

KIC 004646159

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})
004646159-01	OBS	No	471.406878	203.718972	1320.9	8.002	18.1	5.6	2.84	5229	12.53	3.44
004646159-02	OBS	No	608.759464	336.803245	1157.9	6.587	16.9	5.5	2.84	5229	9.47	2.45
004646159-03	OBS	No	523.777450	529.978033	1417.6	3.760	14.4	9.1	2.84	5229	10.98	2.99
004646159-04	OBS	No	332.433179	263.175808	643.0	3.000	12.7	-1.0	2.84	5229	7.08	5.49

Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
004646159-01	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS
004646159-02	OBS	FP	0.00	1	0	1	0	INDIV_TRANS_CHASES—LPP_DV—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—HALO_GHOST
004646159-03	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—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS
004646159-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—INCONSISTENT_TRANS—CENT_NOFITS

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

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

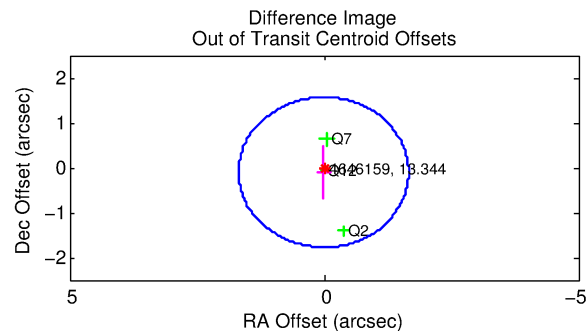
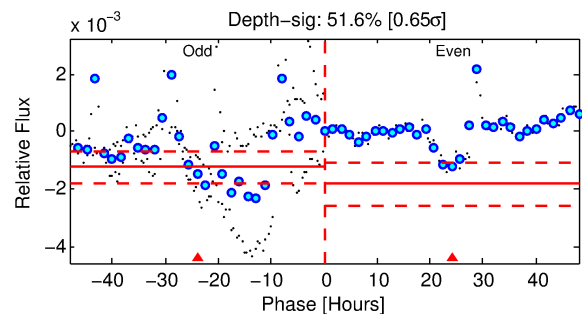
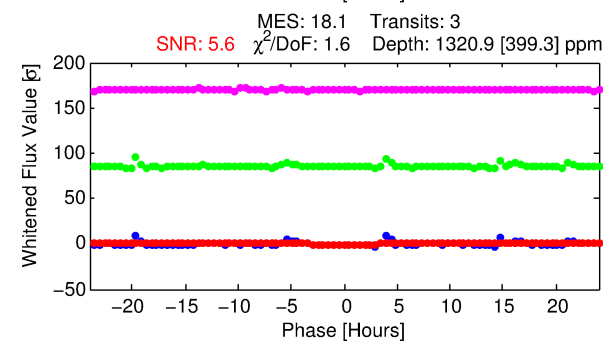
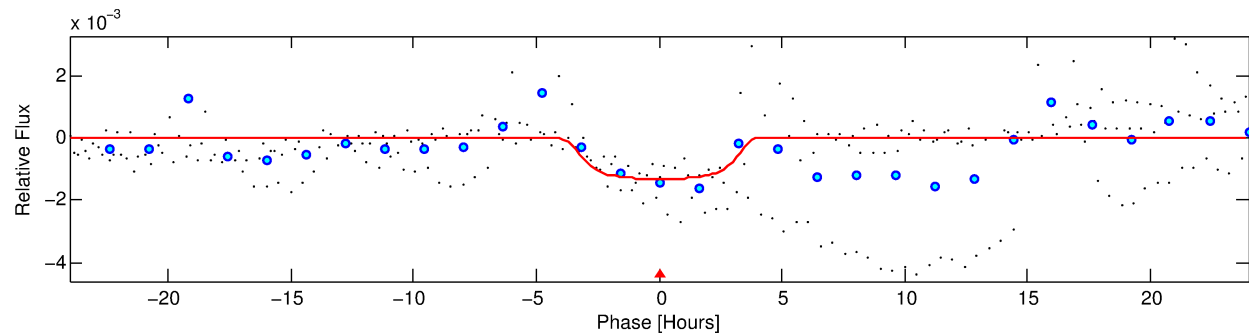
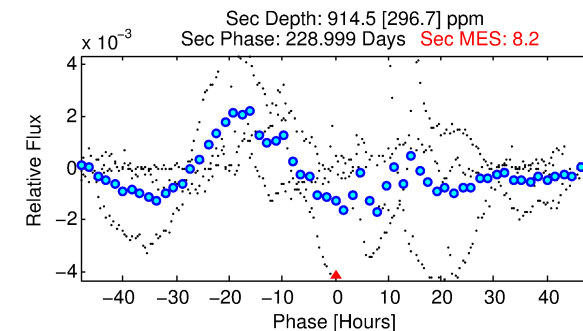
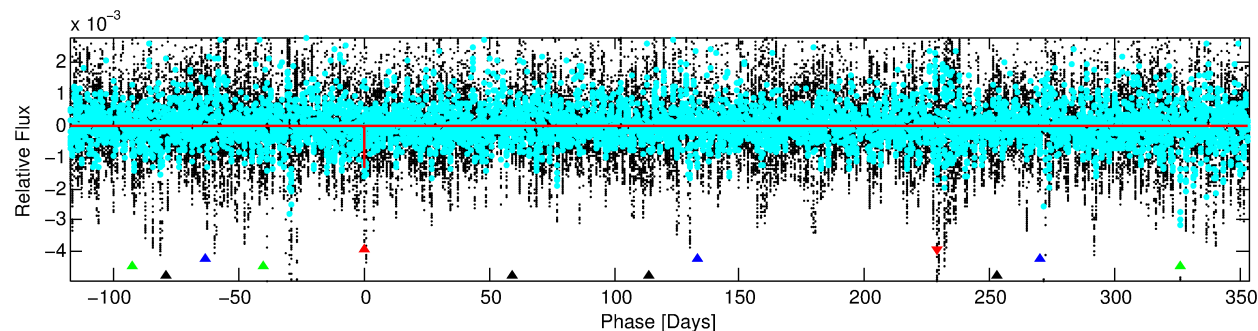
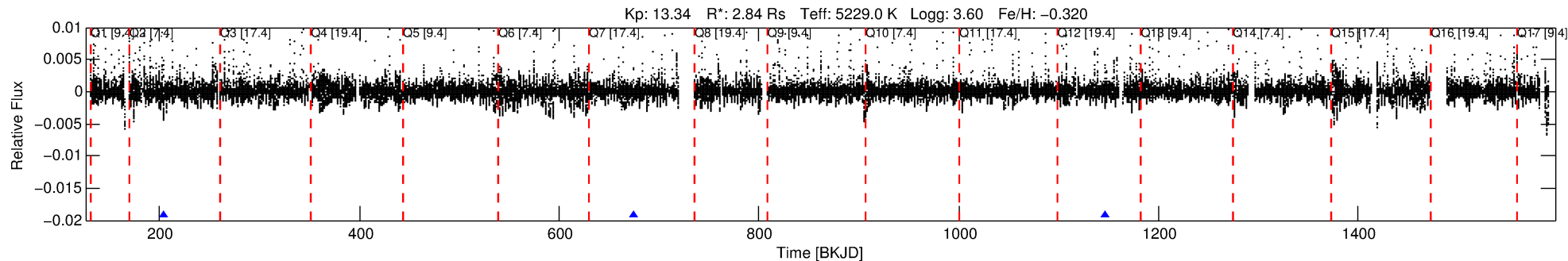
See http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col for comment definitions.

Ephemeris Match Information For 004646159-01

No Significant Match Found

DV One-Page Summary

KIC: 4646159 Candidate: 1 of 4 Period: 471.407 d



DV Fit Results:

Period = 471.40688 [0.01169] d
Epoch = 203.7190 [0.0155] BKJD
Rp/R* = 0.0404 [0.0069]
a/R* = 229.04 [51.87]
b = 0.91 [0.05]
Seff = 3.44 [5.01]
Teq = 347 [126] K
Rp = 12.53 [9.13] Re
a = 1.2533 [1.0431] AU
Ag = 5029.92 [7668.94] [0.66σ]
Teffp = 4523 [550] K [7.39σ]

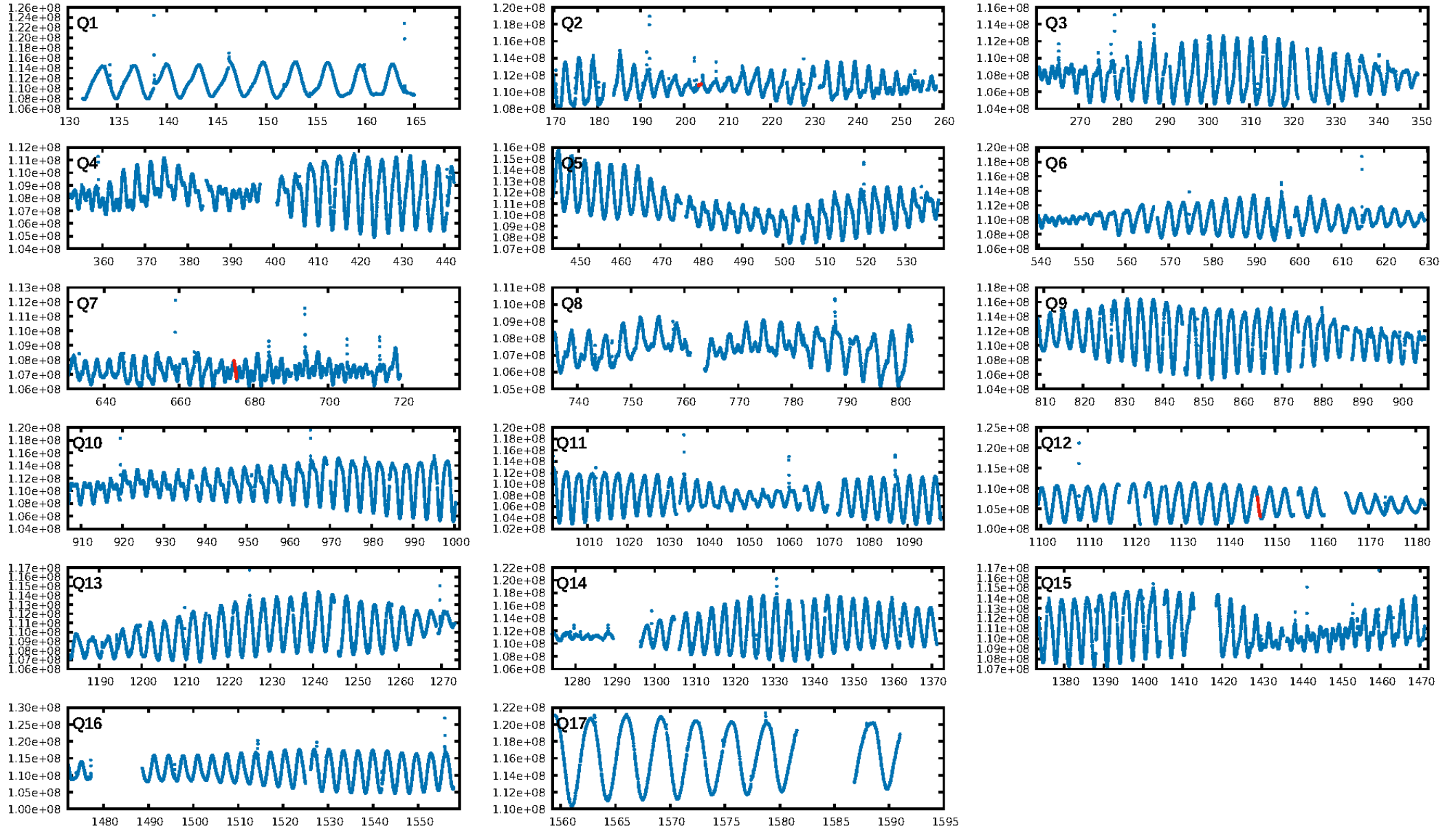
DV Diagnostic Results:

ShortPeriod-sig: 100.0% [390.29σ]
LongPeriod-sig: 100.0% [142.16σ]
ModelChiSquare2-sig: 0.0%
ModelChiSquareGof-sig: 49.1%
Bootstrap-pfa: N/A
RollingBand-fgt: 1.00 [3/3]
GhostDiagnostic-chr: 2.265
Centroid-sig: N/A
Centroid-so: 0.244 arcsec [0.60σ]
OotOffset-rm: 0.104 arcsec [0.19σ]
OotOffset-st: 1/1/1/0 [3]
KicOffset-rm: 0.132 arcsec [0.24σ]
KicOffset-st: 1/1/1/0 [3]
DiffImageQuality-fgm: 0.33 [1/3]
DiffImageOverlap-fno: 1.00 [3/3]

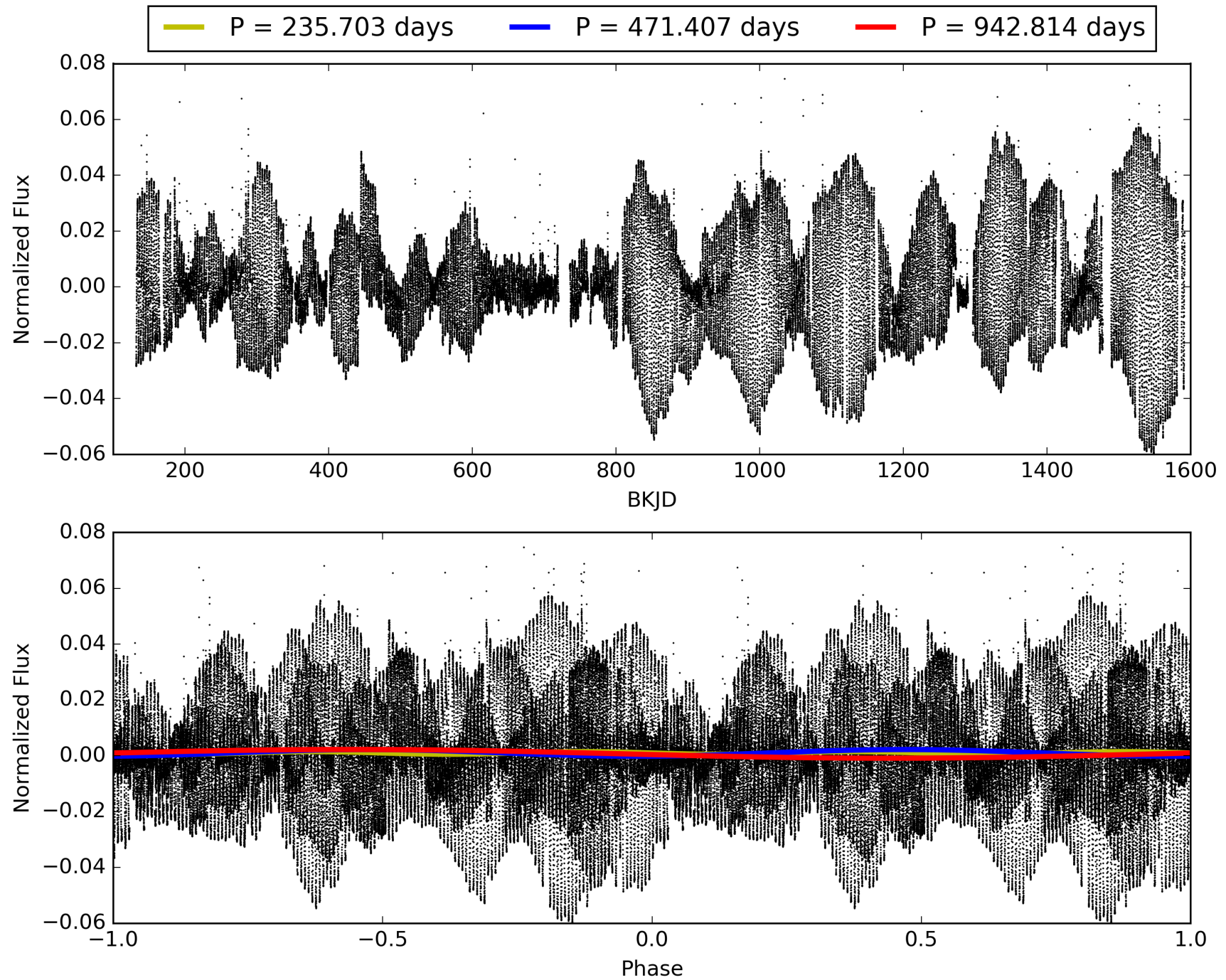
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 02-Feb-2016 00:26:48 Z

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

TCE 004646159-01, PDC Light Curves

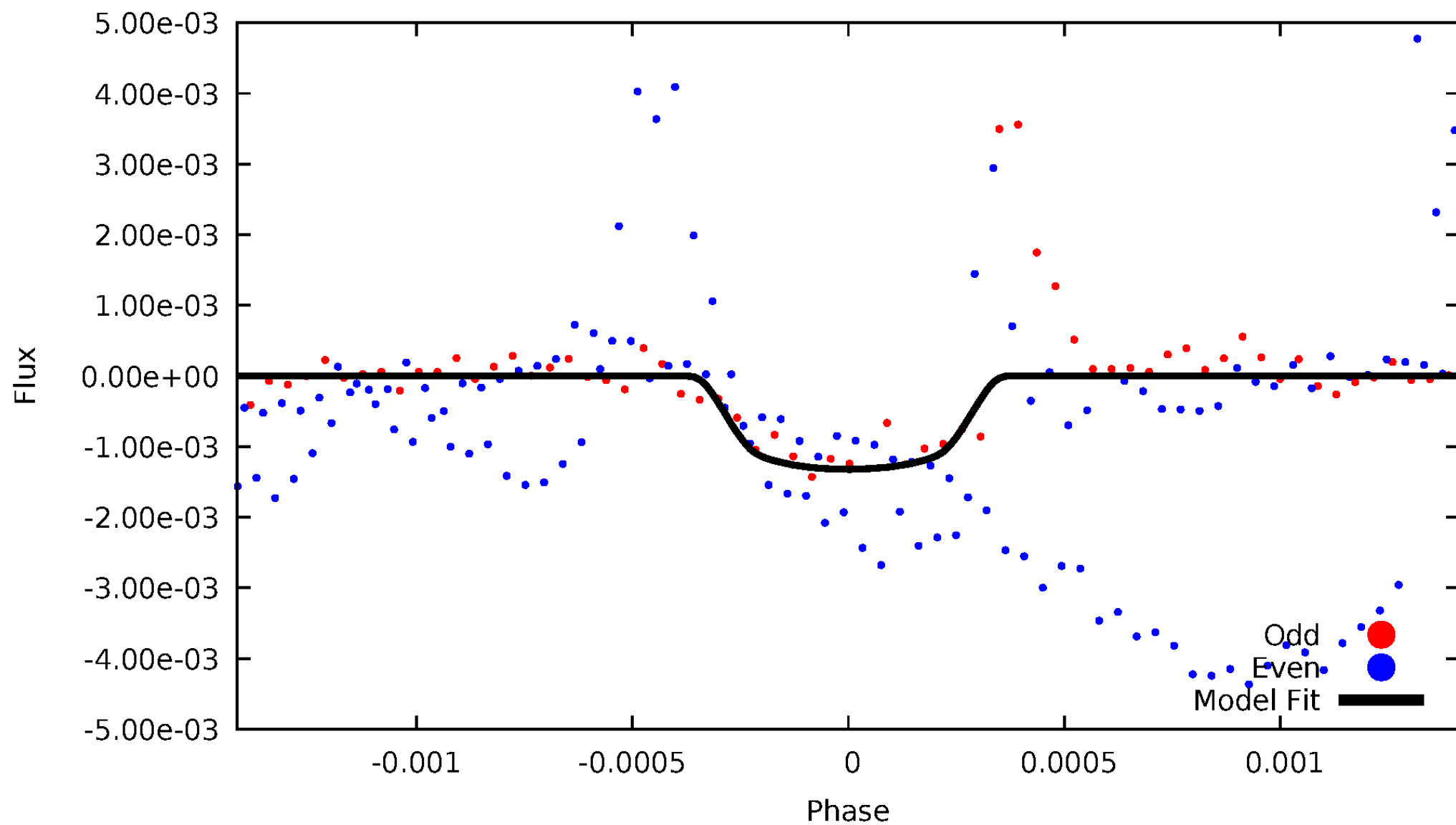


TCE 004646159-01



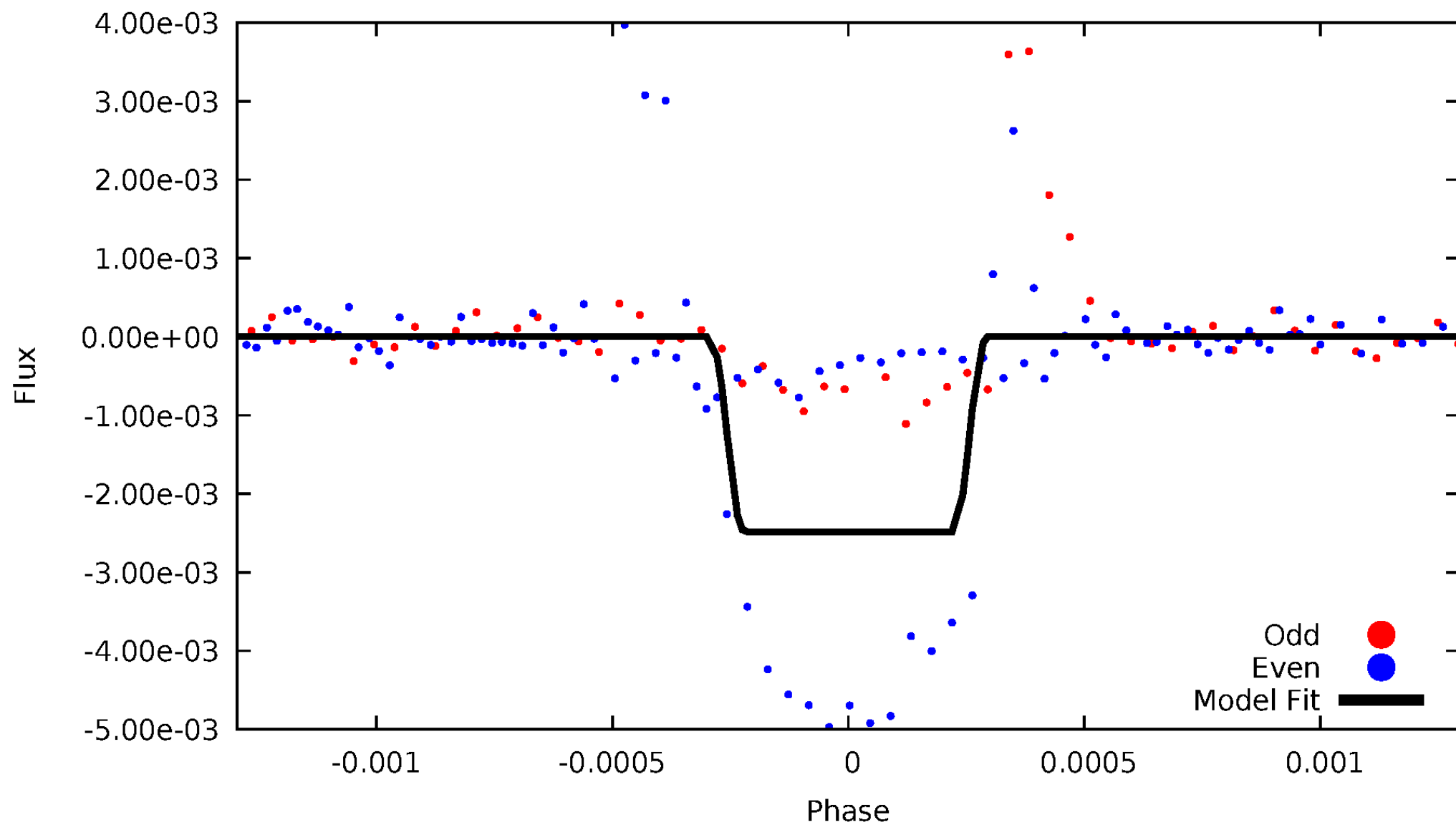
DV Odd/Even

TCE 004646159-01



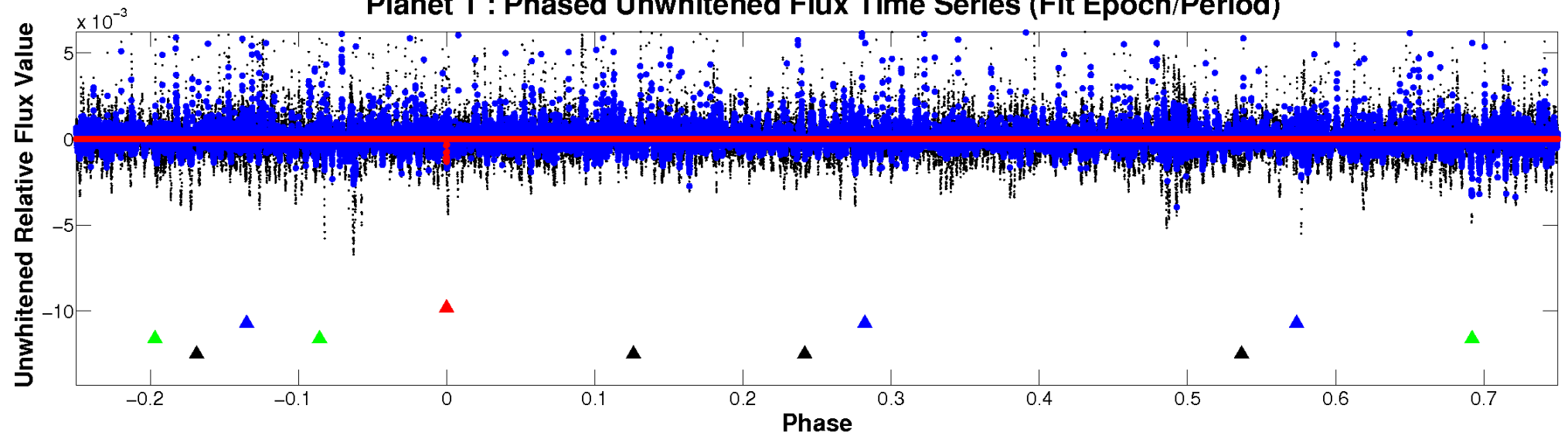
ALT Odd/Even

TCE 004646159-01

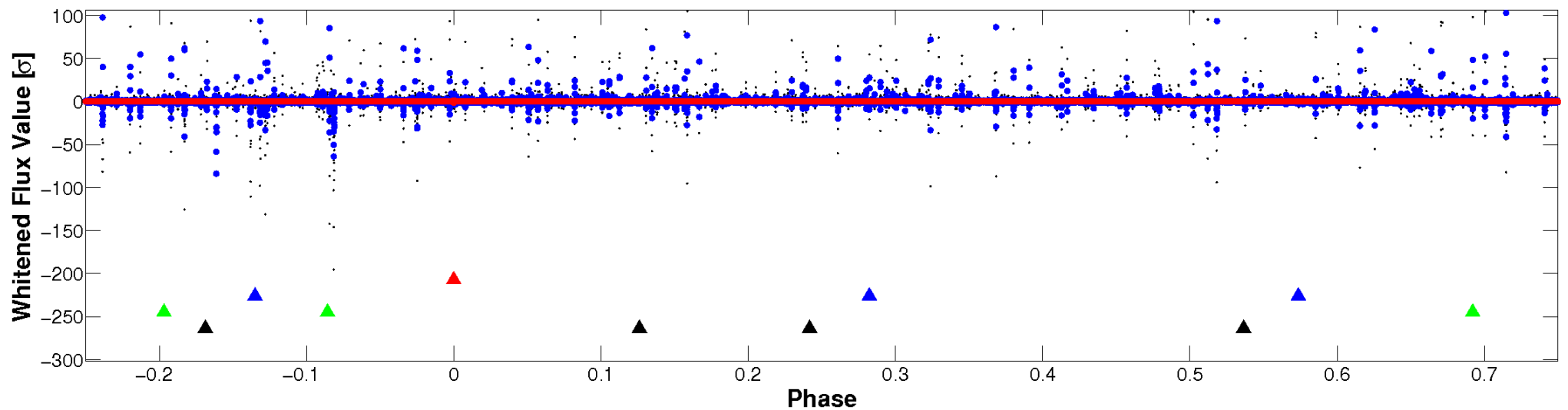


Non-Whitened Vs. Whitened Light Curve

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

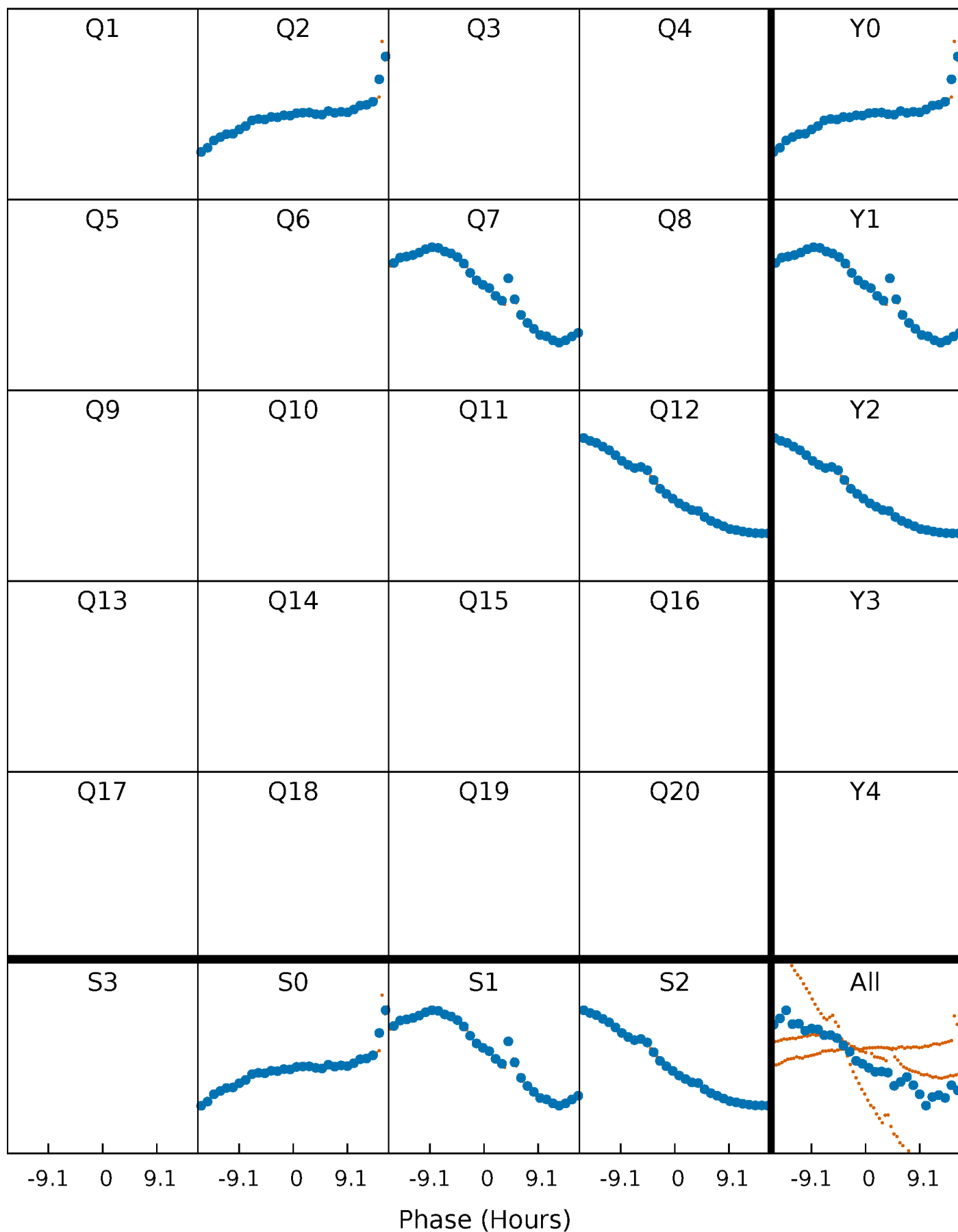


Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)



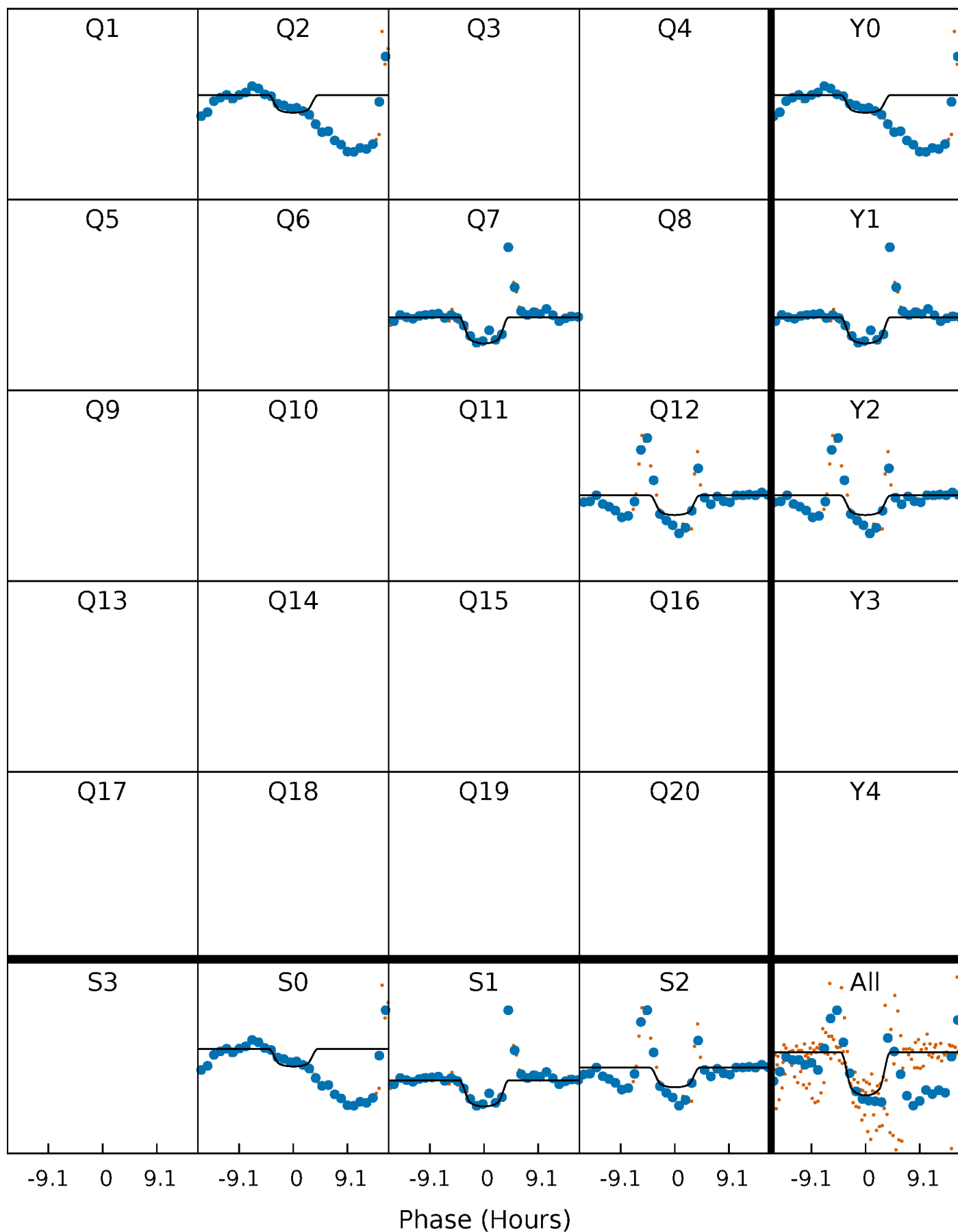
PDC Quarter-Phased Transit Curves

TCE 004646159-01 P=471.406878 Days $T_0=203.718972$ (BKJD)



