

# KIC 004449749

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
004449749-01	OBS	No	518.550927	310.766319	908.2	6.856	12.6	6.4	0.75	5372	2.34	0.31
004449749-02	OBS	No	544.781195	139.693786	1200.2	4.929	12.7	7.8	0.75	5372	2.99	0.29

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
004449749-01	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS
004449749-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—ALL_TRANS_CHASES—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.

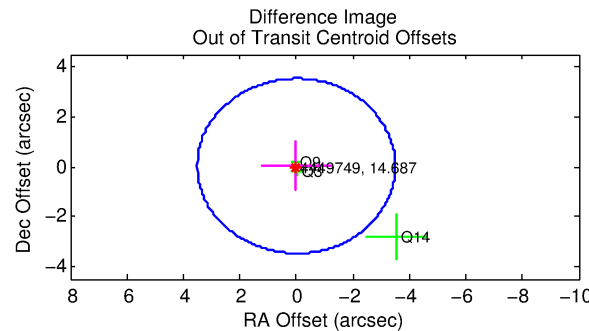
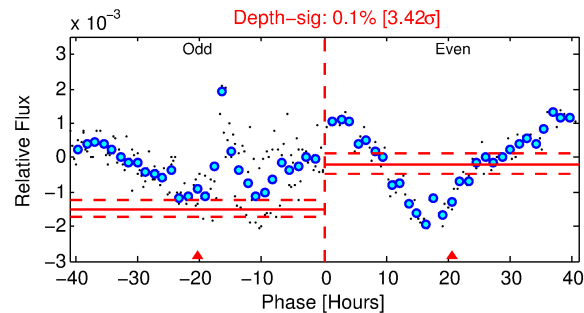
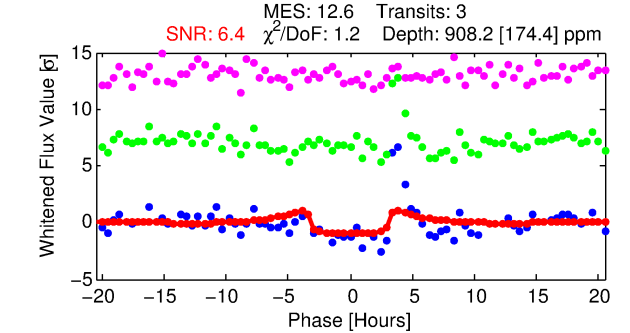
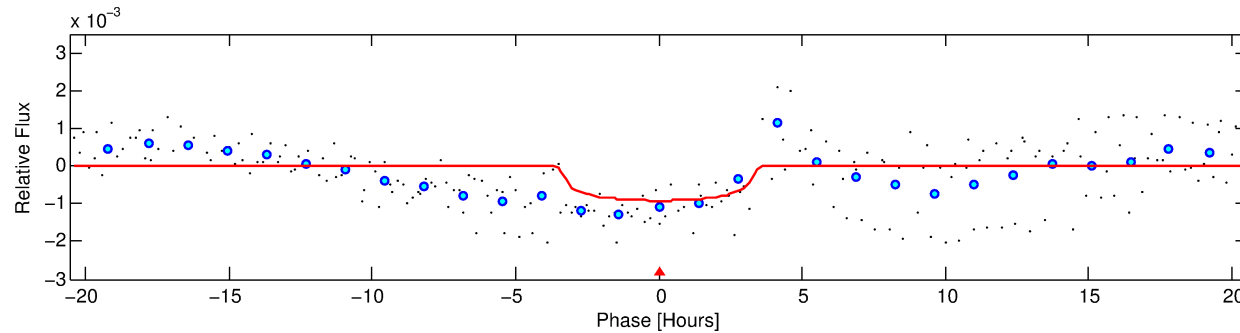
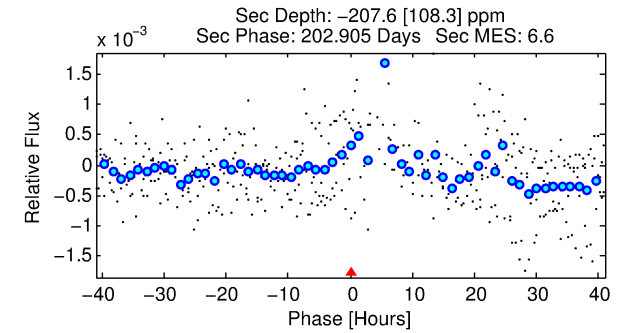
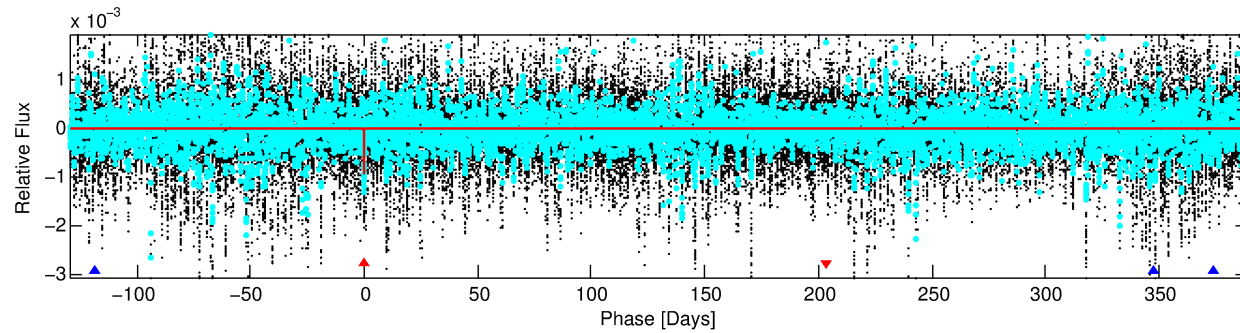
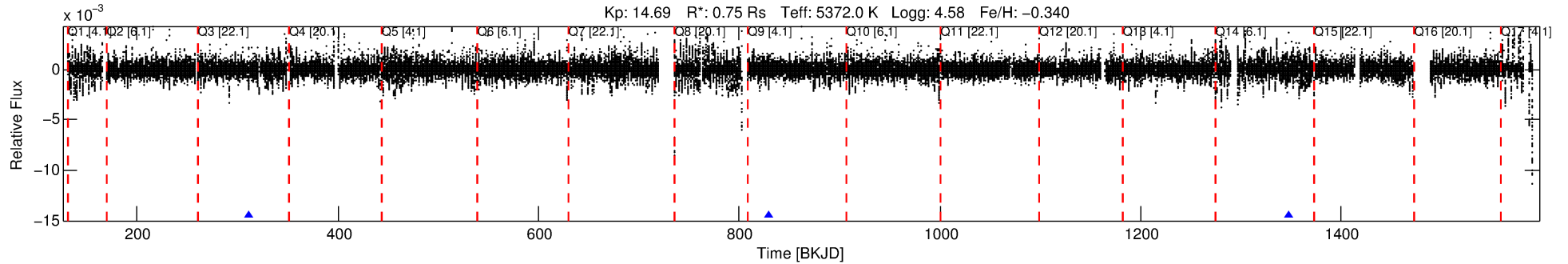
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 004449749-01

No Significant Match Found

# DV One-Page Summary

KIC: 4449749 Candidate: 1 of 2 Period: 518.551 d



## DV Fit Results:

Period = 518.55093 [0.00816] d  
Epoch = 310.7663 [0.0096] BKJD  
Rp/R\* = 0.0286 [0.0240]  
a/R\* = 487.01 [1611.91]  
b = 0.59 [3.71]  
Seff = 0.31 [0.07]  
Teq = 190 [10] K  
Rp = 2.34 [2.00] Re  
a = 1.1650 [0.1510] AU  
Ag = N/A  
Teffp = N/A

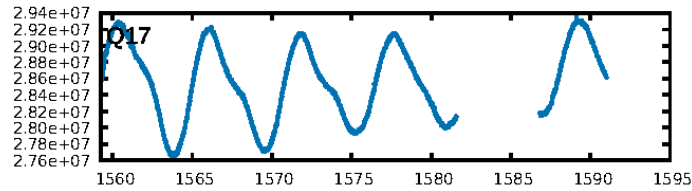
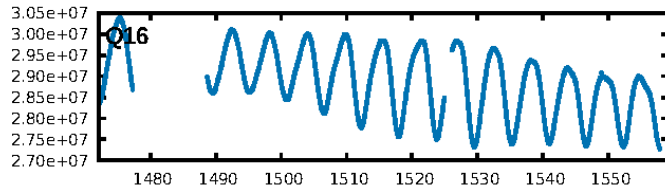
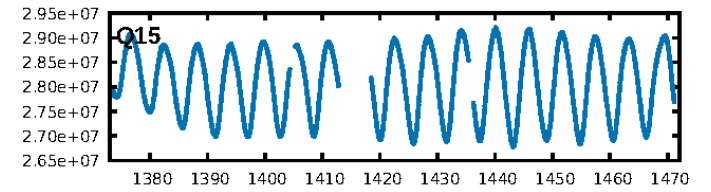
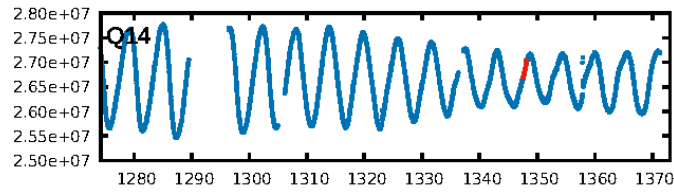
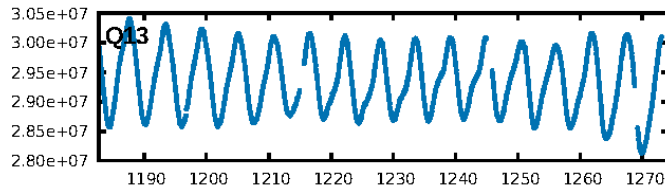
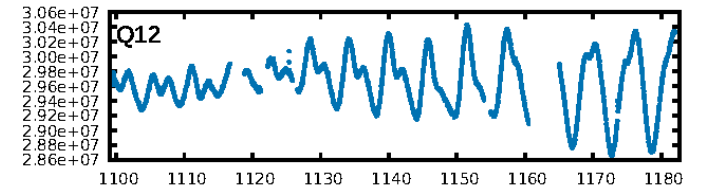
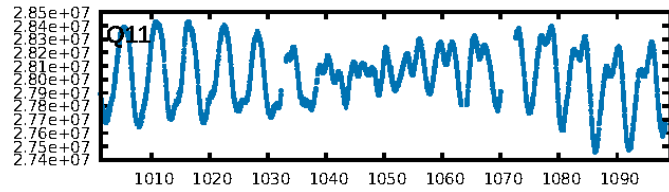
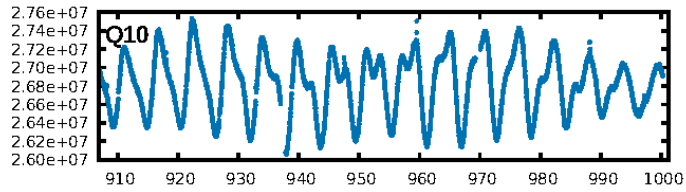
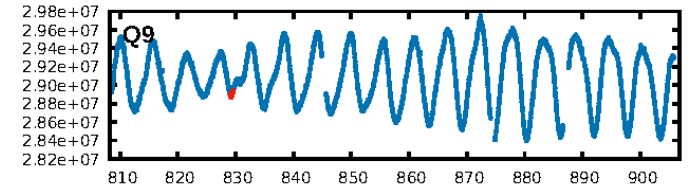
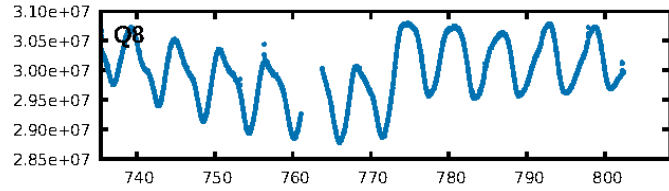
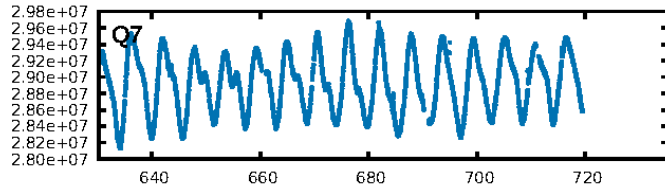
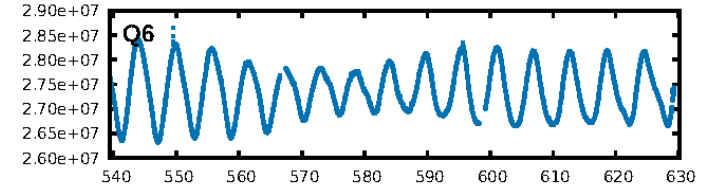
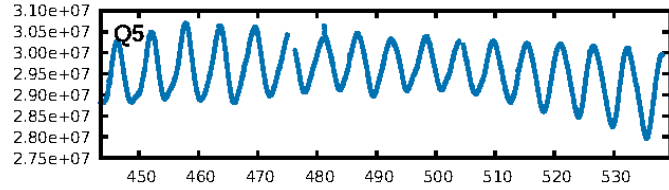
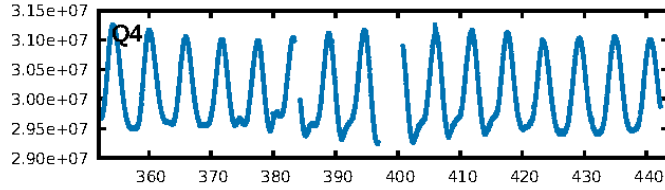
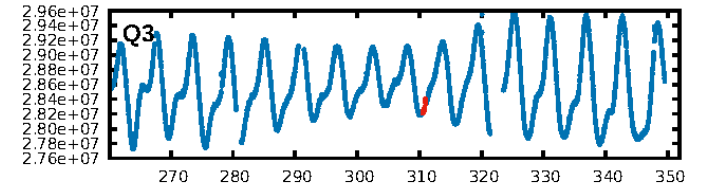
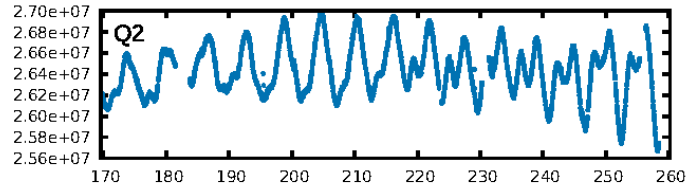
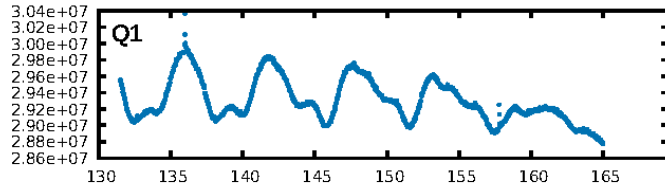
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 100.0% [74.55 $\sigma$ ]  
ModelChiSquare2-sig: 0.1%  
ModelChiSquareGof-sig: 88.2%  
Bootstrap-pfa: 7.23e-11  
RollingBand-fgt: 1.00 [3/3]  
GhostDiagnostic-chr: 1.43  
Centroid-sig: 36.4%  
Centroid-so: 0.709 arcsec [0.68 $\sigma$ ]  
OotOffset-rm: 0.027 arcsec [0.02 $\sigma$ ]  
KicOffset-rm: 0.175 arcsec [0.43 $\sigma$ ]  
OotOffset-st: 1/1/0/1 [3]  
KicOffset-st: 1/1/0/1 [3]  
DiffImageQuality-fgm: 0.67 [2/3]  
DiffImageOverlap-fno: 1.00 [3/3]

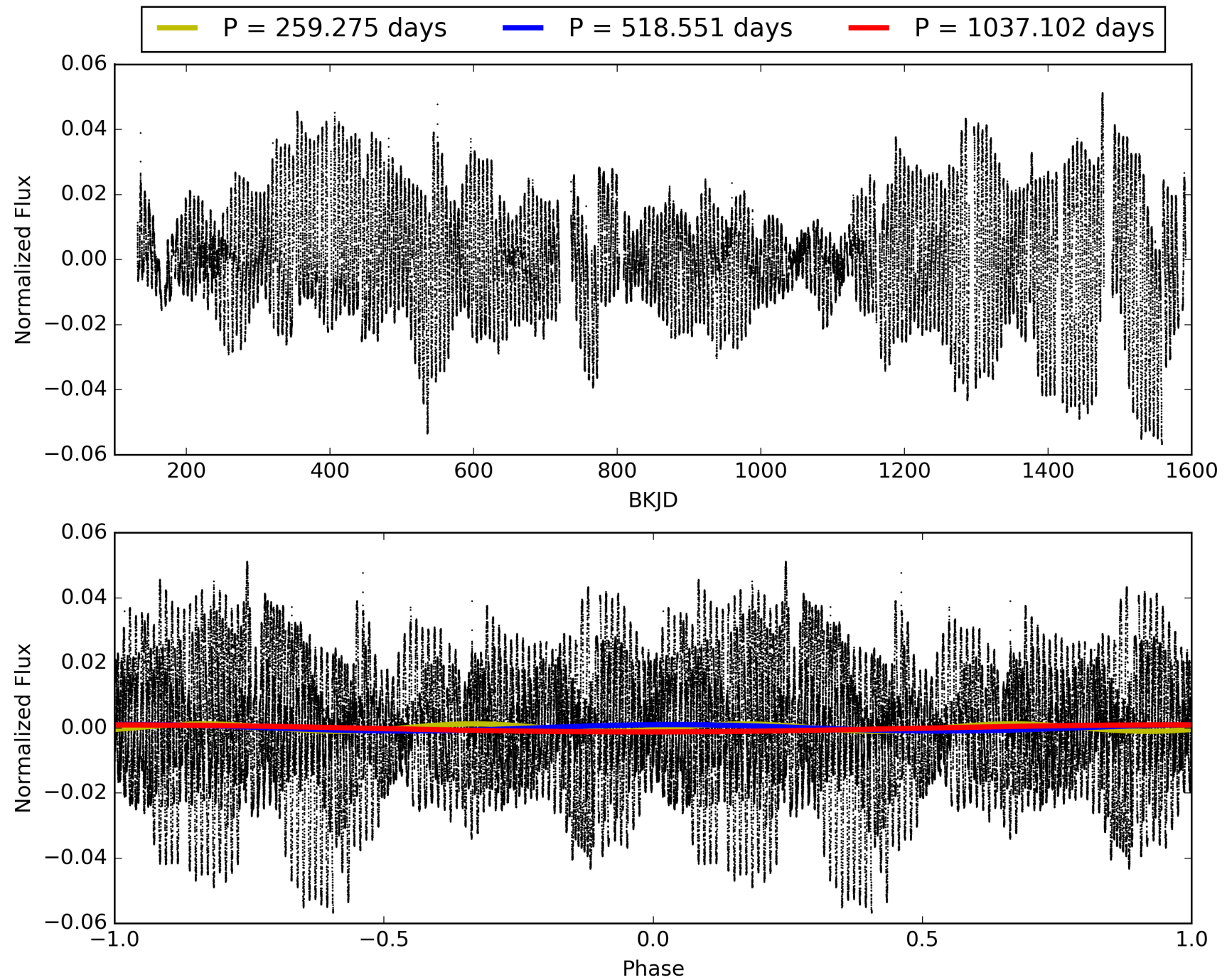
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 01-Feb-2016 09:21:37 Z

