

KIC 008167978

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})
008167978-01	OBS	6053.01	22.052749	151.552414	13802.2	5.548	325.3	318.3	0.74	5510	14.76	21.98
008167978-02	OBS	No	22.052720	142.386440	10071.4	3.328	176.7	177.3	0.74	5510	12.75	21.98

Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
008167978-01	OBS	FP	0.00	0	1	0	0	MOD_SEC_DV—MOD_SEC_ALT—DEEP_V_SHAPED—HAS_SEC_TCE
008167978-02	OBS	FP	0.00	1	1	0	0	IS_SEC_TCE

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

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

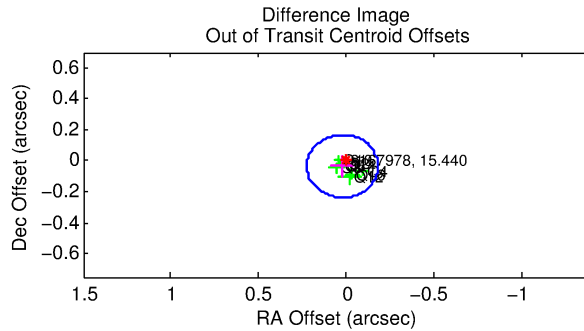
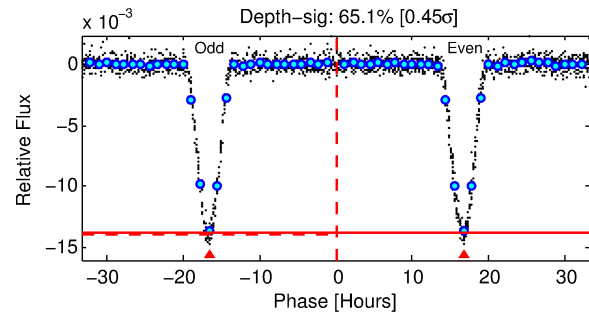
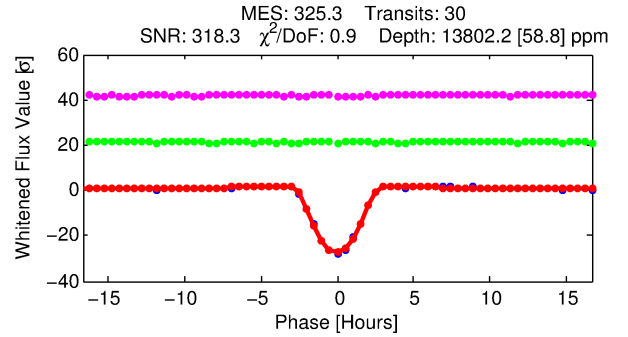
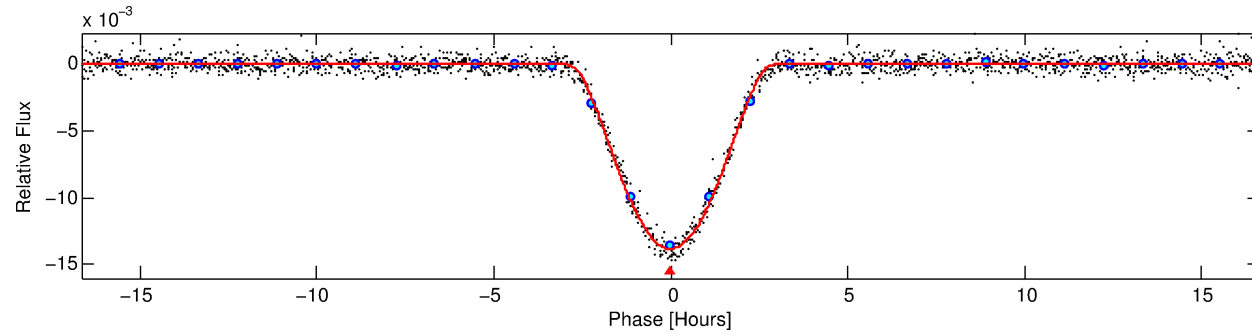
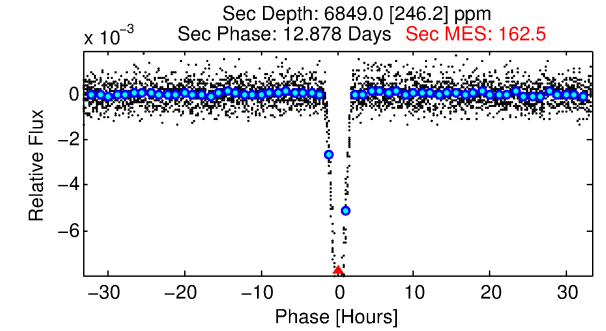
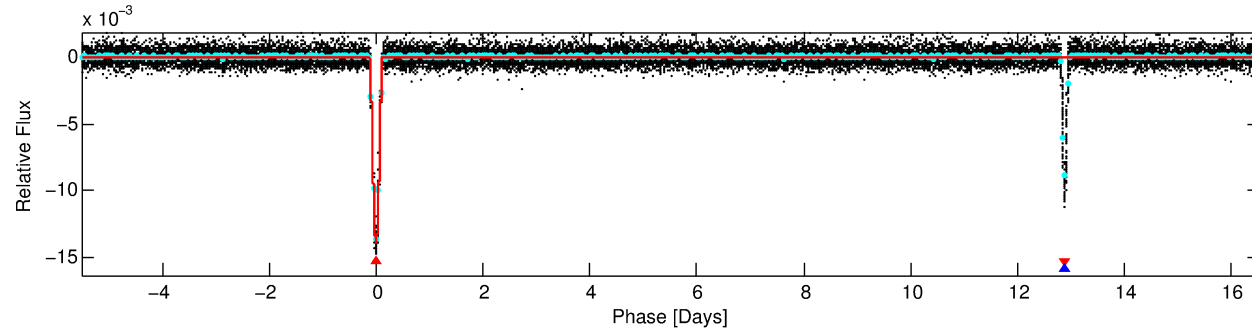
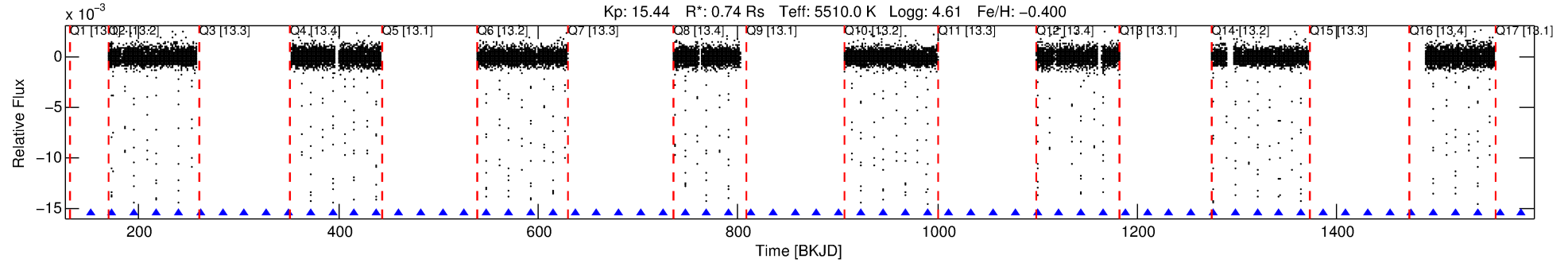
See http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col for comment definitions.

Ephemeris Match Information For 008167978-01

No Significant Match Found

DV One-Page Summary

KIC: 8167978 Candidate: 1 of 2 Period: 22.053 d
KOI: K06053.01 Corr: 0.997



DV Fit Results:

Period = 22.05275 [0.00001] d
Epoch = 151.5524 [0.0004] BKJD
Rp/R* = 0.1826 [0.0277]
a/R* = 19.90 [0.43]
b = 0.98 [0.04]
Seff = 21.98 [6.06]
Teff = 552 [38] K
Rp = 14.76 [3.72] Re
a = 0.1436 [0.0239] AU
Ag = 356.69 [138.24] [2.57σ]
Teffp = 3710 [312] K [10.05σ]

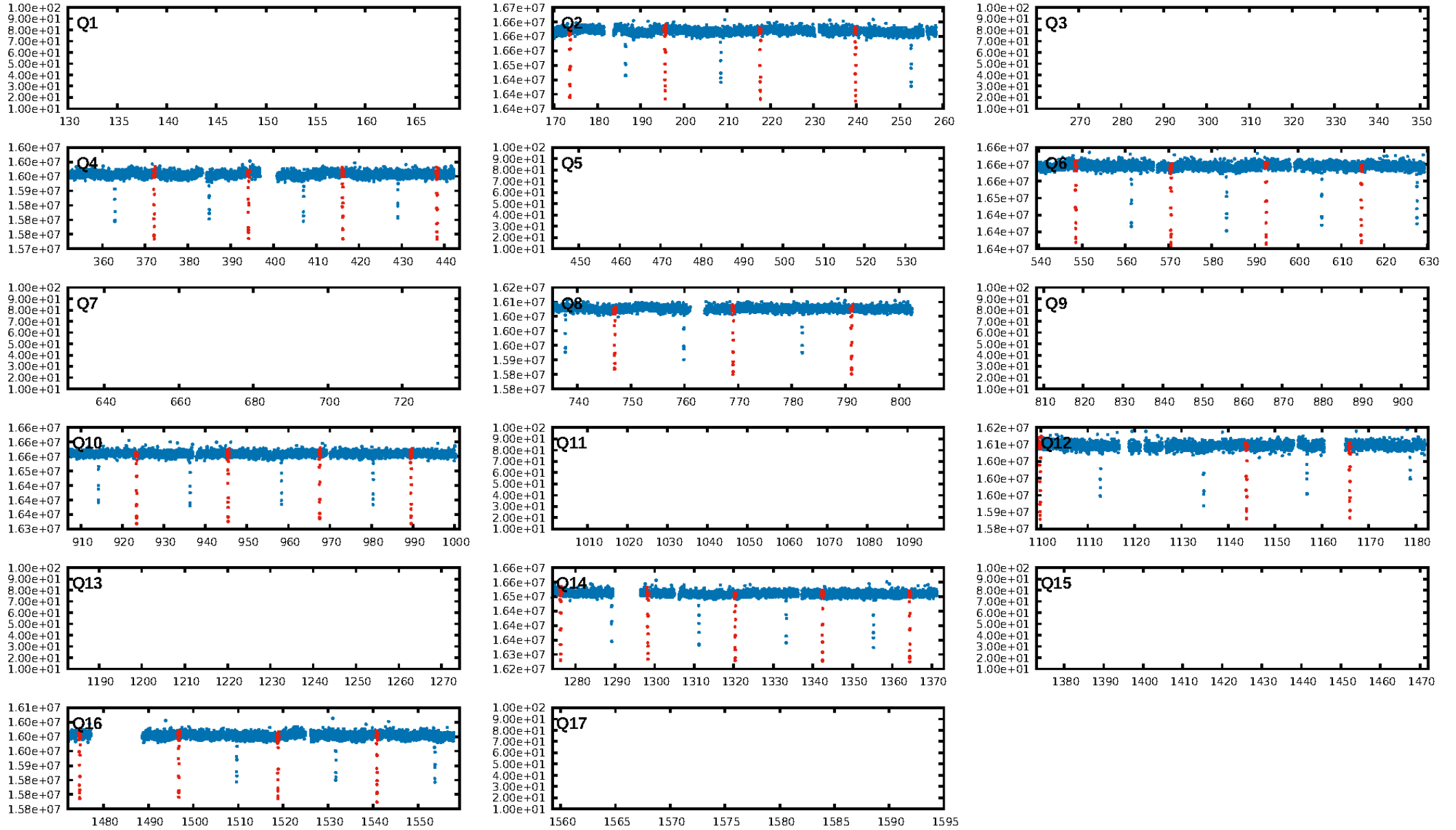
DV Diagnostic Results:

ShortPeriod-sig: 0.0% [0.00σ]
LongPeriod-sig: N/A
ModelChiSquare2-sig: 1.8%
ModelChiSquareGof-sig: 100.0%
Bootstrap-pfa: 0.00e+00
RollingBand-fgt: 1.00 [30/30]
GhostDiagnostic-chr: 3.541
Centroid-sig: 0.0%
Centroid-so: 0.123 arcsec [3.08σ]
OotOffset-rm: 0.042 arcsec [0.62σ]
KicOffset-rm: 0.088 arcsec [1.21σ]
OotOffset-st: 4/0/4/0 [8]
KicOffset-st: 4/0/4/0 [8]
DiffImageQuality-fgm: 1.00 [8/8]
DiffImageOverlap-fno: 1.00 [8/8]

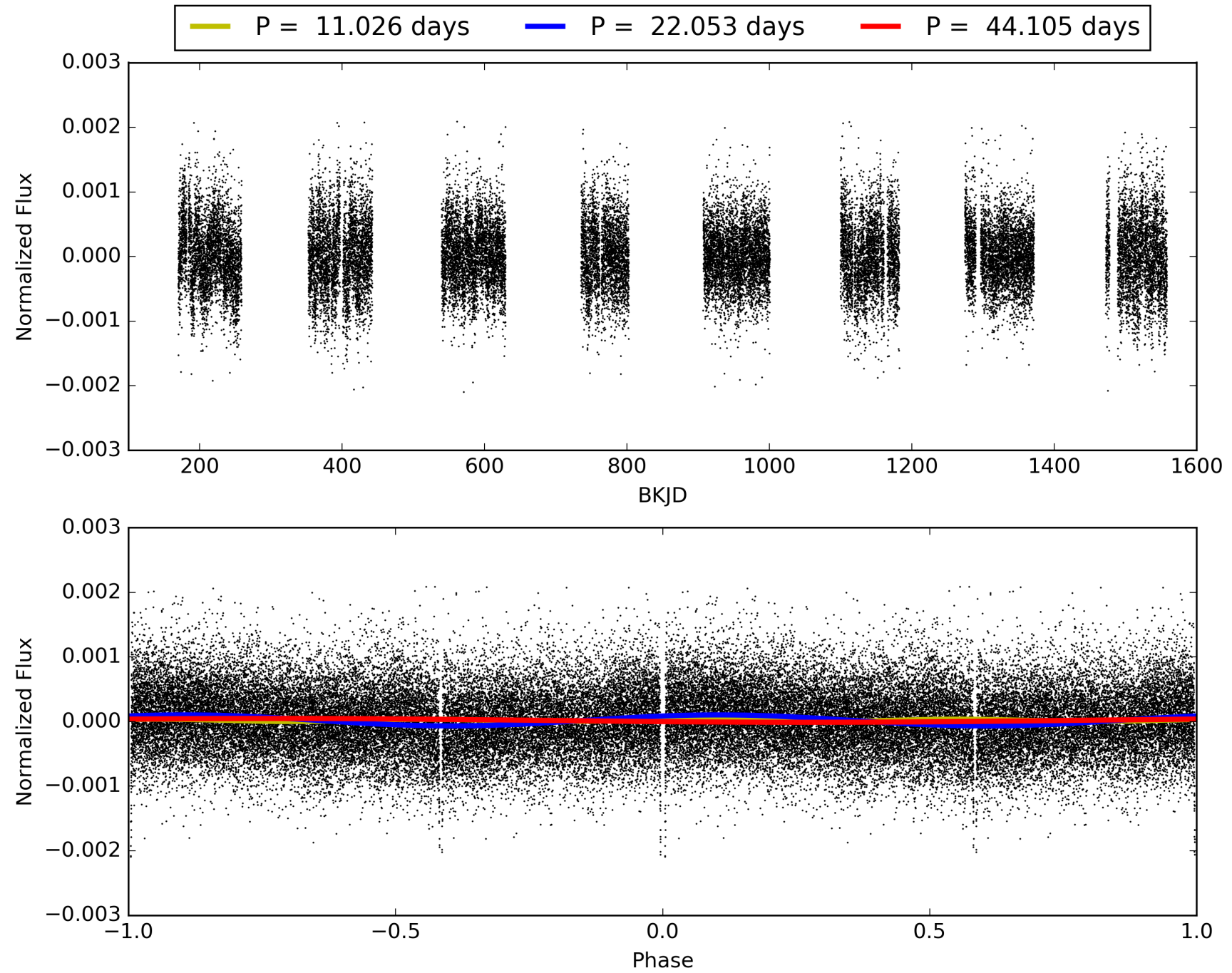
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This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

