

KIC 004059416

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})
004059416-01	OBS	No	159.376808	243.479258	511.7	4.729	12.3	3.7	0.64	5313	1.60	1.21
004059416-02	OBS	No	523.568705	532.060014	2373.7	8.987	15.7	6.9	0.64	5313	3.21	0.25
004059416-03	OBS	No	399.335524	211.086788	1595.5	3.437	12.2	7.7	0.64	5313	2.56	0.35
004059416-04	OBS	No	358.629412	363.319515	708.6	6.000	17.9	-1.0	0.64	5313	1.70	0.41

Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
004059416-01	OBS	FP	0.00	1	0	0	0	MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_KIC_POS
004059416-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_KIC_POS
004059416-03	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
004059416-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES—LPP_DV—CENT_NOFITS

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

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

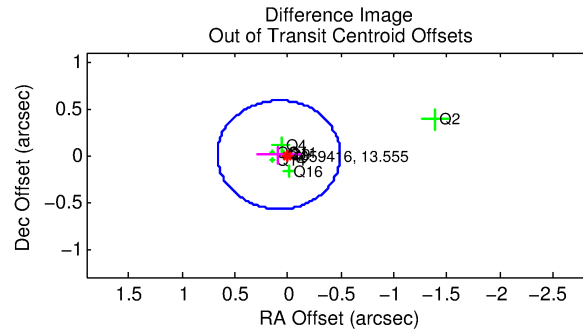
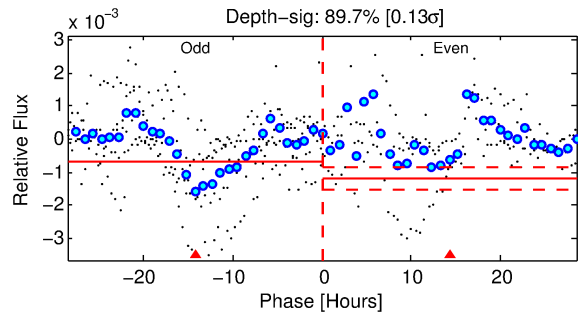
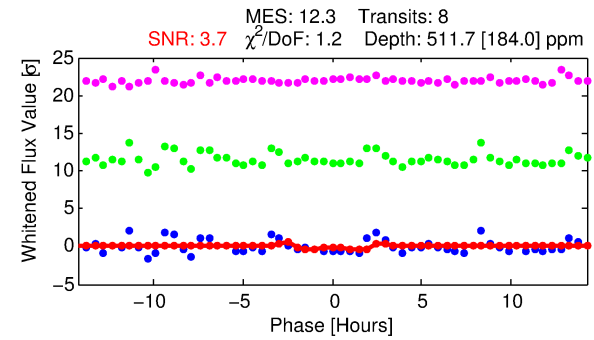
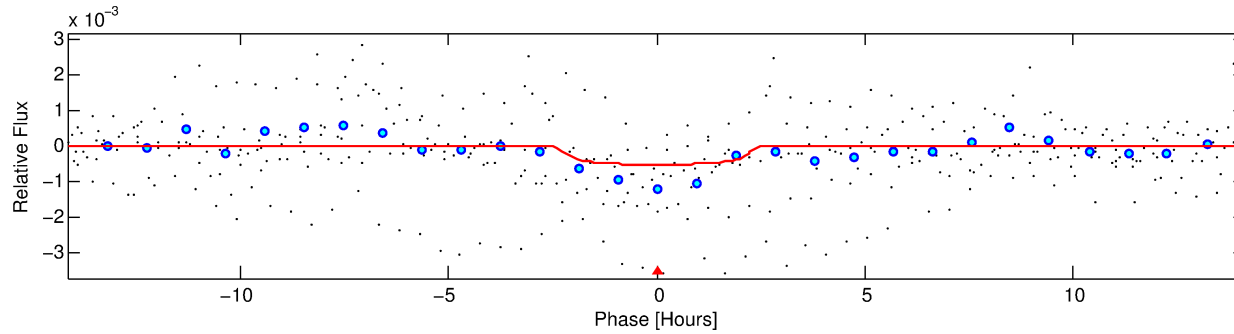
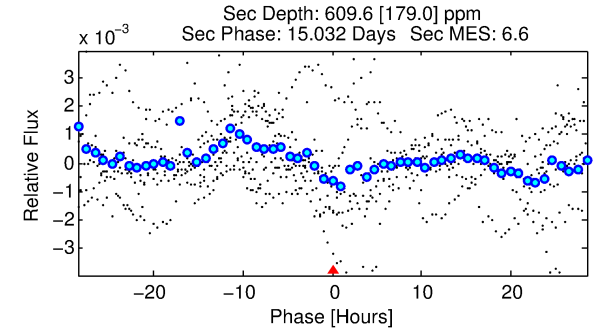
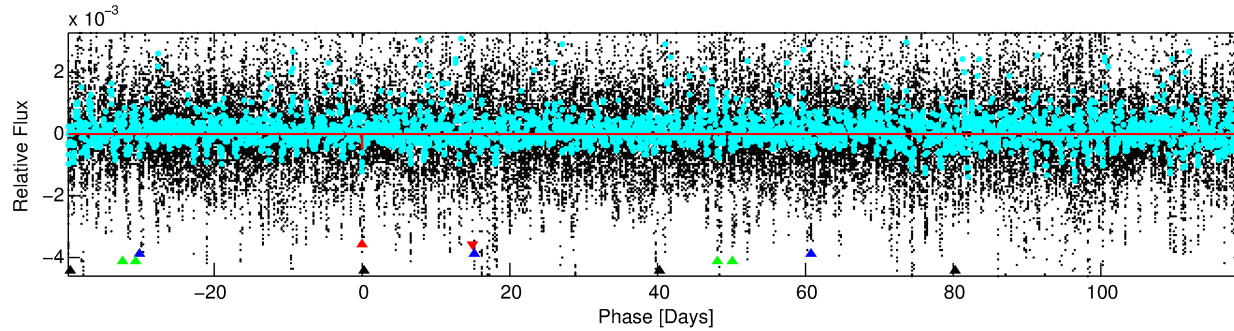
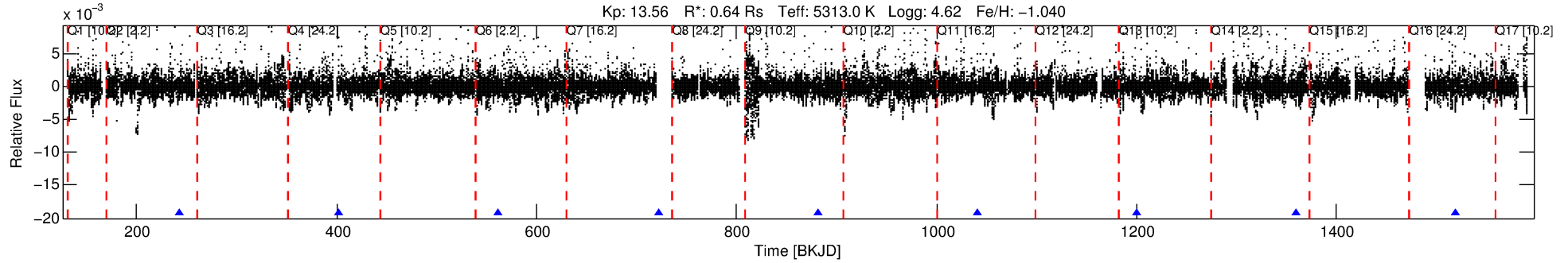
See http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col for comment definitions.

Ephemeris Match Information For 004059416-01

No Significant Match Found

DV One-Page Summary

KIC: 4059416 Candidate: 1 of 4 Period: 159.377 d



DV Fit Results:

Period = 159.37681 [0.00200] d
Epoch = 243.4793 [0.0101] BKJD
Rp/R* = 0.0228 [0.0157]
a/R* = 169.75 [492.13]
b = 0.78 [1.46]
Seff = 1.21 [0.21]
Teq = 267 [11] K
Rp = 1.60 [1.11] Re
a = 0.4936 [0.0373] AU
Ag = 32054.01 [45381.77] [0.71σ]
Teffp = 5530 [1959] K [2.69σ]

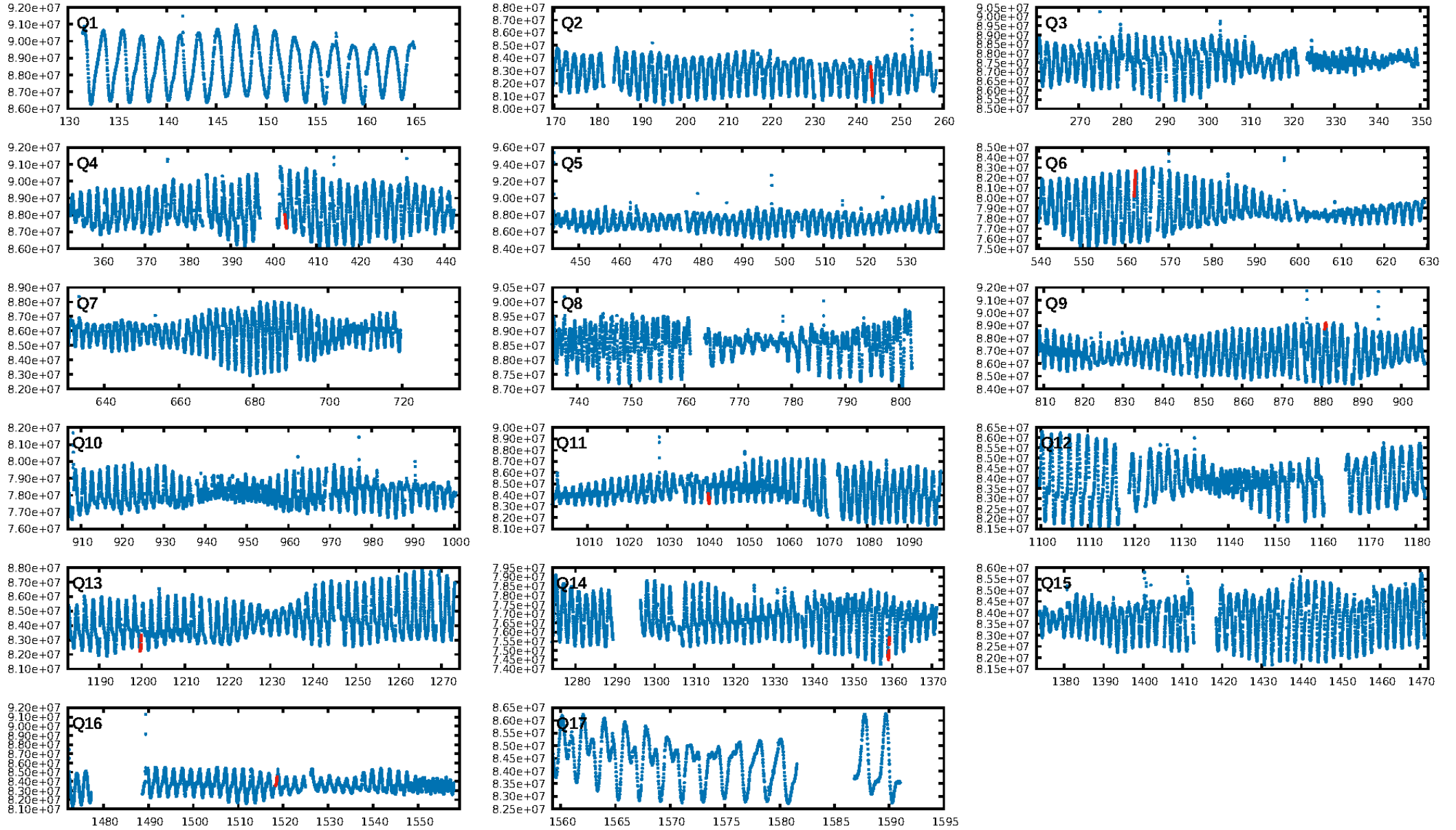
DV Diagnostic Results:

ShortPeriod-sig: N/A
LongPeriod-sig: 100.0% [625.94σ]
ModelChiSquare2-sig: 8.0%
ModelChiSquareGof-sig: 99.1%
Bootstrap-pfa: N/A
RollingBand-fgt: 1.00 [8/8]
GhostDiagnostic-chr: 1.011
Centroid-sig: 0.8%
Centroid-so: 1.262 arcsec [1.59σ]
OotOffset-rm: 0.084 arcsec [0.43σ]
OotOffset-st: 3/1/2/1 [7]
KicOffset-rm: 0.324 arcsec [3.82σ]
KicOffset-st: 3/1/2/1 [7]
DiffImageQuality-fgm: 0.57 [4/7]
DiffImageOverlap-fno: 1.00 [7/7]

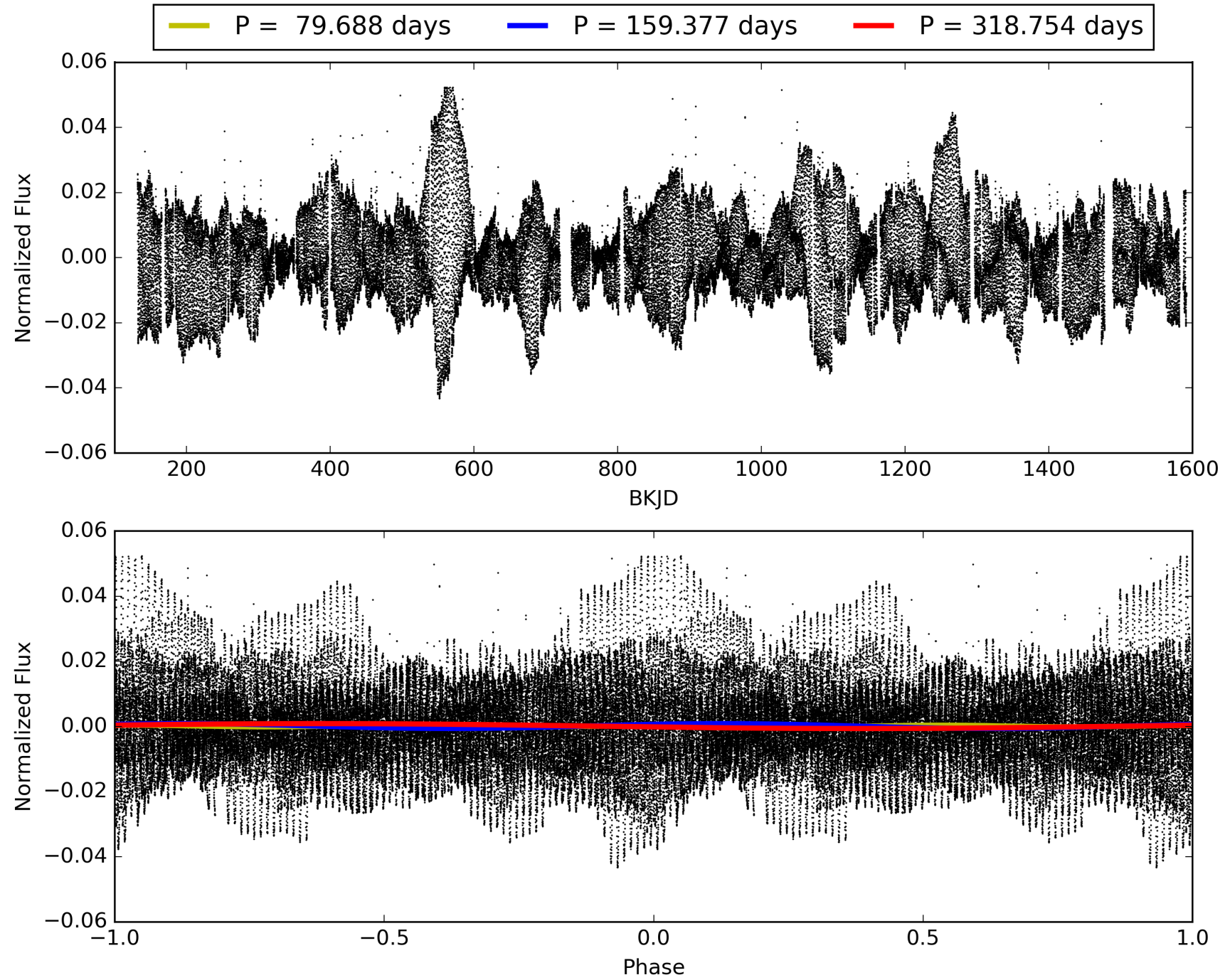
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 01-Feb-2016 05:41:29 Z

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

TCE 004059416-01, PDC Light Curves

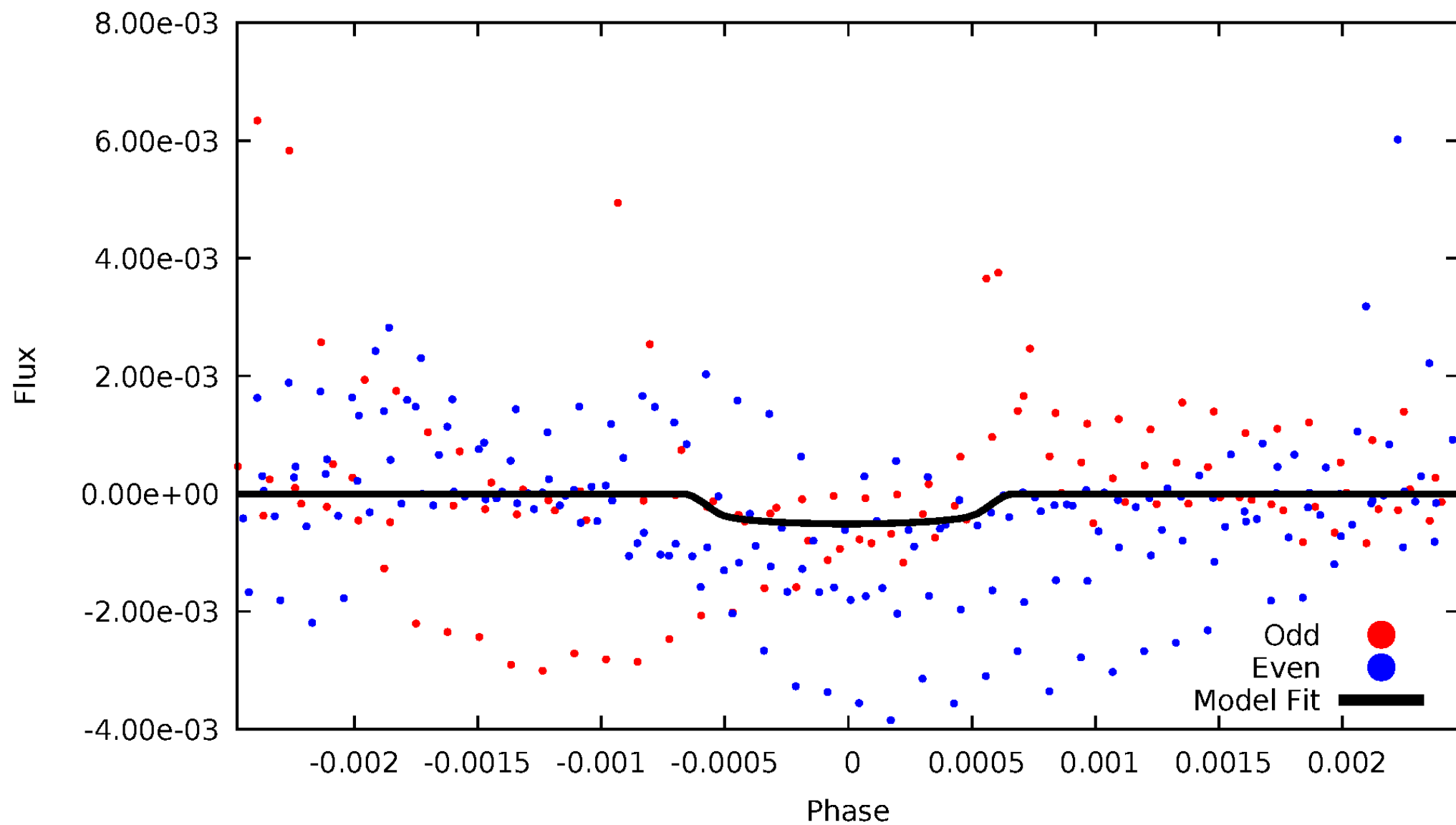


TCE 004059416-01



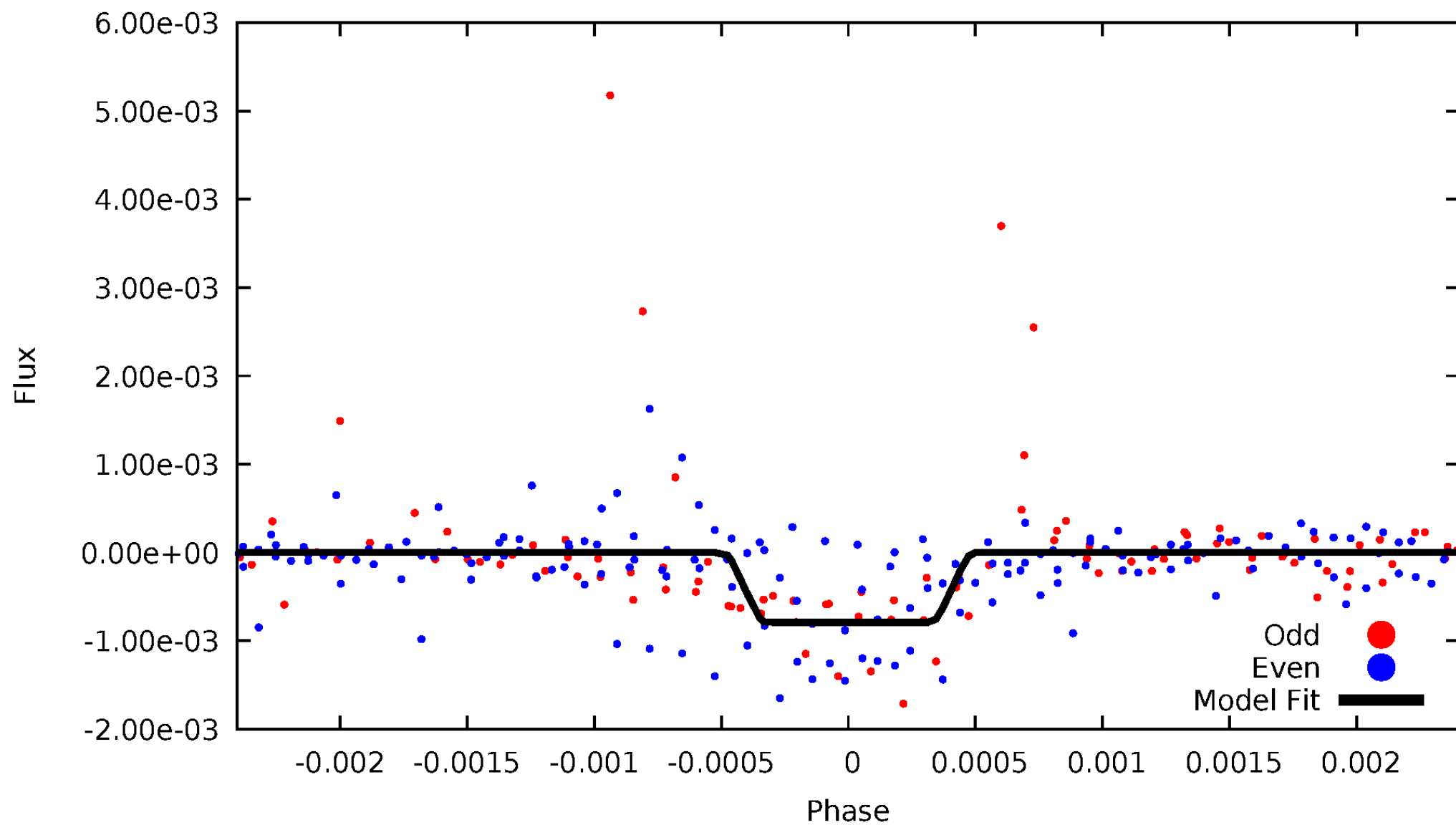
DV Odd/Even

TCE 004059416-01



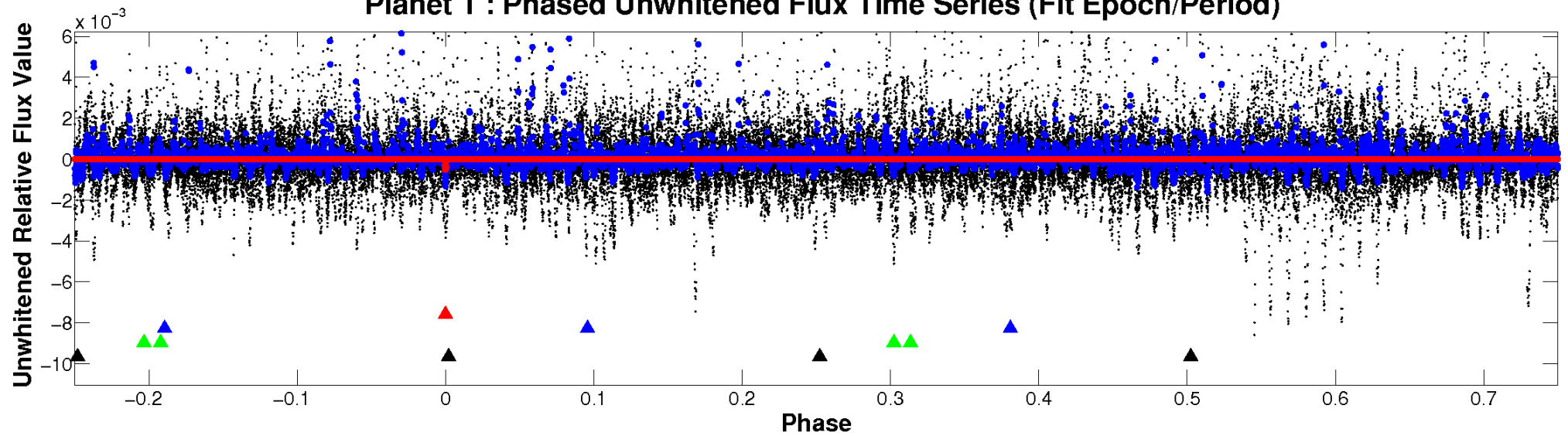
ALT Odd/Even

TCE 004059416-01

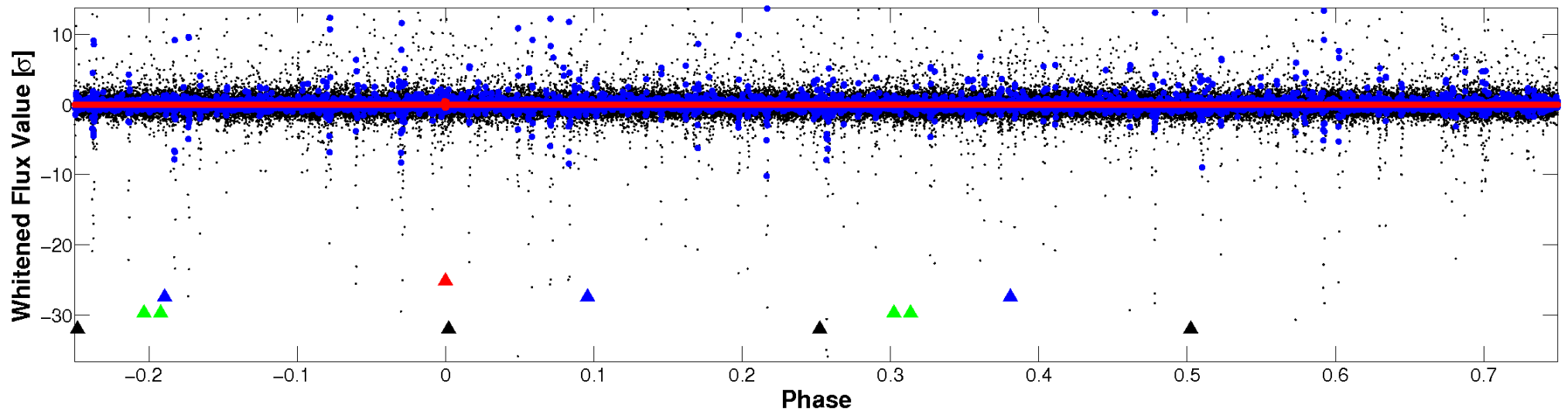


Non-Whitened Vs. Whitened Light Curve

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

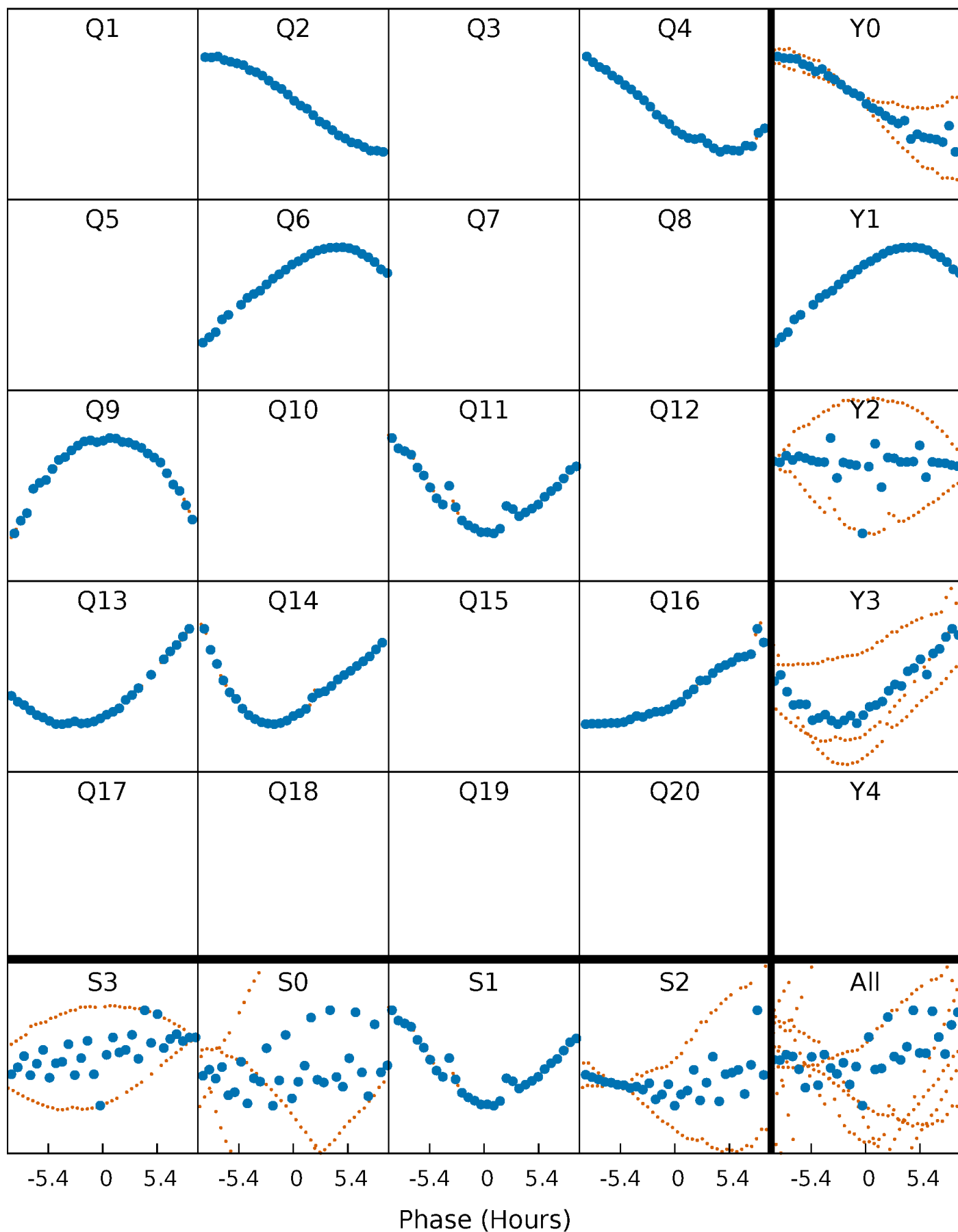


Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)



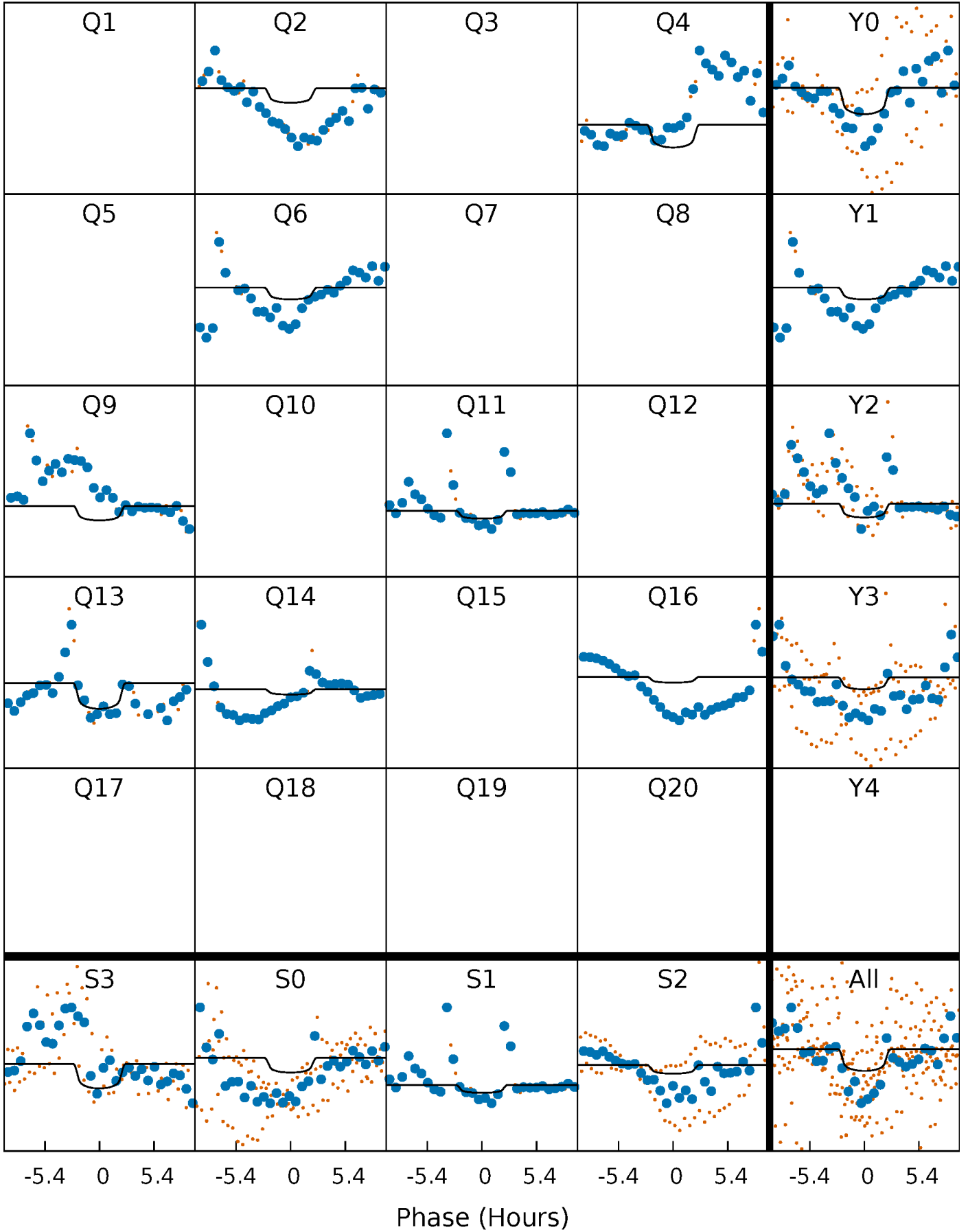
PDC Quarter-Phased Transit Curves

TCE 004059416-01 P=159.376808 Days $T_0=243.479258$ (BKJD)