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

# TCE 004449749-01, PDC Light Curves

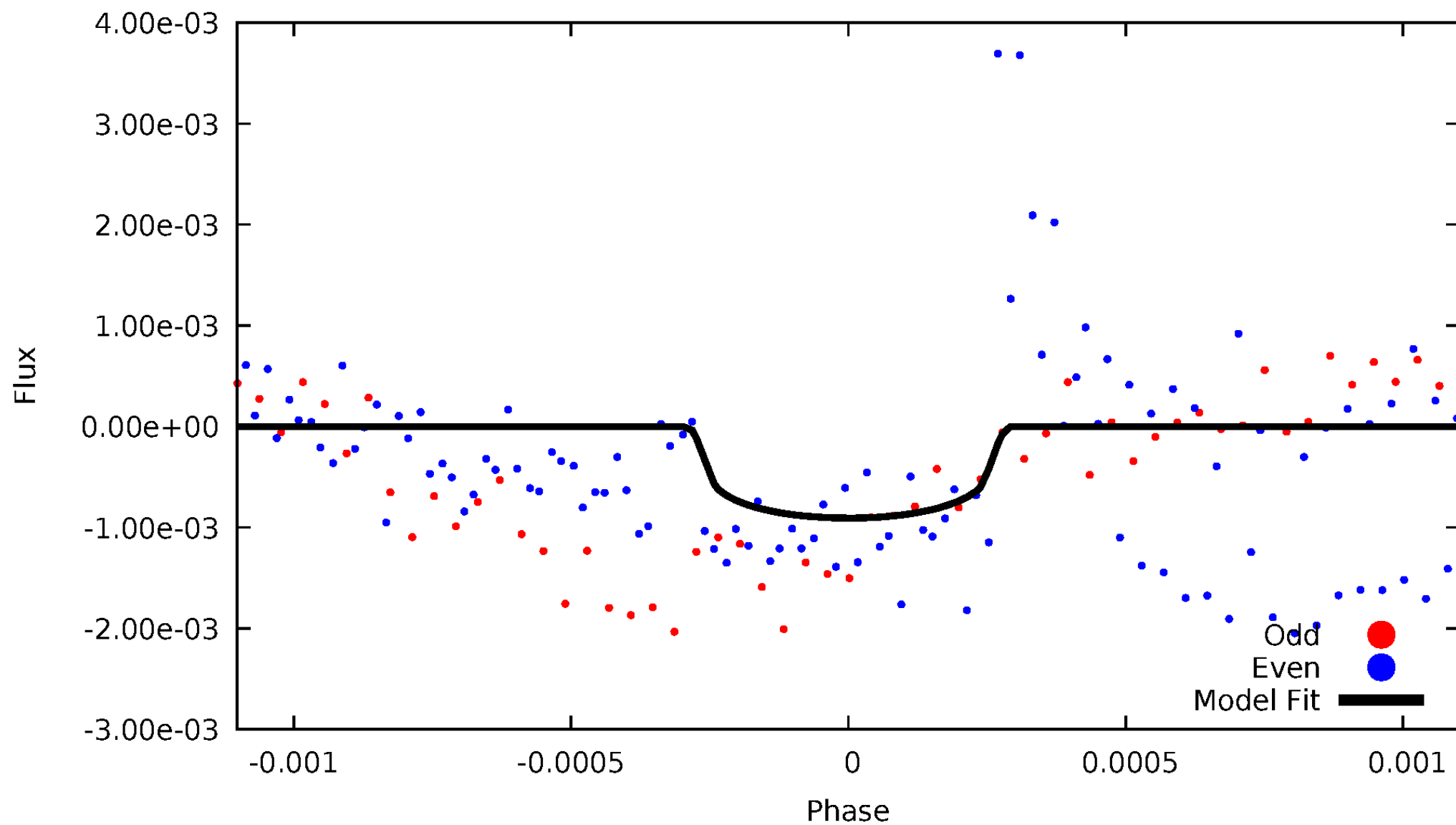


TCE 004449749-01



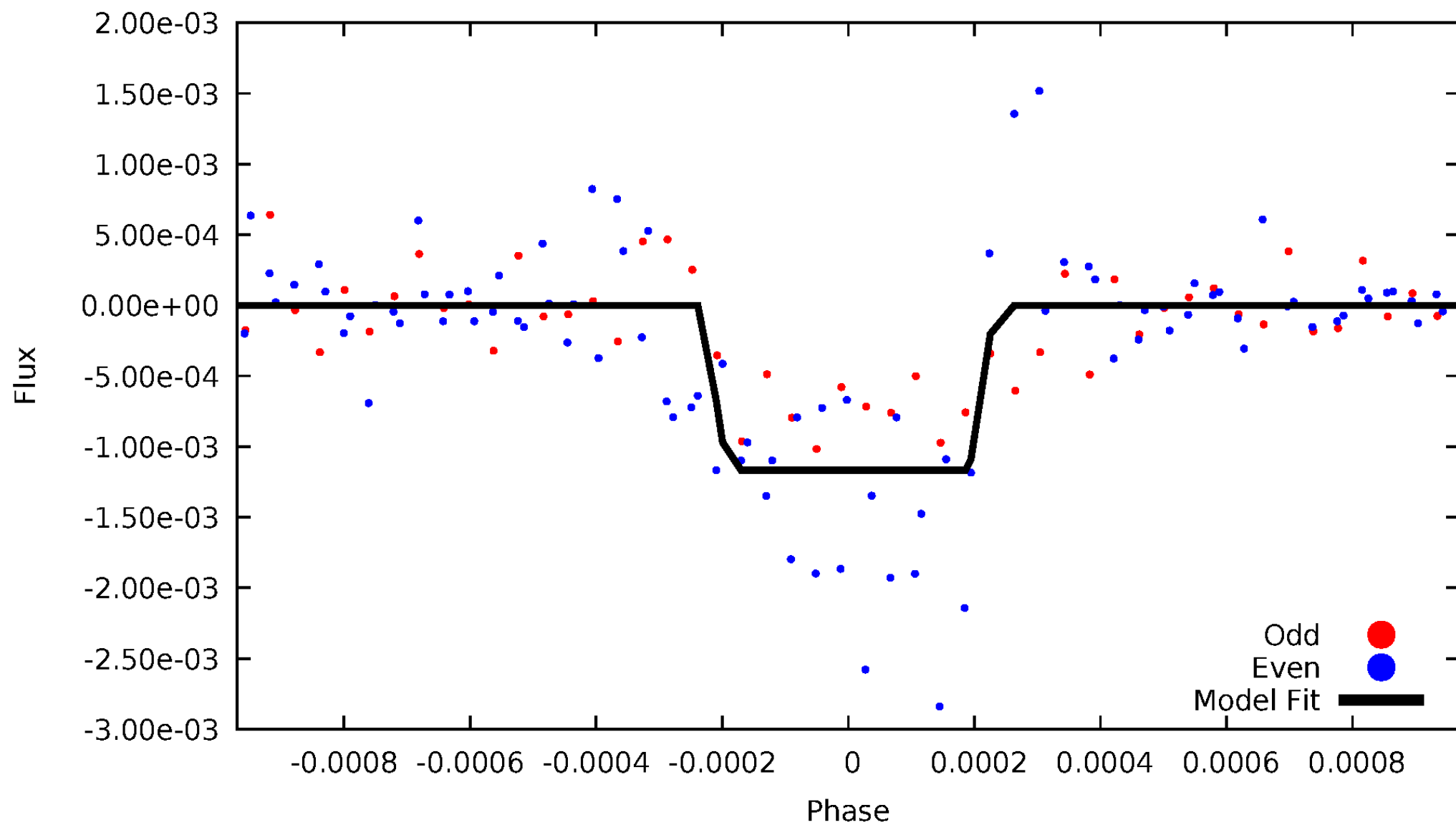
# DV Odd/Even

TCE 004449749-01

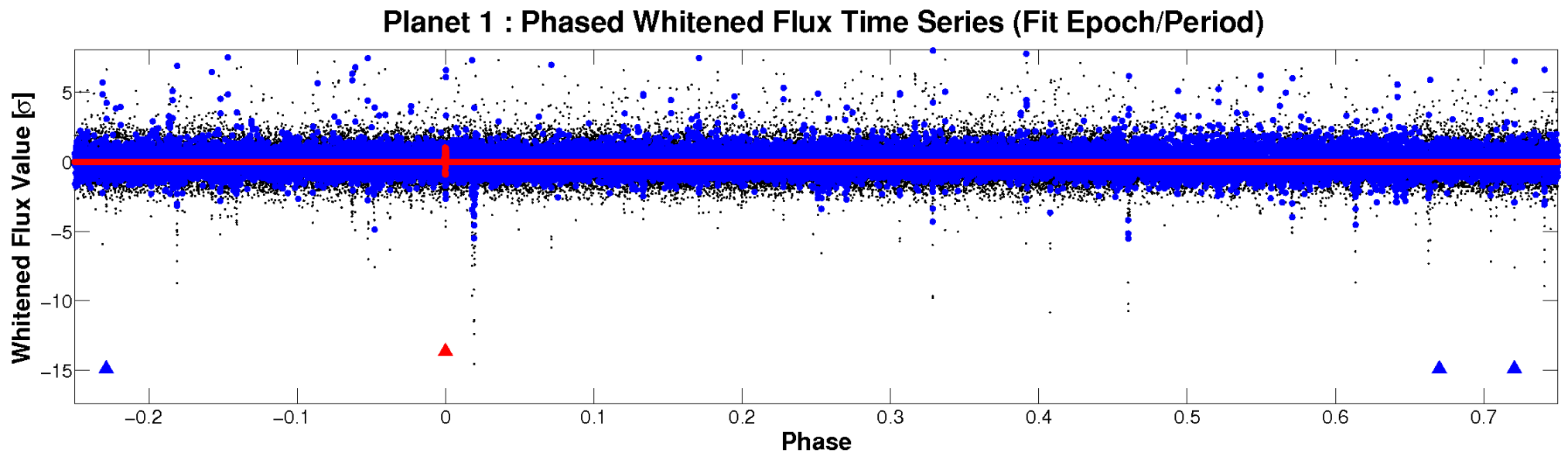
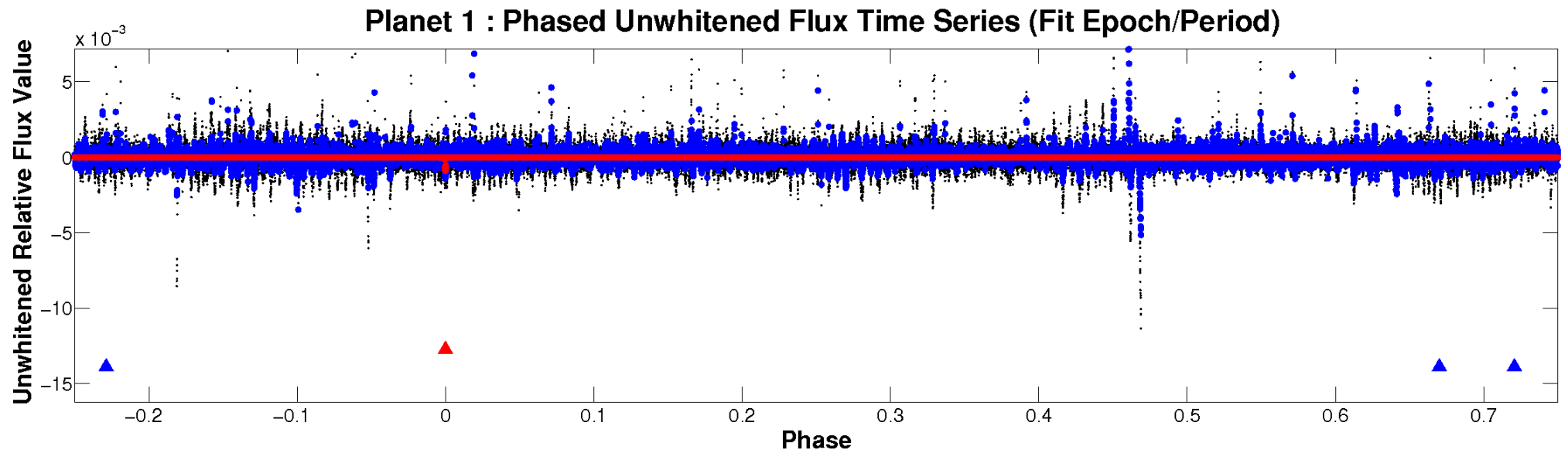


