

KIC 008160546

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})
008160546-01	OBS	No	613.544695	172.985535	596.8	4.462	13.8	6.5	0.74	5532	1.81	0.27
008160546-02	OBS	No	638.719894	262.723530	960.2	6.470	10.3	7.5	0.74	5532	2.44	0.25
008160546-03	OBS	No	538.182767	389.545410	489.6	4.173	11.4	5.1	0.74	5532	1.68	0.32
008160546-04	OBS	No	258.880202	374.328424	357.3	3.751	11.2	5.2	0.74	5532	1.62	0.84

Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
008160546-01	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—CENT_FEW_DIFFS
008160546-02	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
008160546-03	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—CENT_FEW_DIFFS
008160546-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL_SKYE—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS

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

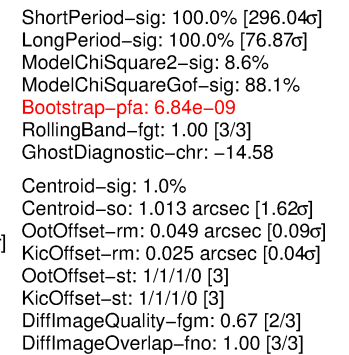
N = Not Transit-Like. S = Stellar Eclipse. C = Centroid Offset. E = Ephemeris Match.

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

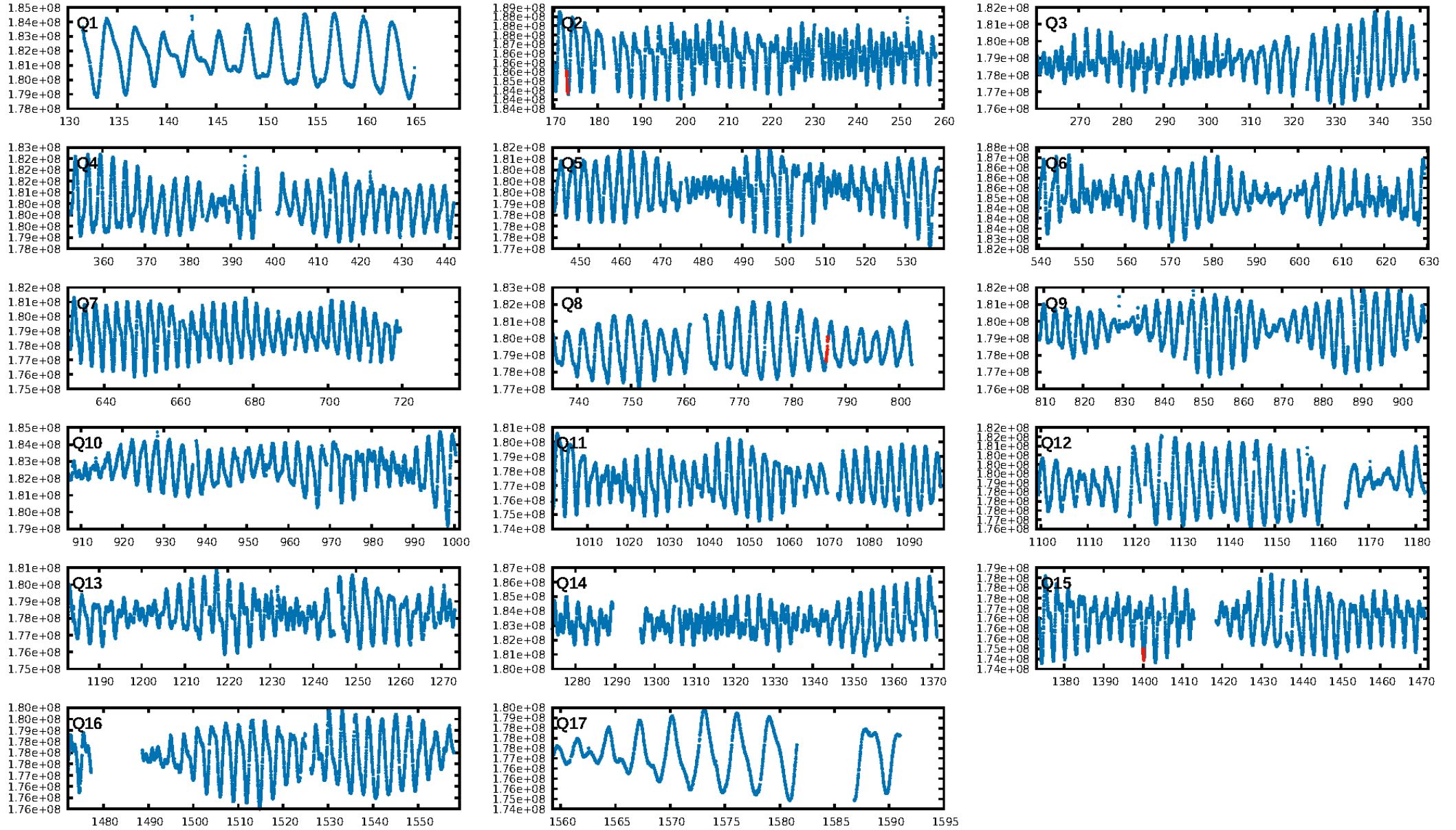
Ephemeris Match Information For 008160546-01

No Significant Match Found

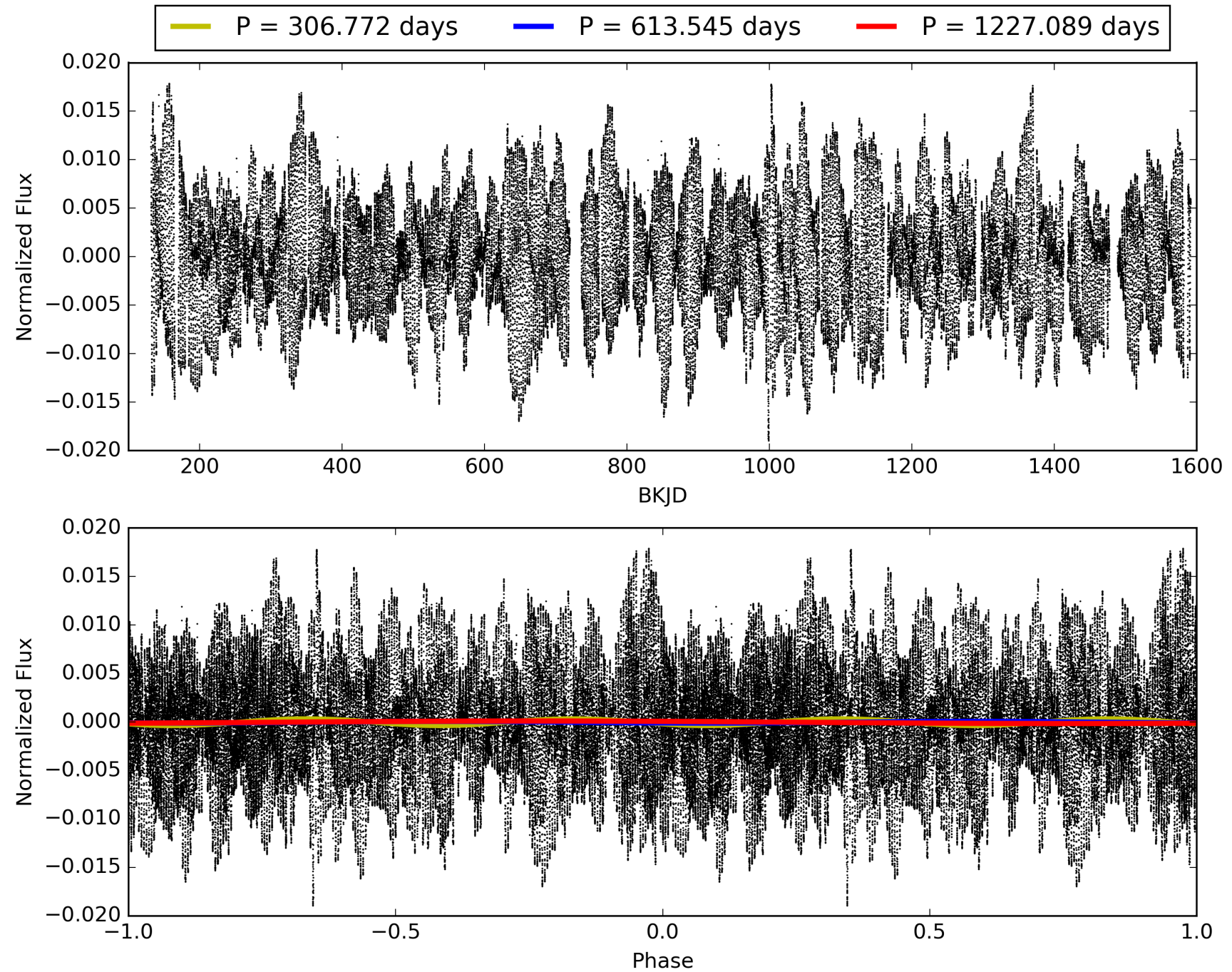
KIC: 8160546 Candidate: 1 of 4 Period: 613.545 d



TCE 008160546-01, PDC Light Curves

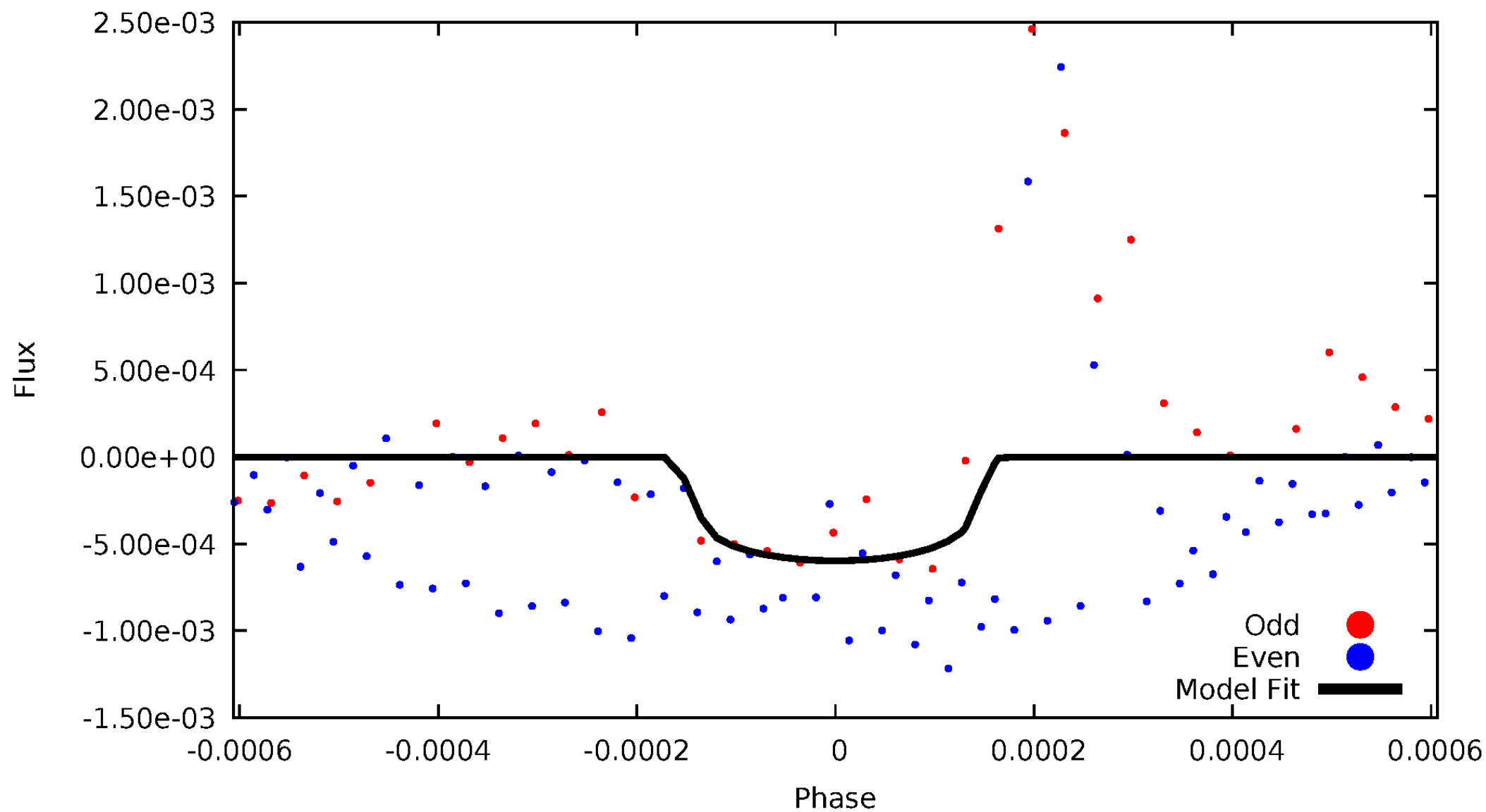


TCE 008160546-01



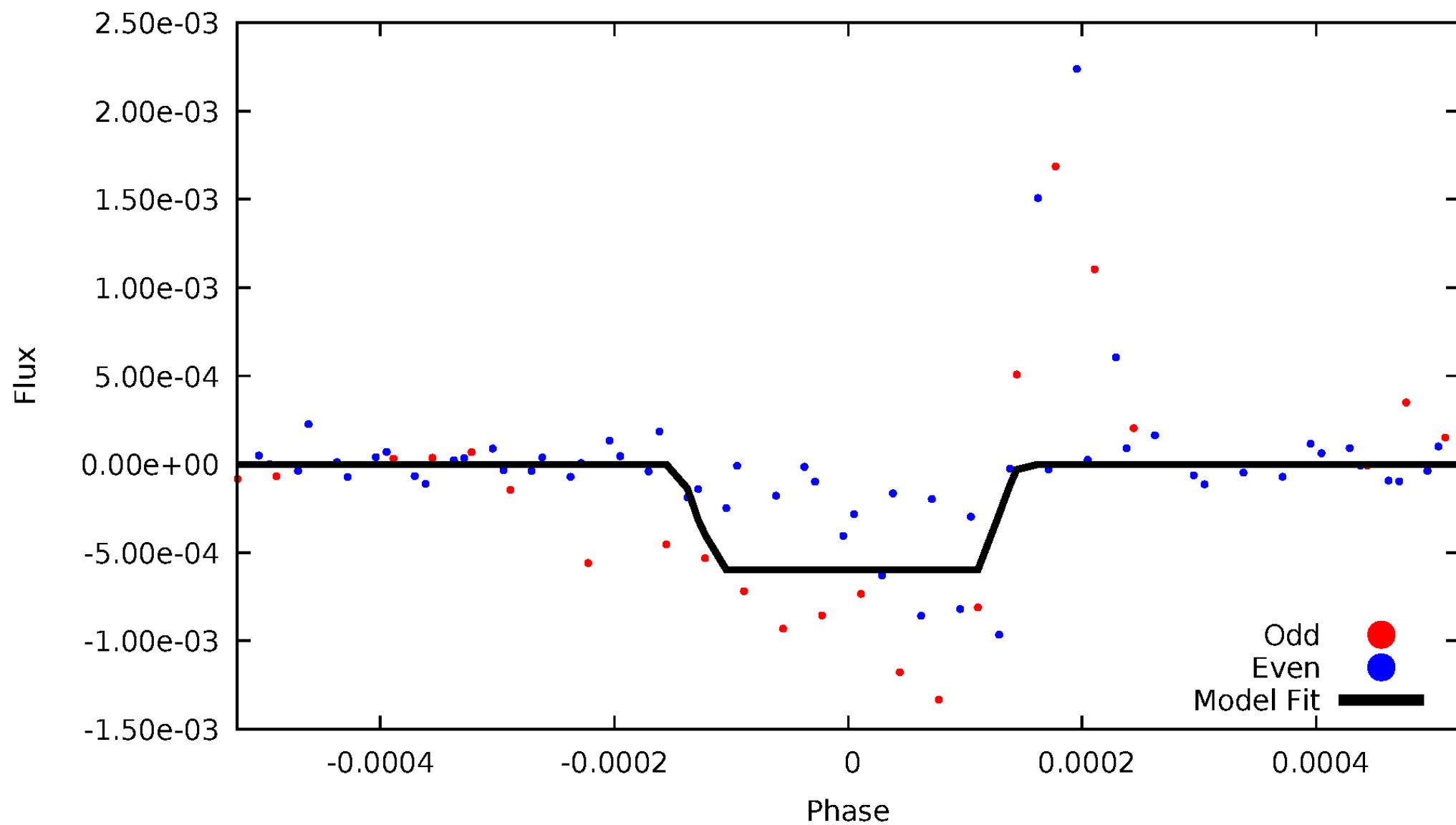
DV Odd/Even

TCE 008160546-01



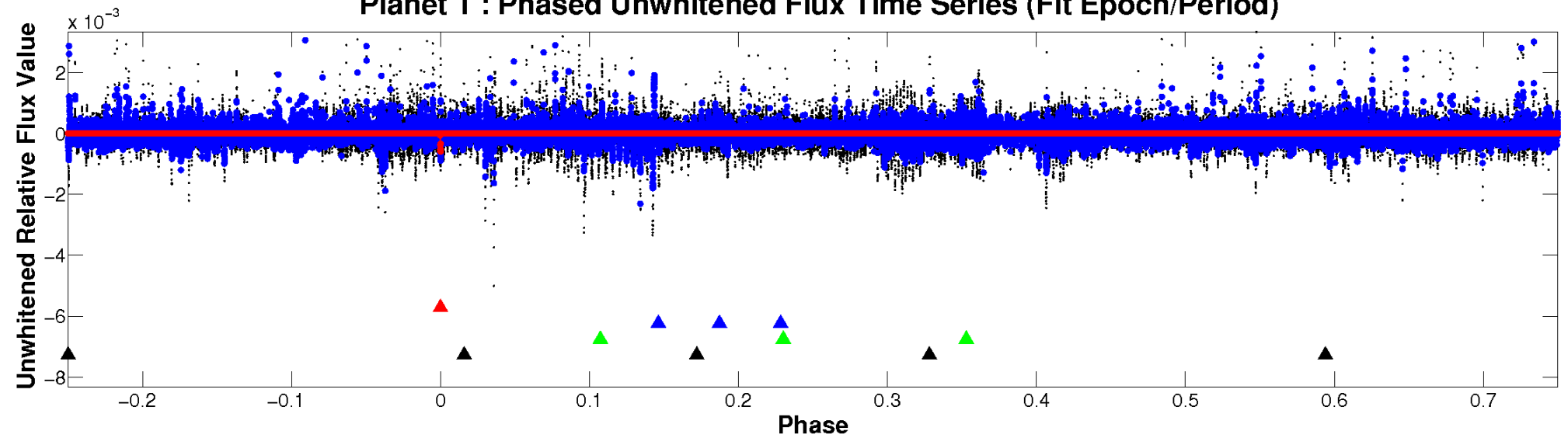
ALT Odd/Even

TCE 008160546-01

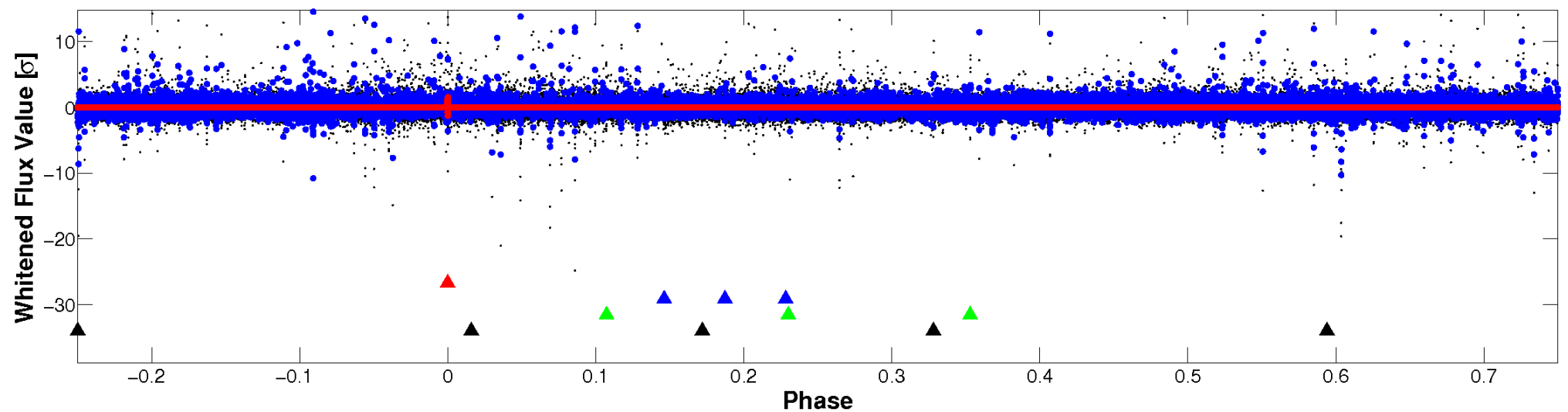


Non-Whitened Vs. Whitened Light Curve

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

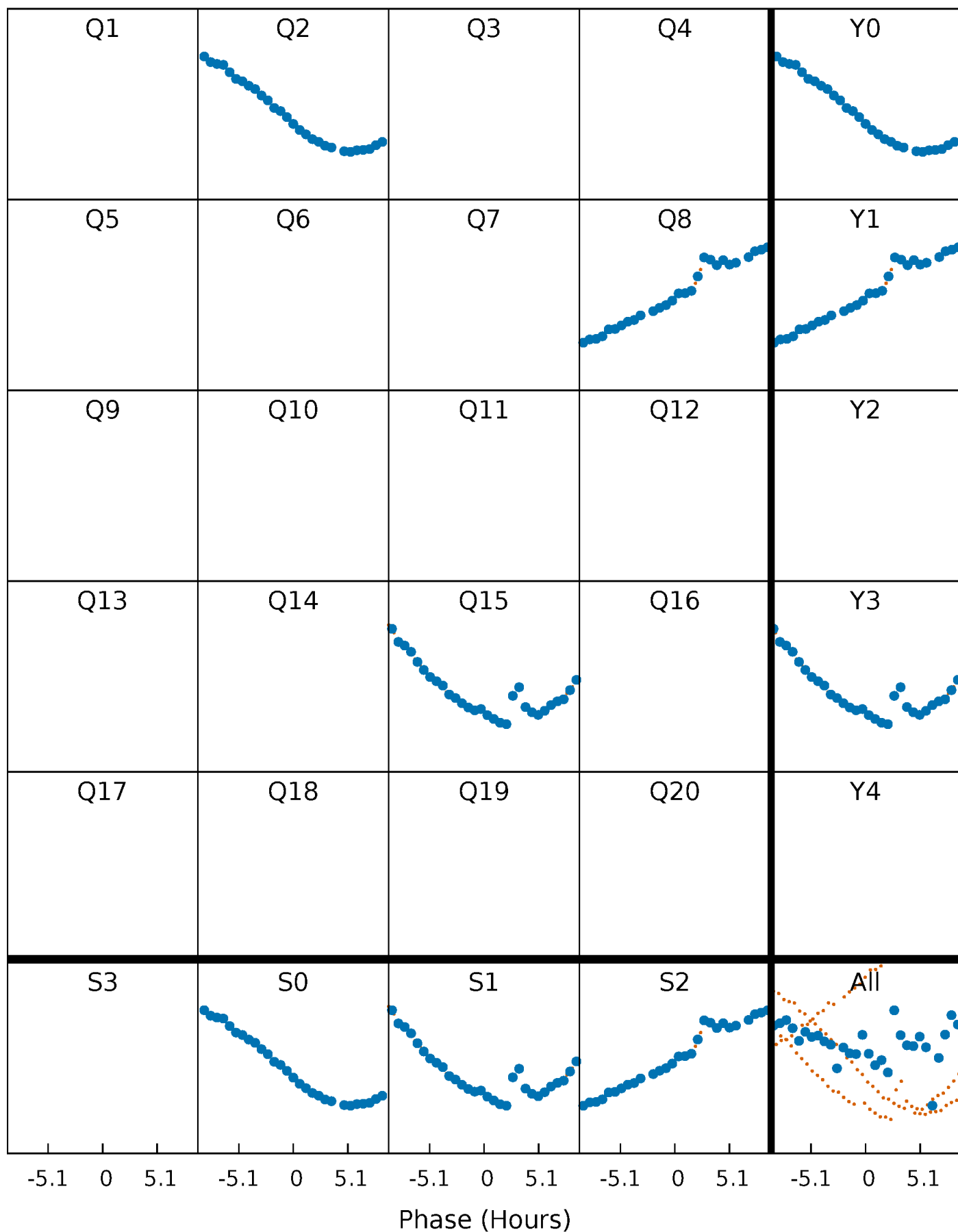


Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)



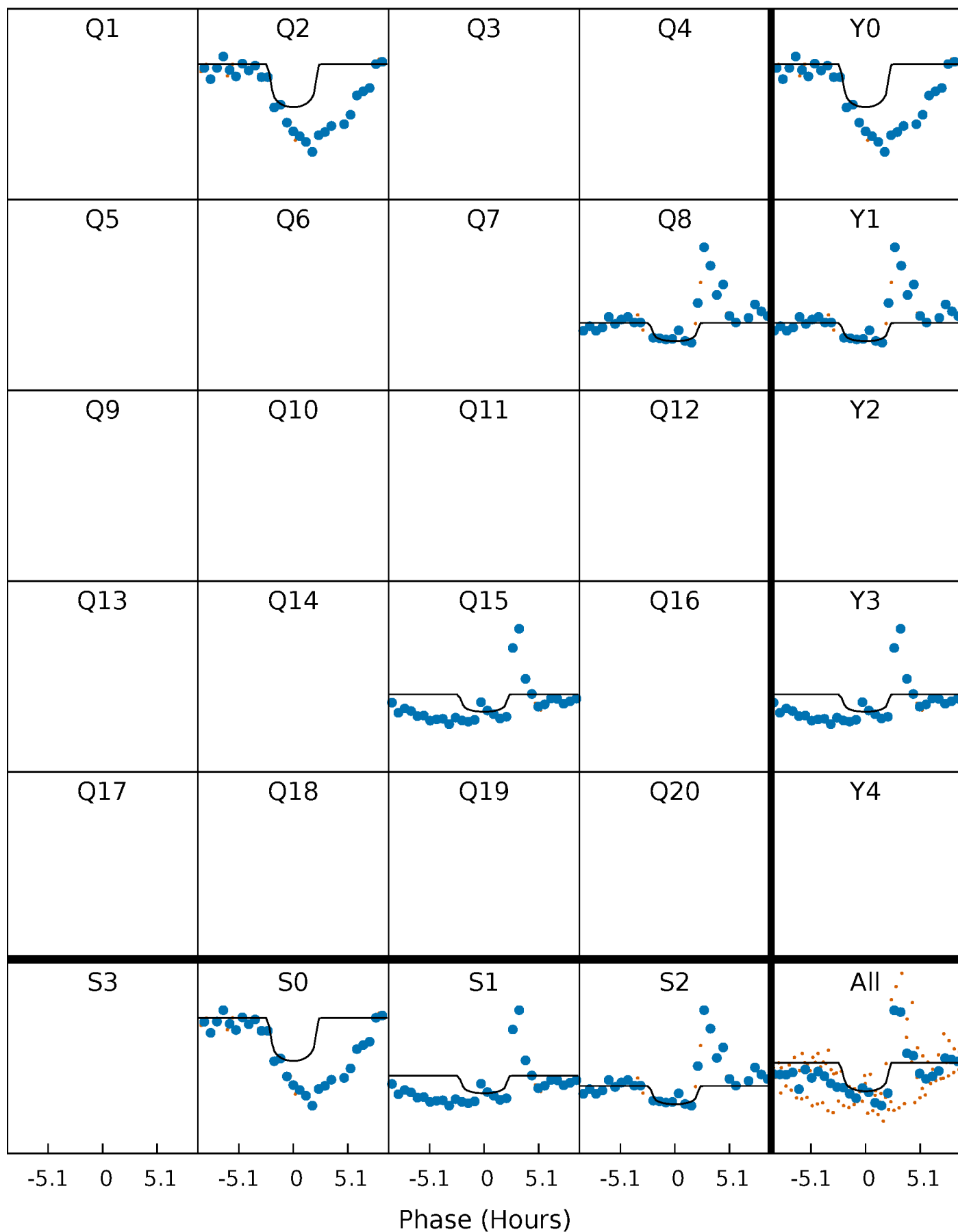
PDC Quarter-Phased Transit Curves

TCE 008160546-01 P=613.544695 Days $T_0=172.985535$ (BKJD)



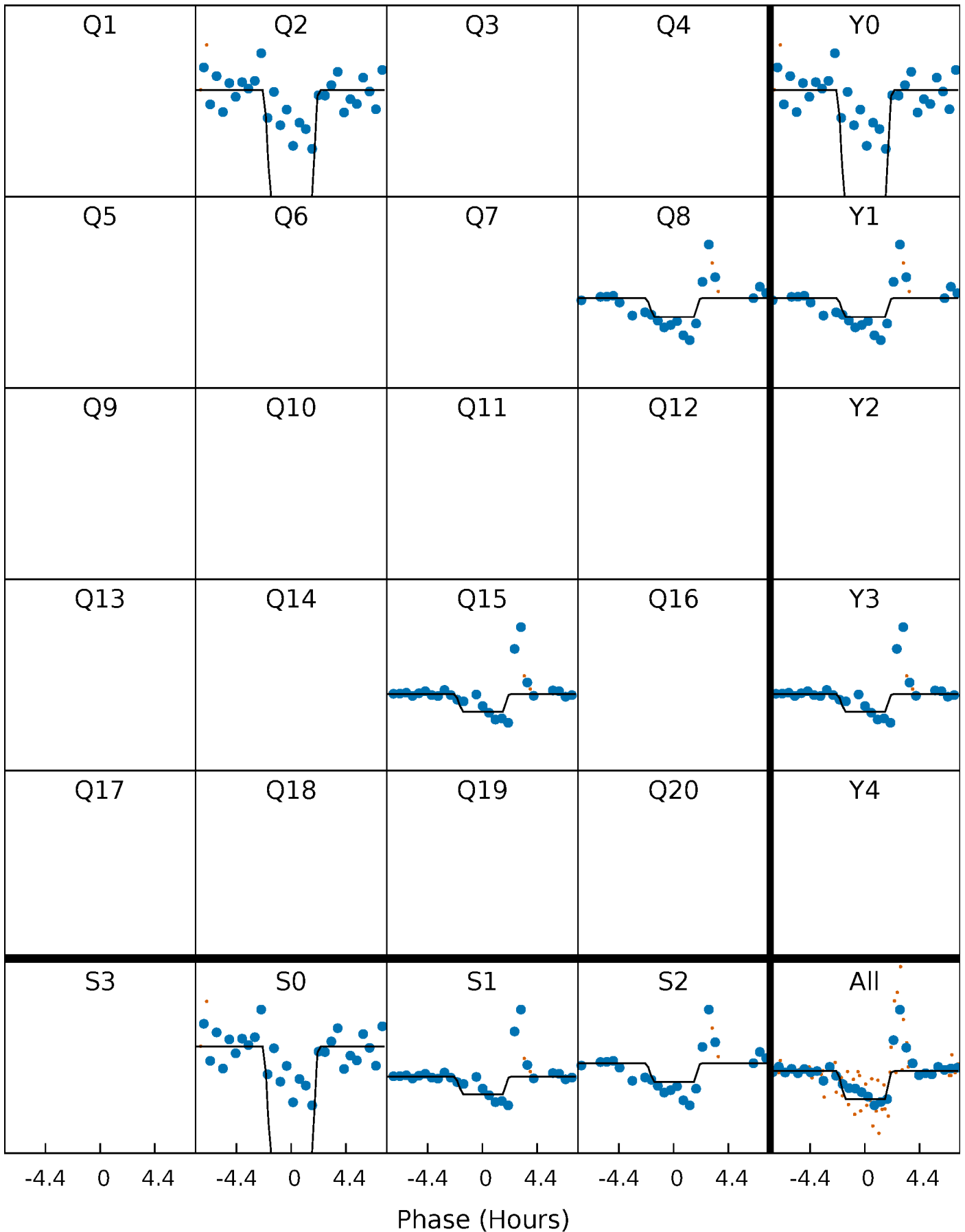
DV Quarter-Phased Transit Curves

TCE 008160546-01 P=613.544695 Days $T_0=172.985535$ (BKJD)



Alt. Detrend Quarter-Phased Transit Curves

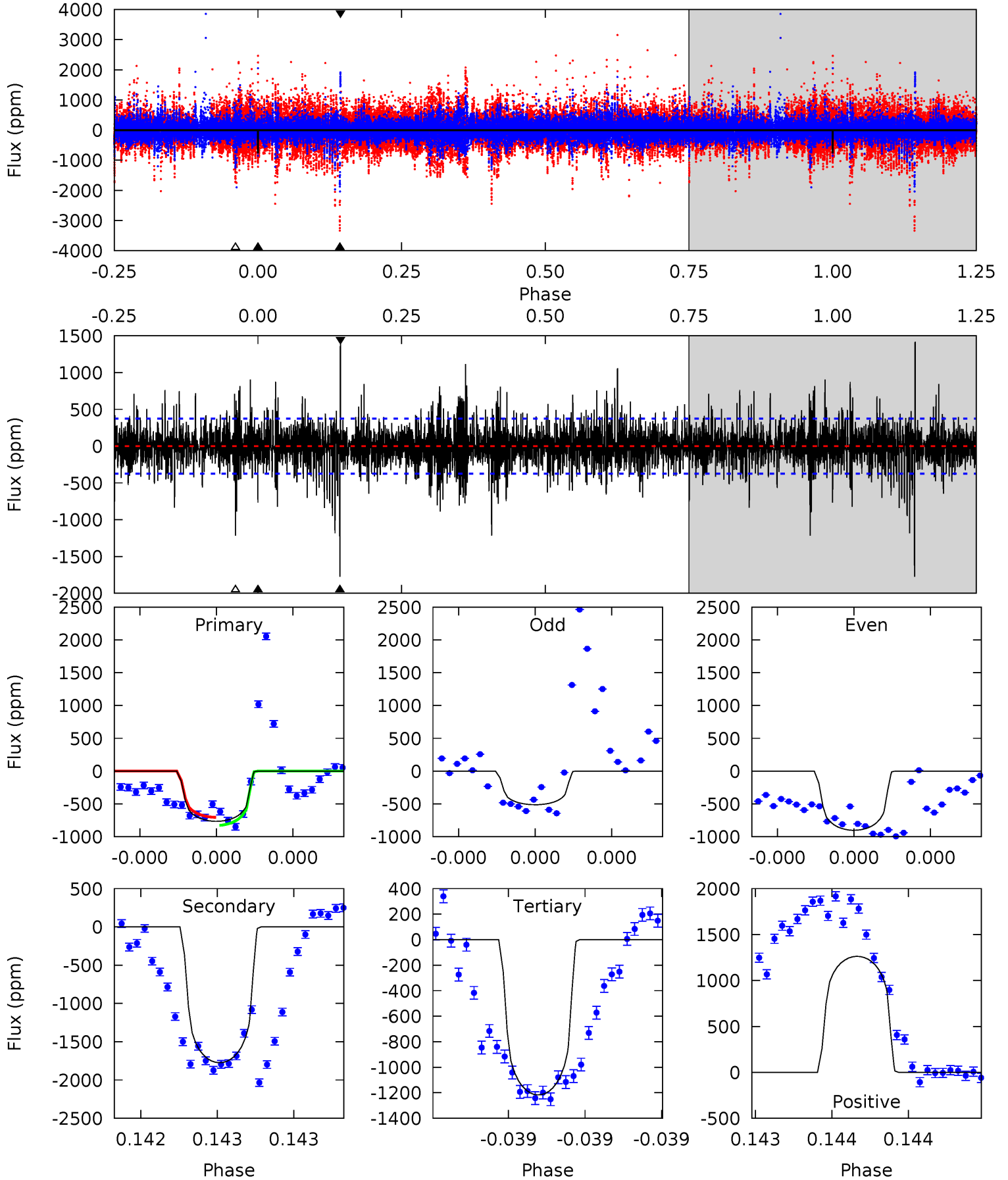
TCE 008160546-01 P=613.551695 Days $T_0=172.991013$ (BKJD)



DV Model-Shift Uniqueness Test

008160546-01, P = 613.544695 Days, E = 172.985535 Days

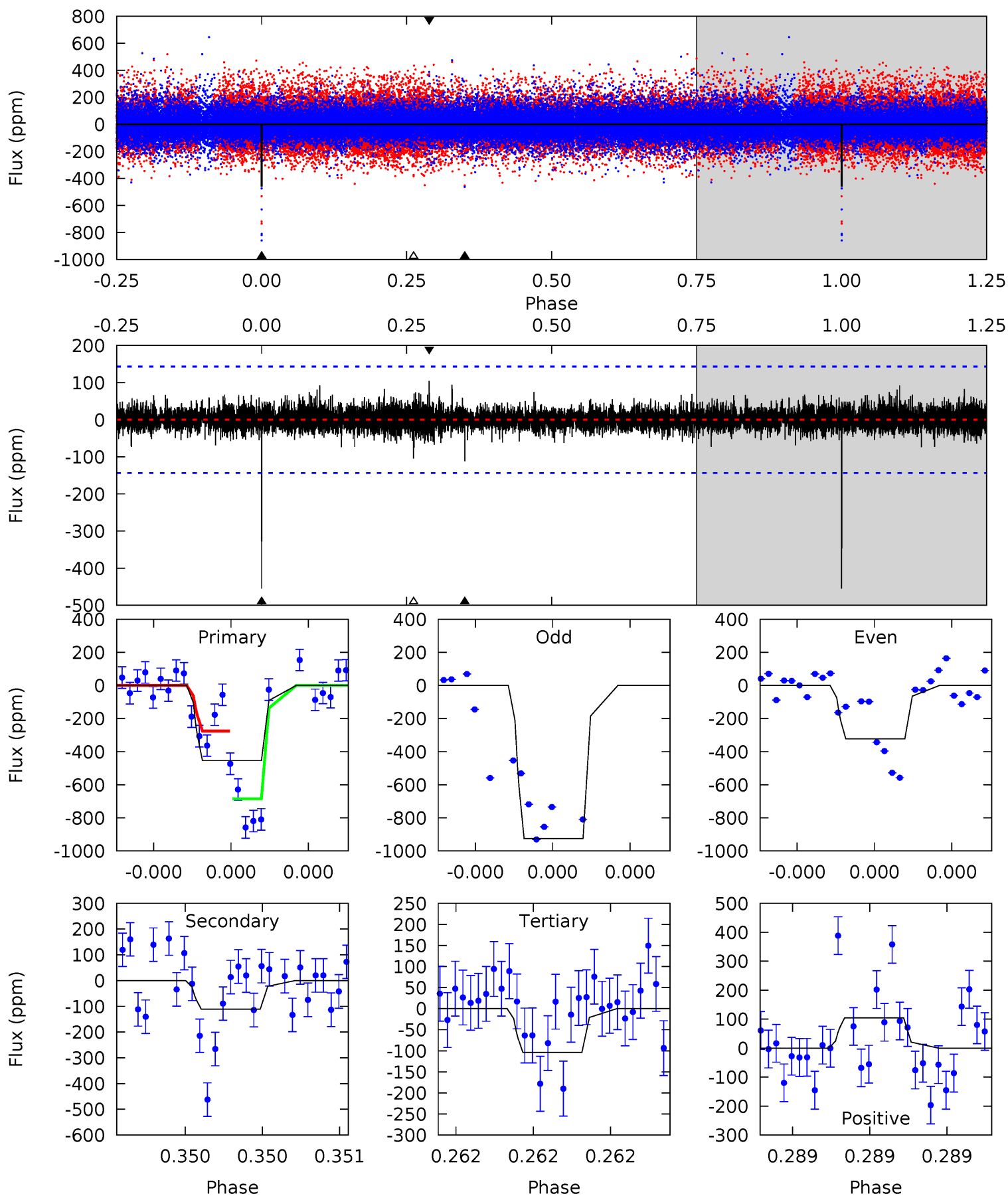
Pri	Sec	Ter	Pos	FA ₁	FA ₂	F _{Red}	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
11.5	26.7	18.3	19.0	5.64	3.59	3.22	-6.79	-7.49	8.40	7.71	2.65	0.96	0.44	0.93



Alt Model-Shift Uniqueness Test

008160546-01, P = 613.551695 Days, E = 172.991013 Days

Pri	Sec	Ter	Pos	FA ₁	FA ₂	F _{Red}	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
18.0	4.40	4.12	4.14	5.67	3.63	0.65	13.9	13.8	0.29	0.26	13.6	1.00	0.19	8.07



