

# KIC 003971507

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
003971507-01	OBS	No	394.175282	419.606328	878.0	3.510	15.7	4.0	1.61	5455	5.49	2.05
003971507-03	OBS	No	376.226986	386.815500	1375.5	3.263	13.4	5.6	1.61	5455	6.19	2.18
003971507-04	OBS	No	315.734653	217.568312	1325.1	6.346	15.2	4.9	1.61	5455	5.96	2.75
003971507-05	OBS	No	420.997596	364.959213	1490.2	4.865	13.6	6.5	1.61	5455	6.23	1.88
003971507-06	OBS	No	323.681895	453.462898	1559.4	3.850	12.6	7.6	1.61	5455	6.54	2.66
003971507-08	OBS	No	407.493824	226.377902	940.2	3.862	13.1	3.4	1.61	5455	5.08	1.96
003971507-09	OBS	No	222.868839	227.780306	357.7	15.000	11.6	-1.0	1.61	5455	3.00	4.38

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
003971507-01	OBS	FP	0.00	1	0	1	0	INDIV_TRANS_MARSHALL_TRACKER—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS—HALO_GHOST
003971507-03	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
003971507-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES—LPP_DV—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS
003971507-05	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—MOD_POS_ALT
003971507-06	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL_SKYE—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS
003971507-08	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—CENT_FEW_DIFFS
003971507-09	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_MARSHALL_SKYE—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—CENT_NOFITS

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

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

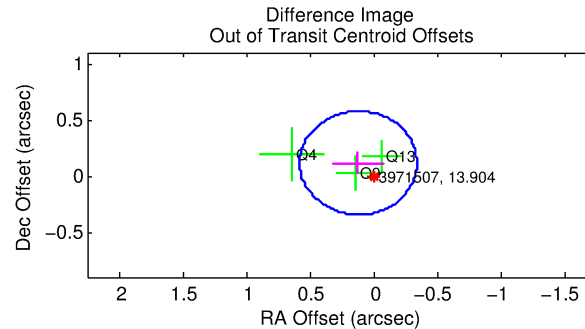
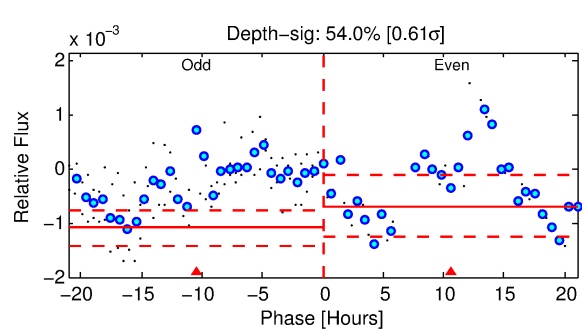
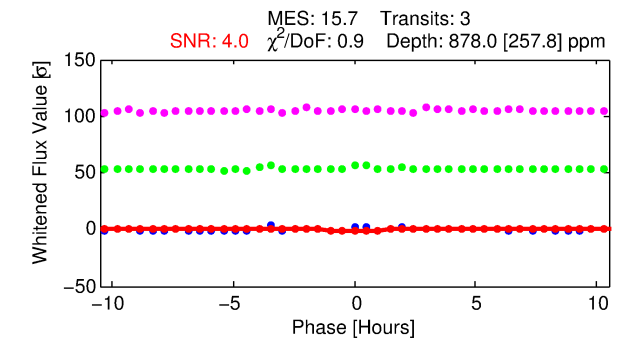
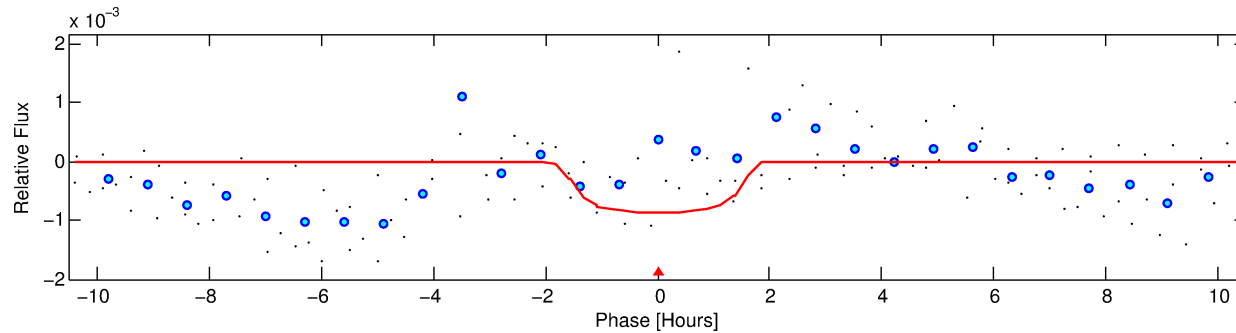
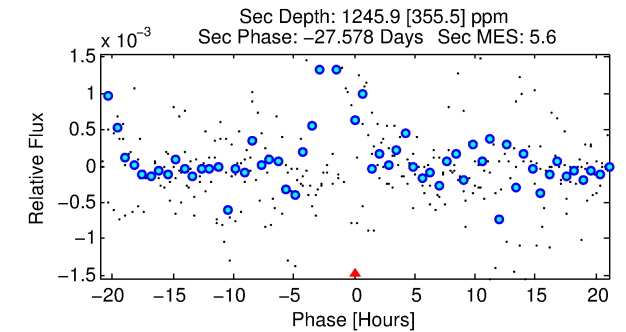
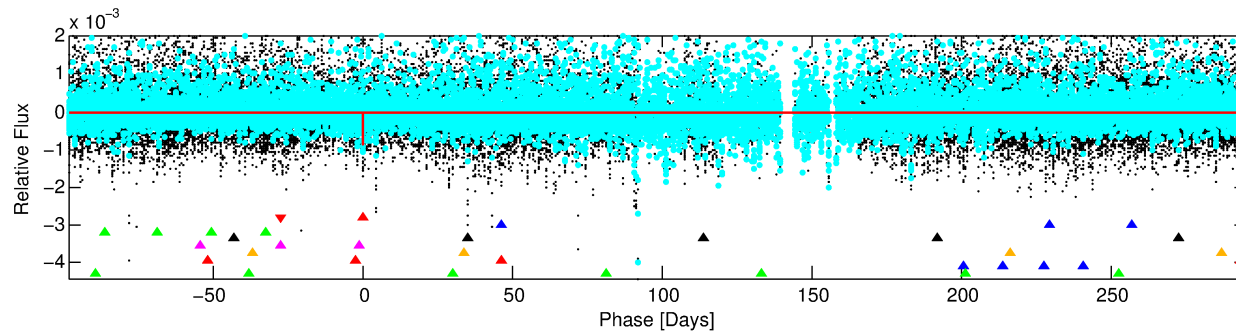
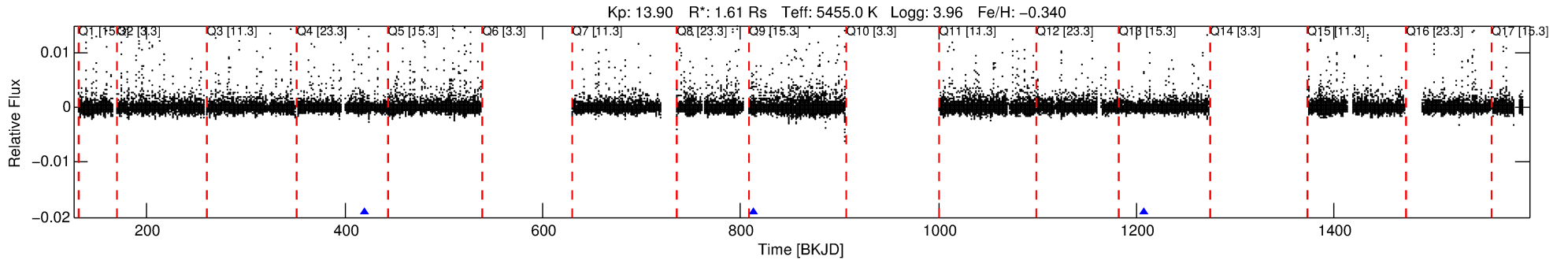
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 003971507-01

No Significant Match Found

# DV One-Page Summary

KIC: 3971507 Candidate: 1 of 9 Period: 394.175 d



## DV Fit Results:

Period = 394.17528 [0.00754] d  
Epoch = 419.6063 [0.0098] BKJD  
Rp/R\* = 0.0313 [0.0161]  
a/R\* = 490.19 [990.32]  
b = 0.86 [0.62]  
Seff = 2.05 [2.06]  
Teq = 305 [77] K  
Rp = 5.49 [4.14] Re  
a = 1.0004 [0.5909] AU  
Ag = 22753.15 [33160.56] [0.69σ]  
Teffp = 5792 [1556] K [3.52σ]

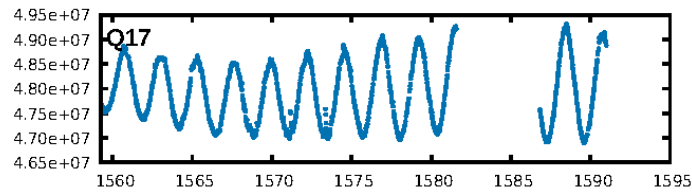
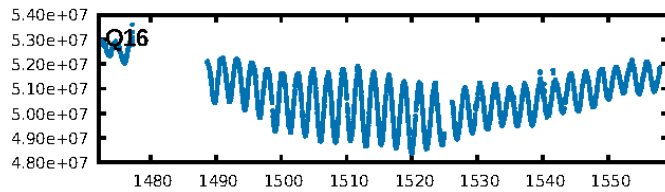
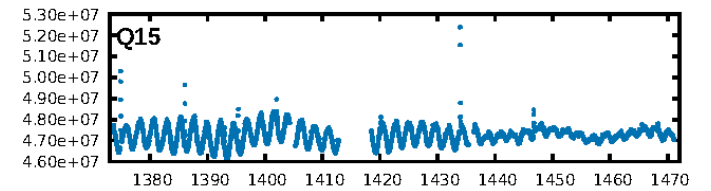
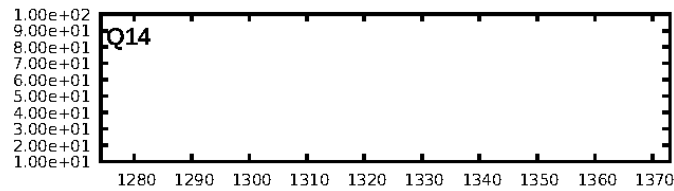
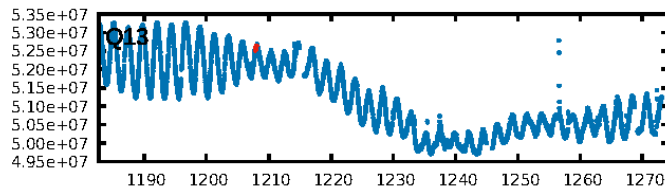
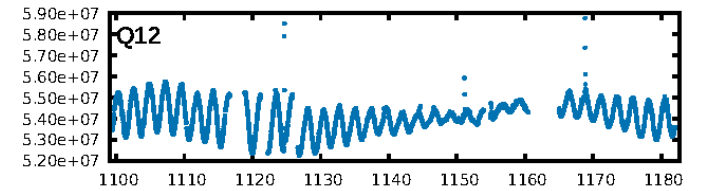
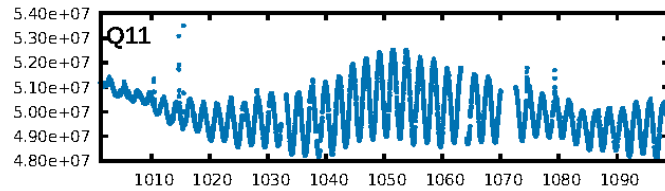
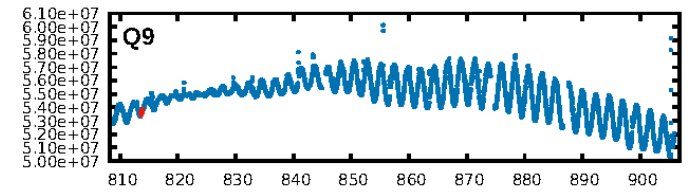
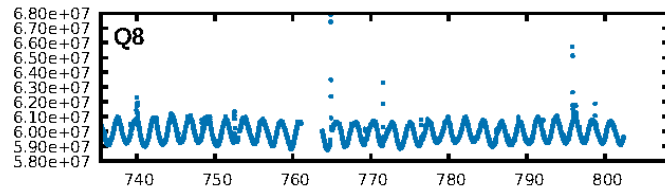
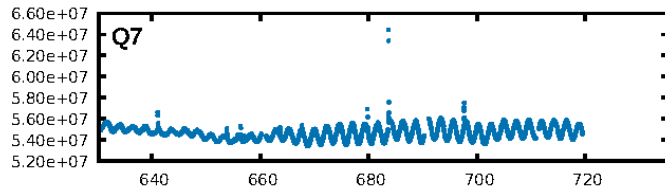
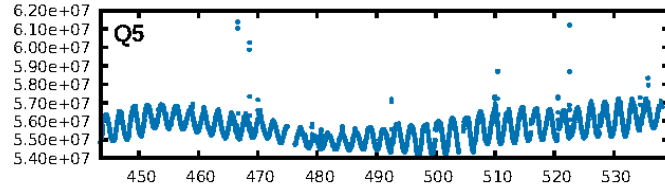
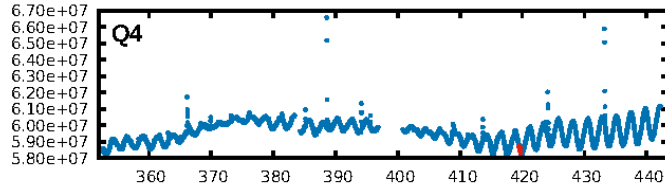
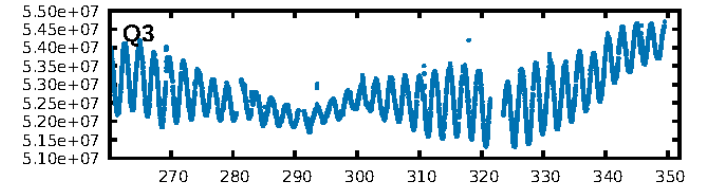
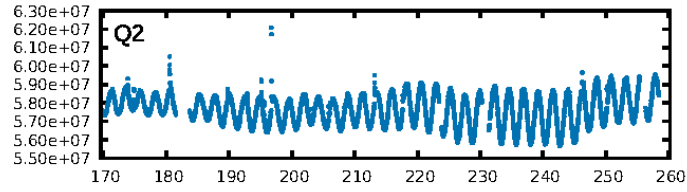
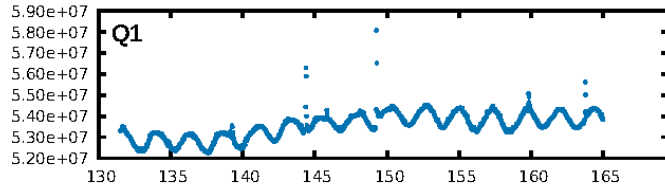
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [89.88σ]  
LongPeriod-sig: 100.0% [61.25σ]  
ModelChiSquare2-sig: 25.2%  
ModelChiSquareGof-sig: 97.4%  
Bootstrap-pfa: 5.25e-13  
RollingBand-fgt: 1.00 [3/3]  
GhostDiagnostic-chr: 0.16  
Centroid-sig: 97.2%  
Centroid-so: 0.199 arcsec [0.18σ]  
OotOffset-rm: 0.165 arcsec [1.07σ]  
KicOffset-rm: 0.214 arcsec [1.47σ]  
OotOffset-st: 0/0/1/2 [3]  
KicOffset-st: 0/0/1/2 [3]  
DiffImageQuality-fgm: 0.67 [2/3]  
DiffImageOverlap-fno: 1.00 [3/3]

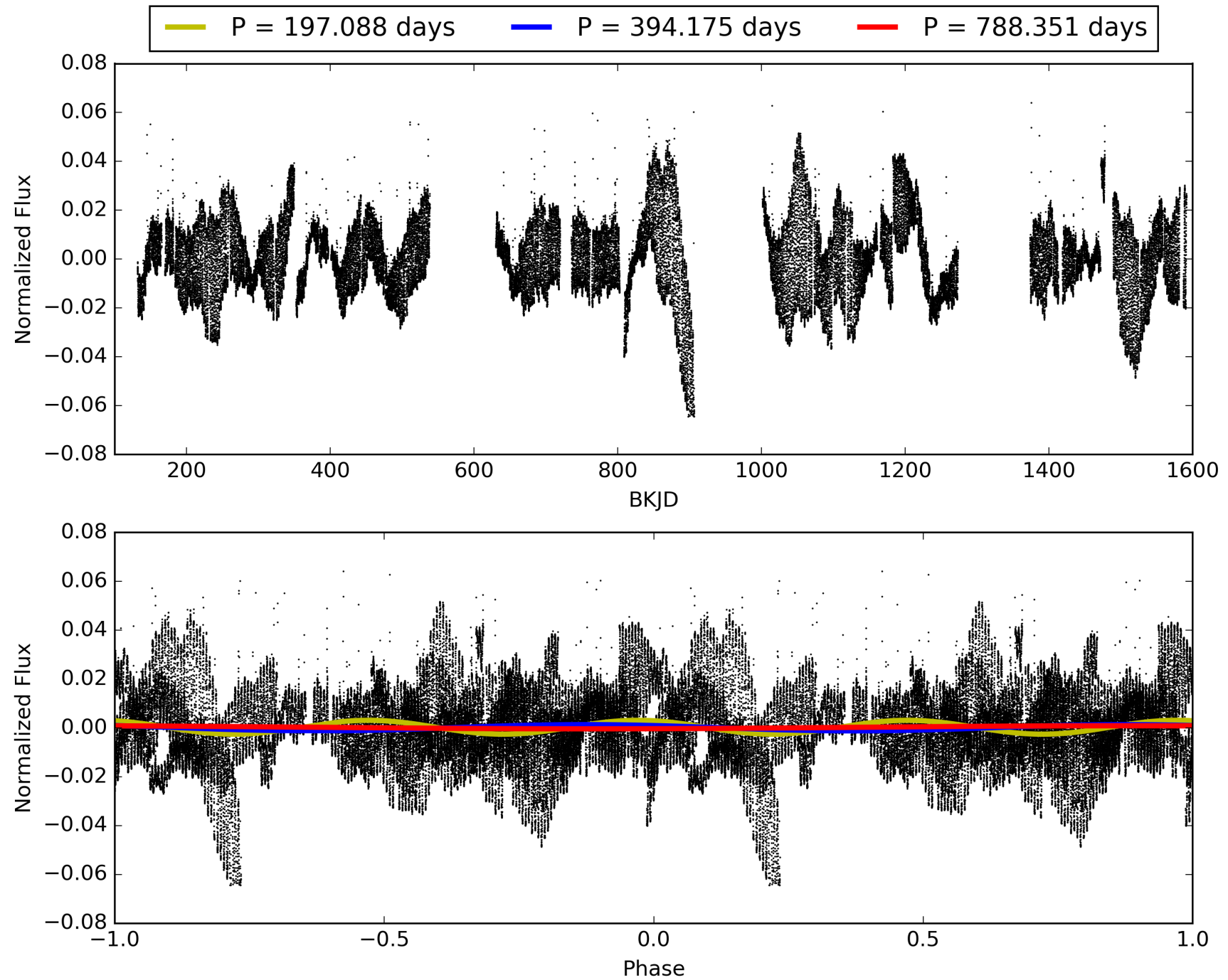
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This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

# TCE 003971507-01, PDC Light Curves



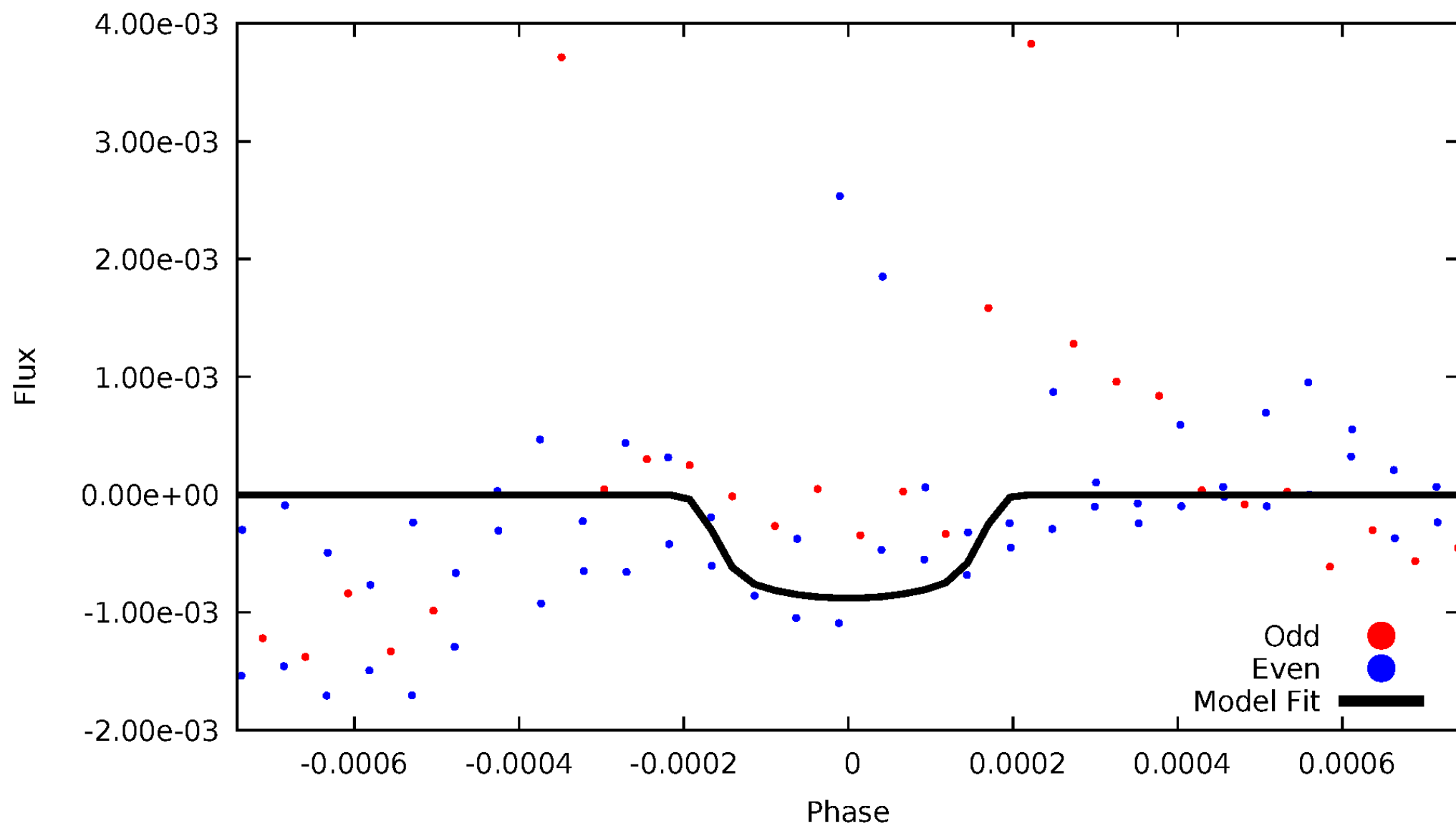
TCE 003971507-01





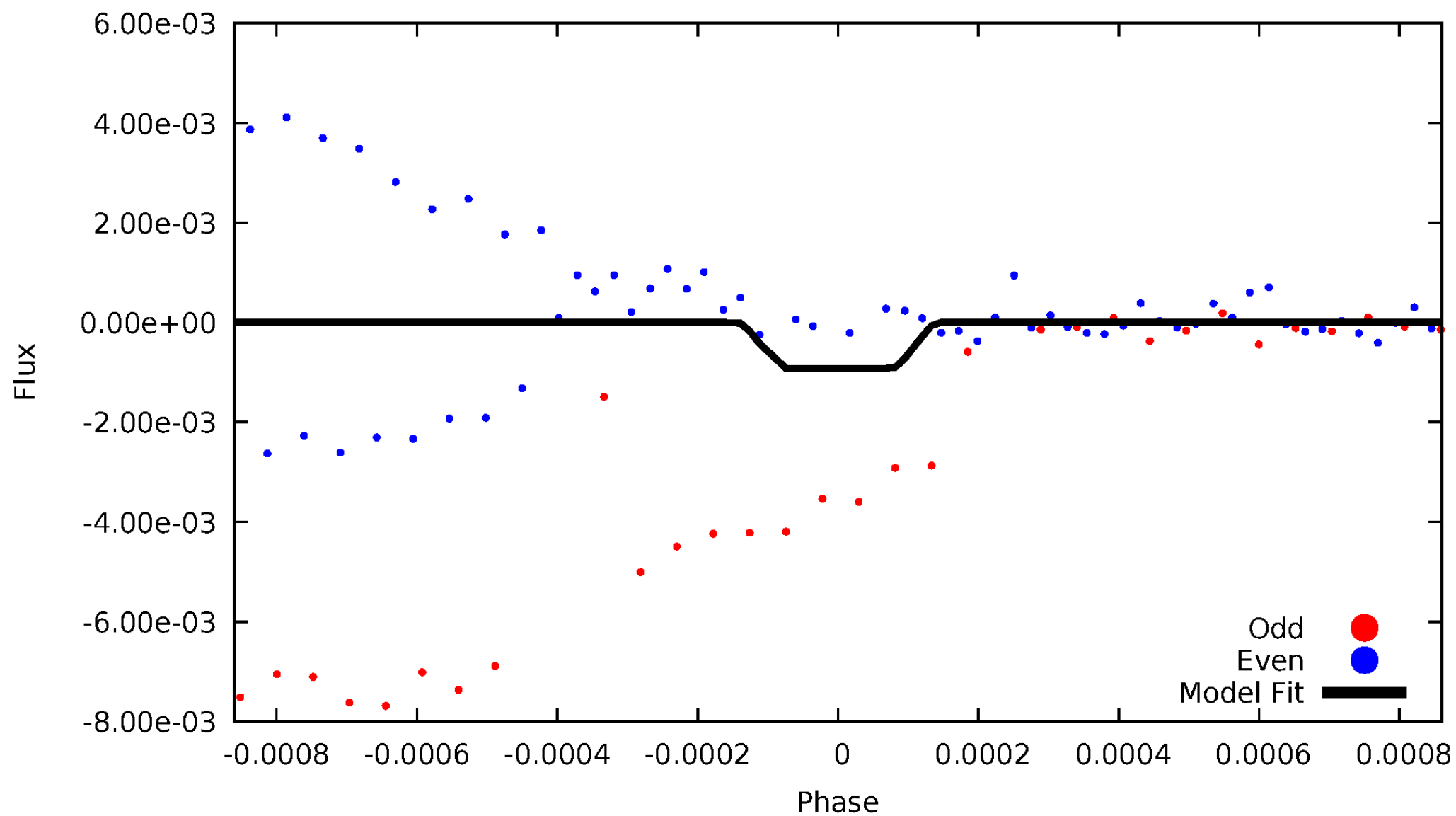
# DV Odd/Even

TCE 003971507-01



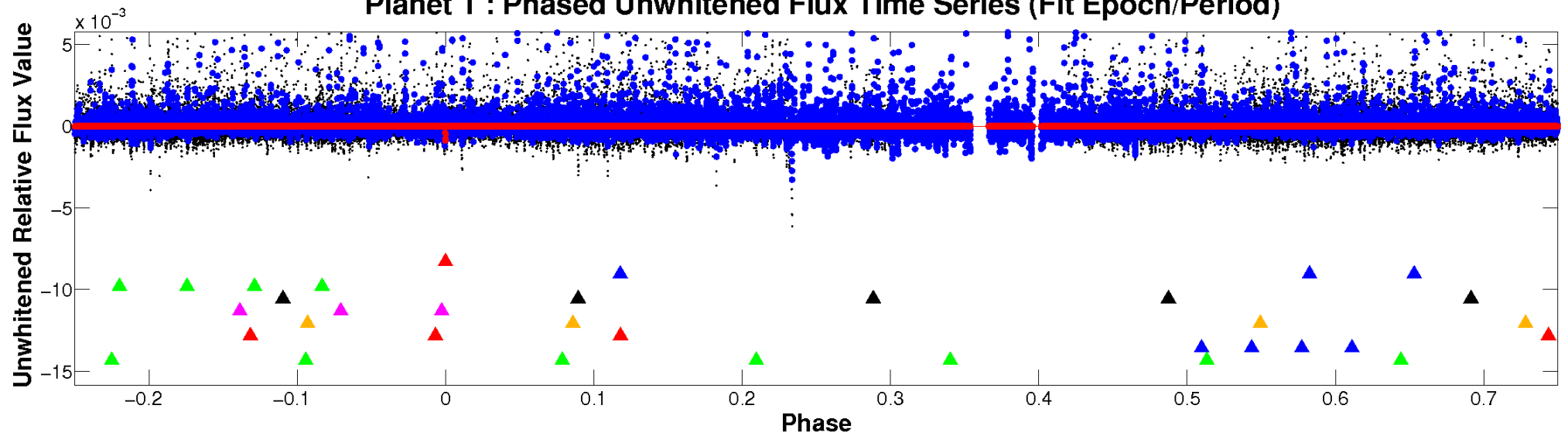
# ALT Odd/Even

TCE 003971507-01

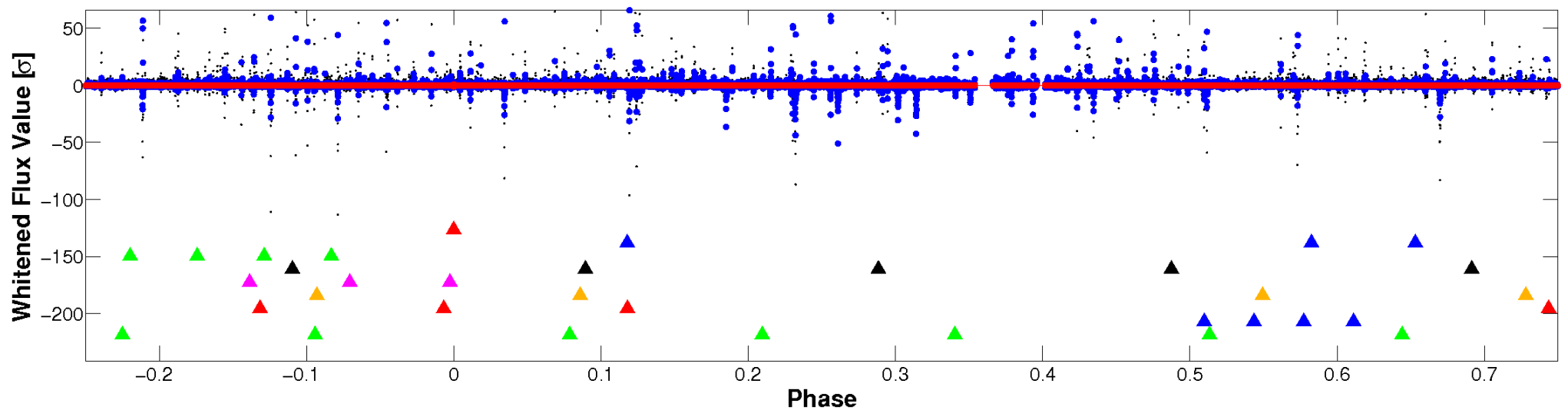


# Non-Whitened Vs. Whitened Light Curve

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

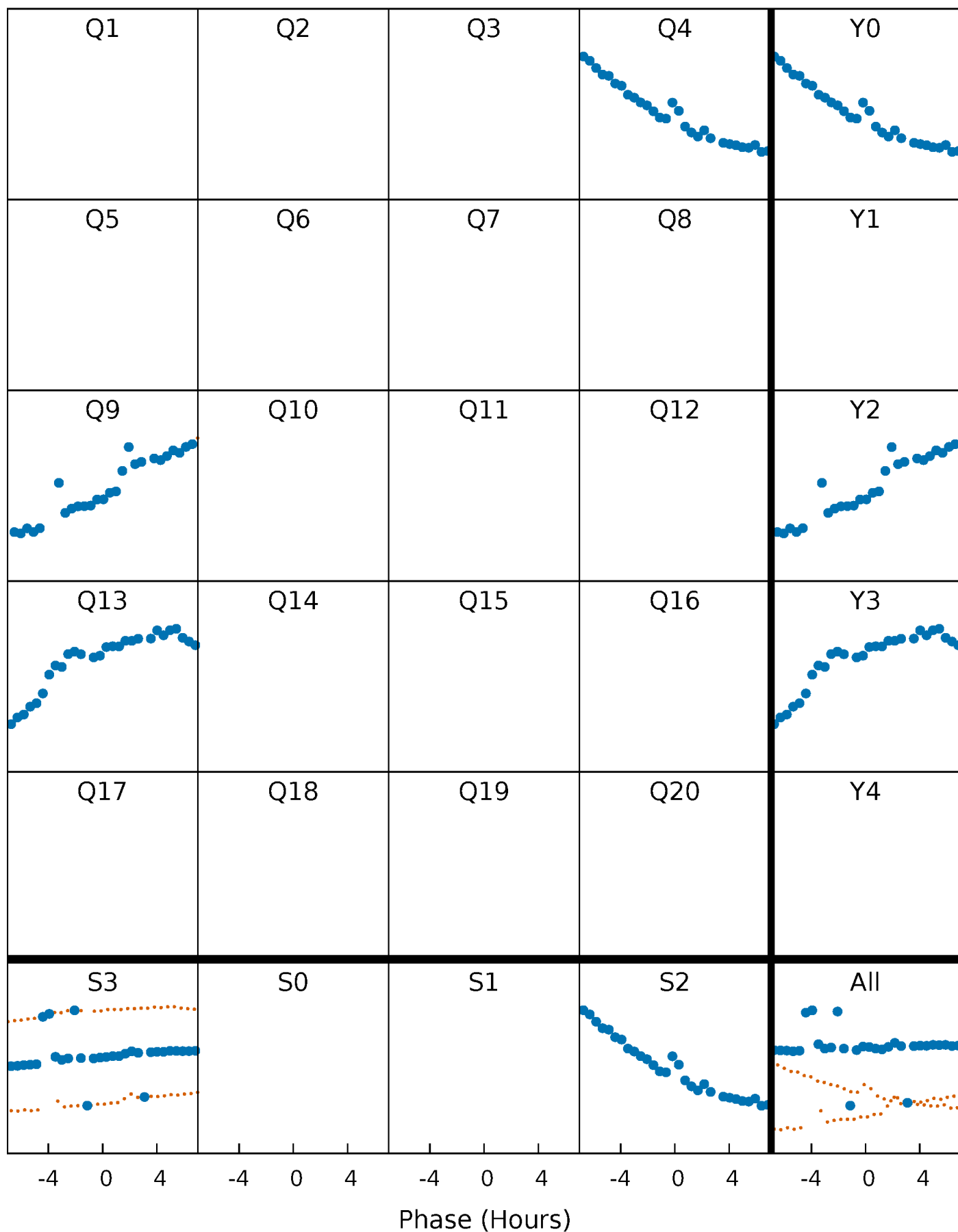


Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)



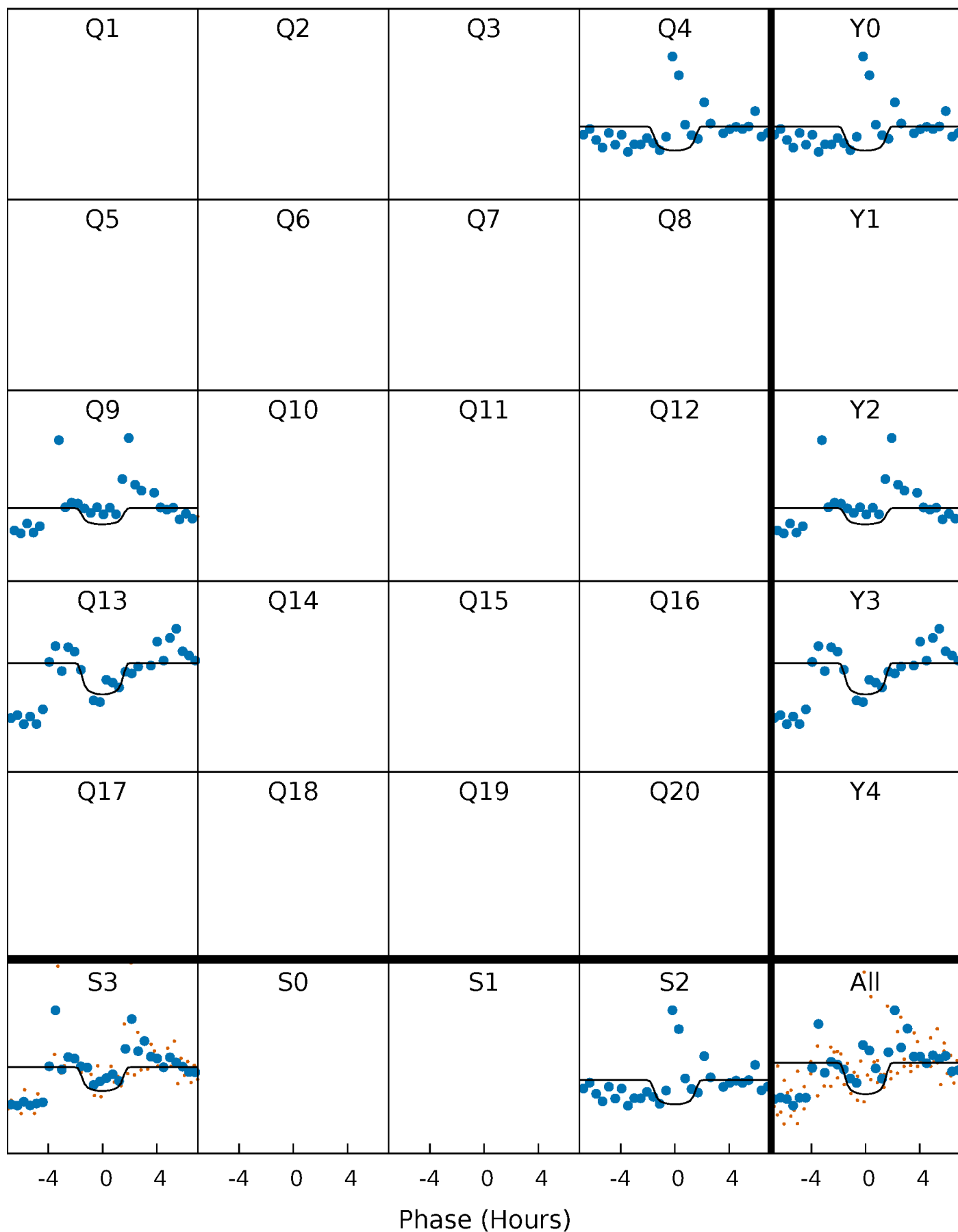
# PDC Quarter-Phased Transit Curves

TCE 003971507-01 P=394.175282 Days  $T_0=419.606328$  (BKJD)



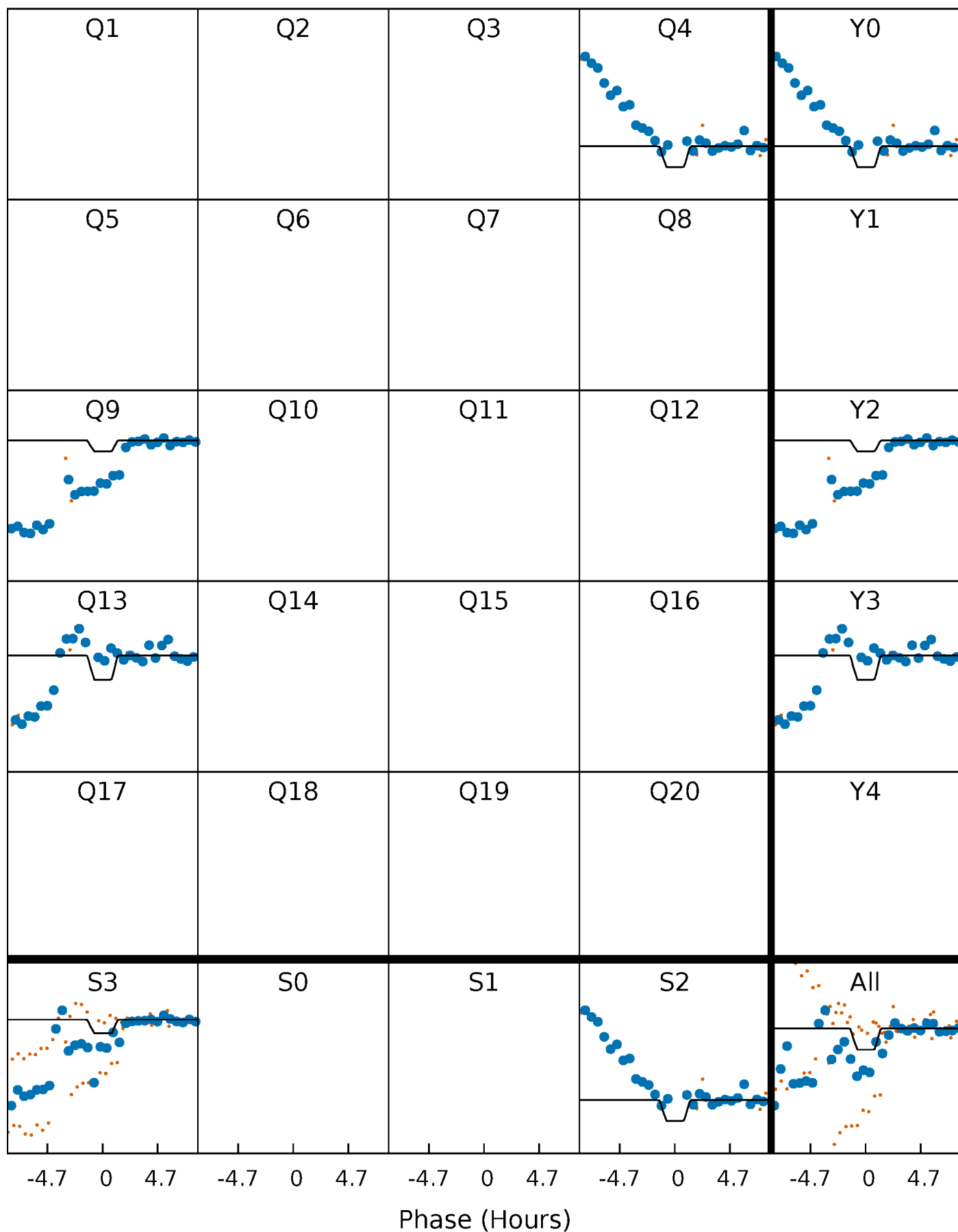
# DV Quarter-Phased Transit Curves

TCE 003971507-01 P=394.175282 Days  $T_0=419.606328$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

TCE 003971507-01 P=394.170184 Days  $T_0=419.605529$  (BKJD)

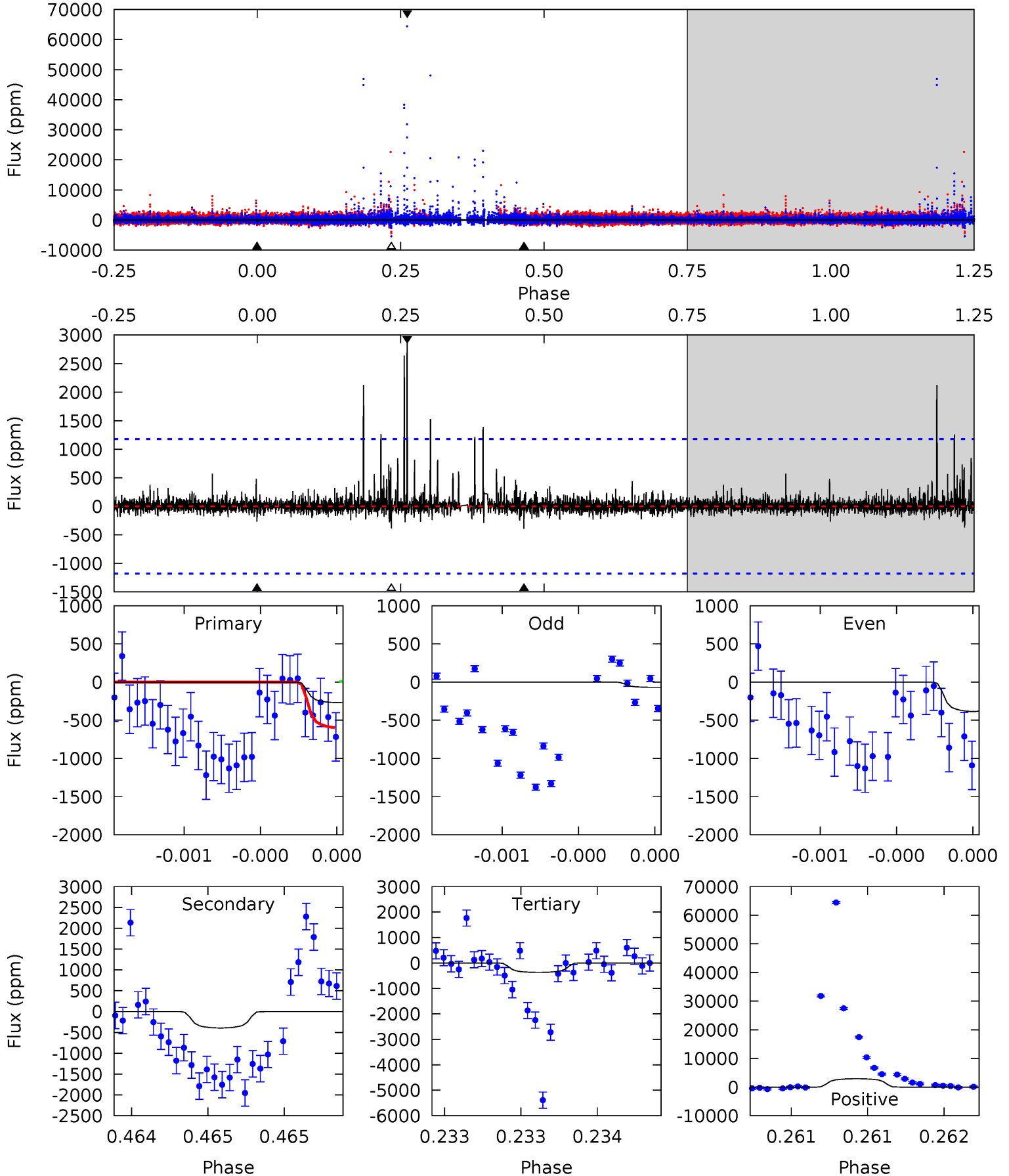




# DV Model-Shift Uniqueness Test

003971507-01,  $P = 394.175282$  Days,  $E = 25.431046$  Days

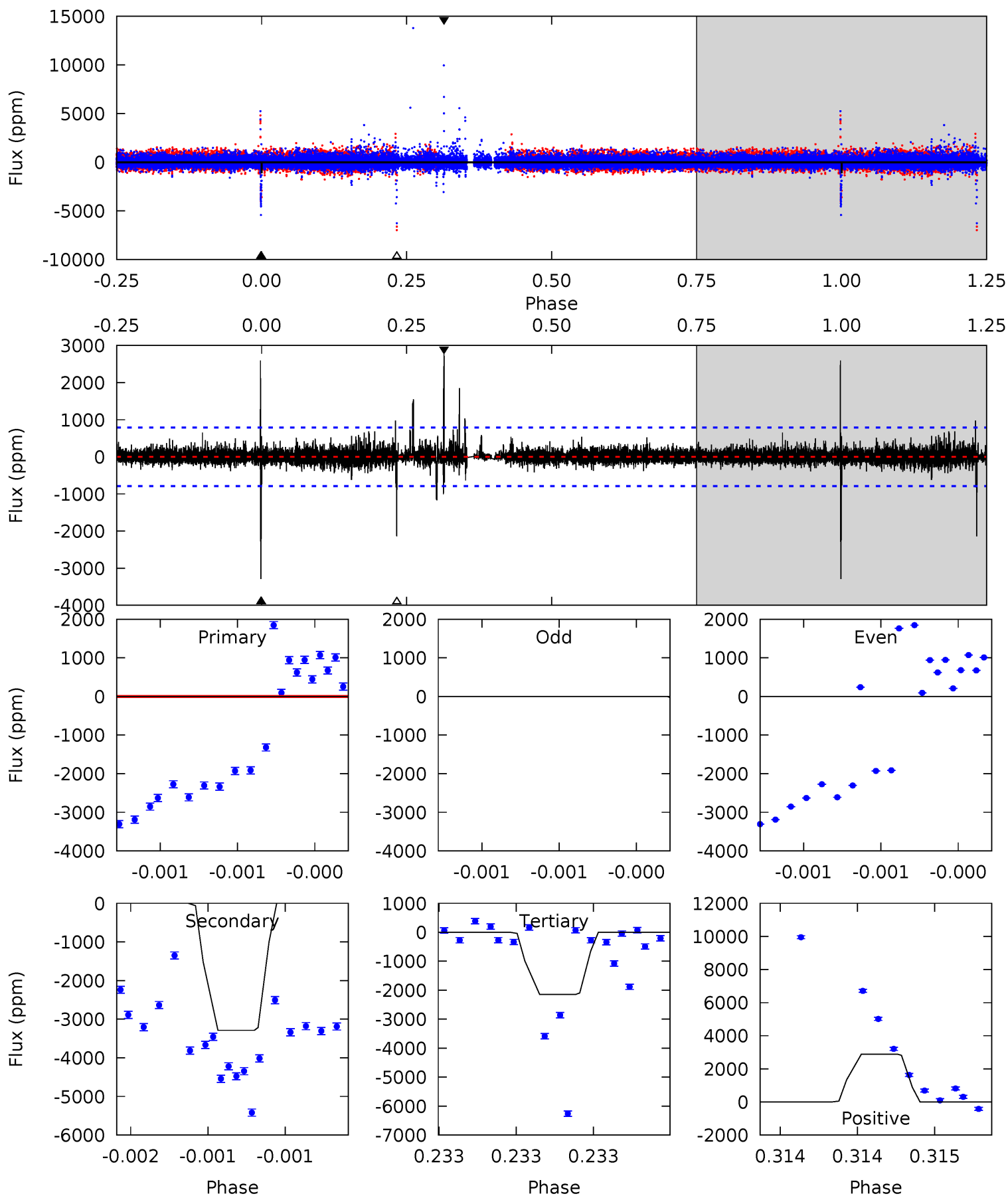
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
1.28	1.87	1.76	13.9	5.61	3.53	0.56	-0.48	-12.6	0.11	-12.0	0.36	1.62	0.88	0



# Alt Model-Shift Uniqueness Test

003971507-01, P = 394.170184 Days, E = 25.435345 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
7.46	23.7	15.4	20.8	5.68	3.64	0.93	-7.99	-13.3	8.28	2.95	13.1	-151.1	0.47	0



### Stellar Parameters For KIC 003971507

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$5455^{+190}_{-152}$	$3.960^{+0.602}_{-0.258}$	$-0.340^{+0.350}_{-0.250}$	$1.607^{+0.806}_{-0.887}$	$0.860^{+0.105}_{-0.105}$	$0.292^{+1.868}_{-0.192}$
	+3%/-3%	+15%/-7%	+103%/-74%	+50%/-55%	+12%/-12%	+640%/-66%
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 003971507-01 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-393 \pm 210$	$5.04^{+3.40}_{-2.60}$	$420^{+55}_{-63}$	$4416^{+1544}_{-741}$	$7652^{+24220}_{-5403}$
Alt.	$-3289 \pm 139$	$4.96^{+3.36}_{-2.57}$	$421^{+52}_{-67}$	$7447^{+4447}_{-1463}$	$75161^{+230952}_{-48716}$

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

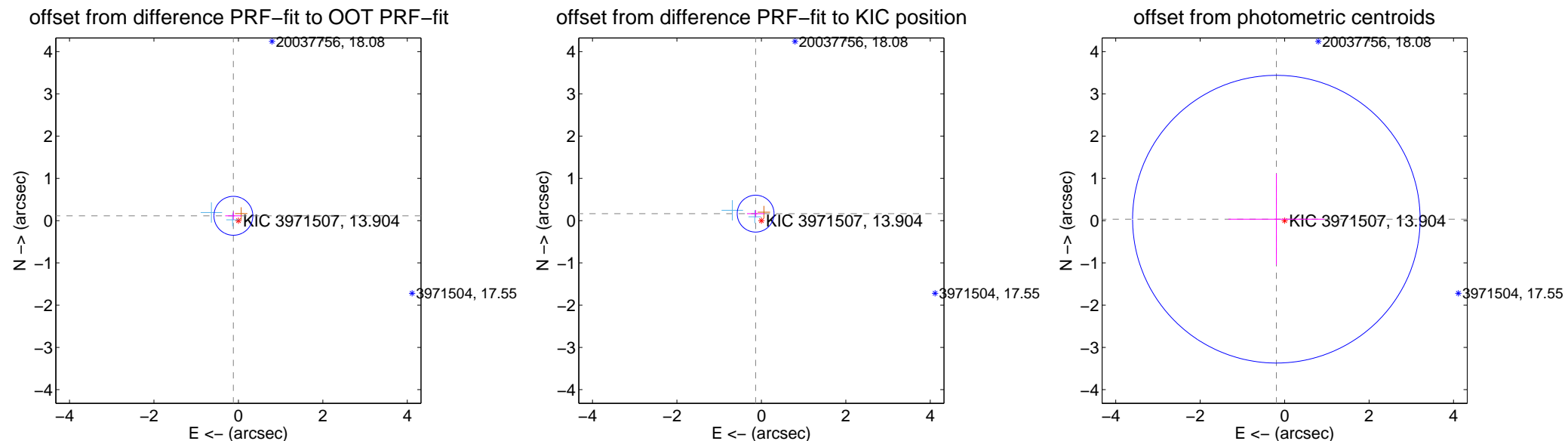
## DV Centroid Data

Supplemental centroid analysis for 003971507-01. Kepler magnitude: 13.90. Transit SNR 3.96

There are 2 quarters with good PRF difference image offsets

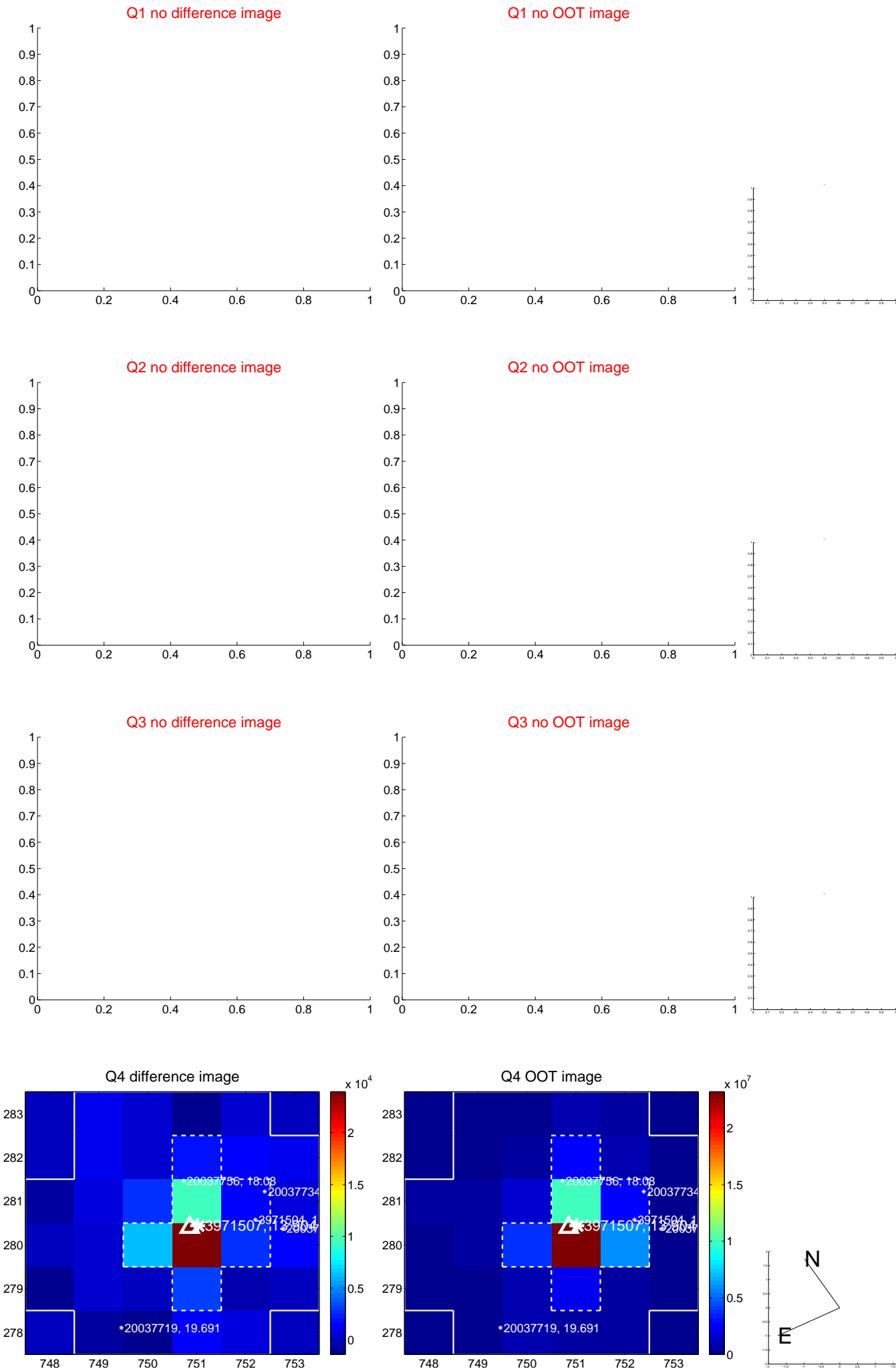
The direct PRF centroid is offset from the target star catalog position by about 0.03 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.165 \pm 0.154$	1.07	$0.119 \pm 0.194$	$0.114 \pm 0.093$
PRF-fit source offset from KIC position	$0.214 \pm 0.145$	1.47	$0.136 \pm 0.204$	$0.165 \pm 0.085$
photometric centroid source offset	$0.20 \pm 1.13$	0.18	$0.20 \pm 1.14$	$0.03 \pm 1.08$



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.

