

KIC 004158372

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})
004158372-01	OBS	No	357.496909	376.973374	928.2	7.479	16.7	5.7	0.67	4267	2.25	0.18
004158372-02	OBS	No	405.589263	275.511211	760.9	4.726	14.2	6.4	0.67	4267	2.03	0.15
004158372-03	OBS	No	522.778675	216.071041	475.4	4.665	16.1	3.6	0.67	4267	1.66	0.11
004158372-04	OBS	No	289.494986	234.246442	1165.9	3.201	12.9	9.0	0.67	4267	2.49	0.24
004158372-05	OBS	No	356.891810	169.321259	1258.1	2.546	12.8	7.2	0.67	4267	2.56	0.18
004158372-07	OBS	No	470.232741	267.941575	1038.8	6.744	12.2	7.4	0.67	4267	2.24	0.12
004158372-08	OBS	No	473.489609	550.580979	1462.8	16.257	10.8	7.4	0.67	4267	2.56	0.12
004158372-09	OBS	No	320.670668	378.593601	373.5	10.500	12.1	-1.0	0.67	4267	1.23	0.21

Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
004158372-01	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_MARSHALL—LPP_DV—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—CENT_FEW_DIFFS
004158372-02	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
004158372-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV
004158372-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—ALL_TRANS_CHASES
004158372-05	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_POS_DV—CENT_UNCERTAIN
004158372-07	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—CENT_FEW_DIFFS
004158372-08	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_MARSHALL—LPP_DV—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—CENT_FEW_DIFFS
004158372-09	OBS	FP	0.00	1	0	1	0	LPP_DV—ALL_TRANS_CHASES—CENT_NOFITS—HALO_GHOST

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

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

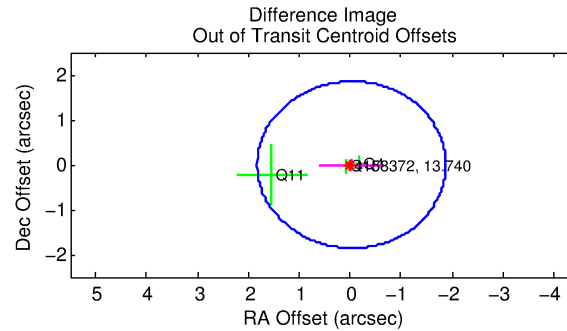
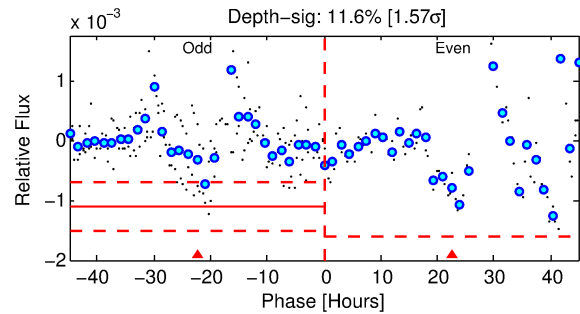
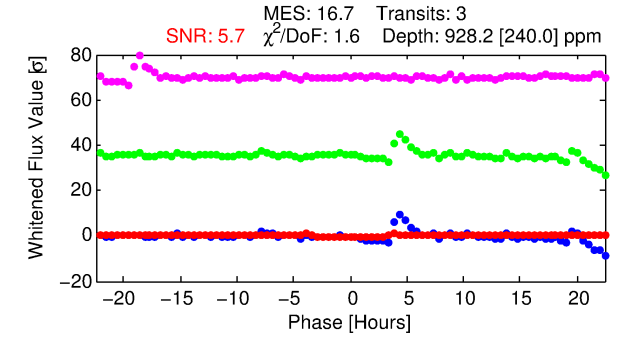
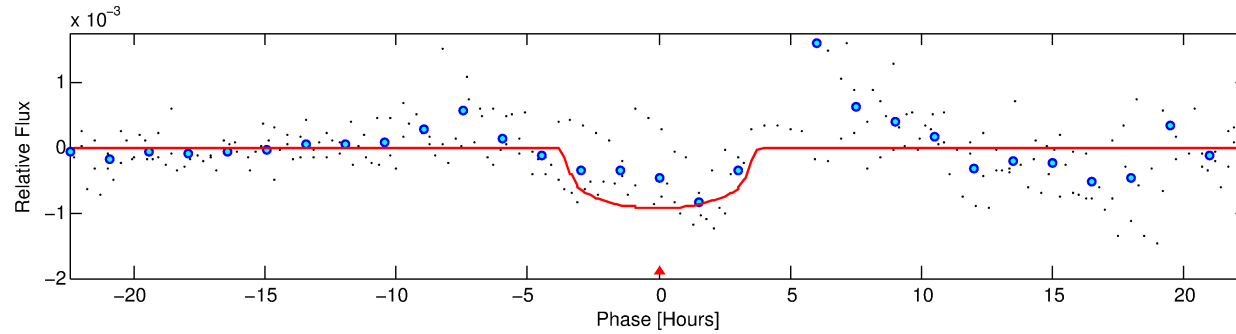
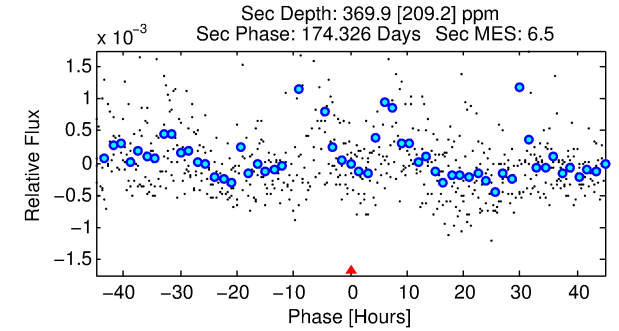
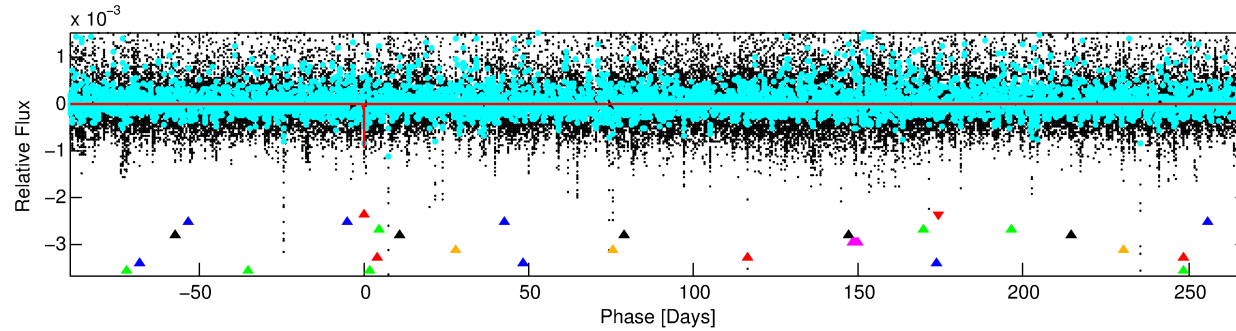
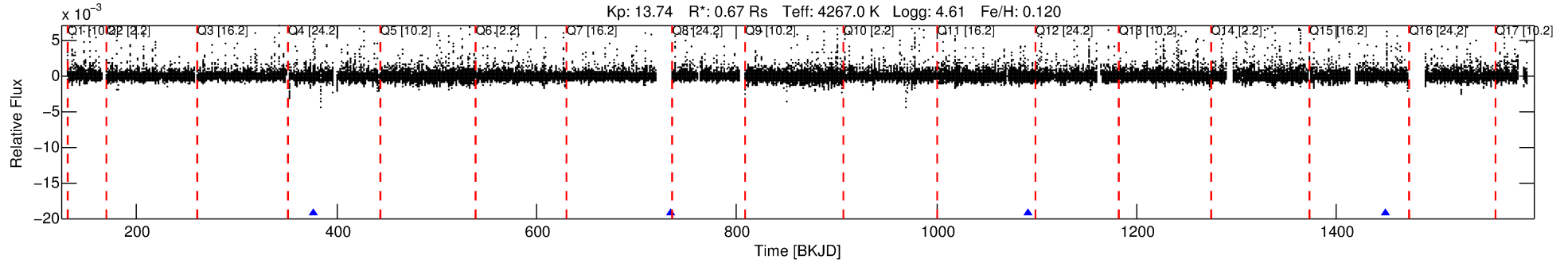
See http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col for comment definitions.

Ephemeris Match Information For 004158372-01

No Significant Match Found

DV One-Page Summary

KIC: 4158372 Candidate: 1 of 9 Period: 357.497 d



DV Fit Results:

Period = 357.49691 [0.00700] d
Epoch = 376.9734 [0.0139] BKJD
Rp/R* = 0.0307 [0.0169]
a/R* = 253.39 [424.87]
b = 0.76 [0.94]
Seff = 0.18 [0.03]
Teq = 166 [6] K
Rp = 2.25 [1.25] Re
a = 0.8602 [0.0585] AU
Ag = 29814.00 [36941.28] [0.81 σ]
Teffp = 3375 [1047] K [3.06 σ]

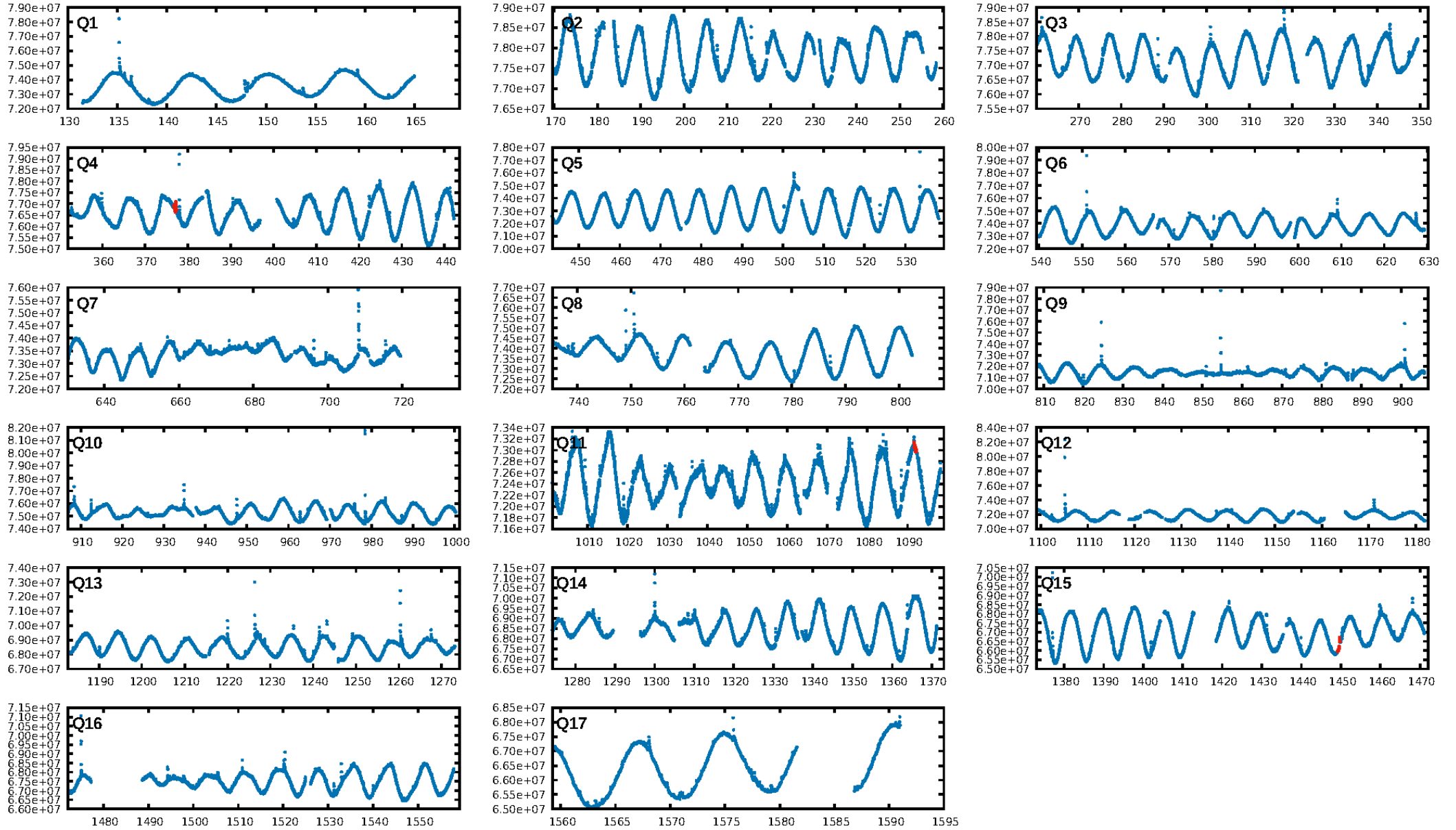
DV Diagnostic Results:

ShortPeriod-sig: 93.4% [1.84 σ]
LongPeriod-sig: 100.0% [130.46 σ]
ModelChiSquare2-sig: 1.2%
ModelChiSquareGof-sig: 30.0%
Bootstrap-pfa: N/A
RollingBand-fgt: 1.00 [3/3]
GhostDiagnostic-chr: 0.7307
Centroid-sig: 66.1%
Centroid-so: 0.406 arcsec [0.57 σ]
OotOffset-rm: 0.029 arcsec [0.05 σ]
OotOffset-st: 0/2/1/0 [3]
KicOffset-rm: 0.111 arcsec [0.46 σ]
KicOffset-st: 0/2/1/0 [3]
DiffImageQuality-fgm: 0.67 [2/3]
DiffImageOverlap-fno: 1.00 [3/3]

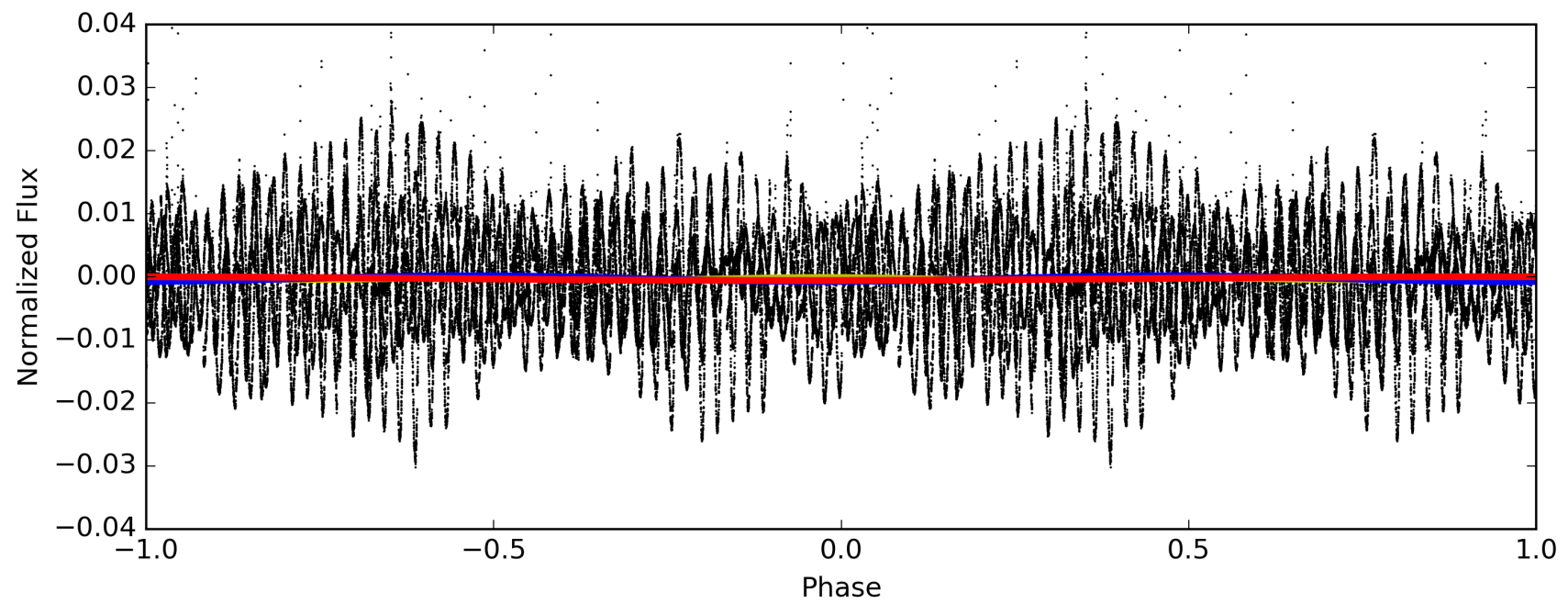
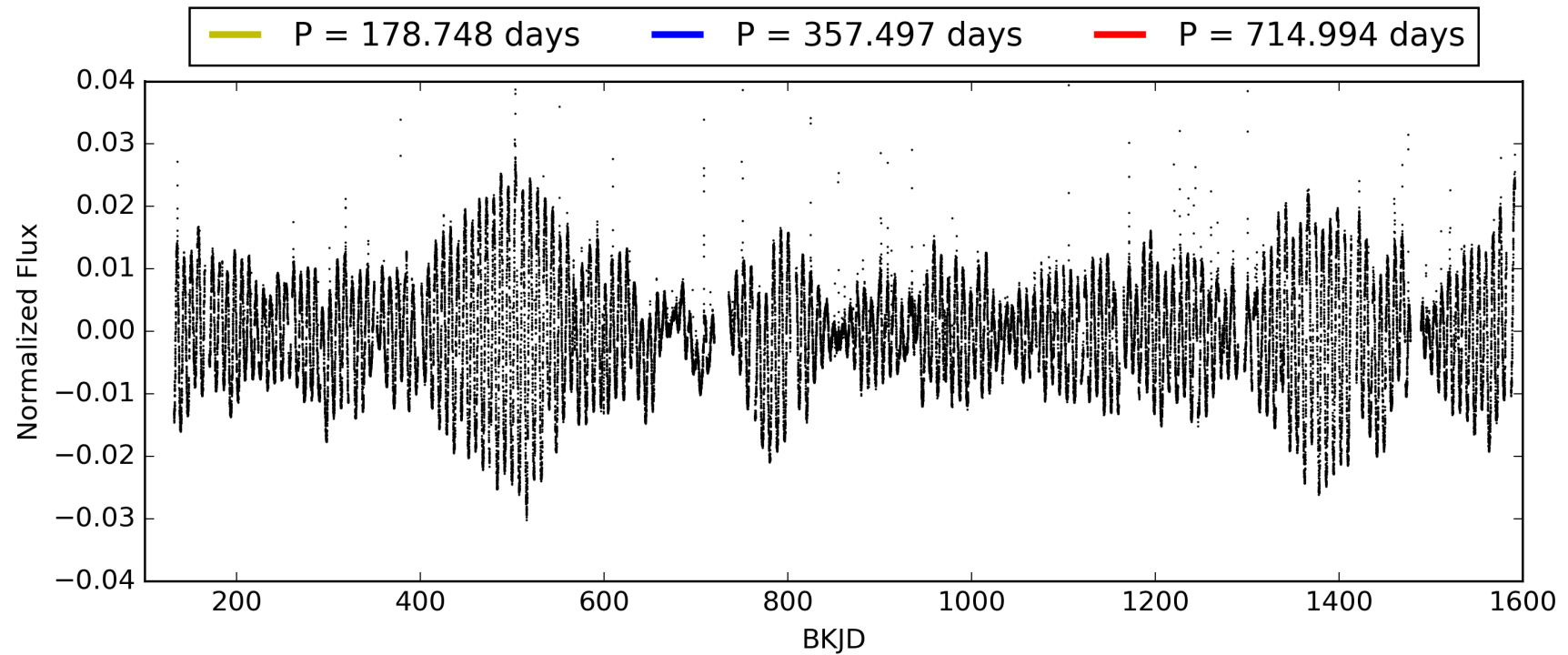
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 01-Feb-2016 06:11:46 Z

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

TCE 004158372-01, PDC Light Curves

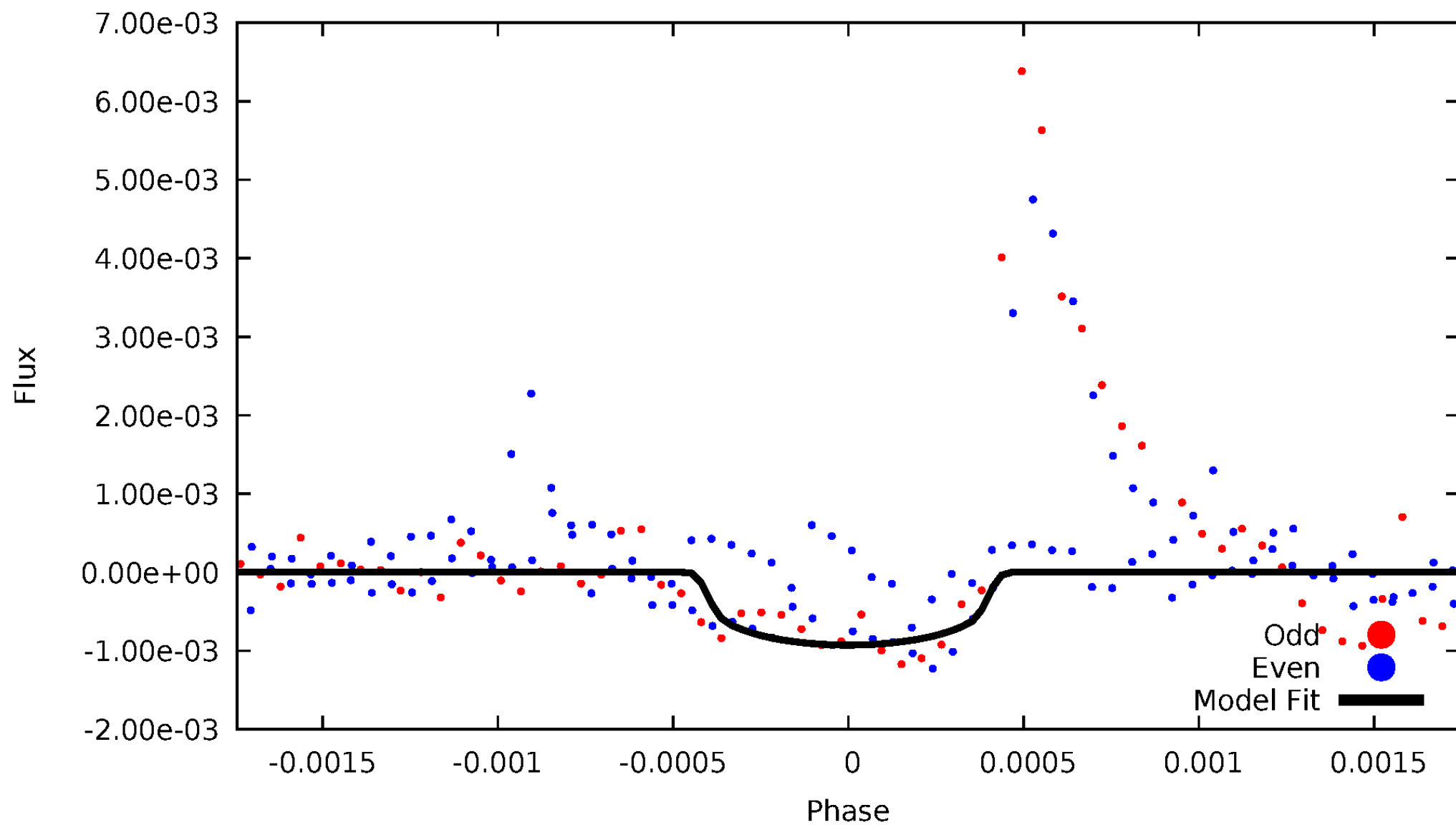


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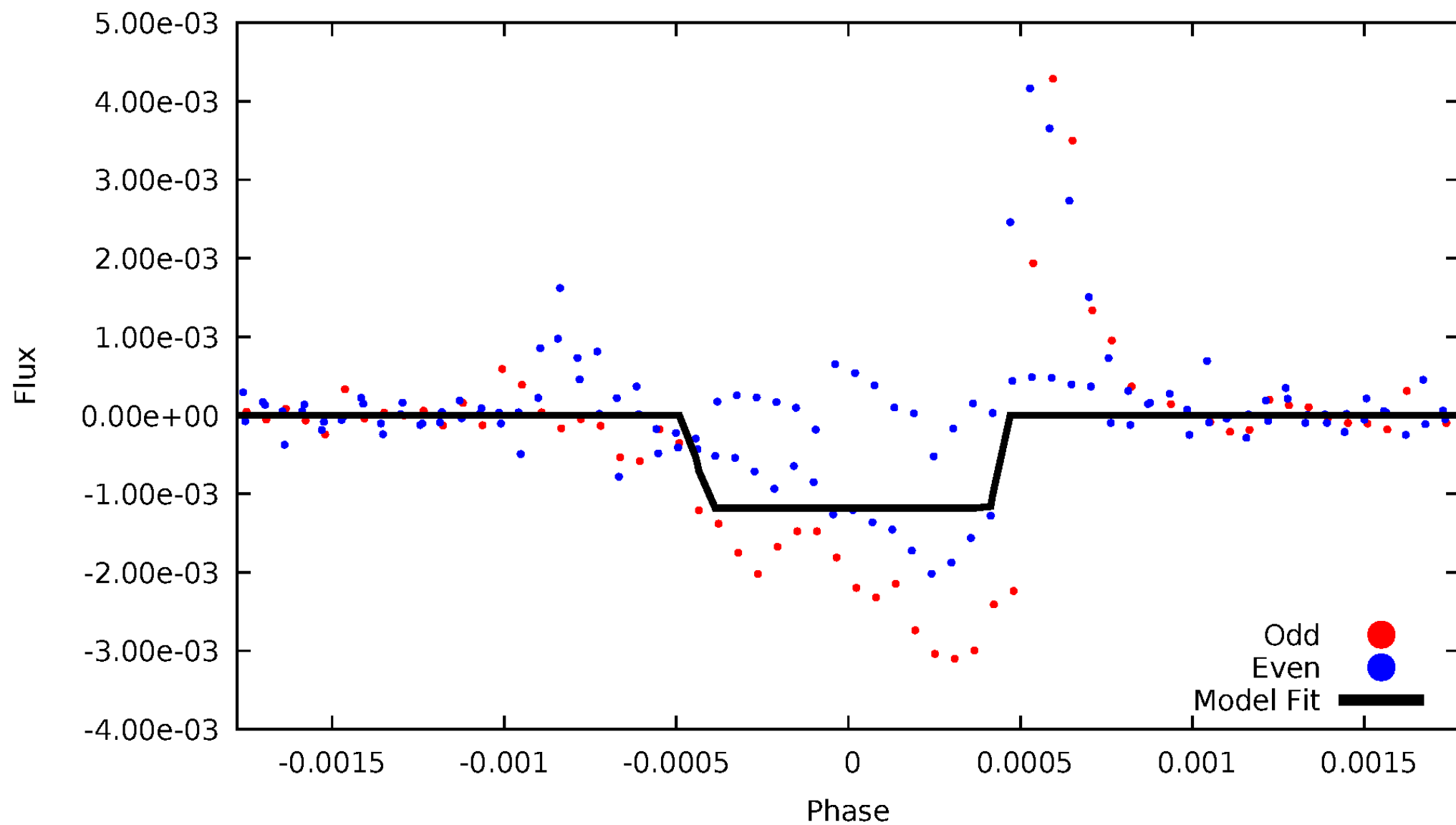
DV Odd/Even

TCE 004158372-01

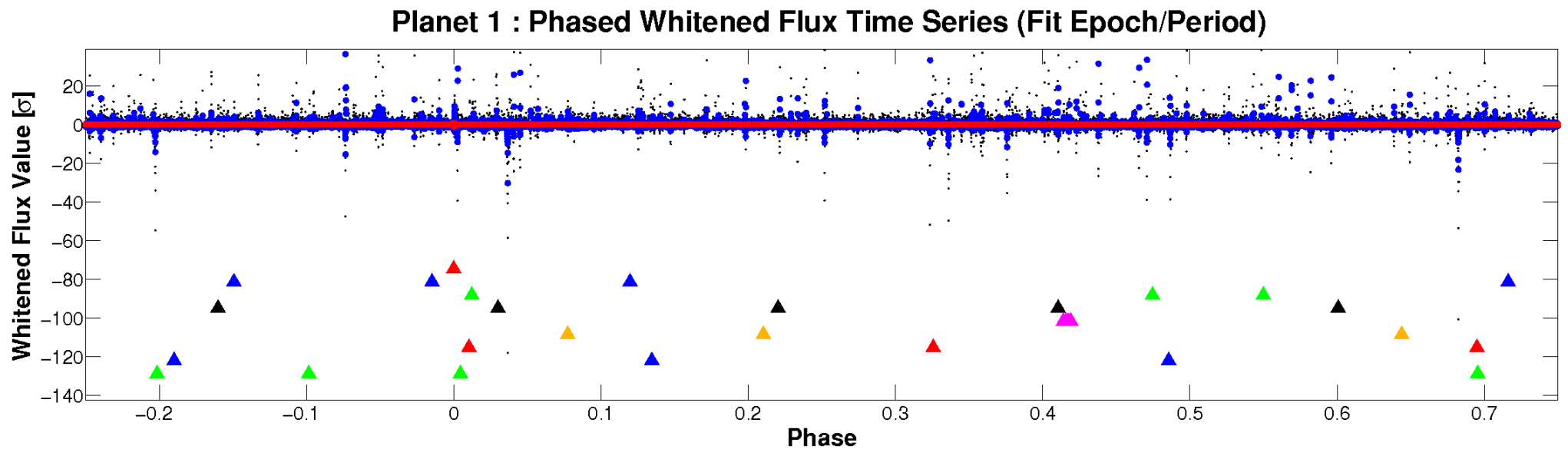
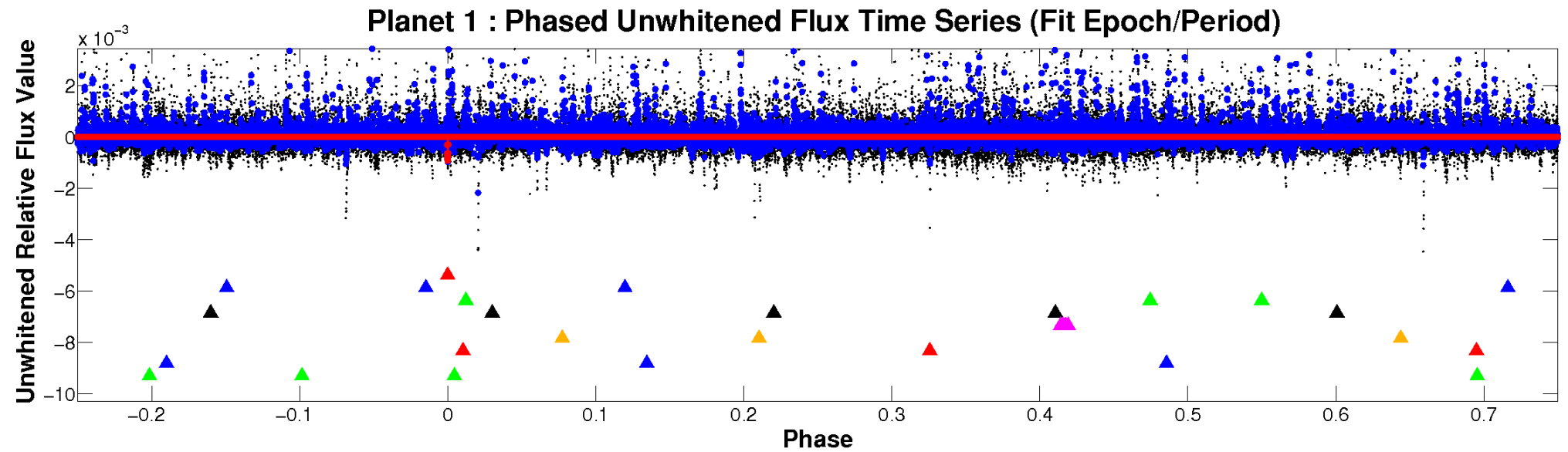


ALT Odd/Even

TCE 004158372-01

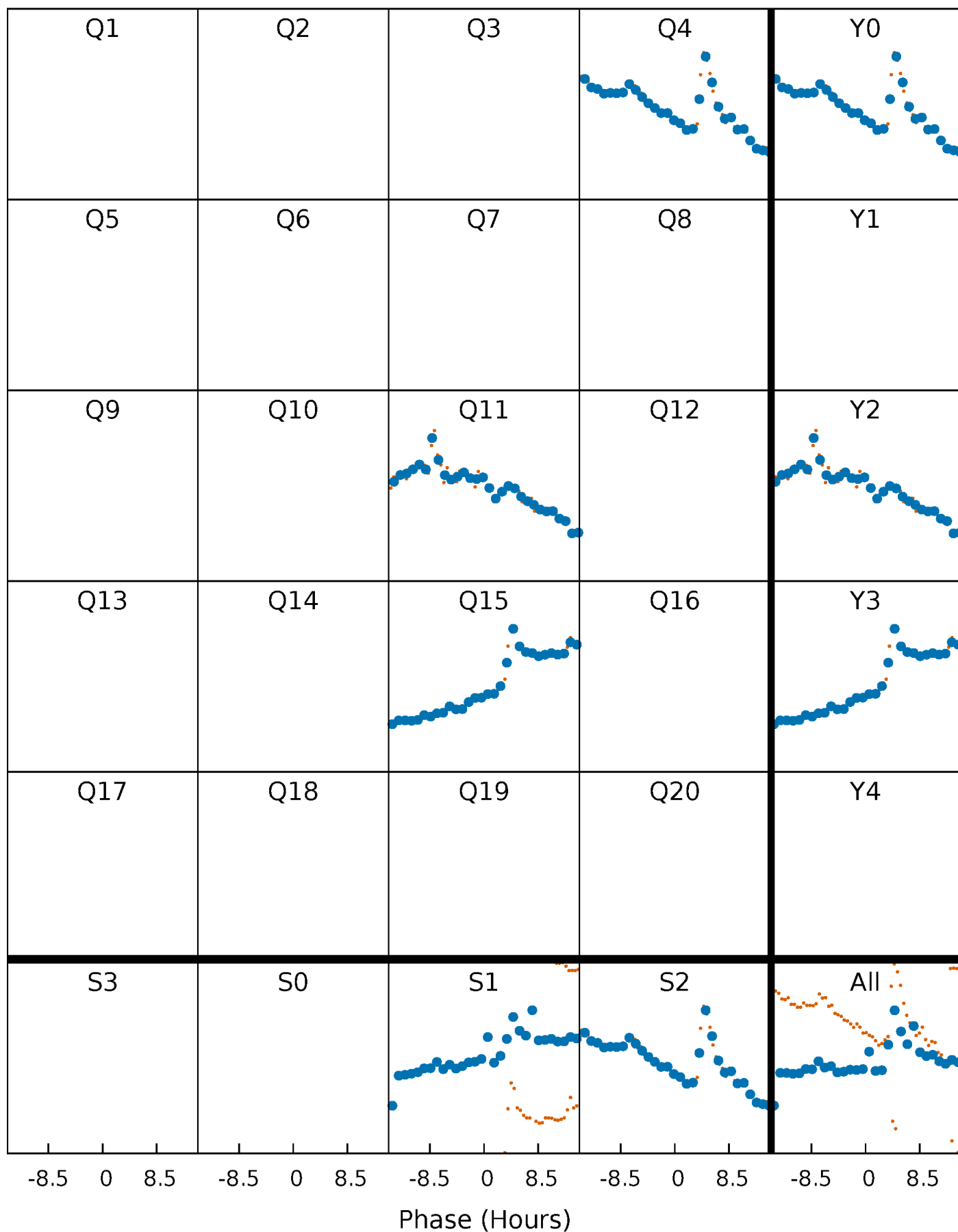


Non-Whitened Vs. Whitened Light Curve



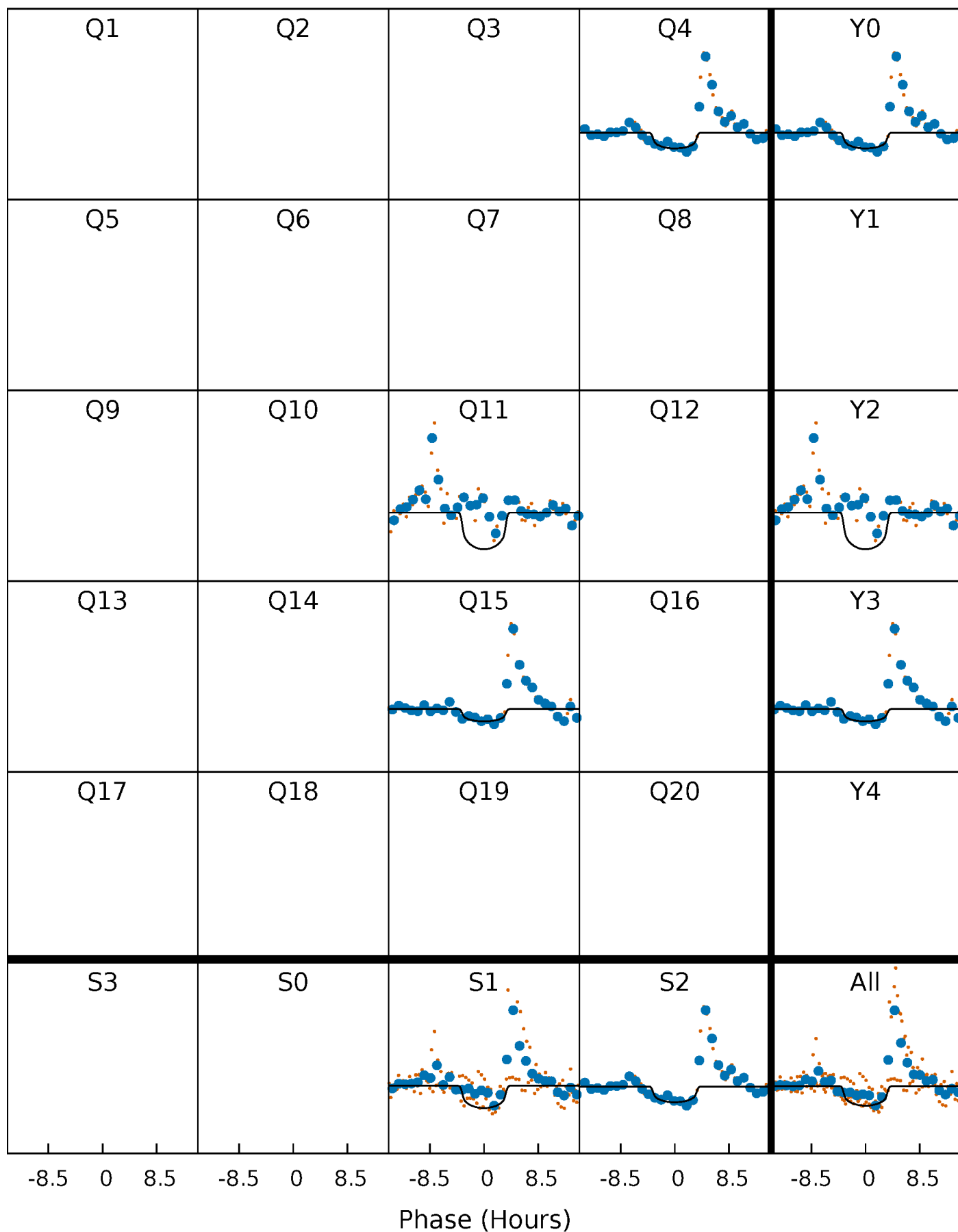
PDC Quarter-Phased Transit Curves

TCE 004158372-01 P=357.496909 Days $T_0=376.973374$ (BKJD)



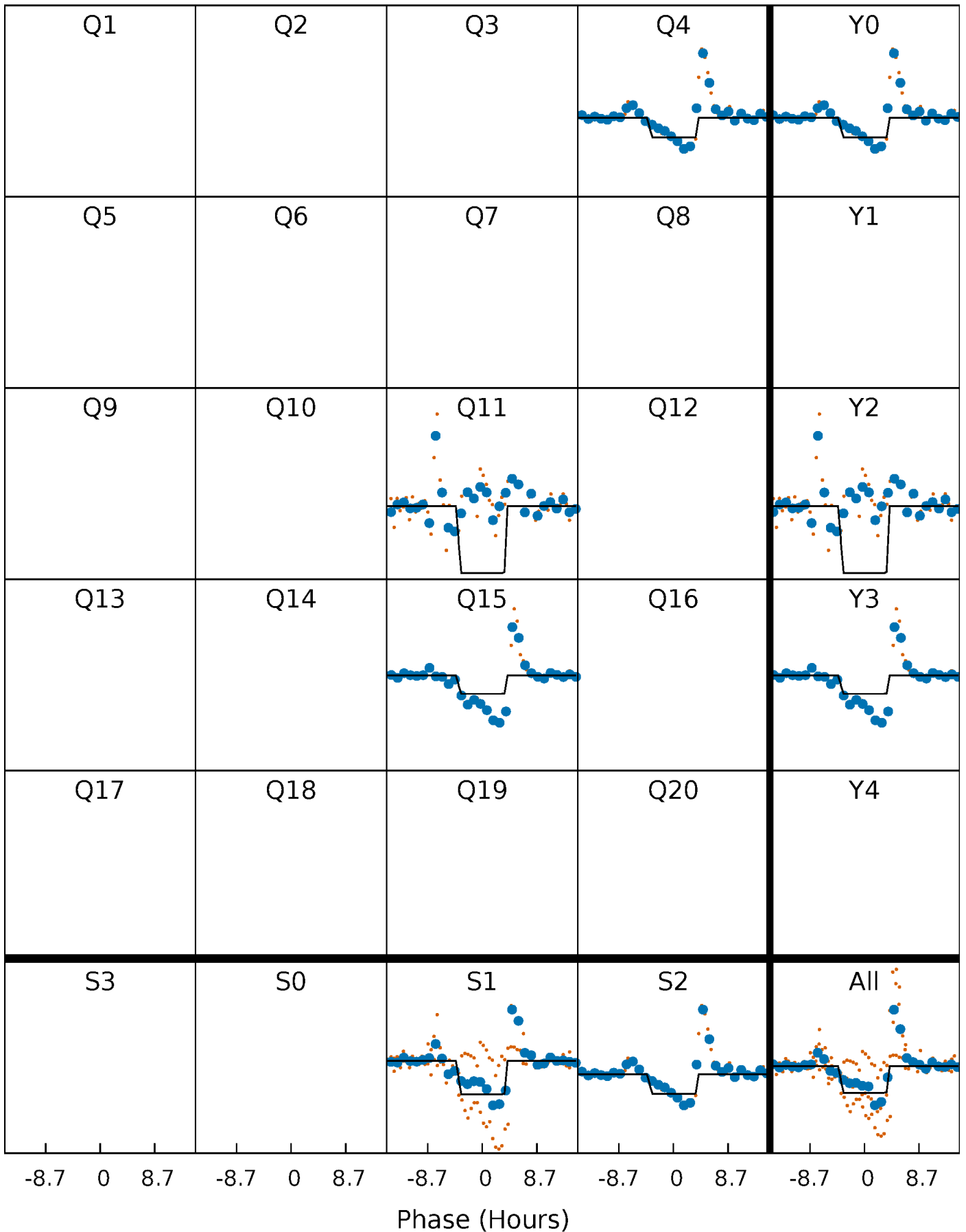
DV Quarter-Phased Transit Curves

TCE 004158372-01 P=357.496909 Days $T_0=376.973374$ (BKJD)



Alt. Detrend Quarter-Phased Transit Curves

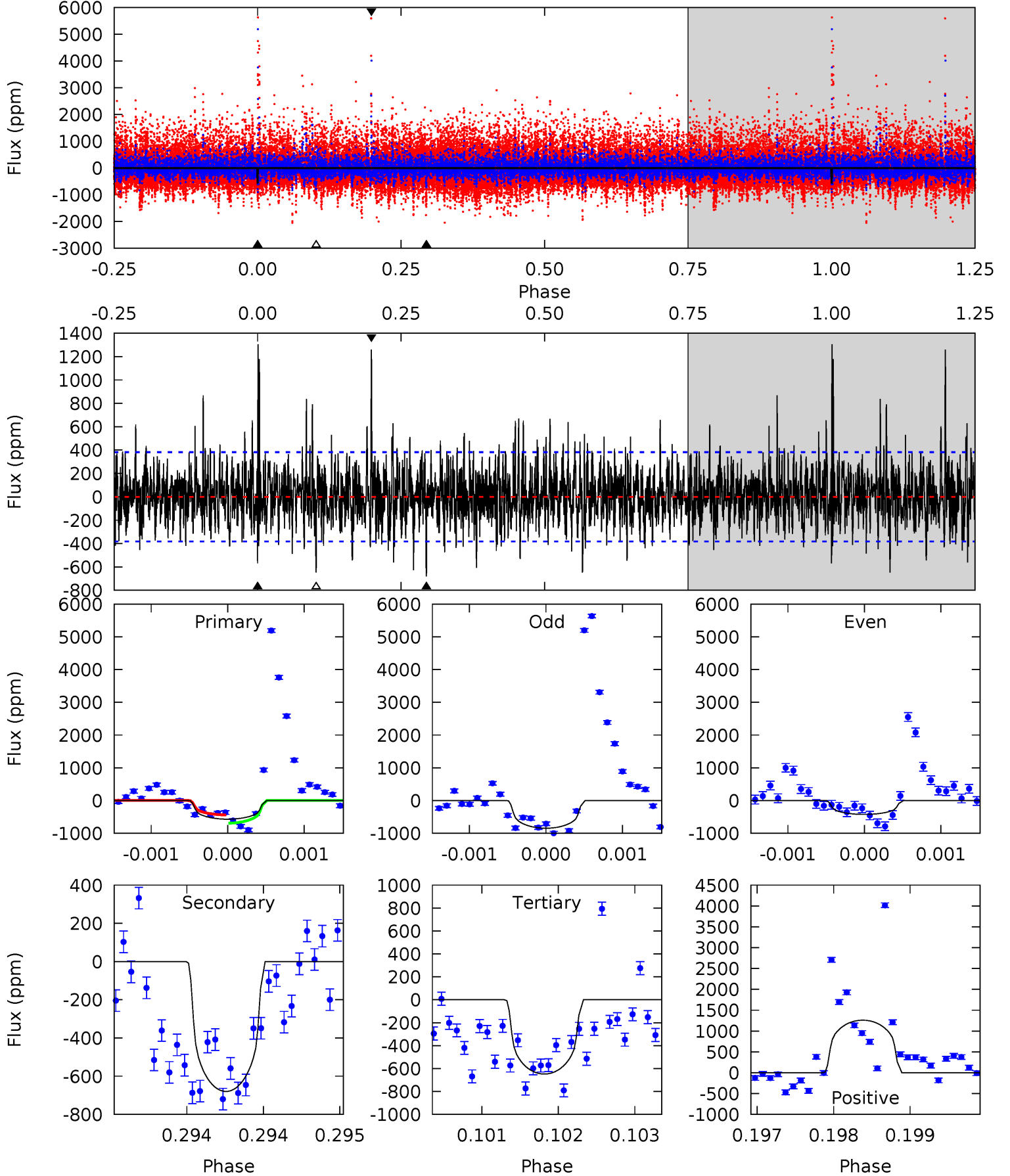
TCE 004158372-01 P=357.485132 Days $T_0=376.973019$ (BKJD)



DV Model-Shift Uniqueness Test

004158372-01, P = 357.496909 Days, E = 19.476465 Days

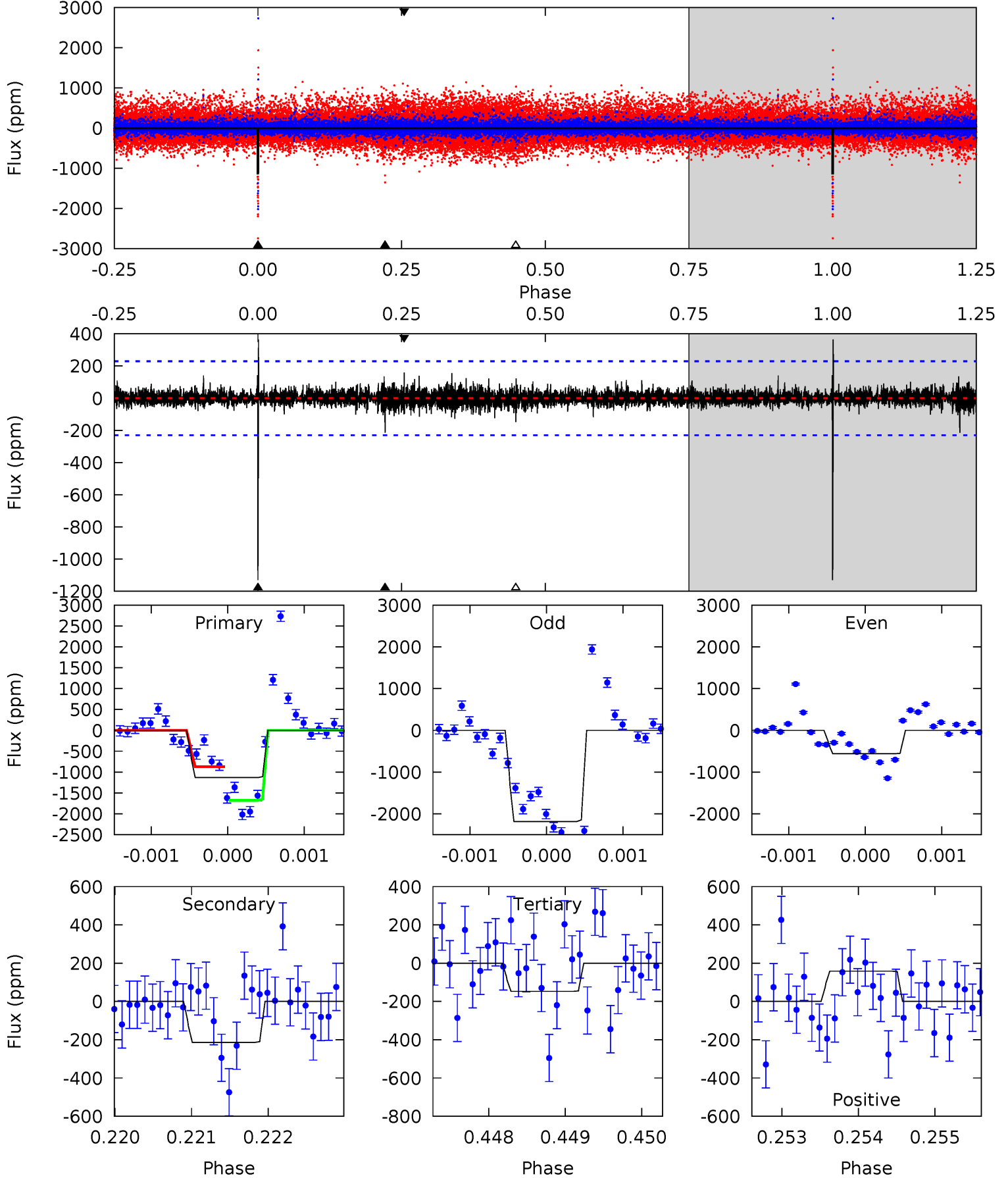
Pri	Sec	Ter	Pos	FA ₁	FA ₂	F _{Red}	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
8.16	9.74	9.28	18.1	5.47	3.32	2.70	-1.12	-9.89	0.46	-8.31	2.36	0.67	0.66	1.82



Alt Model-Shift Uniqueness Test

004158372-01, P = 357.485132 Days, E = 19.487887 Days

Pri	Sec	Ter	Pos	FA ₁	FA ₂	F _{Red}	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
26.9	5.09	3.50	3.77	5.47	3.32	0.67	23.4	23.1	1.59	1.32	22.1	0.91	0.24	8.96



Stellar Parameters For KIC 004158372

	$T_{\text{eff}}(K)$	$\log(g)$	$[\text{Fe}/\text{H}]$	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	4267^{+129}_{-129}	$4.608^{+0.049}_{-0.018}$	$0.120^{+0.250}_{-0.300}$	$0.670^{+0.032}_{-0.057}$	$0.662^{+0.052}_{-0.052}$	$3.109^{+0.665}_{-0.248}$
	+3%/-3%	+1%/-0%	+208%/-250%	+5%/-9%	+8%/-8%	+21%/-8%
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 004158372-01 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	A_{obs}
DV	-680 ± 70	$2.28^{+1.22}_{-1.11}$	230^{+8}_{-7}	3985^{+1208}_{-541}	$55208^{+150746}_{-33152}$
Alt.	-214 ± 42	$2.52^{+1.20}_{-1.16}$	230^{+8}_{-7}	3183^{+697}_{-329}	13942^{+30523}_{-7795}

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 $A_{obs} \gg 1.0$

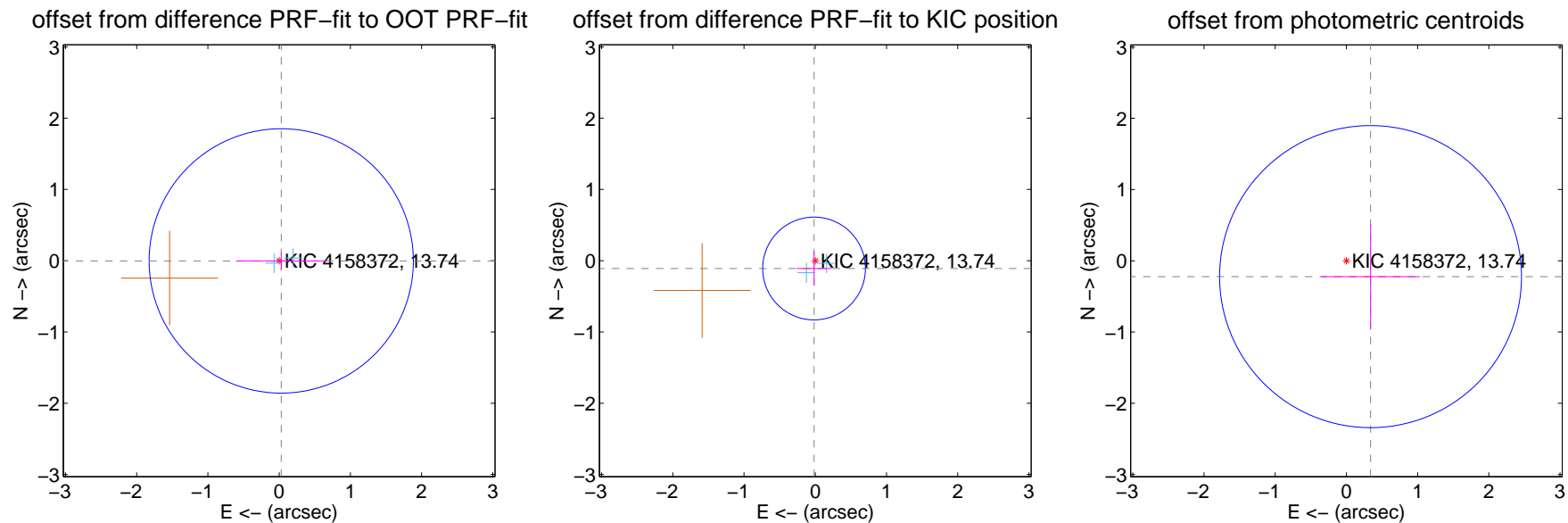
DV Centroid Data

Supplemental centroid analysis for 004158372-01. Kepler magnitude: 13.74. Transit SNR 5.67

There are 2 quarters with good PRF difference image offsets

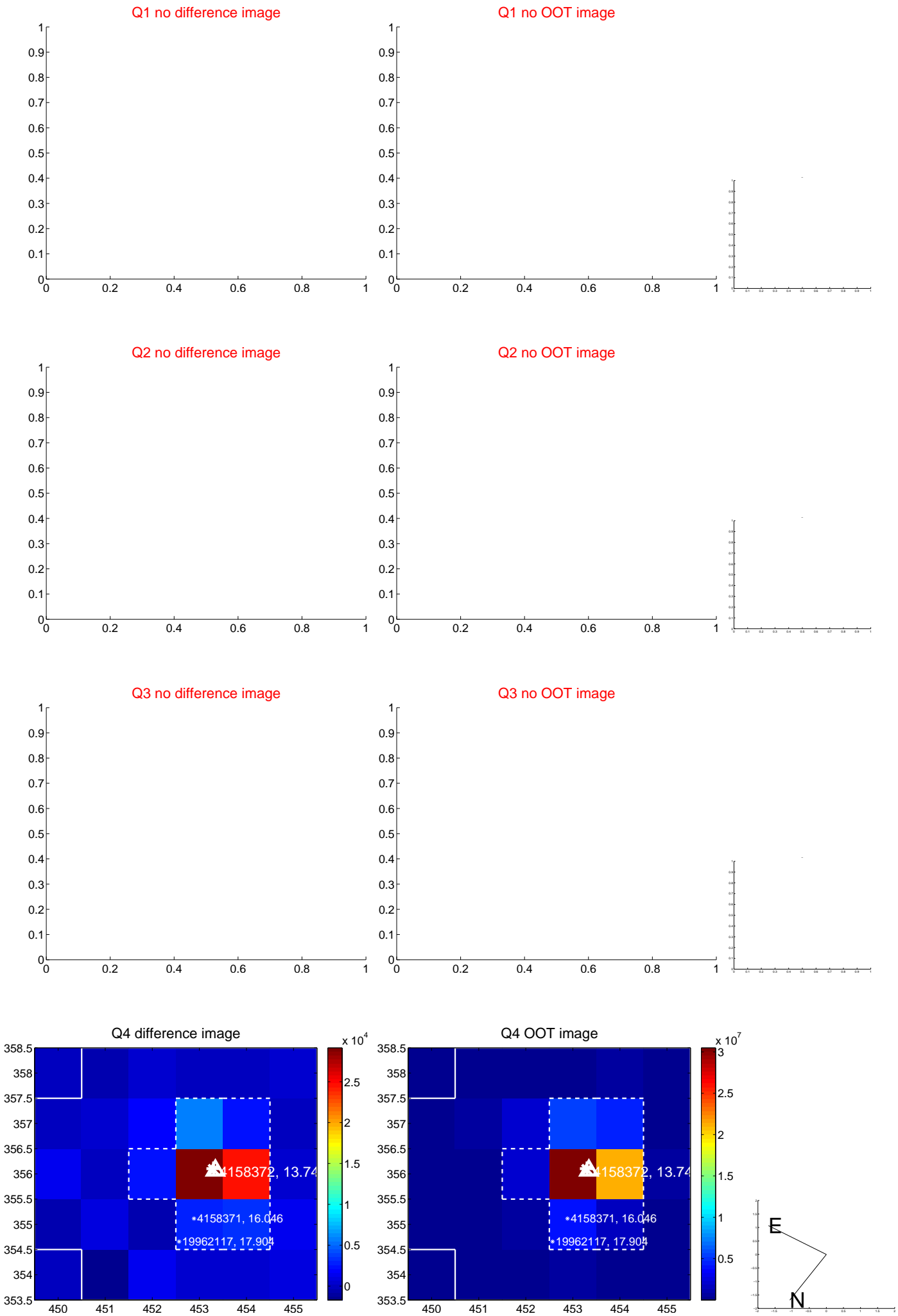
The direct PRF centroid is offset from the target star catalog position by about 0.15 arcsec

	Distance in arcsec	Distance / σ	Δ RA	Δ Dec
PRF-fit source offset from OOT	0.029 ± 0.618	0.05	-0.029 ± 0.634	-0.003 ± 0.121
PRF-fit source offset from KIC position	0.111 ± 0.240	0.46	0.017 ± 0.244	-0.109 ± 0.240
photometric centroid source offset	0.41 ± 0.71	0.57	-0.34 ± 0.69	-0.22 ± 0.74



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 ×: 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.

Q9 no difference image



Q9 no OOT image



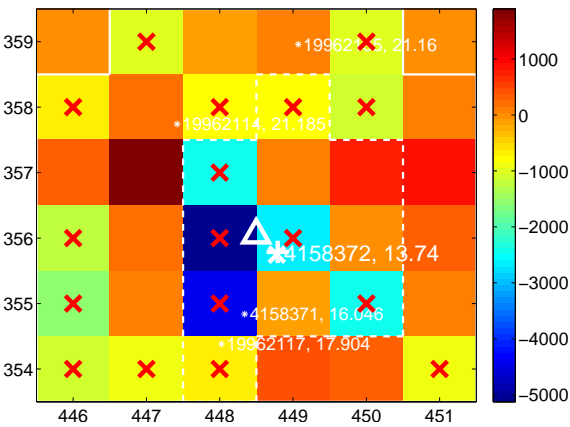
Q10 no difference image



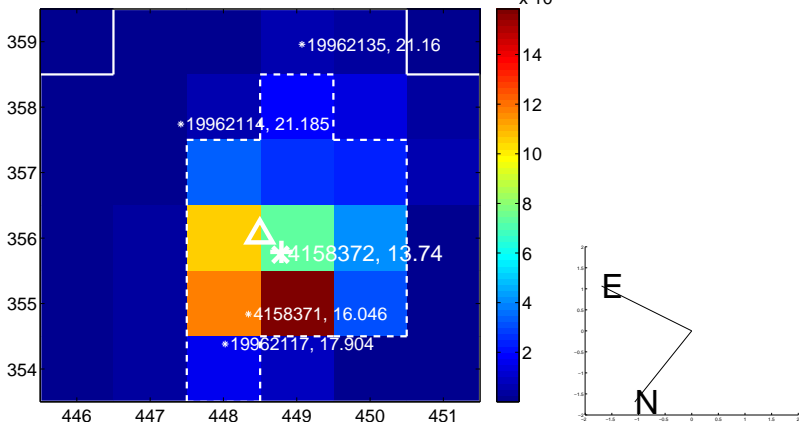
Q10 no OOT image



Q11 difference image. Poor Quality



Q11 OOT image



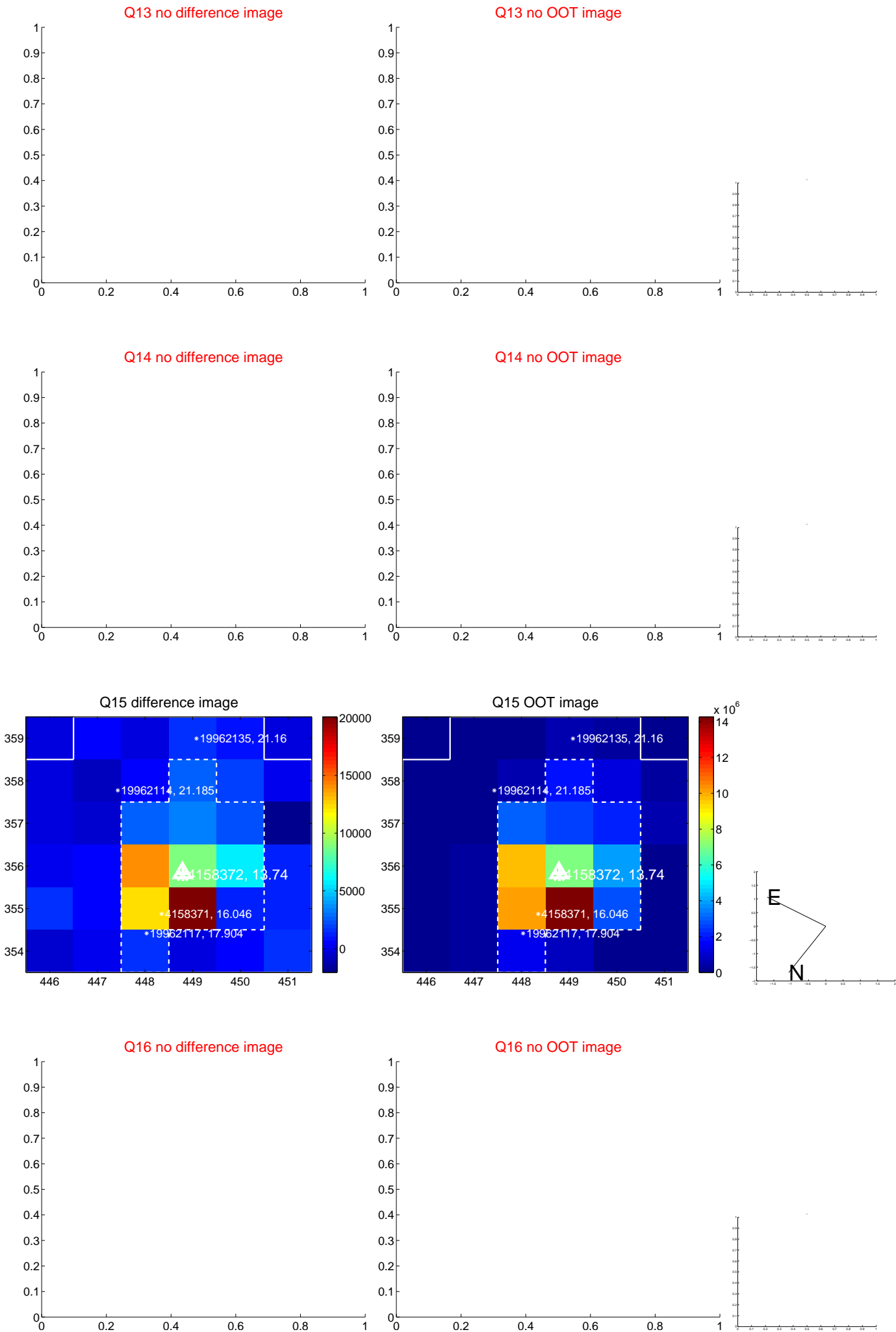
Q12 no difference image



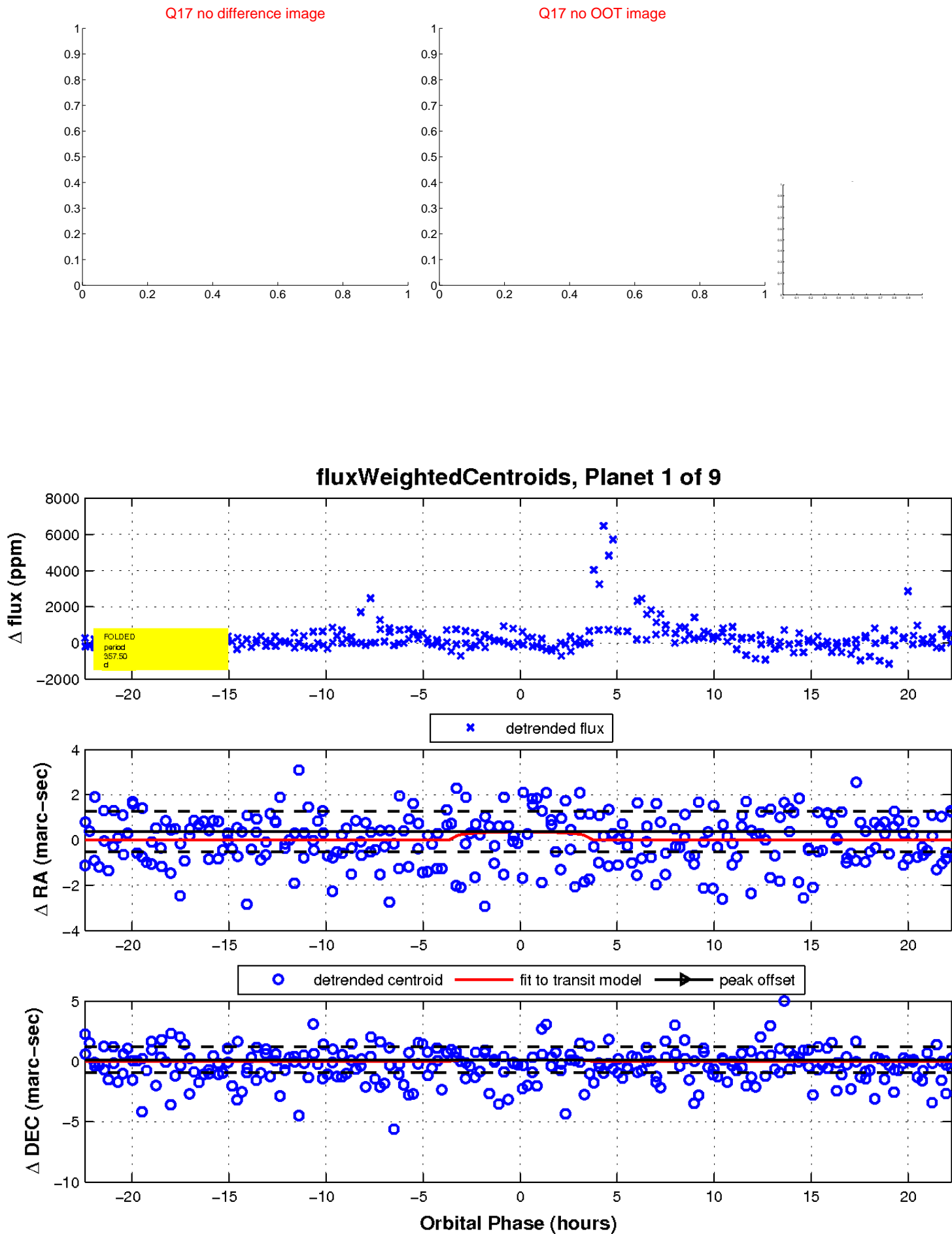
Q12 no OOT image



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

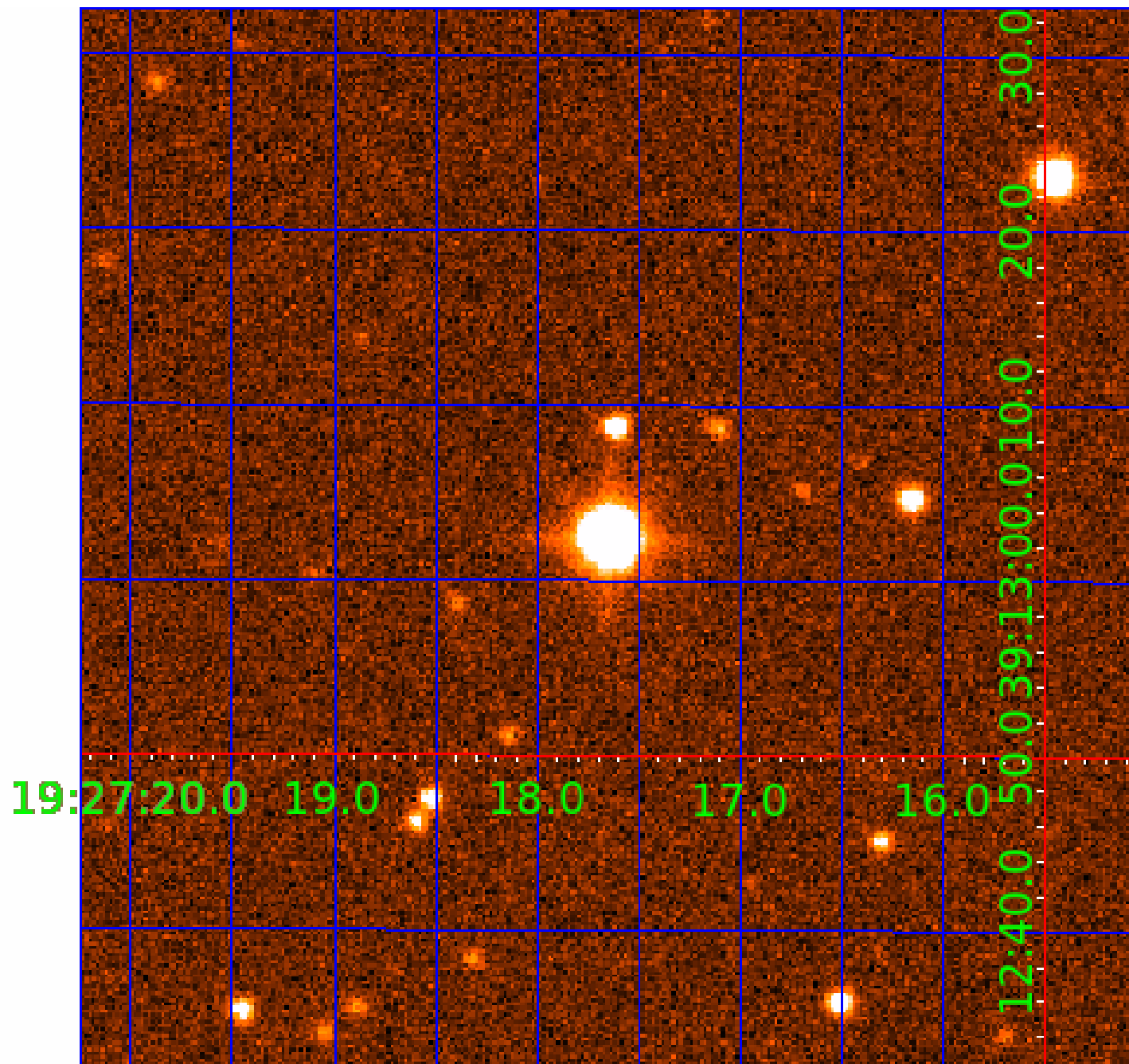


white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



UKIRT Image

Declination



KIC 004158372

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})
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Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
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004158372-02	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
004158372-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV
004158372-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—ALL_TRANS_CHASES
004158372-05	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_POS_DV—CENT_UNCERTAIN
004158372-07	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—CENT_FEW_DIFFS
004158372-08	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_MARSHALL—LPP_DV—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—CENT_FEW_DIFFS
004158372-09	OBS	FP	0.00	1	0	1	0	LPP_DV—ALL_TRANS_CHASES—CENT_NOFITS—HALO_GHOST

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

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

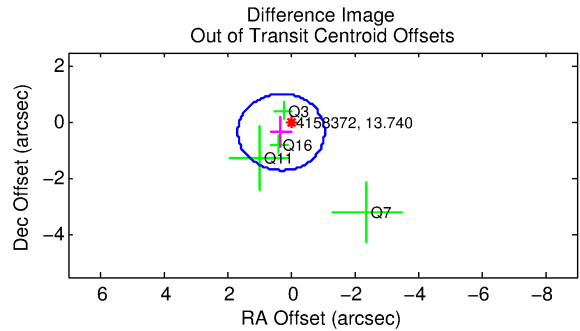
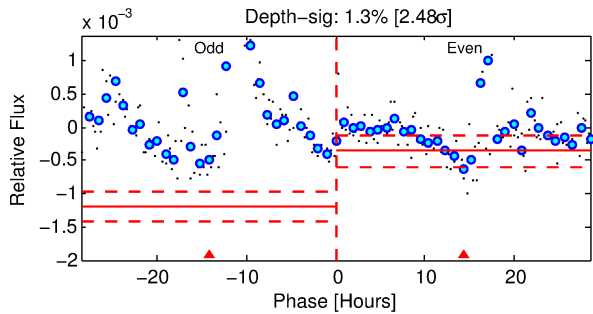
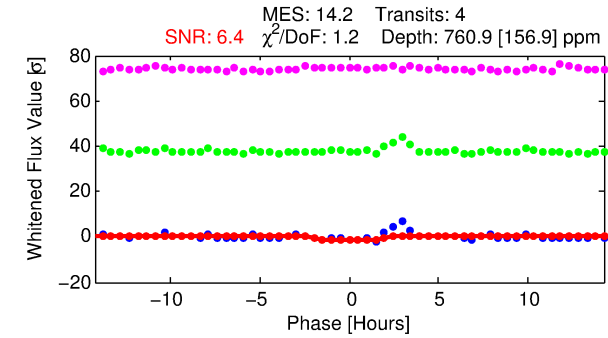
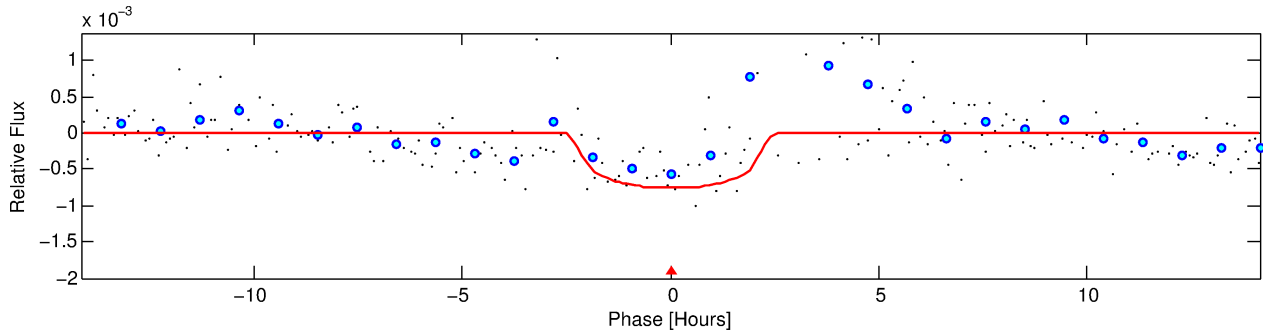
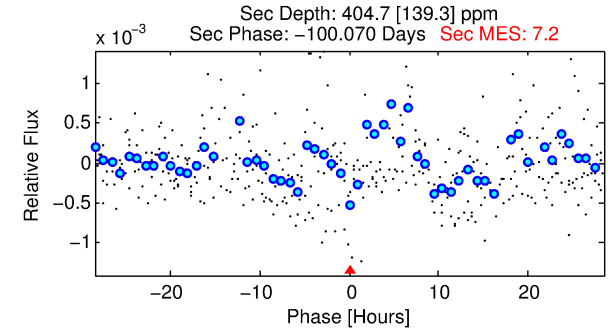
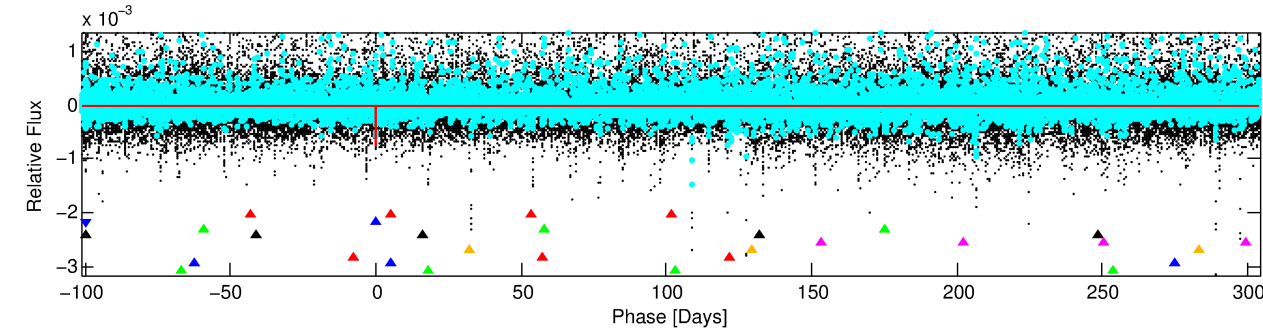
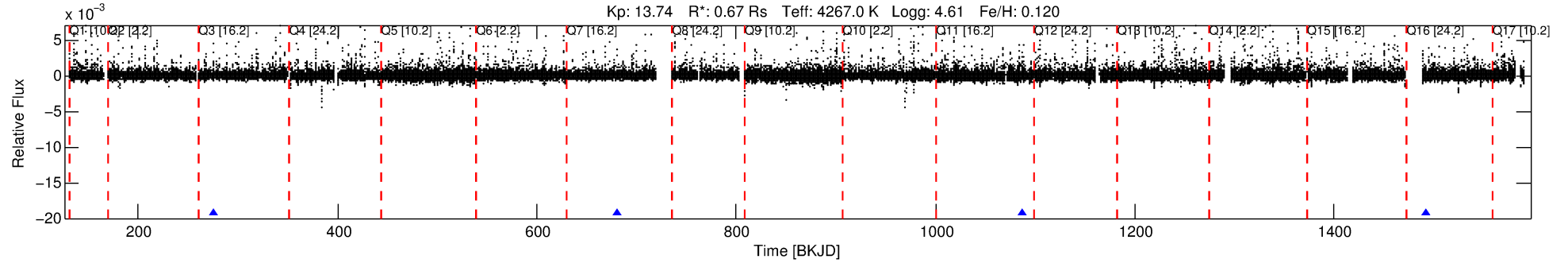
See http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col for comment definitions.