Stellar Parameters For KIC 008160546

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	R (R_{\odot})	M (M_{\odot})	p_{\star} ($\text{g}\cdot\text{cm}^{-3}$)
	5532^{+149}_{-149}	$4.607^{+0.037}_{-0.112}$	$-0.400^{+0.300}_{-0.300}$	$0.745^{+0.139}_{-0.060}$	$0.833^{+0.079}_{-0.097}$	$2.838^{+0.462}_{-1.034}$
	+3%/-3%	+1%/-2%	+75%/-75%	+19%/-8%	+9%/-12%	+16%/-36%
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 008160546-01 / KOI

Detrend	Depth (ppm)	R_p (R_{\oplus})	T_{max} (K)	T_{obs} (K)	A_{obs}
DV	-1774 ± 66	$3.12^{+3.02}_{-2.07}$	260^{+11}_{-10}	5862^{+6092}_{-1423}	$176989^{+1395624}_{-130432}$
Alt.	-111 ± 25	$3.36^{+2.93}_{-2.32}$	259^{+11}_{-10}	3375^{+1764}_{-602}	9627^{+85221}_{-7170}

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 $A_{obs} \gg 1.0$

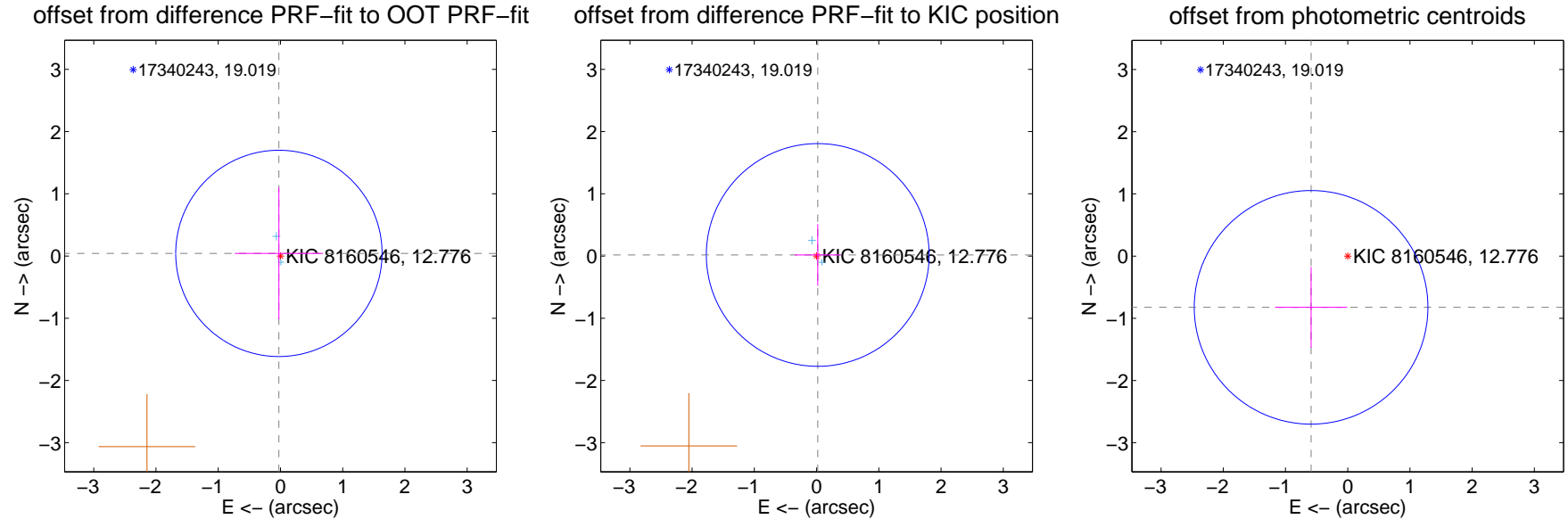
DV Centroid Data

Supplemental centroid analysis for 008160546-01. Kepler magnitude: 12.78. Transit SNR 6.47

There are 2 quarters with good PRF difference image offsets

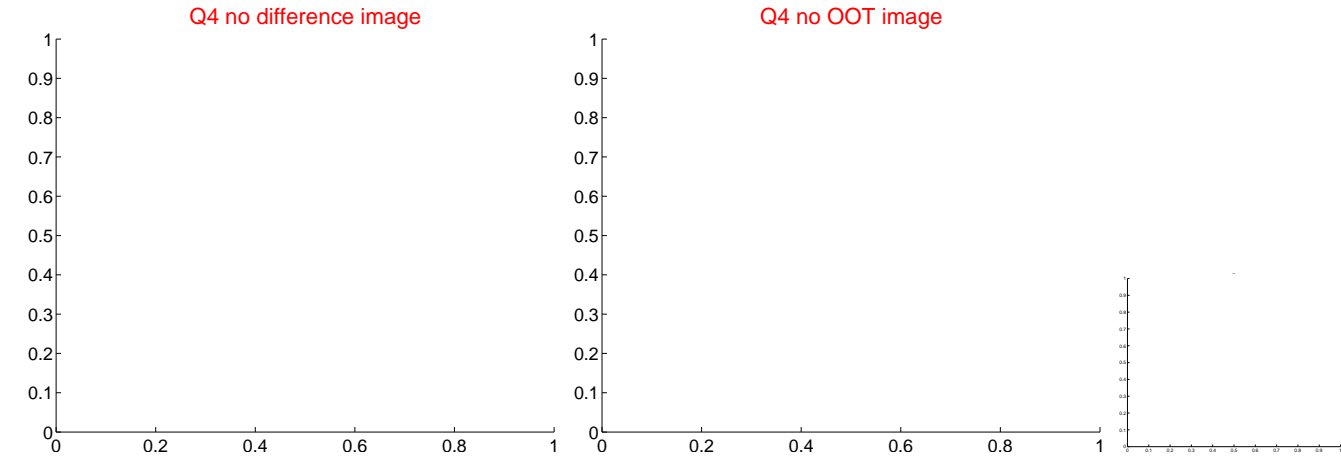
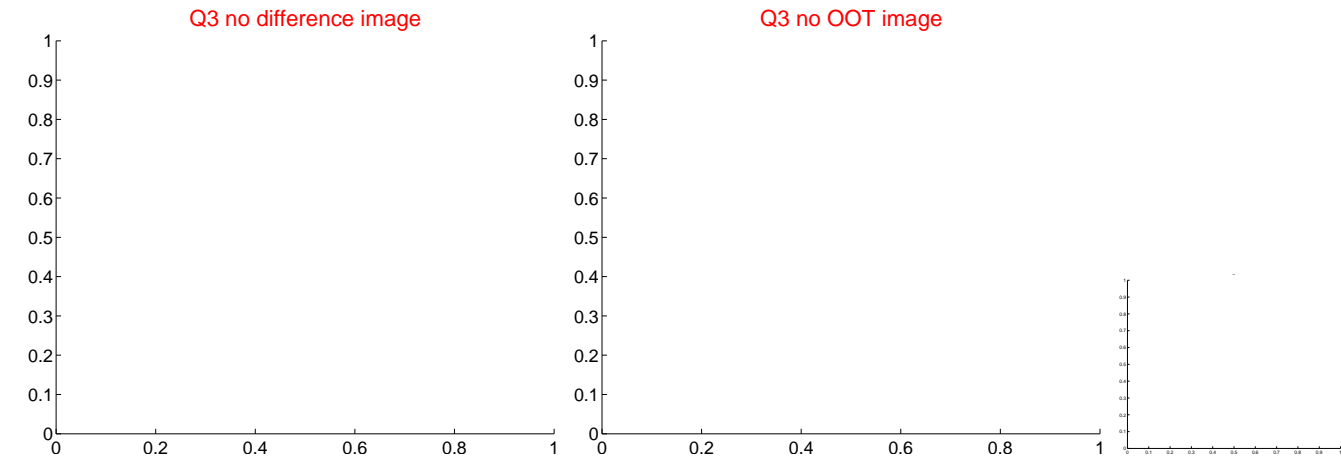
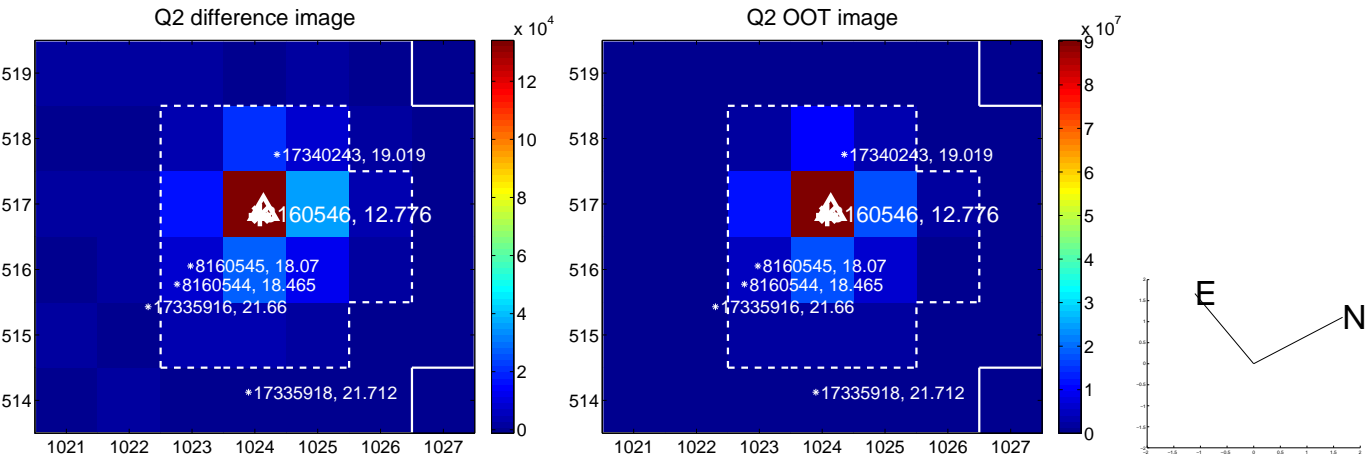
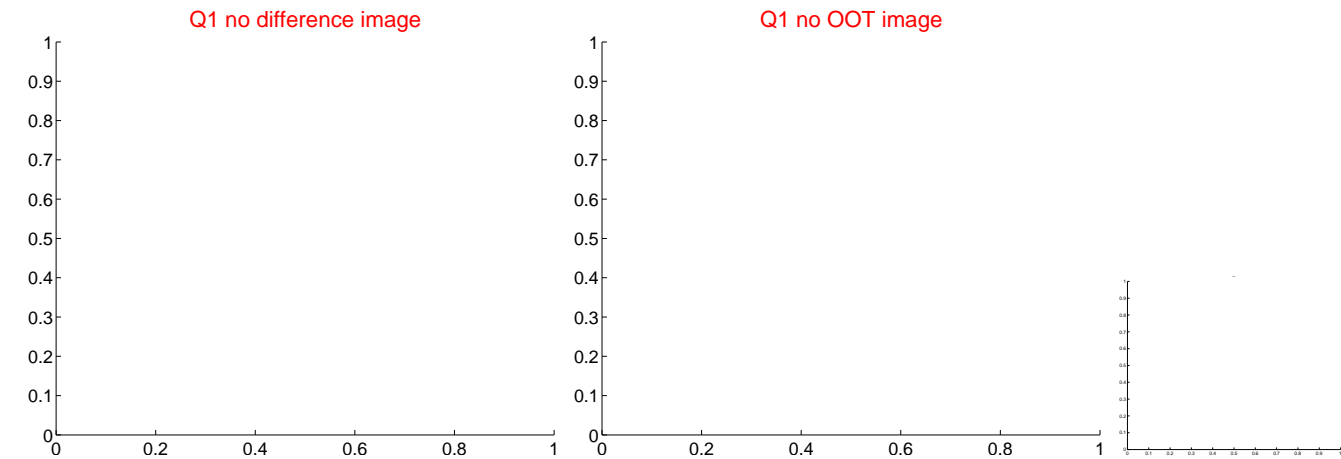
The direct PRF centroid is offset from the target star catalog position by about 0.08 arcsec

	Distance in arcsec	Distance / σ	Δ RA	Δ Dec
PRF-fit source offset from OOT	0.049 ± 0.553	0.09	0.025 ± 0.710	0.042 ± 1.058
PRF-fit source offset from KIC position	0.025 ± 0.597	0.04	-0.019 ± 0.370	0.017 ± 0.496
photometric centroid source offset	1.01 ± 0.63	1.62	0.59 ± 0.58	-0.82 ± 0.65



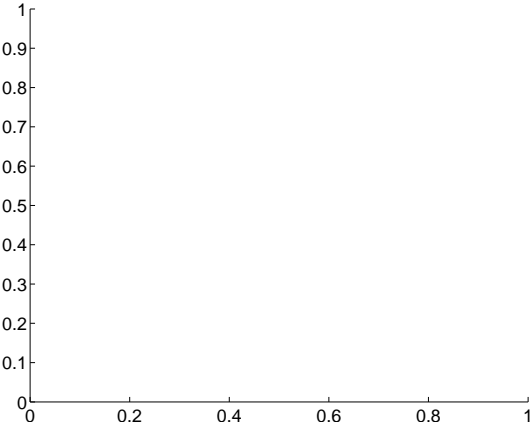
Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- σ uncertainty. Blue circle: three- σ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

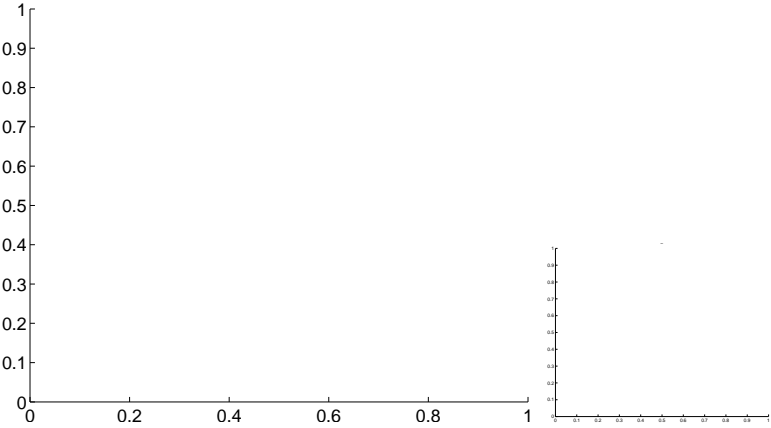


white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.

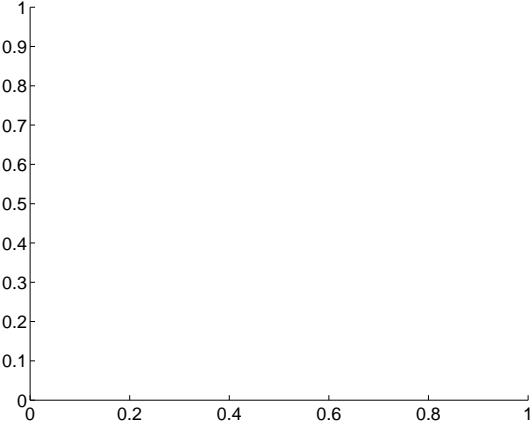
Q5 no difference image



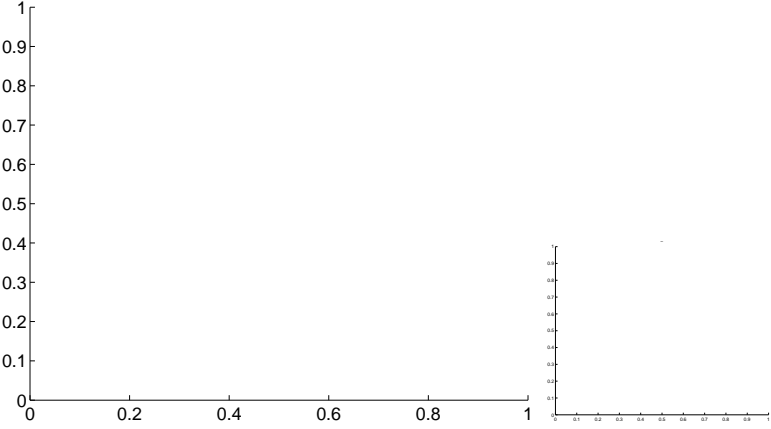
Q5 no OOT image



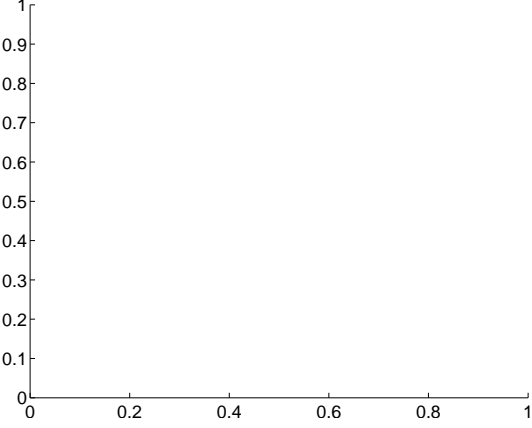
Q6 no difference image



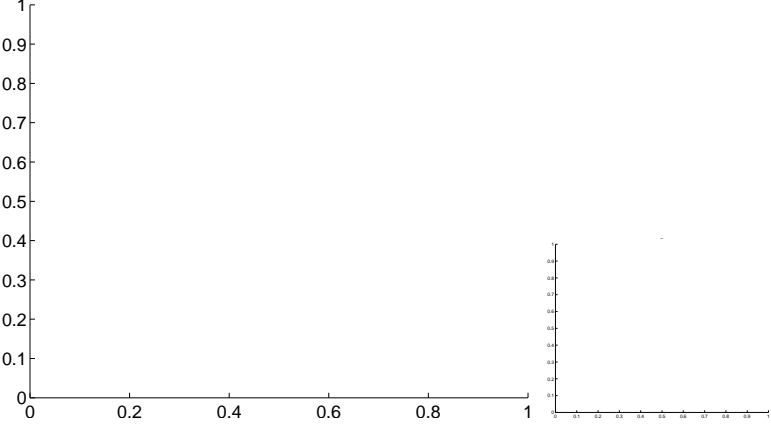
Q6 no OOT image



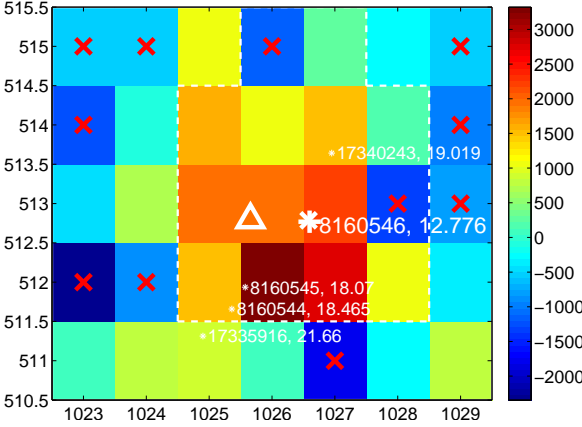
Q7 no difference image



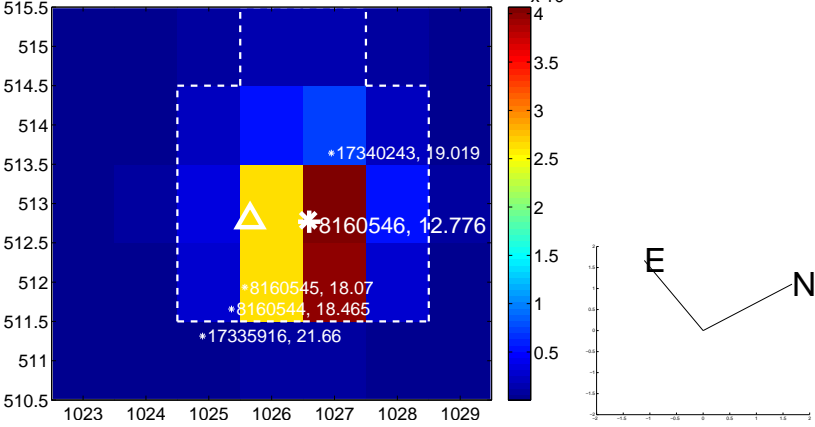
Q7 no OOT image



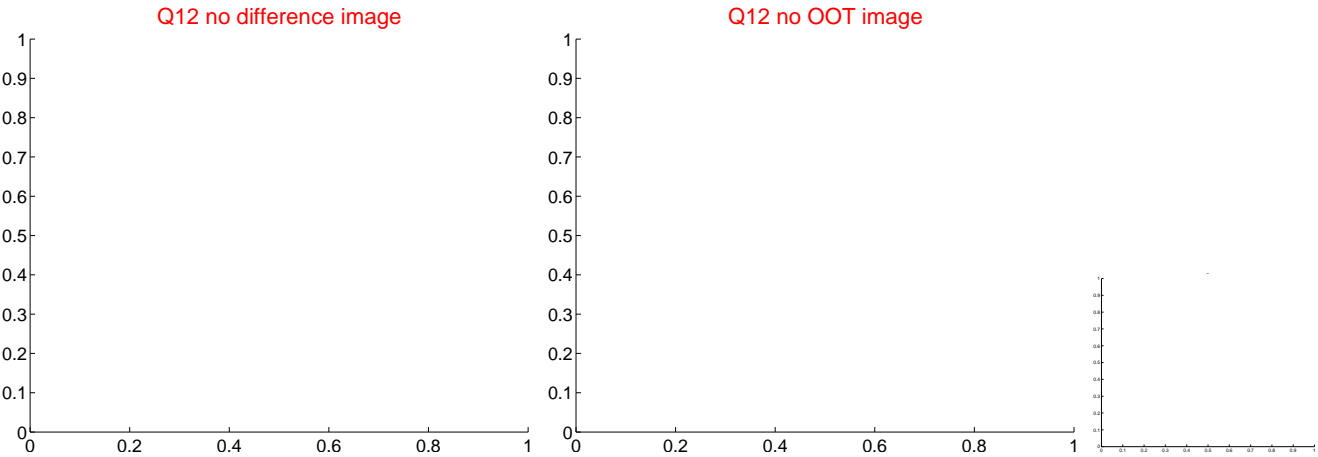
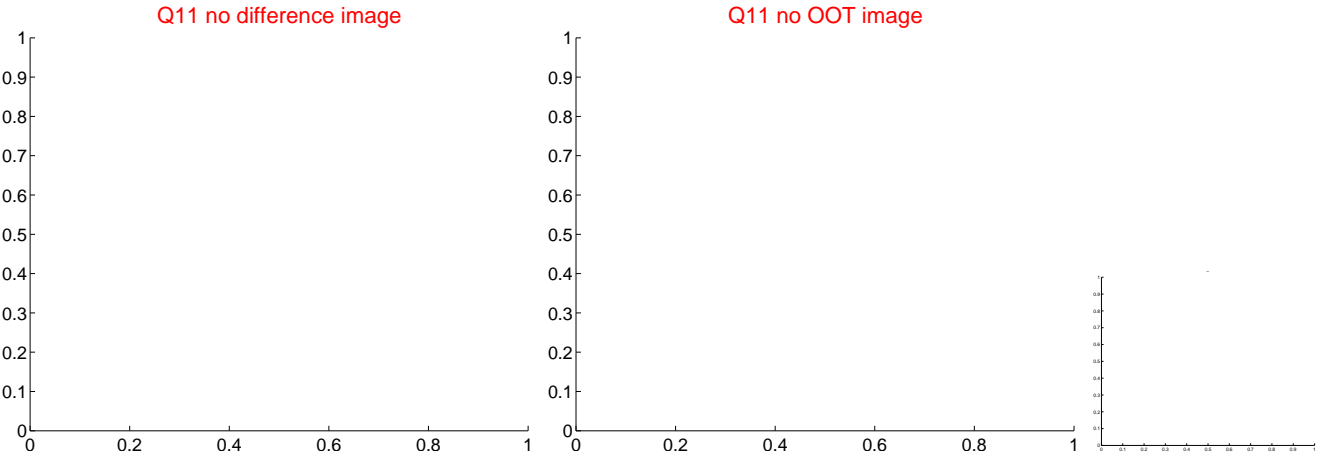
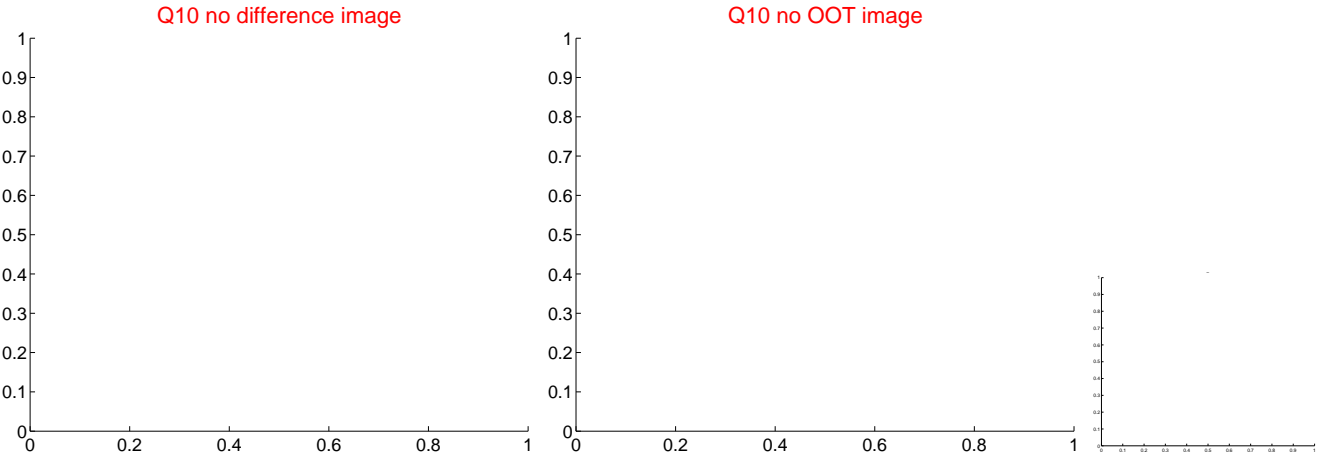
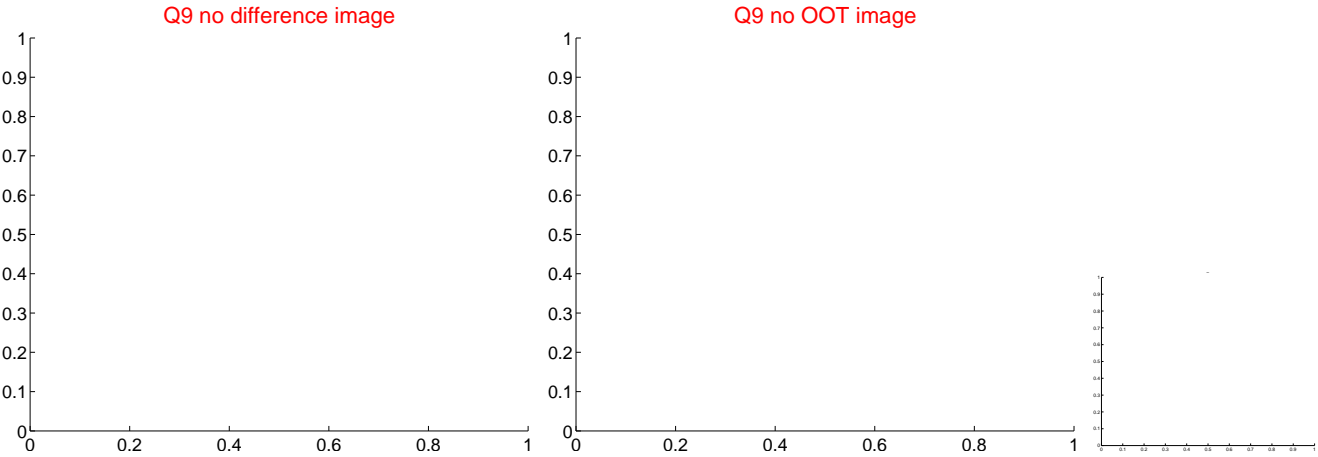
Q8 difference image. Poor Quality



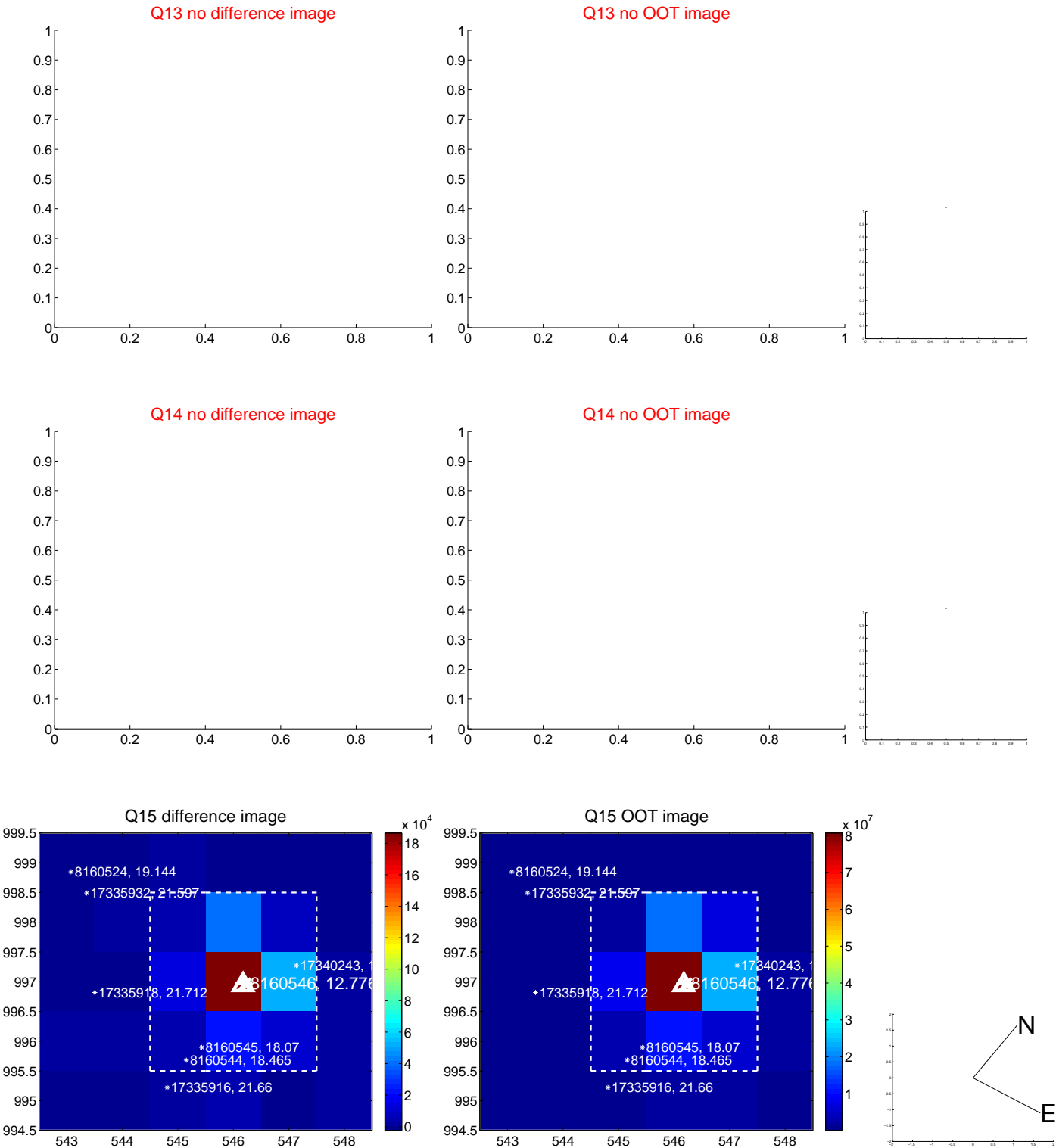
Q8 OOT image



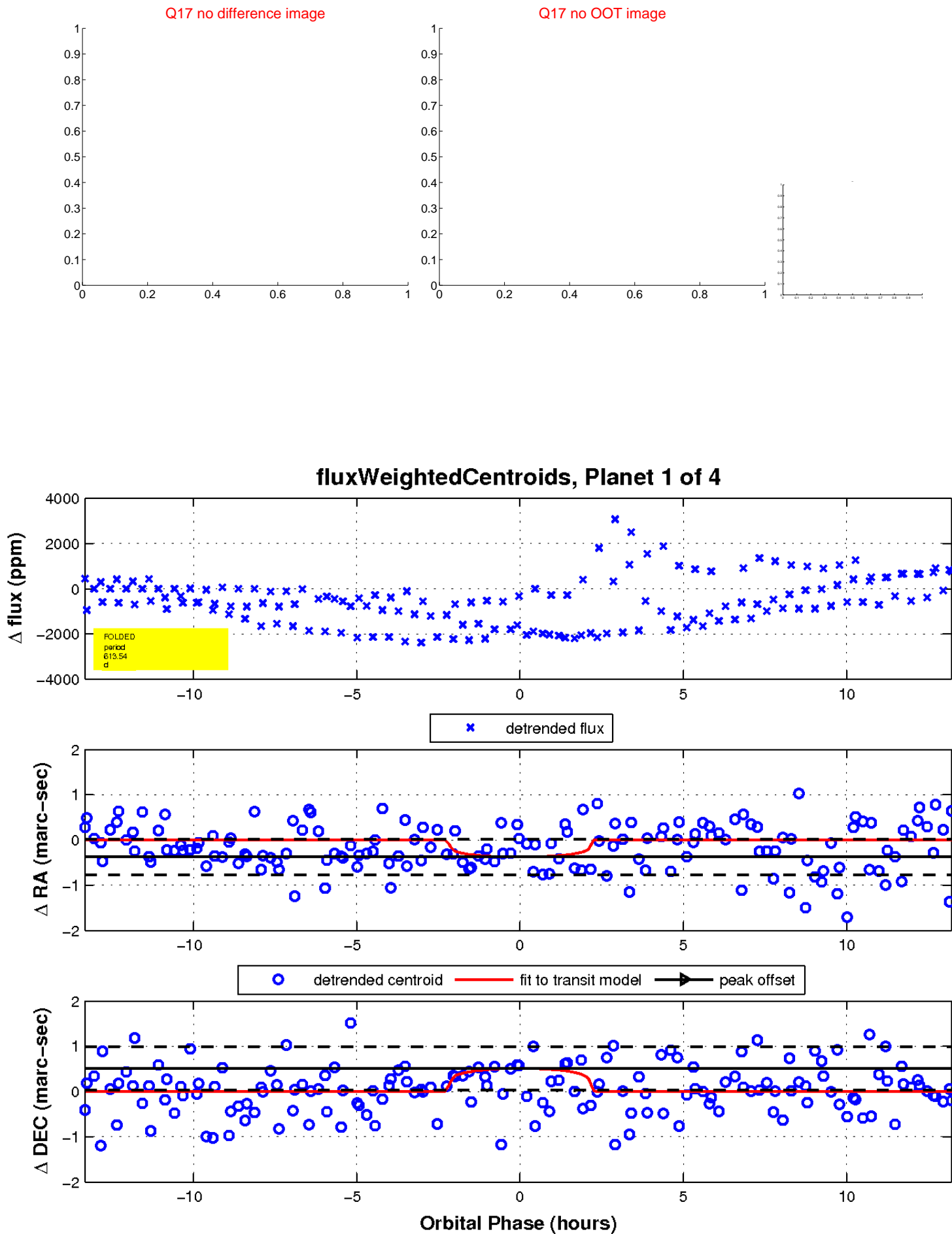
white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



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

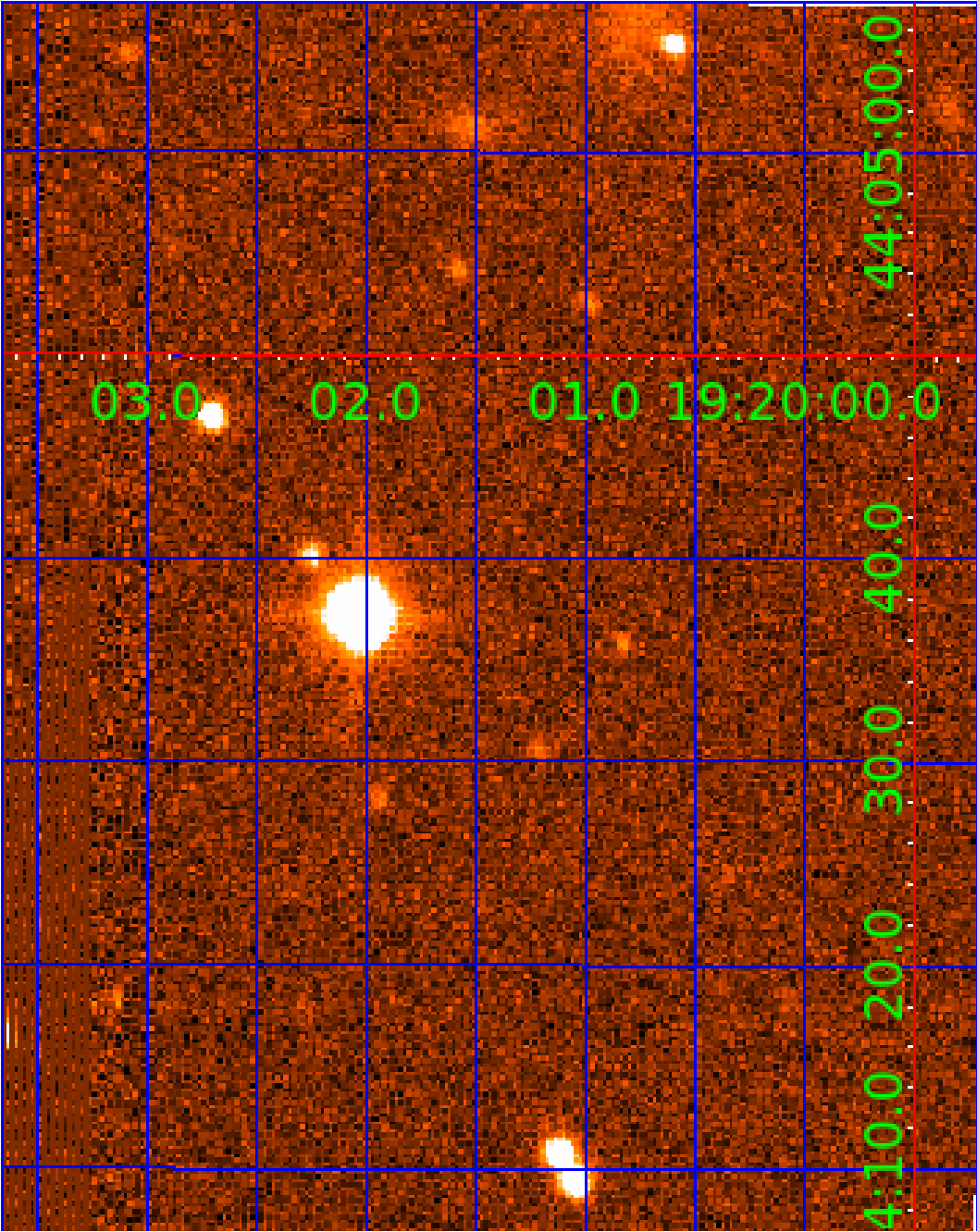


white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



UKIRT Image

Declination



KIC 008160546

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})
008160546-01	OBS	No	613.544695	172.985535	596.8	4.462	13.8	6.5	0.74	5532	1.81	0.27
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008160546-04	OBS	No	258.880202	374.328424	357.3	3.751	11.2	5.2	0.74	5532	1.62	0.84

Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
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008160546-02	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
008160546-03	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—CENT_FEW_DIFFS
008160546-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL_SKYE—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS

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

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

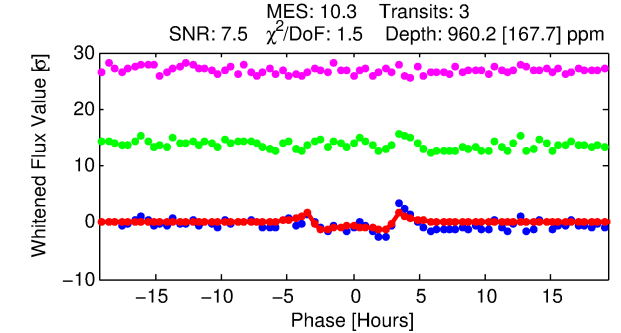
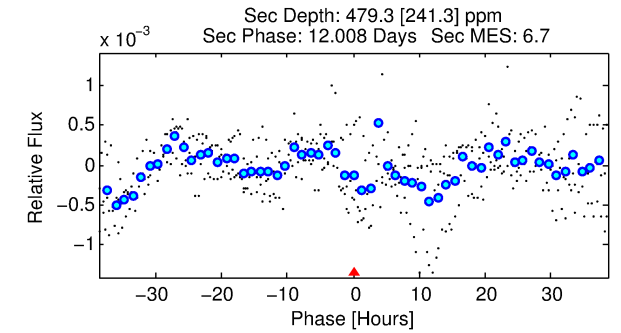
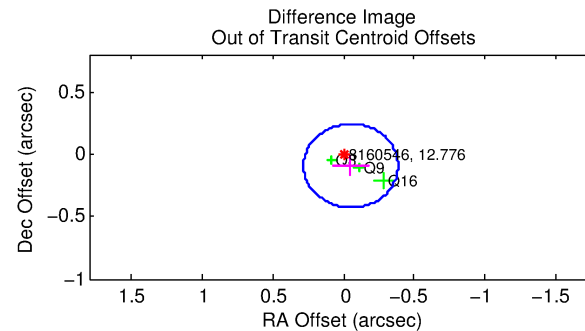
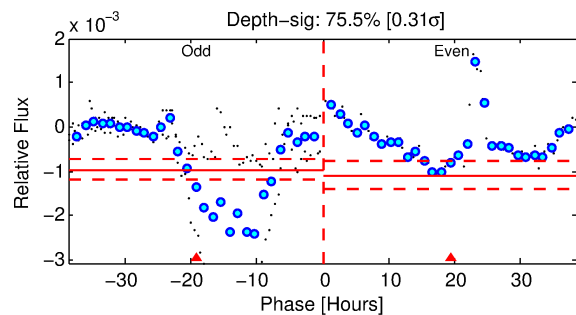
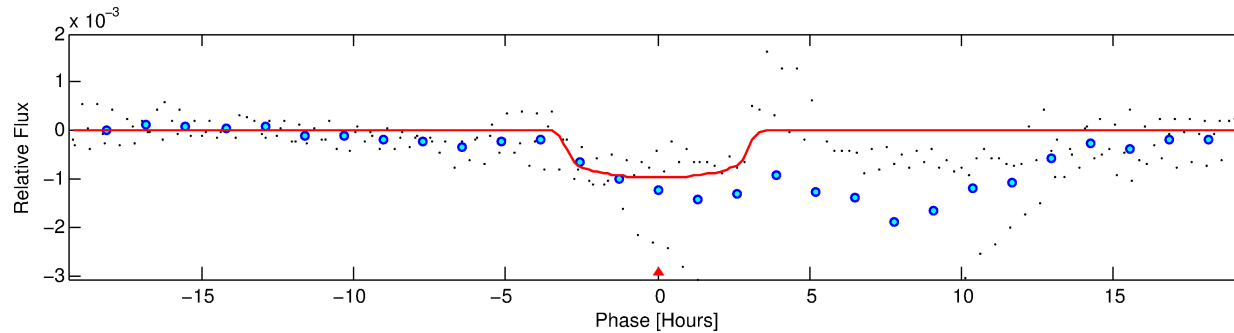
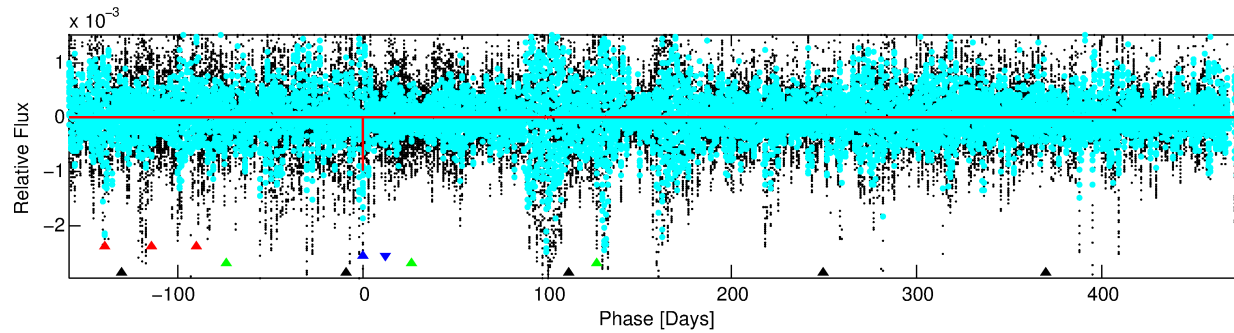
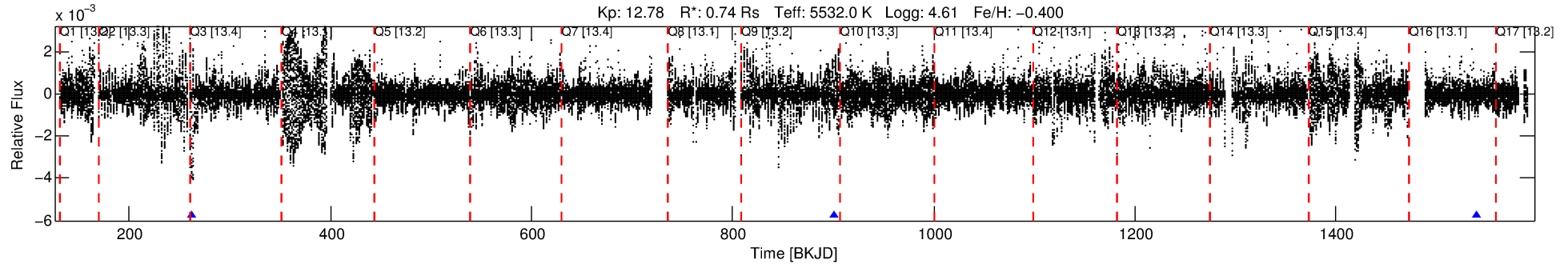
See http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col for comment definitions.