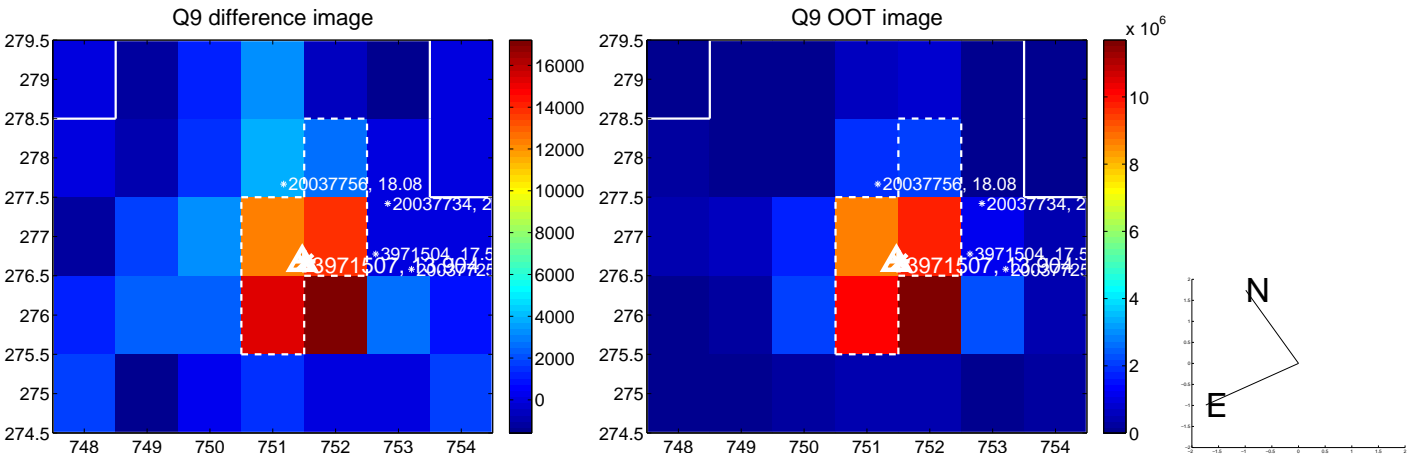


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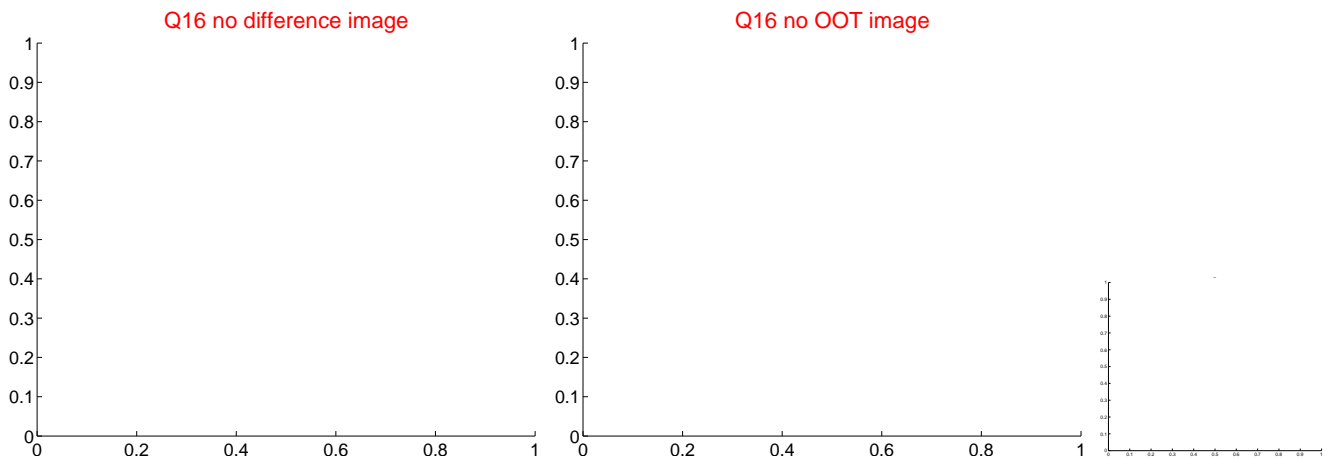
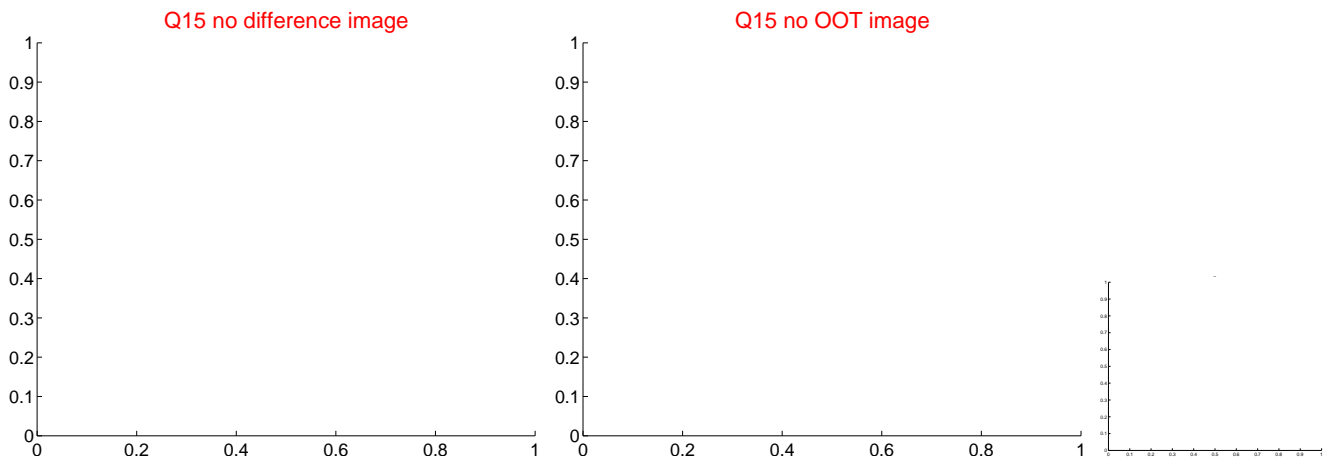
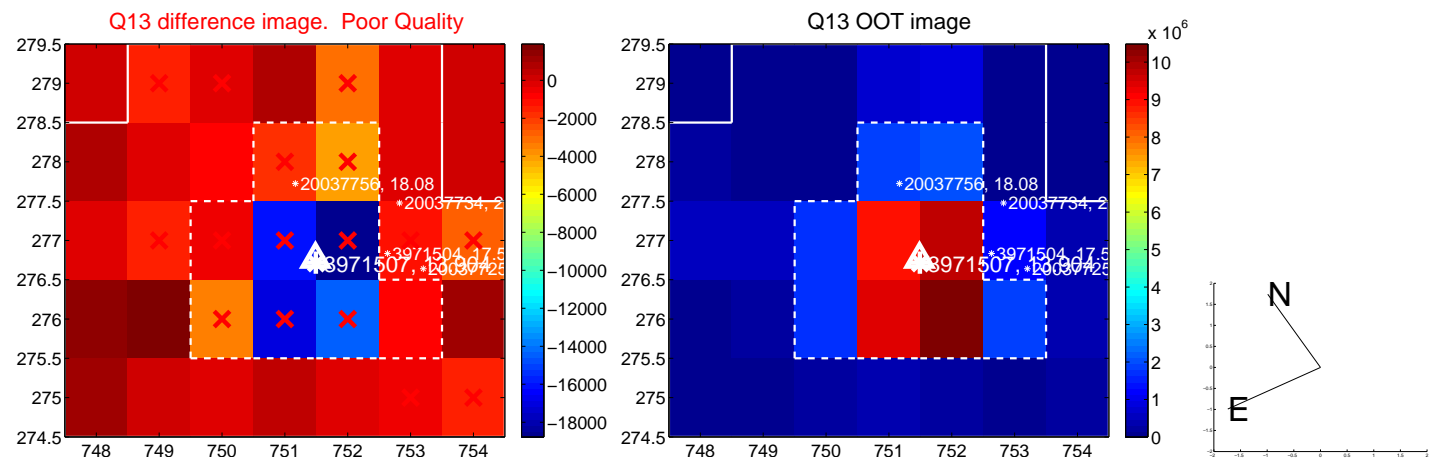




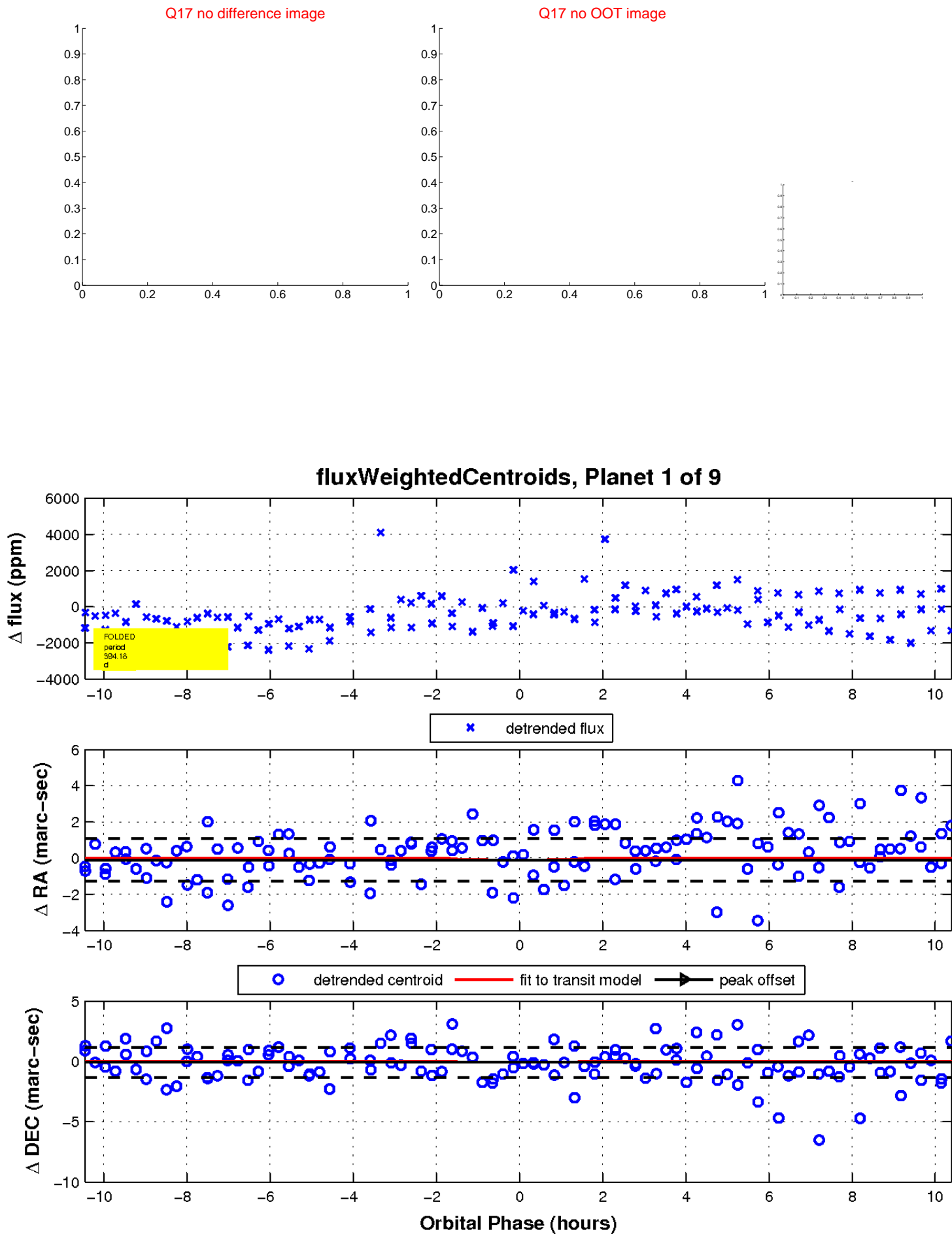
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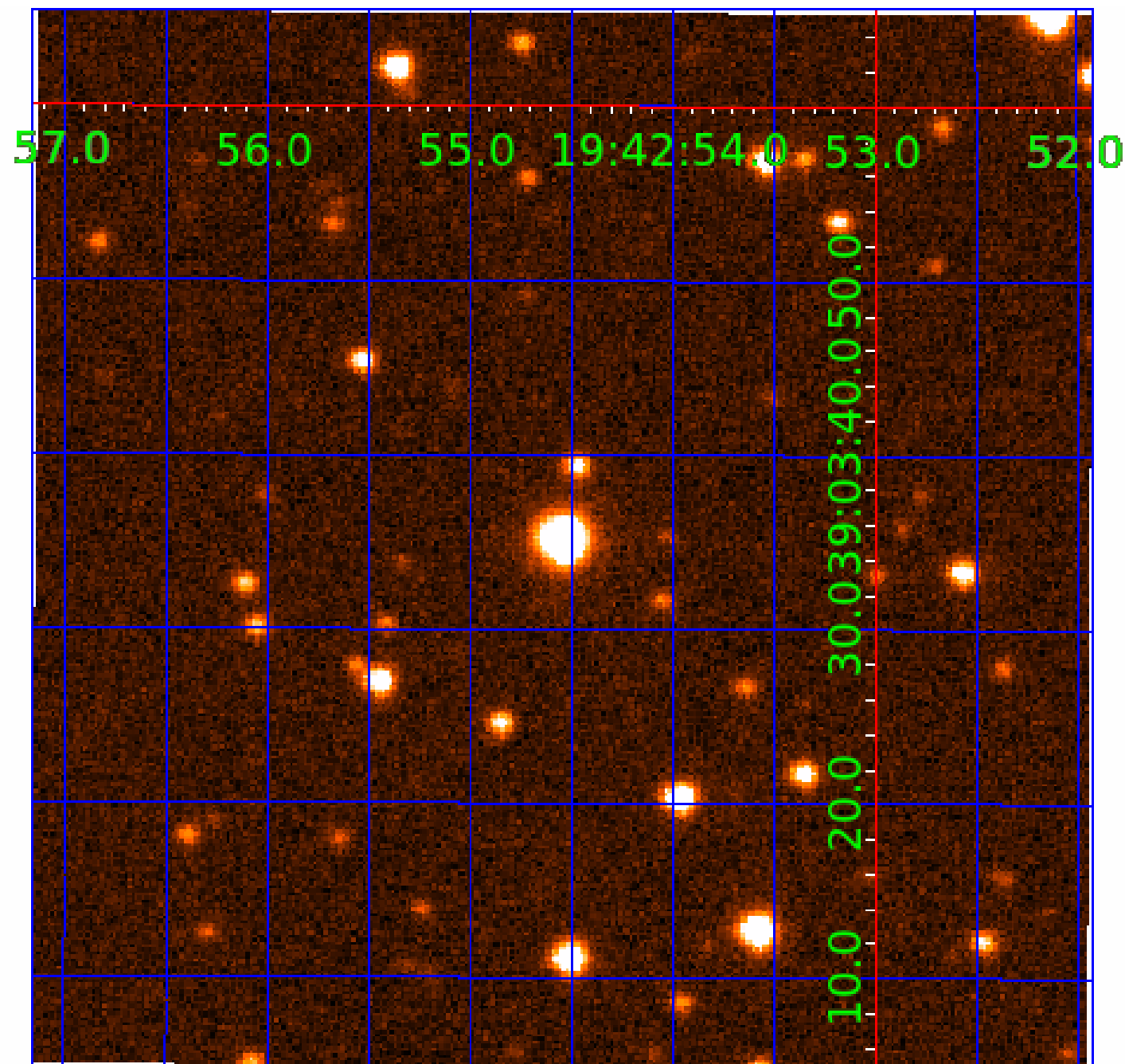


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UKIRT Image

Declination



# KIC 003971507

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003971507-08	OBS	No	407.493824	226.377902	940.2	3.862	13.1	3.4	1.61	5455	5.08	1.96
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## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
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003971507-03	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
003971507-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES—LPP_DV—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS
003971507-05	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—MOD_POS_ALT
003971507-06	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL_SKYE—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS
003971507-08	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—CENT_FEW_DIFFS
003971507-09	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_MARSHALL_SKYE—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—CENT_NOFITS

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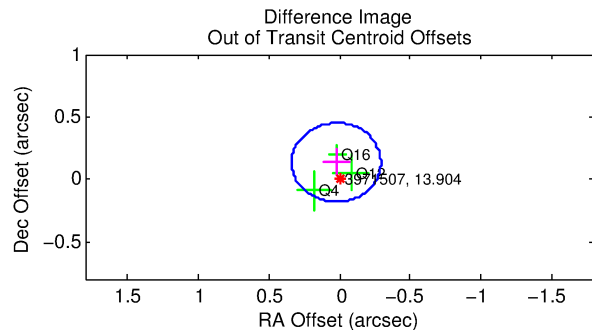
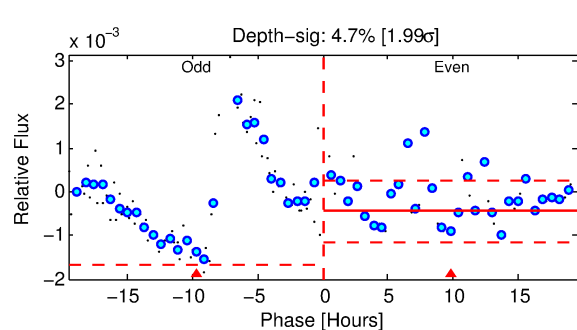
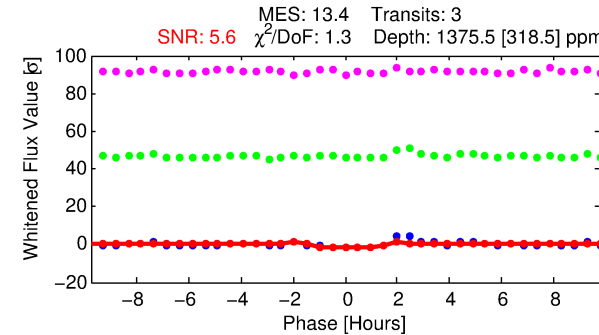
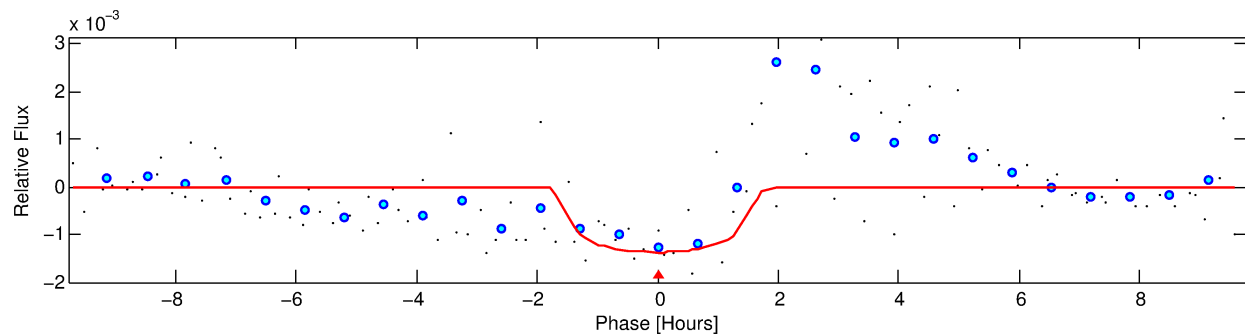
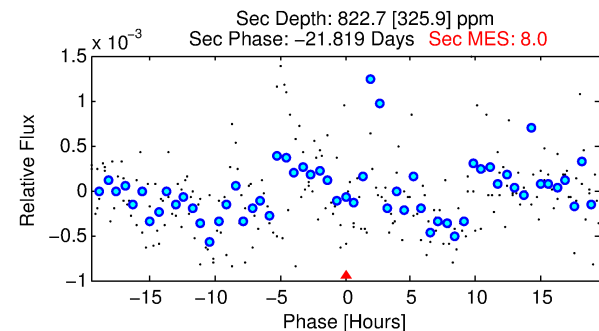
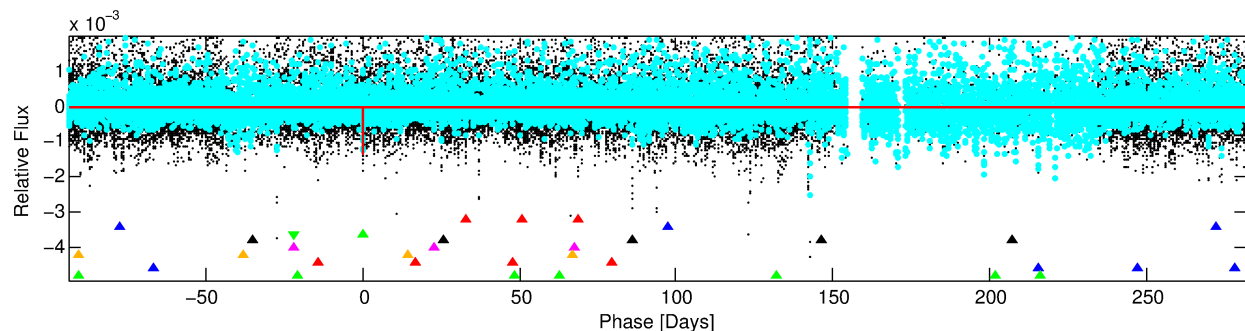
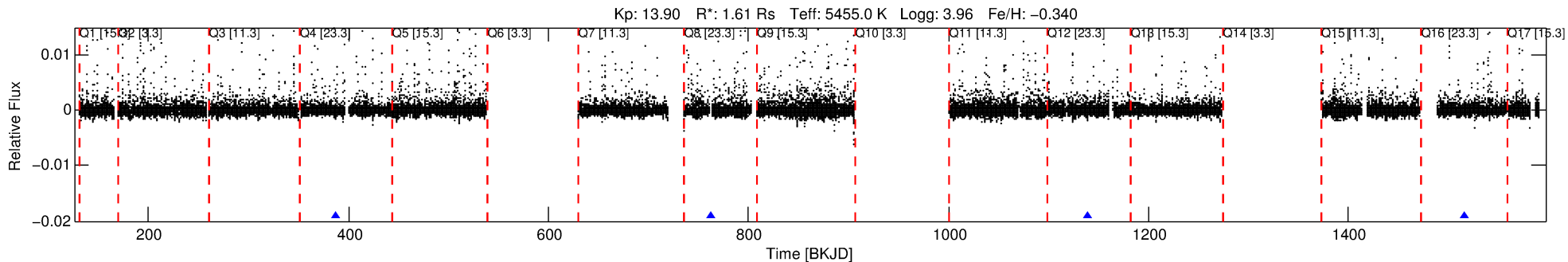
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 003971507-03

No Significant Match Found

# DV One-Page Summary

KIC: 3971507 Candidate: 3 of 9 Period: 376.227 d



## DV Fit Results:

Period = 376.22699 [0.00425] d  
Epoch = 386.8155 [0.0091] BKJD  
Rp/R\* = 0.0353 [0.0594]  
a/R\* = 747.89 [5210.18]  
b = 0.59 [7.73]  
Seff = 2.18 [2.19]  
Teq = 310 [78] K  
Rp = 6.19 [10.96] Re  
a = 0.9698 [0.5728] AU  
Ag = 11122.09 [39307.11] [0.28σ]  
Teffp = 4919 [4174] K [1.10σ]

## DV Diagnostic Results:

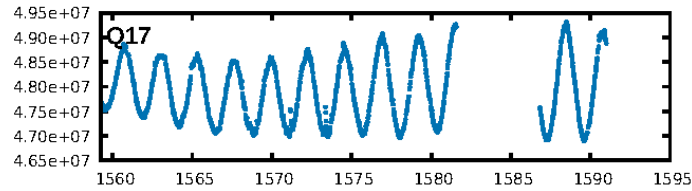
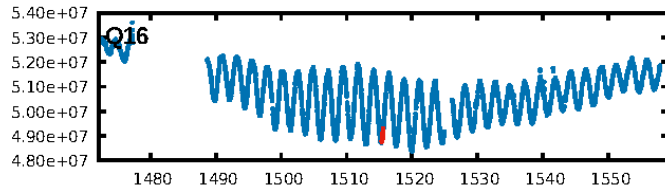
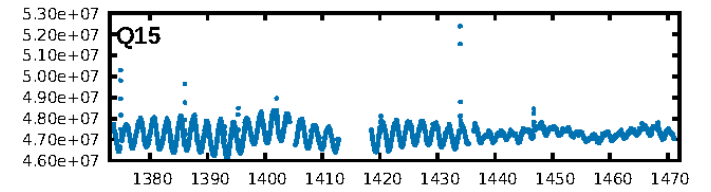
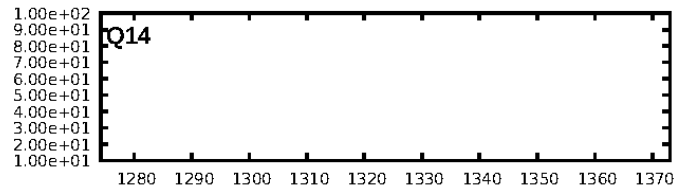
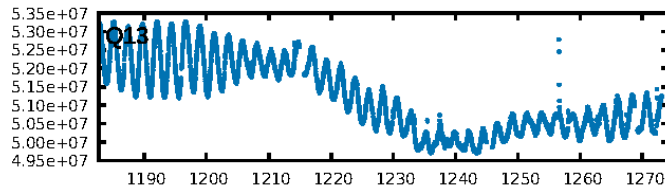
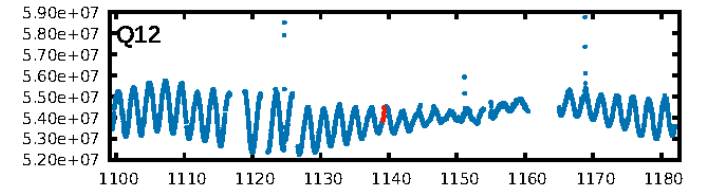
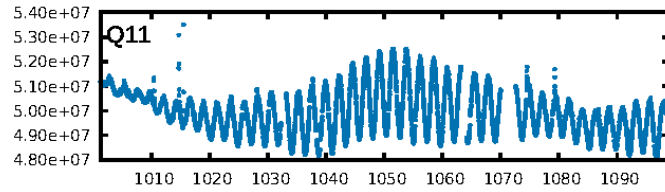
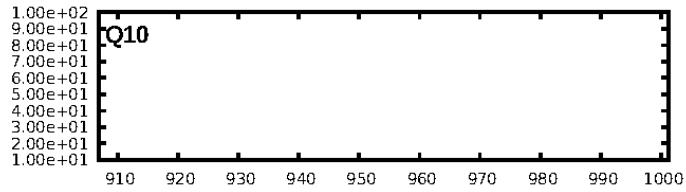
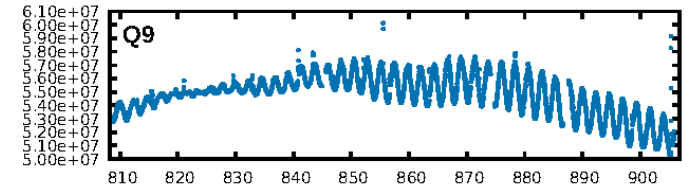
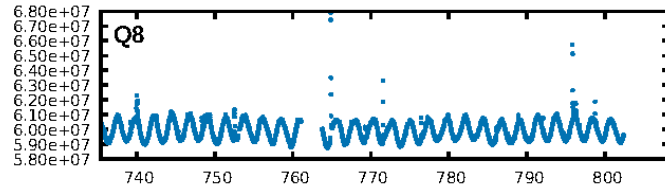
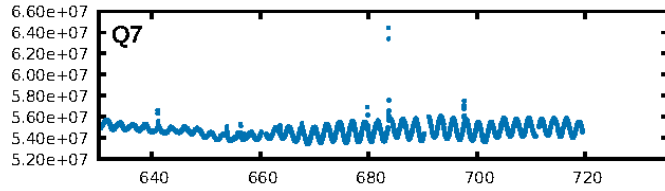
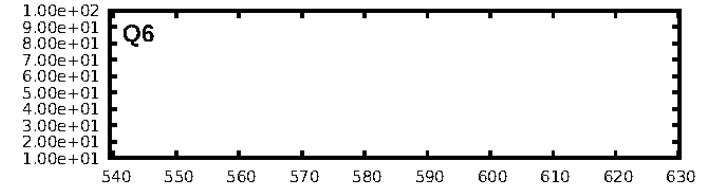
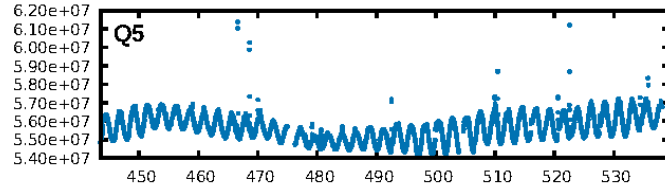
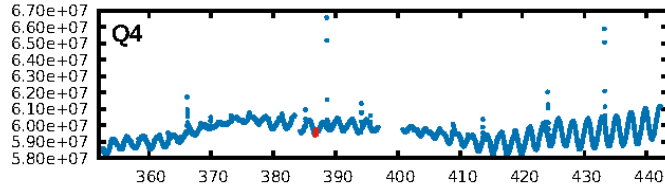
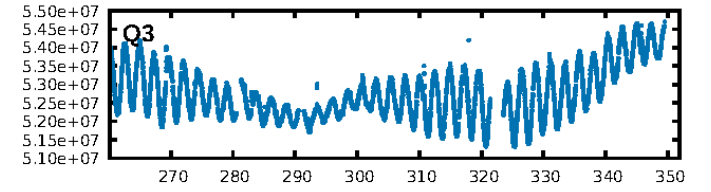
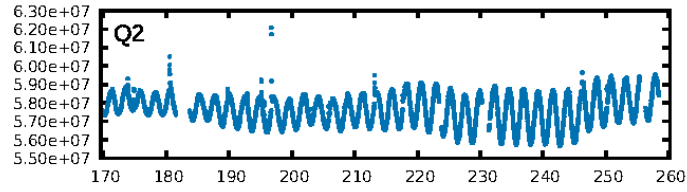
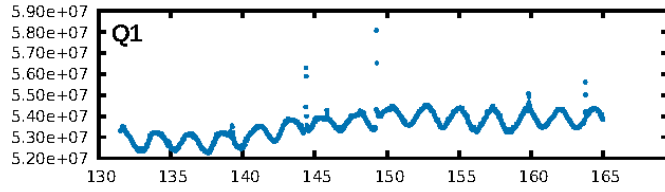
ShortPeriod-sig: 100.0% [52.20σ]  
LongPeriod-sig: 100.0% [89.88σ]  
ModelChiSquare2-sig: 27.7%  
ModelChiSquareGof-sig: 84.5%  
**Bootstrap-pfa: 1.60e-10**  
RollingBand-fgt: 1.00 [3/3]  
GhostDiagnostic-chr: 2.367  
Centroid-sig: 27.7%  
Centroid-so: 0.712 arcsec [0.84σ]  
OotOffset-rm: 0.135 arcsec [1.28σ]  
OotOffset-st: 0/0/3/0 [3]  
KicOffset-rm: 0.227 arcsec [2.19σ]  
KicOffset-st: 0/0/3/0 [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: 31-Jan-2016 05:54:26 Z

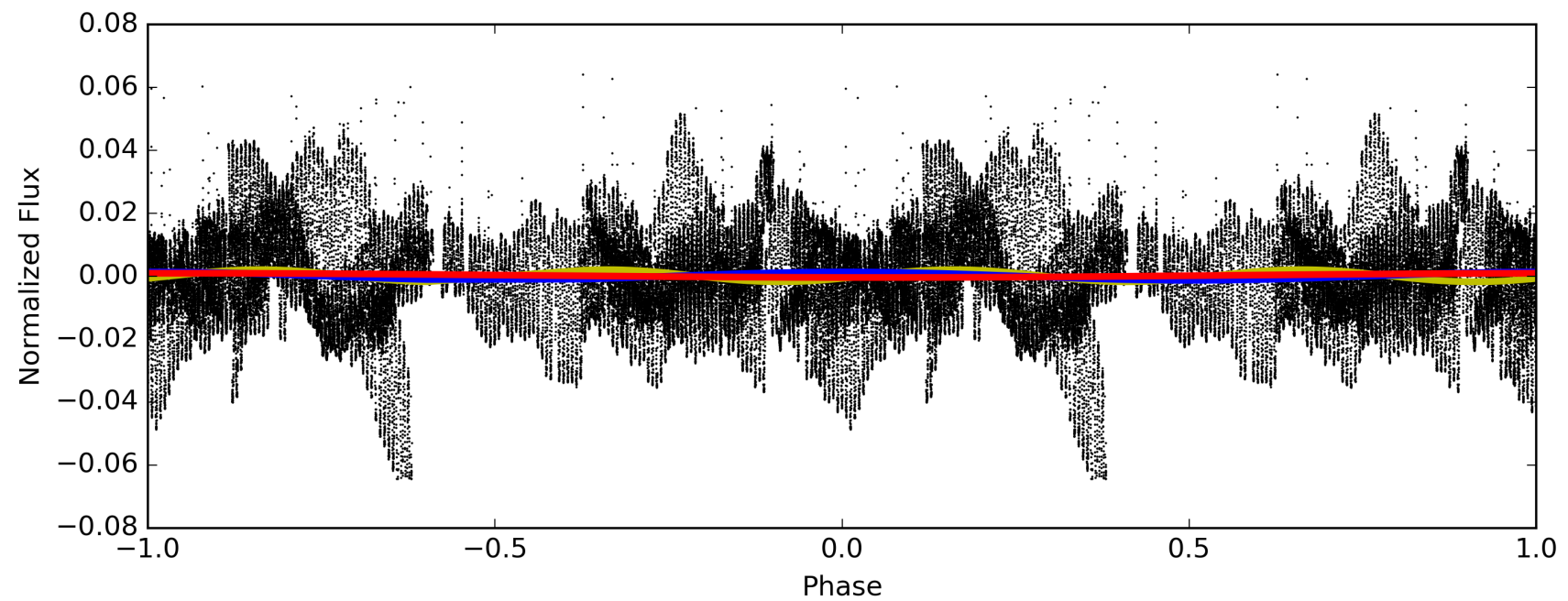
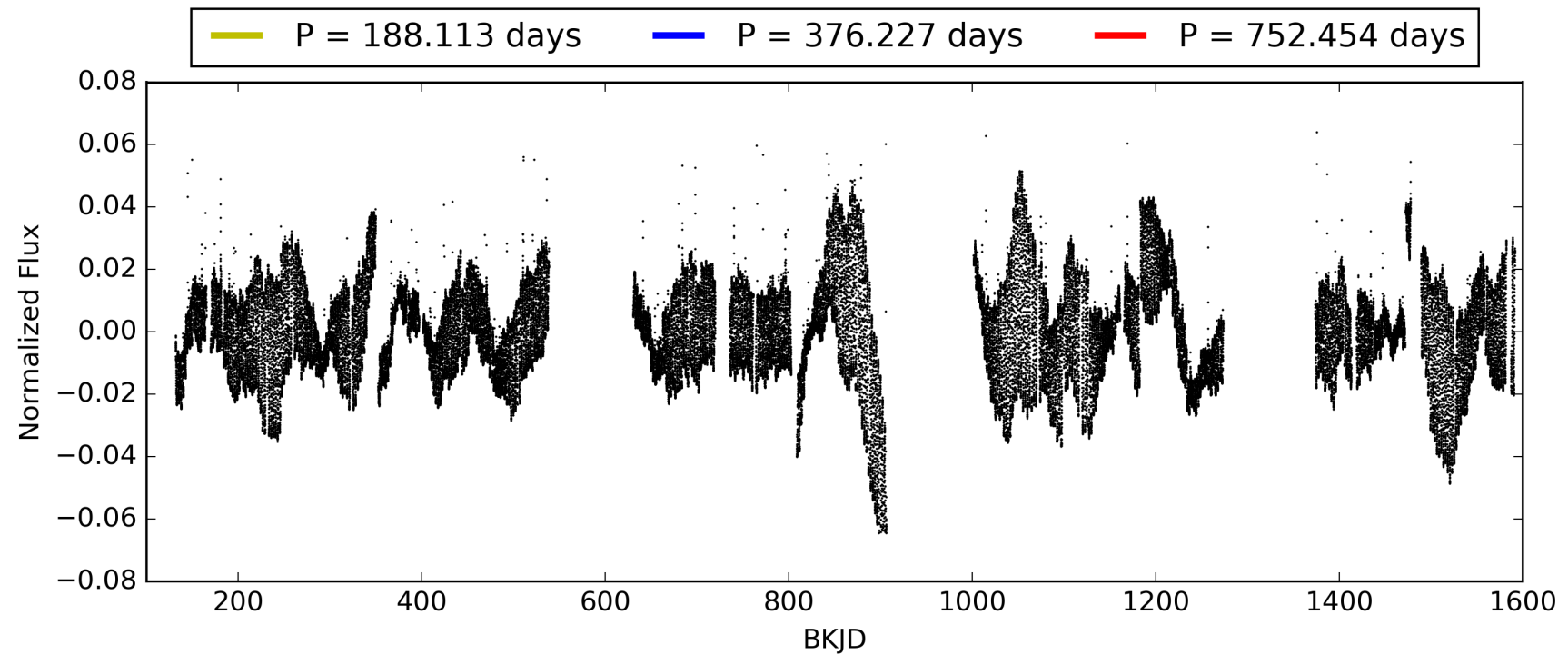
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center



# TCE 003971507-03, PDC Light Curves

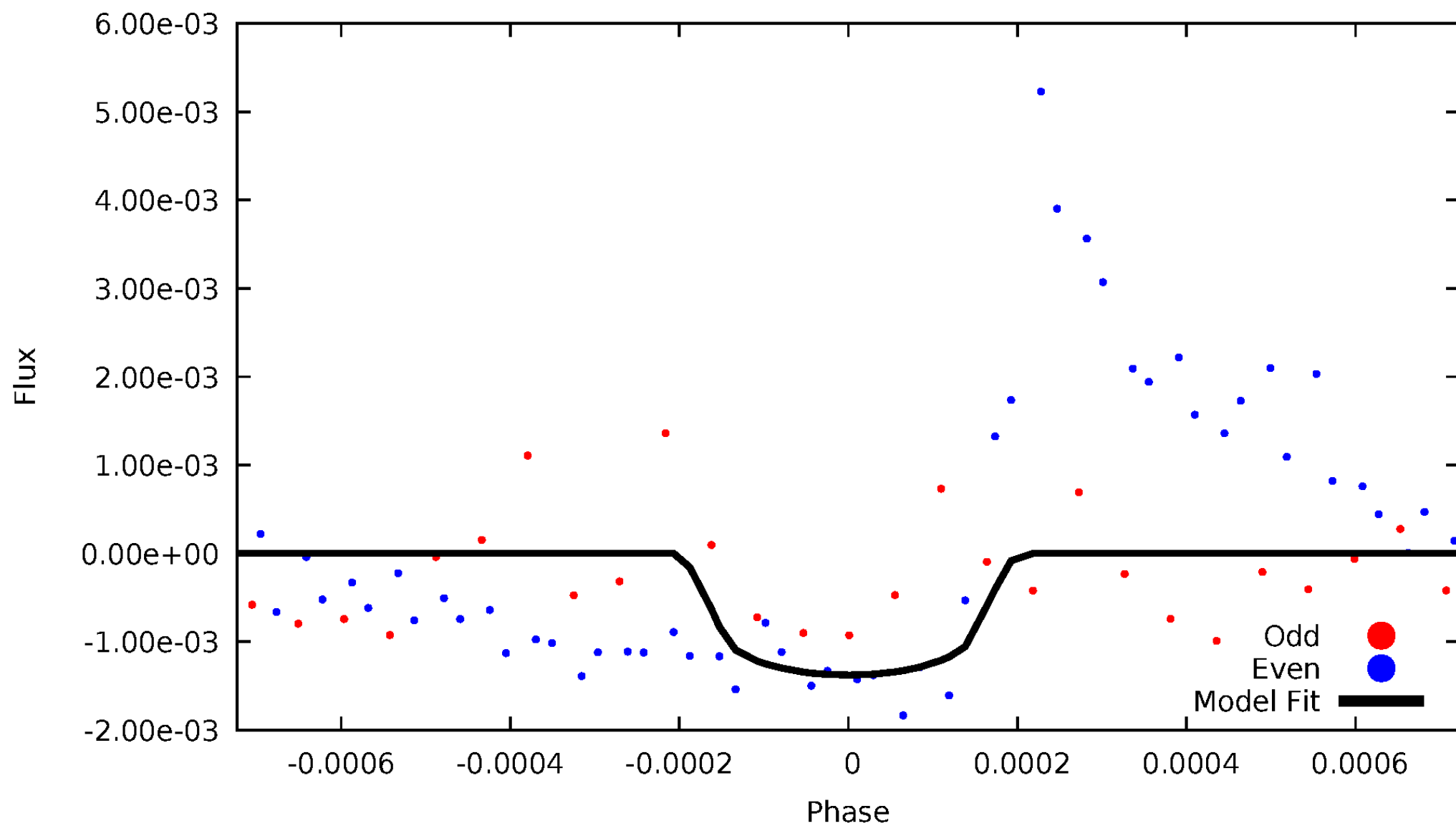


TCE 003971507-03



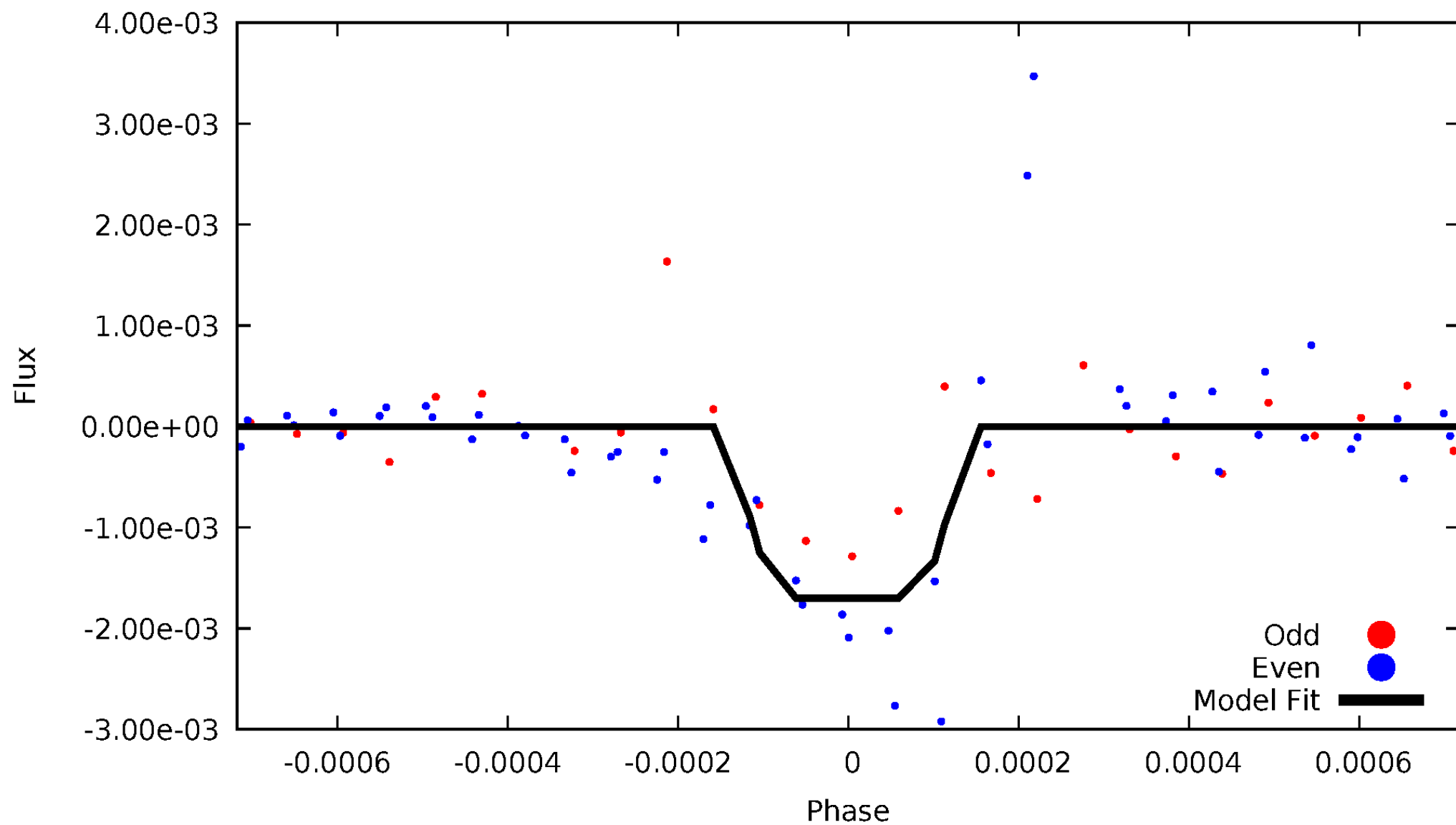
# DV Odd/Even

TCE 003971507-03



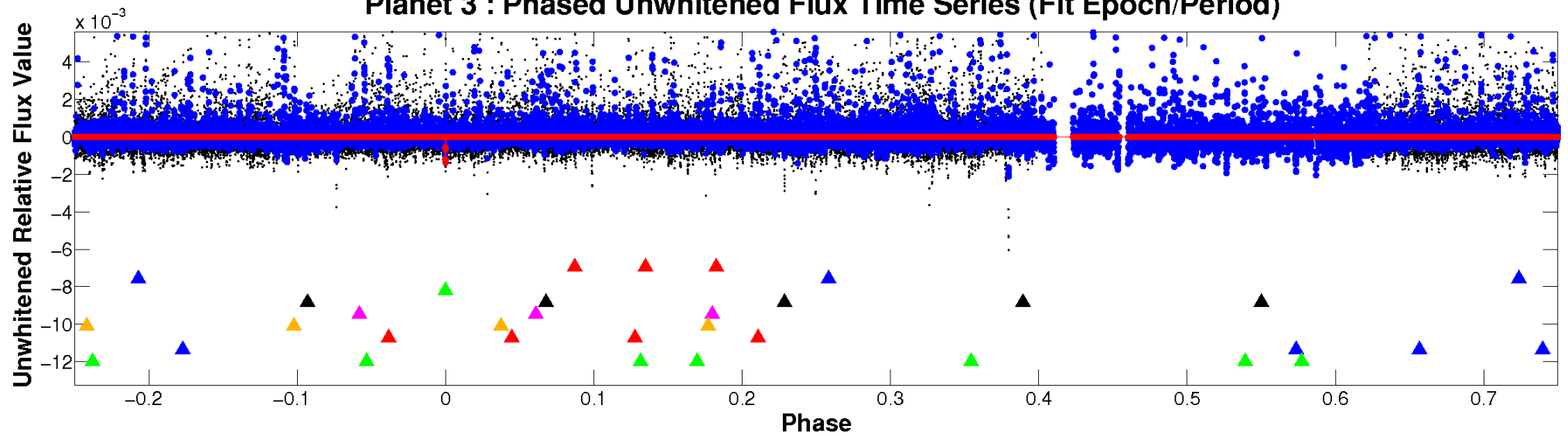
# ALT Odd/Even

TCE 003971507-03

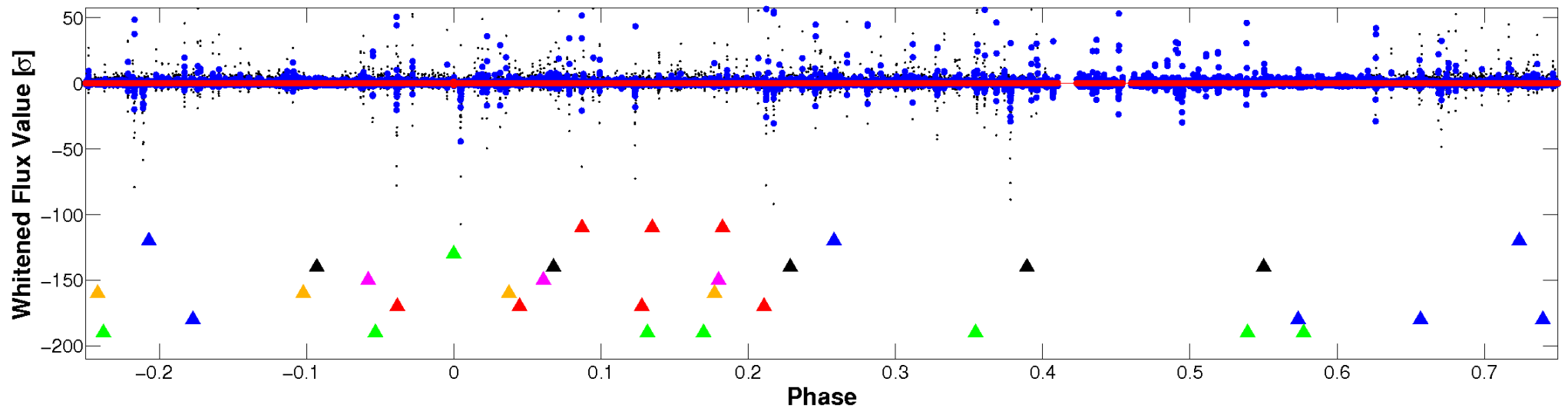


# Non-Whitened Vs. Whitened Light Curve

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

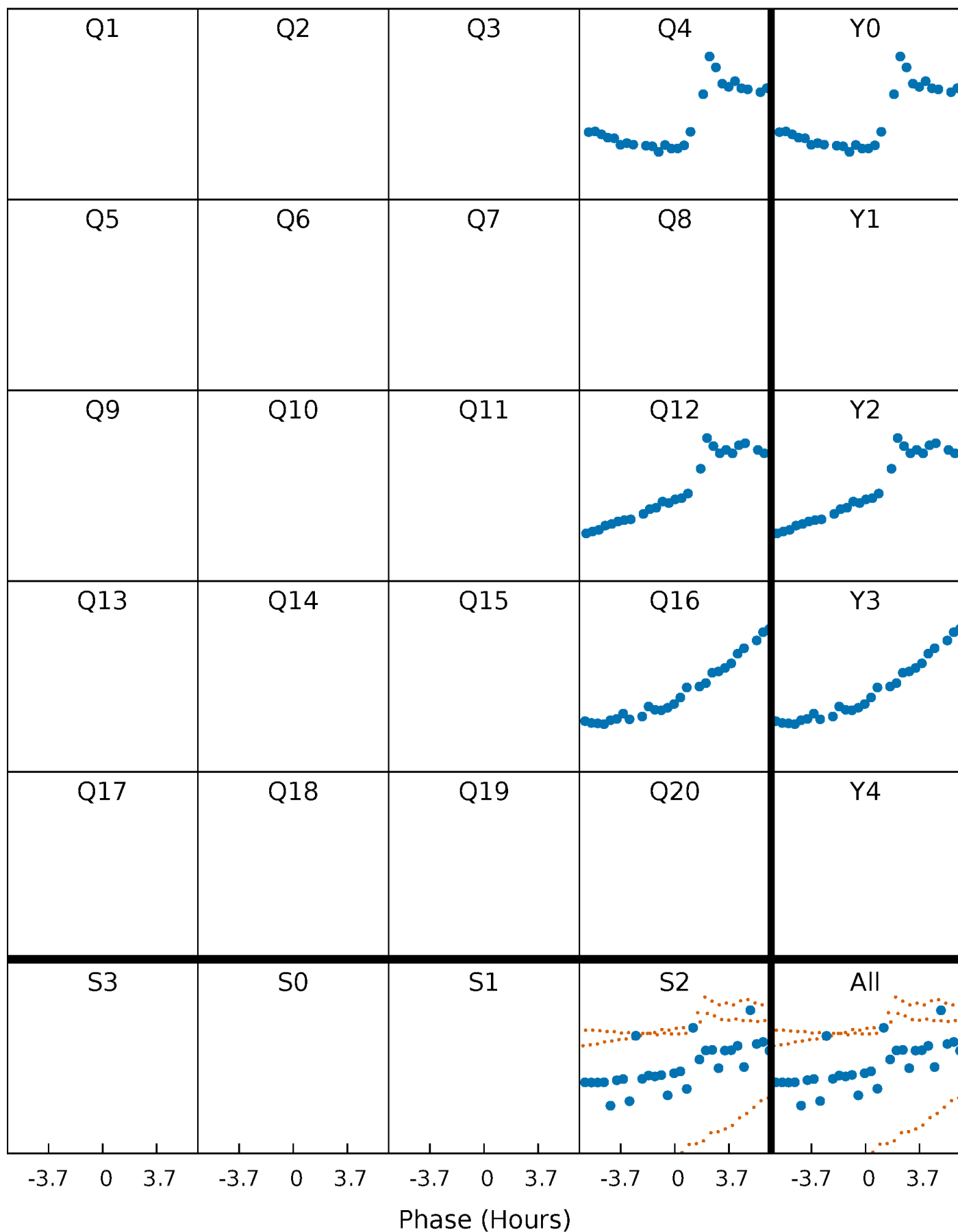


## Planet 3 : Phased Whitened Flux Time Series (Fit Epoch/Period)



# PDC Quarter-Phased Transit Curves

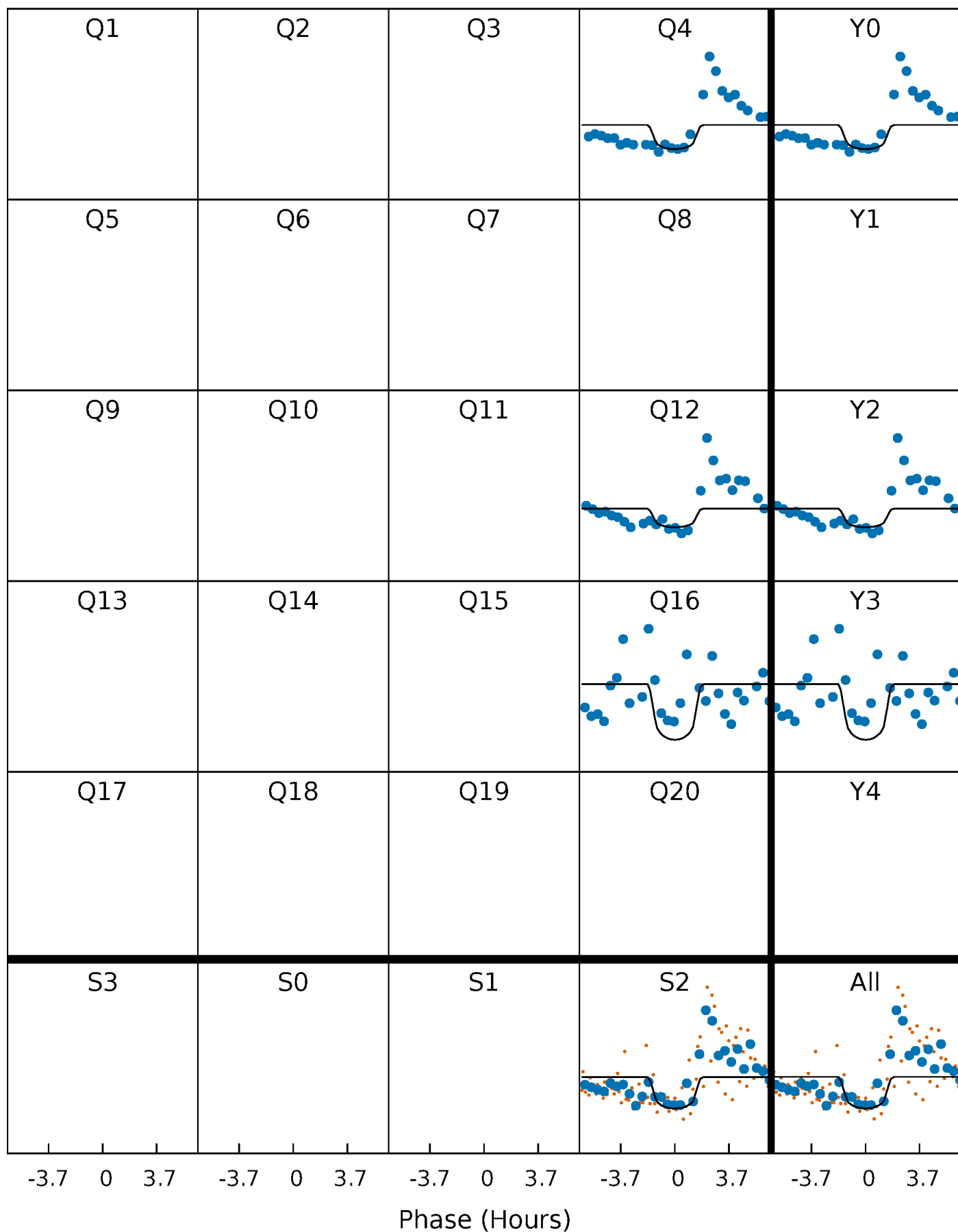
TCE 003971507-03     $P=376.226986$  Days     $T_0=386.815500$  (BKJD)





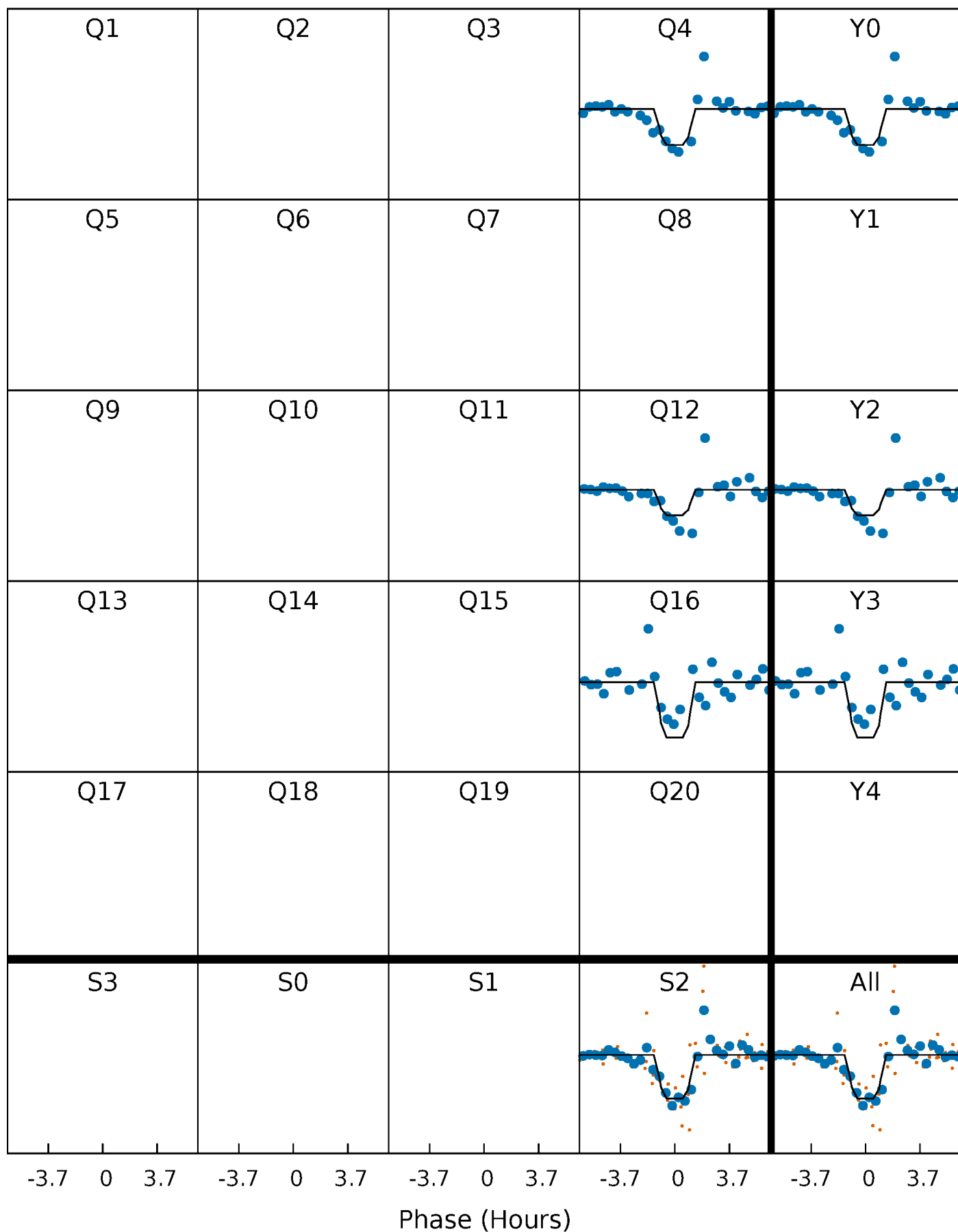
# DV Quarter-Phased Transit Curves

TCE 003971507-03 P=376.226986 Days  $T_0=386.815500$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

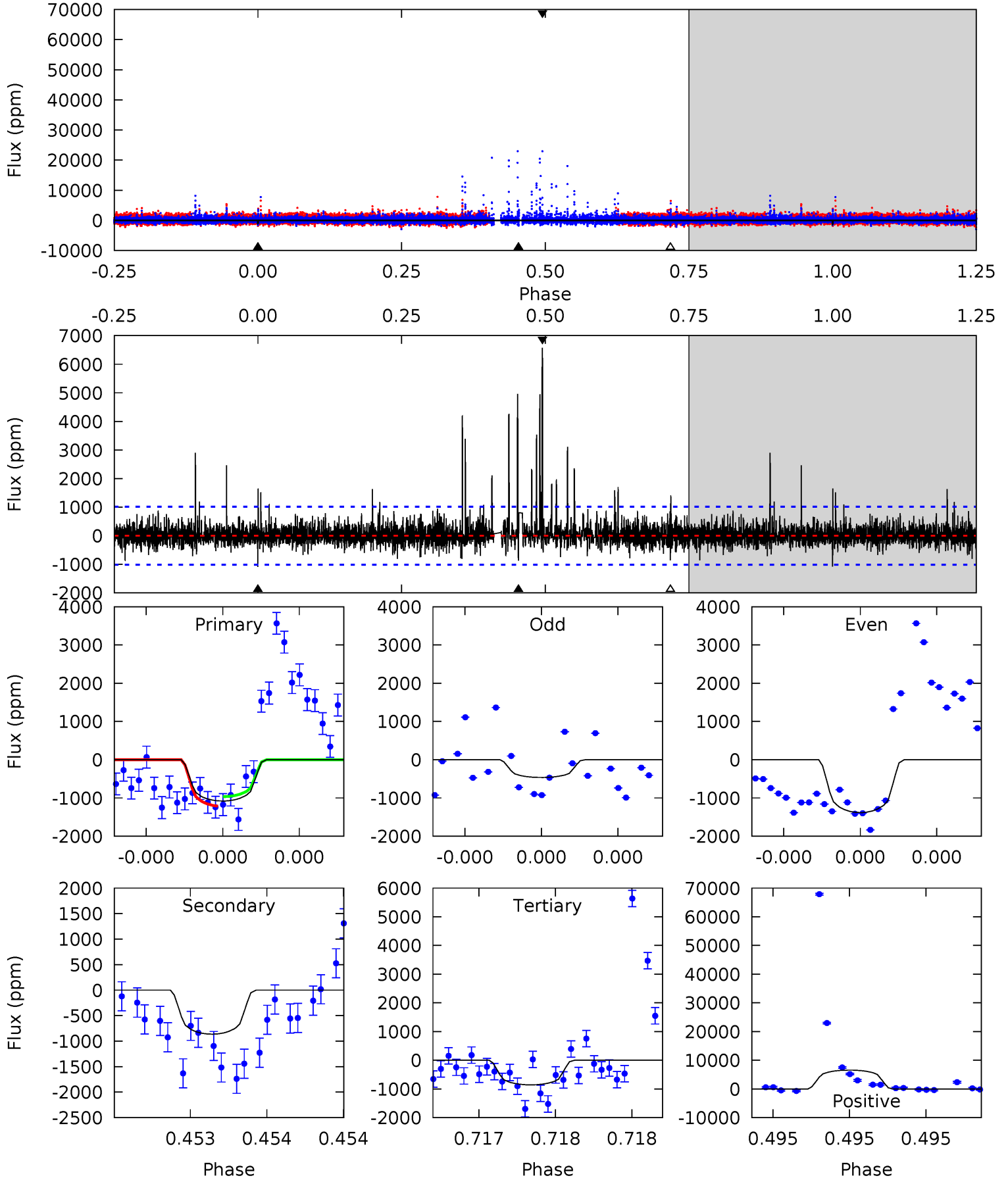
TCE 003971507-03 P=376.221940 Days  $T_0=386.829329$  (BKJD)



# DV Model-Shift Uniqueness Test

003971507-03, P = 376.226986 Days, E = 10.588514 Days

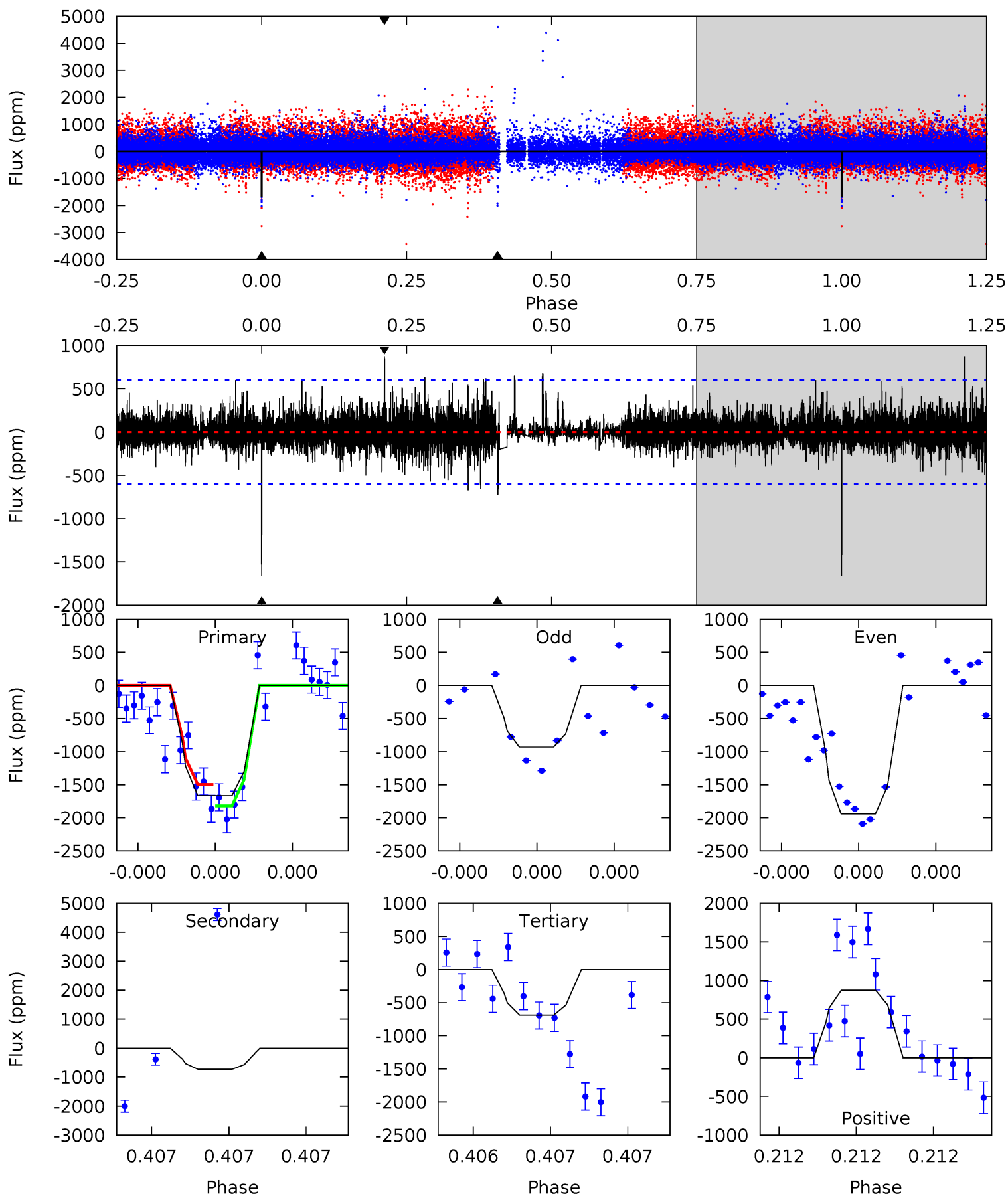
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
5.99	4.79	4.75	36.4	5.62	3.55	1.90	1.24	-30.4	0.03	-31.6	1.22	0.81	0.86	0.70



# Alt Model-Shift Uniqueness Test

003971507-03, P = 376.221940 Days, E = 10.607389 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
15.7	6.87	6.49	8.25	5.68	3.64	1.11	9.19	7.43	0.38	-1.38	4.12	0.93	0.34	1.52



### Stellar Parameters For KIC 003971507

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$5455^{+190}_{-152}$	$3.960^{+0.602}_{-0.258}$	$-0.340^{+0.350}_{-0.250}$	$1.607^{+0.806}_{-0.887}$	$0.860^{+0.105}_{-0.105}$	$0.292^{+1.868}_{-0.192}$
	+3%/-3%	+15%/-7%	+103%/-74%	+50%/-55%	+12%/-12%	+640%/-66%
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 003971507-03 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$-864 \pm 180$	$8.63^{+10.26}_{-5.92}$	$426^{+57}_{-64}$	$4205^{+2702}_{-835}$	$5876^{+53538}_{-4555}$
Alt.	$-728 \pm 106$	$9.48^{+9.75}_{-6.46}$	$429^{+52}_{-67}$	$3995^{+2453}_{-782}$	$4190^{+37260}_{-3191}$

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

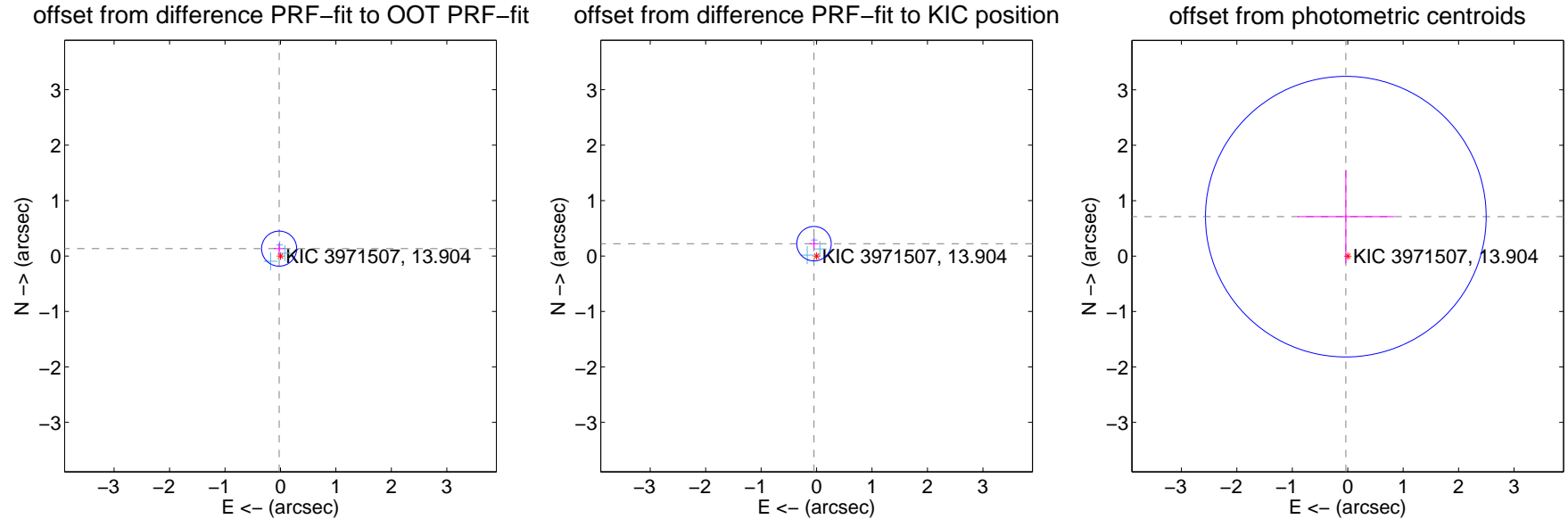
## DV Centroid Data

Supplemental centroid analysis for 003971507-03. Kepler magnitude: 13.90. Transit SNR 5.61

There are 3 quarters with good PRF difference image offsets

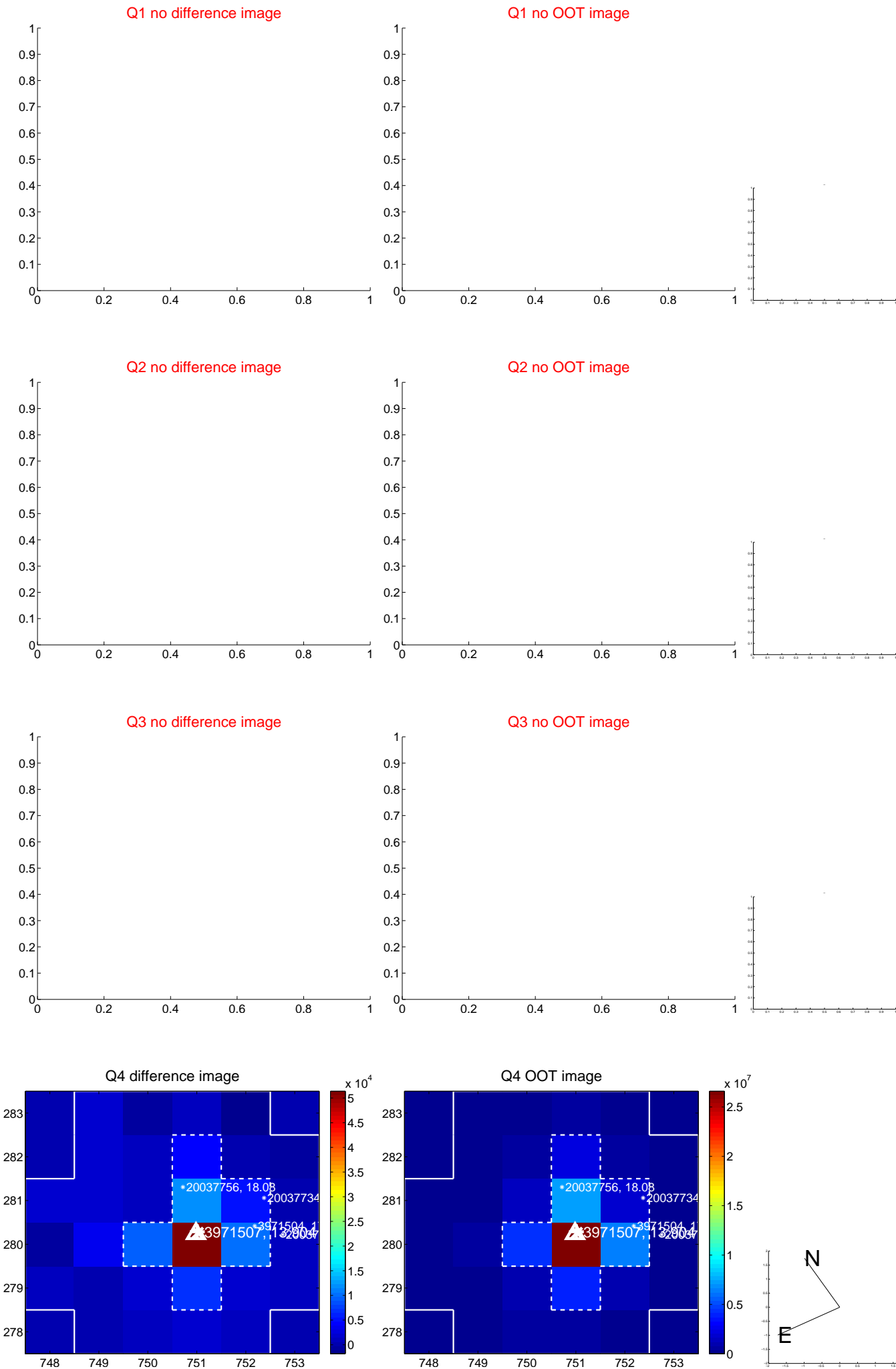
The direct PRF centroid is offset from the target star catalog position by about 0.09 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.135 \pm 0.105$	1.28	$0.024 \pm 0.090$	$0.133 \pm 0.106$
PRF-fit source offset from KIC position	$0.227 \pm 0.104$	2.19	$0.046 \pm 0.084$	$0.222 \pm 0.104$
photometric centroid source offset	$0.71 \pm 0.84$	0.84	$0.03 \pm 0.87$	$0.71 \pm 0.84$



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.