TCE 008167978-01, PDC Light Curves

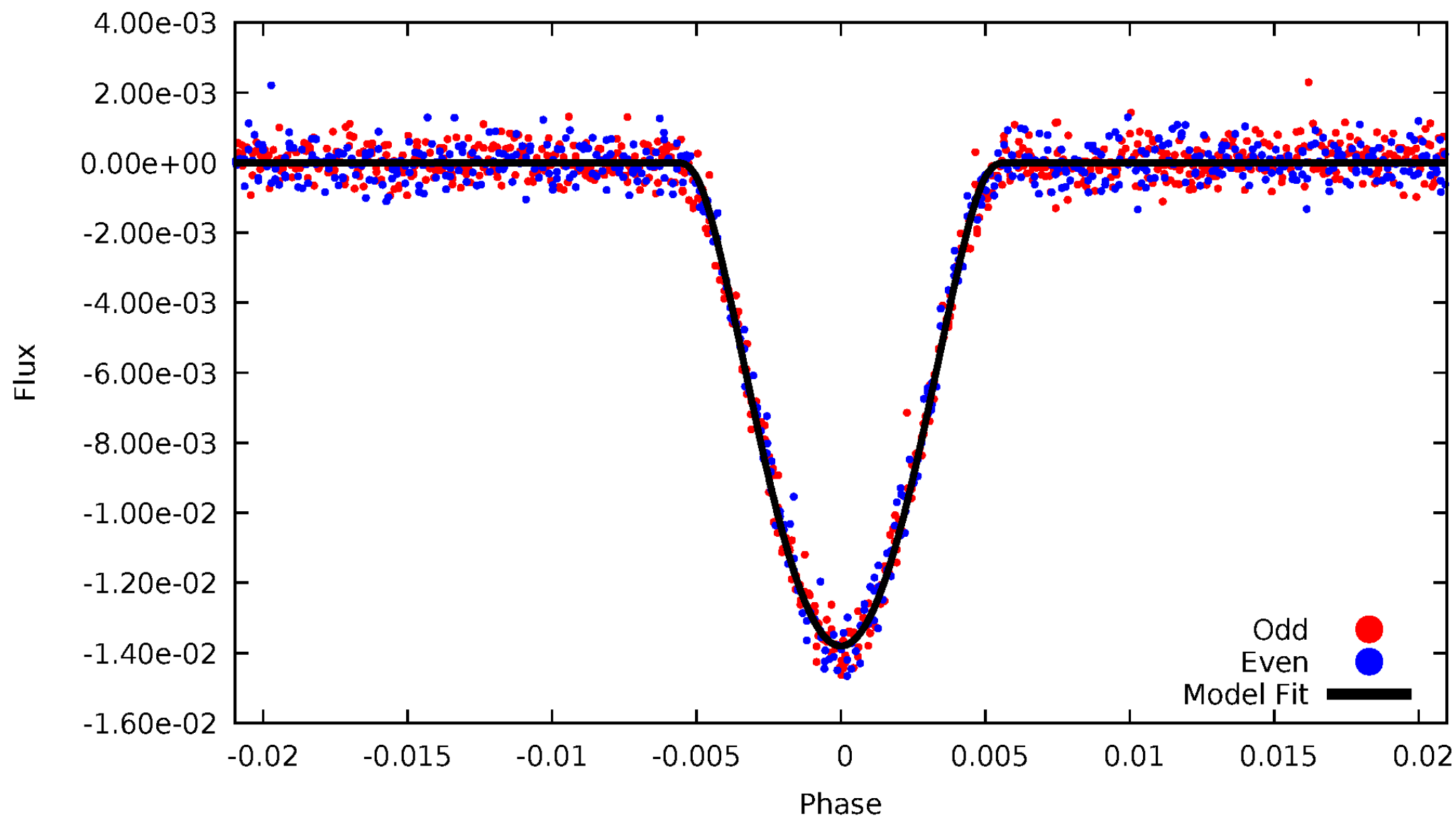


TCE 008167978-01



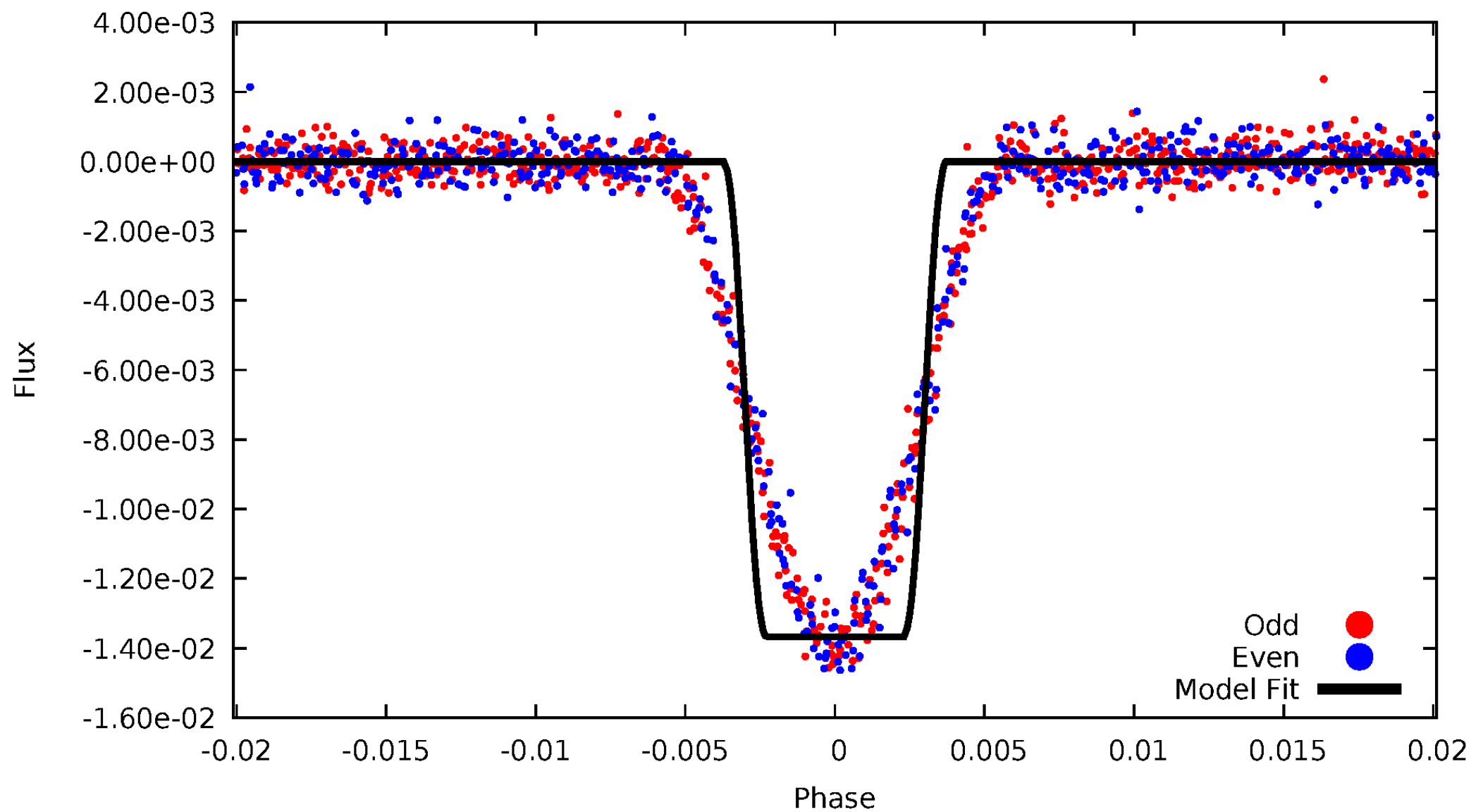
DV Odd/Even

TCE 008167978-01

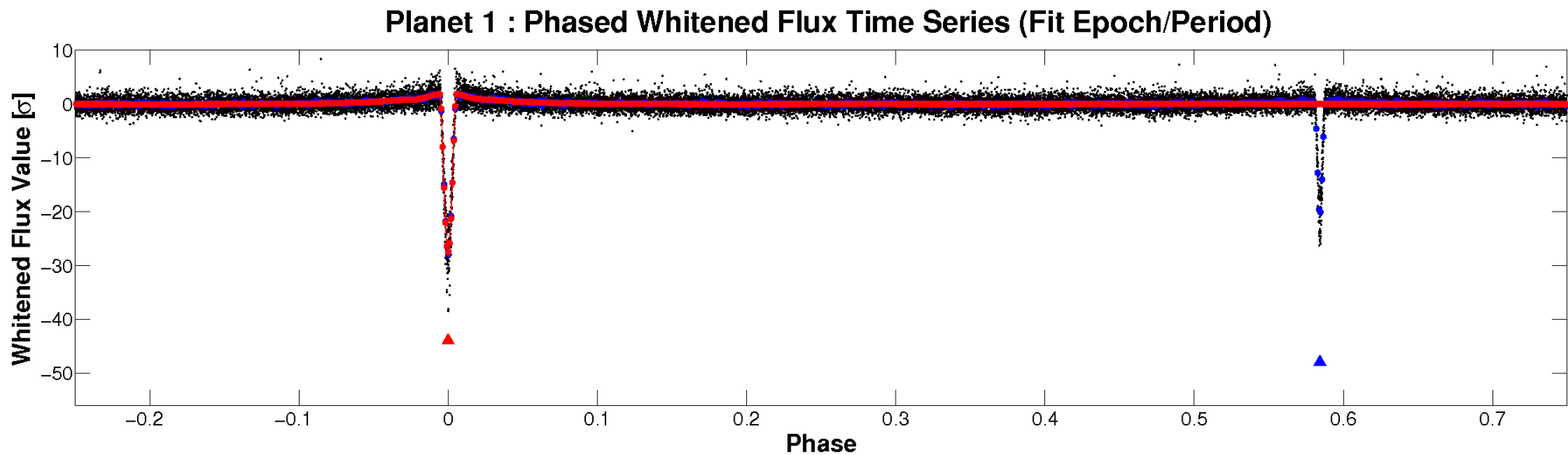
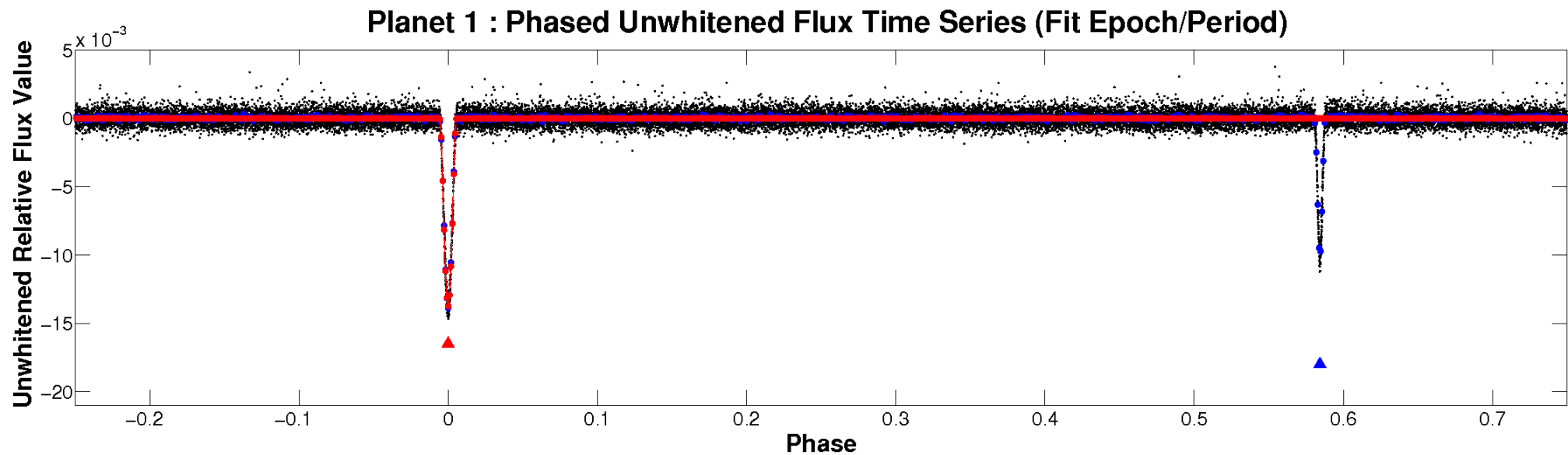


ALT Odd/Even

TCE 008167978-01

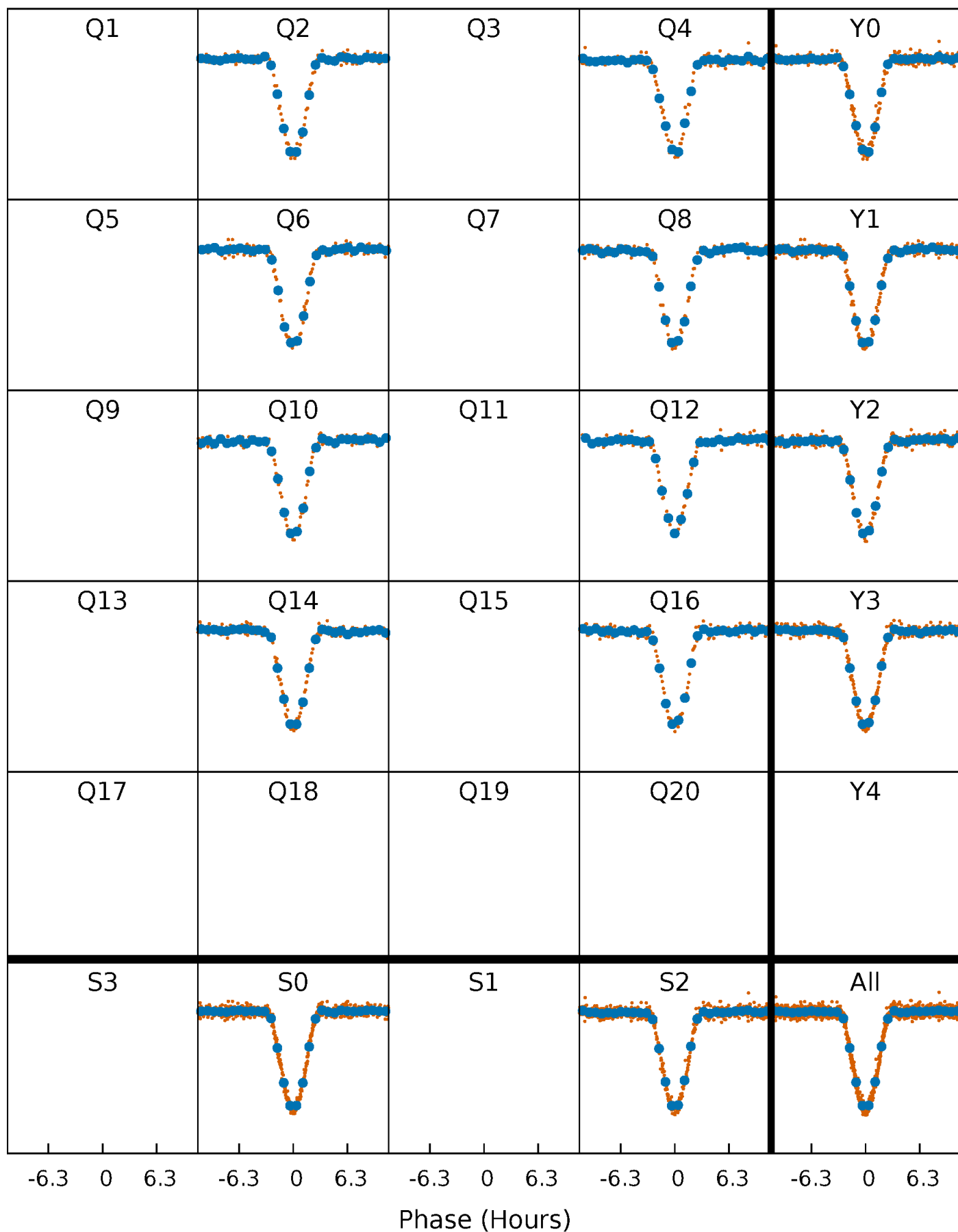


Non-Whitened Vs. Whitened Light Curve



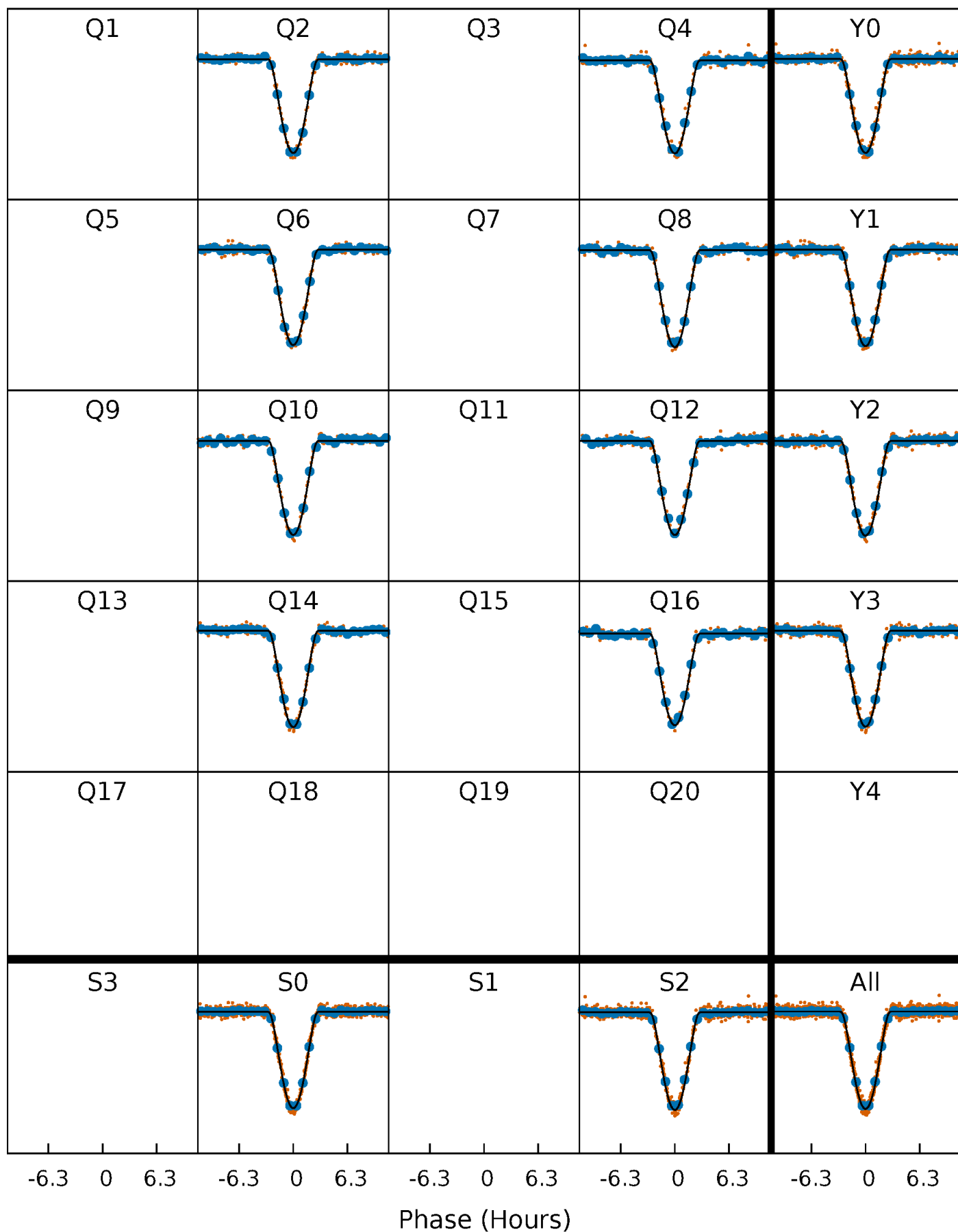
PDC Quarter-Phased Transit Curves

TCE 008167978-01 P= 22.052749 Days $T_0=151.552414$ (BKJD)



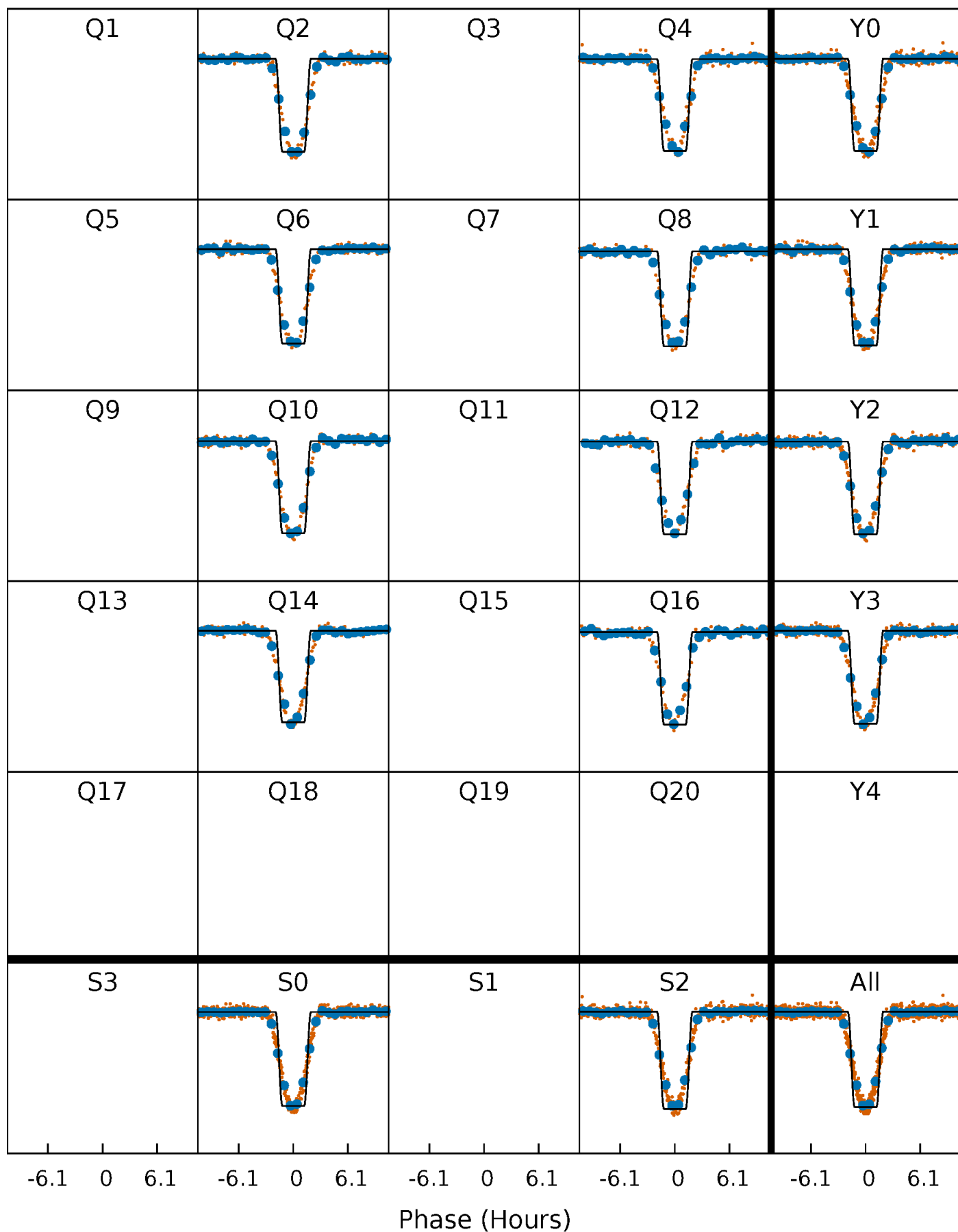
DV Quarter-Phased Transit Curves

TCE 008167978-01 P= 22.052749 Days $T_0=151.552414$ (BKJD)



