

KIC 009778156

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})
009778156-01	OBS	No	1.496271	131.533459	80.4	8.601	16.3	20.8	2.71	6899	4.73	16503.54
009778156-02	OBS	No	134.595940	228.390375	224.7	10.063	10.2	7.6	2.71	6899	4.68	40.95
009778156-03	OBS	No	320.159647	377.542023	331.1	16.036	8.6	7.5	2.71	6899	4.97	12.89
009778156-04	OBS	No	74.165540	197.605944	286.6	4.372	7.4	8.0	2.71	6899	5.29	90.64
009778156-05	OBS	No	92.185666	186.008532	271.5	3.410	9.4	8.8	2.71	6899	4.80	67.82
009778156-06	OBS	No	86.142373	217.359021	219.8	4.750	8.2	6.5	2.71	6899	4.53	74.24
009778156-07	OBS	No	102.590867	209.562276	106.5	11.475	7.7	3.0	2.71	6899	3.02	58.81

Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009778156-01	OBS	FP	0.00	1	0	0	0	LPP_DV
009778156-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—INCONSISTENT_TRANS
009778156-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_MARSHALL—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS
009778156-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT
009778156-05	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_CHASES—TRANS_GAPPED—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT
009778156-06	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_POS_ALT
009778156-07	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT

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

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

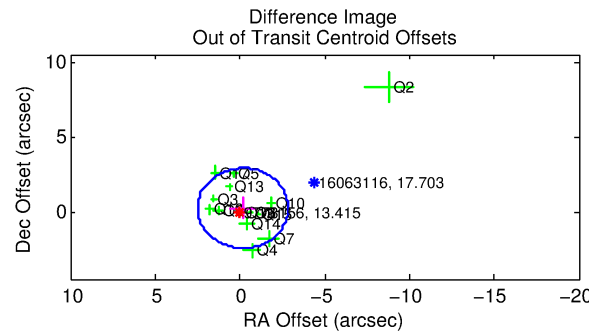
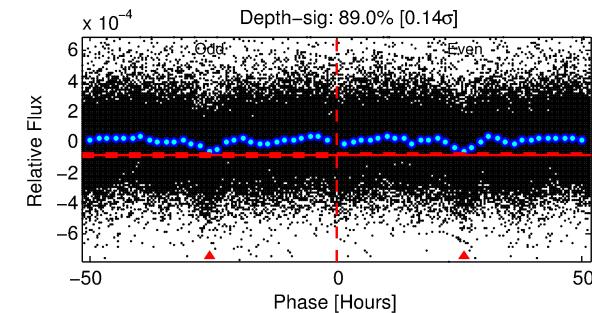
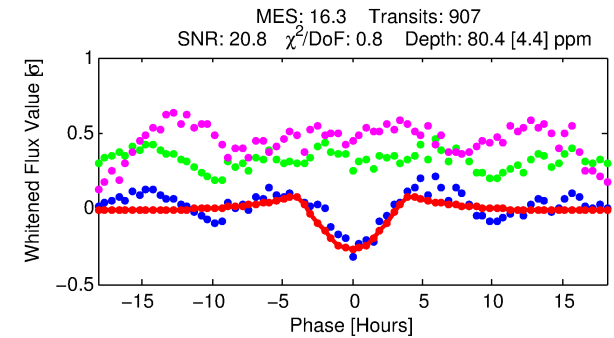
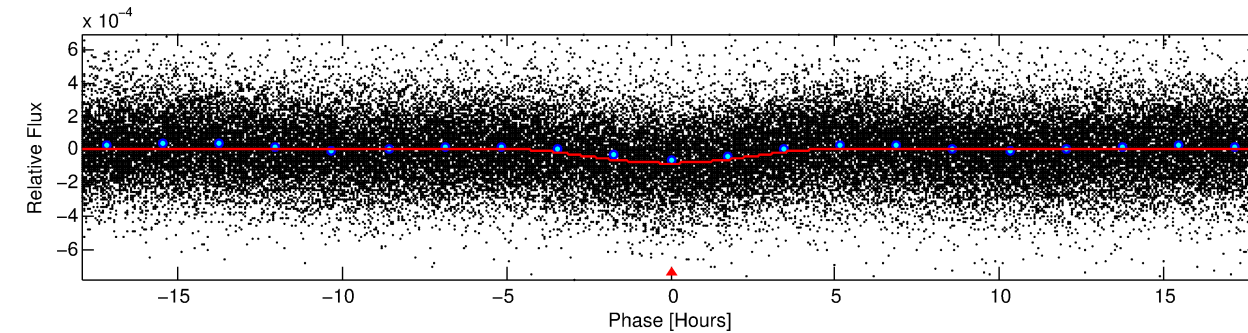
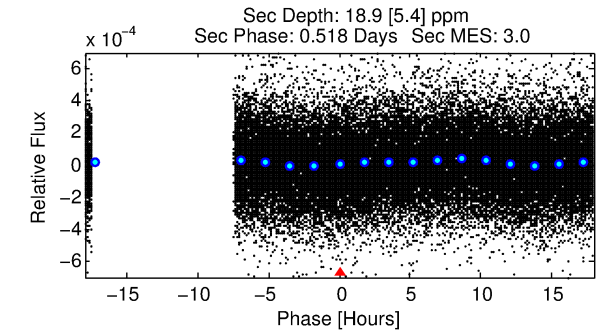
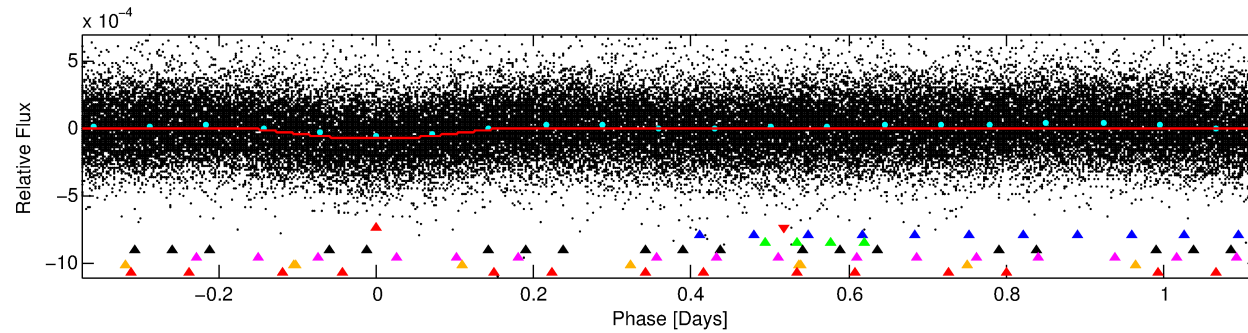
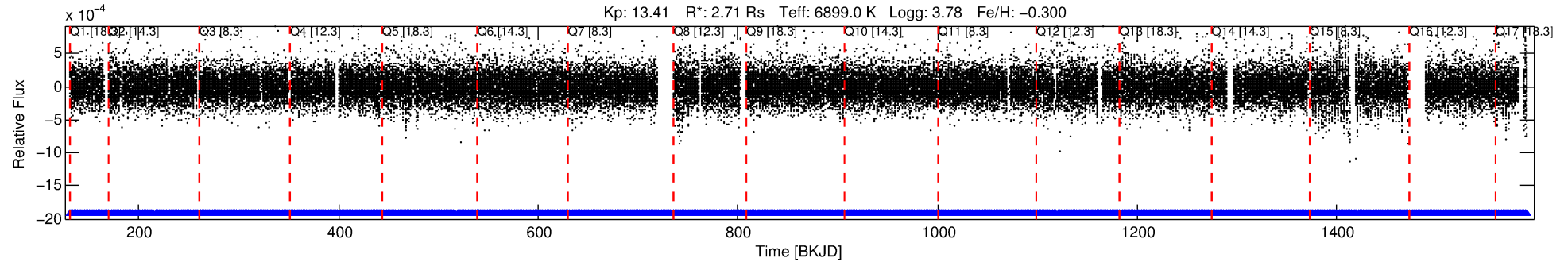
See http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col for comment definitions.

Ephemeris Match Information For 009778156-01

No Significant Match Found

DV One-Page Summary

KIC: 9778156 Candidate: 1 of 7 Period: 1.496 d



DV Fit Results:

Period = 1.49627 [0.00001] d
Epoch = 131.5335 [0.0057] BKJD
Rp/R* = 0.0160 [0.0132]
a/R* = 1.03 [0.00]
b = 1.00 [0.02]
Seff = 16503.54 [9254.52]
Teq = 2890 [405] K
Rp = 4.73 [4.30] Re
a = 0.0300 [0.0105] AU
Ag = 0.42 [0.74] [-0.79σ]
Teffp = 3595 [1509] K [0.45σ]

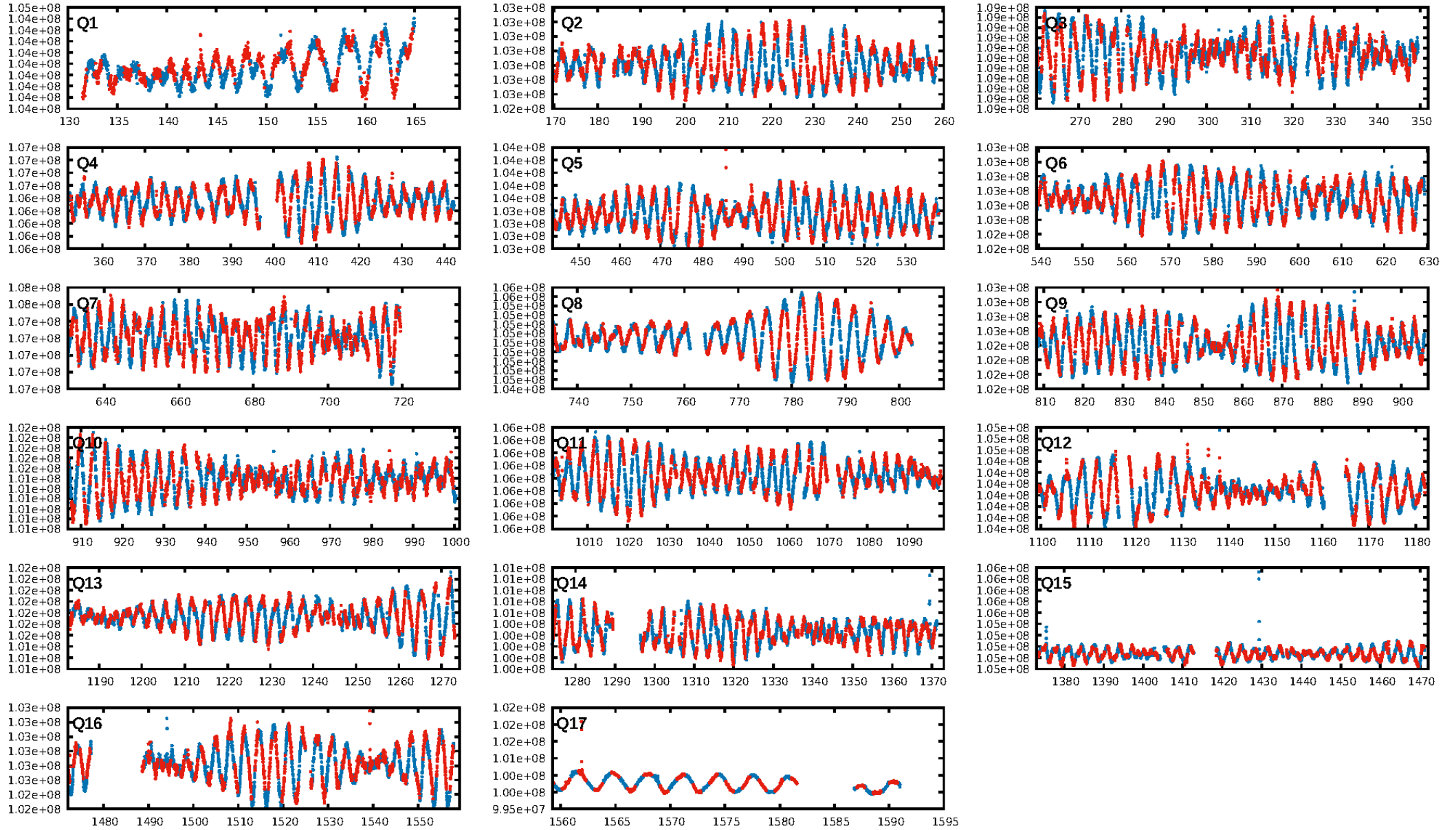
DV Diagnostic Results:

ShortPeriod-sig: N/A
LongPeriod-sig: 100.0% [180.77σ]
ModelChiSquare2-sig: N/A
ModelChiSquareGoF-sig: N/A
Bootstrap-pfa: 6.02e-36
RollingBand-fgt: 1.00 [866/866]
GhostDiagnostic-chr: 2.764
Centroid-sig: 0.5%
Centroid-so: 0.512 arcsec [1.94σ]
OotOffset-rm: 0.285 arcsec [0.32σ]
KicOffset-rm: 0.325 arcsec [0.40σ]
OotOffset-st: 4/3/4/3 [14]
KicOffset-st: 4/3/4/3 [14]
DiffImageQuality-fgm: 0.93 [13/14]
DiffImageOverlap-fno: 1.00 [17/17]

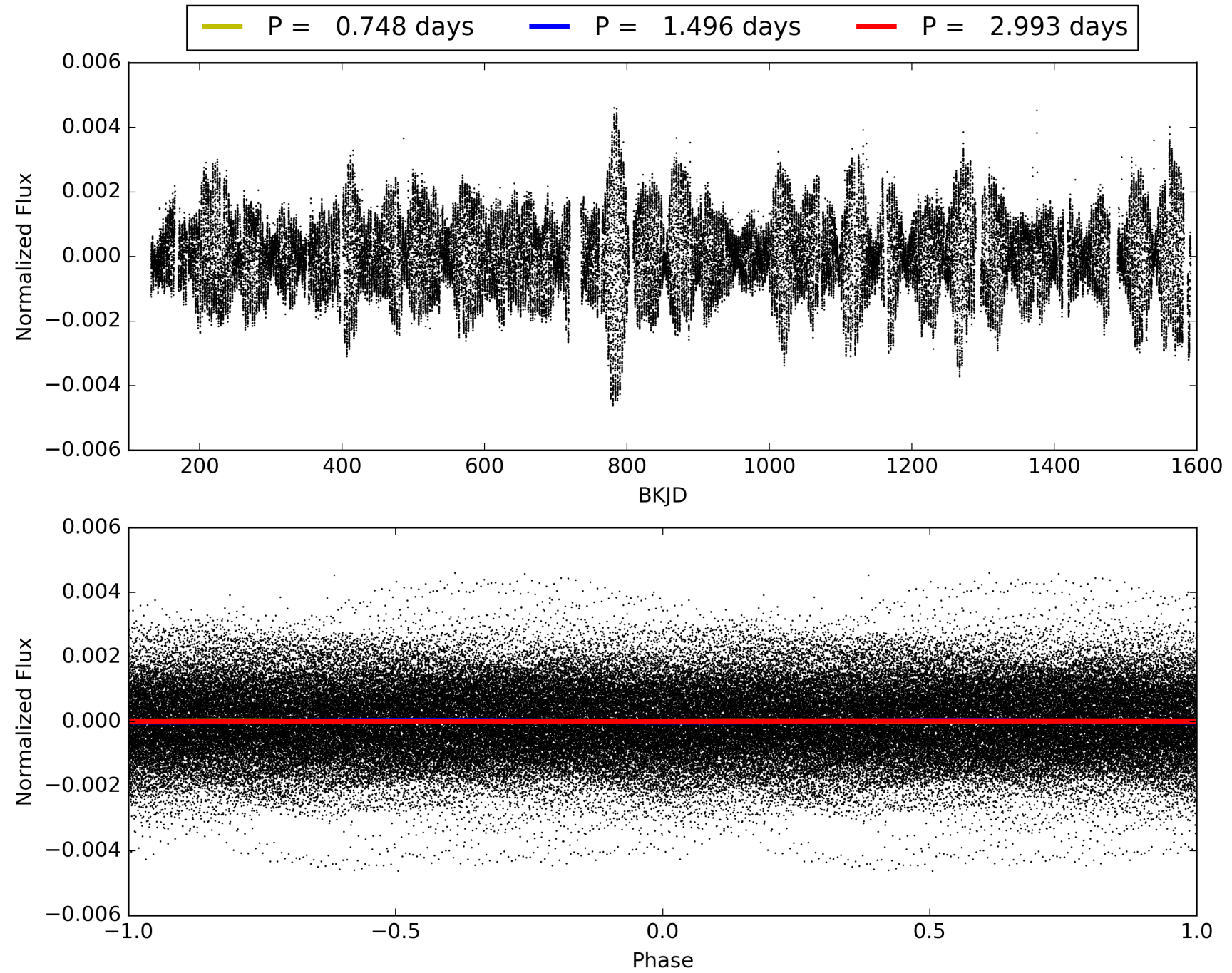
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 30-Jan-2016 20:46:30 Z

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

TCE 009778156-01, PDC Light Curves

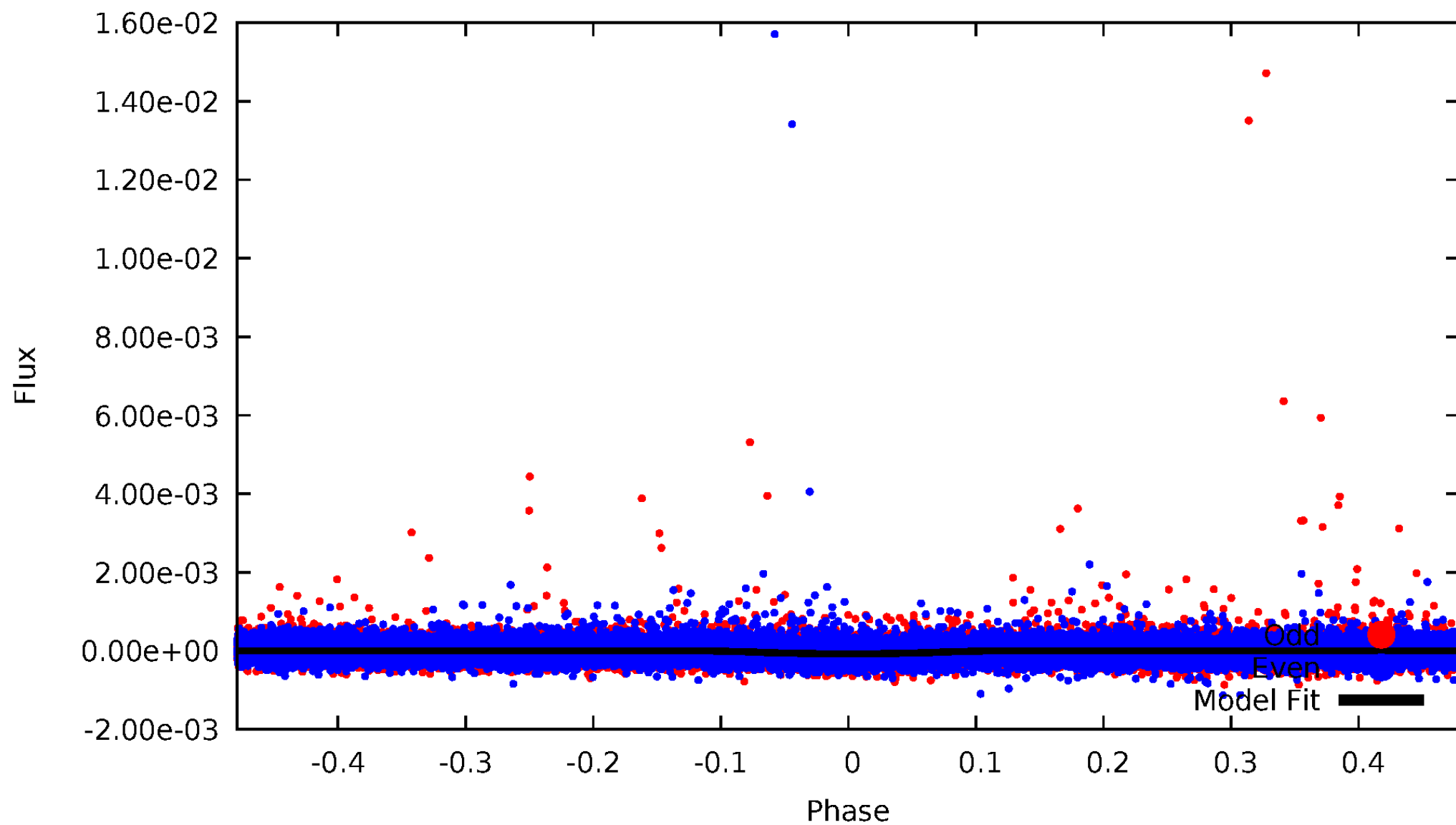


TCE 009778156-01



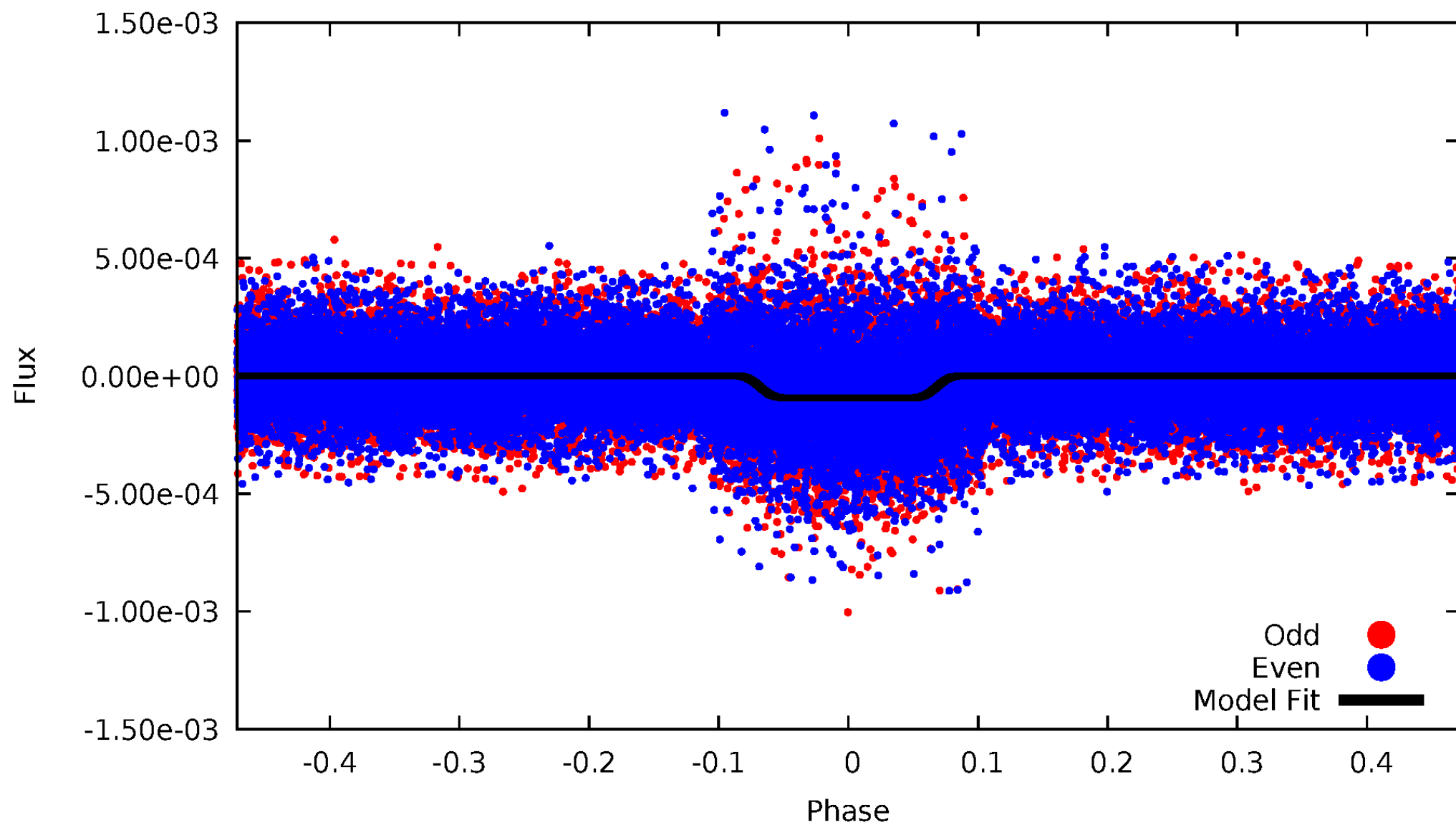
DV Odd/Even

TCE 009778156-01

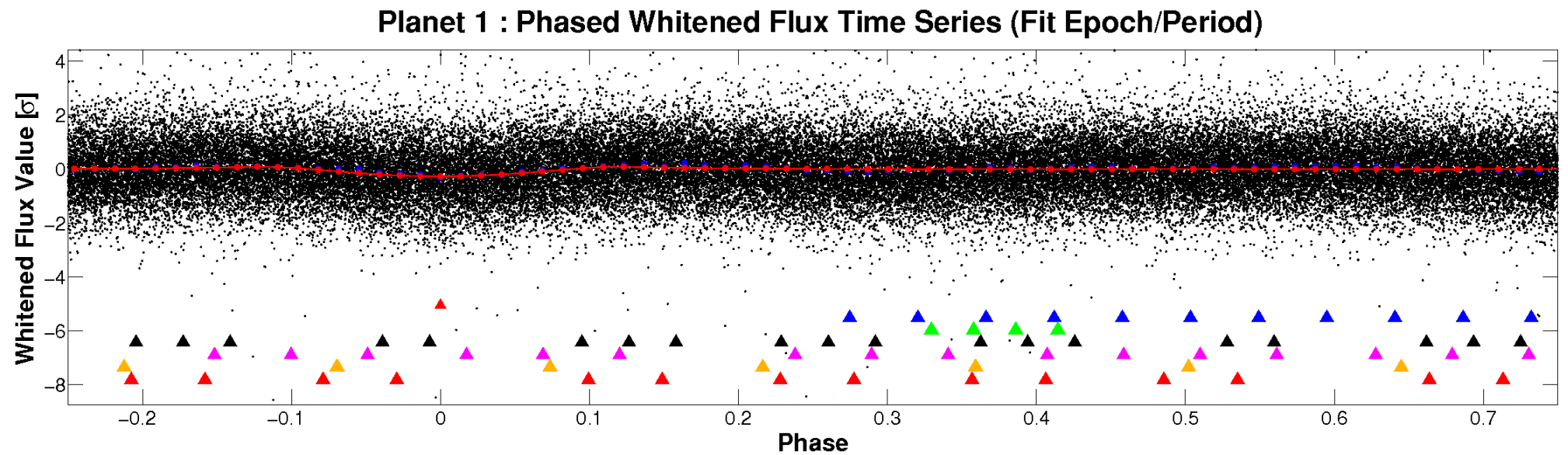
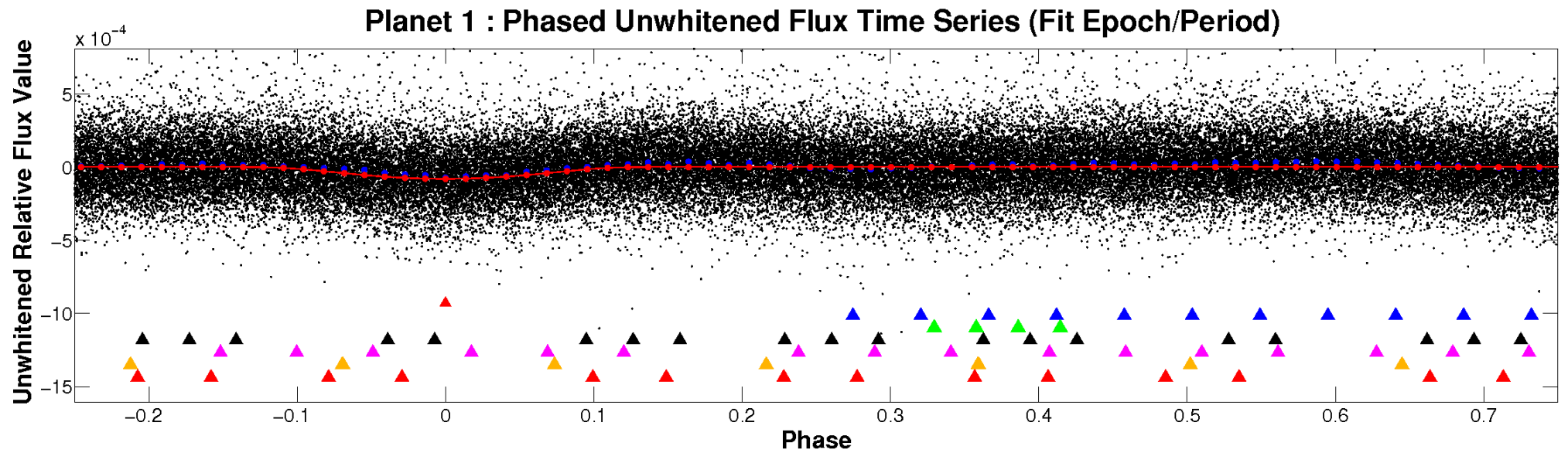


ALT Odd/Even

TCE 009778156-01

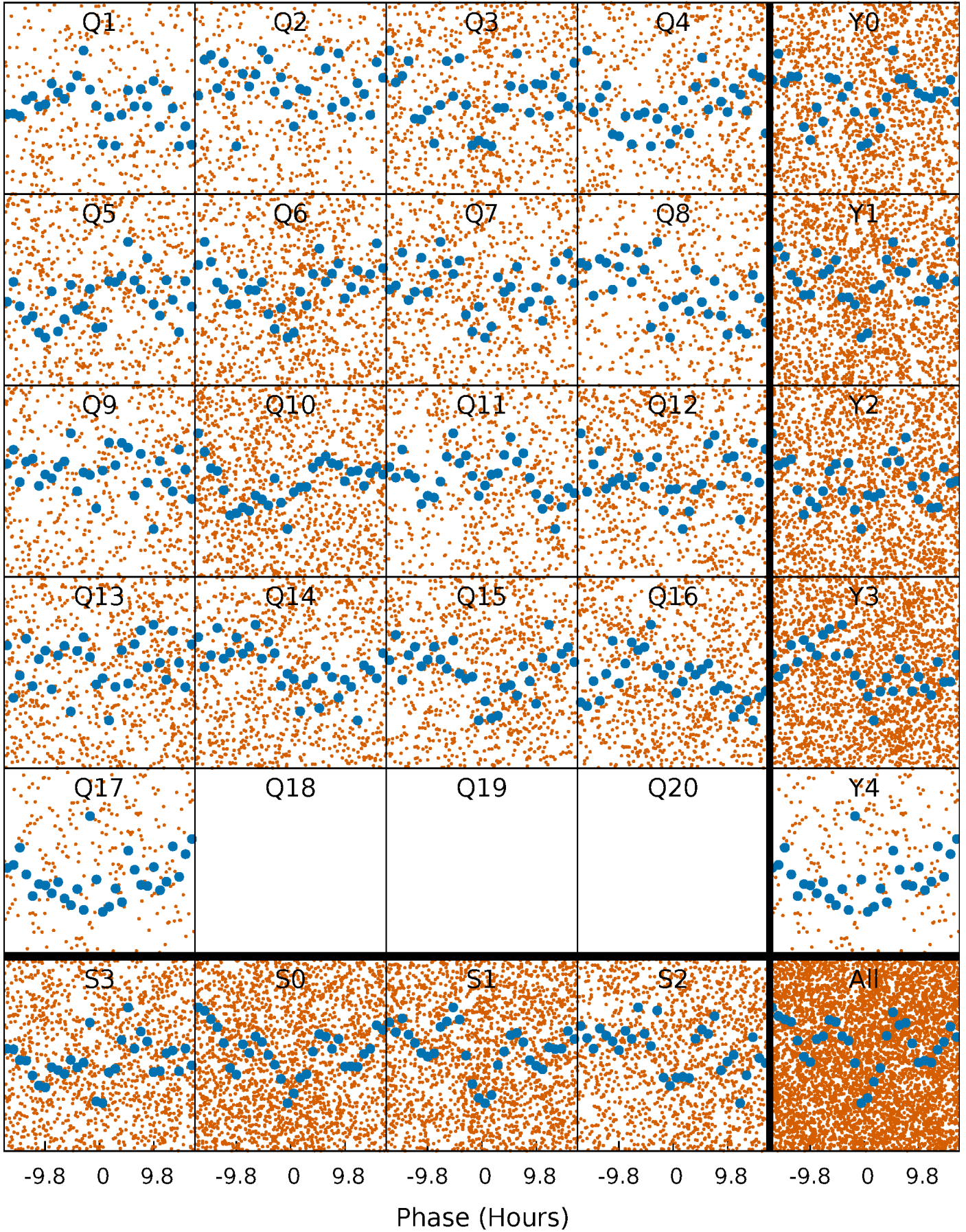


Non-Whitened Vs. Whitened Light Curve



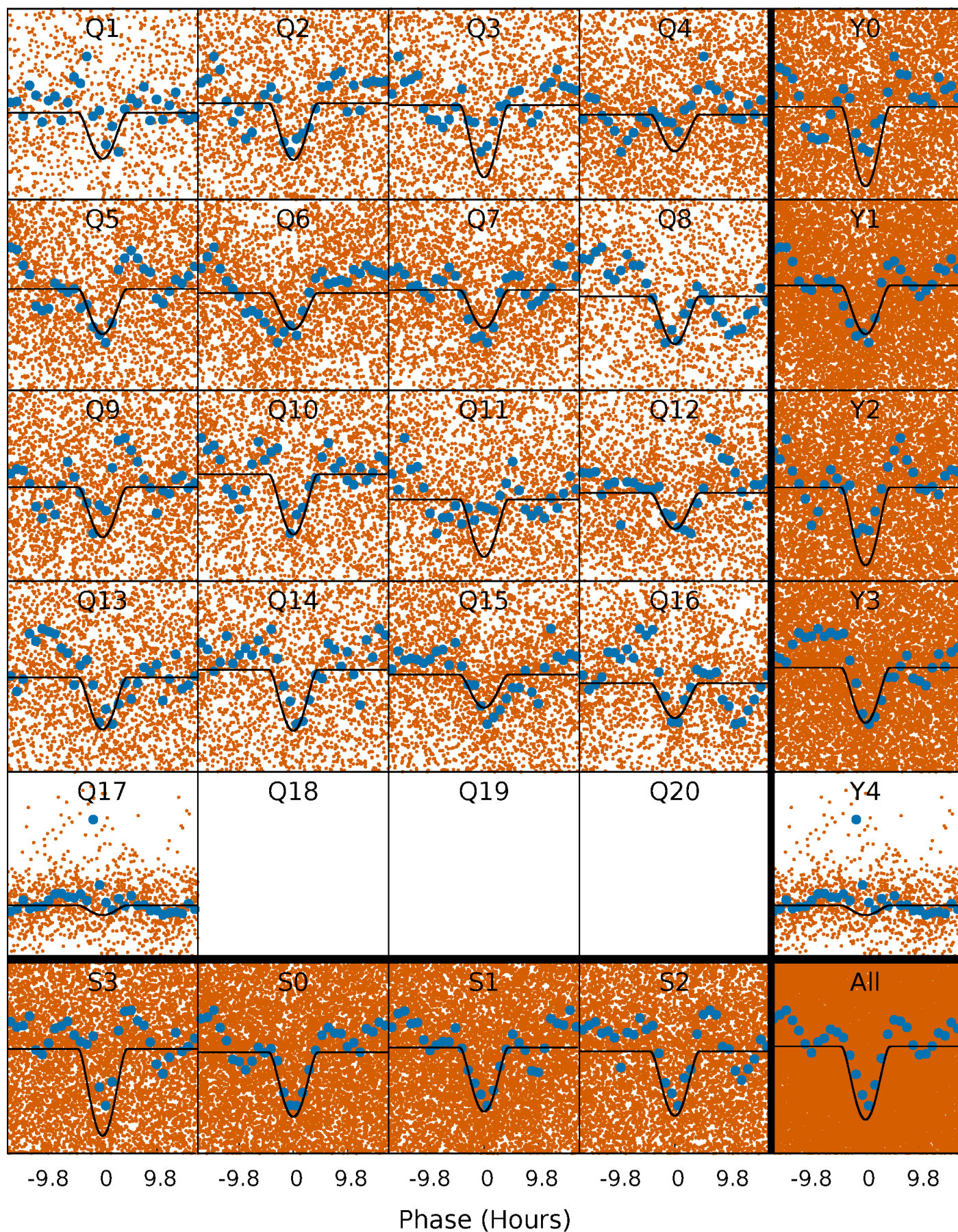
PDC Quarter-Phased Transit Curves

TCE 009778156-01 P= 1.496271 Days $T_0=131.533459$ (BKJD)



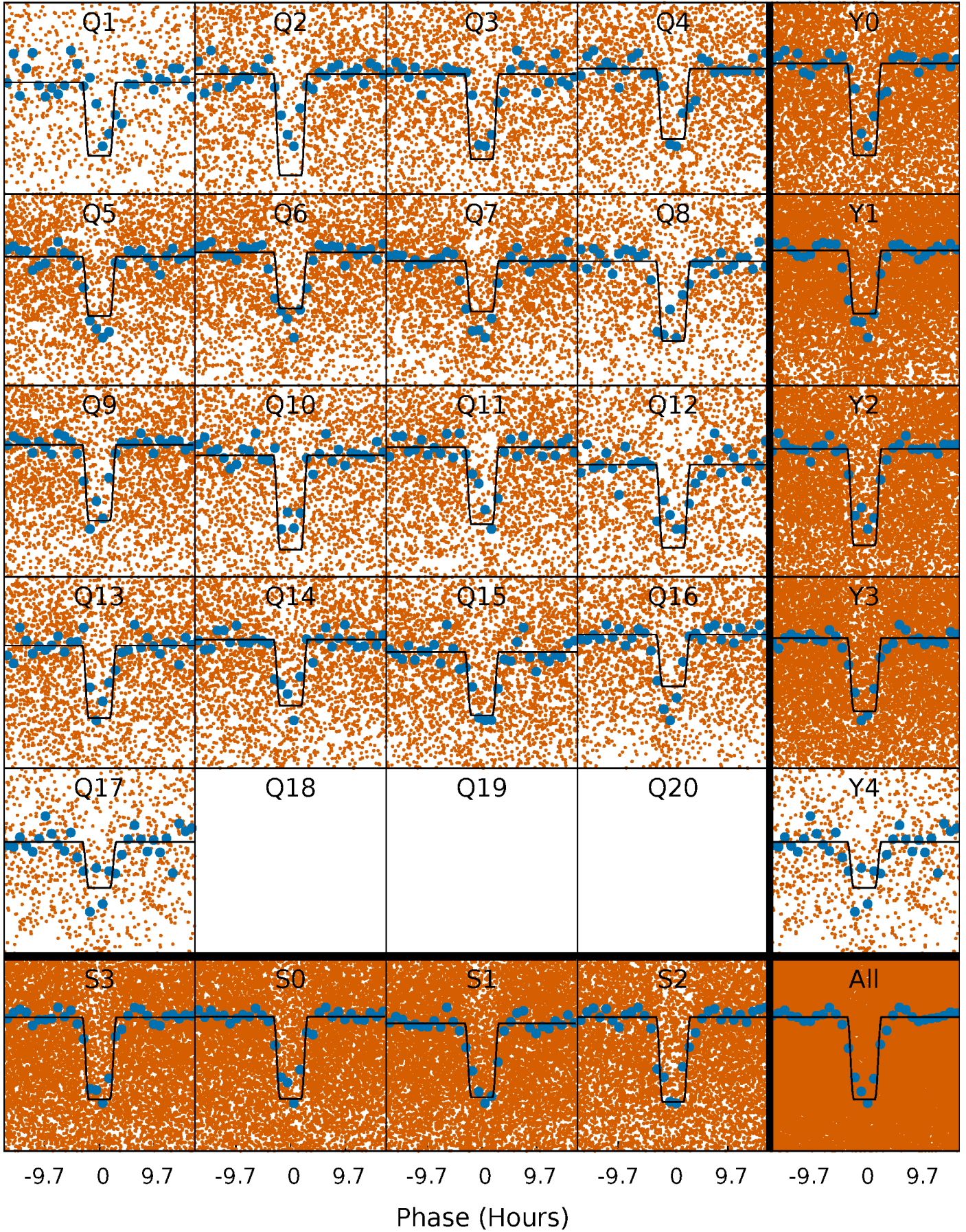
DV Quarter-Phased Transit Curves

TCE 009778156-01 P= 1.496271 Days $T_0=131.533459$ (BKJD)



Alt. Detrend Quarter-Phased Transit Curves

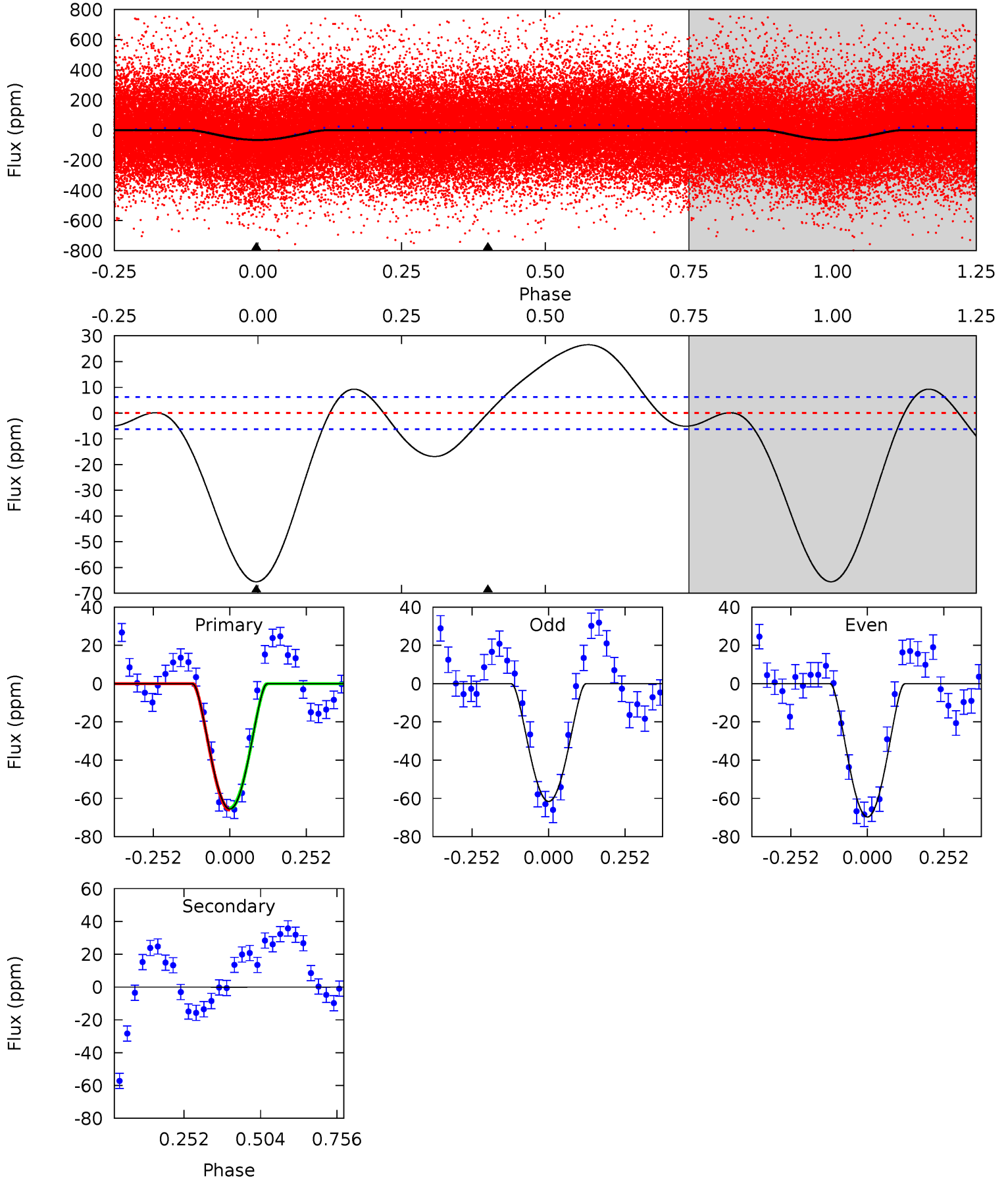
TCE 009778156-01 P= 1.496327 Days $T_0=131.513719$ (BKJD)



DV Model-Shift Uniqueness Test

009778156-01, P = 1.496271 Days, E = 130.037188 Days

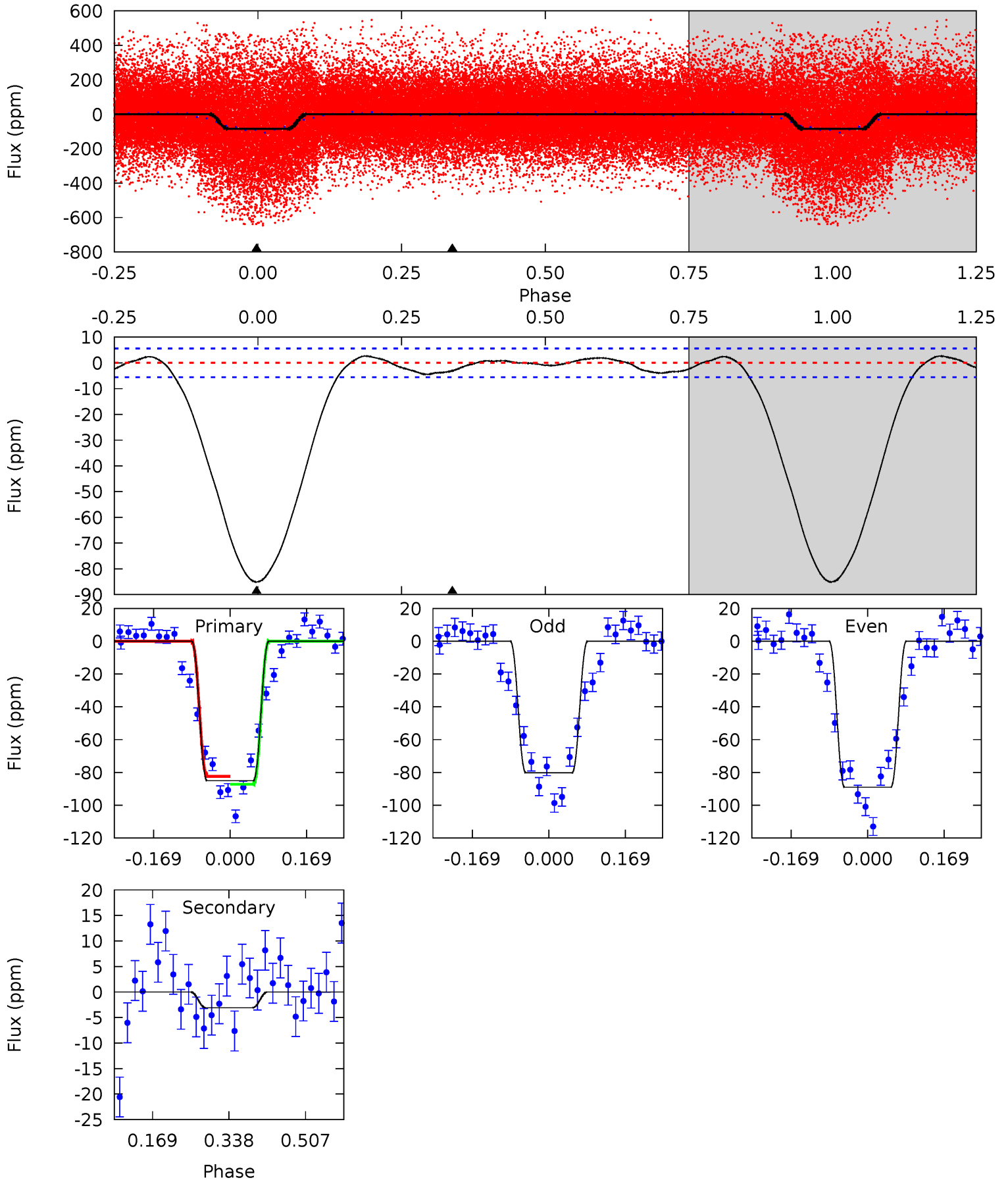
Pri	Sec	Ter	Pos	FA ₁	FA ₂	F _{Red}	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
45.9	0.05	0	0	4.37	1.15	4.29	45.9	45.9	0.05	0.05	2.83	0.93	0.29	0.27



Alt Model-Shift Uniqueness Test

009778156-01, P = 1.496327 Days, E = 130.017392 Days

Pri	Sec	Ter	Pos	FA ₁	FA ₂	F _{Red}	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
68.0	2.46	0	0	4.45	1.38	1.63	68.0	68.0	2.46	2.46	3.52	1.01	0.03	1.95



Stellar Parameters For KIC 009778156

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	6899^{+190}_{-238}	$3.780^{+0.312}_{-0.078}$	$-0.300^{+0.300}_{-0.250}$	$2.706^{+0.417}_{-1.043}$	$1.607^{+0.199}_{-0.369}$	$0.114^{+0.260}_{-0.035}$
	+3%/-3%	+8%/-2%	+100%/-83%	+15%/-39%	+12%/-23%	+227%/-31%
Source	PHO1	FLK73	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 009778156-01 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	A_{obs}
DV	-0±1	$4.88^{+4.10}_{-2.82}$	3938^{+227}_{-387}	-3637^{+302}_{-180}	$0.001^{+0.044}_{-0.033}$
Alt.	-3±1	$3.79^{+3.37}_{-2.58}$	3943^{+214}_{-350}	-3320^{+7421}_{-318}	$0.101^{+0.878}_{-0.074}$

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 $A_{obs} \gg 1.0$

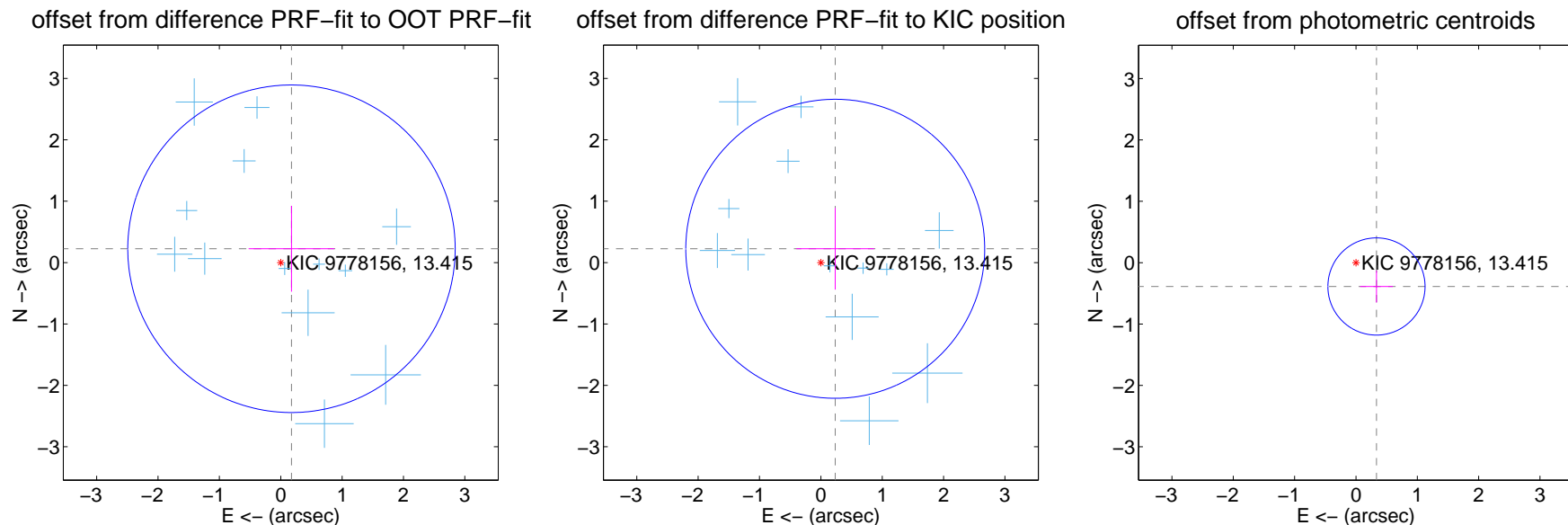
DV Centroid Data

Supplemental centroid analysis for 009778156-01. Kepler magnitude: 13.41. Transit SNR 20.83

There are 13 quarters with good PRF difference image offsets

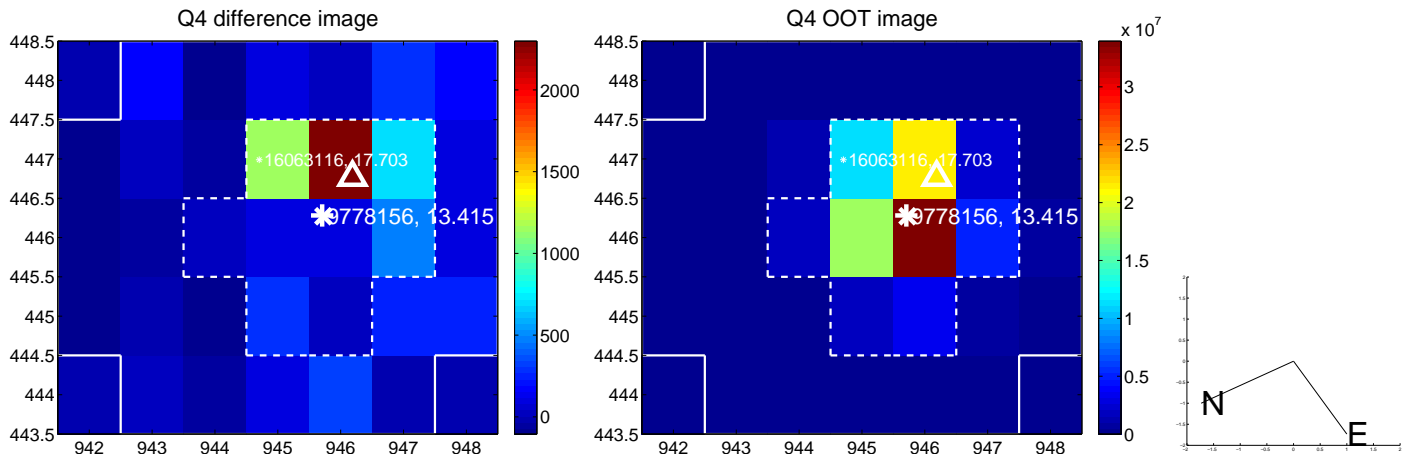
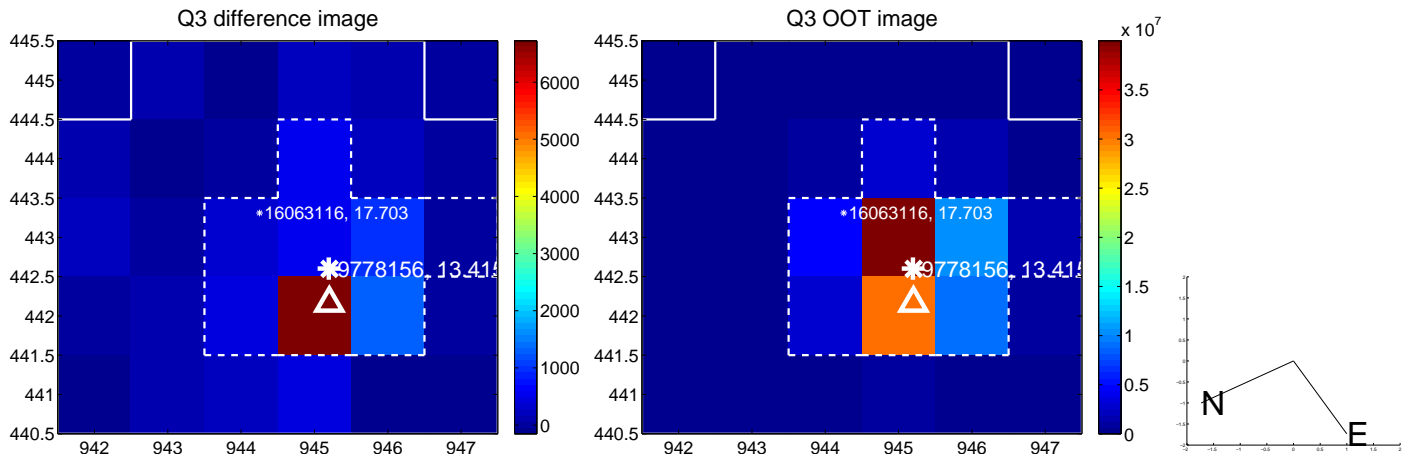
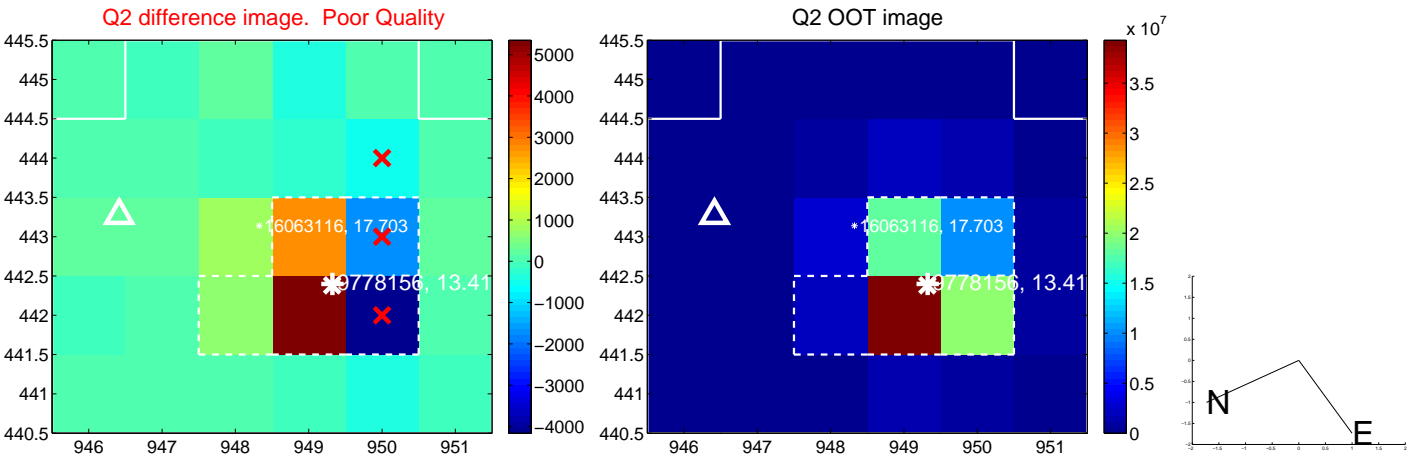
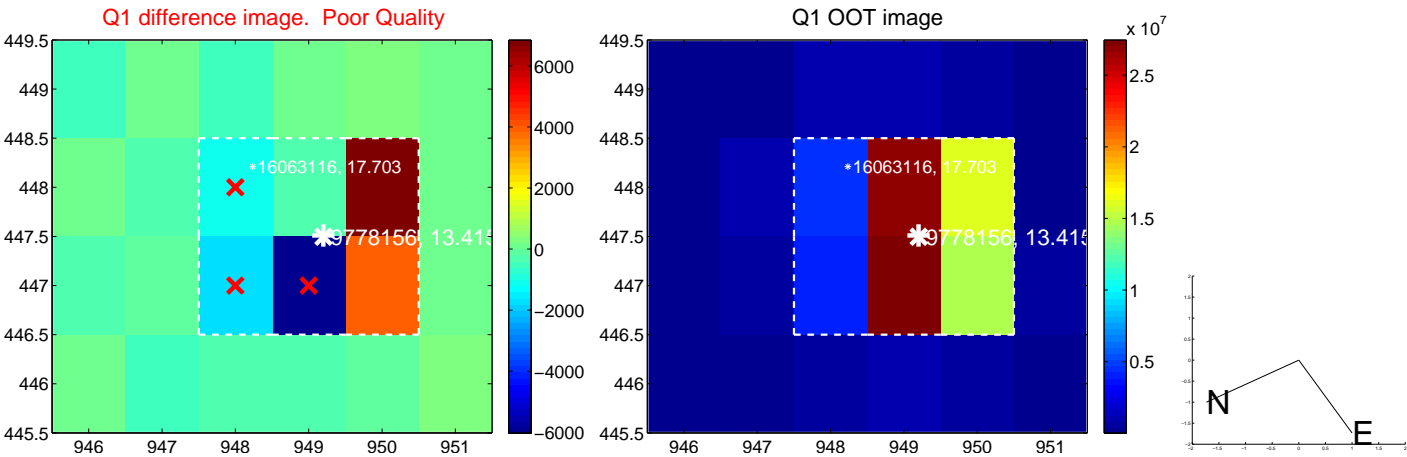
The direct PRF centroid is offset from the target star catalog position by about 0.05 arcsec

	Distance in arcsec	Distance / σ	Δ RA	Δ Dec
PRF-fit source offset from OOT	0.285 ± 0.889	0.32	-0.175 ± 0.699	0.225 ± 0.699
PRF-fit source offset from KIC position	0.325 ± 0.812	0.40	-0.234 ± 0.634	0.225 ± 0.665
photometric centroid source offset	0.51 ± 0.26	1.94	-0.33 ± 0.27	-0.39 ± 0.26

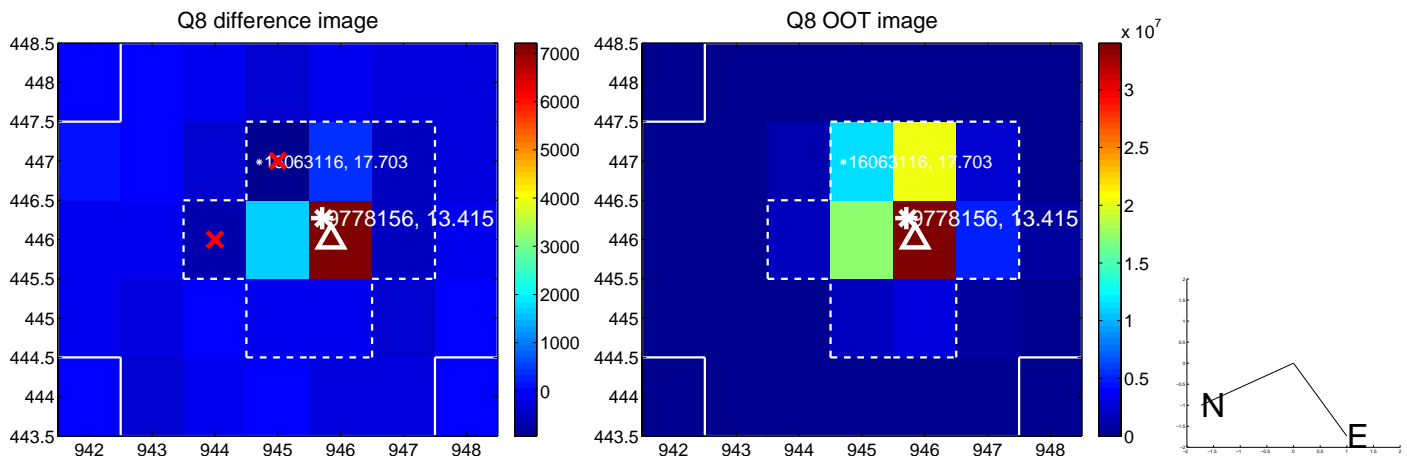
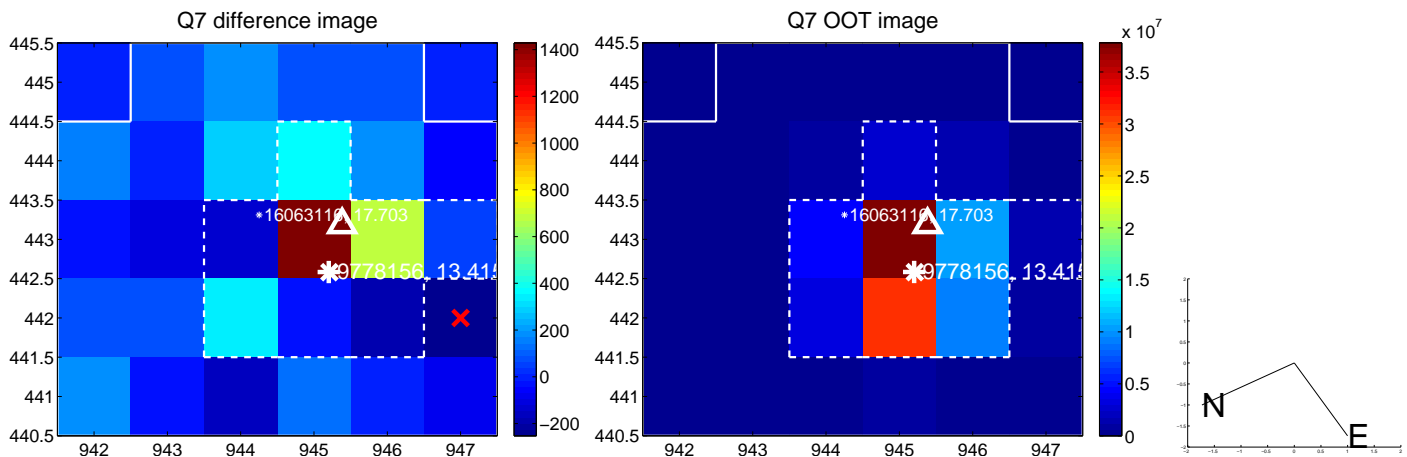
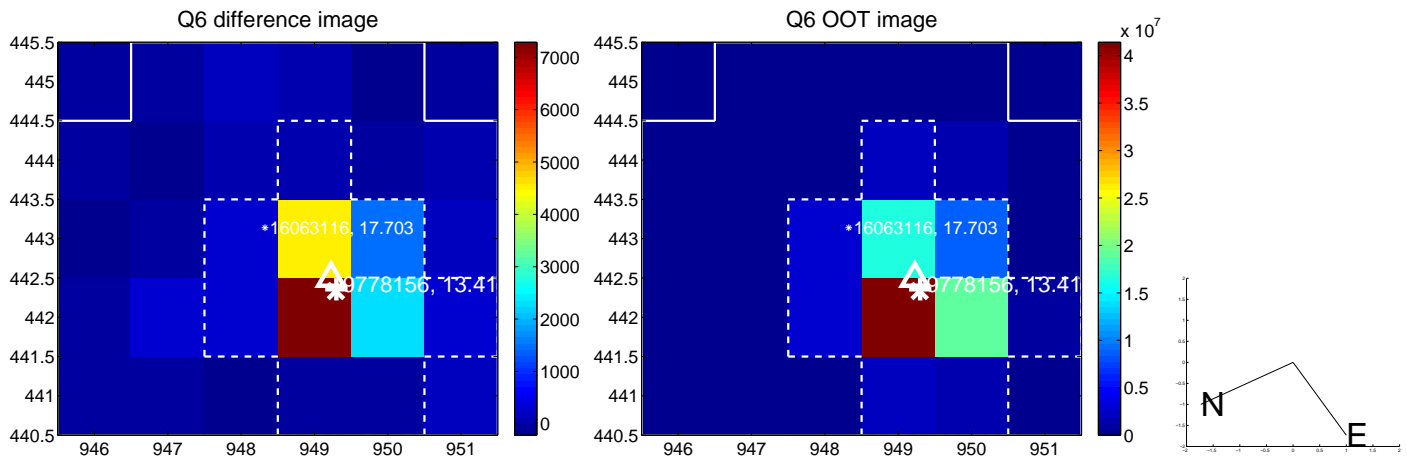
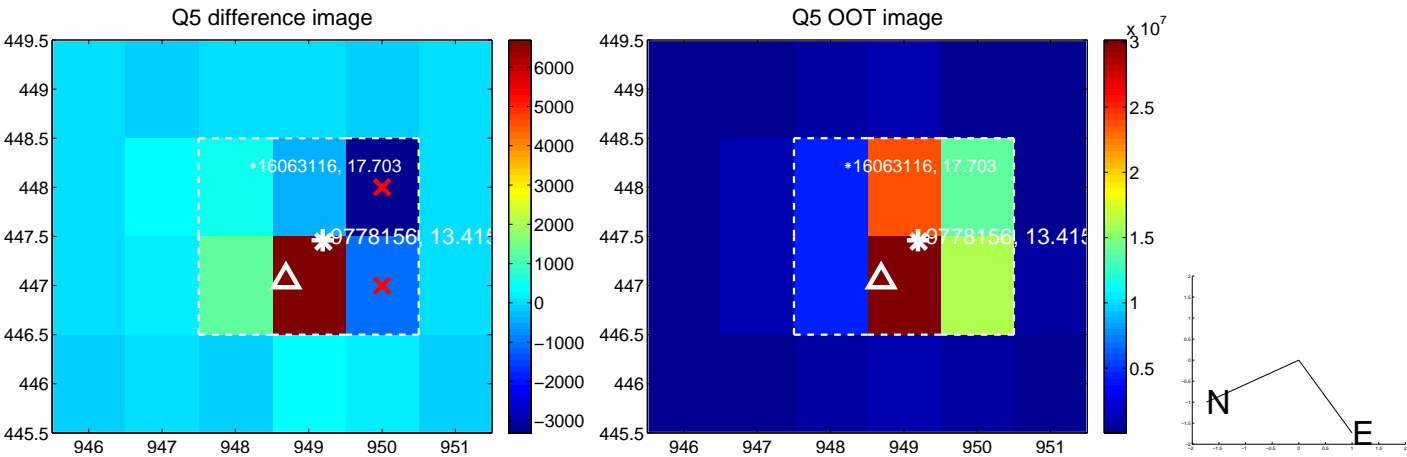


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses:** good quarterly centroid offsets; **Vermillion crosses:** bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- σ uncertainty. Blue circle: three-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