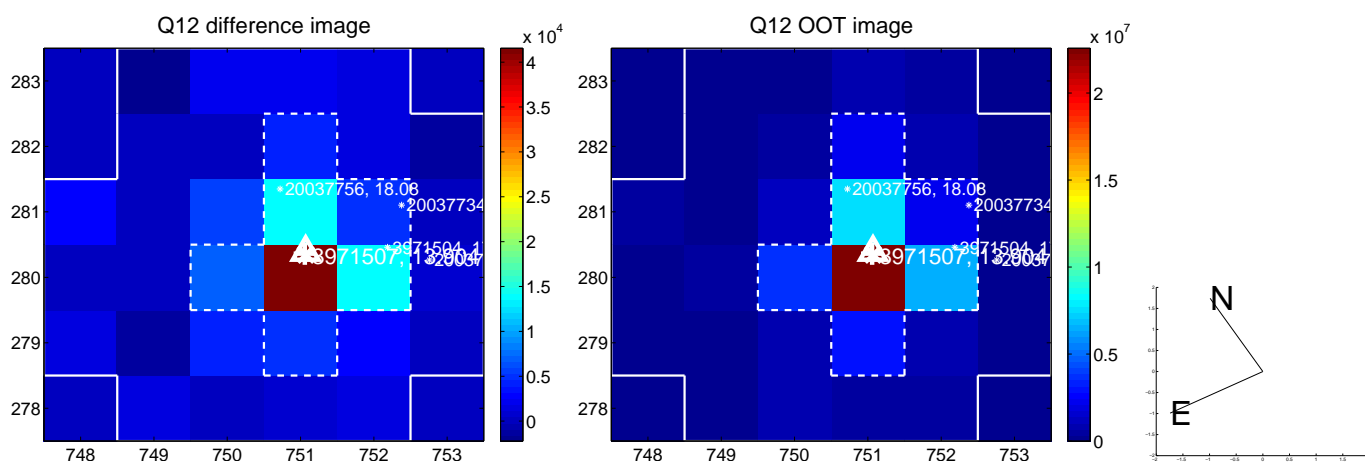


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

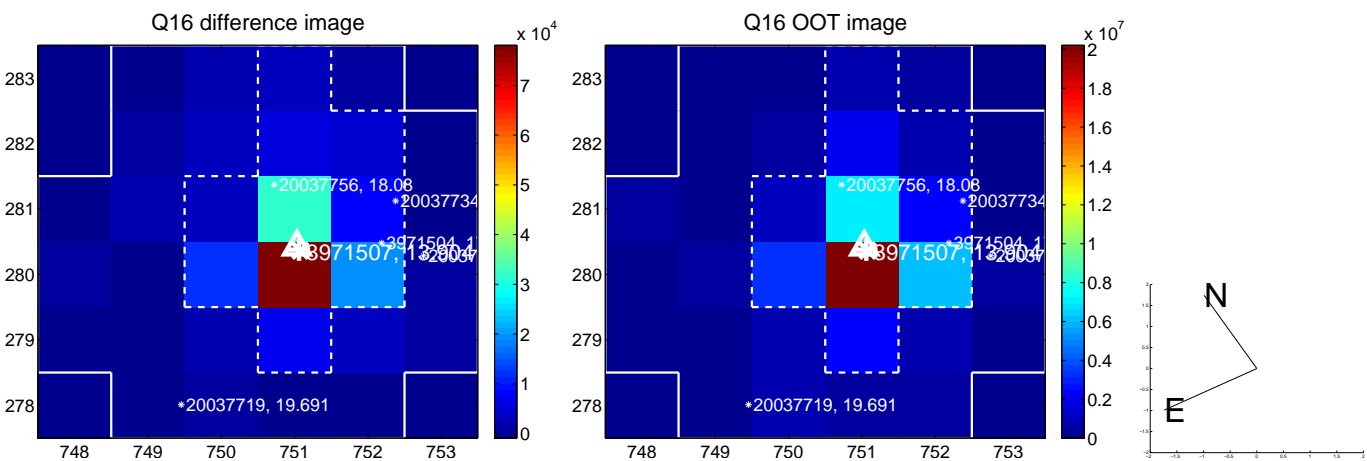
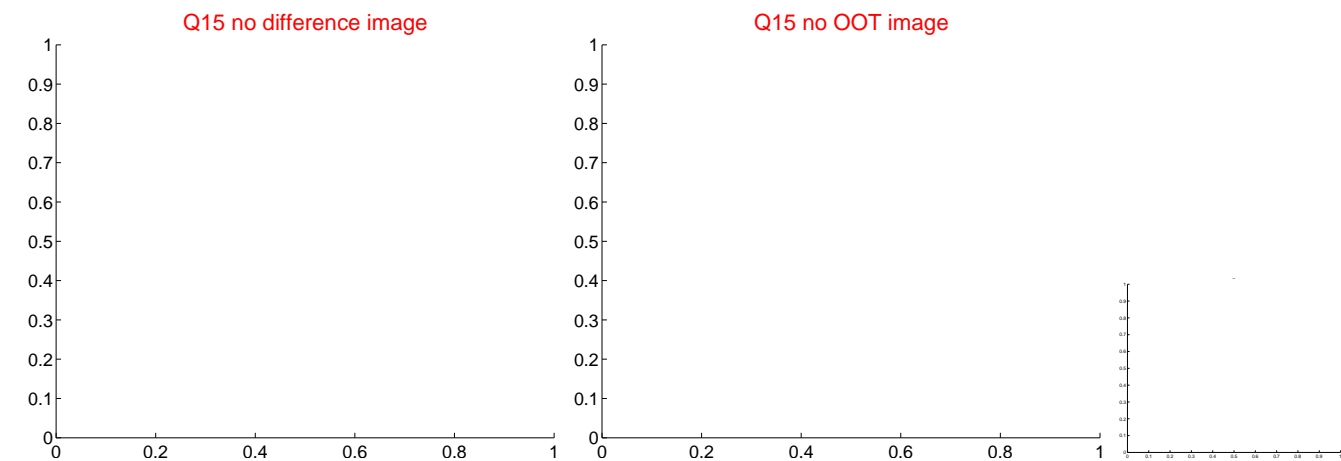
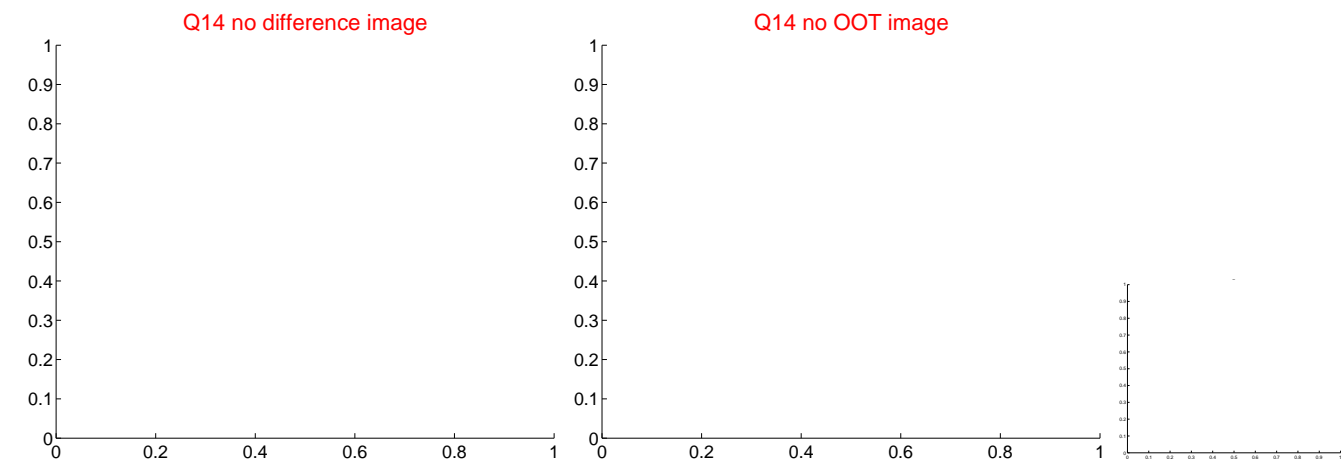
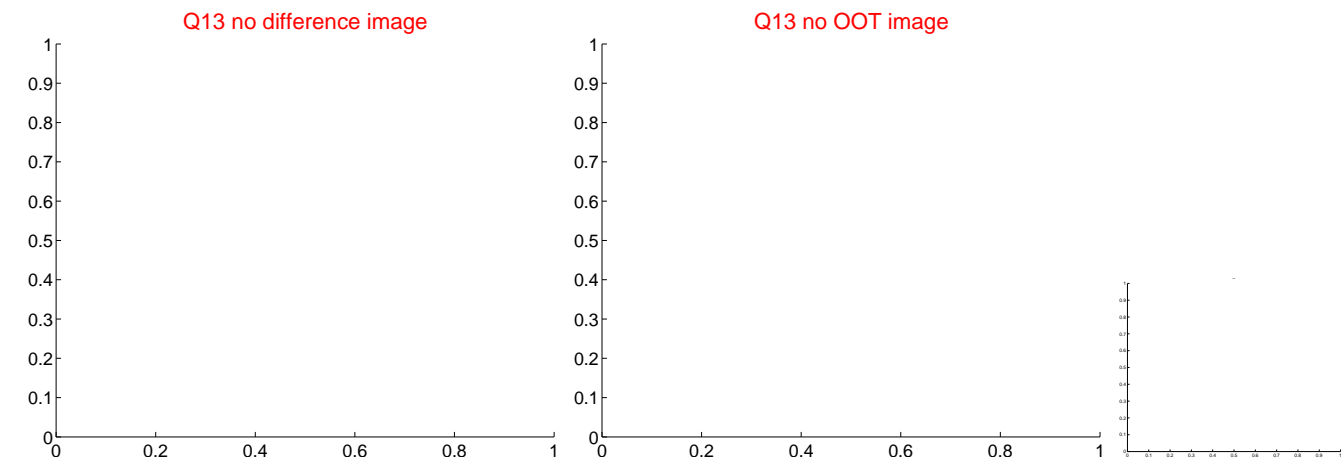




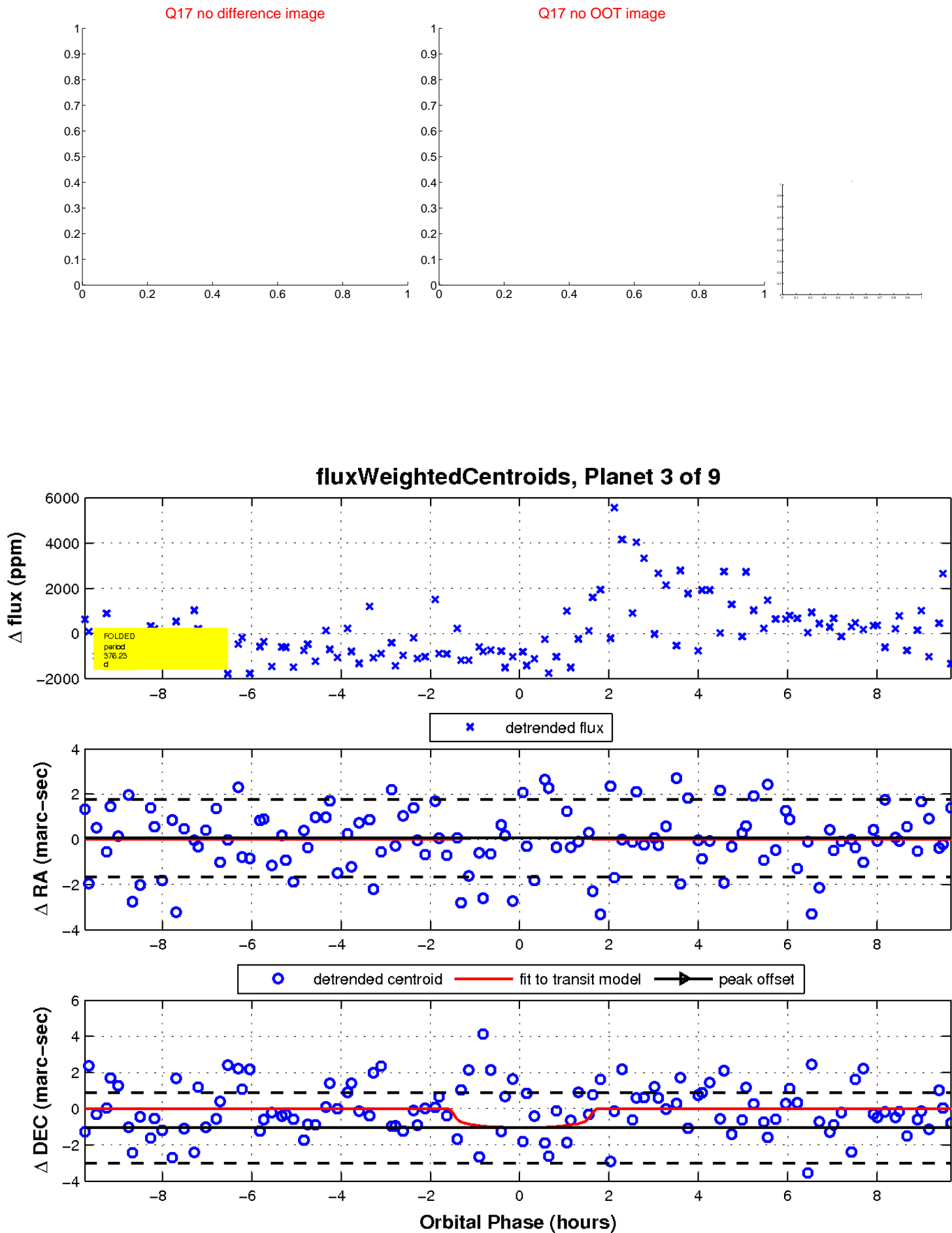
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value



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

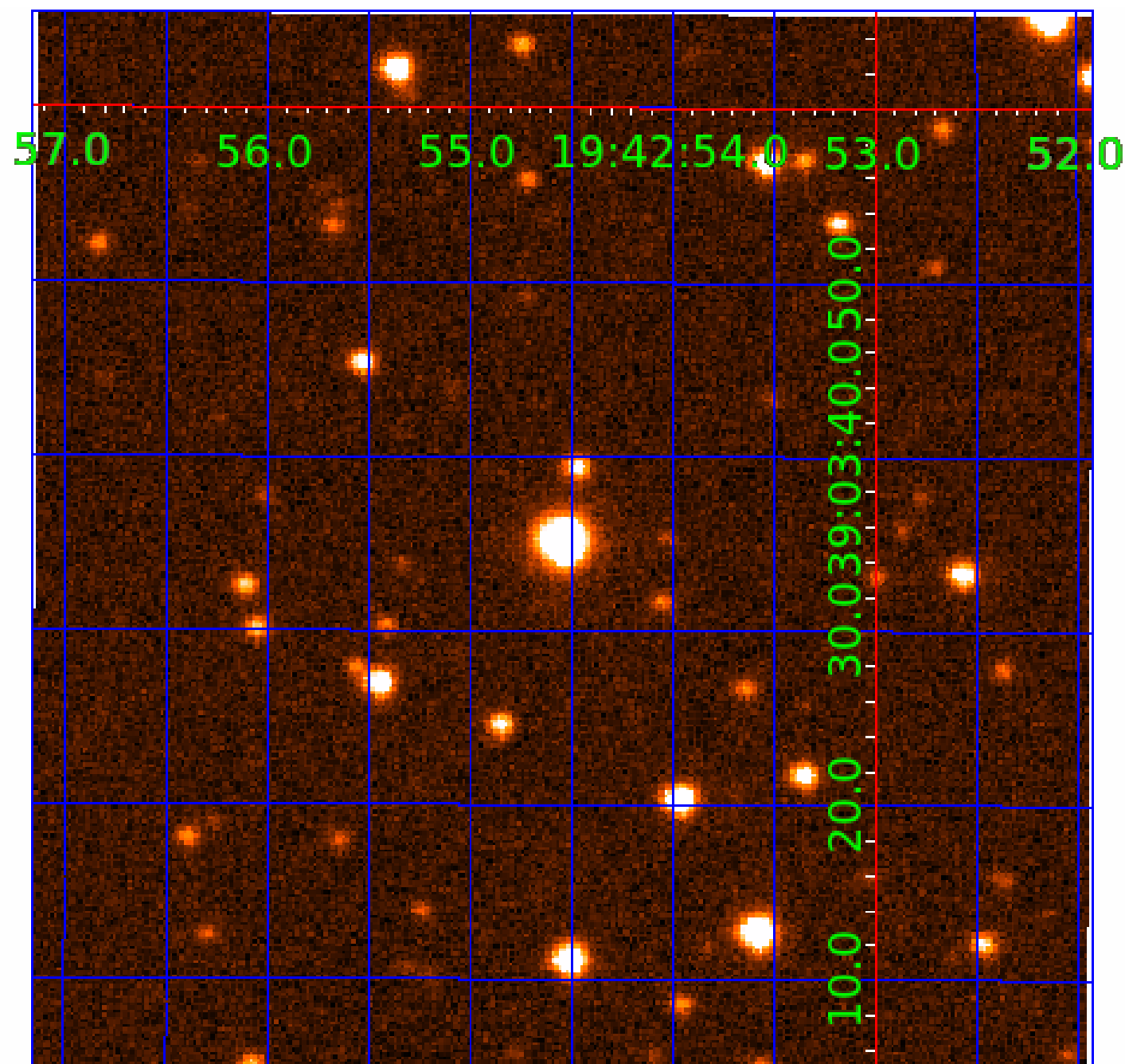


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination



# KIC 003971507

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
003971507-01	OBS	No	394.175282	419.606328	878.0	3.510	15.7	4.0	1.61	5455	5.49	2.05
003971507-03	OBS	No	376.226986	386.815500	1375.5	3.263	13.4	5.6	1.61	5455	6.19	2.18
003971507-04	OBS	No	315.734653	217.568312	1325.1	6.346	15.2	4.9	1.61	5455	5.96	2.75
003971507-05	OBS	No	420.997596	364.959213	1490.2	4.865	13.6	6.5	1.61	5455	6.23	1.88
003971507-06	OBS	No	323.681895	453.462898	1559.4	3.850	12.6	7.6	1.61	5455	6.54	2.66
003971507-08	OBS	No	407.493824	226.377902	940.2	3.862	13.1	3.4	1.61	5455	5.08	1.96
003971507-09	OBS	No	222.868839	227.780306	357.7	15.000	11.6	-1.0	1.61	5455	3.00	4.38

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
003971507-01	OBS	FP	0.00	1	0	1	0	INDIV_TRANS_MARSHALL_TRACKER—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS—HALO_GHOST
003971507-03	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
003971507-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES—LPP_DV—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS
003971507-05	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—MOD_POS_ALT
003971507-06	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL_SKYE—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS
003971507-08	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—CENT_FEW_DIFFS
003971507-09	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_MARSHALL_SKYE—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—CENT_NOFITS

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

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

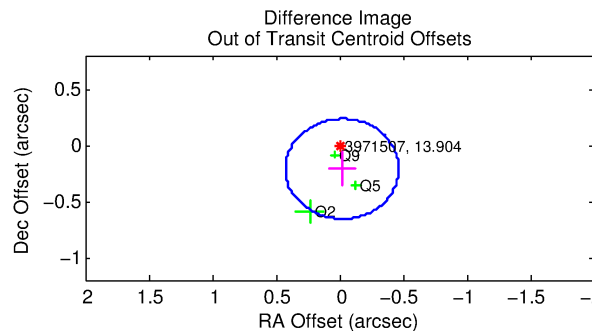
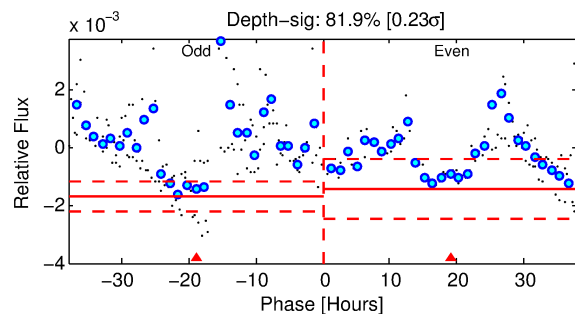
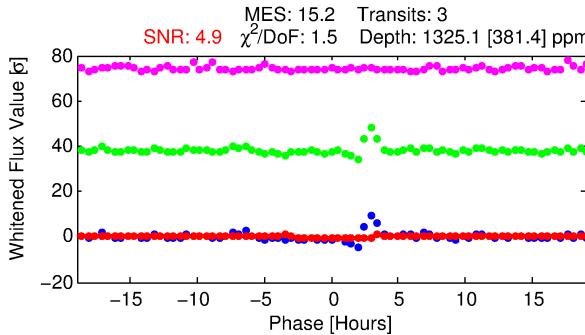
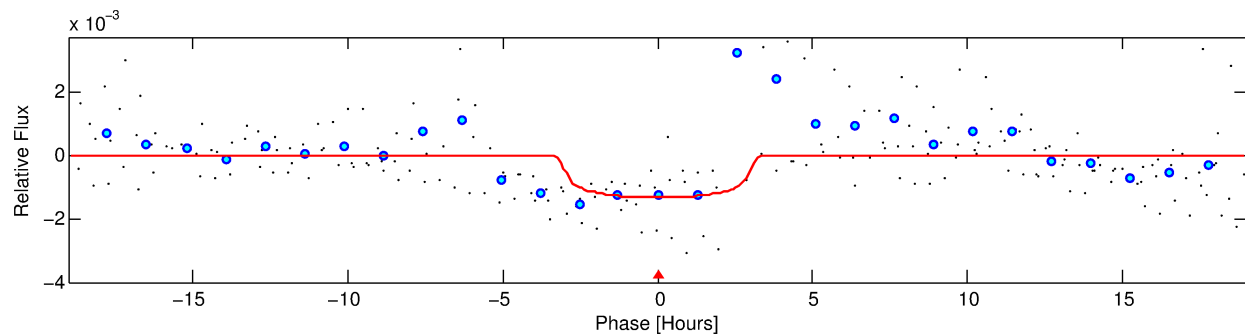
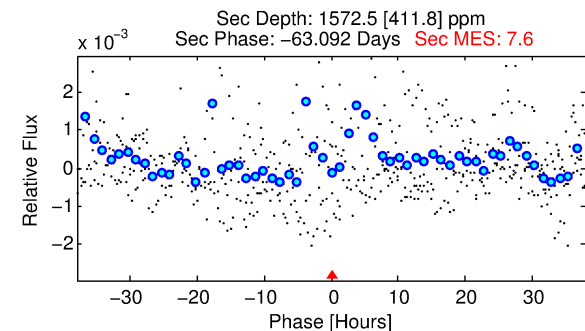
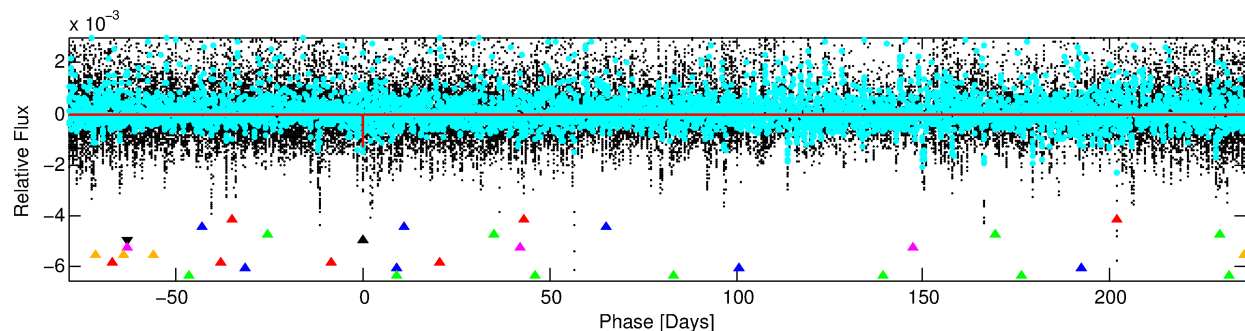
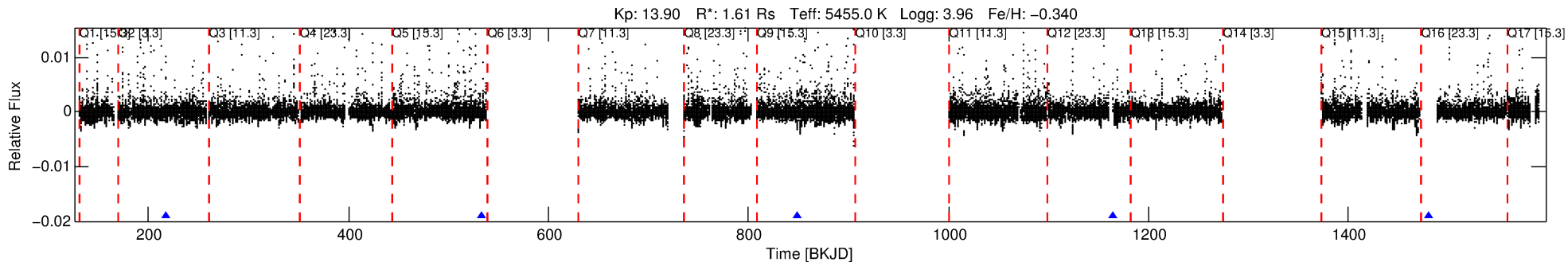
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 003971507-04

No Significant Match Found

# DV One-Page Summary

KIC: 3971507 Candidate: 4 of 9 Period: 315.735 d



## DV Fit Results:

Period = 315.73465 [0.00947] d  
Epoch = 217.5683 [0.0139] BKJD  
Rp/R\* = 0.0340 [0.0360]  
a/R\* = 344.28 [1474.21]  
b = 0.50 [6.51]  
Seff = 2.75 [2.76]  
Teq = 328 [82] K  
Rp = 5.96 [7.11] Re  
a = 0.8628 [0.5096] AU  
Ag = 18109.81 [42597.87] [0.43σ]  
Teffp = 5891 [3146] K [1.77σ]

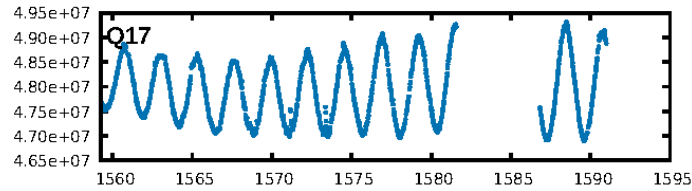
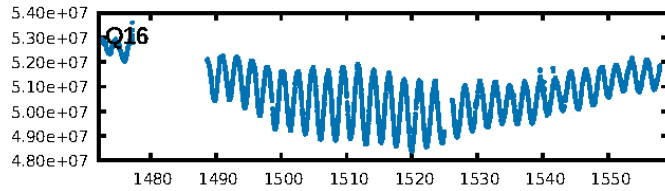
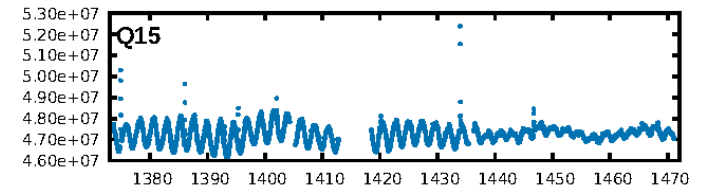
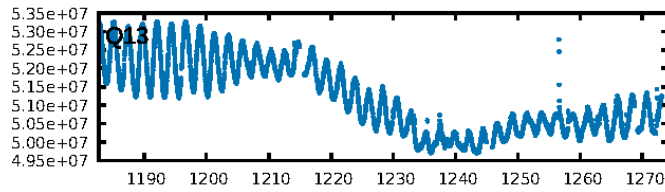
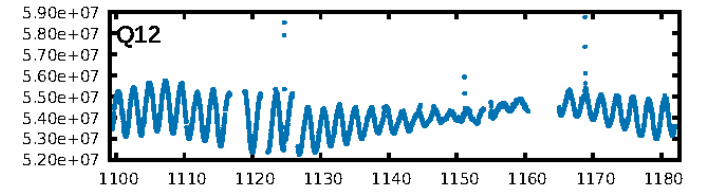
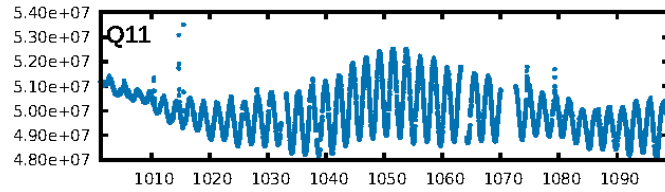
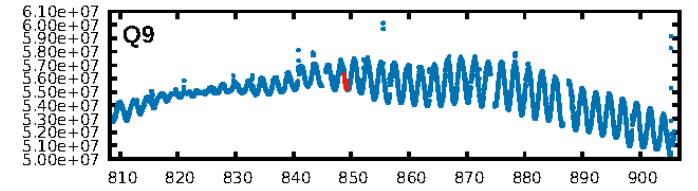
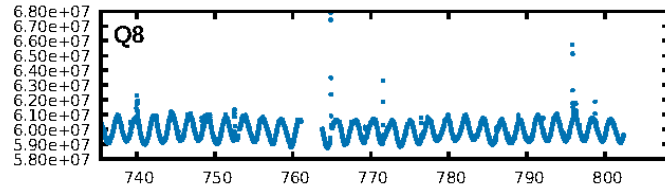
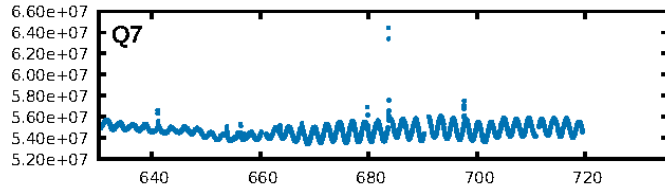
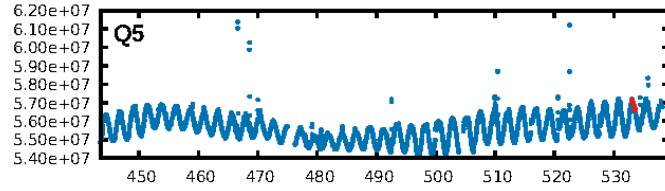
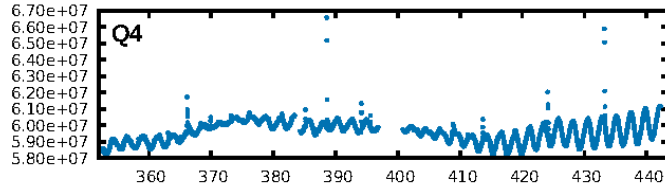
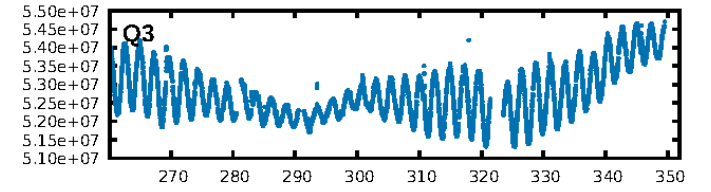
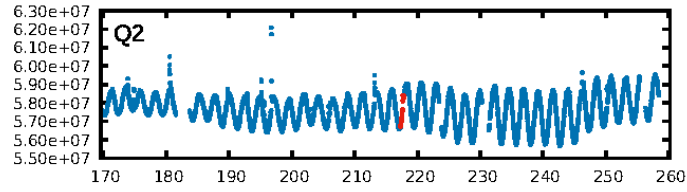
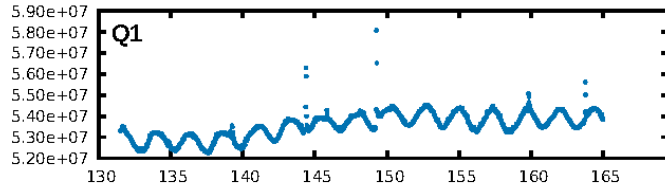
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [136.84σ]  
LongPeriod-sig: 100.0% [25.69σ]  
ModelChiSquare2-sig: 0.5%  
ModelChiSquareGof-sig: 66.9%  
Bootstrap-pfa: 1.49e-13  
RollingBand-fgt: 1.00 [3/3]  
GhostDiagnostic-chr: -8.032  
Centroid-sig: 14.5%  
Centroid-so: 0.648 arcsec [1.15σ]  
OotOffset-rm: 0.212 arcsec [1.43σ]  
OotOffset-st: 1/0/0/2 [3]  
KicOffset-rm: 0.169 arcsec [1.18σ]  
KicOffset-st: 1/0/0/2 [3]  
DiffImageQuality-fgm: 0.67 [2/3]  
DiffImageOverlap-fno: 1.00 [3/3]

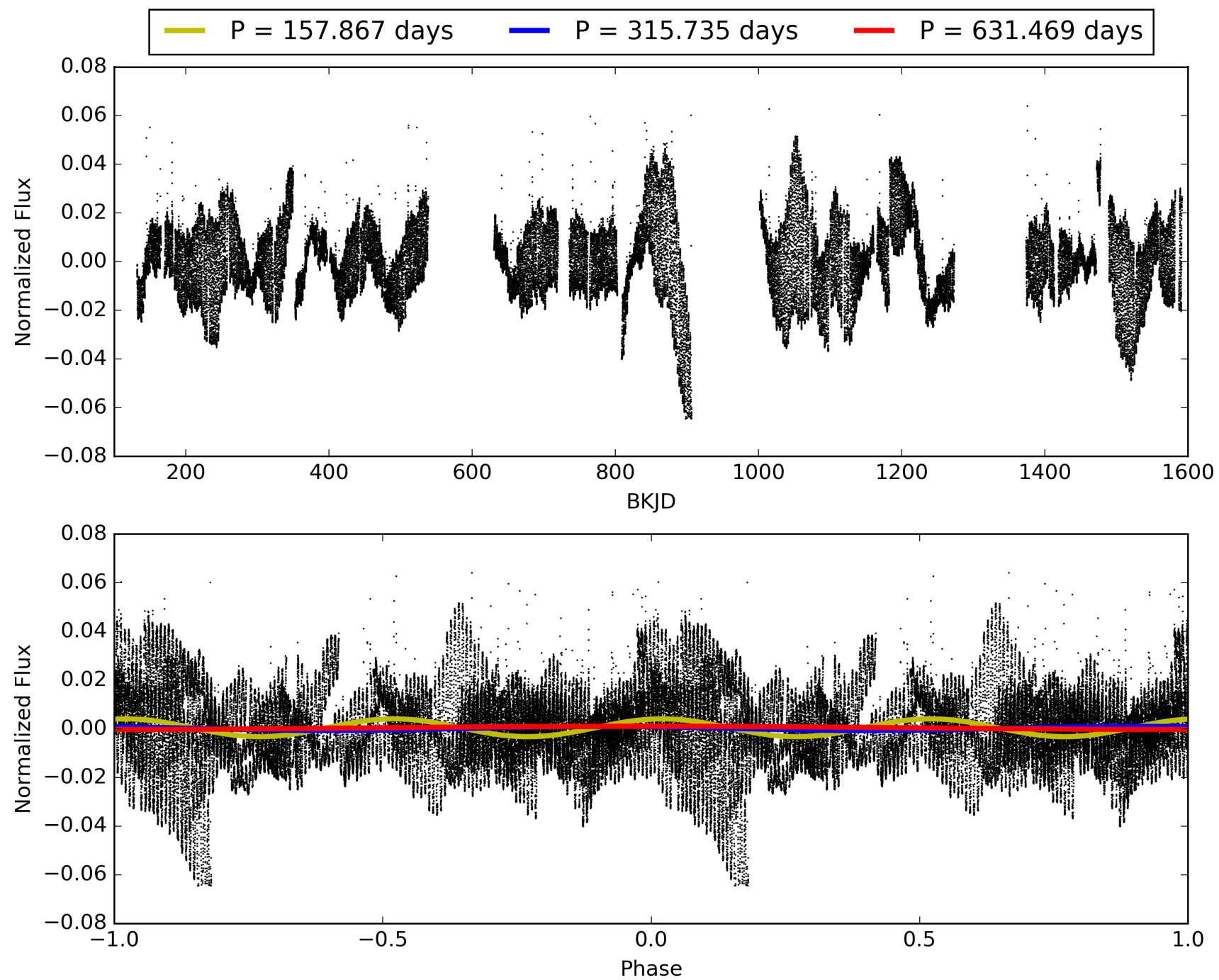
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 31-Jan-2016 05:54:36 Z

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

# TCE 003971507-04, PDC Light Curves



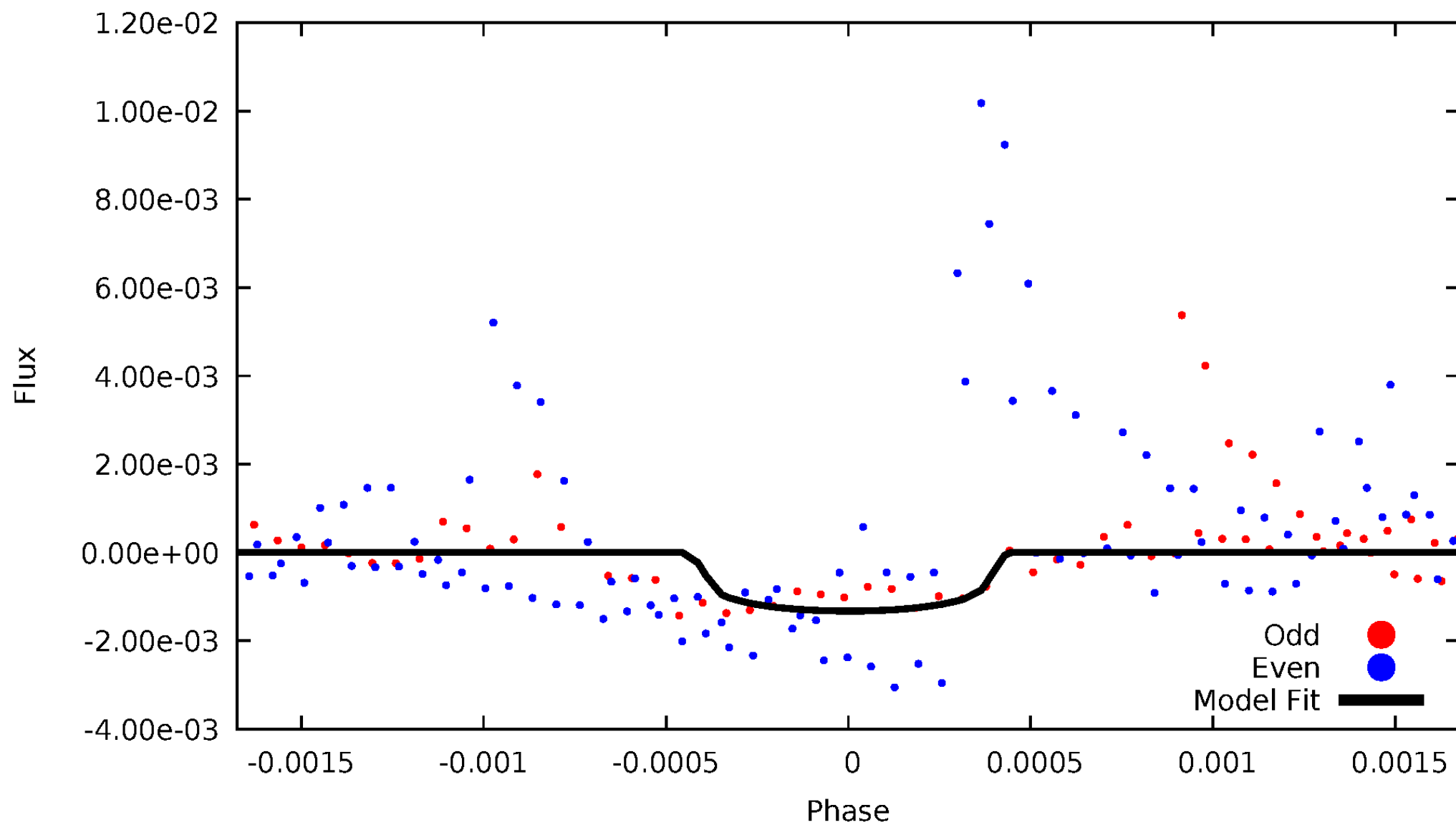
TCE 003971507-04





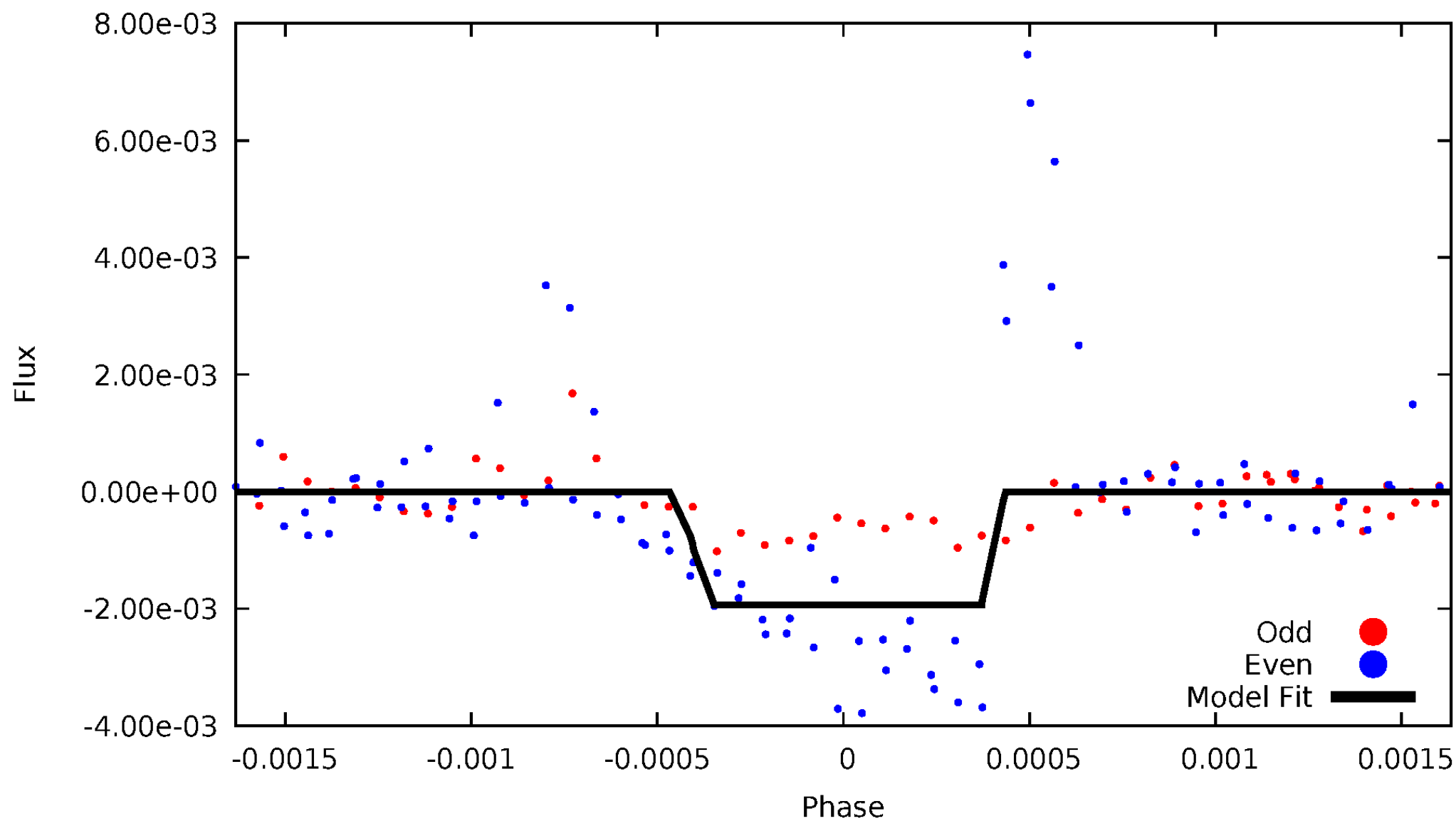
# DV Odd/Even

TCE 003971507-04



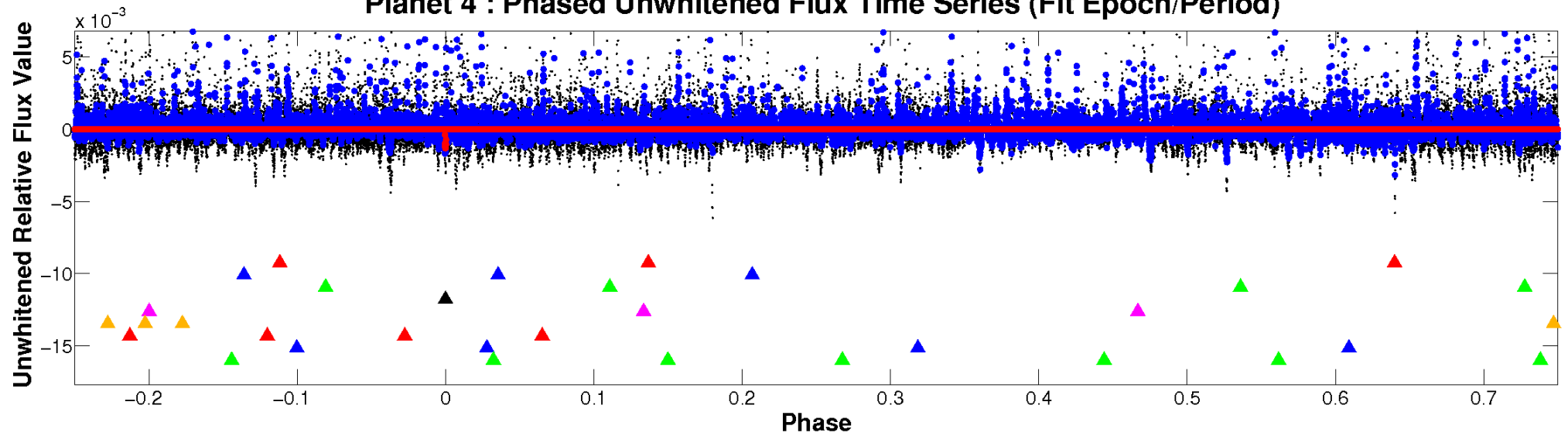
# ALT Odd/Even

TCE 003971507-04

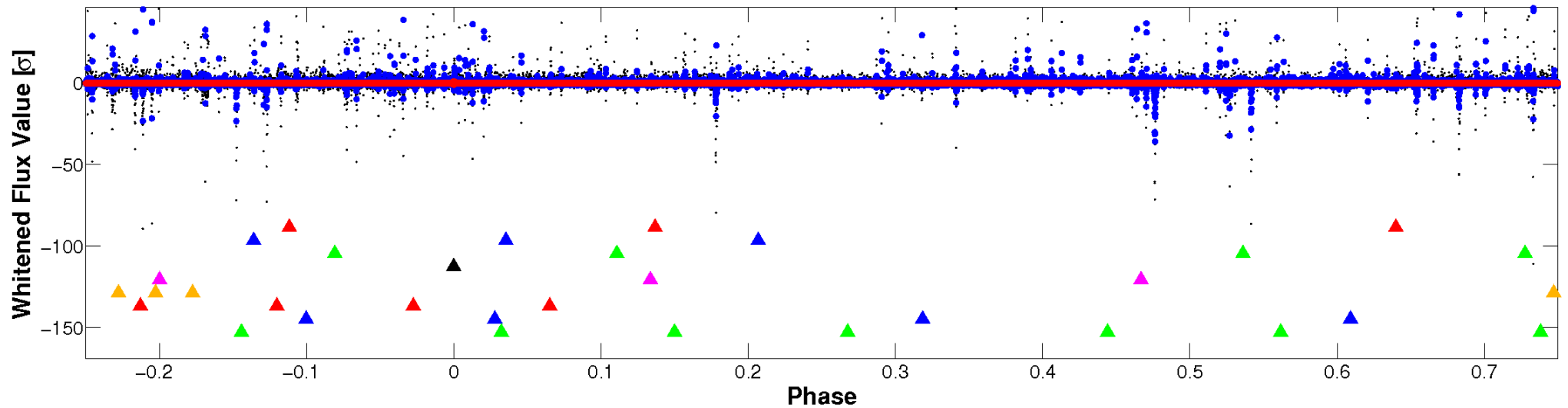


# Non-Whitened Vs. Whitened Light Curve

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

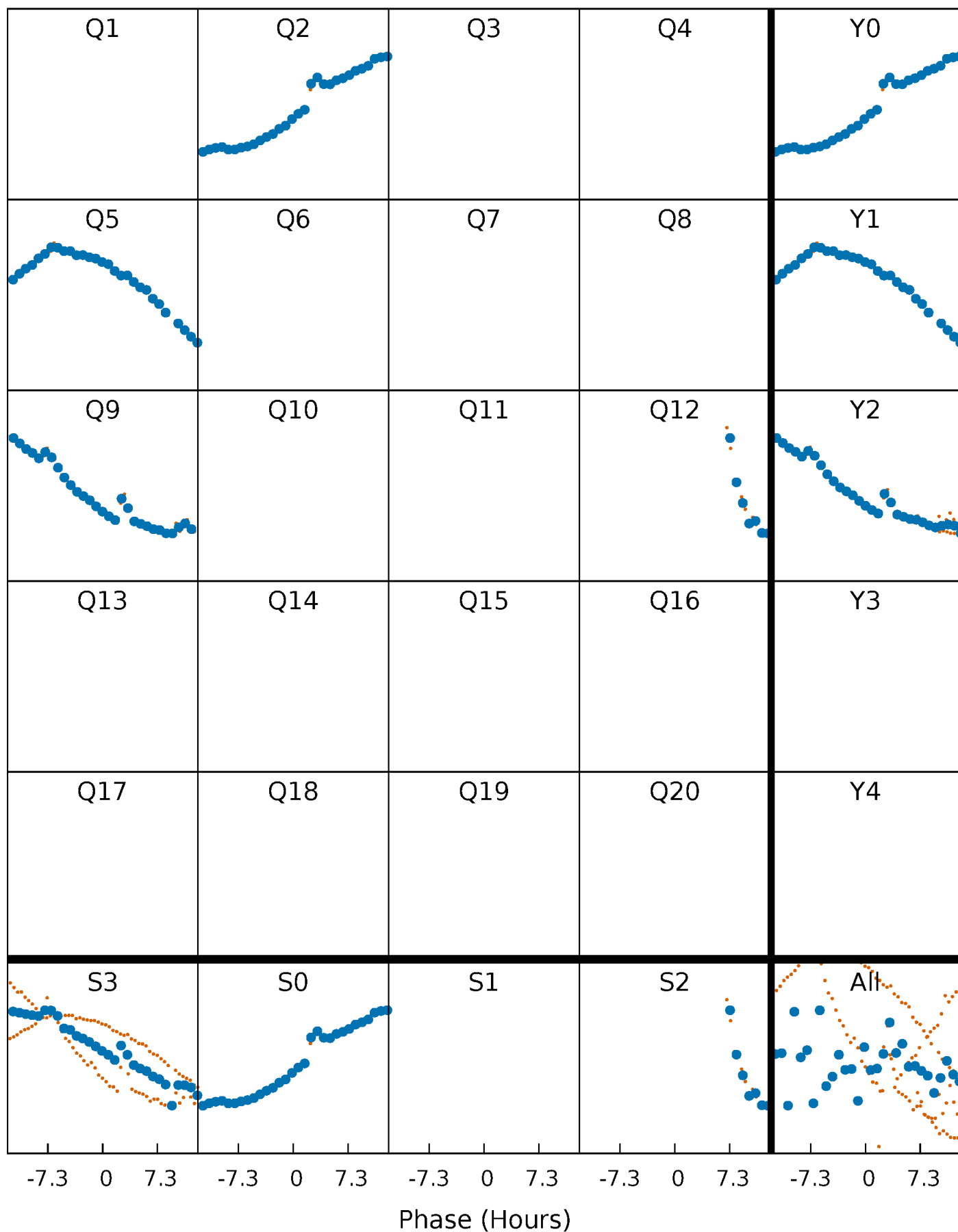


Planet 4 : Phased Whitened Flux Time Series (Fit Epoch/Period)



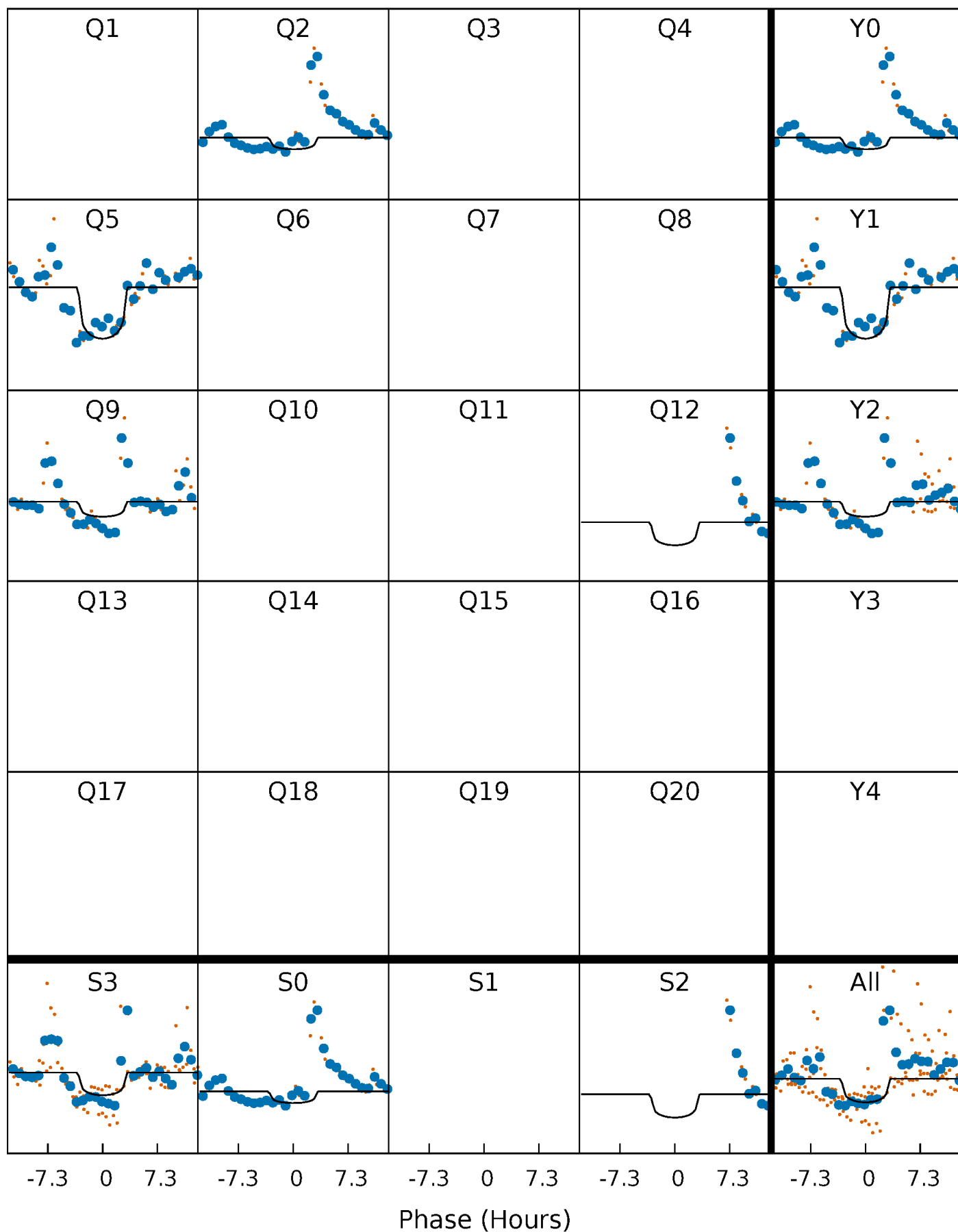
# PDC Quarter-Phased Transit Curves

TCE 003971507-04     $P=315.734652$  Days     $T_0=217.568312$  (BKJD)



