

KIC 009509223

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})
009509223-01	OBS	No	14.200331	131.975598	51.3	7.957	8.7	8.7	1.06	6332	0.83	119.74
009509223-02	OBS	4867.01	14.200795	135.716206	76.8	3.936	8.6	10.5	1.06	6332	1.05	119.73

Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009509223-01	OBS	FP	0.00	1	0	1	1	LPP_DV—HALO_GHOST—EPHEM_MATCH
009509223-02	OBS	FP	0.00	1	0	0	1	SAME_NTL_PERIOD—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 009509223-01

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
009509223-01	9509223	009509207-sec	9509207	1:1	34.4	-8	0	13.13	13.59	3615.70	Direct-PRF	0	1.17	0.09

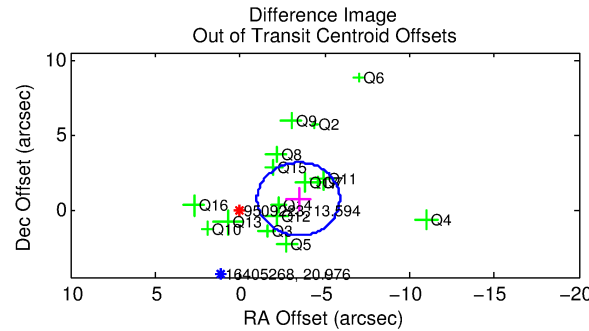
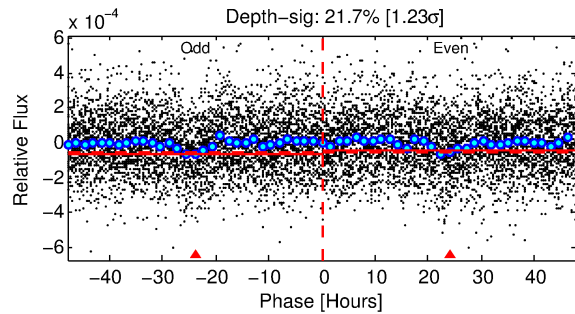
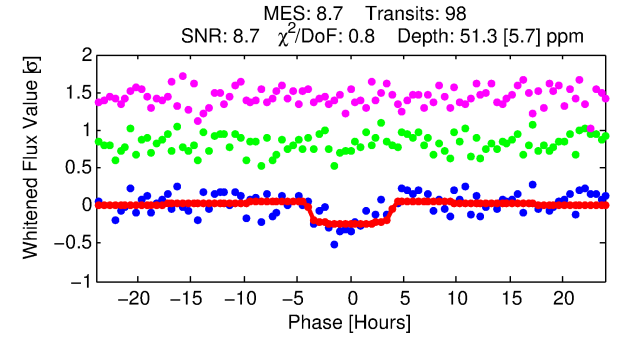
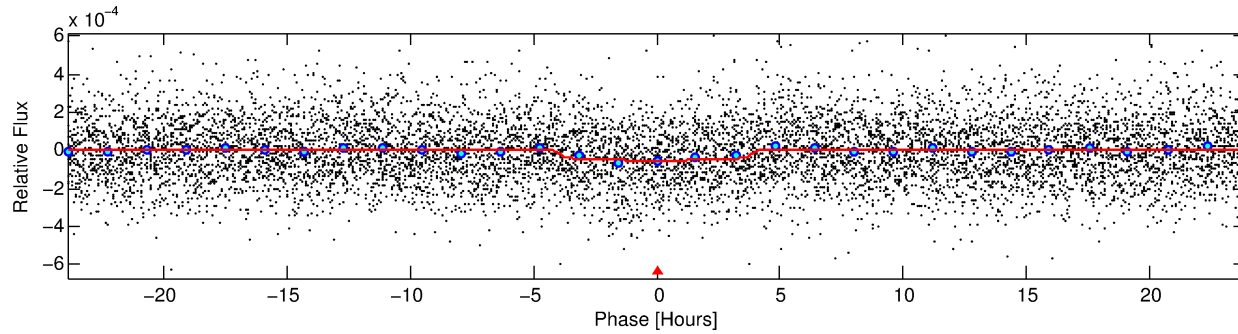
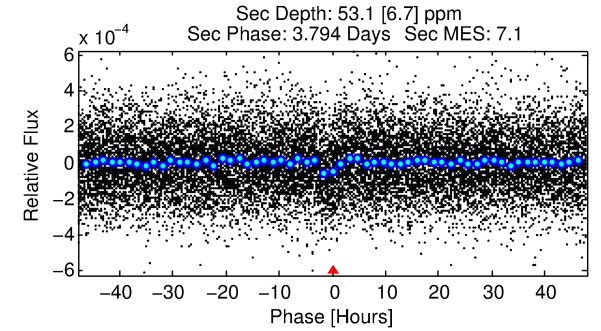
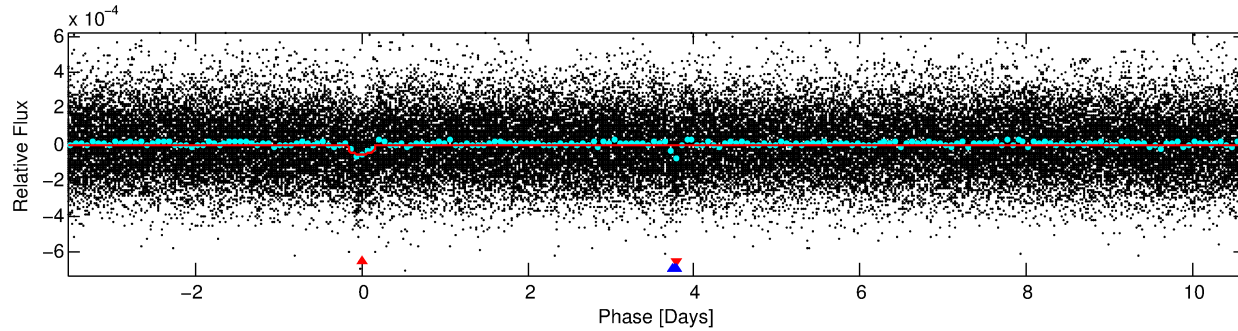
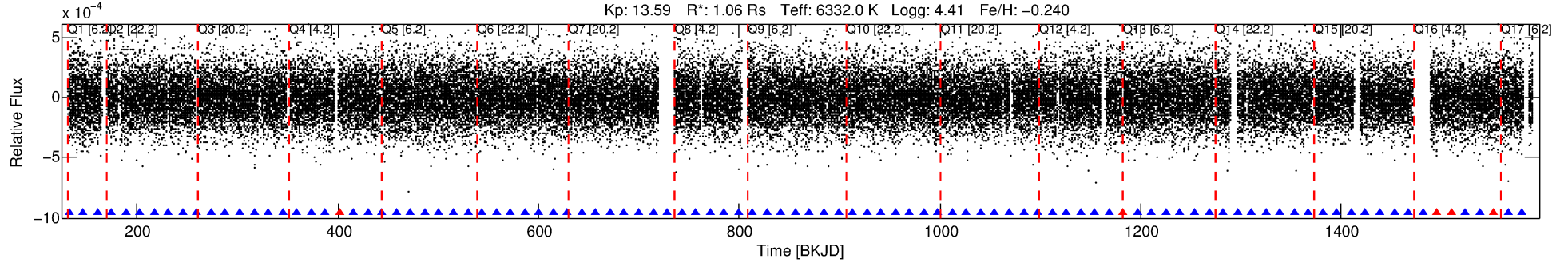
Notes: $P_1:P_2$ is the period ratio. Dist is the distance in arcseconds. Δ Row and Δ Col are the number of pixels apart in row and column. m_2 and m_1 are the magnitudes of the parent and child. D_2/D_1 is the parent's transit depth divided by the child's. σ_P and σ_T are the significance of the match 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: 9509223 Candidate: 1 of 2 Period: 14.200 d

KOI: K04867 Corr: No Ephemeris Match

Kp: 13.59 R*: 1.06 Rs Teff: 6332.0 K Logg: 4.41 Fe/H: -0.240



DV Fit Results:

Period = 14.20033 [0.00022] d
Epoch = 131.9756 [0.0128] BKJD
Rp/R* = 0.0072 [0.0031]
a/R* = 8.92 [20.41]
b = 0.77 [1.24]
Seff = 119.74 [48.75]
Teq = 843 [86] K
Rp = 0.83 [0.45] Re
a = 0.1168 [0.0317] AU
Ag = 574.26 [549.35] [1.04σ]
Teffp = 6384 [1407] K [3.93σ]

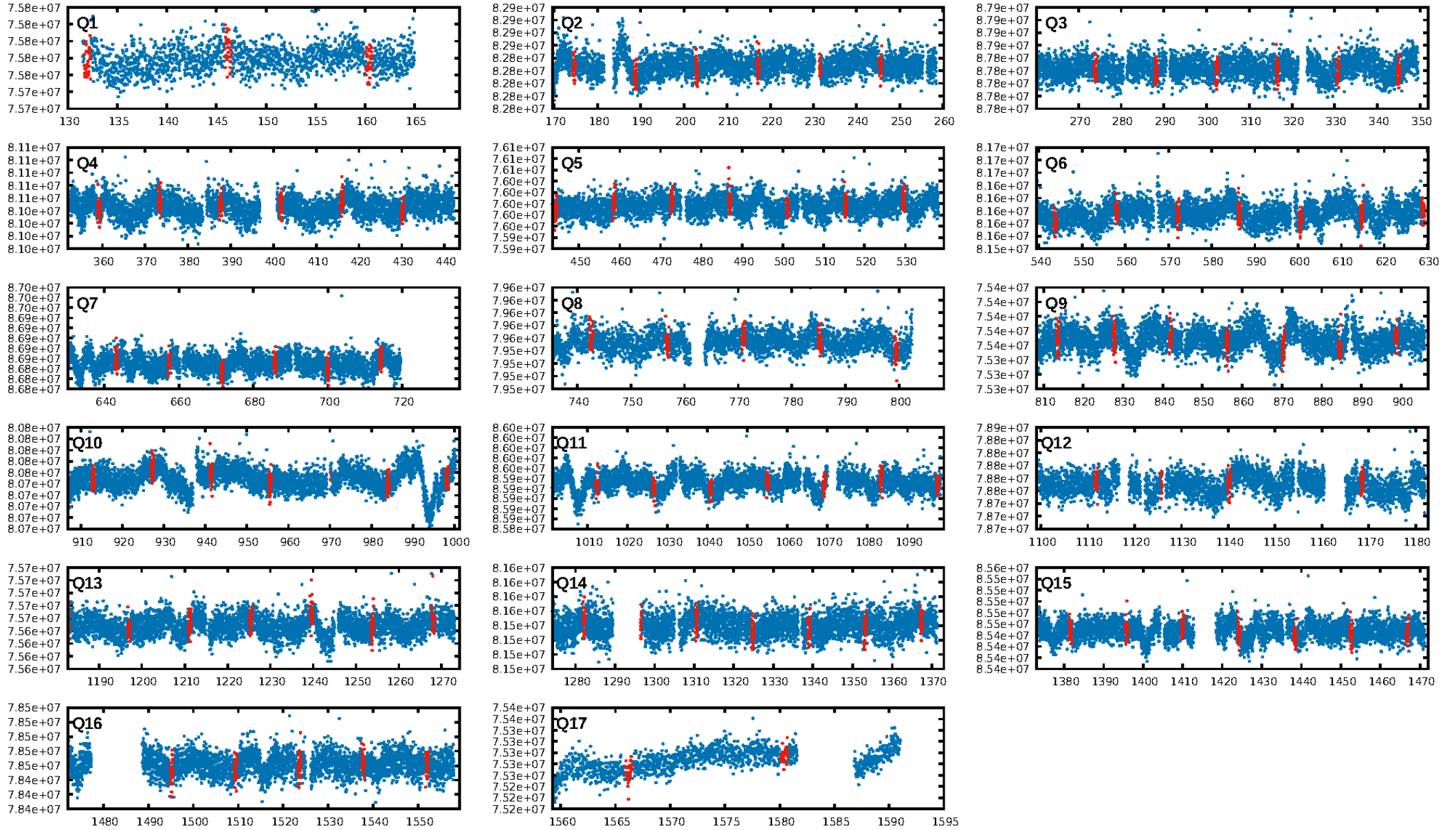
DV Diagnostic Results:

ShortPeriod-sig: N/A
LongPeriod-sig: 0.1% [0.00σ]
ModelChiSquare2-sig: 99.2%
ModelChiSquareGof-sig: 100.0%
Bootstrap-pfa: 1.43e-17
RollingBand-fgt: 0.95 [88/93]
GhostDiagnostic-chr: 0.07379
Centroid-sig: 0.0%
Centroid-so: 3.403 arcsec [2.31σ]
OotOffset-rm: 3.527 arcsec [4.34σ]
KicOffset-rm: 3.591 arcsec [3.86σ]
OotOffset-st: 4/4/4/4 [16]
KicOffset-st: 4/4/4/4 [16]
DiffImageQuality-fgm: 0.19 [3/16]
DiffImageOverlap-fno: 1.00 [17/17]

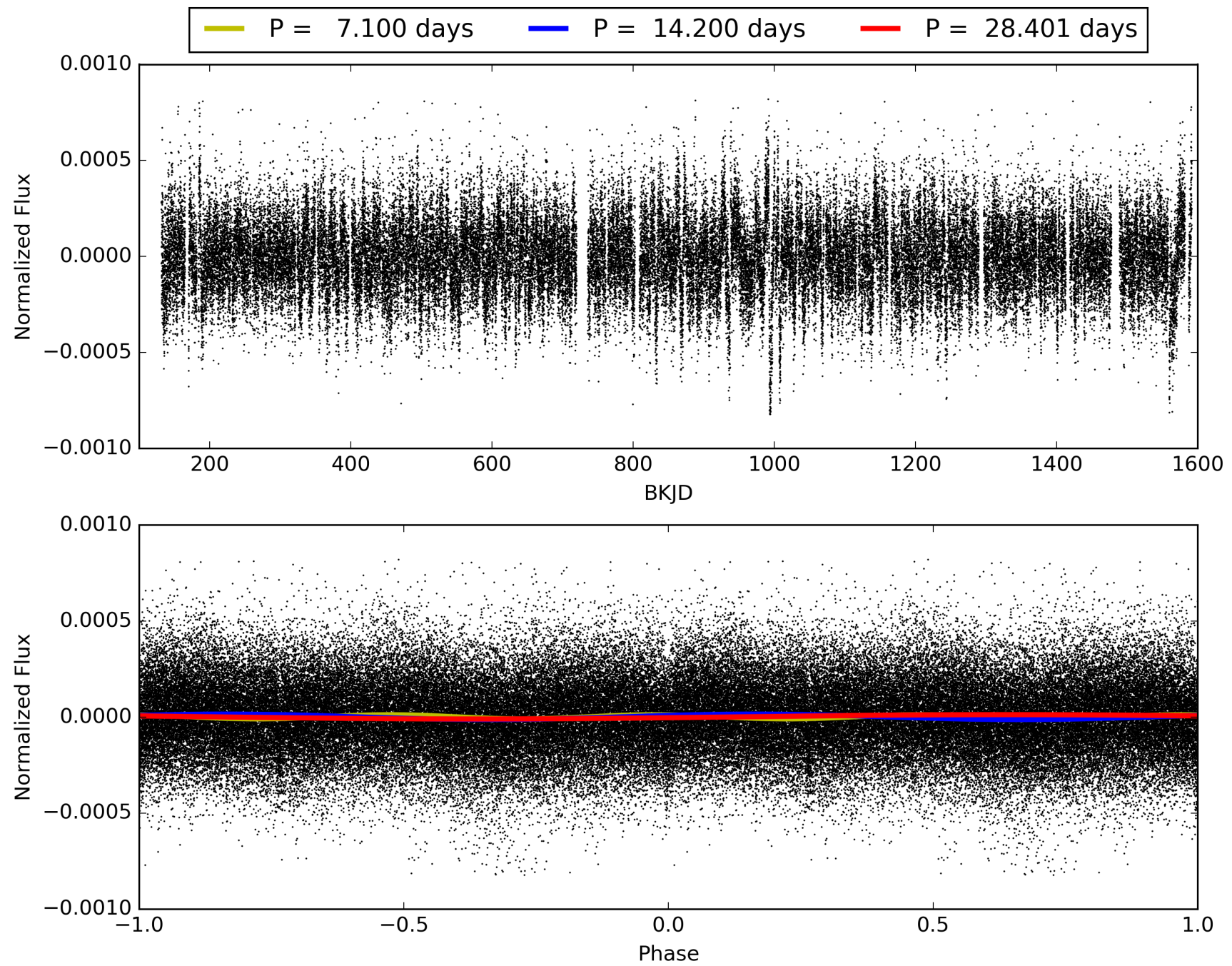
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 28-Jan-2016 23:39:16 Z

