

# KIC 009405969

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
009405969-01	OBS	No	397.597763	490.226276	1514.1	7.218	20.2	6.5	2.38	5138	18.16	3.59
009405969-02	OBS	No	487.486445	346.706405	766.6	4.818	17.8	4.9	2.38	5138	6.74	2.73
009405969-03	OBS	No	307.942552	183.651777	1098.8	4.771	16.6	7.1	2.38	5138	8.15	5.05
009405969-04	OBS	No	636.403226	227.296712	392.5	4.500	16.5	-1.0	2.38	5138	4.63	1.92

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009405969-01	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS
009405969-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS
009405969-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS
009405969-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL_SKYE—LPP_DV—ALL_TRANS_CHASES—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.

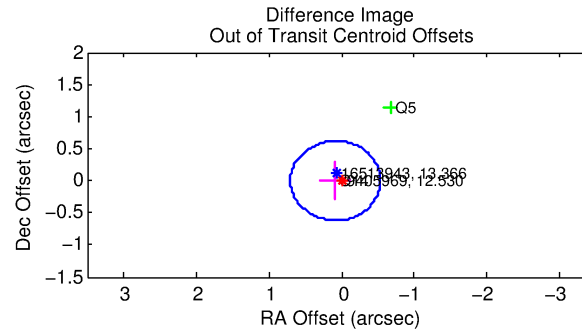
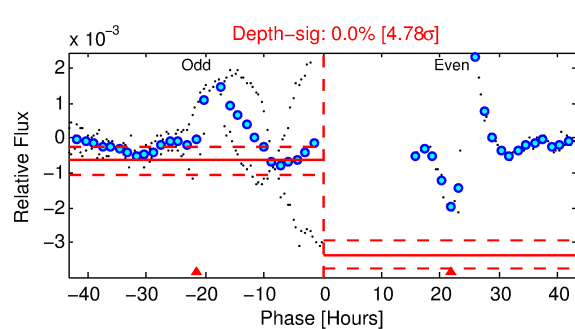
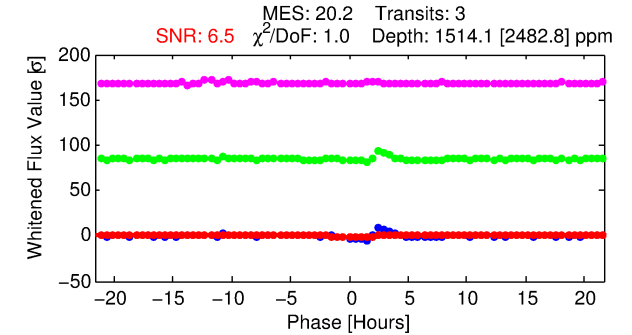
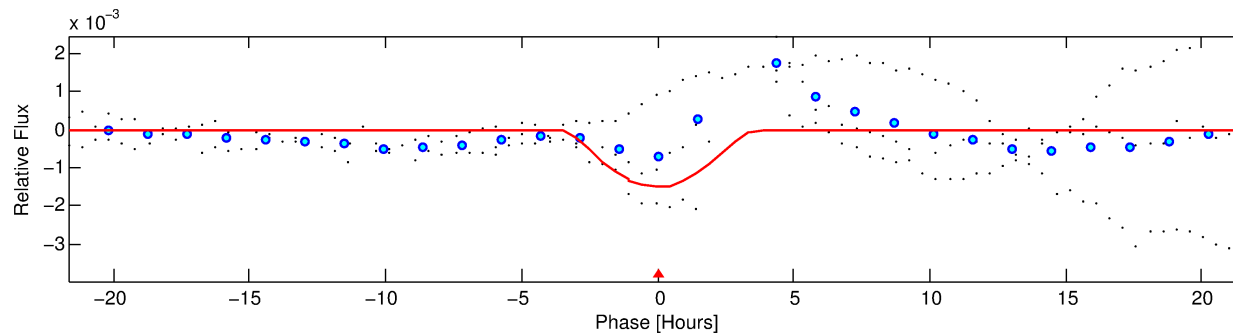
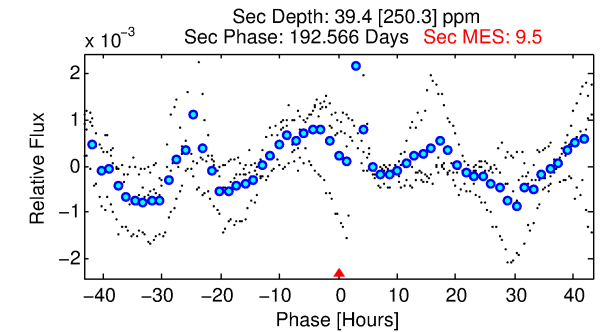
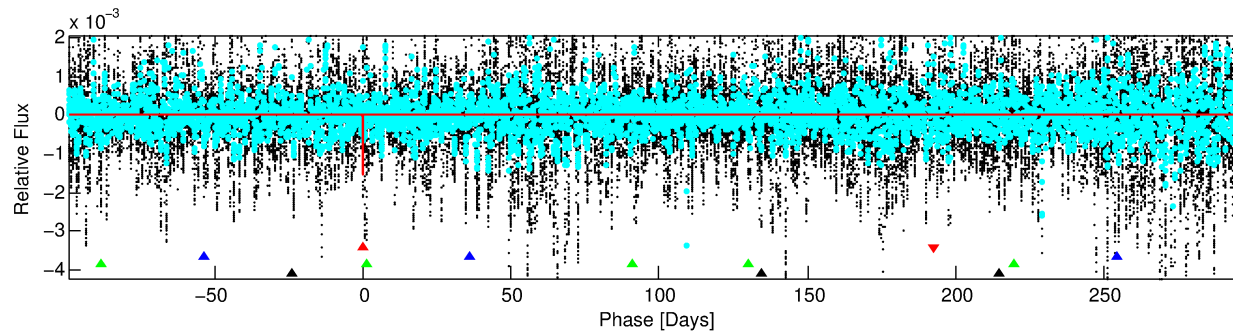
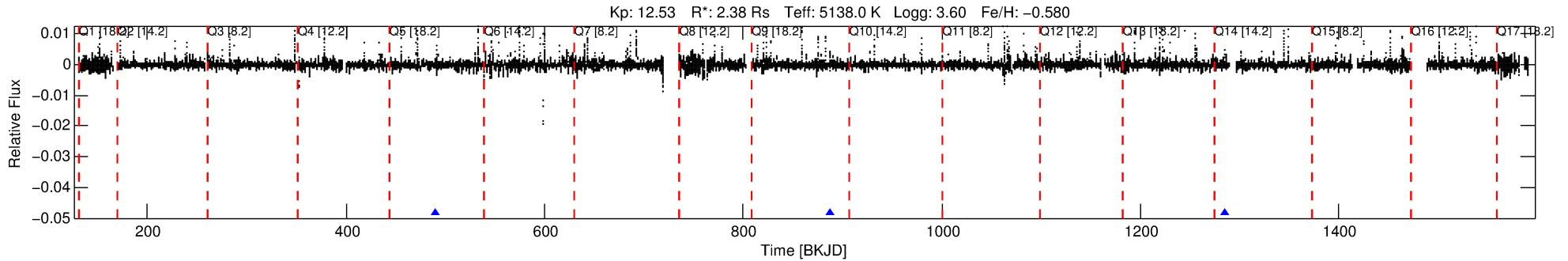
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 009405969-01

No Significant Match Found

# DV One-Page Summary

KIC: 9405969 Candidate: 1 of 4 Period: 397.598 d



## DV Fit Results:

Period = 397.59776 [0.01088] d  
Epoch = 490.2263 [0.0140] BKJD  
Rp/R\* = 0.0700 [0.1580]  
a/R\* = 160.17 [78.13]  
b = 1.00 [0.30]  
Seff = 3.59 [5.89]  
Teq = 351 [144] K  
Rp = 18.16 [43.05] Re  
a = 0.9919 [0.9120] AU  
Ag = 64.67 [515.16] [0.12σ]  
Teffp = 1539 [2999] K [0.40σ]

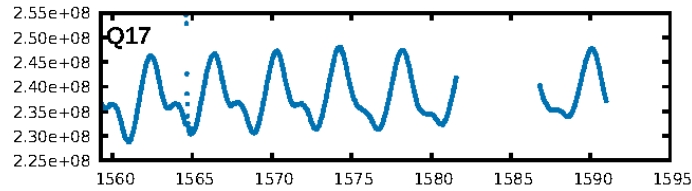
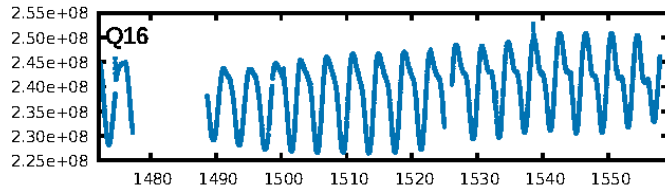
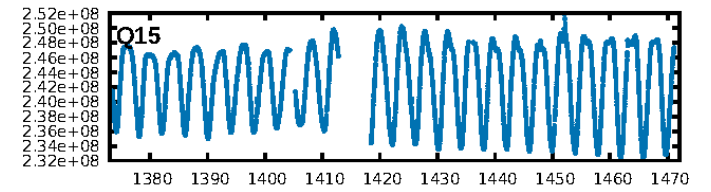
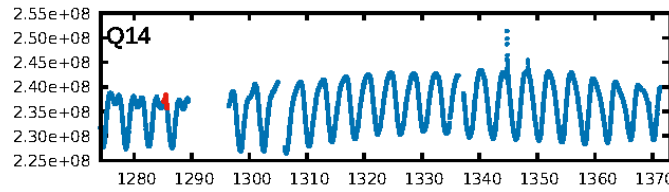
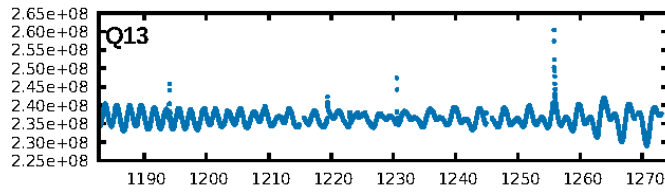
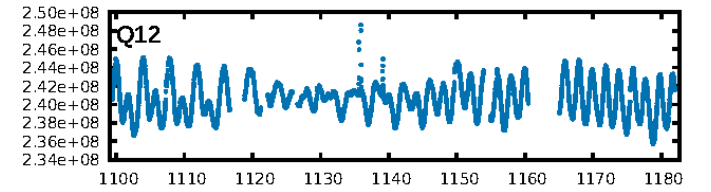
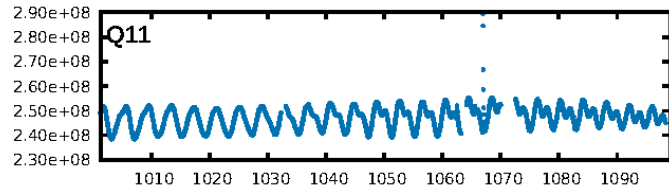
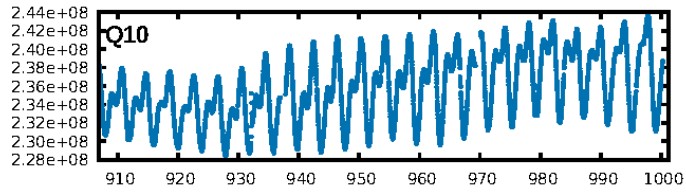
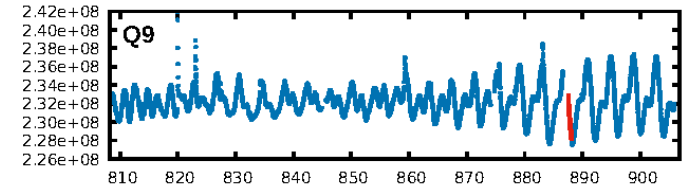
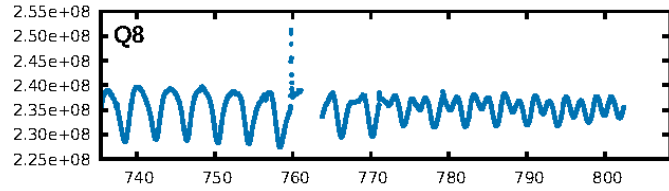
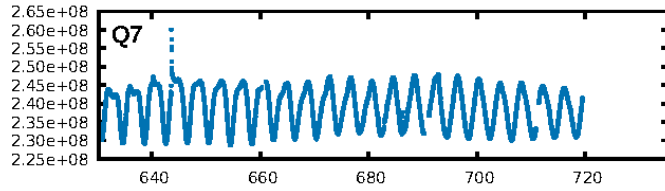
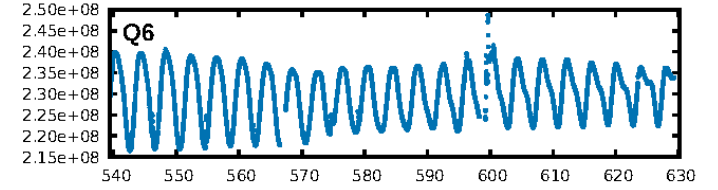
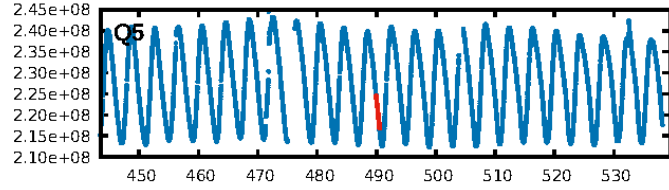
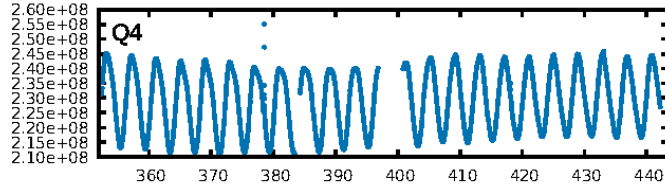
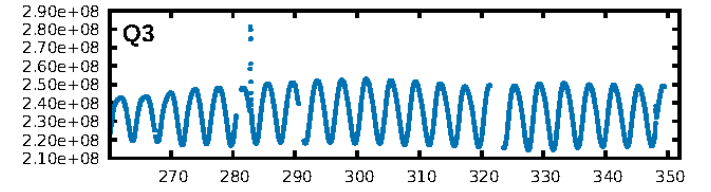
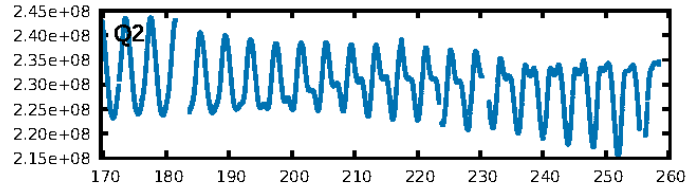
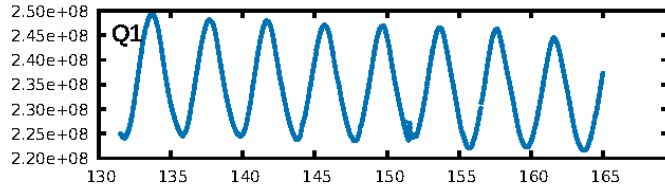
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [248.69σ]  
LongPeriod-sig: 100.0% [248.59σ]  
ModelChiSquare2-sig: 0.0%  
ModelChiSquareGof-sig: 95.1%  
Bootstrap-pfa: N/A  
RollingBand-fgt: 1.00 [3/3]  
GhostDiagnostic-chr: -2795  
Centroid-sig: 52.1%  
Centroid-so: 0.186 arcsec [0.92σ]  
OotOffset-rm: 0.087 arcsec [0.42σ]  
KicOffset-rm: 0.082 arcsec [0.15σ]  
OotOffset-st: 1/0/0/1 [2]  
KicOffset-st: 1/0/0/1 [2]  
DiffImageQuality-fgm: 0.00 [0/2]  
DiffImageOverlap-fno: 1.00 [2/2]

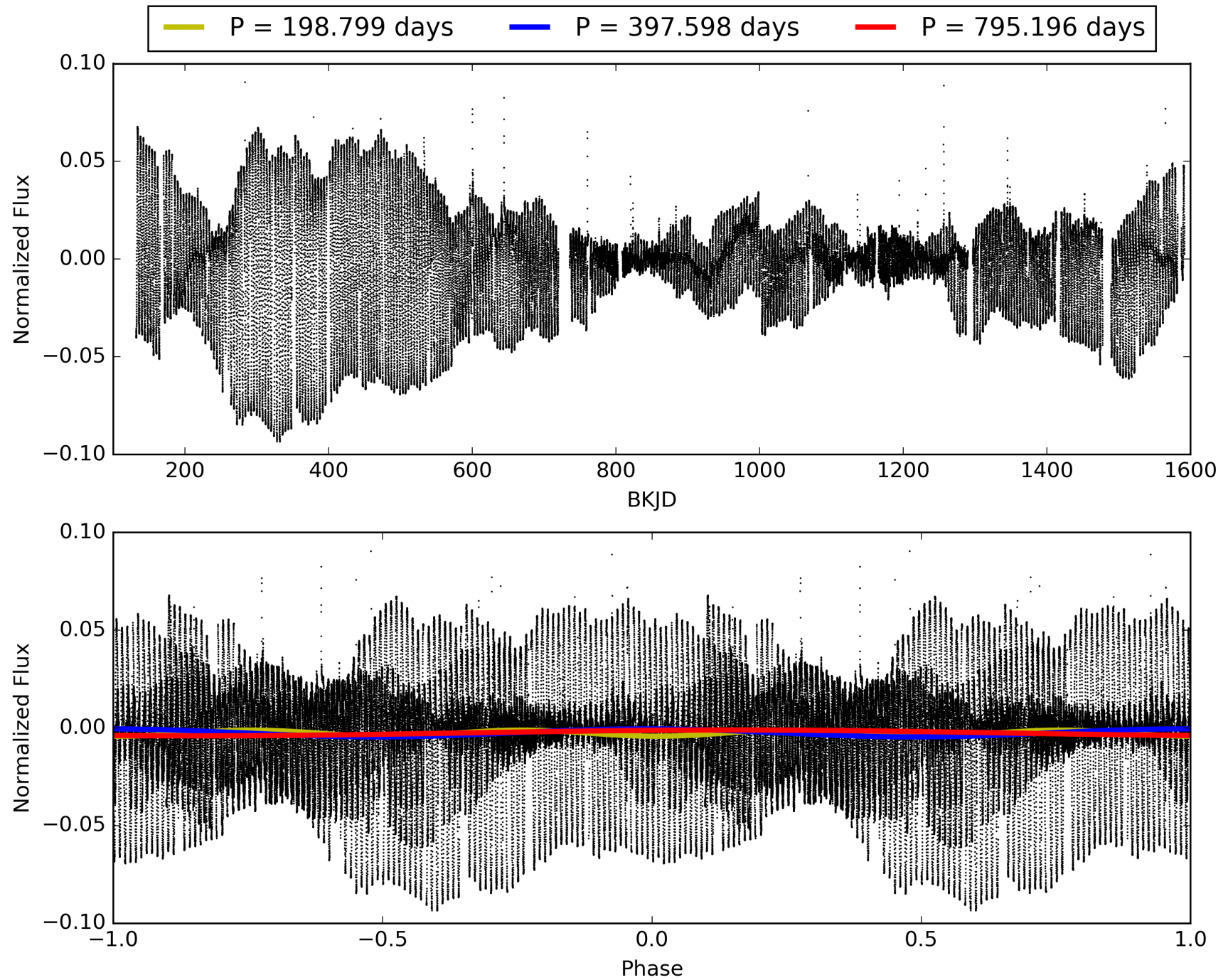
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 31-Jan-2016 22:02:02 Z

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

# TCE 009405969-01, PDC Light Curves

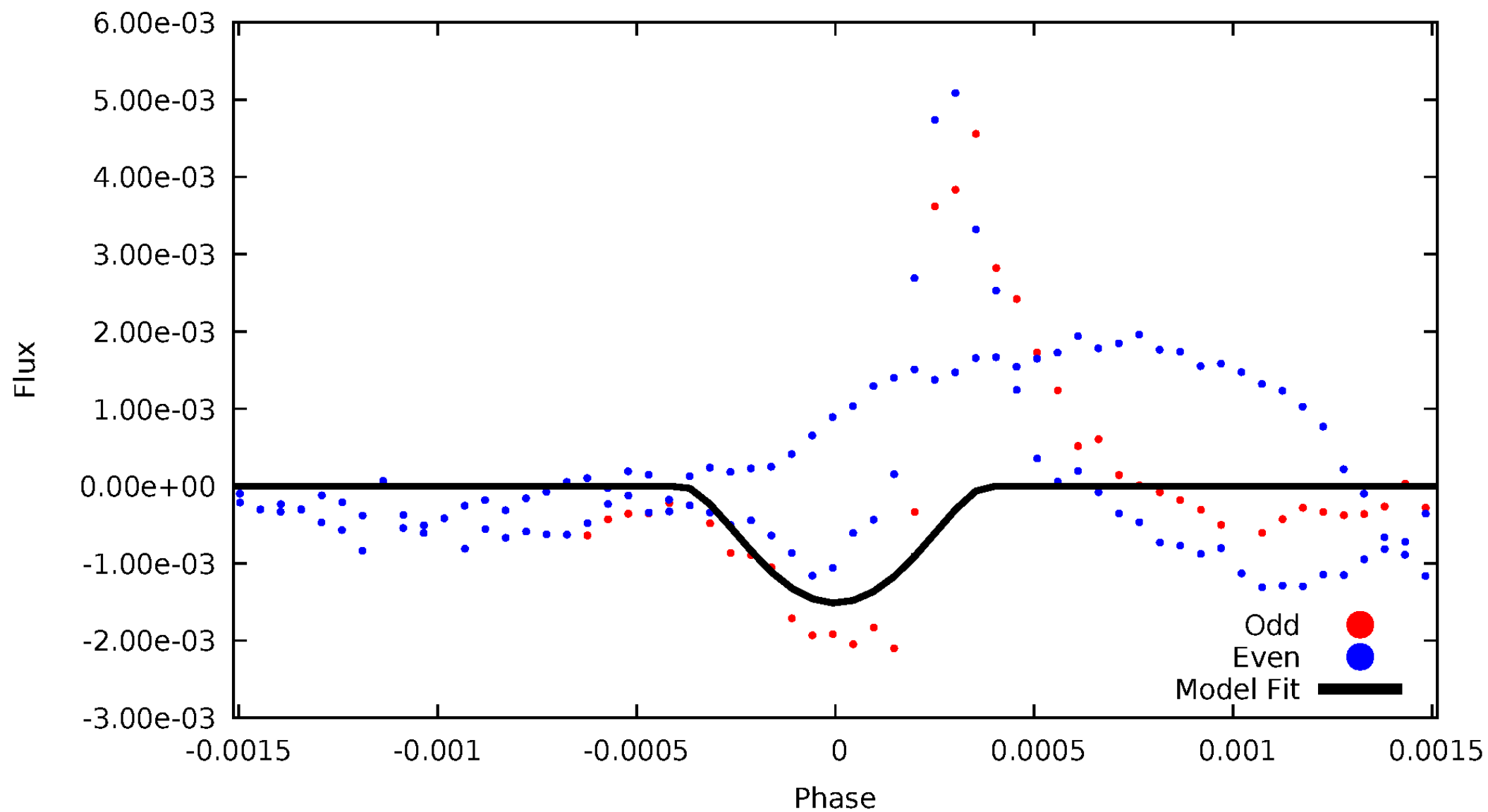


TCE 009405969-01



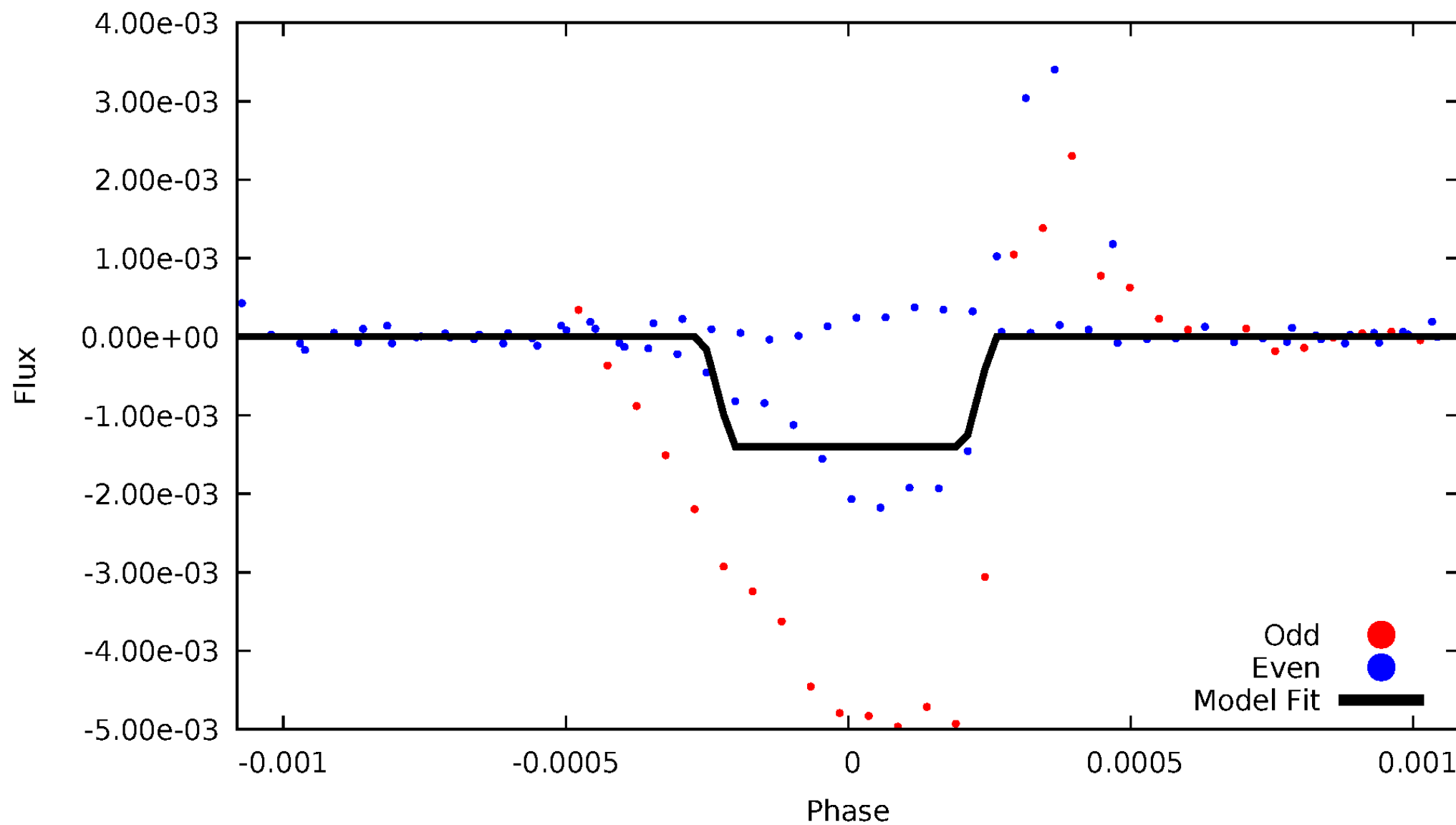
# DV Odd/Even

TCE 009405969-01



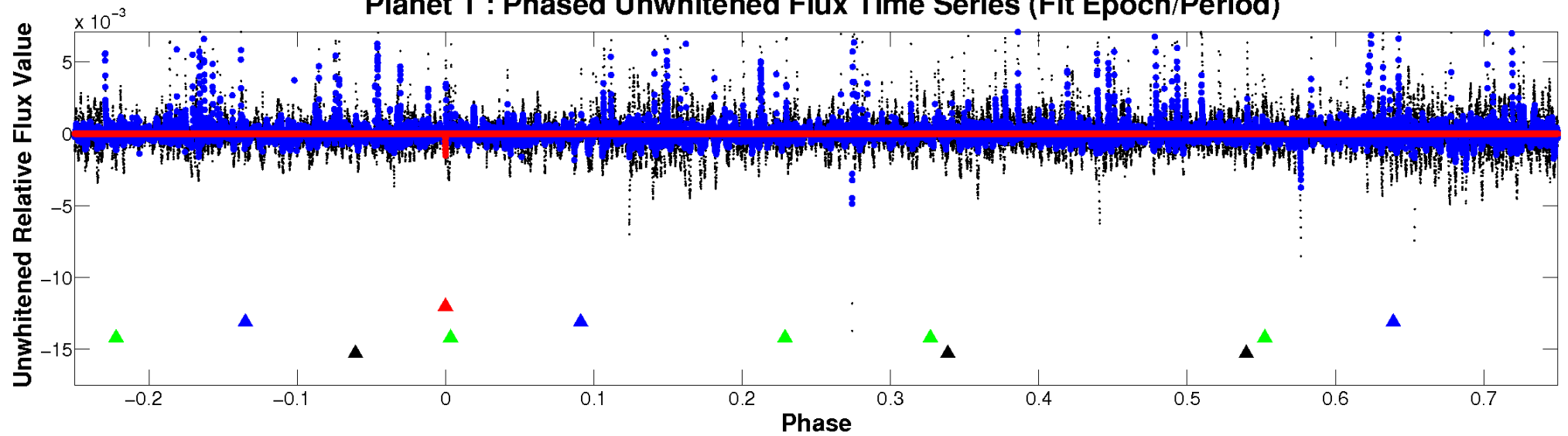
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TCE 009405969-01

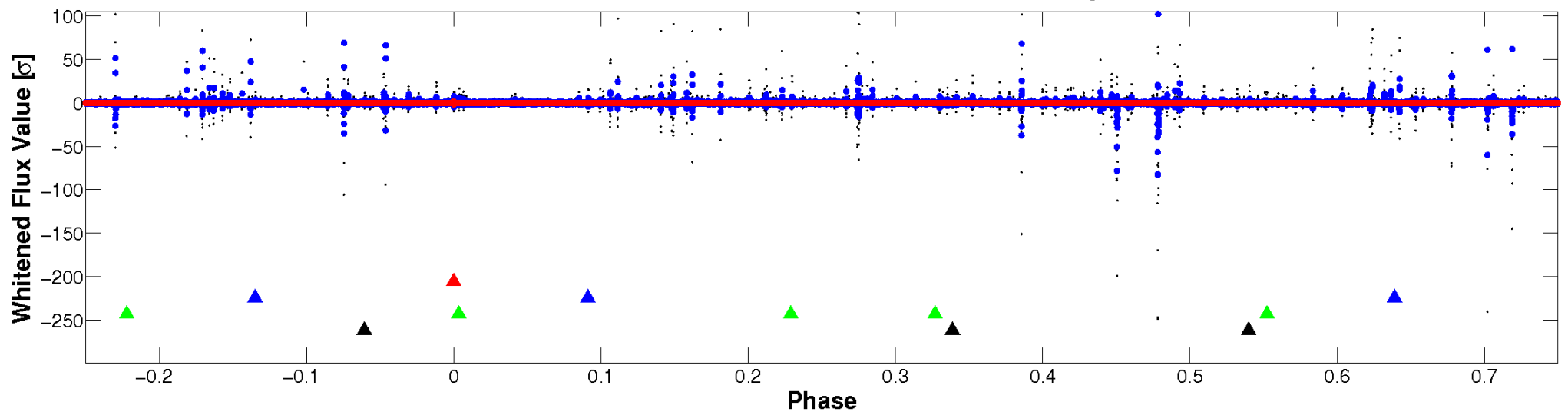


# Non-Whitened Vs. Whitened Light Curve

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

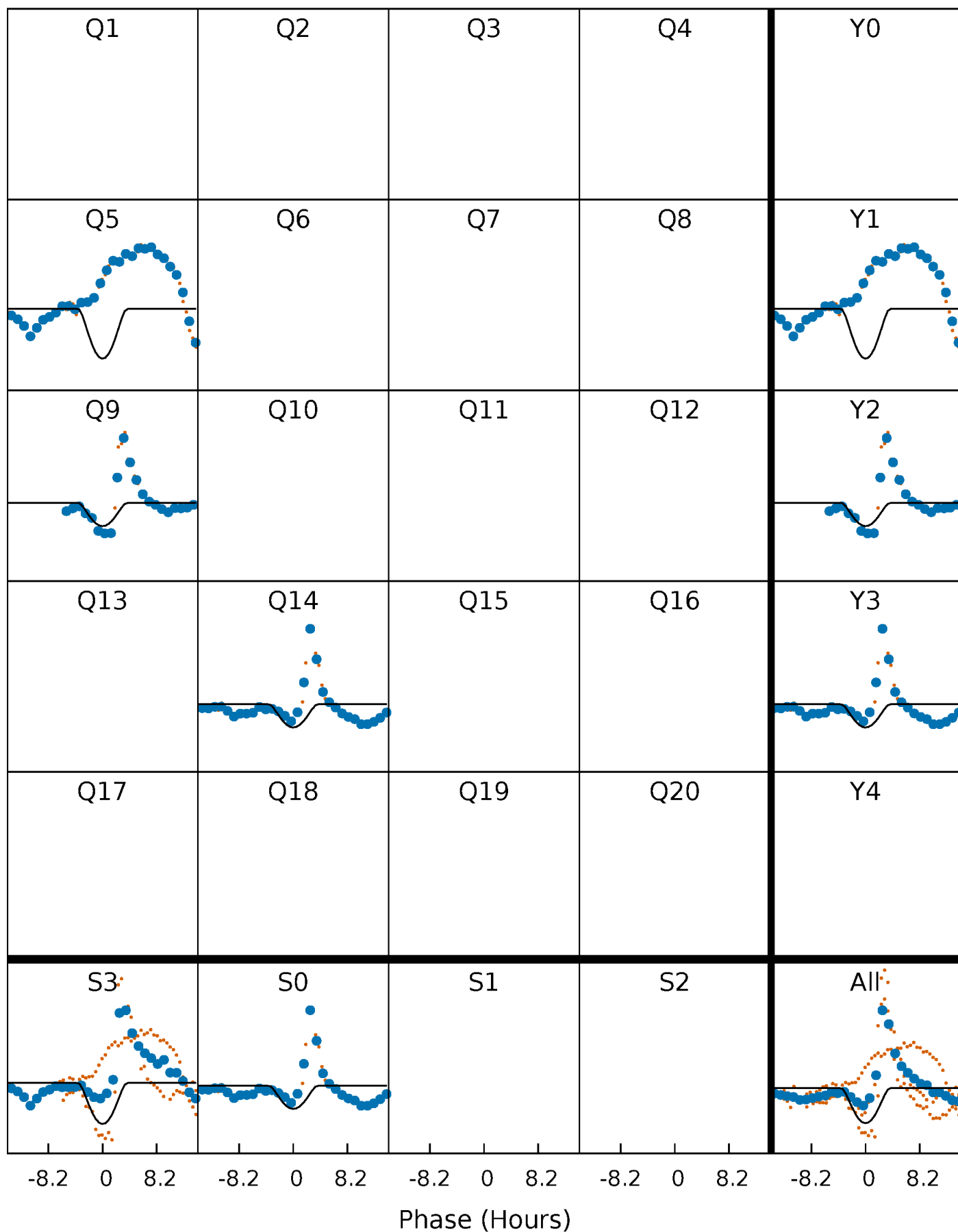
TCE 009405969-01 P=397.597763 Days  $T_0=490.226276$  (BKJD)





