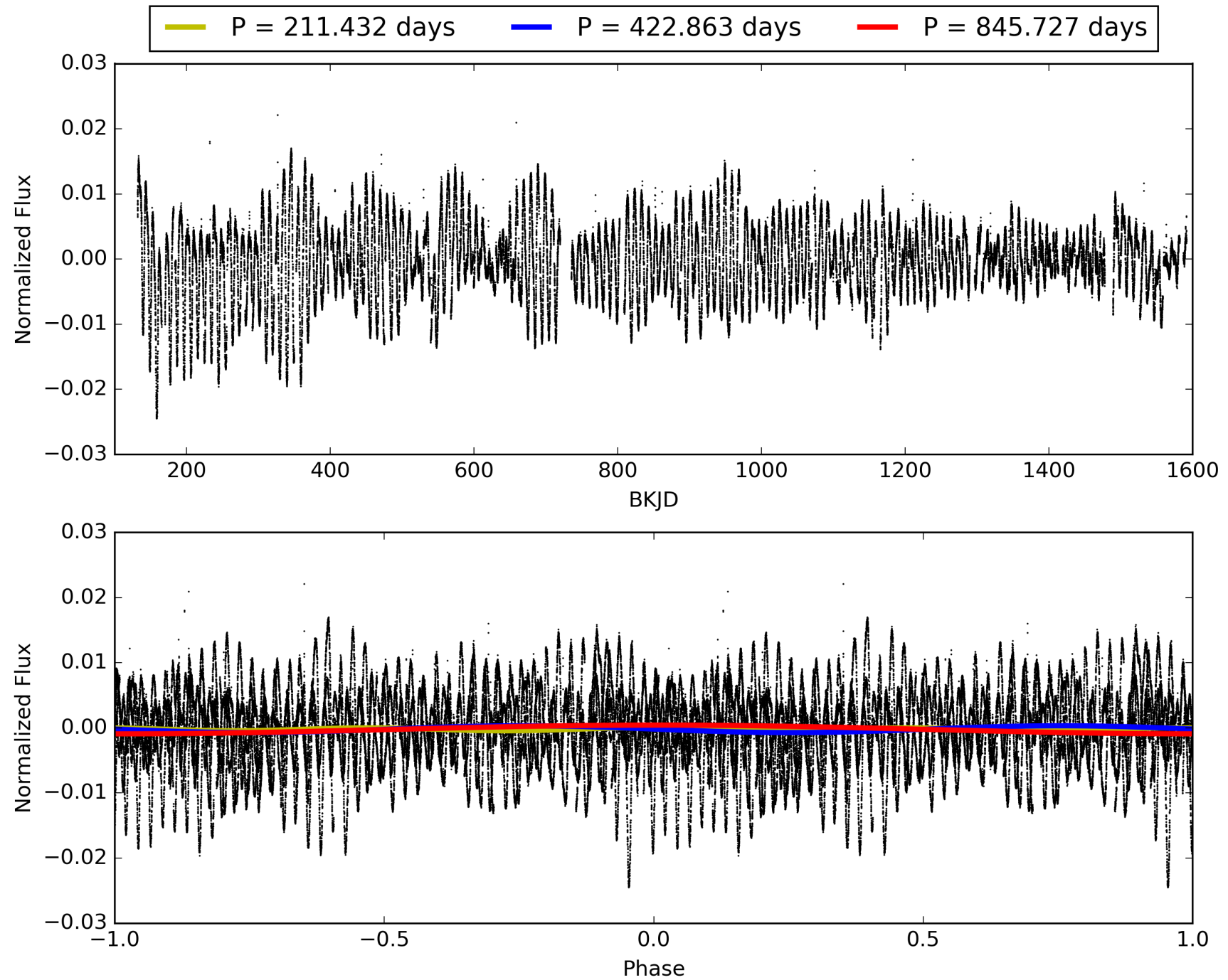
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 01-Feb-2016 08:28:12 Z