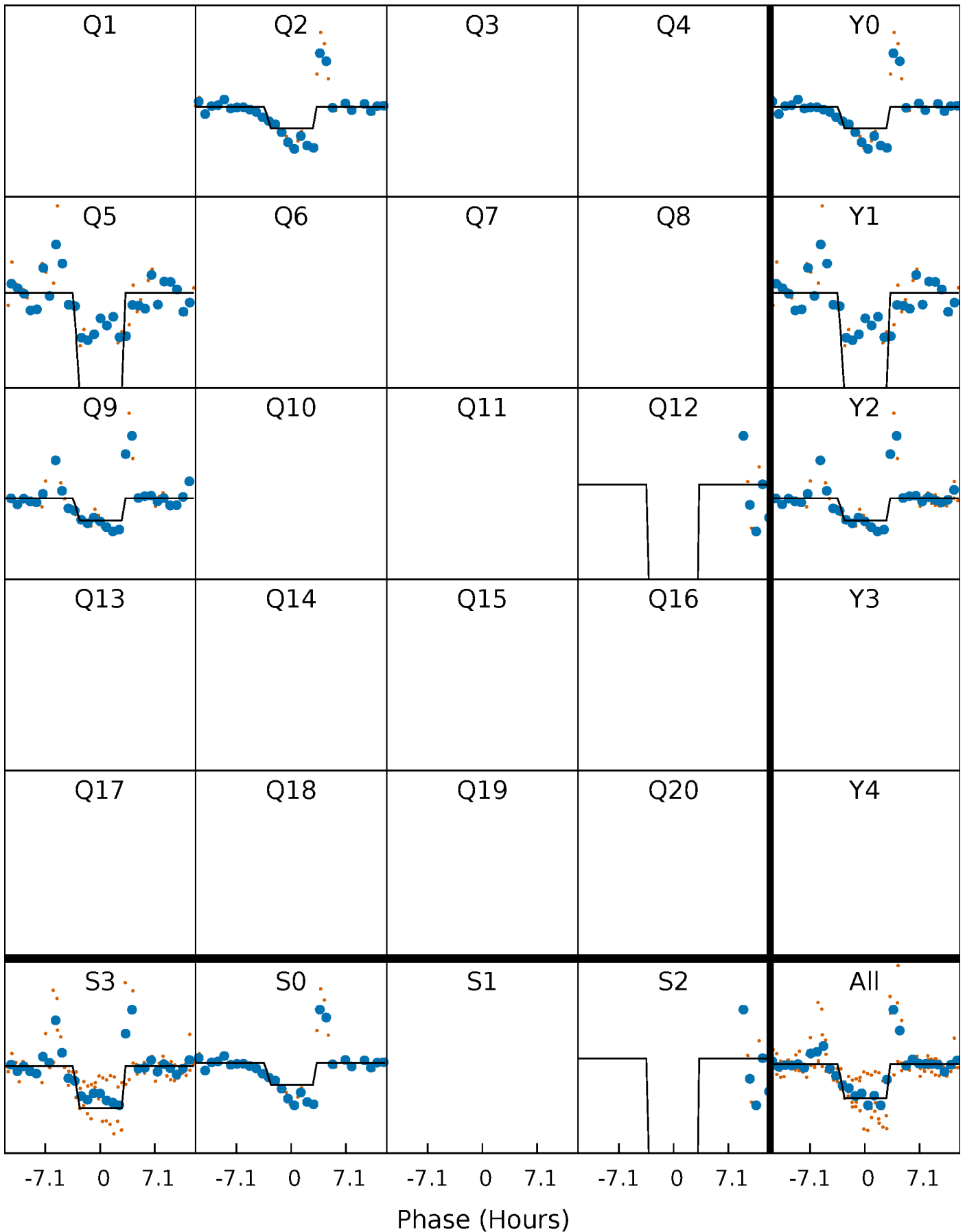
# DV Quarter-Phased Transit Curves

TCE 003971507-04     $P=315.734652$  Days     $T_0=217.568312$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

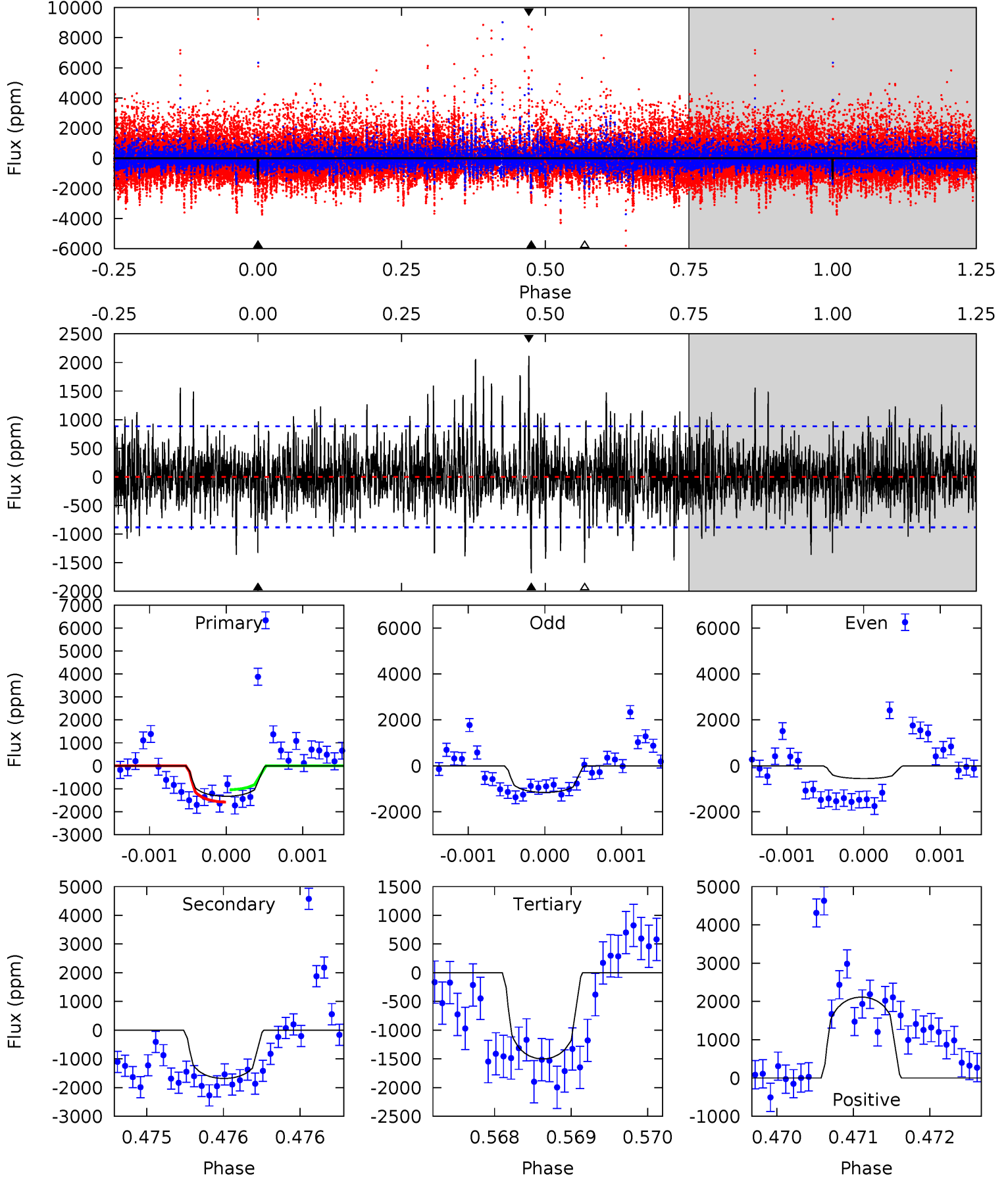
TCE 003971507-04 P=315.739369 Days  $T_0=217.524440$  (BKJD)



# DV Model-Shift Uniqueness Test

003971507-04, P = 315.734652 Days, E = 217.568312 Days

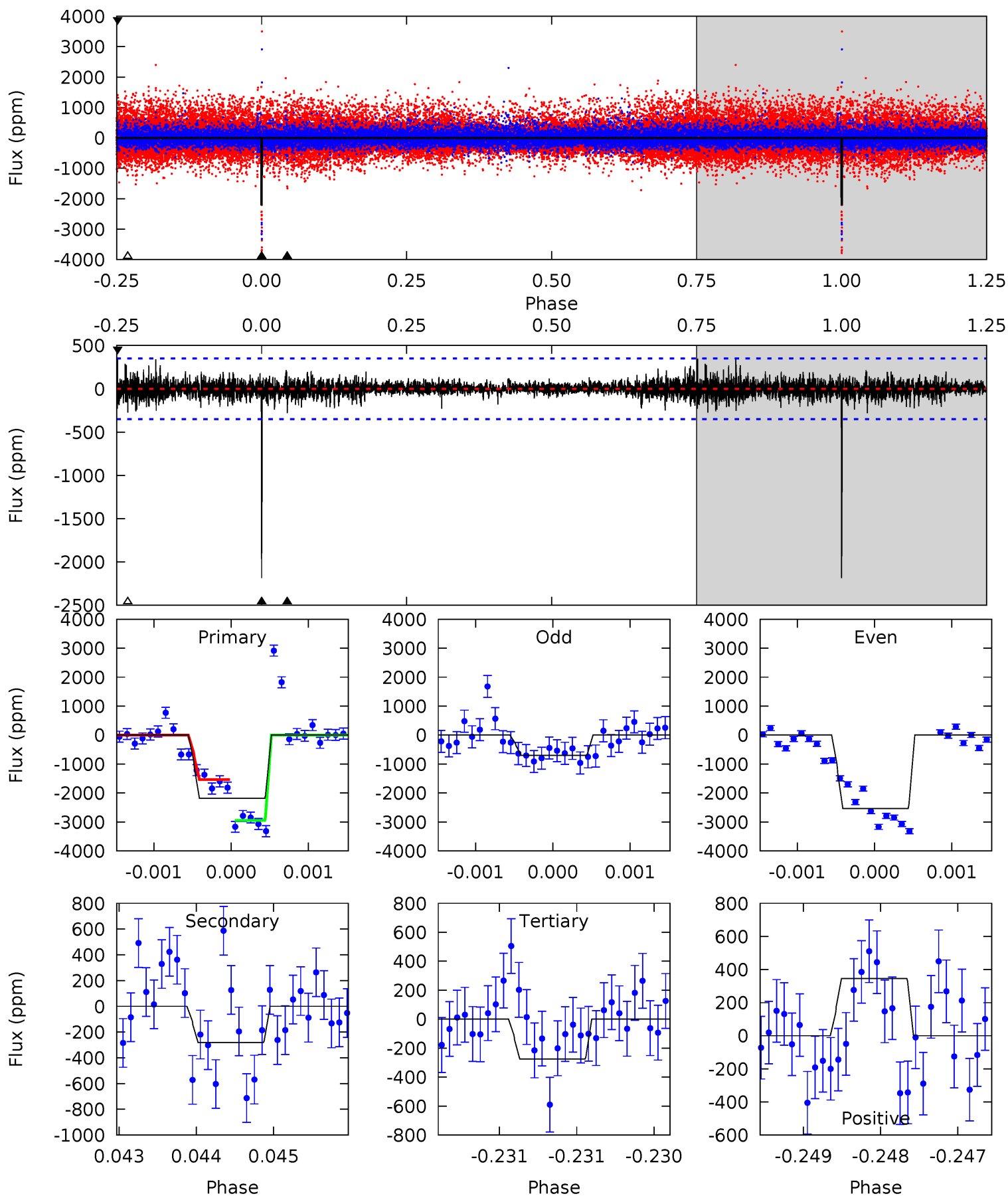
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
8.24	10.4	9.31	13.1	5.48	3.33	2.41	-1.08	-4.88	1.12	-2.68	1.24	0.65	0.56	1.61



# Alt Model-Shift Uniqueness Test

003971507-04, P = 315.739369 Days, E = 217.524440 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
34.3	4.42	4.31	5.43	5.48	3.34	0.92	30.0	28.9	0.11	-1.01	13.8	0.85	0.14	0





### Stellar Parameters For KIC 003971507

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$5455^{+190}_{-152}$	$3.960^{+0.602}_{-0.258}$	$-0.340^{+0.350}_{-0.250}$	$1.607^{+0.806}_{-0.887}$	$0.860^{+0.105}_{-0.105}$	$0.292^{+1.868}_{-0.192}$
	+3%/-3%	+15%/-7%	+103%/-74%	+50%/-55%	+12%/-12%	+640%/-66%
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 003971507-04 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-1682 \pm 161$	$6.53^{+6.43}_{-4.29}$	$448^{+59}_{-67}$	$5464^{+4459}_{-1215}$	$16145^{+125542}_{-12064}$
Alt.	$-282 \pm 64$	$7.46^{+7.00}_{-4.41}$	$452^{+57}_{-74}$	$3635^{+1406}_{-574}$	$1991^{+9845}_{-1453}$

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

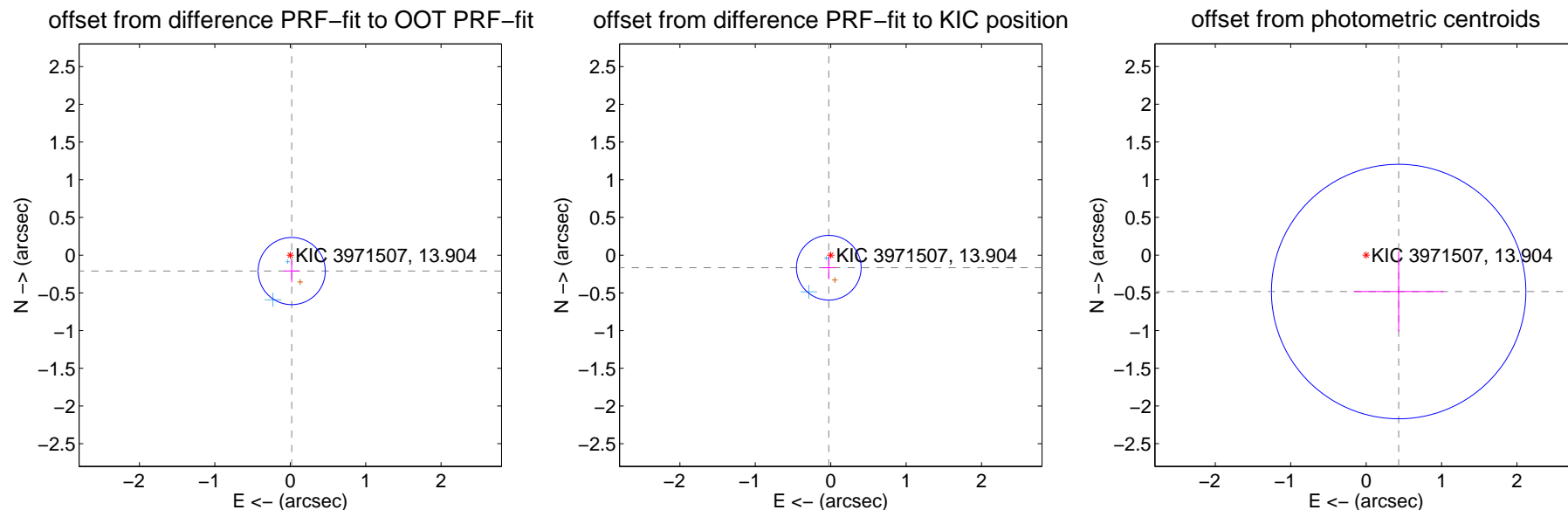
## DV Centroid Data

Supplemental centroid analysis for 003971507-04. Kepler magnitude: 13.90. Transit SNR 4.94

There are 2 quarters with good PRF difference image offsets

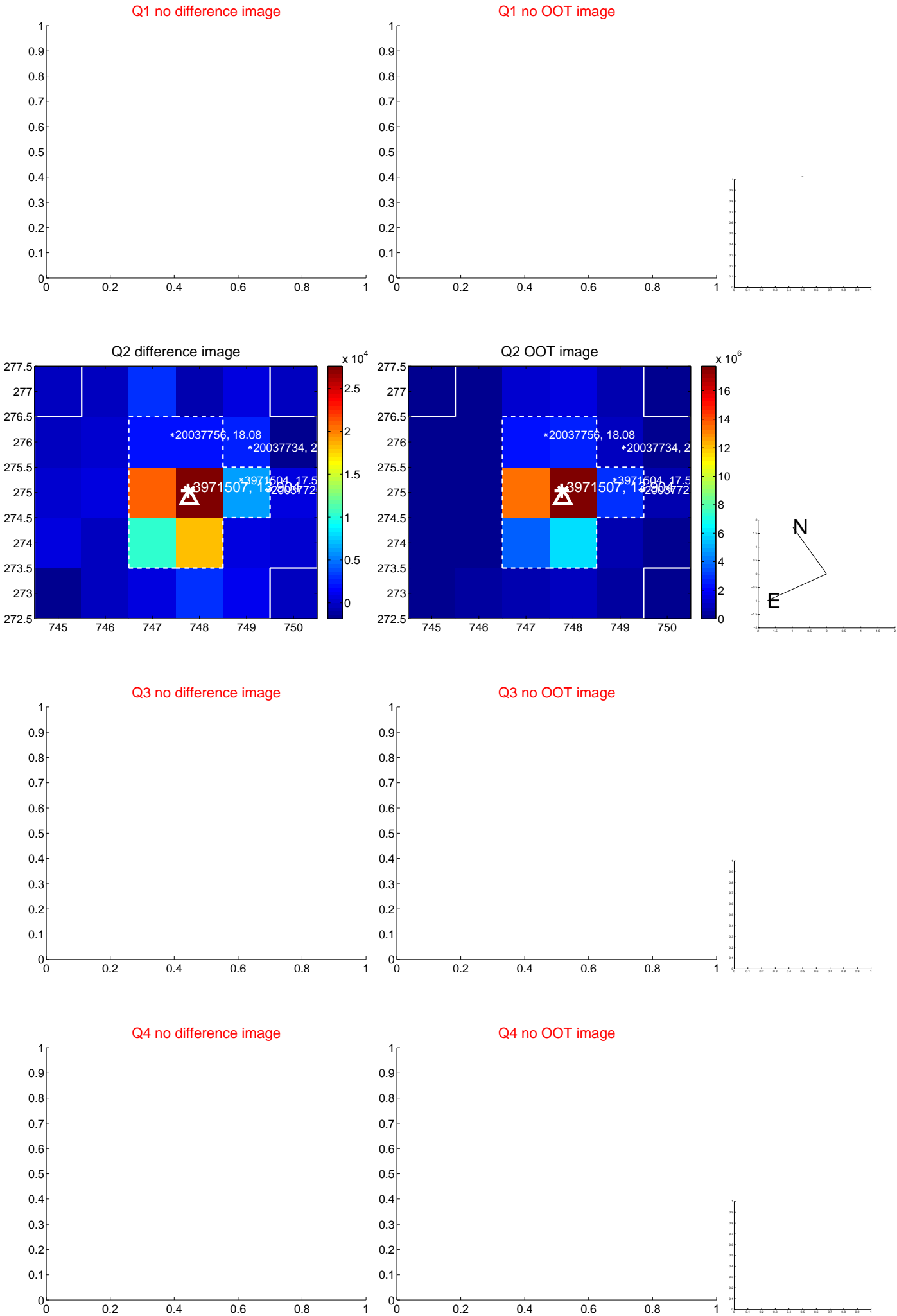
The direct PRF centroid is offset from the target star catalog position by about 0.05 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.212 \pm 0.148$	1.43	$-0.019 \pm 0.102$	$-0.211 \pm 0.149$
PRF-fit source offset from KIC position	$0.169 \pm 0.143$	1.18	$0.026 \pm 0.090$	$-0.167 \pm 0.144$
photometric centroid source offset	$0.65 \pm 0.56$	1.15	$-0.43 \pm 0.60$	$-0.48 \pm 0.53$

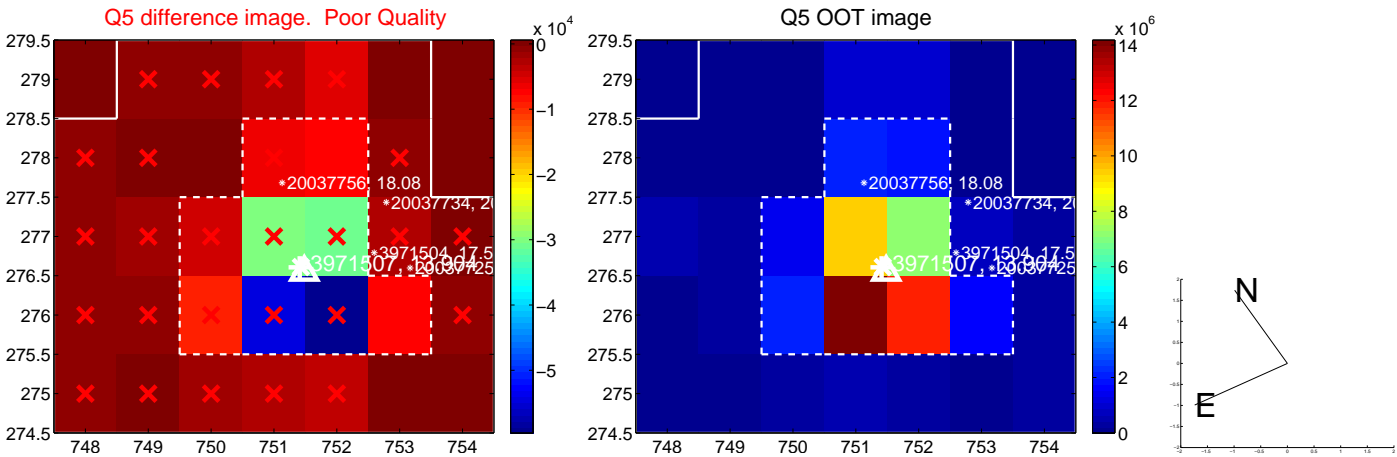


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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

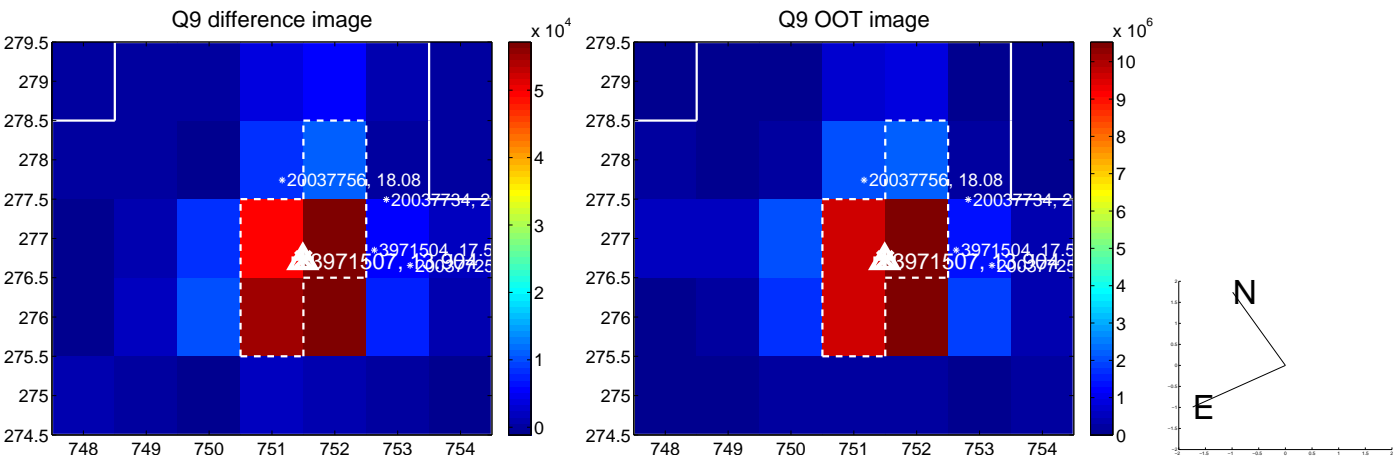
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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



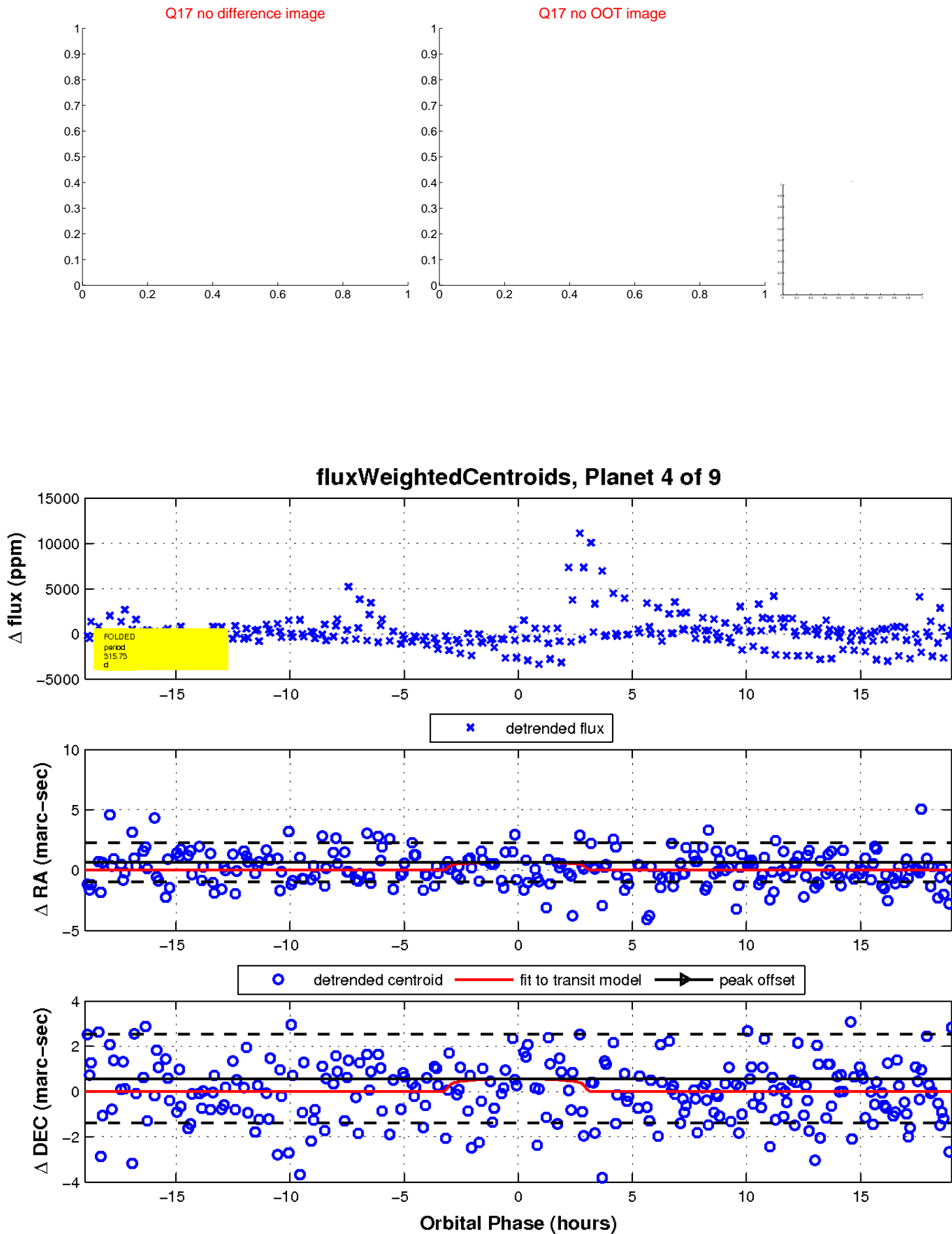
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

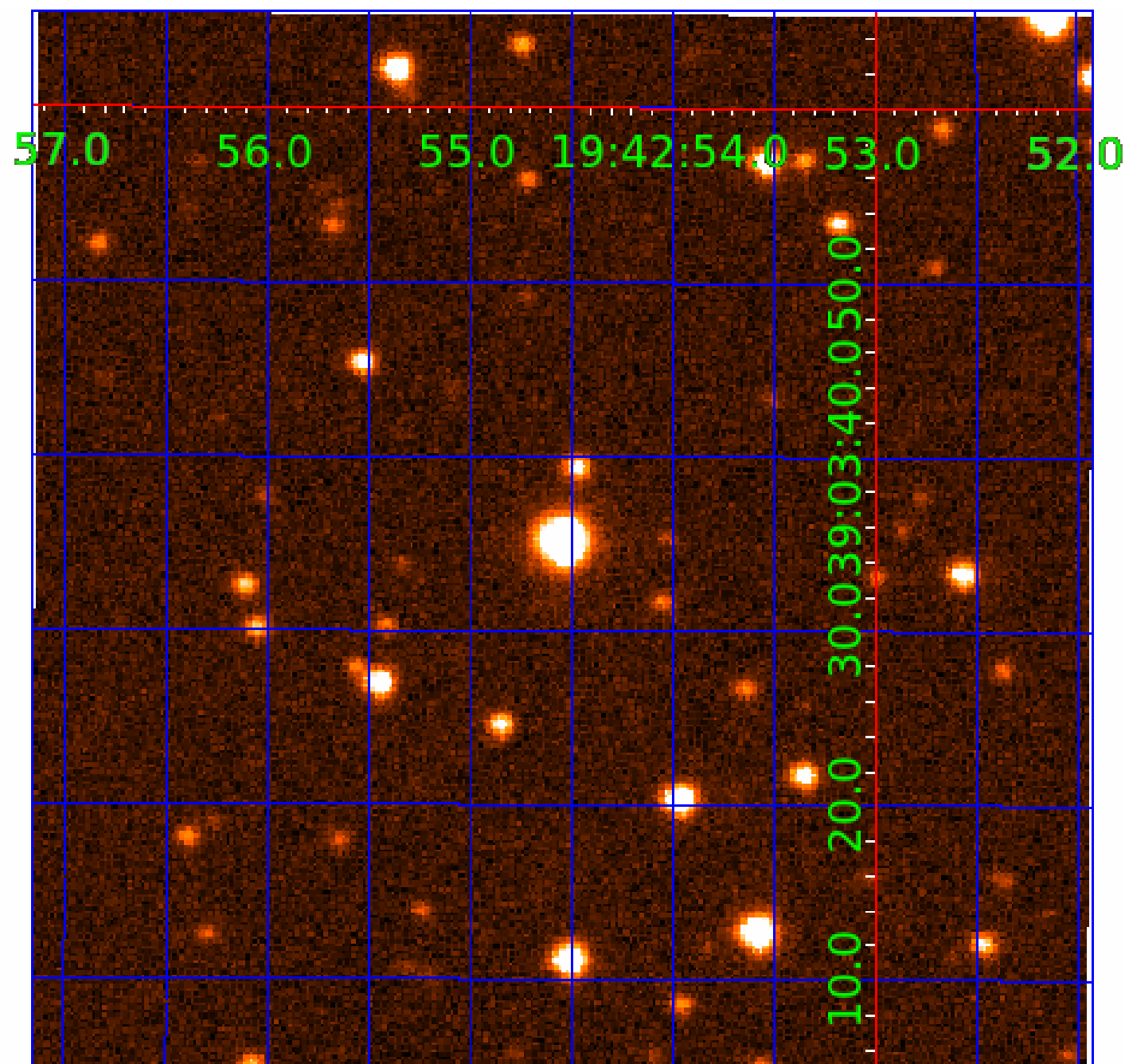


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination





# KIC 003971507

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
003971507-01	OBS	No	394.175282	419.606328	878.0	3.510	15.7	4.0	1.61	5455	5.49	2.05
003971507-03	OBS	No	376.226986	386.815500	1375.5	3.263	13.4	5.6	1.61	5455	6.19	2.18
003971507-04	OBS	No	315.734653	217.568312	1325.1	6.346	15.2	4.9	1.61	5455	5.96	2.75
003971507-05	OBS	No	420.997596	364.959213	1490.2	4.865	13.6	6.5	1.61	5455	6.23	1.88
003971507-06	OBS	No	323.681895	453.462898	1559.4	3.850	12.6	7.6	1.61	5455	6.54	2.66
003971507-08	OBS	No	407.493824	226.377902	940.2	3.862	13.1	3.4	1.61	5455	5.08	1.96
003971507-09	OBS	No	222.868839	227.780306	357.7	15.000	11.6	-1.0	1.61	5455	3.00	4.38

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
003971507-01	OBS	FP	0.00	1	0	1	0	INDIV_TRANS_MARSHALL_TRACKER—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS—HALO_GHOST
003971507-03	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
003971507-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES—LPP_DV—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS
003971507-05	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—MOD_POS_ALT
003971507-06	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL_SKYE—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS
003971507-08	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—CENT_FEW_DIFFS
003971507-09	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_MARSHALL_SKYE—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—CENT_NOFITS

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

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

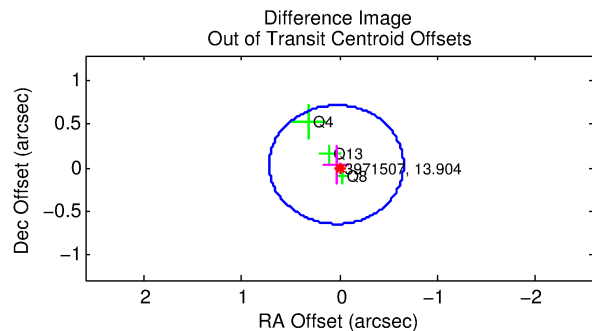
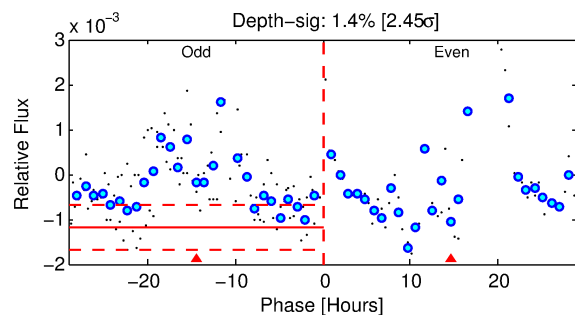
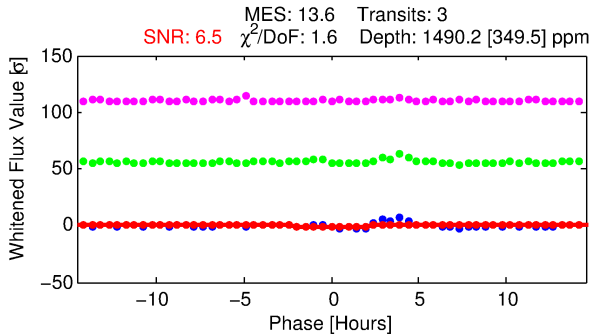
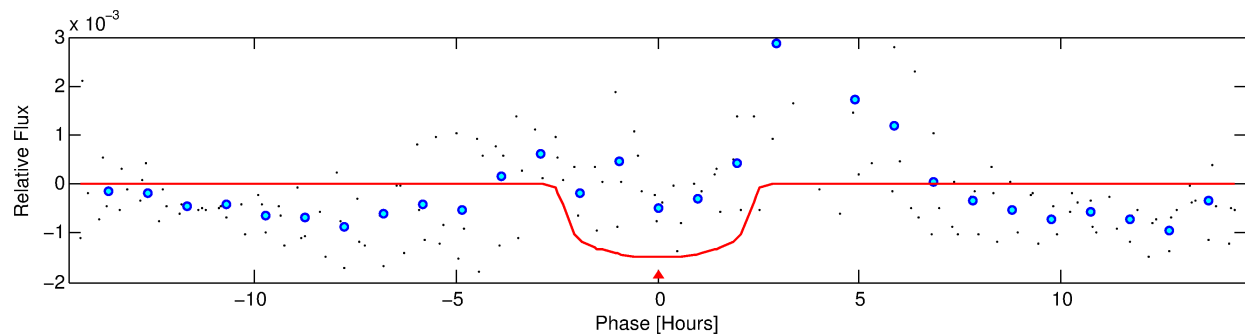
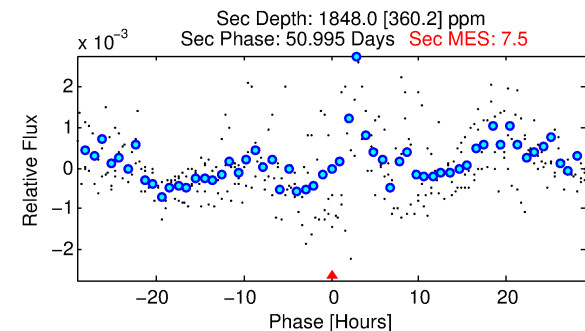
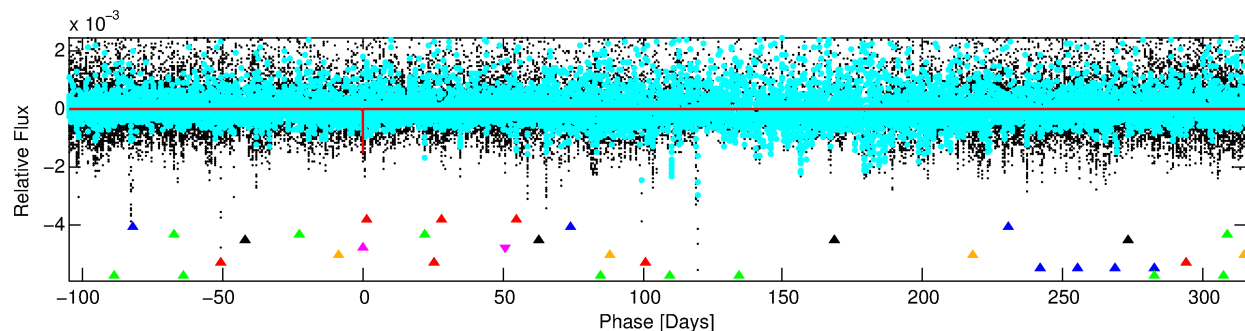
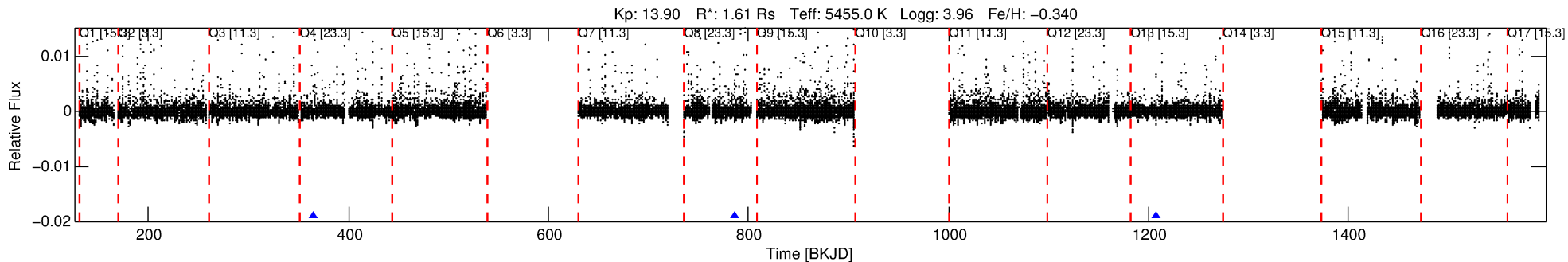
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 003971507-05

No Significant Match Found

# DV One-Page Summary

KIC: 3971507 Candidate: 5 of 9 Period: 420.998 d



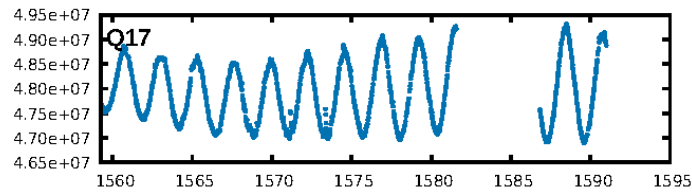
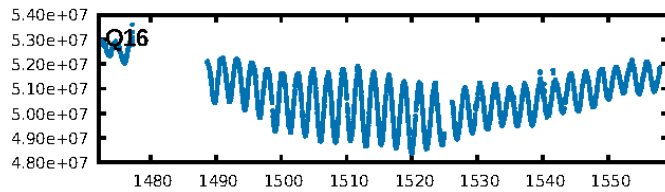
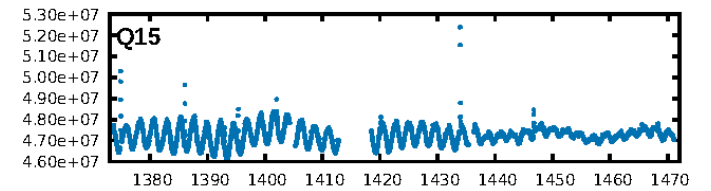
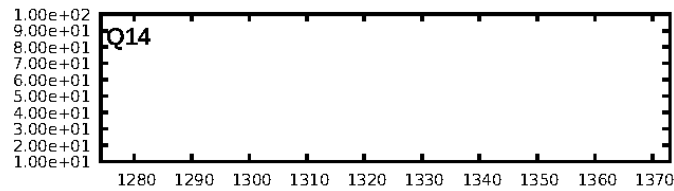
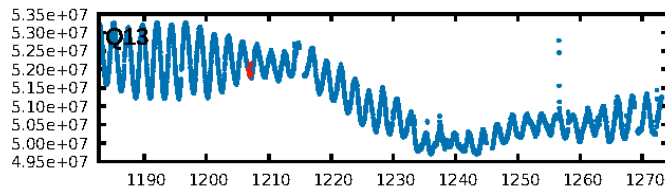
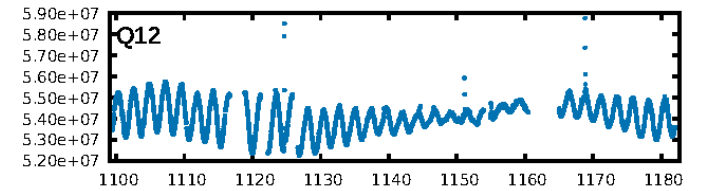
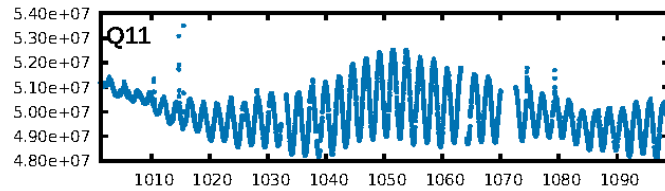
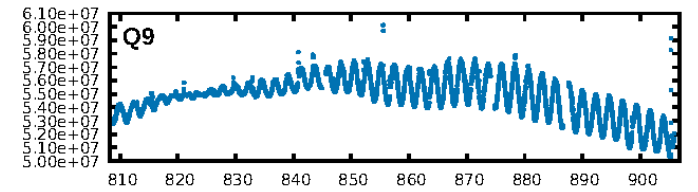
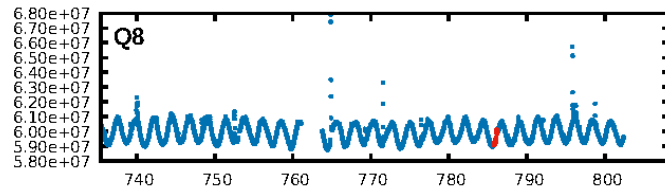
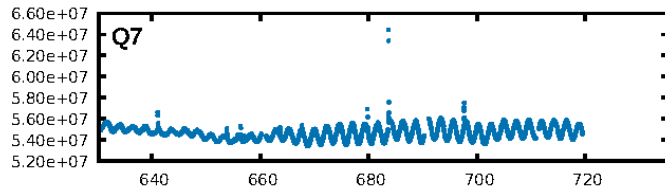
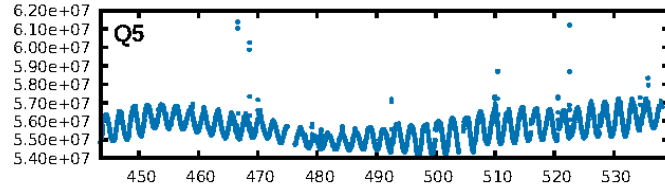
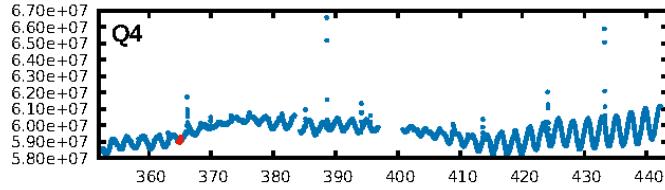
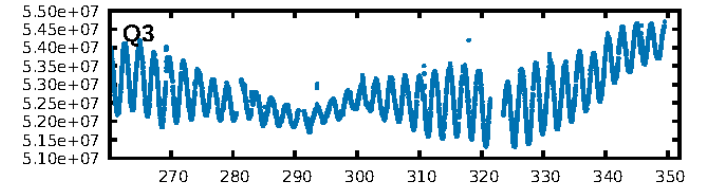
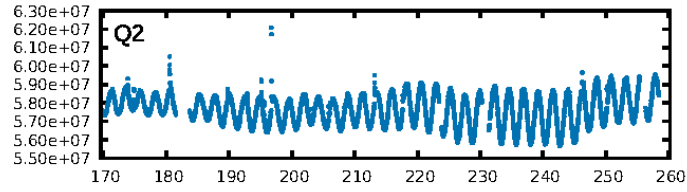
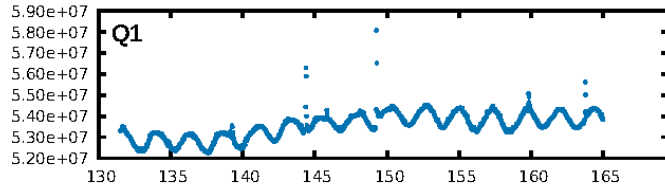
## DV Fit Results:

Period = 420.99760 [0.00702] d  
Epoch = 364.9592 [0.0085] BKJD  
Rp/R\* = 0.0355 [0.0476]  
a/R\* = 637.55 [3502.64]  
b = 0.38 [12.65]  
Seff = 1.88 [1.88]  
Teq = 298 [75] K  
Rp = 6.23 [9.03] Re  
a = 1.0453 [0.6174] AU  
Ag = 28649.18 [82169.36] [0.35σ]  
Teffp = 6002 [4042] K [1.41σ]

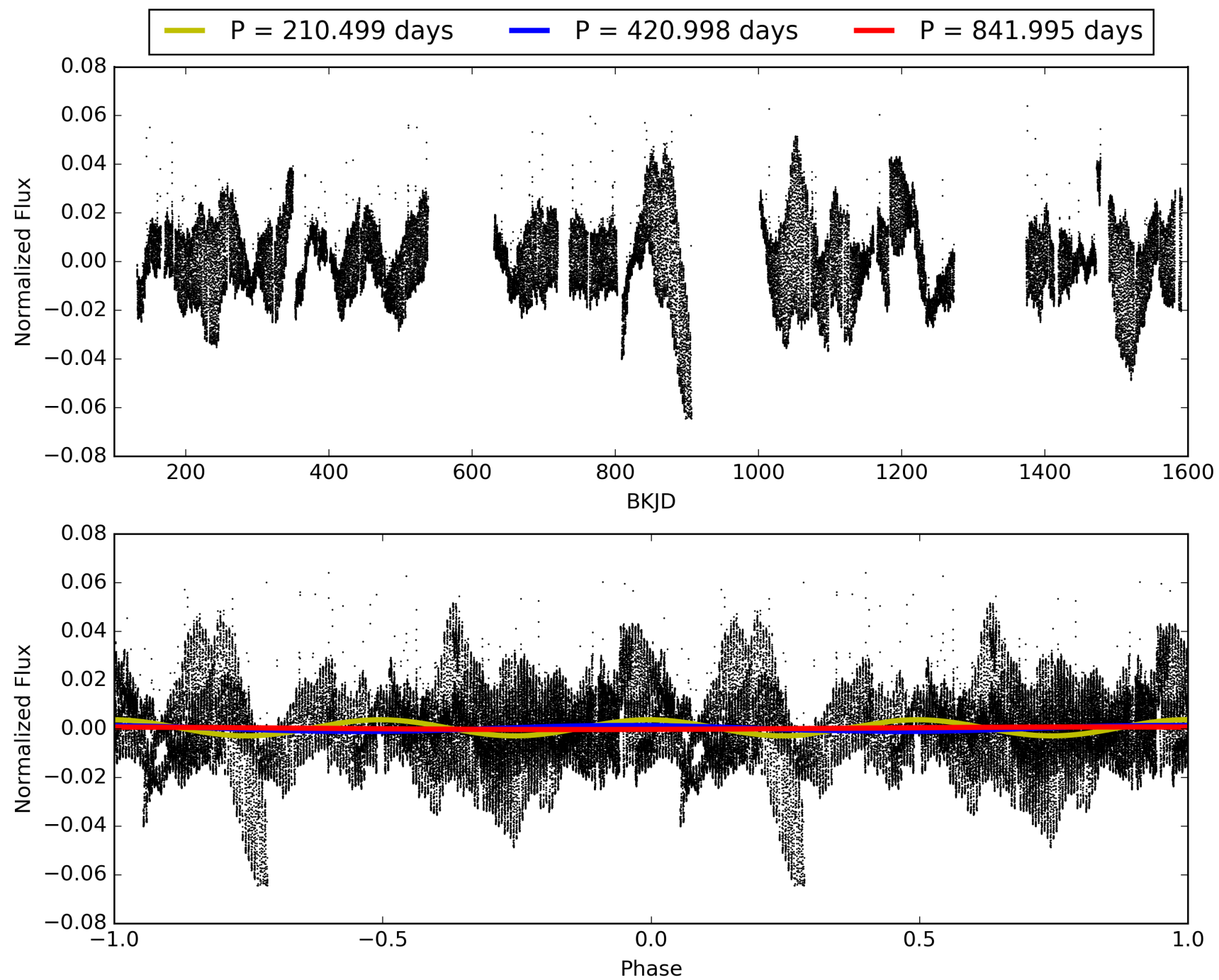
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [52.17σ]  
LongPeriod-sig: 100.0% [562.70σ]  
ModelChiSquare2-sig: 4.2%  
ModelChiSquareGof-sig: 32.4%  
**Bootstrap-pfa: 3.34e-10**  
RollingBand-fgt: 1.00 [3/3]  
GhostDiagnostic-chr: 1.375  
Centroid-sig: 82.5%  
Centroid-so: 0.141 arcsec [0.23σ]  
OotOffset-rm: 0.048 arcsec [0.21σ]  
KicOffset-rm: 0.120 arcsec [0.74σ]  
OotOffset-st: 0/0/2/1 [3]  
KicOffset-st: 0/0/2/1 [3]  
DiffImageQuality-fgm: 1.00 [3/3]  
DiffImageOverlap-fno: 1.00 [3/3]

# TCE 003971507-05, PDC Light Curves

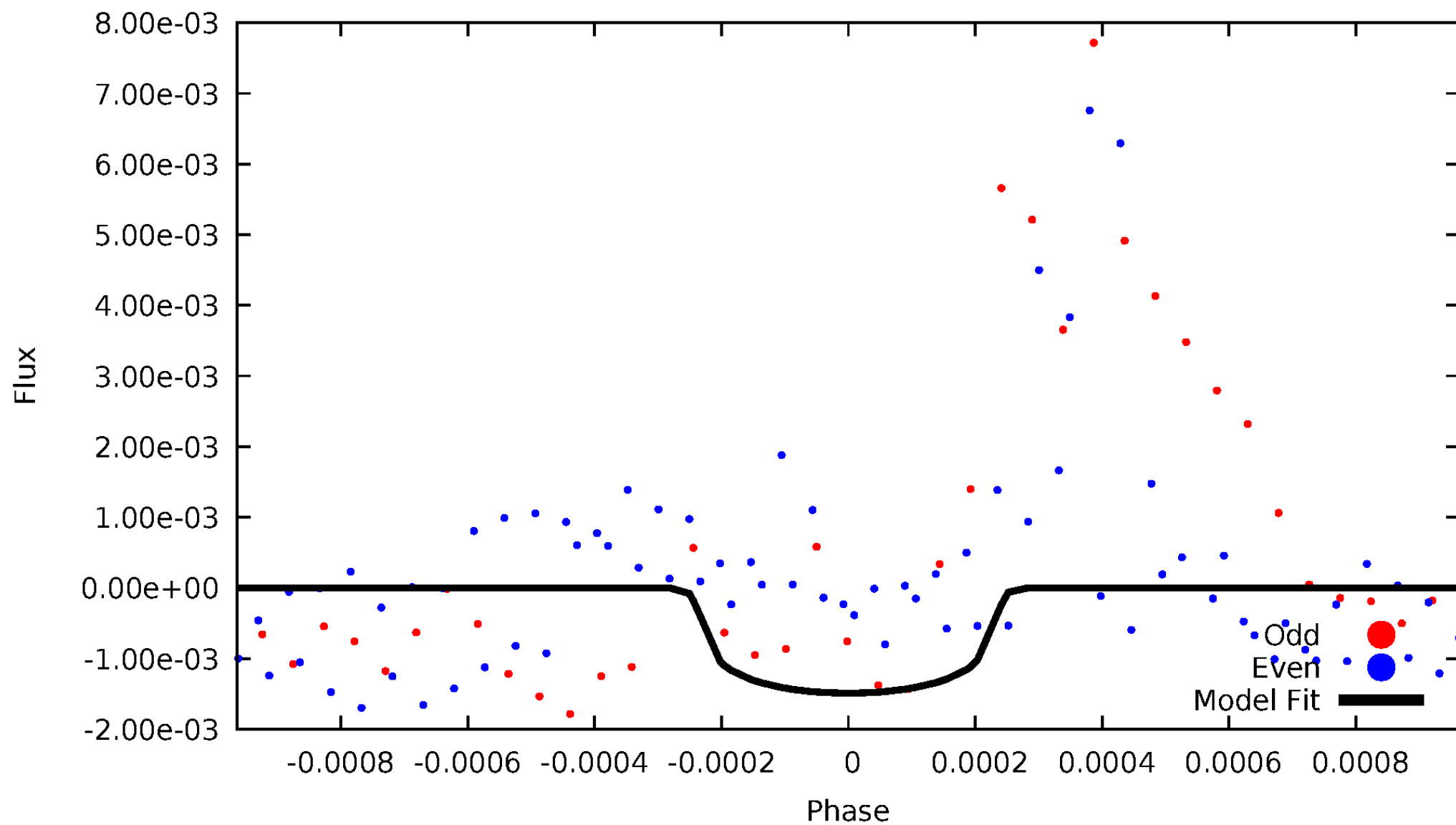


TCE 003971507-05



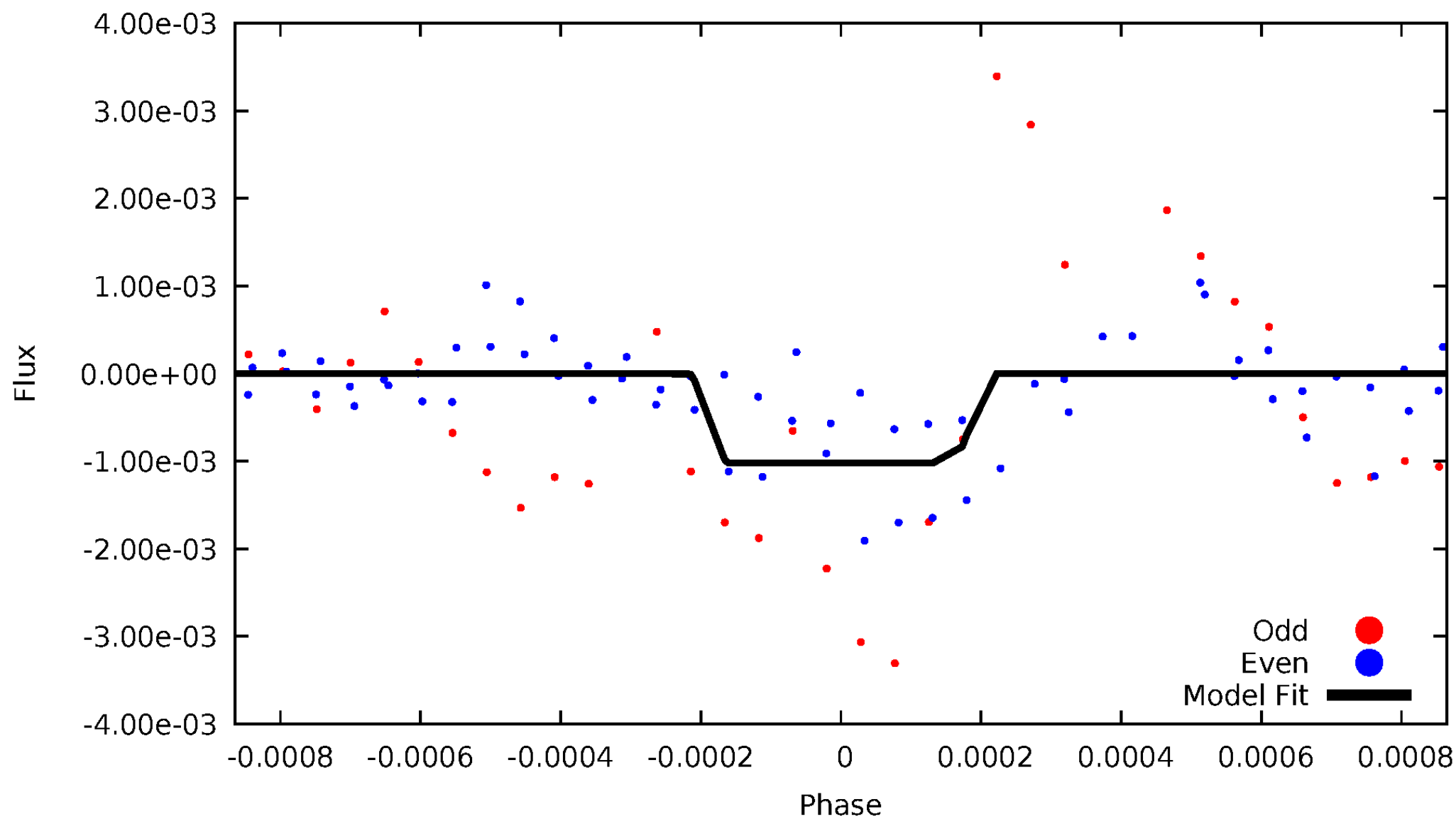
# DV Odd/Even

TCE 003971507-05



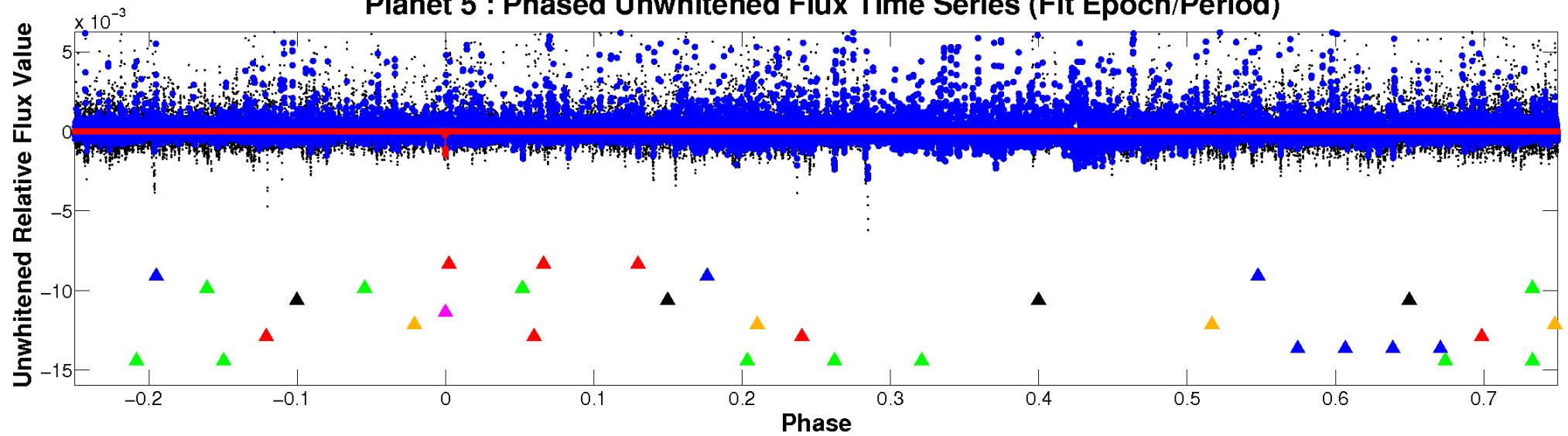
# ALT Odd/Even

TCE 003971507-05

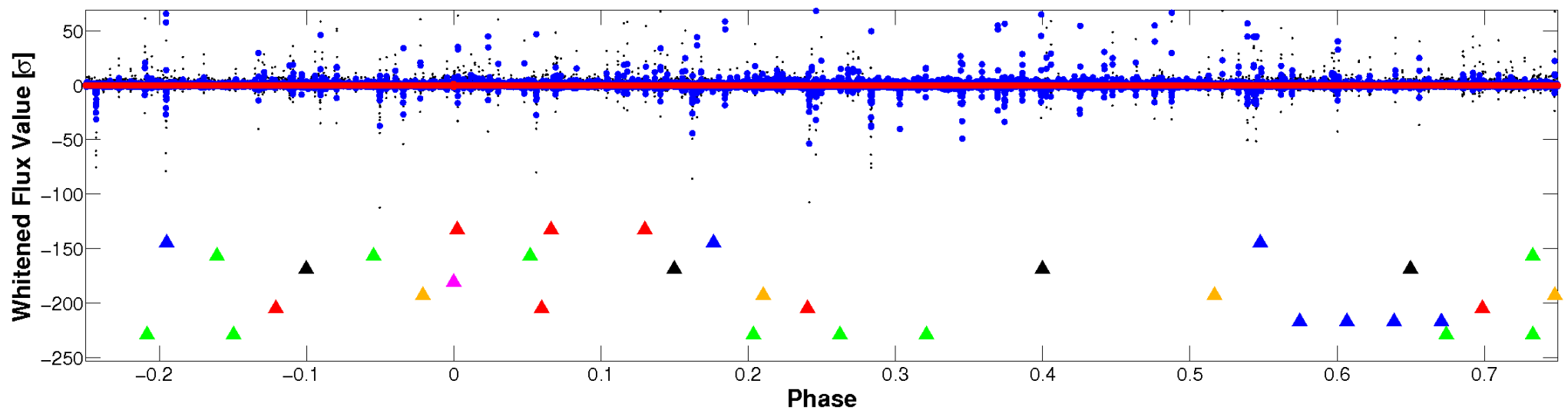


# Non-Whitened Vs. Whitened Light Curve

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

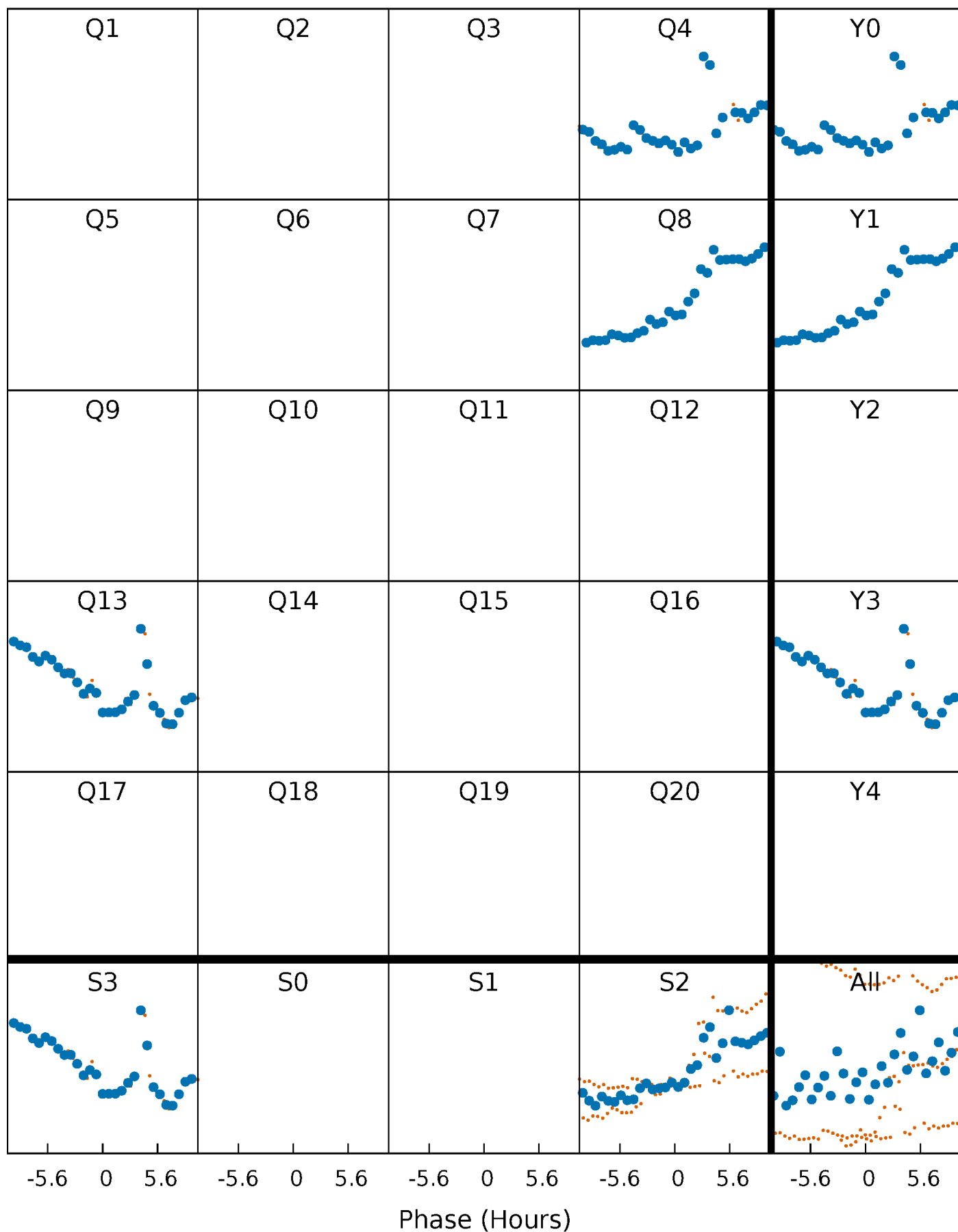


Planet 5 : Phased Whitened Flux Time Series (Fit Epoch/Period)