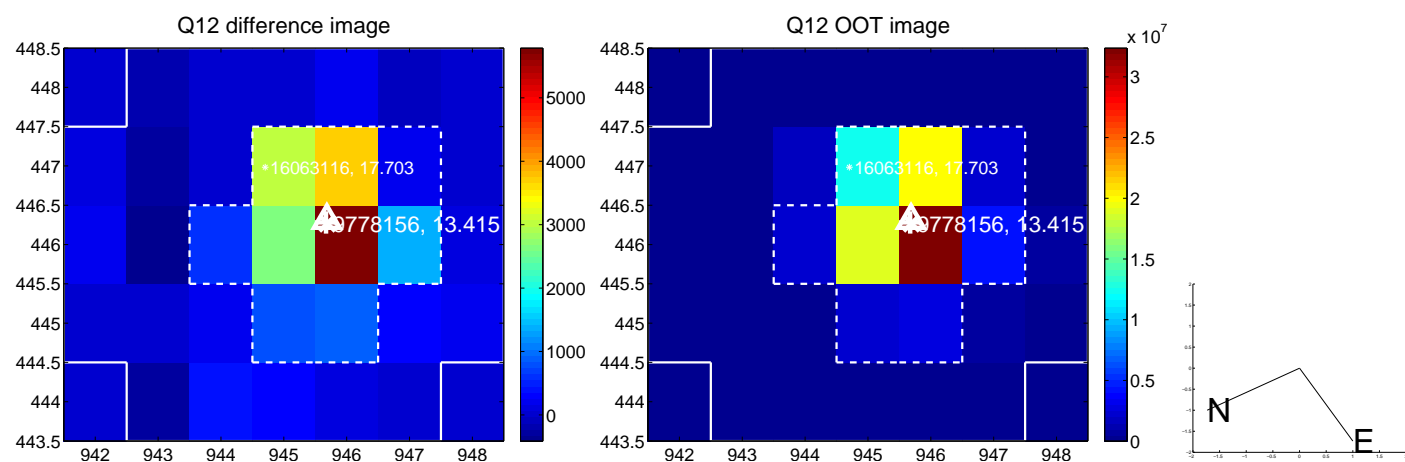
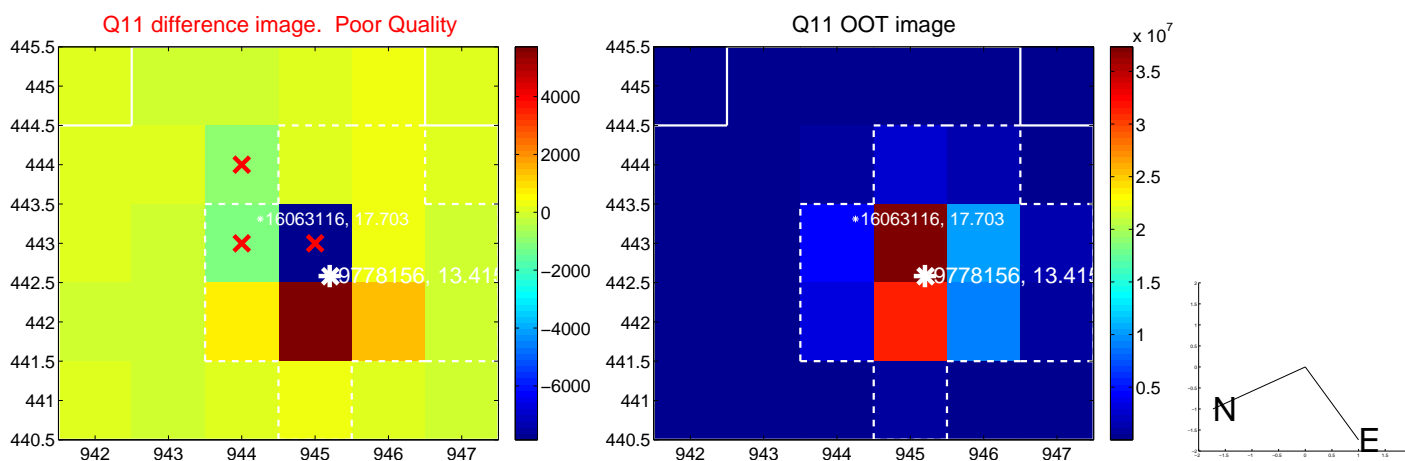
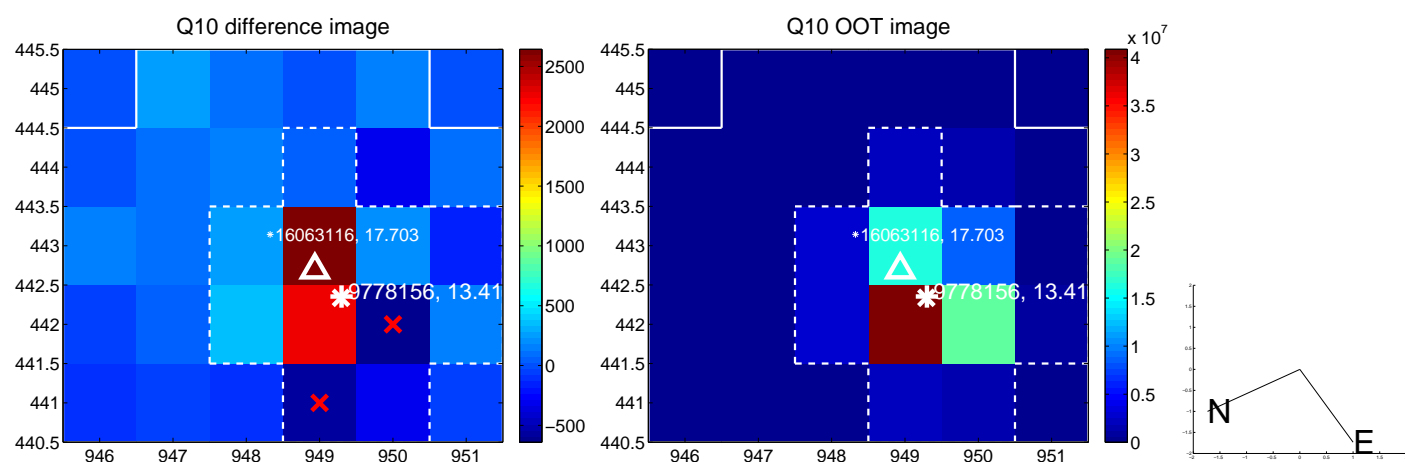
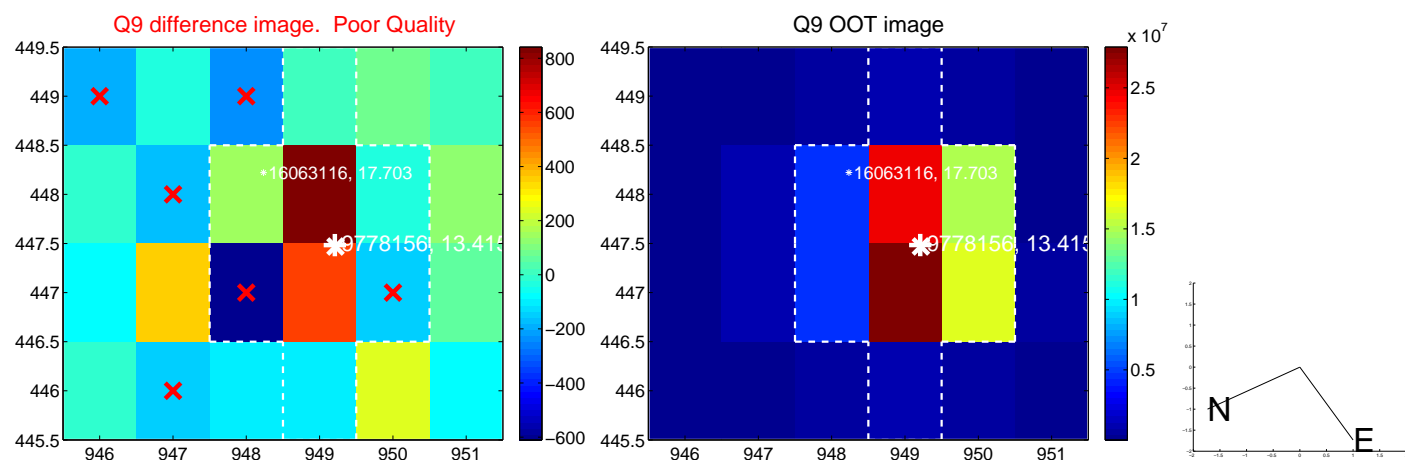
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



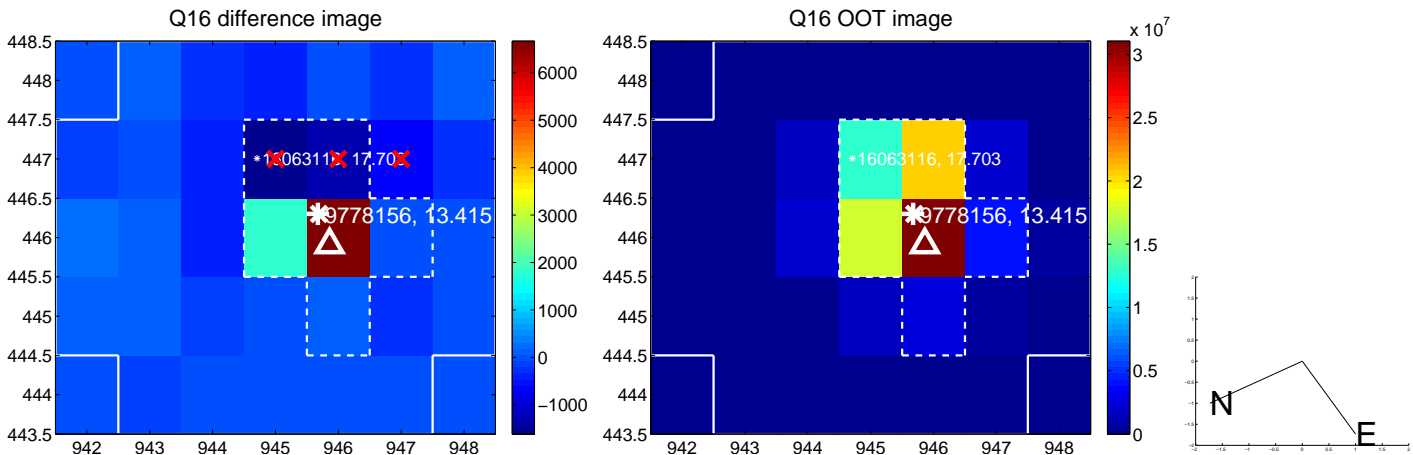
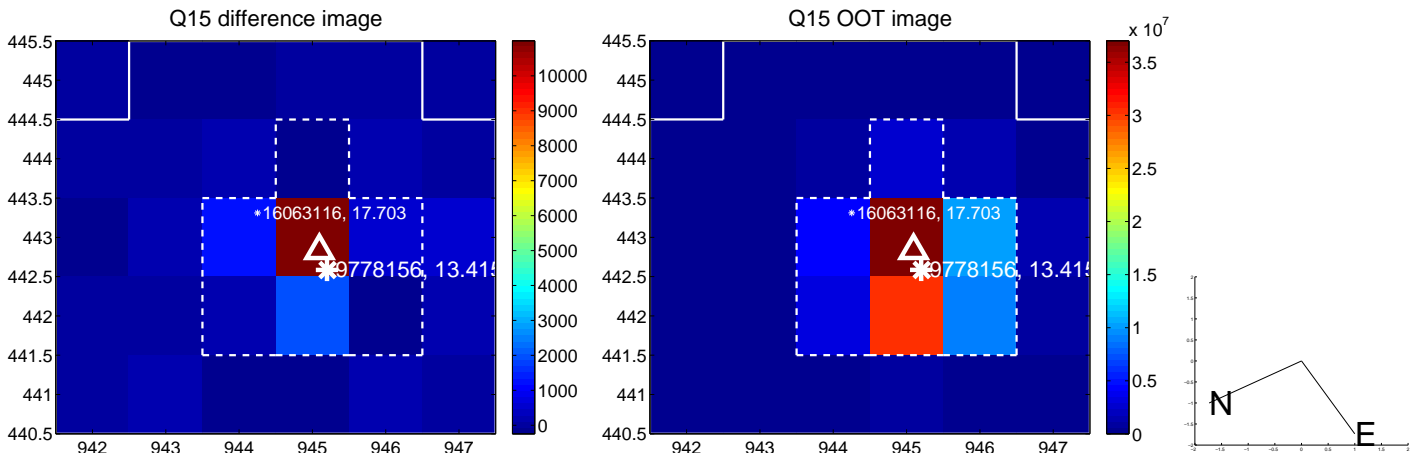
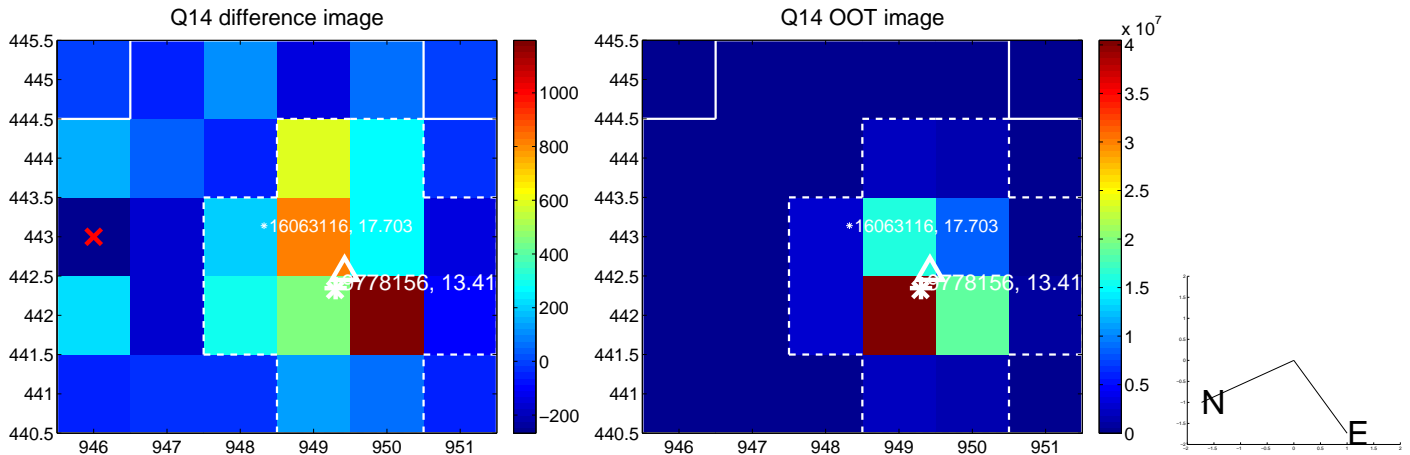
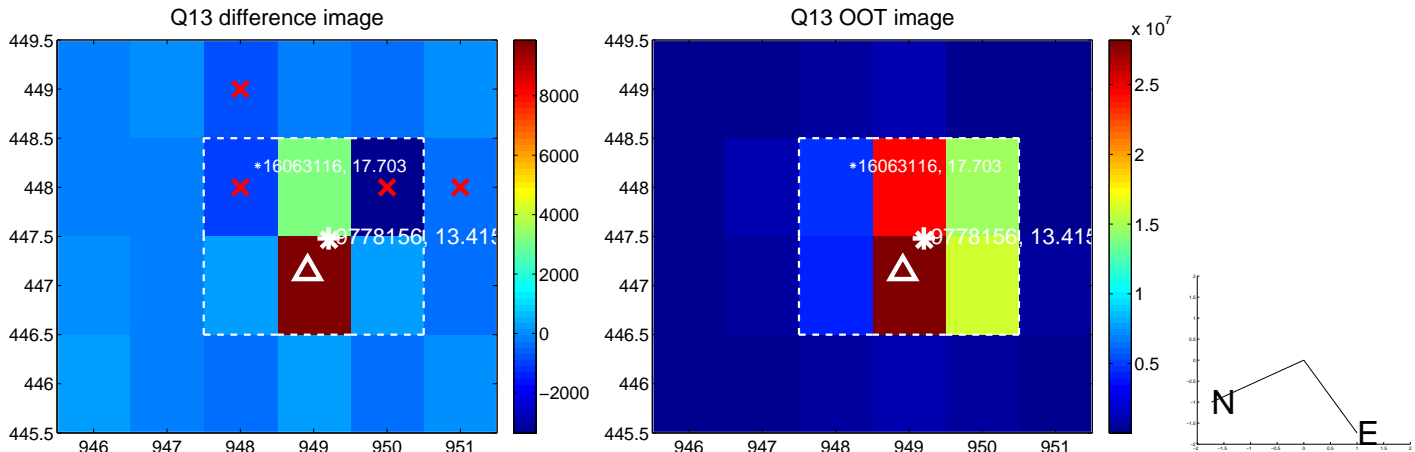
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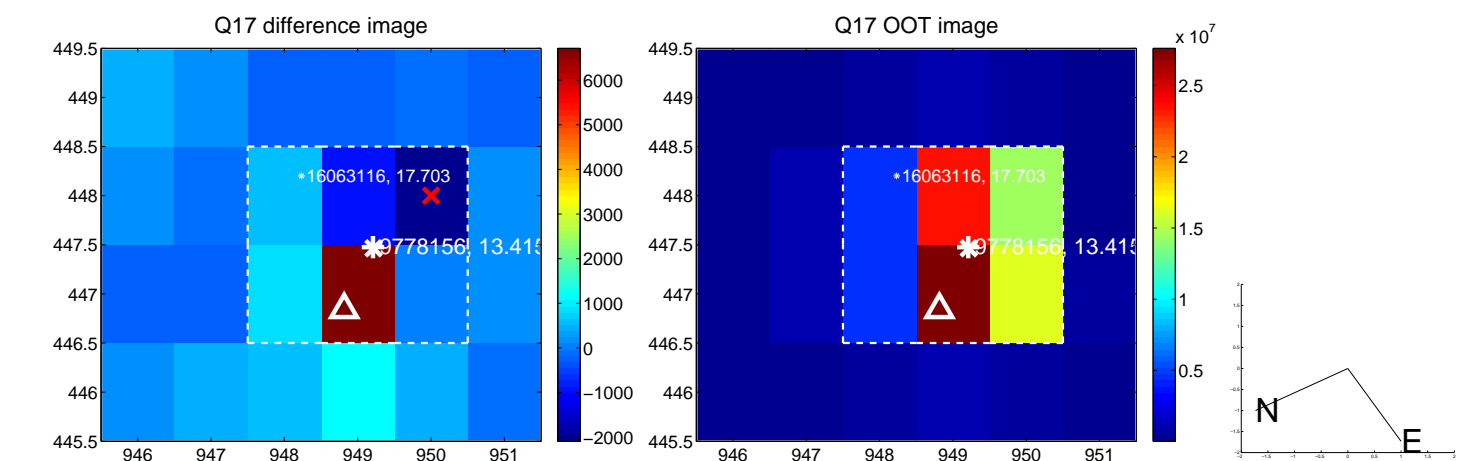
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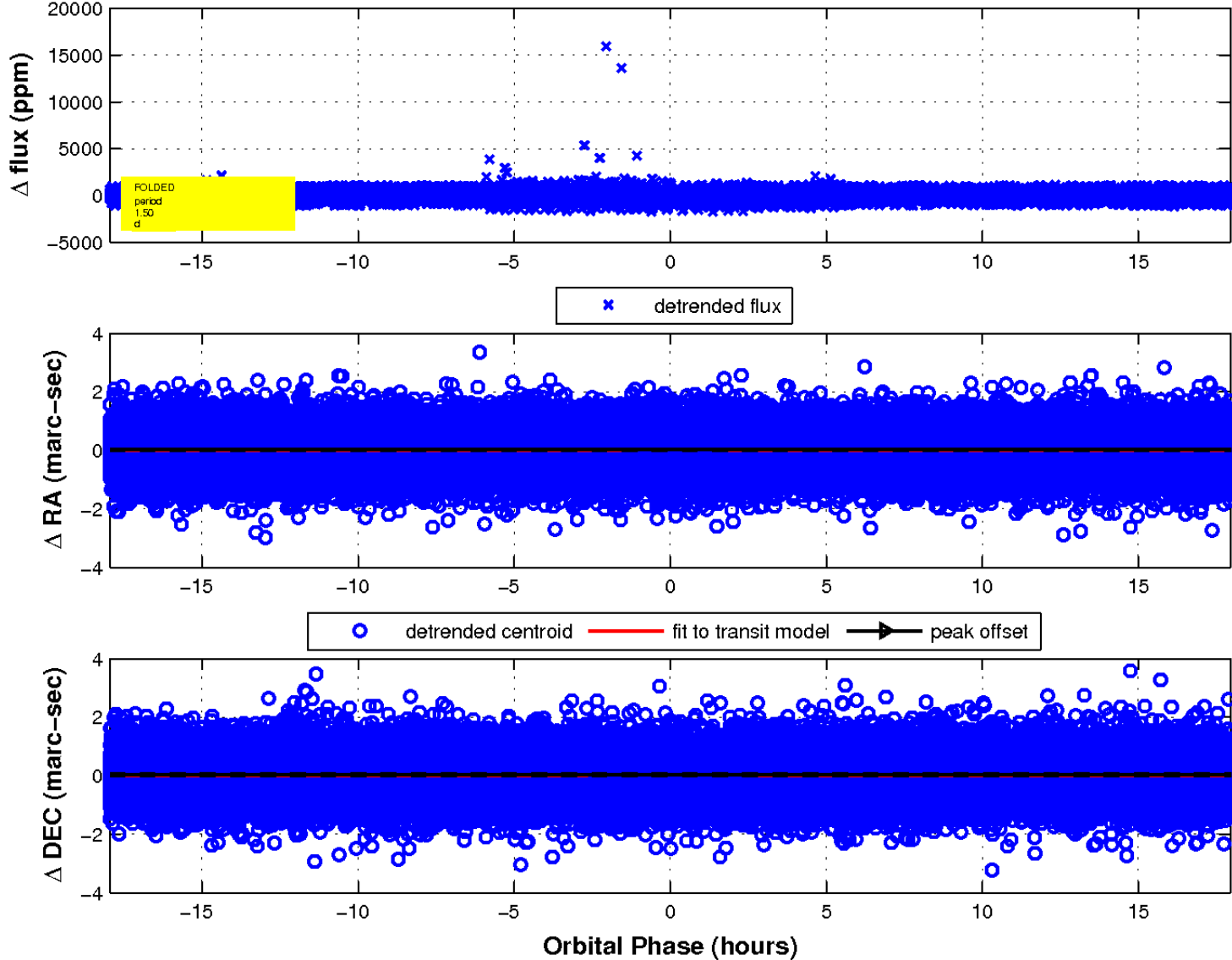
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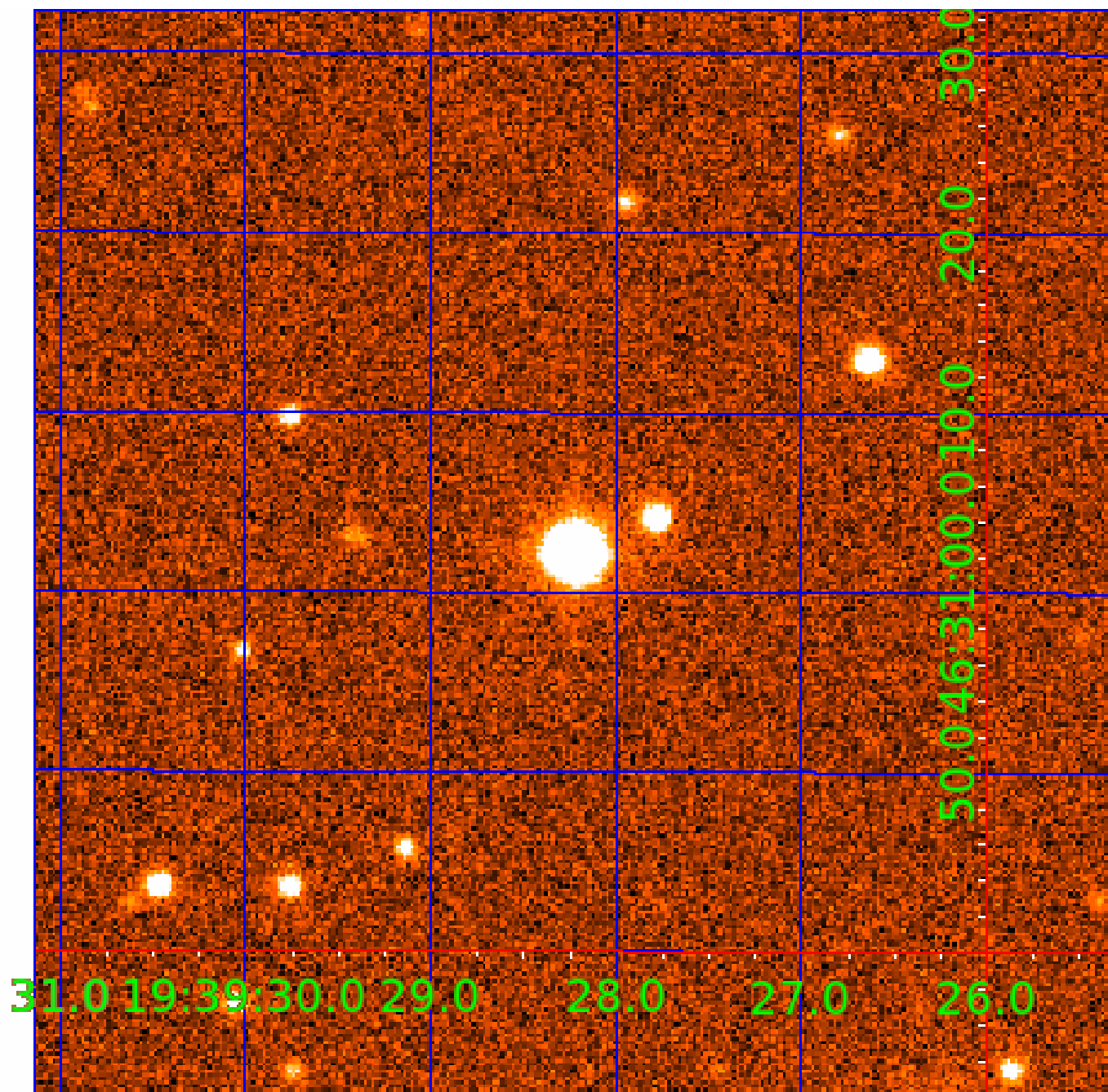


fluxWeightedCentroids, Planet 1 of 7



UKIRT Image

Declination



KIC 009778156

Q1-17 DR25 TCE Parameters

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009778156-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_MARSHALL—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS
009778156-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT
009778156-05	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_CHASES—TRANS_GAPPED—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT
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009778156-07	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT

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

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

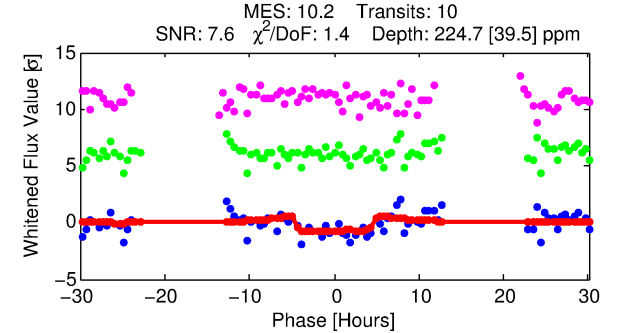
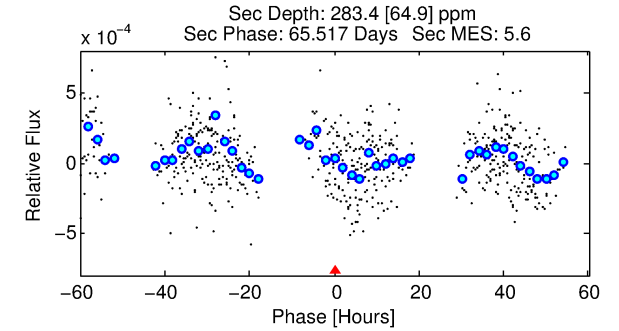
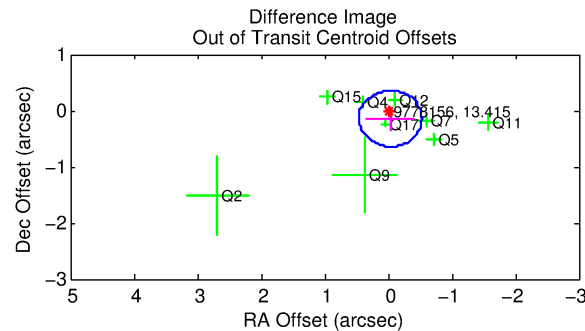
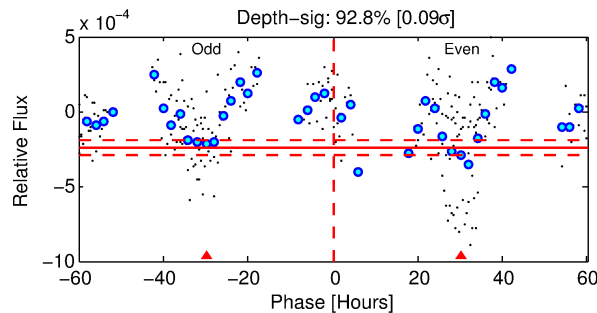
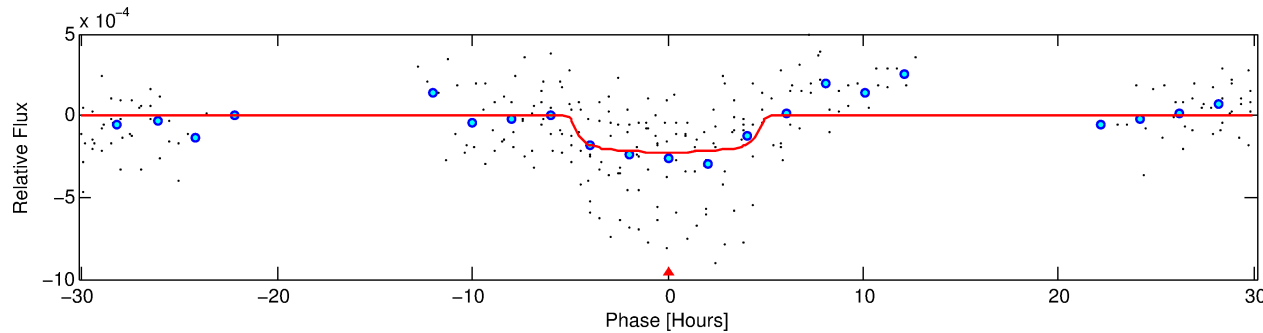
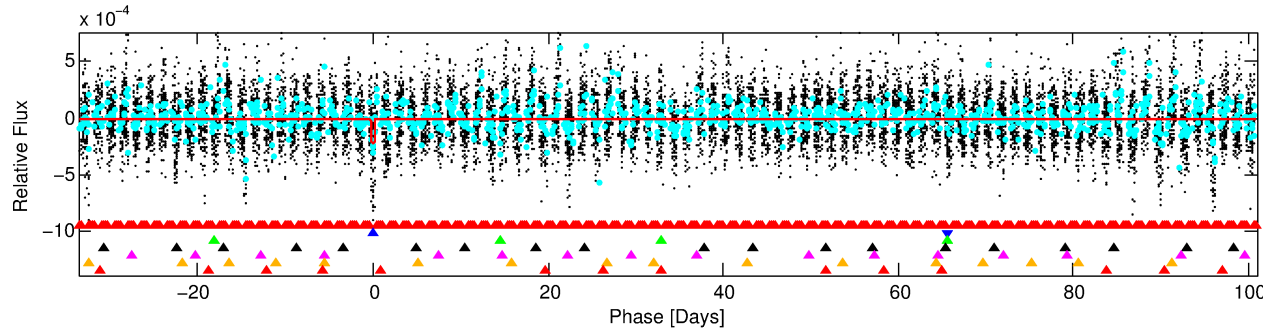
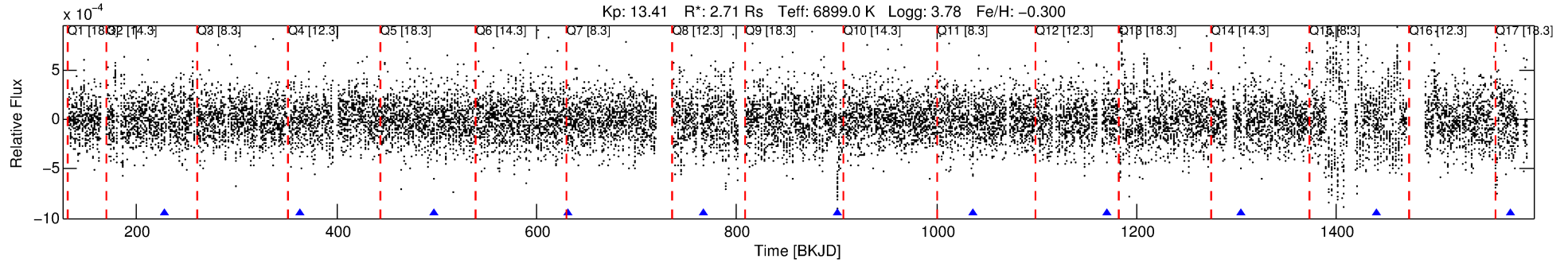
See http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col for comment definitions.

Ephemeris Match Information For 009778156-02

No Significant Match Found

DV One-Page Summary

KIC: 9778156 Candidate: 2 of 7 Period: 134.596 d



DV Fit Results:

Period = 134.59594 [0.00530] d
Epoch = 228.3904 [0.0278] BKJD
Rp/R* = 0.0158 [0.0024]
a/R* = 50.16 [34.14]
b = 0.89 [0.16]
Seff = 40.95 [22.96]
Teq = 645 [90] K
Rp = 4.68 [1.93] Re
a = 0.6025 [0.2116] AU
Ag = 2586.81 [1711.64] [1.51σ]
Teffp = 7112 [714] K [8.98σ]

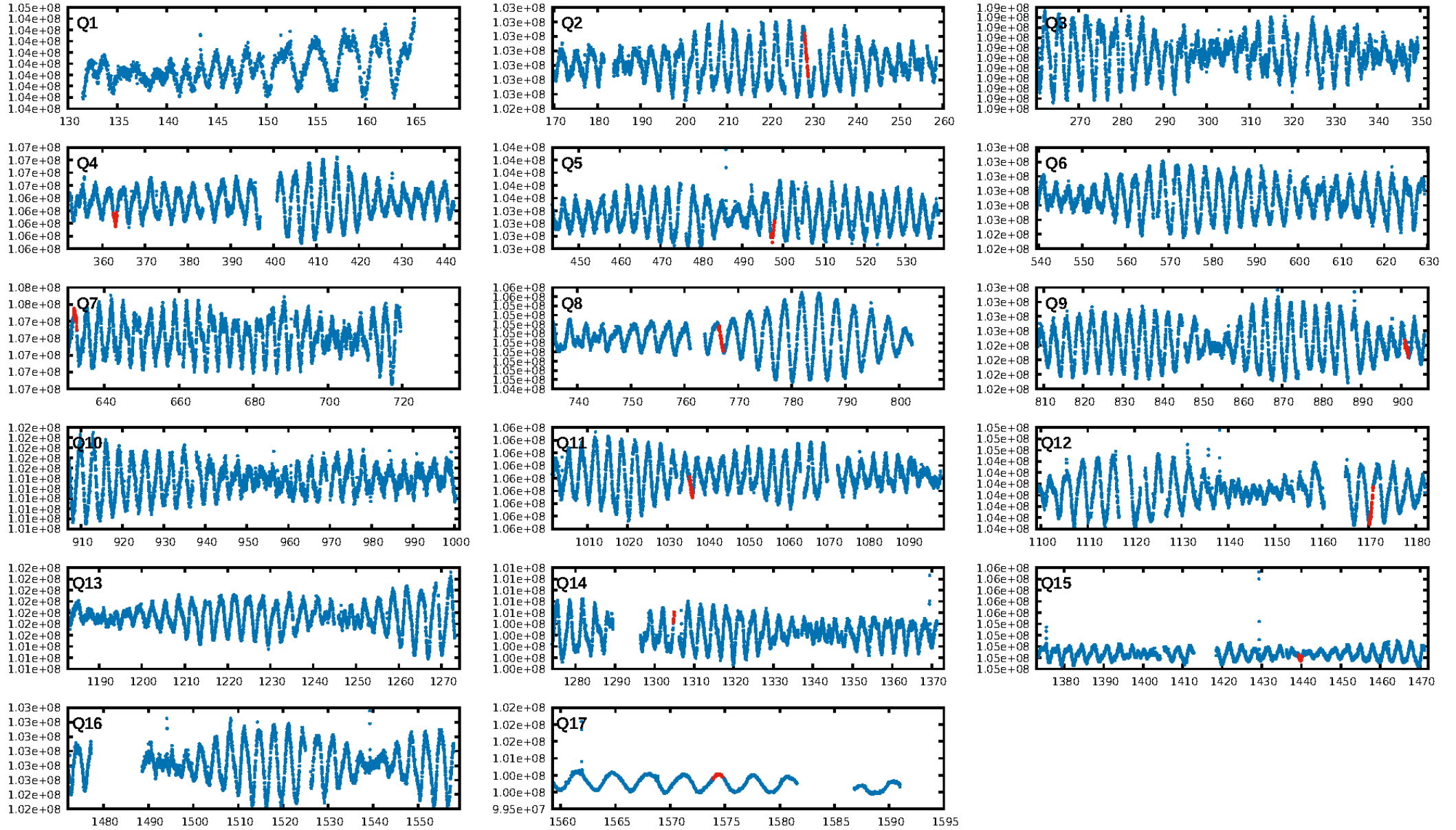
DV Diagnostic Results:

ShortPeriod-sig: 100.0% [50.33σ]
LongPeriod-sig: 100.0% [235.23σ]
ModelChiSquare2-sig: 0.1%
ModelChiSquareGof-sig: 100.0%
Bootstrap-pfa: 2.45e-16
RollingBand-fgt: 1.00 [9/9]
GhostDiagnostic-chr: 2.51
Centroid-sig: 92.2%
Centroid-so: 0.258 arcsec [0.39σ]
OotOffset-rm: 0.149 arcsec [0.90σ]
KicOffset-rm: 0.159 arcsec [0.76σ]
OotOffset-st: 1/3/2/3 [9]
KicOffset-st: 1/3/2/3 [9]
DiffImageQuality-fgm: 0.67 [6/9]
DiffImageOverlap-fno: 0.00 [0/10]

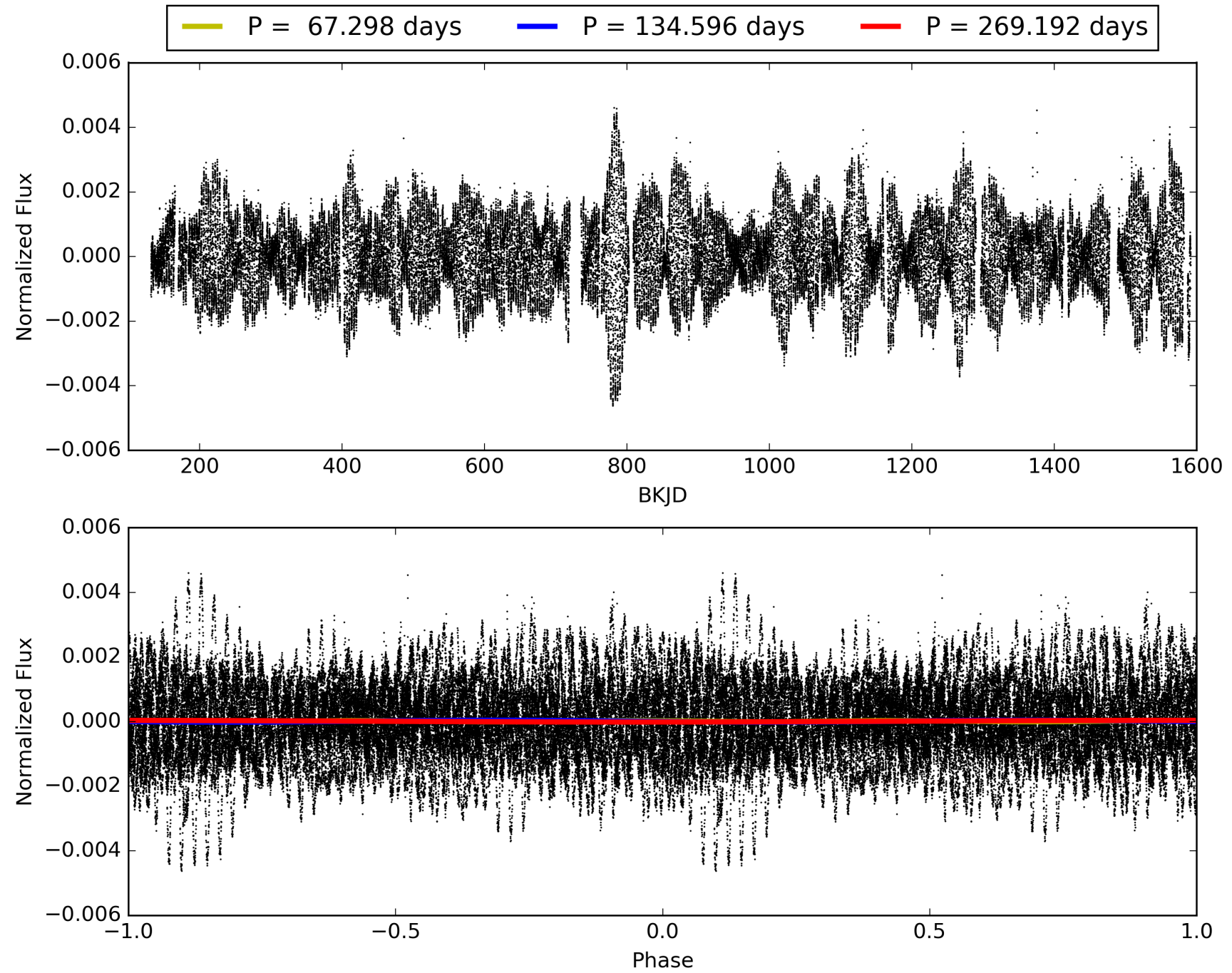
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 30-Jan-2016 20:46:41 Z

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

TCE 009778156-02, PDC Light Curves

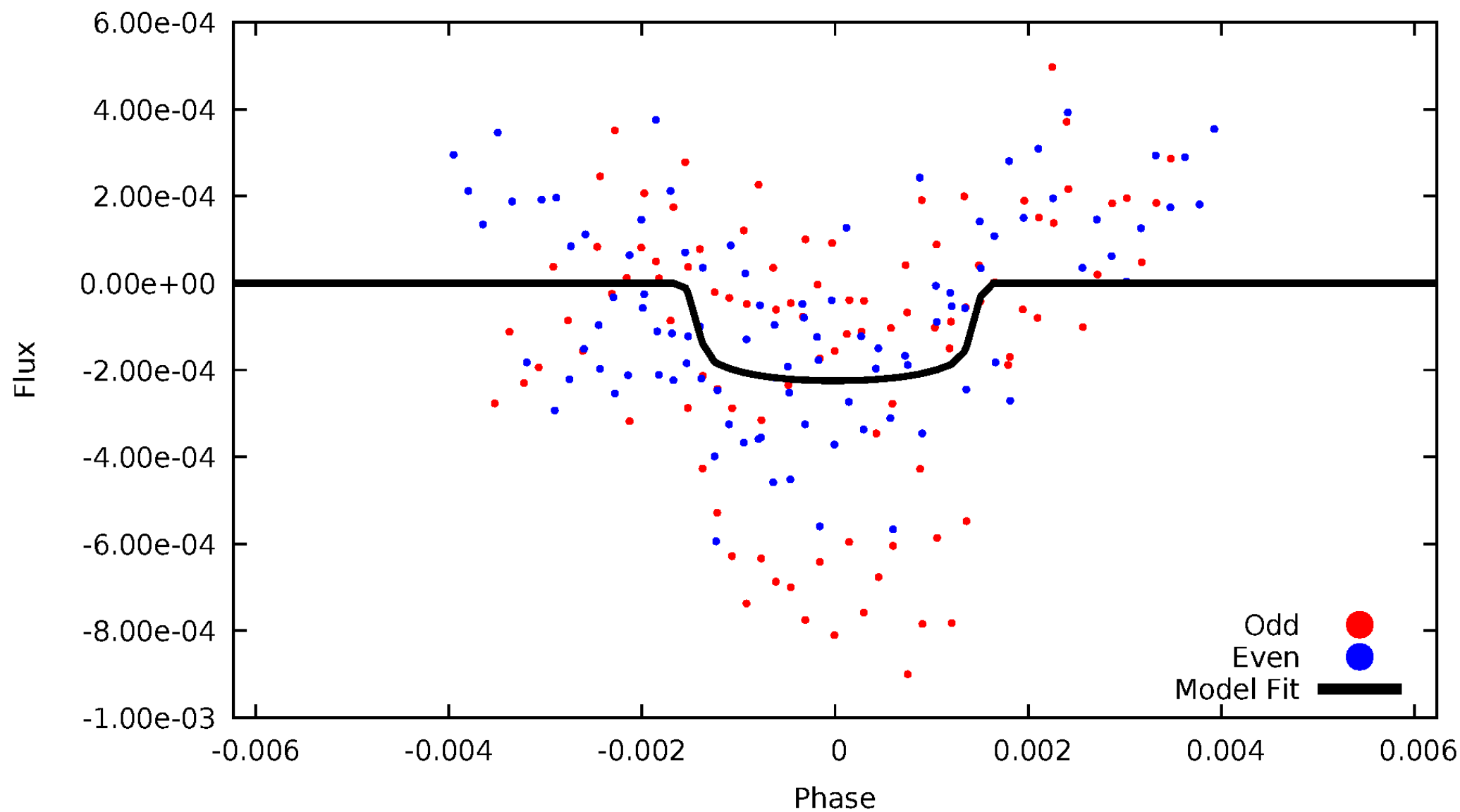


TCE 009778156-02



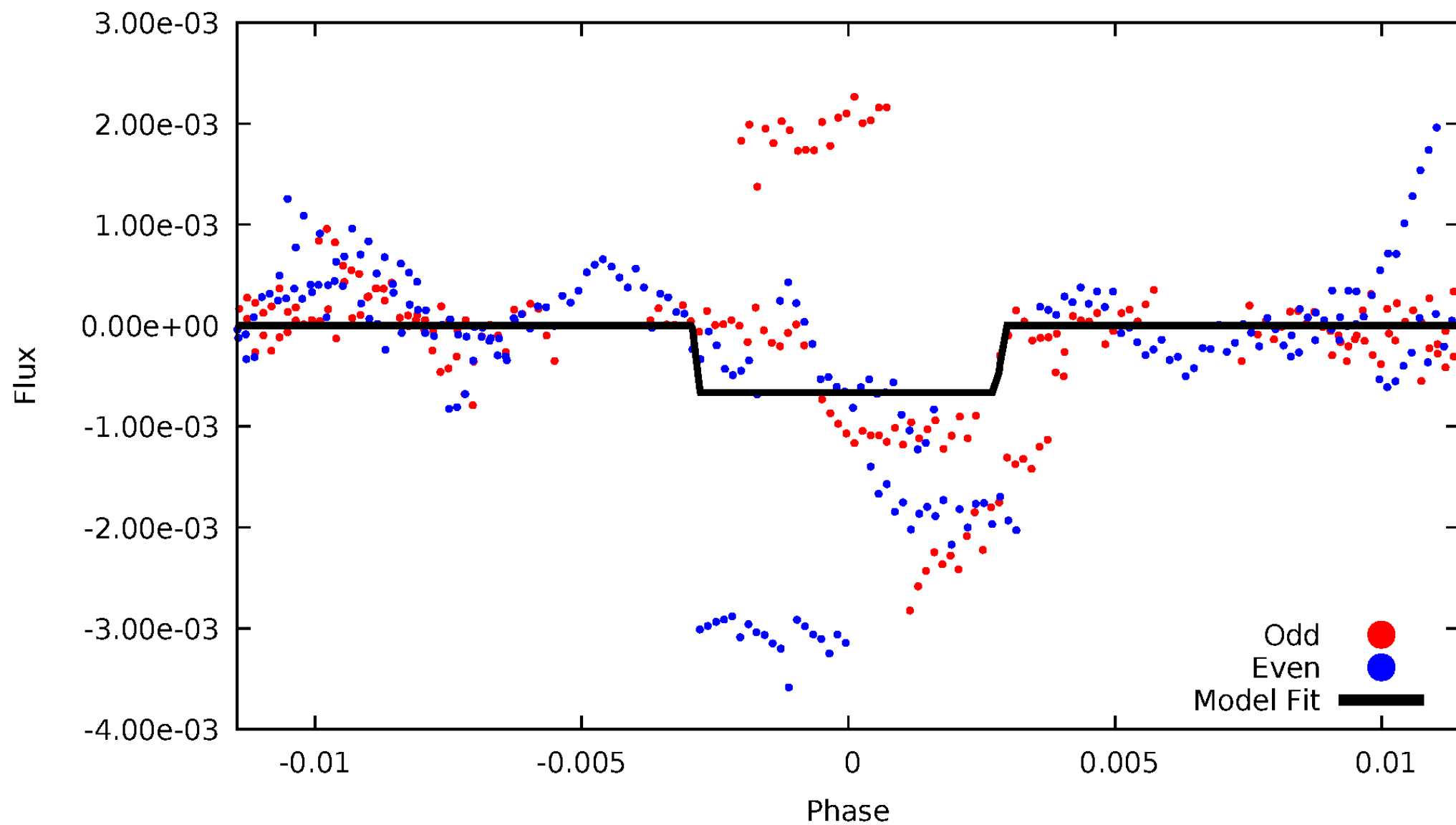
DV Odd/Even

TCE 009778156-02



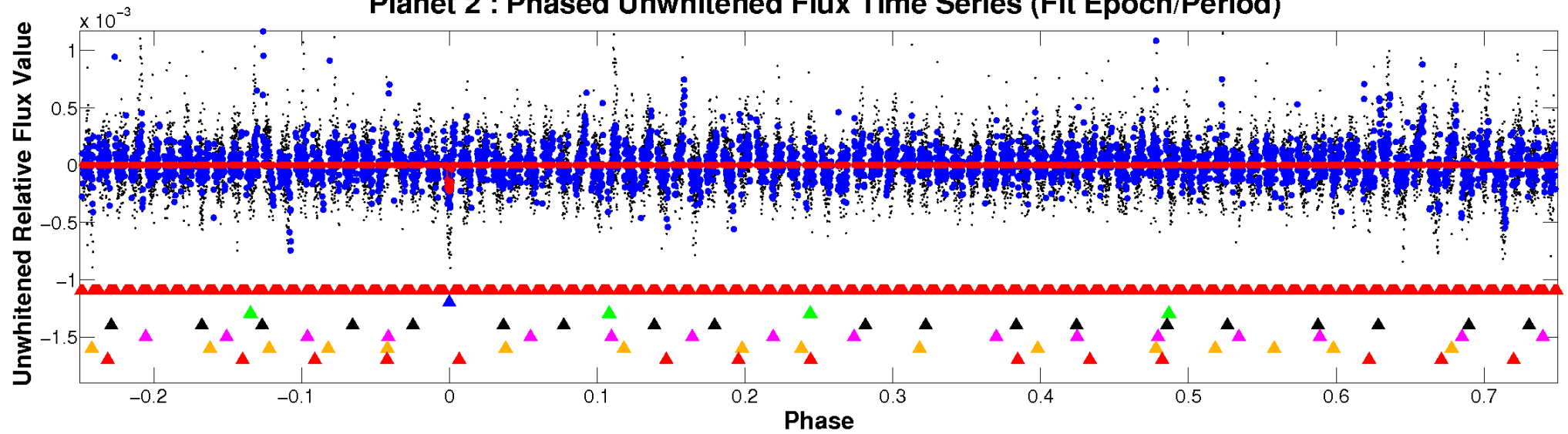
ALT Odd/Even

TCE 009778156-02

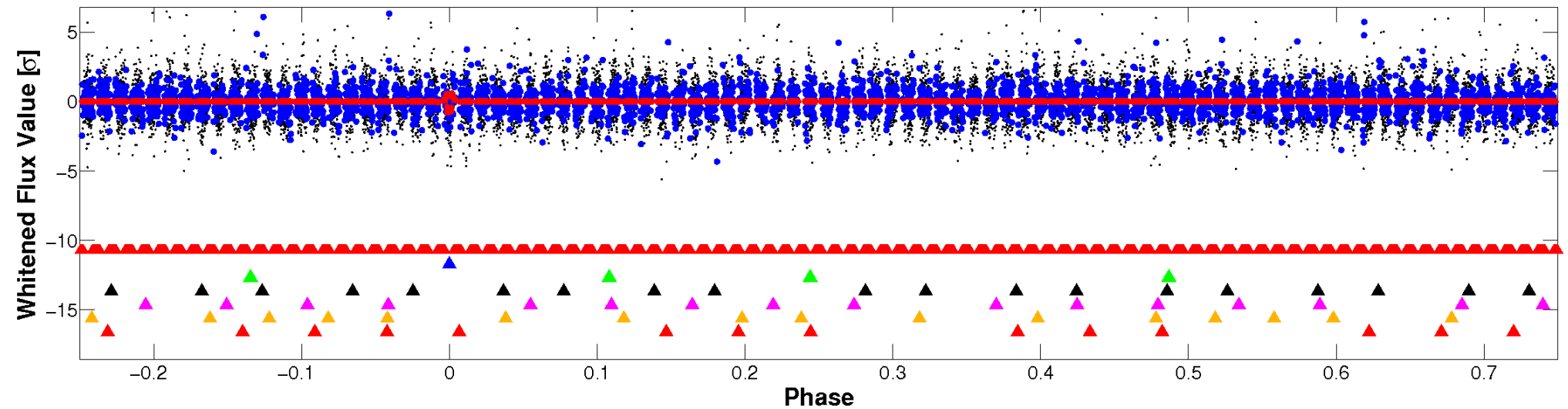


Non-Whitened Vs. Whitened Light Curve

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

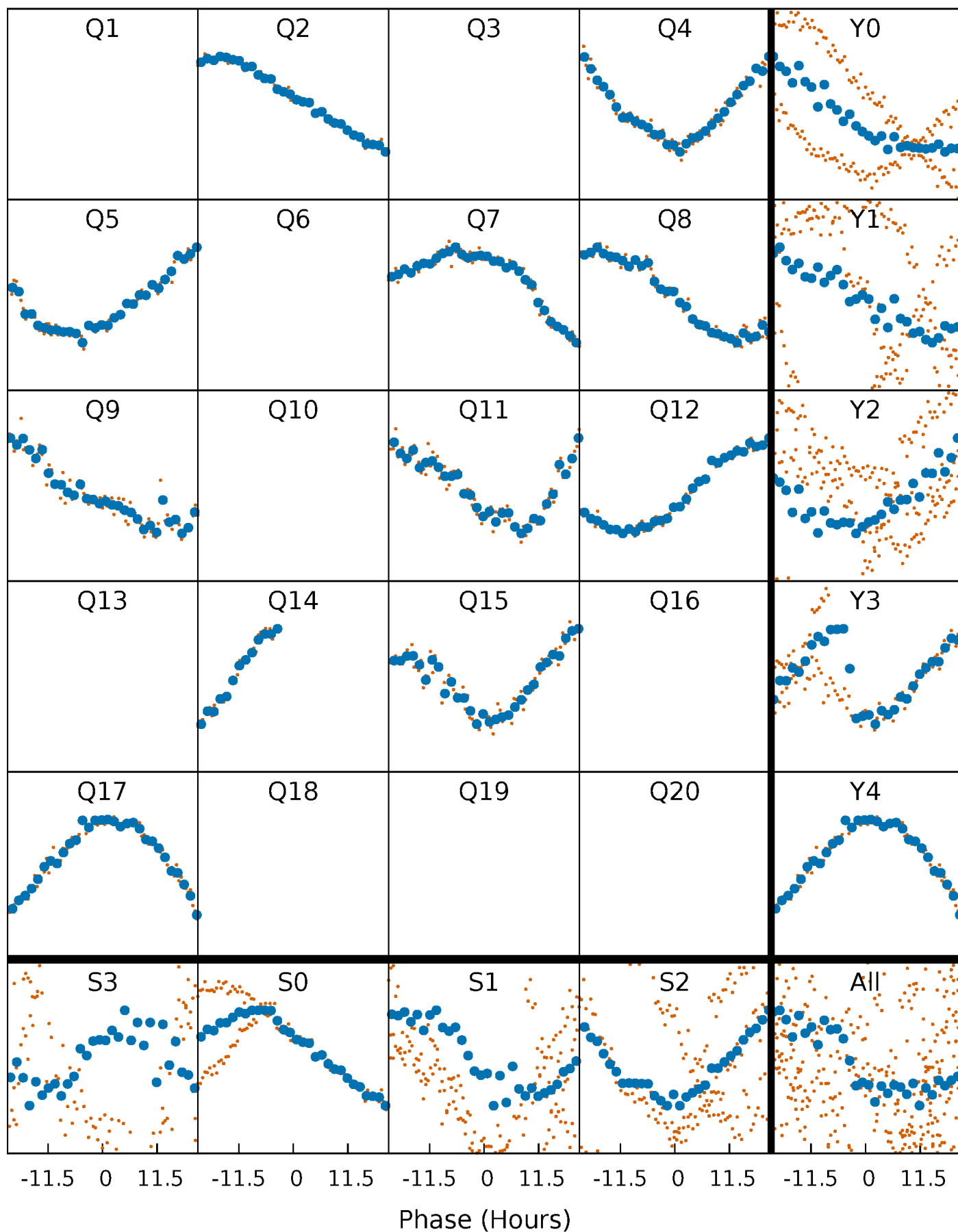


Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



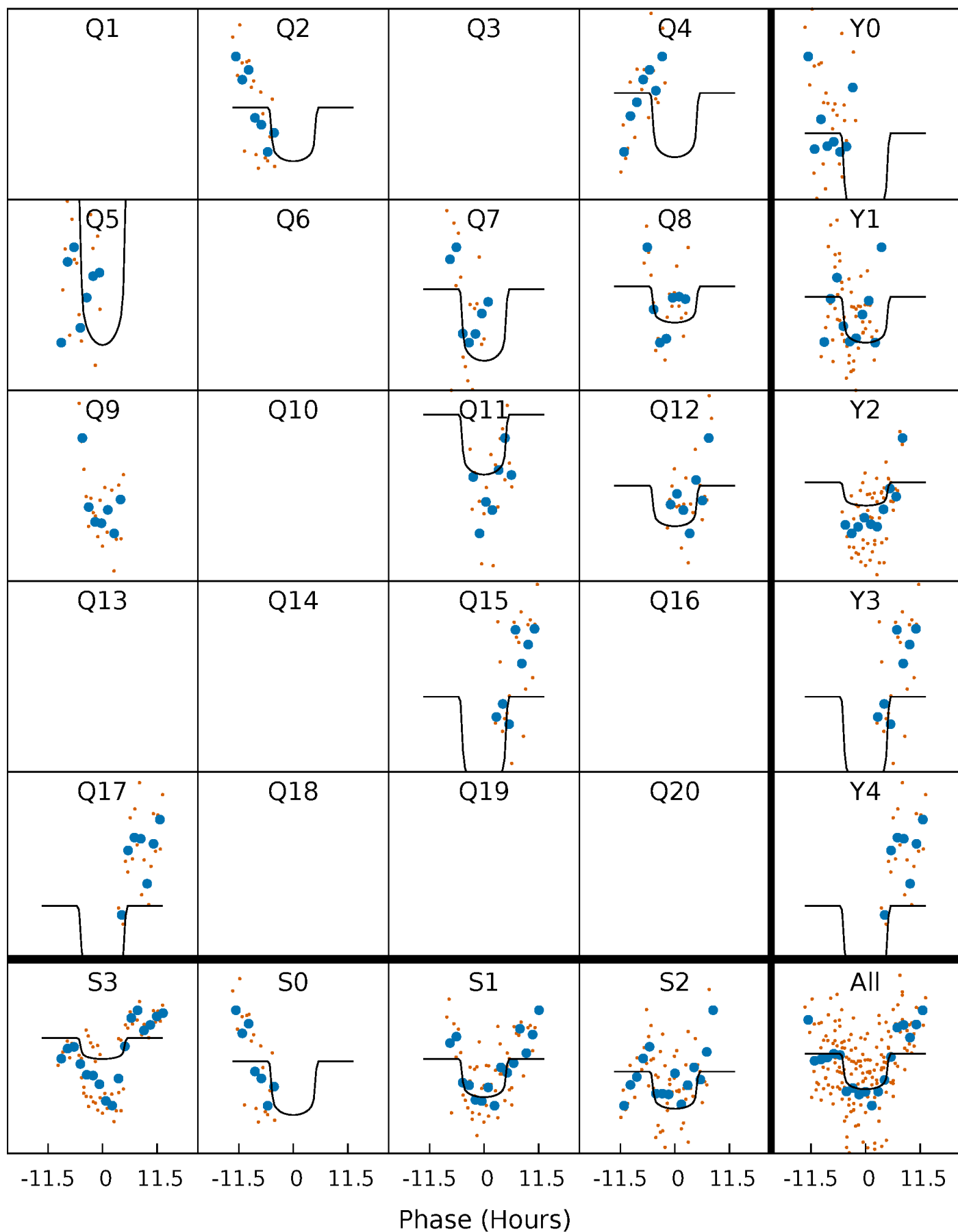
PDC Quarter-Phased Transit Curves

TCE 009778156-02 P=134.595940 Days $T_0=228.390375$ (BKJD)



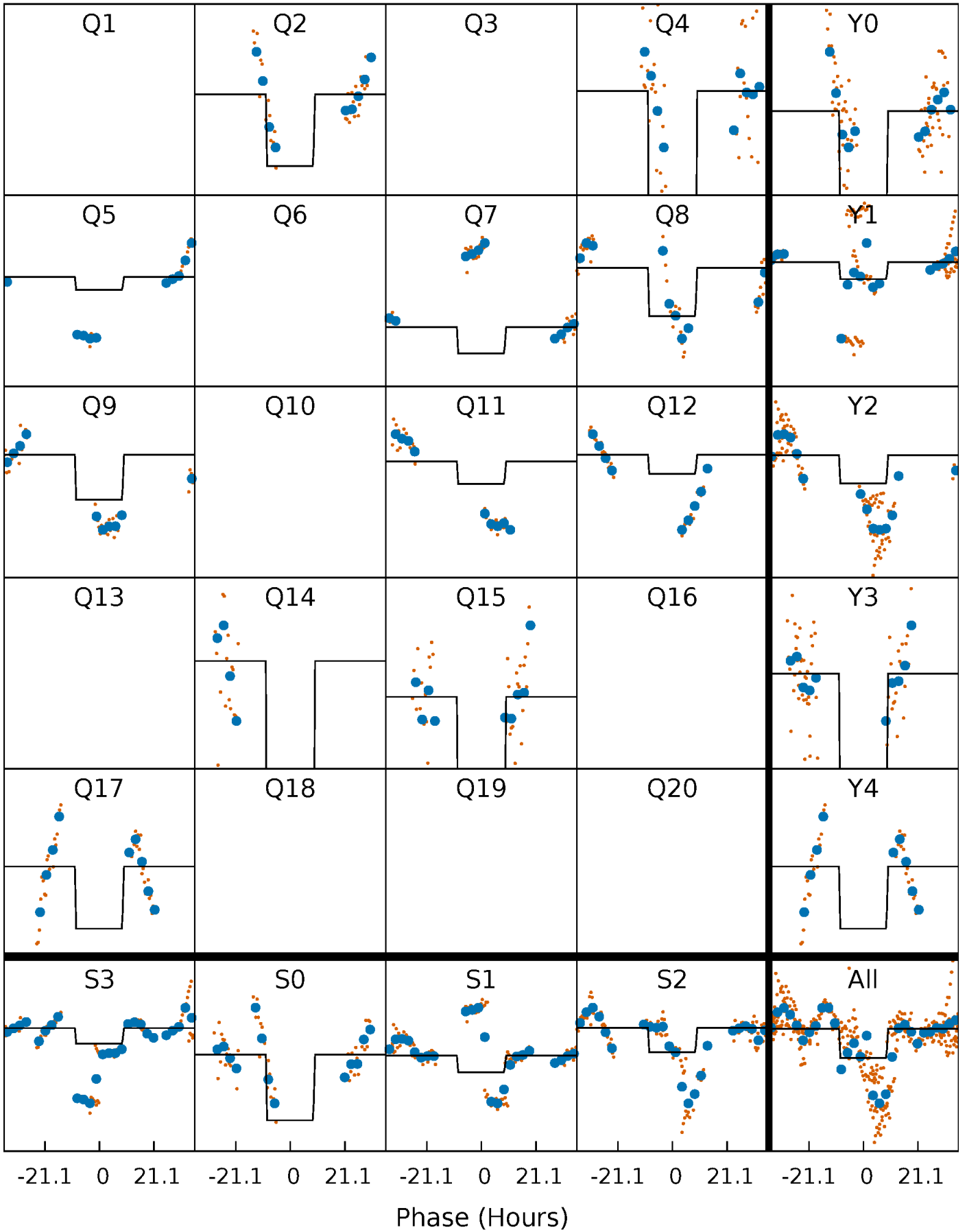
DV Quarter-Phased Transit Curves

TCE 009778156-02 P=134.595940 Days $T_0=228.390375$ (BKJD)



Alt. Detrend Quarter-Phased Transit Curves

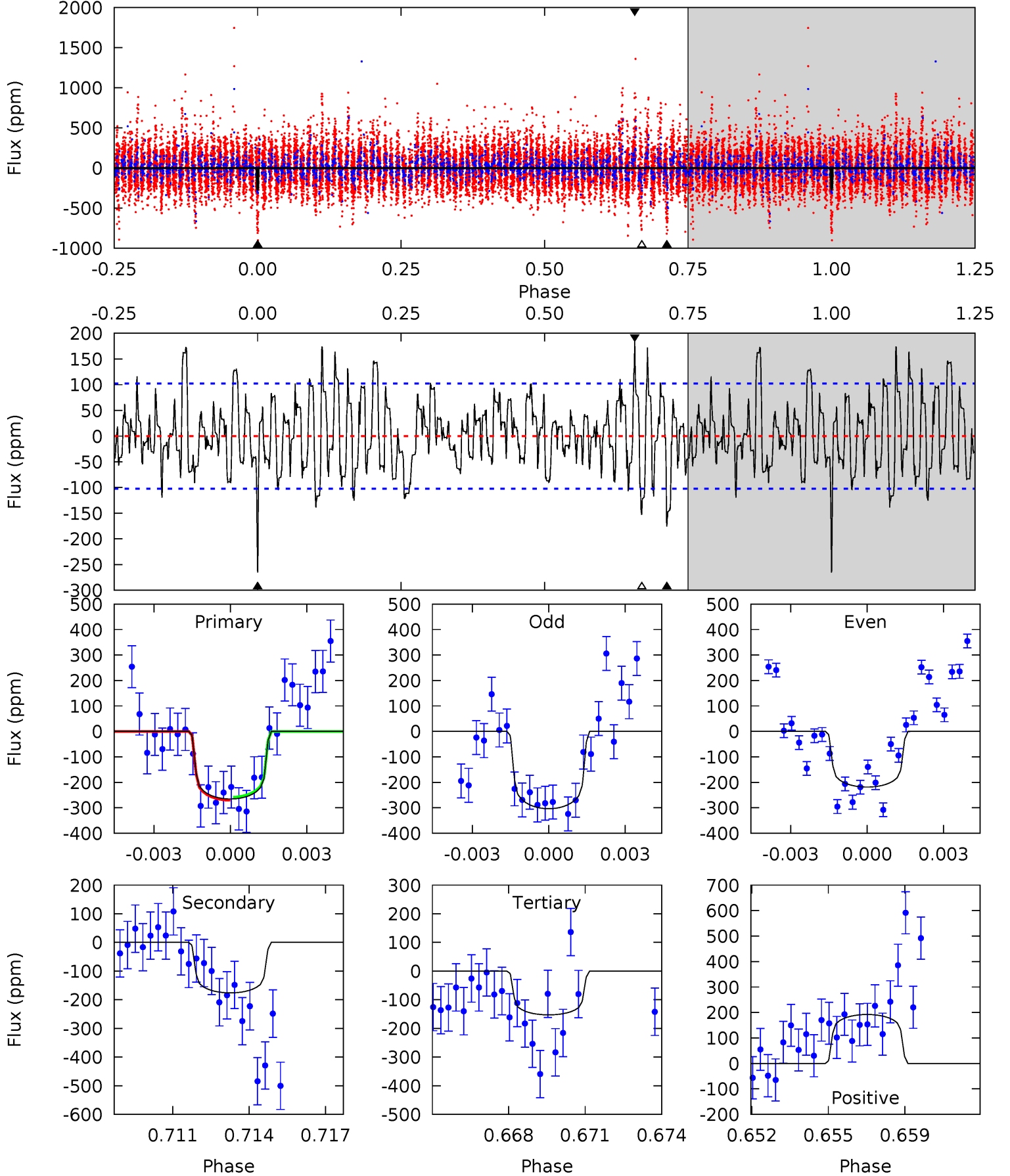
TCE 009778156-02 $P=134.554993$ Days $T_0=228.456285$ (BKJD)



DV Model-Shift Uniqueness Test

009778156-02, P = 134.595940 Days, E = 93.794435 Days

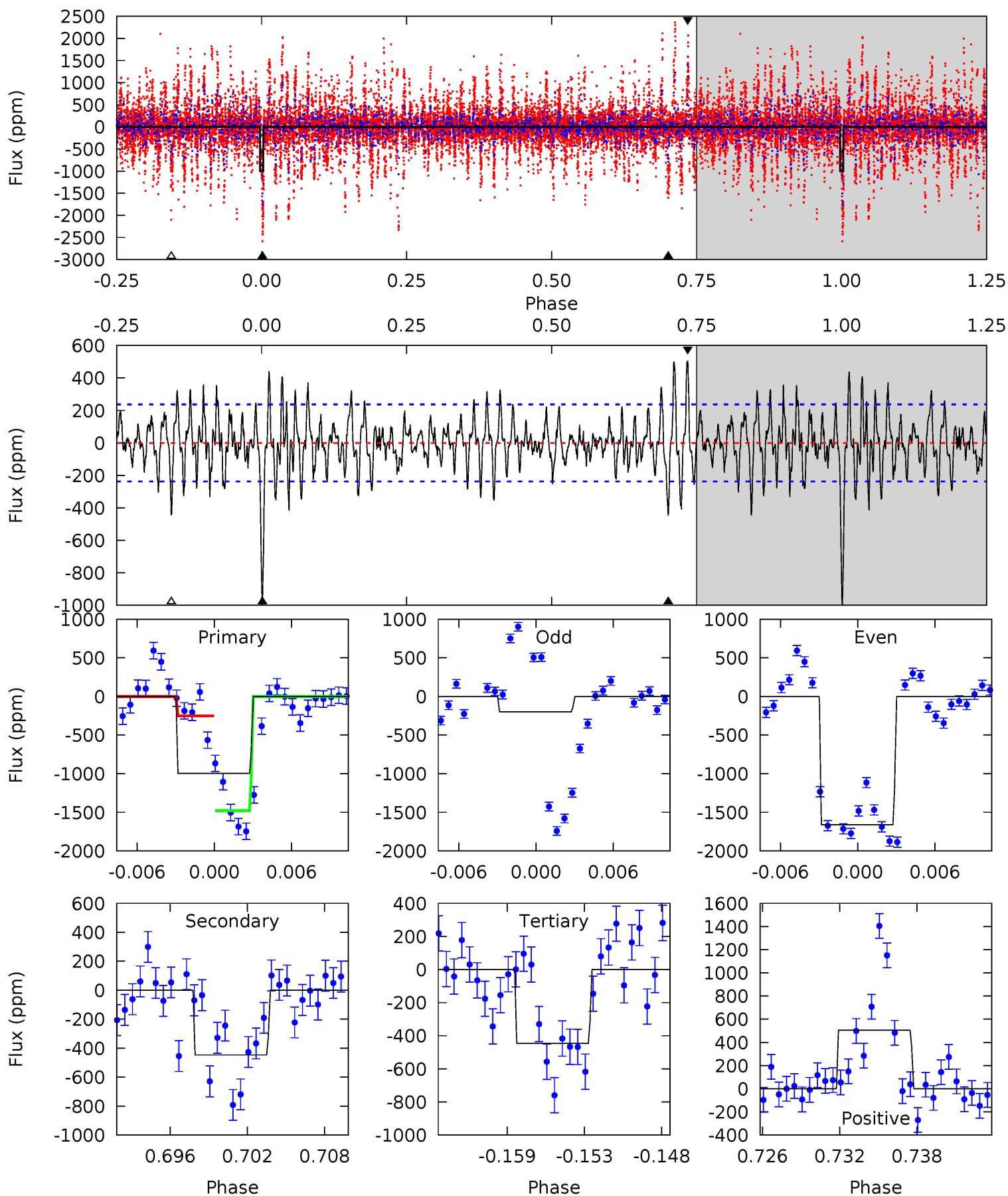
Pri	Sec	Ter	Pos	FA ₁	FA ₂	F _{Red}	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
13.6	9.03	7.83	9.86	5.25	2.96	2.98	5.77	3.75	1.19	-0.83	2.15	1.25	0.42	0.29



Alt Model-Shift Uniqueness Test

009778156-02, P = 134.554993 Days, E = 93.901292 Days

Pri	Sec	Ter	Pos	FA ₁	FA ₂	F _{Red}	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
21.5	9.67	9.64	10.9	5.13	2.75	3.12	11.9	10.6	0.03	-1.27	14.0	1.16	0.34	0



Stellar Parameters For KIC 009778156

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	6899^{+190}_{-238}	$3.780^{+0.312}_{-0.078}$	$-0.300^{+0.300}_{-0.250}$	$2.706^{+0.417}_{-1.043}$	$1.607^{+0.199}_{-0.369}$	$0.114^{+0.260}_{-0.035}$
	+3%/-3%	+8%/-2%	+100%/-83%	+15%/-39%	+12%/-23%	+227%/-31%
Source	PHO1	FLK73	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 009778156-02 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	A_{obs}
DV	-176 ± 19	$4.35^{+0.98}_{-0.99}$	875^{+55}_{-84}	6267^{+616}_{-482}	1877^{+1150}_{-638}
Alt.	-447 ± 46	$7.24^{+1.20}_{-1.52}$	880^{+53}_{-87}	6199^{+408}_{-365}	1740^{+874}_{-484}

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

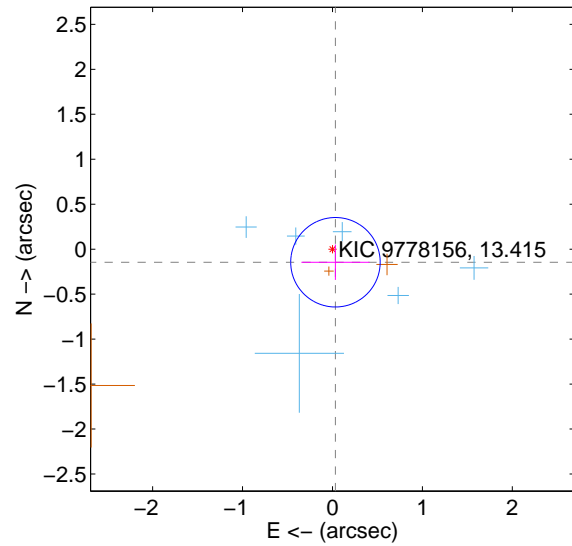
Supplemental centroid analysis for 009778156-02. Kepler magnitude: 13.41. Transit SNR 7.65

There are 6 quarters with good PRF difference image offsets

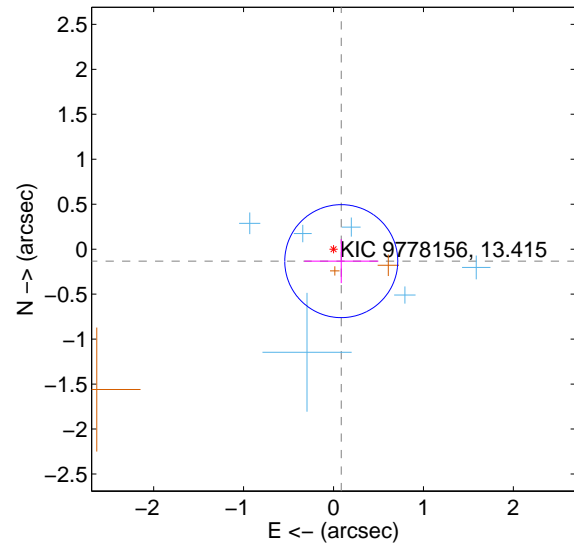
The direct PRF centroid is offset from the target star catalog position by about 0.05 arcsec

