

# KIC 005022440

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
005022440-01	OBS	6491.01	3.693951	133.610608	28080.7	2.260	1277.7	1219.6	0.88	5968	21.08	411.98
005022440-02	OBS	No	3.693952	131.763358	8519.8	2.211	373.0	366.1	0.88	5968	13.46	411.98

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
005022440-01	OBS	FP	0.00	0	1	0	0	MOD_SEC_DV—MOD_SEC_ALT—DEEP_V_SHAPED—HAS_SEC_TCE
005022440-02	OBS	FP	0.00	1	1	0	0	IS_SEC_TCE

**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.

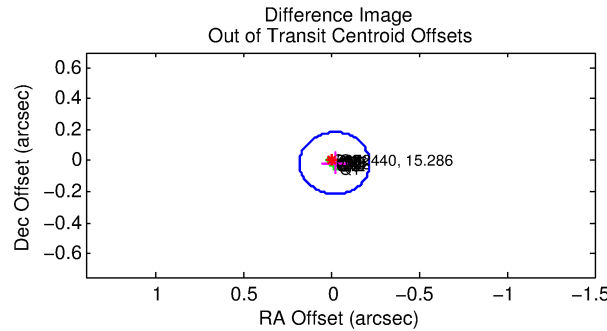
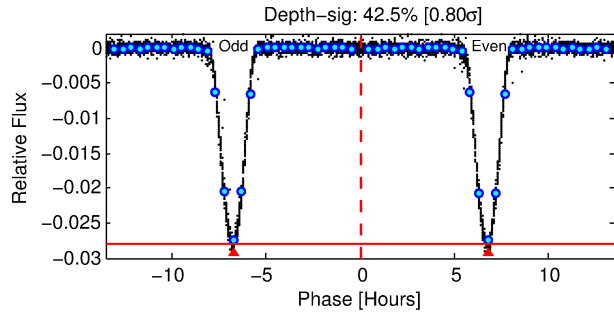
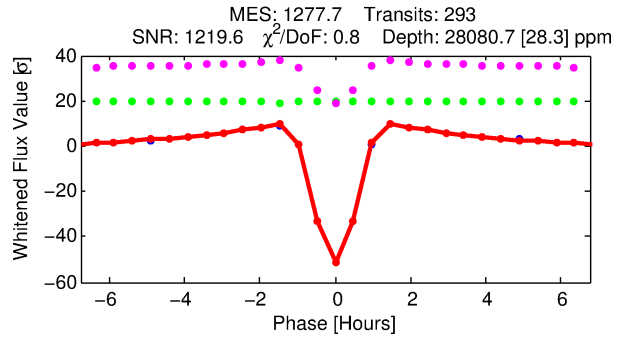
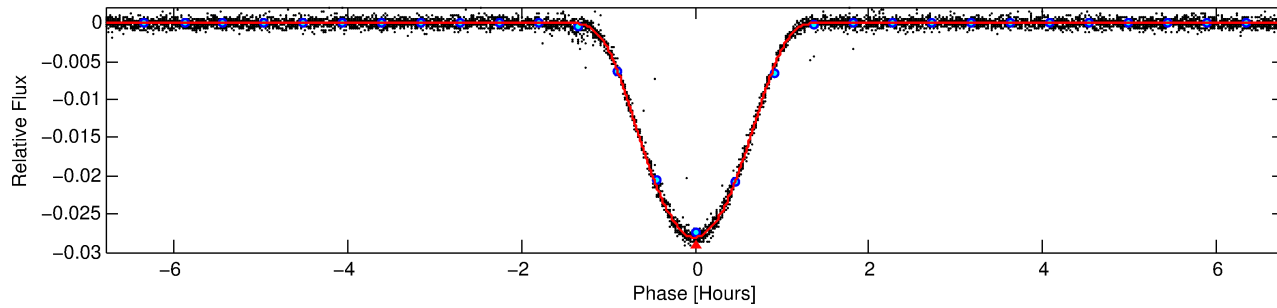
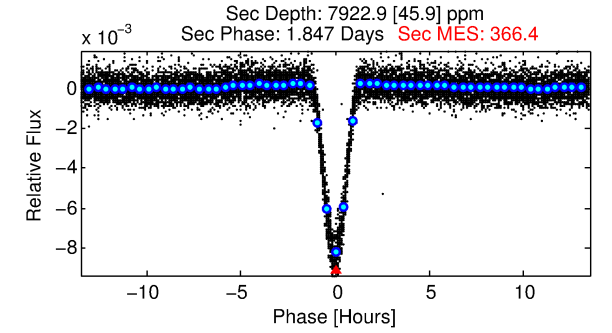
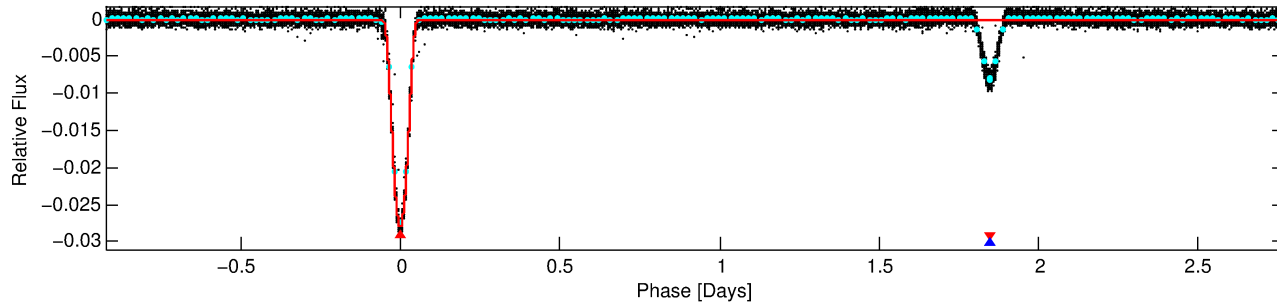
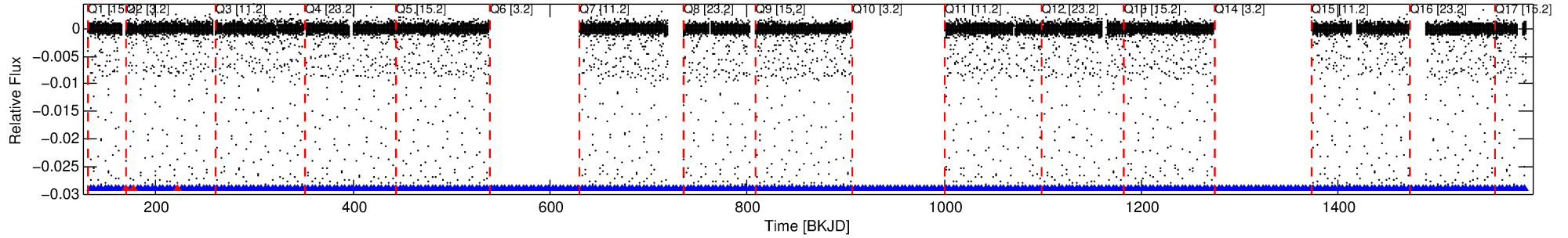
## Ephemeris Match Information For 005022440-01

No Significant Match Found

# DV One-Page Summary

KIC: 5022440 Candidate: 1 of 2 Period: 3.694 d  
KOI: K06491.01 Corr: 0.998

Kp: 15.29 R\*: 0.88 Rs Teff: 5968.0 K Logg: 4.53 Fe/H: -0.260



## DV Fit Results:

Period = 3.69395 [0.00000] d  
Epoch = 133.6106 [0.0000] BKJD  
Rp/R\* = 0.2193 [0.0054]  
a/R\* = 9.99 [0.04]  
b = 0.92 [0.01]  
Seff = 411.98 [148.16]  
Teq = 1149 [103] K  
Rp = 21.08 [5.46] Re  
a = 0.0463 [0.0104] AU  
Ag = 21.00 [7.10] [2.82σ]  
Teff = 3802 [134] K [15.67σ]

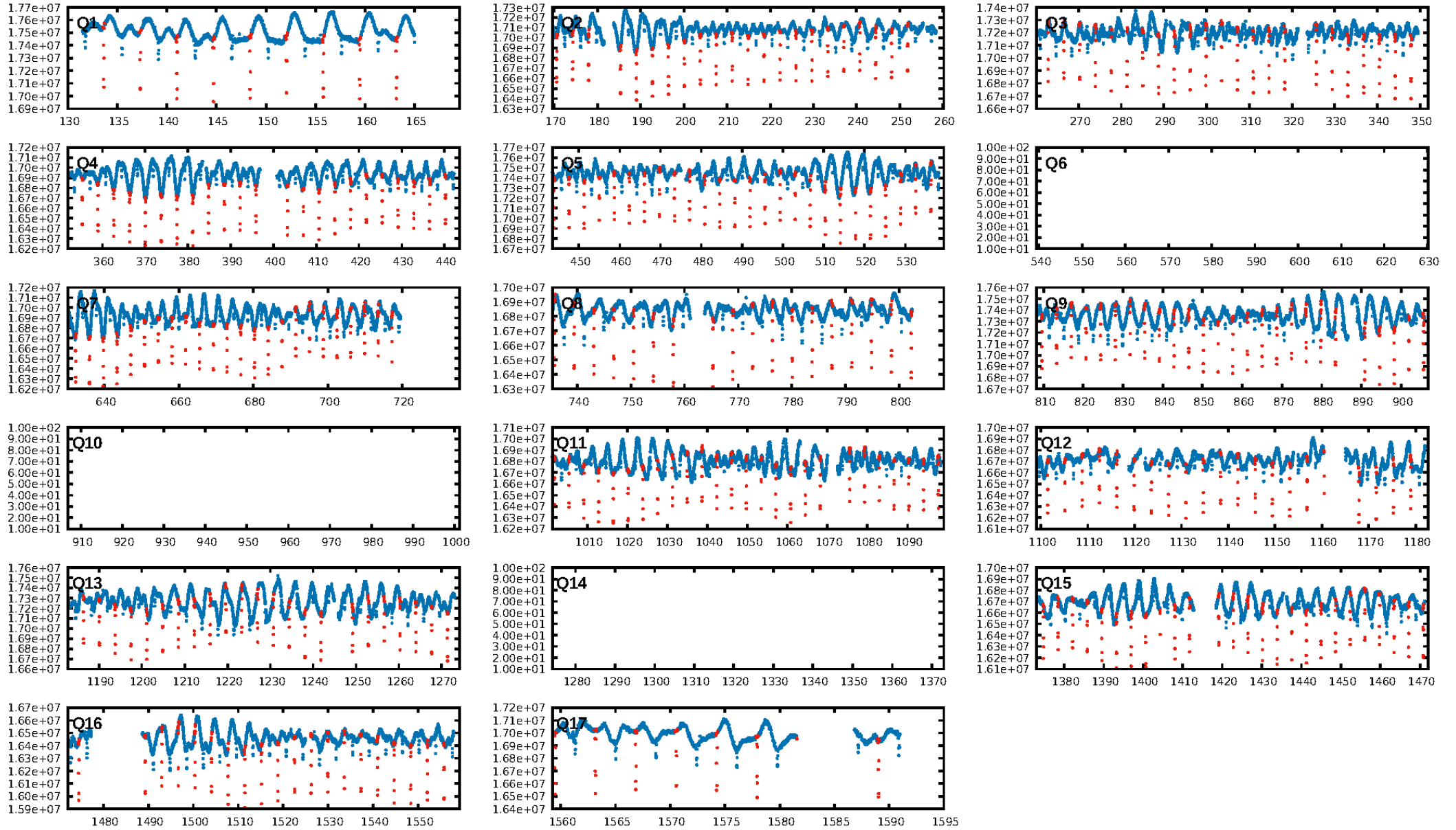
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 0.0% [0.00σ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: 0.00e+00  
RollingBand-fgt: 0.99 [274/277]  
GhostDiagnostic-chr: 3.574  
Centroid-sig: 0.0%  
Centroid-so: 0.098 arcsec [9.88σ]  
OotOffset-rm: 0.024 arcsec [0.36σ]  
KicOffset-rm: 0.156 arcsec [2.29σ]  
OotOffset-st: 1/4/4/5 [14]  
KicOffset-st: 1/4/4/5 [14]  
DiffImageQuality-fgm: 1.00 [14/14]  
DiffImageOverlap-fno: 1.00 [14/14]

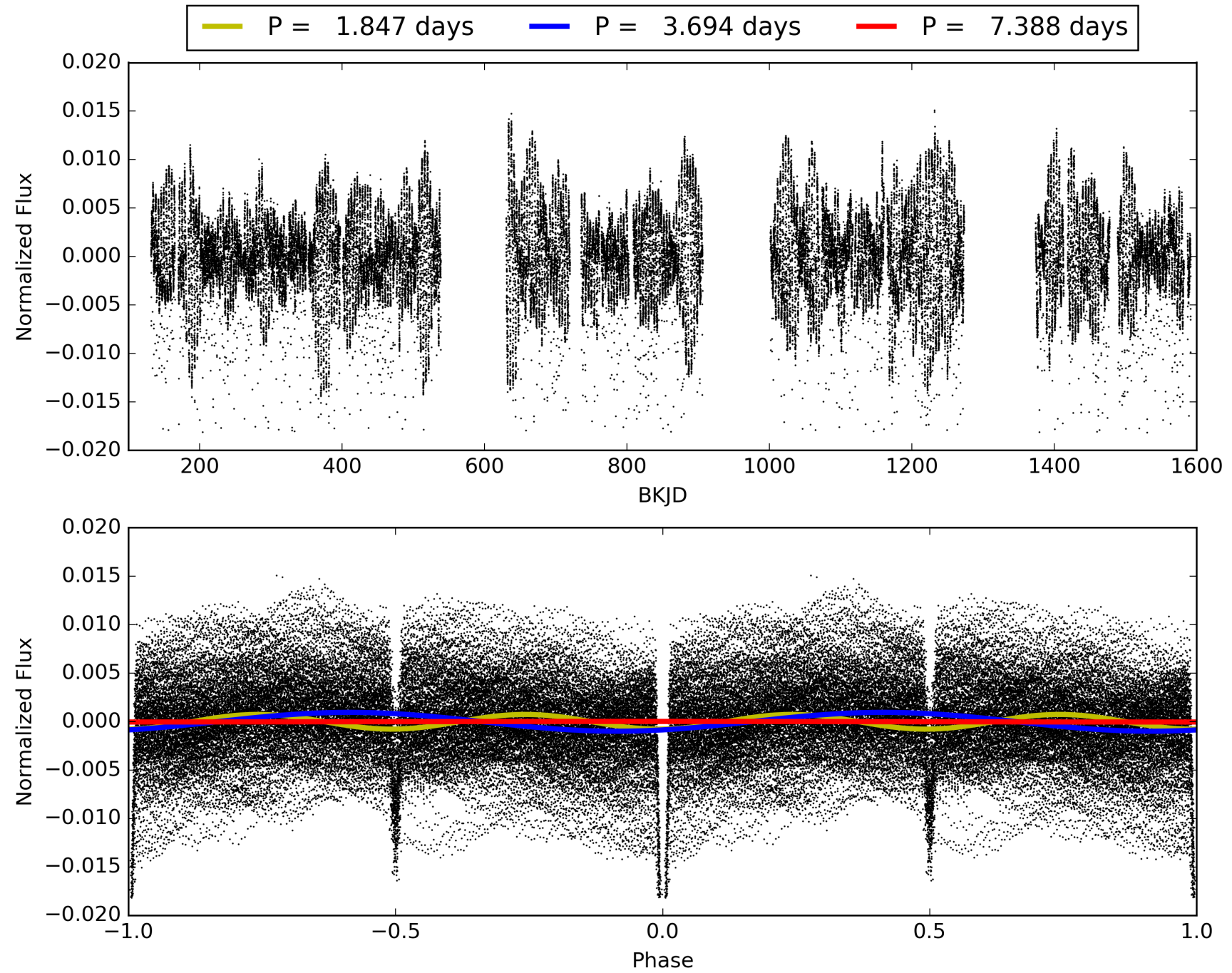
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 31-Jan-2016 02:57:16 Z