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

# TCE 007509496-02, PDC Light Curves



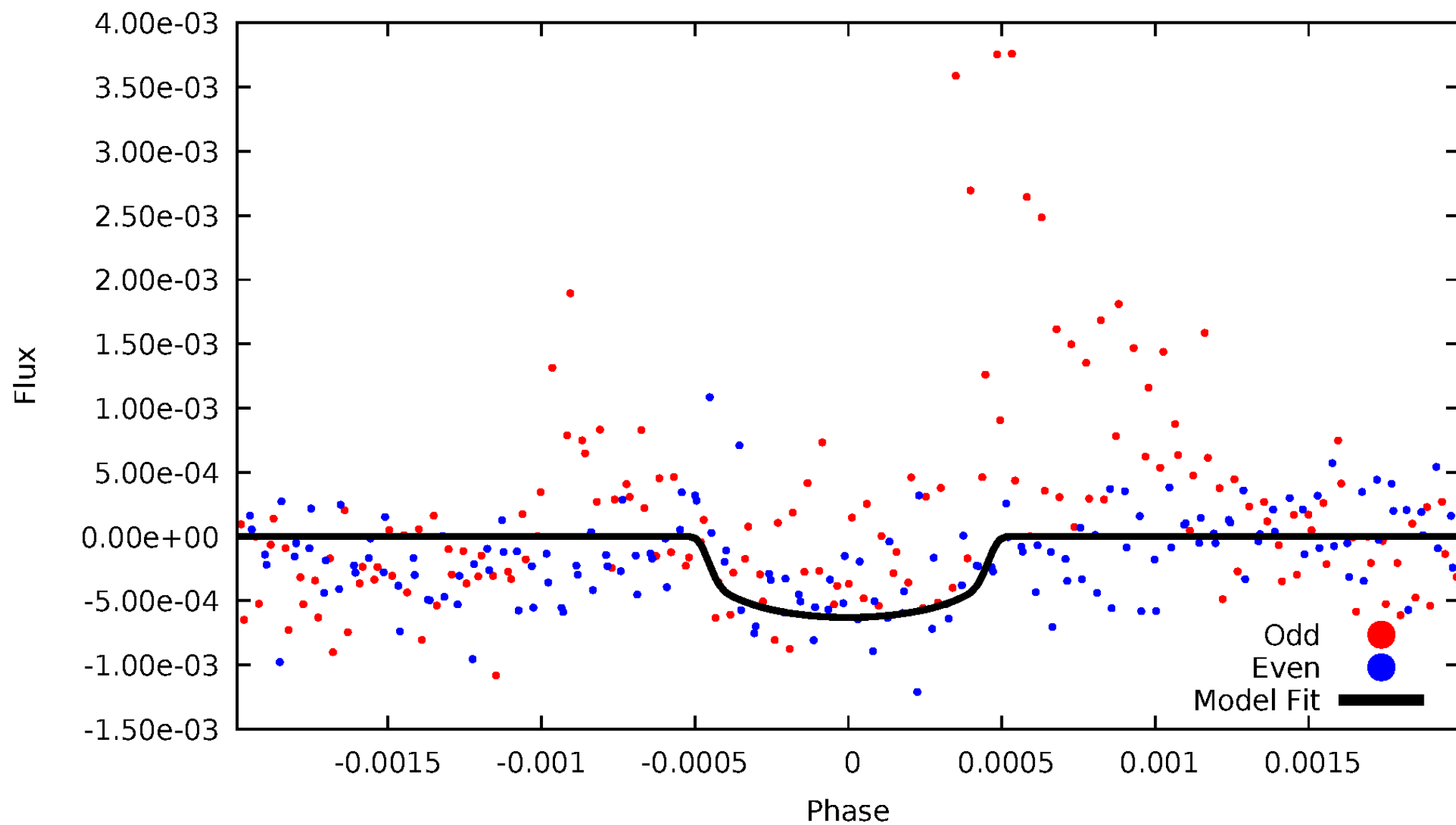
TCE 007509496-02





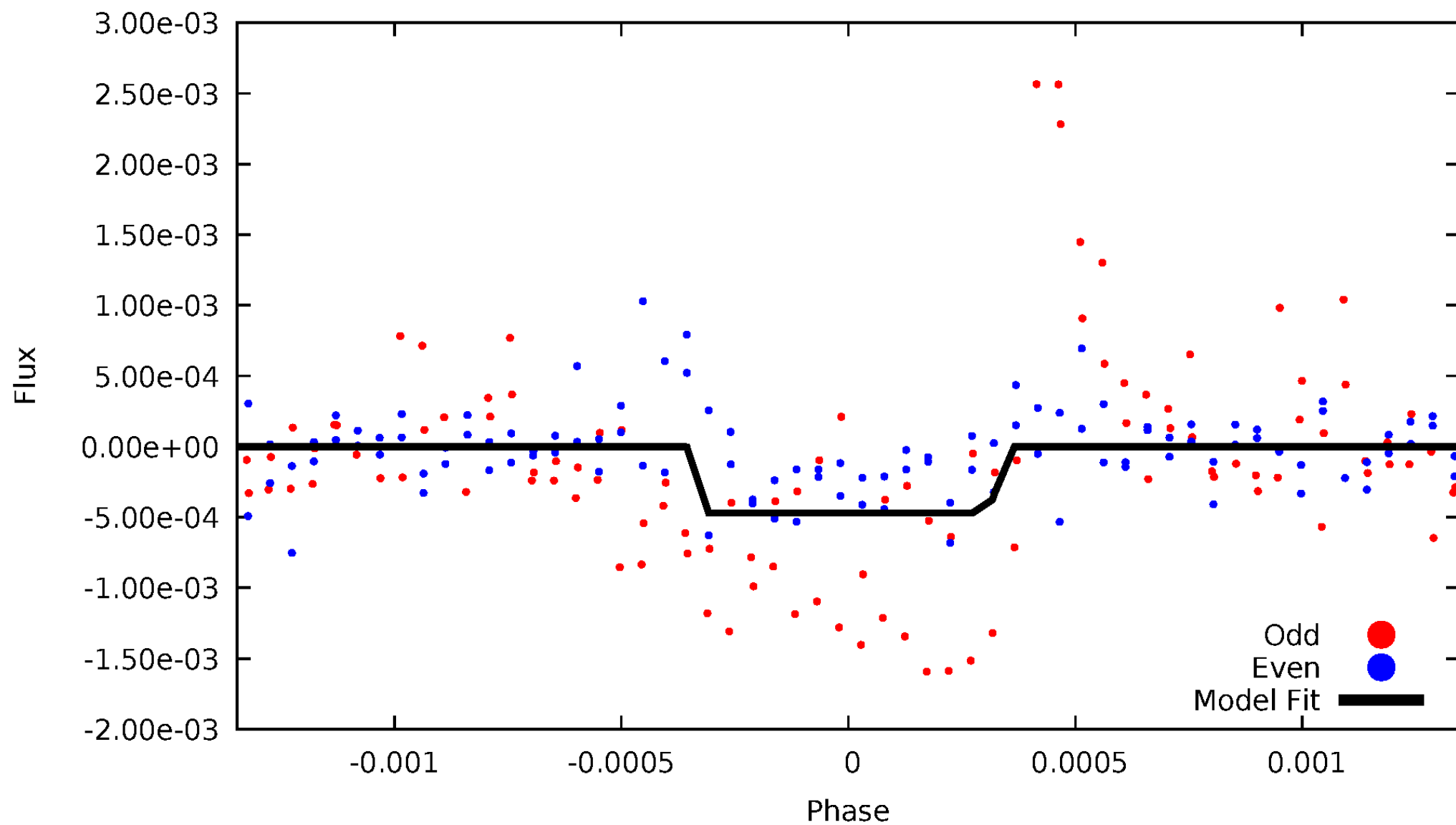
# DV Odd/Even

TCE 007509496-02



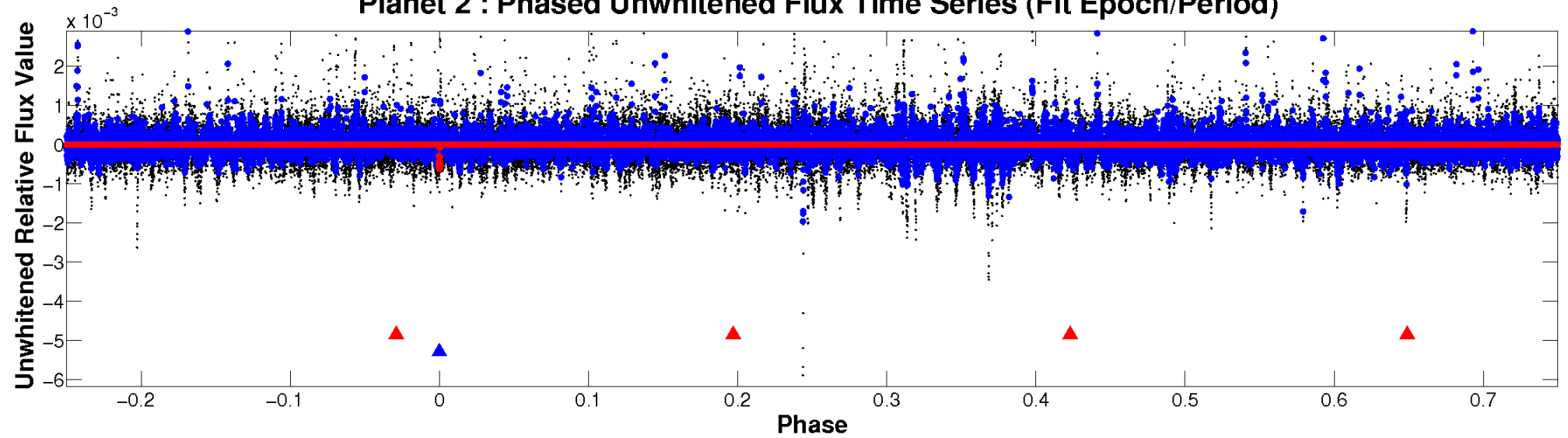
# ALT Odd/Even

TCE 007509496-02

