

KIC 008937021

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})
008937021-01	OBS	1394.01	5.663612	133.891674	675.9	1.457	58.4	26.7	0.72	4917	2.02	84.92
008937021-02	OBS	No	5.663588	131.989279	649.4	1.702	33.8	28.2	0.72	4917	2.27	84.92

Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
008937021-01	OBS	FP	0.00	0	1	1	1	MOD_SEC_DV—MOD_SEC_ALT—HAS_SEC_TCE—CENT_KIC_POS—HALO_GHOST—EPHEM_MATCH
008937021-02	OBS	FP	0.00	1	1	1	1	IS_SEC_TCE—CENT_KIC_POS—HALO_GHOST—EPHEM_MATCH

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 008937021-01

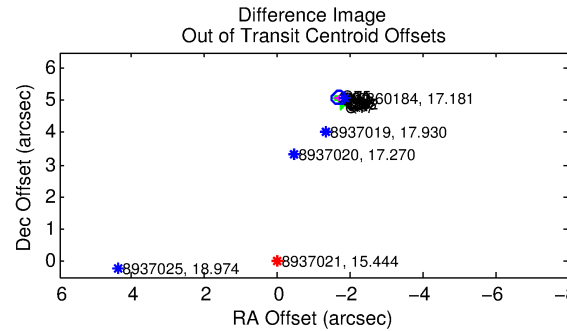
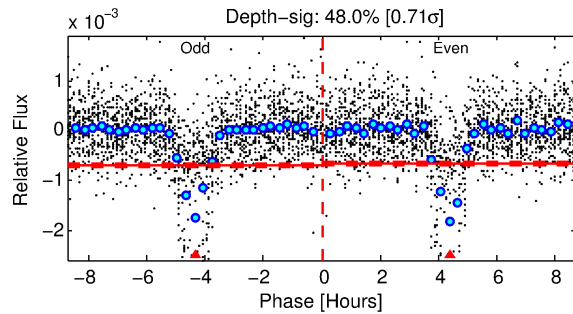
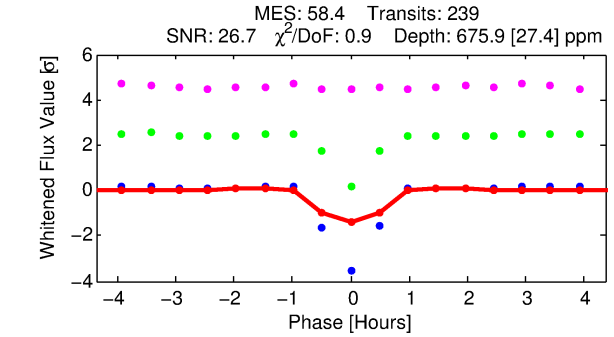
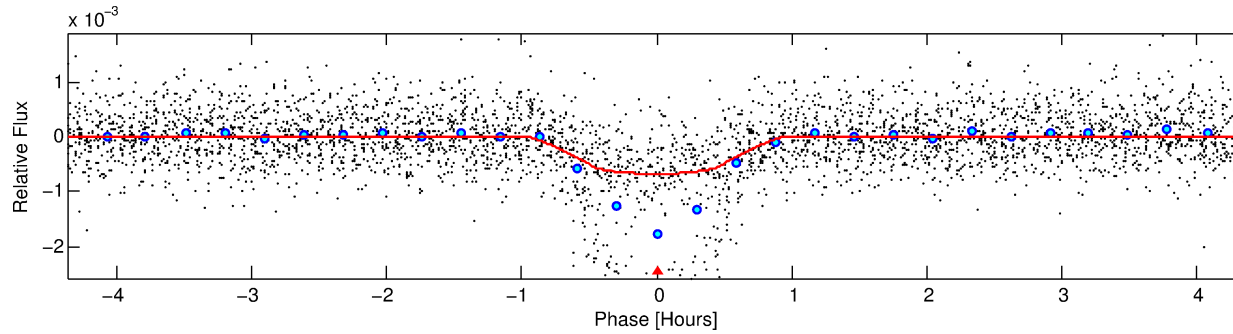
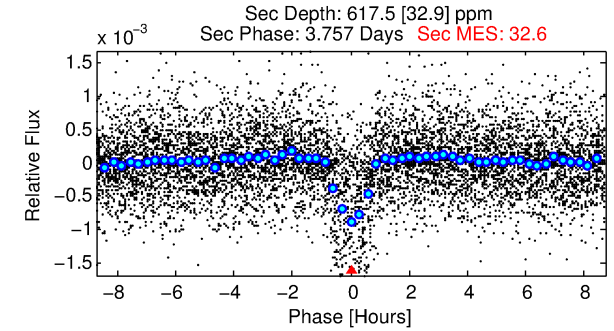
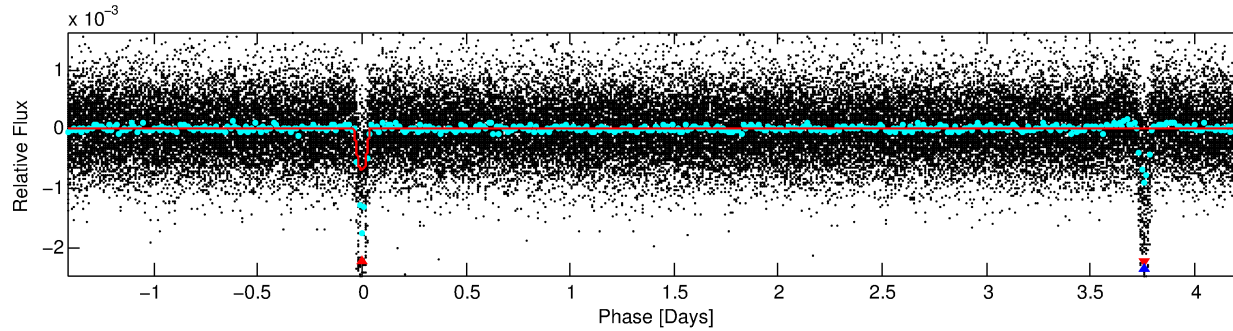
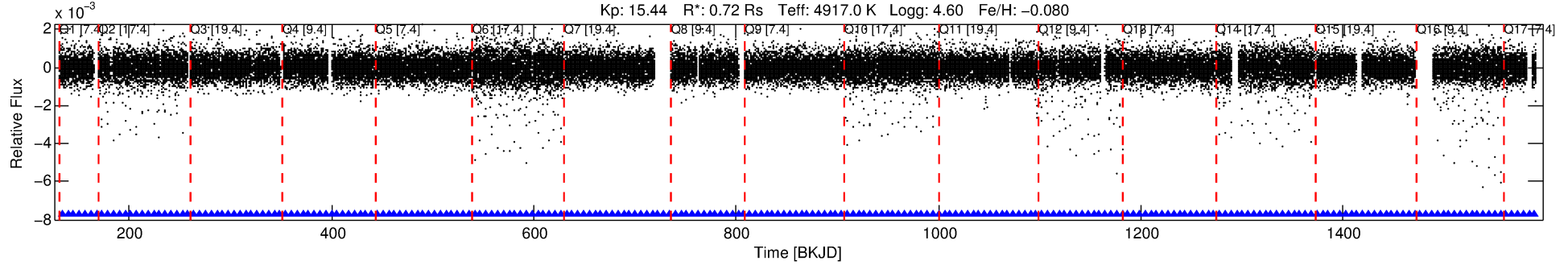
TCE (1)	KIC	Parent (2)	Parent KIC	$P_1:P_2$	Dist ($''$)	Δ Row	Δ Col	m_2	m_1	D_2/D_1	Mechanism	Flag	σ_P	σ_T
008937021-01	8937021	3754.01	8937019	1:1	4.2	0	1	17.93	15.44	307.74	Direct-PRF	0	0.08	0.03

Notes: $P_1:P_2$ is the period ratio. Dist is the distance in arcseconds. Δ Row and Δ Col are the number of pixels apart in row and column. m_2 and m_1 are the magnitudes of the parent and child. D_2/D_1 is the parent's transit depth divided by the child's. σ_P and σ_T are the significance of the match in period and epoch. For a match to be considered significant $\sigma_P < 5.0$ and $\sigma_T < 5.0$. Matches which have σ_P and σ_T very close to this cutoff should receive extra scrutiny, especially if the period ratio is very large.

DV One-Page Summary

KIC: 8937021 Candidate: 1 of 2 Period: 5.664 d
KOI: K01394.01 Corr: 0.980

Kp: 15.44 R*: 0.72 Rs Teff: 4917.0 K Logg: 4.60 Fe/H: -0.080



DV Fit Results:

Period = 5.66361 [0.00001] d
Epoch = 133.8917 [0.0012] BKJD
Rp/R* = 0.0256 [0.0161]
a/R* = 22.24 [47.22]
b = 0.70 [1.59]
Seff = 84.92 [13.54]
Teq = 774 [31] K
Rp = 2.02 [1.29] Re
a = 0.0568 [0.0043] AU
Ag = 269.14 [340.49] [0.79σ]
Teff = 4847 [1535] K [2.65σ]

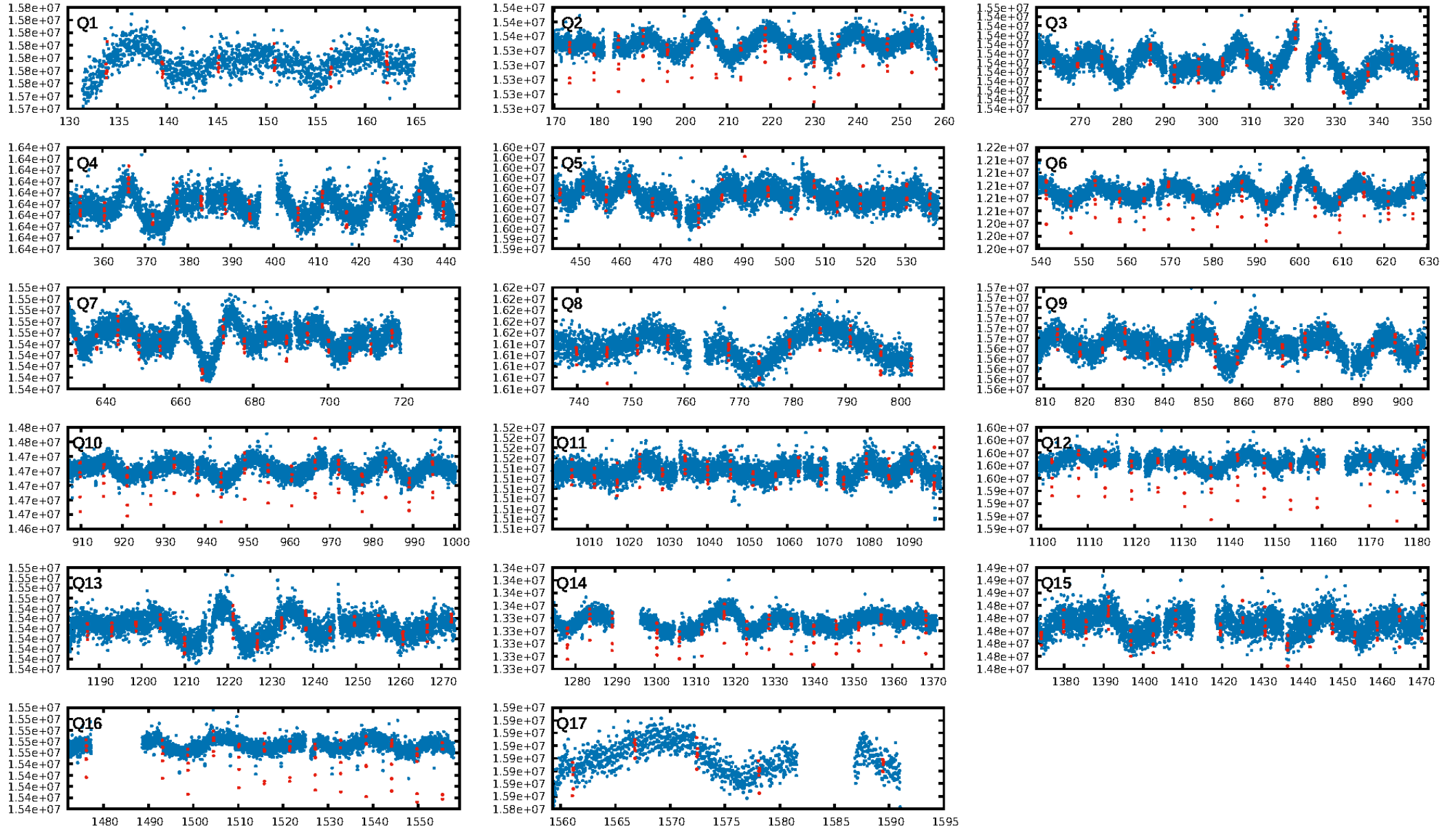
DV Diagnostic Results:

ShortPeriod-sig: 0.0% [0.00σ]
LongPeriod-sig: N/A
ModelChiSquare2-sig: N/A
ModelChiSquareGoF-sig: N/A
Bootstrap-pfa: 0.00e+00
RollingBand-fgt: 1.00 [228/228]
GhostDiagnostic-chr: -0.2364
Centroid-sig: 0.0%
Centroid-so: 32.580 arcsec [84.76σ]
OotOffset-rm: 5.353 arcsec [76.49σ]
KicOffset-rm: 5.419 arcsec [75.06σ]
OotOffset-st: 4/4/4/5 [17]
KicOffset-st: 4/4/4/5 [17]
DiffImageQuality-fgm: 1.00 [17/17]
DiffImageOverlap-fno: 1.00 [17/17]

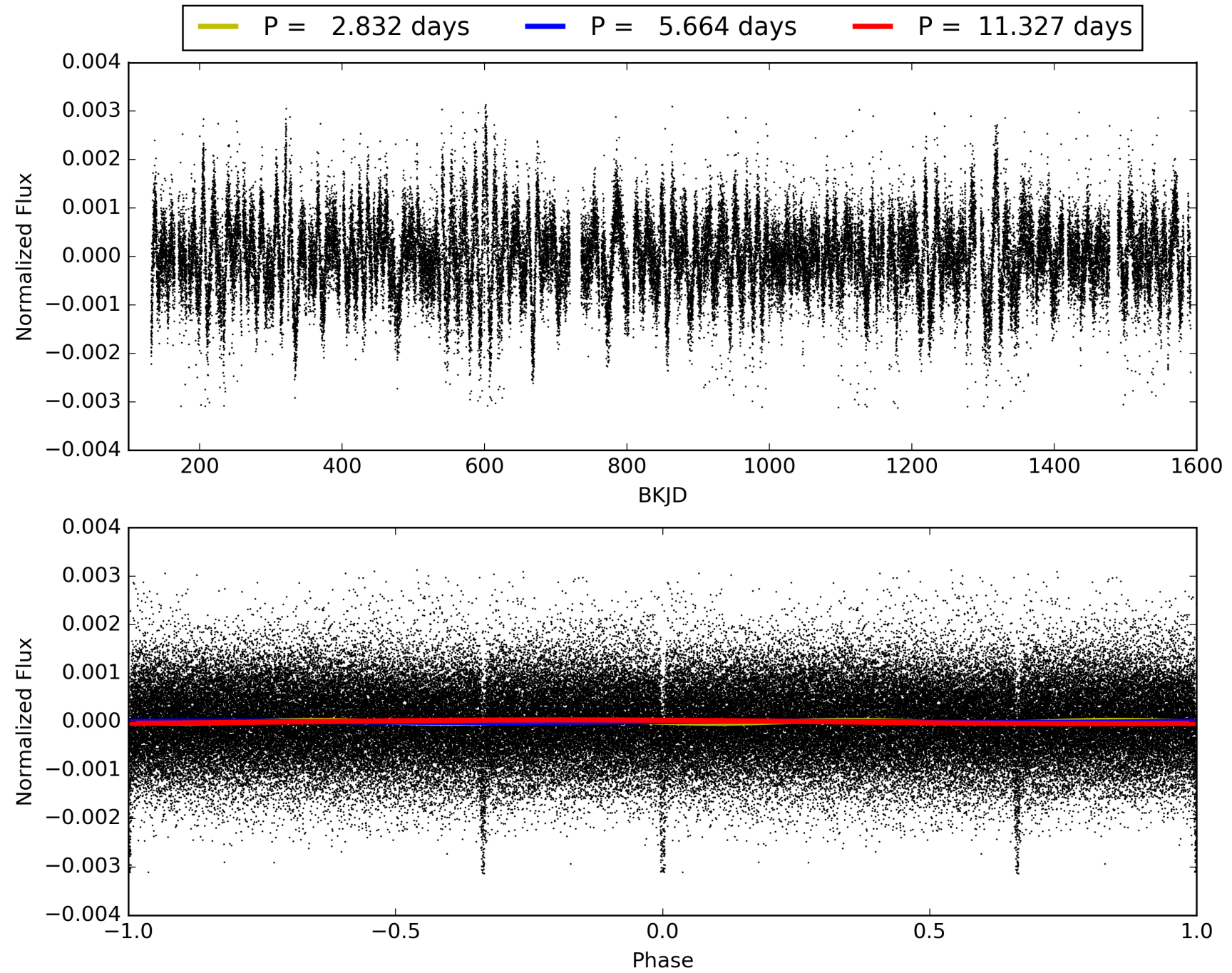
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 01-Feb-2016 09:19:29 Z