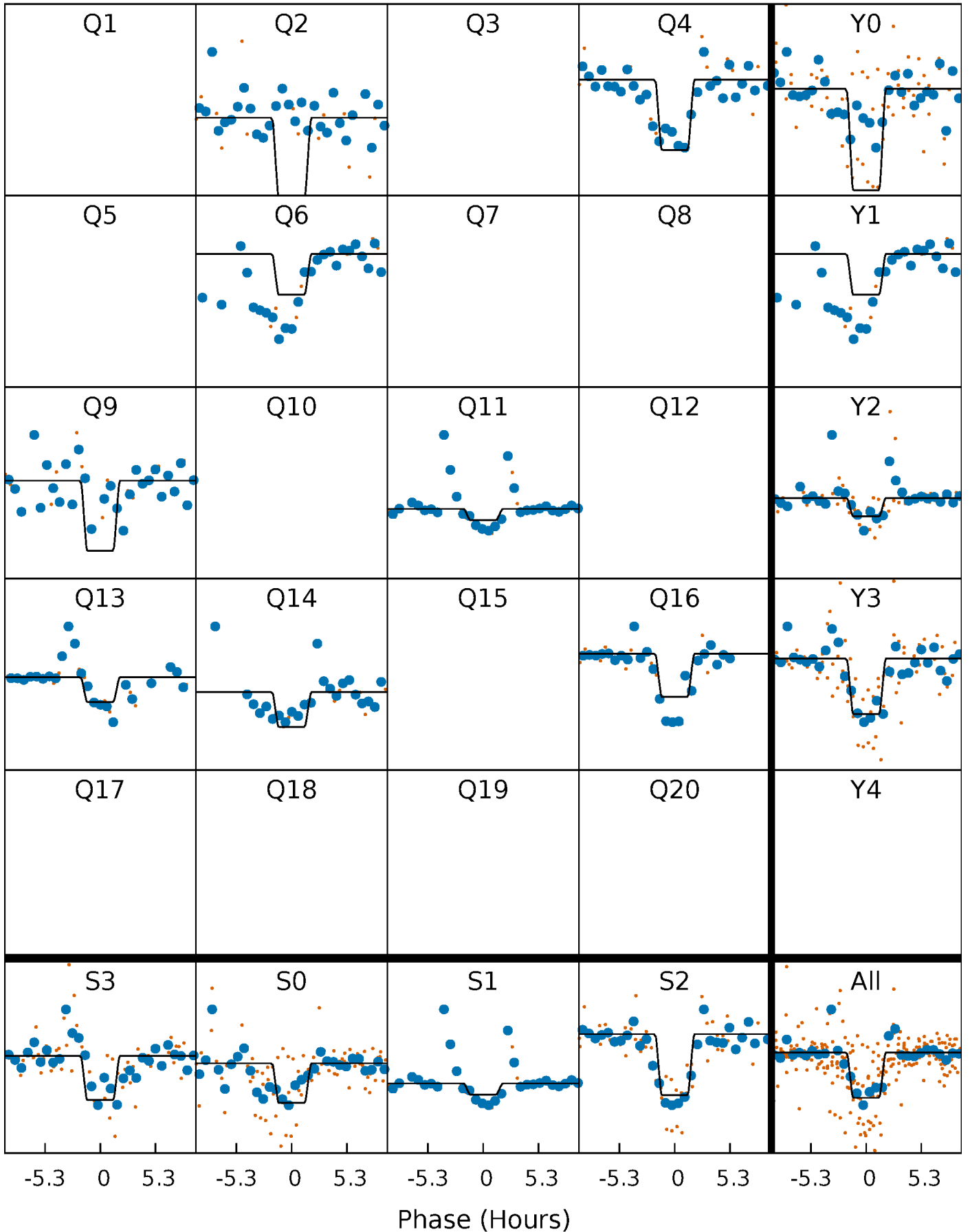
DV Quarter-Phased Transit Curves

TCE 004059416-01 P=159.376808 Days $T_0=243.479258$ (BKJD)



Alt. Detrend Quarter-Phased Transit Curves

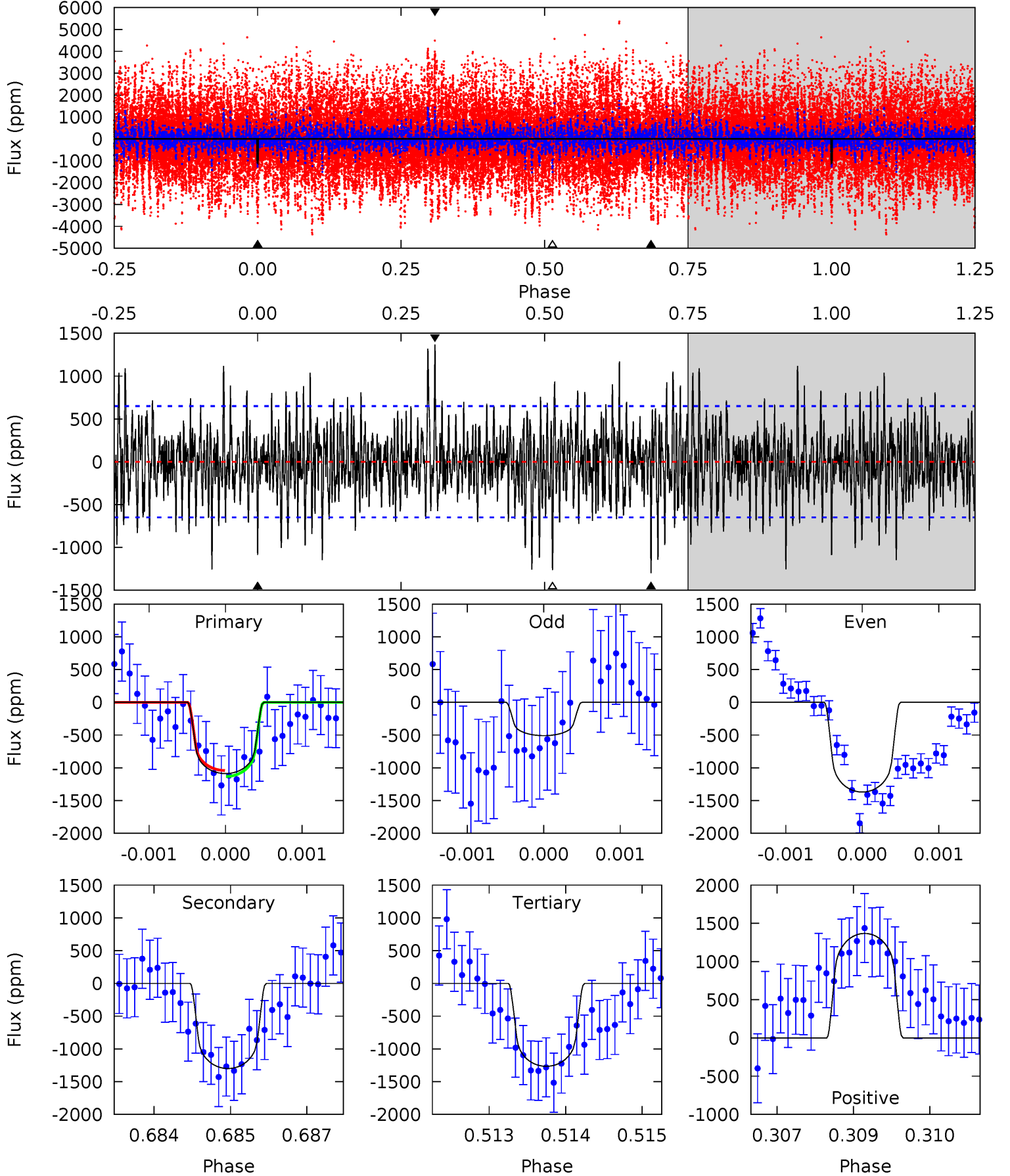
TCE 004059416-01 P=159.375905 Days $T_0=243.484643$ (BKJD)



DV Model-Shift Uniqueness Test

004059416-01, P = 159.376808 Days, E = 84.102450 Days

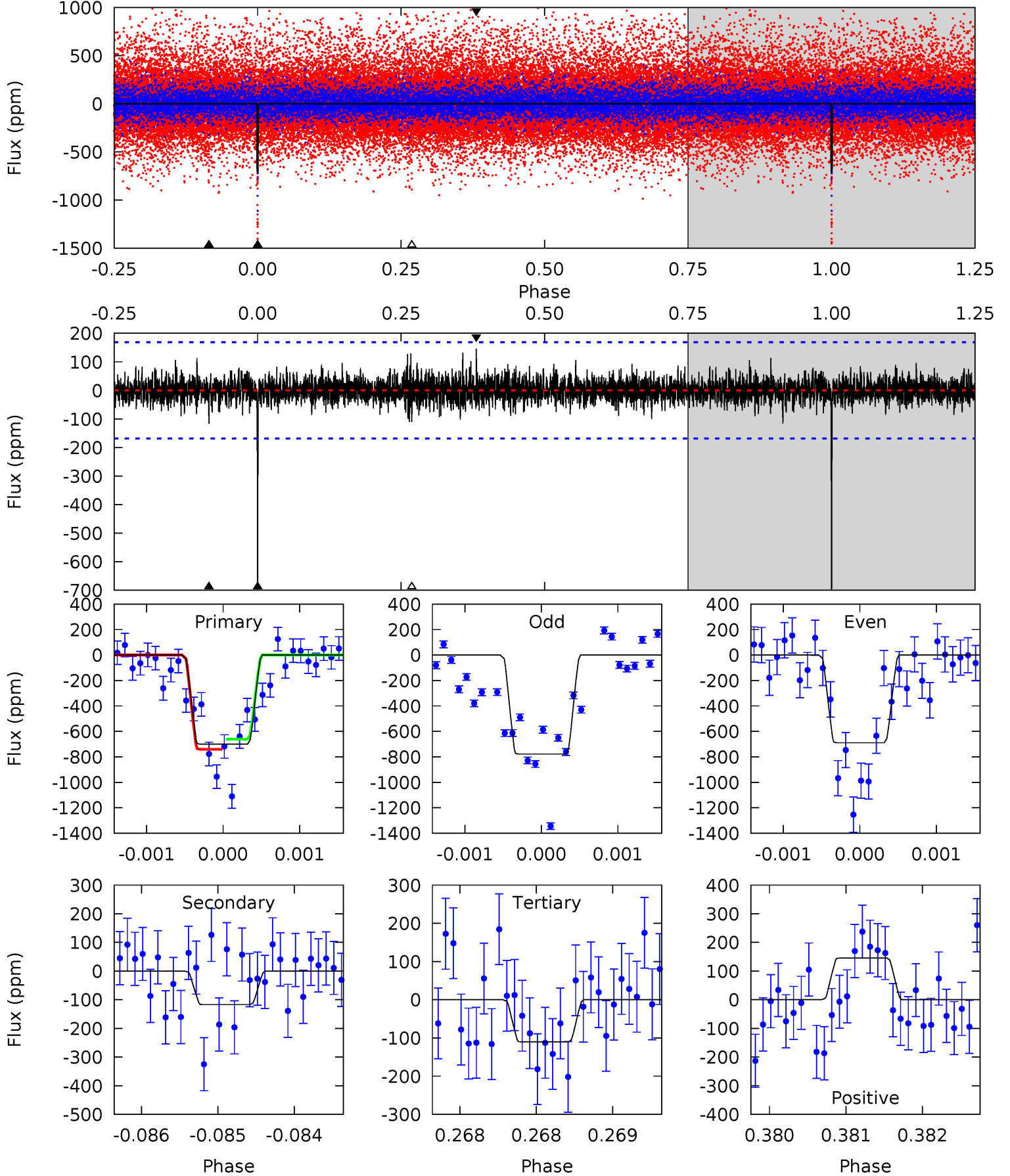
Pri	Sec	Ter	Pos	FA ₁	FA ₂	F _{Red}	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
9.04	10.8	10.5	11.4	5.40	3.20	2.88	-1.48	-2.32	0.28	-0.56	3.50	1.31	0.51	0.38



Alt Model-Shift Uniqueness Test

004059416-01, P = 159.375905 Days, E = 84.108738 Days

Pri	Sec	Ter	Pos	FA ₁	FA ₂	F _{Red}	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
22.7	3.78	3.57	4.71	5.46	3.30	0.96	19.1	18.0	0.21	-0.94	1.43	0.93	0.17	1.28



Stellar Parameters For KIC 004059416

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	R (R_{\odot})	$M(M_{\odot})$	p_{\star} ($\text{g}\cdot\text{cm}^{-3}$)
	5313^{+166}_{-166}	$4.623^{+0.066}_{-0.048}$	$-1.040^{+0.300}_{-0.300}$	$0.642^{+0.054}_{-0.049}$	$0.630^{+0.059}_{-0.023}$	$3.354^{+0.856}_{-0.569}$
	+3%/-3%	+1%/-1%	+29%/-29%	+8%/-8%	+9%/-4%	+26%/-17%
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 004059416-01 / KOI

Detrend	Depth (ppm)	R_p (R_{\oplus})	T_{max} (K)	T_{obs} (K)	A_{obs}
DV	-1300 ± 120	$1.71^{+1.03}_{-0.94}$	373^{+15}_{-14}	6342^{+4097}_{-1223}	$60455^{+236732}_{-36907}$
Alt.	-117 ± 31	$2.00^{+1.02}_{-0.97}$	372^{+13}_{-15}	3633^{+1057}_{-450}	3805^{+11614}_{-2208}

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

DV Centroid Data

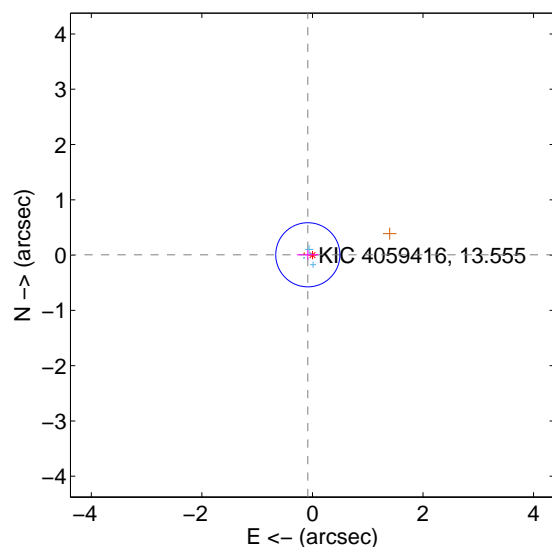
Supplemental centroid analysis for 004059416-01. Kepler magnitude: 13.55. Transit SNR 3.67

There are 4 quarters with good PRF difference image offsets

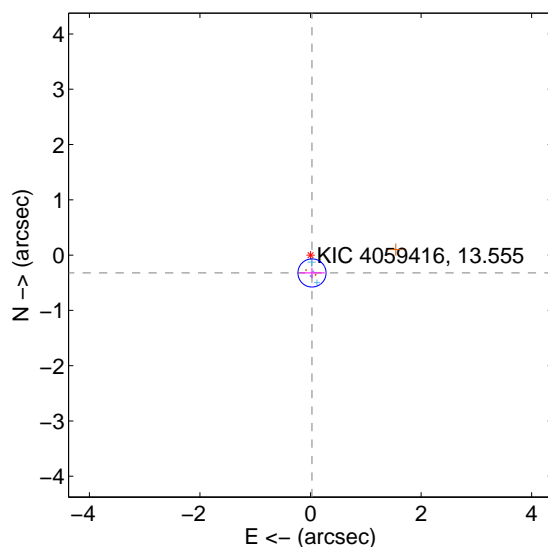
The direct PRF centroid is offset from the target star catalog position by about 0.34 arcsec

	Distance in arcsec	Distance / σ	Δ RA	Δ Dec
PRF-fit source offset from OOT	0.084 ± 0.193	0.43	0.084 ± 0.197	0.006 ± 0.088
PRF-fit source offset from KIC position	0.324 ± 0.085	3.82	-0.027 ± 0.231	-0.323 ± 0.094
photometric centroid source offset	1.26 ± 0.80	1.59	-0.79 ± 0.83	0.98 ± 0.77

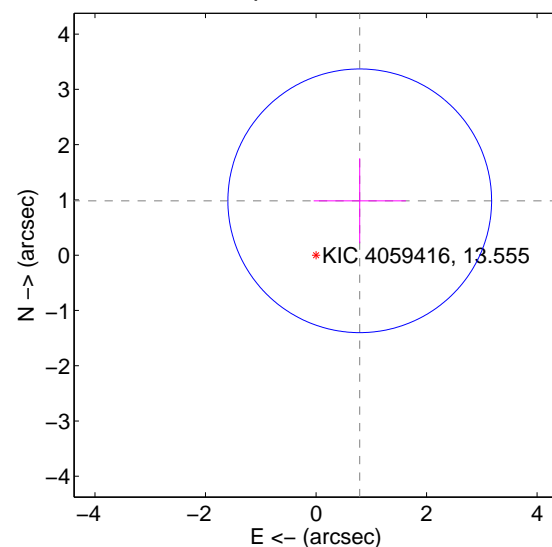
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position

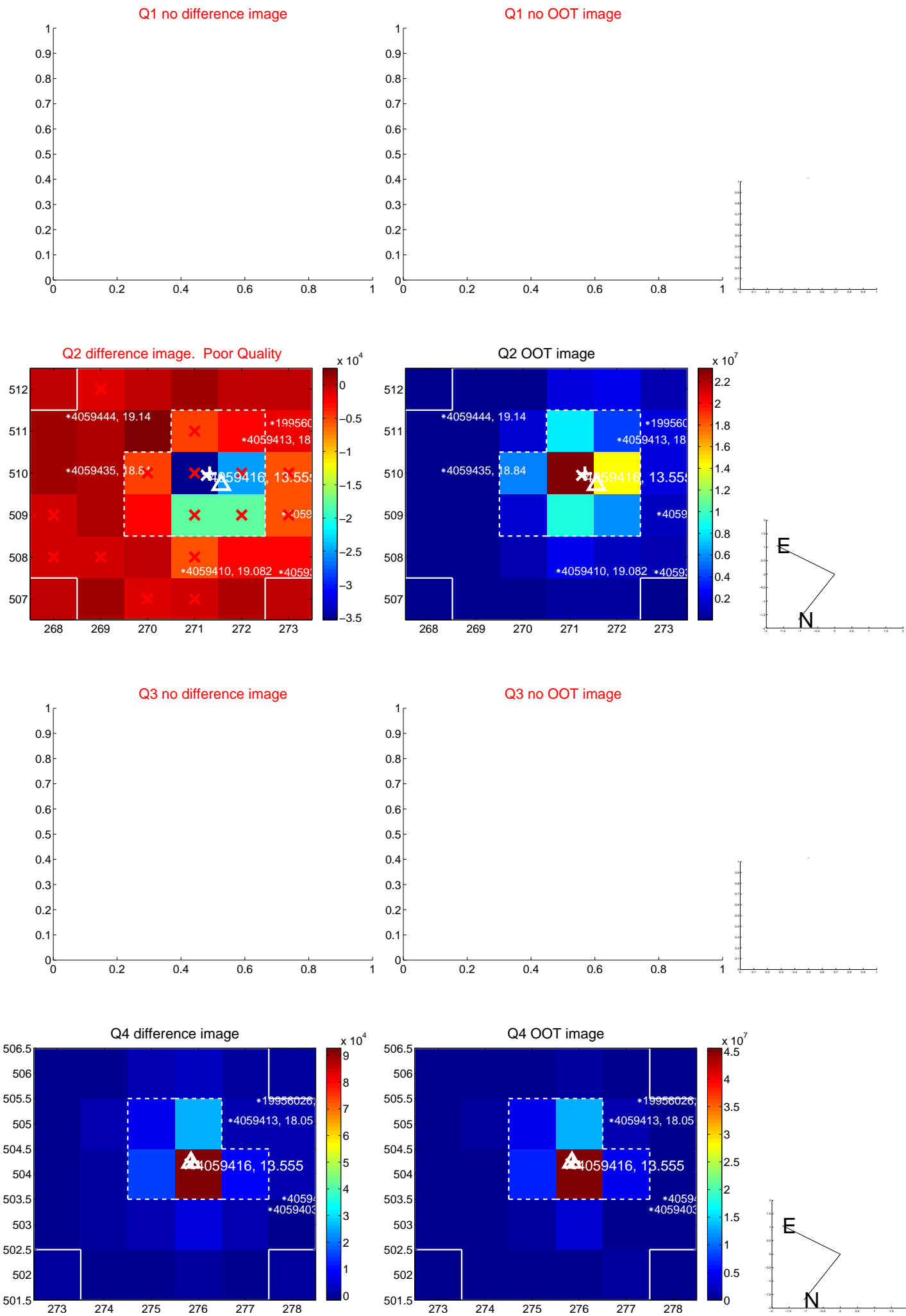


offset from photometric centroids

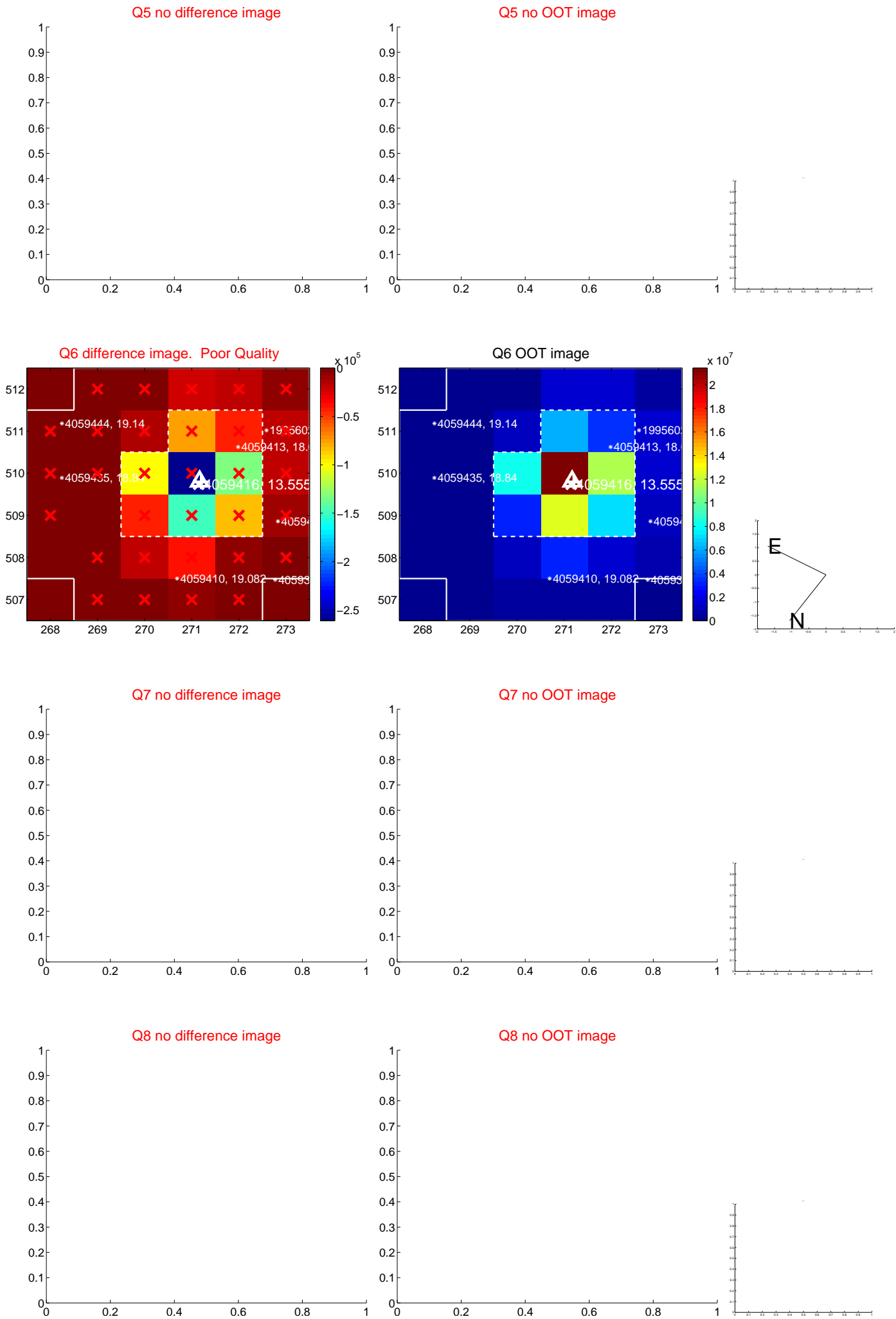


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets**; magenta cross: average over quarters. Length of the crosses: one- σ uncertainty. Blue circle: three-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

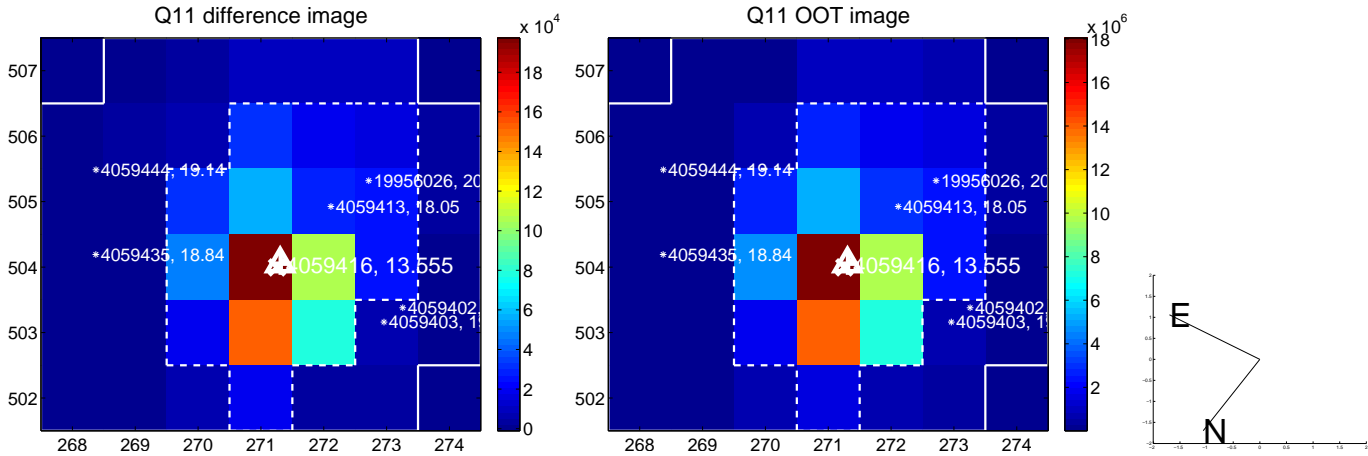
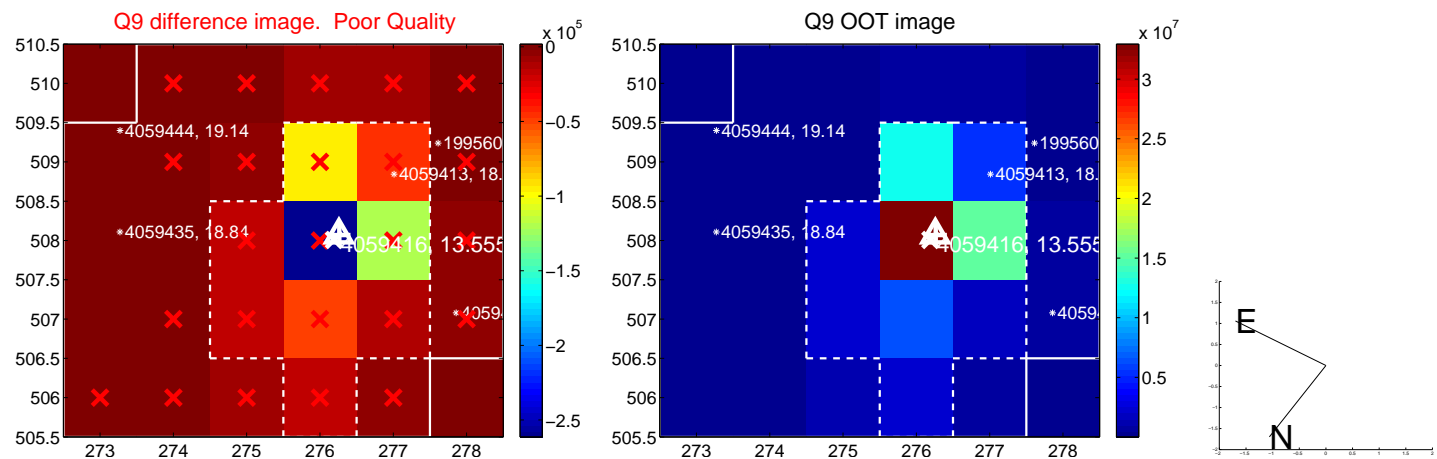
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



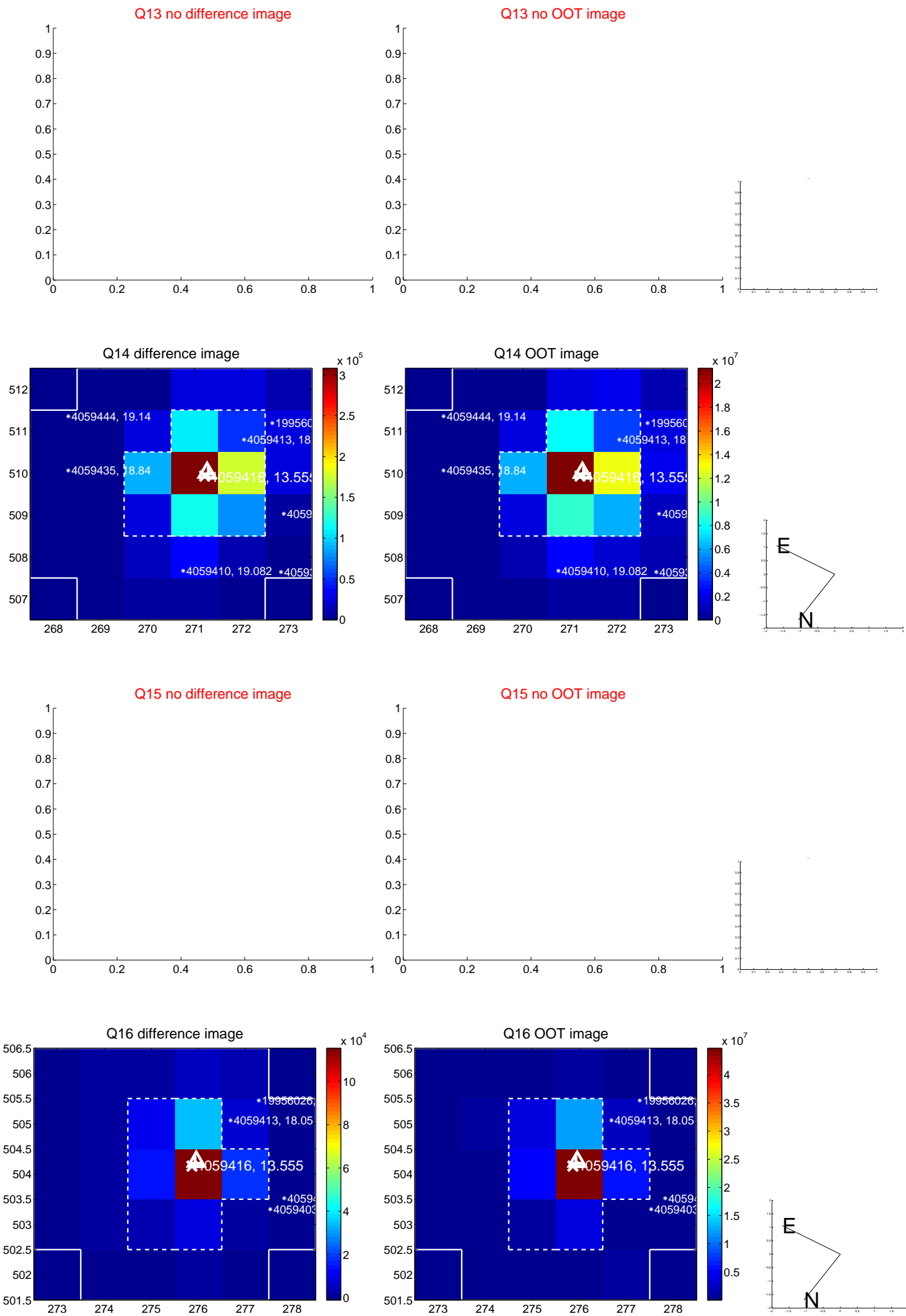
white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



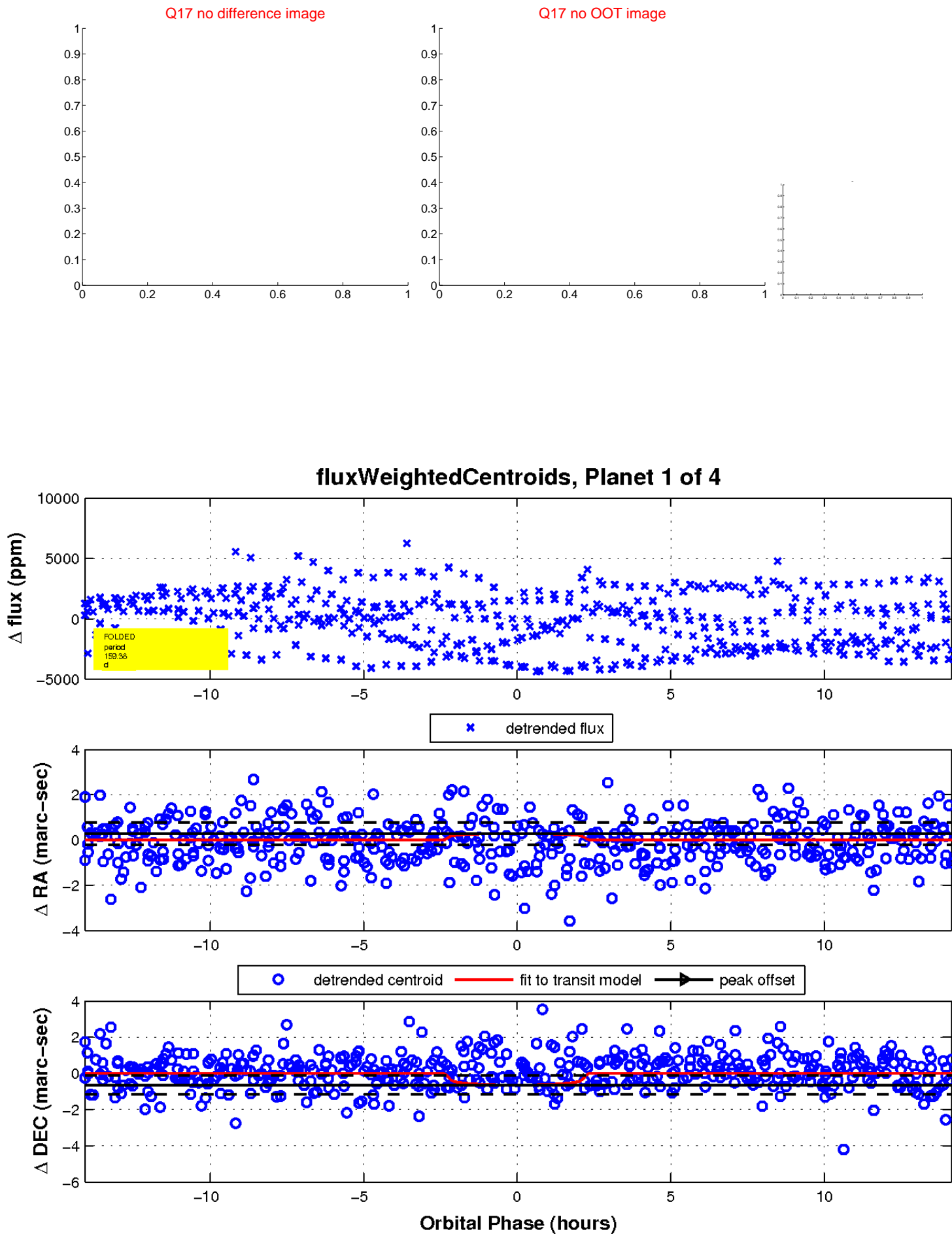
white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