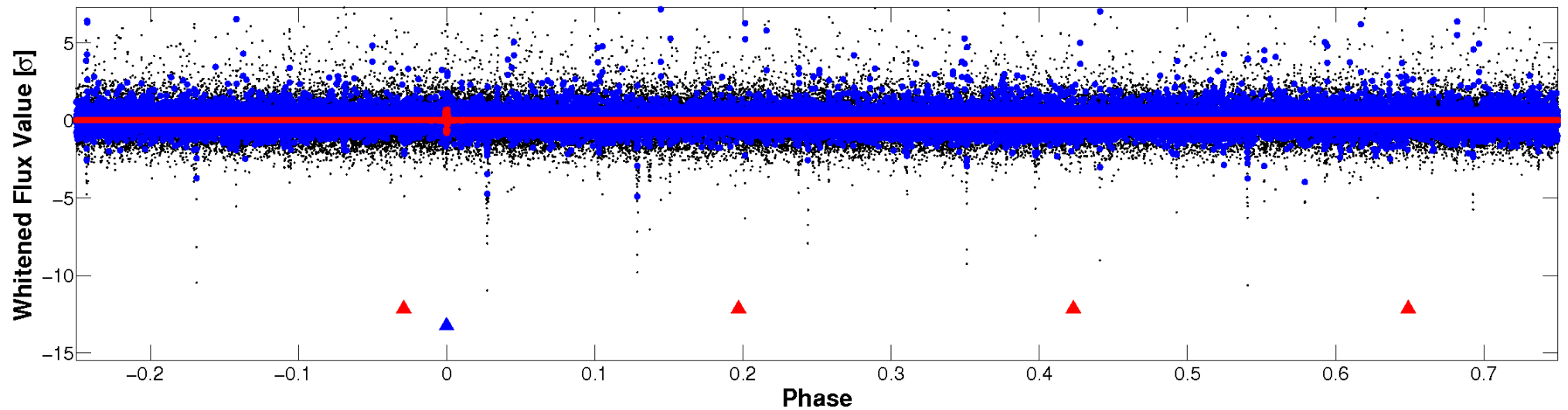


# Non-Whitened Vs. Whitened Light Curve

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

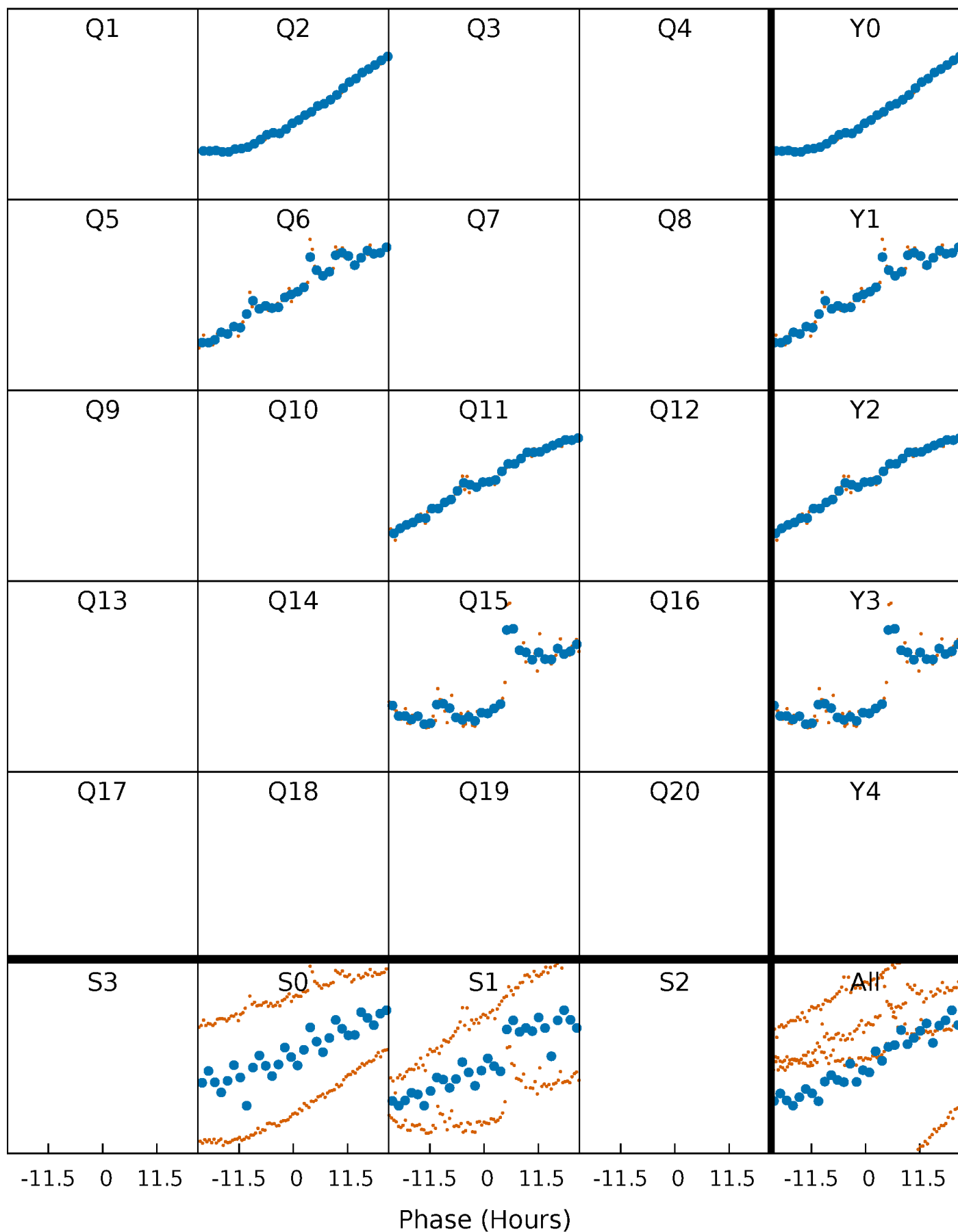


## Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



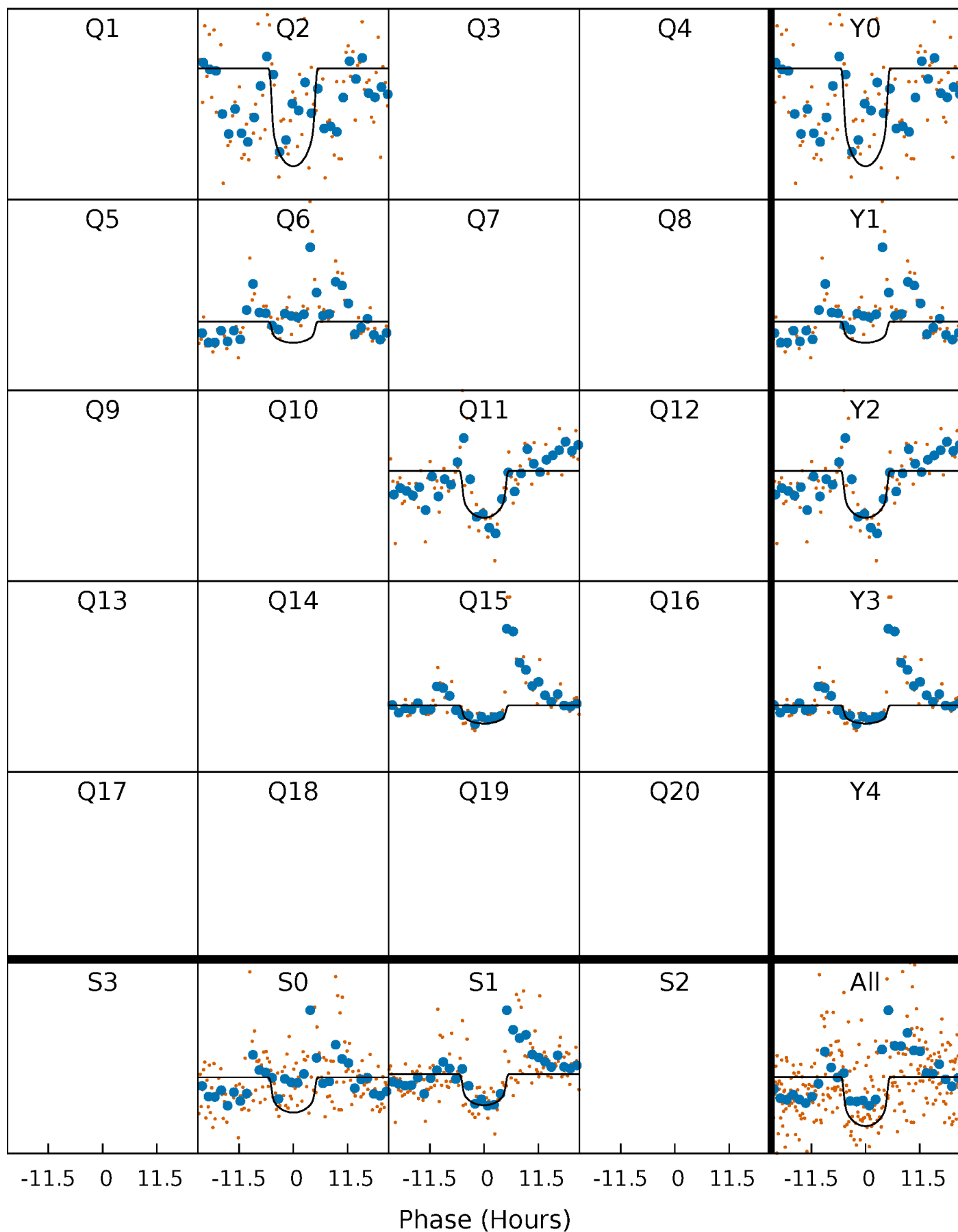