Ephemeris Match Information For 004158372-02

No Significant Match Found

DV One-Page Summary

KIC: 4158372 Candidate: 2 of 9 Period: 405.589 d



DV Fit Results:

Period = 405.58926 [0.00456] d
Epoch = 275.5112 [0.0086] BKJD
Rp/R* = 0.0278 [0.0267]
a/R* = 453.75 [1403.88]
b = 0.76 [1.76]
Seff = 0.15 [0.02]
Teq = 159 [6] K
Rp = 2.03 [1.96] Re
a = 0.9357 [0.0637] AU
Ag = 47164.33 [92282.77] [0.51 σ]
Teffp = 3629 [1777] K [1.95 σ]

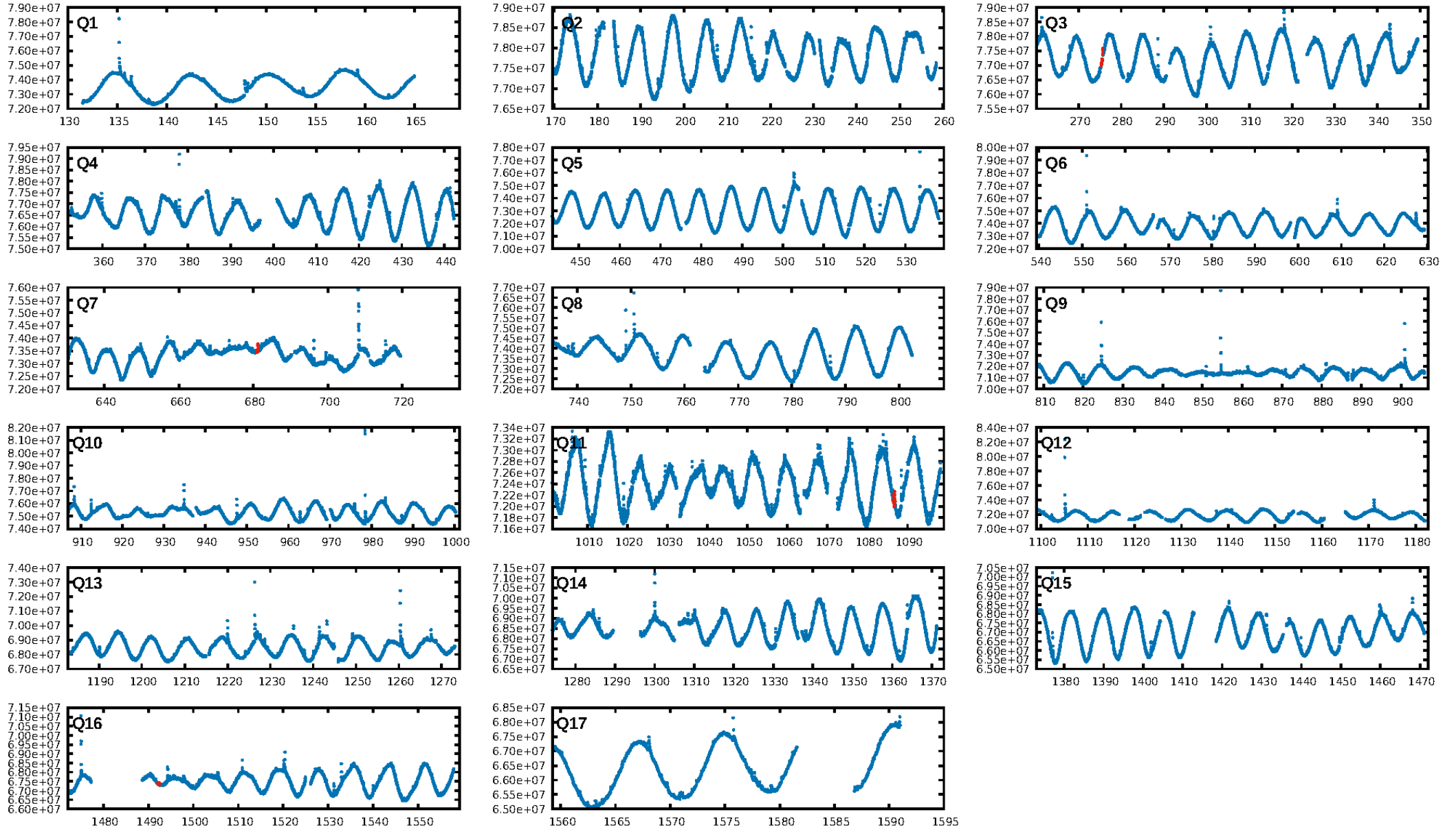
DV Diagnostic Results:

ShortPeriod-sig: 100.0% [130.46 σ]
LongPeriod-sig: 100.0% [188.40 σ]
ModelChiSquare2-sig: 9.0%
ModelChiSquareGof-sig: 91.9%
Bootstrap-pfa: N/A
RollingBand-fgt: 1.00 [4/4]
GhostDiagnostic-chr: 1.159
Centroid-sig: 7.1%
Centroid-so: 1.167 arcsec [1.17 σ]
OotOffset-rm: 0.450 arcsec [0.99 σ]
KicOffset-rm: 0.618 arcsec [1.37 σ]
OotOffset-st: 0/3/1/0 [4]
KicOffset-st: 0/3/1/0 [4]
DiffImageQuality-fgm: 0.75 [3/4]
DiffImageOverlap-fno: 1.00 [4/4]

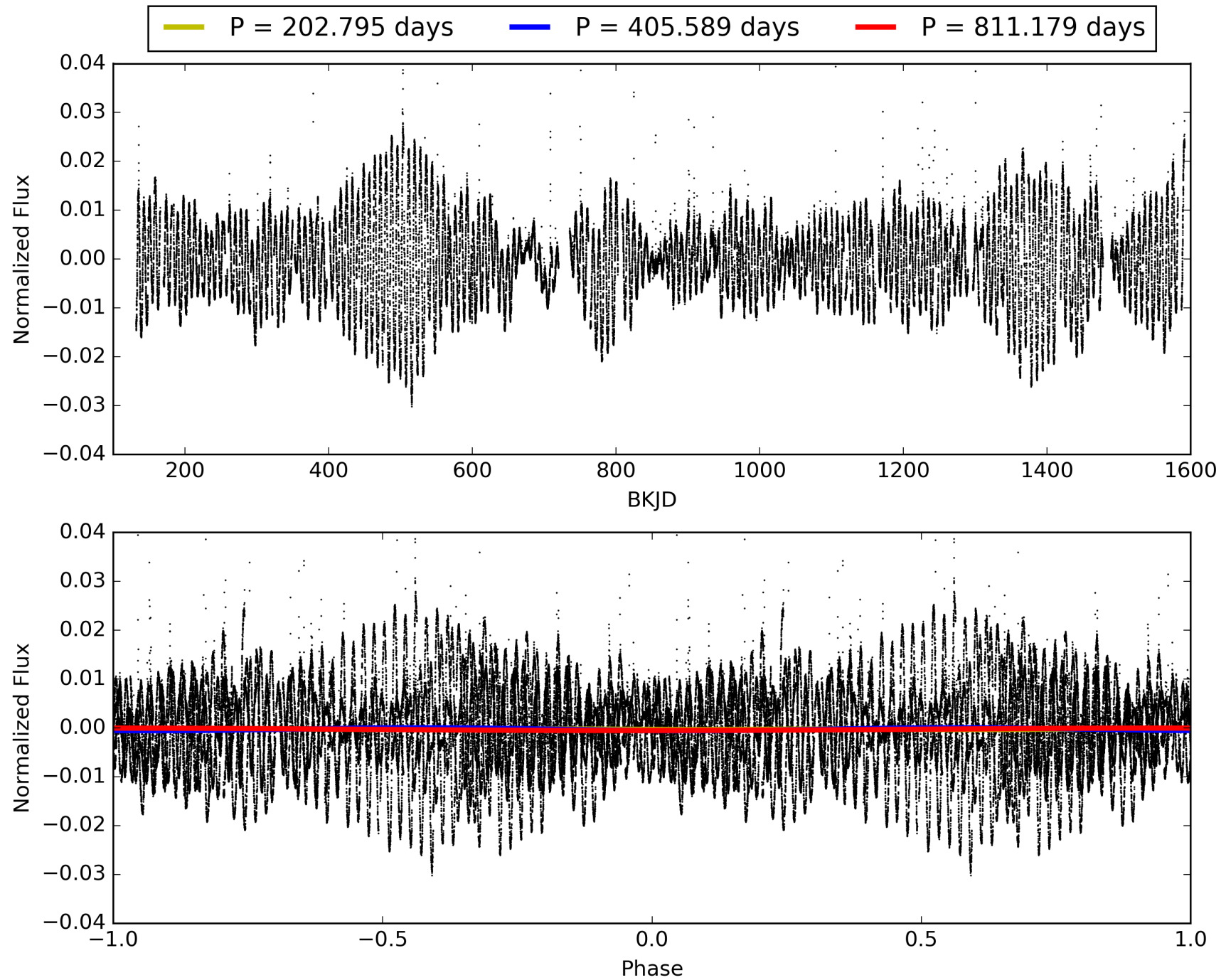
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This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

TCE 004158372-02, PDC Light Curves

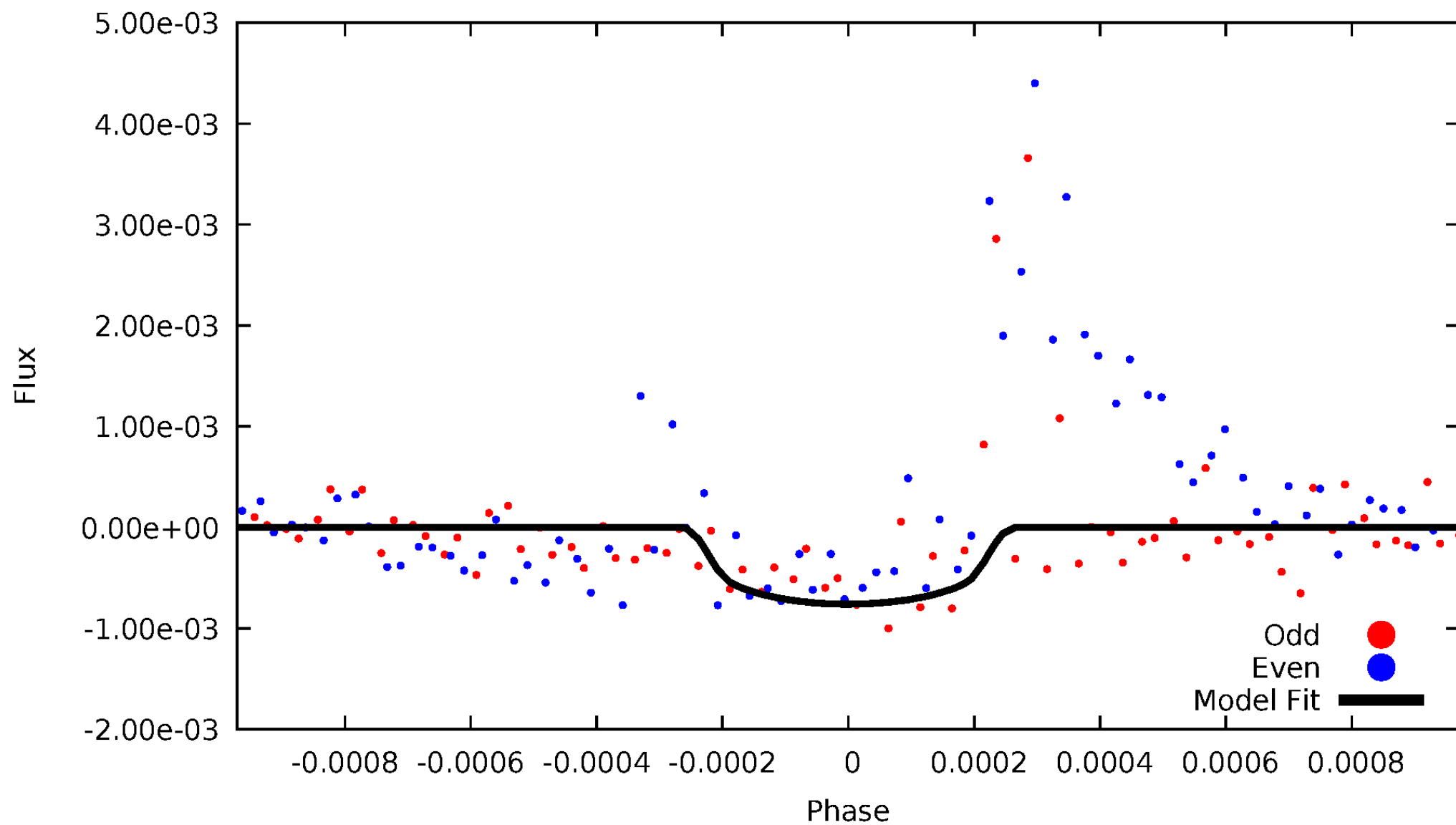


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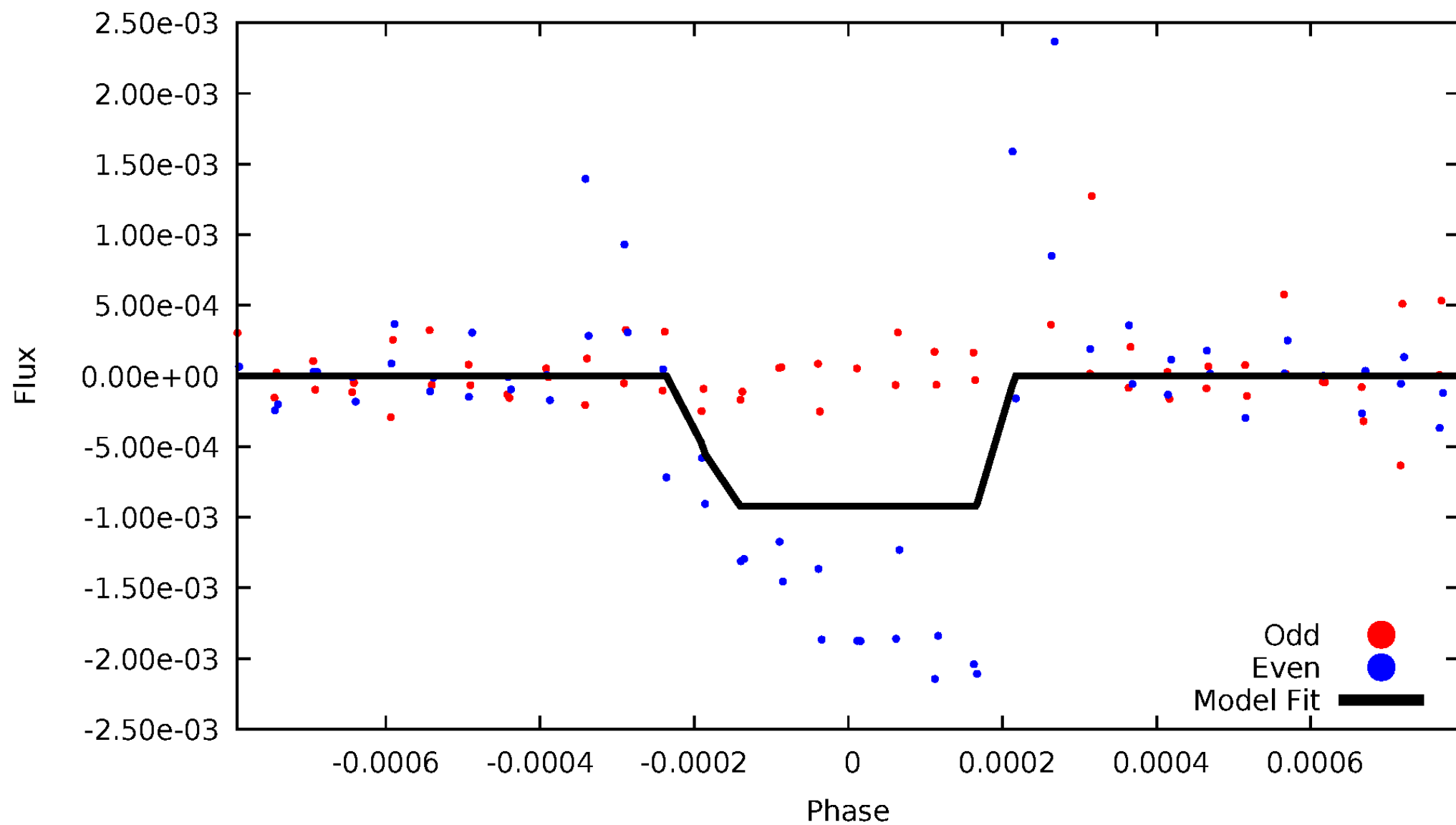
DV Odd/Even

TCE 004158372-02



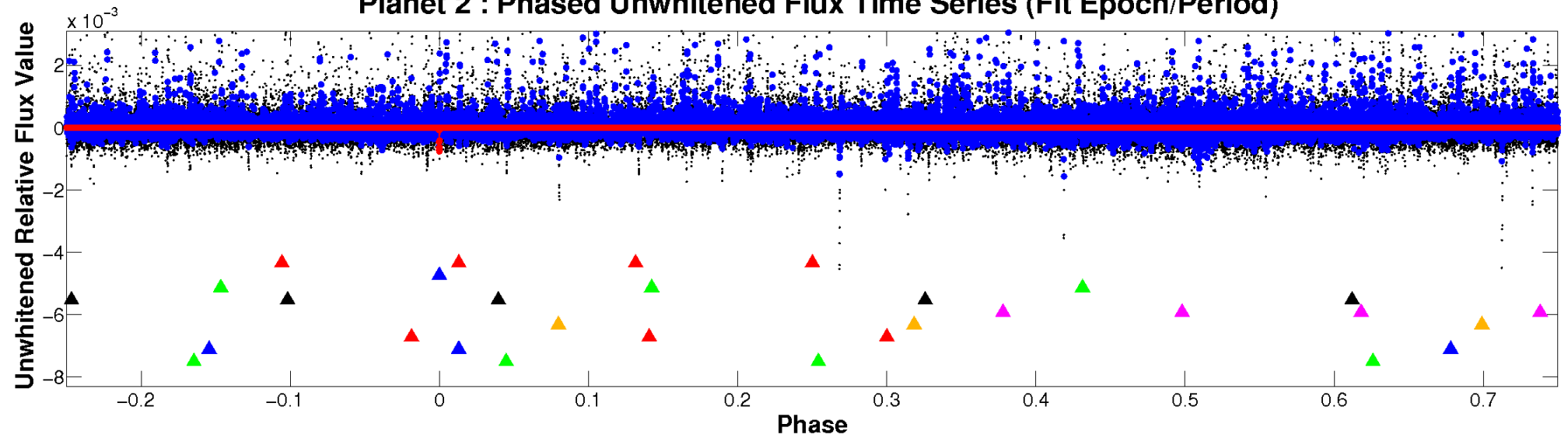
ALT Odd/Even

TCE 004158372-02

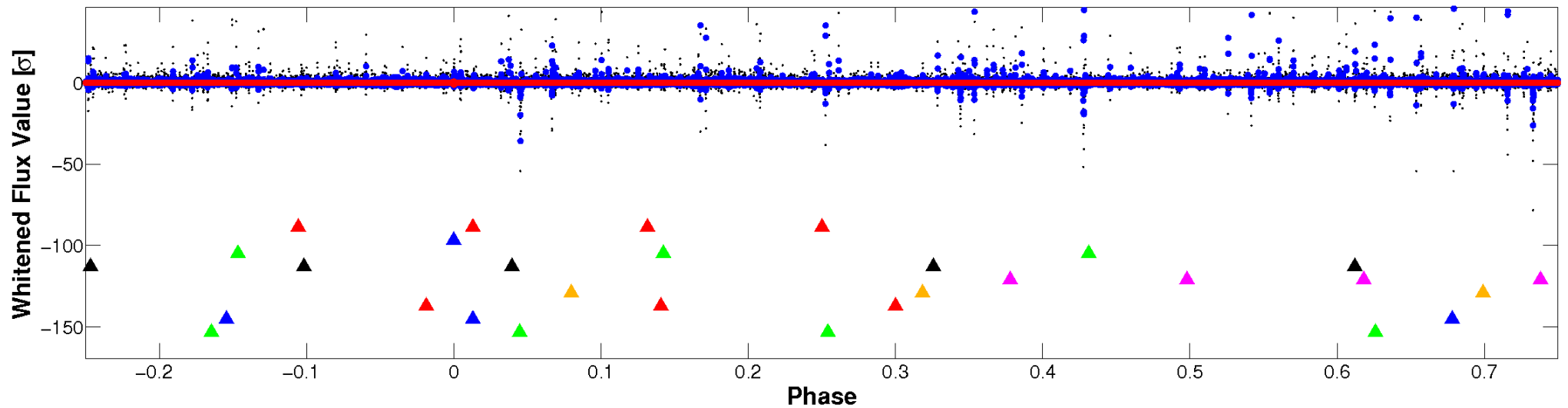


Non-Whitened Vs. Whitened Light Curve

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

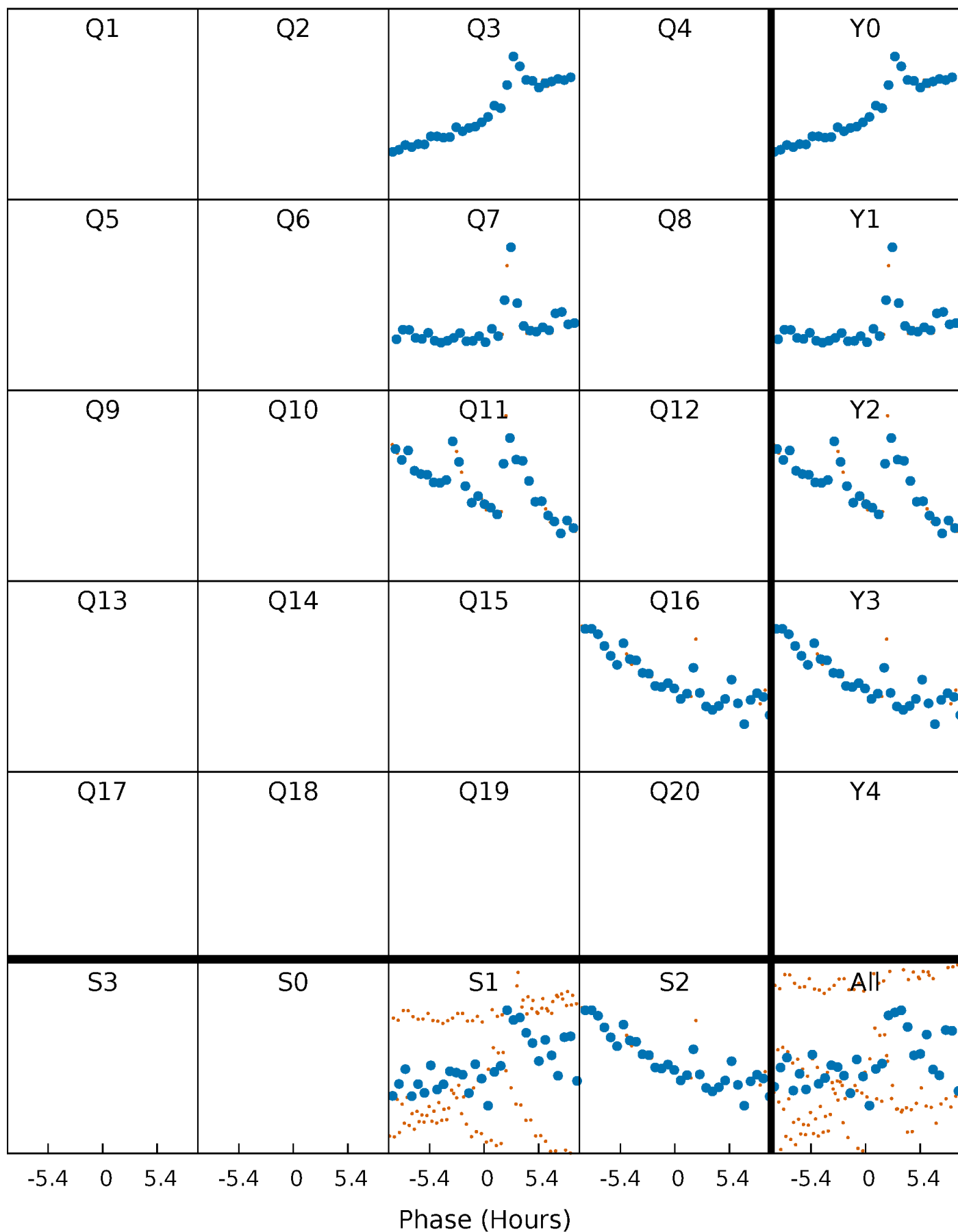


Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



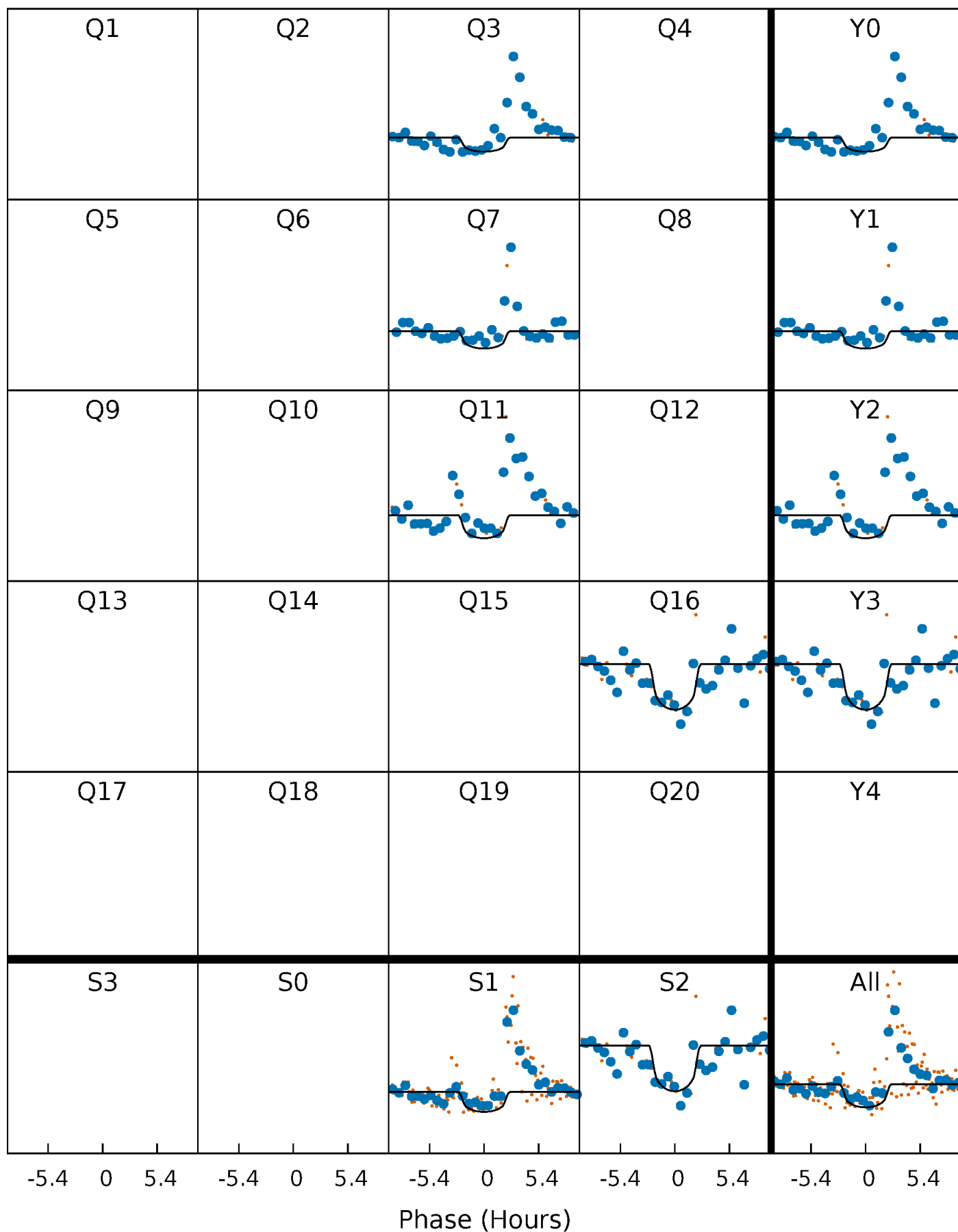
PDC Quarter-Phased Transit Curves

TCE 004158372-02 $P=405.589263$ Days $T_0=275.511211$ (BKJD)



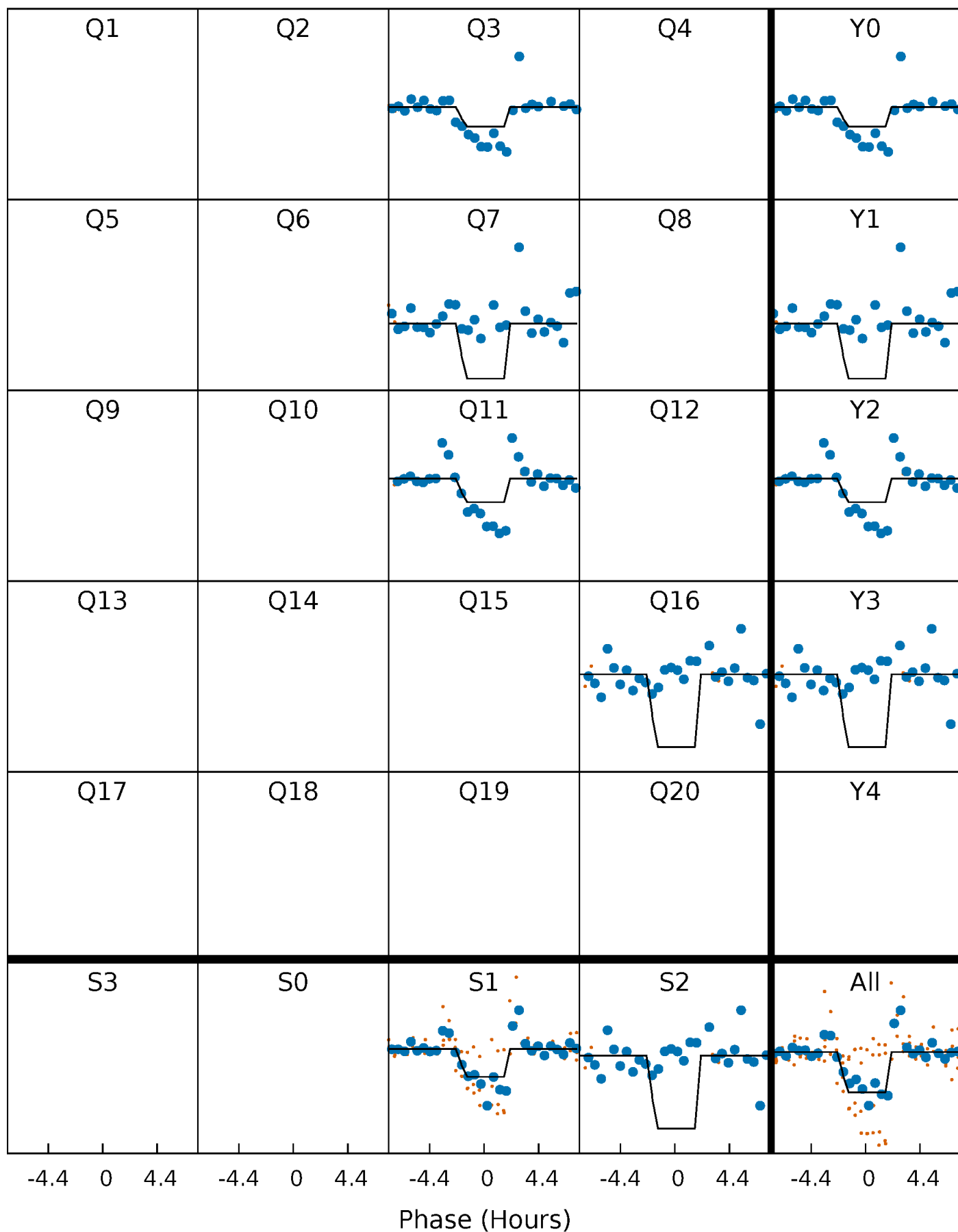
DV Quarter-Phased Transit Curves

TCE 004158372-02 $P=405.589263$ Days $T_0=275.511211$ (BKJD)



Alt. Detrend Quarter-Phased Transit Curves

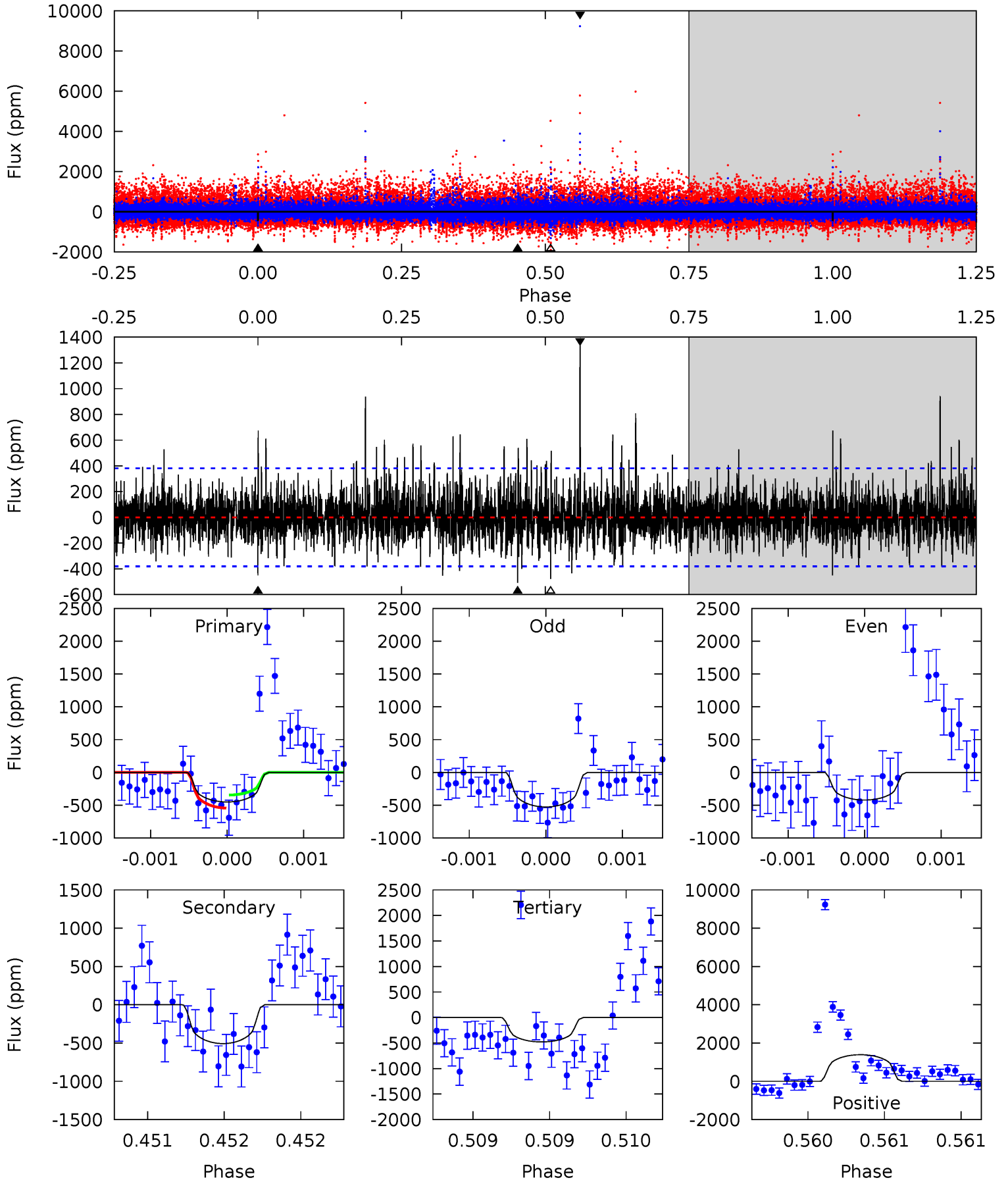
TCE 004158372-02 P=405.585732 Days $T_0=275.522799$ (BKJD)



DV Model-Shift Uniqueness Test

004158372-02, P = 405.589263 Days, E = 275.511211 Days

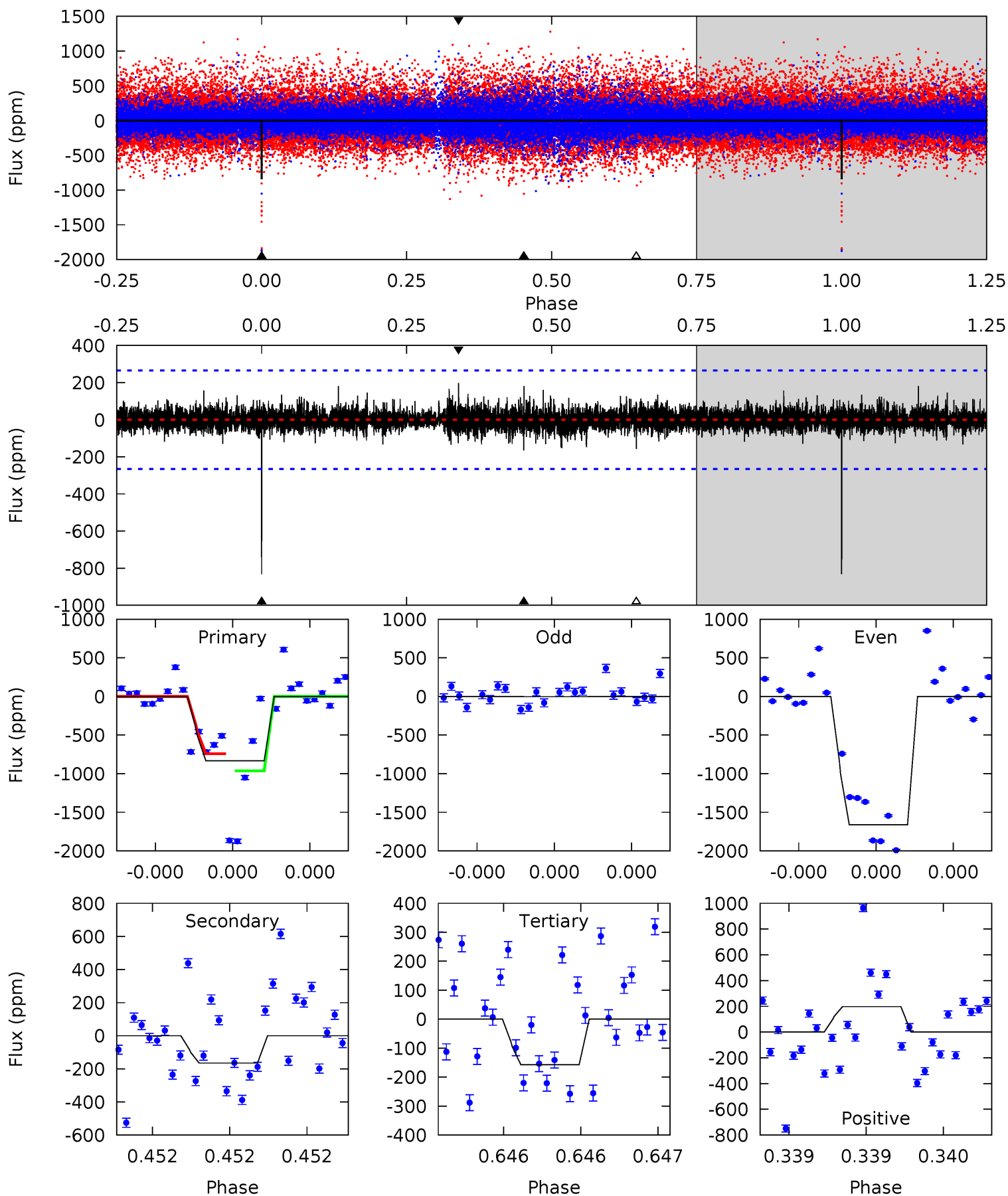
Pri	Sec	Ter	Pos	FA ₁	FA ₂	F _{Red}	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
6.60	7.42	7.00	20.4	5.57	3.48	1.99	-0.40	-13.8	0.42	-12.9	0.46	1.18	0.73	1.46



Alt Model-Shift Uniqueness Test

004158372-02, P = 405.585732 Days, E = 275.522799 Days

Pri	Sec	Ter	Pos	FA ₁	FA ₂	F _{Red}	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
17.6	3.49	3.32	4.19	5.61	3.54	0.71	14.3	13.4	0.17	-0.70	18.7	0.99	0.19	2.26



Stellar Parameters For KIC 004158372

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	4267^{+129}_{-129}	$4.608^{+0.049}_{-0.018}$	$0.120^{+0.250}_{-0.300}$	$0.670^{+0.032}_{-0.057}$	$0.662^{+0.052}_{-0.052}$	$3.109^{+0.665}_{-0.248}$
	+3%/-3%	+1%/-0%	+208%/-250%	+5%/-9%	+8%/-8%	+21%/-8%
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 004158372-02 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	A_{obs}
DV	-507 ± 68	$2.38^{+1.76}_{-1.45}$	221^{+7}_{-8}	3731^{+1678}_{-610}	$44779^{+245078}_{-30944}$
Alt.	-165 ± 47	$2.38^{+1.88}_{-1.42}$	221^{+8}_{-8}	3130^{+1150}_{-472}	14134^{+74015}_{-9827}

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

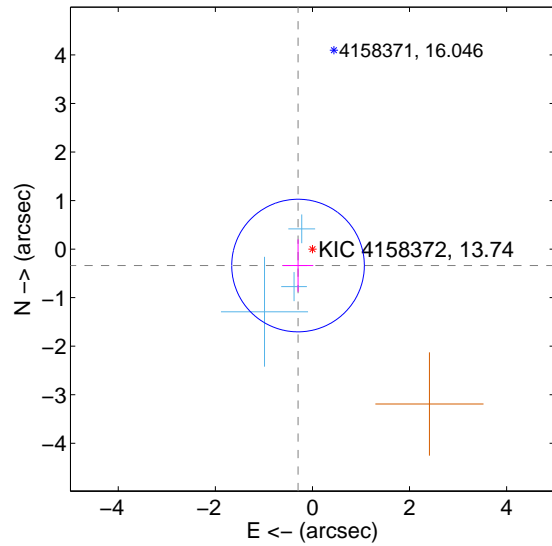
Supplemental centroid analysis for 004158372-02. Kepler magnitude: 13.74. Transit SNR 6.35

There are 3 quarters with good PRF difference image offsets

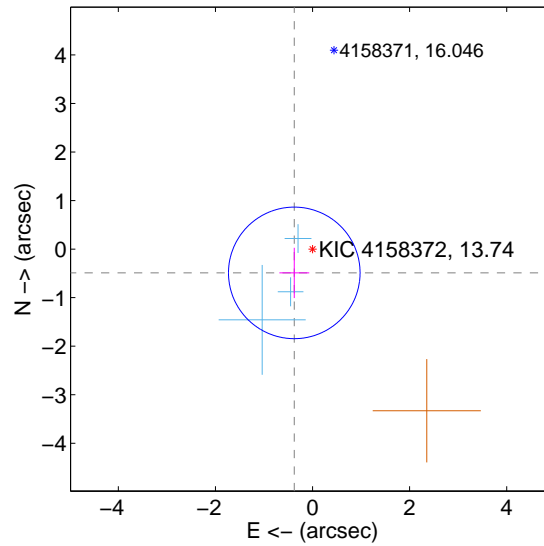
The direct PRF centroid is offset from the target star catalog position by about 0.13 arcsec

	Distance in arcsec	Distance / σ	Δ RA	Δ Dec
PRF-fit source offset from OOT	0.450 ± 0.455	0.99	0.297 ± 0.314	-0.339 ± 0.539
PRF-fit source offset from KIC position	0.618 ± 0.452	1.37	0.376 ± 0.308	-0.490 ± 0.518
photometric centroid source offset	1.17 ± 1.00	1.17	0.52 ± 0.88	1.04 ± 1.02

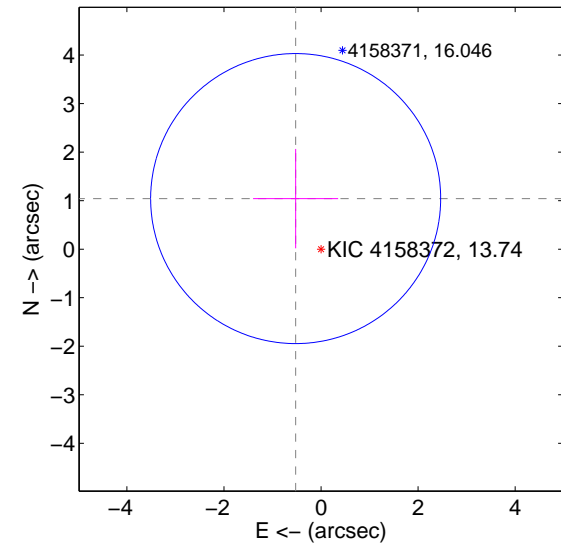
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position

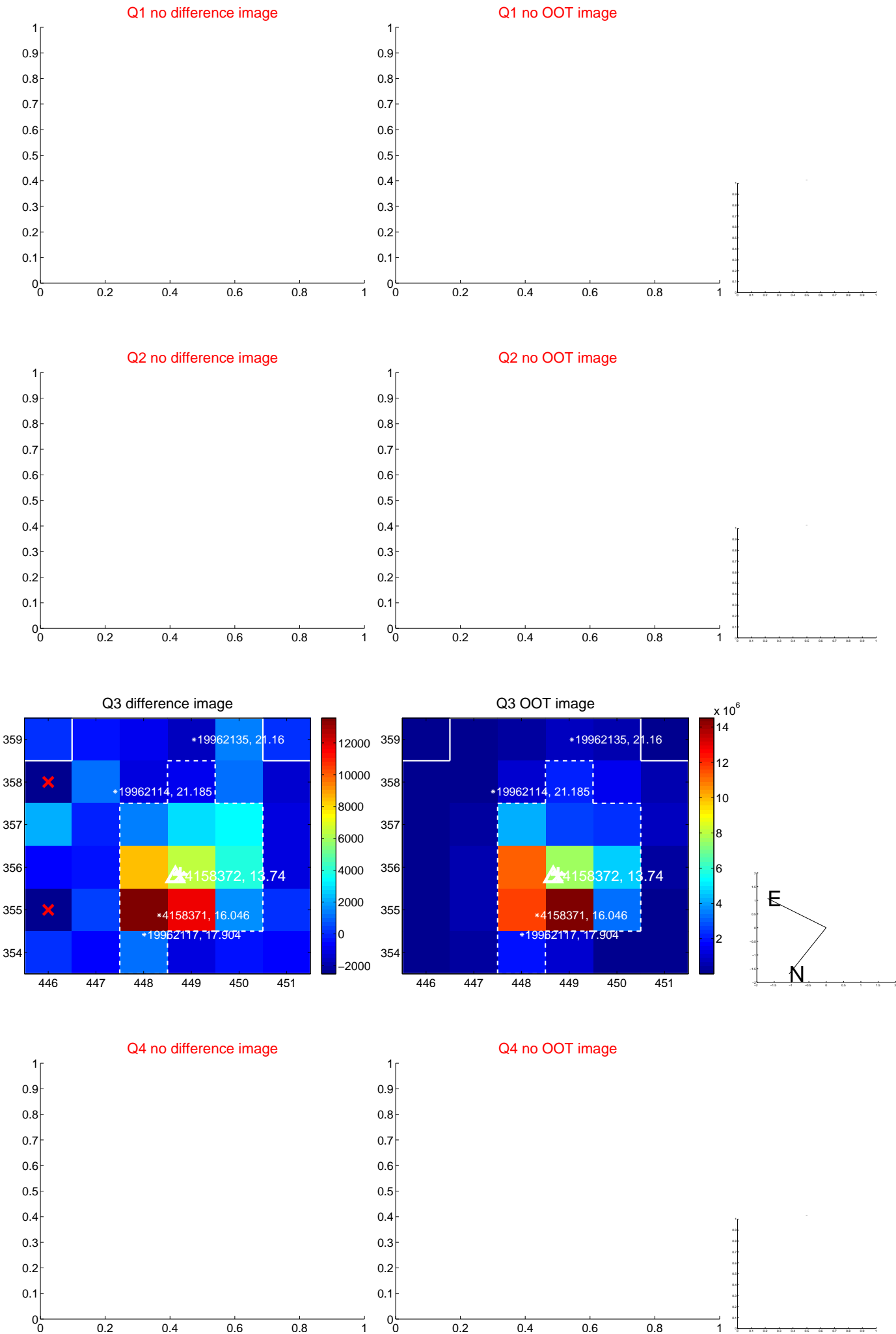


offset from photometric centroids



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.

Q5 no difference image



Q5 no OOT image



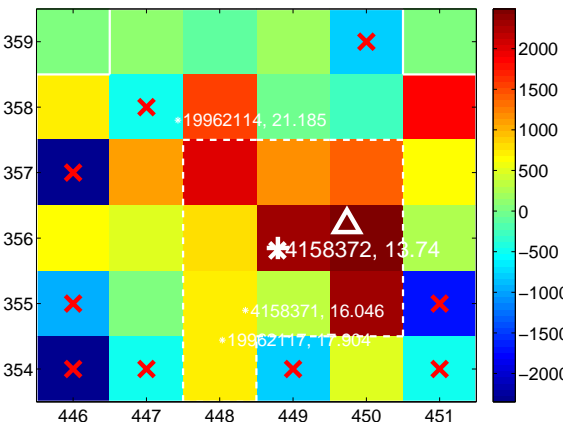
Q6 no difference image



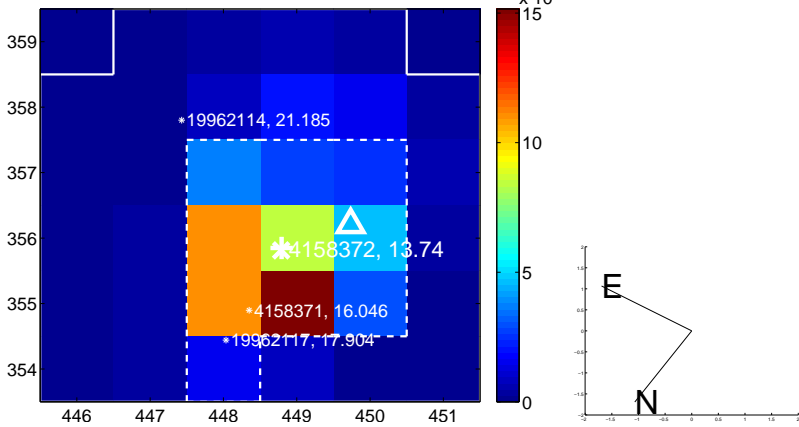
Q6 no OOT image



Q7 difference image. Poor Quality



Q7 OOT image



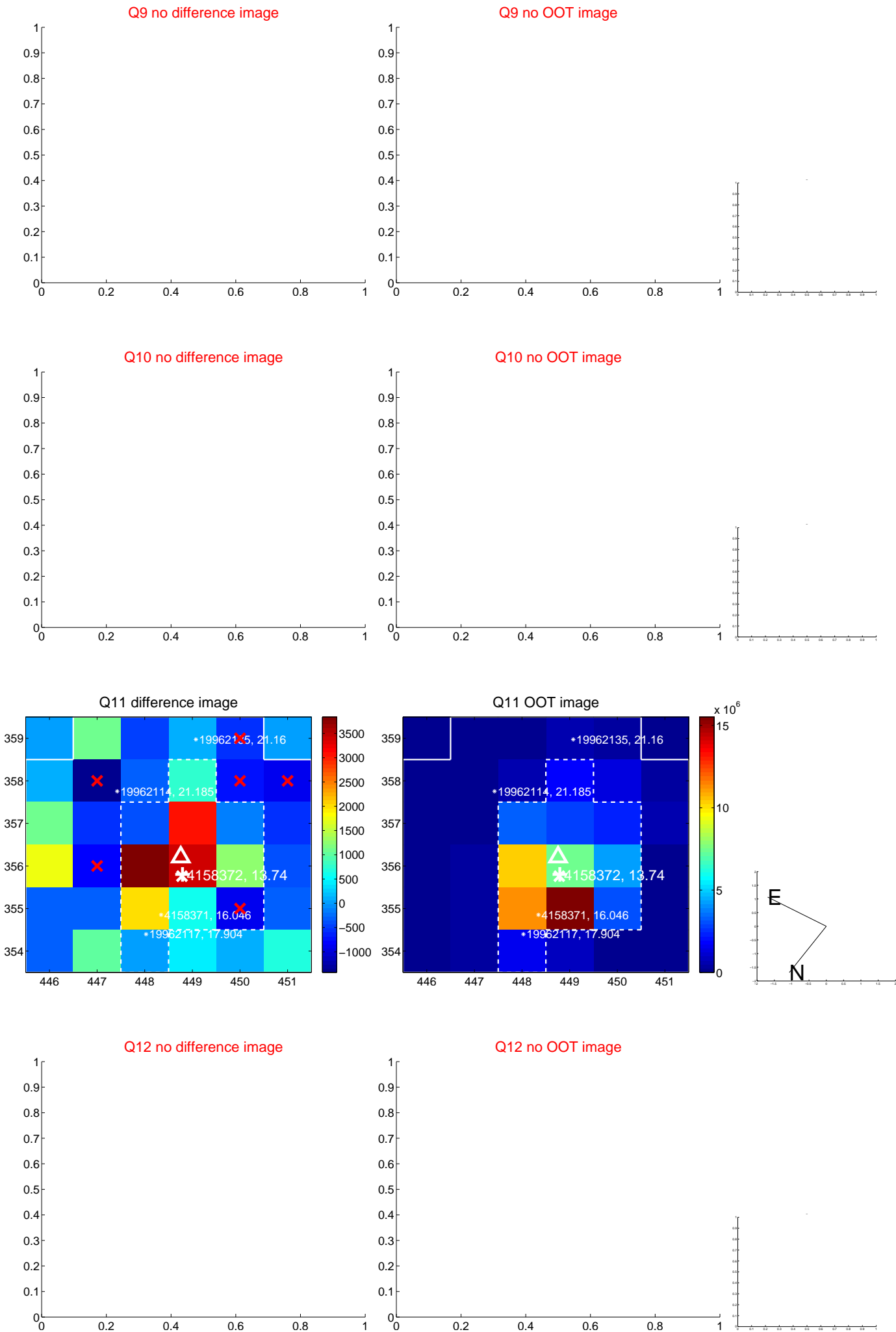
Q8 no difference image



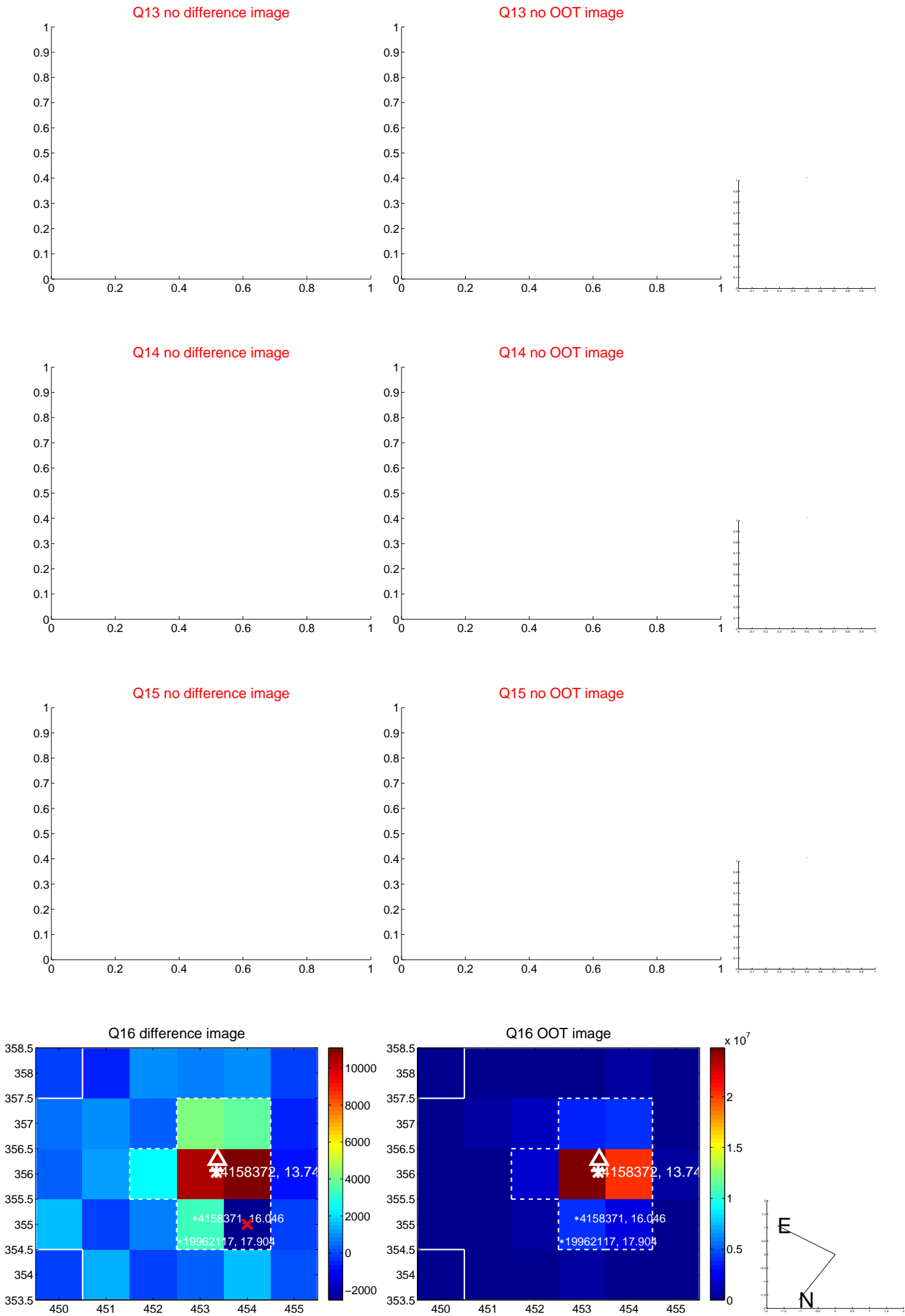
Q8 no OOT image



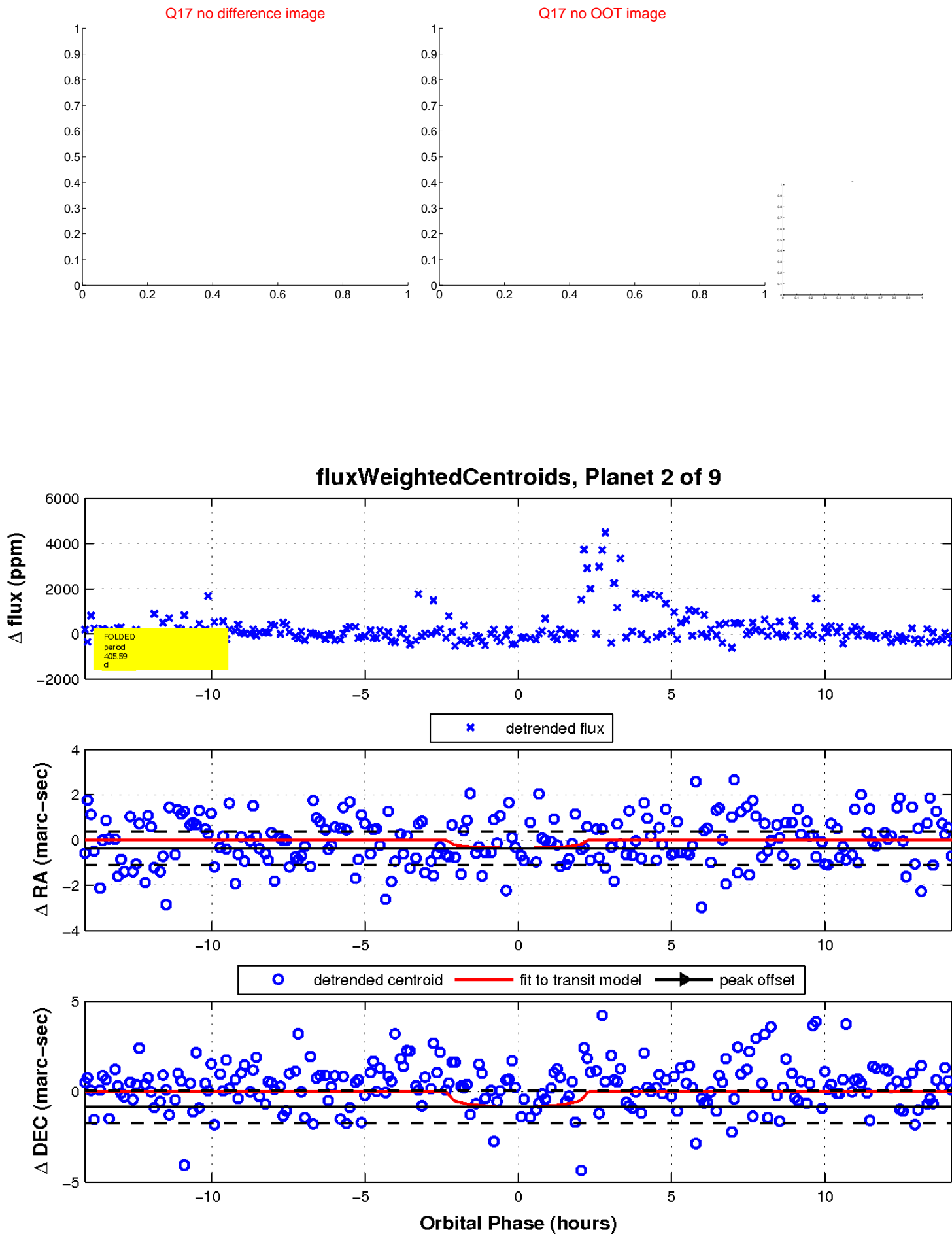
white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