# PDC Quarter-Phased Transit Curves

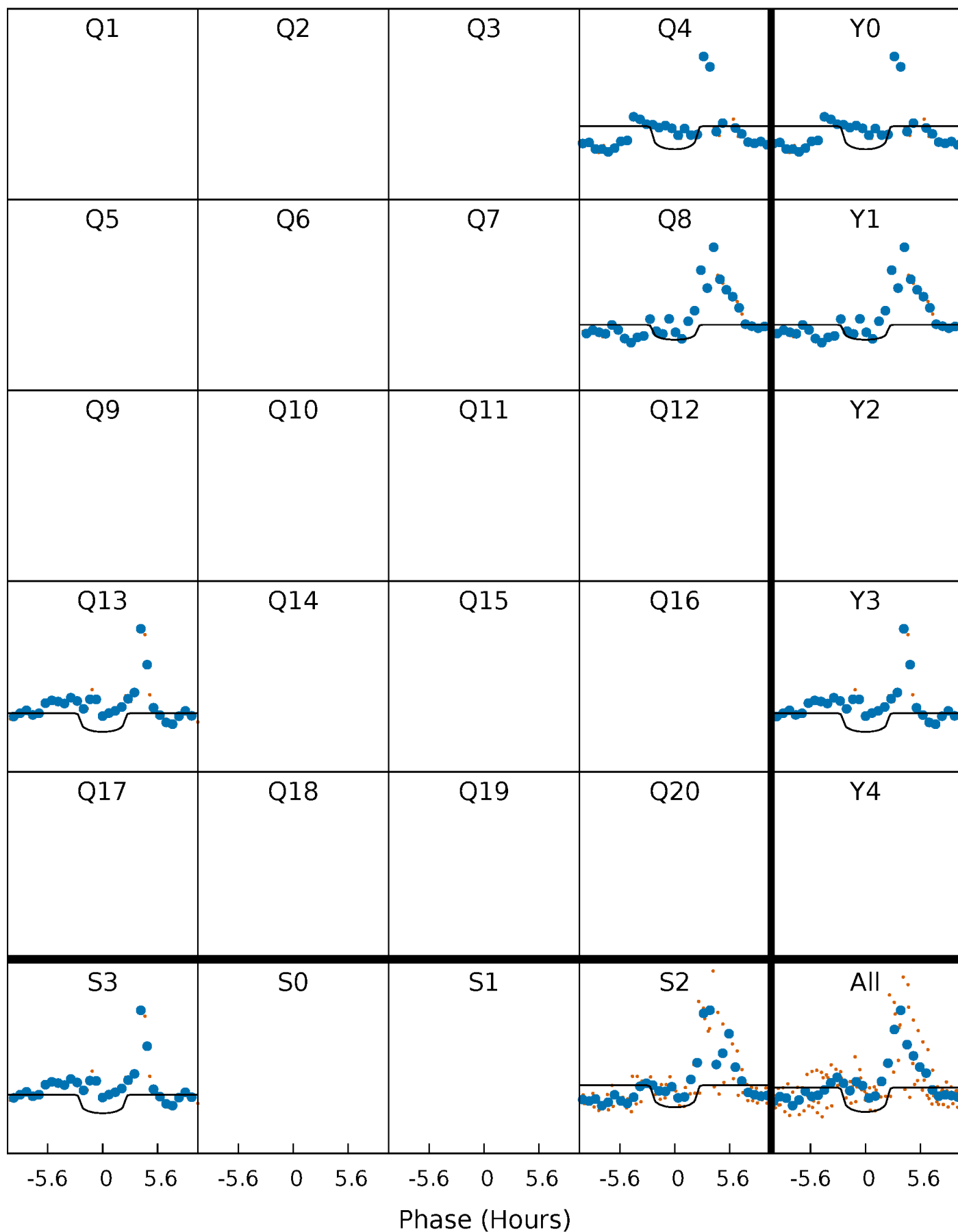
TCE 003971507-05     $P=420.997596$  Days     $T_0=364.959213$  (BKJD)





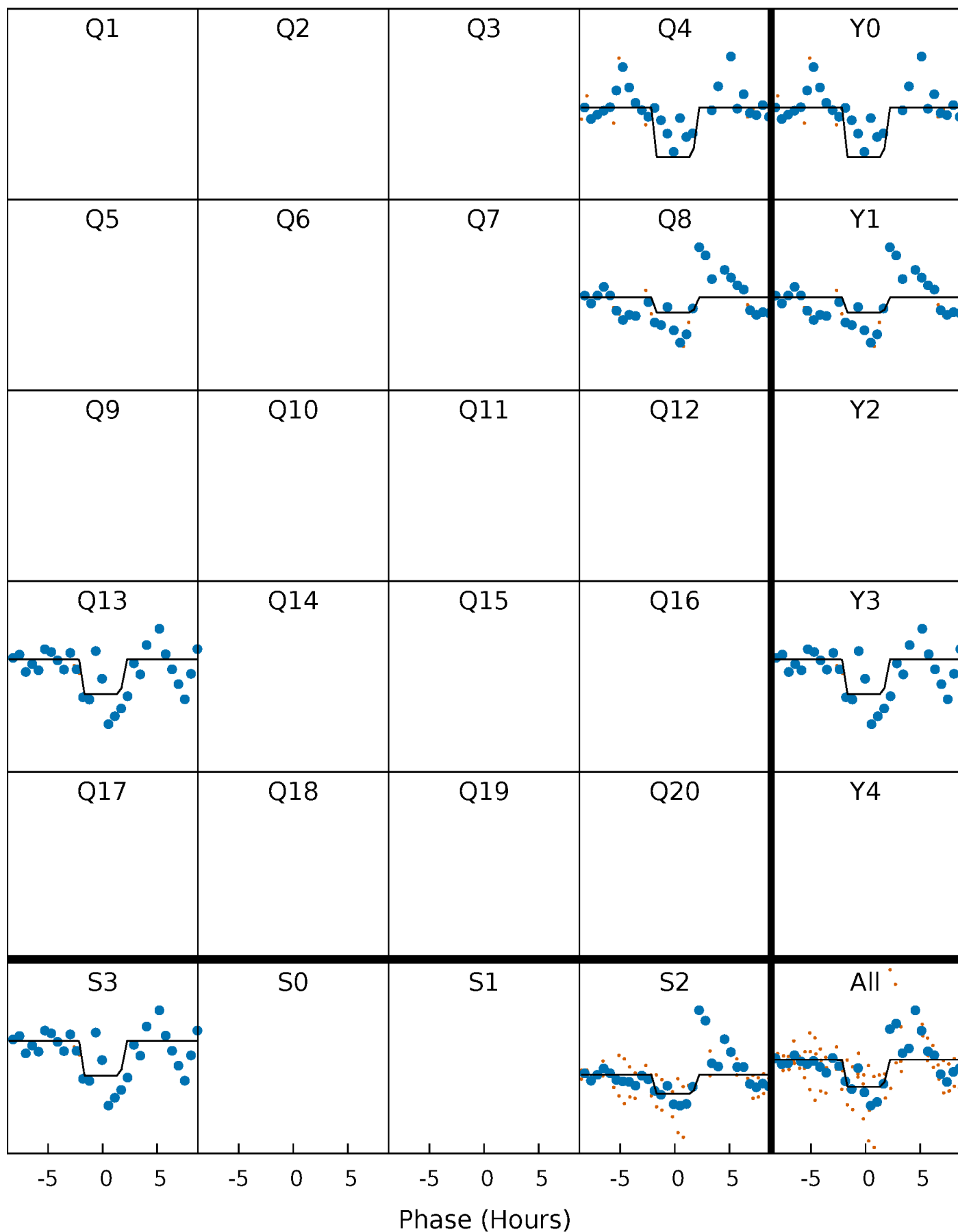
# DV Quarter-Phased Transit Curves

TCE 003971507-05     $P=420.997596$  Days     $T_0=364.959213$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

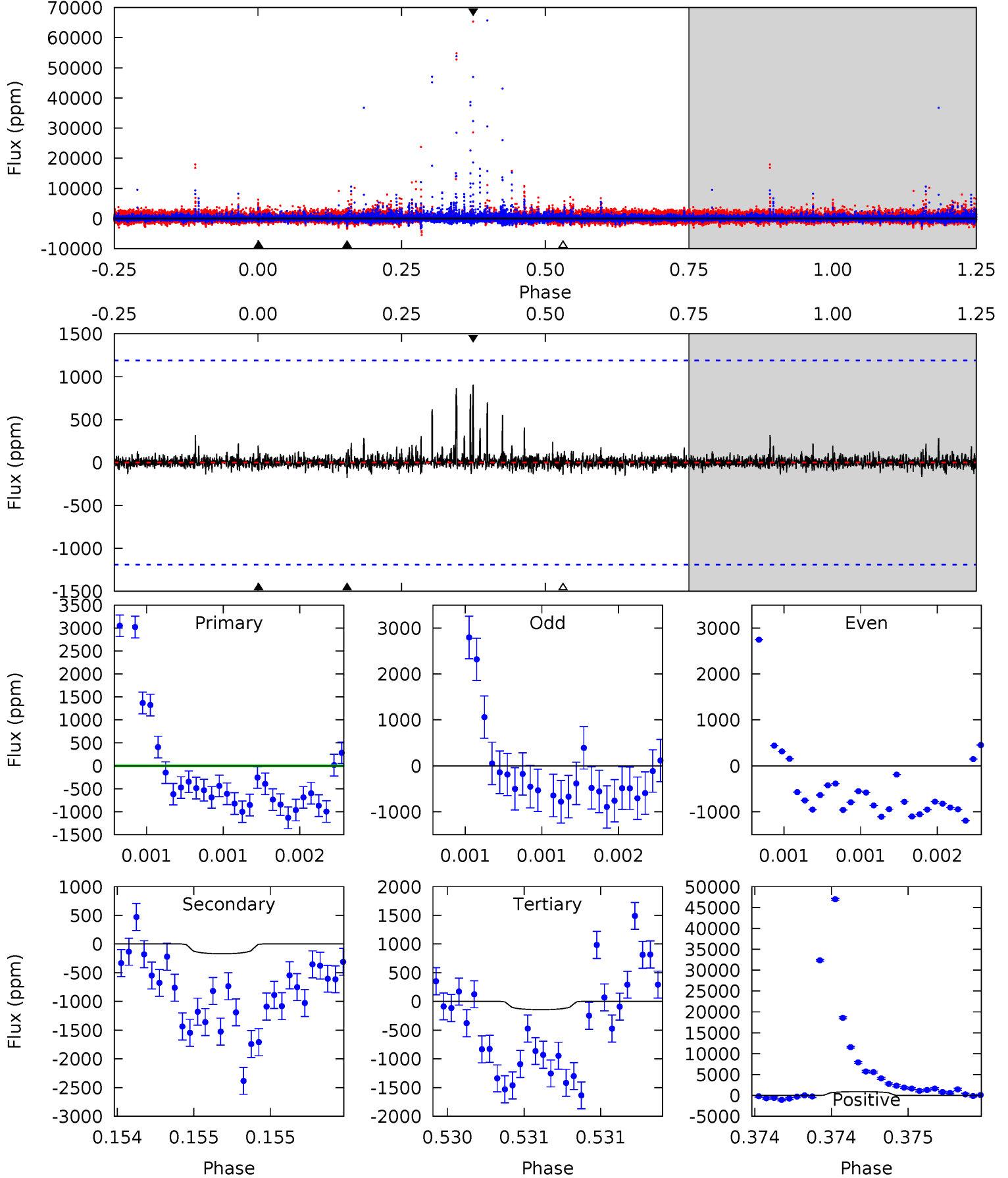
TCE 003971507-05     $P=420.972203$  Days     $T_0=364.992436$  (BKJD)



# DV Model-Shift Uniqueness Test

003971507-05, P = 420.997596 Days, E = 364.959213 Days

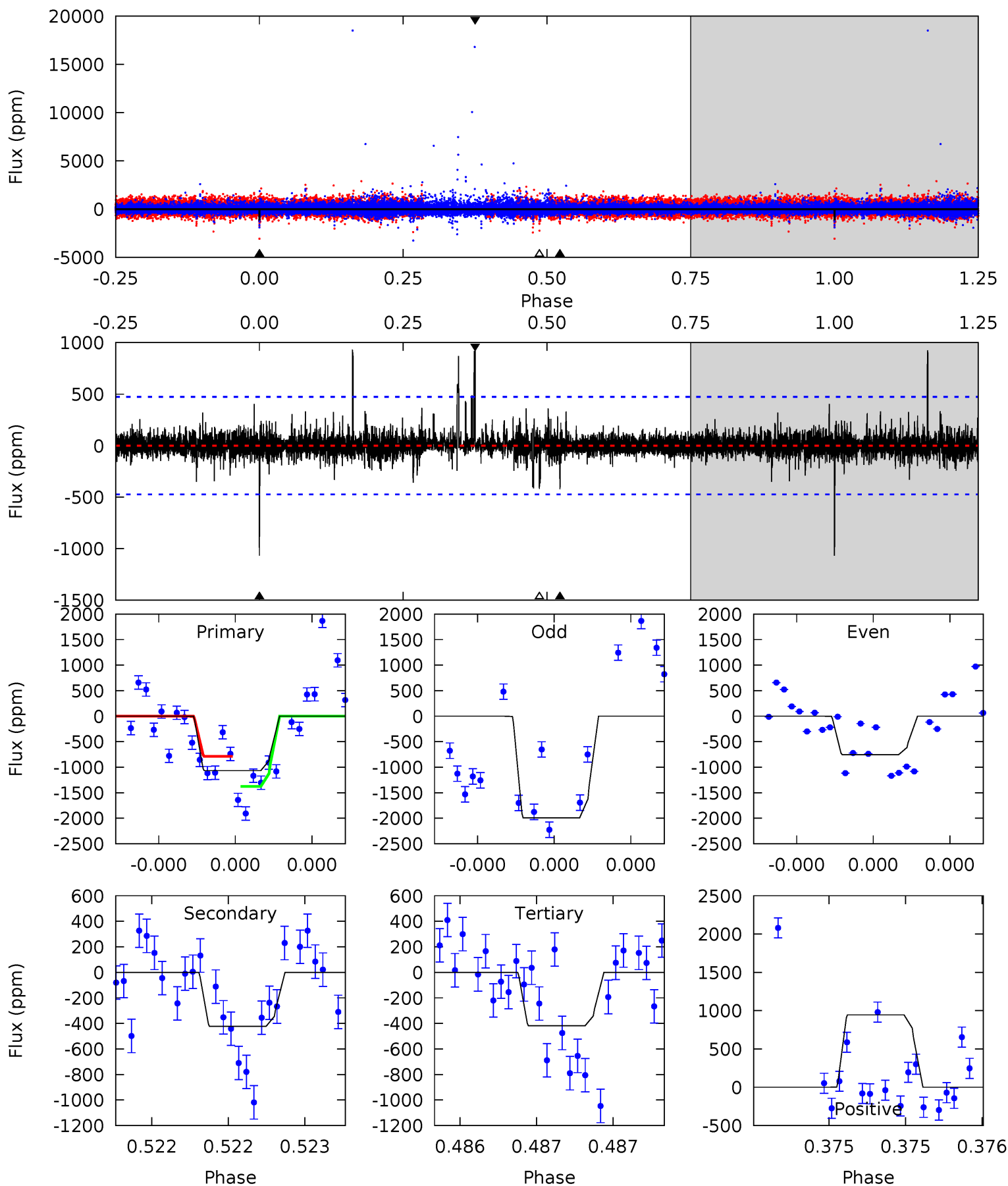
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
0.39	0.79	0.67	4.24	5.56	3.46	0.27	-0.28	-3.85	0.12	-3.45	0.28	0.13	0.84	0.38



# Alt Model-Shift Uniqueness Test

003971507-05, P = 420.972203 Days, E = 364.992436 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
12.7	5.01	4.96	11.2	5.61	3.54	0.86	7.70	1.46	0.05	-6.20	5.26	1.02	0.47	3.28



### Stellar Parameters For KIC 003971507

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$5455^{+190}_{-152}$	$3.960^{+0.602}_{-0.258}$	$-0.340^{+0.350}_{-0.250}$	$1.607^{+0.806}_{-0.887}$	$0.860^{+0.105}_{-0.105}$	$0.292^{+1.868}_{-0.192}$
	+3%/-3%	+15%/-7%	+103%/-74%	+50%/-55%	+12%/-12%	+640%/-66%
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 003971507-05 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-170 \pm 214$	$8.29^{+7.99}_{-5.64}$	$412^{+50}_{-64}$	$3128^{+1390}_{-5844}$	$1068^{+9992}_{-1355}$
Alt.	$-423 \pm 84$	$7.30^{+7.39}_{-4.99}$	$408^{+56}_{-58}$	$3989^{+2372}_{-780}$	$4799^{+45151}_{-3671}$

$T_{max}$  = 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

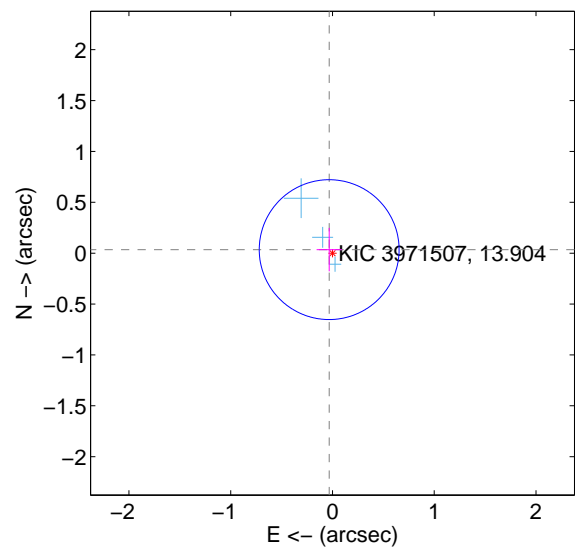
Supplemental centroid analysis for 003971507-05. Kepler magnitude: 13.90. Transit SNR 6.50

There are 3 quarters with good PRF difference image offsets

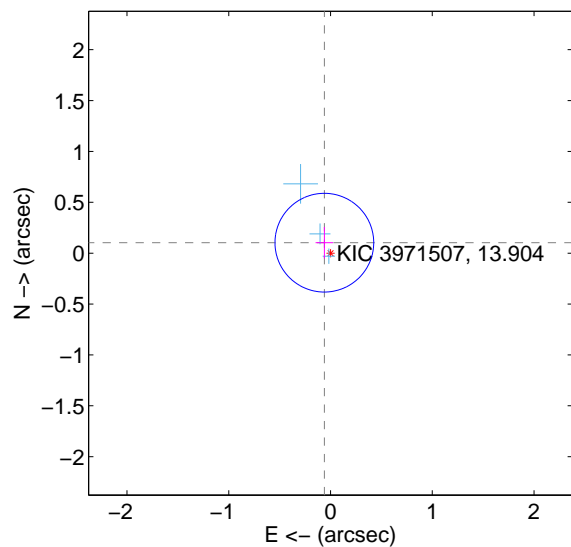
The direct PRF centroid is offset from the target star catalog position by about 0.03 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.048 \pm 0.229$	0.21	$0.032 \pm 0.124$	$0.035 \pm 0.213$
PRF-fit source offset from KIC position	$0.120 \pm 0.162$	0.74	$0.061 \pm 0.086$	$0.103 \pm 0.154$
photometric centroid source offset	$0.14 \pm 0.61$	0.23	$-0.14 \pm 0.62$	$-0.03 \pm 0.59$

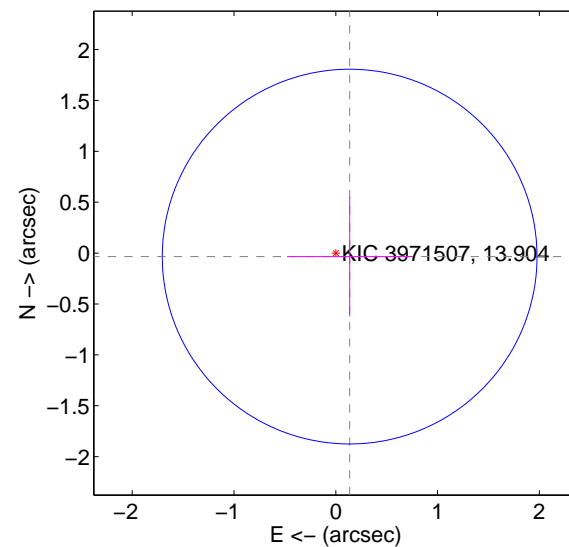
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position

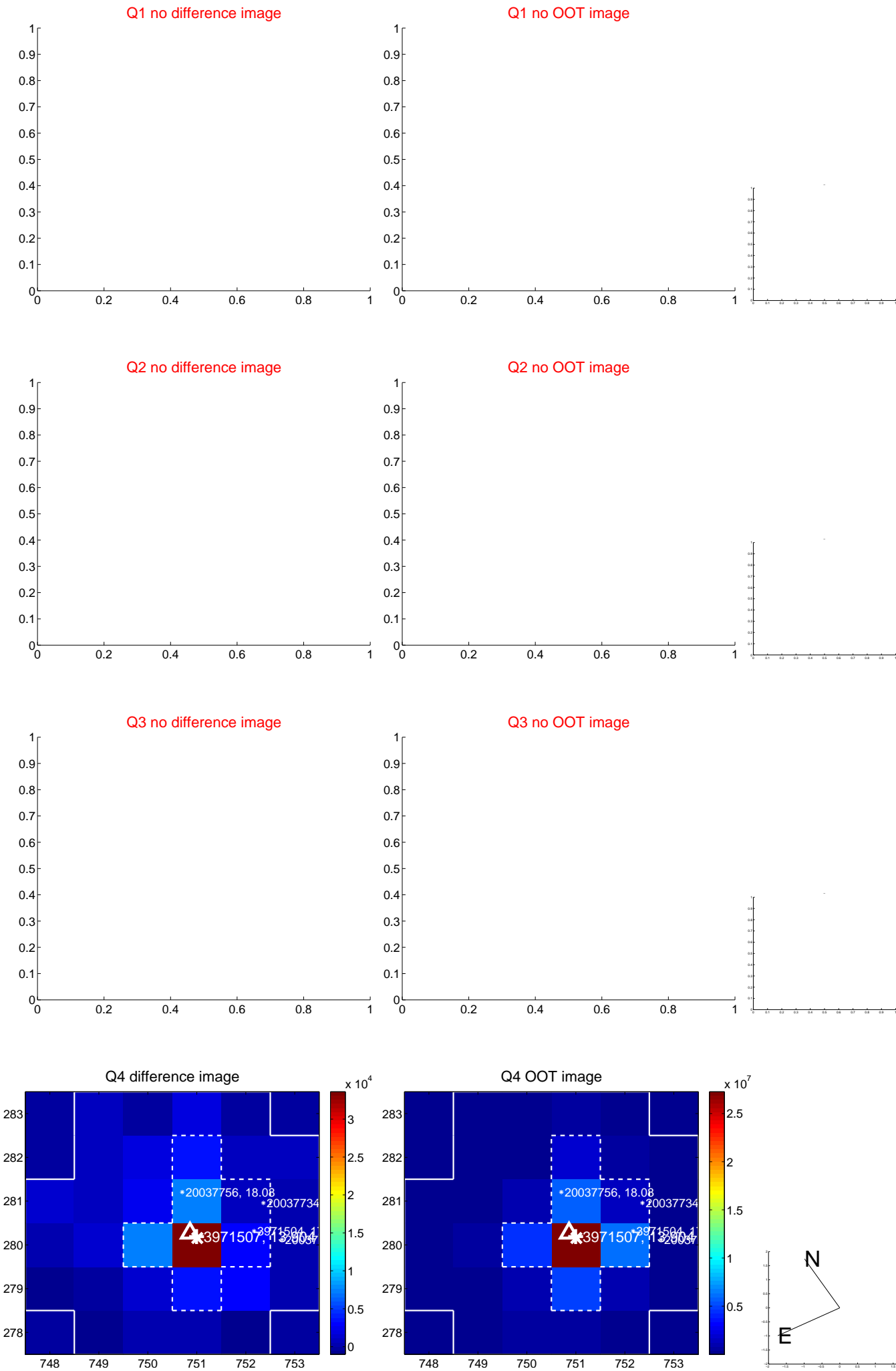


offset from photometric centroids

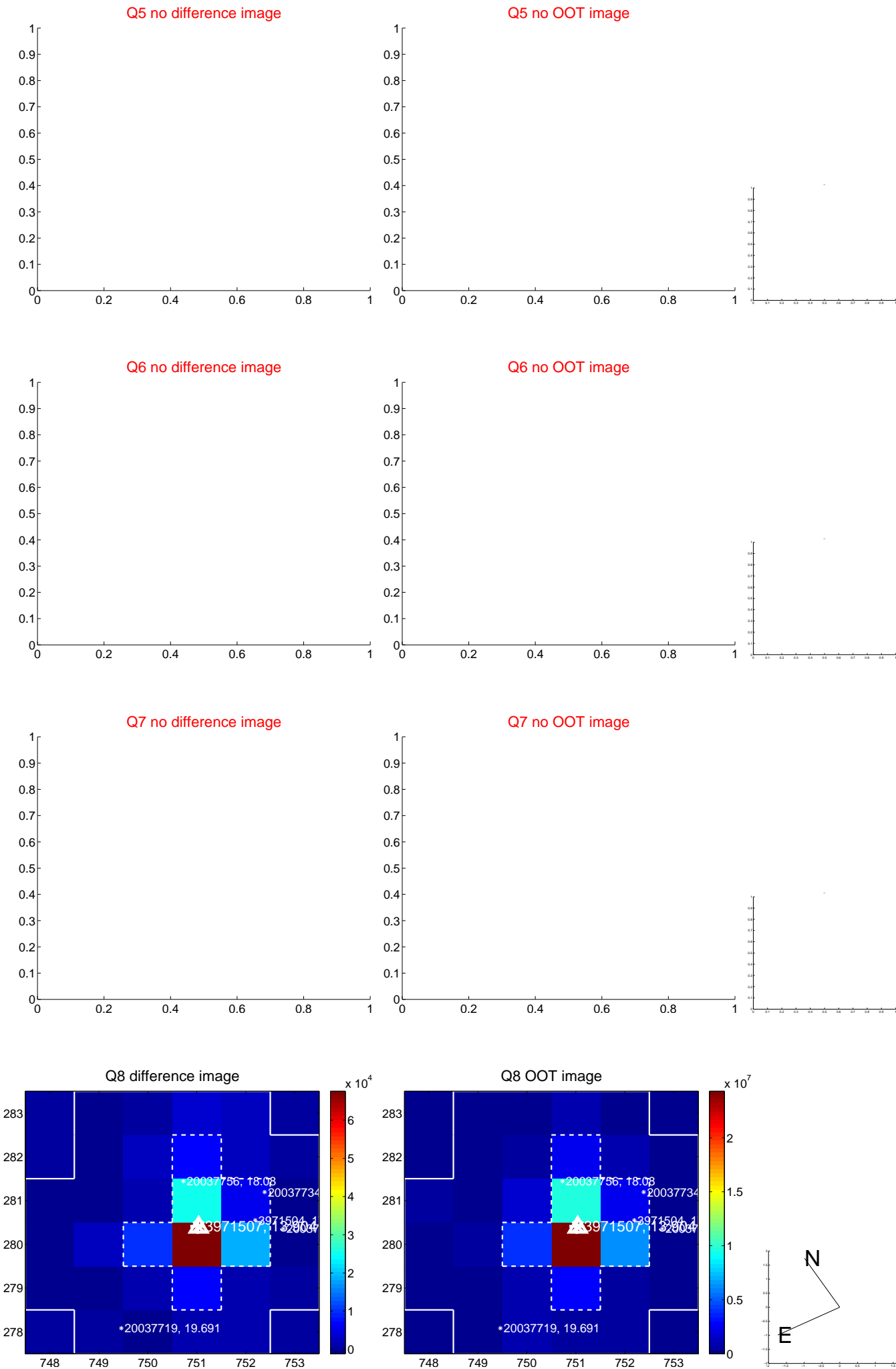


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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

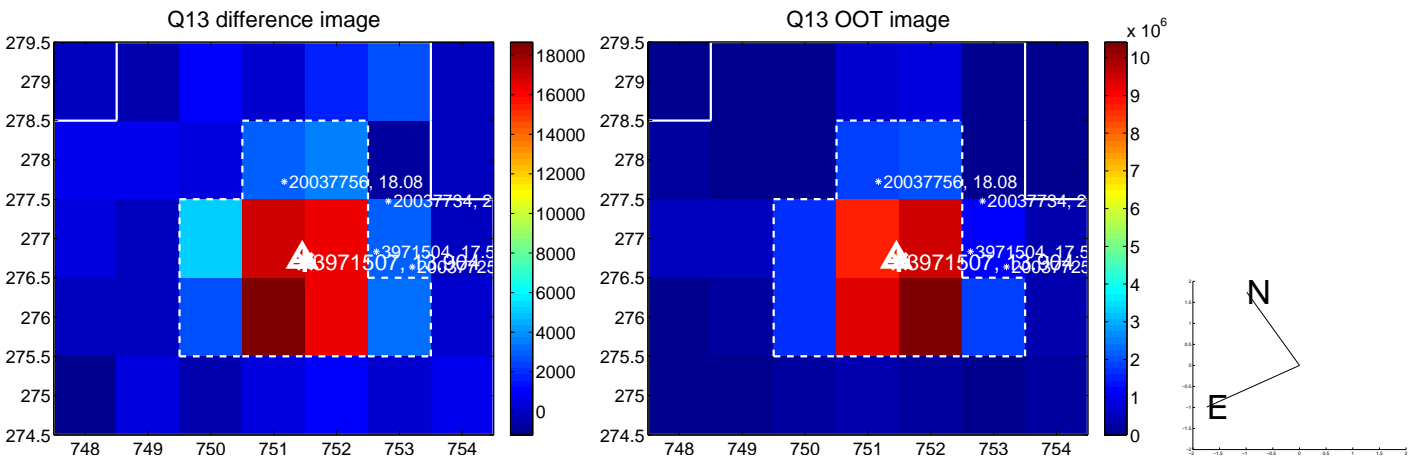




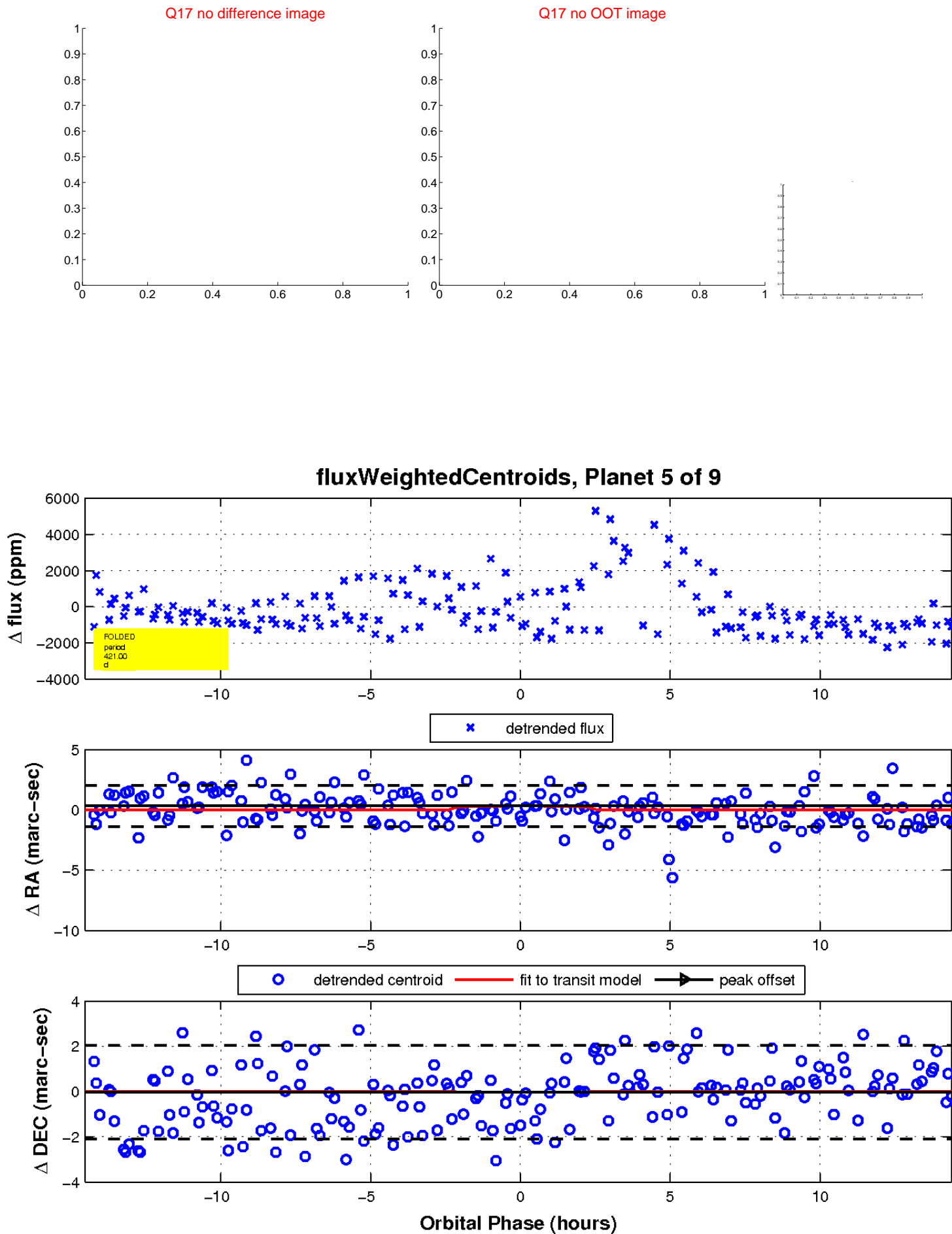
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

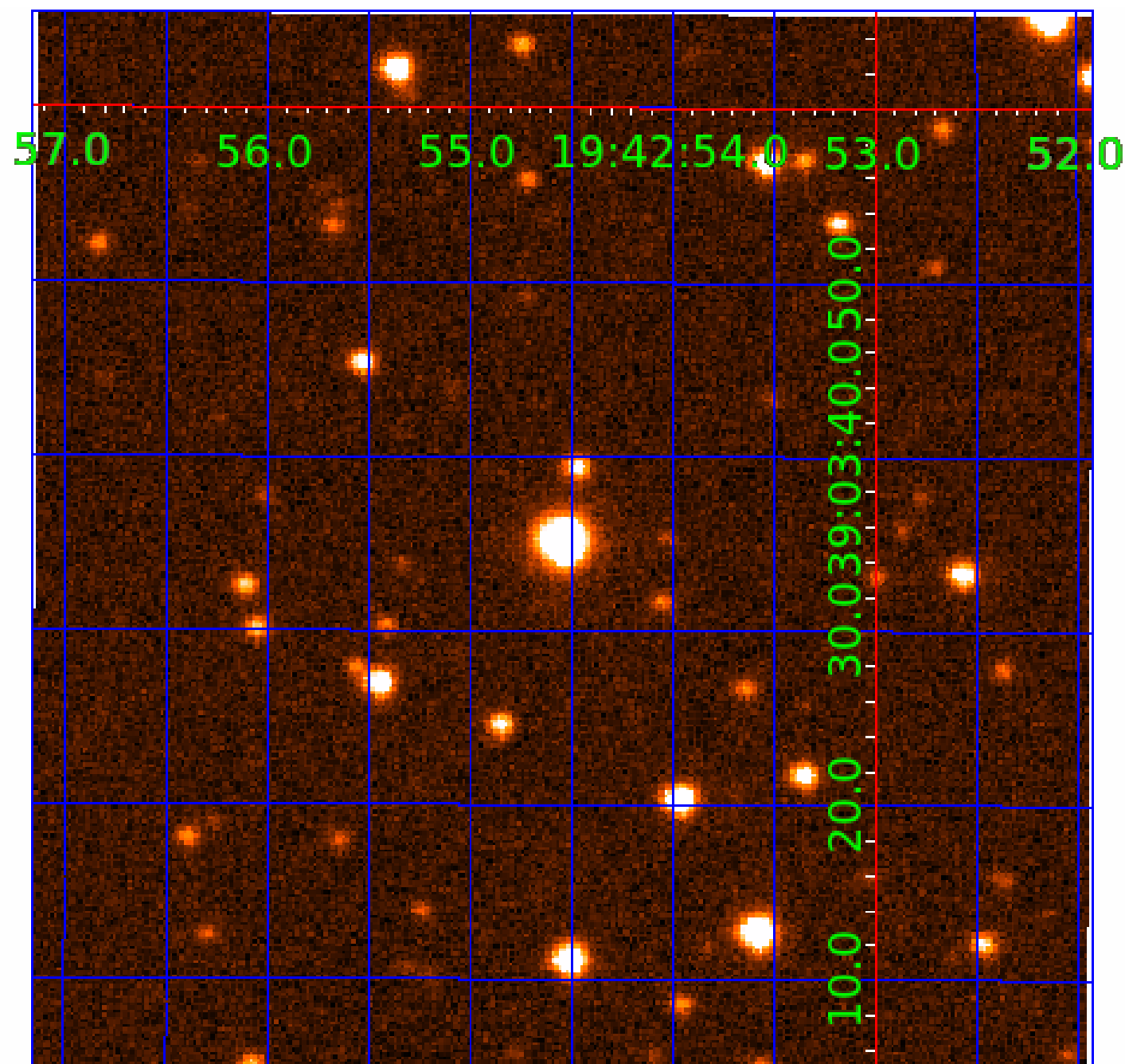


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination



# KIC 003971507

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
003971507-01	OBS	No	394.175282	419.606328	878.0	3.510	15.7	4.0	1.61	5455	5.49	2.05
003971507-03	OBS	No	376.226986	386.815500	1375.5	3.263	13.4	5.6	1.61	5455	6.19	2.18
003971507-04	OBS	No	315.734653	217.568312	1325.1	6.346	15.2	4.9	1.61	5455	5.96	2.75
003971507-05	OBS	No	420.997596	364.959213	1490.2	4.865	13.6	6.5	1.61	5455	6.23	1.88
003971507-06	OBS	No	323.681895	453.462898	1559.4	3.850	12.6	7.6	1.61	5455	6.54	2.66
003971507-08	OBS	No	407.493824	226.377902	940.2	3.862	13.1	3.4	1.61	5455	5.08	1.96
003971507-09	OBS	No	222.868839	227.780306	357.7	15.000	11.6	-1.0	1.61	5455	3.00	4.38

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
003971507-01	OBS	FP	0.00	1	0	1	0	INDIV_TRANS_MARSHALL_TRACKER—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS—HALO_GHOST
003971507-03	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
003971507-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES—LPP_DV—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS
003971507-05	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—MOD_POS_ALT
003971507-06	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL_SKYE—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS
003971507-08	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—CENT_FEW_DIFFS
003971507-09	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_MARSHALL_SKYE—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—CENT_NOFITS

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

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

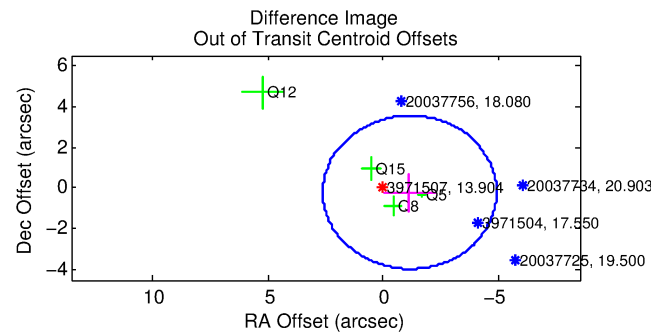
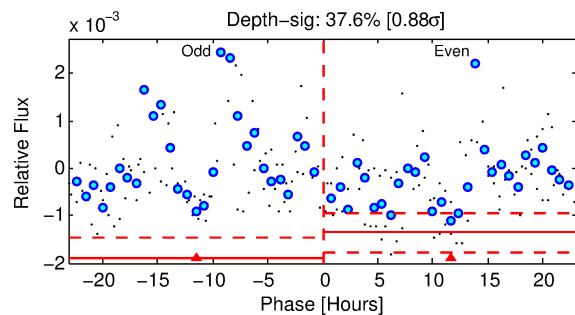
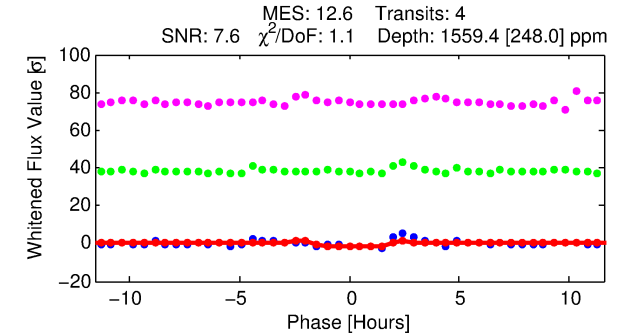
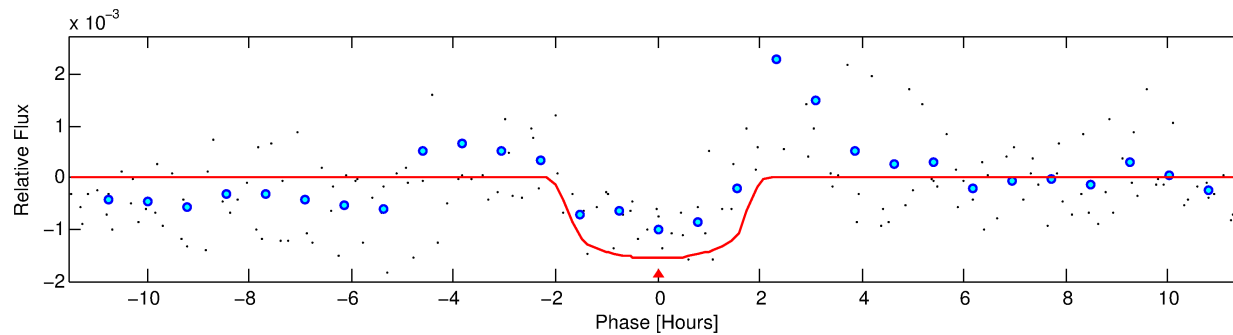
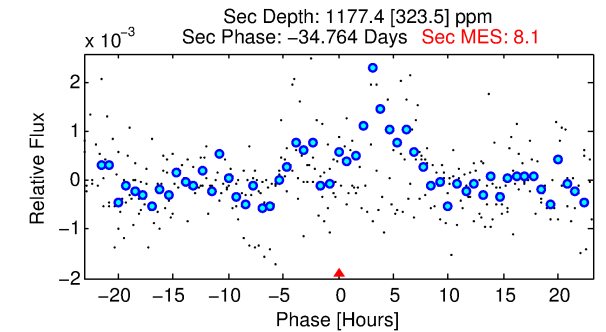
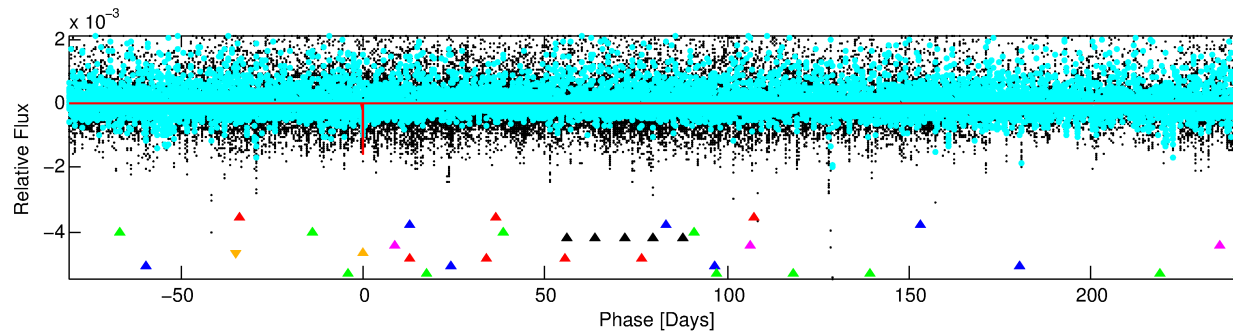
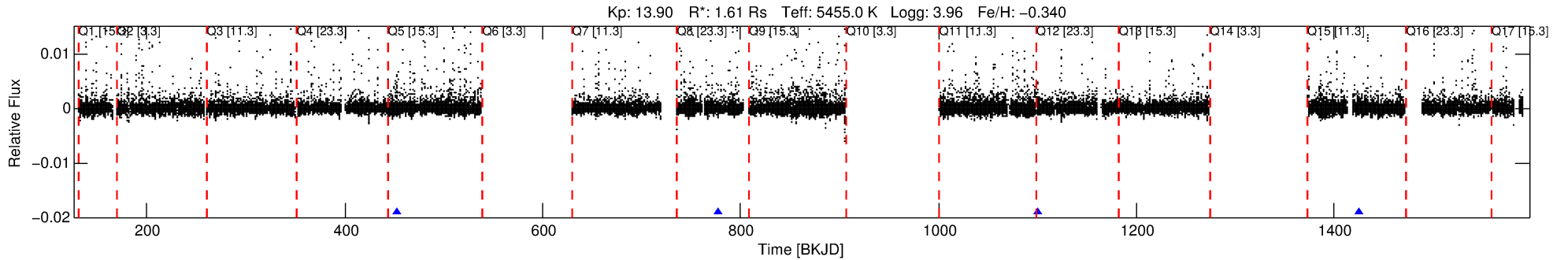
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 003971507-06

No Significant Match Found

# DV One-Page Summary

KIC: 3971507 Candidate: 6 of 9 Period: 323.682 d



## DV Fit Results:

Period = 323.68189 [0.00405] d  
Epoch = 453.4629 [0.0071] BKJD  
Rp/R\* = 0.0373 [0.0300]  
a/R\* = 560.65 [1838.98]  
b = 0.56 [4.07]  
Seff = 2.66 [2.67]  
Teq = 326 [82] K  
Rp = 6.54 [6.38] Re  
a = 0.8772 [0.5182] AU  
Ag = 11646.63 [22239.97] [0.52σ]  
Teffp = 5232 [2140] K [2.29σ]

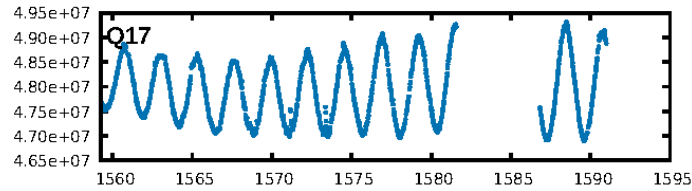
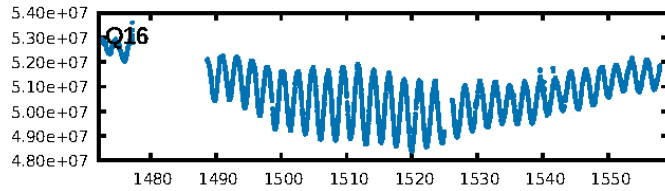
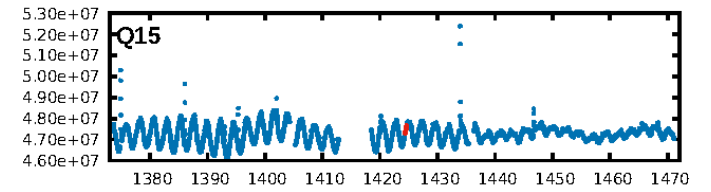
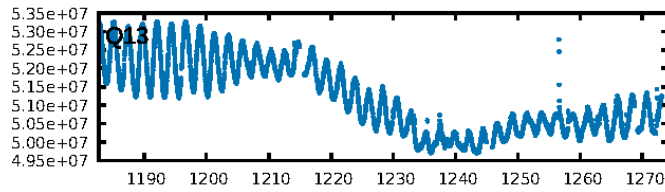
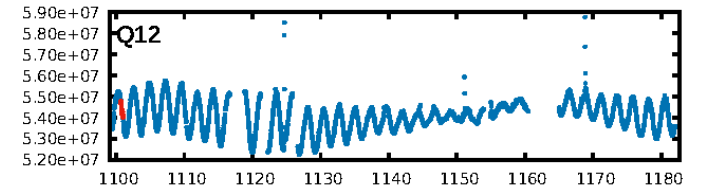
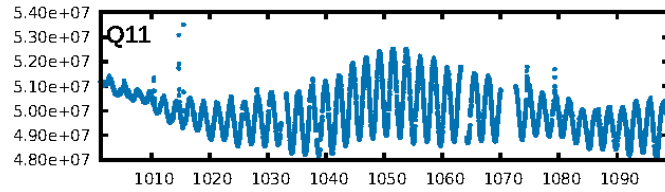
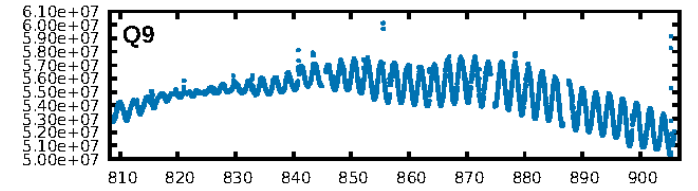
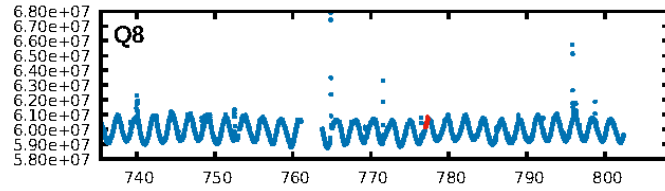
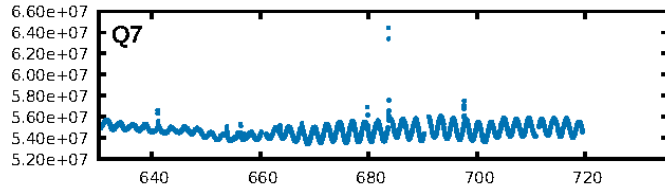
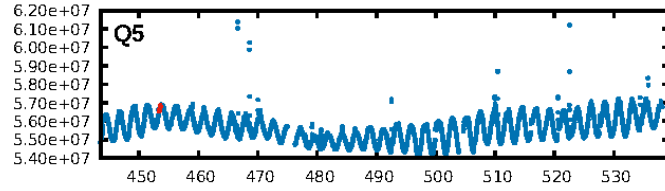
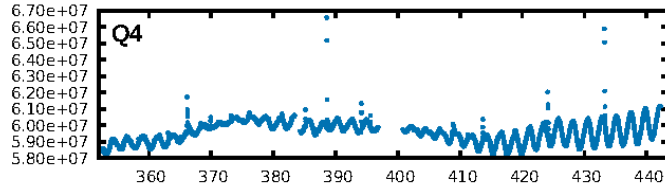
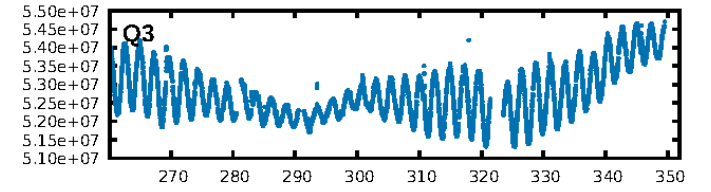
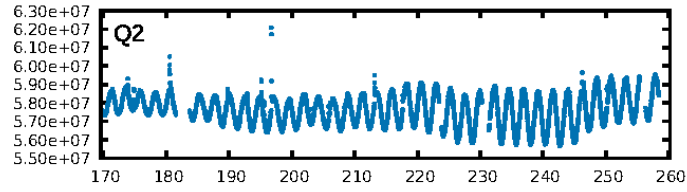
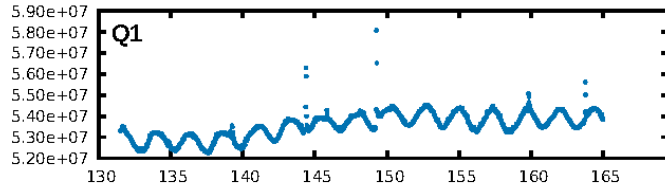
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [25.69σ]  
LongPeriod-sig: 100.0% [35.26σ]  
ModelChiSquare2-sig: 23.2%  
ModelChiSquareGof-sig: 99.8%  
**Bootstrap-pfa: 1.02e-09**  
RollingBand-fgt: 1.00 [4/4]  
GhostDiagnostic-chr: 1.402  
Centroid-sig: 50.4%  
Centroid-so: 0.436 arcsec [0.83σ]  
OotOffset-rm: 1.157 arcsec [0.92σ]  
OotOffset-st: 0/1/2/1 [4]  
KicOffset-rm: 1.131 arcsec [0.85σ]  
OotOffset-st: 0/1/2/1 [4]  
DiffImageQuality-fgm: 0.00 [0/4]  
DiffImageOverlap-fno: 1.00 [4/4]

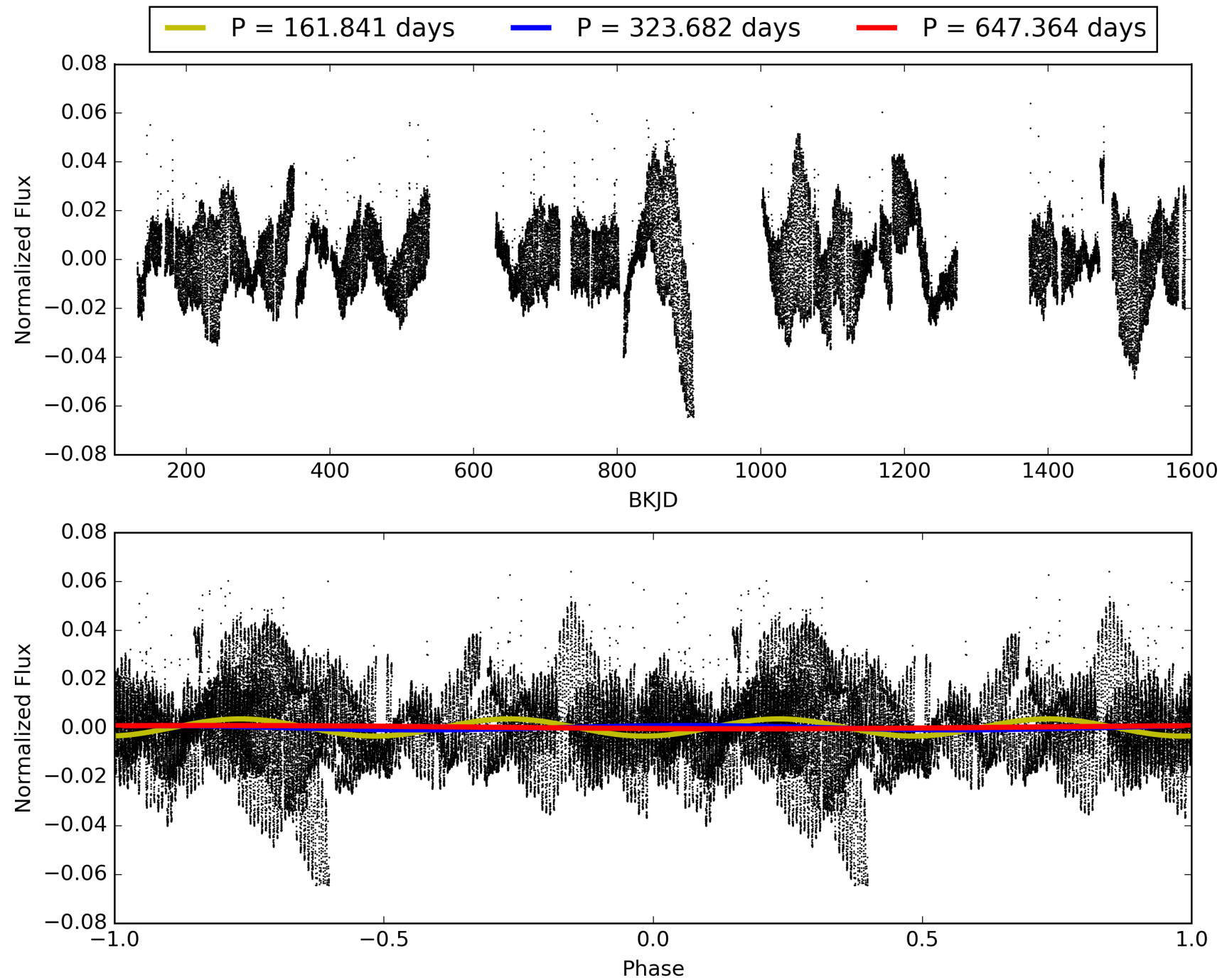
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 31-Jan-2016 05:54:59 Z