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

# TCE 005022440-01, PDC Light Curves

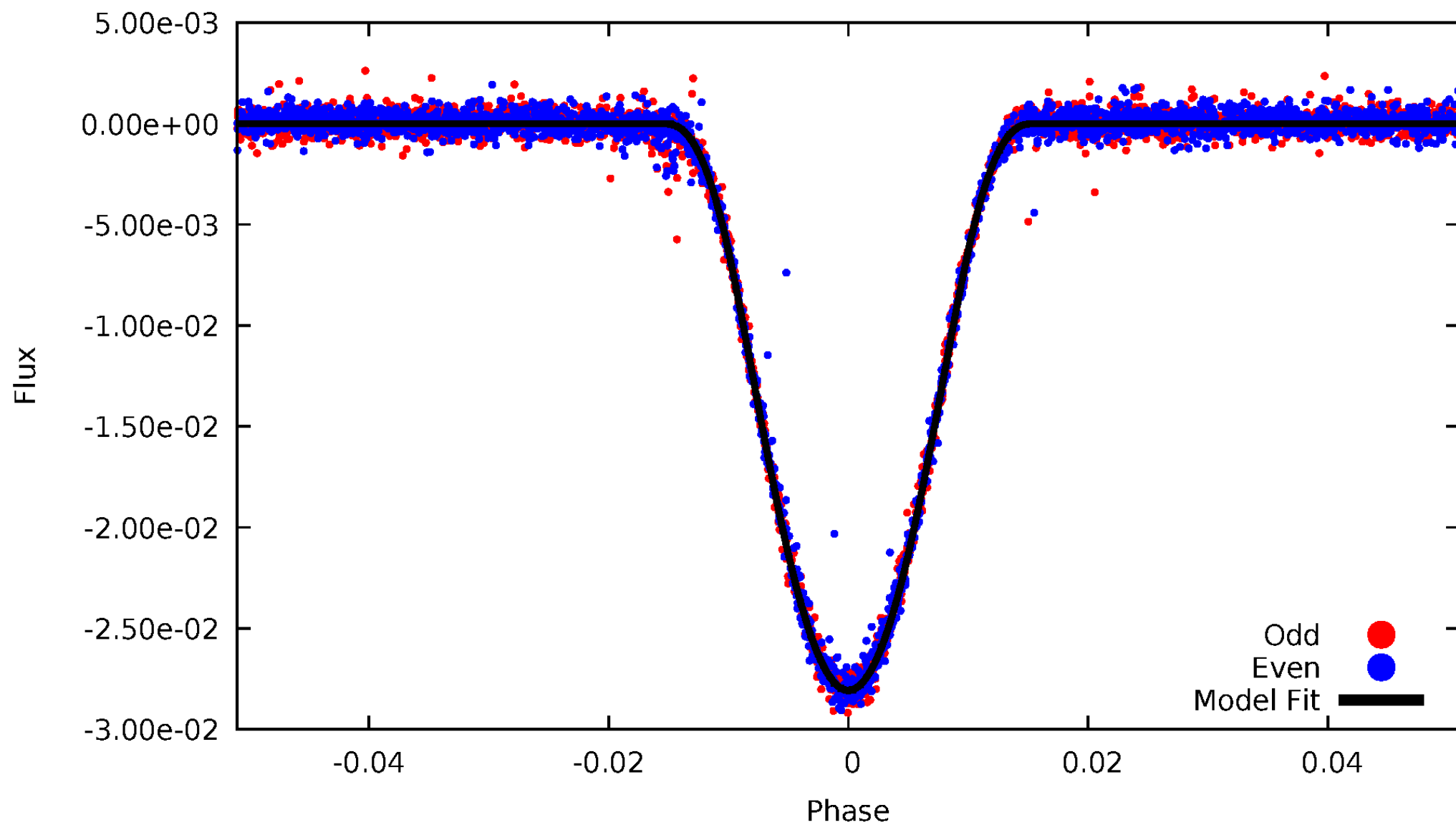


TCE 005022440-01



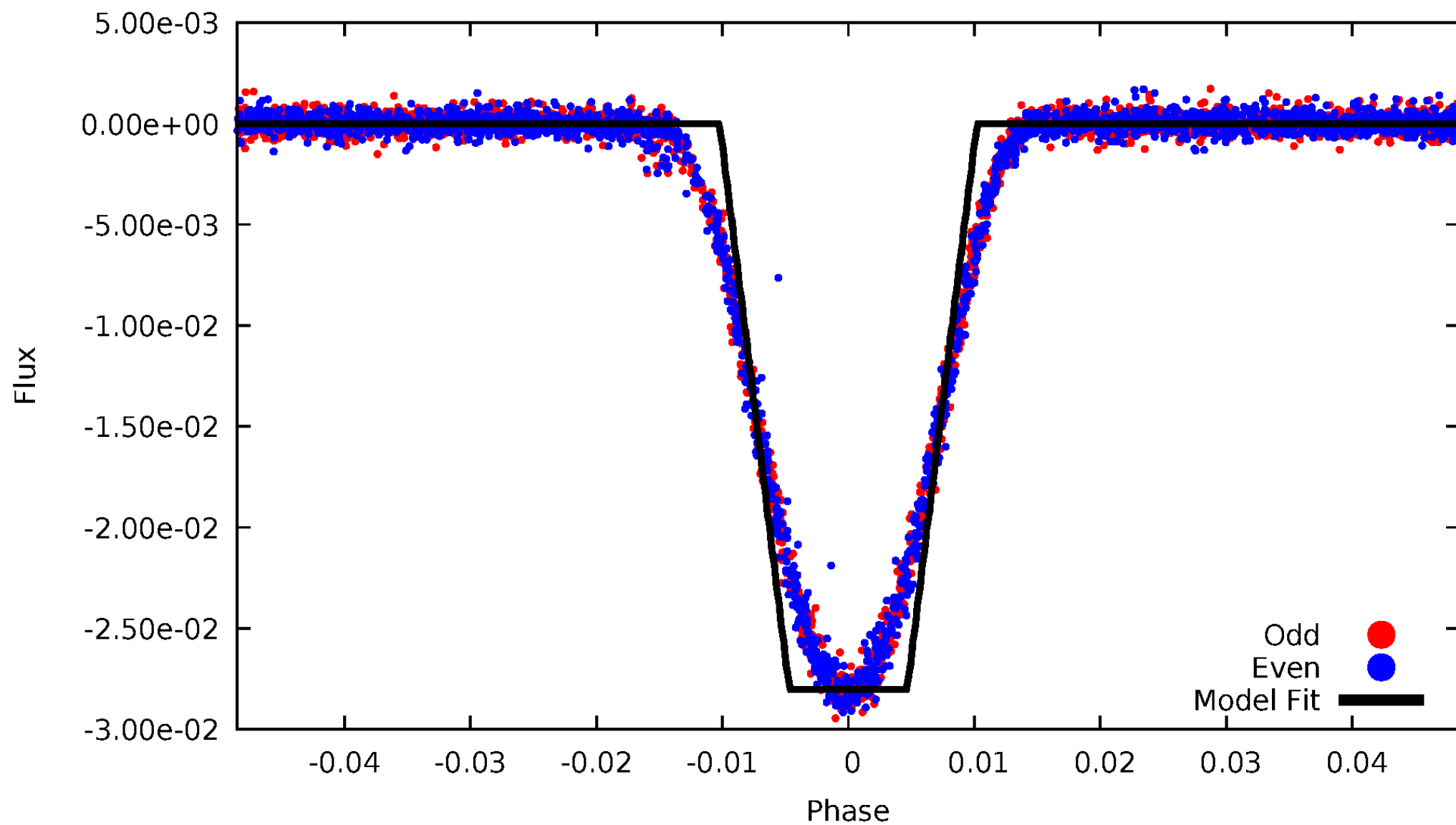
# DV Odd/Even

TCE 005022440-01



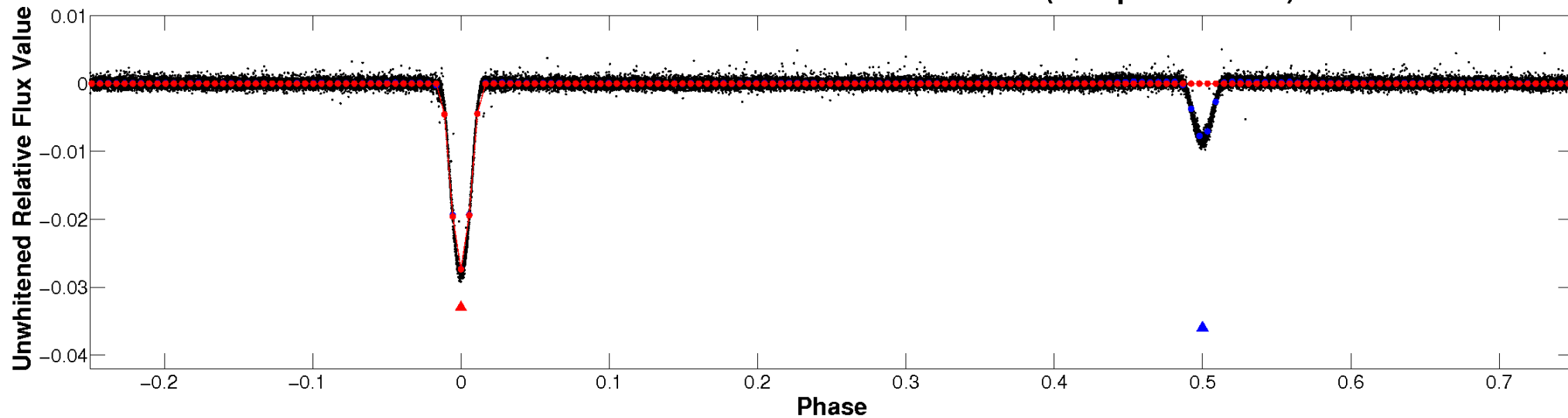
# ALT Odd/Even

TCE 005022440-01

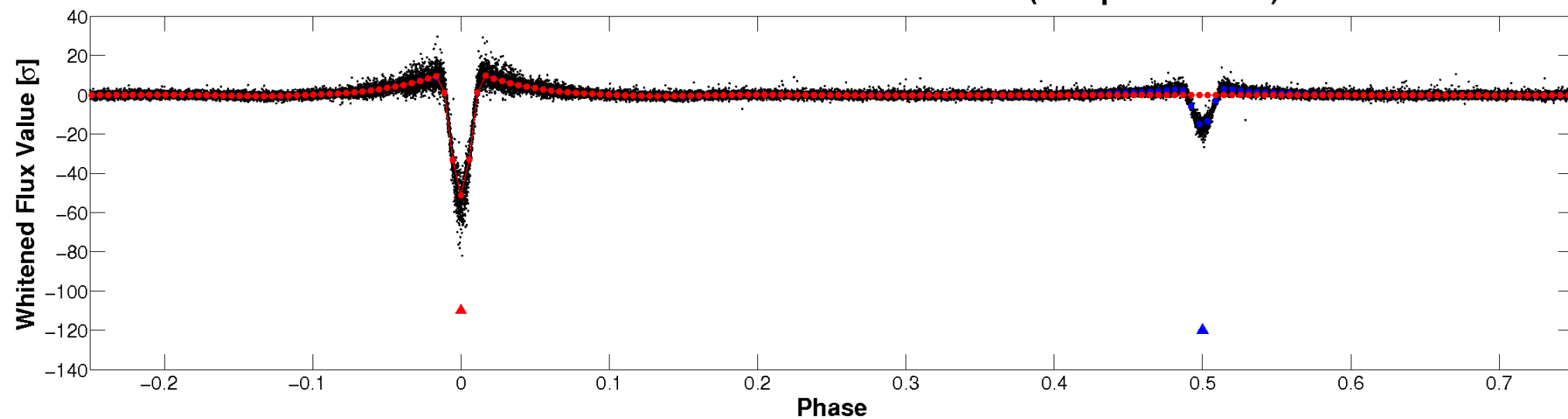


# Non-Whitened Vs. Whitened Light Curve

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



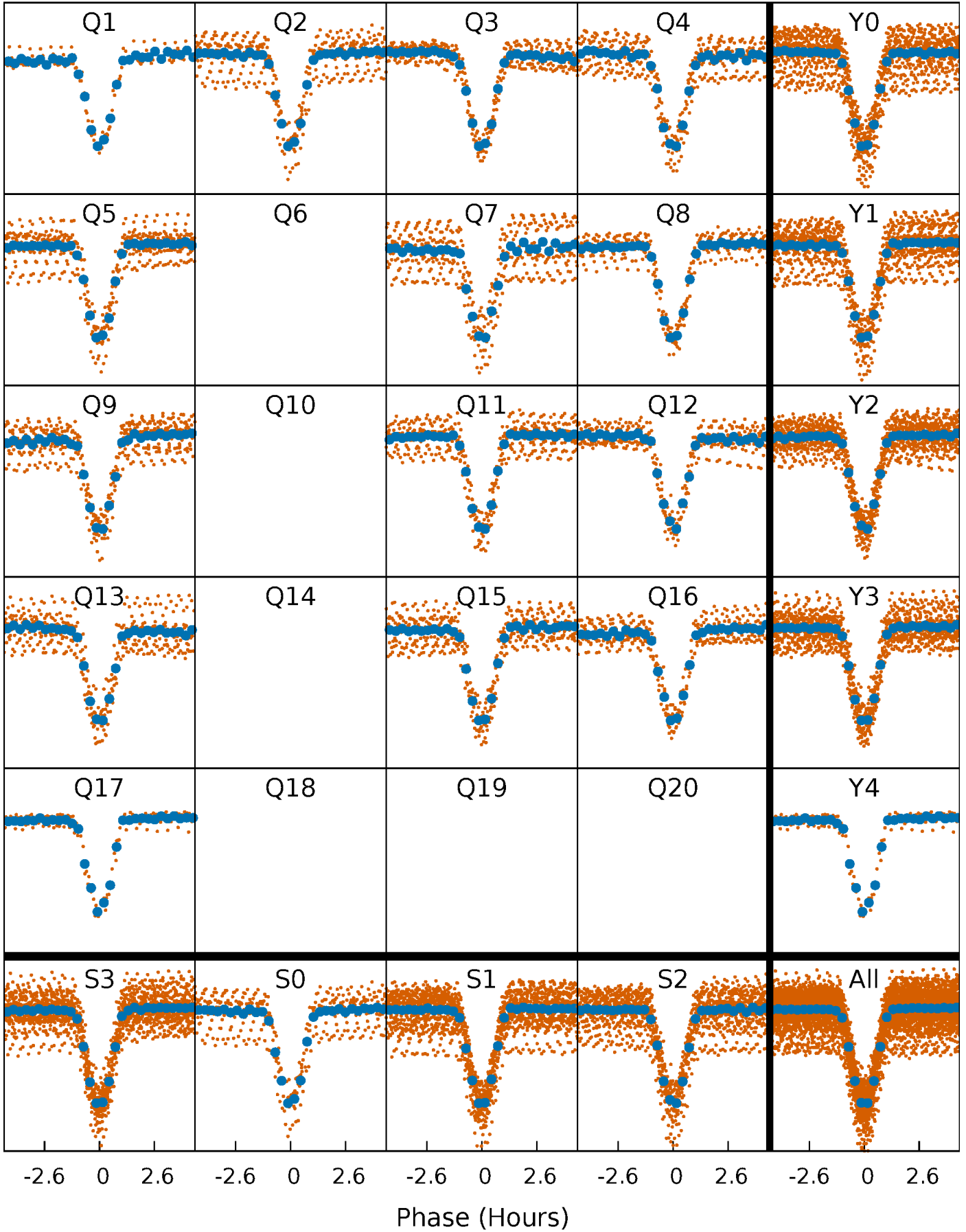
## Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)





# PDC Quarter-Phased Transit Curves

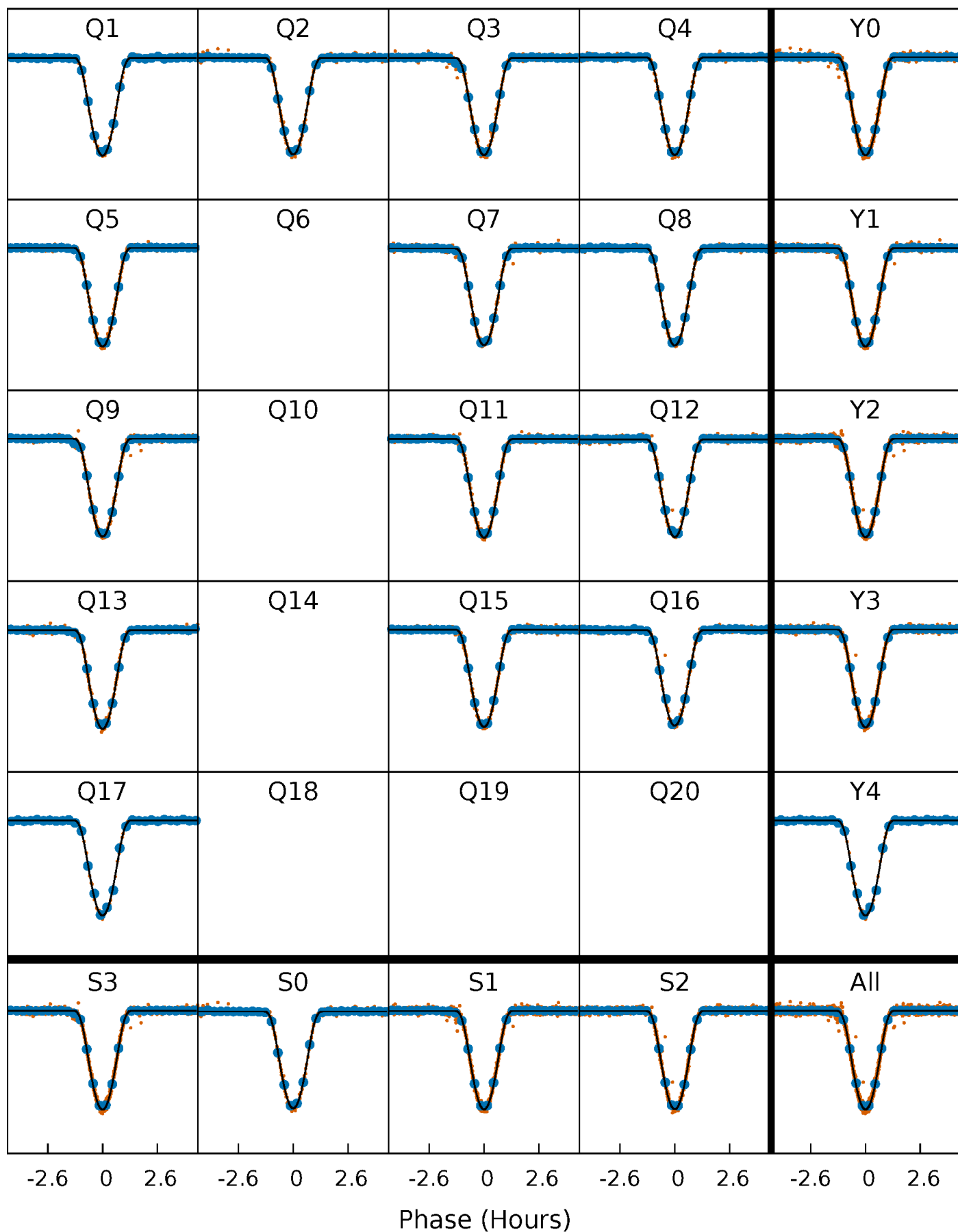
TCE 005022440-01 P= 3.693951 Days  $T_0=133.610608$  (BKJD)





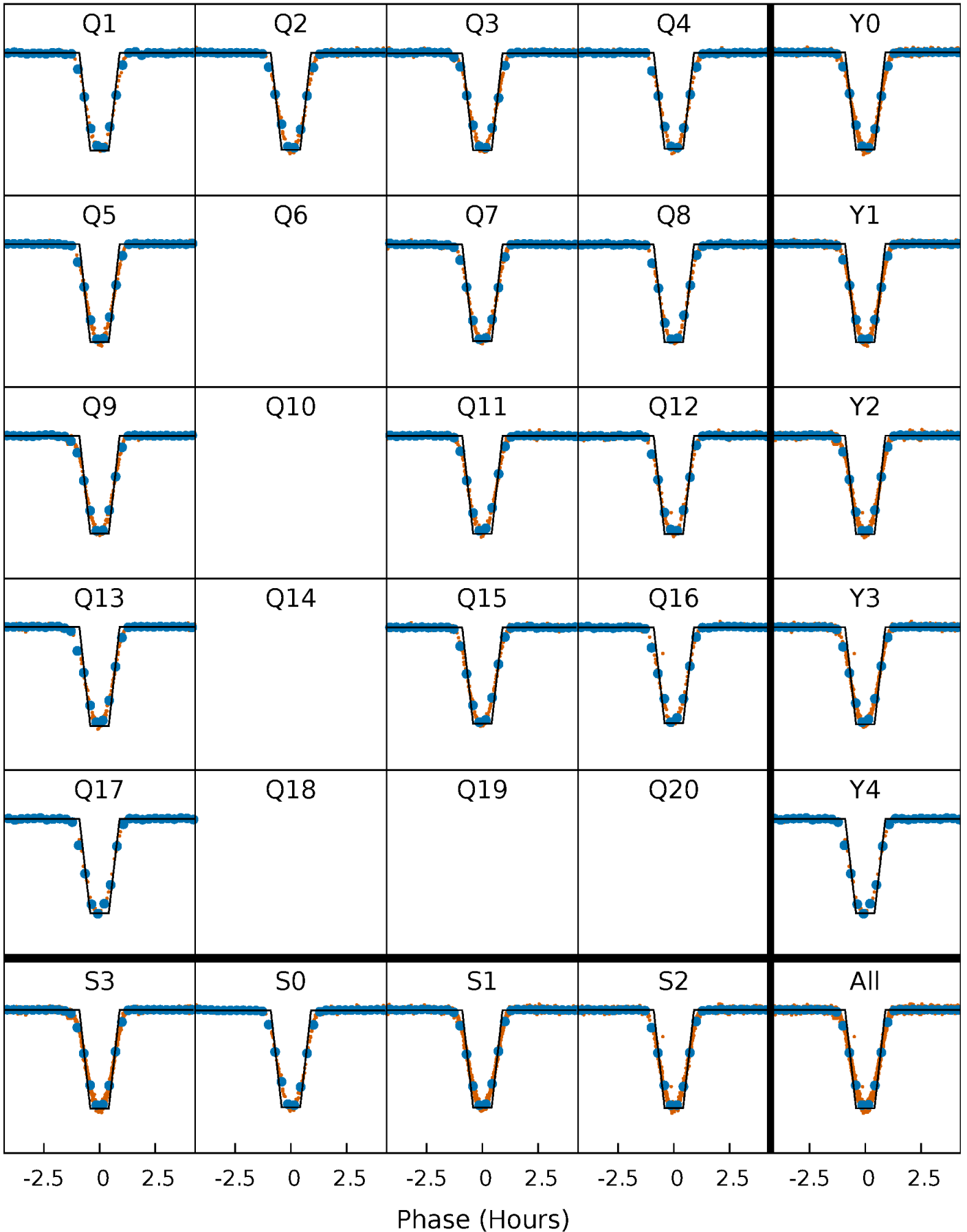
# DV Quarter-Phased Transit Curves

TCE 005022440-01 P= 3.693951 Days  $T_0=133.610608$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