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

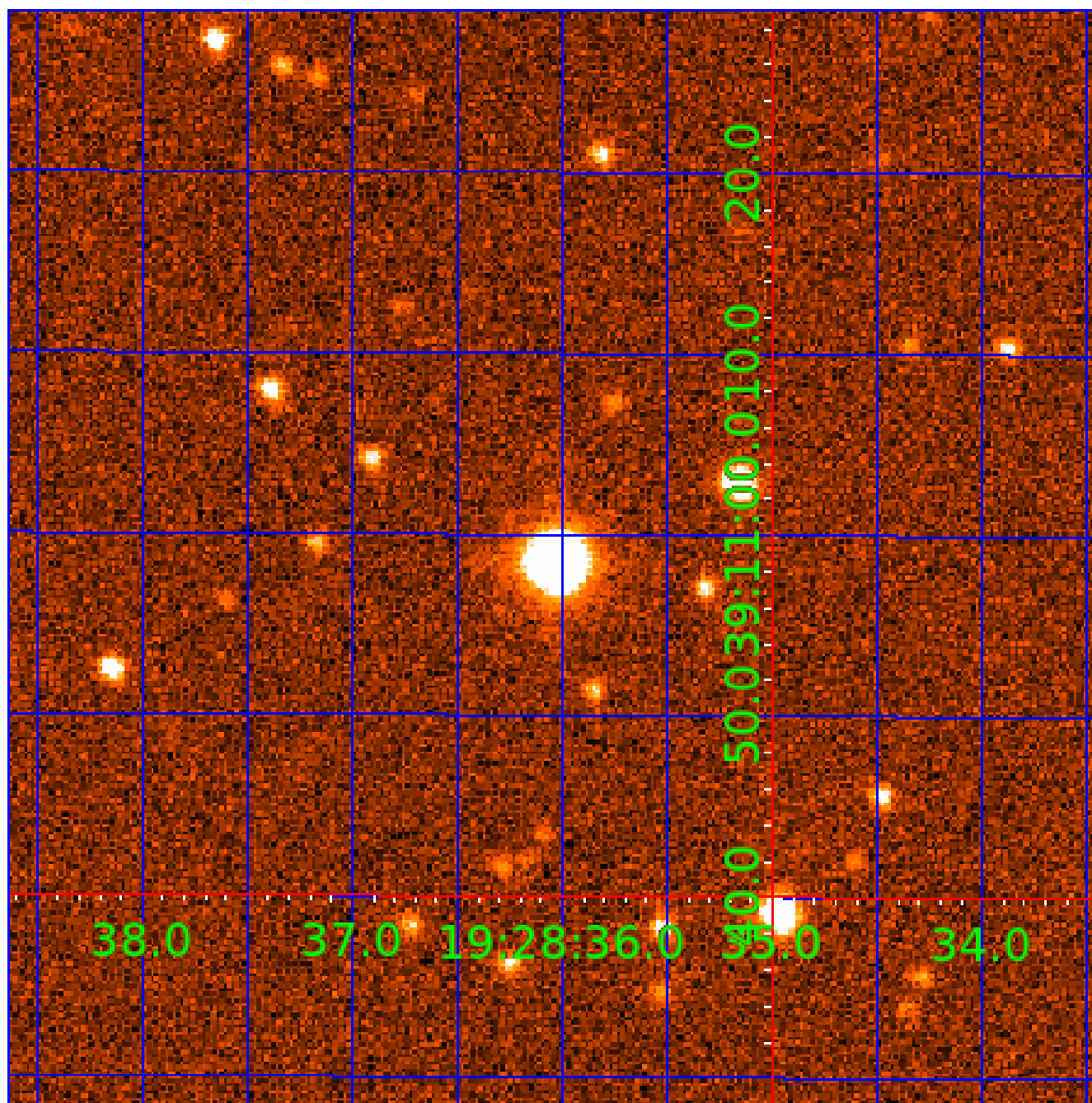


white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



UKIRT Image

Declination



KIC 004059416

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})
004059416-01	OBS	No	159.376808	243.479258	511.7	4.729	12.3	3.7	0.64	5313	1.60	1.21
004059416-02	OBS	No	523.568705	532.060014	2373.7	8.987	15.7	6.9	0.64	5313	3.21	0.25
004059416-03	OBS	No	399.335524	211.086788	1595.5	3.437	12.2	7.7	0.64	5313	2.56	0.35
004059416-04	OBS	No	358.629412	363.319515	708.6	6.000	17.9	-1.0	0.64	5313	1.70	0.41

Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
004059416-01	OBS	FP	0.00	1	0	0	0	MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_KIC_POS
004059416-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_KIC_POS
004059416-03	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
004059416-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES—LPP_DV—CENT_NOFITS

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

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

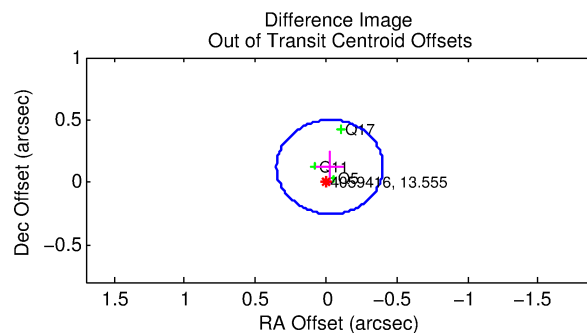
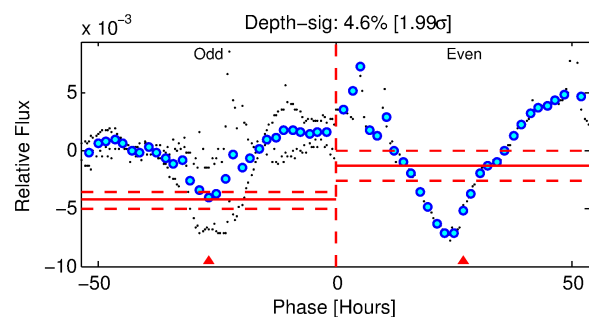
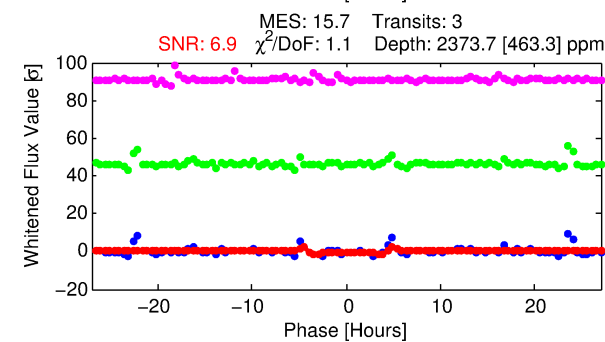
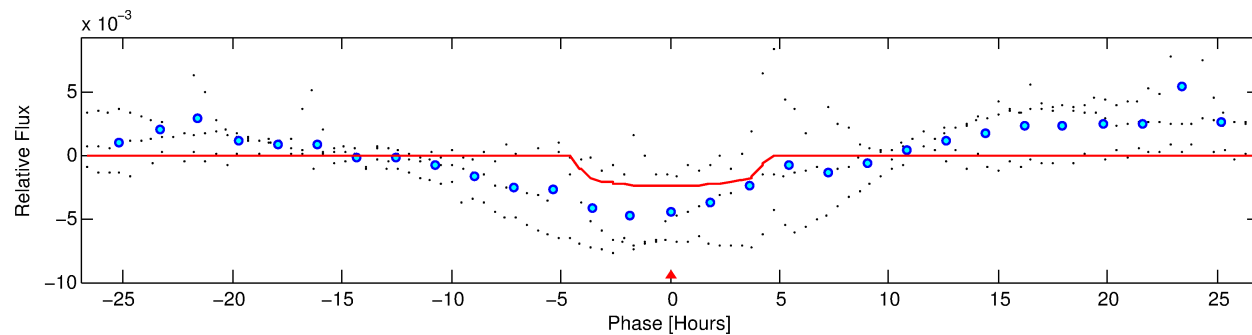
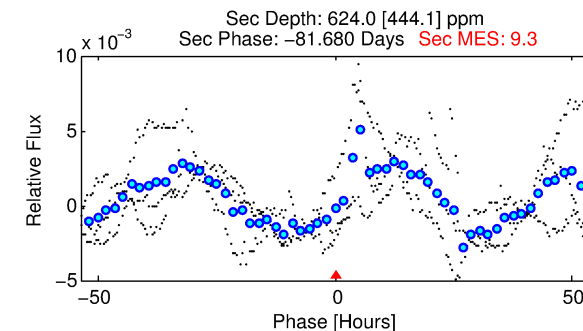
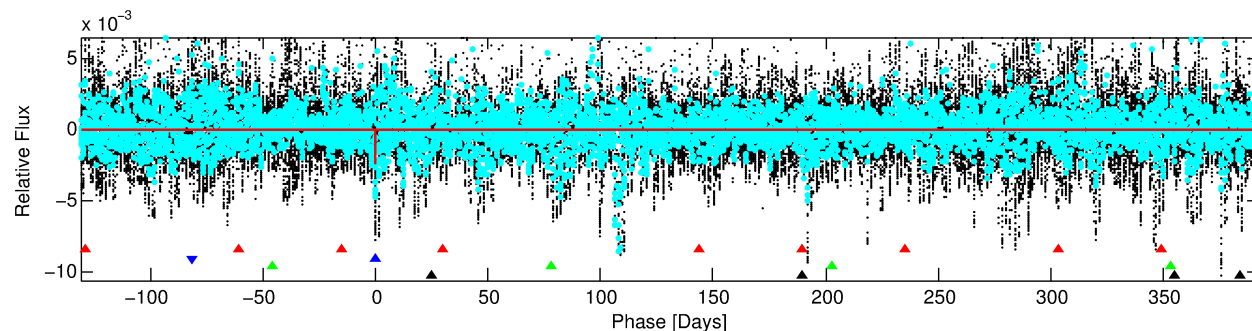
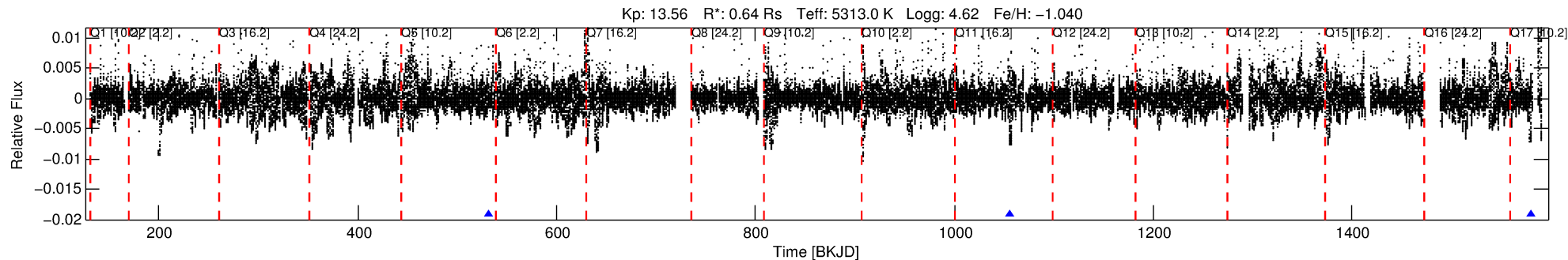
See http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col for comment definitions.

Ephemeris Match Information For 004059416-02

No Significant Match Found

DV One-Page Summary

KIC: 4059416 Candidate: 2 of 4 Period: 523.569 d



DV Fit Results:

Period = 523.56871 [0.00421] d
Epoch = 532.0600 [0.0071] BKJD
Rp/R* = 0.0458 [0.0145]
a/R* = 404.17 [484.50]
b = 0.52 [1.69]
Seff = 0.25 [0.04]
Teq = 180 [8] K
Rp = 3.21 [1.05] Re
a = 1.0907 [0.0824] AU
Ag = 39615.46 [37974.16] [1.04σ]
Teffp = 3922 [941] K [3.98σ]

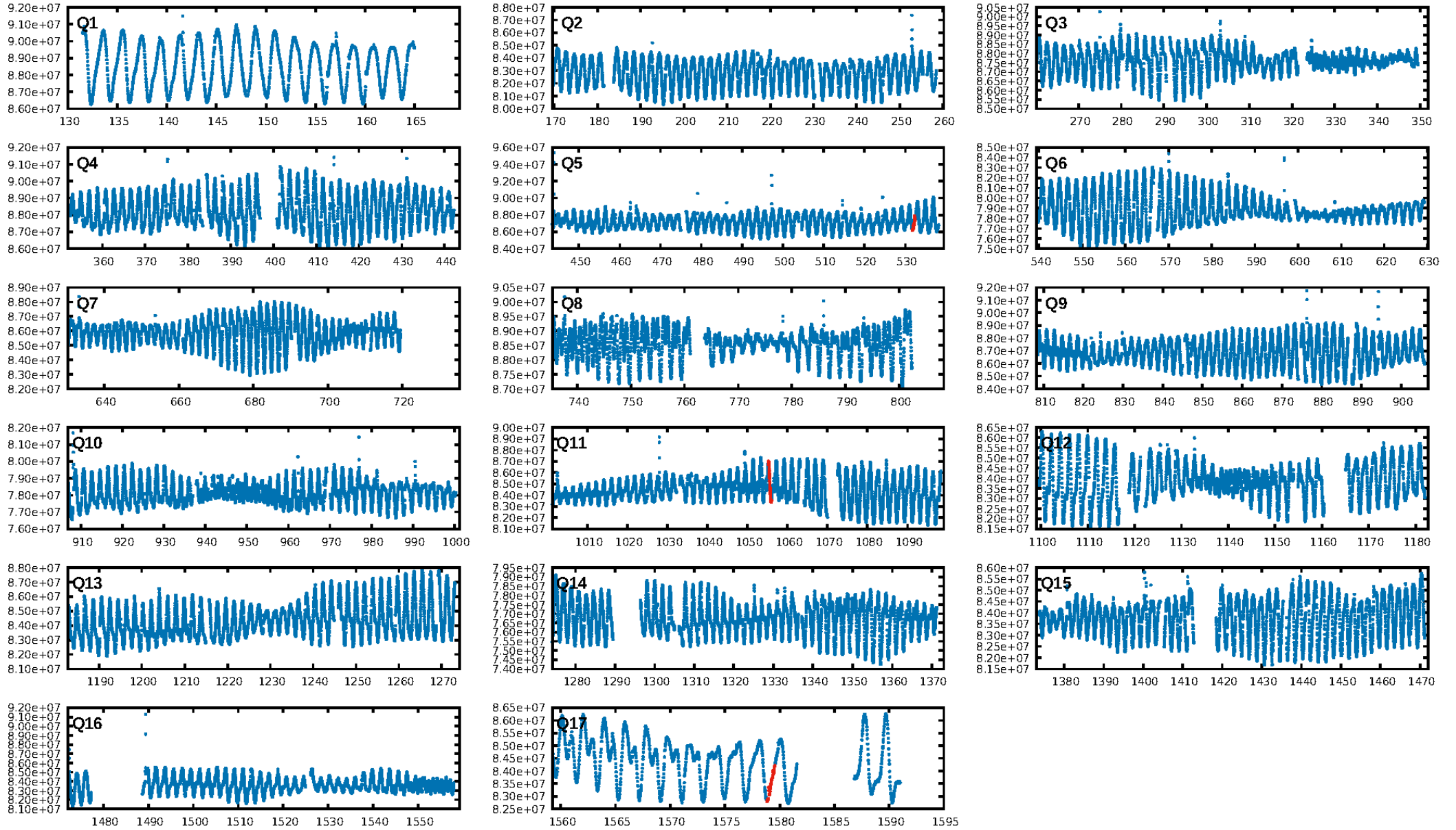
DV Diagnostic Results:

ShortPeriod-sig: 100.0% [309.86σ]
LongPeriod-sig: N/A
ModelChiSquare2-sig: 0.8%
ModelChiSquareGof-sig: 88.8%
Bootstrap-pfa: N/A
RollingBand-fgt: 1.00 [2/2]
GhostDiagnostic-chr: 1.916
Centroid-sig: 76.8%
Centroid-so: 0.303 arcsec [1.53σ]
OotOffset-rm: 0.124 arcsec [0.99σ]
KicOffset-rm: 0.294 arcsec [2.19σ]
OotOffset-st: 0/1/0/2 [3]
KicOffset-st: 0/1/0/2 [3]
DiffImageQuality-fgm: 1.00 [3/3]
DiffImageOverlap-fno: 1.00 [3/3]

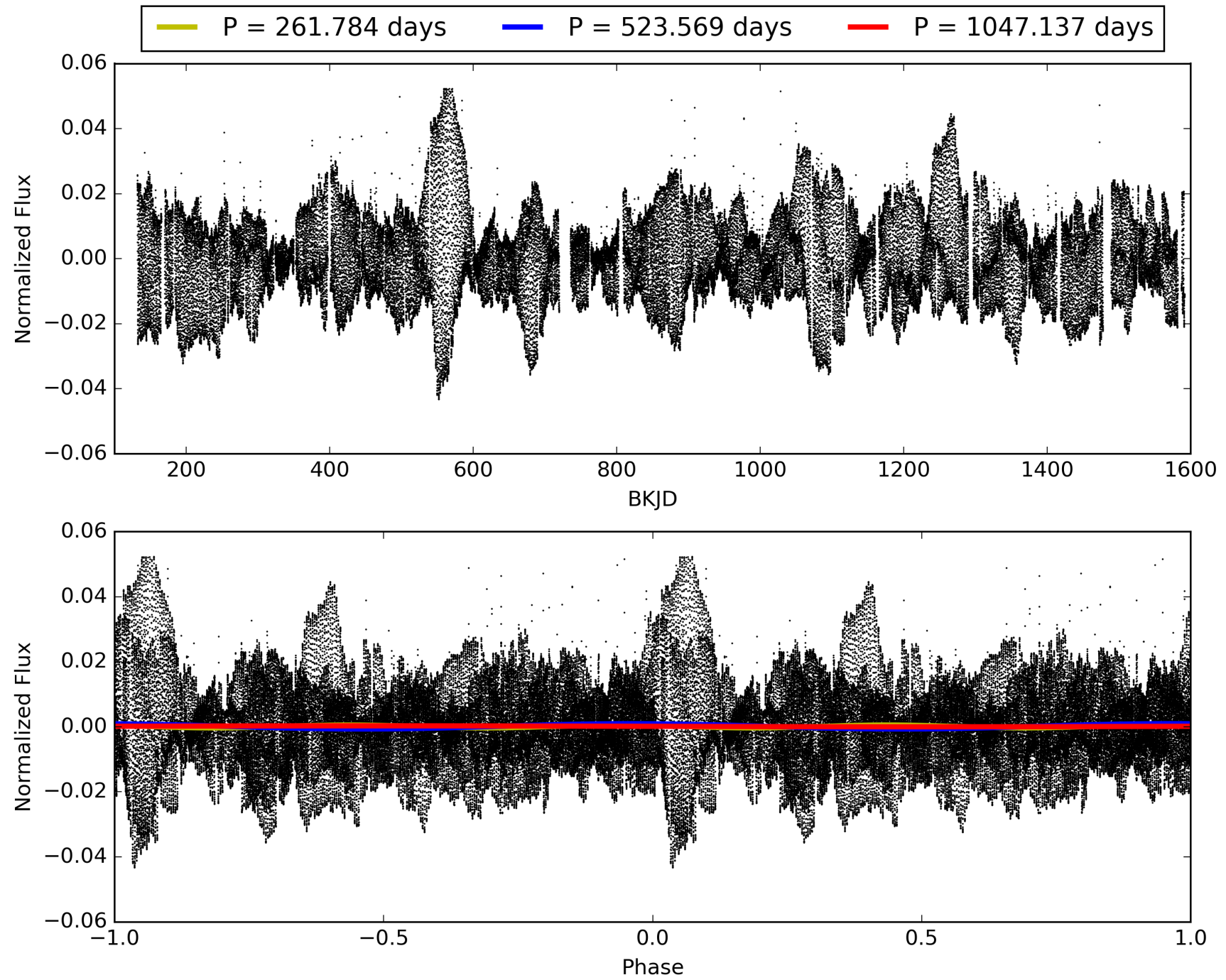
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 01-Feb-2016 05:41:40 Z

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

TCE 004059416-02, PDC Light Curves

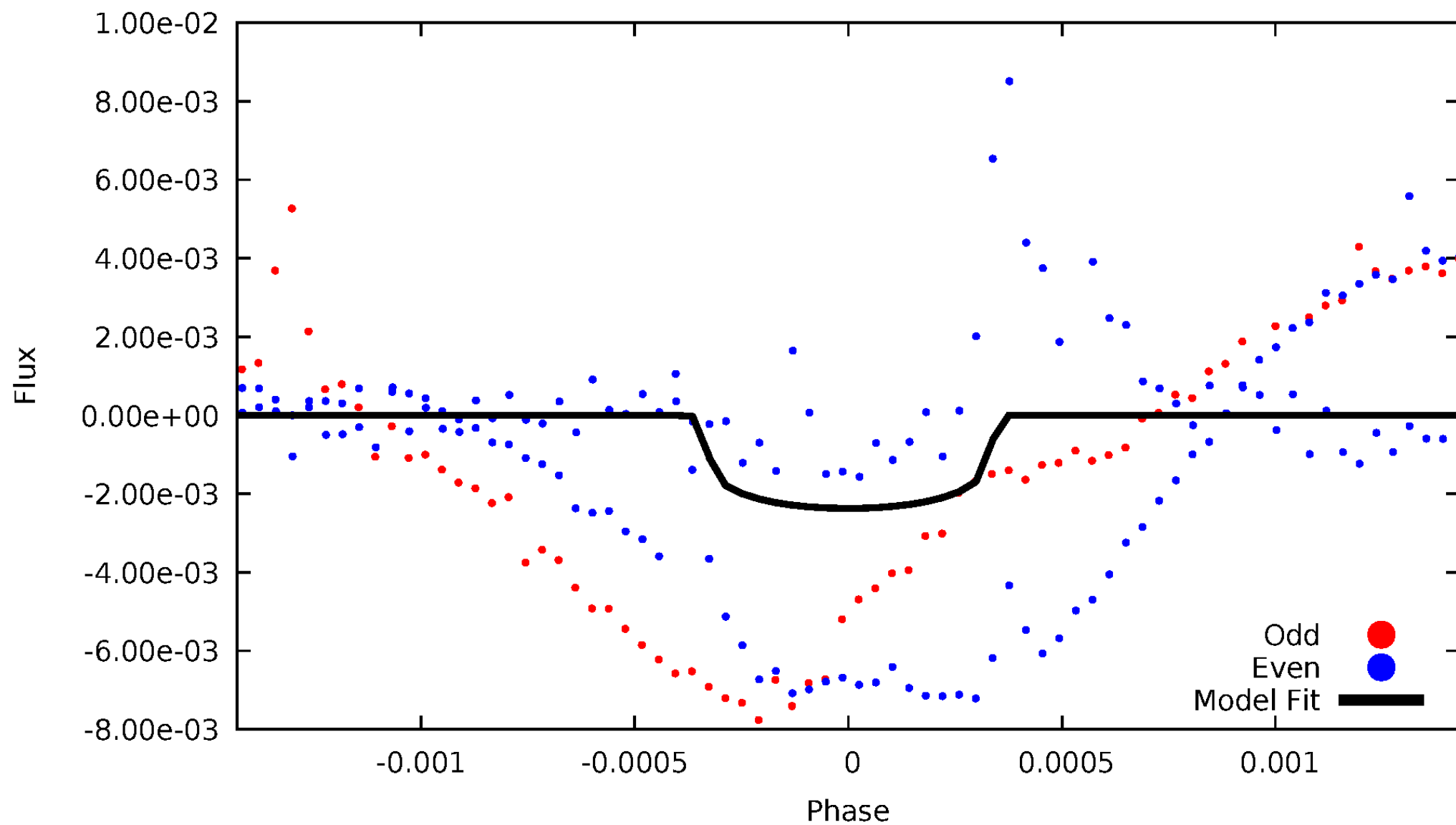


TCE 004059416-02



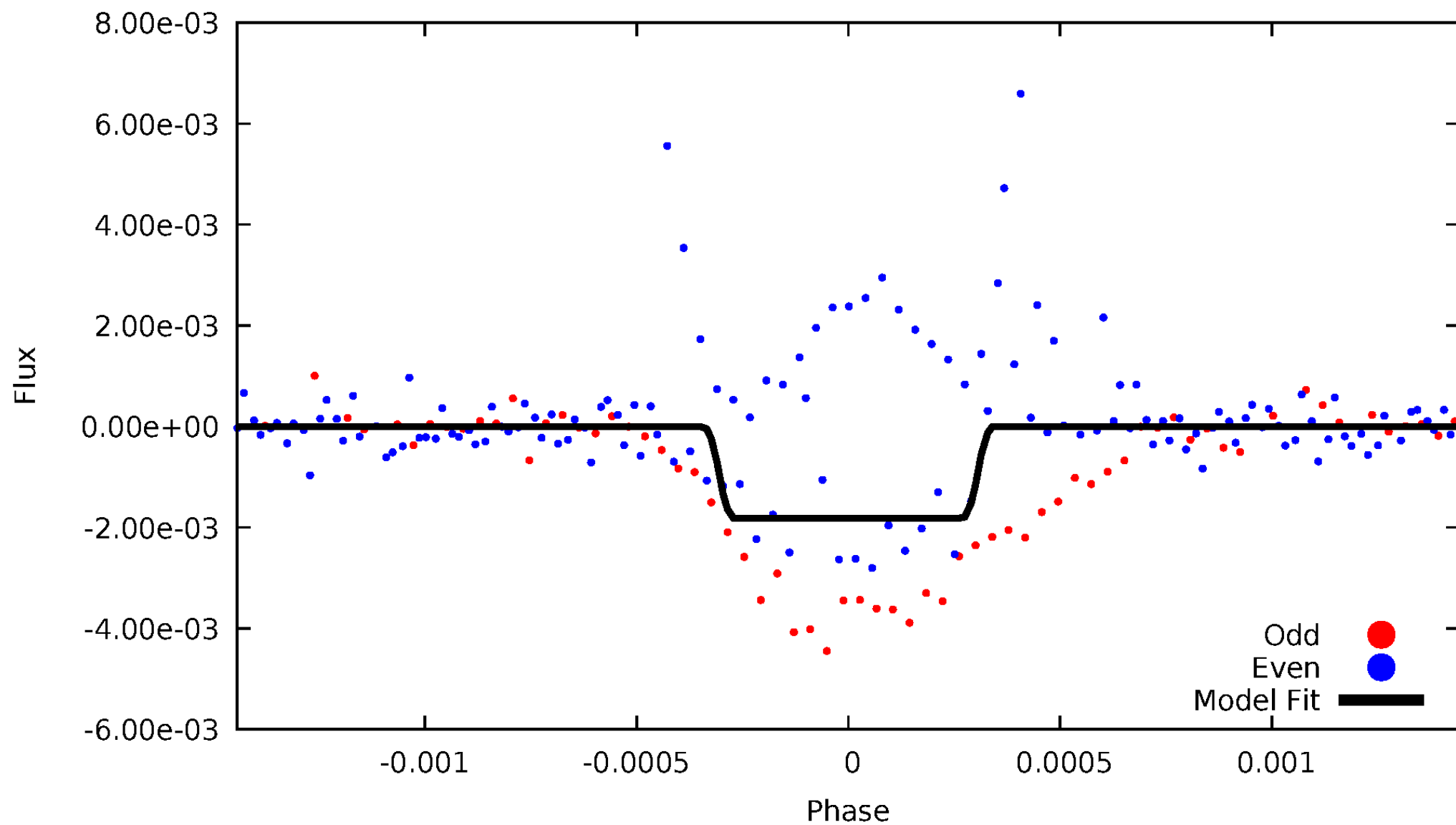
DV Odd/Even

TCE 004059416-02



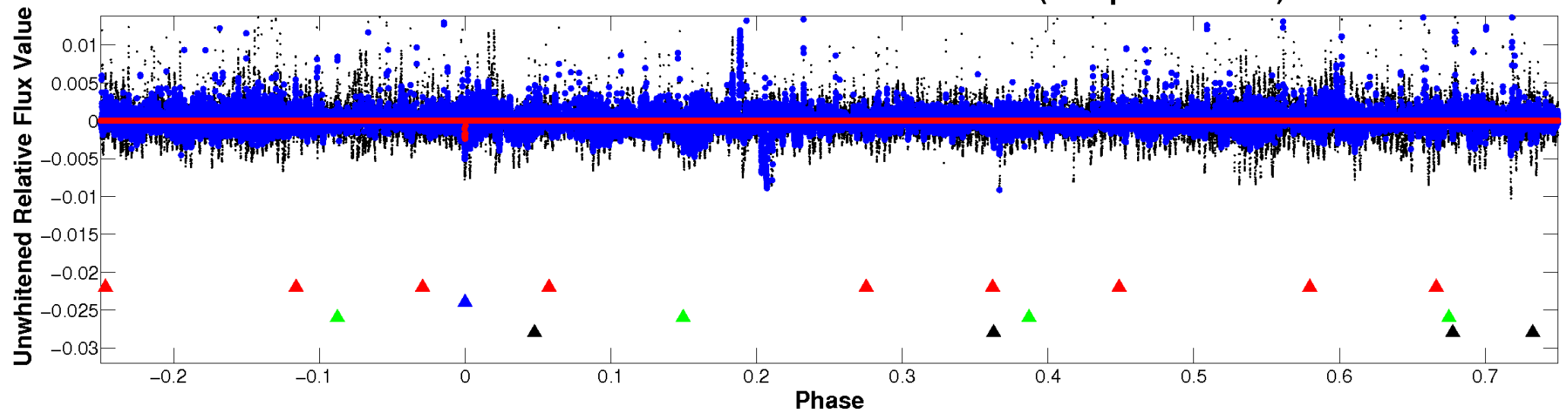
ALT Odd/Even

TCE 004059416-02

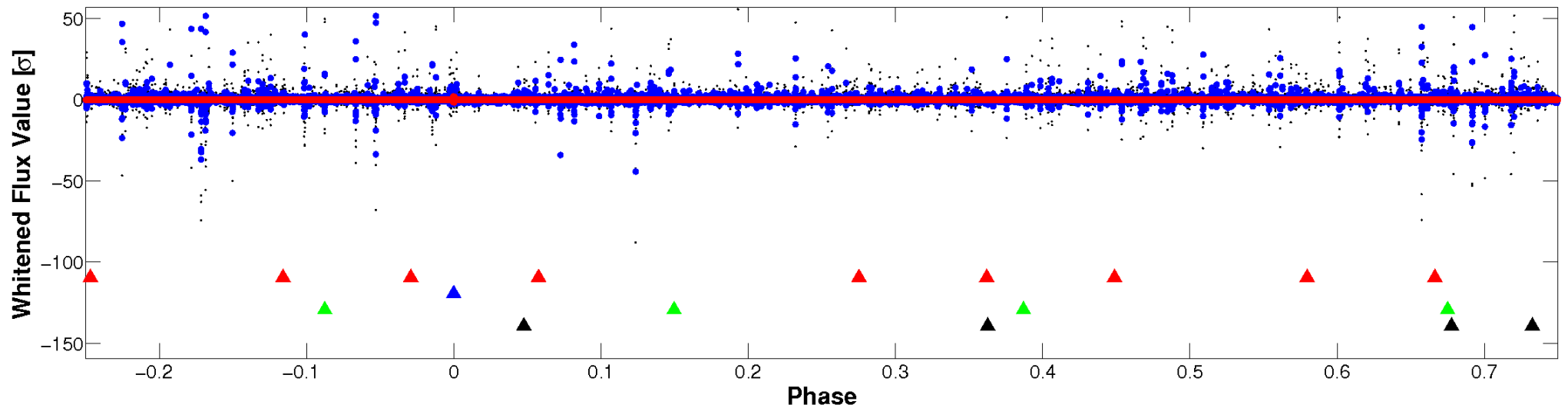


Non-Whitened Vs. Whitened Light Curve

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

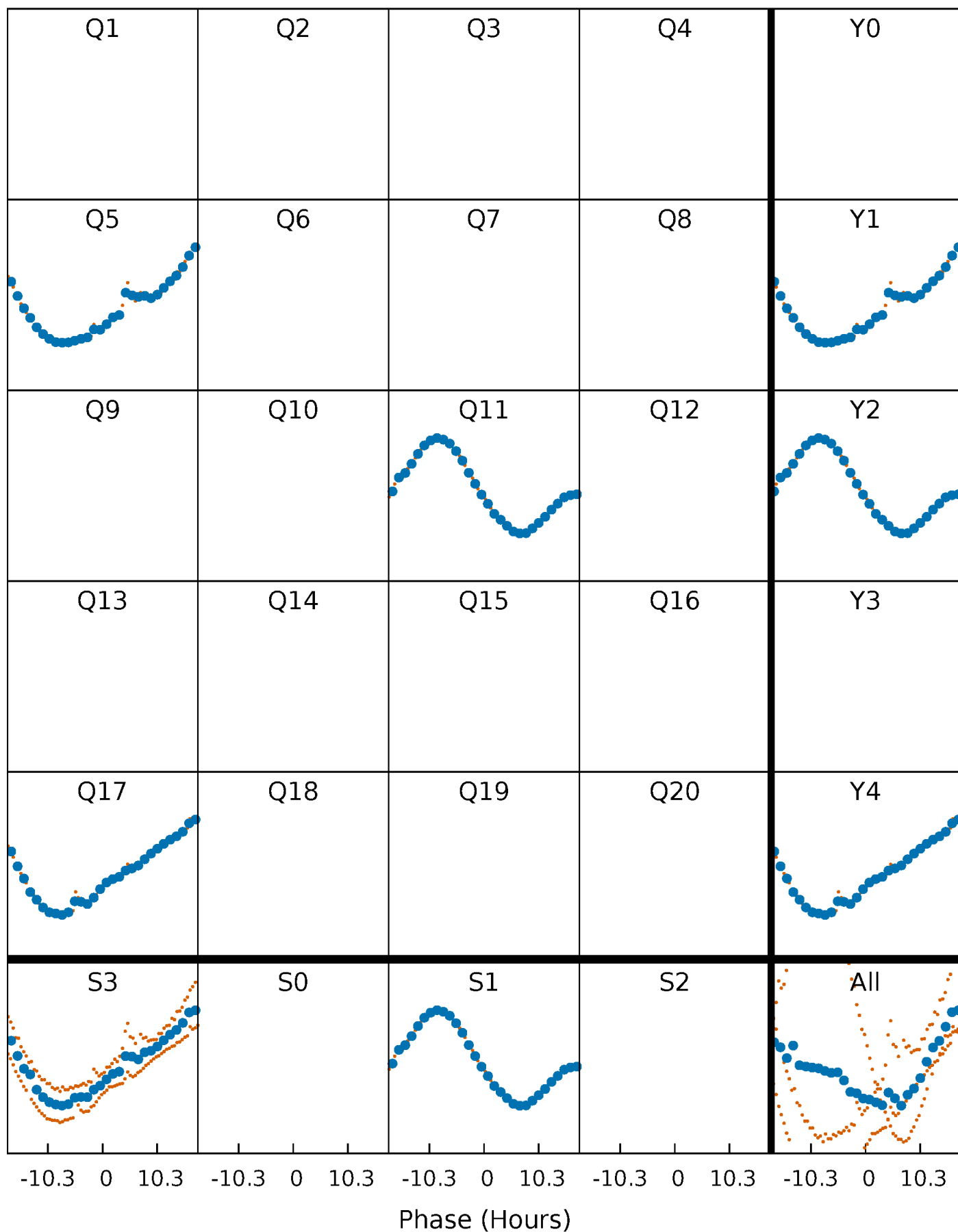


Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



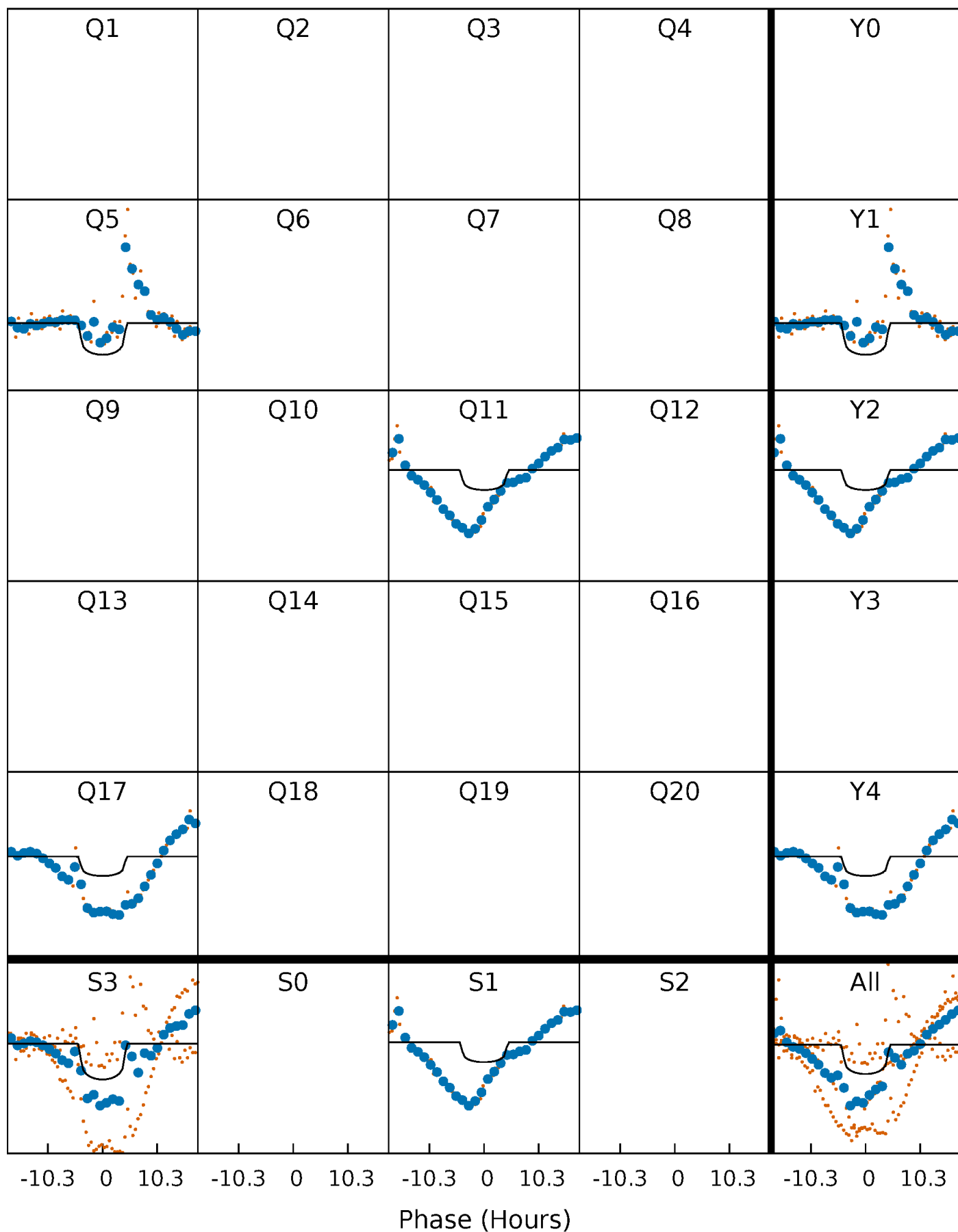
PDC Quarter-Phased Transit Curves

TCE 004059416-02 P=523.568705 Days $T_0=532.060014$ (BKJD)