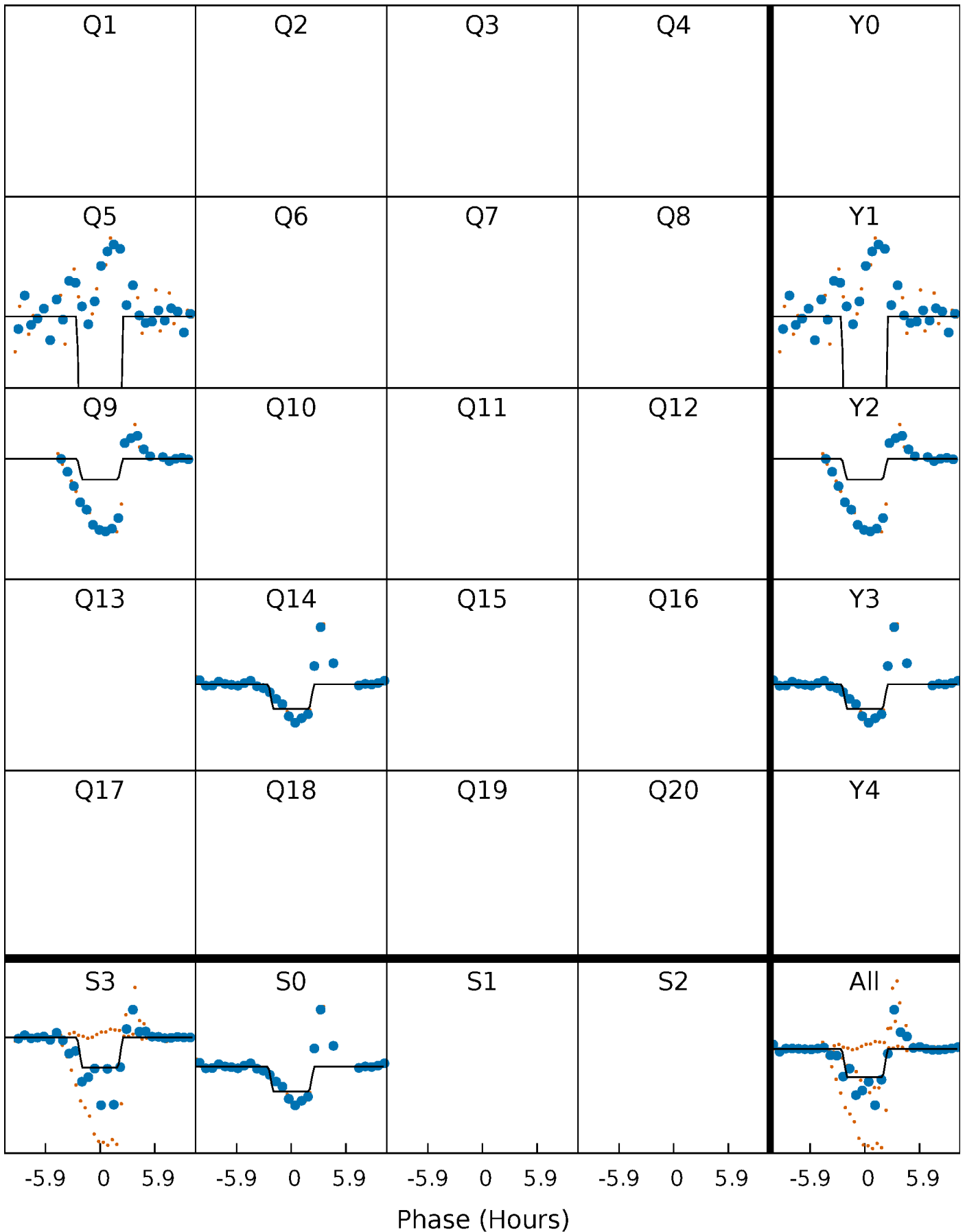
# DV Quarter-Phased Transit Curves

TCE 009405969-01 P=397.597763 Days  $T_0=490.226276$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

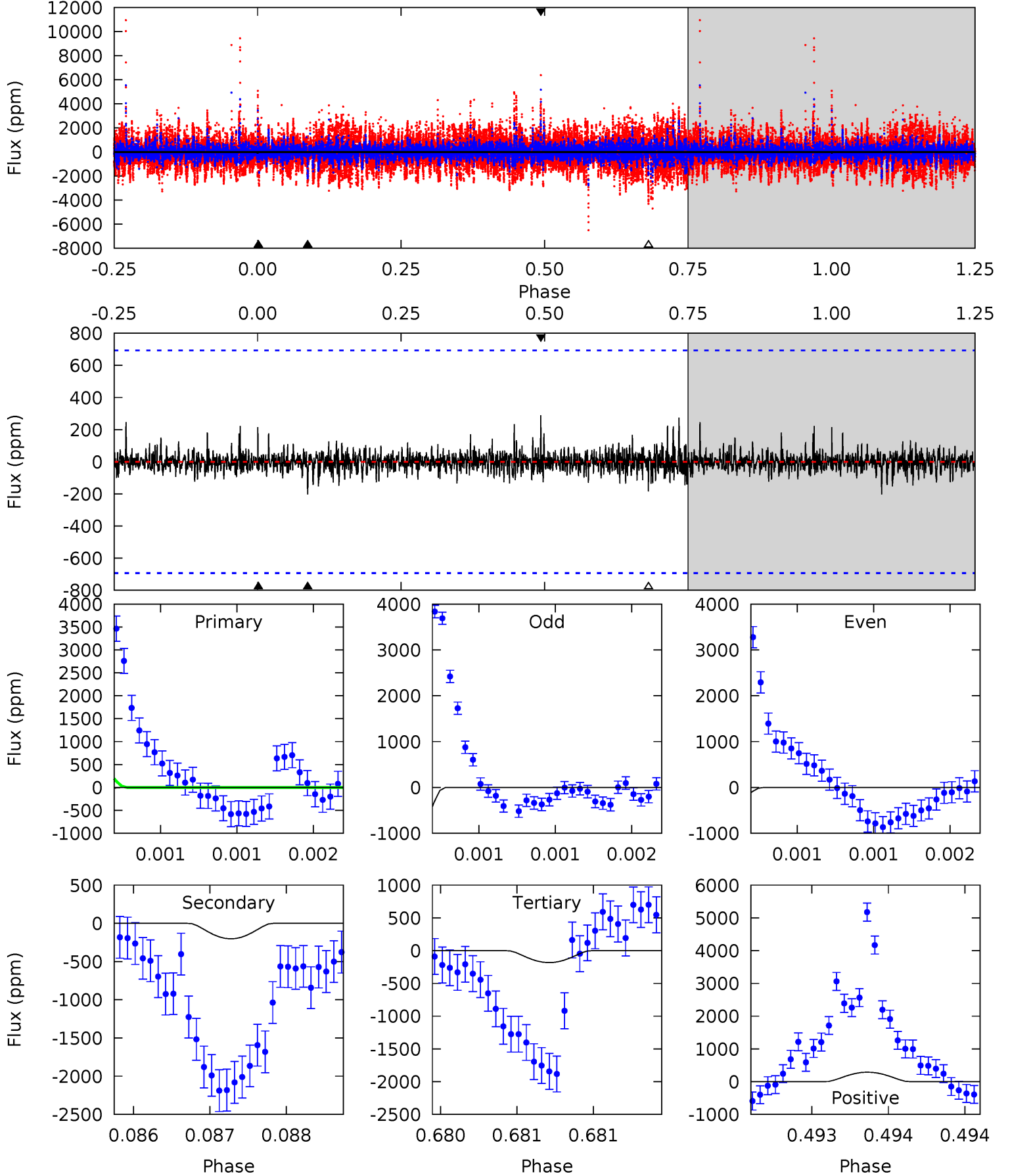
TCE 009405969-01 P=397.589399 Days  $T_0=490.217725$  (BKJD)



# DV Model-Shift Uniqueness Test

009405969-01,  $P = 397.597763$  Days,  $E = 92.628513$  Days

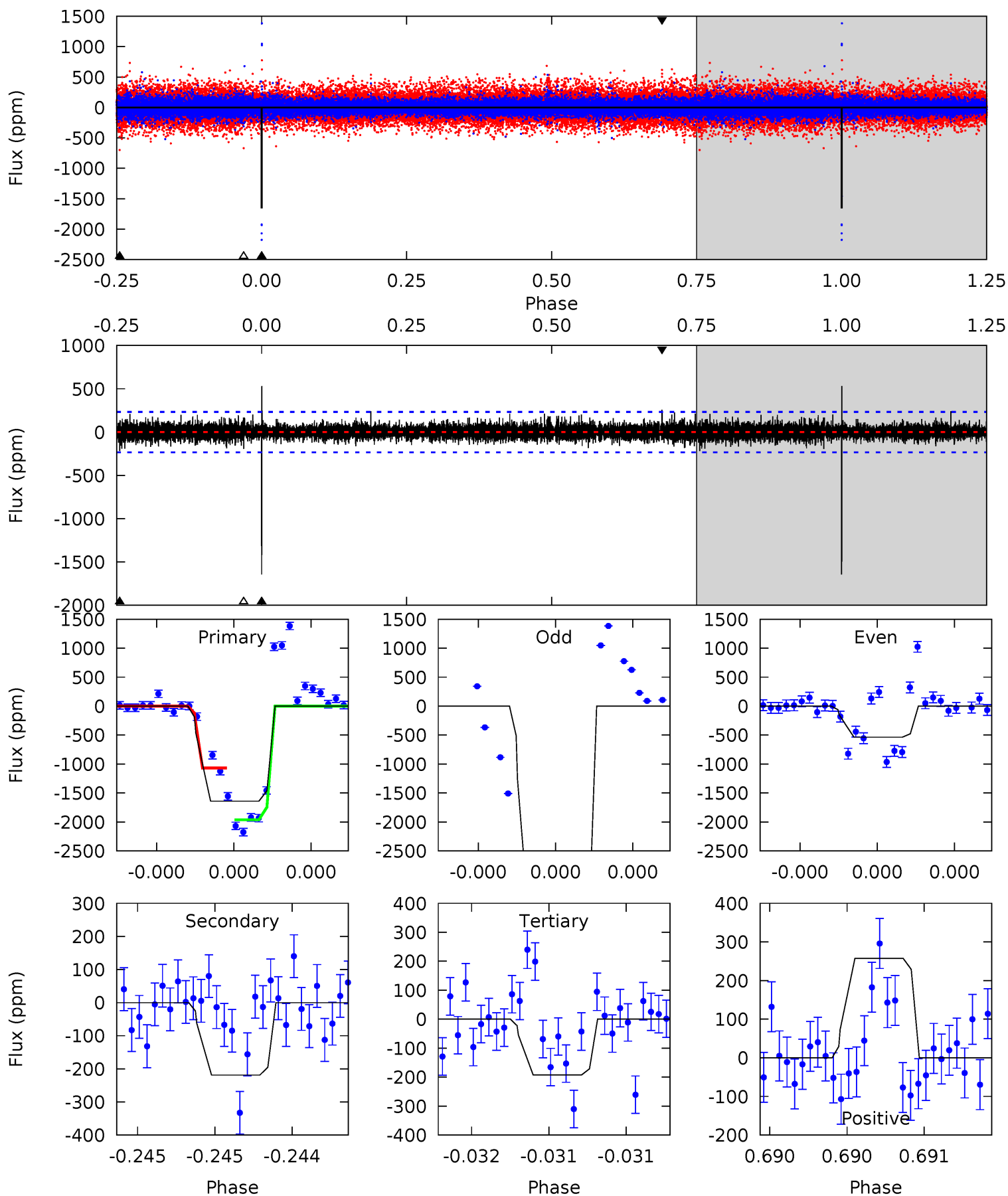
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
0.42	1.61	1.46	2.30	5.51	3.38	0.37	-1.03	-1.88	0.15	-0.69	3.10	14.5	0.59	0.37



# Alt Model-Shift Uniqueness Test

009405969-01, P = 397.589399 Days, E = 92.628326 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
39.3	5.25	4.62	6.16	5.58	3.48	1.09	34.7	33.2	0.63	-0.92	67.0	1.25	0.24	0



### Stellar Parameters For KIC 009405969

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R$ ( $R_{\odot}$ )	$M(M_{\odot})$	$p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ )
	$5138^{+128}_{-128}$	$3.601^{+1.020}_{-0.340}$	$-0.580^{+0.300}_{-0.250}$	$2.378^{+1.407}_{-1.720}$	$0.823^{+0.270}_{-0.166}$	$0.086^{+3.253}_{-0.060}$
	+2%/-2%	+28%/-9%	+52%/-43%	+59%/-72%	+33%/-20%	+3774%/-70%
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 009405969-01 / KOI

Detrend	Depth (ppm)	$R_p$ ( $R_{\oplus}$ )	$T_{\text{max}}$ (K)	$T_{\text{obs}}$ (K)	$A_{\text{obs}}$
DV	$-203 \pm 126$	$31.89^{+41.35}_{-21.16}$	$479^{+77}_{-102}$	$2437^{+780}_{-423}$	$92^{+850}_{-79}$
Alt.	$-219 \pm 42$	$28.84^{+36.90}_{-19.94}$	$481^{+79}_{-97}$	$2549^{+999}_{-383}$	$146^{+1437}_{-118}$

$T_{\text{max}}$  = 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

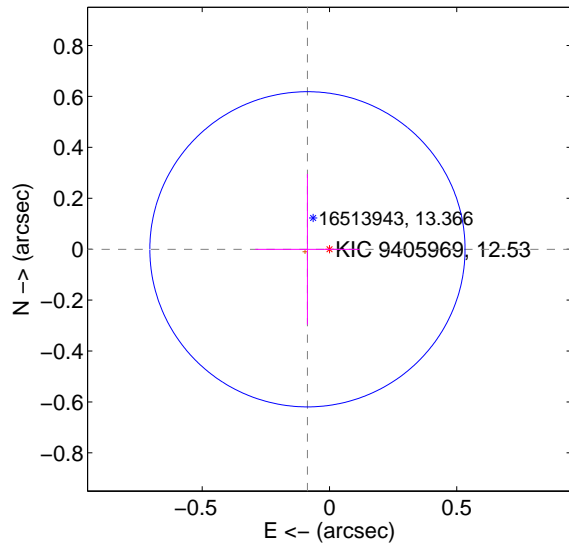
Supplemental centroid analysis for 009405969-01. Kepler magnitude: 12.53. Transit SNR 6.51

There are 0 quarters with good PRF difference image offsets

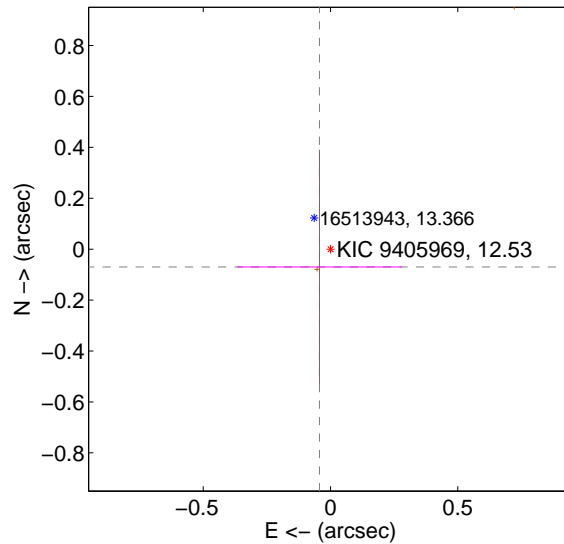
The direct PRF centroid is offset from the target star catalog position by about 0.08 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.087 \pm 0.206$	0.42	$0.087 \pm 0.205$	$-0.000 \pm 0.296$
PRF-fit source offset from KIC position	$0.082 \pm 0.558$	0.15	$0.043 \pm 0.323$	$-0.070 \pm 0.460$
photometric centroid source offset	$0.19 \pm 0.20$	0.92	$-0.18 \pm 0.20$	$0.06 \pm 0.21$

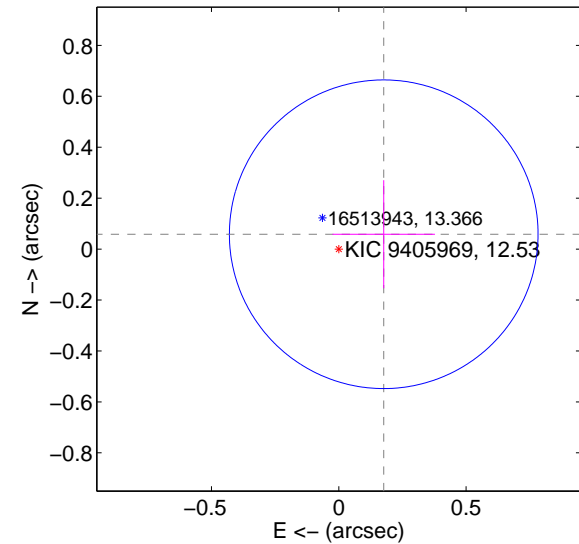
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position



offset from photometric centroids

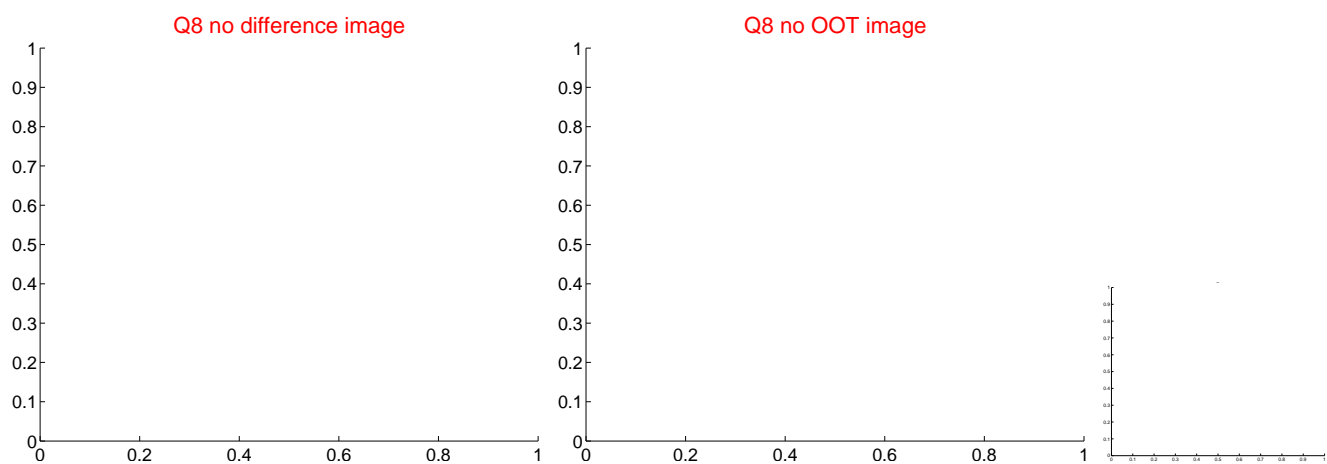
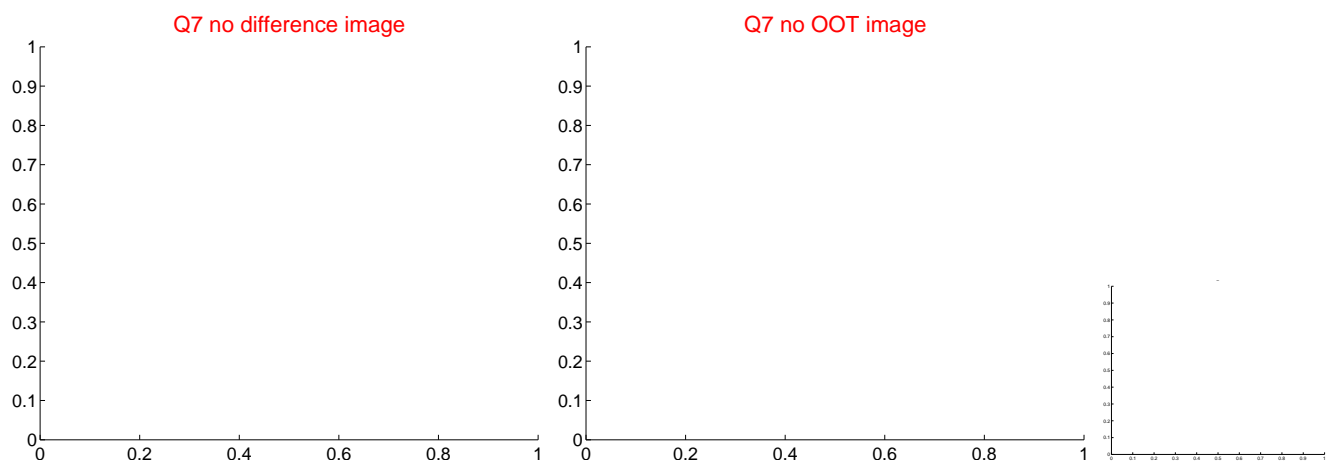
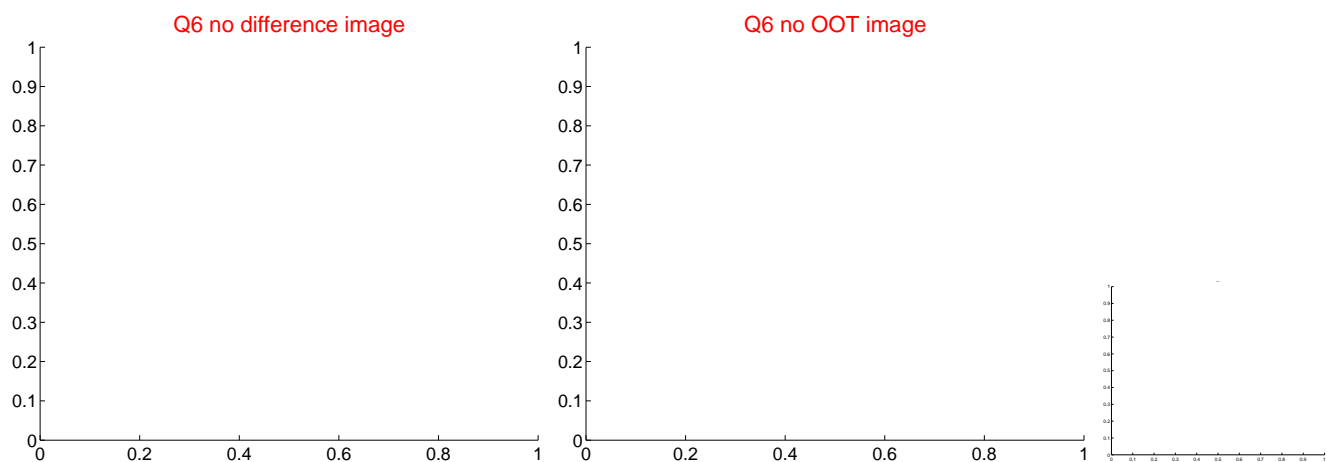
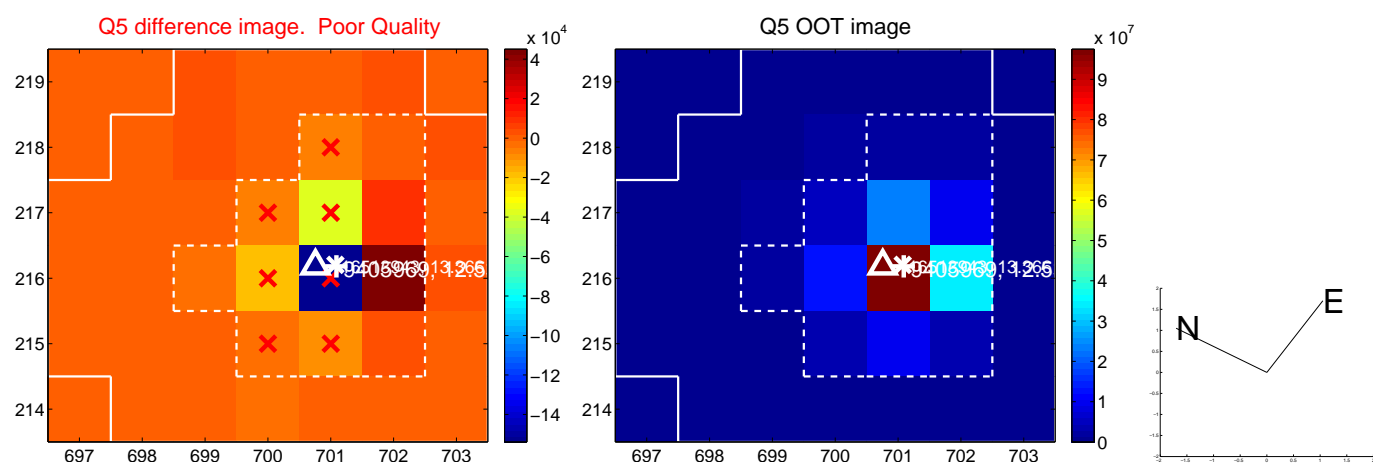


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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

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



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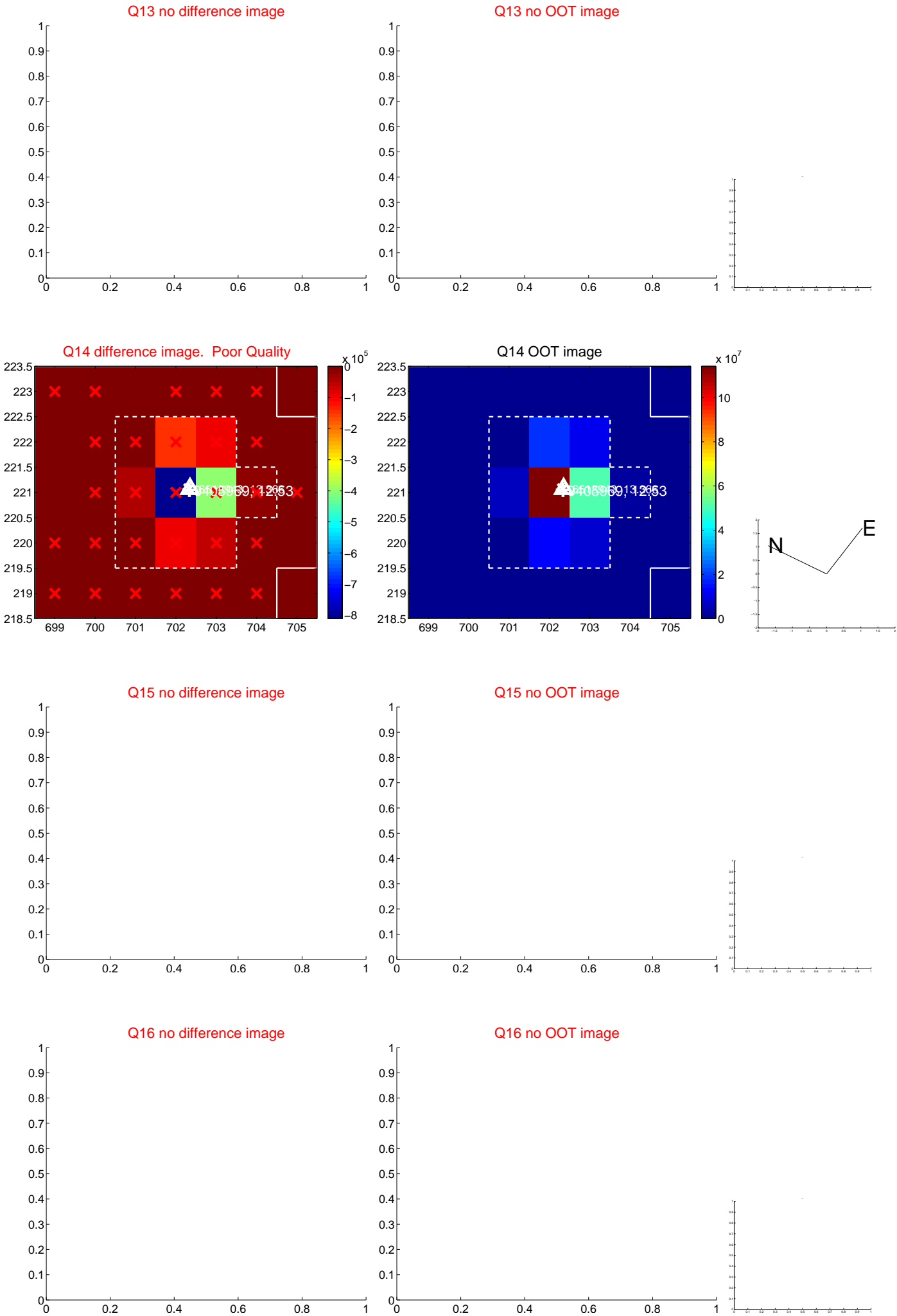




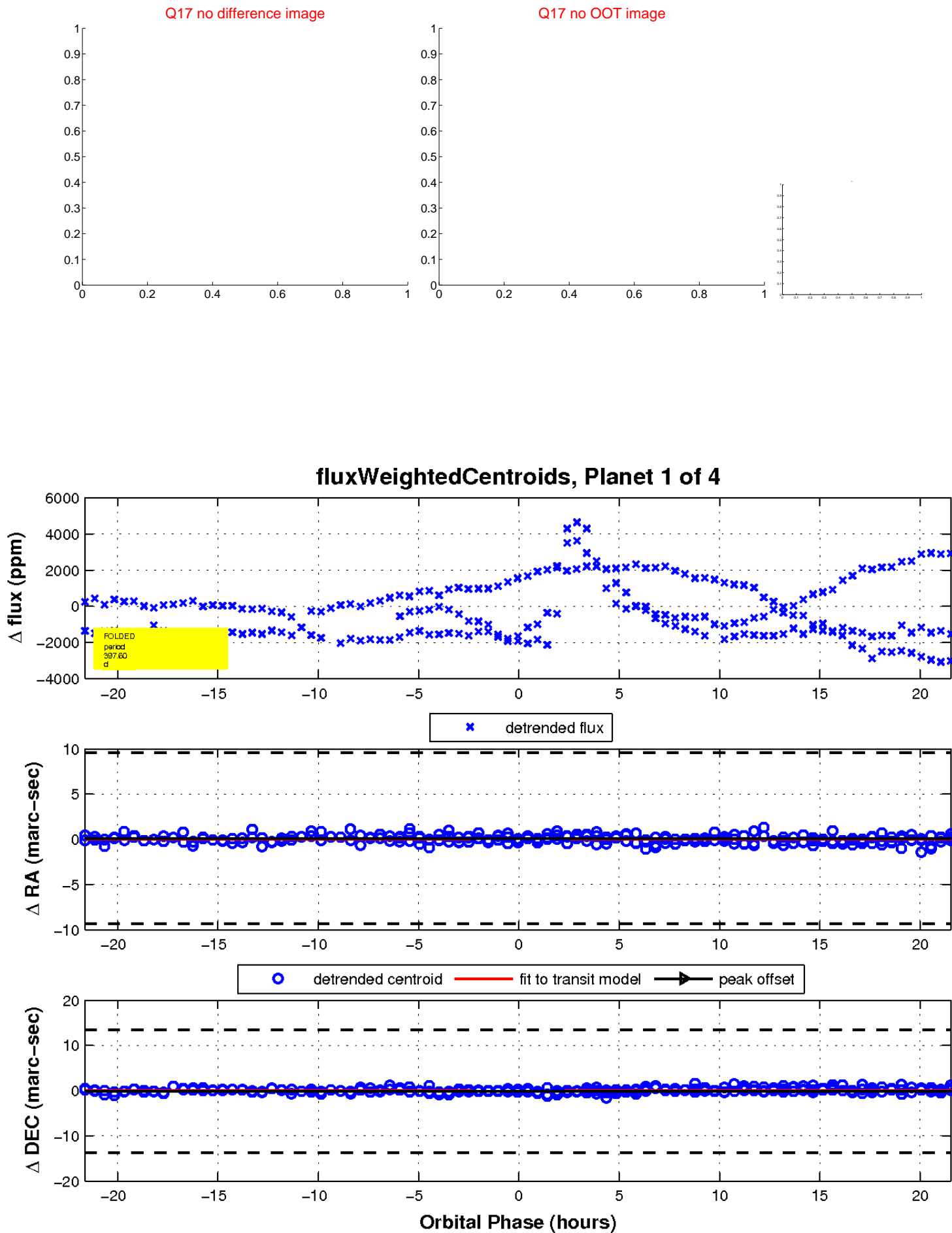
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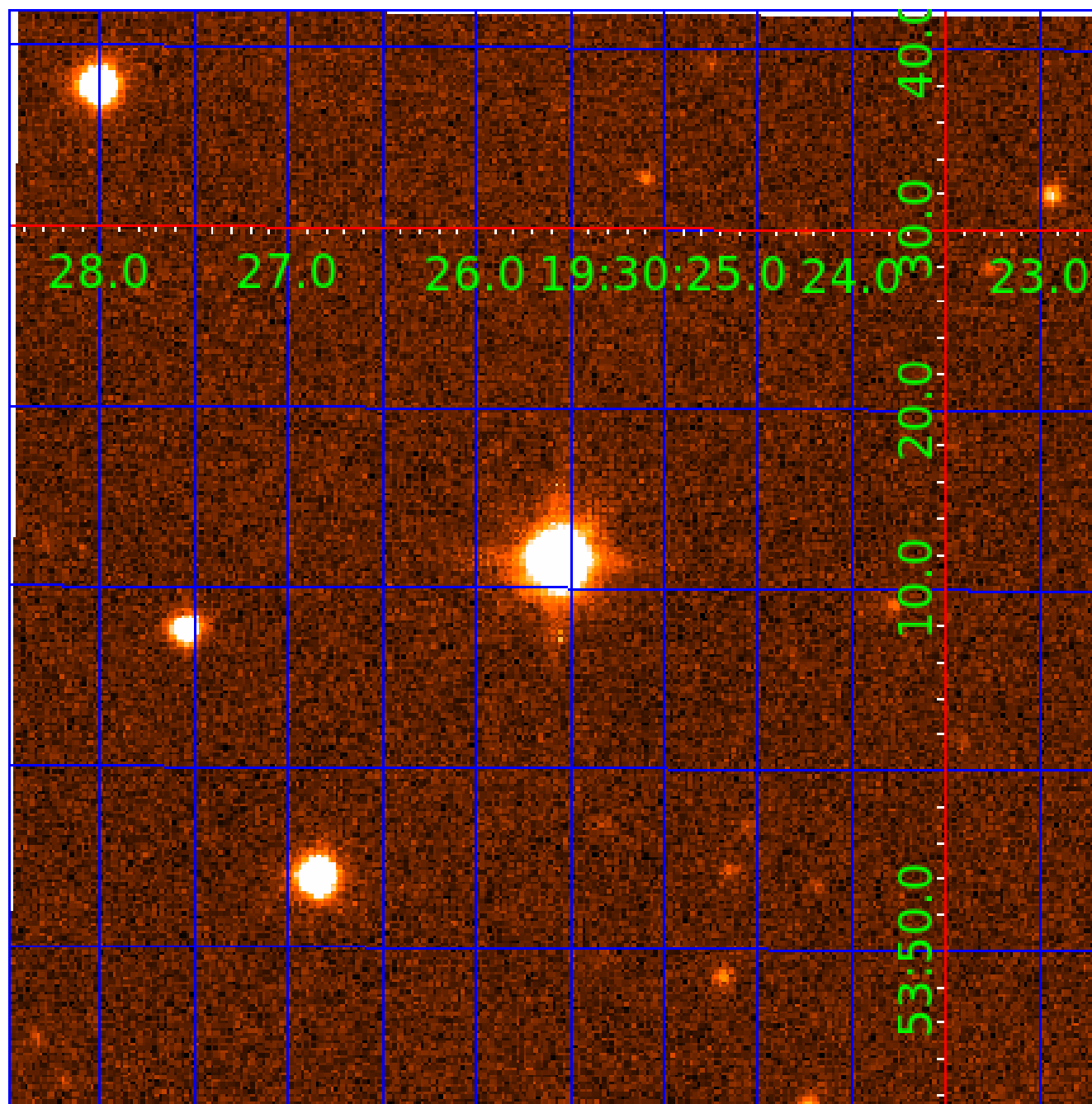


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination



# KIC 009405969

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
009405969-01	OBS	No	397.597763	490.226276	1514.1	7.218	20.2	6.5	2.38	5138	18.16	3.59
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009405969-03	OBS	No	307.942552	183.651777	1098.8	4.771	16.6	7.1	2.38	5138	8.15	5.05
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## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009405969-01	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS
009405969-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS
009405969-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS
009405969-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL_SKYE—LPP_DV—ALL_TRANS_CHASES—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.