Ephemeris Match Information For 008160546-02

No Significant Match Found

DV One-Page Summary

KIC: 8160546 Candidate: 2 of 4 Period: 638.720 d



DV Fit Results:

Period = 638.71989 [0.00426] d
Epoch = 262.7235 [0.0057] BKJD
Rp/R* = 0.0301 [0.0096]
a/R* = 587.24 [719.98]
b = 0.67 [1.00]
Seff = 0.25 [0.06]
Teq = 181 [11] K
Rp = 2.45 [0.90] Re
a = 1.3583 [0.2054] AU
Ag = 81368.88 [68217.02] [1.19 σ]
Teffp = 4720 [965] K [4.70 σ]

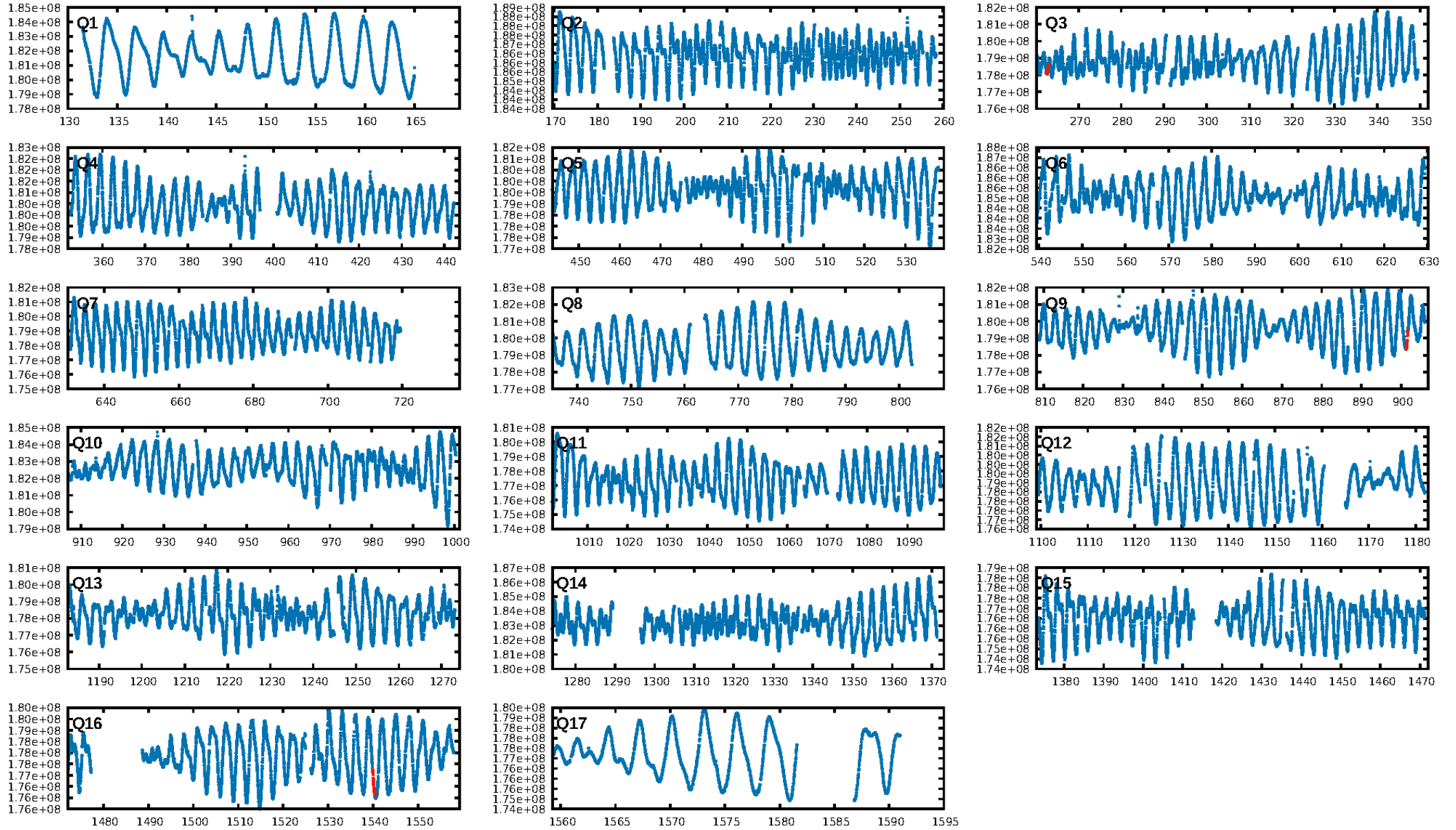
DV Diagnostic Results:

ShortPeriod-sig: 100.0% [76.87 σ]
LongPeriod-sig: N/A
ModelChiSquare2-sig: 6.9%
ModelChiSquareGof-sig: 77.6%
Bootstrap-pfa: 4.31e-07
RollingBand-fgt: 1.00 [3/3]
GhostDiagnostic-chr: -26.9
Centroid-sig: 6.7%
Centroid-so: 0.509 arcsec [1.67 σ]
OotOffset-rm: 0.106 arcsec [0.95 σ]
OotOffset-st: 0/1/1/1 [3]
KicOffset-rm: 0.073 arcsec [0.72 σ]
KicOffset-st: 0/1/1/1 [3]
DiffImageQuality-fgm: 1.00 [3/3]
DiffImageOverlap-fno: 1.00 [3/3]

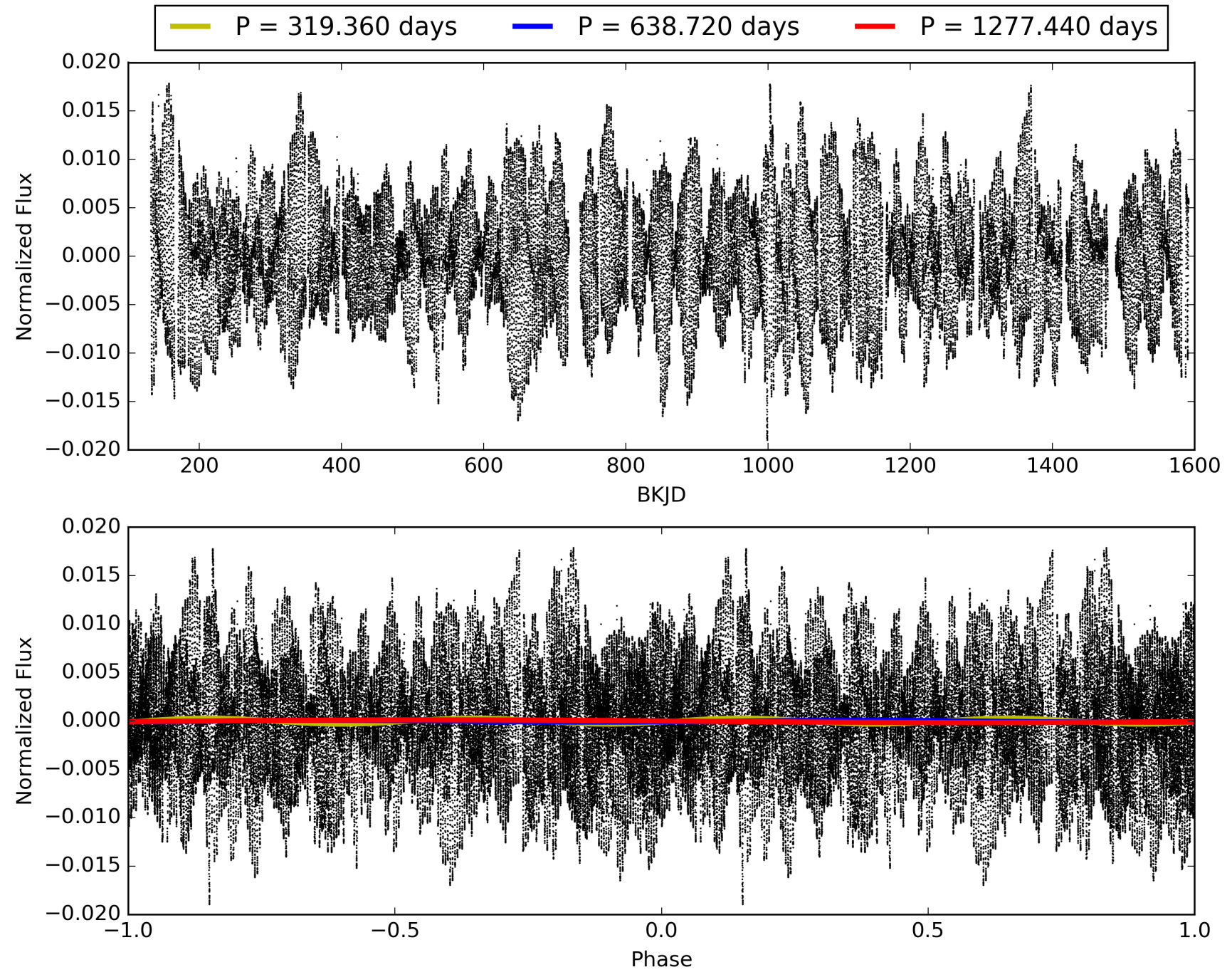
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 31-Jan-2016 21:42:17 Z

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

TCE 008160546-02, PDC Light Curves

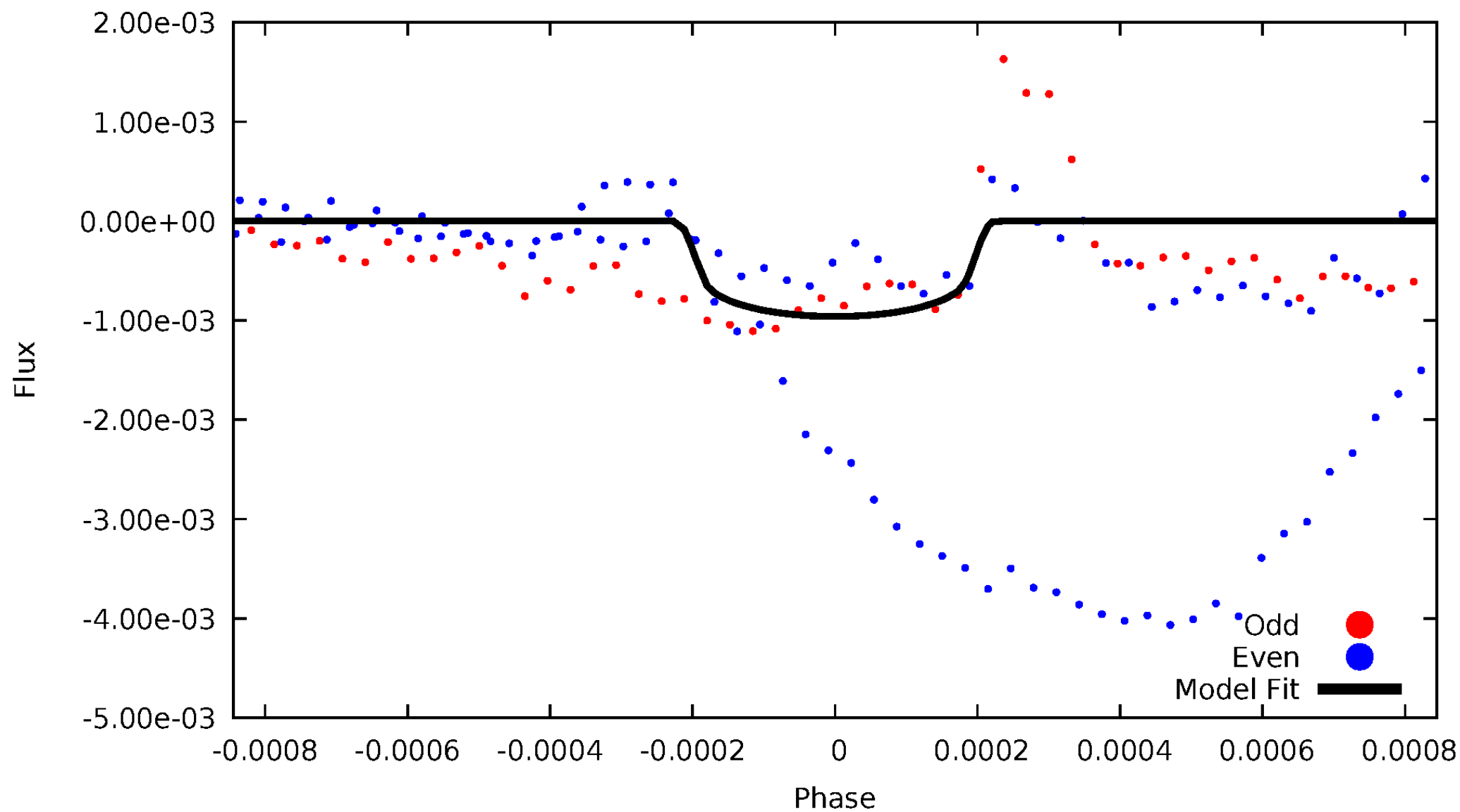


TCE 008160546-02



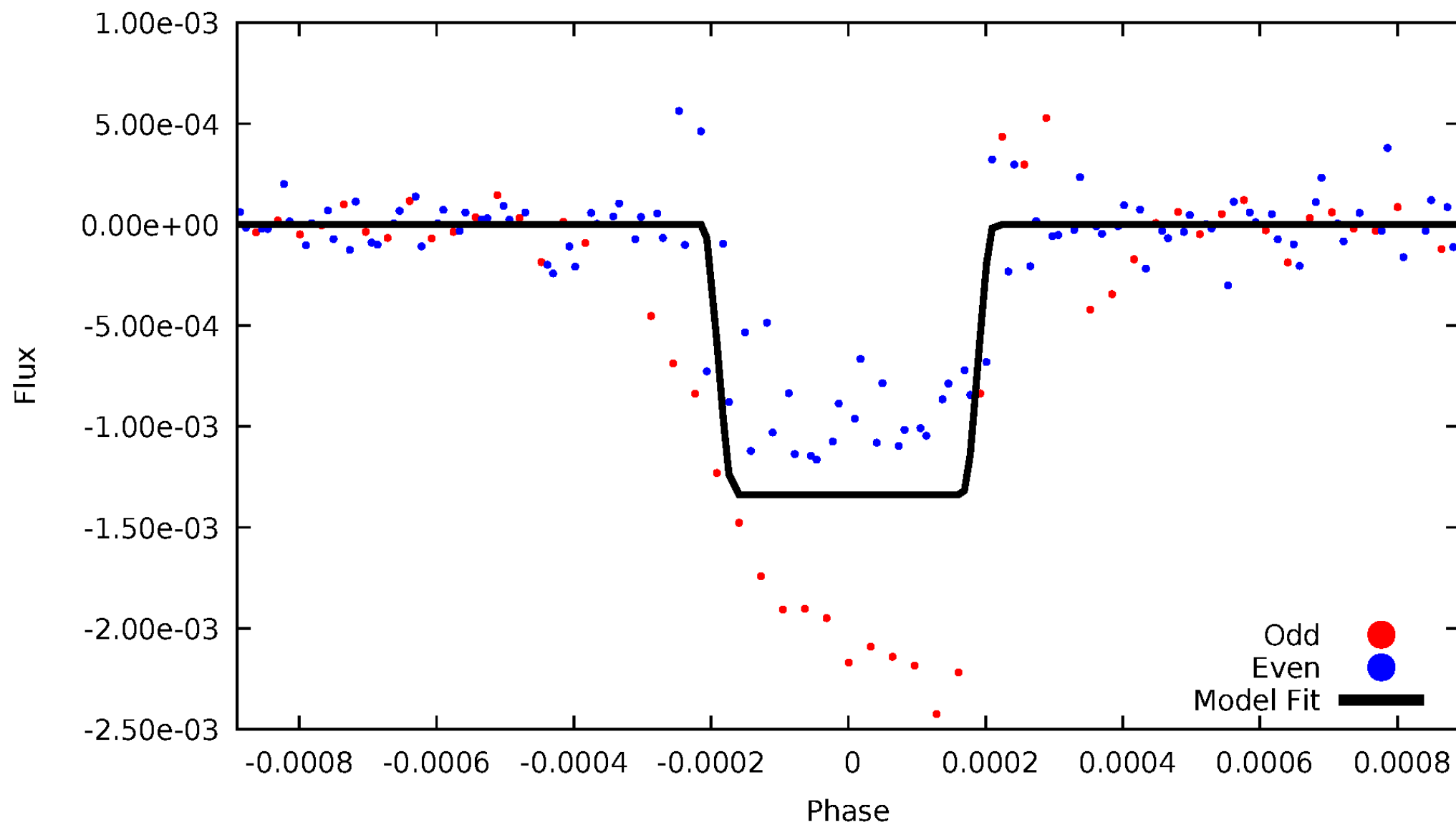
DV Odd/Even

TCE 008160546-02



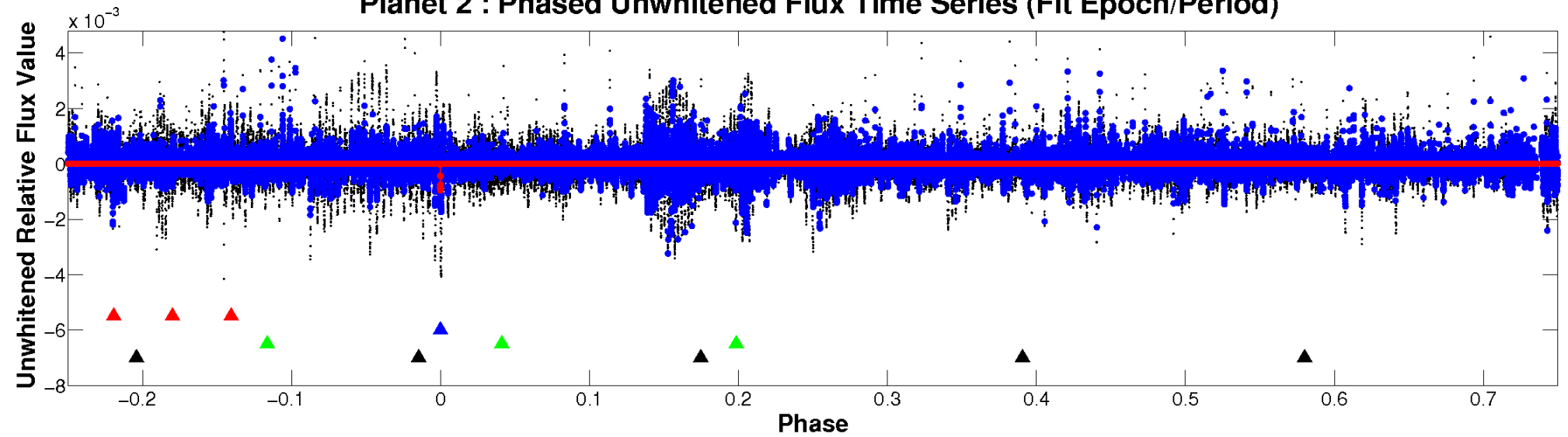
ALT Odd/Even

TCE 008160546-02

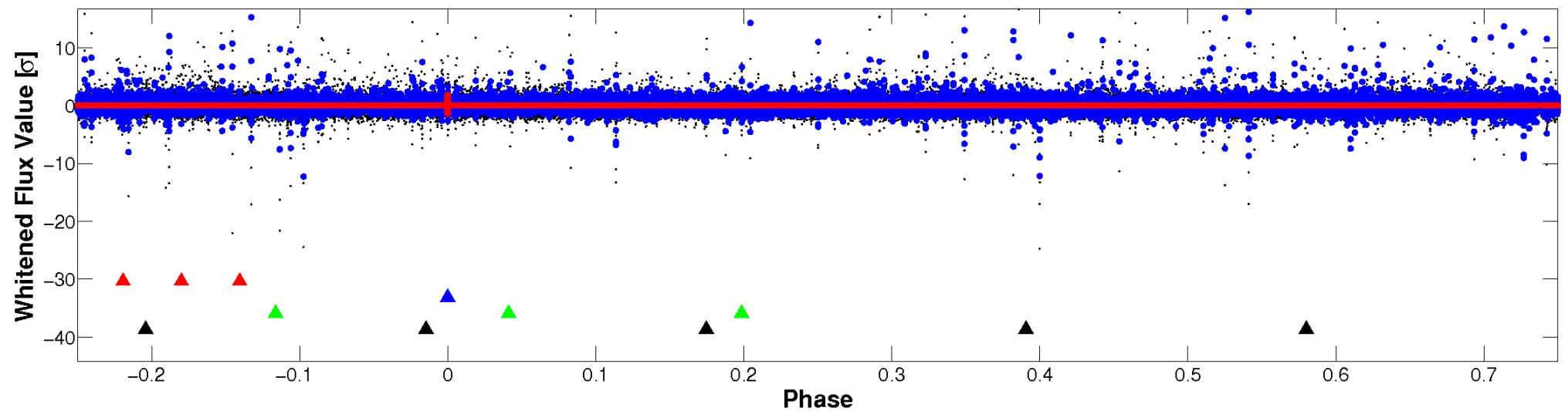


Non-Whitened Vs. Whitened Light Curve

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

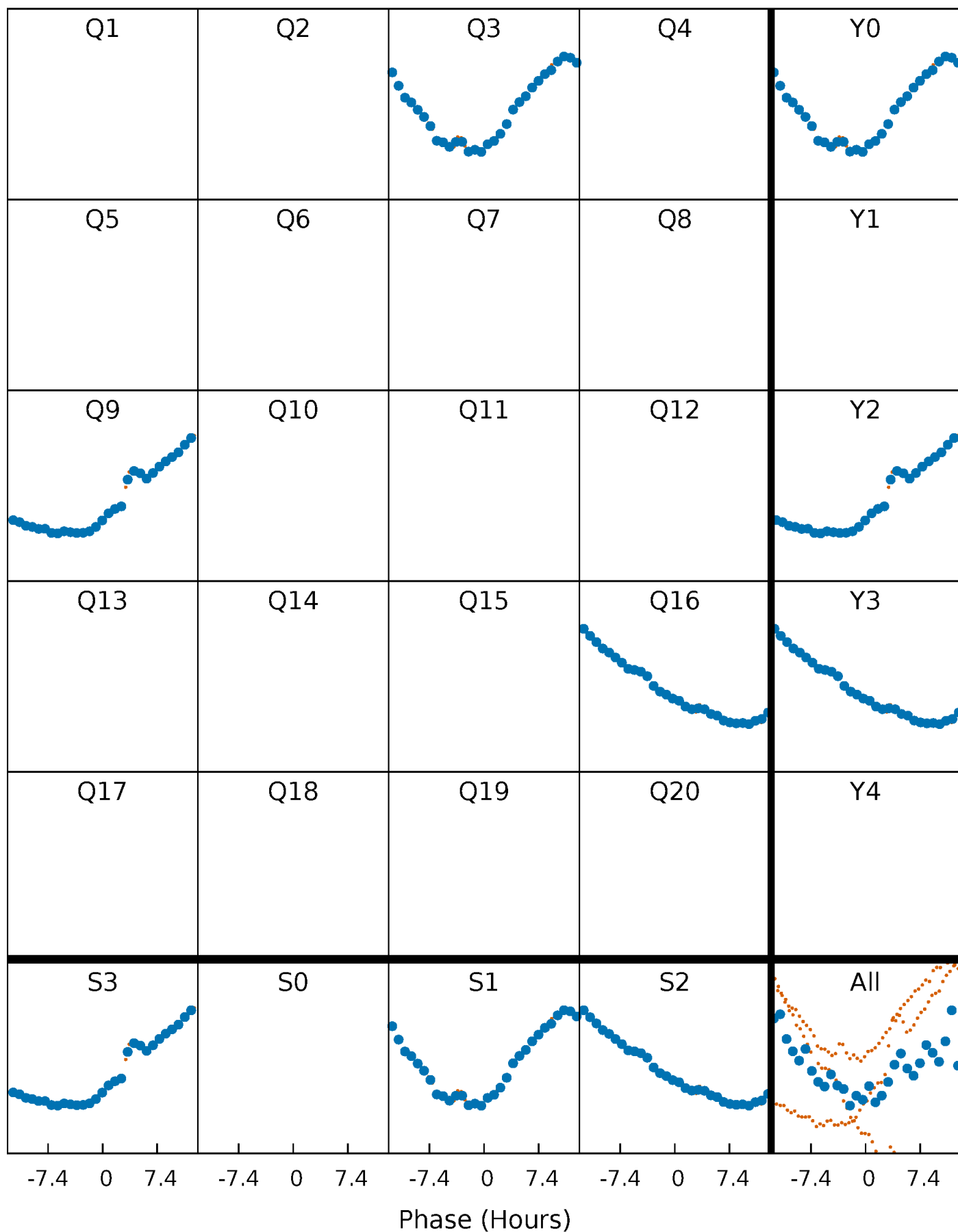


Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



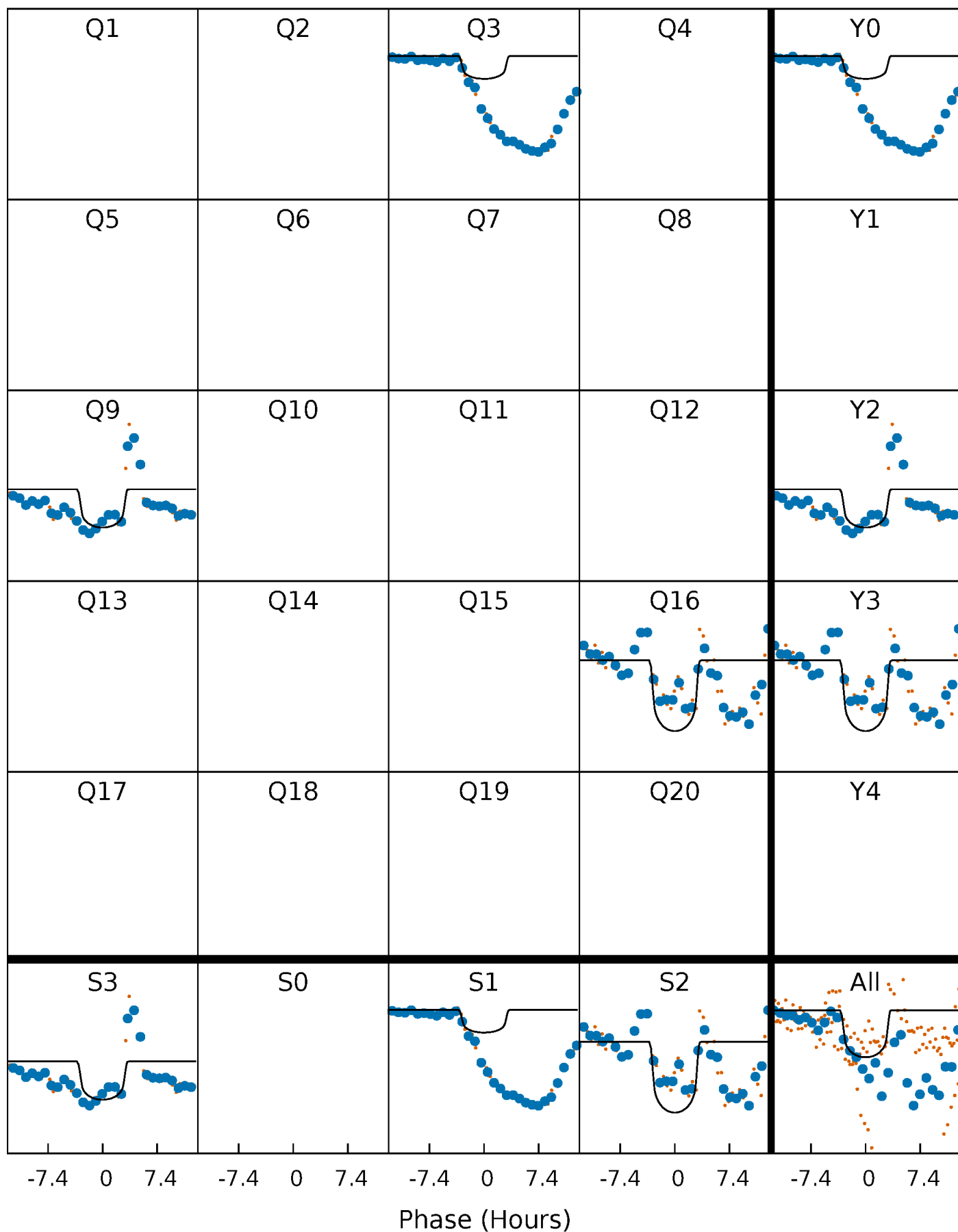
PDC Quarter-Phased Transit Curves

TCE 008160546-02 P=638.719894 Days $T_0=262.723530$ (BKJD)



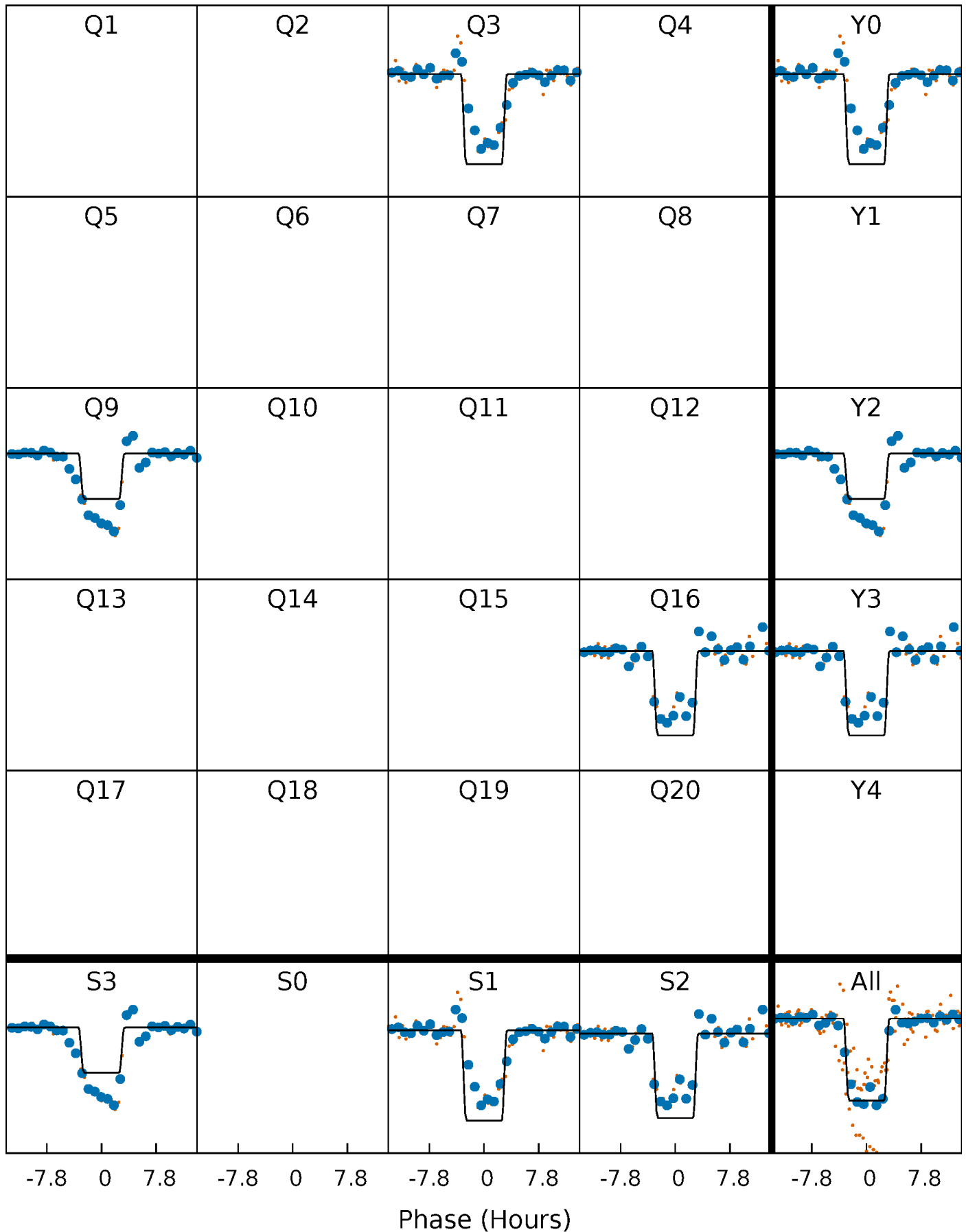
DV Quarter-Phased Transit Curves

TCE 008160546-02 $P=638.719894$ Days $T_0=262.723530$ (BKJD)



Alt. Detrend Quarter-Phased Transit Curves

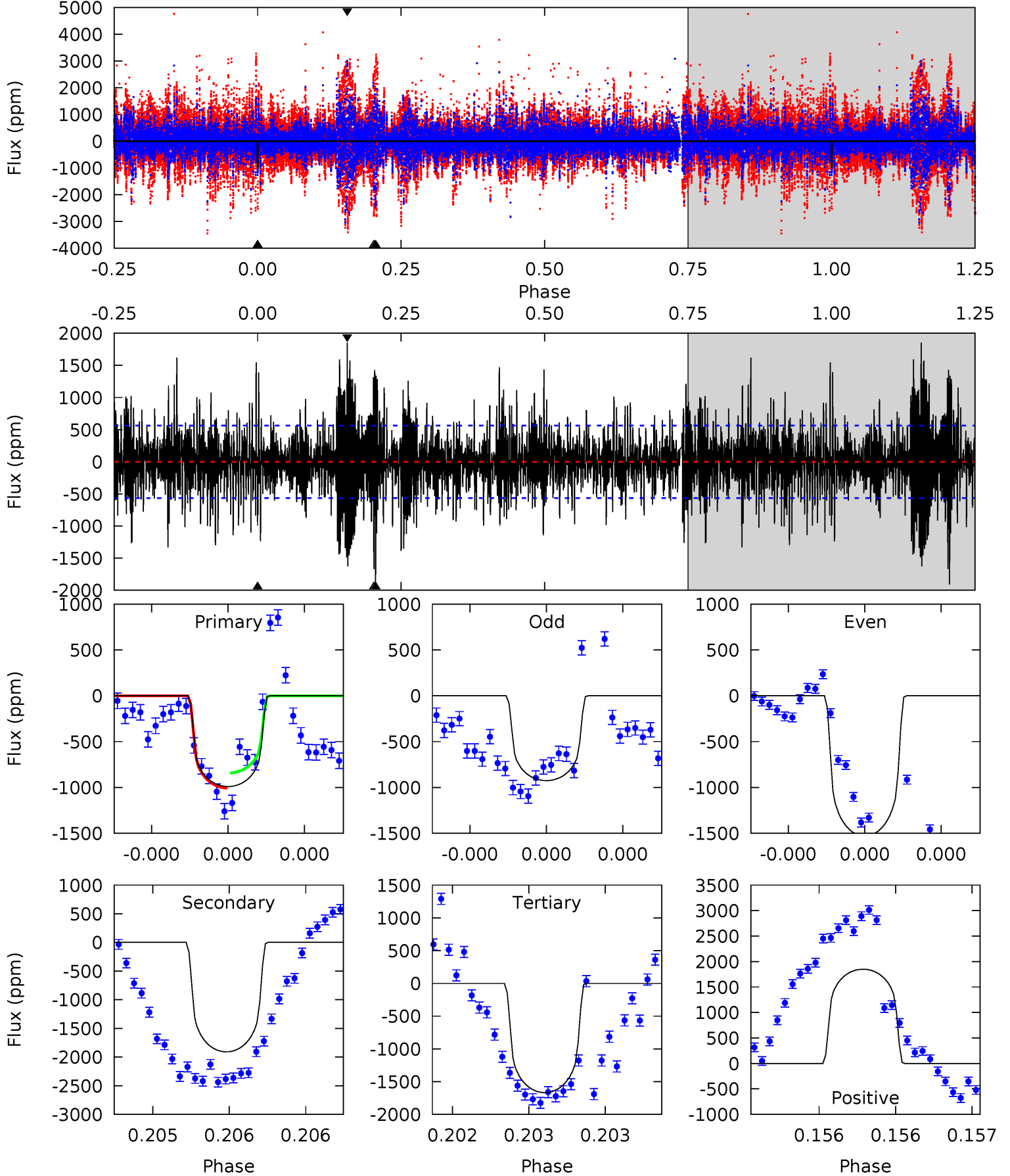
TCE 008160546-02 P=638.719030 Days $T_0=262.732069$ (BKJD)