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

# TCE 003971507-06, PDC Light Curves



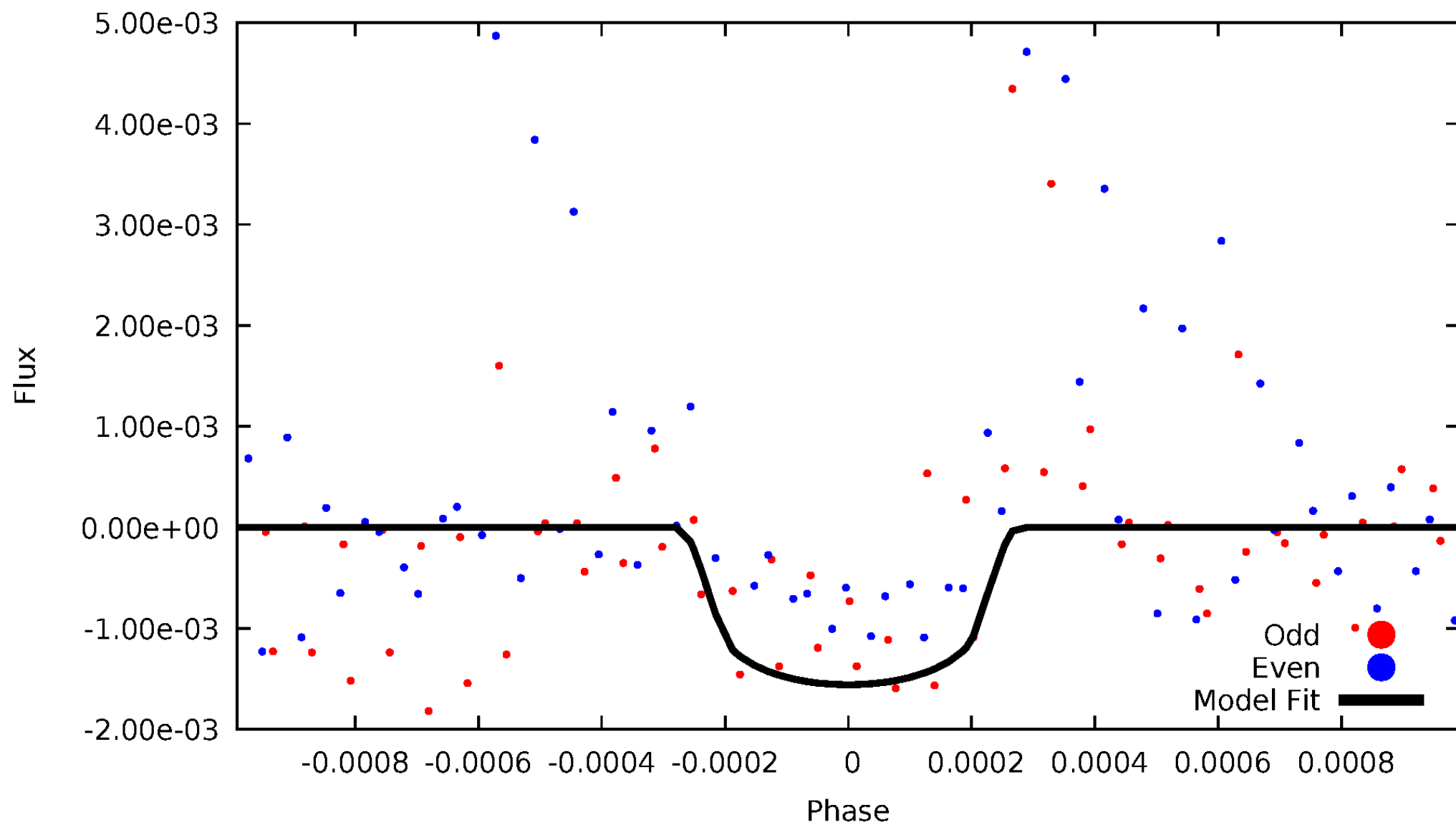
TCE 003971507-06





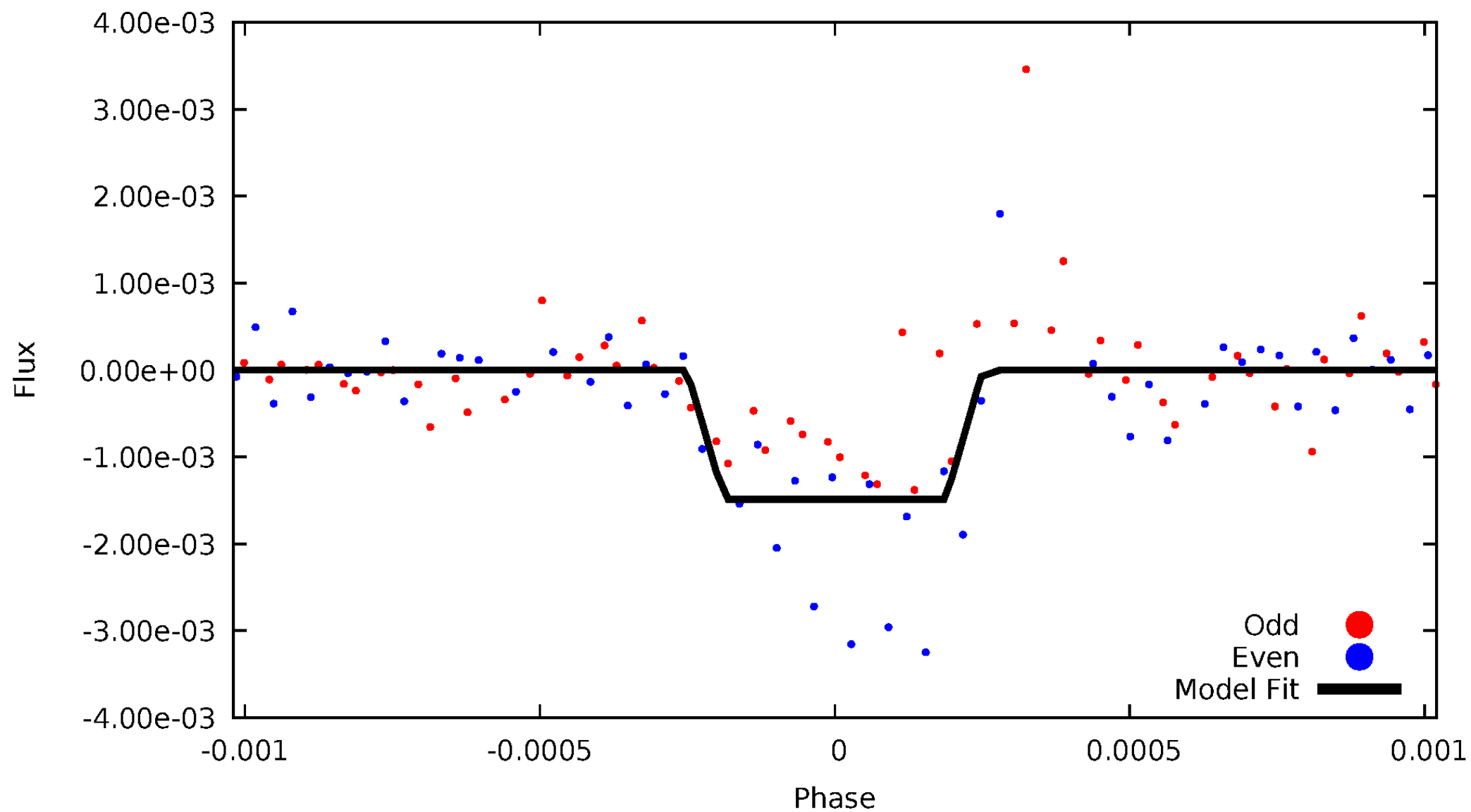
# DV Odd/Even

TCE 003971507-06



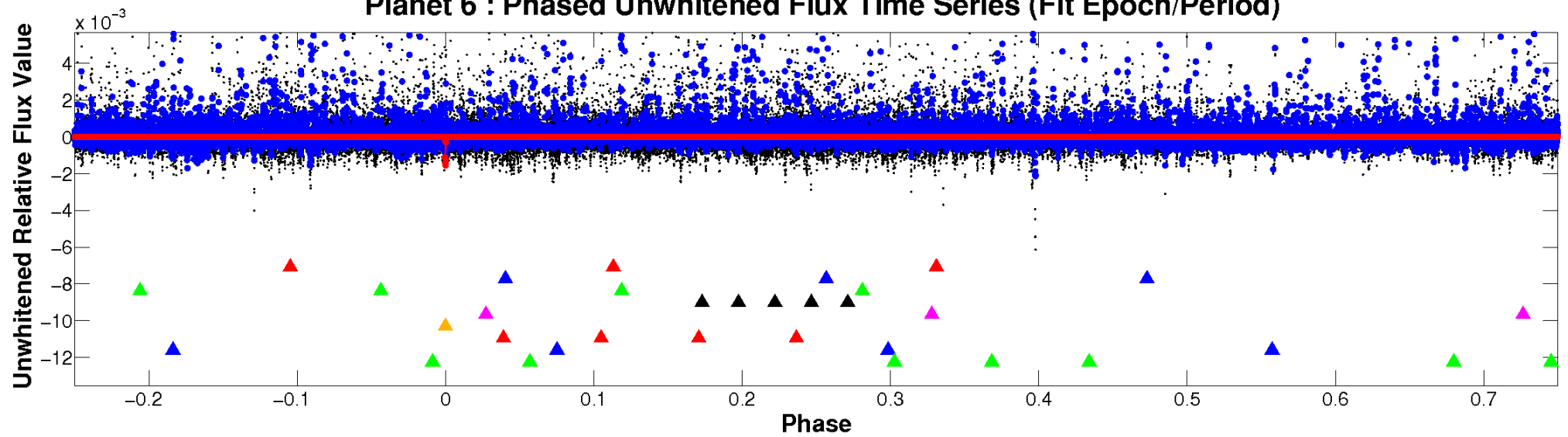
# ALT Odd/Even

TCE 003971507-06

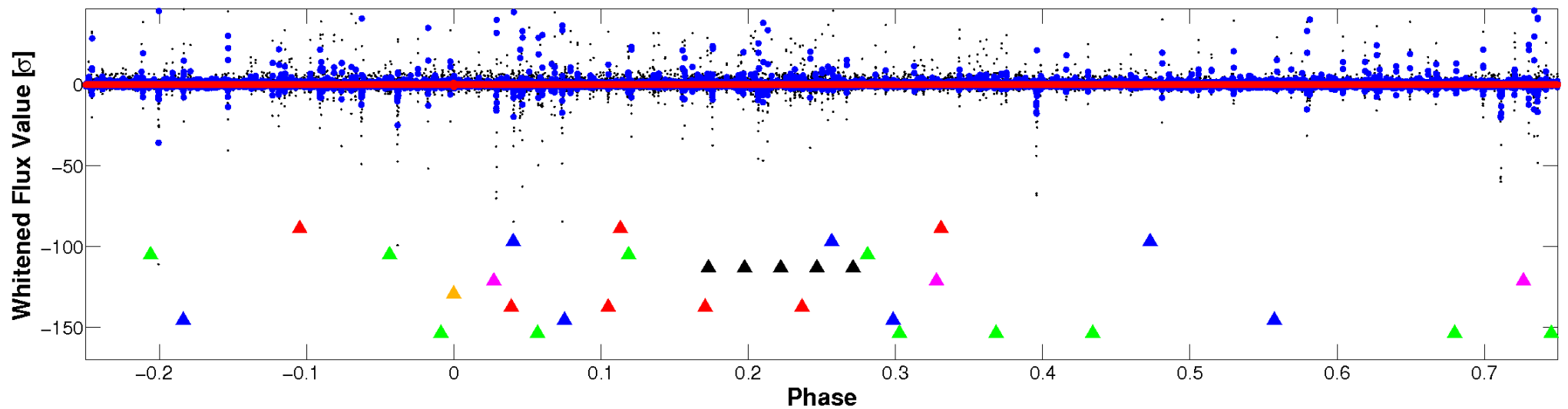


# Non-Whitened Vs. Whitened Light Curve

## Planet 6 : Phased Unwhitened Flux Time Series (Fit Epoch/Period)

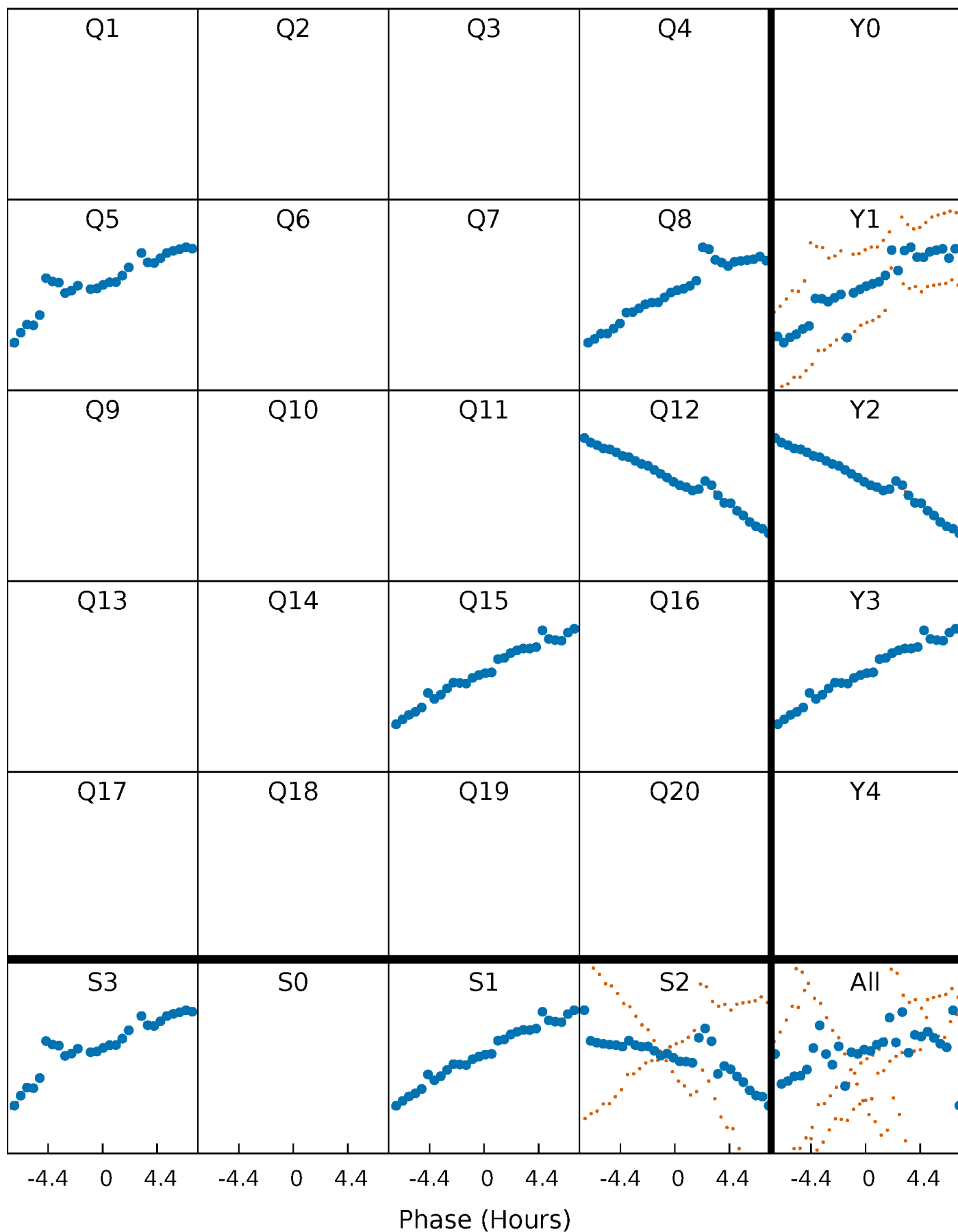


## Planet 6 : Phased Whitened Flux Time Series (Fit Epoch/Period)



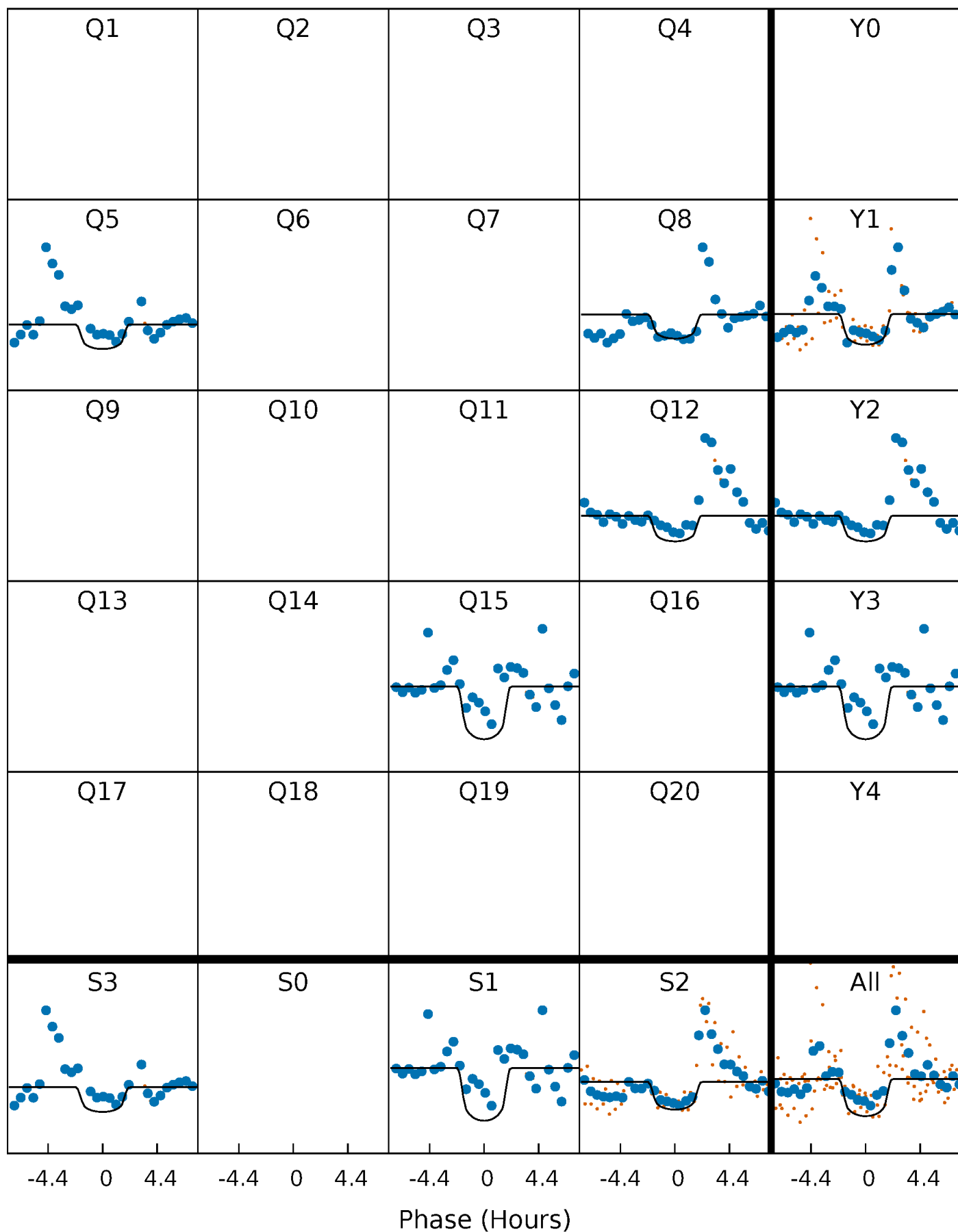
# PDC Quarter-Phased Transit Curves

TCE 003971507-06 P=323.681895 Days  $T_0=453.462898$  (BKJD)



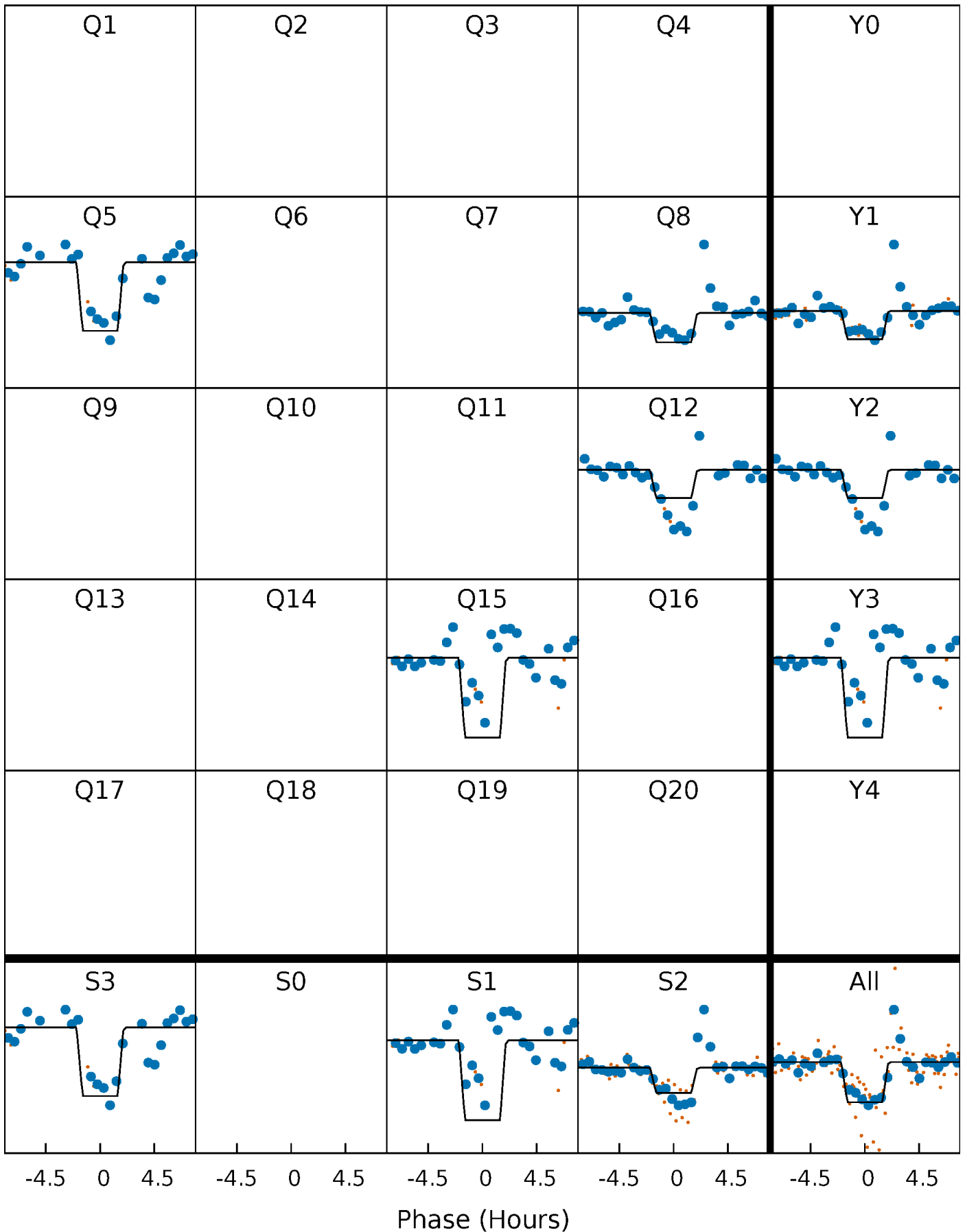
# DV Quarter-Phased Transit Curves

TCE 003971507-06     $P=323.681895$  Days     $T_0=453.462898$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

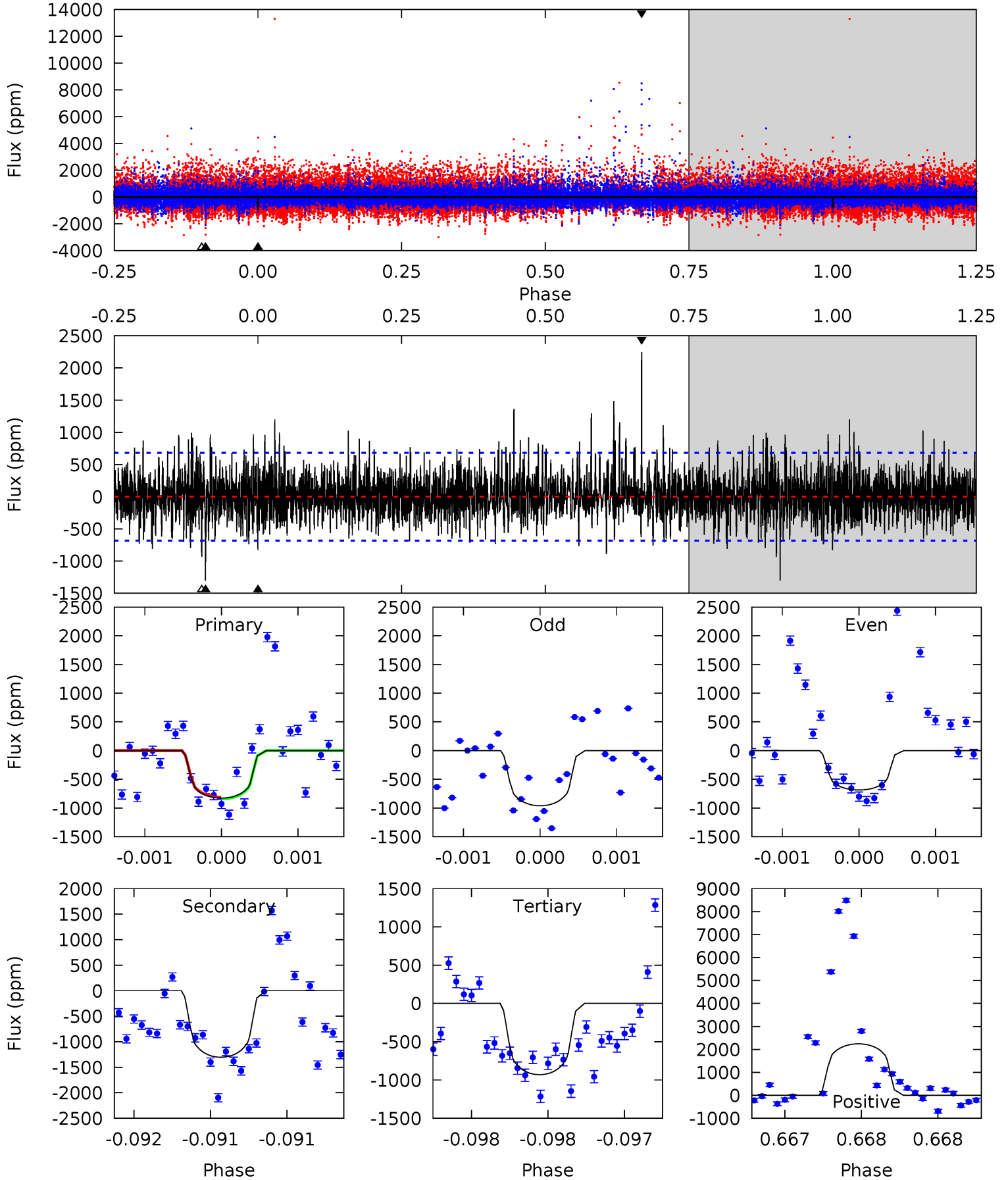
TCE 003971507-06 P=323.683237 Days  $T_0=453.463211$  (BKJD)



# DV Model-Shift Uniqueness Test

003971507-06, P = 323.681895 Days, E = 129.781003 Days

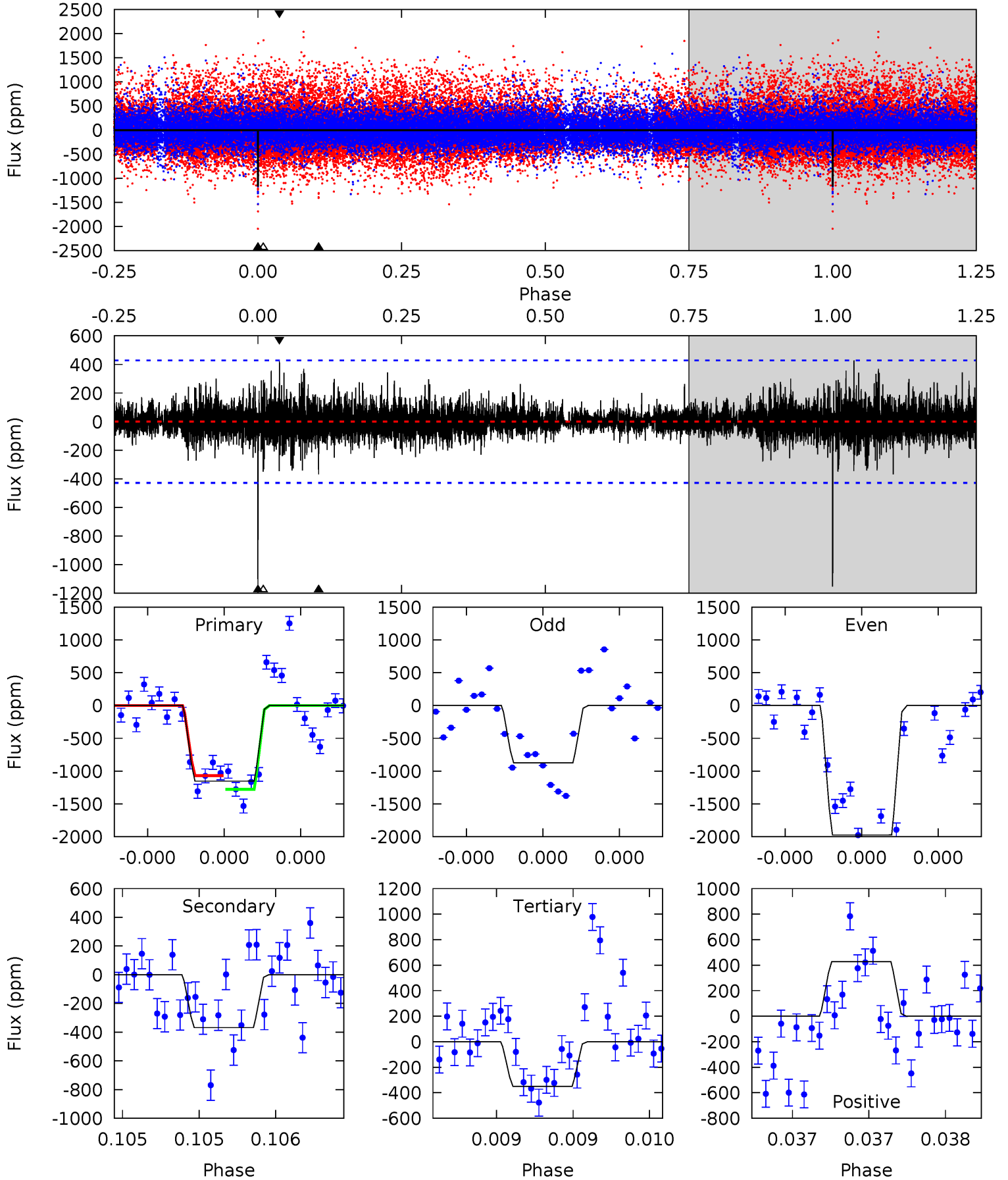
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
6.74	10.6	7.58	18.3	5.56	3.46	2.24	-0.84	-11.5	3.04	-7.65	0.65	1.20	0.63	0.11



# Alt Model-Shift Uniqueness Test

003971507-06, P = 323.683237 Days, E = 129.779974 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
15.1	4.81	4.57	5.58	5.58	3.50	0.94	10.5	9.47	0.24	-0.77	7.61	1.16	0.27	1.35





### Stellar Parameters For KIC 003971507

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$5455^{+190}_{-152}$	$3.960^{+0.602}_{-0.258}$	$-0.340^{+0.350}_{-0.250}$	$1.607^{+0.806}_{-0.887}$	$0.860^{+0.105}_{-0.105}$	$0.292^{+1.868}_{-0.192}$
	+3%/-3%	+15%/-7%	+103%/-74%	+50%/-55%	+12%/-12%	+640%/-66%
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 003971507-06 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-1304 \pm 123$	$6.27^{+6.34}_{-3.82}$	$444^{+53}_{-73}$	$5196^{+3094}_{-1047}$	$13869^{+81586}_{-10327}$
Alt.	$-368 \pm 77$	$6.90^{+5.26}_{-4.11}$	$449^{+54}_{-68}$	$3931^{+1509}_{-587}$	$3179^{+17211}_{-2184}$

$T_{max}$  = 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

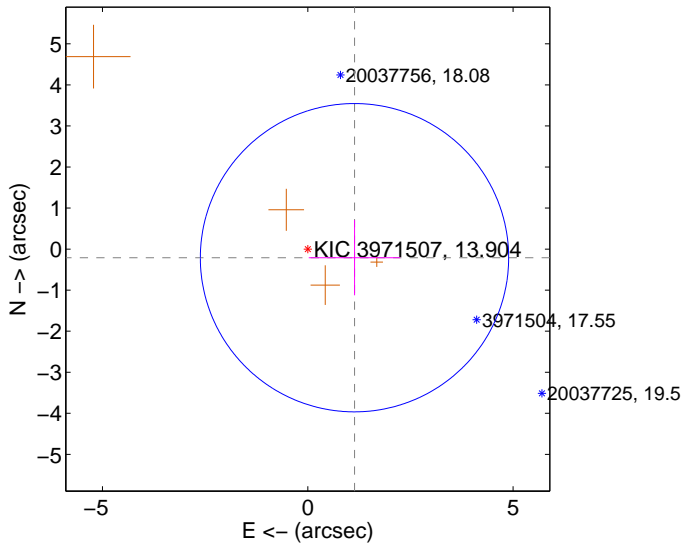
Supplemental centroid analysis for 003971507-06. Kepler magnitude: 13.90. Transit SNR 7.64

There are 0 quarters with good PRF difference image offsets

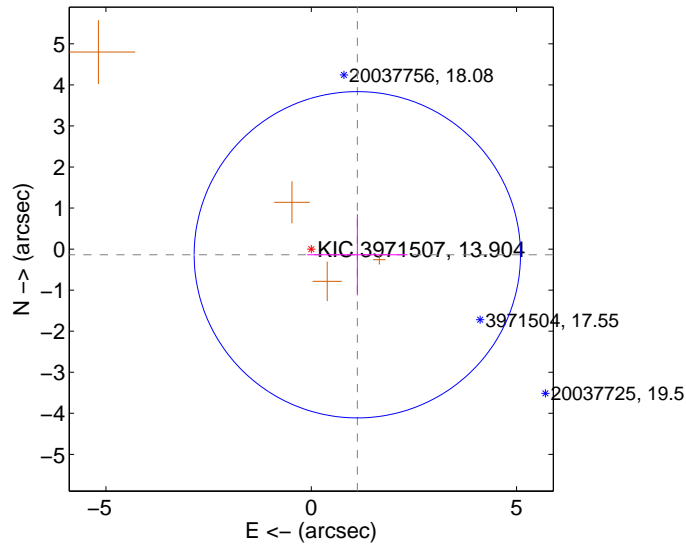
The direct PRF centroid is offset from the target star catalog position by about 0.19 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$1.157 \pm 1.252$	0.92	$-1.138 \pm 1.113$	$-0.210 \pm 0.917$
PRF-fit source offset from KIC position	$1.131 \pm 1.325$	0.85	$-1.122 \pm 1.221$	$-0.138 \pm 0.987$
photometric centroid source offset	$0.44 \pm 0.53$	0.83	$0.30 \pm 0.52$	$-0.32 \pm 0.53$

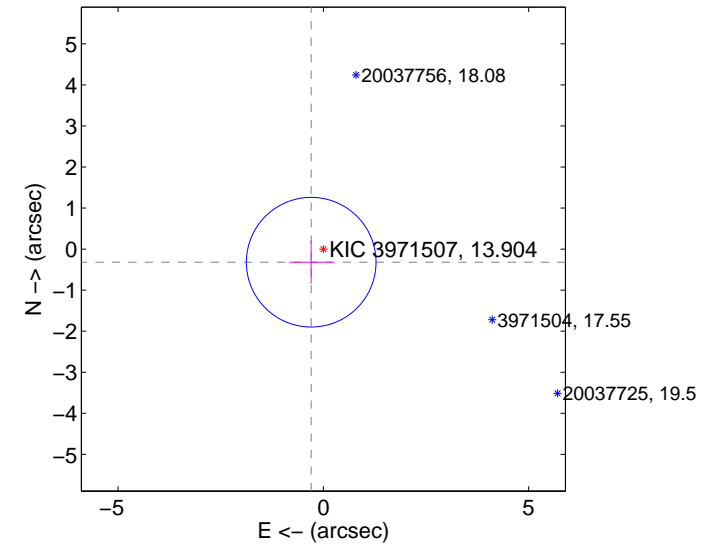
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position



offset from photometric centroids

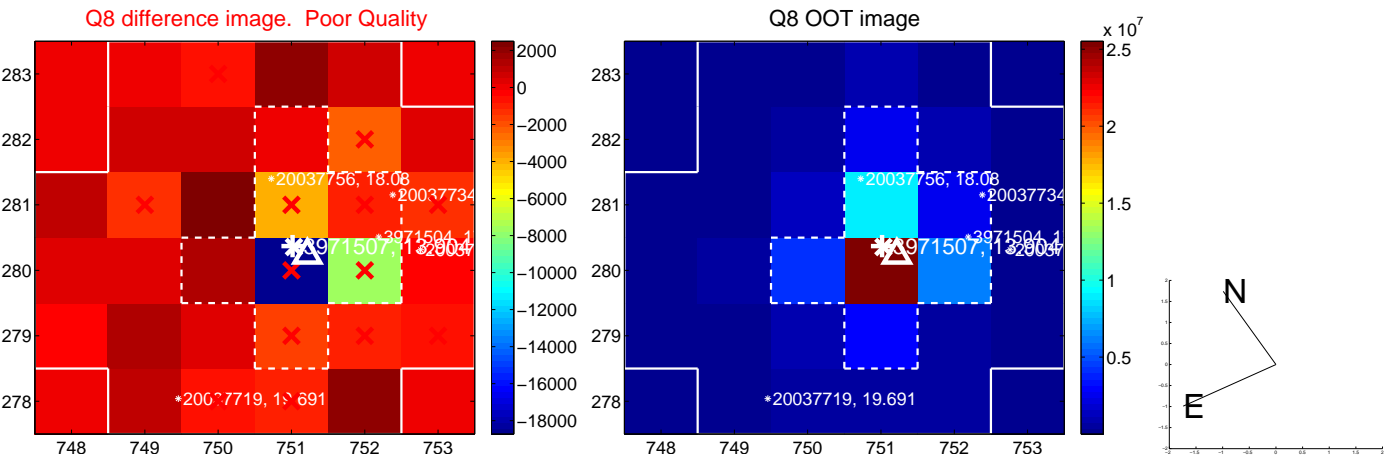
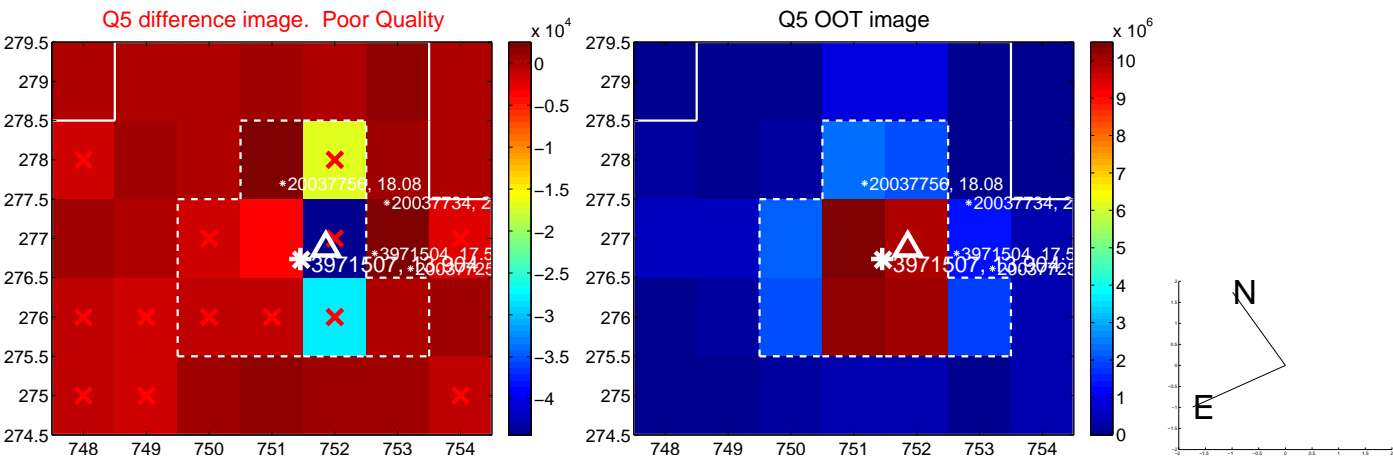


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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

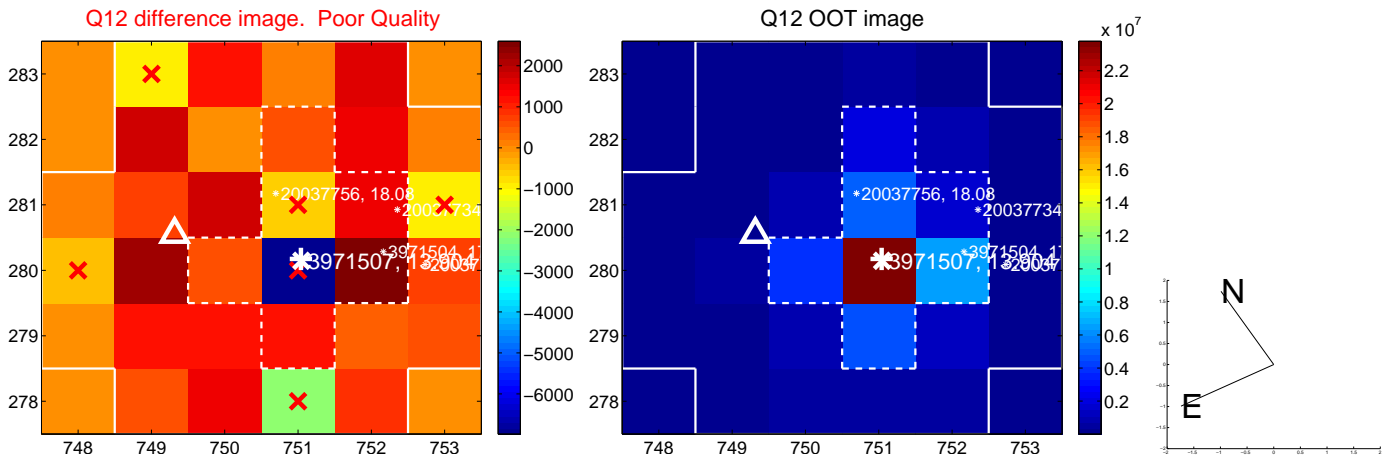
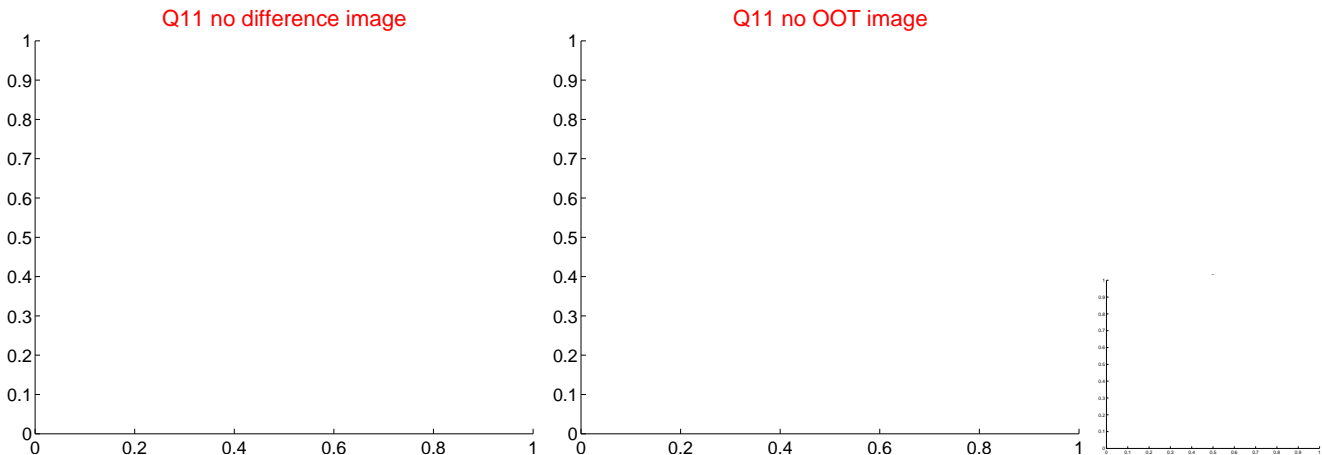
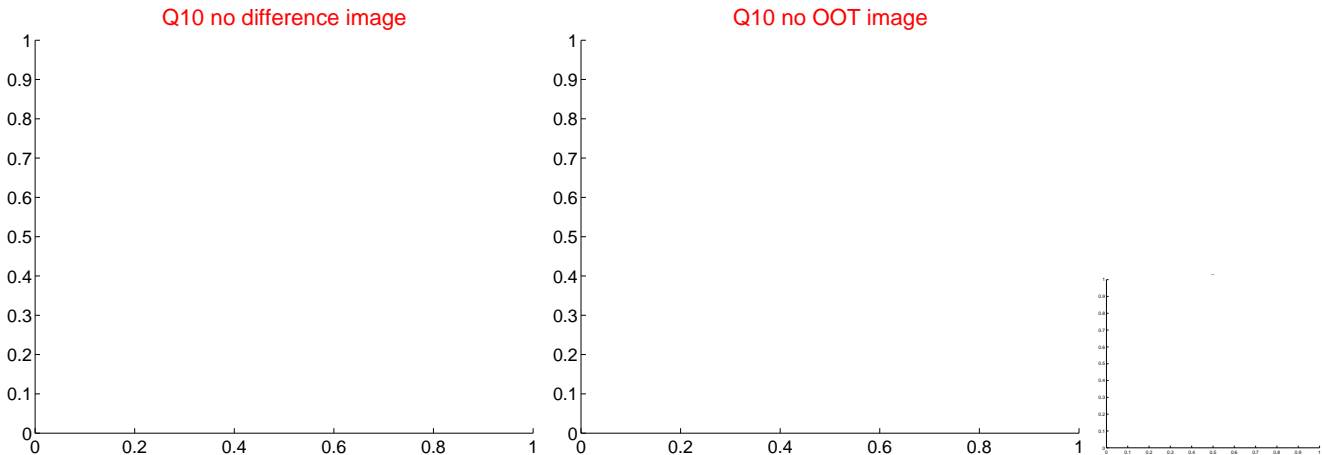
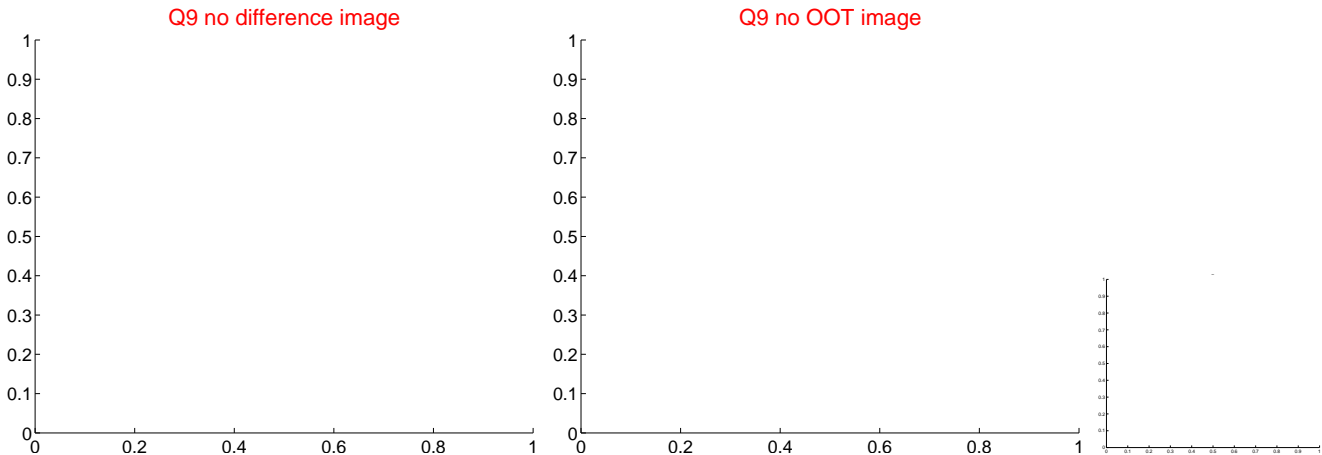
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



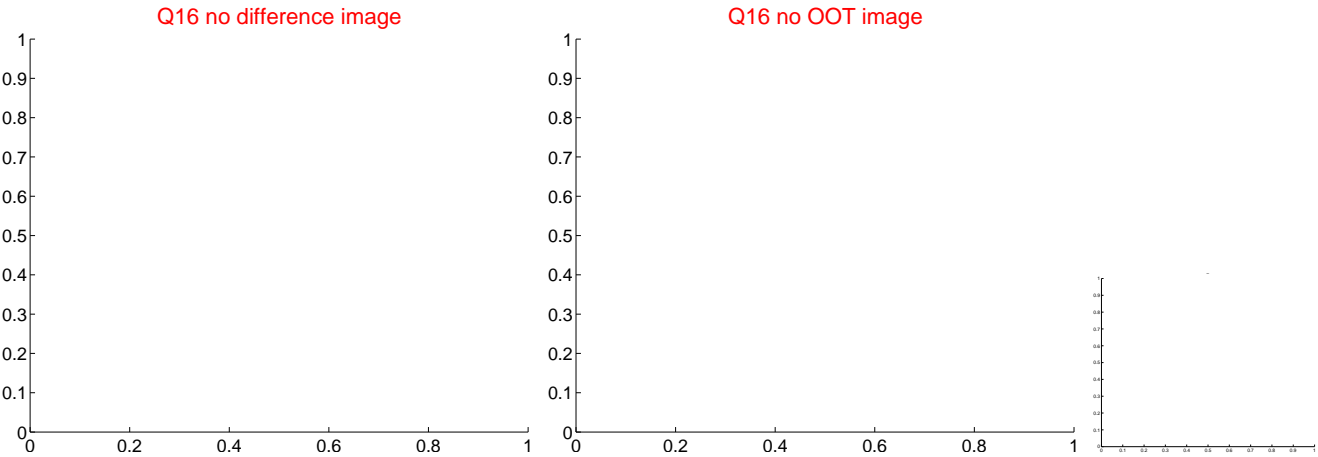
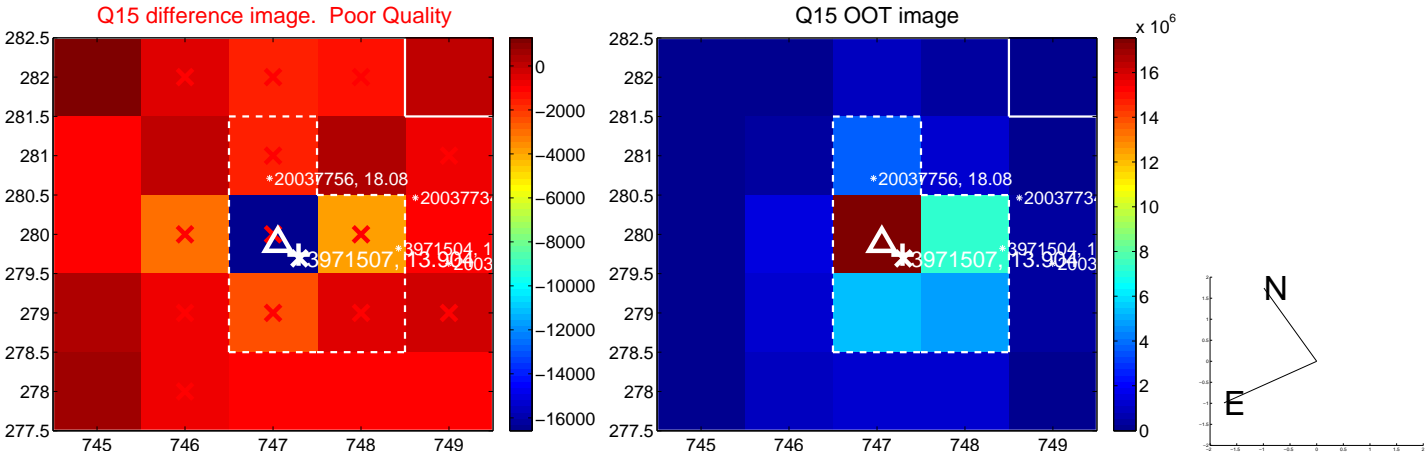
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



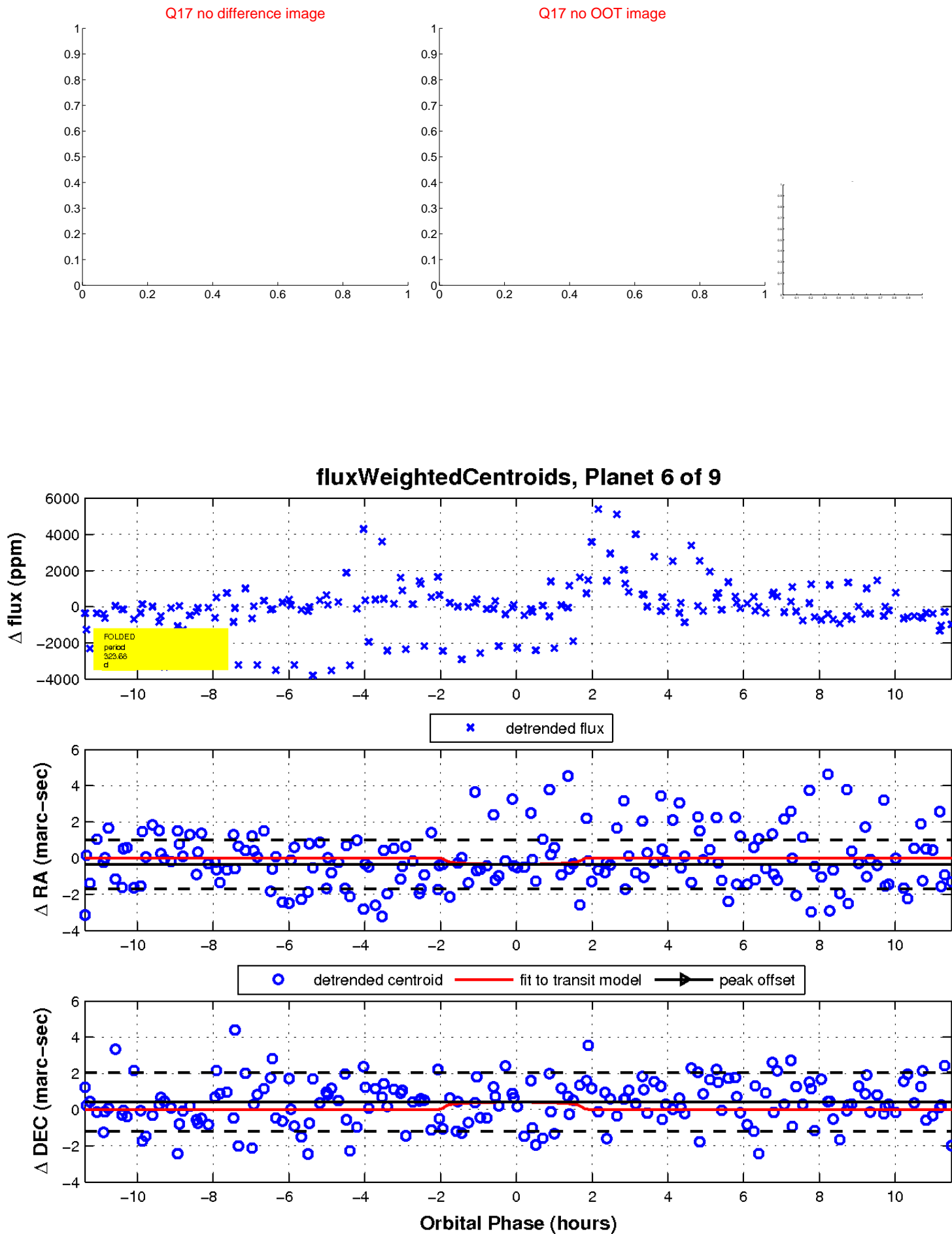
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value



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

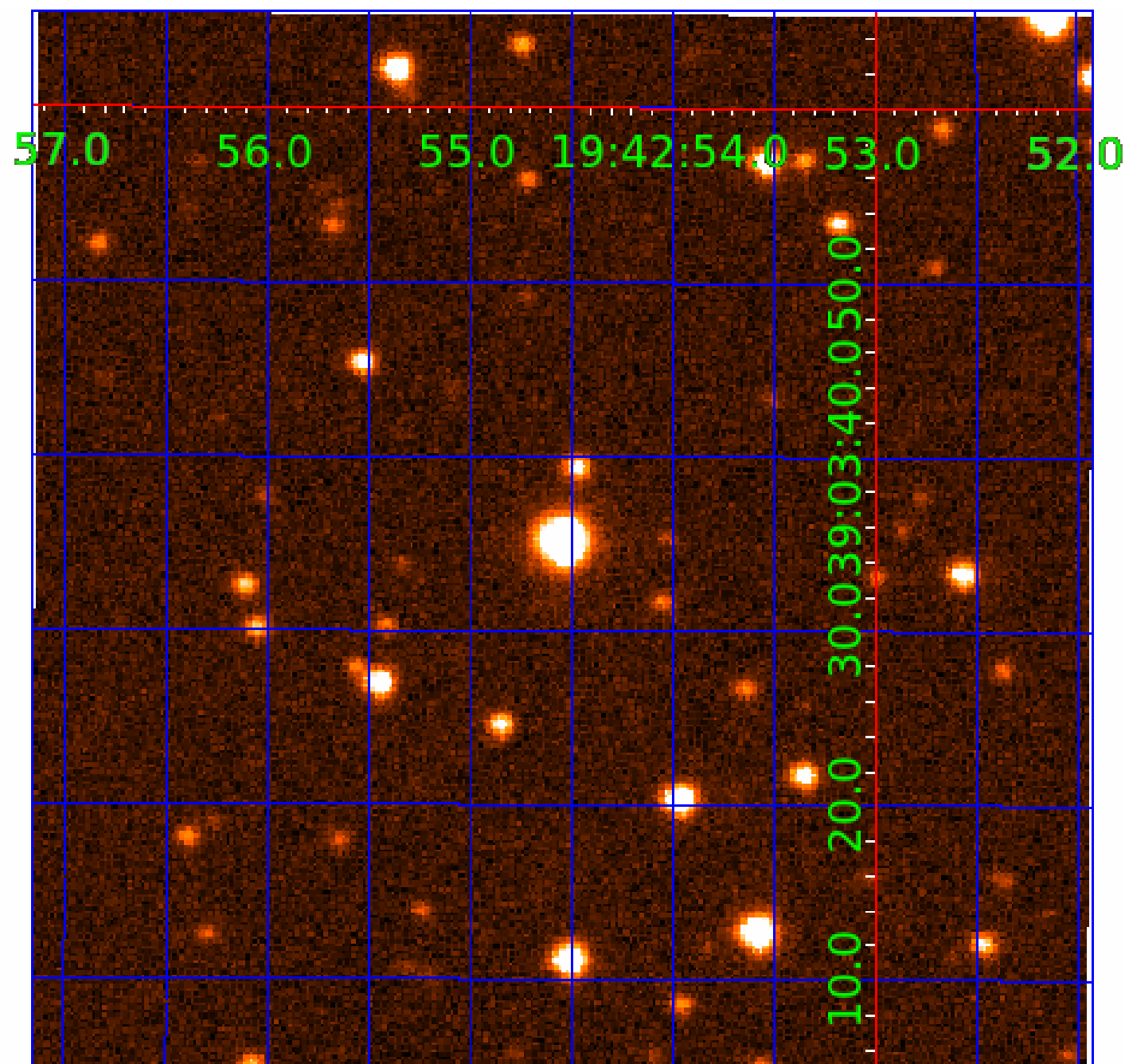


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination





# KIC 003971507

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
003971507-01	OBS	No	394.175282	419.606328	878.0	3.510	15.7	4.0	1.61	5455	5.49	2.05
003971507-03	OBS	No	376.226986	386.815500	1375.5	3.263	13.4	5.6	1.61	5455	6.19	2.18
003971507-04	OBS	No	315.734653	217.568312	1325.1	6.346	15.2	4.9	1.61	5455	5.96	2.75
003971507-05	OBS	No	420.997596	364.959213	1490.2	4.865	13.6	6.5	1.61	5455	6.23	1.88
003971507-06	OBS	No	323.681895	453.462898	1559.4	3.850	12.6	7.6	1.61	5455	6.54	2.66
003971507-08	OBS	No	407.493824	226.377902	940.2	3.862	13.1	3.4	1.61	5455	5.08	1.96
003971507-09	OBS	No	222.868839	227.780306	357.7	15.000	11.6	-1.0	1.61	5455	3.00	4.38

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
003971507-01	OBS	FP	0.00	1	0	1	0	INDIV_TRANS_MARSHALL_TRACKER—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS—HALO_GHOST
003971507-03	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
003971507-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES—LPP_DV—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS
003971507-05	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—MOD_POS_ALT
003971507-06	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL_SKYE—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS
003971507-08	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—CENT_FEW_DIFFS
003971507-09	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_MARSHALL_SKYE—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—CENT_NOFITS

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

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

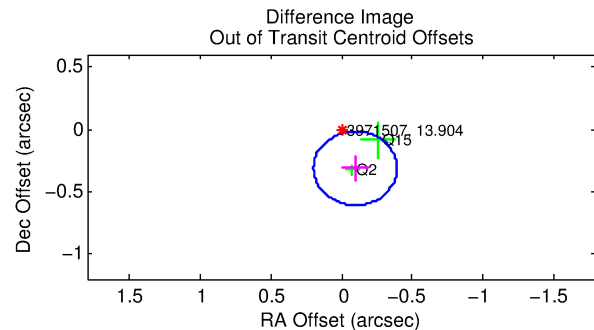
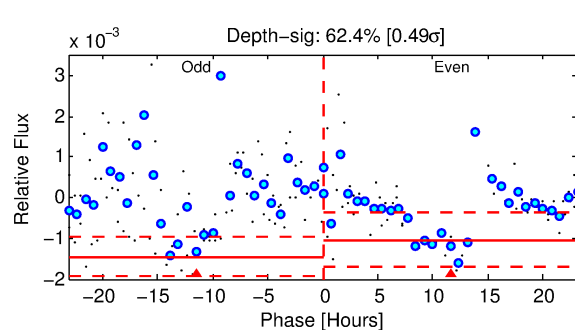
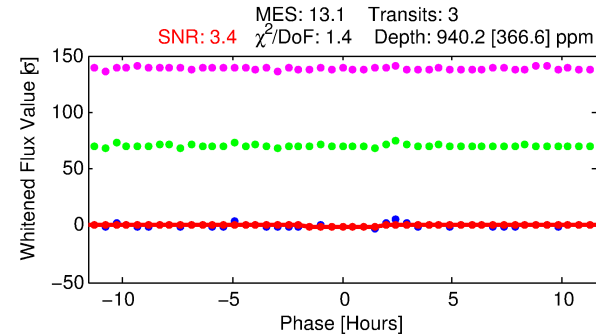
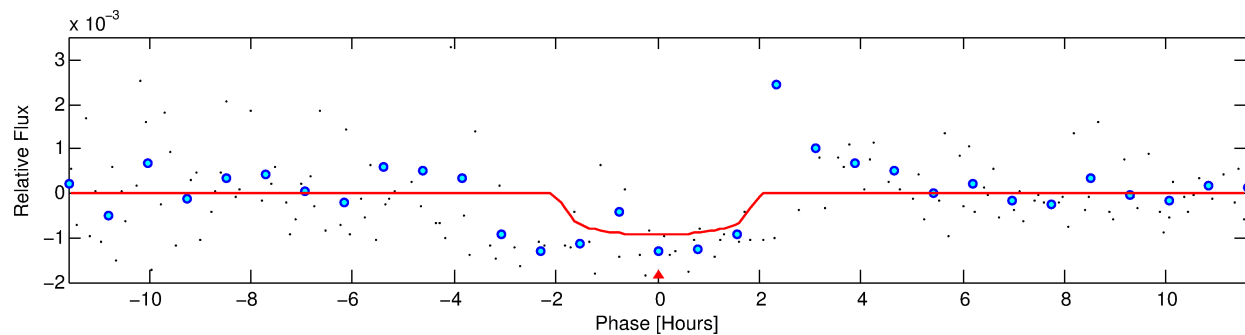
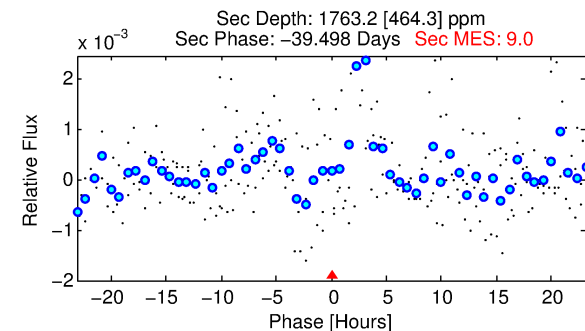
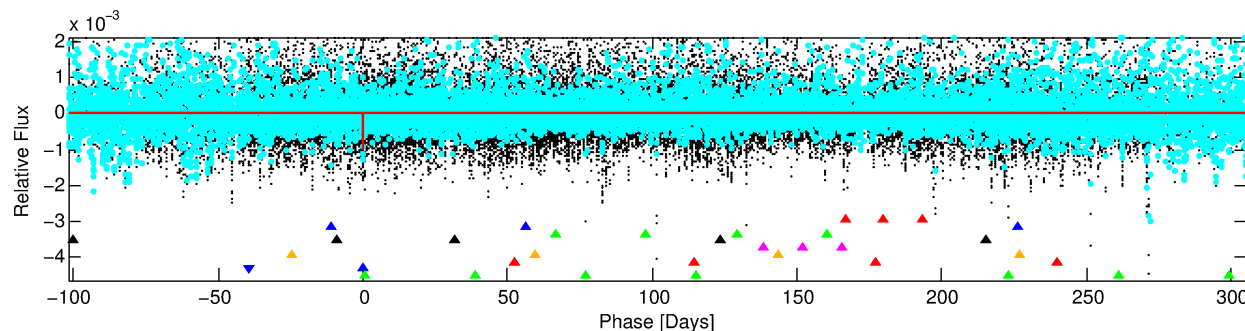
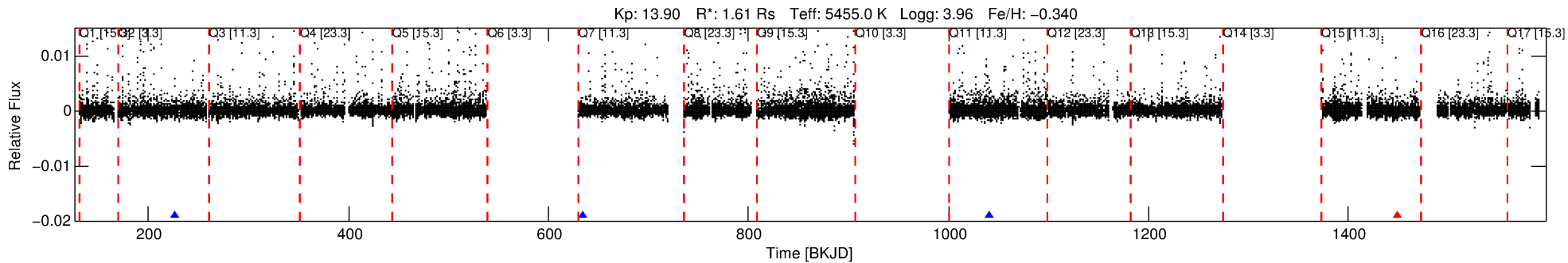
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 003971507-08

No Significant Match Found

# DV One-Page Summary

KIC: 3971507 Candidate: 8 of 9 Period: 407.494 d



## DV Fit Results:

Period = 407.49382 [0.00614] d  
Epoch = 226.3779 [0.0114] BKJD  
Rp/R\* = 0.0290 [0.0631]  
a/R\* = 697.26 [6242.44]  
b = 0.56 [11.20]  
Seff = 1.96 [1.97]  
Teq = 302 [76] K  
Rp = 5.08 [11.41] Re  
a = 1.0228 [0.6041] AU  
Ag = 39367.78 [176320.15] [0.22σ]  
Teffp = 6570 [7176] K [0.87σ]