# PDC Quarter-Phased Transit Curves

TCE 007509496-02 P=422.863424 Days  $T_0=177.821431$  (BKJD)



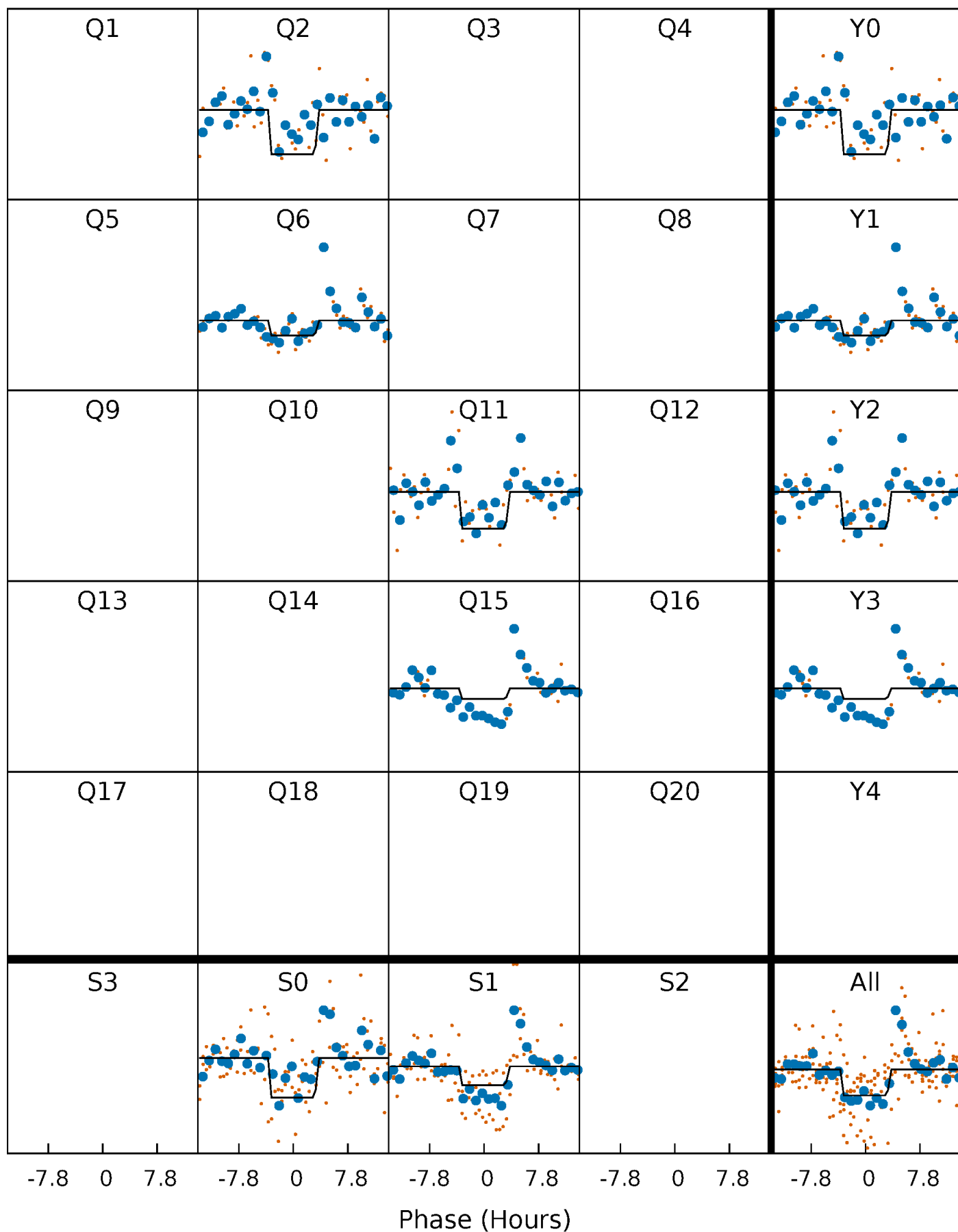
# DV Quarter-Phased Transit Curves

TCE 007509496-02     $P=422.863424$  Days     $T_0=177.821431$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