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

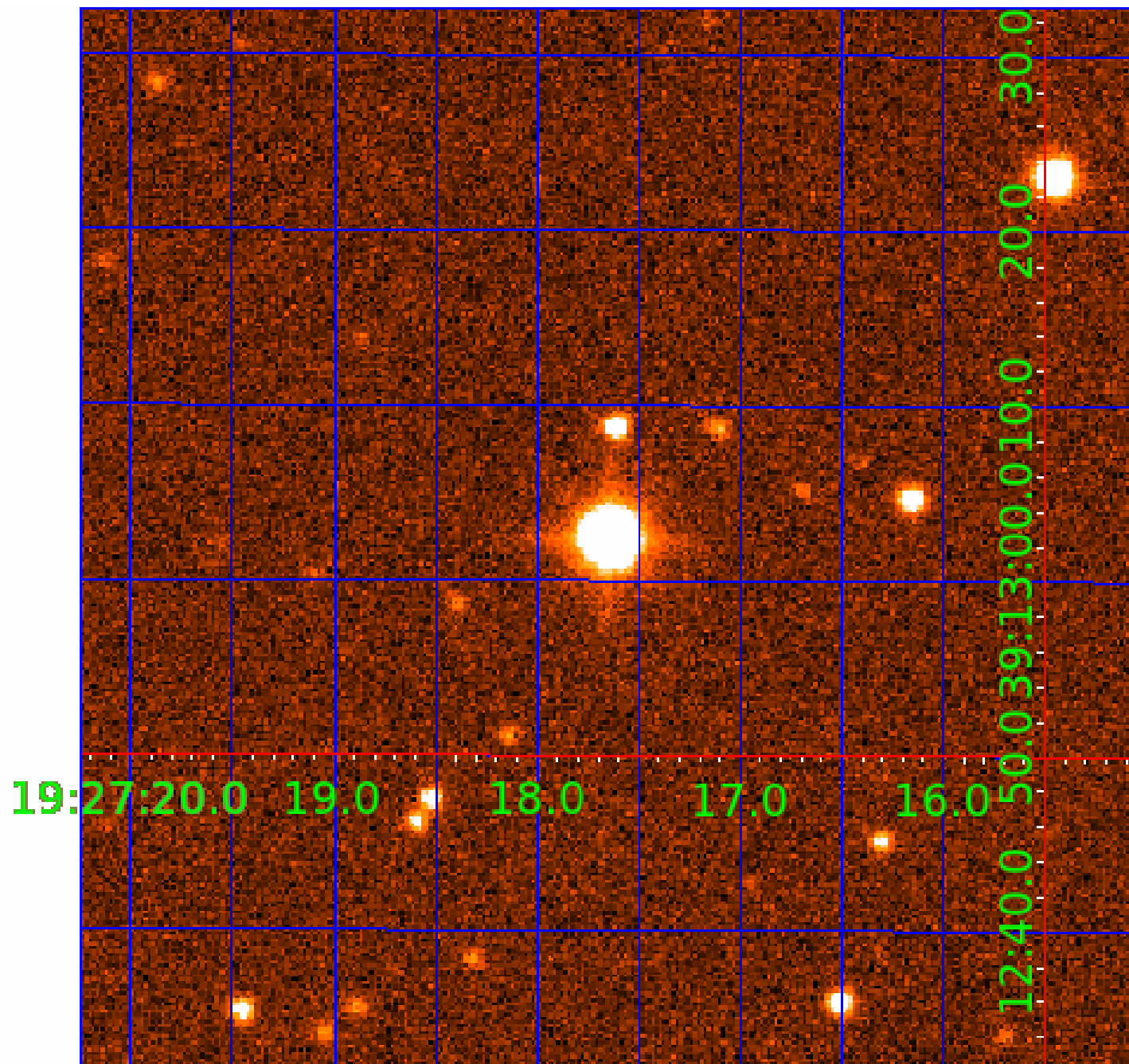


white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



UKIRT Image

Declination



KIC 004158372

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})
004158372-01	OBS	No	357.496909	376.973374	928.2	7.479	16.7	5.7	0.67	4267	2.25	0.18
004158372-02	OBS	No	405.589263	275.511211	760.9	4.726	14.2	6.4	0.67	4267	2.03	0.15
004158372-03	OBS	No	522.778675	216.071041	475.4	4.665	16.1	3.6	0.67	4267	1.66	0.11
004158372-04	OBS	No	289.494986	234.246442	1165.9	3.201	12.9	9.0	0.67	4267	2.49	0.24
004158372-05	OBS	No	356.891810	169.321259	1258.1	2.546	12.8	7.2	0.67	4267	2.56	0.18
004158372-07	OBS	No	470.232741	267.941575	1038.8	6.744	12.2	7.4	0.67	4267	2.24	0.12
004158372-08	OBS	No	473.489609	550.580979	1462.8	16.257	10.8	7.4	0.67	4267	2.56	0.12
004158372-09	OBS	No	320.670668	378.593601	373.5	10.500	12.1	-1.0	0.67	4267	1.23	0.21

Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
004158372-01	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_MARSHALL—LPP_DV—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—CENT_FEW_DIFFS
004158372-02	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
004158372-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV
004158372-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—ALL_TRANS_CHASES
004158372-05	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_POS_DV—CENT_UNCERTAIN
004158372-07	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—CENT_FEW_DIFFS
004158372-08	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_MARSHALL—LPP_DV—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—CENT_FEW_DIFFS
004158372-09	OBS	FP	0.00	1	0	1	0	LPP_DV—ALL_TRANS_CHASES—CENT_NOFITS—HALO_GHOST

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

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

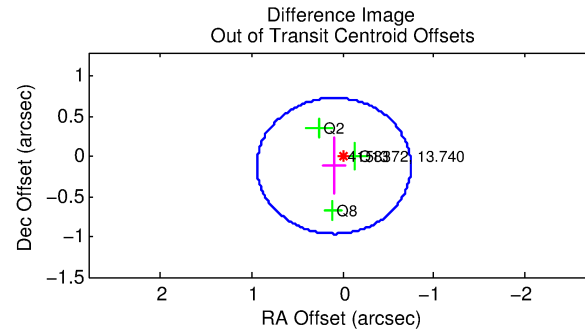
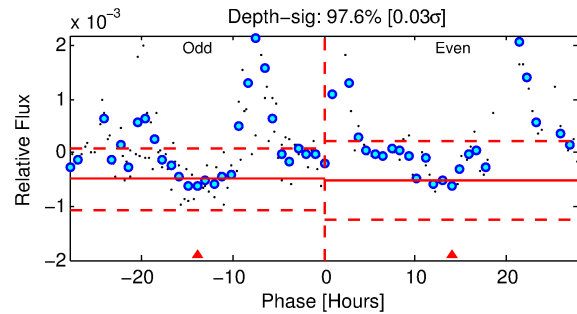
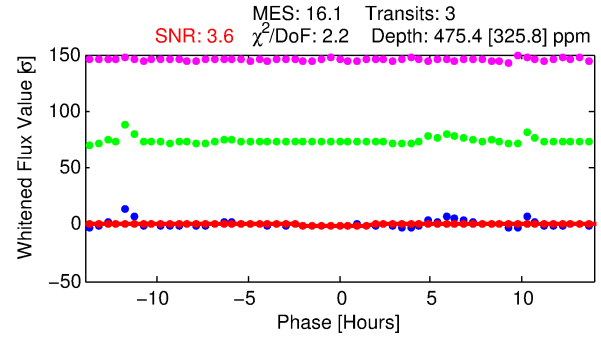
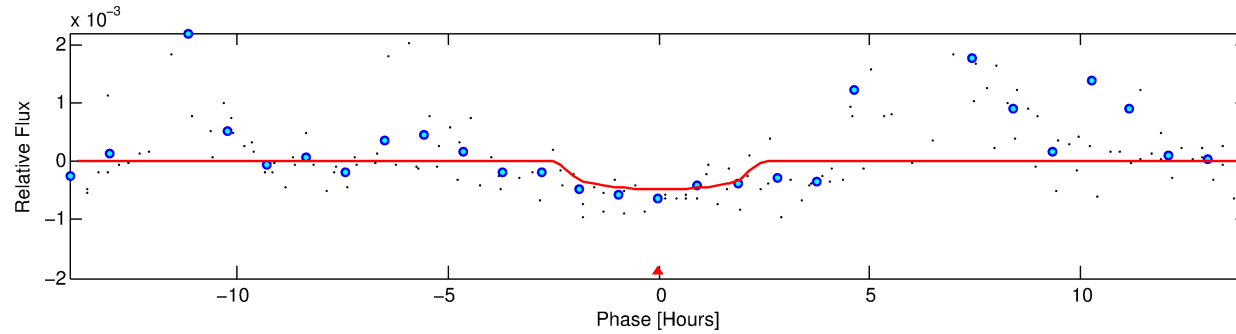
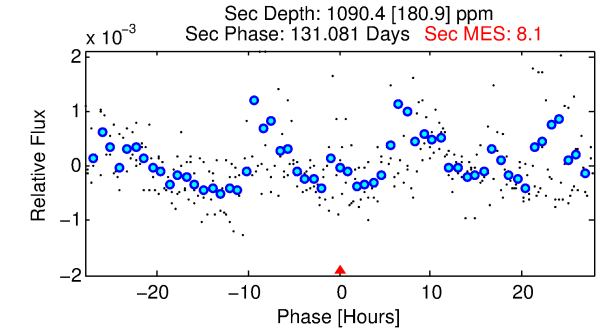
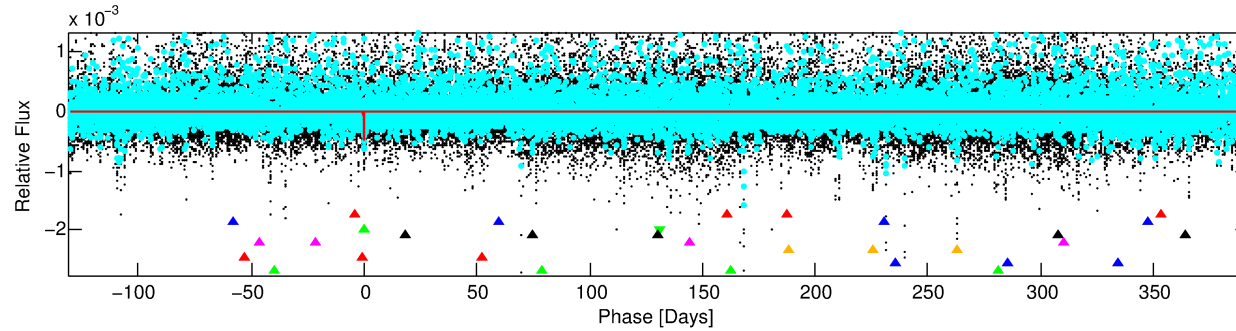
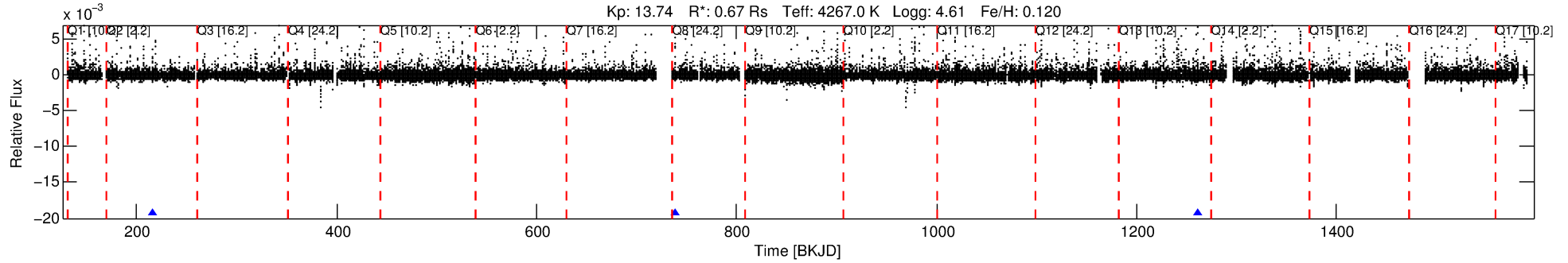
See http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col for comment definitions.

Ephemeris Match Information For 004158372-03

No Significant Match Found

DV One-Page Summary

KIC: 4158372 Candidate: 3 of 9 Period: 522.779 d



DV Fit Results:

Period = 522.77867 [0.02350] d
Epoch = 216.0710 [0.0294] BKJD
Rp/R* = 0.0227 [0.0568]
a/R* = 530.16 [4402.74]
b = 0.81 [3.52]
Seff = 0.11 [0.02]
Teq = 146 [6] K
Rp = 1.66 [4.16] Re
a = 1.1082 [0.0754] AU
Ag = 266349.70 [1331928.31] [0.20 σ]
Teffp = 5141 [6428] K [0.78 σ]

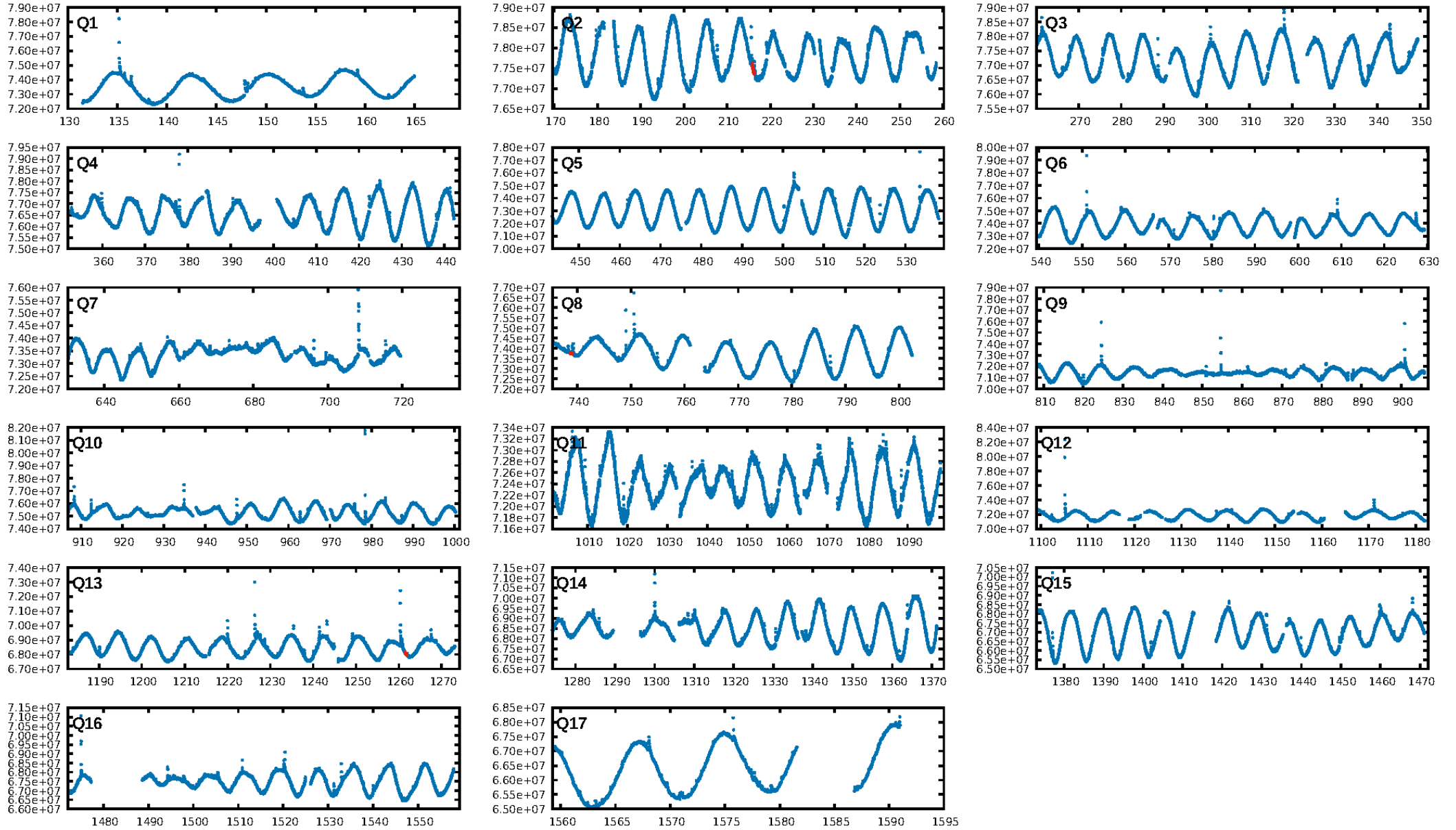
DV Diagnostic Results:

ShortPeriod-sig: 100.0% [69.94 σ]
LongPeriod-sig: 100.0% [162.31 σ]
ModelChiSquare2-sig: 98.7%
ModelChiSquareGof-sig: 99.7%
Bootstrap-pfa: N/A
RollingBand-fgt: 1.00 [3/3]
GhostDiagnostic-chr: 1.456
Centroid-sig: 80.7%
Centroid-so: 0.600 arcsec [0.39 σ]
OotOffset-rm: 0.151 arcsec [0.53 σ]
OotOffset-st: 1/0/1/1 [3]
KicOffset-rm: 0.261 arcsec [0.99 σ]
KicOffset-st: 1/0/1/1 [3]
DiffImageQuality-fgm: 1.00 [3/3]
DiffImageOverlap-fno: 1.00 [3/3]

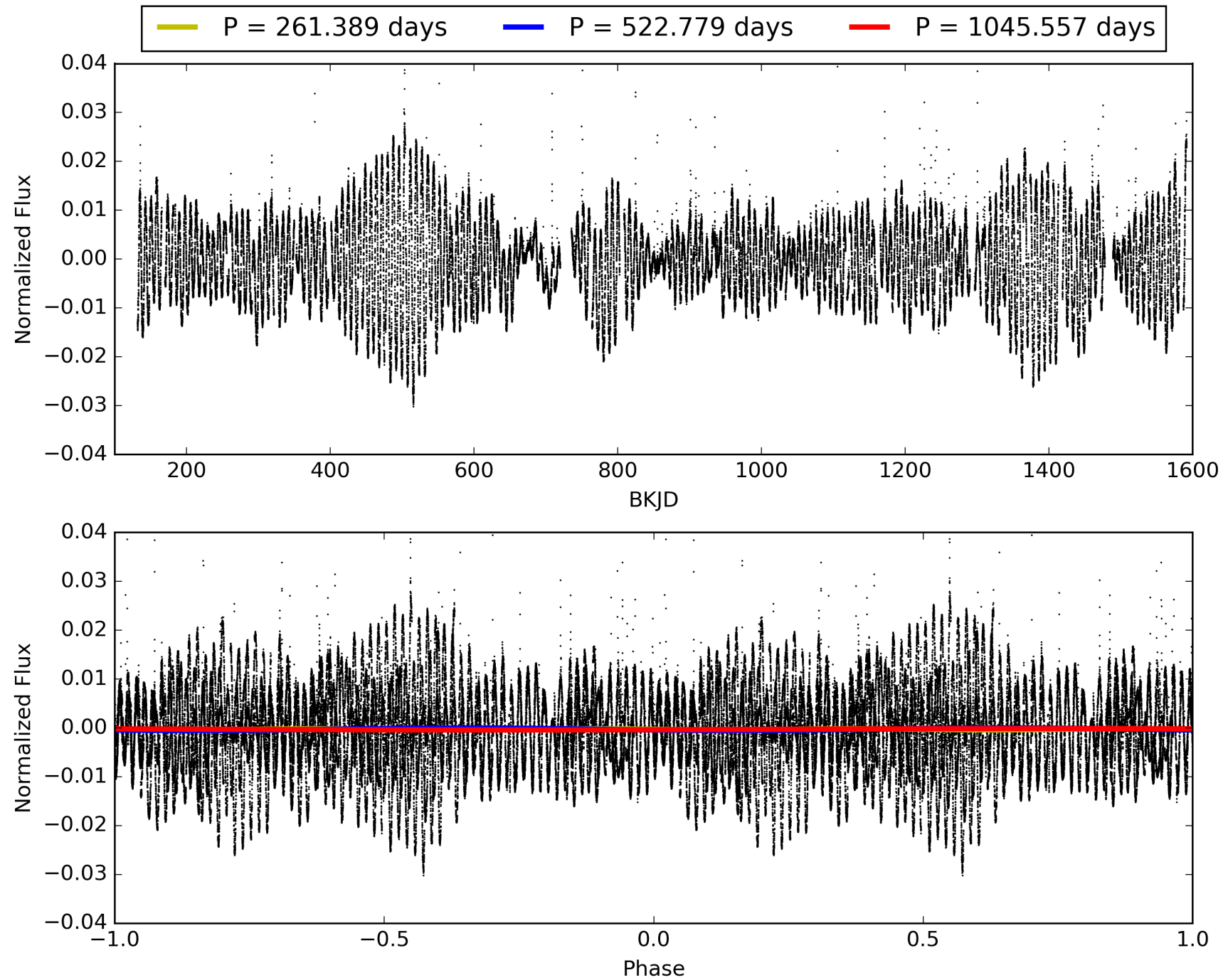
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 01-Feb-2016 06:12:17 Z

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

TCE 004158372-03, PDC Light Curves

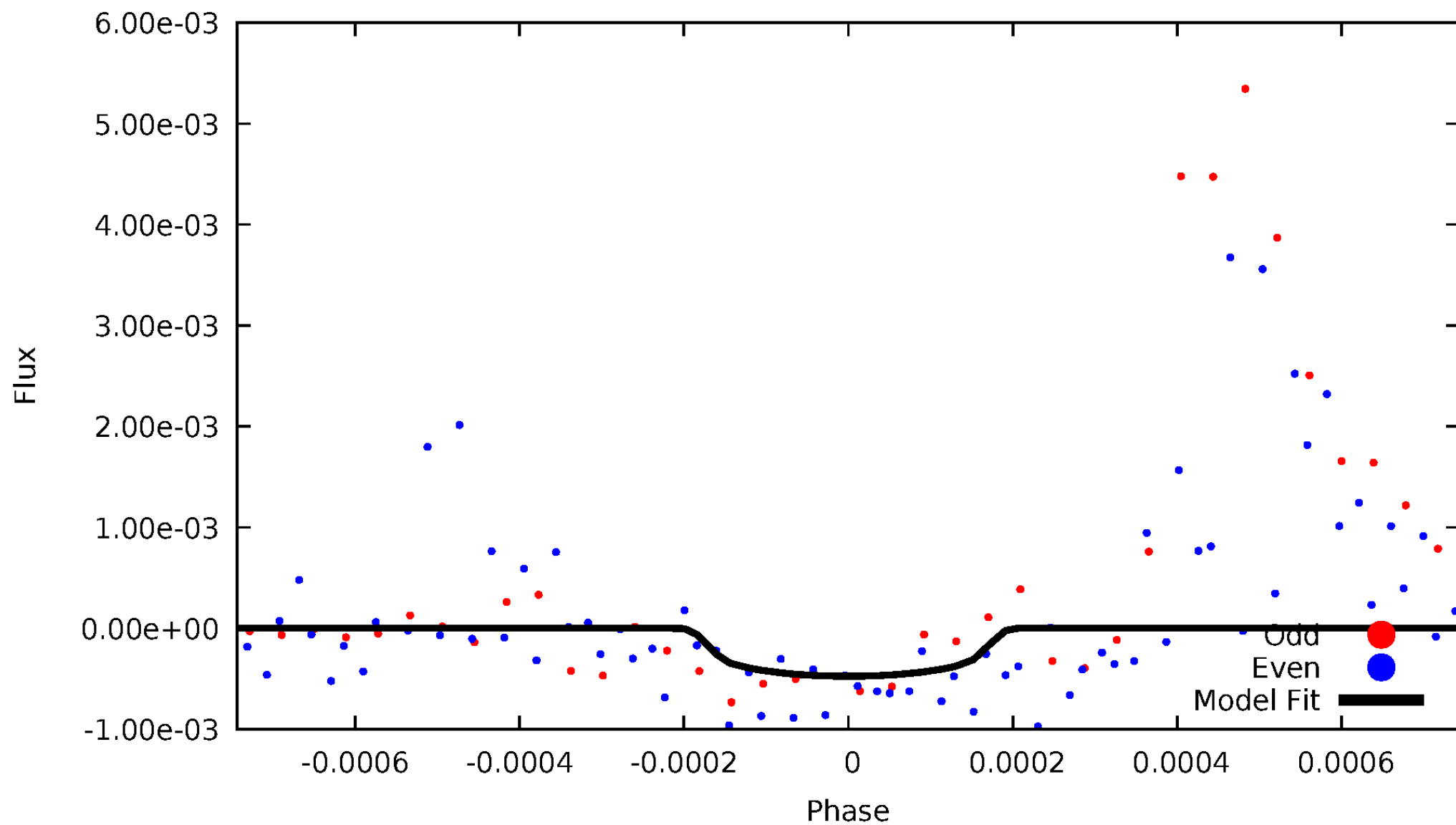


TCE 004158372-03



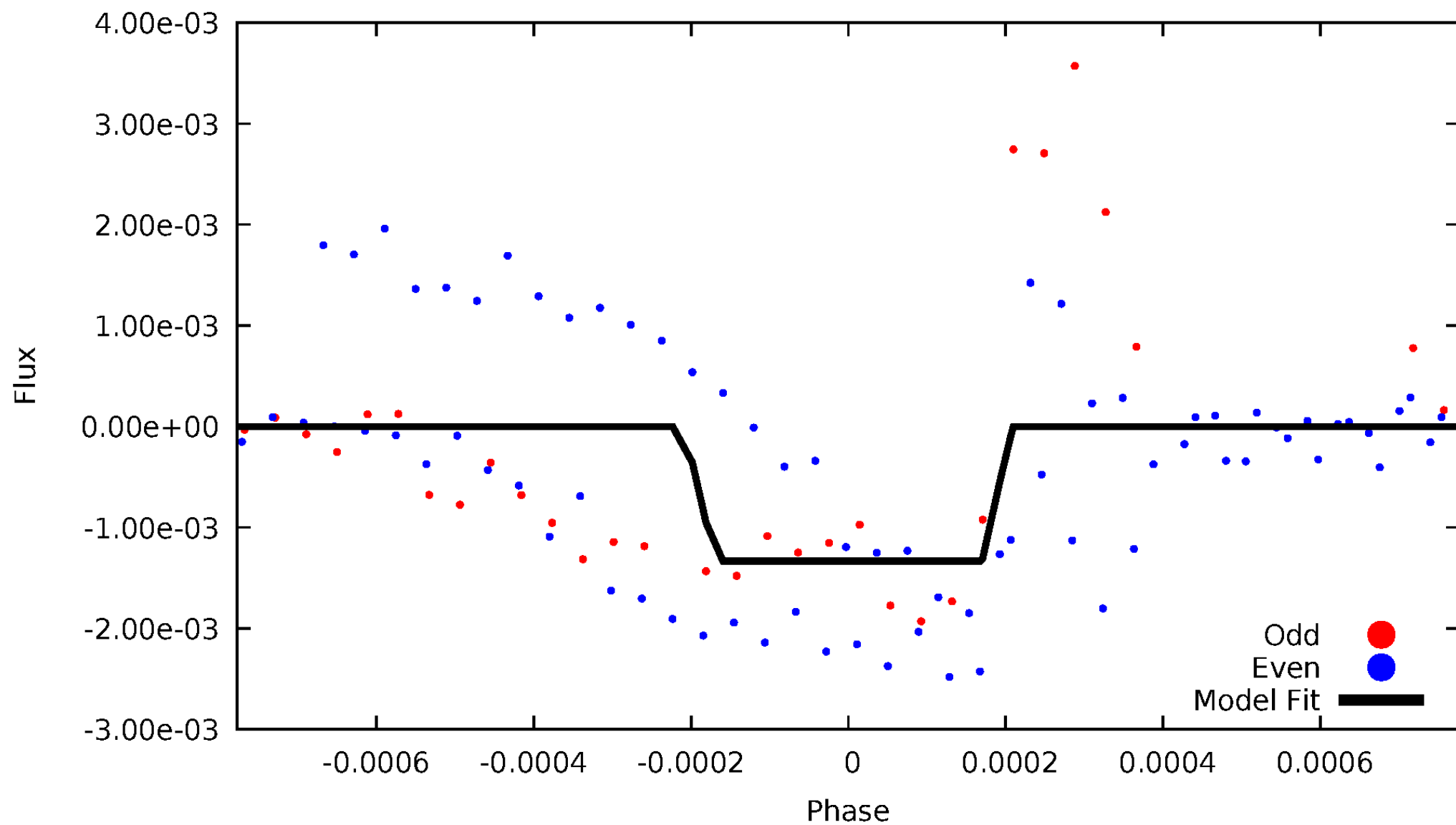
DV Odd/Even

TCE 004158372-03



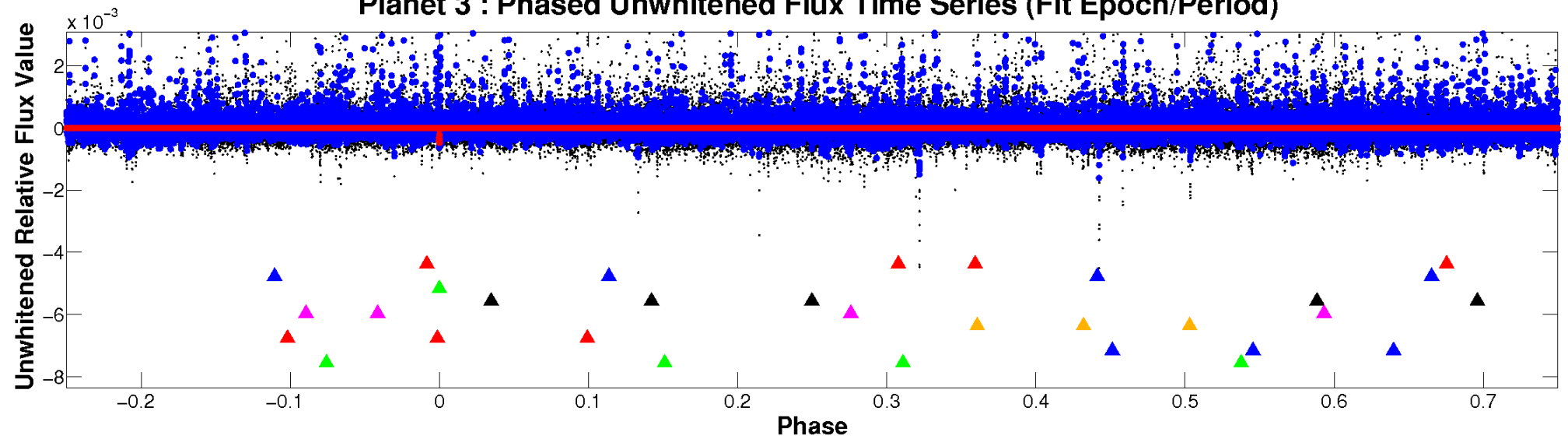
ALT Odd/Even

TCE 004158372-03

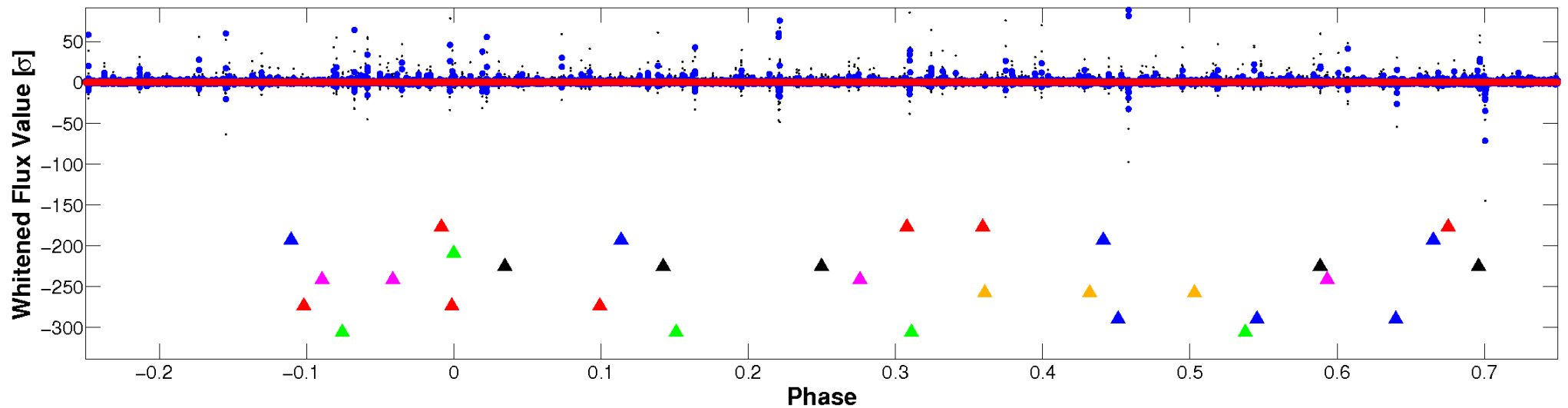


Non-Whitened Vs. Whitened Light Curve

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

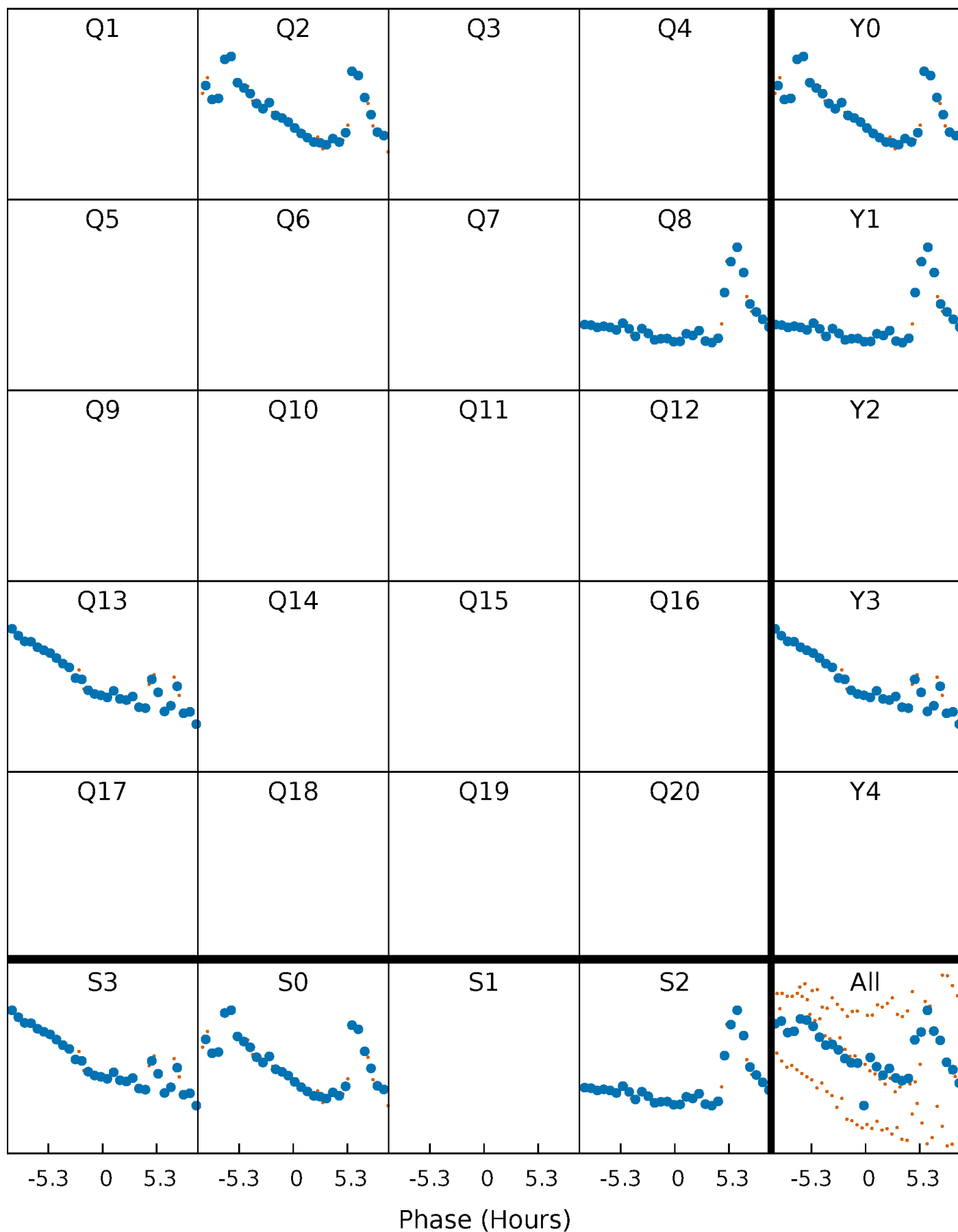


Planet 3 : Phased Whitened Flux Time Series (Fit Epoch/Period)



PDC Quarter-Phased Transit Curves

TCE 004158372-03 $P=522.778675$ Days $T_0=216.071041$ (BKJD)



DV Quarter-Phased Transit Curves

TCE 004158372-03 $P=522.778675$ Days $T_0=216.071041$ (BKJD)



Alt. Detrend Quarter-Phased Transit Curves

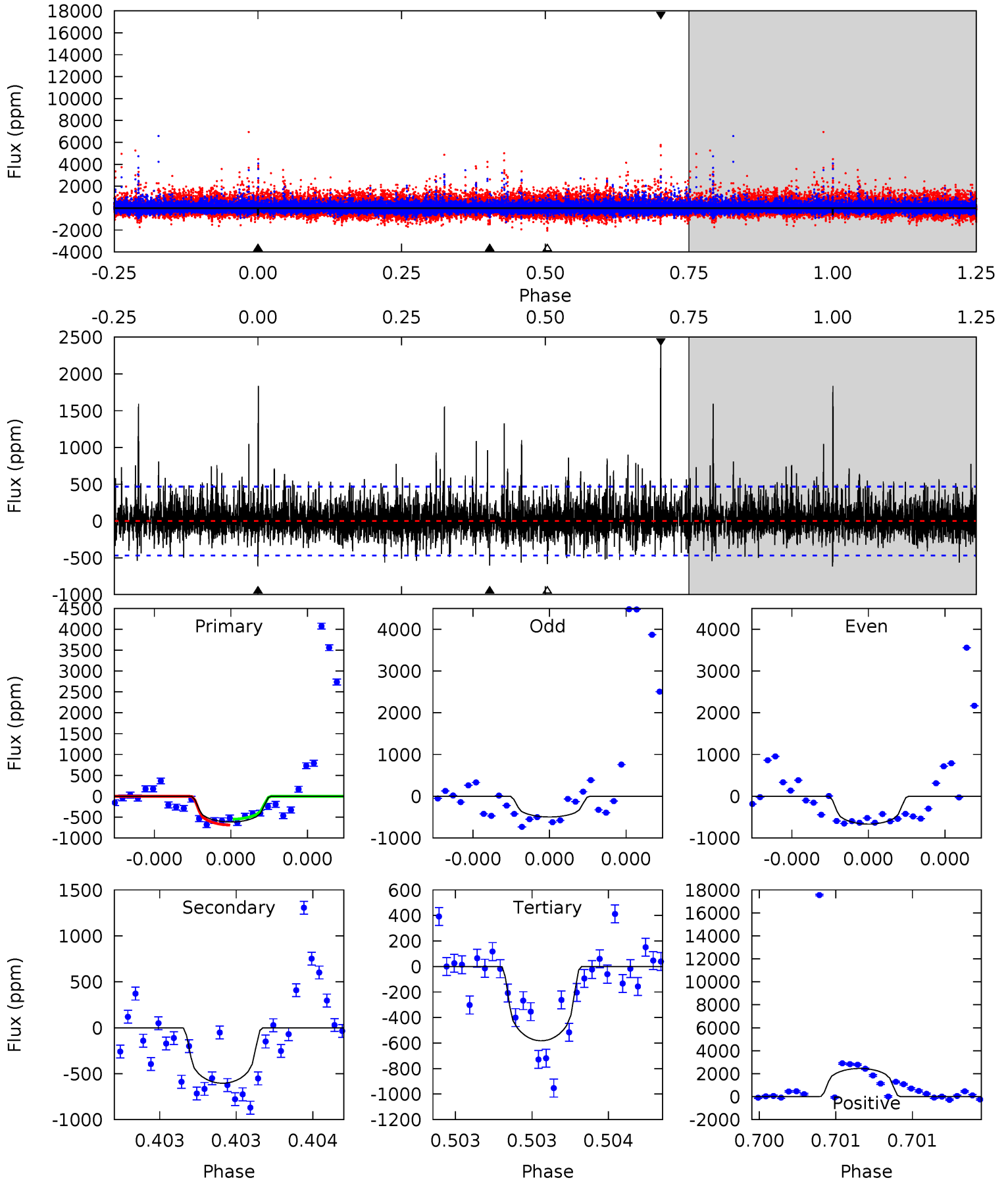
TCE 004158372-03 P=522.758577 Days $T_0=216.193095$ (BKJD)



DV Model-Shift Uniqueness Test

004158372-03, P = 522.778675 Days, E = 216.071041 Days

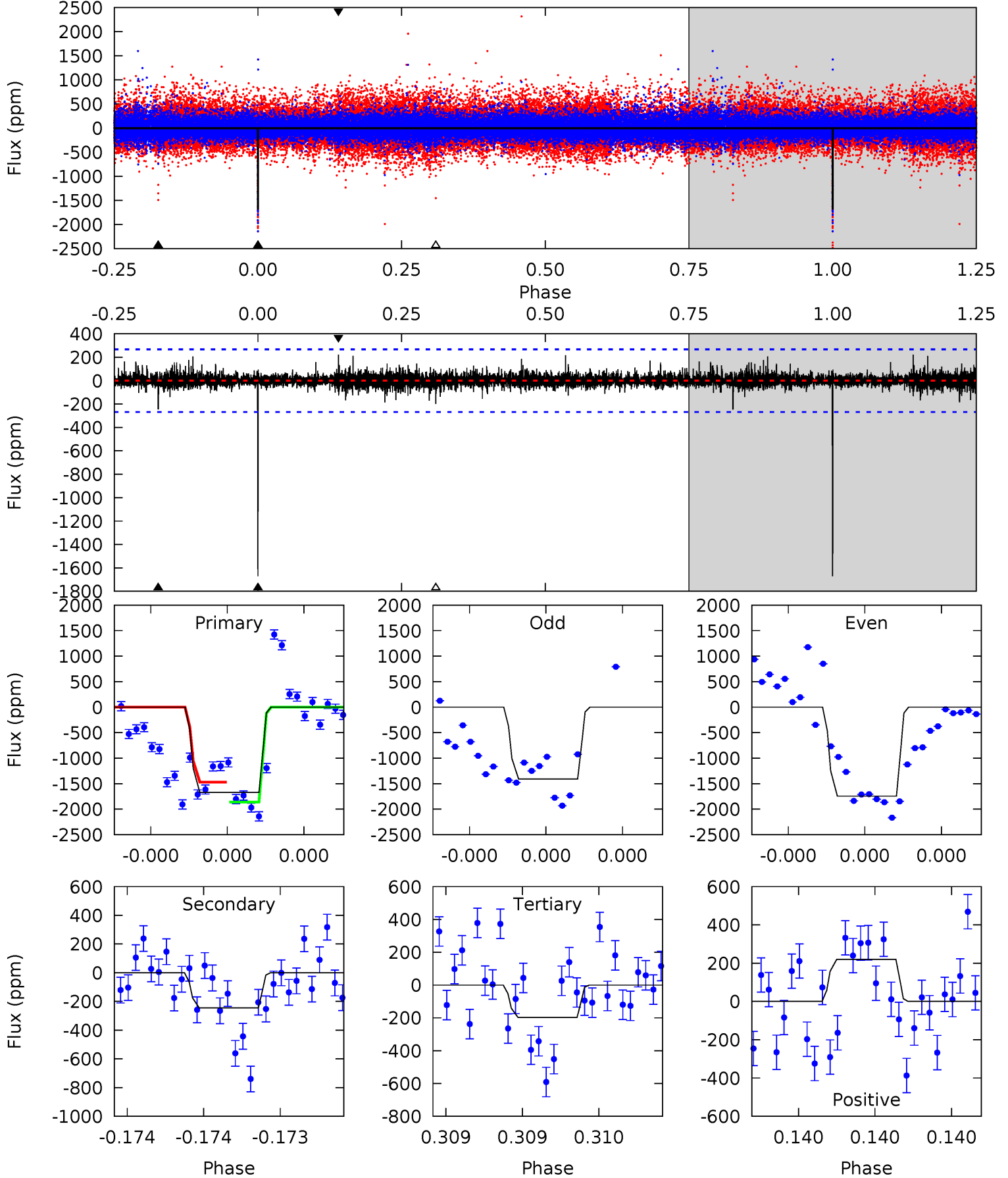
Pri	Sec	Ter	Pos	FA ₁	FA ₂	F _{Red}	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
7.40	7.25	6.98	29.5	5.62	3.55	2.22	0.41	-22.1	0.27	-22.2	0.45	1.04	0.80	0.83



Alt Model-Shift Uniqueness Test

004158372-03, P = 522.758577 Days, E = 216.193095 Days

Pri	Sec	Ter	Pos	FA ₁	FA ₂	F _{Red}	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
35.0	5.13	4.12	4.61	5.61	3.54	0.71	30.8	30.4	1.00	0.52	3.22	1.07	0.12	4.17



Stellar Parameters For KIC 004158372

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	4267^{+129}_{-129}	$4.608^{+0.049}_{-0.018}$	$0.120^{+0.250}_{-0.300}$	$0.670^{+0.032}_{-0.057}$	$0.662^{+0.052}_{-0.052}$	$3.109^{+0.665}_{-0.248}$
	+3%/-3%	+1%/-0%	+208%/-250%	+5%/-9%	+8%/-8%	+21%/-8%
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 004158372-03 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	A_{obs}
DV	-605 ± 83	$3.52^{+3.68}_{-2.33}$	203^{+7}_{-7}	3413^{+1691}_{-645}	$33910^{+270468}_{-25869}$
Alt.	-245 ± 48	$4.03^{+3.24}_{-2.45}$	203^{+7}_{-6}	2849^{+962}_{-396}	10010^{+57987}_{-6935}

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 $A_{obs} \gg 1.0$

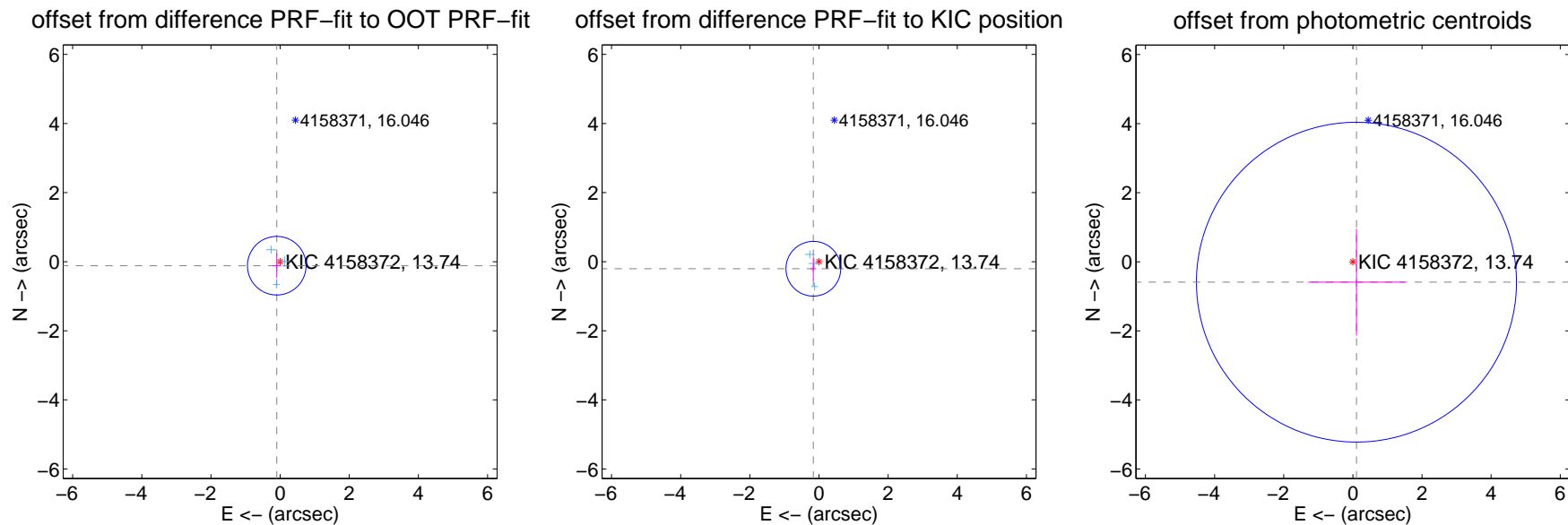
DV Centroid Data

Supplemental centroid analysis for 004158372-03. Kepler magnitude: 13.74. Transit SNR 3.56

There are 3 quarters with good PRF difference image offsets

The direct PRF centroid is offset from the target star catalog position by about 0.27 arcsec

	Distance in arcsec	Distance / σ	Δ RA	Δ Dec
PRF-fit source offset from OOT	0.151 ± 0.283	0.53	0.097 ± 0.121	-0.116 ± 0.354
PRF-fit source offset from KIC position	0.261 ± 0.264	0.99	0.163 ± 0.081	-0.204 ± 0.332
photometric centroid source offset	0.60 ± 1.54	0.39	-0.10 ± 1.40	-0.59 ± 1.55



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

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

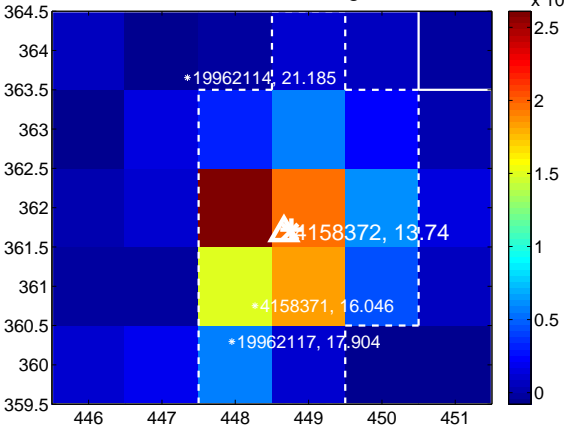
Q1 no difference image



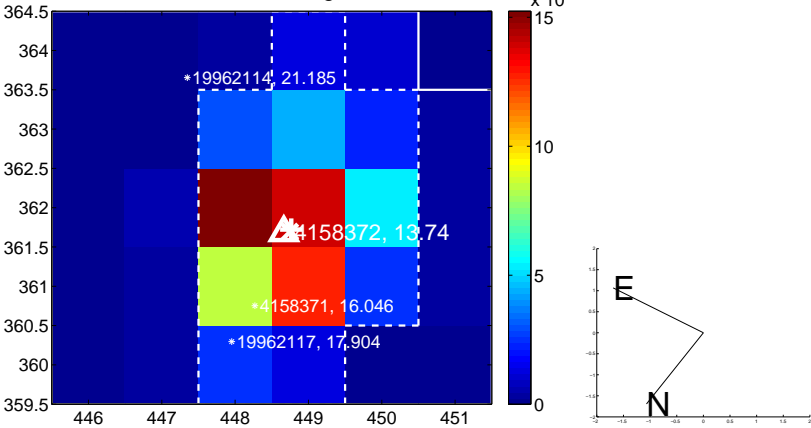
Q1 no OOT image



Q2 difference image



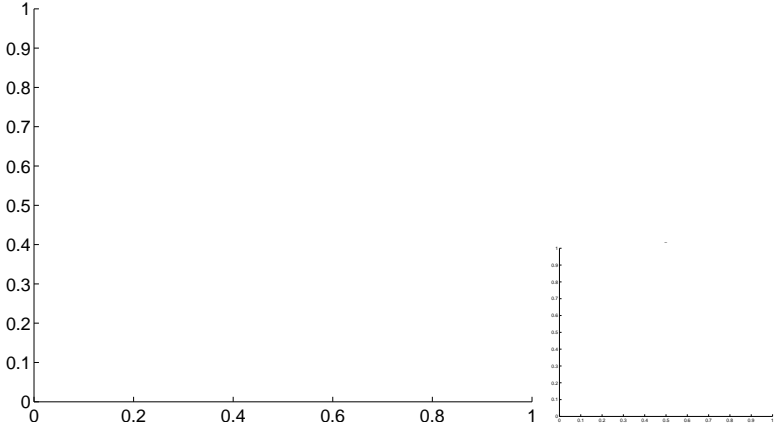
Q2 OOT image



Q3 no difference image



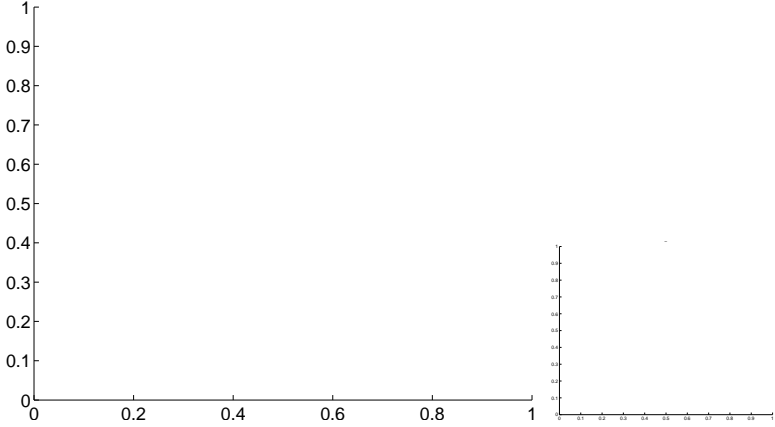
Q3 no OOT image



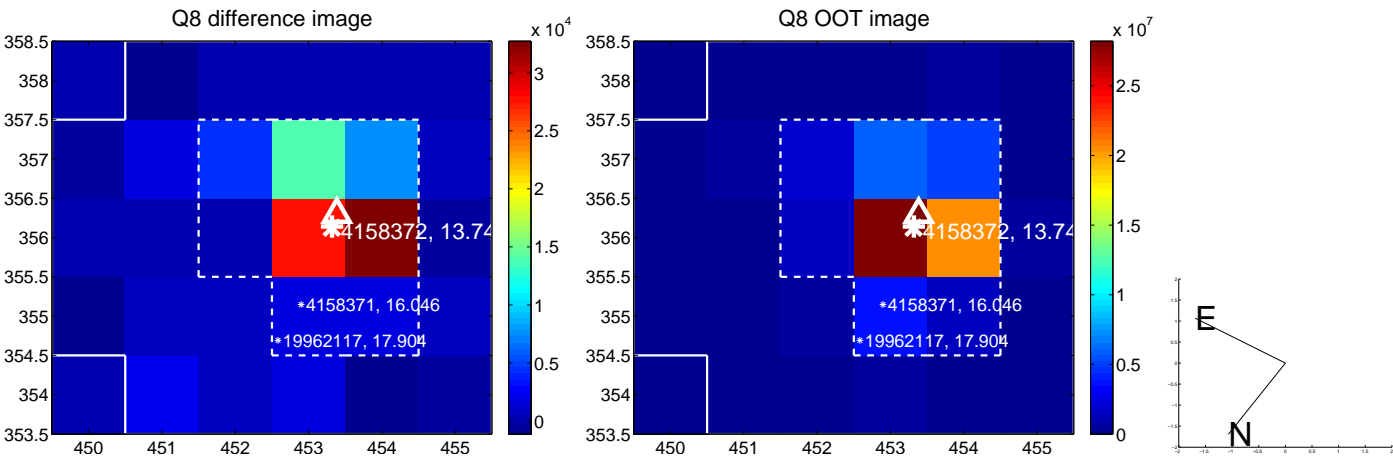
Q4 no difference image



Q4 no OOT image



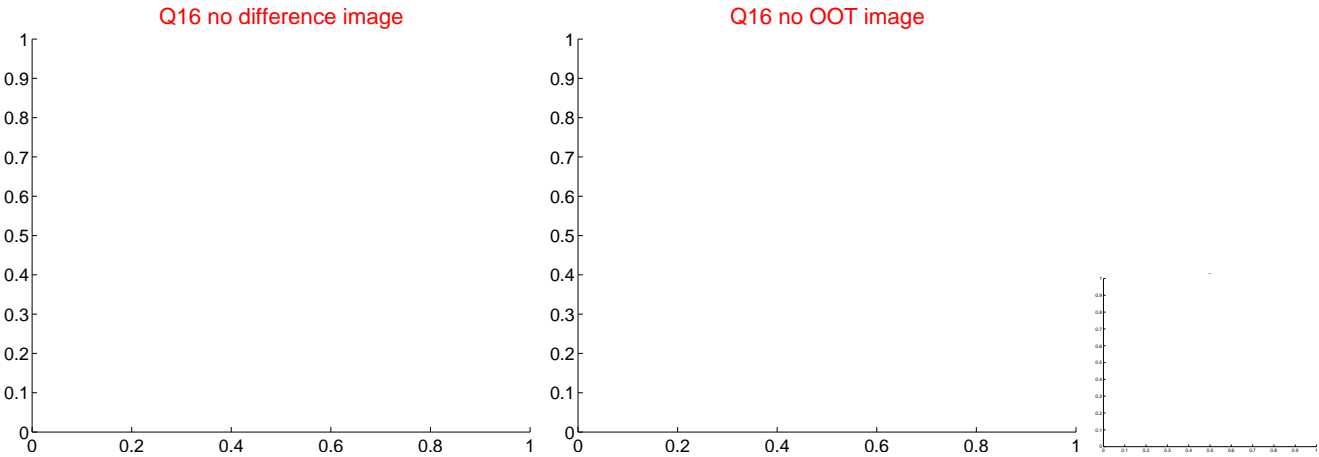
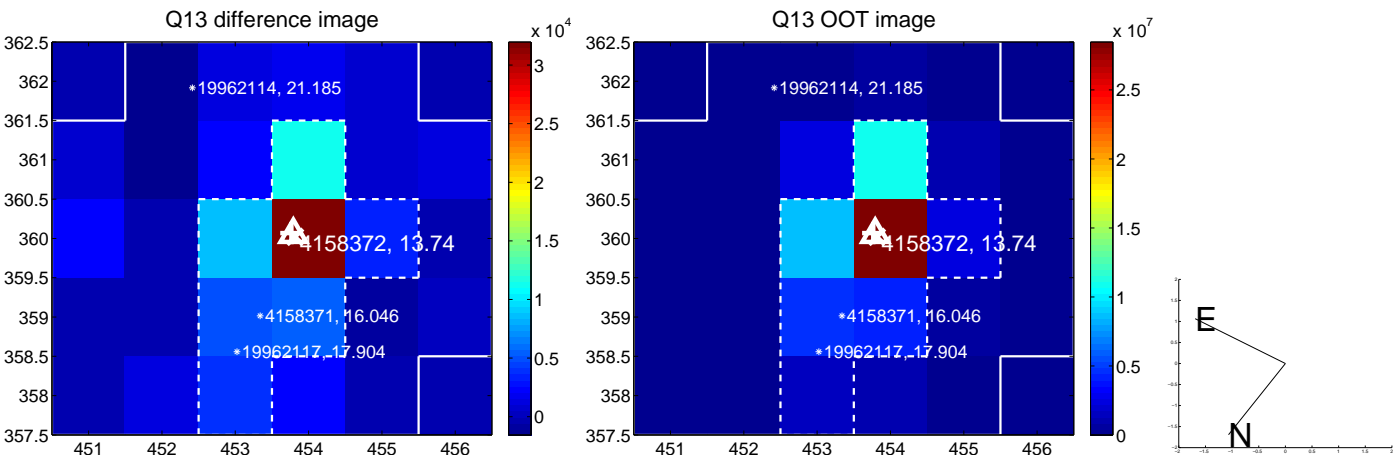
white ×: KIC target position; +: OOT centroid; △: difference centroid. red ✕: large negative pixel value.



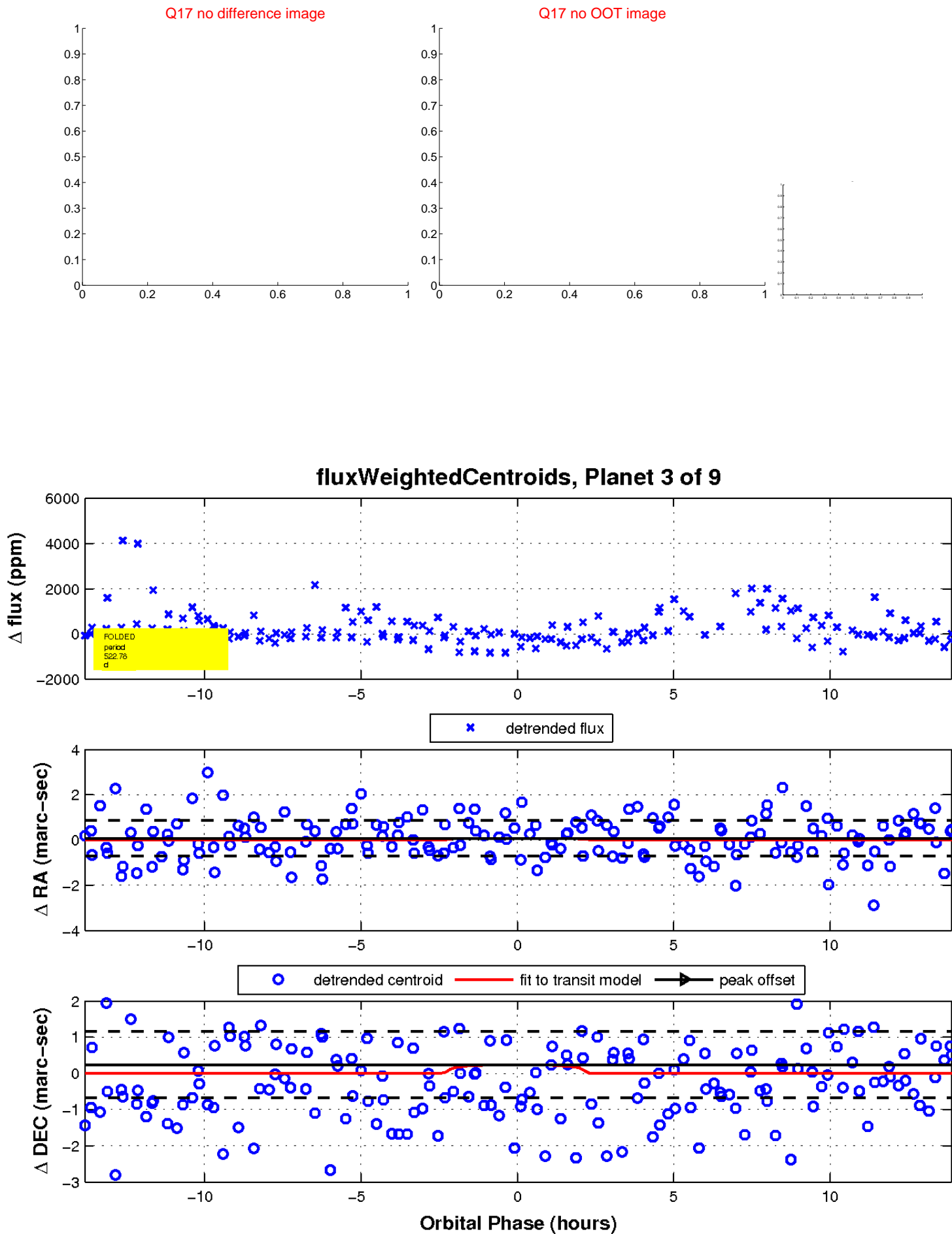
white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



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

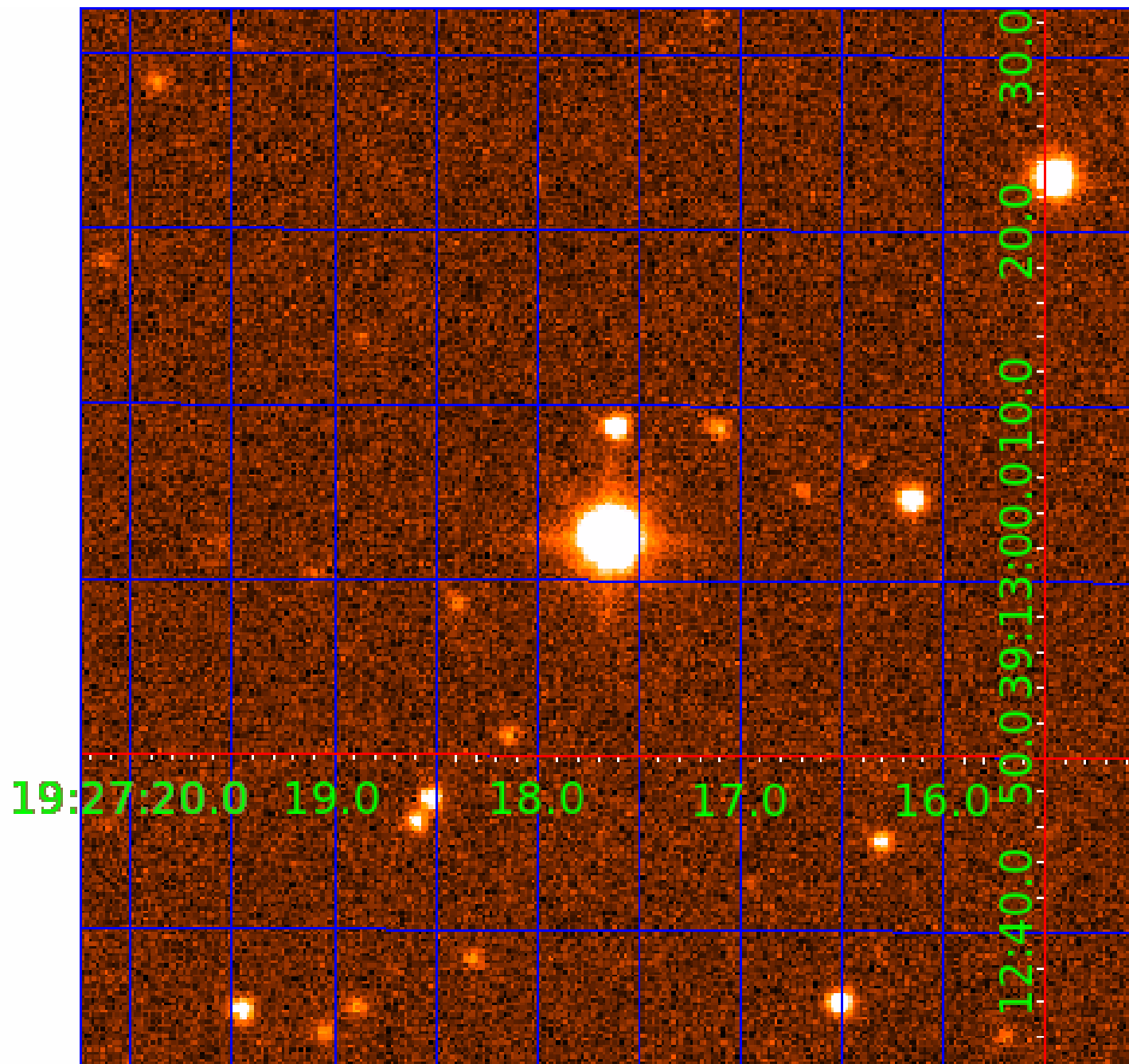


white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



UKIRT Image

Declination



KIC 004158372

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})
004158372-01	OBS	No	357.496909	376.973374	928.2	7.479	16.7	5.7	0.67	4267	2.25	0.18
004158372-02	OBS	No	405.589263	275.511211	760.9	4.726	14.2	6.4	0.67	4267	2.03	0.15
004158372-03	OBS	No	522.778675	216.071041	475.4	4.665	16.1	3.6	0.67	4267	1.66	0.11
004158372-04	OBS	No	289.494986	234.246442	1165.9	3.201	12.9	9.0	0.67	4267	2.49	0.24
004158372-05	OBS	No	356.891810	169.321259	1258.1	2.546	12.8	7.2	0.67	4267	2.56	0.18
004158372-07	OBS	No	470.232741	267.941575	1038.8	6.744	12.2	7.4	0.67	4267	2.24	0.12
004158372-08	OBS	No	473.489609	550.580979	1462.8	16.257	10.8	7.4	0.67	4267	2.56	0.12
004158372-09	OBS	No	320.670668	378.593601	373.5	10.500	12.1	-1.0	0.67	4267	1.23	0.21

Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
004158372-01	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_MARSHALL—LPP_DV—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—CENT_FEW_DIFFS
004158372-02	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
004158372-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV
004158372-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—ALL_TRANS_CHASES
004158372-05	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_POS_DV—CENT_UNCERTAIN
004158372-07	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—CENT_FEW_DIFFS
004158372-08	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_MARSHALL—LPP_DV—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—CENT_FEW_DIFFS
004158372-09	OBS	FP	0.00	1	0	1	0	LPP_DV—ALL_TRANS_CHASES—CENT_NOFITS—HALO_GHOST

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

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

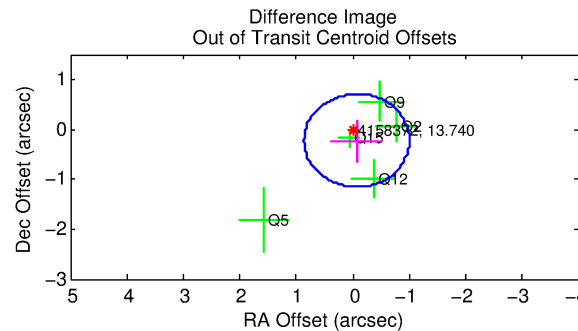
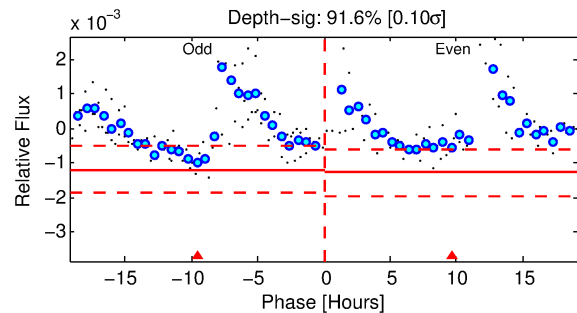
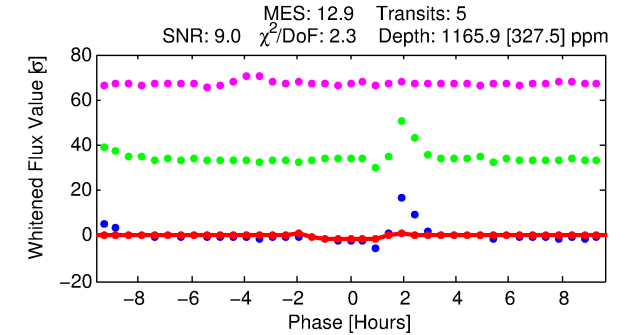
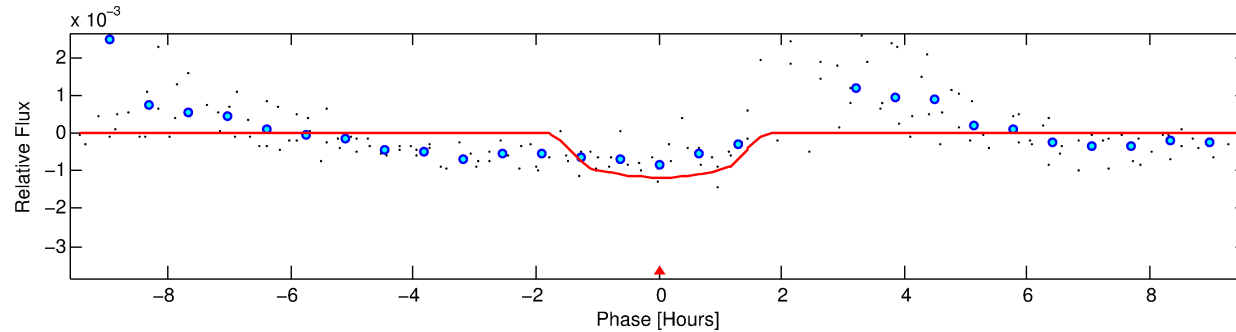
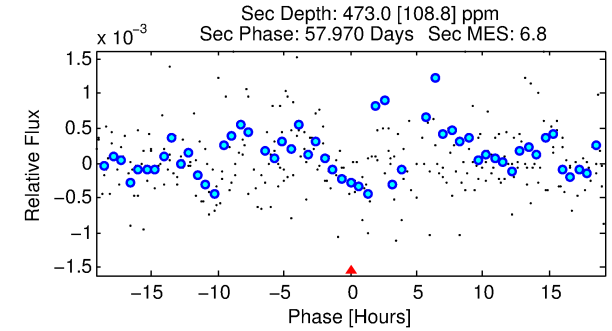
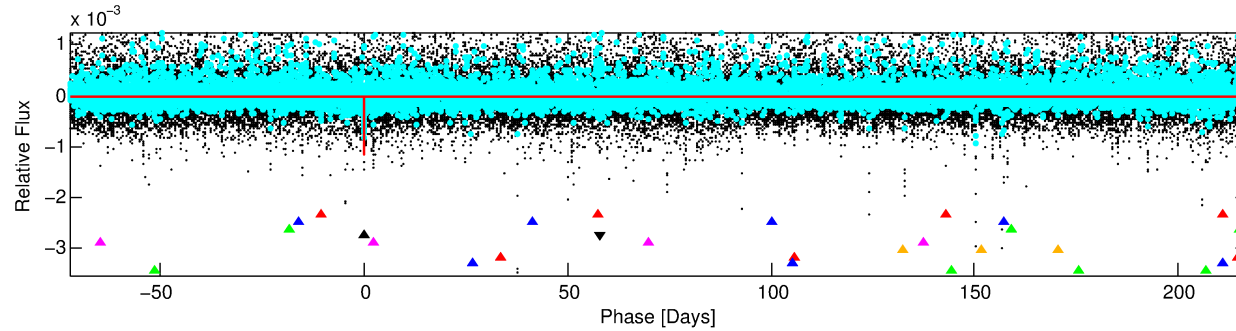
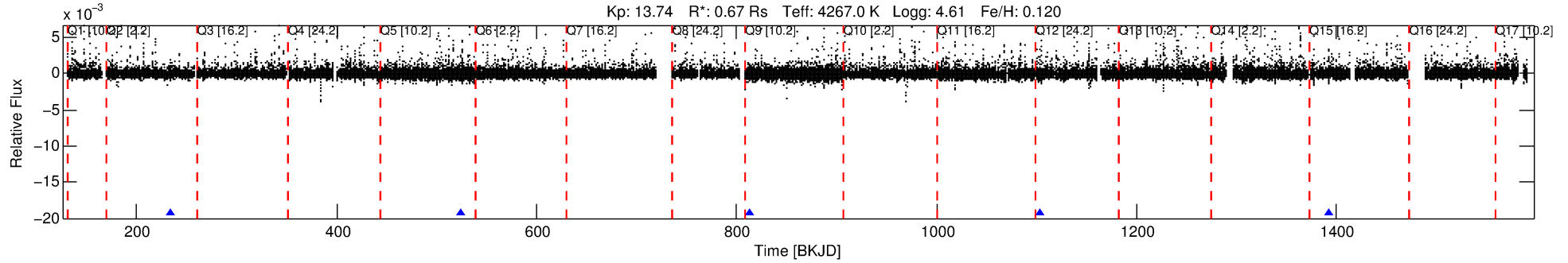
See http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col for comment definitions.