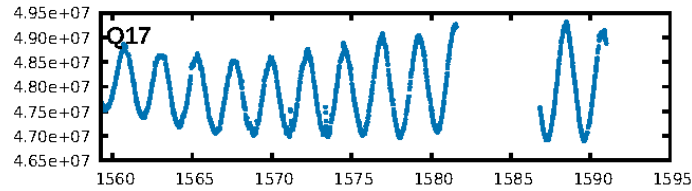
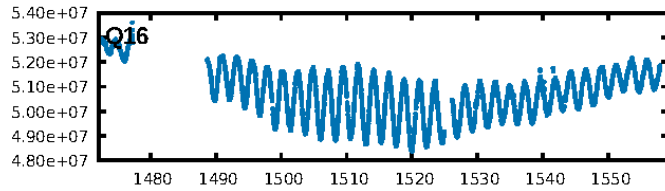
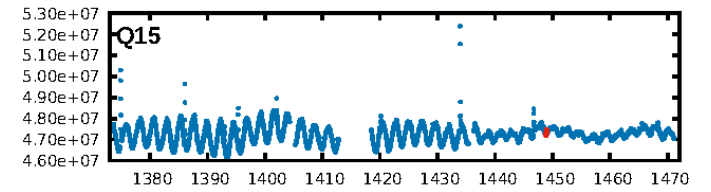
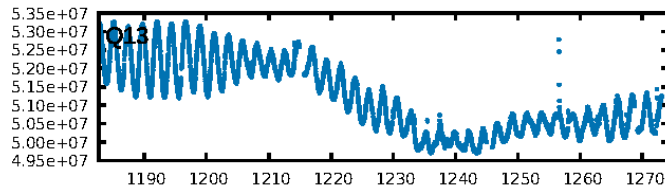
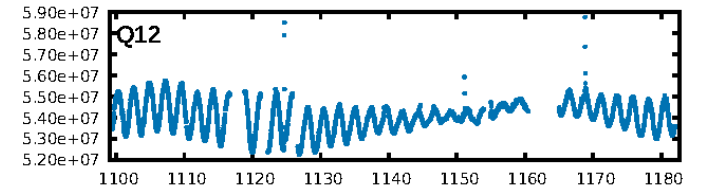
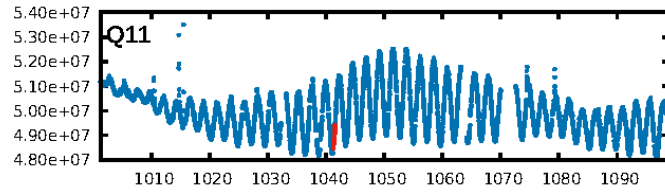
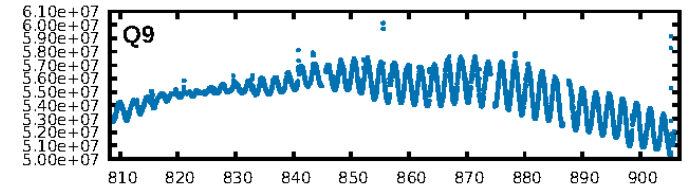
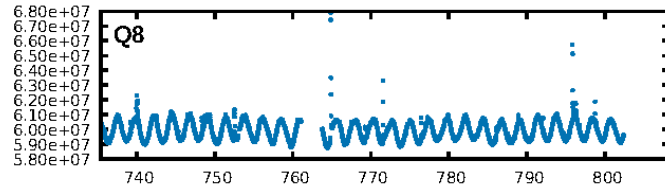
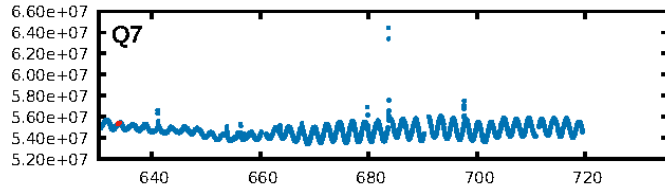
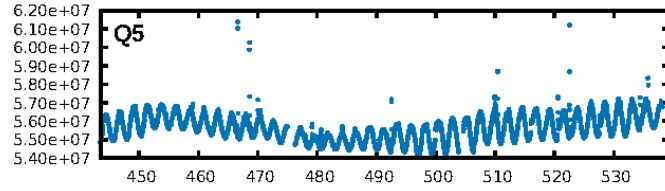
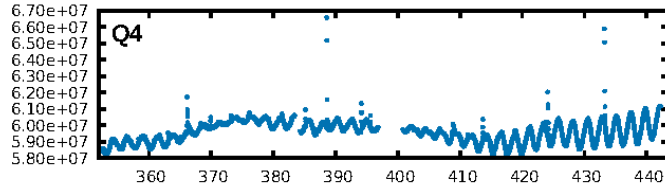
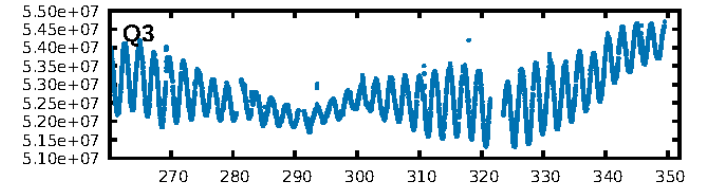
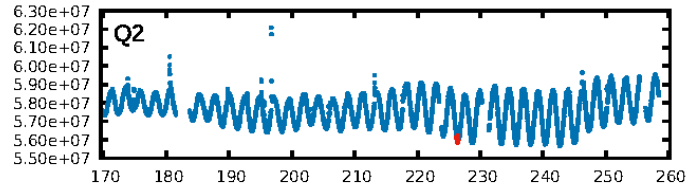
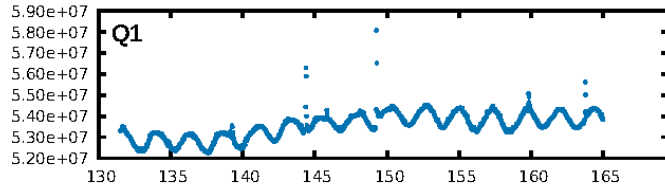
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [61.25σ]  
LongPeriod-sig: 100.0% [52.17σ]  
ModelChiSquare2-sig: 17.4%  
ModelChiSquareGof-sig: 89.9%  
Bootstrap-pfa: 6.43e-11  
RollingBand-fgt: 0.67 [2/3]  
GhostDiagnostic-chr: 0.7465  
Centroid-sig: 67.6%  
Centroid-so: 0.567 arcsec [0.55σ]  
OotOffset-rm: 0.328 arcsec [3.33σ]  
KicOffset-rm: 0.180 arcsec [1.68σ]  
OotOffset-st: 1/1/0/0 [2]  
KicOffset-st: 1/1/0/0 [2]  
DiffImageQuality-fgm: 1.00 [2/2]  
DiffImageOverlap-fno: 0.50 [1/2]

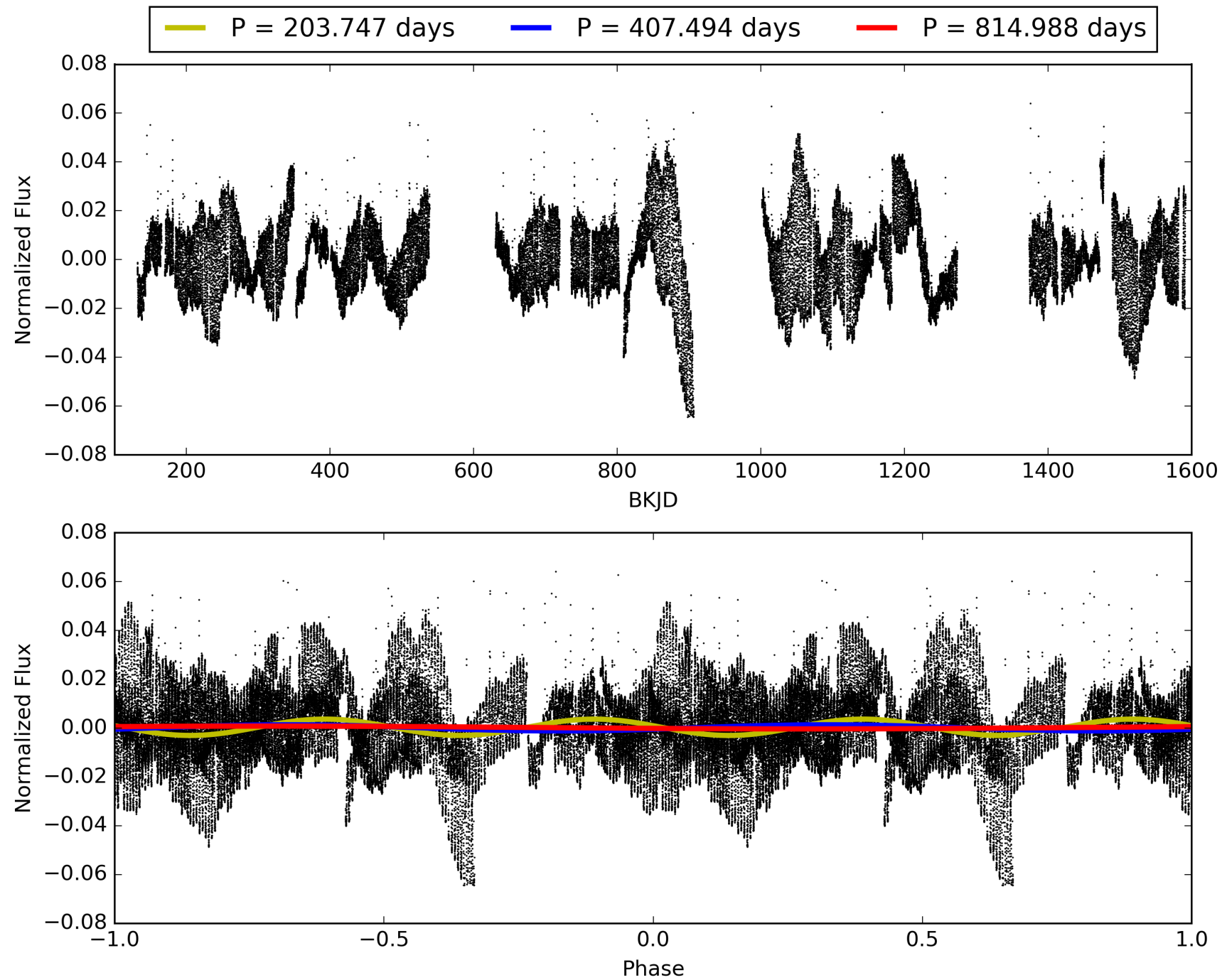
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 31-Jan-2016 05:55:20 Z

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

# TCE 003971507-08, PDC Light Curves

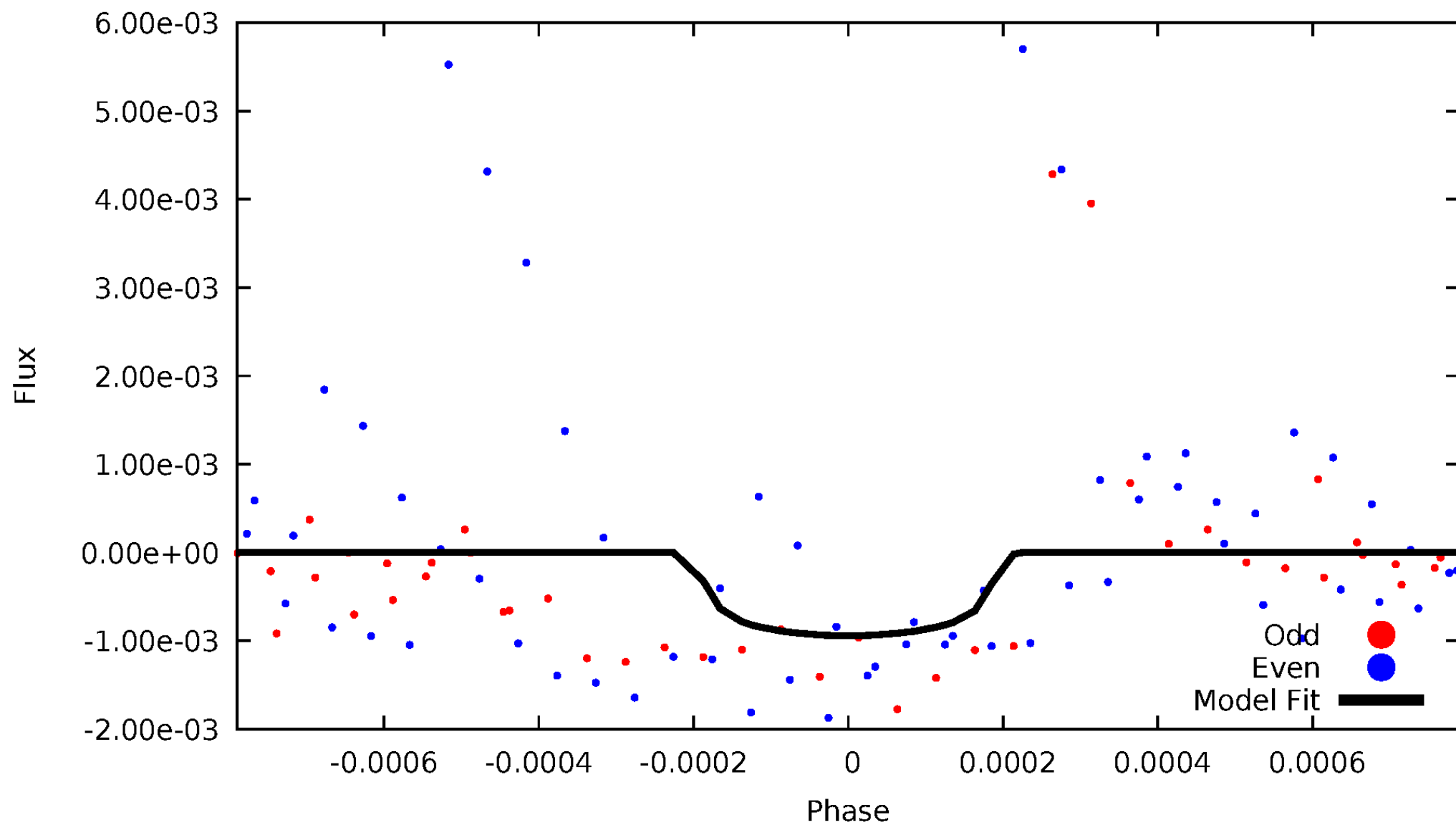


# TCE 003971507-08



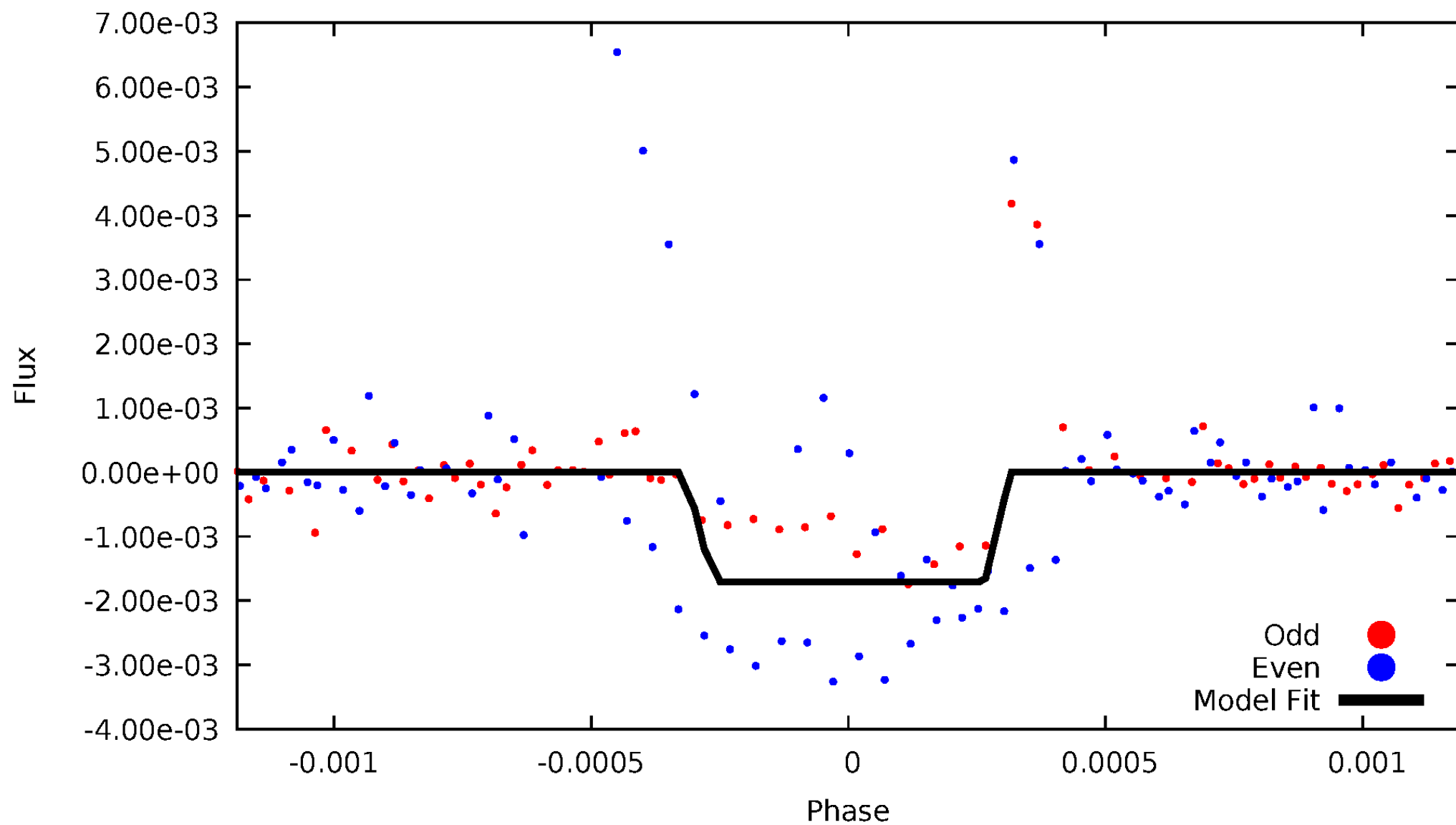
# DV Odd/Even

TCE 003971507-08



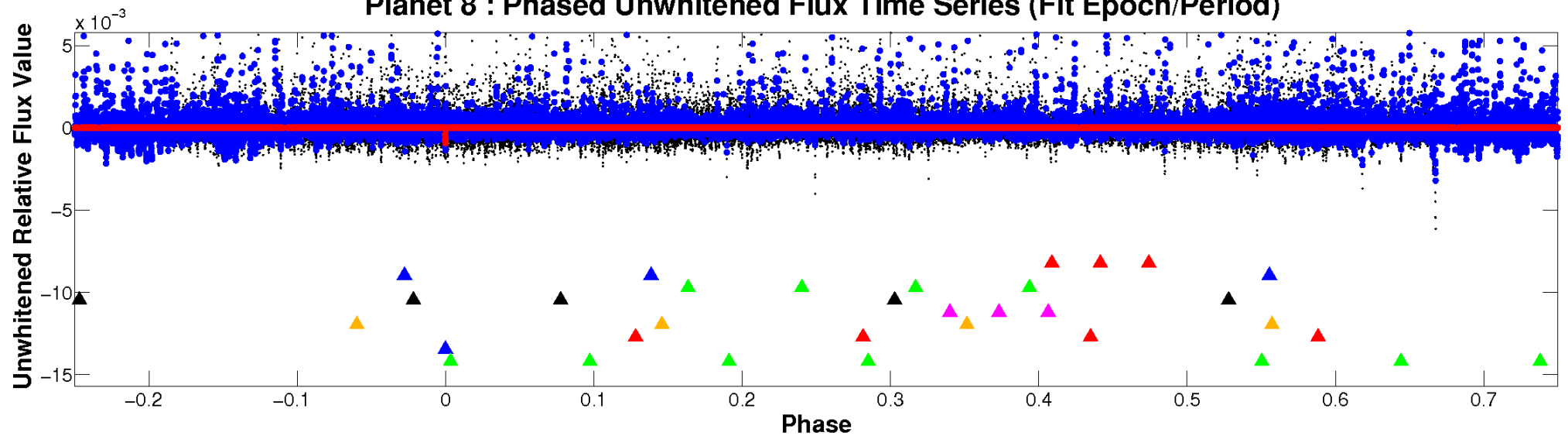
# ALT Odd/Even

TCE 003971507-08

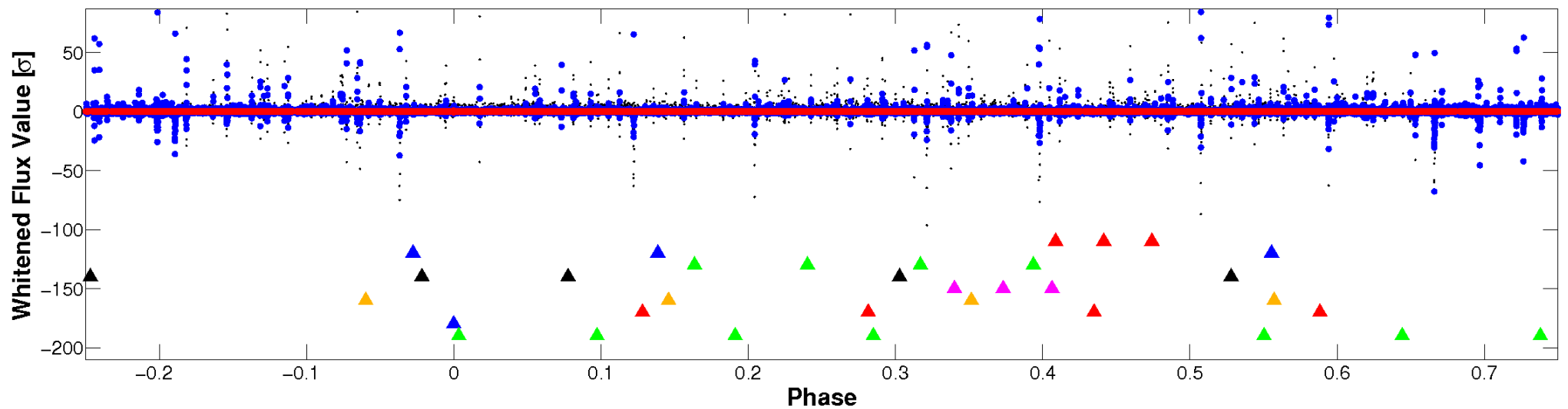


# Non-Whitened Vs. Whitened Light Curve

## Planet 8 : Phased Unwhitened Flux Time Series (Fit Epoch/Period)

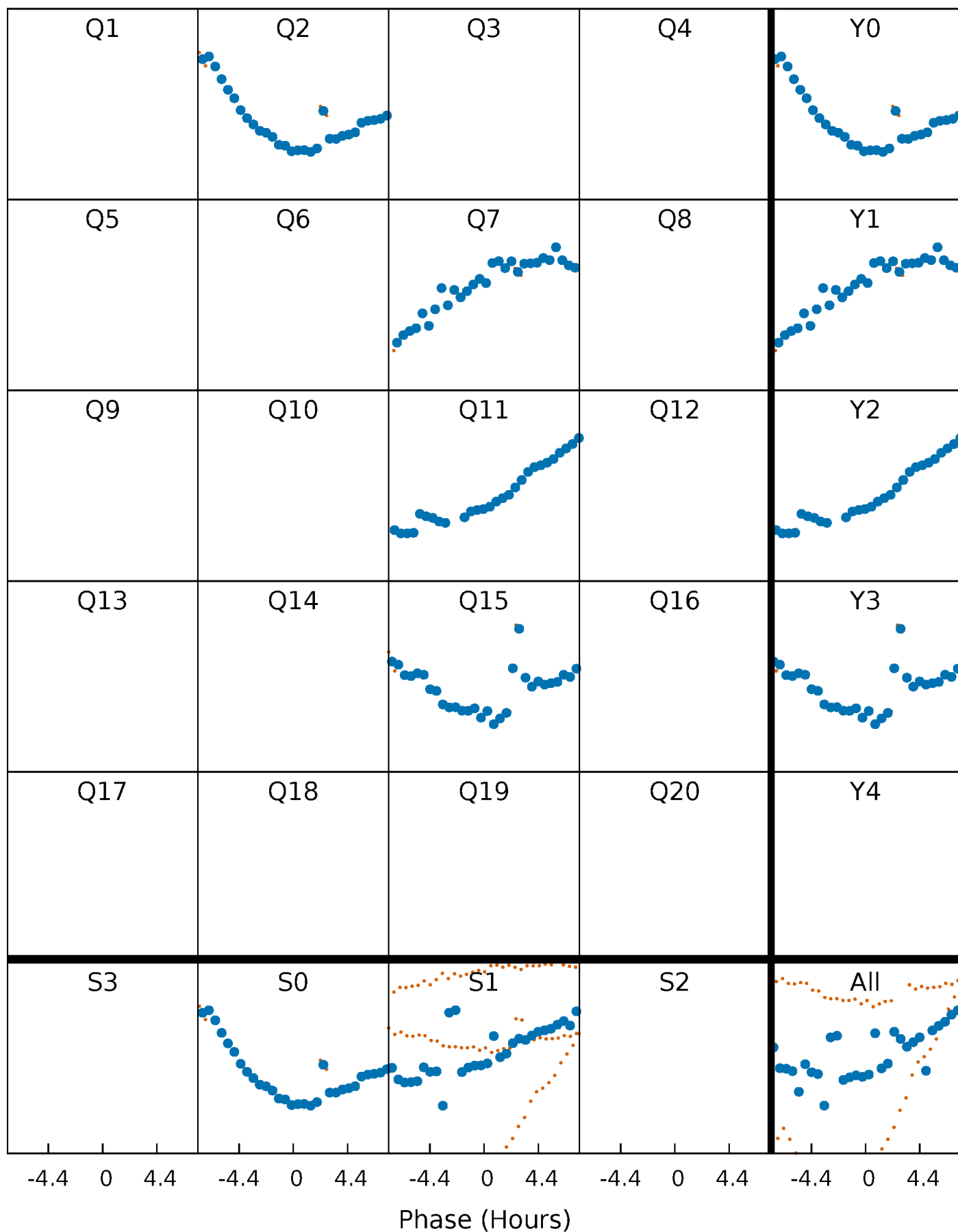


## Planet 8 : Phased Whitened Flux Time Series (Fit Epoch/Period)



# PDC Quarter-Phased Transit Curves

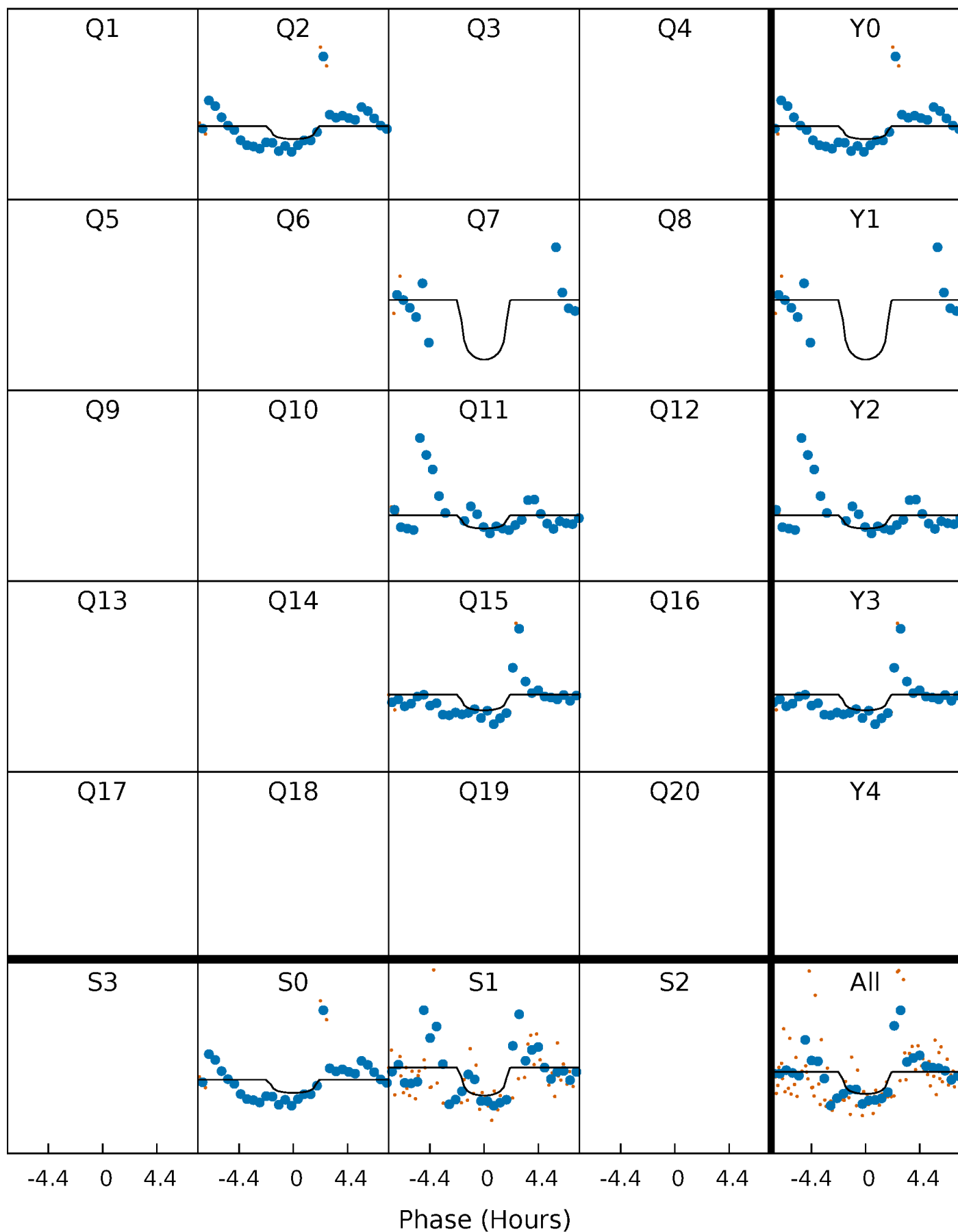
TCE 003971507-08     $P=407.493824$  Days     $T_0=226.377902$  (BKJD)





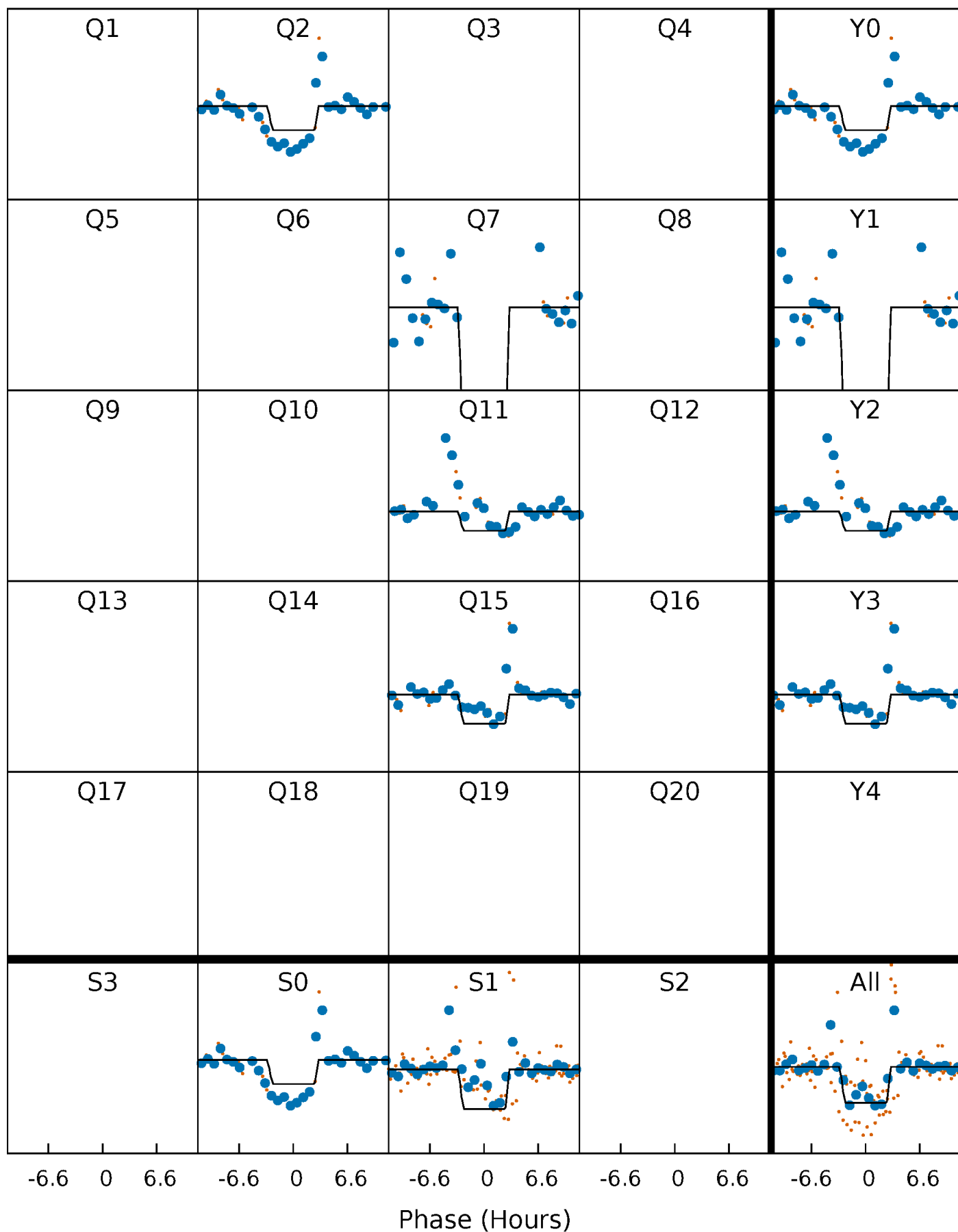
# DV Quarter-Phased Transit Curves

TCE 003971507-08     $P=407.493824$  Days     $T_0=226.377902$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

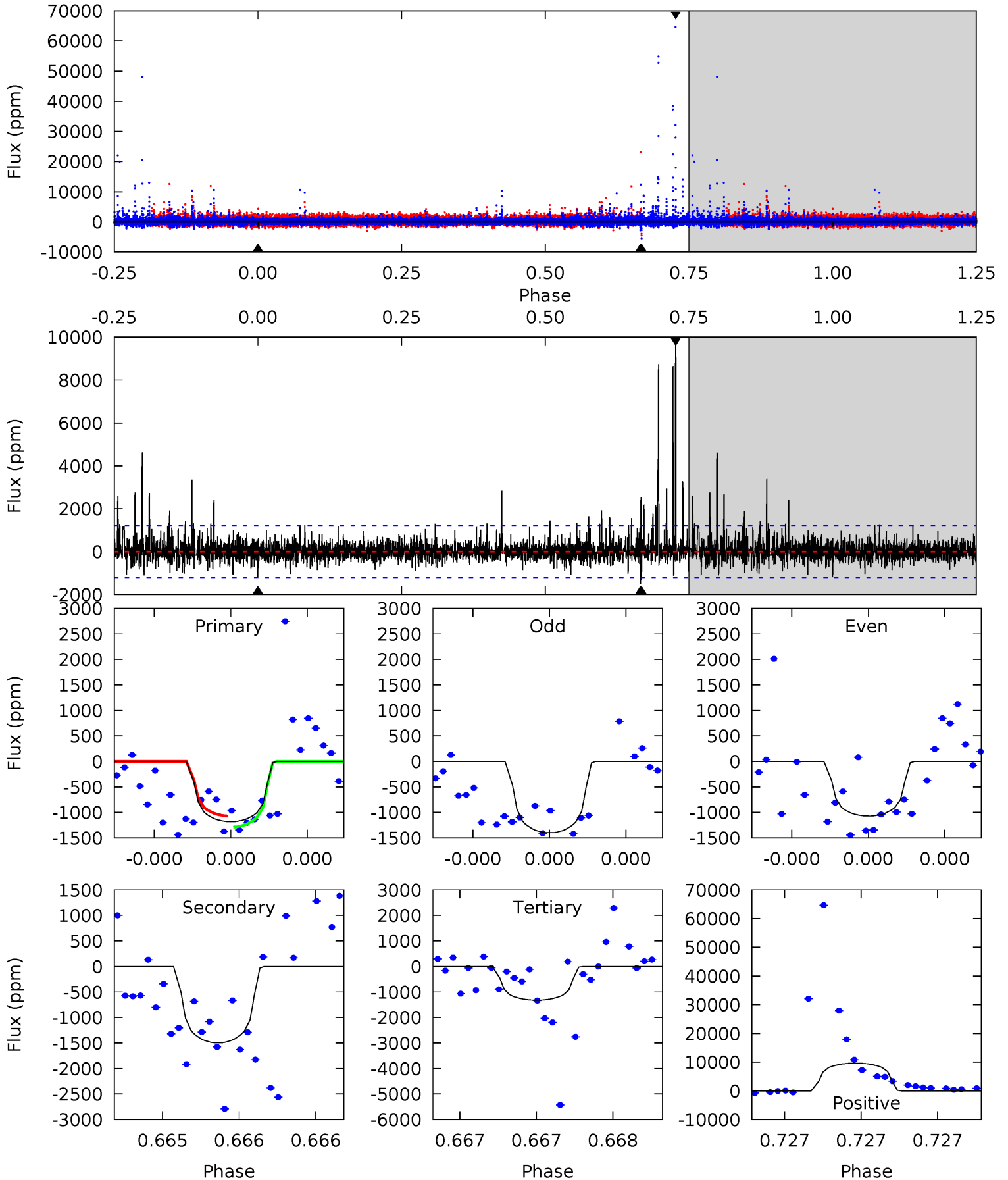
TCE 003971507-08 P=407.499676 Days  $T_0=226.338652$  (BKJD)



# DV Model-Shift Uniqueness Test

003971507-08, P = 407.493824 Days, E = 226.377902 Days

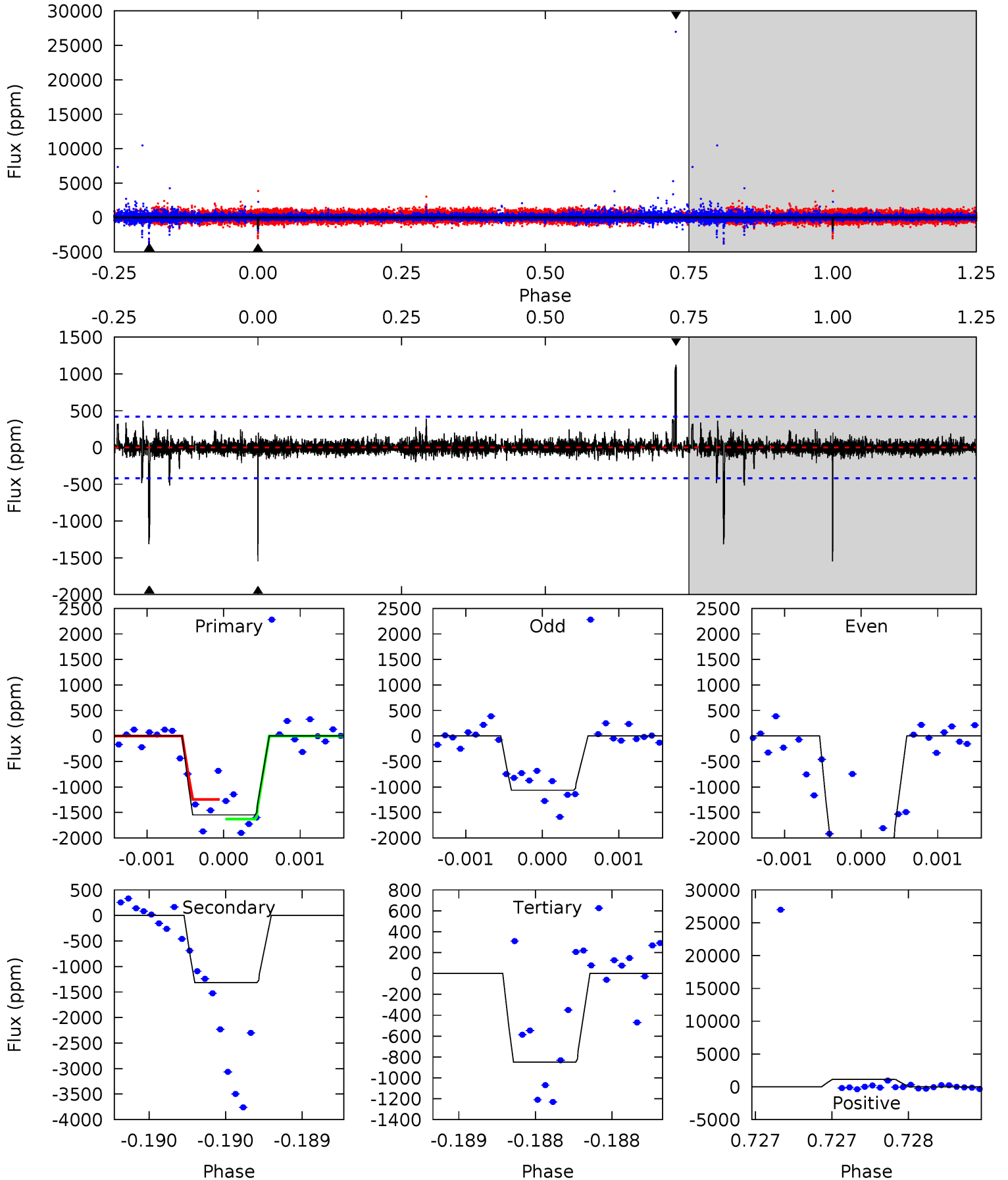
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
5.47	6.94	6.13	44.8	5.62	3.55	2.17	-0.65	-39.3	0.81	-37.9	0.39	0.84	0.87	0.44



# Alt Model-Shift Uniqueness Test

003971507-08, P = 407.499676 Days, E = 226.338652 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
20.4	17.4	11.2	14.8	5.54	3.42	0.81	9.23	5.60	6.16	2.53	6.36	1.41	0.42	0



### Stellar Parameters For KIC 003971507

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$5455^{+190}_{-152}$	$3.960^{+0.602}_{-0.258}$	$-0.340^{+0.350}_{-0.250}$	$1.607^{+0.806}_{-0.887}$	$0.860^{+0.105}_{-0.105}$	$0.292^{+1.868}_{-0.192}$
	+3%/-3%	+15%/-7%	+103%/-74%	+50%/-55%	+12%/-12%	+640%/-66%
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 003971507-08 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-1496 \pm 216$	$9.66^{+9.04}_{-6.41}$	$416^{+52}_{-59}$	$4617^{+3004}_{-984}$	$9420^{+74684}_{-6996}$
Alt.	$-1315 \pm 76$	$9.88^{+9.46}_{-6.61}$	$414^{+51}_{-64}$	$4408^{+2784}_{-870}$	$7996^{+61865}_{-6013}$

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

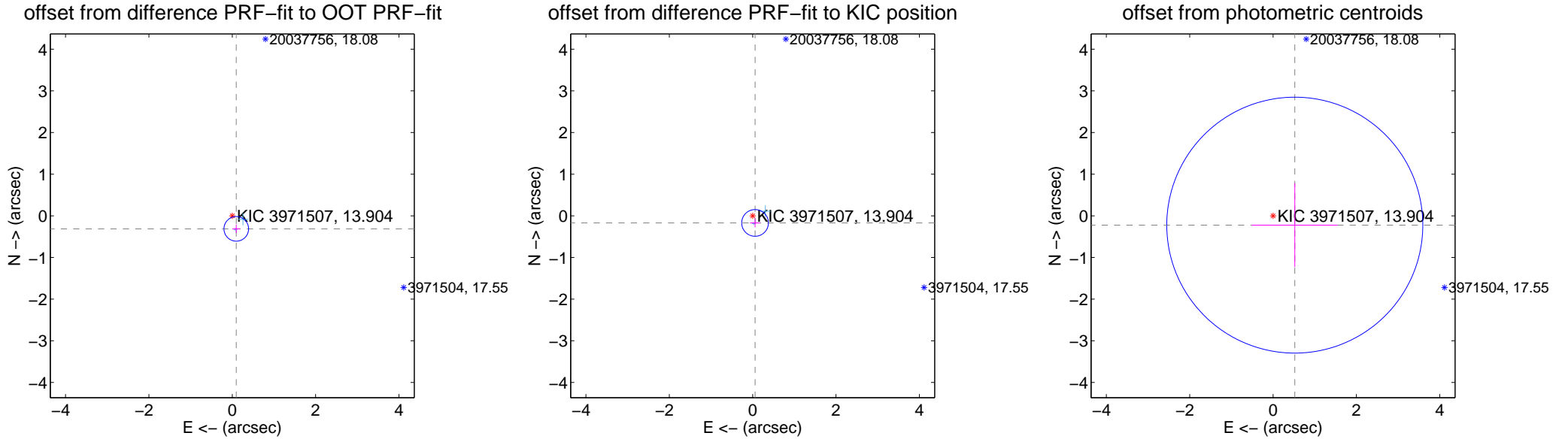
## DV Centroid Data

Supplemental centroid analysis for 003971507-08. Kepler magnitude: 13.90. Transit SNR 3.40

There are 2 quarters with good PRF difference image offsets

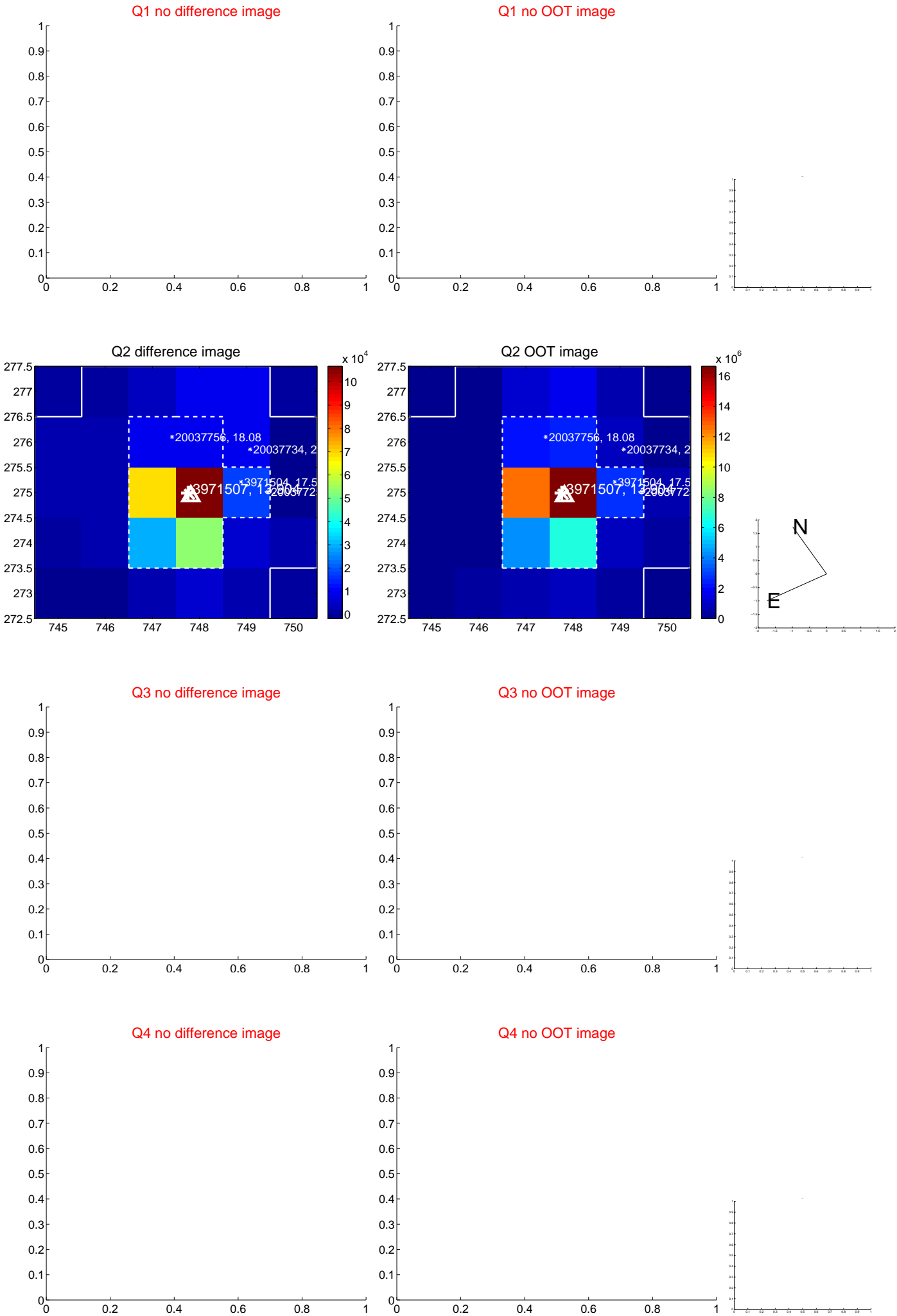
The direct PRF centroid is offset from the target star catalog position by about 0.20 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.328 \pm 0.098$	3.33	$-0.096 \pm 0.093$	$-0.313 \pm 0.099$
PRF-fit source offset from KIC position	$0.180 \pm 0.107$	1.68	$-0.058 \pm 0.120$	$-0.170 \pm 0.105$
photometric centroid source offset	$0.57 \pm 1.02$	0.55	$-0.52 \pm 1.03$	$-0.22 \pm 1.01$



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.

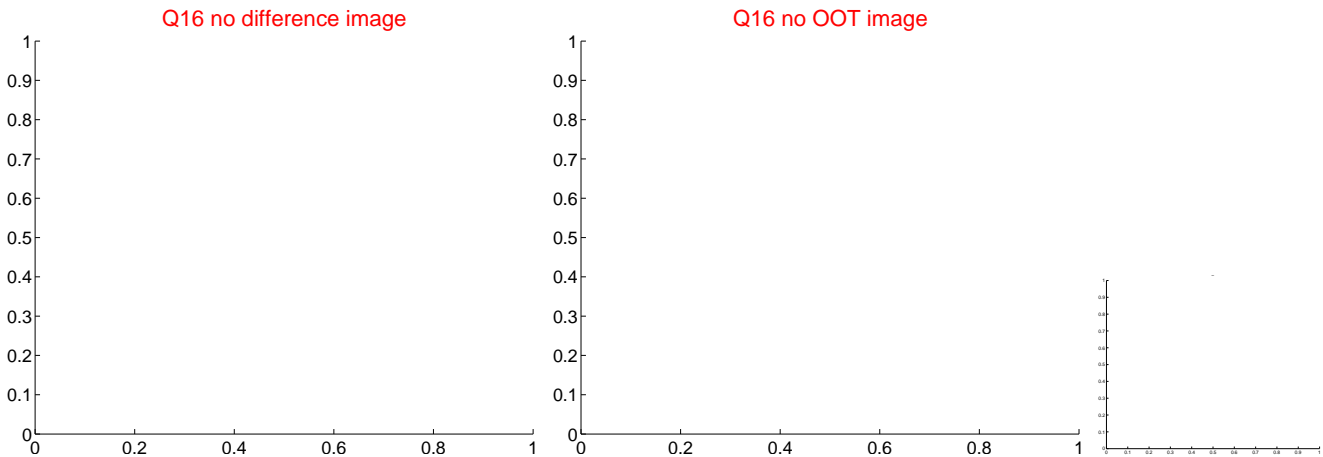
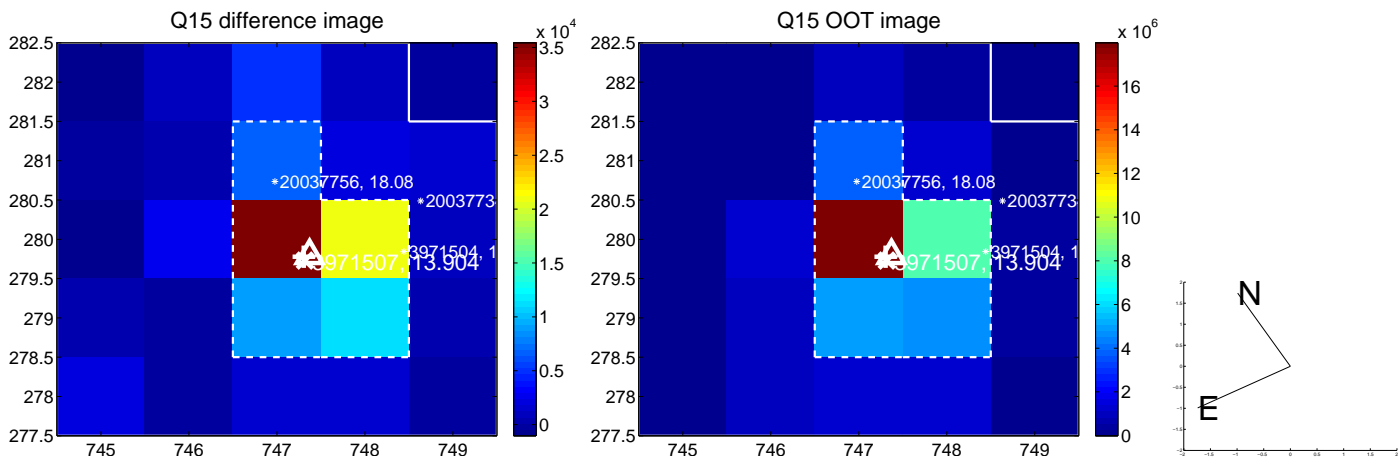
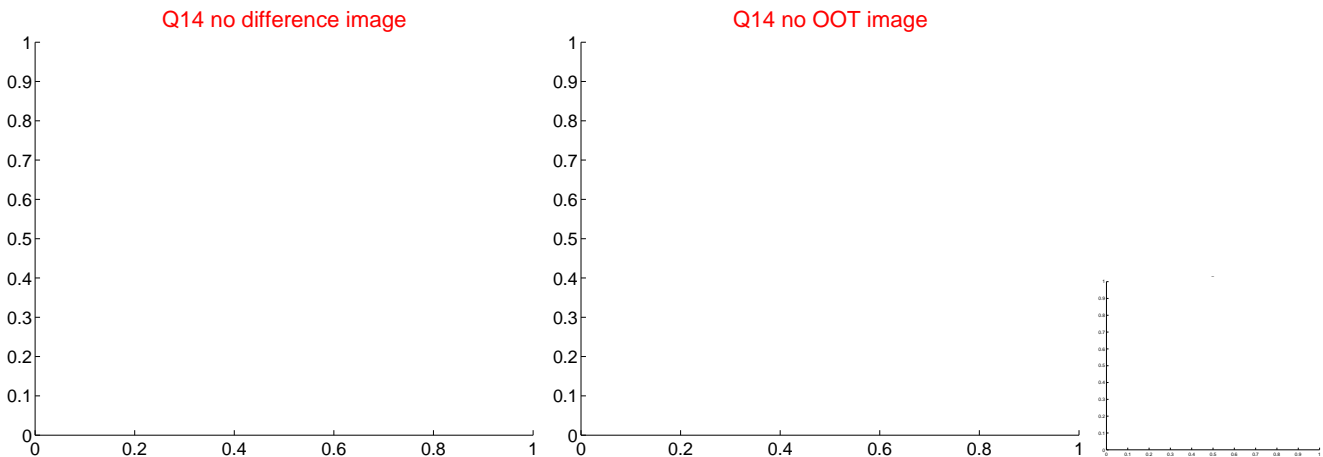




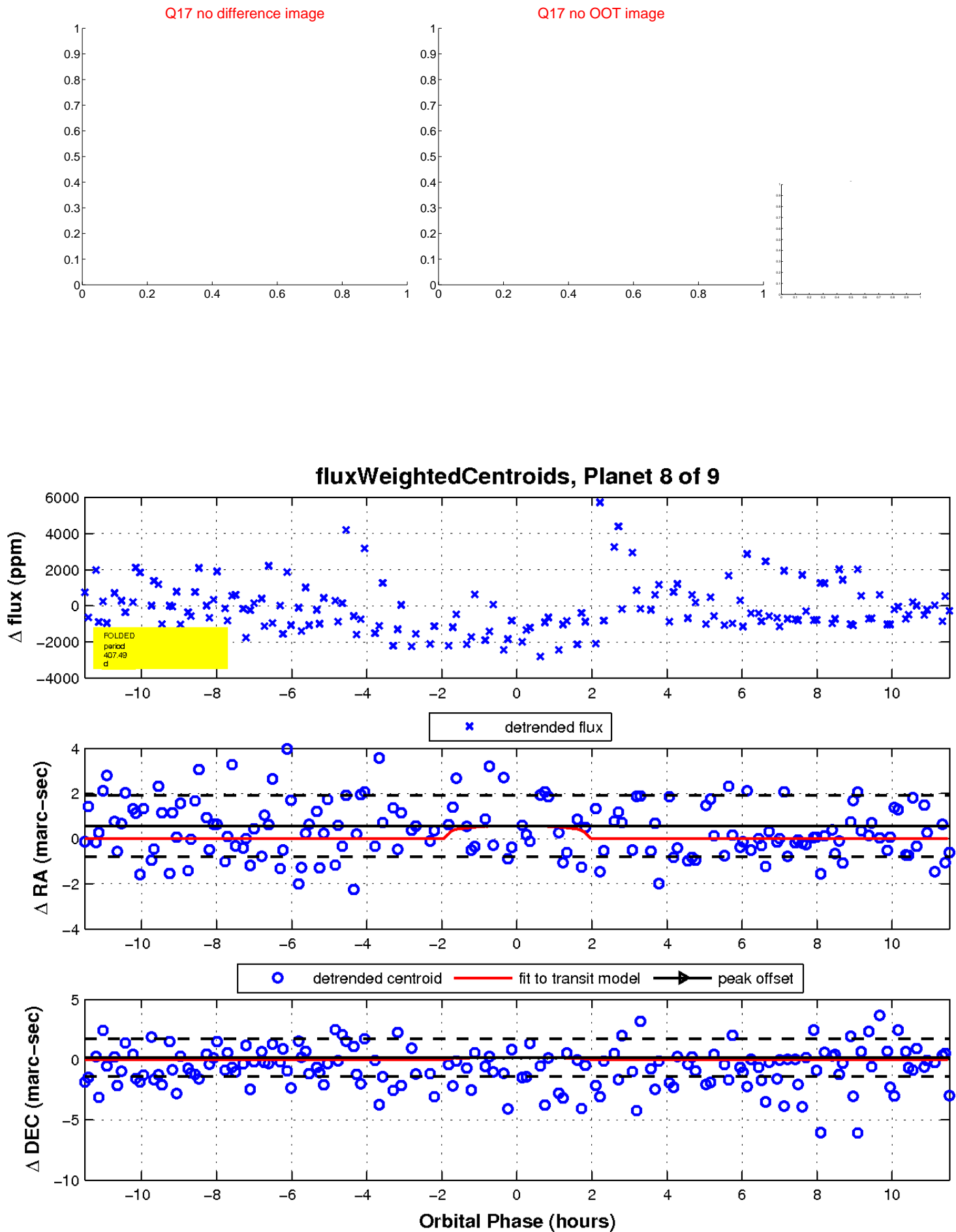
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

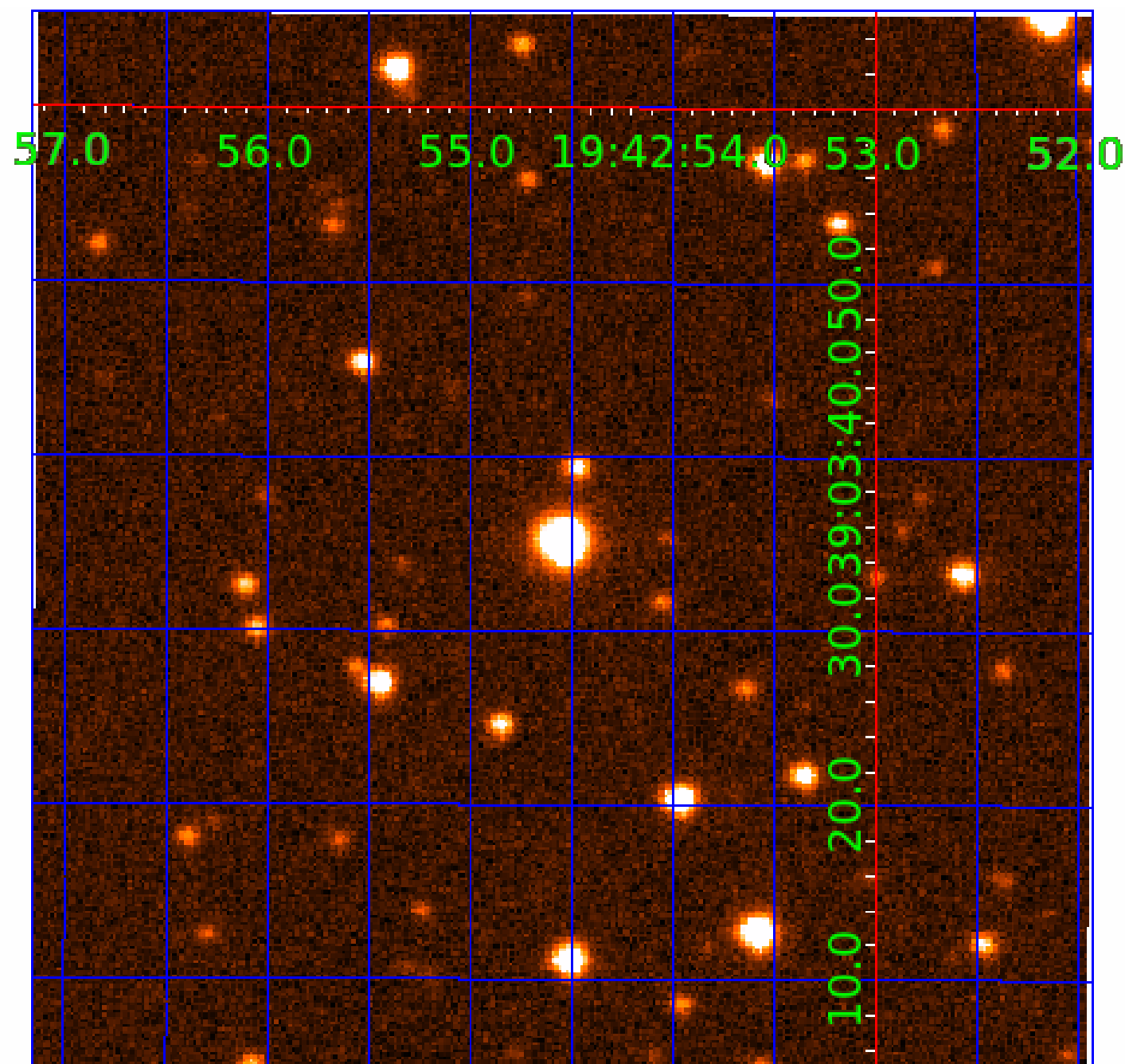


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination



# KIC 003971507

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
003971507-01	OBS	No	394.175282	419.606328	878.0	3.510	15.7	4.0	1.61	5455	5.49	2.05
003971507-03	OBS	No	376.226986	386.815500	1375.5	3.263	13.4	5.6	1.61	5455	6.19	2.18
003971507-04	OBS	No	315.734653	217.568312	1325.1	6.346	15.2	4.9	1.61	5455	5.96	2.75
003971507-05	OBS	No	420.997596	364.959213	1490.2	4.865	13.6	6.5	1.61	5455	6.23	1.88
003971507-06	OBS	No	323.681895	453.462898	1559.4	3.850	12.6	7.6	1.61	5455	6.54	2.66
003971507-08	OBS	No	407.493824	226.377902	940.2	3.862	13.1	3.4	1.61	5455	5.08	1.96
003971507-09	OBS	No	222.868839	227.780306	357.7	15.000	11.6	-1.0	1.61	5455	3.00	4.38

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
003971507-01	OBS	FP	0.00	1	0	1	0	INDIV_TRANS_MARSHALL_TRACKER—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS—HALO_GHOST
003971507-03	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
003971507-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES—LPP_DV—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS
003971507-05	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—MOD_POS_ALT
003971507-06	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL_SKYE—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS
003971507-08	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—CENT_FEW_DIFFS
003971507-09	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_MARSHALL_SKYE—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—CENT_NOFITS