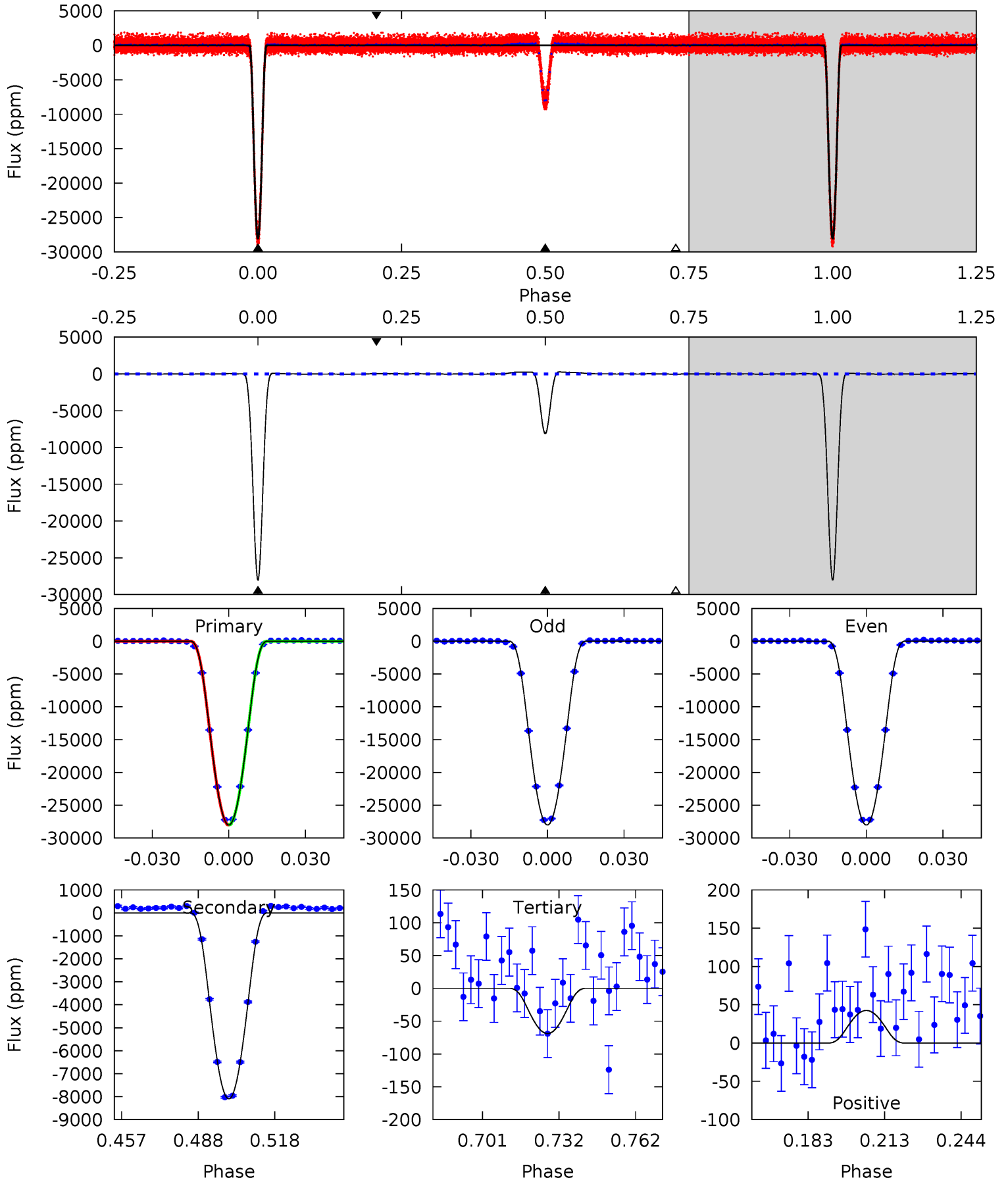
TCE 005022440-01 P= 3.693959 Days  $T_0=133.609163$  (BKJD)



# DV Model-Shift Uniqueness Test

005022440-01, P = 3.693951 Days, E = 129.916657 Days

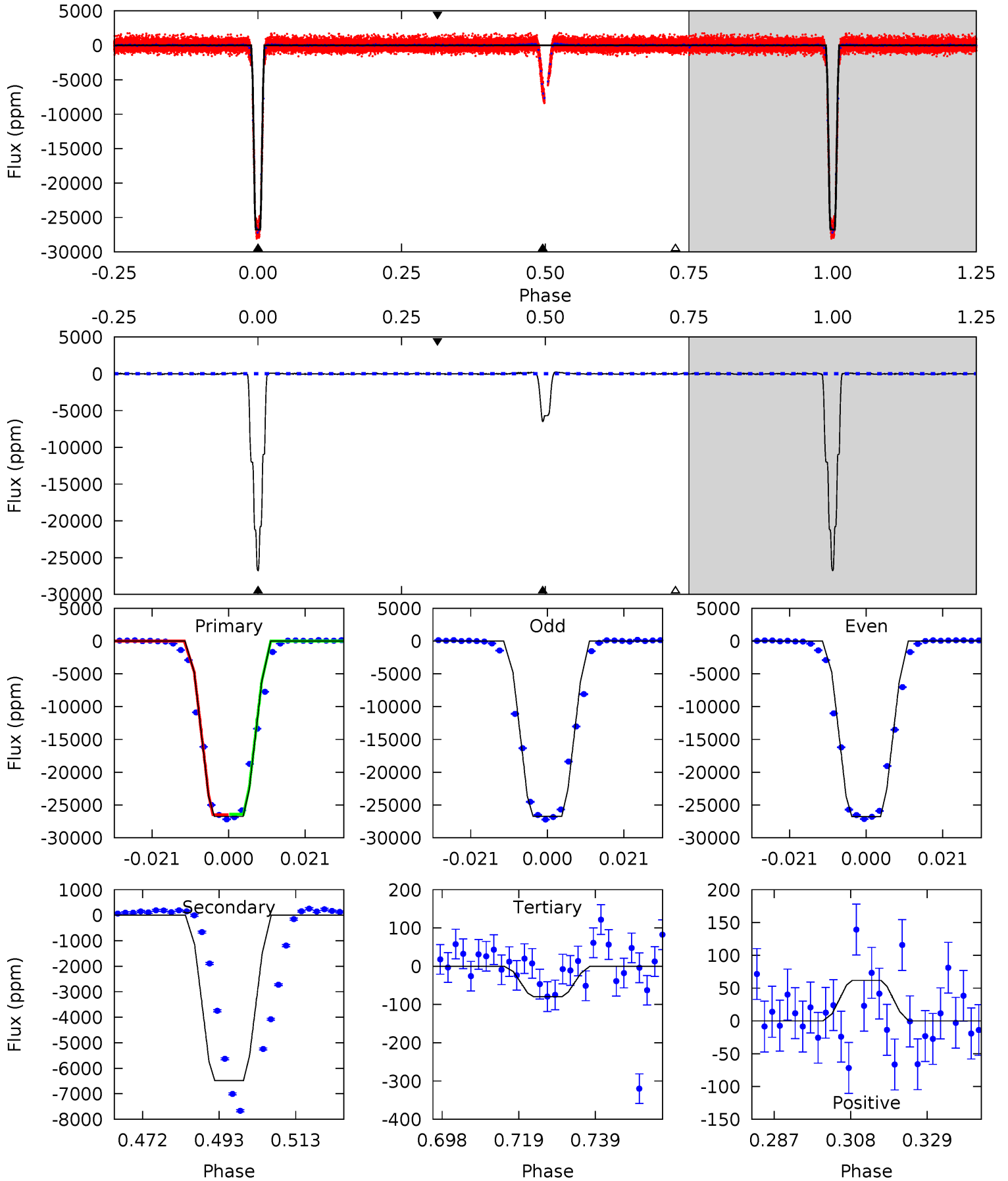
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
2454	709.3	6.03	3.73	4.81	2.16	5.39	2448	2450	703.3	705.6	0.57	1.00	0.01	1.34



# Alt Model-Shift Uniqueness Test

005022440-01, P = 3.693959 Days, E = 129.915204 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
1386	335.6	4.11	3.19	4.89	2.32	2.13	1382	1383	331.5	332.4	1.13	1.00	0.01	1.77



### Stellar Parameters For KIC 005022440

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$5968^{+161}_{-197}$	$4.534^{+0.044}_{-0.187}$	$-0.260^{+0.300}_{-0.300}$	$0.881^{+0.227}_{-0.081}$	$0.970^{+0.108}_{-0.119}$	$1.995^{+0.475}_{-0.946}$
	+3%/-3%	+1%/-4%	+115%/-115%	+26%/-9%	+11%/-12%	+24%/-47%
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 005022440-01 / KOI 6491.01

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$-8098 \pm 11$	$21.53^{+3.35}_{-1.50}$	$1640^{+94}_{-70}$	$4108^{+93}_{-102}$	$20^{+3}_{-4}$
Alt.	$-6478 \pm 19$	$16.64^{+2.40}_{-1.35}$	$1639^{+103}_{-76}$	$4343^{+102}_{-117}$	$27^{+4}_{-6}$

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

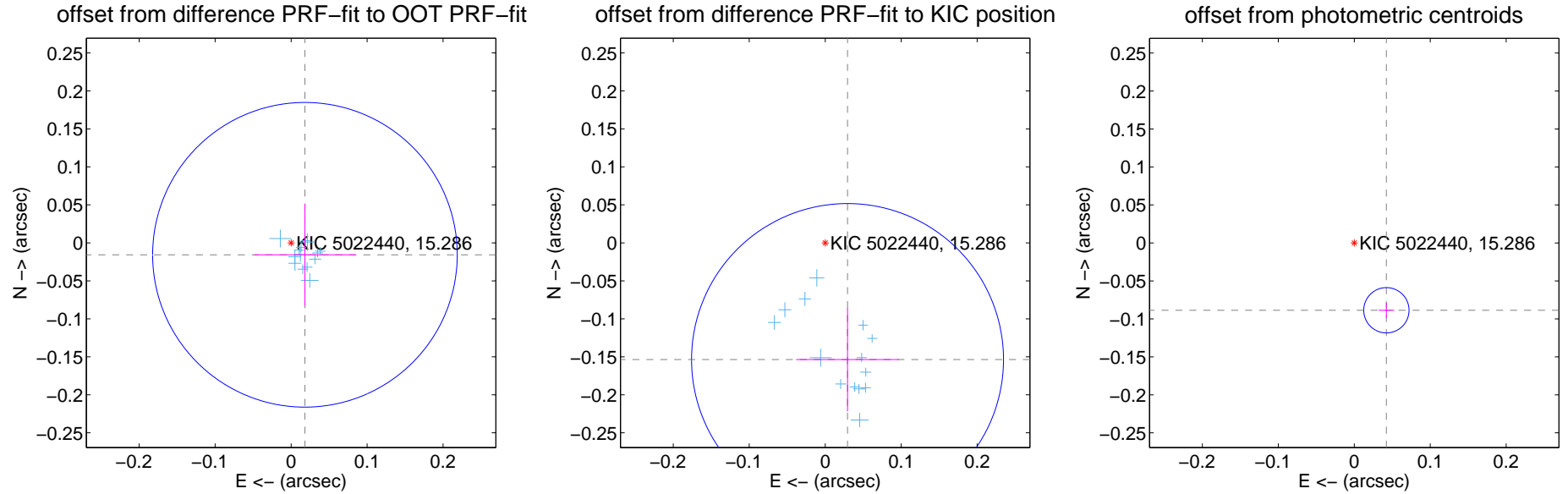
## DV Centroid Data

Supplemental centroid analysis for 005022440-01. Kepler magnitude: 15.29. Transit SNR 1219.64

There are 14 quarters with good PRF difference image offsets

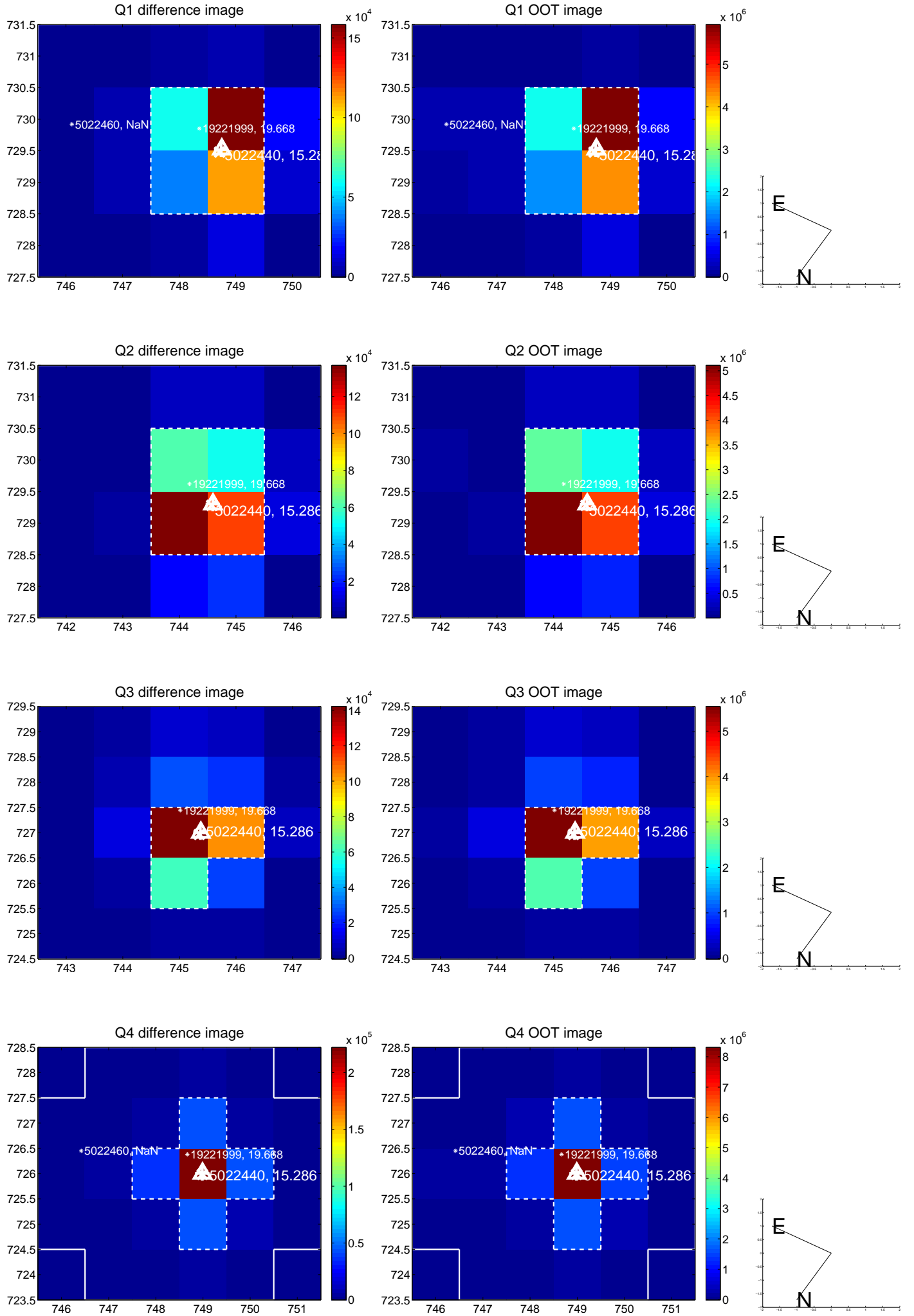
The direct PRF centroid is offset from the target star catalog position by about 0.16 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.024 \pm 0.067$	0.36	$-0.018 \pm 0.067$	$-0.016 \pm 0.067$
PRF-fit source offset from KIC position	$0.156 \pm 0.068$	2.29	$-0.029 \pm 0.068$	$-0.154 \pm 0.068$
photometric centroid source offset	$0.10 \pm 0.01$	9.88	$-0.04 \pm 0.01$	$-0.09 \pm 0.01$



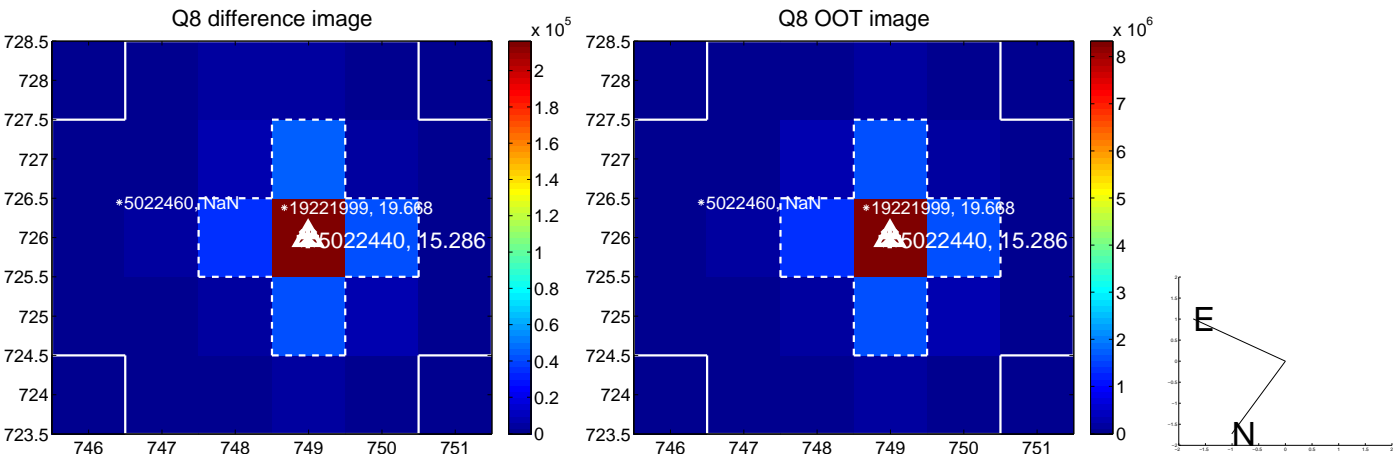
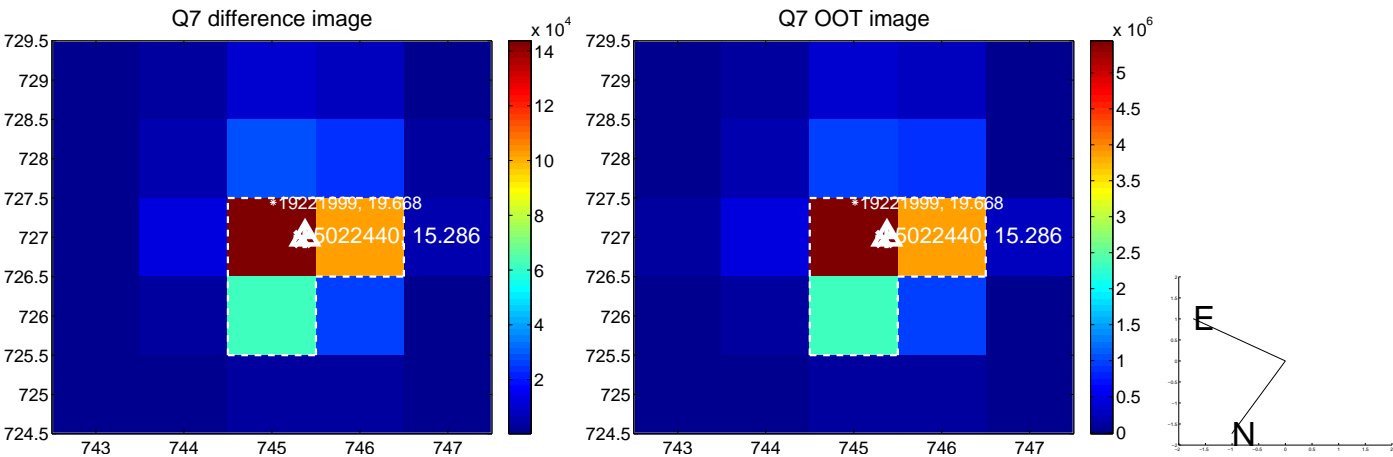
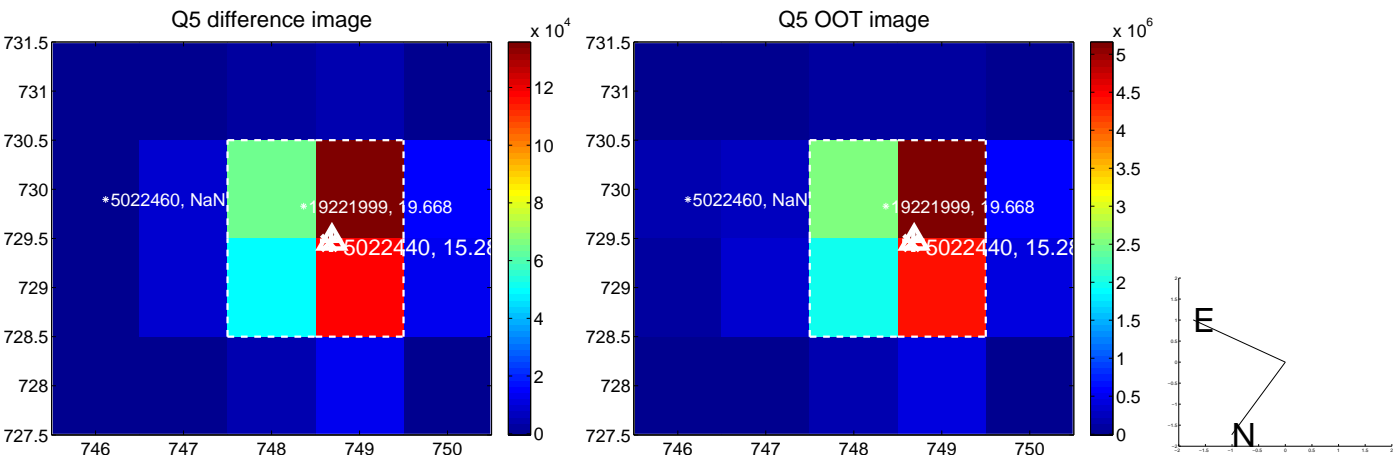
Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets**; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