Ephemeris Match Information For 004158372-04

No Significant Match Found

DV One-Page Summary

KIC: 4158372 Candidate: 4 of 9 Period: 289.495 d



DV Fit Results:

Period = 289.49499 [0.00427] d
Epoch = 234.2464 [0.0117] BKJD
Rp/R* = 0.0340 [0.0623]
a/R* = 501.33 [2859.46]
b = 0.74 [3.64]
Seff = 0.24 [0.04]
Teq = 178 [7] K
Rp = 2.49 [4.56] Re
a = 0.7473 [0.0509] AU
Ag = 23491.26 [86271.39] [0.27 σ]
Teffp = 3412 [3133] K [1.03 σ]

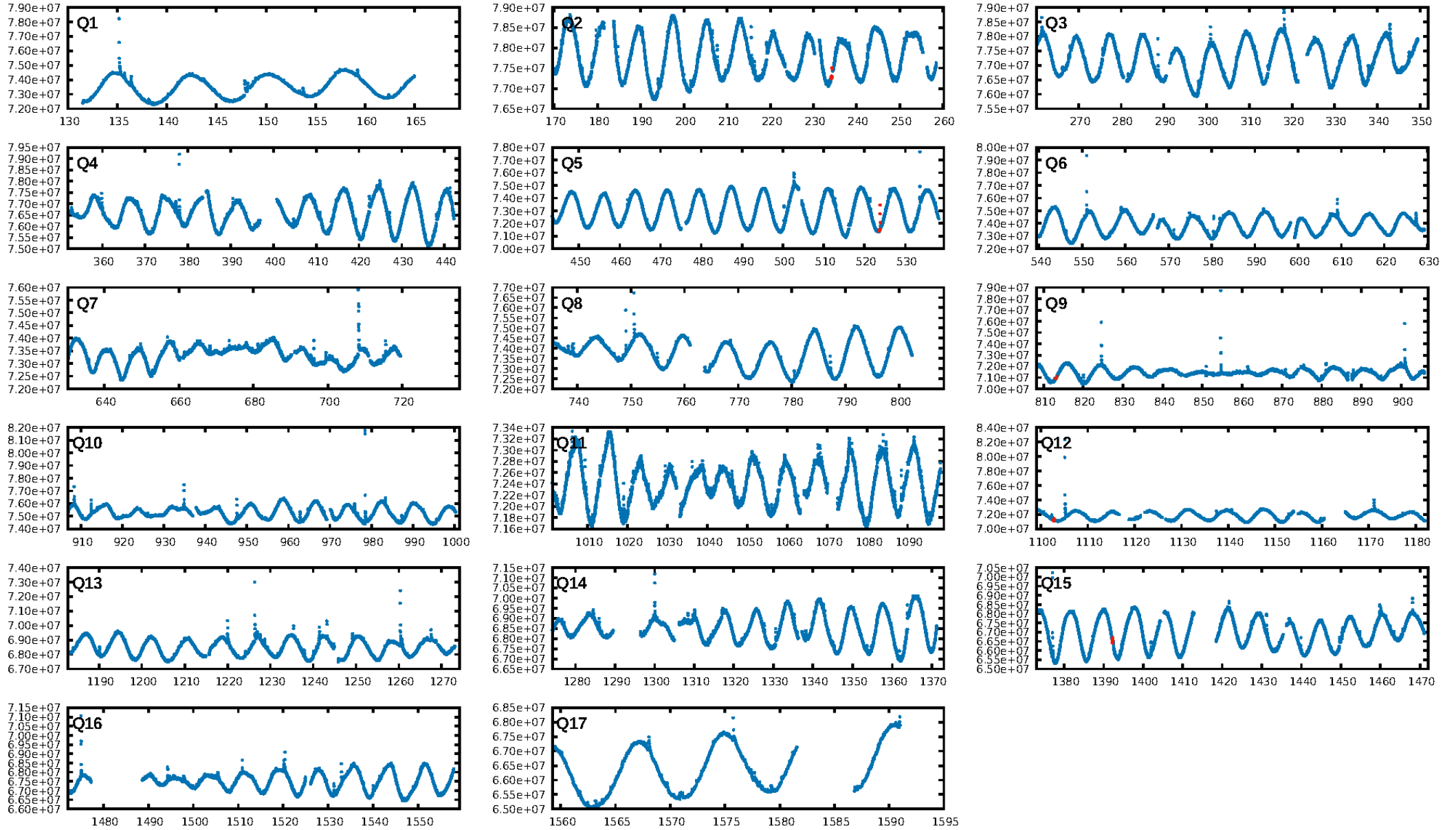
DV Diagnostic Results:

ShortPeriod-sig: N/A
LongPeriod-sig: 100.0% [68.16 σ]
ModelChiSquare2-sig: 0.3%
ModelChiSquareGof-sig: 27.0%
Bootstrap-pfa: N/A
RollingBand-fgt: 1.00 [5/5]
GhostDiagnostic-chr: 10.97
Centroid-sig: 52.9%
Centroid-so: 0.225 arcsec [0.39 σ]
OotOffset-rm: 0.237 arcsec [0.76 σ]
OotOffset-st: 1/1/1/2 [5]
KicOffset-rm: 0.397 arcsec [0.78 σ]
KicOffset-st: 1/1/1/2 [5]
DiffImageQuality-fgm: 1.00 [5/5]
DiffImageOverlap-fno: 1.00 [5/5]

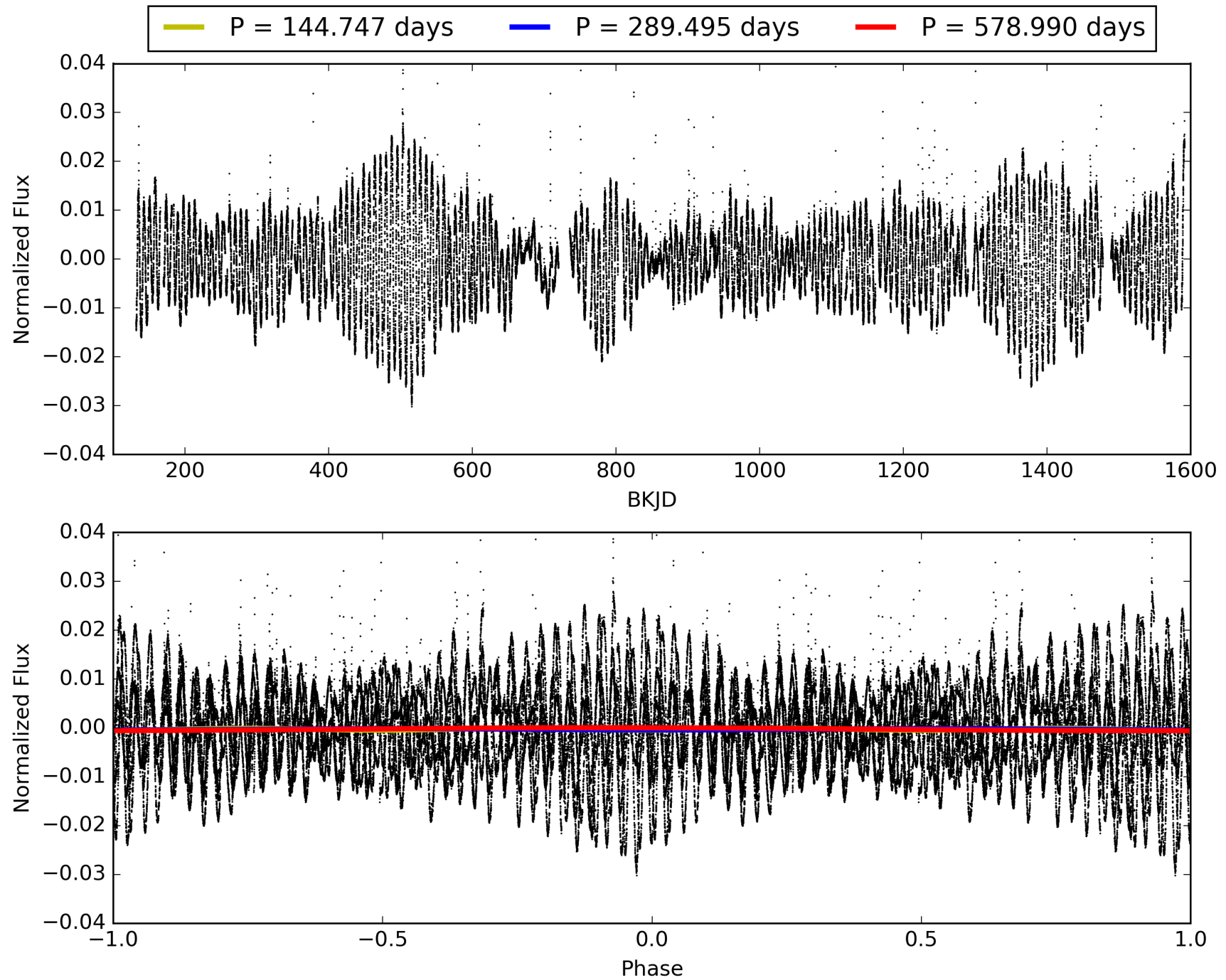
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 01-Feb-2016 06:12:31 Z

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

TCE 004158372-04, PDC Light Curves

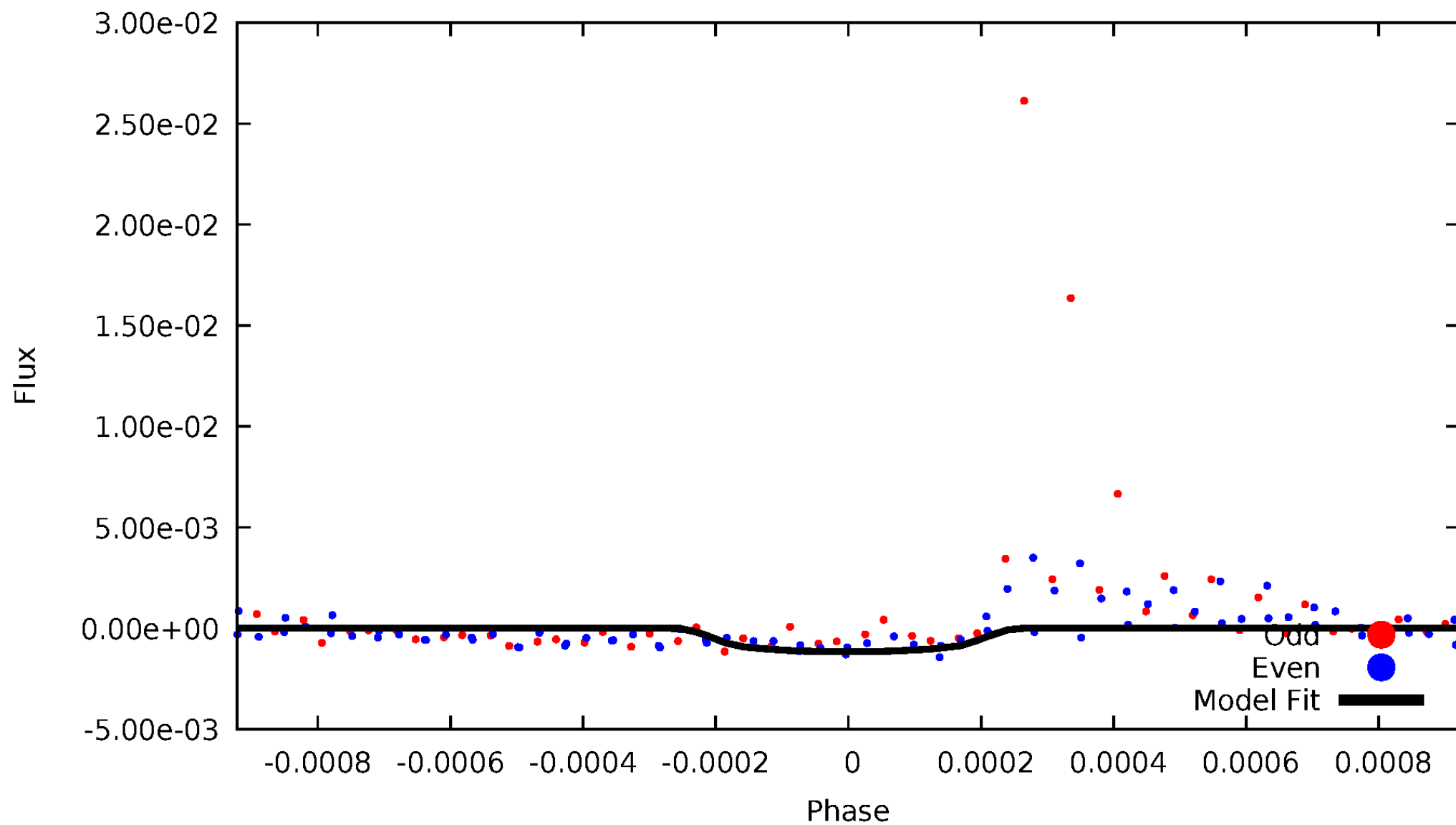


TCE 004158372-04



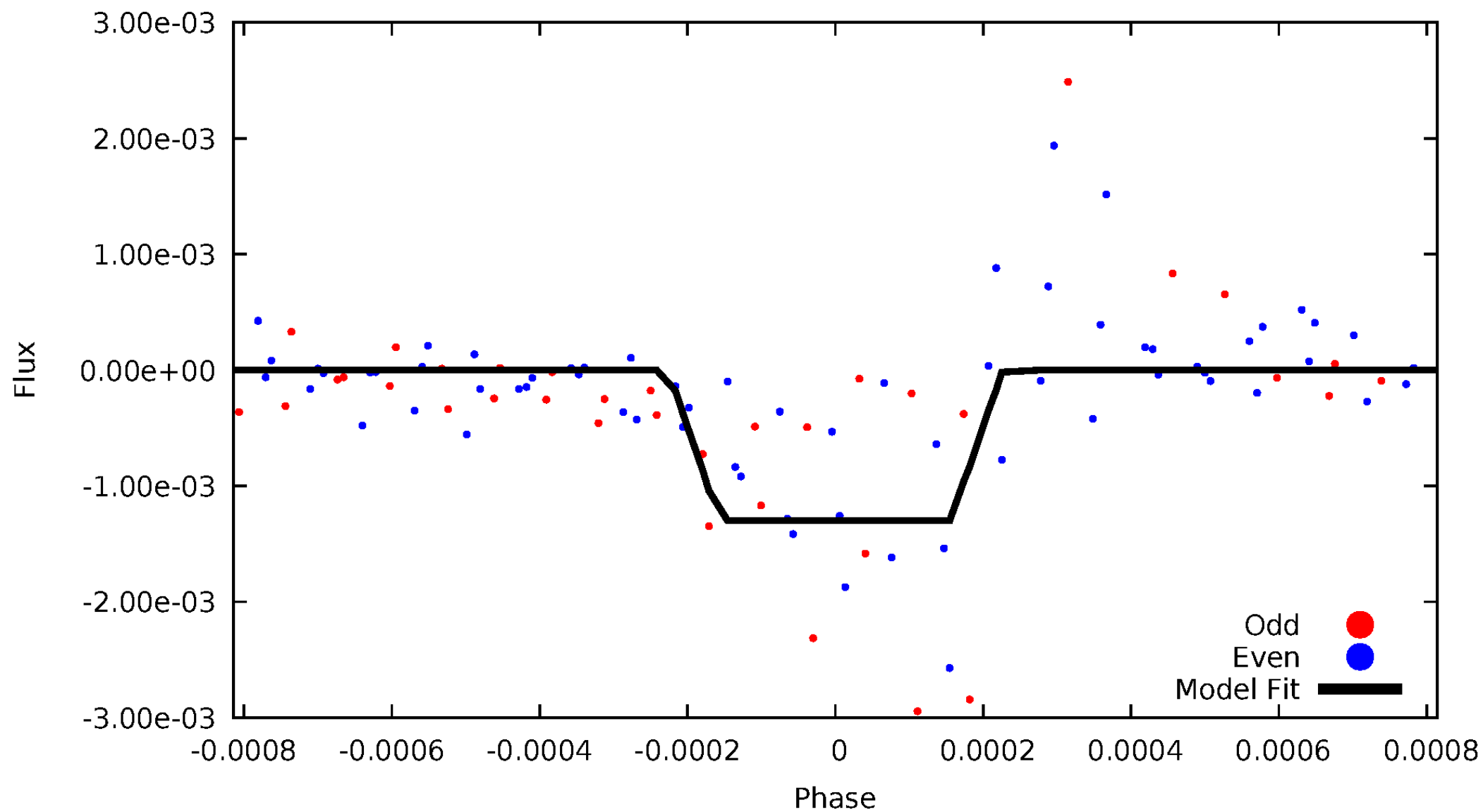
DV Odd/Even

TCE 004158372-04



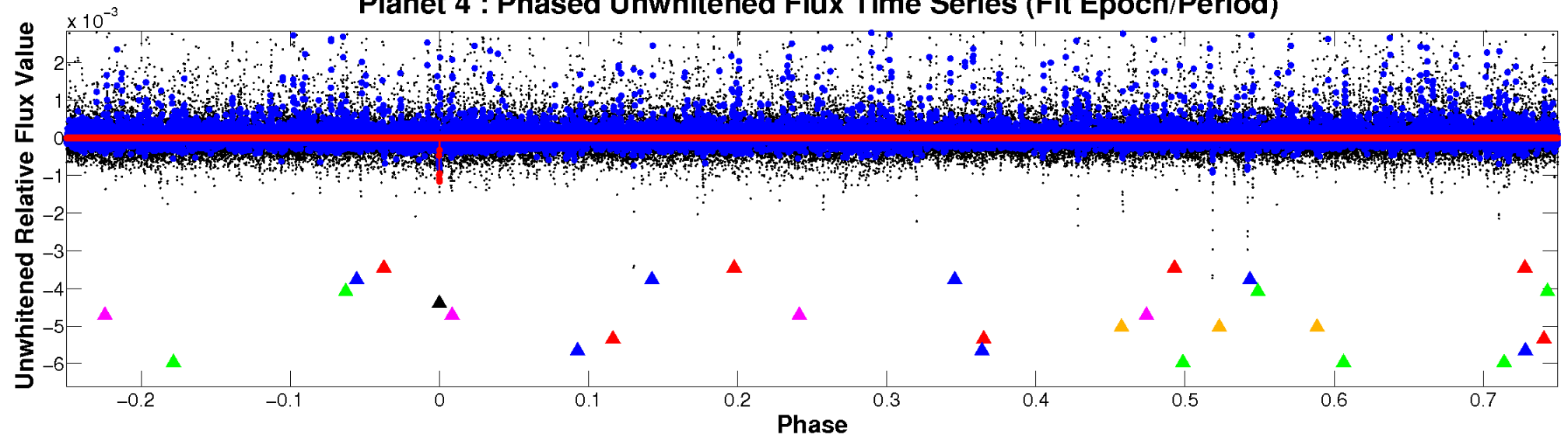
ALT Odd/Even

TCE 004158372-04

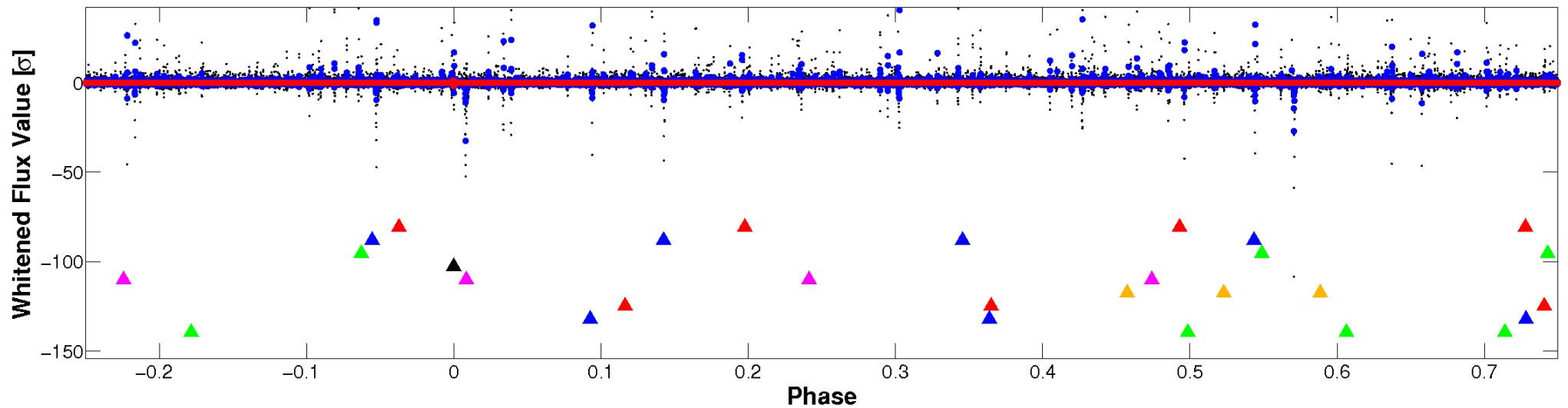


Non-Whitened Vs. Whitened Light Curve

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

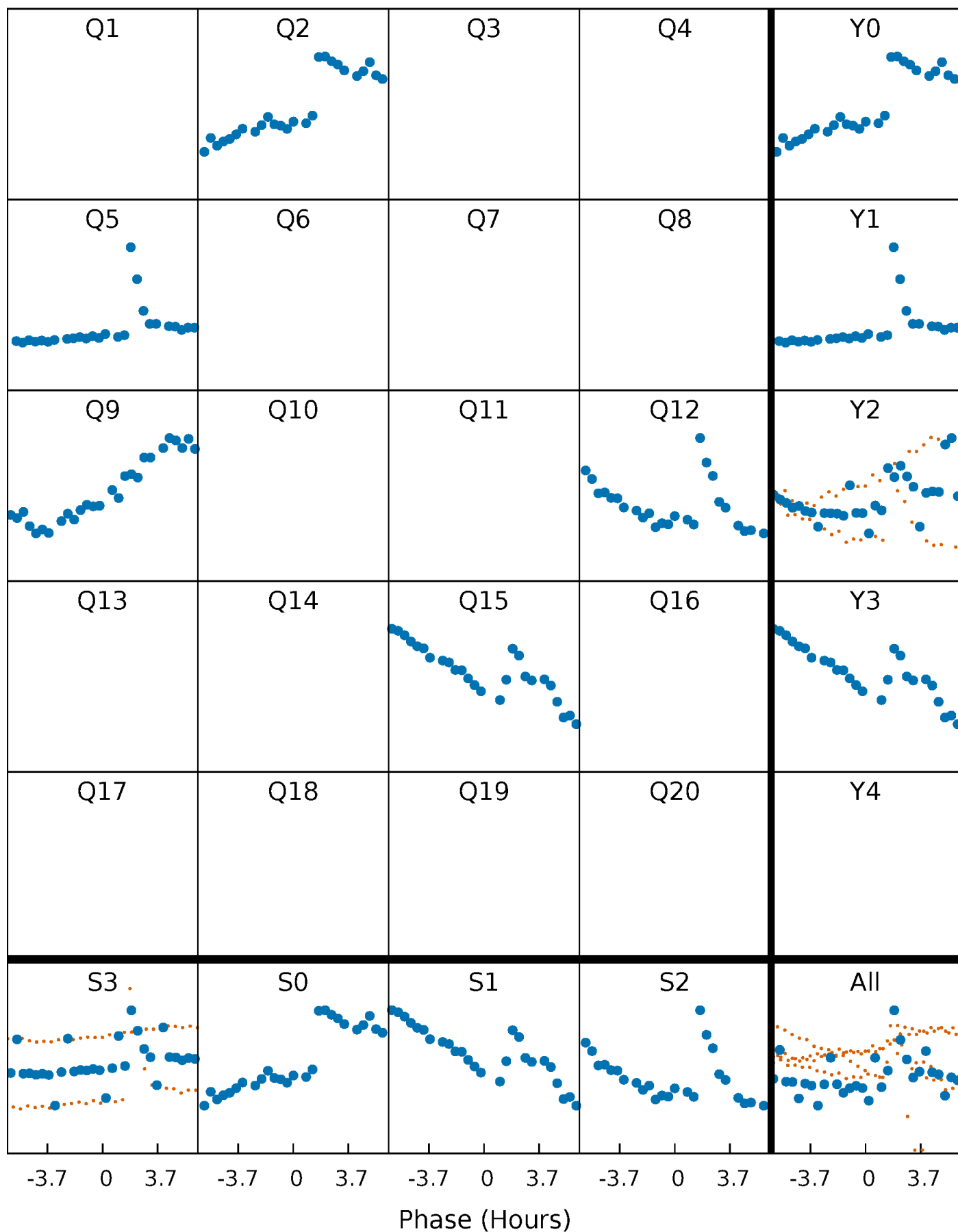


Planet 4 : Phased Whitened Flux Time Series (Fit Epoch/Period)



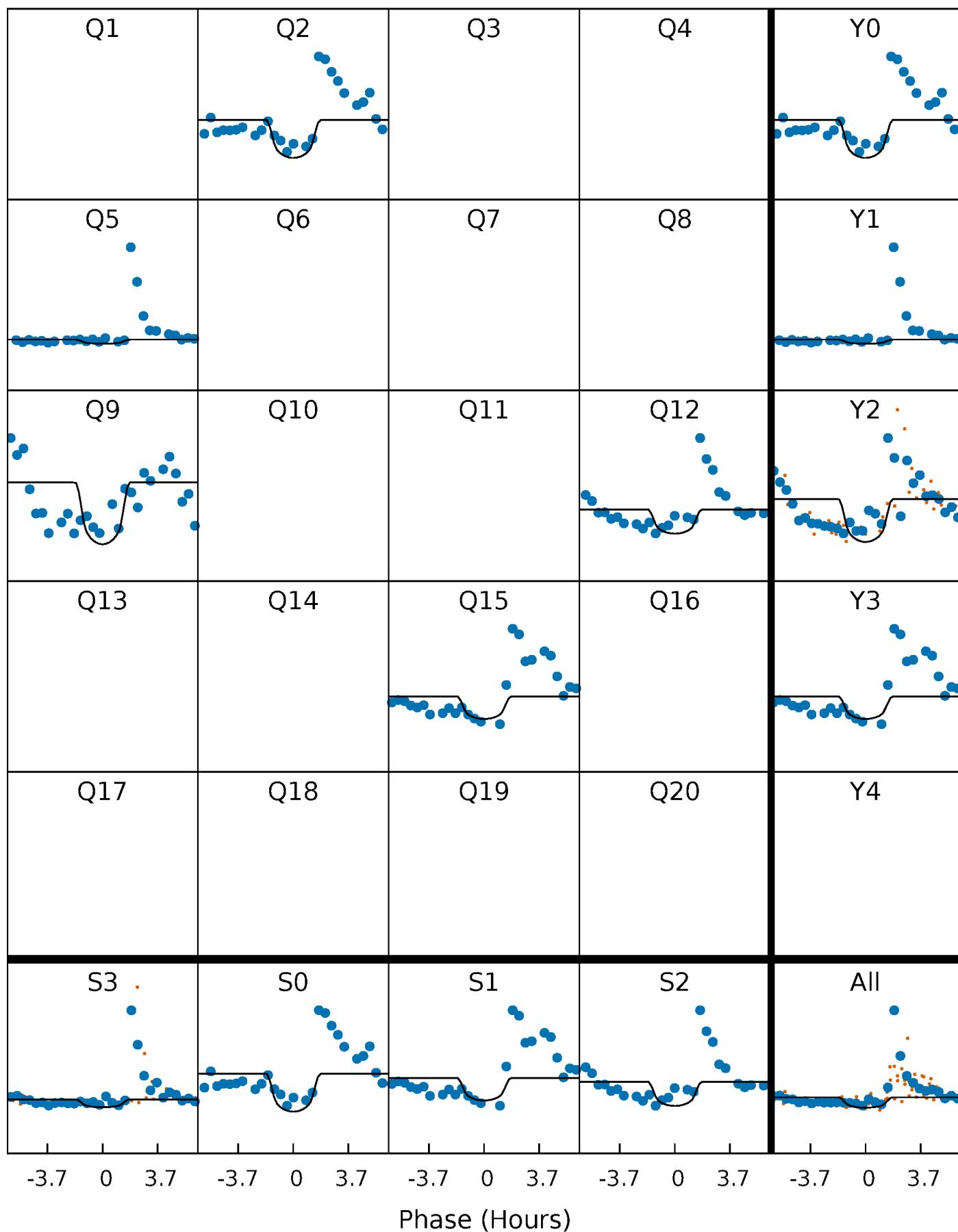
PDC Quarter-Phased Transit Curves

TCE 004158372-04 $P=289.494986$ Days $T_0=234.246442$ (BKJD)



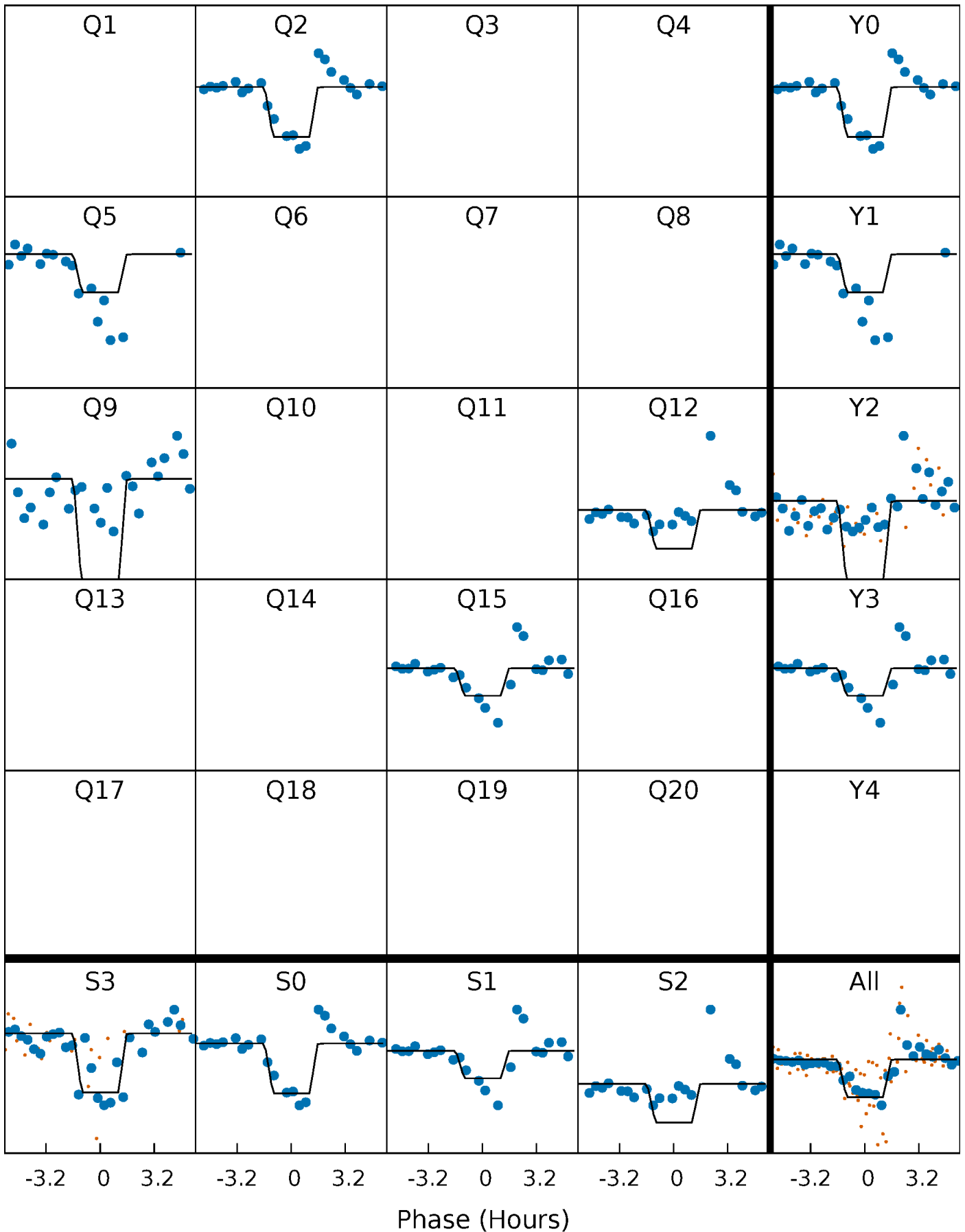
DV Quarter-Phased Transit Curves

TCE 004158372-04 $P=289.494986$ Days $T_0=234.246442$ (BKJD)



Alt. Detrend Quarter-Phased Transit Curves

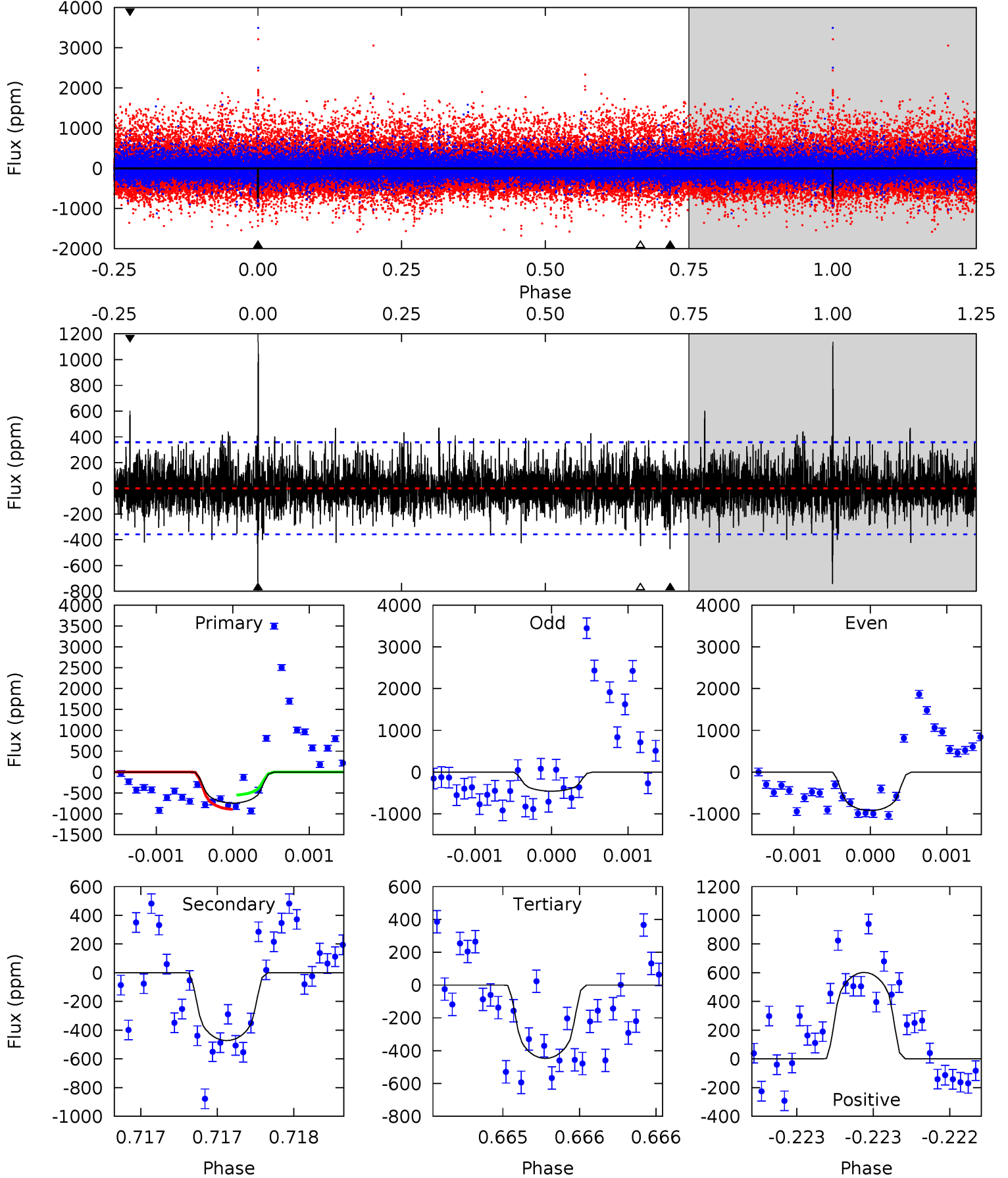
TCE 004158372-04 $P=289.492118$ Days $T_0=234.252968$ (BKJD)



DV Model-Shift Uniqueness Test

004158372-04, P = 289.494986 Days, E = 234.246442 Days

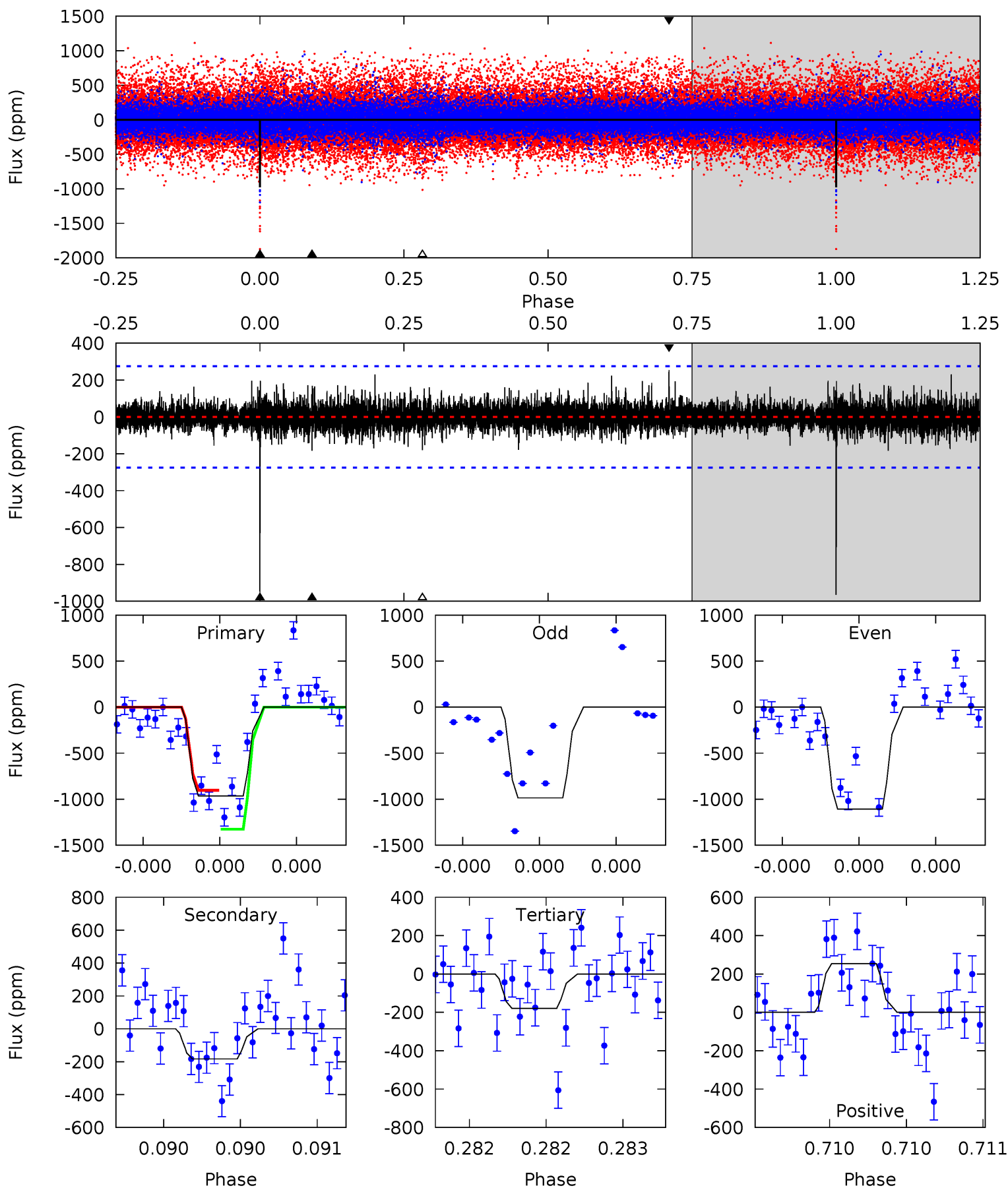
Pri	Sec	Ter	Pos	FA ₁	FA ₂	F _{Red}	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
11.6	7.34	6.95	9.36	5.57	3.47	1.84	4.61	2.20	0.39	-2.02	2.73	0.95	0.60	2.65



Alt Model-Shift Uniqueness Test

004158372-04, P = 289.492118 Days, E = 234.252968 Days

Pri	Sec	Ter	Pos	FA ₁	FA ₂	F _{Red}	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
19.6	3.72	3.64	5.14	5.58	3.49	0.90	16.0	14.4	0.08	-1.43	1.17	0.91	0.21	4.01



Stellar Parameters For KIC 004158372

	$T_{\text{eff}}(K)$	$\log(g)$	$[\text{Fe}/\text{H}]$	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	4267^{+129}_{-129}	$4.608^{+0.049}_{-0.018}$	$0.120^{+0.250}_{-0.300}$	$0.670^{+0.032}_{-0.057}$	$0.662^{+0.052}_{-0.052}$	$3.109^{+0.665}_{-0.248}$
	+3%/-3%	+1%/-0%	+208%/-250%	+5%/-9%	+8%/-8%	+21%/-8%
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 004158372-04 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	A_{obs}
DV	-472 ± 64	$4.15^{+3.65}_{-2.89}$	247^{+9}_{-8}	3127^{+1487}_{-505}	8654^{+78267}_{-6227}
Alt.	-183 ± 49	$4.44^{+3.81}_{-2.89}$	247^{+8}_{-8}	2667^{+924}_{-370}	2786^{+19628}_{-1992}

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

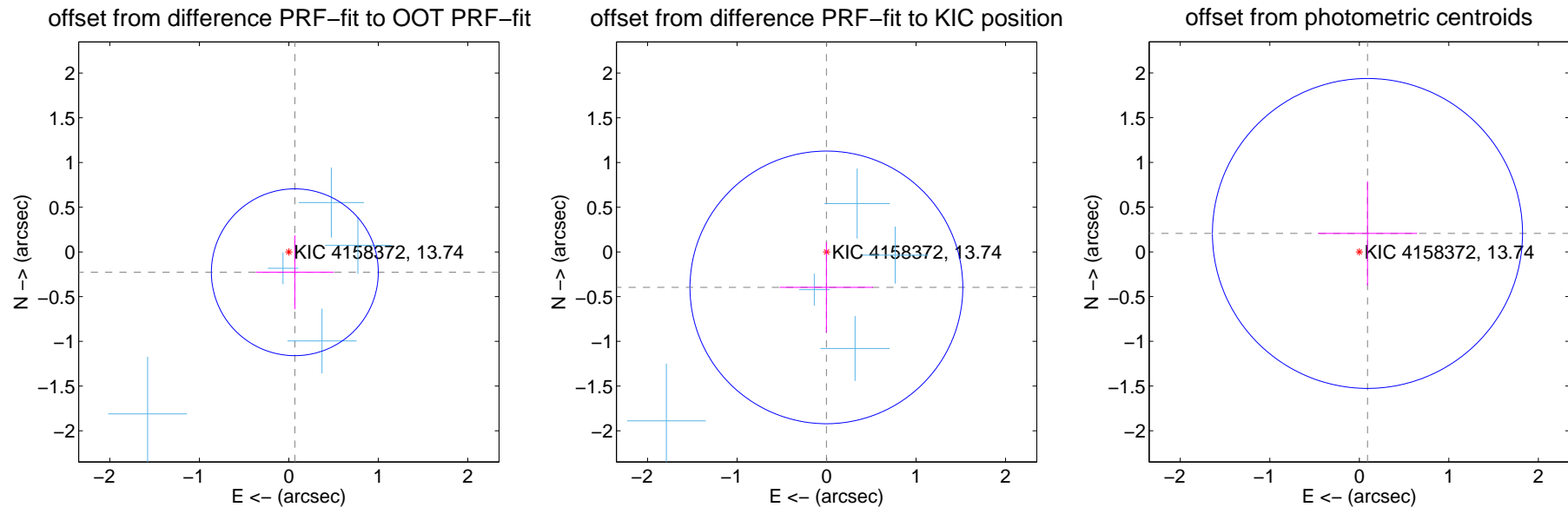
DV Centroid Data

Supplemental centroid analysis for 004158372-04. Kepler magnitude: 13.74. Transit SNR 8.99

There are 5 quarters with good PRF difference image offsets

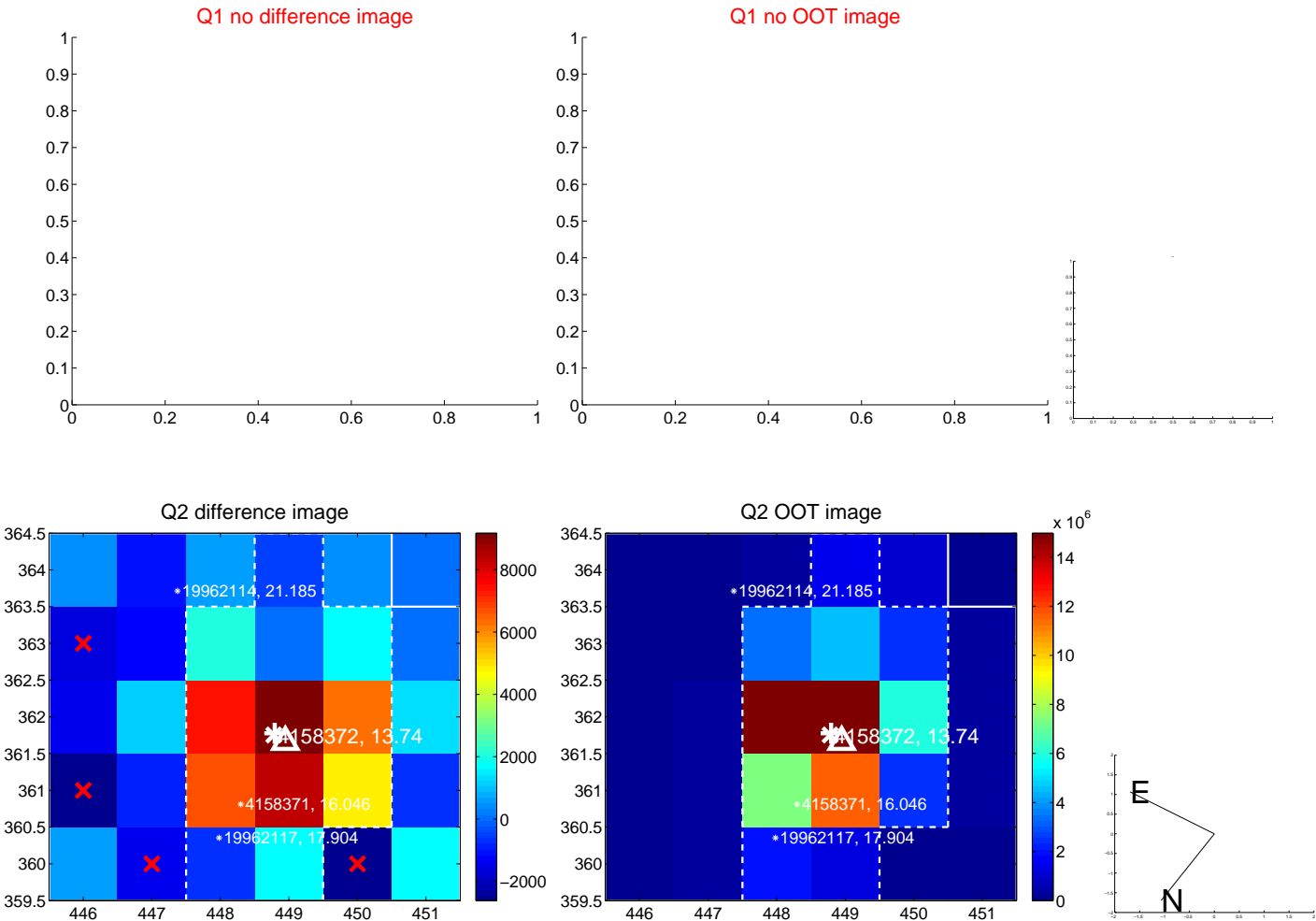
The direct PRF centroid is offset from the target star catalog position by about 0.25 arcsec

	Distance in arcsec	Distance / σ	Δ RA	Δ Dec
PRF-fit source offset from OOT	0.237 ± 0.311	0.76	-0.067 ± 0.435	-0.227 ± 0.413
PRF-fit source offset from KIC position	0.397 ± 0.508	0.78	0.002 ± 0.522	-0.397 ± 0.506
photometric centroid source offset	0.23 ± 0.58	0.39	-0.09 ± 0.55	0.21 ± 0.58

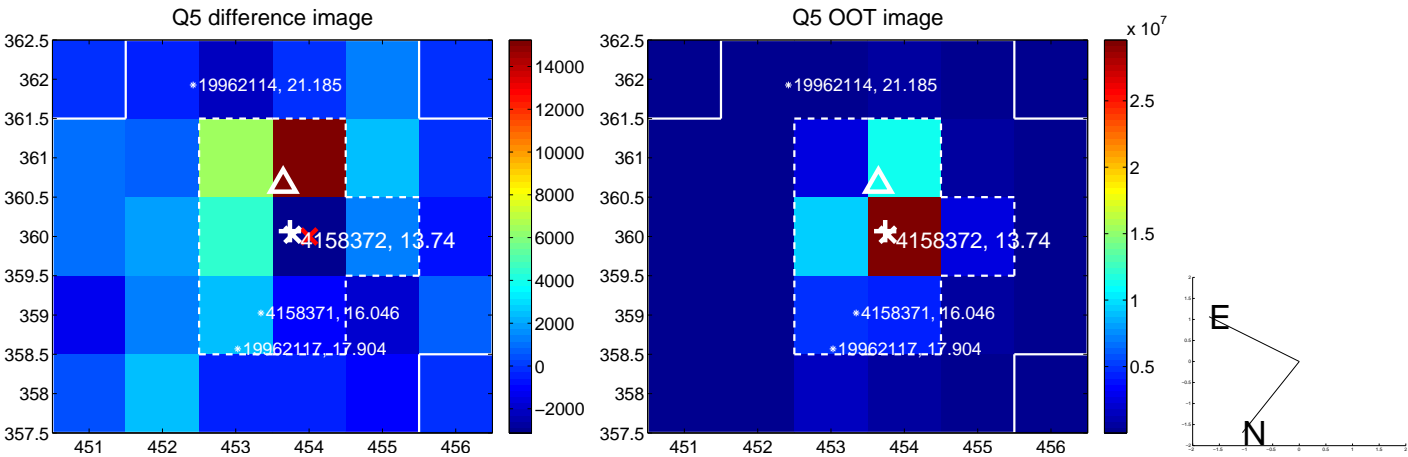


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses:** good quarterly centroid offsets; **Vermillion crosses:** bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- σ uncertainty. Blue circle: three-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

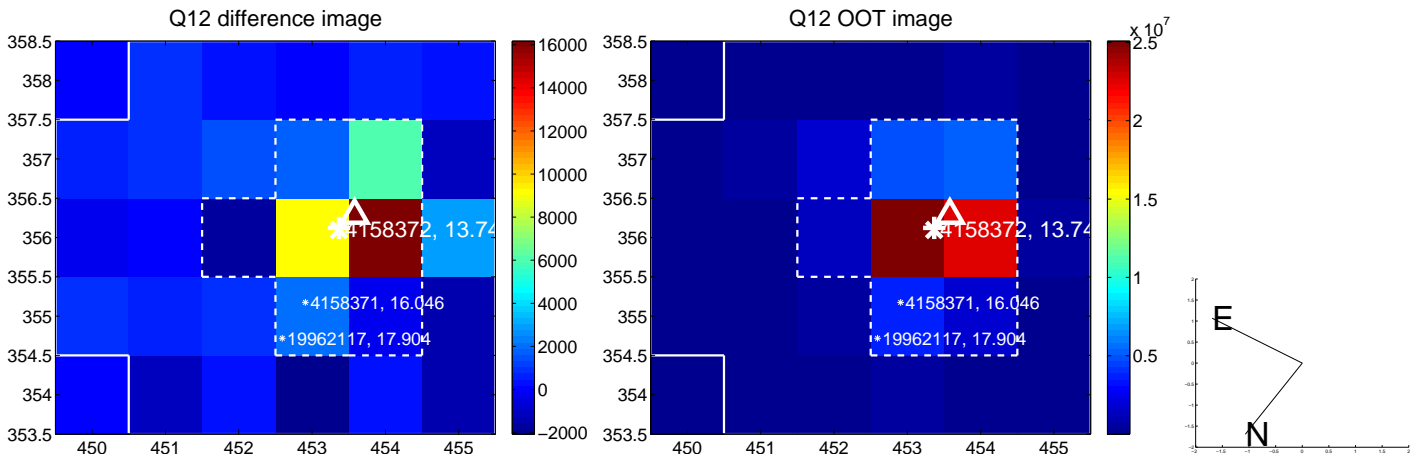
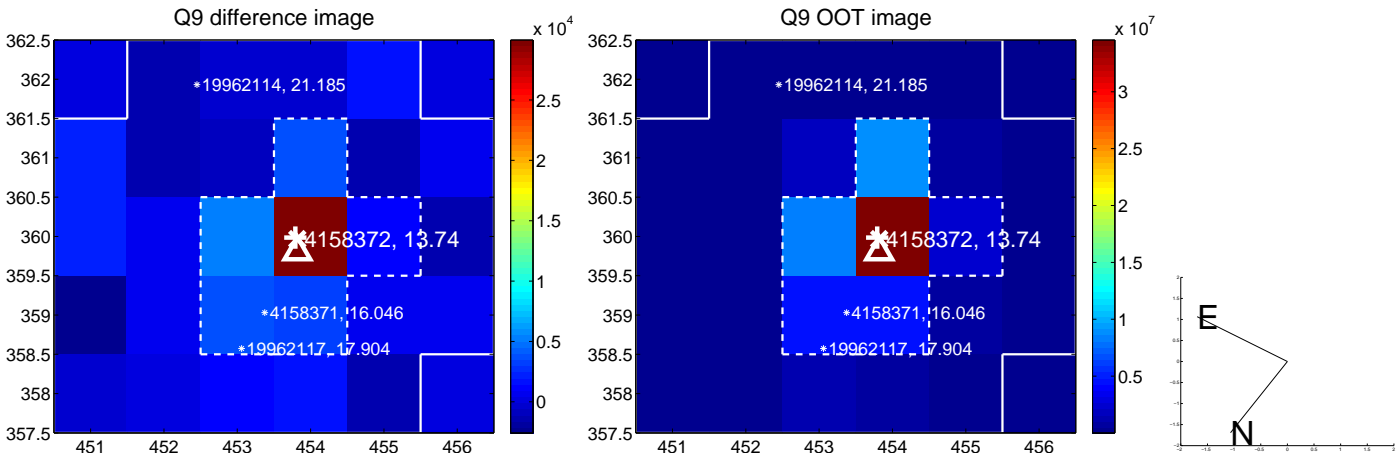
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



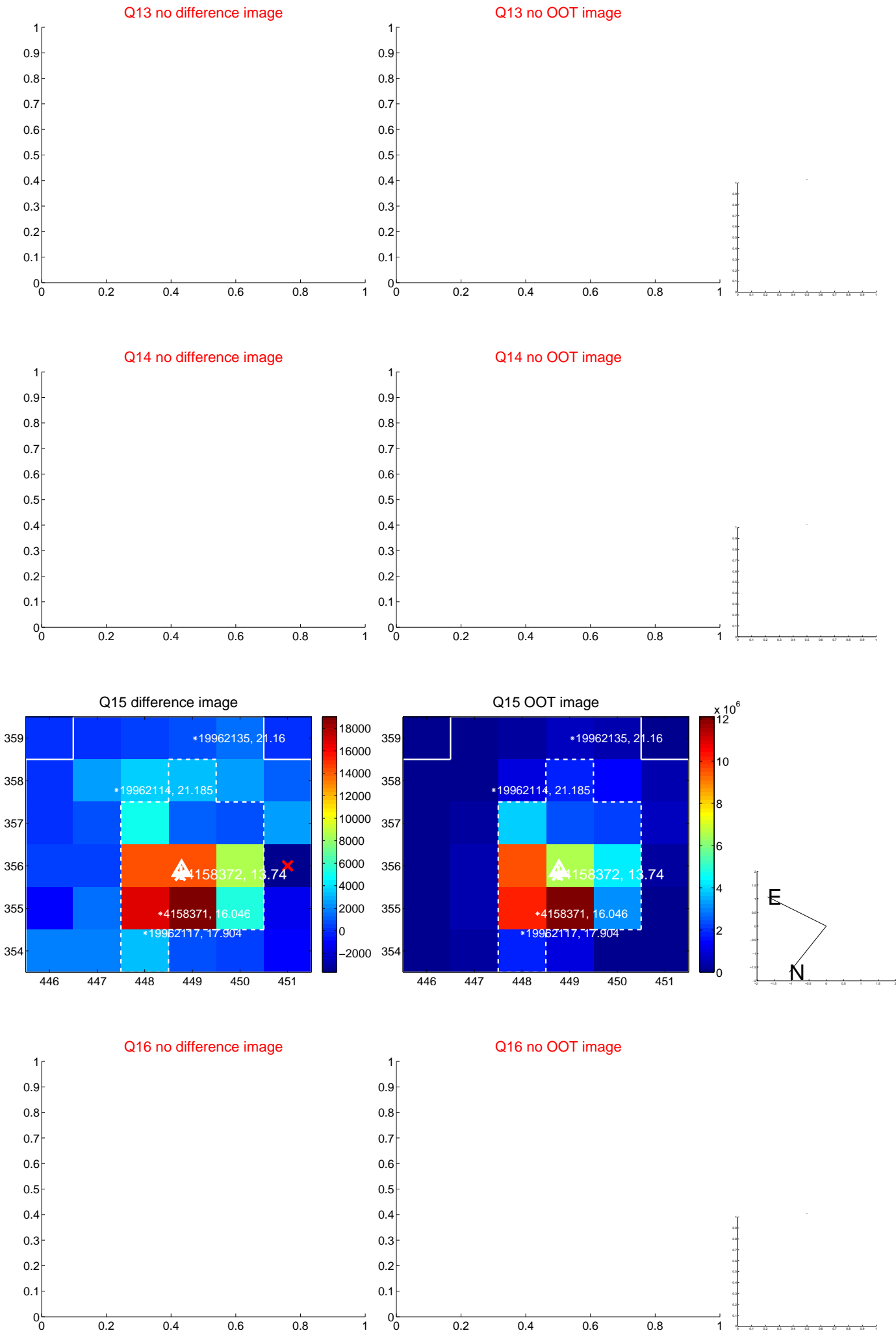
white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



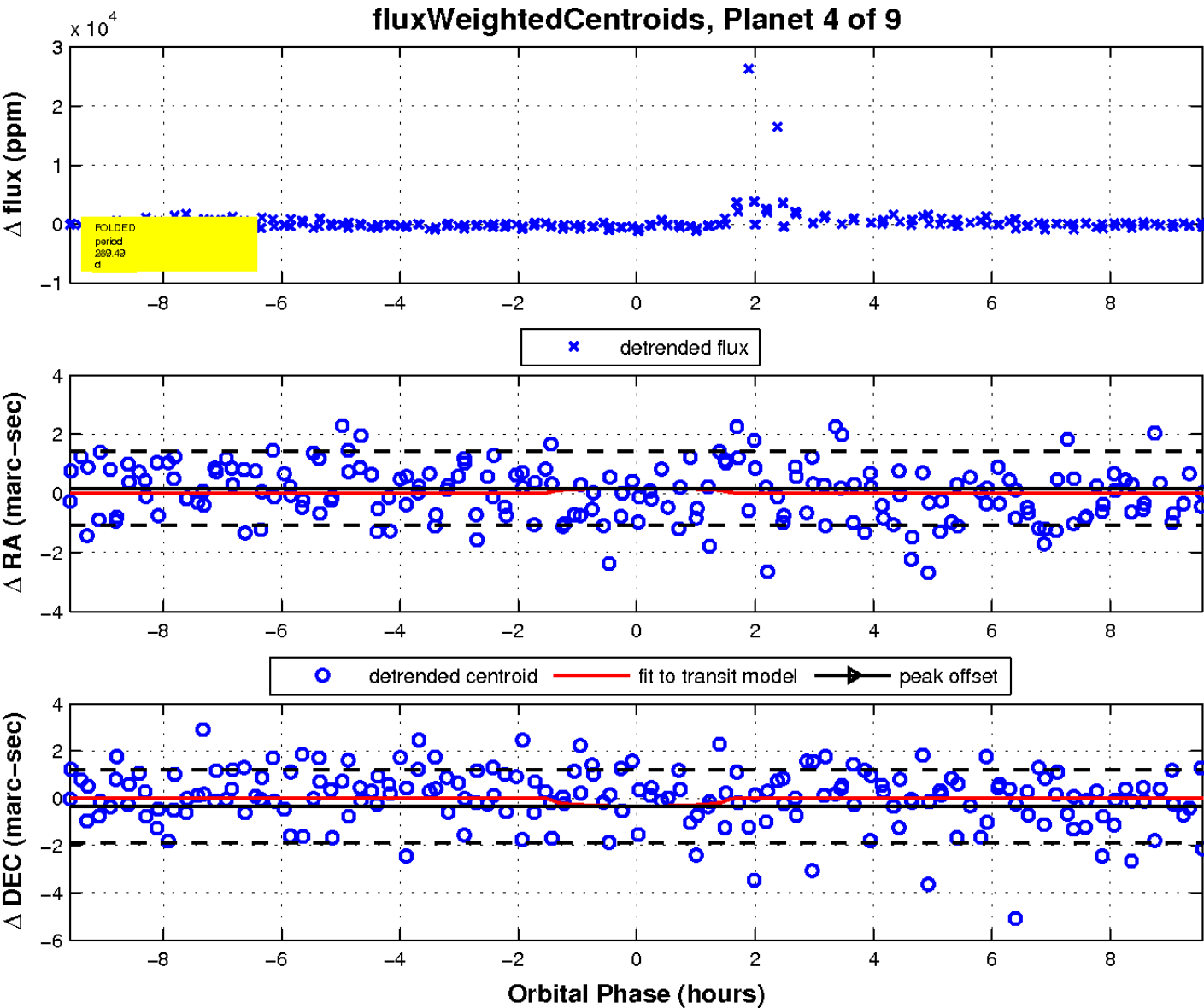
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



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

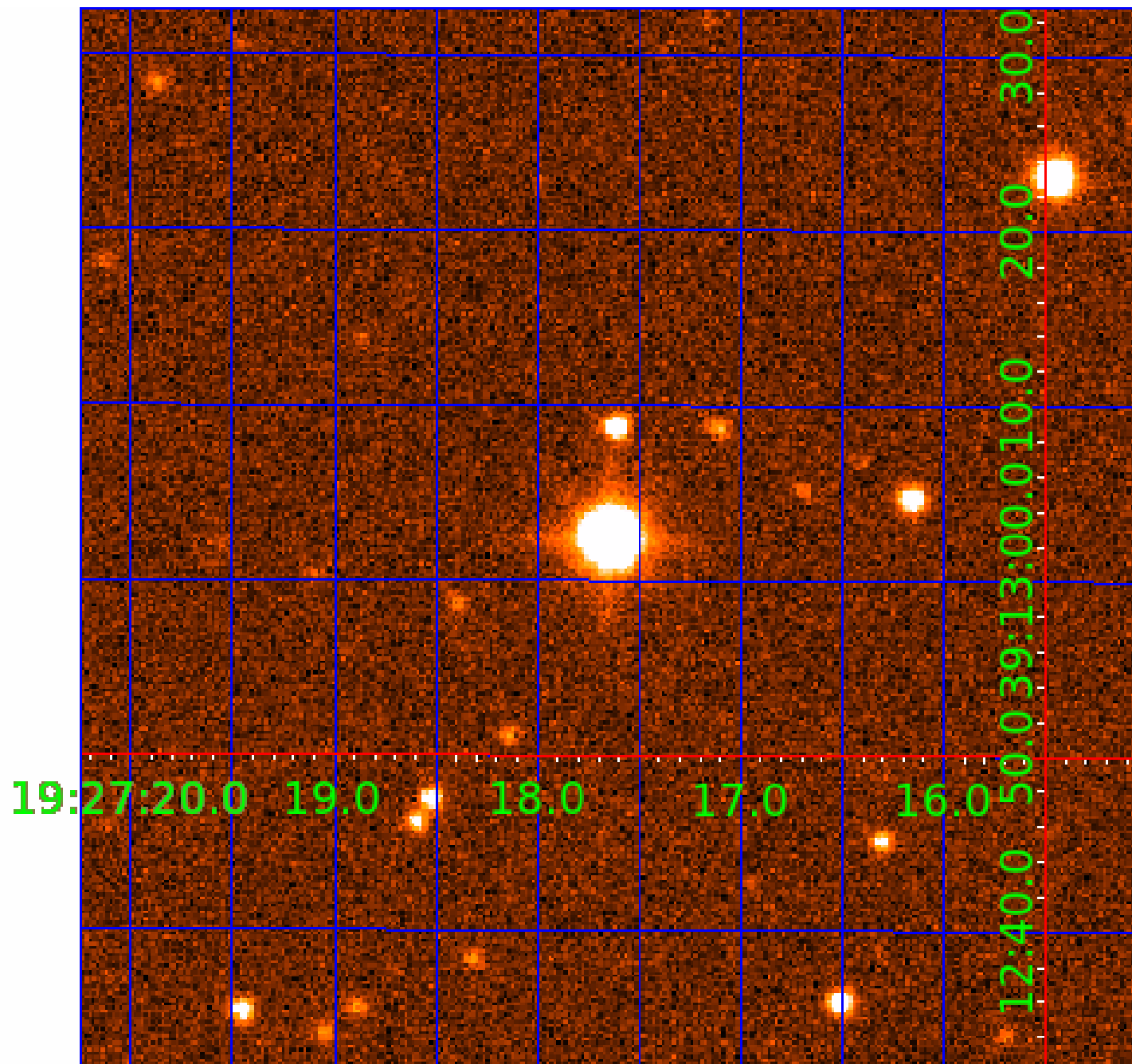


white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



UKIRT Image

Declination



KIC 004158372

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})
004158372-01	OBS	No	357.496909	376.973374	928.2	7.479	16.7	5.7	0.67	4267	2.25	0.18
004158372-02	OBS	No	405.589263	275.511211	760.9	4.726	14.2	6.4	0.67	4267	2.03	0.15
004158372-03	OBS	No	522.778675	216.071041	475.4	4.665	16.1	3.6	0.67	4267	1.66	0.11
004158372-04	OBS	No	289.494986	234.246442	1165.9	3.201	12.9	9.0	0.67	4267	2.49	0.24
004158372-05	OBS	No	356.891810	169.321259	1258.1	2.546	12.8	7.2	0.67	4267	2.56	0.18
004158372-07	OBS	No	470.232741	267.941575	1038.8	6.744	12.2	7.4	0.67	4267	2.24	0.12
004158372-08	OBS	No	473.489609	550.580979	1462.8	16.257	10.8	7.4	0.67	4267	2.56	0.12
004158372-09	OBS	No	320.670668	378.593601	373.5	10.500	12.1	-1.0	0.67	4267	1.23	0.21

Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
004158372-01	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_MARSHALL—LPP_DV—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—CENT_FEW_DIFFS
004158372-02	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
004158372-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV
004158372-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—ALL_TRANS_CHASES
004158372-05	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_POS_DV—CENT_UNCERTAIN
004158372-07	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—CENT_FEW_DIFFS
004158372-08	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_MARSHALL—LPP_DV—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—CENT_FEW_DIFFS
004158372-09	OBS	FP	0.00	1	0	1	0	LPP_DV—ALL_TRANS_CHASES—CENT_NOFITS—HALO_GHOST

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

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

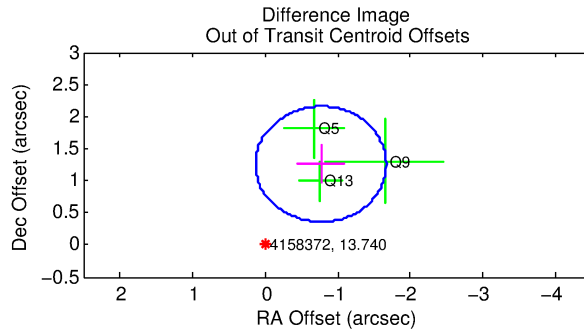
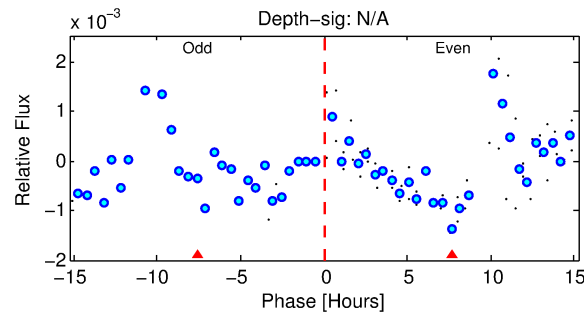
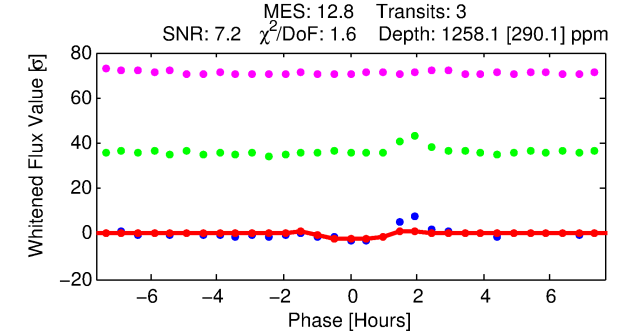
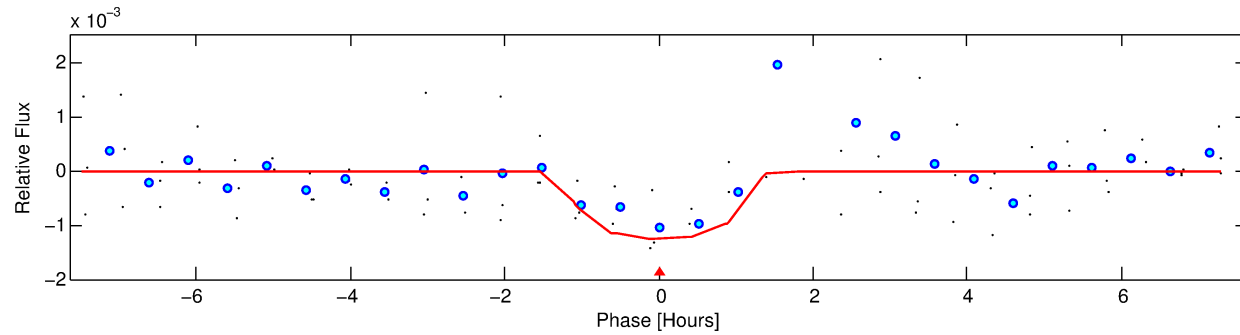
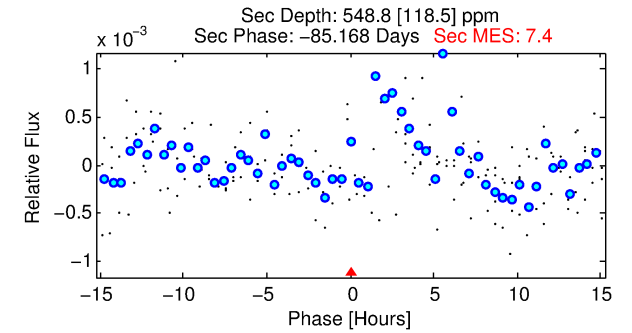
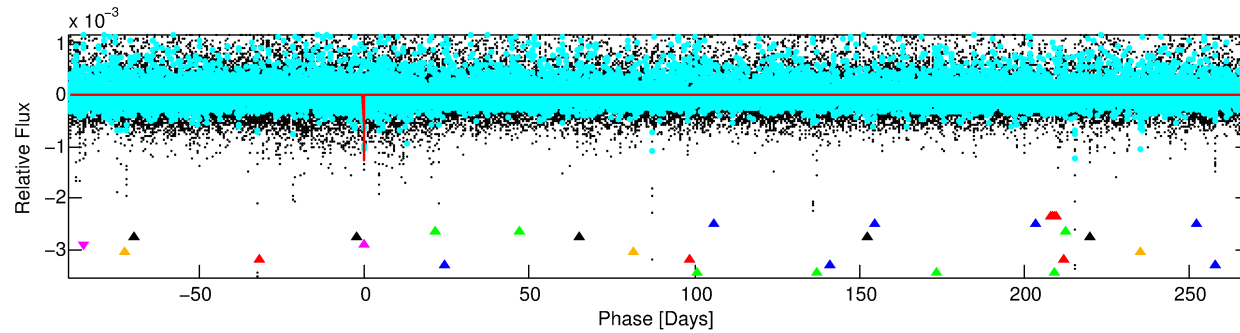
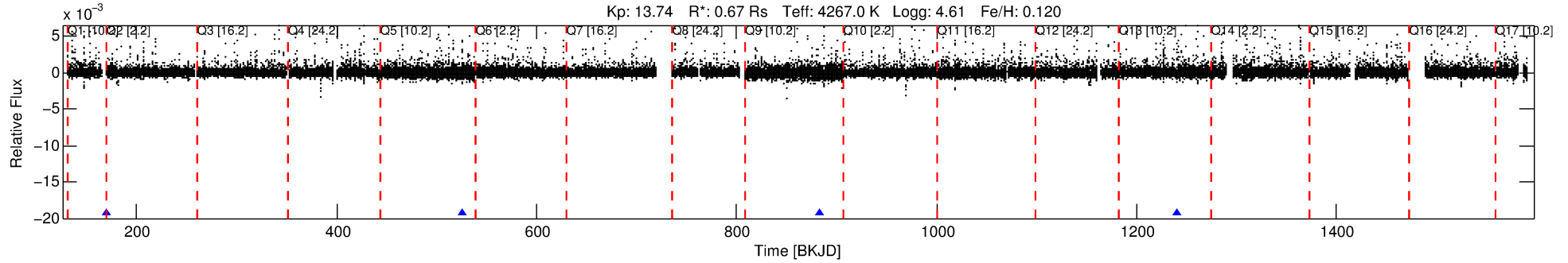
See http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col for comment definitions.