Alt. Detrend Quarter-Phased Transit Curves

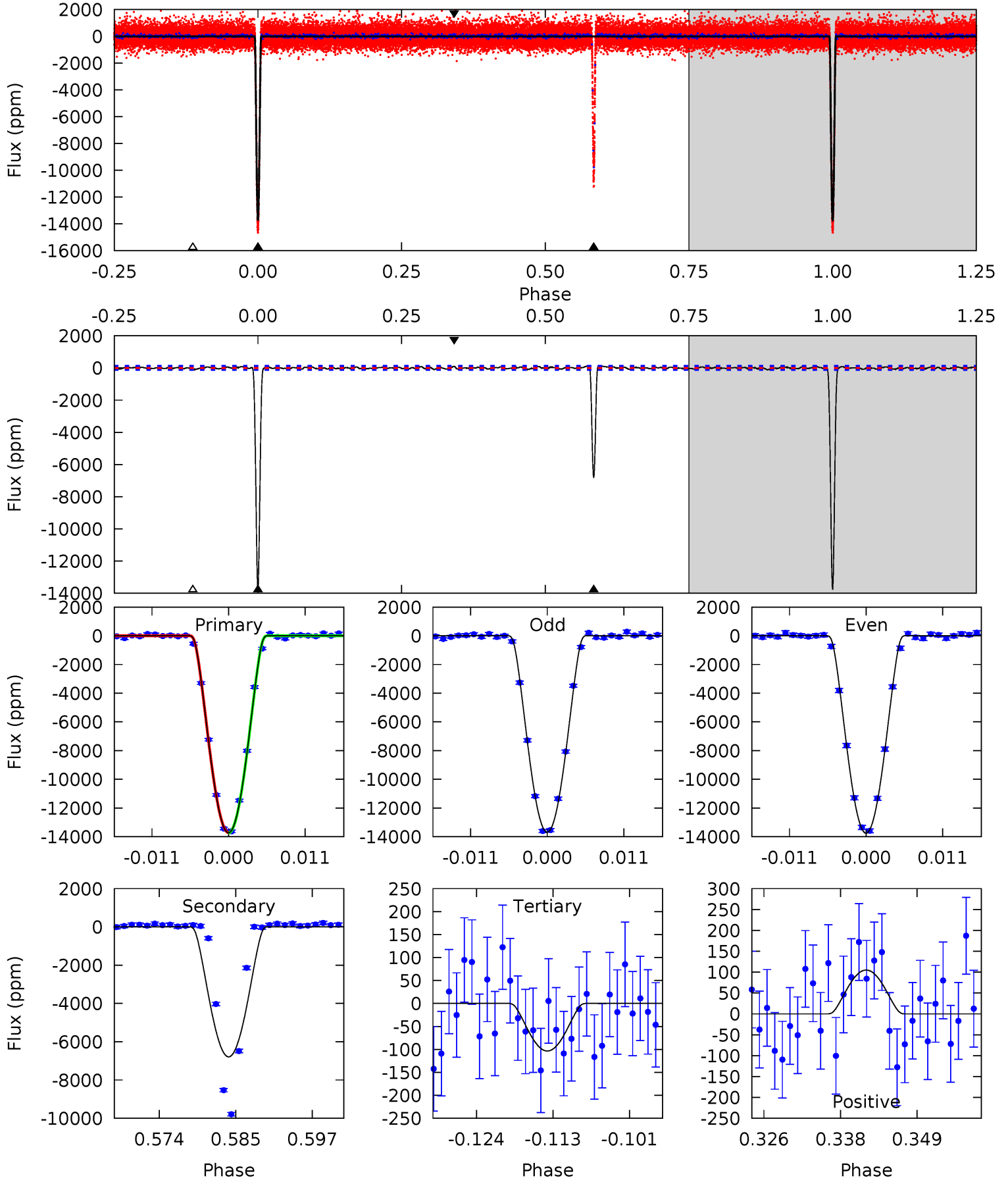
TCE 008167978-01 P= 22.052913 Days $T_0=151.547193$ (BKJD)



DV Model-Shift Uniqueness Test

008167978-01, P = 22.052749 Days, E = 151.552414 Days

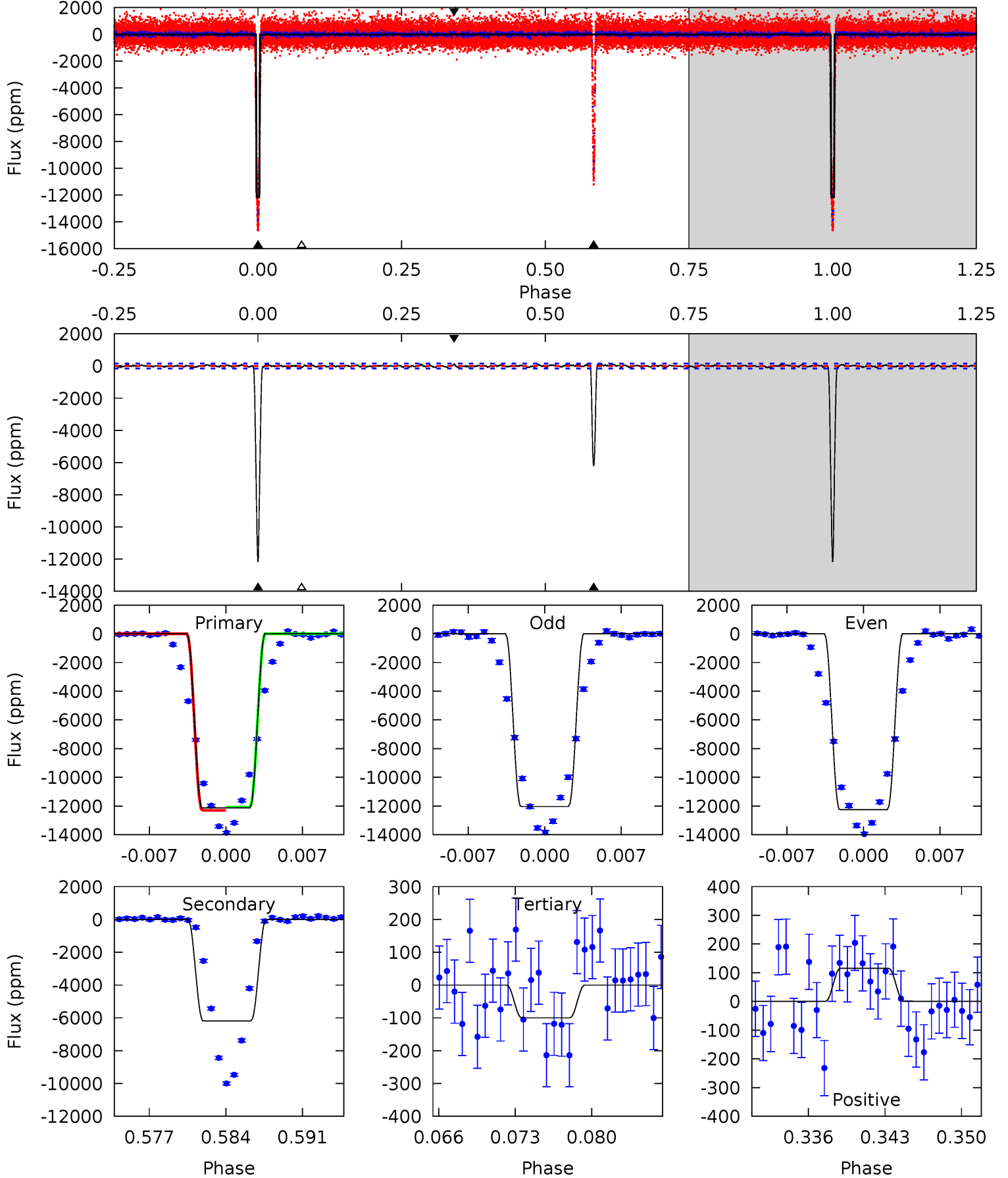
Pri	Sec	Ter	Pos	FA ₁	FA ₂	F _{Red}	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
551.6	272.9	4.16	4.22	5.00	2.53	1.61	547.5	547.4	268.7	268.7	1.36	1.00	0.01	0.43



Alt Model-Shift Uniqueness Test

008167978-01, P = 22.052913 Days, E = 151.547193 Days

Pri	Sec	Ter	Pos	FA ₁	FA ₂	F _{Red}	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
384.8	196.0	3.17	3.66	5.09	2.68	1.17	381.7	381.2	192.8	192.3	3.41	0.99	0.01	2.35



Stellar Parameters For KIC 008167978

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	R (R_{\odot})	M (M_{\odot})	p_{\star} ($\text{g}\cdot\text{cm}^{-3}$)
	5510^{+192}_{-192}	$4.608^{+0.032}_{-0.128}$	$-0.400^{+0.300}_{-0.300}$	$0.741^{+0.149}_{-0.064}$	$0.822^{+0.087}_{-0.095}$	$2.847^{+0.481}_{-1.065}$
	+3%/-3%	+1%/-3%	+75%/-75%	+20%/-9%	+11%/-12%	+17%/-37%
Source	KIC0	KIC0	KIC0	DSEP		

KIC = Kepler Input Catalog; PHO = Photometry; SPE = Spectroscopy; AST = Asteroseismology
 TRA = Transits; DESP = Dartmouth Models; MULT = Multiple Models

Secondary Eclipse Parameters for KIC 008167978-01 / KOI 6053.01

Detrend	Depth (ppm)	R_p (R_{\oplus})	T_{max} (K)	T_{obs} (K)	A_{obs}
DV	-6791 ± 25	$15.51^{+2.73}_{-2.62}$	785^{+43}_{-34}	3988^{+274}_{-214}	322^{+139}_{-89}
Alt.	-6184 ± 32	$9.90^{+2.64}_{-2.30}$	787^{+37}_{-37}	4627^{+546}_{-381}	711^{+508}_{-264}

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

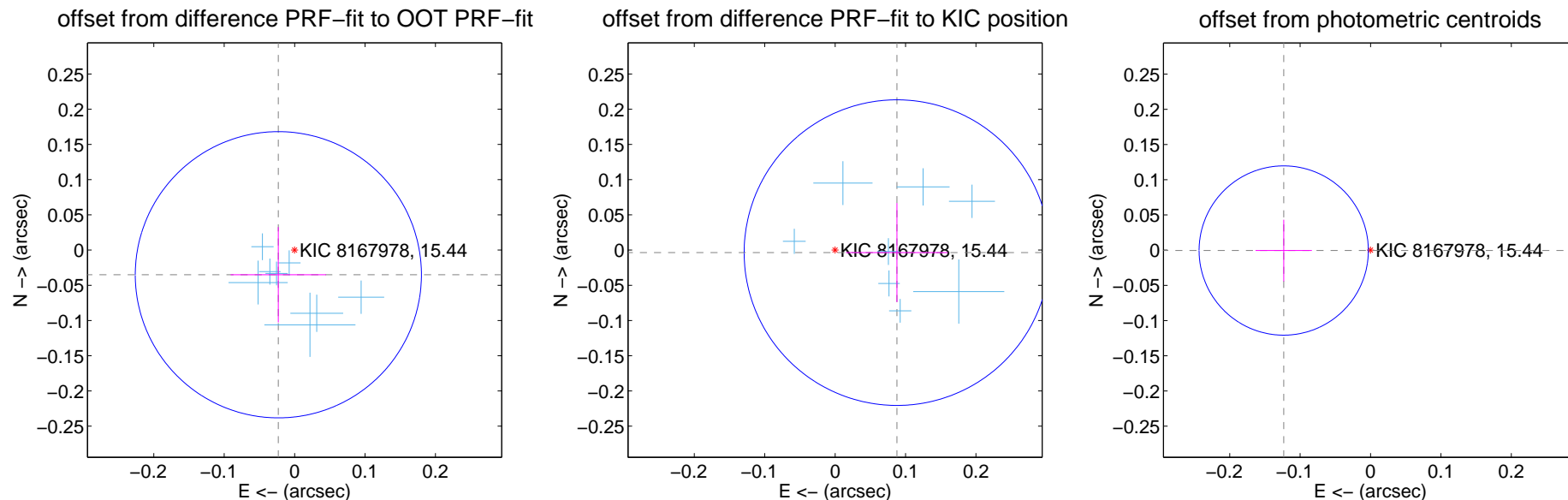
DV Centroid Data

Supplemental centroid analysis for 008167978-01. Kepler magnitude: 15.44. Transit SNR 318.31

There are 8 quarters with good PRF difference image offsets

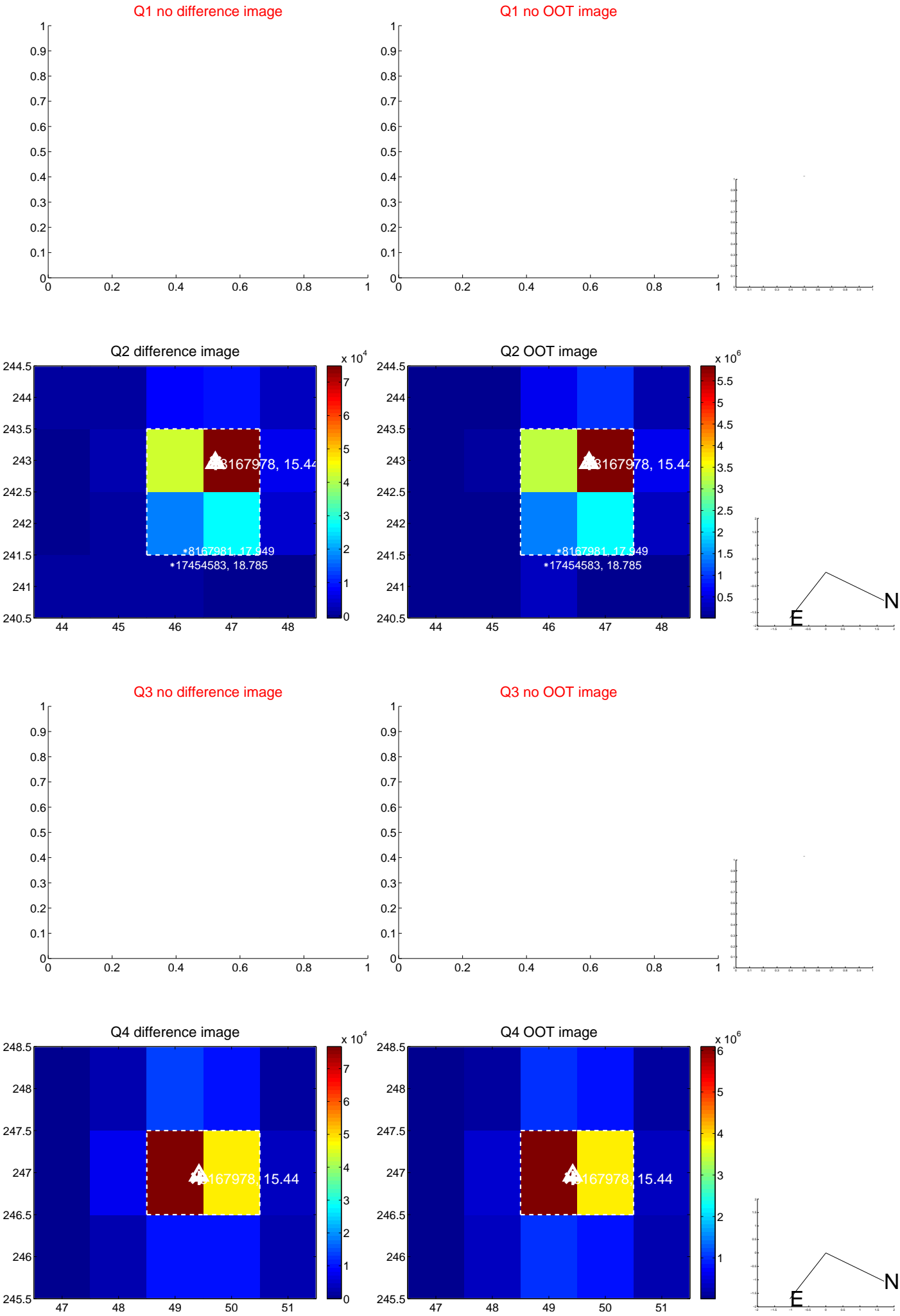
The direct PRF centroid is offset from the target star catalog position by about 0.20 arcsec

	Distance in arcsec	Distance / σ	Δ RA	Δ Dec
PRF-fit source offset from OOT	0.042 ± 0.068	0.62	0.023 ± 0.068	-0.035 ± 0.068
PRF-fit source offset from KIC position	0.088 ± 0.072	1.21	-0.088 ± 0.072	-0.004 ± 0.070
photometric centroid source offset	0.12 ± 0.04	3.08	0.12 ± 0.04	-0.00 ± 0.04

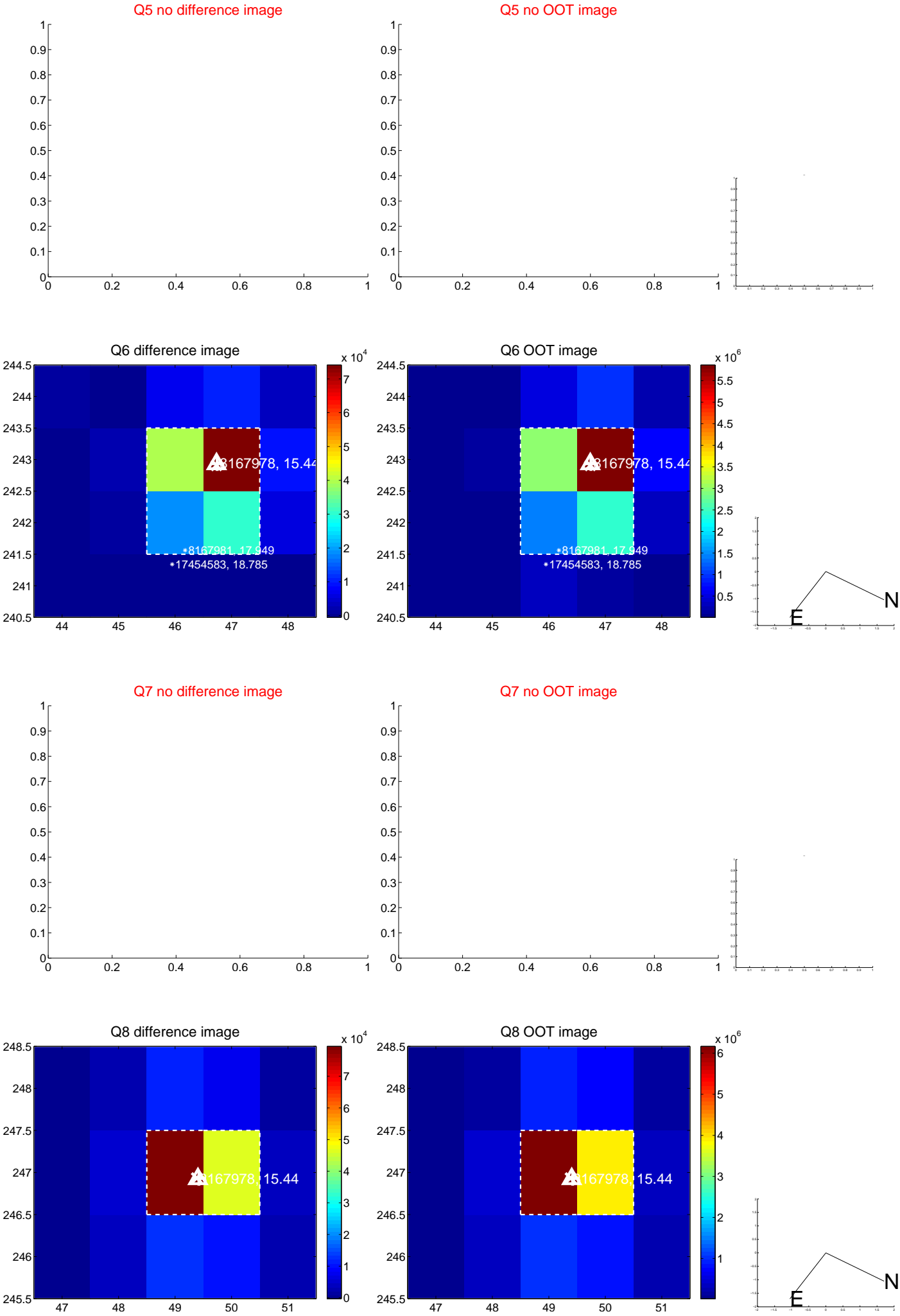


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses:** good quarterly centroid offsets; **Vermillion crosses:** bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- σ uncertainty. Blue circle: three-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