DV Model-Shift Uniqueness Test

008160546-02, P = 638.719894 Days, E = 262.723530 Days

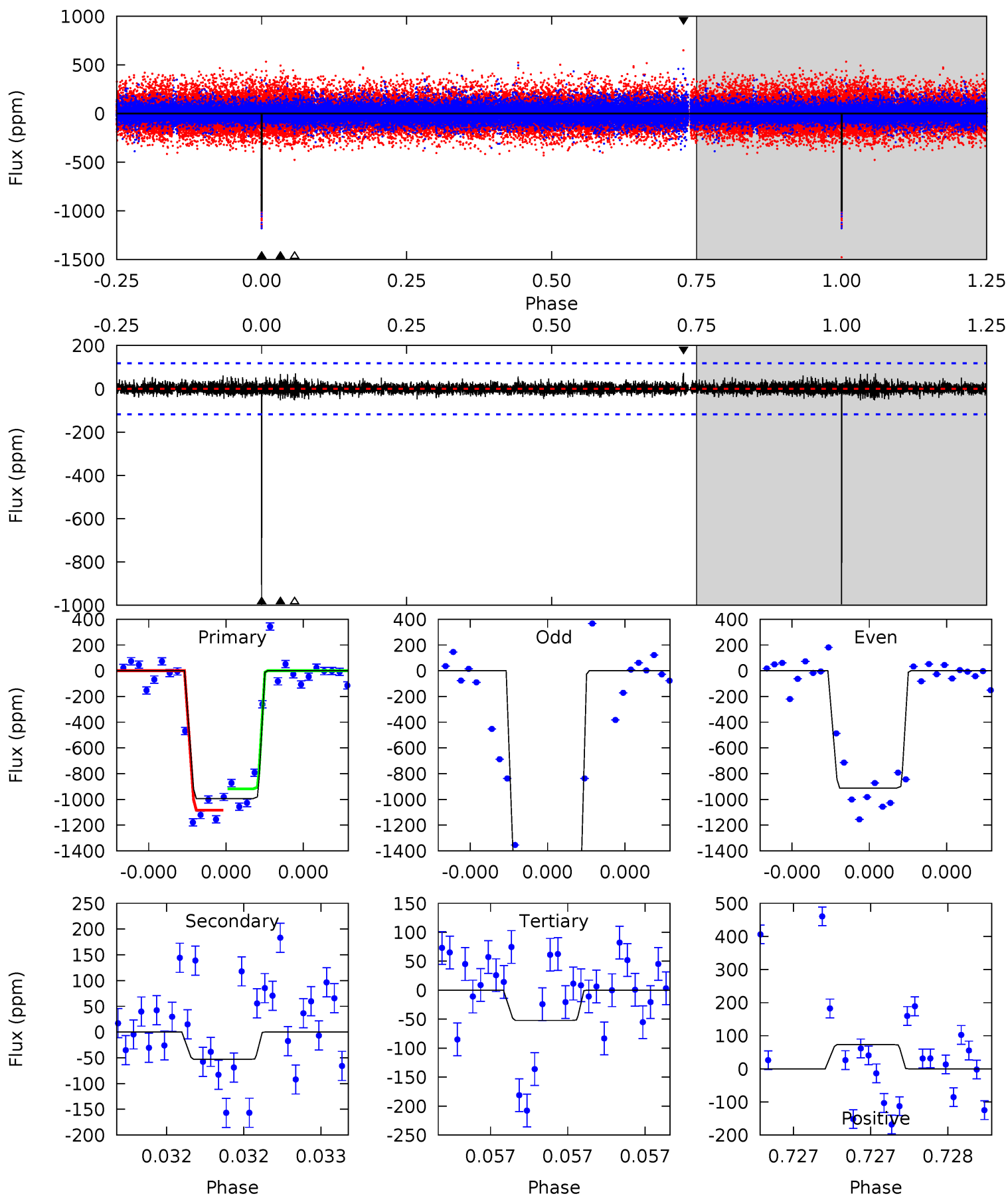
Pri	Sec	Ter	Pos	FA ₁	FA ₂	F _{Red}	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
9.83	18.9	16.5	18.4	5.60	3.52	3.83	-6.72	-8.53	2.39	0.59	3.02	1.43	0.49	0.80



Alt Model-Shift Uniqueness Test

008160546-02, P = 638.719030 Days, E = 262.732069 Days

Pri	Sec	Ter	Pos	FA ₁	FA ₂	F _{Red}	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
47.3	2.52	2.48	3.48	5.61	3.53	0.57	44.8	43.8	0.03	-0.96	31.3	1.33	0.07	3.93



Stellar Parameters For KIC 008160546

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	R (R_{\odot})	$M(M_{\odot})$	p_{\star} ($\text{g}\cdot\text{cm}^{-3}$)
	5532^{+149}_{-149}	$4.607^{+0.037}_{-0.112}$	$-0.400^{+0.300}_{-0.300}$	$0.745^{+0.139}_{-0.060}$	$0.833^{+0.079}_{-0.097}$	$2.838^{+0.462}_{-1.034}$
	+3%/-3%	+1%/-2%	+75%/-75%	+19%/-8%	+9%/-12%	+16%/-36%
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 008160546-02 / KOI

Detrend	Depth (ppm)	R_p (R_{\oplus})	T_{max} (K)	T_{obs} (K)	A_{obs}
DV	-1909 ± 101	$2.54^{+0.79}_{-0.82}$	256^{+11}_{-9}	6616^{+1658}_{-847}	$297854^{+349751}_{-126897}$
Alt.	-53 ± 21	$3.03^{+0.90}_{-0.78}$	256^{+10}_{-10}	3075^{+345}_{-278}	5444^{+5592}_{-2701}

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

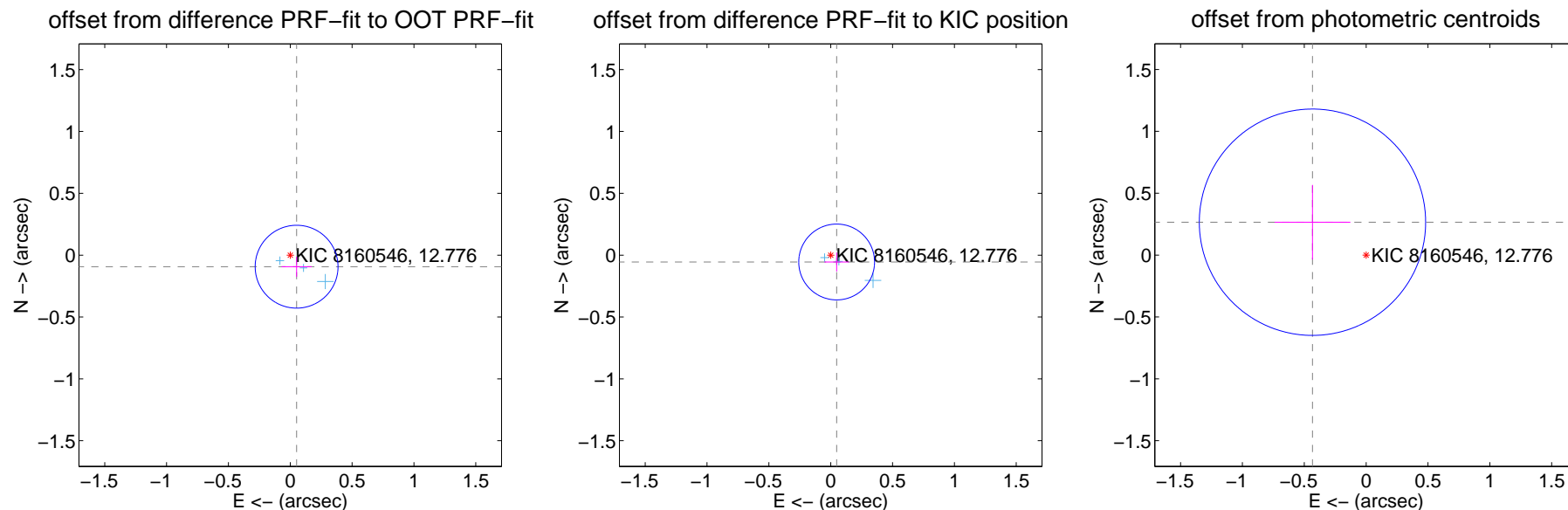
DV Centroid Data

Supplemental centroid analysis for 008160546-02. Kepler magnitude: 12.78. Transit SNR 7.46

There are 3 quarters with good PRF difference image offsets

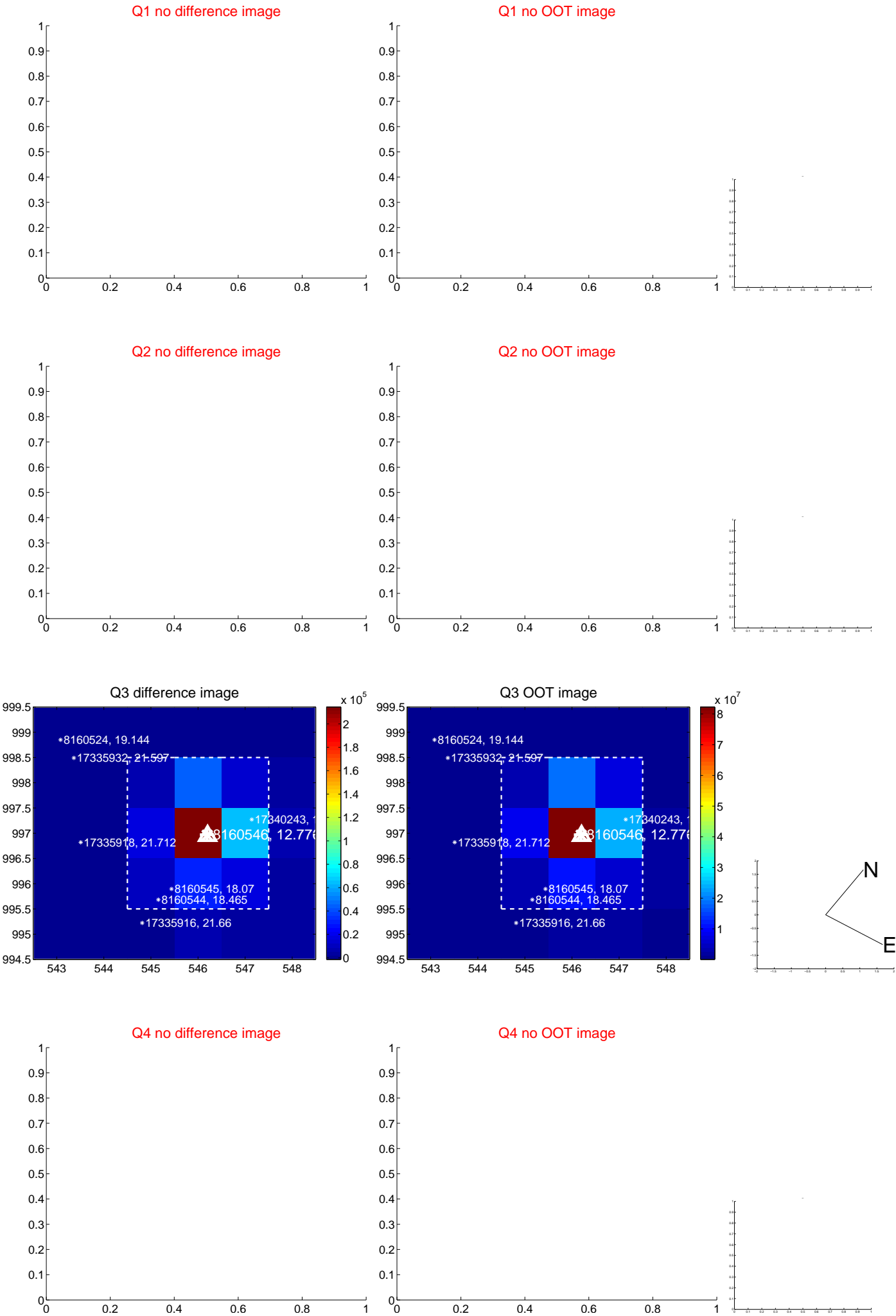
The direct PRF centroid is offset from the target star catalog position by about 0.06 arcsec

	Distance in arcsec	Distance / σ	Δ RA	Δ Dec
PRF-fit source offset from OOT	0.106 ± 0.112	0.95	-0.051 ± 0.121	-0.093 ± 0.081
PRF-fit source offset from KIC position	0.073 ± 0.102	0.72	-0.048 ± 0.100	-0.055 ± 0.077
photometric centroid source offset	0.51 ± 0.30	1.67	0.43 ± 0.31	0.27 ± 0.30

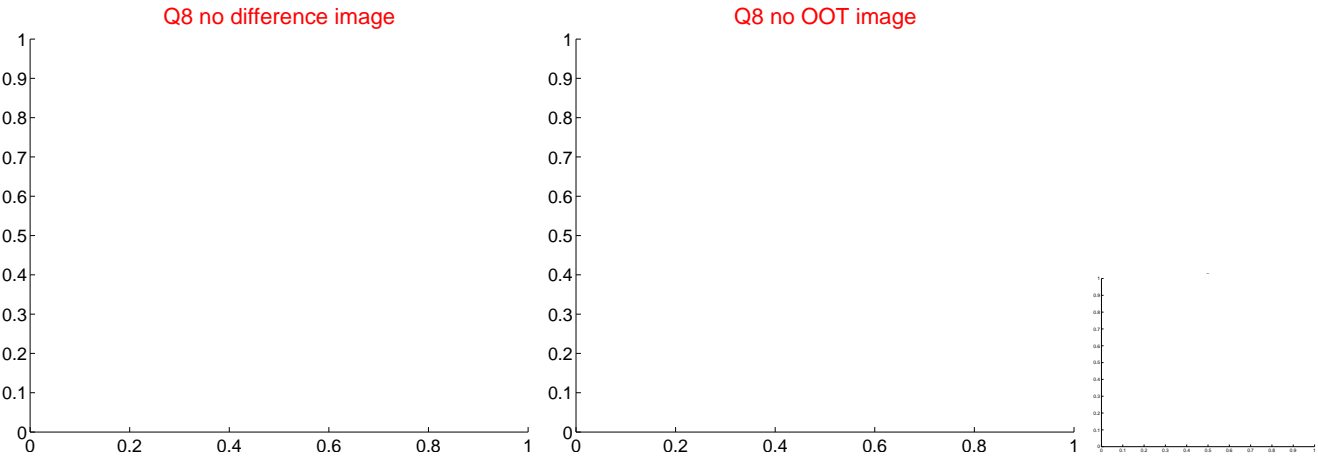
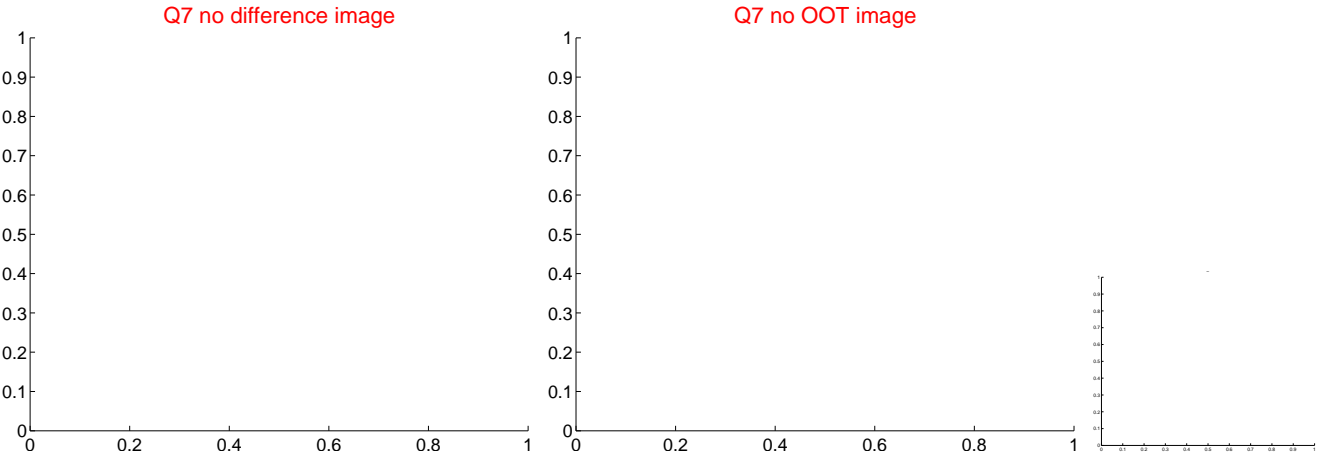
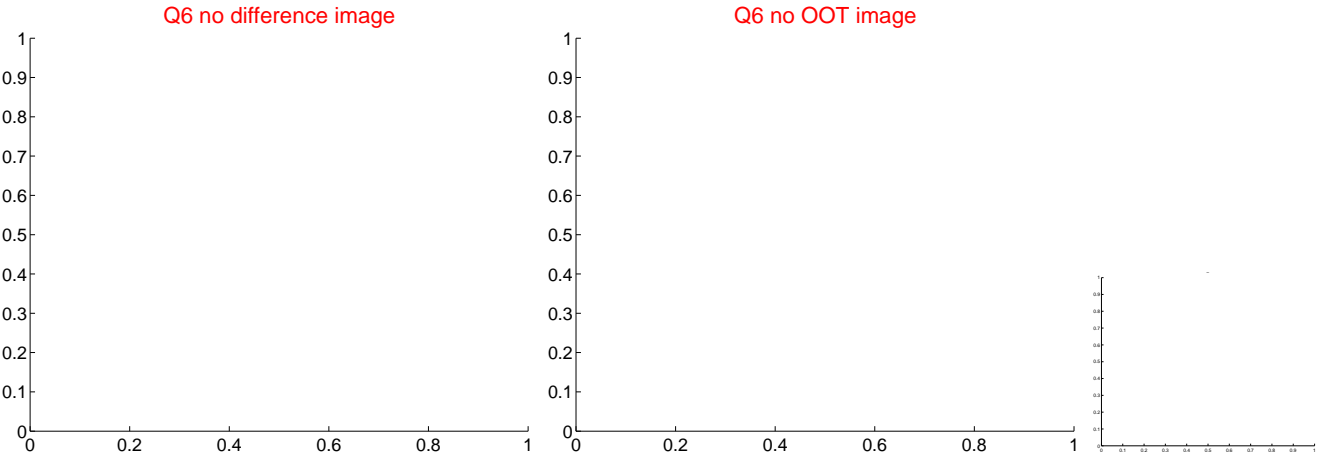
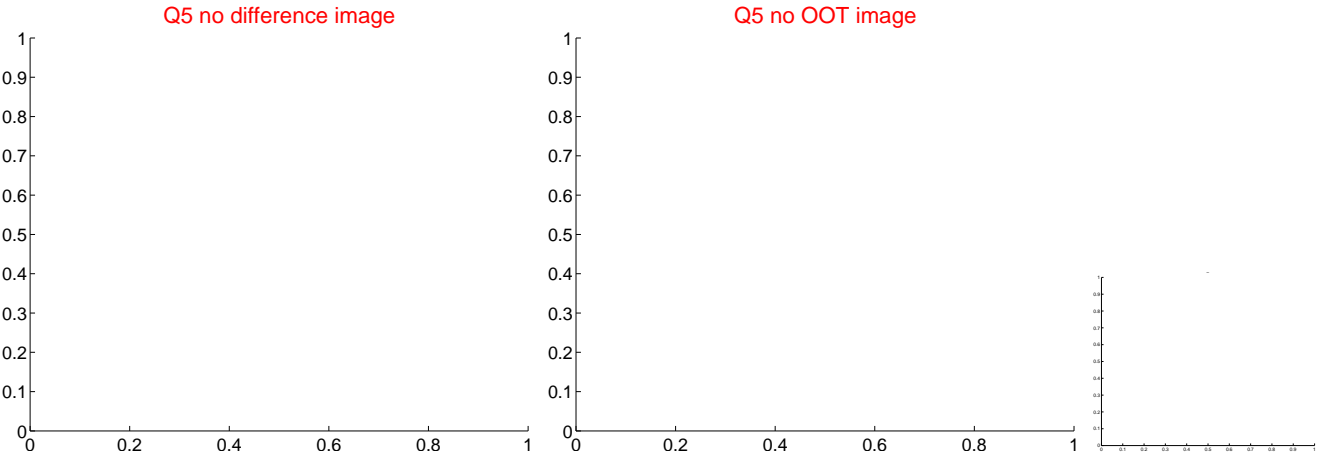


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- σ uncertainty. Blue circle: three- σ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

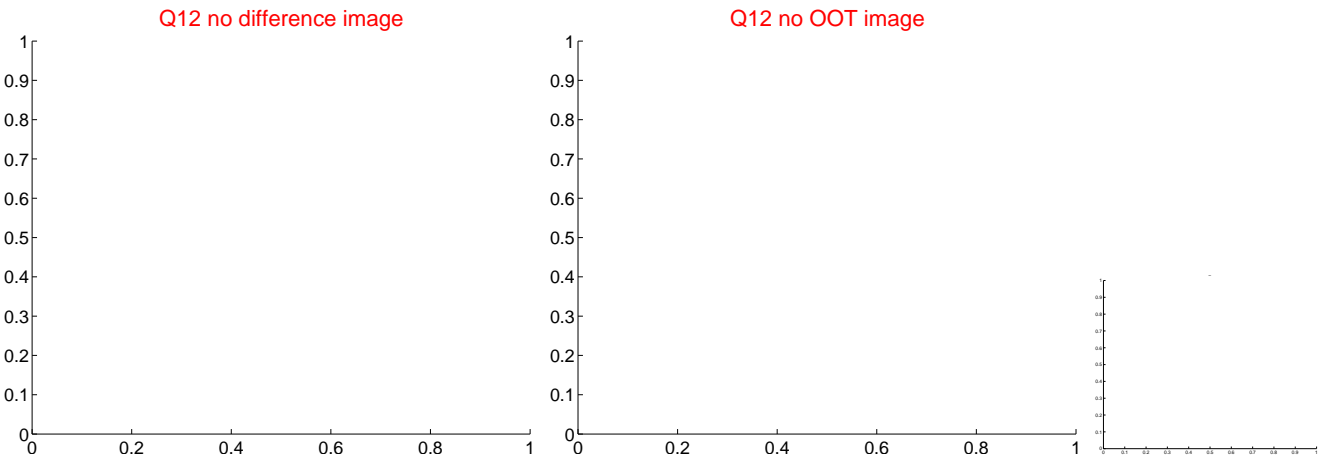
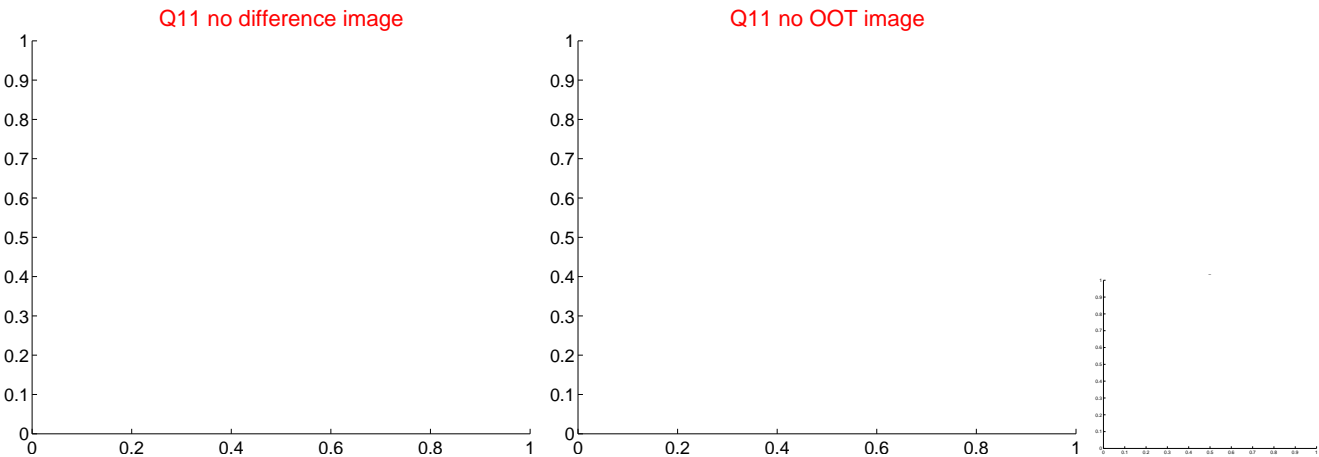
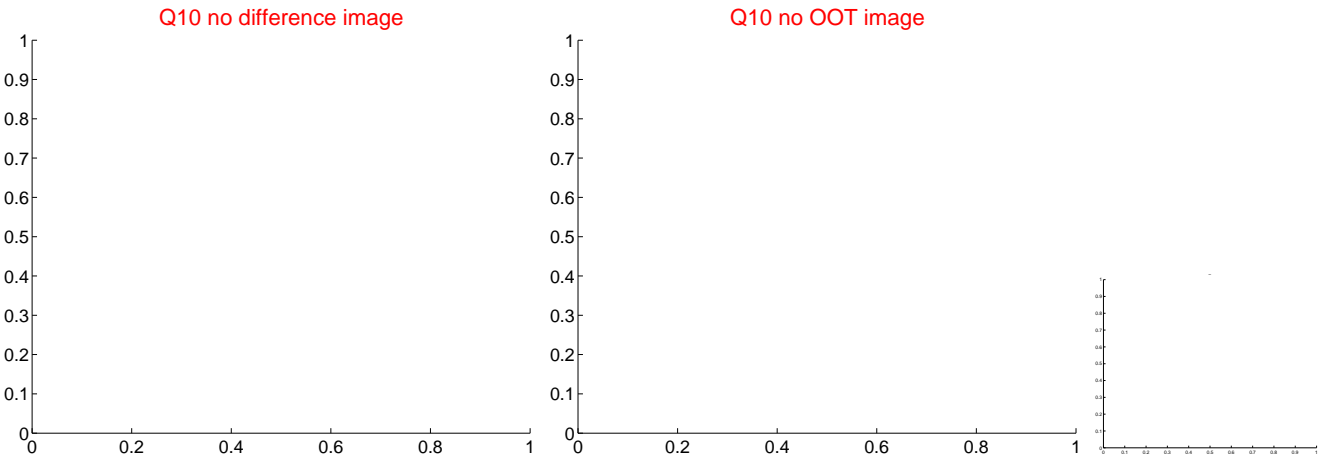
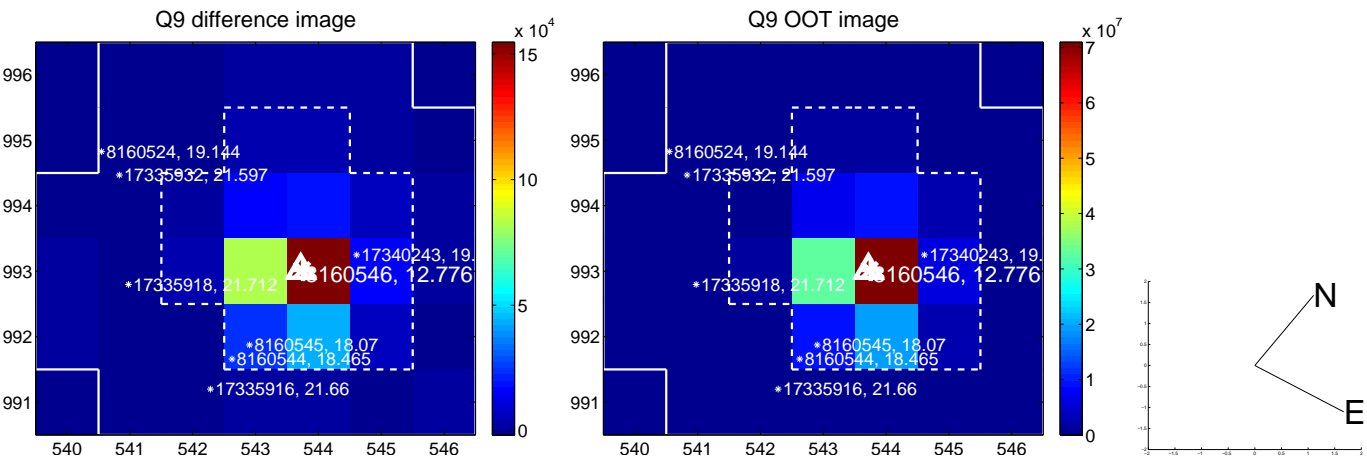
white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



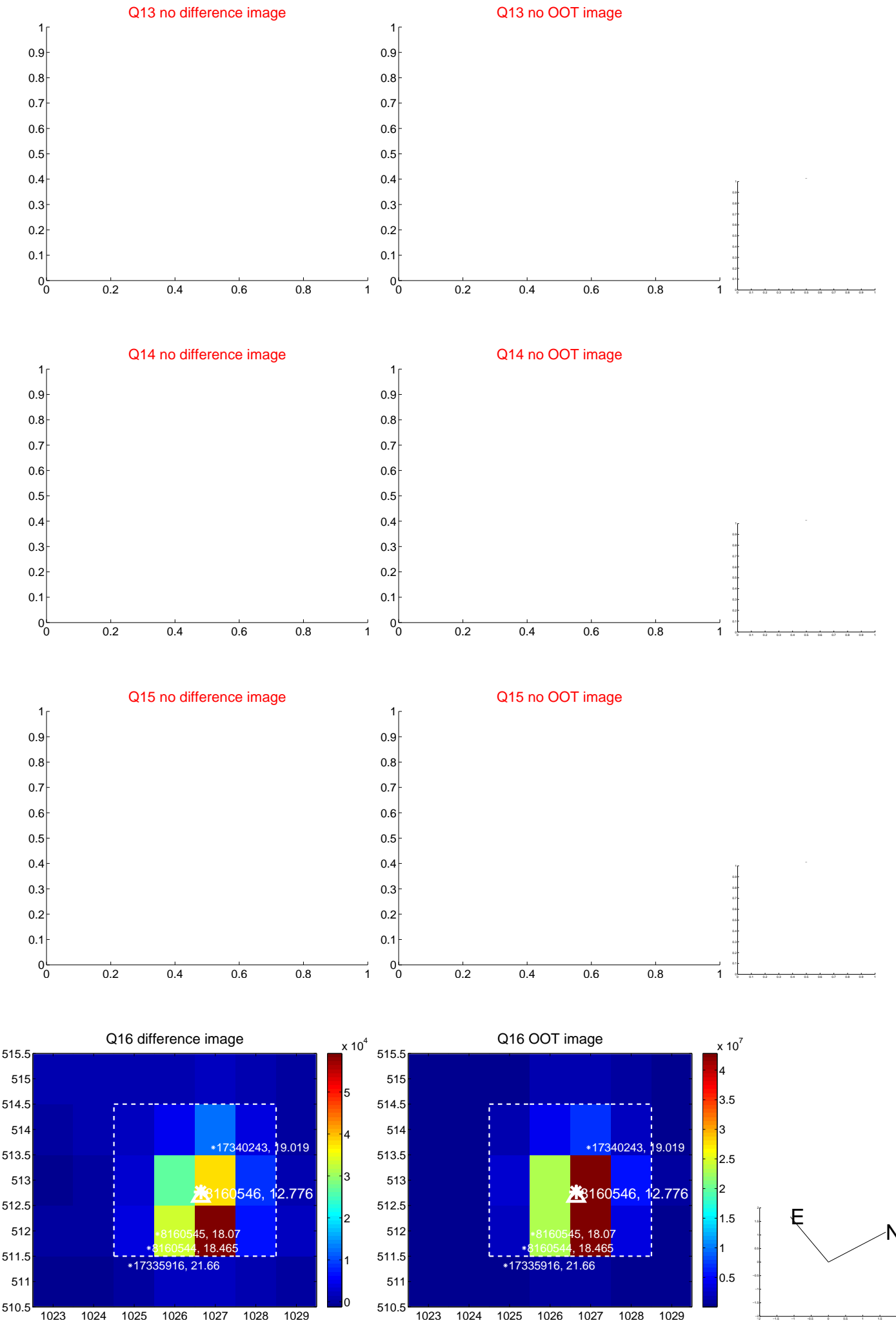
white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



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



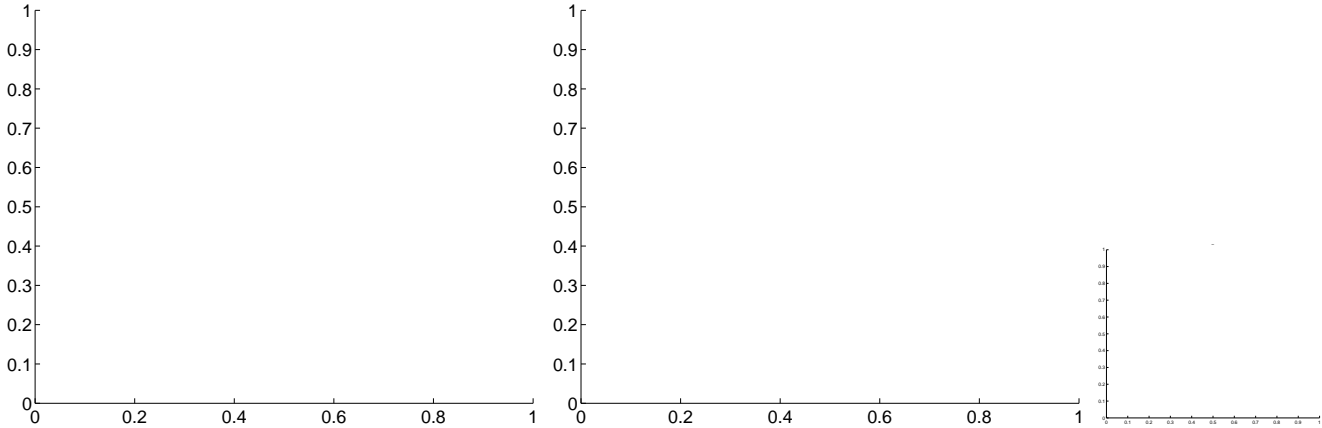
white ×: KIC target position; +: OOT centroid; △: difference centroid. red ✕: large negative pixel value.



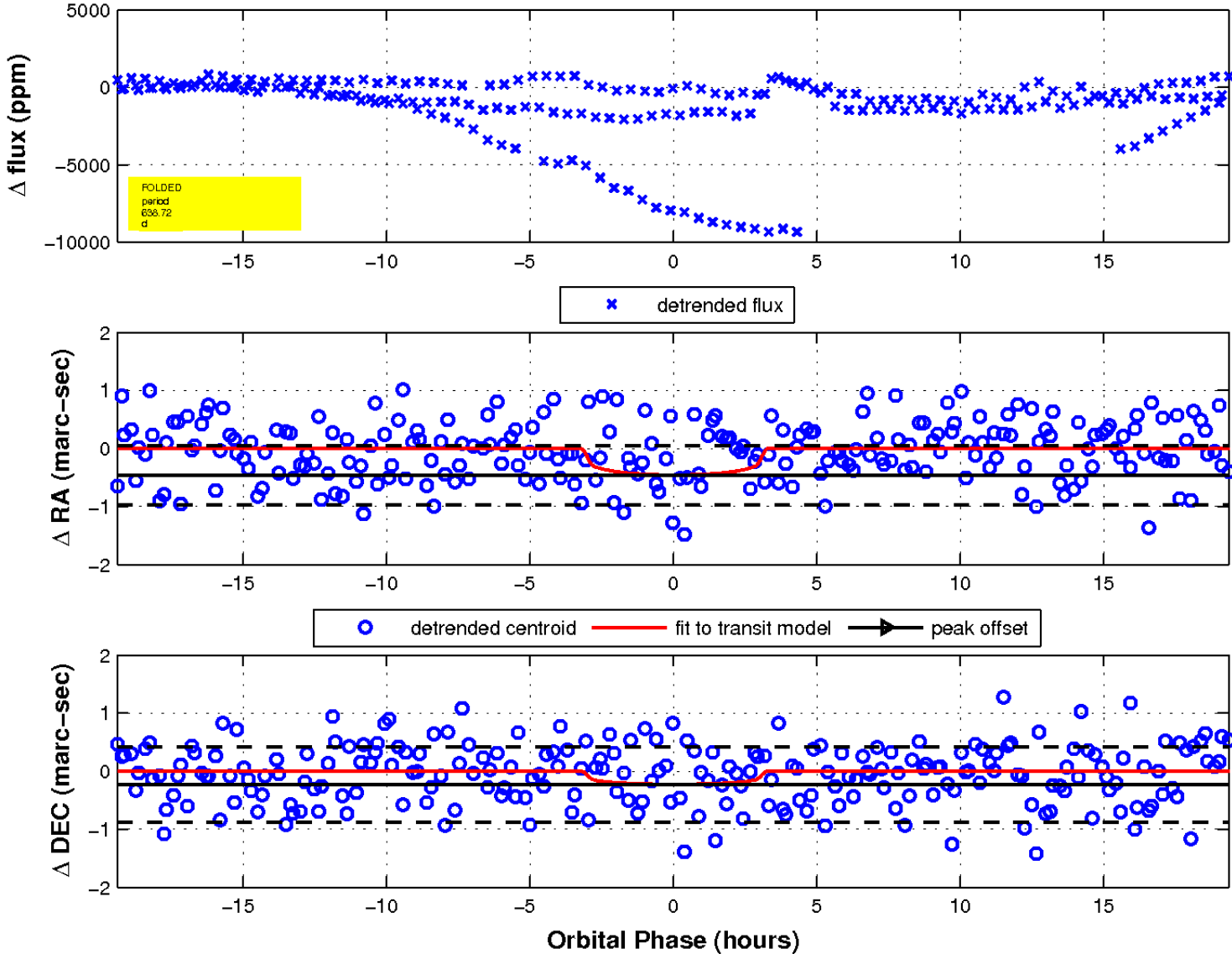
white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.