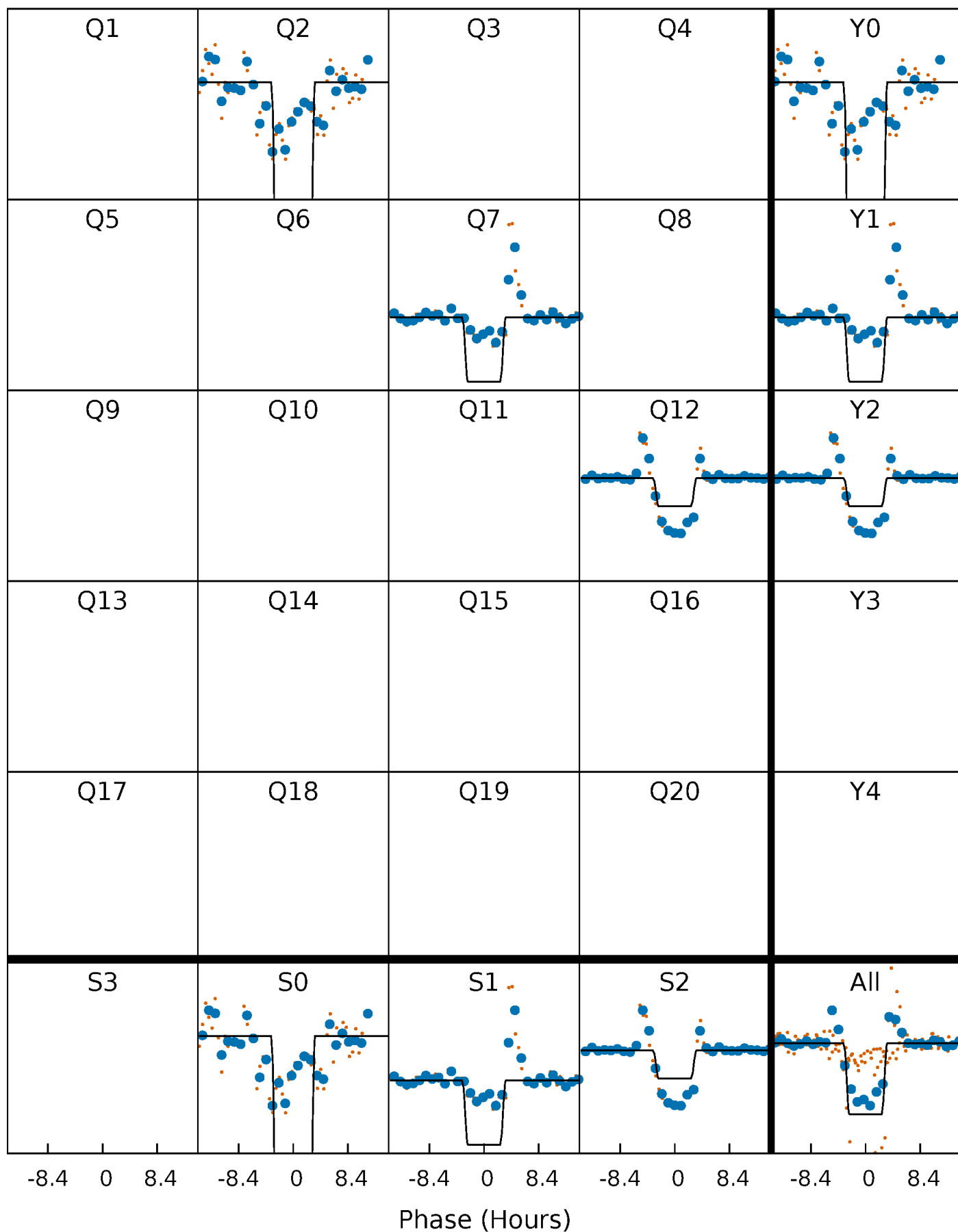
DV Quarter-Phased Transit Curves

TCE 004646159-01 P=471.406878 Days $T_0=203.718972$ (BKJD)



Alt. Detrend Quarter-Phased Transit Curves

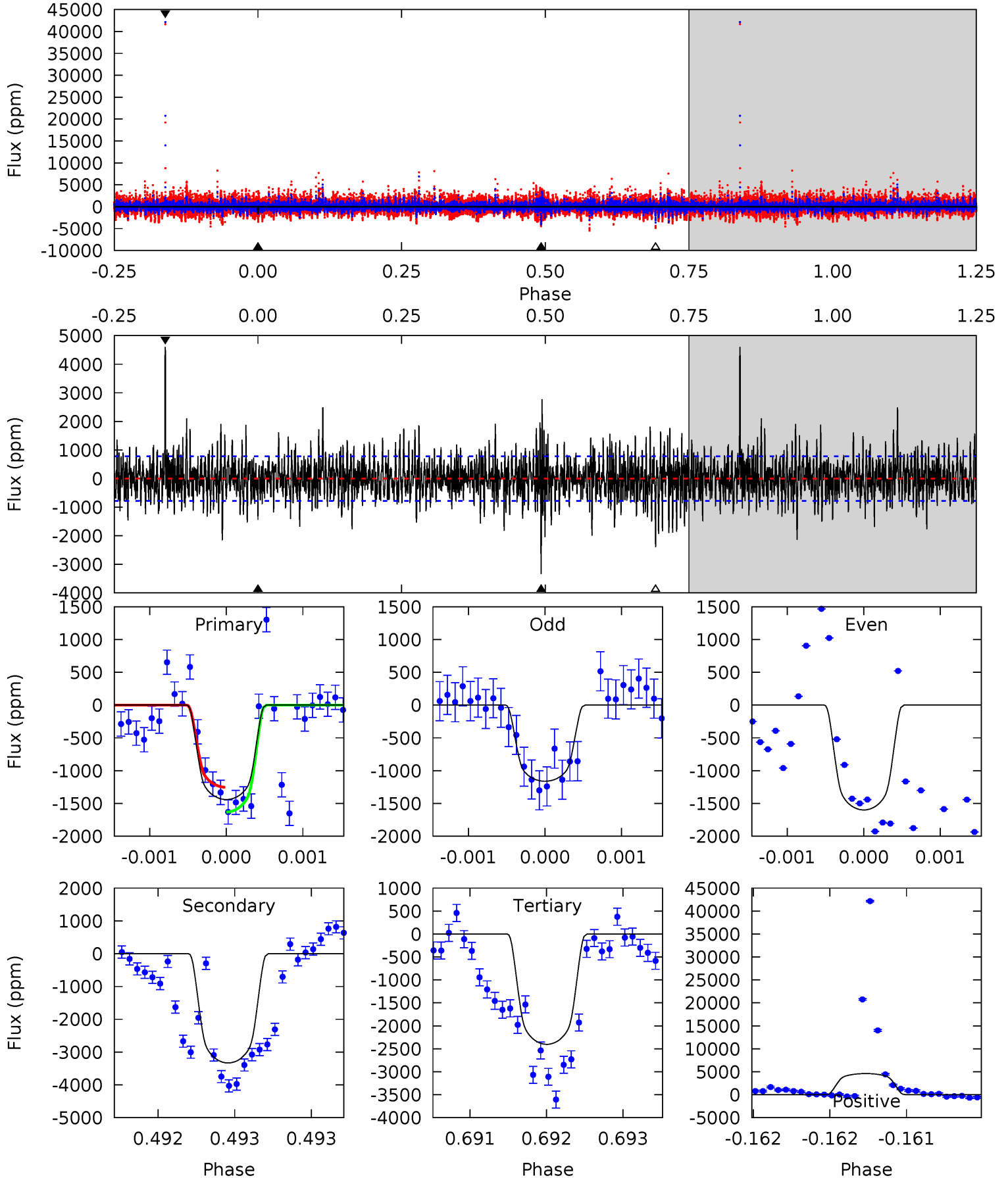
TCE 004646159-01 P=471.395418 Days $T_0=203.735388$ (BKJD)



DV Model-Shift Uniqueness Test

004646159-01, P = 471.406878 Days, E = 203.718972 Days

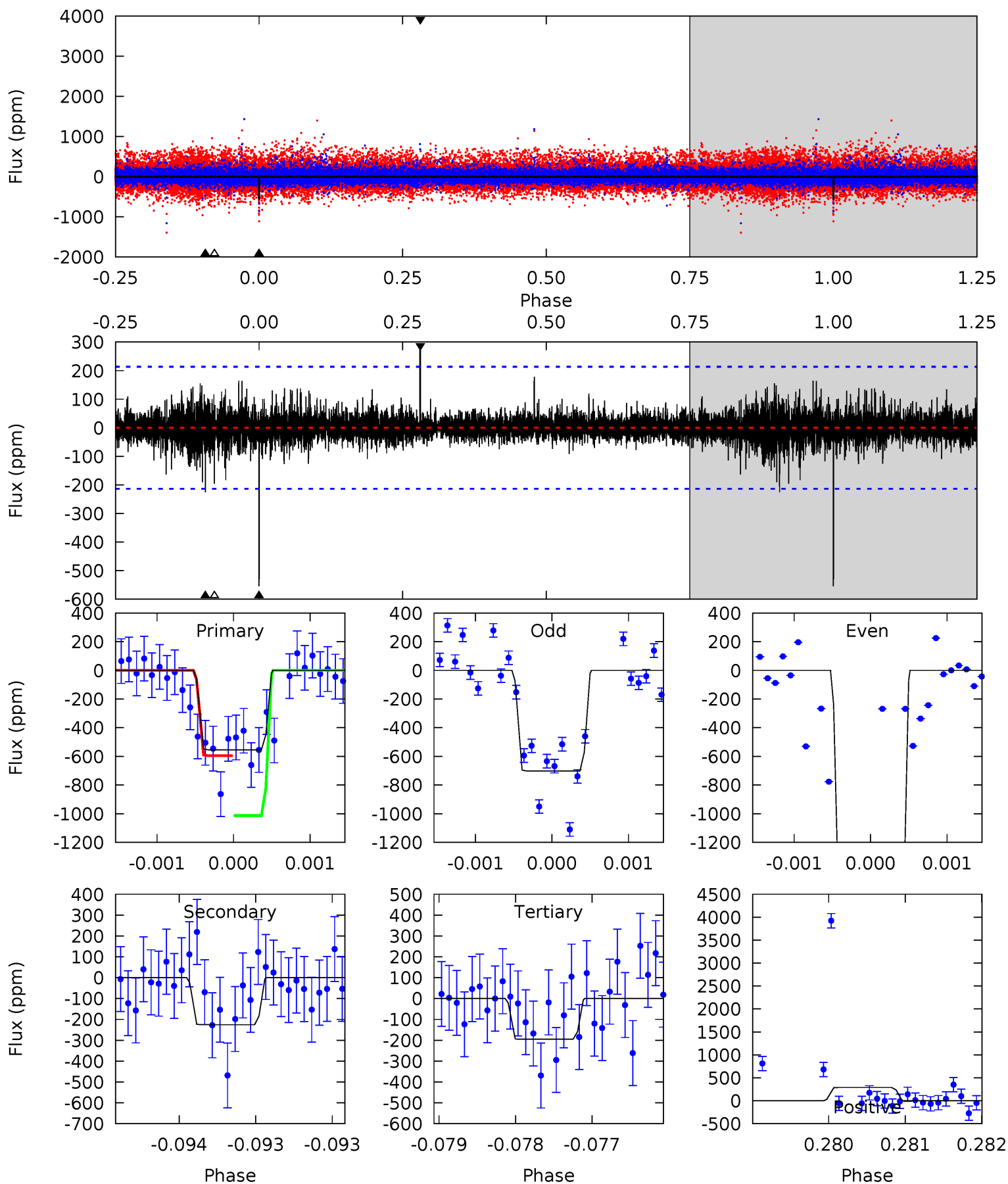
Pri	Sec	Ter	Pos	FA ₁	FA ₂	F _{Red}	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
10.2	23.5	16.9	32.4	5.51	3.38	4.22	-6.79	-22.3	6.56	-8.93	1.07	1.23	0.58	1.35



Alt Model-Shift Uniqueness Test

004646159-01, P = 471.395418 Days, E = 203.735388 Days

Pri	Sec	Ter	Pos	FA ₁	FA ₂	F _{Red}	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
14.4	5.86	5.08	7.48	5.55	3.44	0.80	9.32	6.92	0.78	-1.62	21.3	2.61	0.34	5.44



Stellar Parameters For KIC 004646159

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	R (R_{\odot})	$M(M_{\odot})$	p_{\star} ($\text{g}\cdot\text{cm}^{-3}$)
	5229^{+157}_{-141}	$3.603^{+0.893}_{-0.298}$	$-0.320^{+0.300}_{-0.250}$	$2.842^{+1.084}_{-2.013}$	$1.181^{+0.177}_{-0.329}$	$0.072^{+2.238}_{-0.043}$
	+3%/-3%	+25%/-8%	+94%/-78%	+38%/-71%	+15%/-28%	+3089%/-59%
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 004646159-01 / KOI

Detrend	Depth (ppm)	R_p (R_{\oplus})	T_{max} (K)	T_{obs} (K)	A_{obs}
DV	-3332 ± 142	$11.94^{+4.38}_{-4.45}$	485^{+59}_{-96}	6226^{+662}_{-538}	19944^{+29087}_{-9162}
Alt.	-225 ± 39	$14.88^{+4.89}_{-5.83}$	482^{+63}_{-97}	3367^{+197}_{-162}	866^{+1407}_{-397}

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 $A_{\text{obs}} \gg 1.0$

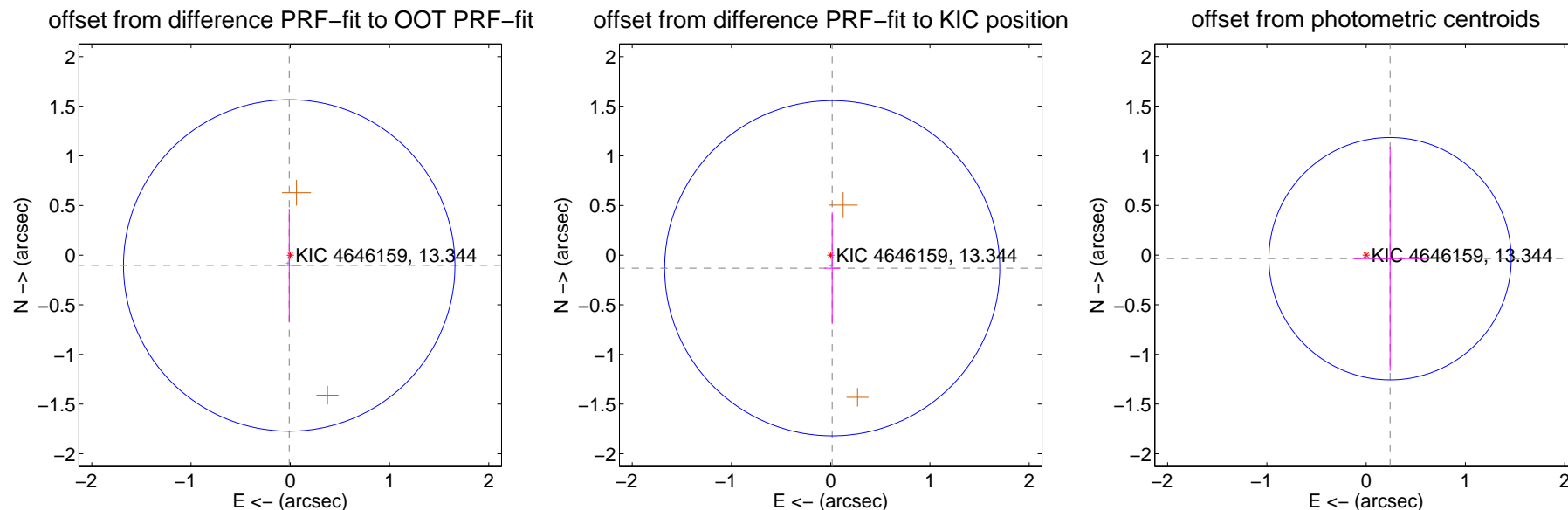
DV Centroid Data

Supplemental centroid analysis for 004646159-01. Kepler magnitude: 13.34. Transit SNR 5.59

There are 1 quarters with good PRF difference image offsets

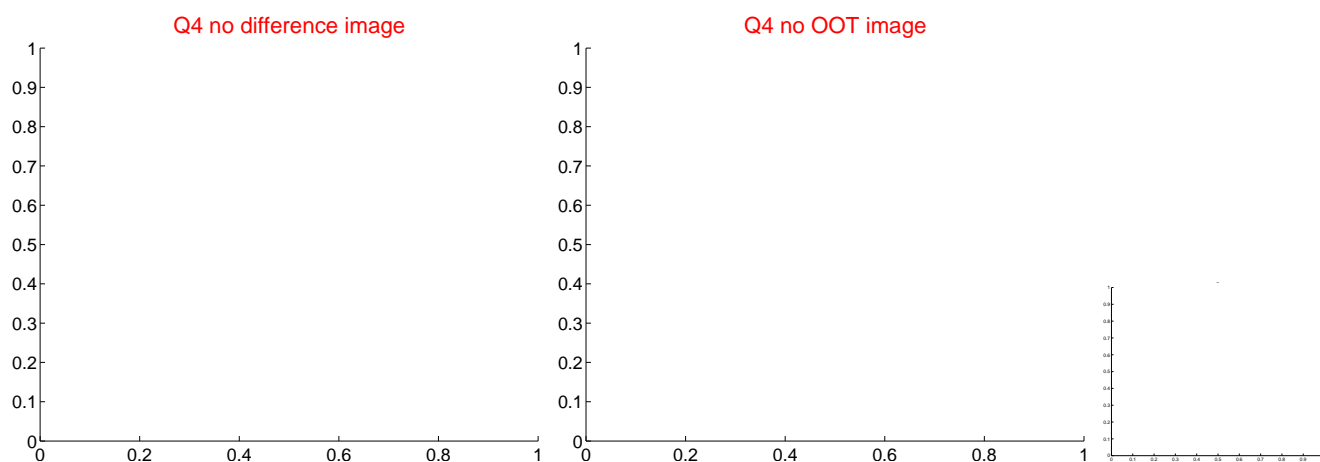
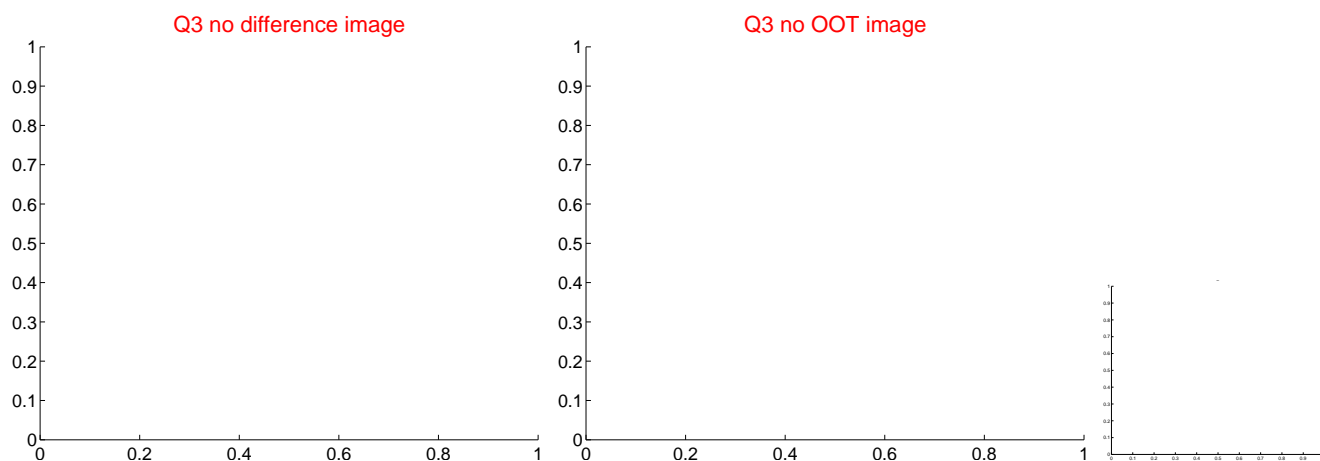
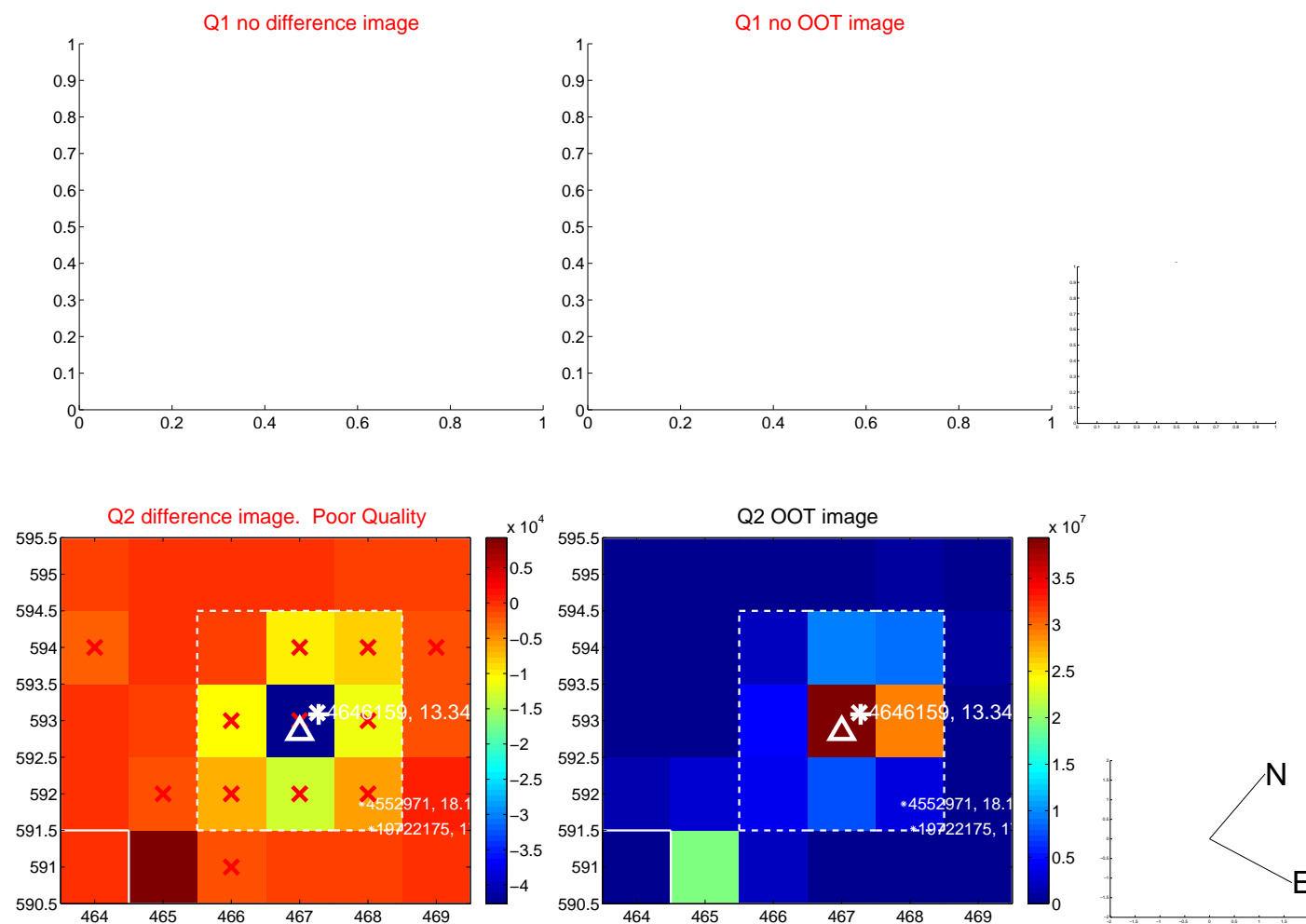
The direct PRF centroid is offset from the target star catalog position by about 0.04 arcsec

	Distance in arcsec	Distance / σ	Δ RA	Δ Dec
PRF-fit source offset from OOT	0.104 ± 0.557	0.19	0.011 ± 0.129	-0.103 ± 0.569
PRF-fit source offset from KIC position	0.132 ± 0.563	0.24	-0.015 ± 0.079	-0.132 ± 0.562
photometric centroid source offset	0.24 ± 0.41	0.60	-0.24 ± 0.37	-0.04 ± 1.13

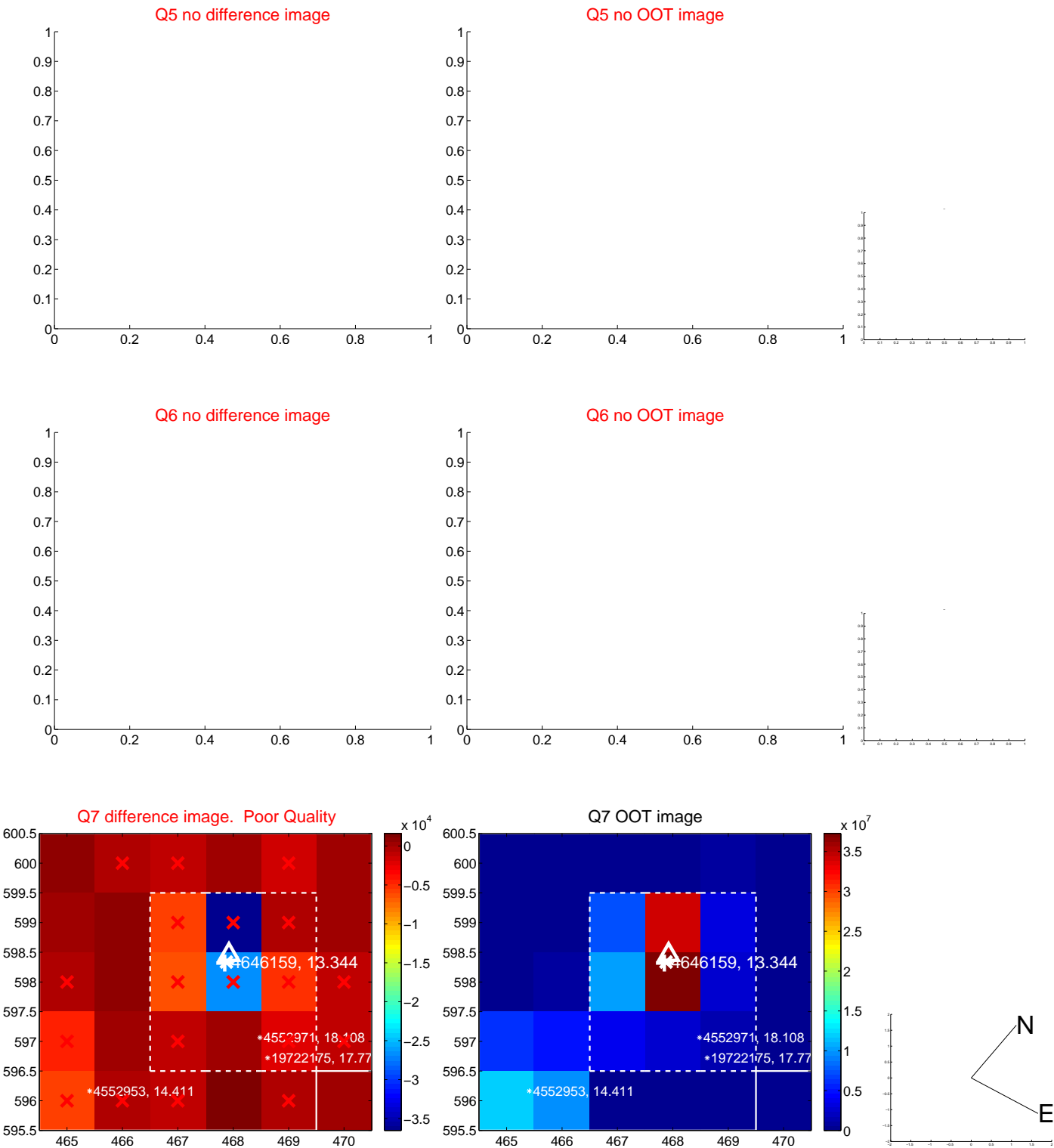


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- σ uncertainty. Blue circle: three- σ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

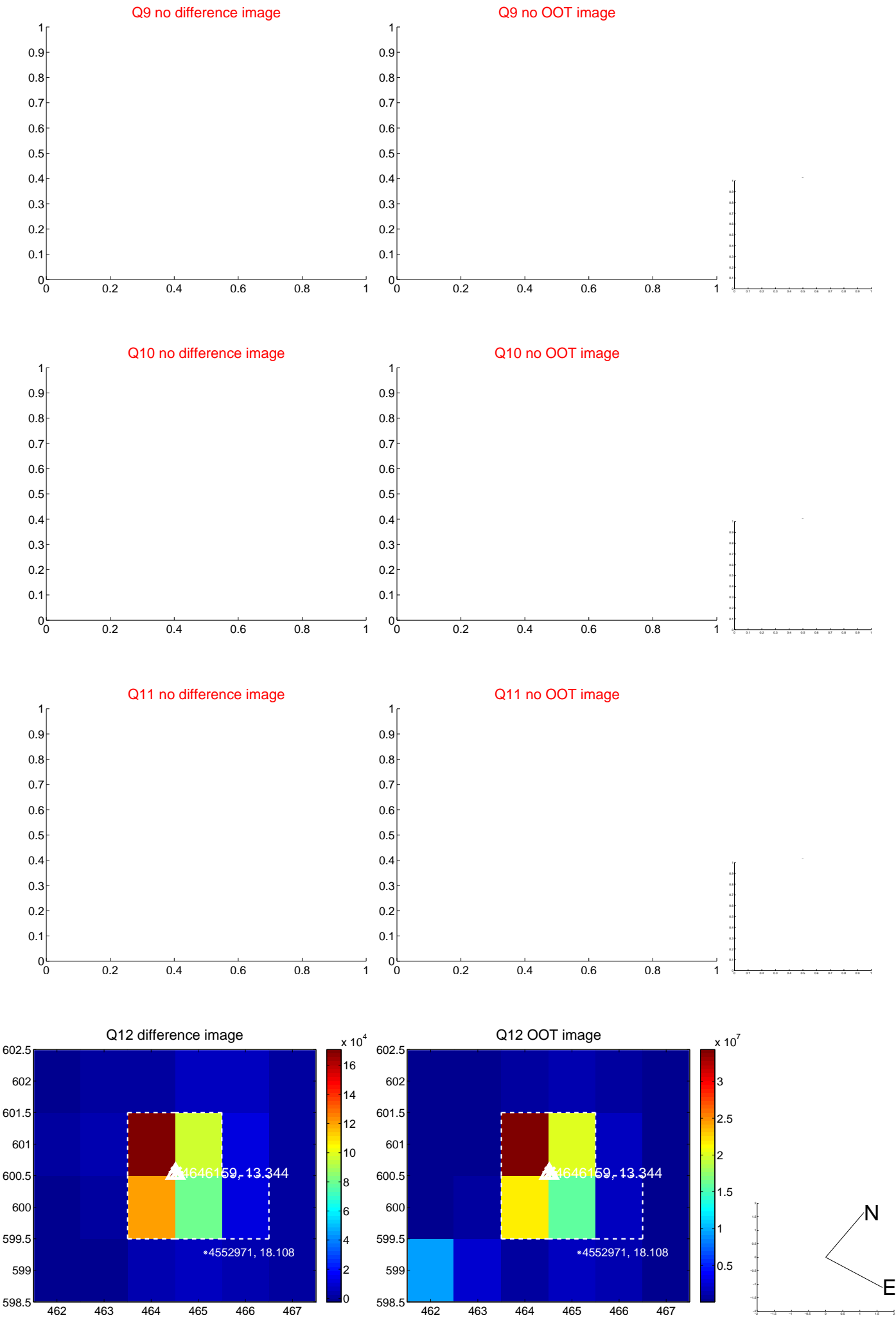
white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value



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



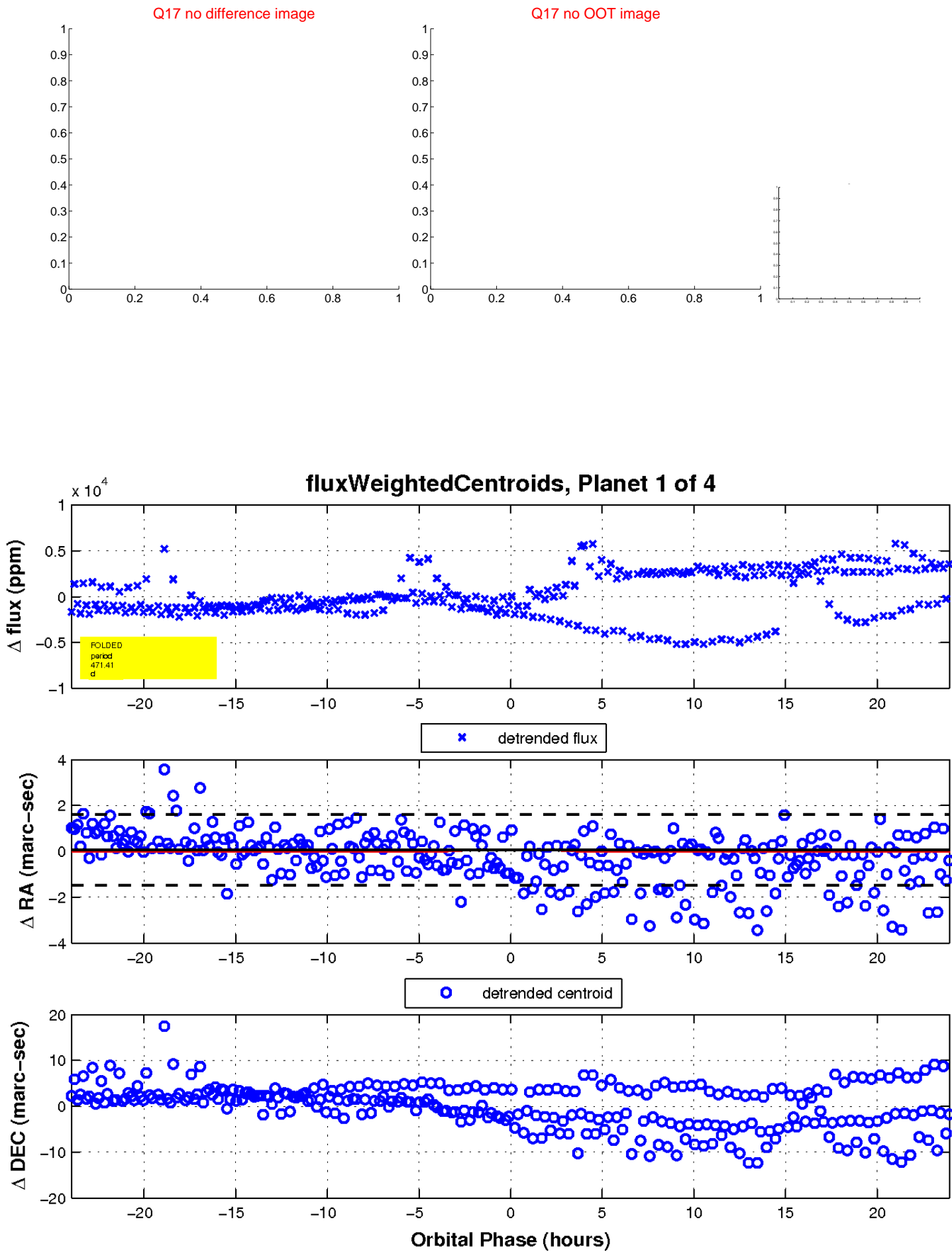
white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