# ALT Odd/Even

TCE 004449749-01



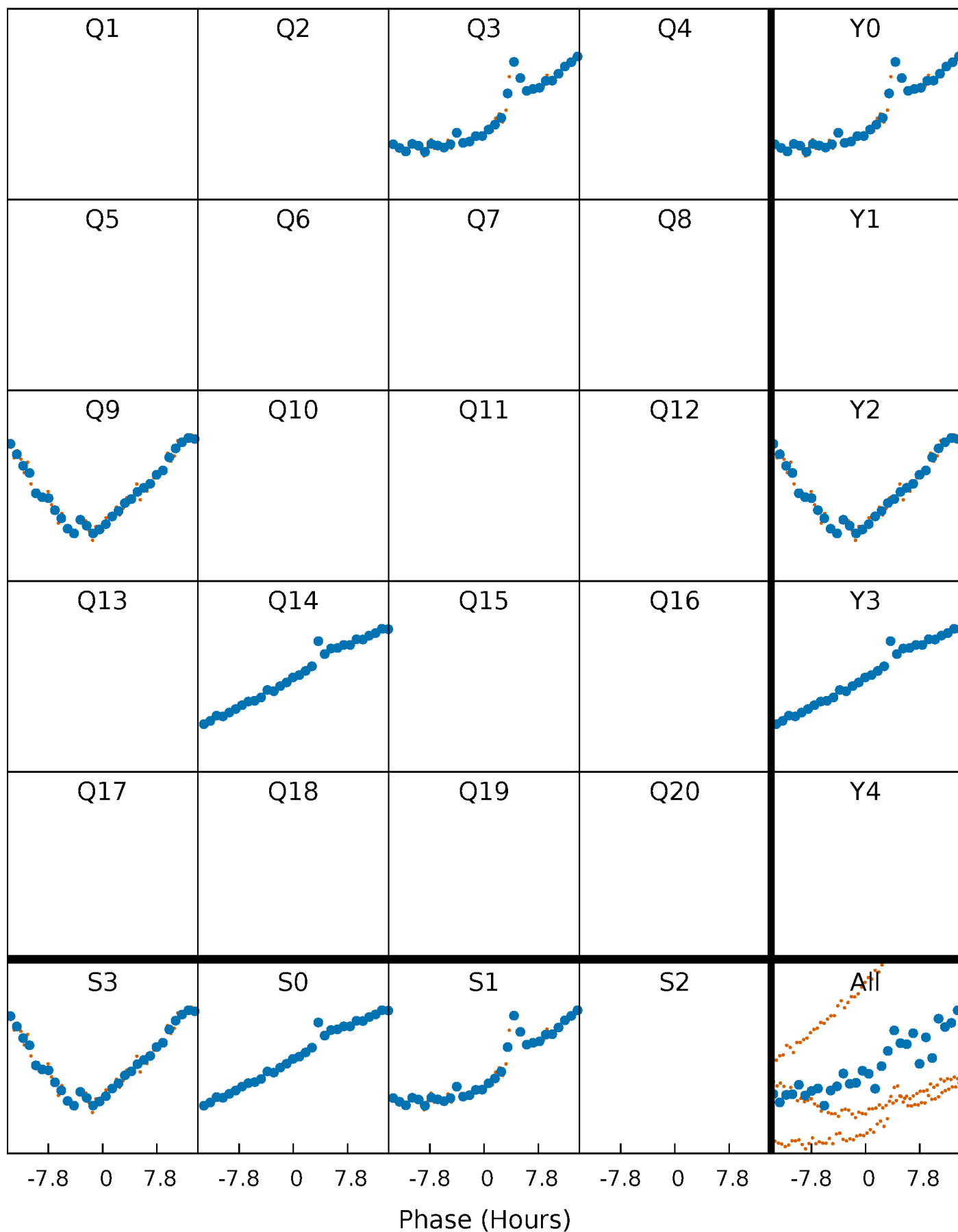
# Non-Whitened Vs. Whitened Light Curve





# PDC Quarter-Phased Transit Curves

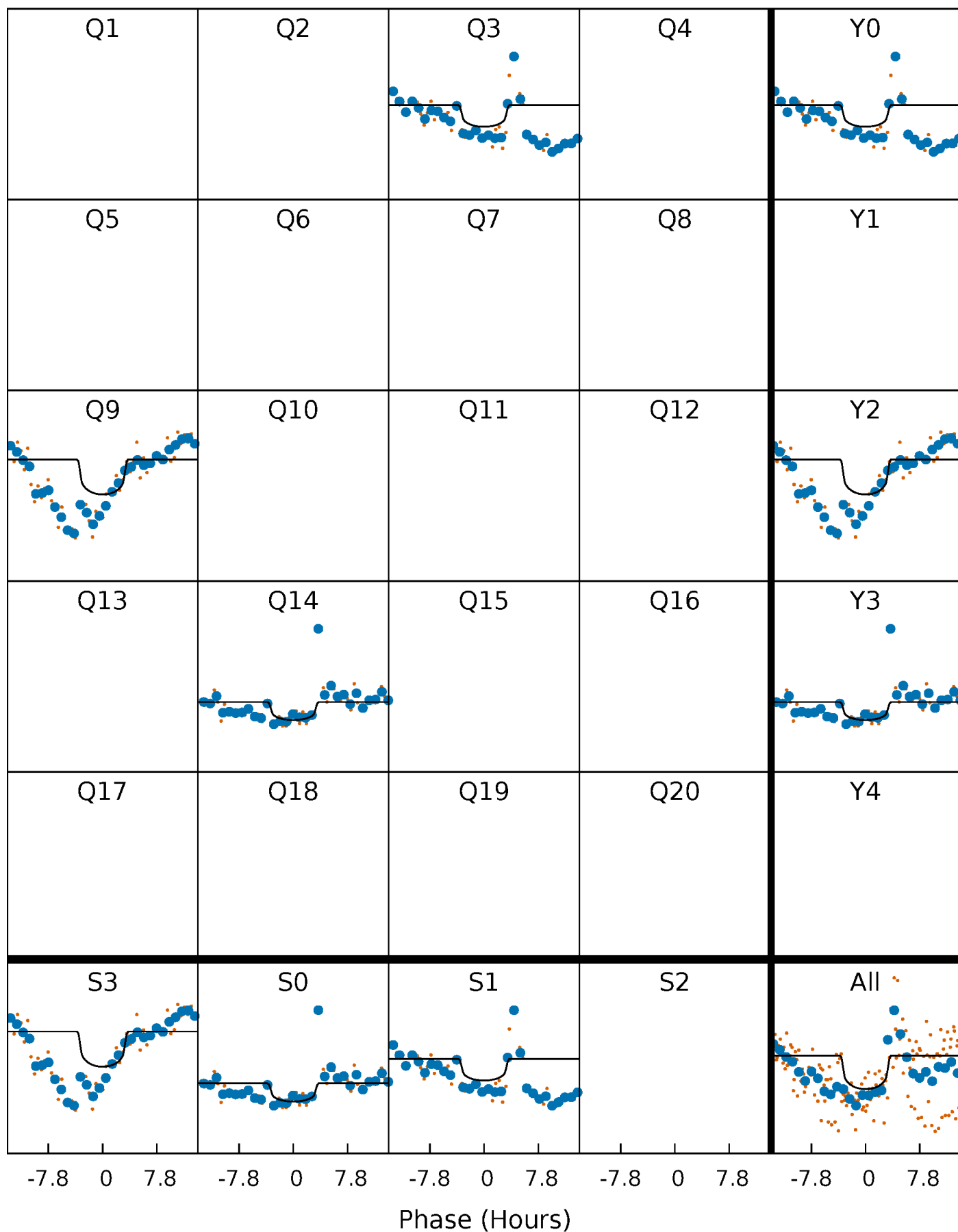
TCE 004449749-01 P=518.550927 Days  $T_0=310.766319$  (BKJD)





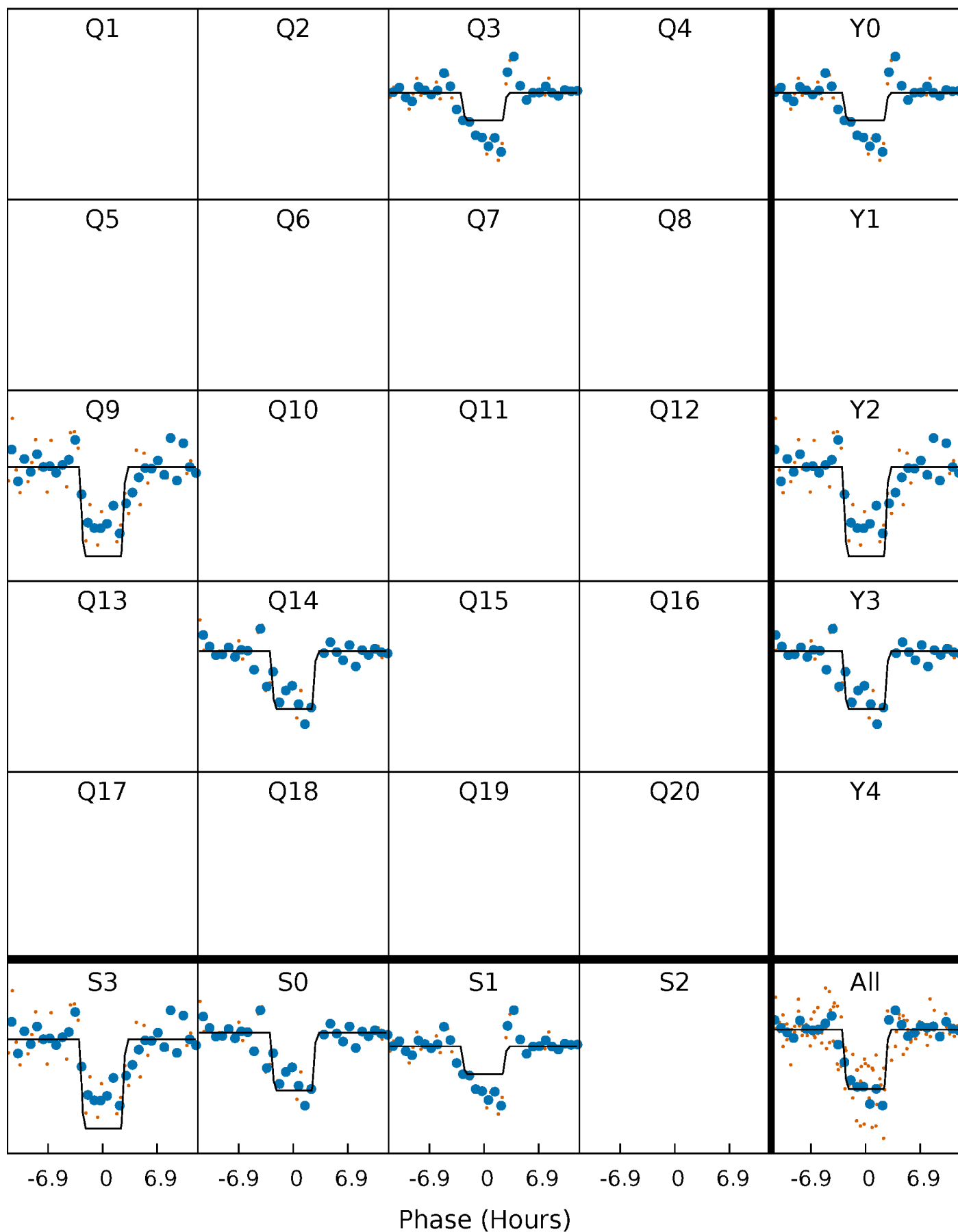
# DV Quarter-Phased Transit Curves

TCE 004449749-01 P=518.550927 Days  $T_0=310.766319$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

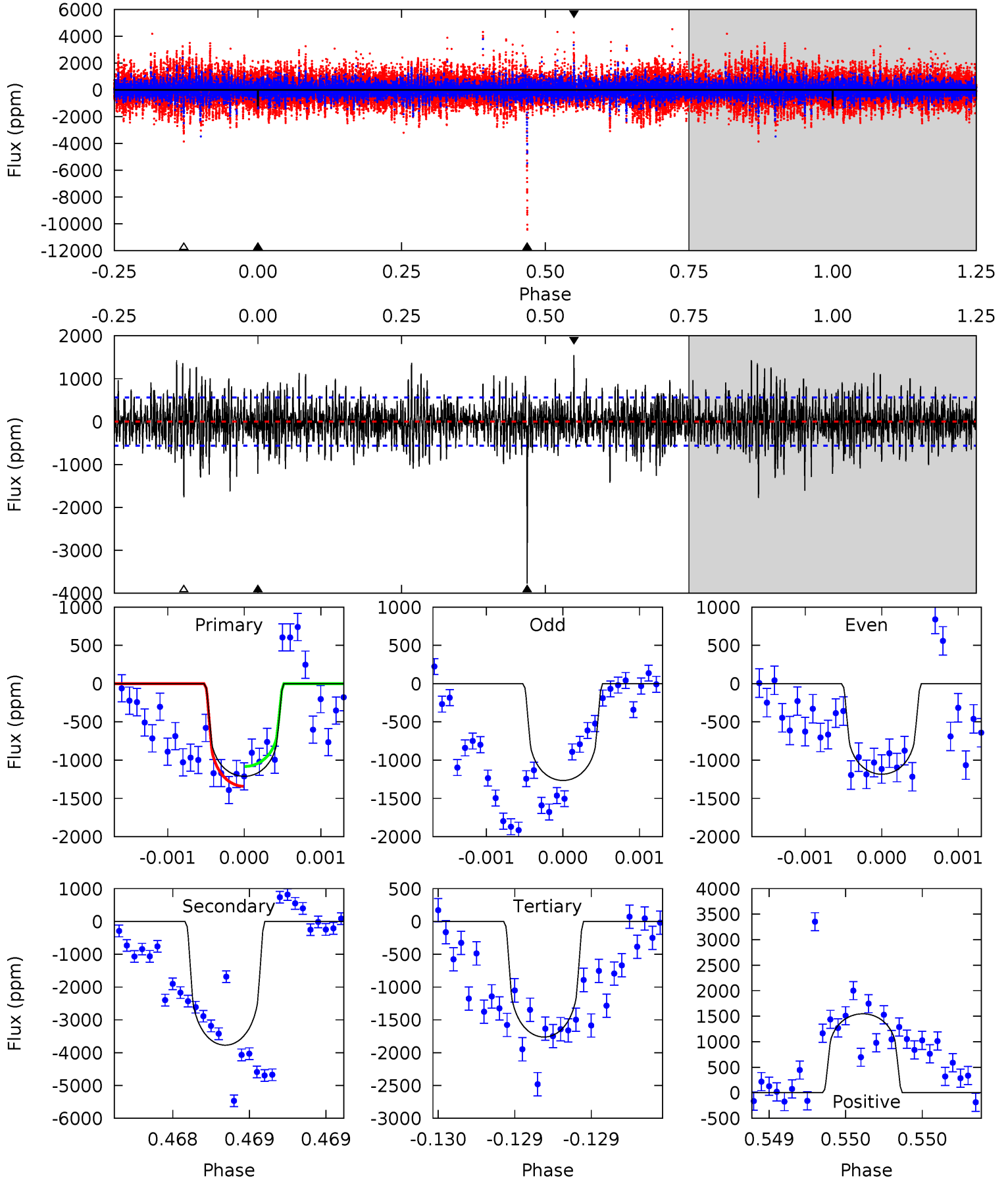
TCE 004449749-01 P=518.542452 Days  $T_0=310.801946$  (BKJD)



# DV Model-Shift Uniqueness Test

004449749-01, P = 518.550927 Days, E = 310.766319 Days

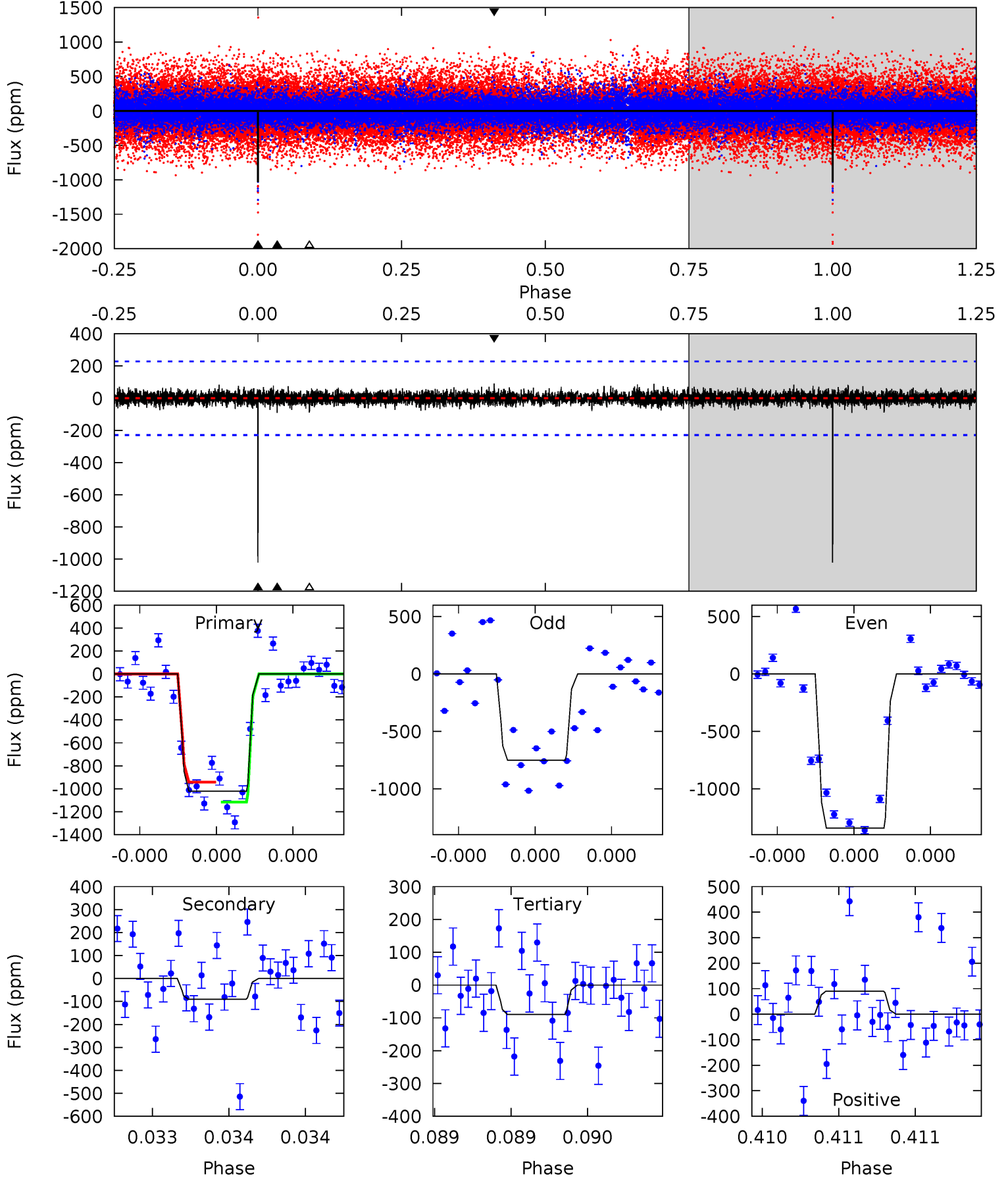
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
12.0	37.3	17.4	15.3	5.55	3.45	3.58	-5.44	-3.32	19.9	22.0	0.35	0.94	0.29	1.28



# Alt Model-Shift Uniqueness Test

004449749-01, P = 518.542452 Days, E = 310.801946 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
24.9	2.21	2.18	2.21	5.58	3.50	0.48	22.7	22.7	0.04	0.00	7.16	1.24	0.08	2.12



### Stellar Parameters For KIC 004449749

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$5372^{+160}_{-144}$	$4.581^{+0.049}_{-0.091}$	$-0.340^{+0.350}_{-0.300}$	$0.751^{+0.123}_{-0.066}$	$0.783^{+0.093}_{-0.067}$	$2.607^{+0.577}_{-0.755}$
	+3%/-3%	+1%/-2%	+103%/-88%	+16%/-9%	+12%/-9%	+22%/-29%
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 004449749-01 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$-3772 \pm 101$	$2.57^{+1.77}_{-1.57}$	$269^{+11}_{-10}$	$7635^{+7718}_{-1838}$	$417815^{+2384598}_{-267845}$
Alt.	$-91 \pm 41$	$3.06^{+1.85}_{-1.70}$	$268^{+13}_{-10}$	$3267^{+1020}_{-494}$	$6629^{+29929}_{-4451}$

$T_{\text{max}}$  = 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

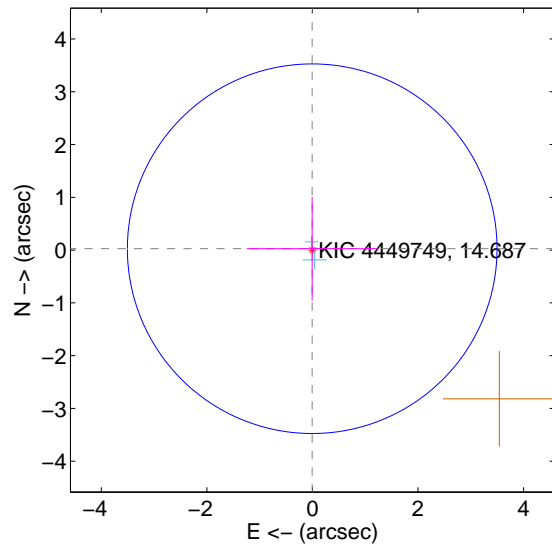
Supplemental centroid analysis for 004449749-01. Kepler magnitude: 14.69. Transit SNR 6.36