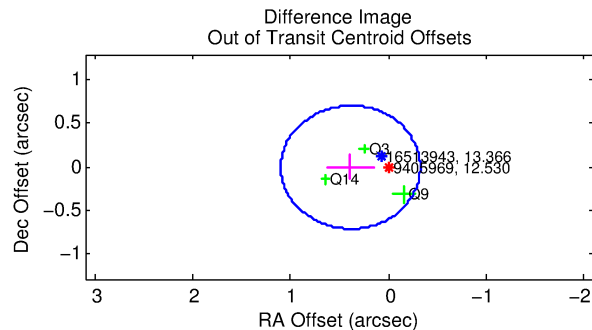
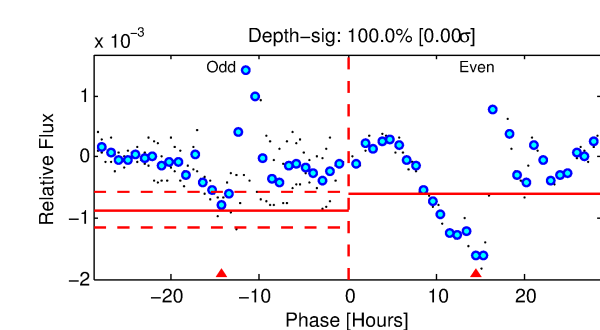
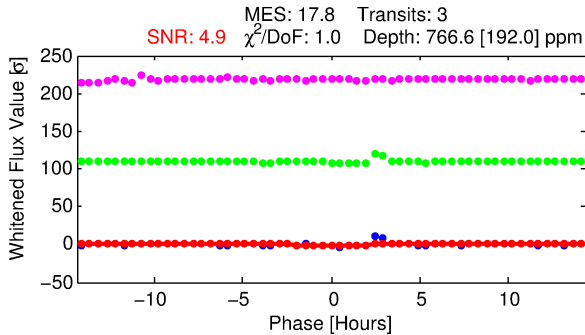
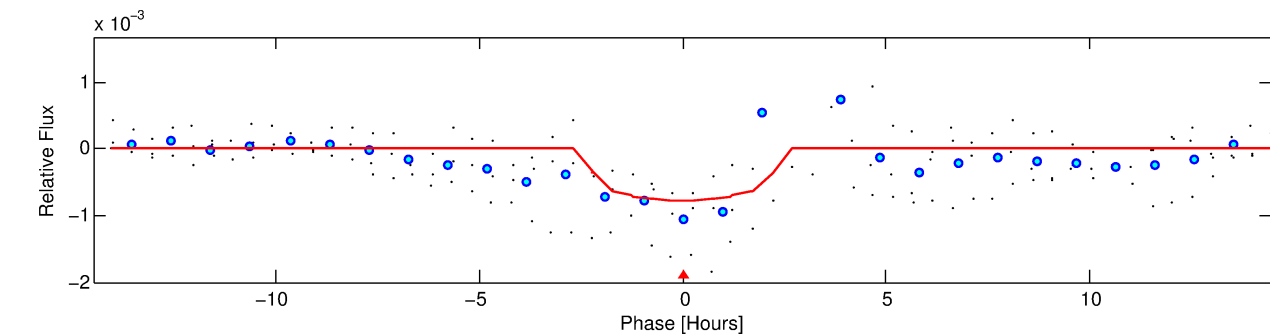
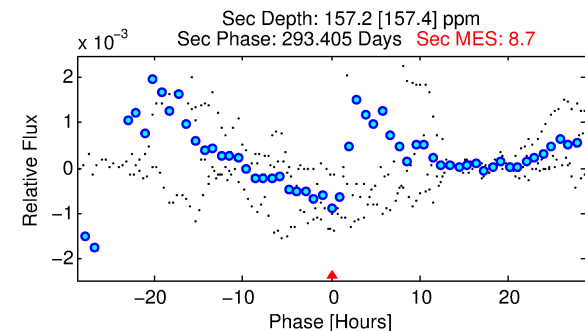
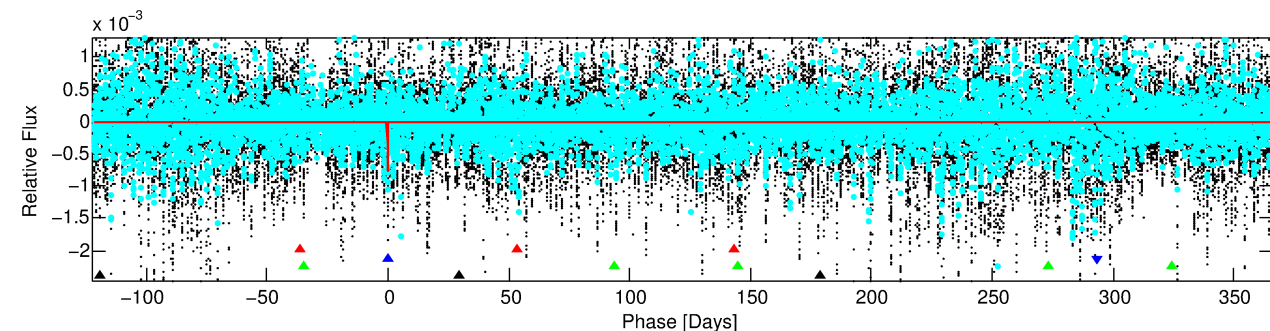
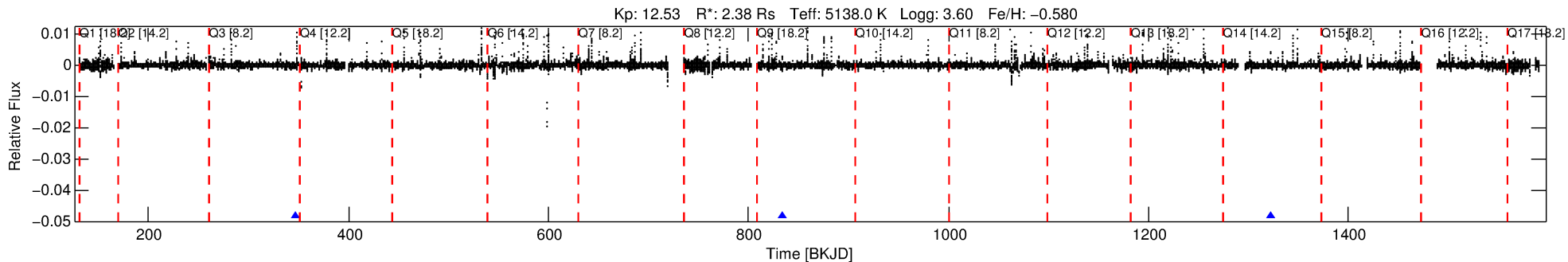
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 009405969-02

No Significant Match Found

# DV One-Page Summary

KIC: 9405969 Candidate: 2 of 4 Period: 487.486 d



## DV Fit Results:

Period = 487.48645 [0.00413] d  
Epoch = 346.7064 [0.0068] BKJD  
Rp/R\* = 0.0260 [0.0748]  
a/R\* = 678.15 [7757.59]  
b = 0.53 [15.60]  
Seff = 2.73 [4.49]  
Teq = 328 [135] K  
Rp = 6.73 [20.02] Re  
a = 1.1363 [1.0448] AU  
Ag = 2461.18 [14955.33] [0.16σ]  
Teffp = 3571 [5225] K [0.62σ]

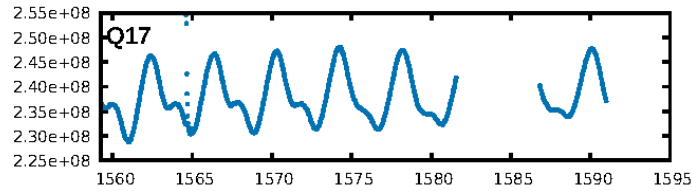
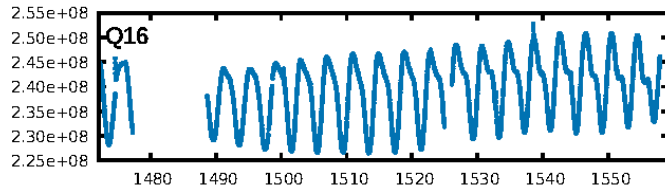
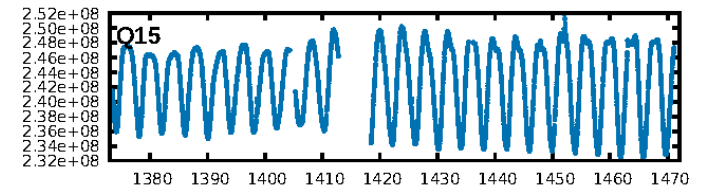
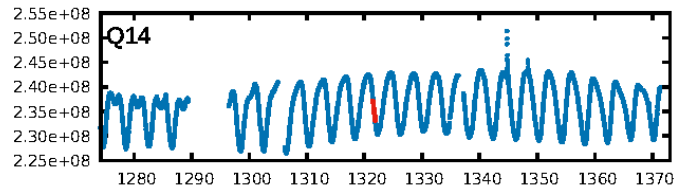
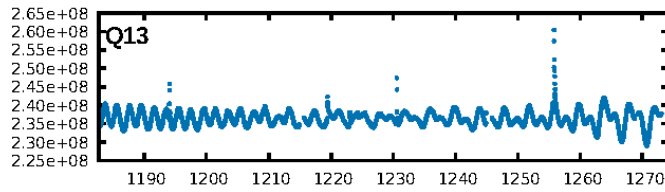
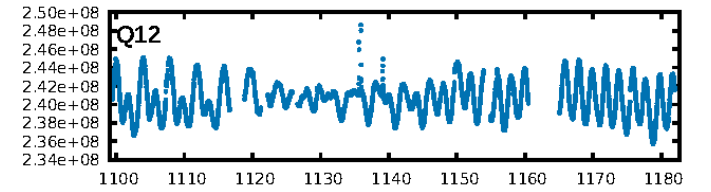
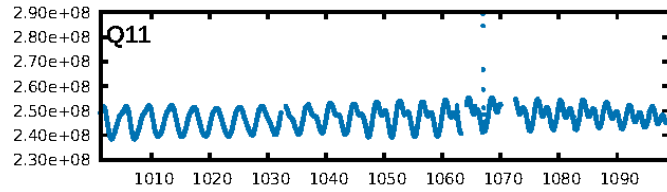
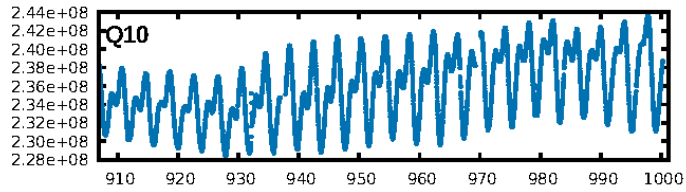
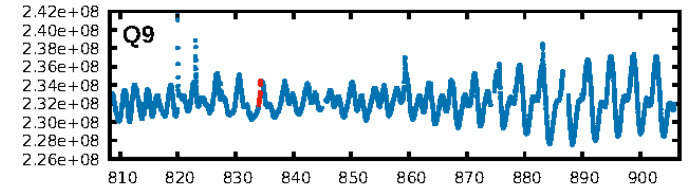
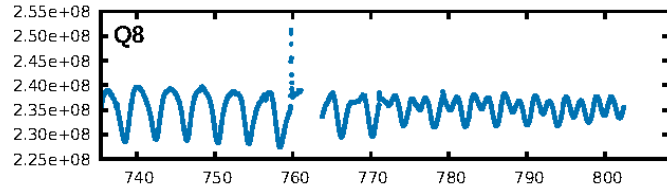
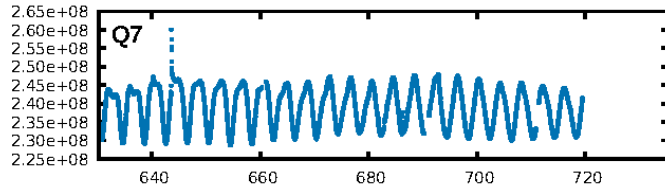
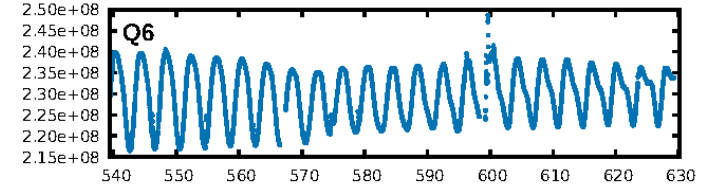
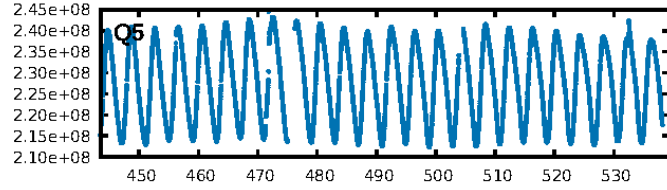
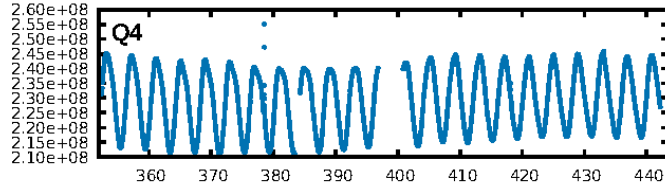
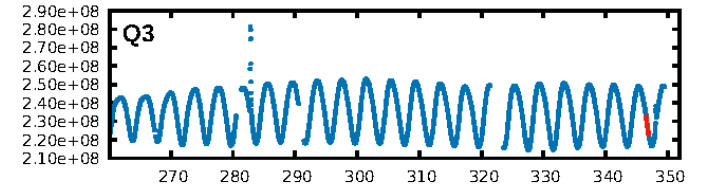
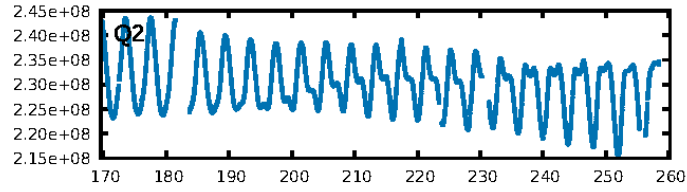
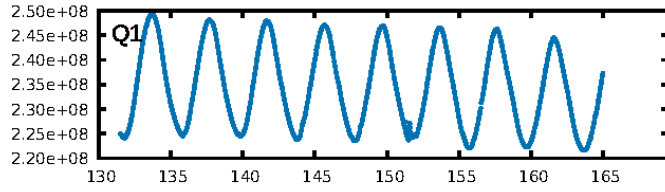
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [248.59σ]  
LongPeriod-sig: 100.0% [542.14σ]  
ModelChiSquare2-sig: 30.4%  
ModelChiSquareGof-sig: 87.6%  
Bootstrap-pfa: N/A  
RollingBand-fgt: 1.00 [3/3]  
GhostDiagnostic-chr: 1.006  
Centroid-sig: 48.0%  
Centroid-so: 0.269 arcsec [0.77σ]  
OotOffset-rm: 0.388 arcsec [1.63σ]  
KicOffset-rm: 0.362 arcsec [1.59σ]  
OotOffset-st: 1/1/0/1 [3]  
KicOffset-st: 1/1/0/1 [3]  
DiffImageQuality-fgm: 1.00 [3/3]  
DiffImageOverlap-fno: 1.00 [3/3]

Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 31-Jan-2016 22:02:17 Z

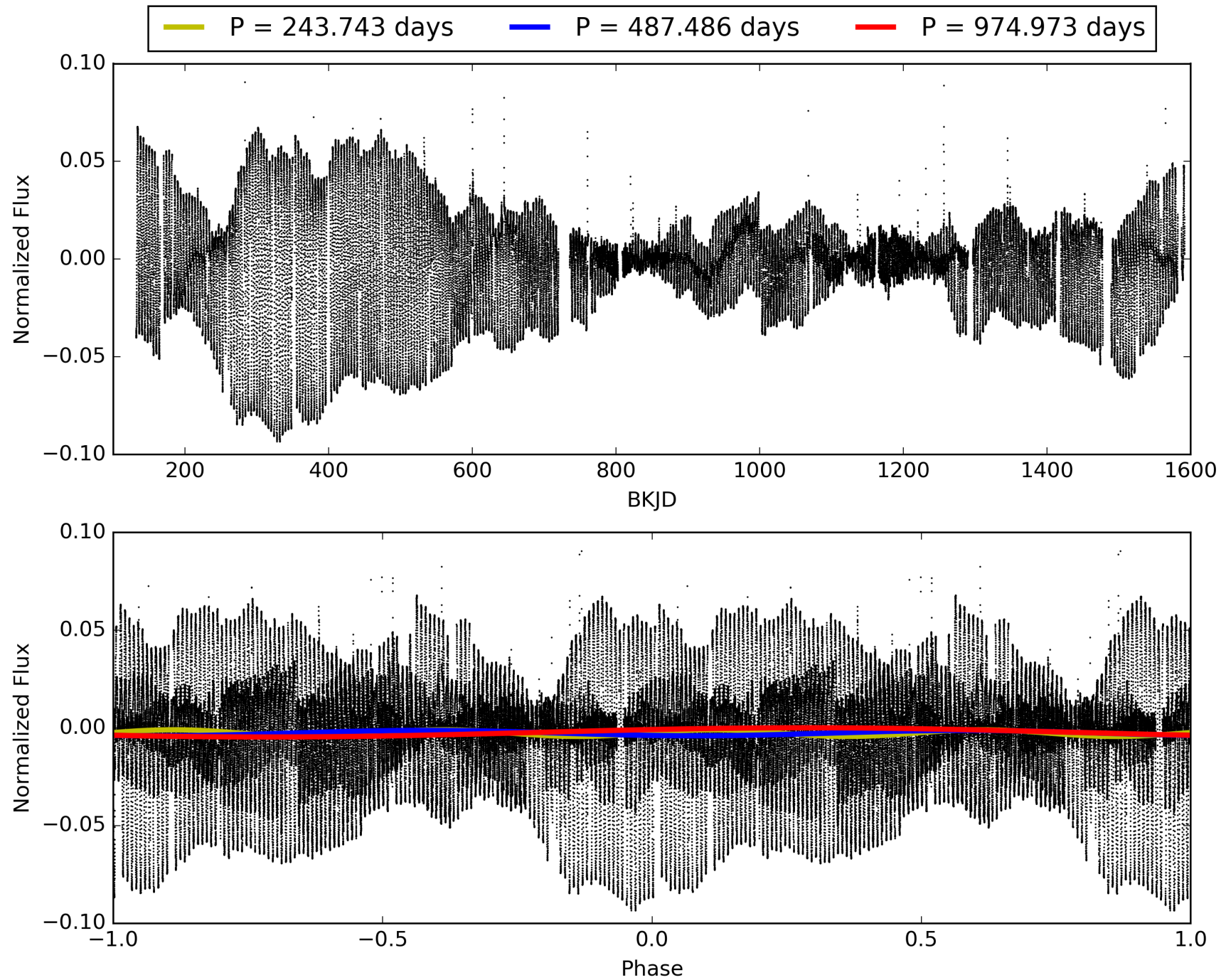
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

# TCE 009405969-02, PDC Light Curves





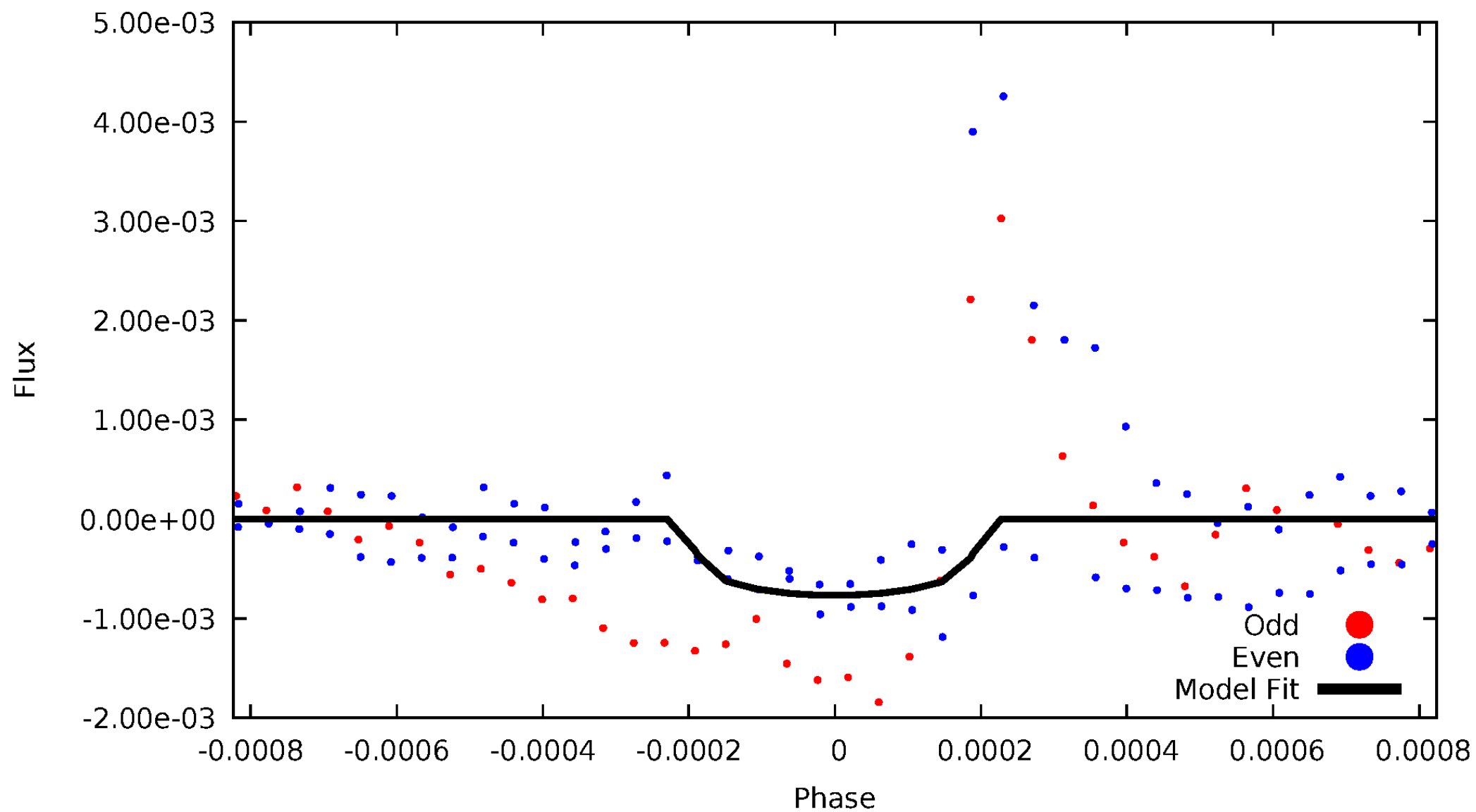
TCE 009405969-02





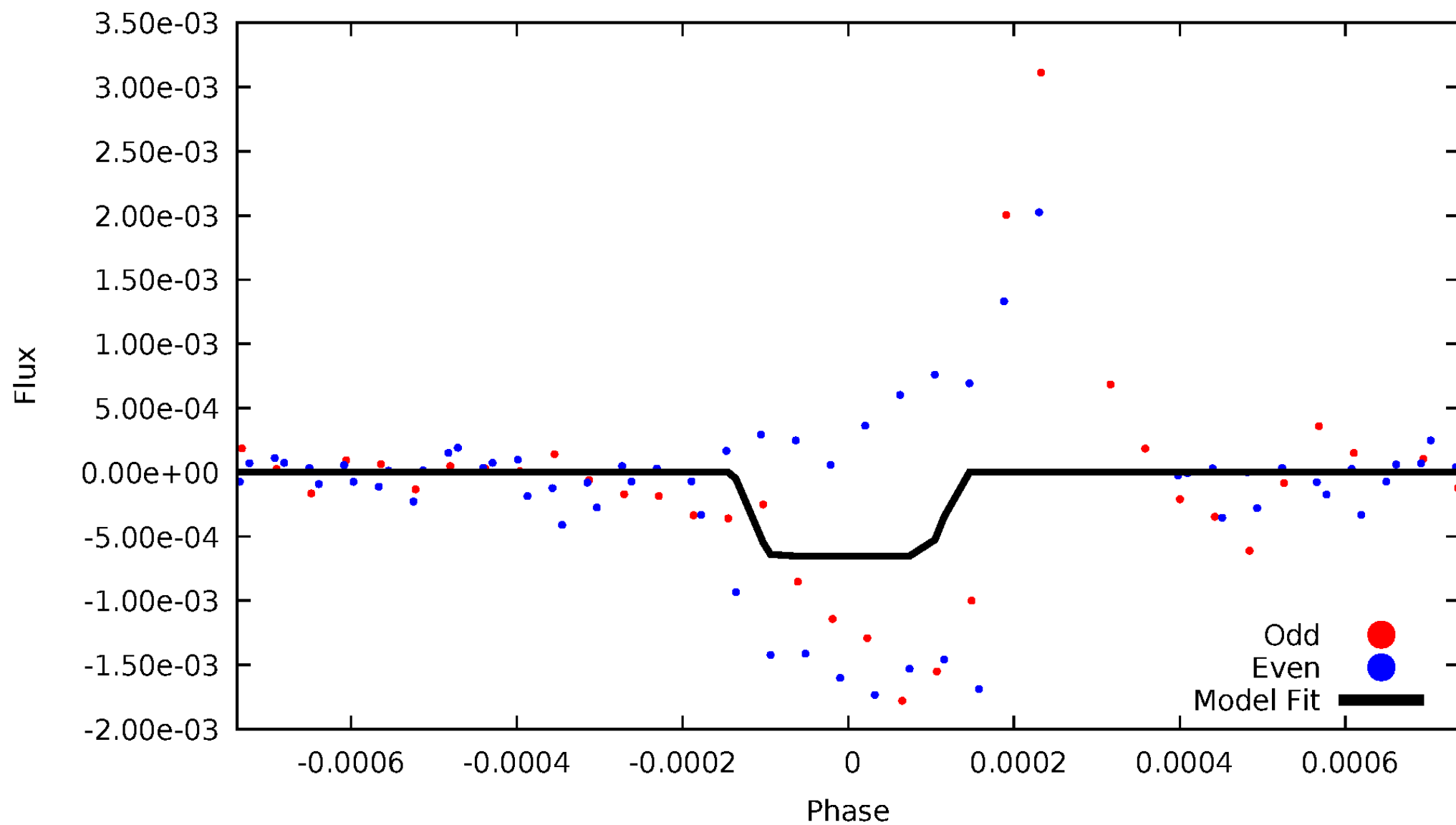
# DV Odd/Even

TCE 009405969-02



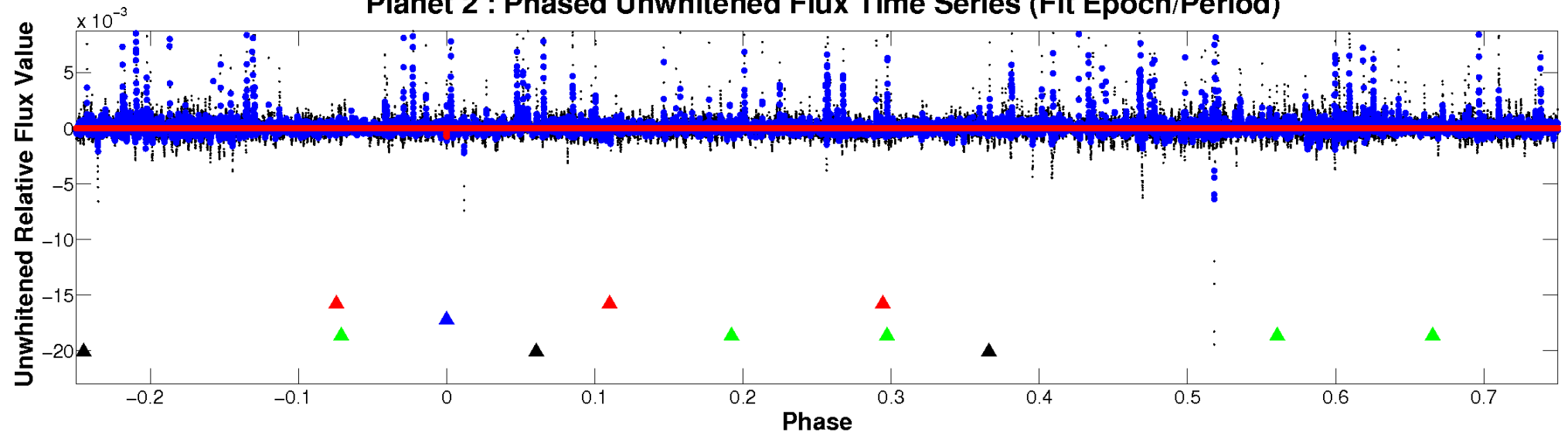
# ALT Odd/Even

TCE 009405969-02

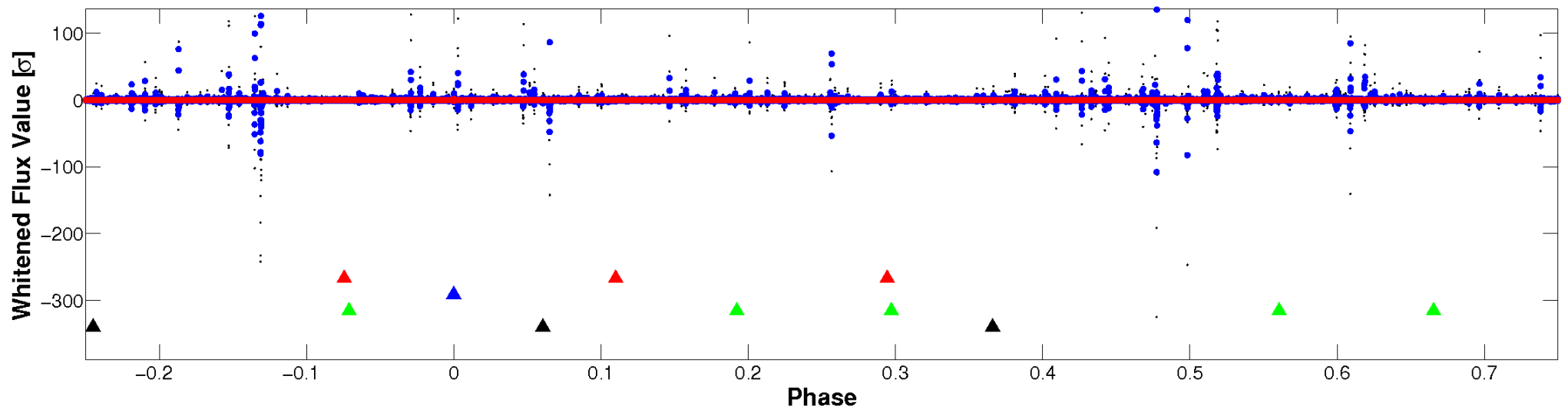


# Non-Whitened Vs. Whitened Light Curve

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

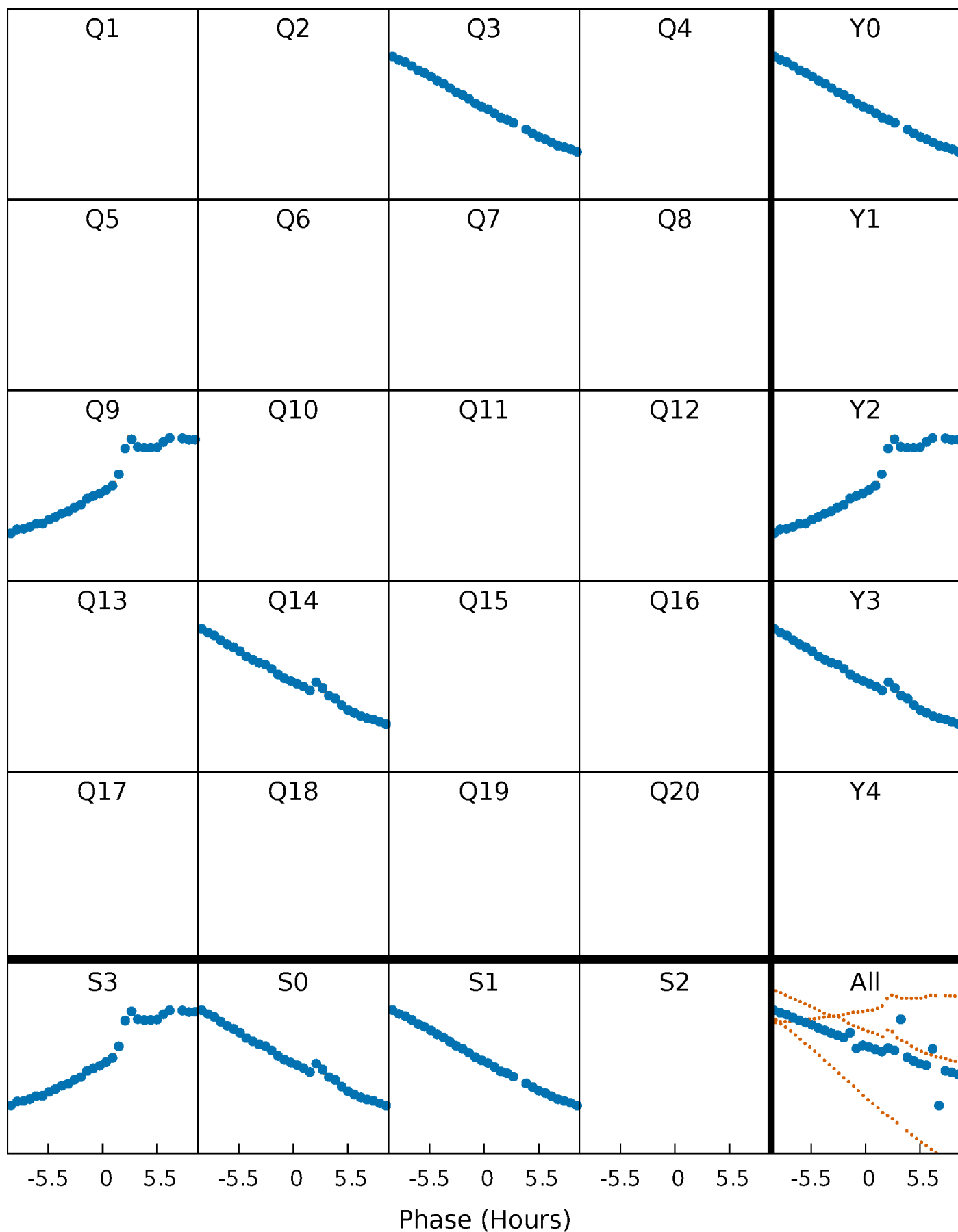


Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



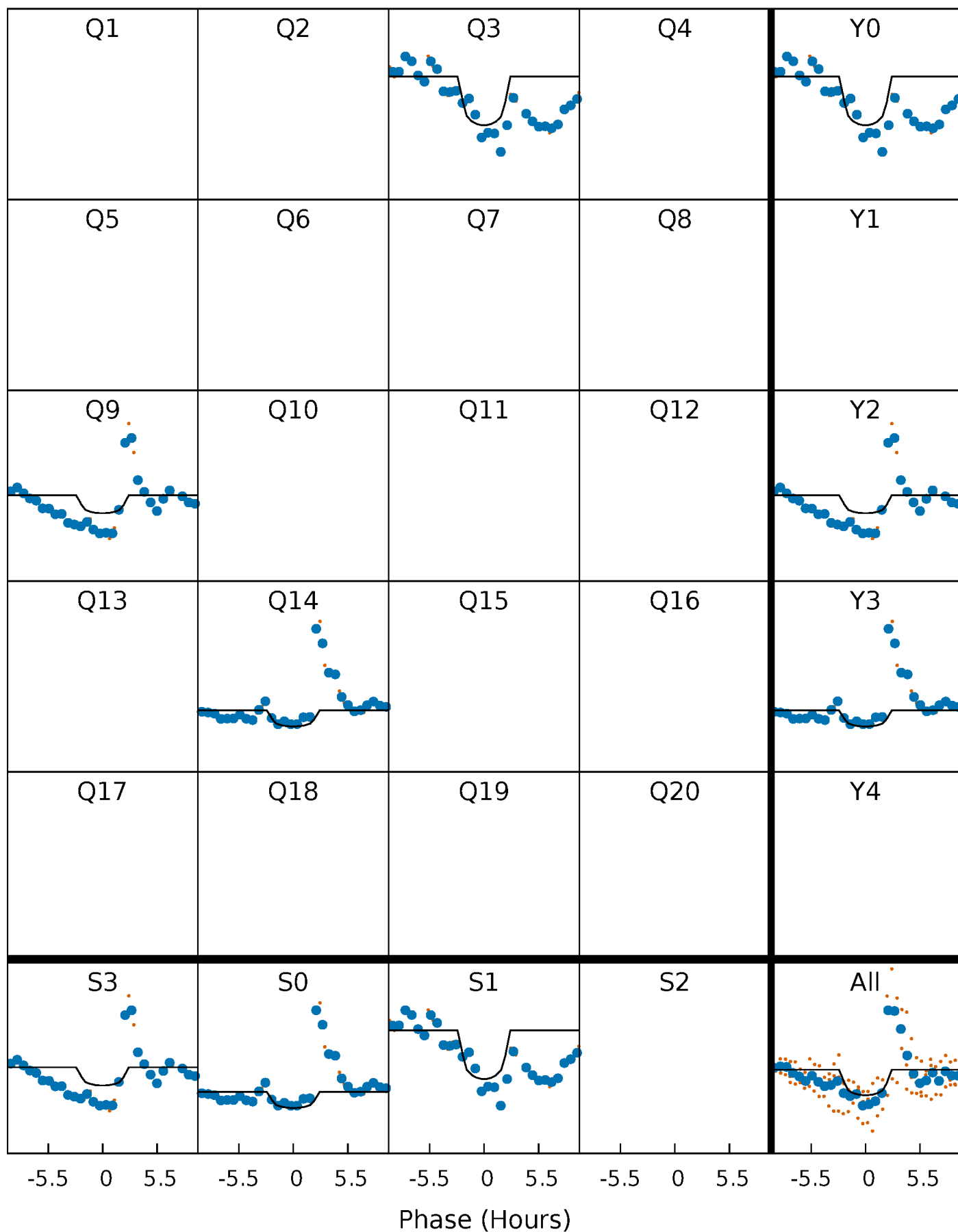
# PDC Quarter-Phased Transit Curves

TCE 009405969-02 P=487.486445 Days  $T_0=346.706405$  (BKJD)