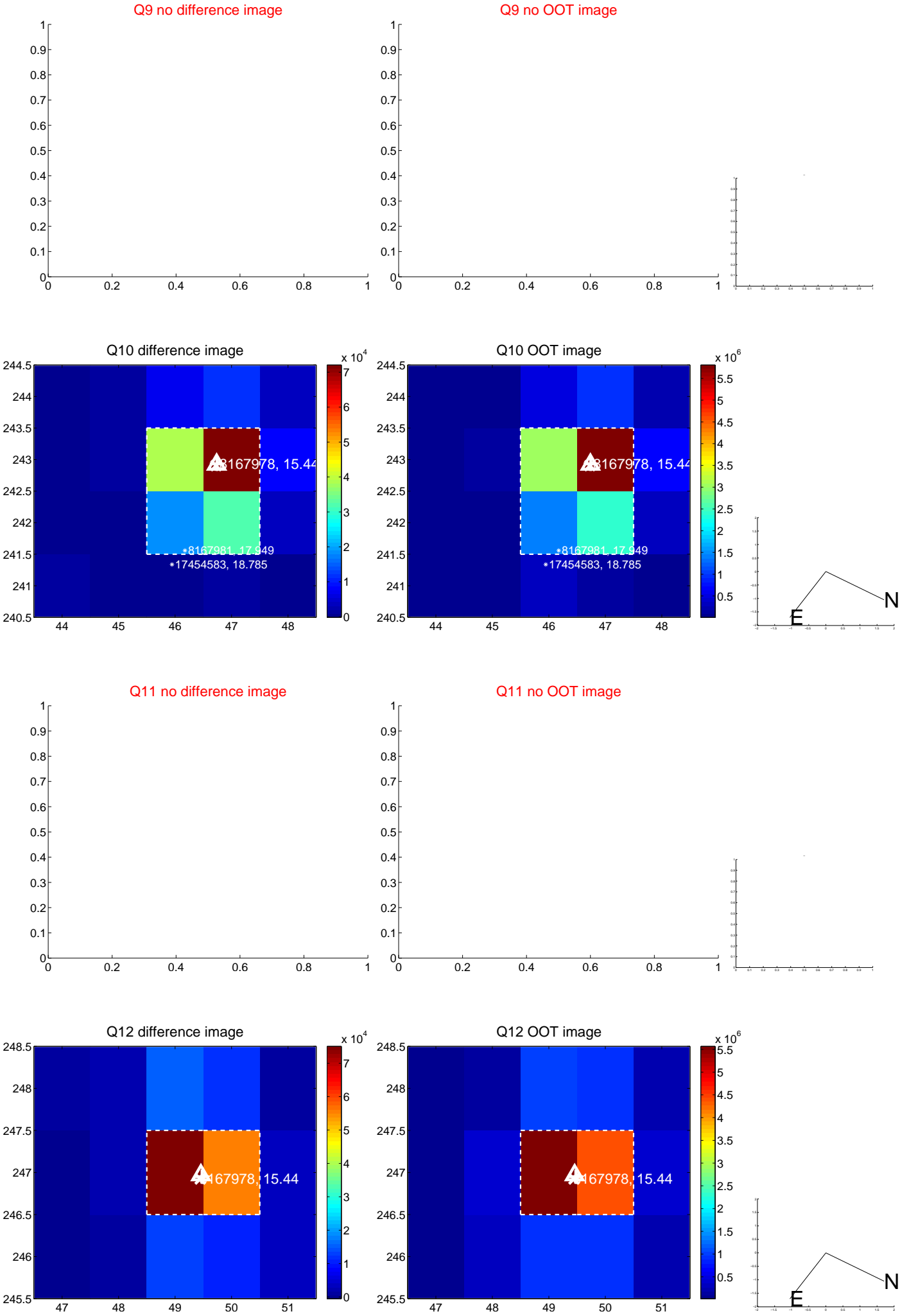
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



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

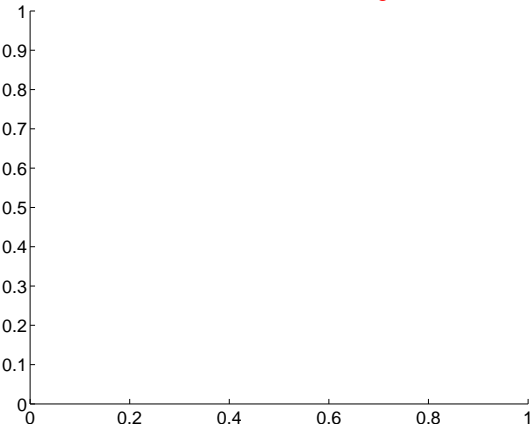


white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.

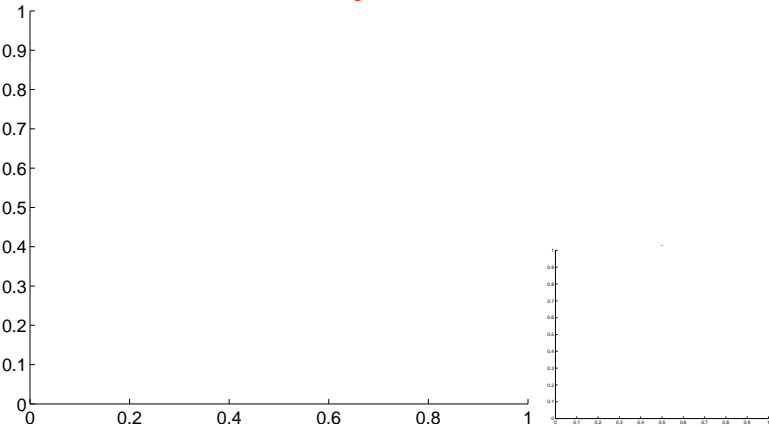


white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.

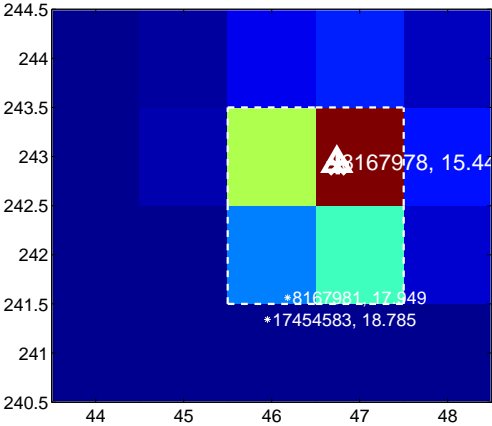
Q13 no difference image



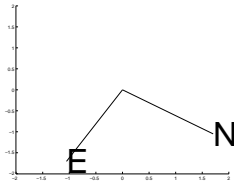
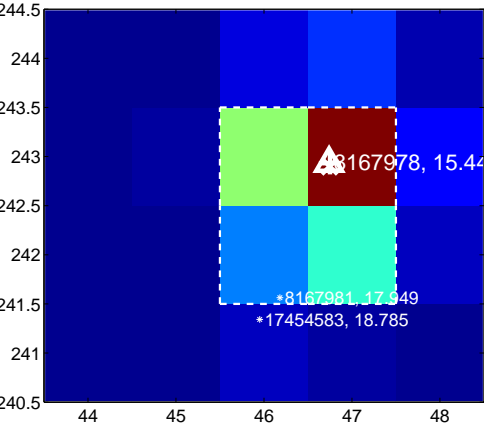
Q13 no OOT image



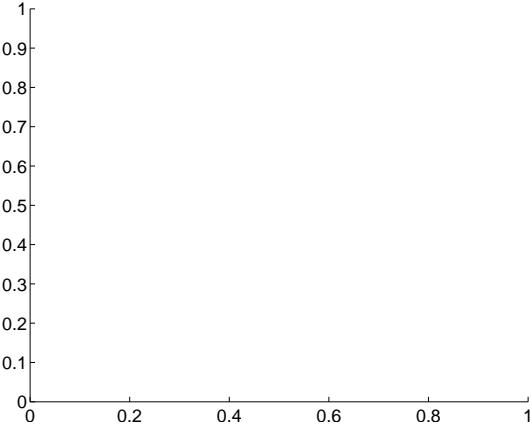
Q14 difference image



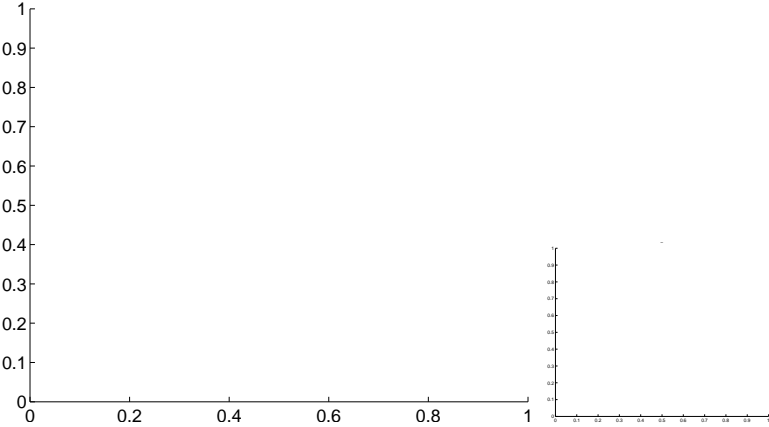
Q14 OOT image



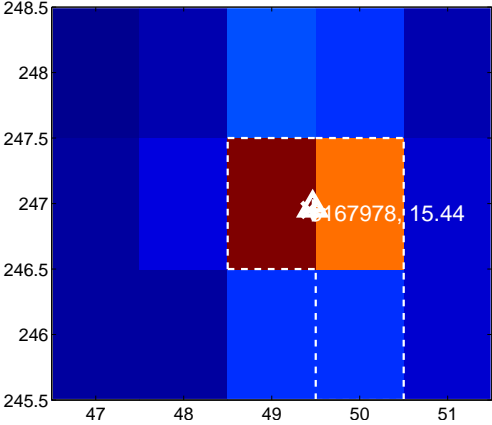
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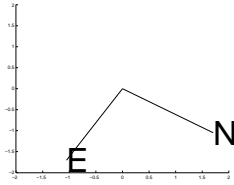
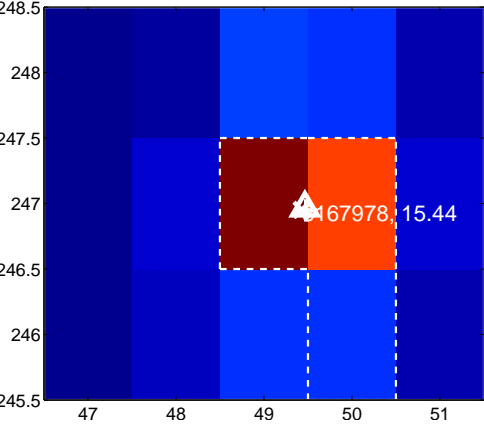
Q15 no OOT image



Q16 difference image



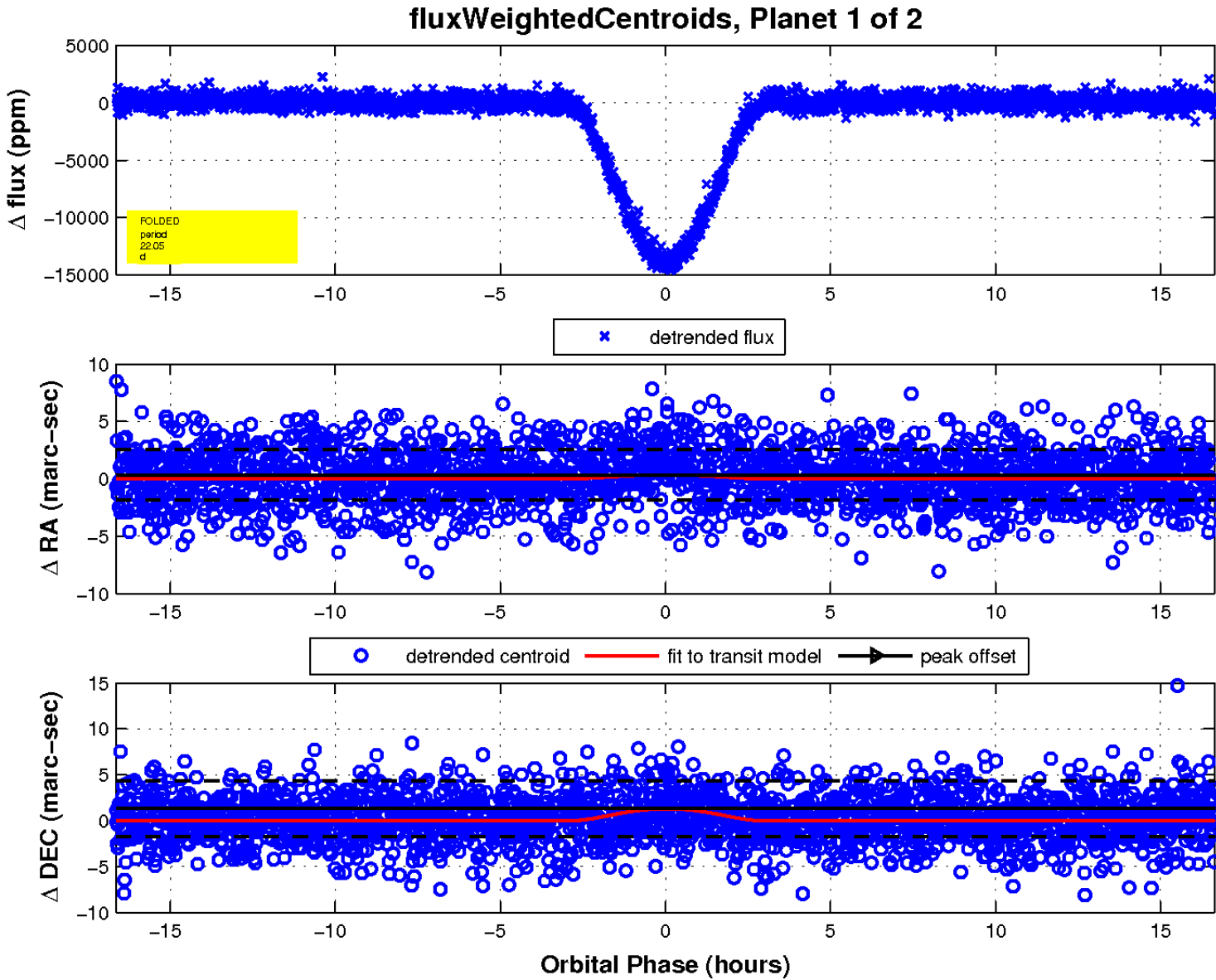
Q16 OOT image



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

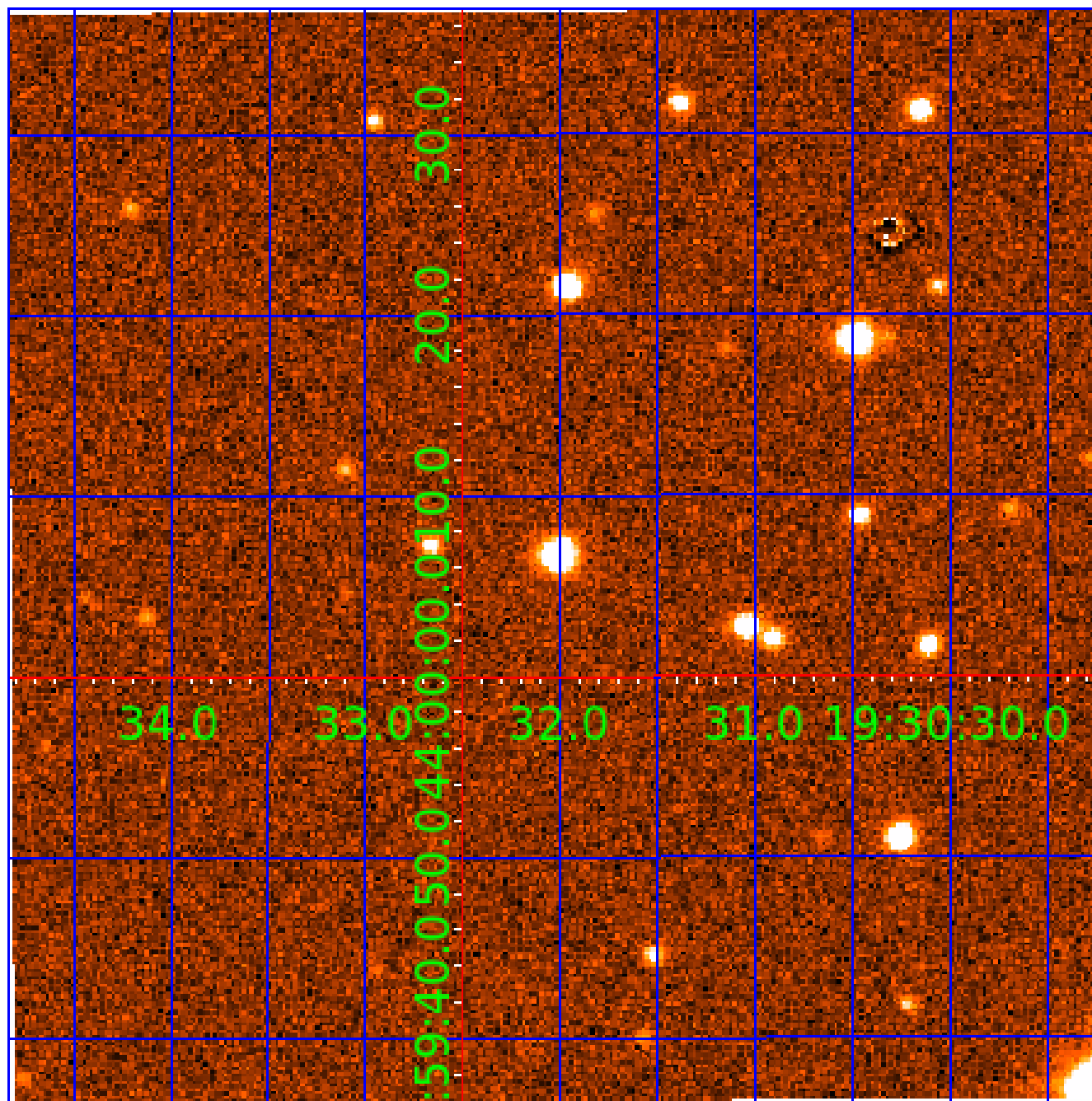
Q17 no difference image

Q17 no OOT image



UKIRT Image

Declination



KIC 008167978

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})
008167978-01	OBS	6053.01	22.052749	151.552414	13802.2	5.548	325.3	318.3	0.74	5510	14.76	21.98
008167978-02	OBS	No	22.052720	142.386440	10071.4	3.328	176.7	177.3	0.74	5510	12.75	21.98

Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
008167978-01	OBS	FP	0.00	0	1	0	0	MOD_SEC_DV—MOD_SEC_ALT—DEEP_V_SHAPED—HAS_SEC_TCE
008167978-02	OBS	FP	0.00	1	1	0	0	IS_SEC_TCE