There are 2 quarters with good PRF difference image offsets

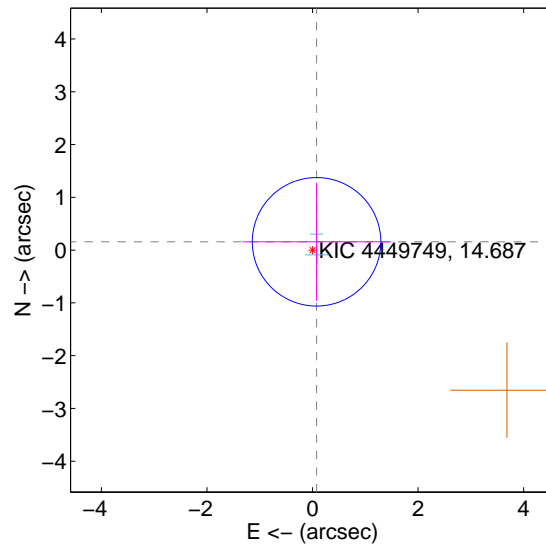
The direct PRF centroid is offset from the target star catalog position by about 0.22 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.027 \pm 1.167$	0.02	$0.004 \pm 1.240$	$0.026 \pm 0.980$
PRF-fit source offset from KIC position	$0.175 \pm 0.406$	0.43	$-0.076 \pm 1.405$	$0.157 \pm 1.123$
photometric centroid source offset	$0.71 \pm 1.04$	0.68	$0.50 \pm 1.02$	$-0.50 \pm 1.05$

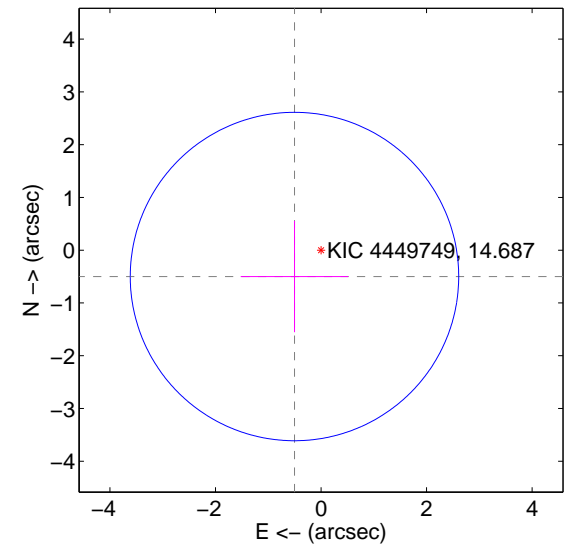
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position

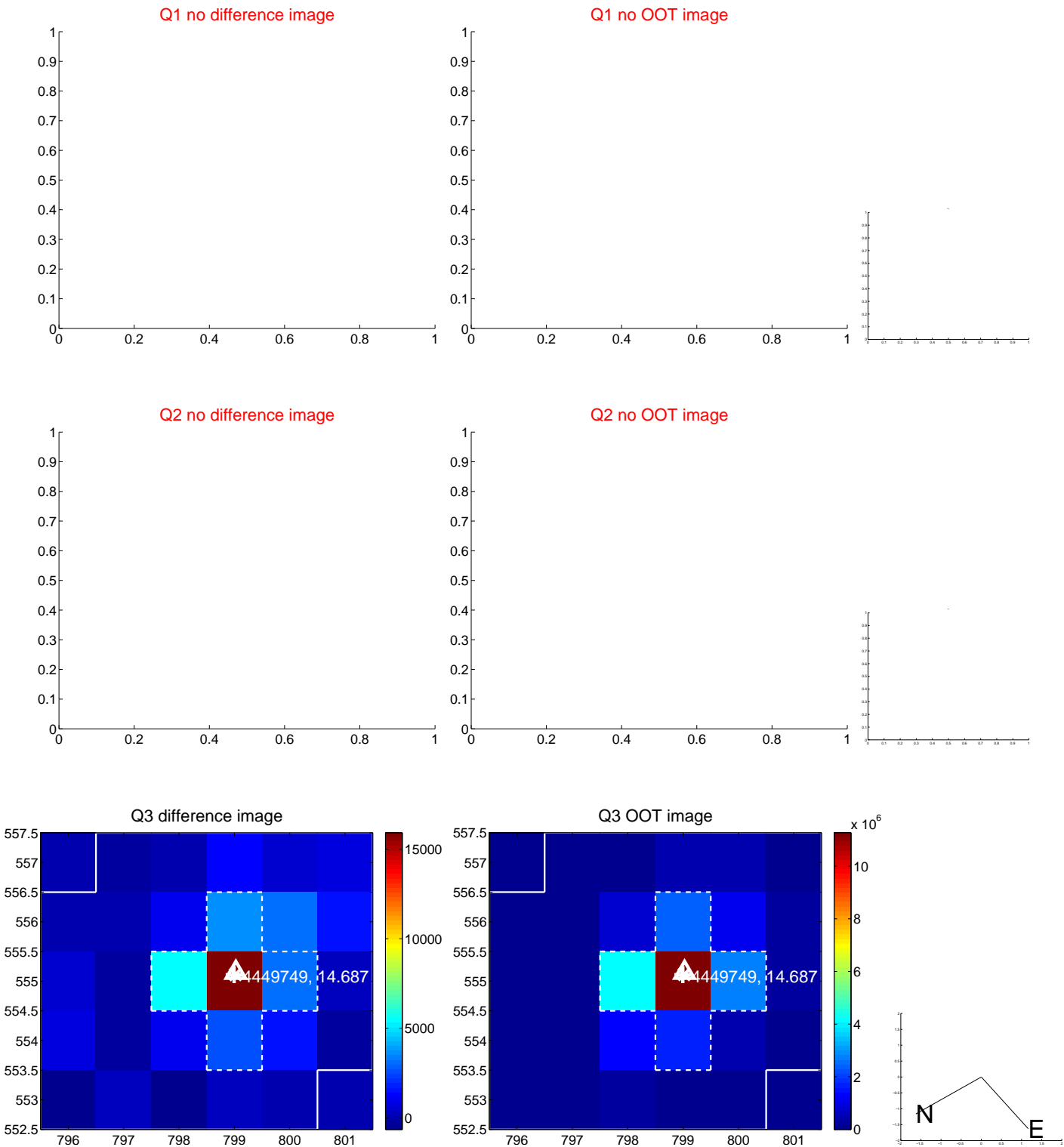


offset from photometric centroids



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.

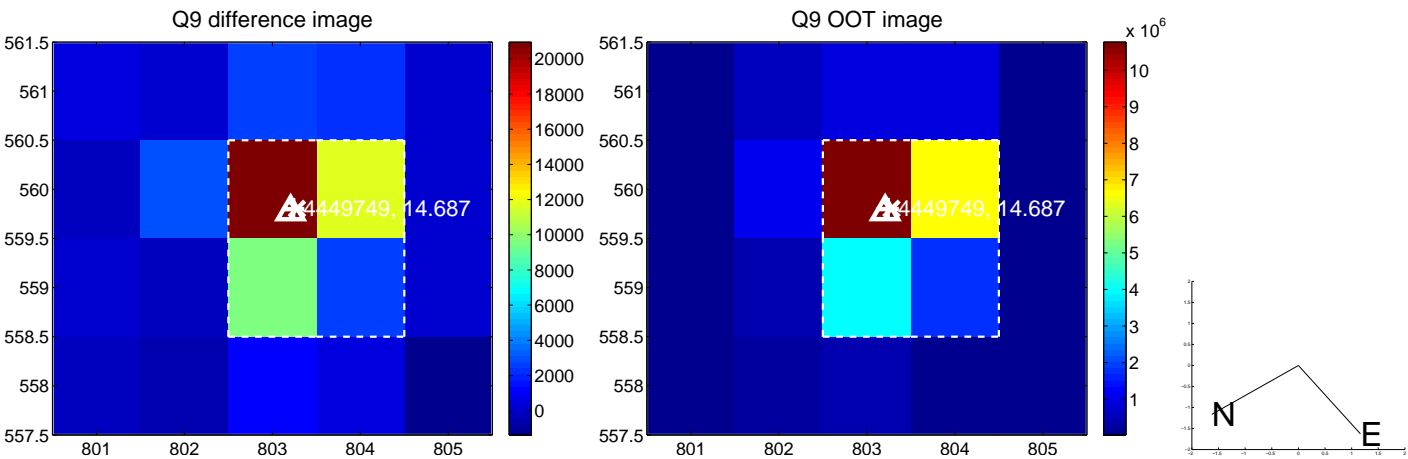




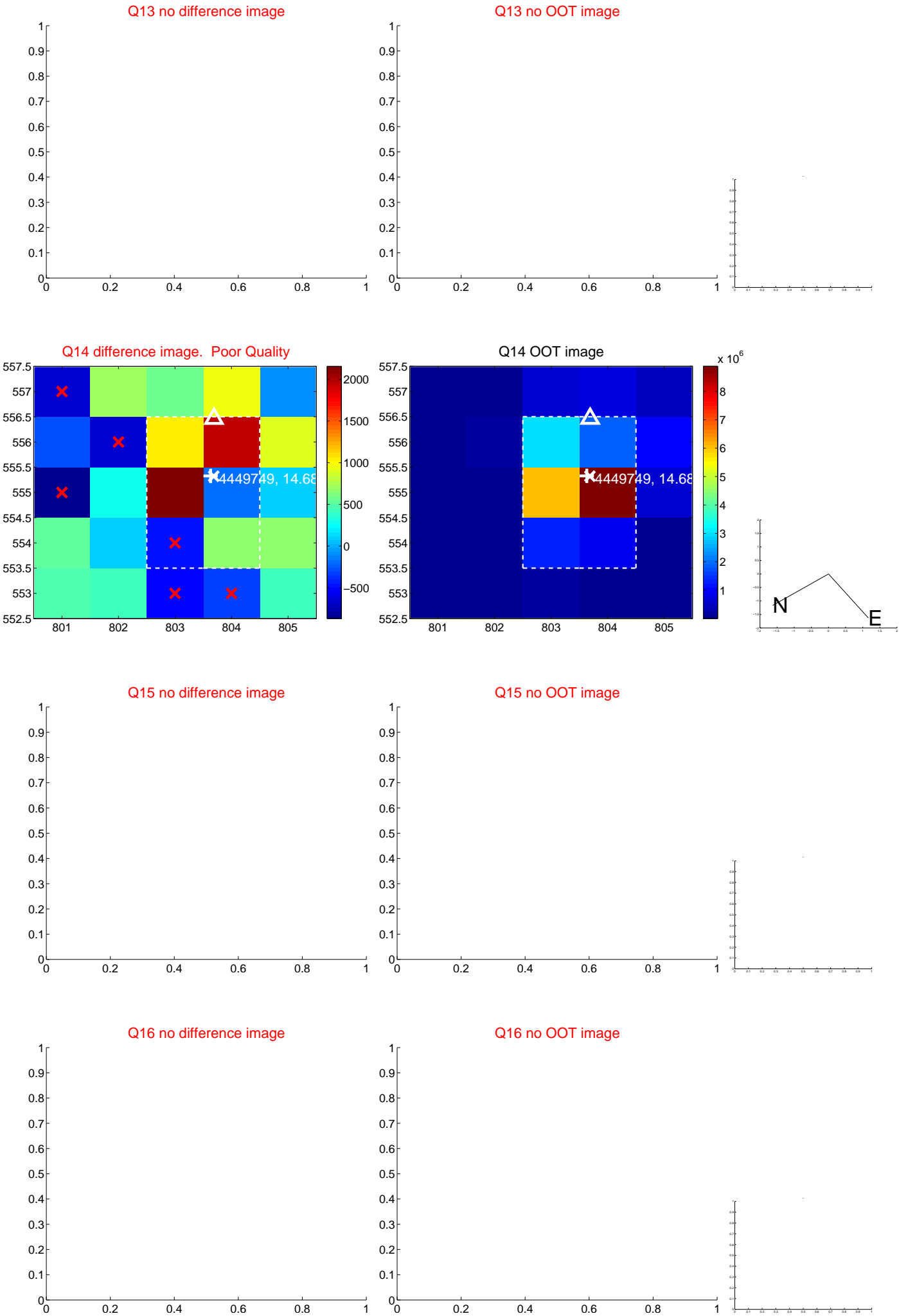
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



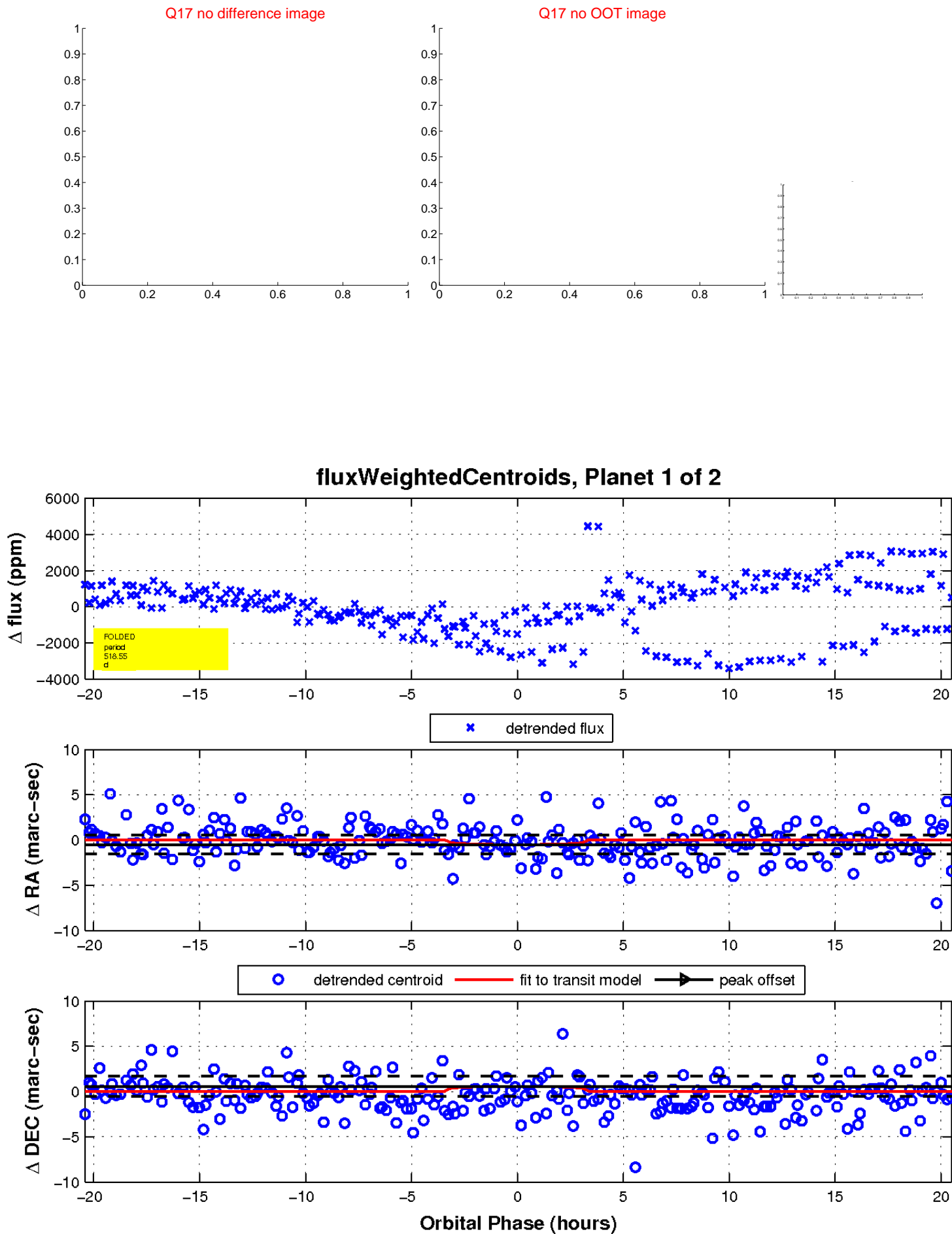
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

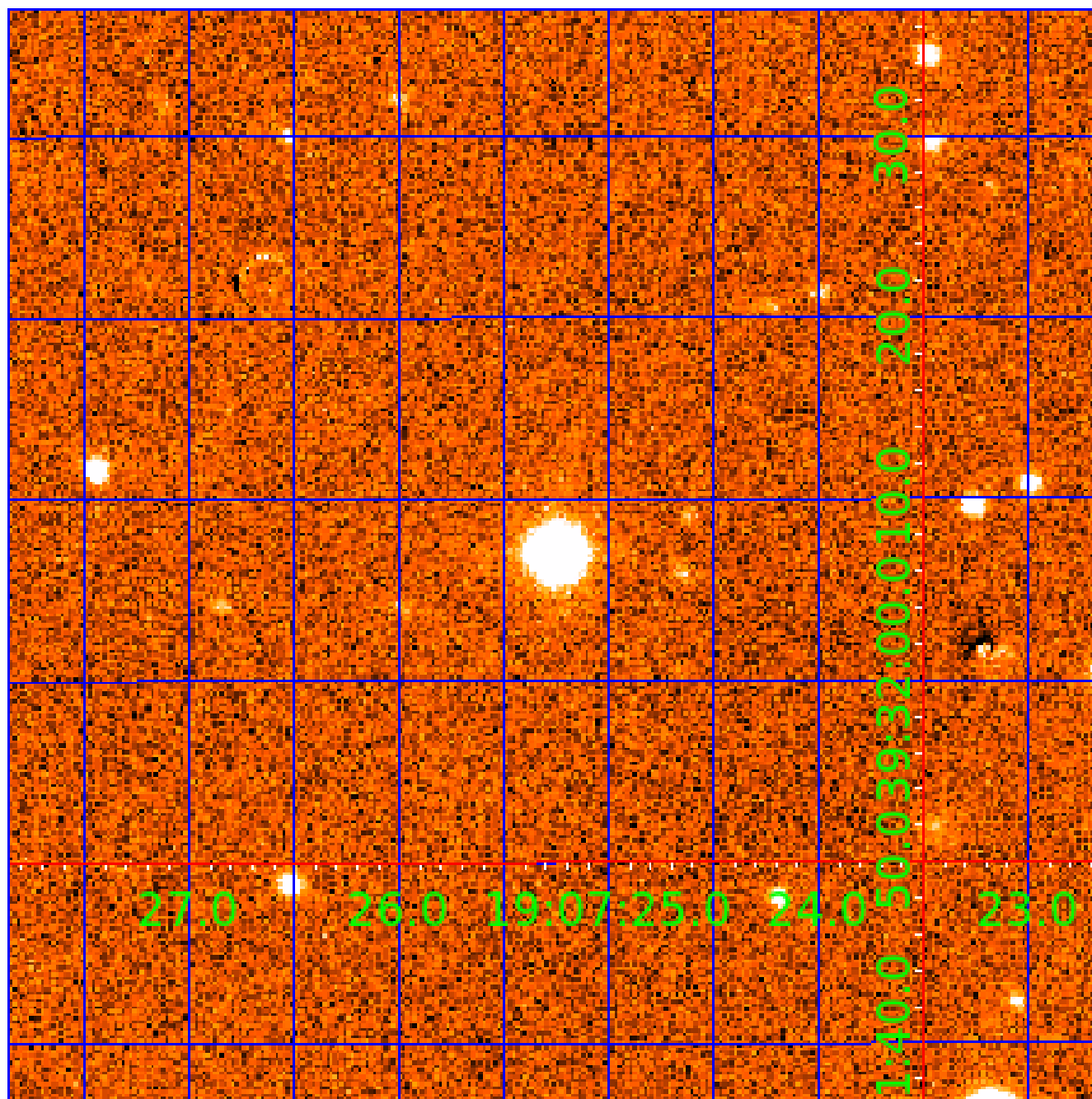


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



# UKIRT Image

Declination



# KIC 004449749

## 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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004449749-02	OBS	No	544.781195	139.693786	1200.2	4.929	12.7	7.8	0.75	5372	2.99	0.29

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
004449749-01	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS
004449749-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—ALL_TRANS_CHASES—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.