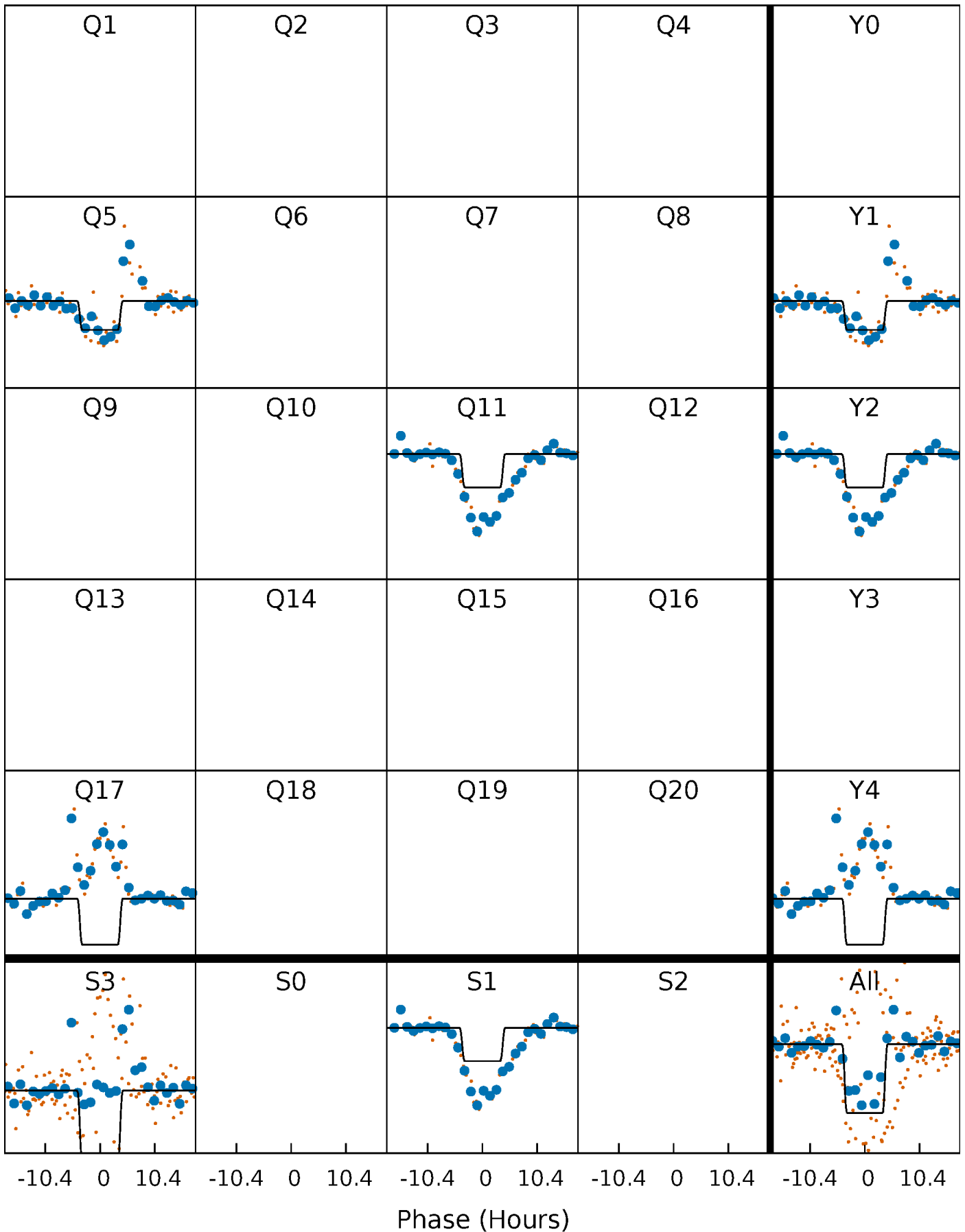
DV Quarter-Phased Transit Curves

TCE 004059416-02 $P=523.568705$ Days $T_0=532.060014$ (BKJD)



Alt. Detrend Quarter-Phased Transit Curves

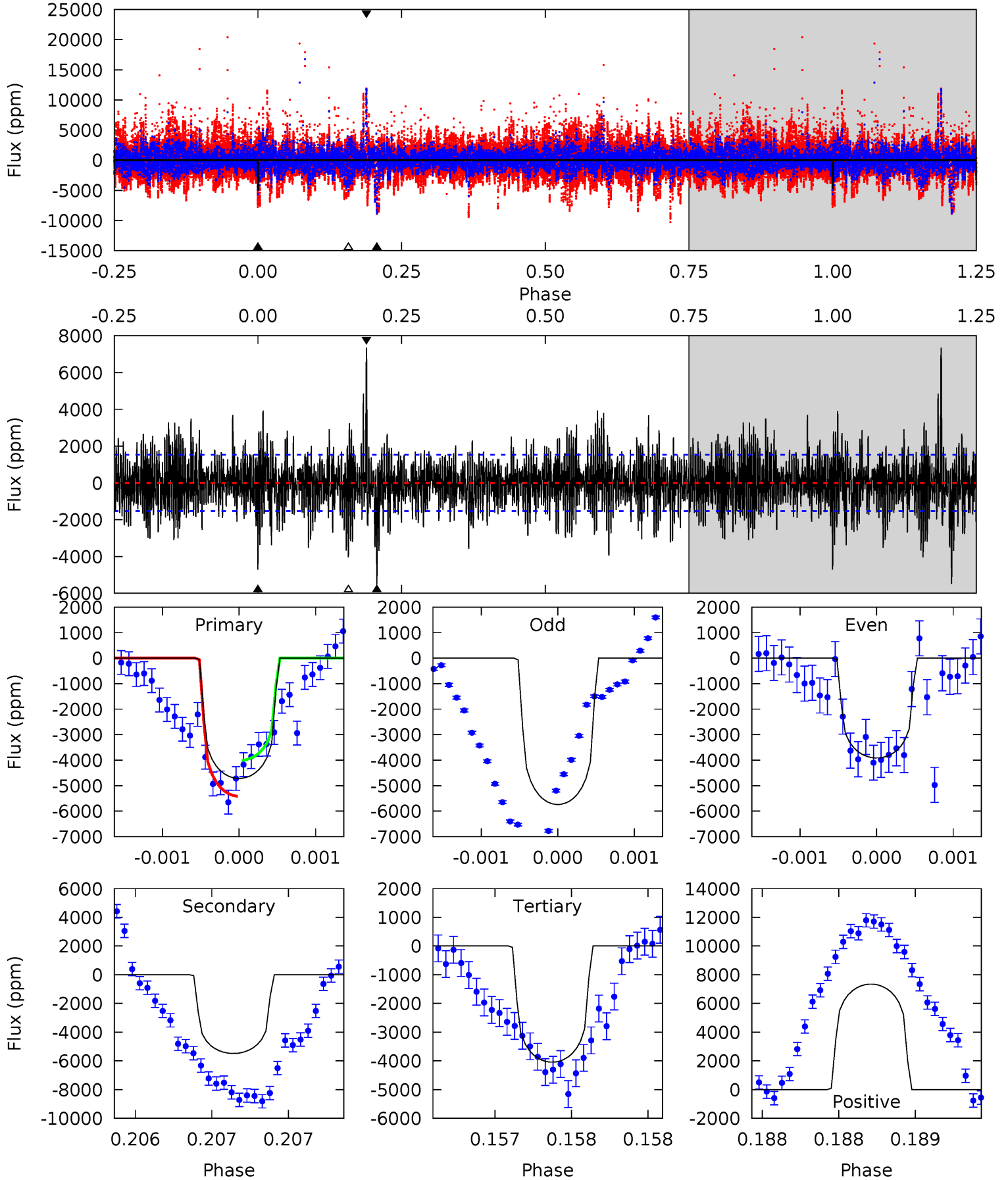
TCE 004059416-02 $P=523.582730$ Days $T_0=532.044310$ (BKJD)



DV Model-Shift Uniqueness Test

004059416-02, P = 523.568705 Days, E = 8.491309 Days

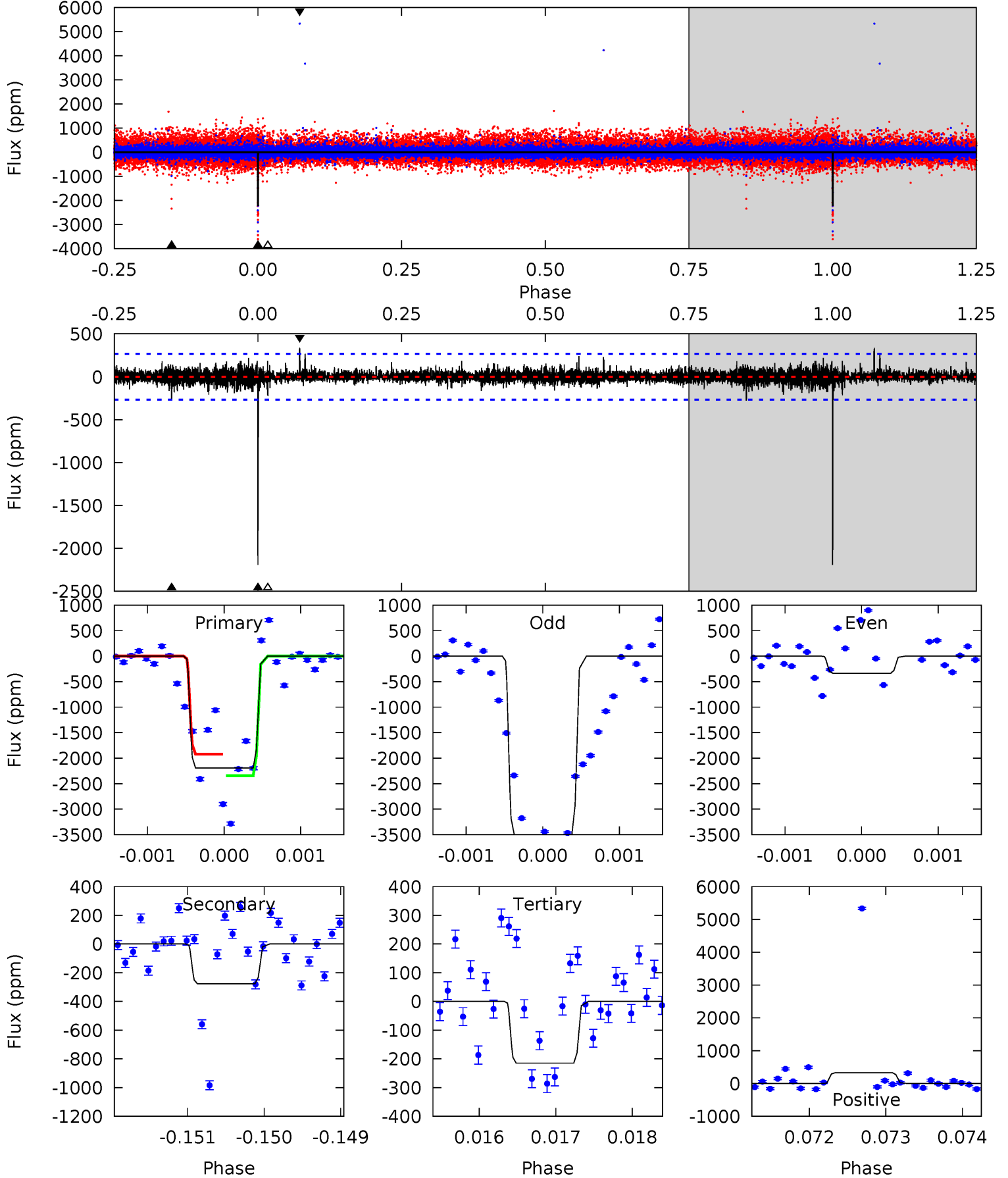
Pri	Sec	Ter	Pos	FA ₁	FA ₂	F _{Red}	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
17.0	19.8	14.6	26.5	5.51	3.39	4.19	2.42	-9.49	5.19	-6.72	2.86	0.79	0.57	2.55



Alt Model-Shift Uniqueness Test

004059416-02, P = 523.582730 Days, E = 8.461580 Days

Pri	Sec	Ter	Pos	FA ₁	FA ₂	F _{Red}	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
45.2	5.71	4.43	6.71	5.52	3.39	0.86	40.8	38.5	1.28	-1.01	36.6	0.66	0.13	4.21



Stellar Parameters For KIC 004059416

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	R (R_{\odot})	$M(M_{\odot})$	p_{\star} ($\text{g}\cdot\text{cm}^{-3}$)
	5313^{+166}_{-166}	$4.623^{+0.066}_{-0.048}$	$-1.040^{+0.300}_{-0.300}$	$0.642^{+0.054}_{-0.049}$	$0.630^{+0.059}_{-0.023}$	$3.354^{+0.856}_{-0.569}$
	+3%/-3%	+1%/-1%	+29%/-29%	+8%/-8%	+9%/-4%	+26%/-17%
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 004059416-02 / KOI

Detrend	Depth (ppm)	R_p (R_{\oplus})	T_{max} (K)	T_{obs} (K)	A_{obs}
DV	-5483 ± 277	$3.21^{+1.13}_{-1.03}$	251^{+10}_{-9}	6710^{+1691}_{-911}	$357139^{+408473}_{-166748}$
Alt.	-277 ± 49	$2.96^{+1.05}_{-1.02}$	251^{+9}_{-9}	3729^{+619}_{-383}	20848^{+28527}_{-9905}

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

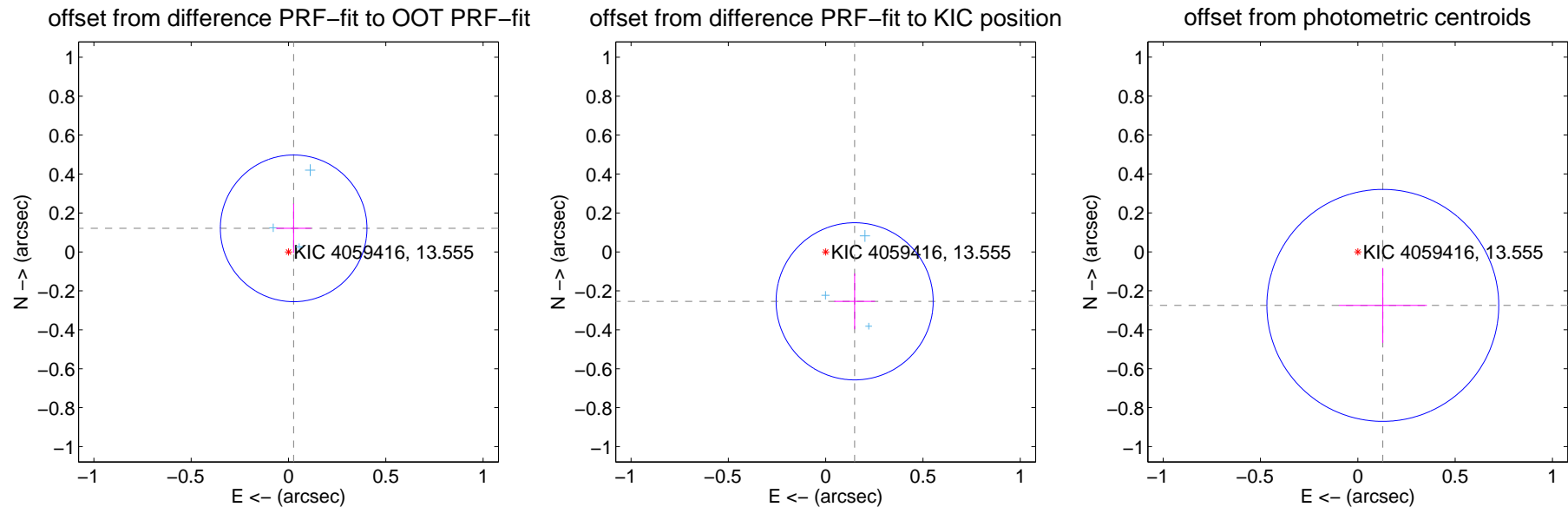
DV Centroid Data

Supplemental centroid analysis for 004059416-02. Kepler magnitude: 13.55. Transit SNR 6.93

There are 3 quarters with good PRF difference image offsets

The direct PRF centroid is offset from the target star catalog position by about 0.35 arcsec

	Distance in arcsec	Distance / σ	Δ RA	Δ Dec
PRF-fit source offset from OOT	0.124 ± 0.126	0.99	-0.027 ± 0.090	0.121 ± 0.127
PRF-fit source offset from KIC position	0.294 ± 0.135	2.19	-0.149 ± 0.105	-0.254 ± 0.143
photometric centroid source offset	0.30 ± 0.20	1.53	-0.13 ± 0.23	-0.27 ± 0.19

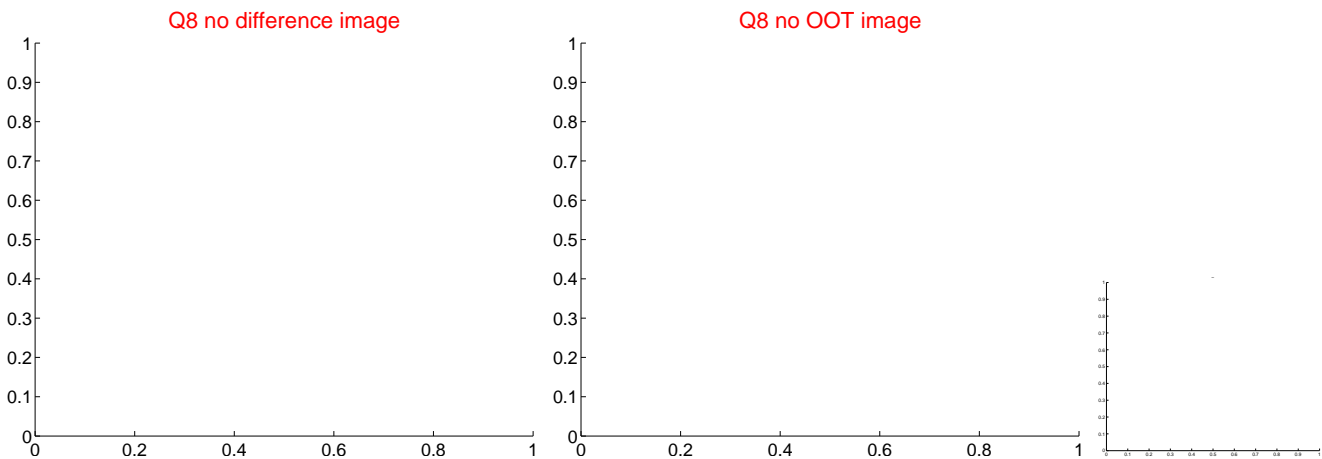
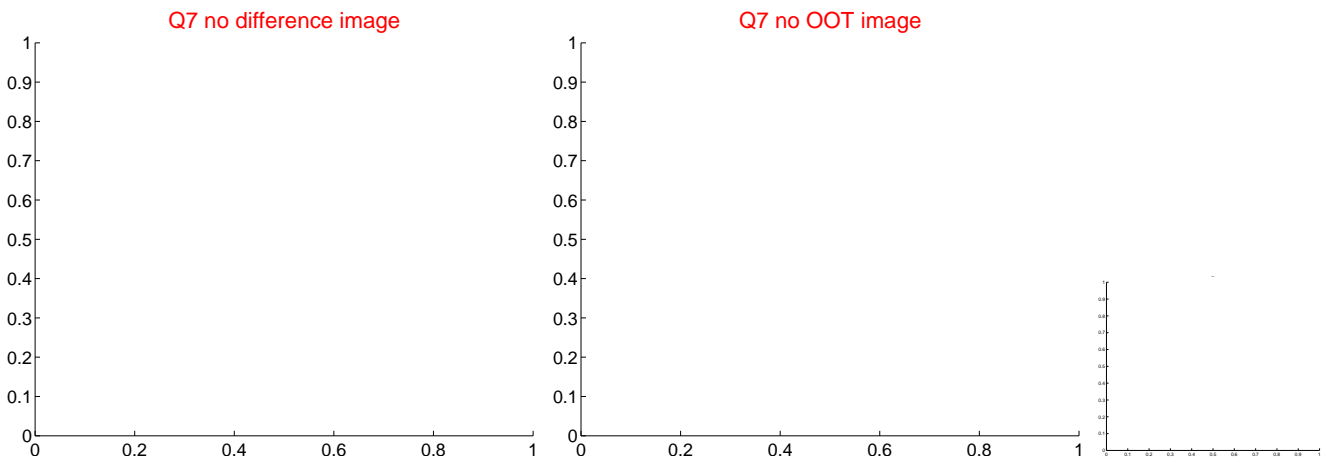
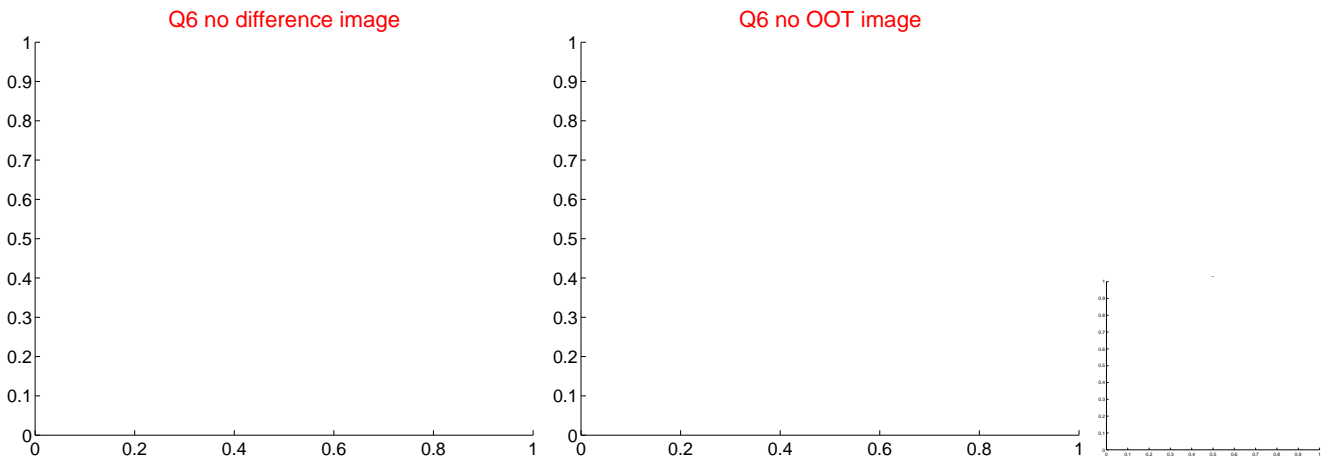
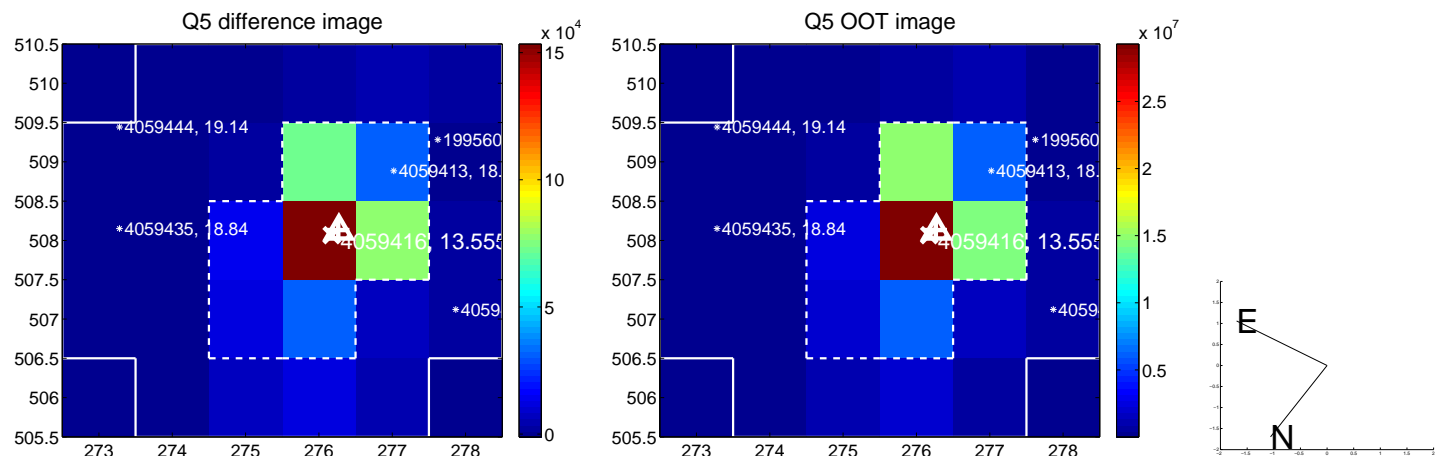


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- σ uncertainty. Blue circle: three- σ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

Q9 no difference image



Q9 no OOT image



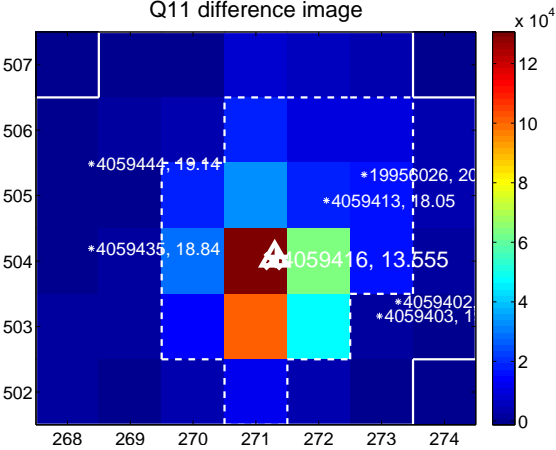
Q10 no difference image



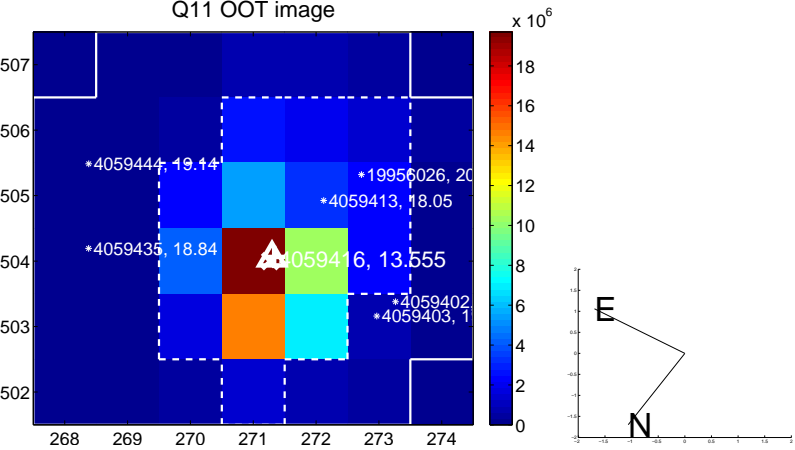
Q10 no OOT image



Q11 difference image



Q11 OOT image



Q12 no difference image



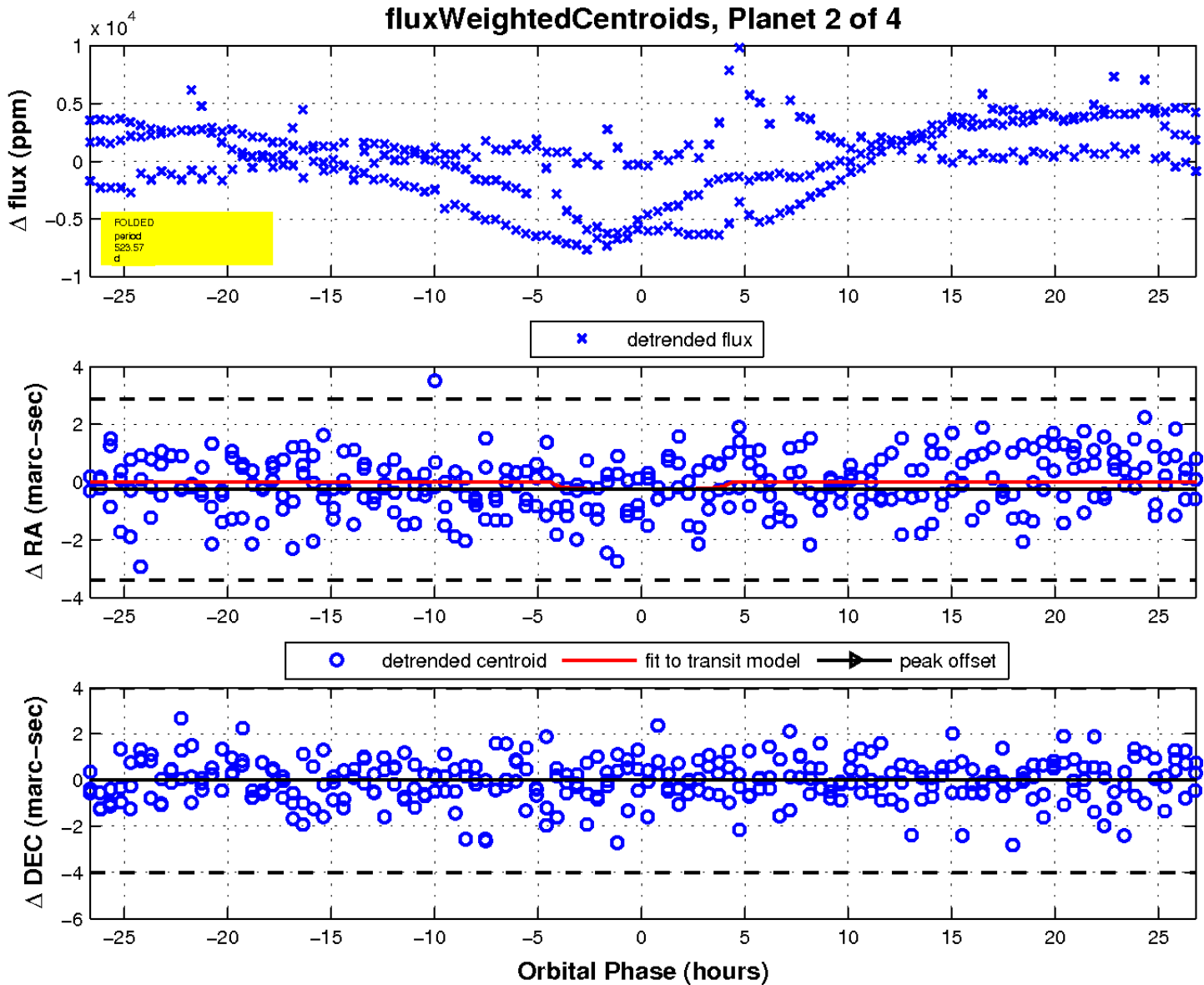
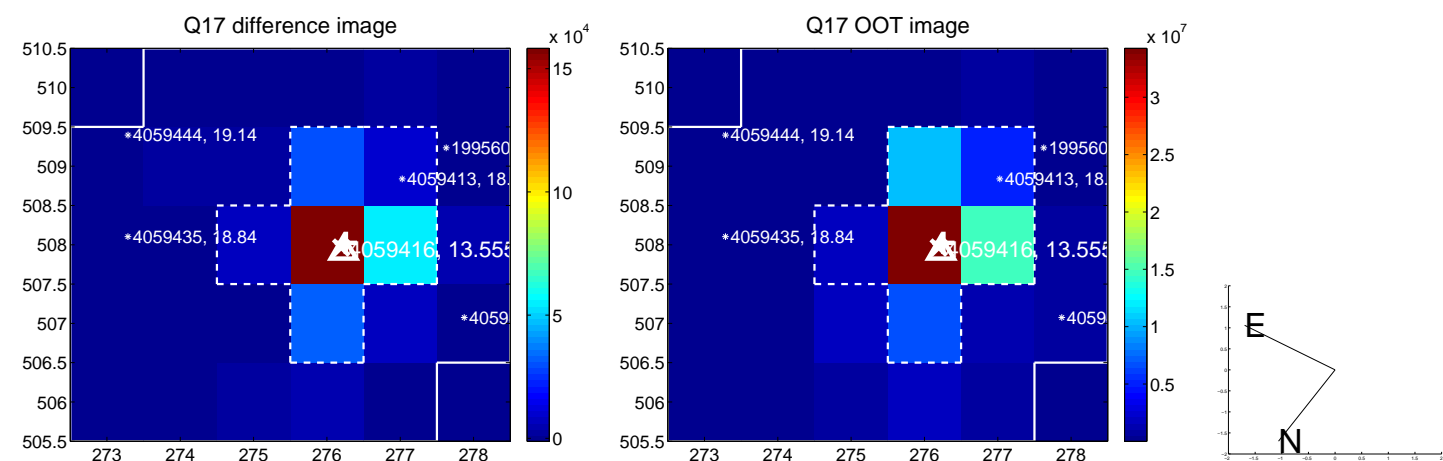
Q12 no OOT image



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

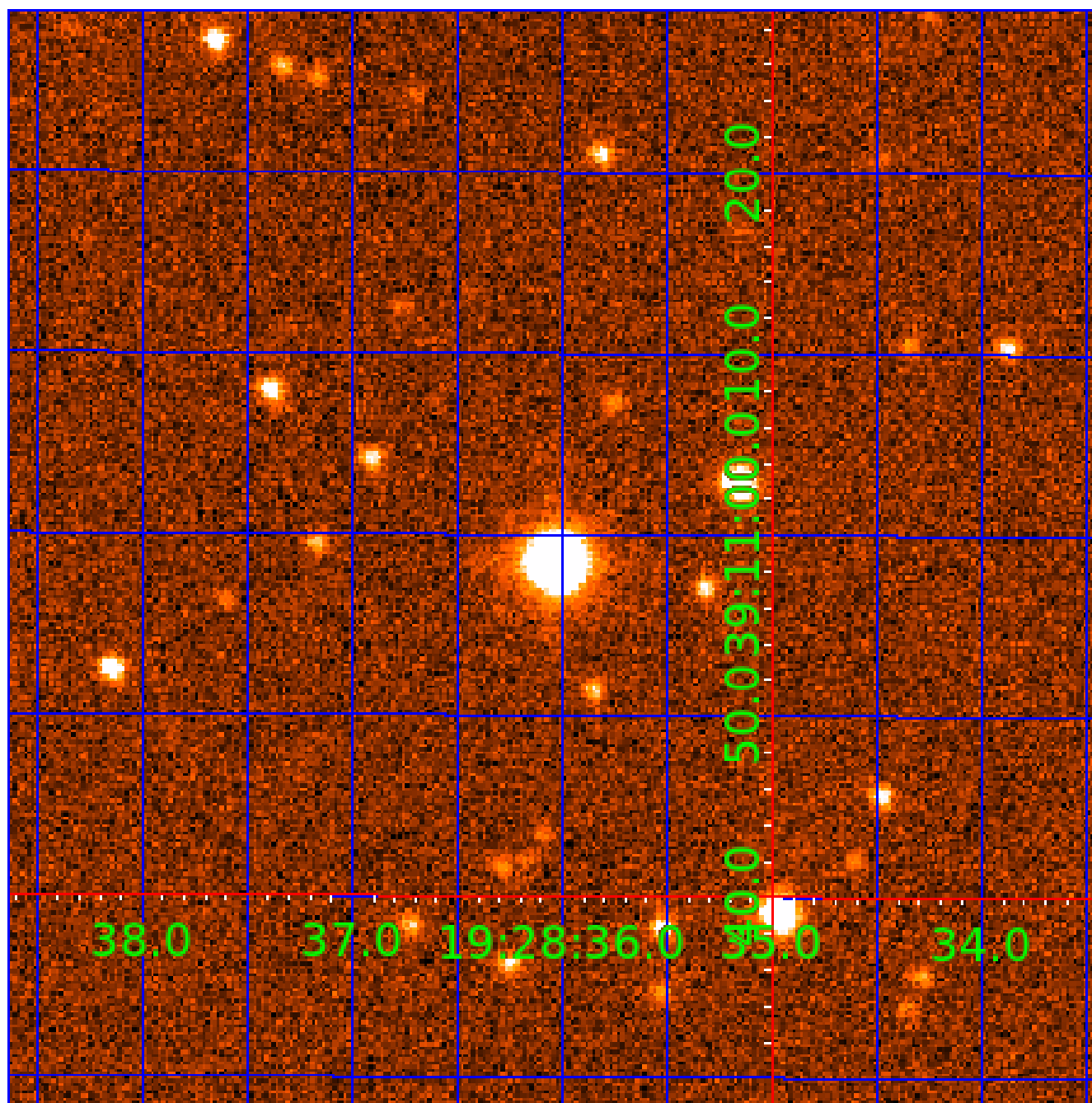


white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



UKIRT Image

Declination



KIC 004059416

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})
004059416-01	OBS	No	159.376808	243.479258	511.7	4.729	12.3	3.7	0.64	5313	1.60	1.21
004059416-02	OBS	No	523.568705	532.060014	2373.7	8.987	15.7	6.9	0.64	5313	3.21	0.25
004059416-03	OBS	No	399.335524	211.086788	1595.5	3.437	12.2	7.7	0.64	5313	2.56	0.35
004059416-04	OBS	No	358.629412	363.319515	708.6	6.000	17.9	-1.0	0.64	5313	1.70	0.41

Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
004059416-01	OBS	FP	0.00	1	0	0	0	MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_KIC_POS
004059416-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_KIC_POS
004059416-03	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
004059416-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES—LPP_DV—CENT_NOFITS

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

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

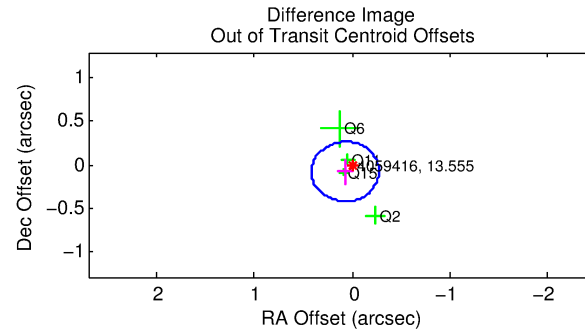
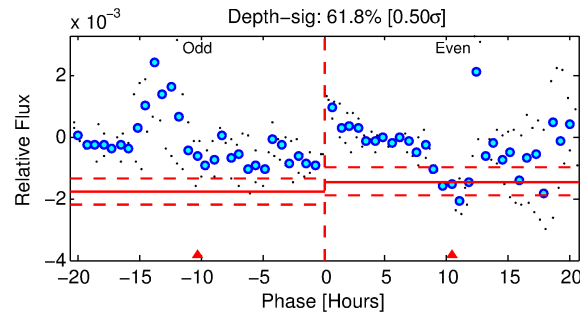
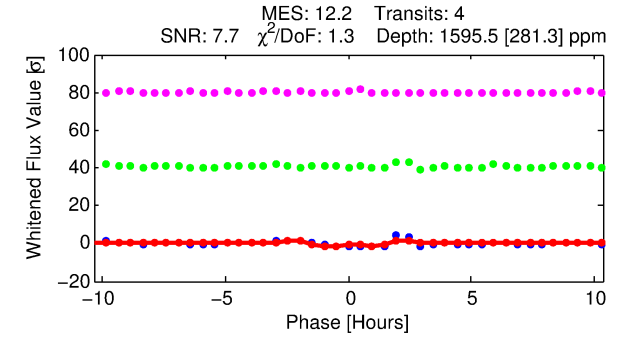
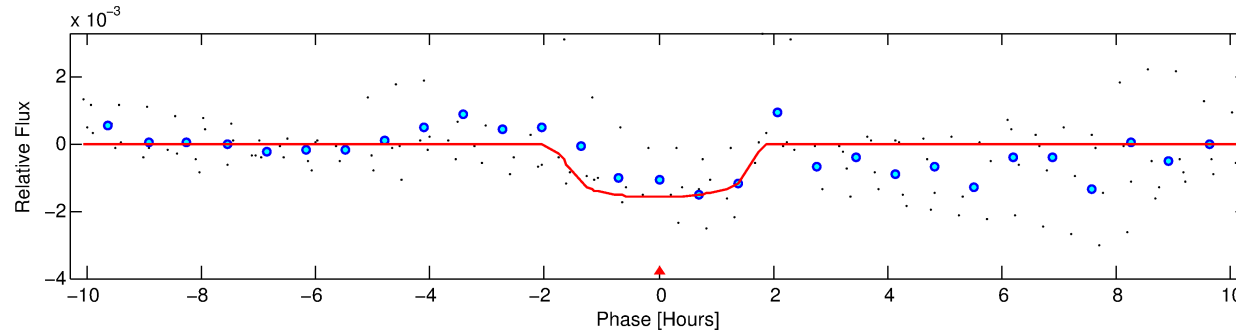
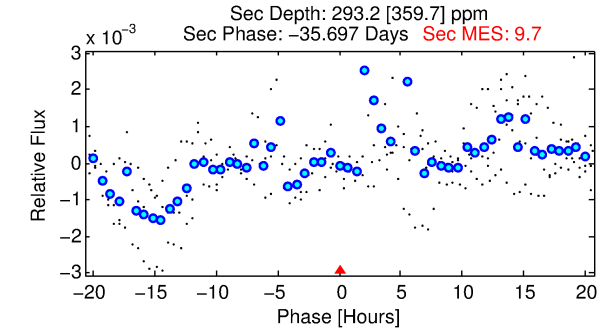
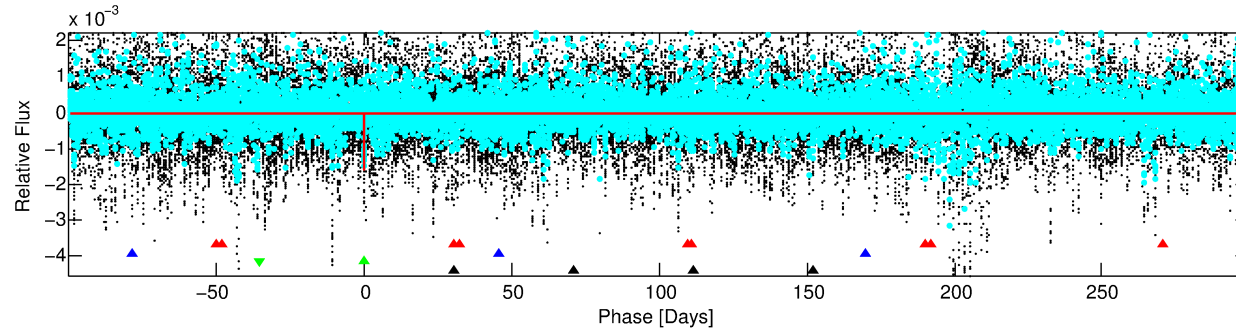
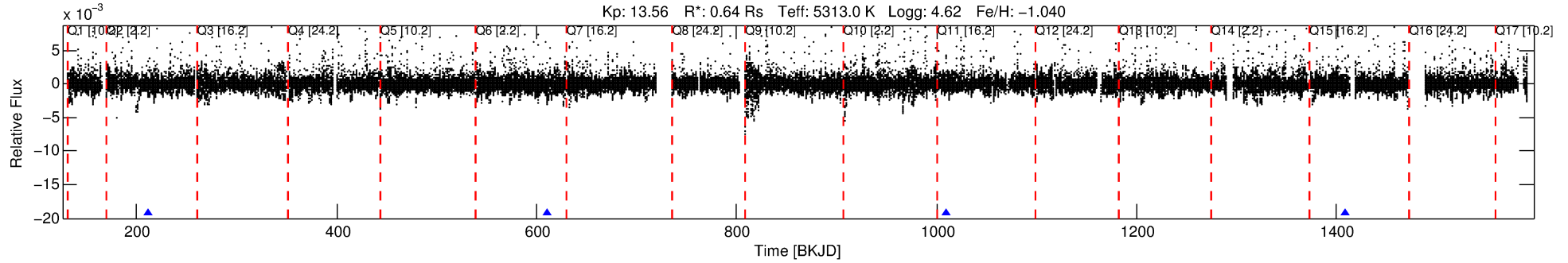
See http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col for comment definitions.

Ephemeris Match Information For 004059416-03

No Significant Match Found

DV One-Page Summary

KIC: 4059416 Candidate: 3 of 4 Period: 399.336 d



DV Fit Results:

Period = 399.33552 [0.00260] d
Epoch = 211.0868 [0.0056] BKJD
Rp/R* = 0.0366 [0.0392]
a/R* = 893.27 [4281.04]
b = 0.25 [18.24]
Seff = 0.35 [0.06]
Teq = 197 [8] K
Rp = 2.56 [2.75] Re
a = 0.9105 [0.0688] AU
Ag = 20343.85 [50277.68] [0.40 σ]
Teffp = 3634 [2246] K [1.53 σ]

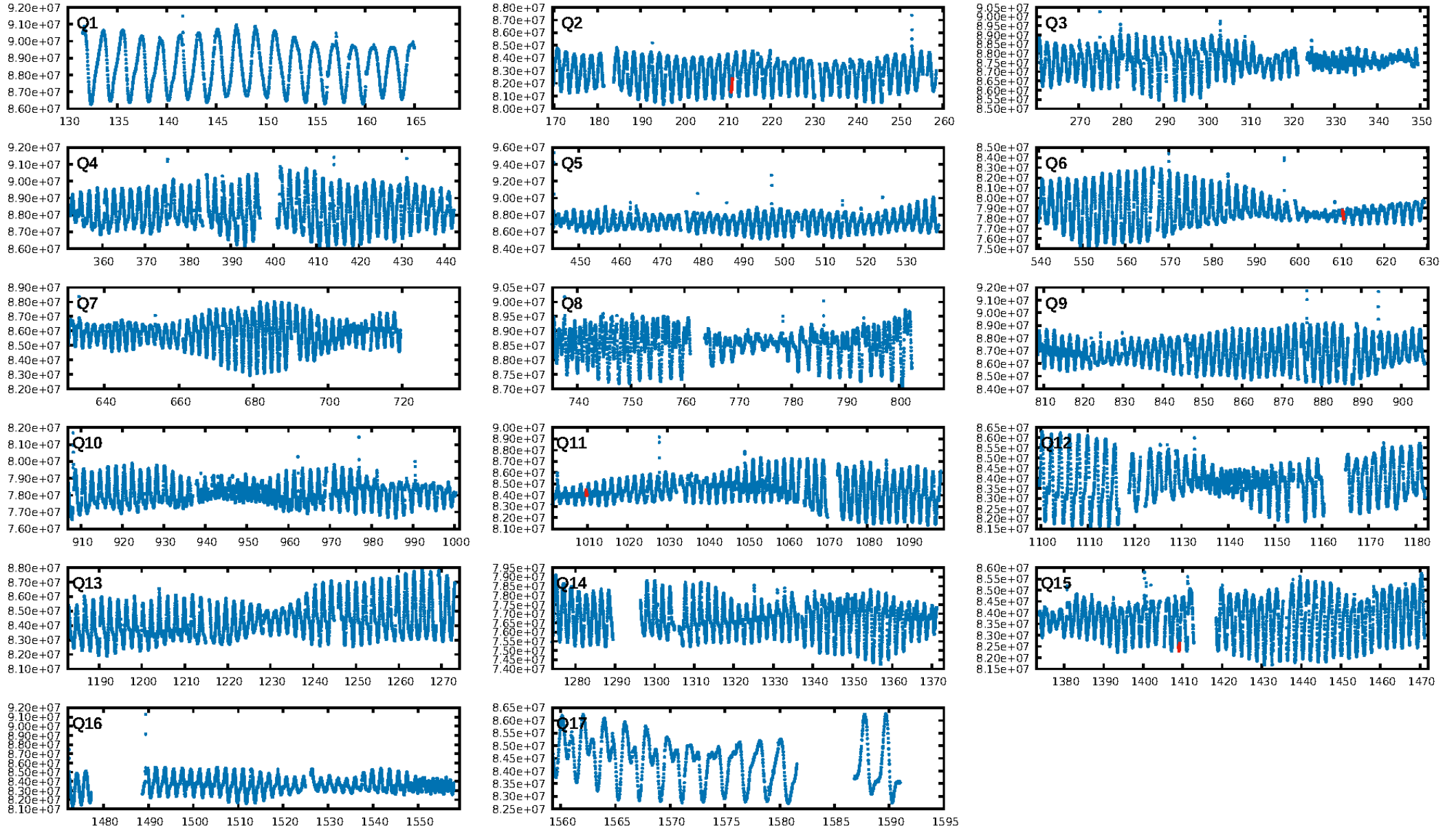
DV Diagnostic Results:

ShortPeriod-sig: 100.0% [141.28 σ]
LongPeriod-sig: 100.0% [309.86 σ]
ModelChiSquare2-sig: 79.8%
ModelChiSquareGo-sig: 79.9%
Bootstrap-pfa: N/A
RollingBand-fgt: 1.00 [4/4]
GhostDiagnostic-chr: 1.214
Centroid-sig: 5.1%
Centroid-so: 0.772 arcsec [1.63 σ]
OotOffset-rm: 0.108 arcsec [0.94 σ]
OotOffset-st: 2/2/0/0 [4]
KicOffset-rm: 0.387 arcsec [2.31 σ]
KicOffset-st: 2/2/0/0 [4]
DiffImageQuality-fgm: 0.75 [3/4]
DiffImageOverlap-fno: 1.00 [4/4]

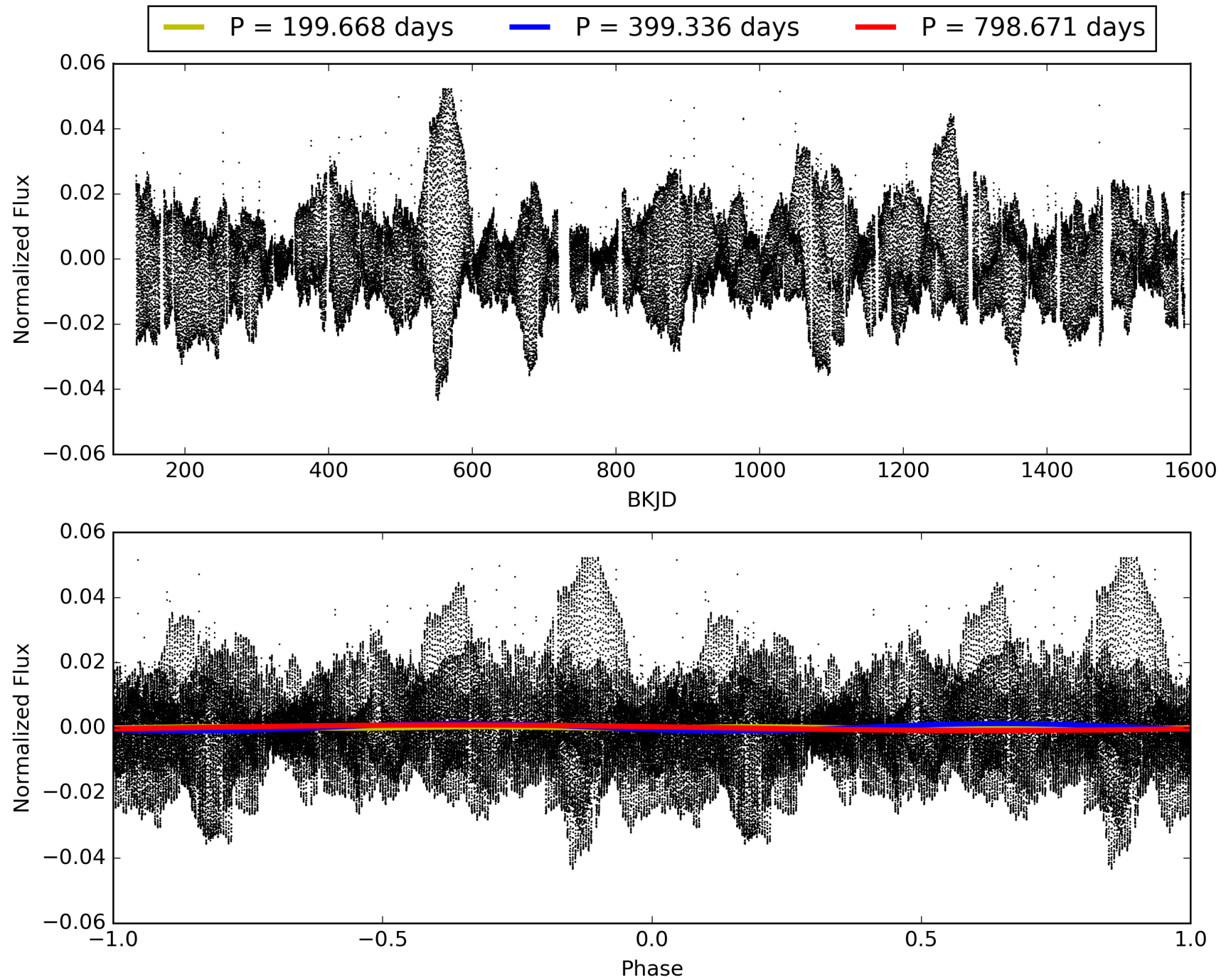
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 01-Feb-2016 05:41:57 Z

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

TCE 004059416-03, PDC Light Curves

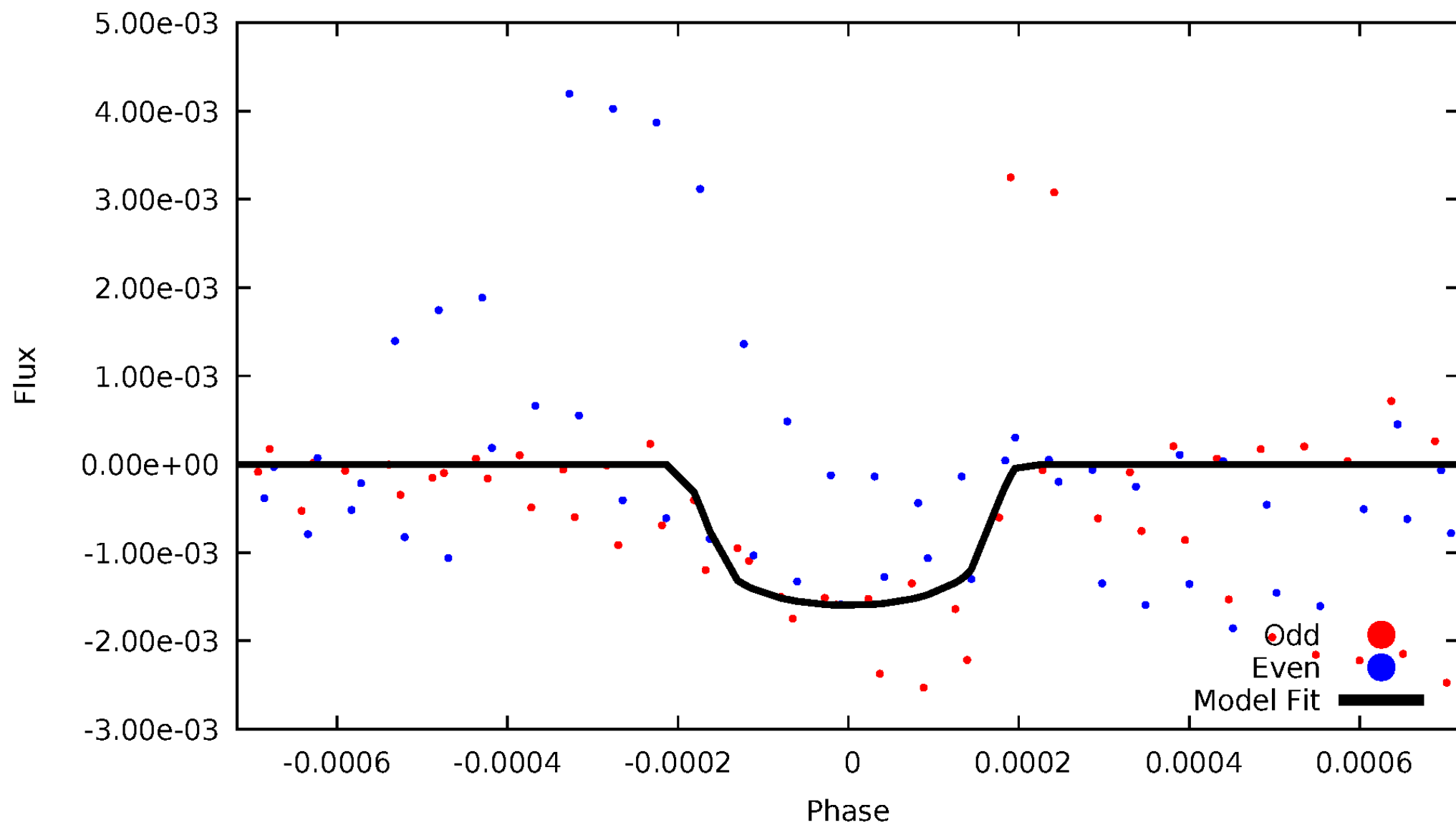


TCE 004059416-03



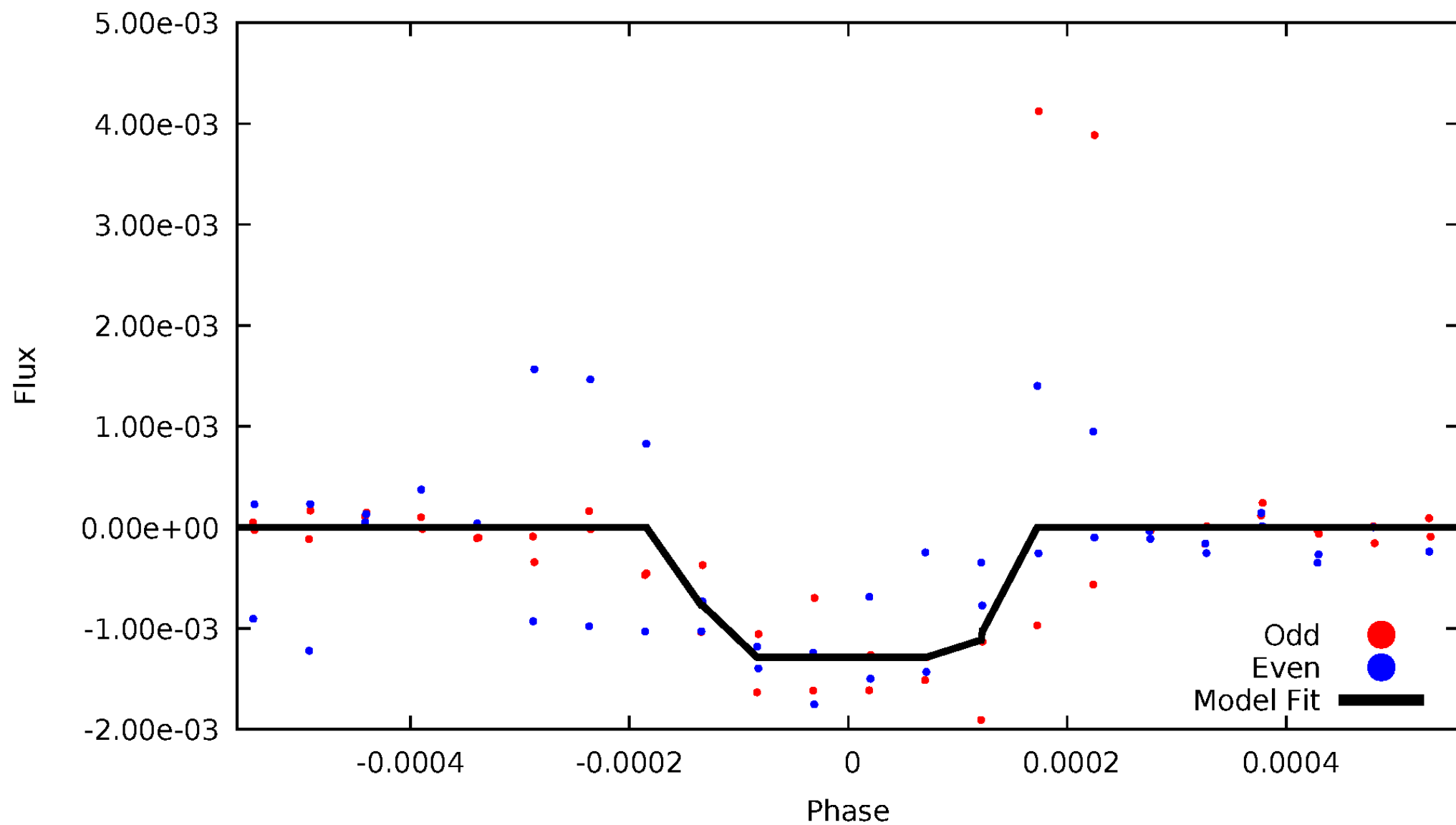
DV Odd/Even

TCE 004059416-03



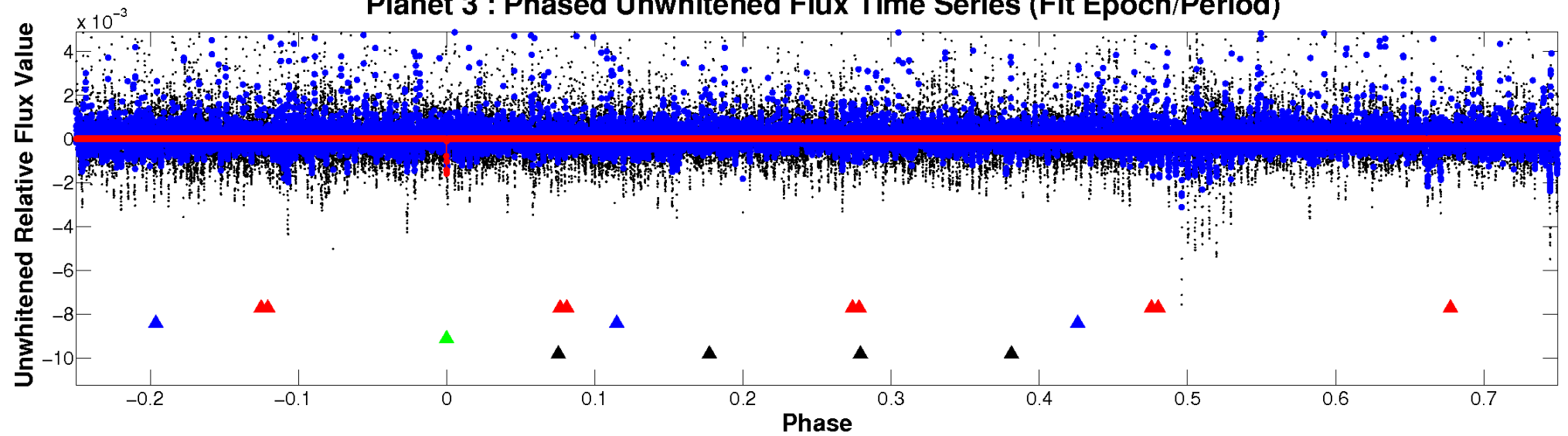
ALT Odd/Even

TCE 004059416-03

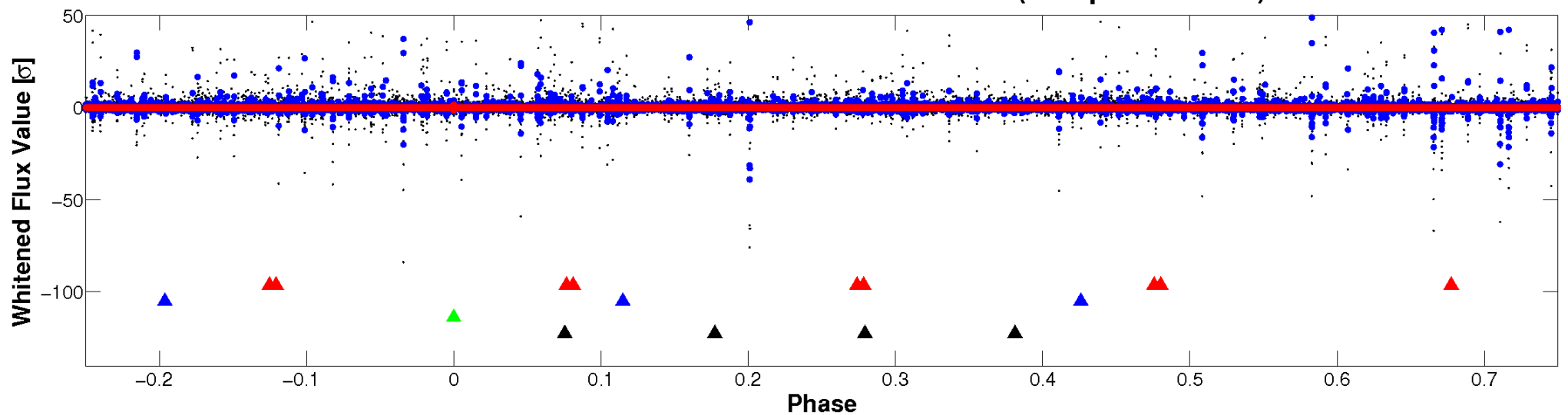


Non-Whitened Vs. Whitened Light Curve

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

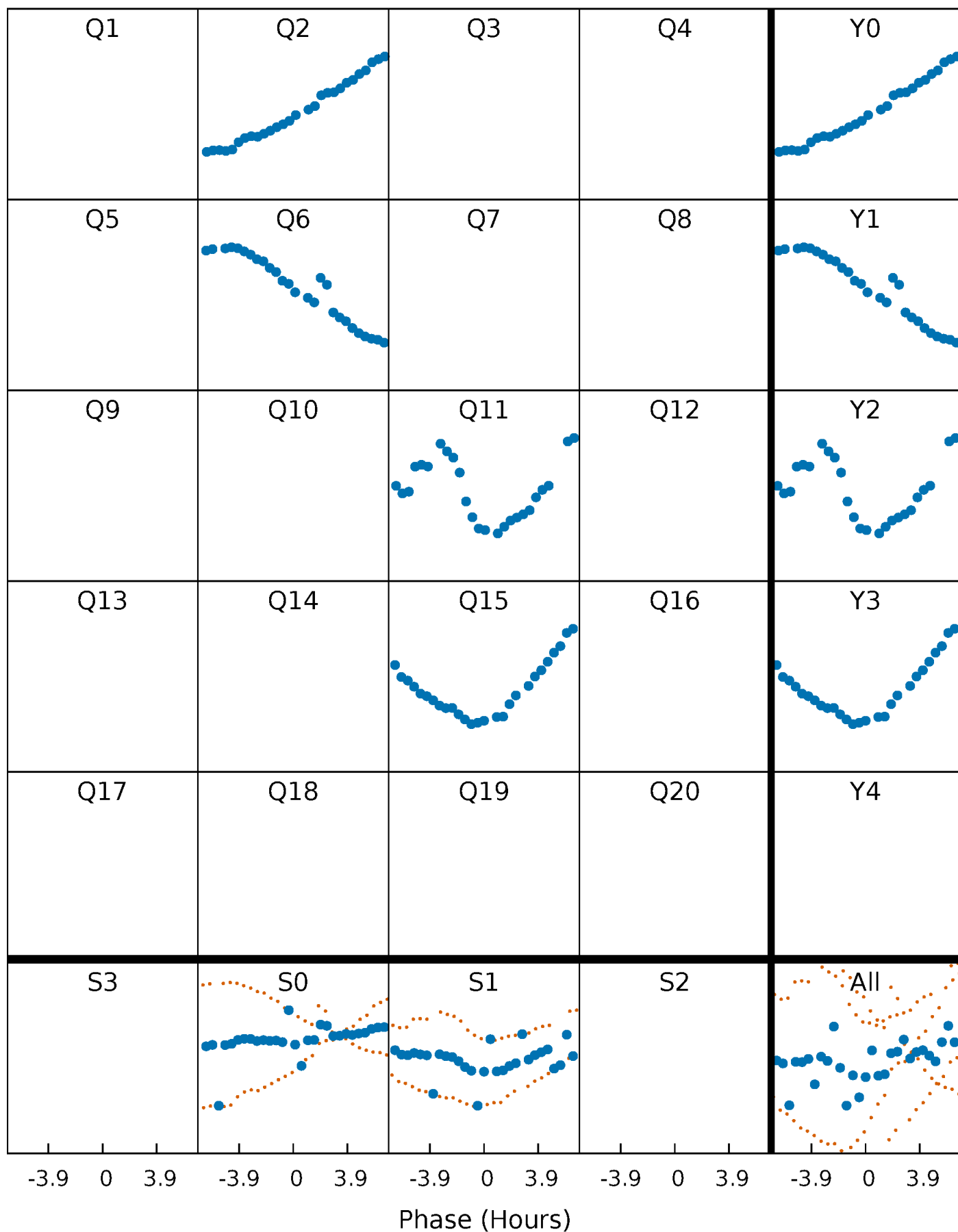


Planet 3 : Phased Whitened Flux Time Series (Fit Epoch/Period)



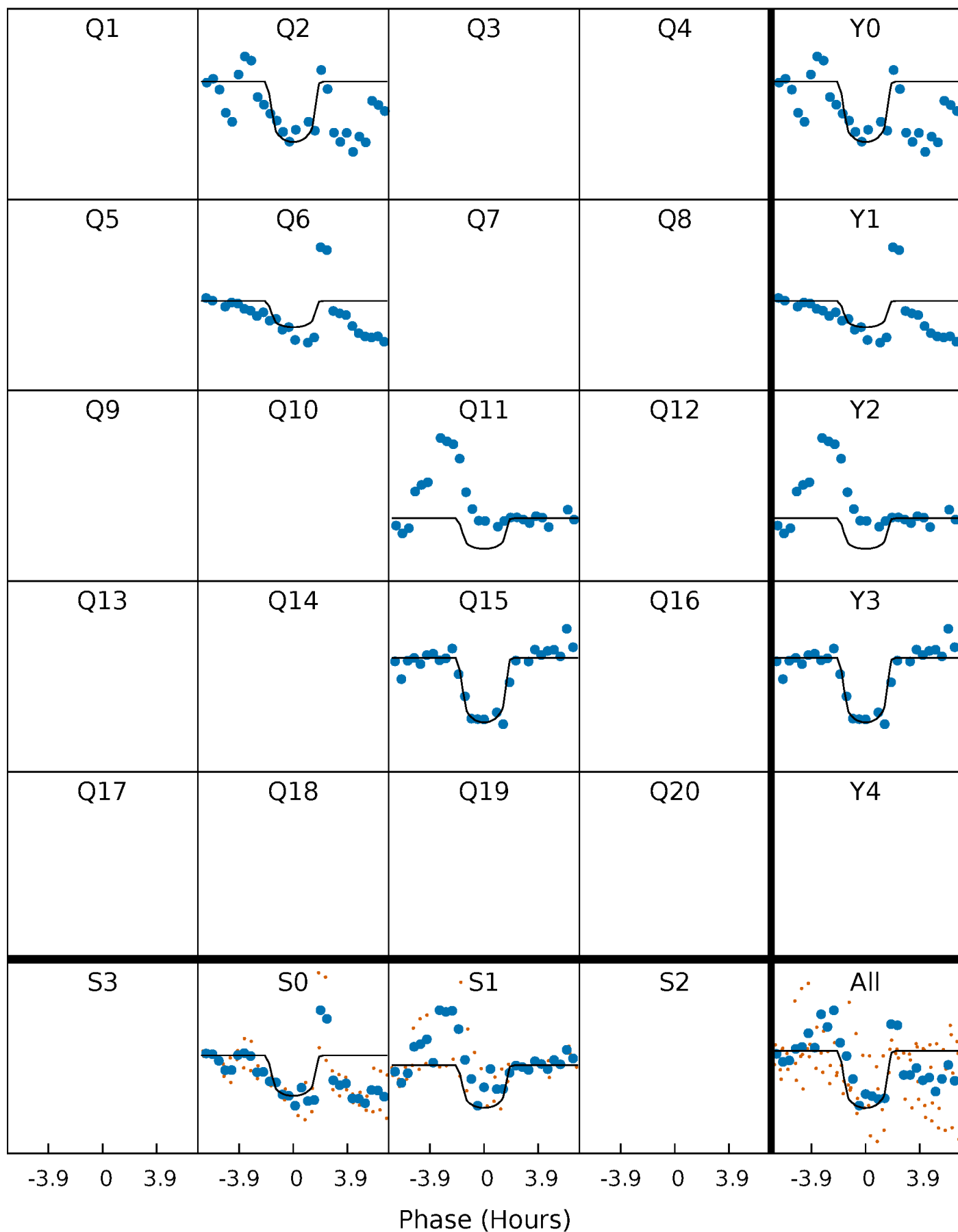
PDC Quarter-Phased Transit Curves

TCE 004059416-03 P=399.335524 Days $T_0=211.086788$ (BKJD)