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 008167978-02

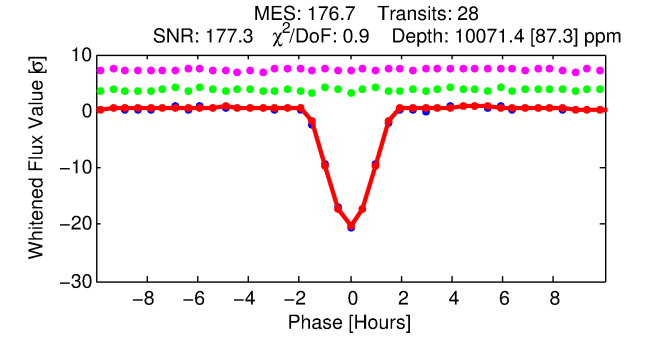
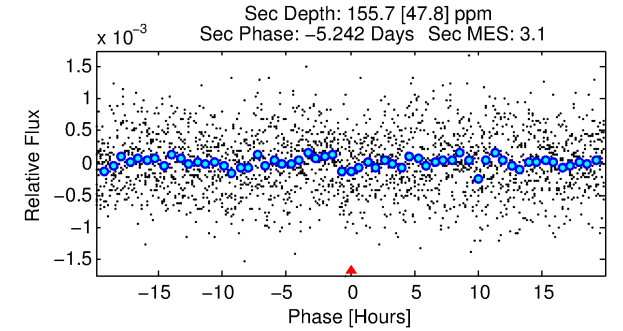
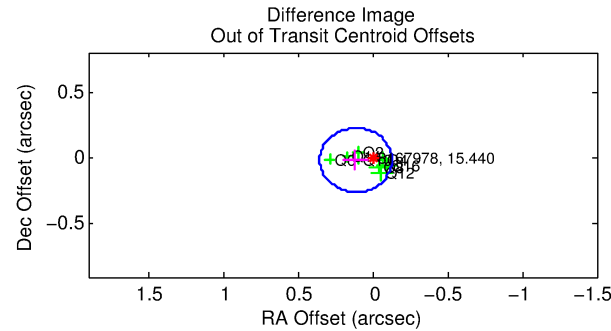
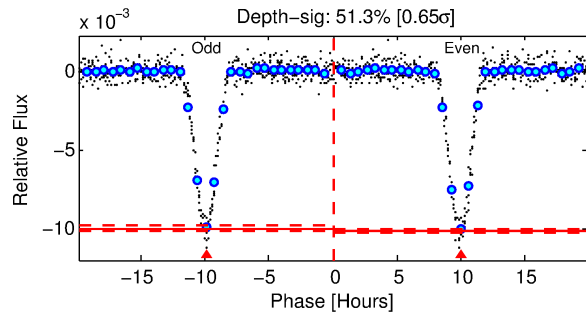
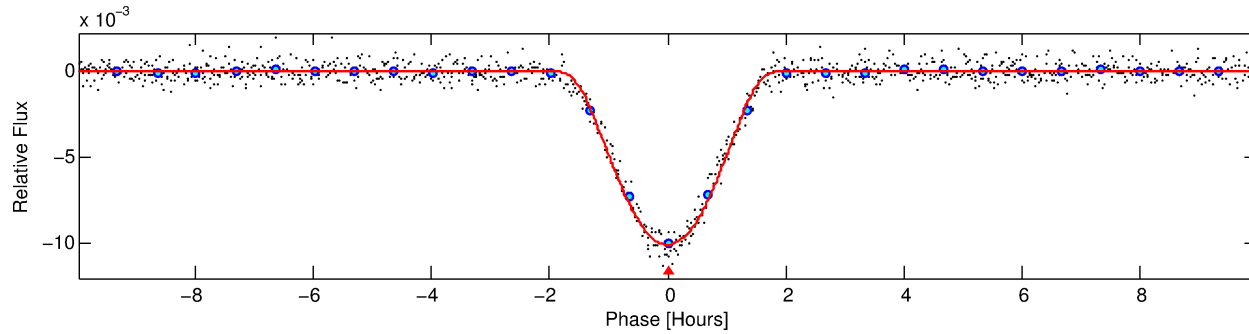
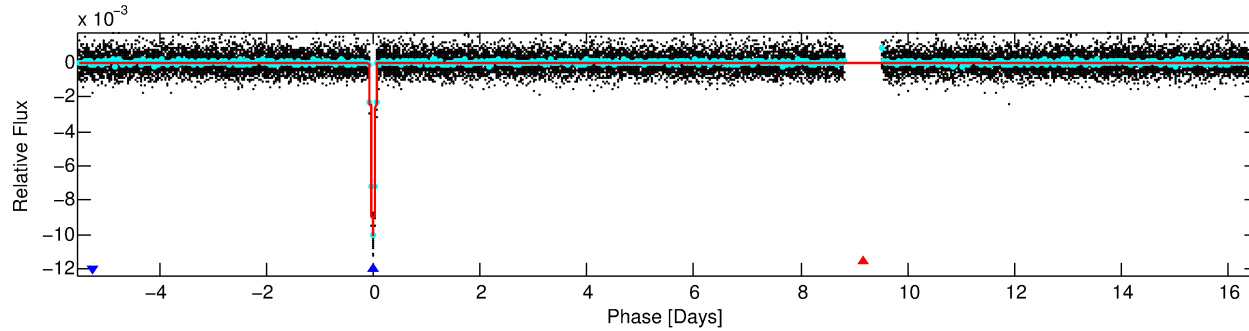
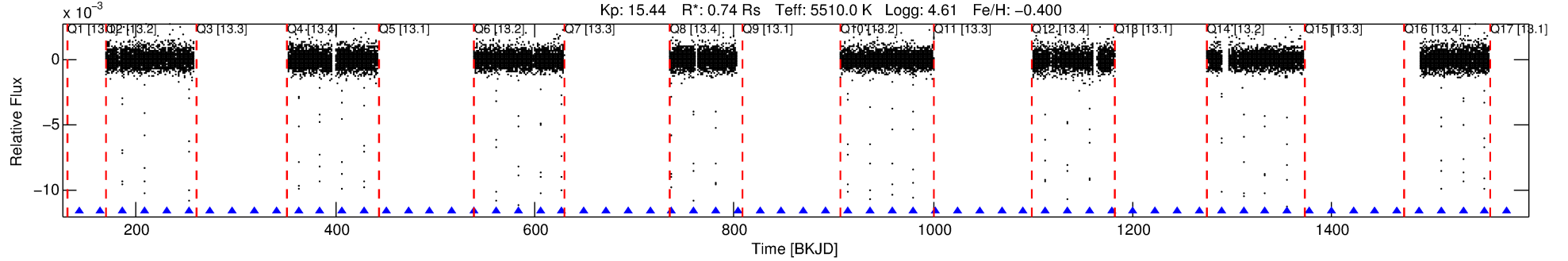
No Significant Match Found

DV One-Page Summary

KIC: 8167978 Candidate: 2 of 2 Period: 22.053 d

KOI: K06053 Corr: No Ephemeris Match

Kp: 15.44 R*: 0.74 Rs Teff: 5510.0 K Logg: 4.61 Fe/H: -0.400



DV Fit Results:

Period = 22.05272 [0.00001] d
Epoch = 142.3864 [0.0005] BKJD
Rp/R* = 0.1577 [0.0468]
a/R* = 30.71 [1.49]
b = 0.99 [0.07]
Seff = 21.98 [6.06]
Teff = 552 [38] K
Rp = 12.75 [4.57] Re
a = 0.1436 [0.0239] AU
Ag = 10.86 [7.70] [1.28σ]
Teffp = 1550 [264] K [3.73σ]

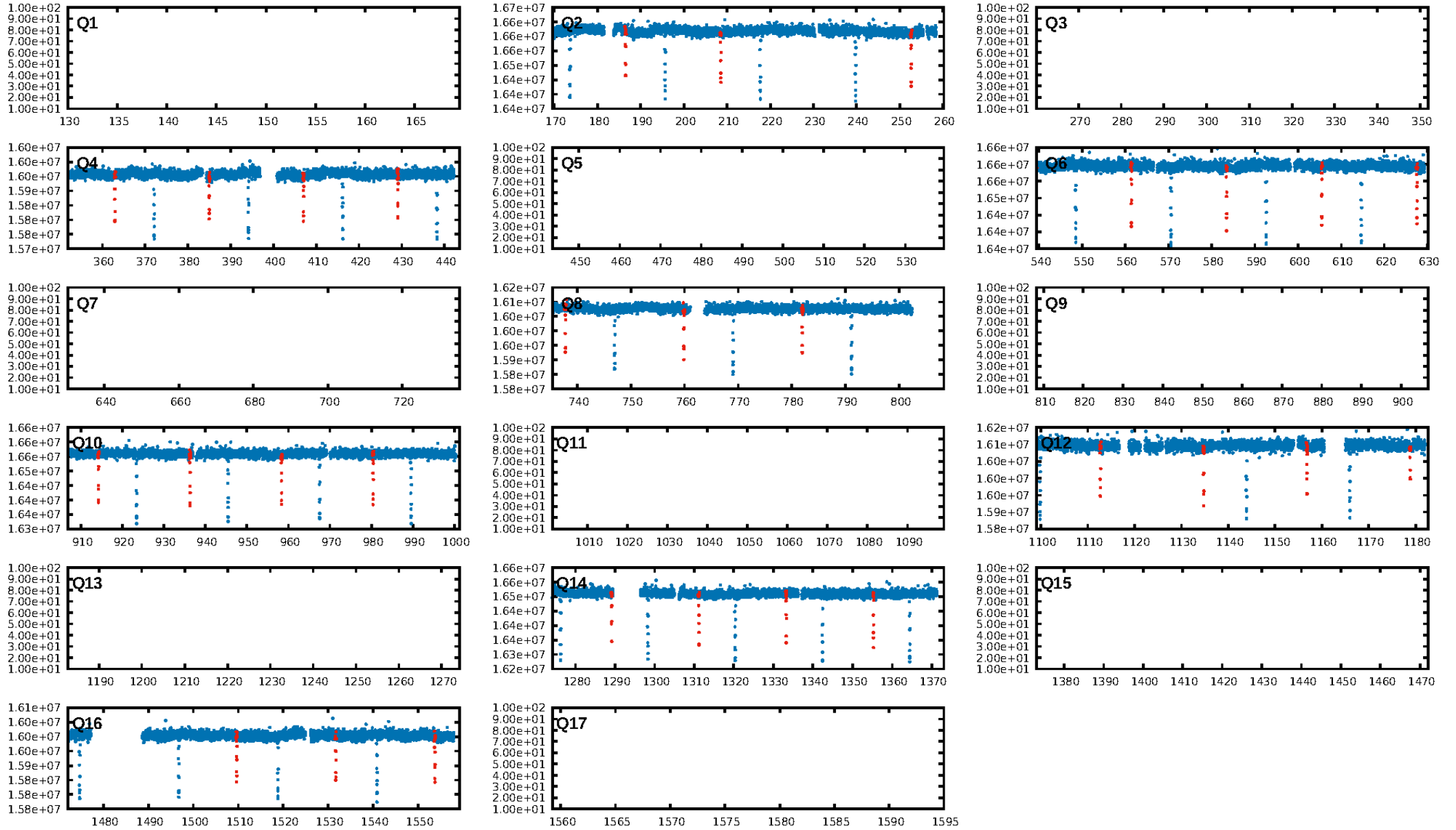
DV Diagnostic Results:

ShortPeriod-sig: N/A
LongPeriod-sig: 0.0% [0.00σ]
ModelChiSquare2-sig: 0.8%
ModelChiSquareGof-sig: 99.5%
Bootstrap-pfa: 0.00e+00
RollingBand-fgt: 1.00 [28/28]
GhostDiagnostic-chr: 3.314
Centroid-sig: 0.0%
Centroid-so: 0.061 arcsec [0.78σ]
OotOffset-rm: 0.114 arcsec [1.41σ]
KicOffset-rm: 0.021 arcsec [0.28σ]
OotOffset-st: 4/0/4/0 [8]
KicOffset-st: 4/0/4/0 [8]
DiffImageQuality-fgm: 1.00 [8/8]
DiffImageOverlap-fno: 1.00 [8/8]

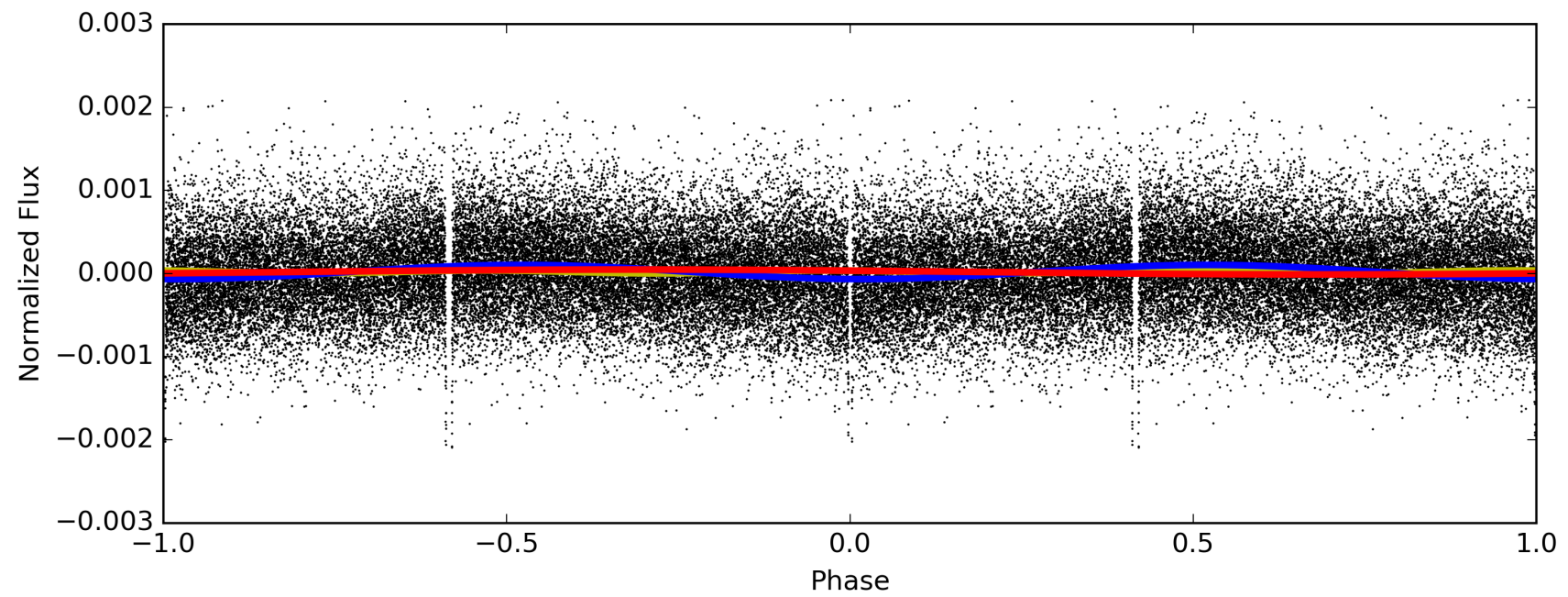
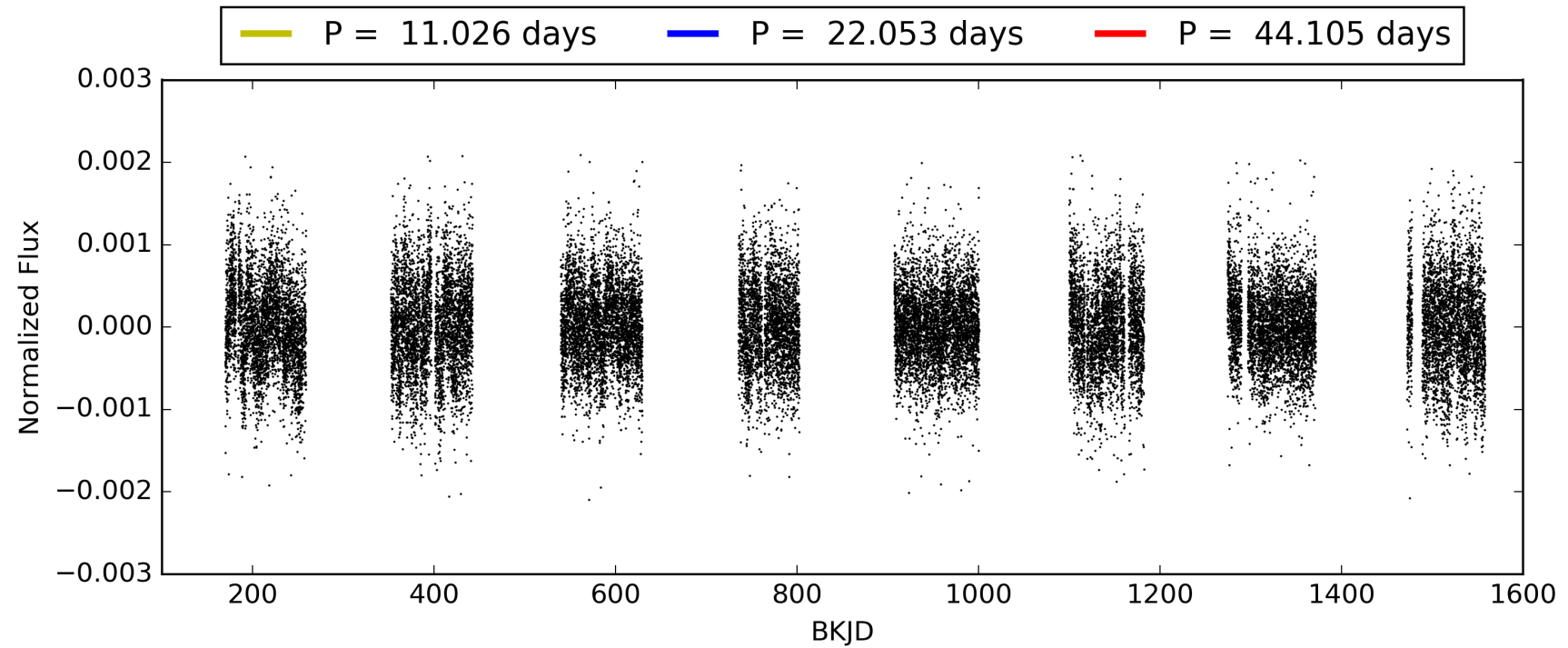
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 31-Jan-2016 21:25:01 Z