Q17 no difference image

Q17 no OOT image

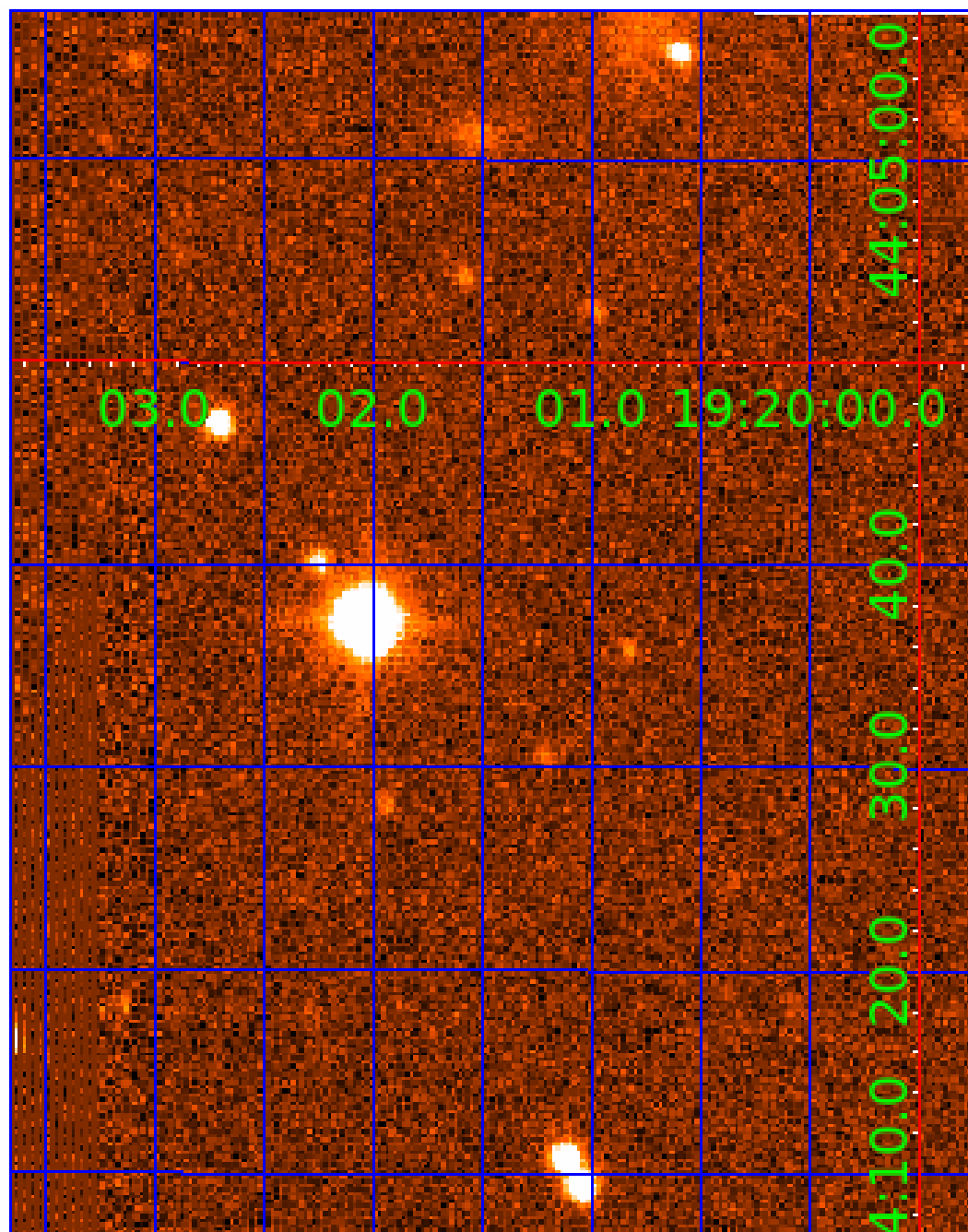


fluxWeightedCentroids, Planet 2 of 4



UKIRT Image

Declination



KIC 008160546

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})
008160546-01	OBS	No	613.544695	172.985535	596.8	4.462	13.8	6.5	0.74	5532	1.81	0.27
008160546-02	OBS	No	638.719894	262.723530	960.2	6.470	10.3	7.5	0.74	5532	2.44	0.25
008160546-03	OBS	No	538.182767	389.545410	489.6	4.173	11.4	5.1	0.74	5532	1.68	0.32
008160546-04	OBS	No	258.880202	374.328424	357.3	3.751	11.2	5.2	0.74	5532	1.62	0.84

Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
008160546-01	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—CENT_FEW_DIFFS
008160546-02	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
008160546-03	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—CENT_FEW_DIFFS
008160546-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL_SKYE—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS

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

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

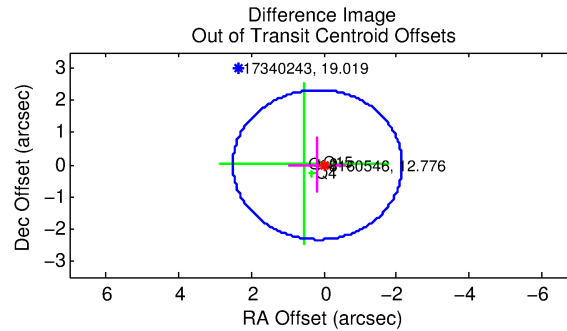
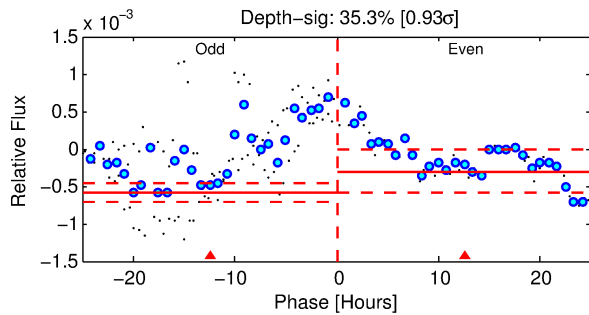
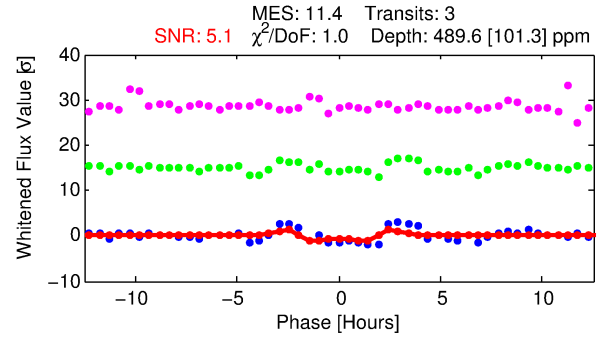
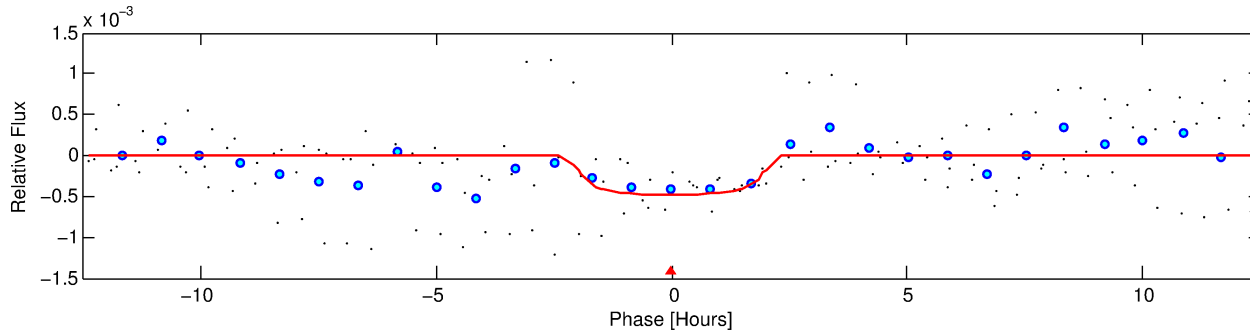
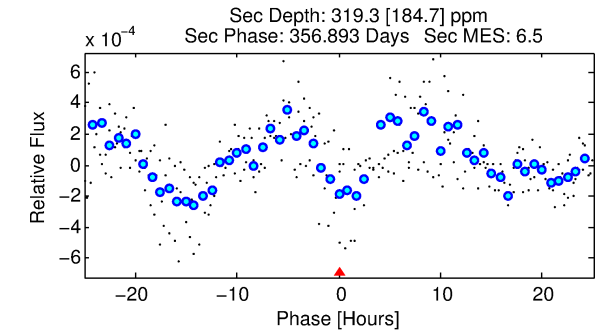
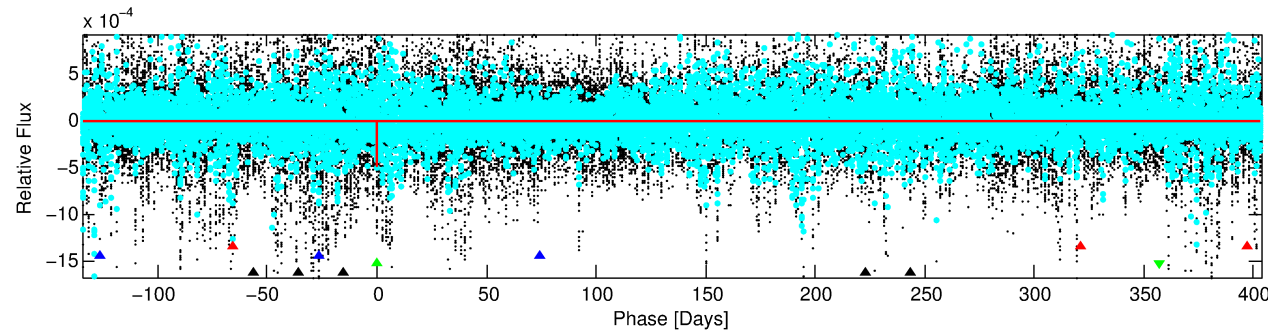
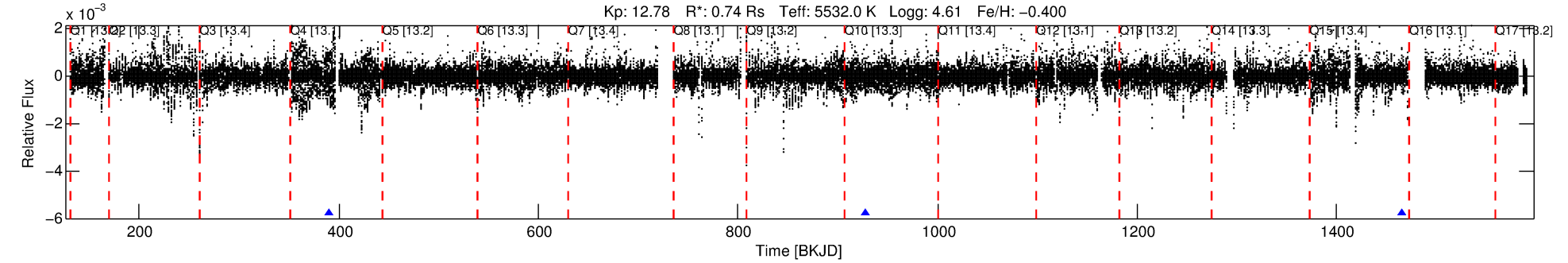
See http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col for comment definitions.

Ephemeris Match Information For 008160546-03

No Significant Match Found

DV One-Page Summary

KIC: 8160546 Candidate: 3 of 4 Period: 538.183 d



DV Fit Results:

Period = 538.18277 [0.00516] d
Epoch = 389.5454 [0.0066] BKJD
Rp/R* = 0.0207 [0.0552]
a/R* = 878.86 [10094.72]
b = 0.50 [17.73]
Seff = 0.32 [0.08]
Teq = 191 [11] K
Rp = 1.68 [4.50] Re
a = 1.2118 [0.1832] AU
Ag = 91081.16 [489291.72] [0.19σ]
Teffp = 5140 [6899] K [0.72σ]

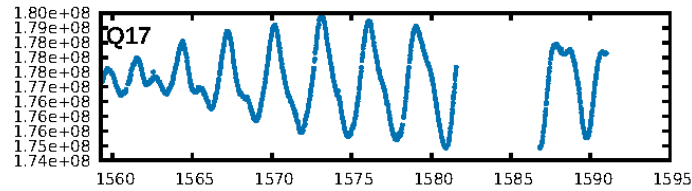
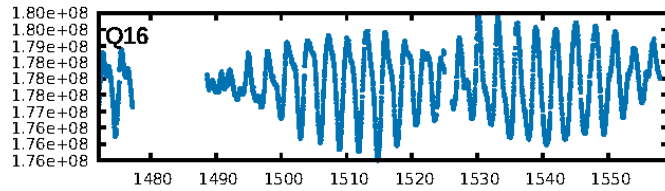
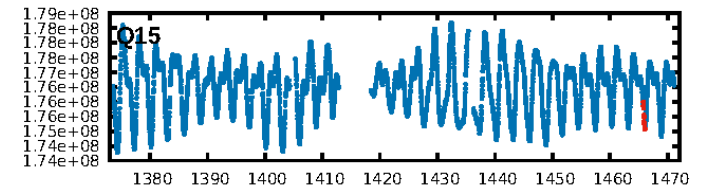
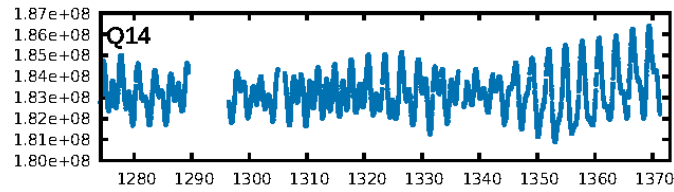
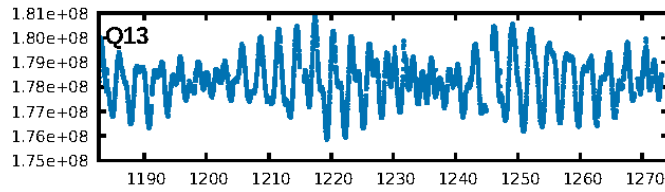
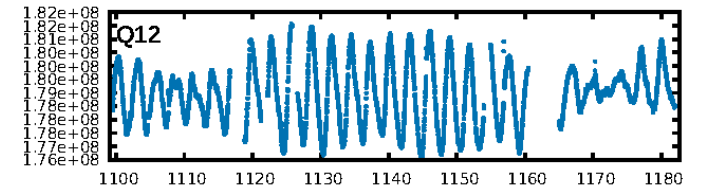
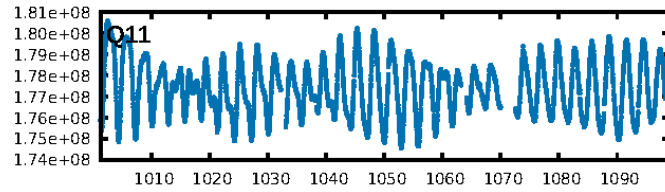
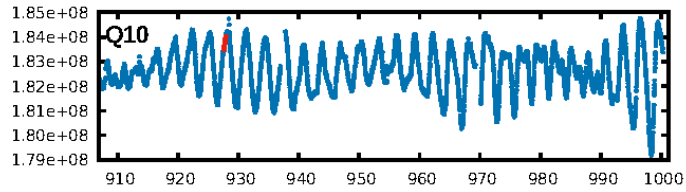
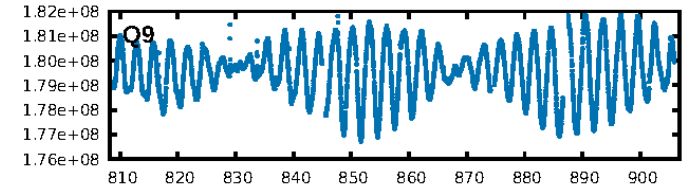
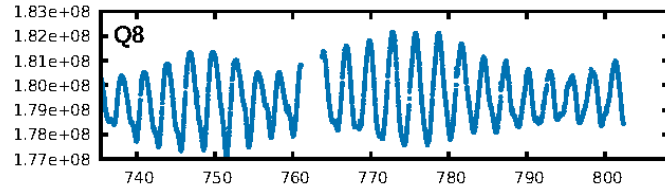
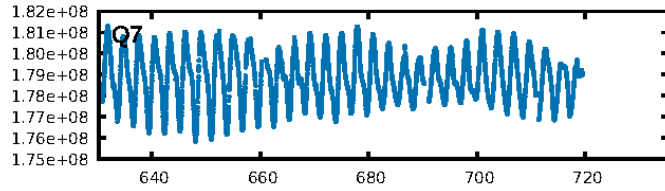
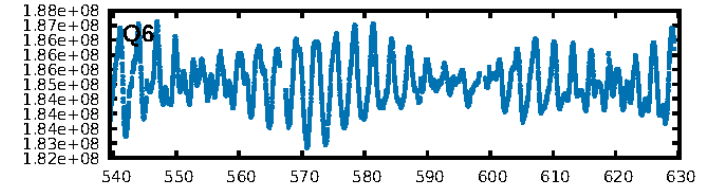
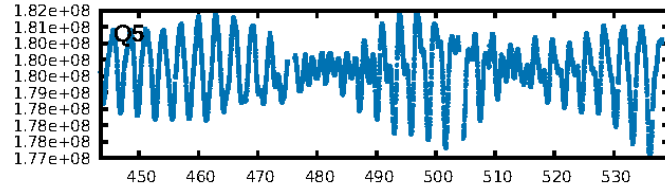
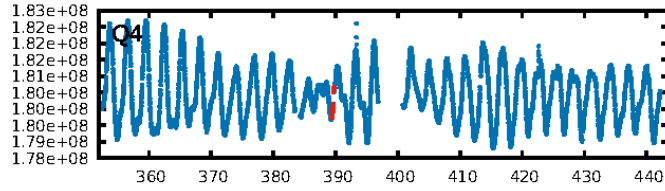
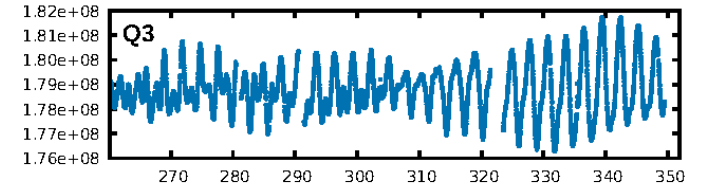
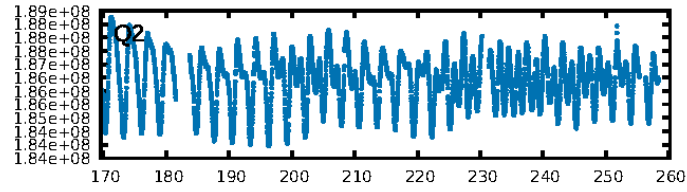
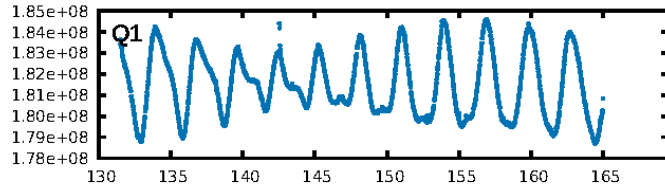
DV Diagnostic Results:

ShortPeriod-sig: 100.0% [1194.58σ]
LongPeriod-sig: 100.0% [296.04σ]
ModelChiSquare2-sig: 10.6%
ModelChiSquareGof-sig: 94.9%
Bootstrap-pfa: 6.00e-08
RollingBand-fgt: 1.00 [3/3]
GhostDiagnostic-chr: 0.8163
Centroid-sig: 20.4%
Centroid-so: 0.891 arcsec [1.10σ]
OotOffset-rm: 0.170 arcsec [0.22σ]
OotOffset-st: 1/1/1/0 [3]
KicOffset-rm: 0.130 arcsec [0.17σ]
KicOffset-st: 1/1/1/0 [3]
DiffImageQuality-fgm: 0.67 [2/3]
DiffImageOverlap-fno: 1.00 [3/3]

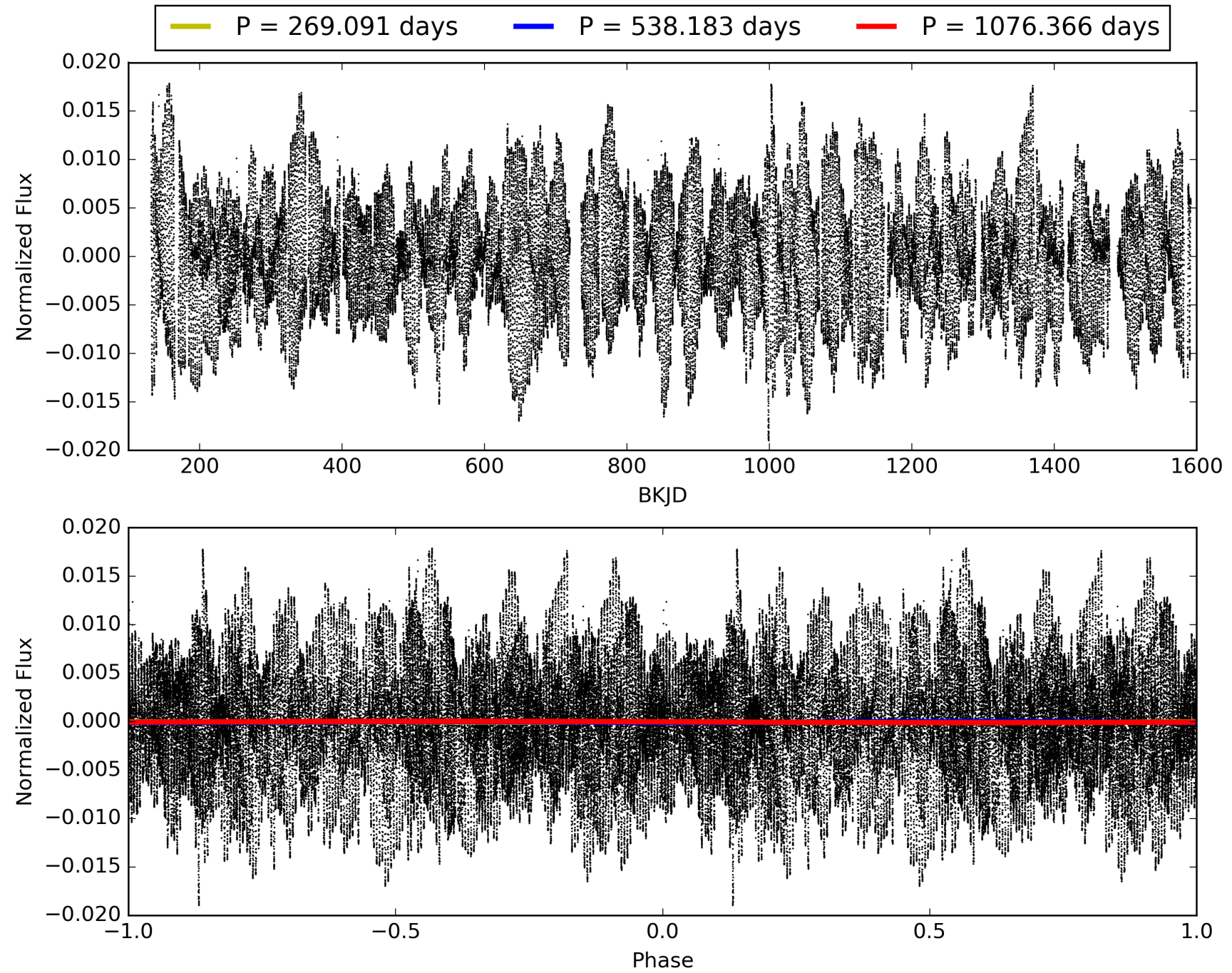
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 31-Jan-2016 21:42:35 Z

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

TCE 008160546-03, PDC Light Curves

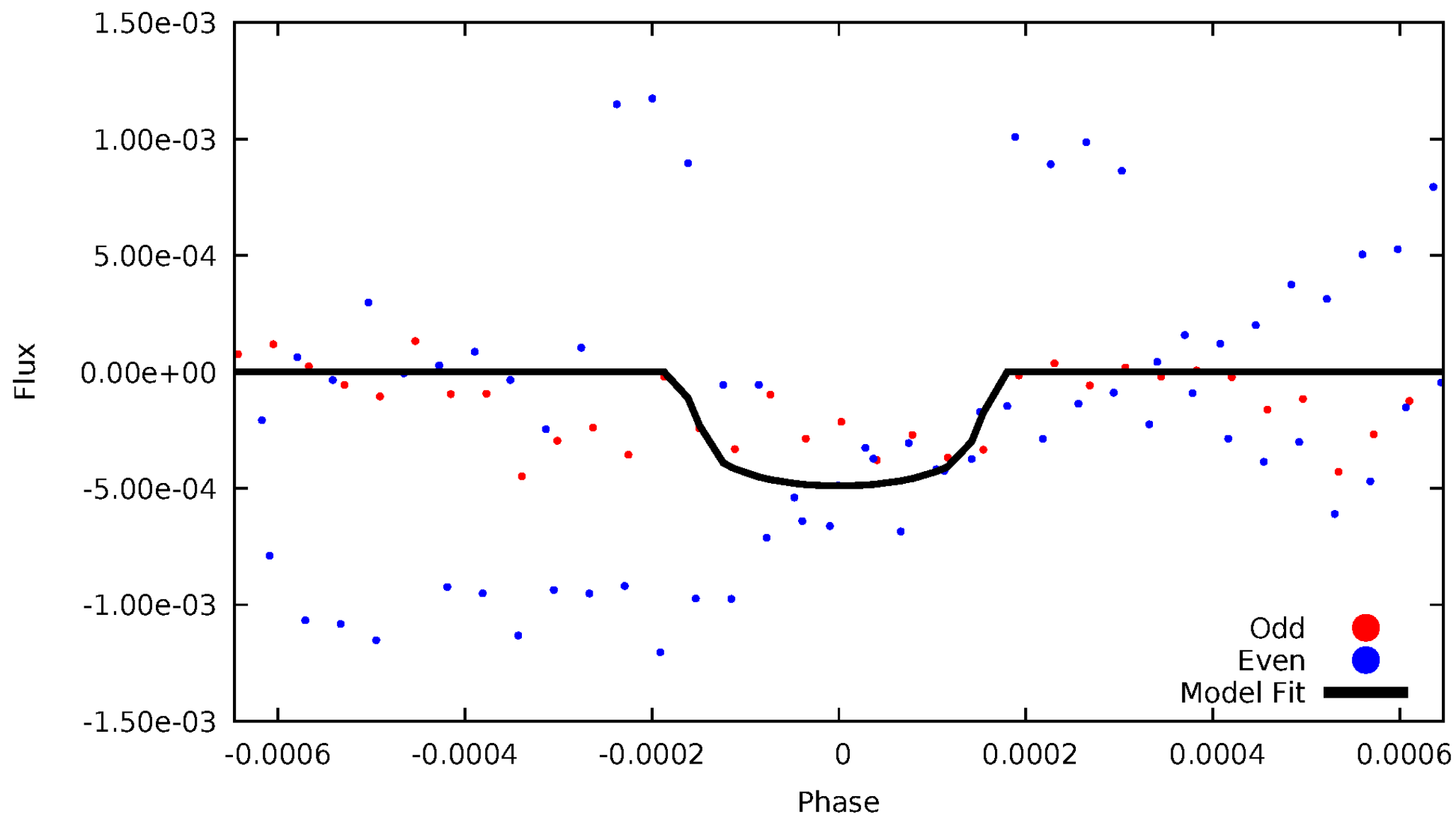


TCE 008160546-03



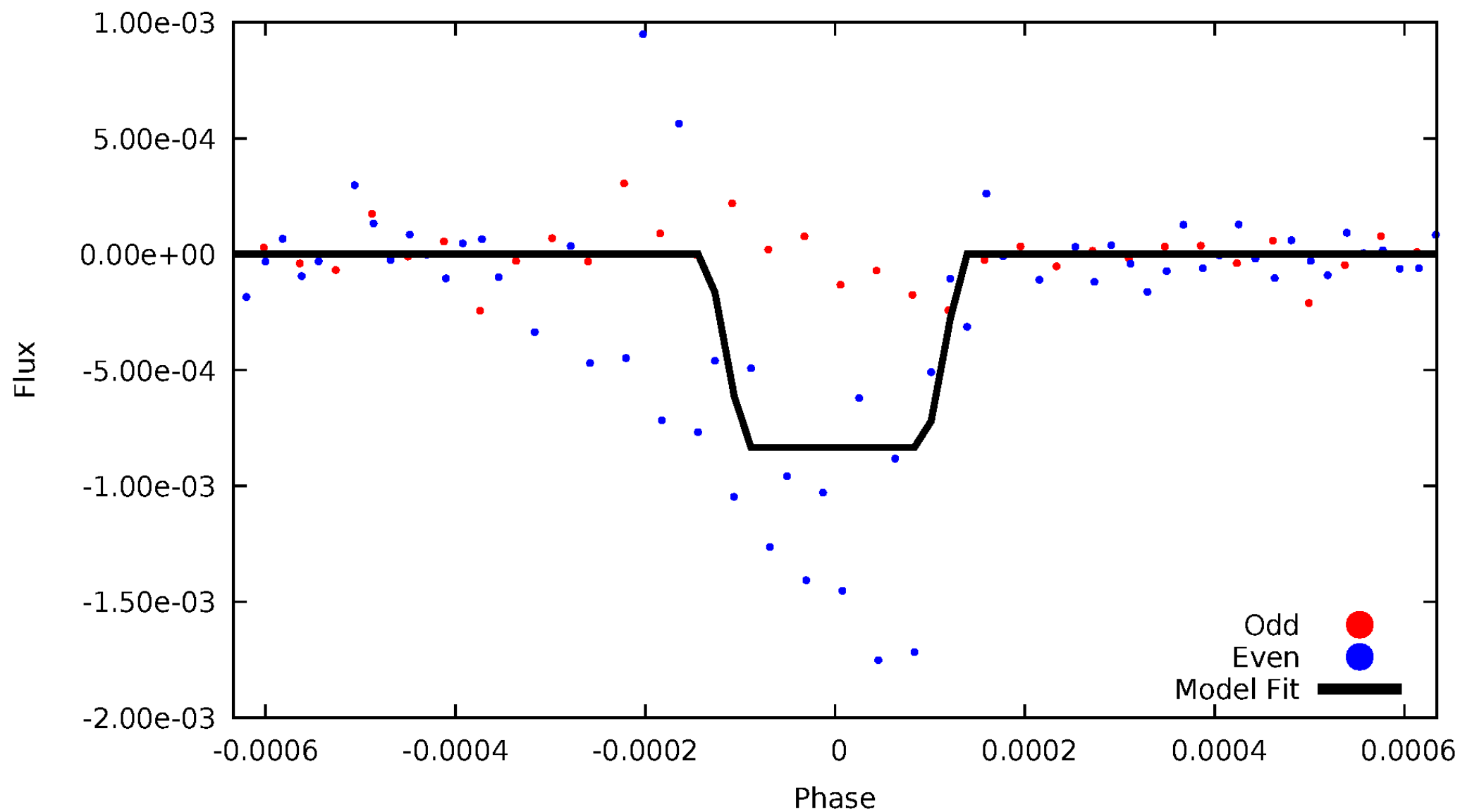
DV Odd/Even

TCE 008160546-03



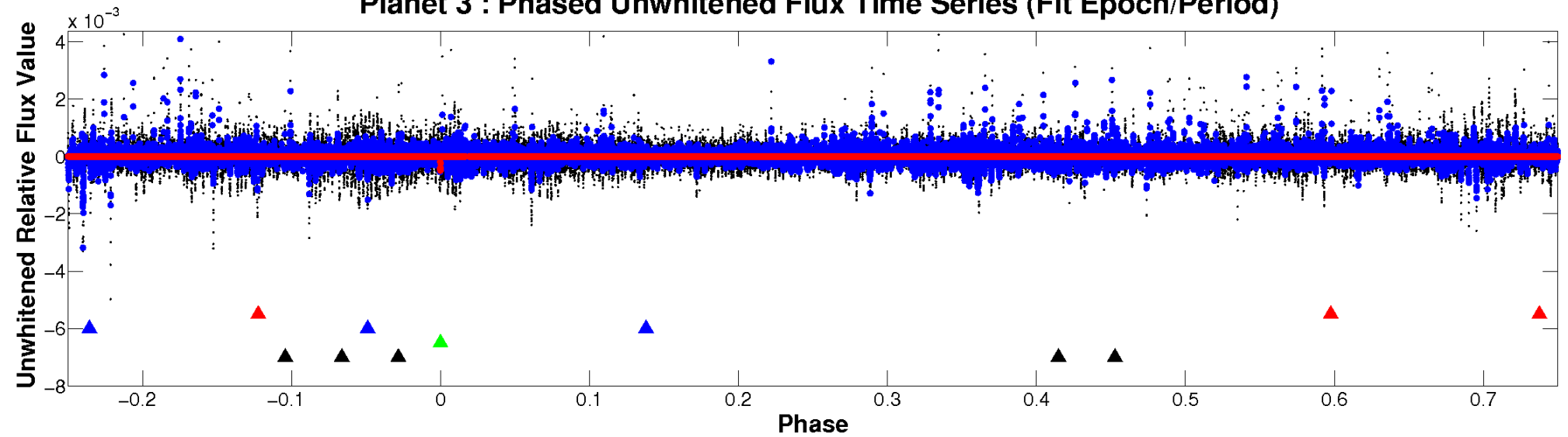
ALT Odd/Even

TCE 008160546-03

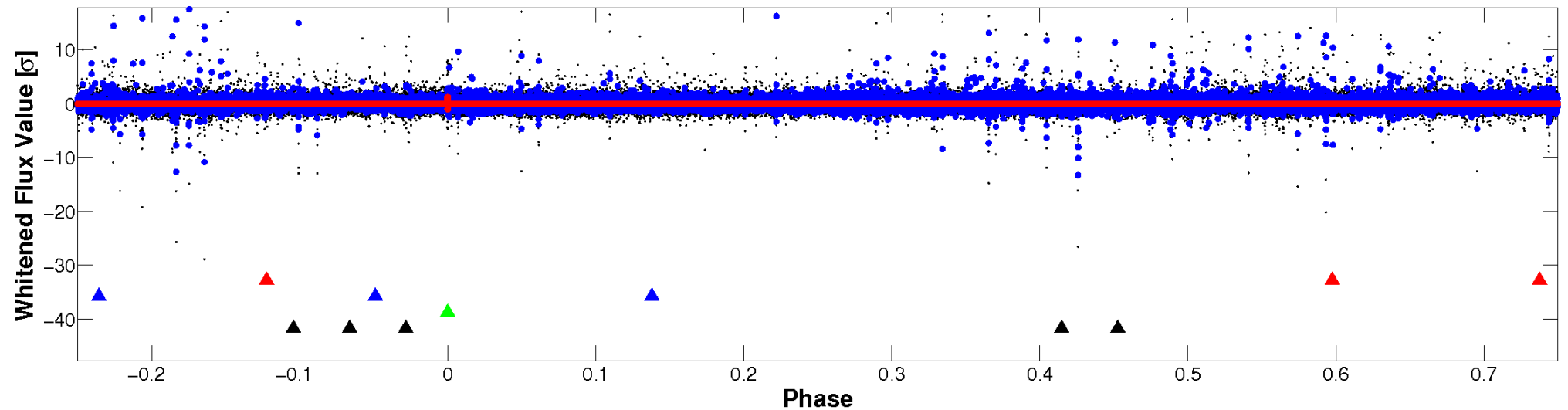


Non-Whitened Vs. Whitened Light Curve

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

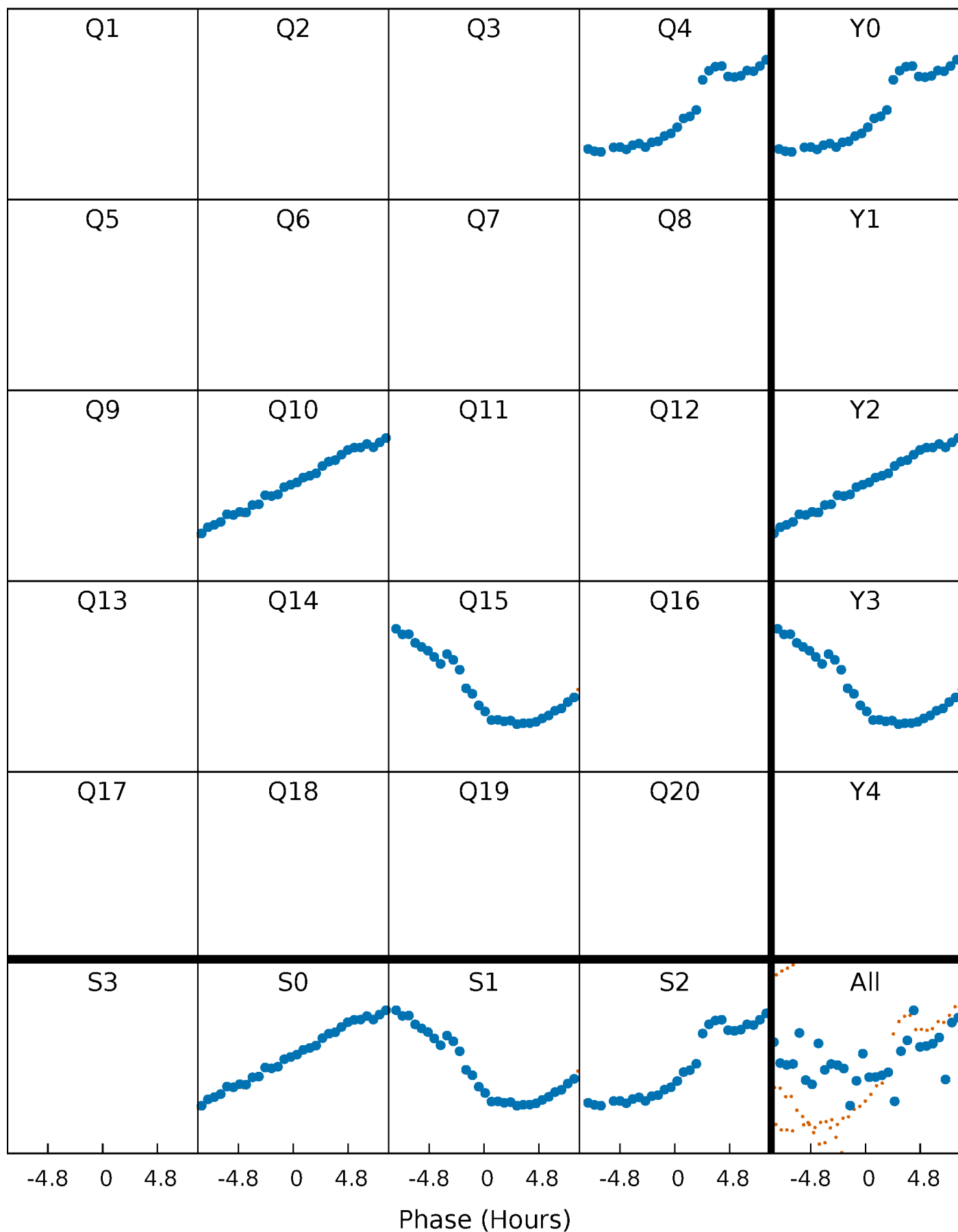


Planet 3 : Phased Whitened Flux Time Series (Fit Epoch/Period)



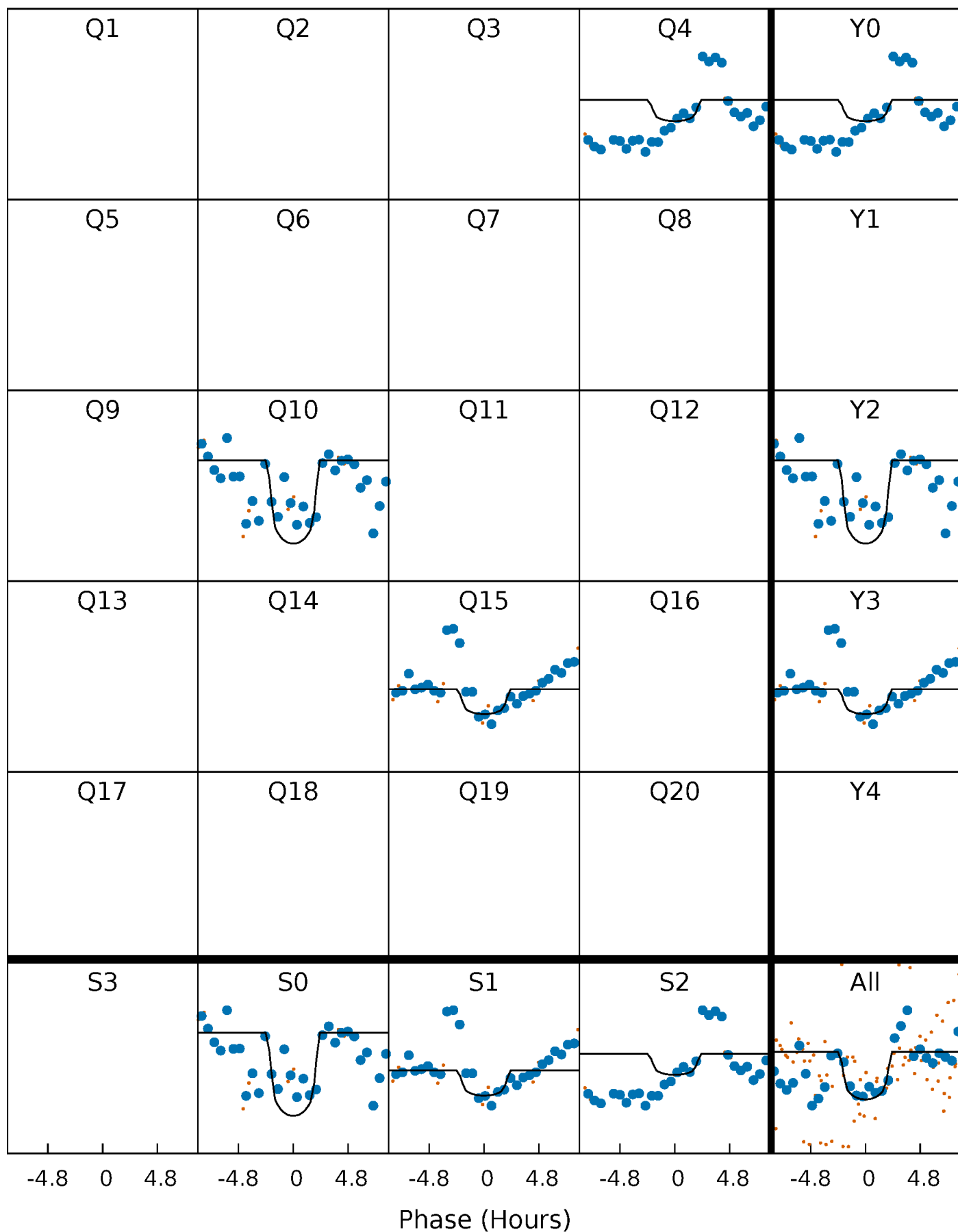
PDC Quarter-Phased Transit Curves

TCE 008160546-03 P=538.182767 Days $T_0=389.545410$ (BKJD)