	Distance in arcsec	Distance / σ	Δ RA	Δ Dec
PRF-fit source offset from OOT	0.149 ± 0.166	0.90	-0.033 ± 0.379	-0.145 ± 0.197
PRF-fit source offset from KIC position	0.159 ± 0.209	0.76	-0.086 ± 0.412	-0.133 ± 0.244
photometric centroid source offset	0.26 ± 0.66	0.39	-0.17 ± 0.66	0.19 ± 0.66

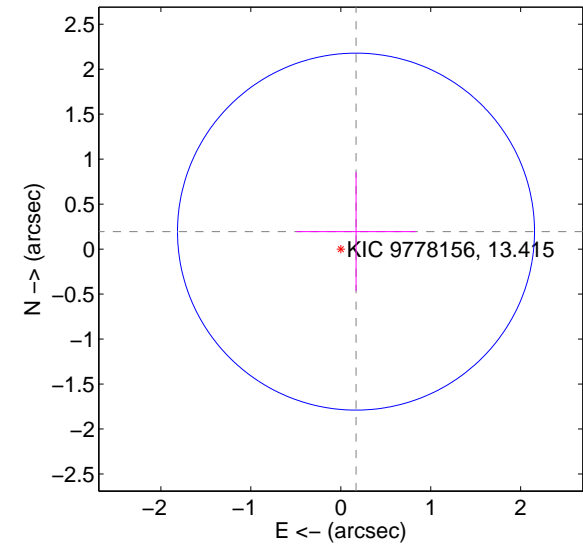
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position

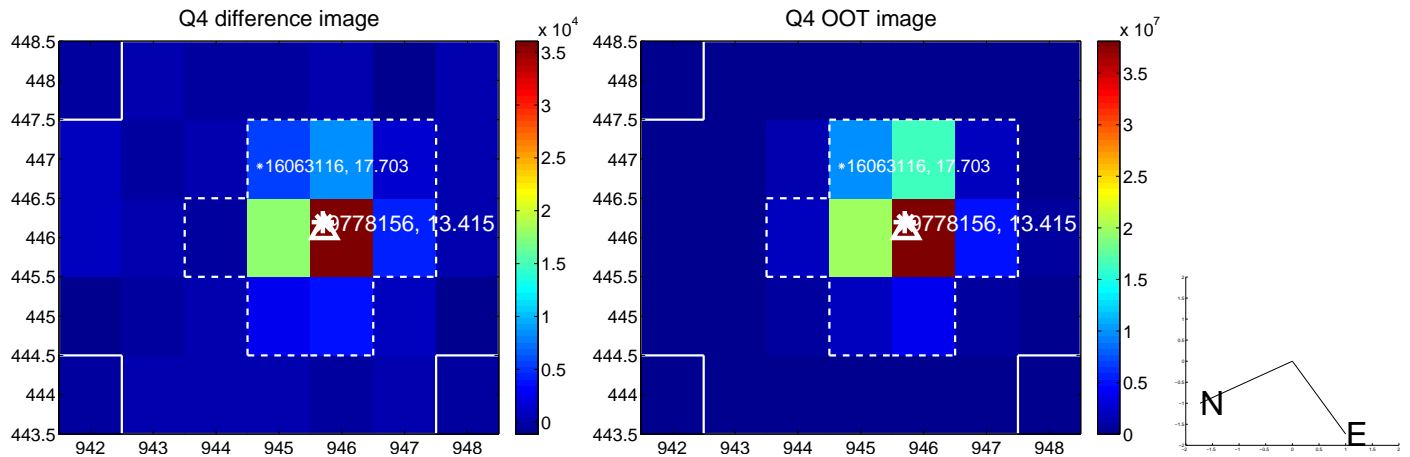
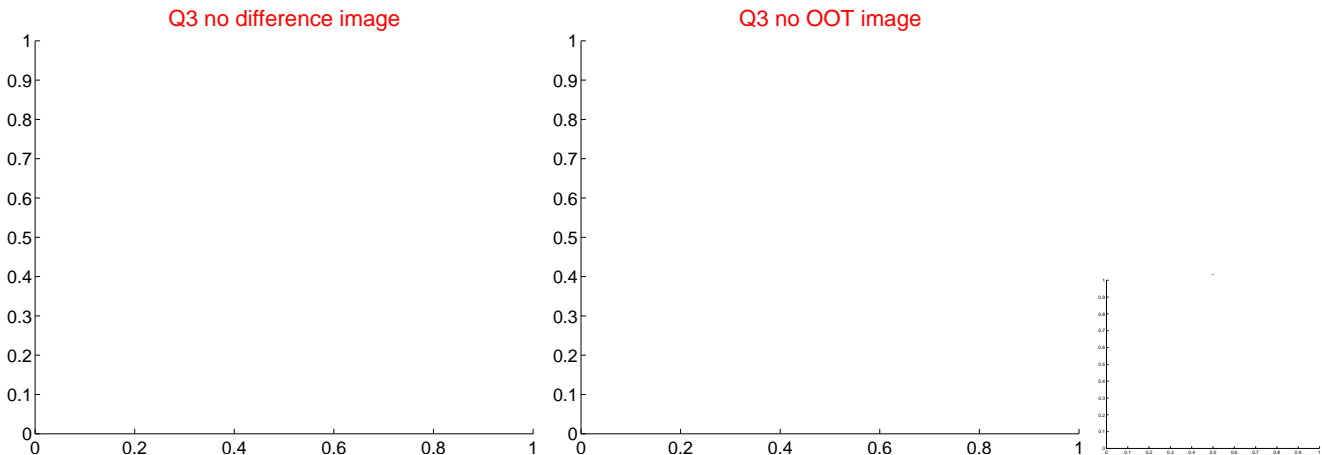
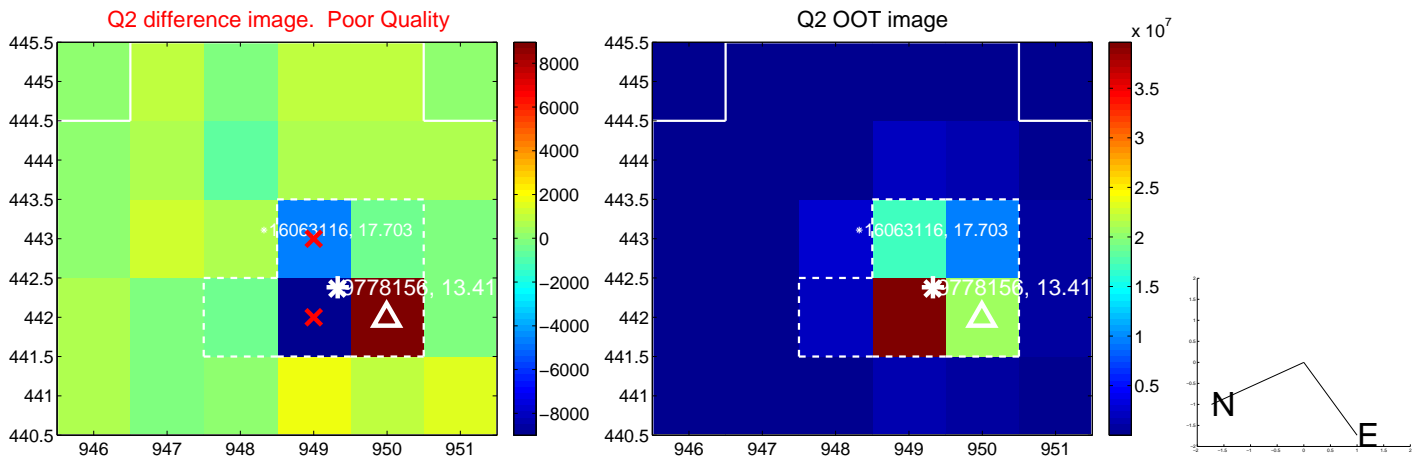
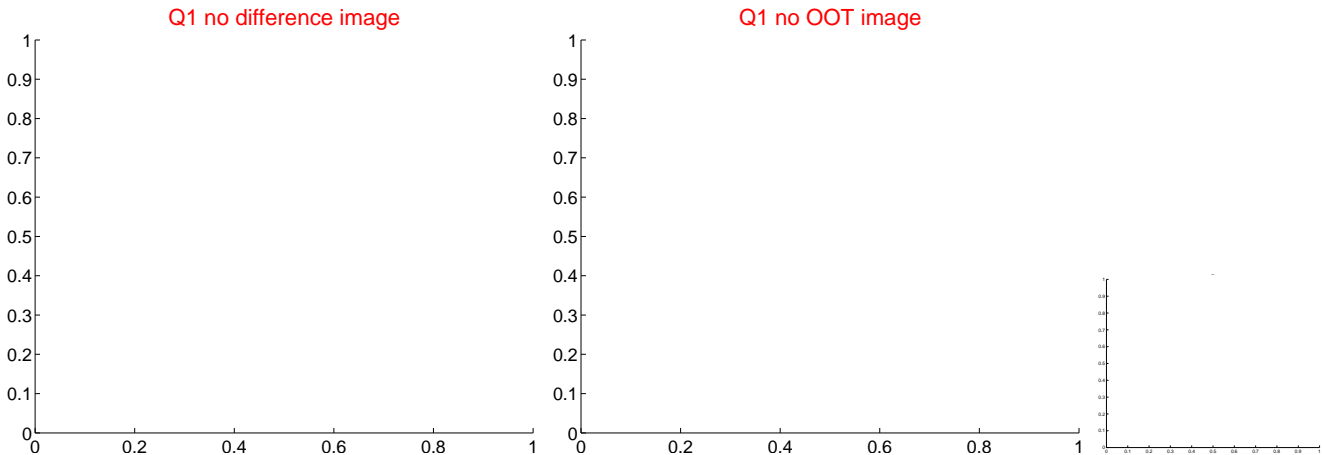


offset from photometric centroids

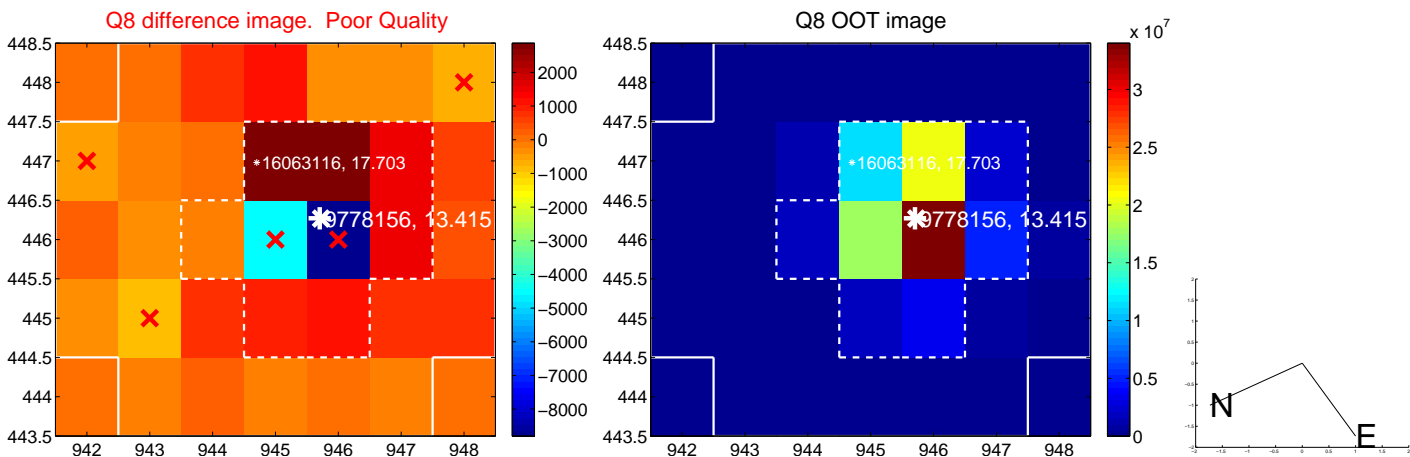
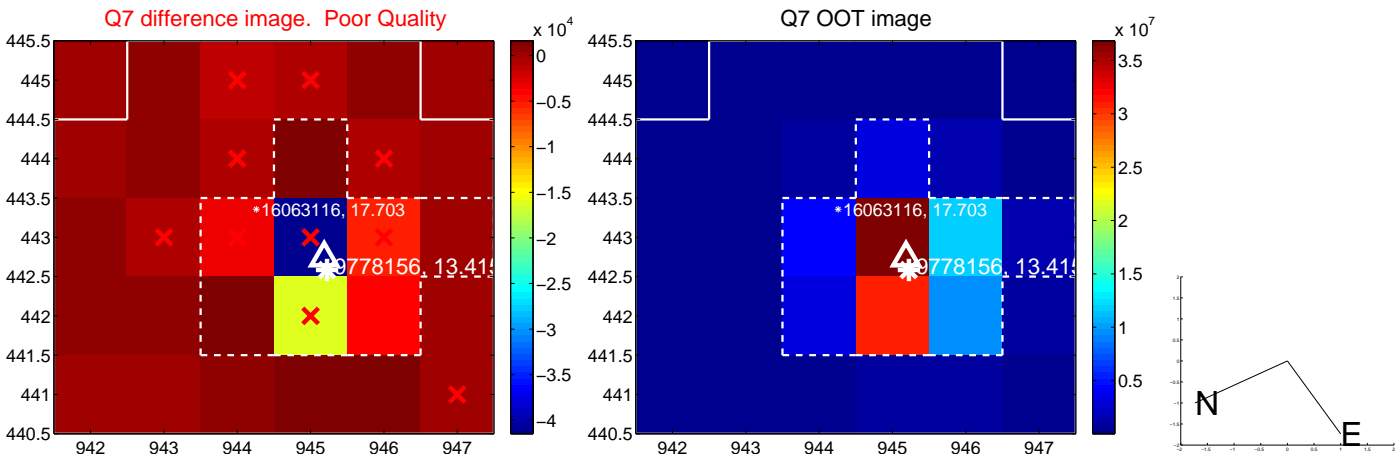
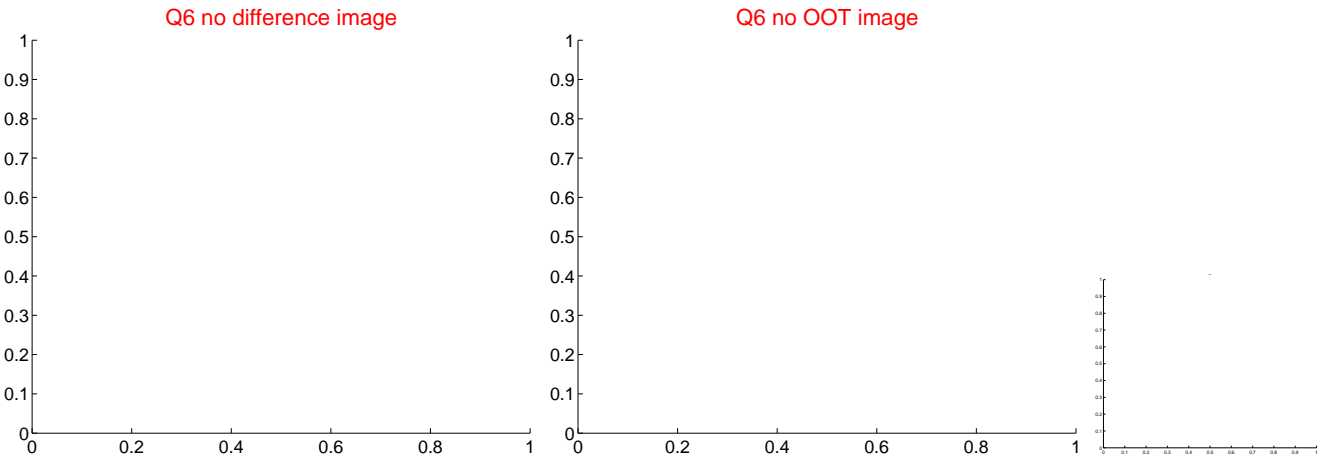
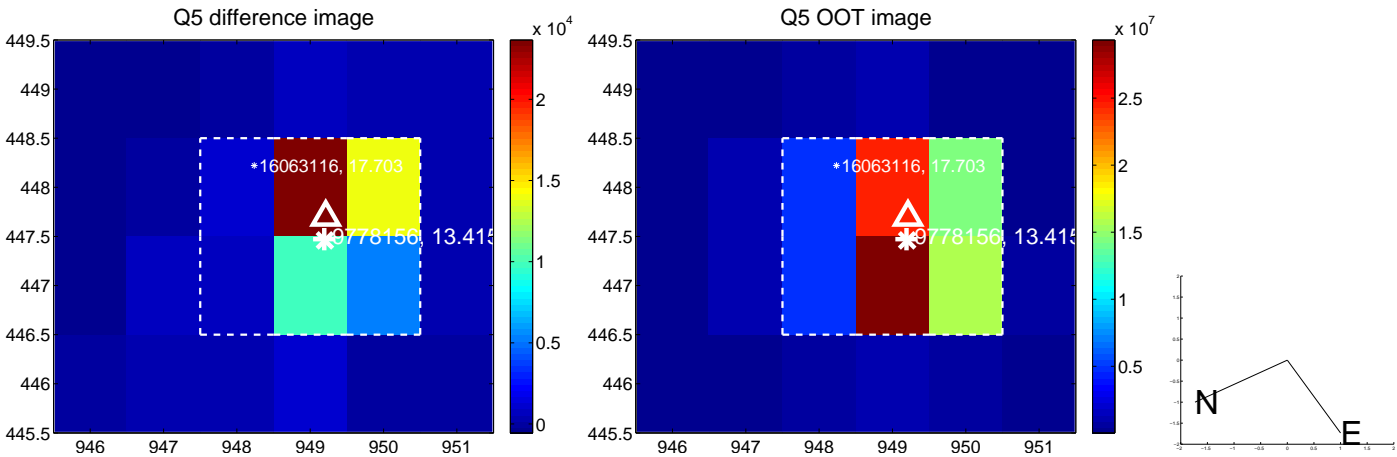


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets**; magenta cross: average over quarters. Length of the crosses: one- σ uncertainty. Blue circle: three-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

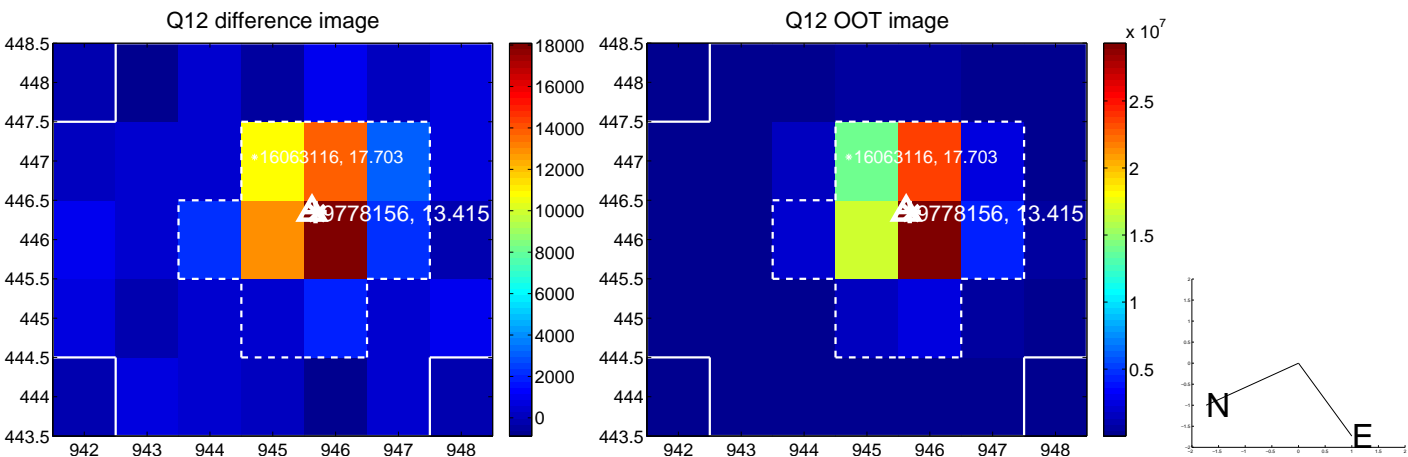
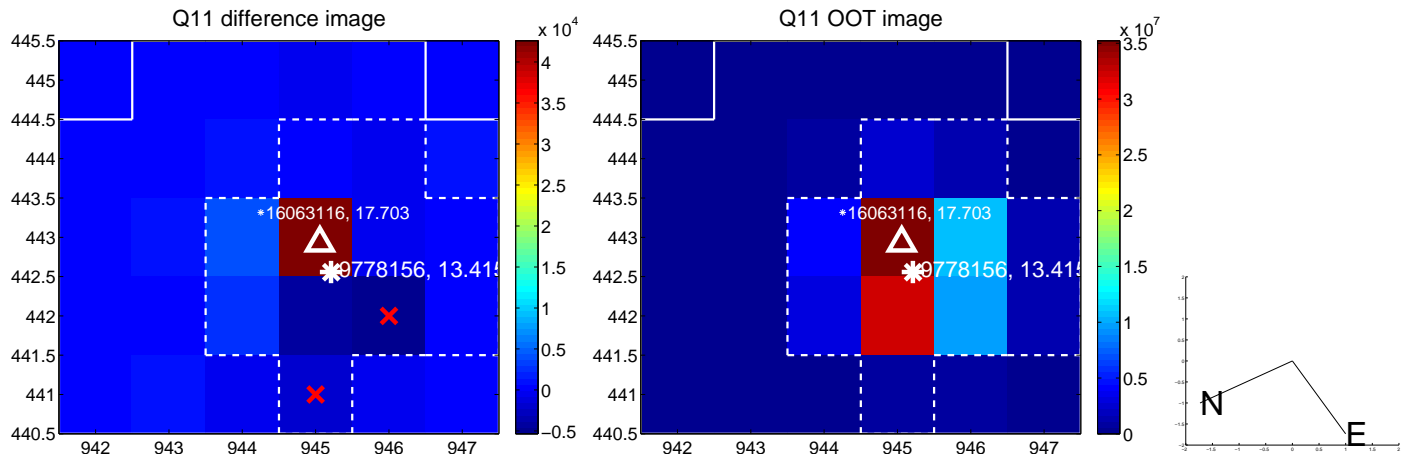
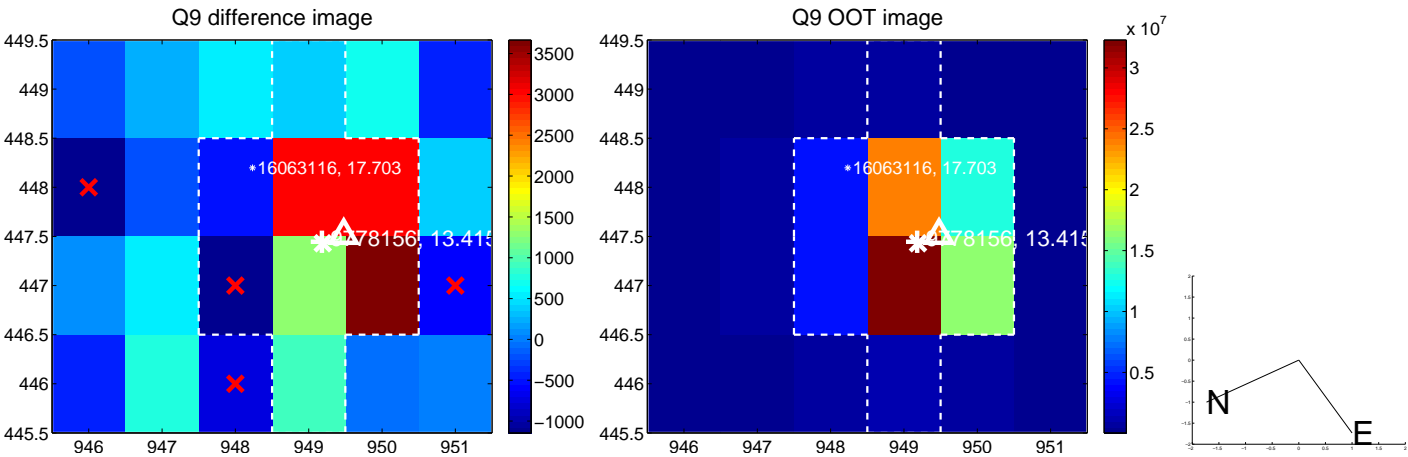
white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value



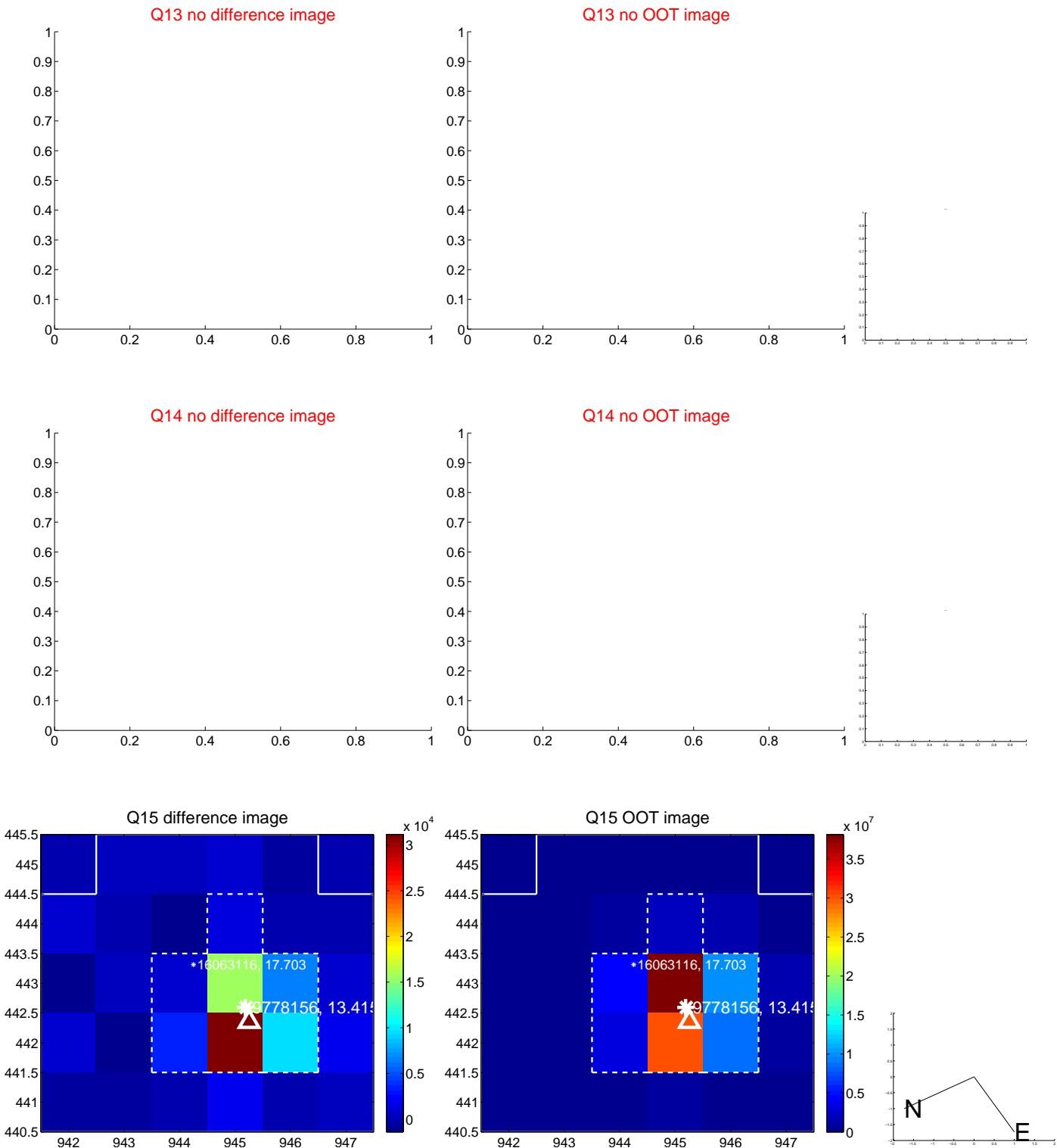
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



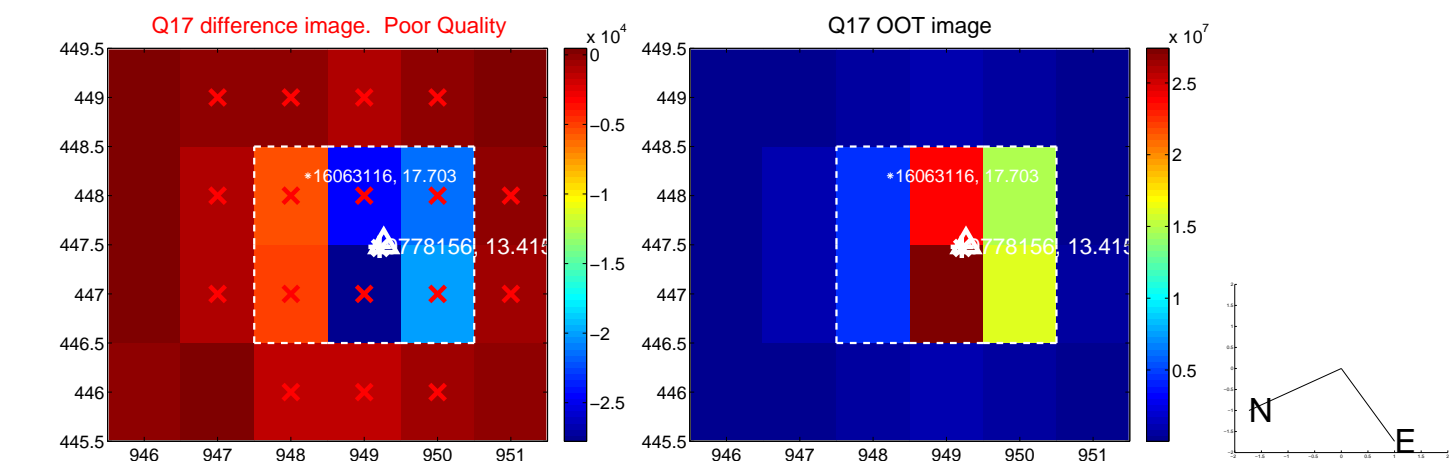
white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



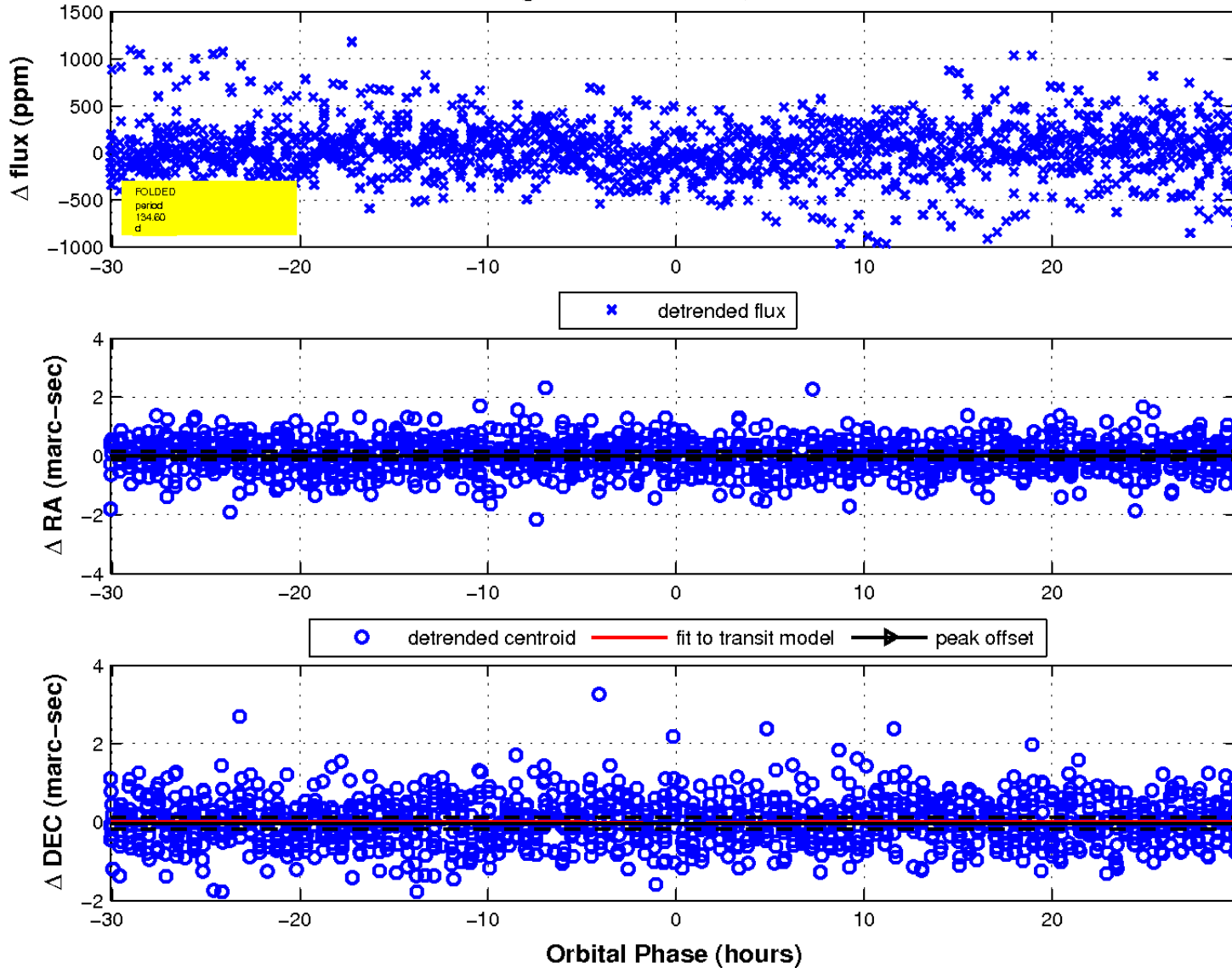
white ×: KIC target position; +: OOT centroid; △: difference centroid. red ✕: large negative pixel value.



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

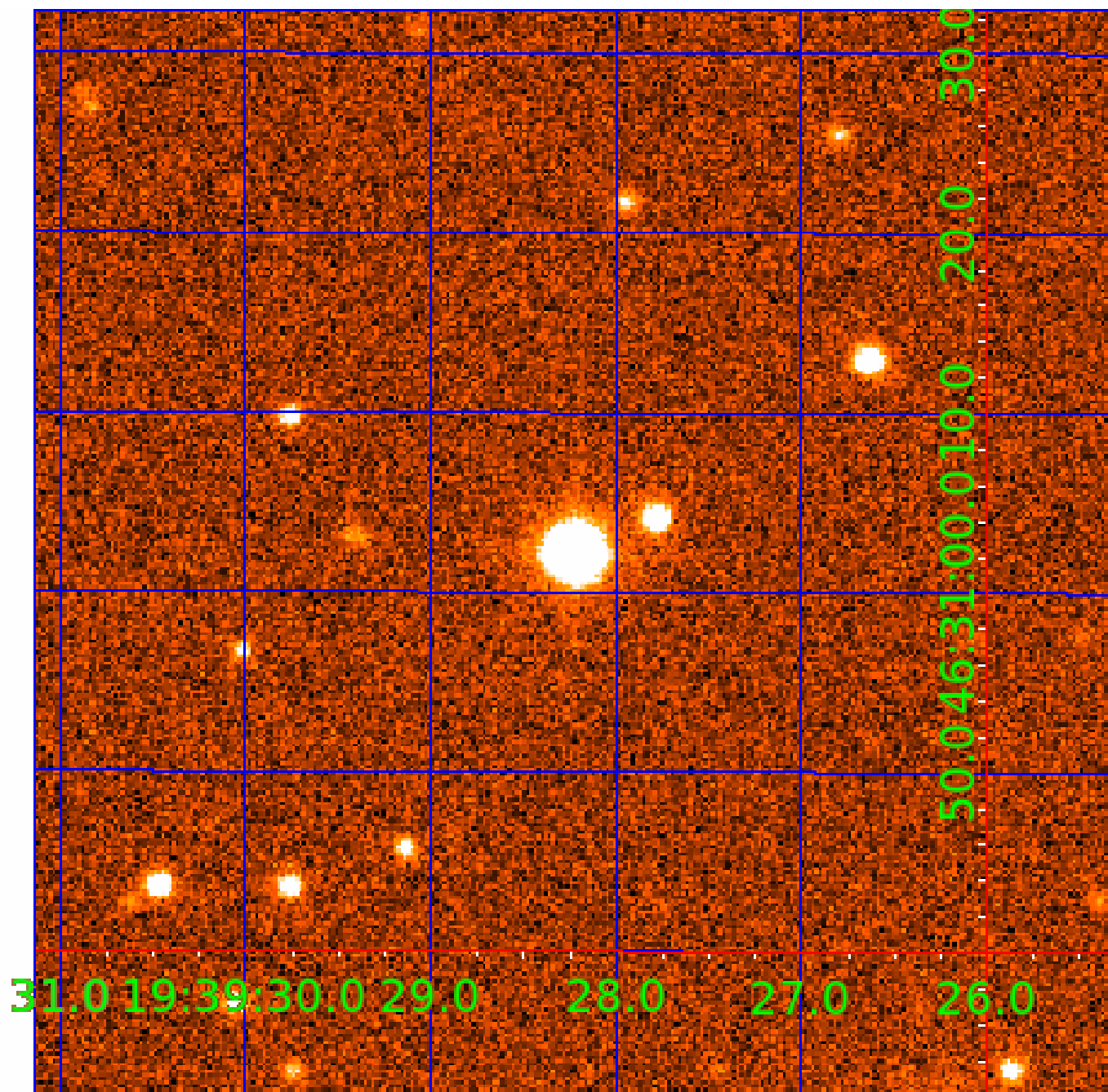


fluxWeightedCentroids, Planet 2 of 7



UKIRT Image

Declination



KIC 009778156

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})
009778156-01	OBS	No	1.496271	131.533459	80.4	8.601	16.3	20.8	2.71	6899	4.73	16503.54
009778156-02	OBS	No	134.595940	228.390375	224.7	10.063	10.2	7.6	2.71	6899	4.68	40.95
009778156-03	OBS	No	320.159647	377.542023	331.1	16.036	8.6	7.5	2.71	6899	4.97	12.89
009778156-04	OBS	No	74.165540	197.605944	286.6	4.372	7.4	8.0	2.71	6899	5.29	90.64
009778156-05	OBS	No	92.185666	186.008532	271.5	3.410	9.4	8.8	2.71	6899	4.80	67.82
009778156-06	OBS	No	86.142373	217.359021	219.8	4.750	8.2	6.5	2.71	6899	4.53	74.24
009778156-07	OBS	No	102.590867	209.562276	106.5	11.475	7.7	3.0	2.71	6899	3.02	58.81

Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009778156-01	OBS	FP	0.00	1	0	0	0	LPP_DV
009778156-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—INCONSISTENT_TRANS
009778156-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_MARSHALL—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS
009778156-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT
009778156-05	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_CHASES—TRANS_GAPPED—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT
009778156-06	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_POS_ALT
009778156-07	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT

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

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

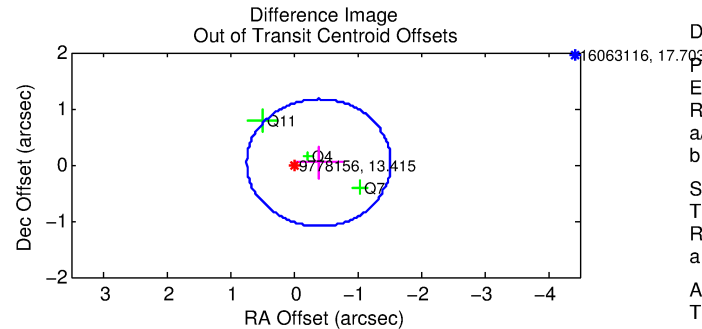
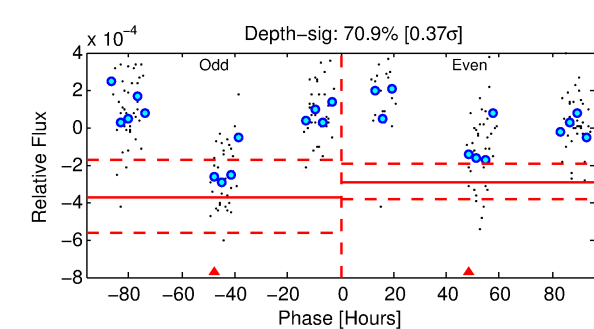
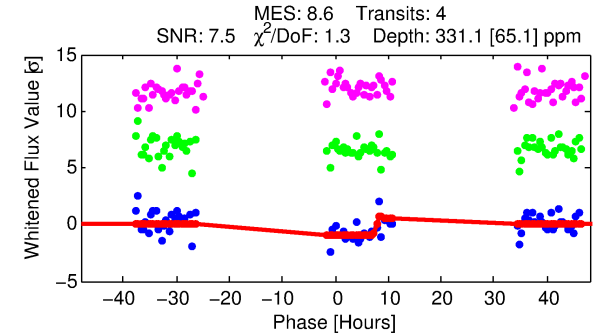
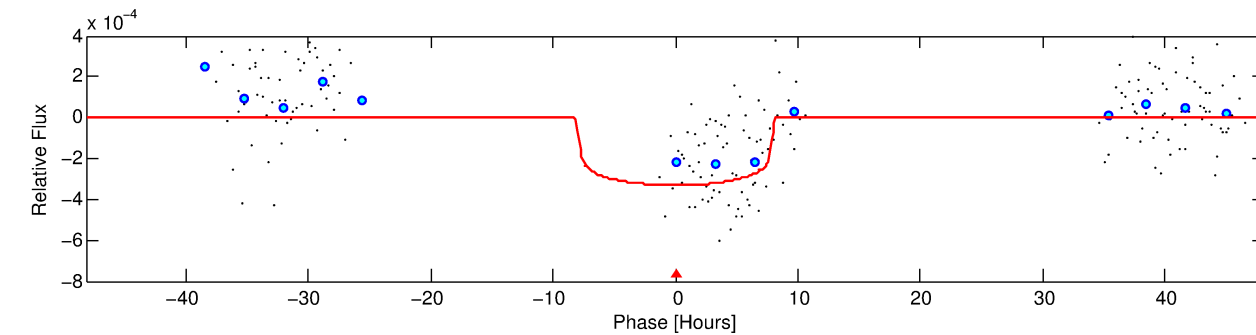
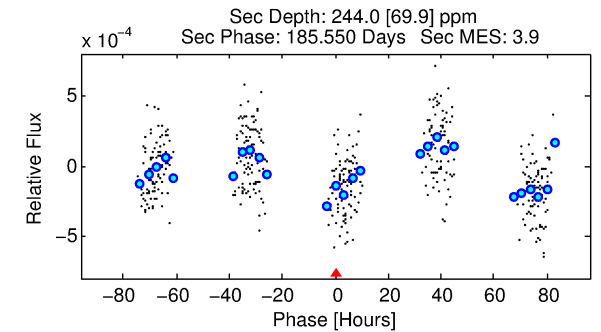
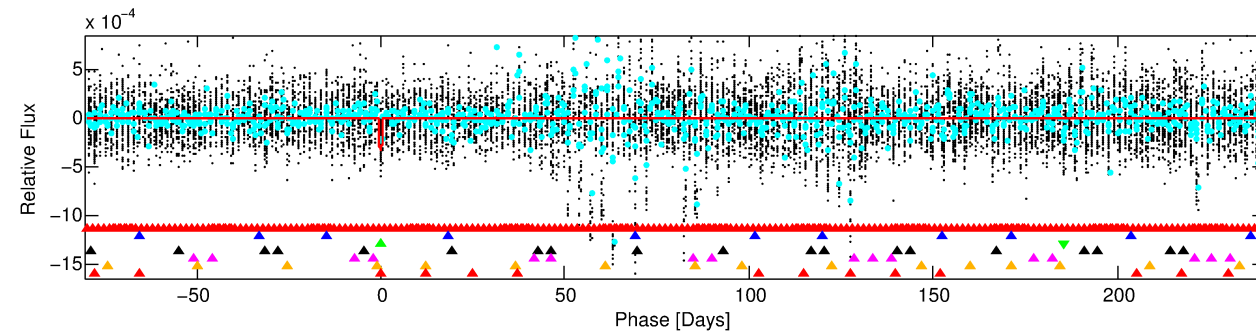
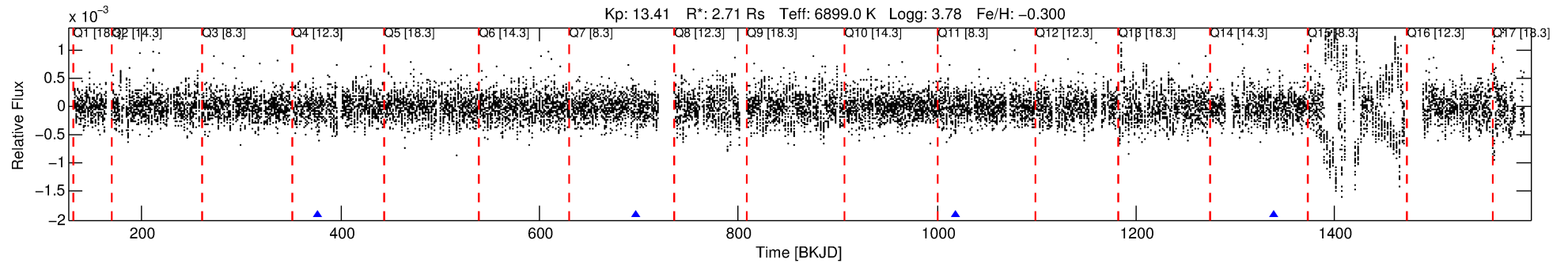
See http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col for comment definitions.

Ephemeris Match Information For 009778156-03

No Significant Match Found

DV One-Page Summary

KIC: 9778156 Candidate: 3 of 7 Period: 320.160 d



DV Fit Results:

Period = 320.15965 [0.01112] d
Epoch = 377.5420 [0.0689] BKJD
Rp/R* = 0.0168 [0.0186]
a/R* = 155.07 [974.21]
b = 0.01 [434.02]
Seff = 12.90 [7.23]
Teq = 483 [68] K
Rp = 4.97 [5.83] Re
a = 1.0736 [0.3771] AU
Ag = 6264.30 [14392.30] [0.44σ]
Teffp = 6647 [3716] K [1.66σ]

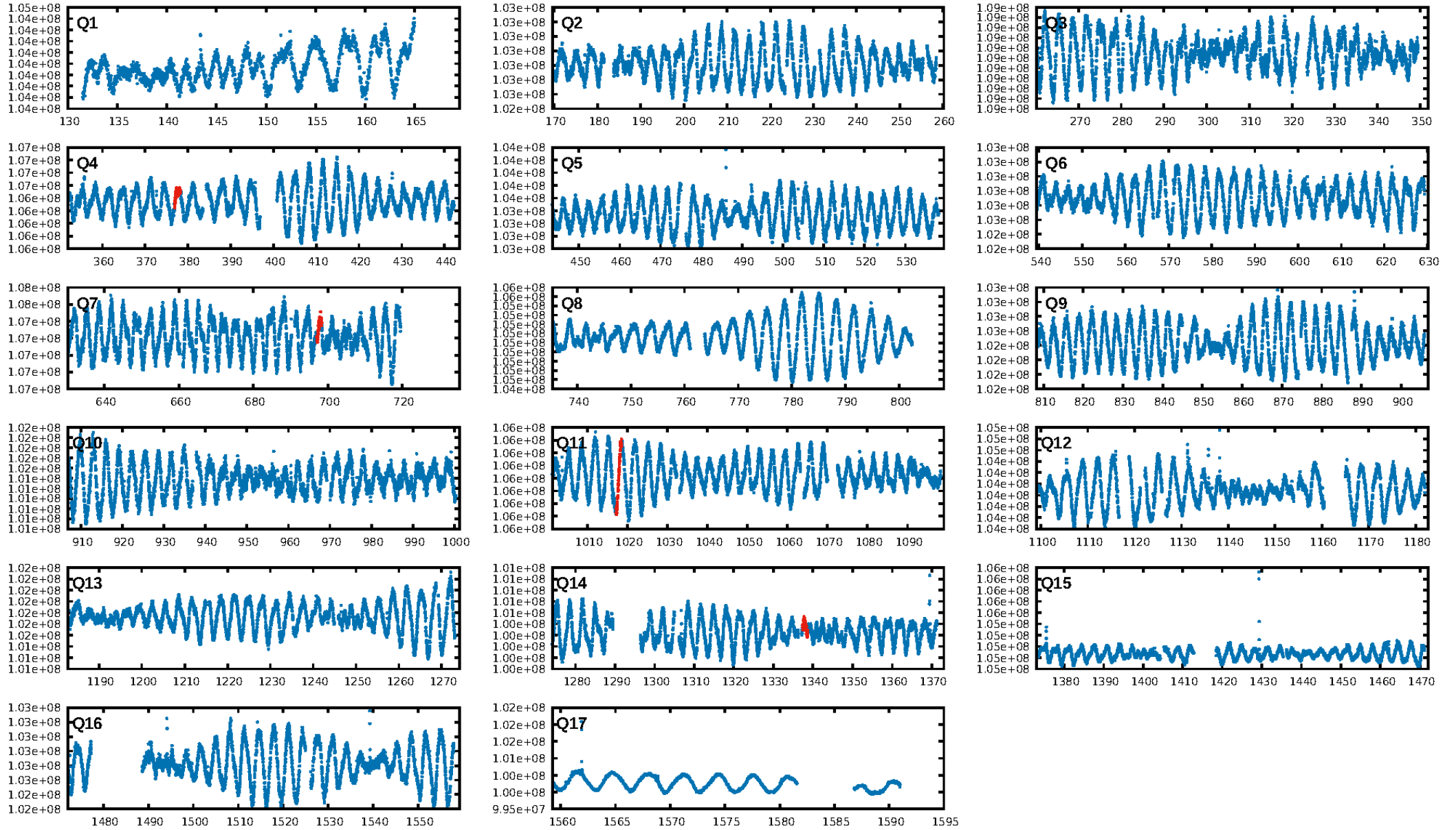
DV Diagnostic Results:

ShortPeriod-sig: 100.0% [235.23σ]
LongPeriod-sig: N/A
ModelChiSquare2-sig: 2.4%
ModelChiSquareGof-sig: 100.0%
Bootstrap-pfa: 1.41e-13
RollingBand-fgt: 1.00 [4/4]
GhostDiagnostic-chr: 0.8943
Centroid-sig: 3.4%
Centroid-so: 0.846 arcsec [1.40σ]
OotOffset-rm: 0.396 arcsec [1.05σ]
KicOffset-rm: 0.460 arcsec [1.26σ]
OotOffset-st: 0/2/1/0 [3]
KicOffset-st: 0/2/1/0 [3]
DiffImageQuality-fgm: 0.00 [0/3]
DiffImageOverlap-fno: 0.00 [0/3]

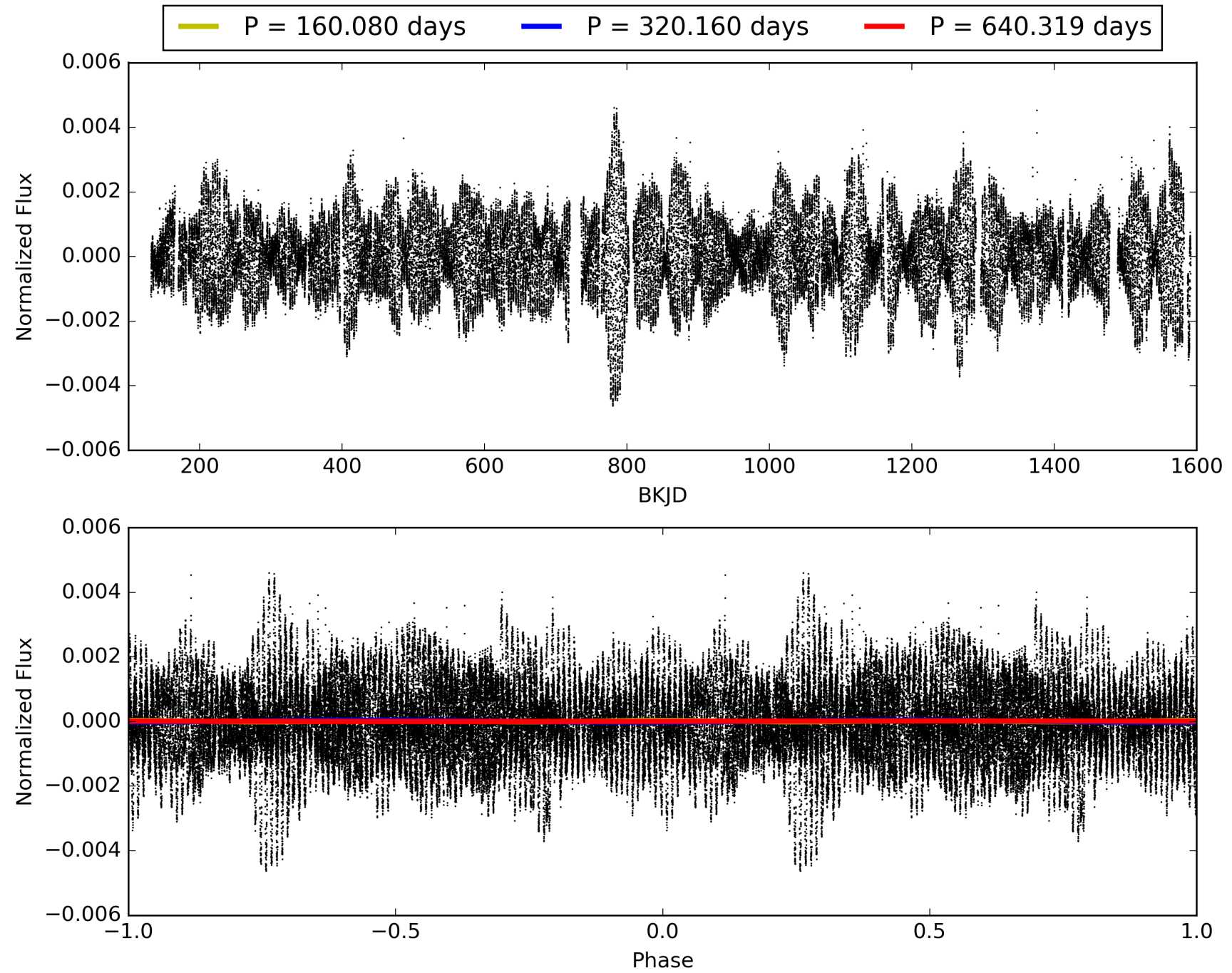
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 30-Jan-2016 20:46:45 Z

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

TCE 009778156-03, PDC Light Curves

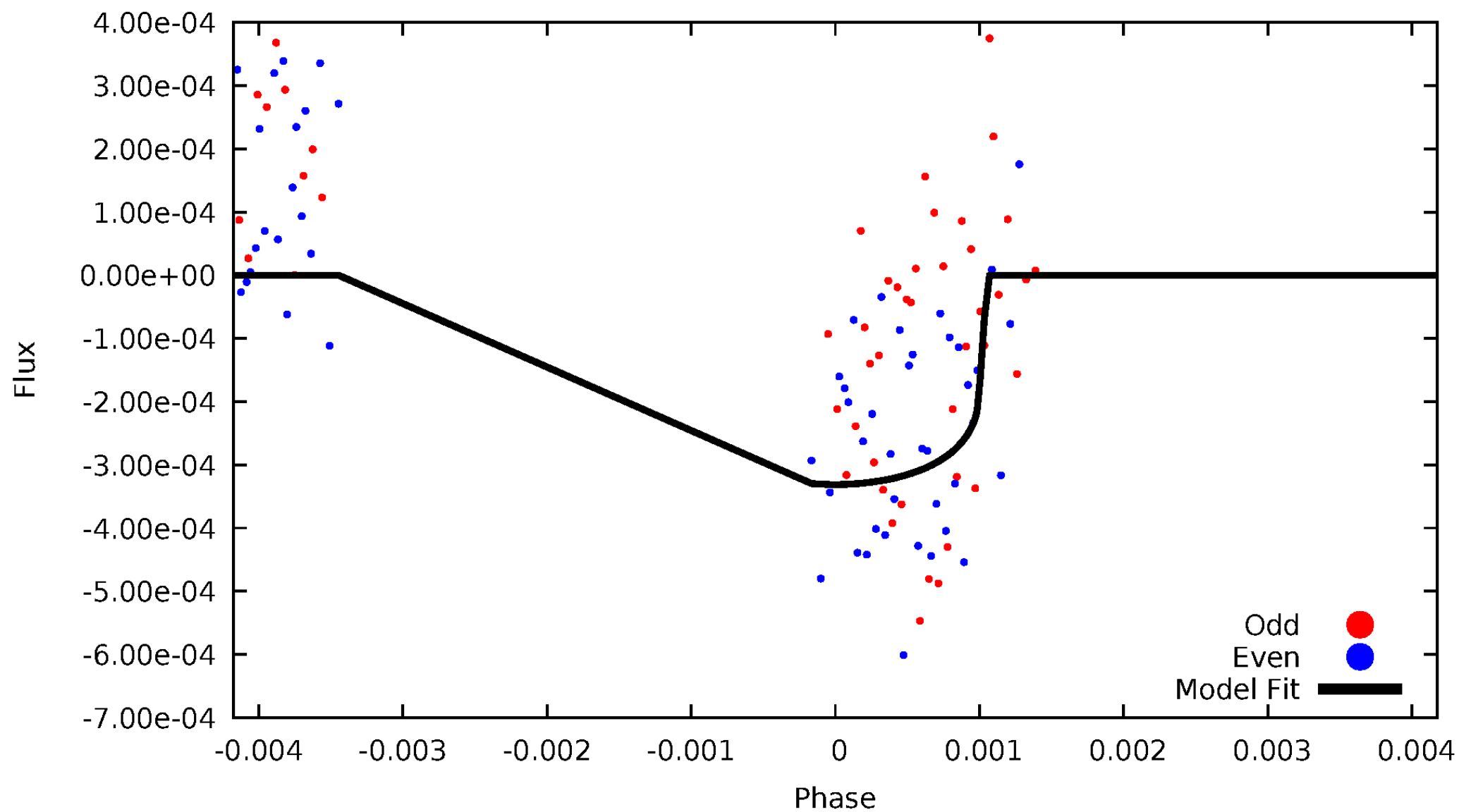


TCE 009778156-03



DV Odd/Even

TCE 009778156-03

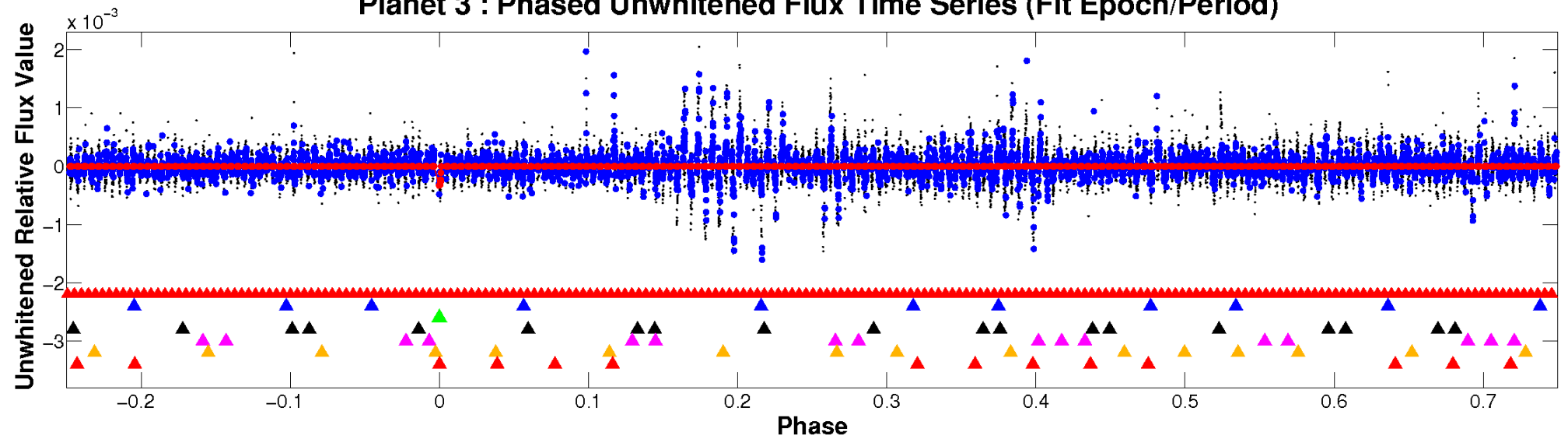


ALT Odd/Even

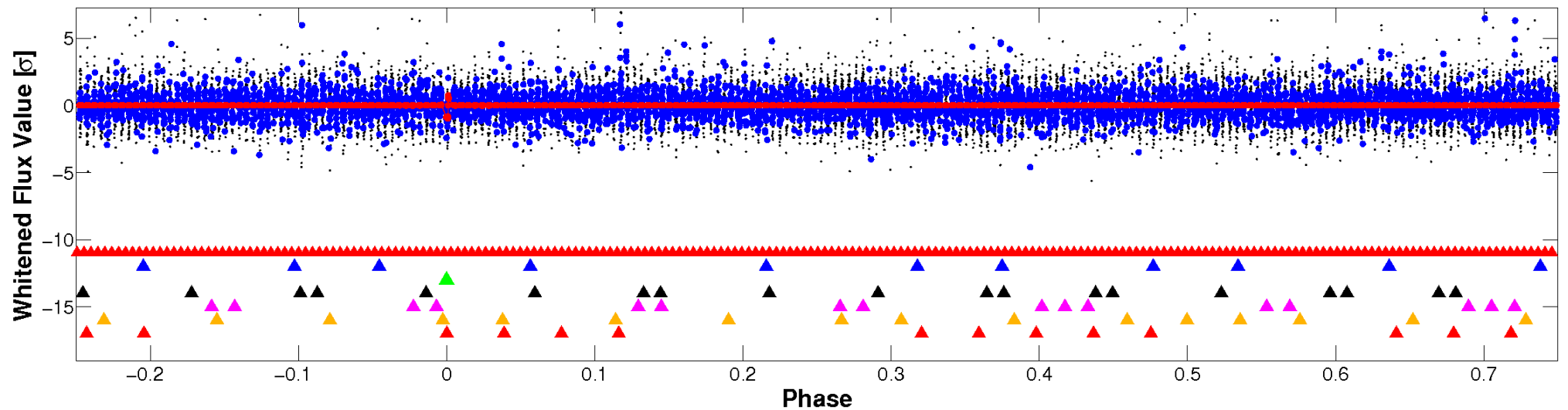
This plot does not exist for this TCE.

Non-Whitened Vs. Whitened Light Curve

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

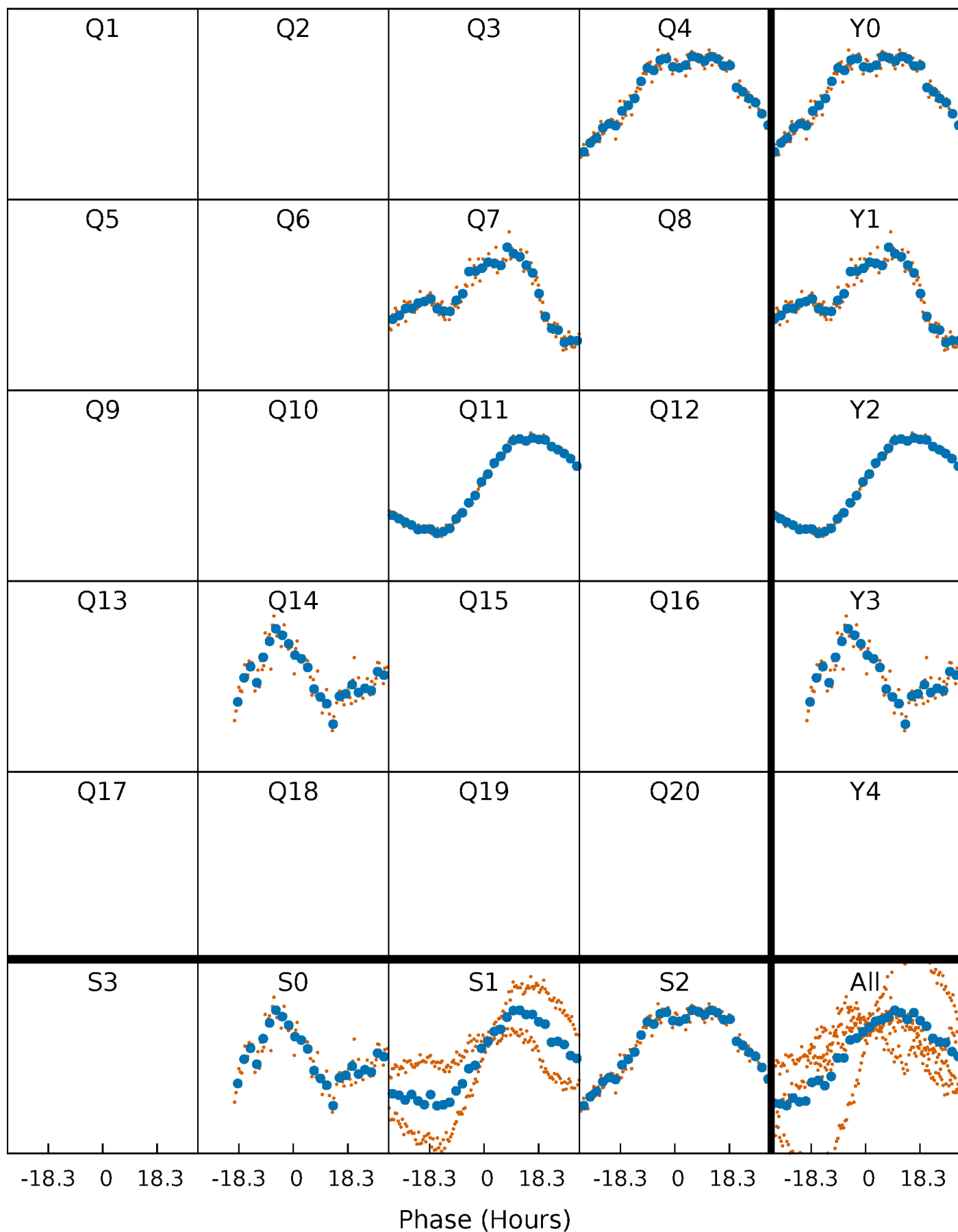


Planet 3 : Phased Whitened Flux Time Series (Fit Epoch/Period)



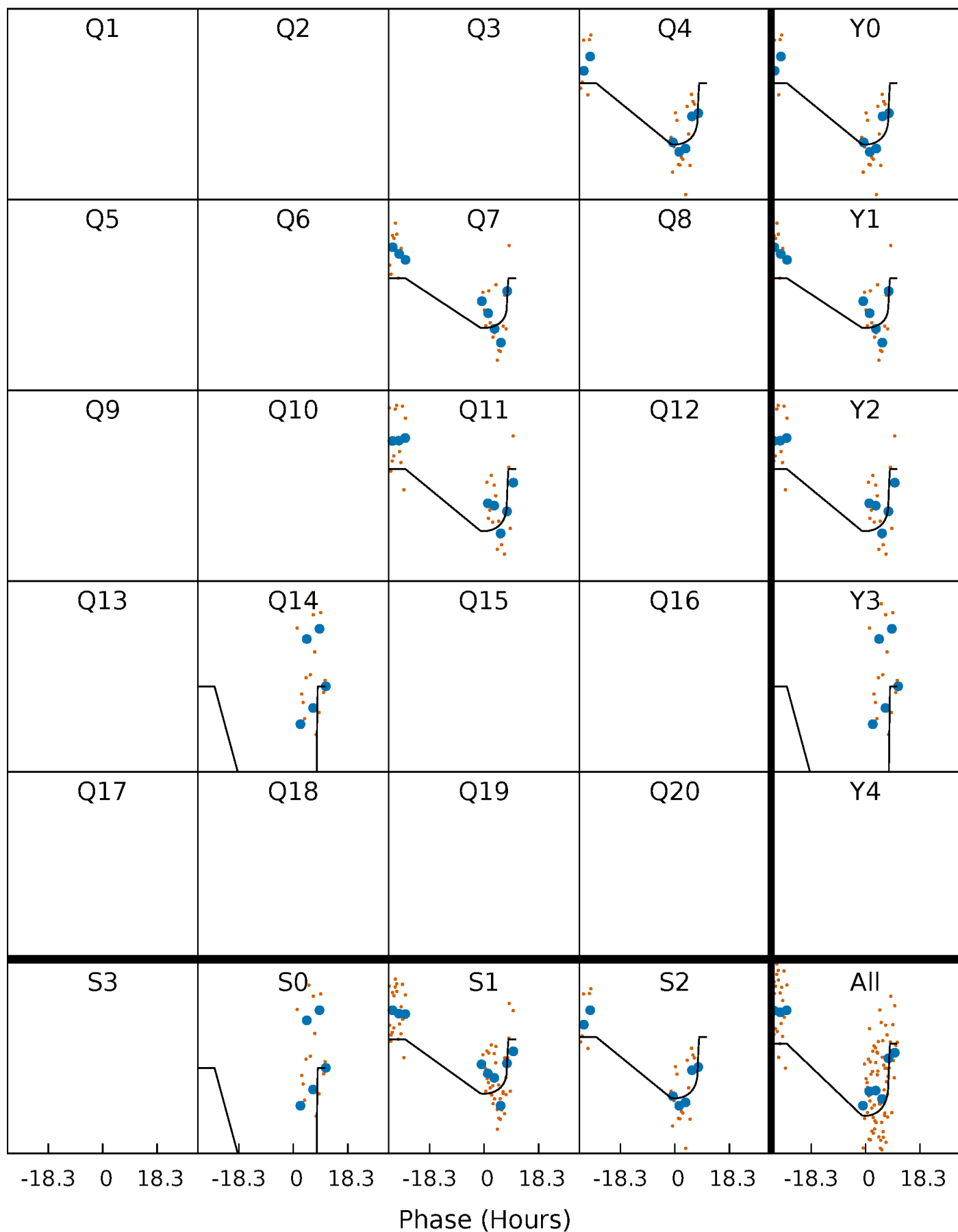
PDC Quarter-Phased Transit Curves

TCE 009778156-03 $P=320.159647$ Days $T_0=377.542023$ (BKJD)



DV Quarter-Phased Transit Curves

TCE 009778156-03 $P=320.159647$ Days $T_0=377.542023$ (BKJD)

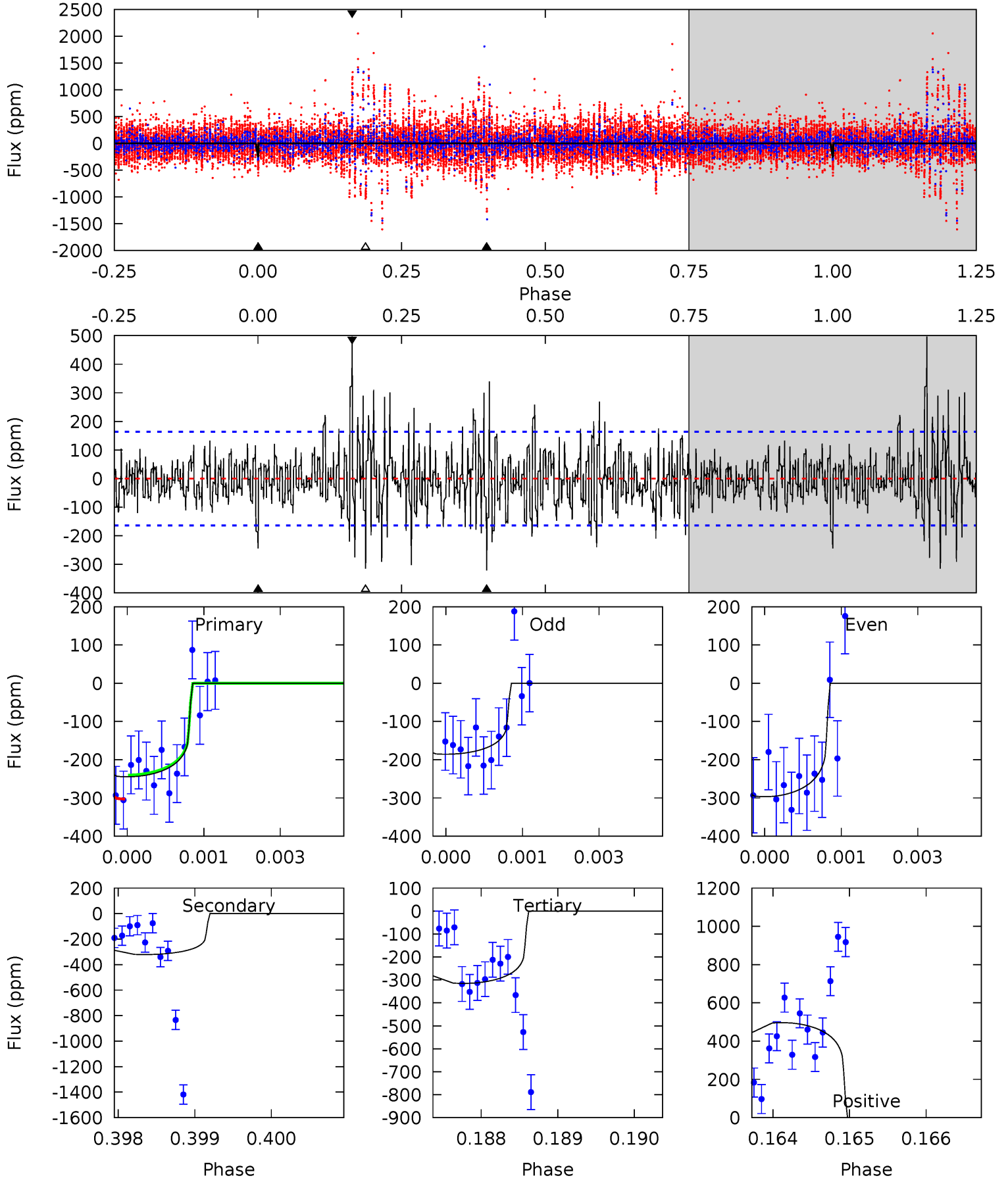


This plot does not exist for this TCE.