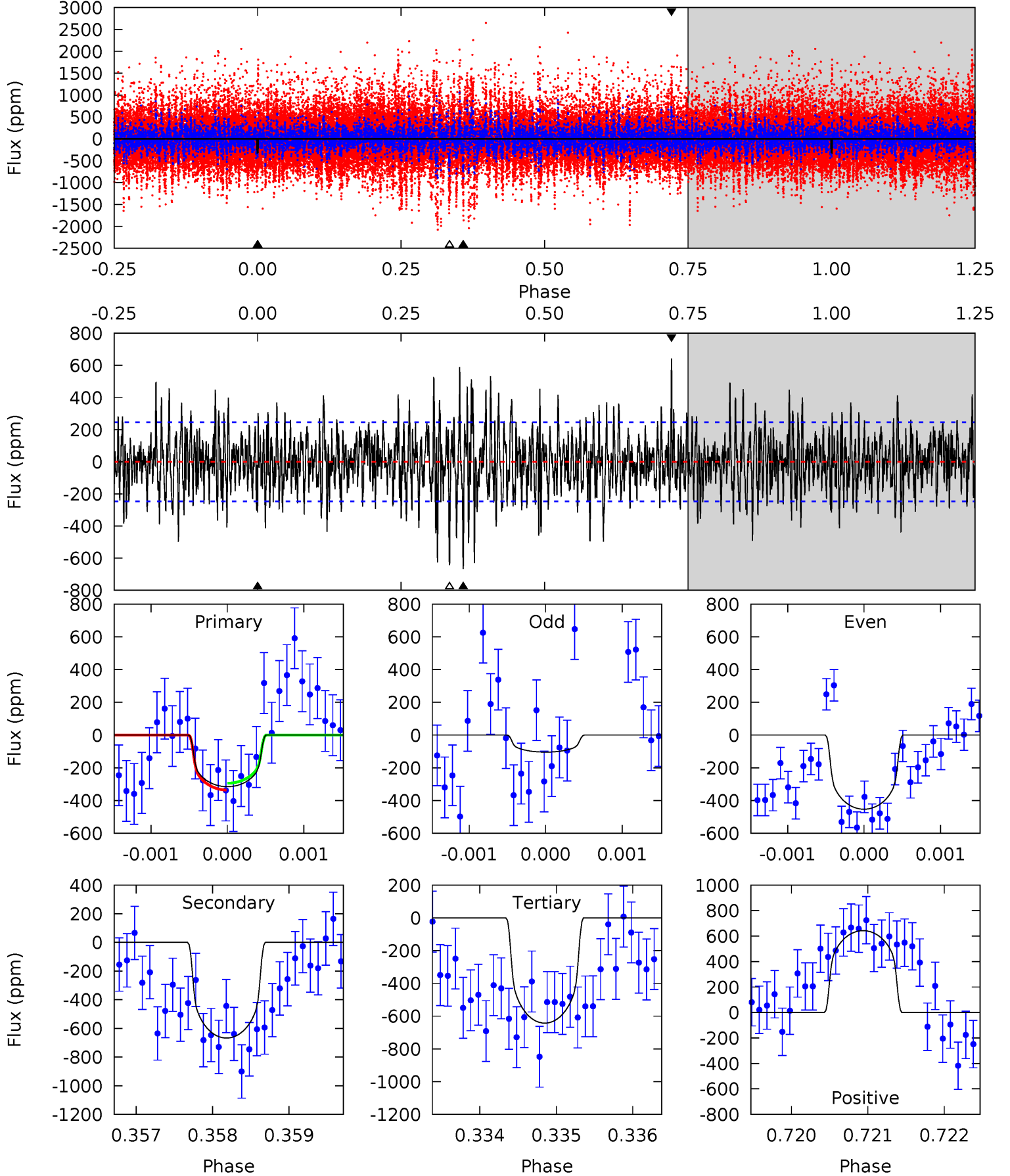
TCE 007509496-02 P=422.892958 Days  $T_0=177.762708$  (BKJD)



# DV Model-Shift Uniqueness Test

007509496-02,  $P = 422.863424$  Days,  $E = 177.821431$  Days

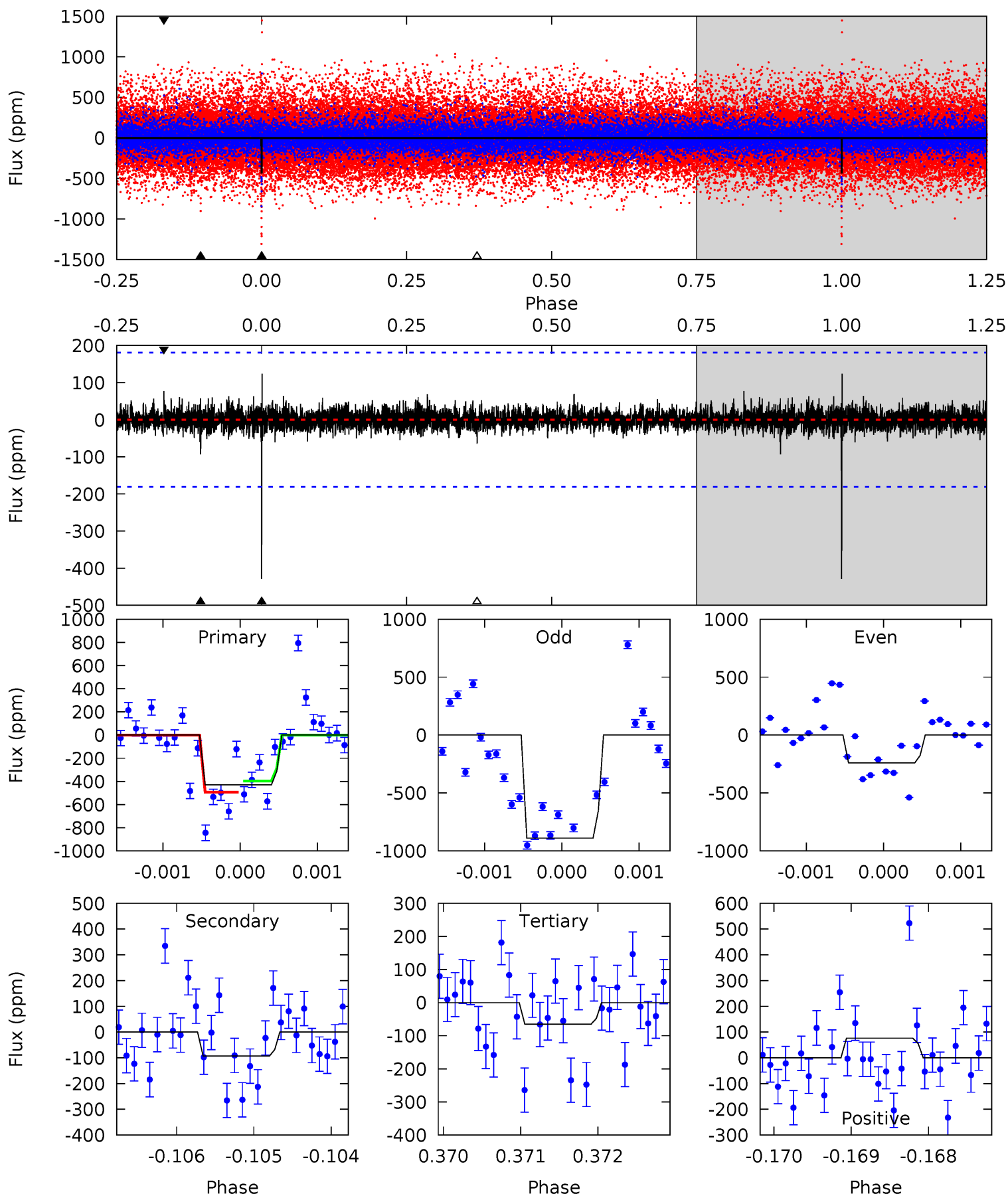
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
6.98	14.8	14.2	14.2	5.45	3.28	3.51	-7.24	-7.24	0.54	0.55	3.57	0.57	0.49	0.46