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

TCE 008937021-01, PDC Light Curves

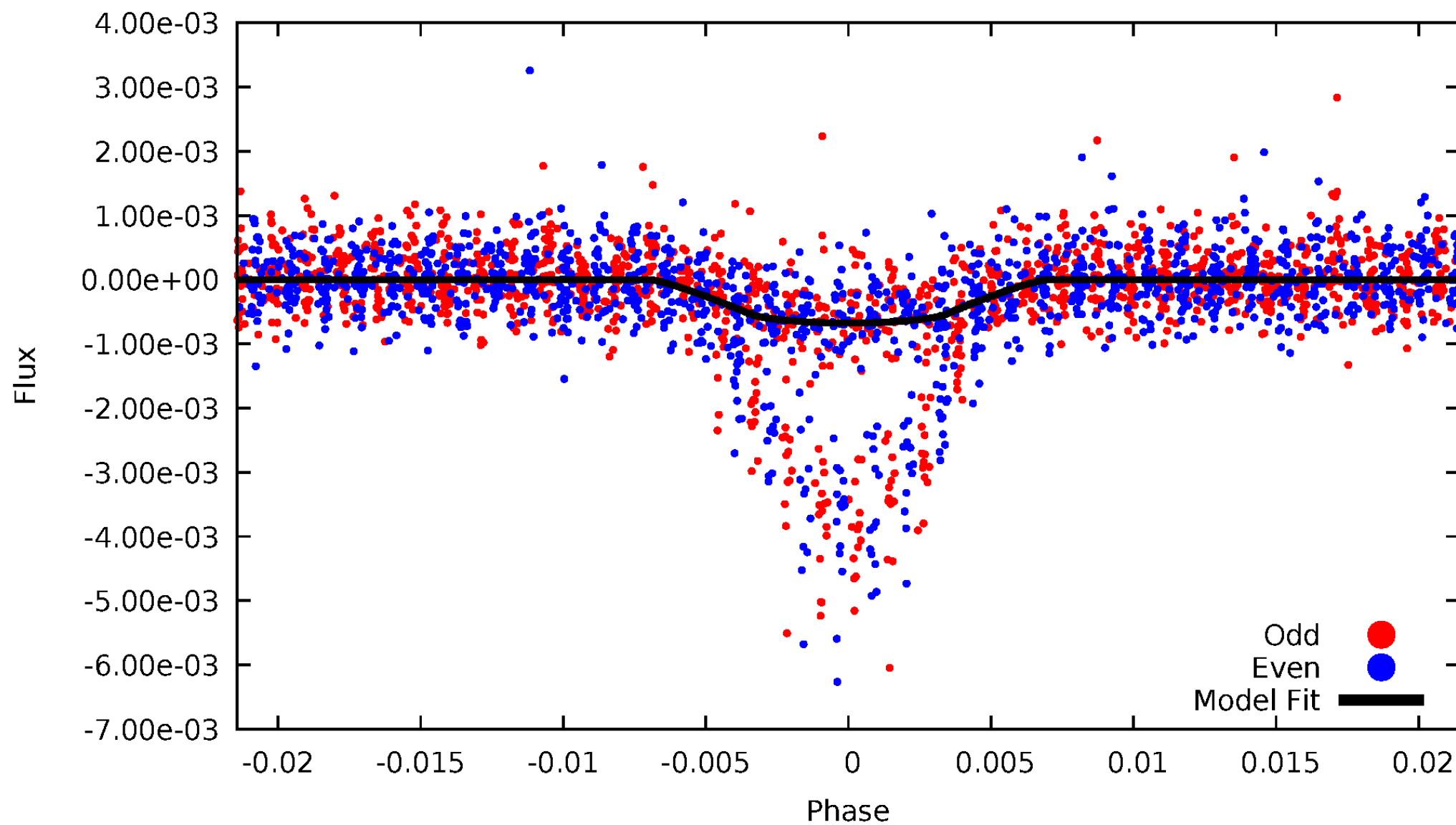


TCE 008937021-01



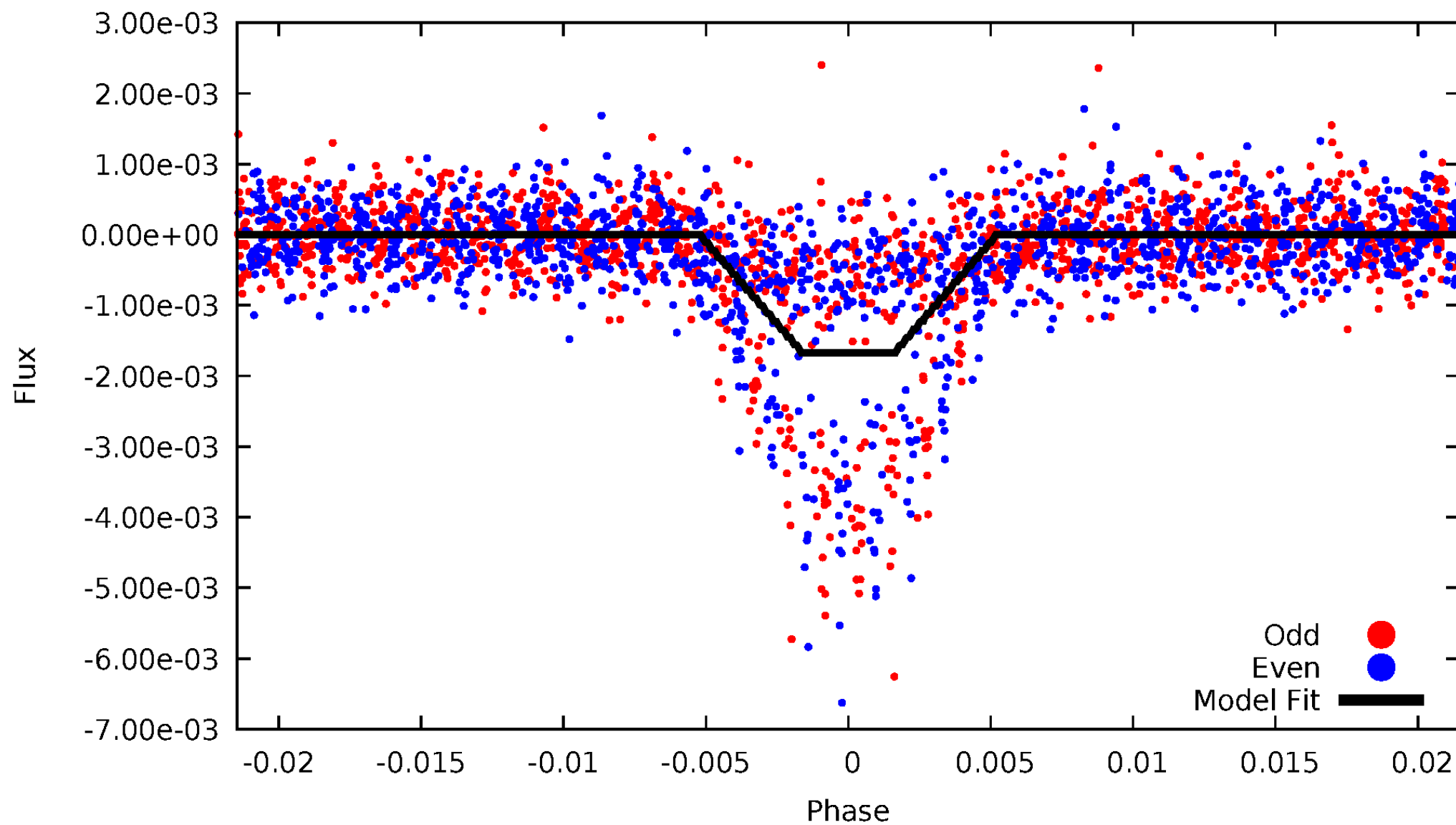
DV Odd/Even

TCE 008937021-01



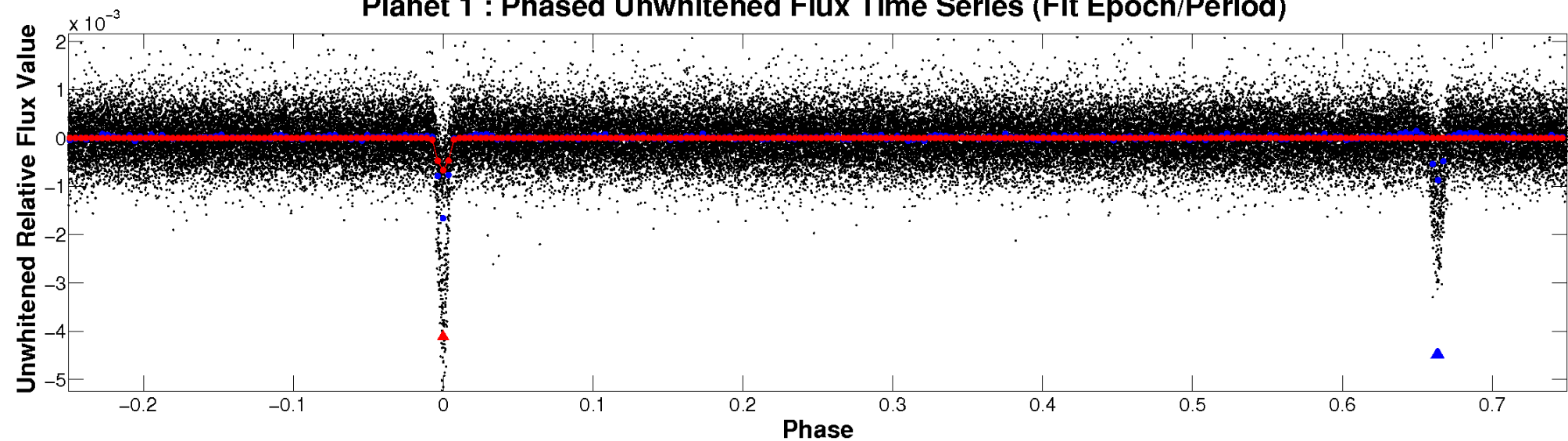
ALT Odd/Even

TCE 008937021-01

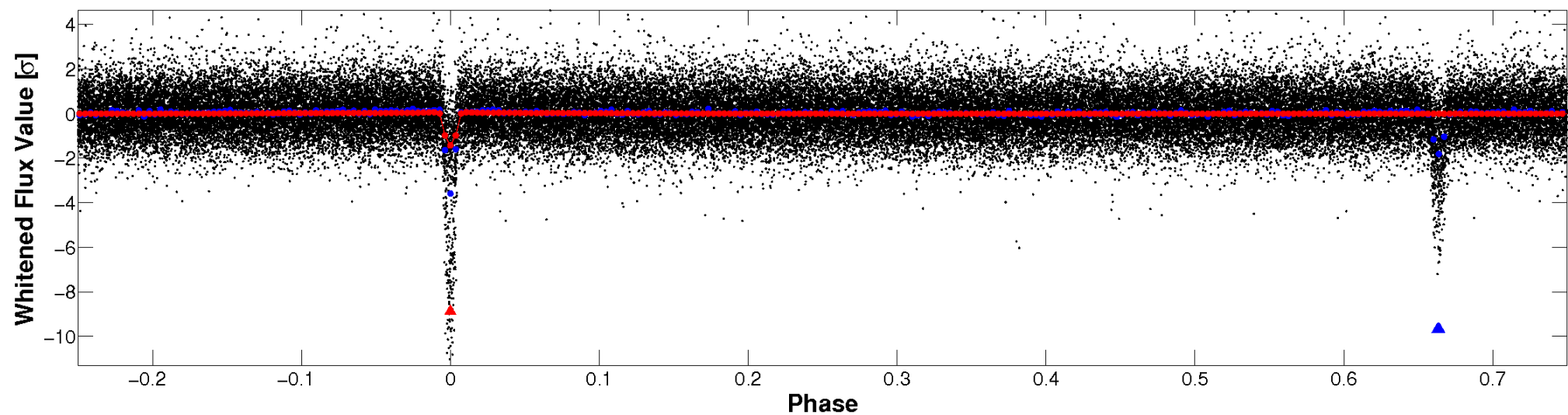


Non-Whitened Vs. Whitened Light Curve

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

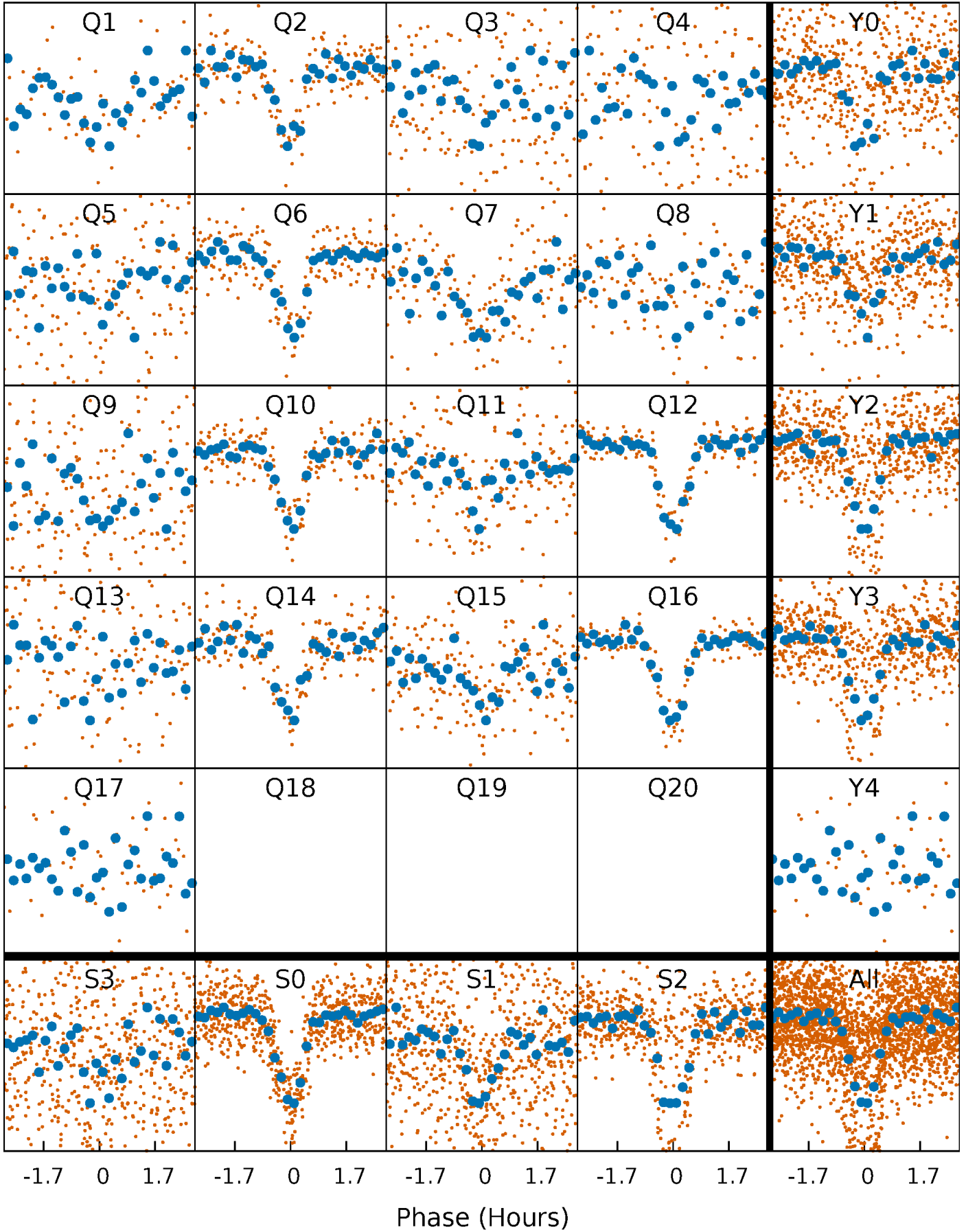


Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)



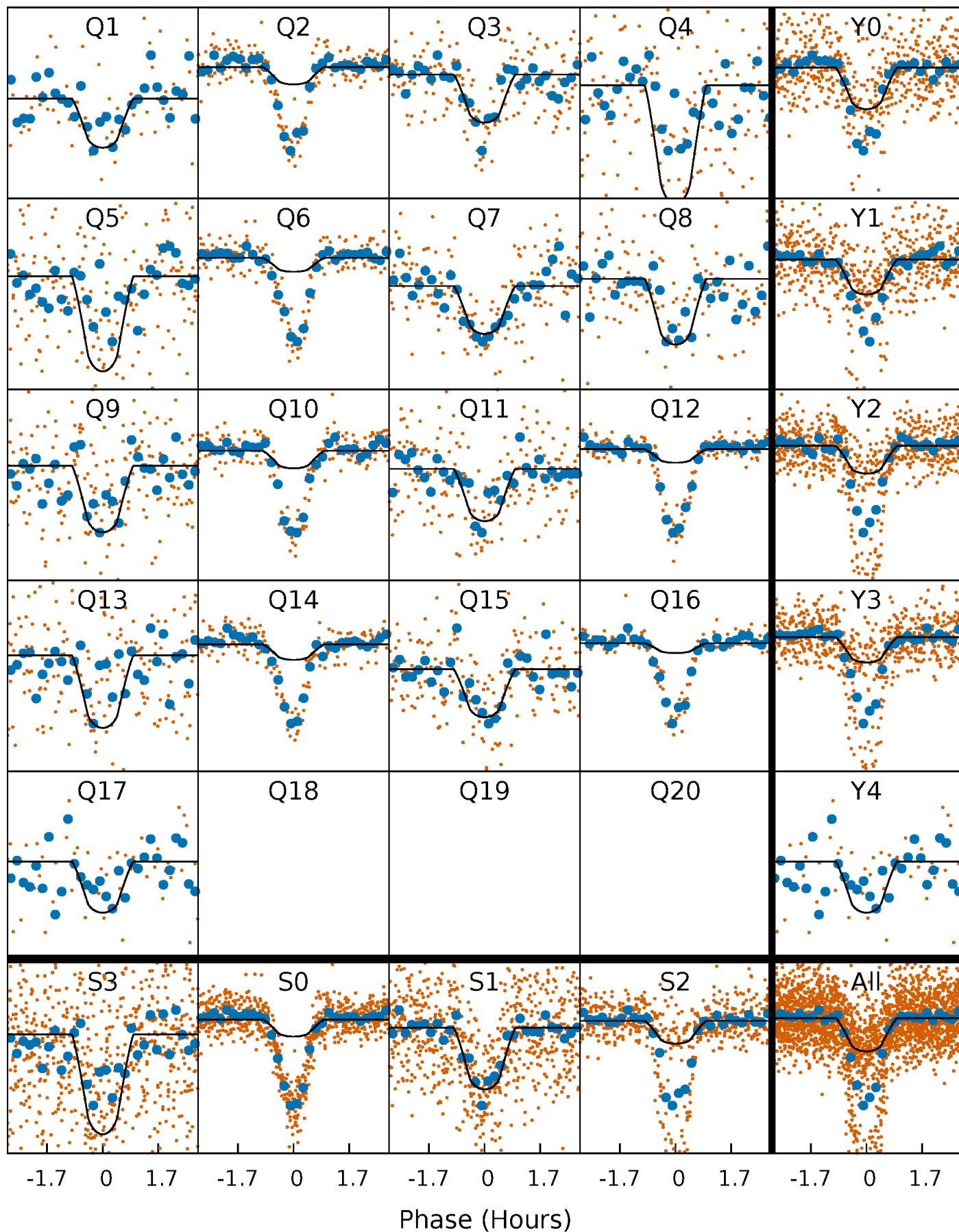
PDC Quarter-Phased Transit Curves

TCE 008937021-01 P= 5.663612 Days $T_0=133.891674$ (BKJD)