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

TCE 008167978-02, PDC Light Curves

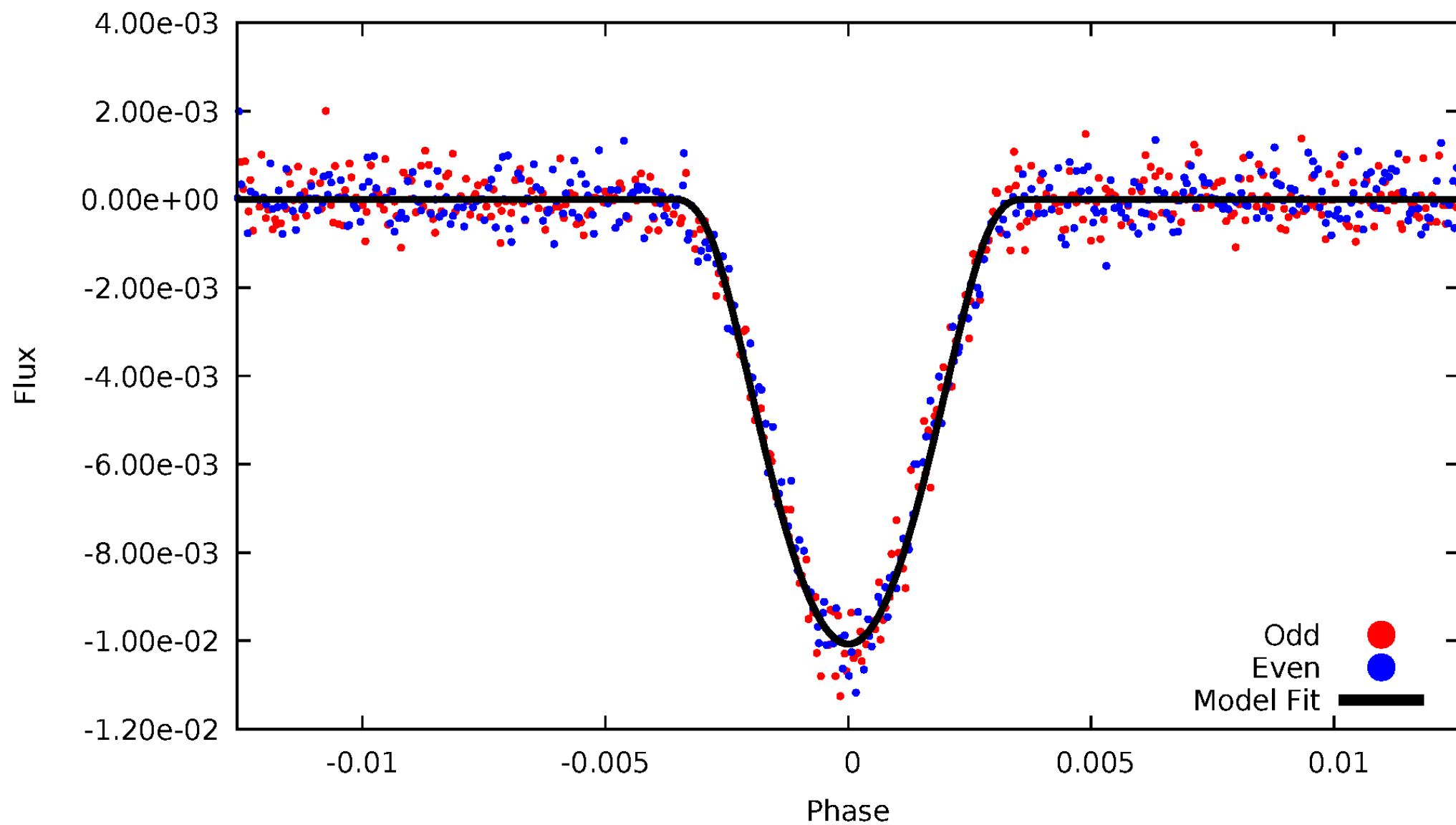


TCE 008167978-02



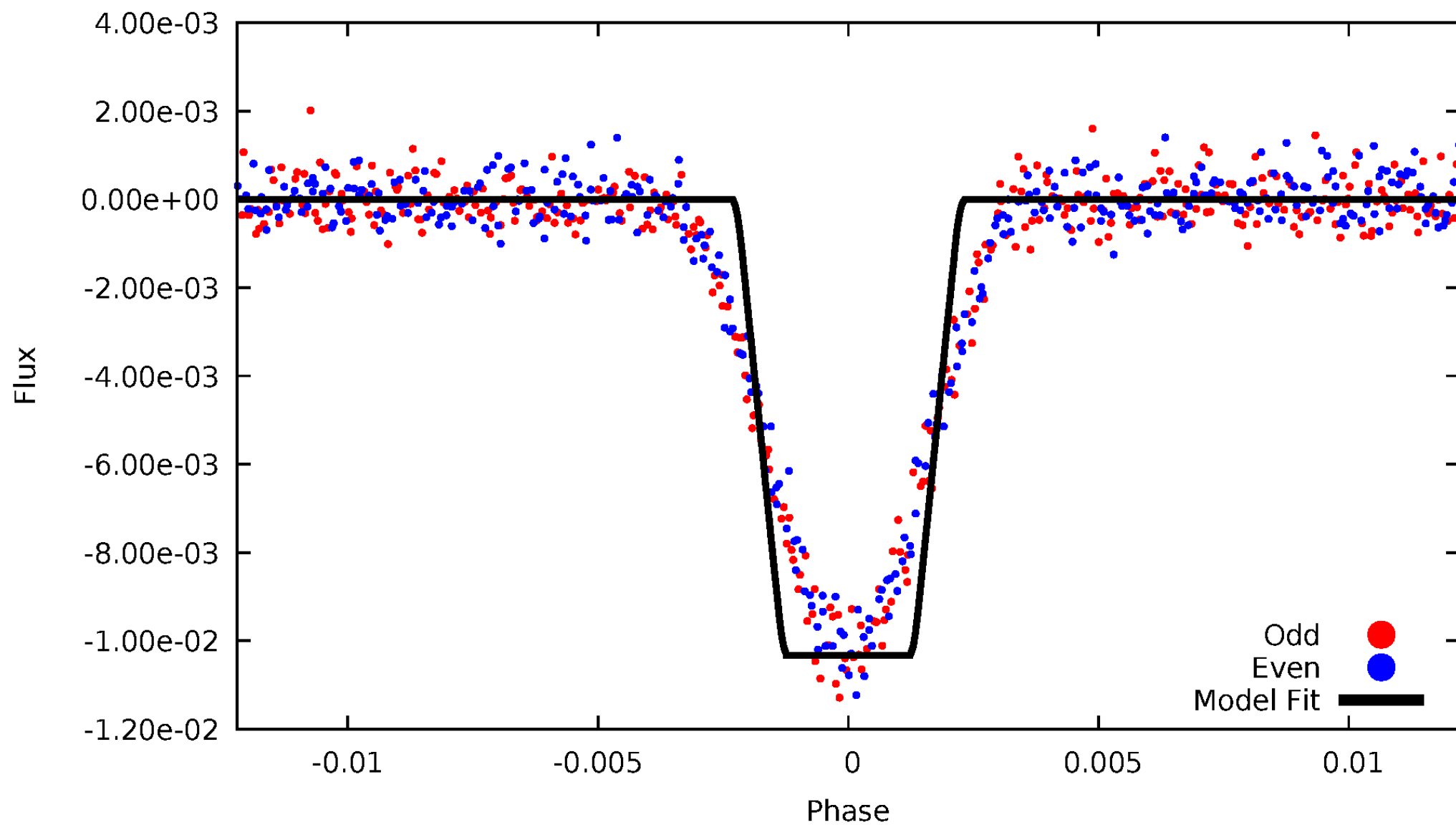
DV Odd/Even

TCE 008167978-02



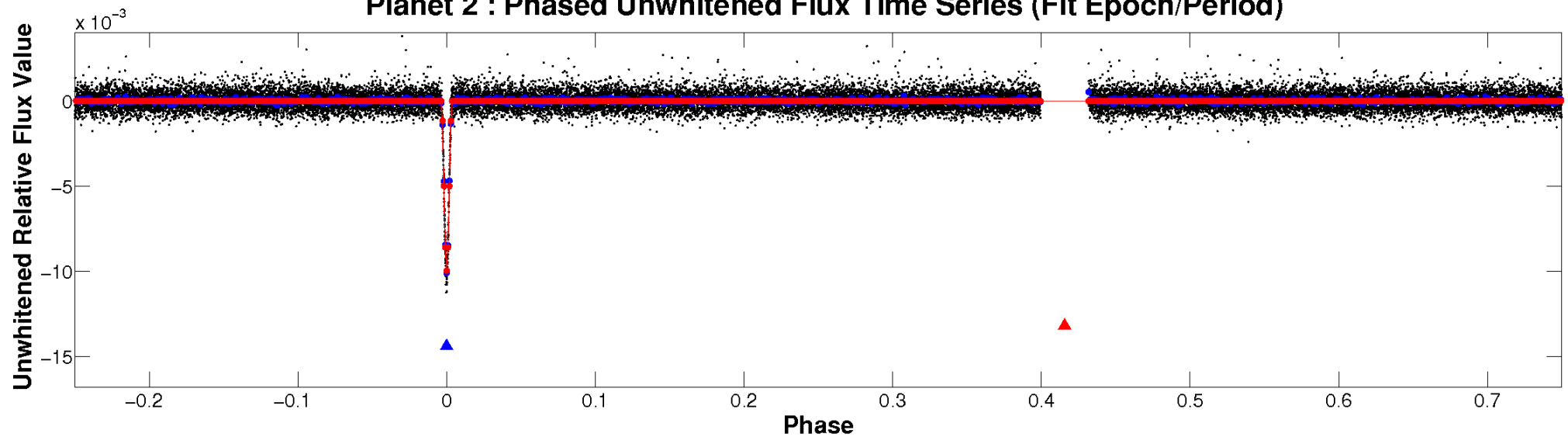
ALT Odd/Even

TCE 008167978-02

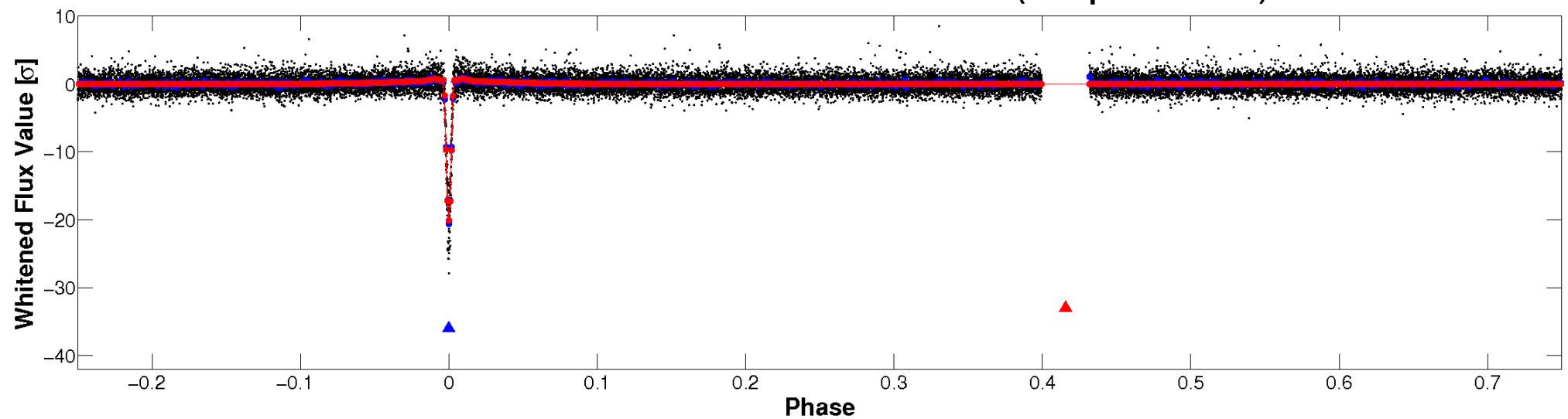


Non-Whitened Vs. Whitened Light Curve

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

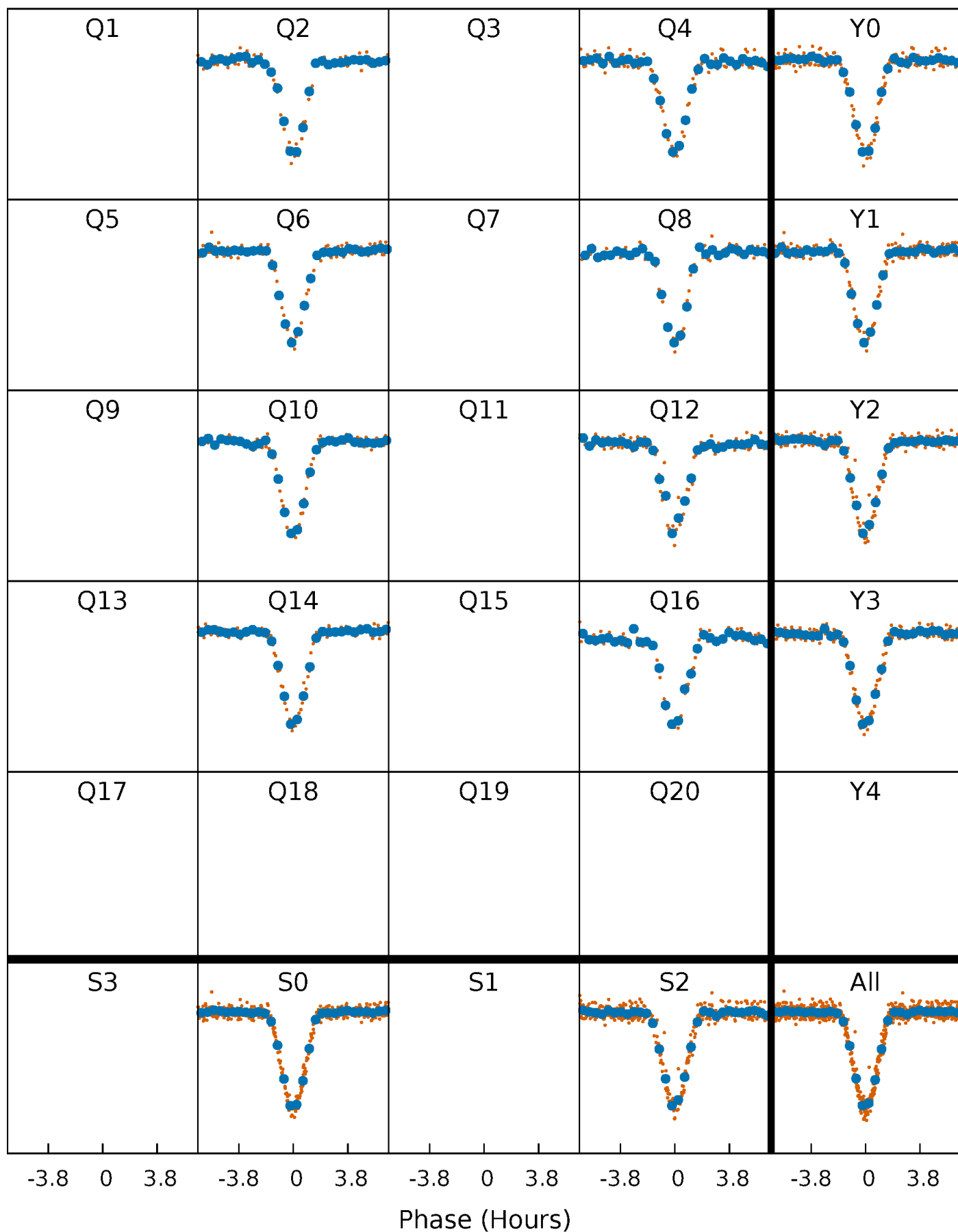


Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



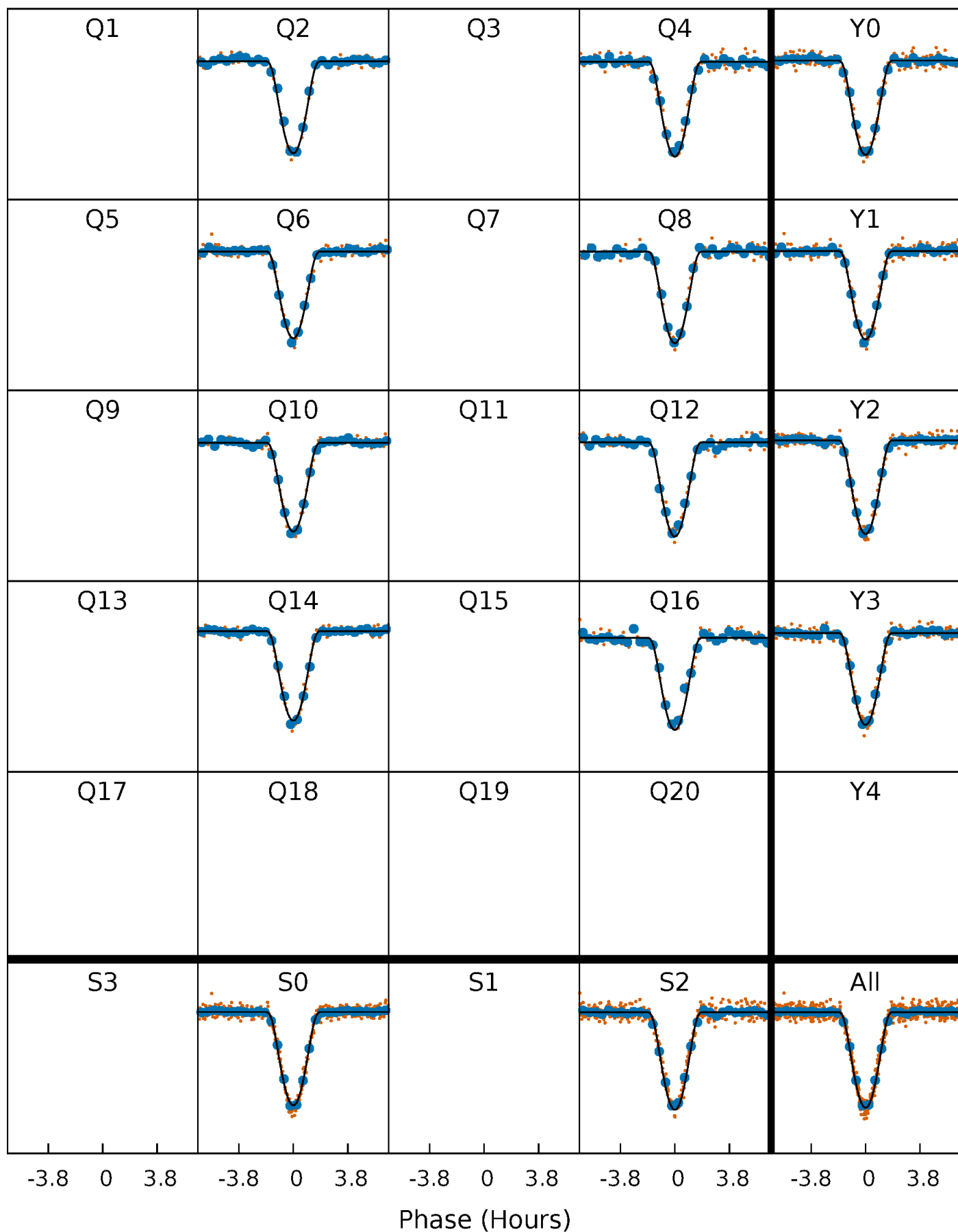
PDC Quarter-Phased Transit Curves

TCE 008167978-02 P= 22.052720 Days $T_0=142.386440$ (BKJD)