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

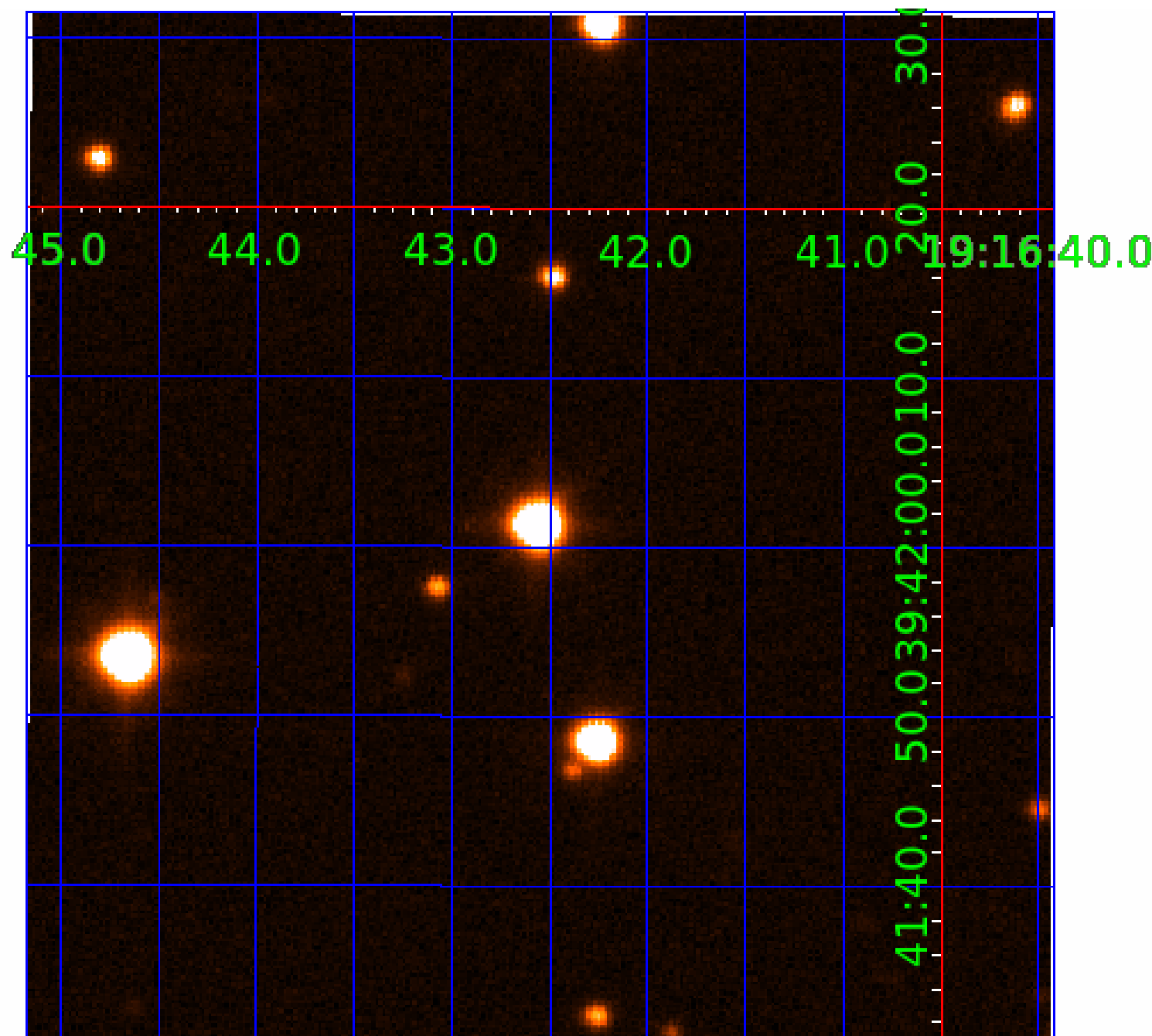


white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



UKIRT Image

Declination



KIC 004646159

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})
004646159-01	OBS	No	471.406878	203.718972	1320.9	8.002	18.1	5.6	2.84	5229	12.53	3.44
004646159-02	OBS	No	608.759464	336.803245	1157.9	6.587	16.9	5.5	2.84	5229	9.47	2.45
004646159-03	OBS	No	523.777450	529.978033	1417.6	3.760	14.4	9.1	2.84	5229	10.98	2.99
004646159-04	OBS	No	332.433179	263.175808	643.0	3.000	12.7	-1.0	2.84	5229	7.08	5.49

Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
004646159-01	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS
004646159-02	OBS	FP	0.00	1	0	1	0	INDIV_TRANS_CHASES—LPP_DV—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—HALO_GHOST
004646159-03	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—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS
004646159-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—INCONSISTENT_TRANS—CENT_NOFITS

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

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

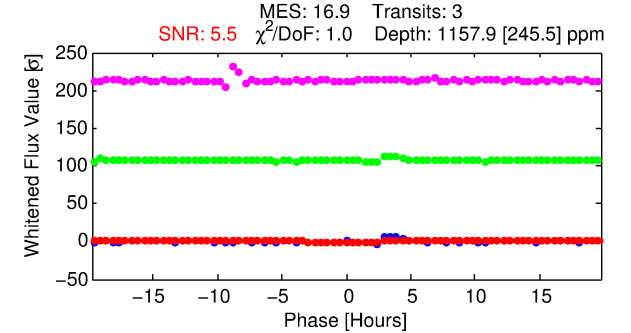
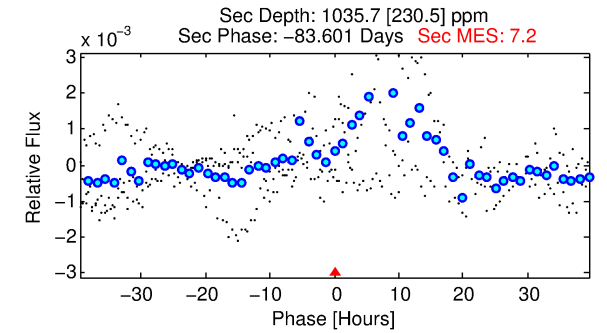
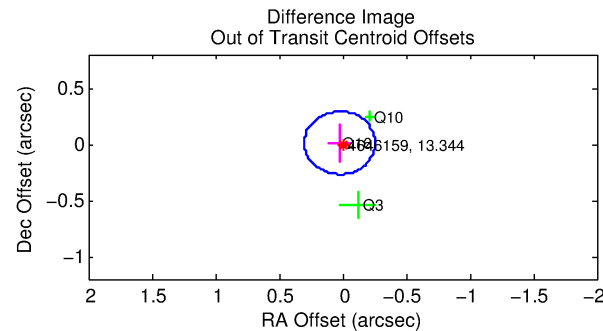
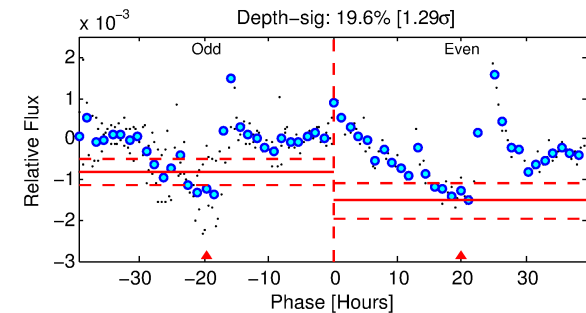
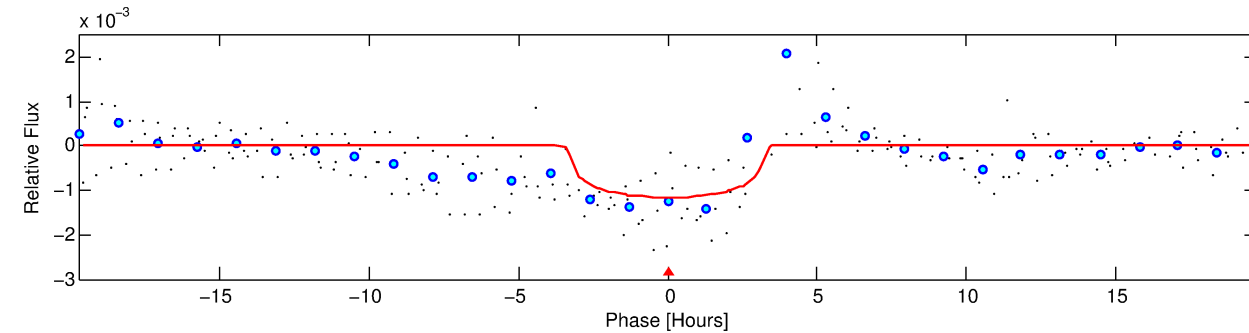
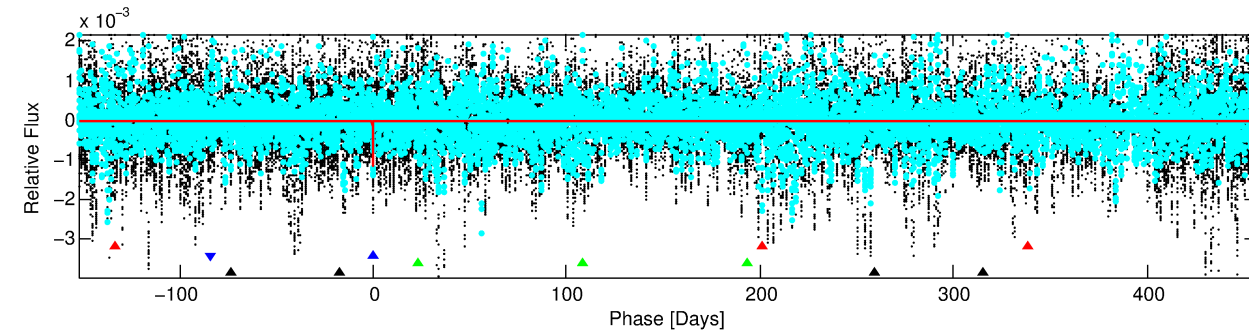
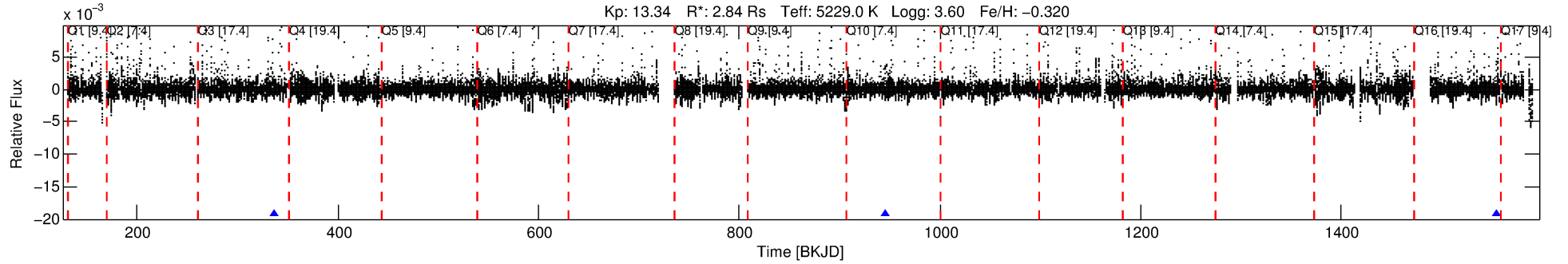
See http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col for comment definitions.

Ephemeris Match Information For 004646159-02

No Significant Match Found

DV One-Page Summary

KIC: 4646159 Candidate: 2 of 4 Period: 608.759 d



DV Fit Results:

Period = 608.75946 [0.00679] d
Epoch = 336.8032 [0.0090] BKJD
Rp/R* = 0.0305 [0.0349]
a/R* = 727.36 [3147.09]
b = 0.02 [189.84]
Seff = 2.45 [3.56]
Teq = 319 [116] K
Rp = 9.47 [12.74] Re
a = 1.4862 [1.2370] AU
Ag = 14035.43 [38136.89] [0.37 σ]
Teffp = 5368 [3088] K [1.63 σ]

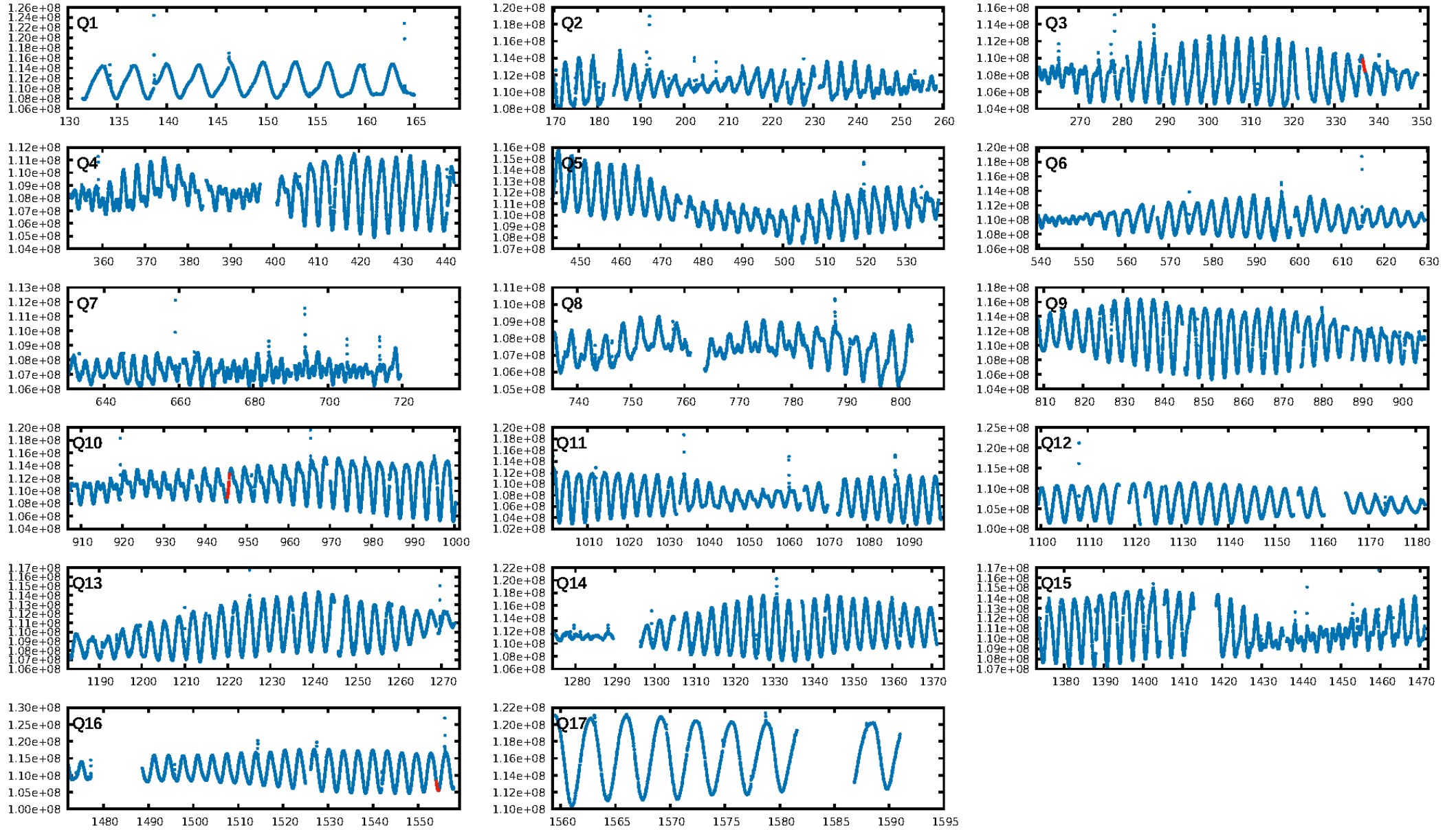
DV Diagnostic Results:

ShortPeriod-sig: 100.0% [268.90 σ]
LongPeriod-sig: N/A
ModelChiSquare2-sig: 0.4%
ModelChiSquareGof-sig: 91.4%
Bootstrap-pfa: N/A
RollingBand-fgt: 1.00 [3/3]
GhostDiagnostic-chr: 0.2
Centroid-sig: N/A
Centroid-so: 0.464 arcsec [0.29 σ]
OotOffset-rm: 0.026 arcsec [0.28 σ]
KicOffset-rm: 0.027 arcsec [0.16 σ]
OotOffset-st: 1/1/1/0 [3]
KicOffset-st: 1/1/1/0 [3]
DiffImageQuality-fgm: 1.00 [3/3]
DiffImageOverlap-fno: 1.00 [3/3]

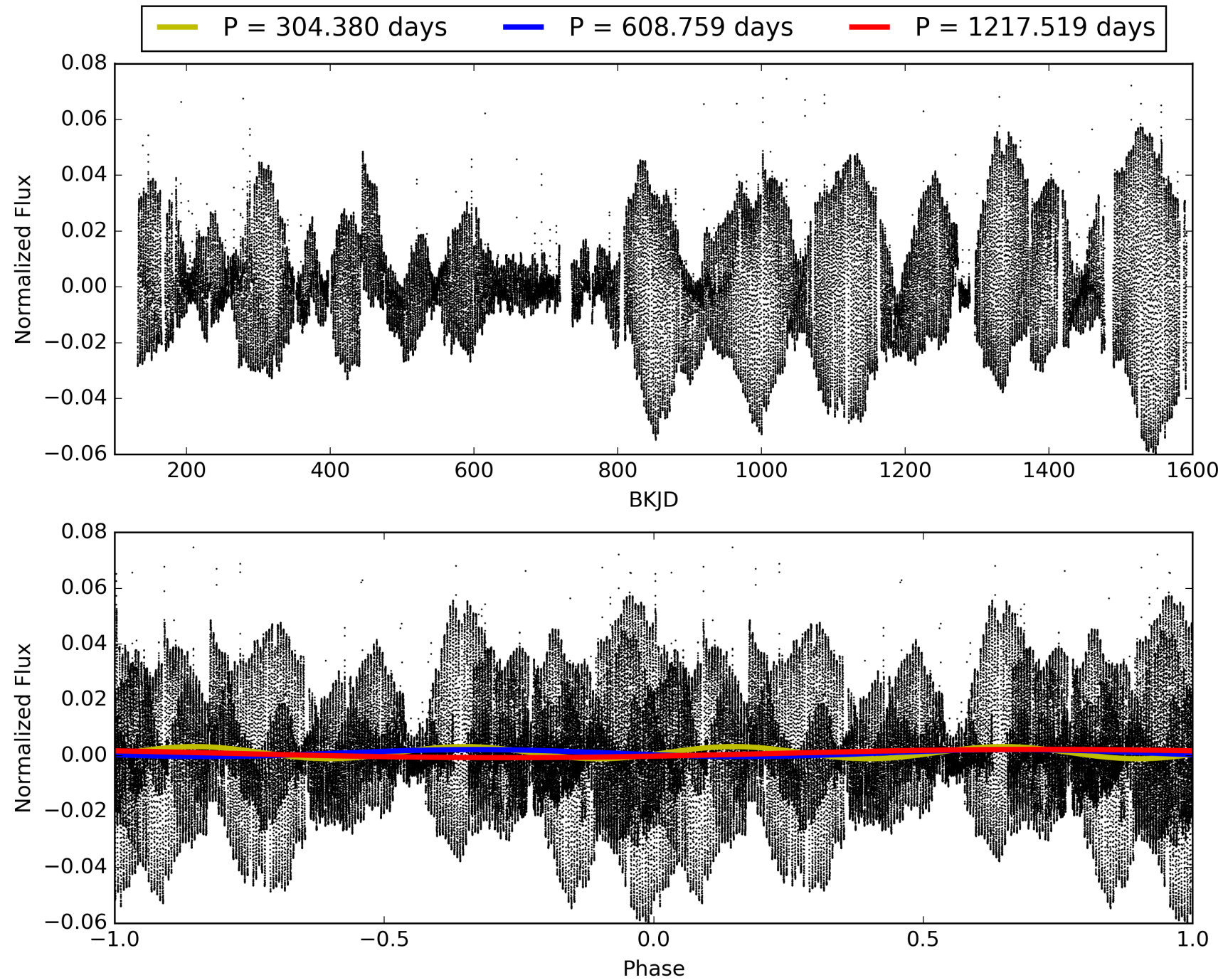
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 02-Feb-2016 00:27:03 Z

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

TCE 004646159-02, PDC Light Curves

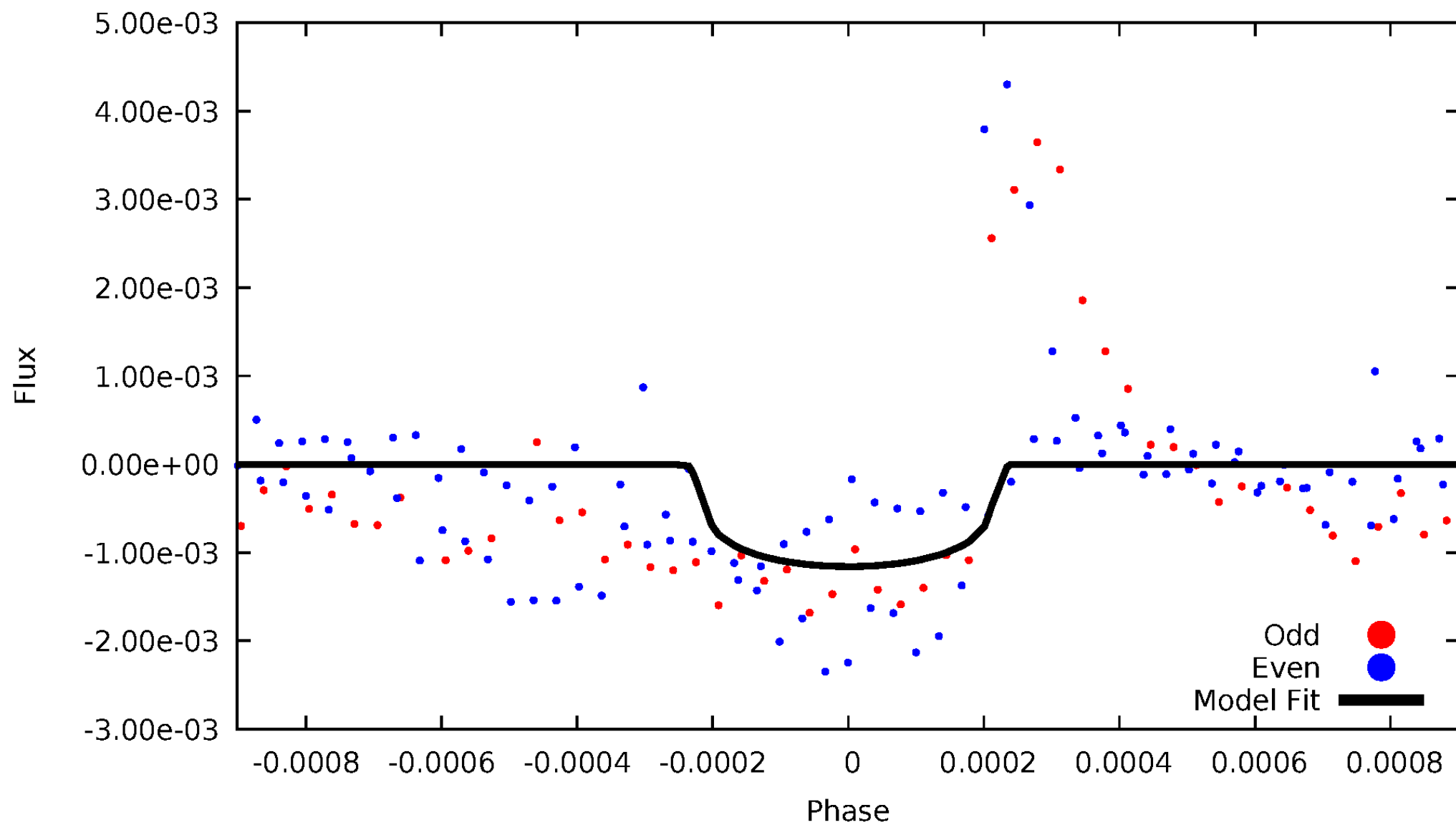


TCE 004646159-02



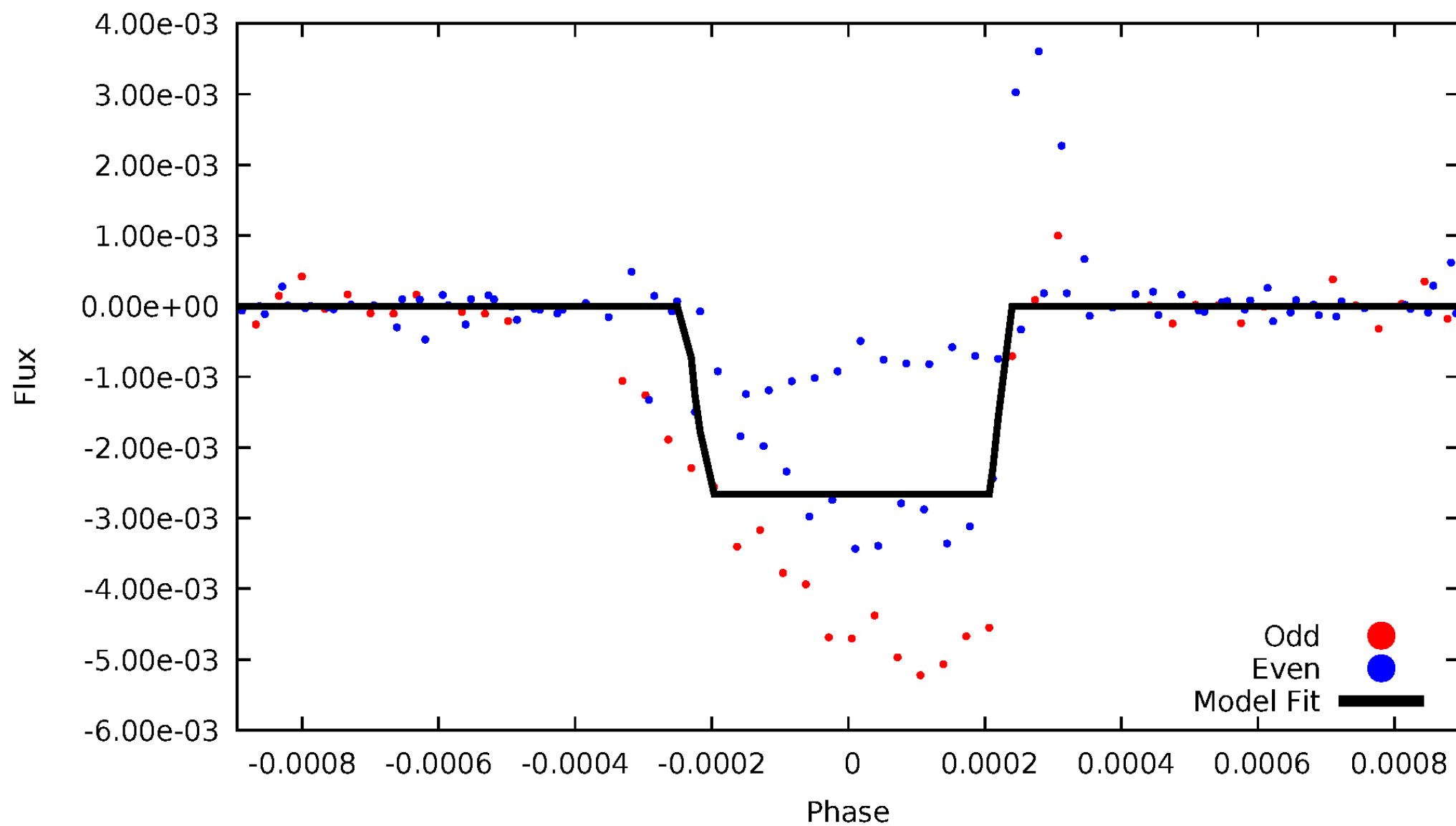
DV Odd/Even

TCE 004646159-02



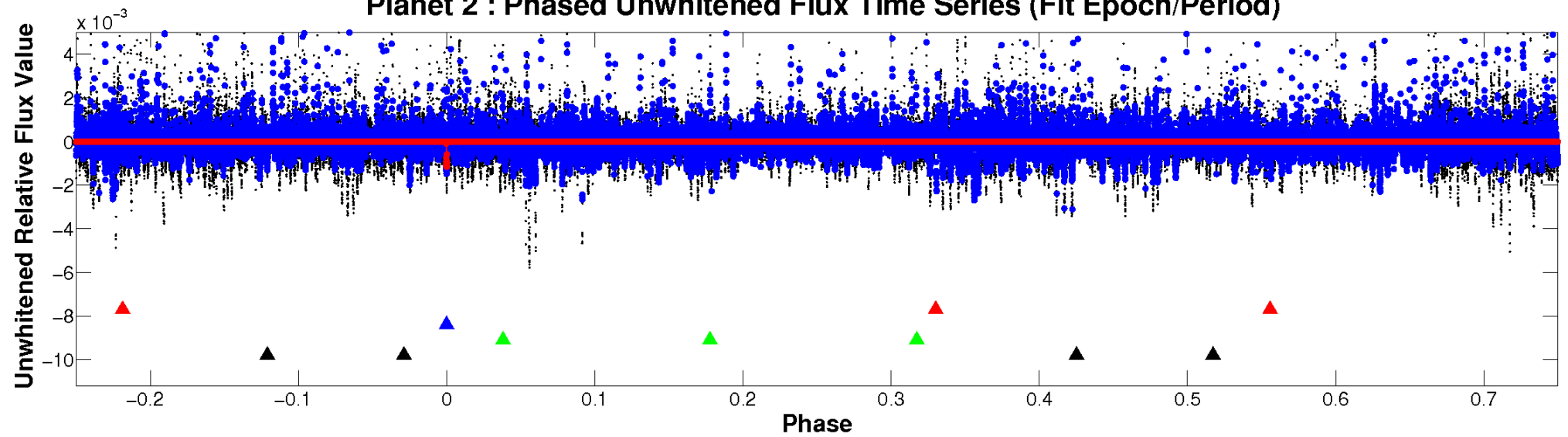
ALT Odd/Even

TCE 004646159-02

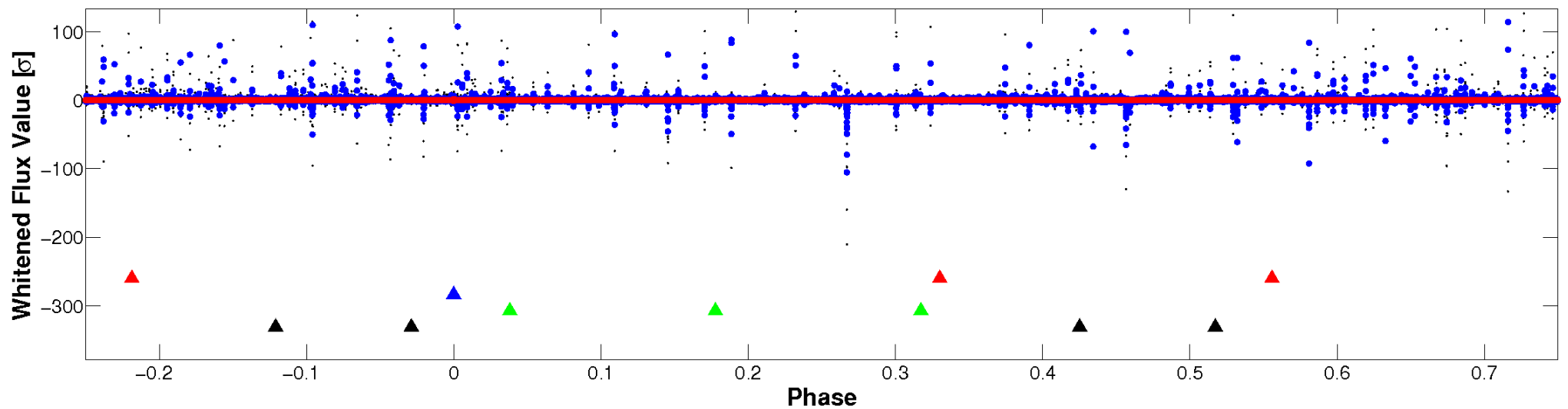


Non-Whitened Vs. Whitened Light Curve

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

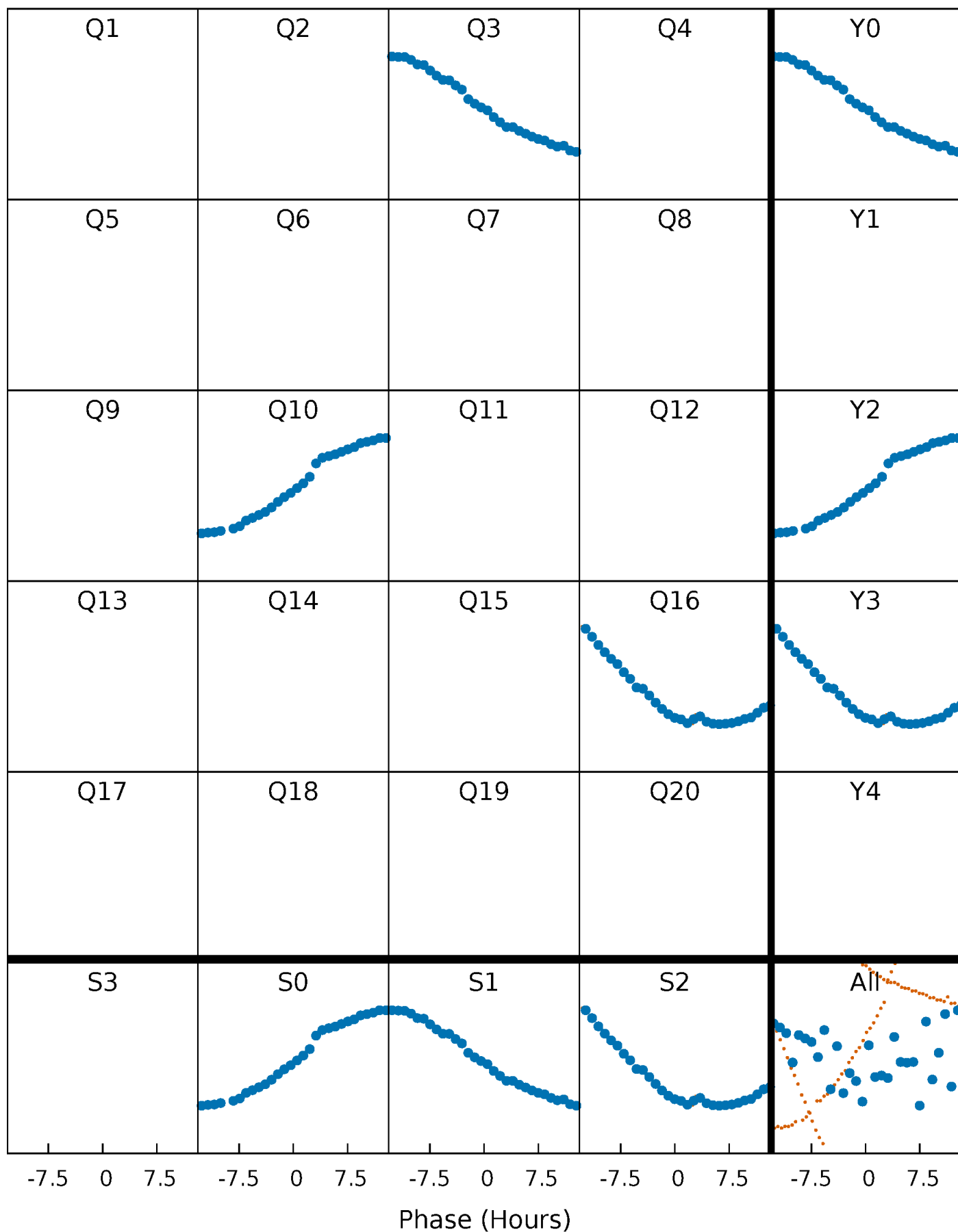


Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



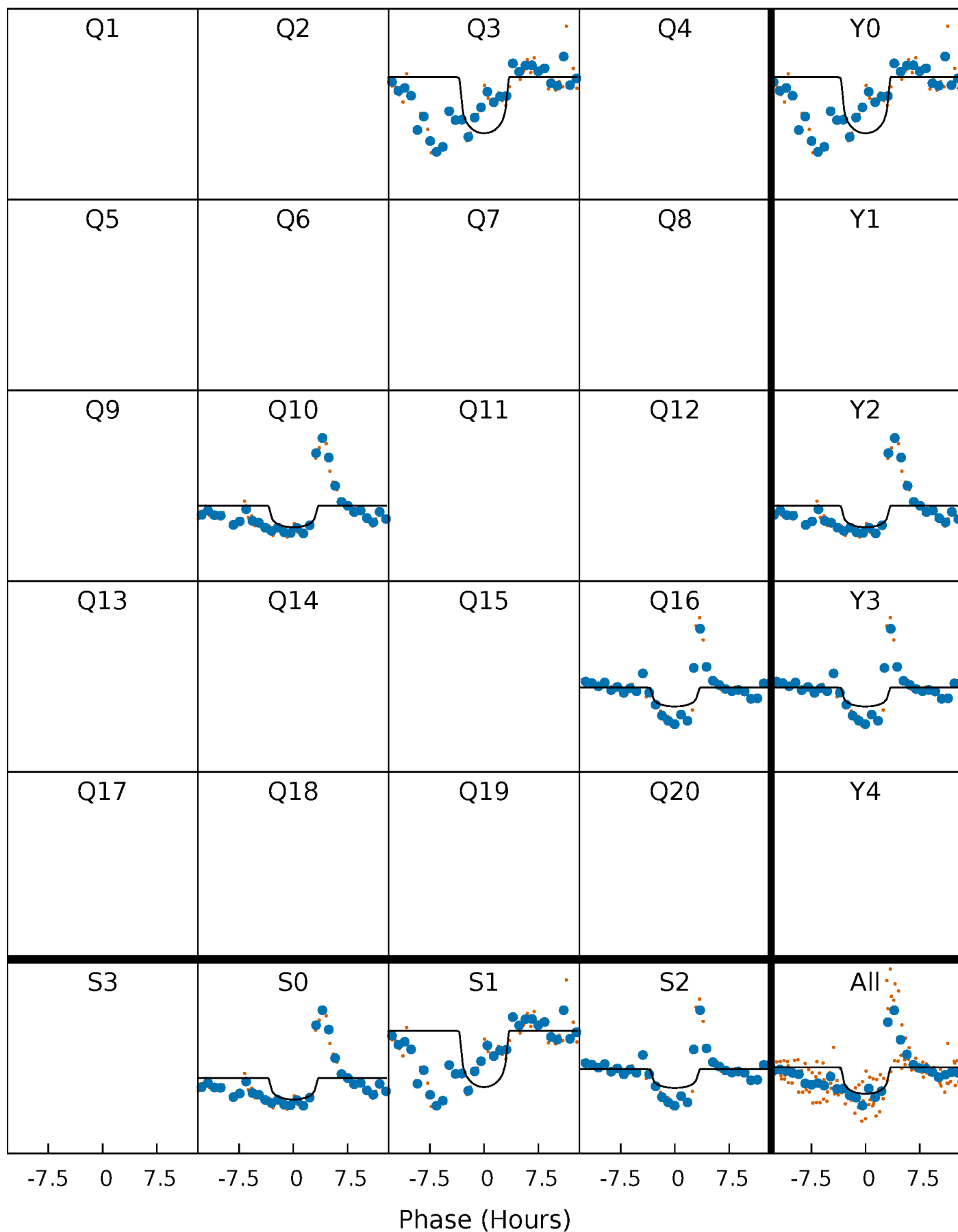
PDC Quarter-Phased Transit Curves

TCE 004646159-02 P=608.759464 Days $T_0=336.803245$ (BKJD)