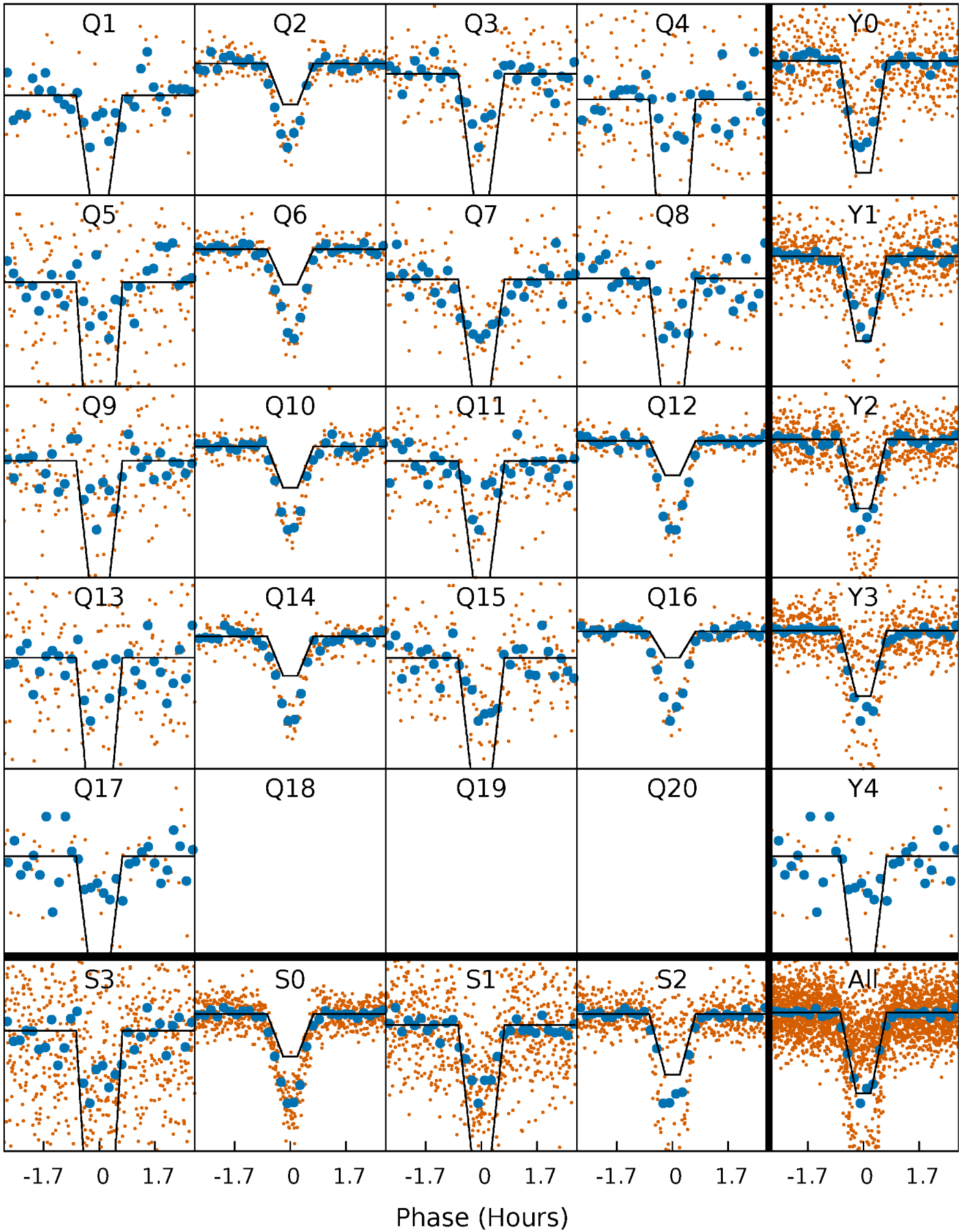
DV Quarter-Phased Transit Curves

TCE 008937021-01 P= 5.663612 Days $T_0=133.891674$ (BKJD)



Alt. Detrend Quarter-Phased Transit Curves

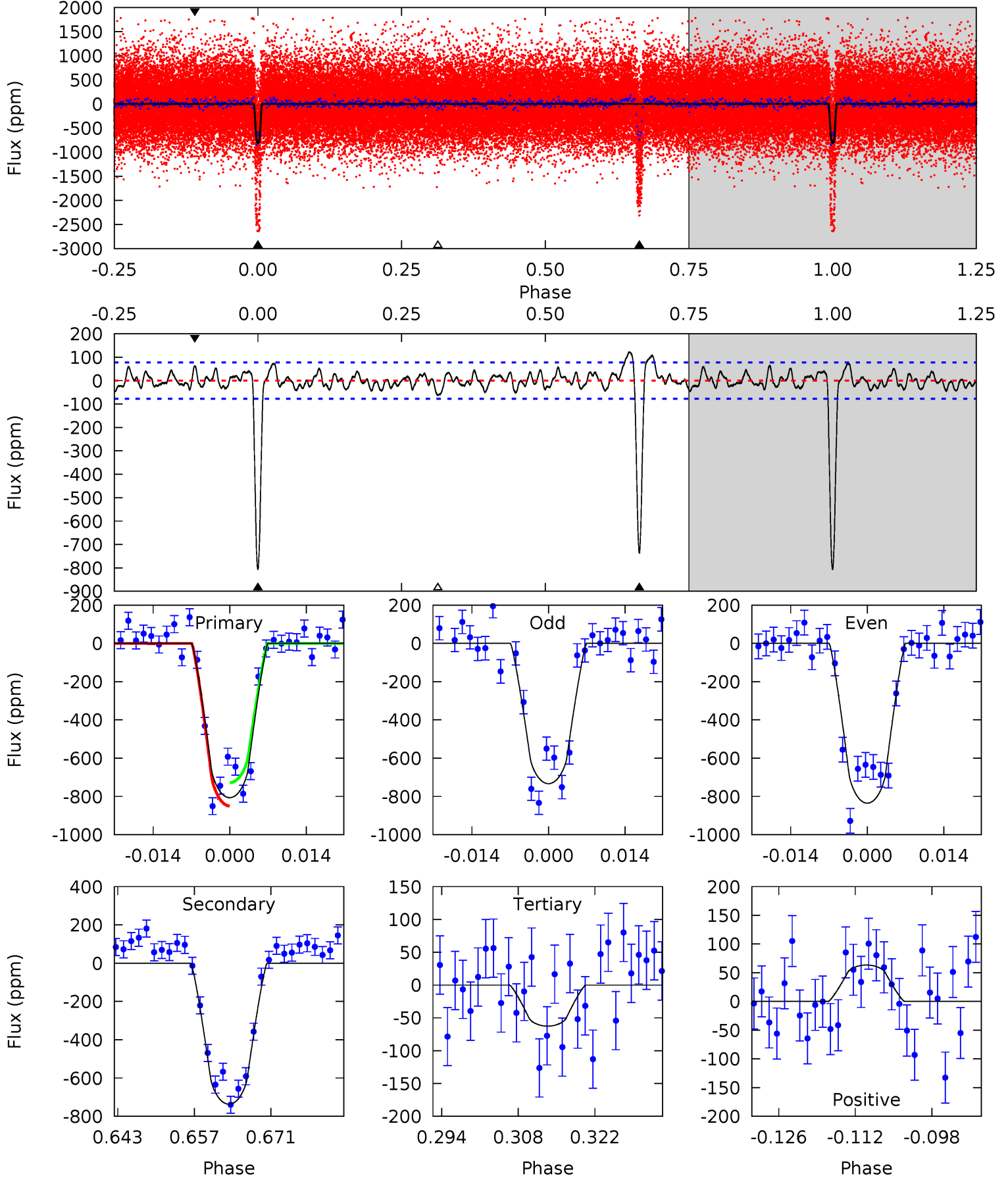
TCE 008937021-01 P= 5.663606 Days $T_0=133.892224$ (BKJD)



DV Model-Shift Uniqueness Test

008937021-01, P = 5.663612 Days, E = 128.228062 Days

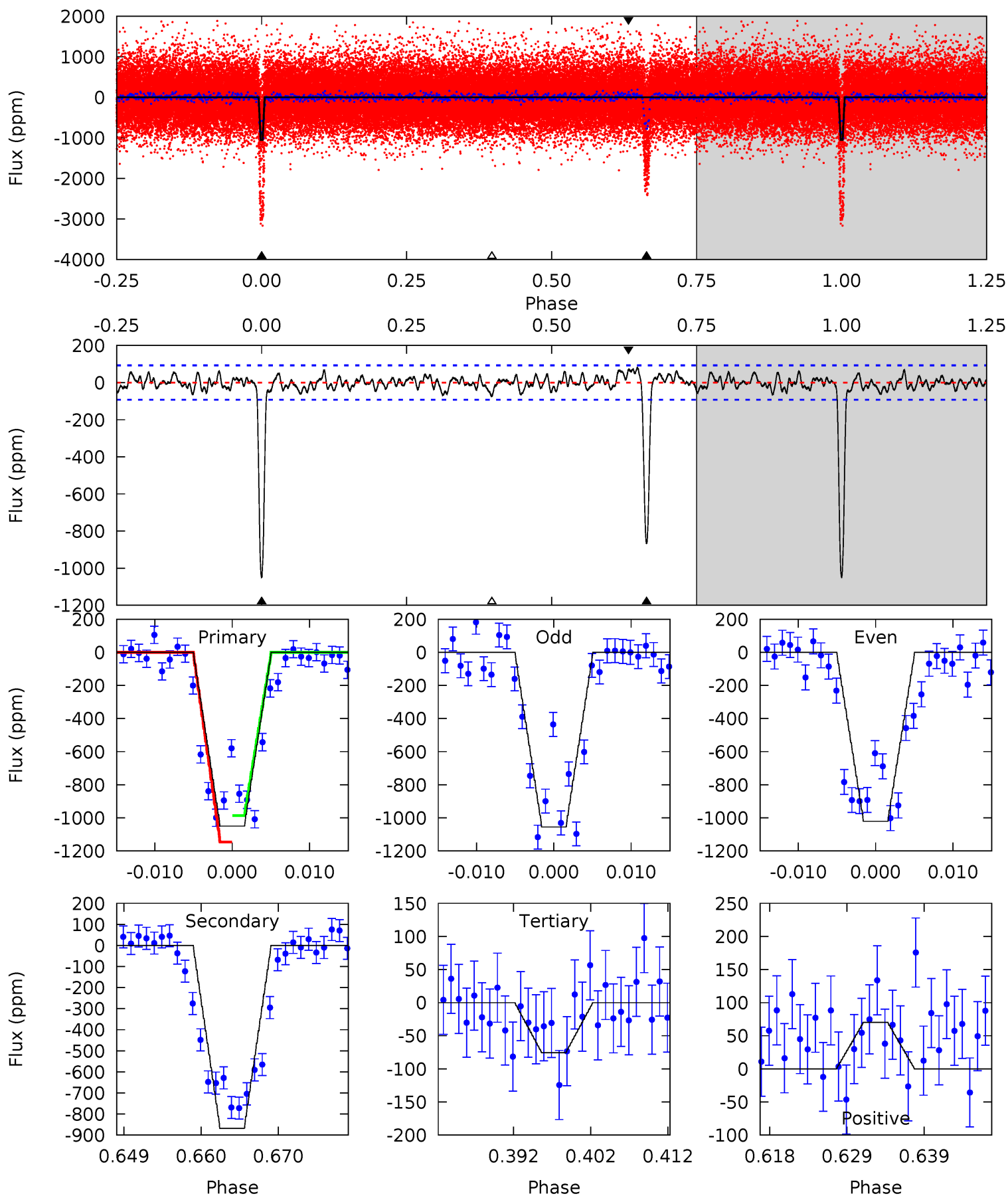
Pri	Sec	Ter	Pos	FA ₁	FA ₂	F _{Red}	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
51.7	47.3	4.02	4.07	4.96	2.46	1.90	47.7	47.7	43.2	43.2	3.27	1.90	0.13	3.84



Alt Model-Shift Uniqueness Test

008937021-01, P = 5.663606 Days, E = 128.228618 Days

Pri	Sec	Ter	Pos	FA ₁	FA ₂	F _{Red}	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
56.9	47.0	4.09	3.80	5.02	2.57	1.57	52.8	53.1	43.0	43.2	0.93	1.96	0.07	0



Stellar Parameters For KIC 008937021

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (g \cdot \text{cm}^{-3})$
	4917^{+148}_{-133}	$4.601^{+0.036}_{-0.054}$	$-0.080^{+0.300}_{-0.300}$	$0.723^{+0.069}_{-0.057}$	$0.761^{+0.069}_{-0.069}$	$2.834^{+0.514}_{-0.565}$
	+3%/-3%	+1%/-1%	+375%/-375%	+10%/-8%	+9%/-9%	+18%/-20%
Source	PHO1	KIC0	KIC0	DSEP		

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

Secondary Eclipse Parameters for KIC 008937021-01 / KOI 1394.01

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	A_{obs}
DV	-736 ± 16	$2.07^{+1.32}_{-1.01}$	1086^{+42}_{-36}	5022^{+1951}_{-919}	304^{+838}_{-191}
Alt.	-868 ± 18	$3.21^{+1.35}_{-1.29}$	1087^{+39}_{-34}	4378^{+1022}_{-519}	153^{+272}_{-78}

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 $A_{obs} \gg 1.0$

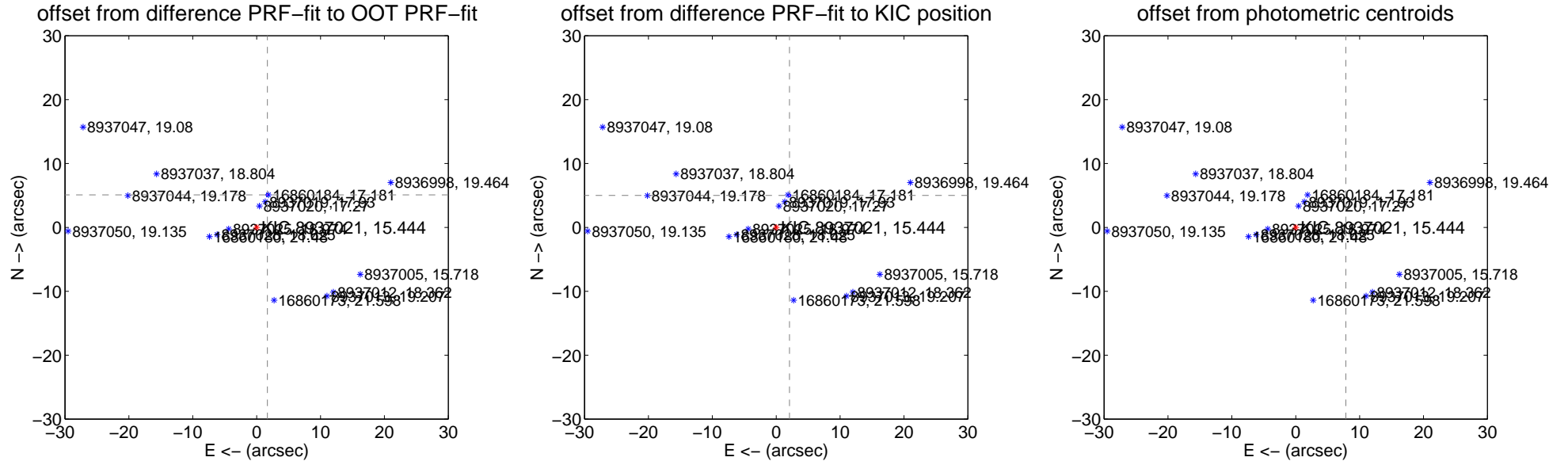
DV Centroid Data

Supplemental centroid analysis for 008937021-01. Kepler magnitude: 15.44. Transit SNR 26.71

There are 17 quarters with good PRF difference image offsets

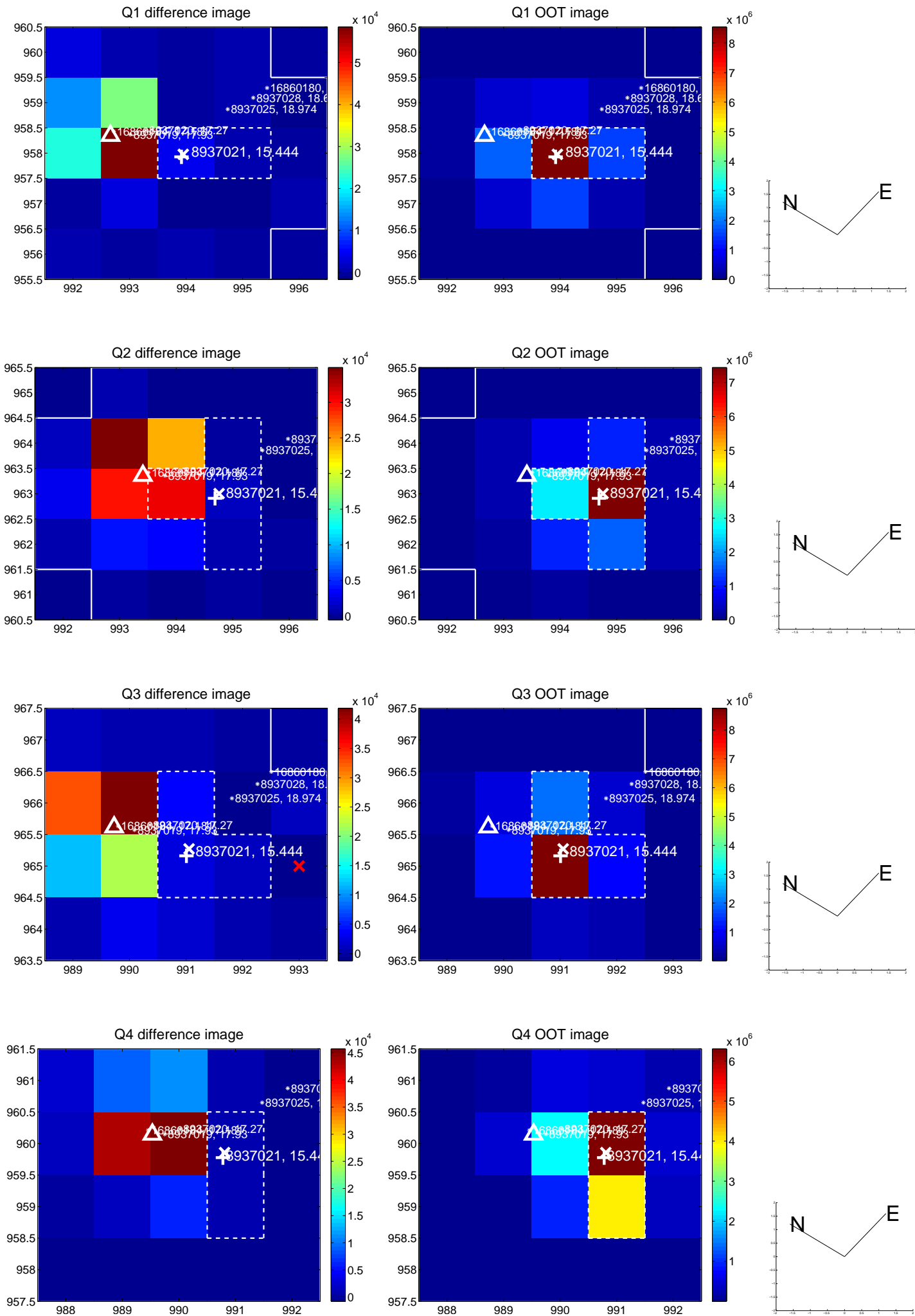
The direct PRF centroid is offset from the target star catalog position by about 0.29 arcsec