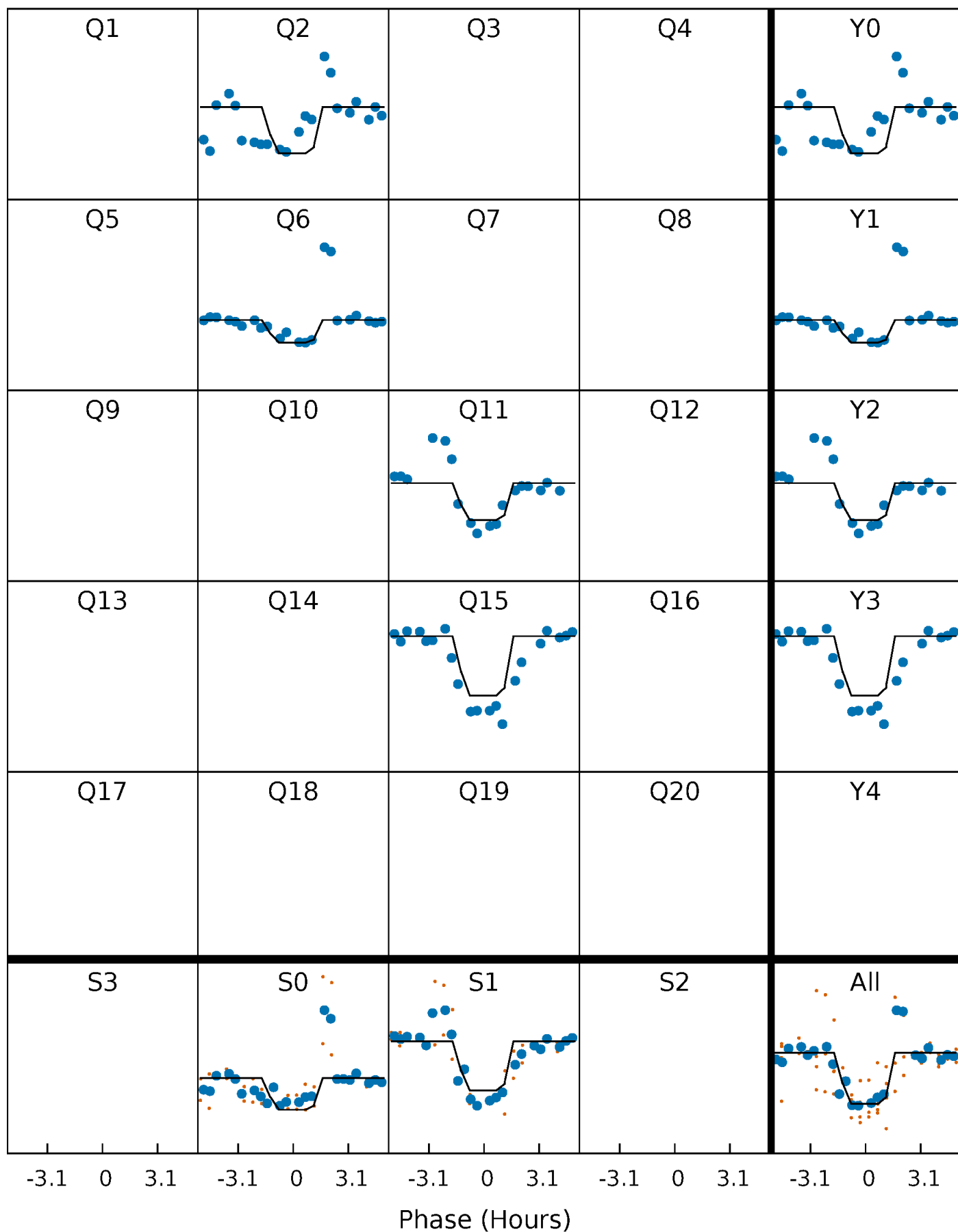
DV Quarter-Phased Transit Curves

TCE 004059416-03 $P=399.335524$ Days $T_0=211.086788$ (BKJD)



Alt. Detrend Quarter-Phased Transit Curves

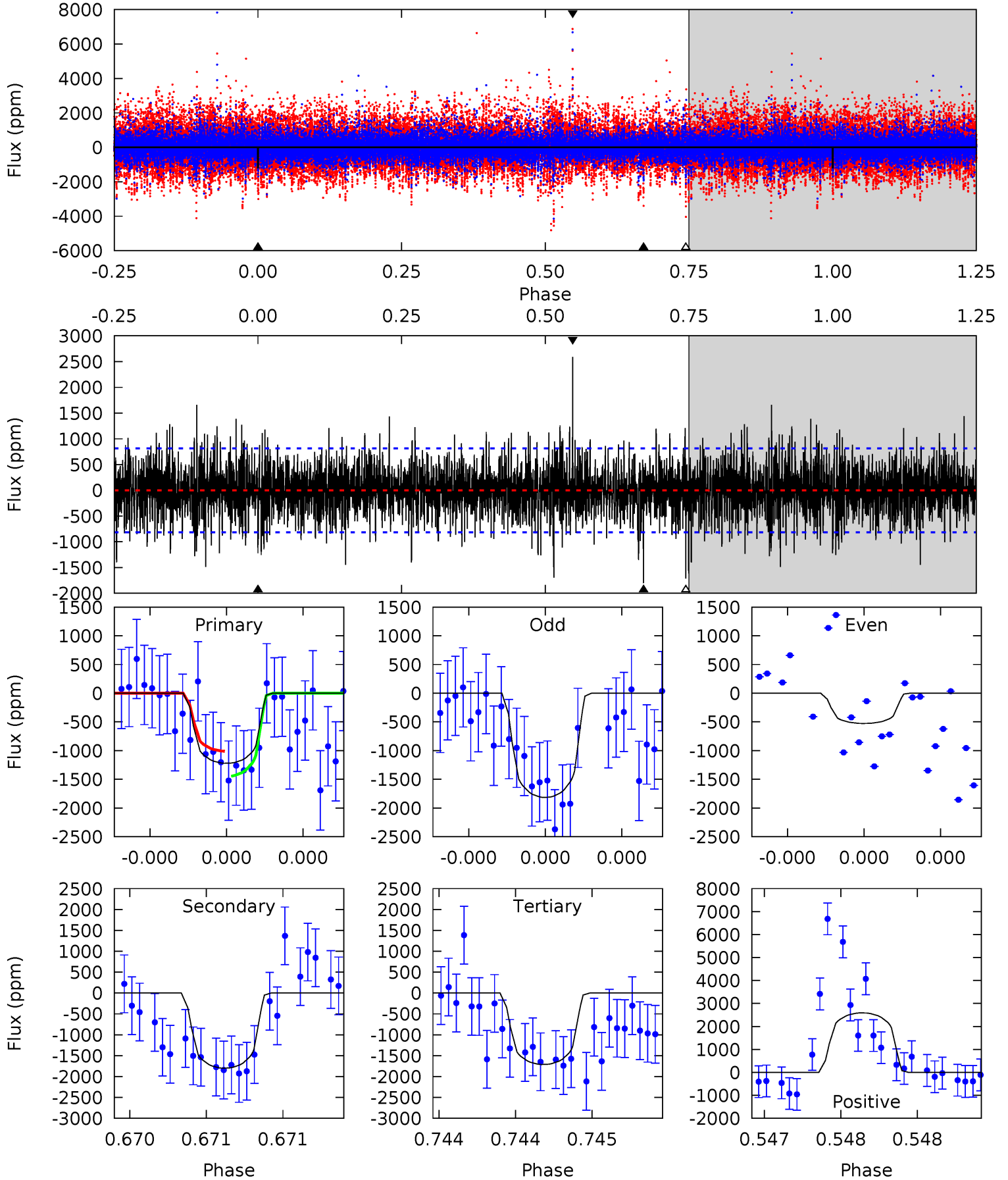
TCE 004059416-03 P=399.333063 Days $T_0=211.095957$ (BKJD)



DV Model-Shift Uniqueness Test

004059416-03, P = 399.335524 Days, E = 211.086788 Days

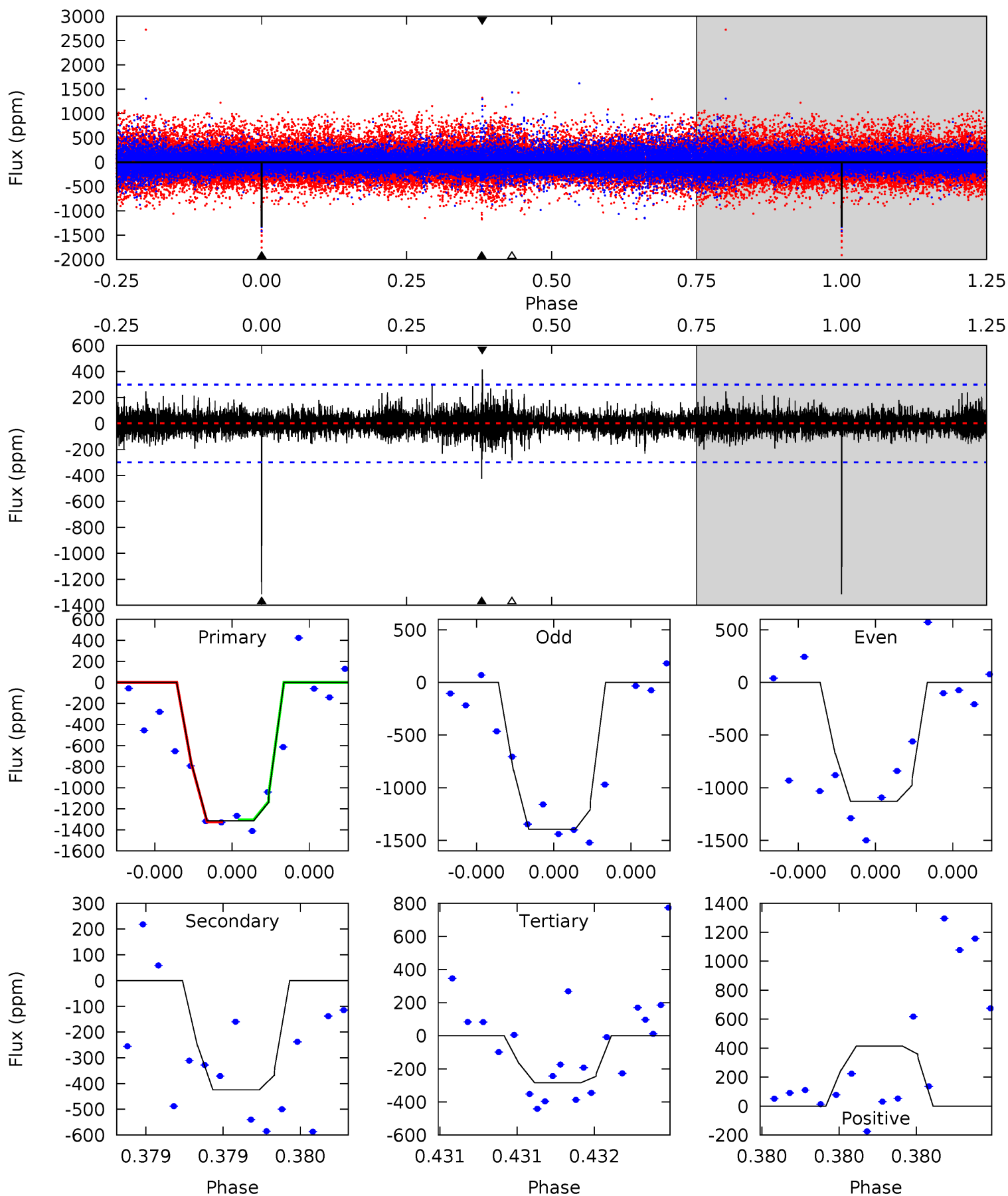
Pri	Sec	Ter	Pos	FA ₁	FA ₂	F _{Red}	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
8.43	12.4	11.8	17.9	5.62	3.56	2.62	-3.39	-9.45	0.61	-5.46	3.19	0.79	0.59	1.50



Alt Model-Shift Uniqueness Test

004059416-03, P = 399.333063 Days, E = 211.095957 Days

Pri	Sec	Ter	Pos	FA ₁	FA ₂	F _{Red}	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
25.0	8.06	5.39	7.86	5.69	3.66	1.01	19.6	17.1	2.67	0.20	2.33	1.00	0.24	0.16



Stellar Parameters For KIC 004059416

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	R (R_{\odot})	$M(M_{\odot})$	p_{\star} ($\text{g}\cdot\text{cm}^{-3}$)
	5313^{+166}_{-166}	$4.623^{+0.066}_{-0.048}$	$-1.040^{+0.300}_{-0.300}$	$0.642^{+0.054}_{-0.049}$	$0.630^{+0.059}_{-0.023}$	$3.354^{+0.856}_{-0.569}$
	+3%/-3%	+1%/-1%	+29%/-29%	+8%/-8%	+9%/-4%	+26%/-17%
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 004059416-03 / KOI

Detrend	Depth (ppm)	R_p (R_{\oplus})	T_{max} (K)	T_{obs} (K)	A_{obs}
DV	-1800 ± 145	$3.04^{+2.58}_{-1.98}$	274^{+11}_{-10}	5267^{+3926}_{-1114}	$88826^{+596791}_{-62725}$
Alt.	-424 ± 53	$3.11^{+2.43}_{-1.94}$	274^{+10}_{-10}	3924^{+1926}_{-686}	$19485^{+131441}_{-13148}$

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 $A_{obs} \gg 1.0$

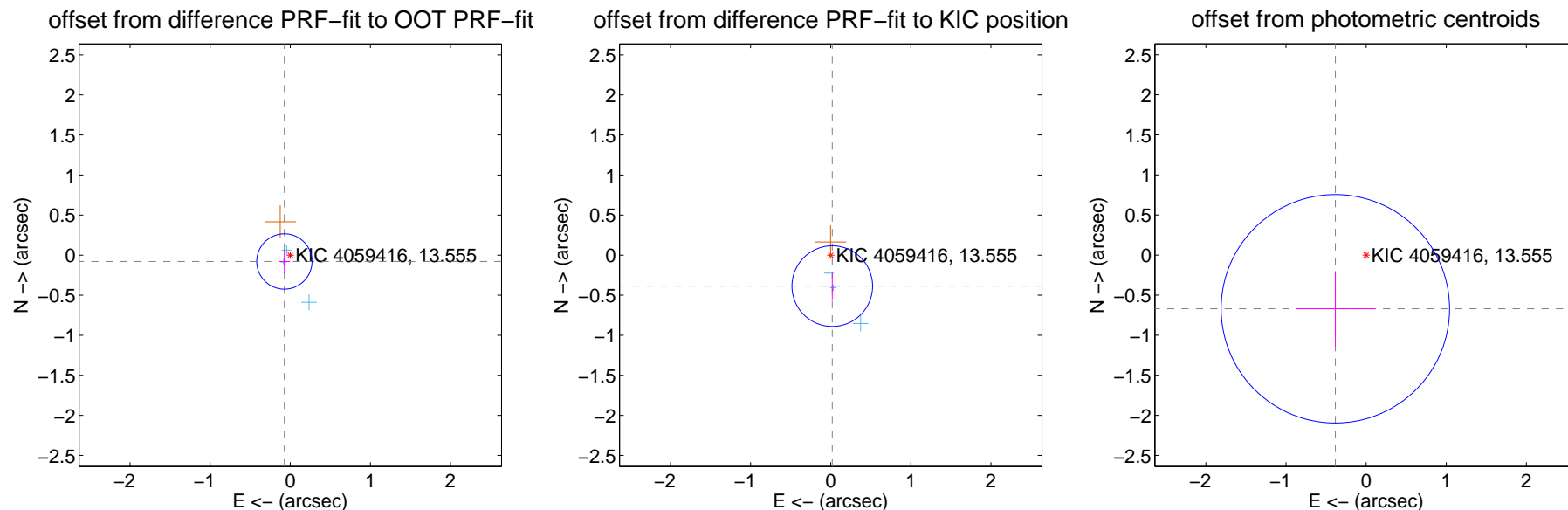
DV Centroid Data

Supplemental centroid analysis for 004059416-03. Kepler magnitude: 13.55. Transit SNR 7.75

There are 3 quarters with good PRF difference image offsets

The direct PRF centroid is offset from the target star catalog position by about 0.34 arcsec

	Distance in arcsec	Distance / σ	Δ RA	Δ Dec
PRF-fit source offset from OOT	0.108 ± 0.115	0.94	0.074 ± 0.072	-0.079 ± 0.142
PRF-fit source offset from KIC position	0.387 ± 0.168	2.31	-0.019 ± 0.096	-0.387 ± 0.165
photometric centroid source offset	0.77 ± 0.48	1.63	0.38 ± 0.49	-0.67 ± 0.47



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- σ uncertainty. Blue circle: three- σ . 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.

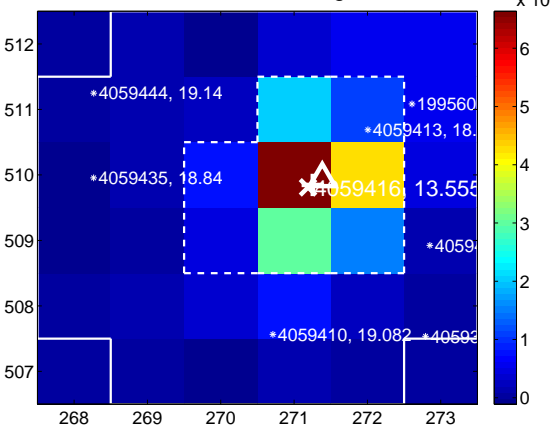
Q1 no difference image



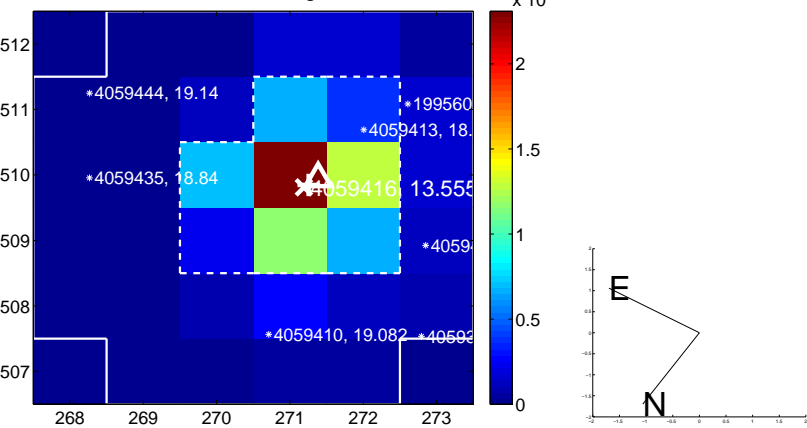
Q1 no OOT image



Q2 difference image



Q2 OOT image



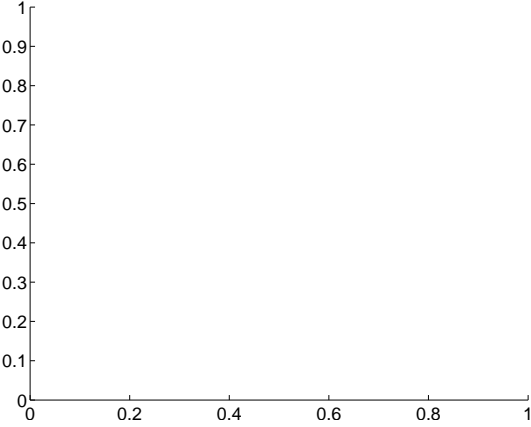
Q3 no difference image



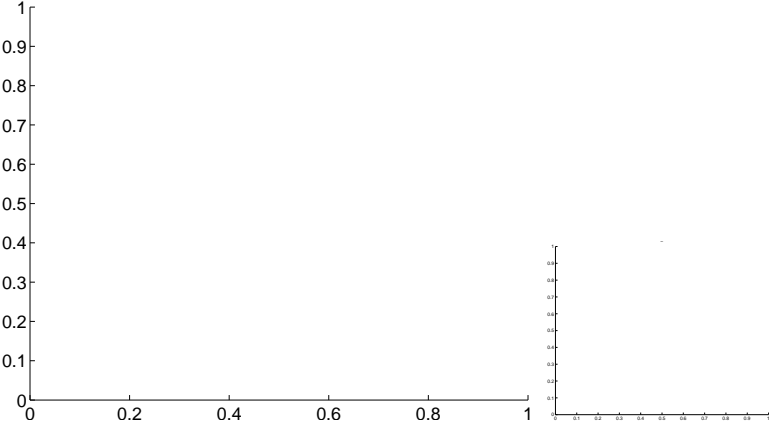
Q3 no OOT image



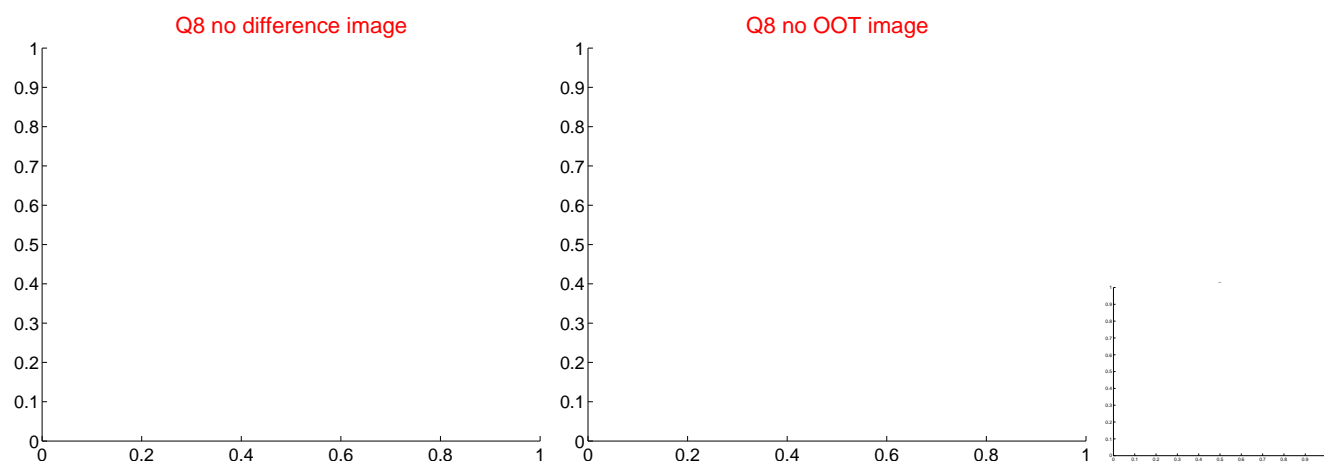
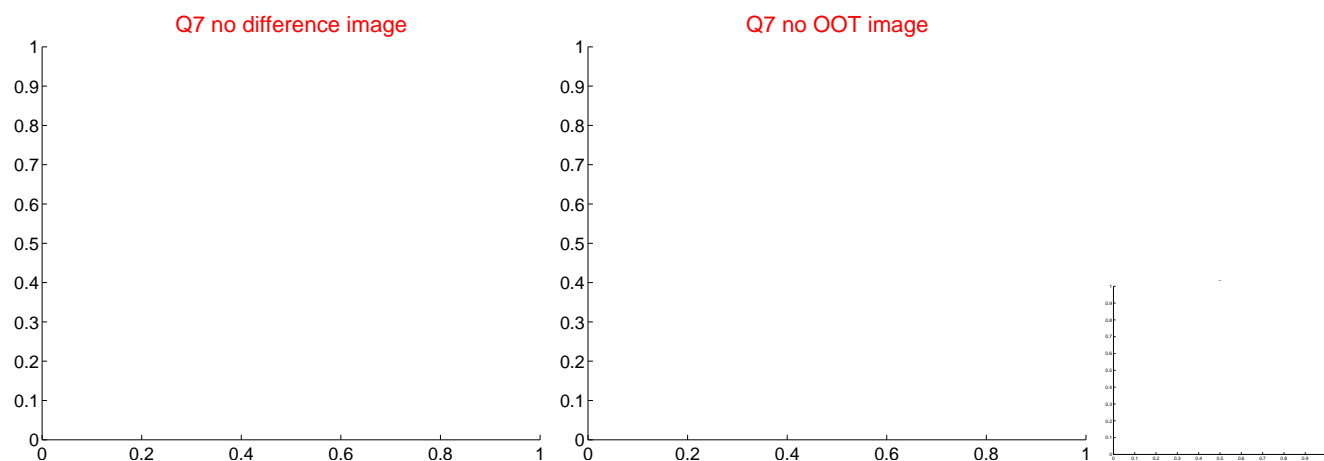
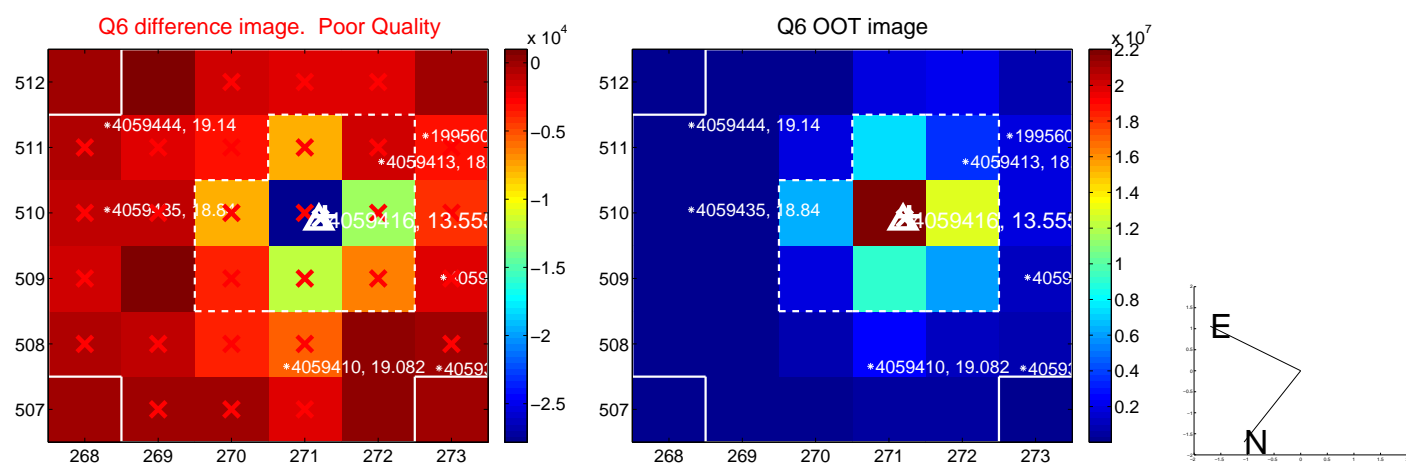
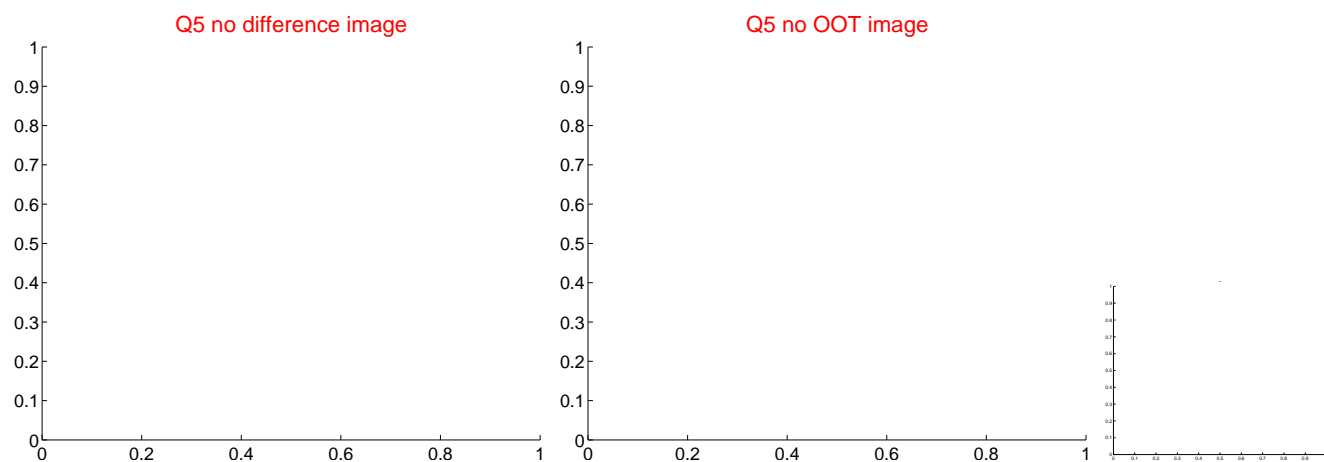
Q4 no difference image



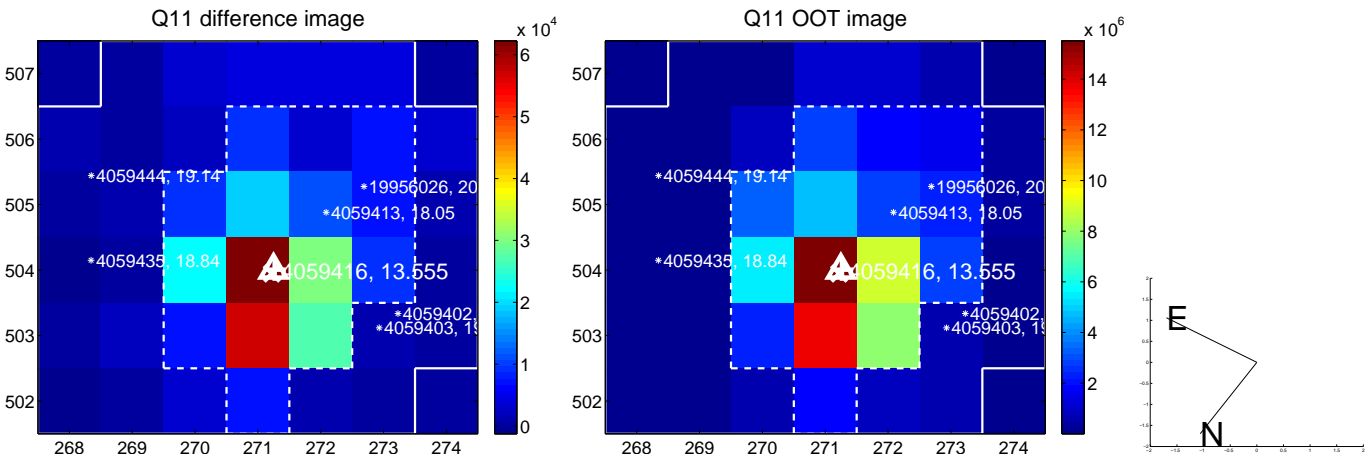
Q4 no OOT image



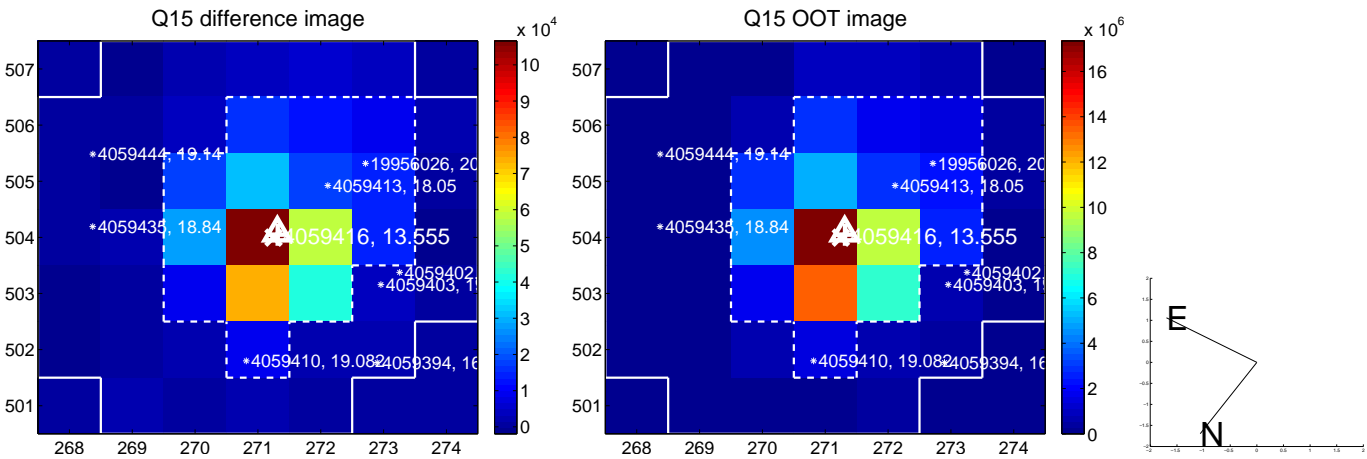
white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value



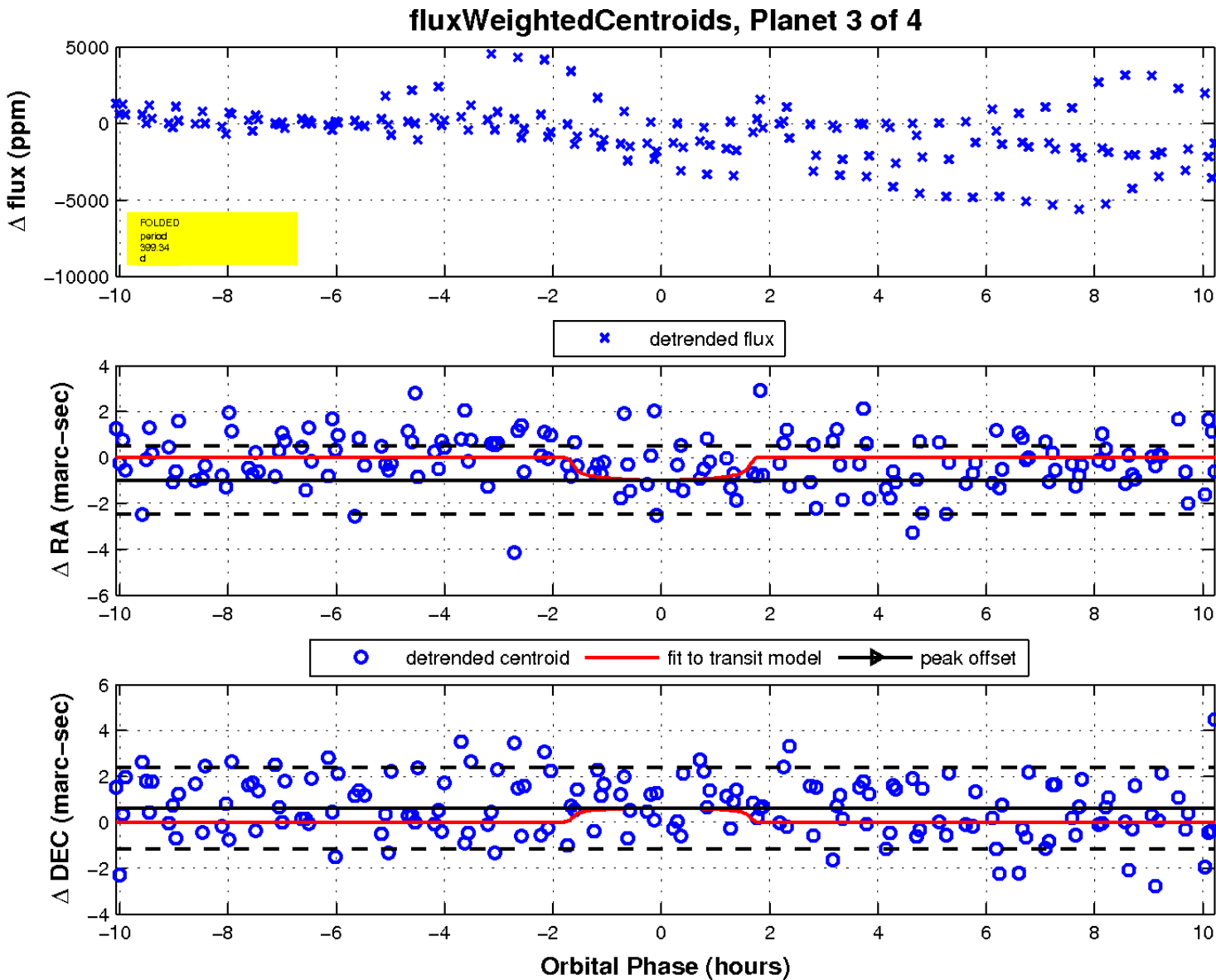
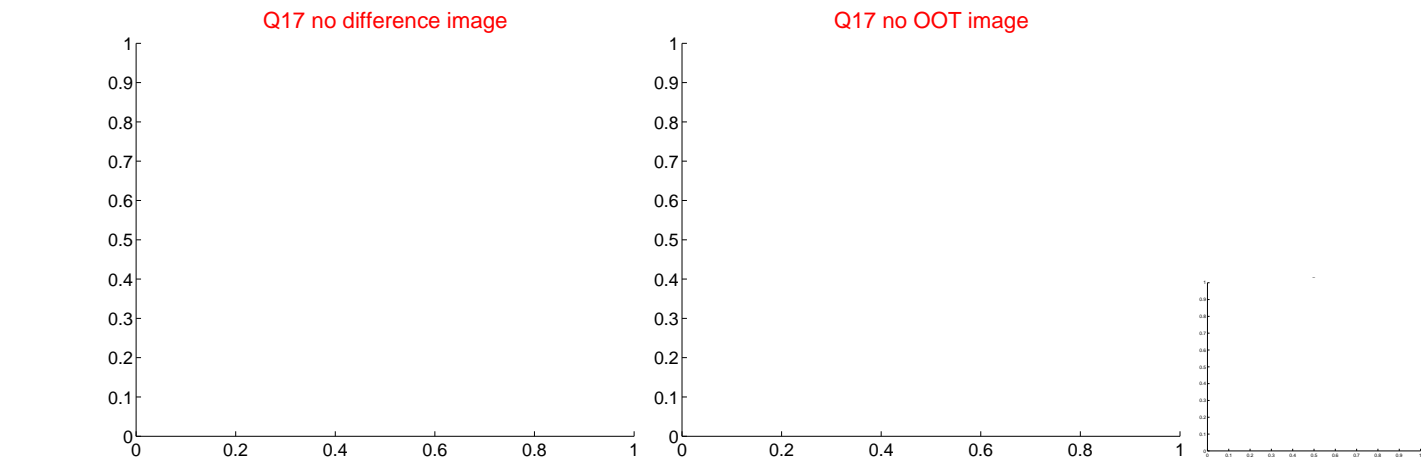
white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