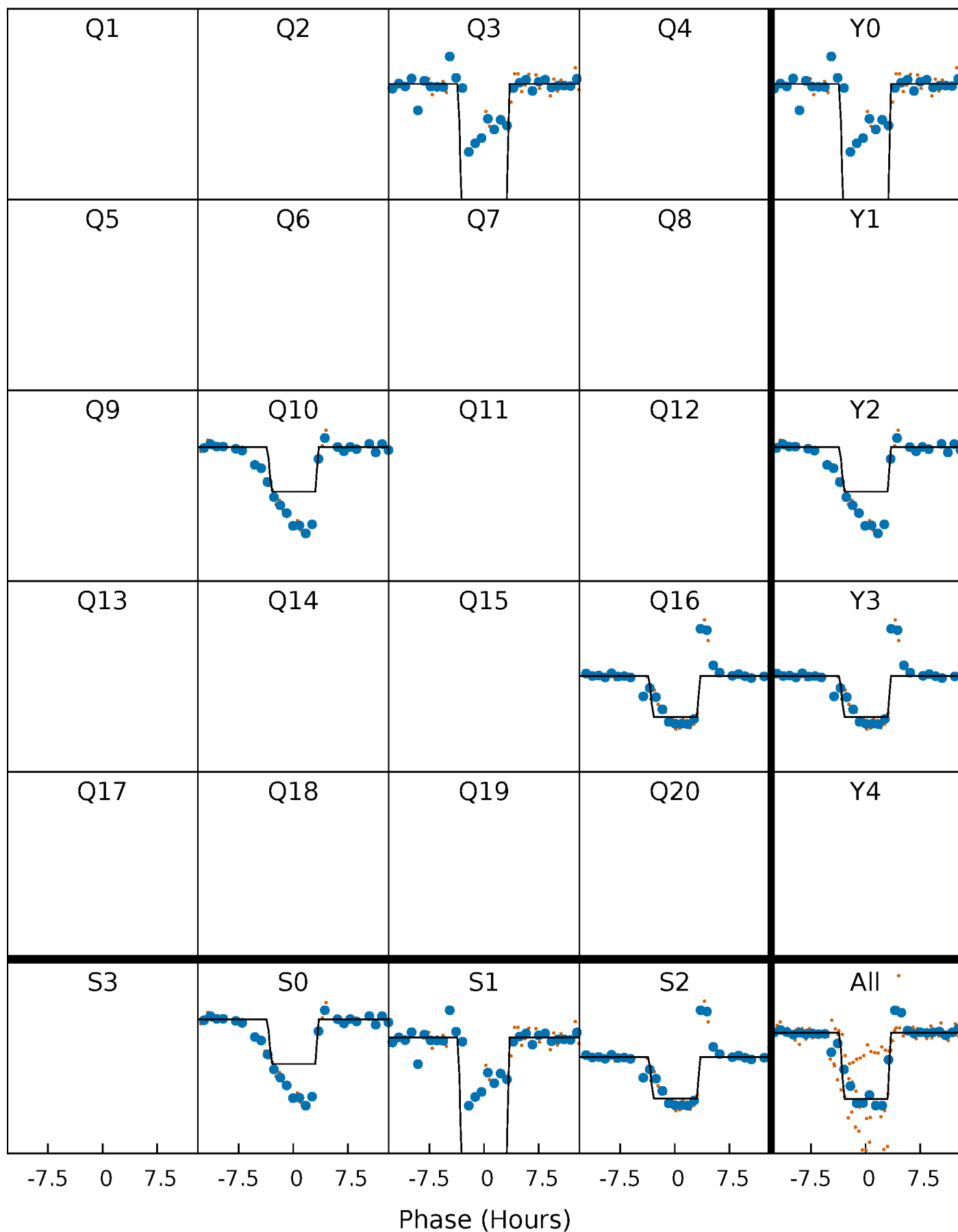
DV Quarter-Phased Transit Curves

TCE 004646159-02 P=608.759464 Days $T_0=336.803245$ (BKJD)



Alt. Detrend Quarter-Phased Transit Curves

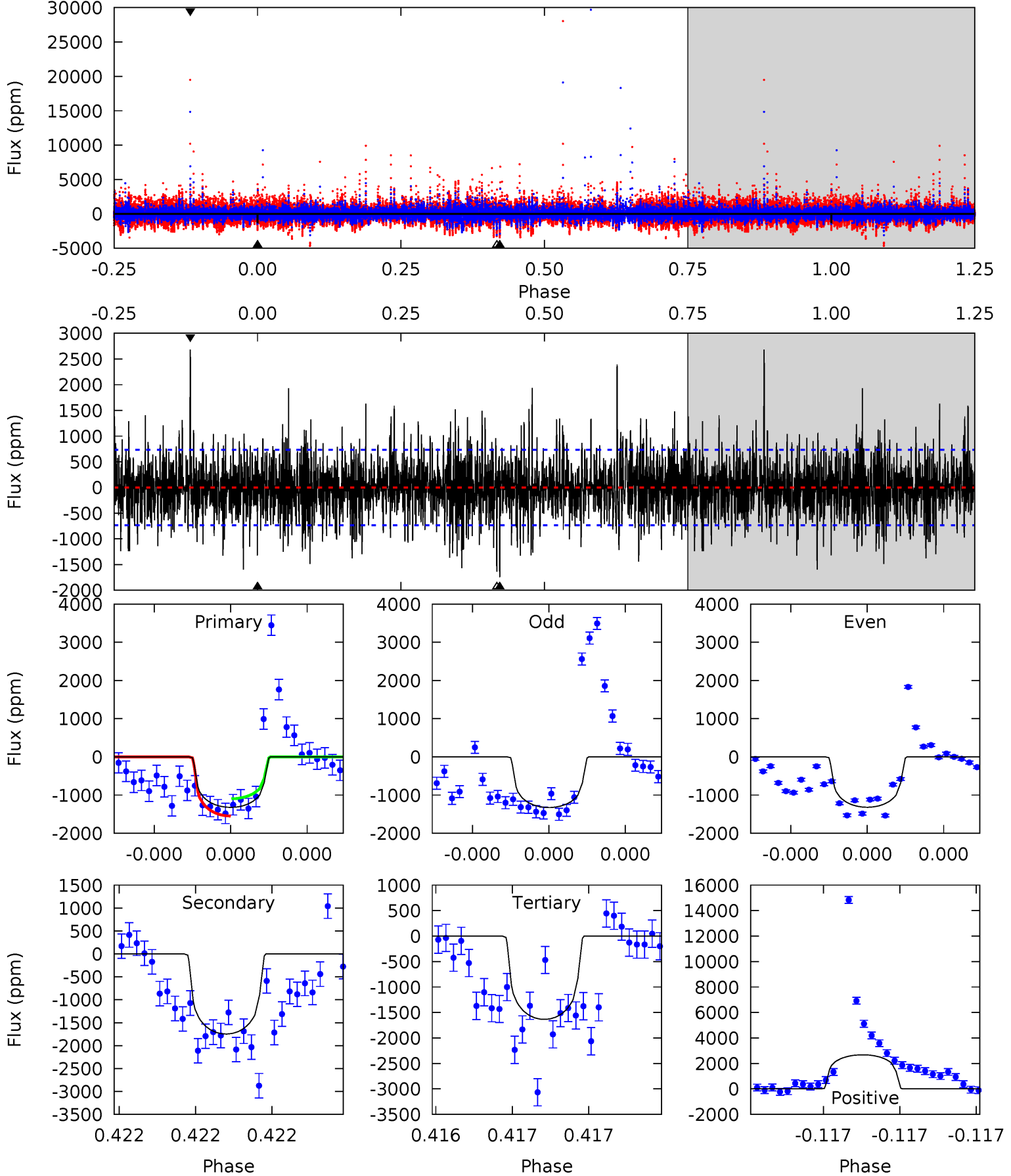
TCE 004646159-02 P=608.749808 Days $T_0=336.795562$ (BKJD)



DV Model-Shift Uniqueness Test

004646159-02, P = 608.759464 Days, E = 336.803245 Days

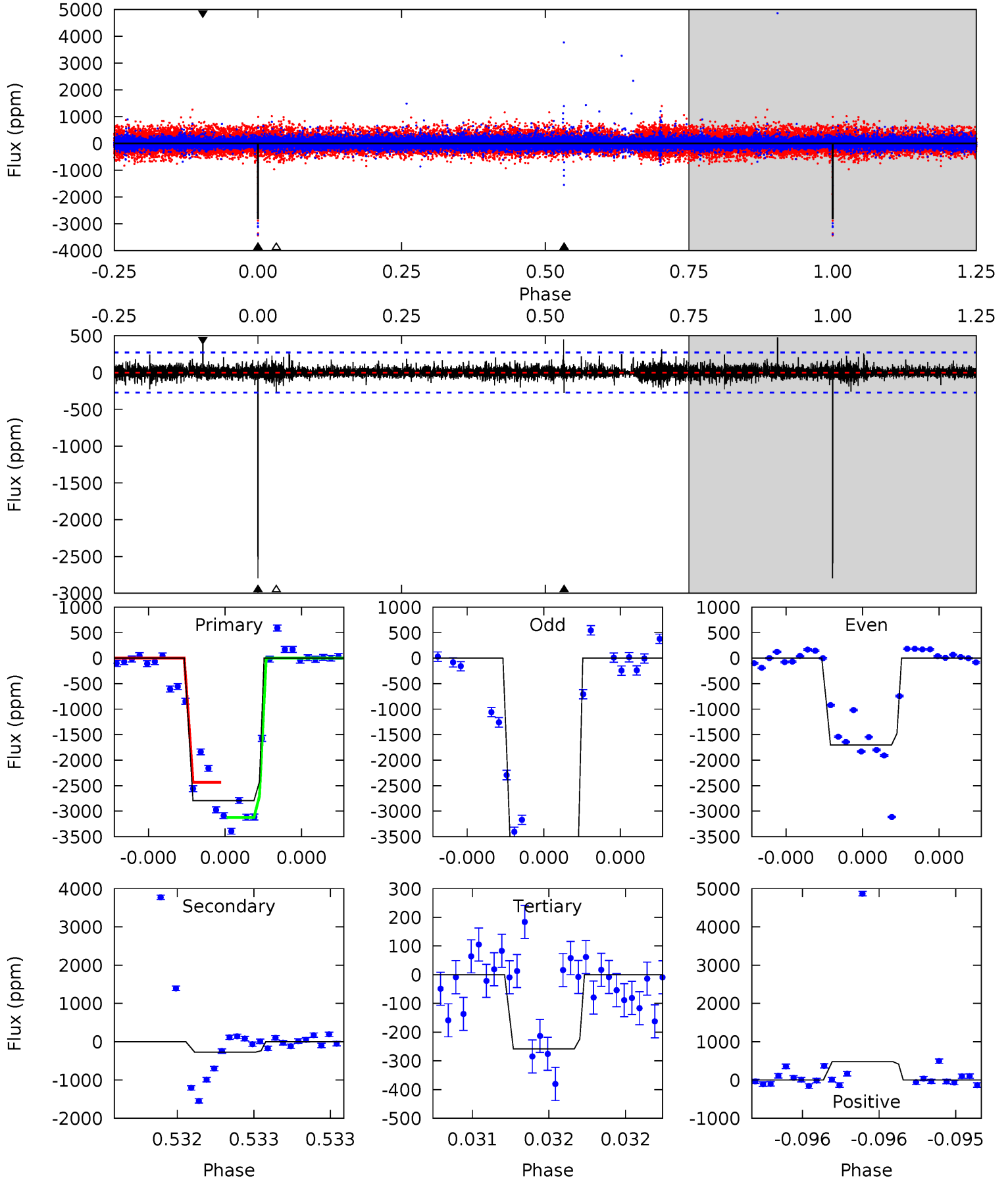
Pri	Sec	Ter	Pos	FA ₁	FA ₂	F _{Red}	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
10.0	13.3	12.4	20.4	5.58	3.50	3.38	-2.38	-10.3	0.85	-7.09	0.01	0.92	0.61	1.73



Alt Model-Shift Uniqueness Test

004646159-02, P = 608.749808 Days, E = 336.795562 Days

Pri	Sec	Ter	Pos	FA ₁	FA ₂	F _{Red}	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
57.2	5.58	5.28	9.78	5.58	3.50	0.86	51.9	47.4	0.29	-4.21	34.1	0.97	0.15	0



Stellar Parameters For KIC 004646159

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	R (R_{\odot})	$M(M_{\odot})$	p_{\star} ($\text{g}\cdot\text{cm}^{-3}$)
	5229^{+157}_{-141}	$3.603^{+0.893}_{-0.298}$	$-0.320^{+0.300}_{-0.250}$	$2.842^{+1.084}_{-2.013}$	$1.181^{+0.177}_{-0.329}$	$0.072^{+2.238}_{-0.043}$
	+3%/-3%	+25%/-8%	+94%/-78%	+38%/-71%	+15%/-28%	+3089%/-59%
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 004646159-02 / KOI

Detrend	Depth (ppm)	R_p (R_{\oplus})	T_{max} (K)	T_{obs} (K)	A_{obs}
DV	-1747 ± 131	$10.71^{+11.47}_{-6.99}$	442^{+58}_{-85}	5443^{+4083}_{-1208}	$18487^{+129336}_{-14049}$
Alt.	-272 ± 49	$14.86^{+13.17}_{-8.84}$	442^{+56}_{-90}	3375^{+1075}_{-451}	1461^{+7593}_{-1038}

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 $A_{\text{obs}} \gg 1.0$

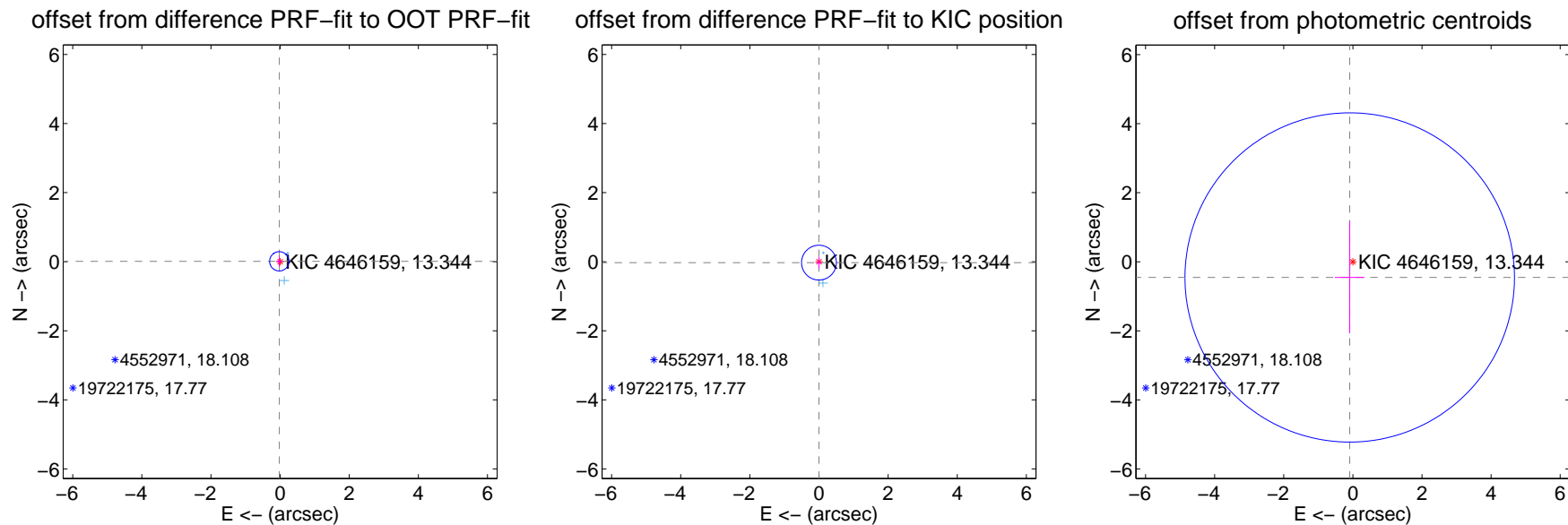
DV Centroid Data

Supplemental centroid analysis for 004646159-02. Kepler magnitude: 13.34. Transit SNR 5.54

There are 3 quarters with good PRF difference image offsets

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

	Distance in arcsec	Distance / σ	Δ RA	Δ Dec
PRF-fit source offset from OOT	0.026 ± 0.093	0.28	0.024 ± 0.084	0.011 ± 0.161
PRF-fit source offset from KIC position	0.027 ± 0.168	0.16	0.001 ± 0.076	-0.027 ± 0.168
photometric centroid source offset	0.46 ± 1.59	0.29	0.09 ± 0.43	-0.45 ± 1.62



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



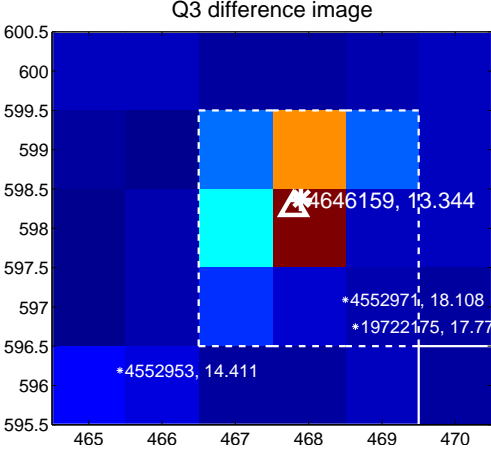
Q2 no difference image



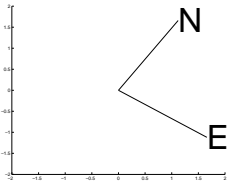
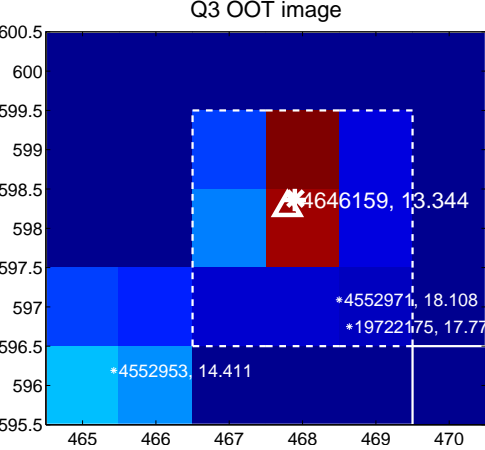
Q2 no OOT image



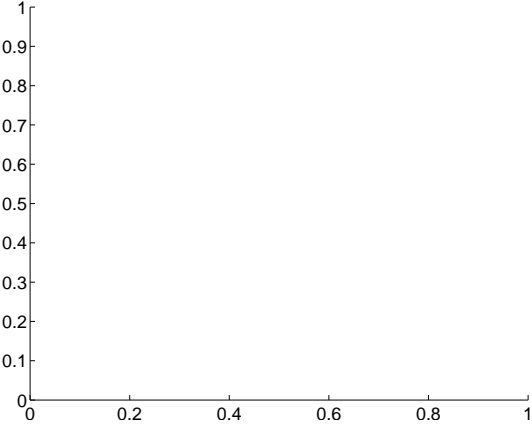
Q3 difference image



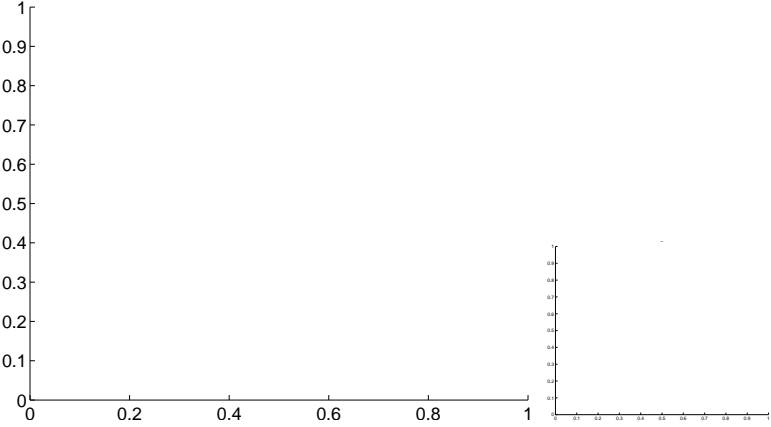
Q3 OOT image



Q4 no difference image



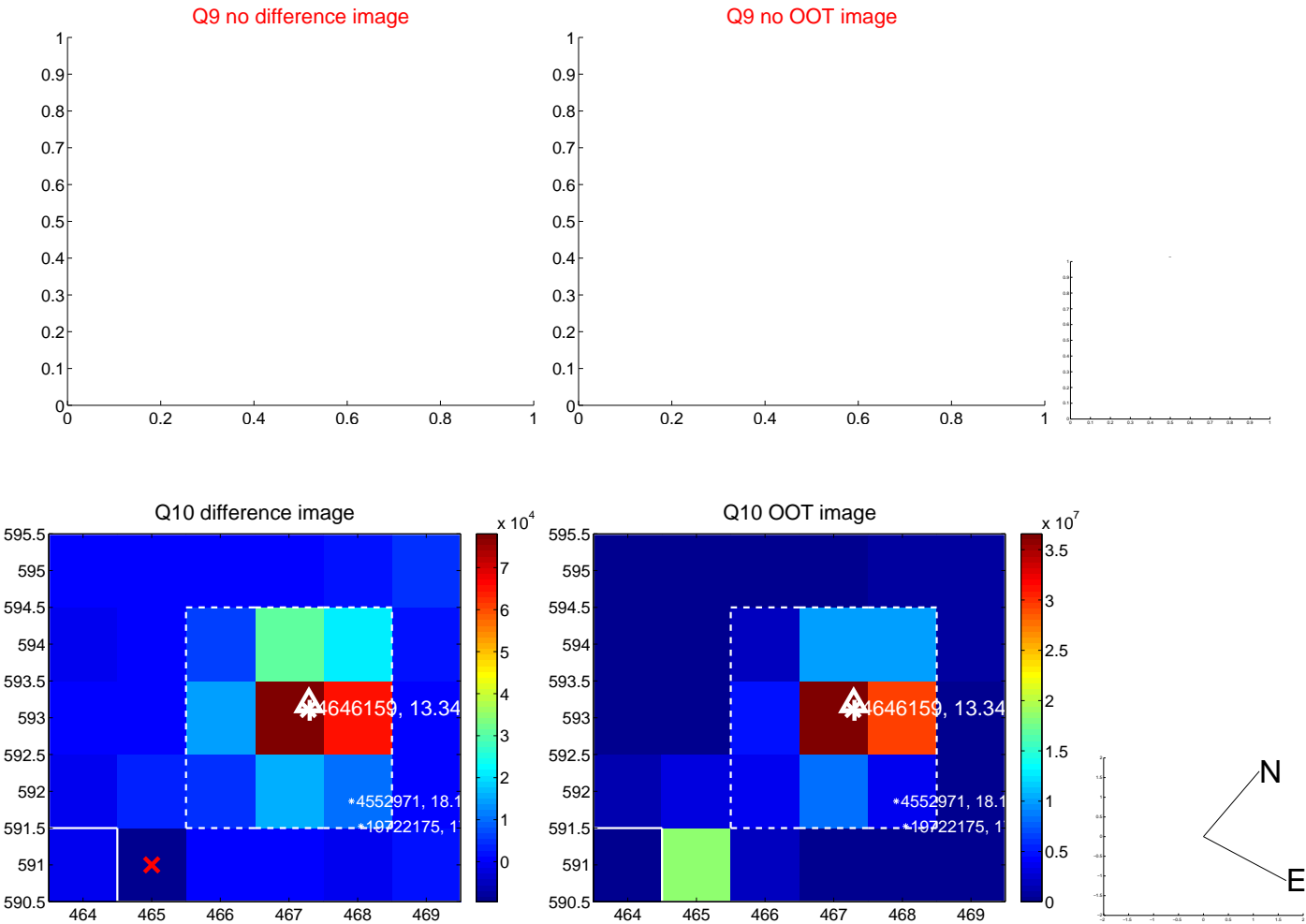
Q4 no OOT image



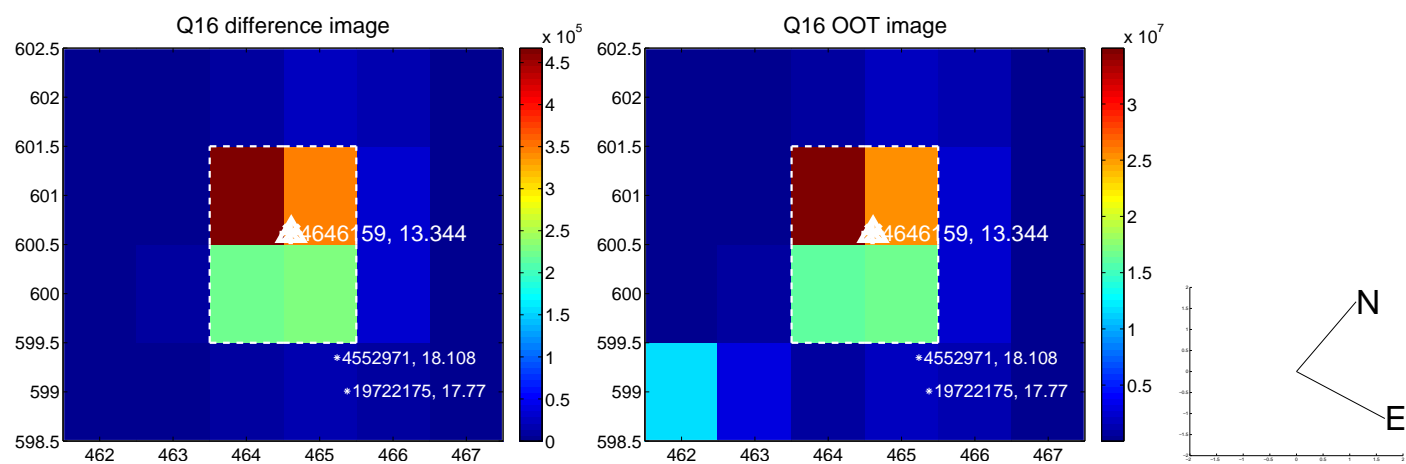
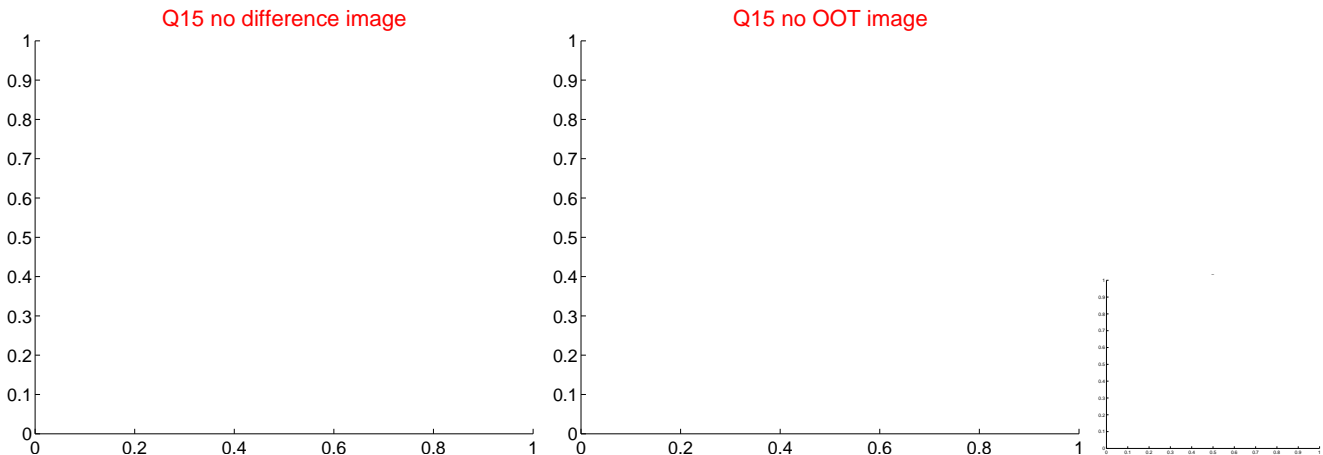
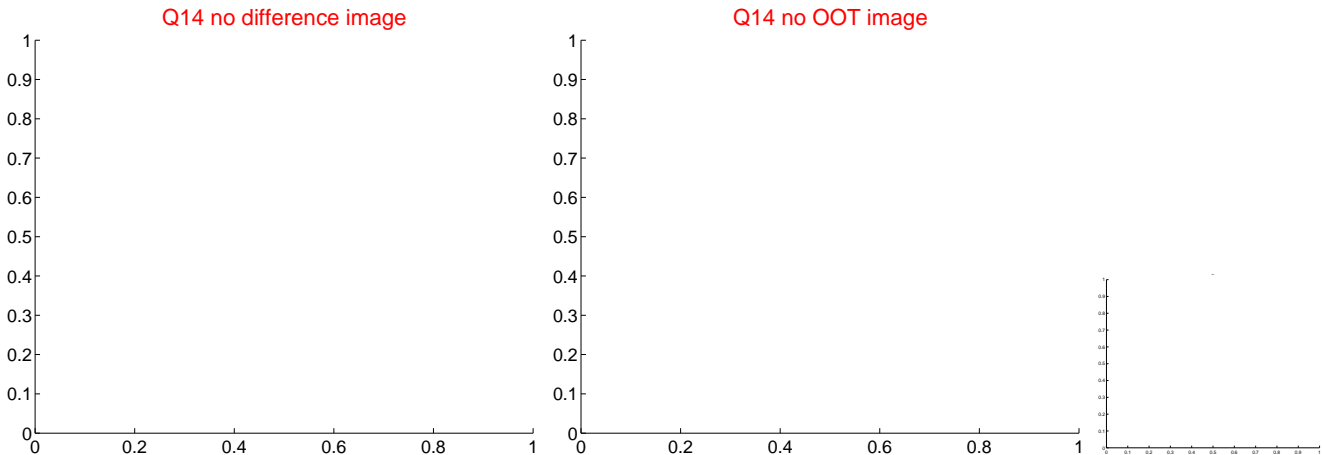
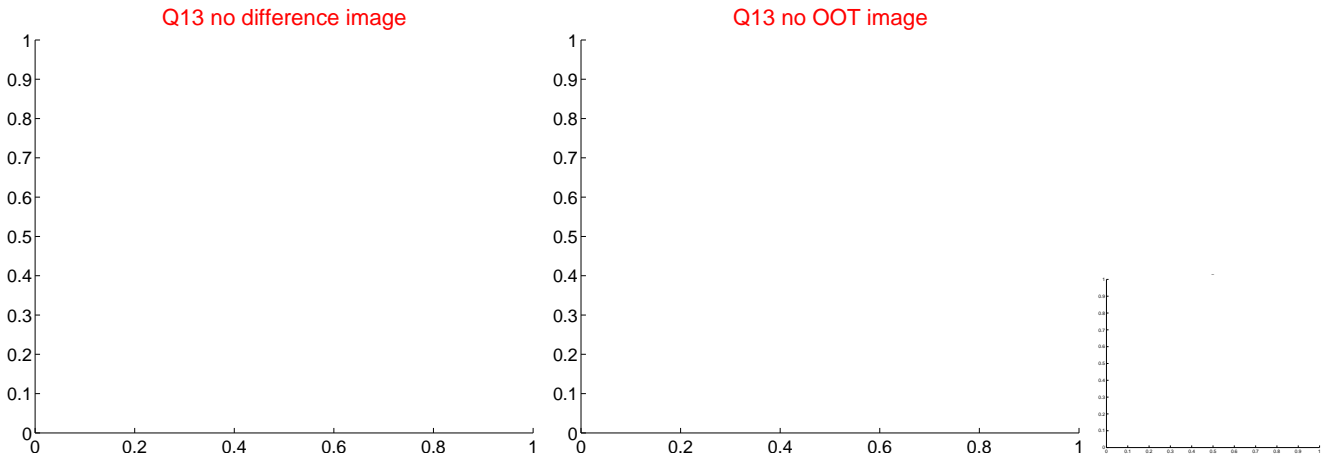
white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