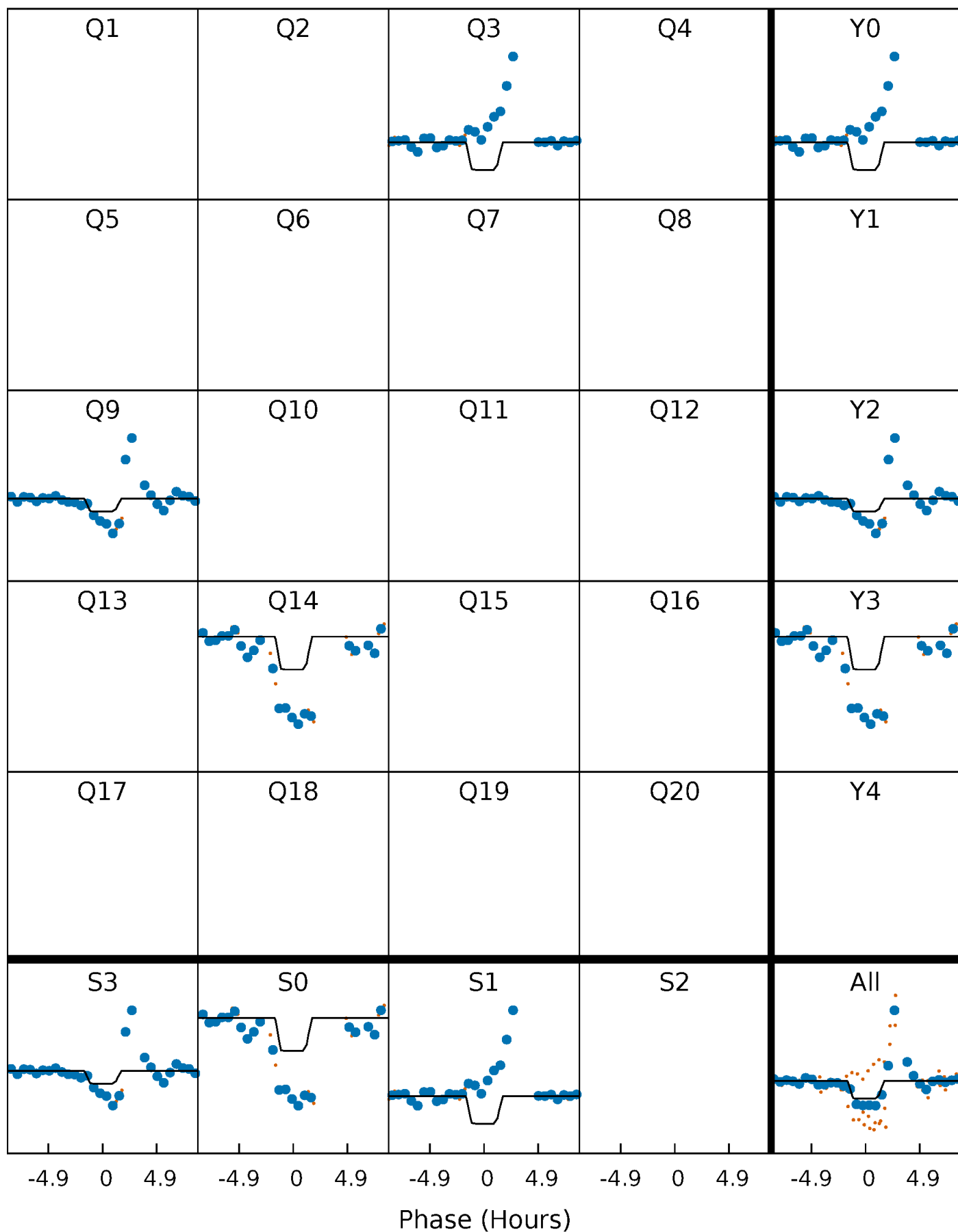
# DV Quarter-Phased Transit Curves

TCE 009405969-02     $P=487.486445$  Days     $T_0=346.706405$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

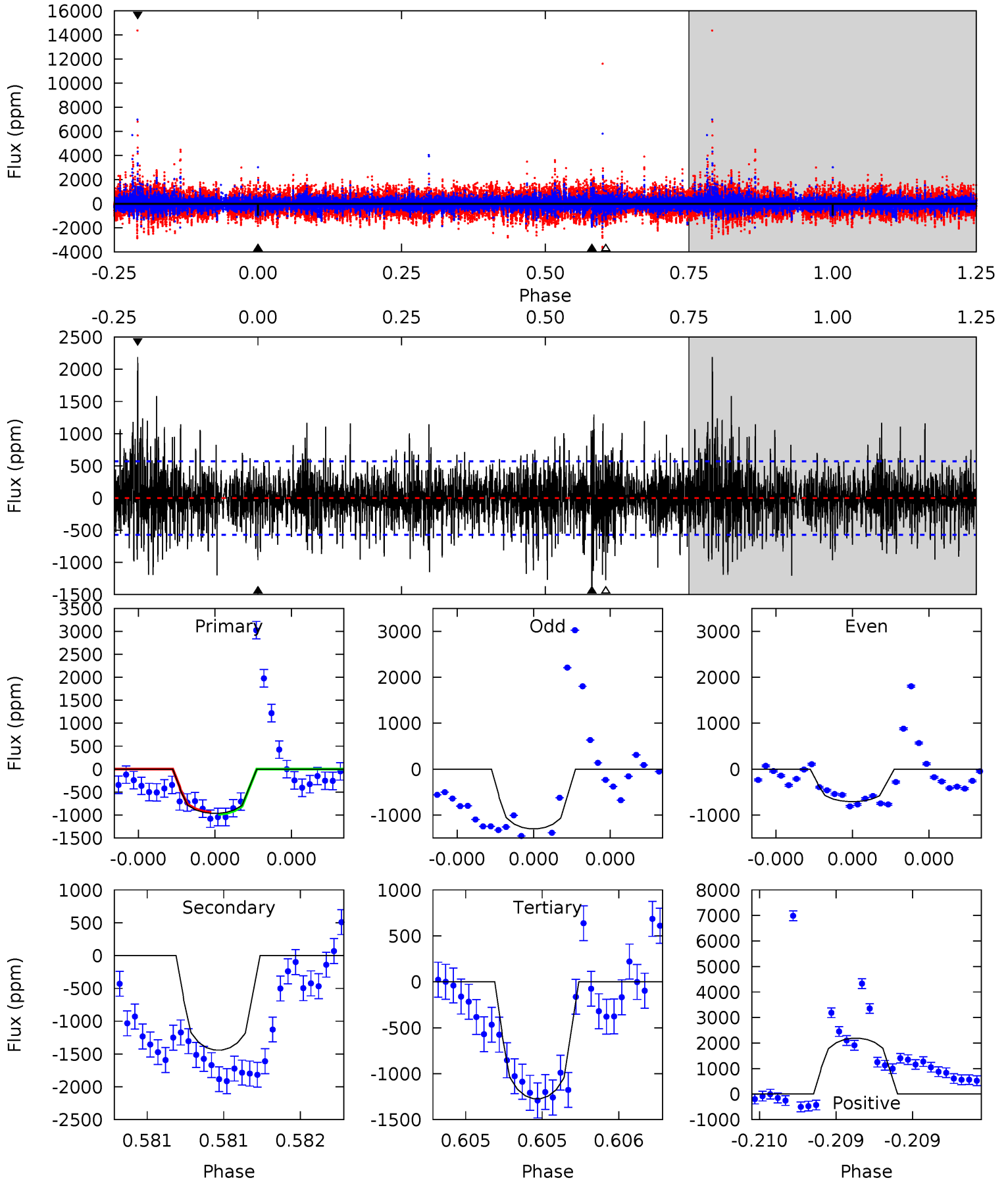
TCE 009405969-02 P=487.483441 Days  $T_0=346.707059$  (BKJD)



# DV Model-Shift Uniqueness Test

009405969-02, P = 487.486445 Days, E = 346.706405 Days

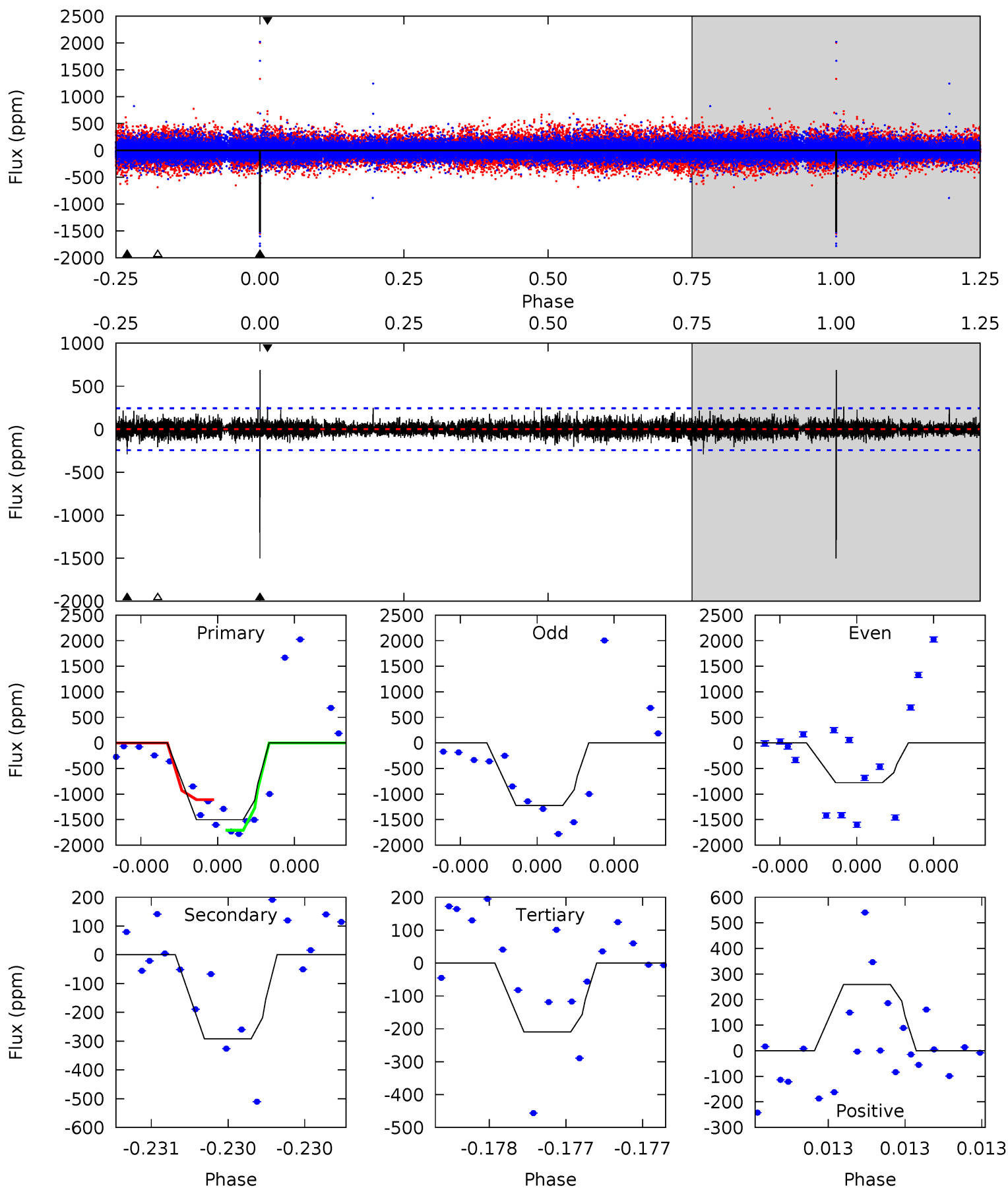
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
9.45	14.1	12.5	21.5	5.61	3.53	2.98	-3.03	-12.0	1.65	-7.34	0.88	0.96	0.60	0.22



# Alt Model-Shift Uniqueness Test

009405969-02, P = 487.483441 Days, E = 346.707059 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
35.2	6.84	4.91	6.07	5.71	3.69	1.01	30.3	29.1	1.93	0.76	5.69	0.67	0.31	7.37





### Stellar Parameters For KIC 009405969

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R$ ( $R_{\odot}$ )	$M(M_{\odot})$	$p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ )
	$5138^{+128}_{-128}$	$3.601^{+1.020}_{-0.340}$	$-0.580^{+0.300}_{-0.250}$	$2.378^{+1.407}_{-1.720}$	$0.823^{+0.270}_{-0.166}$	$0.086^{+3.253}_{-0.060}$
	+2%/-2%	+28%/-9%	+52%/-43%	+59%/-72%	+33%/-20%	+3774%/-70%
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 009405969-02 / KOI

Detrend	Depth (ppm)	$R_p$ ( $R_{\oplus}$ )	$T_{max}$ (K)	$T_{obs}$ (K)	$A_{obs}$
DV	$-1440 \pm 102$	$13.91^{+18.02}_{-10.32}$	$448^{+71}_{-92}$	$4359^{+3446}_{-1001}$	$5511^{+82124}_{-4431}$
Alt.	$-292 \pm 43$	$14.34^{+16.94}_{-10.29}$	$445^{+77}_{-94}$	$3245^{+1439}_{-577}$	$1022^{+11747}_{-813}$

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

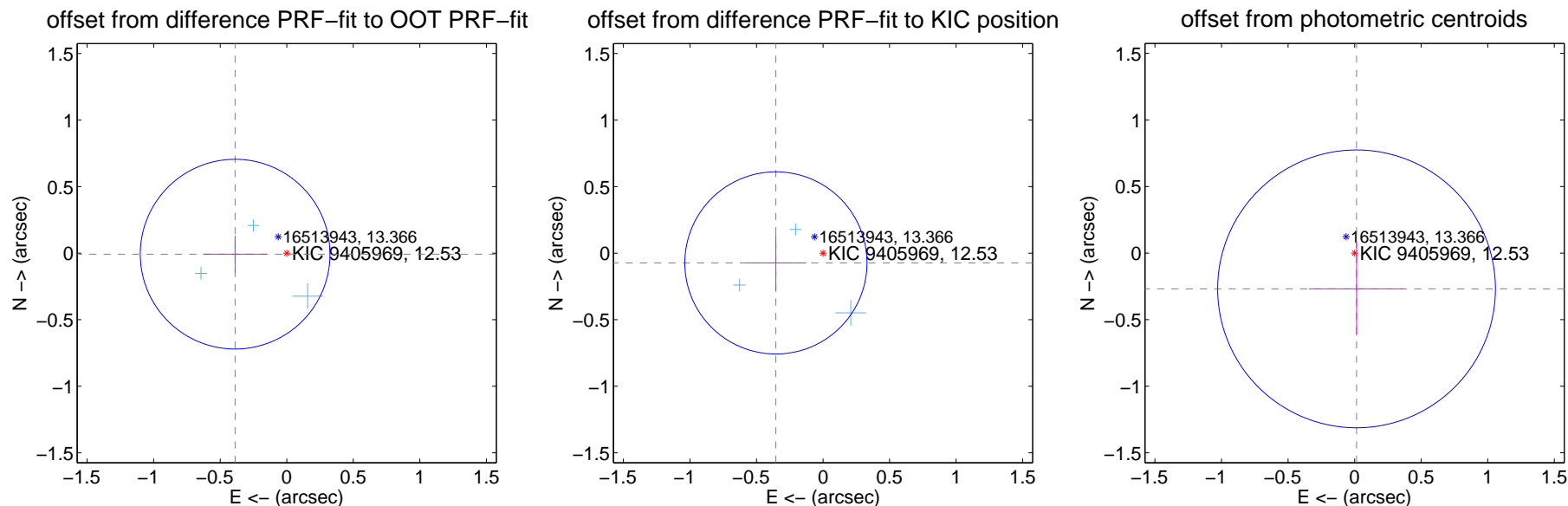
## DV Centroid Data

Supplemental centroid analysis for 009405969-02. Kepler magnitude: 12.53. Transit SNR 4.87

There are 3 quarters with good PRF difference image offsets

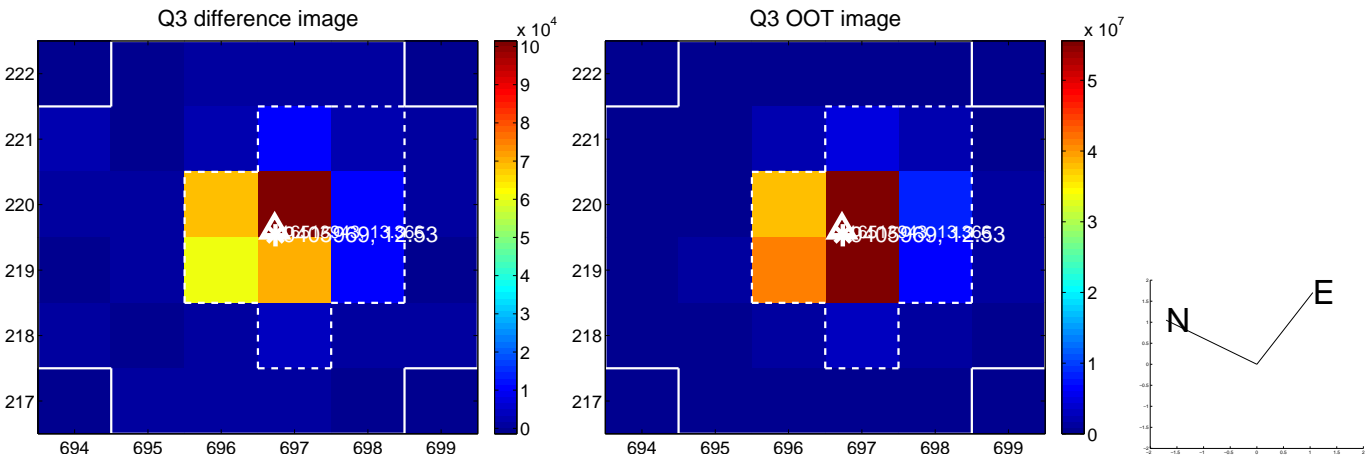
The direct PRF centroid is offset from the target star catalog position by about 0.09 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.388 \pm 0.238$	1.63	$0.388 \pm 0.239$	$-0.007 \pm 0.139$
PRF-fit source offset from KIC position	$0.362 \pm 0.228$	1.59	$0.354 \pm 0.229$	$-0.073 \pm 0.215$
photometric centroid source offset	$0.27 \pm 0.35$	0.77	$-0.01 \pm 0.36$	$-0.27 \pm 0.35$



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.

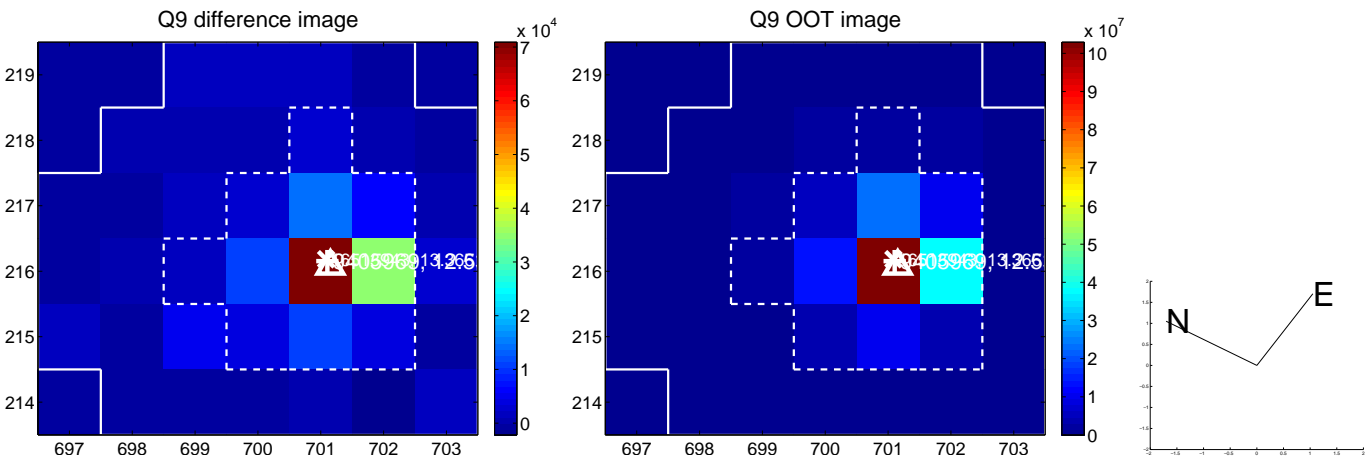
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



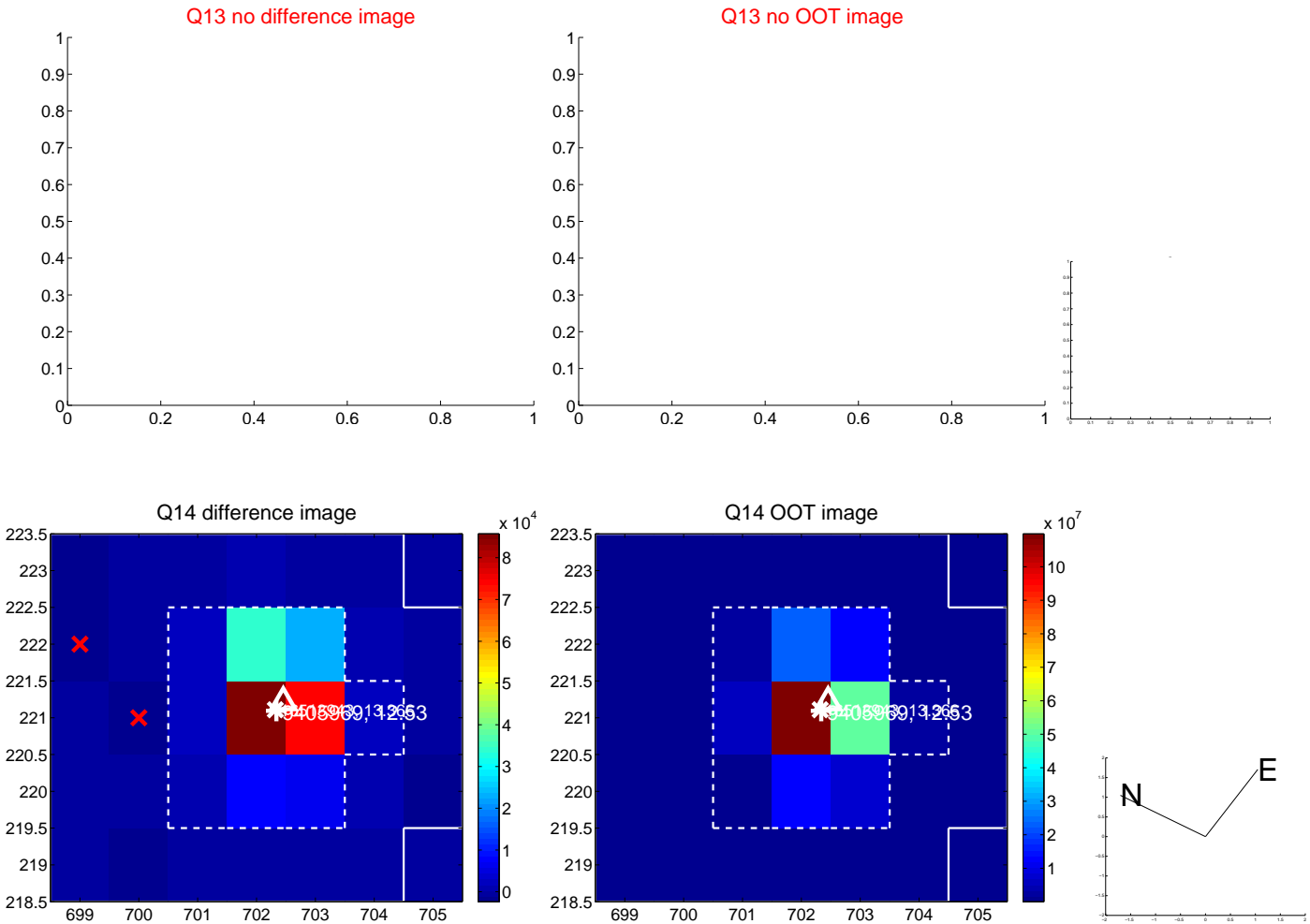
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



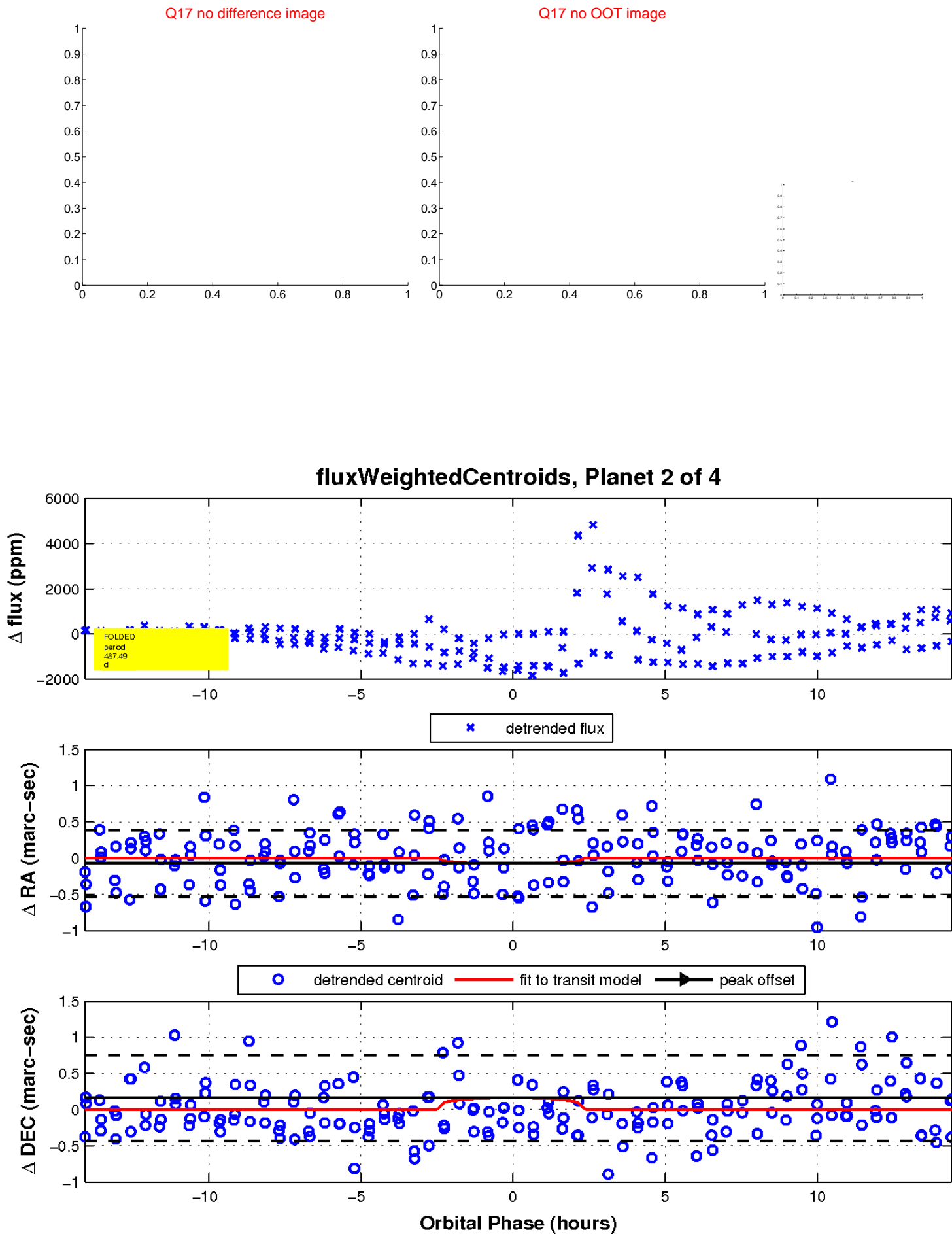
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

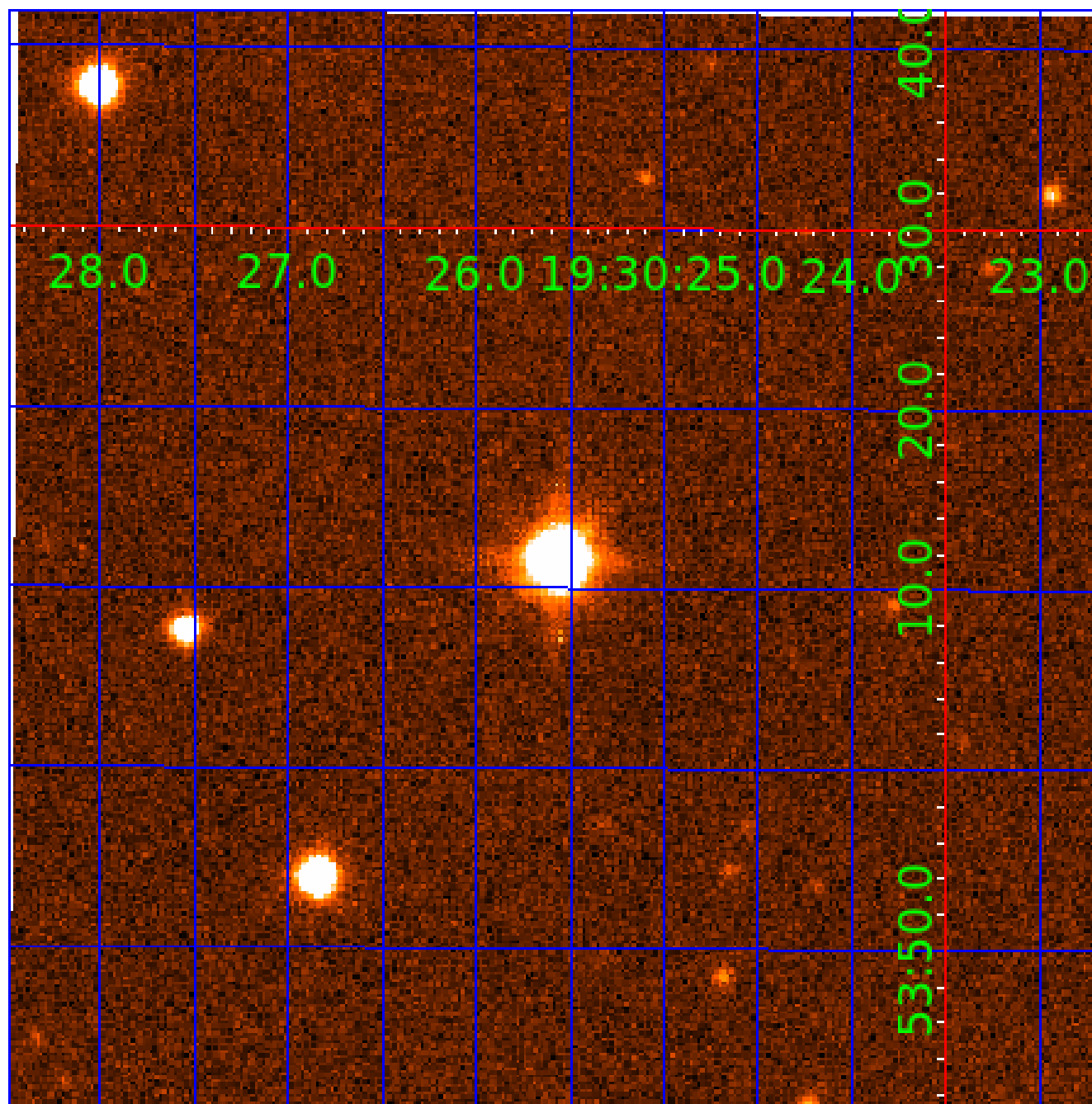


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination





# KIC 009405969

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
009405969-01	OBS	No	397.597763	490.226276	1514.1	7.218	20.2	6.5	2.38	5138	18.16	3.59
009405969-02	OBS	No	487.486445	346.706405	766.6	4.818	17.8	4.9	2.38	5138	6.74	2.73
009405969-03	OBS	No	307.942552	183.651777	1098.8	4.771	16.6	7.1	2.38	5138	8.15	5.05
009405969-04	OBS	No	636.403226	227.296712	392.5	4.500	16.5	-1.0	2.38	5138	4.63	1.92

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009405969-01	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS
009405969-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS
009405969-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS
009405969-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL_SKYE—LPP_DV—ALL_TRANS_CHASES—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.