	Distance in arcsec	Distance / σ	Δ RA	Δ Dec
PRF-fit source offset from OOT	5.353 \pm 0.070	76.49	-1.679 \pm 0.071	5.083 \pm 0.073
PRF-fit source offset from KIC position	5.419 \pm 0.072	75.06	-2.074 \pm 0.069	5.007 \pm 0.075
photometric centroid source offset	32.58 \pm 0.38	84.76	-7.84 \pm 0.34	31.62 \pm 0.39

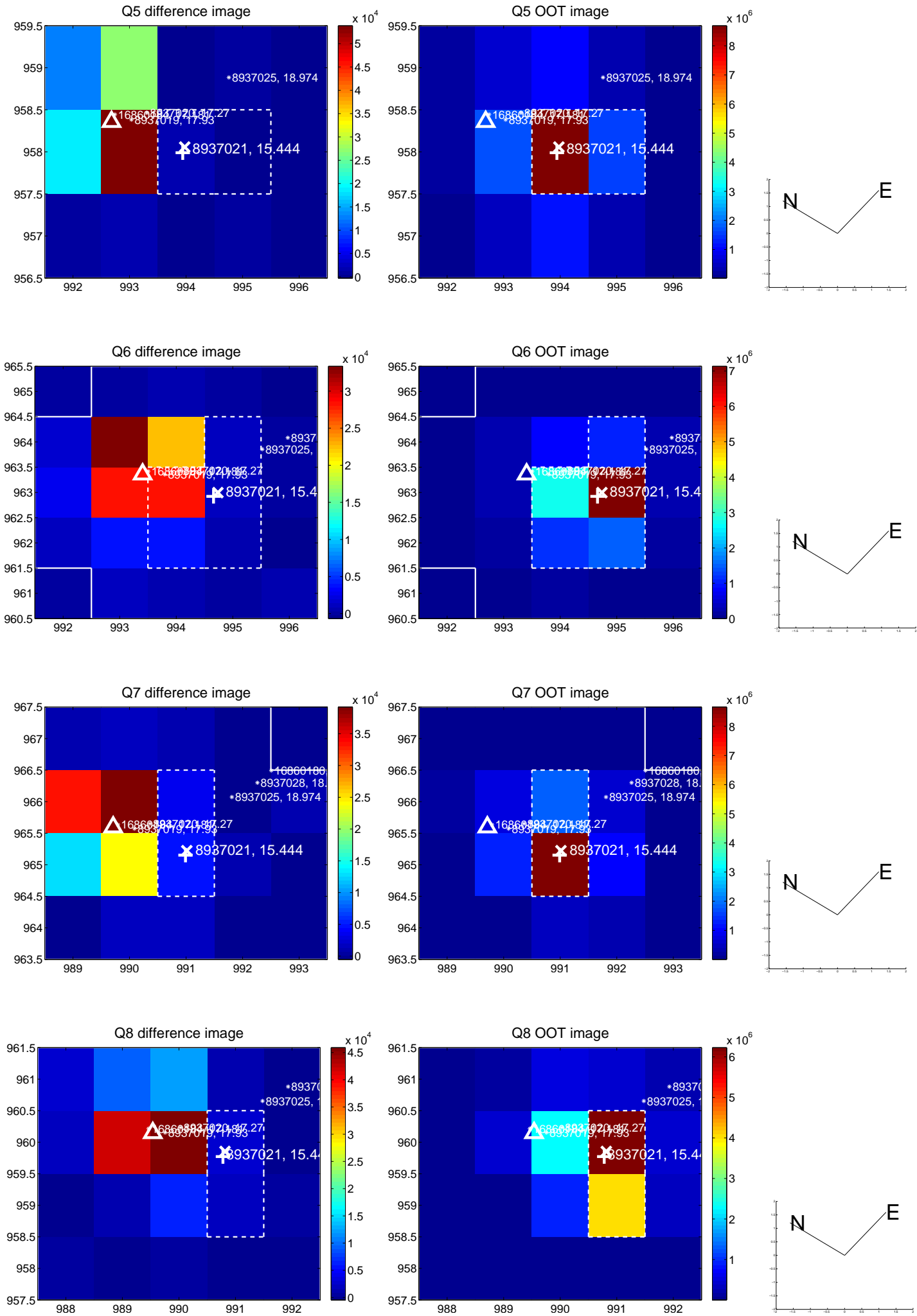


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets**; magenta cross: average over quarters. Length of the crosses: one- σ uncertainty. Blue circle: three-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

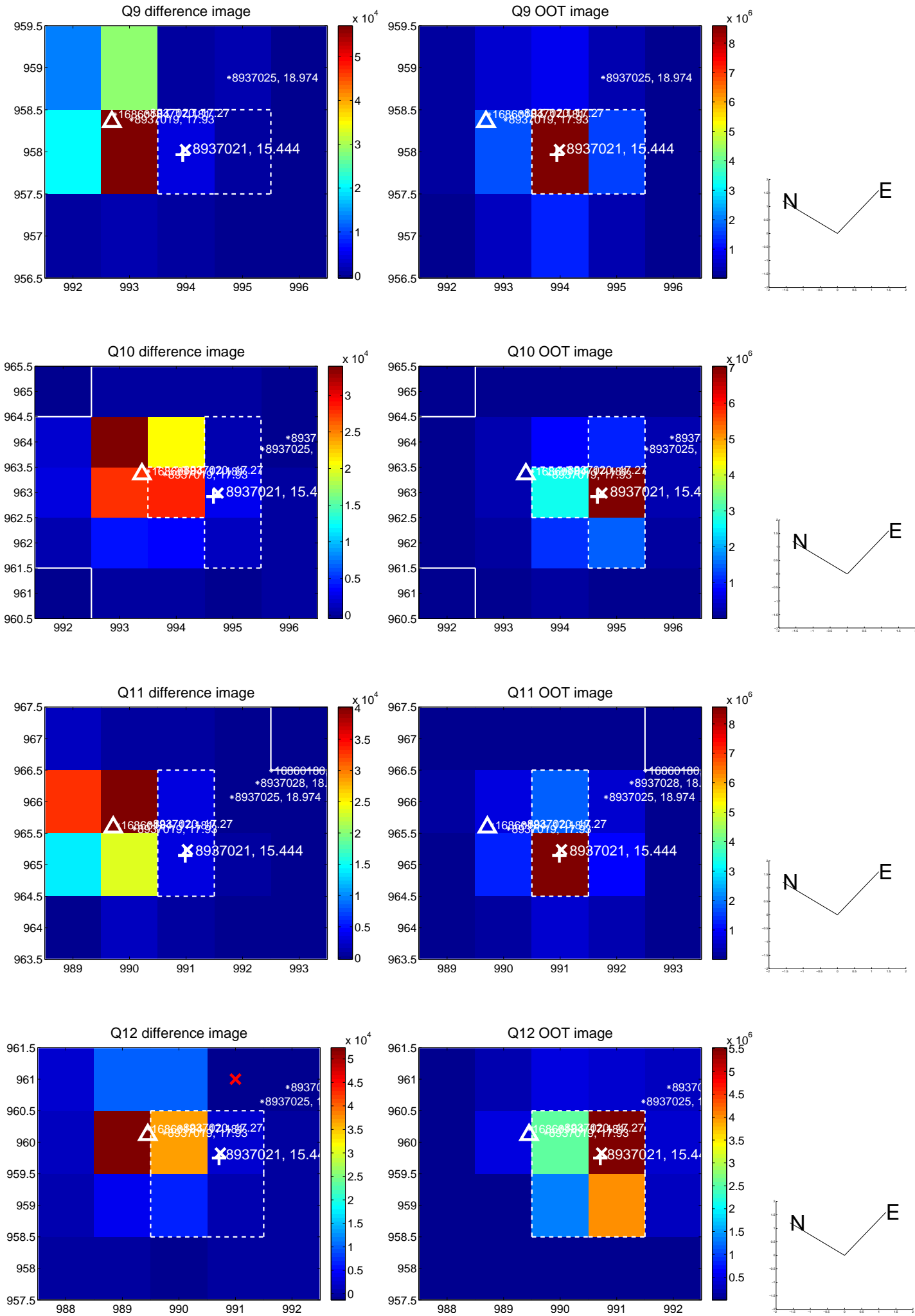
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



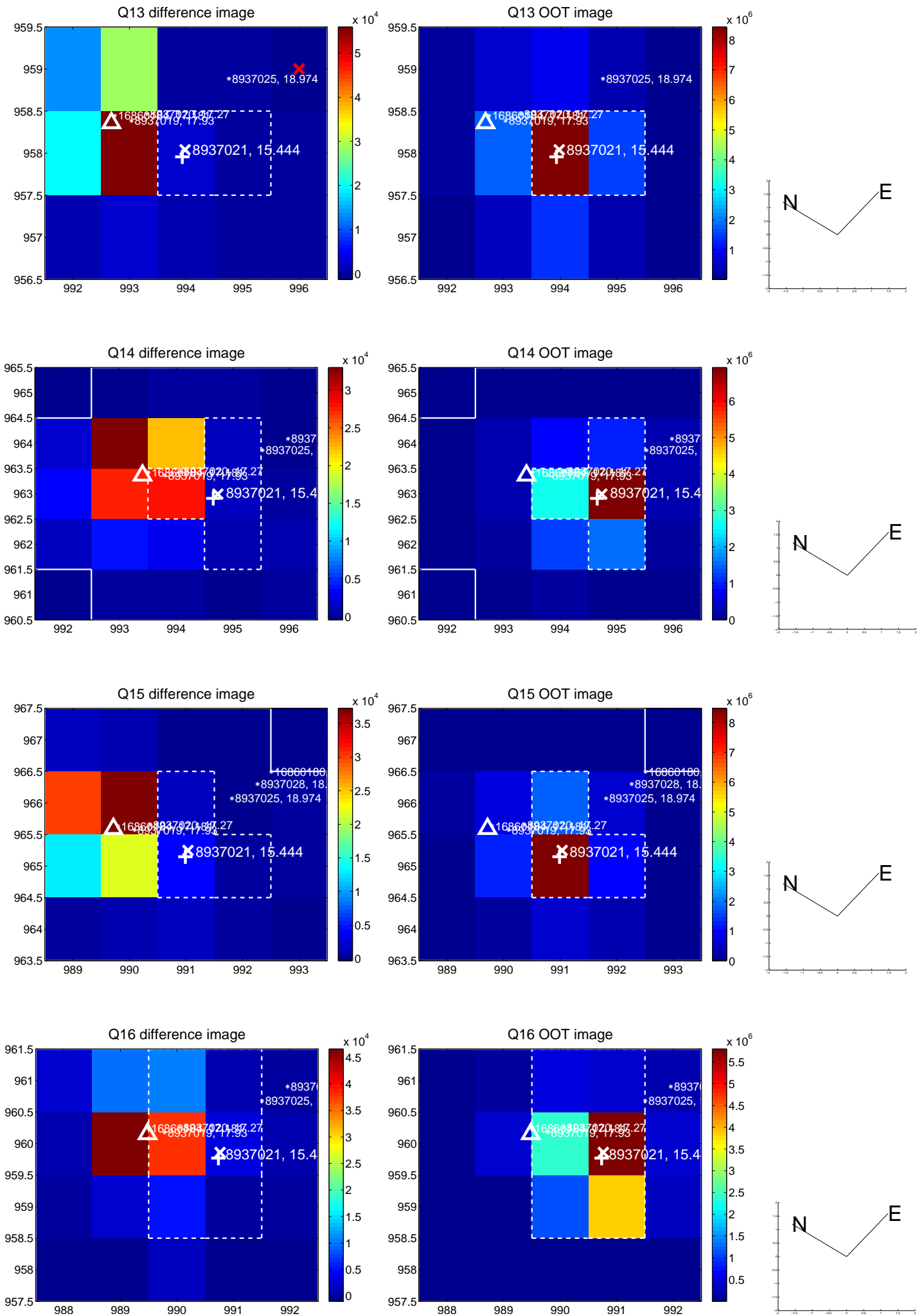
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



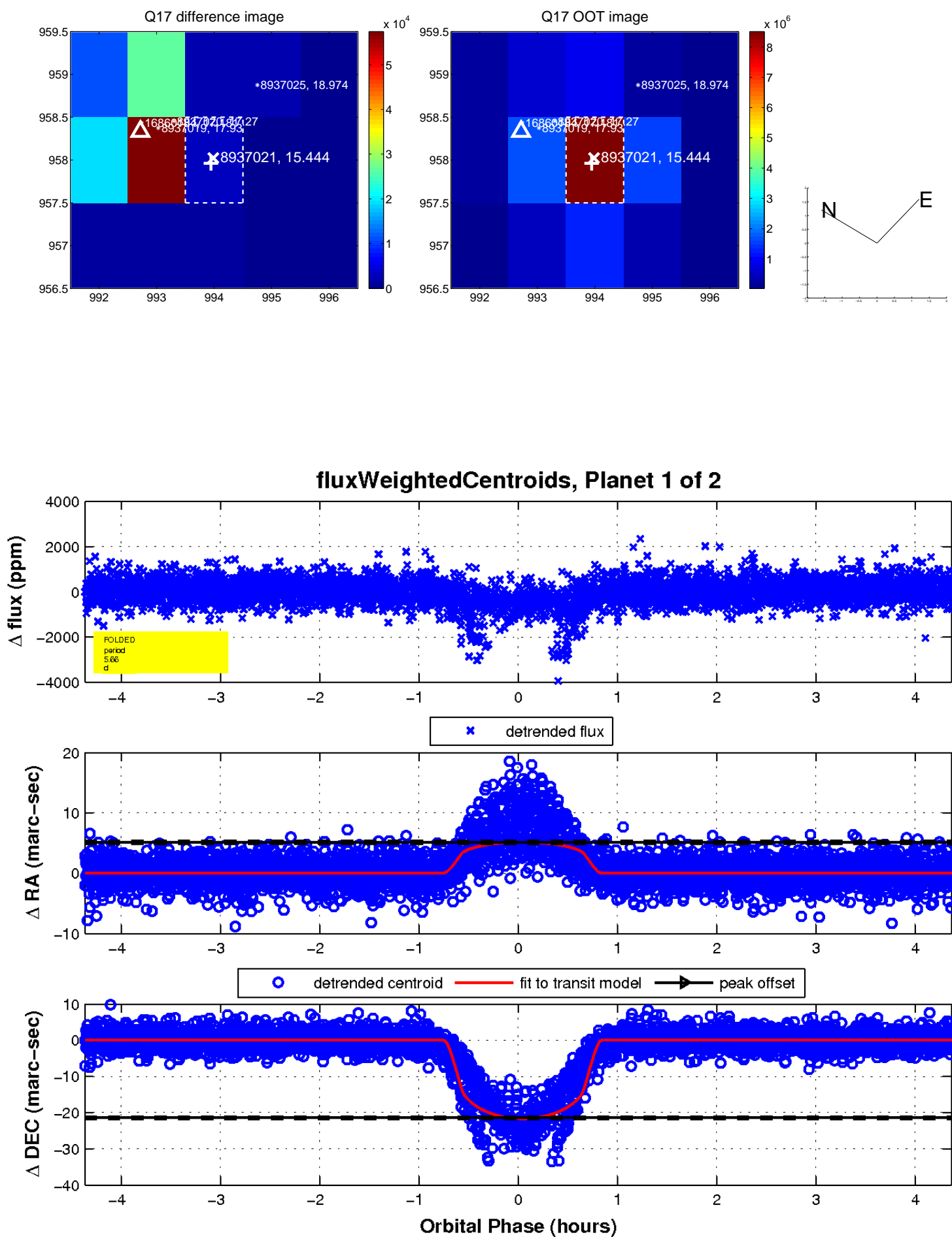
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



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

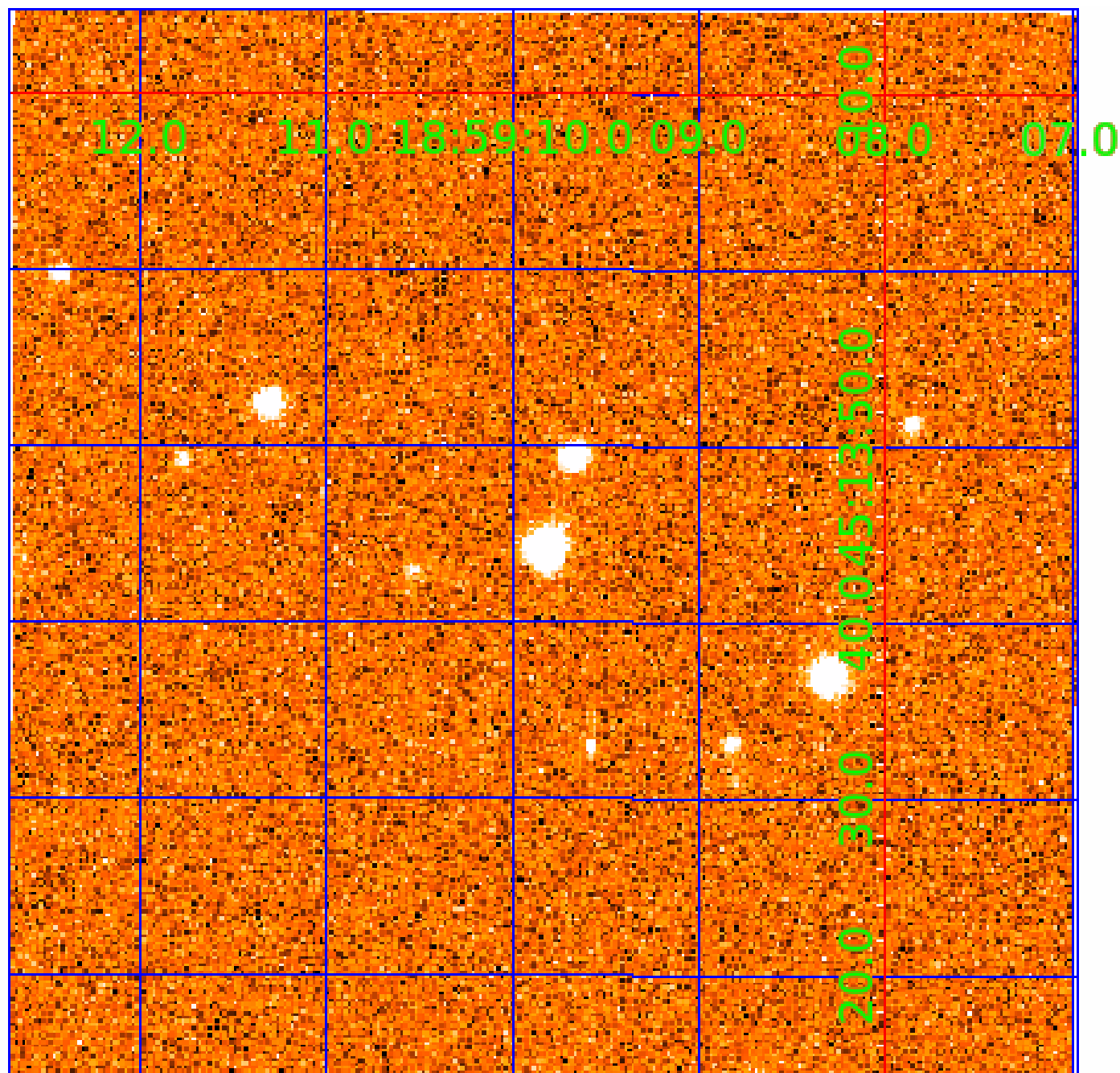


white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



UKIRT Image

Declination



KIC 008937021

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})
008937021-01	OBS	1394.01	5.663612	133.891674	675.9	1.457	58.4	26.7	0.72	4917	2.02	84.92
008937021-02	OBS	No	5.663588	131.989279	649.4	1.702	33.8	28.2	0.72	4917	2.27	84.92

Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
008937021-01	OBS	FP	0.00	0	1	1	1	MOD_SEC_DV—MOD_SEC_ALT—HAS_SEC_TCE—CENT_KIC_POS—HALO_GHOST—EPHEM_MATCH
008937021-02	OBS	FP	0.00	1	1	1	1	IS_SEC_TCE—CENT_KIC_POS—HALO_GHOST—EPHEM_MATCH

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 008937021-02

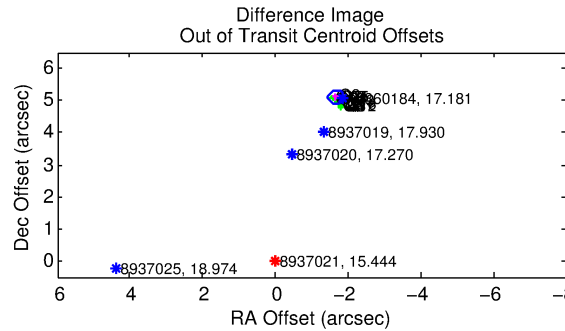
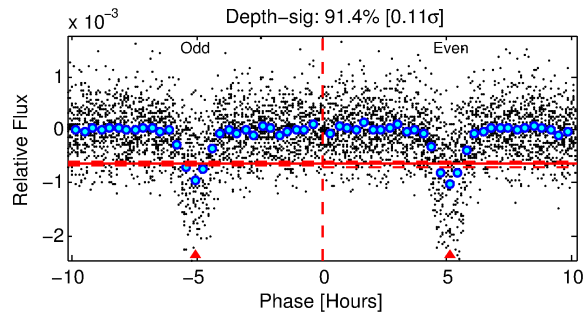
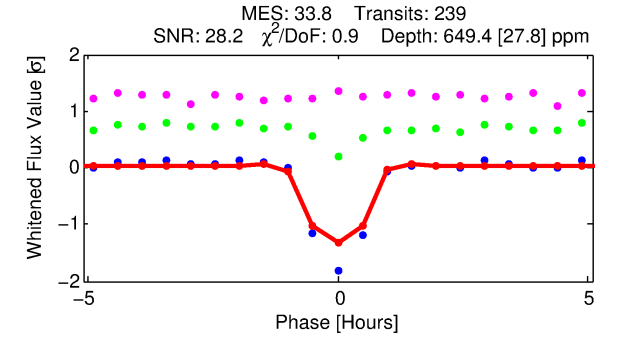
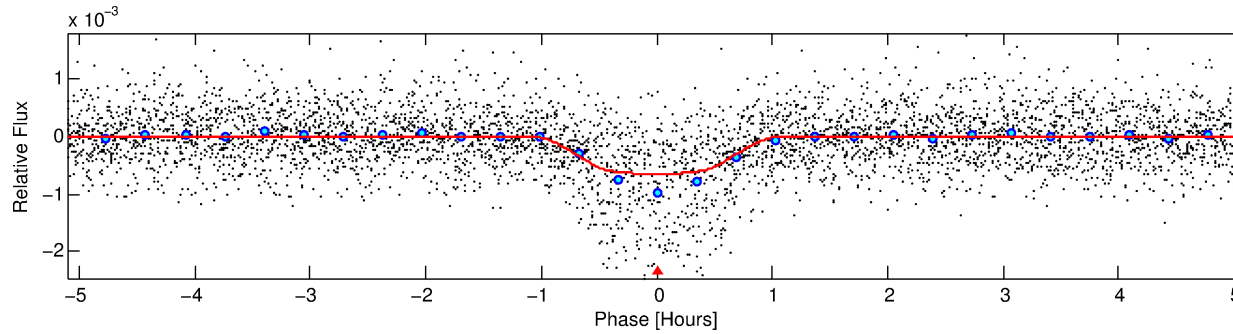
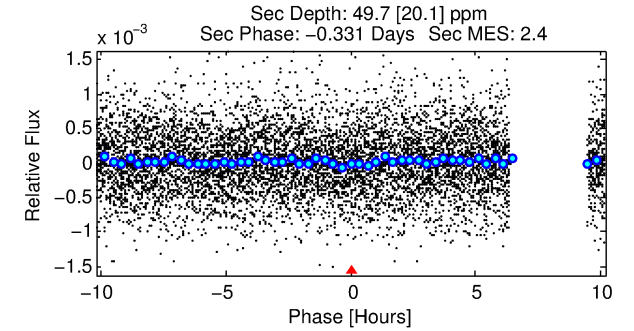
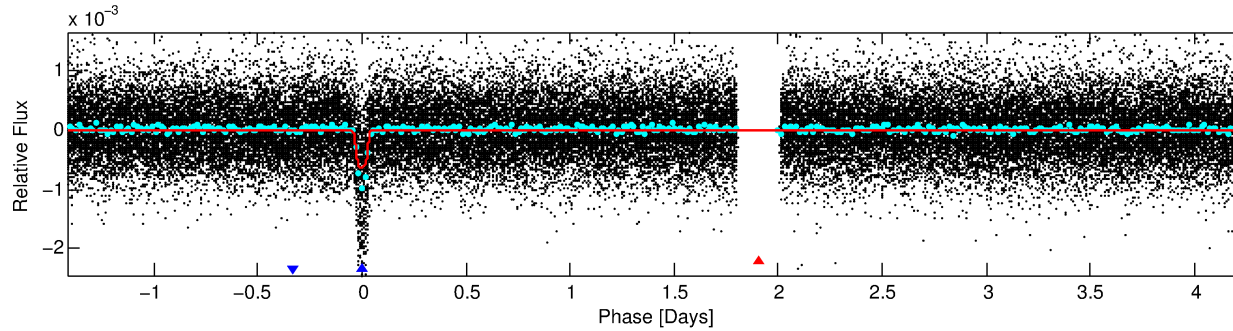
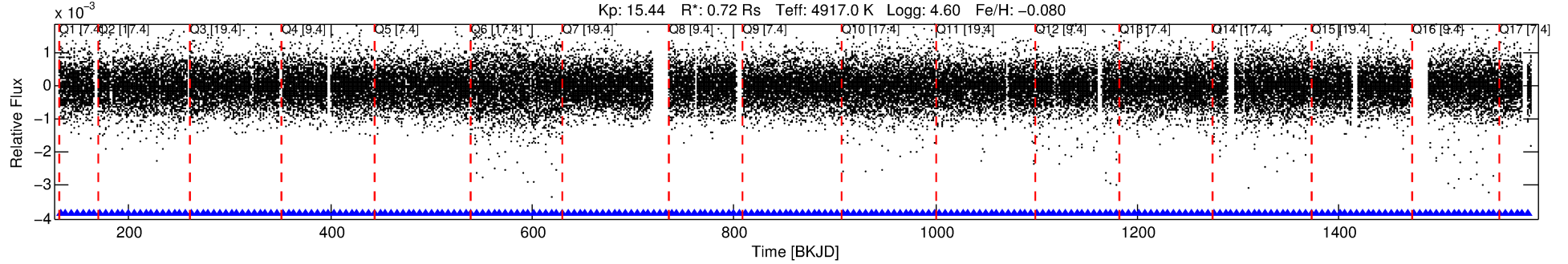
TCE (1)	KIC	Parent (2)	Parent KIC	$P_1:P_2$	Dist ($''$)	Δ Row	Δ Col	m_2	m_1	D_2/D_1	Mechanism	Flag	σ_P	σ_T
008937021-02	8937021	008937019-02	8937019	1:1	4.2	0	1	17.93	15.44	103.43	Direct-PRF	0	0.12	0.16

Notes: $P_1:P_2$ is the period ratio. Dist is the distance in arcseconds. Δ Row and Δ Col are the number of pixels apart in row and column. m_2 and m_1 are the magnitudes of the parent and child. D_2/D_1 is the parent's transit depth divided by the child's. σ_P and σ_T are the significance of the match in period and epoch. For a match to be considered significant $\sigma_P < 5.0$ and $\sigma_T < 5.0$. Matches which have σ_P and σ_T very close to this cutoff should receive extra scrutiny, especially if the period ratio is very large.

DV One-Page Summary

KIC: 8937021 Candidate: 2 of 2 Period: 5.664 d
KOI: K01394 Corr: No Ephemeris Match

Kp: 15.44 R*: 0.72 Rs Teff: 4917.0 K Logg: 4.60 Fe/H: -0.080



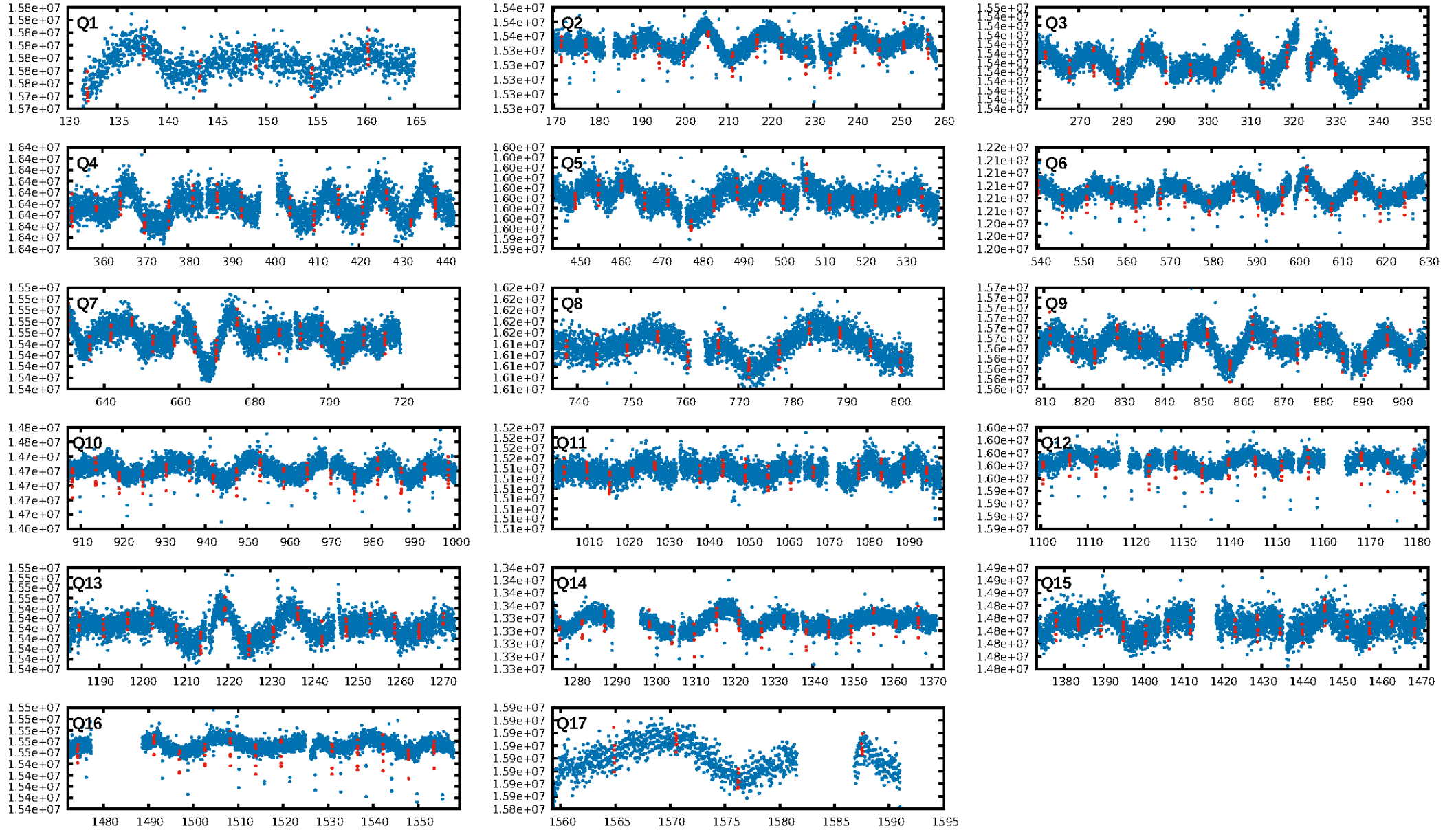
DV Fit Results:

Period = 5.66359 [0.00001] d
Epoch = 131.9893 [0.0013] BKJD
Rp/R* = 0.0287 [0.0059]
a/R* = 12.57 [9.70]
b = 0.90 [0.17]
Seff = 84.92 [13.54]
Teq = 774 [31] K
Rp = 2.27 [0.51] Re
a = 0.0568 [0.0043] AU
Ag = 17.16 [10.04] [1.61σ]
Teff = 2436 [358] K [4.62σ]

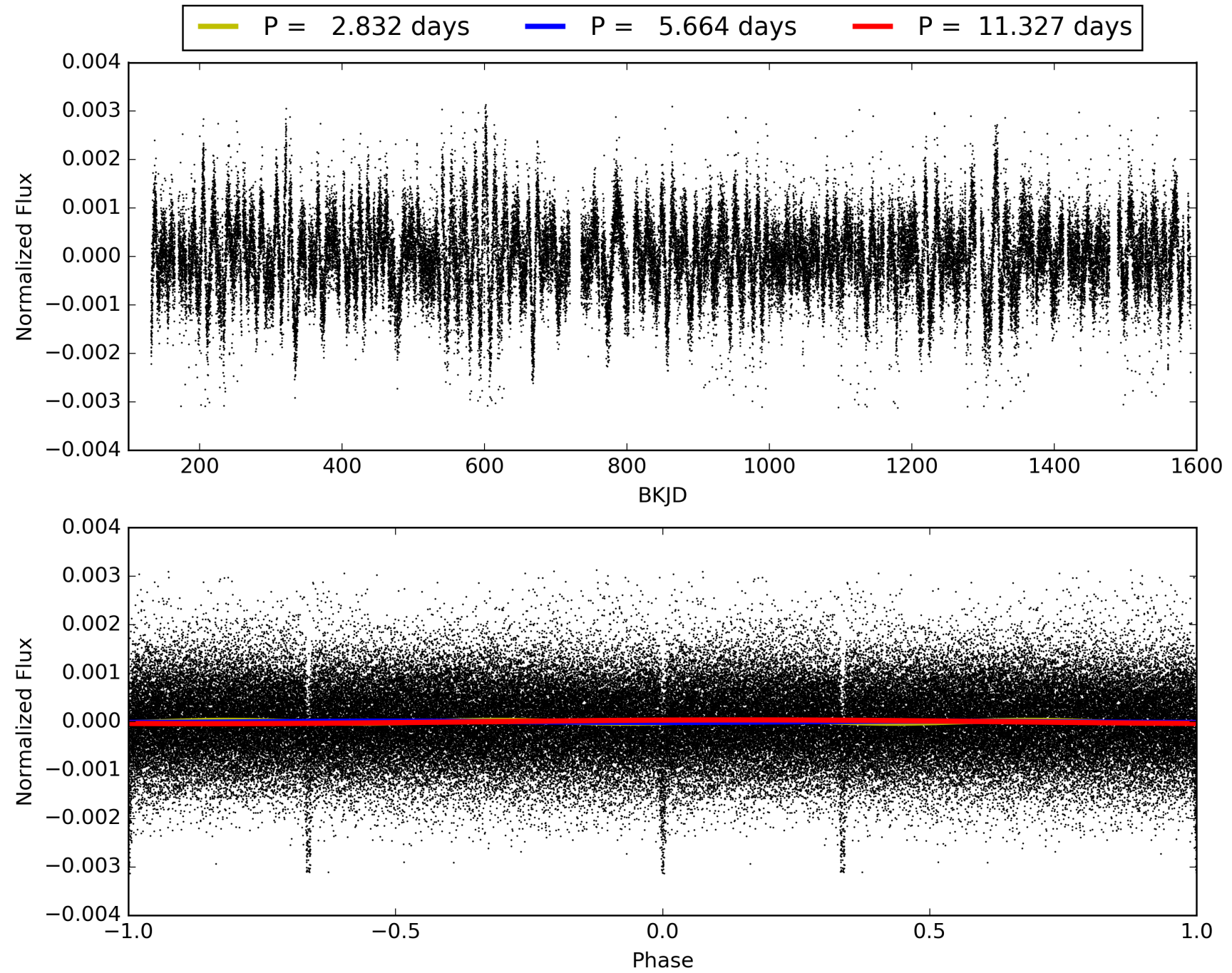
DV Diagnostic Results:

ShortPeriod-sig: N/A
LongPeriod-sig: 0.0% [0.00σ]
ModelChiSquare2-sig: N/A
ModelChiSquareGof-sig: N/A
Bootstrap-pfa: 7.90e-240
RollingBand-fgt: 1.00 [228/228]
GhostDiagnostic-chr: -0.09554
Centroid-sig: 0.0%
Centroid-so: 18.705 arcsec [48.85σ]
OotOffset-rm: 5.375 arcsec [74.50σ]
KicOffset-rm: 5.428 arcsec [74.68σ]
OotOffset-st: 4/4/4/5 [17]
KicOffset-st: 4/4/4/5 [17]
DiffImageQuality-fgm: 1.00 [17/17]
DiffImageOverlap-fno: 1.00 [17/17]