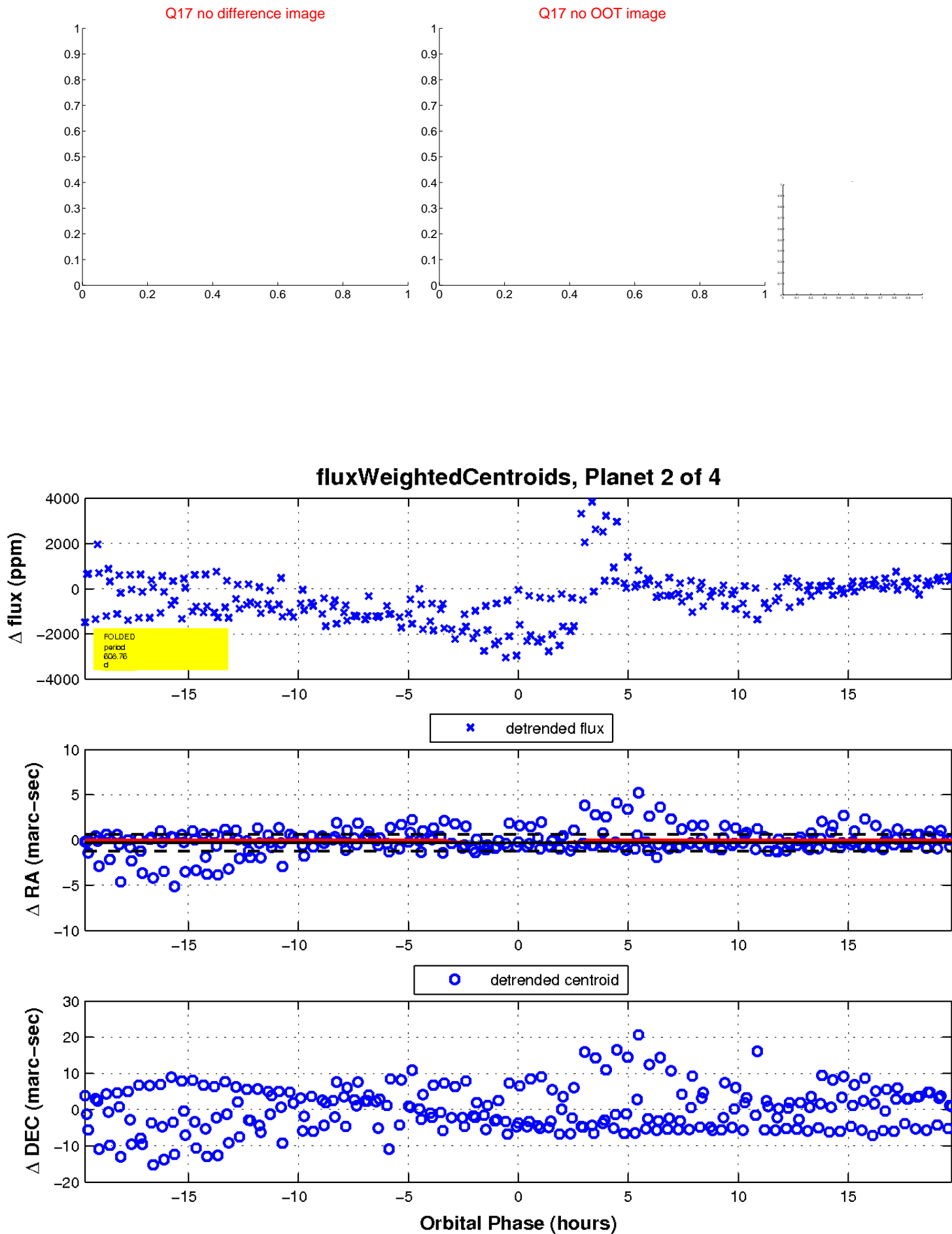
white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



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

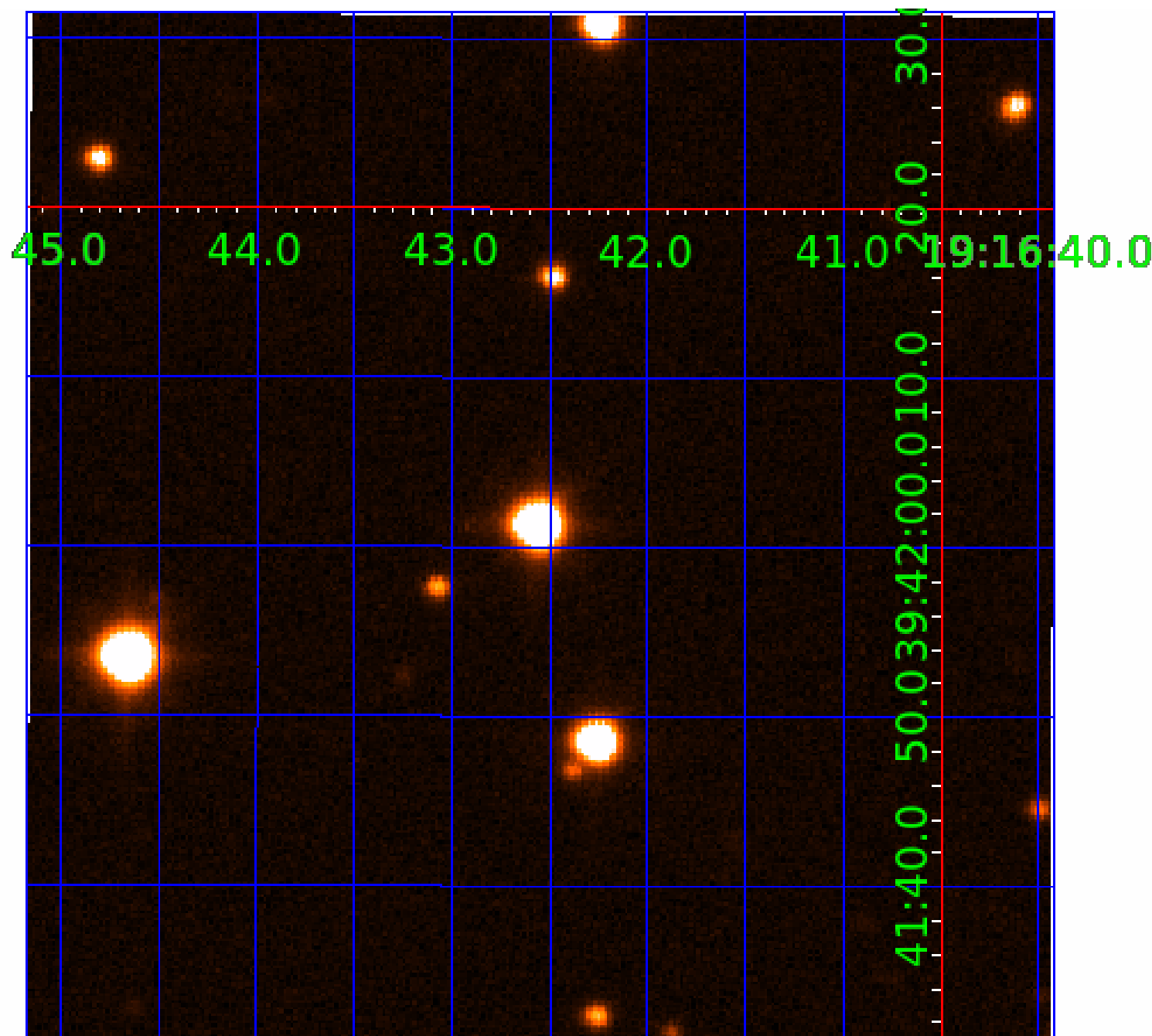


white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



UKIRT Image

Declination



KIC 004646159

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})
004646159-01	OBS	No	471.406878	203.718972	1320.9	8.002	18.1	5.6	2.84	5229	12.53	3.44
004646159-02	OBS	No	608.759464	336.803245	1157.9	6.587	16.9	5.5	2.84	5229	9.47	2.45
004646159-03	OBS	No	523.777450	529.978033	1417.6	3.760	14.4	9.1	2.84	5229	10.98	2.99
004646159-04	OBS	No	332.433179	263.175808	643.0	3.000	12.7	-1.0	2.84	5229	7.08	5.49

Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
004646159-01	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS
004646159-02	OBS	FP	0.00	1	0	1	0	INDIV_TRANS_CHASES—LPP_DV—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—HALO_GHOST
004646159-03	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—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS
004646159-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—INCONSISTENT_TRANS—CENT_NOFITS

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

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

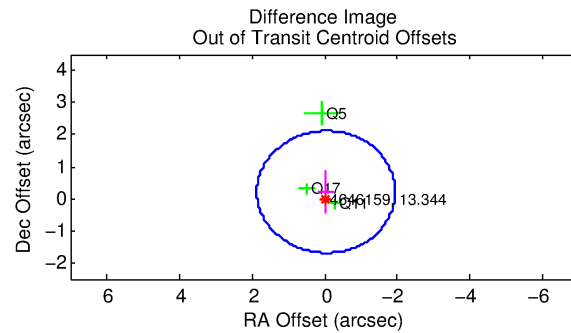
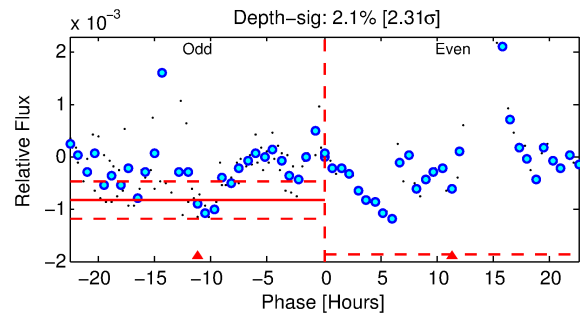
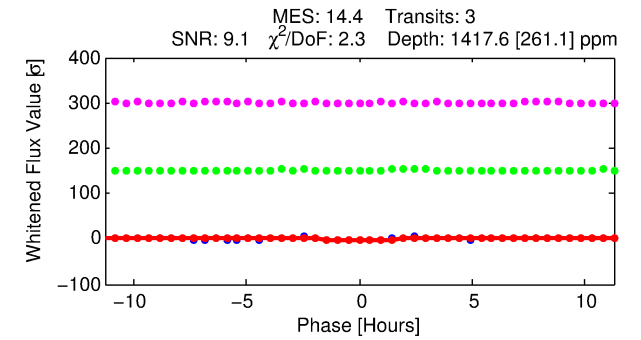
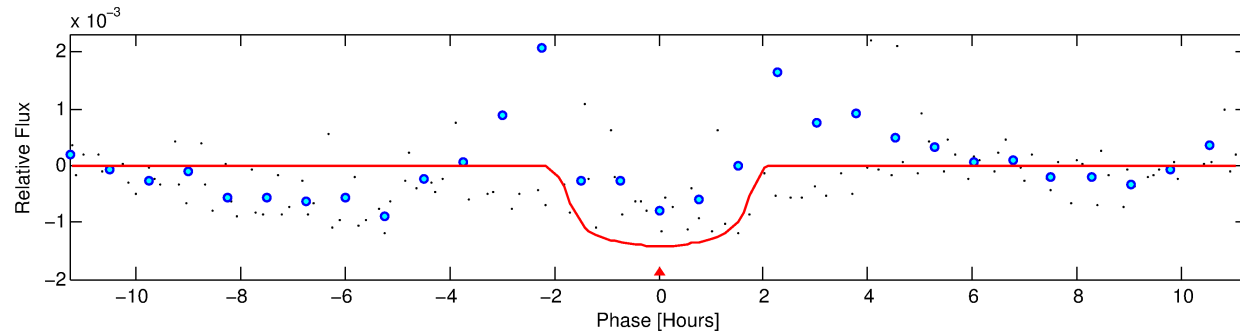
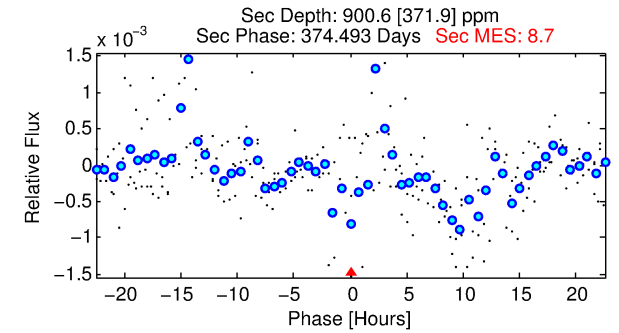
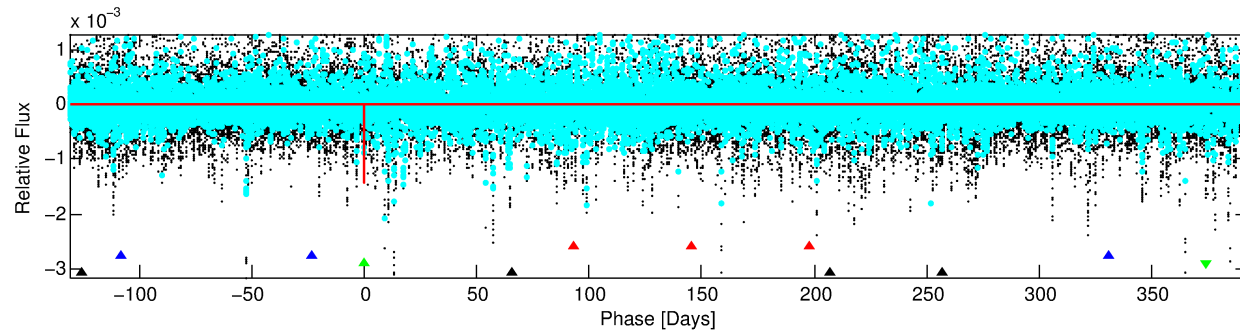
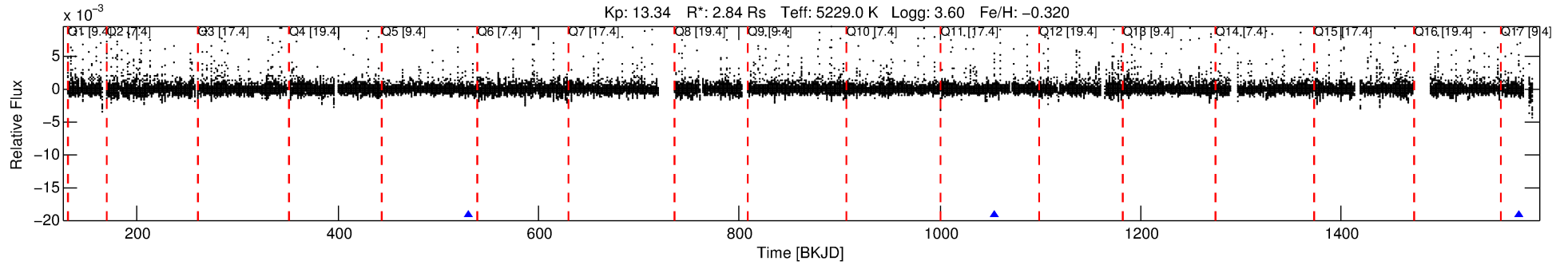
See http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col for comment definitions.

Ephemeris Match Information For 004646159-03

No Significant Match Found

DV One-Page Summary

KIC: 4646159 Candidate: 3 of 4 Period: 523.777 d



DV Fit Results:

Period = 523.77745 [0.00434] d
Epoch = 529.9780 [0.0043] BKJD
Rp/R* = 0.0354 [0.0345]
a/R* = 931.21 [3457.10]
b = 0.55 [4.72]
Seff = 2.99 [4.35]
Teq = 335 [122] K
Rp = 10.98 [13.23] Re
a = 1.3444 [1.1190] AU
Ag = 7423.71 [18296.08] [0.41σ]
Teffp = 4813 [2403] K [1.86σ]

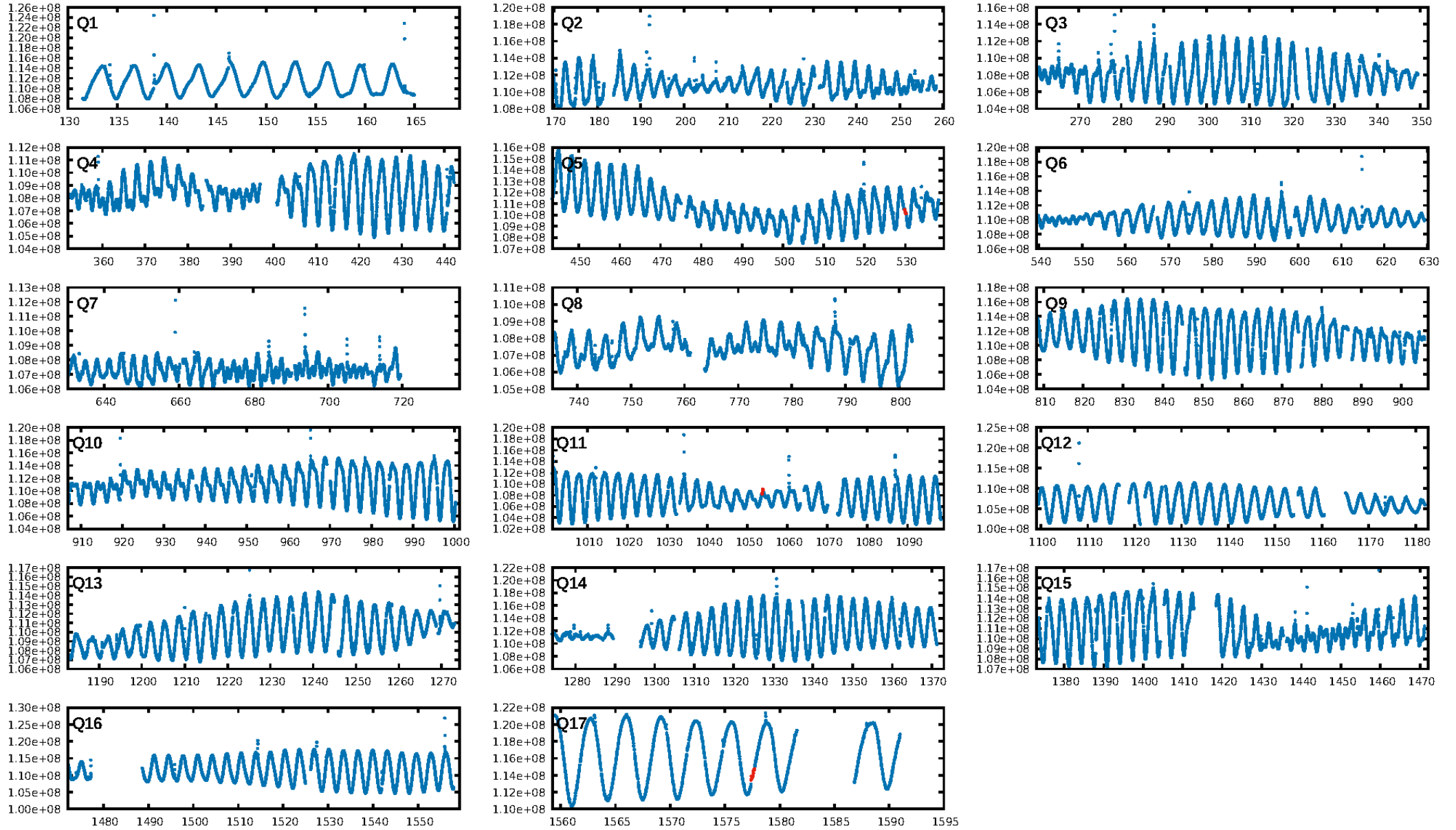
DV Diagnostic Results:

ShortPeriod-sig: 100.0% [142.16σ]
LongPeriod-sig: 100.0% [268.90σ]
ModelChiSquare2-sig: 0.0%
ModelChiSquareGof-sig: 0.9%
Bootstrap-pfa: N/A
RollingBand-fgt: 1.00 [2/2]
GhostDiagnostic-chr: 0.3427
Centroid-sig: N/A
Centroid-so: 0.029 arcsec [0.08σ]
OotOffset-rm: 0.215 arcsec [0.34σ]
OotOffset-st: 0.1/0/2 [3]
KicOffset-rm: 0.184 arcsec [0.22σ]
KicOffset-st: 0.1/0/2 [3]
DiffImageQuality-fgm: 0.33 [1/3]
DiffImageOverlap-fno: 1.00 [3/3]

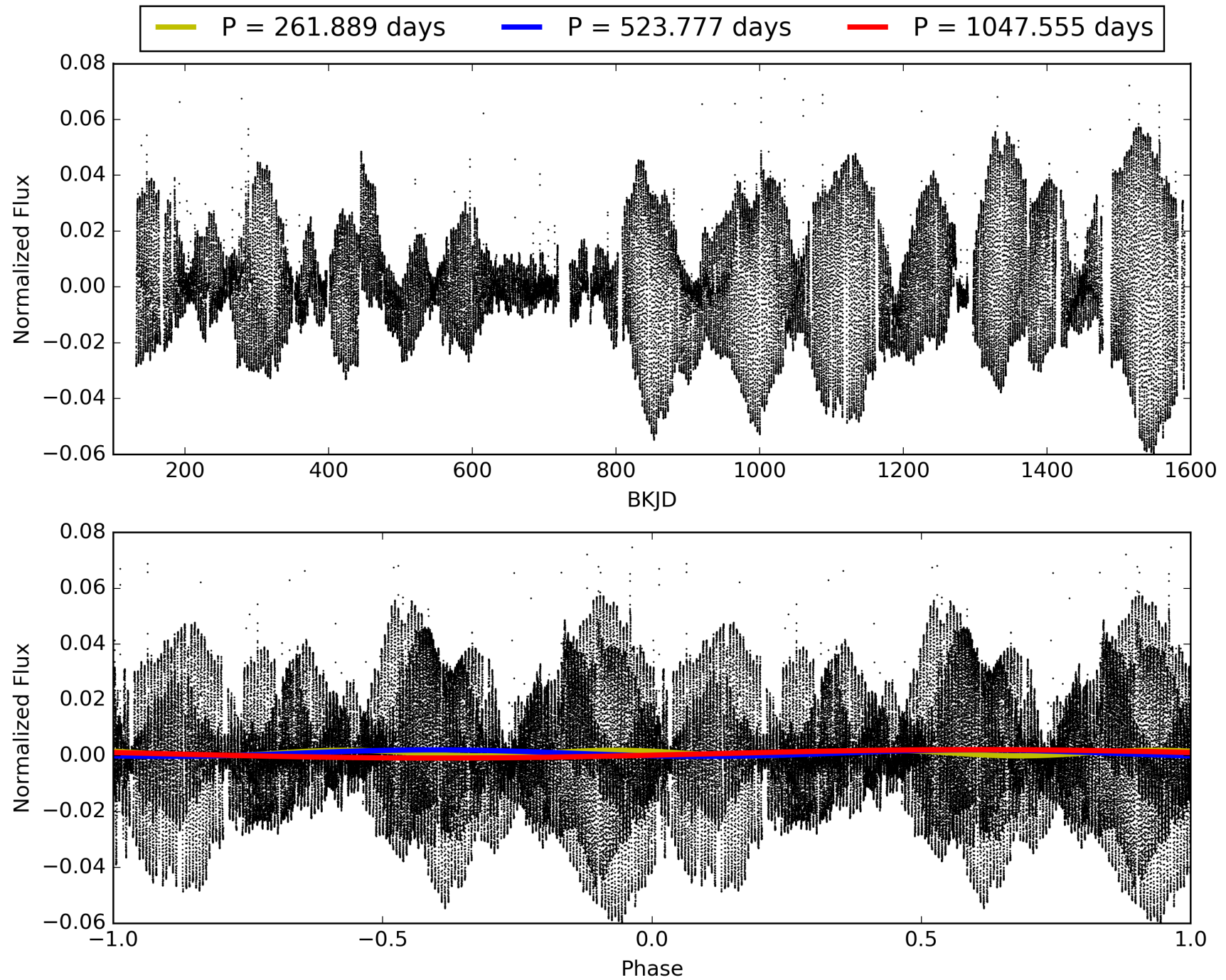
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 02-Feb-2016 00:27:22 Z

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

TCE 004646159-03, PDC Light Curves

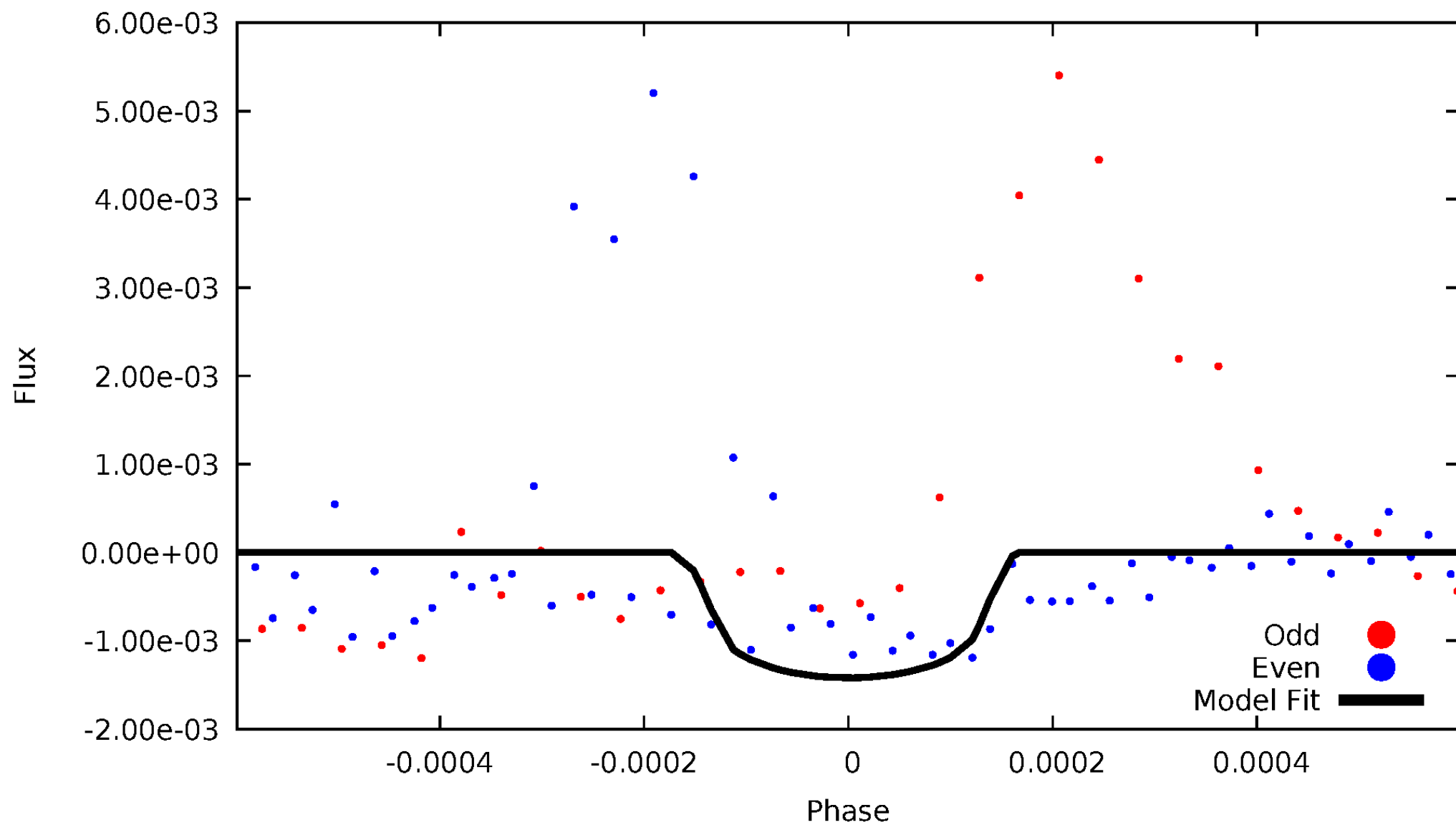


TCE 004646159-03



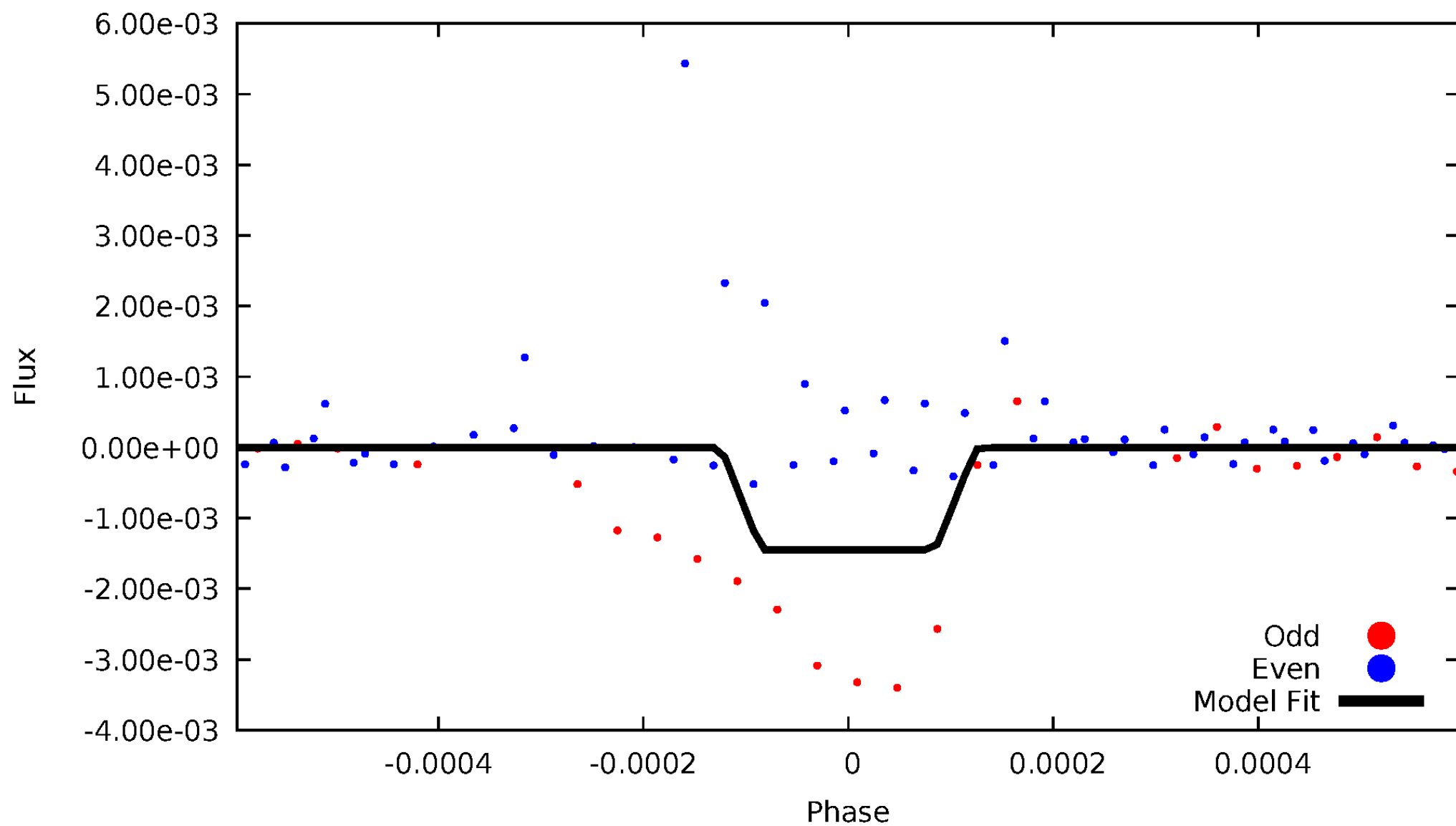
DV Odd/Even

TCE 004646159-03



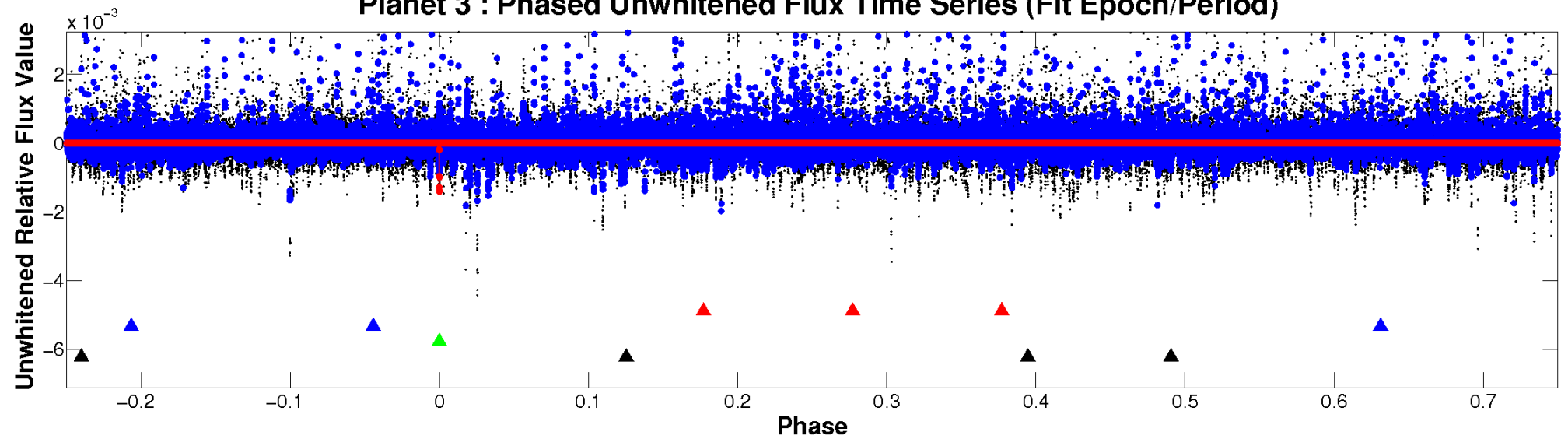
ALT Odd/Even

TCE 004646159-03

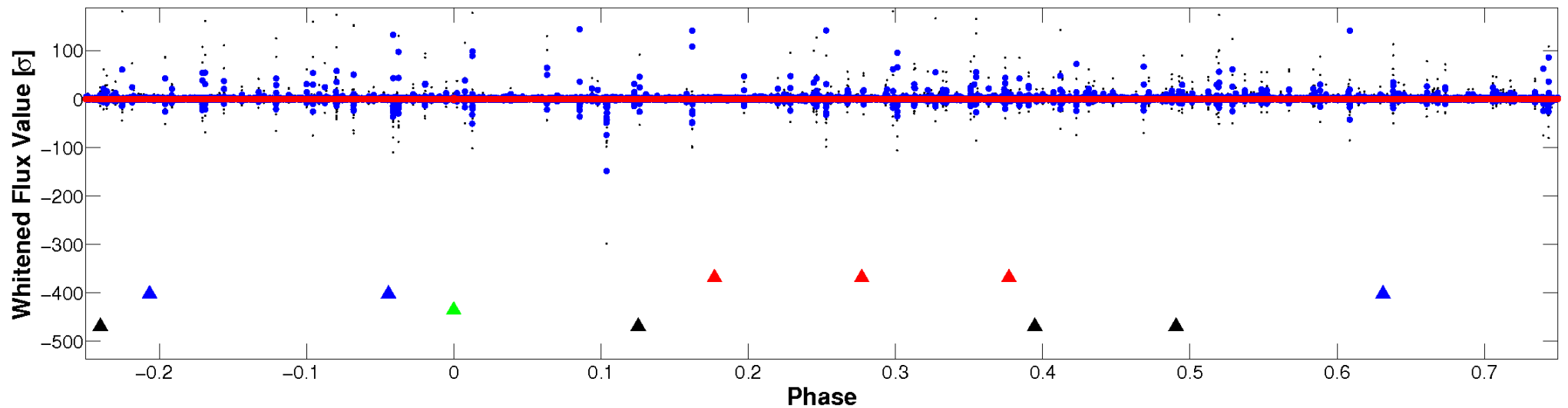


Non-Whitened Vs. Whitened Light Curve

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

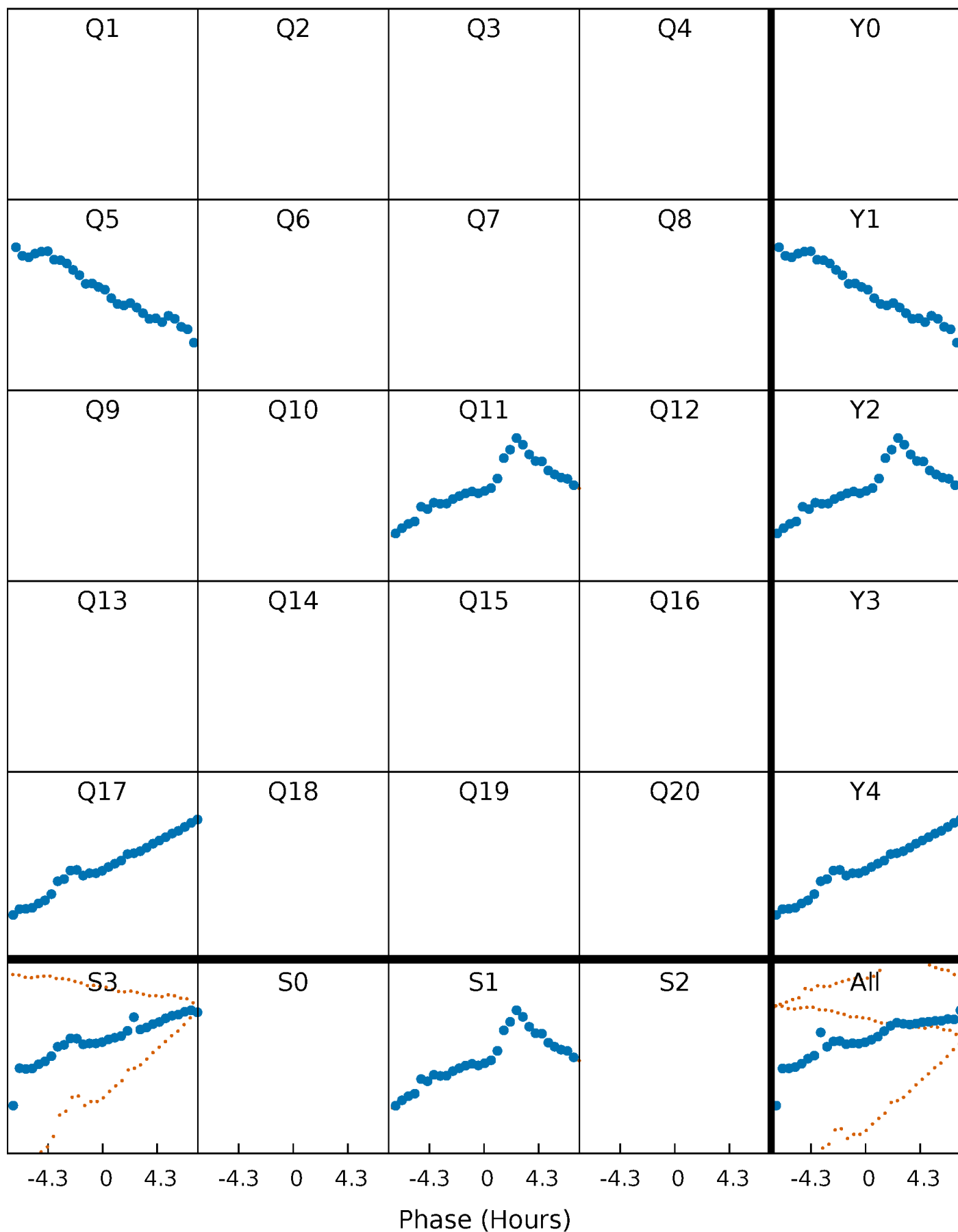


Planet 3 : Phased Whitened Flux Time Series (Fit Epoch/Period)