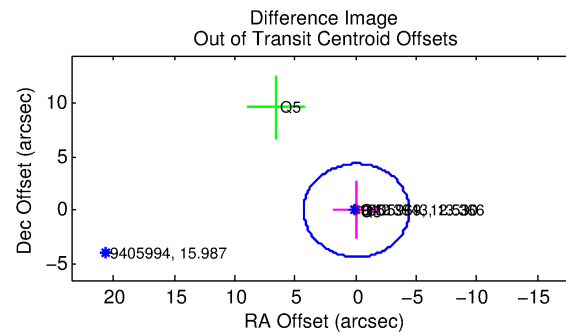
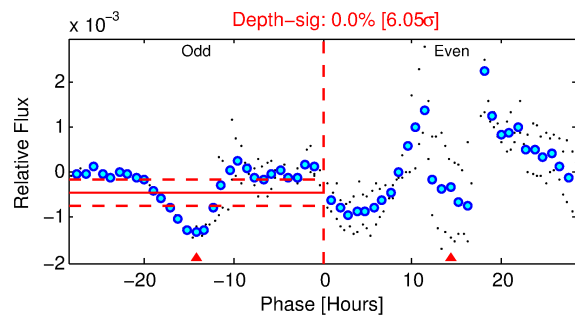
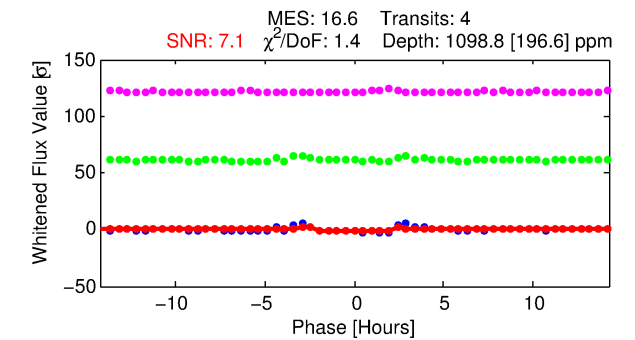
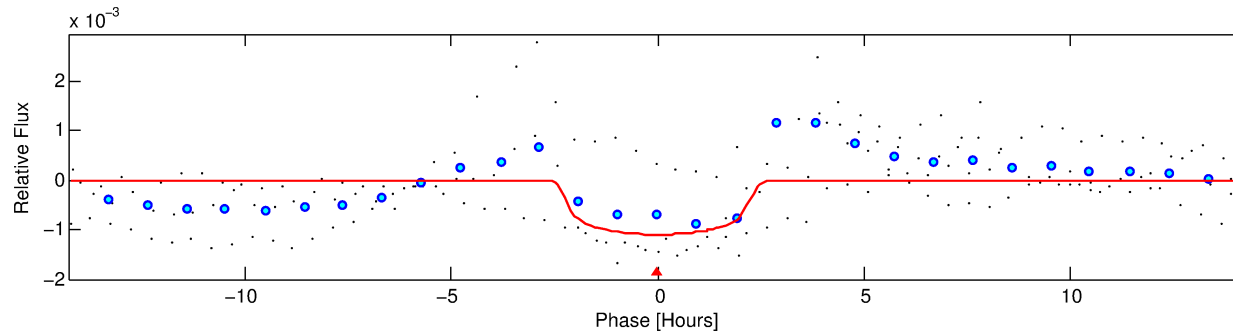
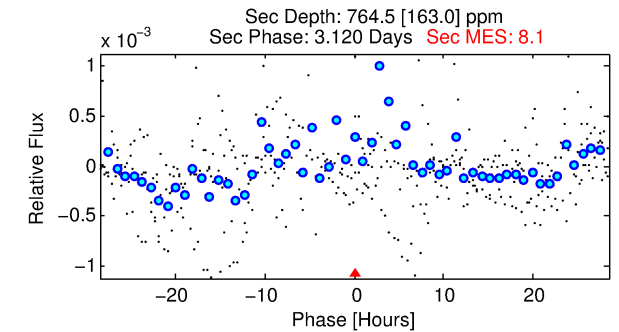
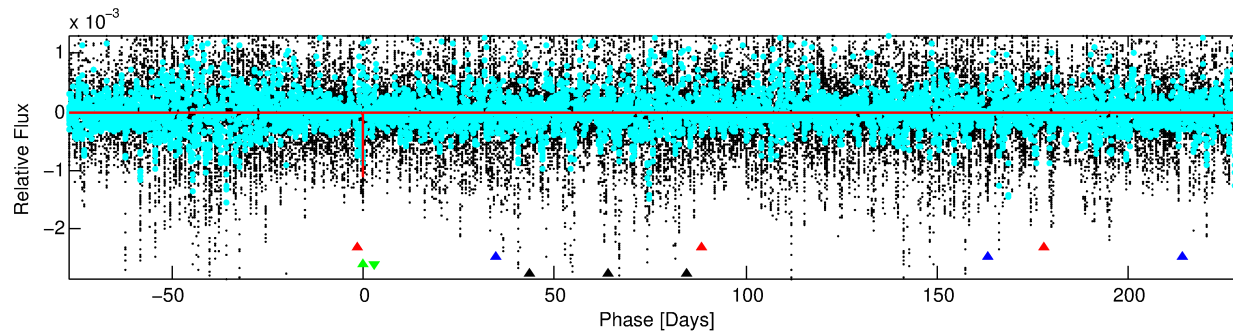
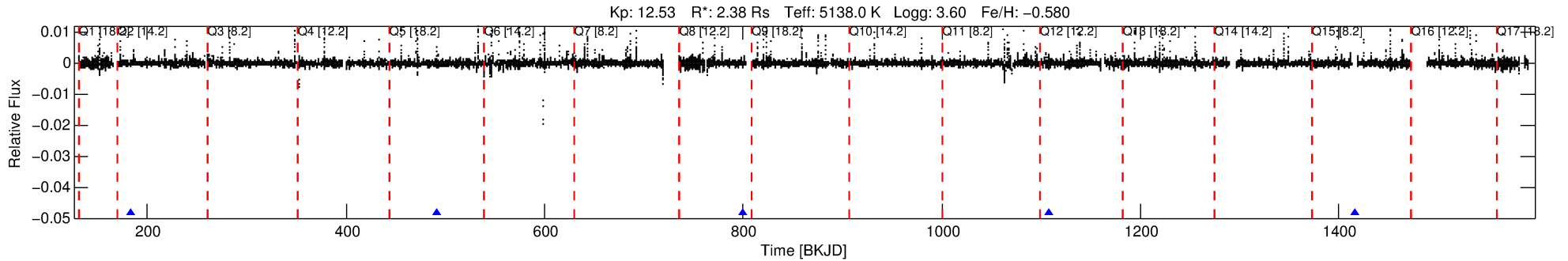
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 009405969-03

No Significant Match Found

# DV One-Page Summary

KIC: 9405969 Candidate: 3 of 4 Period: 307.943 d



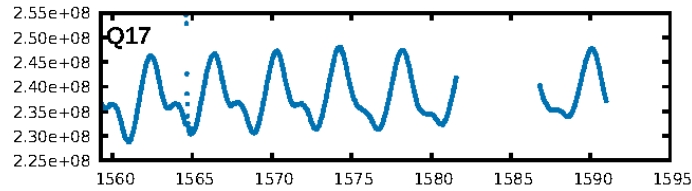
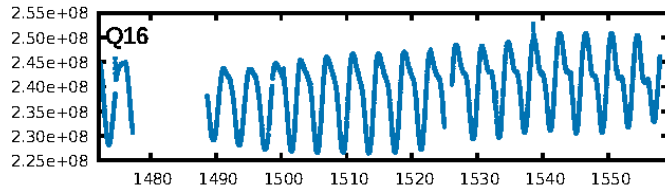
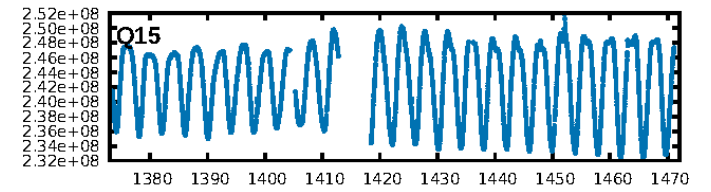
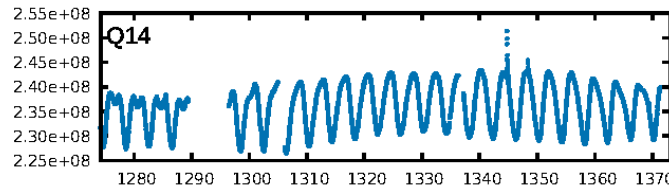
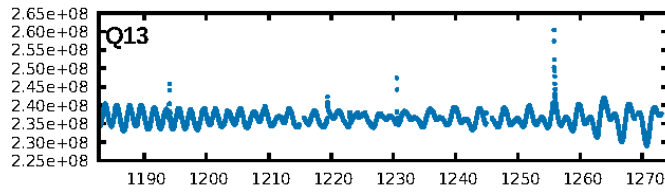
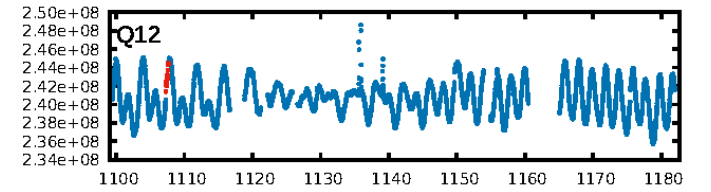
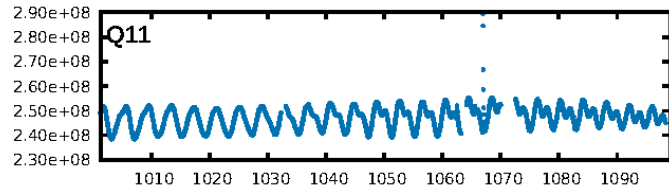
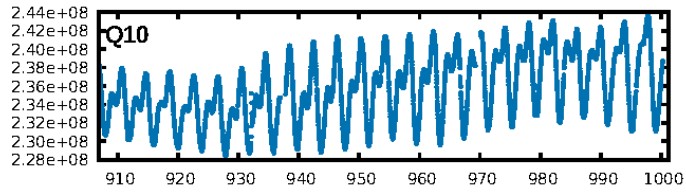
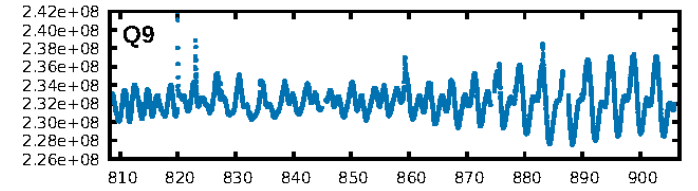
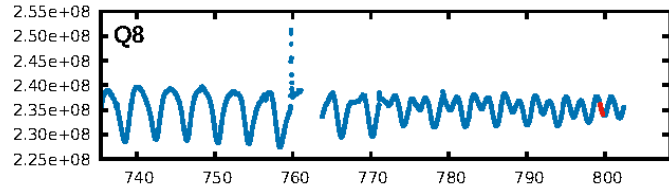
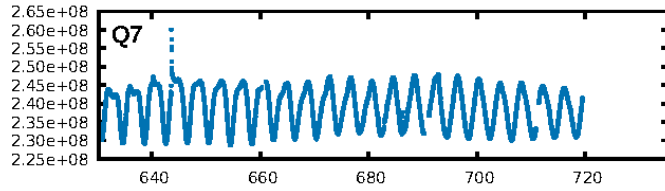
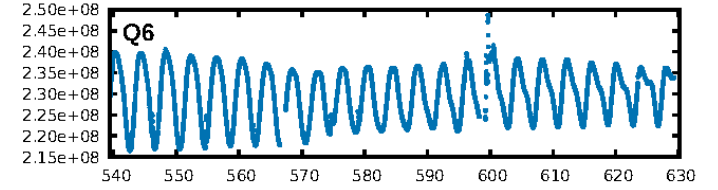
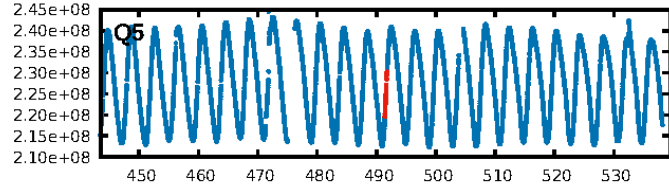
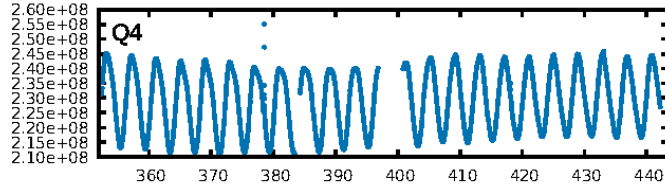
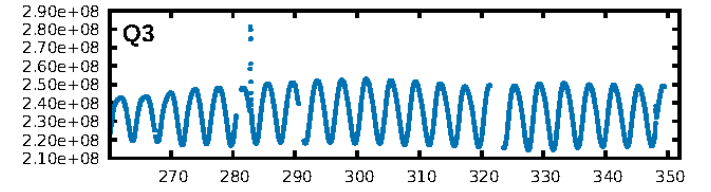
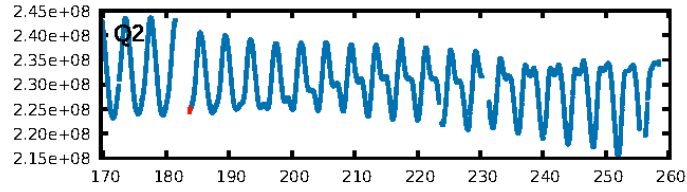
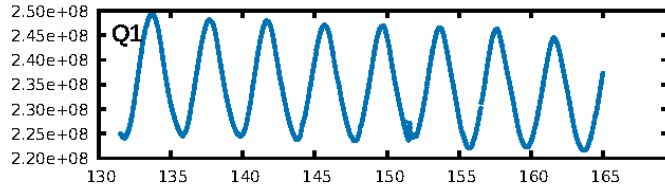
## DV Fit Results:

Period = 307.94255 [0.00341] d  
Epoch = 183.6518 [0.0062] BKJD  
Rp/R\* = 0.0314 [0.0196]  
a/R\* = 417.01 [976.79]  
b = 0.59 [2.62]  
Seff = 5.05 [8.28]  
Teq = 382 [157] K  
Rp = 8.15 [7.78] Re  
a = 0.8365 [0.7692] AU  
Ag = 4427.60 [9161.18] [0.48σ]  
Teffp = 4820 [1528] K [2.89σ]

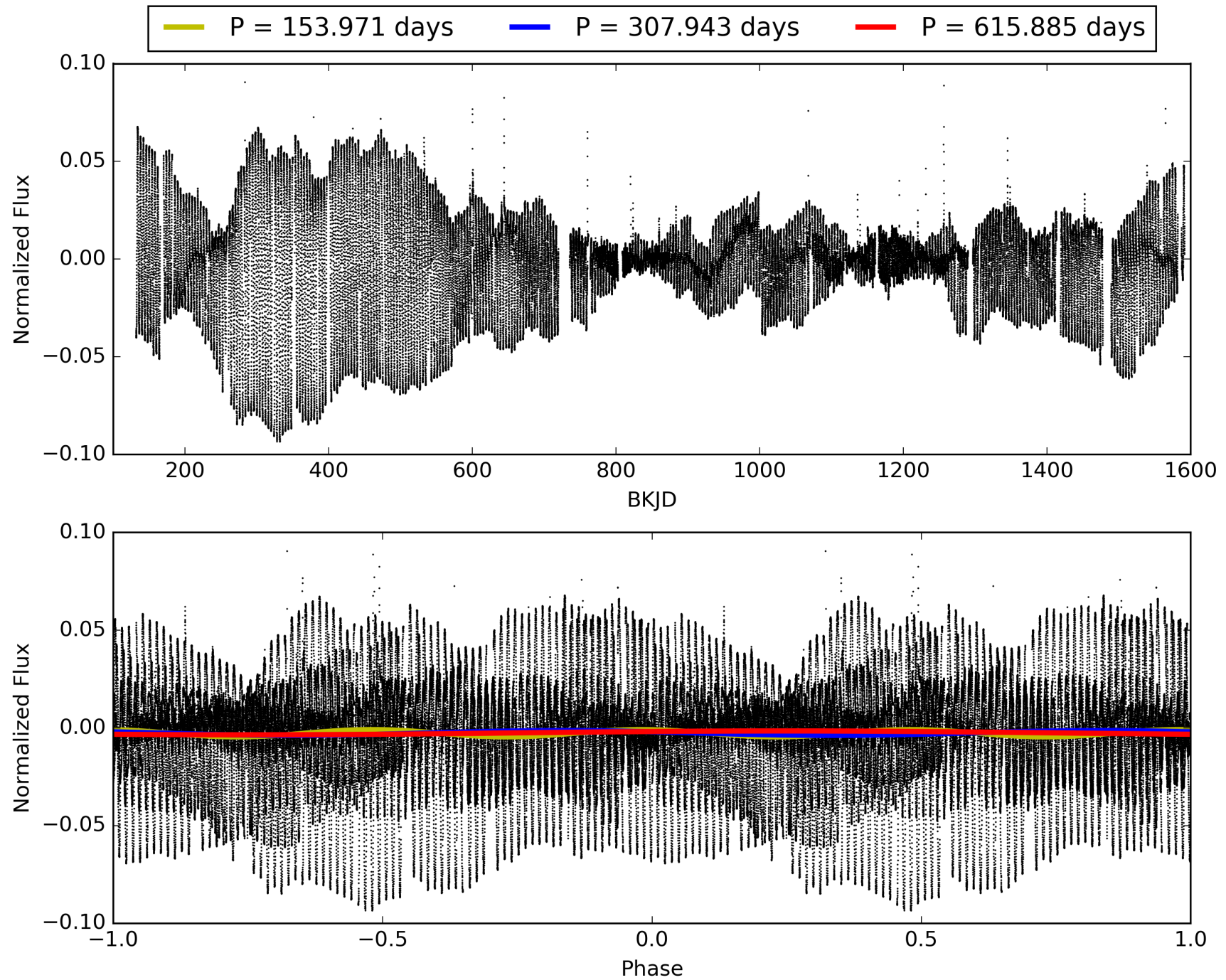
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 100.0% [248.69σ]  
ModelChiSquare2-sig: 0.8%  
ModelChiSquareGof-sig: 77.8%  
Bootstrap-pfa: N/A  
RollingBand-fgt: 1.00 [4/4]  
GhostDiagnostic-chr: 0.2767  
Centroid-sig: 33.0%  
Centroid-so: 0.206 arcsec [0.69σ]  
OotOffset-rm: 0.036 arcsec [0.02σ]  
OotOffset-st: 0/0/2/1 [3]  
KicOffset-rm: 0.185 arcsec [0.05σ]  
KicOffset-st: 0/0/2/1 [3]  
DiffImageQuality-fgm: 0.33 [1/3]  
DiffImageOverlap-fno: 1.00 [3/3]

# TCE 009405969-03, PDC Light Curves

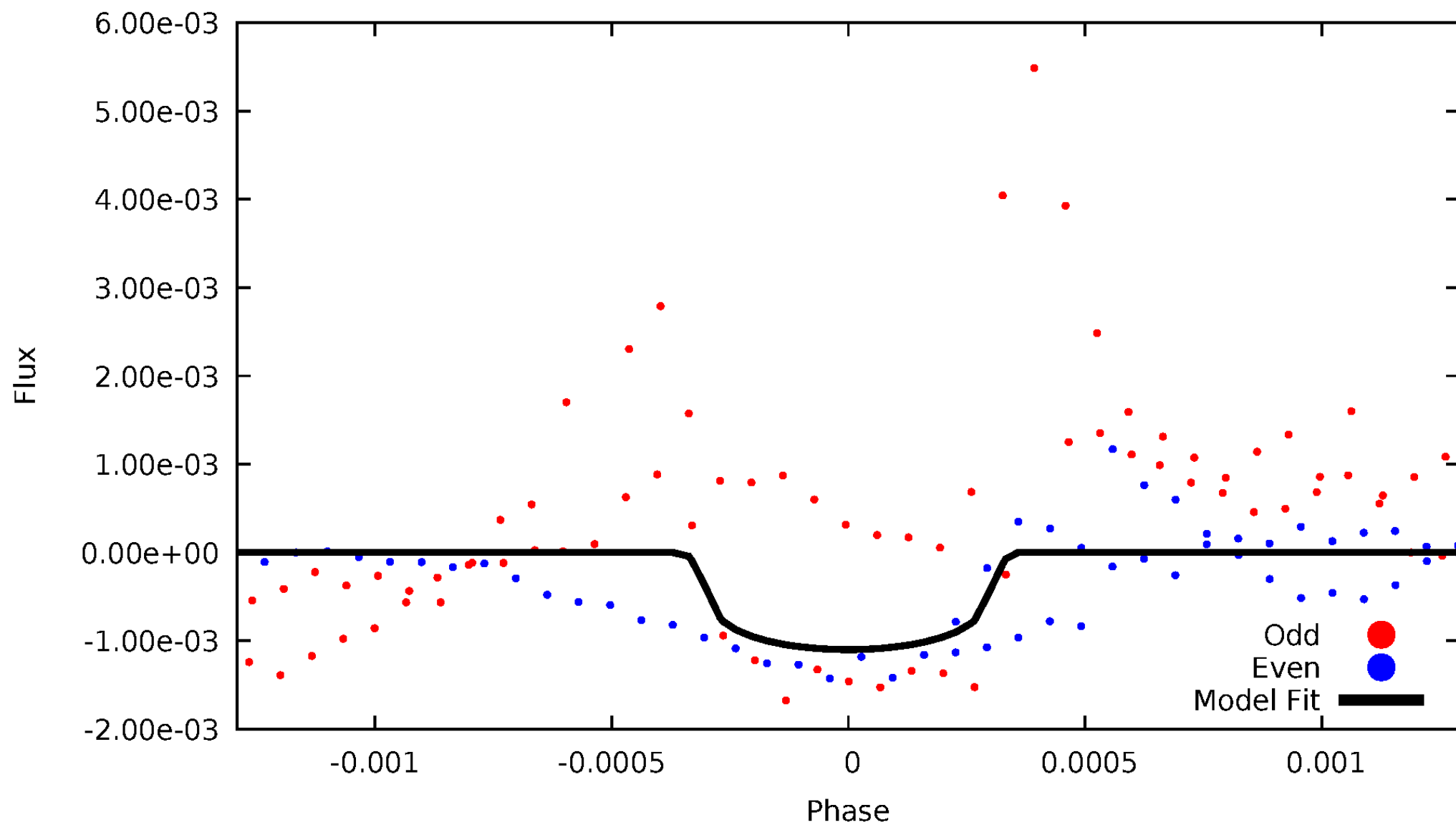


TCE 009405969-03



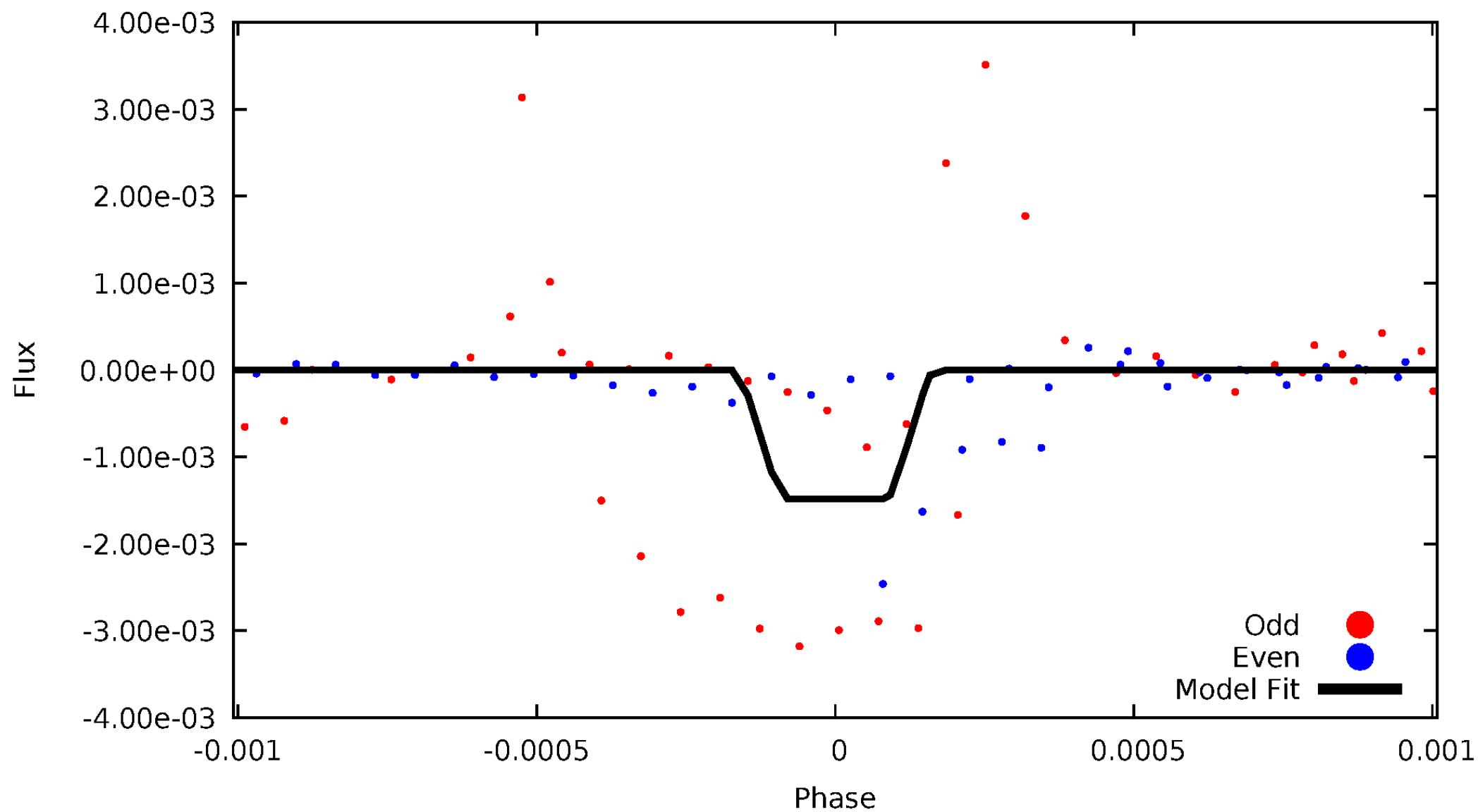
# DV Odd/Even

TCE 009405969-03



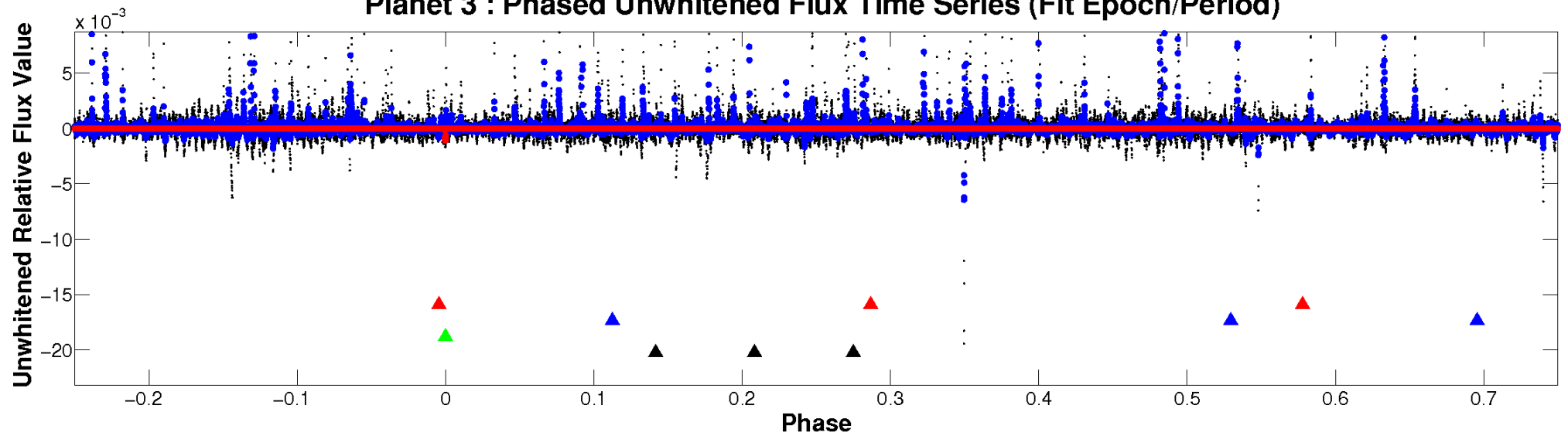
# ALT Odd/Even

TCE 009405969-03

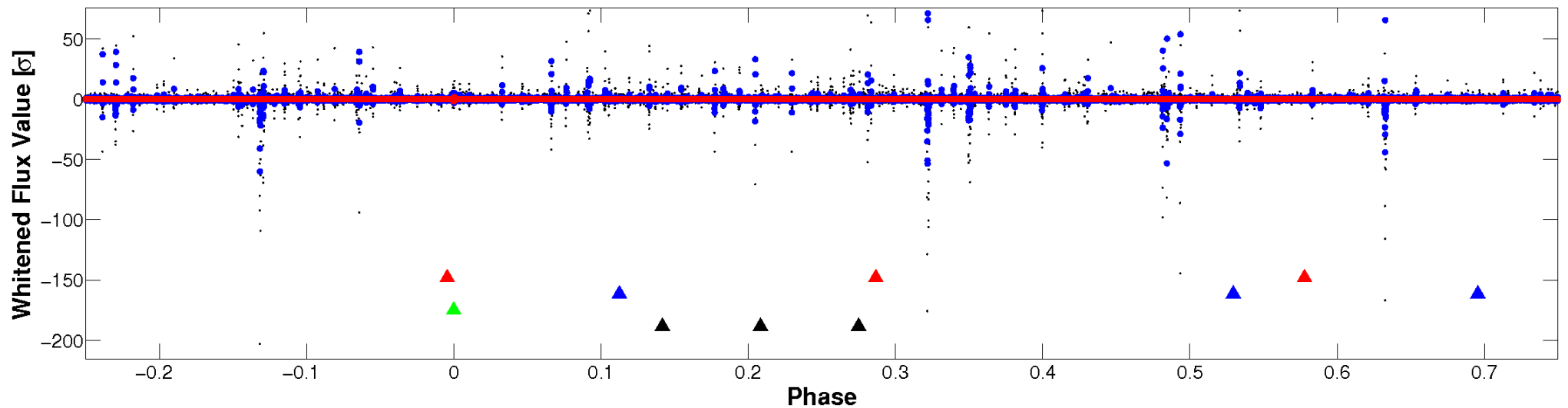


# Non-Whitened Vs. Whitened Light Curve

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

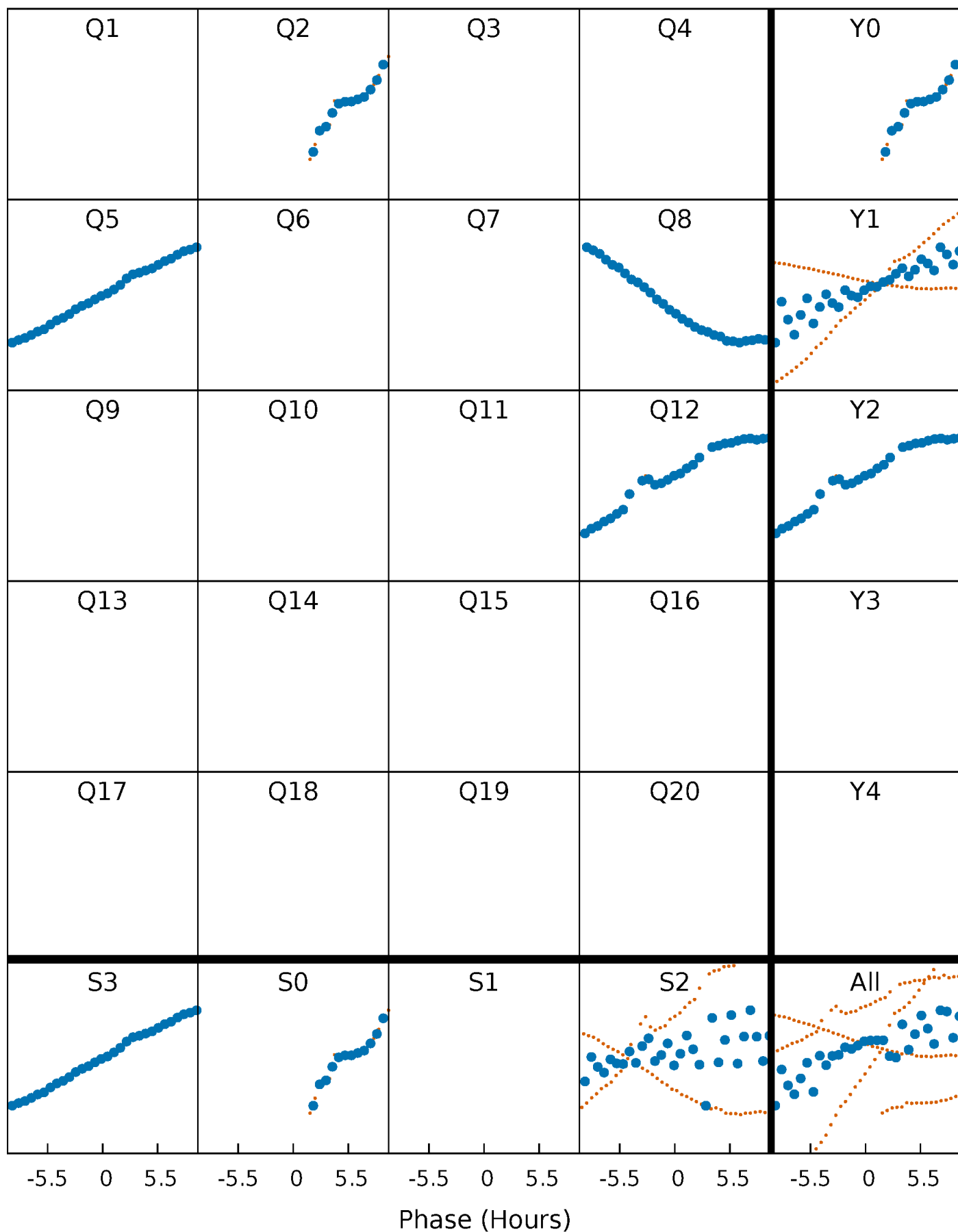


Planet 3 : Phased Whitened Flux Time Series (Fit Epoch/Period)