# Alt Model-Shift Uniqueness Test

007509496-02, P = 422.892958 Days, E = 177.762708 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
13.1	2.84	1.99	2.33	5.52	3.40	0.48	11.1	10.8	0.86	0.51	10.7	1.52	0.22	1.49





### Stellar Parameters For KIC 007509496

	$T_{\text{eff}}(K)$	$\log(g)$	$[\text{Fe}/\text{H}]$	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$4301^{+116}_{-129}$	$4.610^{+0.056}_{-0.018}$	$0.020^{+0.250}_{-0.300}$	$0.662^{+0.031}_{-0.062}$	$0.652^{+0.057}_{-0.057}$	$3.160^{+0.740}_{-0.246}$
	+3%/-3%	+1%/-0%	+1250%/-1500%	+5%/-9%	+9%/-9%	+23%/-8%
Source	PHO1	KIC0	KIC0	DSEP		

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

### Secondary Eclipse Parameters for KIC 007509496-02 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$-667 \pm 45$	$1.90^{+0.43}_{-0.42}$	$218^{+7}_{-7}$	$4239^{+460}_{-328}$	$93484^{+61050}_{-31383}$
Alt.	$-93 \pm 33$	$1.57^{+0.43}_{-0.44}$	$219^{+7}_{-7}$	$3254^{+416}_{-298}$	$18719^{+20704}_{-8609}$

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

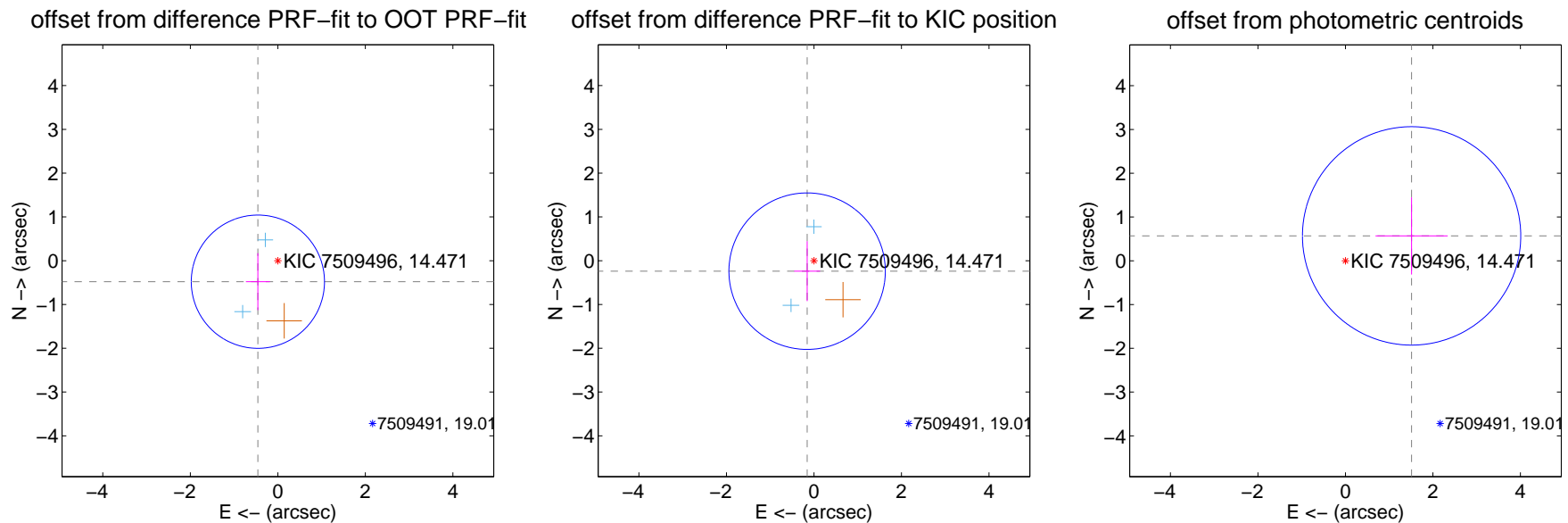
## DV Centroid Data

Supplemental centroid analysis for 007509496-02. Kepler magnitude: 14.47. Transit SNR 7.31

There are 2 quarters with good PRF difference image offsets

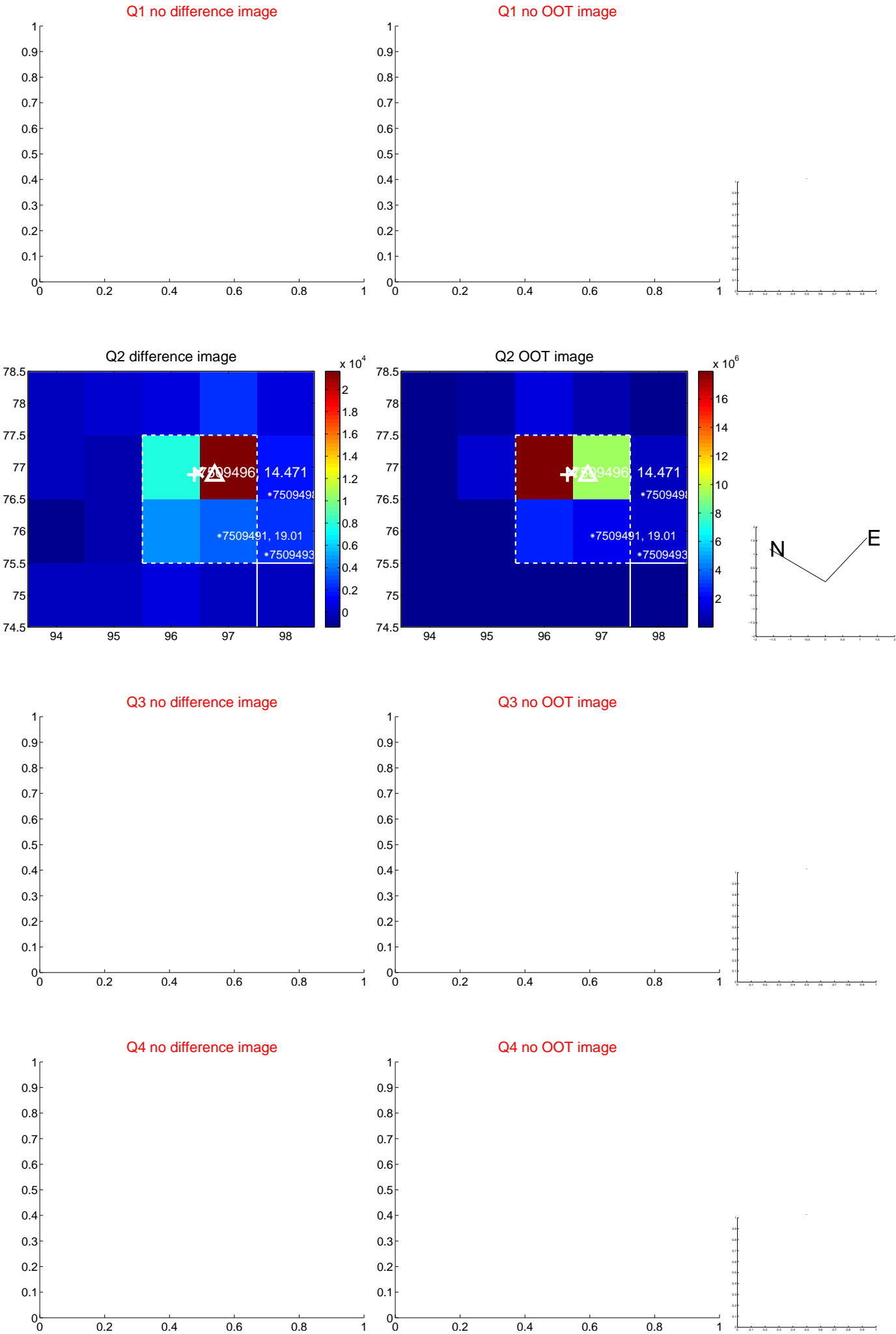
The direct PRF centroid is offset from the target star catalog position by about 0.42 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.662 \pm 0.507$	1.30	$0.456 \pm 0.273$	$-0.480 \pm 0.650$
PRF-fit source offset from KIC position	$0.286 \pm 0.596$	0.48	$0.156 \pm 0.295$	$-0.239 \pm 0.685$
photometric centroid source offset	$1.62 \pm 0.83$	1.94	$-1.51 \pm 0.82$	$0.57 \pm 0.88$