DV Model-Shift Uniqueness Test

009778156-03, P = 320.159647 Days, E = 57.382376 Days

Pri	Sec	Ter	Pos	FA ₁	FA ₂	F _{Red}	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
8.09	10.6	10.4	16.4	5.41	3.23	2.90	-2.34	-8.33	0.20	-5.80	1.69	0.78	0.61	0.49



Alt Model-Shift Uniqueness Test

This plot does not exist for this TCE.

Stellar Parameters For KIC 009778156

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	6899^{+190}_{-238}	$3.780^{+0.312}_{-0.078}$	$-0.300^{+0.300}_{-0.250}$	$2.706^{+0.417}_{-1.043}$	$1.607^{+0.199}_{-0.369}$	$0.114^{+0.260}_{-0.035}$
	+3%/-3%	+8%/-2%	+100%/-83%	+15%/-39%	+12%/-23%	+227%/-31%
Source	PHO1	FLK73	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 009778156-03 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	A_{obs}
DV	-321 ± 30	$5.79^{+4.55}_{-3.42}$	659^{+40}_{-59}	6237^{+4801}_{-1381}	6041^{+29877}_{-4192}
Alt.	N/A	N/A	N/A	N/A	N/A

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

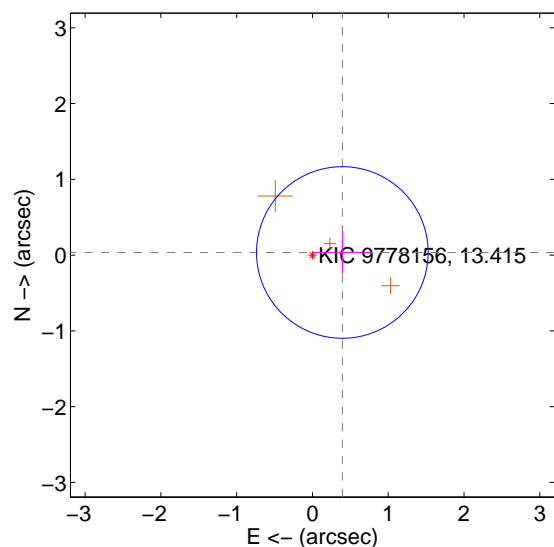
Supplemental centroid analysis for 009778156-03. Kepler magnitude: 13.41. Transit SNR 7.48

There are 0 quarters with good PRF difference image offsets

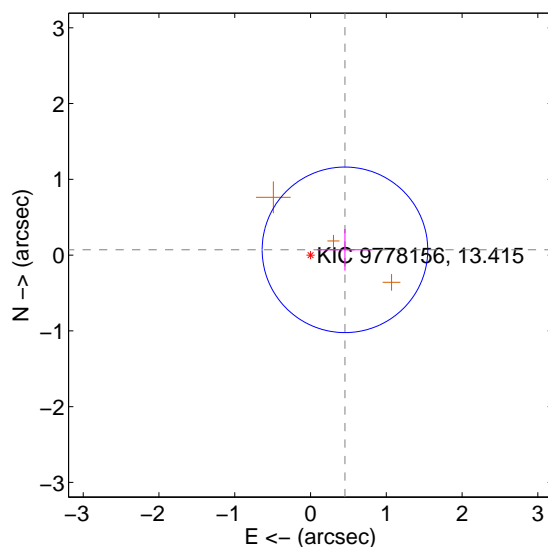
The direct PRF centroid is offset from the target star catalog position by about 0.02 arcsec

	Distance in arcsec	Distance / σ	Δ RA	Δ Dec
PRF-fit source offset from OOT	0.396 ± 0.377	1.05	-0.395 ± 0.378	0.034 ± 0.282
PRF-fit source offset from KIC position	0.460 ± 0.364	1.26	-0.454 ± 0.366	0.070 ± 0.274
photometric centroid source offset	0.85 ± 0.61	1.40	0.02 ± 0.63	-0.85 ± 0.61

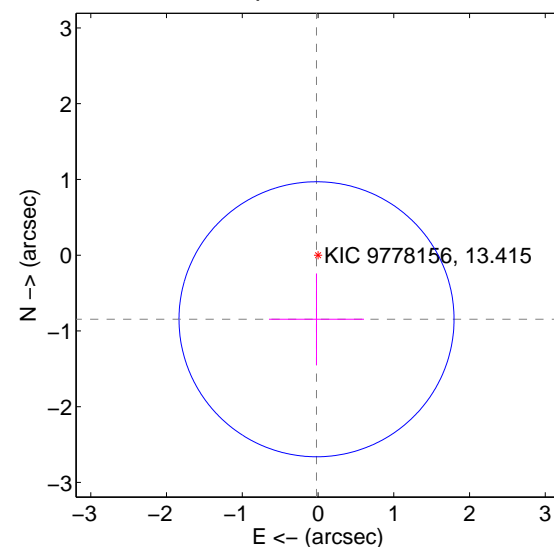
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position

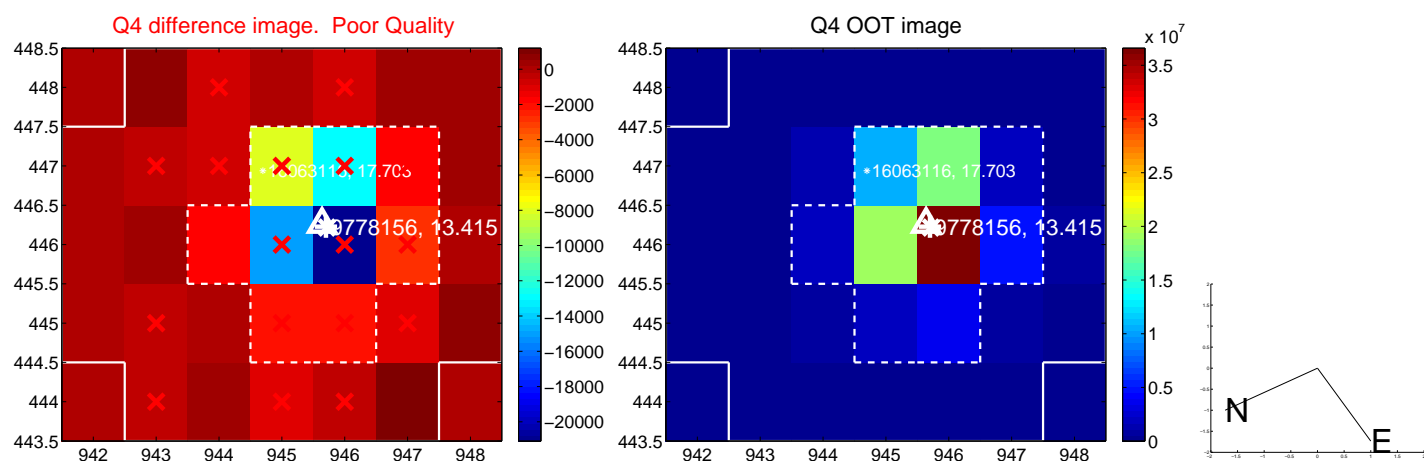
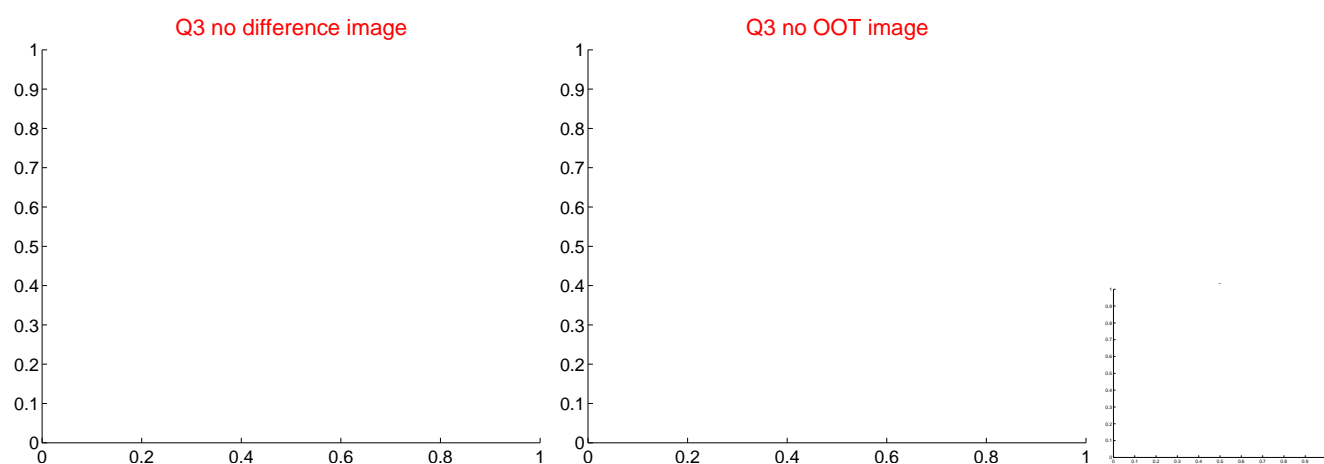
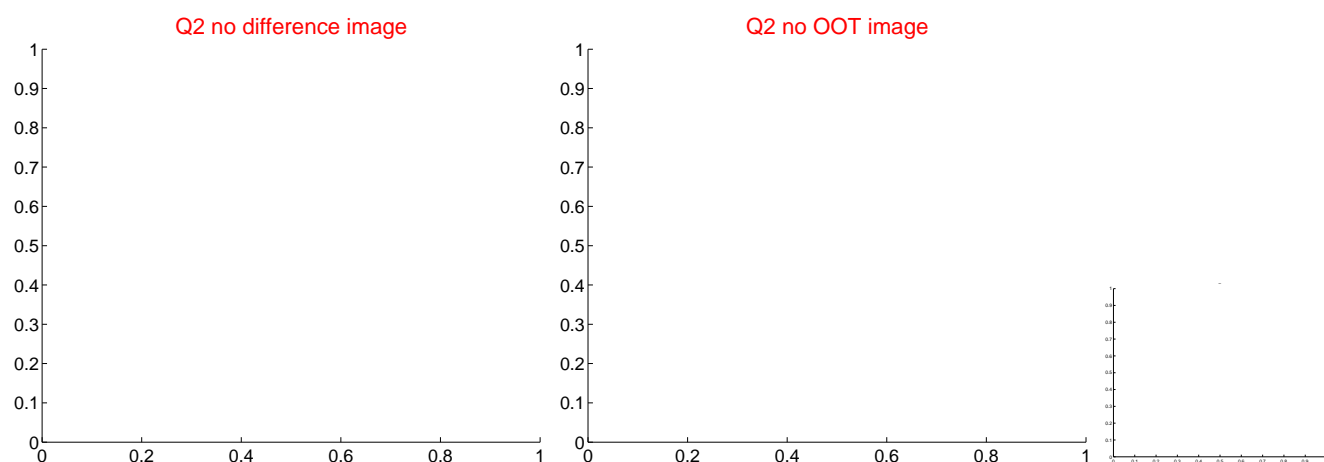
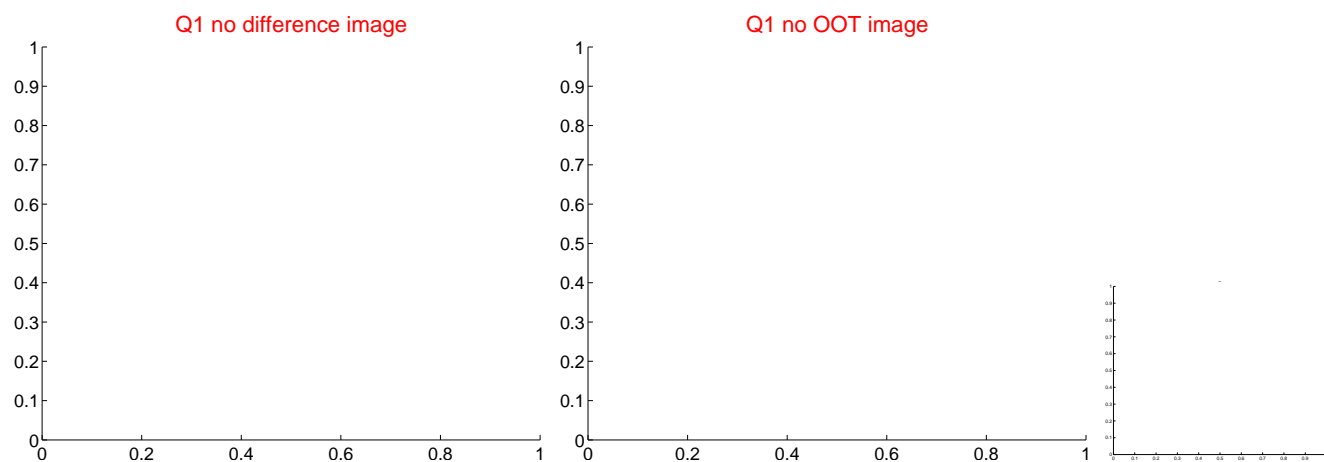


offset from photometric centroids

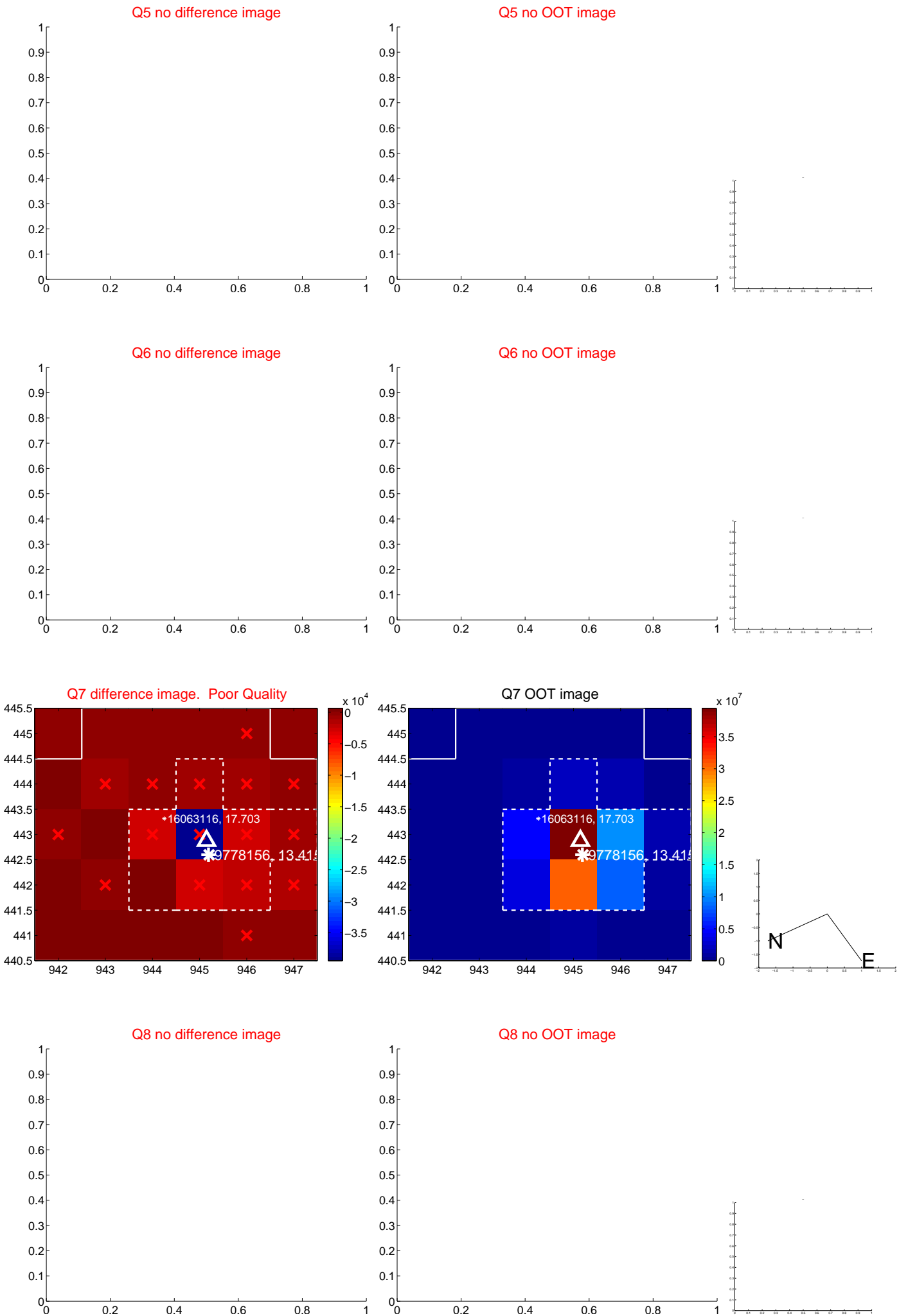


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- σ uncertainty. Blue circle: three- σ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

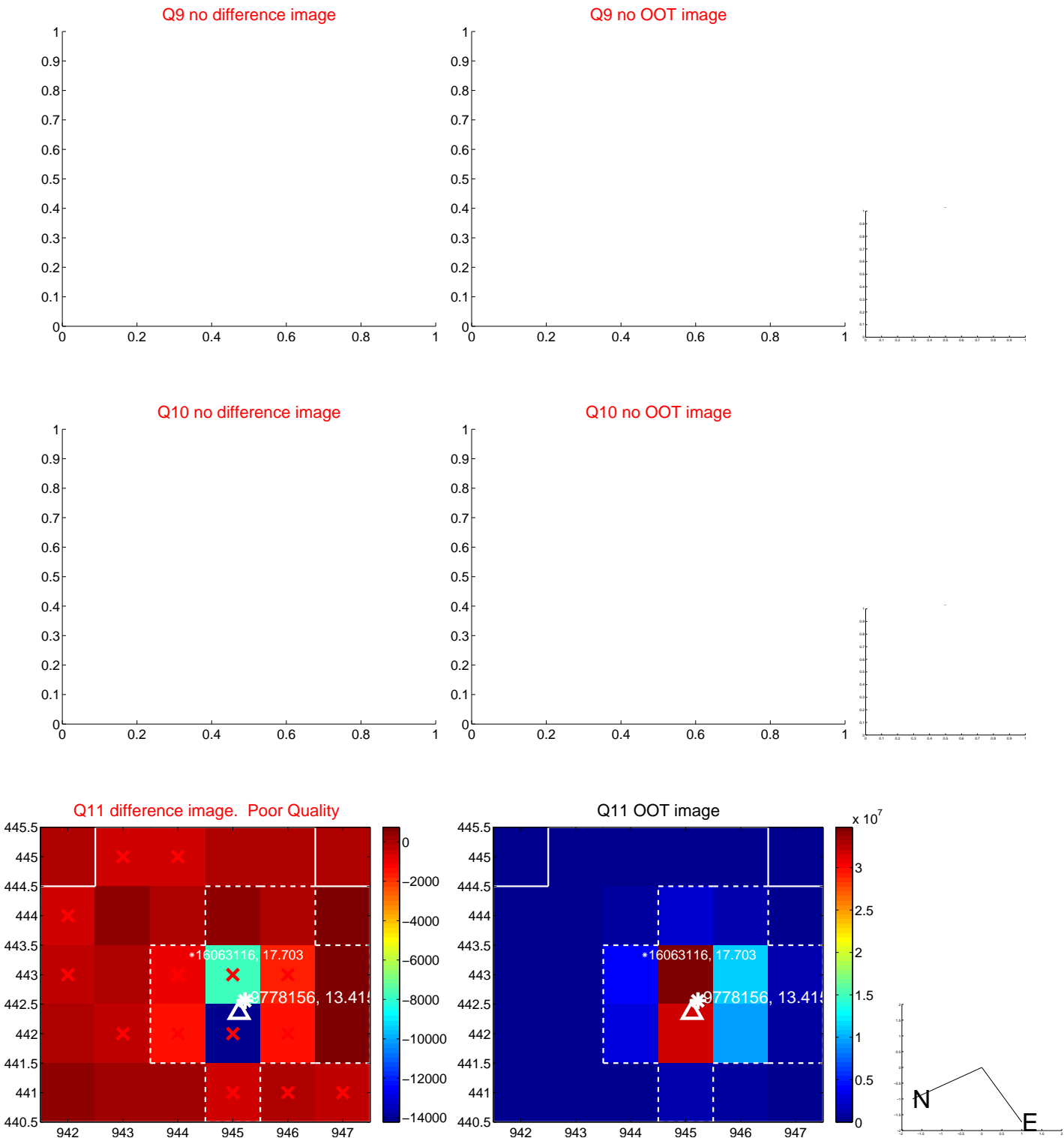
white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value



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



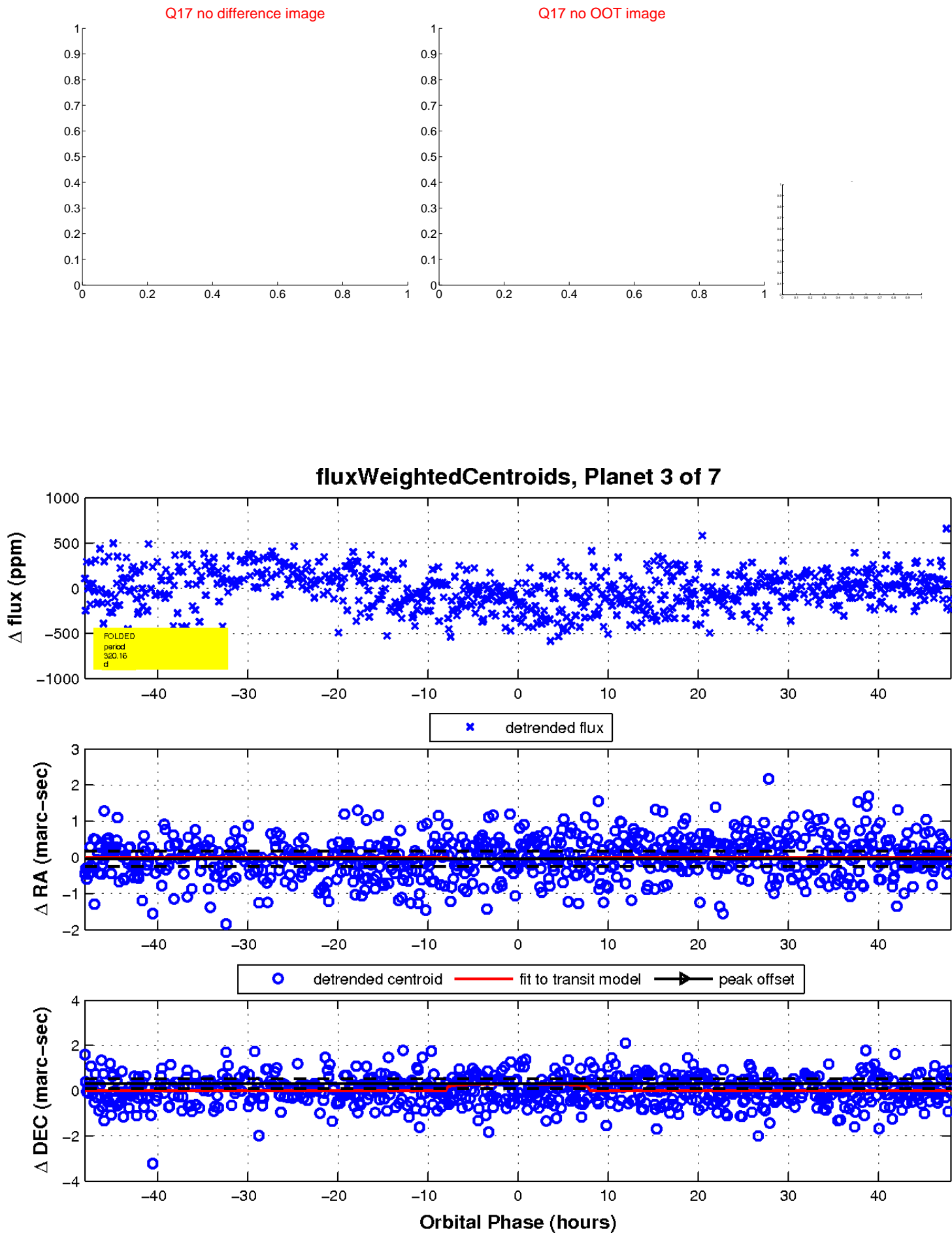
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



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

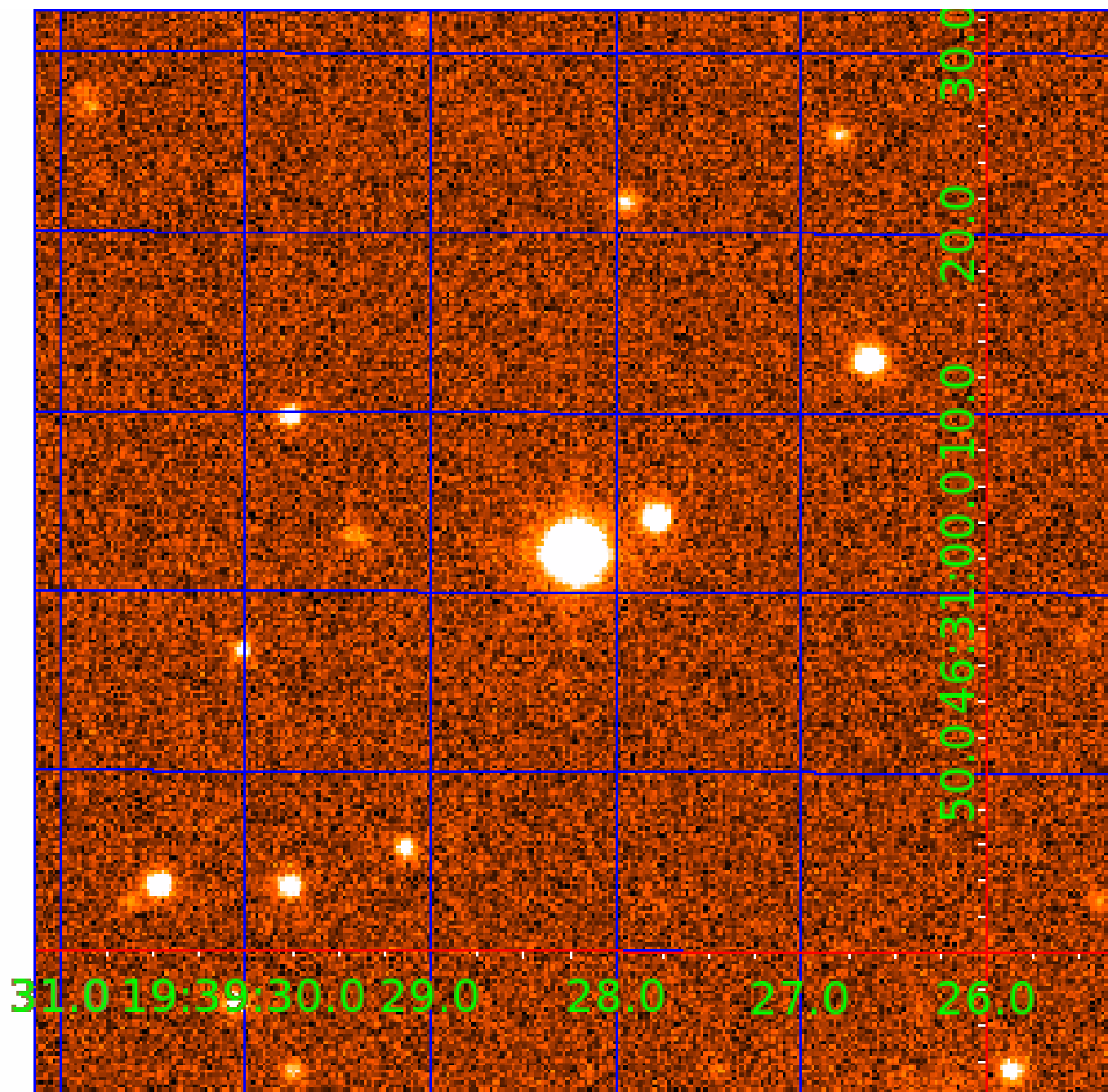


white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



UKIRT Image

Declination



KIC 009778156

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})
009778156-01	OBS	No	1.496271	131.533459	80.4	8.601	16.3	20.8	2.71	6899	4.73	16503.54
009778156-02	OBS	No	134.595940	228.390375	224.7	10.063	10.2	7.6	2.71	6899	4.68	40.95
009778156-03	OBS	No	320.159647	377.542023	331.1	16.036	8.6	7.5	2.71	6899	4.97	12.89
009778156-04	OBS	No	74.165540	197.605944	286.6	4.372	7.4	8.0	2.71	6899	5.29	90.64
009778156-05	OBS	No	92.185666	186.008532	271.5	3.410	9.4	8.8	2.71	6899	4.80	67.82
009778156-06	OBS	No	86.142373	217.359021	219.8	4.750	8.2	6.5	2.71	6899	4.53	74.24
009778156-07	OBS	No	102.590867	209.562276	106.5	11.475	7.7	3.0	2.71	6899	3.02	58.81

Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009778156-01	OBS	FP	0.00	1	0	0	0	LPP_DV
009778156-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—INCONSISTENT_TRANS
009778156-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_MARSHALL—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS
009778156-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT
009778156-05	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_CHASES—TRANS_GAPPED—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT
009778156-06	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_POS_ALT
009778156-07	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT

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

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

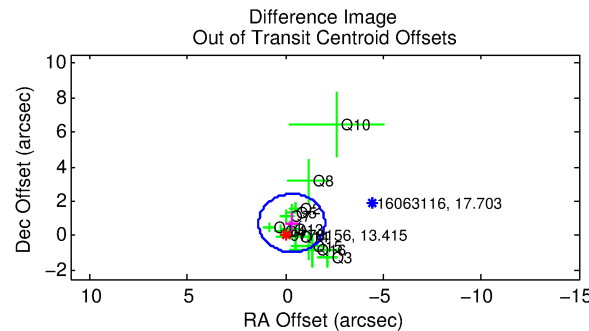
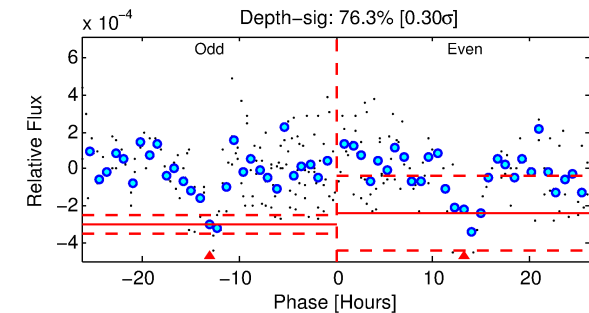
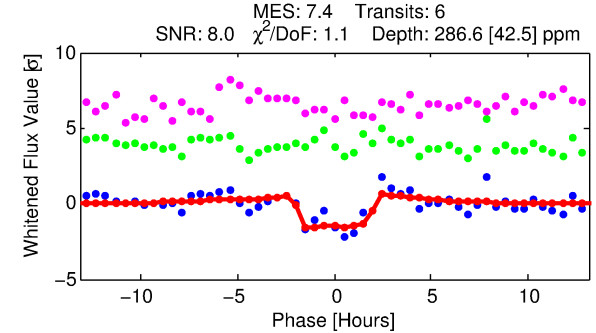
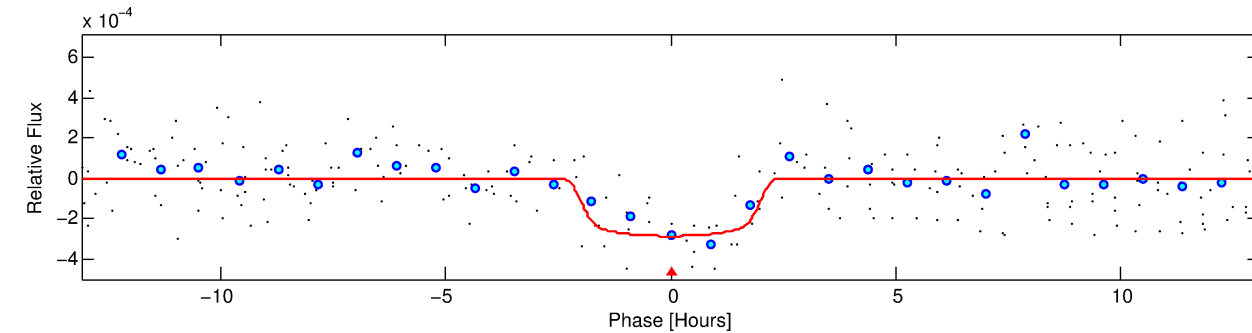
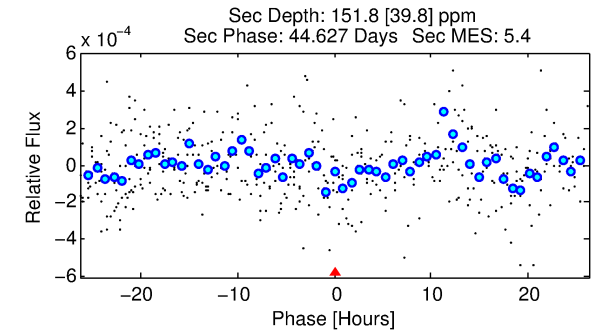
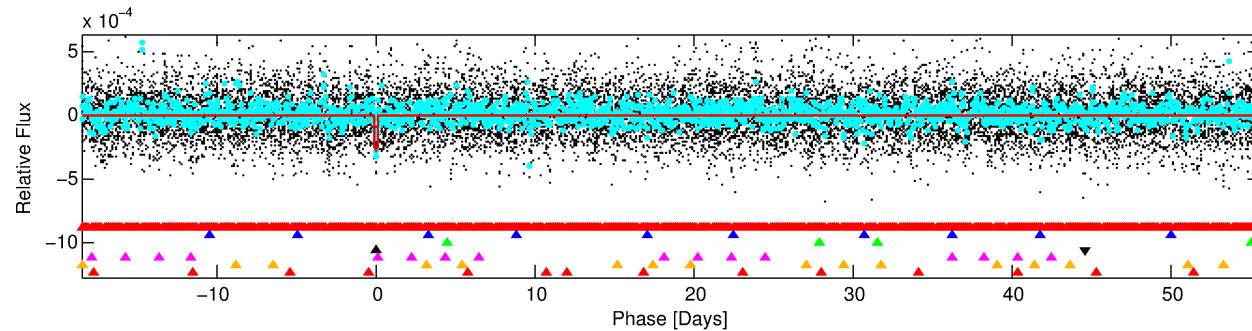
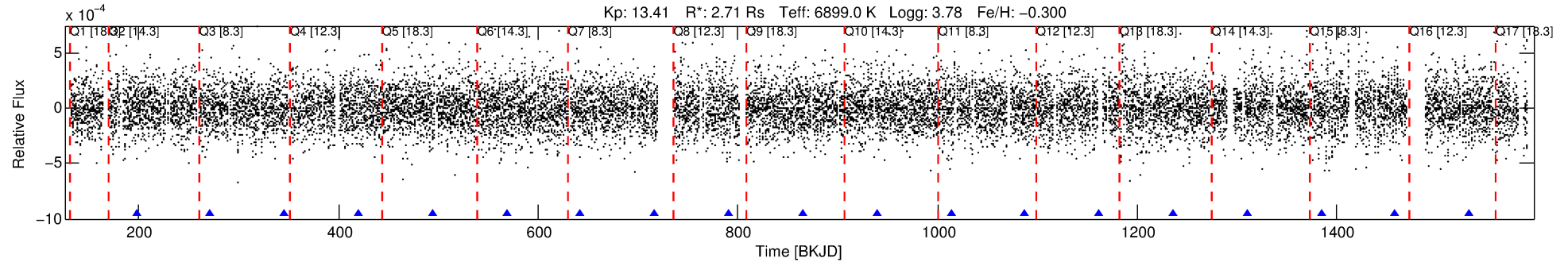
See http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col for comment definitions.

Ephemeris Match Information For 009778156-04

No Significant Match Found

DV One-Page Summary

KIC: 9778156 Candidate: 4 of 7 Period: 74.166 d



DV Fit Results:

Period = 74.16554 [0.00100] d
Epoch = 197.6059 [0.0098] BKJD
Rp/R* = 0.0179 [0.0084]
a/R* = 63.98 [176.63]
b = 0.89 [0.65]
Seff = 90.64 [50.83]
Teq = 787 [110] K
Rp = 5.29 [3.20] Re
a = 0.4049 [0.1422] AU
Ag = 489.90 [544.27] [0.90σ]
Teffp = 5723 [1400] K [3.51σ]

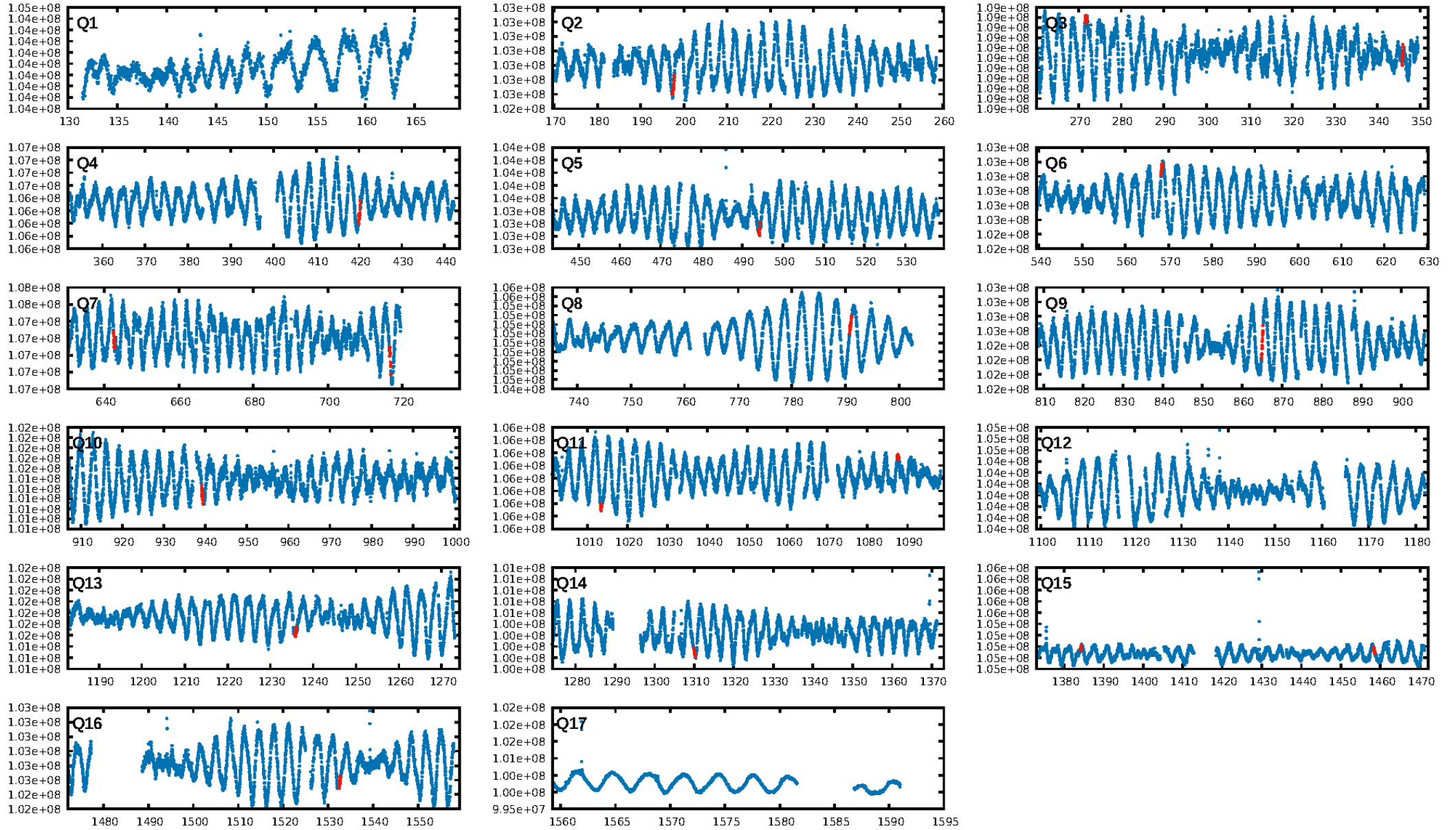
DV Diagnostic Results:

ShortPeriod-sig: 100.0% [180.77σ]
LongPeriod-sig: 100.0% [44.53σ]
ModelChiSquare2-sig: 93.9%
ModelChiSquareGof-sig: 100.0%
Bootstrap-pfa: 1.46e-08
RollingBand-fgt: 1.00 [6/6]
GhostDiagnostic-chr: -0.9317
Centroid-sig: 42.6%
Centroid-so: 0.426 arcsec [0.79σ]
OotOffset-rm: 0.797 arcsec [1.41σ]
OotOffset-st: 3/4/3/2 [12]
KicOffset-rm: 0.816 arcsec [1.42σ]
KicOffset-st: 3/4/3/2 [12]
DiffImageQuality-fgm: 0.67 [8/12]
DiffImageOverlap-fno: 0.23 [3/13]

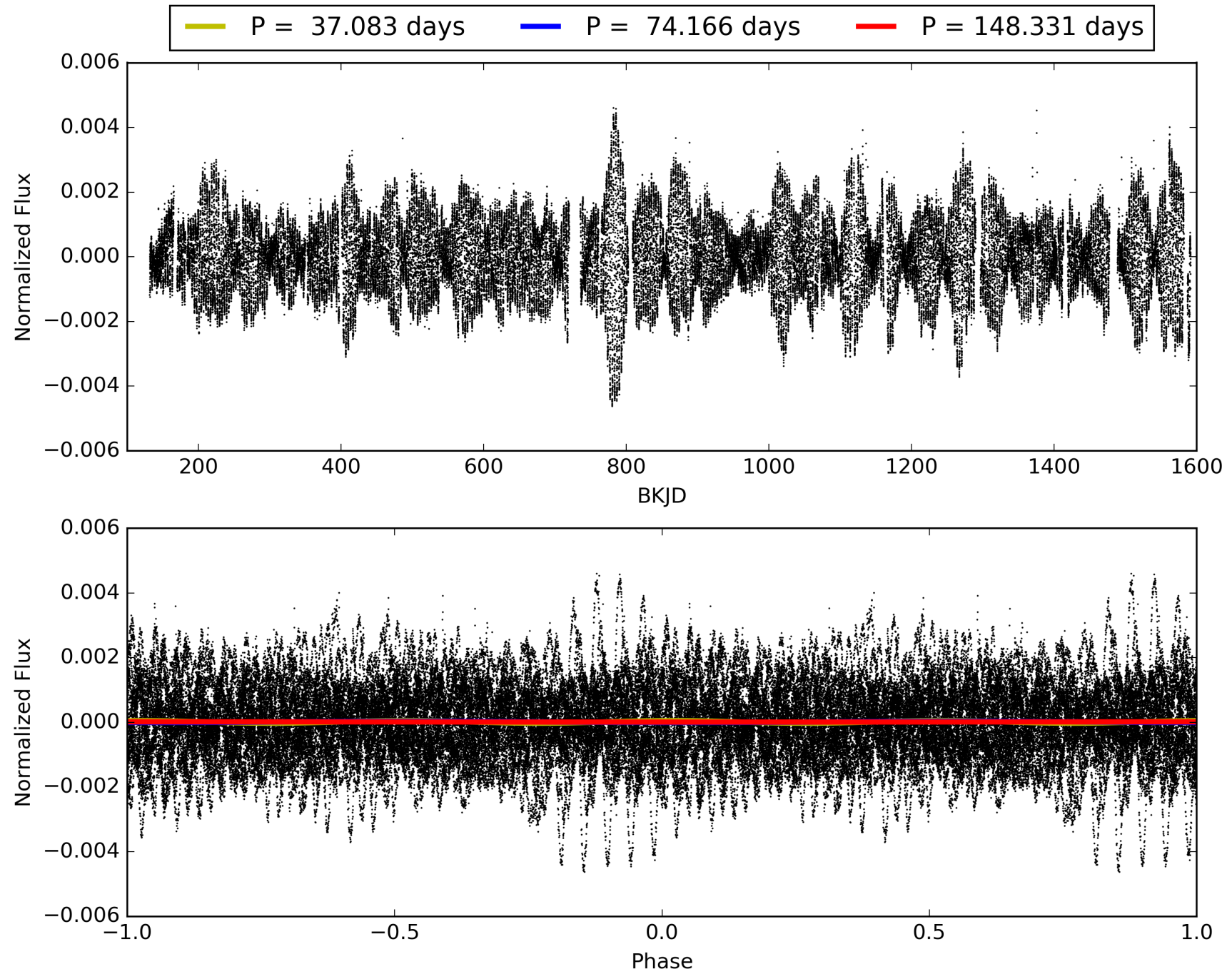
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 30-Jan-2016 20:46:49 Z

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

TCE 009778156-04, PDC Light Curves

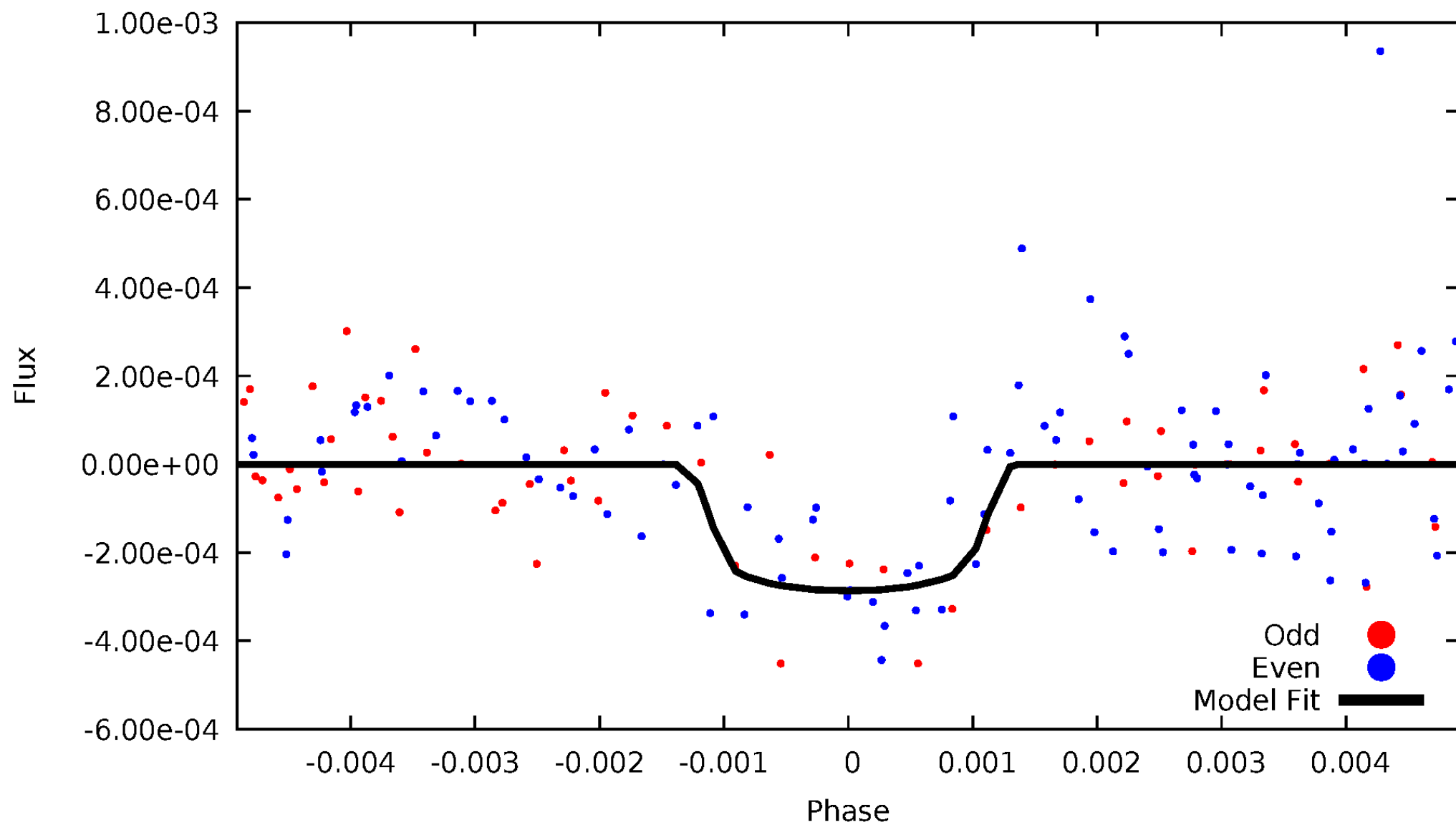


TCE 009778156-04



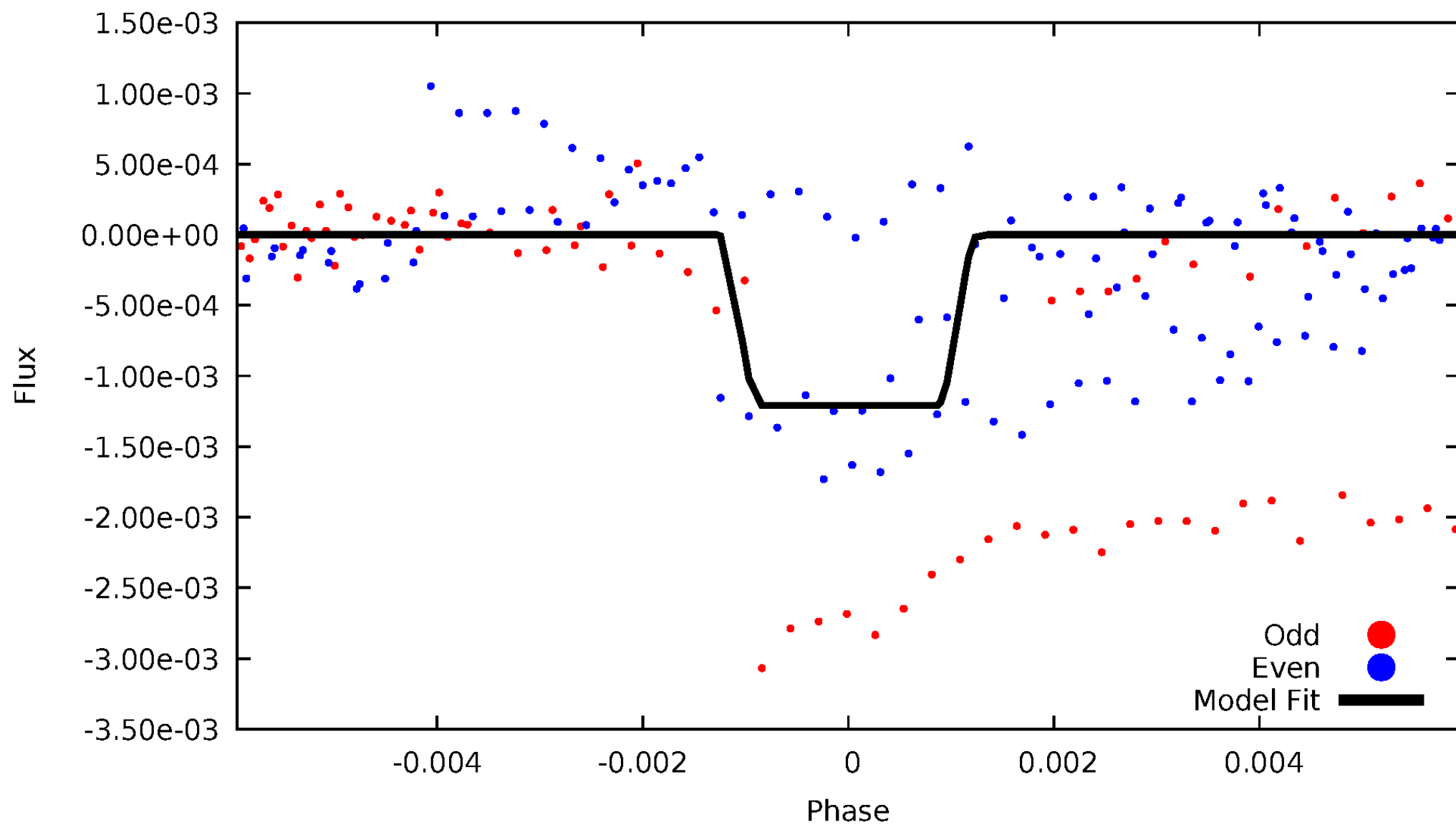
DV Odd/Even

TCE 009778156-04



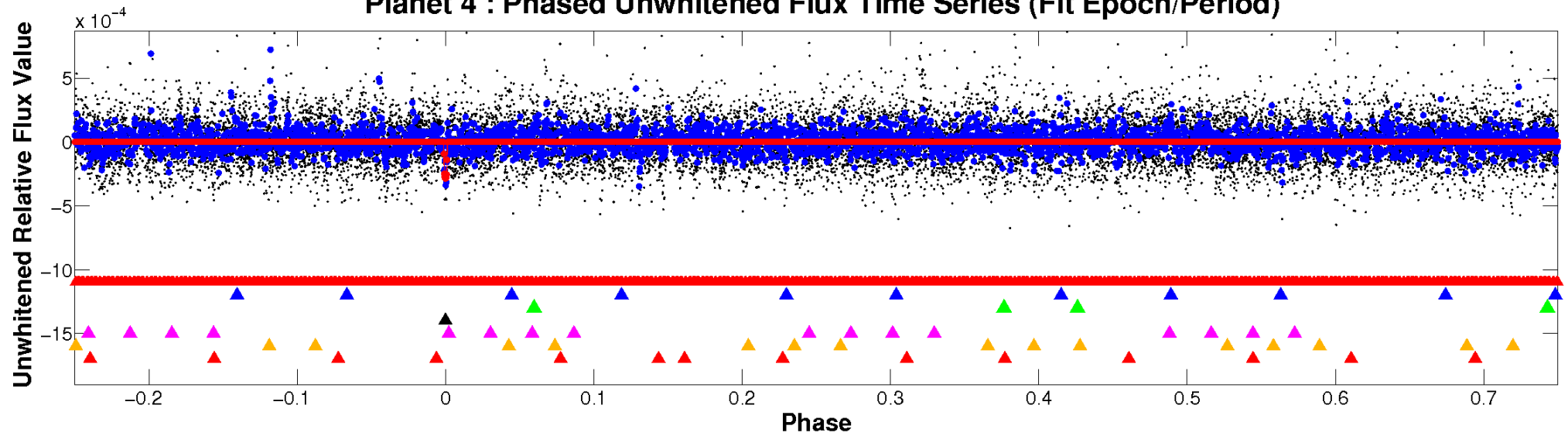
ALT Odd/Even

TCE 009778156-04

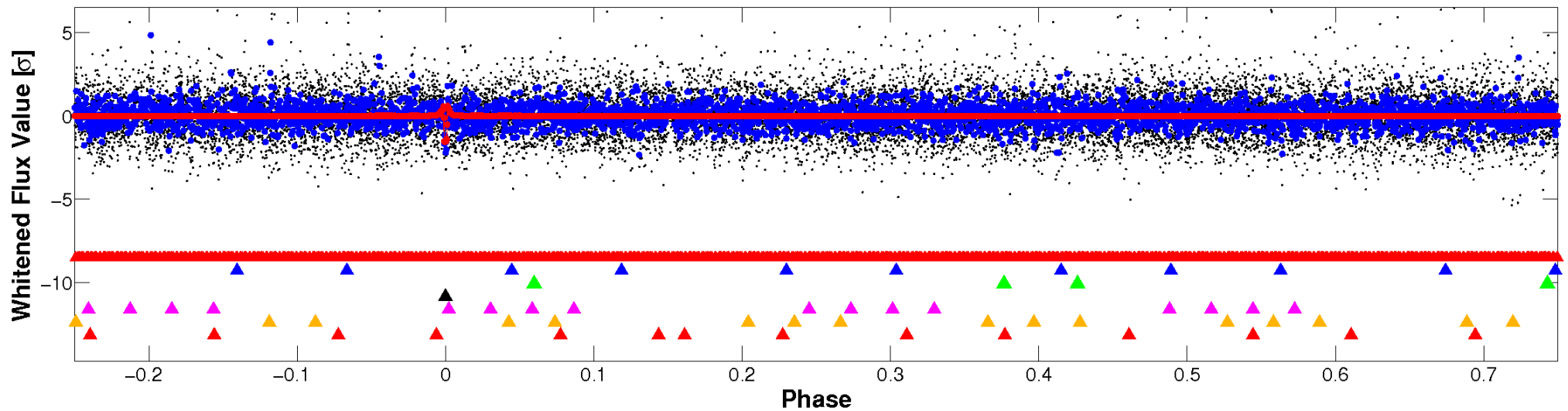


Non-Whitened Vs. Whitened Light Curve

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

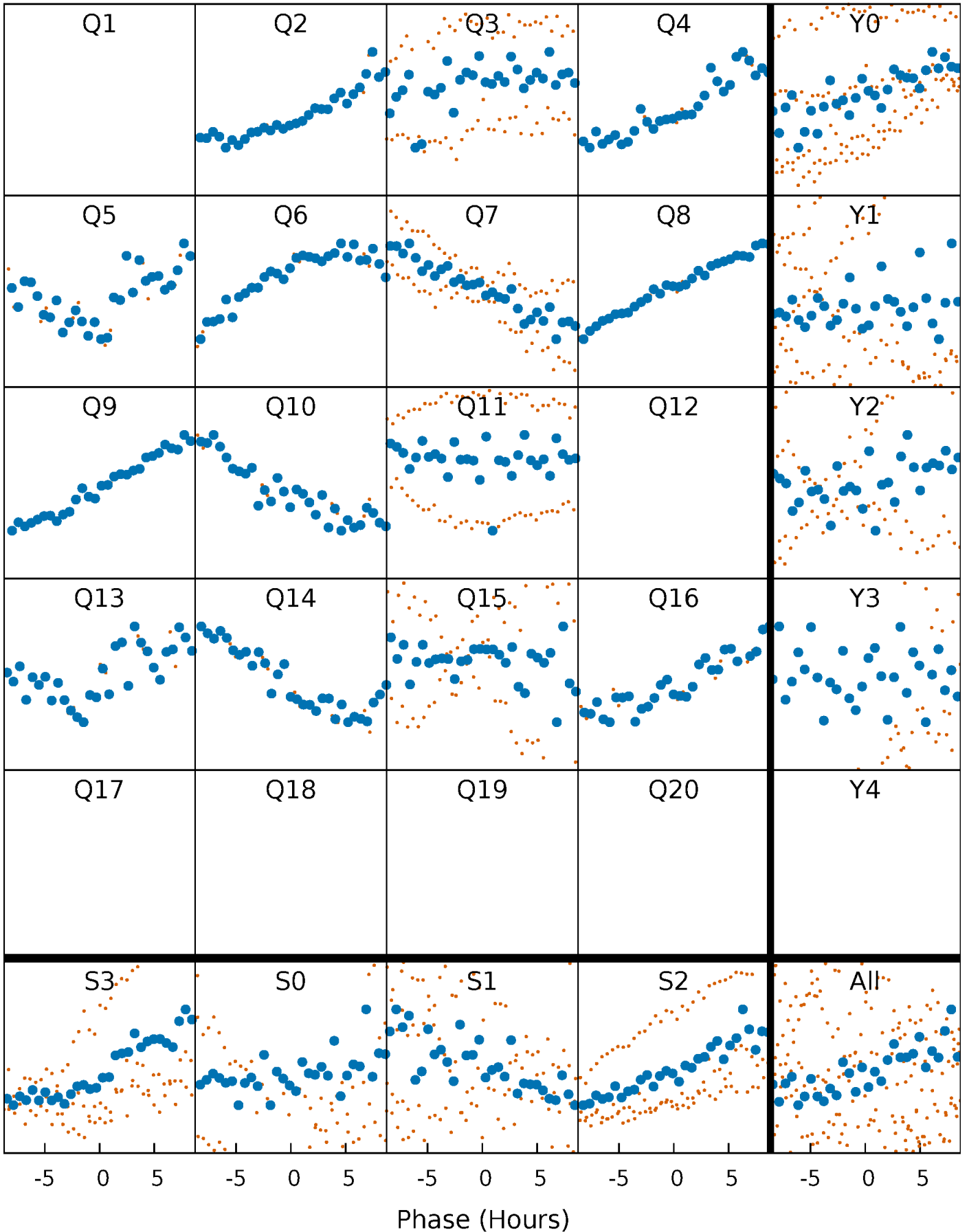


Planet 4 : Phased Whitened Flux Time Series (Fit Epoch/Period)



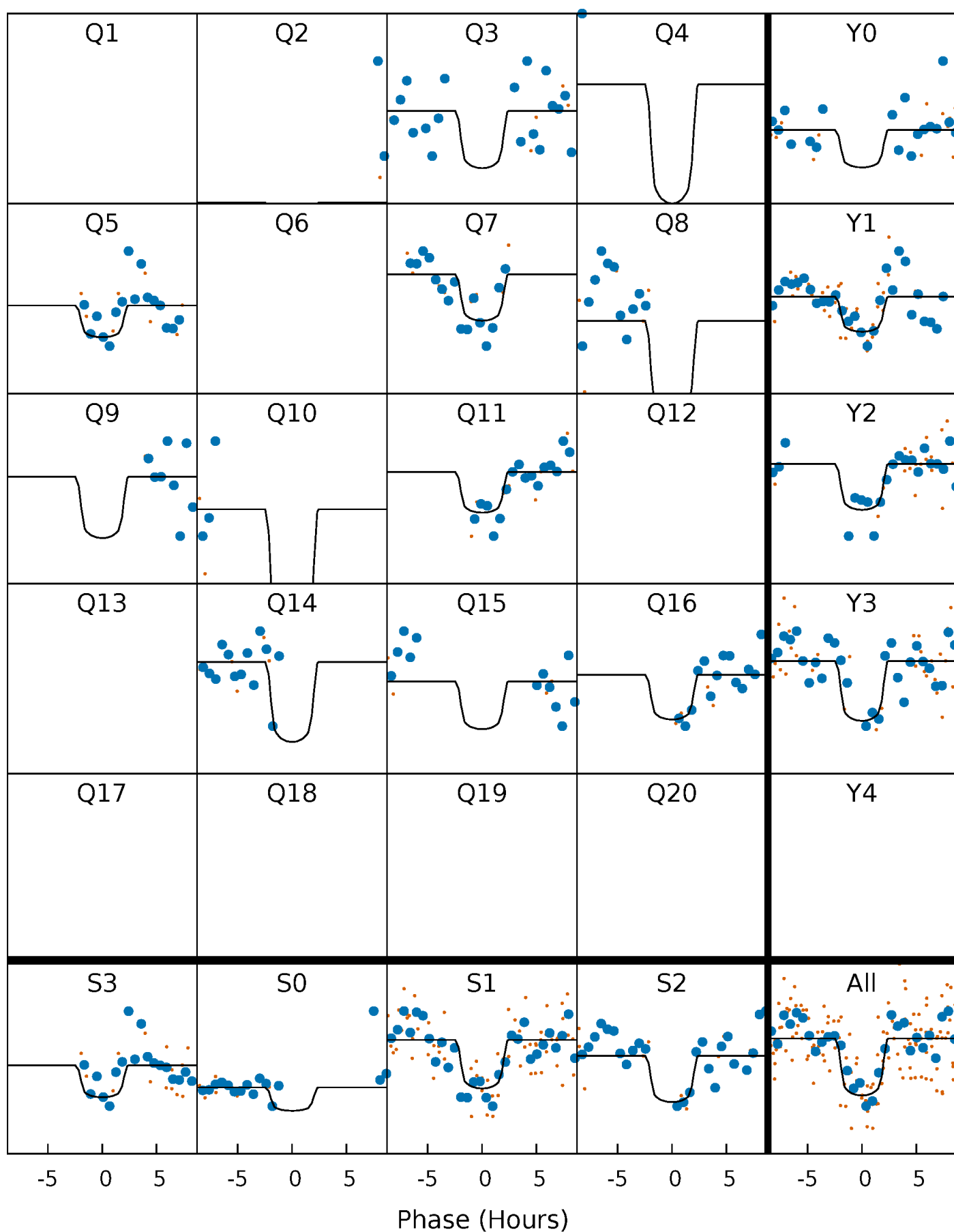
PDC Quarter-Phased Transit Curves

TCE 009778156-04 P= 74.165540 Days $T_0=197.605944$ (BKJD)



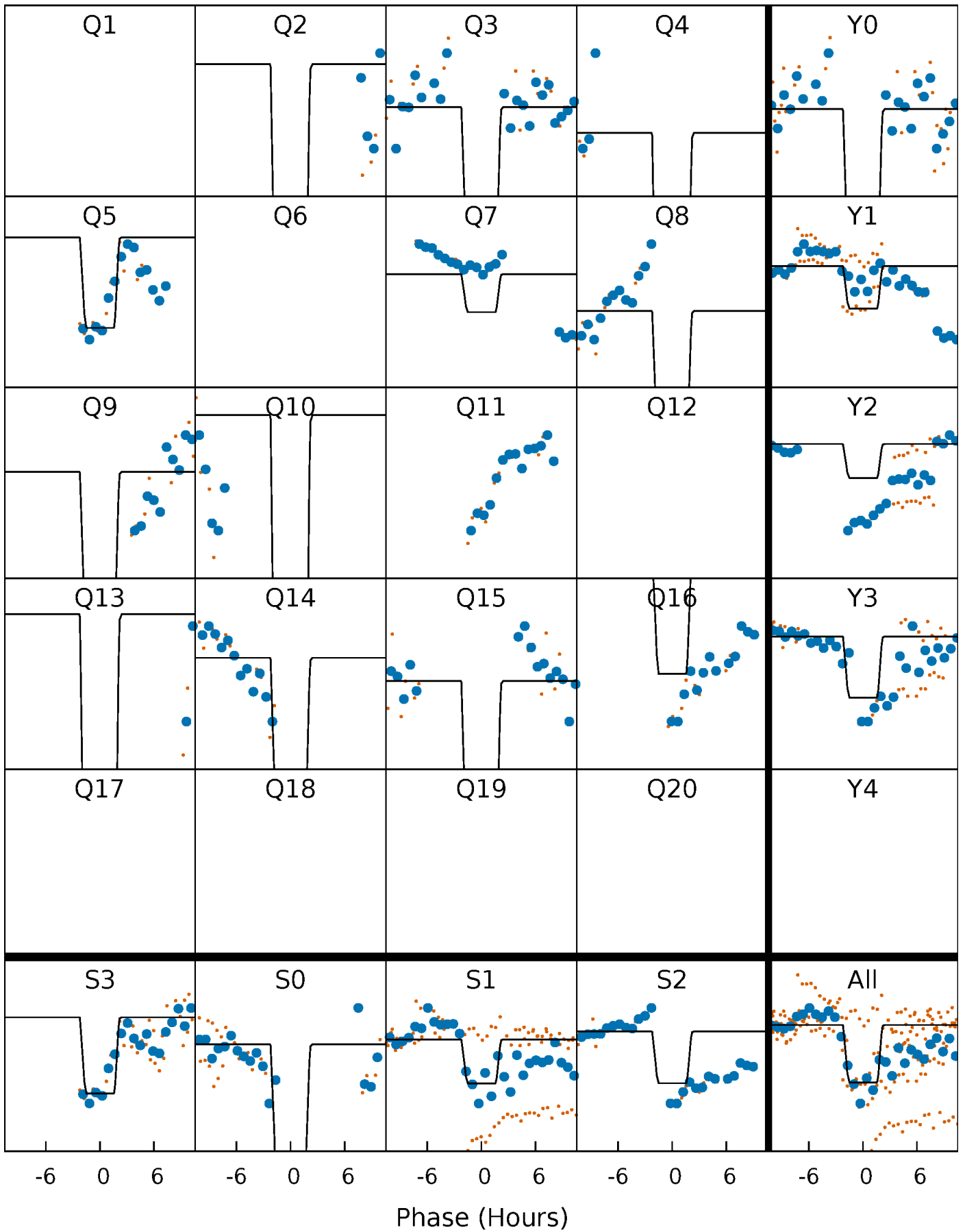
DV Quarter-Phased Transit Curves

TCE 009778156-04 P= 74.165540 Days $T_0=197.605944$ (BKJD)



Alt. Detrend Quarter-Phased Transit Curves

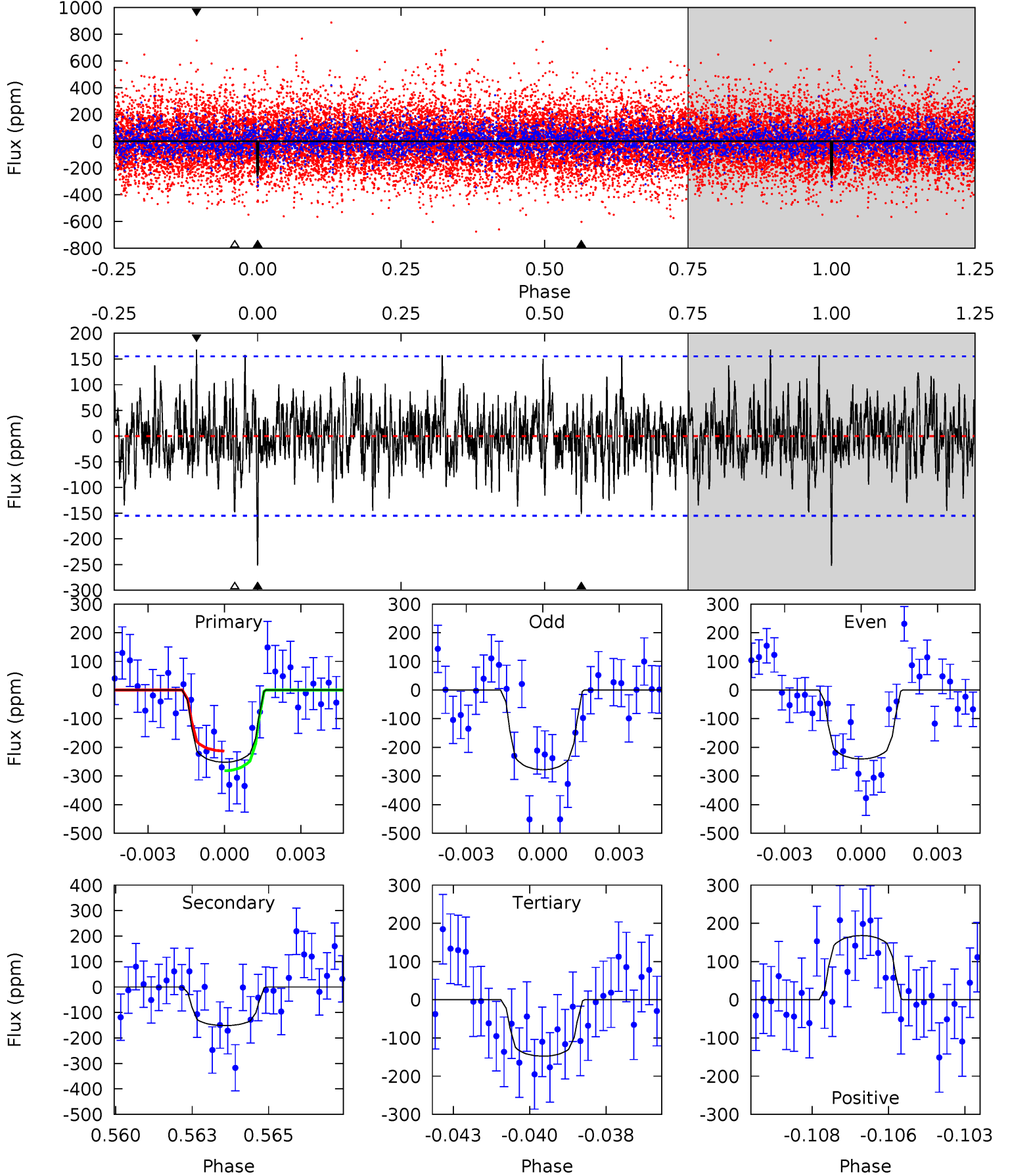
TCE 009778156-04 P= 74.167021 Days $T_0=197.611748$ (BKJD)