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

TCE 009509223-01, PDC Light Curves

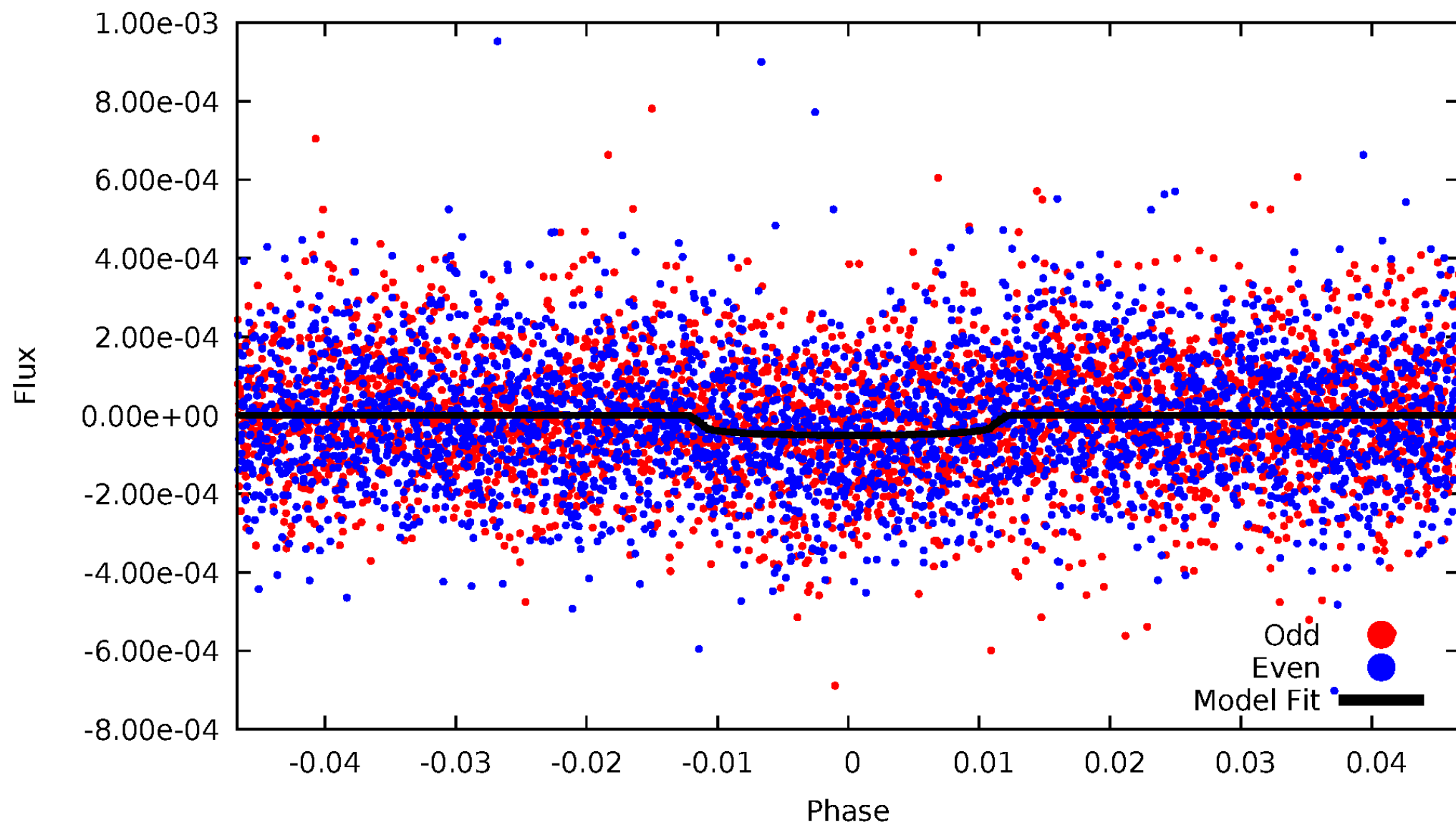


TCE 009509223-01



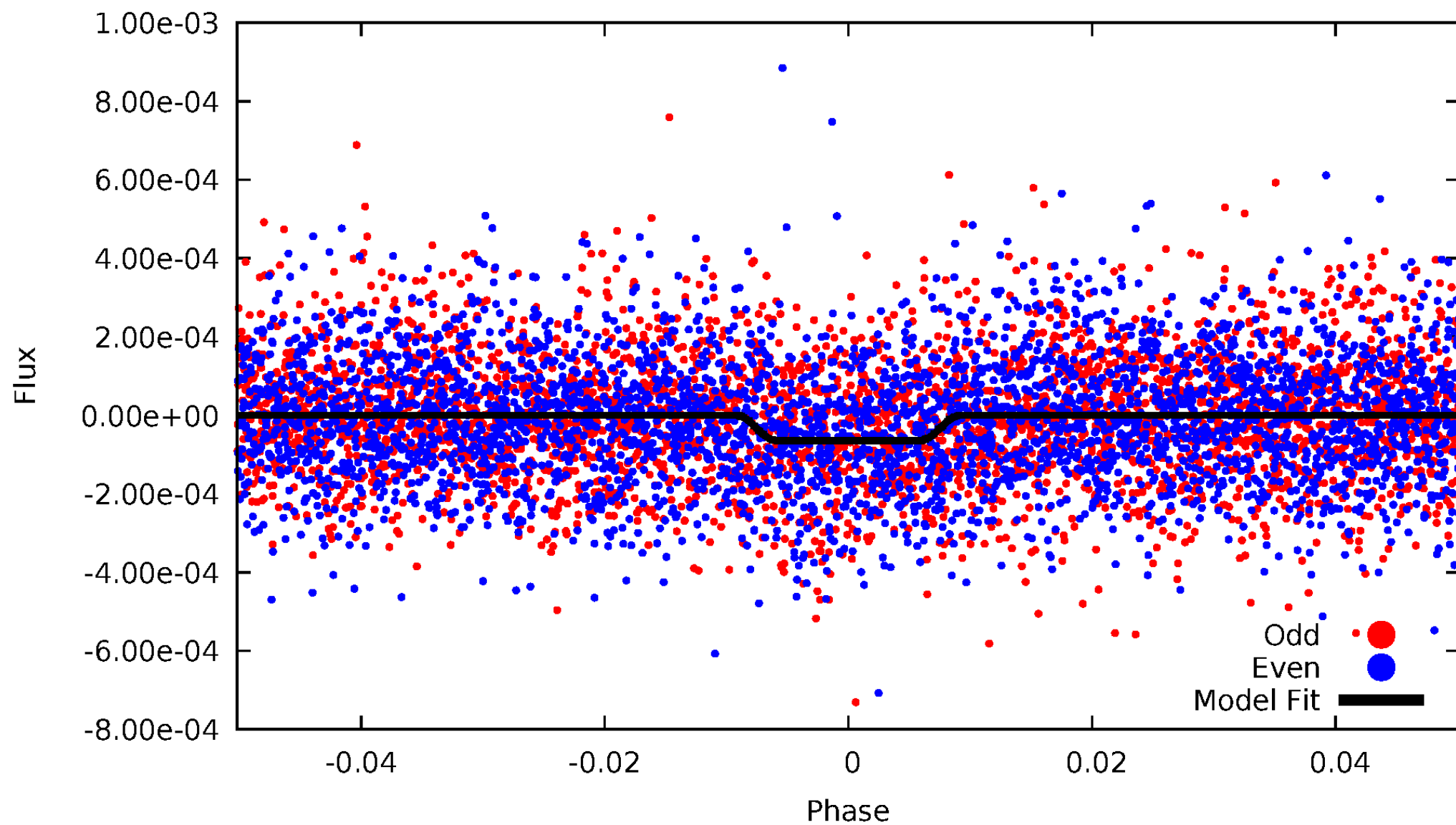
DV Odd/Even

TCE 009509223-01

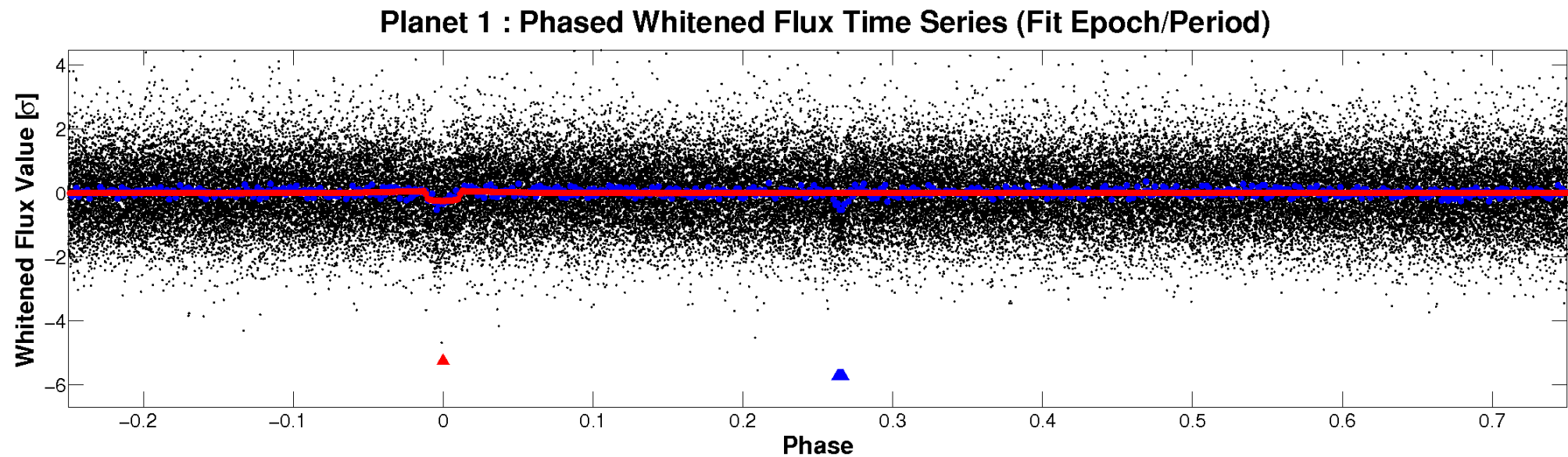
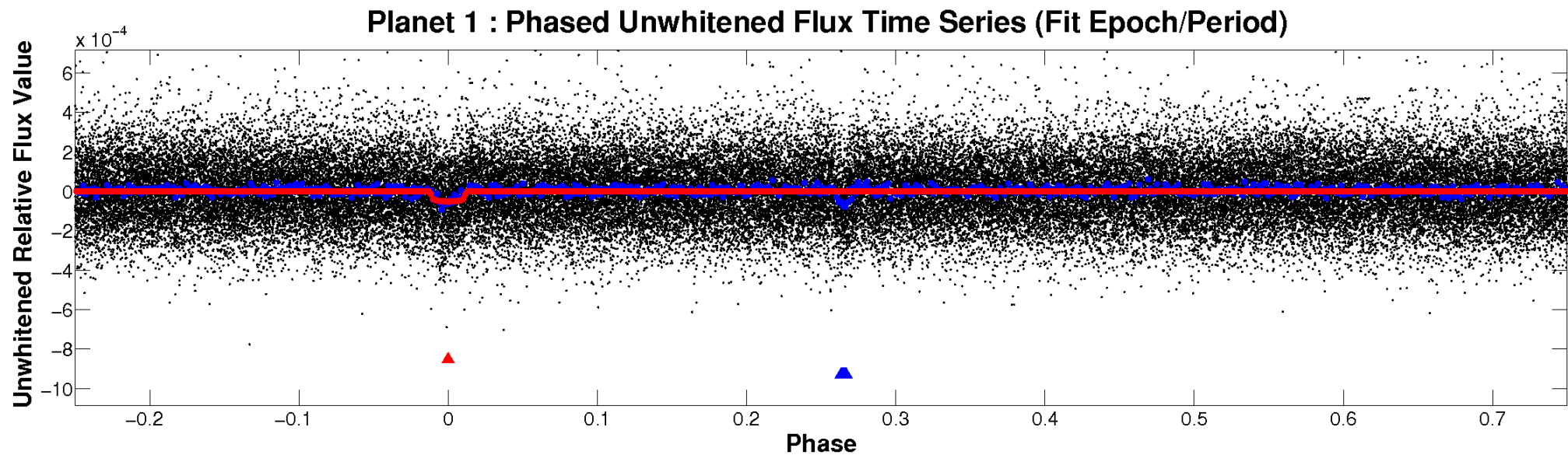


ALT Odd/Even

TCE 009509223-01

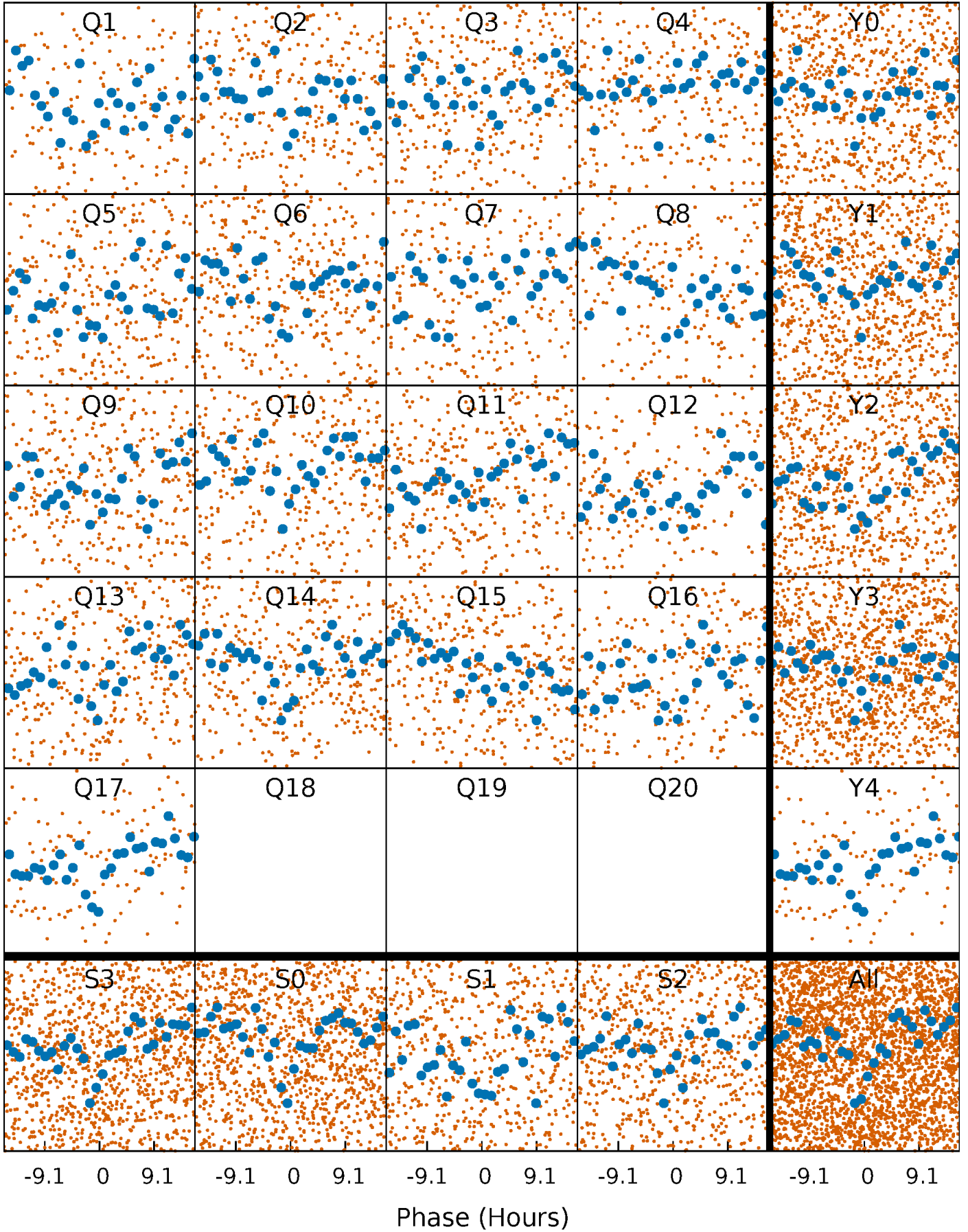


Non-Whitened Vs. Whitened Light Curve



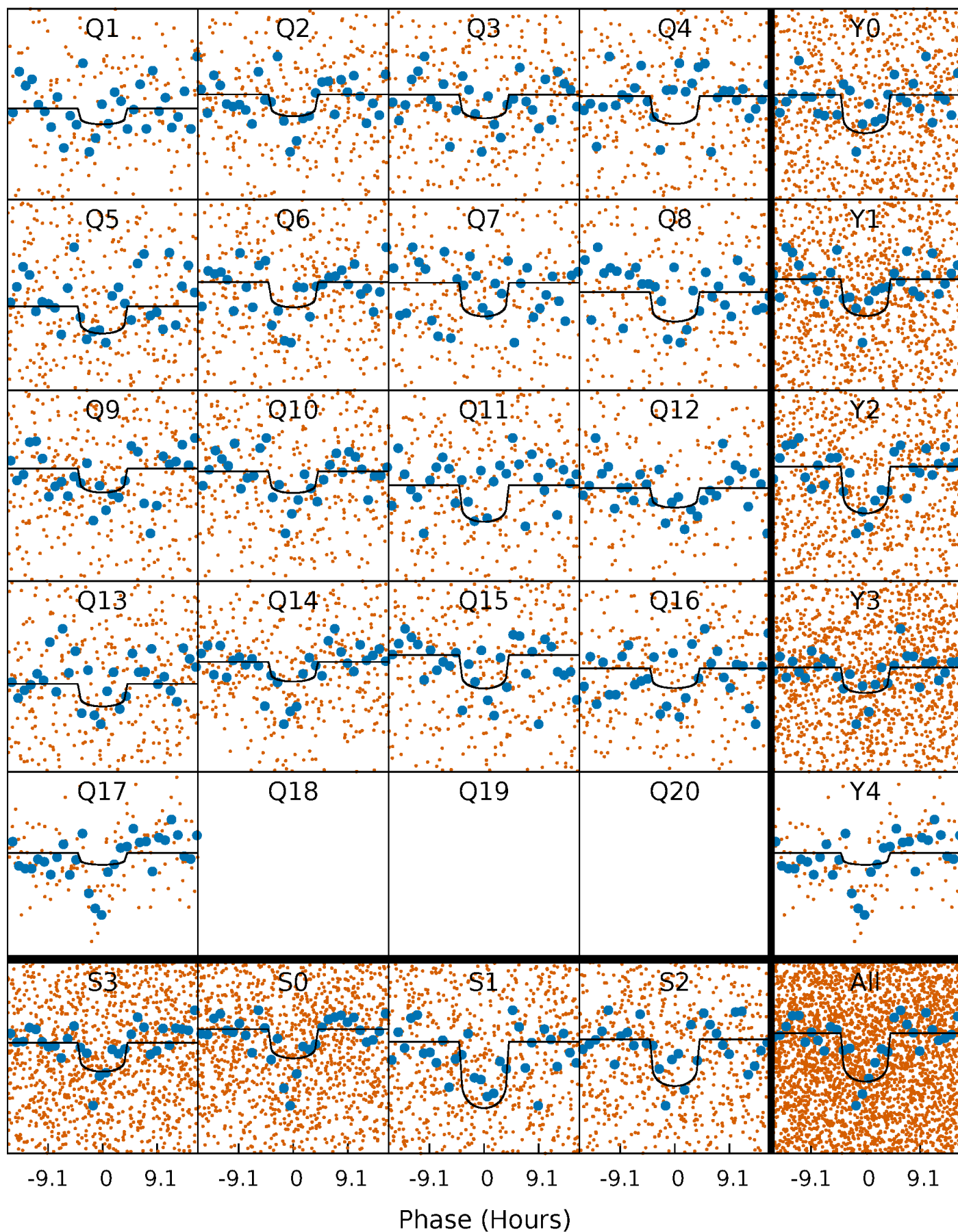
PDC Quarter-Phased Transit Curves

TCE 009509223-01 P= 14.200331 Days $T_0=131.975598$ (BKJD)