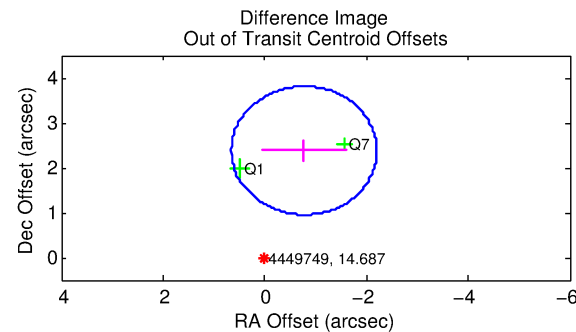
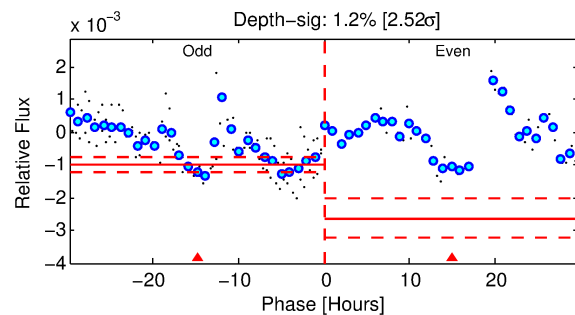
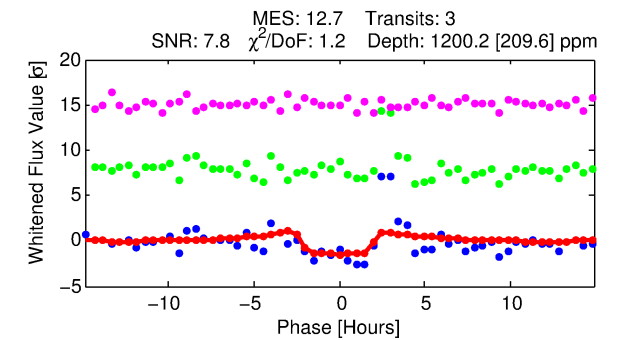
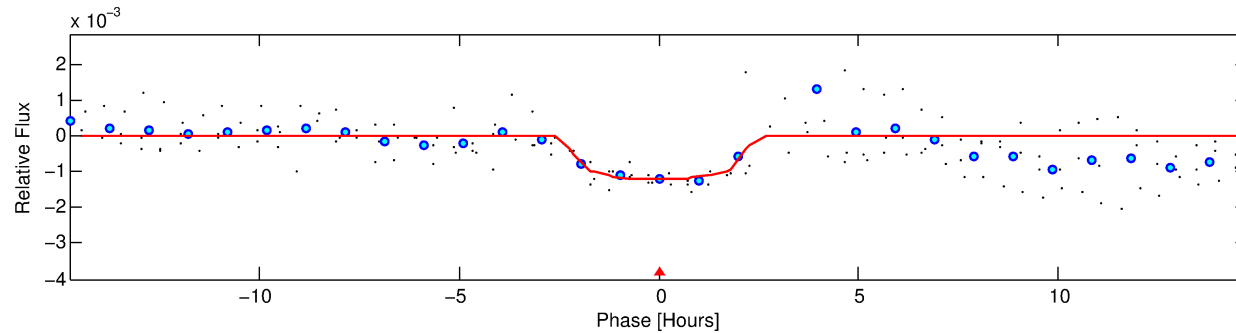
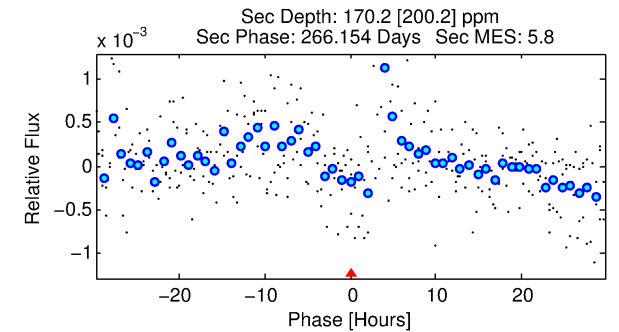
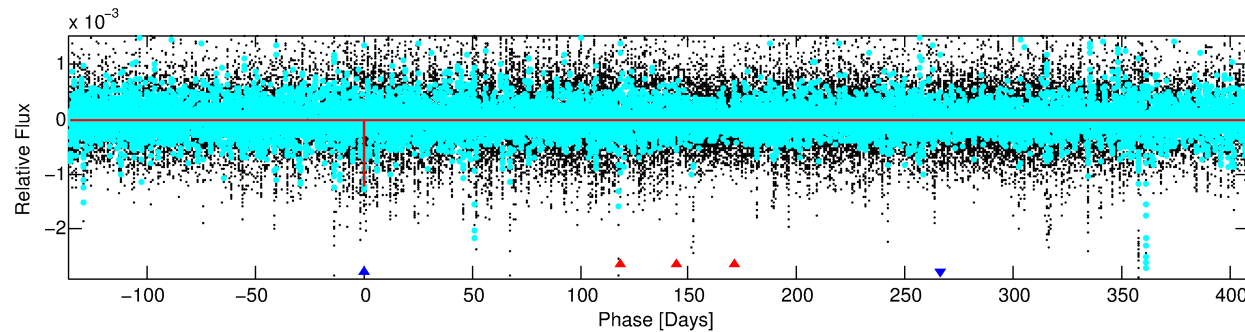
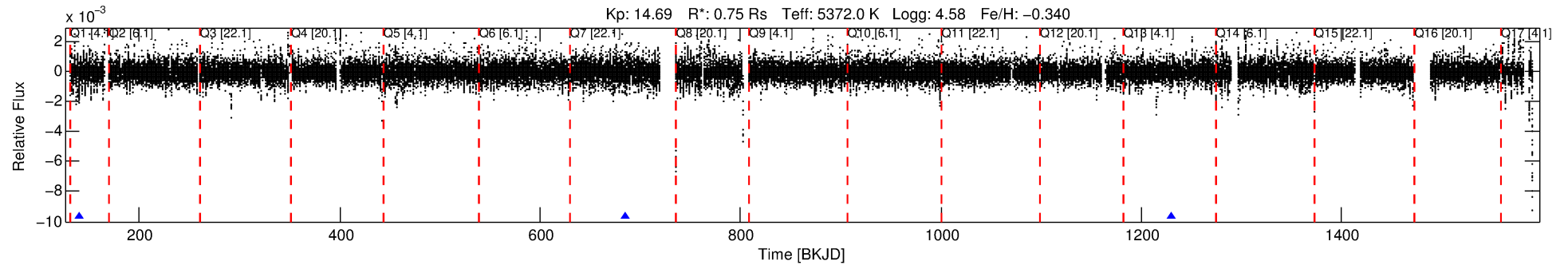
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 004449749-02

No Significant Match Found

# DV One-Page Summary

KIC: 4449749 Candidate: 2 of 2 Period: 544.781 d



## DV Fit Results:

Period = 544.78120 [0.00619] d  
Epoch = 139.6938 [0.0087] BKJD  
Rp/R\* = 0.0364 [0.0171]  
a/R\* = 501.87 [912.78]  
b = 0.85 [0.62]  
Seff = 0.29 [0.06]  
Teff = 187 [10] K  
Rp = 2.99 [1.48] Re  
a = 1.2039 [0.1560] AU  
Ag = 15218.66 [23053.89] [0.66σ]  
Teffp = 3214 [1213] K [2.50σ]

## DV Diagnostic Results:

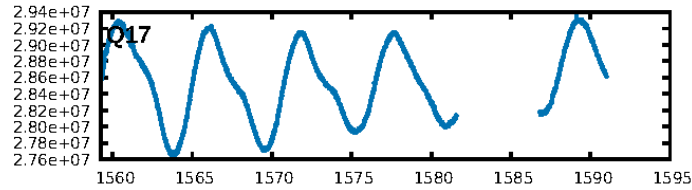
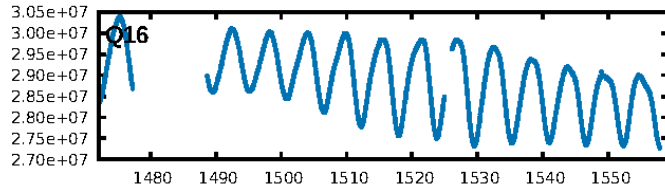
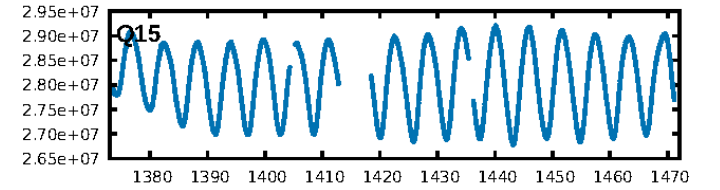
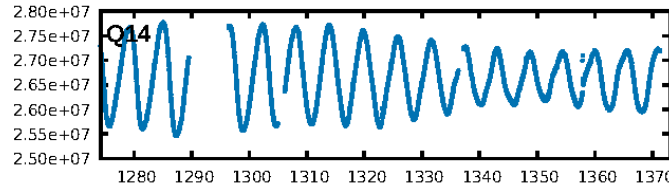
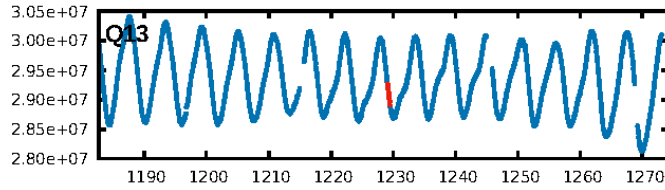
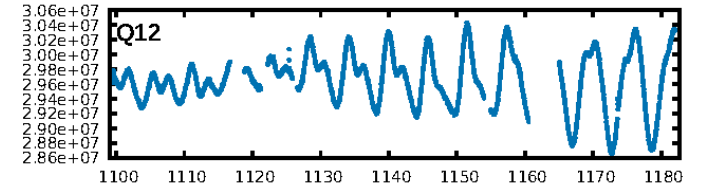
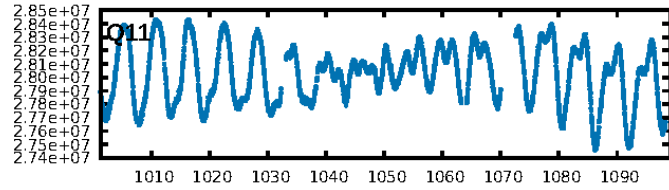
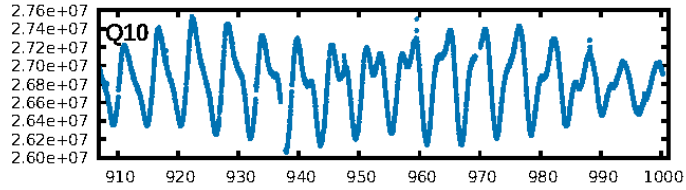
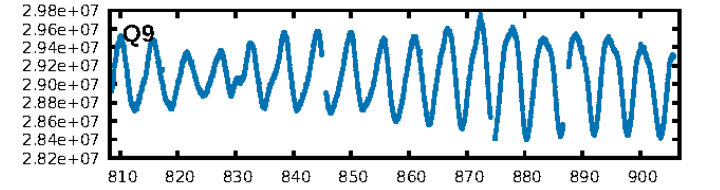
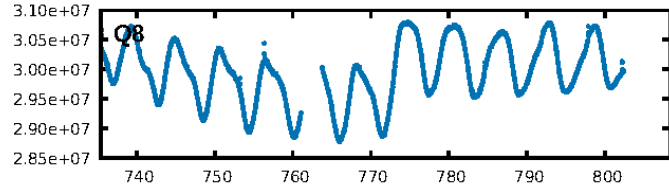
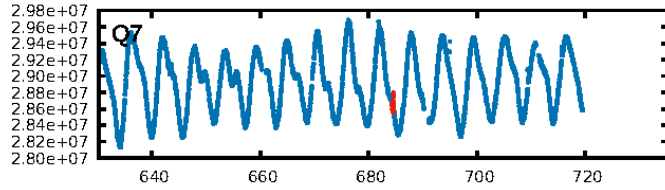
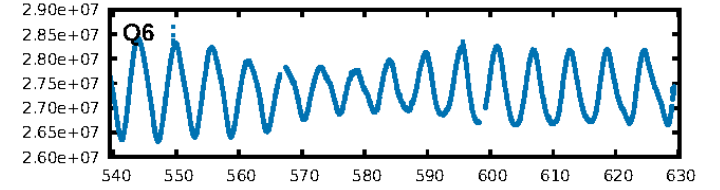
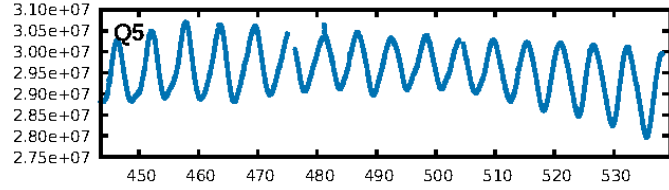
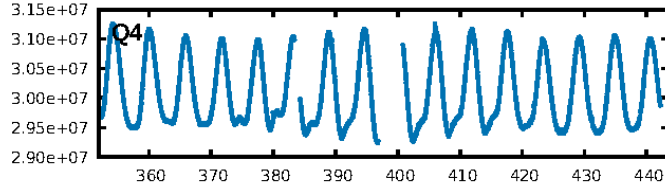
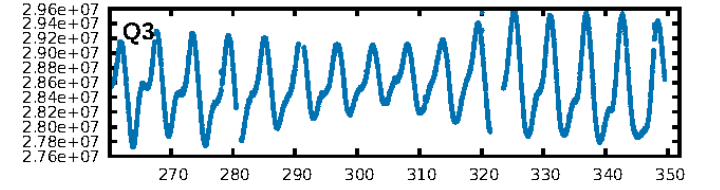
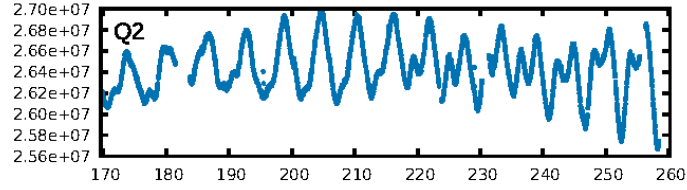
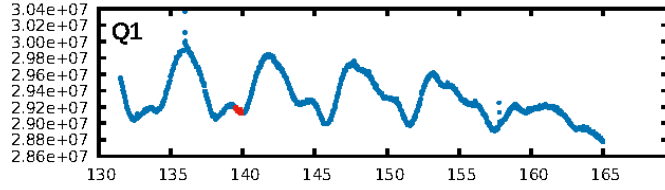
ShortPeriod-sig: 100.0% [74.55σ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: 0.0%  
ModelChiSquareGof-sig: 82.4%  
Bootstrap-pfa: 2.16e-11  
RollingBand-fgt: 1.00 [2/2]  
GhostDiagnostic-chr: -1.798  
Centroid-sig: 75.3%  
Centroid-so: 0.454 arcsec [0.54σ]  
OotOffset-rm: 2.503 arcsec [5.25σ]  
OotOffset-st: 0/1/0/1 [2]  
KicOffset-rm: 2.626 arcsec [4.07σ]  
KicOffset-st: 0/1/0/1 [2]  
DiffImageQuality-fgm: 0.50 [1/2]  
DiffImageOverlap-fno: 1.00 [2/2]

Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 01-Feb-2016 09:21:54 Z

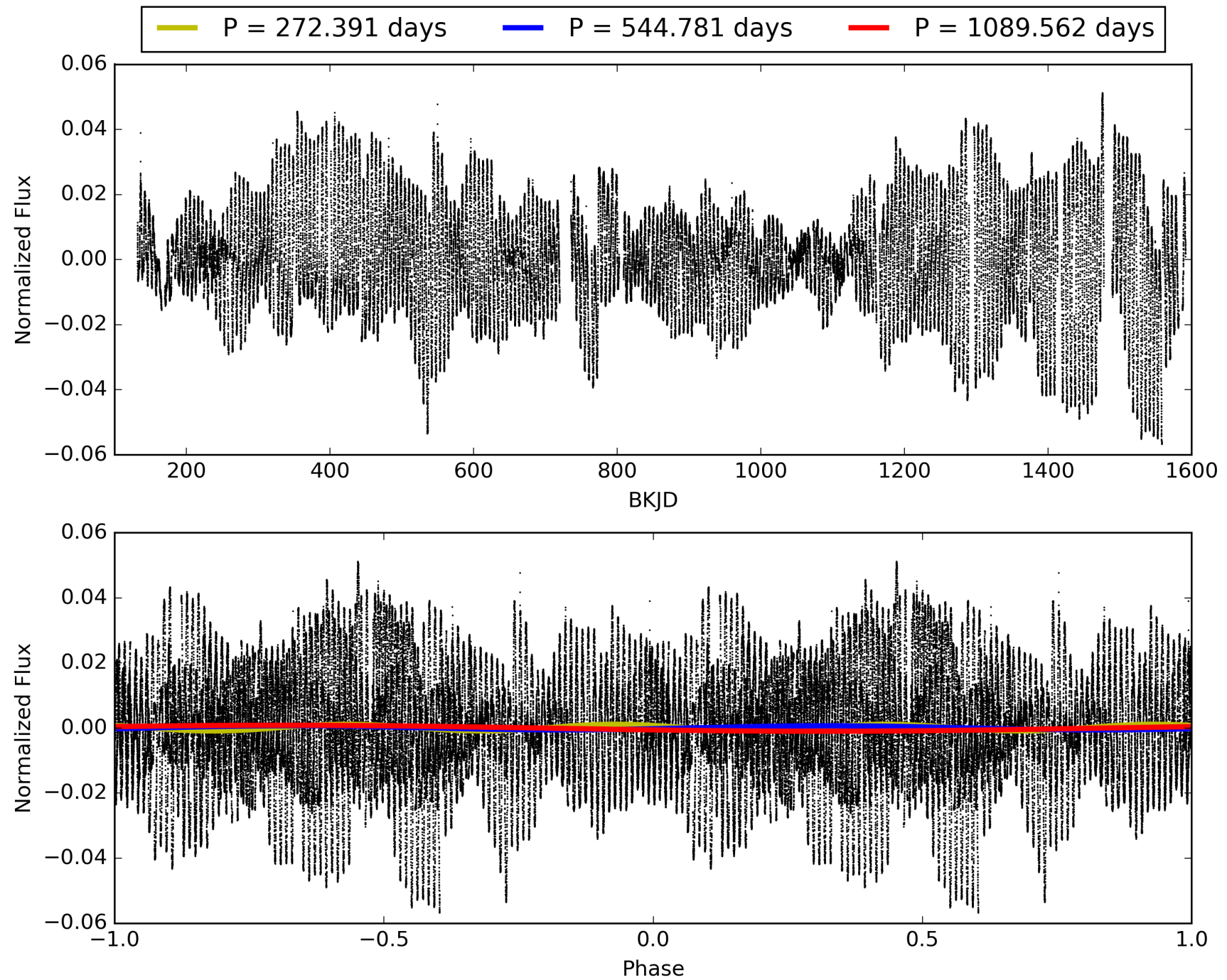
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center