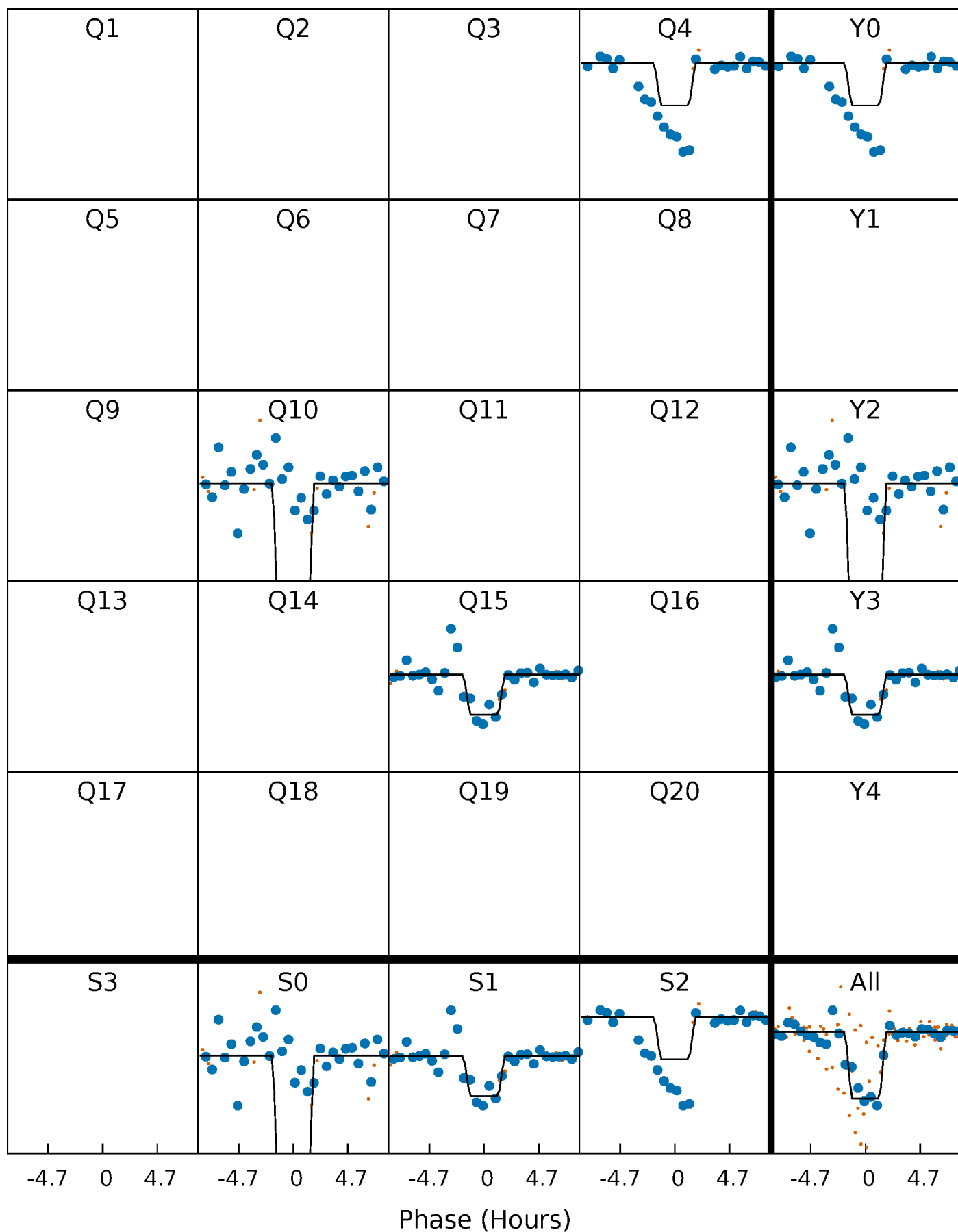
DV Quarter-Phased Transit Curves

TCE 008160546-03 P=538.182767 Days $T_0=389.545410$ (BKJD)



Alt. Detrend Quarter-Phased Transit Curves

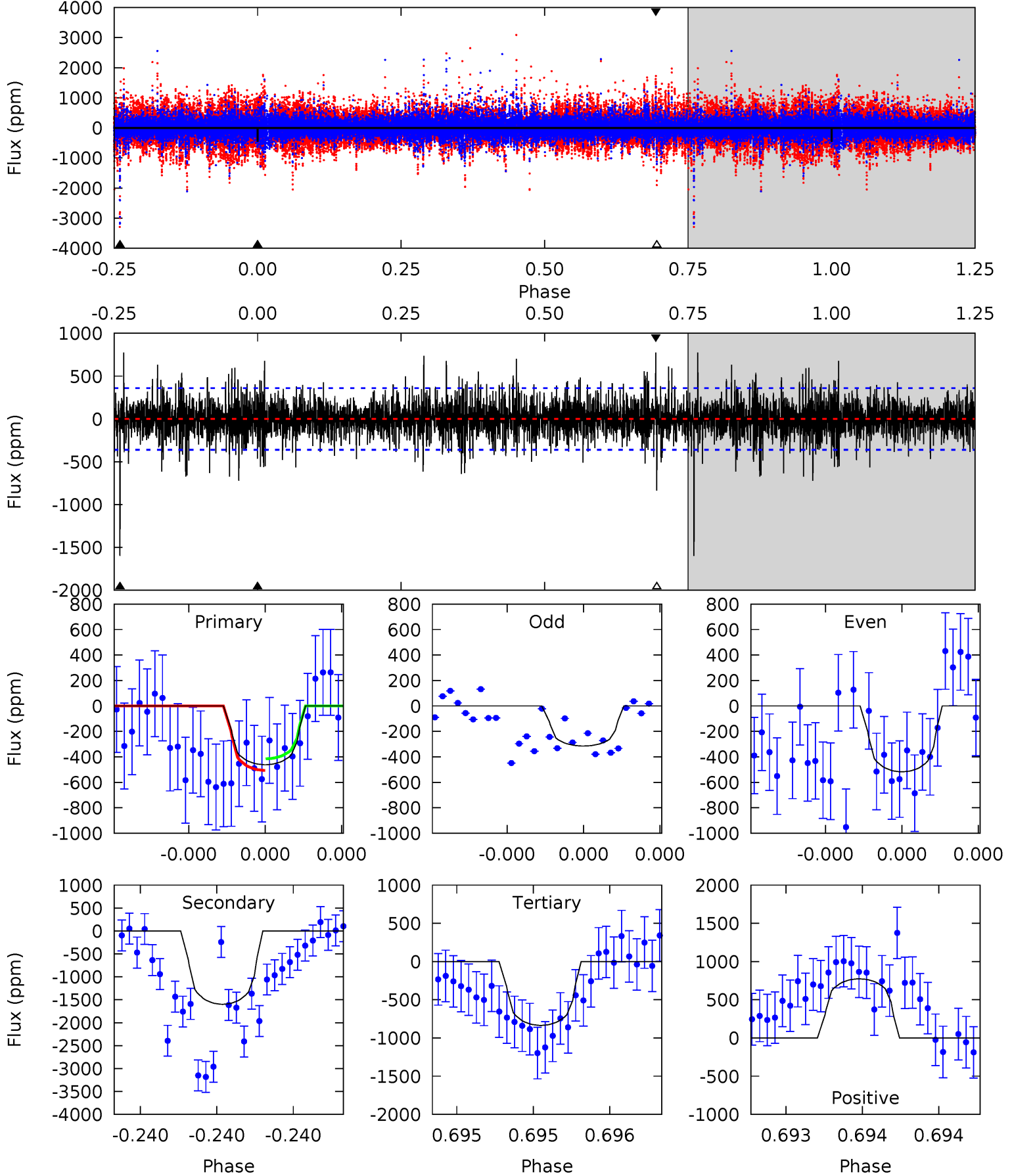
TCE 008160546-03 P=538.165481 Days $T_0=389.581582$ (BKJD)



DV Model-Shift Uniqueness Test

008160546-03, P = 538.182767 Days, E = 389.545410 Days

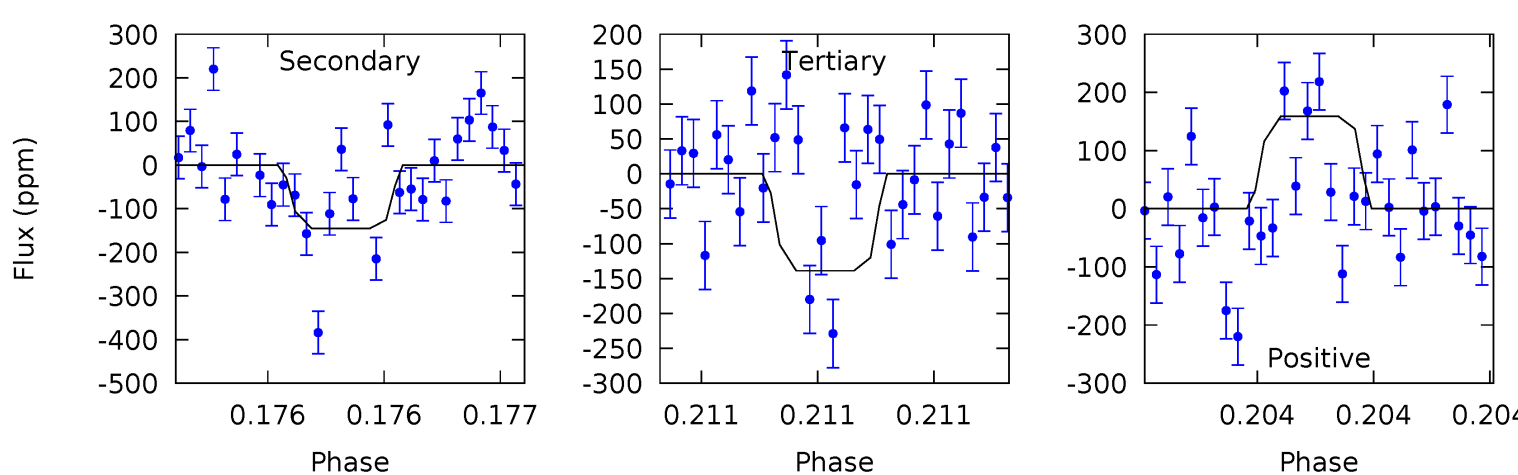
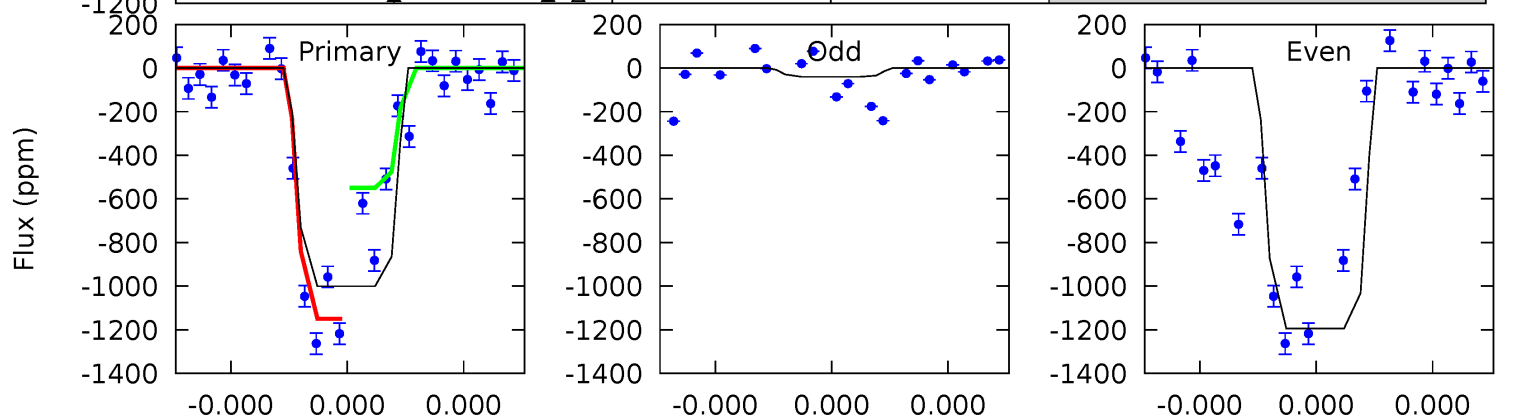
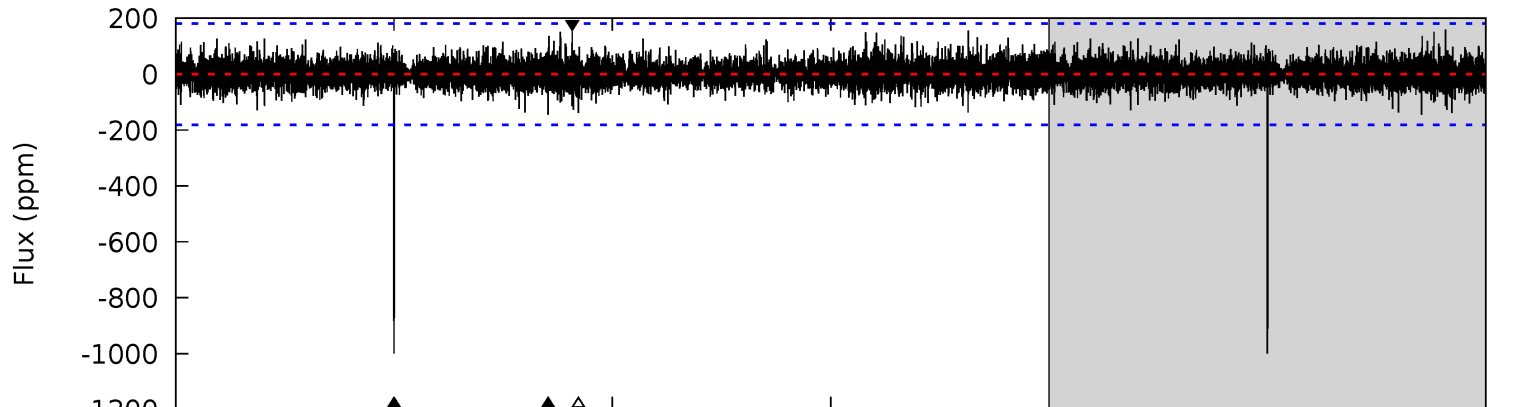
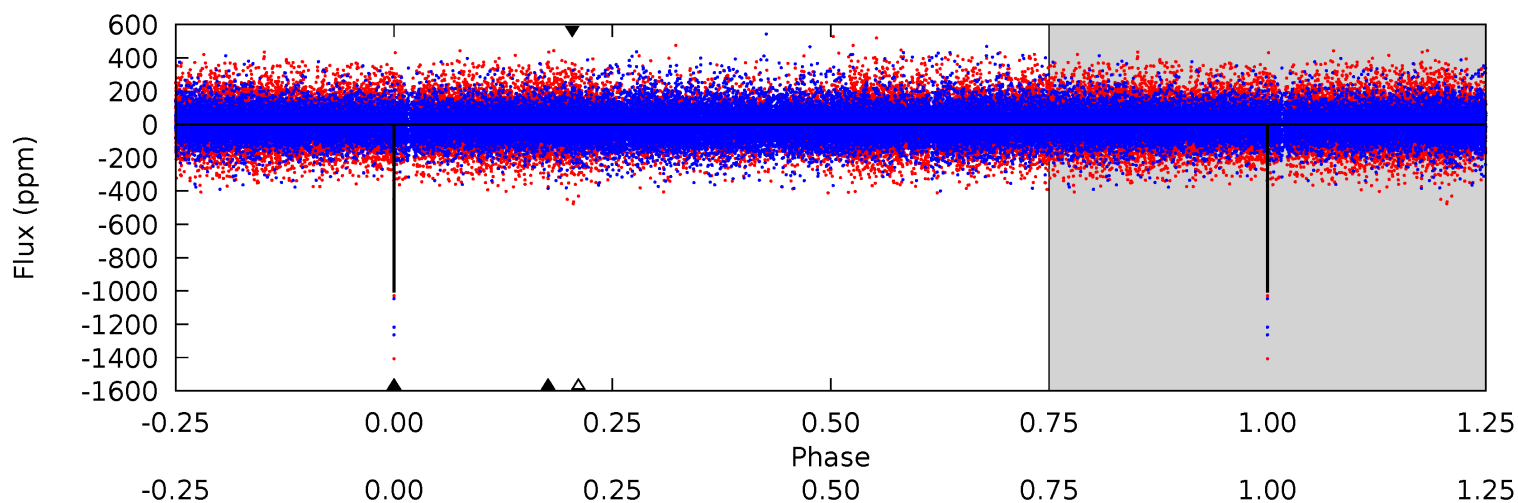
Pri	Sec	Ter	Pos	FA ₁	FA ₂	F _{Red}	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
7.25	25.1	13.1	12.2	5.64	3.58	2.48	-5.87	-4.90	12.0	13.0	1.34	1.11	0.33	0.72



Alt Model-Shift Uniqueness Test

008160546-03, P = 538.165481 Days, E = 389.581582 Days

Pri	Sec	Ter	Pos	FA ₁	FA ₂	F _{Red}	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
31.4	4.56	4.35	4.98	5.68	3.65	0.91	27.0	26.4	0.21	-0.42	23.6	0.99	0.14	9.23



Stellar Parameters For KIC 008160546

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (g \cdot \text{cm}^{-3})$
	5532^{+149}_{-149}	$4.607^{+0.037}_{-0.112}$	$-0.400^{+0.300}_{-0.300}$	$0.745^{+0.139}_{-0.060}$	$0.833^{+0.079}_{-0.097}$	$2.838^{+0.462}_{-1.034}$
	+3%/-3%	+1%/-2%	+75%/-75%	+19%/-8%	+9%/-12%	+16%/-36%
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 008160546-03 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	A_{obs}
DV	-1598 ± 64	$3.71^{+3.75}_{-2.59}$	270^{+11}_{-9}	5234^{+5003}_{-1238}	$91253^{+921777}_{-68318}$
Alt.	-145 ± 32	$4.33^{+3.59}_{-2.79}$	271^{+12}_{-10}	3224^{+1415}_{-505}	6275^{+43133}_{-4529}

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 $A_{obs} \gg 1.0$

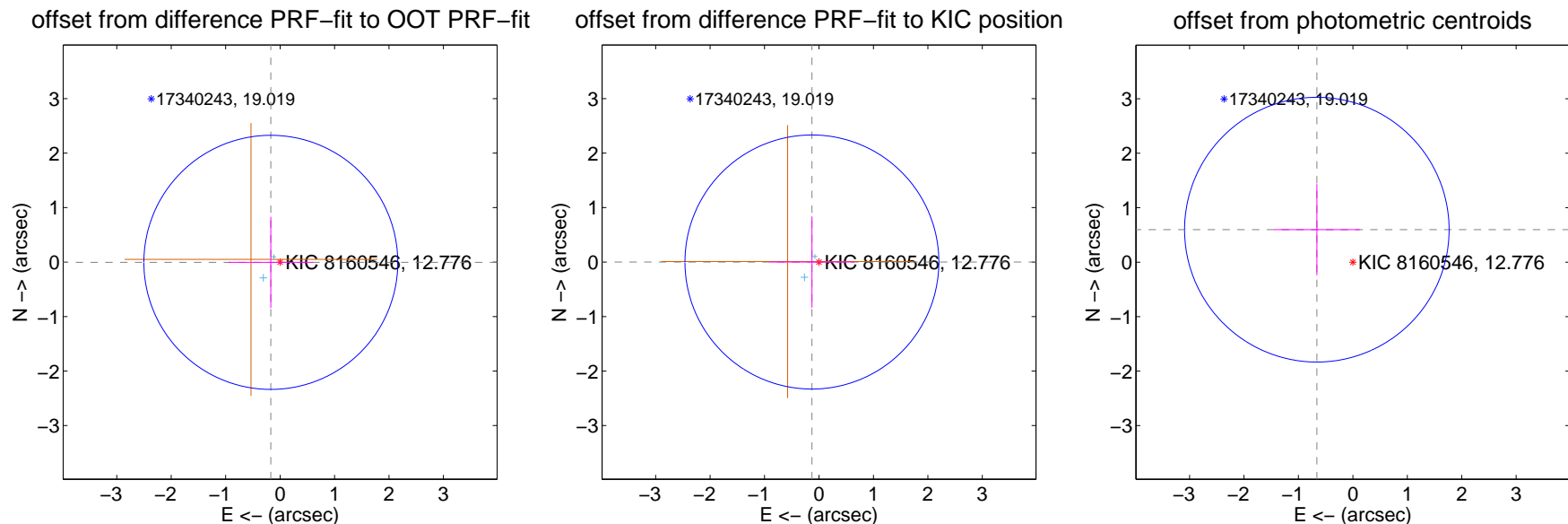
DV Centroid Data

Supplemental centroid analysis for 008160546-03. Kepler magnitude: 12.78. Transit SNR 5.13

There are 2 quarters with good PRF difference image offsets

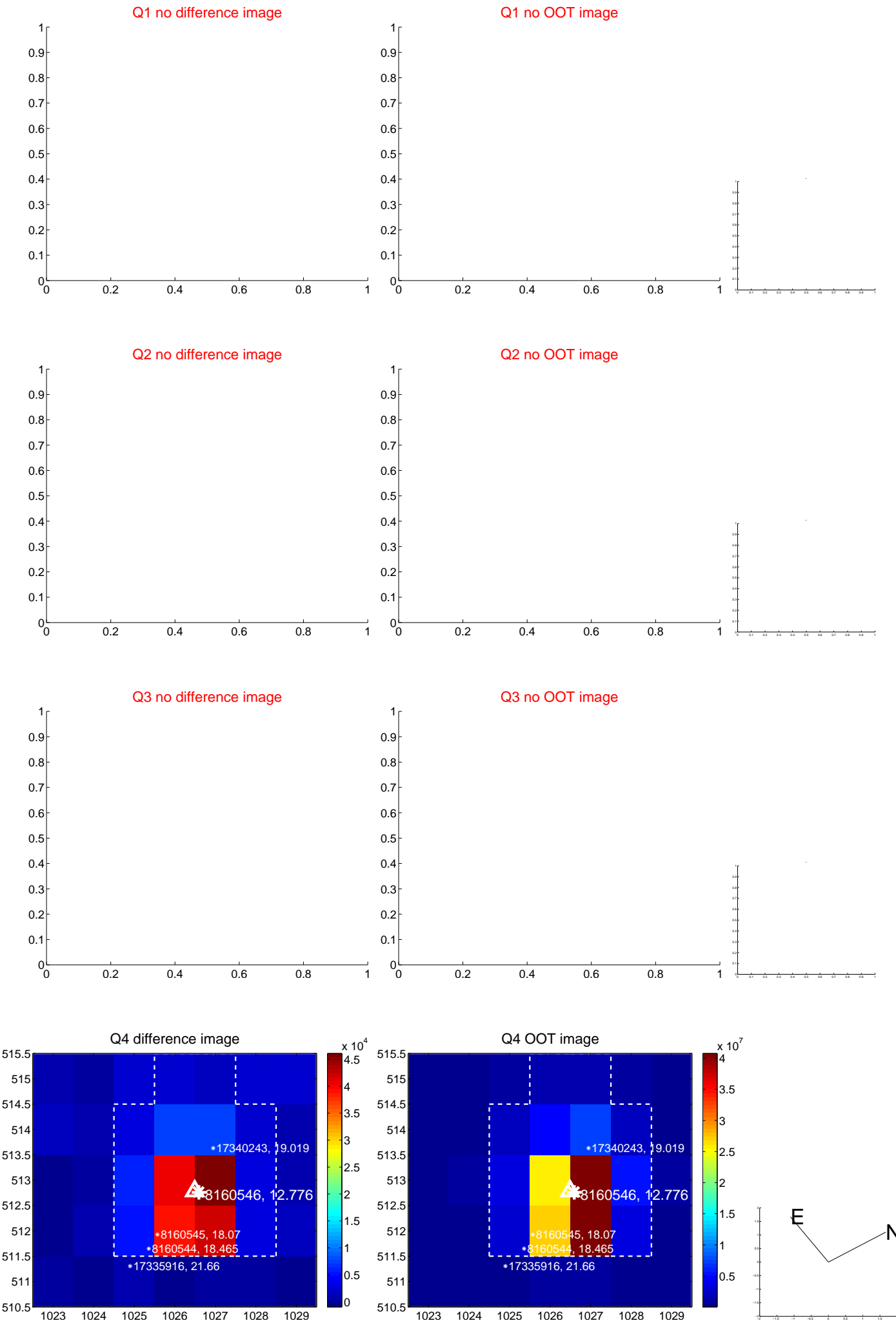
The direct PRF centroid is offset from the target star catalog position by about 0.04 arcsec

	Distance in arcsec	Distance / σ	Δ RA	Δ Dec
PRF-fit source offset from OOT	0.170 ± 0.777	0.22	0.170 ± 0.777	-0.005 ± 0.837
PRF-fit source offset from KIC position	0.130 ± 0.777	0.17	0.130 ± 0.777	0.001 ± 0.837
photometric centroid source offset	0.89 ± 0.81	1.10	0.66 ± 0.79	0.60 ± 0.84

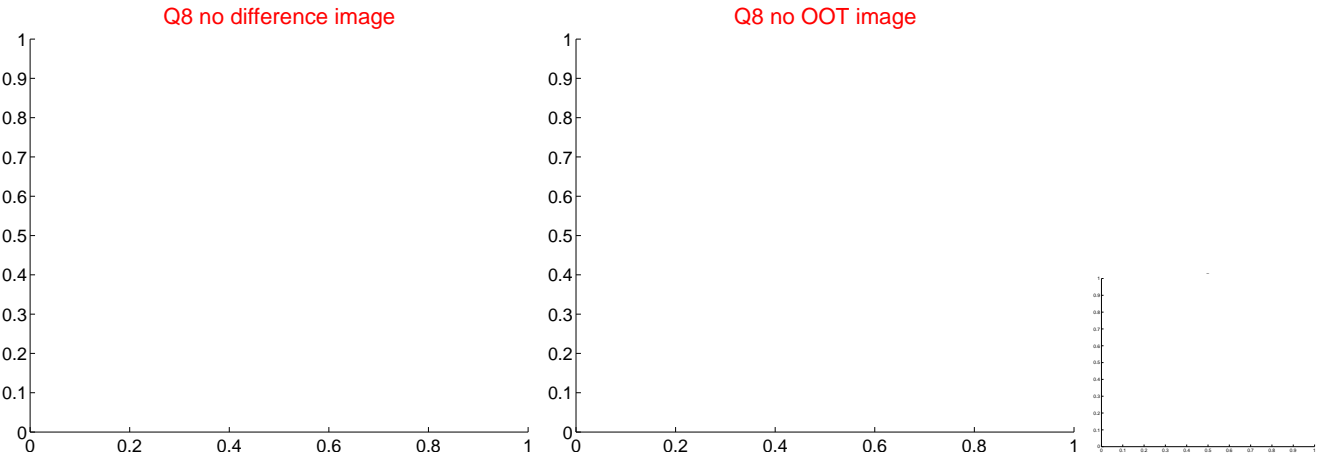
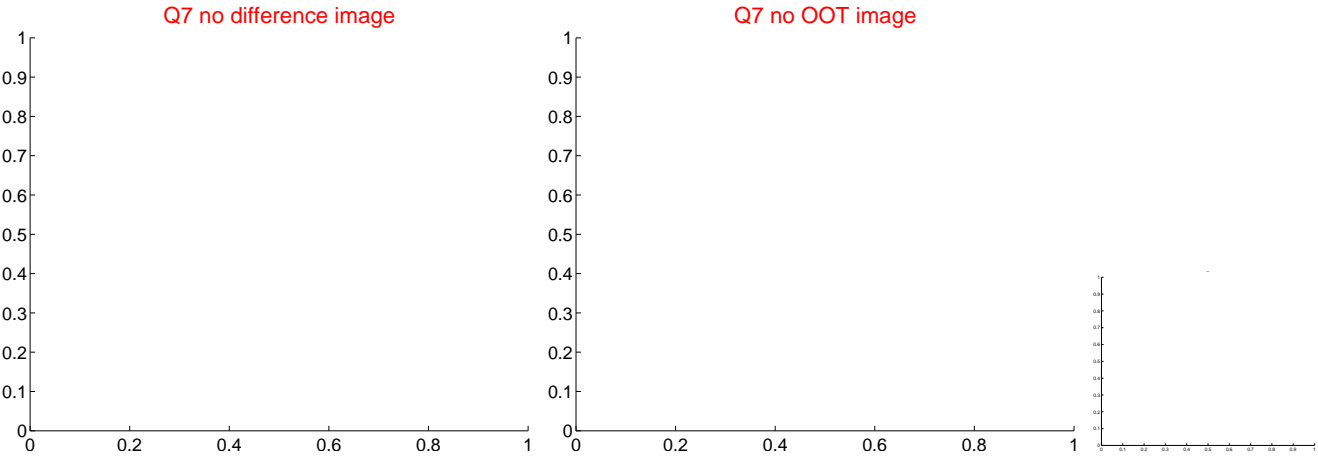
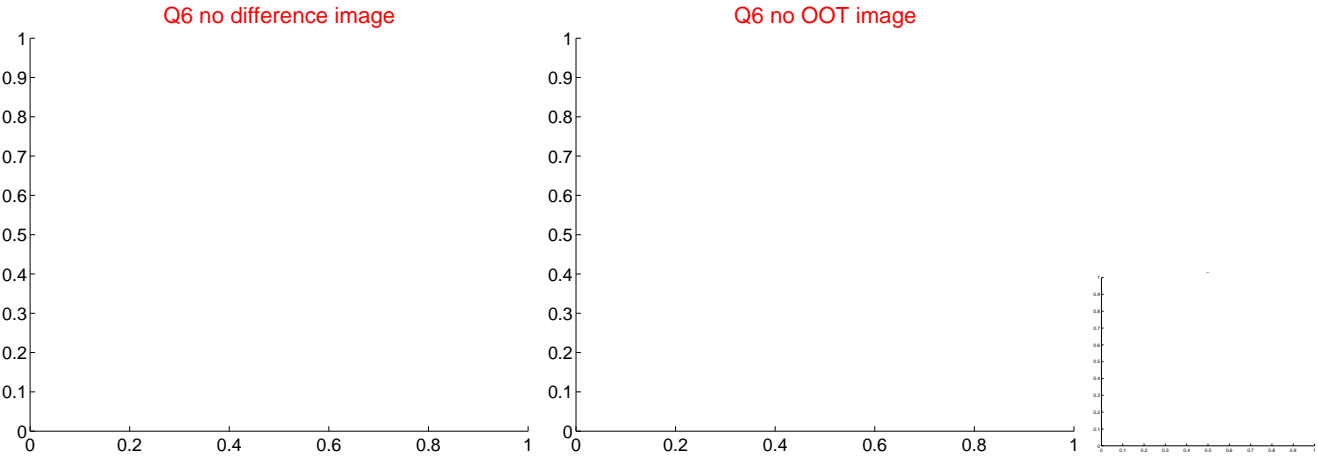
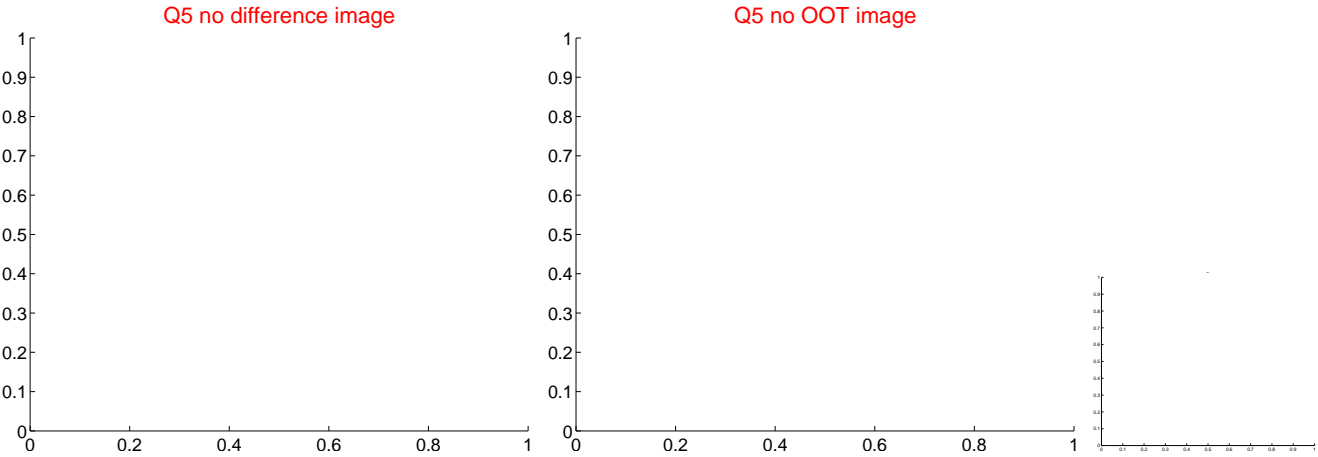


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- σ uncertainty. Blue circle: three- σ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

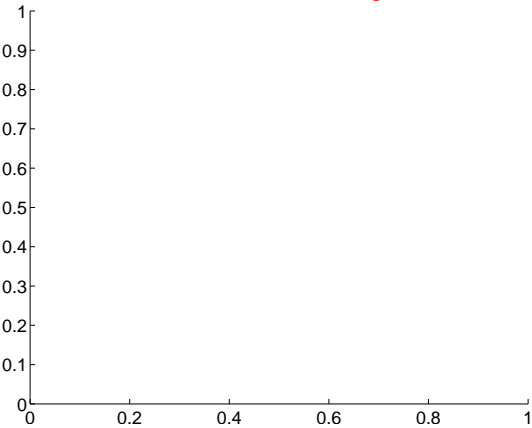


white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.

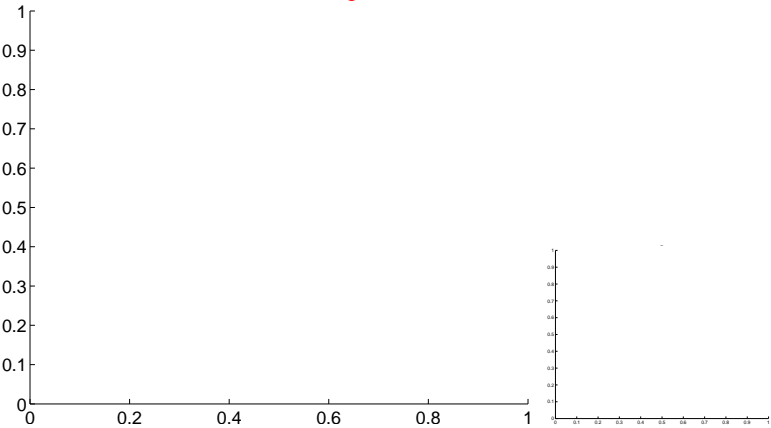


white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.