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

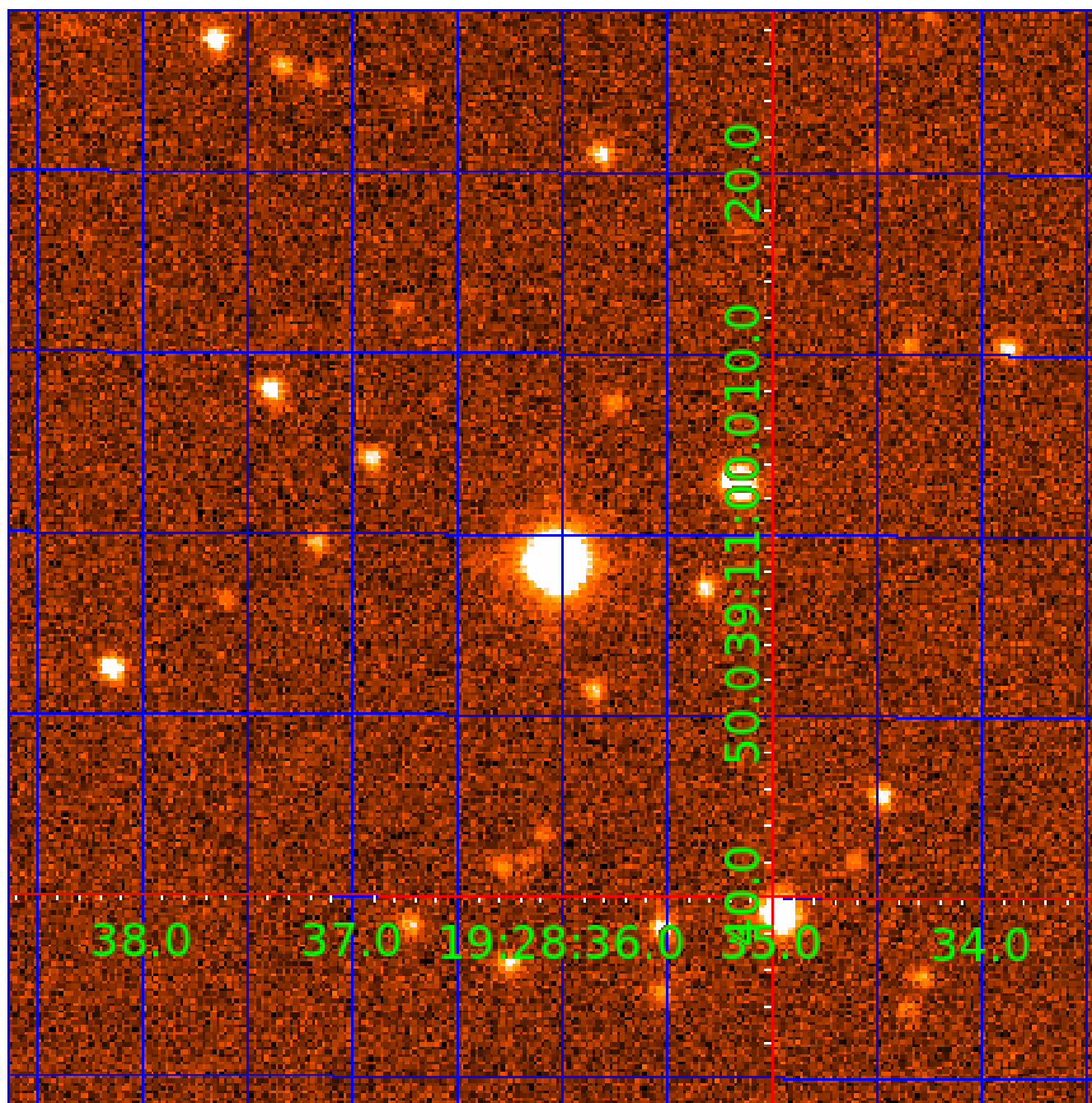


white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



UKIRT Image

Declination



KIC 004059416

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})
004059416-01	OBS	No	159.376808	243.479258	511.7	4.729	12.3	3.7	0.64	5313	1.60	1.21
004059416-02	OBS	No	523.568705	532.060014	2373.7	8.987	15.7	6.9	0.64	5313	3.21	0.25
004059416-03	OBS	No	399.335524	211.086788	1595.5	3.437	12.2	7.7	0.64	5313	2.56	0.35
004059416-04	OBS	No	358.629412	363.319515	708.6	6.000	17.9	-1.0	0.64	5313	1.70	0.41

Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
004059416-01	OBS	FP	0.00	1	0	0	0	MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_KIC_POS
004059416-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_KIC_POS
004059416-03	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
004059416-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES—LPP_DV—CENT_NOFITS

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

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

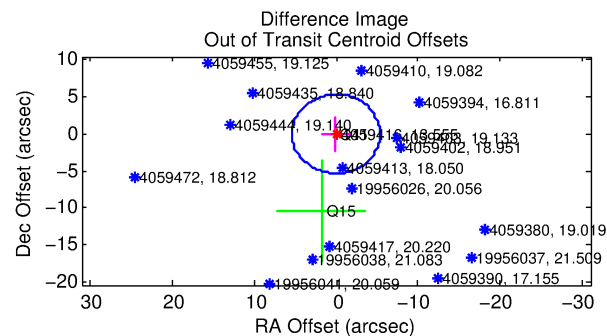
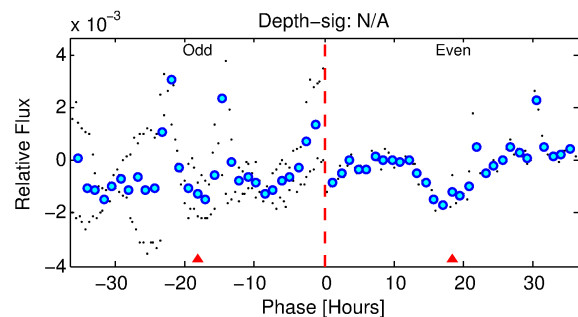
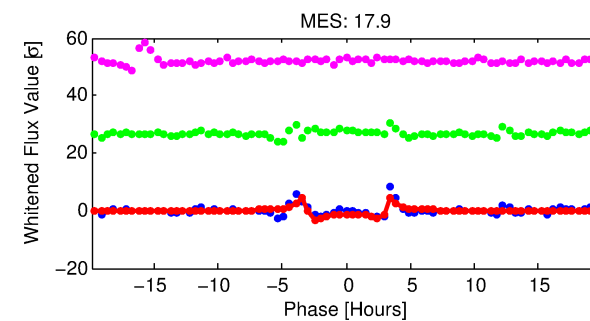
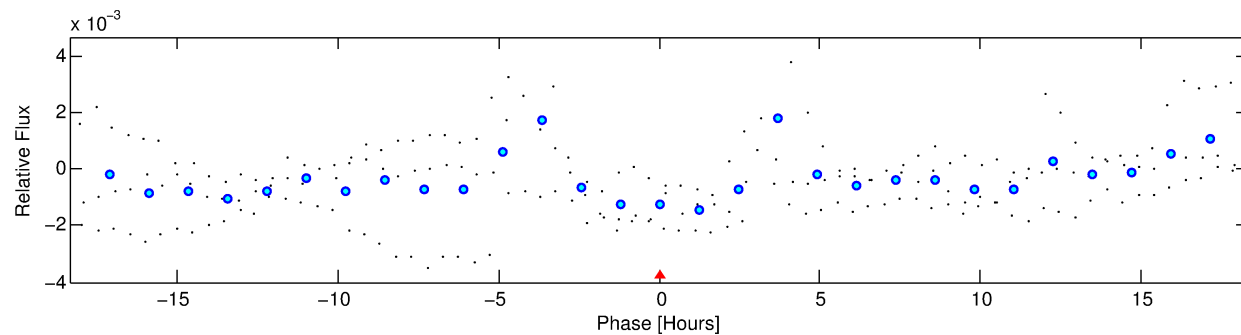
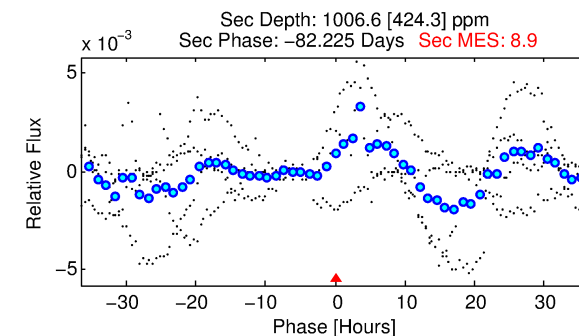
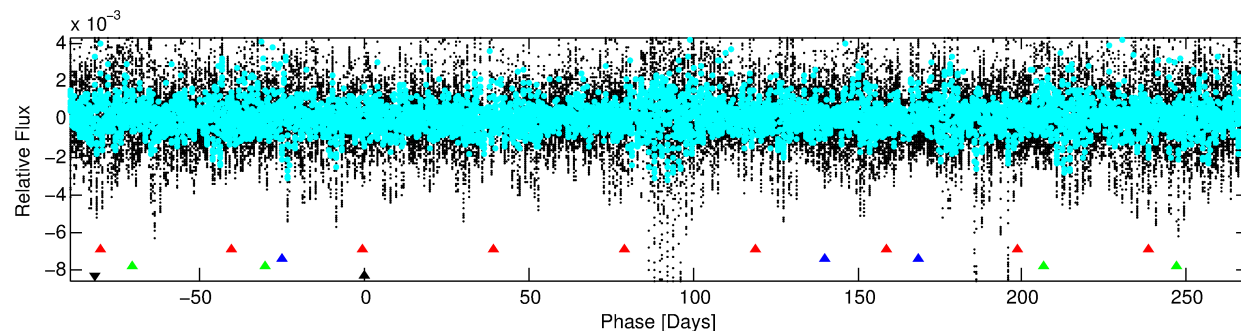
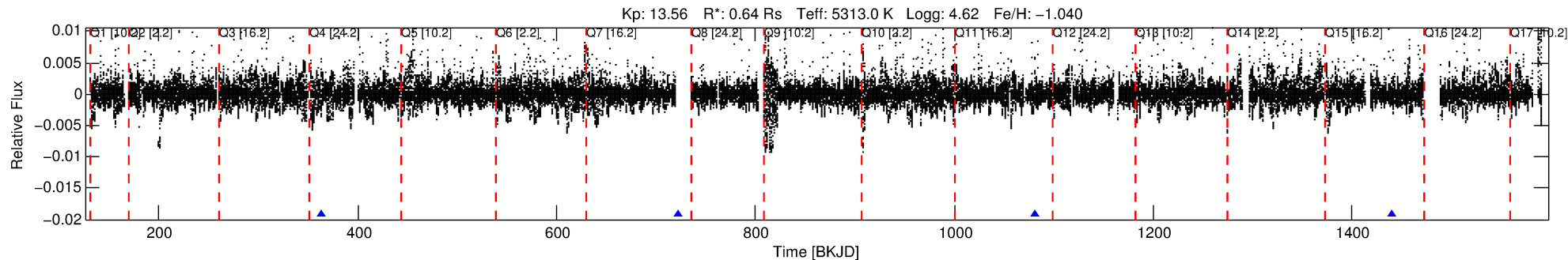
See http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col for comment definitions.

Ephemeris Match Information For 004059416-04

No Significant Match Found

DV One-Page Summary

KIC: 4059416 Candidate: 4 of 4 Period: 358.629 d



TPS TCE Results:

Period = 358.62941 d
Epoch = 363.3195 BKJD

DV fit results are unavailable

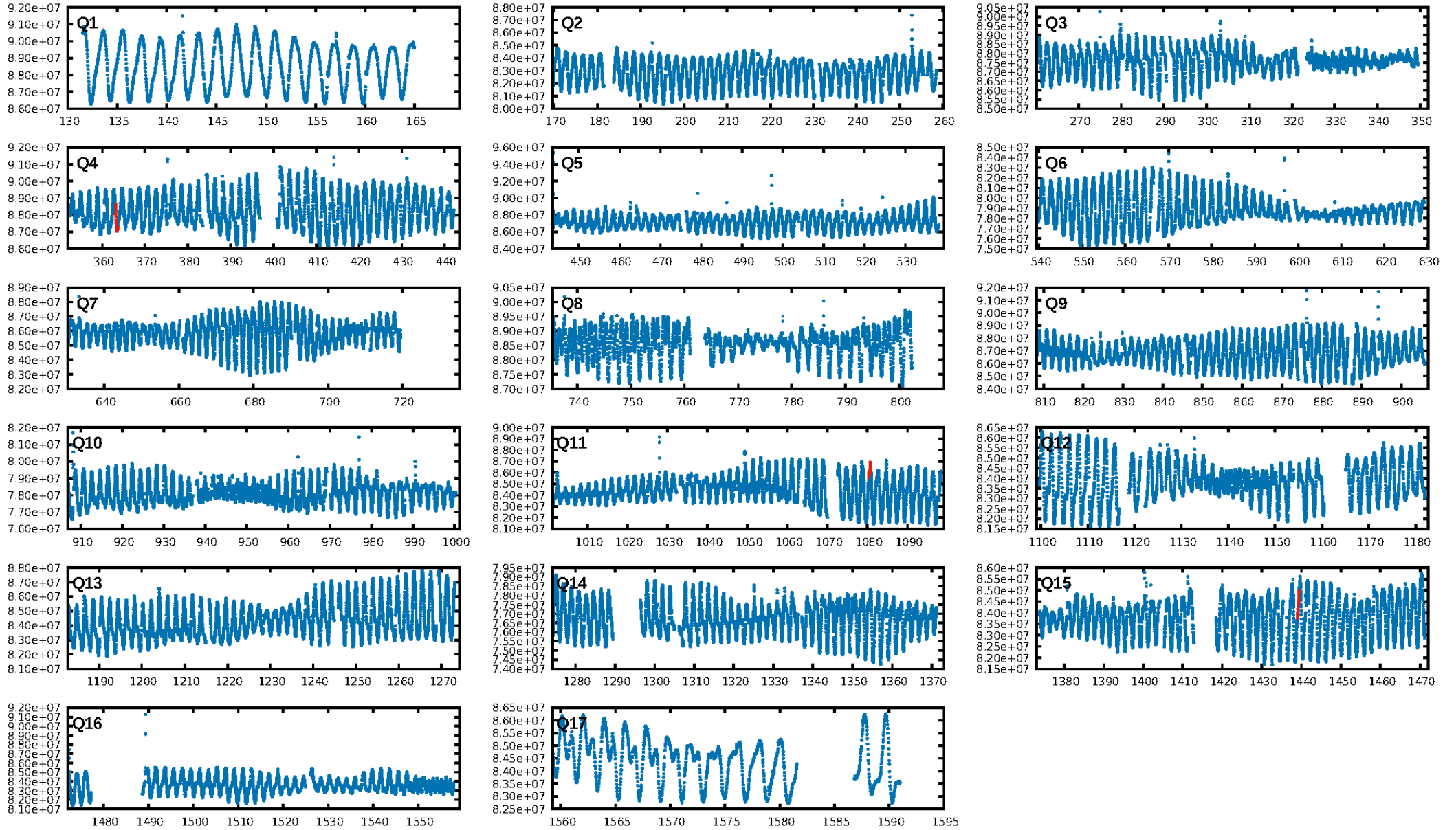
DV Diagnostic Results:

ShortPeriod-sig: 100.0% [625.94 σ]
LongPeriod-sig: 100.0% [141.28 σ]
ModelChiSquare2-sig: N/A
ModelChiSquareGof-sig: N/A
Bootstrap-pfa: N/A
RollingBand-fgt: 1.00 [3/3]
GhostDiagnostic-chr: 1.364
Centroid-sig: 59.5%
Centroid-so: 0.291 arcsec [1.30 σ]
OotOffset-rm: 0.029 arcsec [0.02 σ]
KicOffset-rm: 0.283 arcsec [0.12 σ]
OotOffset-st: 0/2/1/0 [3]
KicOffset-st: 0/2/1/0 [3]
DiffImageQuality-fgm: 0.33 [1/3]
DiffImageOverlap-fno: 1.00 [3/3]

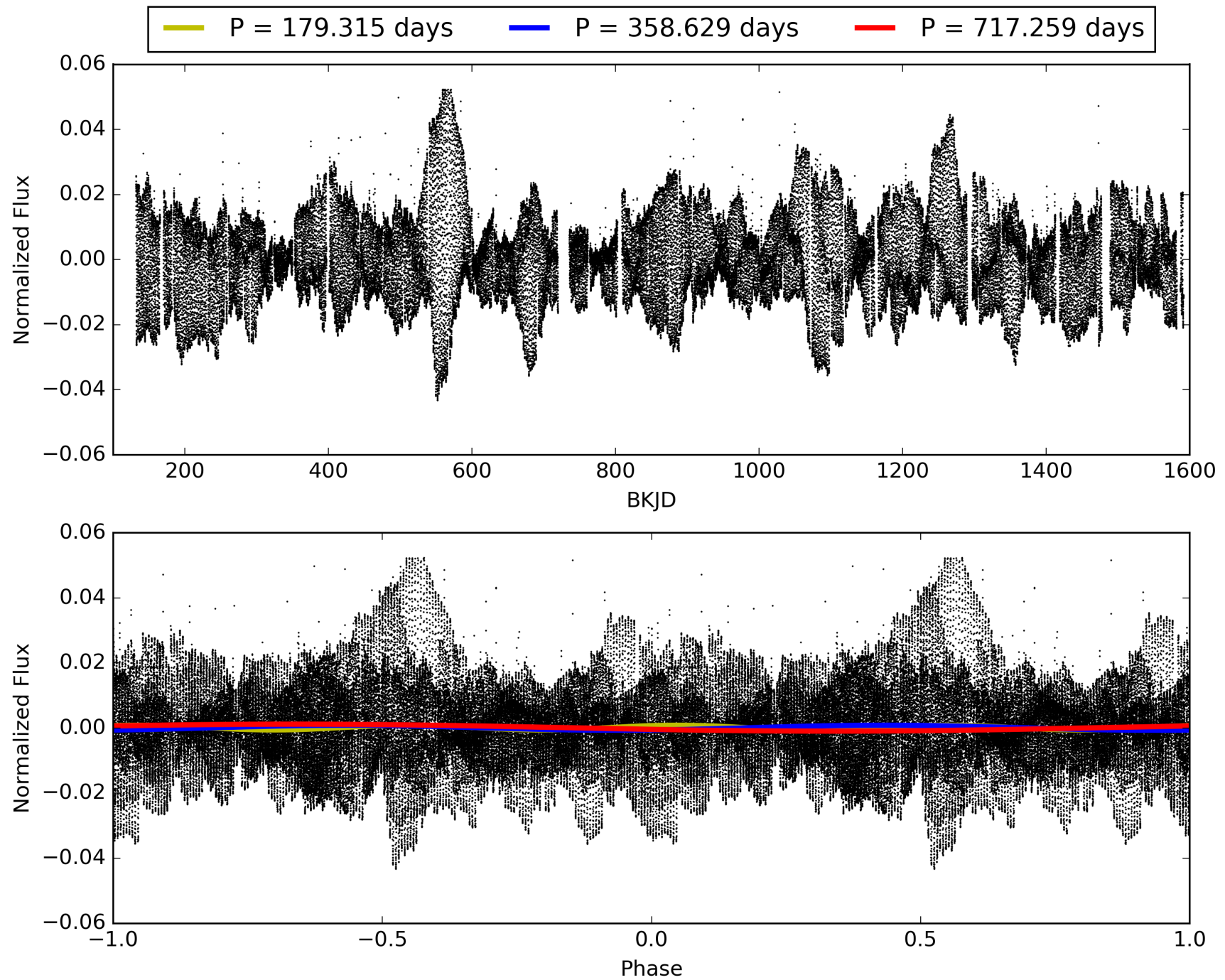
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 01-Feb-2016 05:42:09 Z

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

TCE 004059416-04, PDC Light Curves

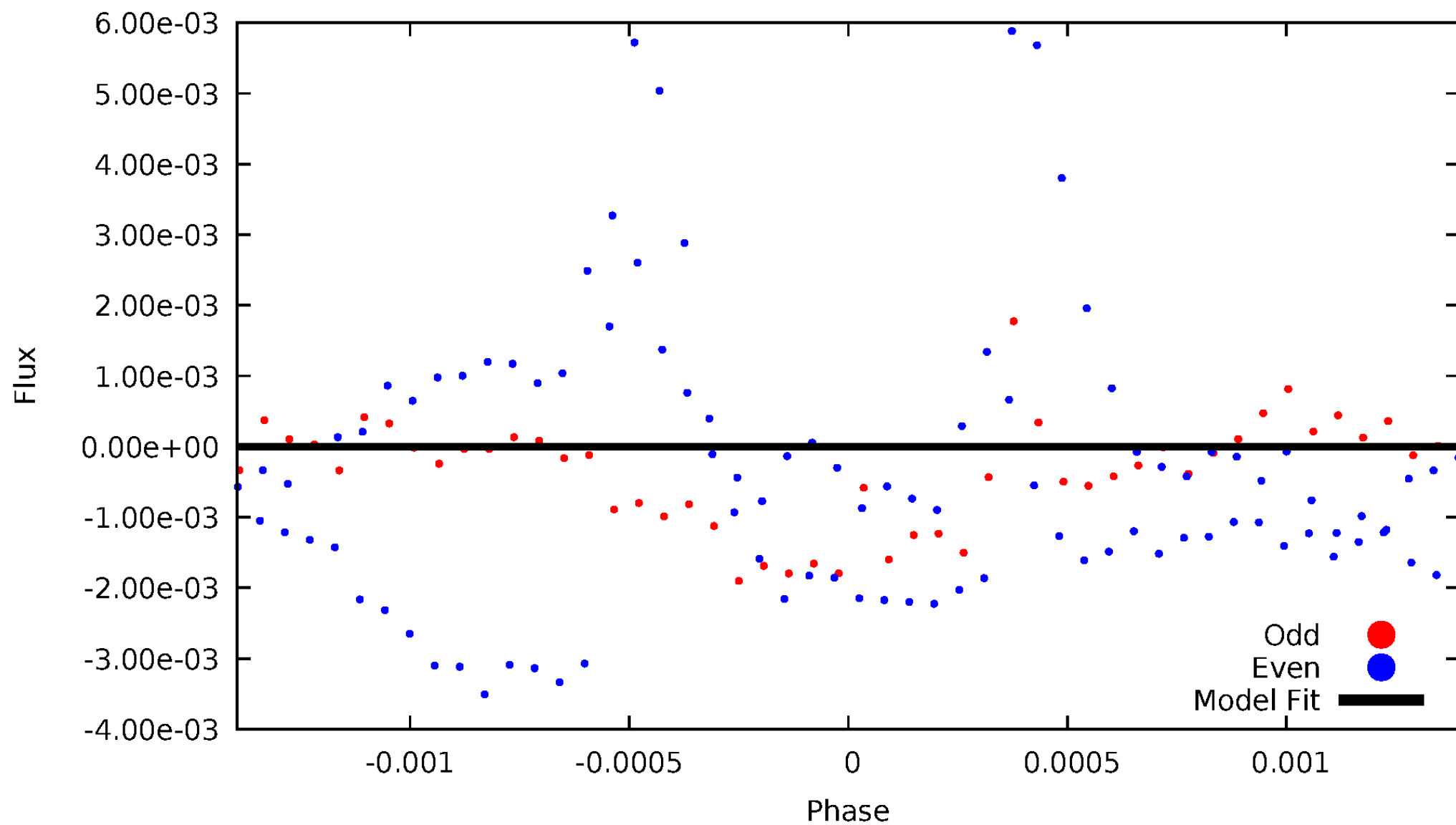


TCE 004059416-04



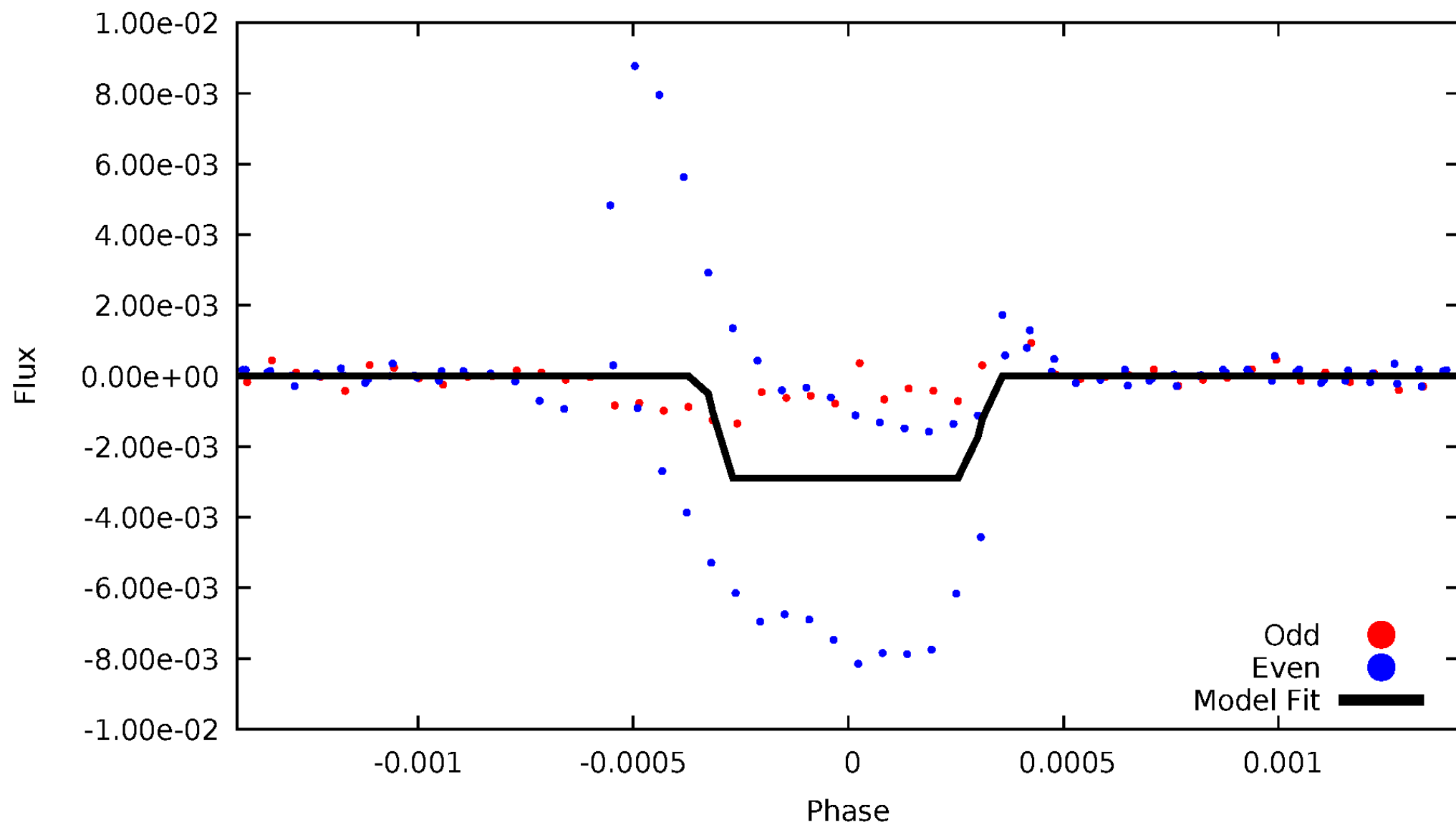
DV Odd/Even

TCE 004059416-04

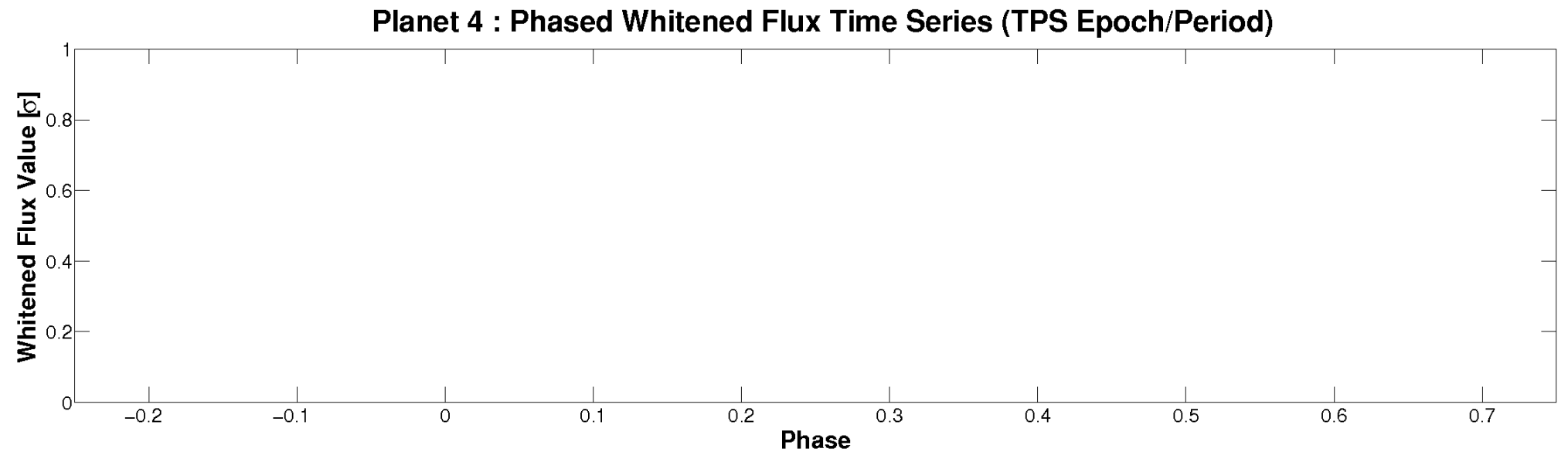
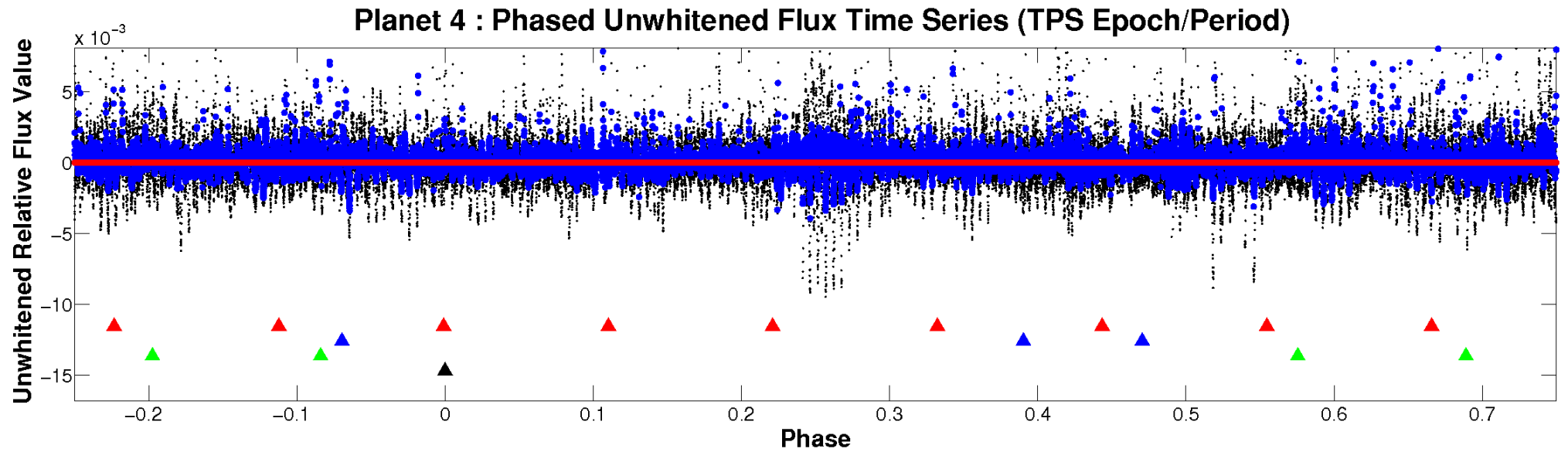


ALT Odd/Even

TCE 004059416-04

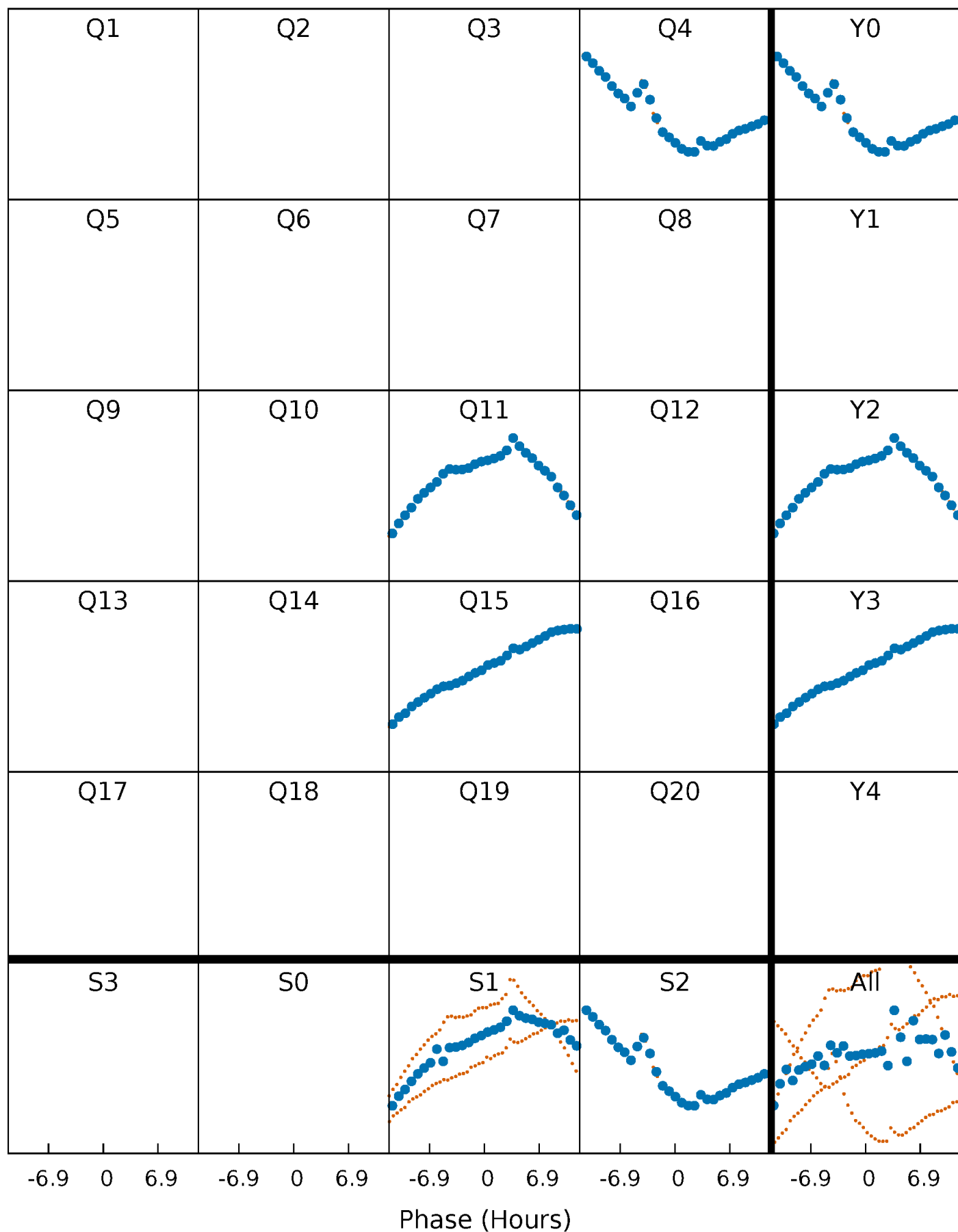


Non-Whitened Vs. Whitened Light Curve



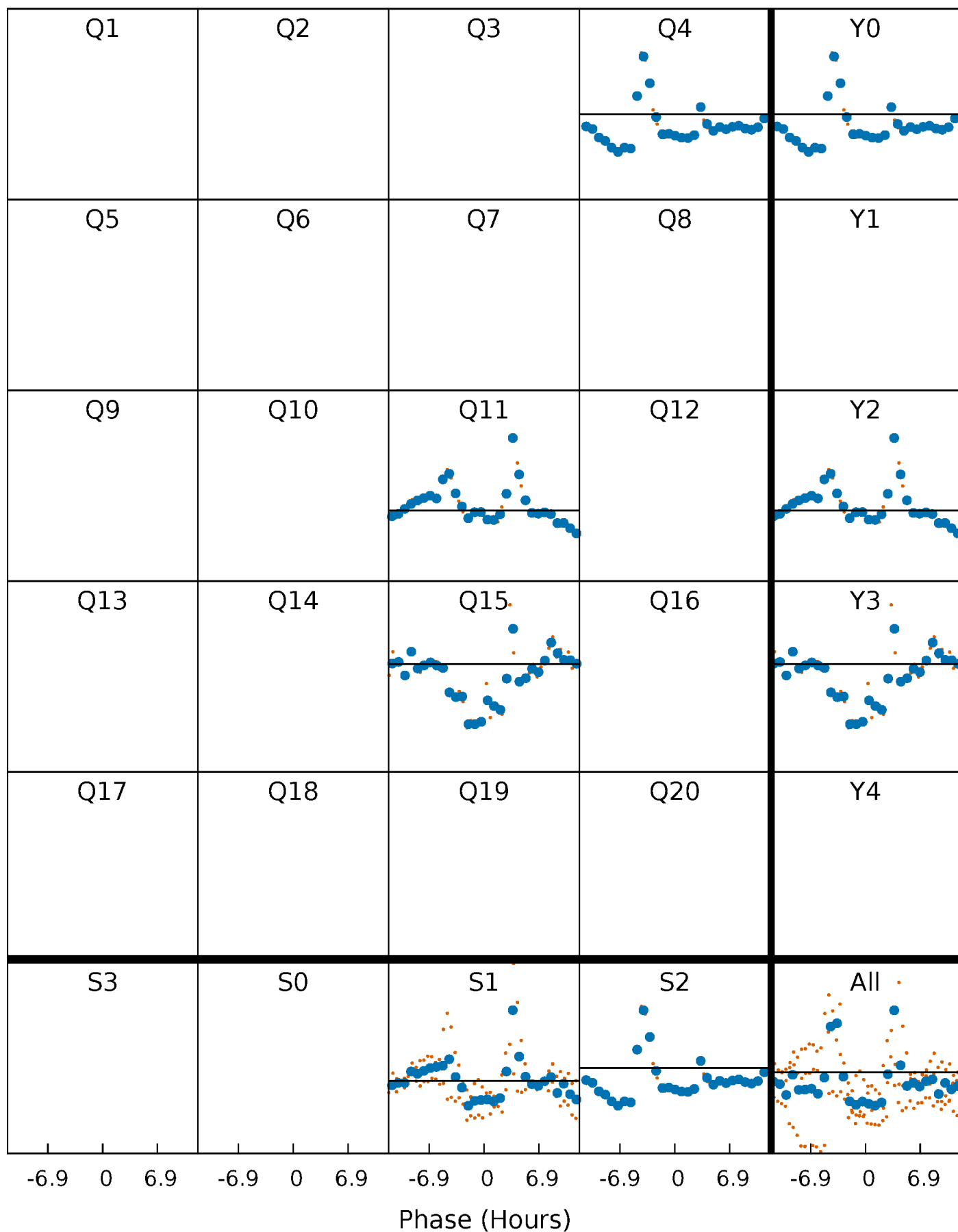
PDC Quarter-Phased Transit Curves

TCE 004059416-04 P=358.629412 Days $T_0=363.319515$ (BKJD)