# TCE 004449749-02, PDC Light Curves

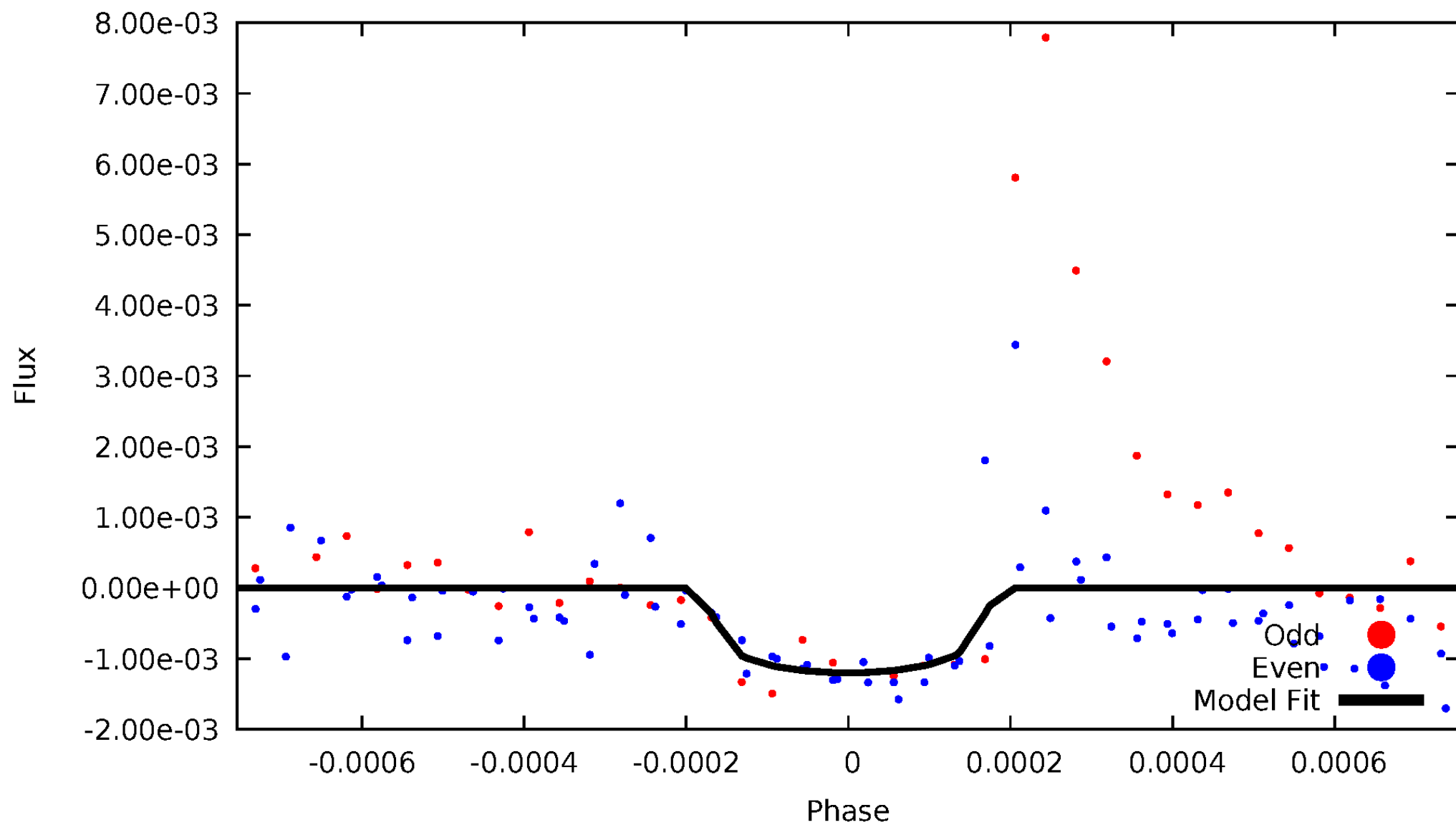


TCE 004449749-02



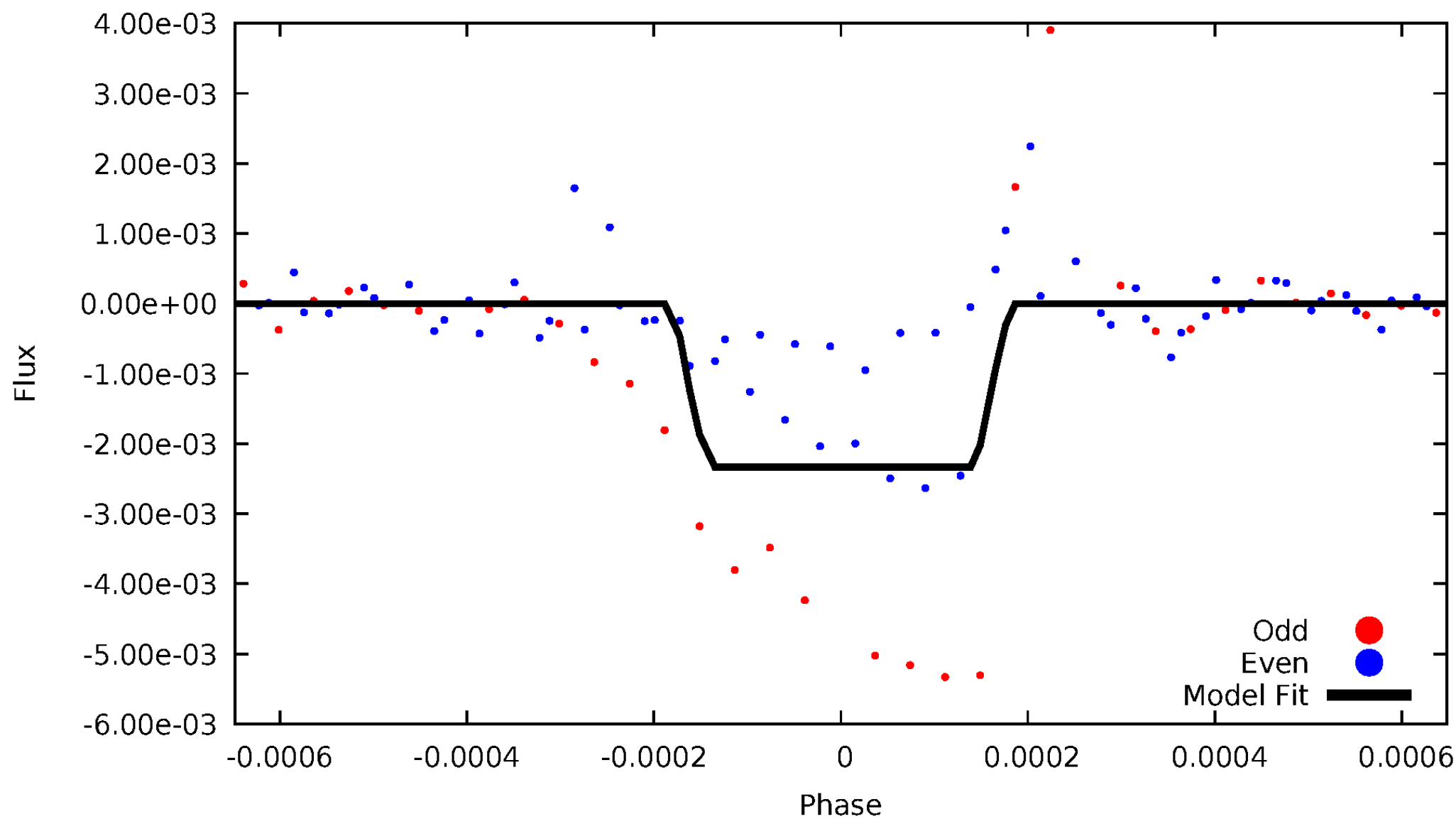
# DV Odd/Even

TCE 004449749-02



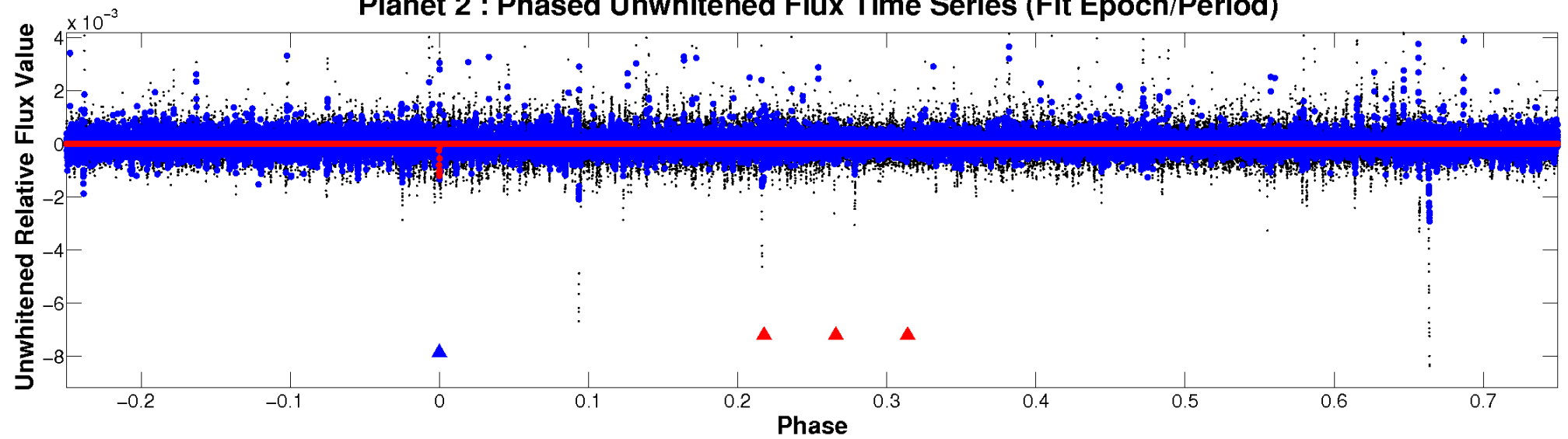
# ALT Odd/Even

TCE 004449749-02

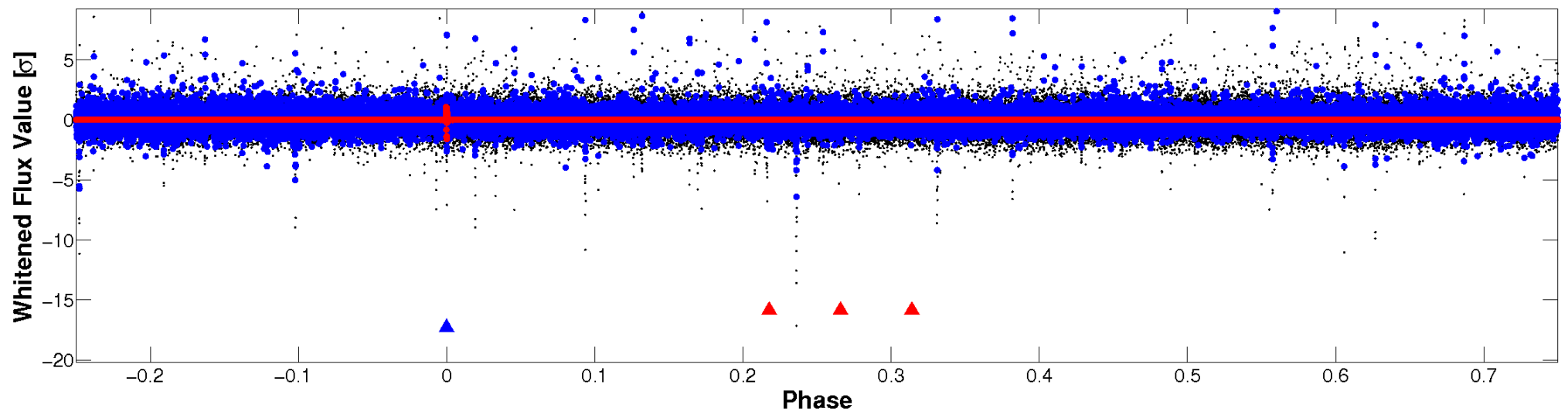


# Non-Whitened Vs. Whitened Light Curve

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

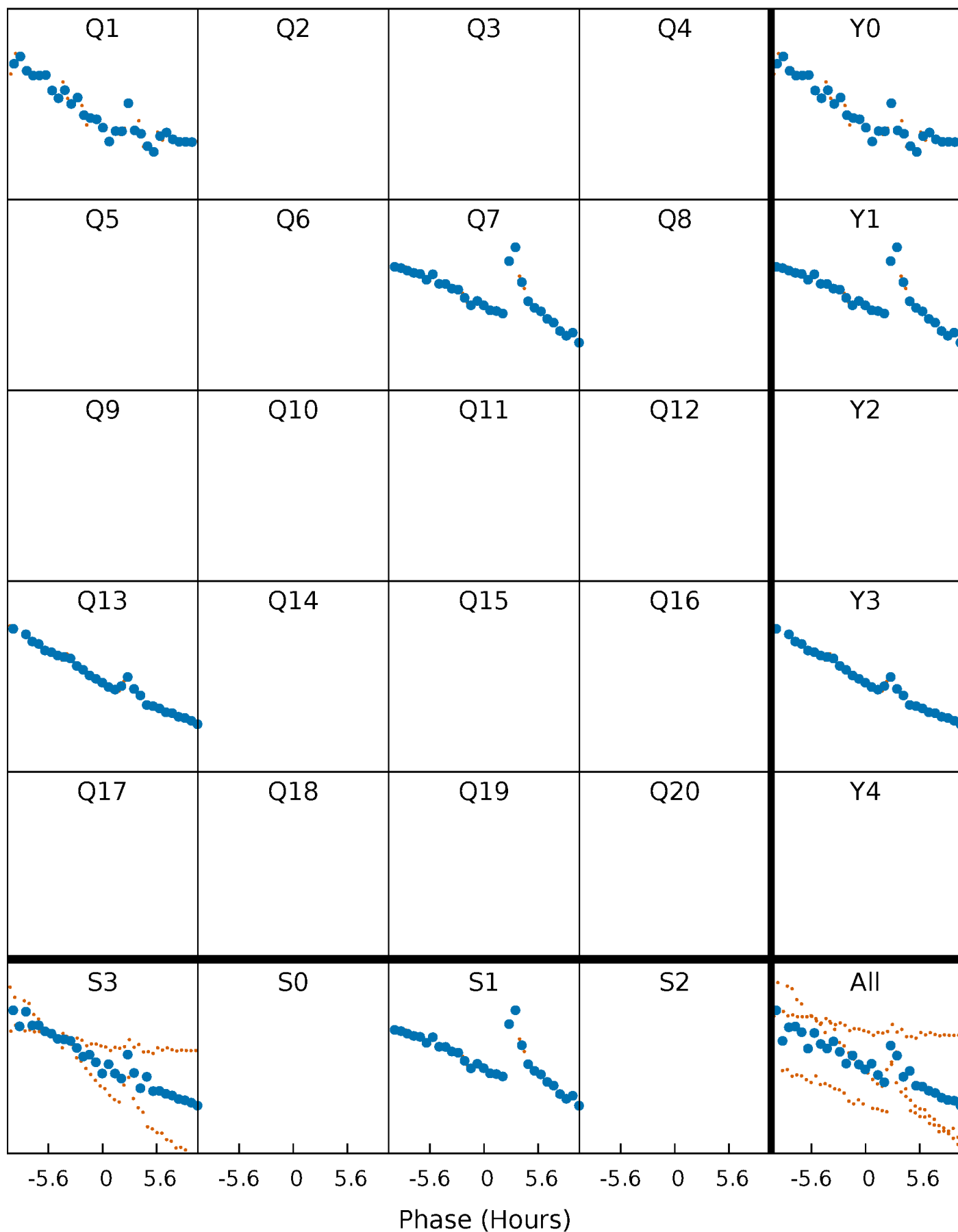


**Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)**



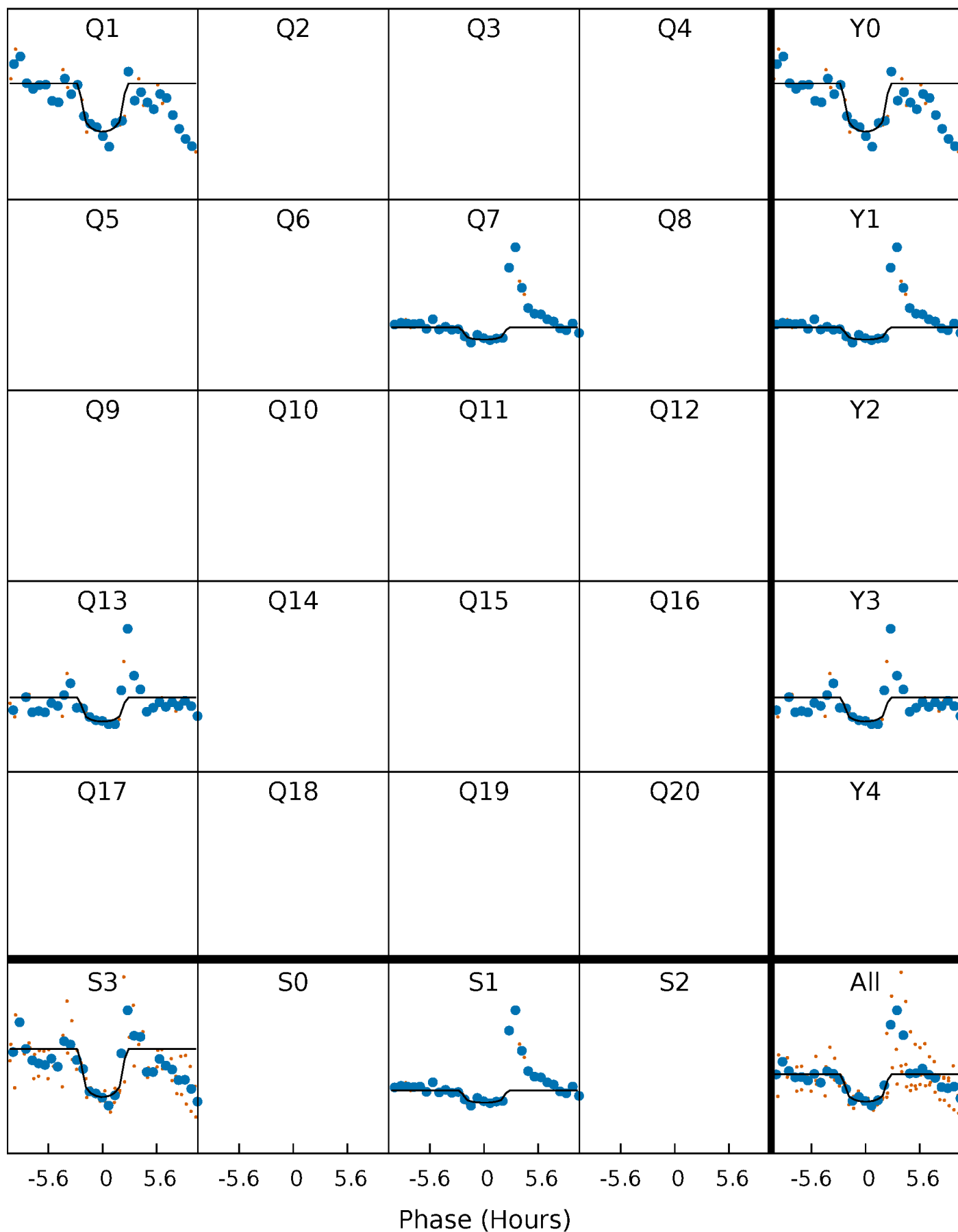
# PDC Quarter-Phased Transit Curves

TCE 004449749-02 P=544.781195 Days  $T_0=139.693786$  (BKJD)



# DV Quarter-Phased Transit Curves

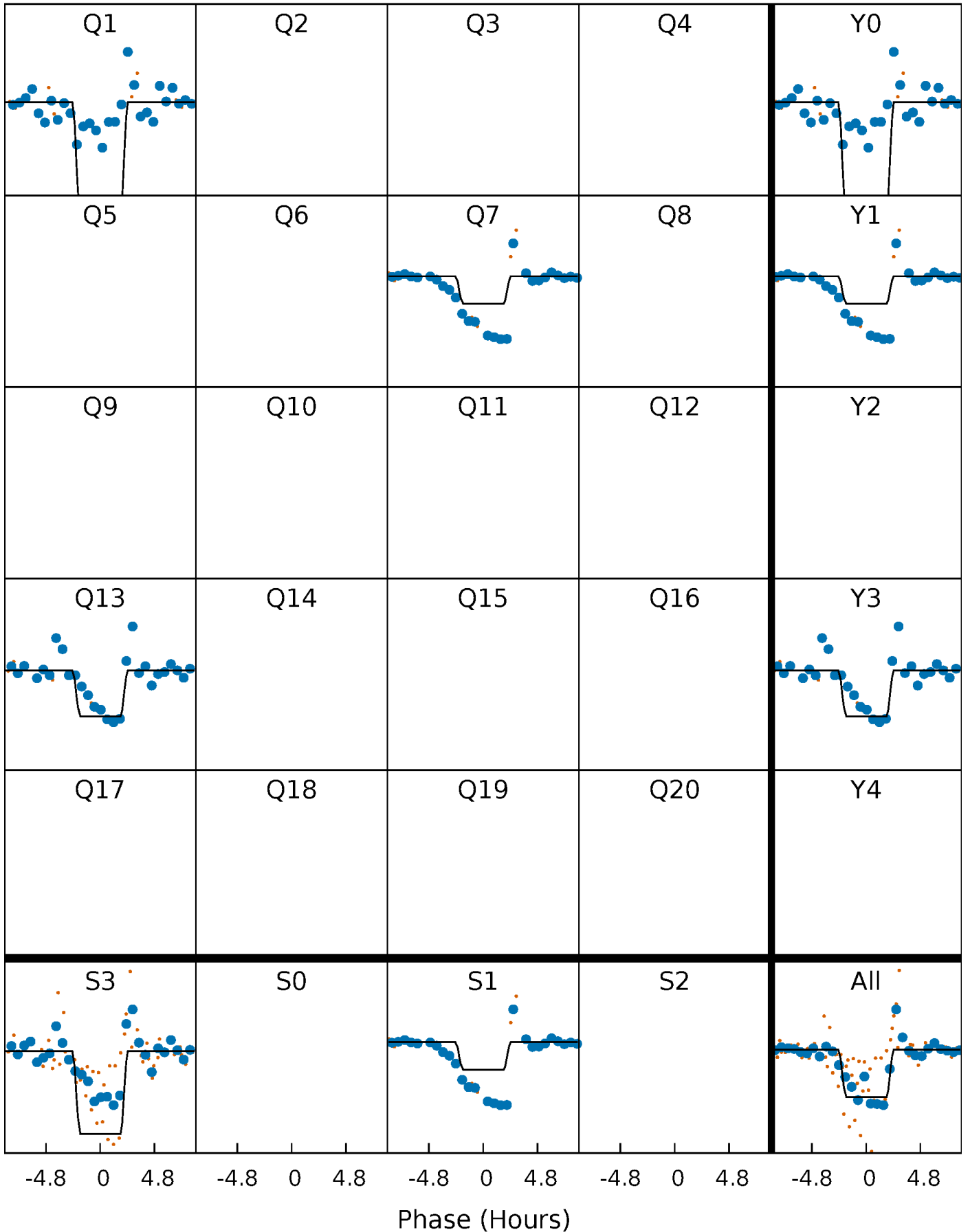
TCE 004449749-02 P=544.781195 Days  $T_0=139.693786$  (BKJD)





# Alt. Detrend Quarter-Phased Transit Curves

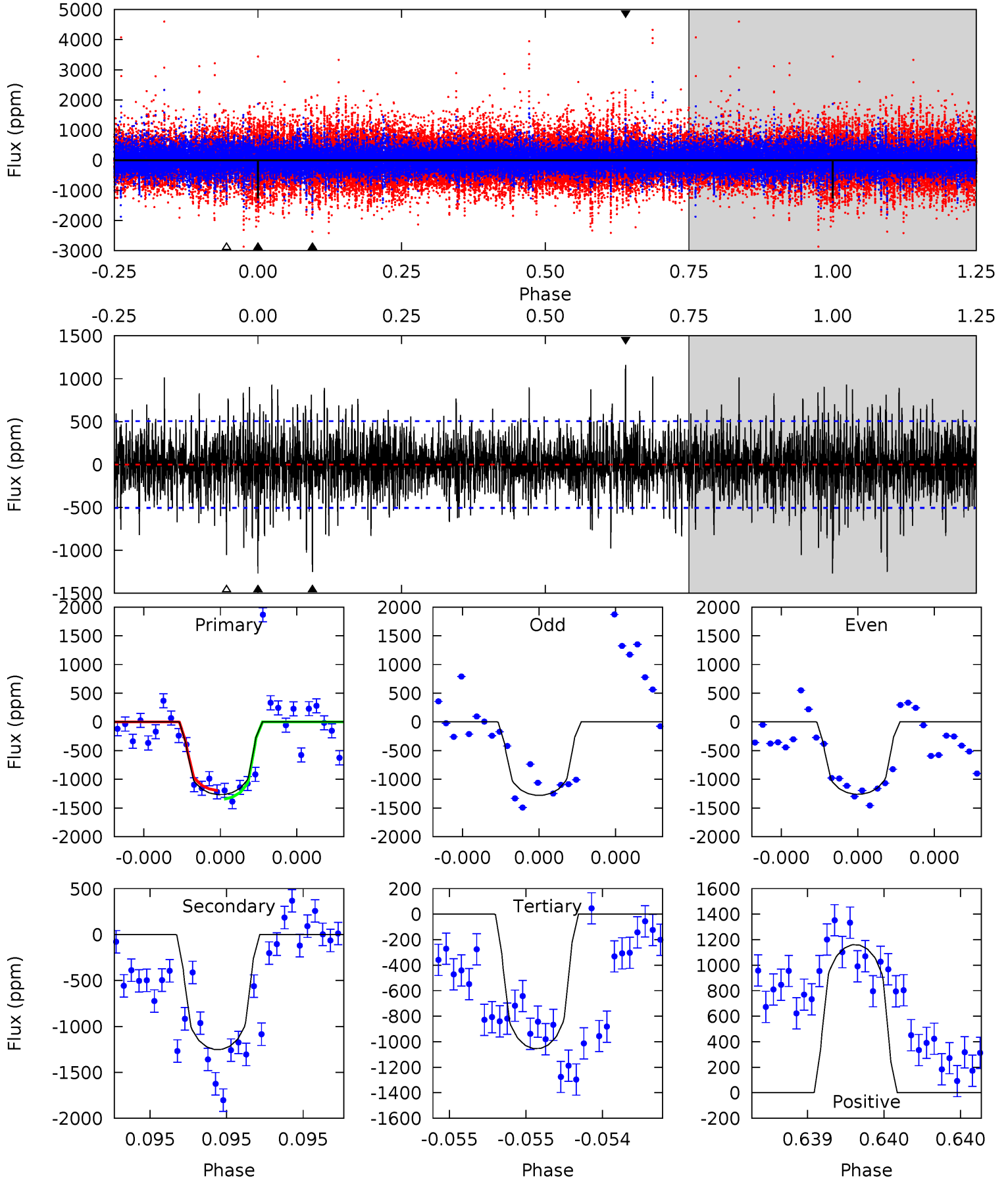
TCE 004449749-02 P=544.772332 Days  $T_0=139.713317$  (BKJD)



# DV Model-Shift Uniqueness Test

004449749-02, P = 544.781195 Days, E = 139.693786 Days

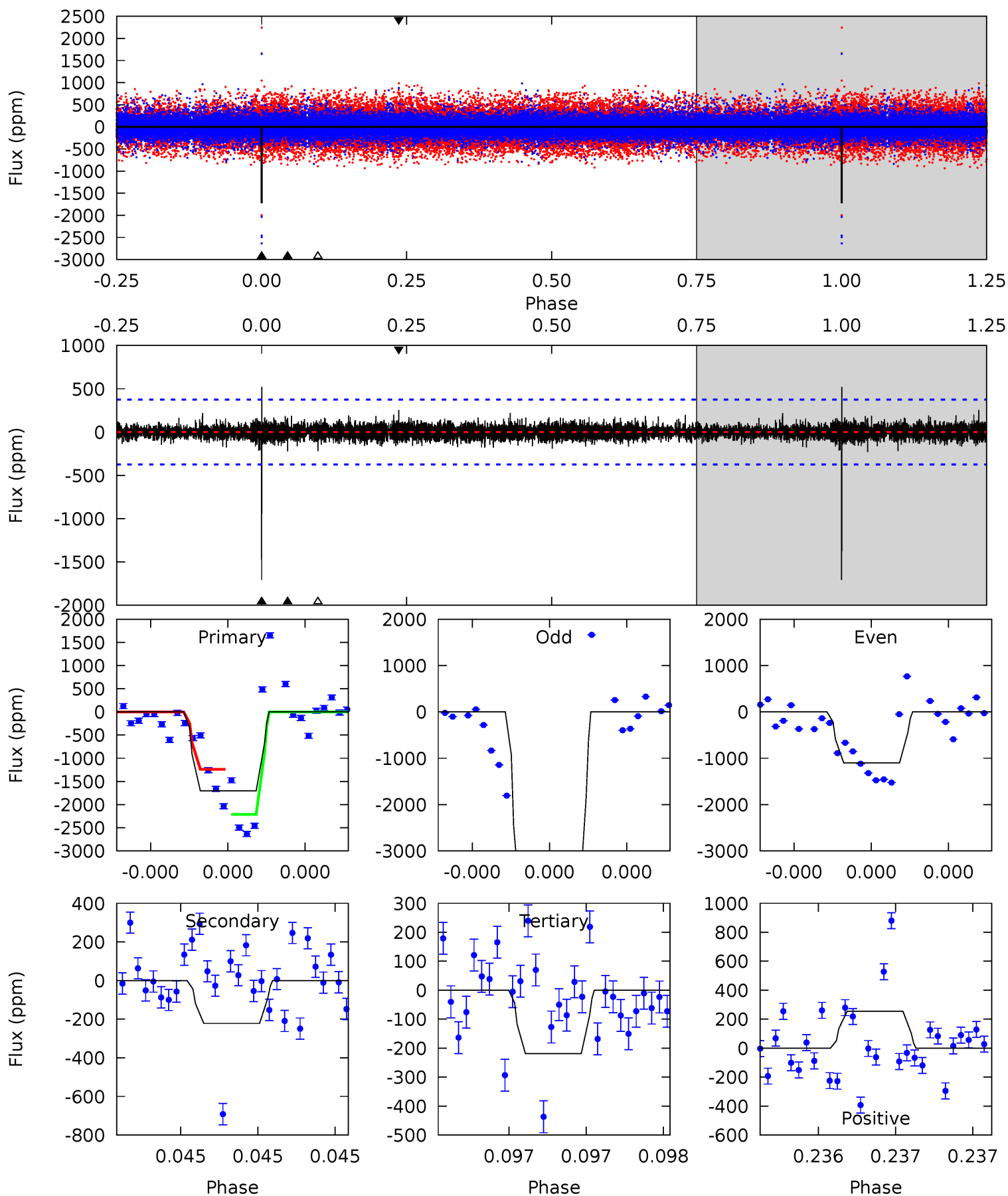
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
14.1	13.9	11.7	12.9	5.62	3.56	2.56	2.37	1.19	2.19	1.01	0.08	0.96	0.48	0.84



# Alt Model-Shift Uniqueness Test

004449749-02, P = 544.772332 Days, E = 139.713317 Days

Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
25.6	3.33	3.29	3.82	5.64	3.58	0.65	22.3	21.8	0.04	-0.48	38.4	1.26	0.23	7.34