# PDC Quarter-Phased Transit Curves

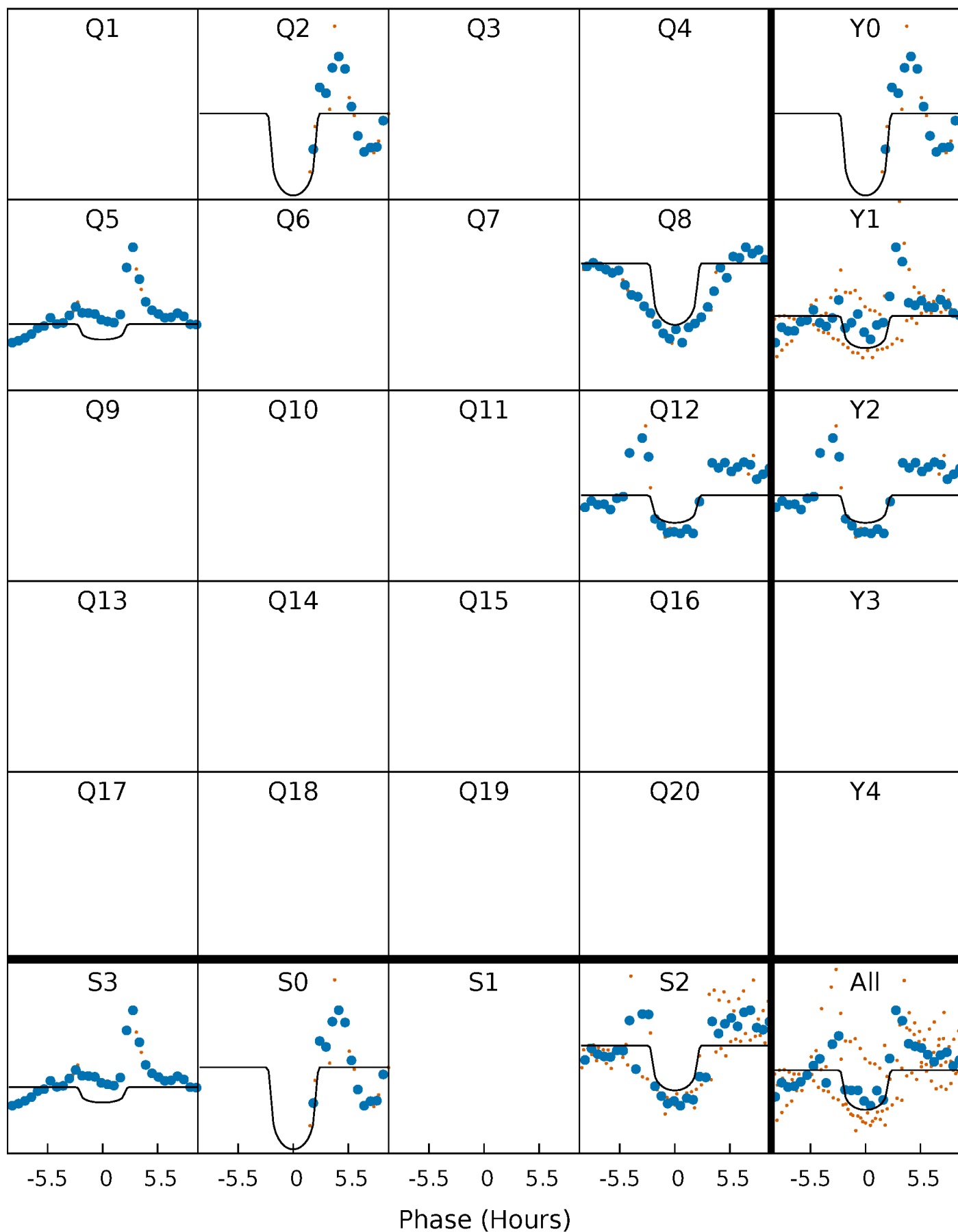
TCE 009405969-03     $P=307.942552$  Days     $T_0=183.651777$  (BKJD)





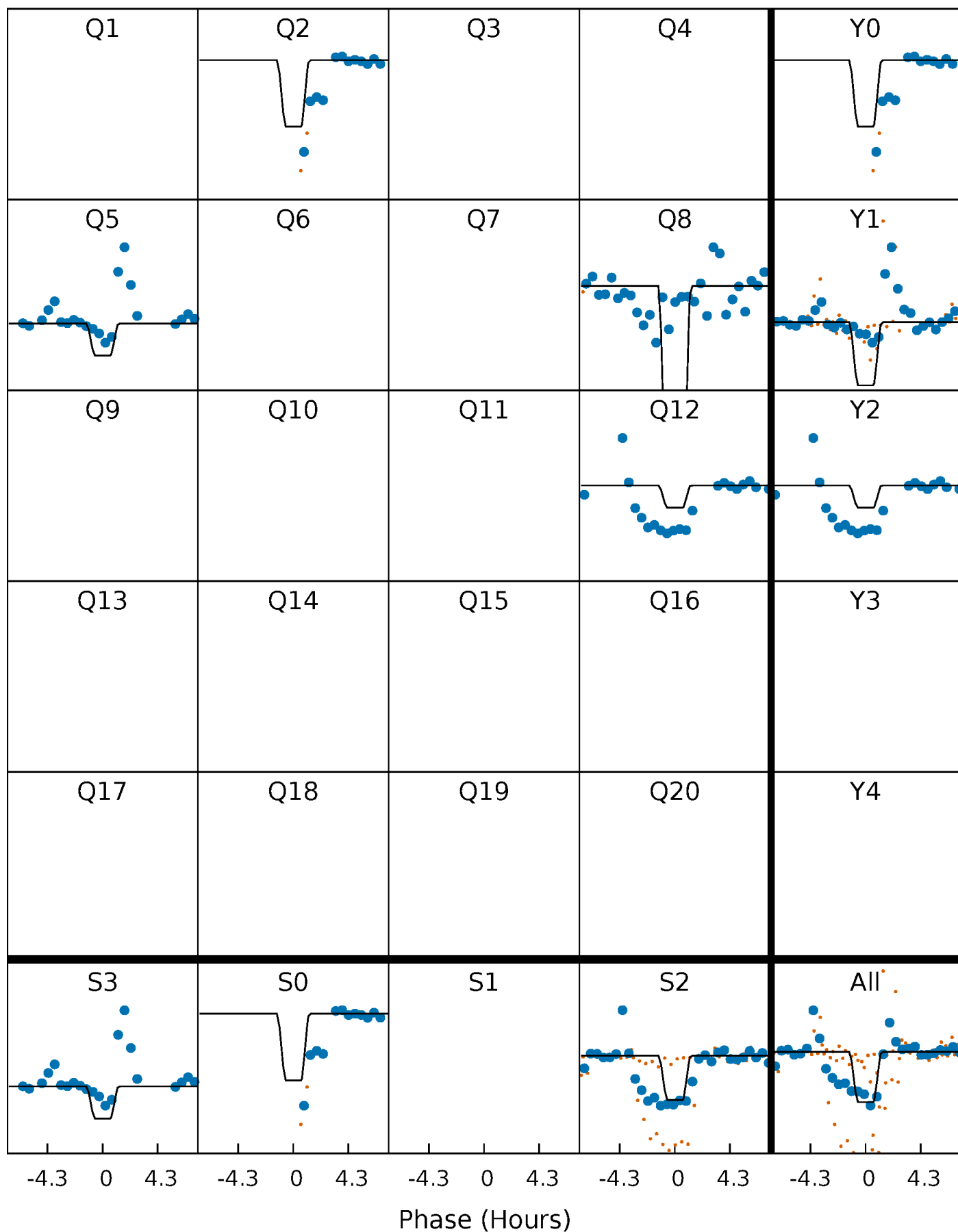
# DV Quarter-Phased Transit Curves

TCE 009405969-03     $P=307.942552$  Days     $T_0=183.651777$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

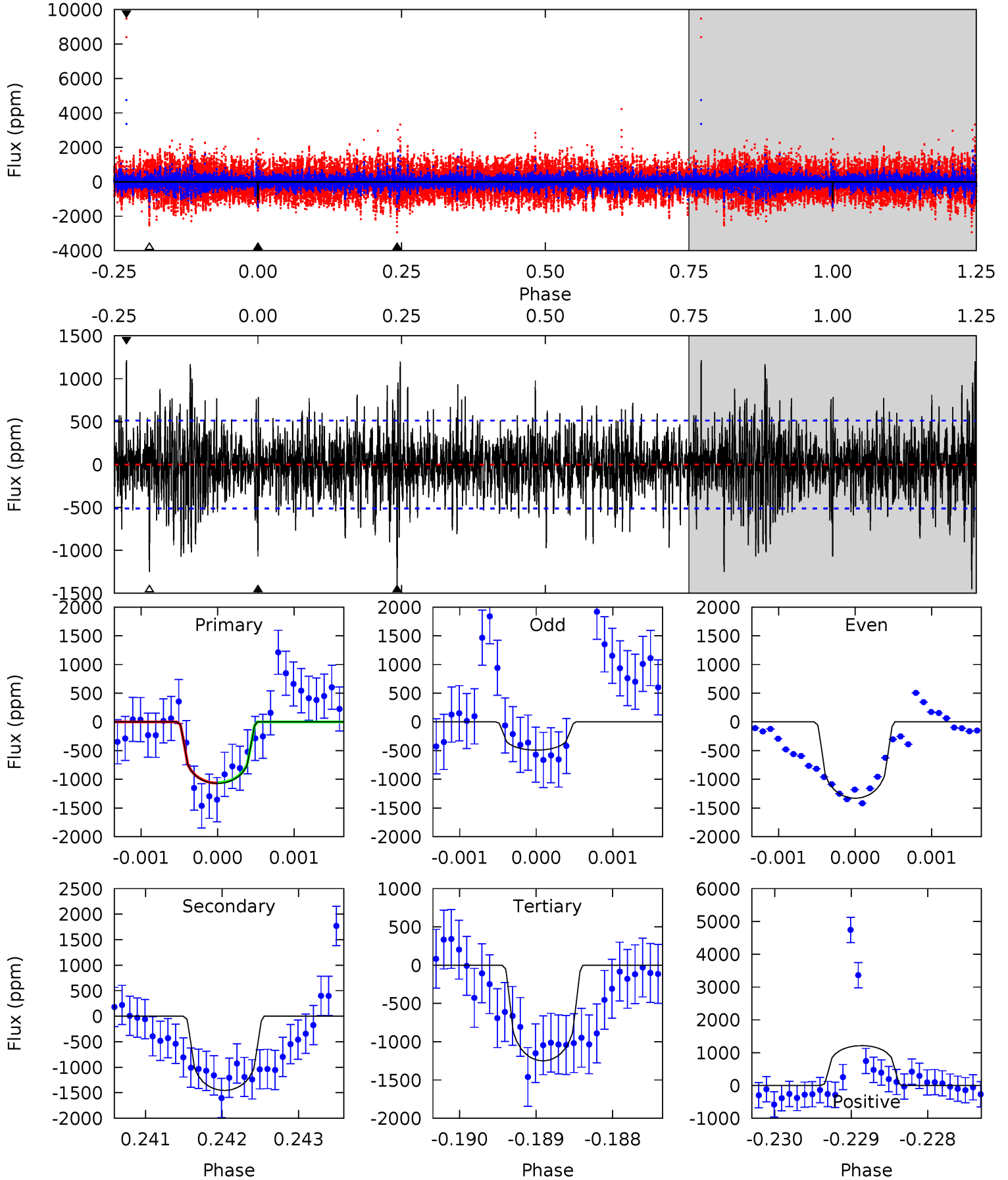
TCE 009405969-03 P=307.940560 Days  $T_0=183.697079$  (BKJD)



# DV Model-Shift Uniqueness Test

009405969-03, P = 307.942552 Days, E = 183.651777 Days

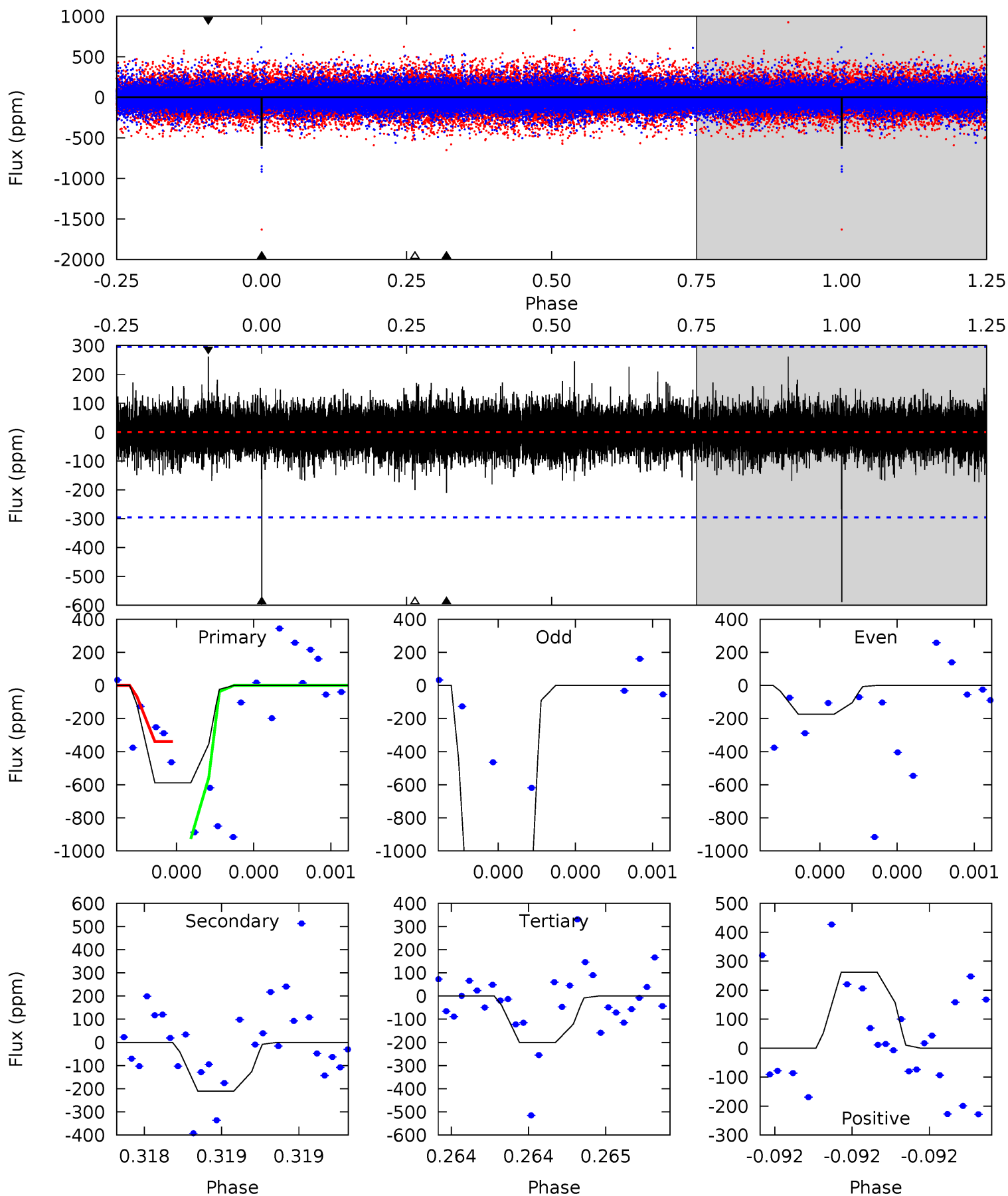
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
11.5	15.6	13.4	13.1	5.52	3.39	2.86	-1.92	-1.56	2.20	2.56	2.90	0.71	0.46	0.03



# Alt Model-Shift Uniqueness Test

009405969-03, P = 307.940560 Days, E = 183.697079 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
11.3	4.04	3.85	5.02	5.67	3.63	0.81	7.44	6.27	0.19	-0.98	23.3	1.05	0.31	5.06



### Stellar Parameters For KIC 009405969

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R$ ( $R_{\odot}$ )	$M(M_{\odot})$	$p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ )
	$5138^{+128}_{-128}$	$3.601^{+1.020}_{-0.340}$	$-0.580^{+0.300}_{-0.250}$	$2.378^{+1.407}_{-1.720}$	$0.823^{+0.270}_{-0.166}$	$0.086^{+3.253}_{-0.060}$
	+2%/-2%	+28%/-9%	+52%/-43%	+59%/-72%	+33%/-20%	+3774%/-70%
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 009405969-03 / KOI

Detrend	Depth (ppm)	$R_p$ ( $R_{\oplus}$ )	$T_{\text{max}}$ (K)	$T_{\text{obs}}$ (K)	$A_{\text{obs}}$
DV	$-1454 \pm 93$	$7.58^{+5.95}_{-4.66}$	$518^{+80}_{-106}$	$5500^{+2911}_{-934}$	$10705^{+52082}_{-7512}$
Alt.	$-210 \pm 52$	$9.05^{+6.85}_{-5.26}$	$529^{+80}_{-109}$	$3591^{+965}_{-458}$	$1032^{+4797}_{-724}$

$T_{\text{max}}$  = 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

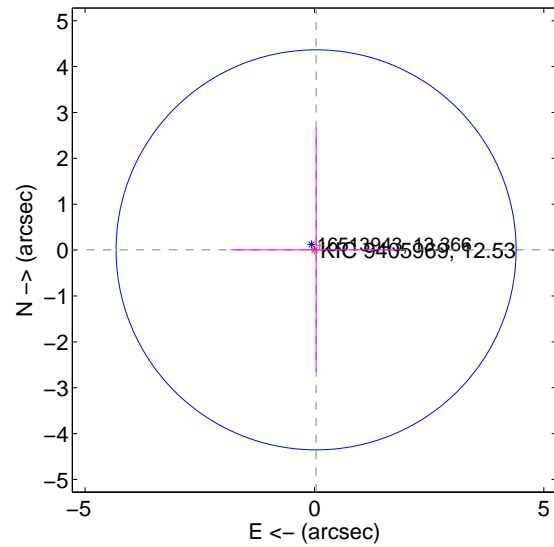
Supplemental centroid analysis for 009405969-03. Kepler magnitude: 12.53. Transit SNR 7.09

There are 1 quarters with good PRF difference image offsets

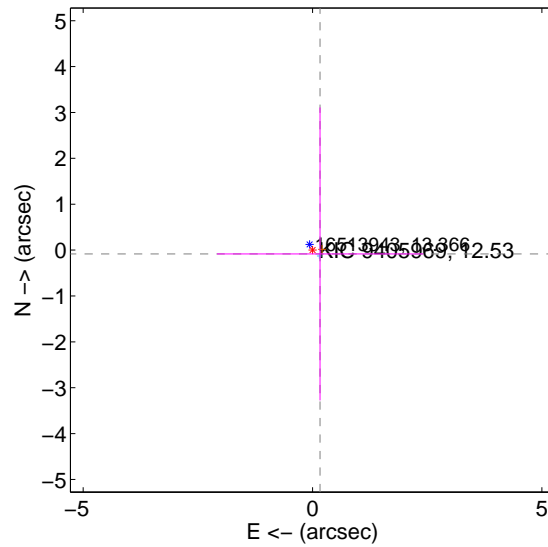
The direct PRF centroid is offset from the target star catalog position by about 0.13 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.036 \pm 1.453$	0.02	$-0.036 \pm 1.865$	$0.005 \pm 2.651$
PRF-fit source offset from KIC position	$0.185 \pm 3.452$	0.05	$-0.164 \pm 2.248$	$-0.084 \pm 3.193$
photometric centroid source offset	$0.21 \pm 0.30$	0.69	$0.20 \pm 0.30$	$0.05 \pm 0.27$

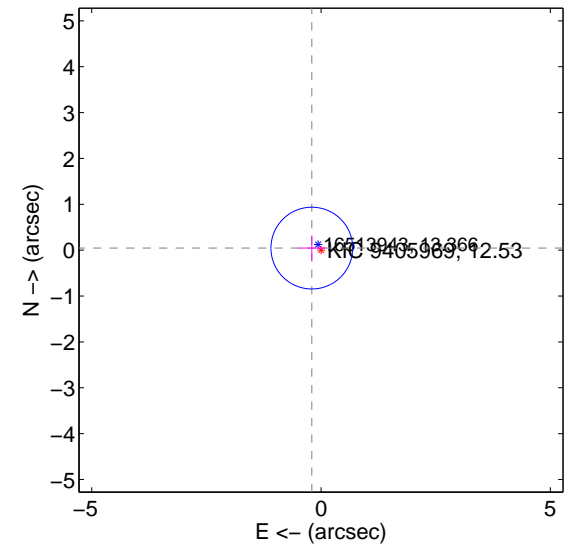
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position



offset from photometric centroids

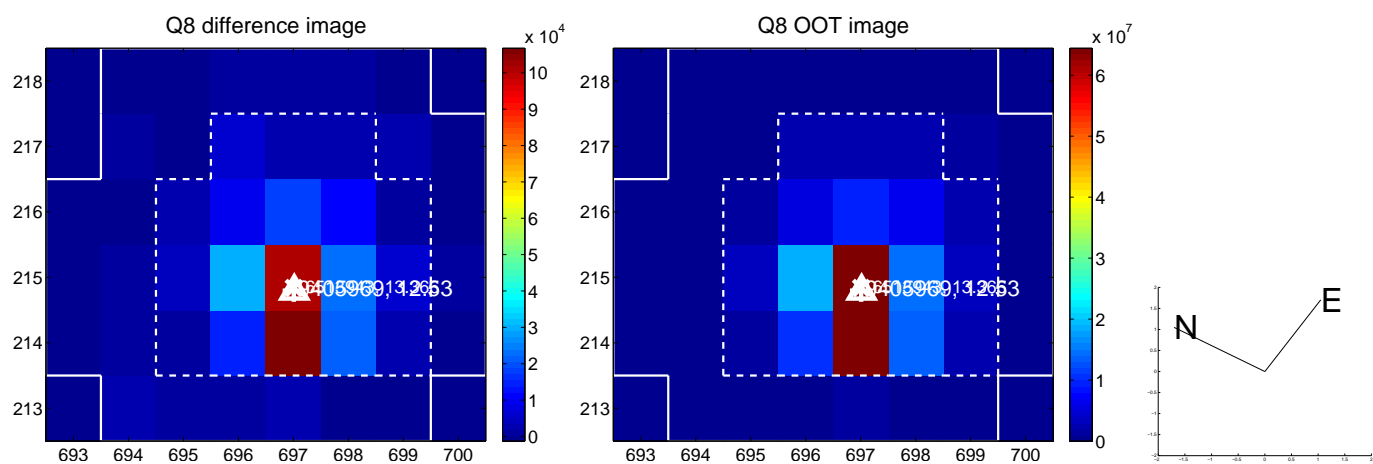
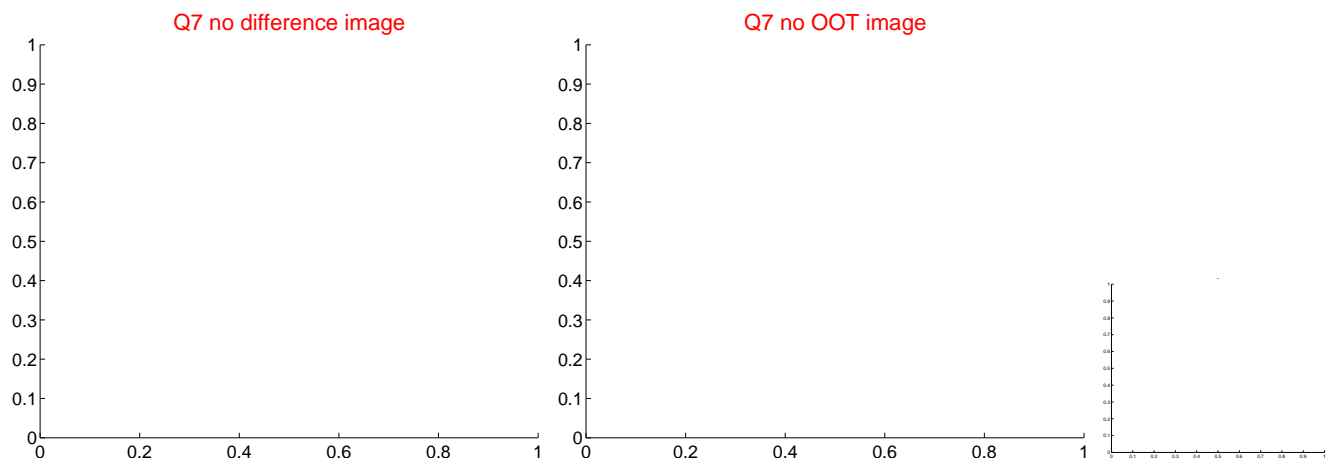
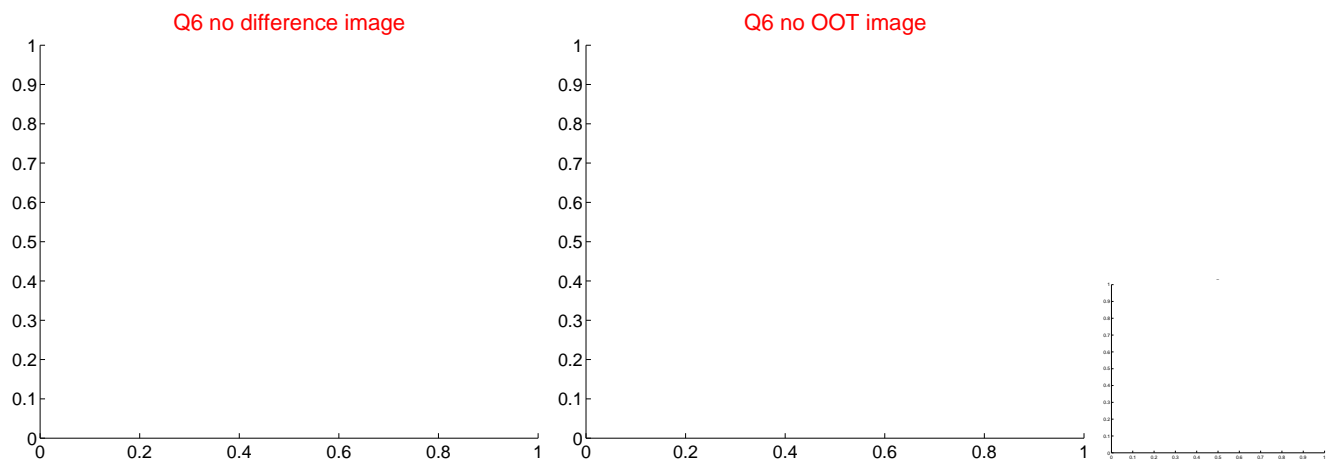
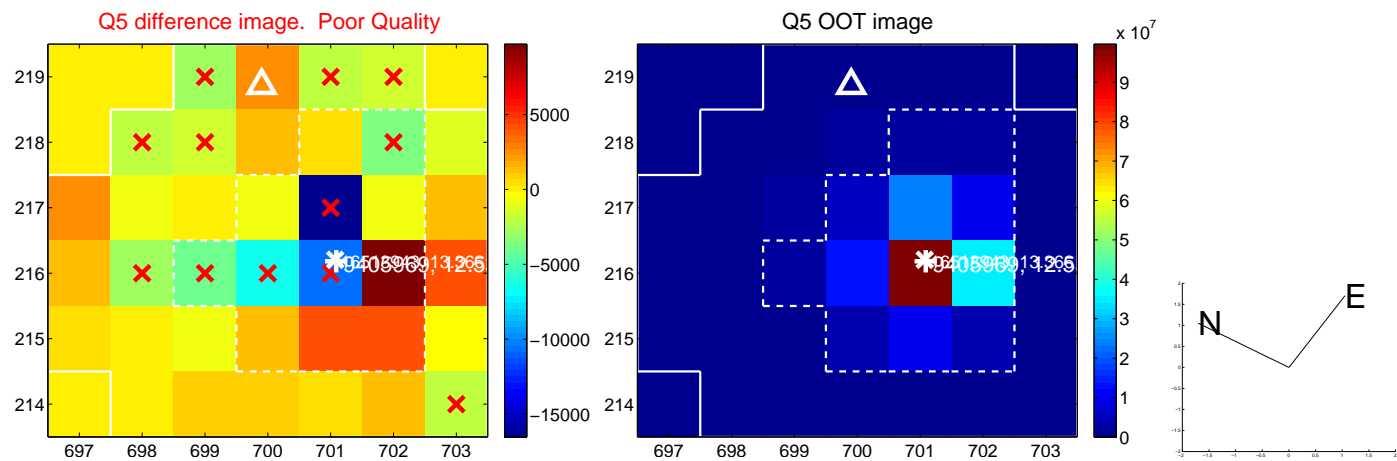


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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

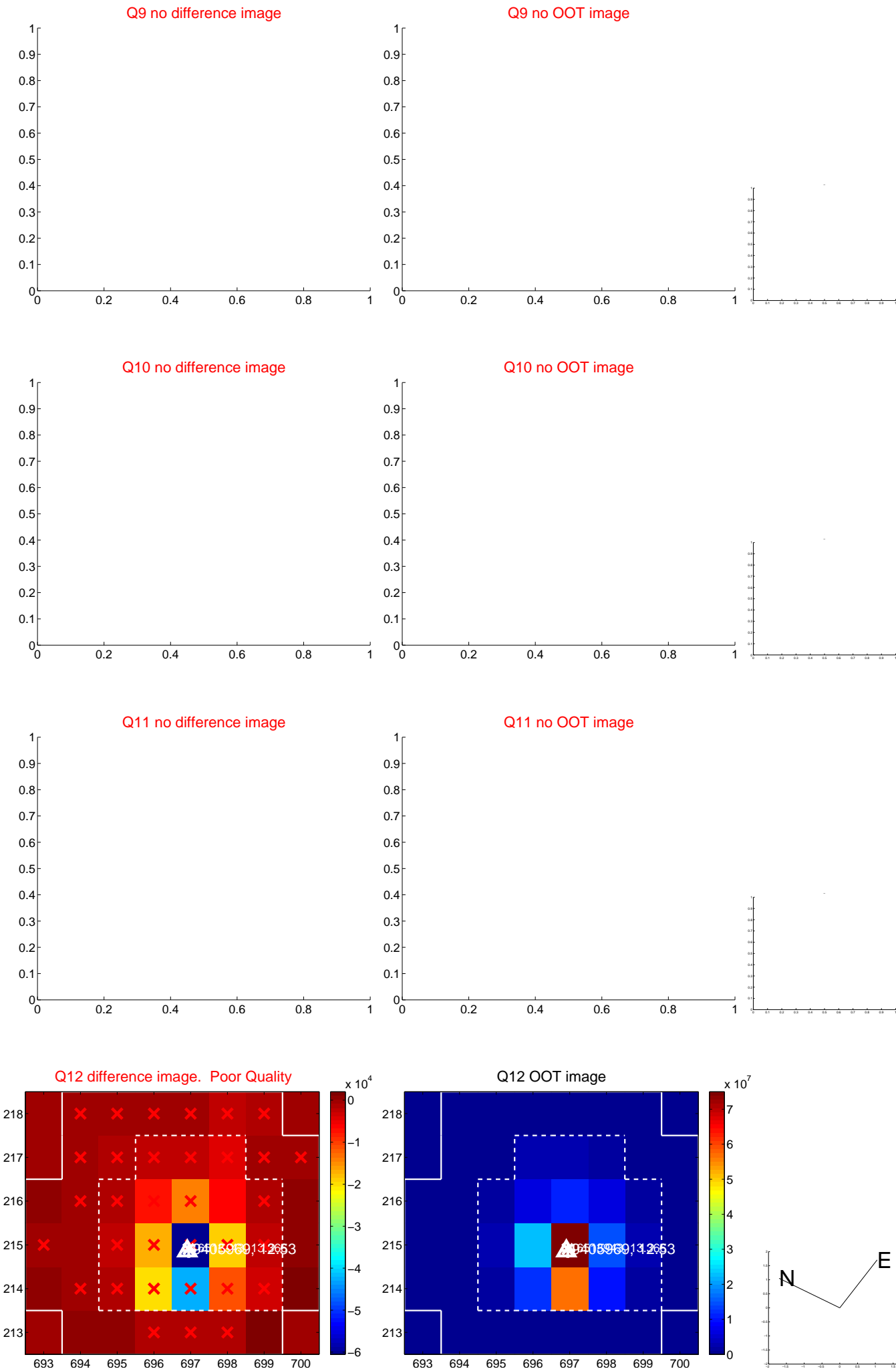


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.