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.

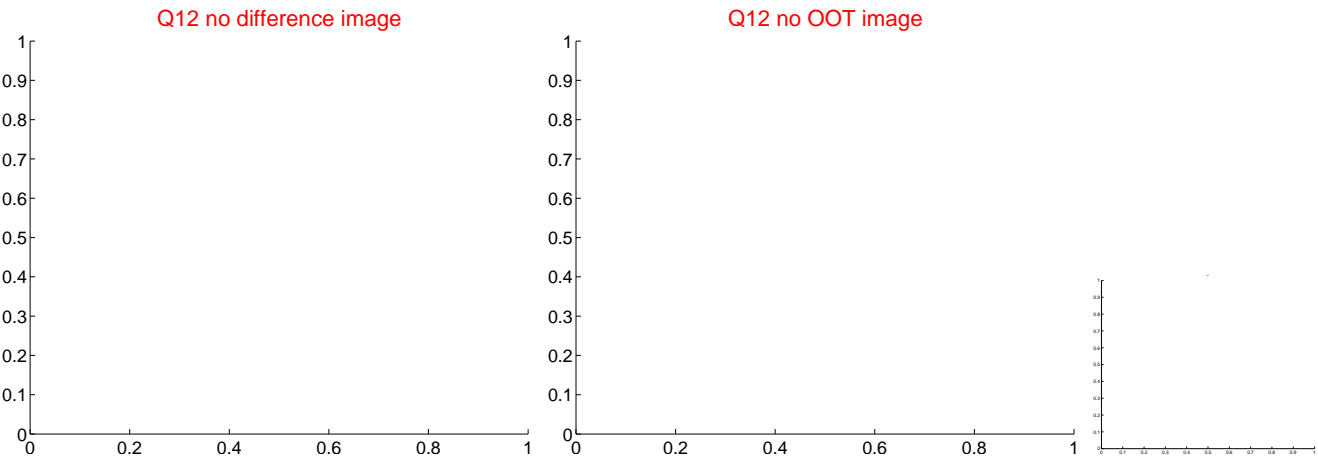
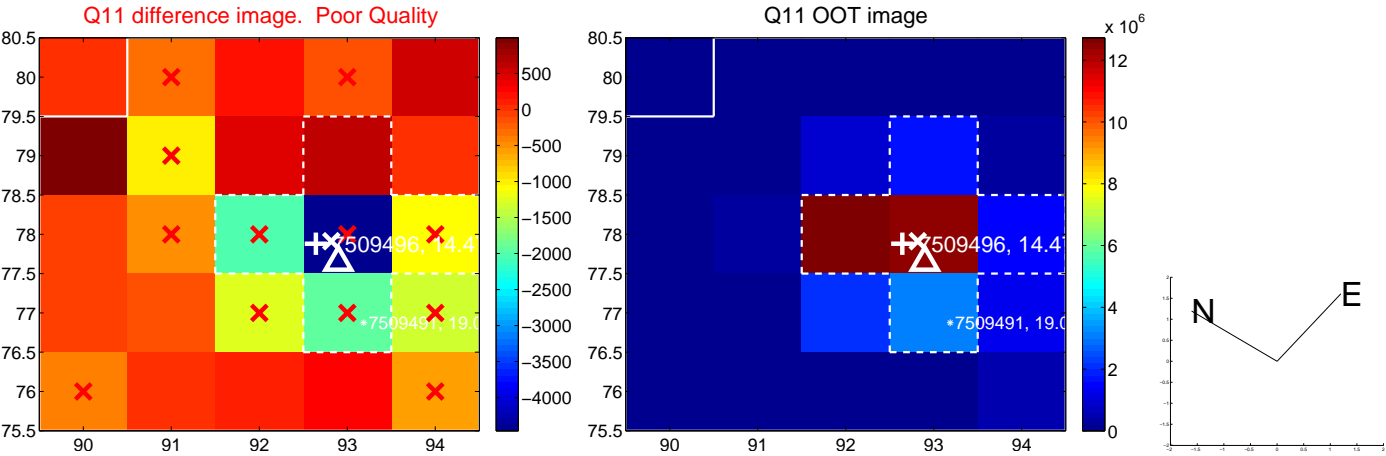
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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



white ×: 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.