TCE 008937021-02, PDC Light Curves

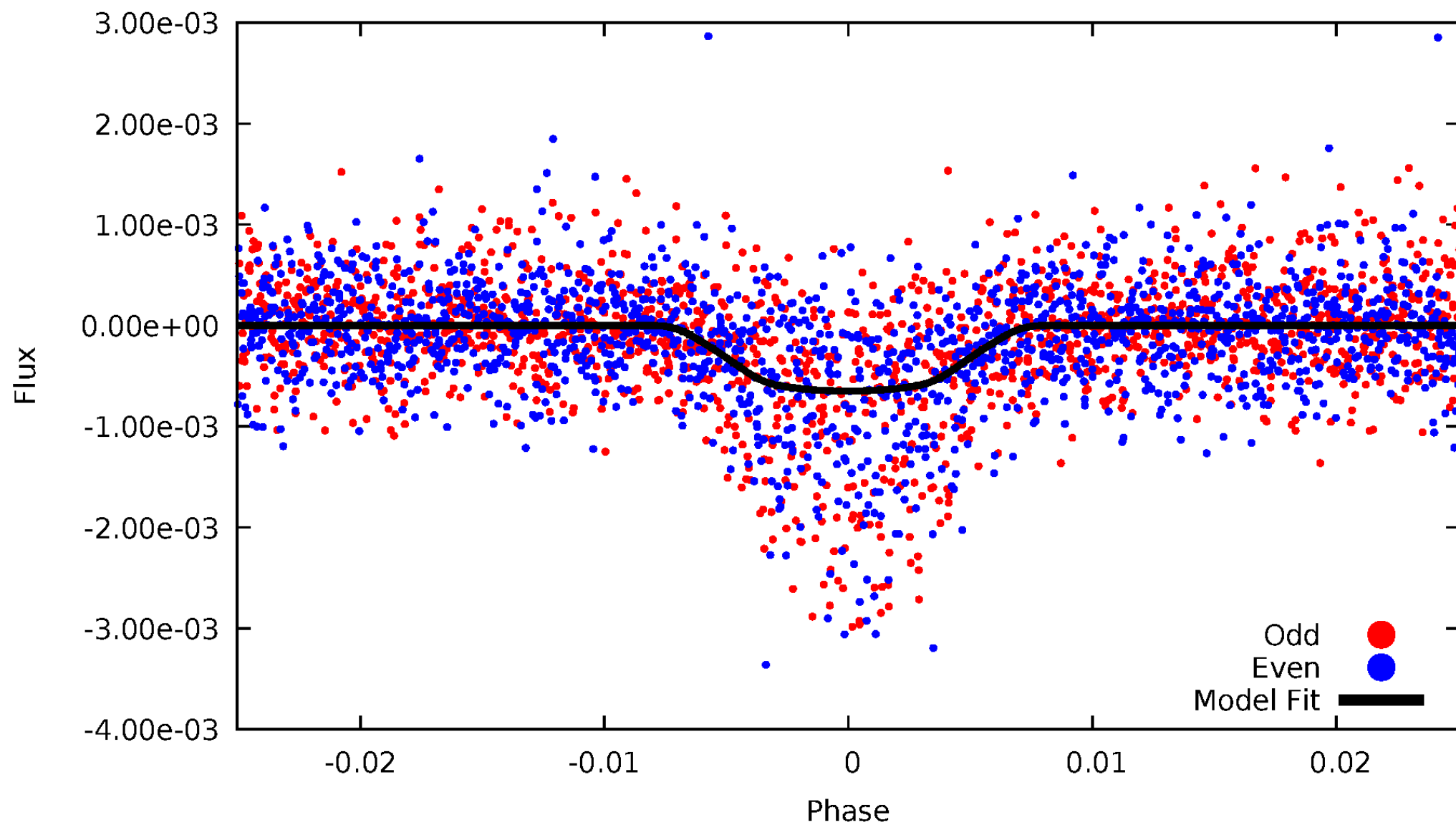


TCE 008937021-02



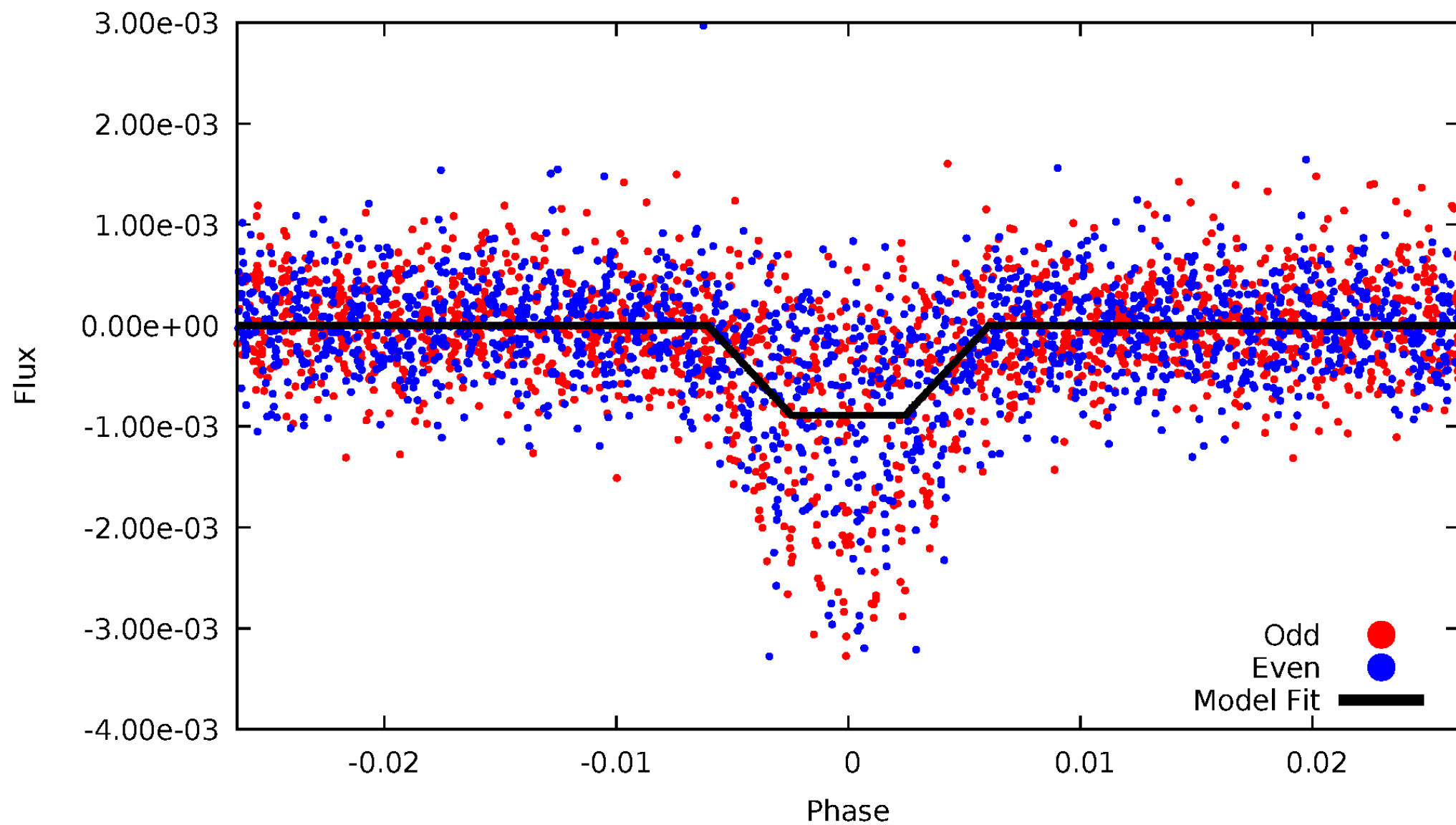
DV Odd/Even

TCE 008937021-02



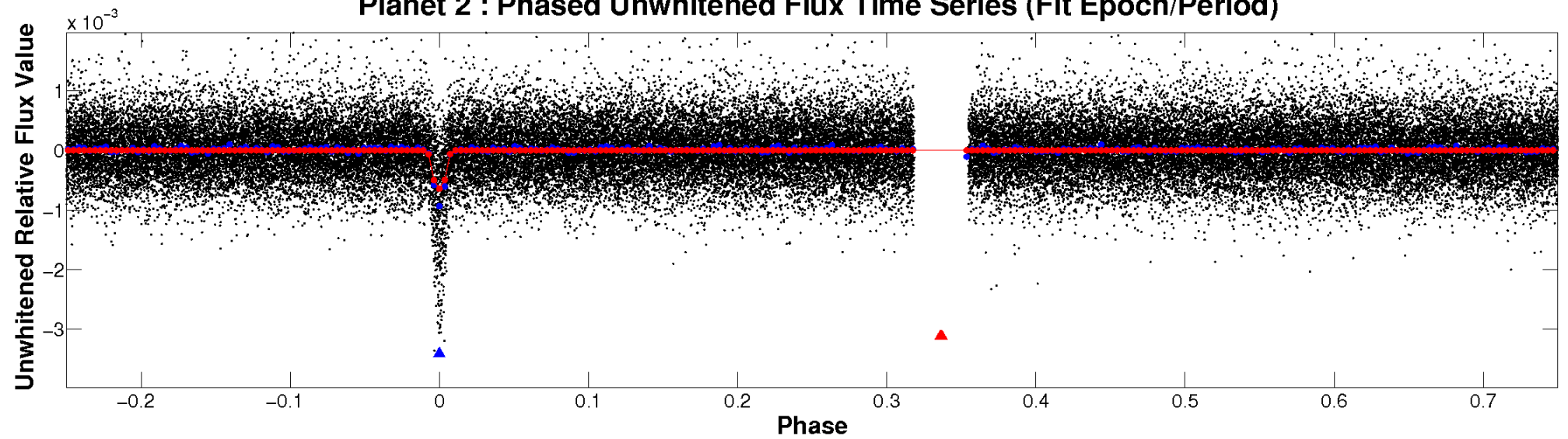
ALT Odd/Even

TCE 008937021-02

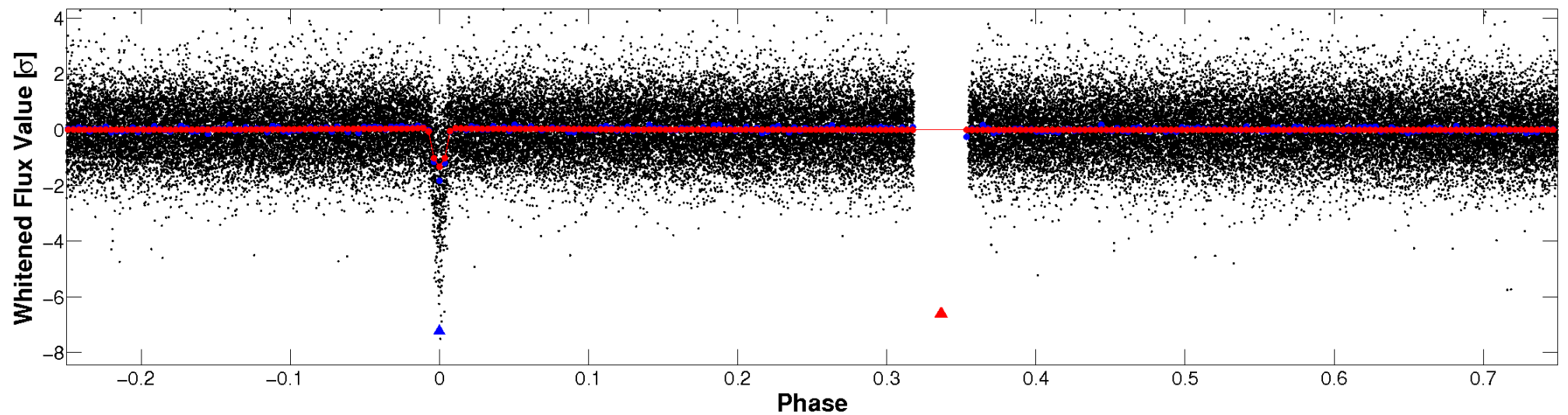


Non-Whitened Vs. Whitened Light Curve

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

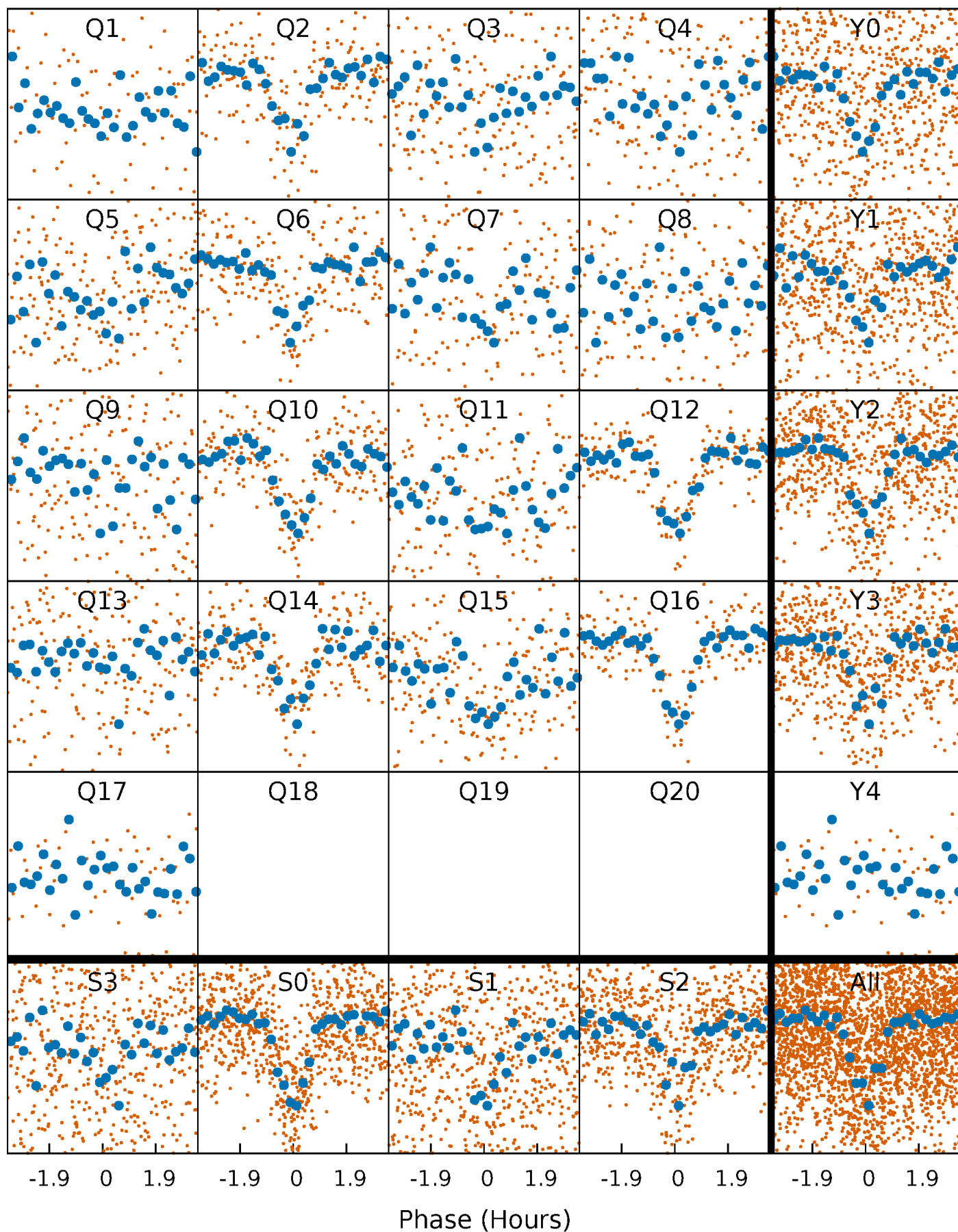


Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



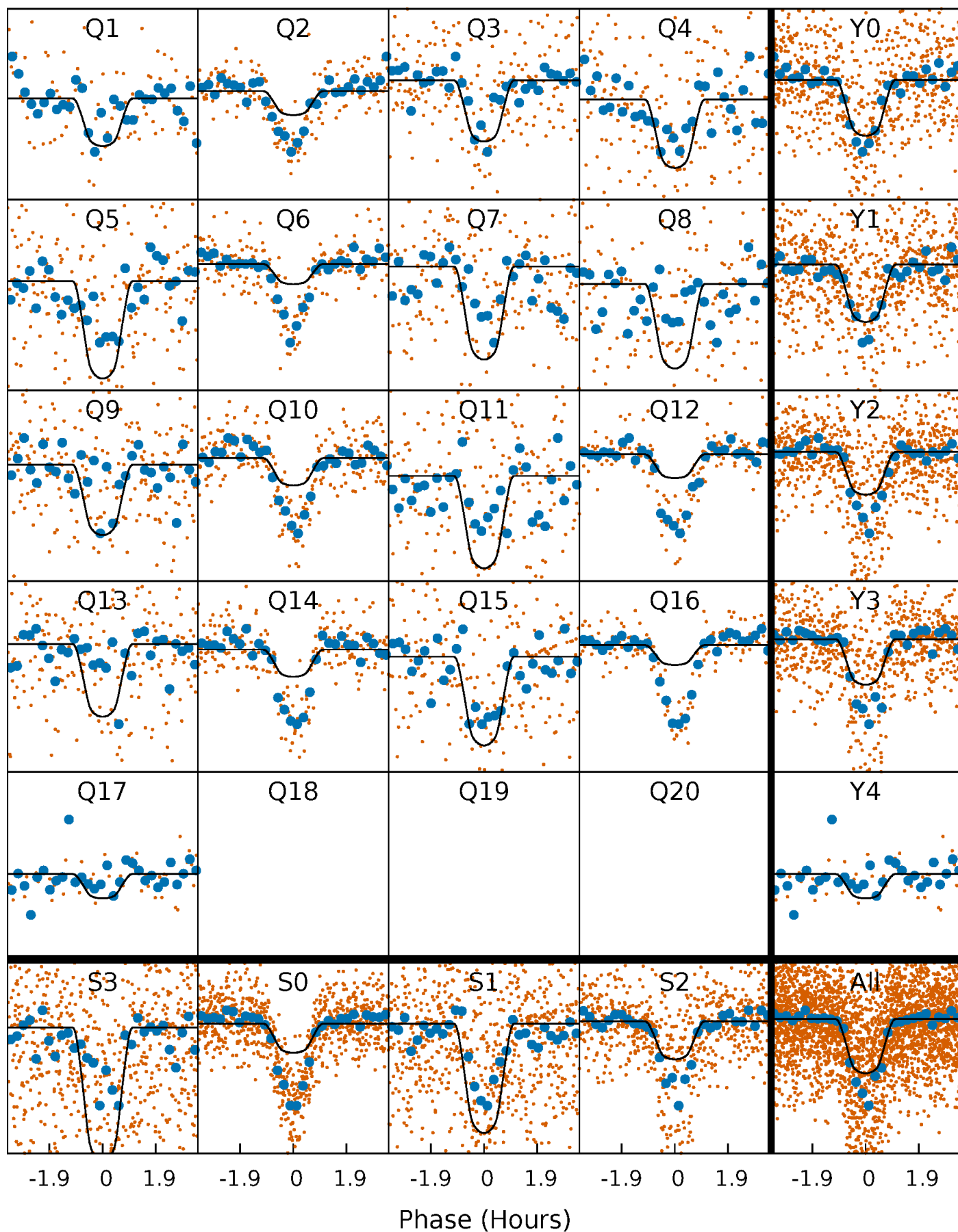
PDC Quarter-Phased Transit Curves

TCE 008937021-02 $P = 5.663588$ Days $T_0 = 131.989279$ (BKJD)