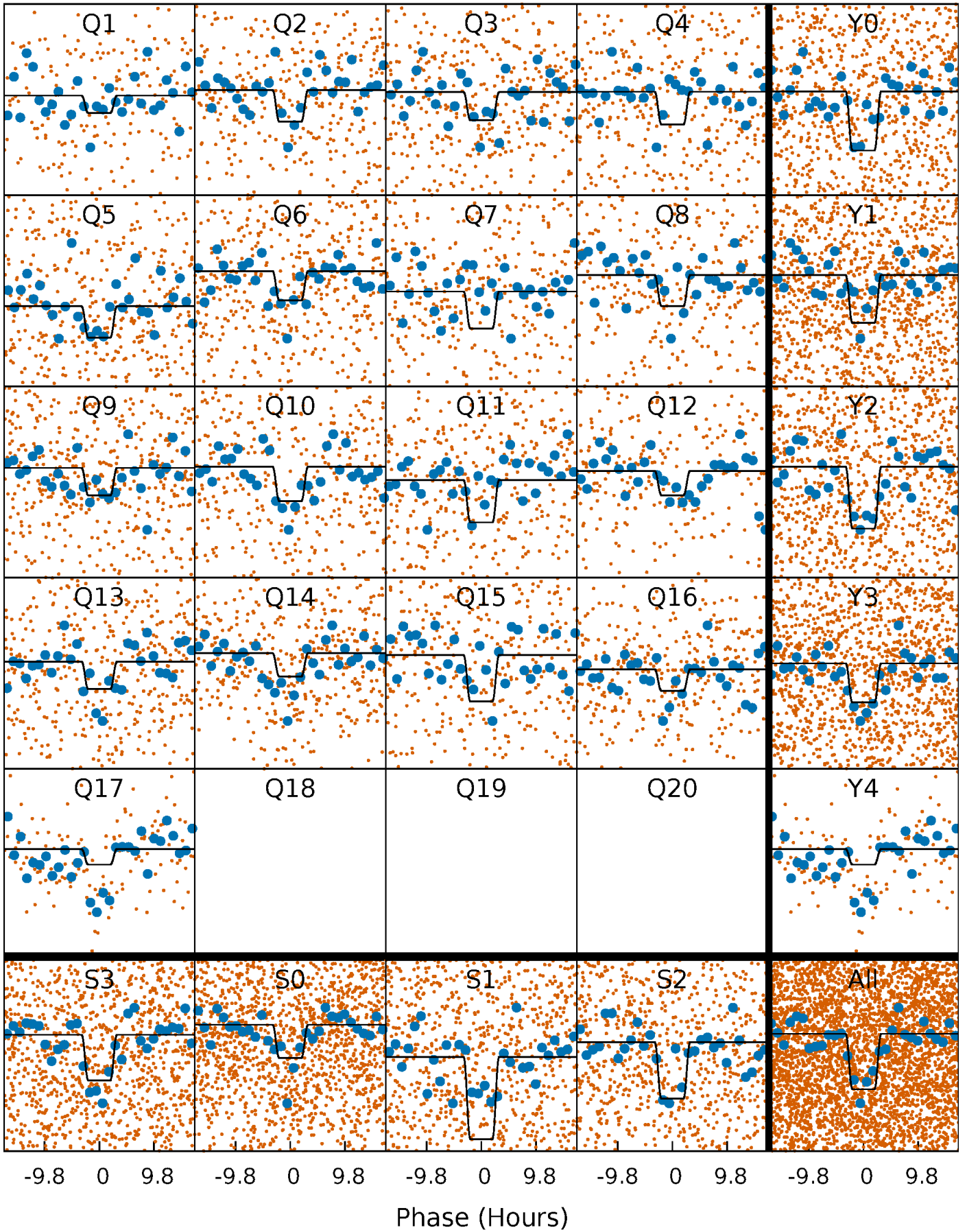
DV Quarter-Phased Transit Curves

TCE 009509223-01 P= 14.200331 Days $T_0=131.975598$ (BKJD)



Alt. Detrend Quarter-Phased Transit Curves

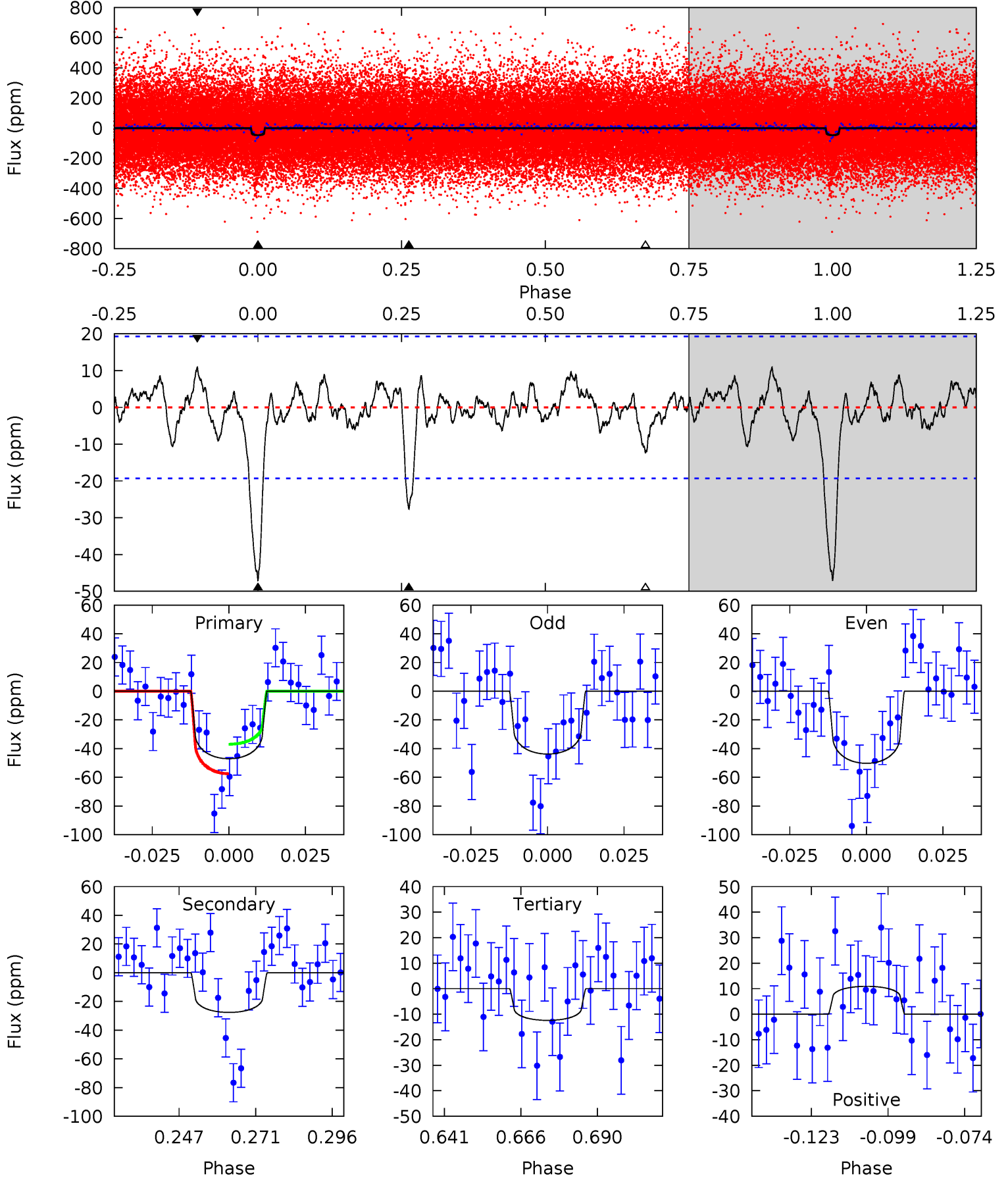
TCE 009509223-01 P= 14.200085 Days $T_0=131.977593$ (BKJD)



DV Model-Shift Uniqueness Test

009509223-01, P = 14.200331 Days, E = 117.775267 Days

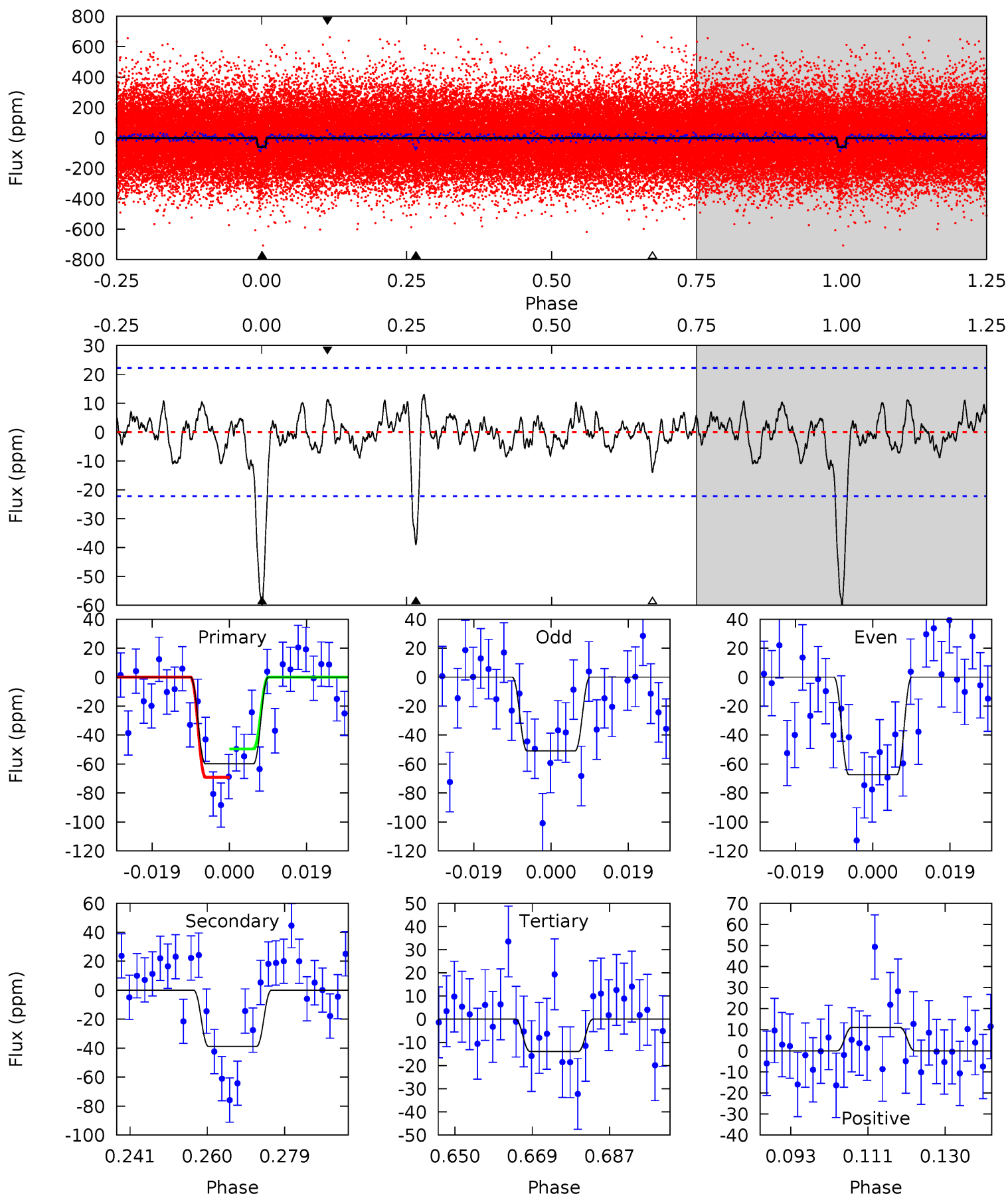
Pri	Sec	Ter	Pos	FA ₁	FA ₂	F _{Red}	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
11.8	6.95	3.12	2.75	4.85	2.25	1.01	8.71	9.08	3.83	4.20	0.82	0.94	0.19	2.59



Alt Model-Shift Uniqueness Test

009509223-01, P = 14.200085 Days, E = 117.777508 Days

Pri	Sec	Ter	Pos	FA ₁	FA ₂	F _{Red}	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
13.2	8.59	3.09	2.45	4.91	2.35	1.01	10.1	10.8	5.50	6.13	1.82	1.08	0.18	2.18