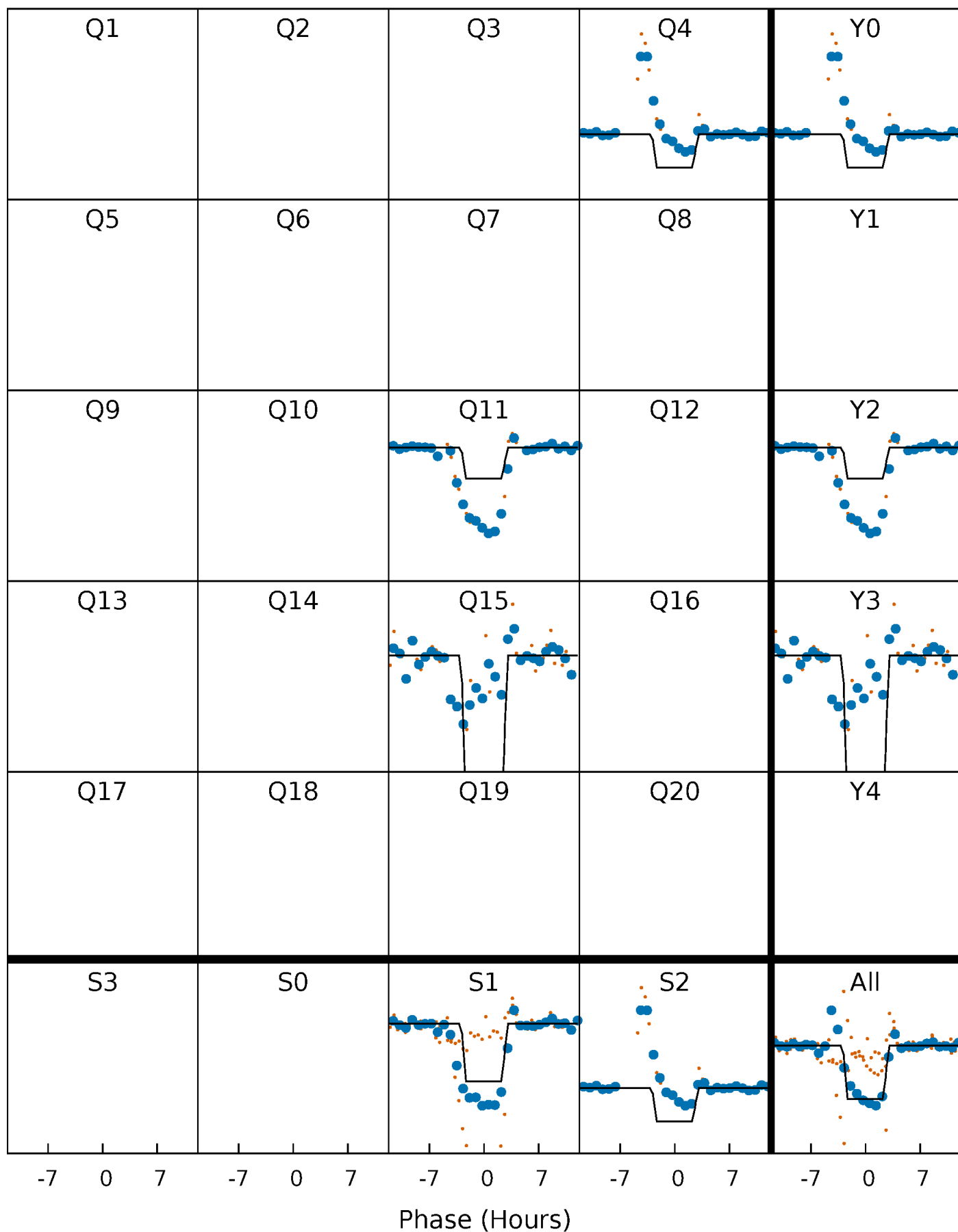
DV Quarter-Phased Transit Curves

TCE 004059416-04 $P=358.629412$ Days $T_0=363.319515$ (BKJD)



Alt. Detrend Quarter-Phased Transit Curves

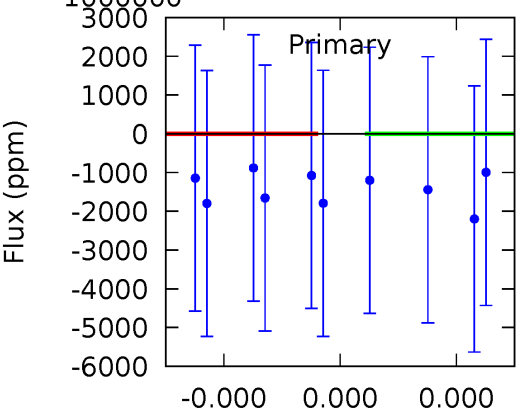
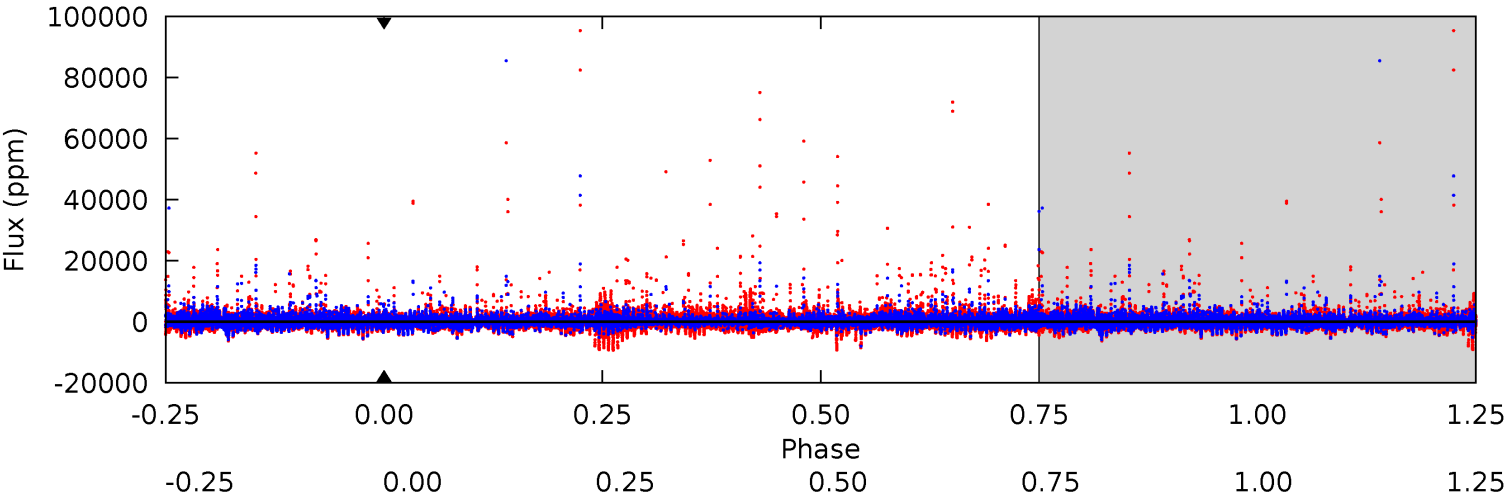
TCE 004059416-04 P=358.629412 Days $T_0=363.322544$ (BKJD)



DV Model-Shift Uniqueness Test

004059416-04, P = 358.629412 Days, E = 4.690103 Days

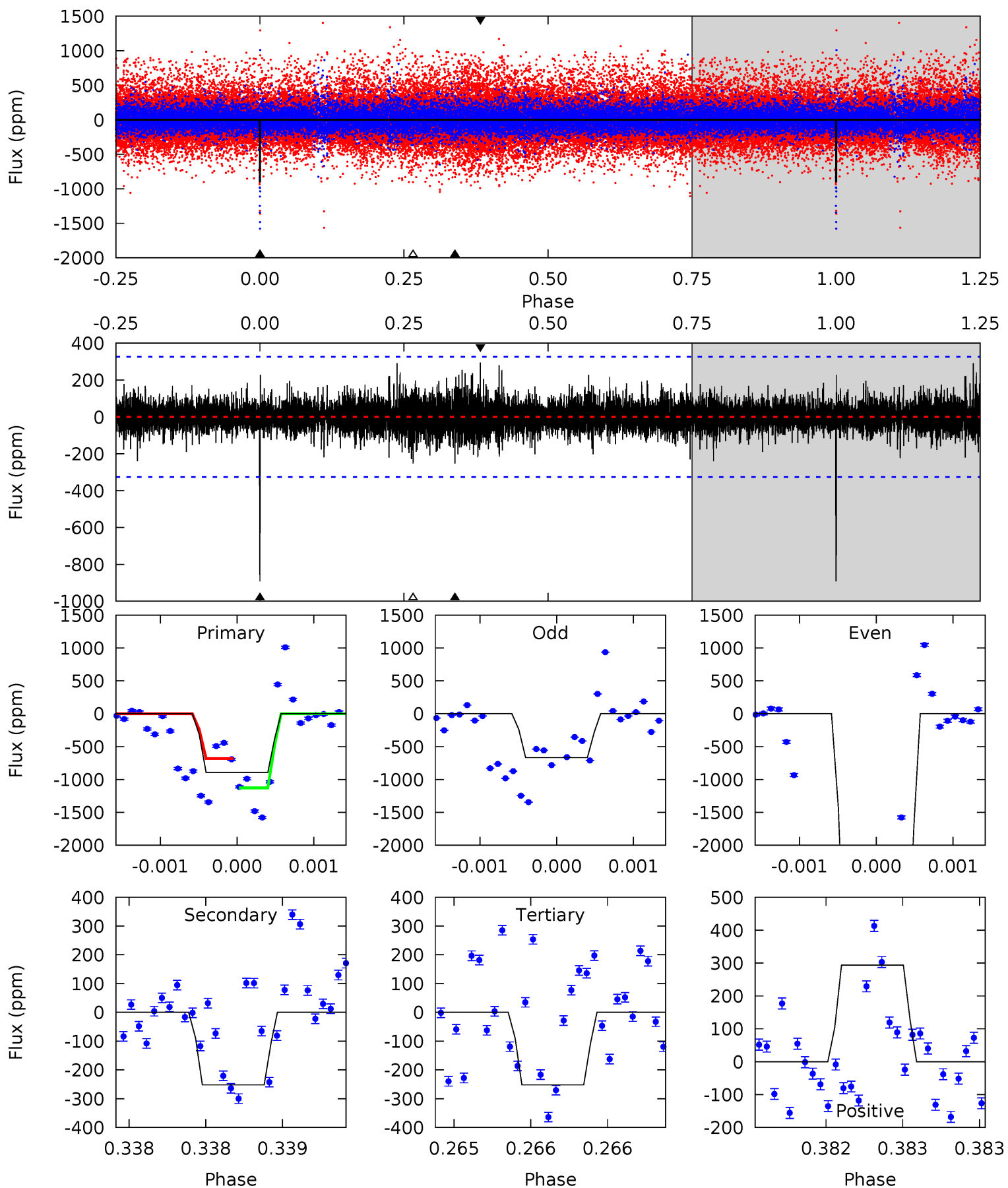
Pri	Sec	Ter	Pos	FA ₁	FA ₂	F _{Red}	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
0	0	0	0	1.00	1.00	1.00	0	0	0	0	0	0	0	0



Alt Model-Shift Uniqueness Test

004059416-04, P = 358.629412 Days, E = 4.693132 Days

Pri	Sec	Ter	Pos	FA ₁	FA ₂	F _{Red}	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
15.1	4.27	4.27	4.98	5.53	3.42	0.93	10.8	10.1	0.00	-0.71	35.0	4.50	0.25	3.75



Stellar Parameters For KIC 004059416

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	R (R_{\odot})	$M(M_{\odot})$	p_{\star} ($\text{g}\cdot\text{cm}^{-3}$)
	5313^{+166}_{-166}	$4.623^{+0.066}_{-0.048}$	$-1.040^{+0.300}_{-0.300}$	$0.642^{+0.054}_{-0.049}$	$0.630^{+0.059}_{-0.023}$	$3.354^{+0.856}_{-0.569}$
	+3%/-3%	+1%/-1%	+29%/-29%	+8%/-8%	+9%/-4%	+26%/-17%
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 004059416-04 / KOI

Detrend	Depth (ppm)	R_p (R_{\oplus})	T_{max} (K)	T_{obs} (K)	A_{obs}
DV	0 ± 1000000	$5.68^{+5.29}_{-3.82}$	284^{+11}_{-11}	4065^{+12583}_{-17988}	$19819^{+2448298}_{-1652671}$
Alt.	-252 ± 59	$6.13^{+6.50}_{-4.13}$	284^{+11}_{-11}	2935^{+1241}_{-492}	2684^{+21254}_{-2058}

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

DV Centroid Data

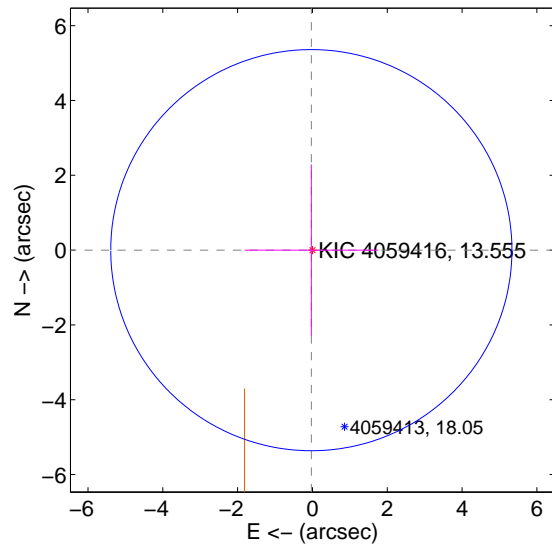
Supplemental centroid analysis for 004059416-04. Kepler magnitude: 13.55. Transit SNR -1.00

There are 1 quarters with good PRF difference image offsets

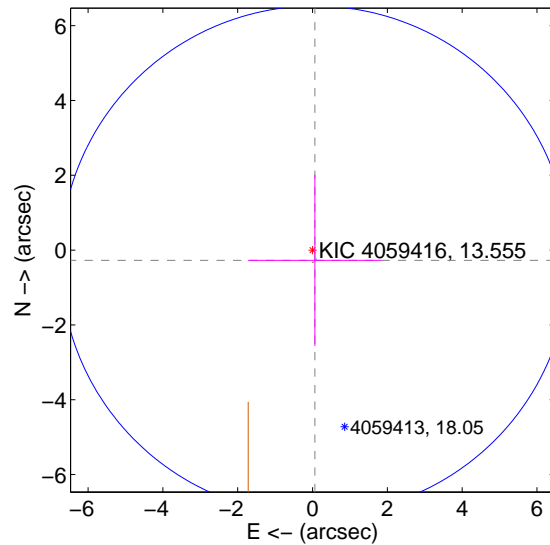
The direct PRF centroid is offset from the target star catalog position by about 0.37 arcsec

	Distance in arcsec	Distance / σ	Δ RA	Δ Dec
PRF-fit source offset from OOT	0.029 ± 1.787	0.02	0.029 ± 1.786	-0.001 ± 2.290
PRF-fit source offset from KIC position	0.283 ± 2.267	0.12	-0.063 ± 1.786	-0.275 ± 2.290
photometric centroid source offset	0.29 ± 0.22	1.30	-0.22 ± 0.24	-0.19 ± 0.20

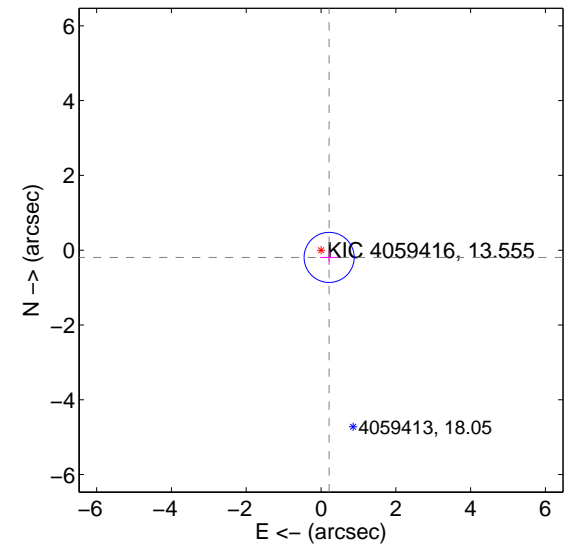
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position

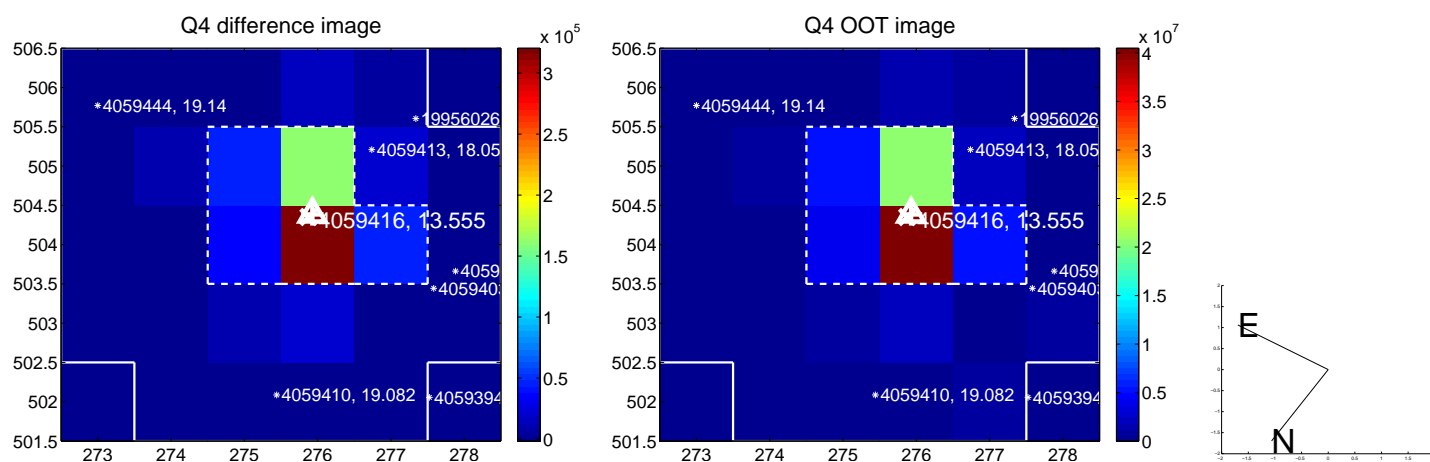
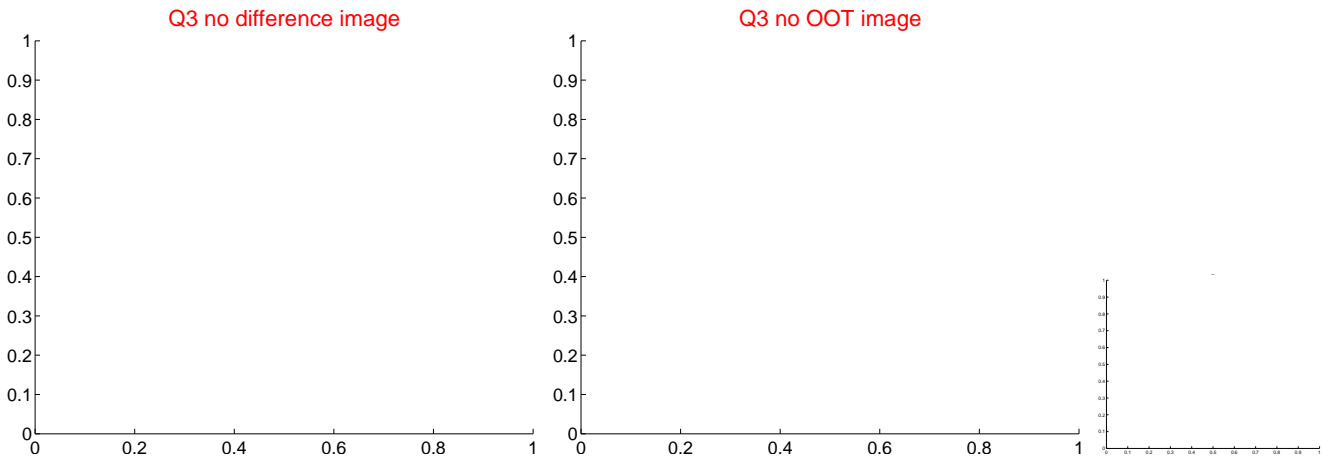
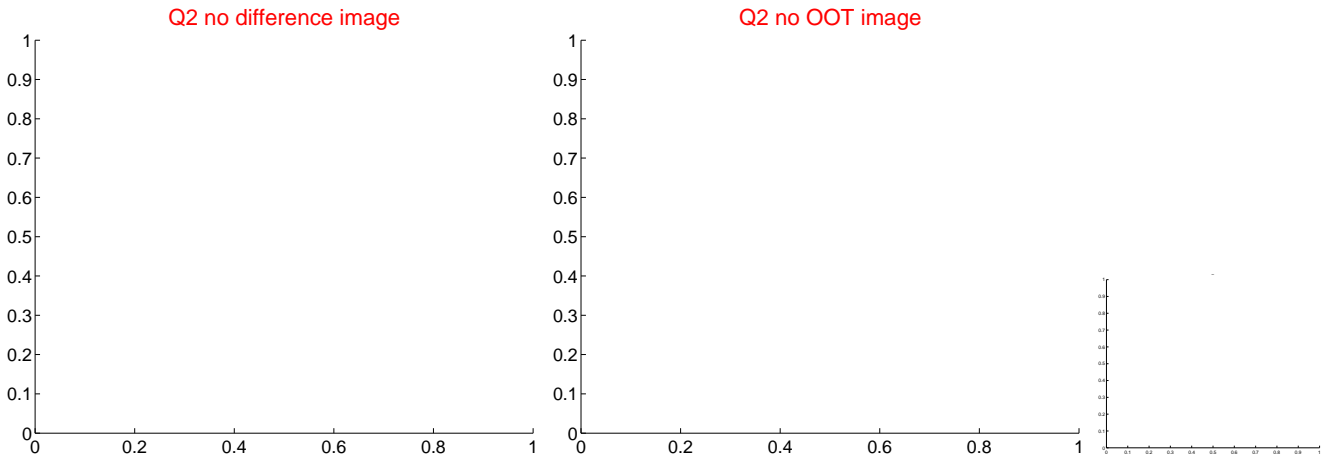
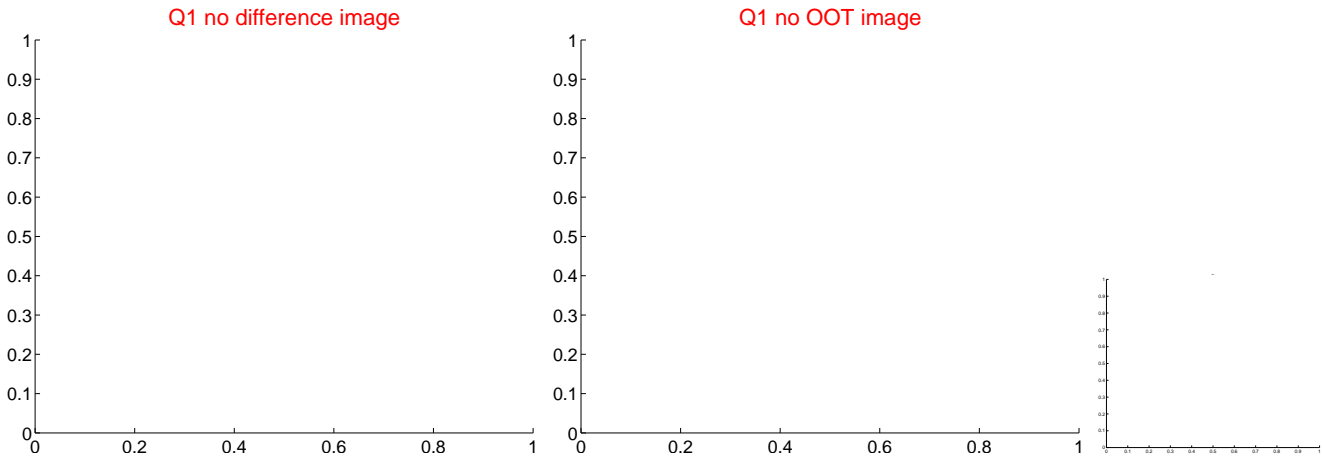


offset from photometric centroids



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- σ uncertainty. Blue circle: three- σ . 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.

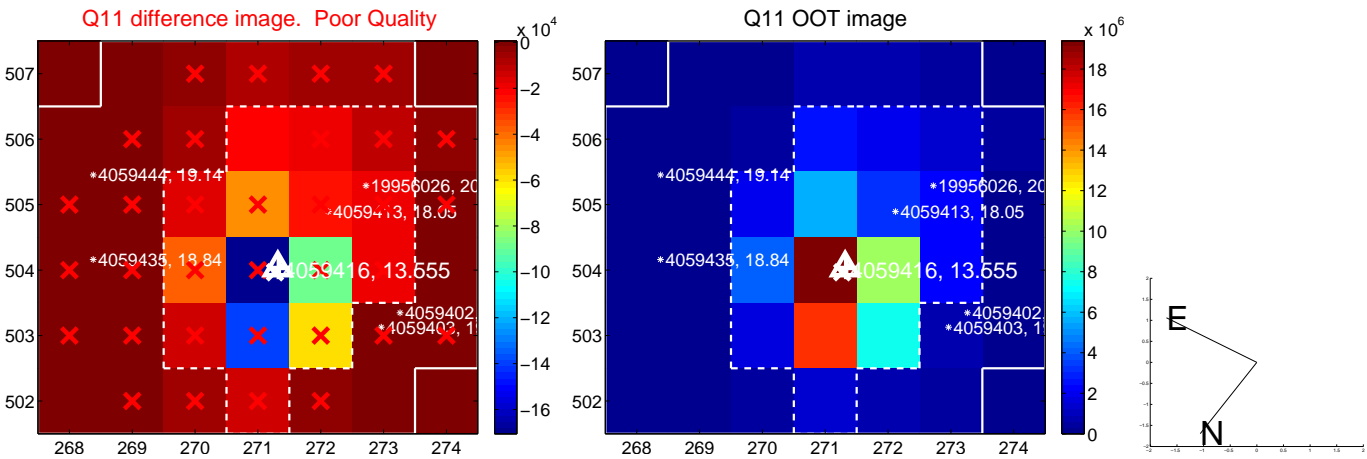
white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value



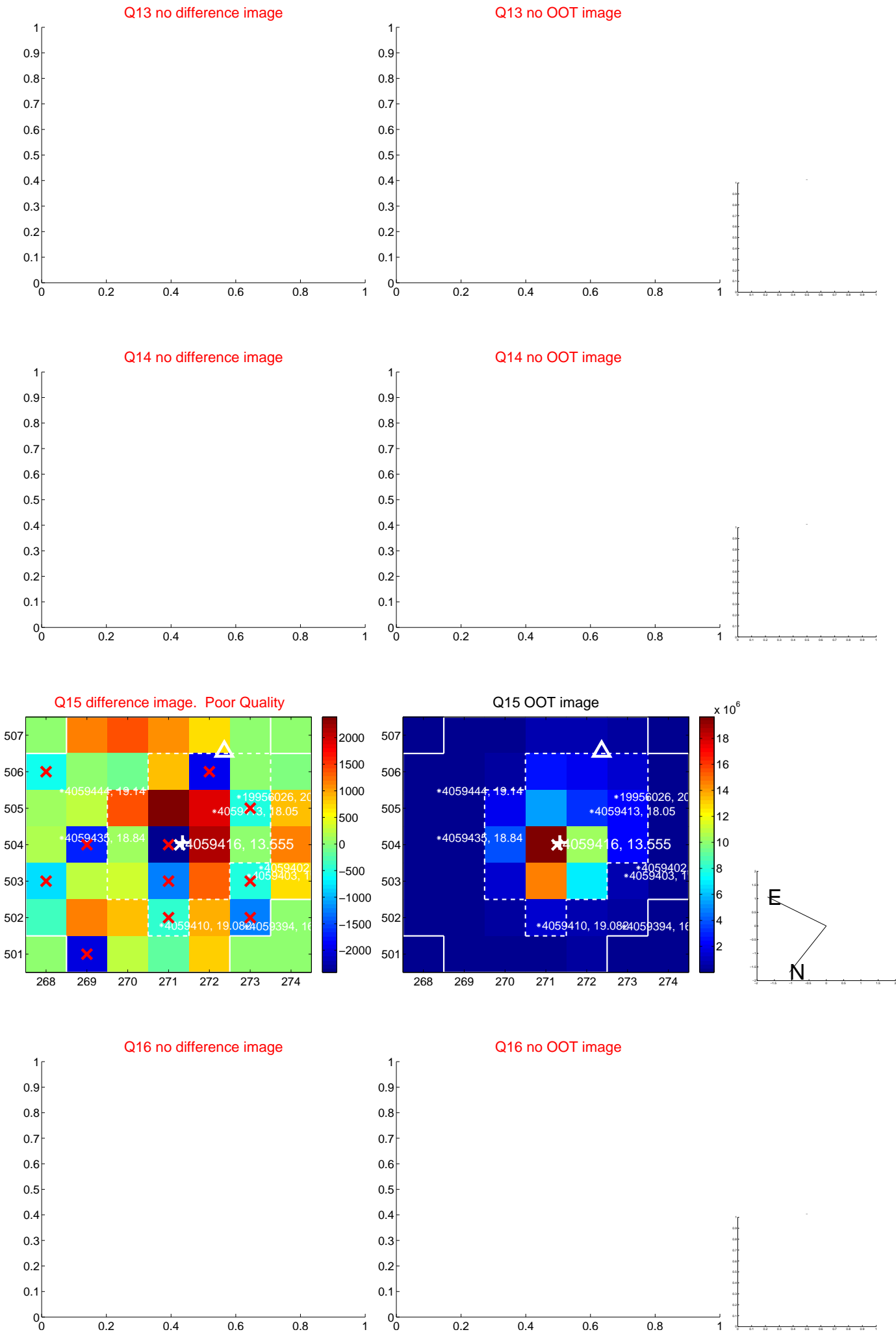
white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



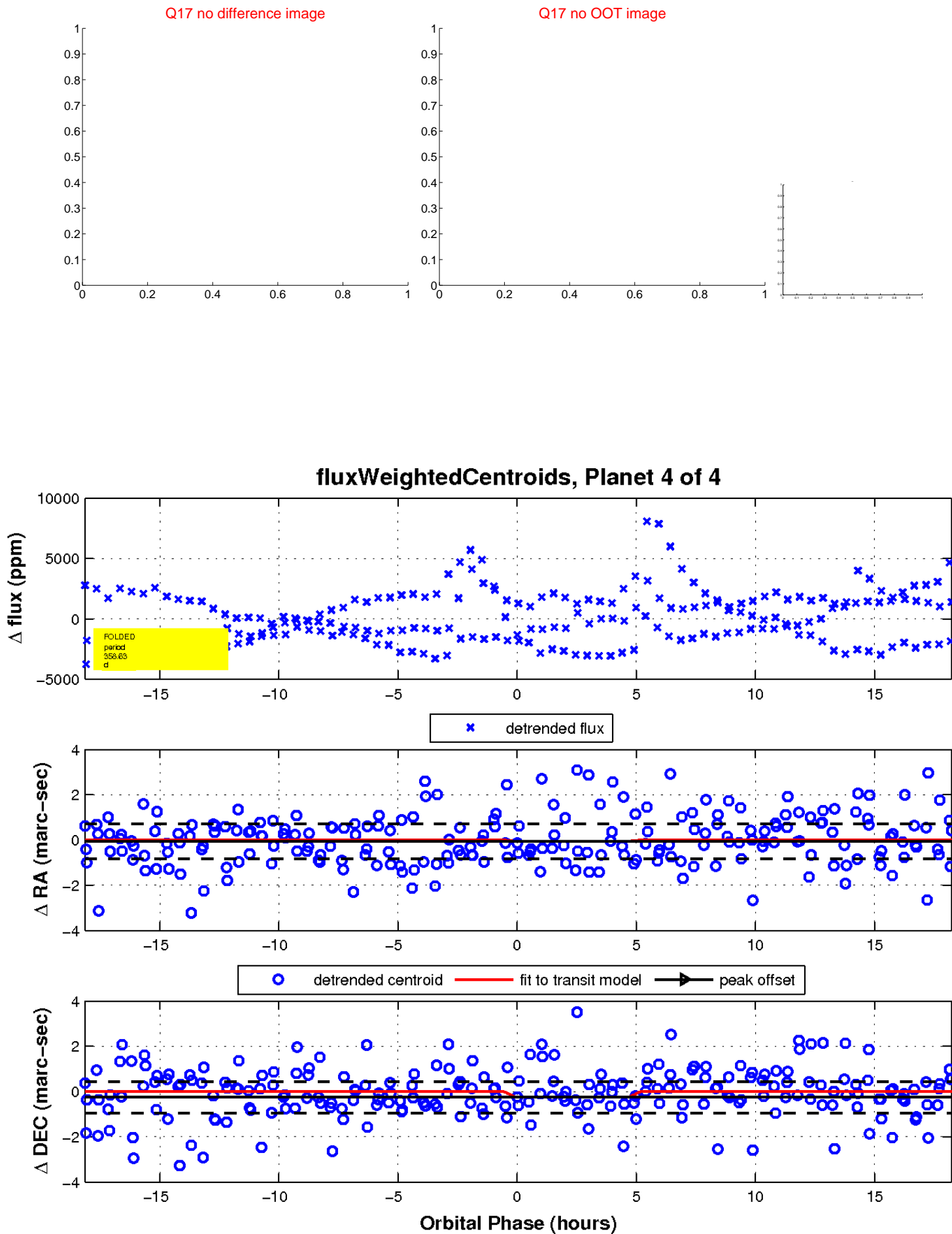
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



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