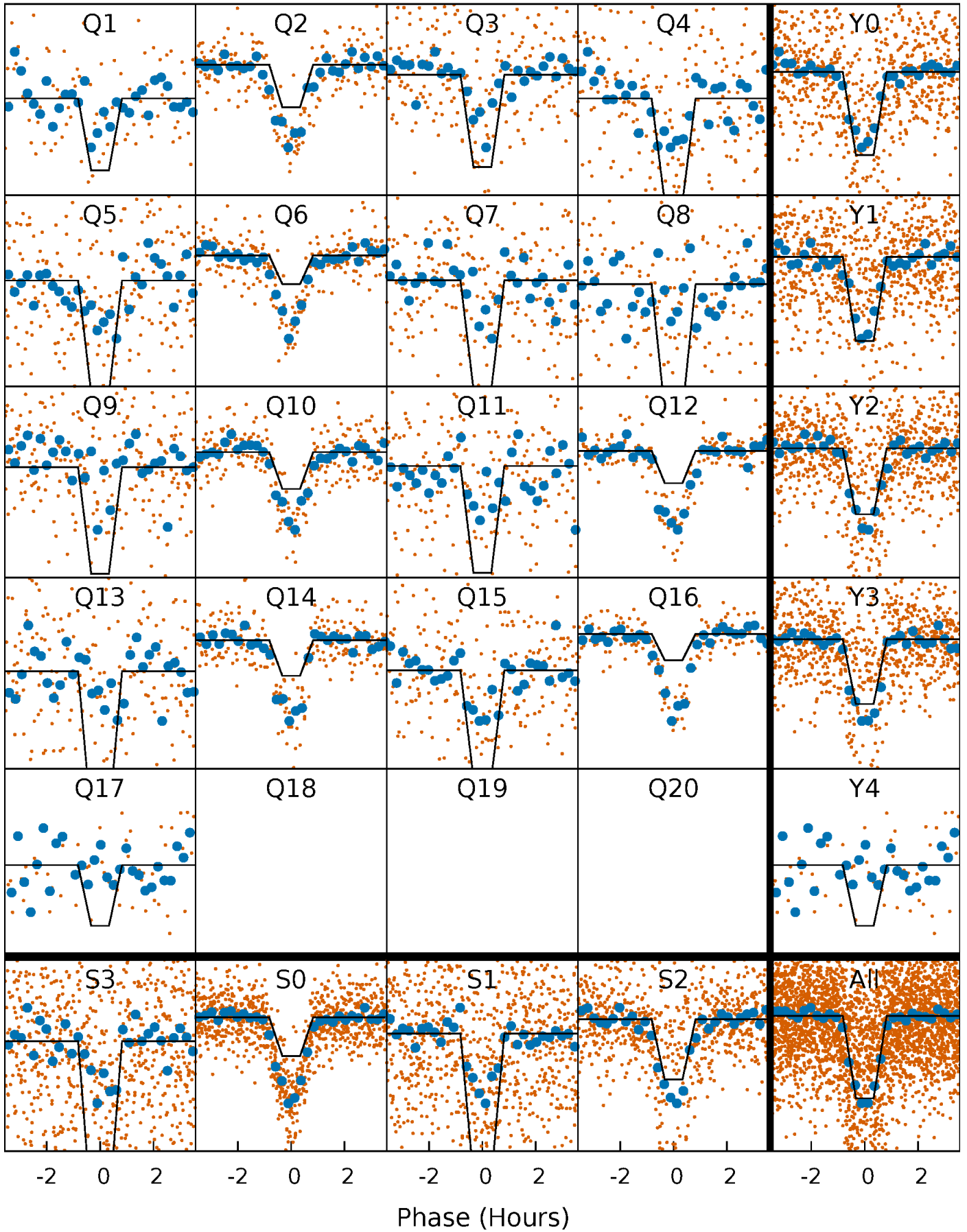
DV Quarter-Phased Transit Curves

TCE 008937021-02 P= 5.663588 Days $T_0=131.989279$ (BKJD)



Alt. Detrend Quarter-Phased Transit Curves

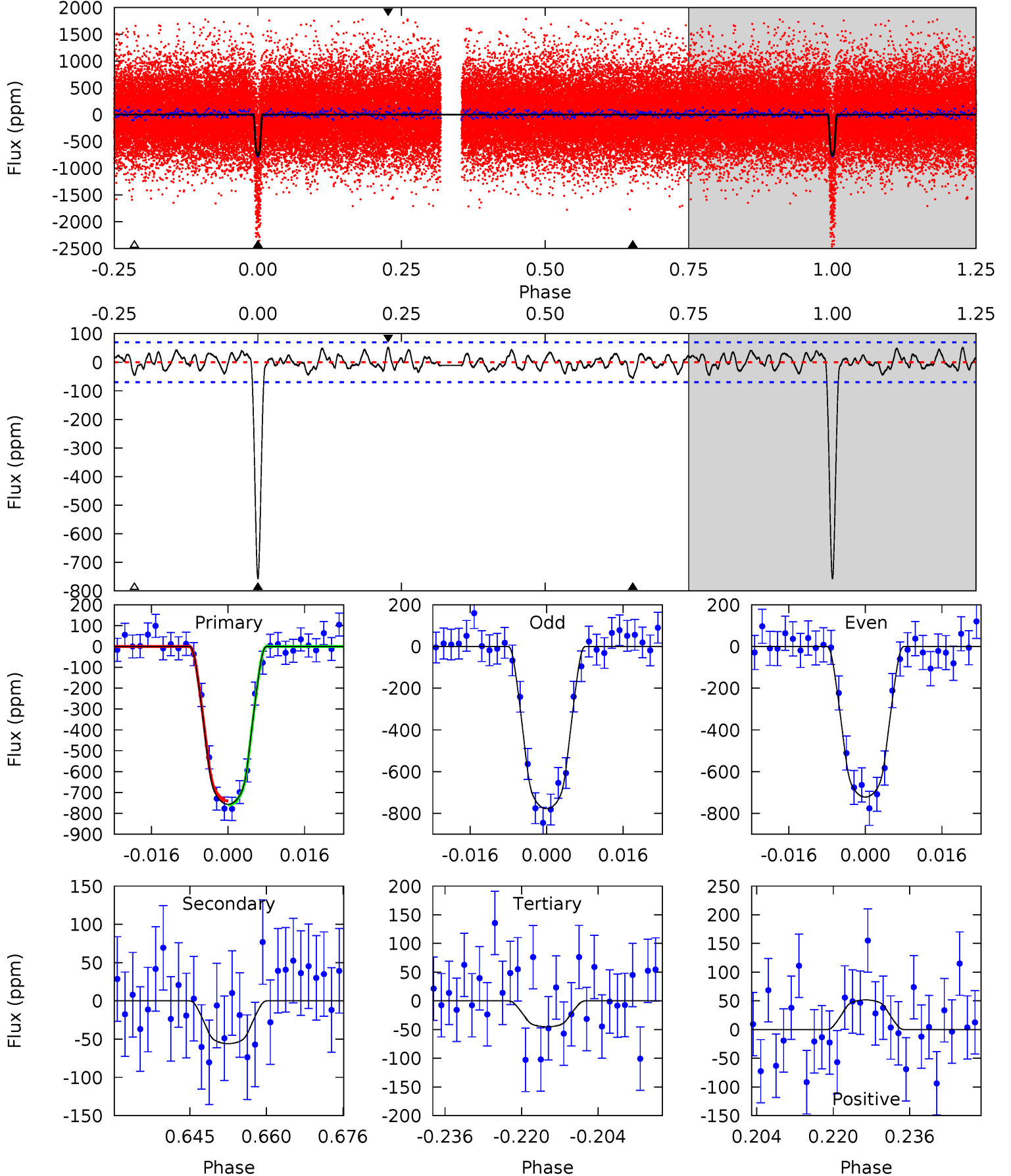
TCE 008937021-02 $P = 5.663606$ Days $T_0 = 131.987806$ (BKJD)



DV Model-Shift Uniqueness Test

008937021-02, P = 5.663588 Days, E = 126.325691 Days

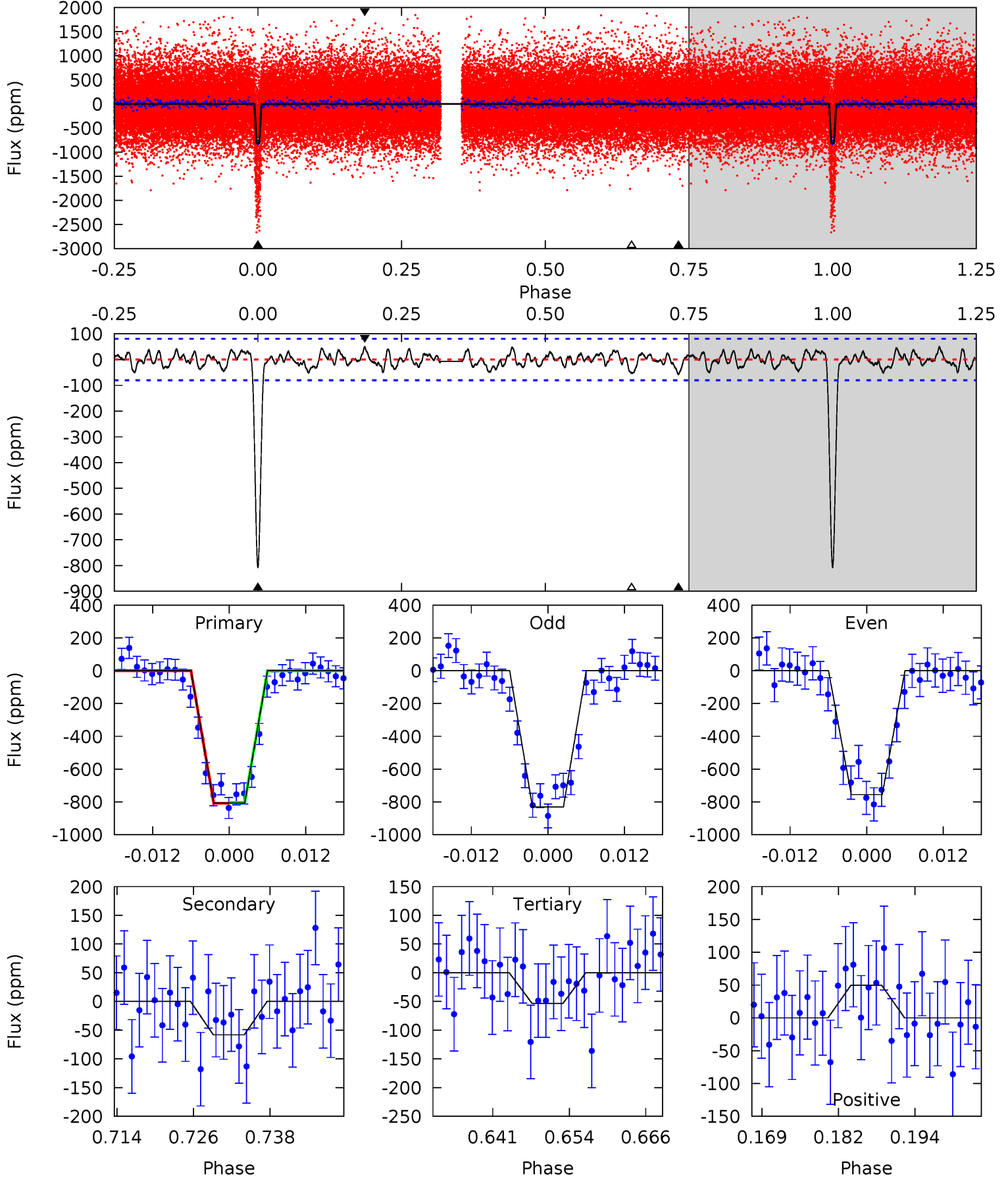
Pri	Sec	Ter	Pos	FA ₁	FA ₂	F _{Red}	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
53.6	3.96	3.20	3.66	4.94	2.42	1.40	50.4	49.9	0.76	0.30	1.98	1.47	0.06	0.70



Alt Model-Shift Uniqueness Test

008937021-02, P = 5.663606 Days, E = 126.324200 Days

Pri	Sec	Ter	Pos	FA ₁	FA ₂	F _{Red}	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
49.9	3.59	3.29	3.06	4.99	2.51	1.30	46.6	46.9	0.30	0.53	2.35	1.52	0.06	0.13



Stellar Parameters For KIC 008937021

	$T_{\text{eff}}(K)$	$\log(g)$	$[\text{Fe}/\text{H}]$	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	4917^{+148}_{-133}	$4.601^{+0.036}_{-0.054}$	$-0.080^{+0.300}_{-0.300}$	$0.723^{+0.069}_{-0.057}$	$0.761^{+0.069}_{-0.069}$	$2.834^{+0.514}_{-0.565}$
	+3%/-3%	+1%/-1%	+375%/-375%	+10%/-8%	+9%/-9%	+18%/-20%
Source	PHO1	KIC0	KIC0	DSEP		

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

Secondary Eclipse Parameters for KIC 008937021-02 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	A_{obs}
DV	-56 ± 14	$2.27^{+0.51}_{-0.47}$	1087^{+37}_{-35}	3082^{+265}_{-212}	19^{+13}_{-7}
Alt.	-58 ± 16	$2.38^{+0.50}_{-0.49}$	1088^{+40}_{-36}	3073^{+245}_{-211}	18^{+12}_{-7}

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 $A_{obs} \gg 1.0$

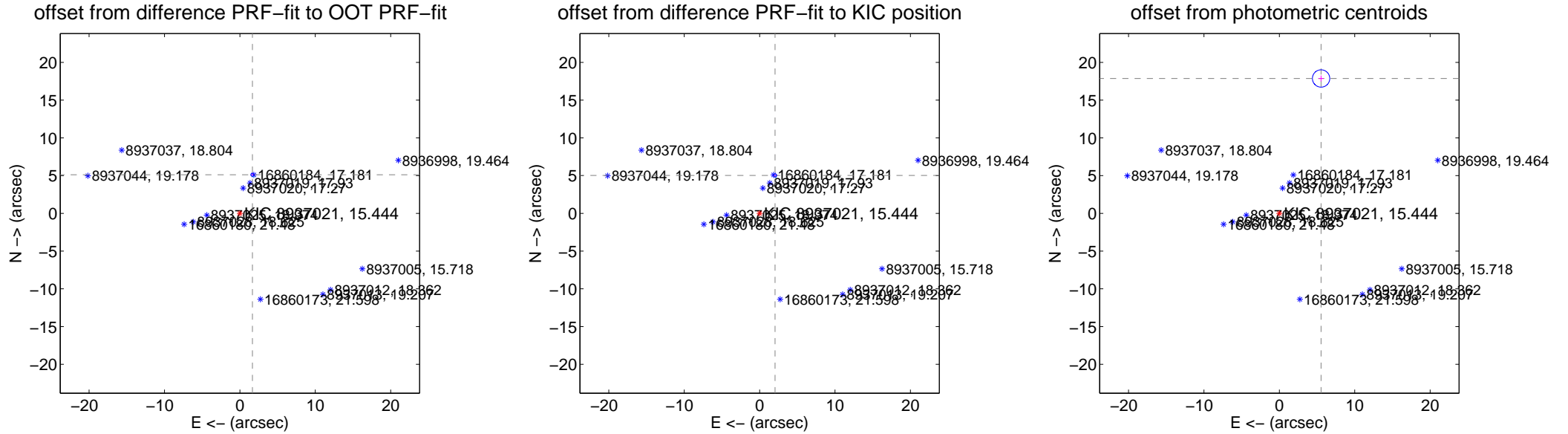
DV Centroid Data

Supplemental centroid analysis for 008937021-02. Kepler magnitude: 15.44. Transit SNR 28.22

There are 17 quarters with good PRF difference image offsets

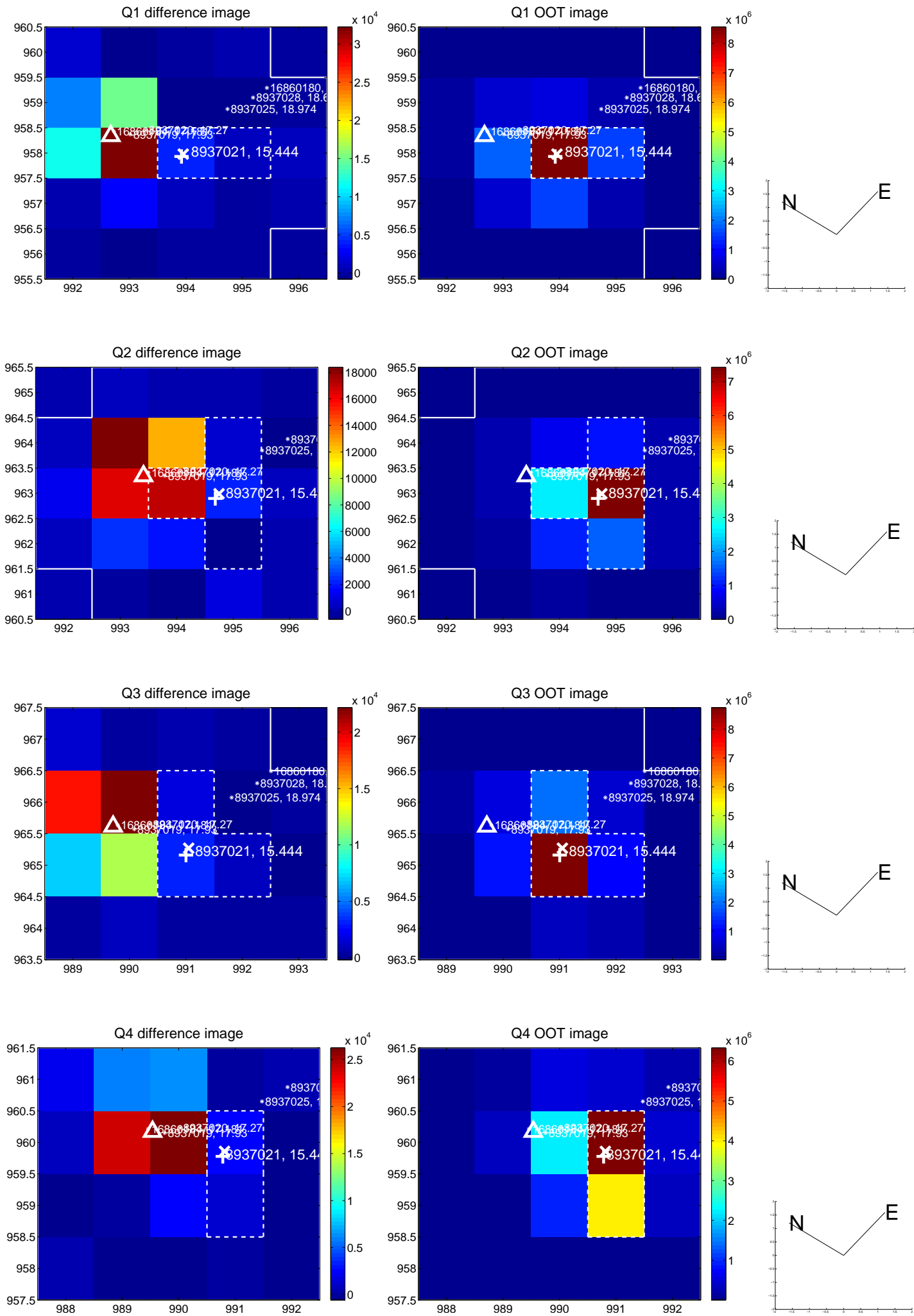
The direct PRF centroid is offset from the target star catalog position by about 0.30 arcsec