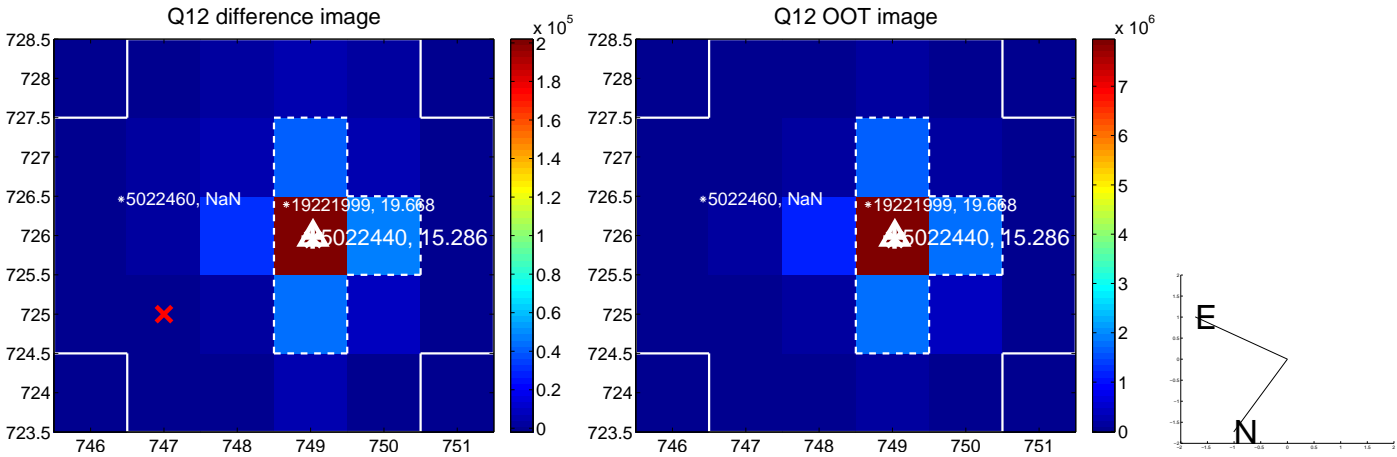
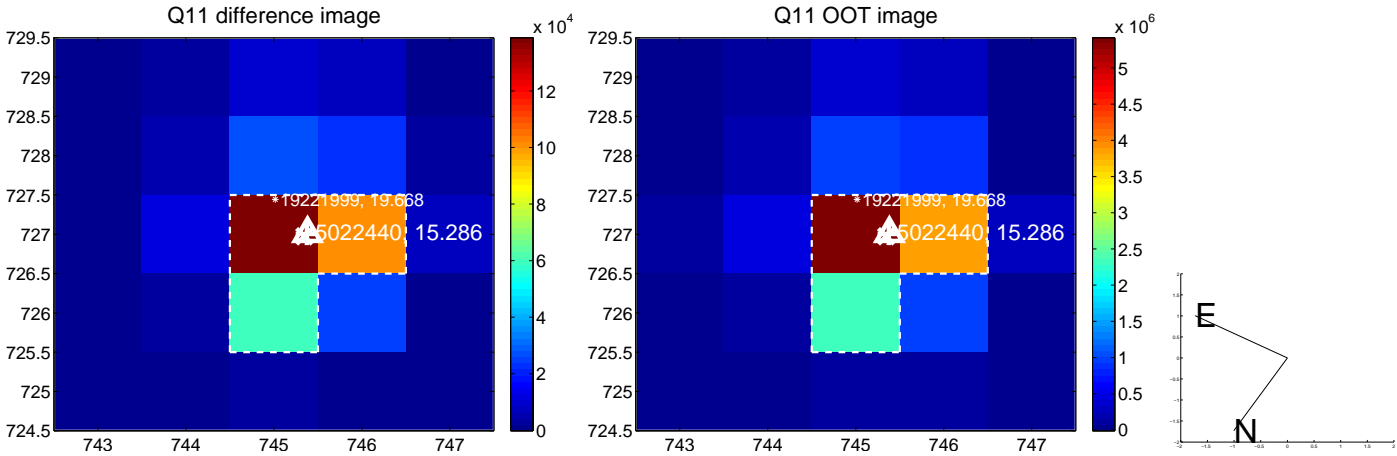
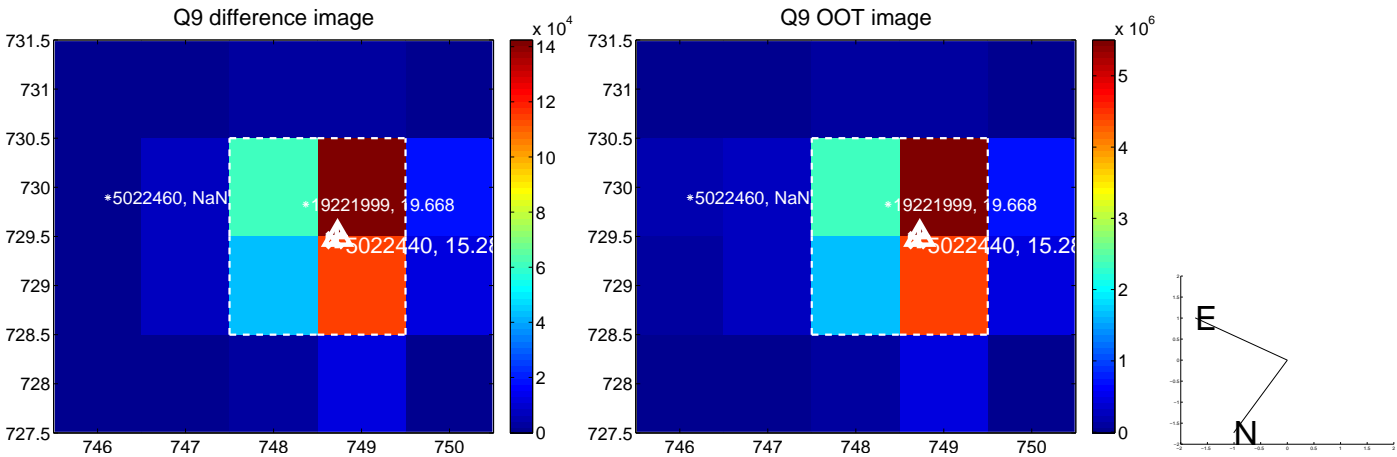




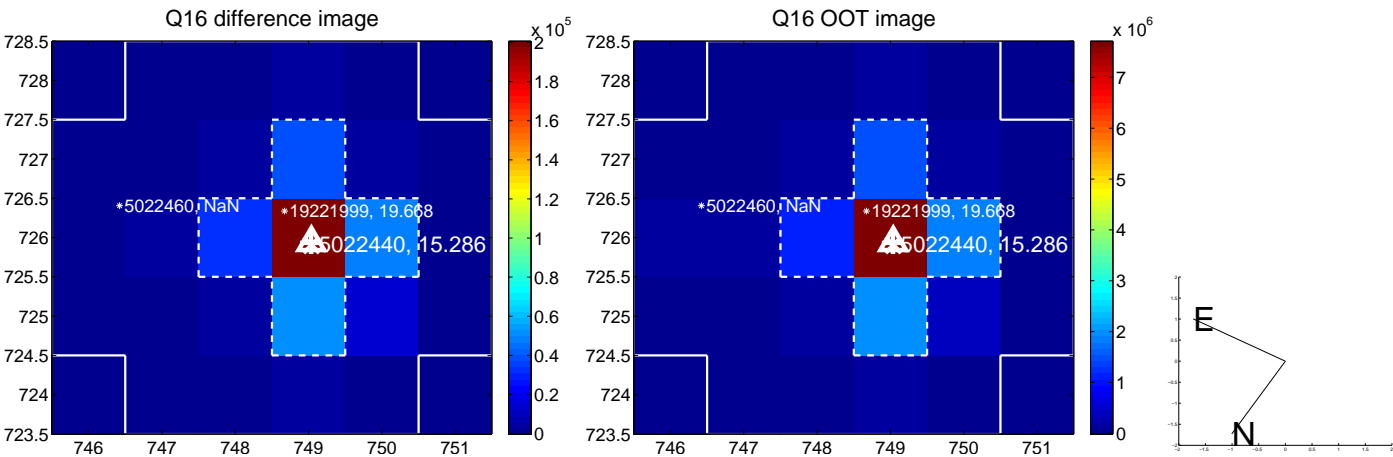
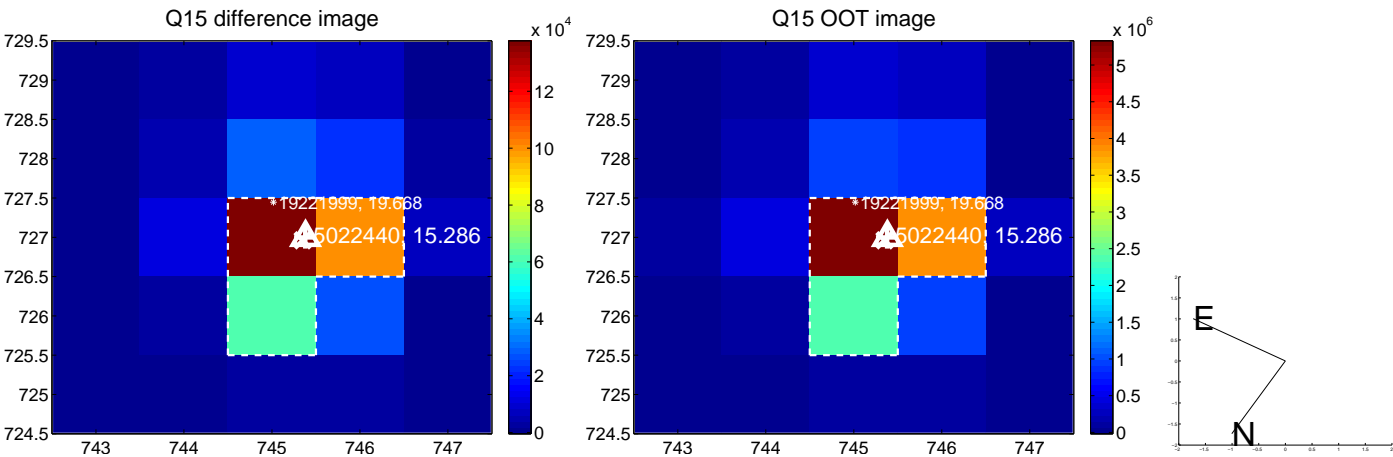
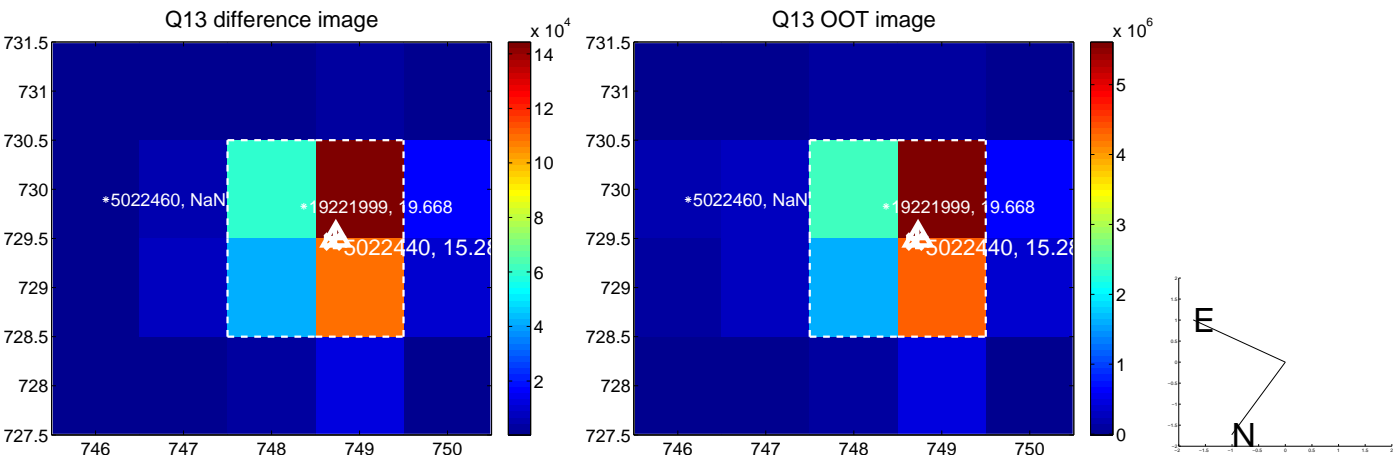
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



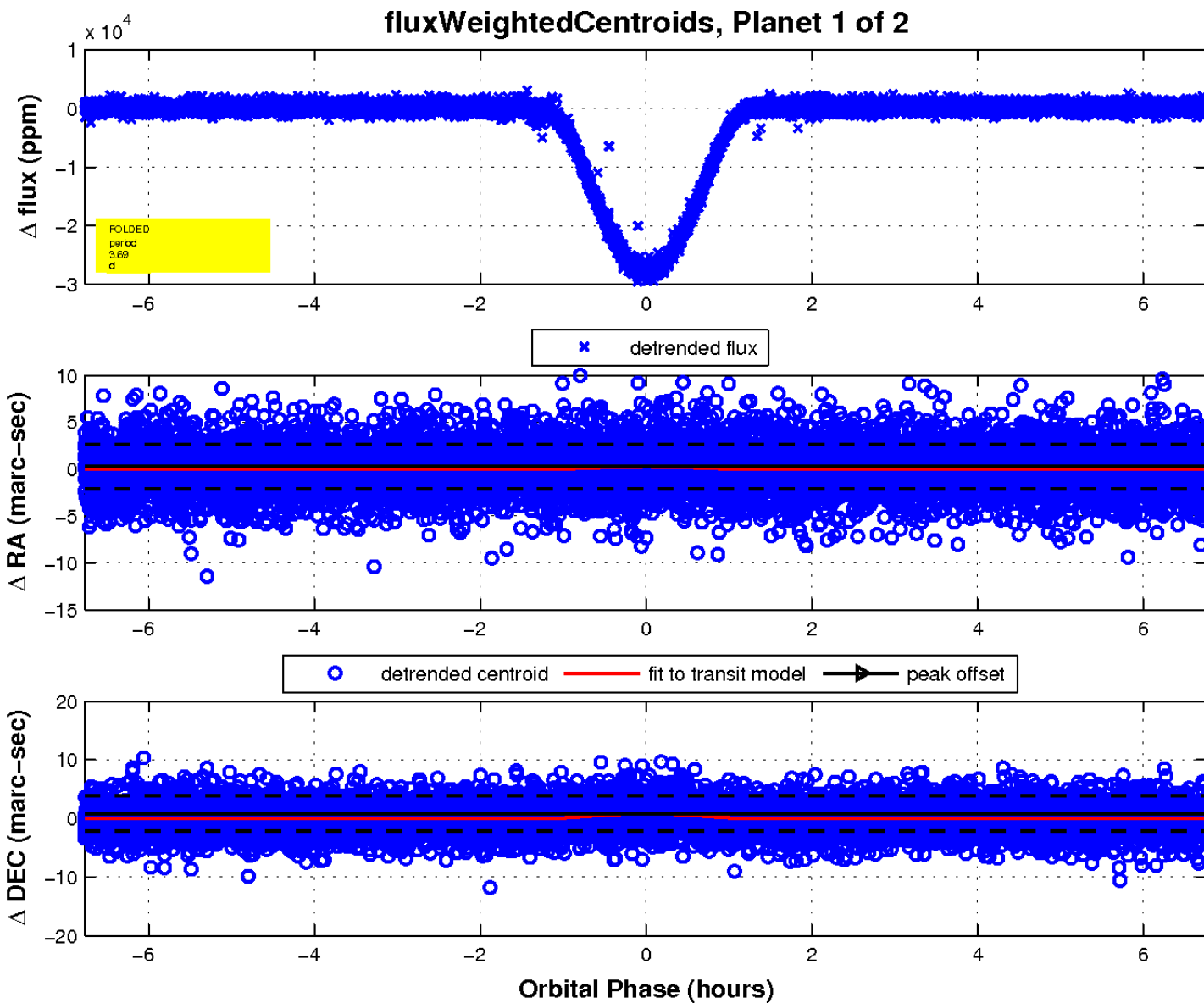
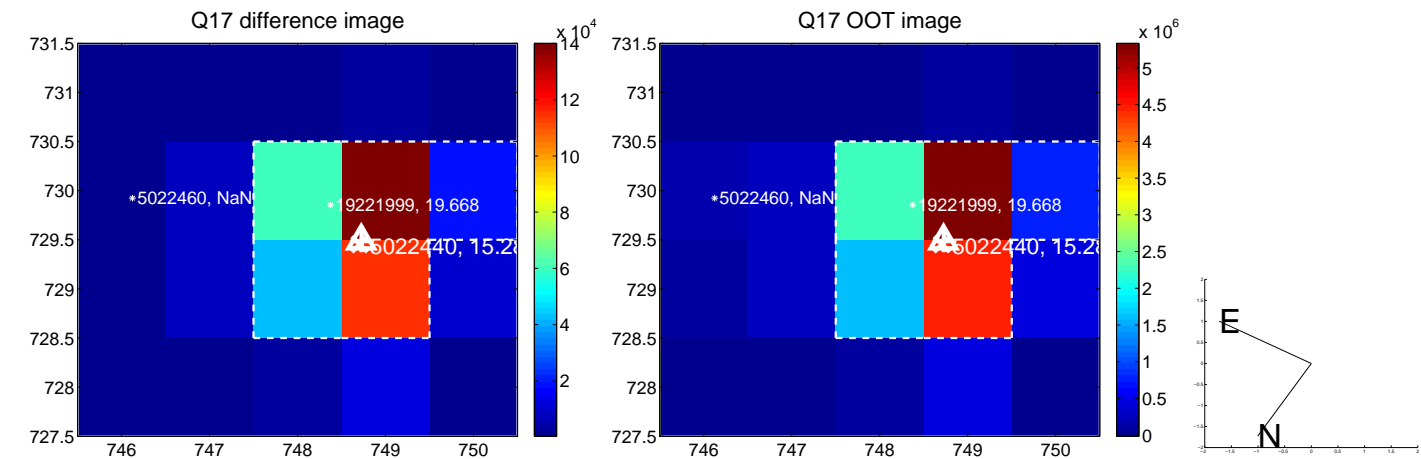
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