Stellar Parameters For KIC 009509223

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	6332^{+169}_{-188}	$4.406^{+0.070}_{-0.210}$	$-0.240^{+0.250}_{-0.300}$	$1.065^{+0.349}_{-0.116}$	$1.048^{+0.172}_{-0.115}$	$1.223^{+0.448}_{-0.664}$
	+3%/-3%	+2%/-5%	+104%/-125%	+33%/-11%	+16%/-11%	+37%/-54%
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 009509223-01 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	A_{obs}
DV	-28 ± 4	$0.83^{+0.40}_{-0.35}$	1190^{+88}_{-52}	5494^{+1853}_{-844}	288^{+600}_{-158}
Alt.	-39 ± 5	$1.00^{+0.39}_{-0.38}$	1195^{+88}_{-58}	5561^{+1438}_{-784}	296^{+451}_{-147}

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

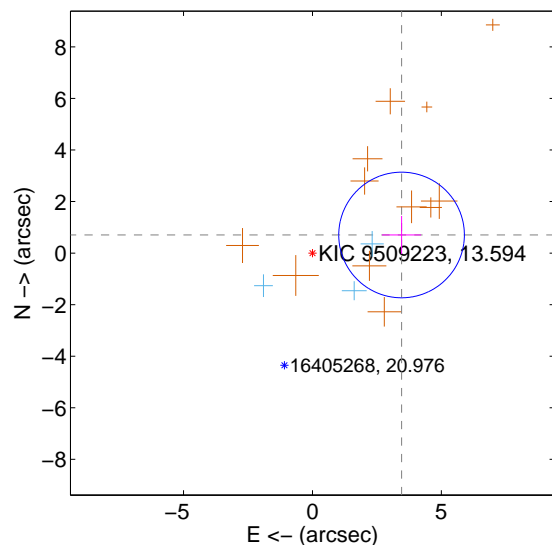
Supplemental centroid analysis for 009509223-01. Kepler magnitude: 13.59. Transit SNR 8.72

There are 3 quarters with good PRF difference image offsets

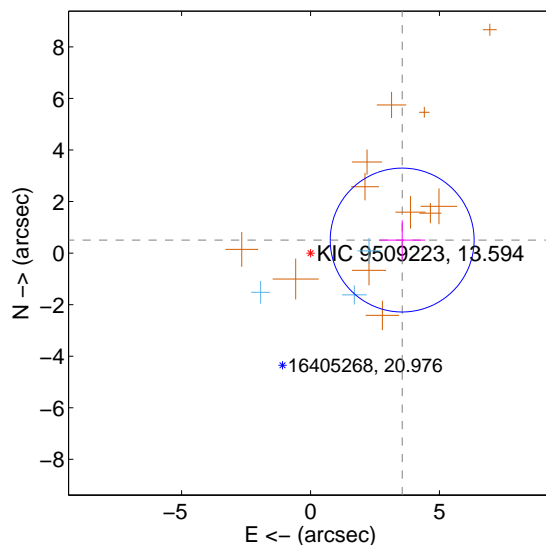
The direct PRF centroid is offset from the target star catalog position by about 0.21 arcsec

	Distance in arcsec	Distance / σ	Δ RA	Δ Dec
PRF-fit source offset from OOT	3.527 ± 0.812	4.34	-3.457 ± 0.757	0.703 ± 0.740
PRF-fit source offset from KIC position	3.591 ± 0.930	3.86	-3.555 ± 0.898	0.506 ± 0.760
photometric centroid source offset	3.40 ± 1.47	2.31	0.46 ± 1.51	3.37 ± 1.47

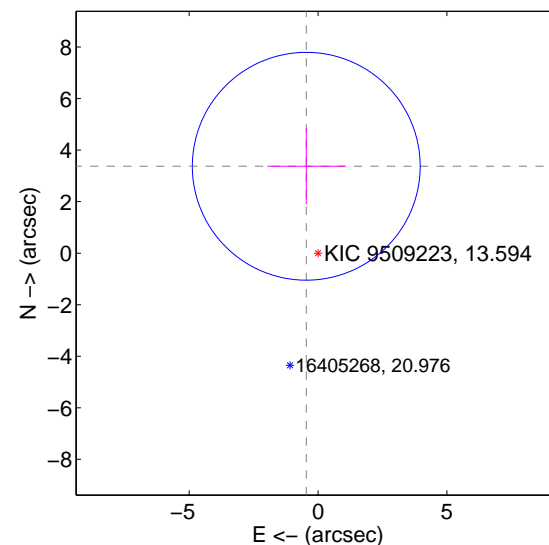
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position

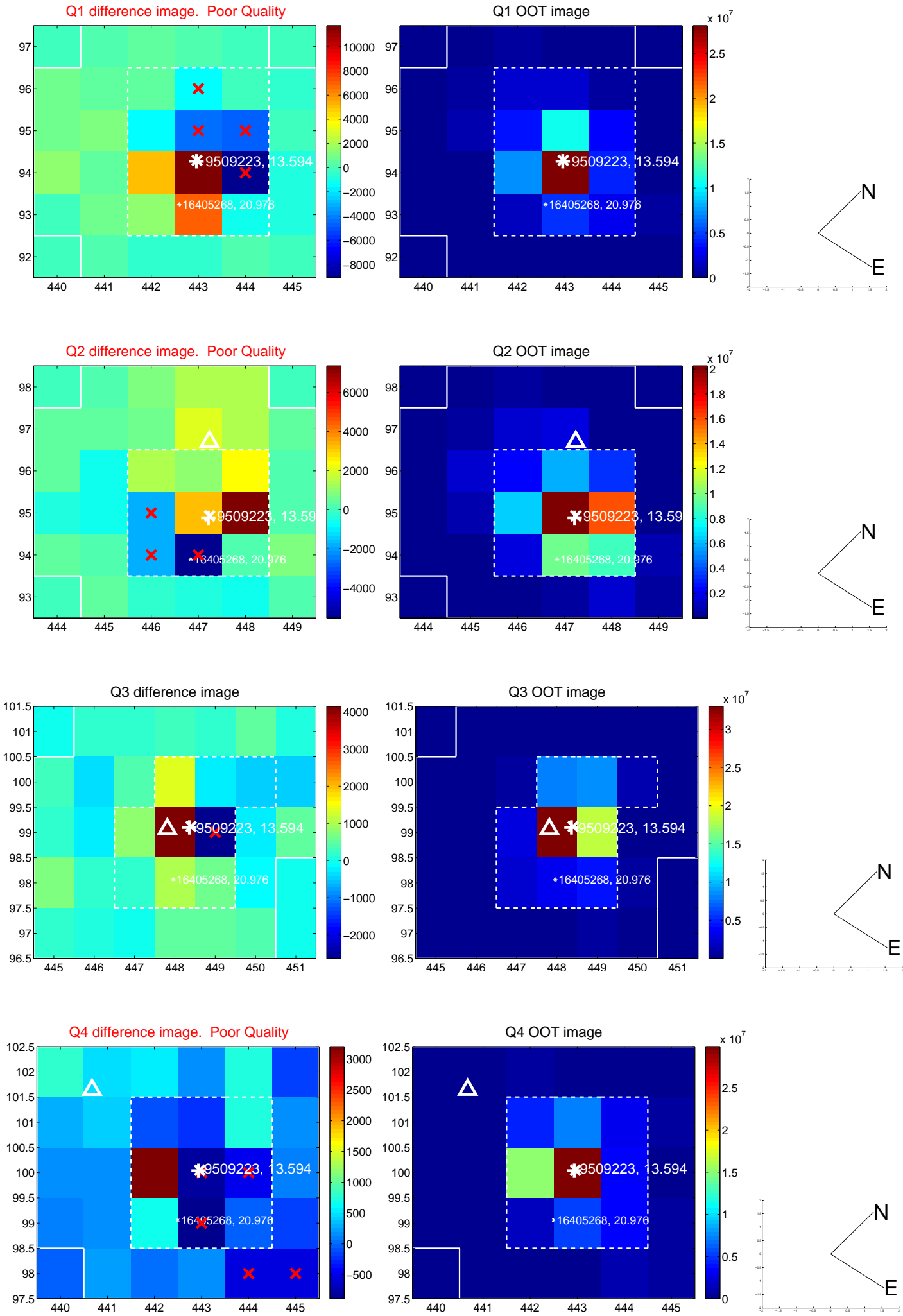


offset from photometric centroids

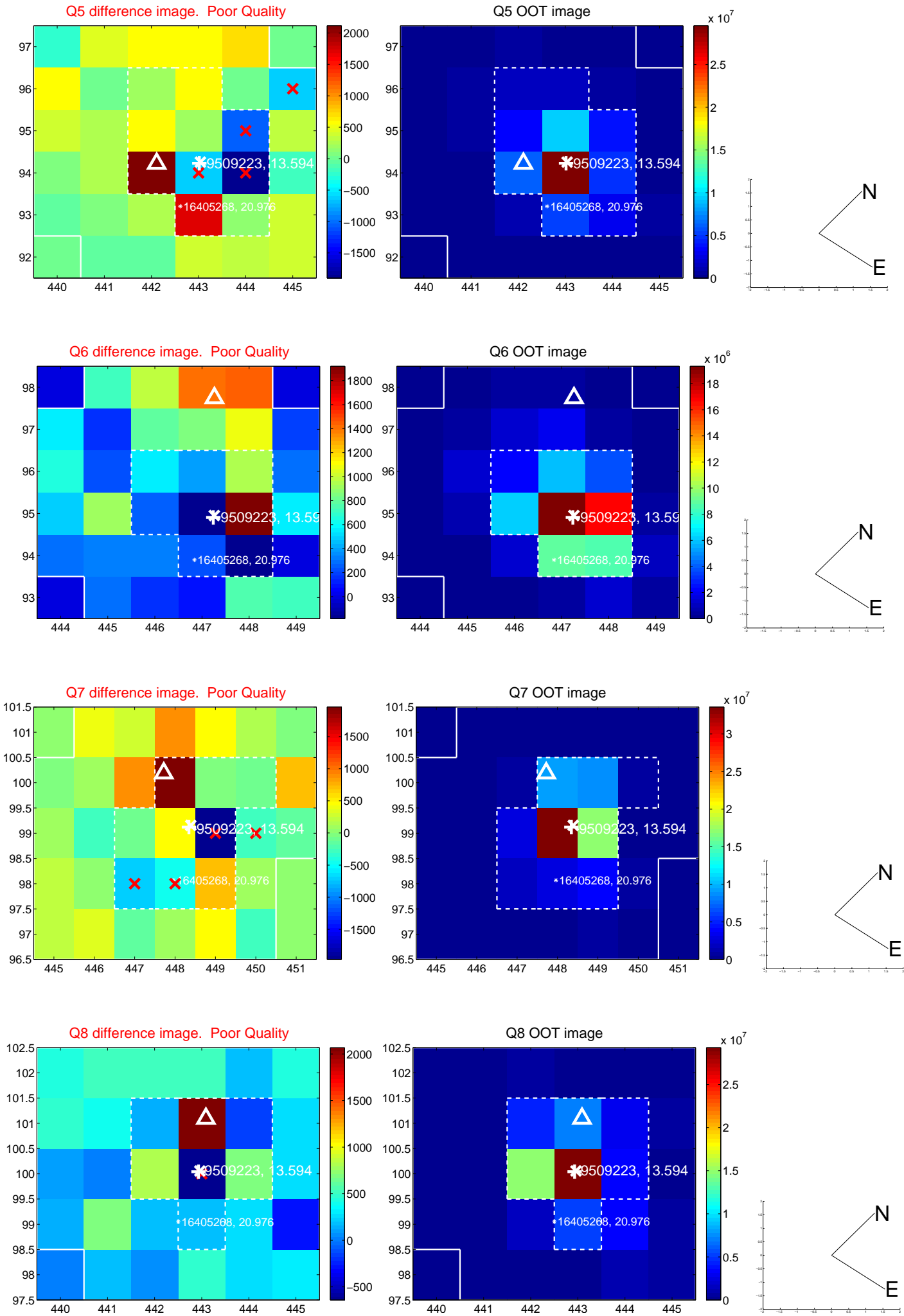


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- σ uncertainty. Blue circle: three- σ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