DV Model-Shift Uniqueness Test

009778156-04, P = 74.165540 Days, E = 123.440404 Days

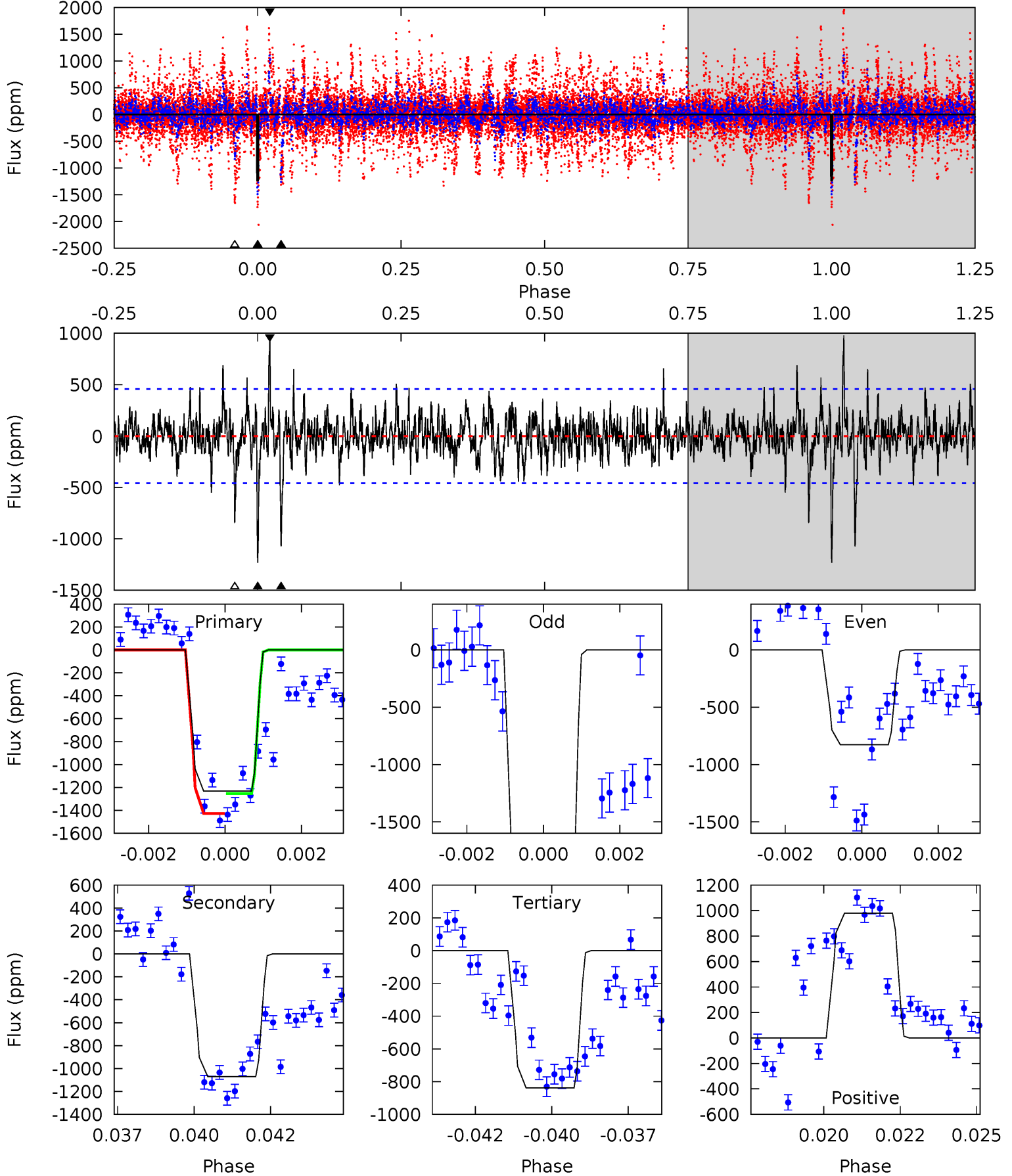
Pri	Sec	Ter	Pos	FA ₁	FA ₂	F _{Red}	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
8.60	5.16	5.04	5.73	5.29	3.02	1.53	3.56	2.87	0.12	-0.57	0.59	0.85	0.40	1.17



Alt Model-Shift Uniqueness Test

009778156-04, P = 74.167021 Days, E = 123.444727 Days

Pri	Sec	Ter	Pos	FA ₁	FA ₂	F _{Red}	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
14.2	12.4	9.67	11.3	5.29	3.03	1.84	4.54	2.91	2.69	1.06	12.2	0.98	0.44	1.05



Stellar Parameters For KIC 009778156

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	6899^{+190}_{-238}	$3.780^{+0.312}_{-0.078}$	$-0.300^{+0.300}_{-0.250}$	$2.706^{+0.417}_{-1.043}$	$1.607^{+0.199}_{-0.369}$	$0.114^{+0.260}_{-0.035}$
	+3%/-3%	+8%/-2%	+100%/-83%	+15%/-39%	+12%/-23%	+227%/-31%
Source	PHO1	FLK73	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 009778156-04 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	A_{obs}
DV	-151 ± 29	$4.94^{+2.63}_{-2.07}$	1069^{+72}_{-95}	5623^{+1849}_{-877}	560^{+1063}_{-321}
Alt.	-1071 ± 87	$9.24^{+3.09}_{-2.33}$	1067^{+63}_{-95}	6707^{+1121}_{-788}	1106^{+908}_{-464}

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

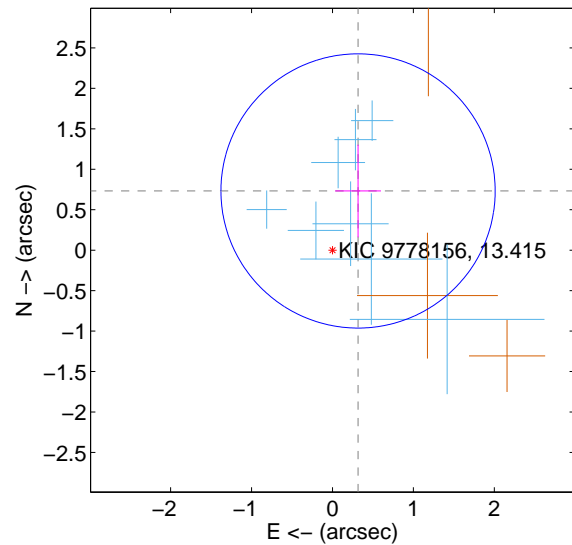
Supplemental centroid analysis for 009778156-04. Kepler magnitude: 13.41. Transit SNR 7.99

There are 8 quarters with good PRF difference image offsets

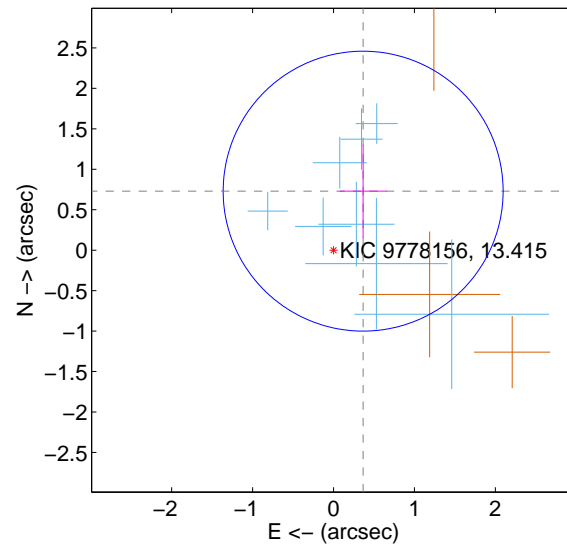
The direct PRF centroid is offset from the target star catalog position by about 0.08 arcsec

	Distance in arcsec	Distance / σ	Δ RA	Δ Dec
PRF-fit source offset from OOT	0.797 ± 0.565	1.41	-0.316 ± 0.283	0.732 ± 0.572
PRF-fit source offset from KIC position	0.816 ± 0.577	1.42	-0.366 ± 0.290	0.729 ± 0.573
photometric centroid source offset	0.43 ± 0.54	0.79	0.18 ± 0.55	0.39 ± 0.54

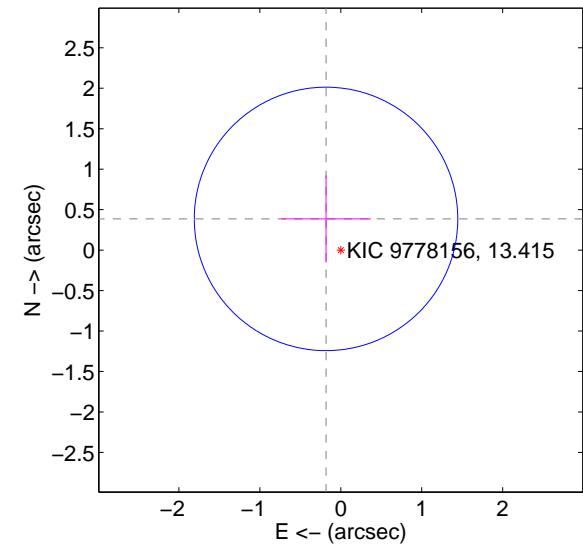
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position

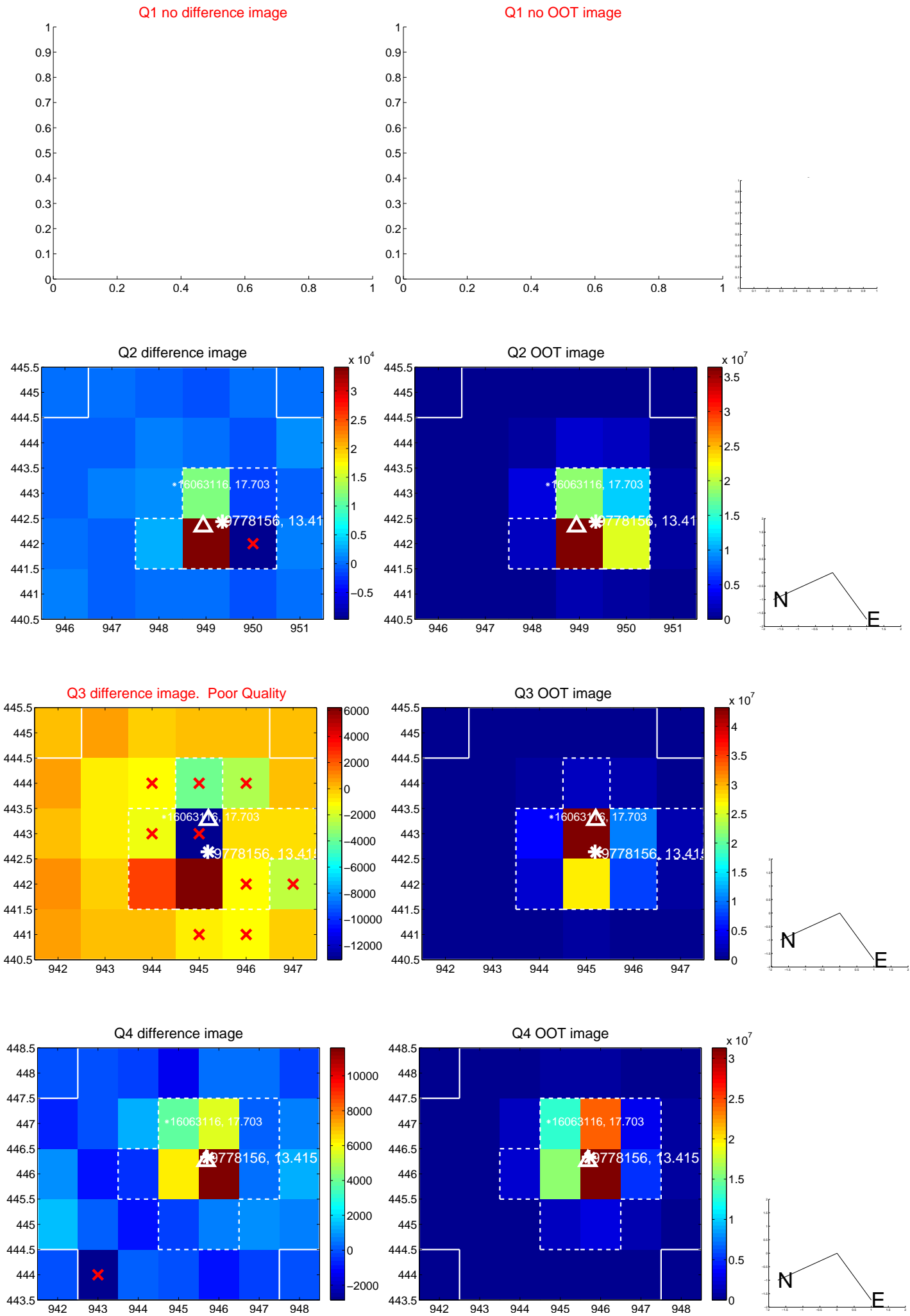


offset from photometric centroids

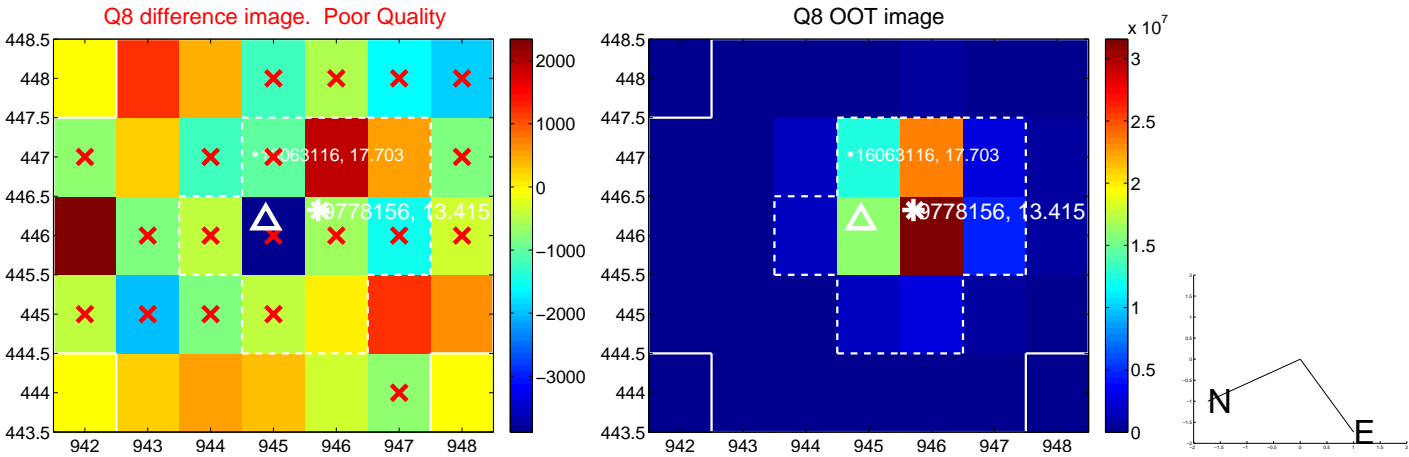
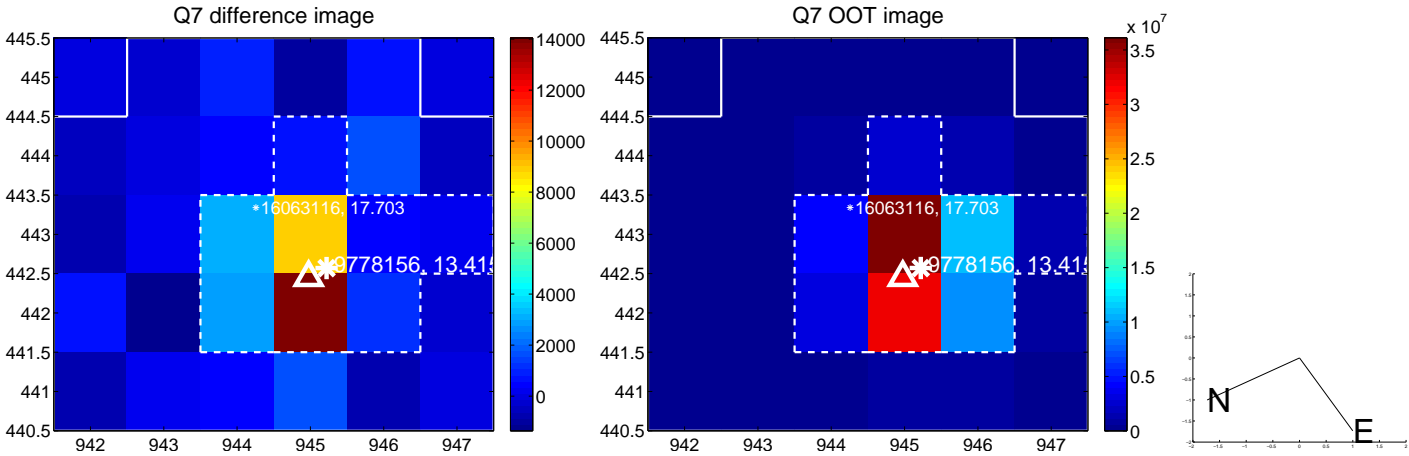
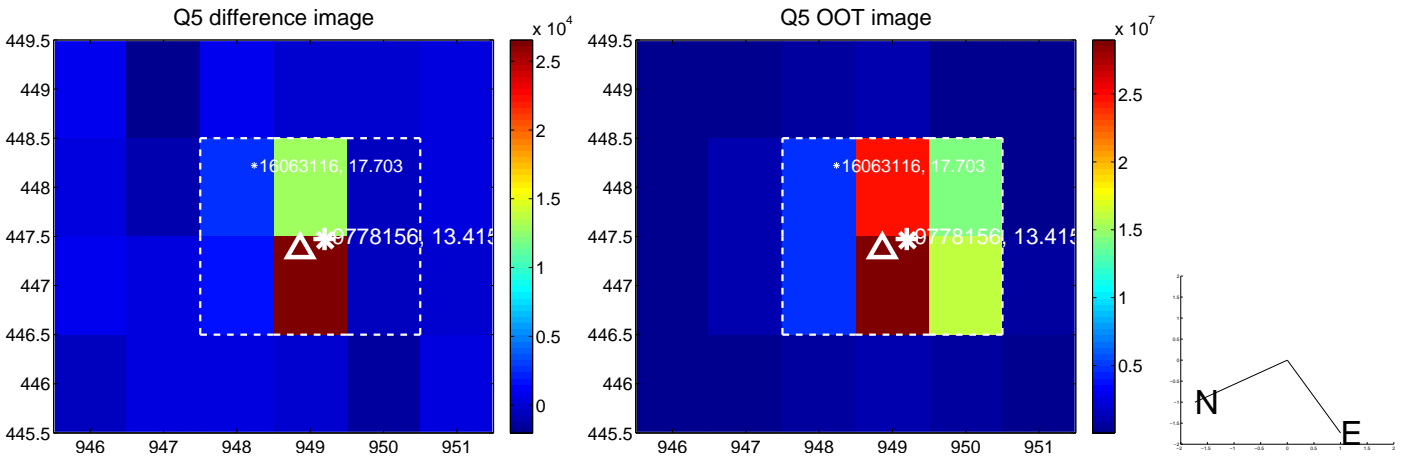


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses:** good quarterly centroid offsets; **Vermillion crosses:** bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- σ uncertainty. Blue circle: three-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

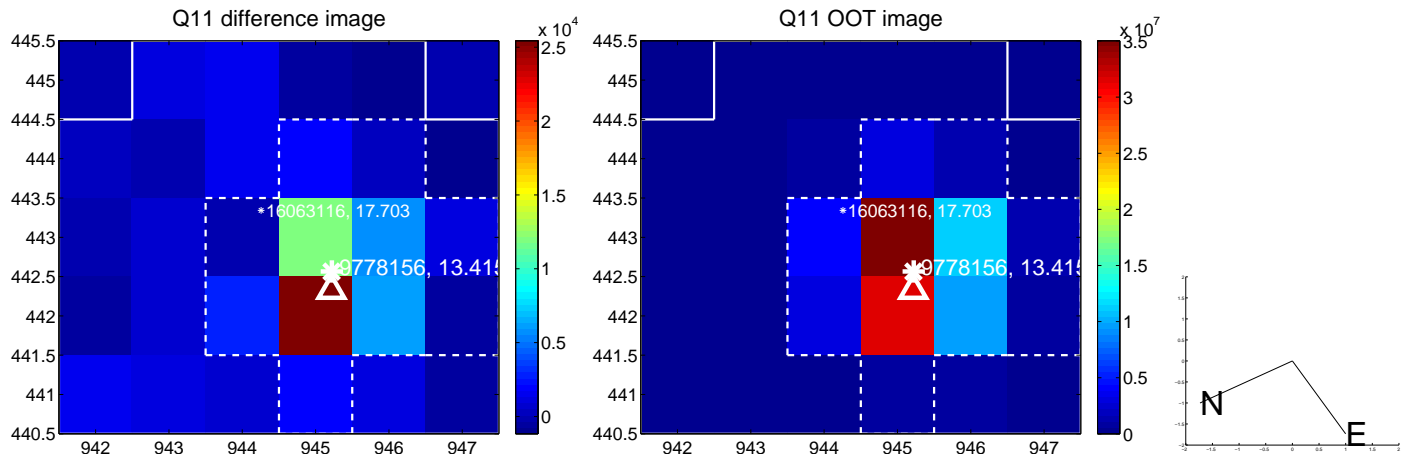
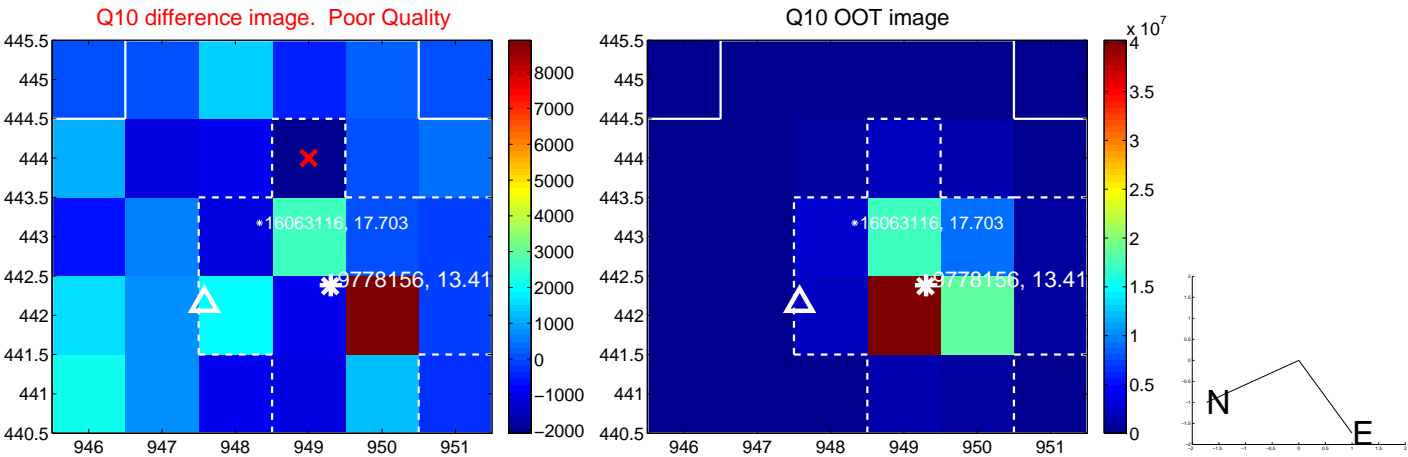
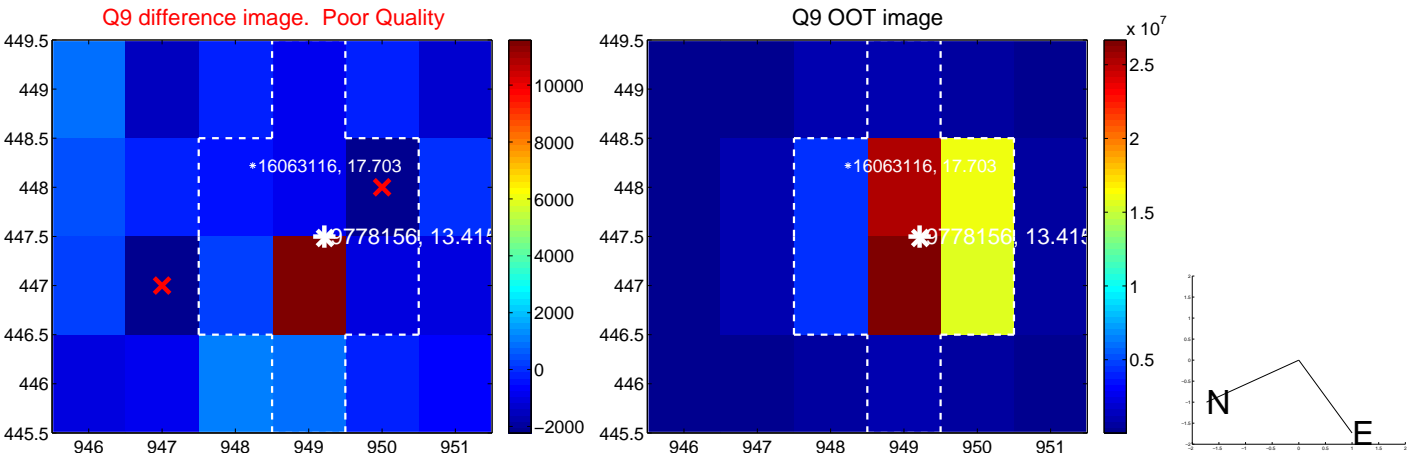
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



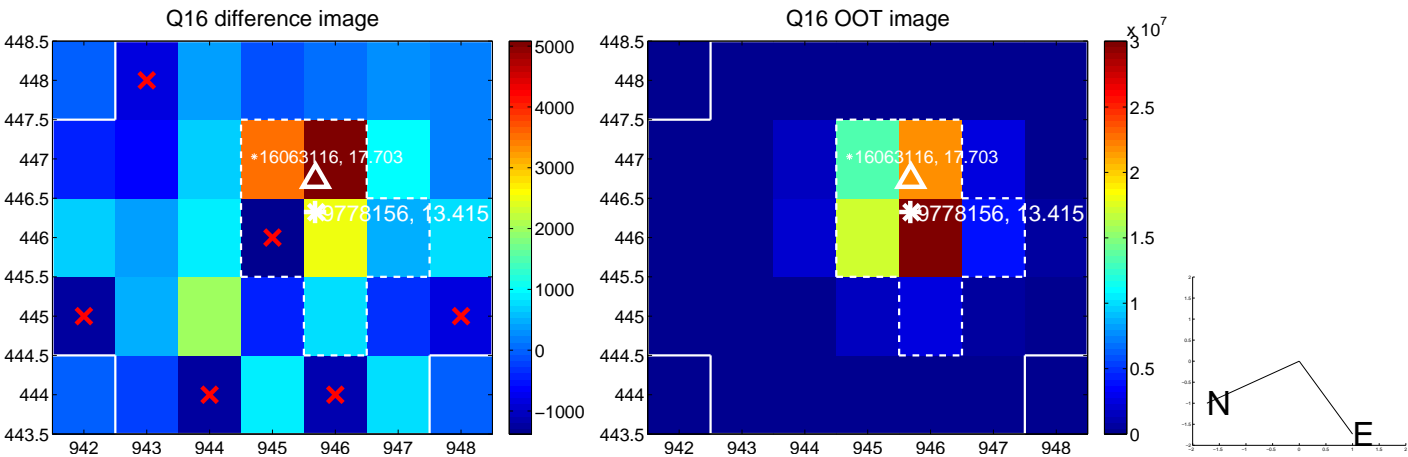
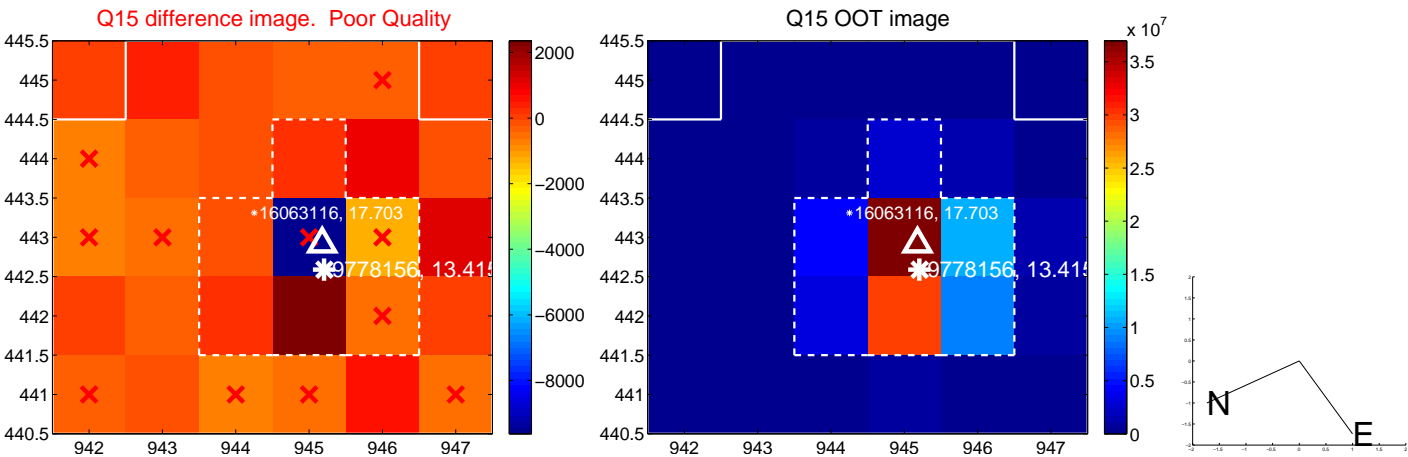
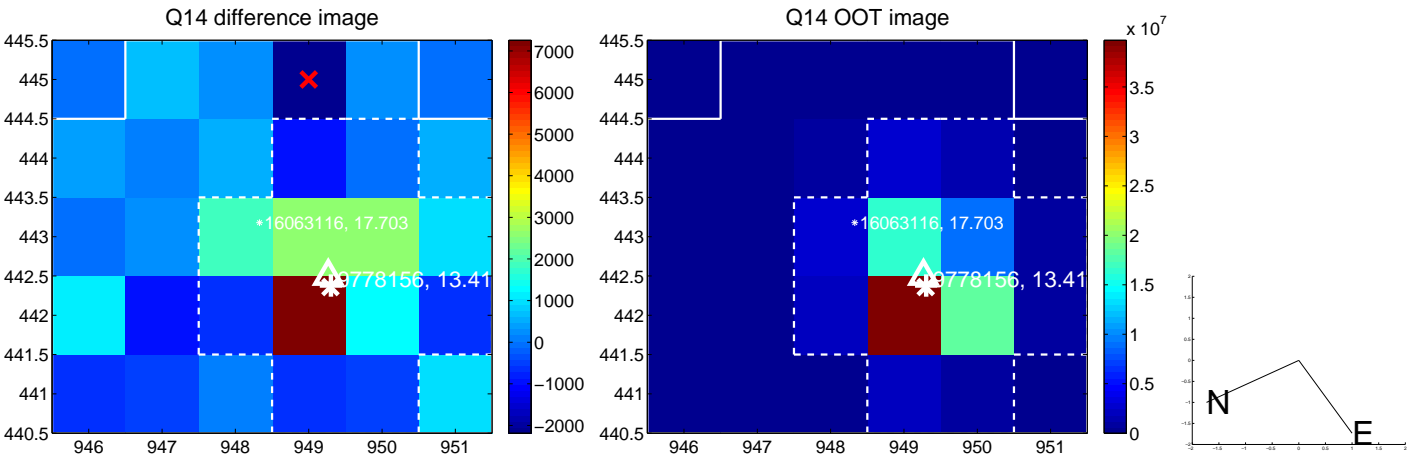
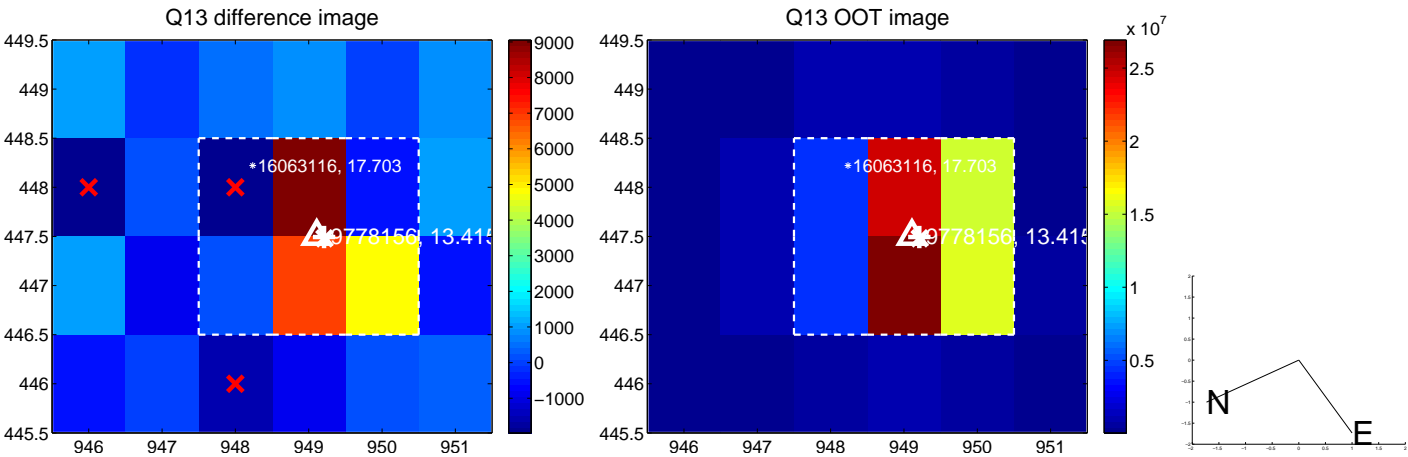
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



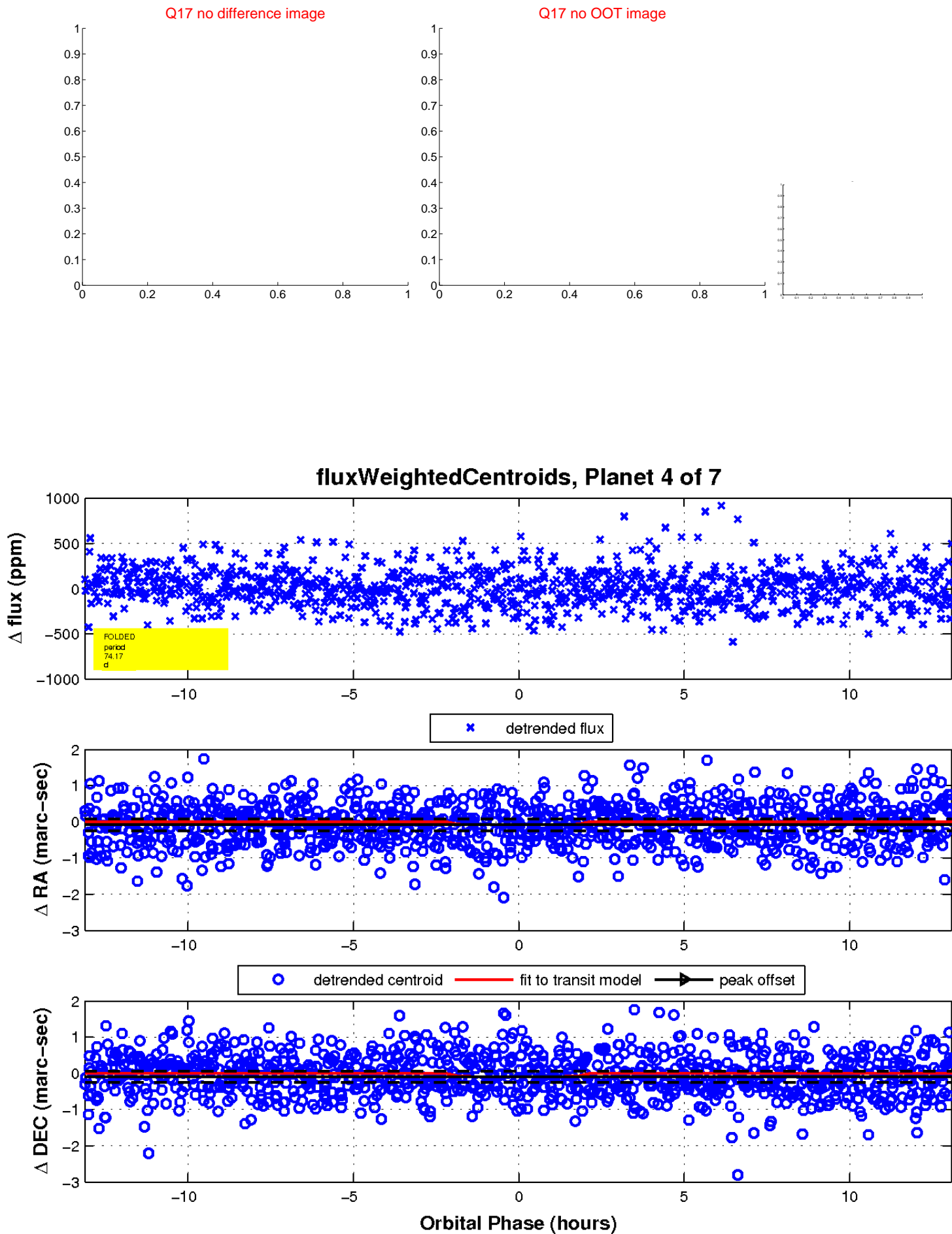
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



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

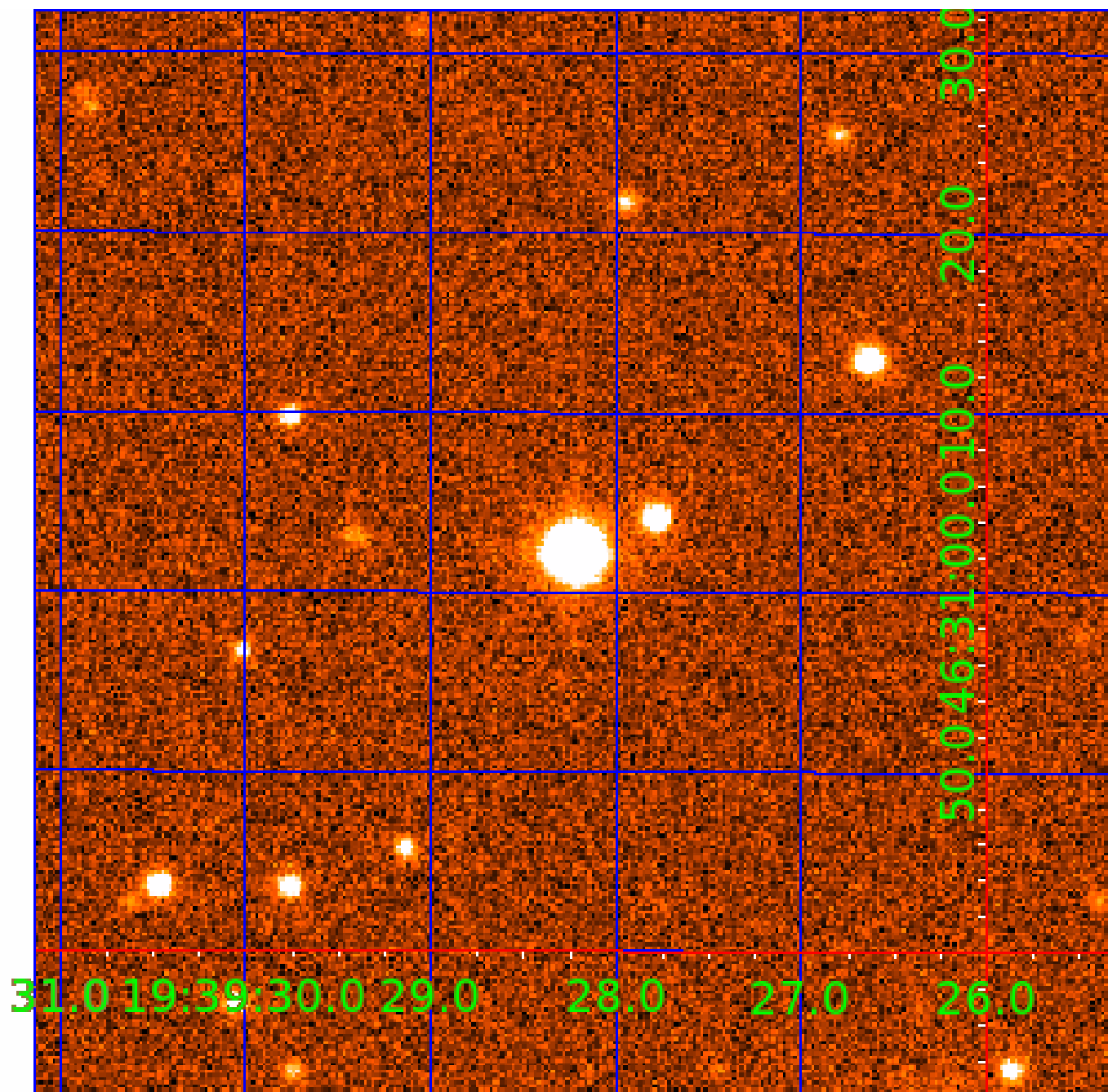


white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



UKIRT Image

Declination



KIC 009778156

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})
009778156-01	OBS	No	1.496271	131.533459	80.4	8.601	16.3	20.8	2.71	6899	4.73	16503.54
009778156-02	OBS	No	134.595940	228.390375	224.7	10.063	10.2	7.6	2.71	6899	4.68	40.95
009778156-03	OBS	No	320.159647	377.542023	331.1	16.036	8.6	7.5	2.71	6899	4.97	12.89
009778156-04	OBS	No	74.165540	197.605944	286.6	4.372	7.4	8.0	2.71	6899	5.29	90.64
009778156-05	OBS	No	92.185666	186.008532	271.5	3.410	9.4	8.8	2.71	6899	4.80	67.82
009778156-06	OBS	No	86.142373	217.359021	219.8	4.750	8.2	6.5	2.71	6899	4.53	74.24
009778156-07	OBS	No	102.590867	209.562276	106.5	11.475	7.7	3.0	2.71	6899	3.02	58.81

Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009778156-01	OBS	FP	0.00	1	0	0	0	LPP_DV
009778156-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—INCONSISTENT_TRANS
009778156-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_MARSHALL—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS
009778156-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT
009778156-05	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_CHASES—TRANS_GAPPED—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT
009778156-06	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_POS_ALT
009778156-07	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT

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

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

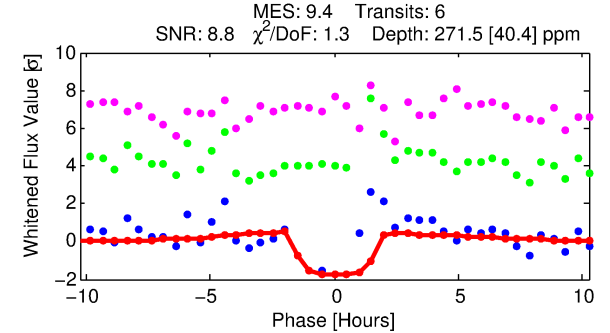
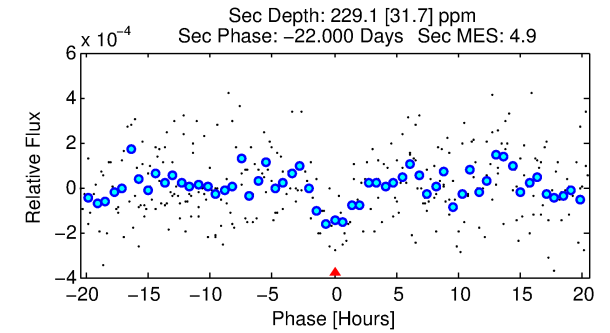
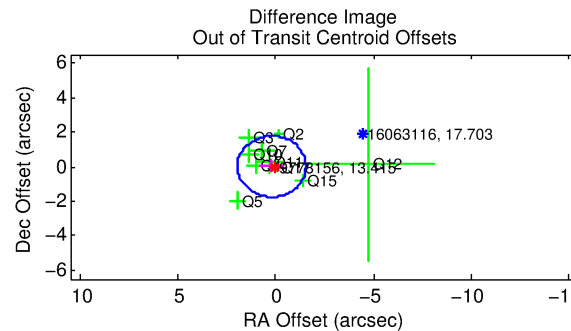
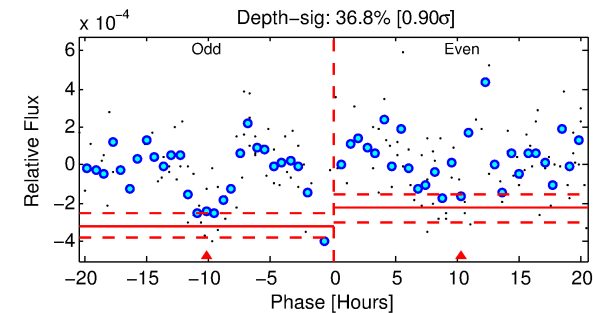
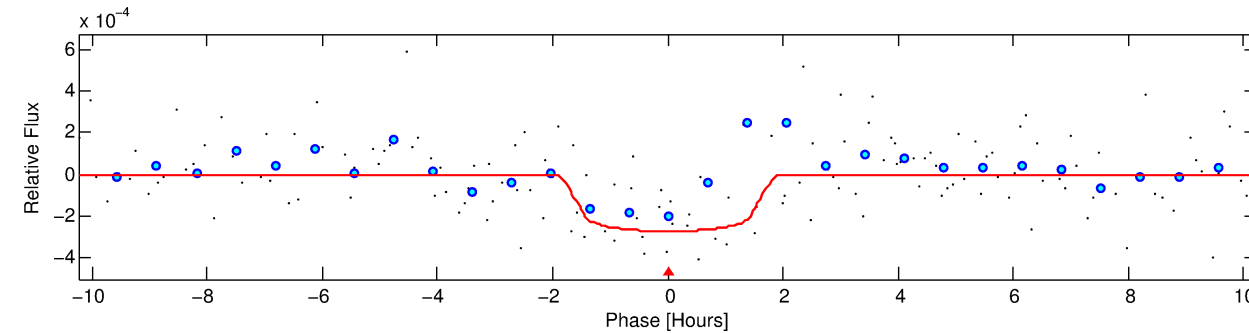
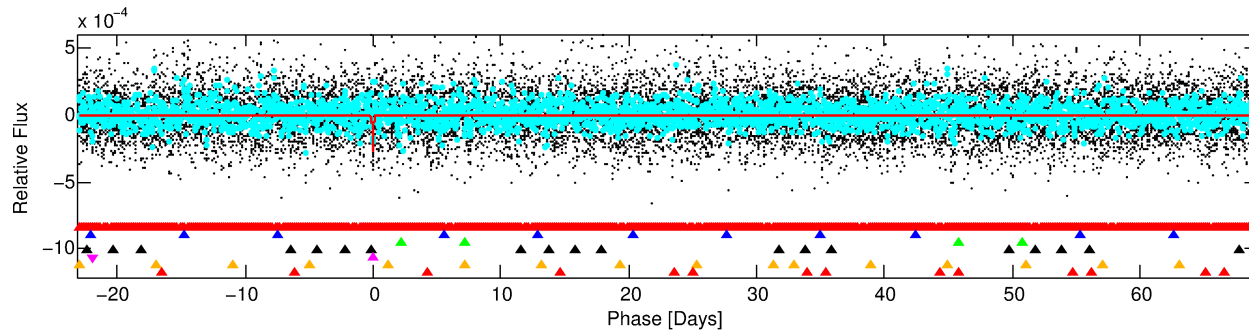
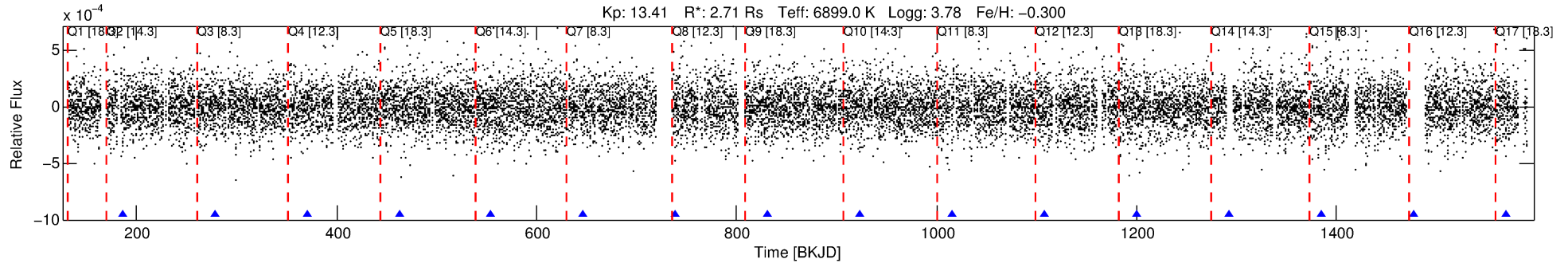
See http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col for comment definitions.

Ephemeris Match Information For 009778156-05

No Significant Match Found

DV One-Page Summary

KIC: 9778156 Candidate: 5 of 7 Period: 92.186 d



DV Fit Results:

Period = 92.18567 [0.00099] d
Epoch = 186.0085 [0.0087] BKJD
Rp/R* = 0.0162 [0.0281]
a/R* = 148.99 [1522.54]
b = 0.72 [7.00]
Seff = 67.82 [38.03]
Teq = 732 [103] K
Rp = 4.80 [8.51] Re
a = 0.4681 [0.1644] AU
Ag = 1200.76 [4212.92] [0.28 σ]
Teffp = 6660 [5776] K [1.03 σ]

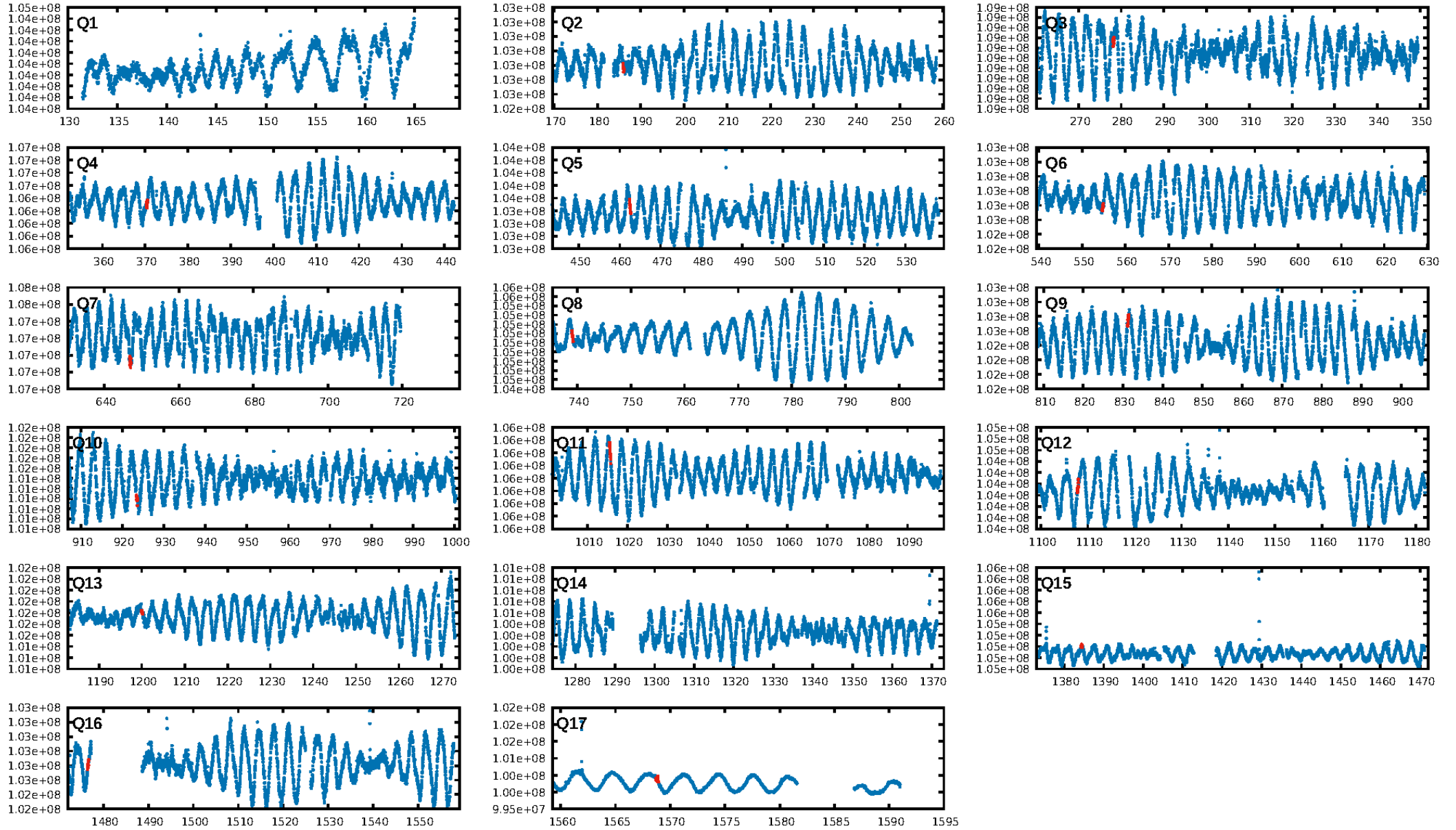
DV Diagnostic Results:

ShortPeriod-sig: 100.0% [24.80 σ]
LongPeriod-sig: 100.0% [20.86 σ]
ModelChiSquare2-sig: 8.7%
ModelChiSquareGof-sig: 93.6%
Bootstrap-pfa: 1.04e-12
RollingBand-fgt: 1.00 [5/5]
GhostDiagnostic-chr: 1.17
Centroid-sig: 1.4%
Centroid-so: 1.778 arcsec [2.43 σ]
OotOffset-rm: 0.215 arcsec [0.37 σ]
KicOffset-rm: 0.175 arcsec [0.27 σ]
OotOffset-st: 2/4/2/2 [10]
KicOffset-st: 2/4/2/2 [10]
DiffImageQuality-fgm: 0.60 [6/10]
DiffImageOverlap-fno: 0.38 [5/13]

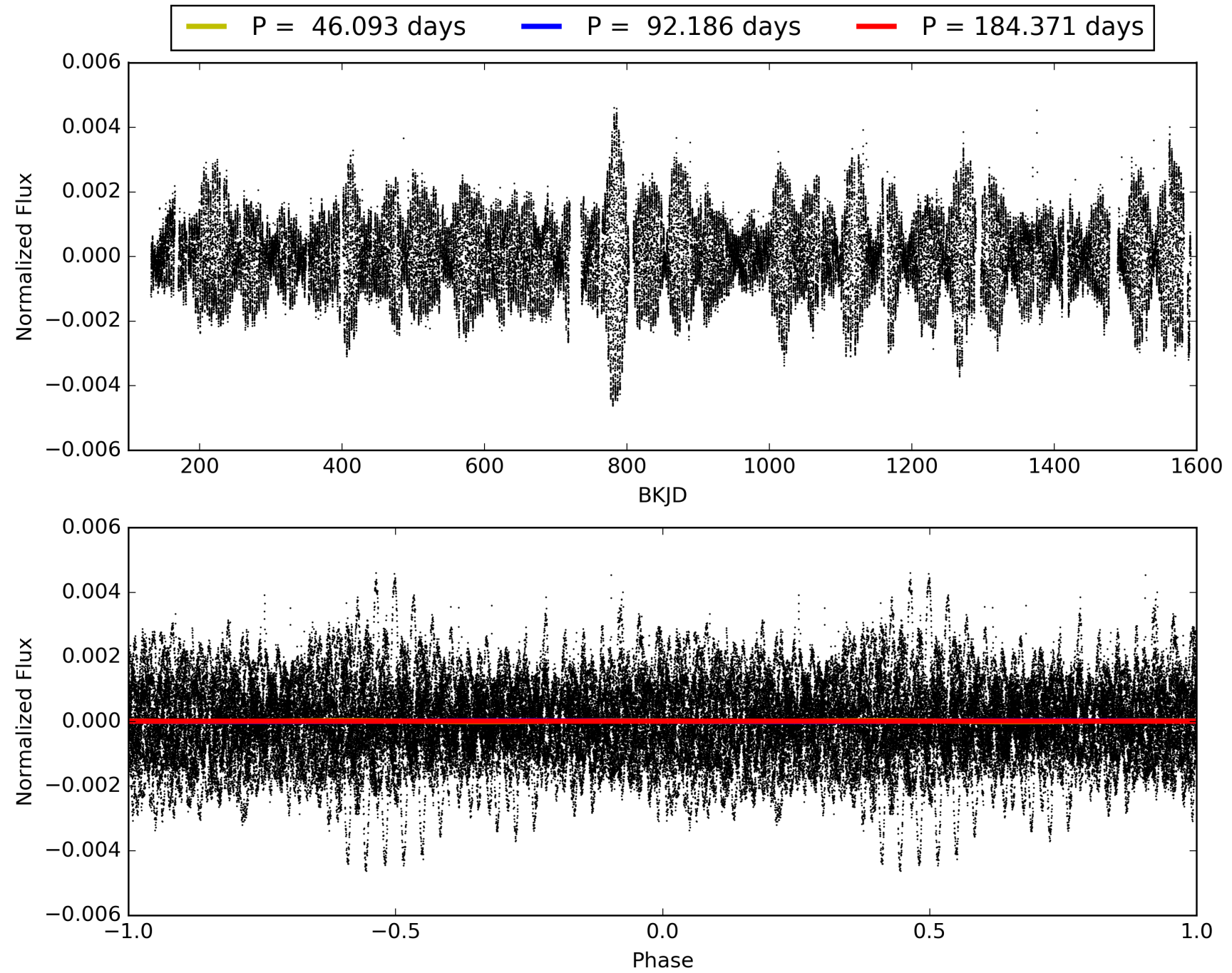
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 30-Jan-2016 20:46:54 Z

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

TCE 009778156-05, PDC Light Curves

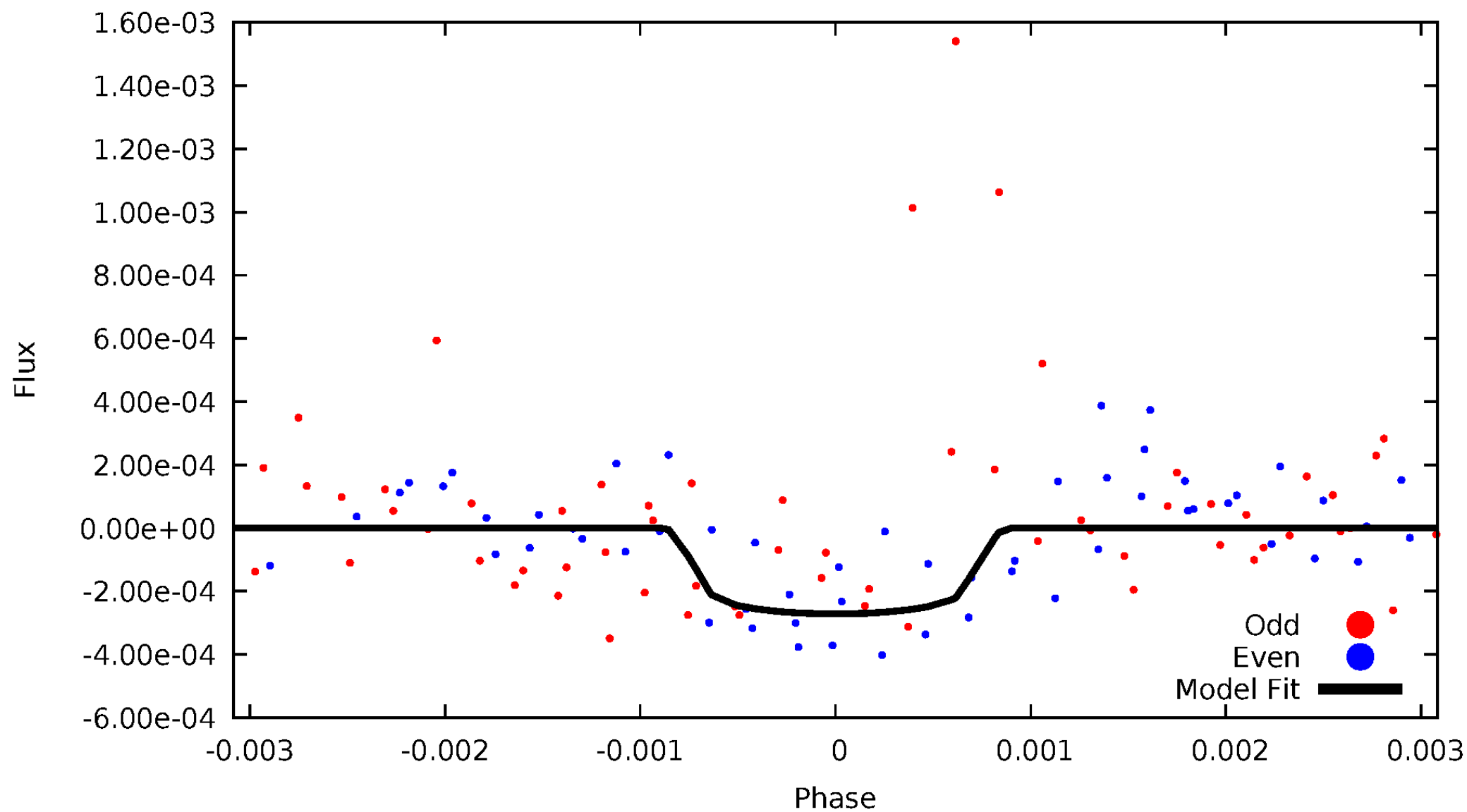


TCE 009778156-05



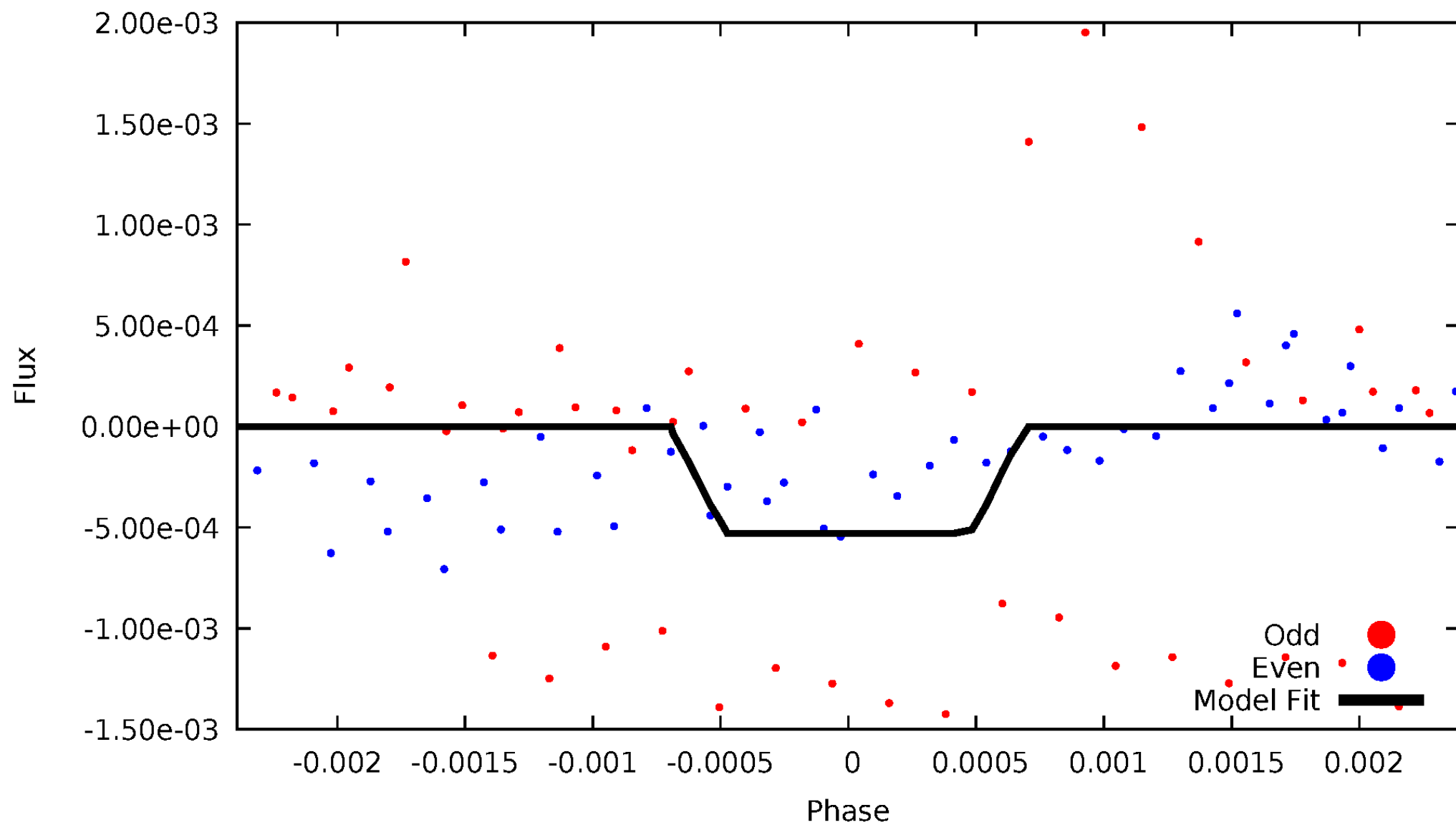
DV Odd/Even

TCE 009778156-05



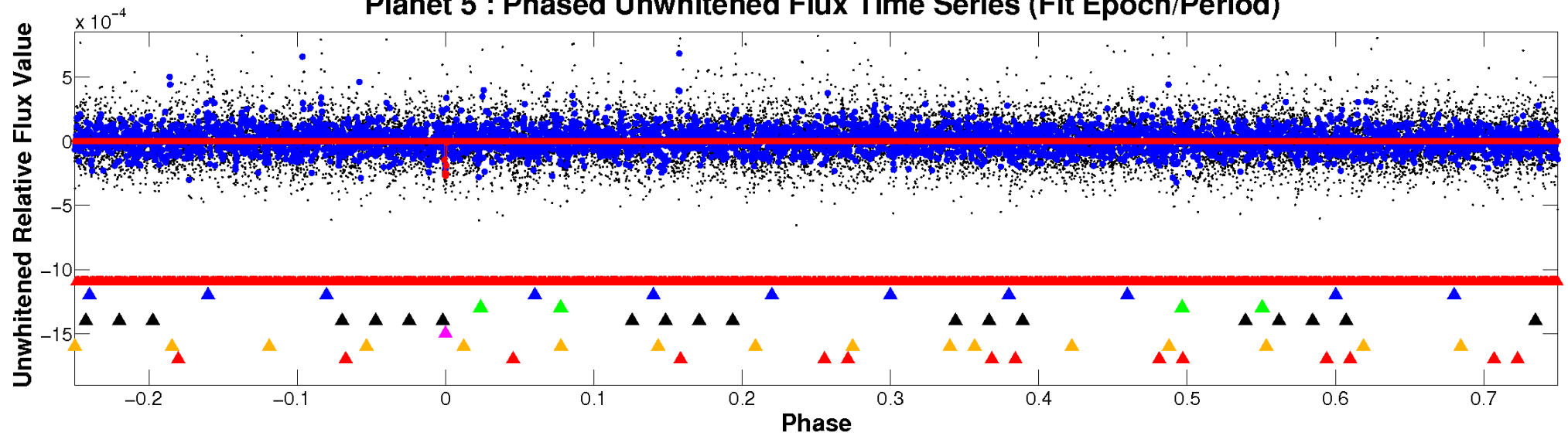
ALT Odd/Even

TCE 009778156-05

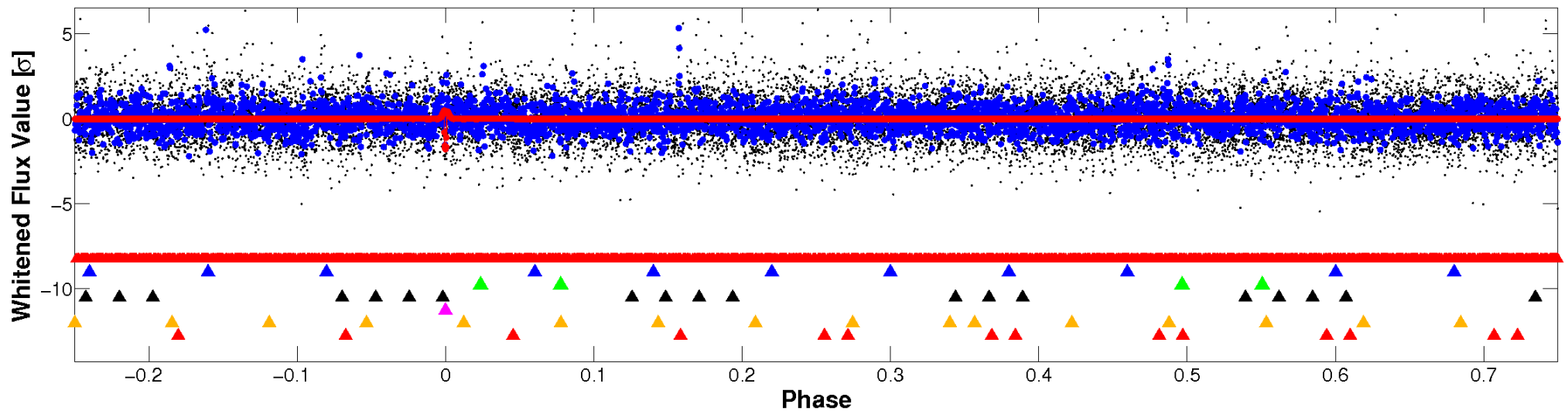


Non-Whitened Vs. Whitened Light Curve

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

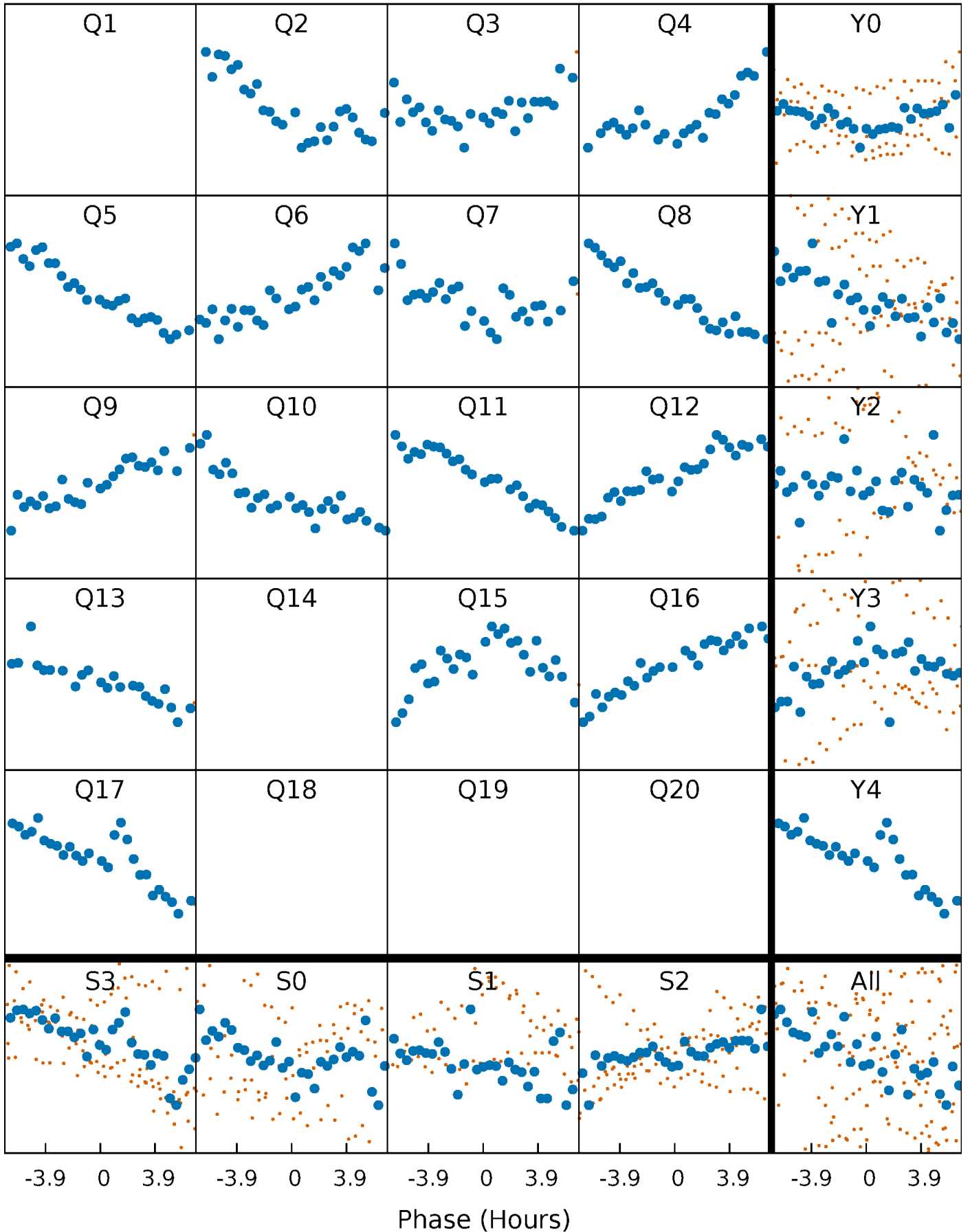


Planet 5 : Phased Whitened Flux Time Series (Fit Epoch/Period)