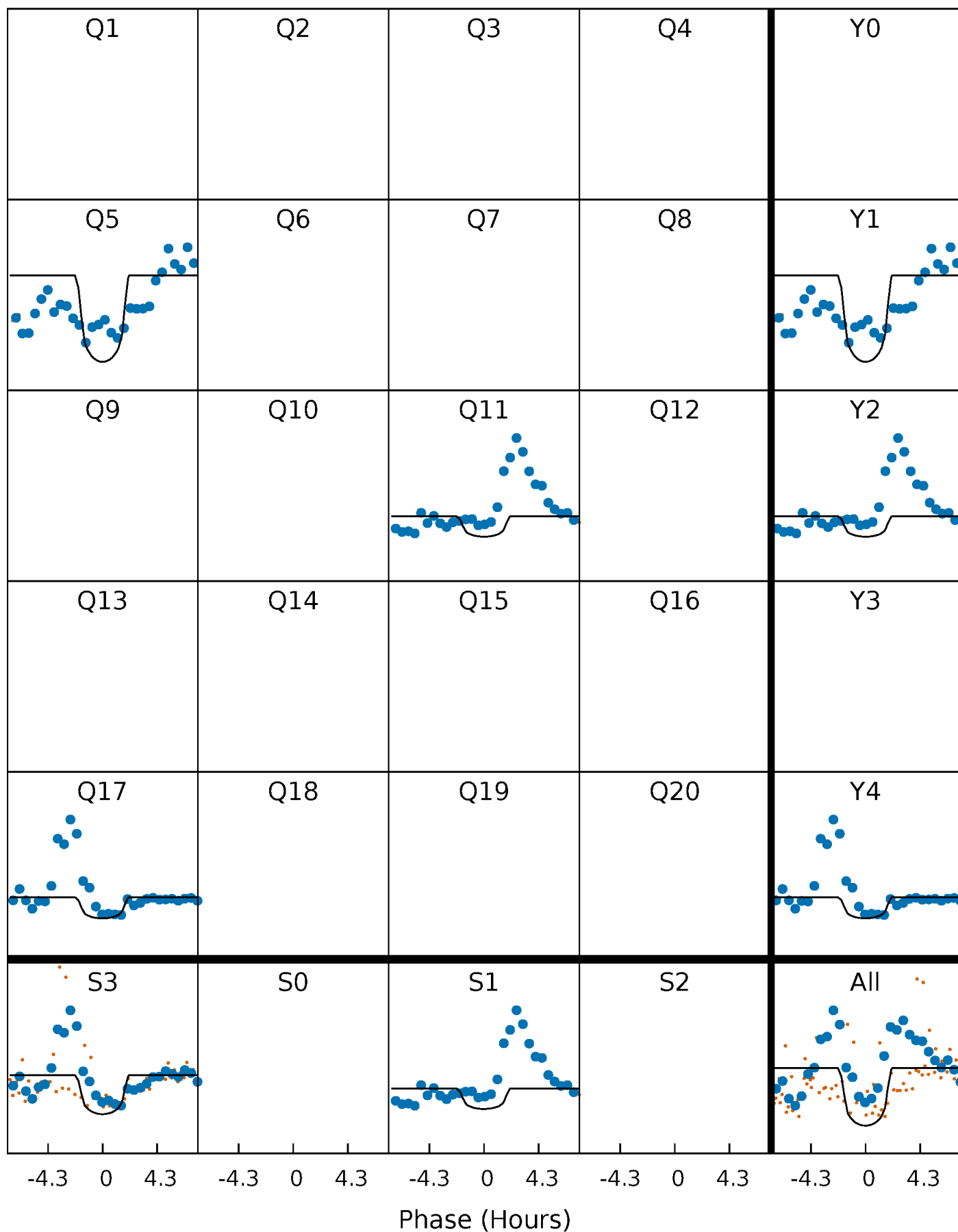
PDC Quarter-Phased Transit Curves

TCE 004646159-03 $P=523.777450$ Days $T_0=529.978033$ (BKJD)



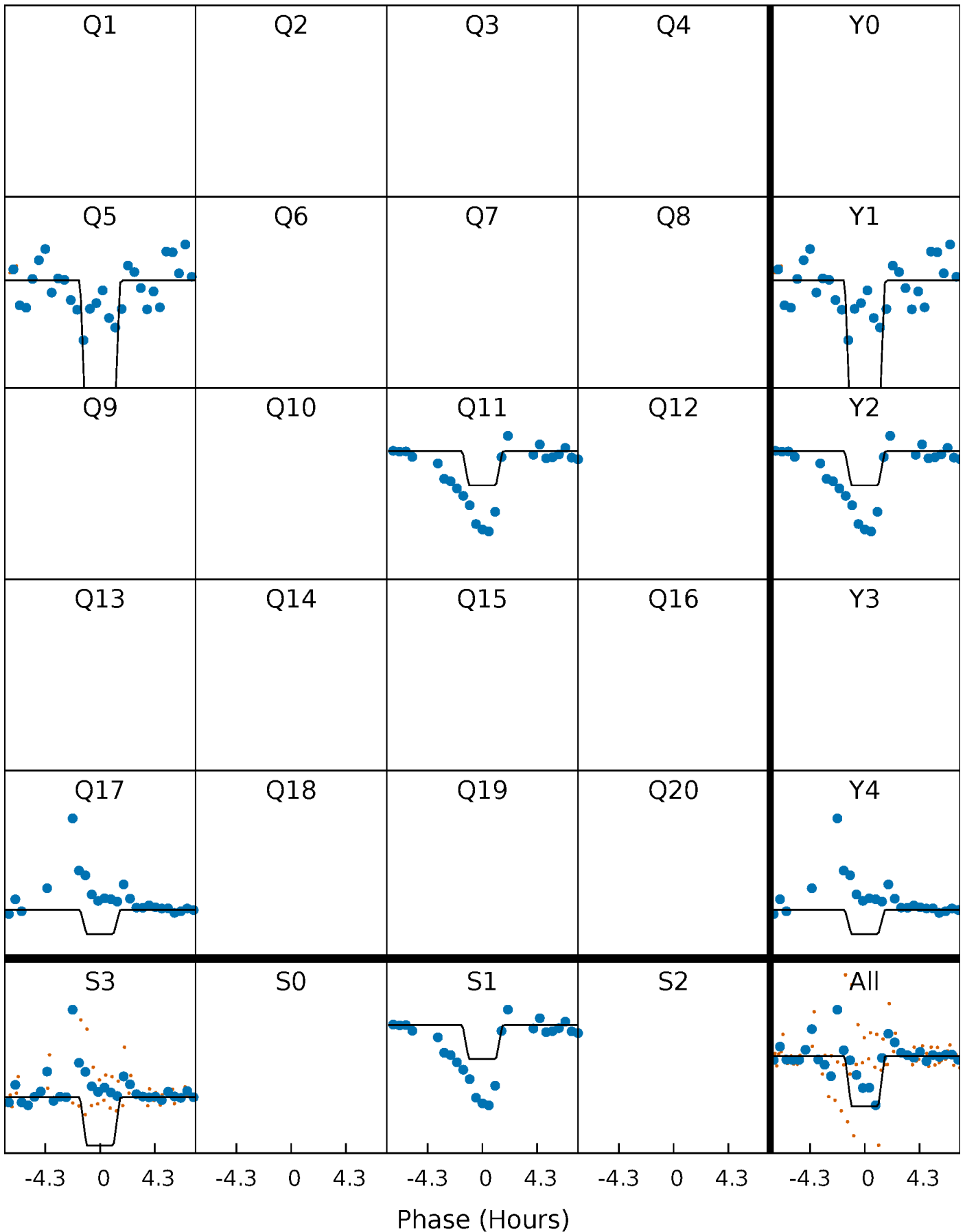
DV Quarter-Phased Transit Curves

TCE 004646159-03 $P=523.777450$ Days $T_0=529.978033$ (BKJD)



Alt. Detrend Quarter-Phased Transit Curves

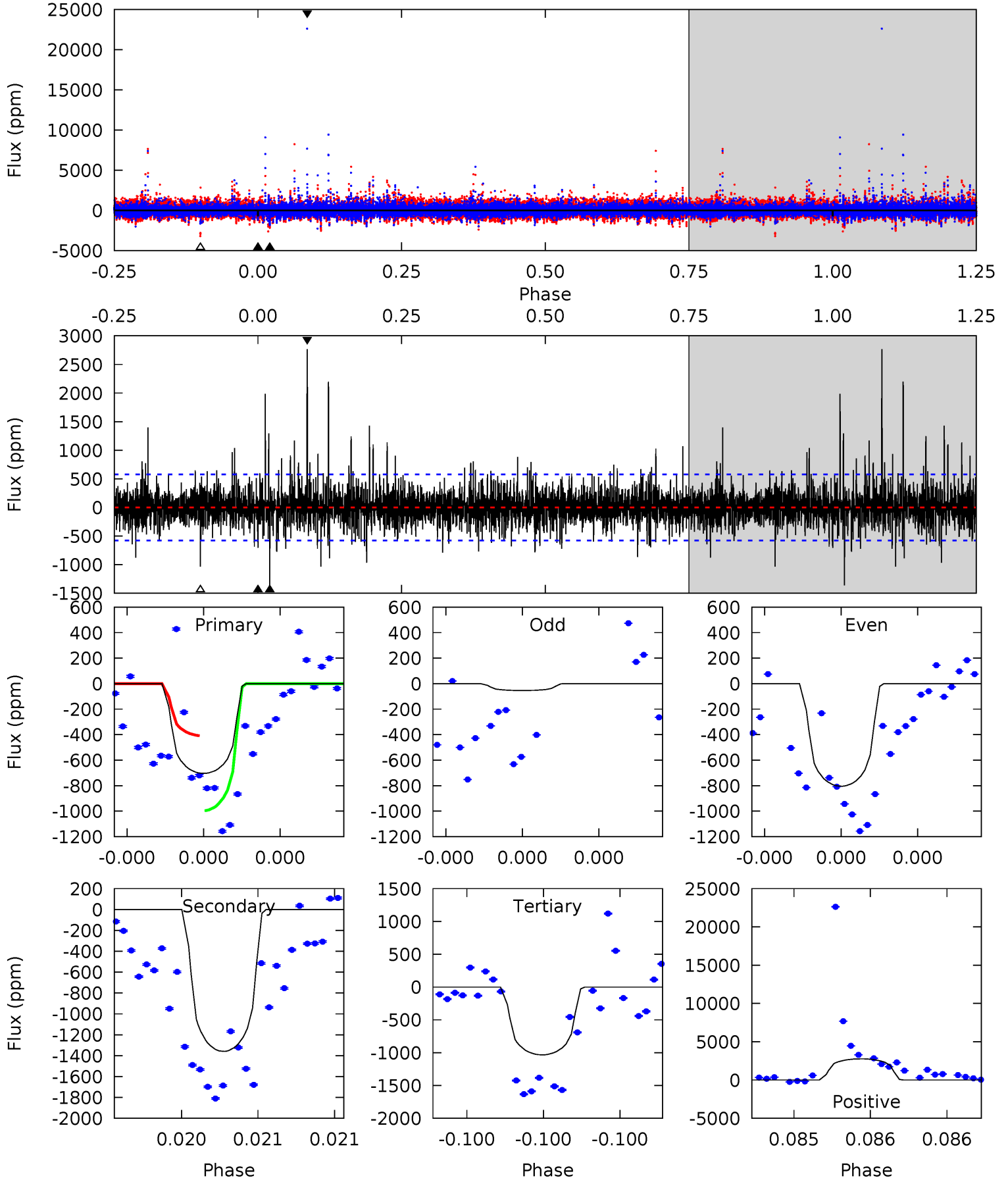
TCE 004646159-03 P=523.780255 Days $T_0=529.976563$ (BKJD)



DV Model-Shift Uniqueness Test

004646159-03, P = 523.777450 Days, E = 6.200583 Days

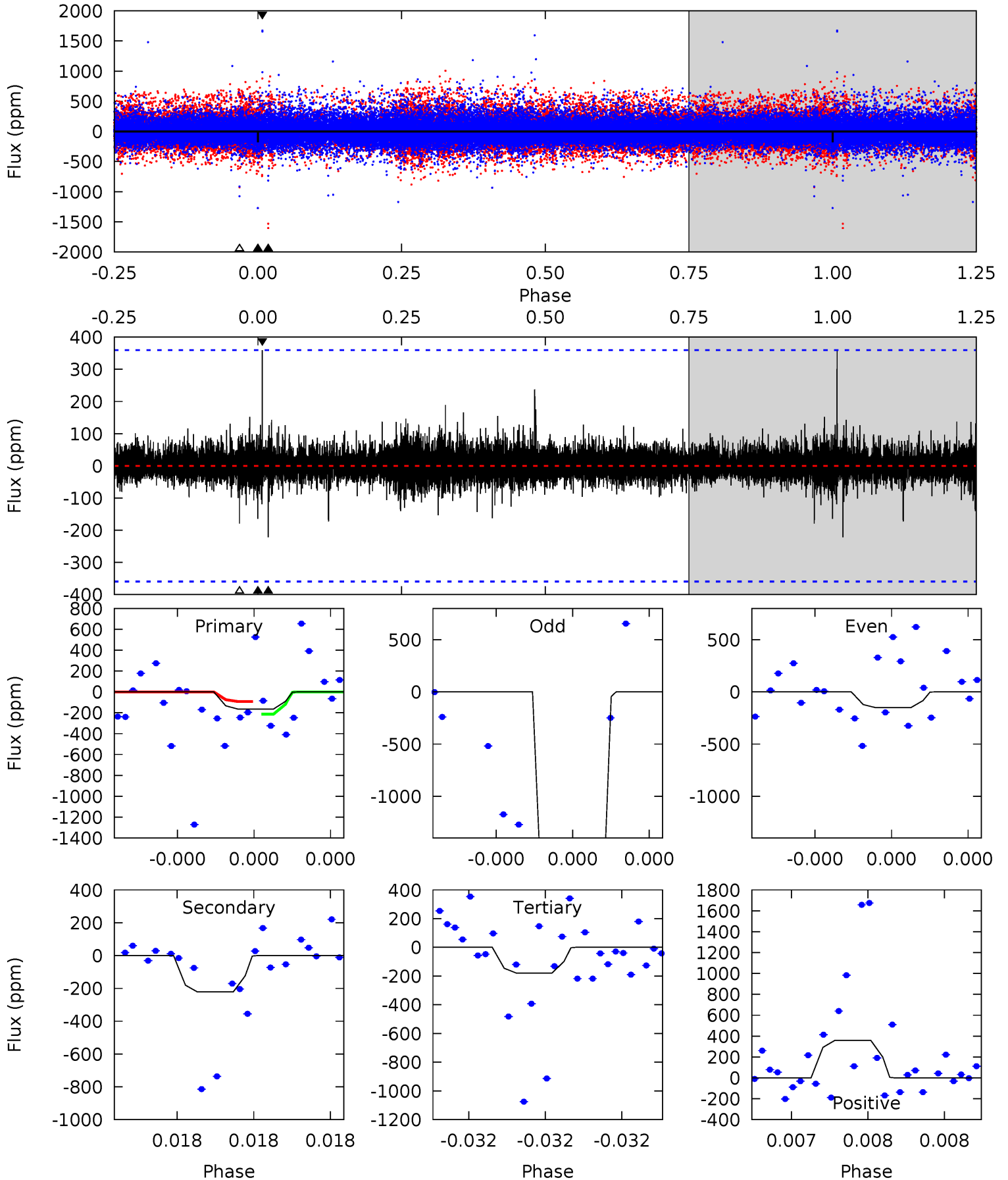
Pri	Sec	Ter	Pos	FA ₁	FA ₂	F _{Red}	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
6.88	13.3	10.1	27.0	5.65	3.60	2.18	-3.22	-20.2	3.18	-13.8	1.83	1.02	0.67	2.87



Alt Model-Shift Uniqueness Test

004646159-03, P = 523.780255 Days, E = 6.196308 Days

Pri	Sec	Ter	Pos	FA ₁	FA ₂	F _{Red}	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
2.59	3.51	2.83	5.69	5.69	3.66	0.45	-0.24	-3.09	0.68	-2.17	27.7	2.56	0.62	1.02



Stellar Parameters For KIC 004646159

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	R (R_{\odot})	$M(M_{\odot})$	p_{\star} ($\text{g}\cdot\text{cm}^{-3}$)
	5229^{+157}_{-141}	$3.603^{+0.893}_{-0.298}$	$-0.320^{+0.300}_{-0.250}$	$2.842^{+1.084}_{-2.013}$	$1.181^{+0.177}_{-0.329}$	$0.072^{+2.238}_{-0.043}$
	+3%/-3%	+25%/-8%	+94%/-78%	+38%/-71%	+15%/-28%	+3089%/-59%
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 004646159-03 / KOI

Detrend	Depth (ppm)	R_p (R_{\oplus})	T_{max} (K)	T_{obs} (K)	A_{obs}
DV	-1359 ± 102	$11.27^{+11.36}_{-7.54}$	469^{+60}_{-94}	4981^{+3729}_{-951}	10029^{+86432}_{-7442}
Alt.	-222 ± 63	$11.25^{+11.75}_{-6.95}$	466^{+58}_{-93}	3511^{+1381}_{-579}	1568^{+10503}_{-1179}

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 $A_{\text{obs}} \gg 1.0$

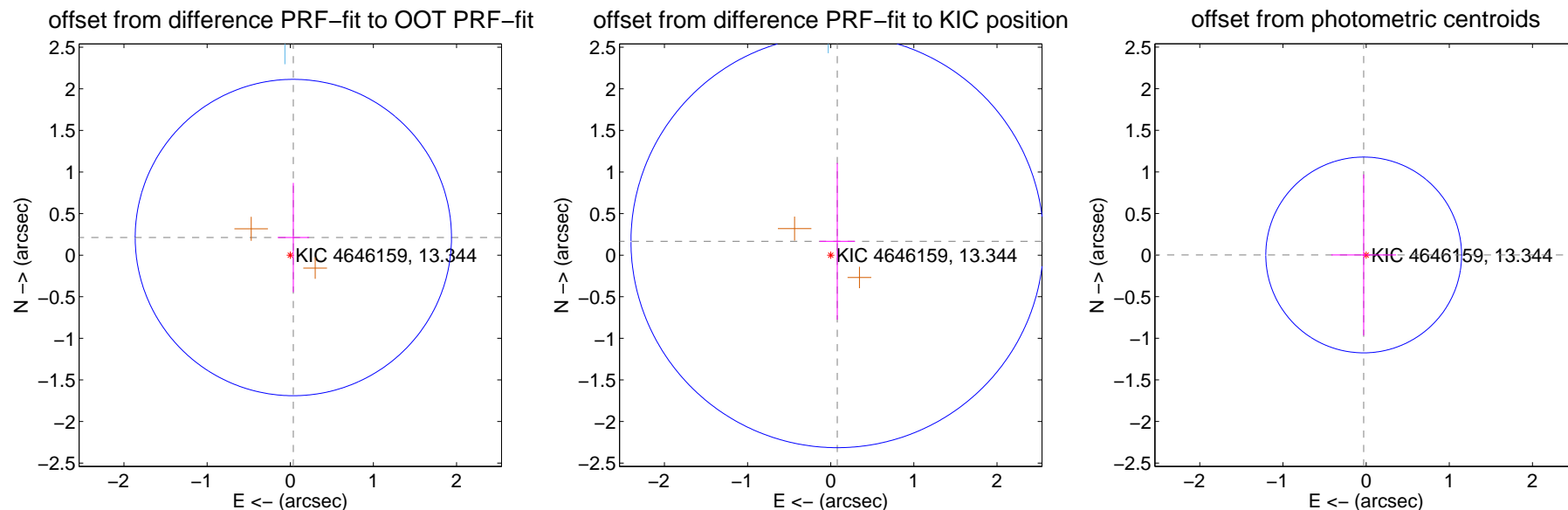
DV Centroid Data

Supplemental centroid analysis for 004646159-03. Kepler magnitude: 13.34. Transit SNR 9.13

There are 1 quarters with good PRF difference image offsets

The direct PRF centroid is offset from the target star catalog position by about 0.04 arcsec

	Distance in arcsec	Distance / σ	Δ RA	Δ Dec
PRF-fit source offset from OOT	0.215 ± 0.634	0.34	-0.037 ± 0.189	0.212 ± 0.657
PRF-fit source offset from KIC position	0.184 ± 0.827	0.22	-0.079 ± 0.213	0.166 ± 0.942
photometric centroid source offset	0.03 ± 0.39	0.08	0.03 ± 0.39	0.00 ± 0.97

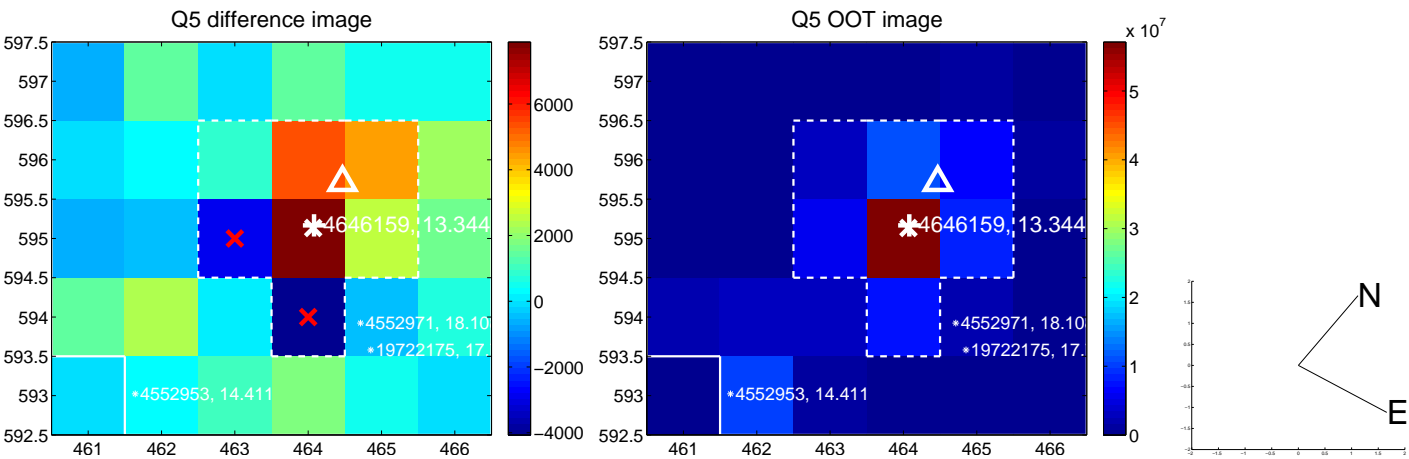


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- σ uncertainty. Blue circle: three- σ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

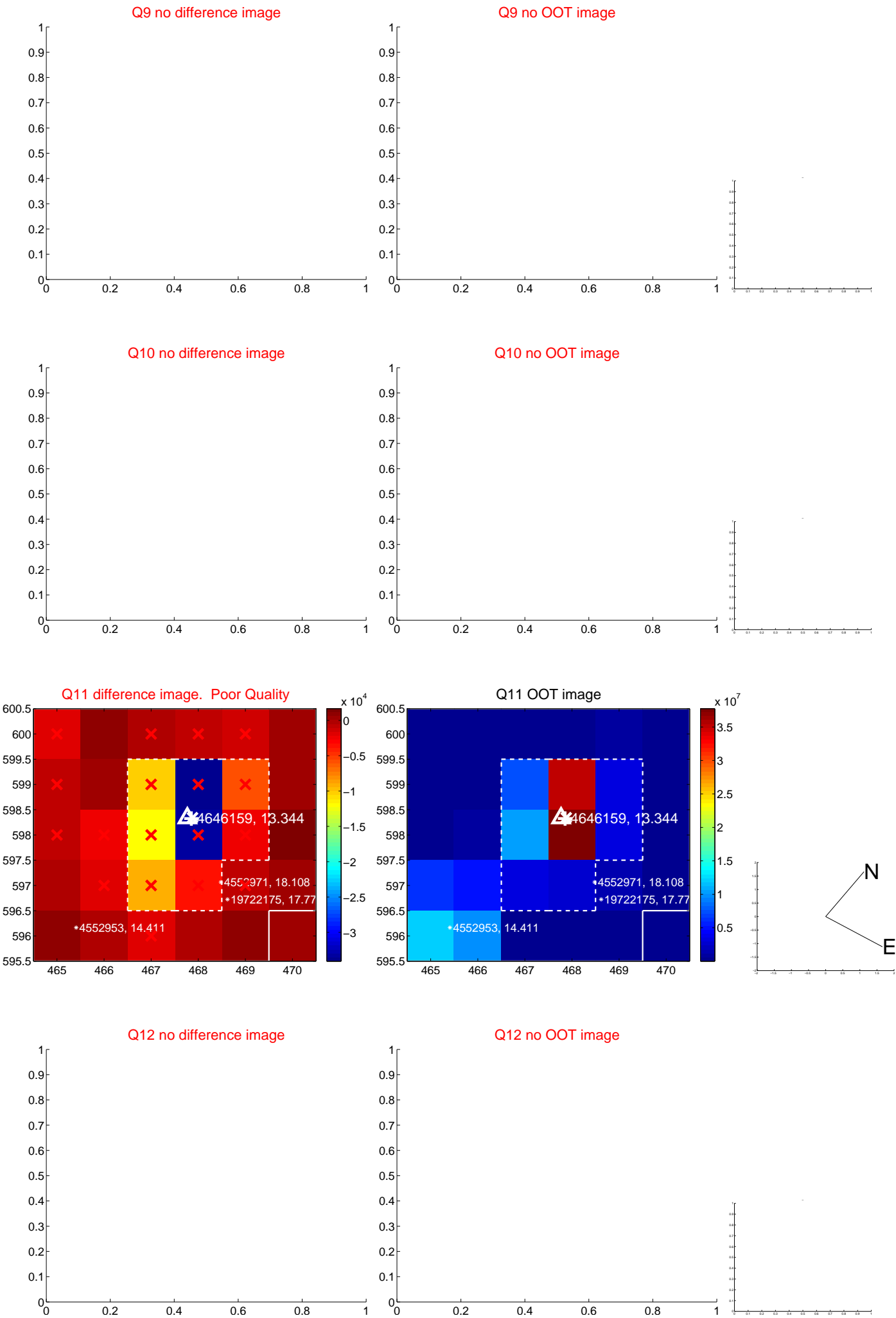
white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



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



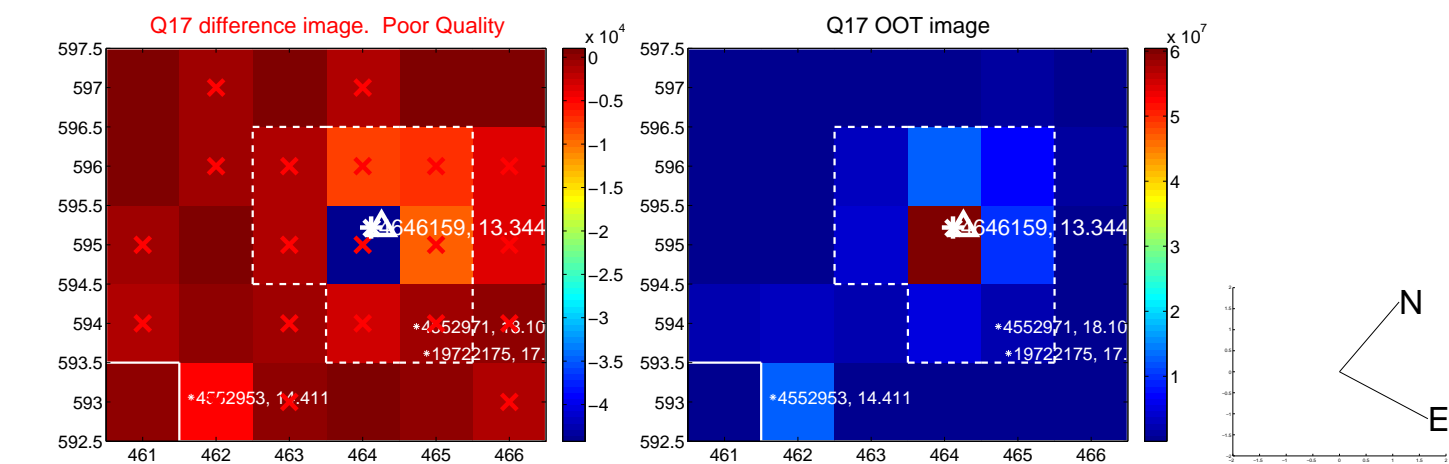
white ×: KIC target position; +: OOT centroid; △: difference centroid. red ✕: large negative pixel value.