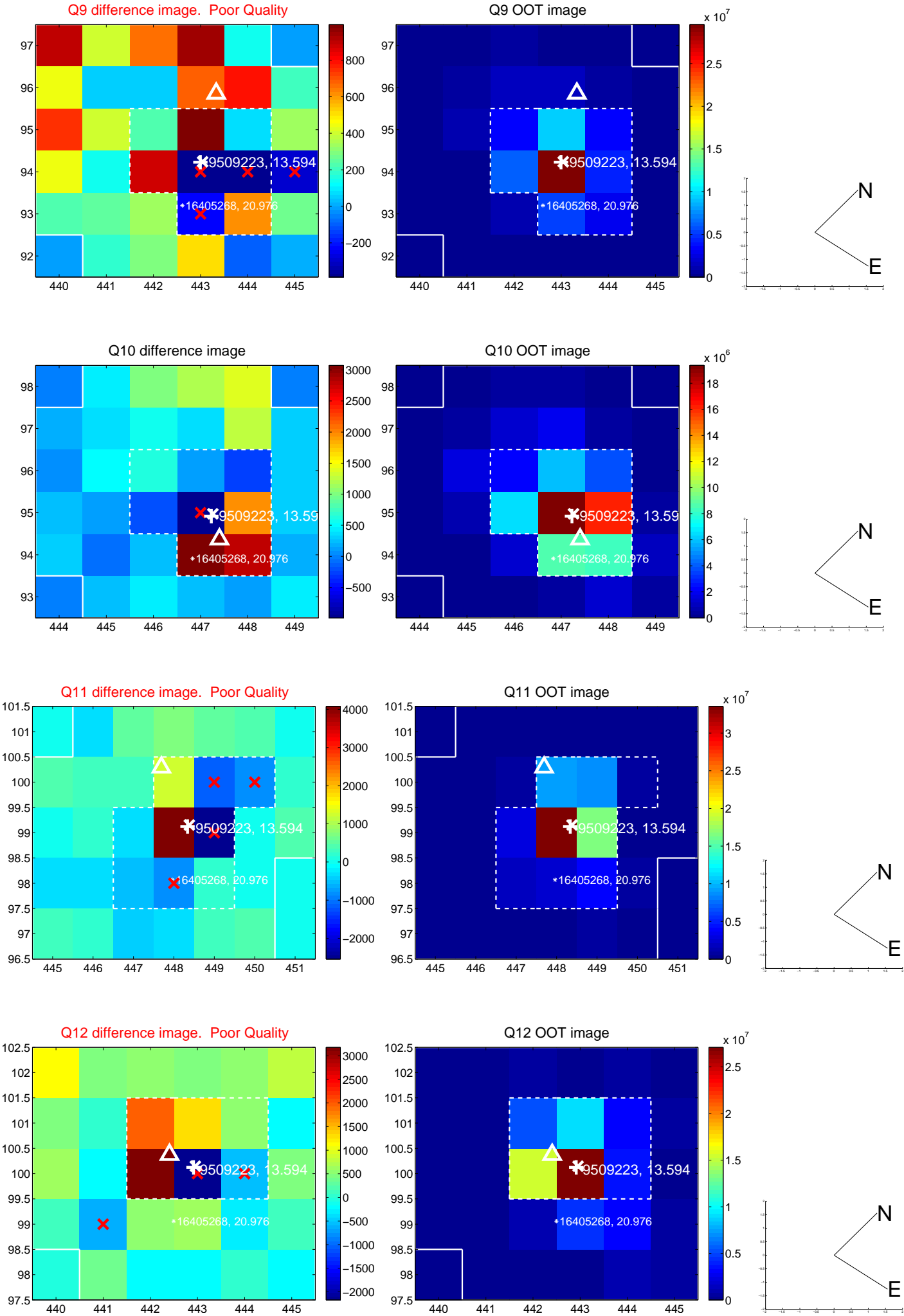
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



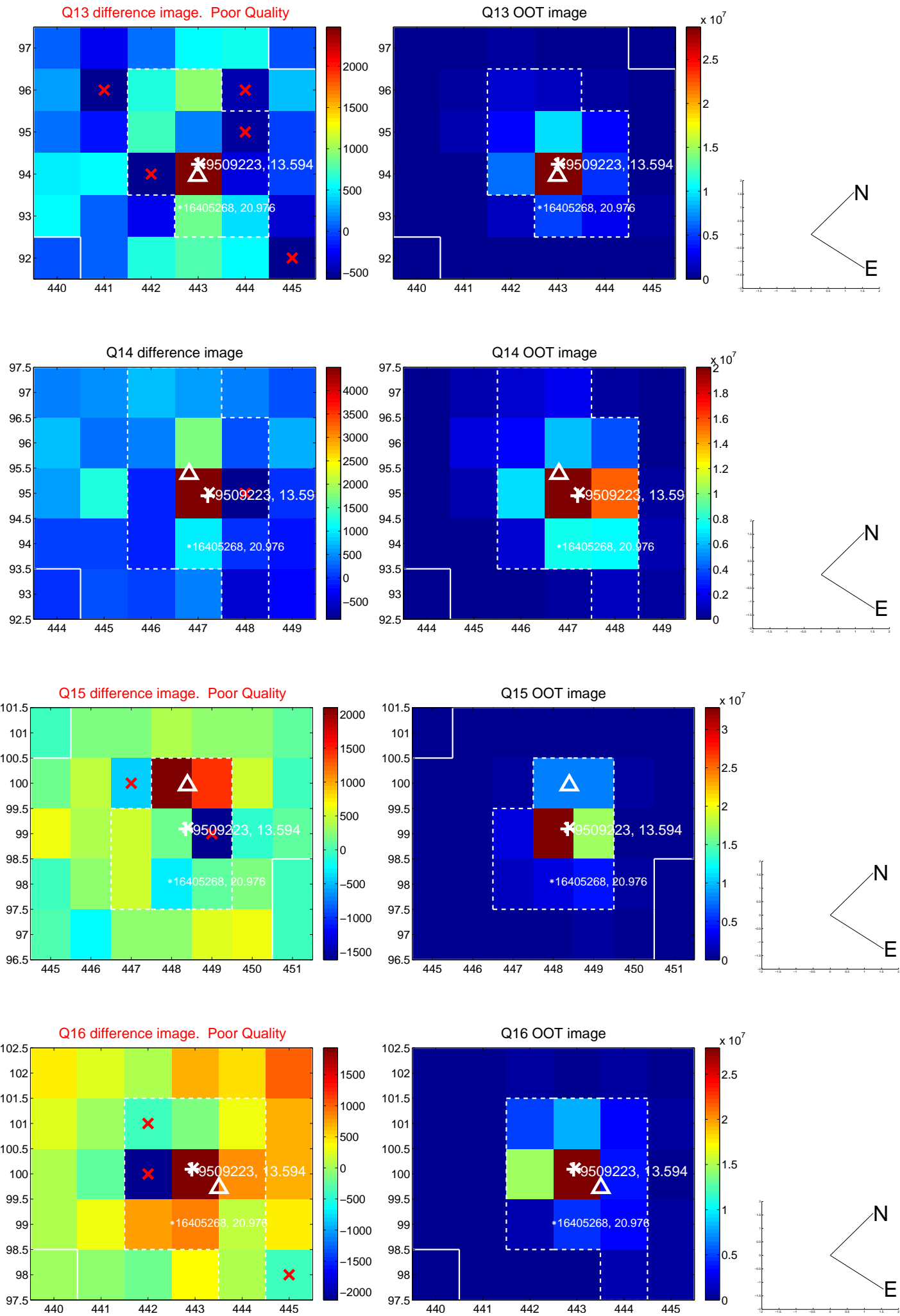
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



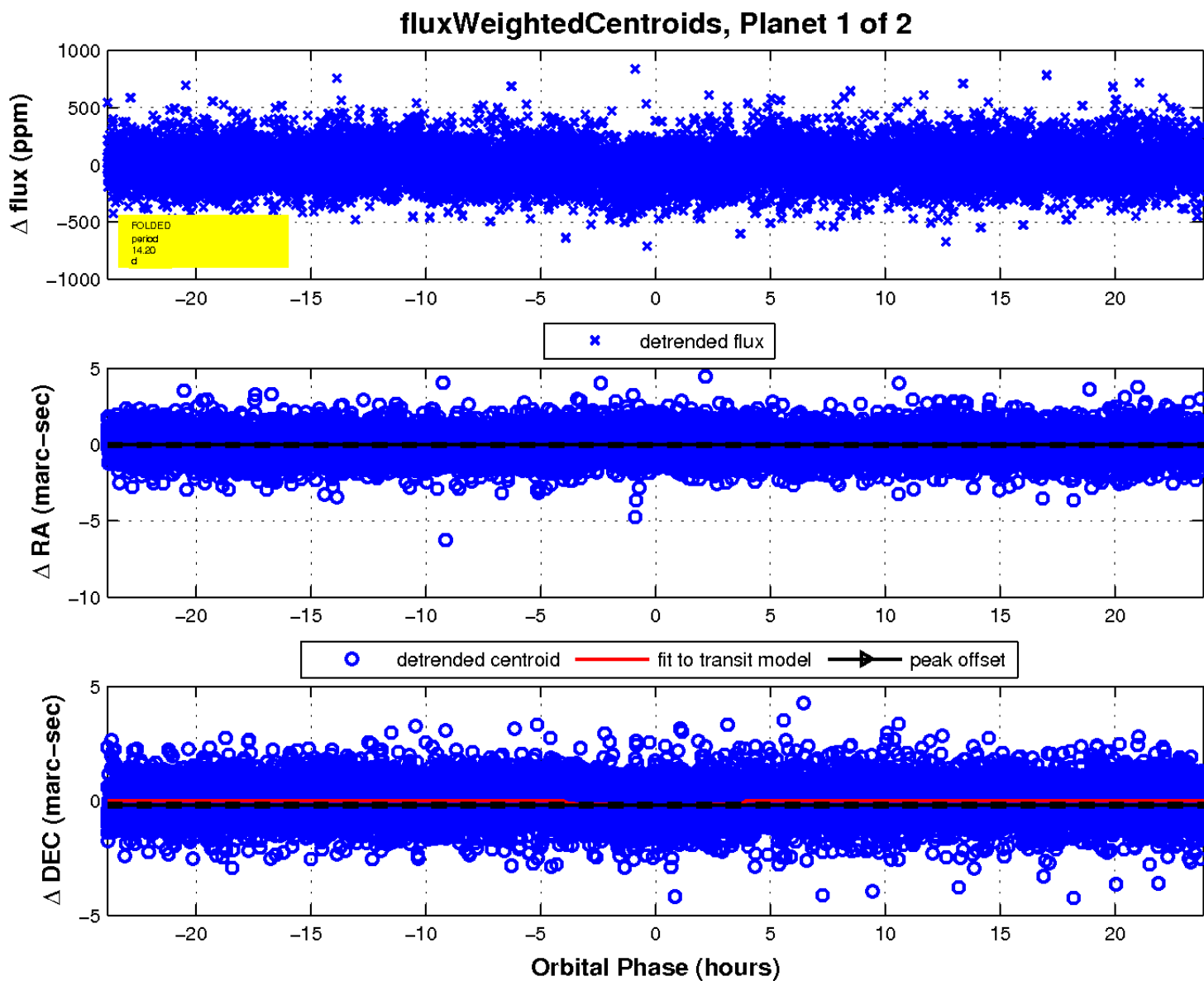
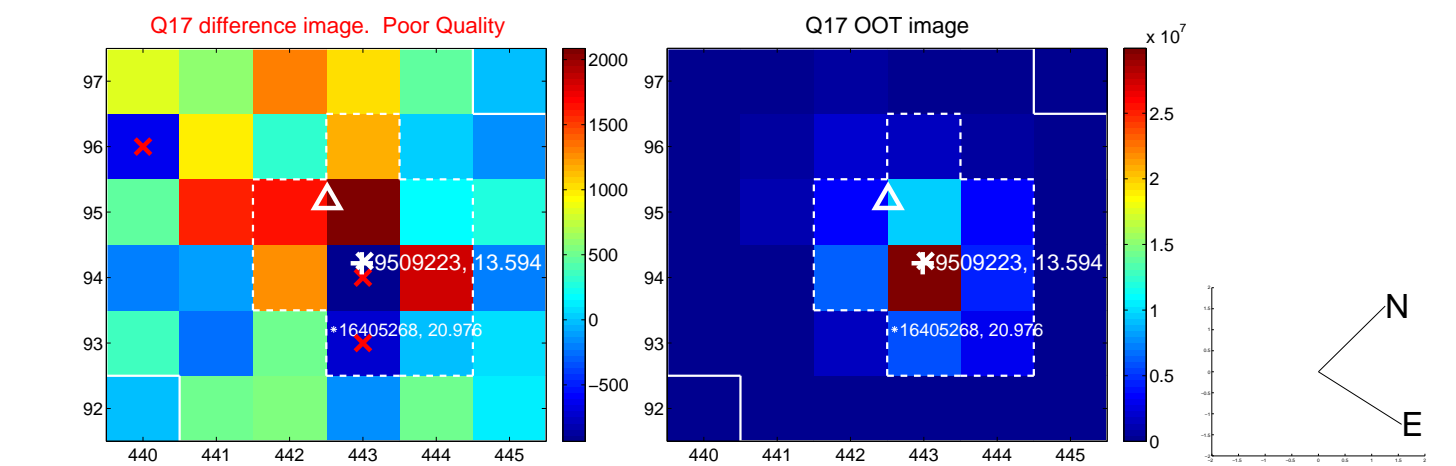
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