Ephemeris Match Information For 004158372-05

No Significant Match Found

DV One-Page Summary

KIC: 4158372 Candidate: 5 of 9 Period: 356.892 d



DV Fit Results:

Period = 356.89181 [0.00649] d
Epoch = 169.3213 [0.0154] BKJD
Rp/R* = 0.0350 [0.1574]
a/R* = 803.52 [10901.95]
b = 0.71 [9.77]
Seff = 0.18 [0.03]
Teq = 166 [6] K
Rp = 2.56 [11.51] Re
a = 0.8592 [0.0585] AU
Ag = 34093.38 [307047.91] [0.11σ]
Teffp = 3492 [7863] K [0.42σ]

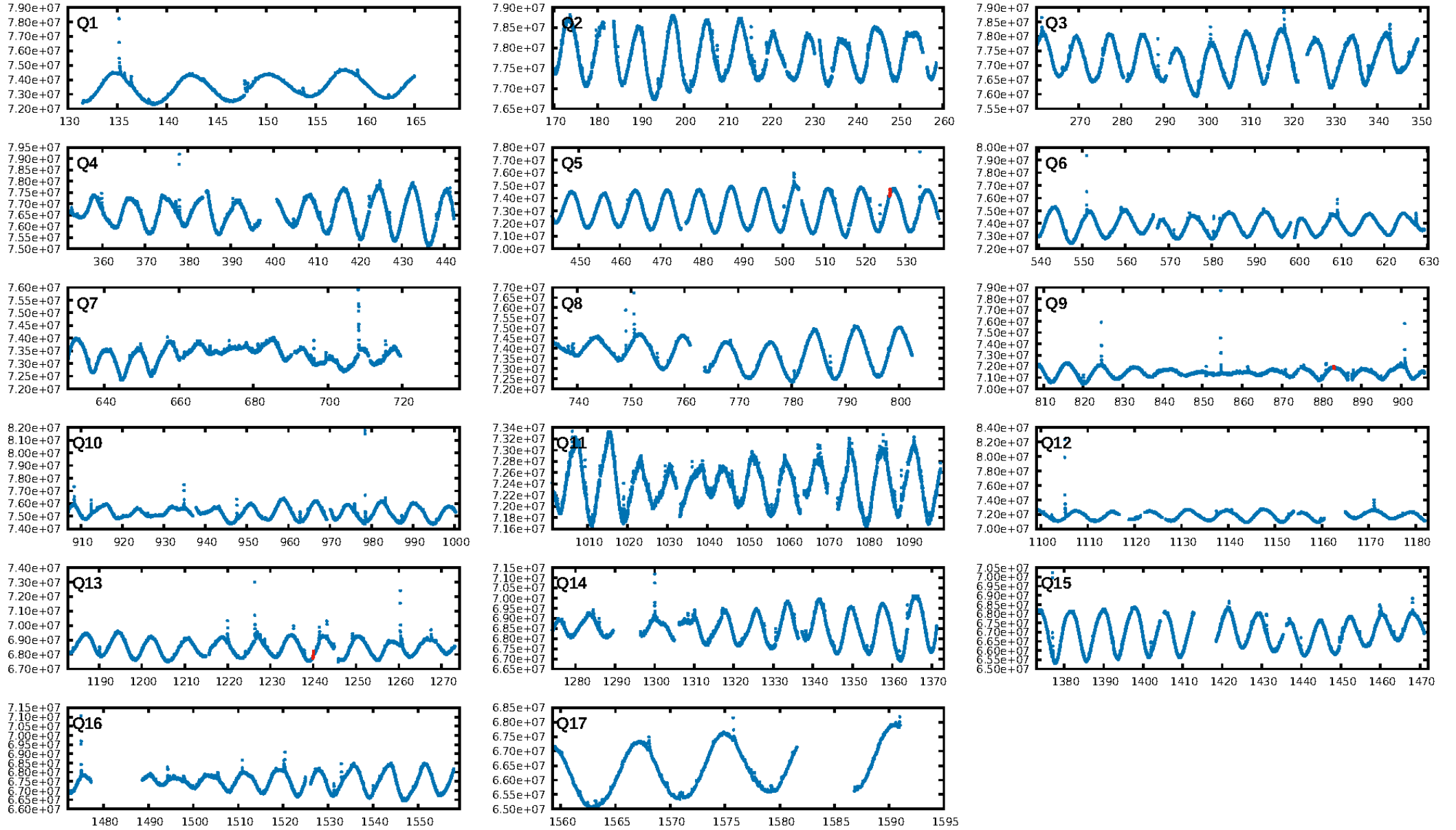
DV Diagnostic Results:

ShortPeriod-sig: 100.0% [80.46σ]
LongPeriod-sig: 93.4% [1.84σ]
ModelChiSquare2-sig: 4.1%
ModelChiSquareGof-sig: 69.9%
Bootstrap-pfa: N/A
RollingBand-fgt: 1.00 [3/3]
GhostDiagnostic-chr: 2.765
Centroid-sig: 9.5%
Centroid-so: 0.641 arcsec [0.89σ]
OotOffset-rm: 1.475 arcsec [4.92σ]
KicOffset-rm: 1.320 arcsec [4.44σ]
OotOffset-st: 0/0/0/3 [3]
KicOffset-st: 0/0/0/3 [3]
DiffImageQuality-fgm: 1.00 [3/3]
DiffImageOverlap-fno: 1.00 [3/3]

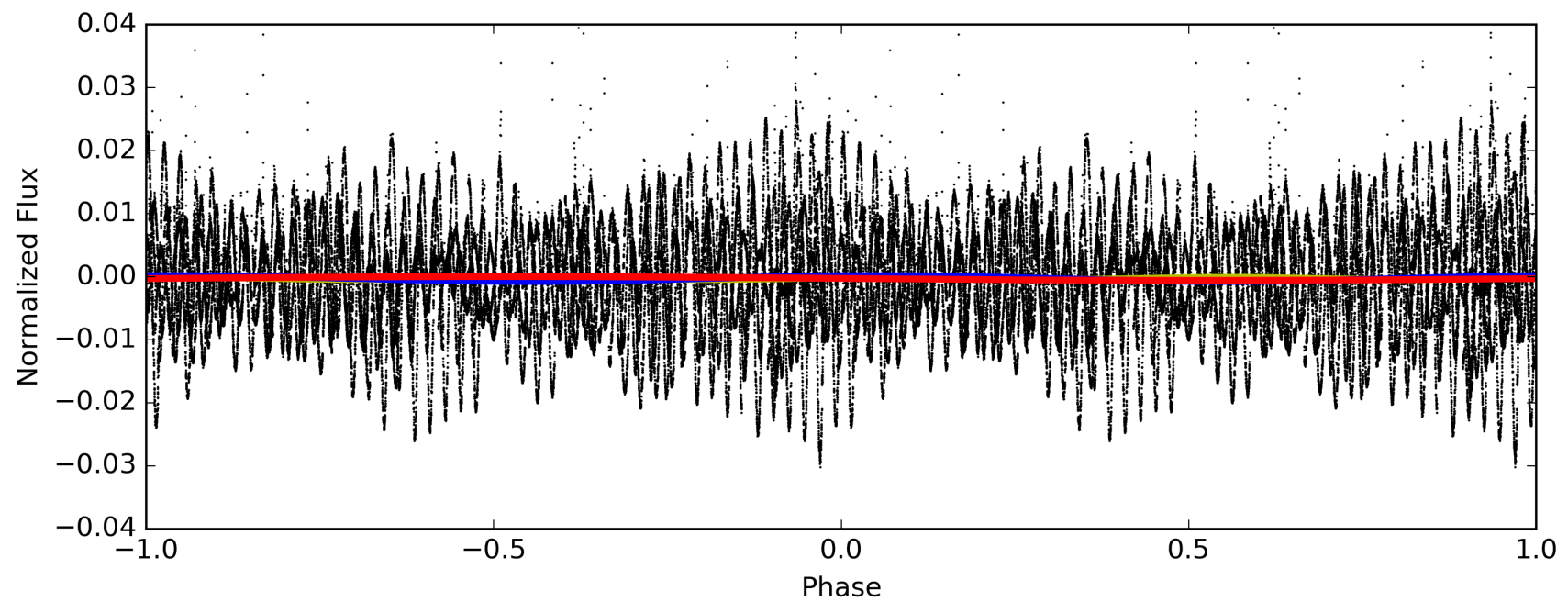
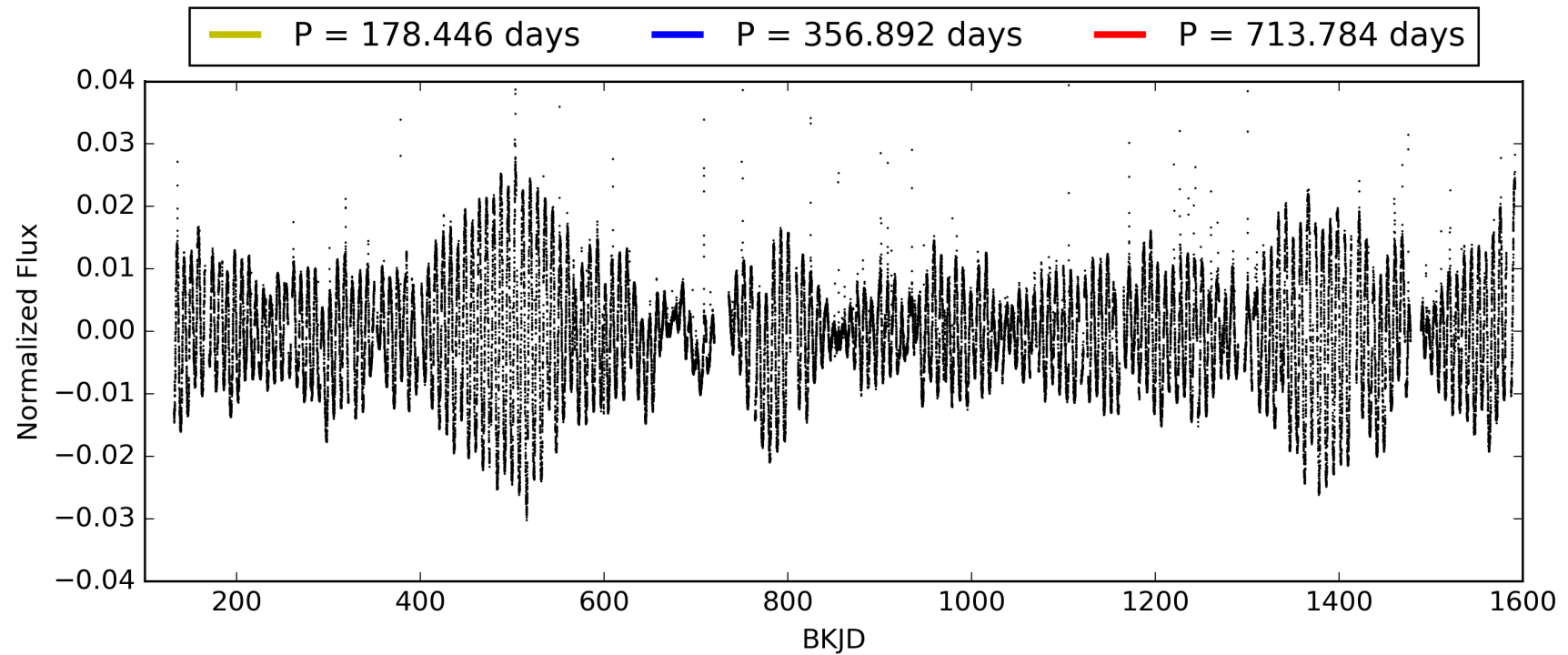
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 01-Feb-2016 06:12:50 Z

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

TCE 004158372-05, PDC Light Curves

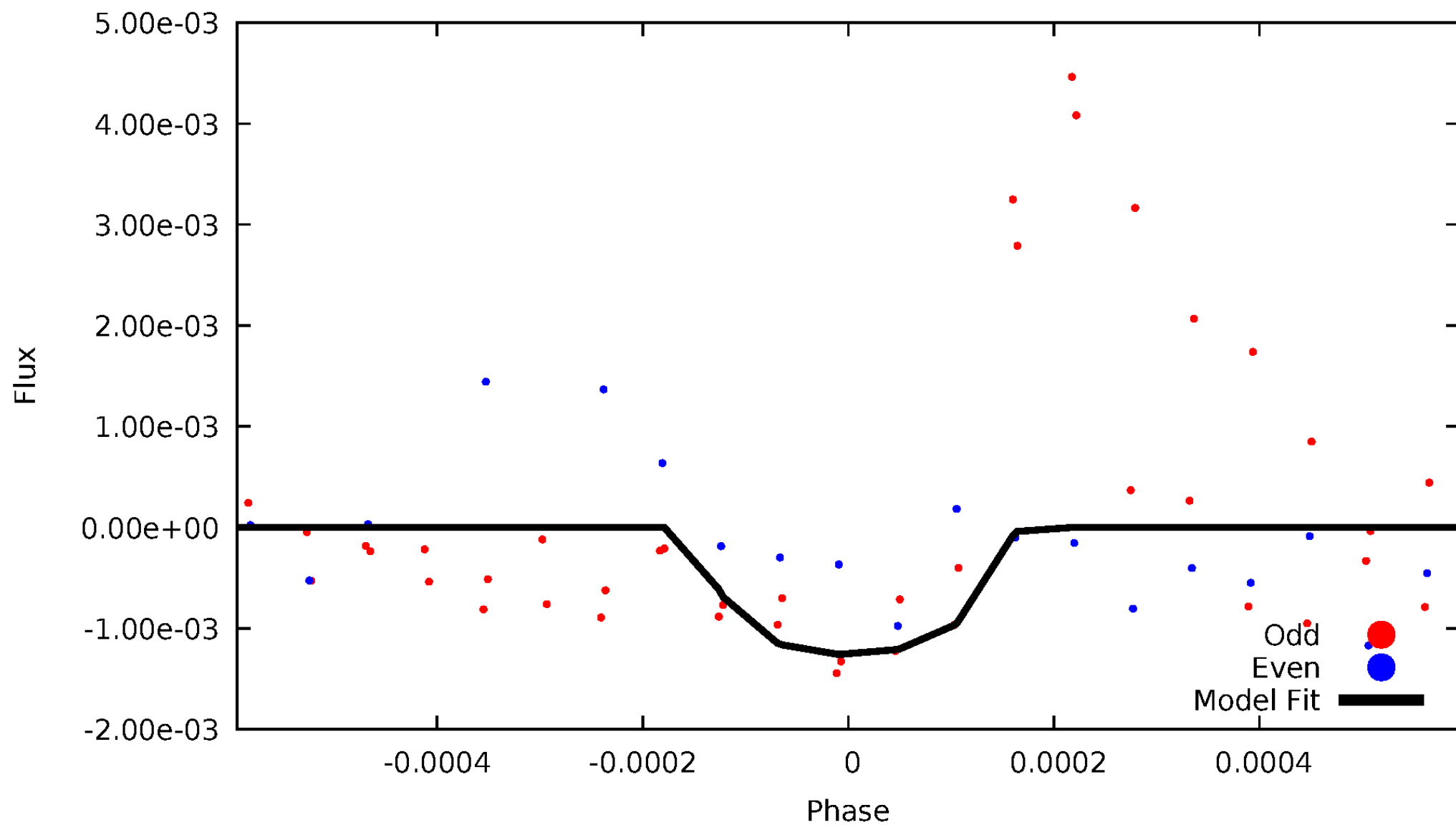


TCE 004158372-05



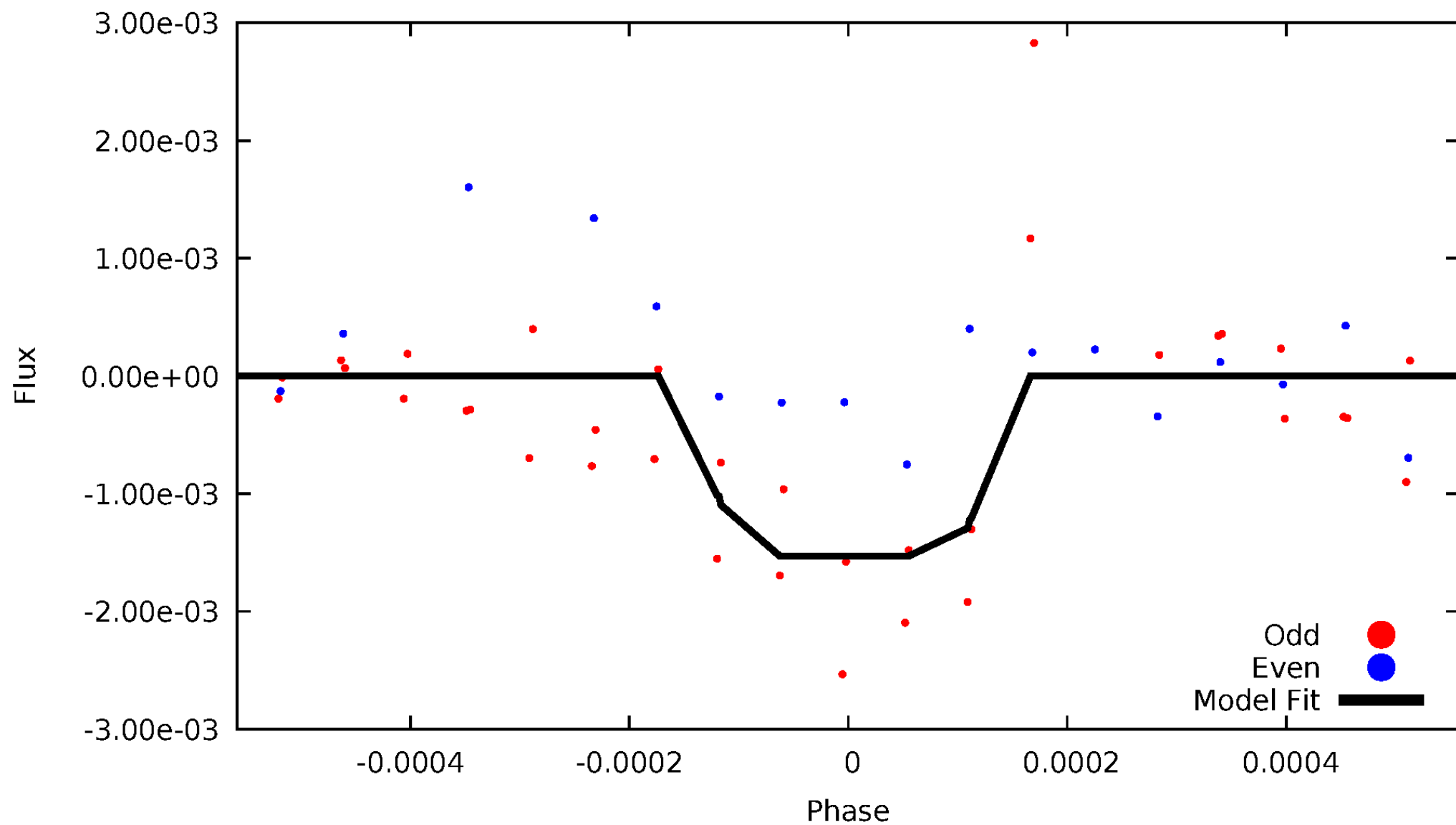
DV Odd/Even

TCE 004158372-05



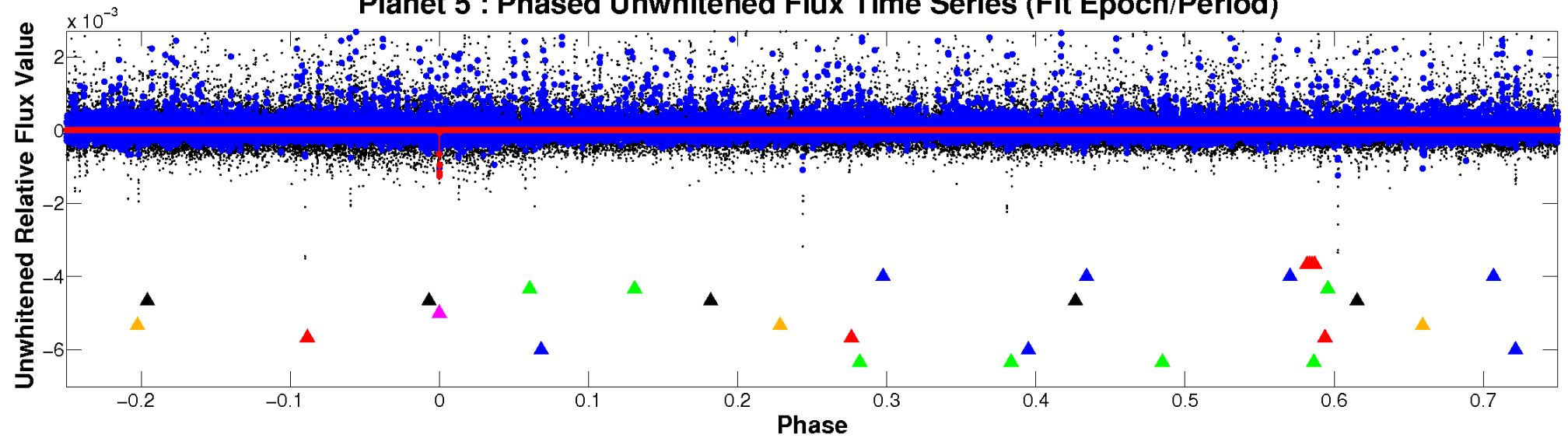
ALT Odd/Even

TCE 004158372-05

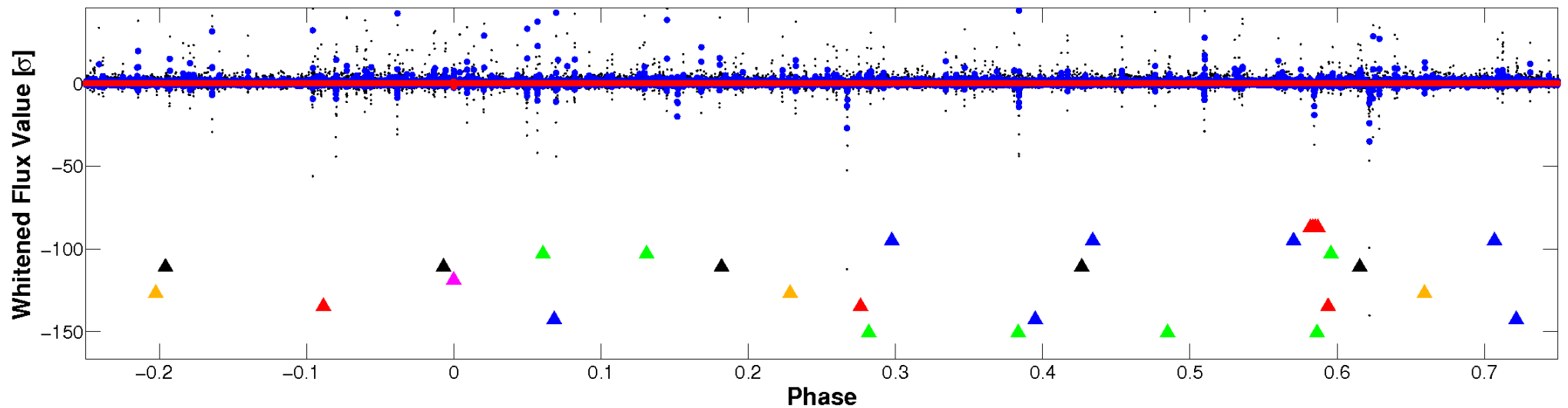


Non-Whitened Vs. Whitened Light Curve

Planet 5 : Phased Unwhitened Flux Time Series (Fit Epoch/Period)

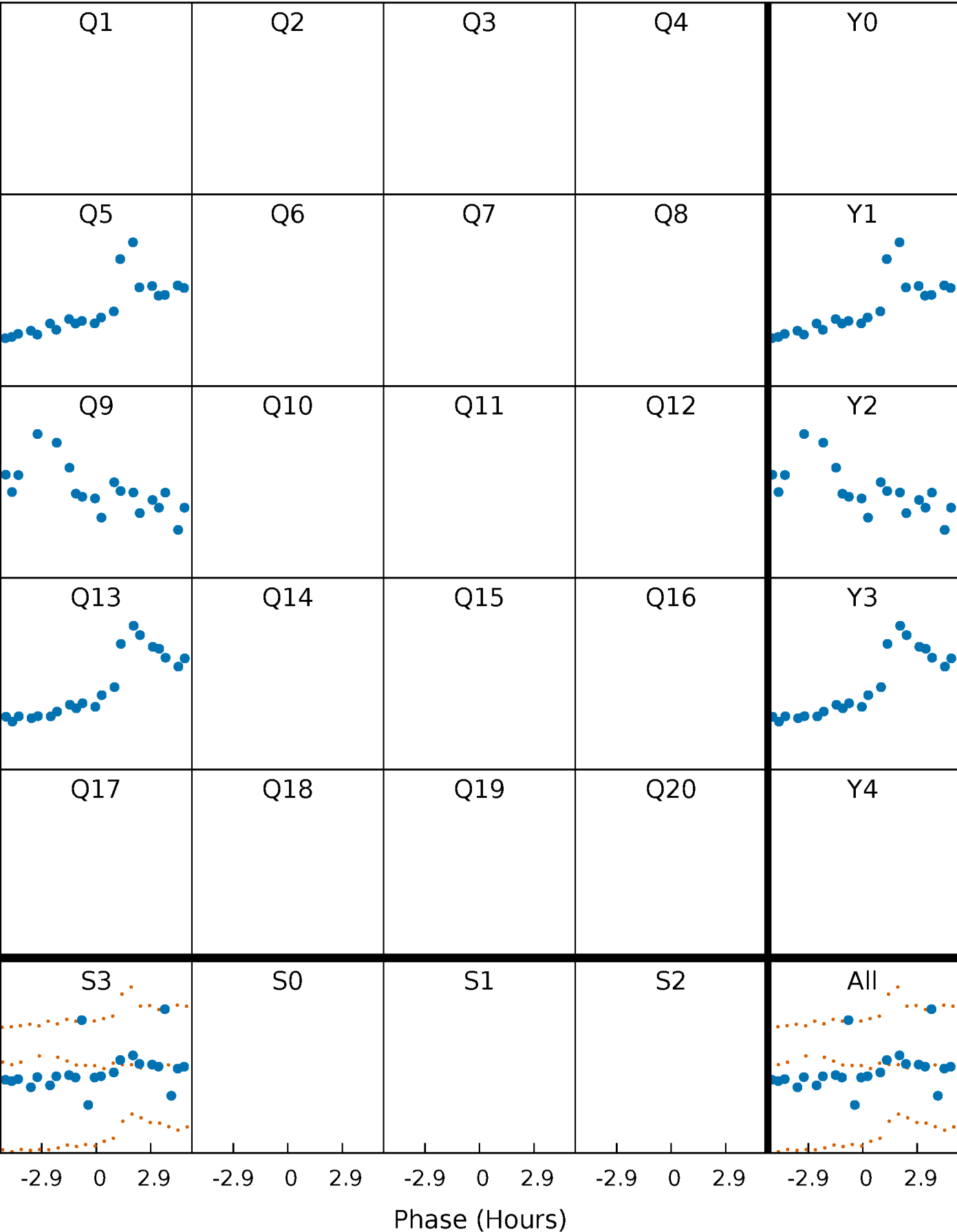


Planet 5 : Phased Whitened Flux Time Series (Fit Epoch/Period)



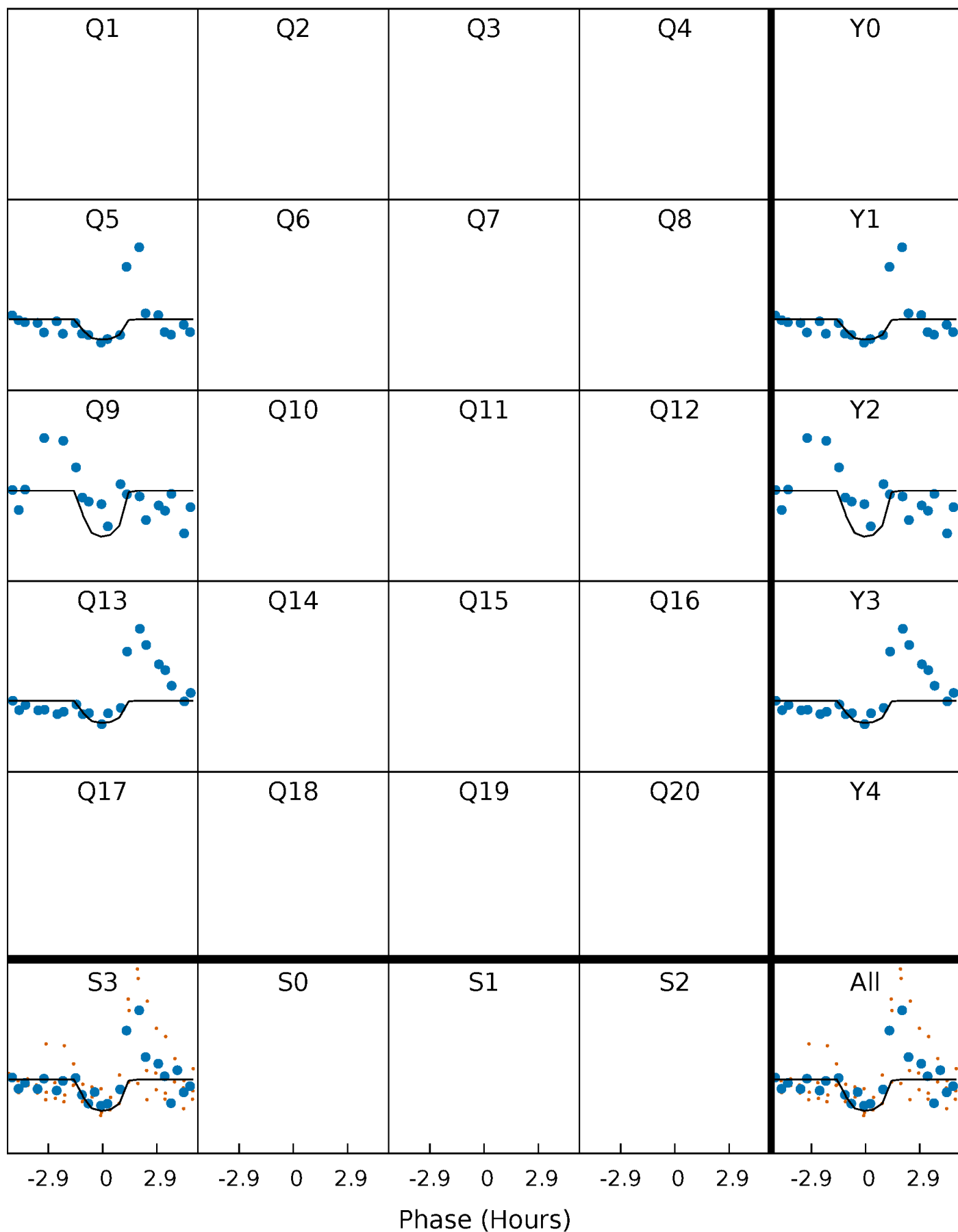
PDC Quarter-Phased Transit Curves

TCE 004158372-05 P=356.891810 Days T₀=169.321259 (BKJD)



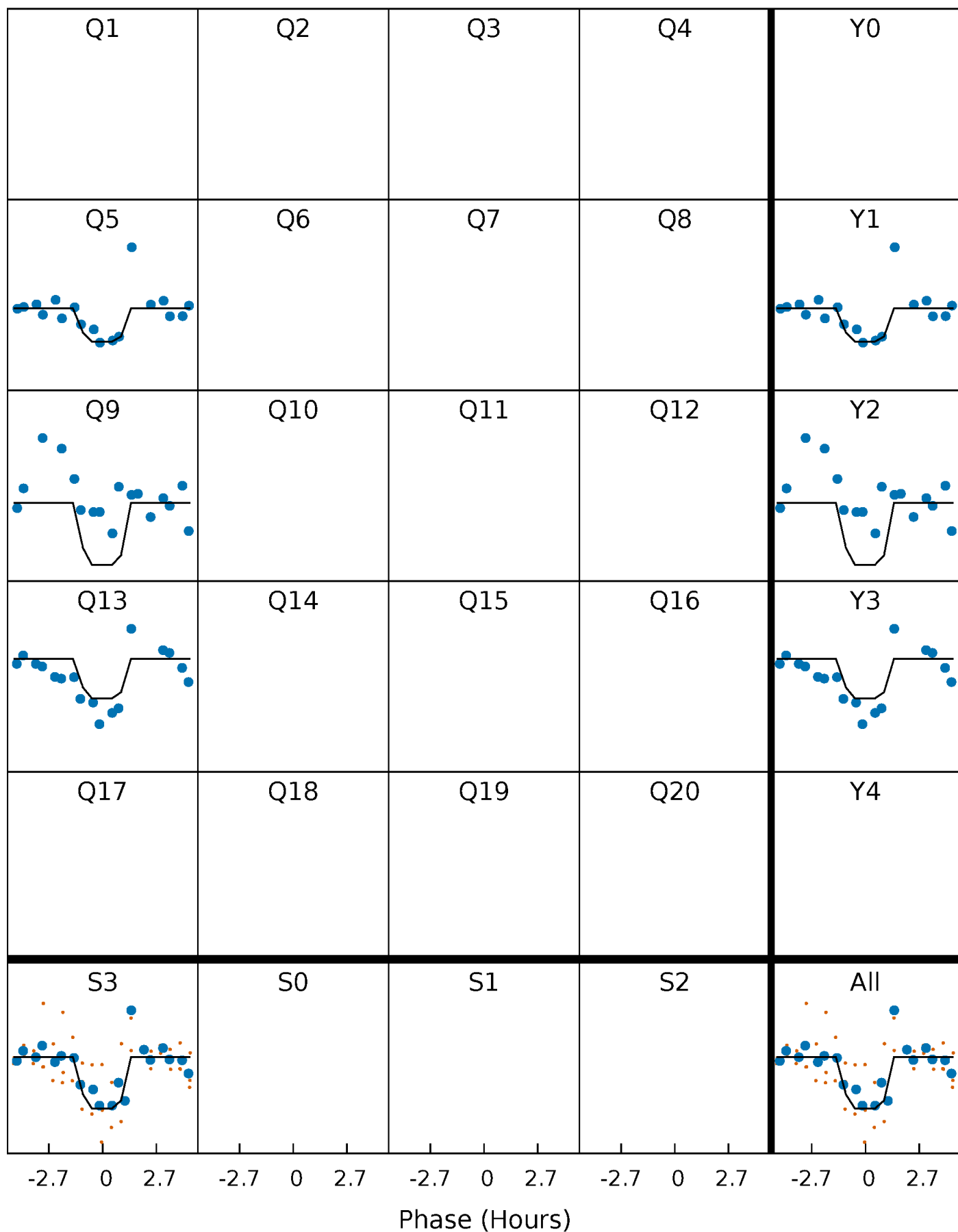
DV Quarter-Phased Transit Curves

TCE 004158372-05 $P=356.891810$ Days $T_0=169.321259$ (BKJD)



Alt. Detrend Quarter-Phased Transit Curves

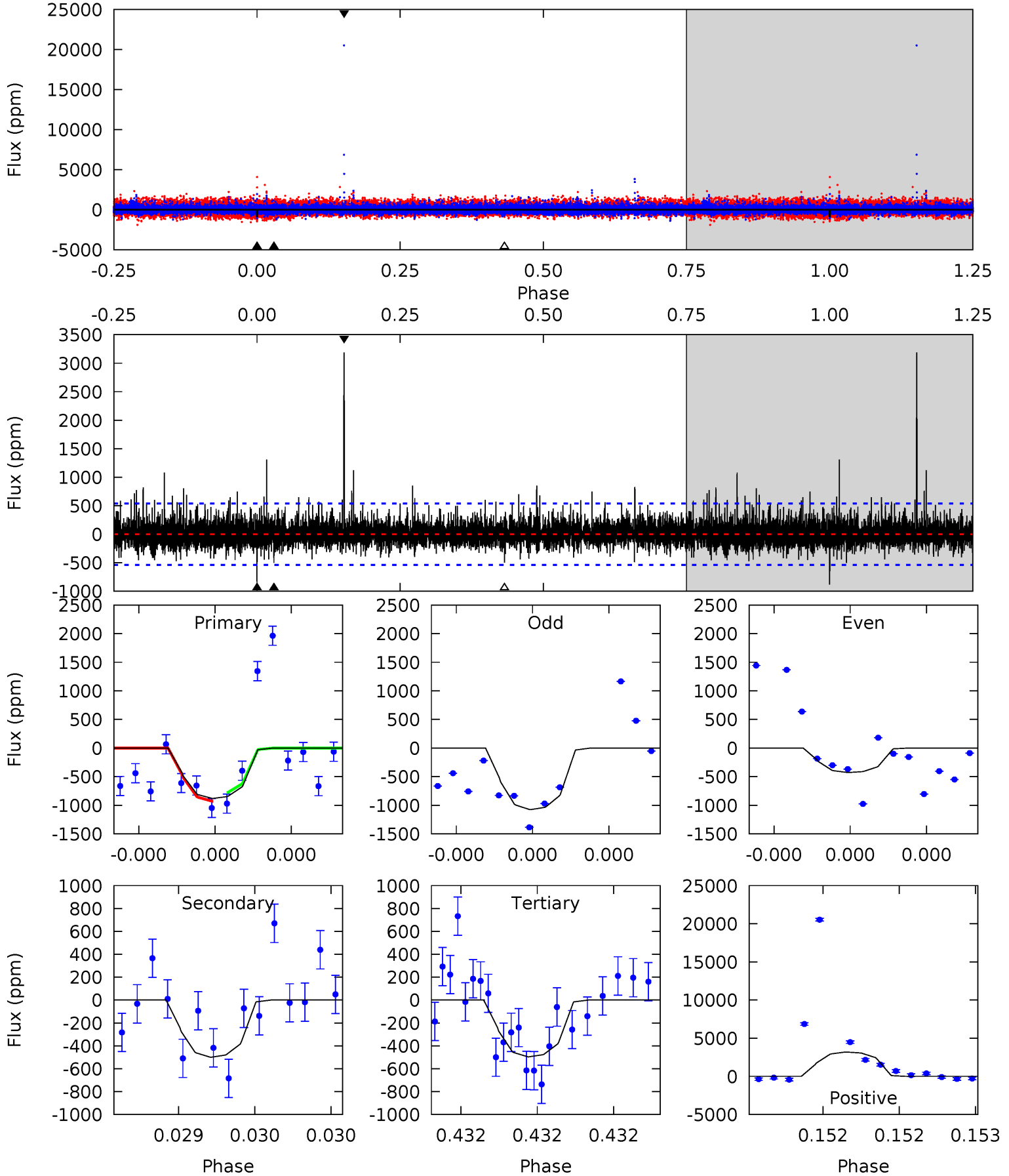
TCE 004158372-05 $P=356.893185$ Days $T_0=169.316502$ (BKJD)



DV Model-Shift Uniqueness Test

004158372-05, P = 356.891810 Days, E = 169.321259 Days

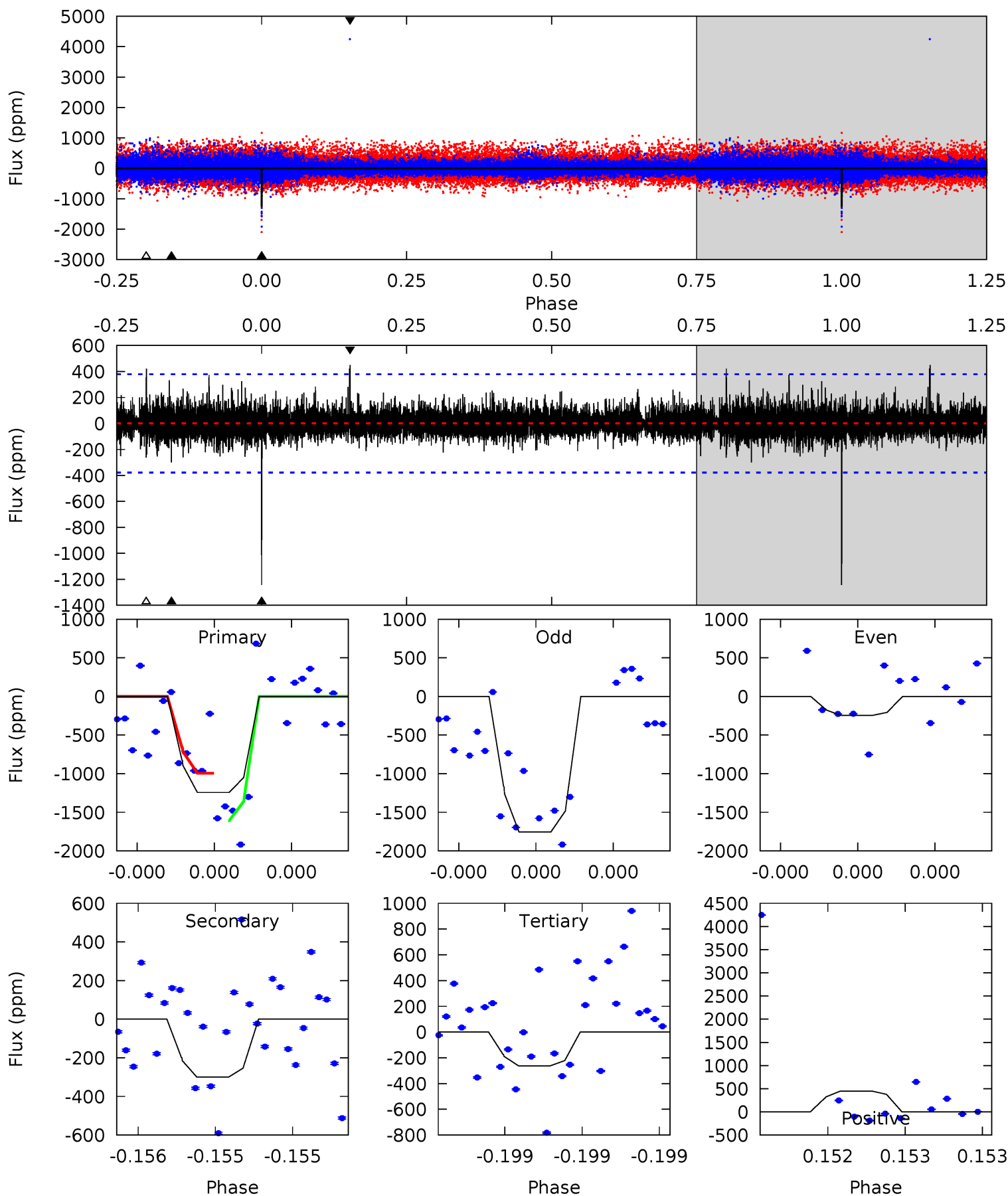
Pri	Sec	Ter	Pos	FA ₁	FA ₂	F _{Red}	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
9.28	5.26	5.23	33.6	5.67	3.62	1.63	4.05	-24.3	0.03	-28.3	2.81	0.94	0.78	0.79



Alt Model-Shift Uniqueness Test

004158372-05, P = 356.893185 Days, E = 169.316502 Days

Pri	Sec	Ter	Pos	FA ₁	FA ₂	F _{Red}	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
18.6	4.48	3.93	6.71	5.67	3.63	0.96	14.7	11.9	0.56	-2.23	11.5	0.93	0.27	4.58



Stellar Parameters For KIC 004158372

	$T_{\text{eff}}(K)$	$\log(g)$	$[\text{Fe}/\text{H}]$	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	4267^{+129}_{-129}	$4.608^{+0.049}_{-0.018}$	$0.120^{+0.250}_{-0.300}$	$0.670^{+0.032}_{-0.057}$	$0.662^{+0.052}_{-0.052}$	$3.109^{+0.665}_{-0.248}$
	+3%/-3%	+1%/-0%	+208%/-250%	+5%/-9%	+8%/-8%	+21%/-8%
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 004158372-05 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	A_{obs}
DV	-499 ± 95	$8.49^{+9.95}_{-5.90}$	231^{+8}_{-8}	2580^{+1064}_{-443}	2767^{+27987}_{-2187}
Alt.	-300 ± 67	$9.23^{+8.55}_{-6.54}$	231^{+7}_{-7}	2382^{+884}_{-343}	1395^{+14712}_{-1035}

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

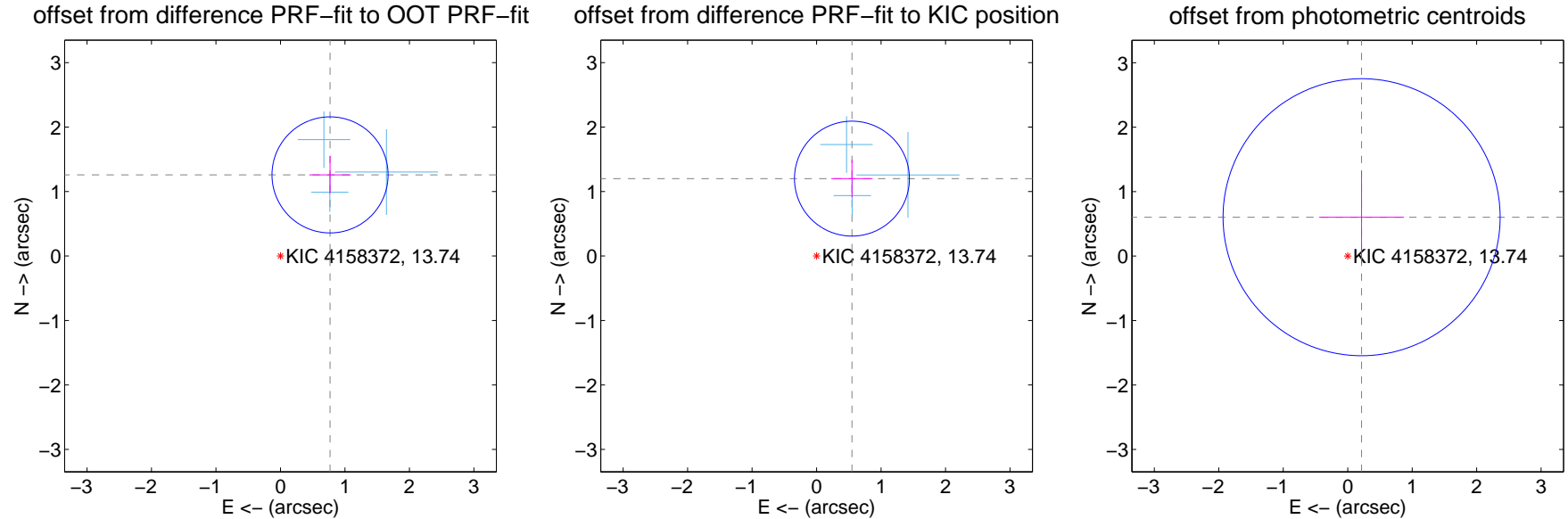
DV Centroid Data

Supplemental centroid analysis for 004158372-05. Kepler magnitude: 13.74. Transit SNR 7.19

There are 3 quarters with good PRF difference image offsets

The direct PRF centroid is offset from the target star catalog position by about 0.22 arcsec

	Distance in arcsec	Distance / σ	Δ RA	Δ Dec
PRF-fit source offset from OOT	1.475 ± 0.300	4.92	-0.769 ± 0.321	1.259 ± 0.292
PRF-fit source offset from KIC position	1.320 ± 0.297	4.44	-0.549 ± 0.321	1.200 ± 0.292
photometric centroid source offset	0.64 ± 0.72	0.89	-0.22 ± 0.66	0.60 ± 0.72

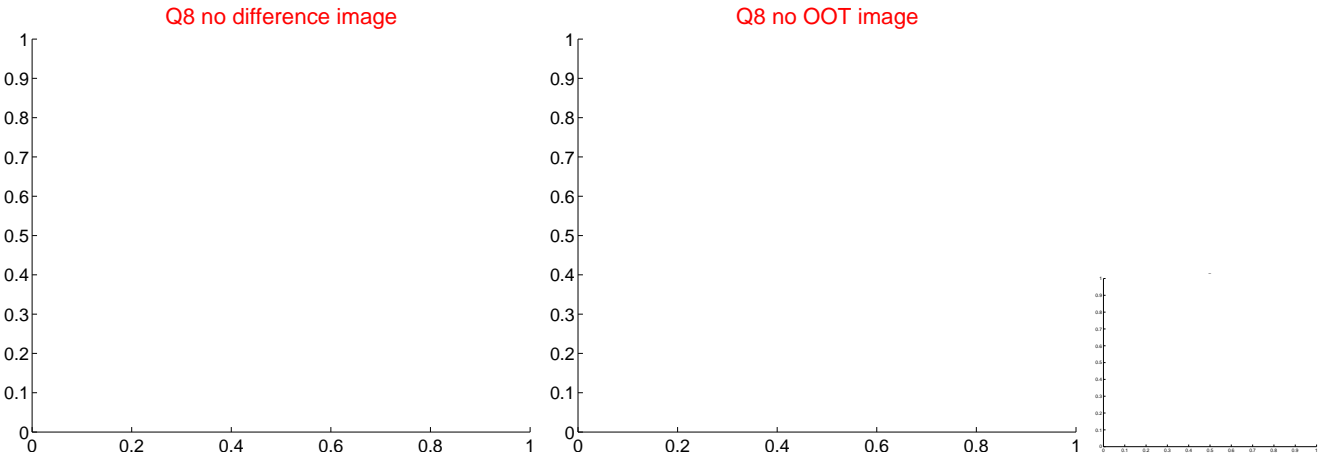
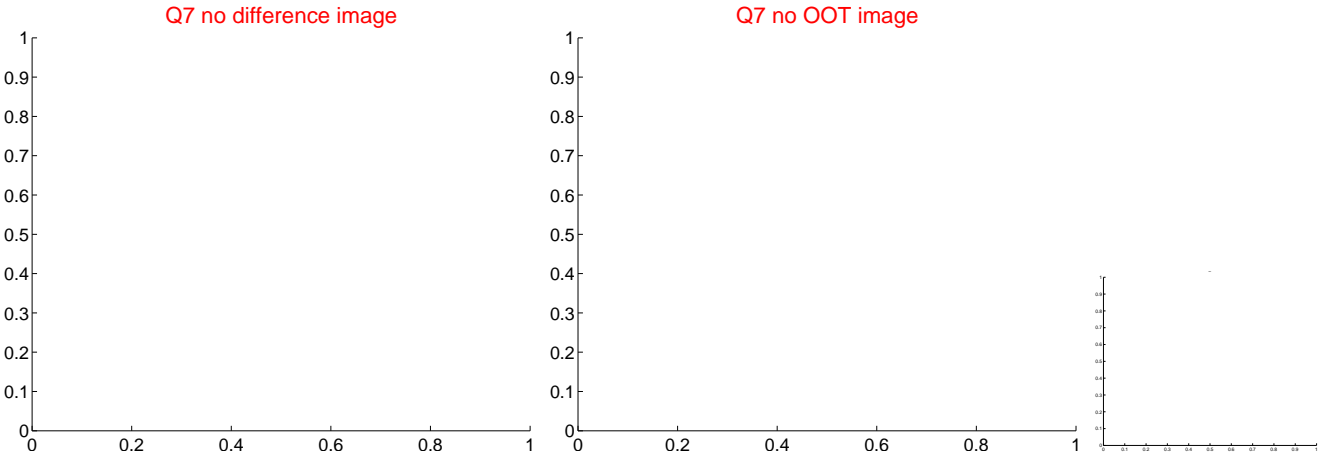
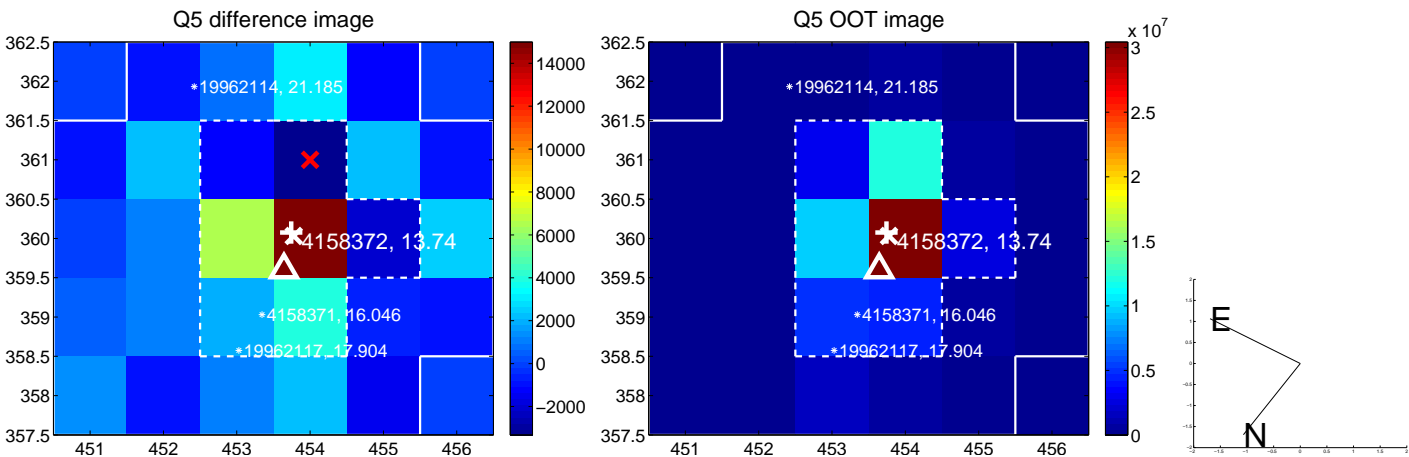


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- σ uncertainty. Blue circle: three- σ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

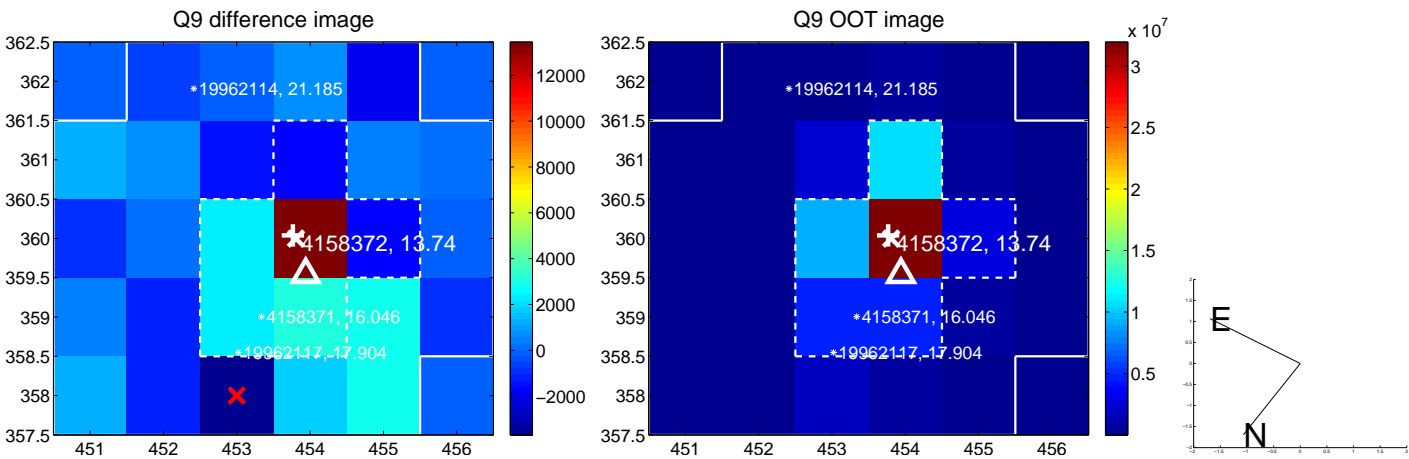
white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



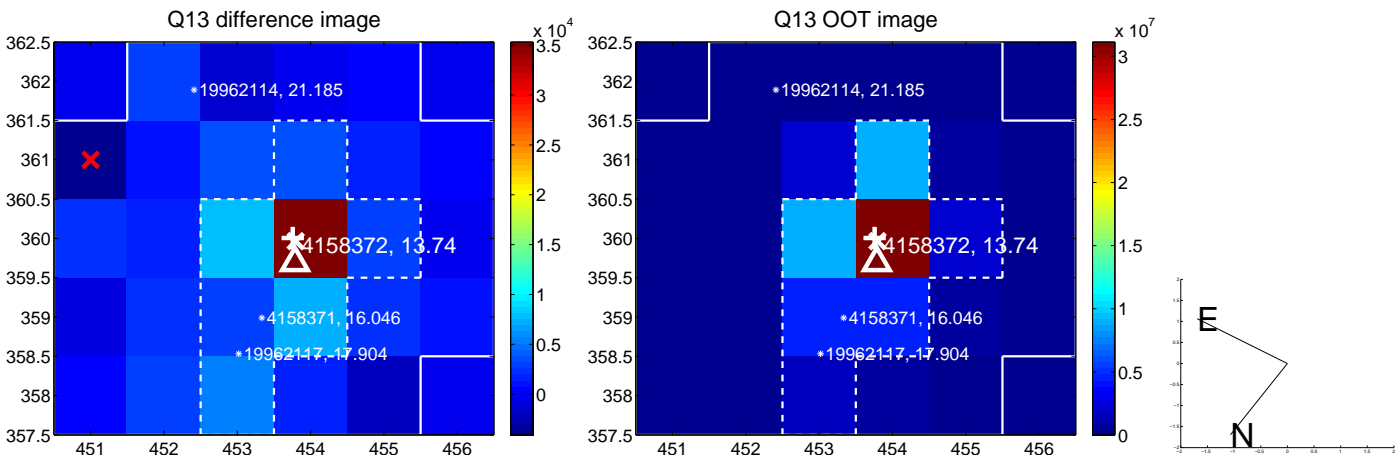
white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



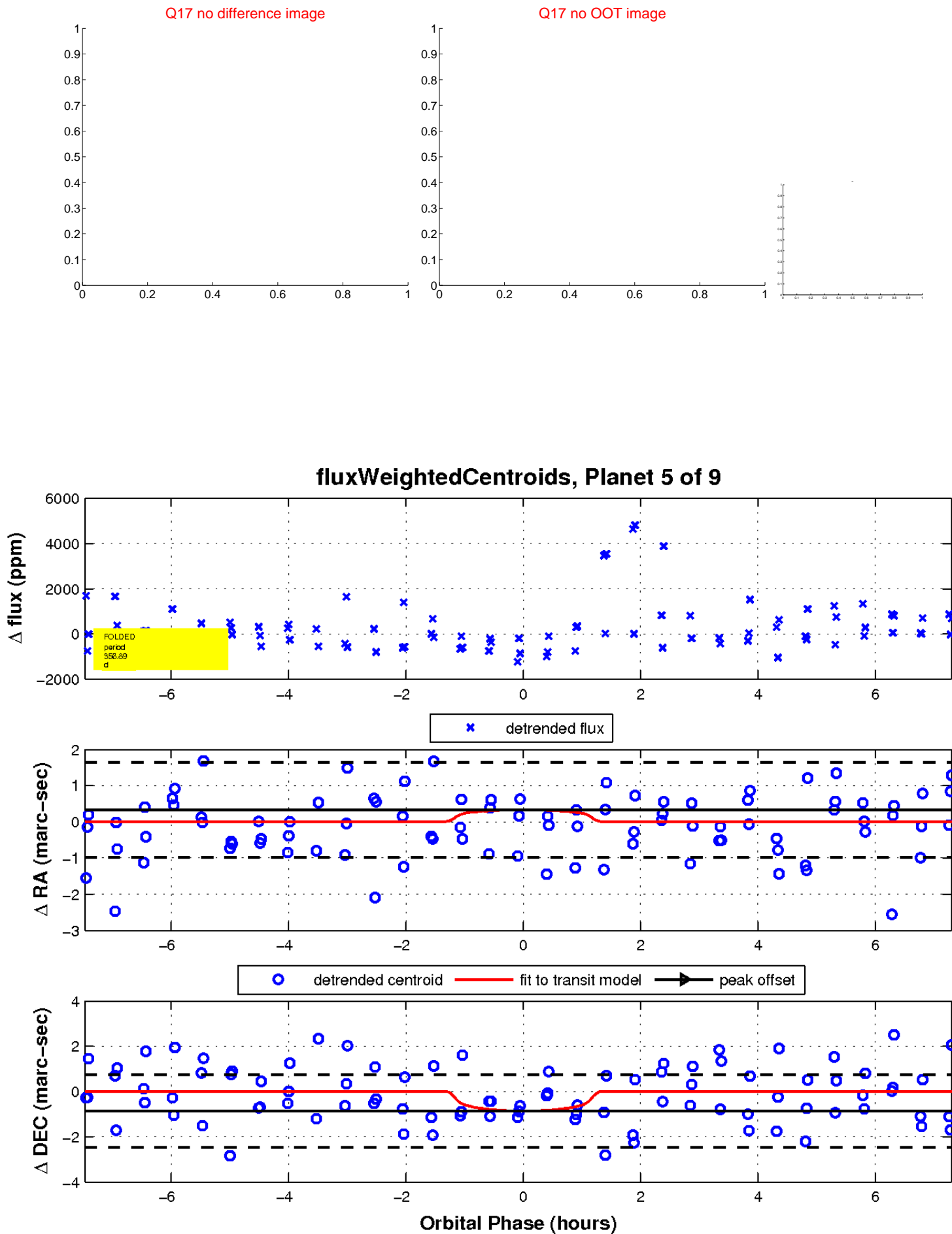
white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