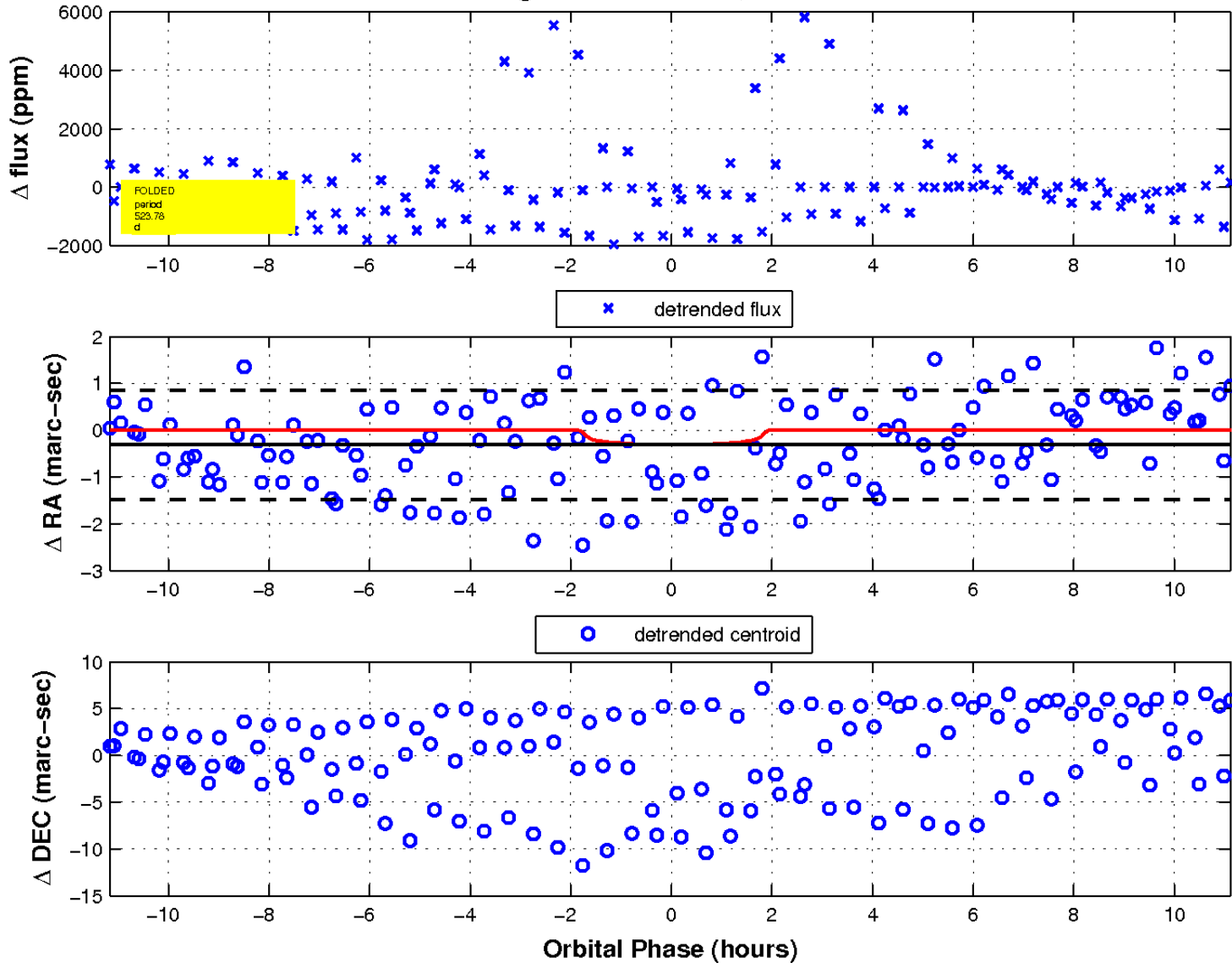
white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



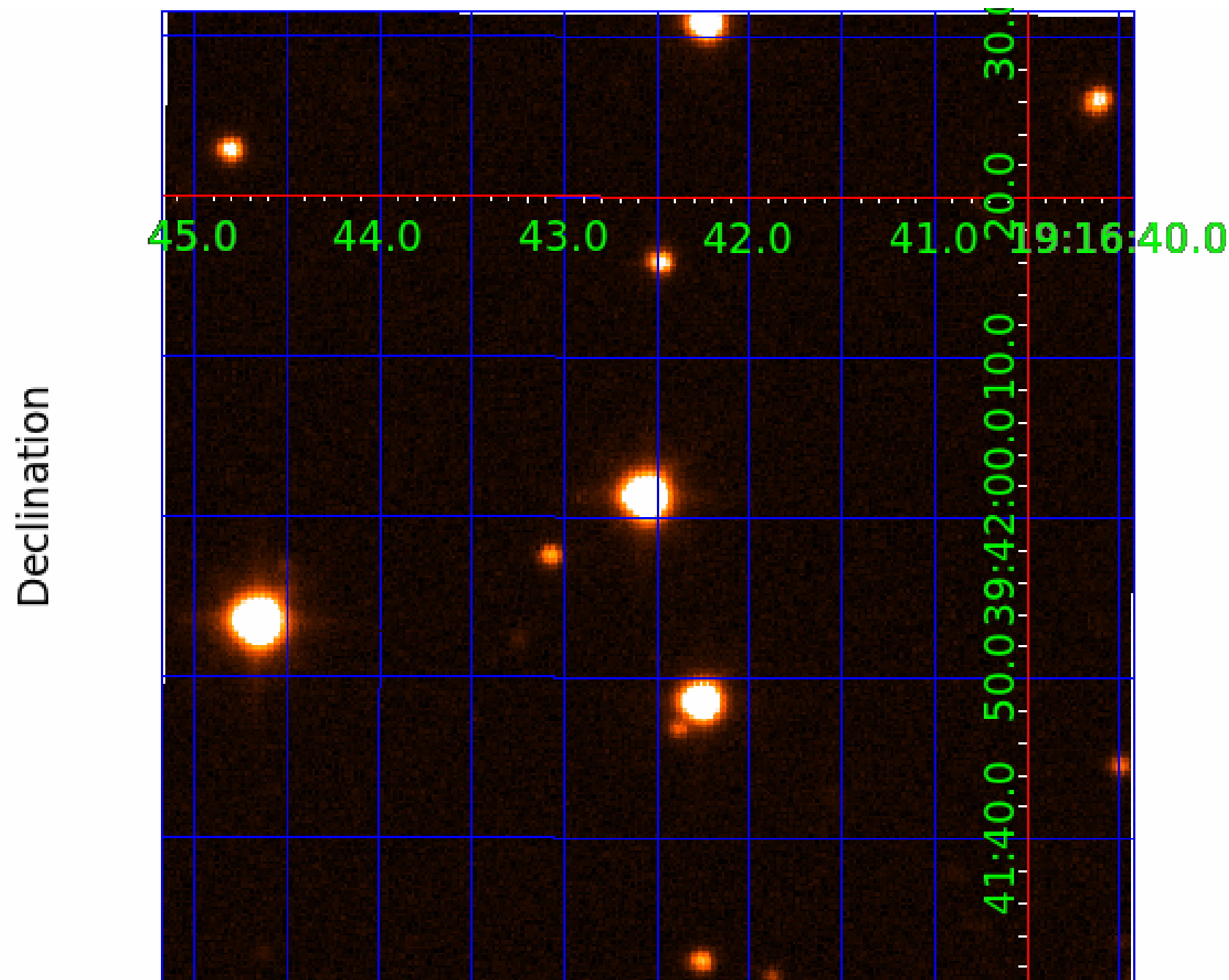
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



fluxWeightedCentroids, Planet 3 of 4



UKIRT Image



KIC 004646159

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})
004646159-01	OBS	No	471.406878	203.718972	1320.9	8.002	18.1	5.6	2.84	5229	12.53	3.44
004646159-02	OBS	No	608.759464	336.803245	1157.9	6.587	16.9	5.5	2.84	5229	9.47	2.45
004646159-03	OBS	No	523.777450	529.978033	1417.6	3.760	14.4	9.1	2.84	5229	10.98	2.99
004646159-04	OBS	No	332.433179	263.175808	643.0	3.000	12.7	-1.0	2.84	5229	7.08	5.49

Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
004646159-01	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS
004646159-02	OBS	FP	0.00	1	0	1	0	INDIV_TRANS_CHASES—LPP_DV—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—HALO_GHOST
004646159-03	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—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS
004646159-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—INCONSISTENT_TRANS—CENT_NOFITS

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

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

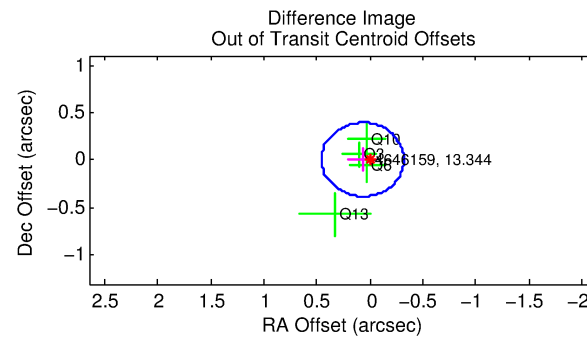
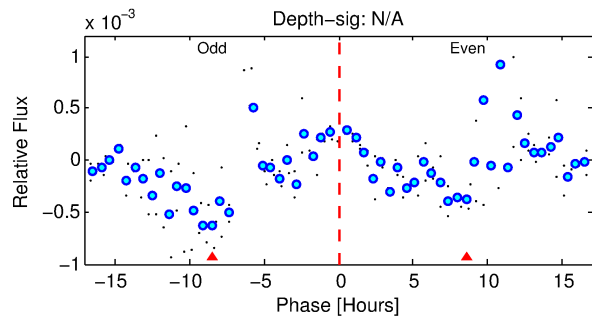
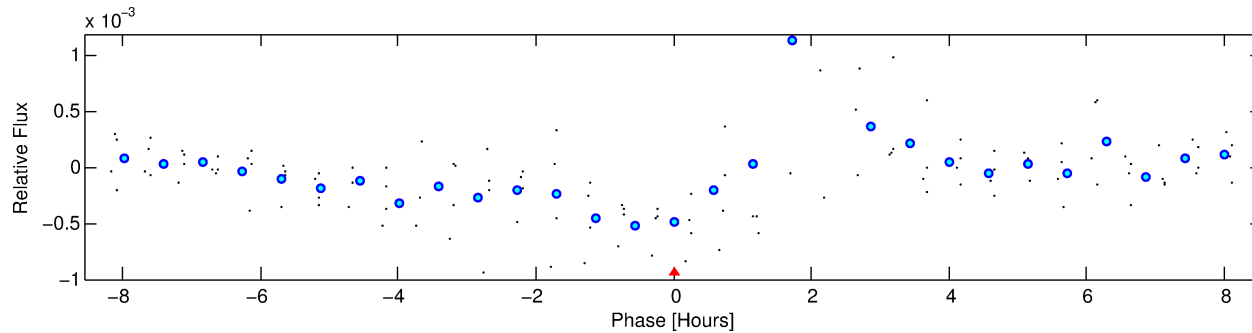
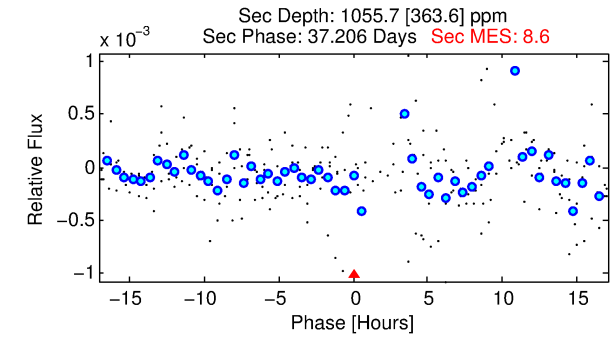
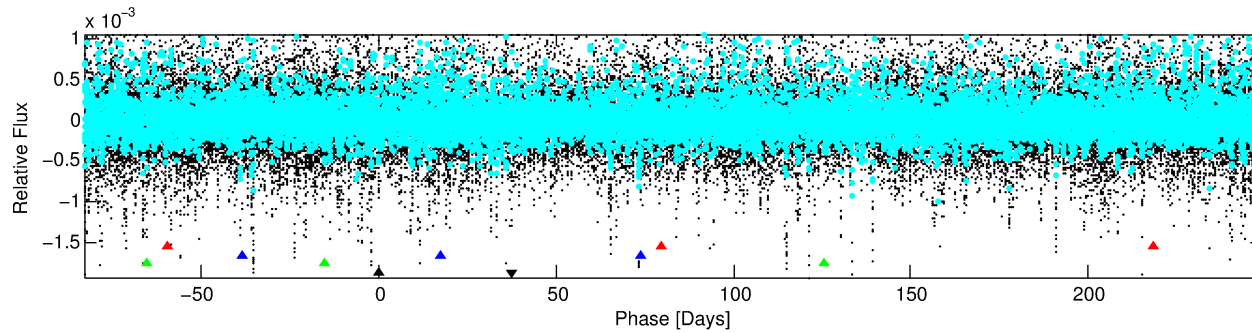
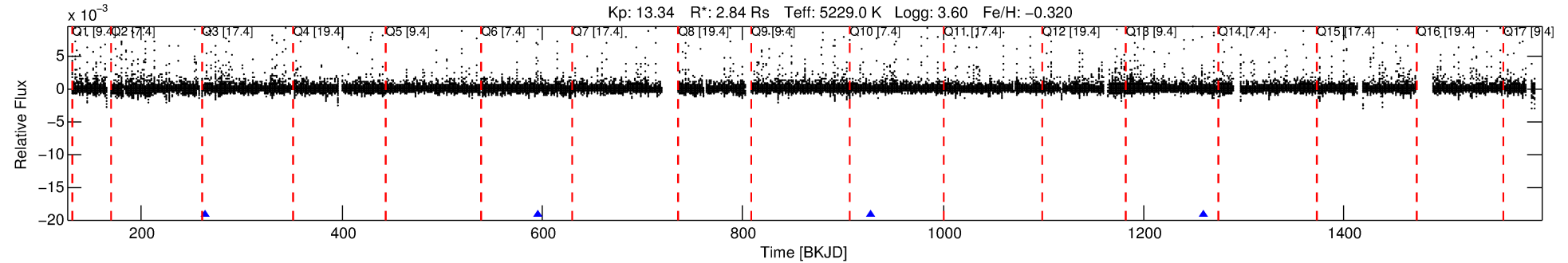
See http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col for comment definitions.

Ephemeris Match Information For 004646159-04

No Significant Match Found

DV One-Page Summary

KIC: 4646159 Candidate: 4 of 4 Period: 332.433 d



TPS TCE Results:

Period = 332.43318 d
Epoch = 263.1758 BKJD

DV fit results are unavailable

DV Diagnostic Results:

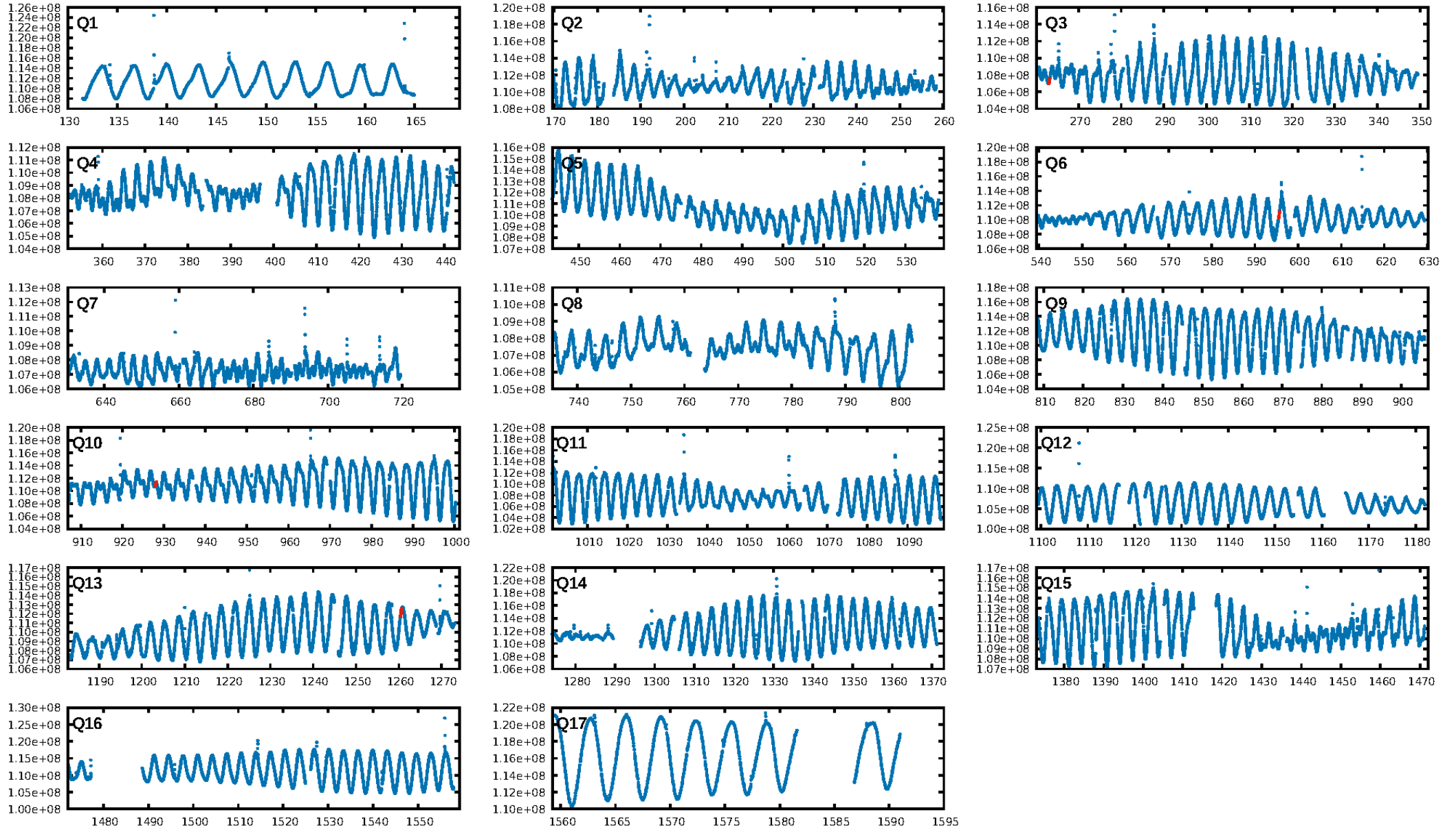
ShortPeriod-sig: N/A
LongPeriod-sig: 100.0% [390.29σ]
ModelChiSquare2-sig: N/A
ModelChiSquareGof-sig: N/A
Bootstrap-pfa: N/A
RollingBand-fgt: 1.00 [4/4]
GhostDiagnostic-chr: 0.721

Centroid-sig: N/A
Centroid-so: 2.969 arcsec [1.34σ]
OotOffset-rm: 0.070 arcsec [0.54σ]
KicOffset-rm: 0.118 arcsec [0.90σ]
OotOffset-st: 2/1/0/1 [4]
KicOffset-st: 2/1/0/1 [4]
DiffImageQuality-fgm: 0.50 [2/4]
DiffImageOverlap-fno: 1.00 [4/4]

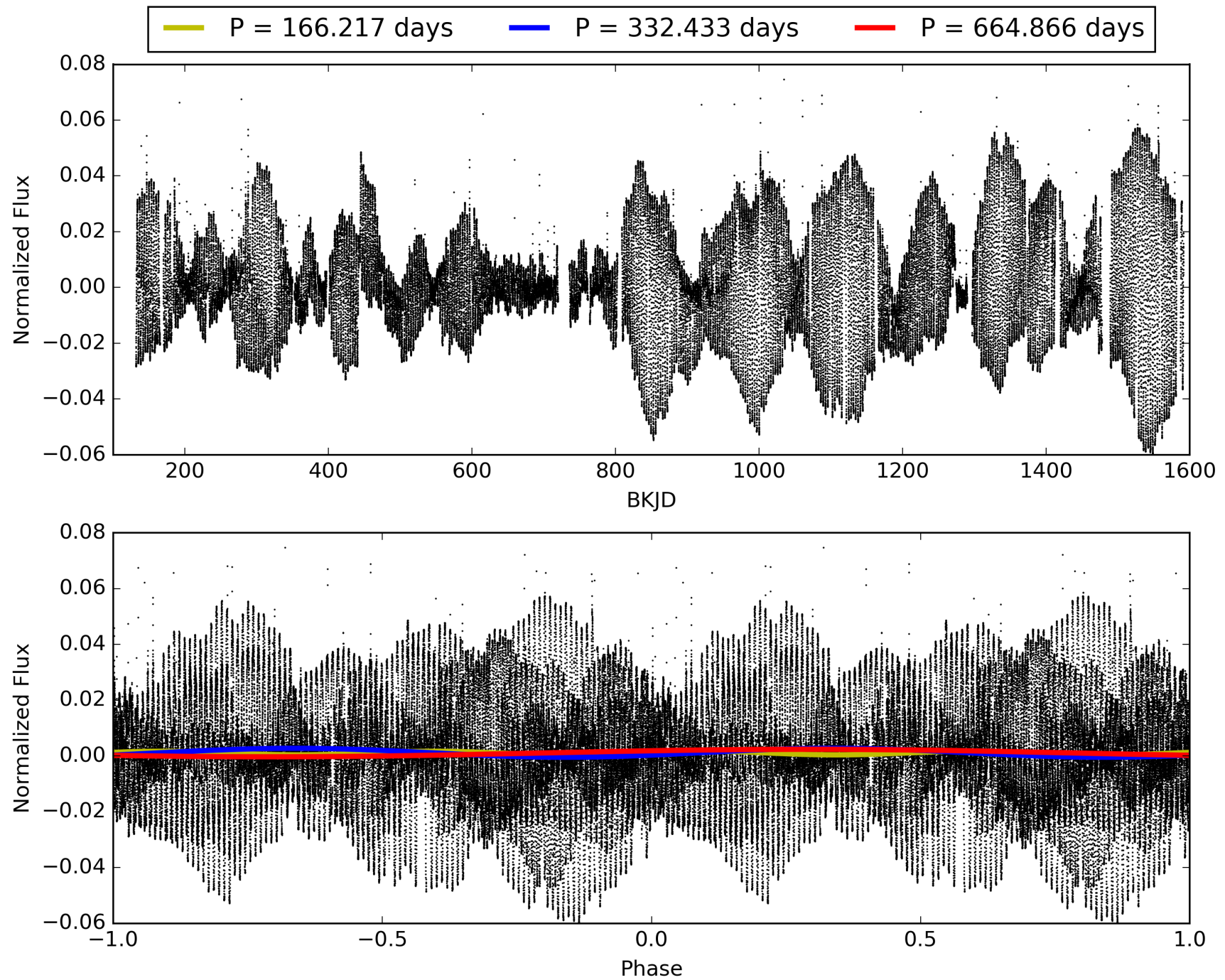
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 02-Feb-2016 00:27:39 Z

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

TCE 004646159-04, PDC Light Curves

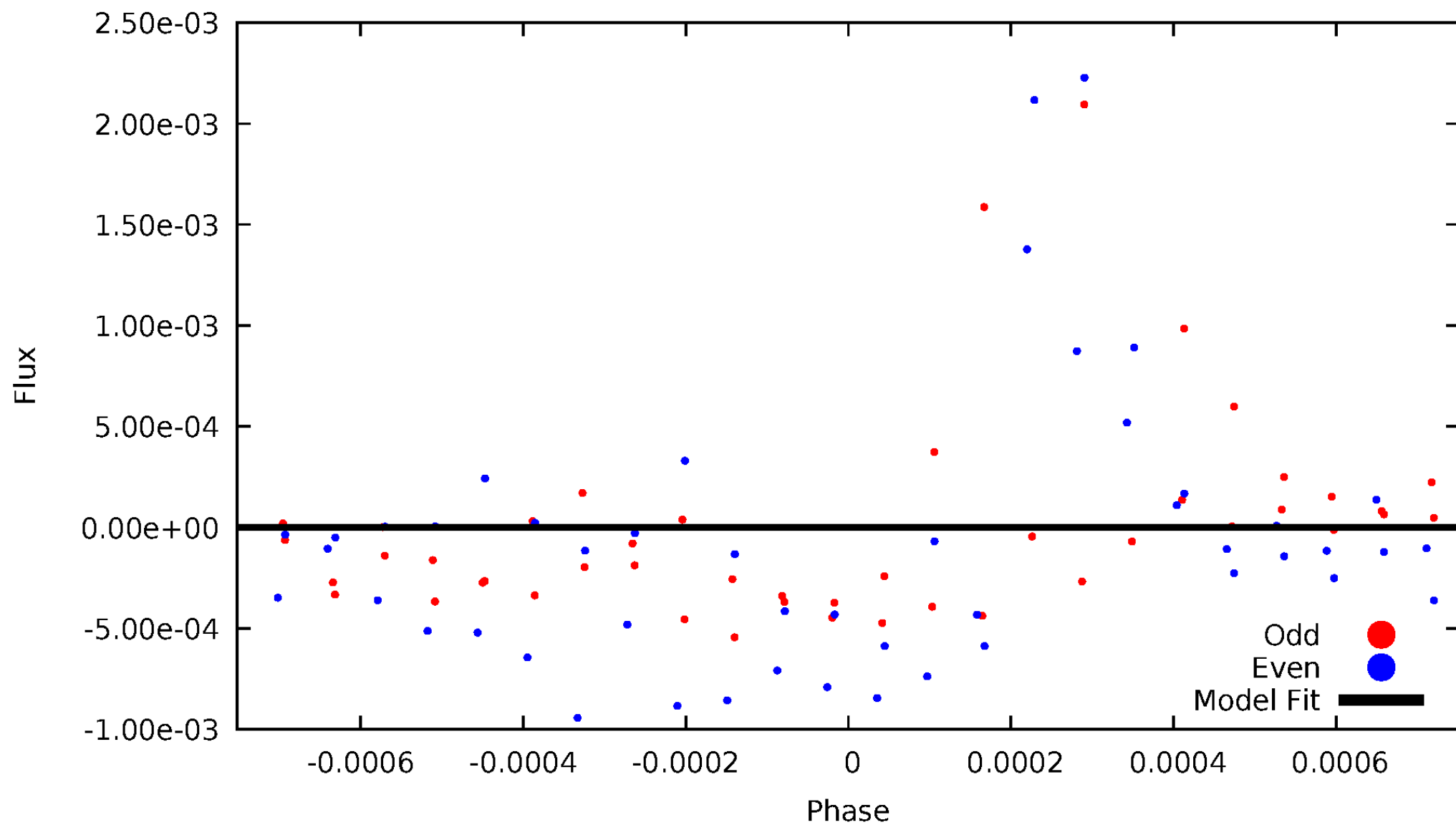


TCE 004646159-04



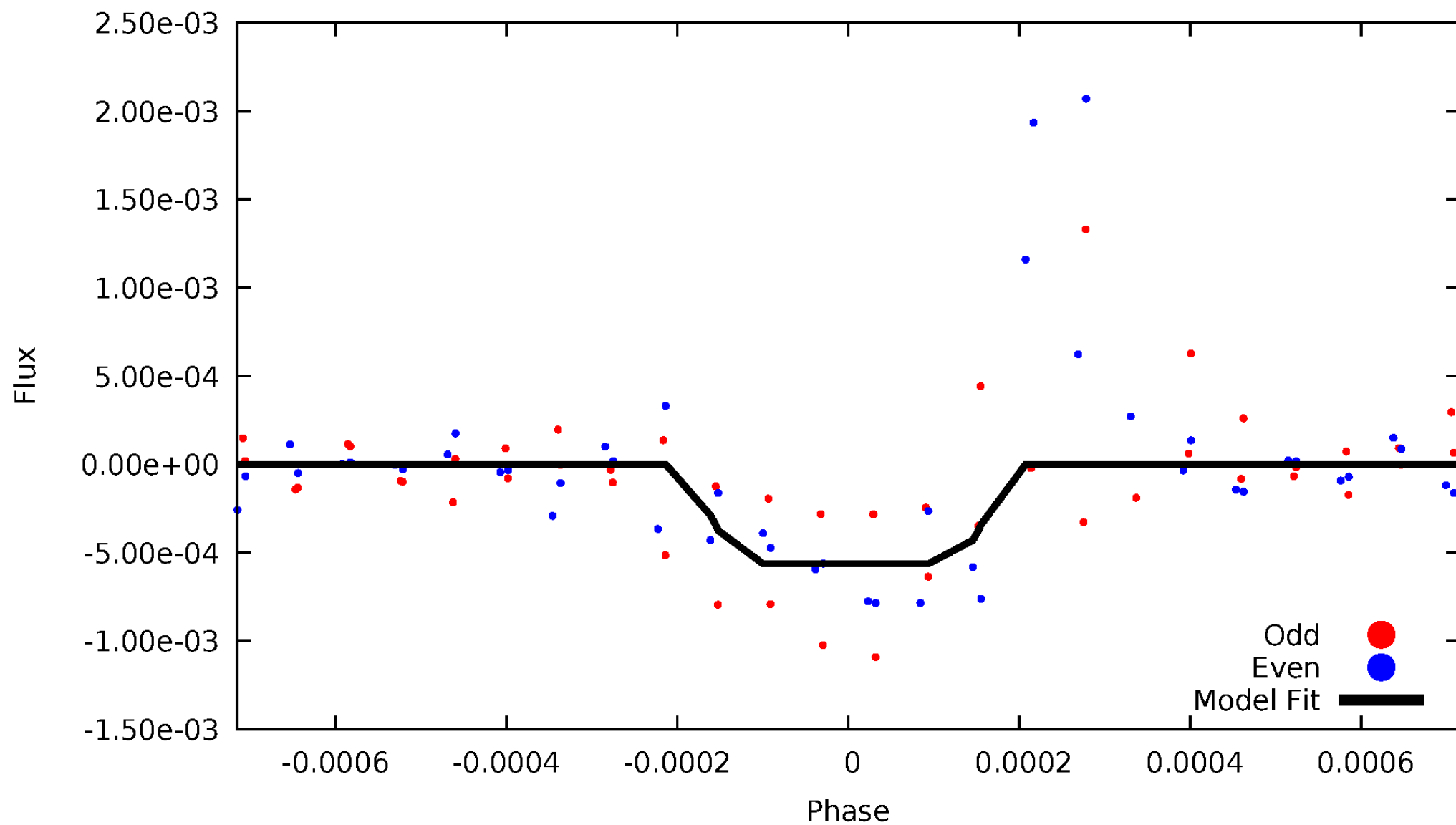
DV Odd/Even

TCE 004646159-04



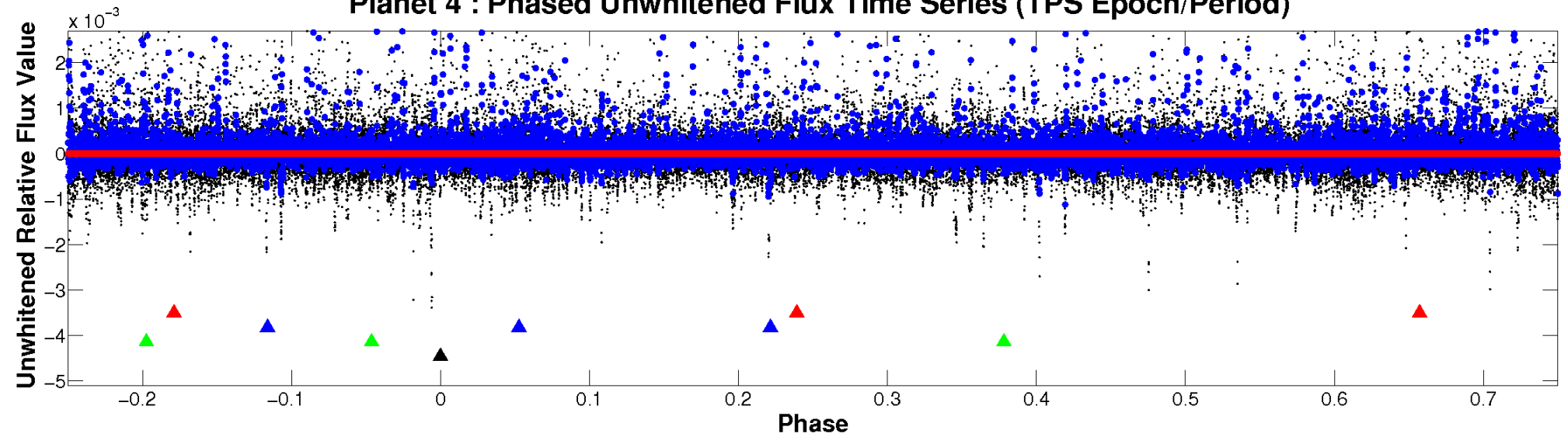
ALT Odd/Even

TCE 004646159-04

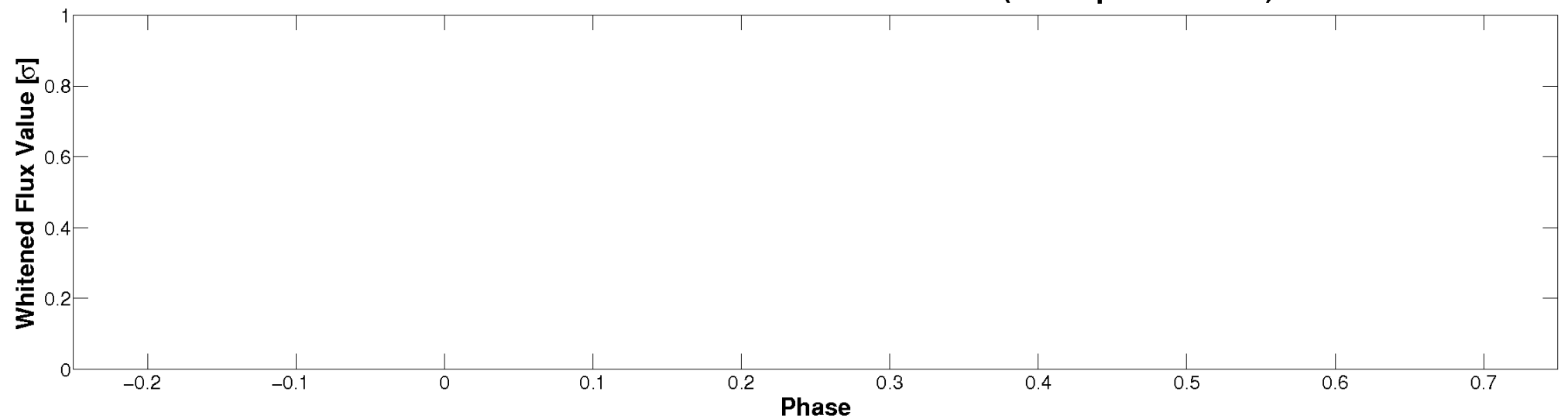


Non-Whitened Vs. Whitened Light Curve

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

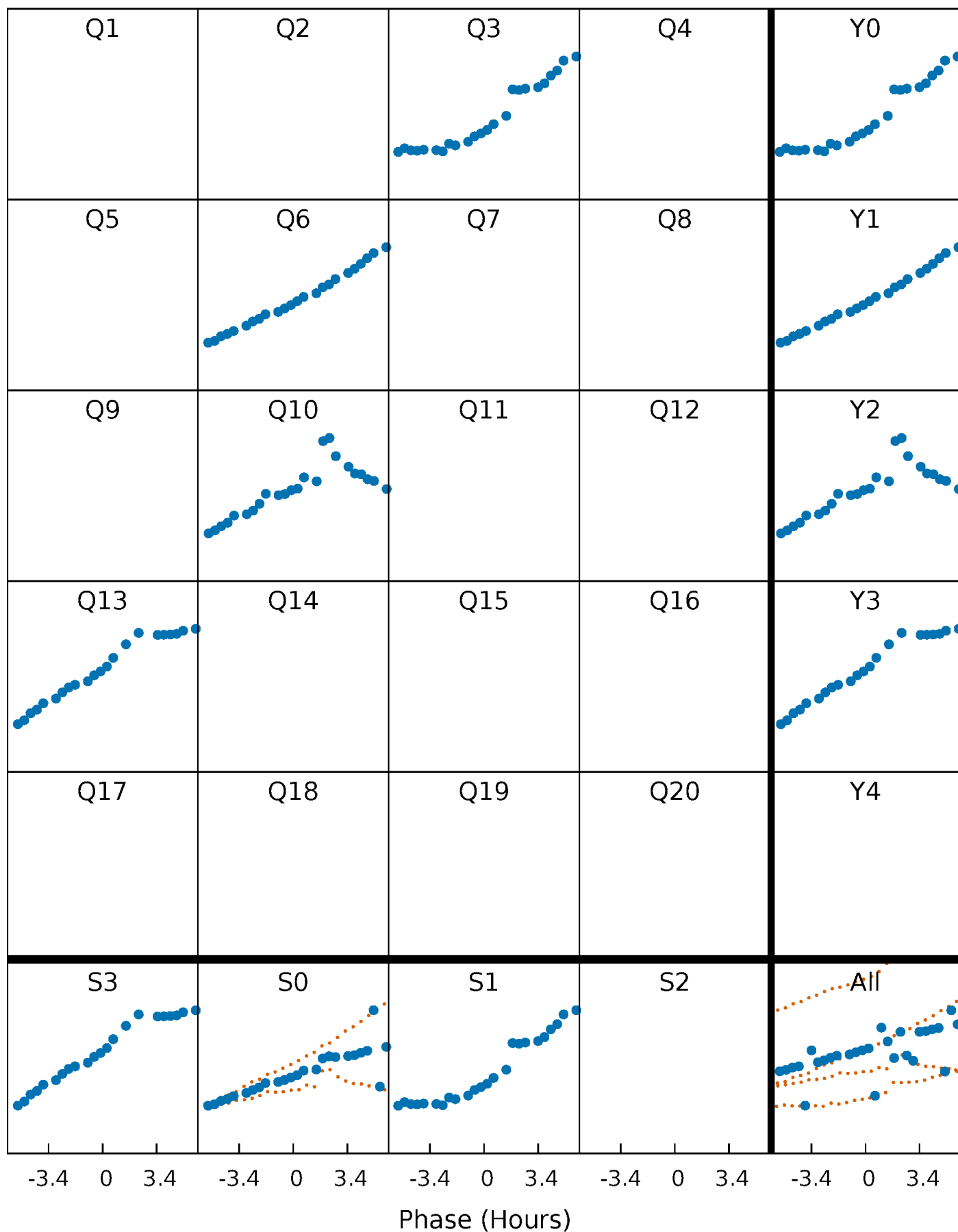


Planet 4 : Phased Whitened Flux Time Series (TPS Epoch/Period)