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

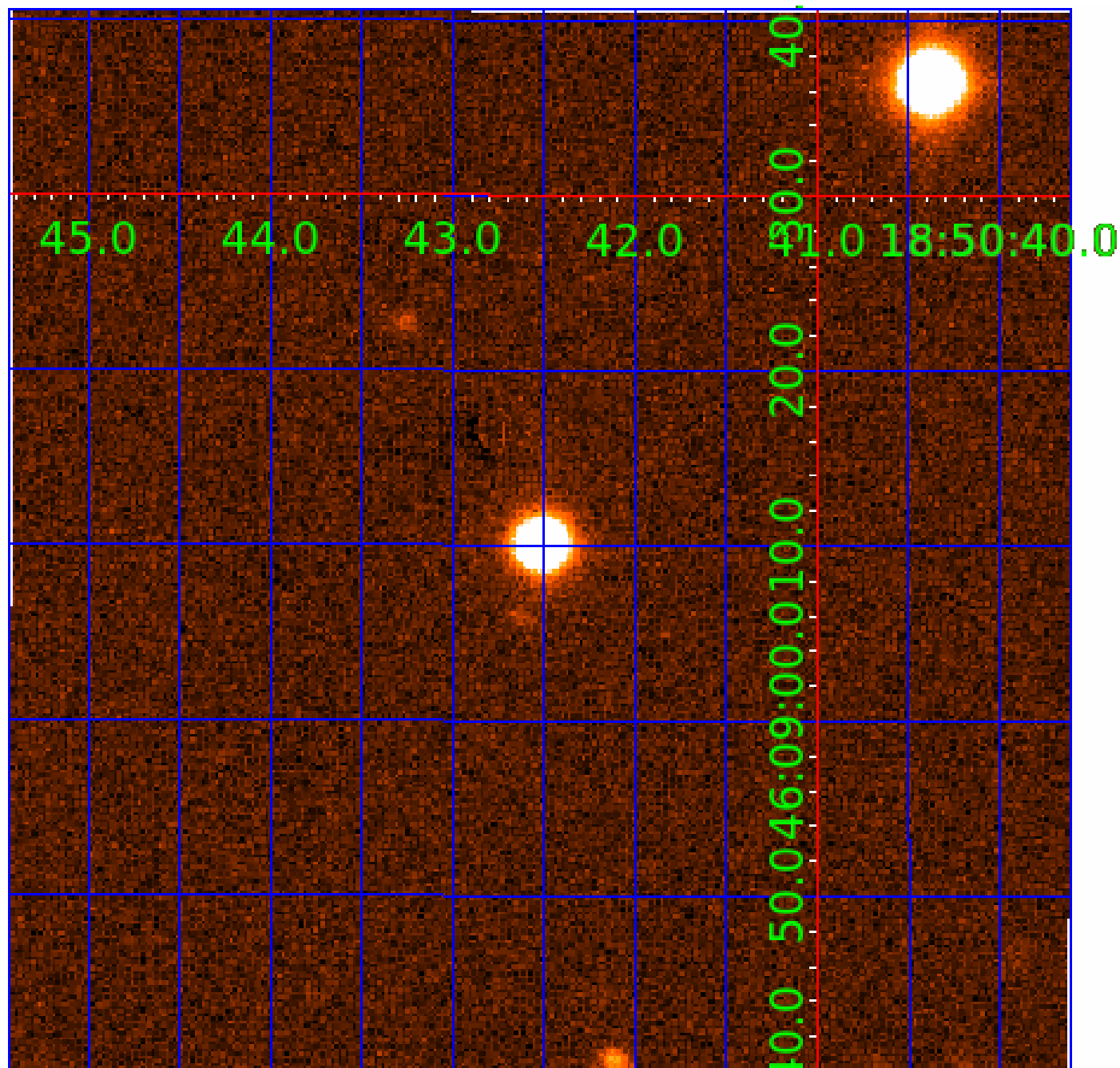


white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



UKIRT Image

Declination



KIC 009509223

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})
009509223-01	OBS	No	14.200331	131.975598	51.3	7.957	8.7	8.7	1.06	6332	0.83	119.74
009509223-02	OBS	4867.01	14.200795	135.716206	76.8	3.936	8.6	10.5	1.06	6332	1.05	119.73

Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009509223-01	OBS	FP	0.00	1	0	1	1	LPP_DV—HALO_GHOST—EPHEM_MATCH
009509223-02	OBS	FP	0.00	1	0	0	1	SAME_NTL_PERIOD—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.

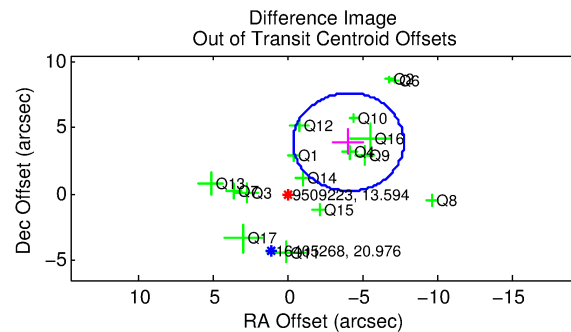
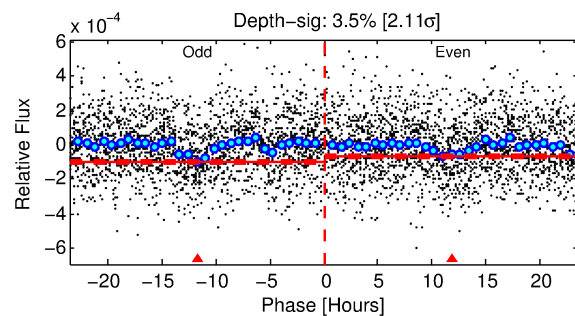
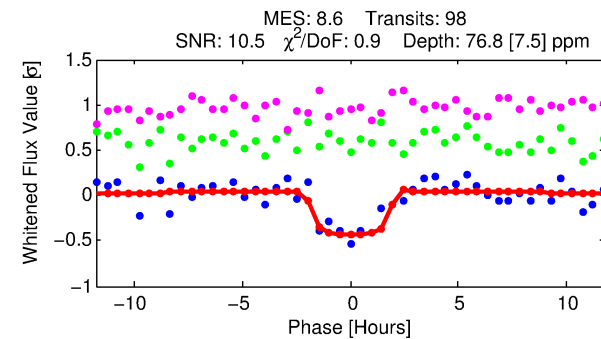
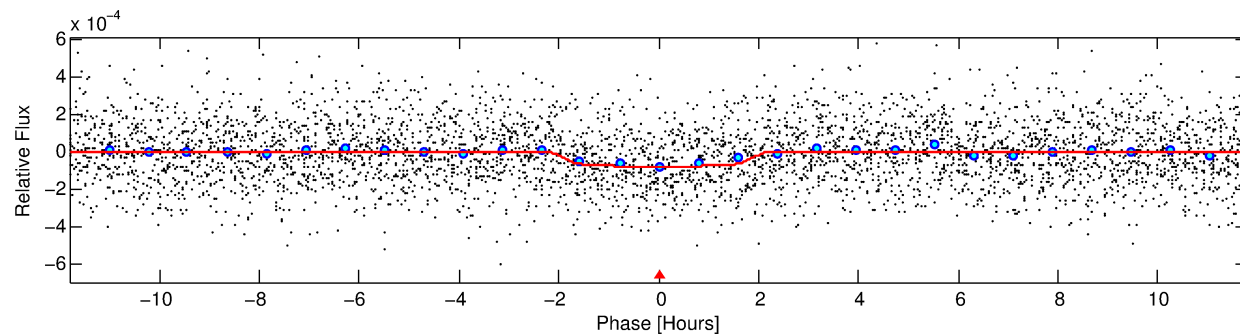
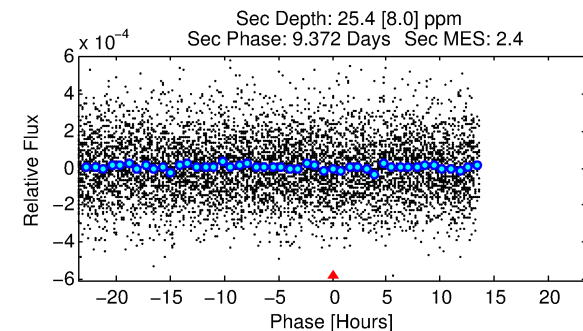
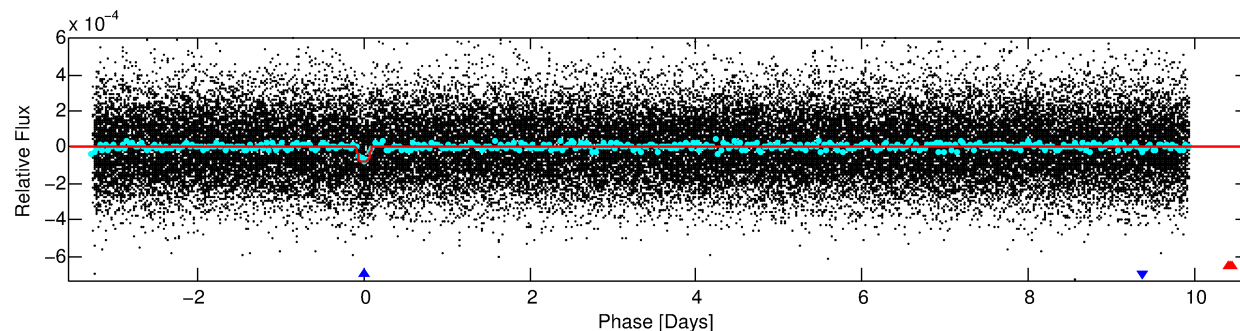
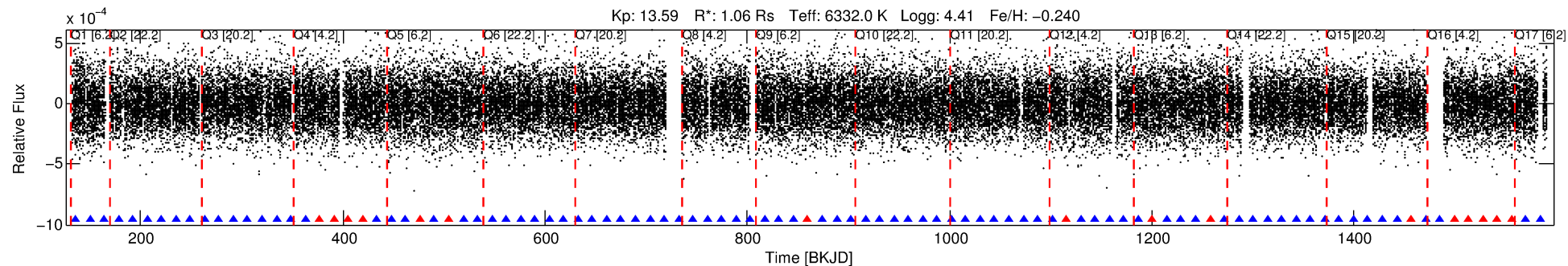
Ephemeris Match Information For 009509223-02

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
009509223-02	9509223	7181.01	9509207	1:1	34.4	-8	0	13.13	13.59	2792.30	Direct-PRF	0	2.27	0.89

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: 9509223 Candidate: 2 of 2 Period: 14.201 d
KOI: K04867.01 Corr: 0.888