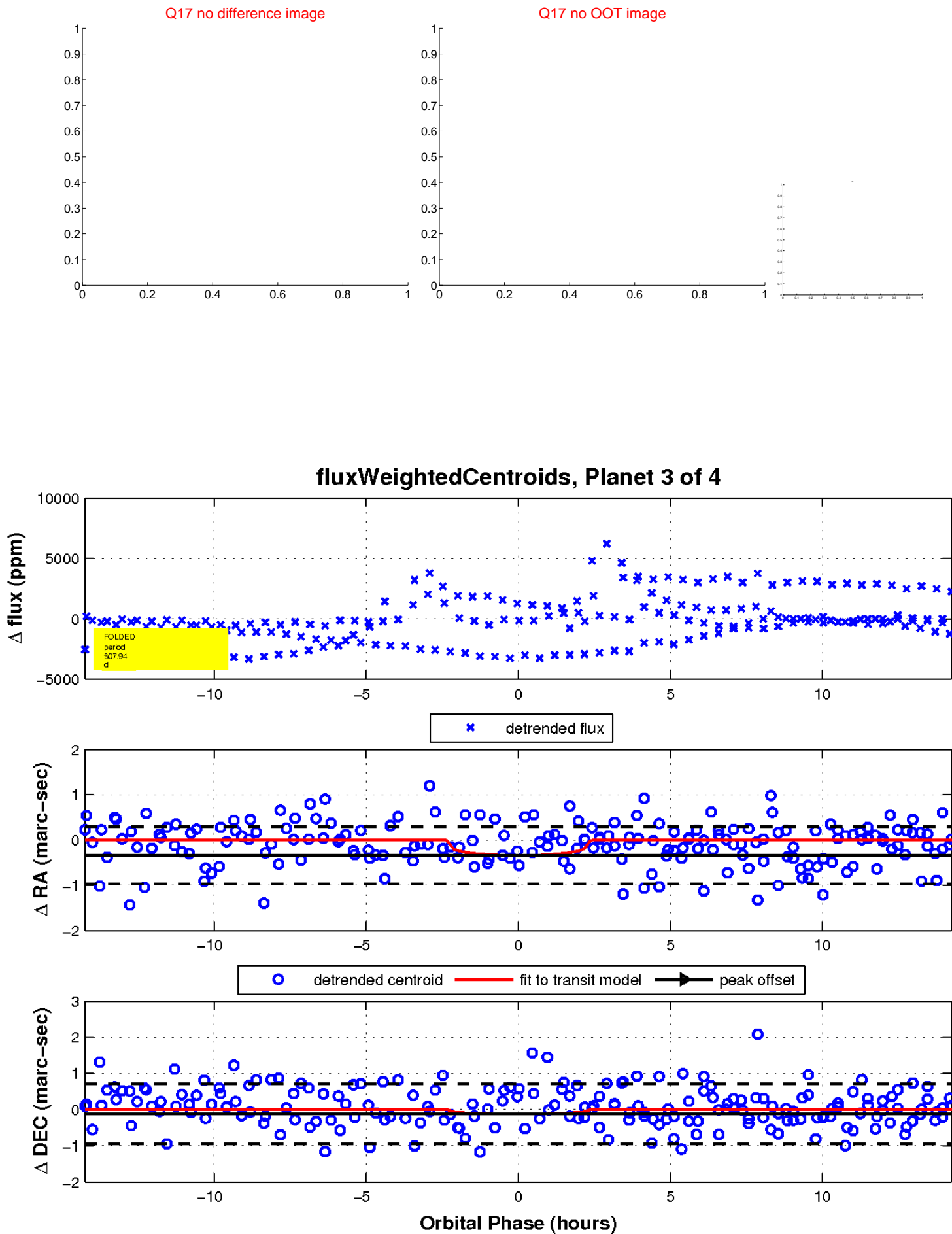
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

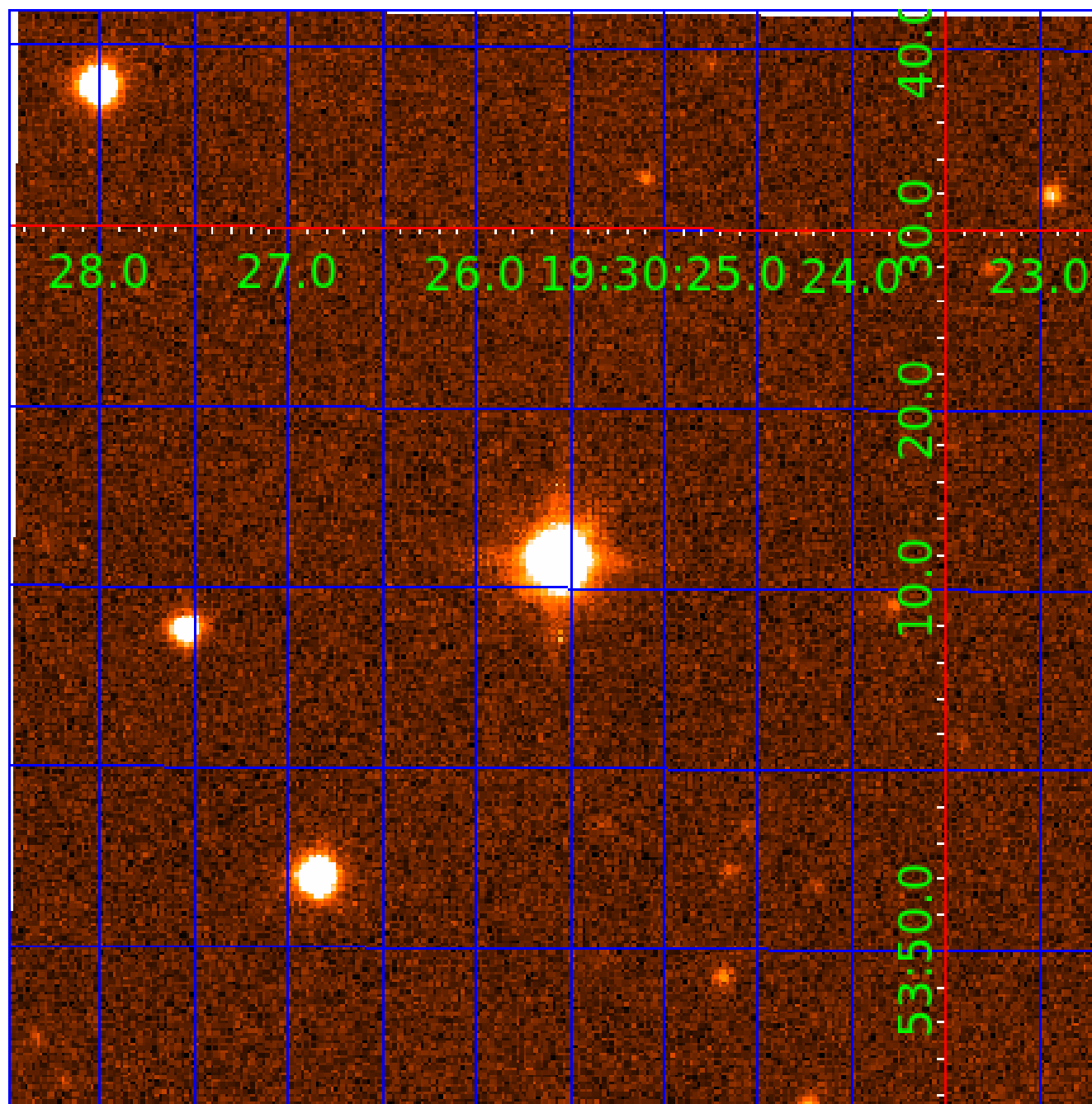


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination



# KIC 009405969

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
009405969-01	OBS	No	397.597763	490.226276	1514.1	7.218	20.2	6.5	2.38	5138	18.16	3.59
009405969-02	OBS	No	487.486445	346.706405	766.6	4.818	17.8	4.9	2.38	5138	6.74	2.73
009405969-03	OBS	No	307.942552	183.651777	1098.8	4.771	16.6	7.1	2.38	5138	8.15	5.05
009405969-04	OBS	No	636.403226	227.296712	392.5	4.500	16.5	-1.0	2.38	5138	4.63	1.92

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009405969-01	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS
009405969-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS
009405969-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS
009405969-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL_SKYE—LPP_DV—ALL_TRANS_CHASES—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.

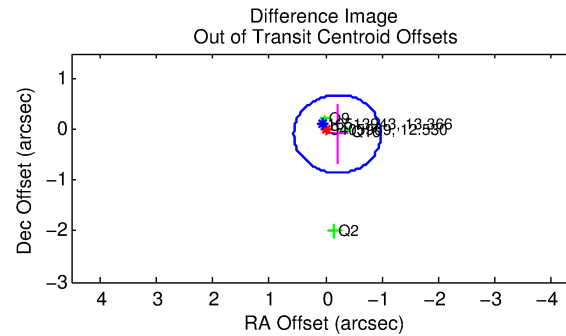
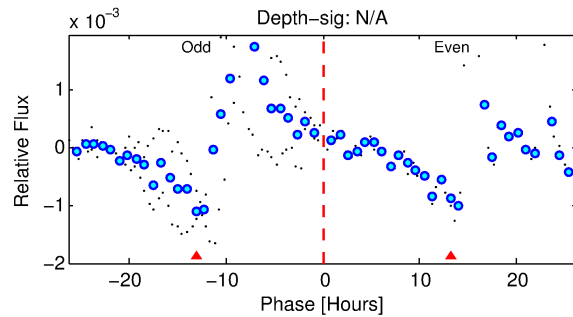
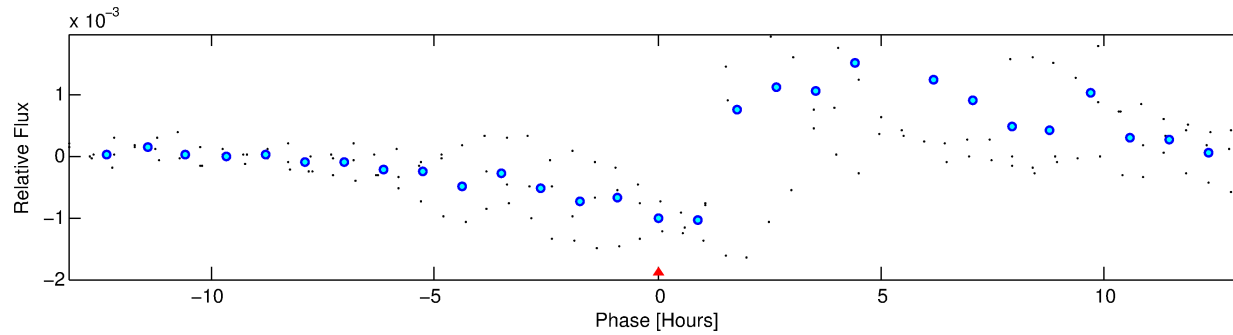
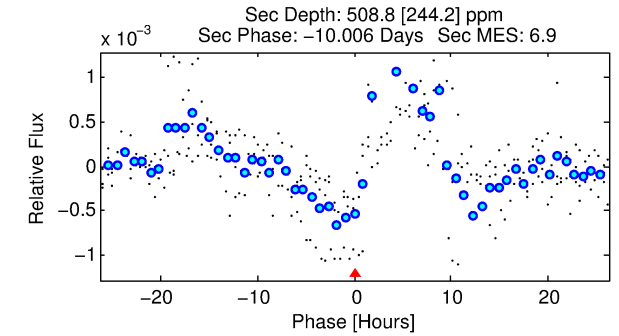
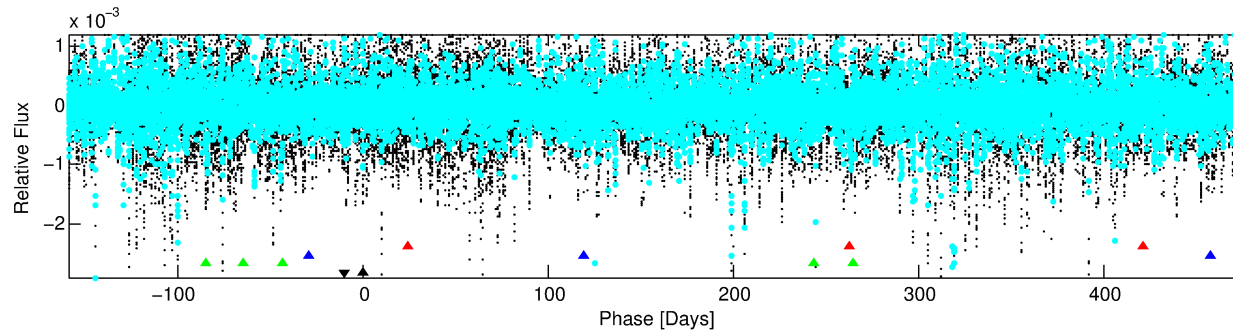
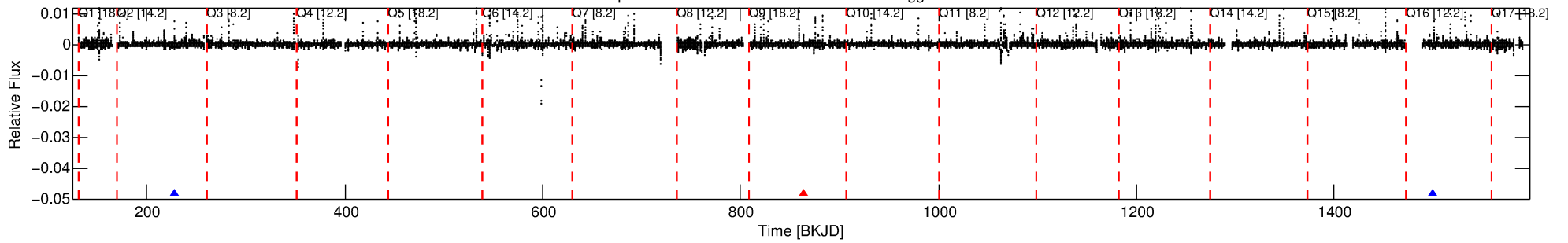
Ephemeris Match Information For 009405969-04

No Significant Match Found

# DV One-Page Summary

KIC: 9405969 Candidate: 4 of 4 Period: 636.403 d

Kp: 12.53 R\*: 2.38 Rs Teff: 5138.0 K Logg: 3.60 Fe/H: -0.580



## TPS TCE Results:

Period = 636.40323 d  
Epoch = 227.2967 BKJD

DV fit results are unavailable

## DV Diagnostic Results:

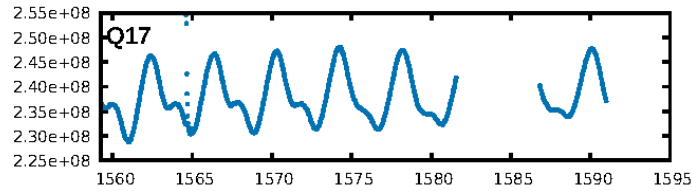
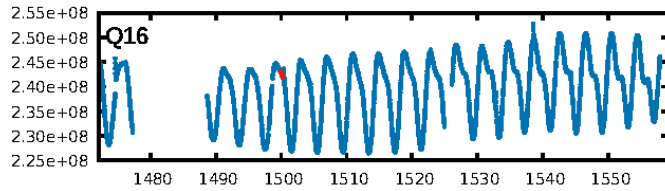
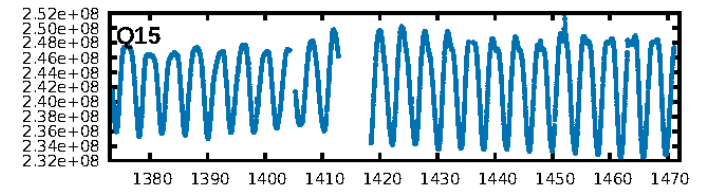
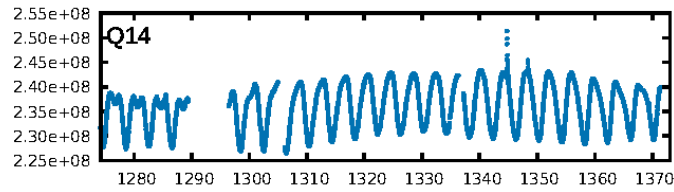
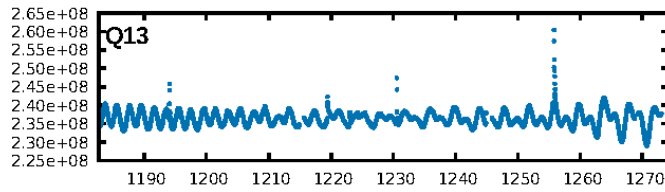
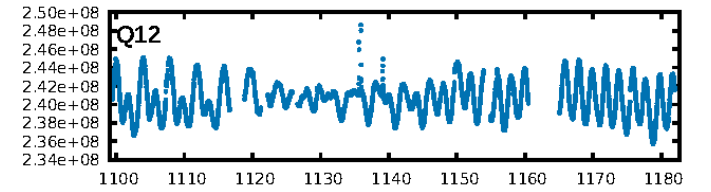
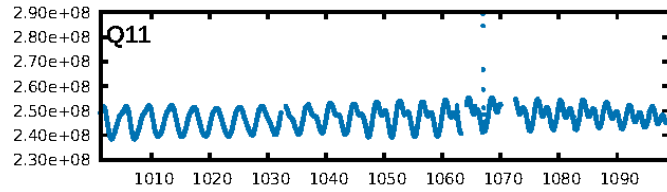
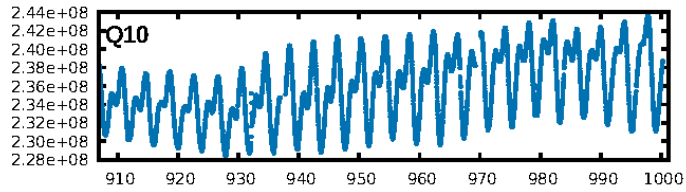
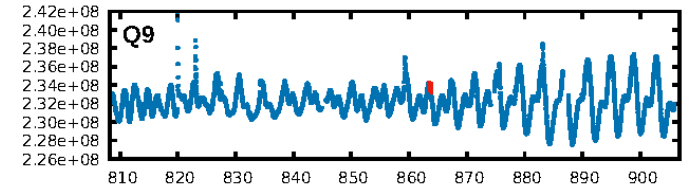
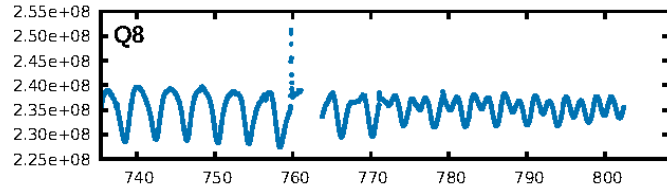
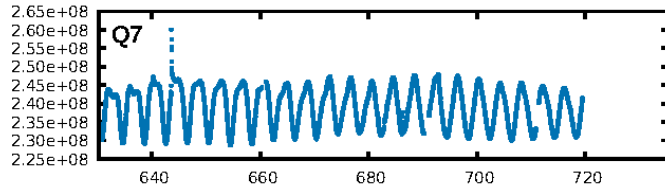
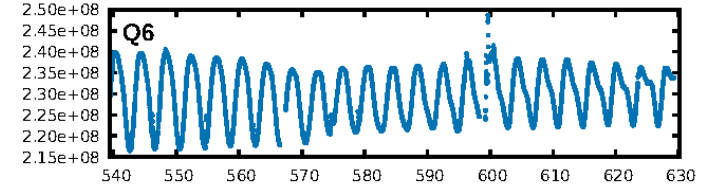
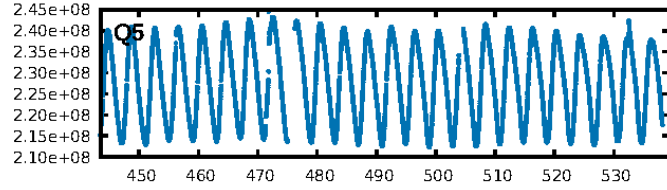
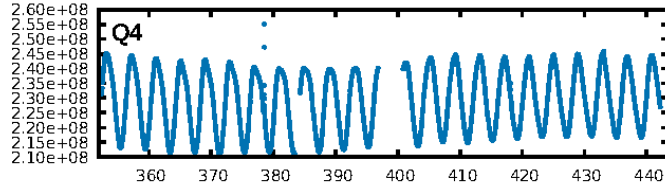
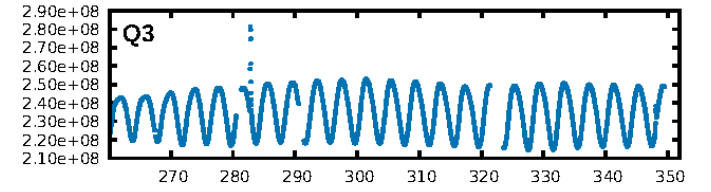
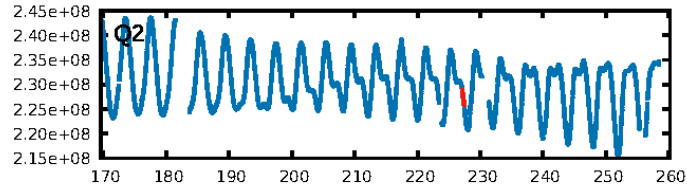
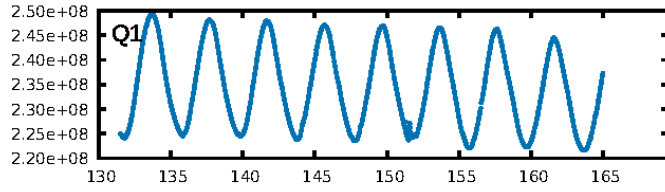
ShortPeriod-sig: 100.0% [542.14σ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: N/A  
RollingBand-fgt: 0.67 [2/3]  
GhostDiagnostic-chr: -2.31

Centroid-sig: 37.9%  
Centroid-so: 0.218 arcsec [0.93σ]  
OotOffset-rm: 0.225 arcsec [0.87σ]  
KicOffset-rm: 0.343 arcsec [1.03σ]  
OotOffset-st: 1/0/1/1 [3]  
KicOffset-st: 1/0/1/1 [3]  
DiffImageQuality-fgm: 0.33 [1/3]  
DiffImageOverlap-fno: 1.00 [3/3]

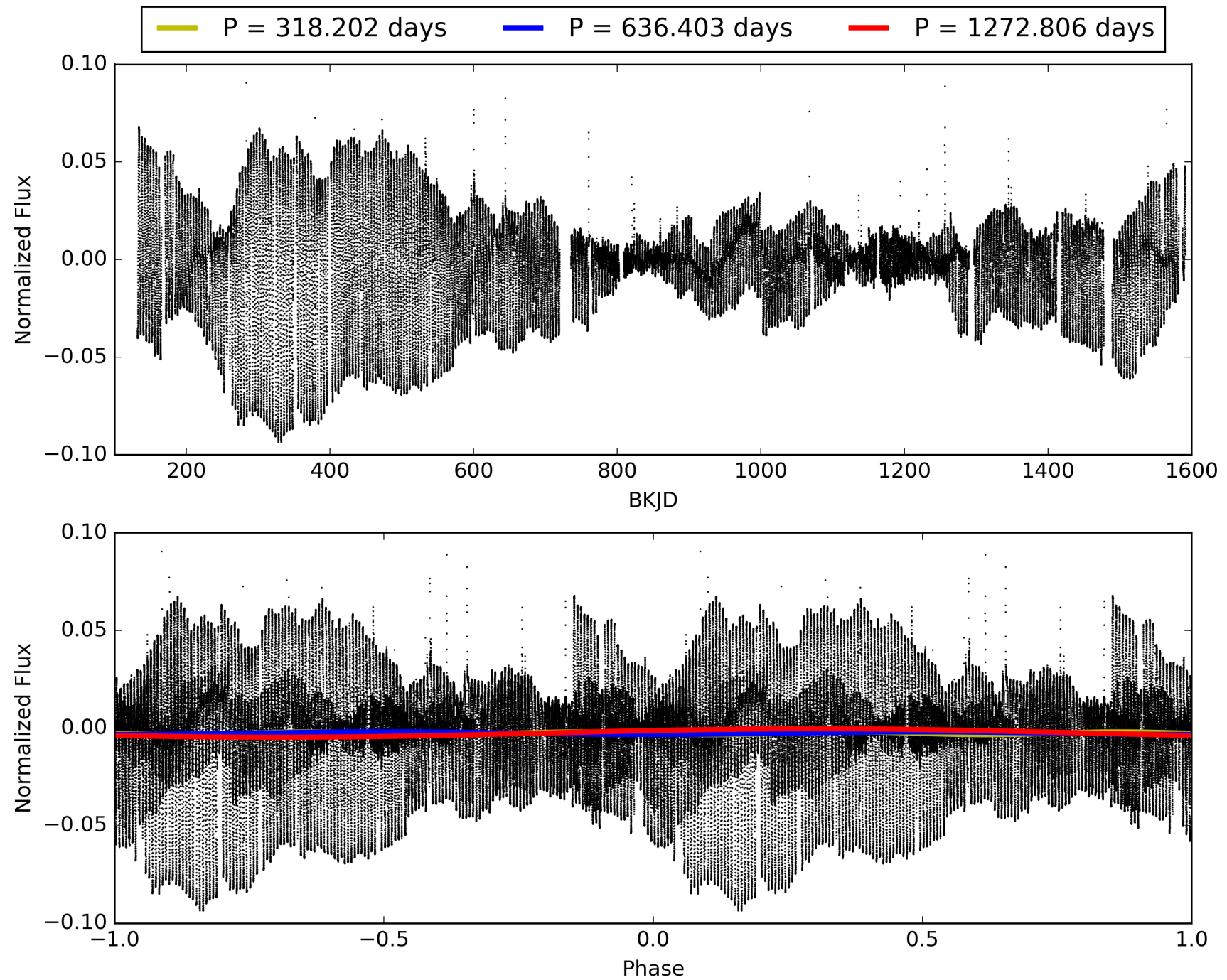
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 31-Jan-2016 22:02:48 Z