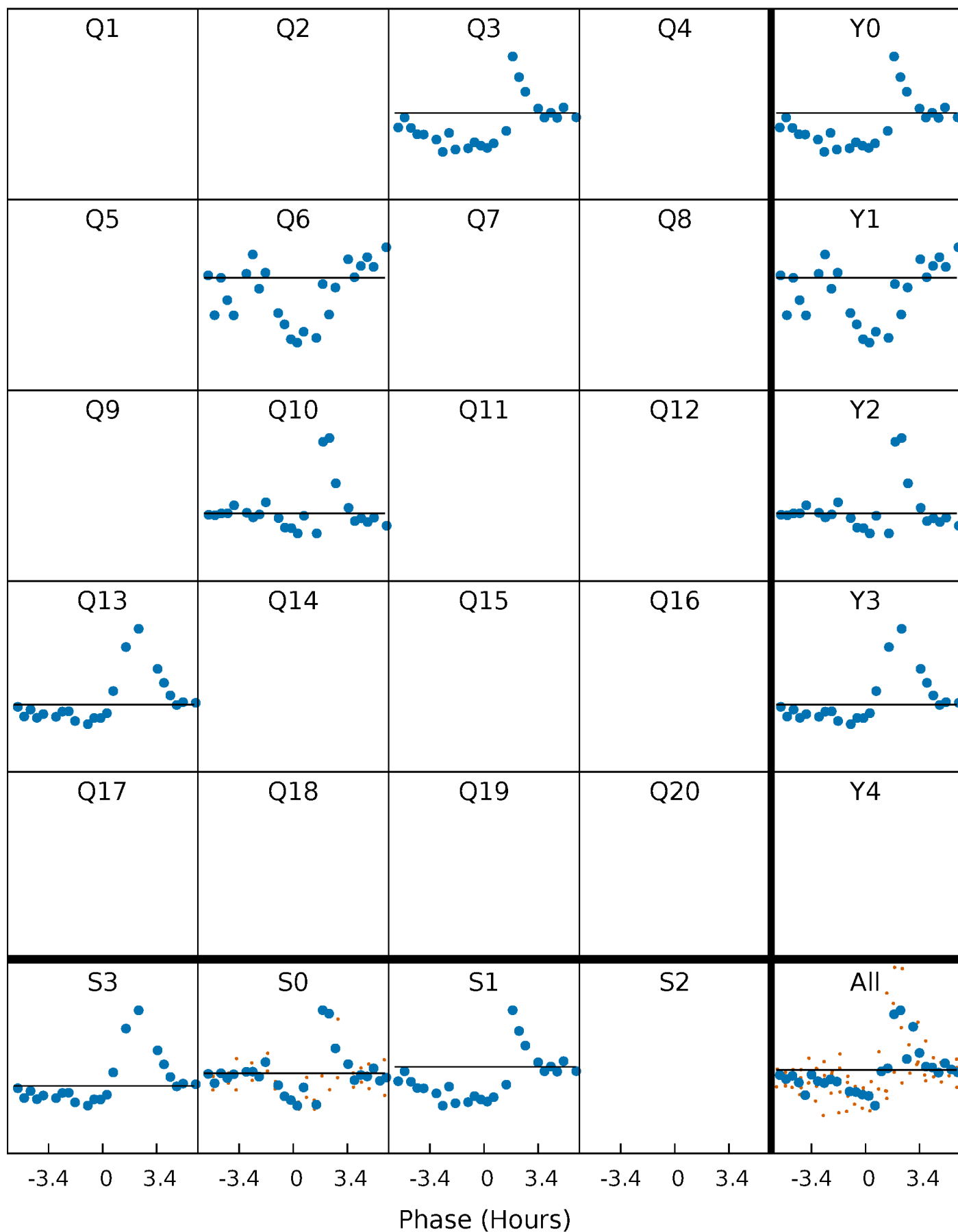
PDC Quarter-Phased Transit Curves

TCE 004646159-04 P=332.433179 Days $T_0=263.175808$ (BKJD)



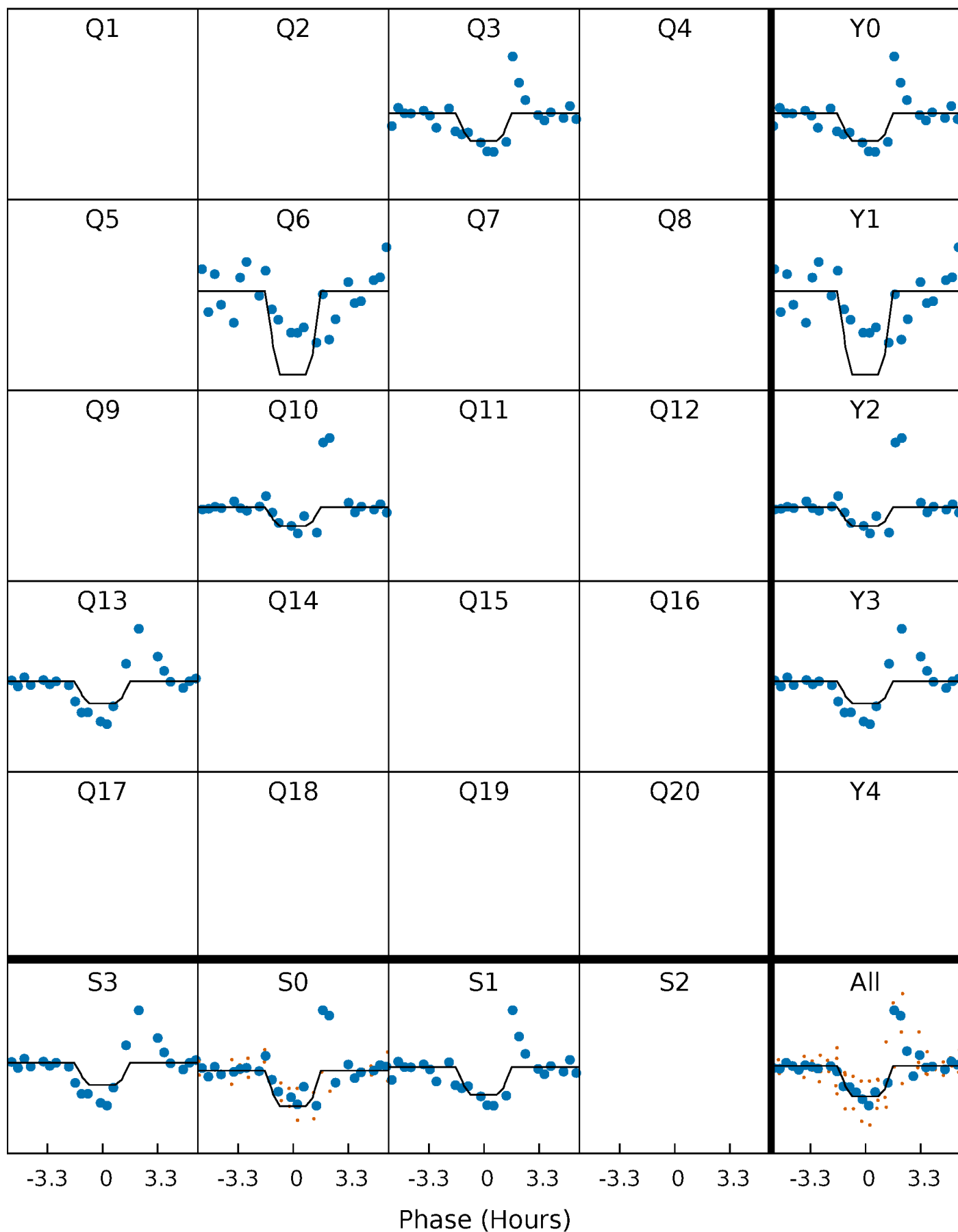
DV Quarter-Phased Transit Curves

TCE 004646159-04 P=332.433179 Days $T_0=263.175808$ (BKJD)



Alt. Detrend Quarter-Phased Transit Curves

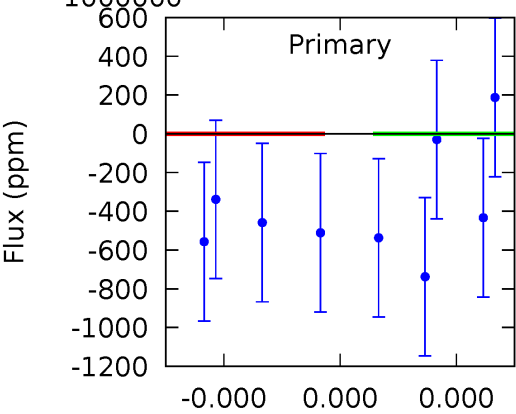
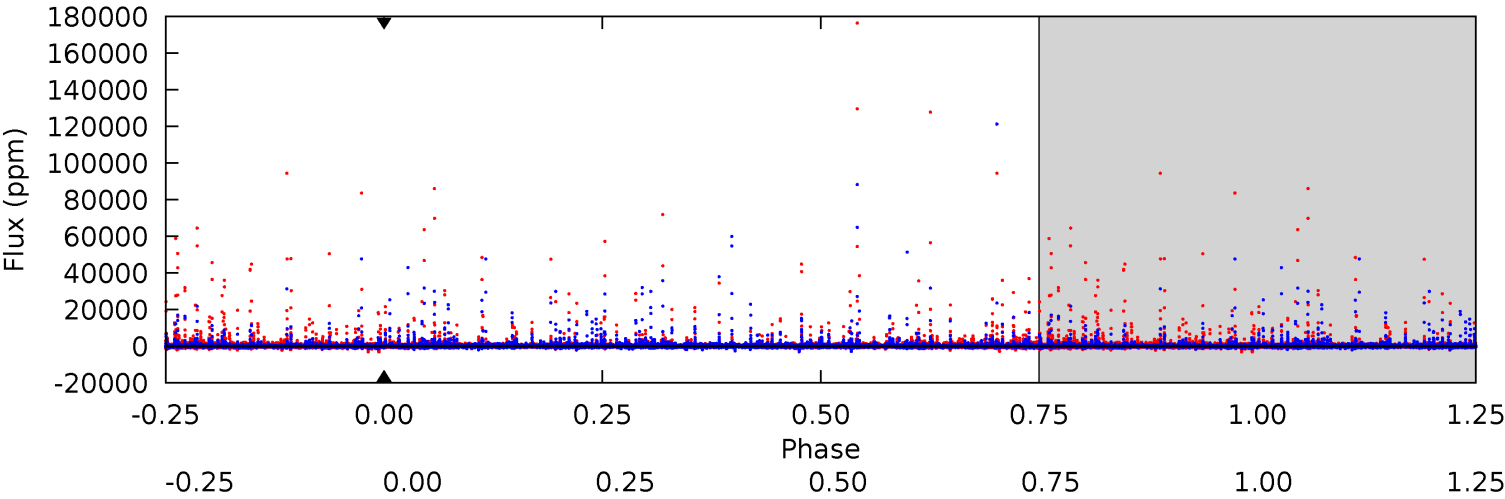
TCE 004646159-04 P=332.433179 Days $T_0=263.179946$ (BKJD)



DV Model-Shift Uniqueness Test

004646159-04, P = 332.433179 Days, E = 263.175808 Days

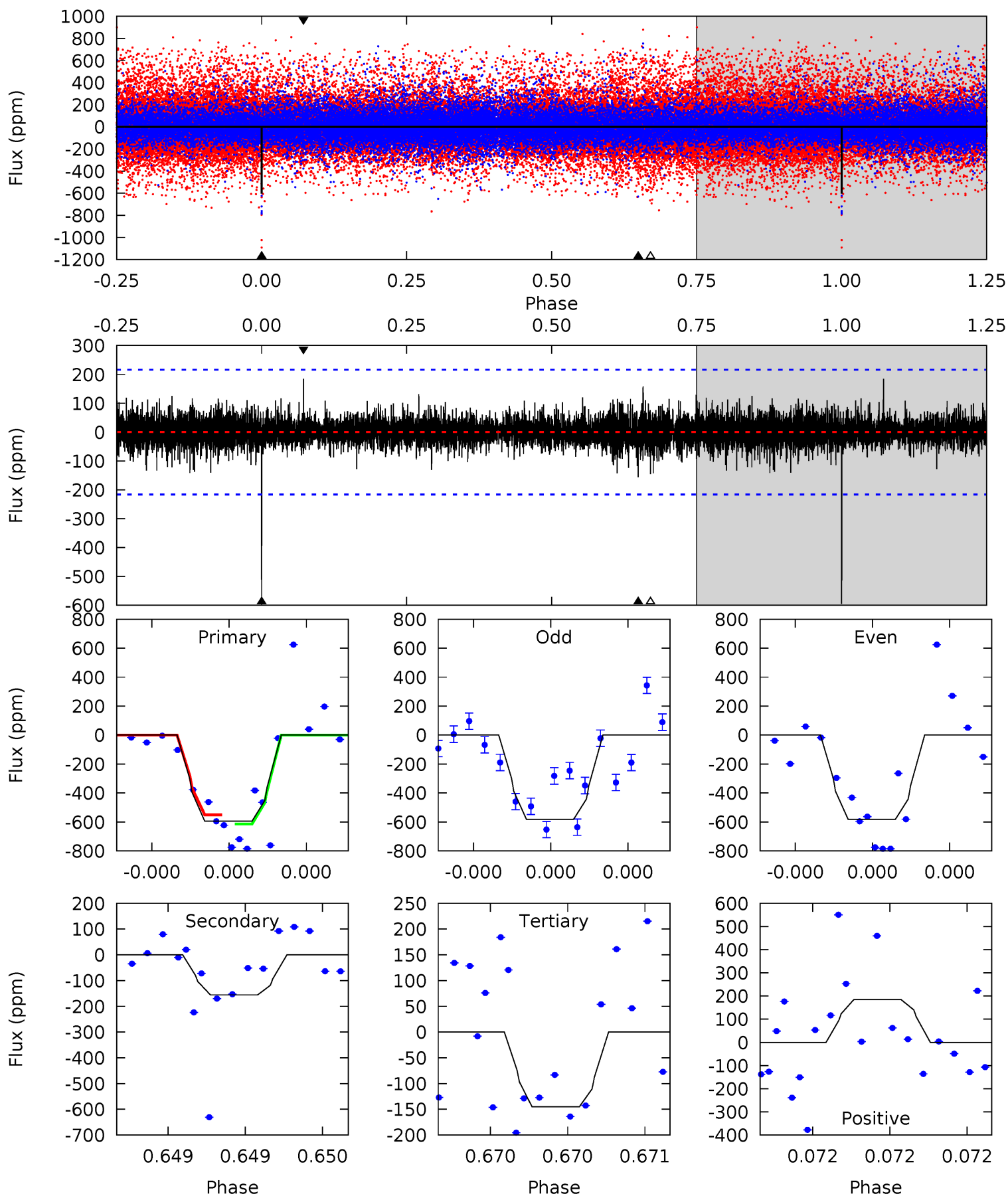
Pri	Sec	Ter	Pos	FA ₁	FA ₂	F _{Red}	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
0	0	0	0	1.00	1.00	1.00	0	0	0	0	0	0	0	0



Alt Model-Shift Uniqueness Test

004646159-04, P = 332.433179 Days, E = 263.179946 Days

Pri	Sec	Ter	Pos	FA ₁	FA ₂	F _{Red}	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
15.6	4.07	3.80	4.83	5.65	3.60	0.86	11.8	10.7	0.27	-0.76	0.01	0.94	0.24	0.84



Stellar Parameters For KIC 004646159

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	R (R_{\odot})	$M(M_{\odot})$	p_{\star} ($\text{g}\cdot\text{cm}^{-3}$)
	5229^{+157}_{-141}	$3.603^{+0.893}_{-0.298}$	$-0.320^{+0.300}_{-0.250}$	$2.842^{+1.084}_{-2.013}$	$1.181^{+0.177}_{-0.329}$	$0.072^{+2.238}_{-0.043}$
	+3%/-3%	+25%/-8%	+94%/-78%	+38%/-71%	+15%/-28%	+3089%/-59%
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 004646159-04 / KOI

Detrend	Depth (ppm)	R_p (R_{\oplus})	T_{max} (K)	T_{obs} (K)	A_{obs}
DV	0 ± 1000000	$21.51^{+24.68}_{-15.48}$	539^{+70}_{-106}	-4394^{+21423}_{-10036}	$-1915.454^{+231545.051}_{-203347.872}$
Alt.	-156 ± 38	$22.34^{+24.19}_{-15.47}$	540^{+66}_{-111}	2770^{+1182}_{-433}	158^{+1559}_{-123}

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

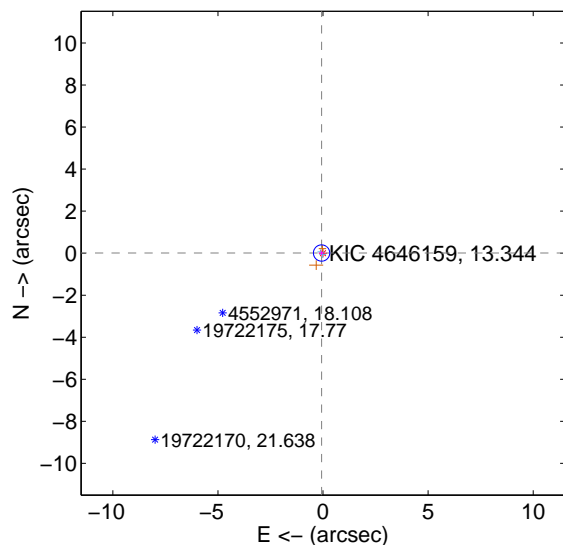
Supplemental centroid analysis for 004646159-04. Kepler magnitude: 13.34. Transit SNR -1.00

There are 2 quarters with good PRF difference image offsets

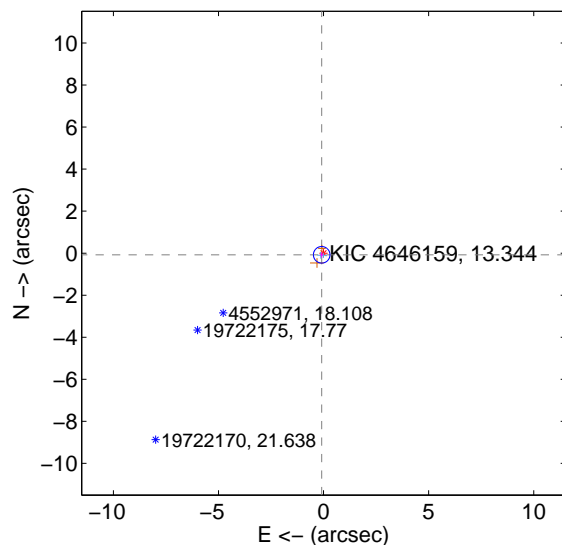
The direct PRF centroid is offset from the target star catalog position by about 0.11 arcsec

	Distance in arcsec	Distance / σ	Δ RA	Δ Dec
PRF-fit source offset from OOT	0.070 ± 0.129	0.54	0.070 ± 0.129	0.007 ± 0.110
PRF-fit source offset from KIC position	0.118 ± 0.131	0.90	0.090 ± 0.095	-0.077 ± 0.131
photometric centroid source offset	2.97 ± 2.21	1.34	1.68 ± 0.99	-2.45 ± 2.59

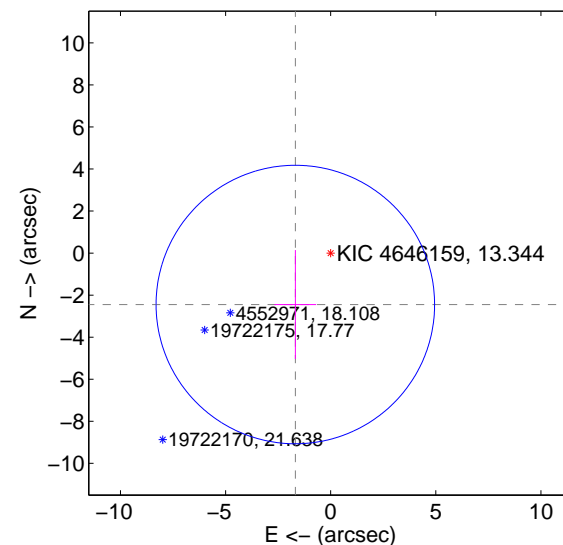
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position

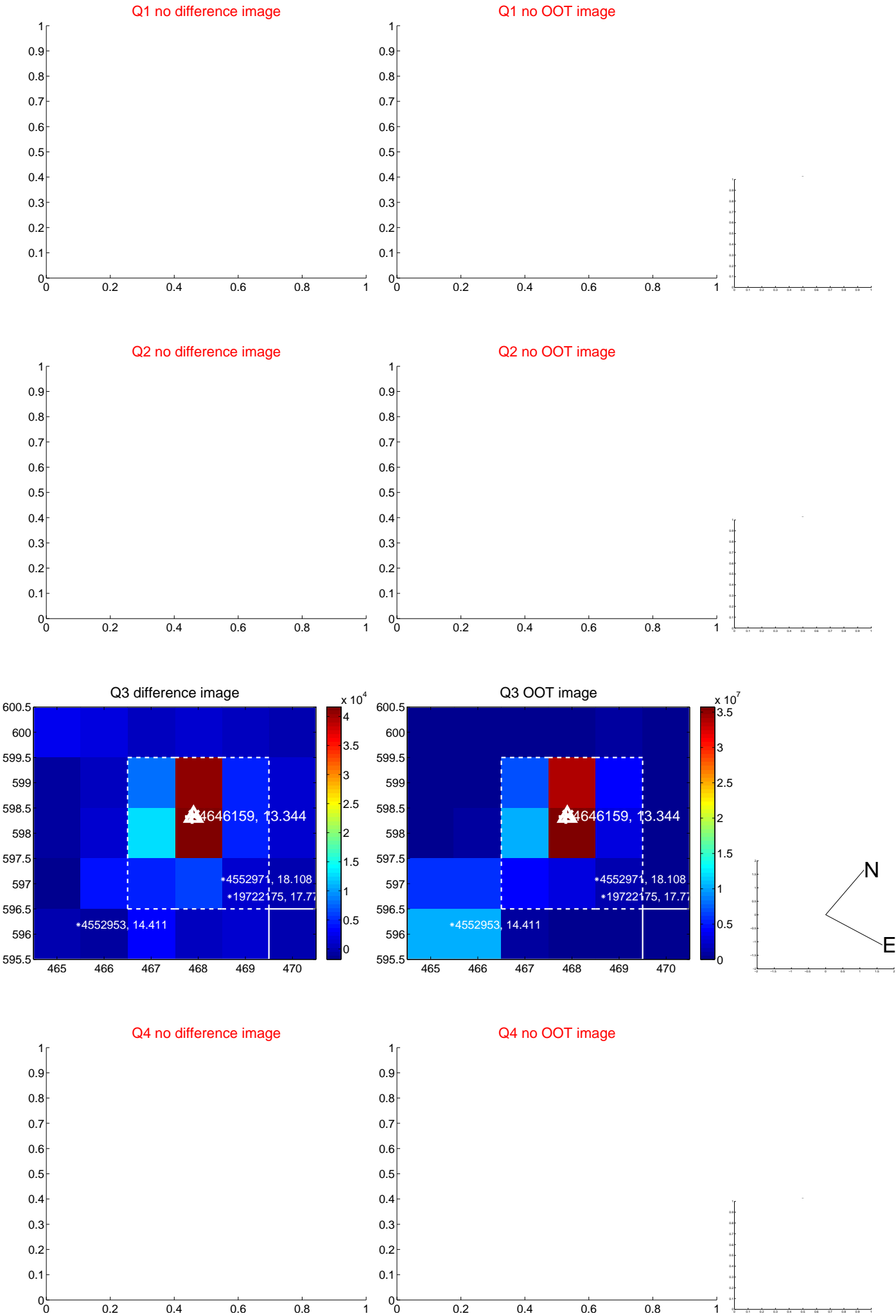


offset from photometric centroids

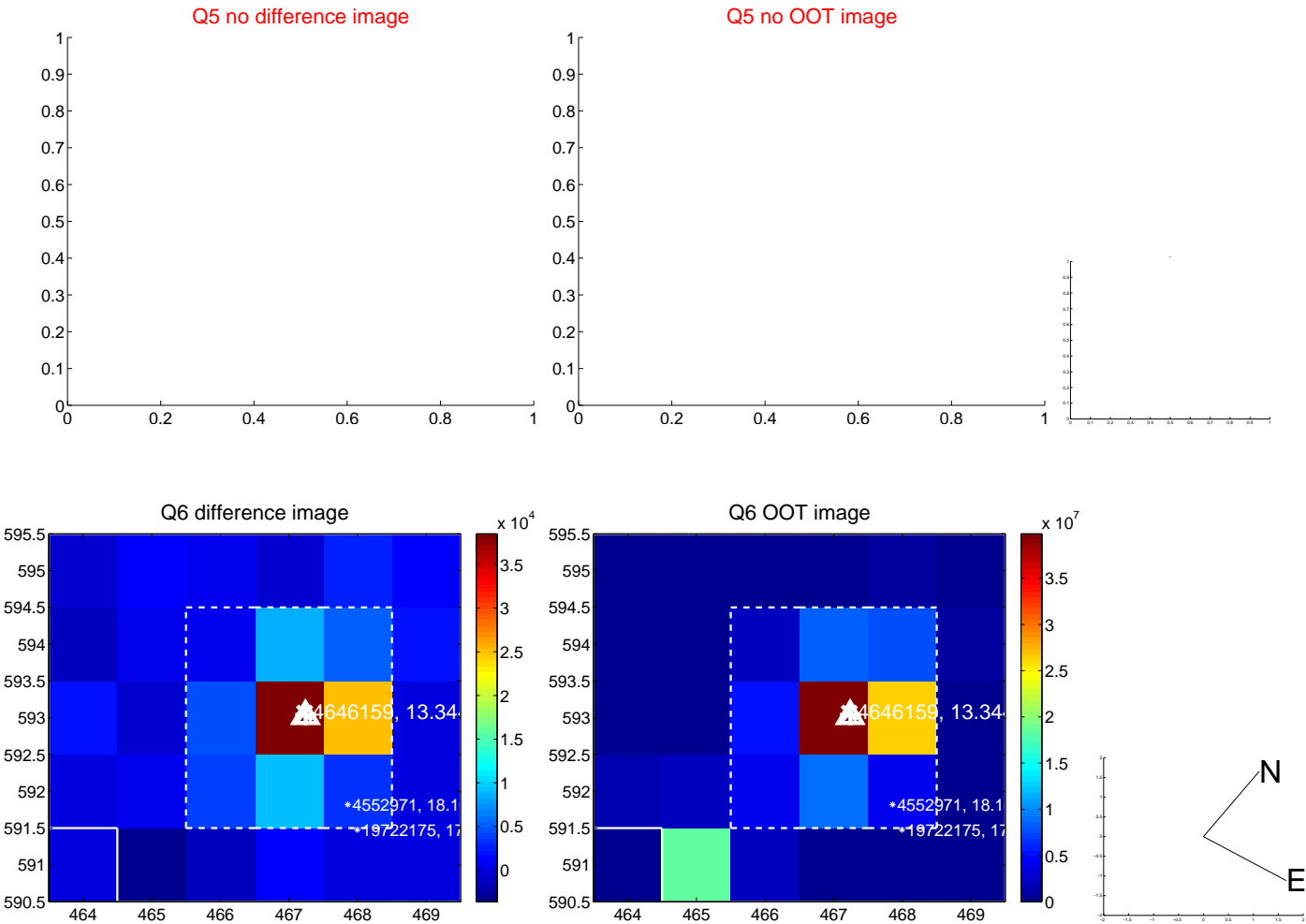


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- σ uncertainty. Blue circle: three- σ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

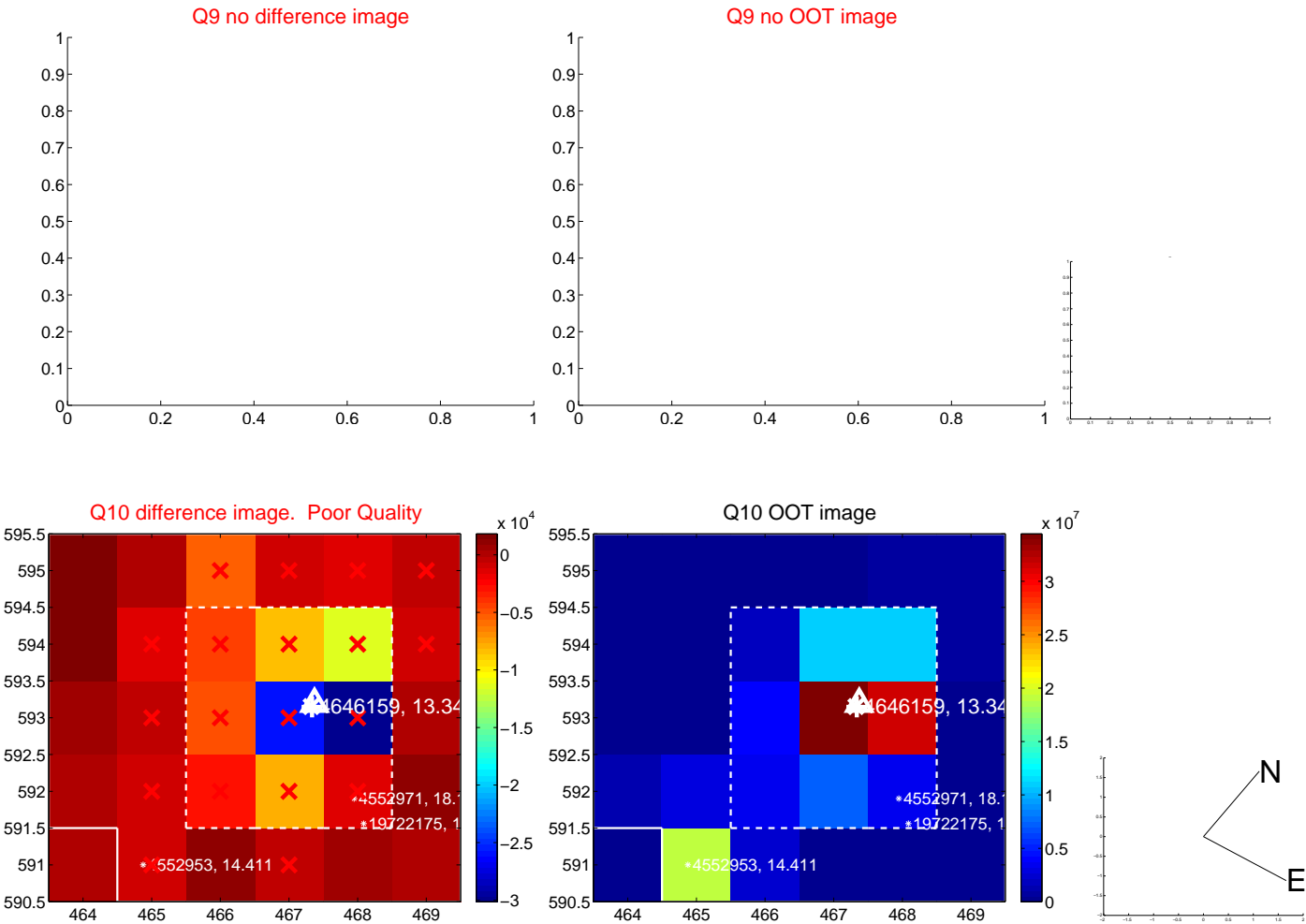
white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



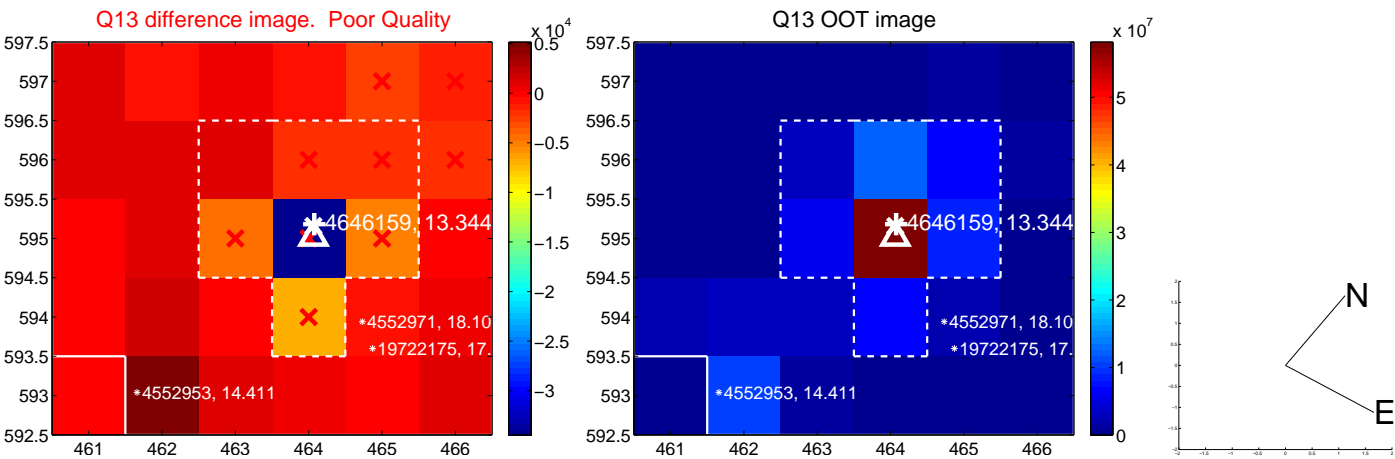
white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



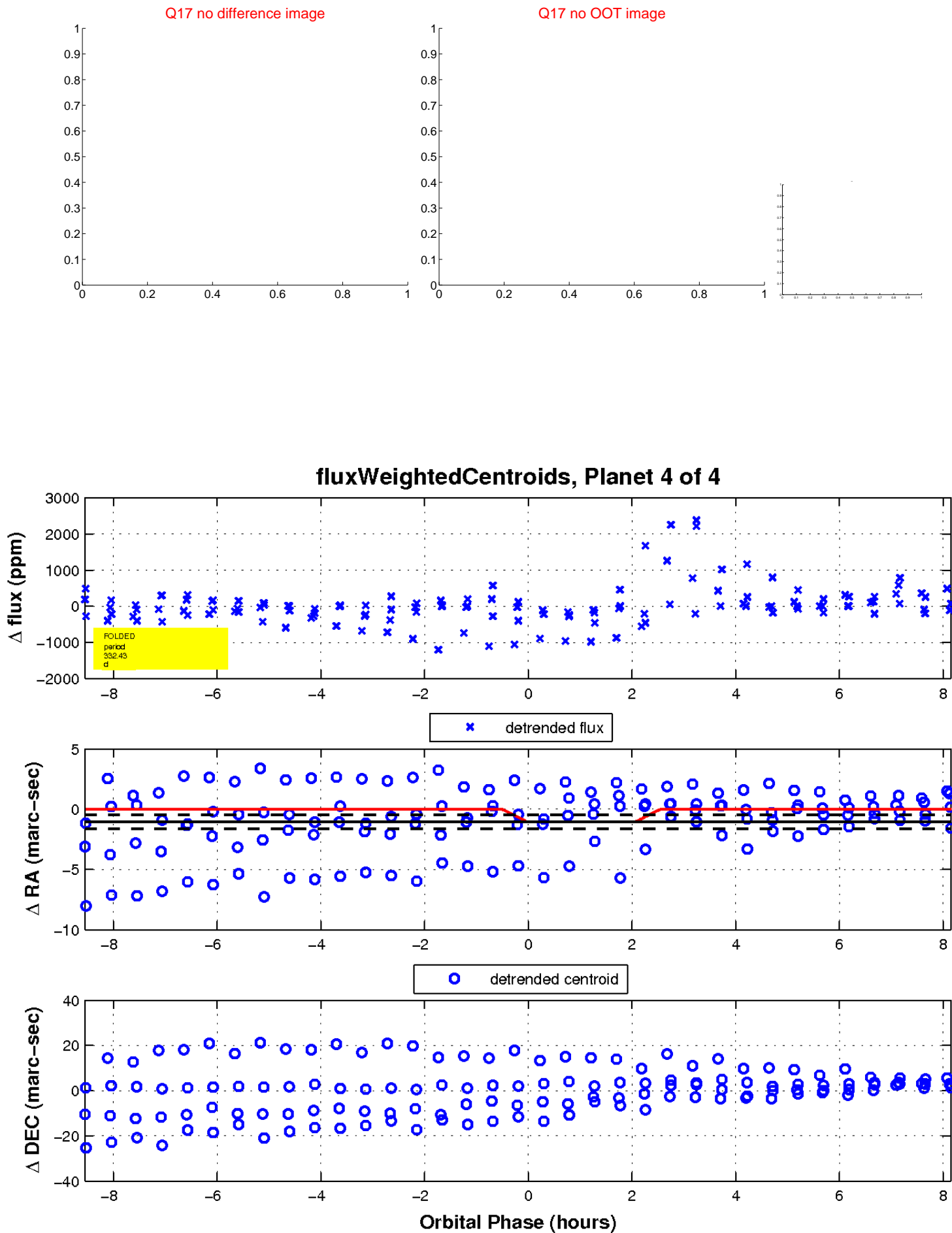
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



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