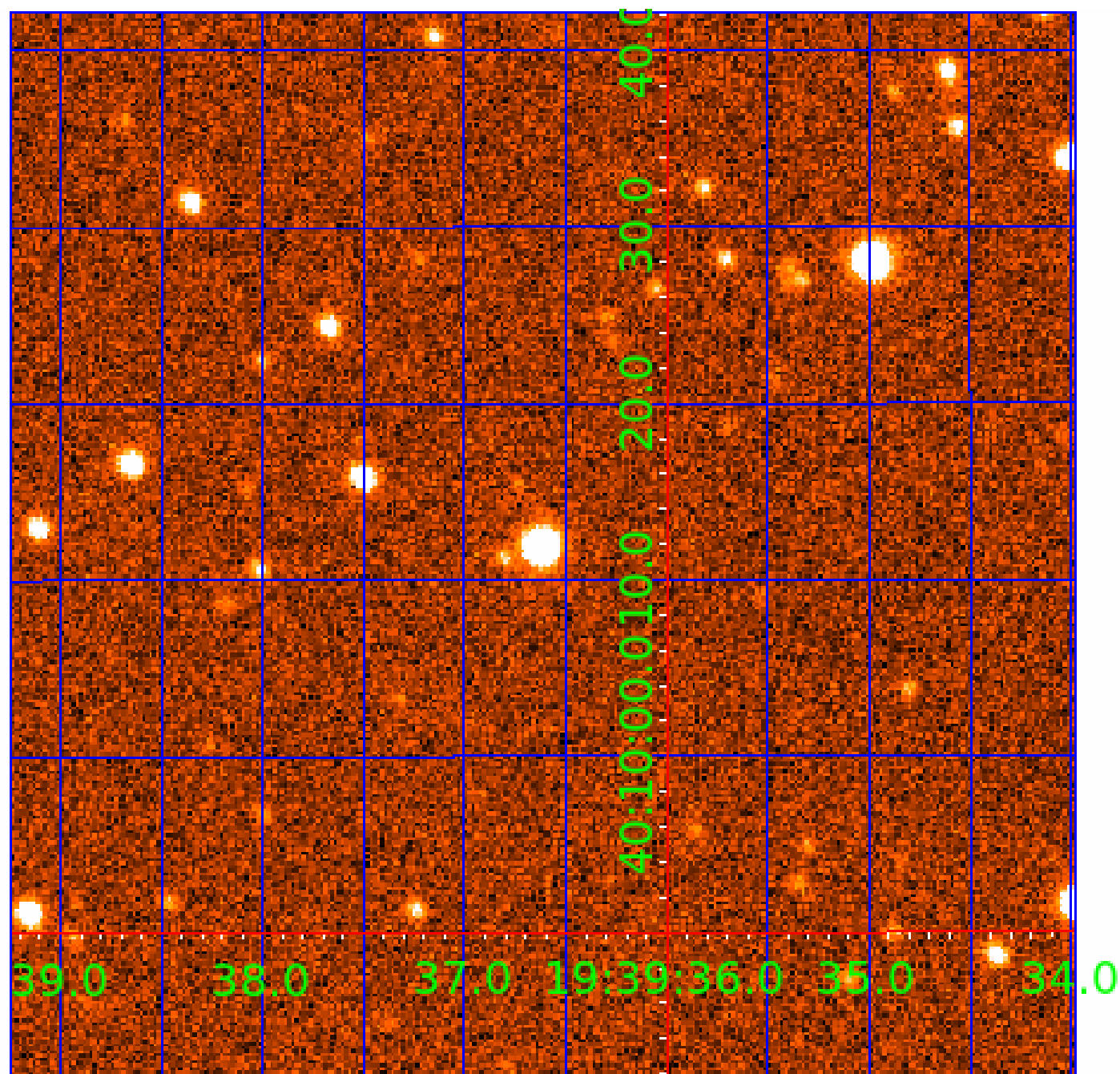


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination



# KIC 005022440

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
005022440-01	OBS	6491.01	3.693951	133.610608	28080.7	2.260	1277.7	1219.6	0.88	5968	21.08	411.98
005022440-02	OBS	No	3.693952	131.763358	8519.8	2.211	373.0	366.1	0.88	5968	13.46	411.98

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
005022440-01	OBS	FP	0.00	0	1	0	0	MOD_SEC_DV—MOD_SEC_ALT—DEEP_V_SHAPED—HAS_SEC_TCE
005022440-02	OBS	FP	0.00	1	1	0	0	IS_SEC_TCE

**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 005022440-02

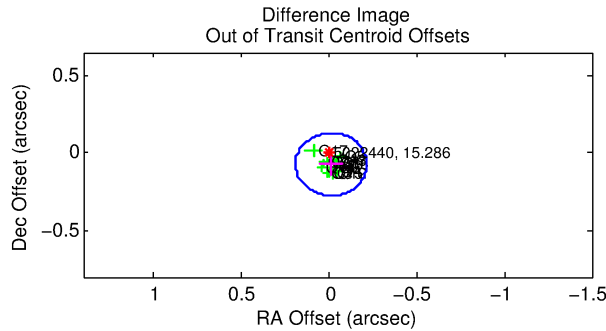
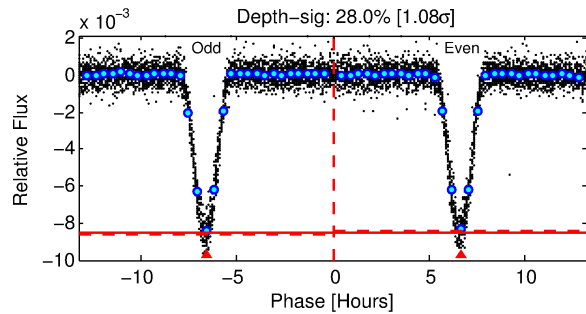
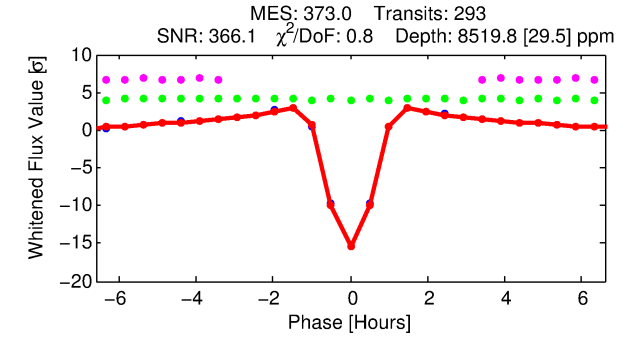
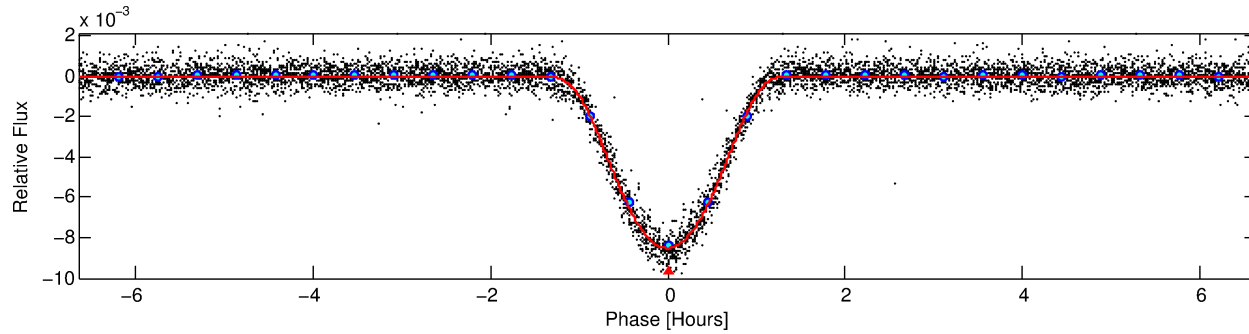
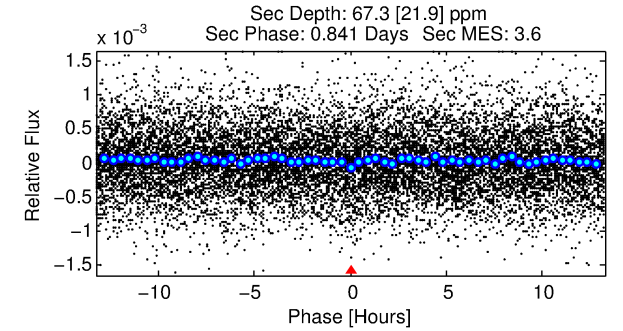
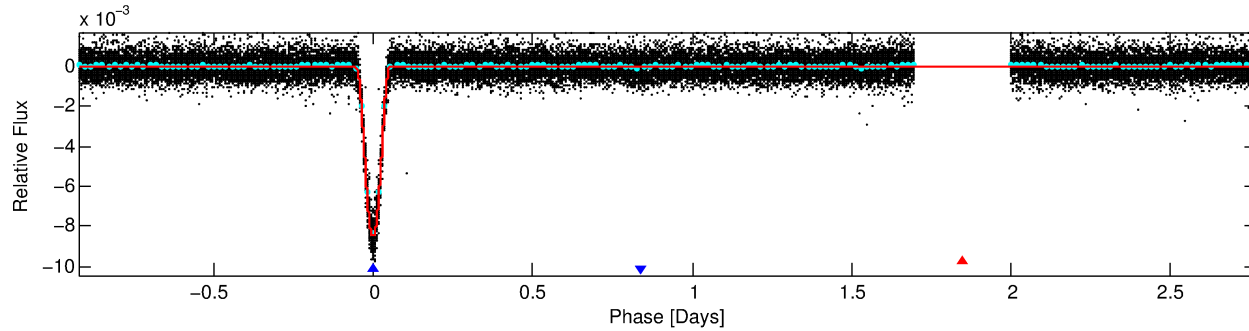
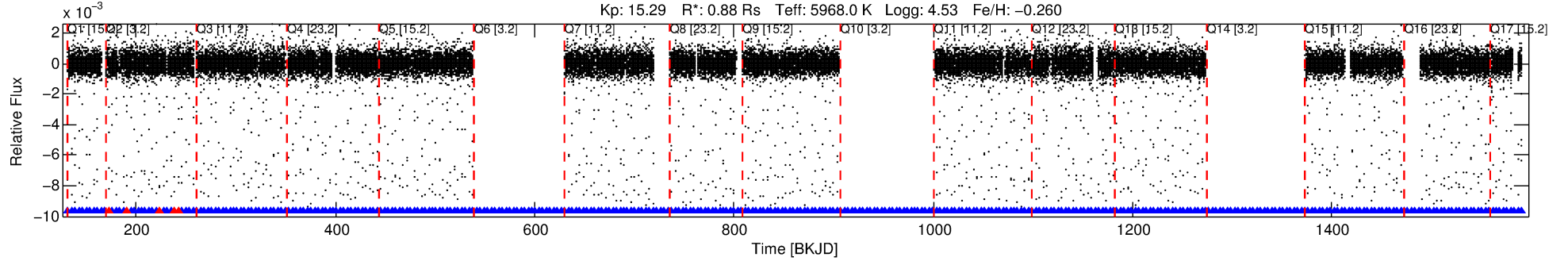
No Significant Match Found

# DV One-Page Summary

KIC: 5022440 Candidate: 2 of 2 Period: 3.694 d

KOI: K06491 Corr: No Ephemeris Match

Kp: 15.29 R\*: 0.88 Rs Teff: 5968.0 K Logg: 4.53 Fe/H: -0.260



## DV Fit Results:

Period = 3.69395 [0.00000] d  
Epoch = 131.7634 [0.0001] BKJD  
Rp/R\* = 0.1400 [0.0150]  
a/R\* = 7.51 [0.15]  
b = 0.98 [0.02]  
Seff = 411.98 [148.16]  
Teq = 1149 [103] K  
Rp = 13.45 [3.76] Re  
a = 0.0463 [0.0104] AU  
Ag = 0.44 [0.23] [-2.49σ]  
Teffp = 1445 [149] K [1.64σ]

## DV Diagnostic Results:

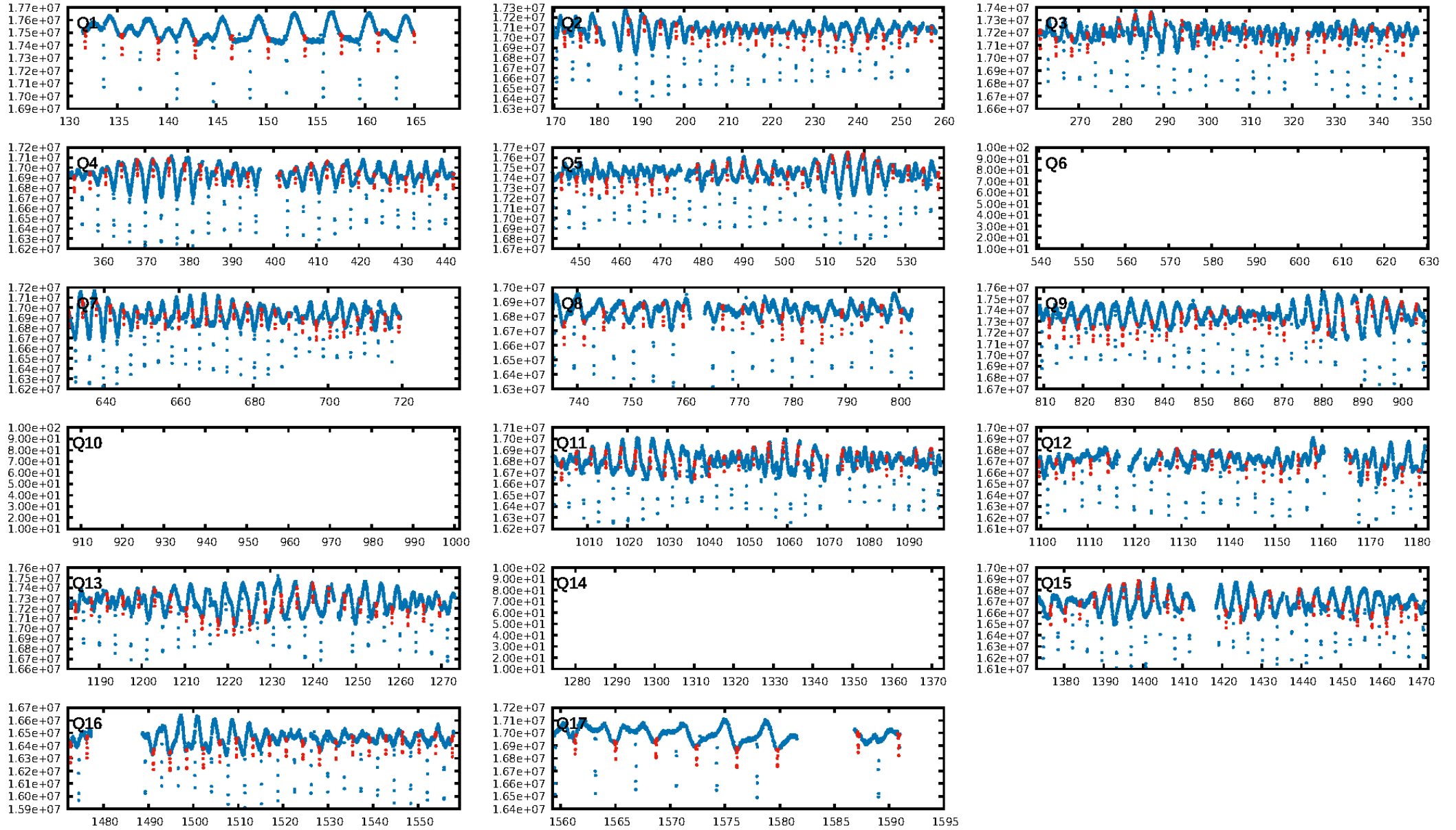
ShortPeriod-sig: 0.0% [0.00σ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: 0.00e+00  
RollingBand-fgt: 0.98 [270/275]  
GhostDiagnostic-chr: 3.768  
Centroid-sig: 0.0%  
Centroid-so: 0.184 arcsec [5.61σ]  
OotOffset-rm: 0.074 arcsec [1.09σ]  
KicOffset-rm: 0.208 arcsec [3.04σ]  
OotOffset-st: 1/4/4/5 [14]  
KicOffset-st: 1/4/4/5 [14]  
DiffImageQuality-fgm: 1.00 [14/14]  
DiffImageOverlap-fno: 1.00 [14/14]

Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 31-Jan-2016 02:57:22 Z

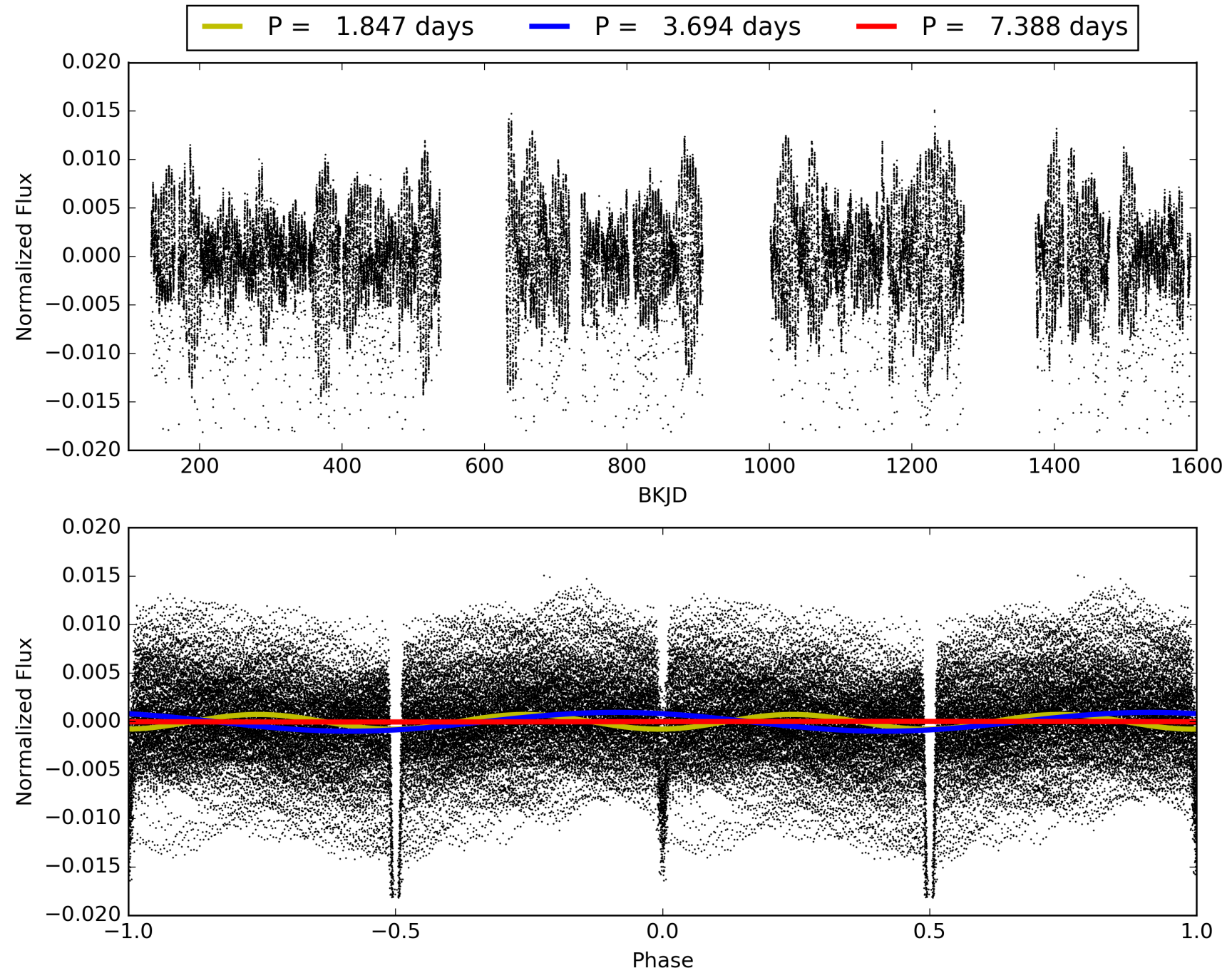
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center