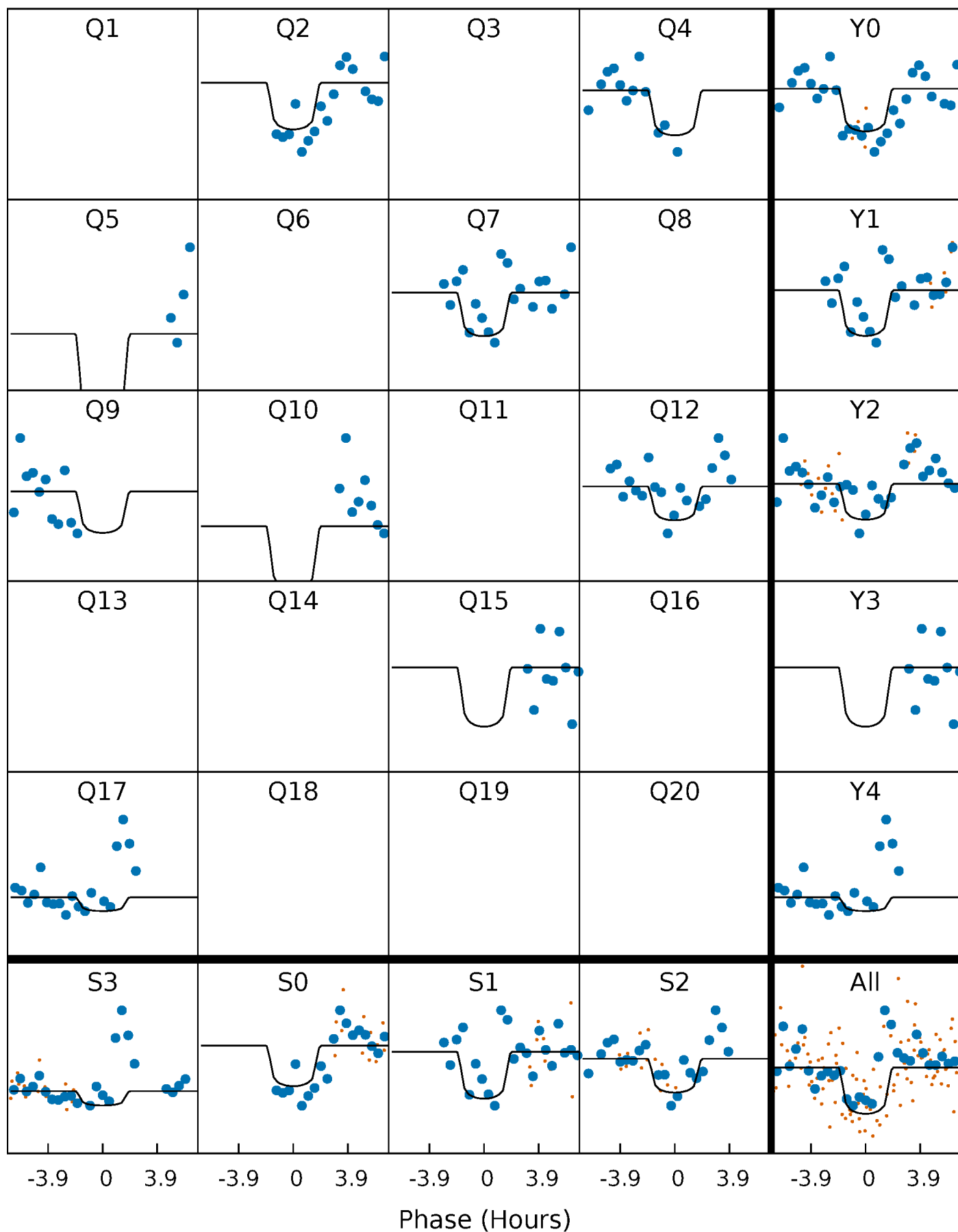
PDC Quarter-Phased Transit Curves

TCE 009778156-05 P= 92.185666 Days $T_0=186.008532$ (BKJD)



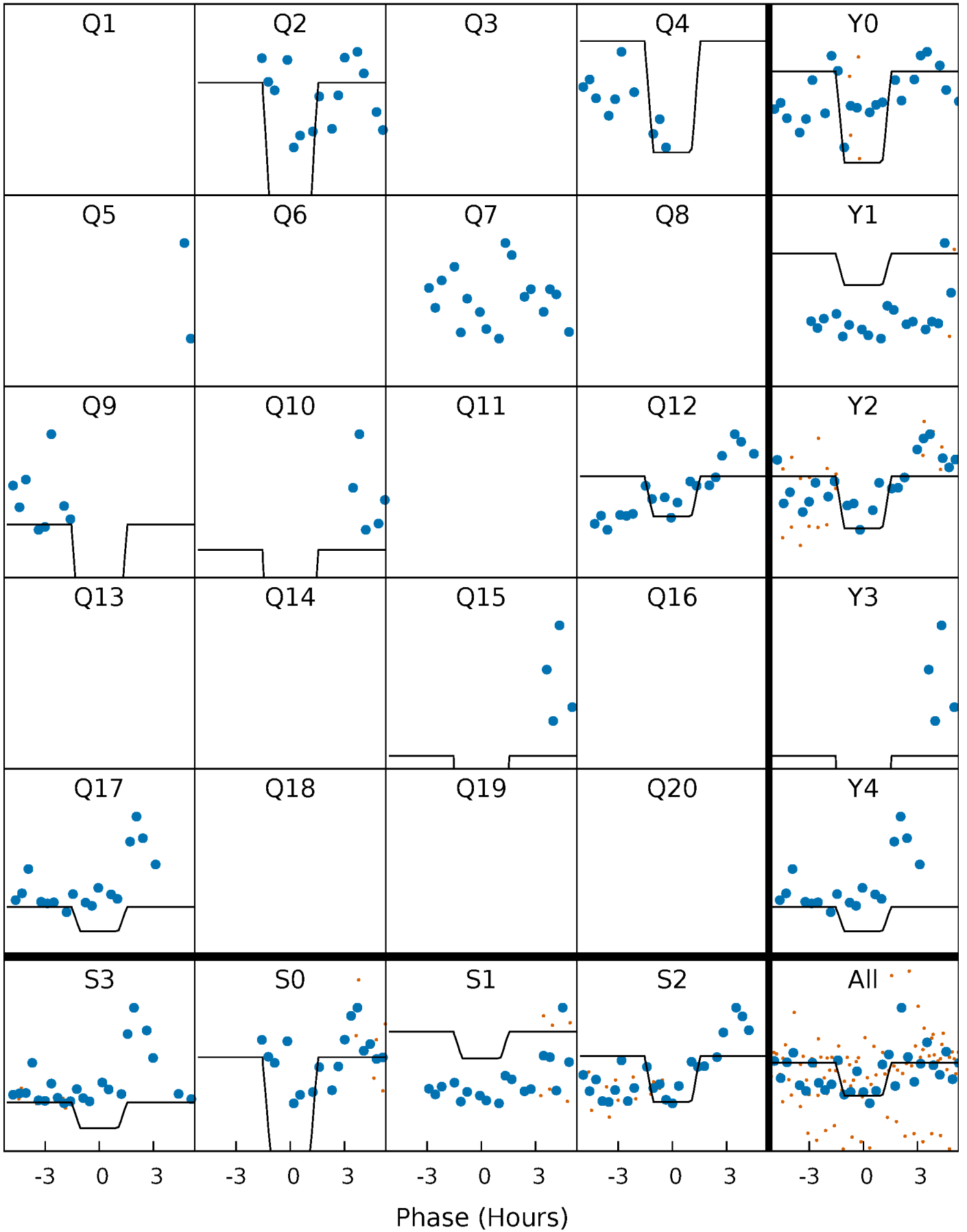
DV Quarter-Phased Transit Curves

TCE 009778156-05 P= 92.185666 Days $T_0=186.008532$ (BKJD)



Alt. Detrend Quarter-Phased Transit Curves

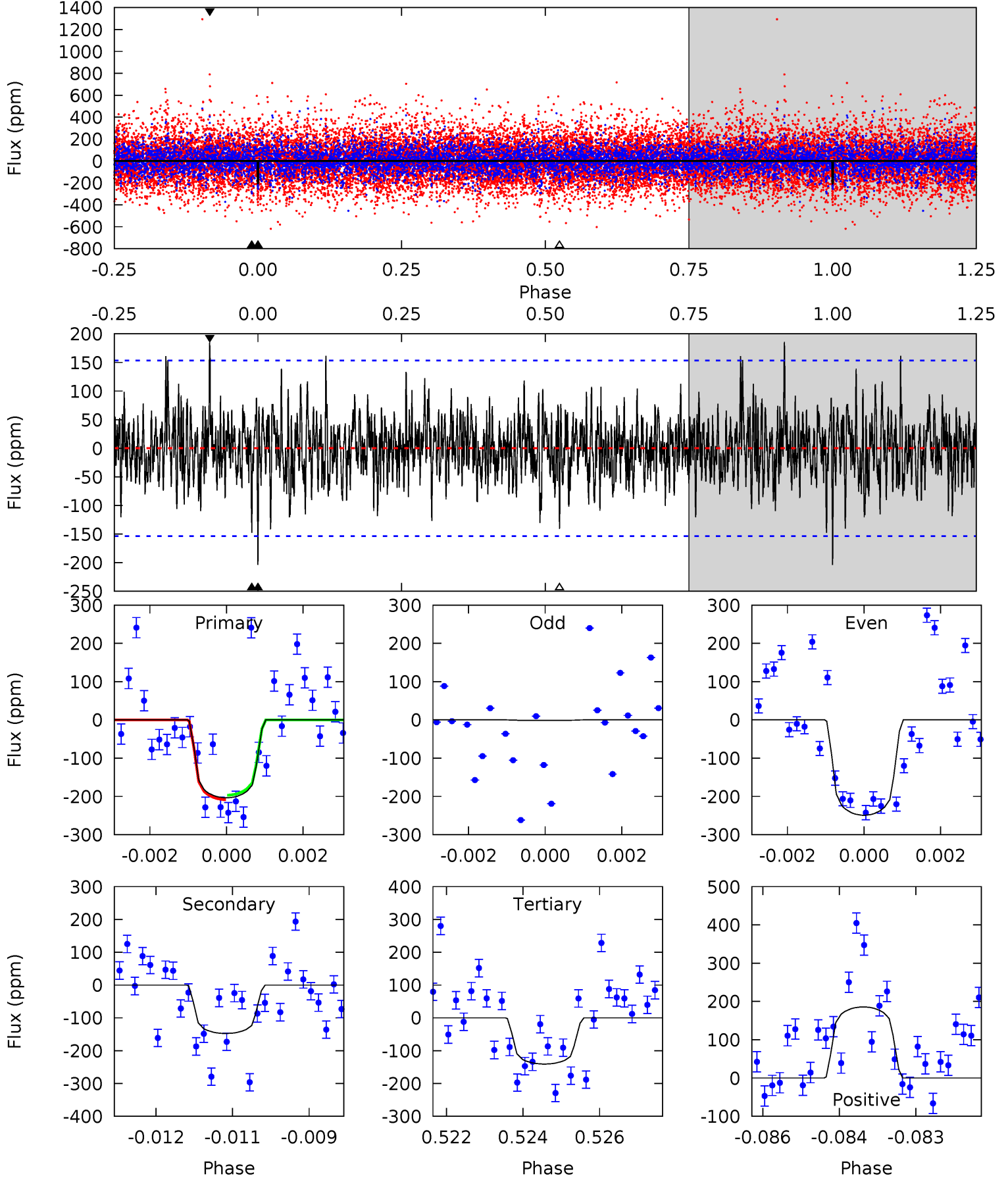
TCE 009778156-05 P= 92.182879 Days $T_0=186.021673$ (BKJD)



DV Model-Shift Uniqueness Test

009778156-05, P = 92.185666 Days, E = 93.822866 Days

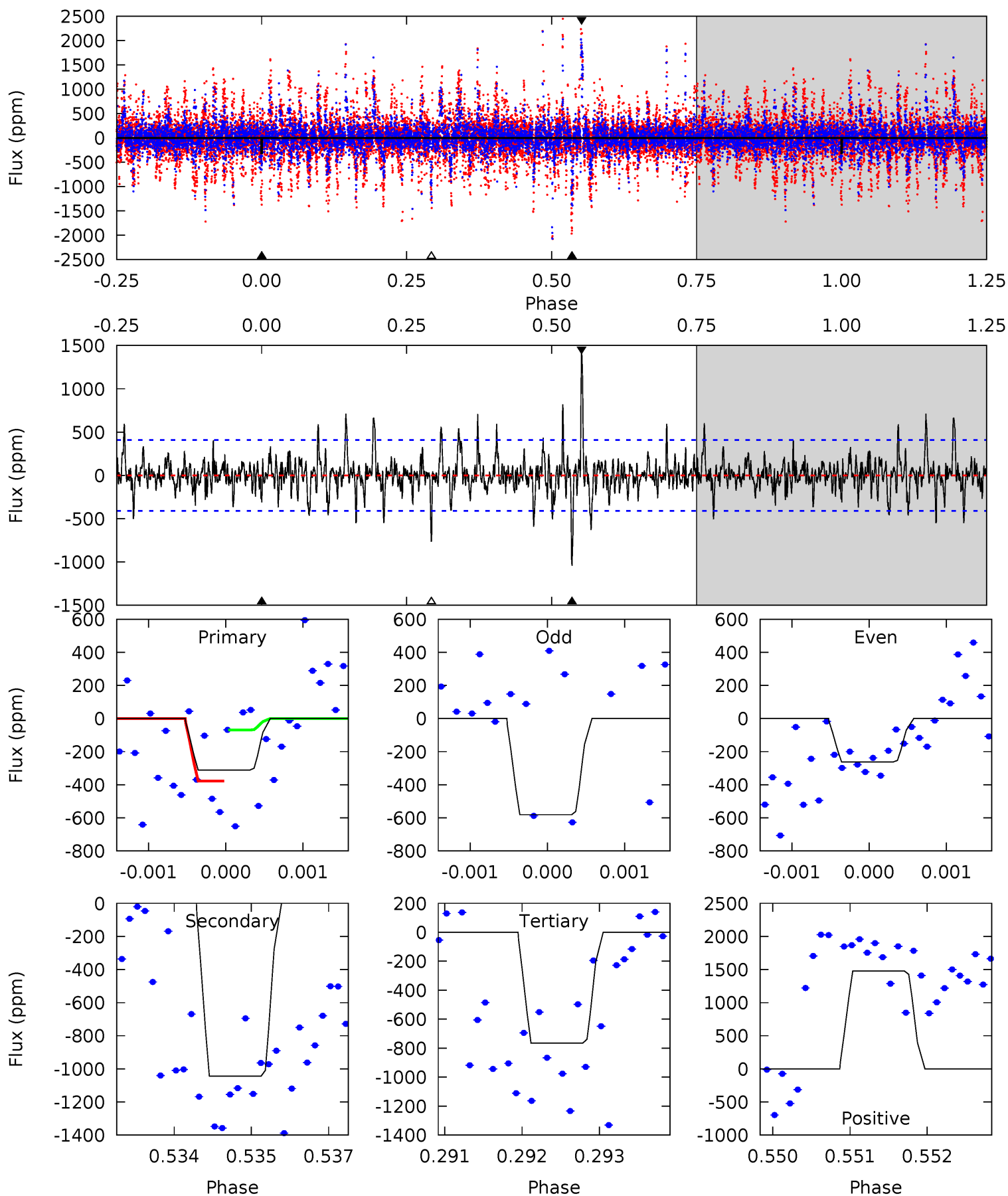
Pri	Sec	Ter	Pos	FA ₁	FA ₂	F _{Red}	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
7.10	5.15	4.91	6.47	5.35	3.13	1.50	2.19	0.62	0.24	-1.33	4.38	0.76	0.48	0.20



Alt Model-Shift Uniqueness Test

009778156-05, P = 92.182879 Days, E = 93.838794 Days

Pri	Sec	Ter	Pos	FA ₁	FA ₂	F _{Red}	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
4.10	13.8	10.1	19.5	5.40	3.21	2.20	-5.98	-15.4	3.68	-5.70	1.76	1.34	0.59	1.95



Stellar Parameters For KIC 009778156

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	6899^{+190}_{-238}	$3.780^{+0.312}_{-0.078}$	$-0.300^{+0.300}_{-0.250}$	$2.706^{+0.417}_{-1.043}$	$1.607^{+0.199}_{-0.369}$	$0.114^{+0.260}_{-0.035}$
	+3%/-3%	+8%/-2%	+100%/-83%	+15%/-39%	+12%/-23%	+227%/-31%
Source	PHO1	FLK73	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 009778156-05 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	A_{obs}
DV	-148 ± 29	$6.96^{+7.10}_{-5.15}$	993^{+63}_{-87}	4843^{+4767}_{-1116}	370^{+4861}_{-285}
Alt.	-1043 ± 76	$8.03^{+6.83}_{-5.23}$	997^{+55}_{-90}	7111^{+7701}_{-1787}	1966^{+13380}_{-1408}

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 $A_{obs} \gg 1.0$

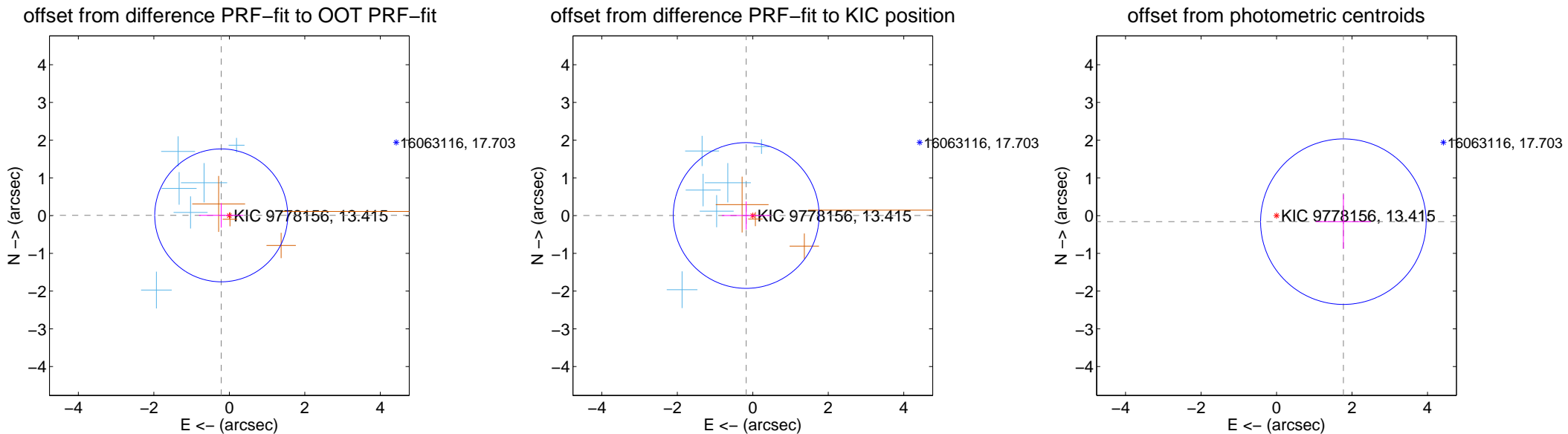
DV Centroid Data

Supplemental centroid analysis for 009778156-05. Kepler magnitude: 13.41. Transit SNR 8.78

There are 6 quarters with good PRF difference image offsets

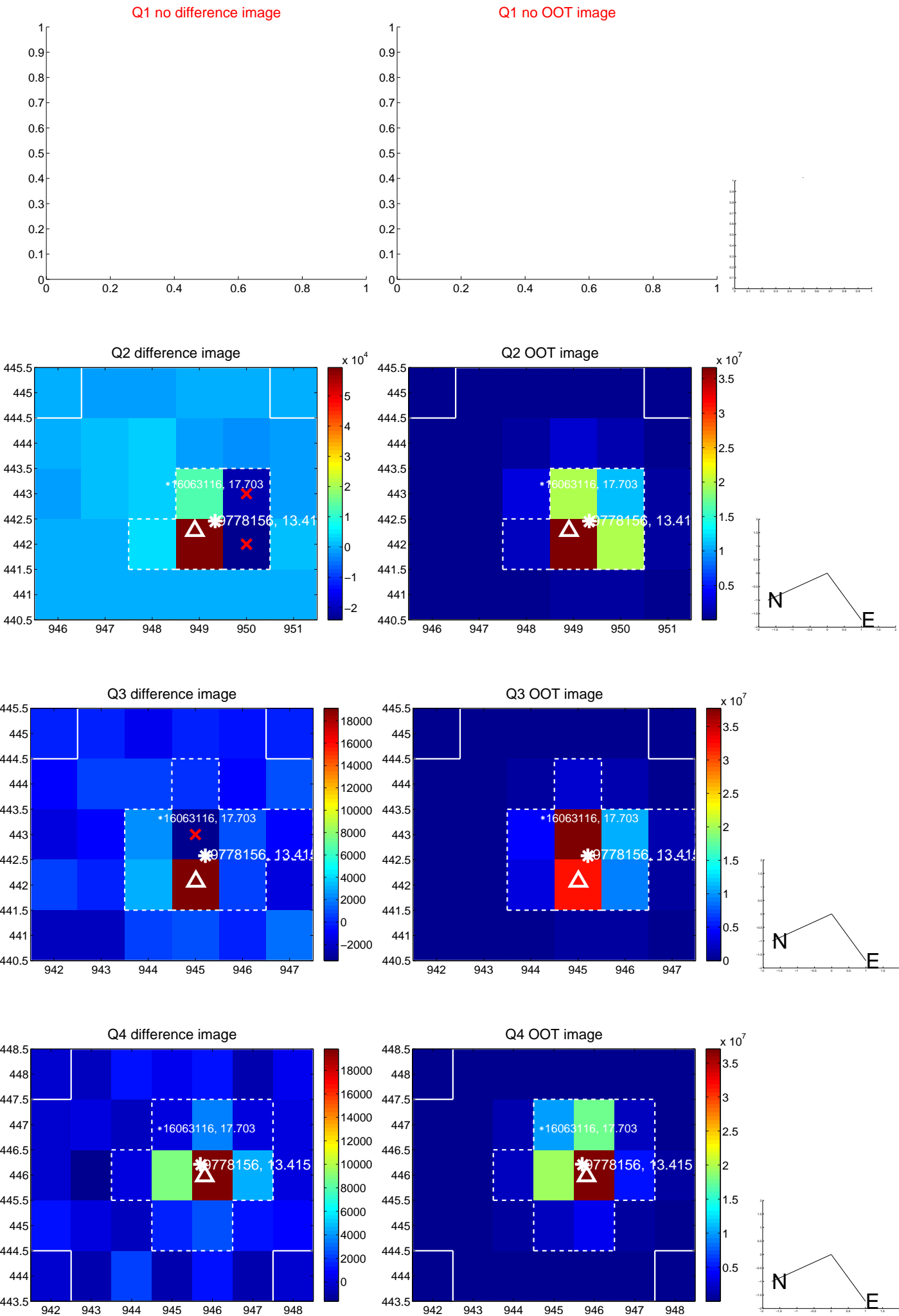
The direct PRF centroid is offset from the target star catalog position by about 0.05 arcsec

	Distance in arcsec	Distance / σ	Δ RA	Δ Dec
PRF-fit source offset from OOT	0.215 ± 0.587	0.37	0.215 ± 0.587	0.007 ± 0.324
PRF-fit source offset from KIC position	0.175 ± 0.644	0.27	0.175 ± 0.645	0.004 ± 0.373
photometric centroid source offset	1.78 ± 0.73	2.43	-1.77 ± 0.73	-0.16 ± 0.72

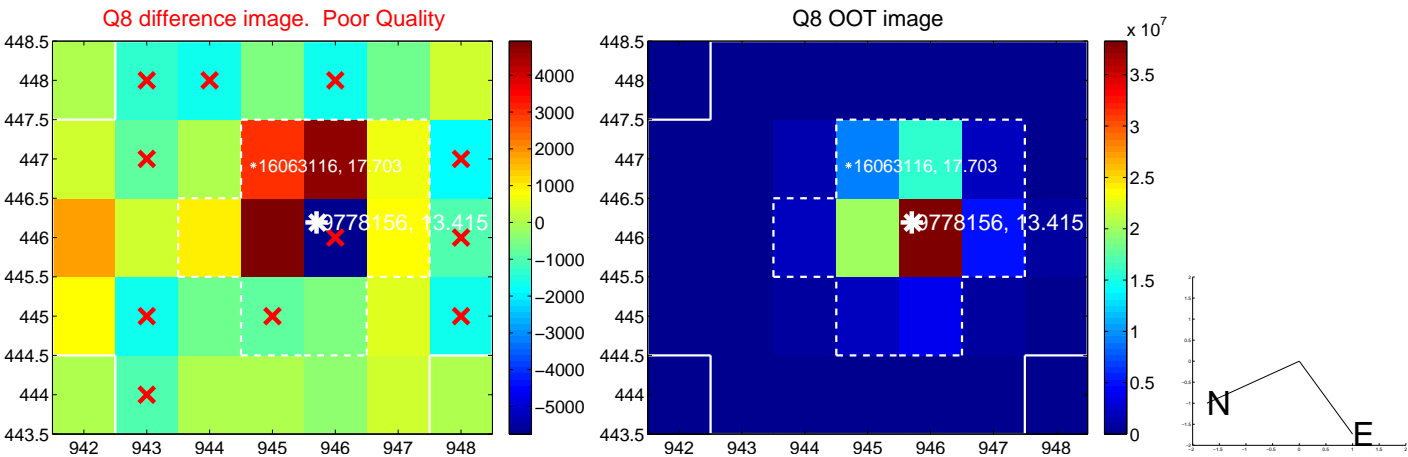
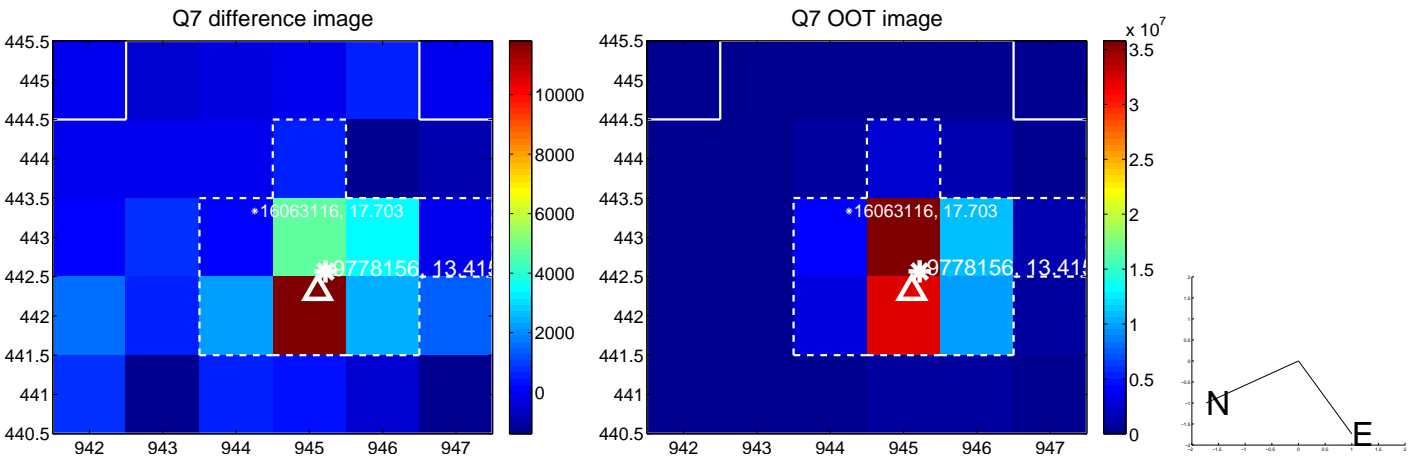
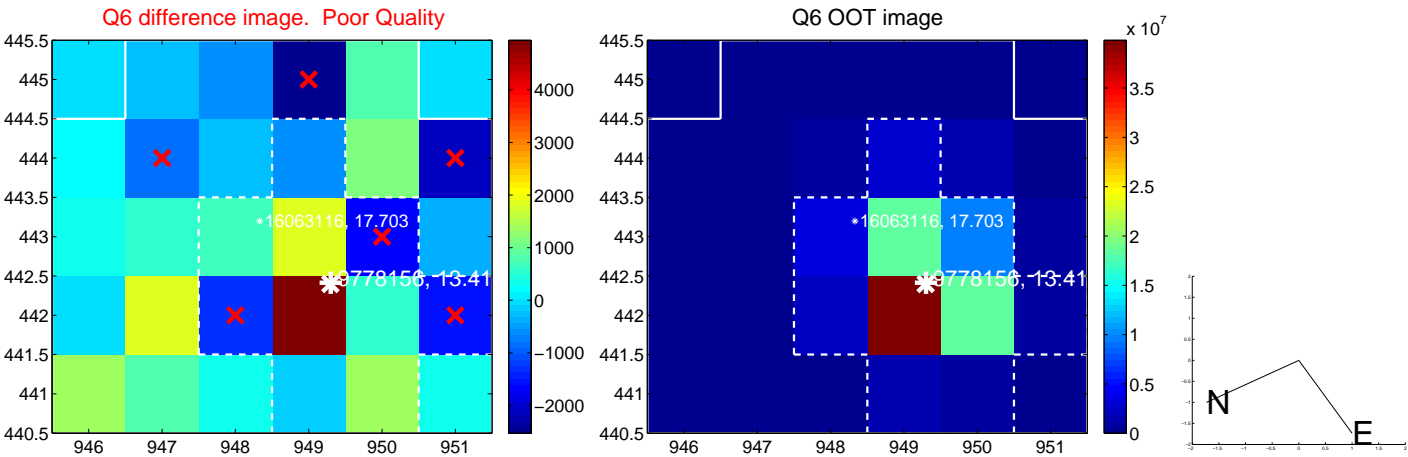
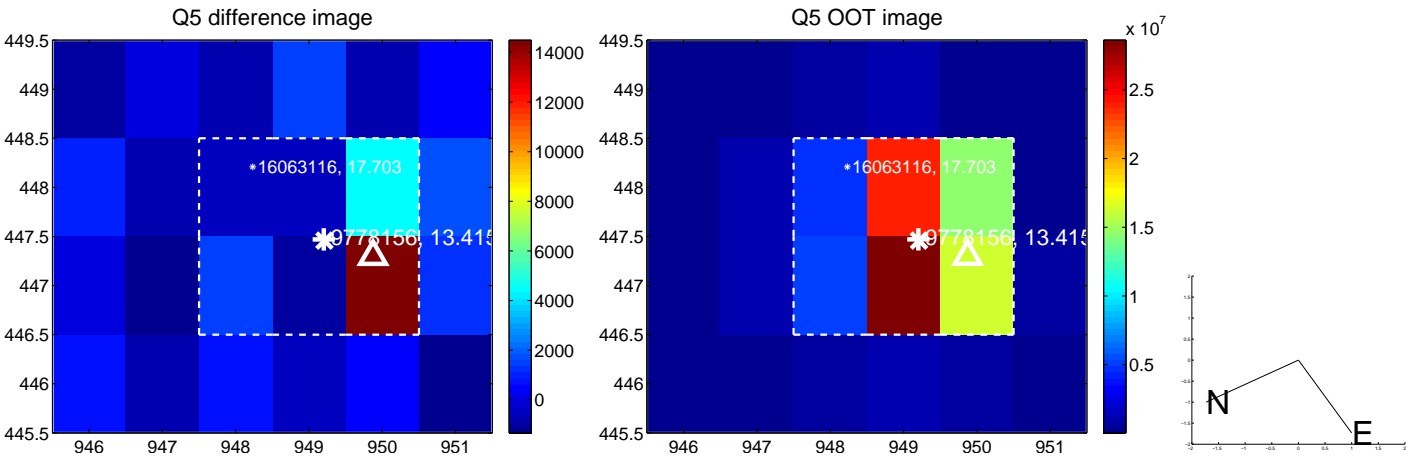


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses:** good quarterly centroid offsets; **Vermillion crosses:** bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- σ uncertainty. Blue circle: three-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

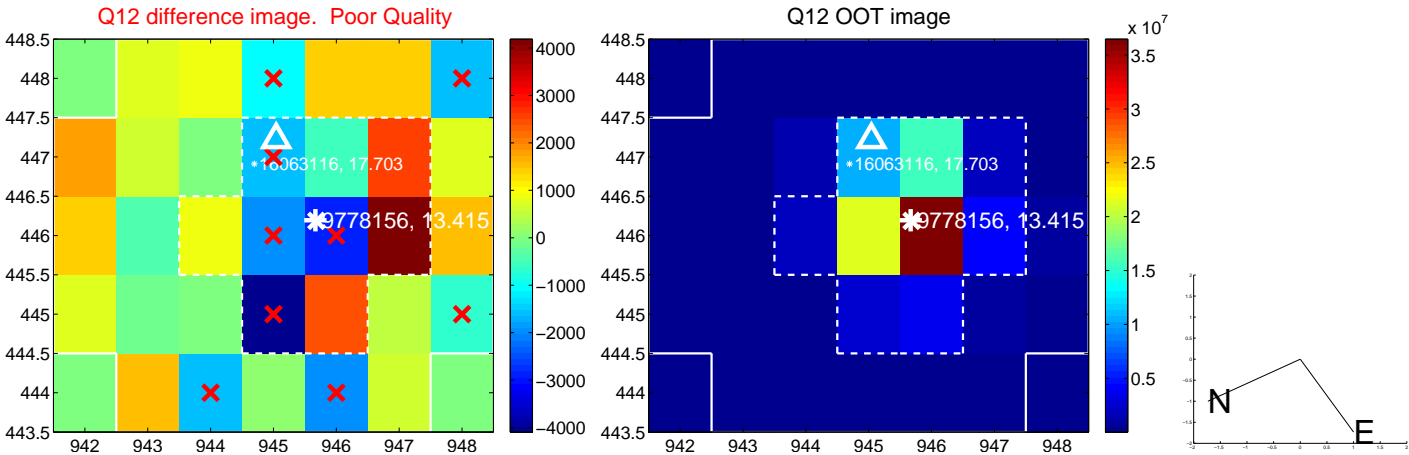
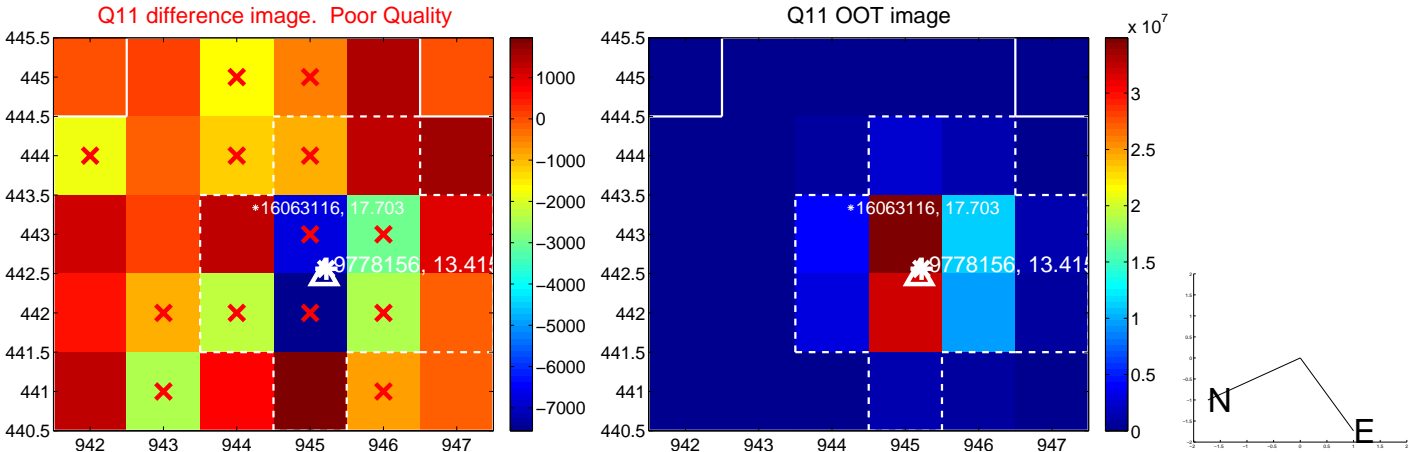
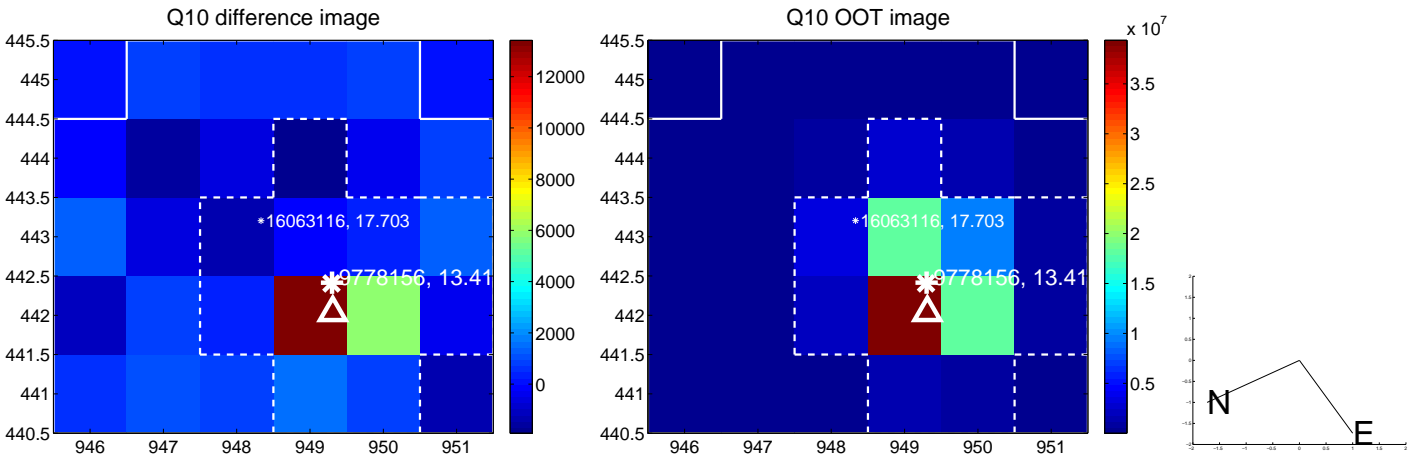
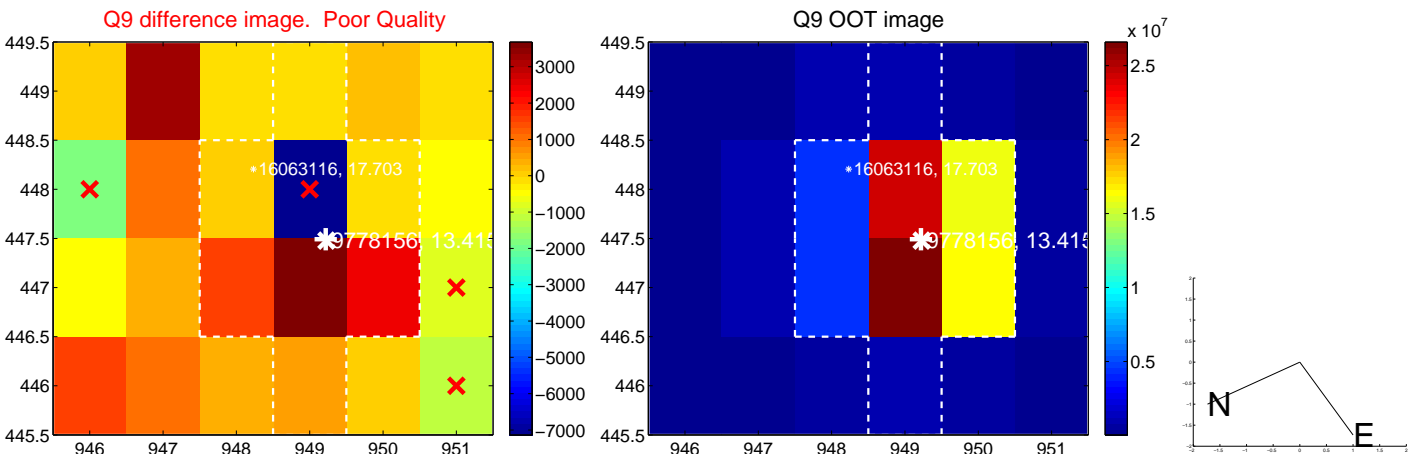
white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



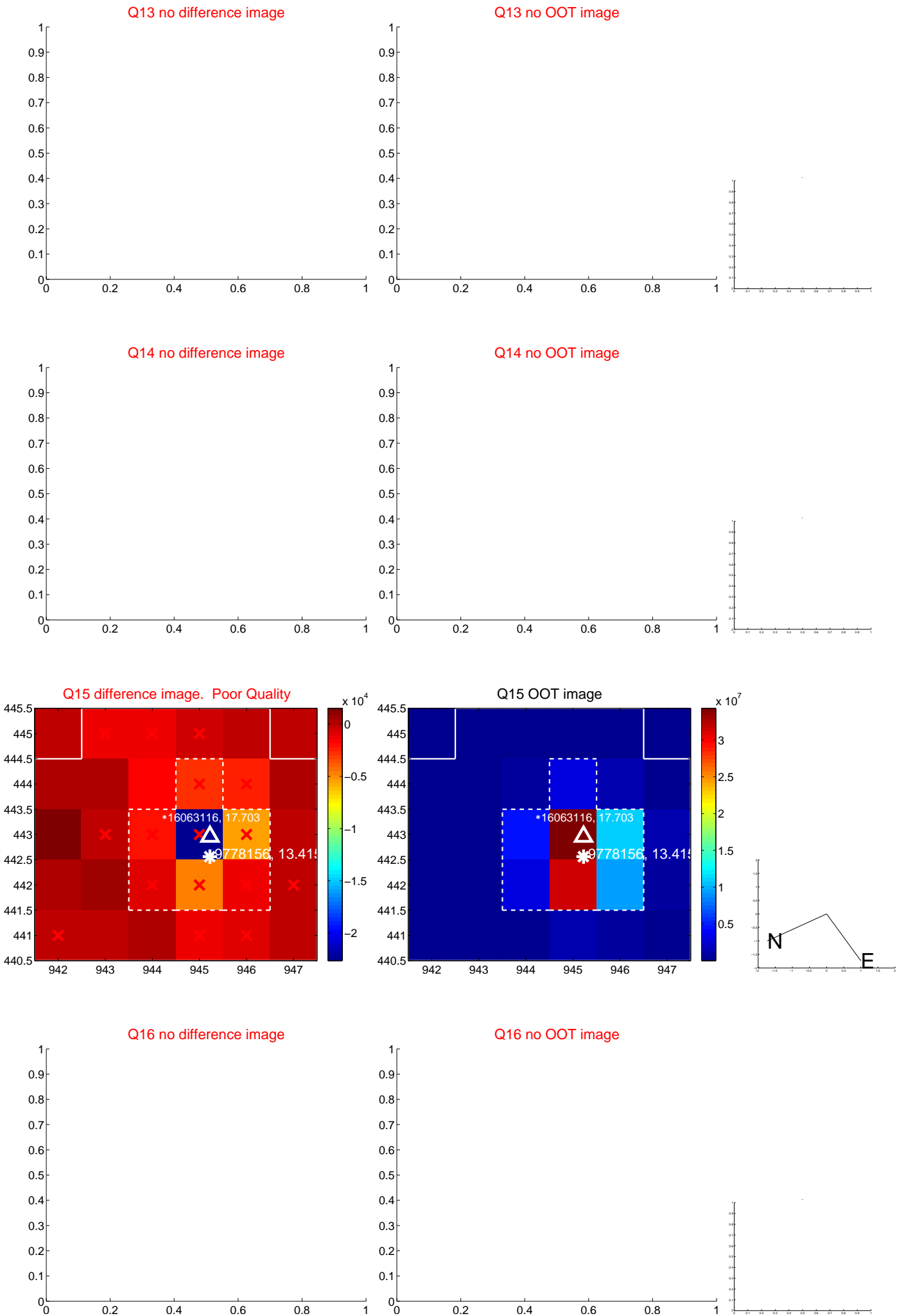
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



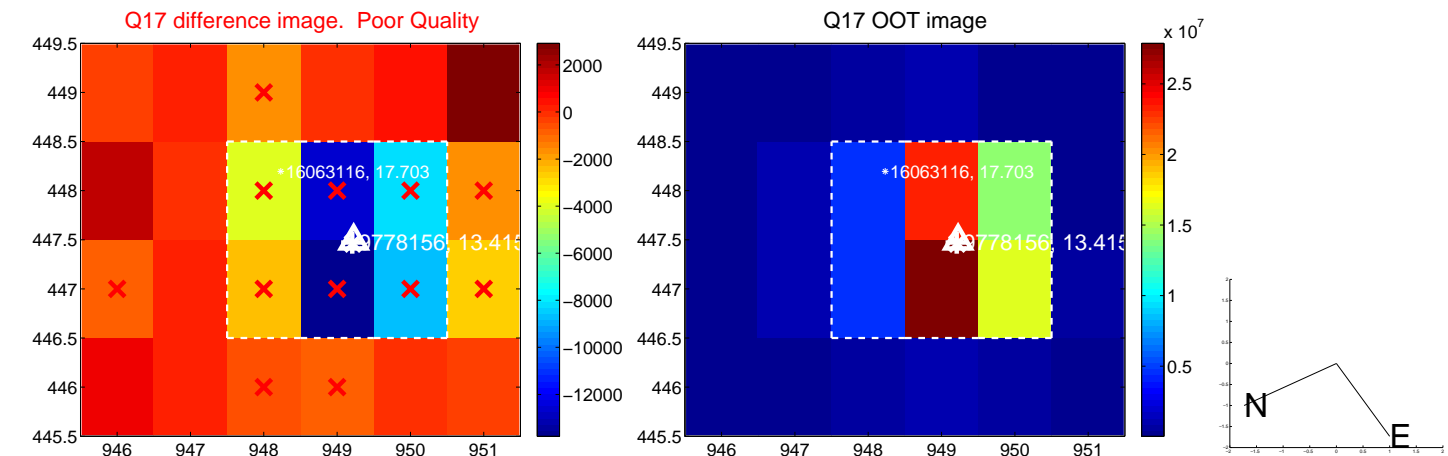
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



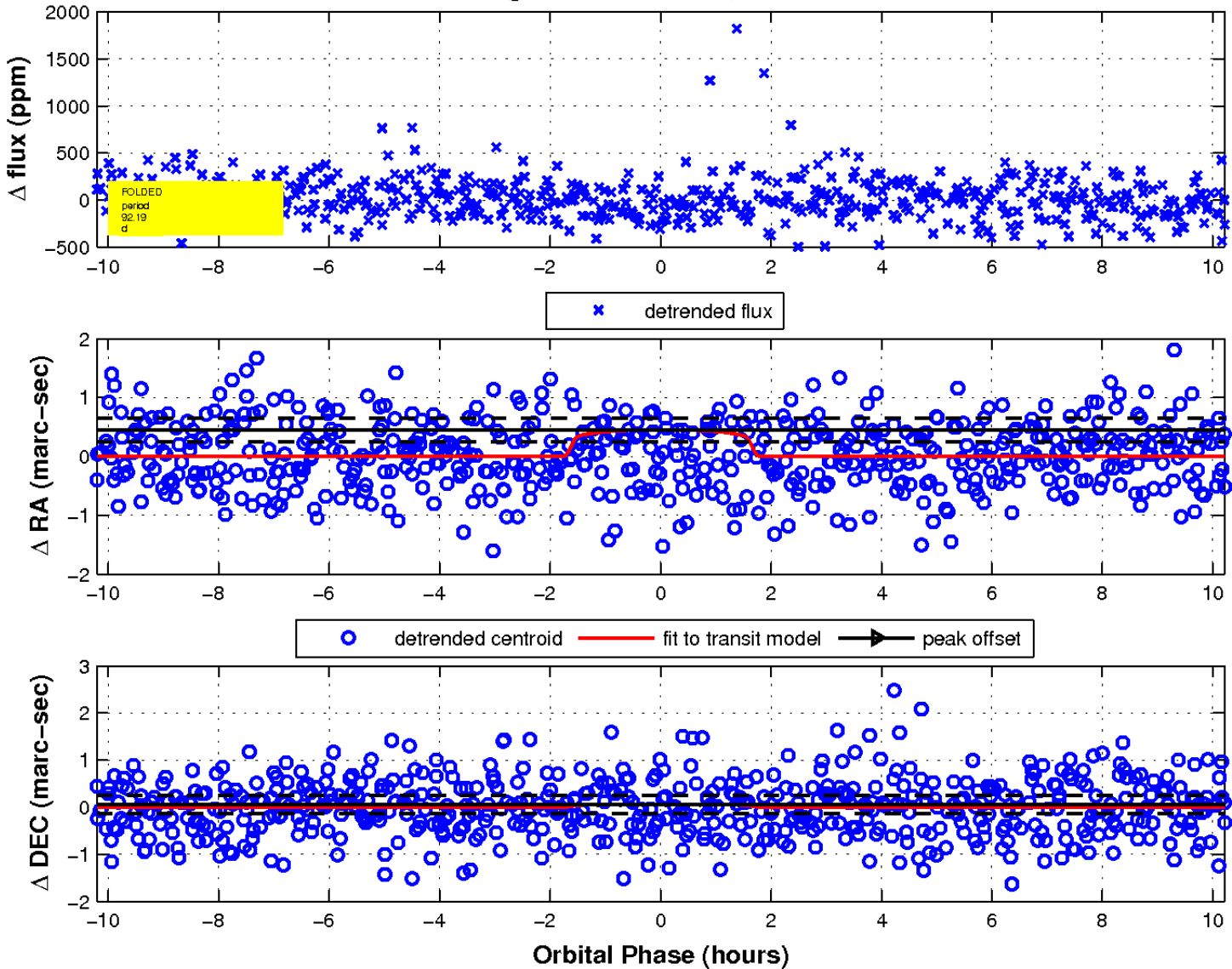
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



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

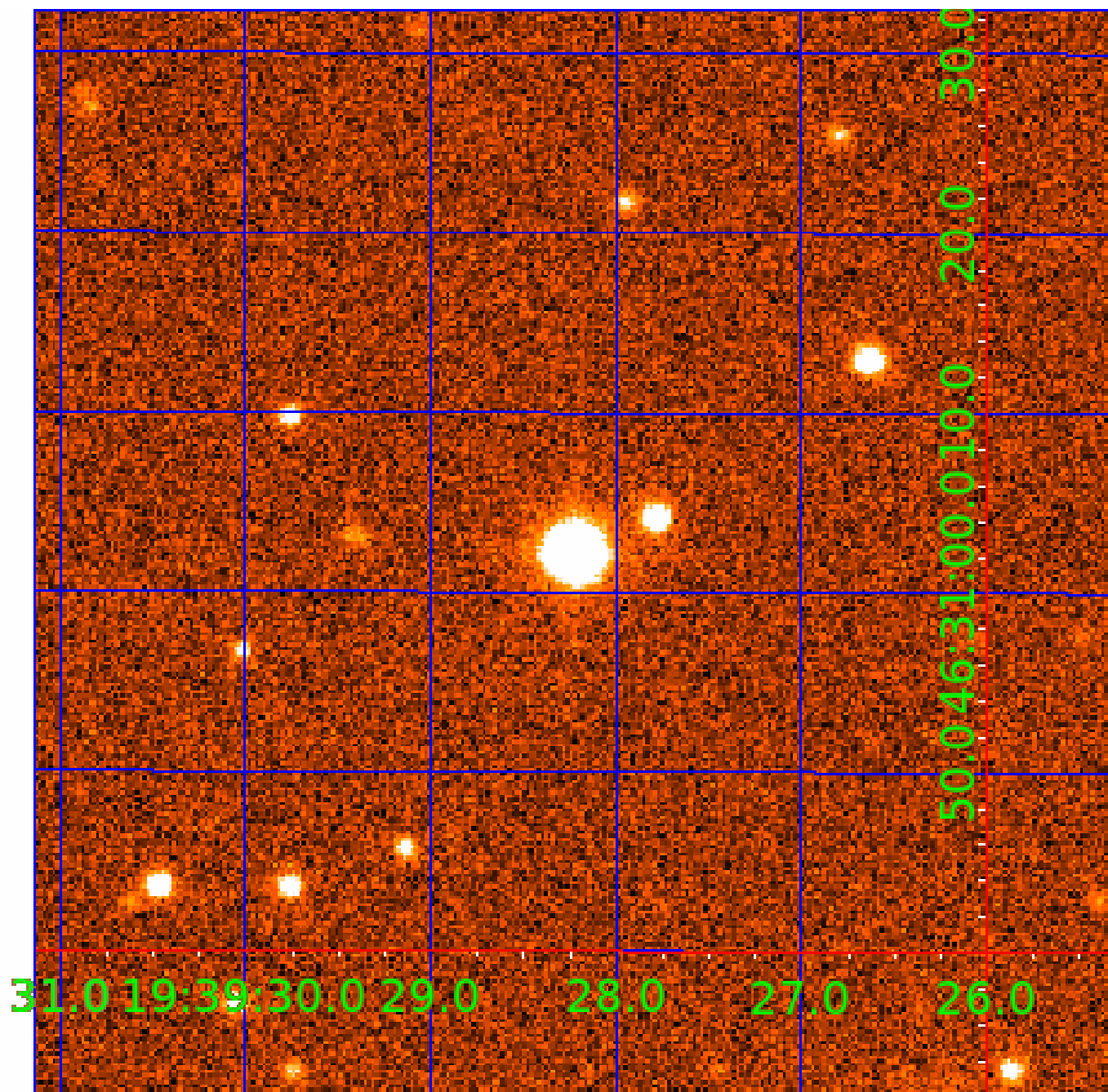


fluxWeightedCentroids, Planet 5 of 7



UKIRT Image

Declination



KIC 009778156

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})
009778156-01	OBS	No	1.496271	131.533459	80.4	8.601	16.3	20.8	2.71	6899	4.73	16503.54
009778156-02	OBS	No	134.595940	228.390375	224.7	10.063	10.2	7.6	2.71	6899	4.68	40.95
009778156-03	OBS	No	320.159647	377.542023	331.1	16.036	8.6	7.5	2.71	6899	4.97	12.89
009778156-04	OBS	No	74.165540	197.605944	286.6	4.372	7.4	8.0	2.71	6899	5.29	90.64
009778156-05	OBS	No	92.185666	186.008532	271.5	3.410	9.4	8.8	2.71	6899	4.80	67.82
009778156-06	OBS	No	86.142373	217.359021	219.8	4.750	8.2	6.5	2.71	6899	4.53	74.24
009778156-07	OBS	No	102.590867	209.562276	106.5	11.475	7.7	3.0	2.71	6899	3.02	58.81

Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009778156-01	OBS	FP	0.00	1	0	0	0	LPP_DV
009778156-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—INCONSISTENT_TRANS
009778156-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_MARSHALL—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS
009778156-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT
009778156-05	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_CHASES—TRANS_GAPPED—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT
009778156-06	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_POS_ALT
009778156-07	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT

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

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

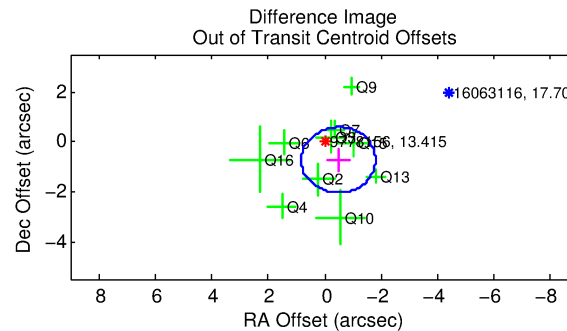
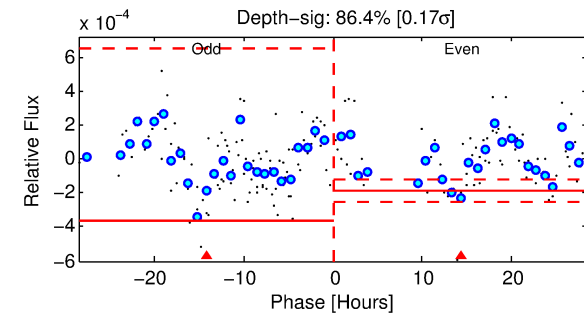
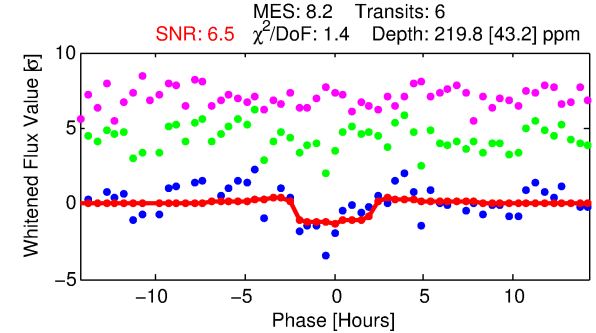
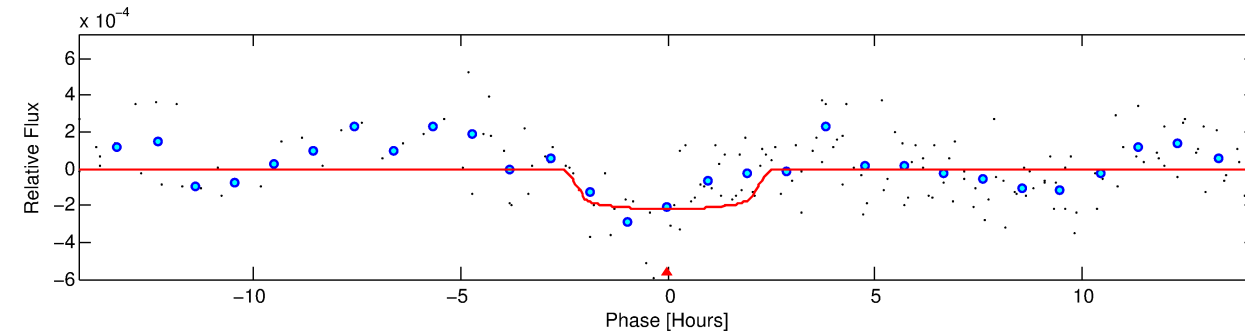
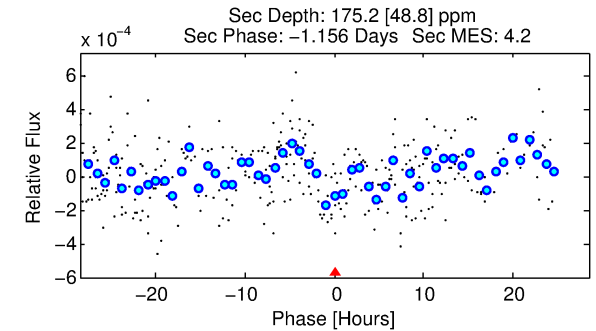
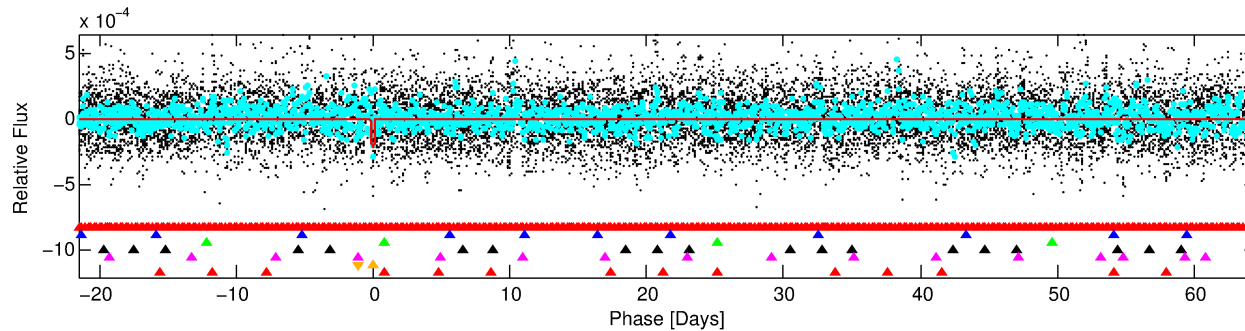
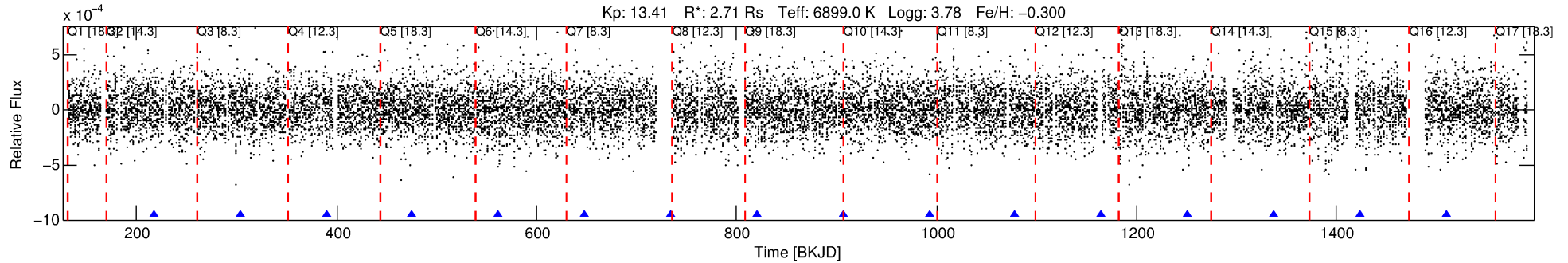
See http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col for comment definitions.

Ephemeris Match Information For 009778156-06

No Significant Match Found

DV One-Page Summary

KIC: 9778156 Candidate: 6 of 7 Period: 86.142 d



DV Fit Results:

Period = 86.14237 [0.00174] d
Epoch = 217.3590 [0.0126] BKJD
Rp/R* = 0.0154 [0.0096]
a/R* = 75.83 [277.70]
b = 0.86 [1.16]
Seff = 74.24 [41.63]
Teq = 748 [105] K
Rp = 4.53 [3.34] Re
a = 0.4474 [0.1572] AU
Ag = 938.95 [1309.15] [0.72σ]
Teffp = 6406 [2068] K [2.73σ]

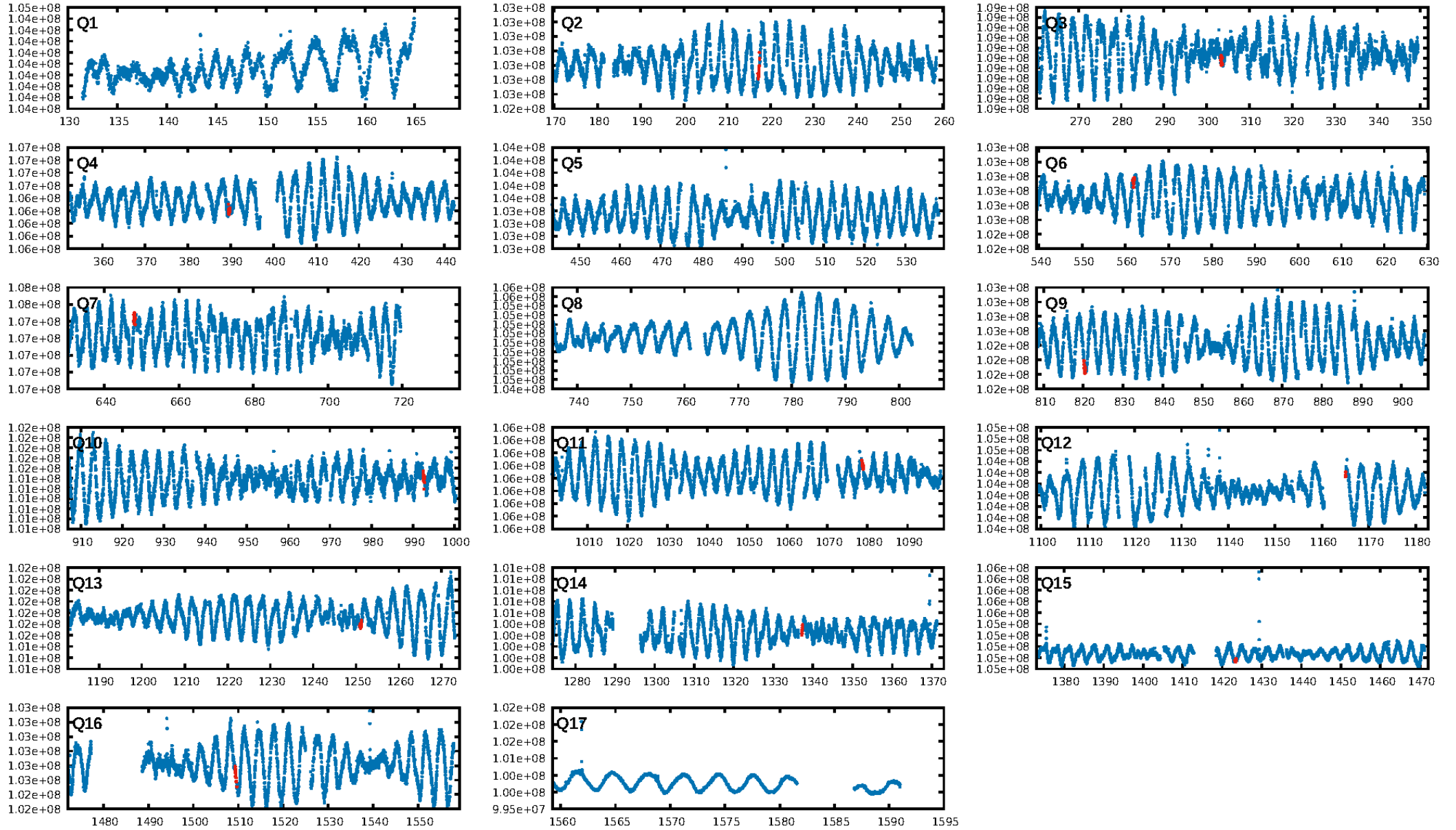
DV Diagnostic Results:

ShortPeriod-sig: 100.0% [44.53σ]
LongPeriod-sig: 100.0% [24.80σ]
ModelChiSquare2-sig: 4.9%
ModelChiSquareGof-sig: 99.9%
Bootstrap-pfa: 5.57e-10
RollingBand-fgt: 1.00 [6/6]
GhostDiagnostic-chr: 1.612
Centroid-sig: 38.8%
Centroid-so: 0.736 arcsec [0.86σ]
OotOffset-rm: 0.877 arcsec [2.00σ]
KicOffset-rm: 0.880 arcsec [2.02σ]
OotOffset-st: 3/3/2/2 [10]
KicOffset-st: 3/3/2/2 [10]
DiffImageQuality-fgm: 0.70 [7/10]
DiffImageOverlap-fno: 0.18 [2/11]

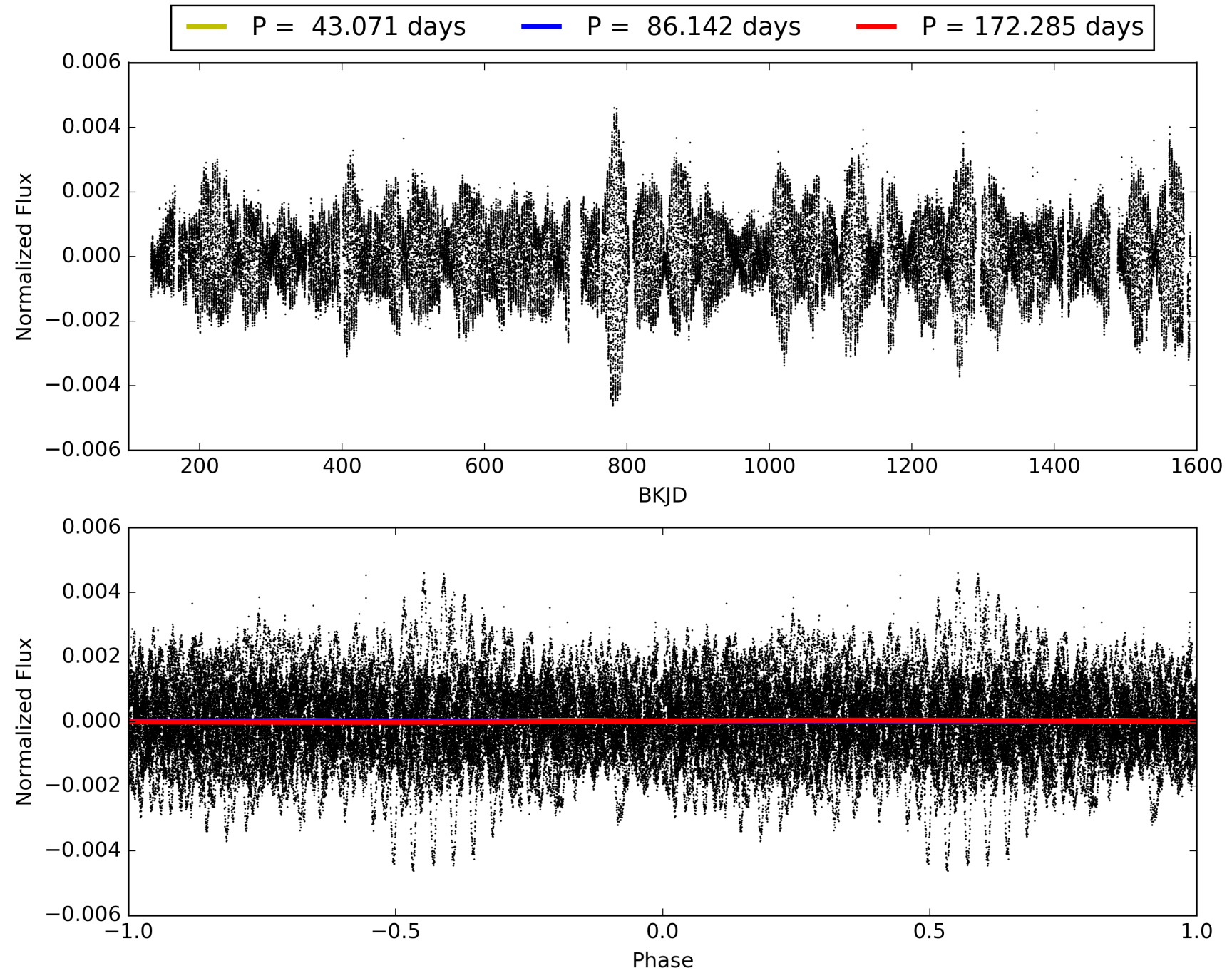
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 30-Jan-2016 20:46:58 Z