### Stellar Parameters For KIC 004449749

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$5372^{+160}_{-144}$	$4.581^{+0.049}_{-0.091}$	$-0.340^{+0.350}_{-0.300}$	$0.751^{+0.123}_{-0.066}$	$0.783^{+0.093}_{-0.067}$	$2.607^{+0.577}_{-0.755}$
	+3%/-3%	+1%/-2%	+103%/-88%	+16%/-9%	+12%/-9%	+22%/-29%
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 004449749-02 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$-1251 \pm 90$	$3.00^{+1.50}_{-1.45}$	$263^{+12}_{-10}$	$5340^{+2101}_{-842}$	$111450^{+296423}_{-61571}$
Alt.	$-222 \pm 67$	$4.01^{+1.59}_{-1.50}$	$264^{+11}_{-10}$	$3454^{+594}_{-365}$	$10841^{+16029}_{-5732}$

$T_{\text{max}}$  = 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

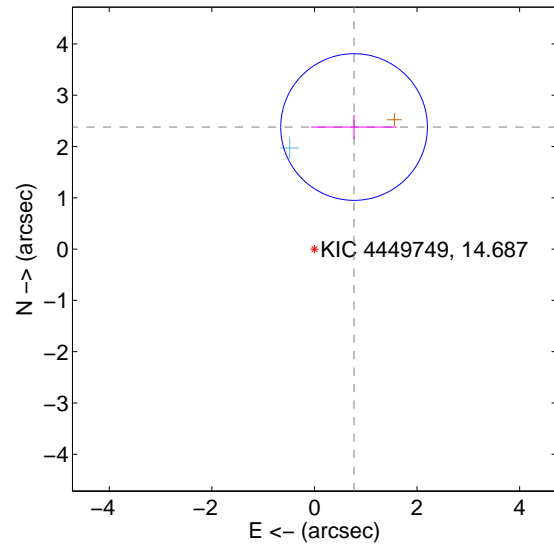
Supplemental centroid analysis for 004449749-02. Kepler magnitude: 14.69. Transit SNR 7.77

There are 1 quarters with good PRF difference image offsets

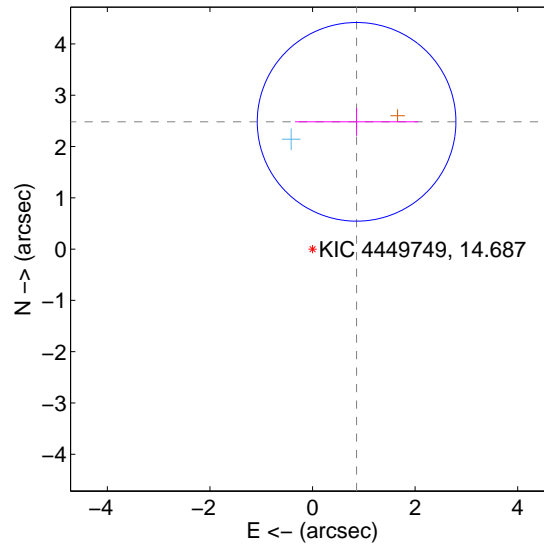
The direct PRF centroid is offset from the target star catalog position by about 0.13 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$2.503 \pm 0.477$	5.25	$-0.773 \pm 0.837$	$2.380 \pm 0.235$
PRF-fit source offset from KIC position	$2.626 \pm 0.646$	4.07	$-0.859 \pm 1.200$	$2.482 \pm 0.273$
photometric centroid source offset	$0.45 \pm 0.84$	0.54	$0.02 \pm 0.67$	$0.45 \pm 0.84$

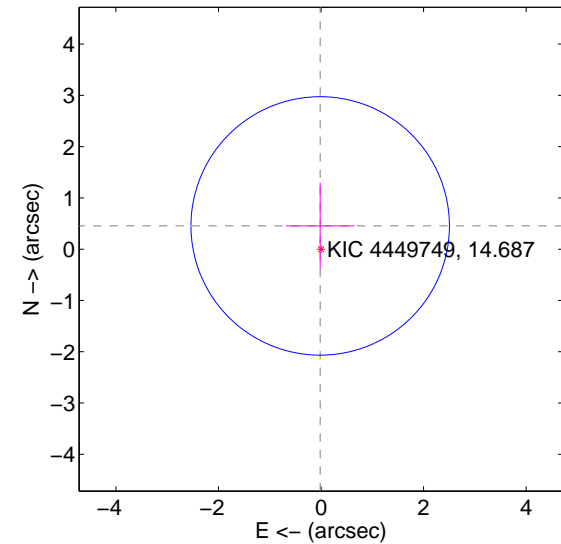
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position

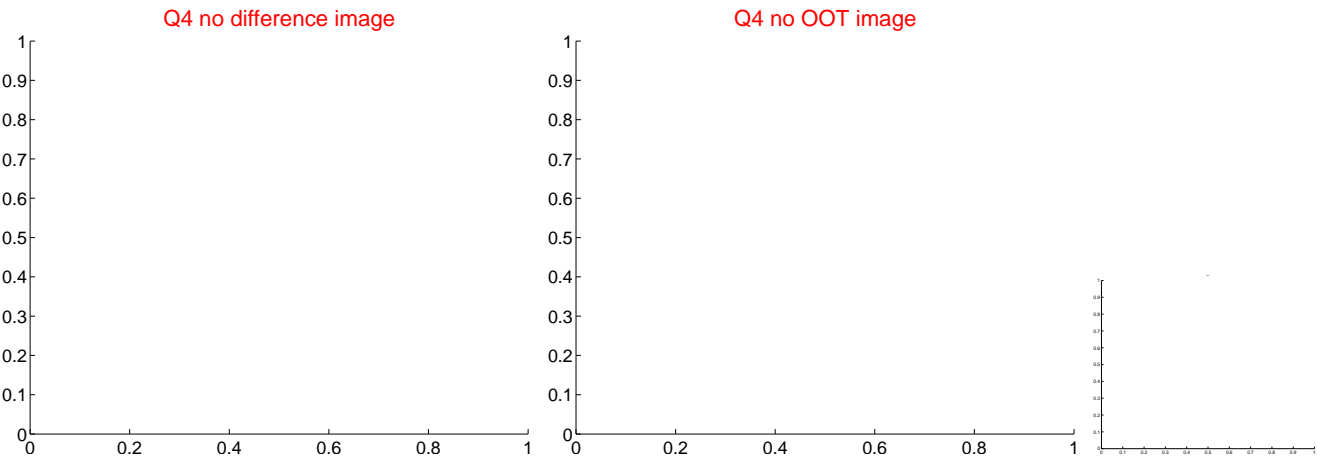
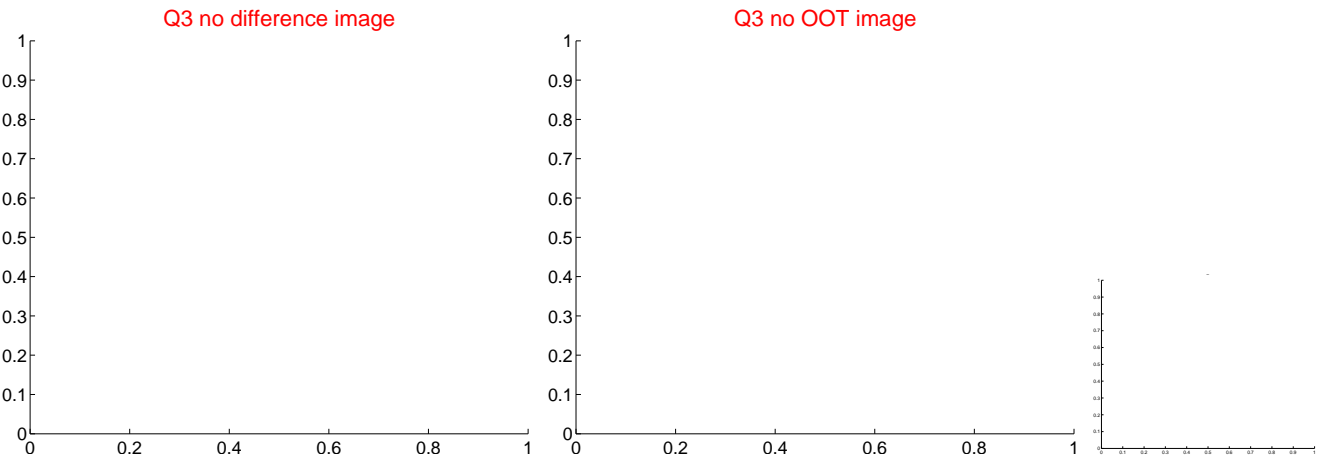
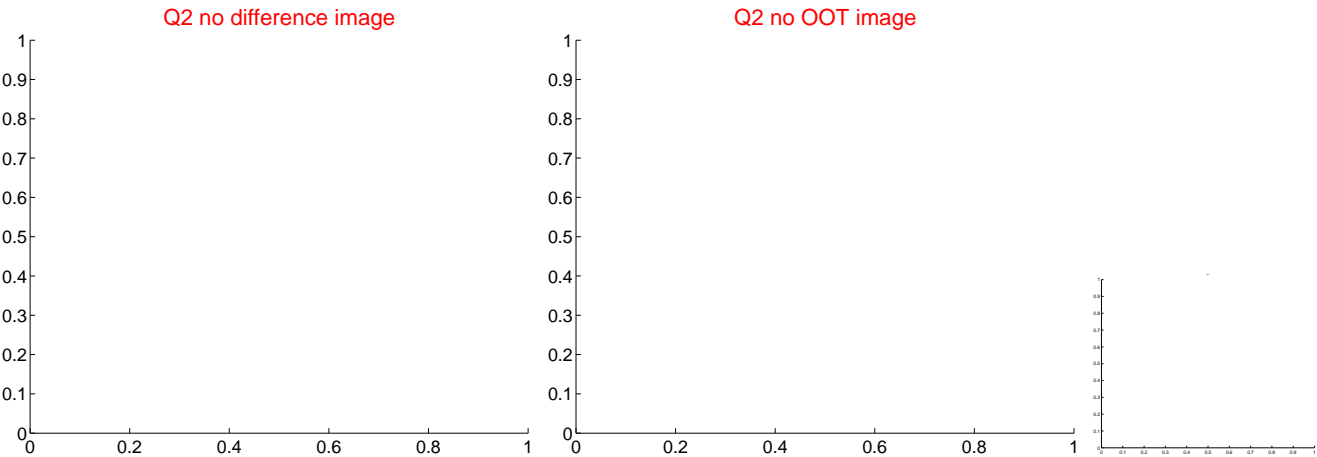
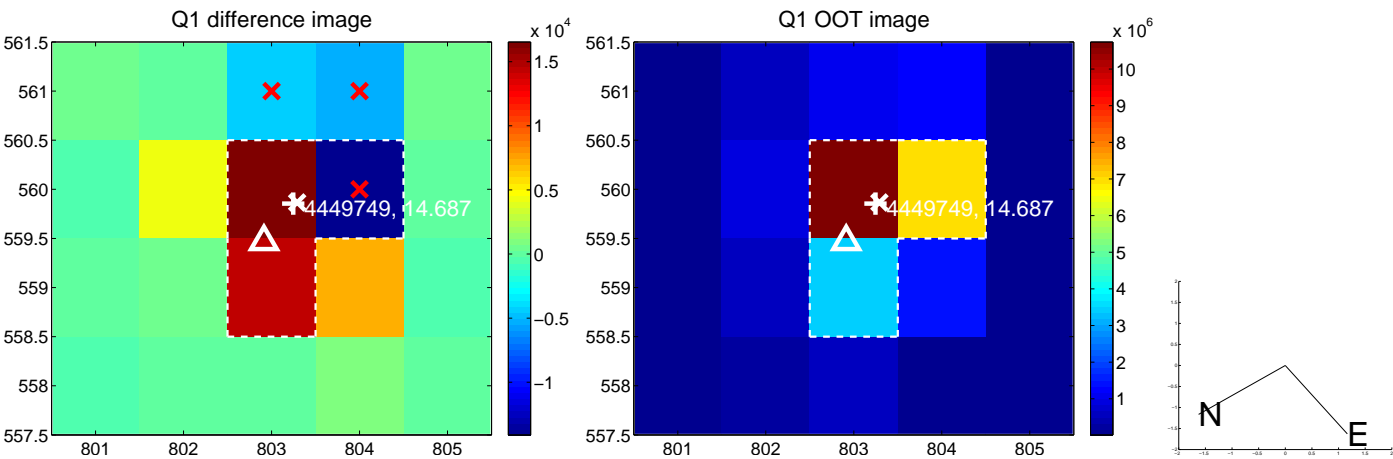


offset from photometric centroids



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.

Q5 no difference image



Q5 no OOT image



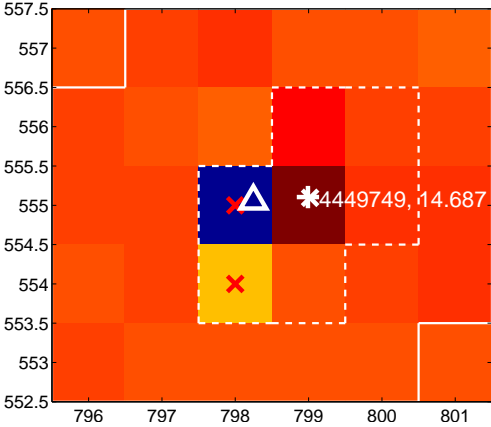
Q6 no difference image



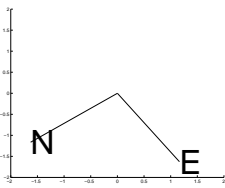
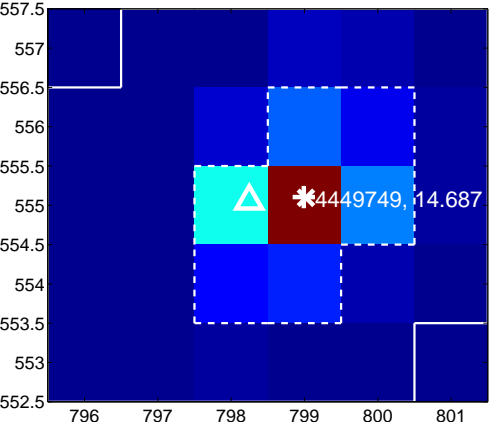
Q6 no OOT image



Q7 difference image. Poor Quality



Q7 OOT image



Q8 no difference image



Q8 no OOT image





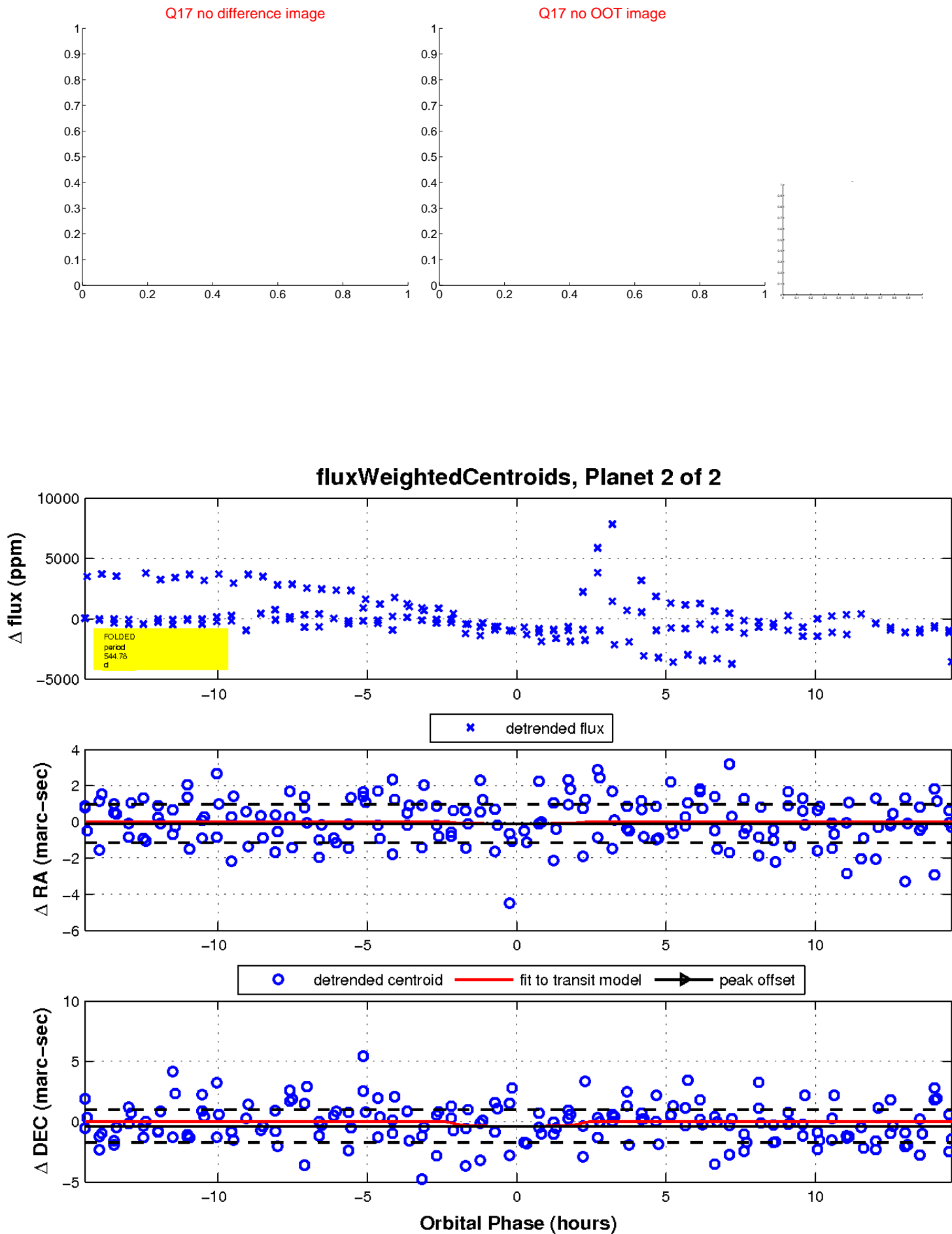
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