# TCE 005022440-02, PDC Light Curves

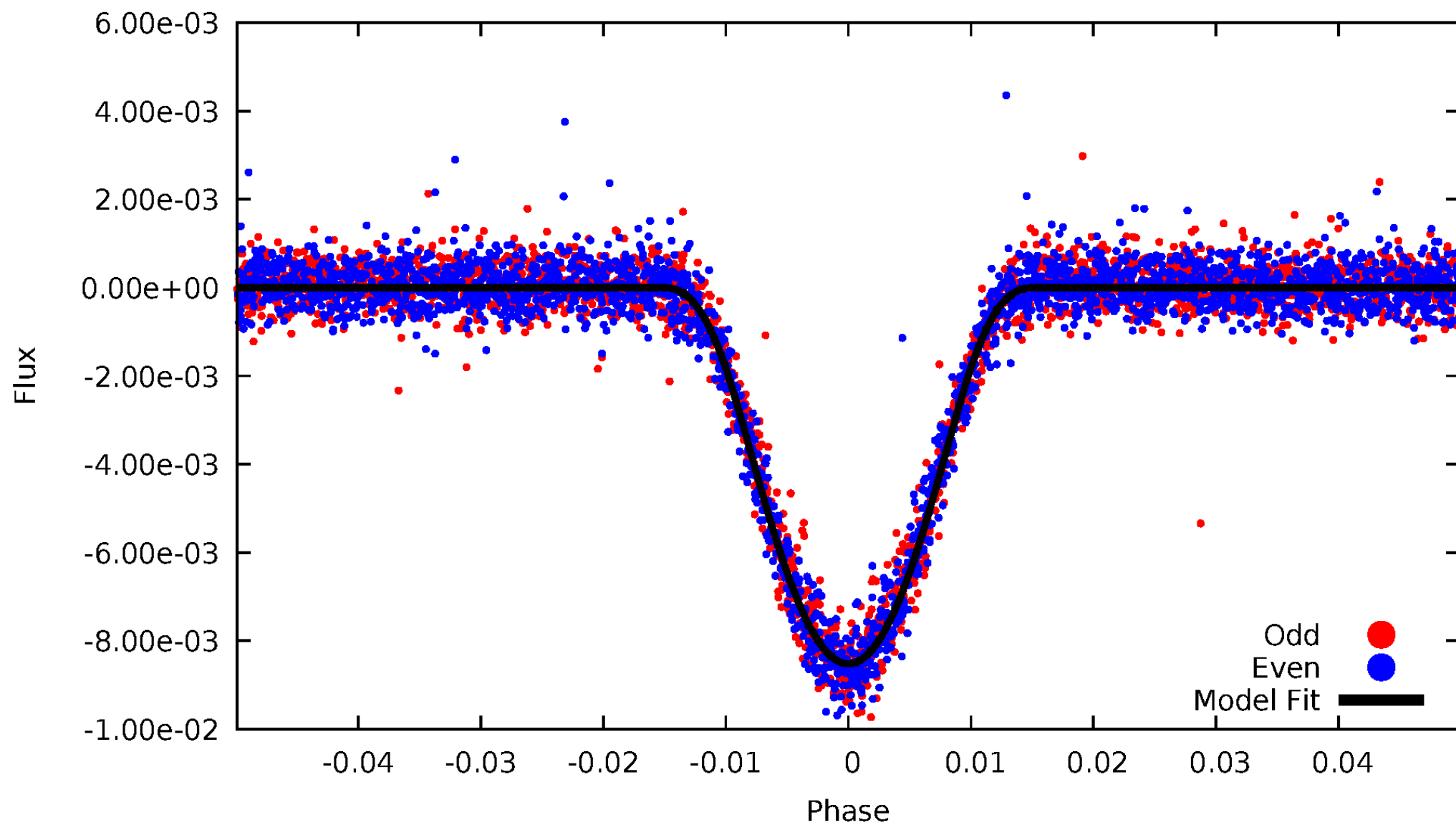


TCE 005022440-02



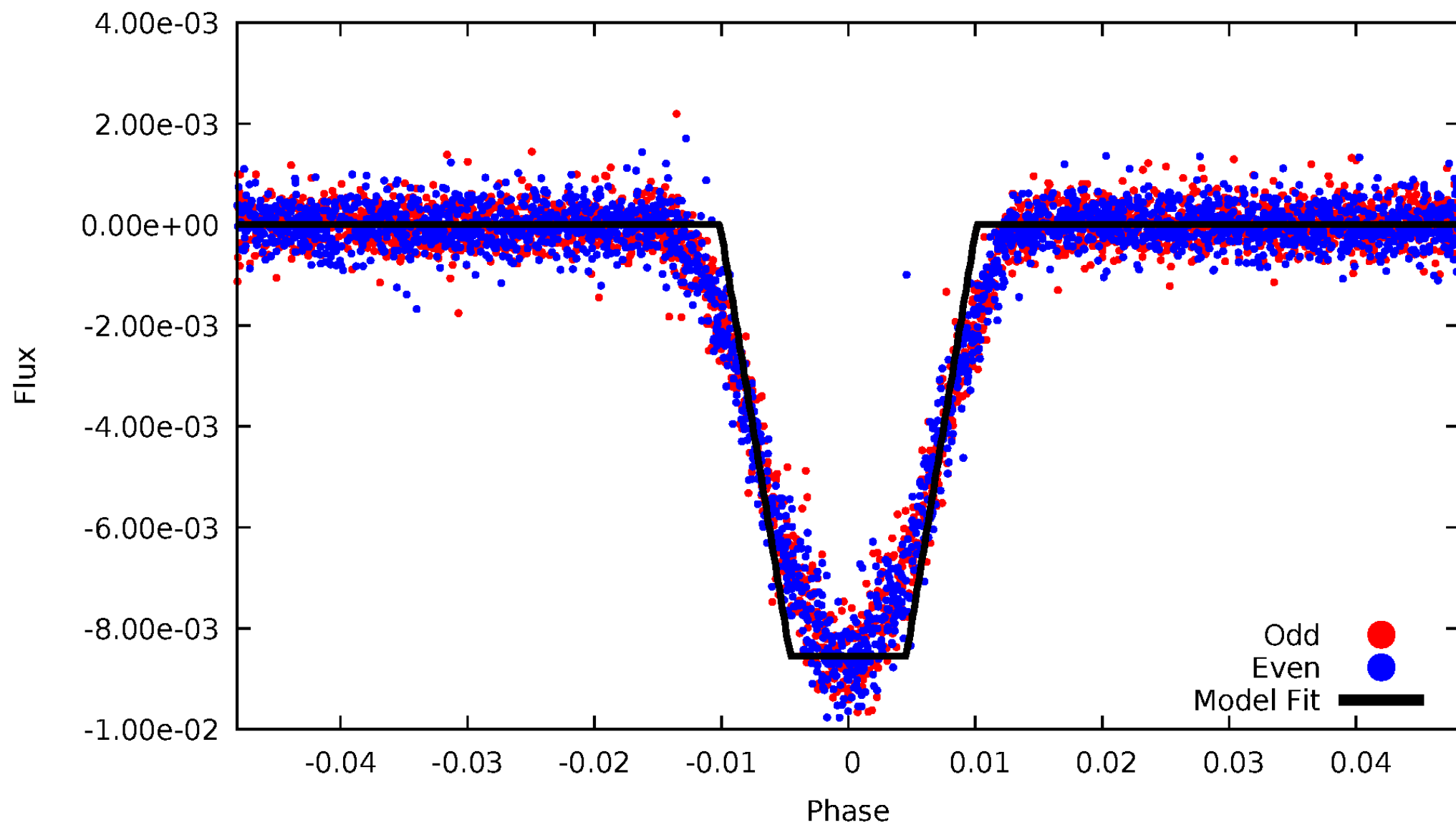
# DV Odd/Even

TCE 005022440-02



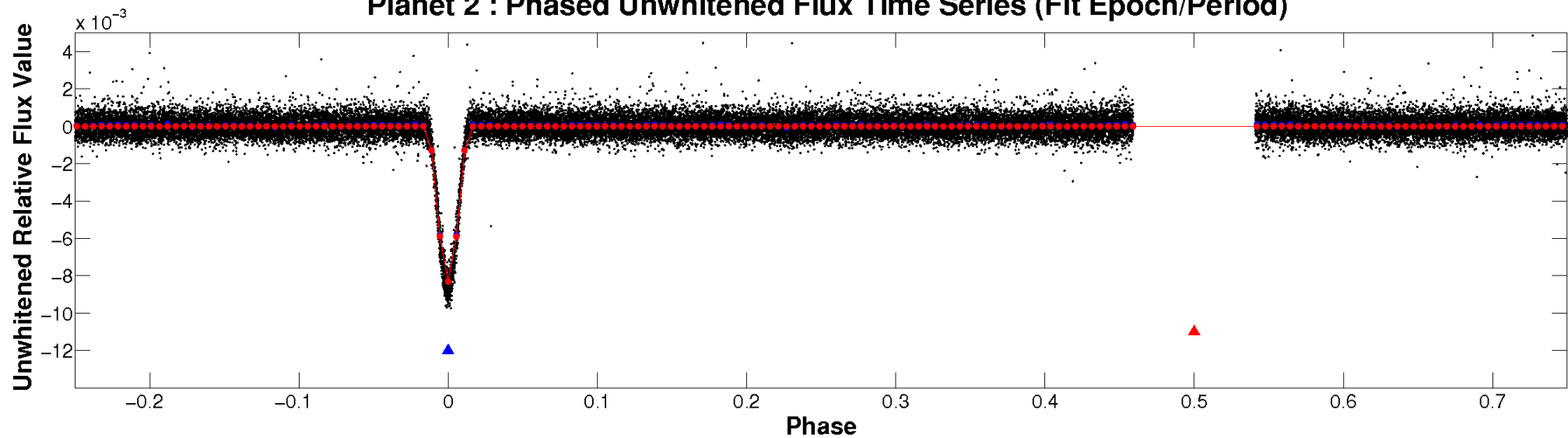
# ALT Odd/Even

TCE 005022440-02

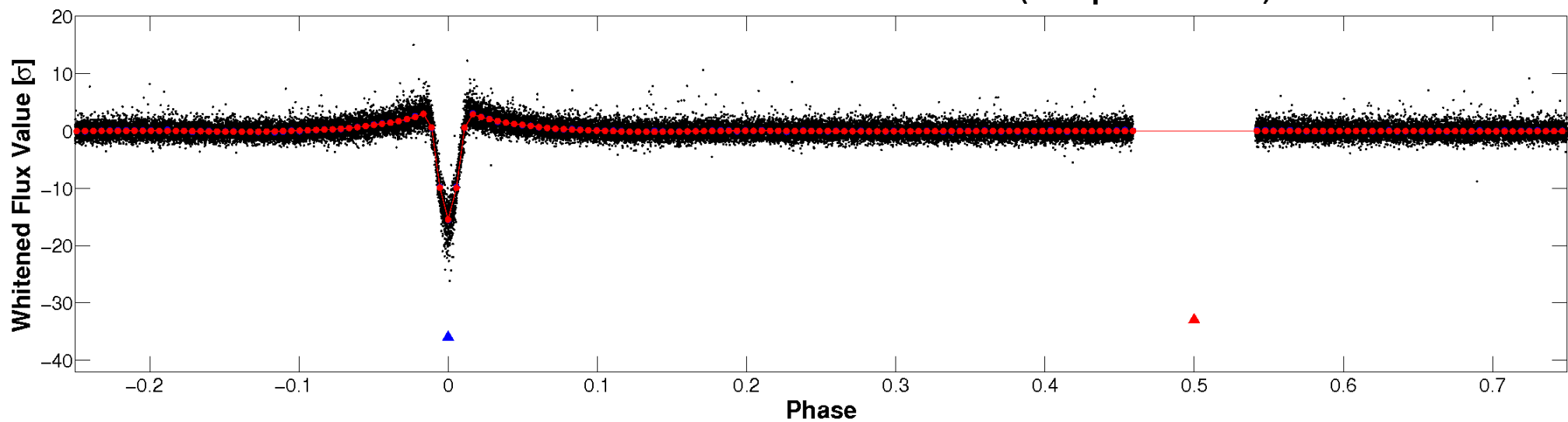


# Non-Whitened Vs. Whitened Light Curve

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

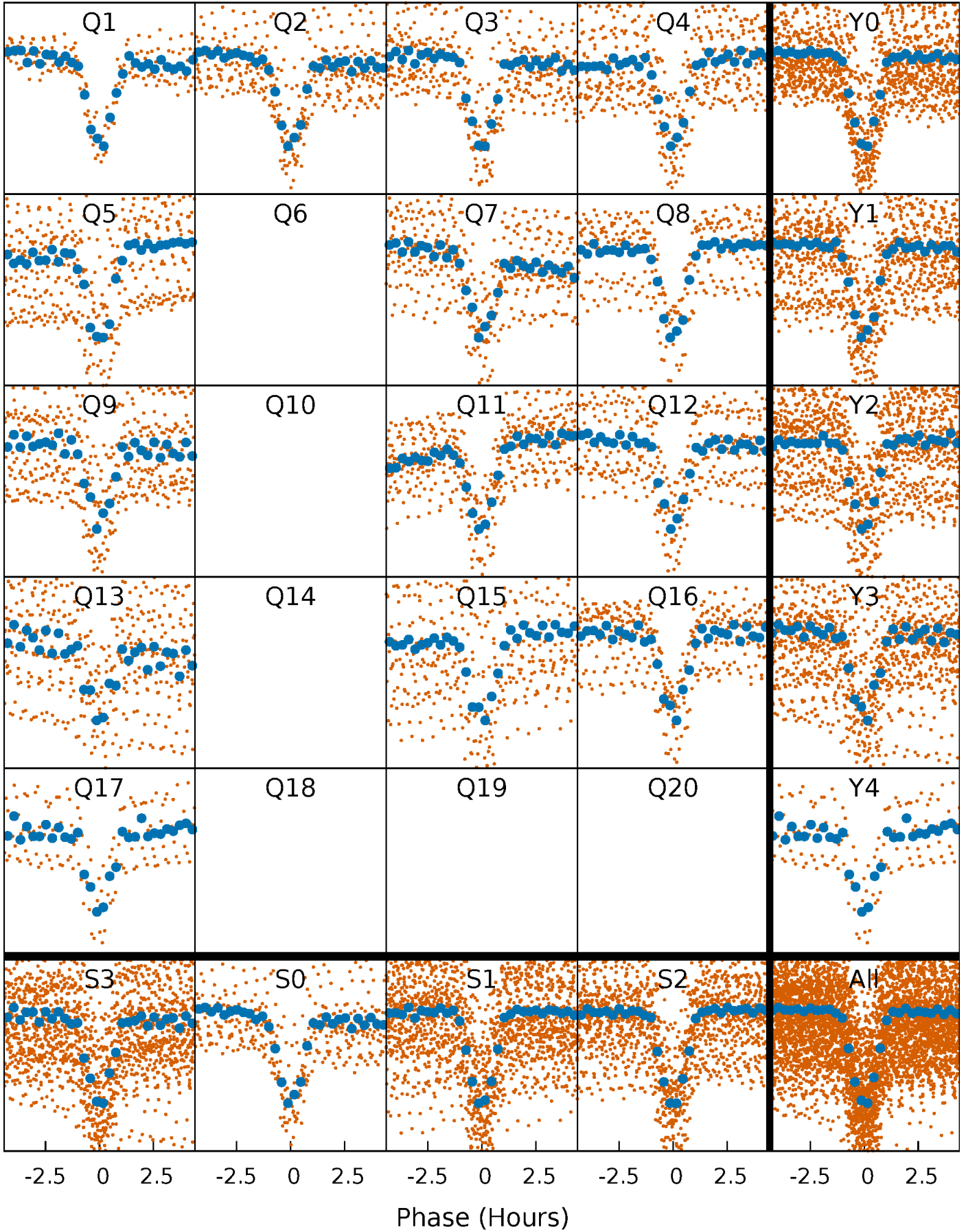


## Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



# PDC Quarter-Phased Transit Curves

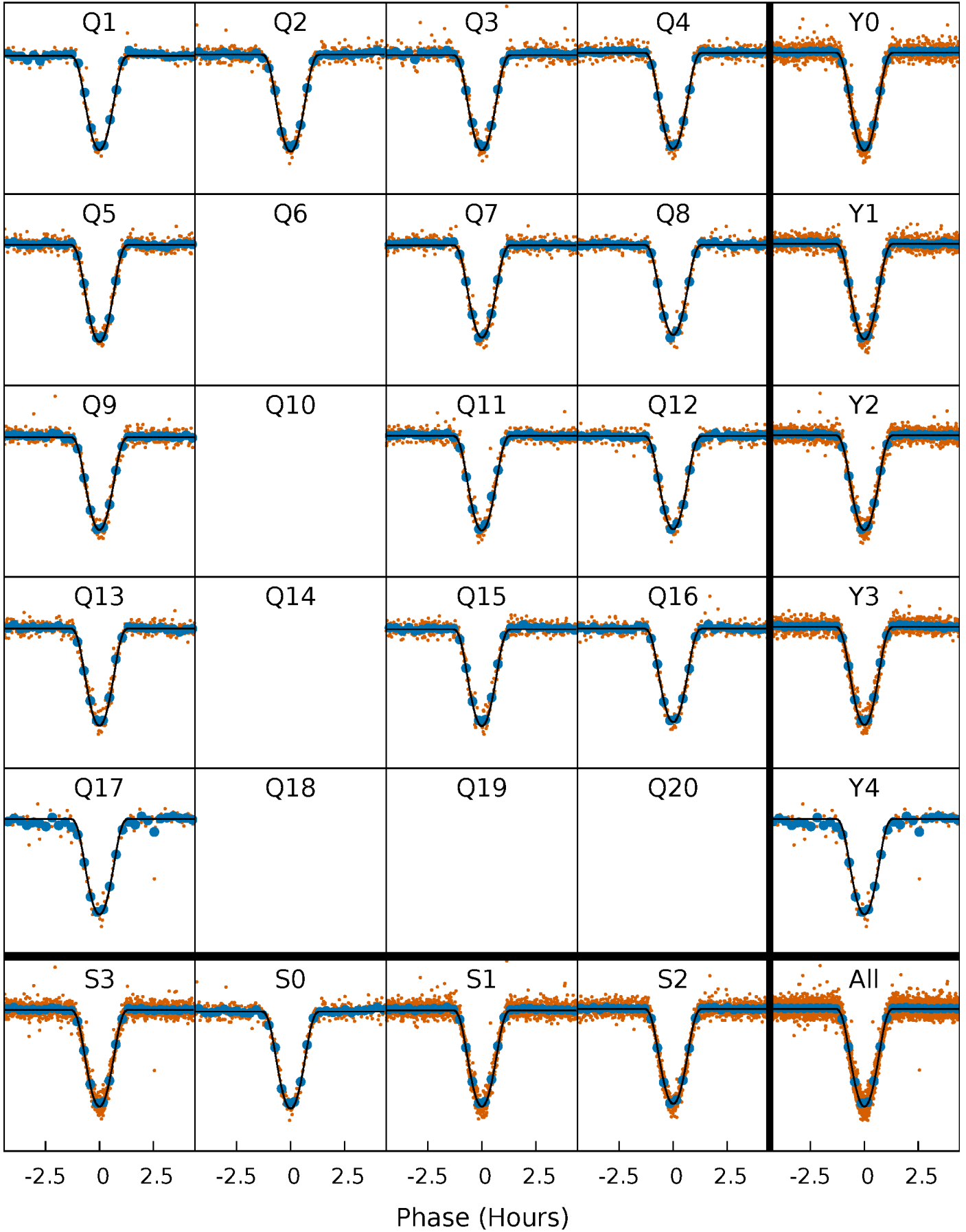
TCE 005022440-02   P= 3.693952 Days    $T_0=131.763358$  (BKJD)





# DV Quarter-Phased Transit Curves

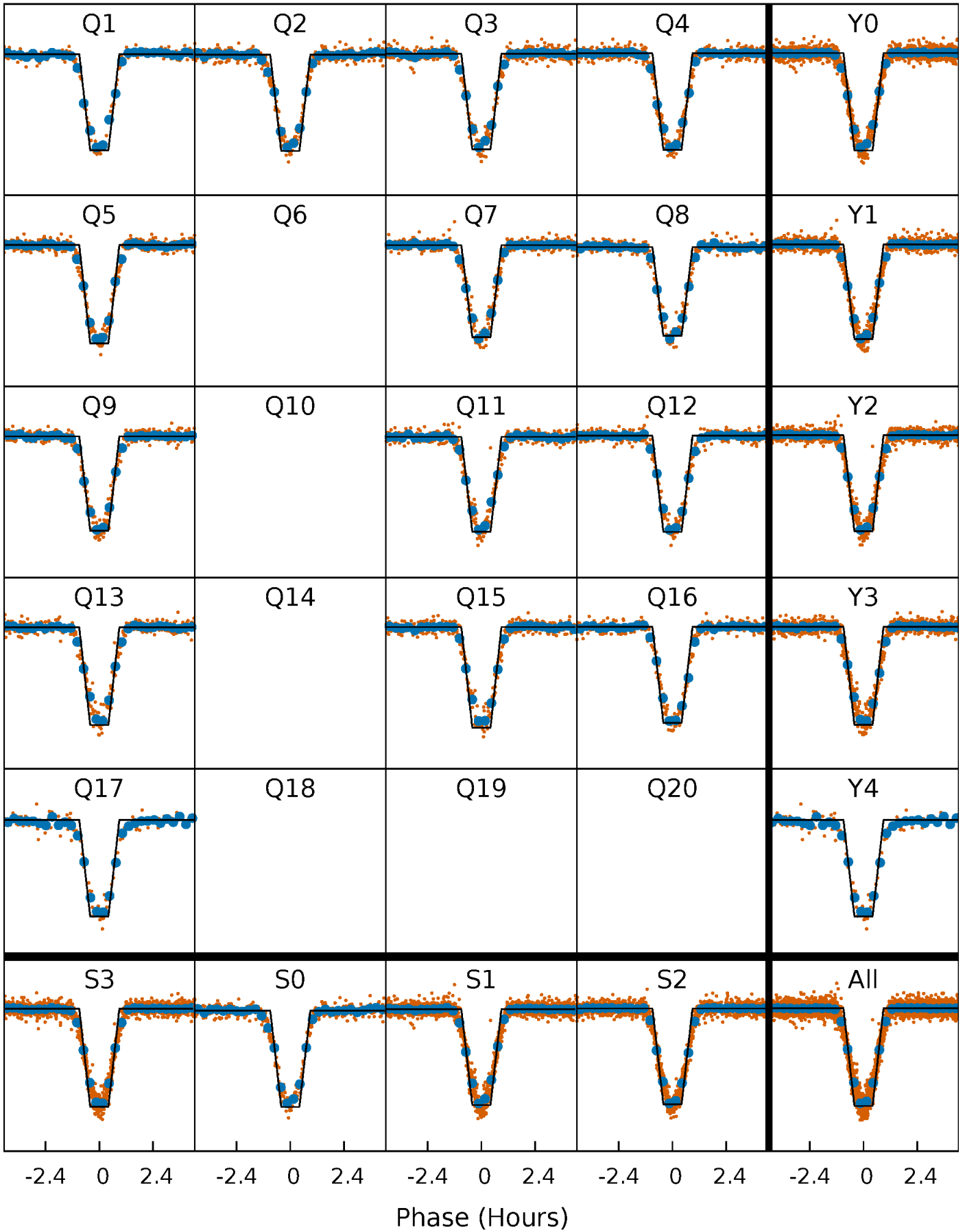
TCE 005022440-02   P= 3.693952 Days    $T_0=131.763358$  (BKJD)