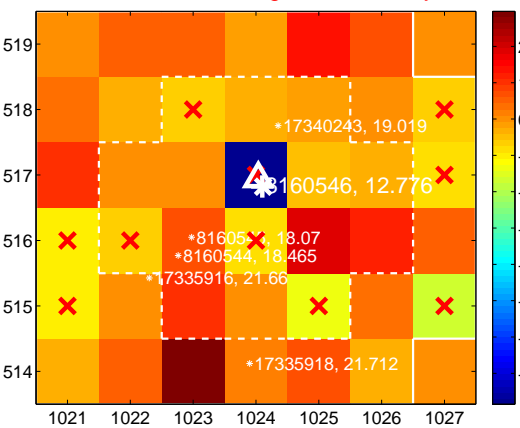
Q9 no difference image



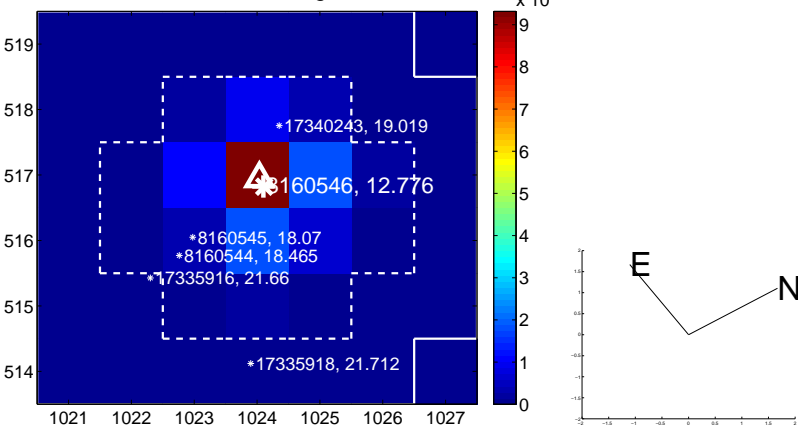
Q9 no OOT image



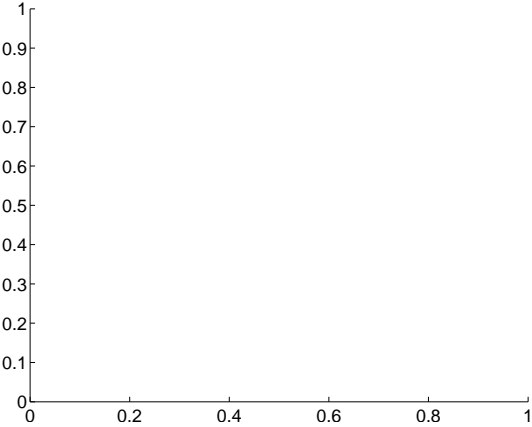
Q10 difference image. Poor Quality



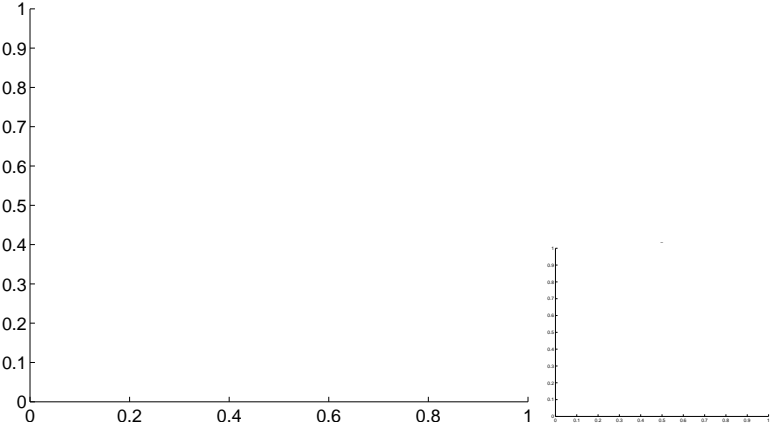
Q10 OOT image



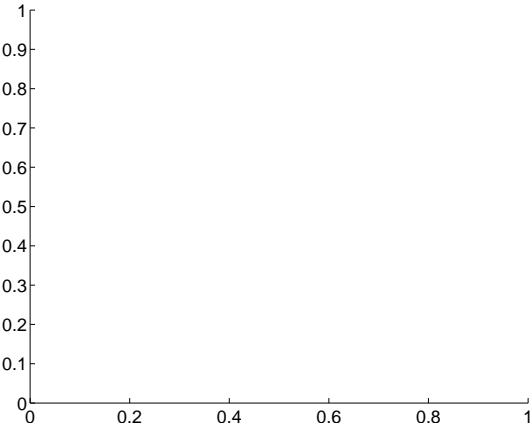
Q11 no difference image



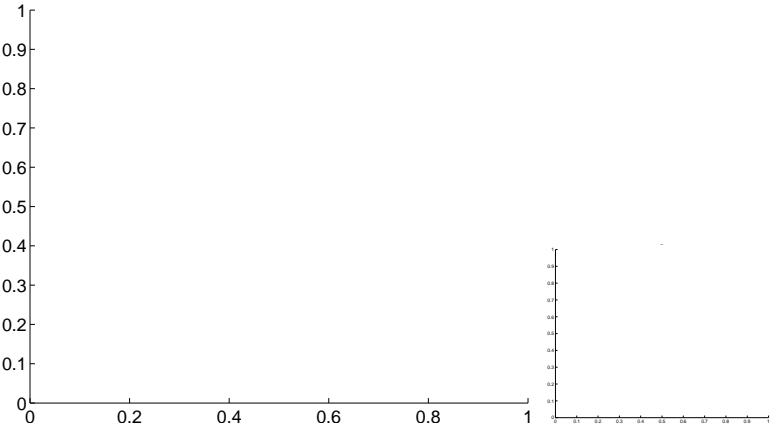
Q11 no OOT image



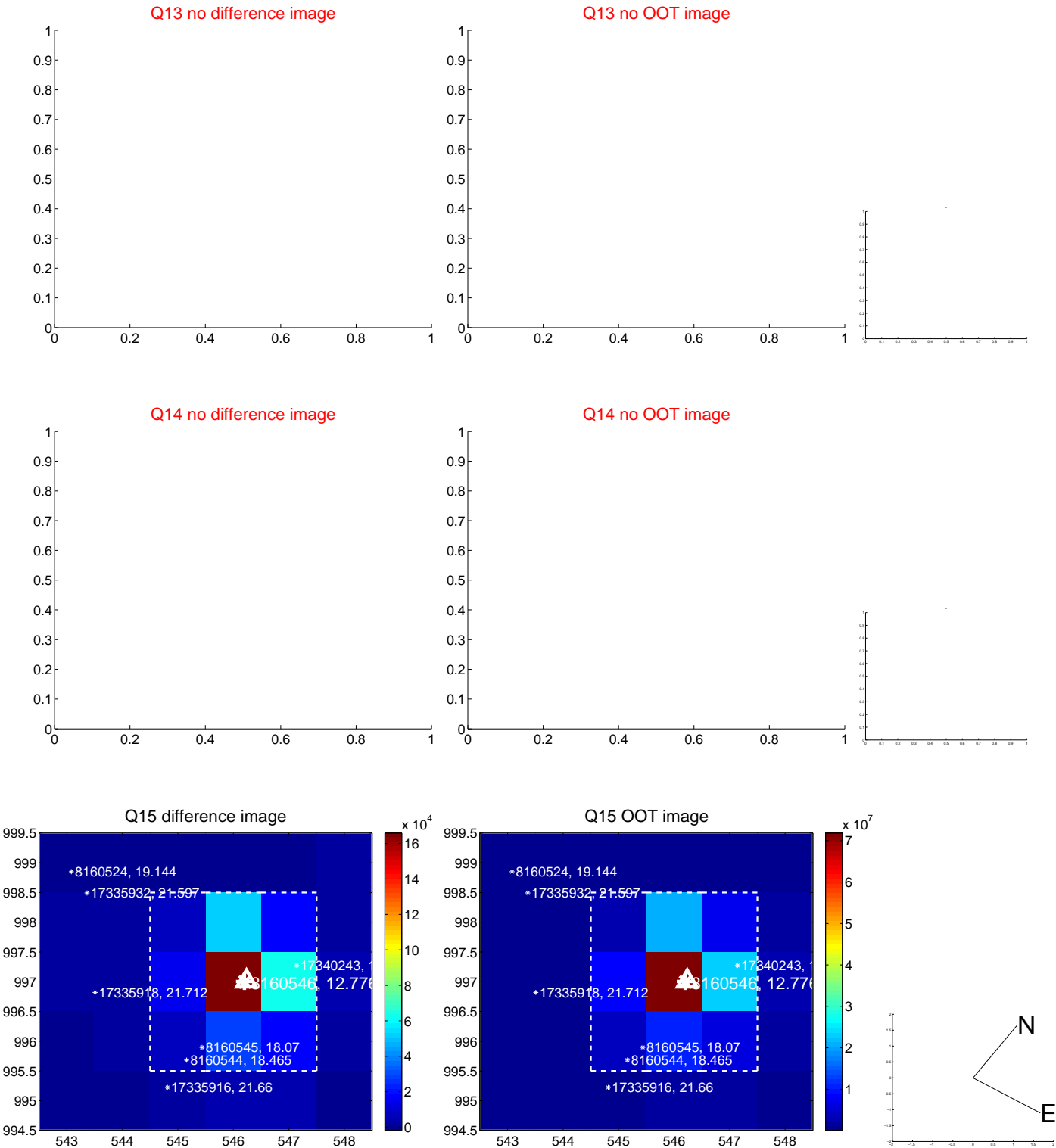
Q12 no difference image



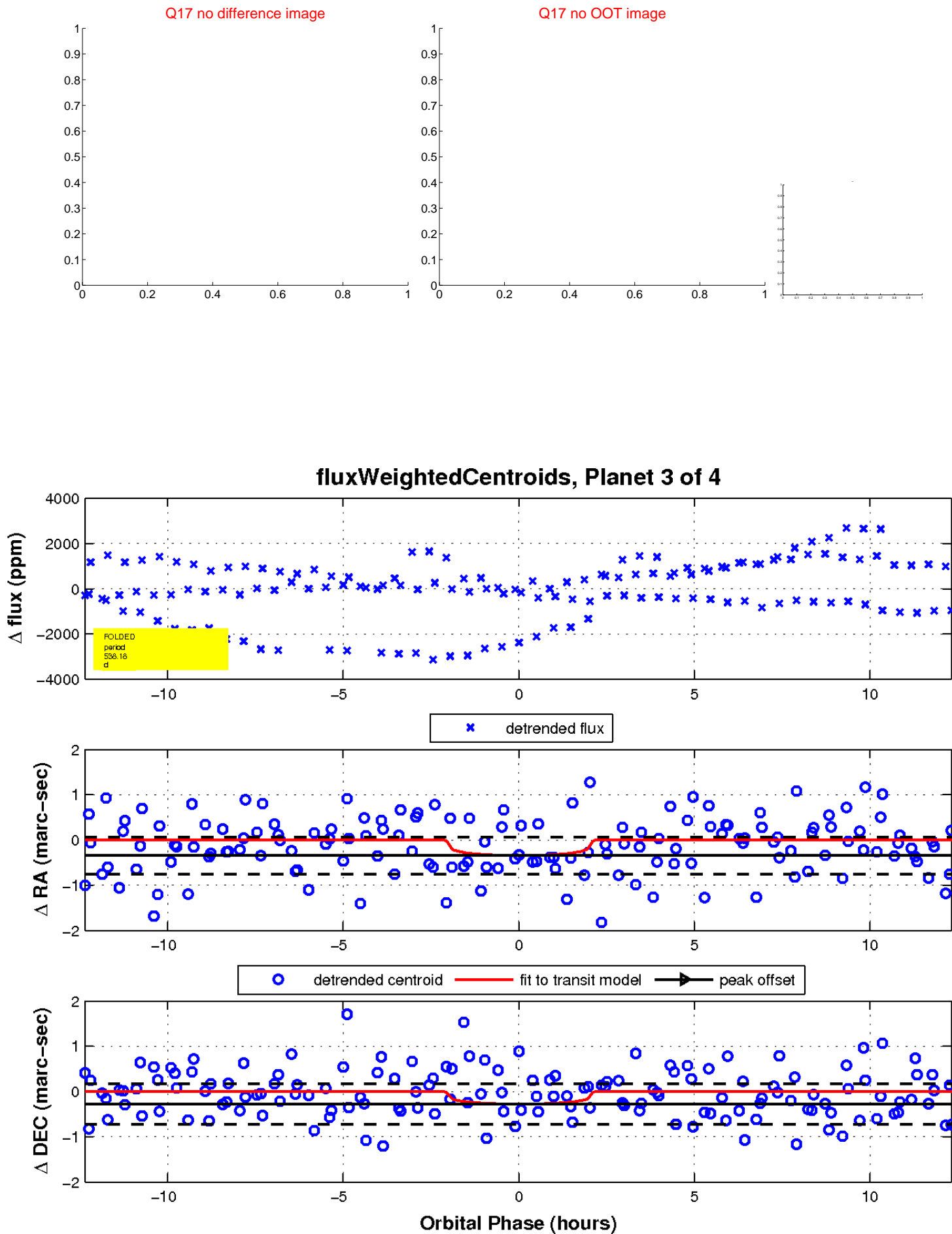
Q12 no OOT image



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

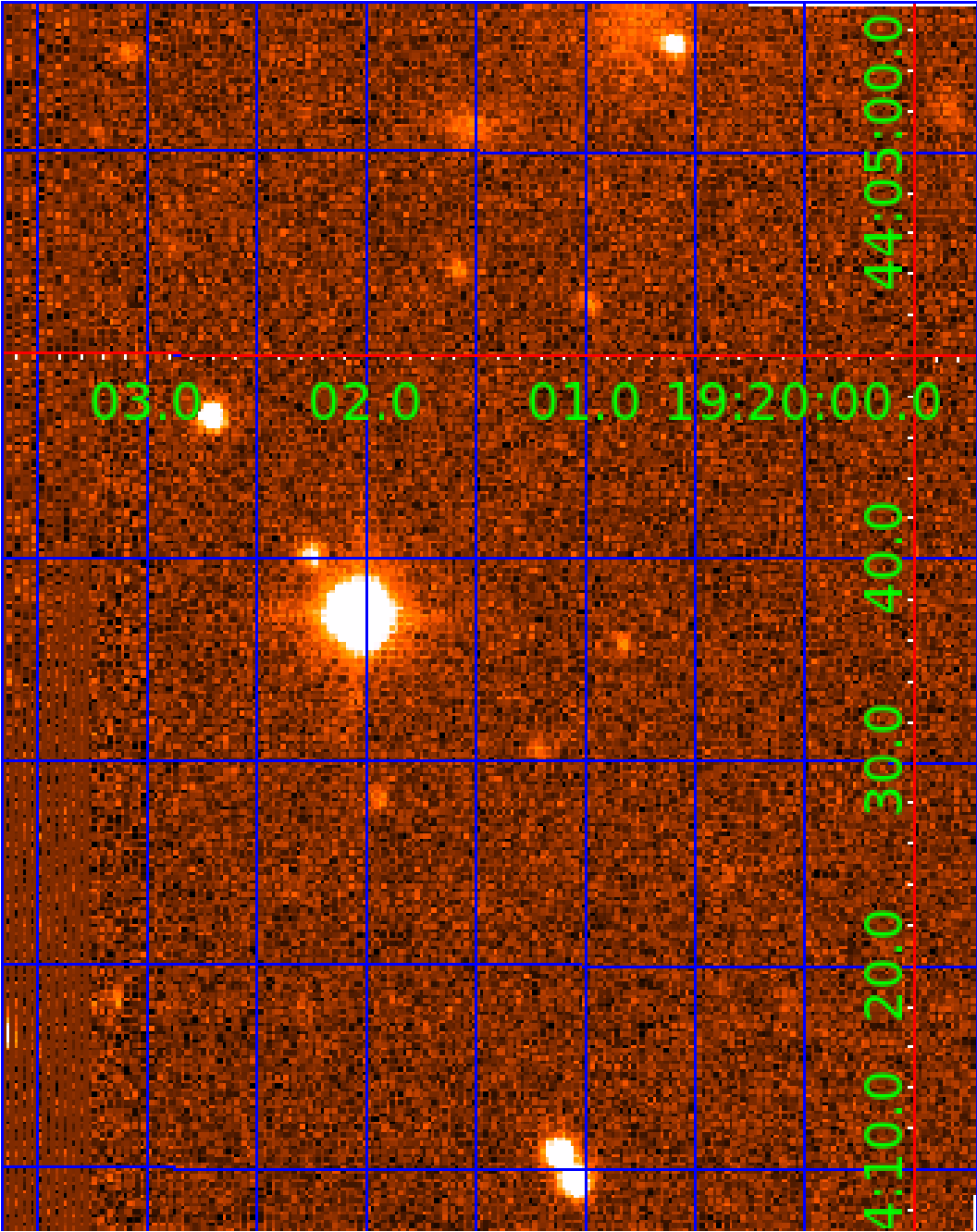


white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



UKIRT Image

Declination



KIC 008160546

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})
008160546-01	OBS	No	613.544695	172.985535	596.8	4.462	13.8	6.5	0.74	5532	1.81	0.27
008160546-02	OBS	No	638.719894	262.723530	960.2	6.470	10.3	7.5	0.74	5532	2.44	0.25
008160546-03	OBS	No	538.182767	389.545410	489.6	4.173	11.4	5.1	0.74	5532	1.68	0.32
008160546-04	OBS	No	258.880202	374.328424	357.3	3.751	11.2	5.2	0.74	5532	1.62	0.84

Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
008160546-01	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—CENT_FEW_DIFFS
008160546-02	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
008160546-03	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—CENT_FEW_DIFFS
008160546-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL_SKYE—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS

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

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

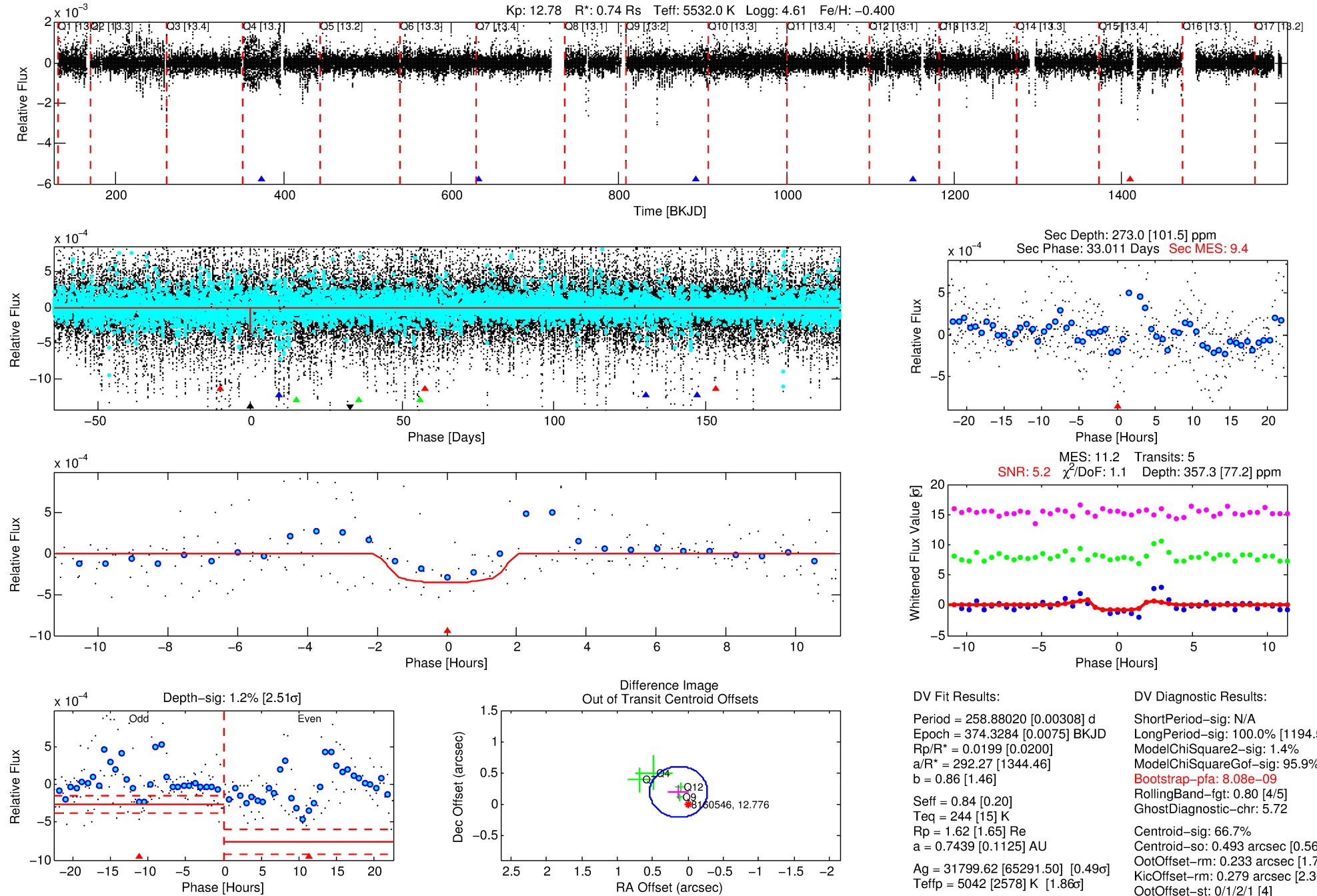
See http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col for comment definitions.

Ephemeris Match Information For 008160546-04

No Significant Match Found

DV One-Page Summary

KIC: 8160546 Candidate: 4 of 4 Period: 258.880 d



DV Fit Results:

Period = 258.88020 [0.00308] d
Epoch = 374.3284 [0.0075] BKJD
Rp/R* = 0.0199 [0.0200]
a/R* = 292.27 [1344.46]
b = 0.86 [1.46]
Seff = 0.84 [0.20]
Teq = 244 [15] K
Rp = 1.62 [1.65] Re
a = 0.7439 [0.1125] AU
Ag = 31799.62 [65291.50] [0.49σ]
Teffp = 5042 [2578] K [1.86σ]

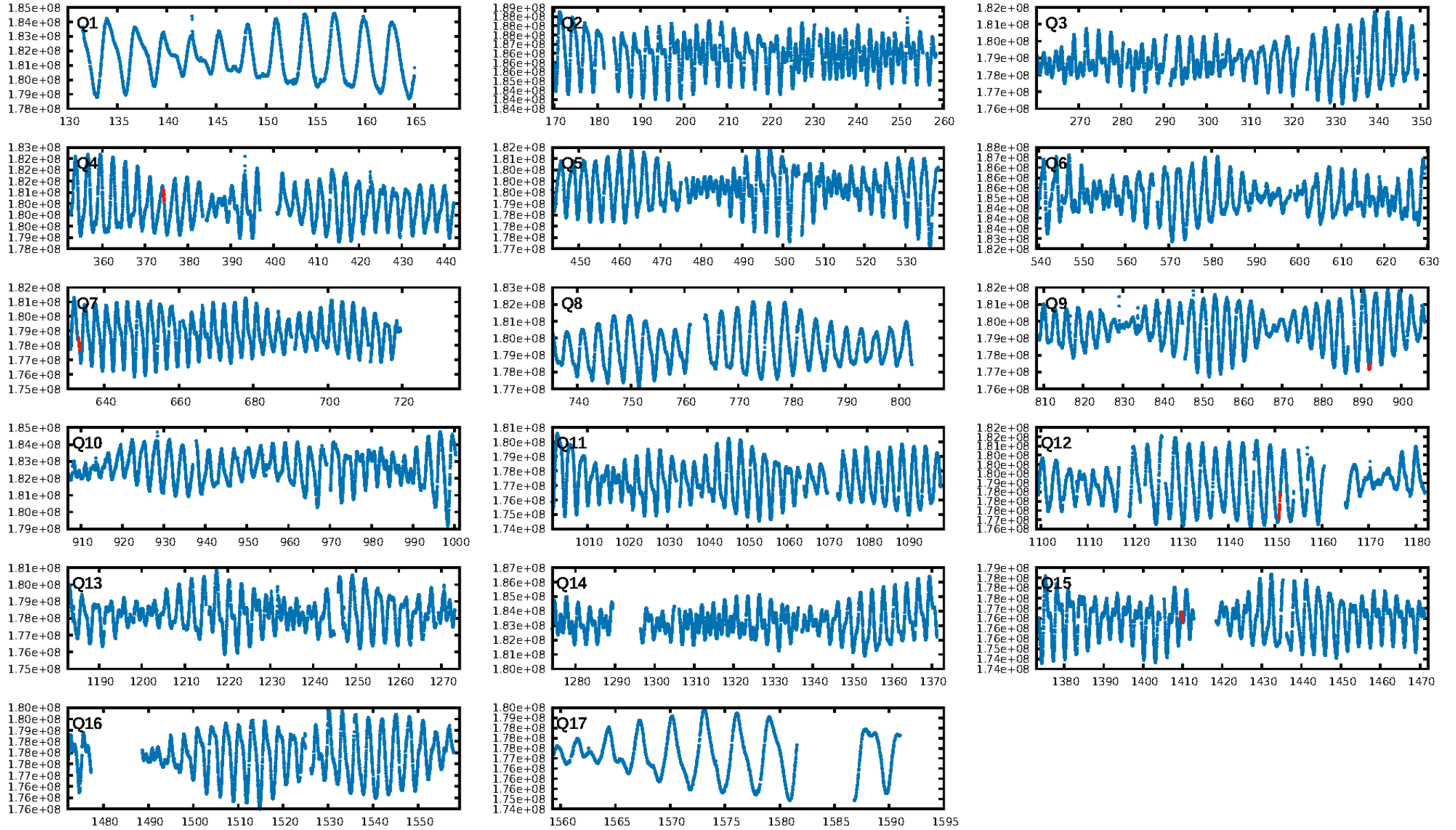
DV Diagnostic Results:

ShortPeriod-sig: N/A
LongPeriod-sig: 100.0% [1194.58σ]
ModelChiSquare2-sig: 1.4%
ModelChiSquareGof-sig: 95.9%
Bootstrap-pfa: 8.08e-09
RollingBand-fgt: 0.80 [4/5]
GhostDiagnostic-chr: 5.72
Centroid-sig: 66.7%
Centroid-so: 0.493 arcsec [0.56σ]
OotOffset-rm: 0.233 arcsec [1.71σ]
OotOffset-st: 0/1/2/1 [4]
KicOffset-rm: 0.279 arcsec [2.36σ]
KicOffset-st: 0/1/2/1 [4]
DiffImageQuality-fgm: 0.50 [2/4]
DiffImageOverlap-fno: 1.00 [4/4]

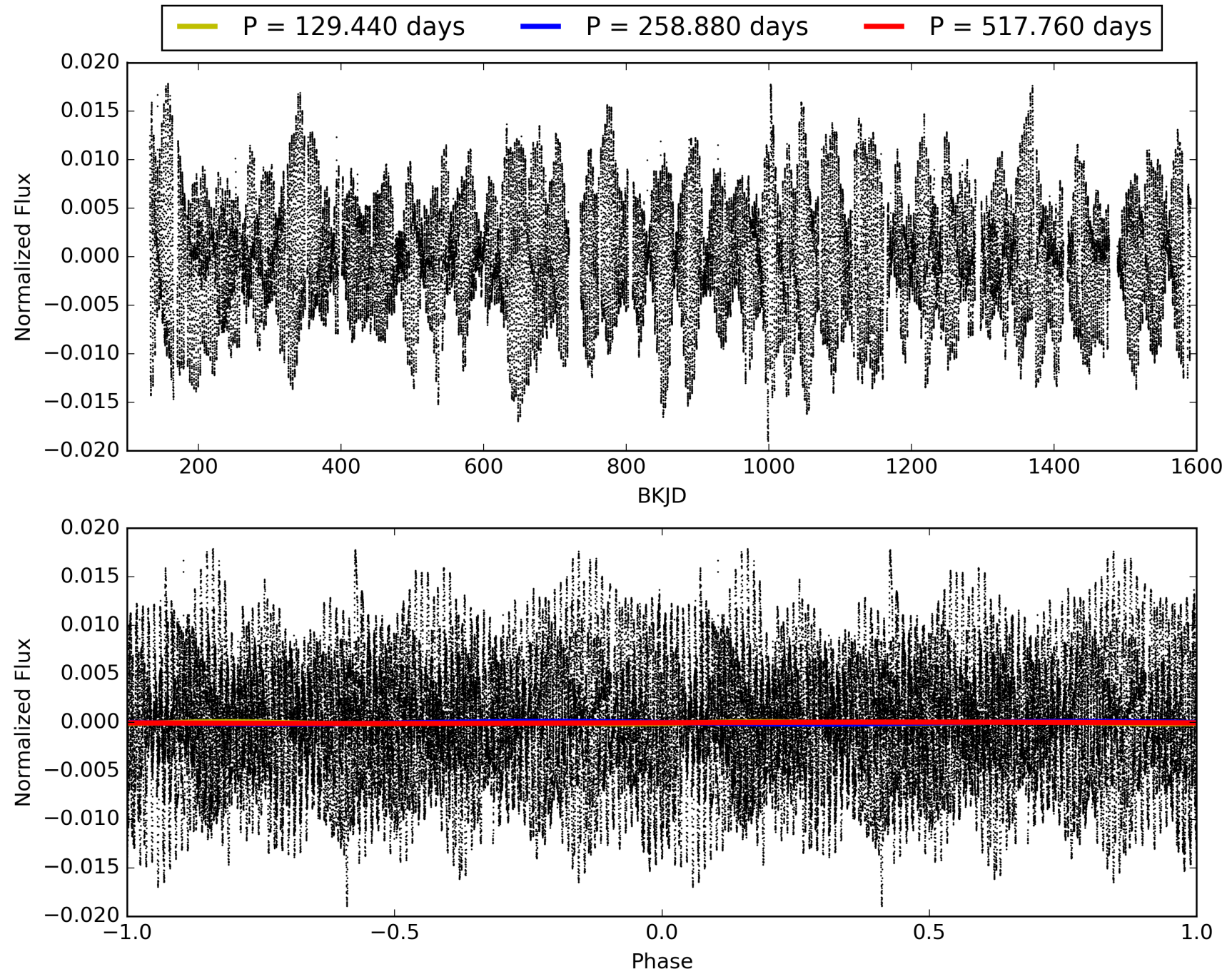
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 31-Jan-2016 21:42:48 Z

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

TCE 008160546-04, PDC Light Curves

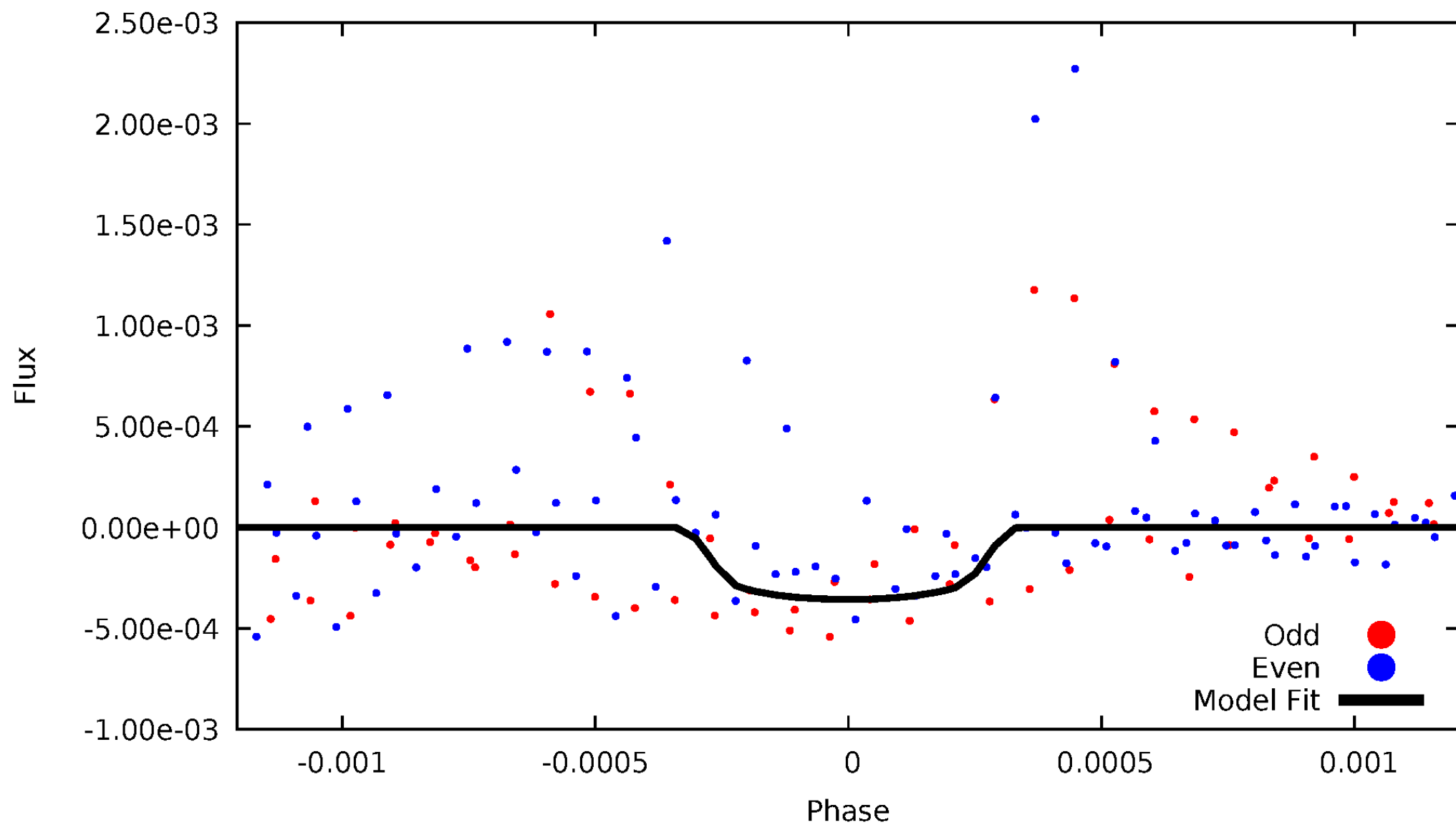


TCE 008160546-04



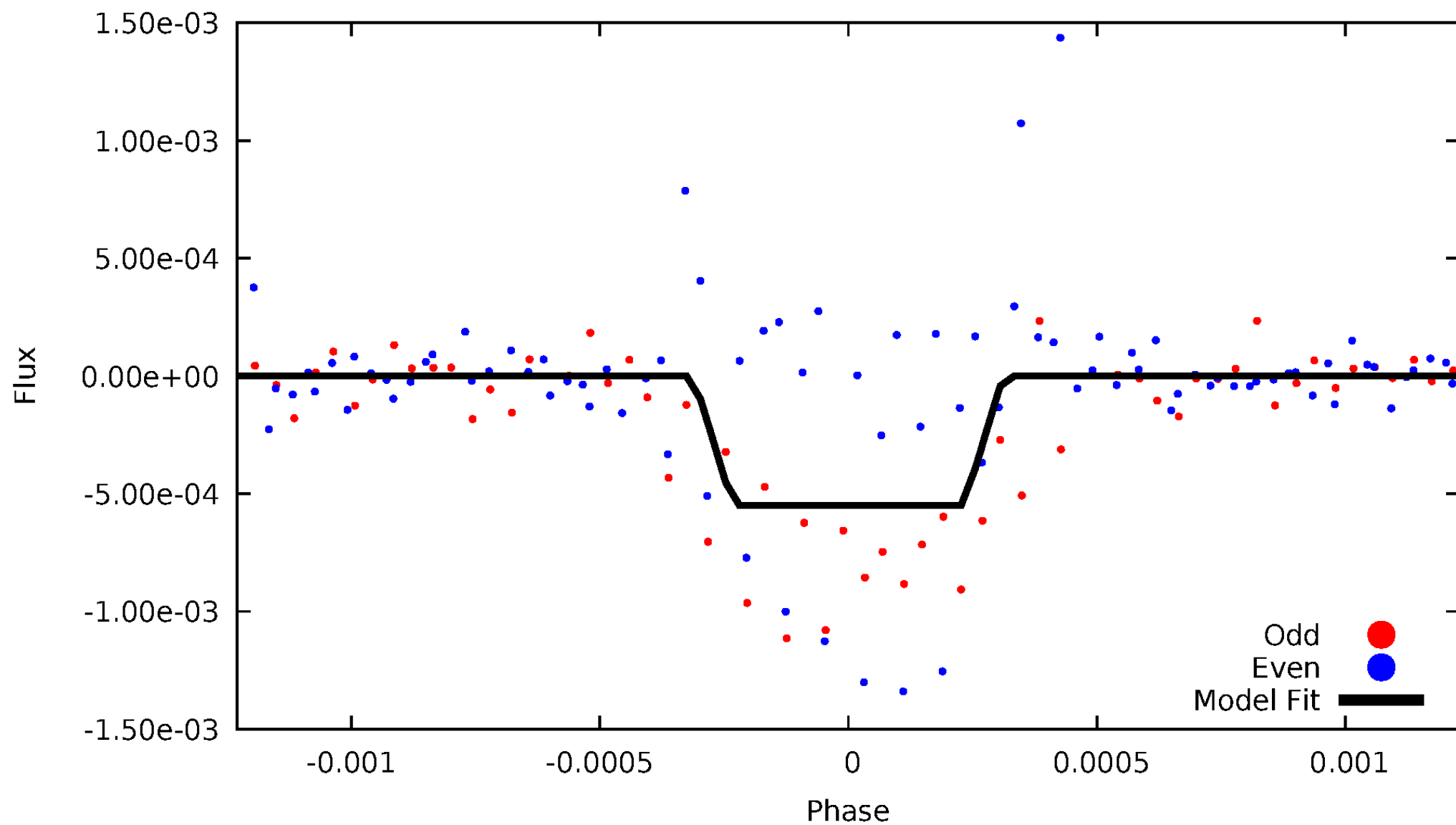
DV Odd/Even

TCE 008160546-04



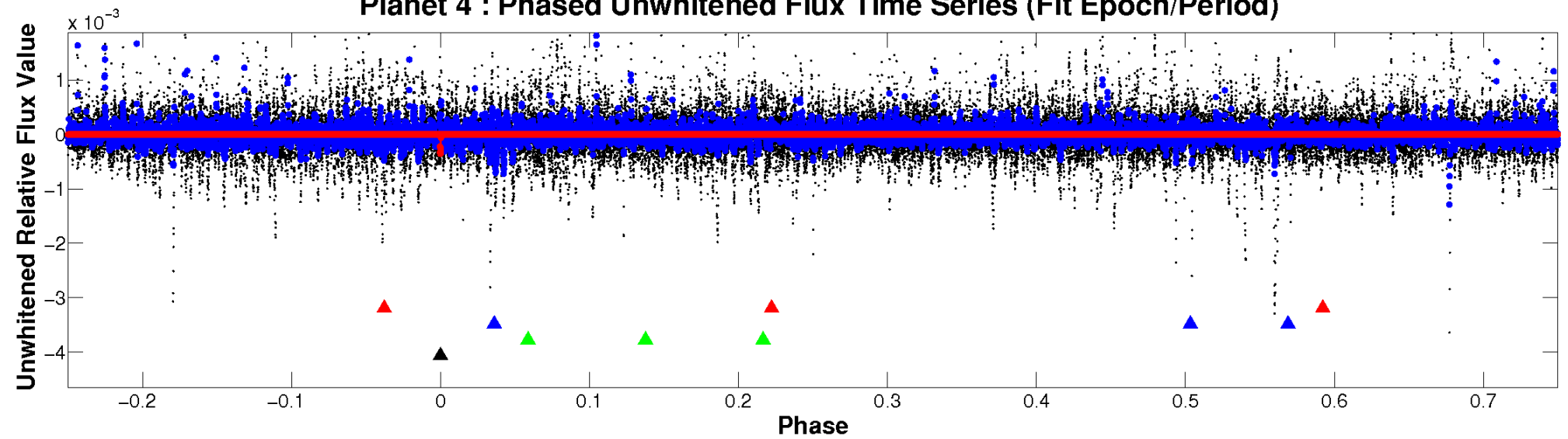
ALT Odd/Even

TCE 008160546-04

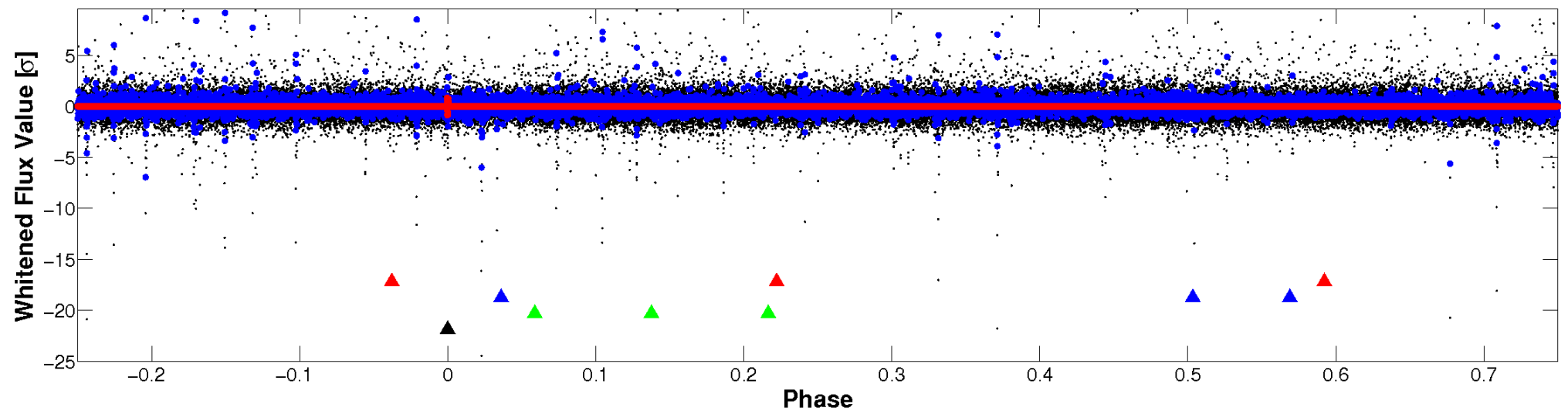


Non-Whitened Vs. Whitened Light Curve

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

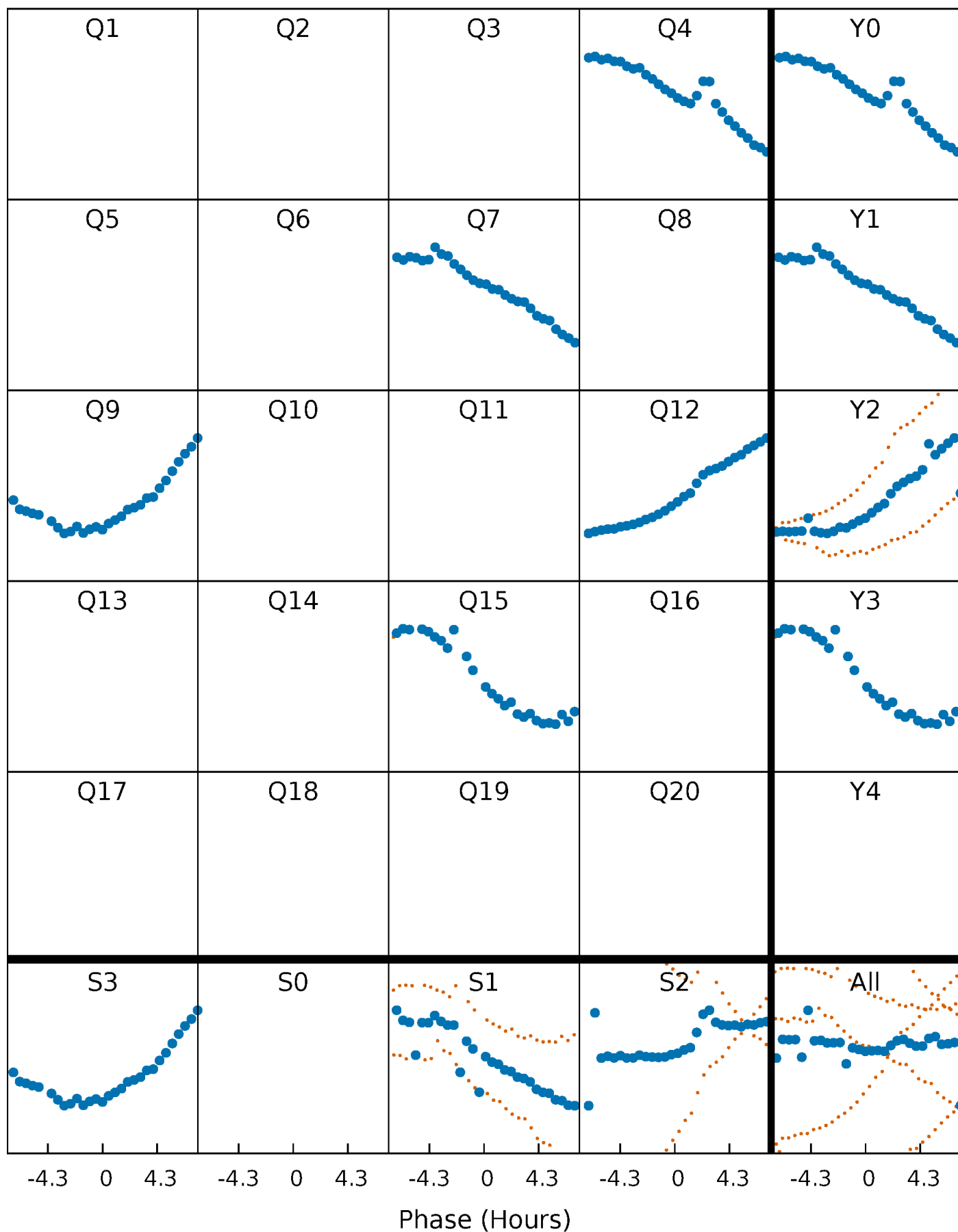


Planet 4 : Phased Whitened Flux Time Series (Fit Epoch/Period)