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

TCE 009778156-06, PDC Light Curves

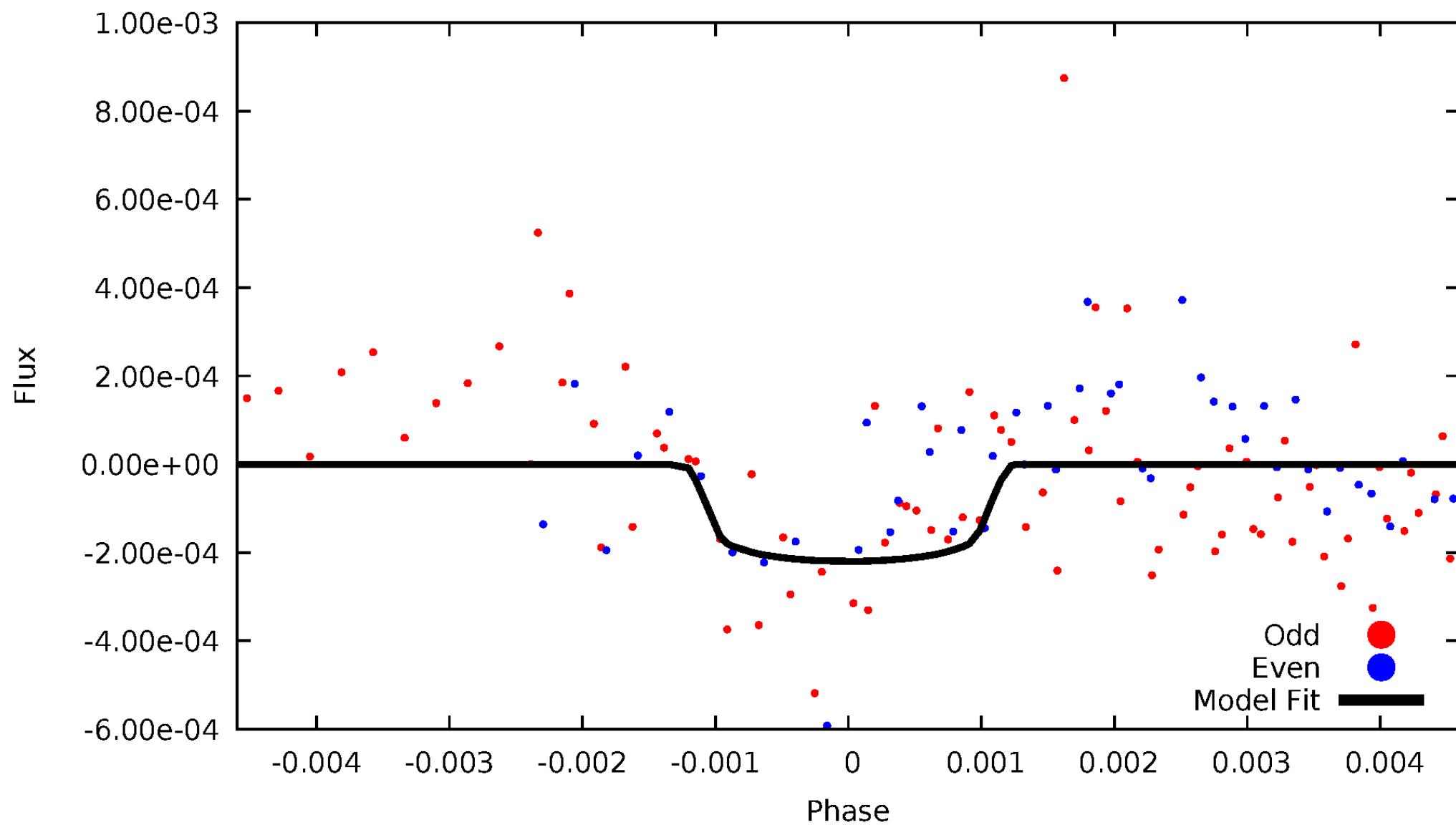


TCE 009778156-06



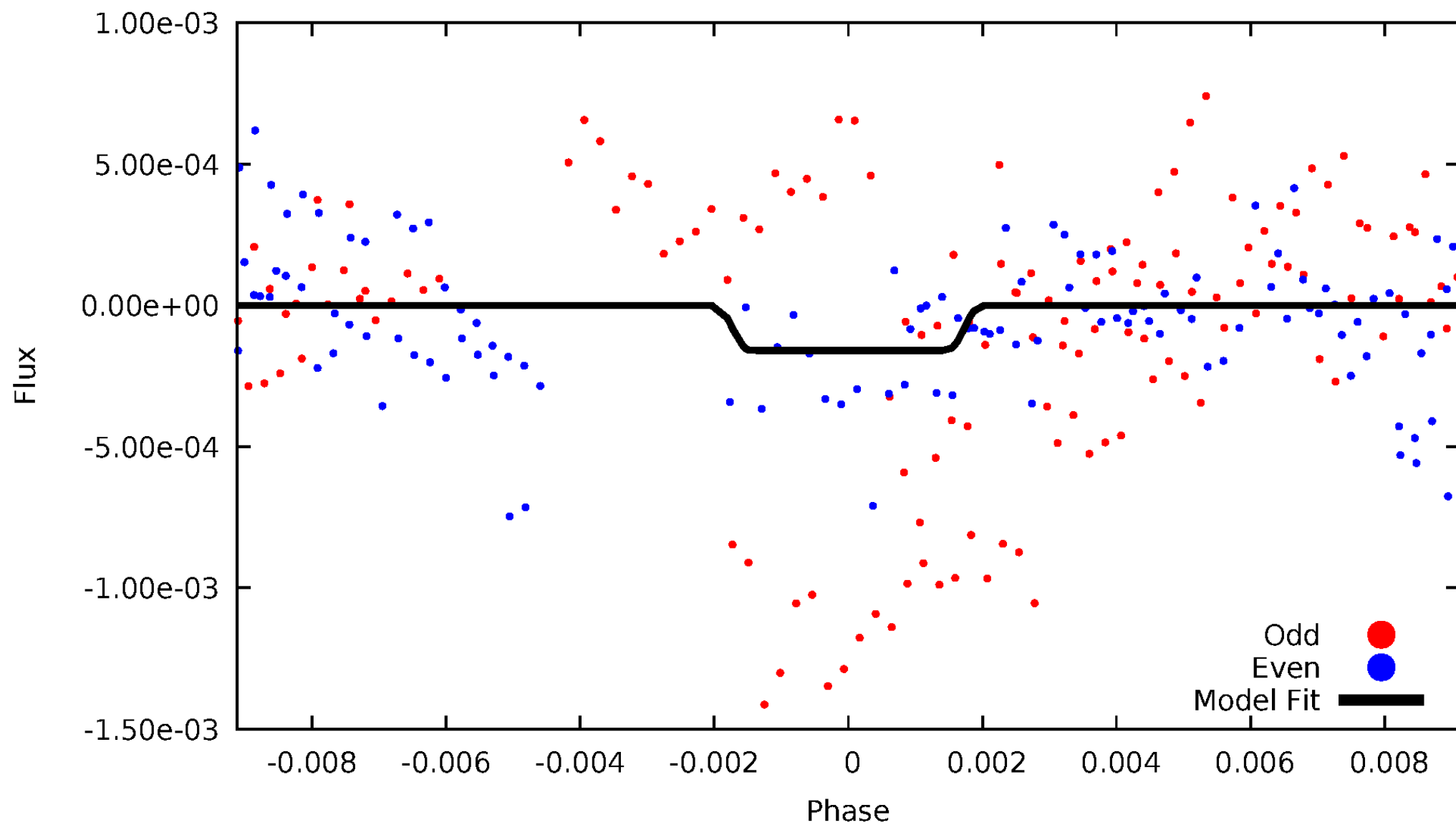
DV Odd/Even

TCE 009778156-06



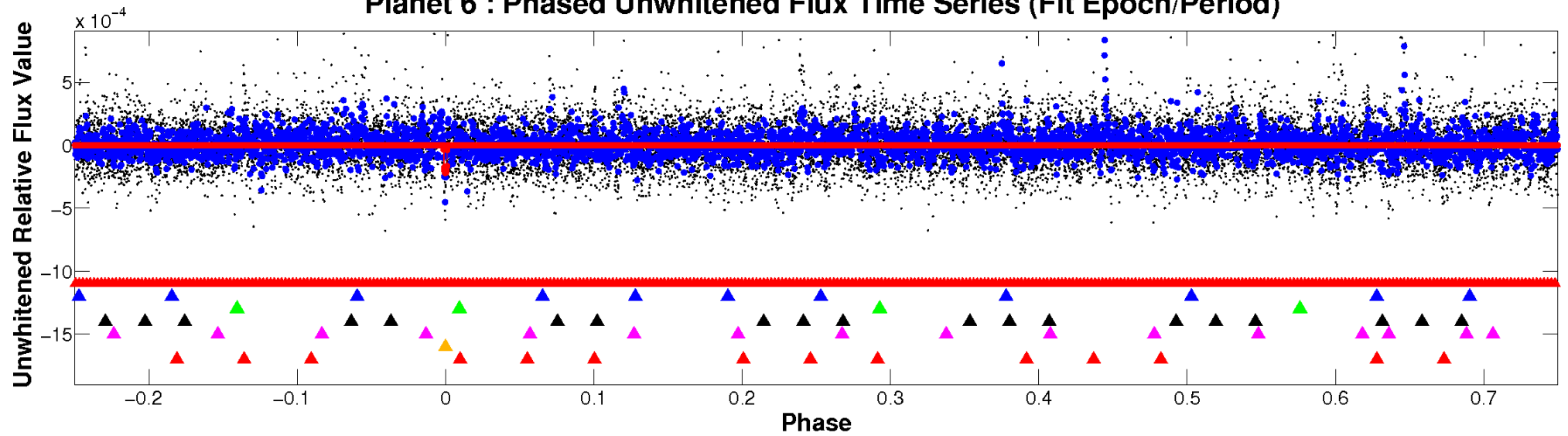
ALT Odd/Even

TCE 009778156-06

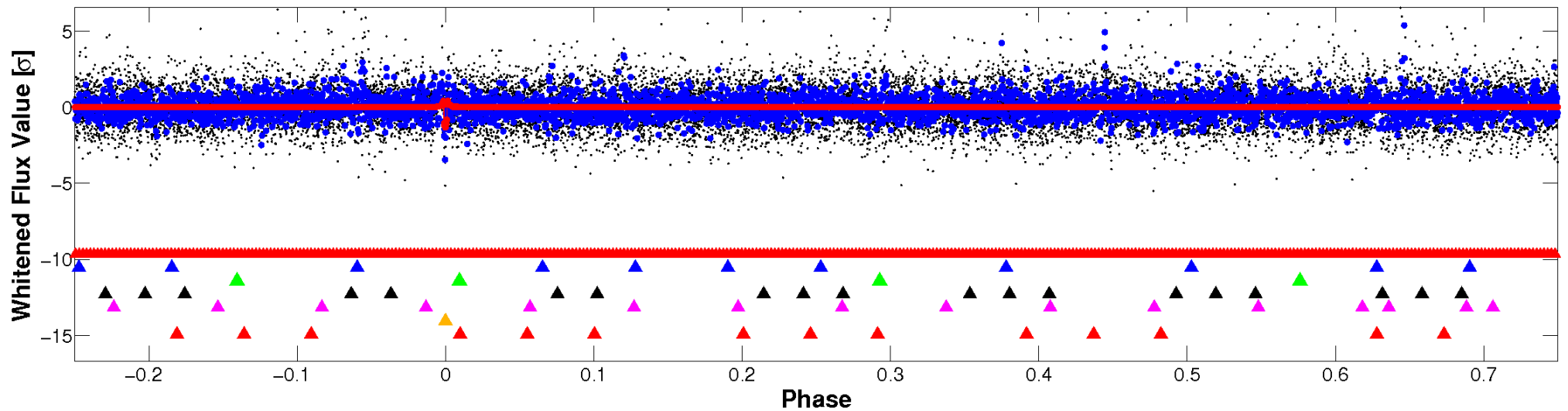


Non-Whitened Vs. Whitened Light Curve

Planet 6 : Phased Unwhitened Flux Time Series (Fit Epoch/Period)

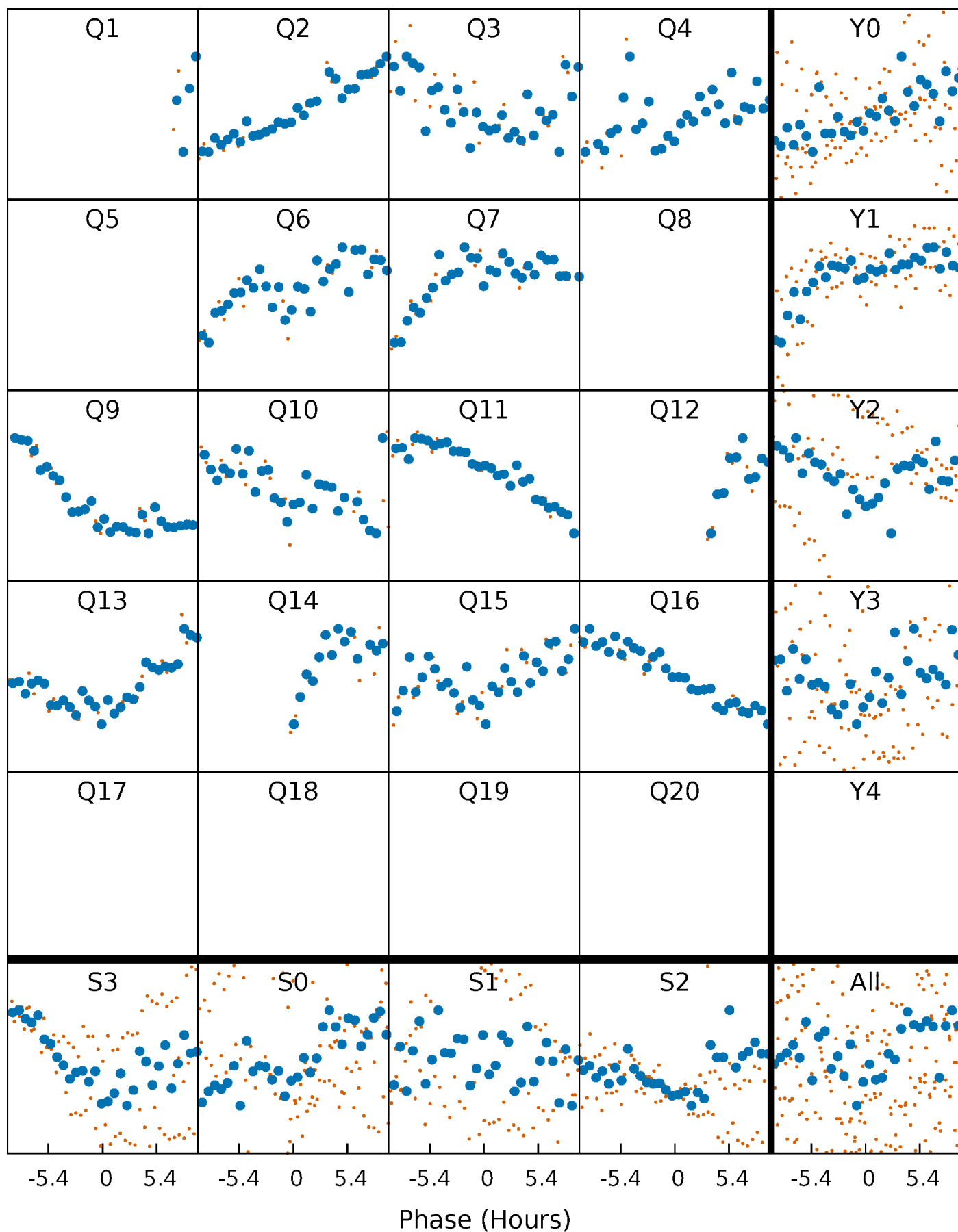


Planet 6 : Phased Whitened Flux Time Series (Fit Epoch/Period)



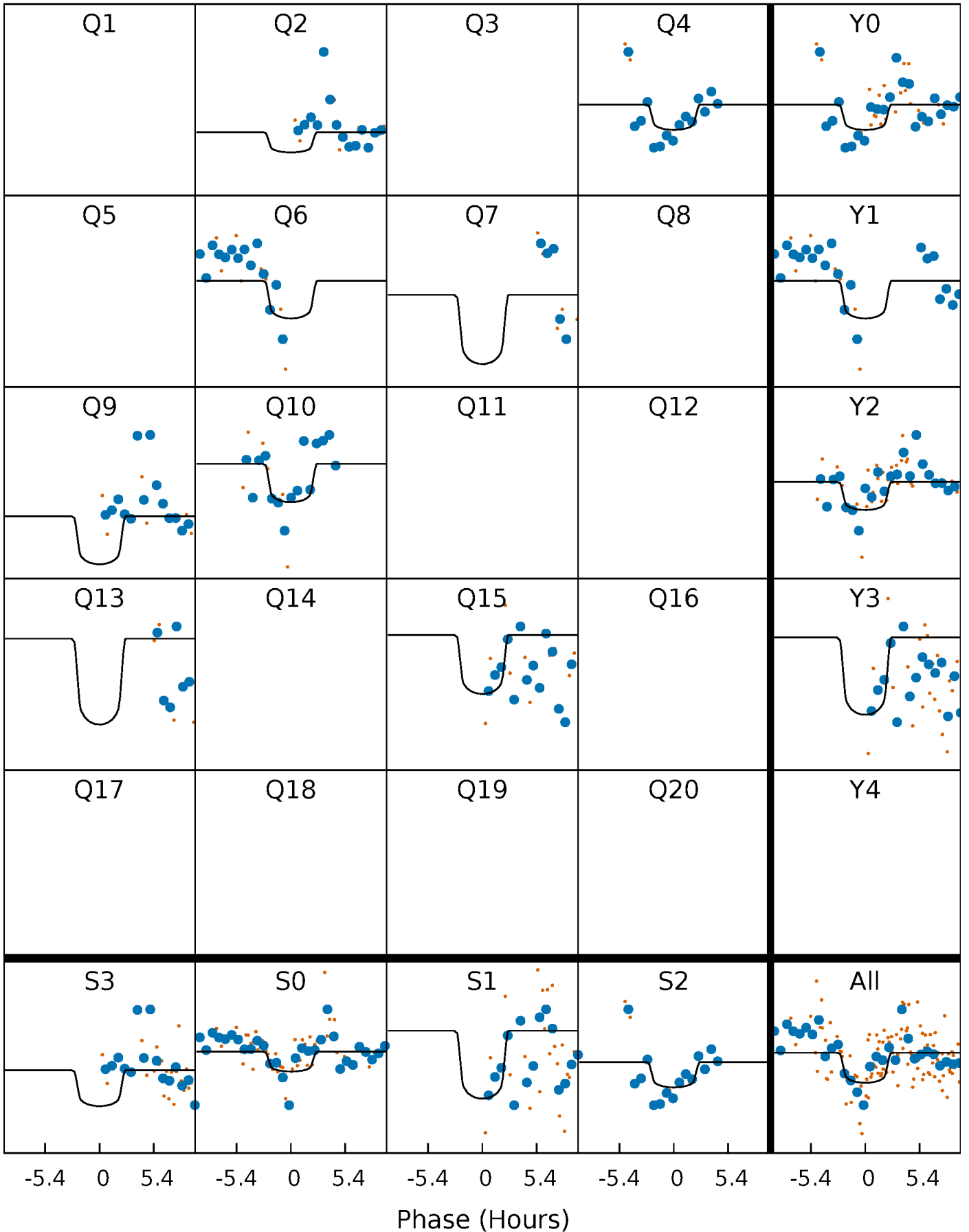
PDC Quarter-Phased Transit Curves

TCE 009778156-06 P= 86.142373 Days $T_0=217.359021$ (BKJD)



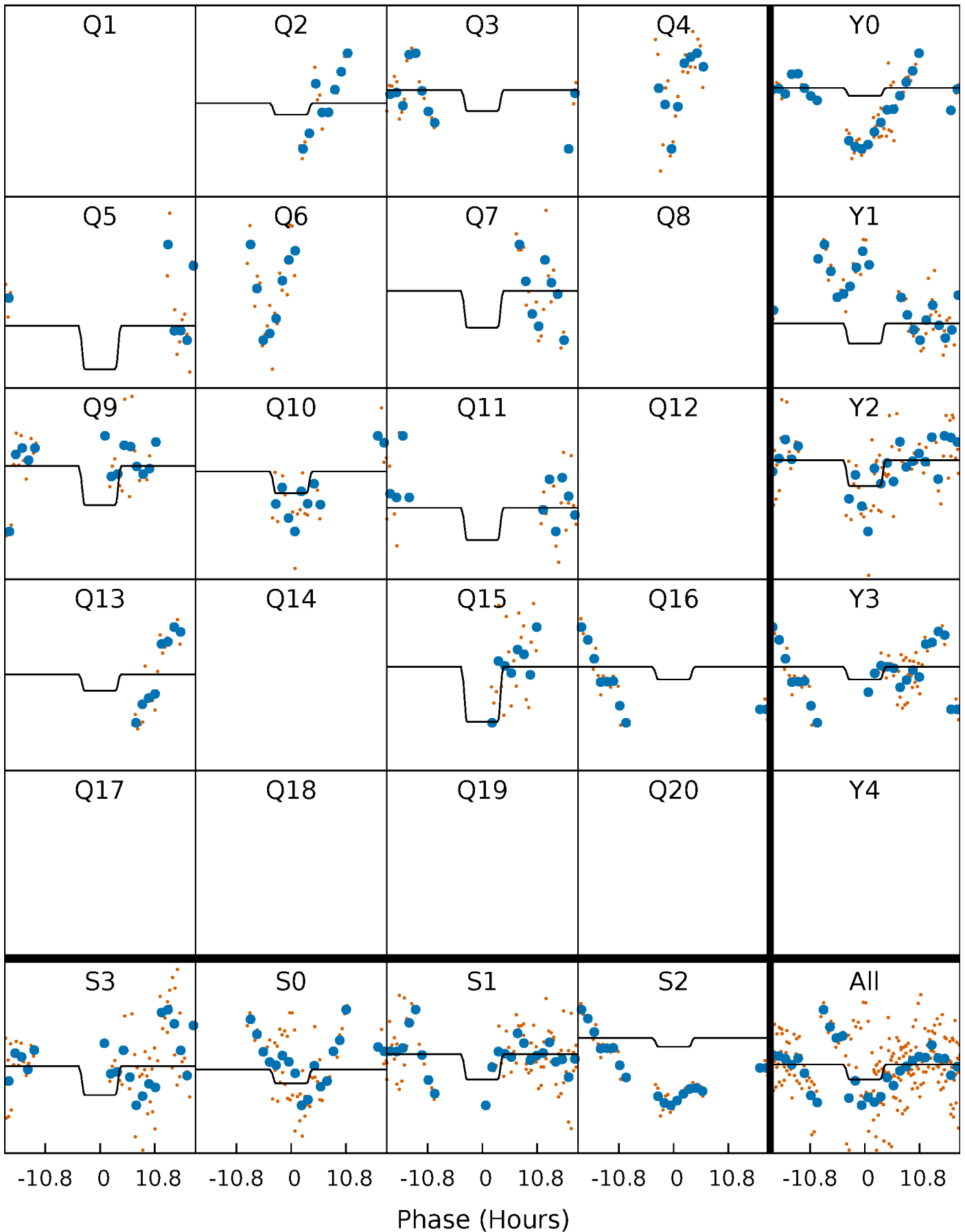
DV Quarter-Phased Transit Curves

TCE 009778156-06 P= 86.142373 Days $T_0=217.359021$ (BKJD)



Alt. Detrend Quarter-Phased Transit Curves

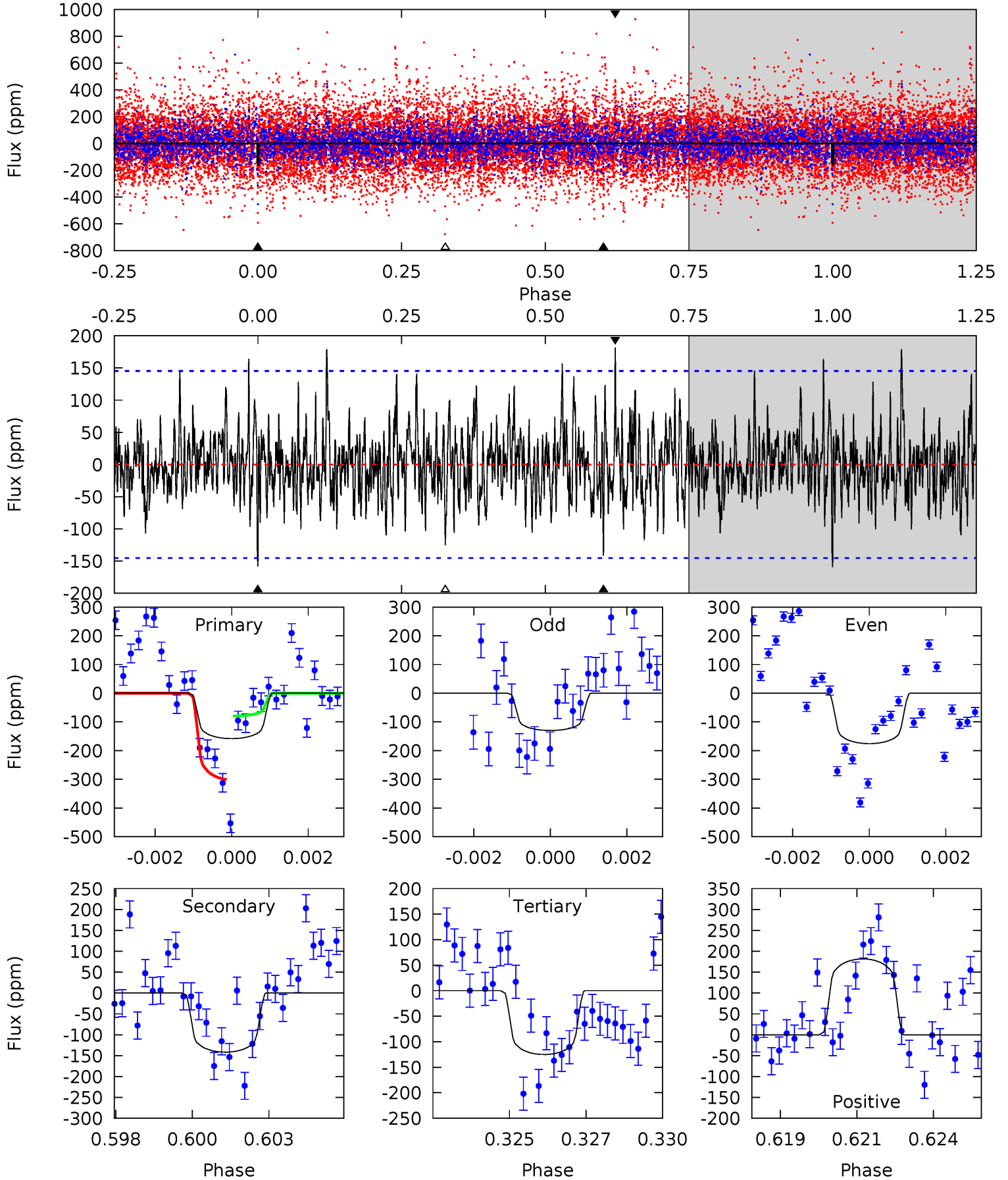
TCE 009778156-06 P= 86.143355 Days $T_0=217.304796$ (BKJD)



DV Model-Shift Uniqueness Test

009778156-06, $P = 86.142373$ Days, $E = 131.216648$ Days

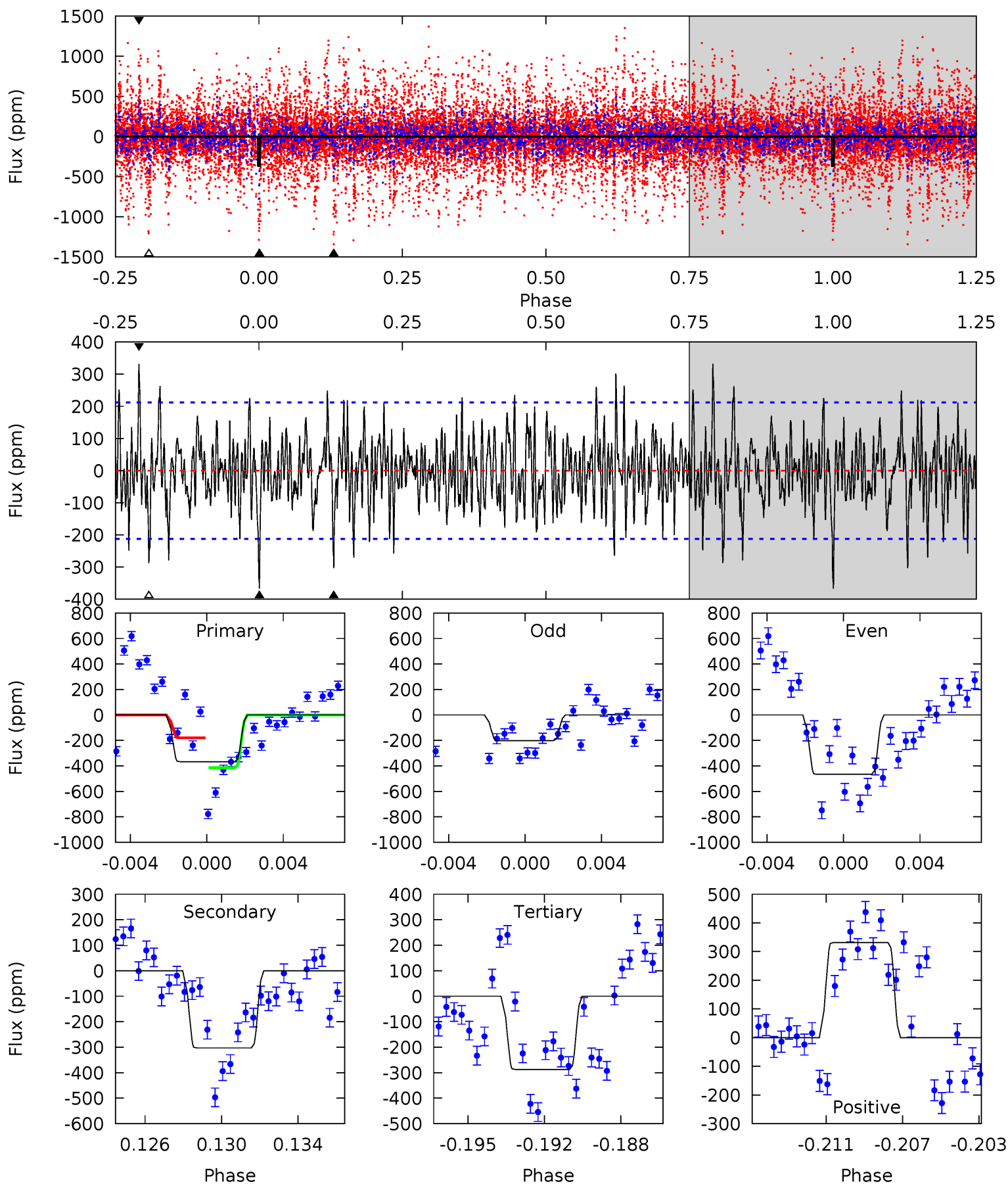
Pri	Sec	Ter	Pos	FA ₁	FA ₂	F _{Red}	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
5.77	5.16	4.56	6.62	5.30	3.04	1.66	1.21	-0.85	0.60	-1.46	0.81	0.69	0.53	3.83



Alt Model-Shift Uniqueness Test

009778156-06, P = 86.143355 Days, E = 131.161441 Days

Pri	Sec	Ter	Pos	FA ₁	FA ₂	F _{Red}	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
8.99	7.43	7.04	8.13	5.21	2.89	2.20	1.95	0.86	0.38	-0.71	3.10	1.55	0.47	2.79



Stellar Parameters For KIC 009778156

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	6899^{+190}_{-238}	$3.780^{+0.312}_{-0.078}$	$-0.300^{+0.300}_{-0.250}$	$2.706^{+0.417}_{-1.043}$	$1.607^{+0.199}_{-0.369}$	$0.114^{+0.260}_{-0.035}$
	+3%/-3%	+8%/-2%	+100%/-83%	+15%/-39%	+12%/-23%	+227%/-31%
Source	PHO1	FLK73	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 009778156-06 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	A_{obs}
DV	-142 ± 27	$4.42^{+2.94}_{-2.50}$	1021^{+59}_{-96}	5856^{+3462}_{-1115}	798^{+3324}_{-514}
Alt.	-303 ± 41	$3.87^{+2.68}_{-2.22}$	1021^{+59}_{-89}	7679^{+7138}_{-1720}	2163^{+10451}_{-1386}

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

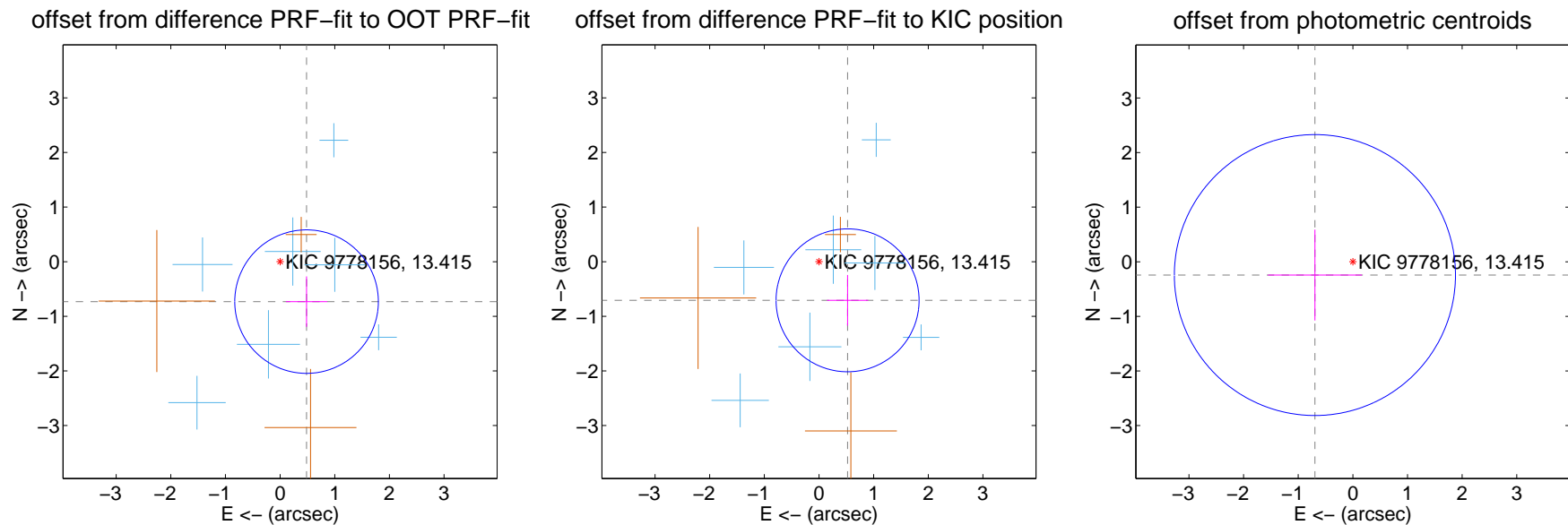
DV Centroid Data

Supplemental centroid analysis for 009778156-06. Kepler magnitude: 13.41. Transit SNR 6.54

There are 7 quarters with good PRF difference image offsets

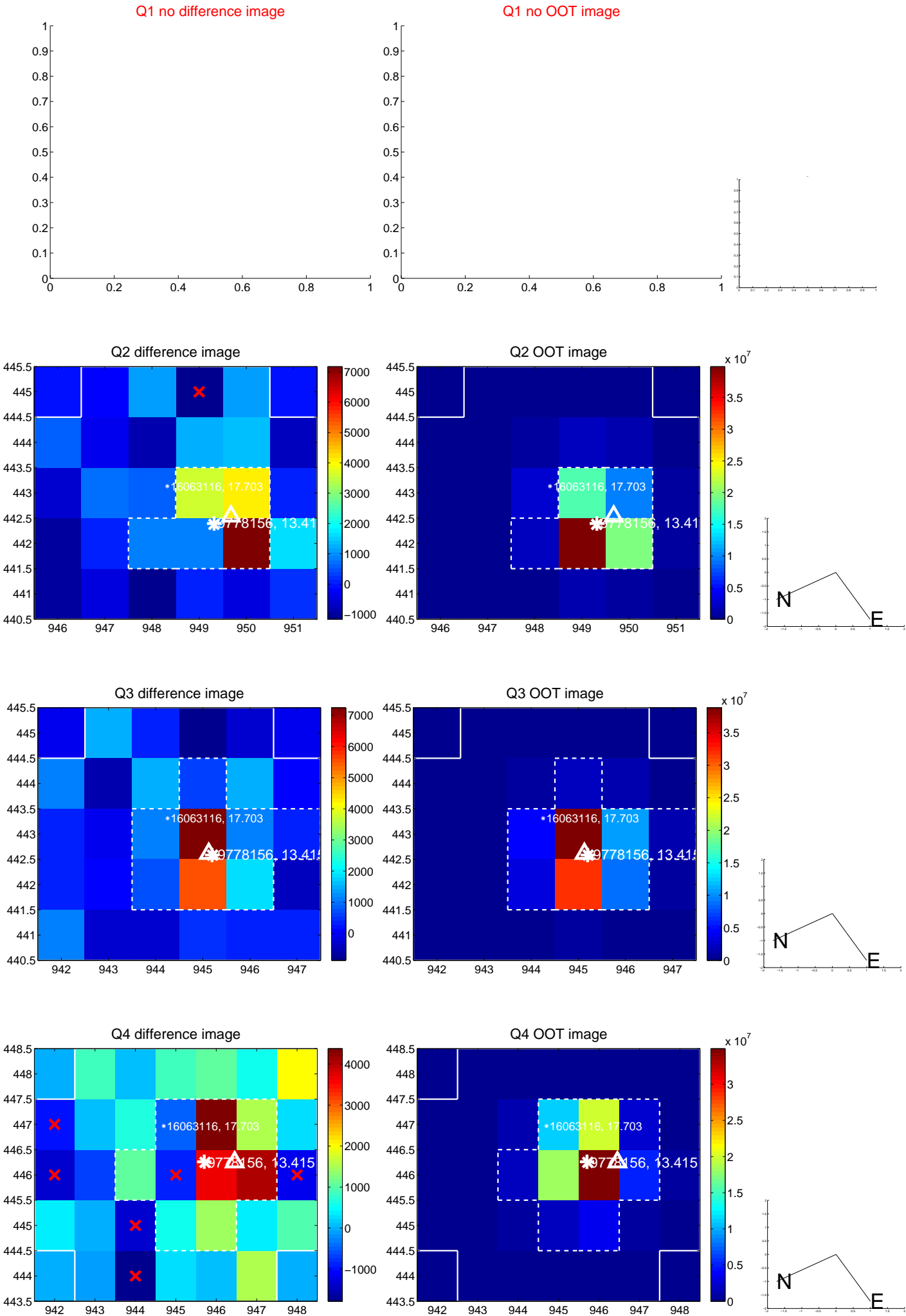
The direct PRF centroid is offset from the target star catalog position by about 0.07 arcsec

	Distance in arcsec	Distance / σ	Δ RA	Δ Dec
PRF-fit source offset from OOT	0.877 ± 0.438	2.00	-0.484 ± 0.379	-0.731 ± 0.462
PRF-fit source offset from KIC position	0.880 ± 0.436	2.02	-0.523 ± 0.378	-0.707 ± 0.465
photometric centroid source offset	0.74 ± 0.86	0.86	0.69 ± 0.86	-0.24 ± 0.83



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.

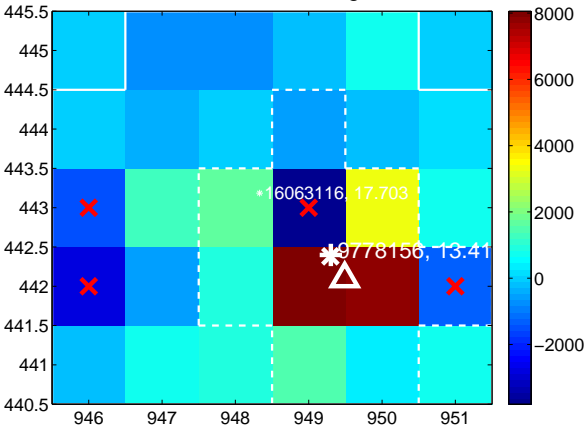
Q5 no difference image



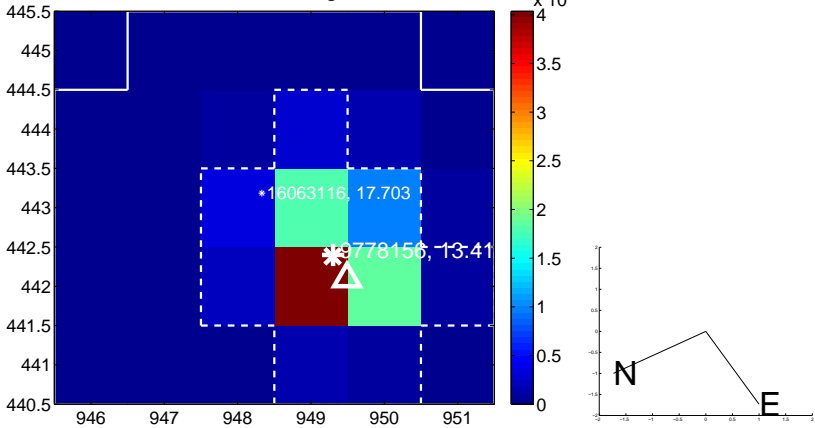
Q5 no OOT image



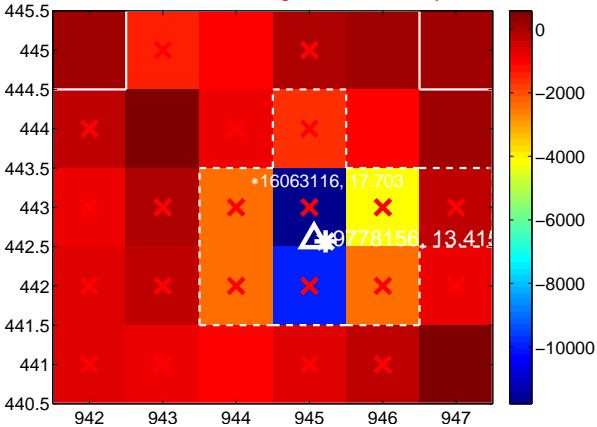
Q6 difference image



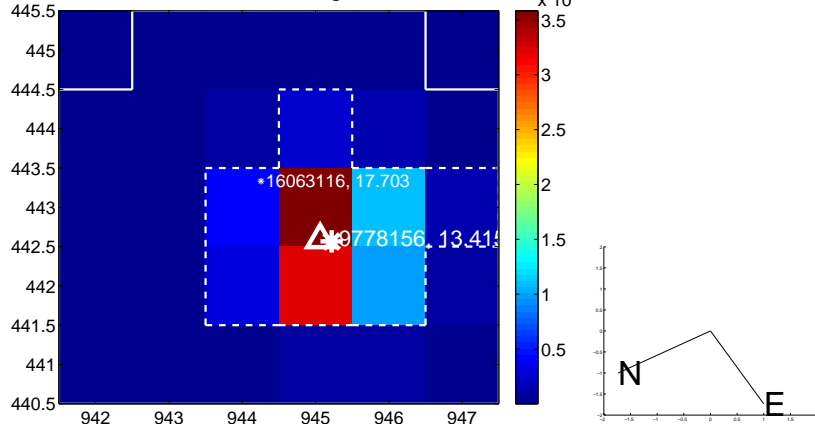
Q6 OOT image



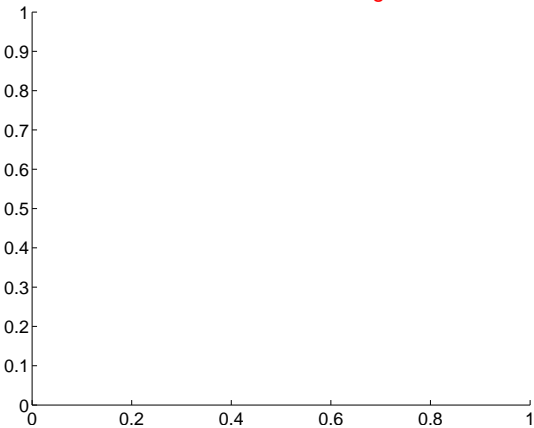
Q7 difference image. Poor Quality



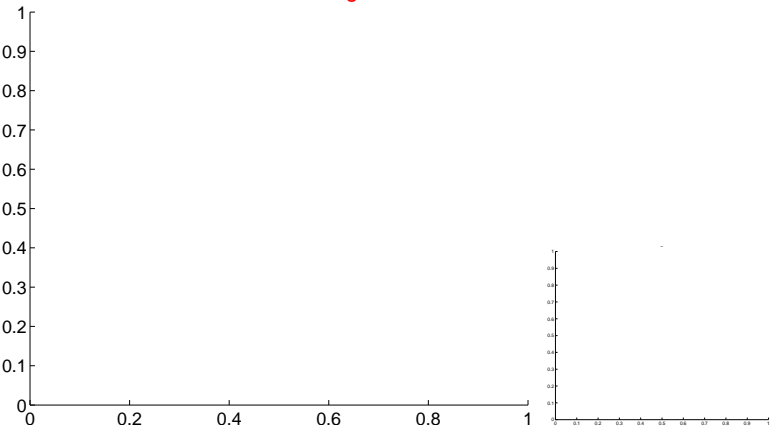
Q7 OOT image



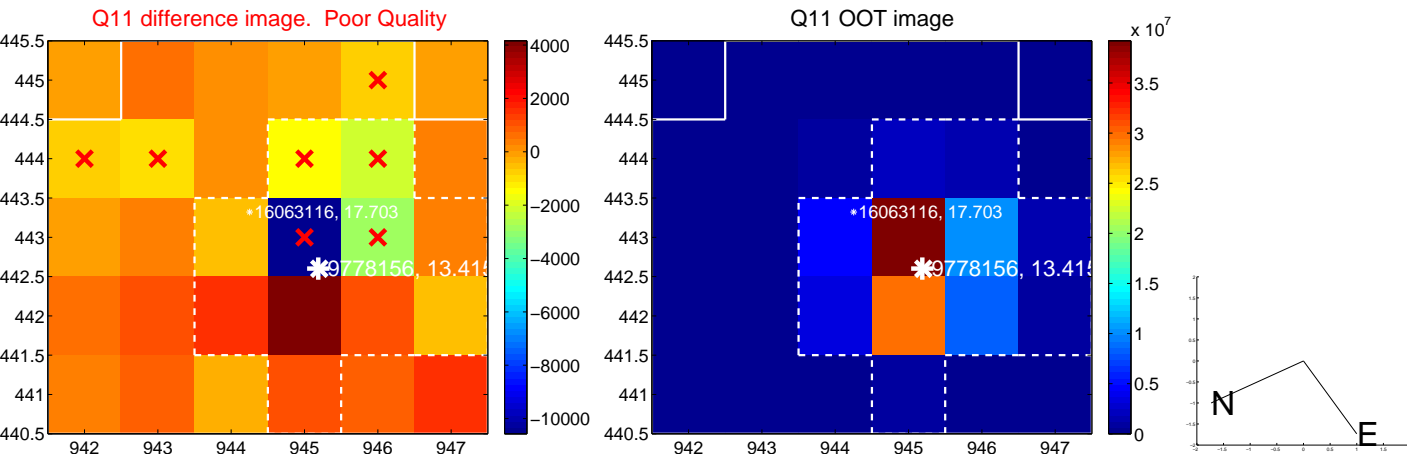
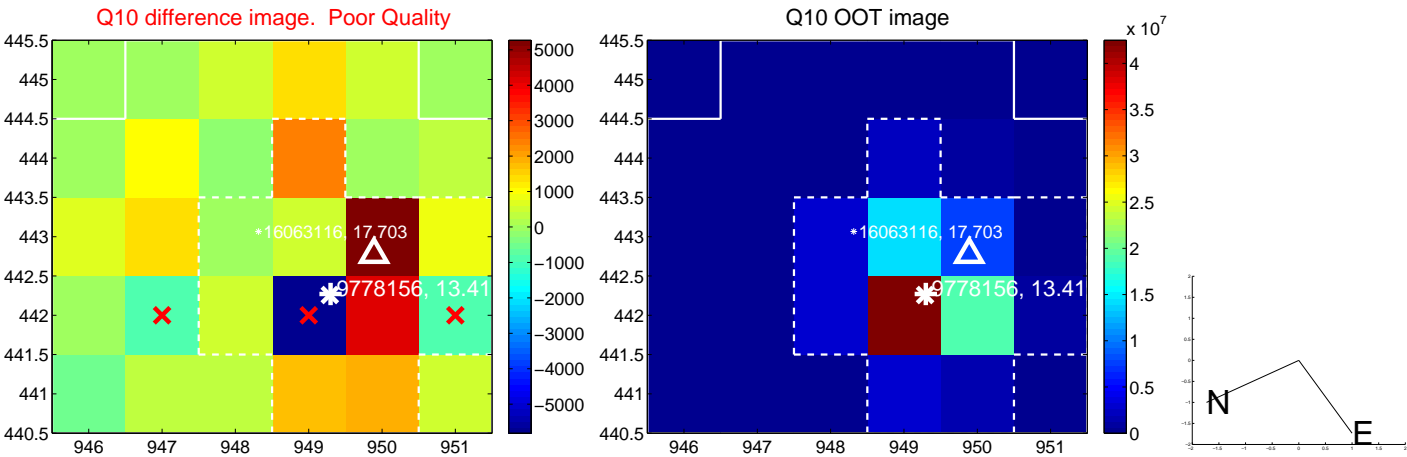
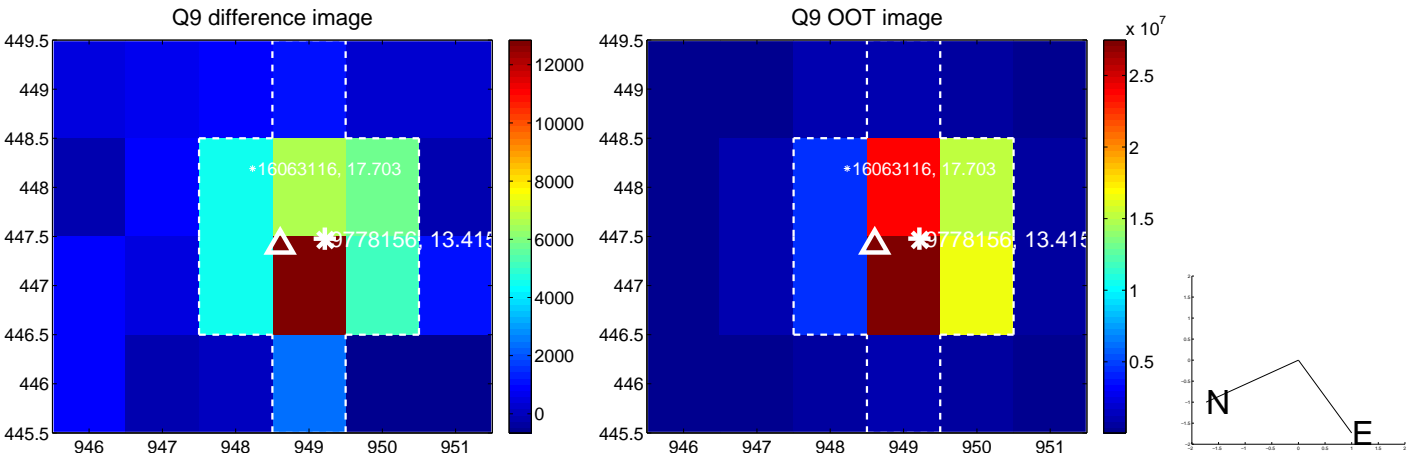
Q8 no difference image



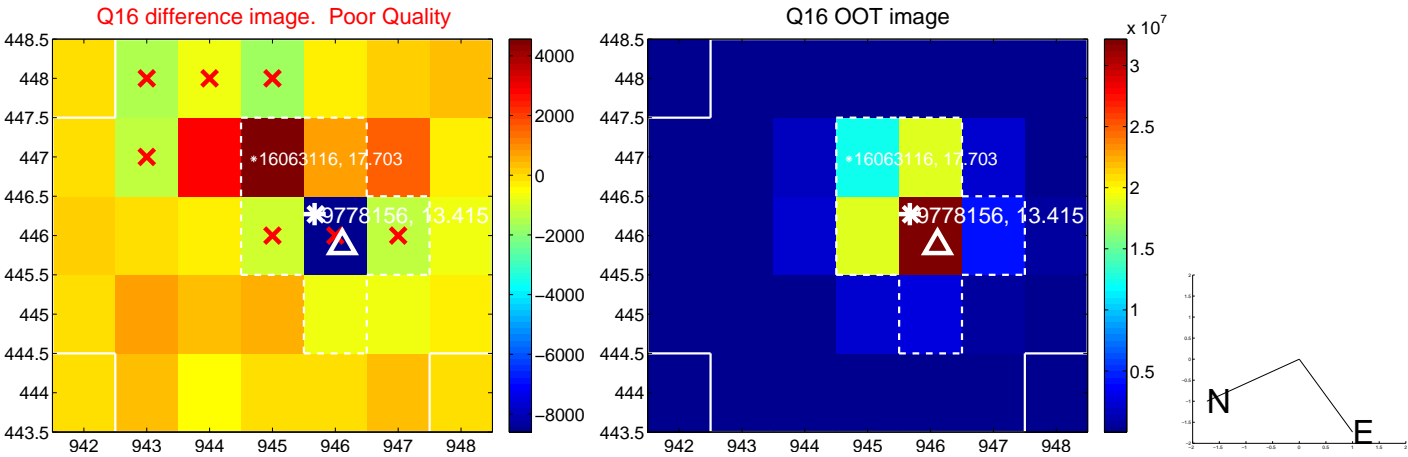
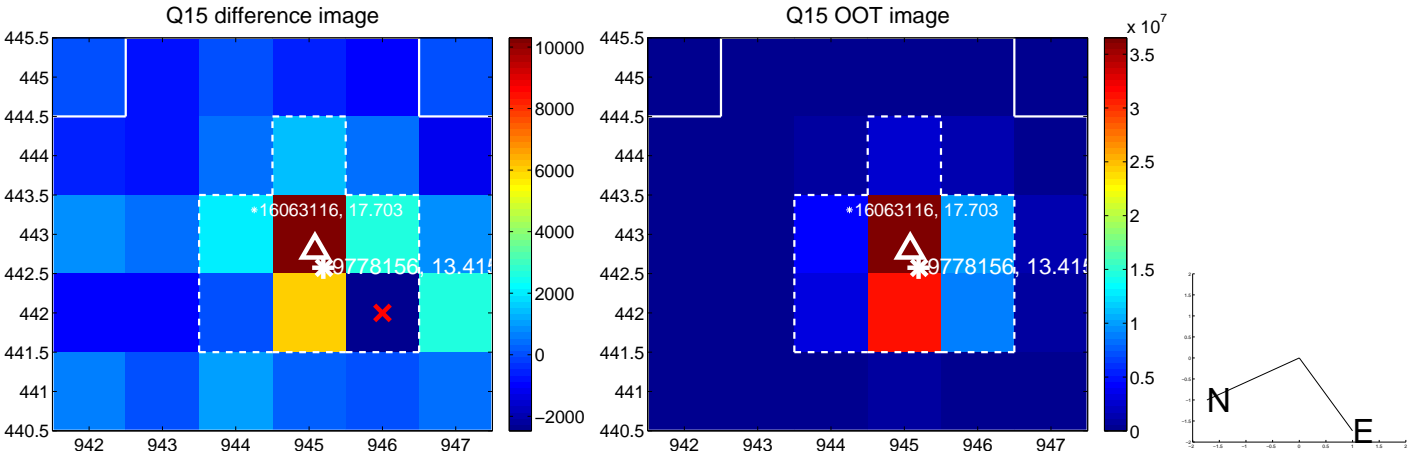
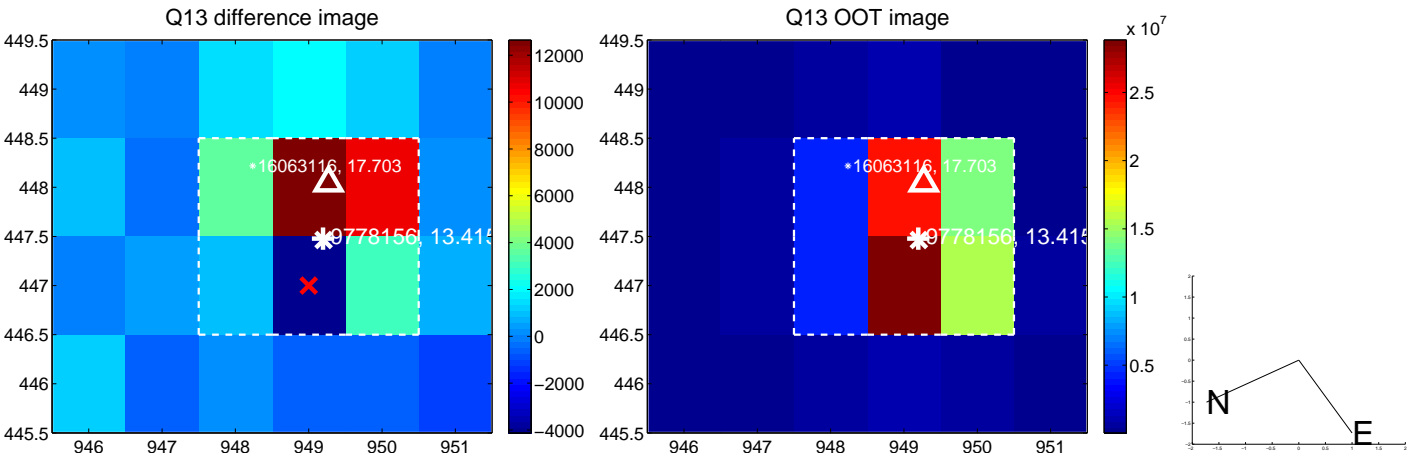
Q8 no OOT image



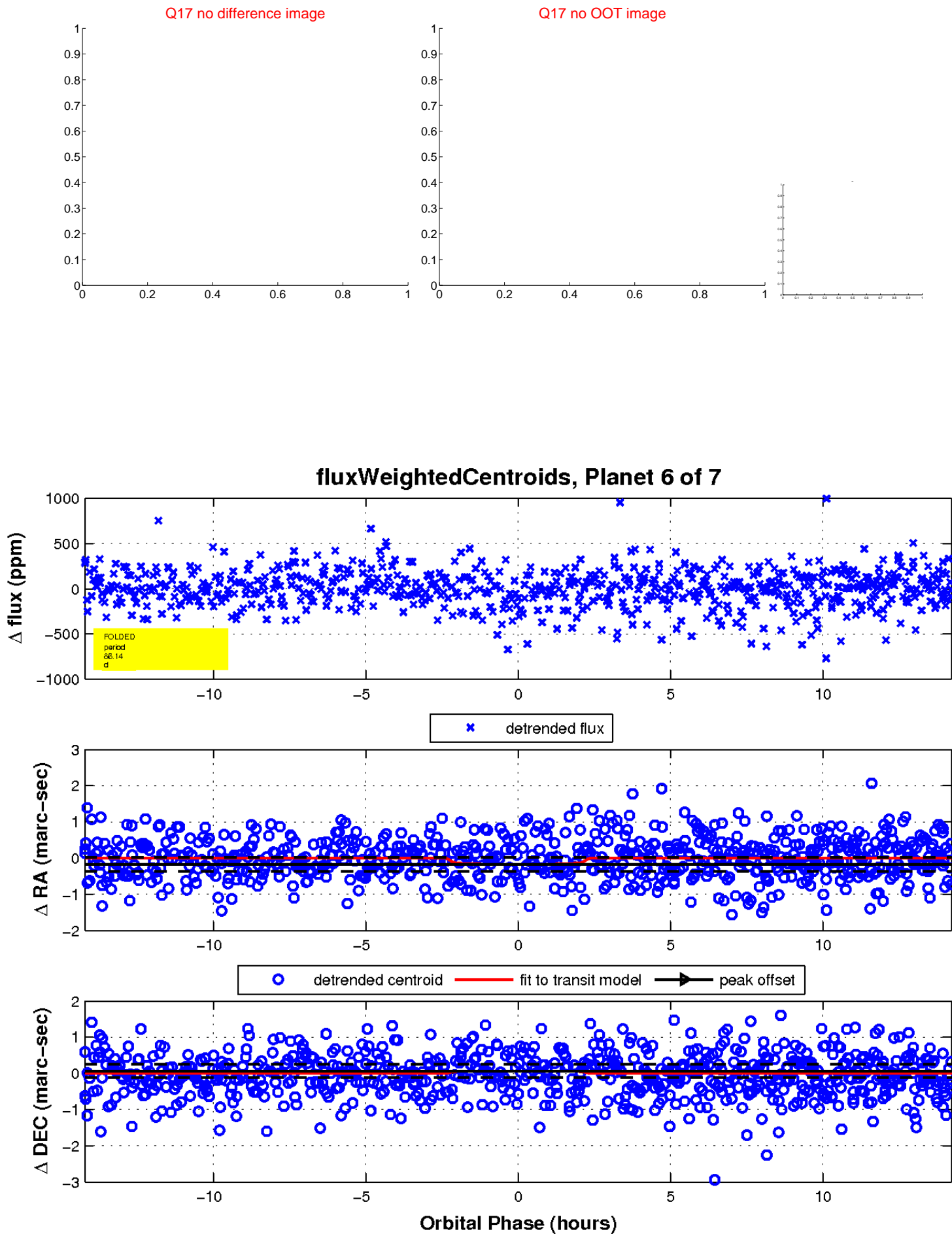
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



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

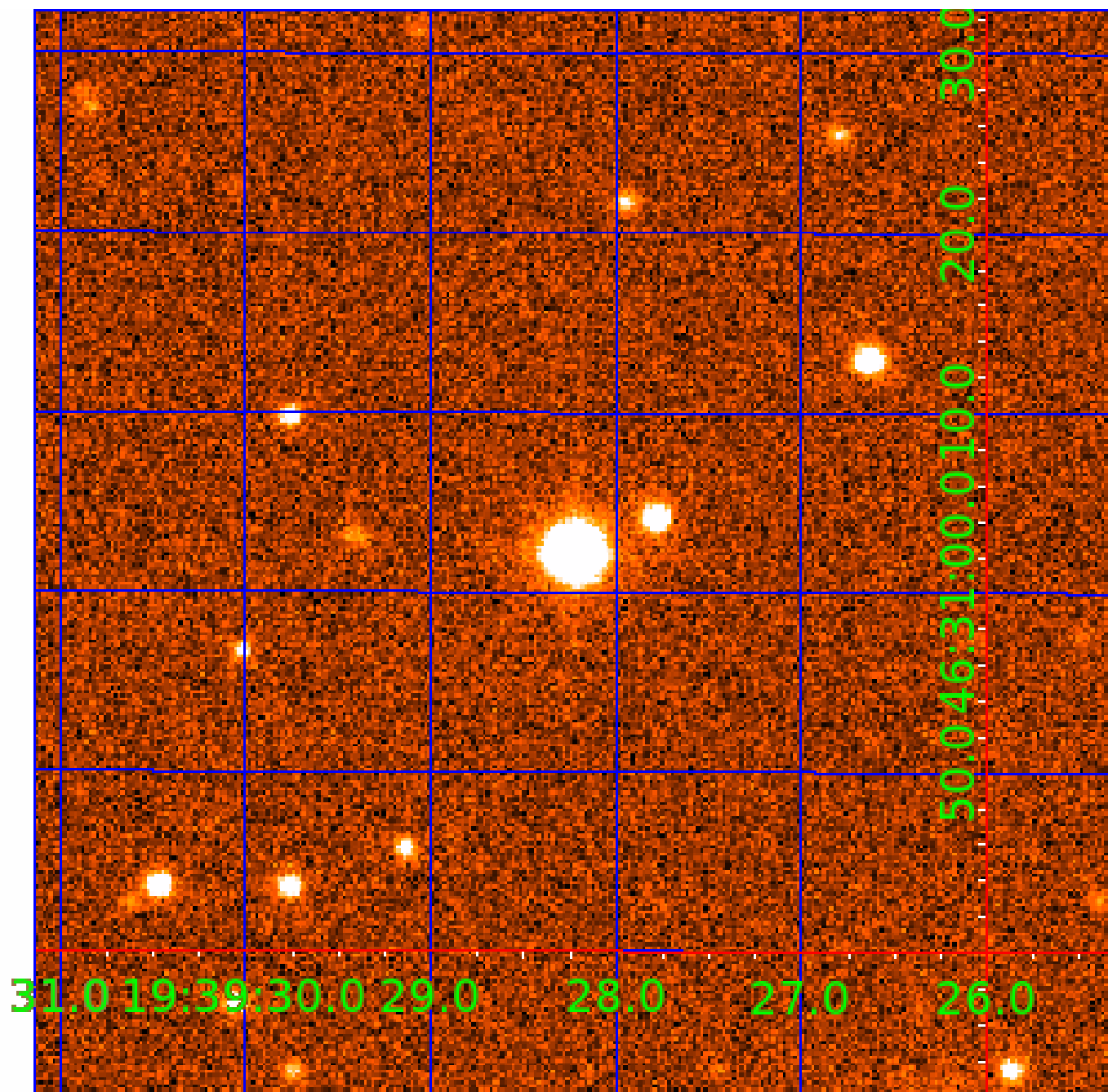


white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



UKIRT Image

Declination



KIC 009778156

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})
009778156-01	OBS	No	1.496271	131.533459	80.4	8.601	16.3	20.8	2.71	6899	4.73	16503.54
009778156-02	OBS	No	134.595940	228.390375	224.7	10.063	10.2	7.6	2.71	6899	4.68	40.95
009778156-03	OBS	No	320.159647	377.542023	331.1	16.036	8.6	7.5	2.71	6899	4.97	12.89
009778156-04	OBS	No	74.165540	197.605944	286.6	4.372	7.4	8.0	2.71	6899	5.29	90.64
009778156-05	OBS	No	92.185666	186.008532	271.5	3.410	9.4	8.8	2.71	6899	4.80	67.82
009778156-06	OBS	No	86.142373	217.359021	219.8	4.750	8.2	6.5	2.71	6899	4.53	74.24
009778156-07	OBS	No	102.590867	209.562276	106.5	11.475	7.7	3.0	2.71	6899	3.02	58.81

Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009778156-01	OBS	FP	0.00	1	0	0	0	LPP_DV
009778156-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—INCONSISTENT_TRANS
009778156-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_MARSHALL—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS
009778156-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT
009778156-05	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_CHASES—TRANS_GAPPED—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT
009778156-06	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_POS_ALT
009778156-07	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT

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

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

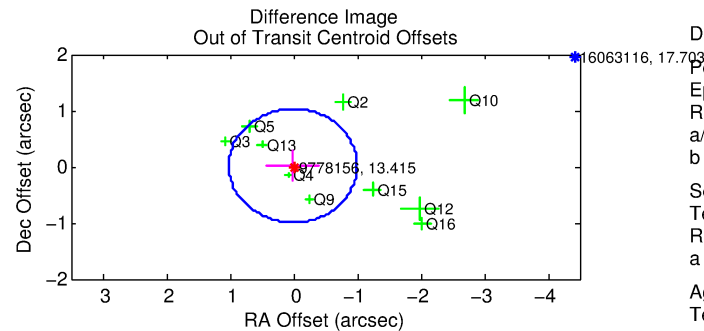
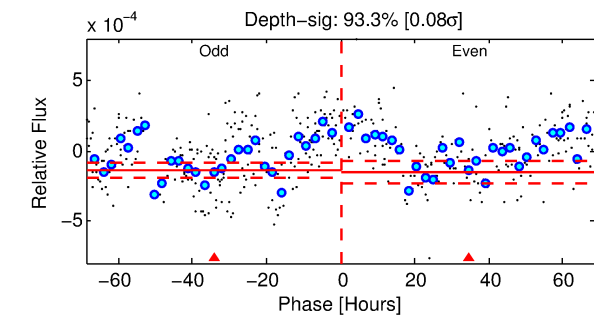
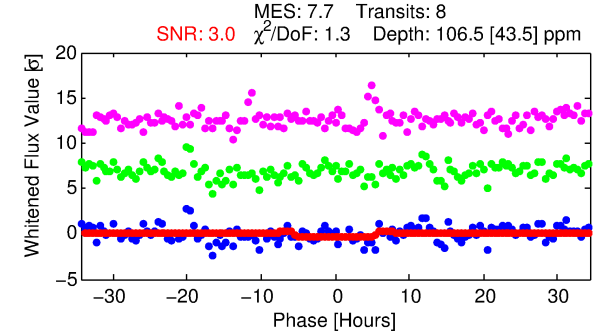
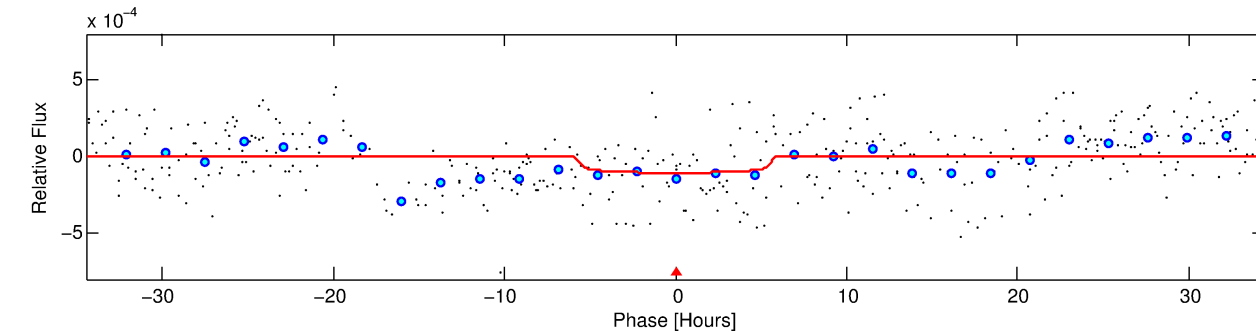
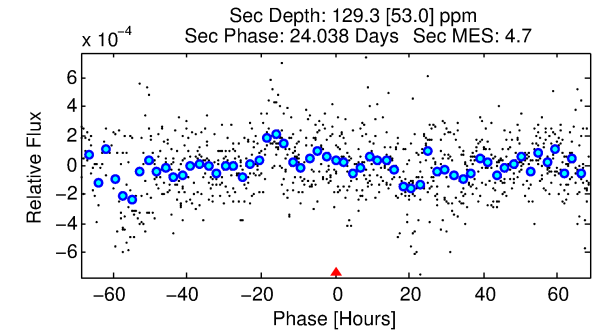
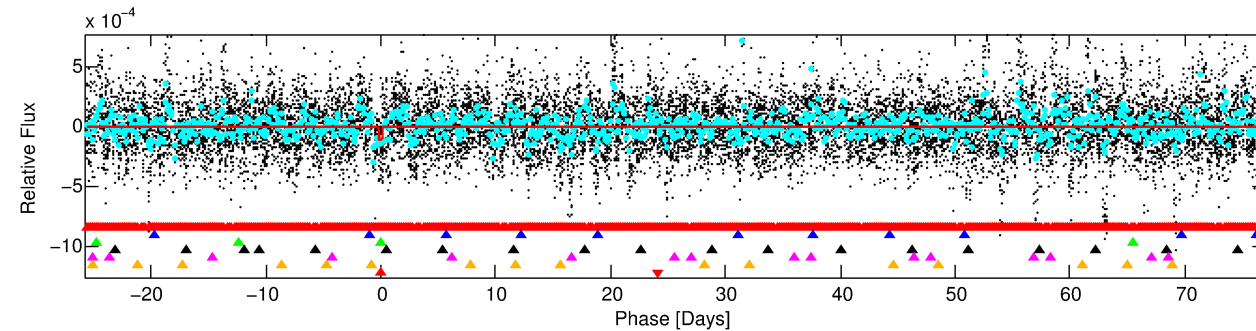
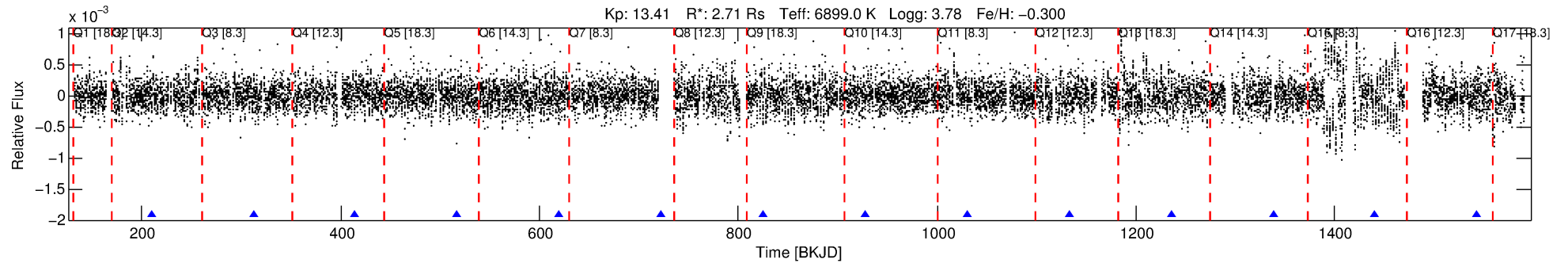
See http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col for comment definitions.