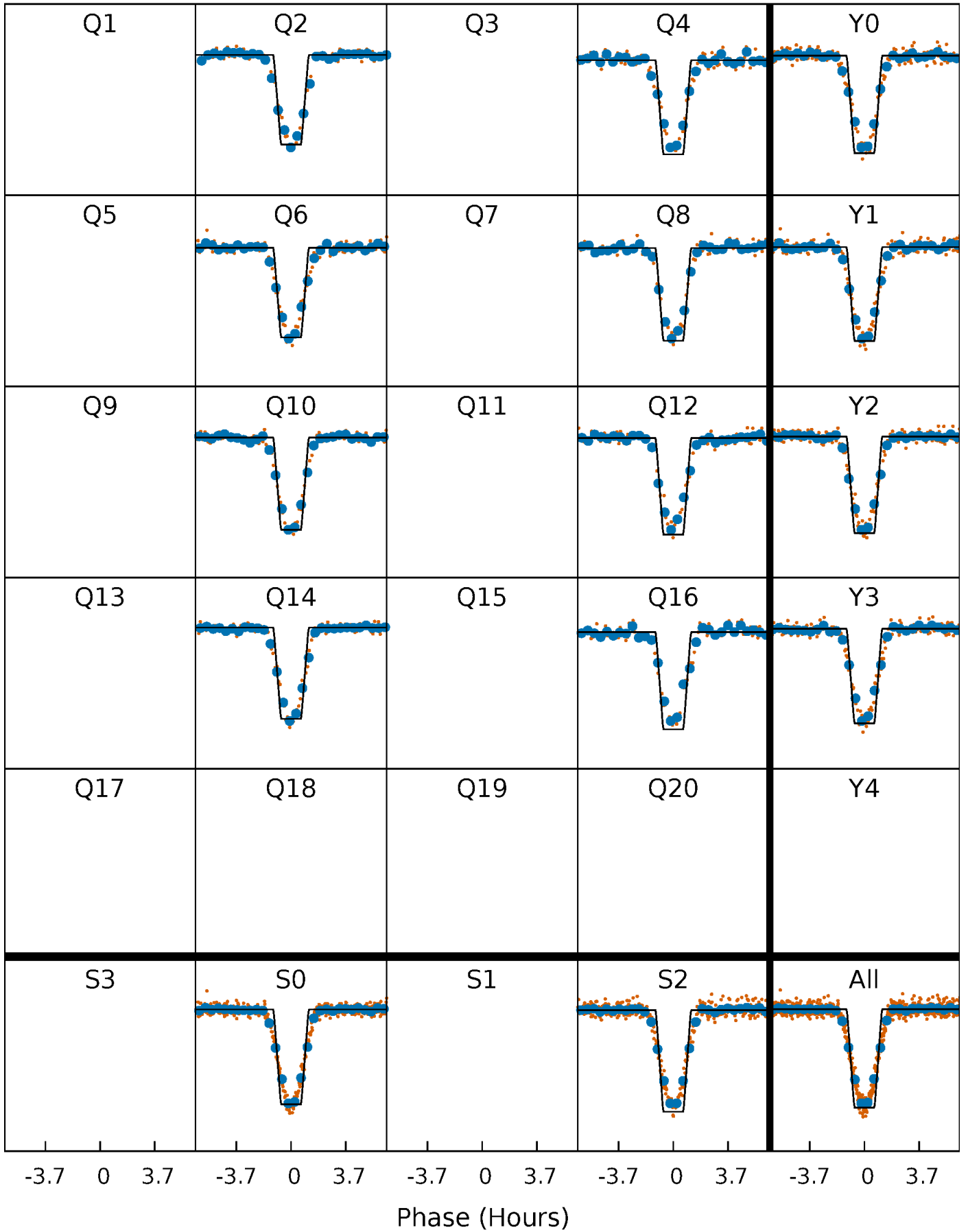
DV Quarter-Phased Transit Curves

TCE 008167978-02 P= 22.052720 Days $T_0=142.386440$ (BKJD)



Alt. Detrend Quarter-Phased Transit Curves

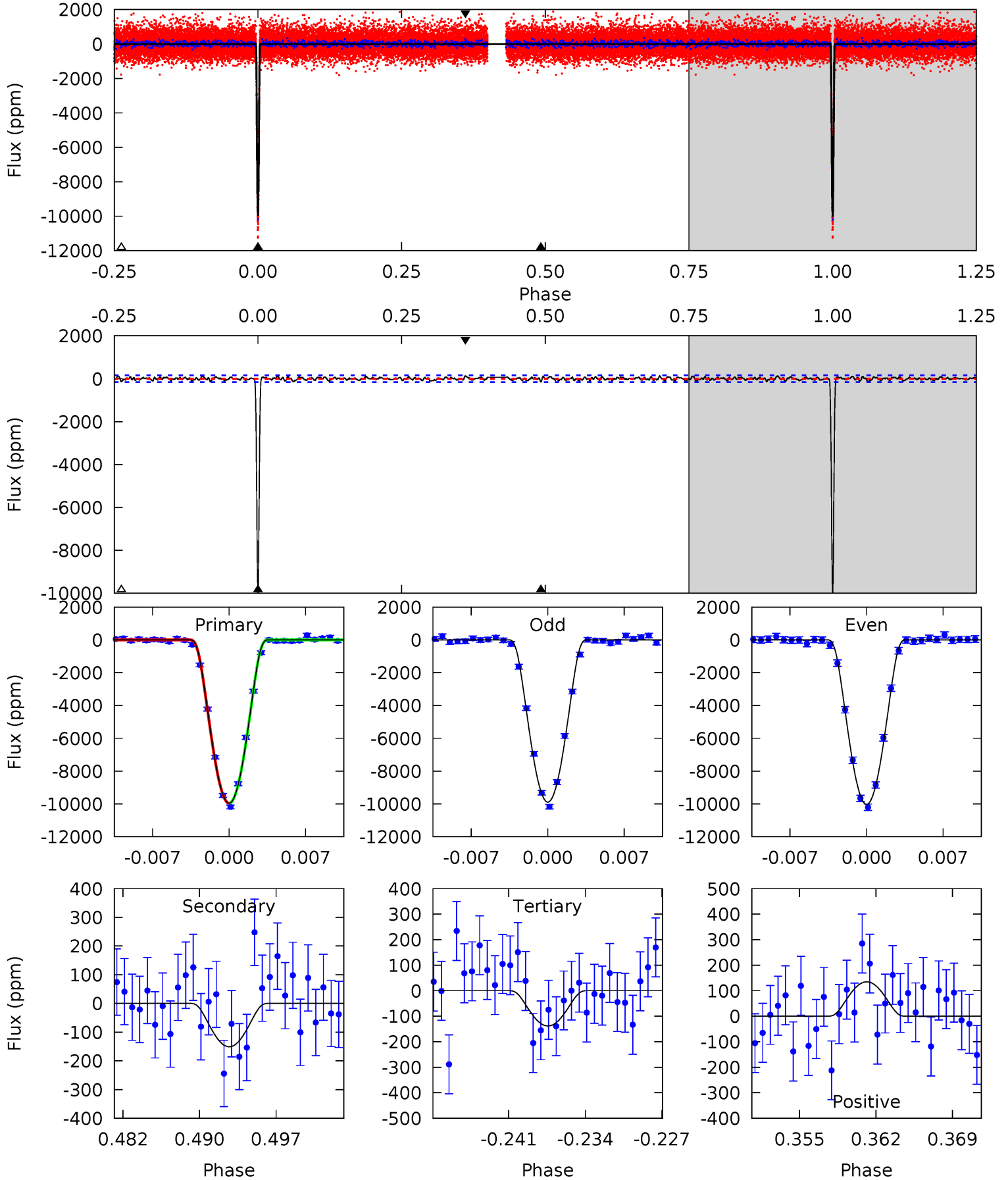
TCE 008167978-02 P= 22.052729 Days $T_0=142.386141$ (BKJD)



DV Model-Shift Uniqueness Test

008167978-02, P = 22.052720 Days, E = 142.386440 Days

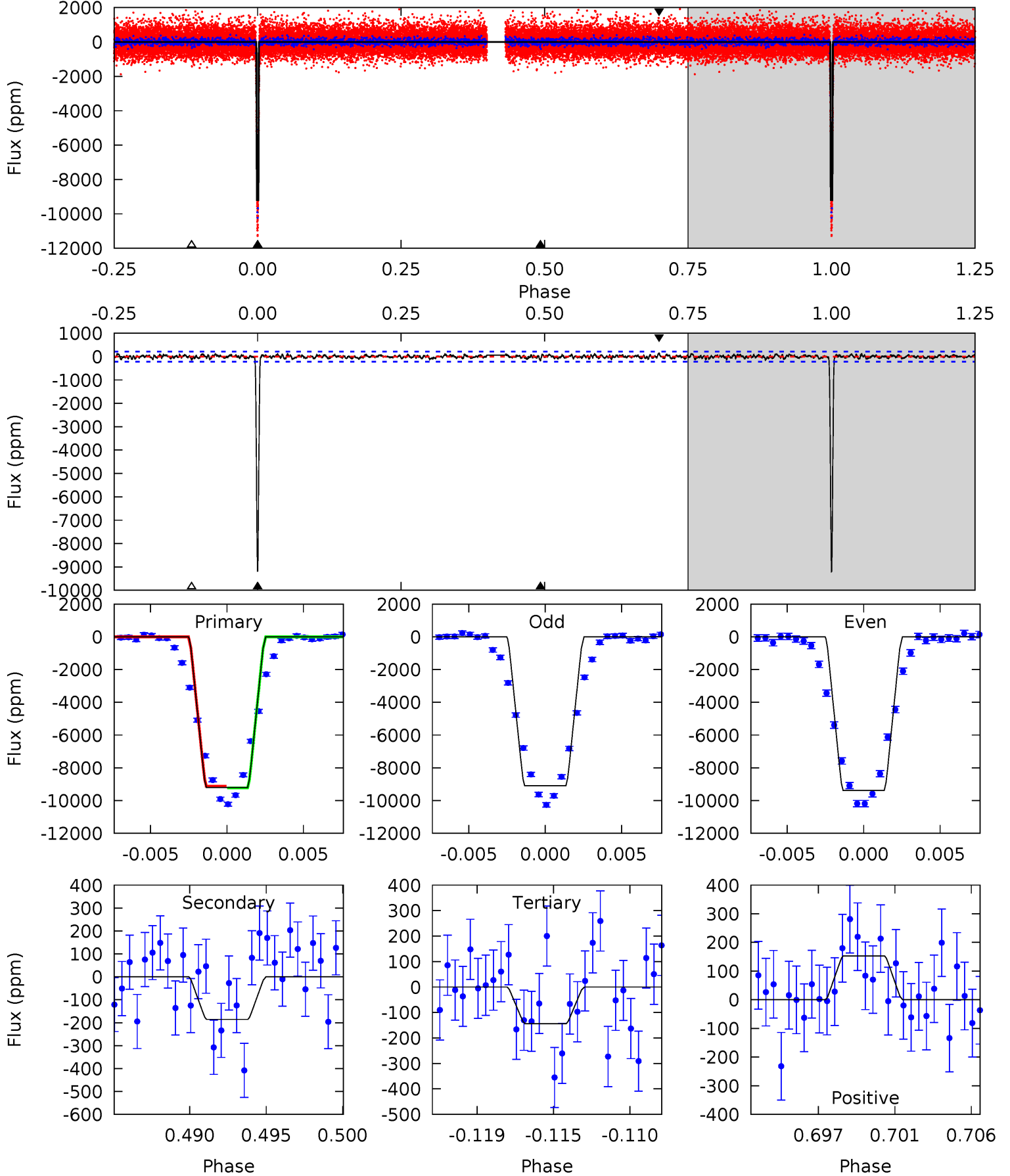
Pri	Sec	Ter	Pos	FA ₁	FA ₂	F _{Red}	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
312.8	4.74	4.34	4.23	5.09	2.69	1.54	308.4	308.5	0.40	0.51	2.15	1.00	0.01	0.01



Alt Model-Shift Uniqueness Test

008167978-02, P = 22.052729 Days, E = 142.386141 Days

Pri	Sec	Ter	Pos	FA ₁	FA ₂	F _{Red}	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
220.7	4.46	3.45	3.67	5.17	2.83	1.11	217.2	217.0	1.01	0.78	3.33	1.01	0.02	1.22



Stellar Parameters For KIC 008167978

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	5510^{+192}_{-192}	$4.608^{+0.032}_{-0.128}$	$-0.400^{+0.300}_{-0.300}$	$0.741^{+0.149}_{-0.064}$	$0.822^{+0.087}_{-0.095}$	$2.847^{+0.481}_{-1.065}$
	+3%/-3%	+1%/-3%	+75%/-75%	+20%/-9%	+11%/-12%	+17%/-37%
Source	KIC0	KIC0	KIC0	DSEP		

KIC = Kepler Input Catalog; PHO = Photometry; SPE = Spectroscopy; AST = Asteroseismology
 TRA = Transits; DESP = Dartmouth Models; MULT = Multiple Models

Secondary Eclipse Parameters for KIC 008167978-02 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	A_{obs}
DV	-151 ± 32	$13.02^{+4.19}_{-3.86}$	787^{+41}_{-35}	2409^{+235}_{-171}	10^{+10}_{-5}
Alt.	-186 ± 42	$8.89^{+3.93}_{-3.81}$	785^{+43}_{-35}	2735^{+473}_{-257}	27^{+54}_{-14}

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 $A_{obs} \gg 1.0$

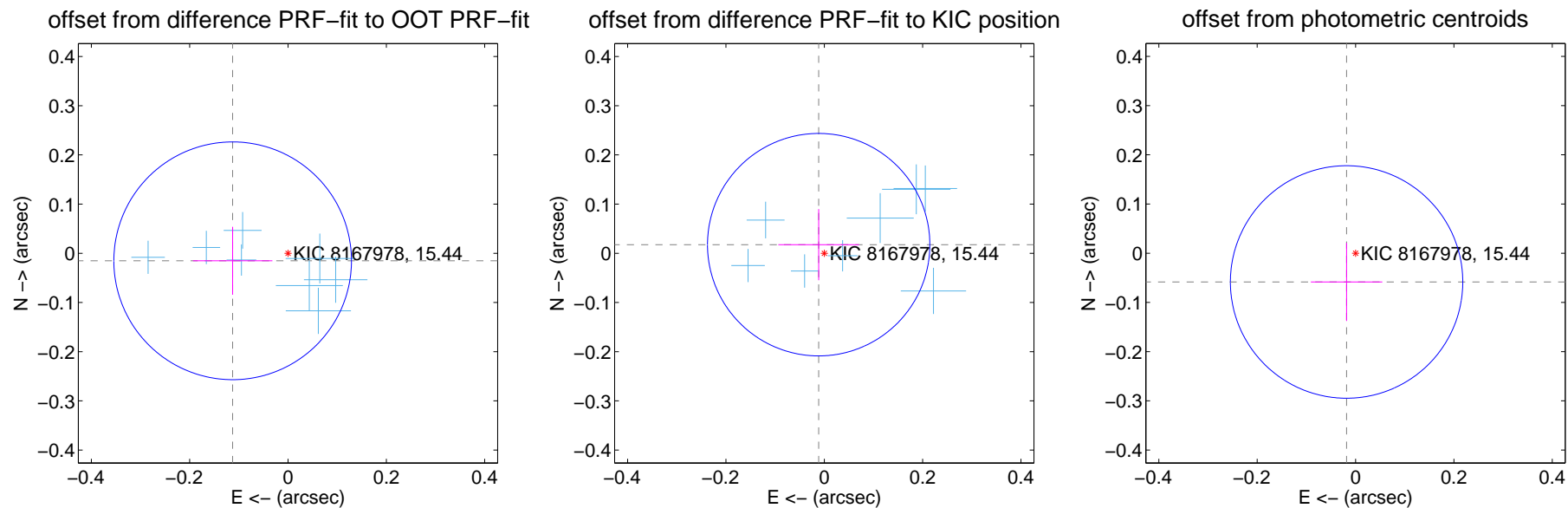
DV Centroid Data

Supplemental centroid analysis for 008167978-02. Kepler magnitude: 15.44. Transit SNR 177.26

There are 8 quarters with good PRF difference image offsets

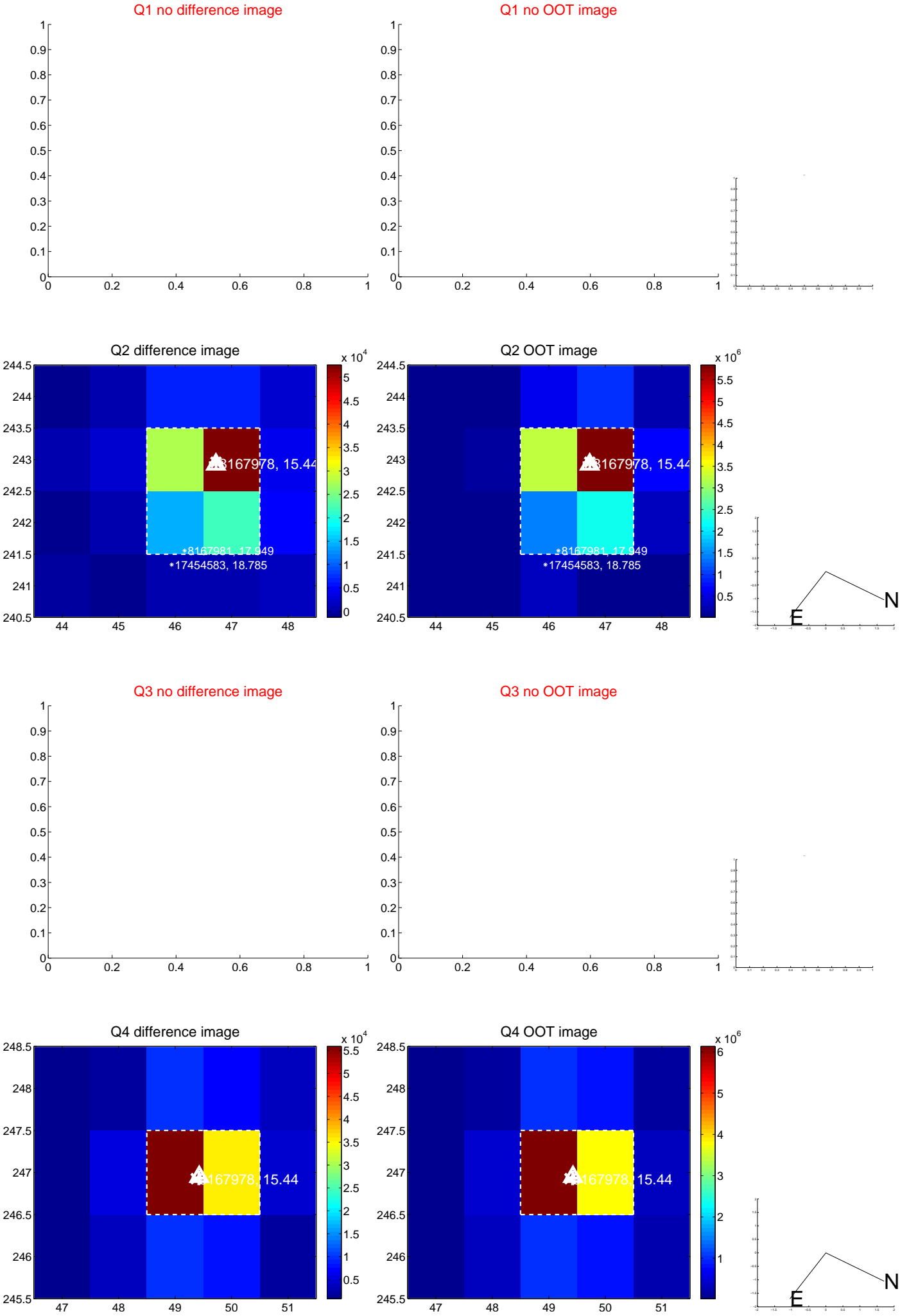
The direct PRF centroid is offset from the target star catalog position by about 0.22 arcsec

	Distance in arcsec	Distance / σ	Δ RA	Δ Dec
PRF-fit source offset from OOT	0.114 ± 0.081	1.41	0.113 ± 0.081	-0.015 ± 0.069
PRF-fit source offset from KIC position	0.021 ± 0.075	0.28	0.011 ± 0.082	0.018 ± 0.072
photometric centroid source offset	0.06 ± 0.08	0.78	0.02 ± 0.07	-0.06 ± 0.08