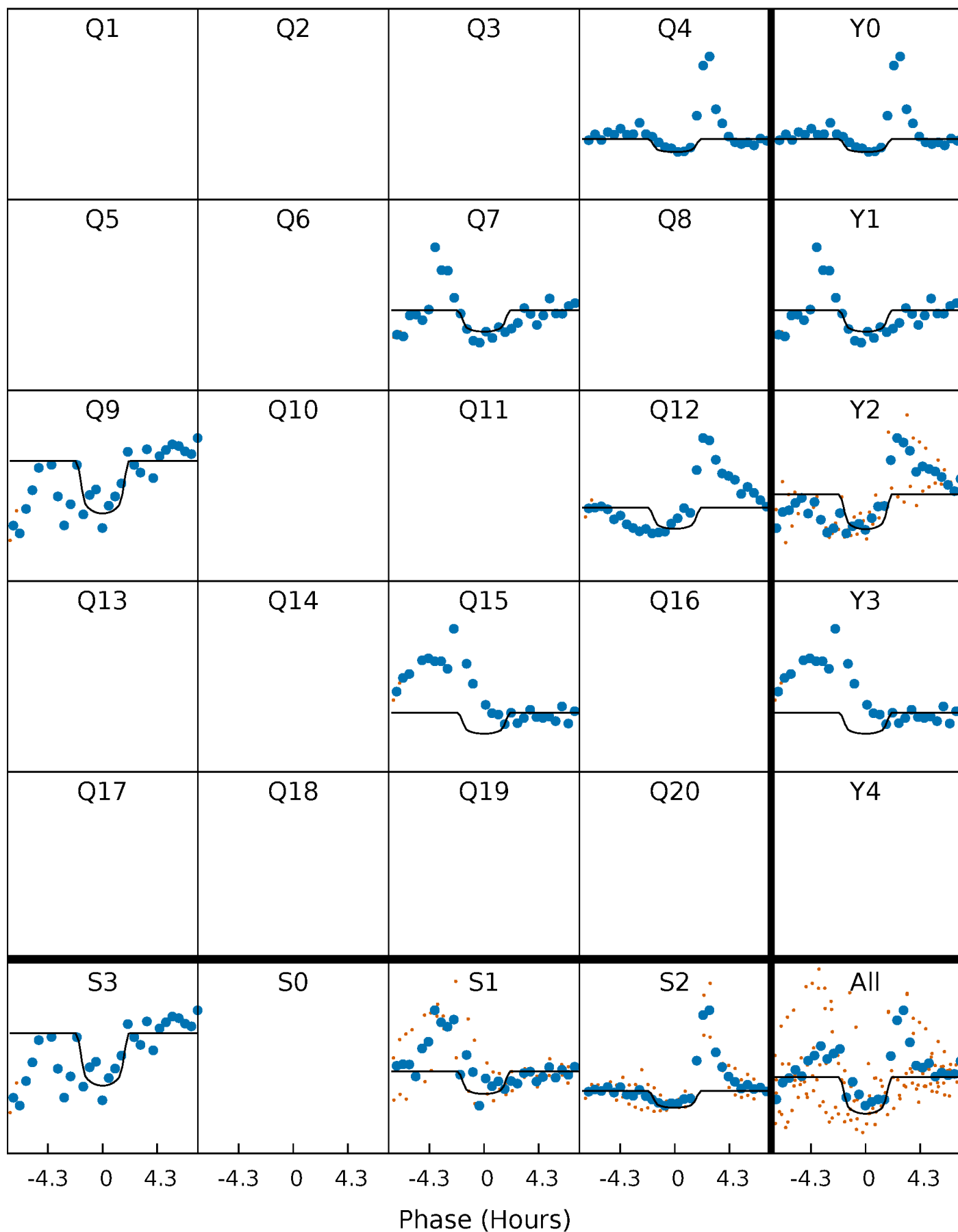
PDC Quarter-Phased Transit Curves

TCE 008160546-04 P=258.880202 Days $T_0=374.328424$ (BKJD)



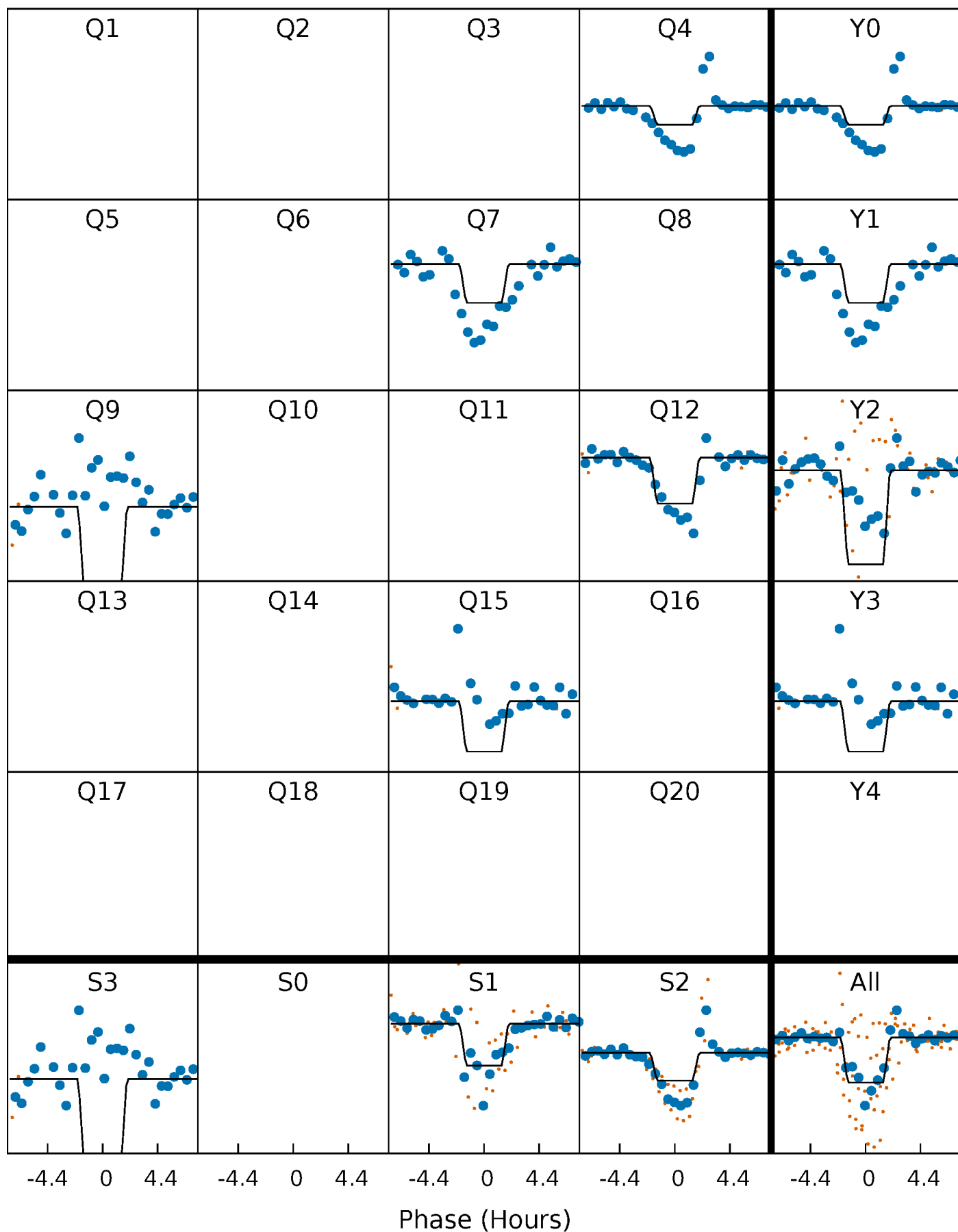
DV Quarter-Phased Transit Curves

TCE 008160546-04 $P=258.880202$ Days $T_0=374.328424$ (BKJD)



Alt. Detrend Quarter-Phased Transit Curves

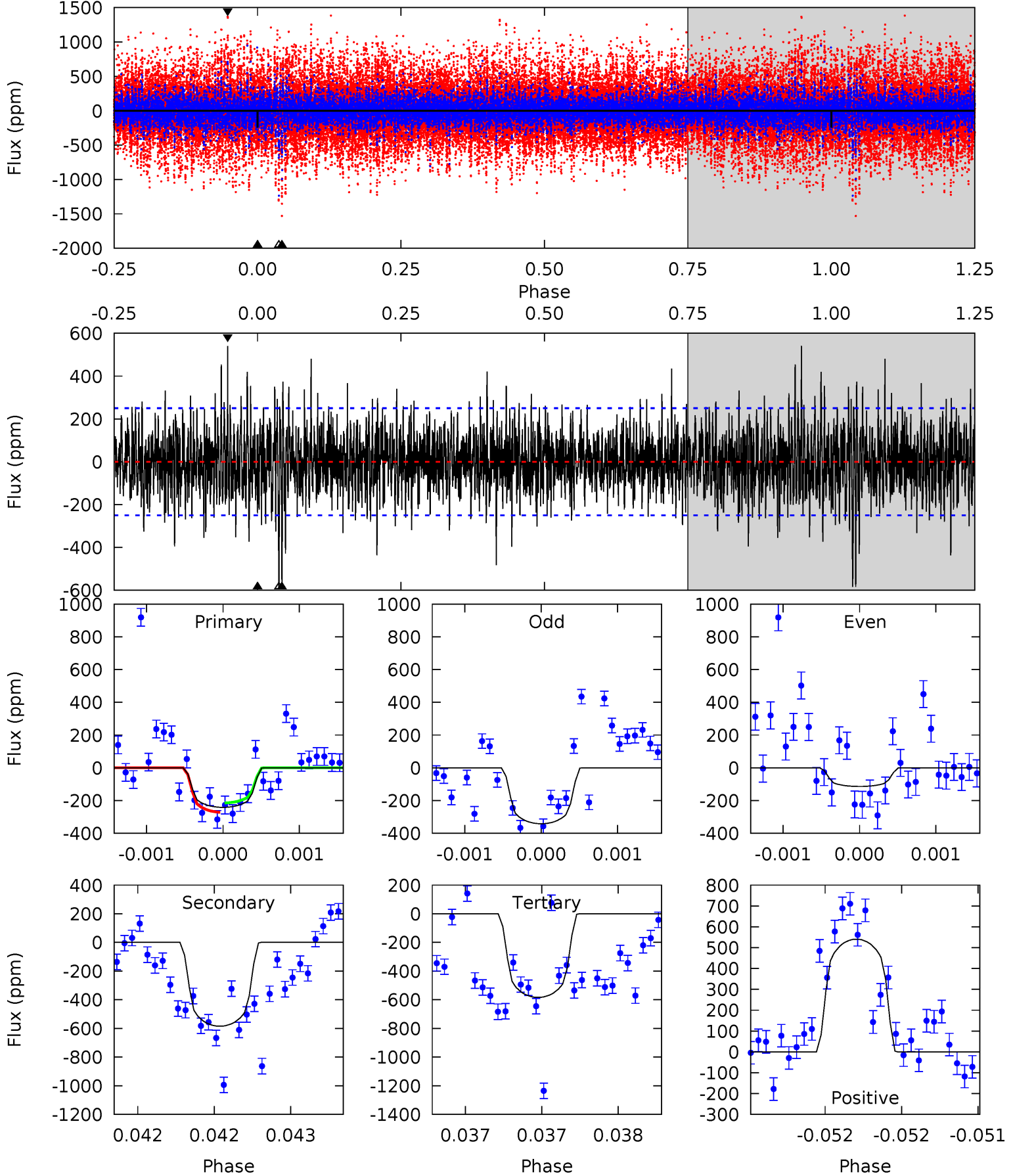
TCE 008160546-04 $P=258.876833$ Days $T_0=374.334129$ (BKJD)



DV Model-Shift Uniqueness Test

008160546-04, P = 258.880202 Days, E = 115.448222 Days

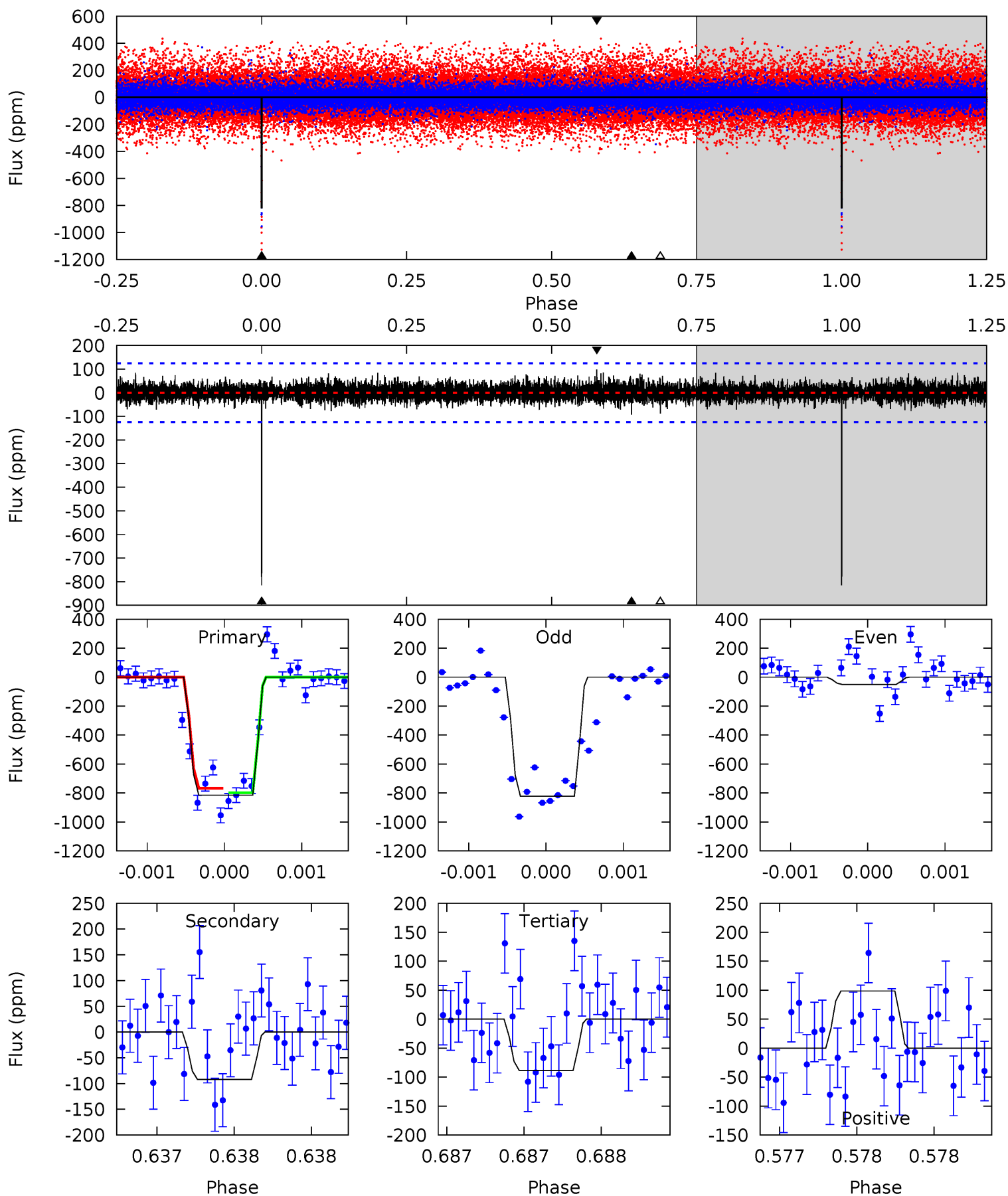
Pri	Sec	Ter	Pos	FA ₁	FA ₂	F _{Red}	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
5.33	12.9	12.9	11.9	5.53	3.41	2.51	-7.55	-6.61	0.02	0.97	2.39	0.79	0.48	0.63



Alt Model-Shift Uniqueness Test

008160546-04, P = 258.876833 Days, E = 115.457296 Days

Pri	Sec	Ter	Pos	FA ₁	FA ₂	F _{Red}	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
36.2	4.09	3.92	4.39	5.54	3.42	0.92	32.3	31.9	0.17	-0.29	19.8	0.80	0.11	0.67



Stellar Parameters For KIC 008160546

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	R (R_{\odot})	$M(M_{\odot})$	p_{\star} ($\text{g}\cdot\text{cm}^{-3}$)
	5532^{+149}_{-149}	$4.607^{+0.037}_{-0.112}$	$-0.400^{+0.300}_{-0.300}$	$0.745^{+0.139}_{-0.060}$	$0.833^{+0.079}_{-0.097}$	$2.838^{+0.462}_{-1.034}$
	+3%/-3%	+1%/-2%	+75%/-75%	+19%/-8%	+9%/-12%	+16%/-36%
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 008160546-04 / KOI

Detrend	Depth (ppm)	R_p (R_{\oplus})	T_{max} (K)	T_{obs} (K)	A_{obs}
DV	-584 ± 45	$2.00^{+1.48}_{-1.24}$	346^{+16}_{-13}	5581^{+3994}_{-1162}	$45040^{+258892}_{-30347}$
Alt.	-92 ± 22	$2.22^{+1.64}_{-1.41}$	347^{+16}_{-13}	3747^{+1763}_{-602}	5894^{+36987}_{-3986}

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 $A_{obs} \gg 1.0$

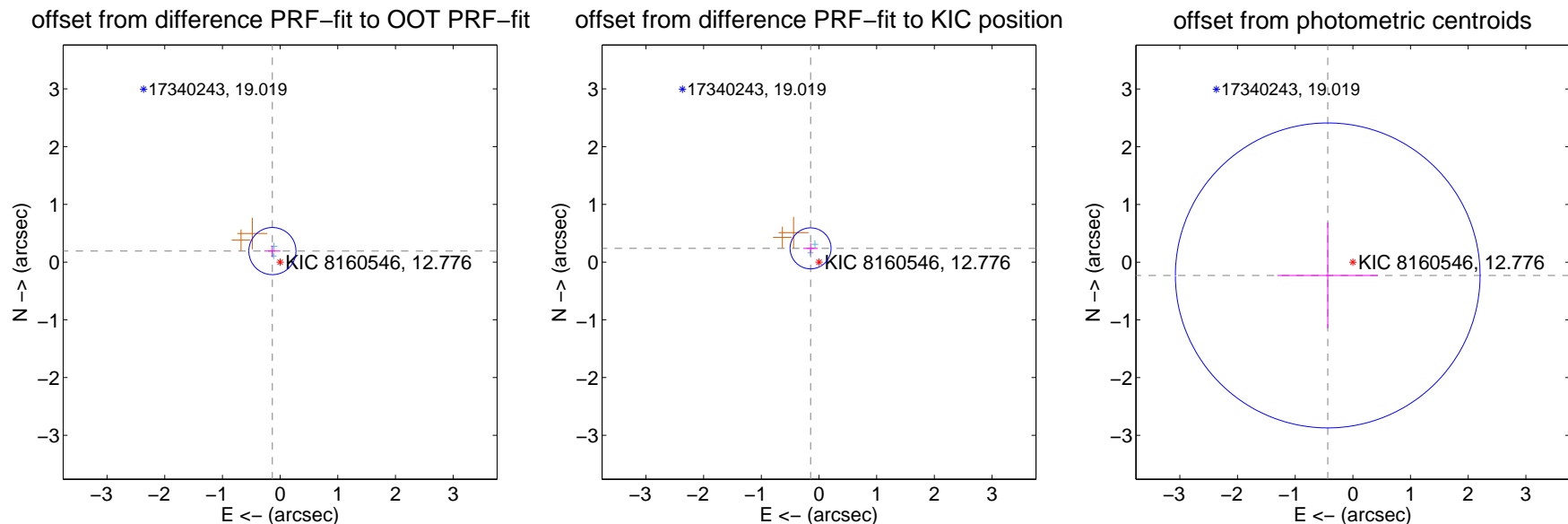
DV Centroid Data

Supplemental centroid analysis for 008160546-04. Kepler magnitude: 12.78. Transit SNR 5.17

There are 2 quarters with good PRF difference image offsets

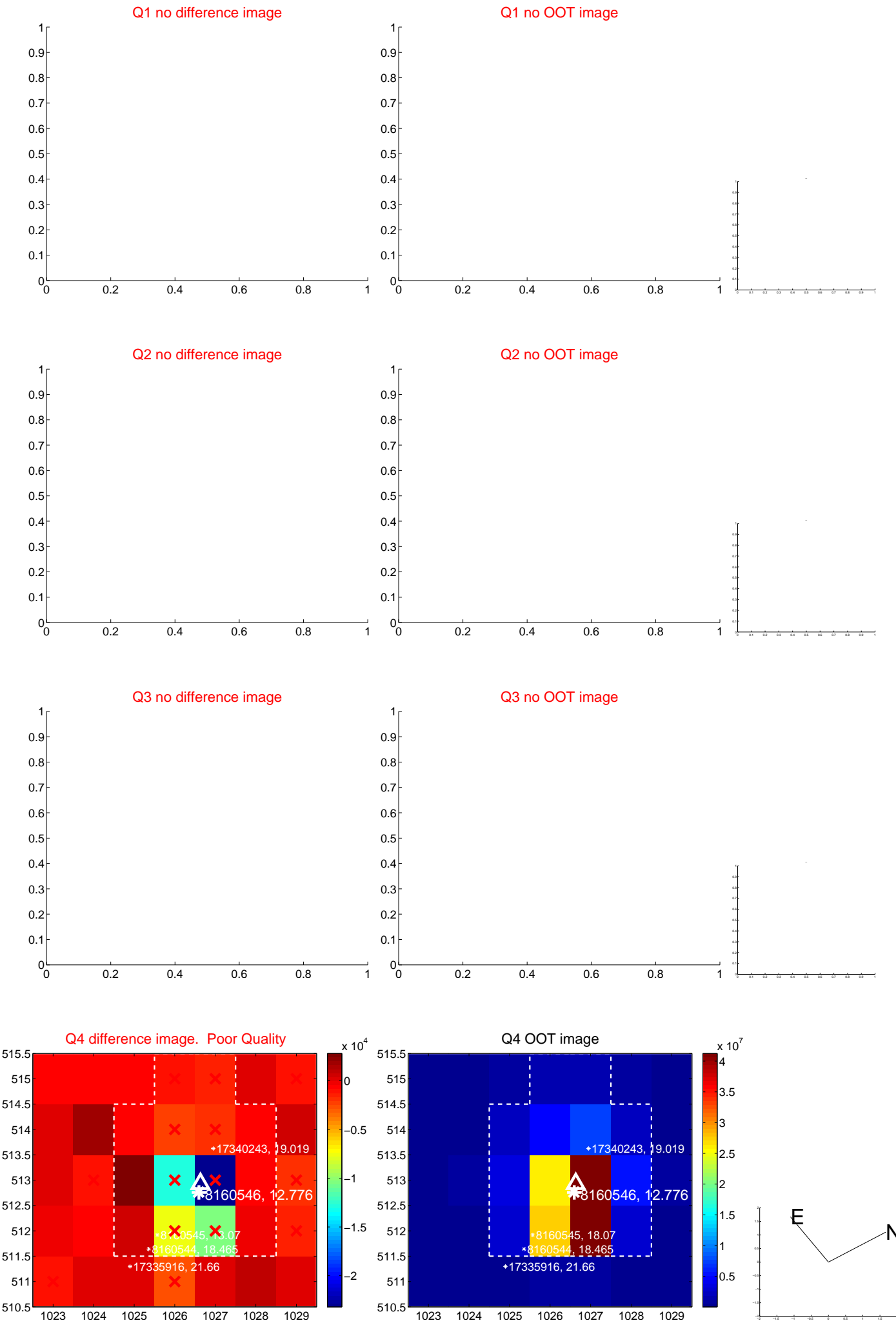
The direct PRF centroid is offset from the target star catalog position by about 0.05 arcsec

	Distance in arcsec	Distance / σ	Δ RA	Δ Dec
PRF-fit source offset from OOT	0.233 ± 0.136	1.71	0.134 ± 0.137	0.191 ± 0.097
PRF-fit source offset from KIC position	0.279 ± 0.118	2.36	0.146 ± 0.126	0.238 ± 0.088
photometric centroid source offset	0.49 ± 0.88	0.56	0.44 ± 0.87	-0.23 ± 0.91

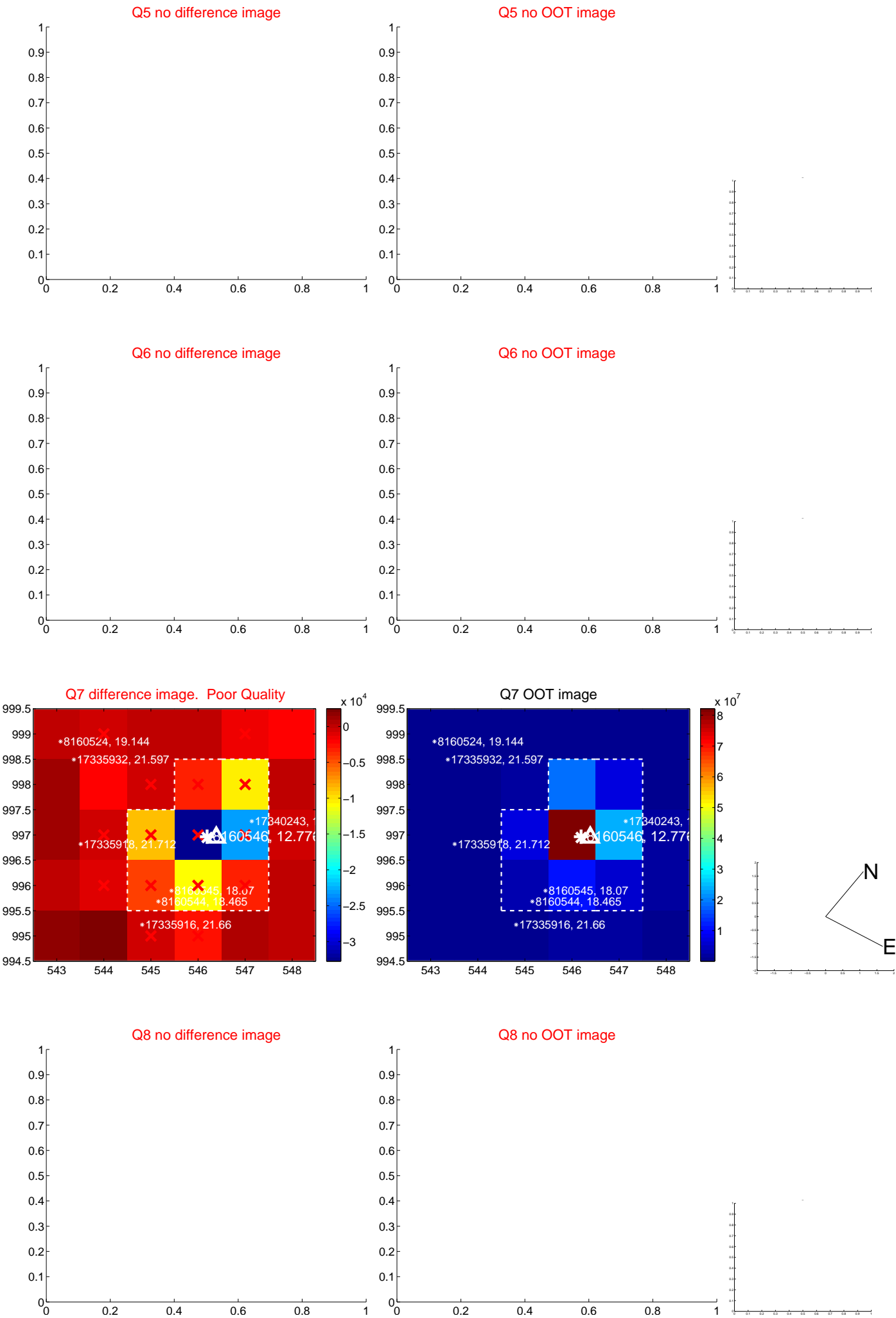


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- σ uncertainty. Blue circle: three- σ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

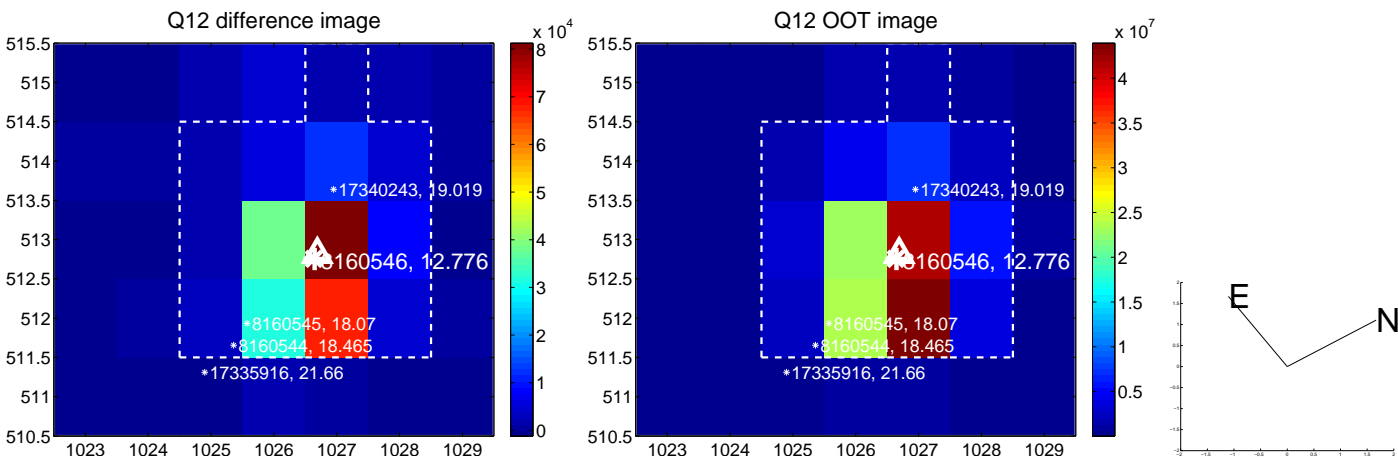
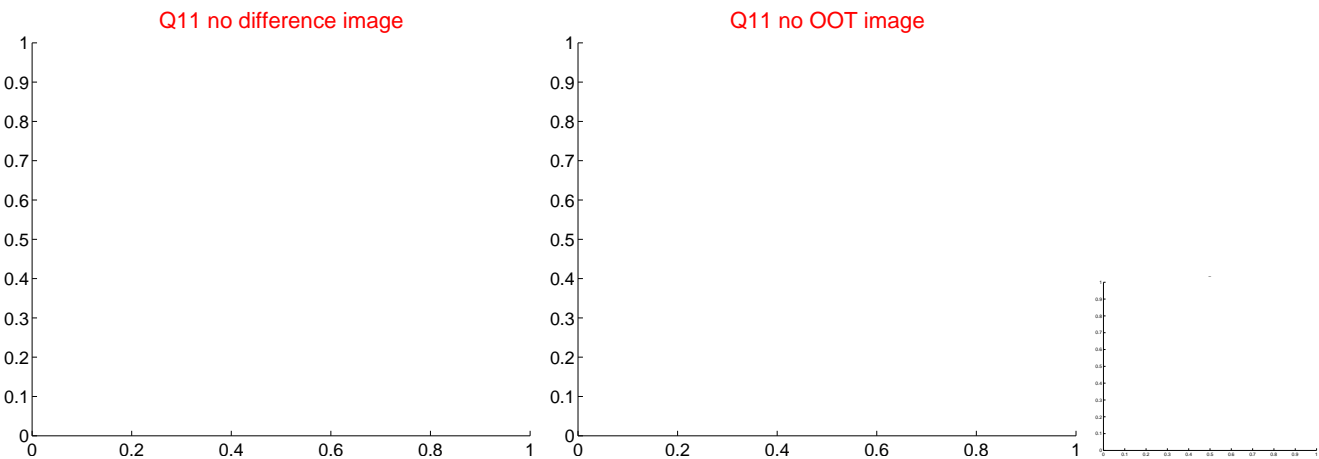
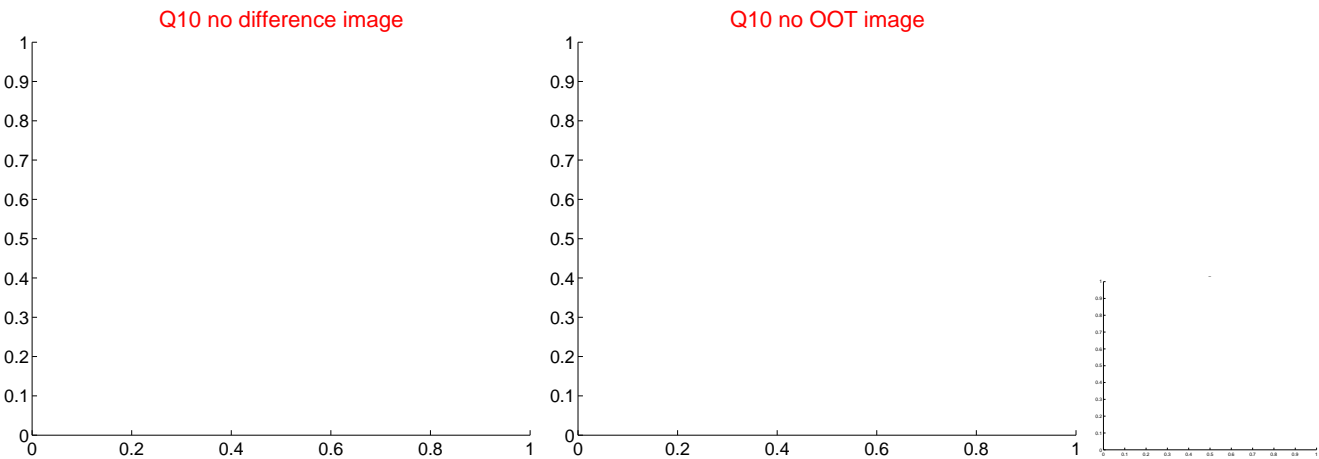
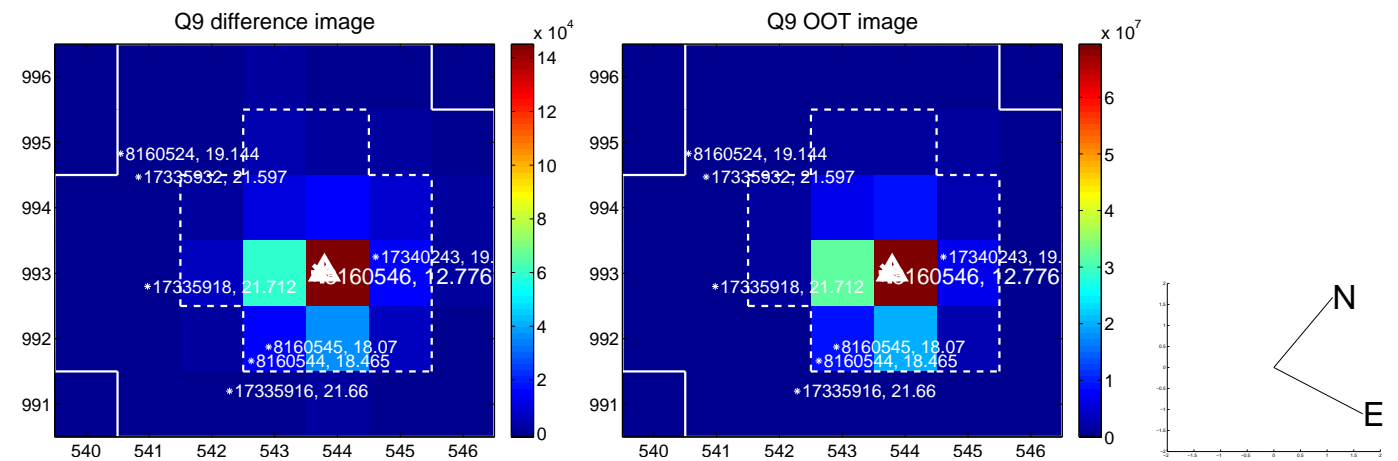
white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



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



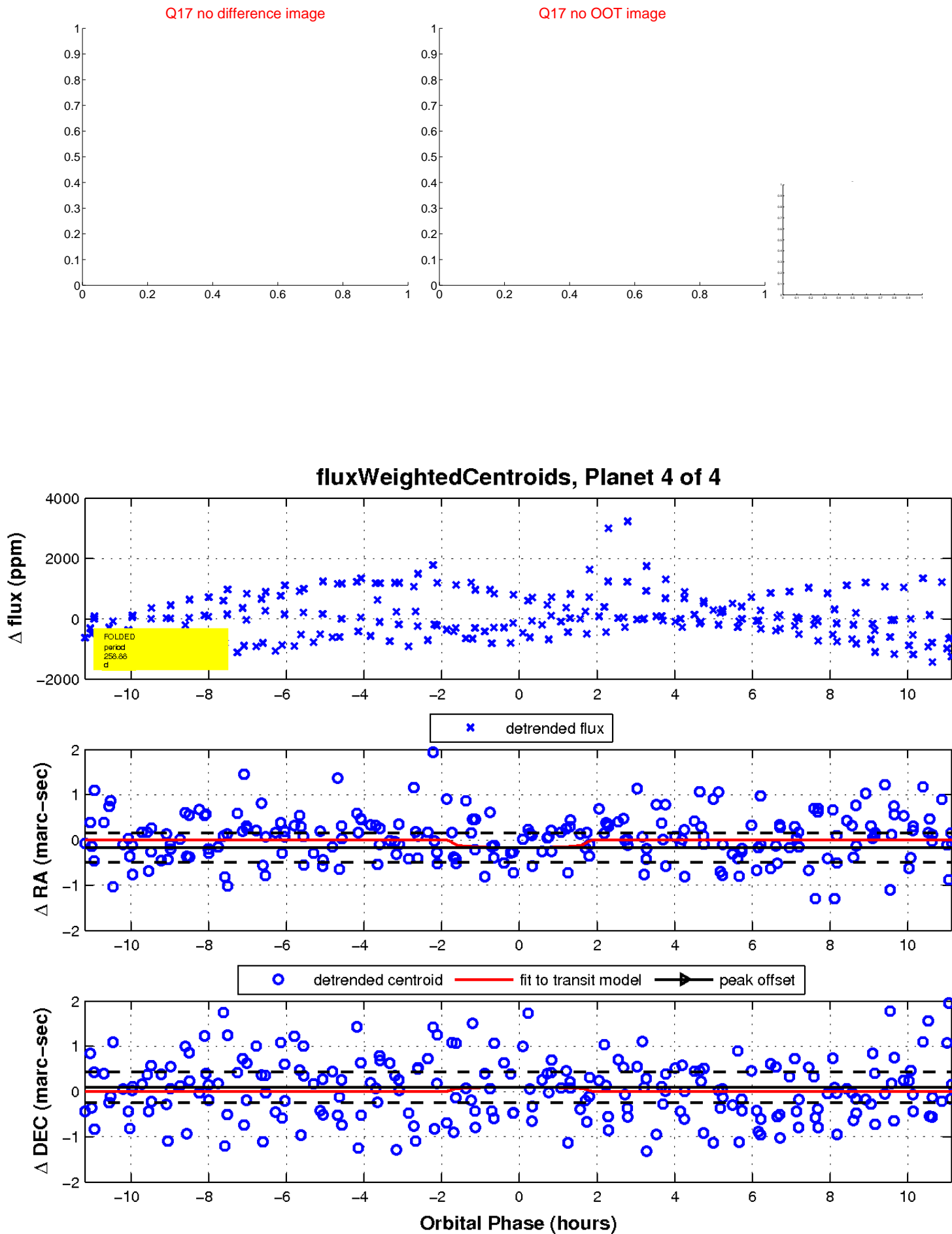
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



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



UKIRT Image

Declination