Ephemeris Match Information For 009778156-07

No Significant Match Found

DV One-Page Summary

KIC: 9778156 Candidate: 7 of 7 Period: 102.591 d



DV Fit Results:

Period = 102.59087 [0.00475] d
Epoch = 209.5623 [0.0324] BKJD
Rp/R* = 0.0102 [0.0085]
a/R* = 47.09 [220.10]
b = 0.74 [2.90]
Seff = 58.81 [32.98]
Teff = 706 [99] K
Rp = 3.02 [2.78] Re
a = 0.5027 [0.1766] AU
Ag = 1971.17 [3557.77] [0.55σ]
Teffp = 7275 [3140] K [2.09σ]

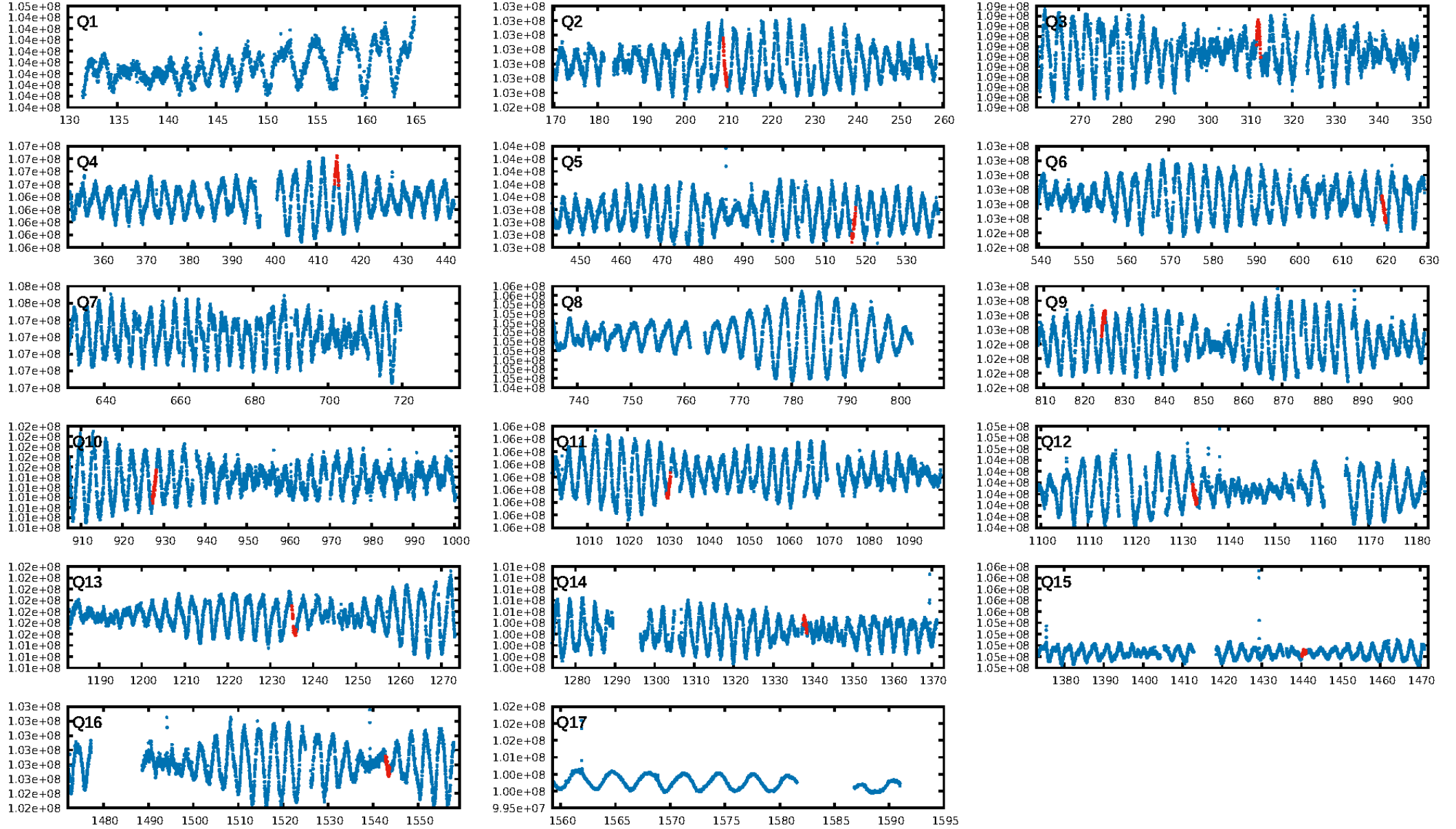
DV Diagnostic Results:

ShortPeriod-sig: 100.0% [20.86σ]
LongPeriod-sig: 100.0% [50.33σ]
ModelChiSquare2-sig: 82.8%
ModelChiSquareGof-sig: 100.0%
Bootstrap-pfa: 4.35e-09
RollingBand-fgt: 1.00 [8/8]
GhostDiagnostic-chr: 0.2581
Centroid-sig: 2.0%
Centroid-so: 2.001 arcsec [1.71σ]
OotOffset-rm: 0.020 arcsec [0.06σ]
KicOffset-rm: 0.068 arcsec [0.23σ]
OotOffset-st: 2/2/3/3 [10]
KicOffset-st: 2/2/3/3 [10]
DiffImageQuality-fgm: 0.60 [6/10]
DiffImageOverlap-fno: 0.00 [0/11]

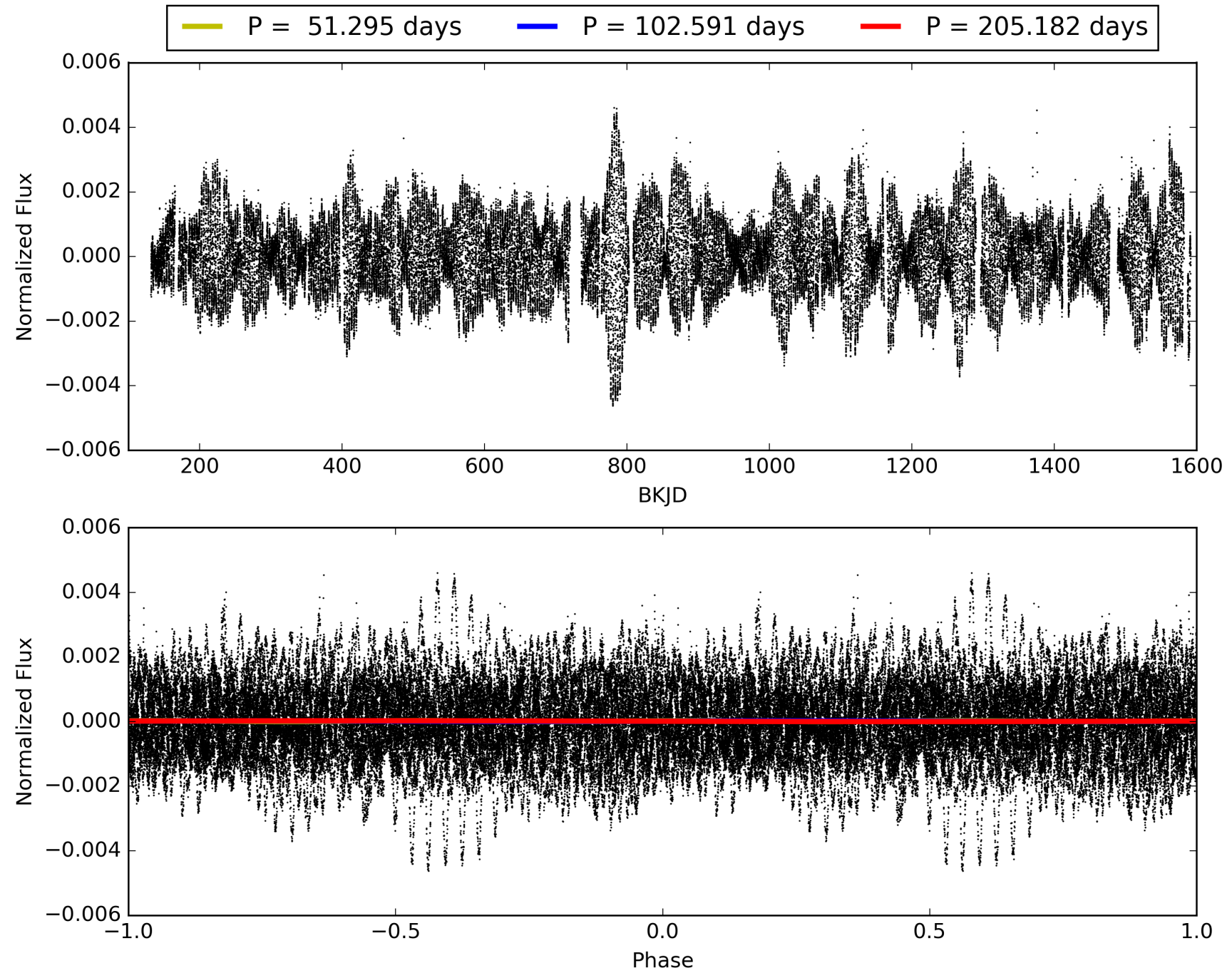
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 30-Jan-2016 20:47:02 Z

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

TCE 009778156-07, PDC Light Curves

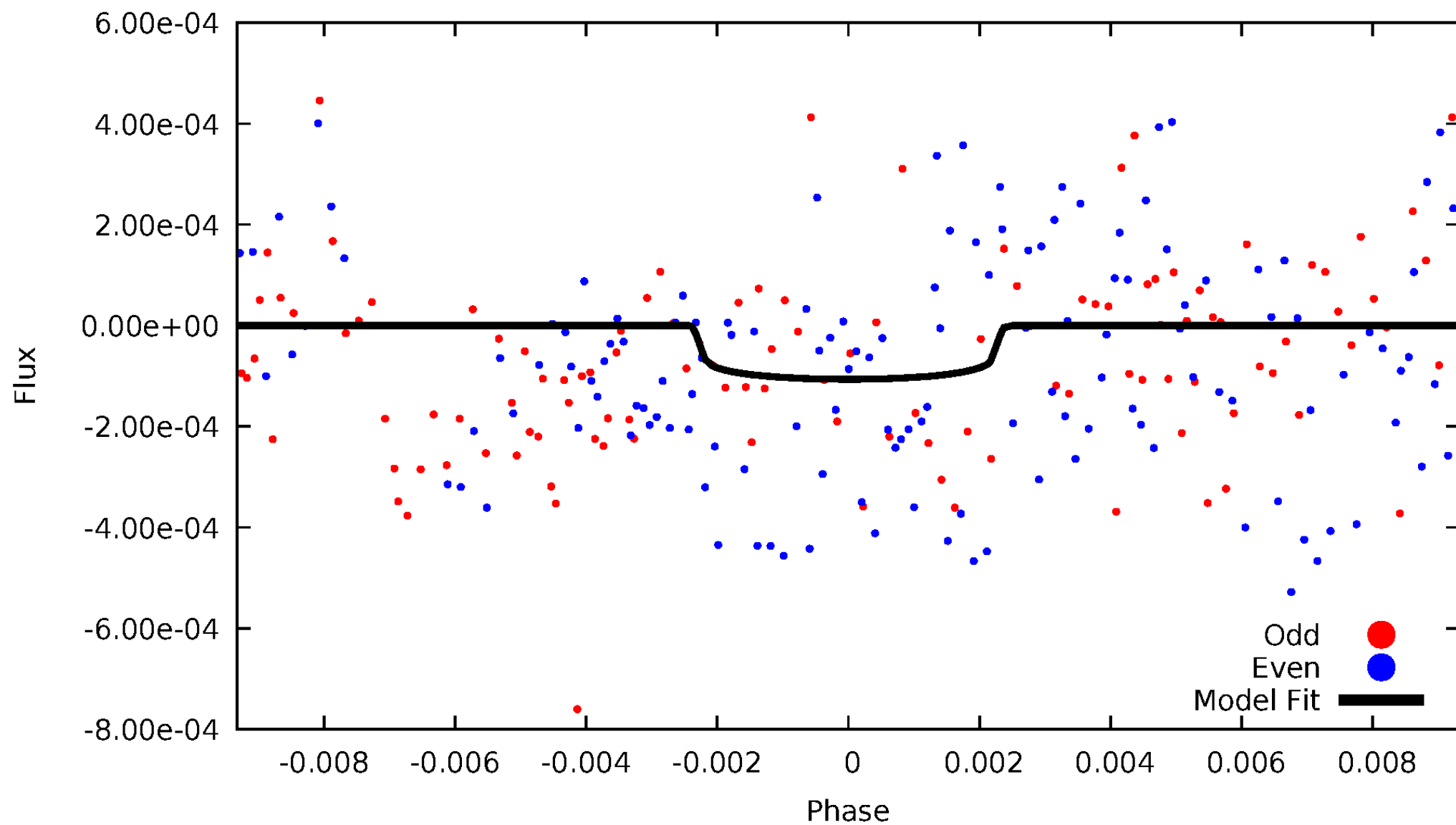


TCE 009778156-07



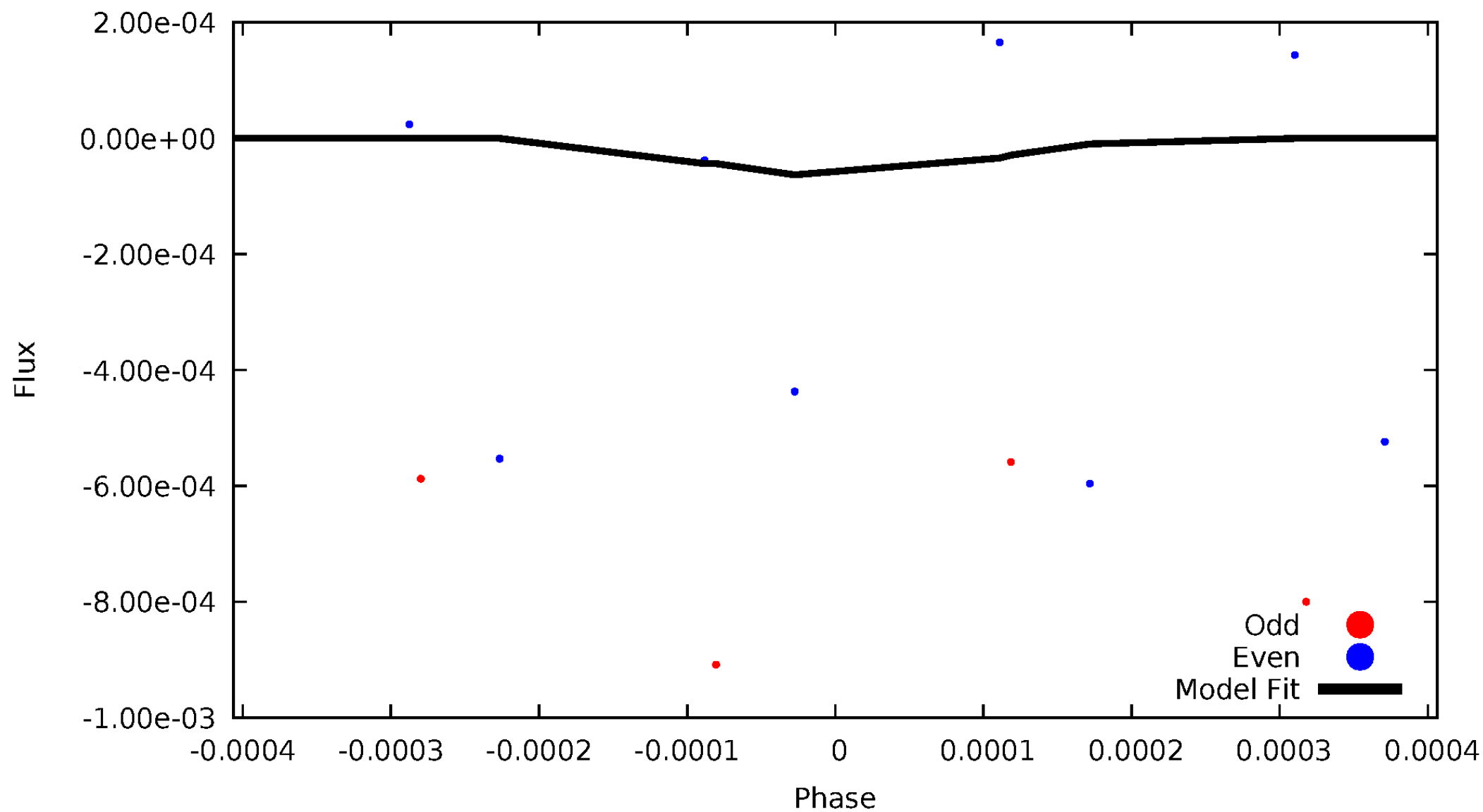
DV Odd/Even

TCE 009778156-07



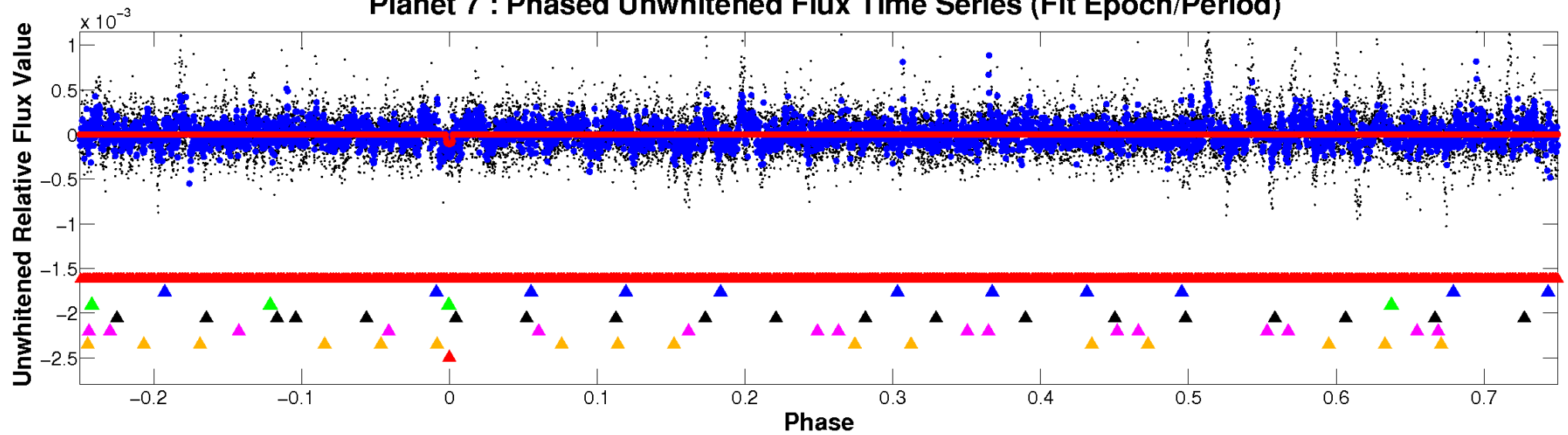
ALT Odd/Even

TCE 009778156-07

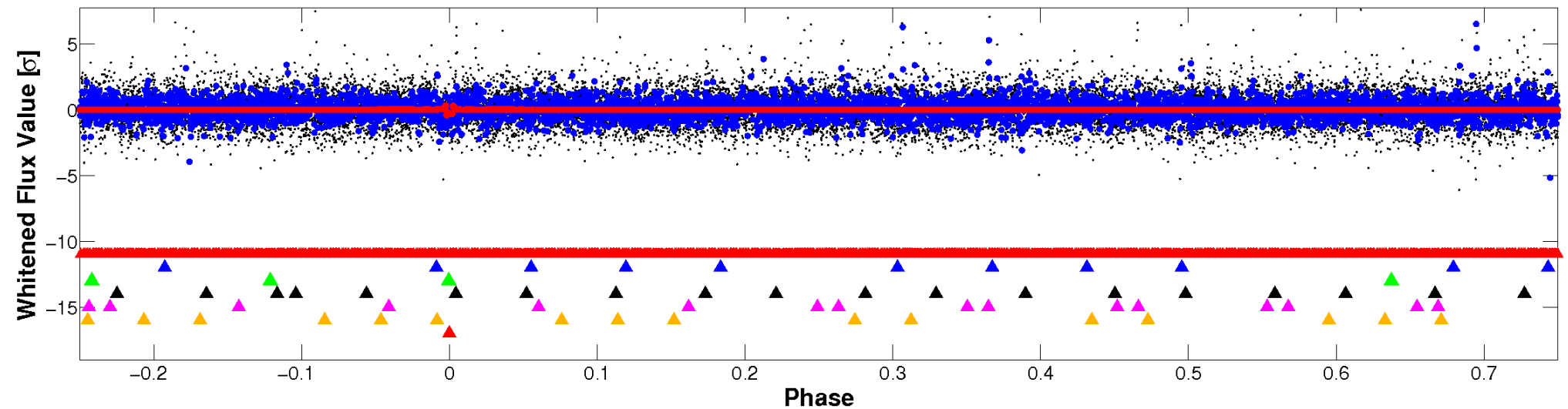


Non-Whitened Vs. Whitened Light Curve

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

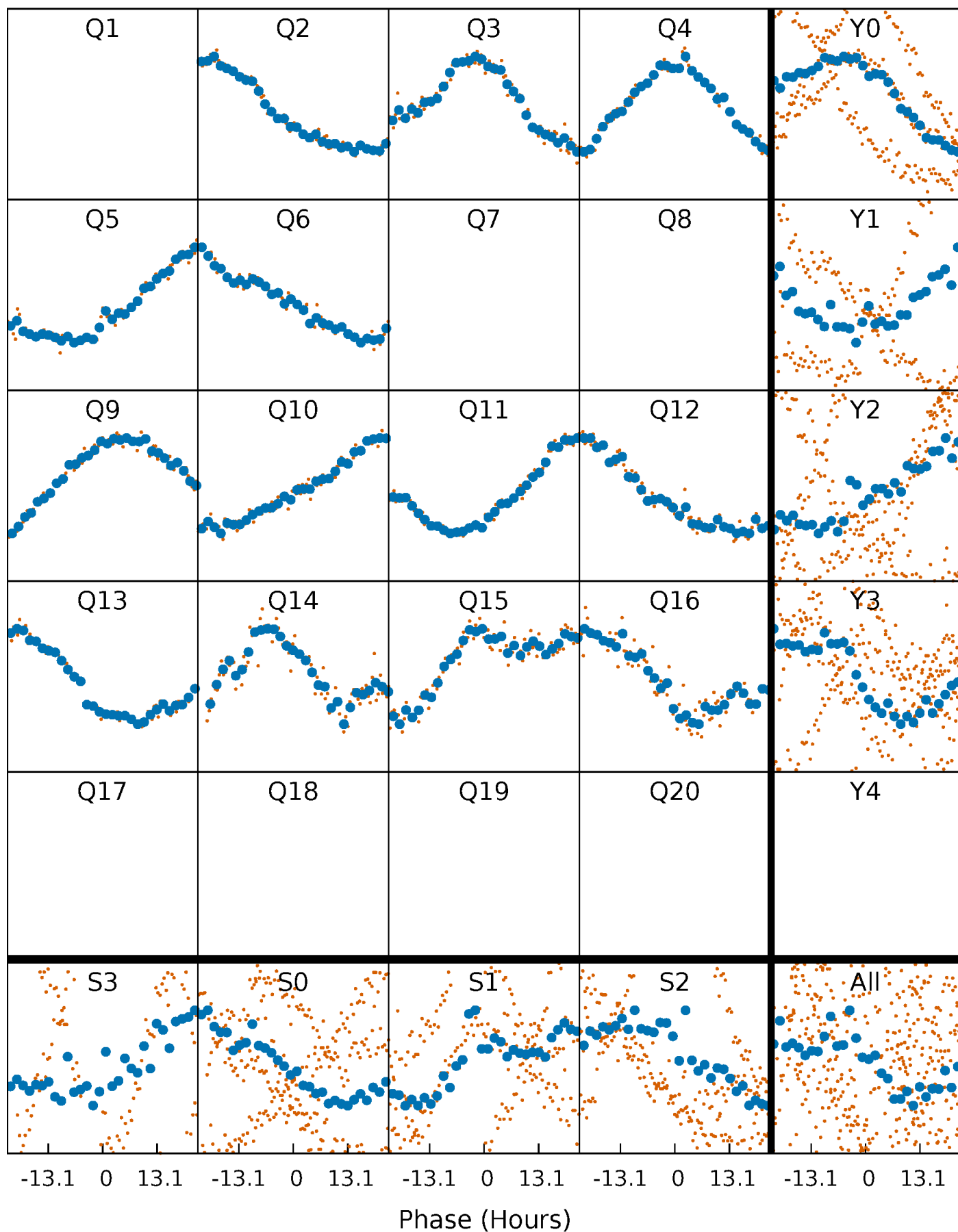


Planet 7 : Phased Whitened Flux Time Series (Fit Epoch/Period)



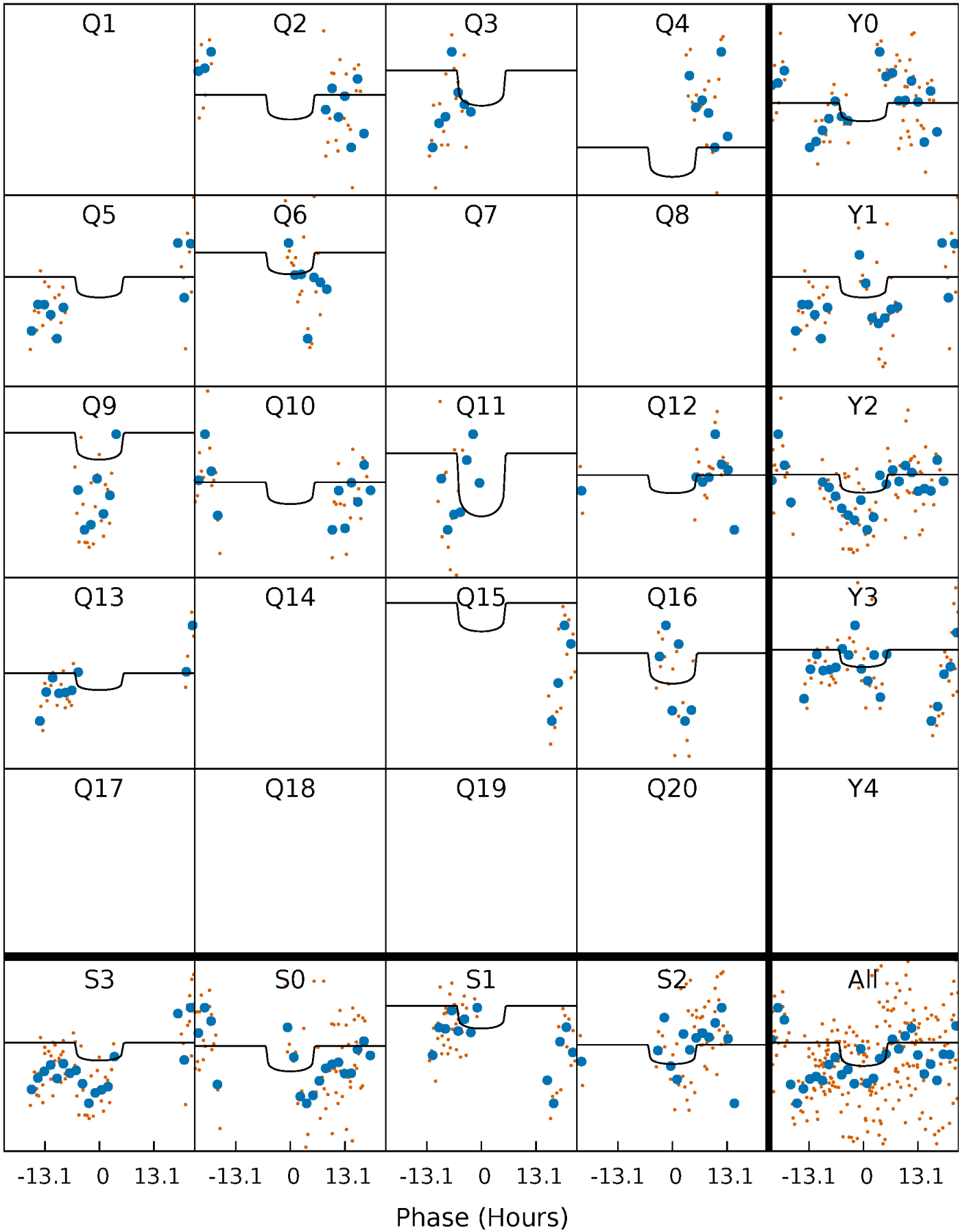
PDC Quarter-Phased Transit Curves

TCE 009778156-07 P=102.590867 Days $T_0=209.562275$ (BKJD)



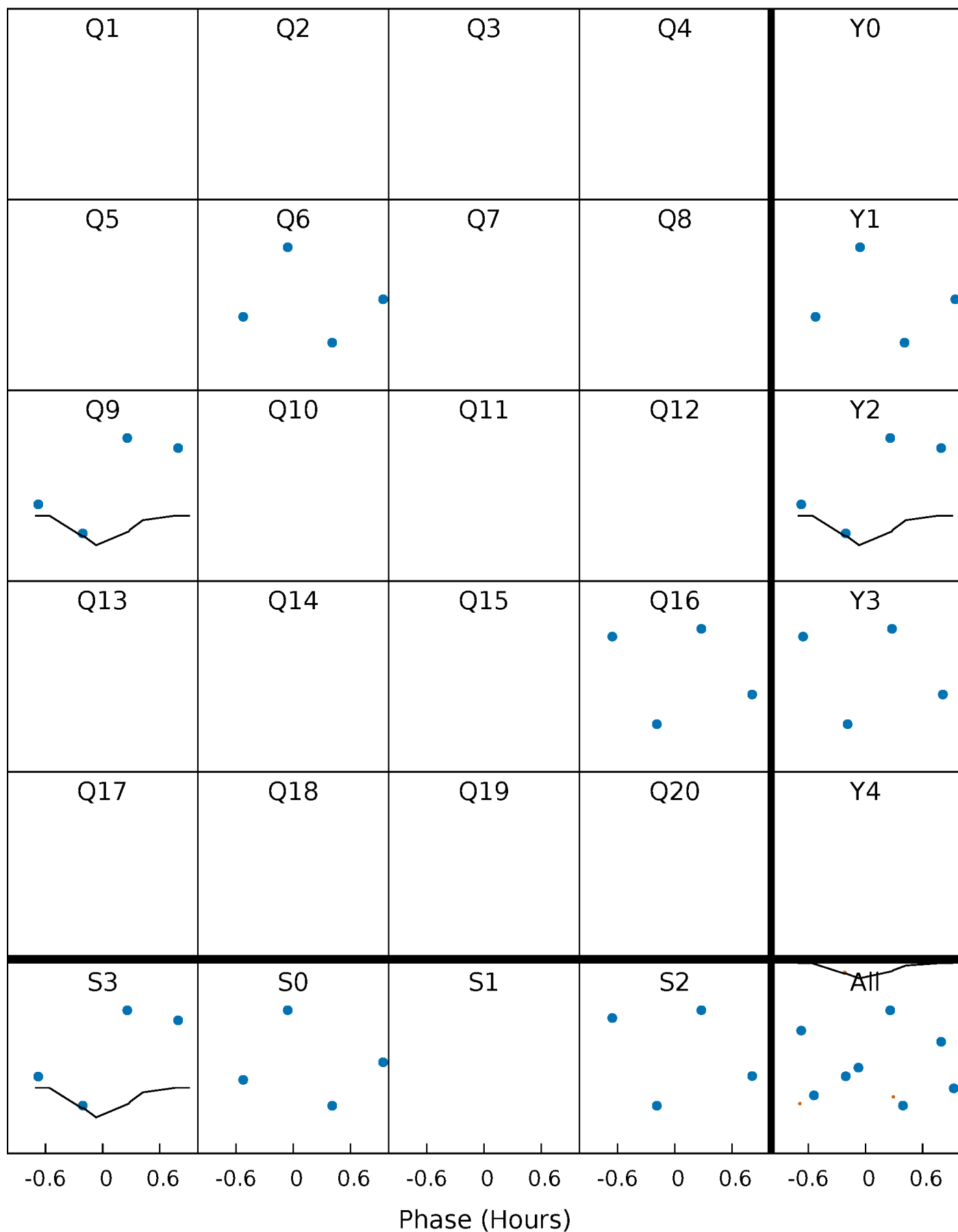
DV Quarter-Phased Transit Curves

TCE 009778156-07 P=102.590867 Days $T_0=209.562275$ (BKJD)



Alt. Detrend Quarter-Phased Transit Curves

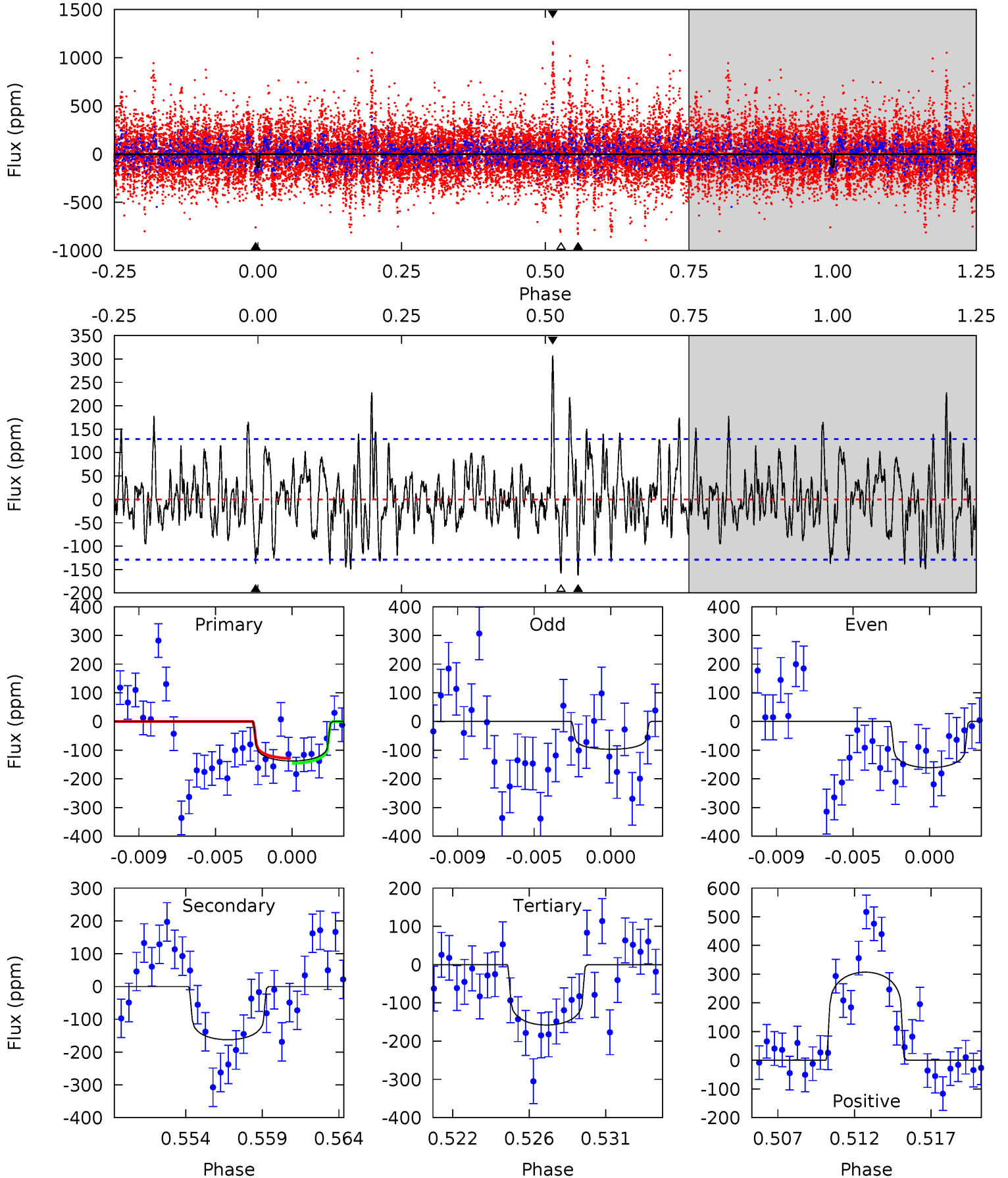
TCE 009778156-07 P=102.588138 Days $T_0=209.629360$ (BKJD)



DV Model-Shift Uniqueness Test

009778156-07, P = 102.590867 Days, E = 106.971408 Days

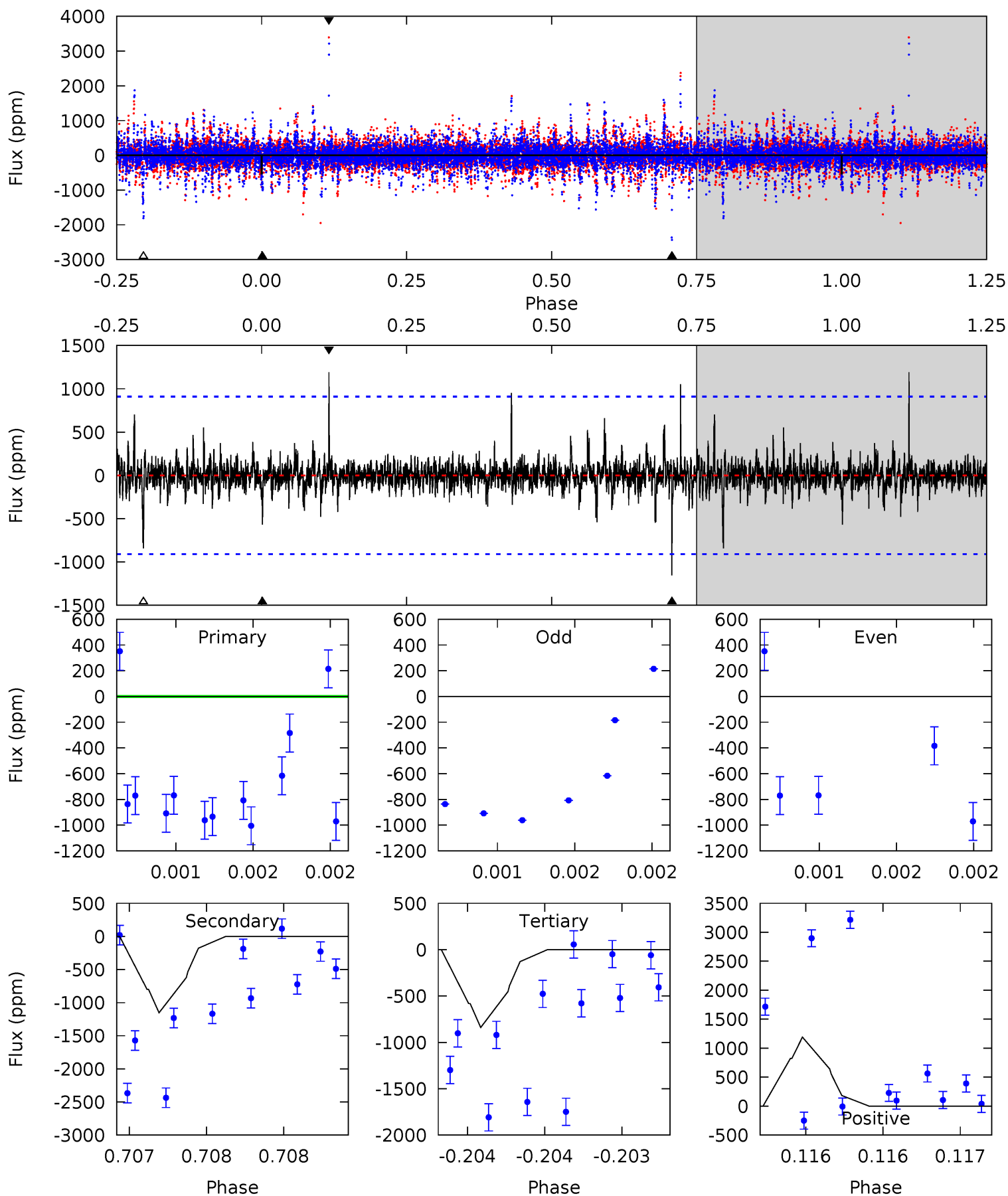
Pri	Sec	Ter	Pos	FA ₁	FA ₂	F _{Red}	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
5.52	6.51	6.32	12.3	5.17	2.83	2.36	-0.81	-6.78	0.18	-5.79	1.24	0.96	0.65	0.35



Alt Model-Shift Uniqueness Test

009778156-07, P = 102.588138 Days, E = 107.041222 Days

Pri	Sec	Ter	Pos	FA ₁	FA ₂	F _{Red}	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
3.36	7.12	5.19	7.35	5.62	3.55	0.74	-1.82	-3.98	1.93	-0.23	1.26	1.11	0.51	0.75



Stellar Parameters For KIC 009778156

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	6899^{+190}_{-238}	$3.780^{+0.312}_{-0.078}$	$-0.300^{+0.300}_{-0.250}$	$2.706^{+0.417}_{-1.043}$	$1.607^{+0.199}_{-0.369}$	$0.114^{+0.260}_{-0.035}$
	+3%/-3%	+8%/-2%	+100%/-83%	+15%/-39%	+12%/-23%	+227%/-31%
Source	PHO1	FLK73	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 009778156-07 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	A_{obs}
DV	-162 ± 25	$3.22^{+2.19}_{-2.00}$	963^{+59}_{-88}	7287^{+7062}_{-1712}	2262^{+12509}_{-1475}
Alt.	-1153 ± 162	$2.71^{+2.20}_{-1.67}$	967^{+53}_{-84}	17114^{+43995}_{-6835}	$21026^{+126980}_{-14349}$

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

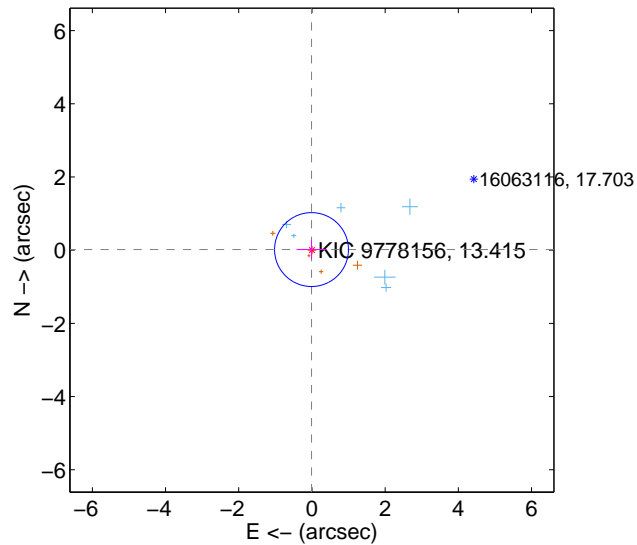
Supplemental centroid analysis for 009778156-07. Kepler magnitude: 13.41. Transit SNR 3.01

There are 6 quarters with good PRF difference image offsets

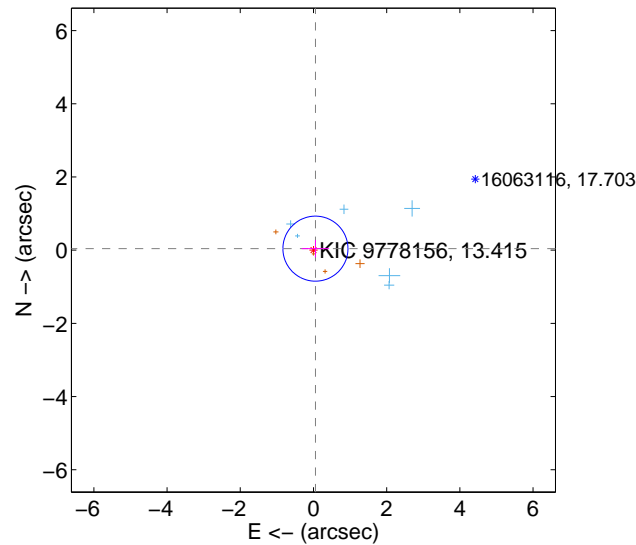
The direct PRF centroid is offset from the target star catalog position by about 0.08 arcsec

	Distance in arcsec	Distance / σ	Δ RA	Δ Dec
PRF-fit source offset from OOT	0.020 ± 0.336	0.06	0.011 ± 0.406	0.016 ± 0.257
PRF-fit source offset from KIC position	0.068 ± 0.296	0.23	-0.054 ± 0.375	0.042 ± 0.236
photometric centroid source offset	2.00 ± 1.17	1.71	-1.35 ± 1.20	1.48 ± 1.14

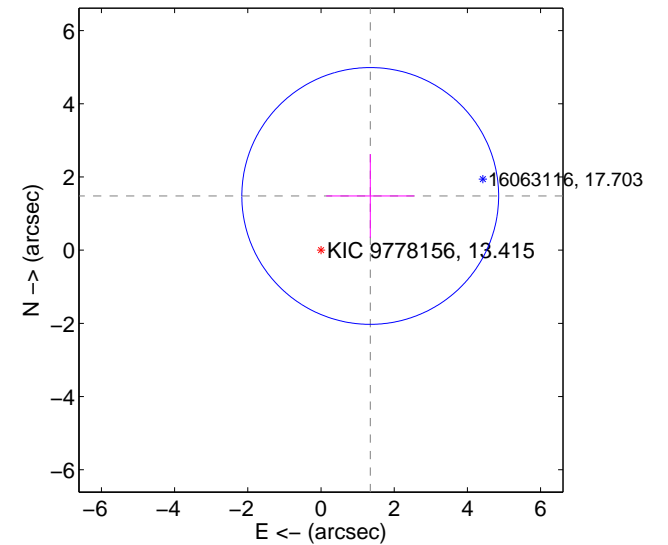
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position

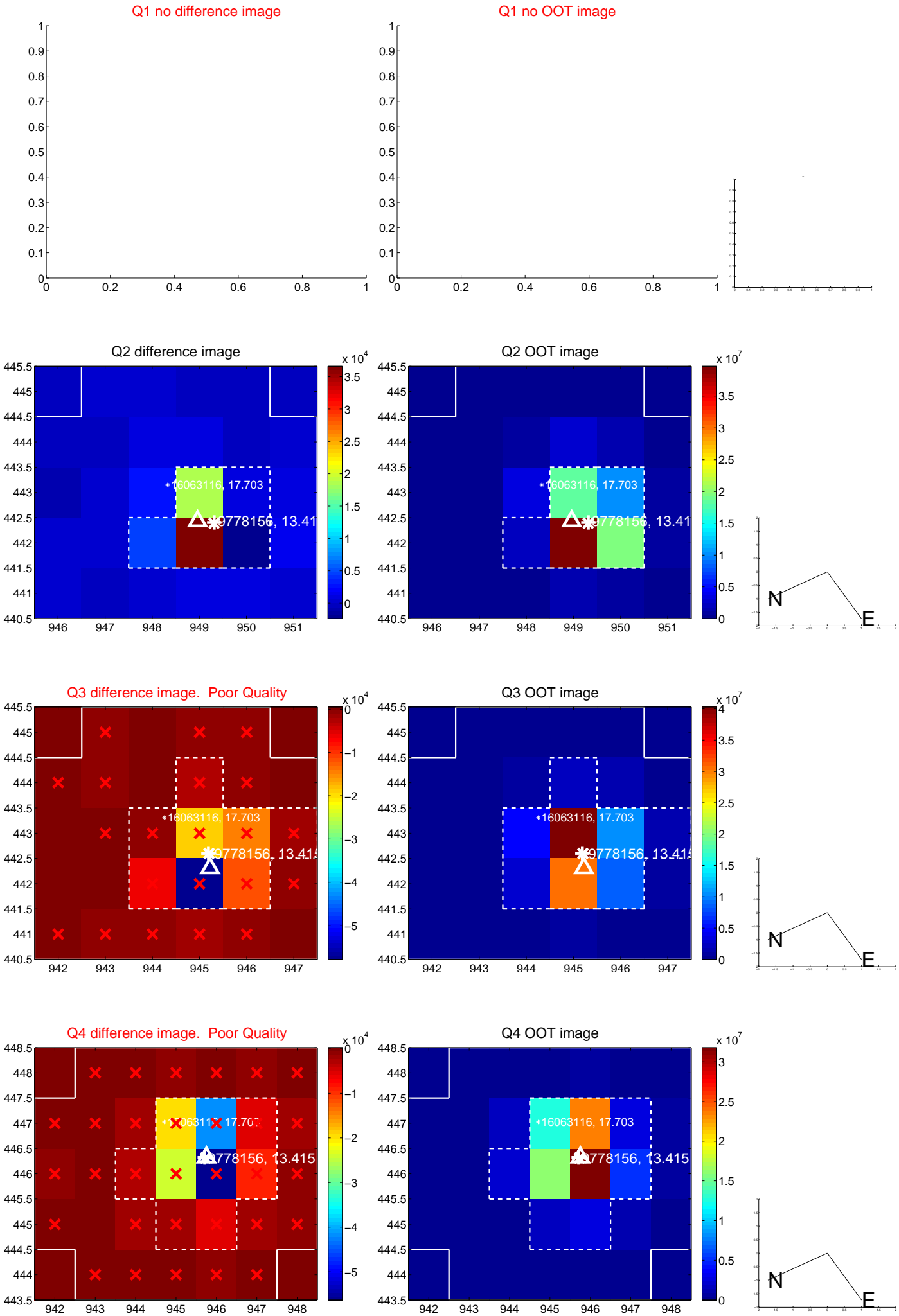


offset from photometric centroids

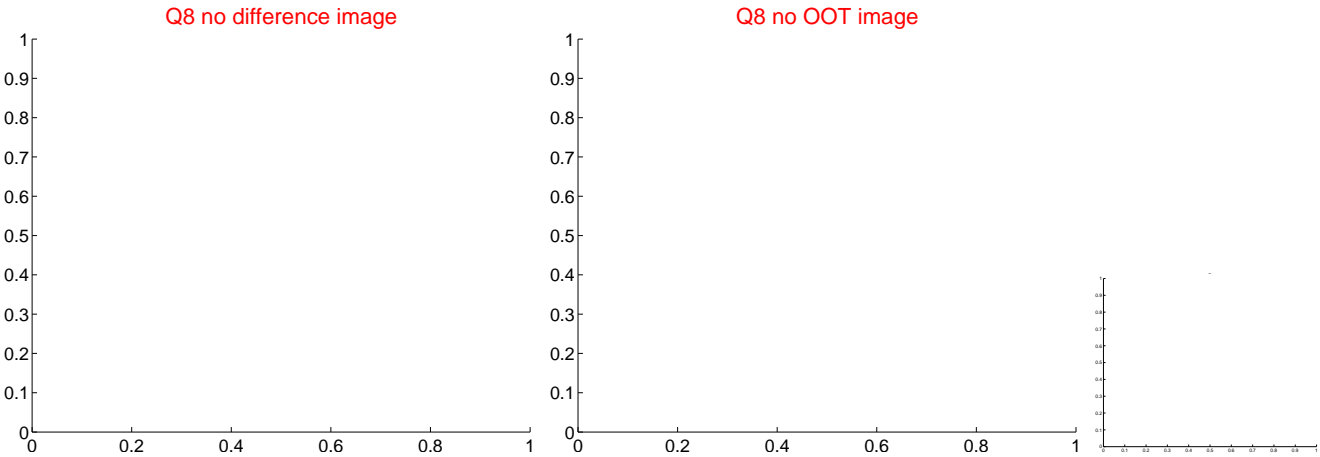
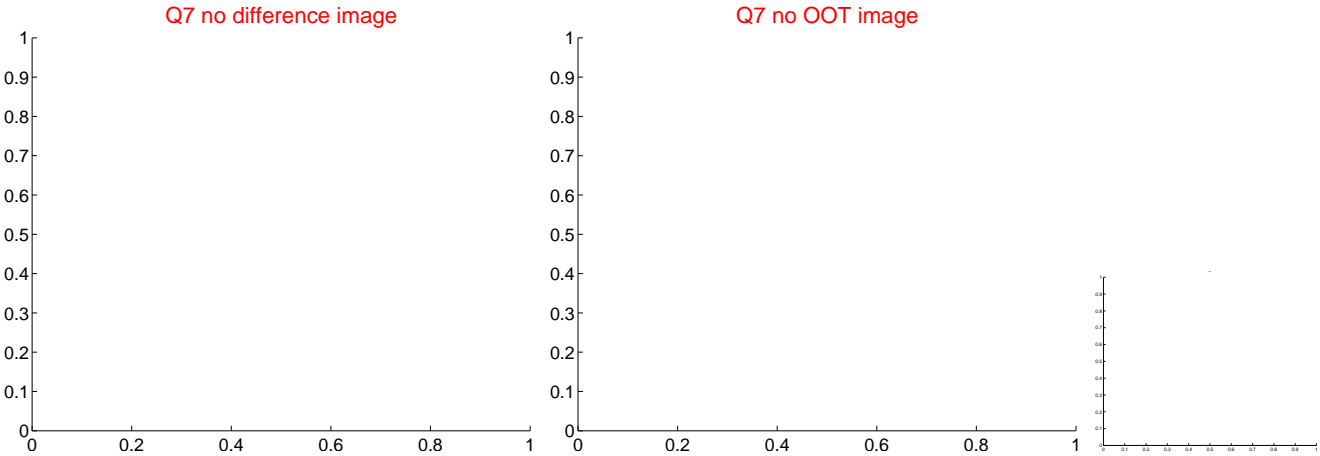
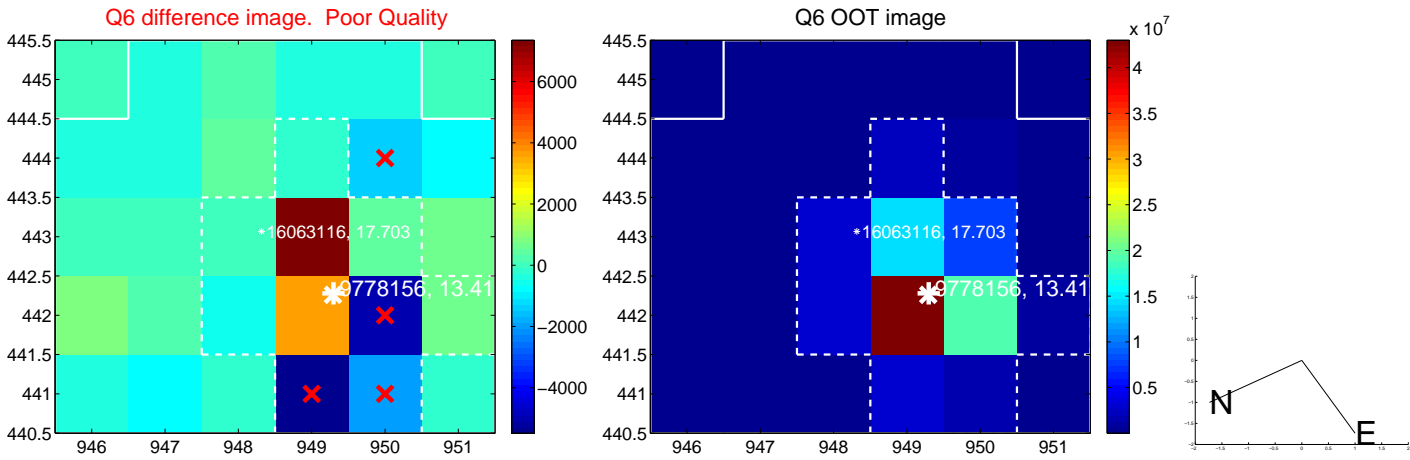
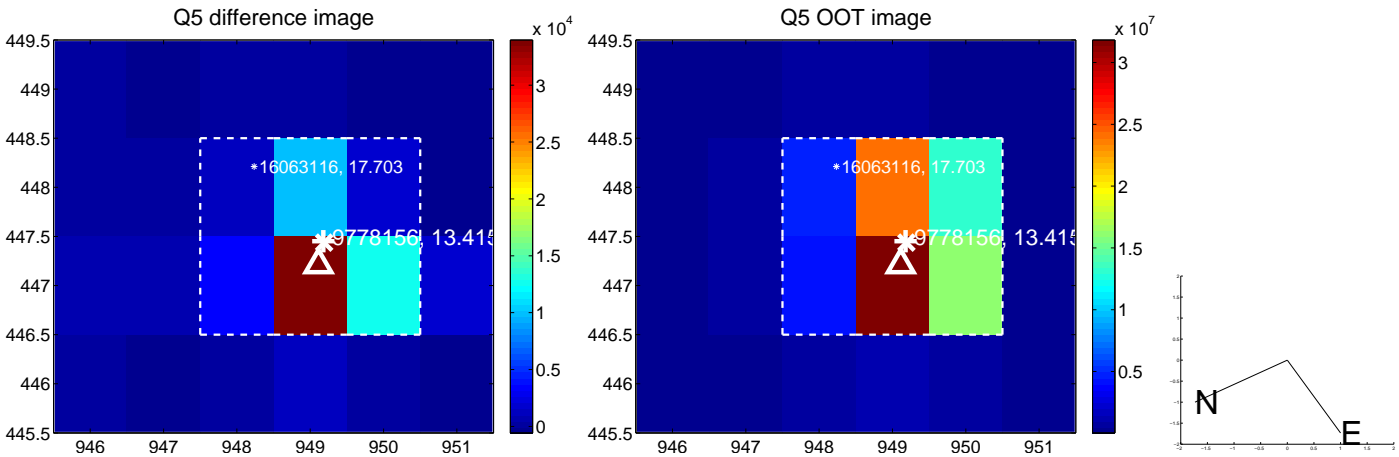


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets**; magenta cross: average over quarters. Length of the crosses: one- σ uncertainty. Blue circle: three-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

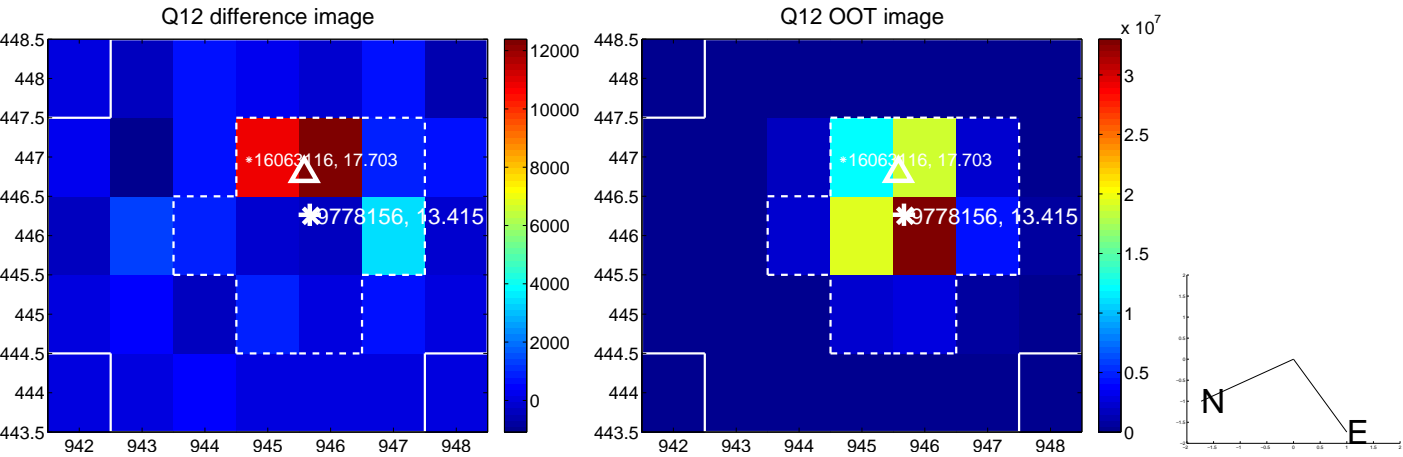
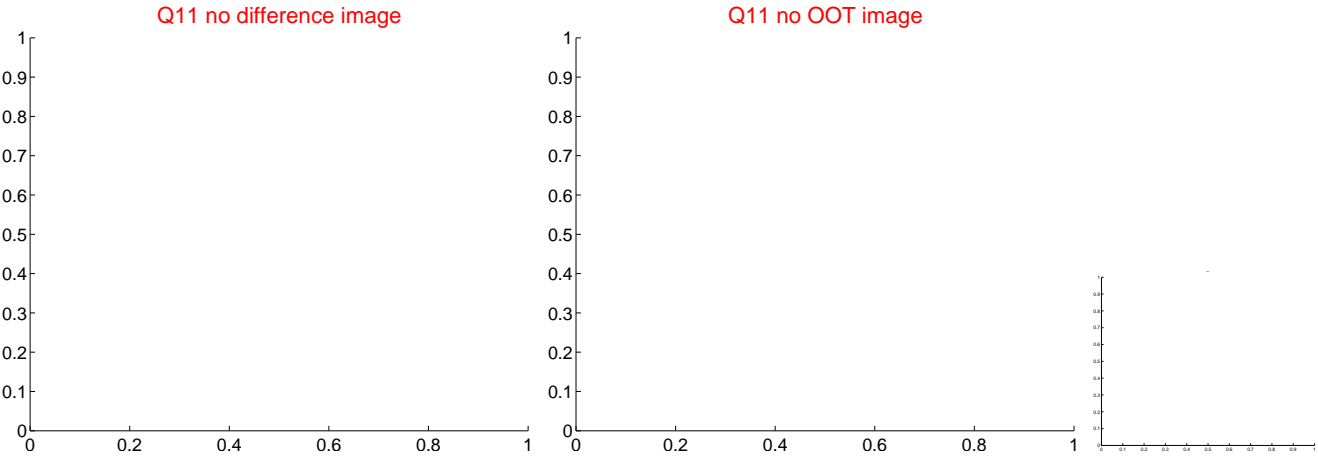
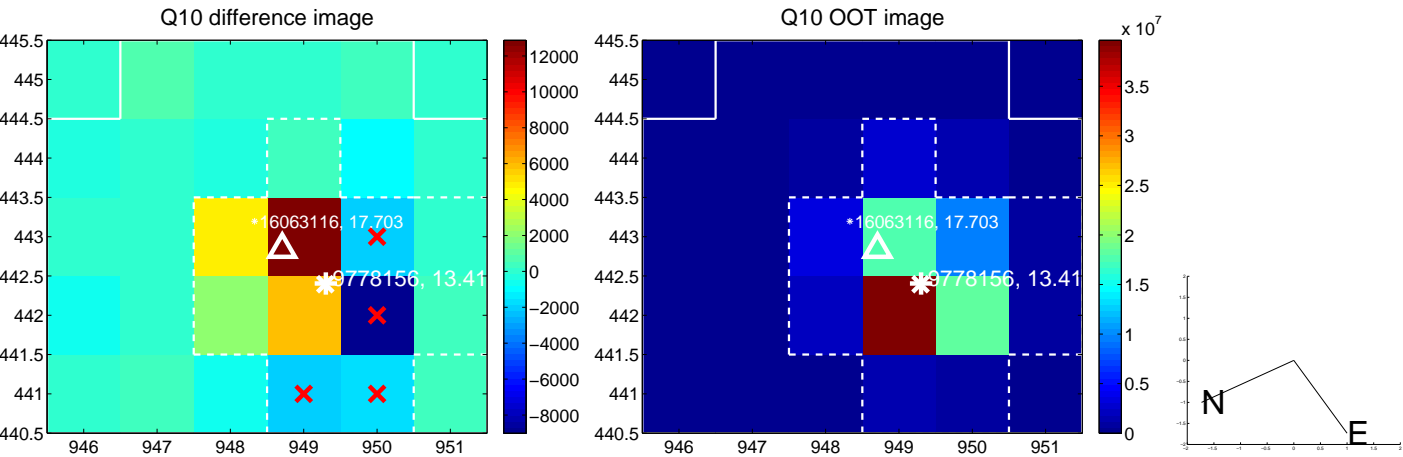
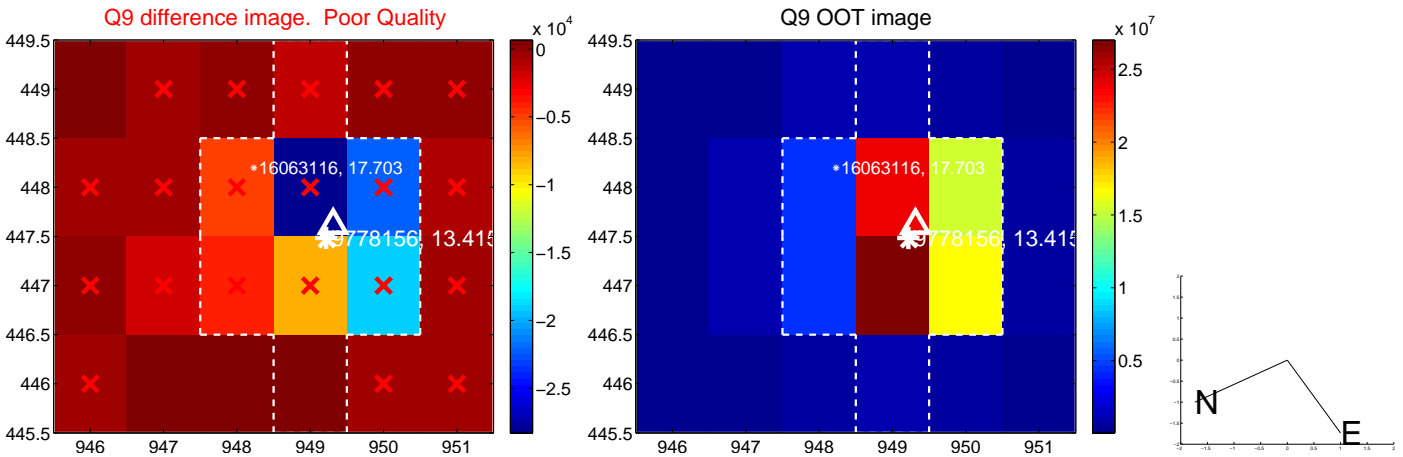
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



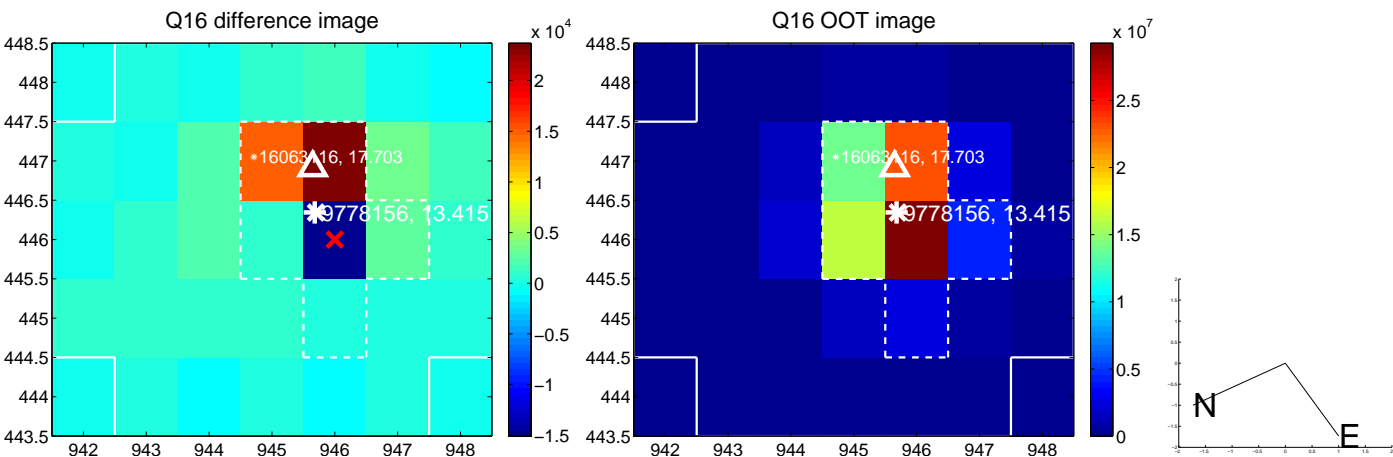
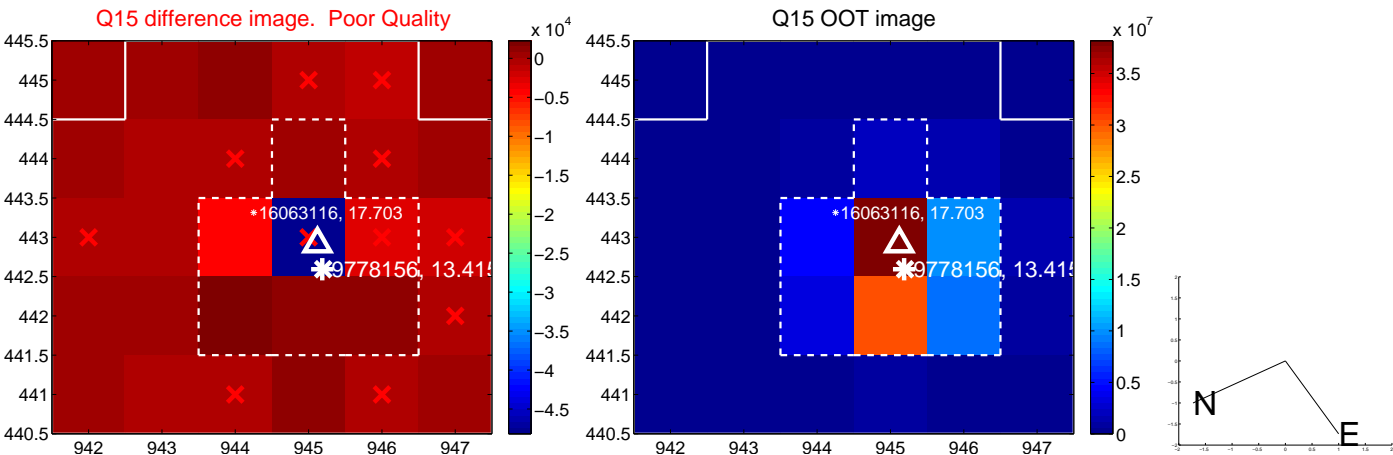
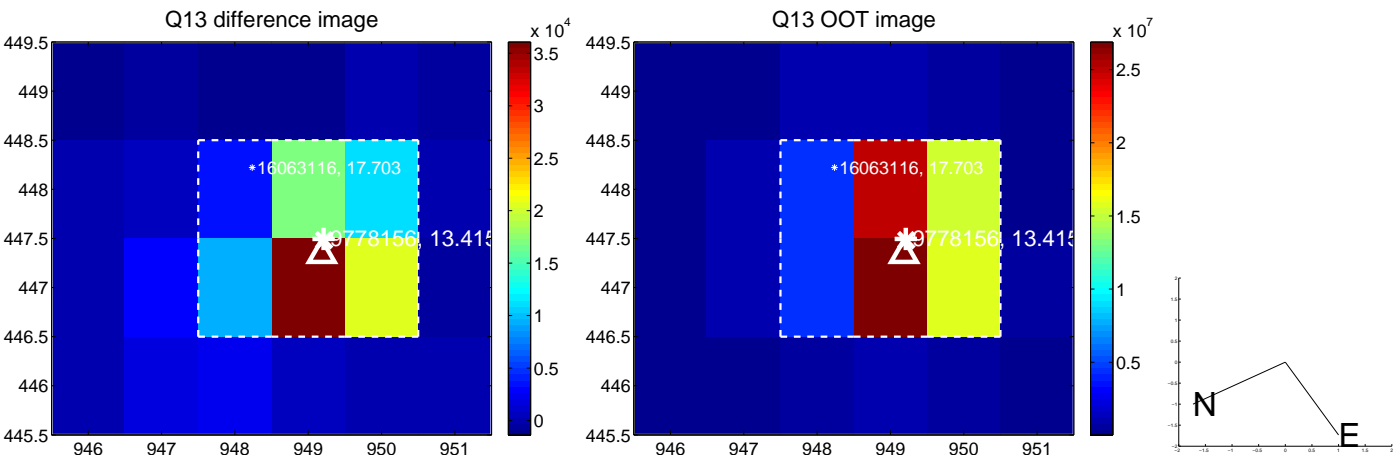
white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



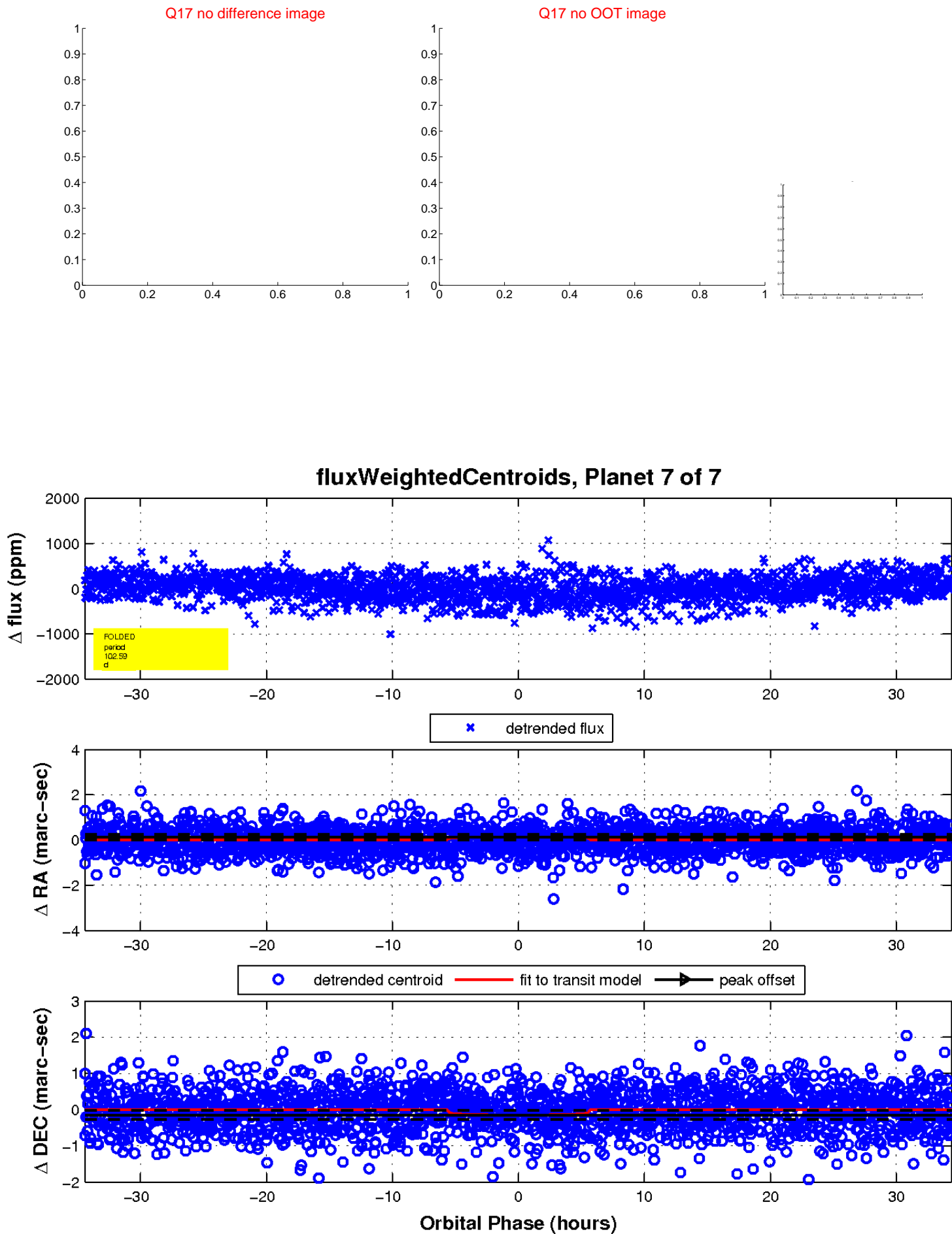
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



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