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

# TCE 009405969-04, PDC Light Curves



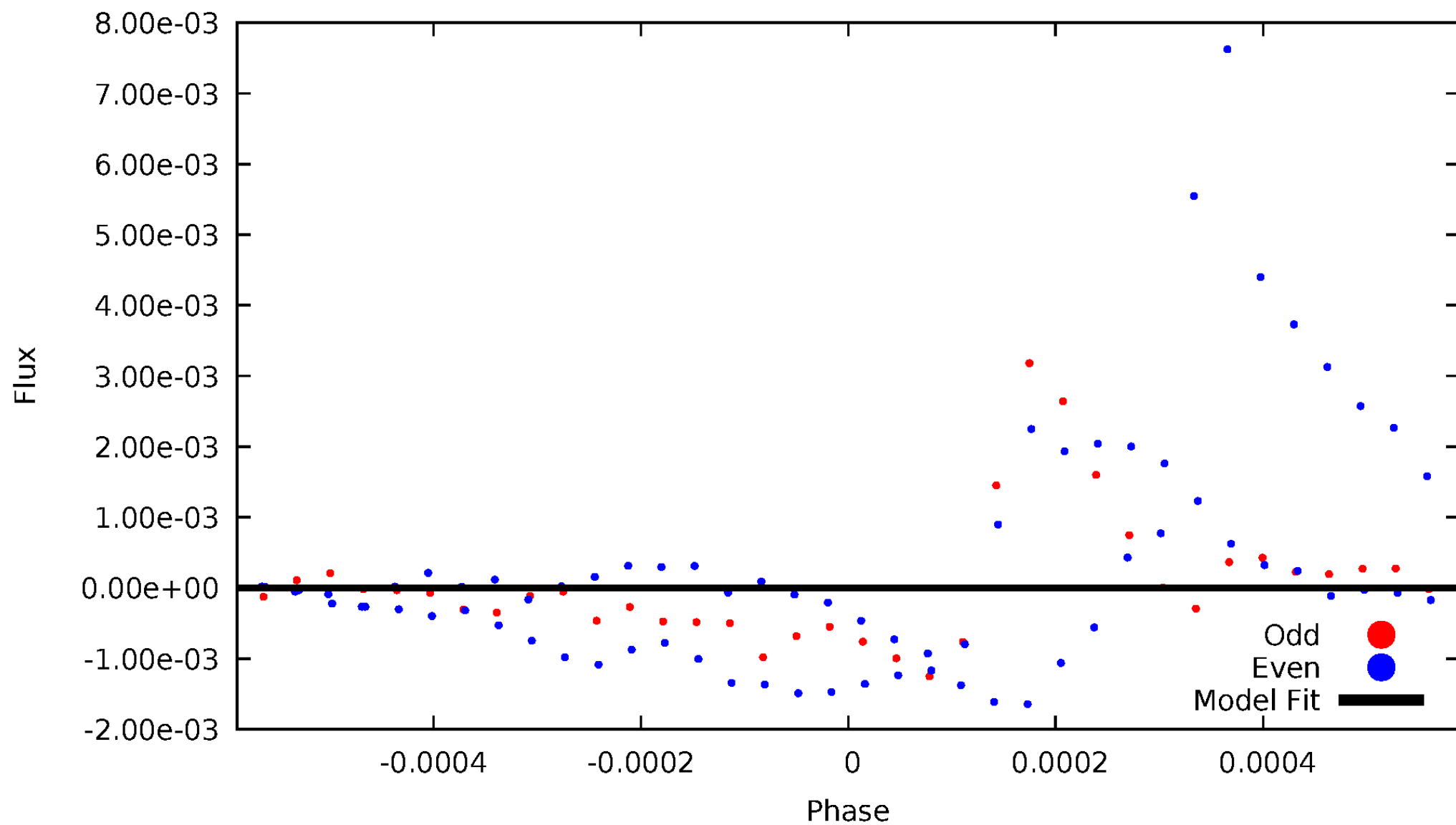
TCE 009405969-04





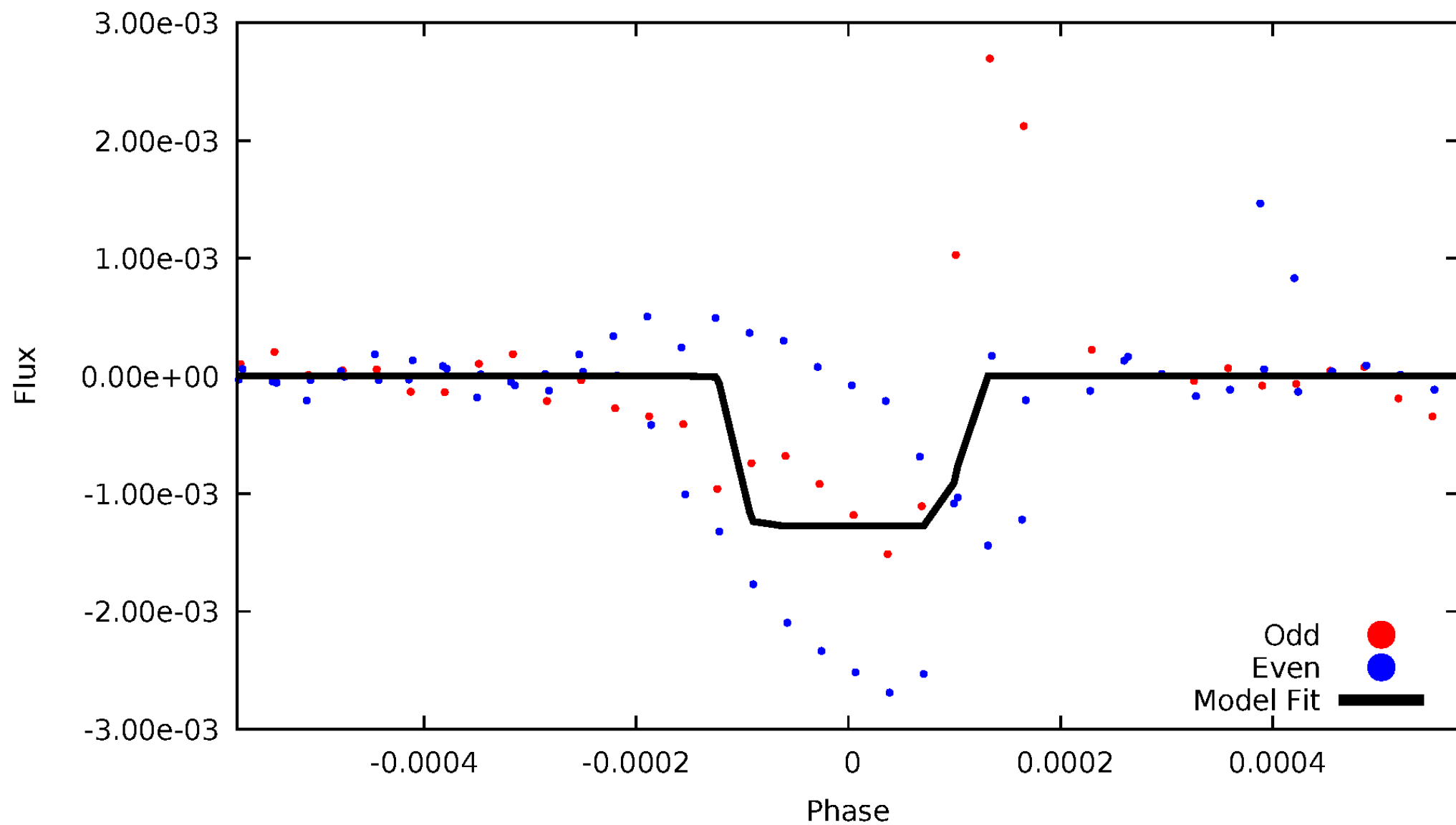
# DV Odd/Even

TCE 009405969-04



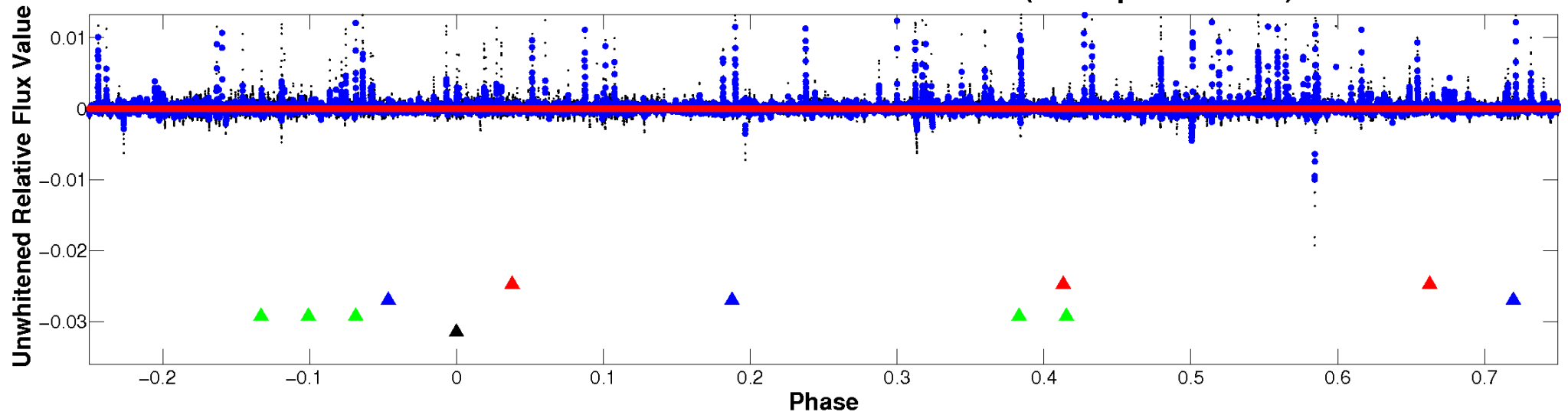
# ALT Odd/Even

TCE 009405969-04



# Non-Whitened Vs. Whitened Light Curve

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

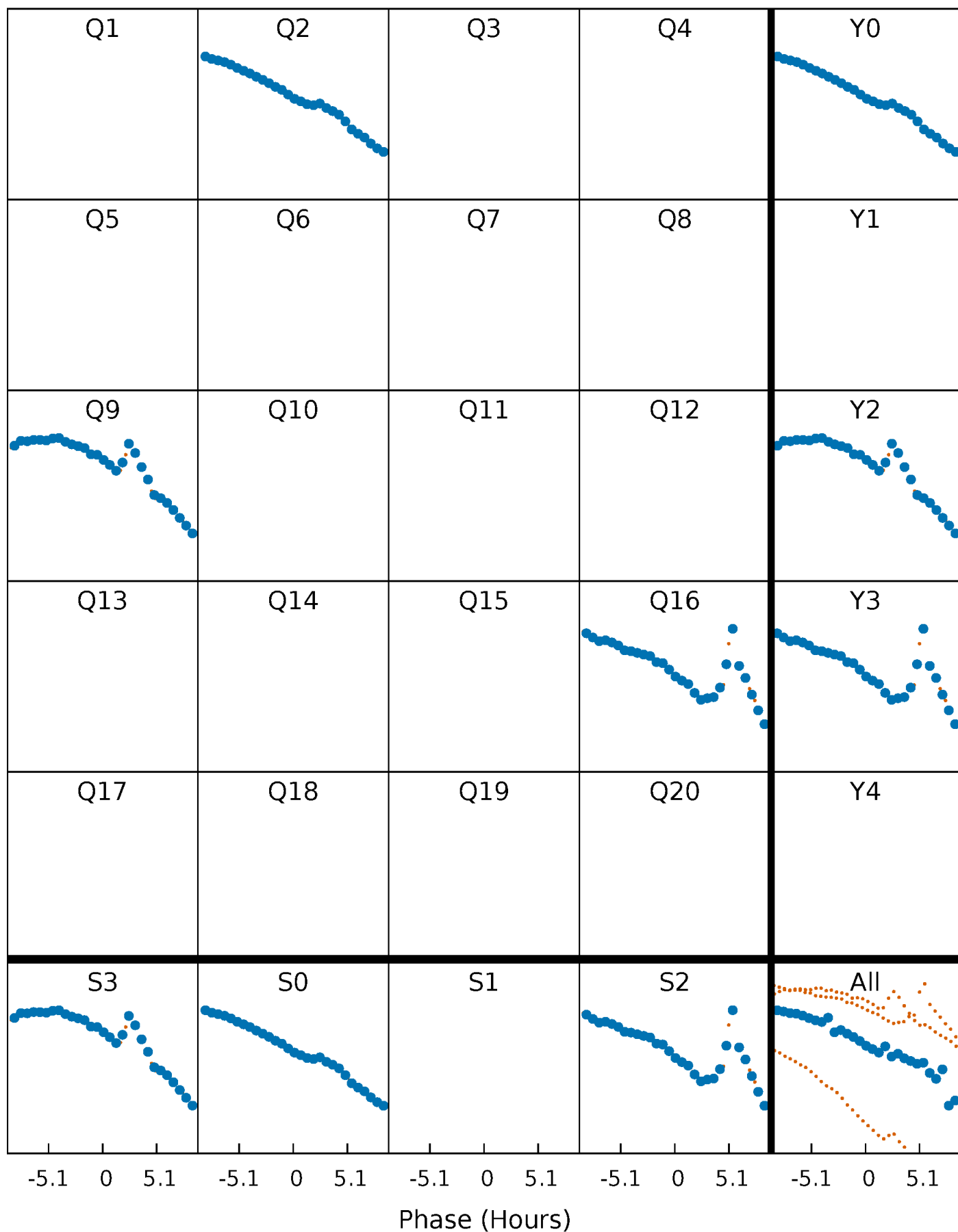


**Planet 4 : Phased Whitened Flux Time Series (TPS Epoch/Period)**



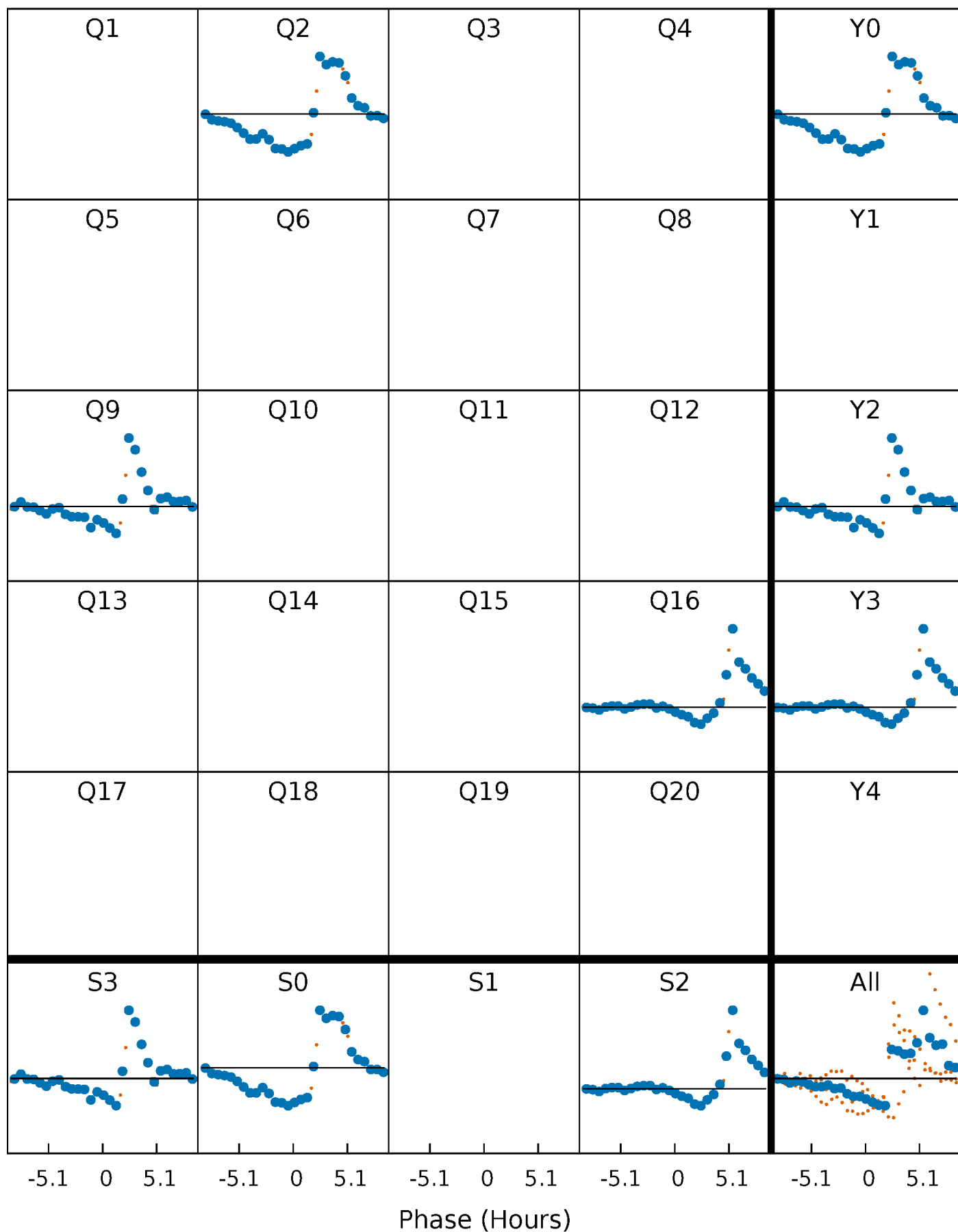
# PDC Quarter-Phased Transit Curves

TCE 009405969-04 P=636.403226 Days  $T_0=227.296712$  (BKJD)



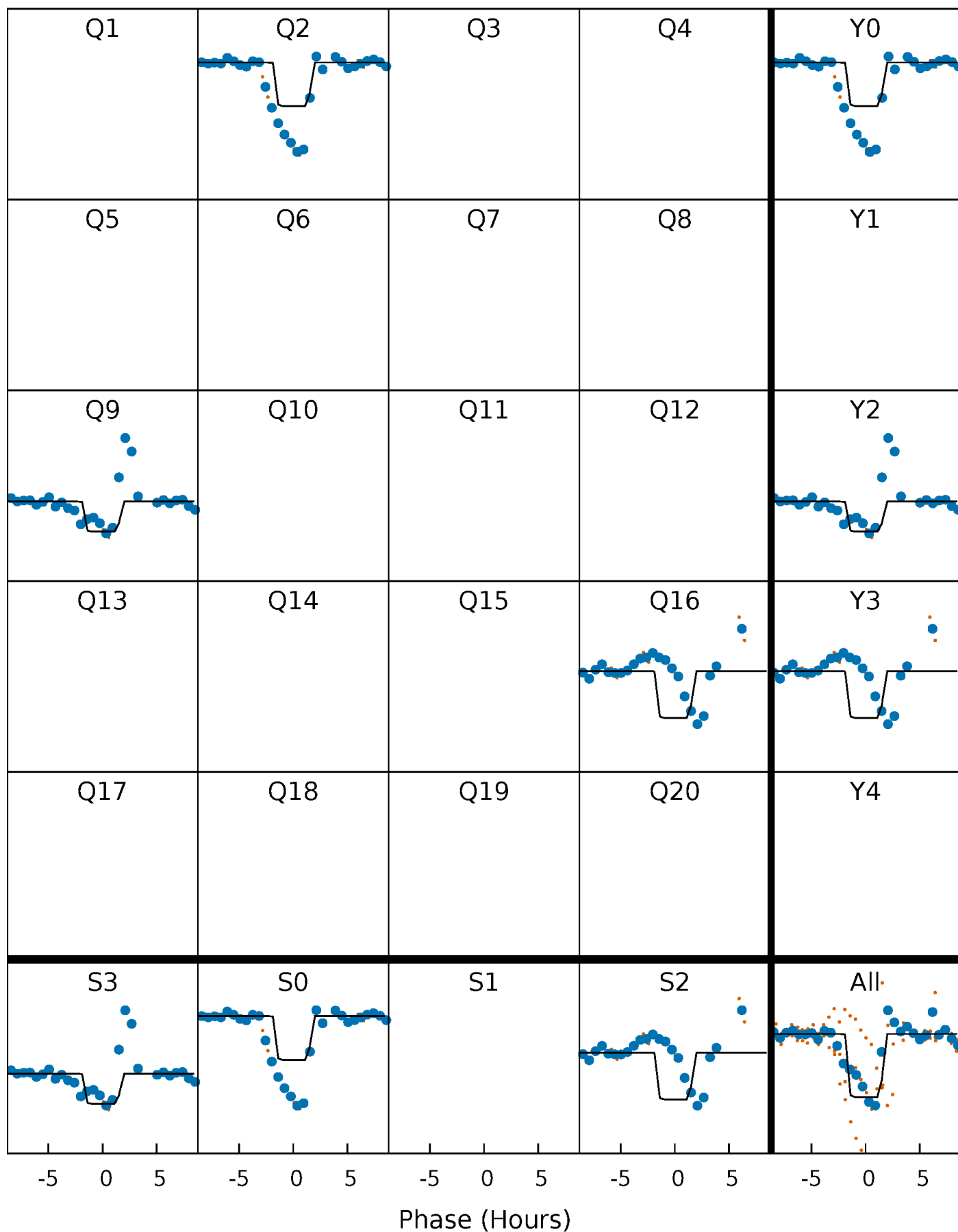
# DV Quarter-Phased Transit Curves

TCE 009405969-04     $P=636.403226$  Days     $T_0=227.296712$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

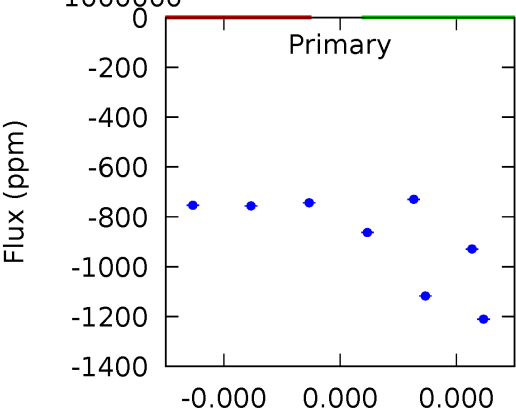
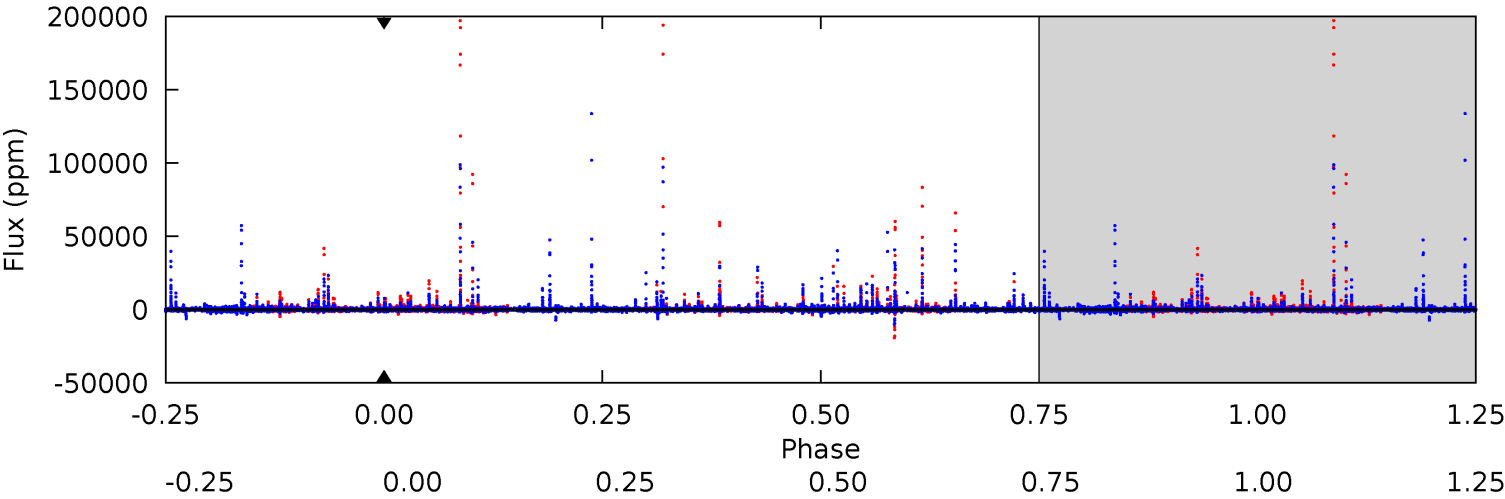
TCE 009405969-04 P=636.403226 Days  $T_0=227.323006$  (BKJD)



# DV Model-Shift Uniqueness Test

009405969-04, P = 636.403226 Days, E = 227.296712 Days

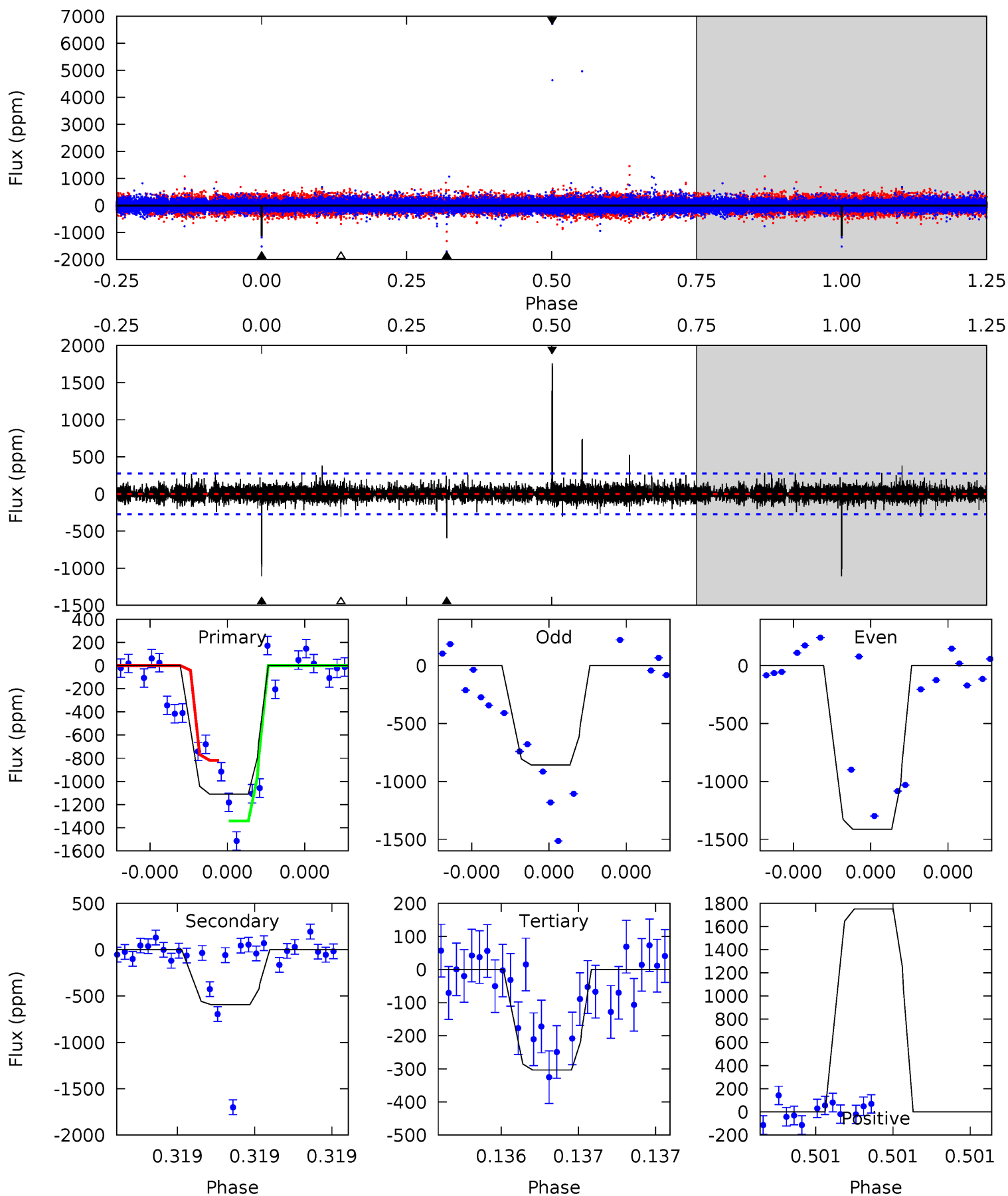
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
0	0	0	0	1.00	1.00	1.00	0	0	0	0	0	0	0	0



# Alt Model-Shift Uniqueness Test

009405969-04, P = 636.403226 Days, E = 227.323006 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
23.0	12.3	6.29	36.3	5.69	3.66	1.10	16.7	-13.3	6.00	-24.0	5.21	1.29	0.61	0





### Stellar Parameters For KIC 009405969

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R$ ( $R_{\odot}$ )	$M(M_{\odot})$	$p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ )
	$5138^{+128}_{-128}$	$3.601^{+1.020}_{-0.340}$	$-0.580^{+0.300}_{-0.250}$	$2.378^{+1.407}_{-1.720}$	$0.823^{+0.270}_{-0.166}$	$0.086^{+3.253}_{-0.060}$
	+2%/-2%	+28%/-9%	+52%/-43%	+59%/-72%	+33%/-20%	+3774%/-70%
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 009405969-04 / KOI

Detrend	Depth (ppm)	$R_p$ ( $R_{\oplus}$ )	$T_{max}$ (K)	$T_{obs}$ (K)	$A_{obs}$
DV	$0 \pm 1000000$	$16.91^{+24.29}_{-12.14}$	$411^{+68}_{-81}$	$4217^{+13047}_{-18556}$	$4086^{+844236}_{-597221}$
Alt.	$-593 \pm 48$	$18.40^{+22.82}_{-13.21}$	$411^{+67}_{-85}$	$3342^{+1819}_{-609}$	$1867^{+20708}_{-1481}$

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

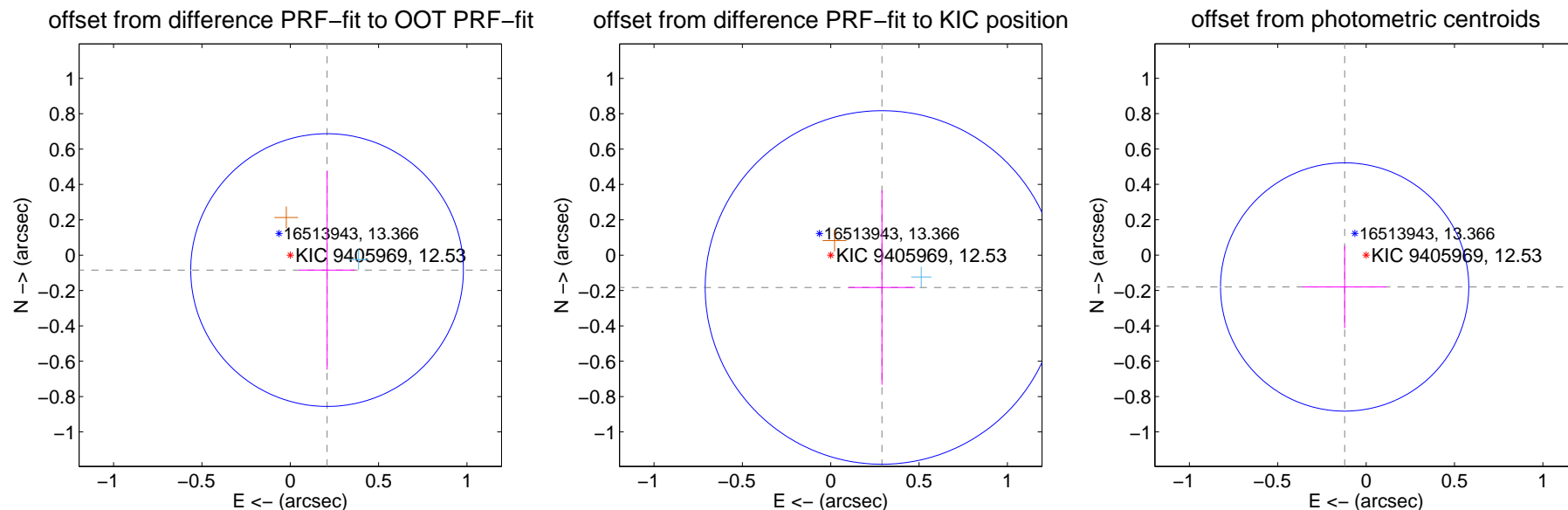
## DV Centroid Data

Supplemental centroid analysis for 009405969-04. Kepler magnitude: 12.53. Transit SNR -1.00

There are 1 quarters with good PRF difference image offsets

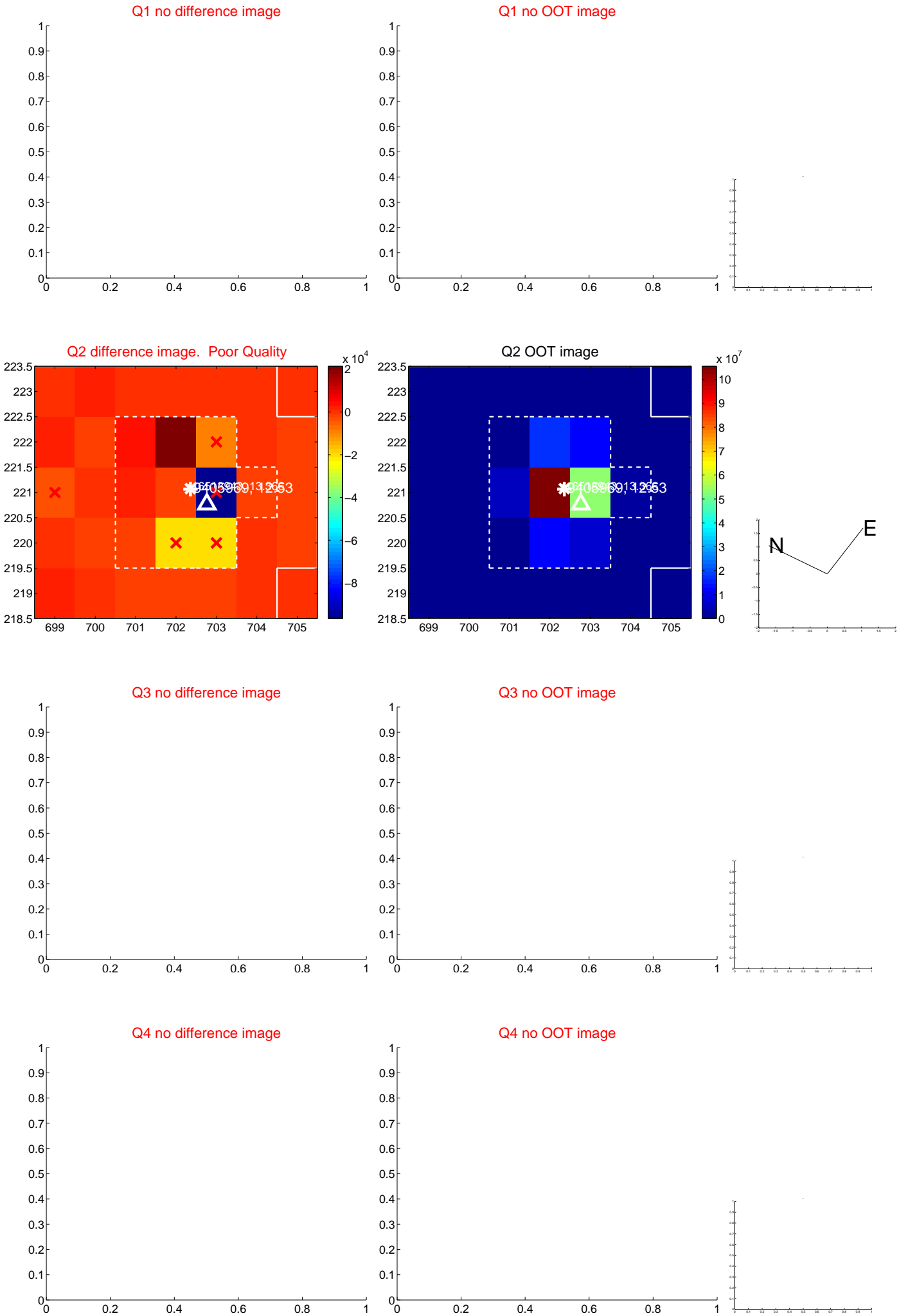
The direct PRF centroid is offset from the target star catalog position by about 0.16 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.225 \pm 0.257$	0.87	$-0.208 \pm 0.158$	$-0.084 \pm 0.563$
PRF-fit source offset from KIC position	$0.343 \pm 0.333$	1.03	$-0.290 \pm 0.187$	$-0.183 \pm 0.550$
photometric centroid source offset	$0.22 \pm 0.23$	0.93	$0.12 \pm 0.24$	$-0.18 \pm 0.23$



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.

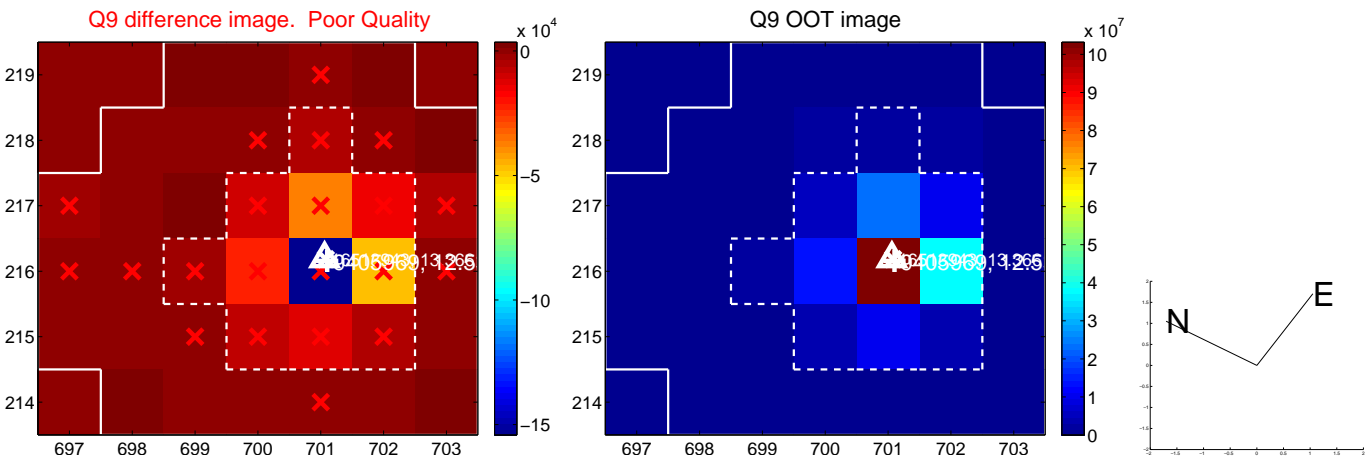
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



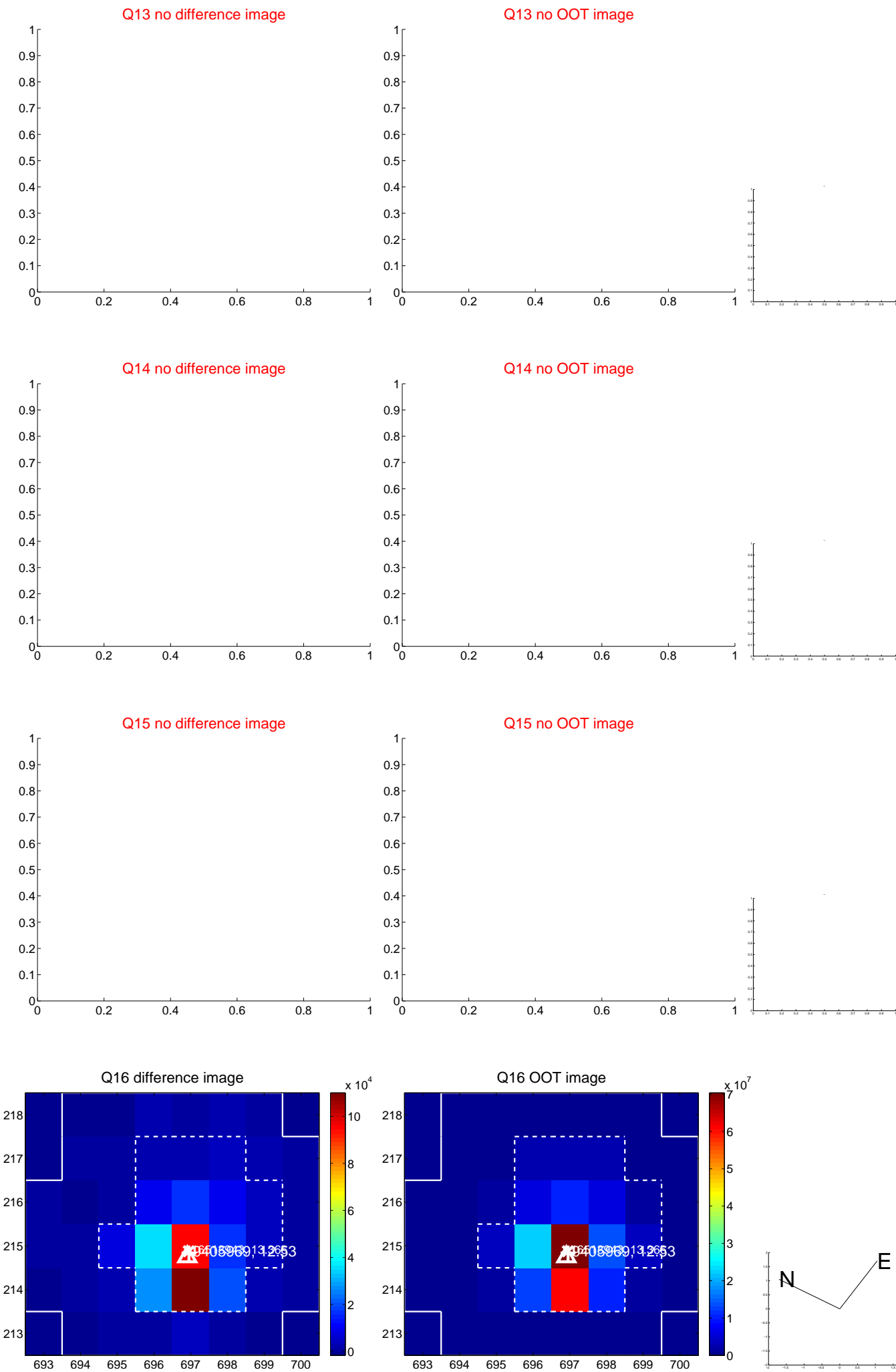
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



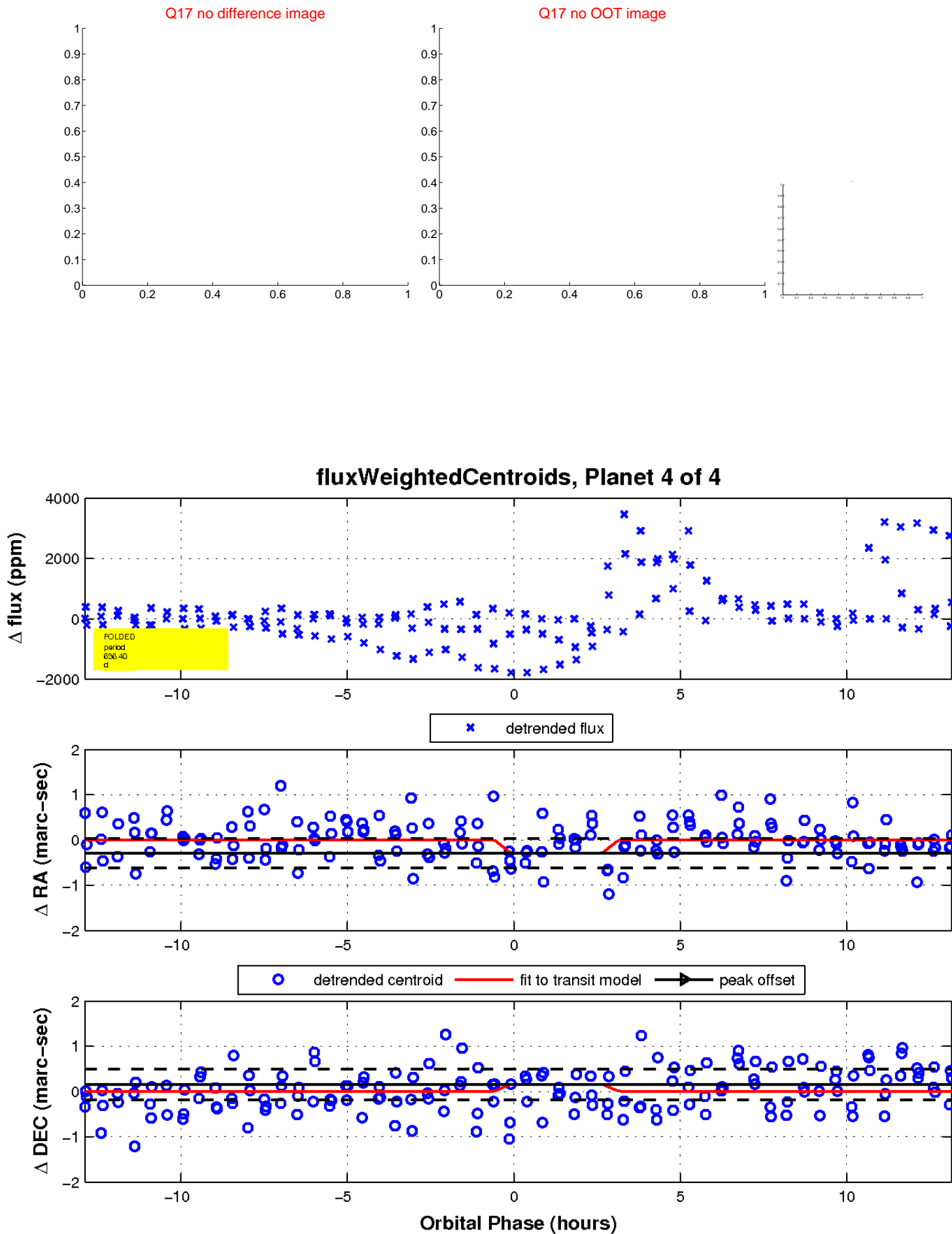
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