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

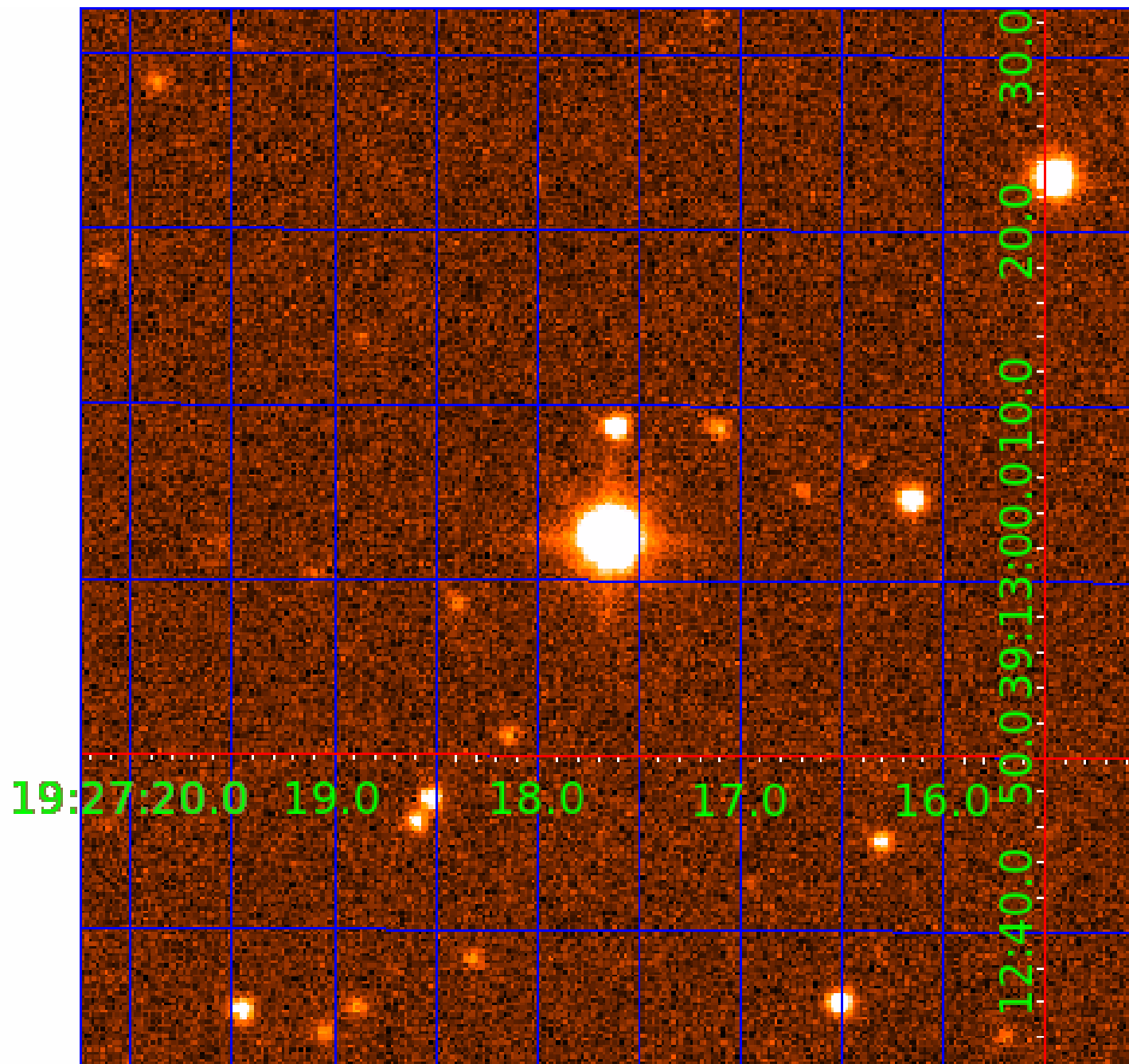


white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



UKIRT Image

Declination



KIC 004158372

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})
004158372-01	OBS	No	357.496909	376.973374	928.2	7.479	16.7	5.7	0.67	4267	2.25	0.18
004158372-02	OBS	No	405.589263	275.511211	760.9	4.726	14.2	6.4	0.67	4267	2.03	0.15
004158372-03	OBS	No	522.778675	216.071041	475.4	4.665	16.1	3.6	0.67	4267	1.66	0.11
004158372-04	OBS	No	289.494986	234.246442	1165.9	3.201	12.9	9.0	0.67	4267	2.49	0.24
004158372-05	OBS	No	356.891810	169.321259	1258.1	2.546	12.8	7.2	0.67	4267	2.56	0.18
004158372-07	OBS	No	470.232741	267.941575	1038.8	6.744	12.2	7.4	0.67	4267	2.24	0.12
004158372-08	OBS	No	473.489609	550.580979	1462.8	16.257	10.8	7.4	0.67	4267	2.56	0.12
004158372-09	OBS	No	320.670668	378.593601	373.5	10.500	12.1	-1.0	0.67	4267	1.23	0.21

Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
004158372-01	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_MARSHALL—LPP_DV—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—CENT_FEW_DIFFS
004158372-02	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
004158372-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV
004158372-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—ALL_TRANS_CHASES
004158372-05	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_POS_DV—CENT_UNCERTAIN
004158372-07	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—CENT_FEW_DIFFS
004158372-08	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_MARSHALL—LPP_DV—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—CENT_FEW_DIFFS
004158372-09	OBS	FP	0.00	1	0	1	0	LPP_DV—ALL_TRANS_CHASES—CENT_NOFITS—HALO_GHOST

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

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

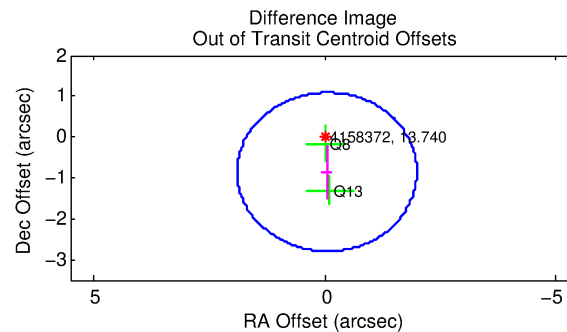
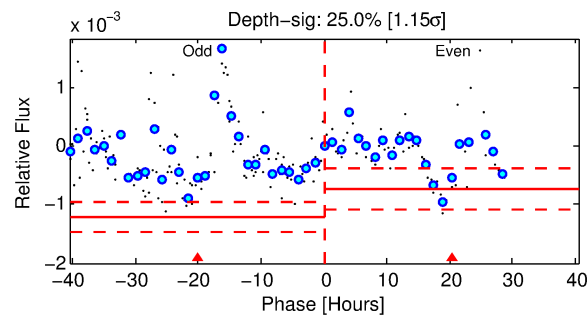
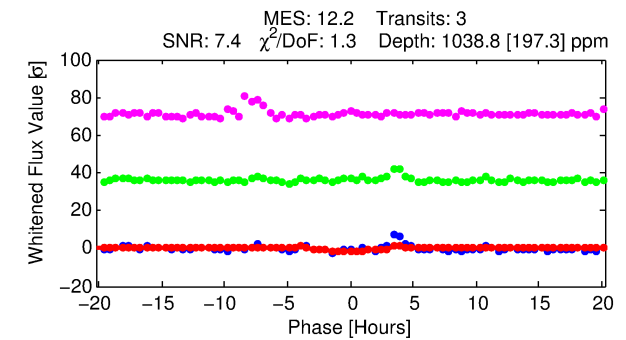
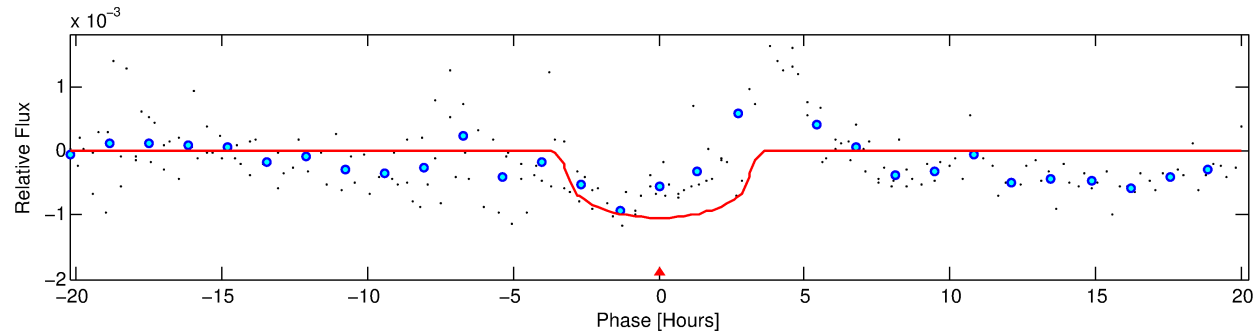
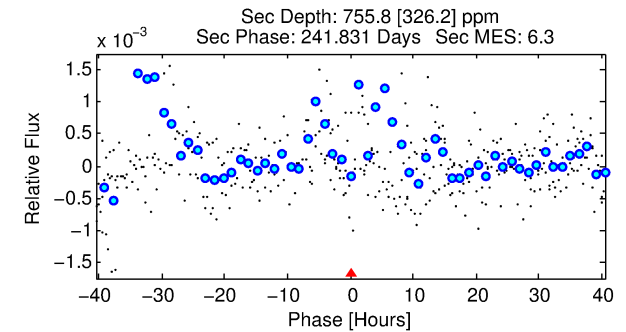
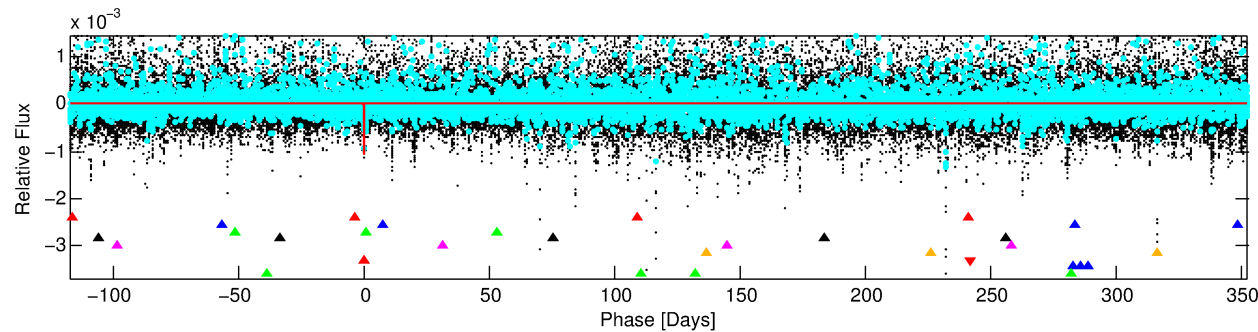
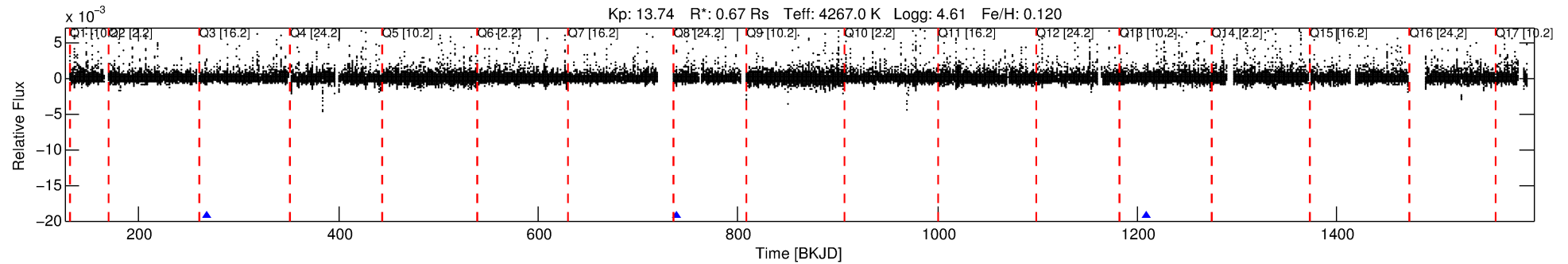
See http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col for comment definitions.

Ephemeris Match Information For 004158372-07

No Significant Match Found

DV One-Page Summary

KIC: 4158372 Candidate: 7 of 9 Period: 470.233 d



DV Fit Results:

Period = 470.23274 [0.00798] d
Epoch = 267.9416 [0.0098] BKJD
Rp/R* = 0.0306 [0.0263]
a/R* = 437.06 [1154.83]
b = 0.62 [2.64]
Seff = 0.13 [0.02]
Teq = 152 [6] K
Rp = 2.24 [1.93] Re
a = 1.0327 [0.0703] AU
Ag = 88569.44 [157254.87] [0.56 σ]
Teffp = 4044 [1797] K [2.17 σ]

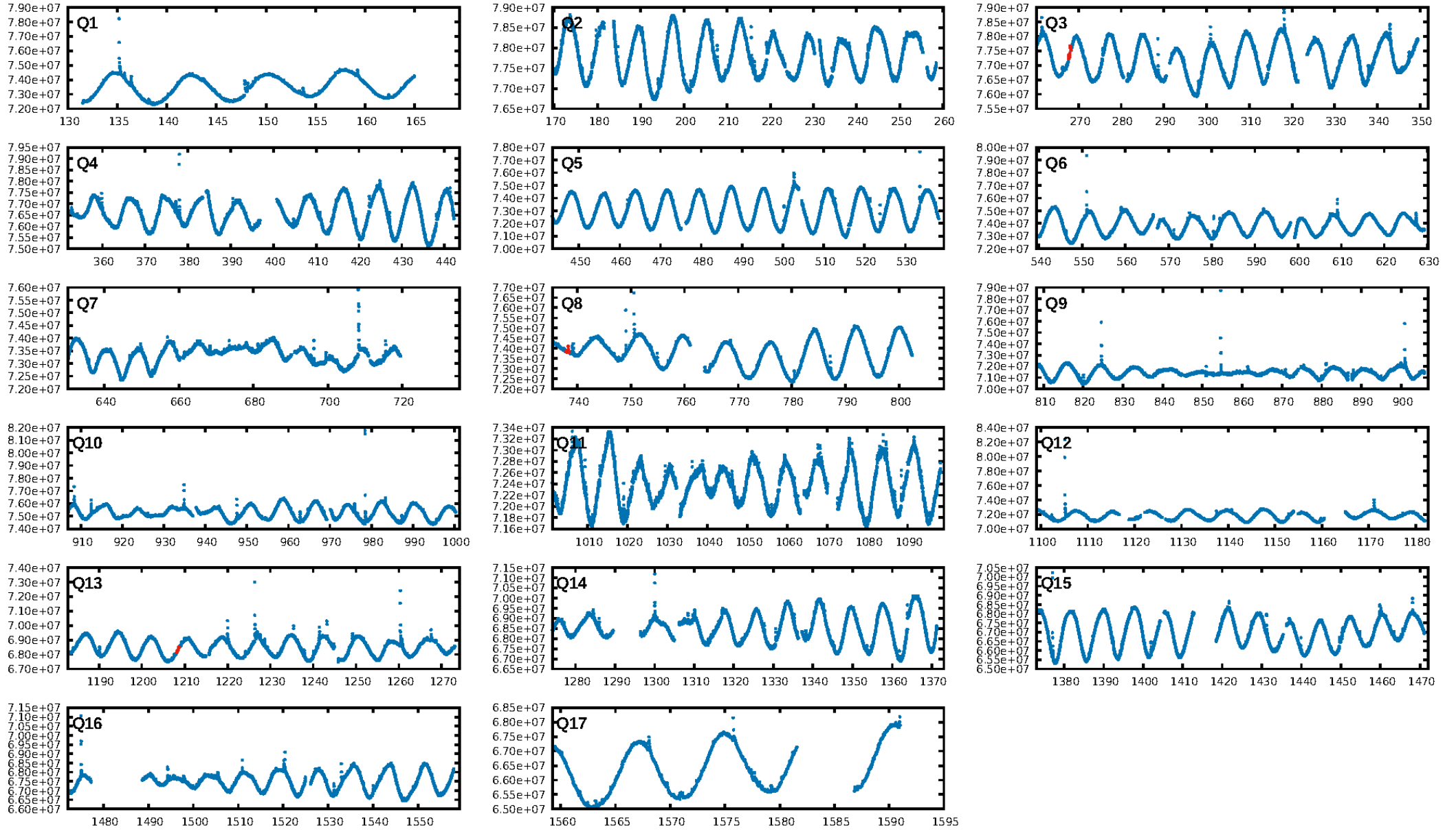
DV Diagnostic Results:

ShortPeriod-sig: 100.0% [188.40 σ]
LongPeriod-sig: 100.0% [4.44 σ]
ModelChiSquare2-sig: 35.7%
ModelChiSquareGof-sig: 98.8%
Bootstrap-pfa: N/A
RollingBand-fgt: 1.00 [3/3]
GhostDiagnostic-chr: 0.3875
Centroid-sig: 33.4%
Centroid-so: 0.593 arcsec [1.02 σ]
OotOffset-rm: 0.857 arcsec [1.32 σ]
OotOffset-st: 0/0/1/1 [2]
KicOffset-rm: 0.899 arcsec [1.42 σ]
KicOffset-st: 0/0/1/1 [2]
DiffImageQuality-fgm: 1.00 [2/2]
DiffImageOverlap-fno: 1.00 [2/2]

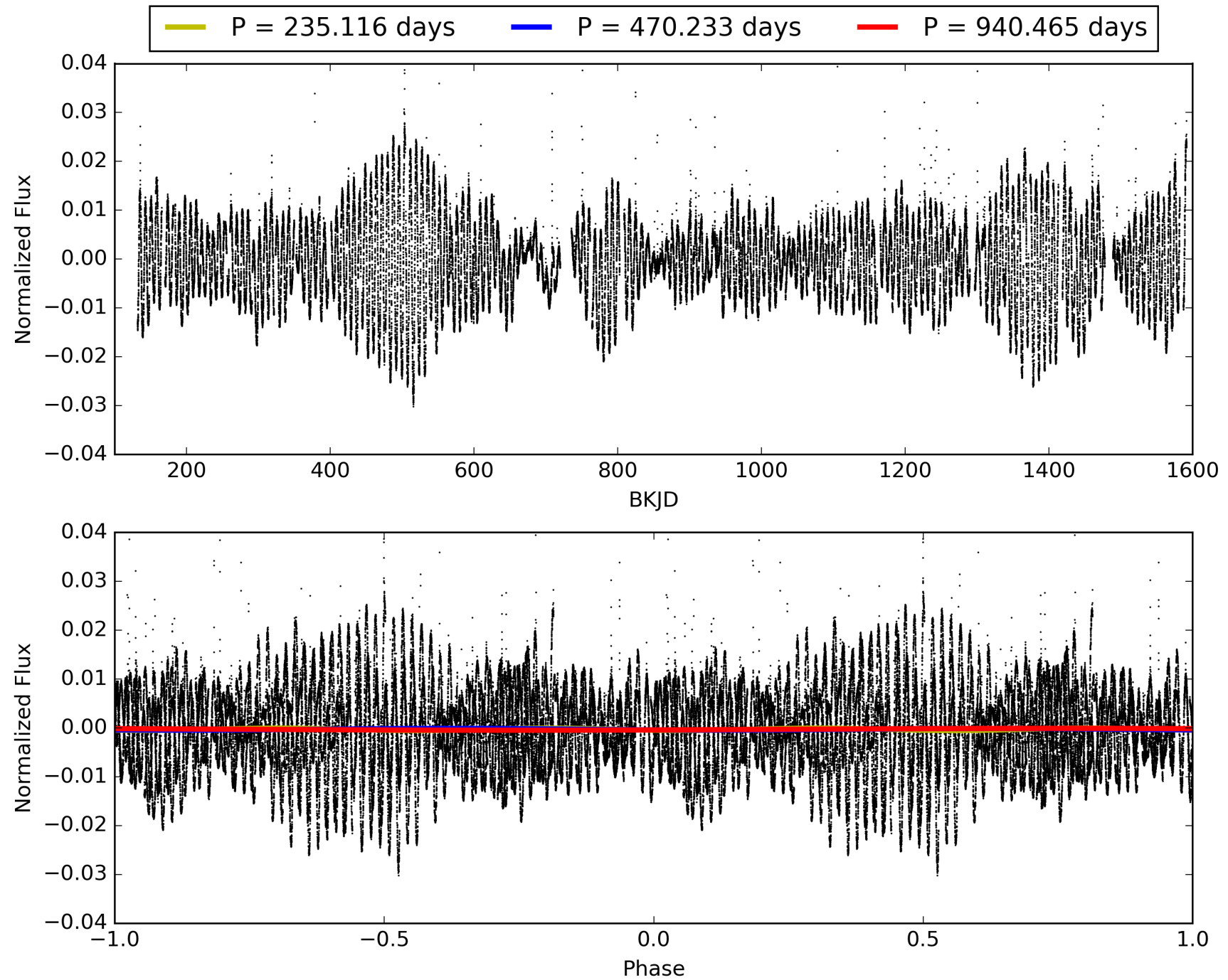
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 01-Feb-2016 06:13:28 Z

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

TCE 004158372-07, PDC Light Curves

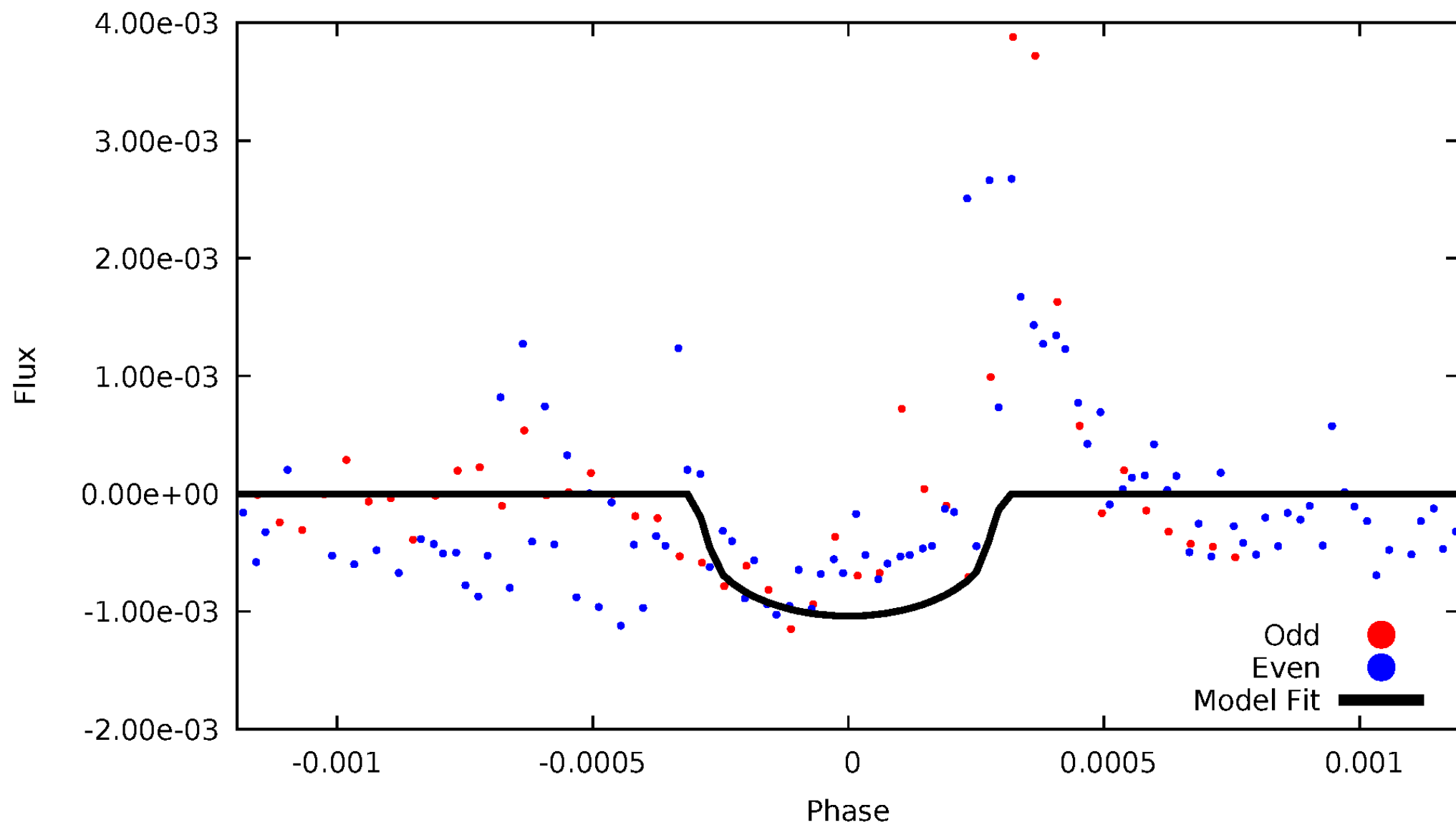


TCE 004158372-07



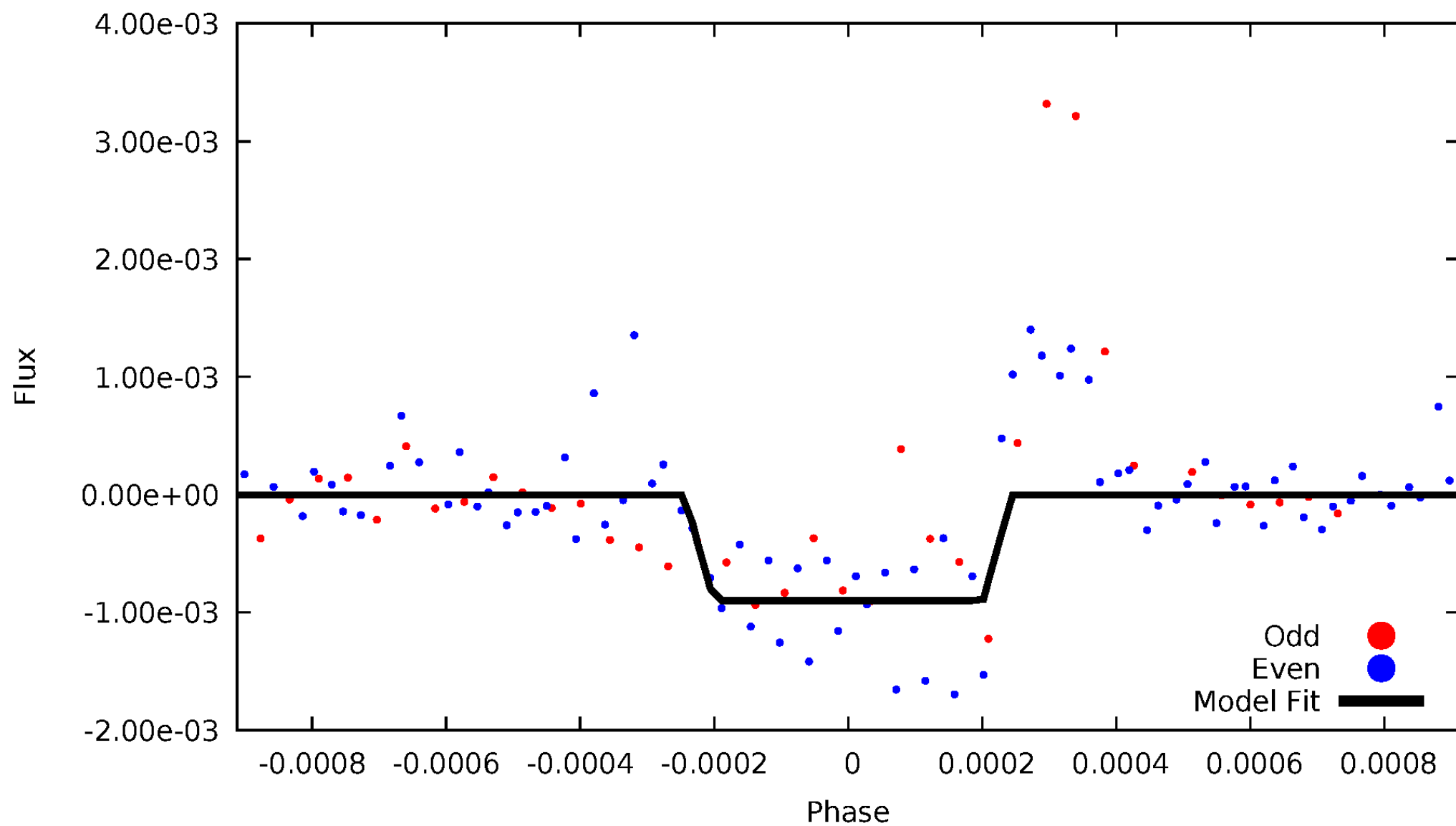
DV Odd/Even

TCE 004158372-07



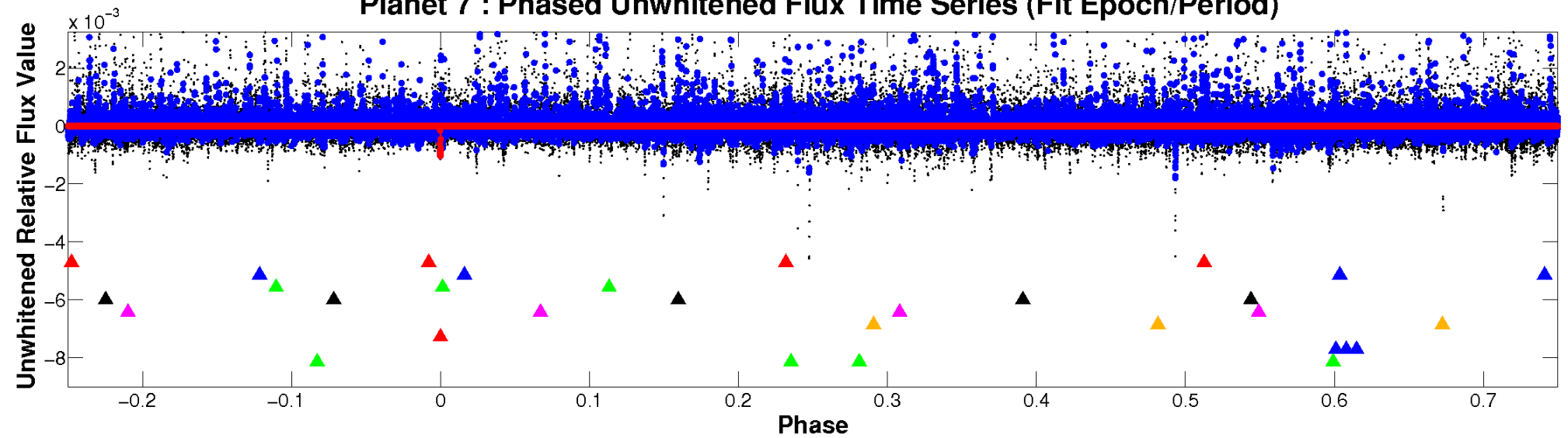
ALT Odd/Even

TCE 004158372-07

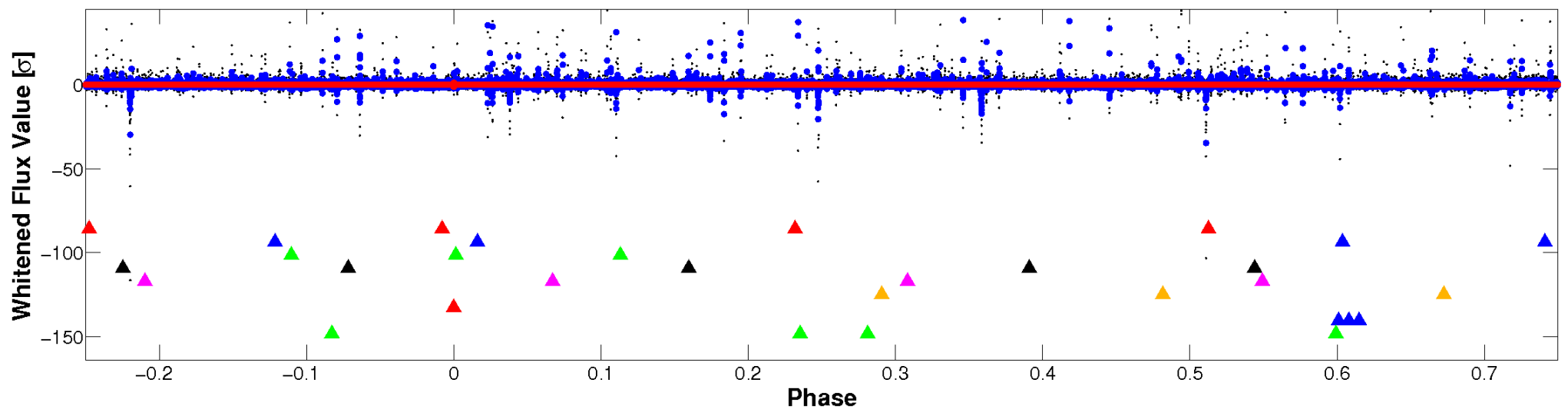


Non-Whitened Vs. Whitened Light Curve

Planet 7 : Phased Unwhitened Flux Time Series (Fit Epoch/Period)

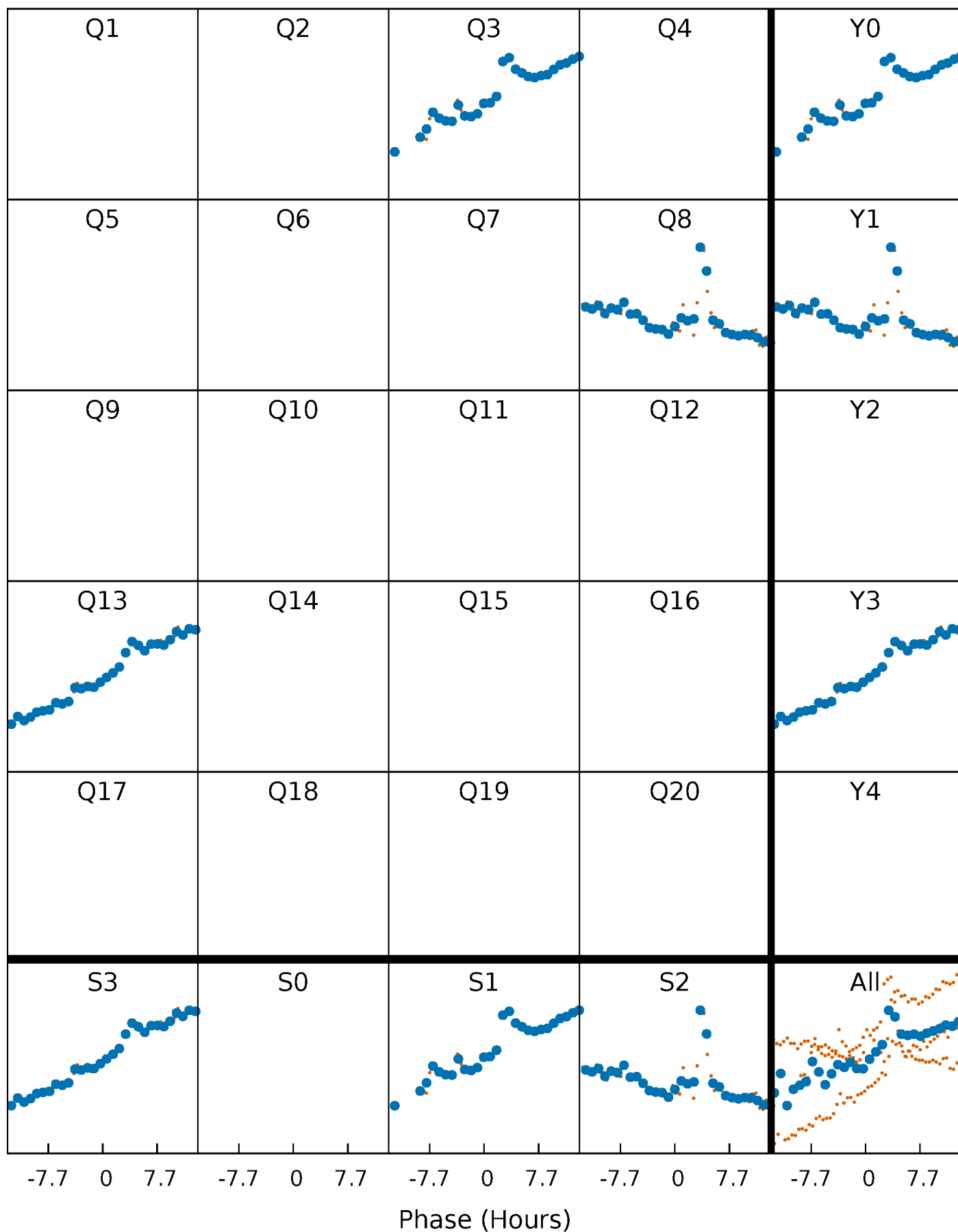


Planet 7 : Phased Whitened Flux Time Series (Fit Epoch/Period)



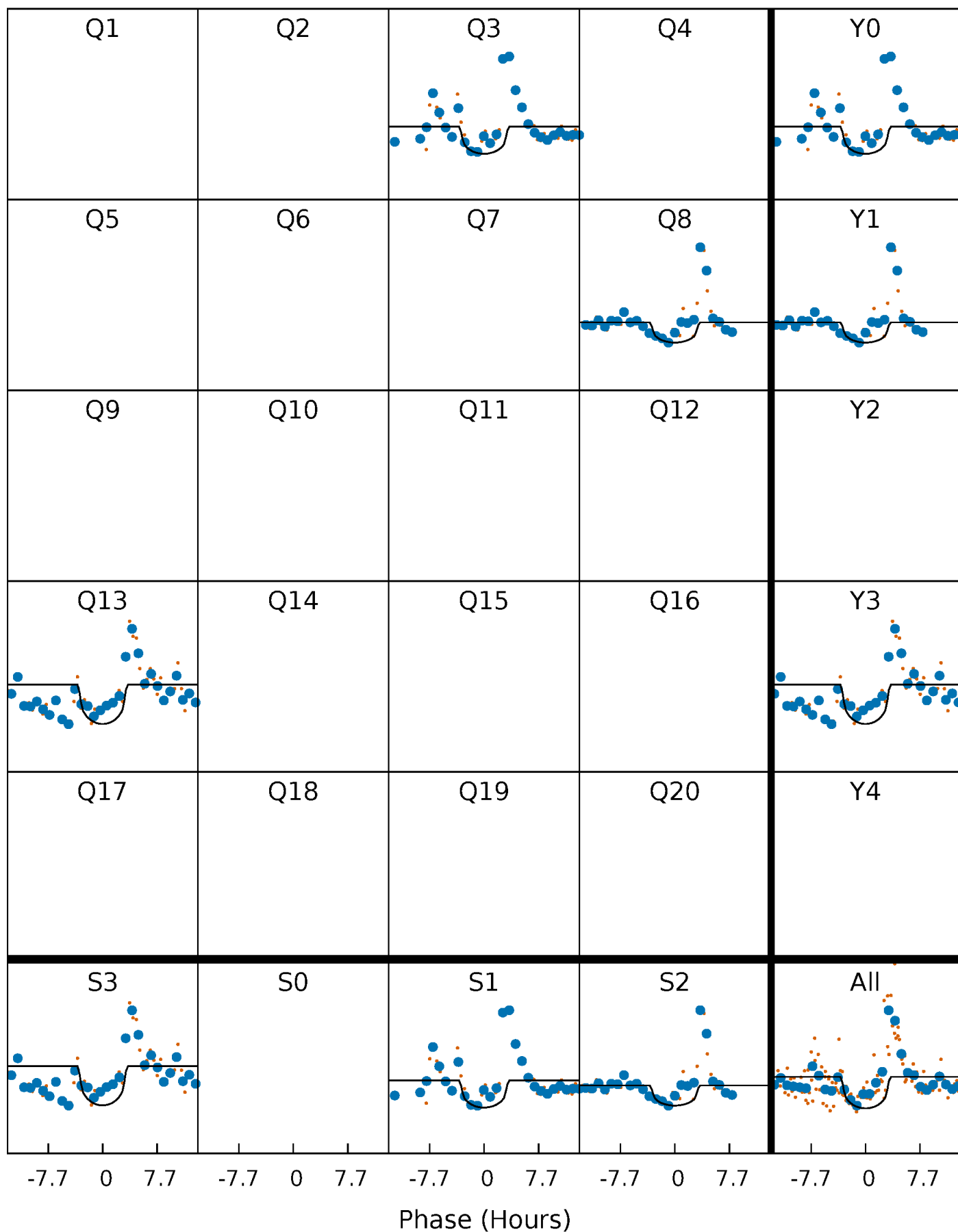
PDC Quarter-Phased Transit Curves

TCE 004158372-07 $P=470.232741$ Days $T_0=267.941575$ (BKJD)



DV Quarter-Phased Transit Curves

TCE 004158372-07 $P=470.232741$ Days $T_0=267.941575$ (BKJD)



Alt. Detrend Quarter-Phased Transit Curves

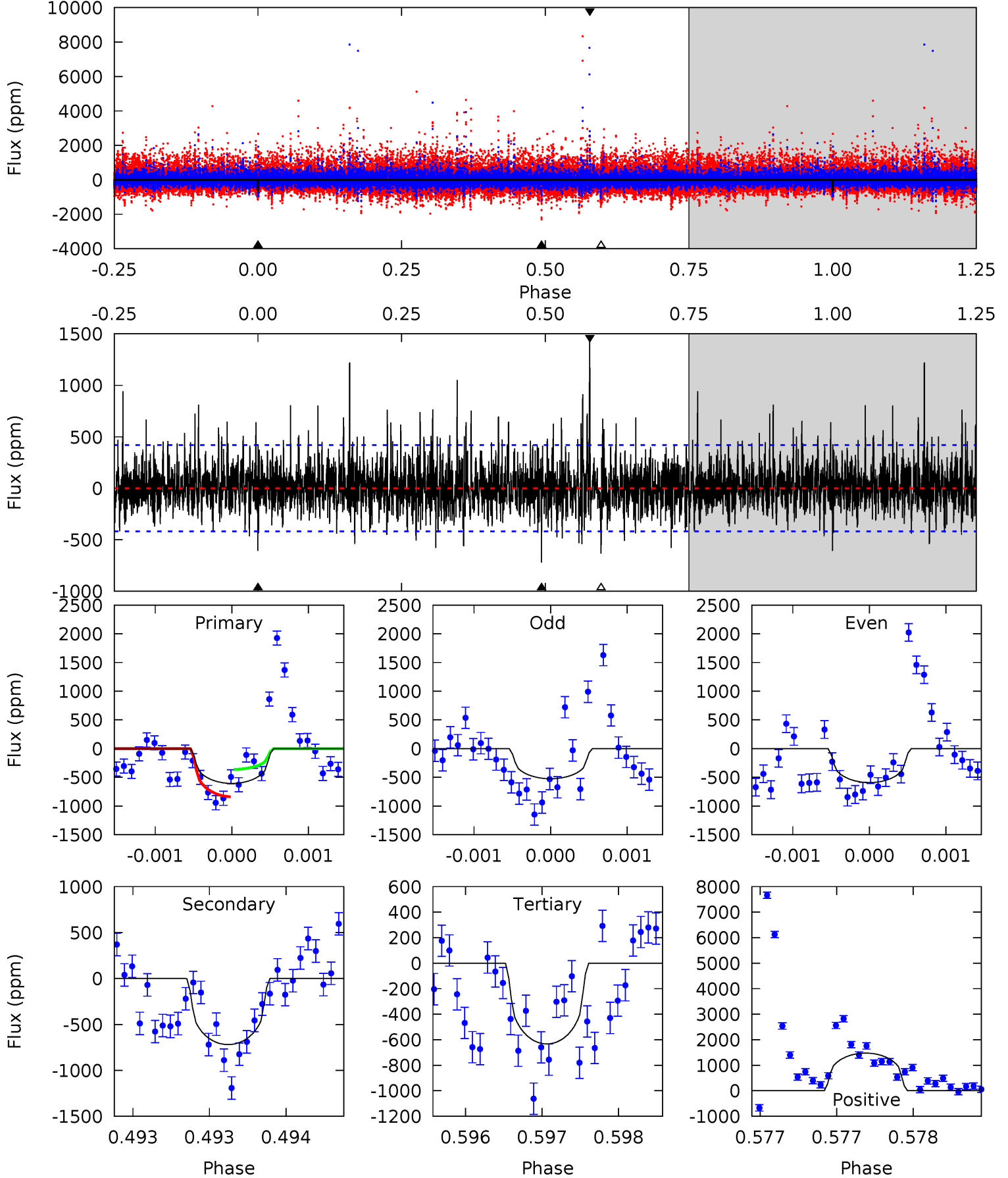
TCE 004158372-07 $P=470.251139$ Days $T_0=267.935458$ (BKJD)



DV Model-Shift Uniqueness Test

004158372-07, P = 470.232741 Days, E = 267.941575 Days

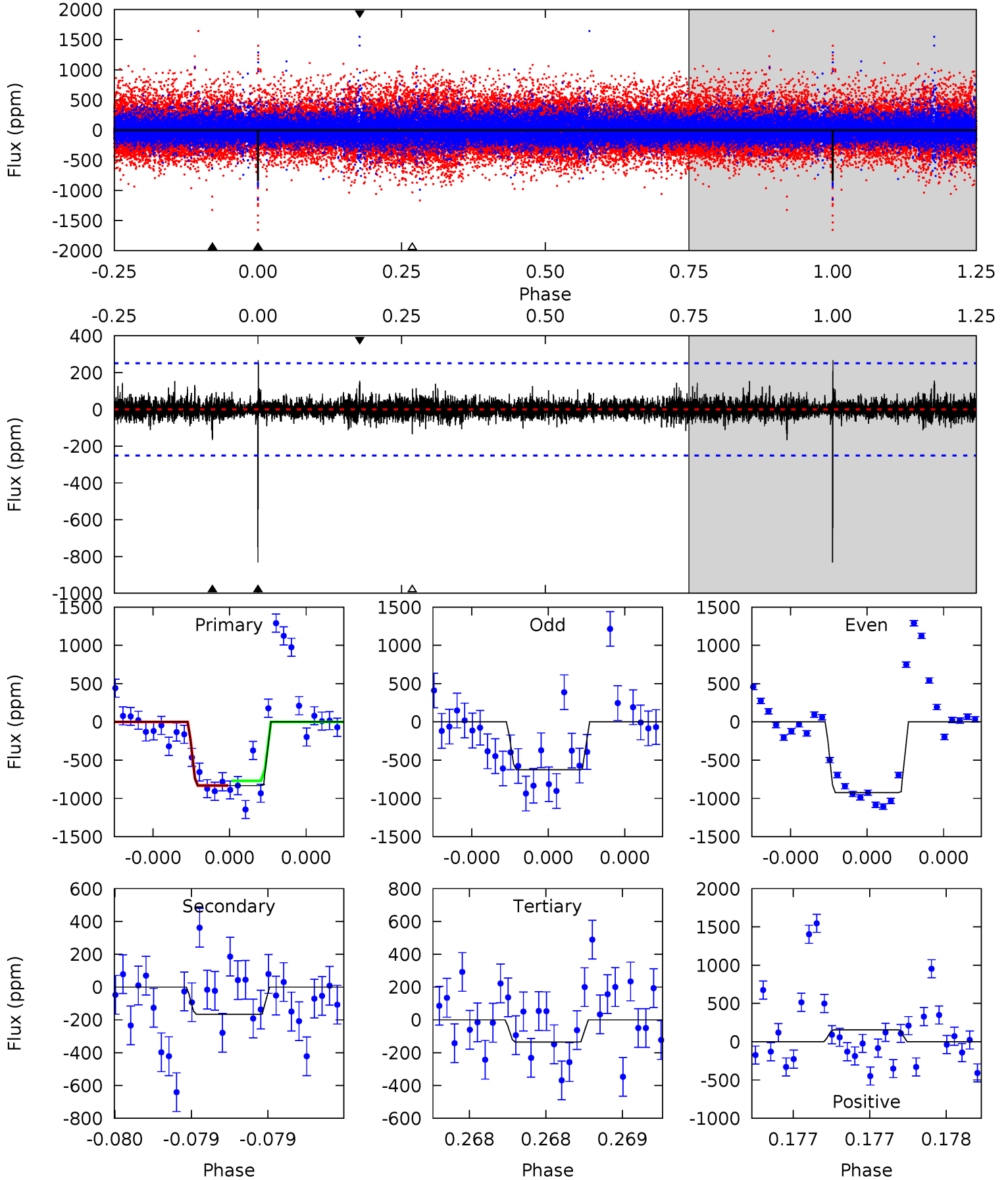
Pri	Sec	Ter	Pos	FA ₁	FA ₂	F _{Red}	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
8.03	9.52	8.37	19.5	5.55	3.44	2.43	-0.34	-11.5	1.15	-10.0	0.27	0.95	0.67	3.17



Alt Model-Shift Uniqueness Test

004158372-07, P = 470.251139 Days, E = 267.935458 Days

Pri	Sec	Ter	Pos	FA ₁	FA ₂	F _{Red}	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
18.6	3.70	3.00	3.46	5.59	3.51	0.60	15.6	15.1	0.70	0.25	2.87	1.35	0.24	0.65



Stellar Parameters For KIC 004158372

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	4267^{+129}_{-129}	$4.608^{+0.049}_{-0.018}$	$0.120^{+0.250}_{-0.300}$	$0.670^{+0.032}_{-0.057}$	$0.662^{+0.052}_{-0.052}$	$3.109^{+0.665}_{-0.248}$
	+3%/-3%	+1%/-0%	+208%/-250%	+5%/-9%	+8%/-8%	+21%/-8%
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 004158372-07 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	A_{obs}
DV	-719 ± 76	$2.52^{+1.75}_{-1.52}$	210^{+7}_{-7}	3902^{+1744}_{-642}	$68279^{+353870}_{-45377}$
Alt.	-166 ± 45	$2.55^{+1.67}_{-1.54}$	210^{+7}_{-7}	3051^{+1035}_{-392}	14711^{+73322}_{-9396}

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 $A_{obs} \gg 1.0$

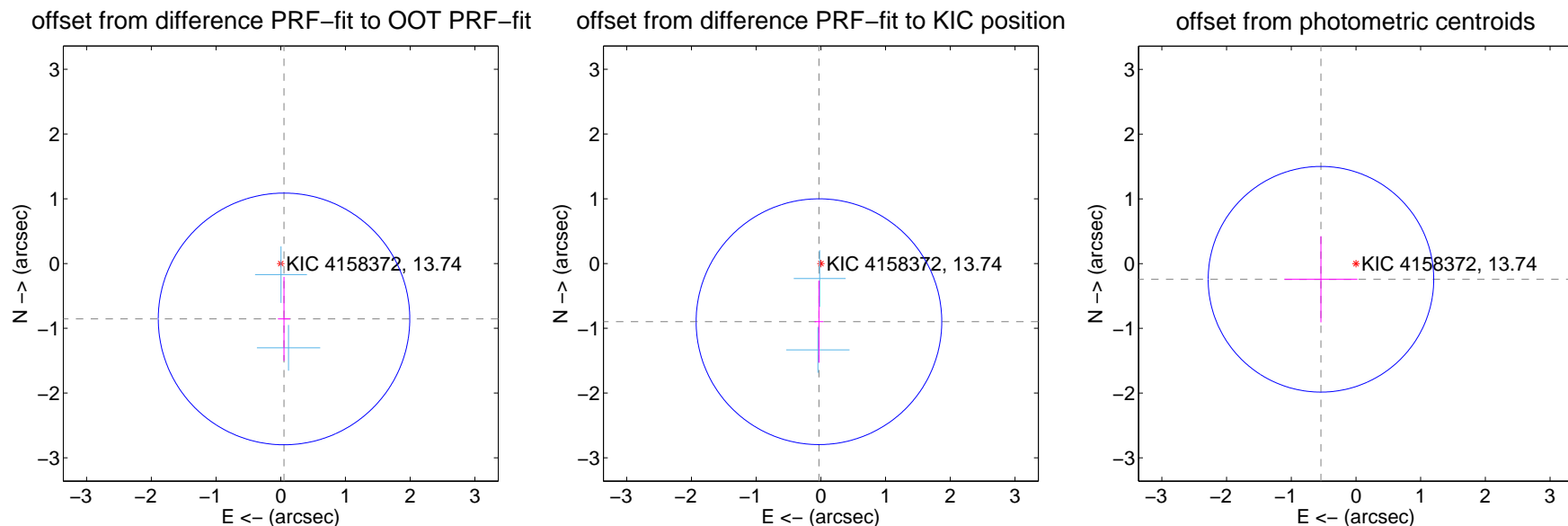
DV Centroid Data

Supplemental centroid analysis for 004158372-07. Kepler magnitude: 13.74. Transit SNR 7.38

There are 2 quarters with good PRF difference image offsets

The direct PRF centroid is offset from the target star catalog position by about 0.17 arcsec

	Distance in arcsec	Distance / σ	Δ RA	Δ Dec
PRF-fit source offset from OOT	0.857 ± 0.648	1.32	-0.051 ± 0.095	-0.855 ± 0.649
PRF-fit source offset from KIC position	0.899 ± 0.633	1.42	0.030 ± 0.068	-0.898 ± 0.633
photometric centroid source offset	0.59 ± 0.58	1.02	0.54 ± 0.56	-0.24 ± 0.67

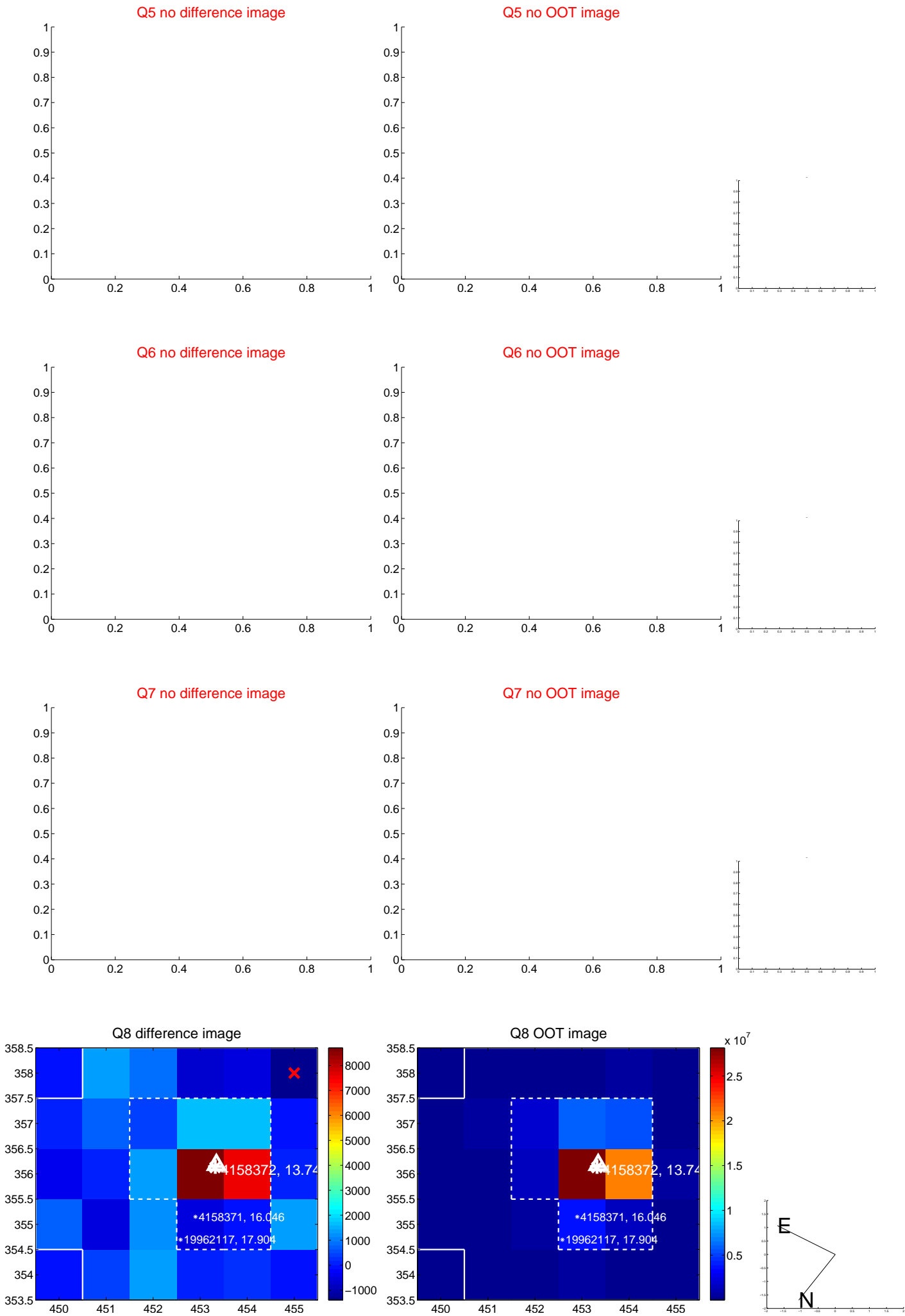


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- σ uncertainty. Blue circle: three- σ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



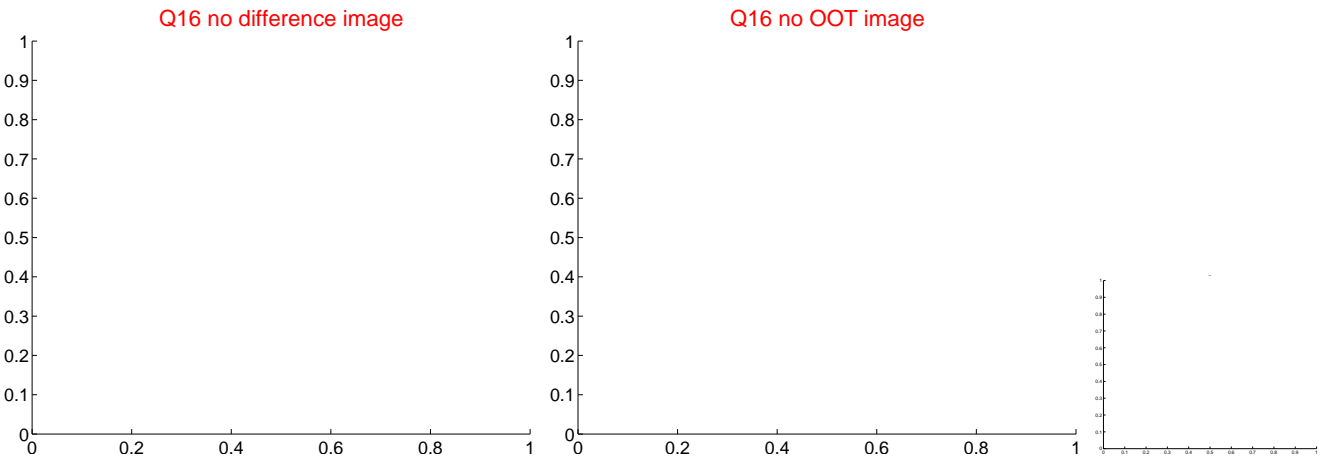
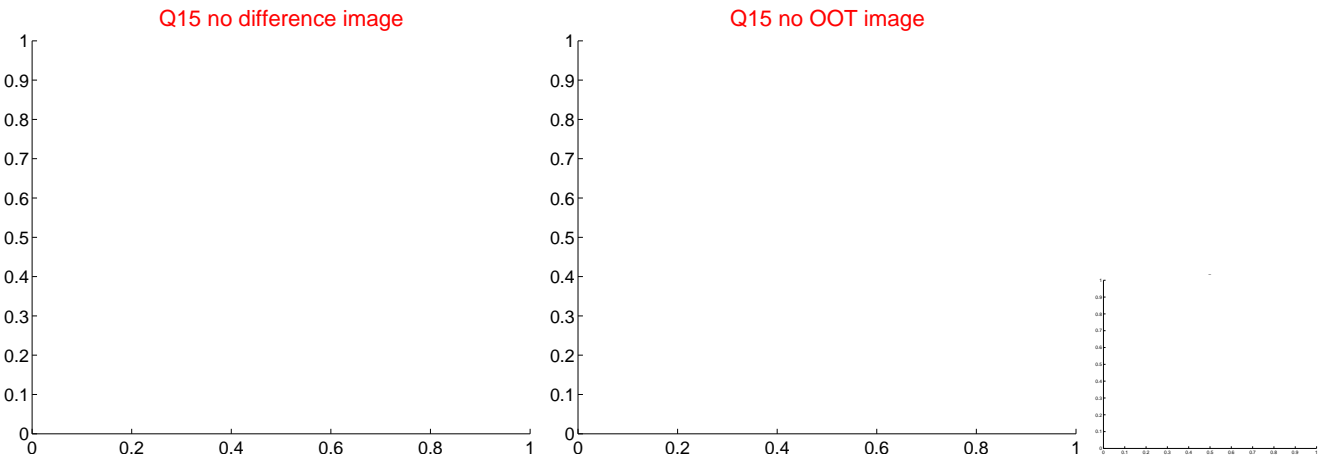
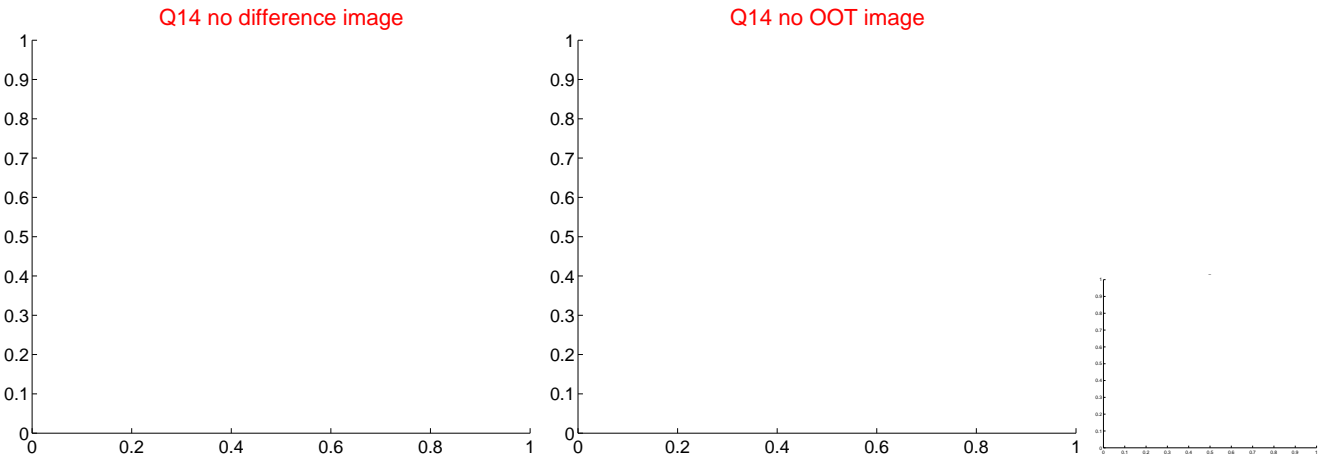
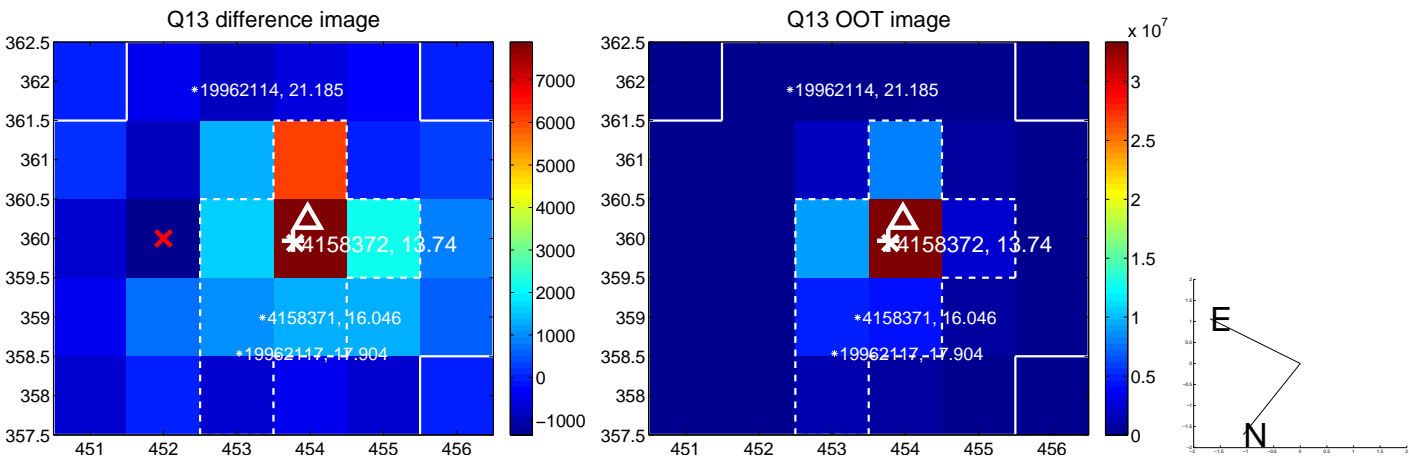
white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



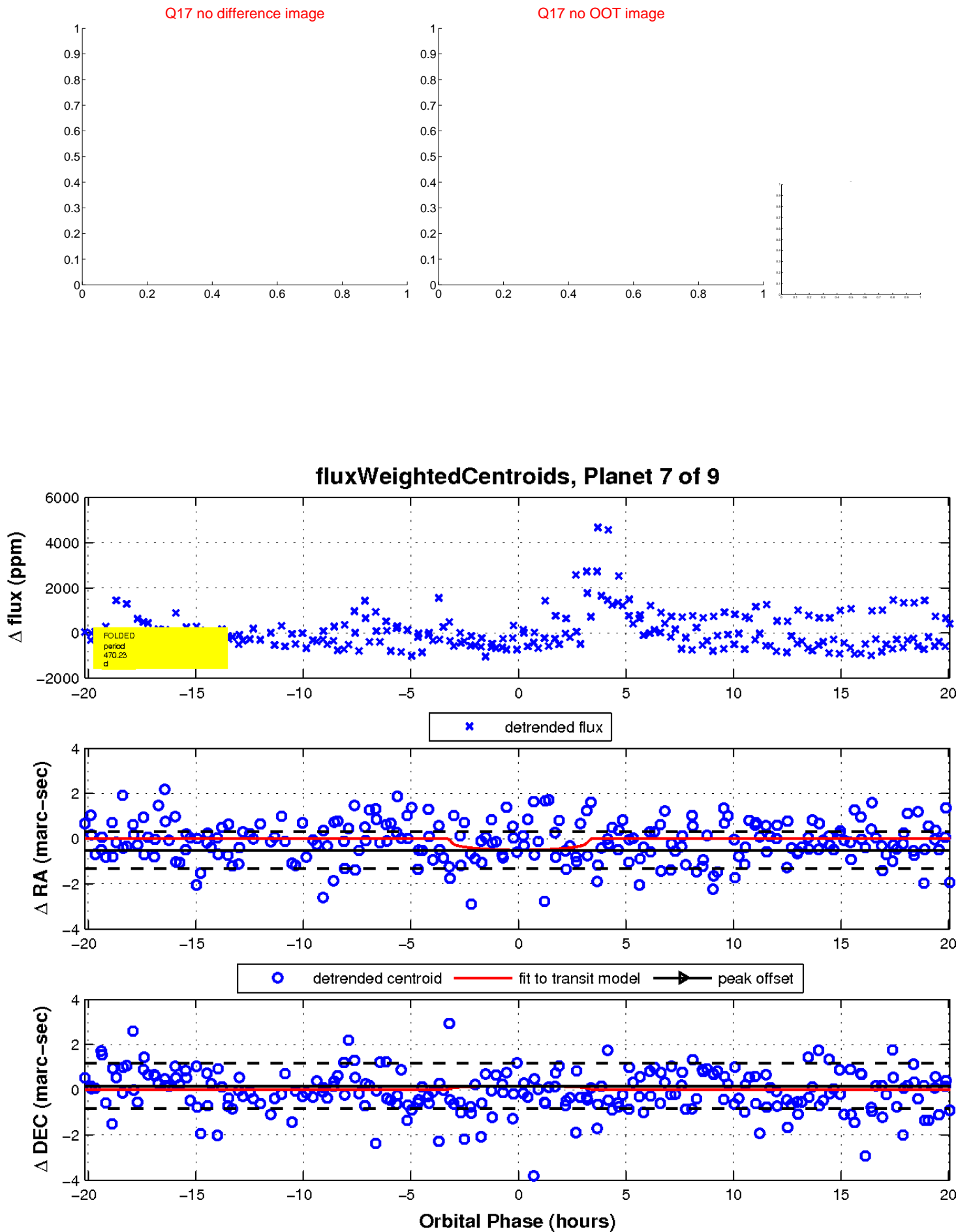
white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



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

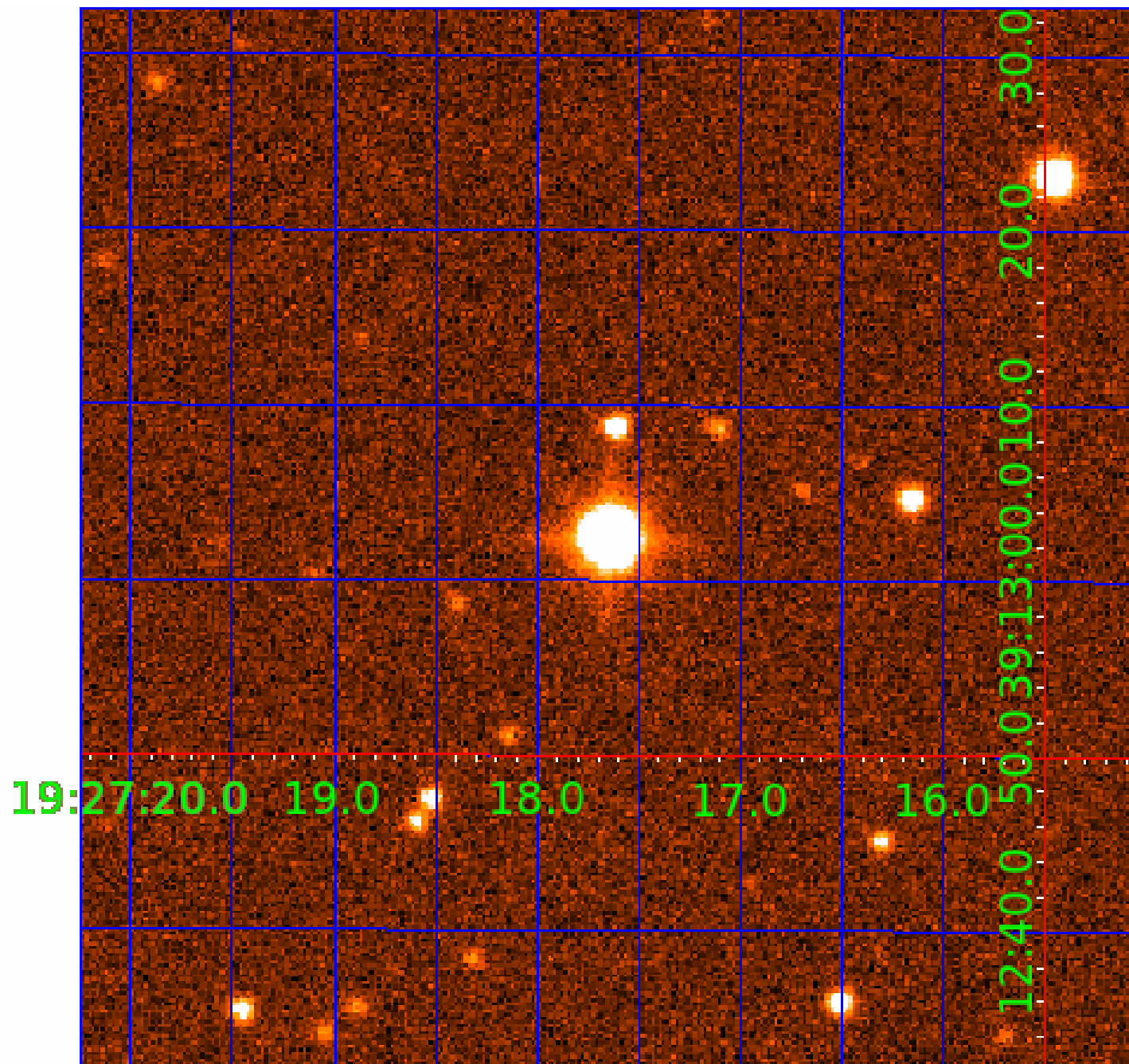


white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



UKIRT Image

Declination



KIC 004158372

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})
004158372-01	OBS	No	357.496909	376.973374	928.2	7.479	16.7	5.7	0.67	4267	2.25	0.18
004158372-02	OBS	No	405.589263	275.511211	760.9	4.726	14.2	6.4	0.67	4267	2.03	0.15
004158372-03	OBS	No	522.778675	216.071041	475.4	4.665	16.1	3.6	0.67	4267	1.66	0.11
004158372-04	OBS	No	289.494986	234.246442	1165.9	3.201	12.9	9.0	0.67	4267	2.49	0.24
004158372-05	OBS	No	356.891810	169.321259	1258.1	2.546	12.8	7.2	0.67	4267	2.56	0.18
004158372-07	OBS	No	470.232741	267.941575	1038.8	6.744	12.2	7.4	0.67	4267	2.24	0.12
004158372-08	OBS	No	473.489609	550.580979	1462.8	16.257	10.8	7.4	0.67	4267	2.56	0.12
004158372-09	OBS	No	320.670668	378.593601	373.5	10.500	12.1	-1.0	0.67	4267	1.23	0.21

Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
004158372-01	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_MARSHALL—LPP_DV—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—CENT_FEW_DIFFS
004158372-02	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
004158372-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV
004158372-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—ALL_TRANS_CHASES
004158372-05	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_POS_DV—CENT_UNCERTAIN
004158372-07	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—CENT_FEW_DIFFS
004158372-08	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_MARSHALL—LPP_DV—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—CENT_FEW_DIFFS
004158372-09	OBS	FP	0.00	1	0	1	0	LPP_DV—ALL_TRANS_CHASES—CENT_NOFITS—HALO_GHOST

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

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

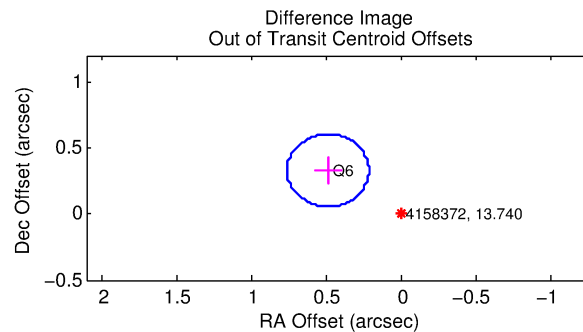
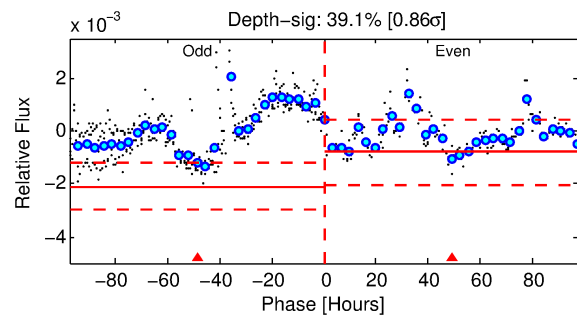
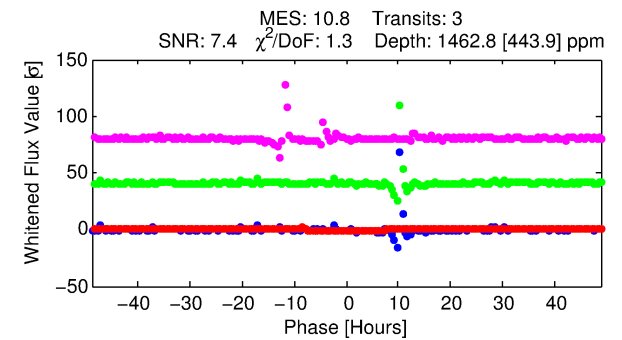
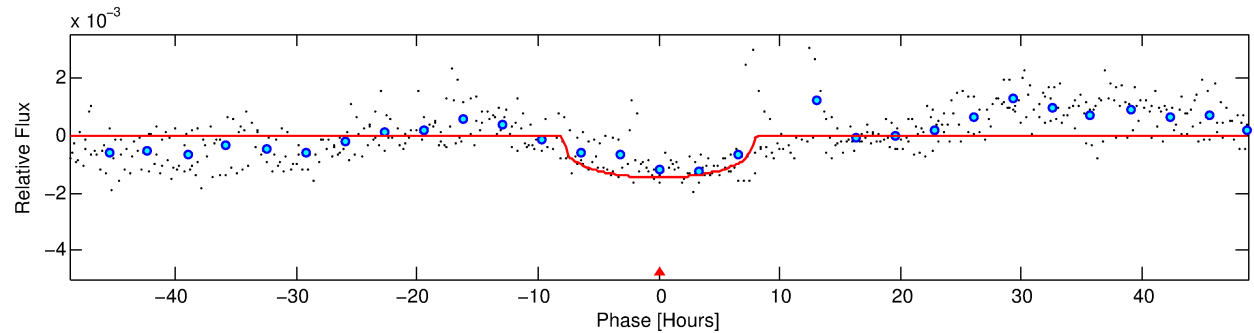
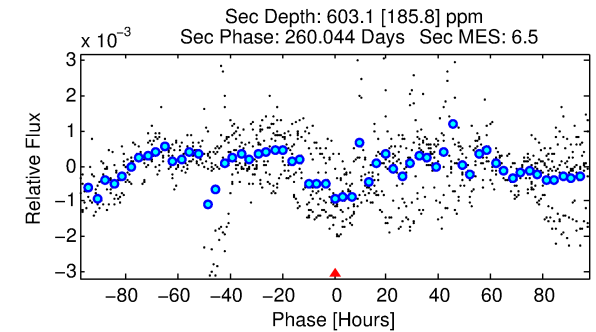
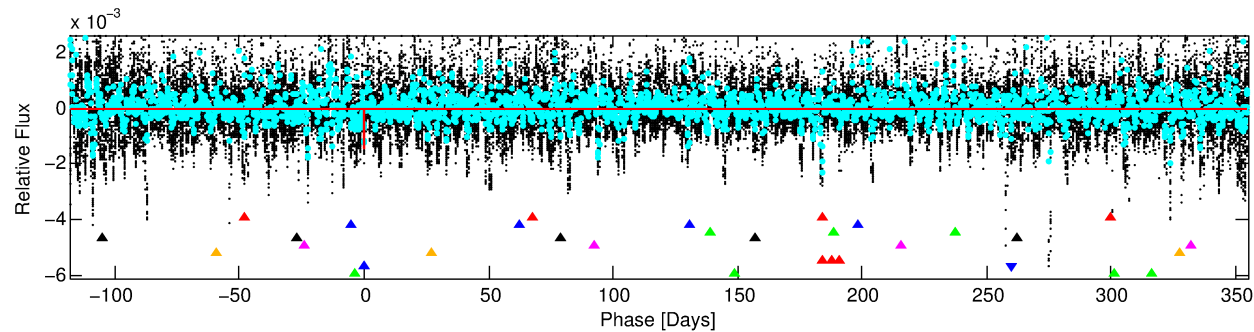
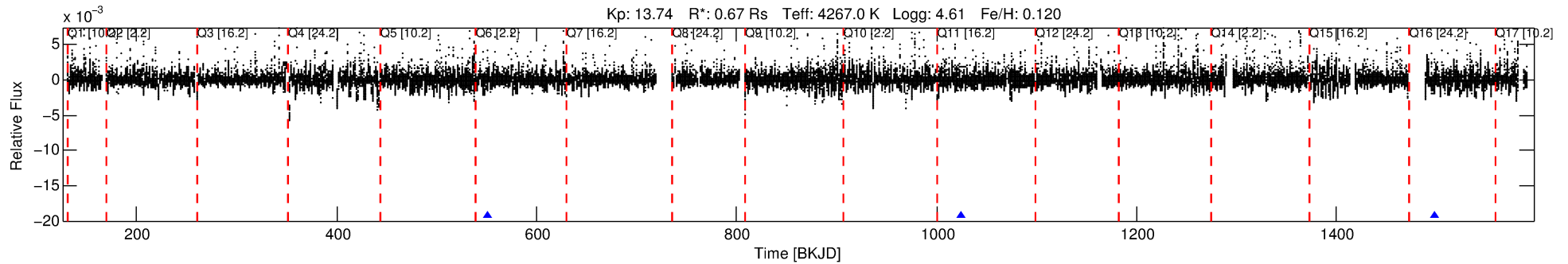
See http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col for comment definitions.