Q13 no difference image



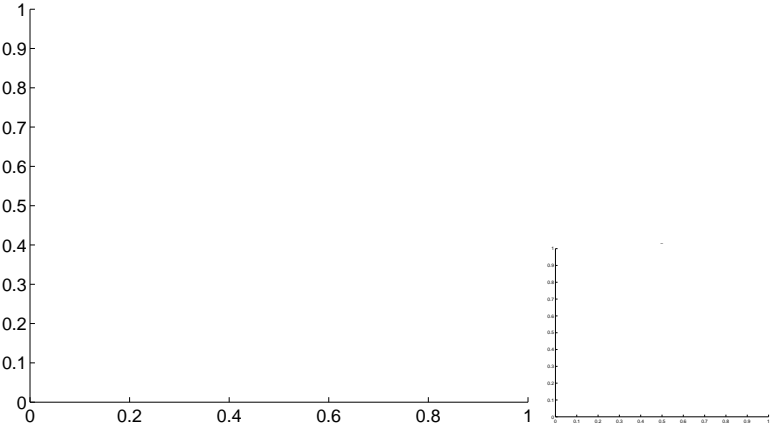
Q13 no OOT image



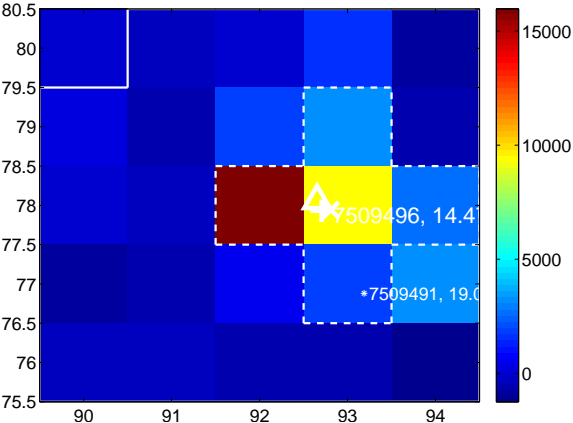
Q14 no difference image



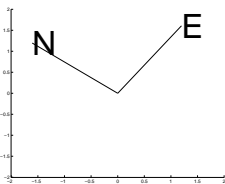
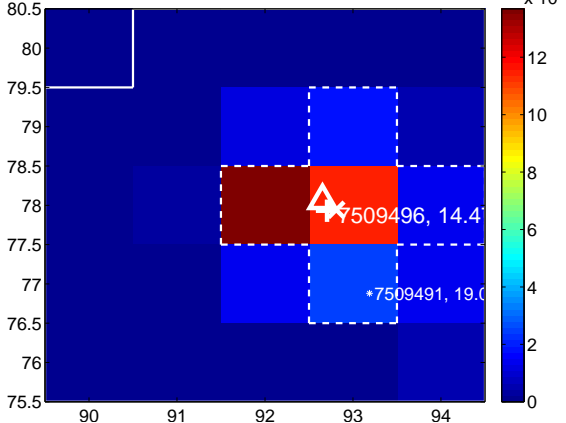
Q14 no OOT image



Q15 difference image



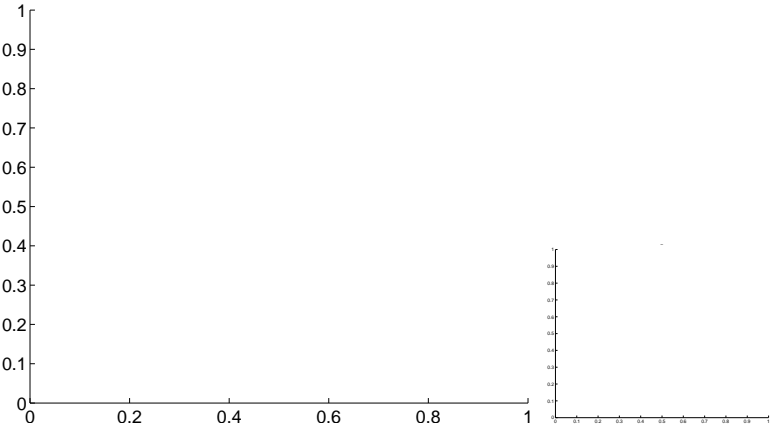
Q15 OOT image



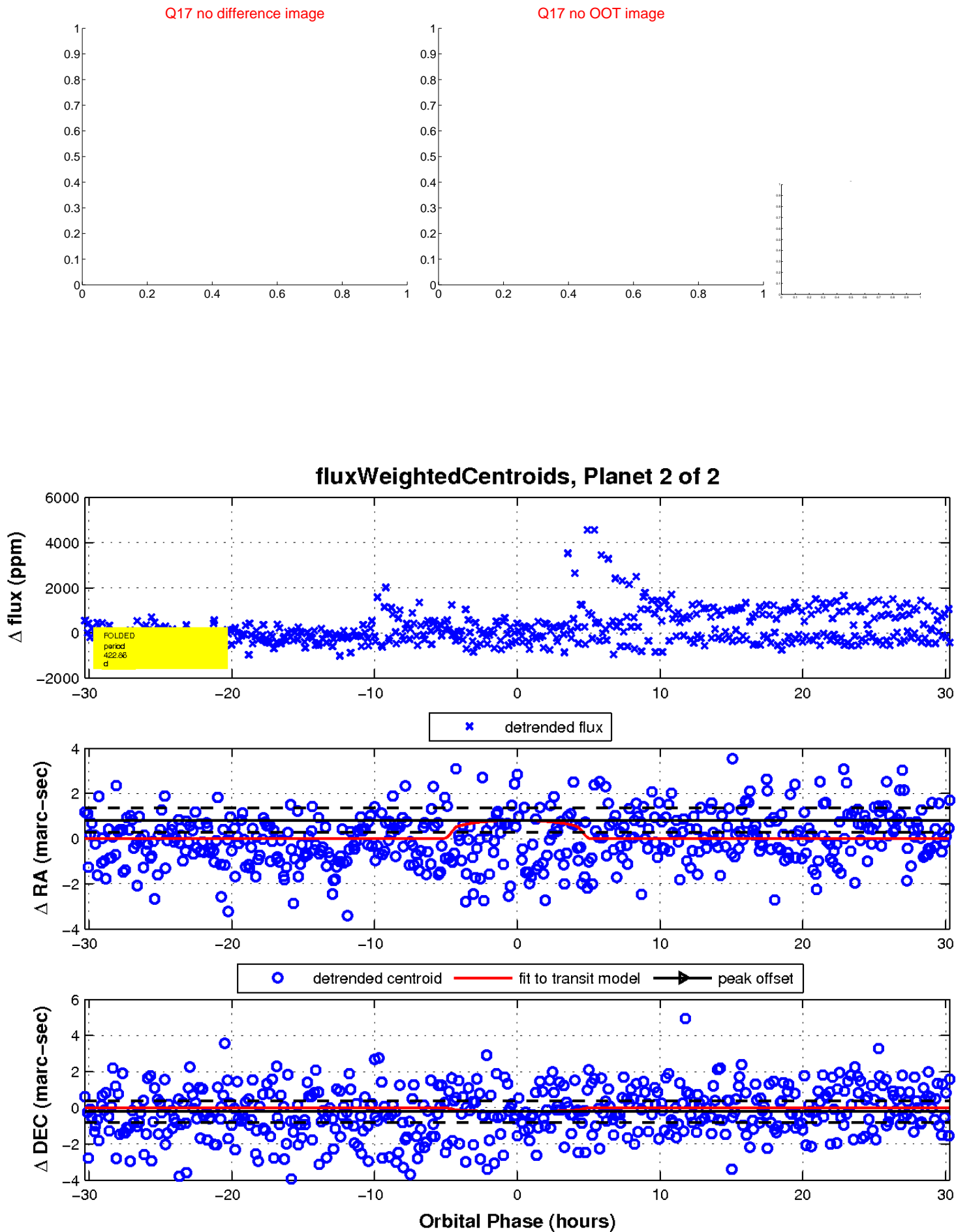
Q16 no difference image



Q16 no OOT image



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



UKIRT Image

Declination