# Alt. Detrend Quarter-Phased Transit Curves

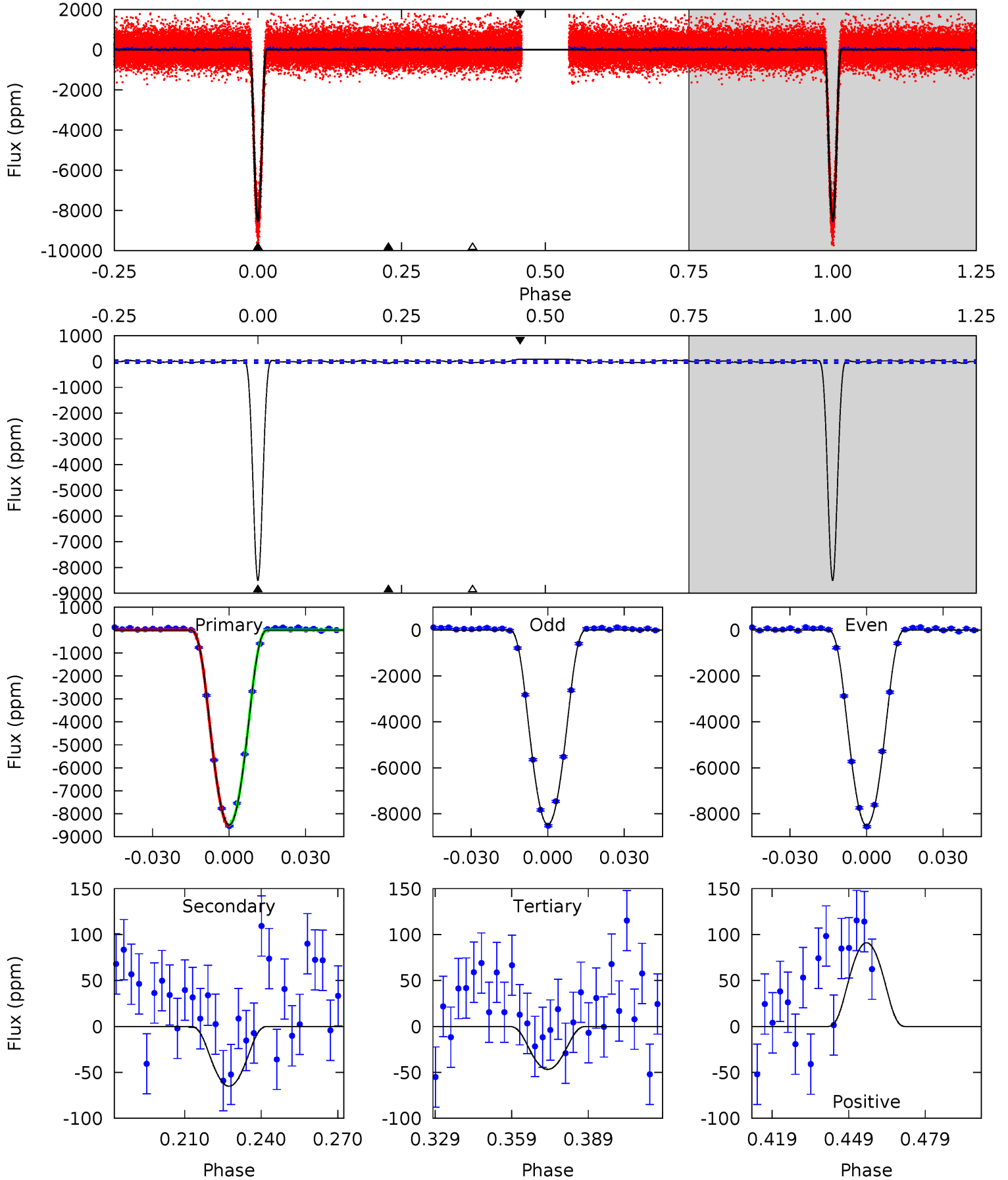
TCE 005022440-02   P= 3.693944 Days    $T_0=131.764820$  (BKJD)



# DV Model-Shift Uniqueness Test

005022440-02, P = 3.693952 Days, E = 128.069406 Days

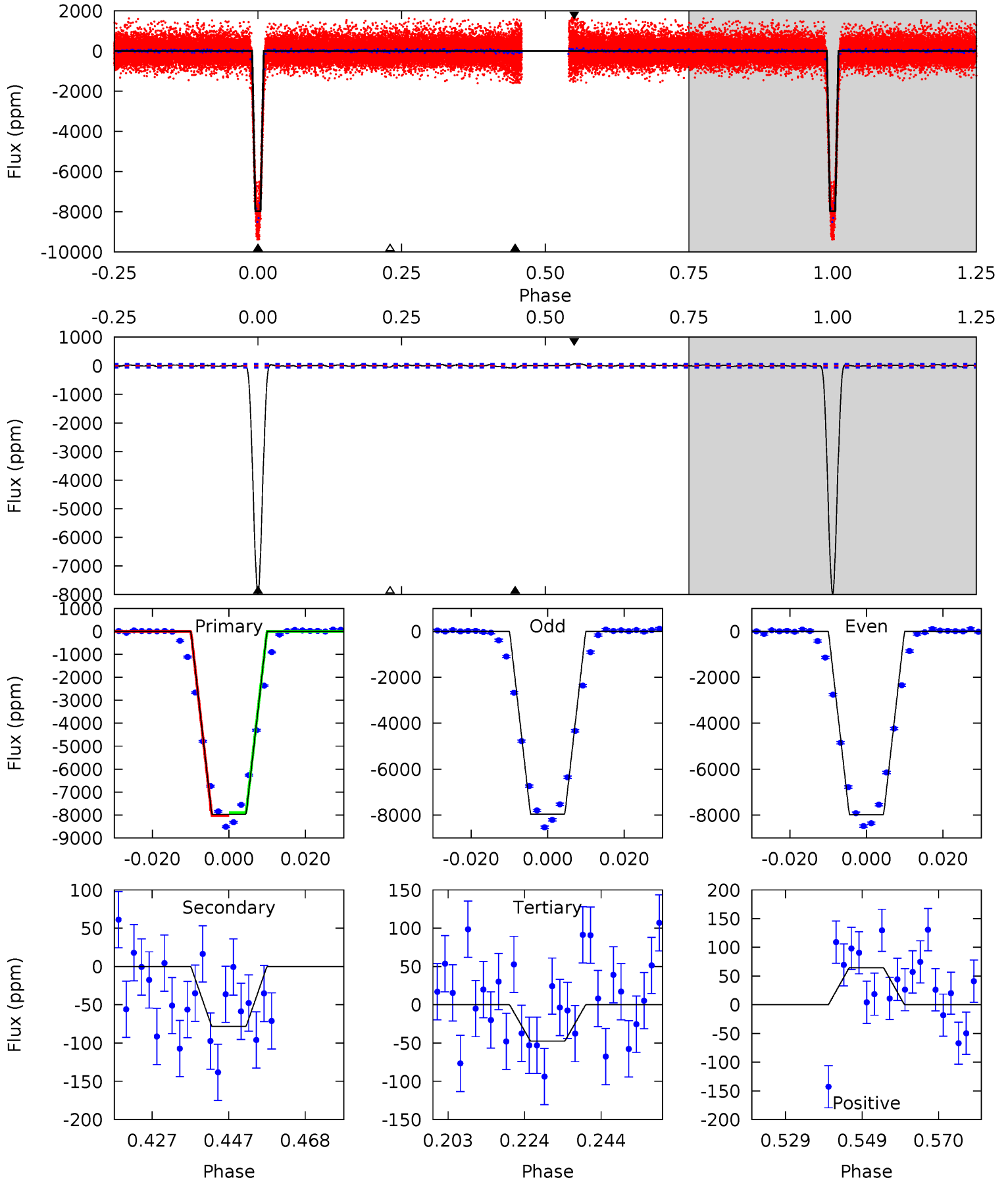
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
737.3	5.65	4.06	7.90	4.81	2.17	2.33	733.3	729.4	1.59	-2.25	1.83	1.00	0.01	2.35



# Alt Model-Shift Uniqueness Test

005022440-02, P = 3.693944 Days, E = 128.070876 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
618.4	6.08	3.69	5.02	4.89	2.32	1.34	614.7	613.3	2.39	1.06	0.84	1.00	0.01	4.82



### Stellar Parameters For KIC 005022440

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R$ ( $R_{\odot}$ )	$M$ ( $M_{\odot}$ )	$p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ )
	$5968^{+161}_{-197}$	$4.534^{+0.044}_{-0.187}$	$-0.260^{+0.300}_{-0.300}$	$0.881^{+0.227}_{-0.081}$	$0.970^{+0.108}_{-0.119}$	$1.995^{+0.475}_{-0.946}$
	+3%/-3%	+1%/-4%	+115%/-115%	+26%/-9%	+11%/-12%	+24%/-47%
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 005022440-02 / KOI

Detrend	Depth (ppm)	$R_p$ ( $R_{\oplus}$ )	$T_{\text{max}}$ (K)	$T_{\text{obs}}$ (K)	$A_{\text{obs}}$
DV	$-65 \pm 12$	$14.08^{+2.17}_{-1.98}$	$1637^{+109}_{-76}$	$1965^{+223}_{-3769}$	$0.381^{+0.144}_{-0.110}$
Alt.	$-78 \pm 13$	$9.43^{+1.92}_{-1.79}$	$1636^{+121}_{-74}$	$2520^{+174}_{-168}$	$1.018^{+0.554}_{-0.335}$

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

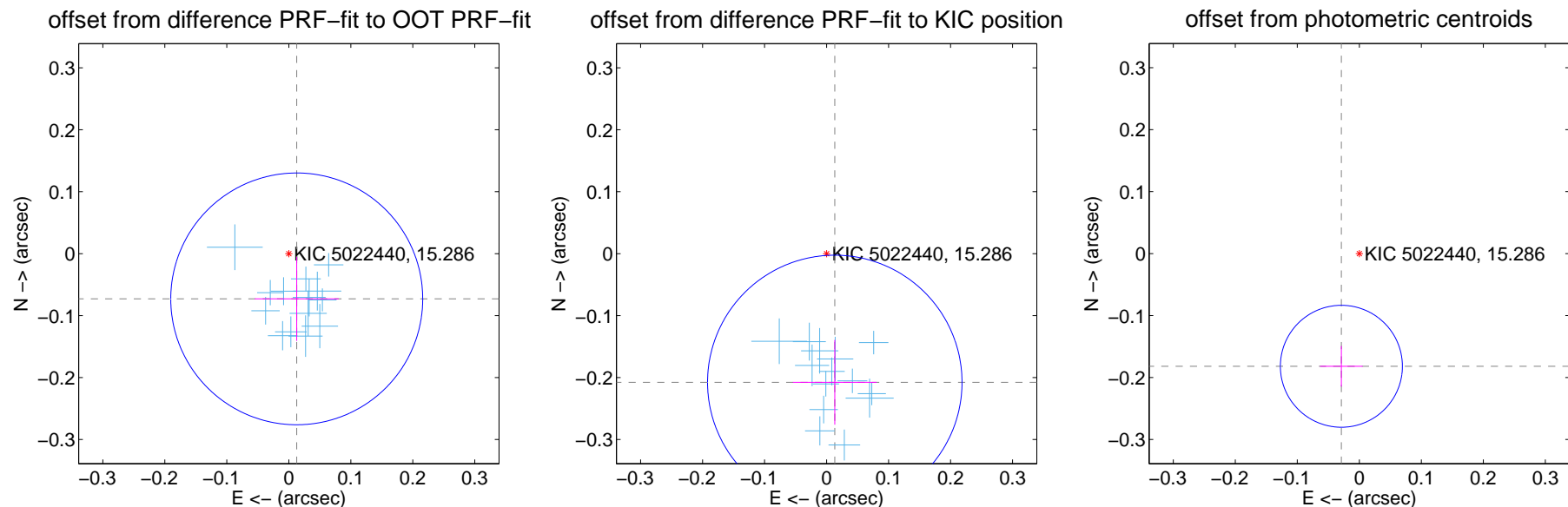
## DV Centroid Data

Supplemental centroid analysis for 005022440-02. Kepler magnitude: 15.29. Transit SNR 366.13

There are 14 quarters with good PRF difference image offsets

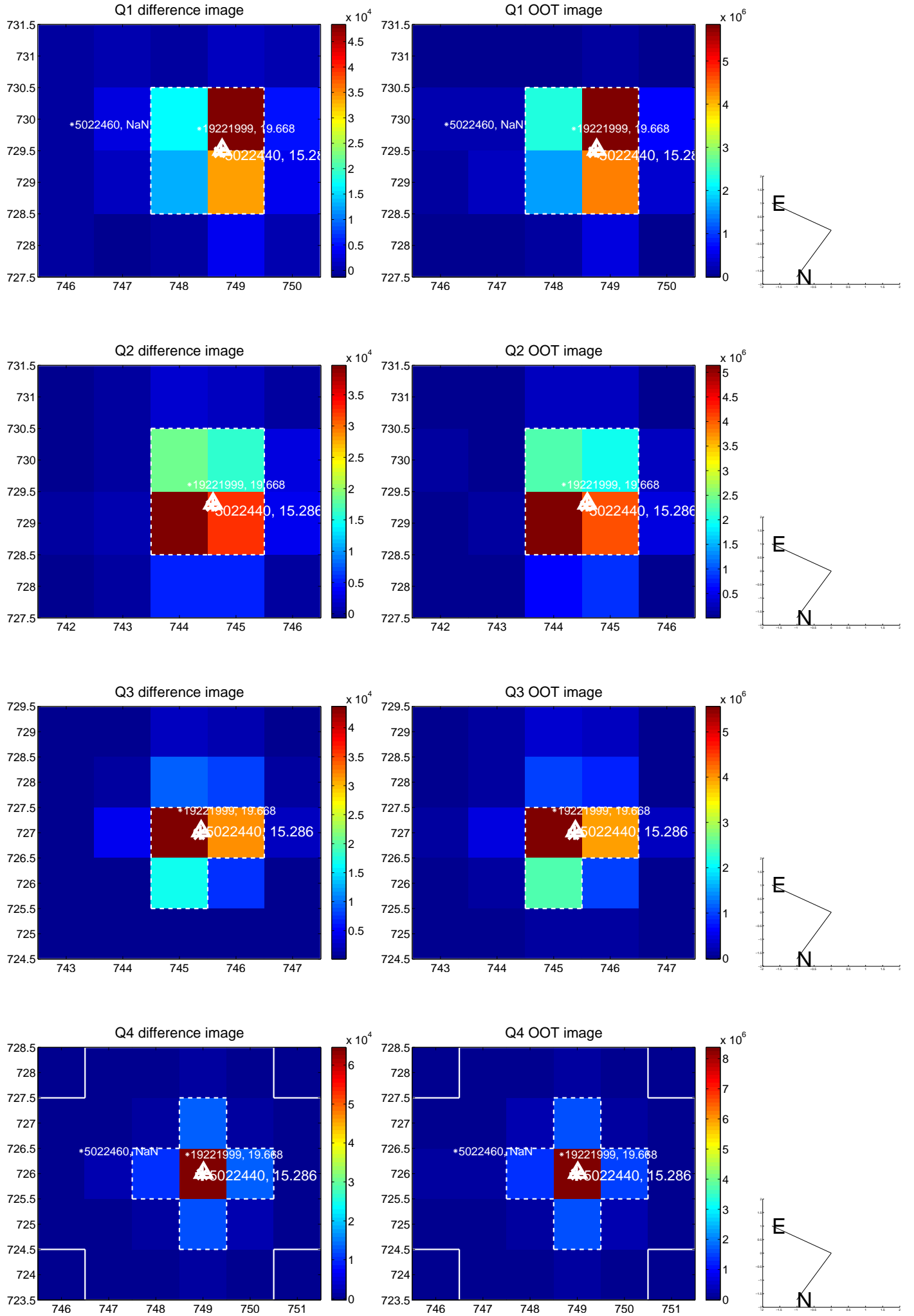
The direct PRF centroid is offset from the target star catalog position by about 0.15 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.074 \pm 0.068$	1.09	$-0.013 \pm 0.068$	$-0.073 \pm 0.068$
PRF-fit source offset from KIC position	$0.208 \pm 0.068$	3.04	$-0.013 \pm 0.068$	$-0.208 \pm 0.068$
photometric centroid source offset	$0.18 \pm 0.03$	5.61	$0.03 \pm 0.03$	$-0.18 \pm 0.03$