	Distance in arcsec	Distance / σ	Δ RA	Δ Dec
PRF-fit source offset from OOT	5.375 \pm 0.070	76.50	-1.661 \pm 0.071	5.112 \pm 0.073
PRF-fit source offset from KIC position	5.428 \pm 0.073	74.68	-2.049 \pm 0.069	5.026 \pm 0.075
photometric centroid source offset	18.70 \pm 0.38	48.85	-5.53 \pm 0.34	17.87 \pm 0.39

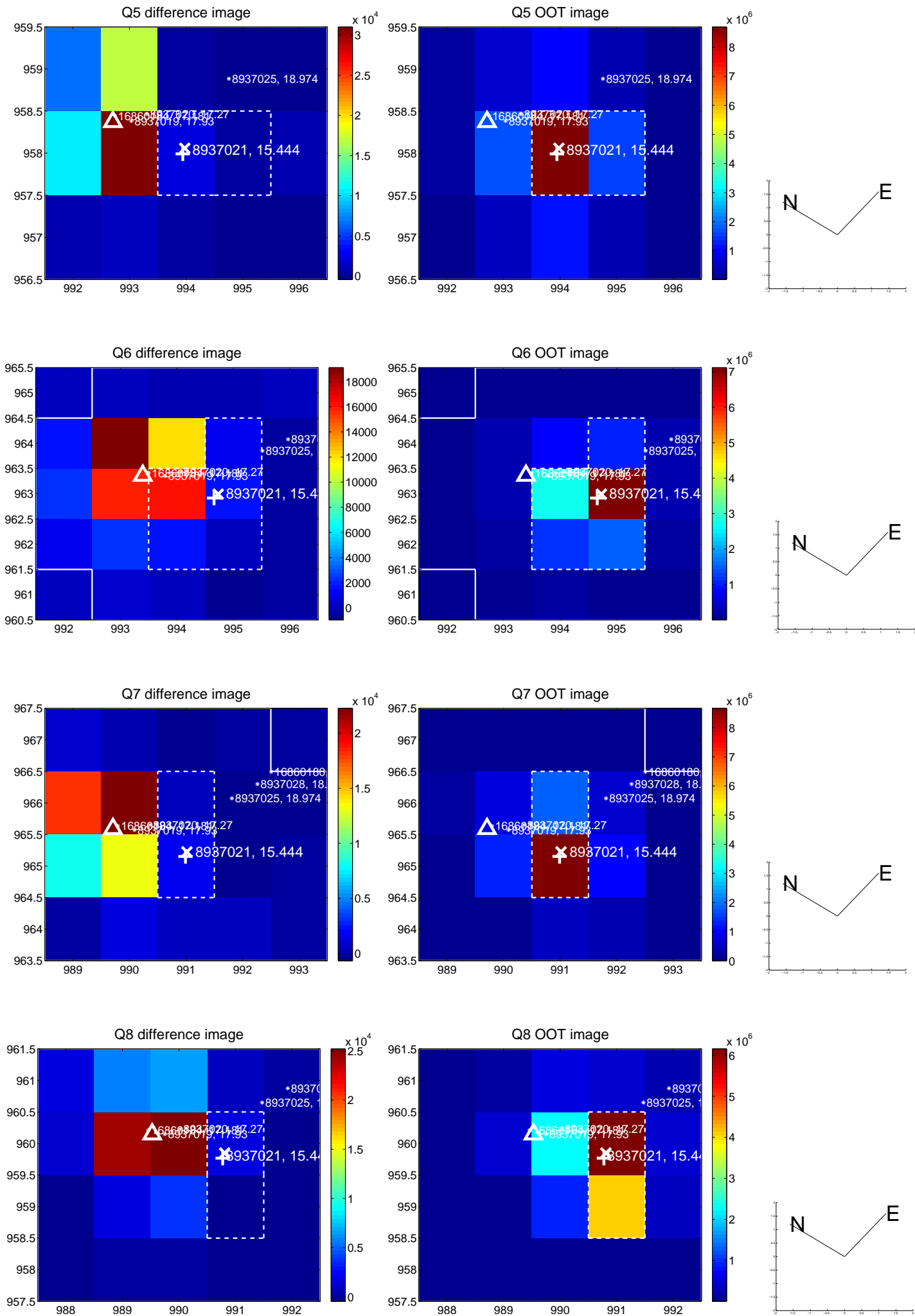


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets**; magenta cross: average over quarters. Length of the crosses: one- σ uncertainty. Blue circle: three-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

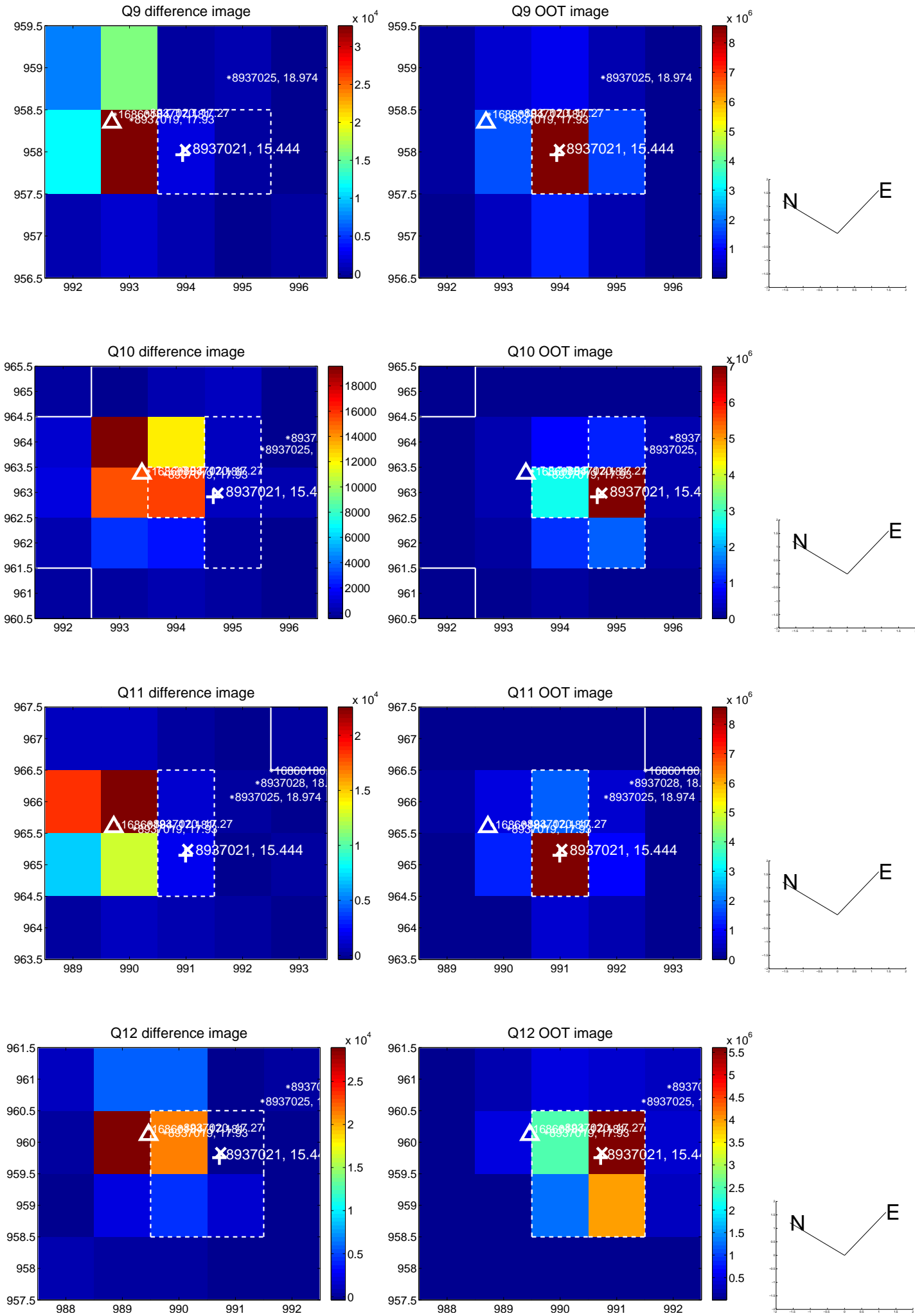
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



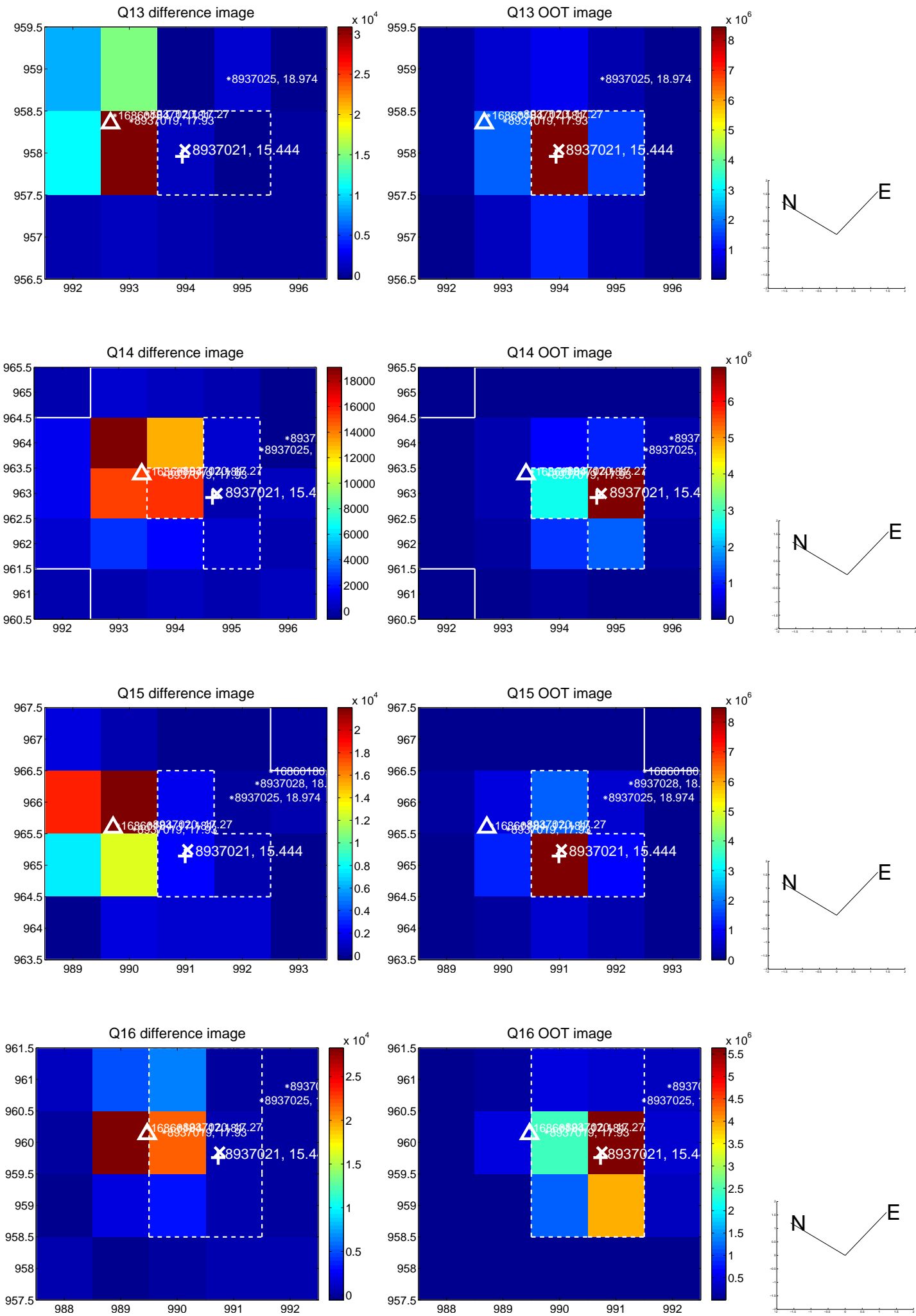
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



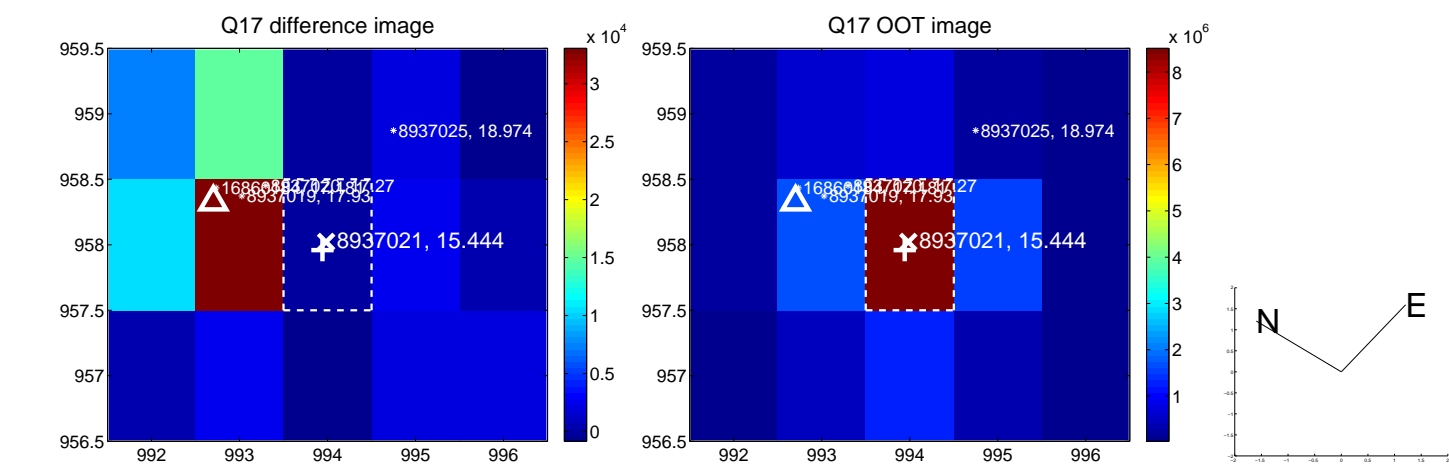
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



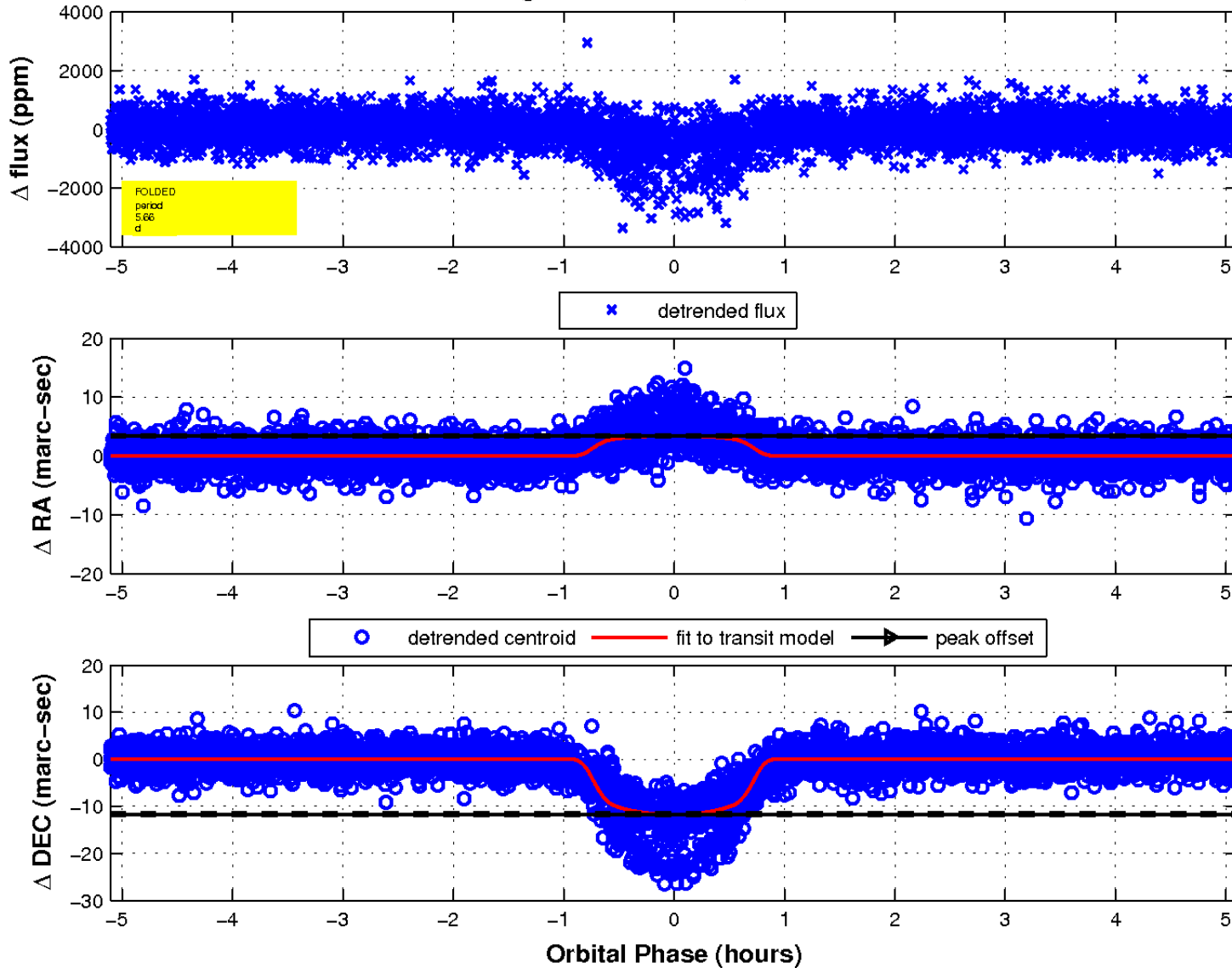
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



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



fluxWeightedCentroids, Planet 2 of 2



UKIRT Image

Declination