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

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

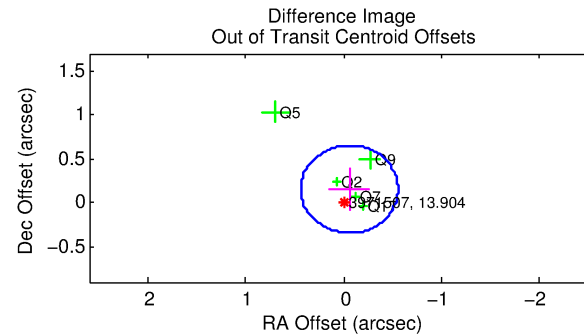
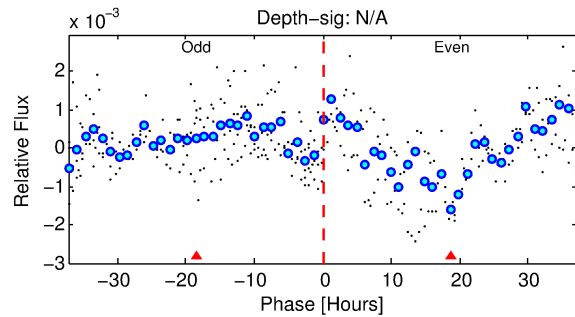
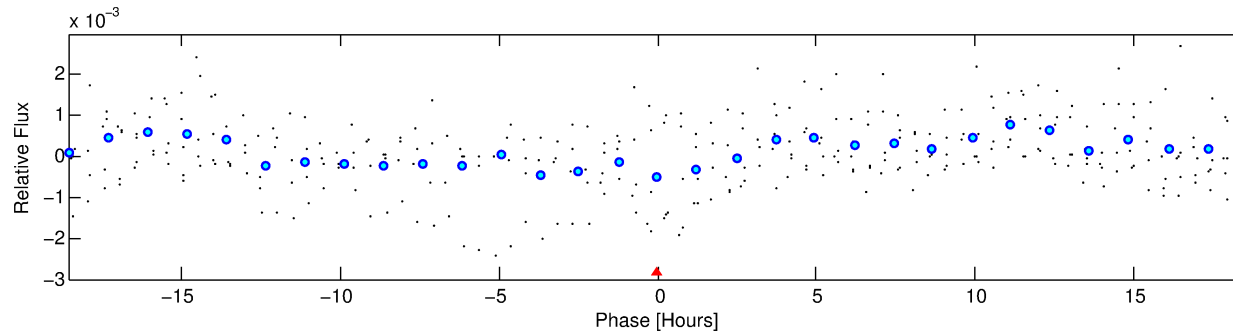
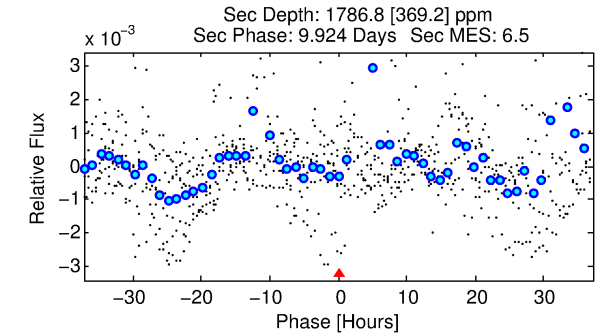
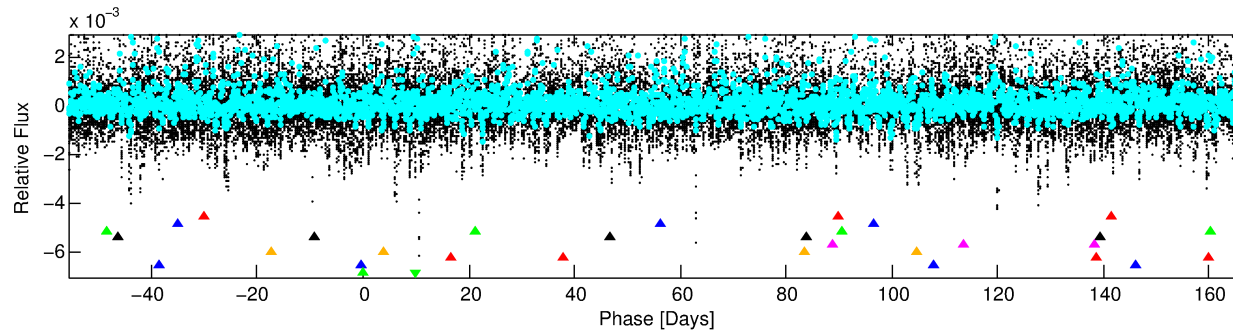
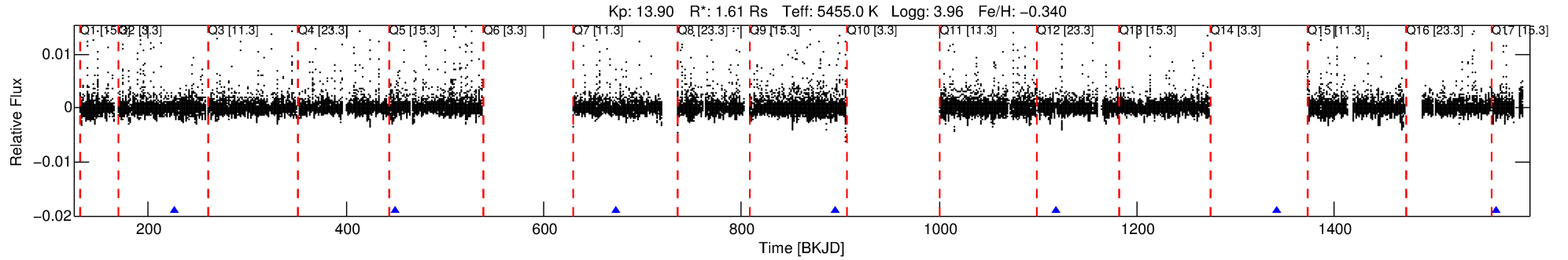
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 003971507-09

No Significant Match Found

# DV One-Page Summary

KIC: 3971507 Candidate: 9 of 9 Period: 222.869 d



## TPS TCE Results:

Period = 222.86884 d  
Epoch = 227.7803 BKJD

DV fit results are unavailable

## DV Diagnostic Results:

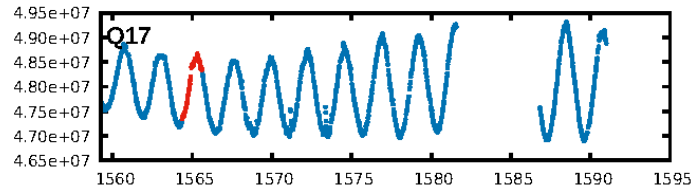
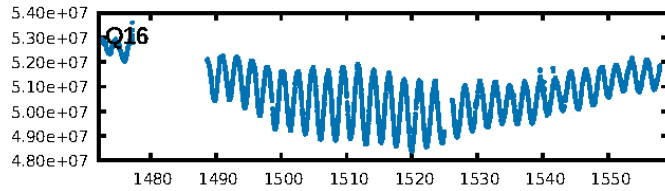
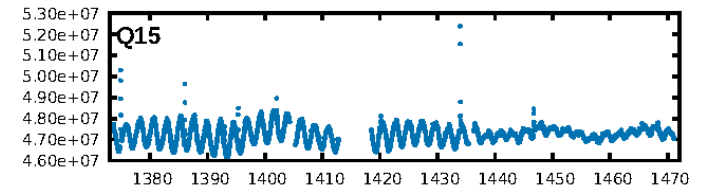
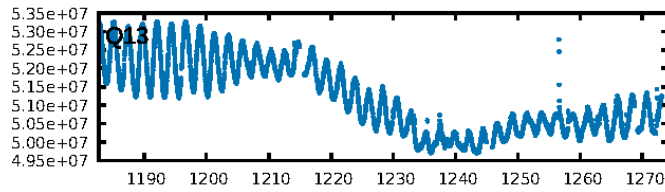
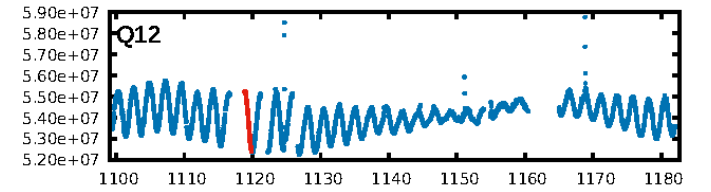
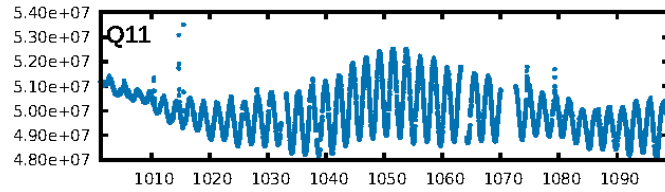
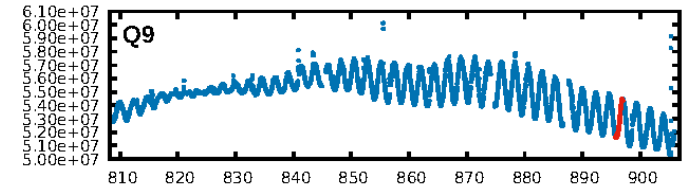
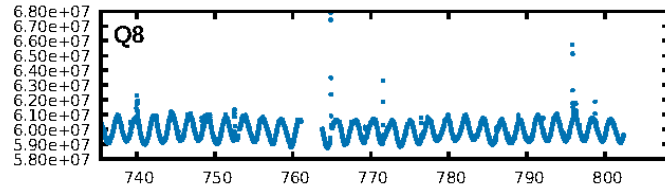
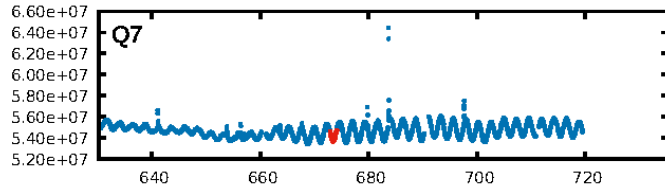
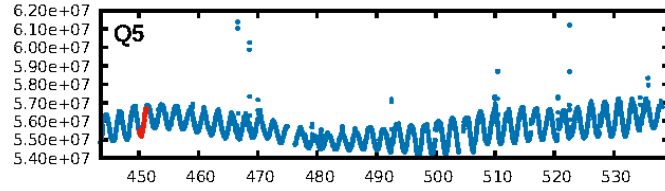
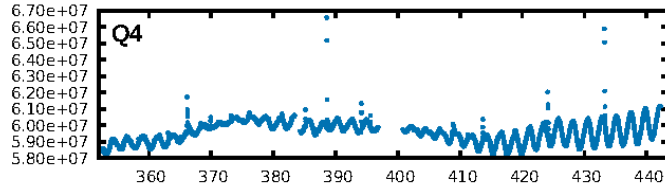
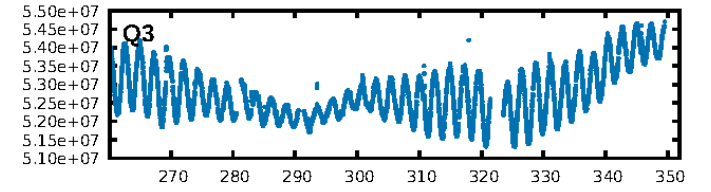
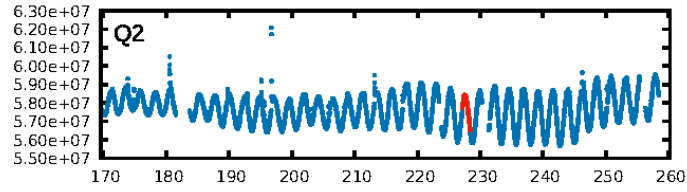
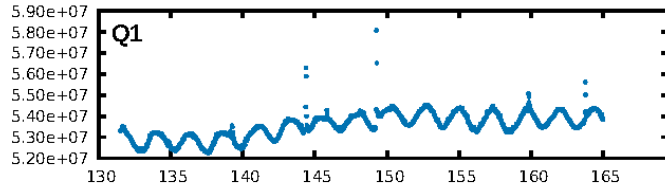
ShortPeriod-sig: N/A  
LongPeriod-sig: 100.0% [136.84σ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: 7.55e-10  
RollingBand-fgt: 1.00 [4/4]  
GhostDiagnostic-chr: 1.104

Centroid-sig: 1.2%  
Centroid-so: 0.647 arcsec [1.96σ]  
OotOffset-rm: 0.167 arcsec [1.00σ]  
KicOffset-rm: 0.283 arcsec [1.89σ]  
OotOffset-st: 1/1/0/3 [5]  
KicOffset-st: 1/1/0/3 [5]  
DiffImageQuality-fgm: 0.60 [3/5]  
DiffImageOverlap-fno: 0.80 [4/5]

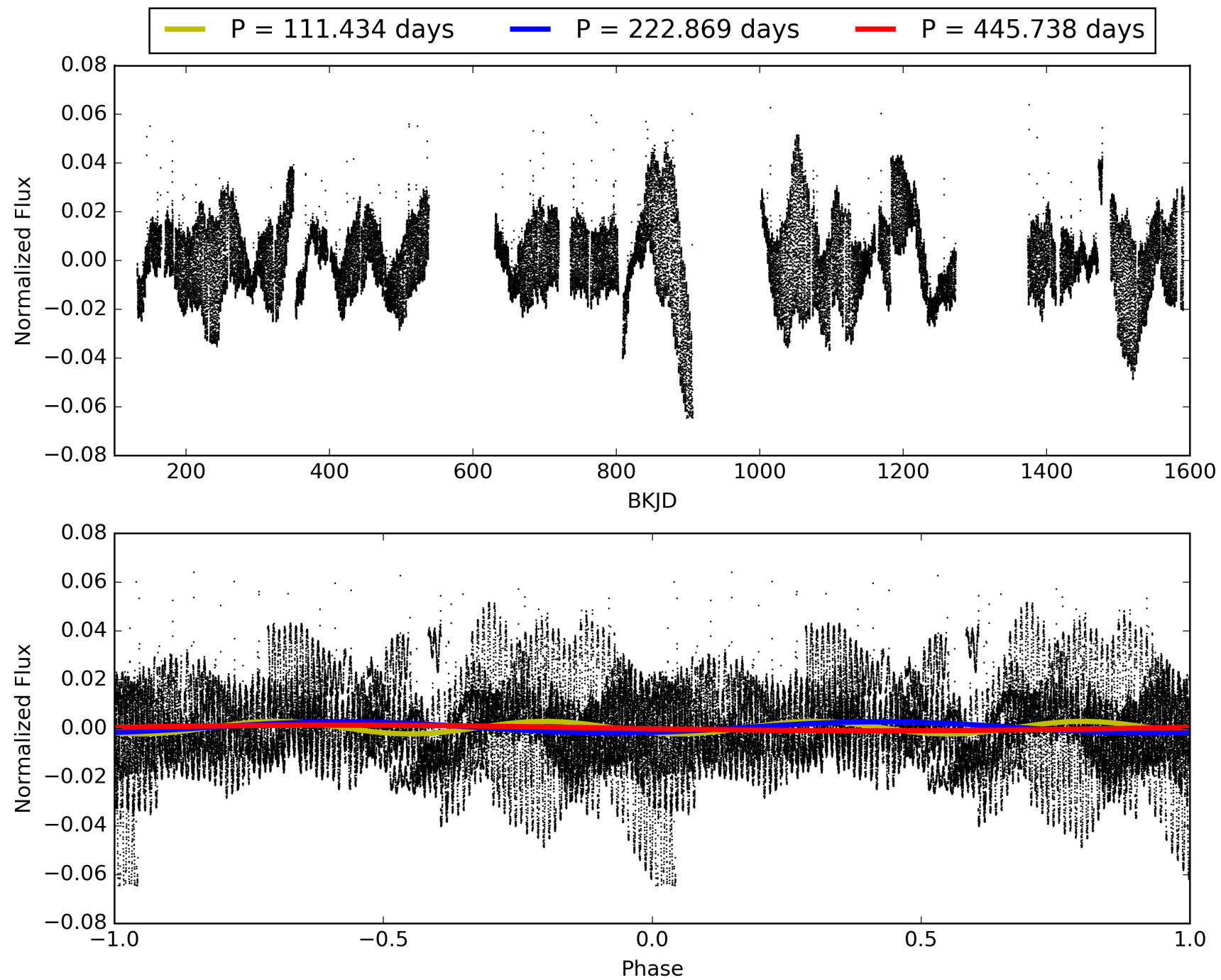
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 31-Jan-2016 05:55:28 Z

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

# TCE 003971507-09, PDC Light Curves



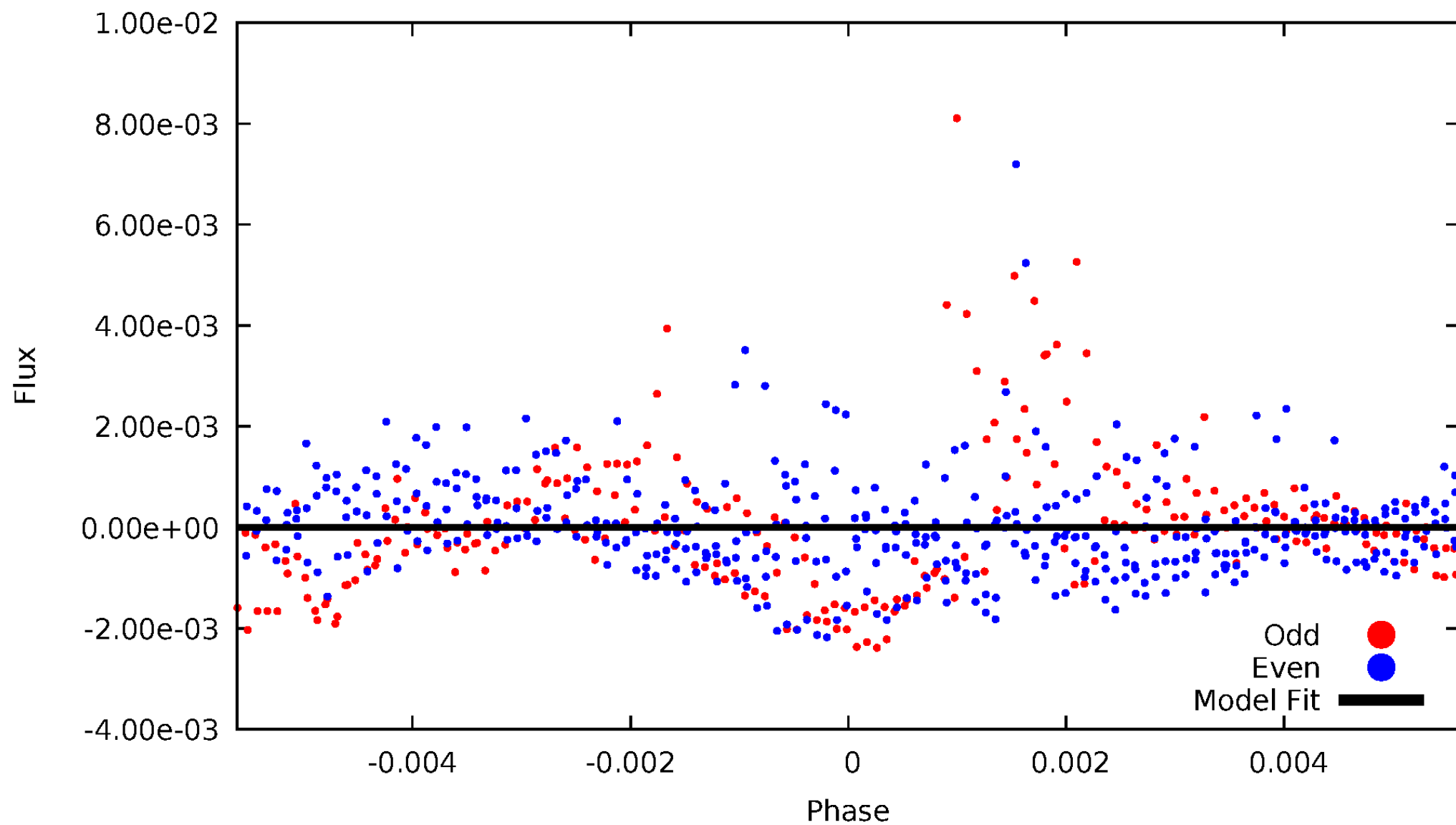
TCE 003971507-09





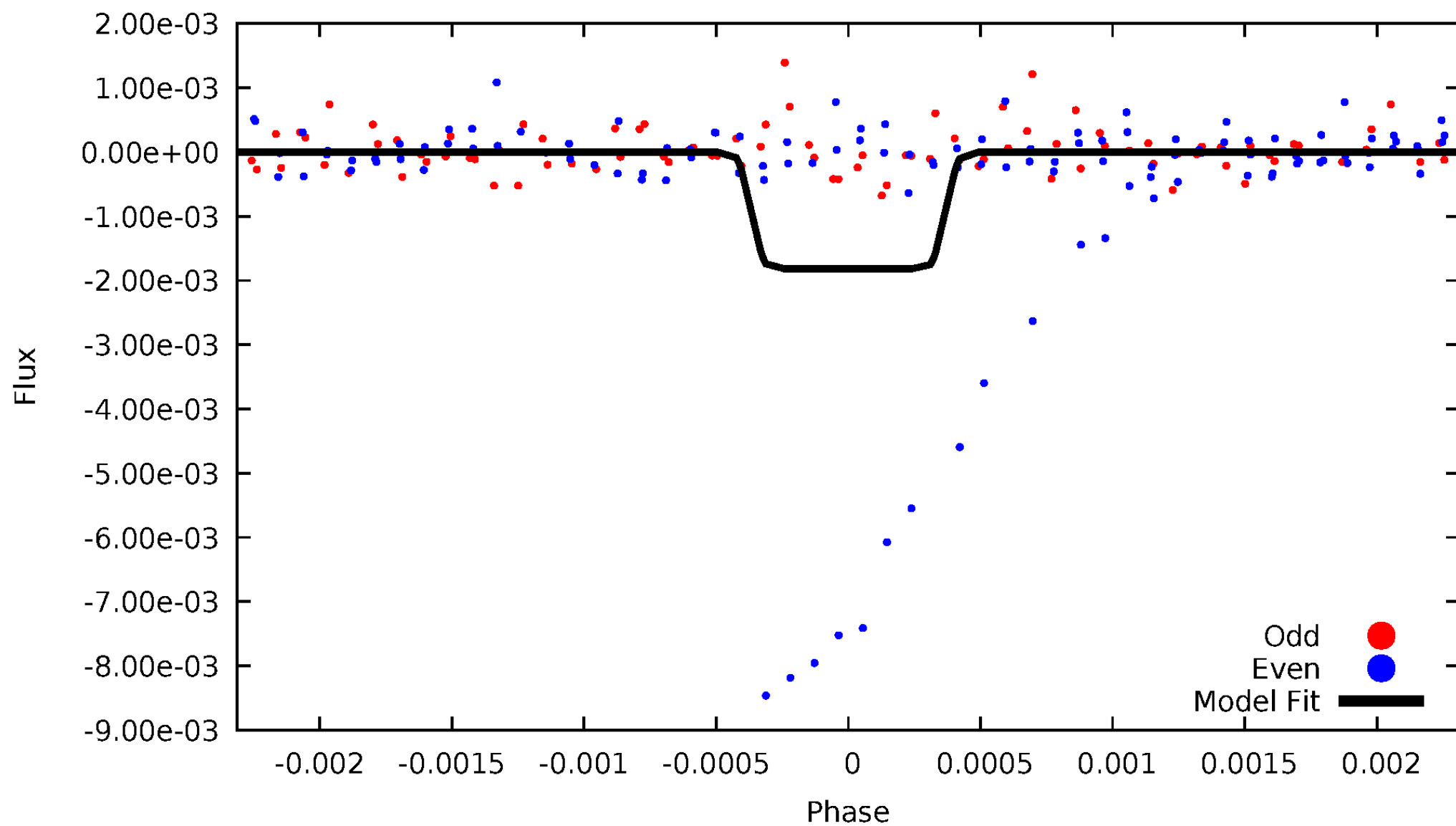
# DV Odd/Even

TCE 003971507-09



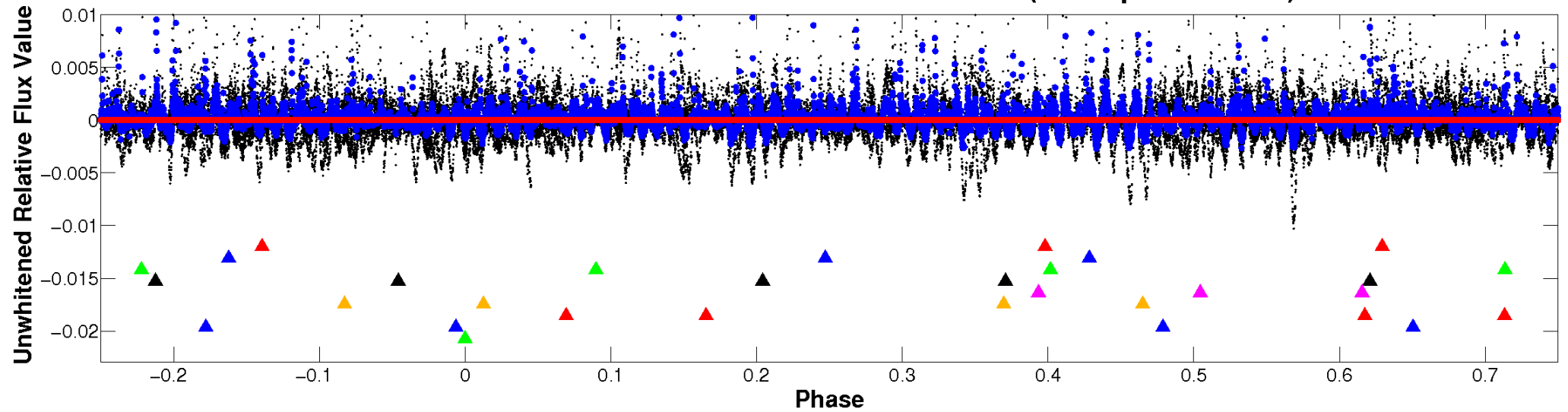
# ALT Odd/Even

TCE 003971507-09



# Non-Whitened Vs. Whitened Light Curve

Planet 9 : Phased Unwhitened Flux Time Series (TPS Epoch/Period)

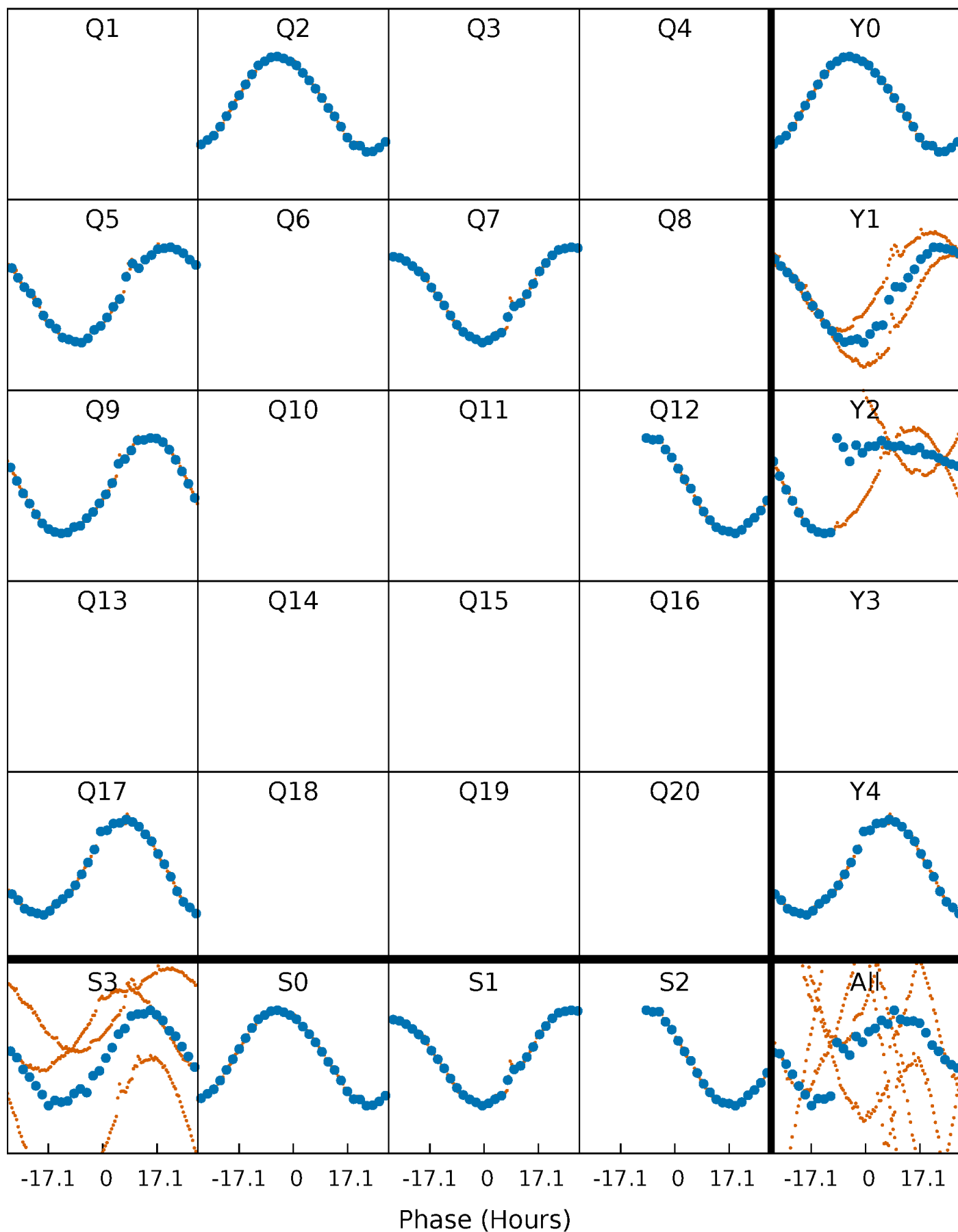


Planet 9 : Phased Whitened Flux Time Series (TPS Epoch/Period)



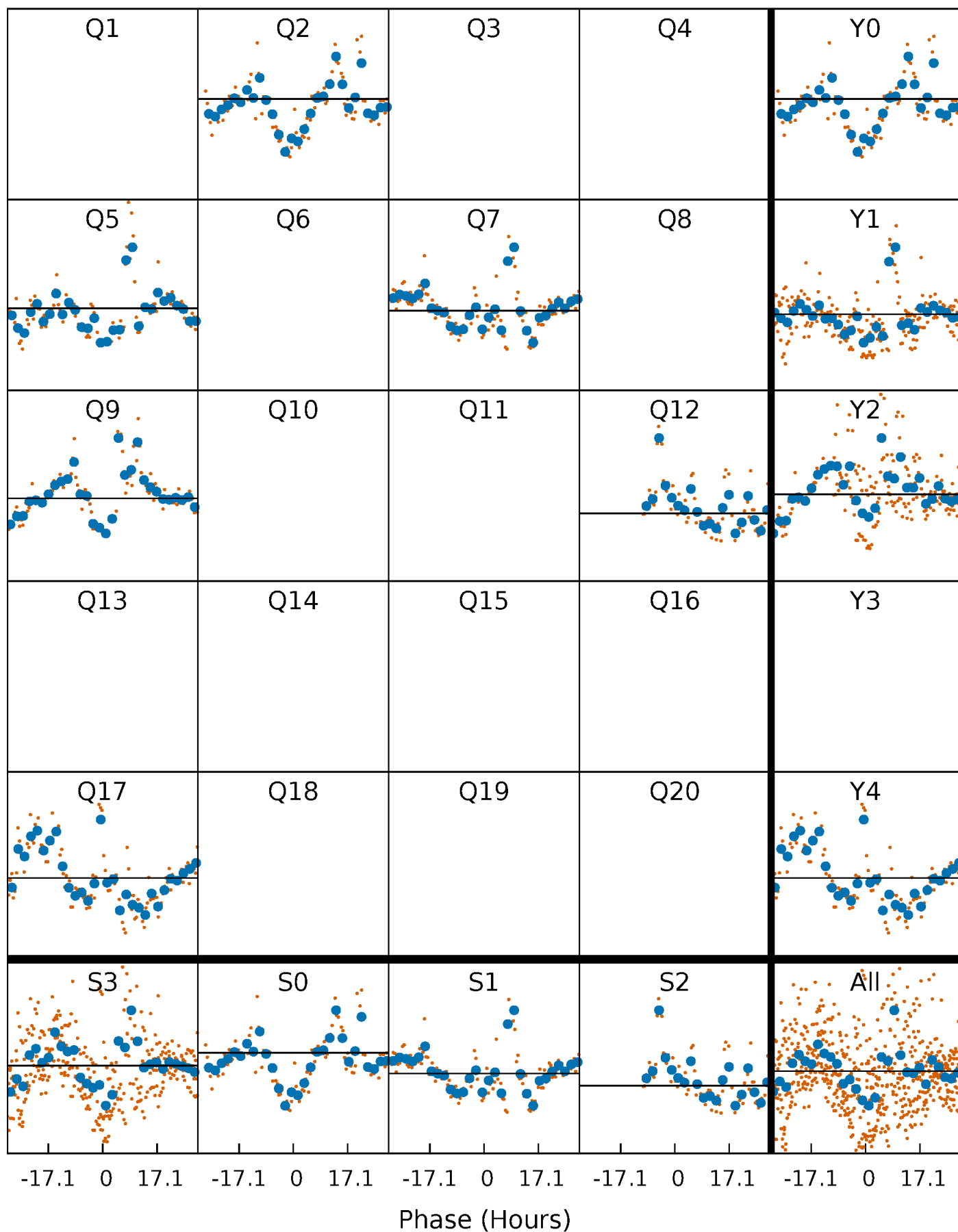
# PDC Quarter-Phased Transit Curves

TCE 003971507-09     $P=222.868839$  Days     $T_0=227.780306$  (BKJD)



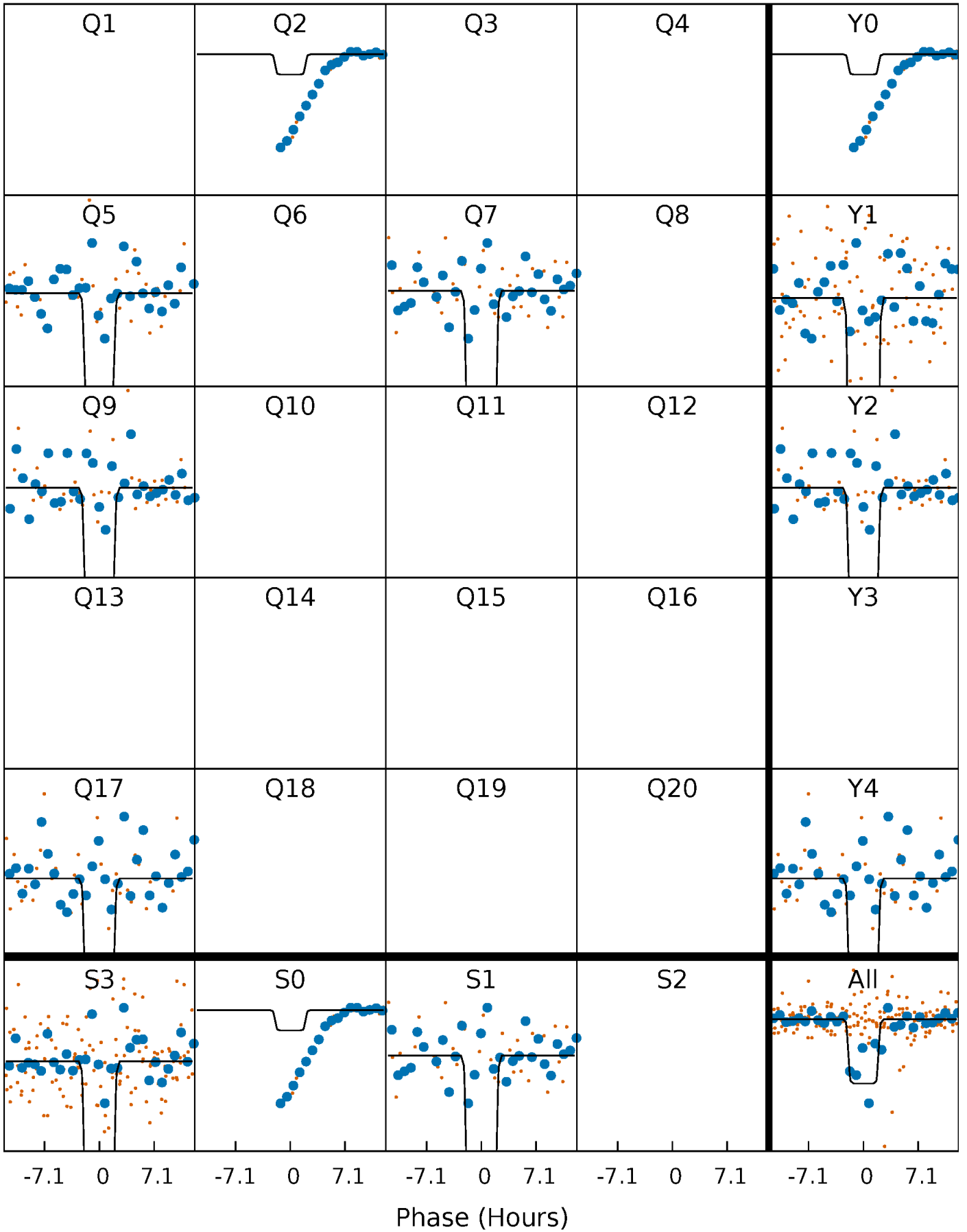
# DV Quarter-Phased Transit Curves

TCE 003971507-09     $P=222.868839$  Days     $T_0=227.780306$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

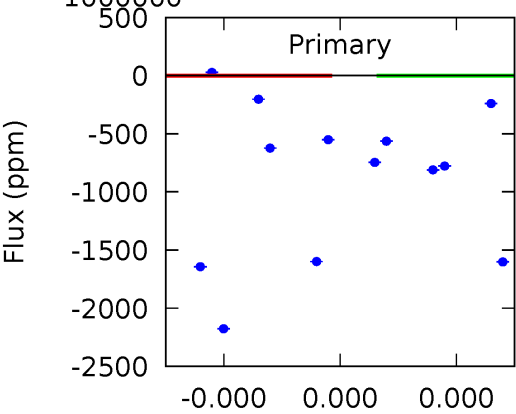
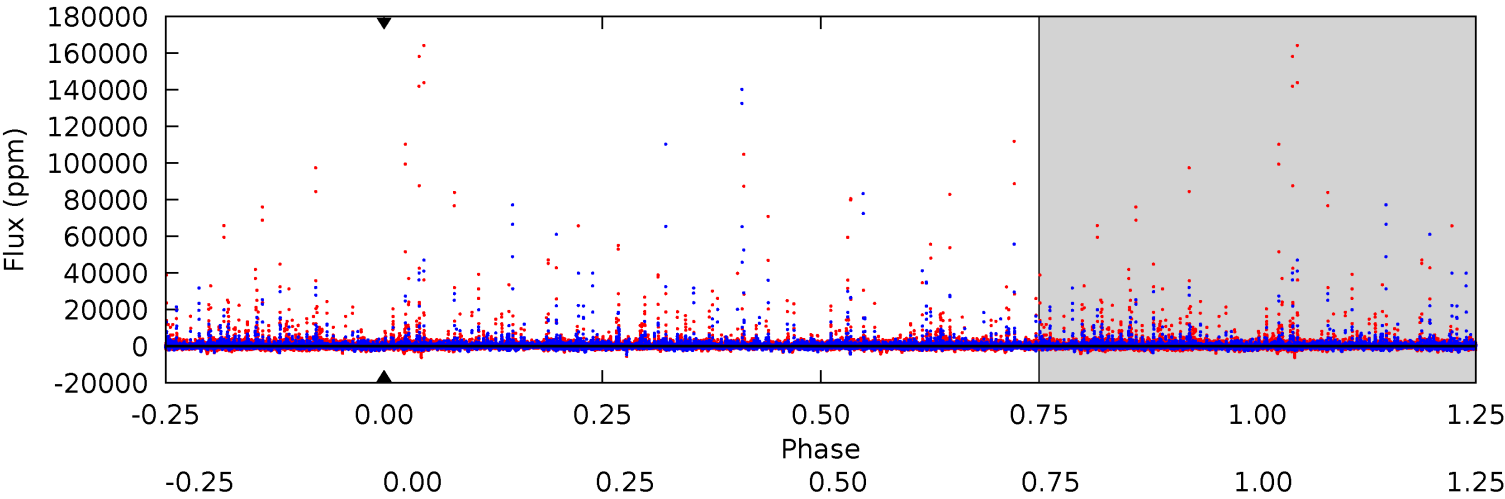
TCE 003971507-09     $P=222.868839$  Days     $T_0=226.702611$  (BKJD)



# DV Model-Shift Uniqueness Test

003971507-09, P = 222.868839 Days, E = 4.911467 Days

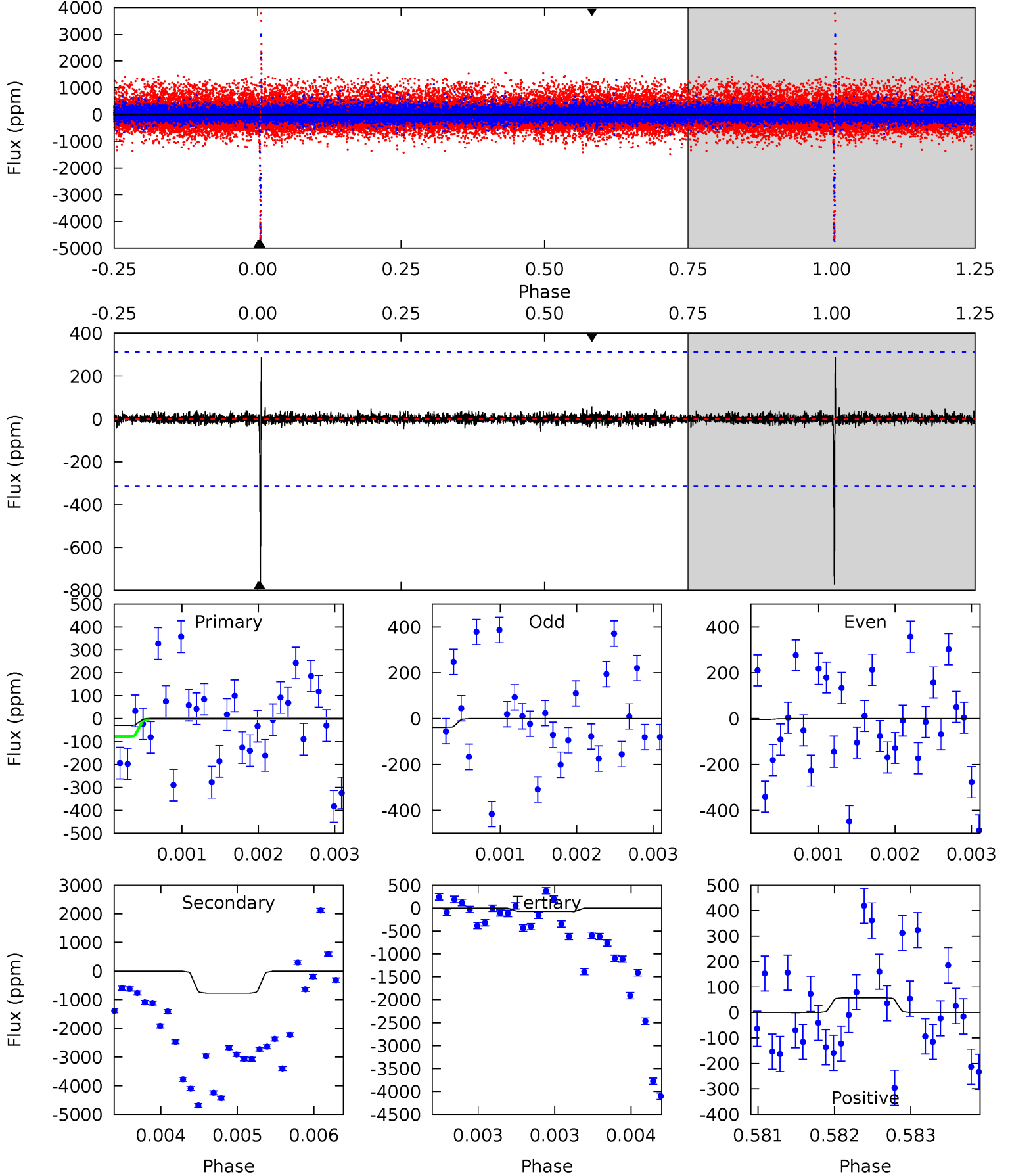
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
0	0	0	0	1.00	1.00	1.00	0	0	0	0	0	0	0	0



# Alt Model-Shift Uniqueness Test

003971507-09, P = 222.868839 Days, E = 3.833772 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
0.52	13.5	1.28	1.01	5.48	3.34	0.24	-0.76	-0.49	12.3	12.5	0.26	-98.9	0.27	0





### Stellar Parameters For KIC 003971507

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$5455^{+190}_{-152}$	$3.960^{+0.602}_{-0.258}$	$-0.340^{+0.350}_{-0.250}$	$1.607^{+0.806}_{-0.887}$	$0.860^{+0.105}_{-0.105}$	$0.292^{+1.868}_{-0.192}$
	+3%/-3%	+15%/-7%	+103%/-74%	+50%/-55%	+12%/-12%	+640%/-66%
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 003971507-09 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$0 \pm 1000000$	$11.95^{+13.68}_{-8.11}$	$509^{+62}_{-75}$	$-4191^{+21212}_{-13154}$	$-2043.404^{+299501.163}_{-305307.754}$
Alt.	$-772 \pm 57$	$13.27^{+14.85}_{-9.62}$	$507^{+66}_{-75}$	$3614^{+2011}_{-672}$	$1154^{+13340}_{-906}$

$T_{max}$  = 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

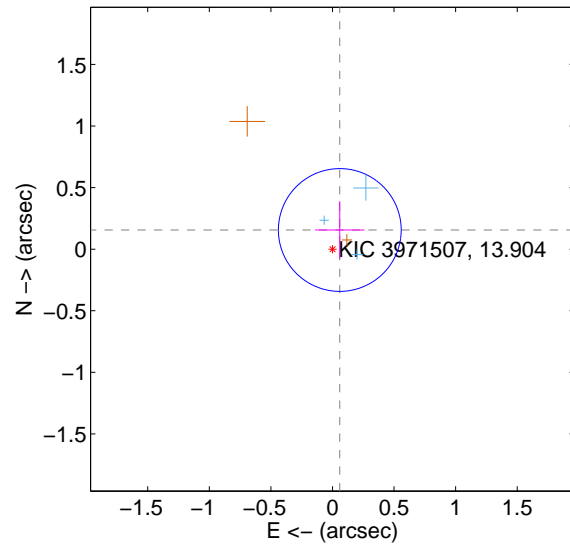
Supplemental centroid analysis for 003971507-09. Kepler magnitude: 13.90. Transit SNR -1.00

There are 3 quarters with good PRF difference image offsets

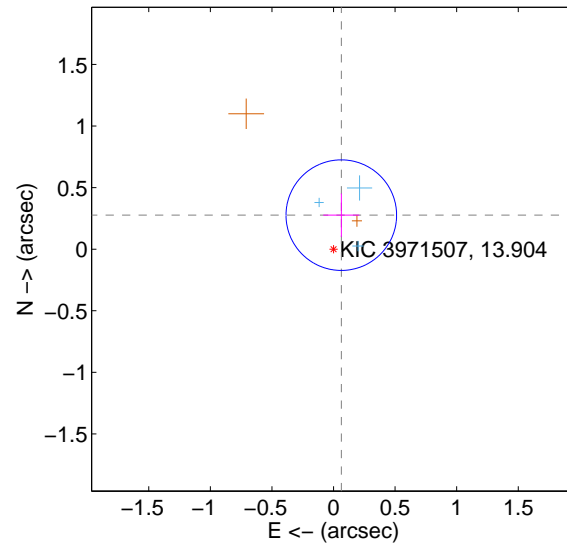
The direct PRF centroid is offset from the target star catalog position by about 0.07 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.167 \pm 0.166$	1.00	$-0.059 \pm 0.201$	$0.156 \pm 0.234$
PRF-fit source offset from KIC position	$0.283 \pm 0.150$	1.89	$-0.063 \pm 0.146$	$0.276 \pm 0.176$
photometric centroid source offset	$0.65 \pm 0.33$	1.96	$0.02 \pm 0.36$	$-0.65 \pm 0.33$

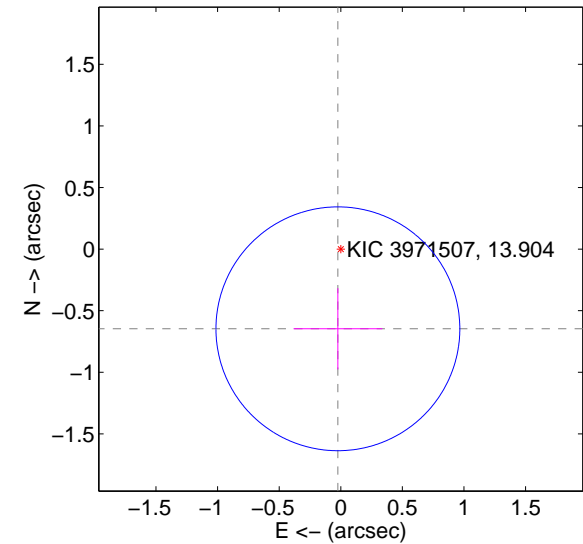
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position

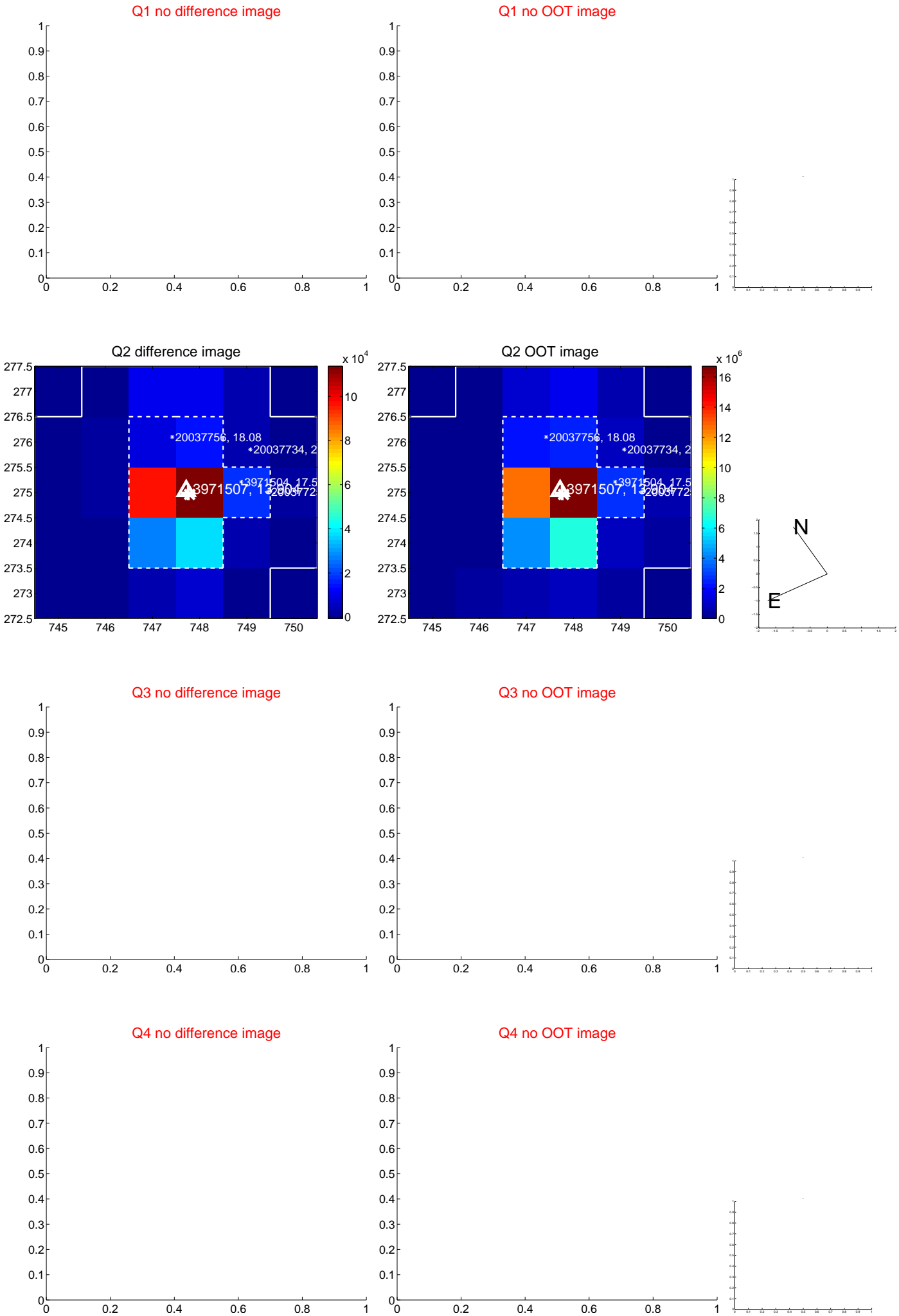


offset from photometric centroids

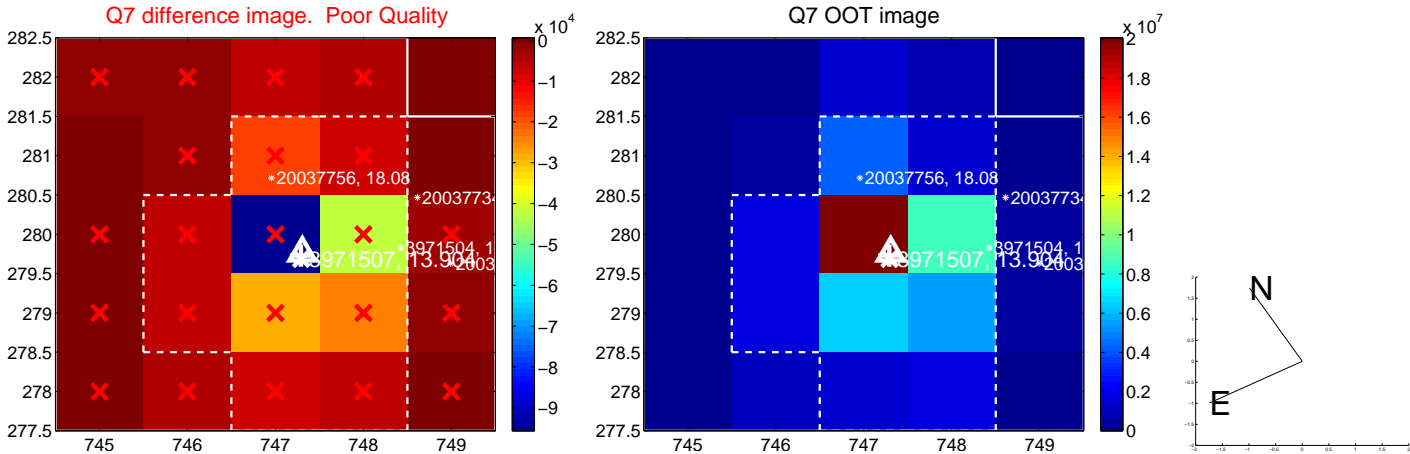
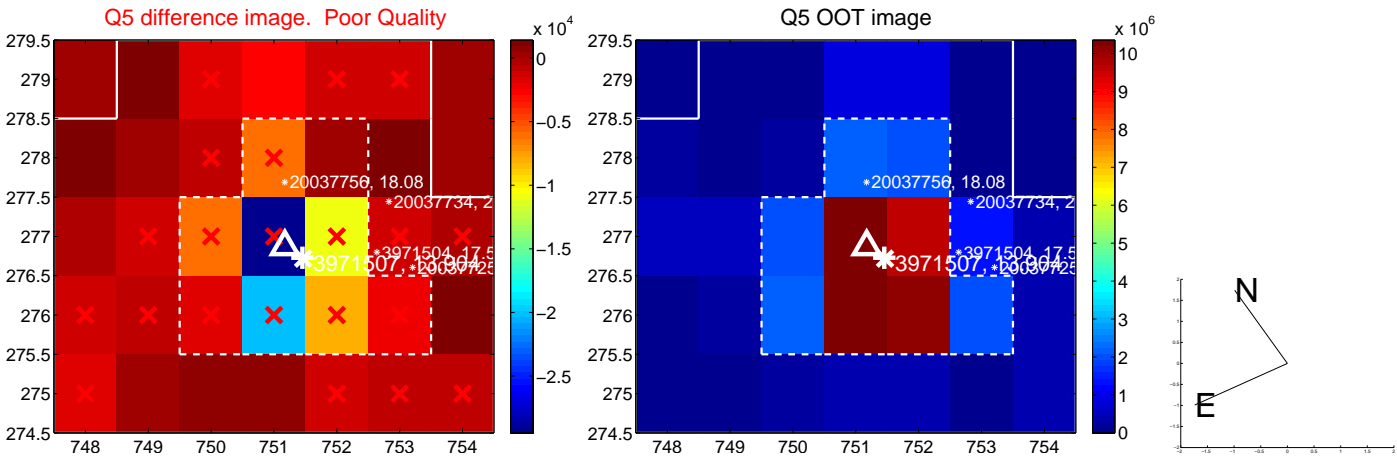


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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

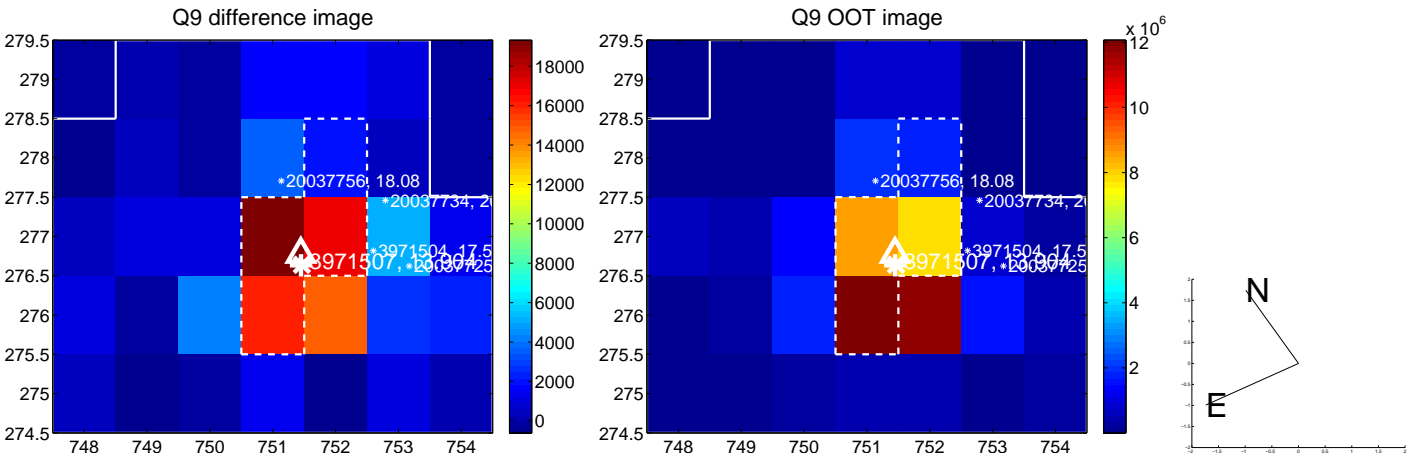
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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



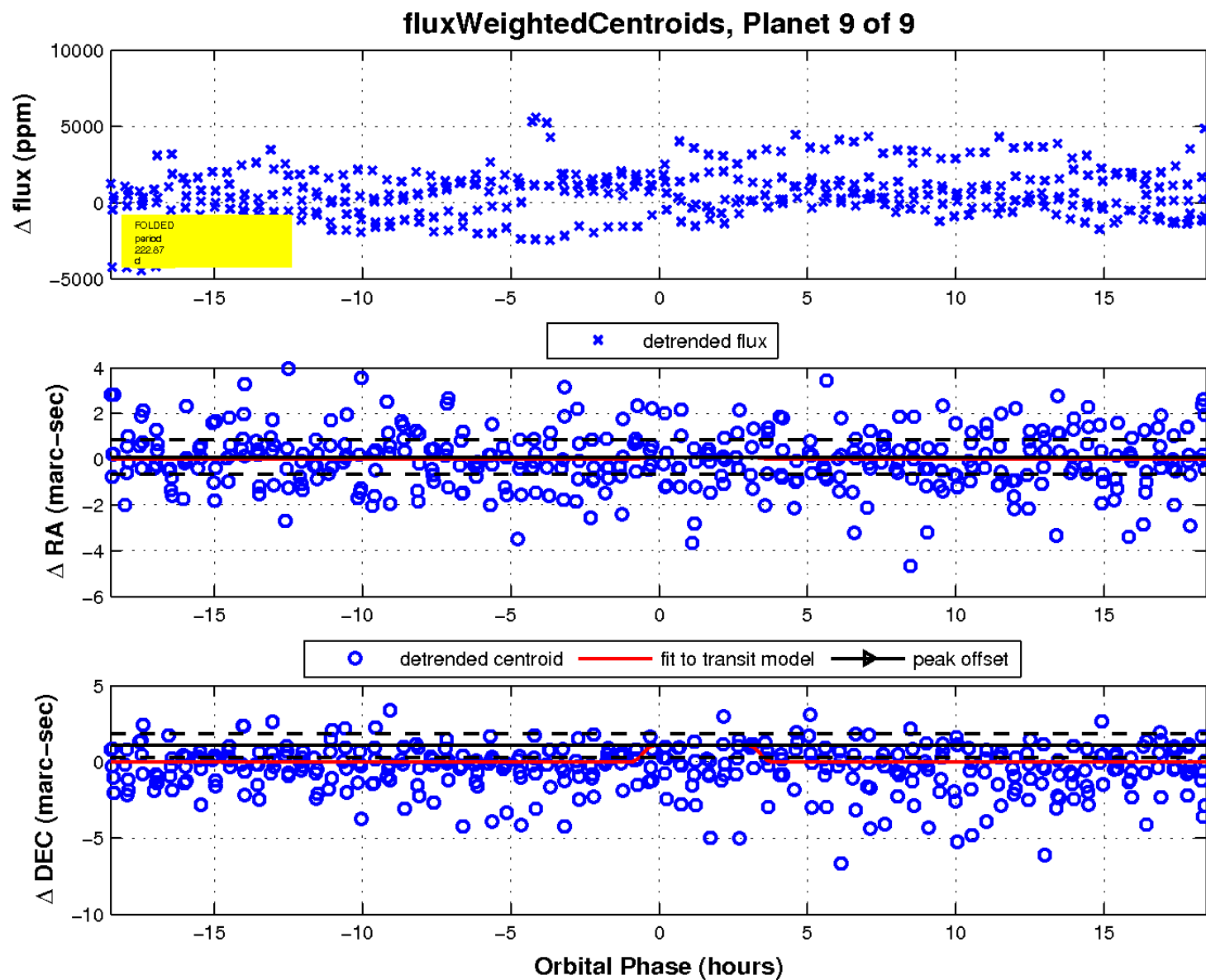
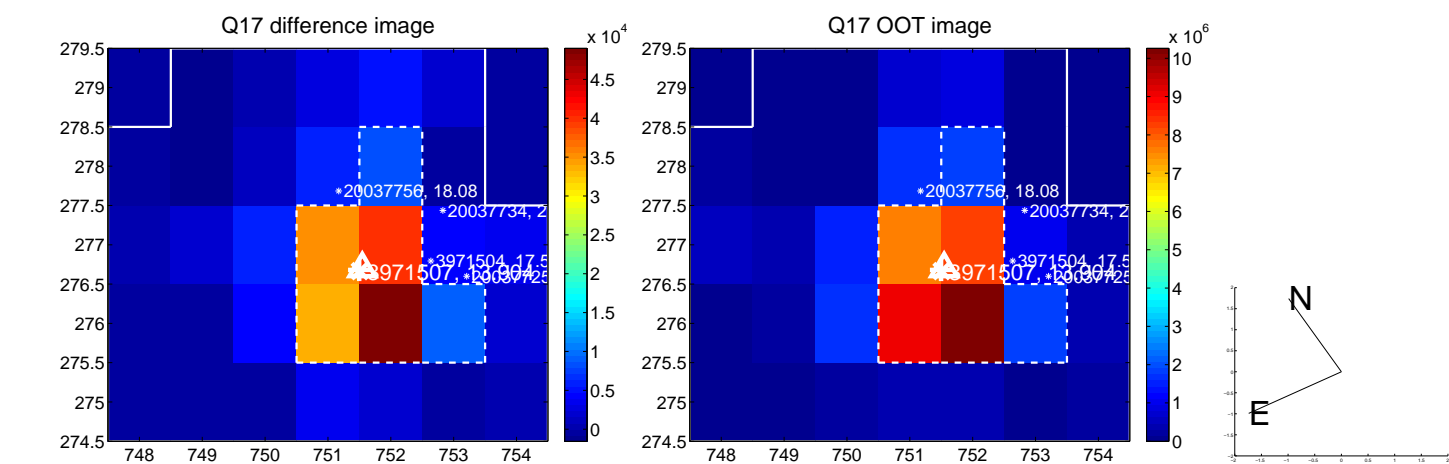
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