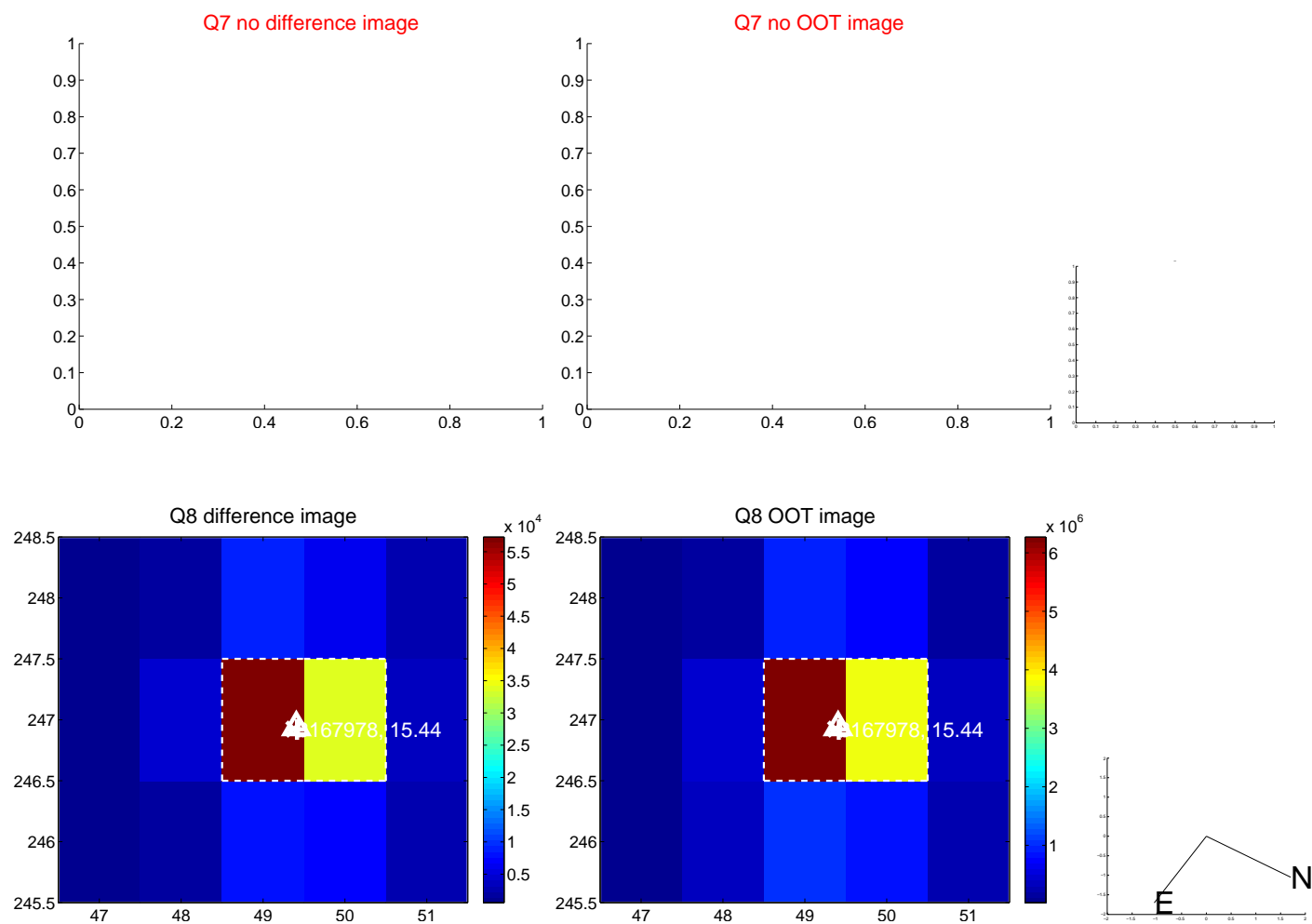
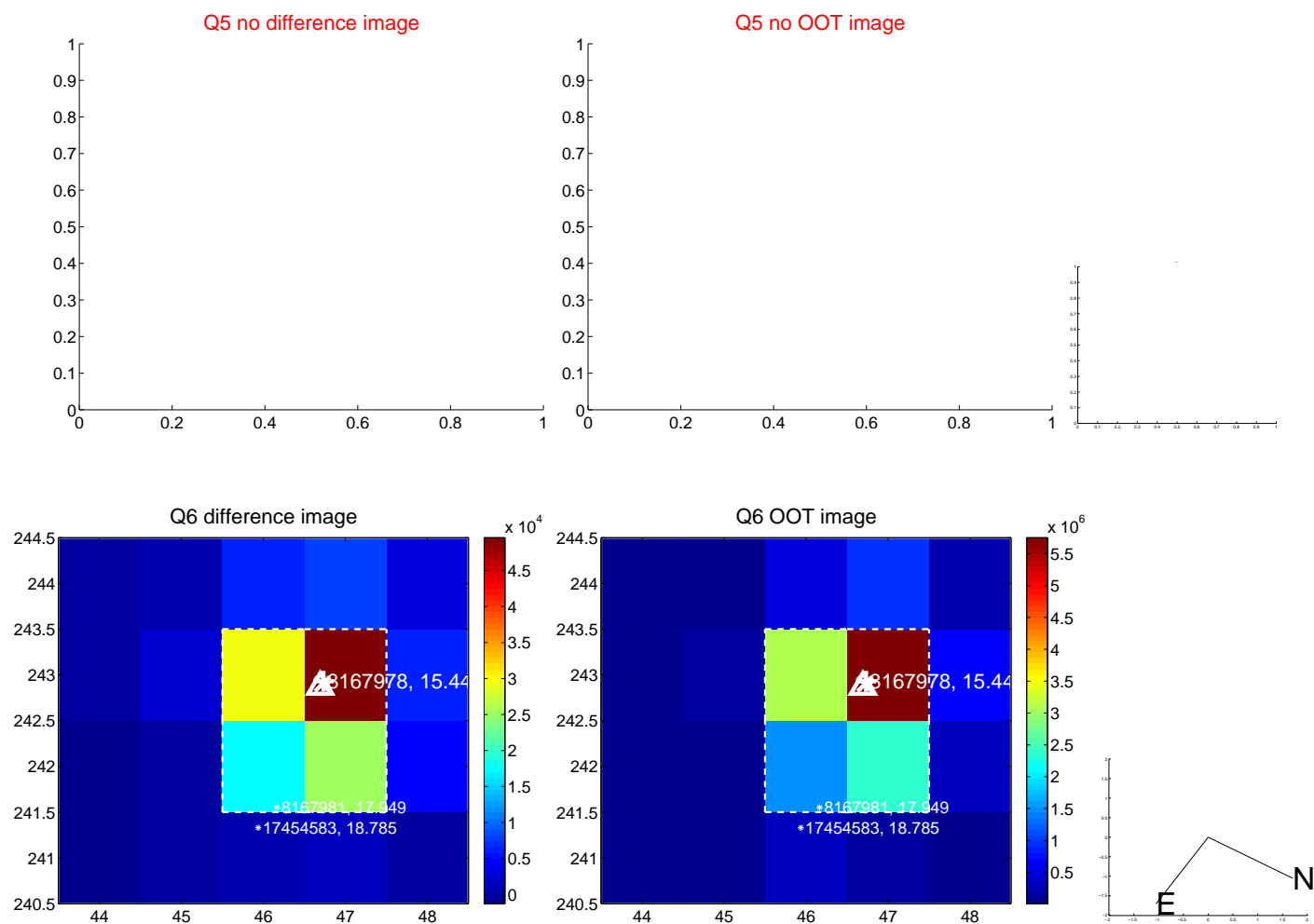


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- σ uncertainty. Blue circle: three- σ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

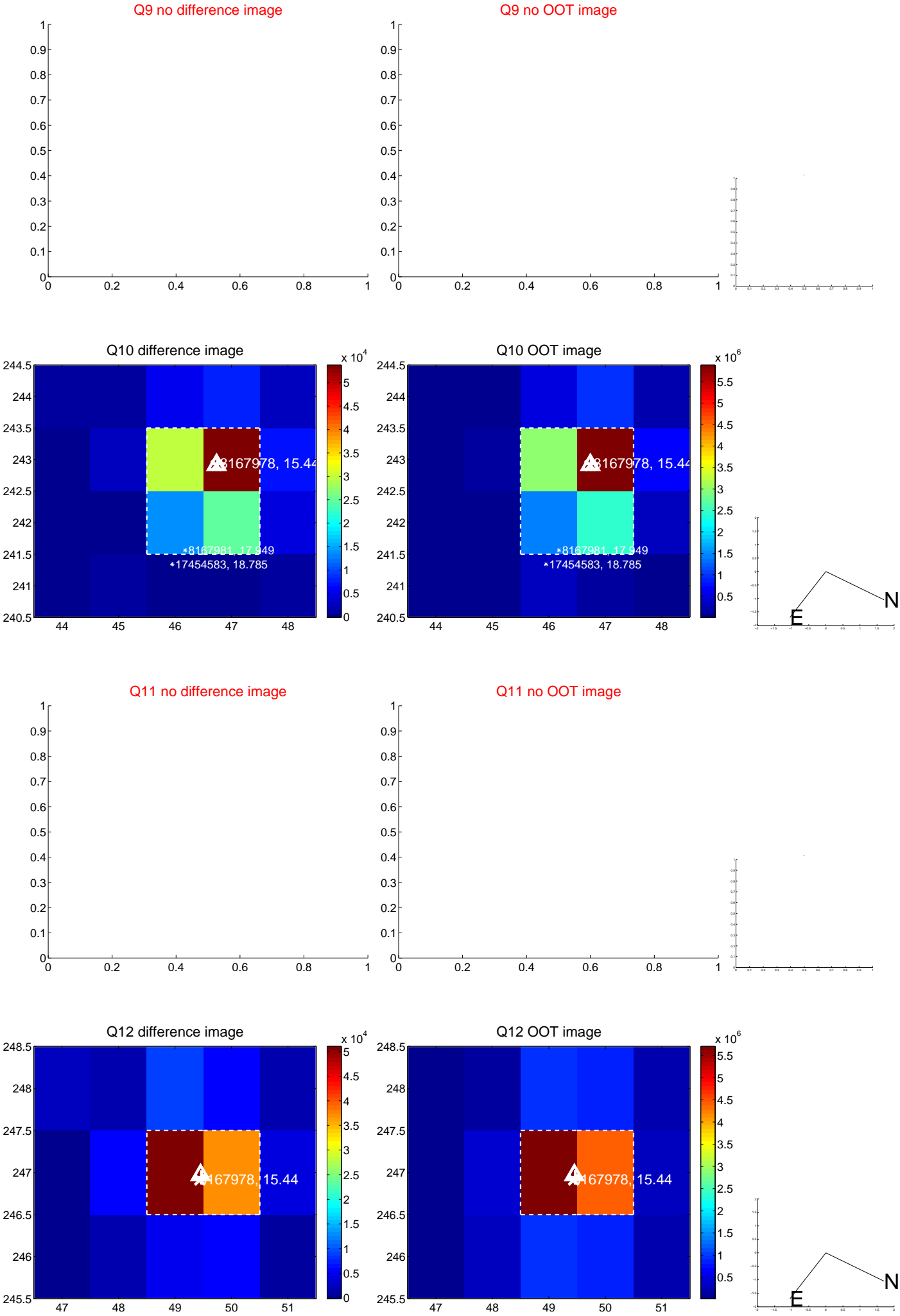
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



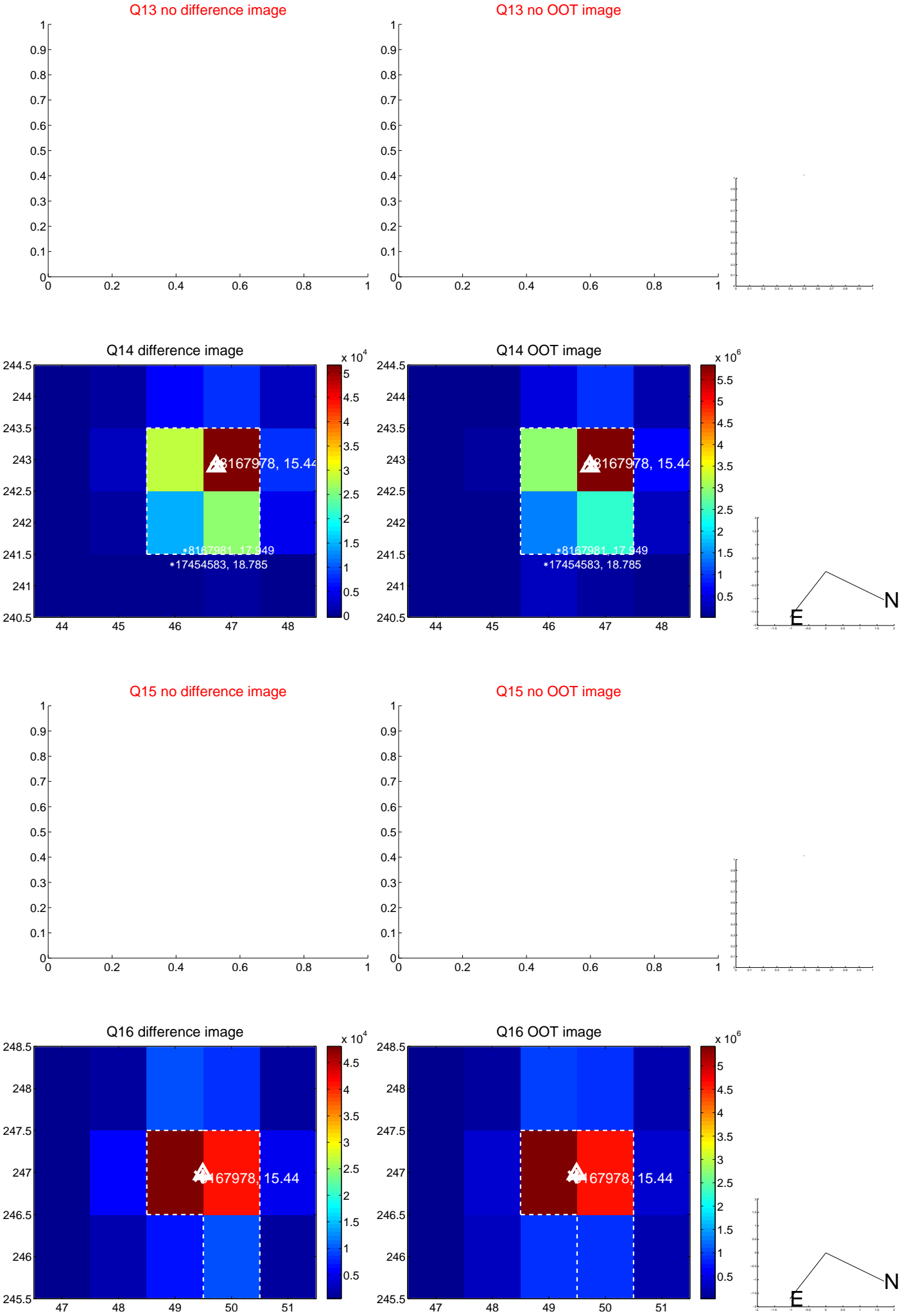
white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value



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

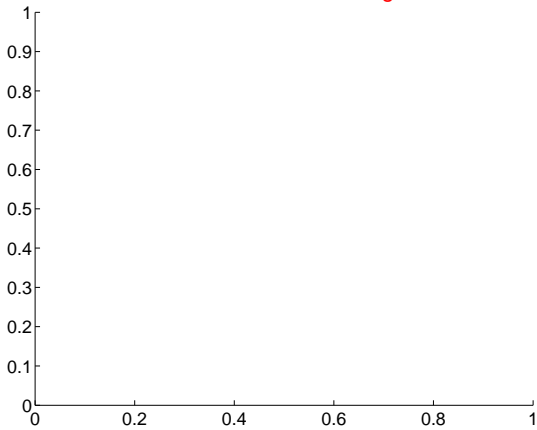


white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.

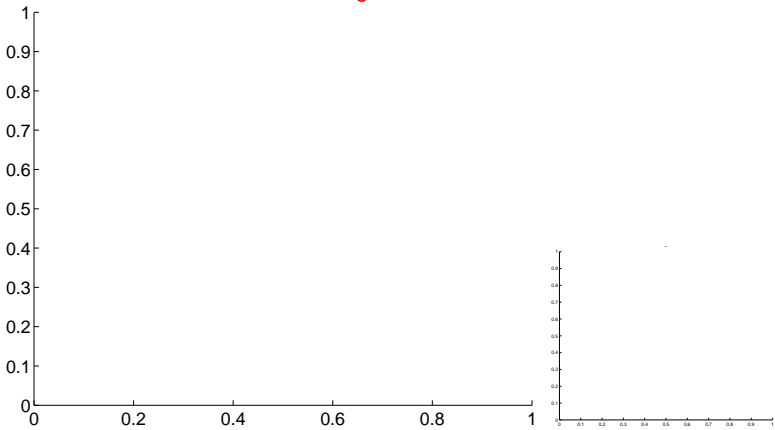


white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.

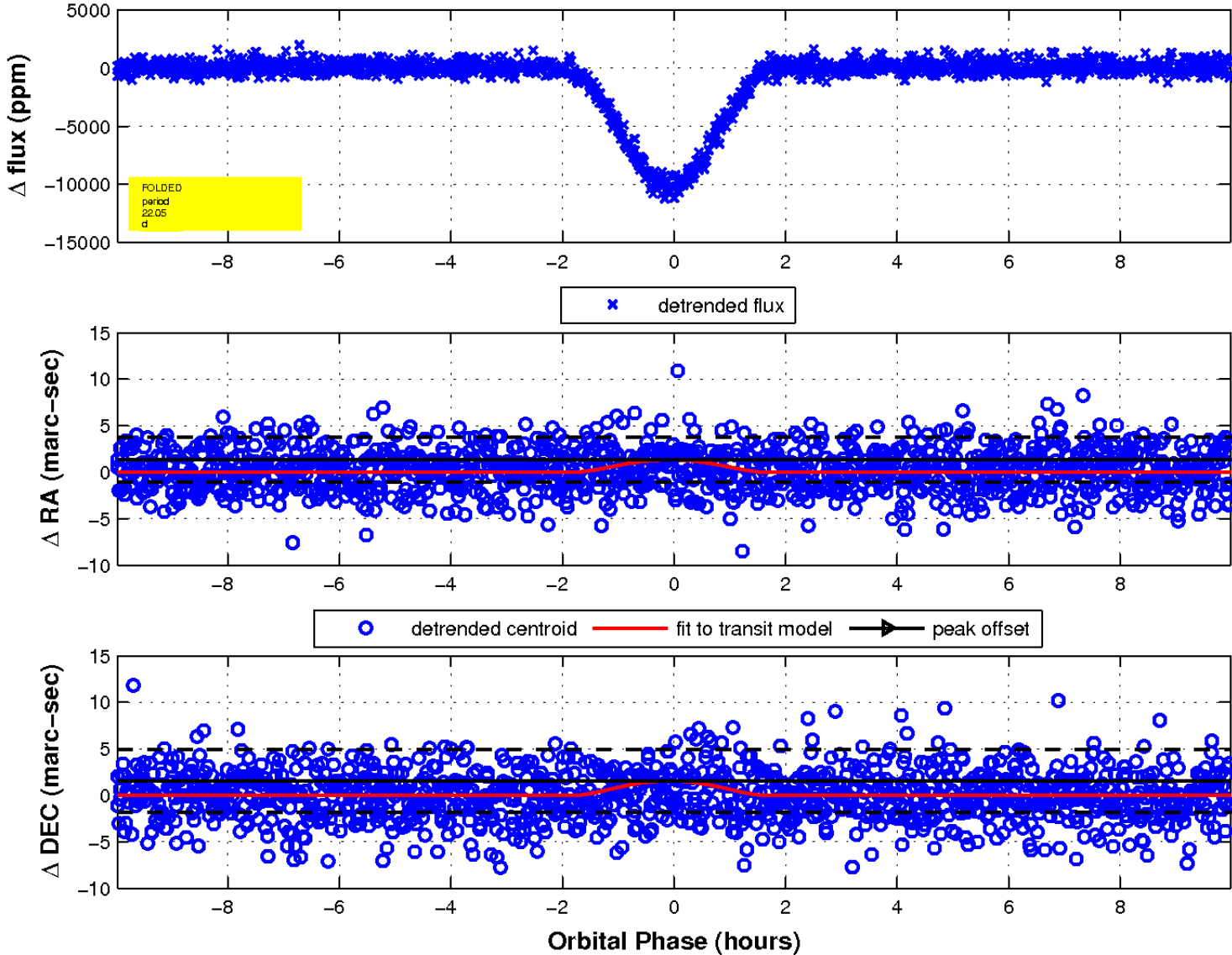
Q17 no difference image



Q17 no OOT image



fluxWeightedCentroids, Planet 2 of 2



UKIRT Image

Declination