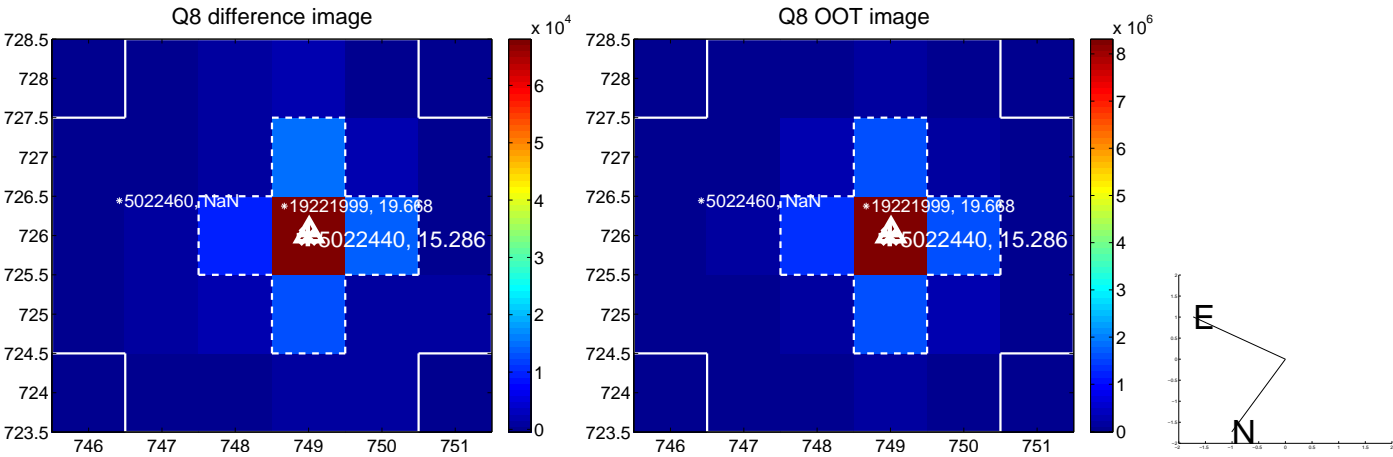
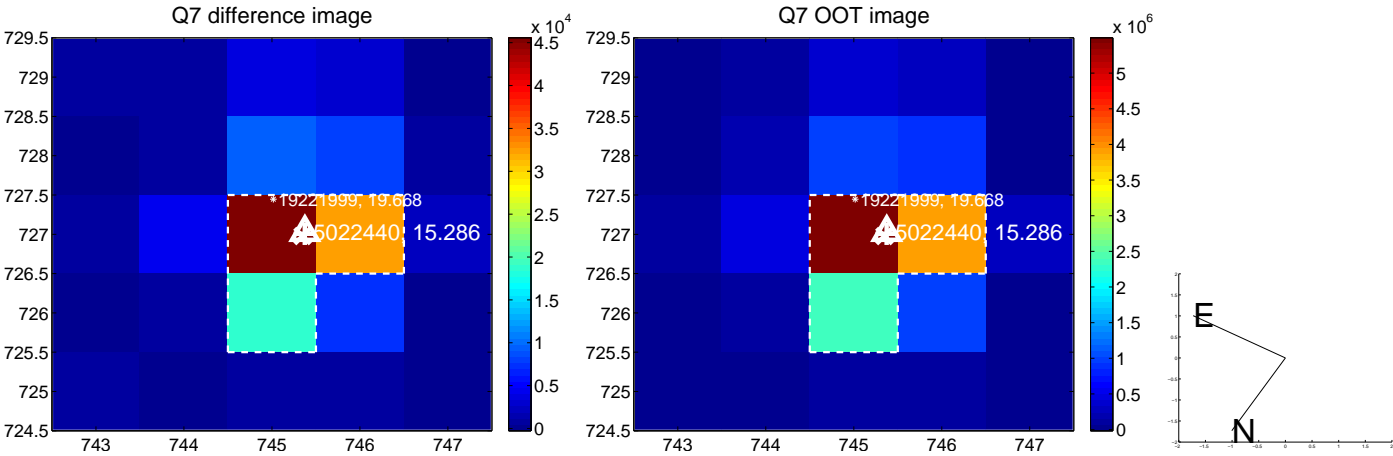
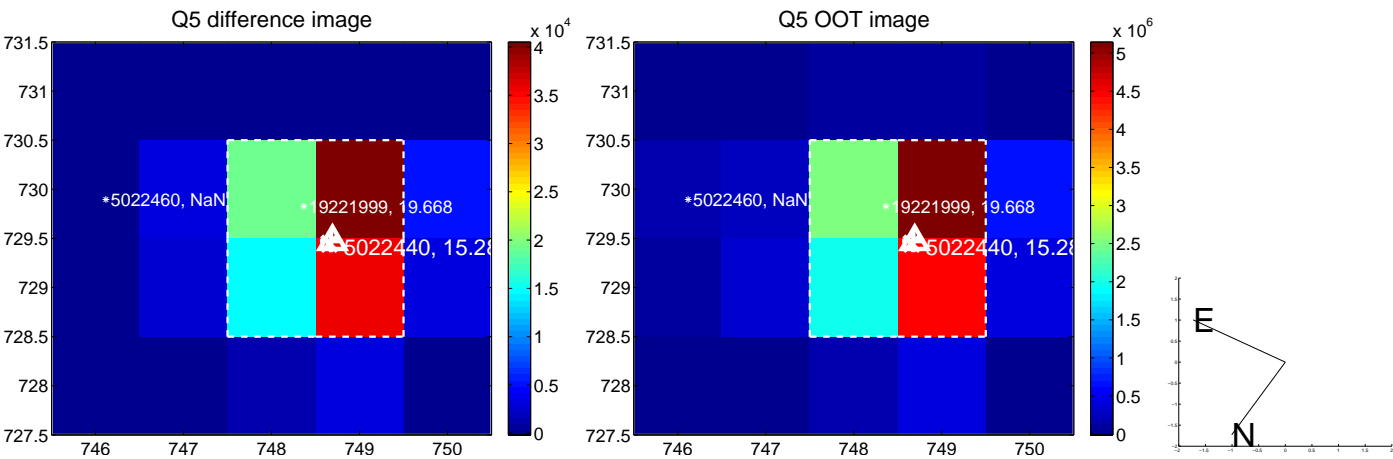


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses:** good quarterly centroid offsets; **Vermillion crosses:** bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

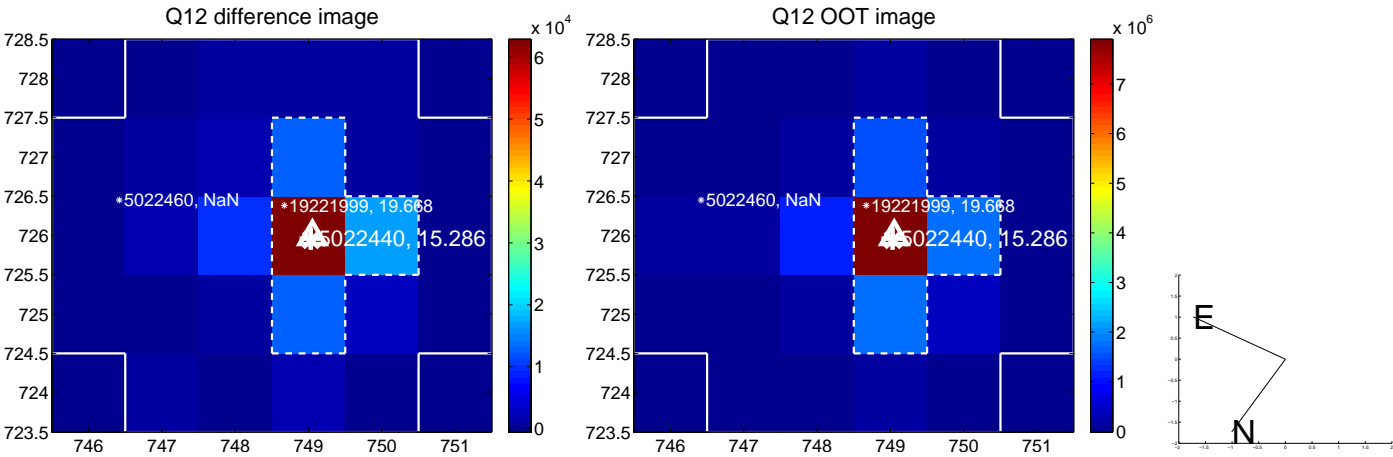
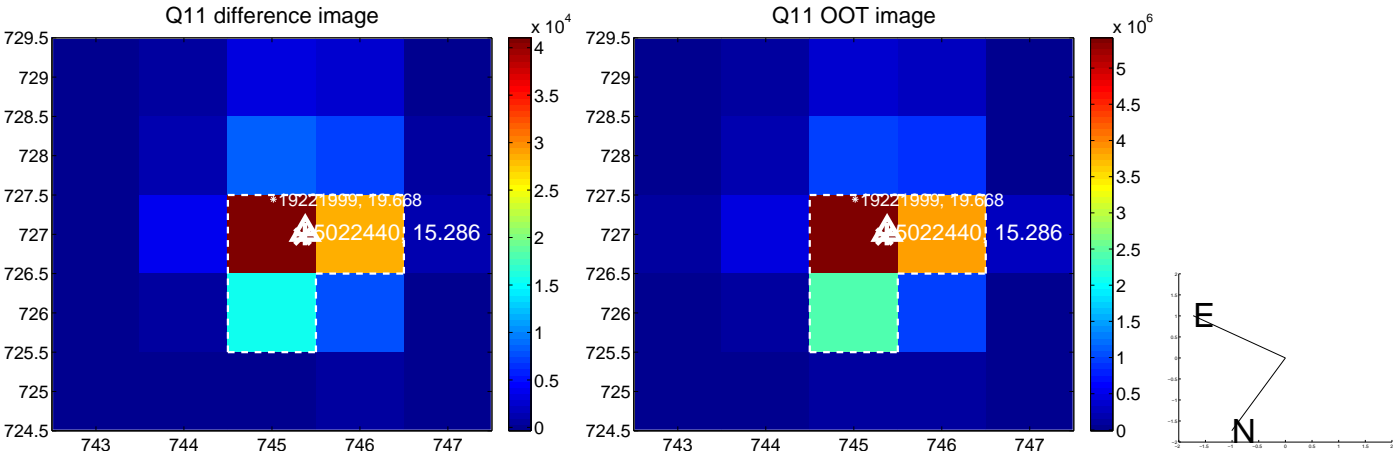
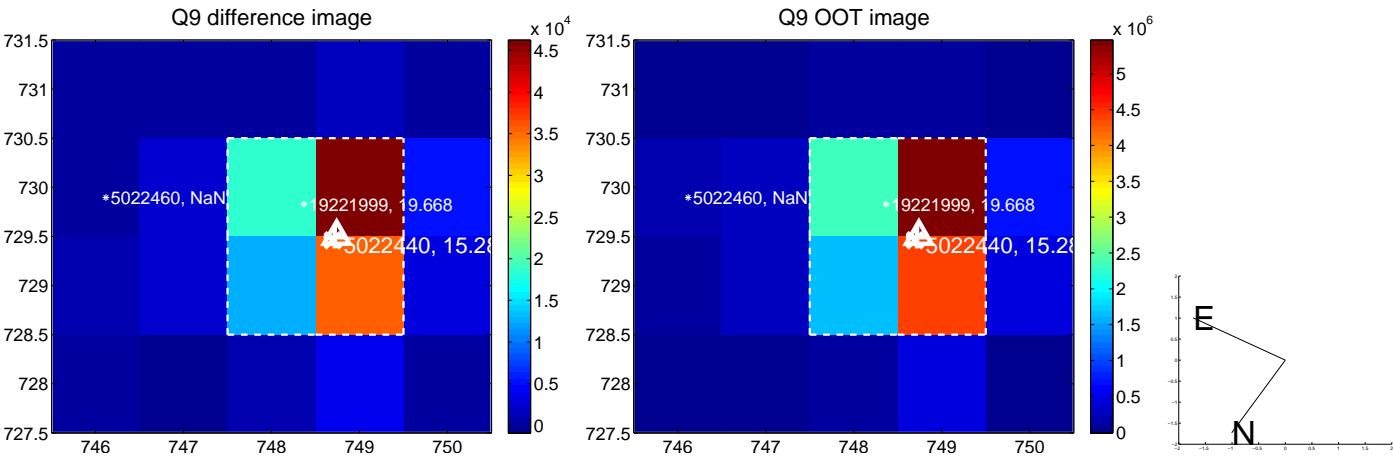


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

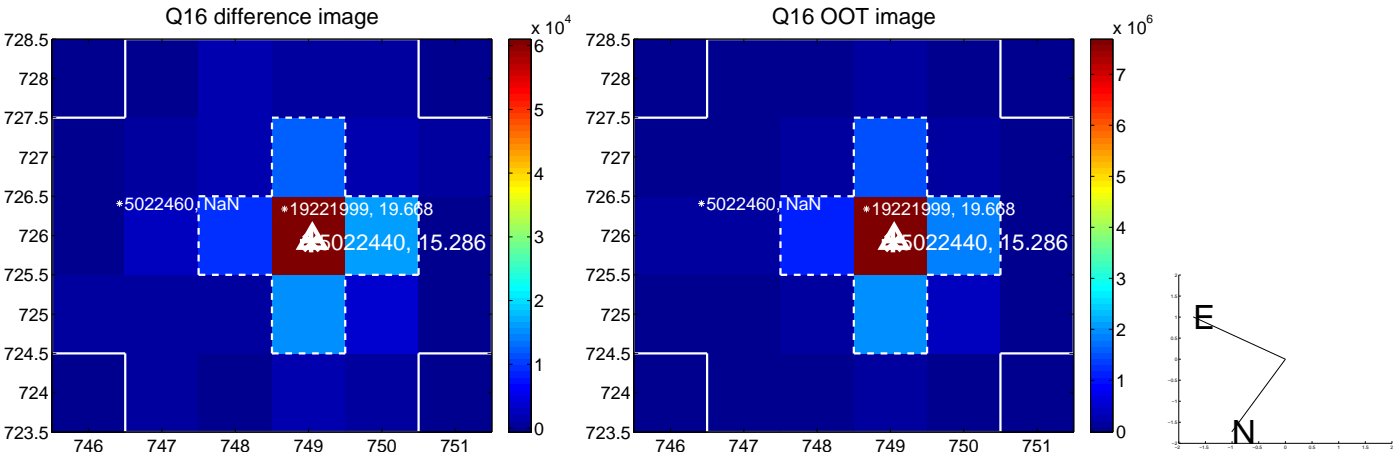
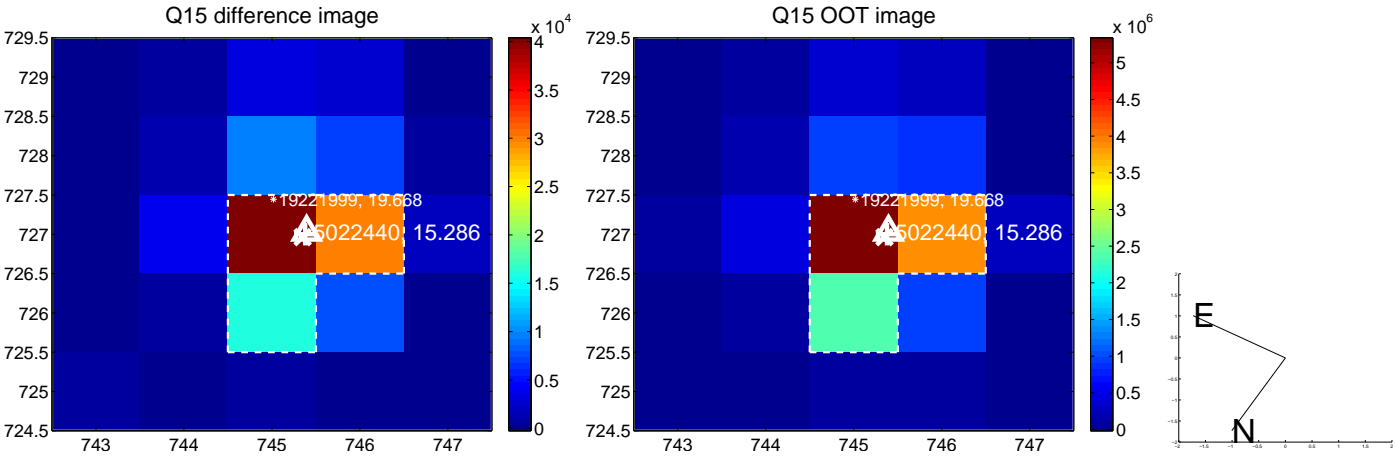
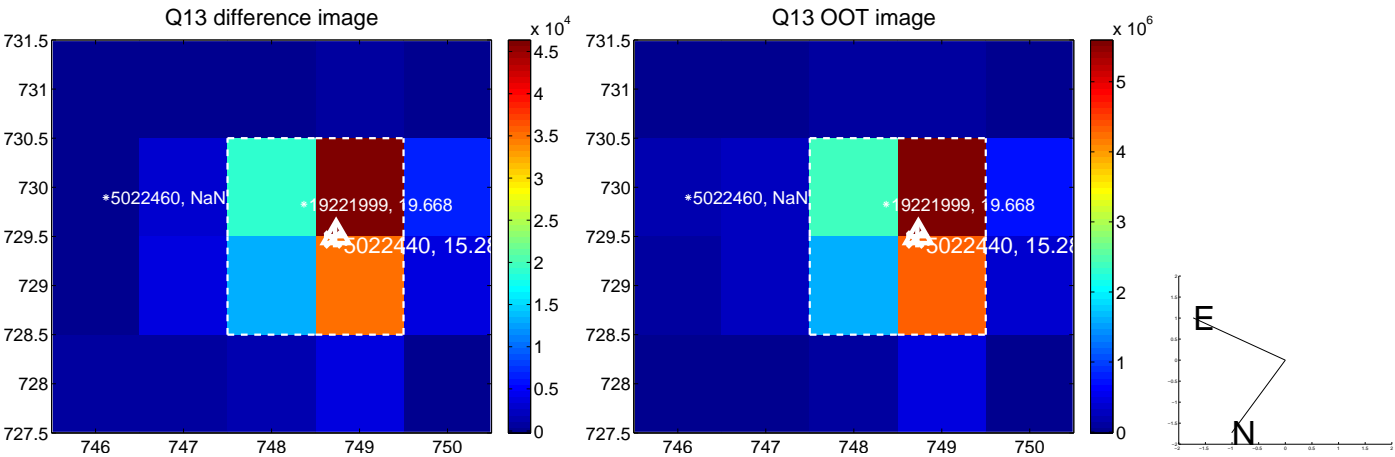




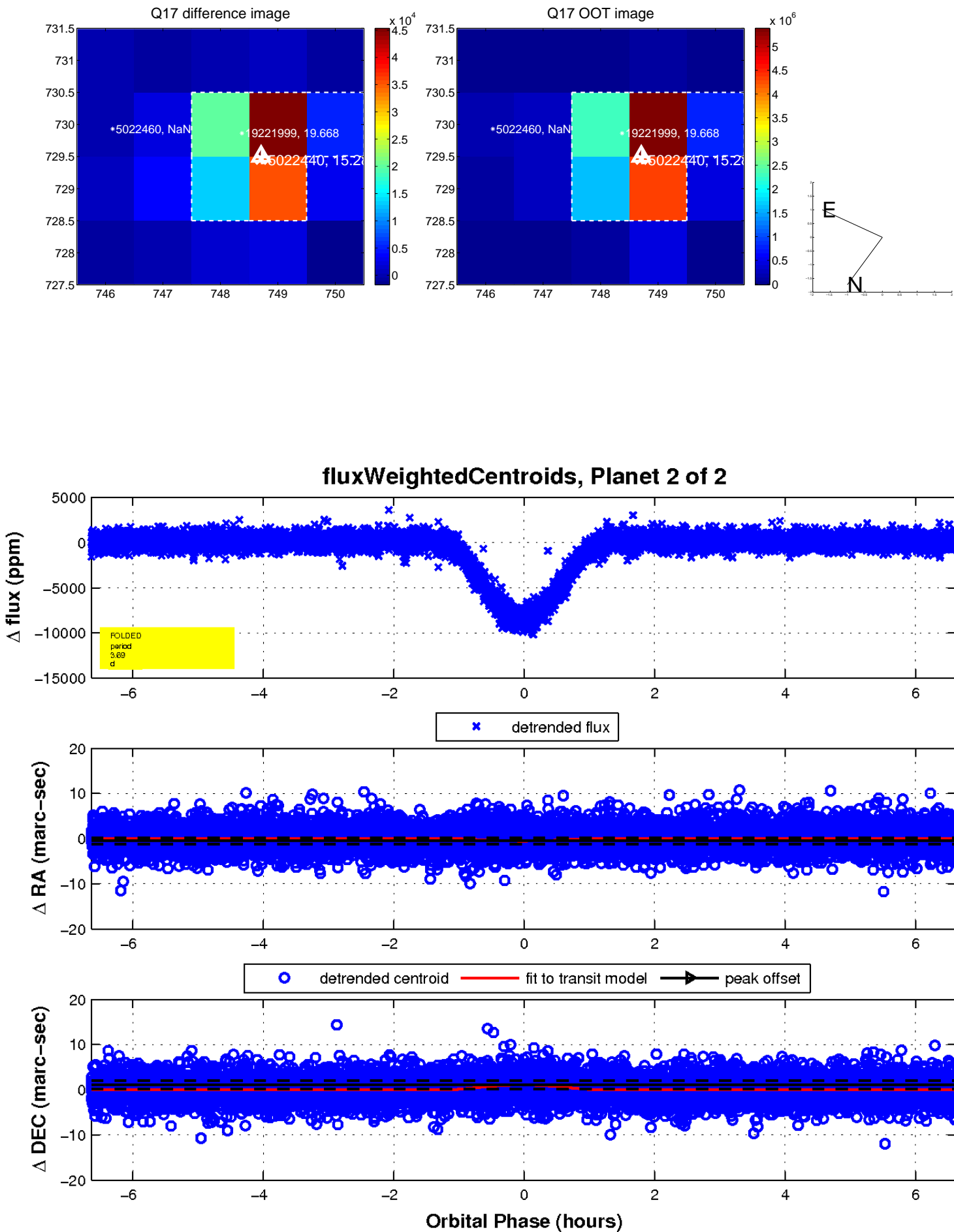
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UKIRT Image

Declination