Ephemeris Match Information For 004158372-08

No Significant Match Found

DV One-Page Summary

KIC: 4158372 Candidate: 8 of 9 Period: 473.490 d



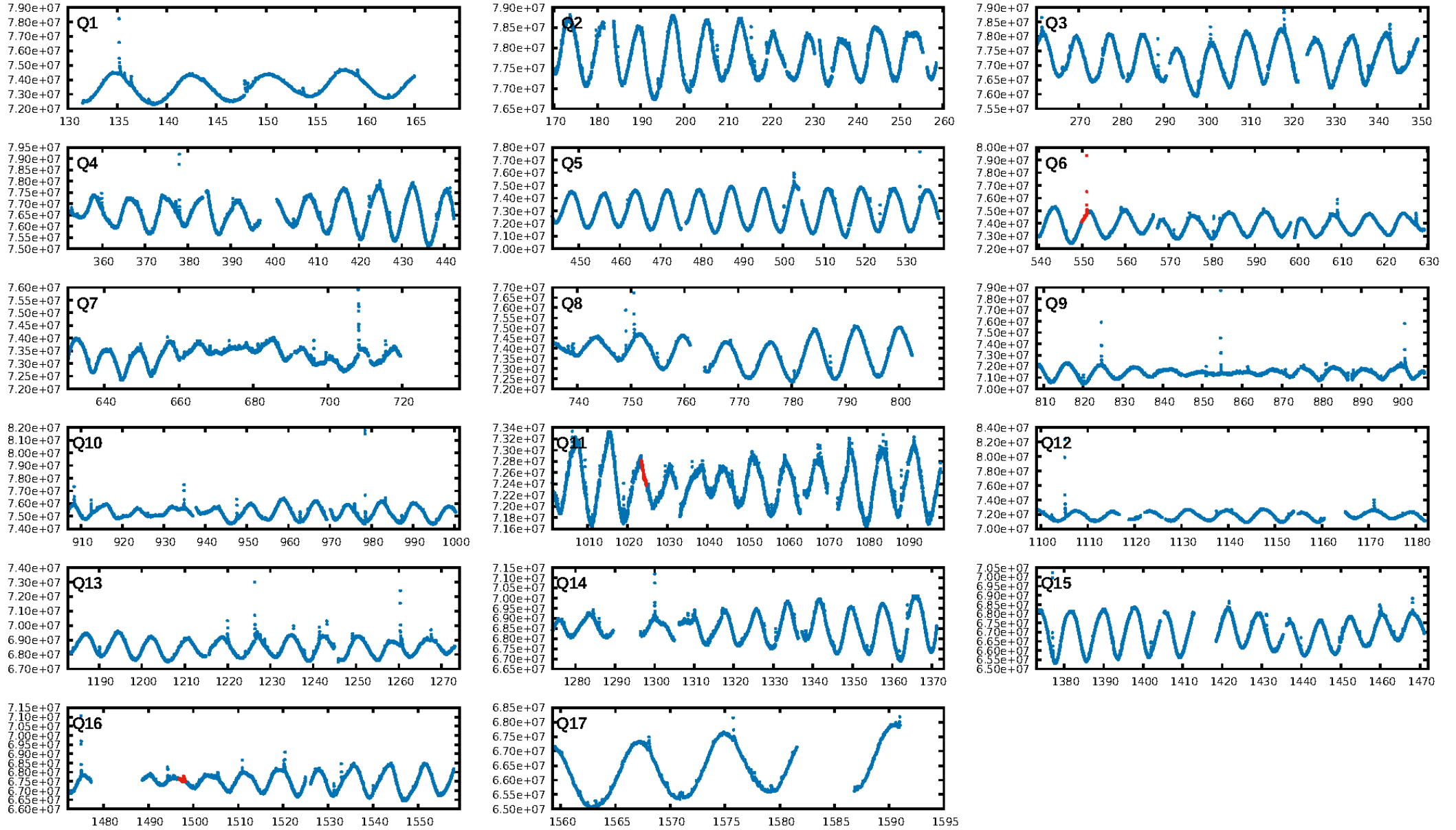
DV Fit Results:

Period = 473.48961 [0.01495] d
Epoch = 550.5810 [0.0192] BKJD
Rp/R* = 0.0350 [0.0141]
a/R* = 202.04 [216.20]
b = 0.50 [1.65]
Seff = 0.12 [0.02]
Teq = 151 [6] K
Rp = 2.56 [1.05] Re
a = 1.0374 [0.0706] AU
Ag = 54404.07 [47203.02] [1.15 σ]
Teffp = 3572 [778] K [4.40 σ]

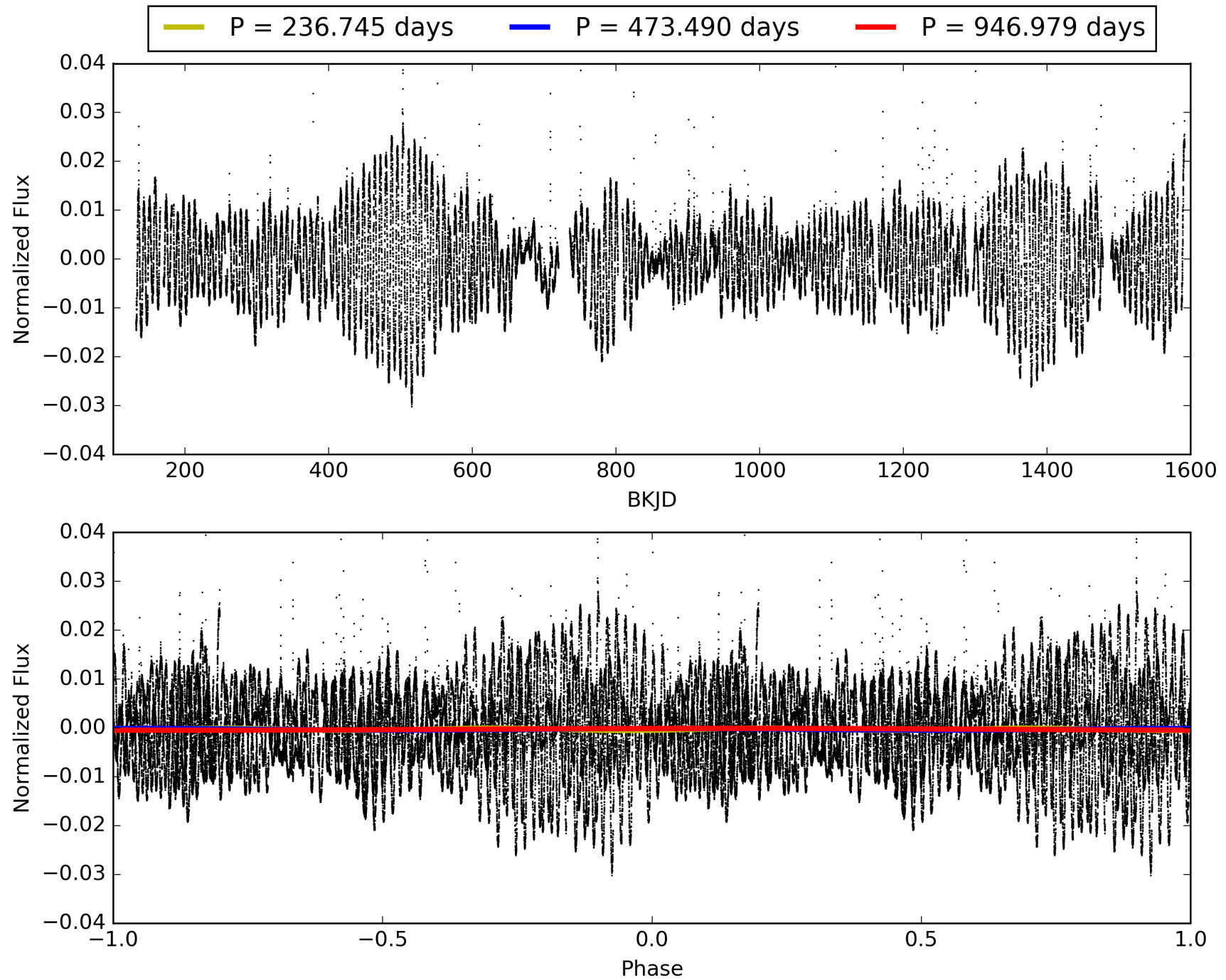
DV Diagnostic Results:

ShortPeriod-sig: 100.0% [4.44 σ]
LongPeriod-sig: 100.0% [69.94 σ]
ModelChiSquare2-sig: 0.0%
ModelChiSquareGof-sig: 82.5%
Bootstrap-pfa: N/A
RollingBand-fgt: 1.00 [3/3]
GhostDiagnostic-chr: -0.5636
Centroid-sig: 0.9%
Centroid-so: 0.692 arcsec [2.09 σ]
OotOffset-rm: 0.585 arcsec [6.41 σ]
KicOffset-rm: 0.579 arcsec [6.36 σ]
OotOffset-st: 1/0/0/0 [1]
KicOffset-st: 1/0/0/0 [1]
DiffImageQuality-fgm: 1.00 [1/1]
DiffImageOverlap-fno: 1.00 [2/2]

TCE 004158372-08, PDC Light Curves

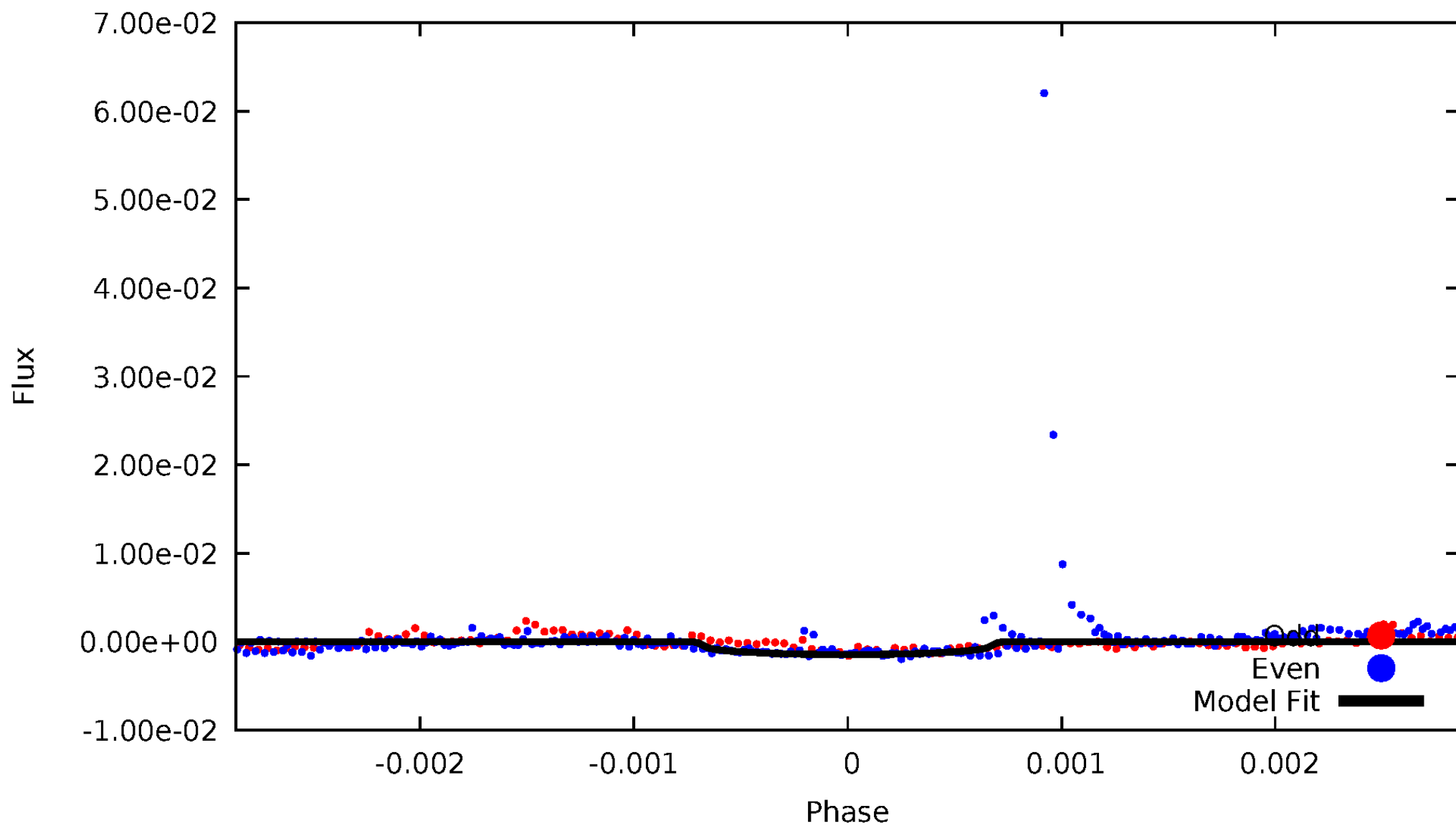


TCE 004158372-08



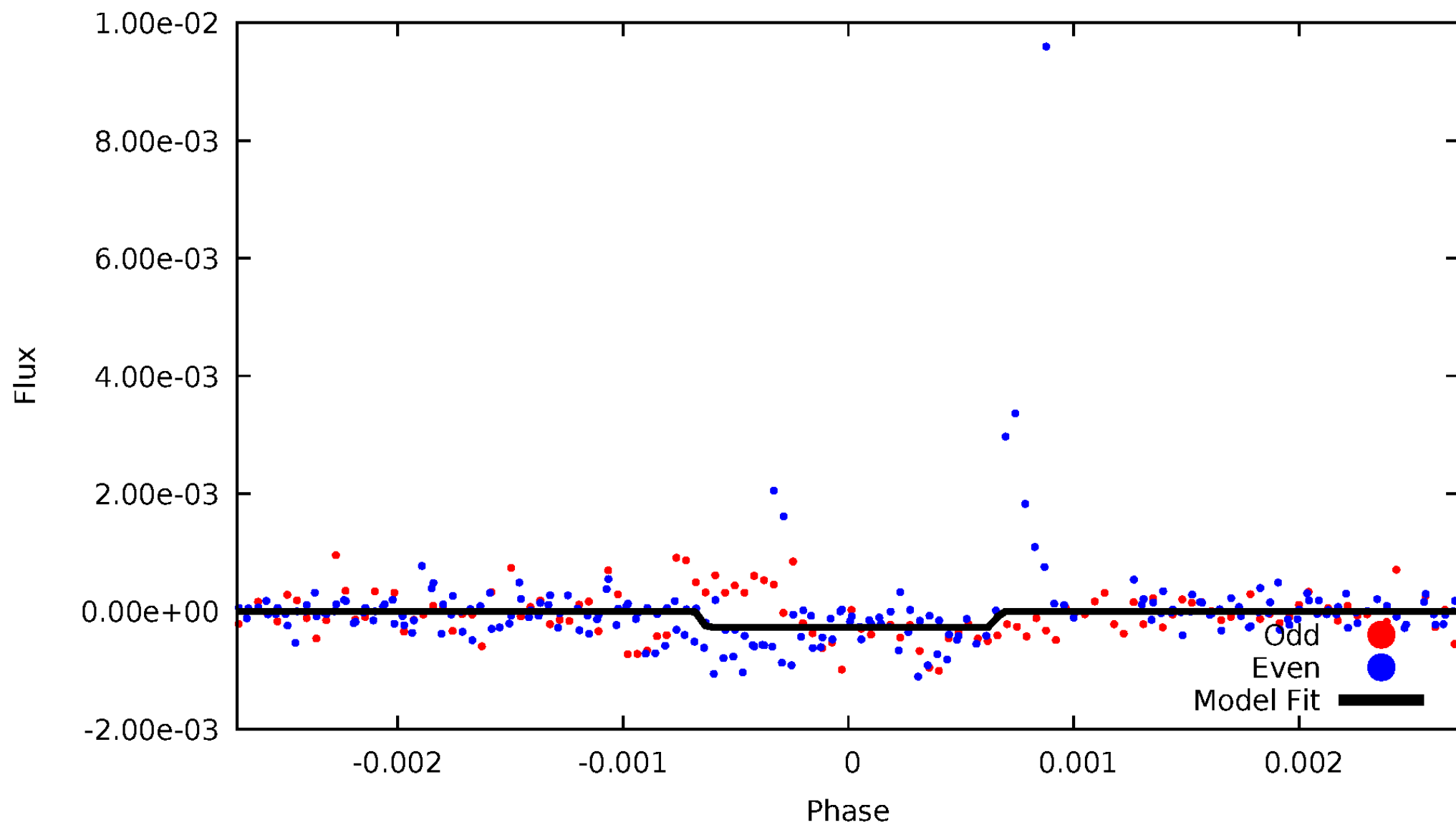
DV Odd/Even

TCE 004158372-08



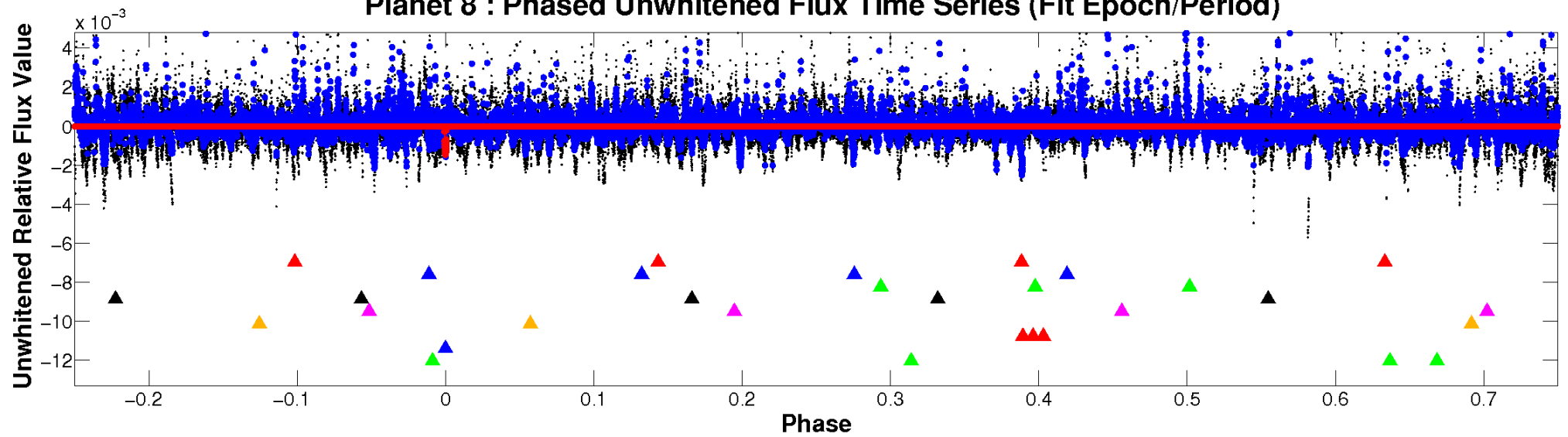
ALT Odd/Even

TCE 004158372-08

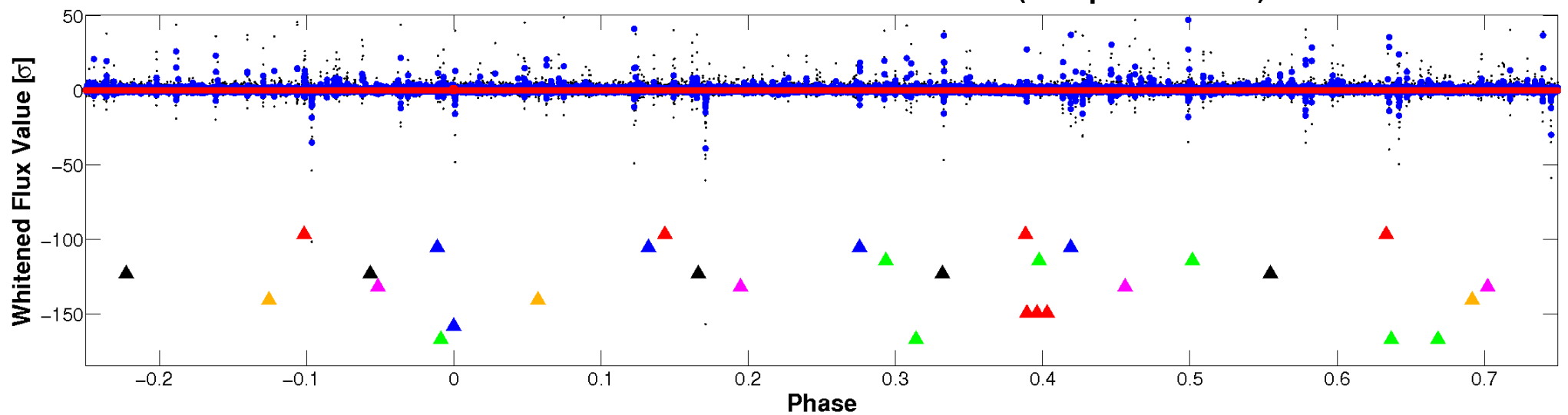


Non-Whitened Vs. Whitened Light Curve

Planet 8 : Phased Unwhitened Flux Time Series (Fit Epoch/Period)

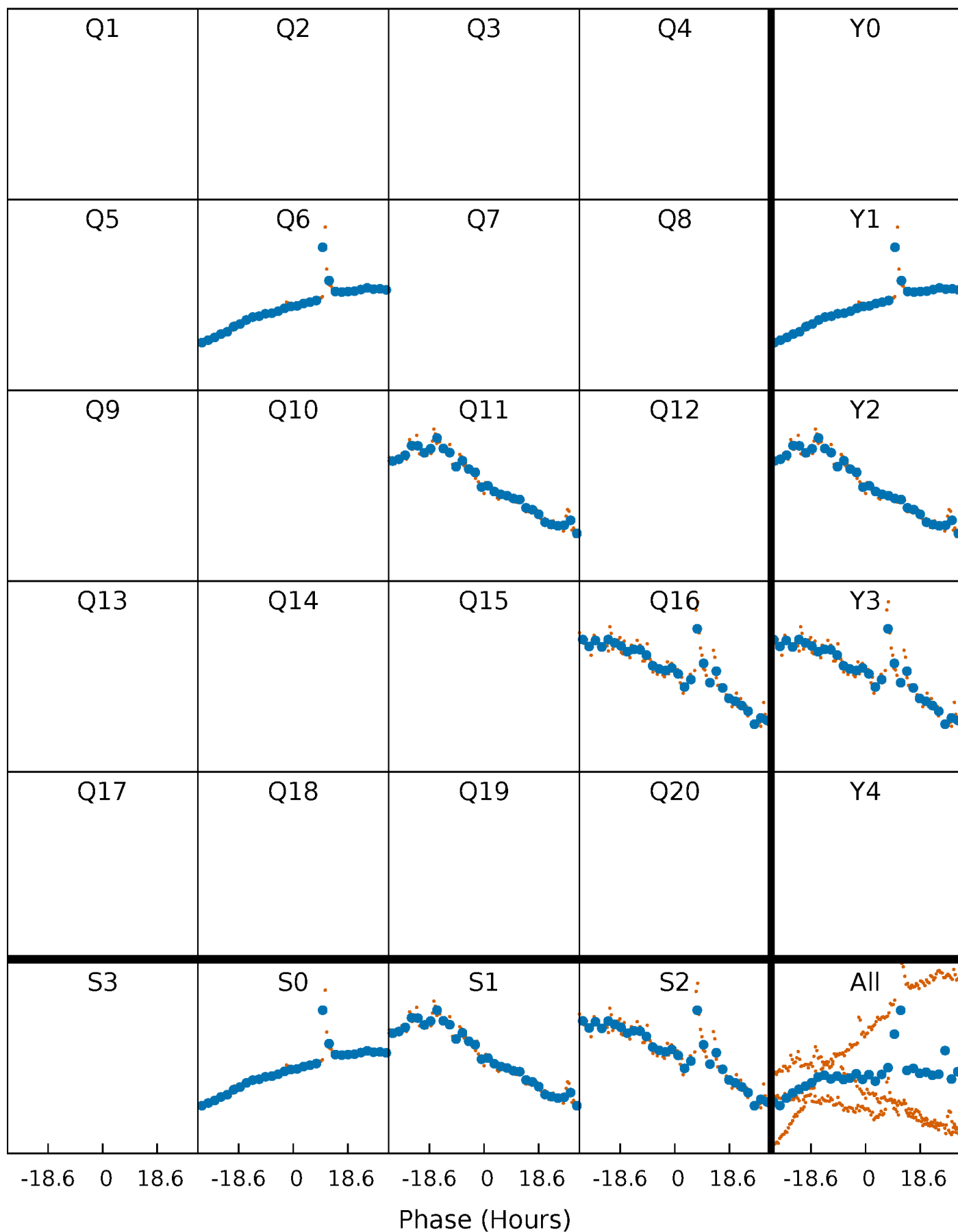


Planet 8 : Phased Whitened Flux Time Series (Fit Epoch/Period)



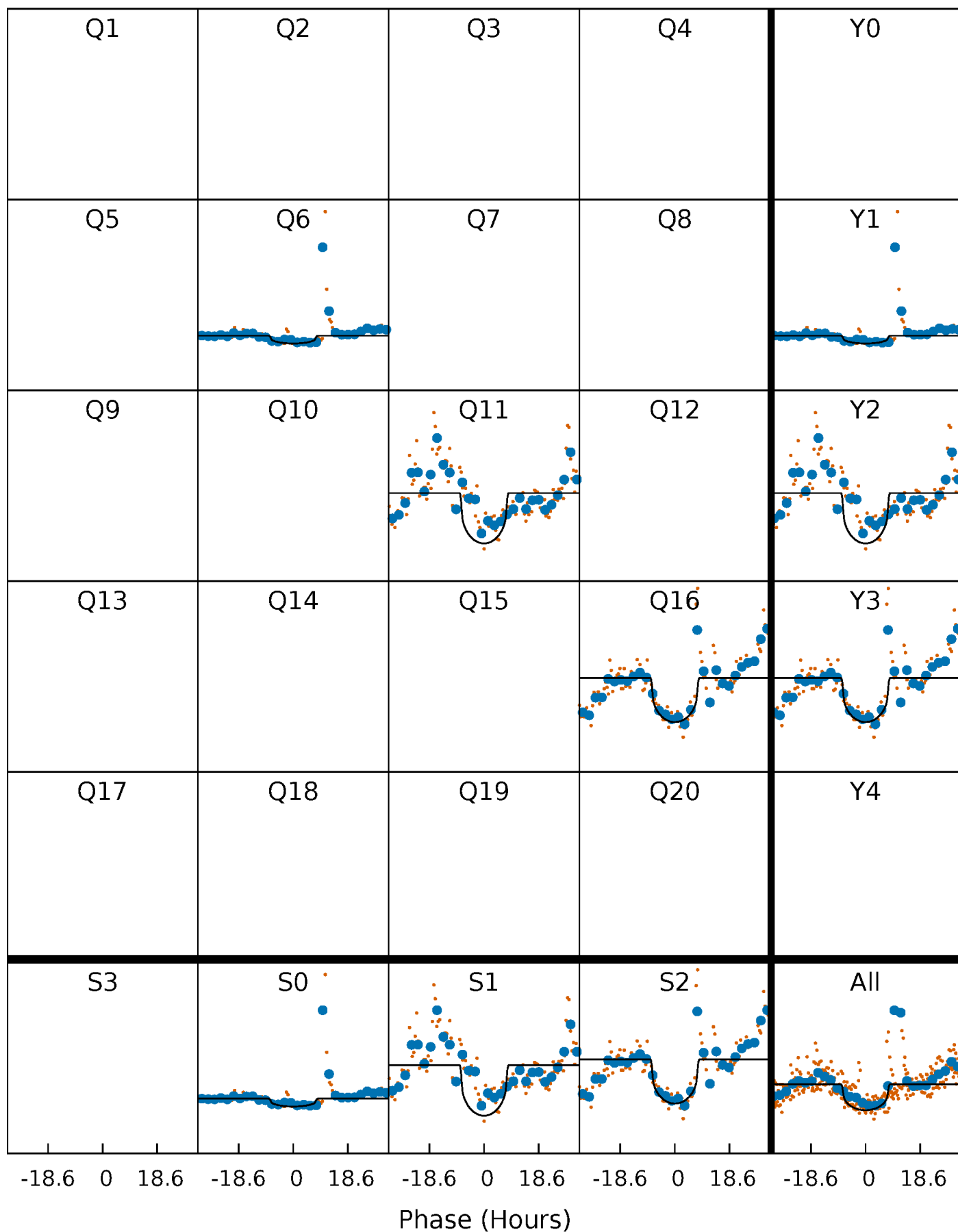
PDC Quarter-Phased Transit Curves

TCE 004158372-08 P=473.489609 Days $T_0=550.580979$ (BKJD)



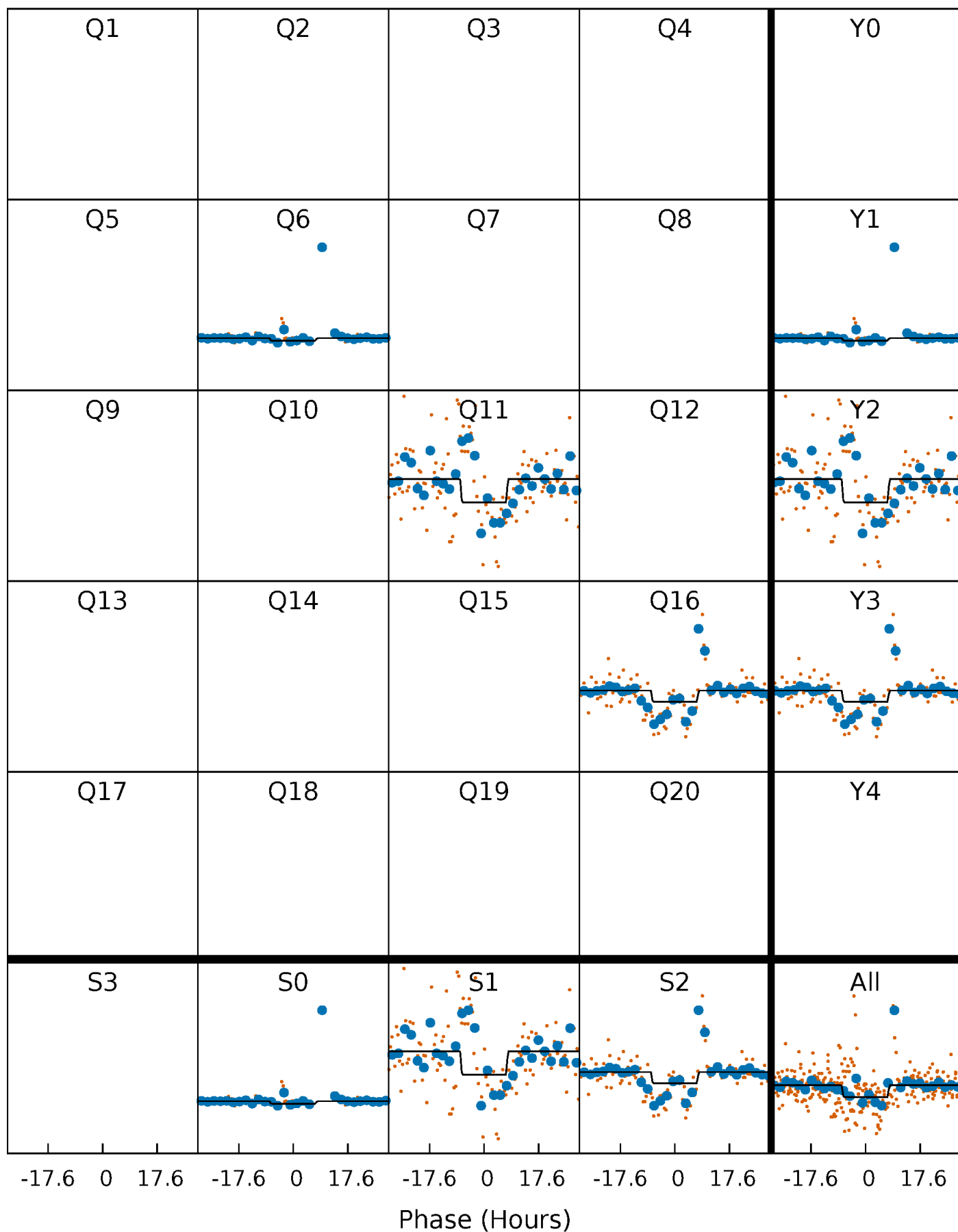
DV Quarter-Phased Transit Curves

TCE 004158372-08 $P=473.489609$ Days $T_0=550.580979$ (BKJD)



Alt. Detrend Quarter-Phased Transit Curves

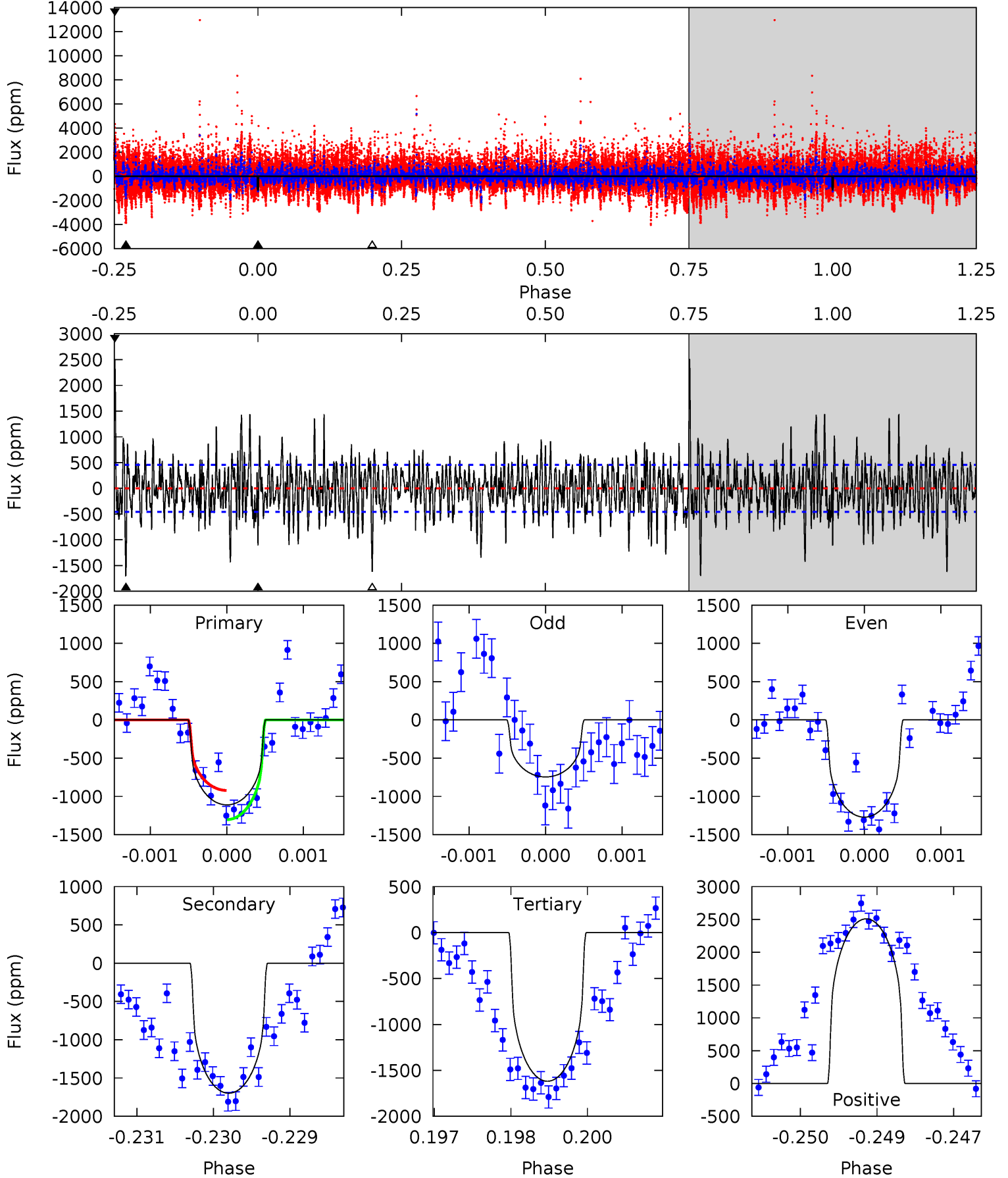
TCE 004158372-08 $P=473.445585$ Days $T_0=550.641222$ (BKJD)



DV Model-Shift Uniqueness Test

004158372-08, P = 473.489609 Days, E = 77.091370 Days

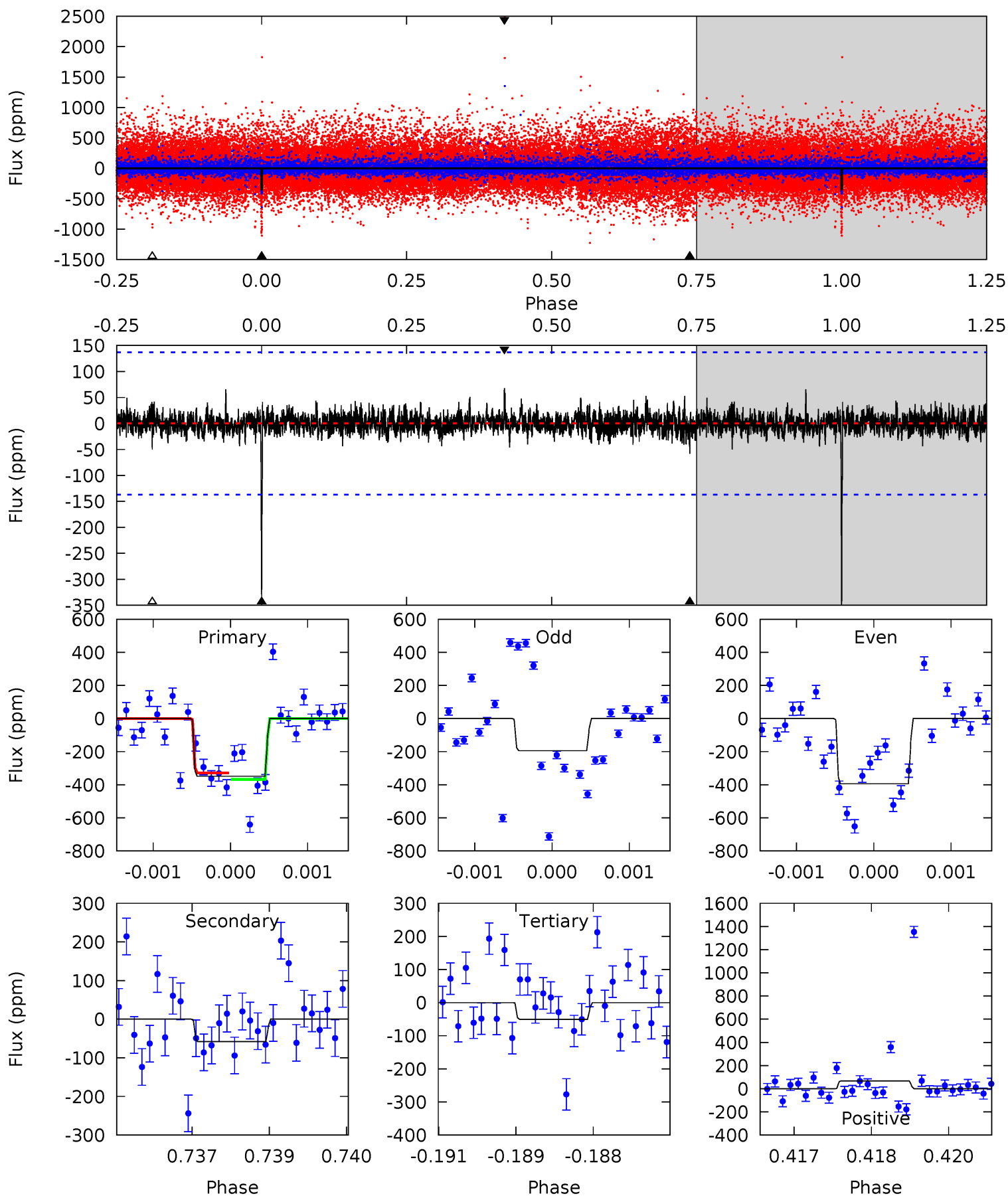
Pri	Sec	Ter	Pos	FA ₁	FA ₂	F _{Red}	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
13.1	20.0	19.1	29.5	5.39	3.19	4.76	-5.98	-16.5	0.94	-9.54	2.23	0.90	0.60	2.25



Alt Model-Shift Uniqueness Test

004158372-08, $P = 473.445585$ Days, $E = 77.195637$ Days

Pri	Sec	Ter	Pos	FA ₁	FA ₂	F _{Red}	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
13.7	2.30	1.98	2.67	5.39	3.20	0.50	11.7	11.1	0.32	-0.37	3.54	1.61	0.16	0.78



Stellar Parameters For KIC 004158372

	$T_{\text{eff}}(K)$	$\log(g)$	$[\text{Fe}/\text{H}]$	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	4267^{+129}_{-129}	$4.608^{+0.049}_{-0.018}$	$0.120^{+0.250}_{-0.300}$	$0.670^{+0.032}_{-0.057}$	$0.662^{+0.052}_{-0.052}$	$3.109^{+0.665}_{-0.248}$
	+3%/-3%	+1%/-0%	+208%/-250%	+5%/-9%	+8%/-8%	+21%/-8%
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 004158372-08 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	A_{obs}
DV	-1699 ± 85	$2.53^{+1.01}_{-1.03}$	210^{+7}_{-7}	4542^{+1184}_{-569}	$157781^{+288524}_{-76643}$
Alt.	-58 ± 25	$1.35^{+1.02}_{-0.84}$	210^{+6}_{-8}	3154^{+1238}_{-502}	$18339^{+118223}_{-13237}$

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

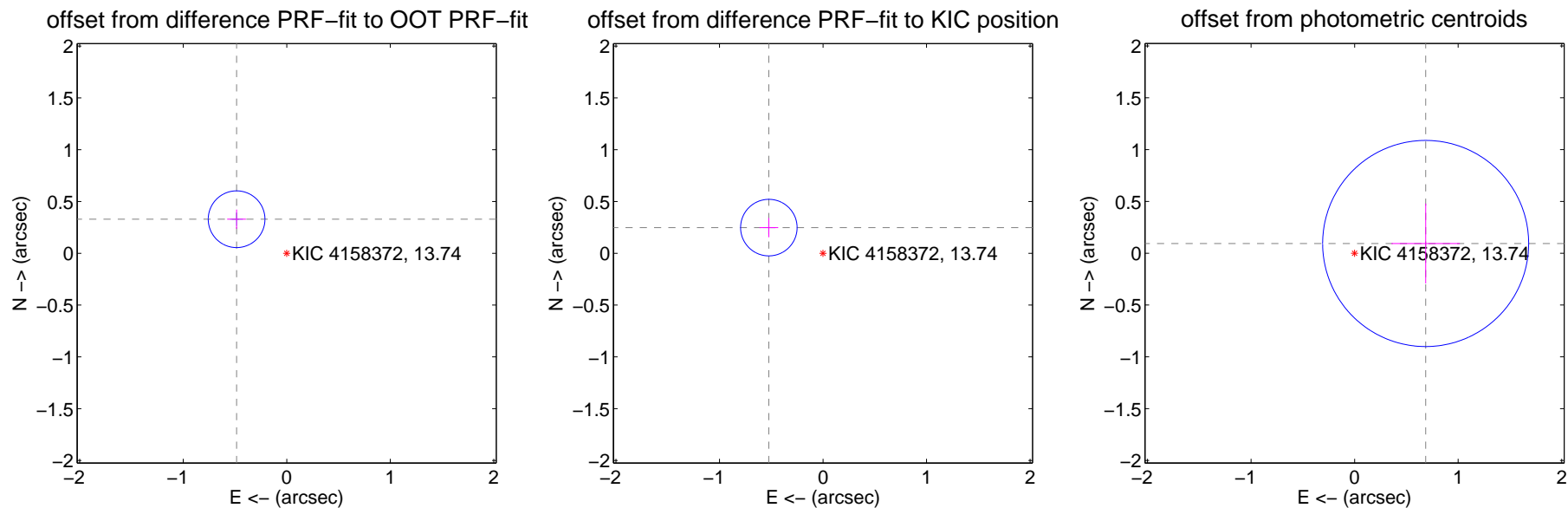
DV Centroid Data

Supplemental centroid analysis for 004158372-08. Kepler magnitude: 13.74. Transit SNR 7.37

There are 1 quarters with good PRF difference image offsets

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

	Distance in arcsec	Distance / σ	Δ RA	Δ Dec
PRF-fit source offset from OOT	0.585 ± 0.091	6.41	0.484 ± 0.091	0.329 ± 0.093
PRF-fit source offset from KIC position	0.579 ± 0.091	6.36	0.523 ± 0.091	0.248 ± 0.093
photometric centroid source offset	0.69 ± 0.33	2.09	-0.69 ± 0.33	0.09 ± 0.39



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.

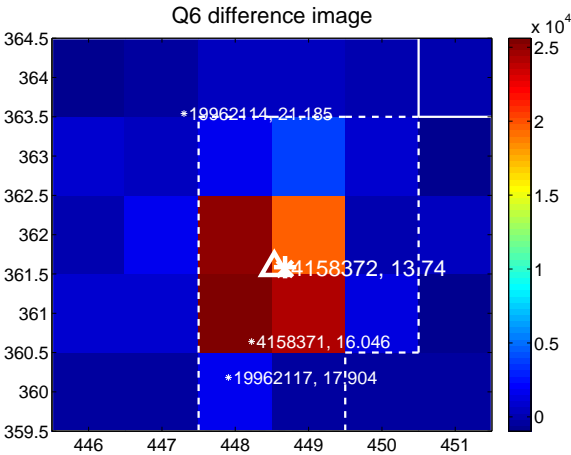
Q5 no difference image



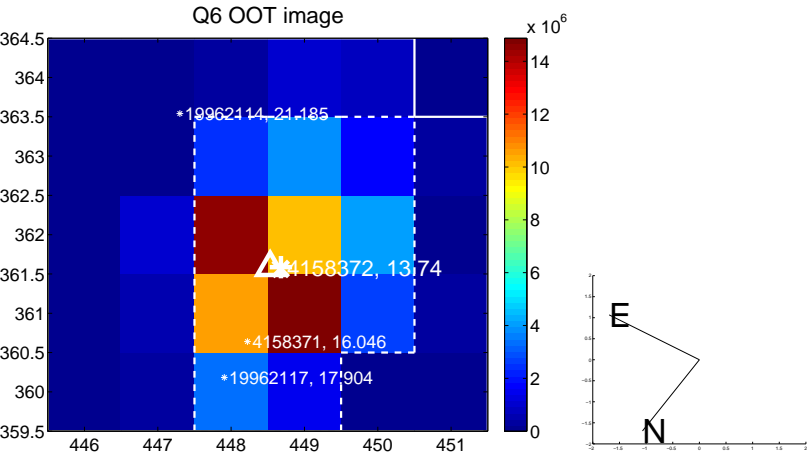
Q5 no OOT image



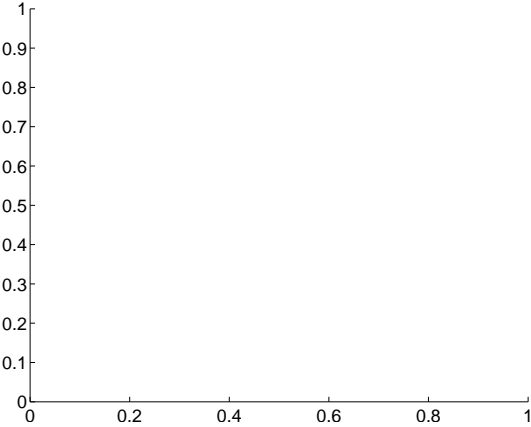
Q6 difference image



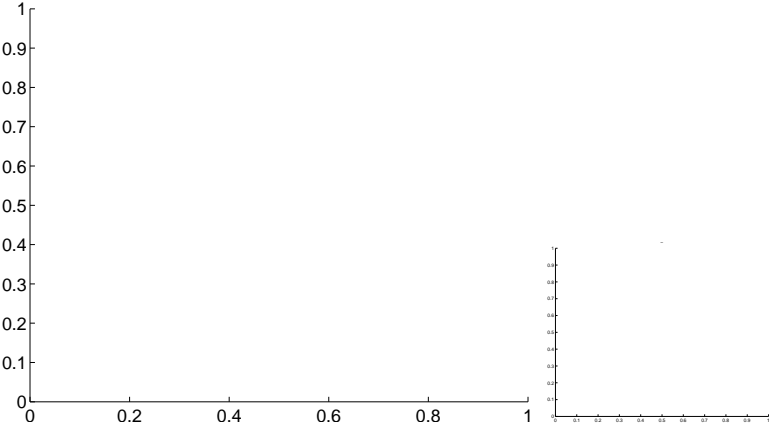
Q6 OOT image



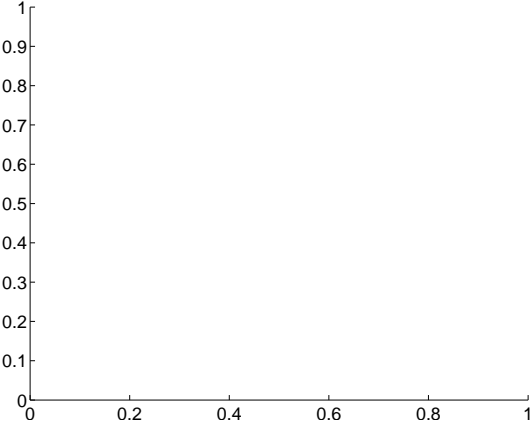
Q7 no difference image



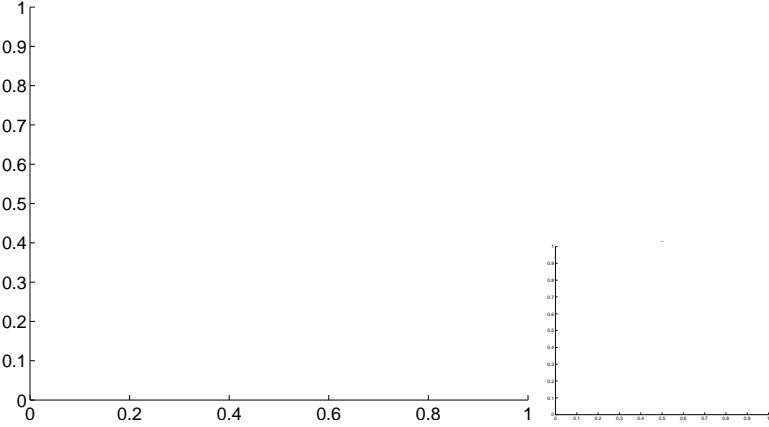
Q7 no OOT image



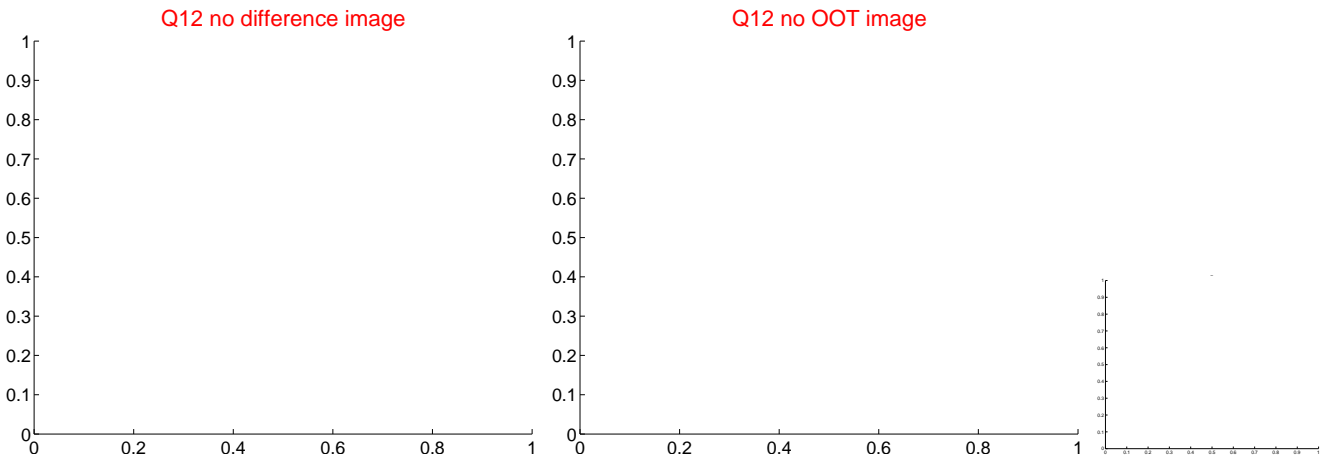
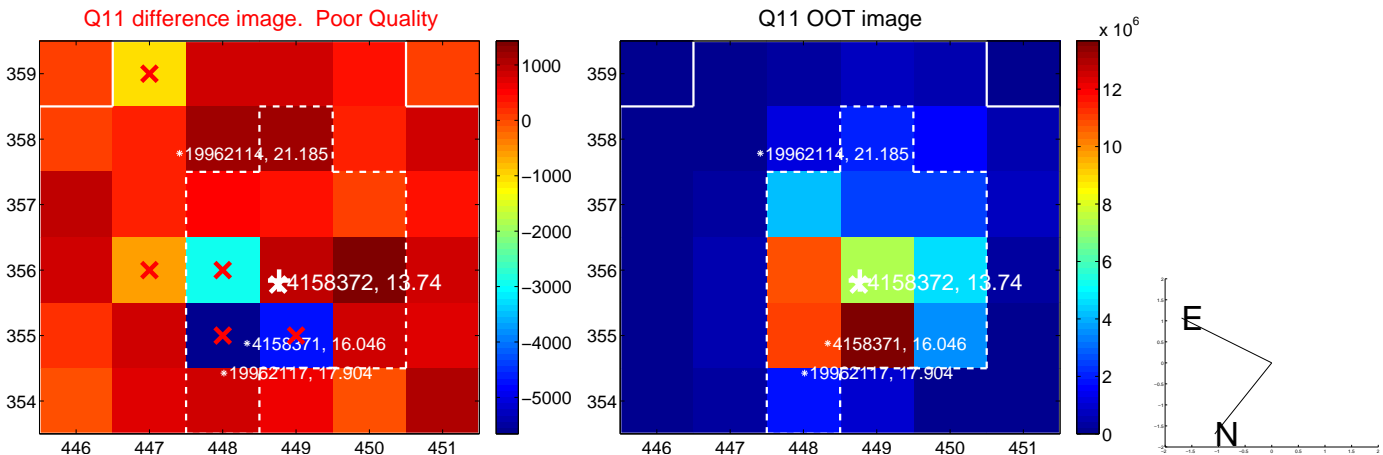
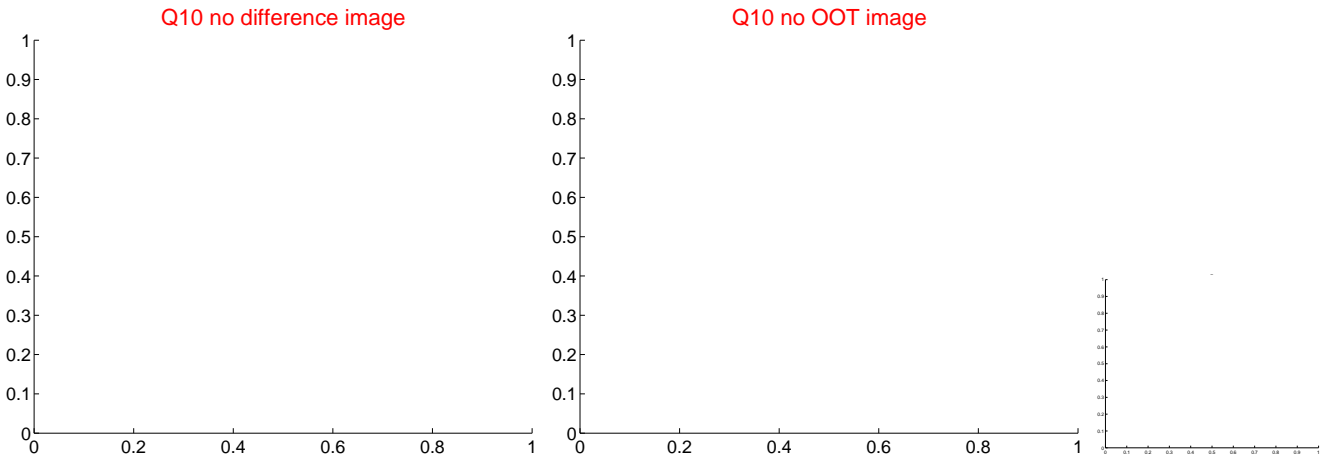
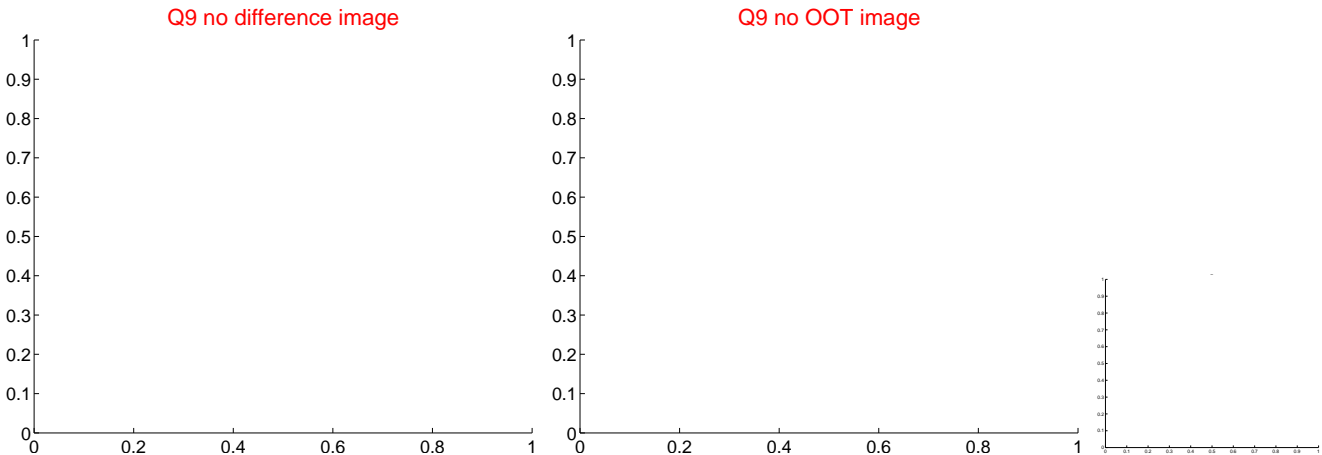
Q8 no difference image



Q8 no OOT image



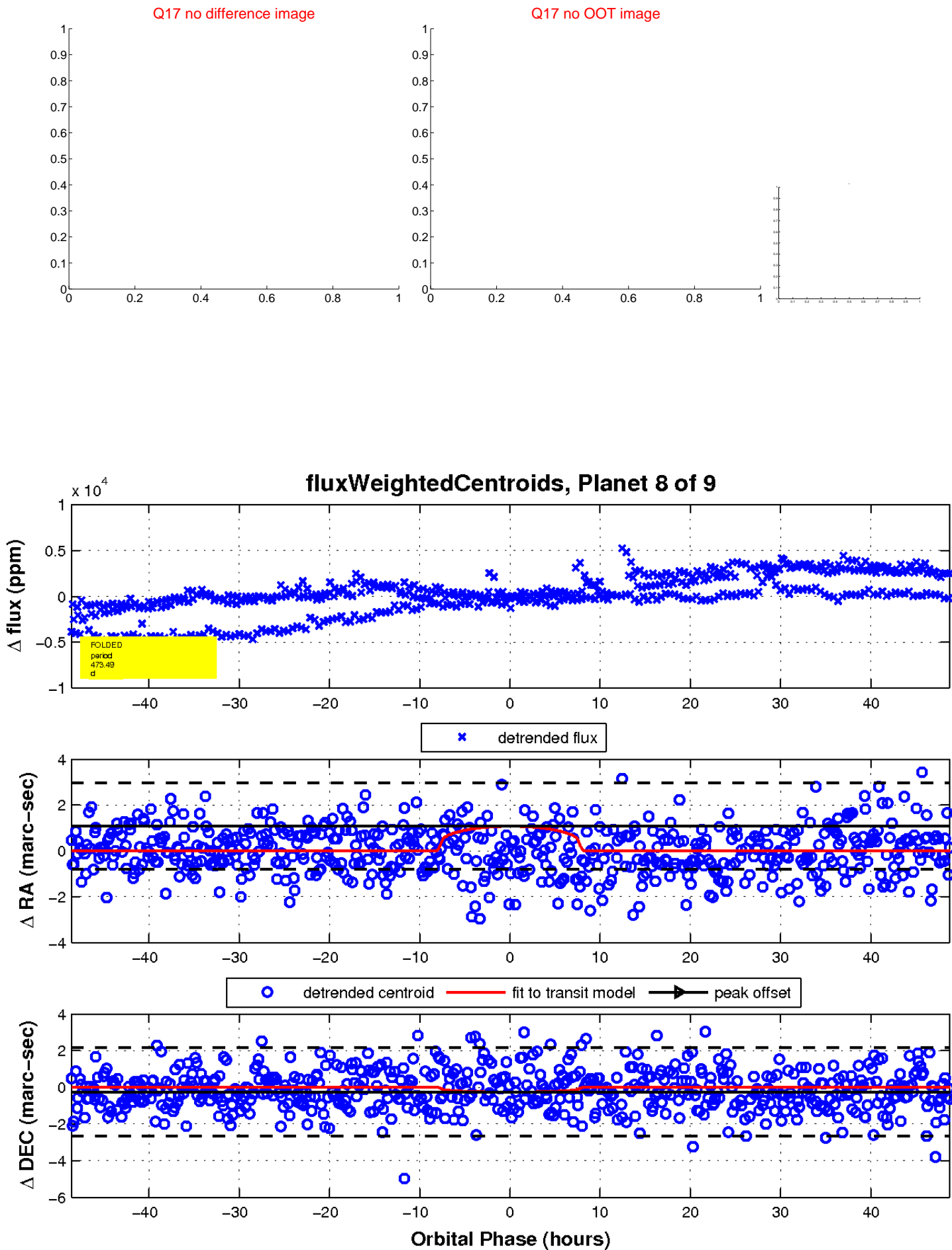
white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value



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

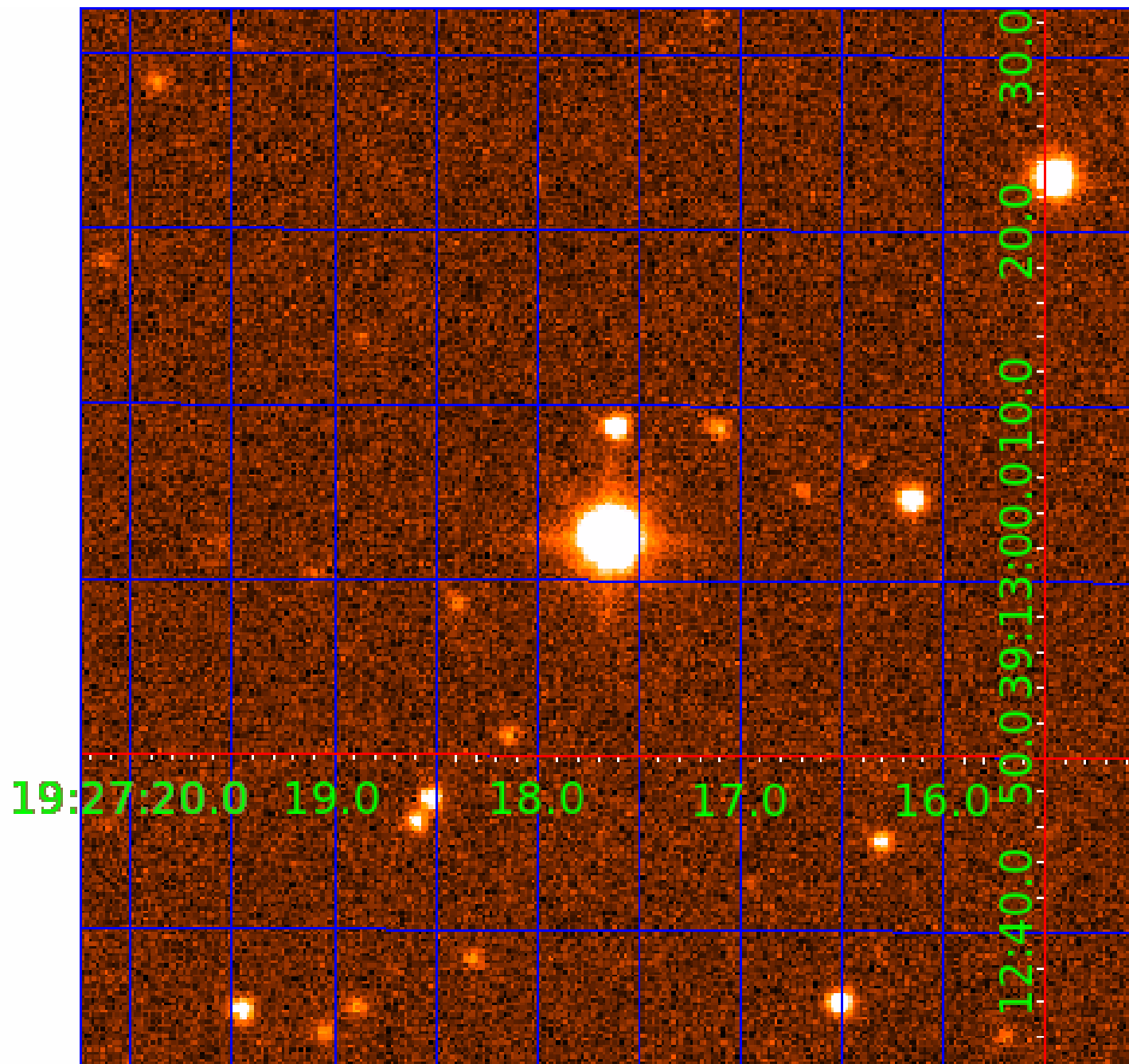


white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



UKIRT Image

Declination



KIC 004158372

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})
004158372-01	OBS	No	357.496909	376.973374	928.2	7.479	16.7	5.7	0.67	4267	2.25	0.18
004158372-02	OBS	No	405.589263	275.511211	760.9	4.726	14.2	6.4	0.67	4267	2.03	0.15
004158372-03	OBS	No	522.778675	216.071041	475.4	4.665	16.1	3.6	0.67	4267	1.66	0.11
004158372-04	OBS	No	289.494986	234.246442	1165.9	3.201	12.9	9.0	0.67	4267	2.49	0.24
004158372-05	OBS	No	356.891810	169.321259	1258.1	2.546	12.8	7.2	0.67	4267	2.56	0.18
004158372-07	OBS	No	470.232741	267.941575	1038.8	6.744	12.2	7.4	0.67	4267	2.24	0.12
004158372-08	OBS	No	473.489609	550.580979	1462.8	16.257	10.8	7.4	0.67	4267	2.56	0.12
004158372-09	OBS	No	320.670668	378.593601	373.5	10.500	12.1	-1.0	0.67	4267	1.23	0.21

Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
004158372-01	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_MARSHALL—LPP_DV—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—CENT_FEW_DIFFS
004158372-02	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
004158372-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV
004158372-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—ALL_TRANS_CHASES
004158372-05	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_POS_DV—CENT_UNCERTAIN
004158372-07	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—CENT_FEW_DIFFS
004158372-08	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_MARSHALL—LPP_DV—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—CENT_FEW_DIFFS
004158372-09	OBS	FP	0.00	1	0	1	0	LPP_DV—ALL_TRANS_CHASES—CENT_NOFITS—HALO_GHOST

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

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

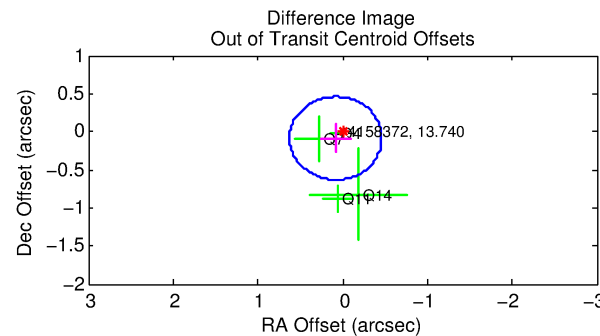
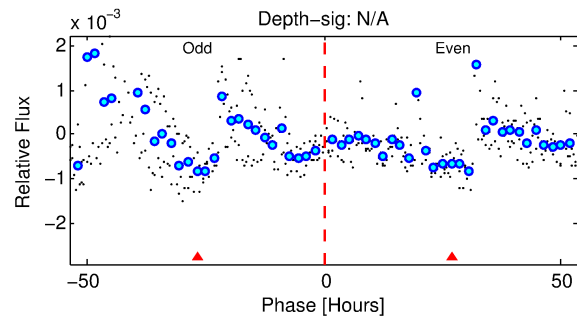
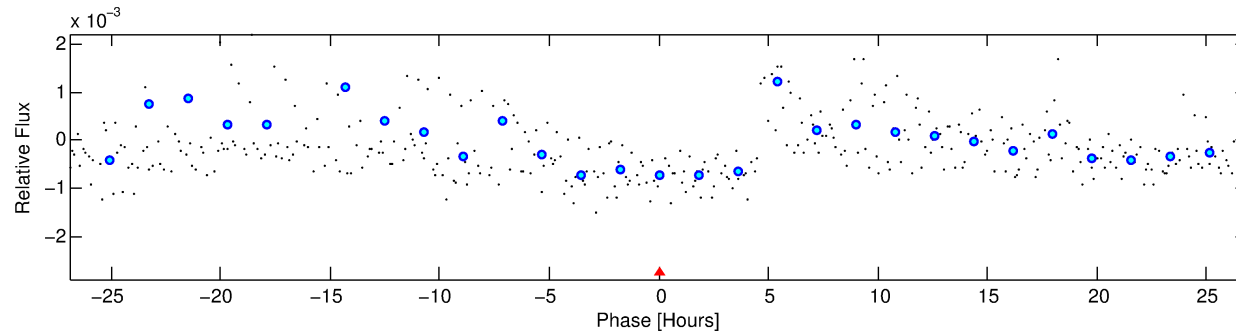
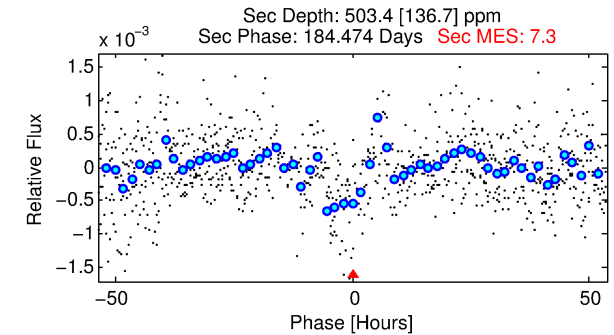
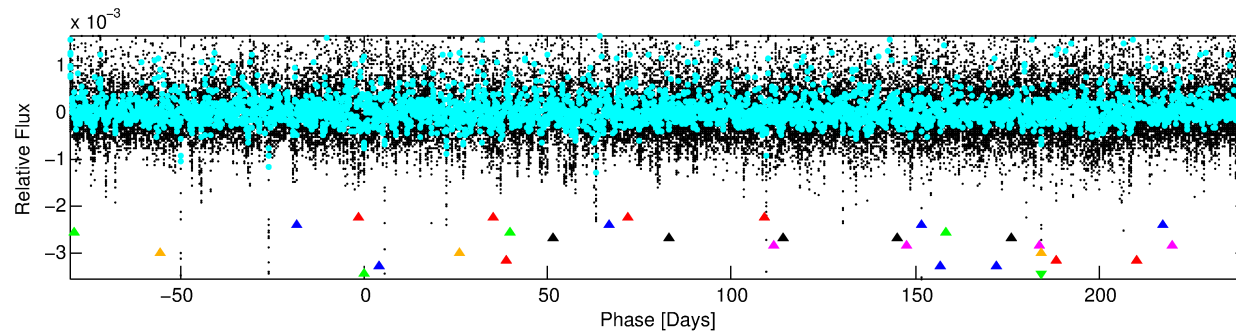
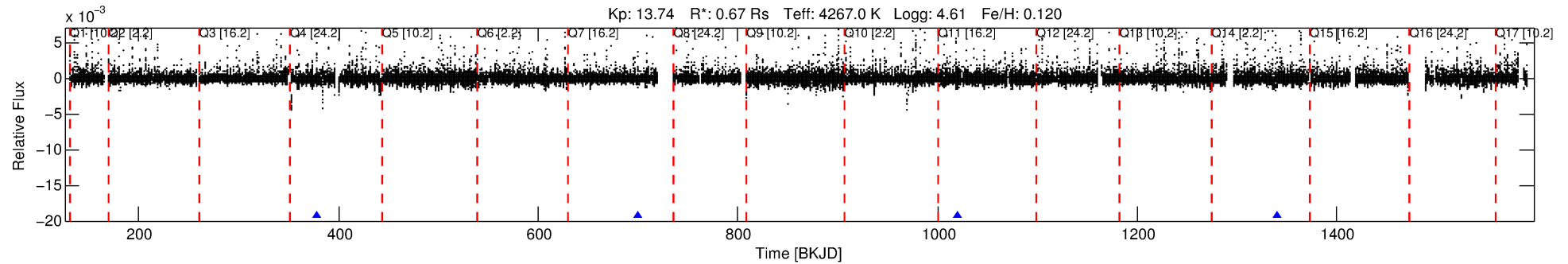
See http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col for comment definitions.

Ephemeris Match Information For 004158372-09

No Significant Match Found

DV One-Page Summary

KIC: 4158372 Candidate: 9 of 9 Period: 320.671 d



TPS TCE Results:

Period = 320.67067 d
Epoch = 378.5936 BKJD

DV fit results are unavailable

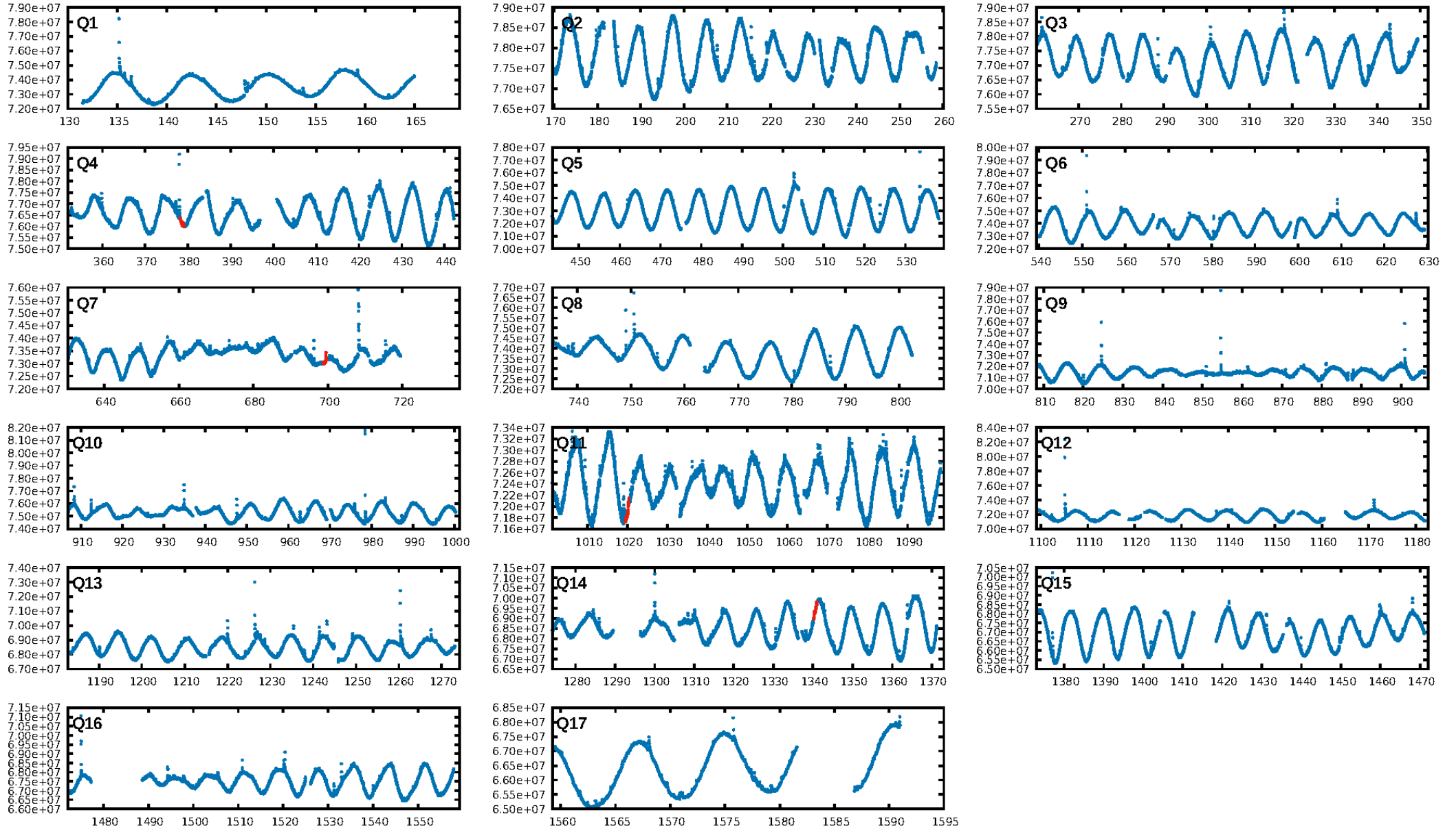
DV Diagnostic Results:

ShortPeriod-sig: 100.0% [68.16σ]
LongPeriod-sig: 100.0% [80.46σ]
ModelChiSquare2-sig: N/A
ModelChiSquareGof-sig: N/A
Bootstrap-pfa: N/A
RollingBand-fgt: 1.00 [4/4]
GhostDiagnostic-chr: 0.07371
Centroid-sig: 71.5%
Centroid-so: 0.350 arcsec [0.52σ]
OotOffset-rm: 0.120 arcsec [0.66σ]
KicOffset-rm: 0.217 arcsec [1.19σ]
OotOffset-st: 1/2/1/0 [4]
KicOffset-st: 1/2/1/0 [4]
DiffImageQuality-fgm: 1.00 [4/4]
DiffImageOverlap-fno: 1.00 [4/4]

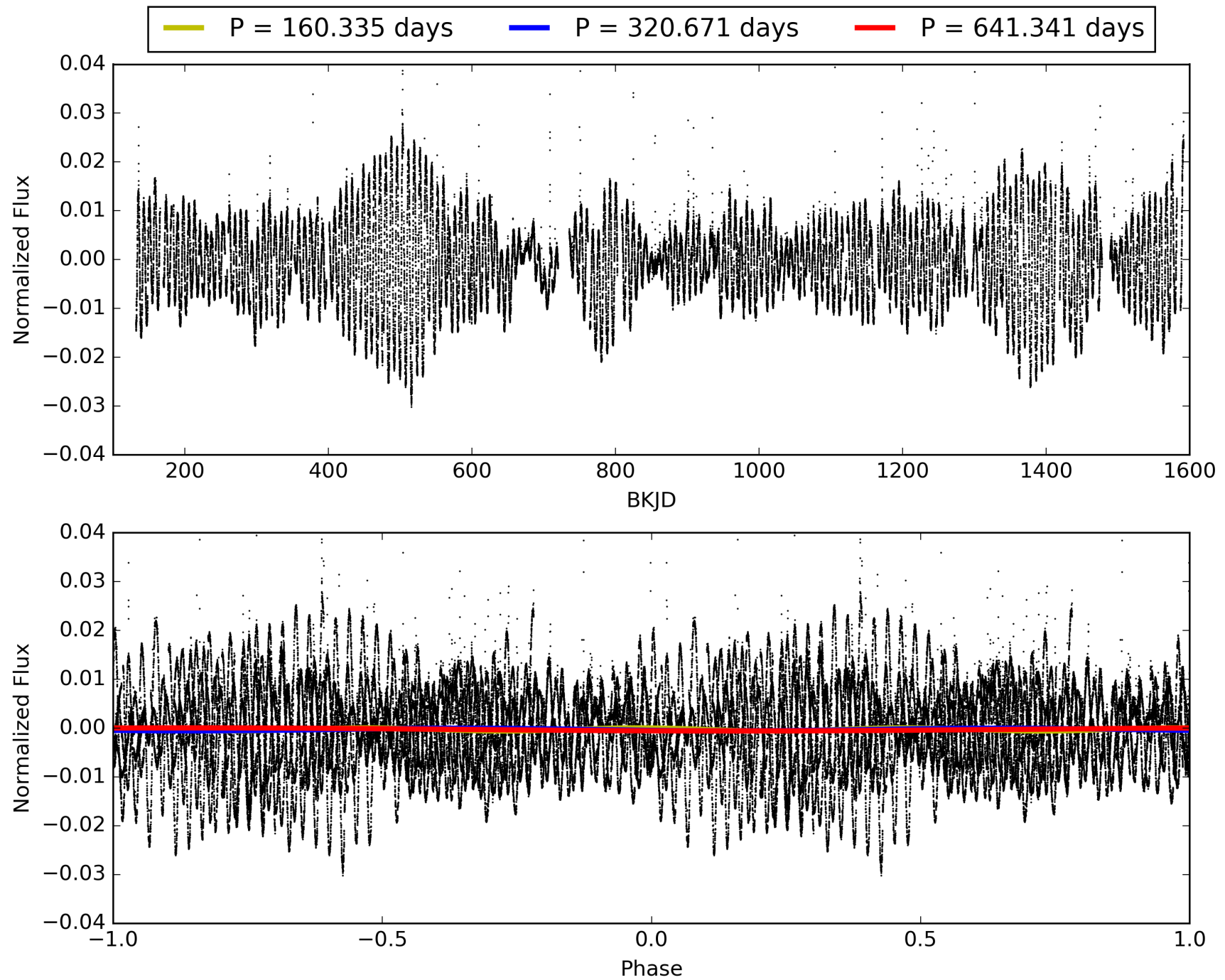
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 01-Feb-2016 06:13:45 Z

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

TCE 004158372-09, PDC Light Curves

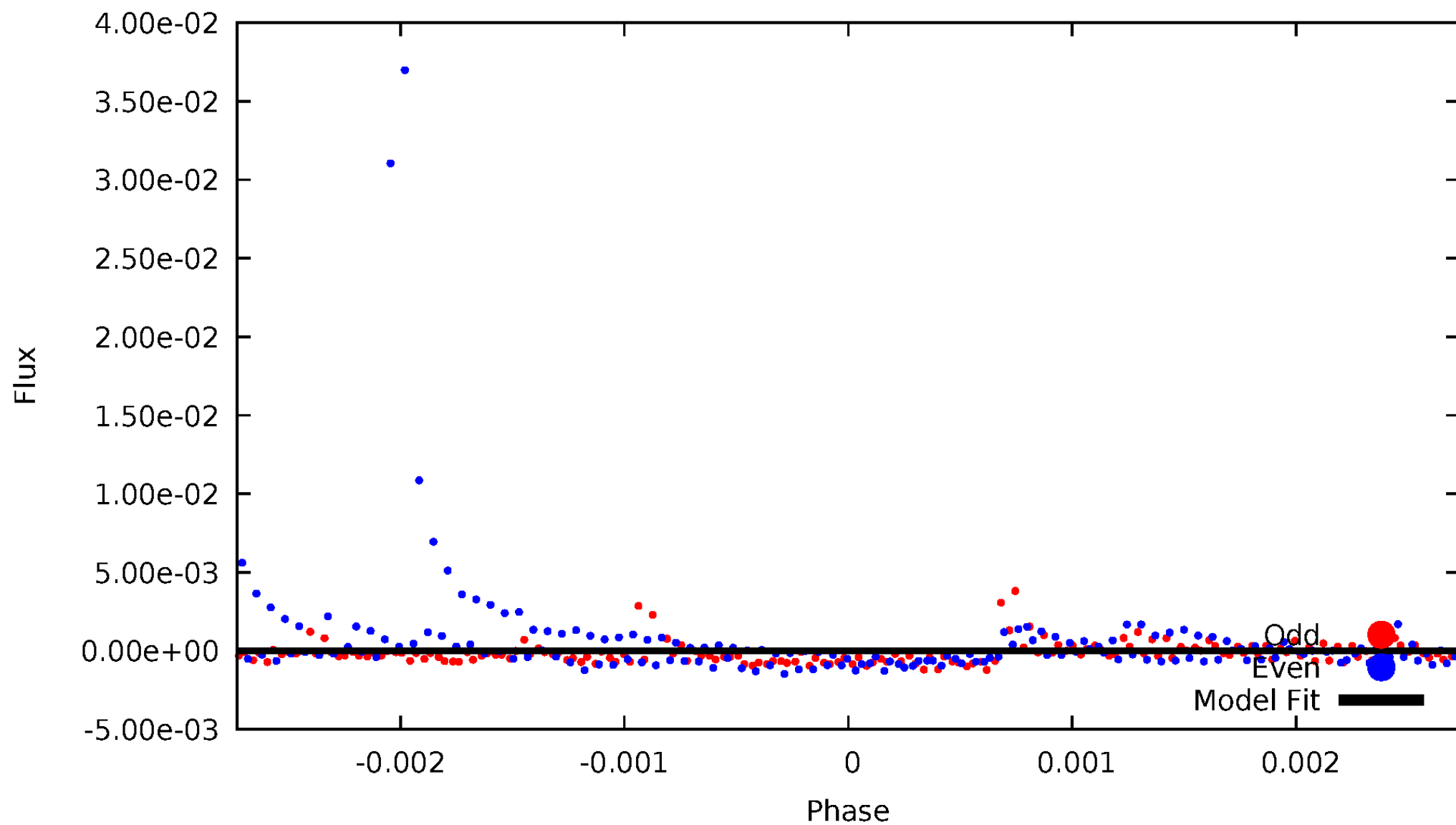


TCE 004158372-09



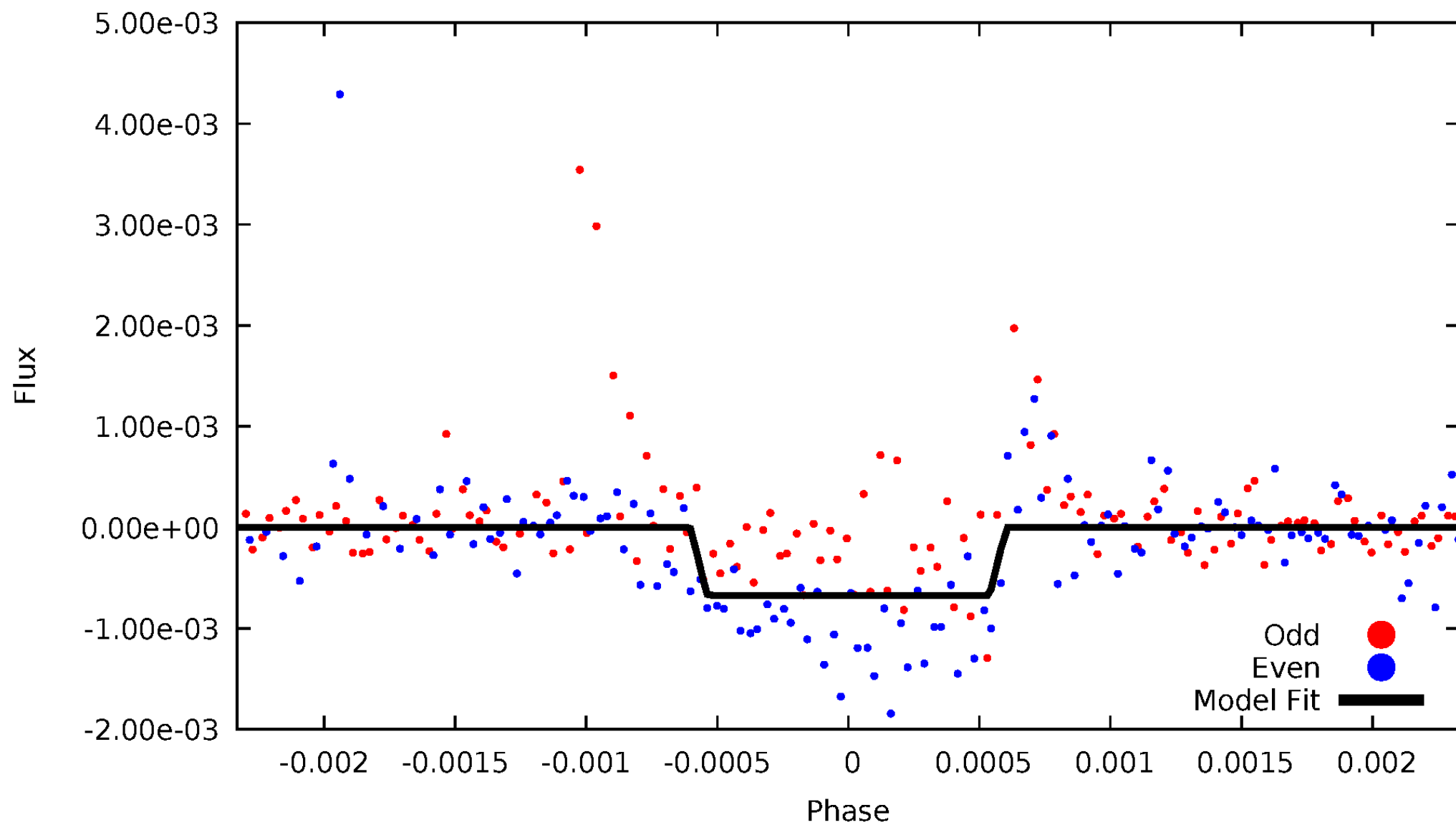
DV Odd/Even

TCE 004158372-09



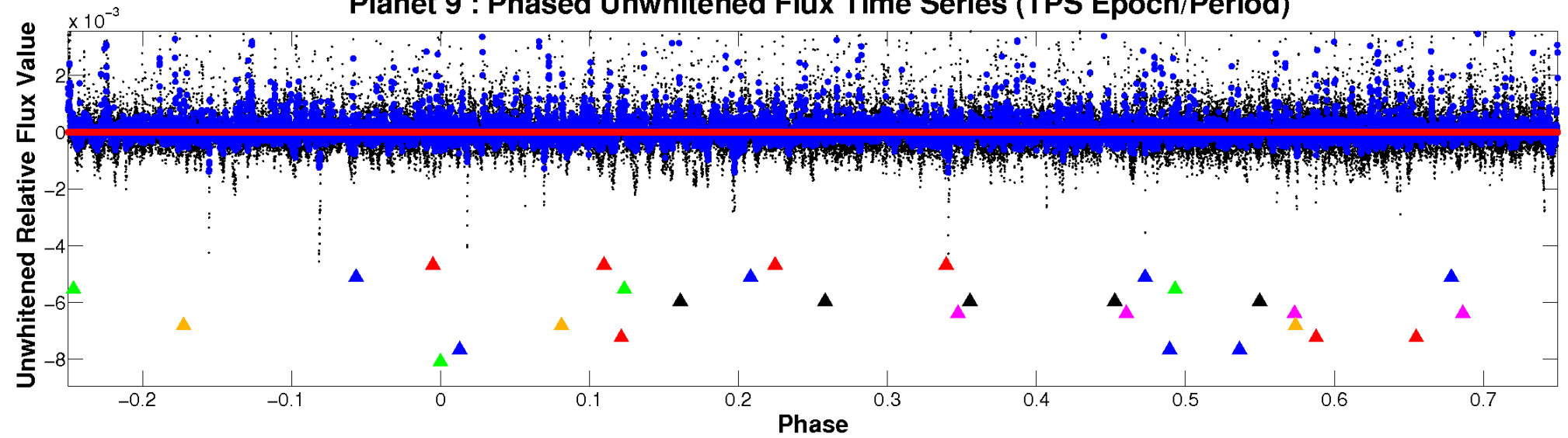
ALT Odd/Even

TCE 004158372-09



Non-Whitened Vs. Whitened Light Curve

Planet 9 : Phased Unwhitened Flux Time Series (TPS Epoch/Period)

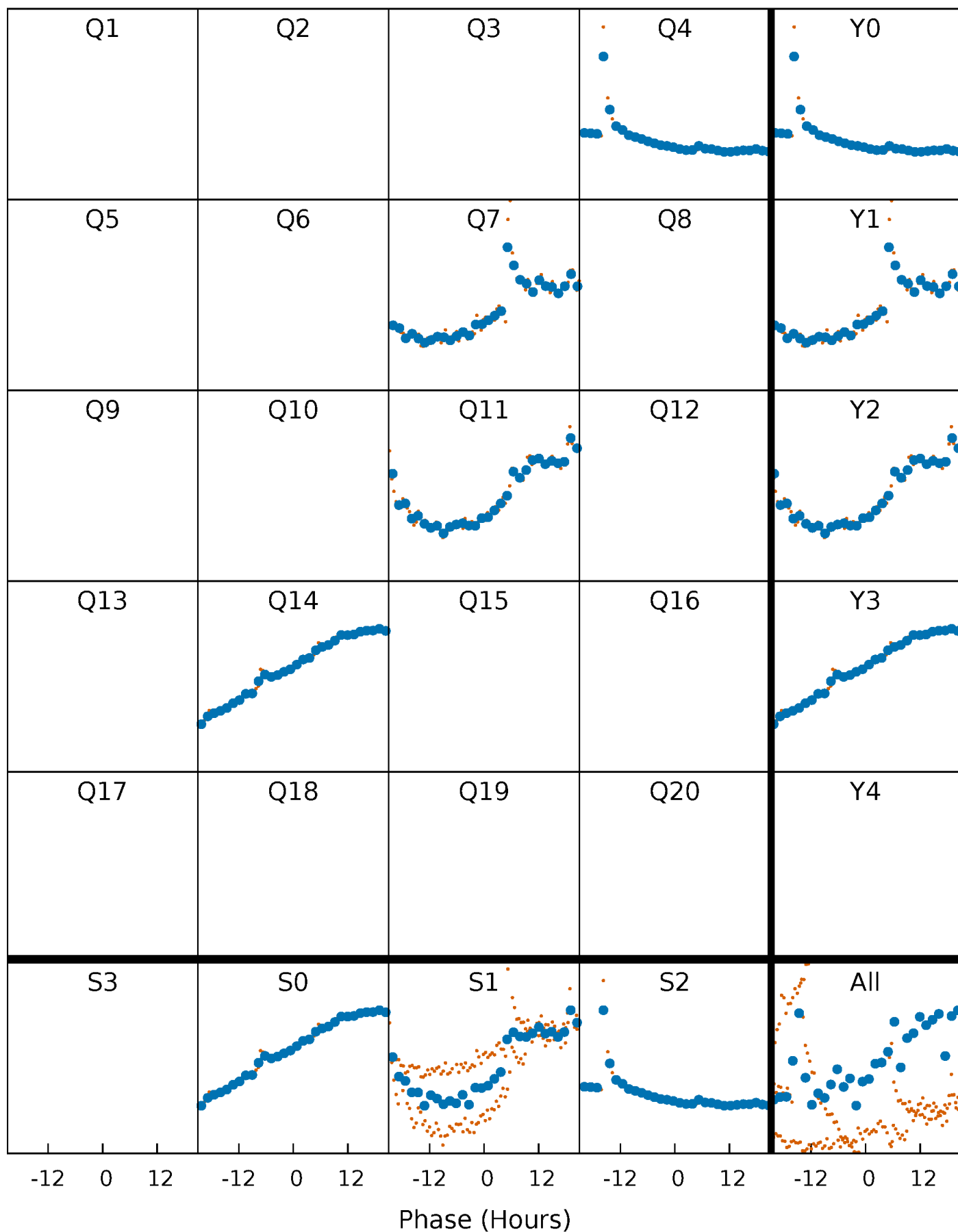


Planet 9 : Phased Whitened Flux Time Series (TPS Epoch/Period)



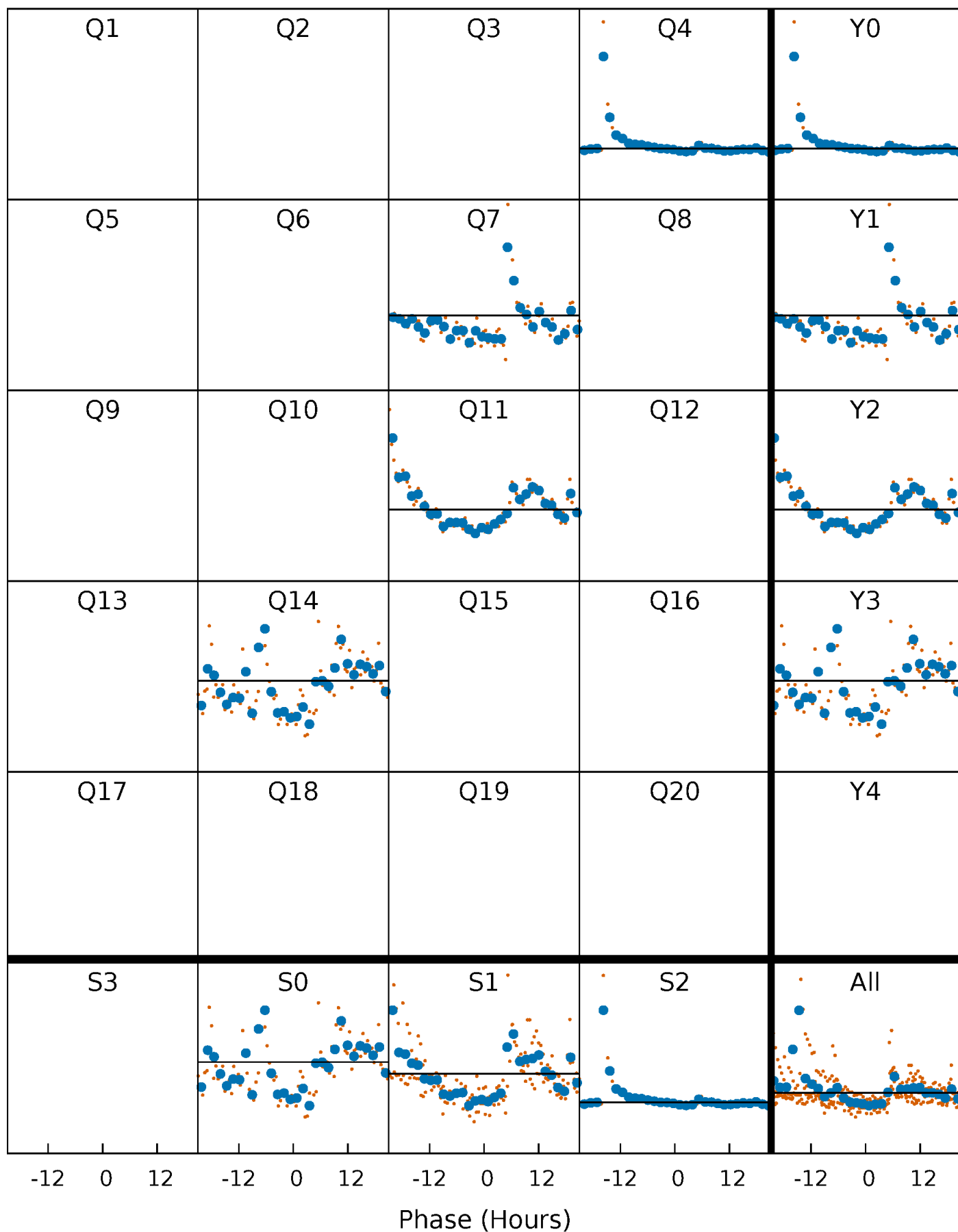
PDC Quarter-Phased Transit Curves

TCE 004158372-09 $P=320.670668$ Days $T_0=378.593601$ (BKJD)



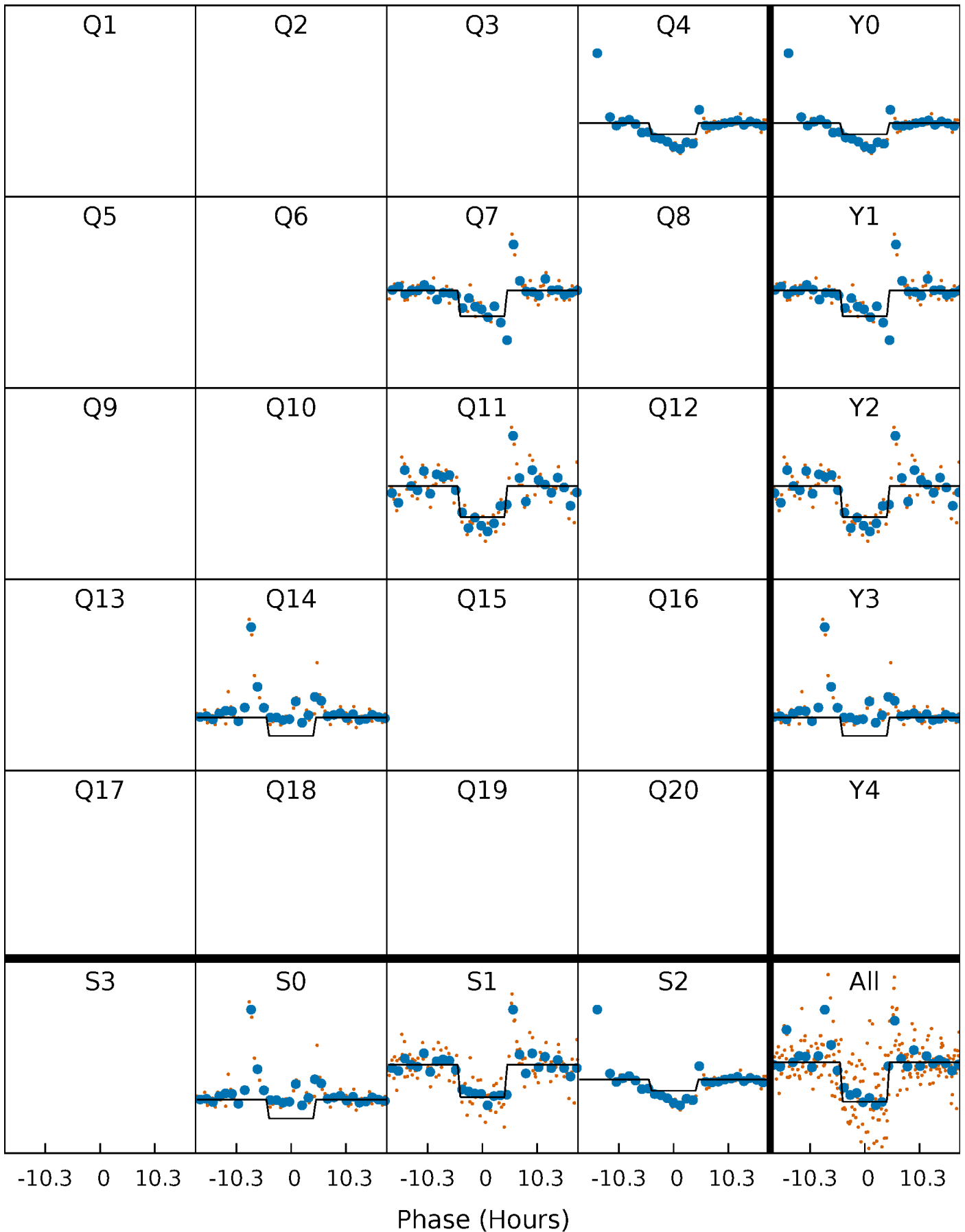
DV Quarter-Phased Transit Curves

TCE 004158372-09 $P=320.670668$ Days $T_0=378.593601$ (BKJD)



Alt. Detrend Quarter-Phased Transit Curves

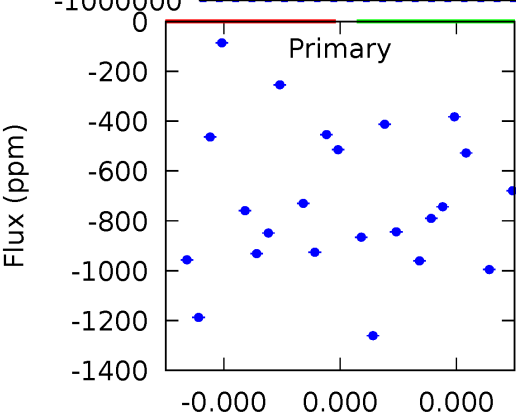
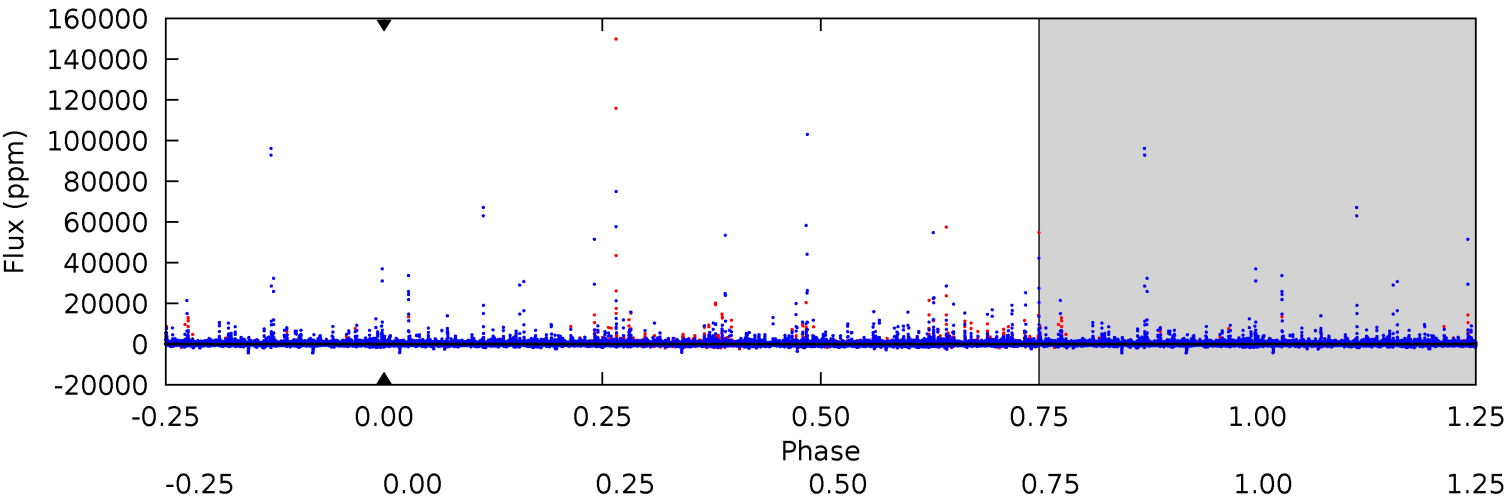
TCE 004158372-09 $P=320.670668$ Days $T_0=378.621682$ (BKJD)



DV Model-Shift Uniqueness Test

004158372-09, P = 320.670668 Days, E = 57.922933 Days

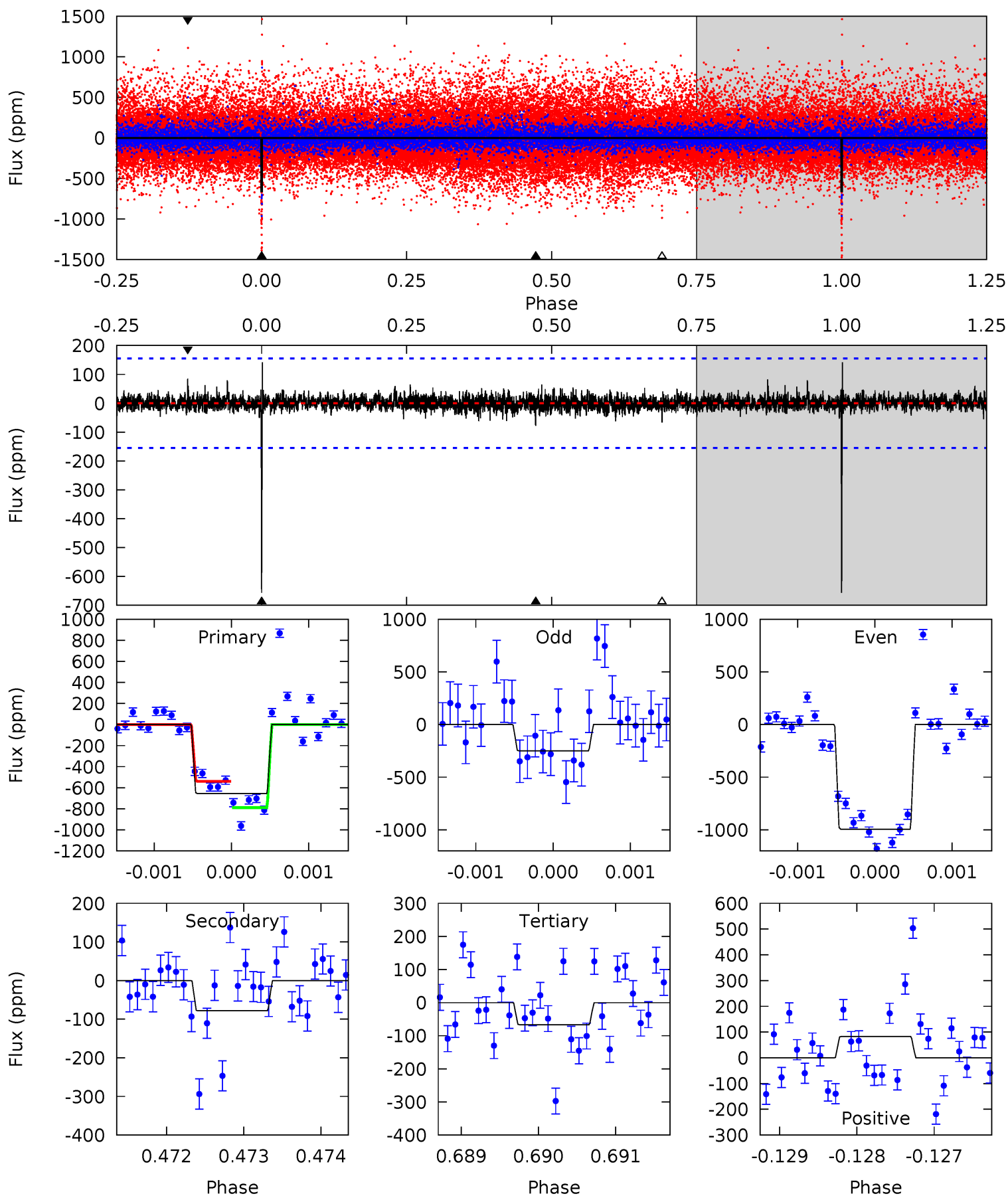
Pri	Sec	Ter	Pos	FA ₁	FA ₂	F _{Red}	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
0	0	0	0	1.00	1.00	1.00	0	0	0	0	0	0	0	0



Alt Model-Shift Uniqueness Test

004158372-09, P = 320.670668 Days, E = 57.951014 Days

Pri	Sec	Ter	Pos	FA ₁	FA ₂	F _{Red}	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
23.0	2.74	2.33	2.89	5.42	3.25	0.54	20.6	20.1	0.41	-0.15	13.4	0.94	0.18	4.38



Stellar Parameters For KIC 004158372

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	4267^{+129}_{-129}	$4.608^{+0.049}_{-0.018}$	$0.120^{+0.250}_{-0.300}$	$0.670^{+0.032}_{-0.057}$	$0.662^{+0.052}_{-0.052}$	$3.109^{+0.665}_{-0.248}$
	+3%/-3%	+1%/-0%	+208%/-250%	+5%/-9%	+8%/-8%	+21%/-8%
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 004158372-09 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	A_{obs}
DV	0 ± 1000000	$4.97^{+5.45}_{-3.40}$	239^{+8}_{-8}	-2971^{+13765}_{-7798}	$-8935.507^{+2213954.614}_{-2182008.977}$
Alt.	-78 ± 29	$5.53^{+6.08}_{-3.89}$	239^{+8}_{-8}	2286^{+797}_{-341}	863^{+8533}_{-665}

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

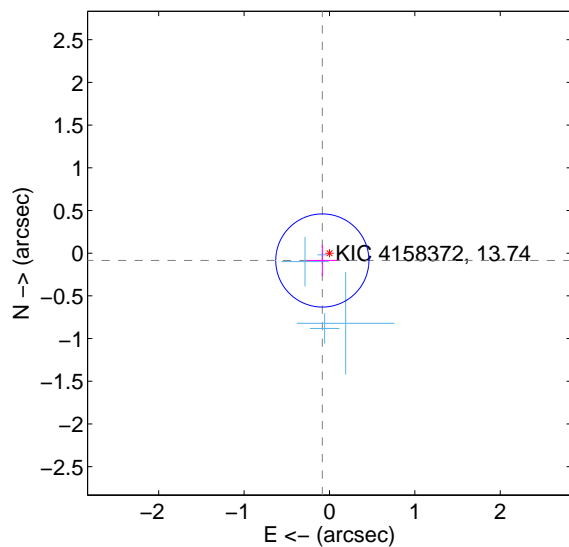
Supplemental centroid analysis for 004158372-09. Kepler magnitude: 13.74. Transit SNR -1.00

There are 4 quarters with good PRF difference image offsets

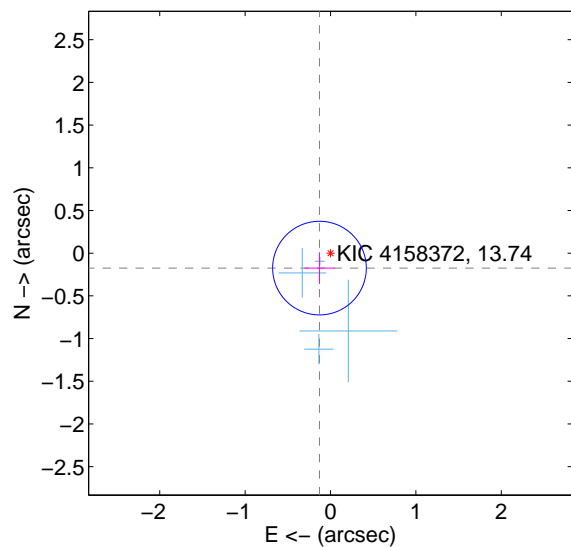
The direct PRF centroid is offset from the target star catalog position by about 0.09 arcsec

	Distance in arcsec	Distance / σ	Δ RA	Δ Dec
PRF-fit source offset from OOT	0.120 ± 0.182	0.66	0.084 ± 0.178	-0.086 ± 0.185
PRF-fit source offset from KIC position	0.217 ± 0.183	1.19	0.129 ± 0.178	-0.175 ± 0.185
photometric centroid source offset	0.35 ± 0.67	0.52	-0.17 ± 0.64	-0.30 ± 0.68

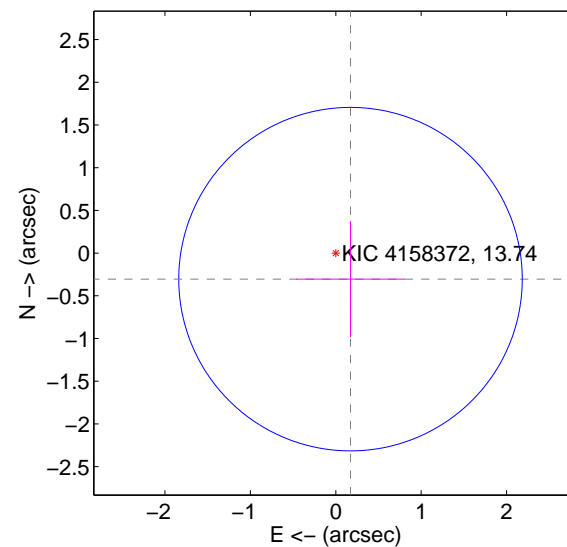
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position

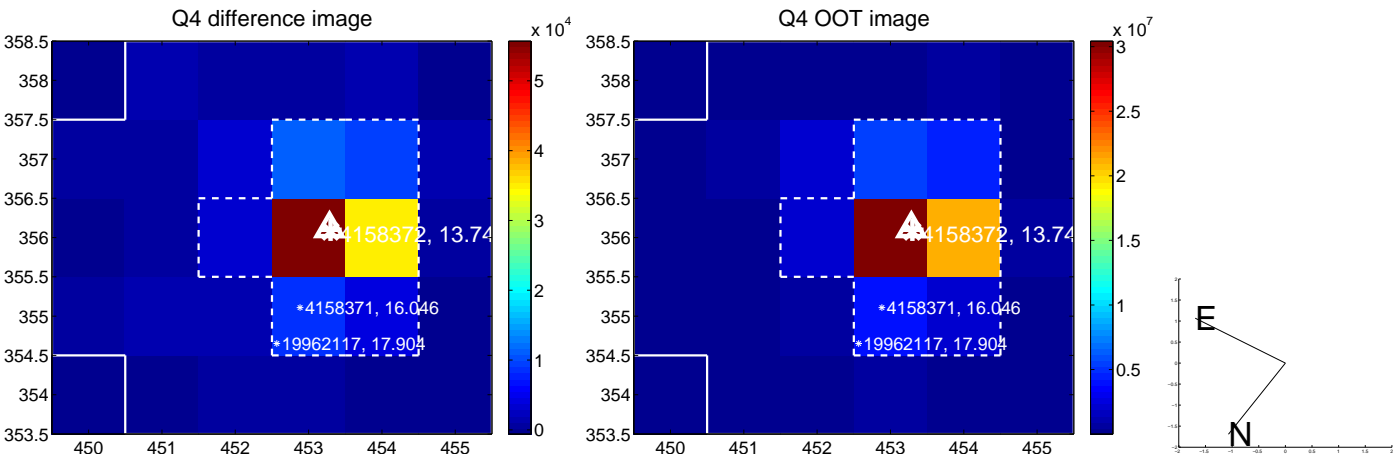


offset from photometric centroids

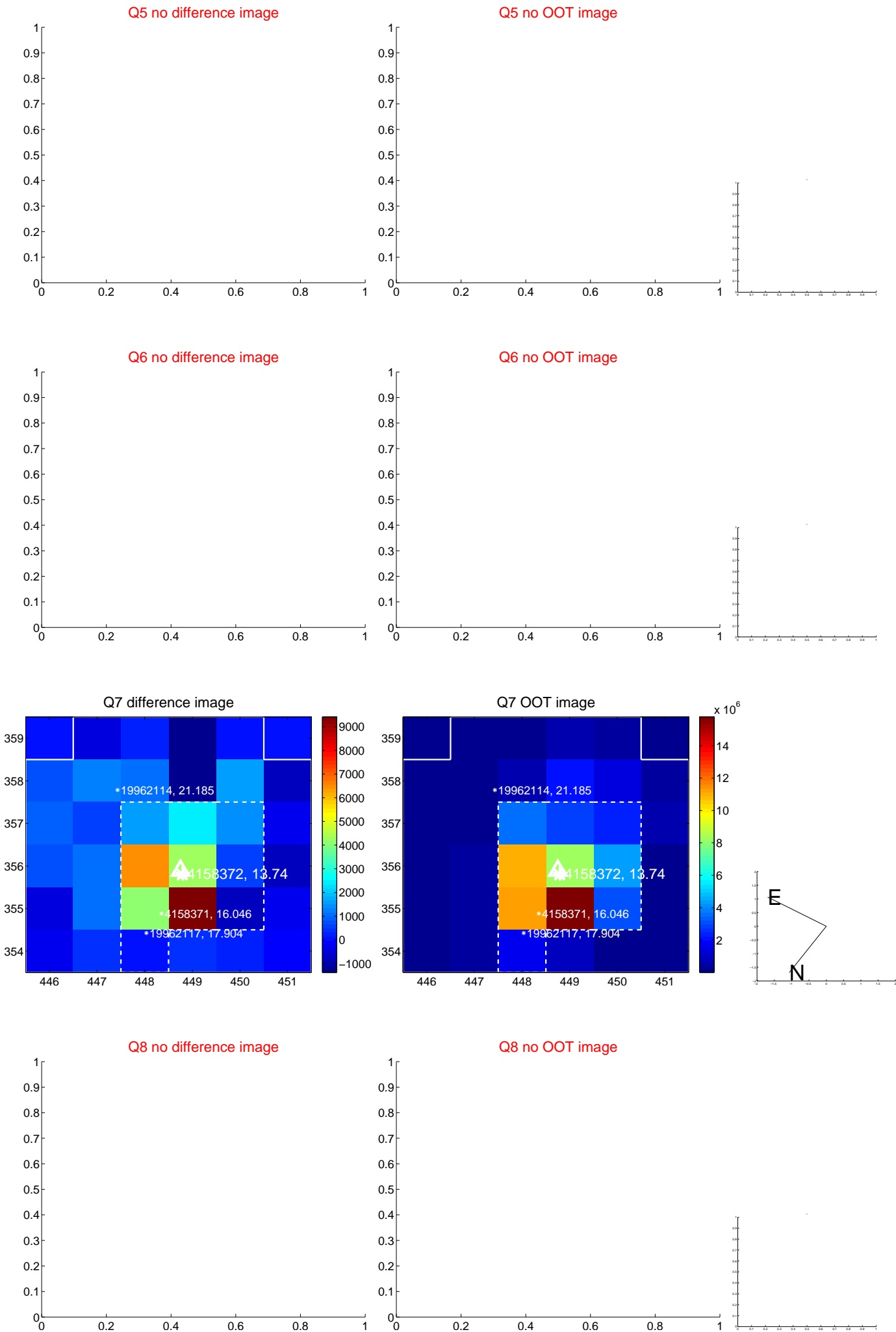


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets**; **Vermillion crosses: bad quarterly centroid offsets**; magenta cross: average over quarters. Length of the crosses: one- σ uncertainty. Blue circle: three-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

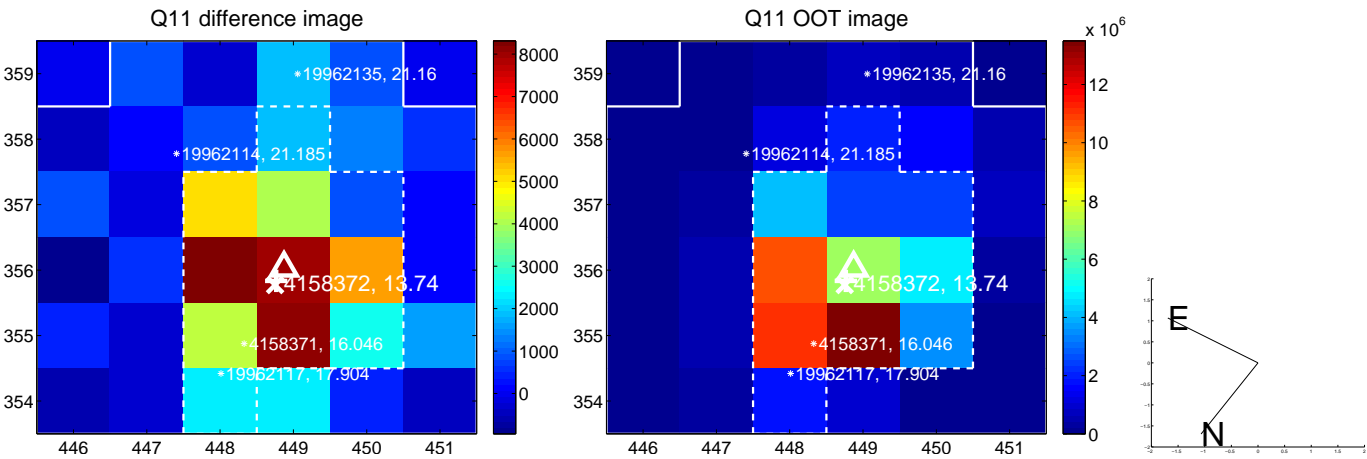
white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



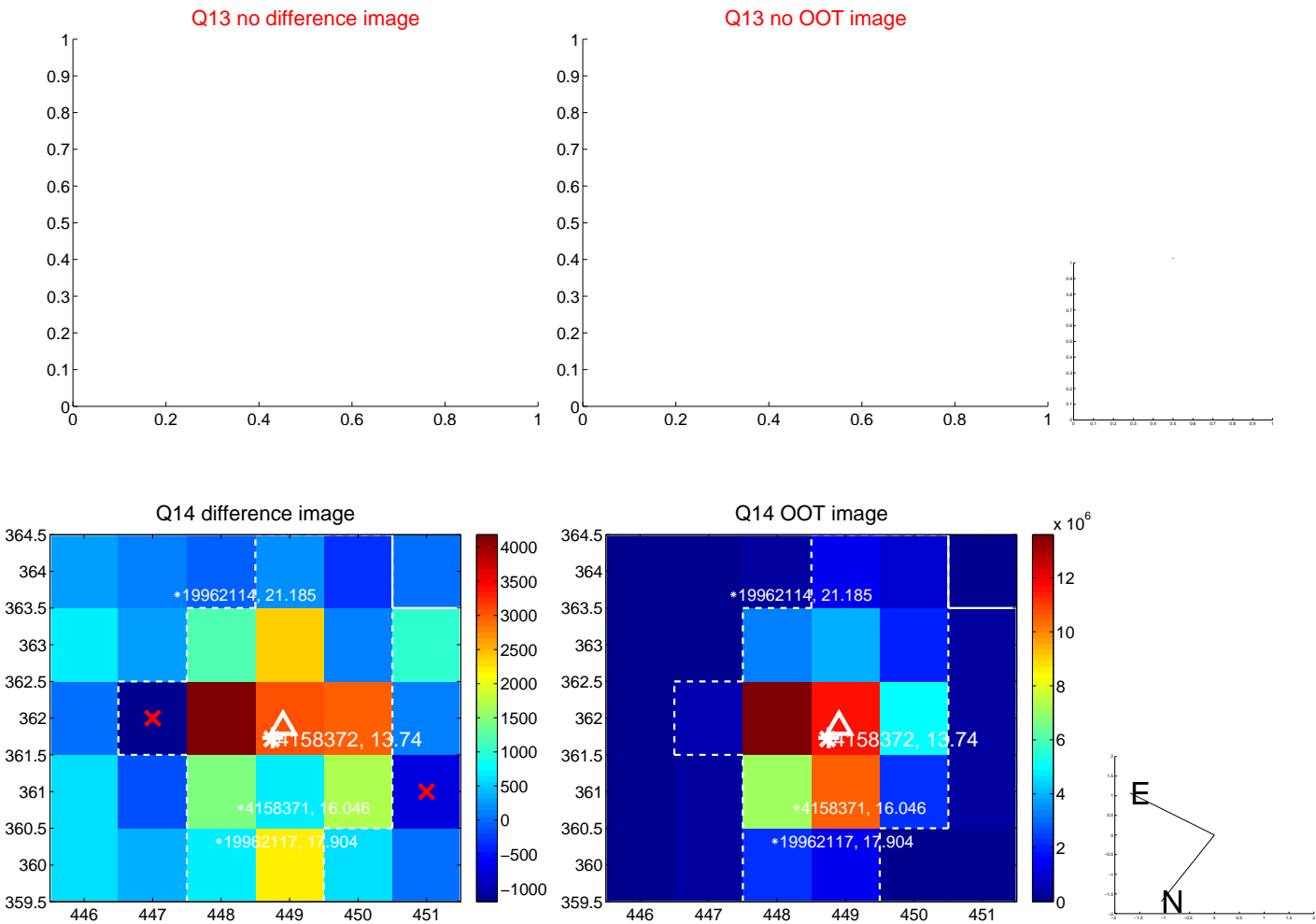
white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



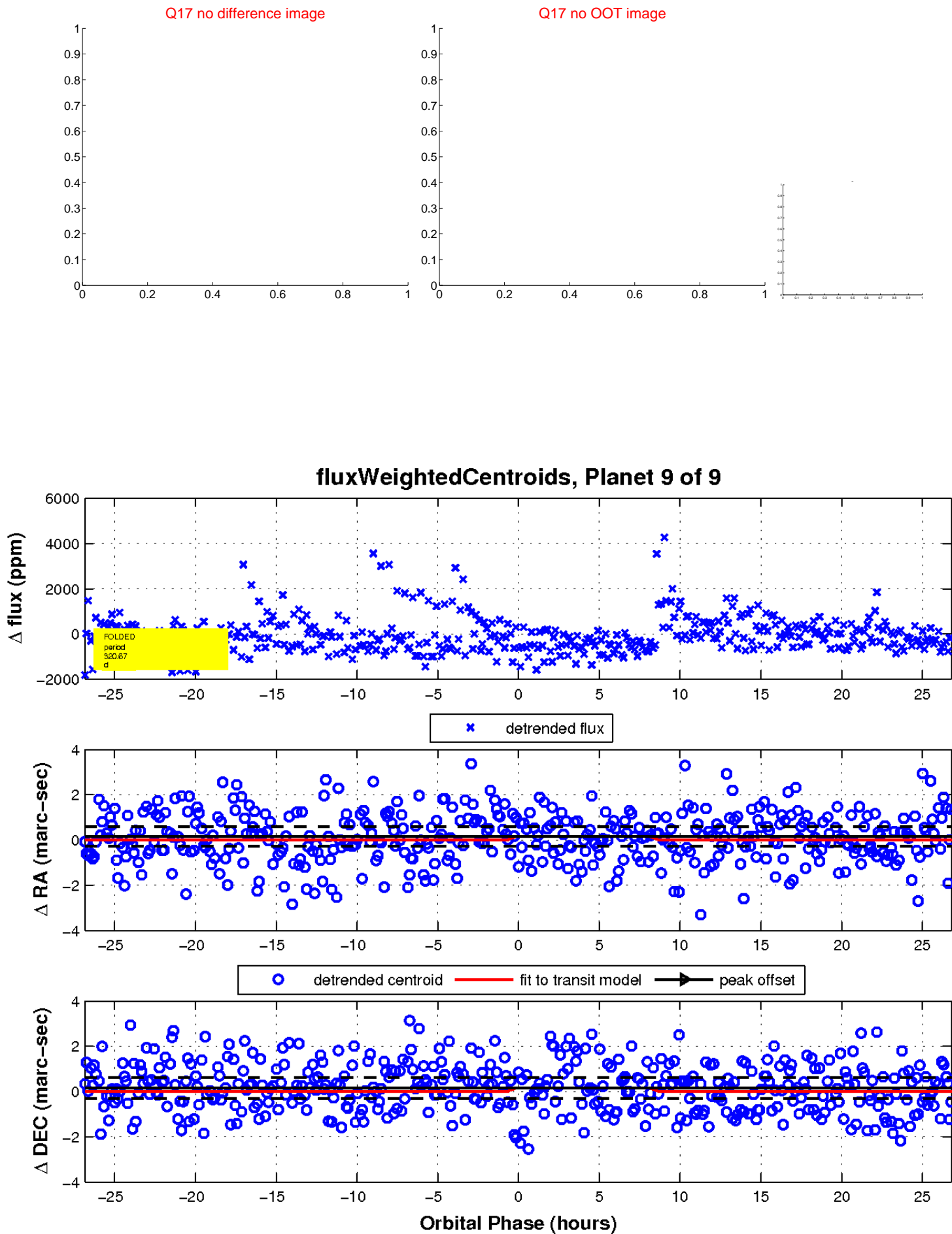
white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



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