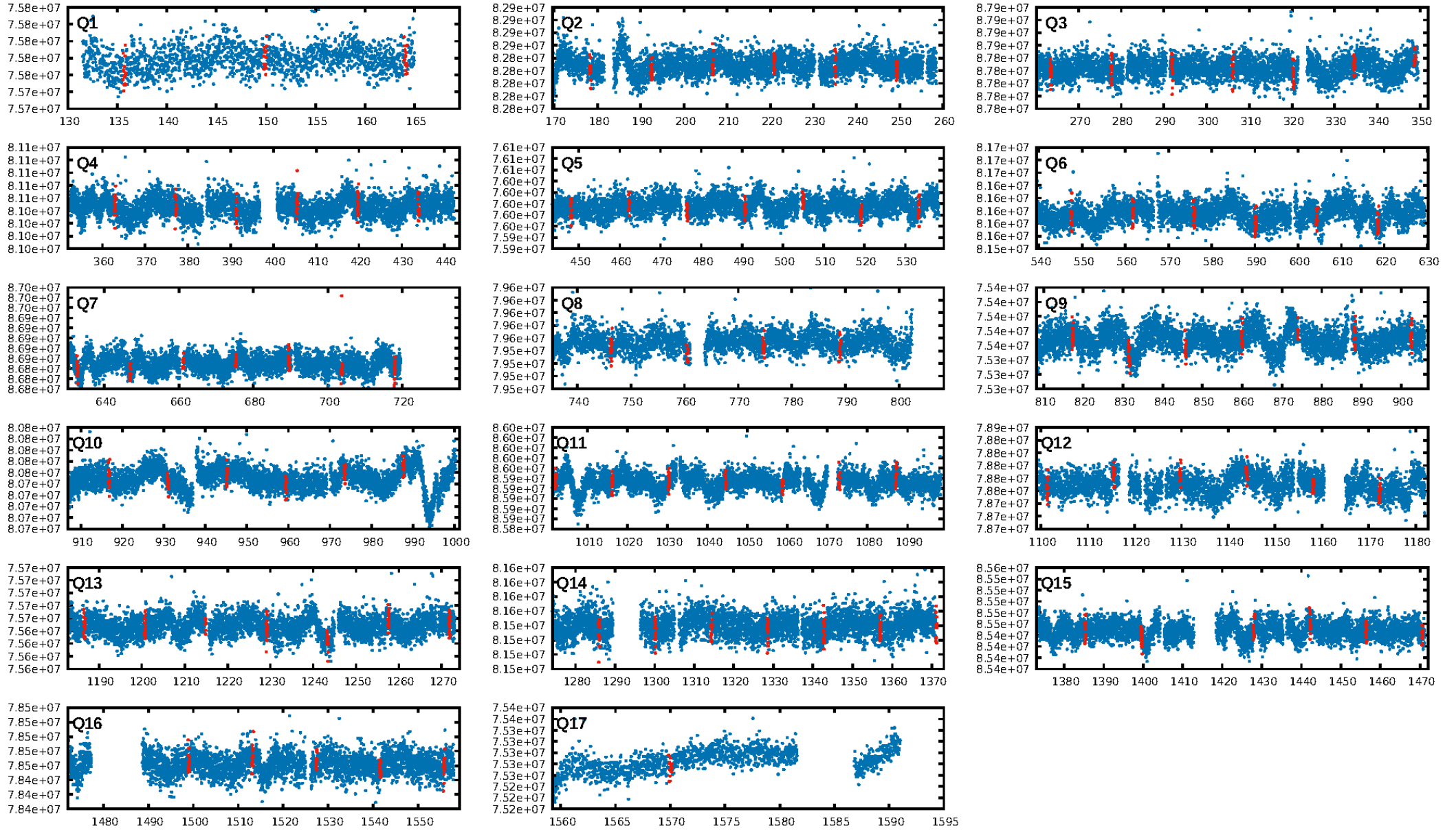
DV Fit Results:

Period = 14.20079 [0.00013] d
Epoch = 135.7162 [0.0075] BKJD
Rp/R* = 0.0090 [0.0044]
a/R* = 15.47 [41.04]
b = 0.84 [0.95]
Seff = 119.73 [48.75]
Teq = 843 [86] K
Rp = 1.05 [0.62] Re
a = 0.1168 [0.0317] AU
Ag = 172.74 [188.84] [0.91σ]
Teff = 4728 [1216] K [3.19σ]

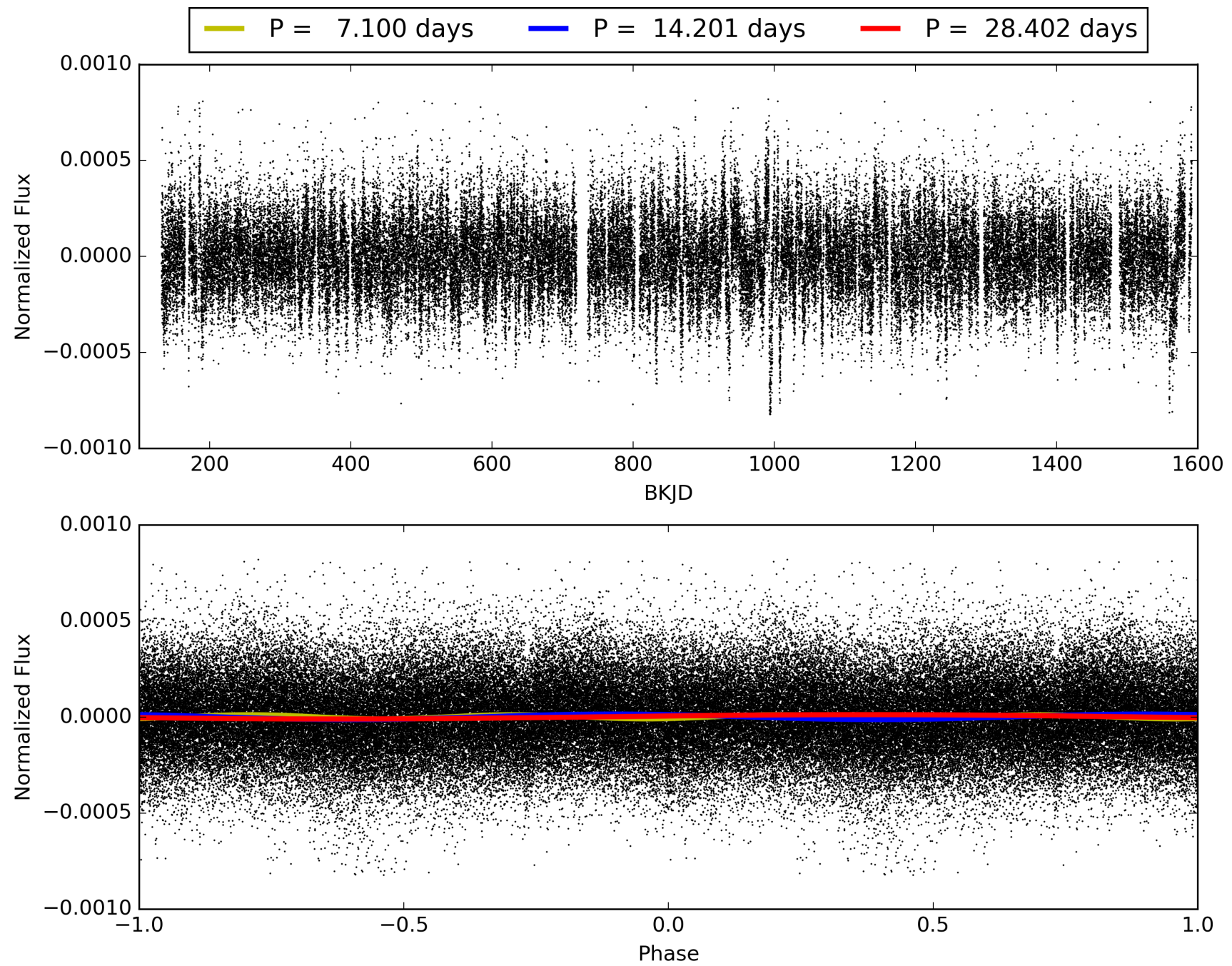
DV Diagnostic Results:

ShortPeriod-sig: 0.1% [0.00σ]
LongPeriod-sig: N/A
ModelChiSquare2-sig: 97.9%
ModelChiSquareGof-sig: 100.0%
Bootstrap-pfa: 2.73e-17
RollingBand-fgt: 0.83 [78/94]
GhostDiagnostic-chr: 0.5258
Centroid-sig: 0.1%
Centroid-so: 2.871 arcsec [2.14σ]
OotOffset-rm: 5.678 arcsec [4.60σ]
KicOffset-rm: 5.532 arcsec [4.23σ]
OotOffset-st: 4/4/4/4 [16]
KicOffset-st: 4/4/4/4 [16]
DiffImageQuality-fgm: 0.12 [2/16]
DiffImageOverlap-fno: 1.00 [17/17]

TCE 009509223-02, PDC Light Curves

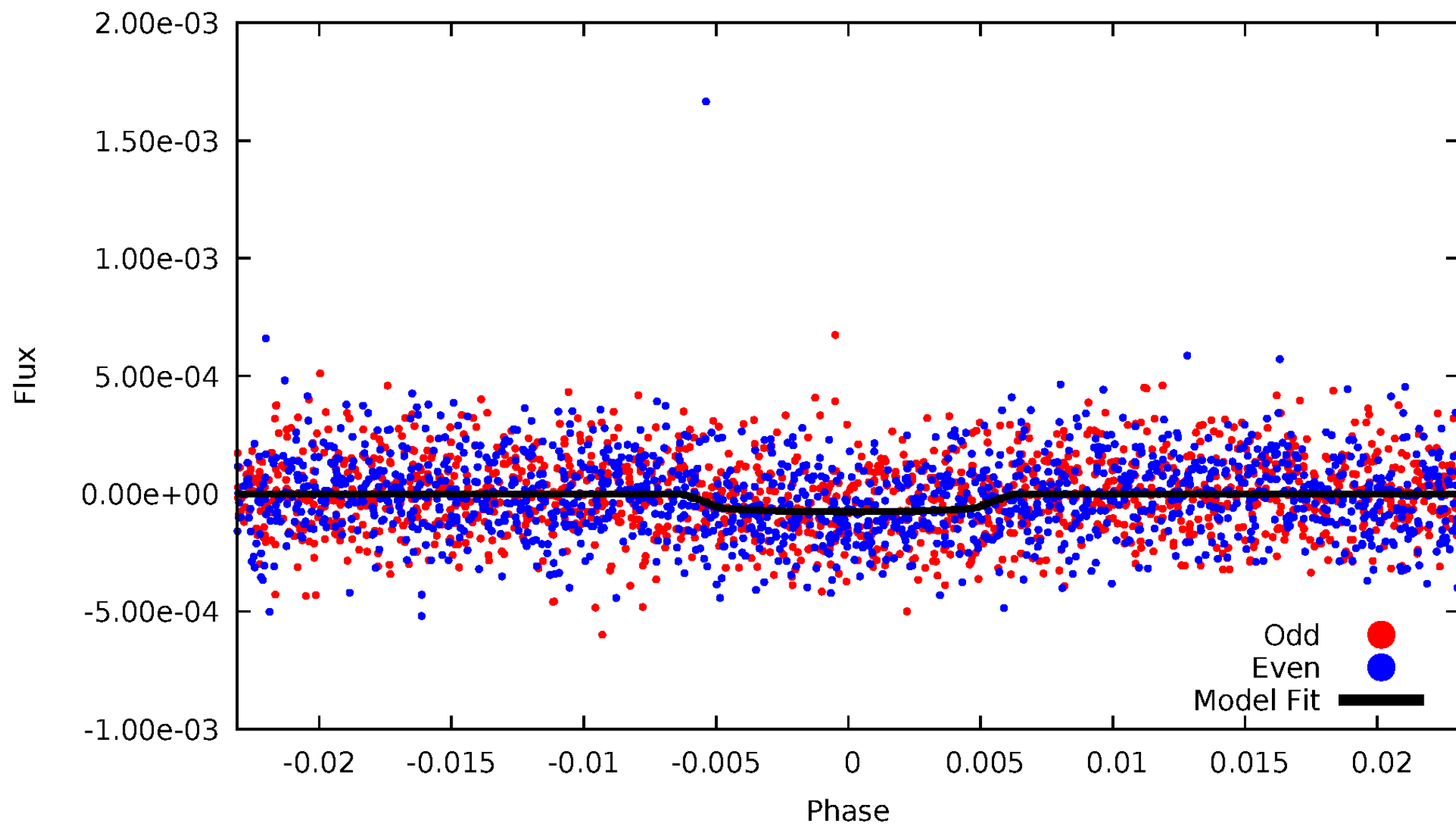


TCE 009509223-02



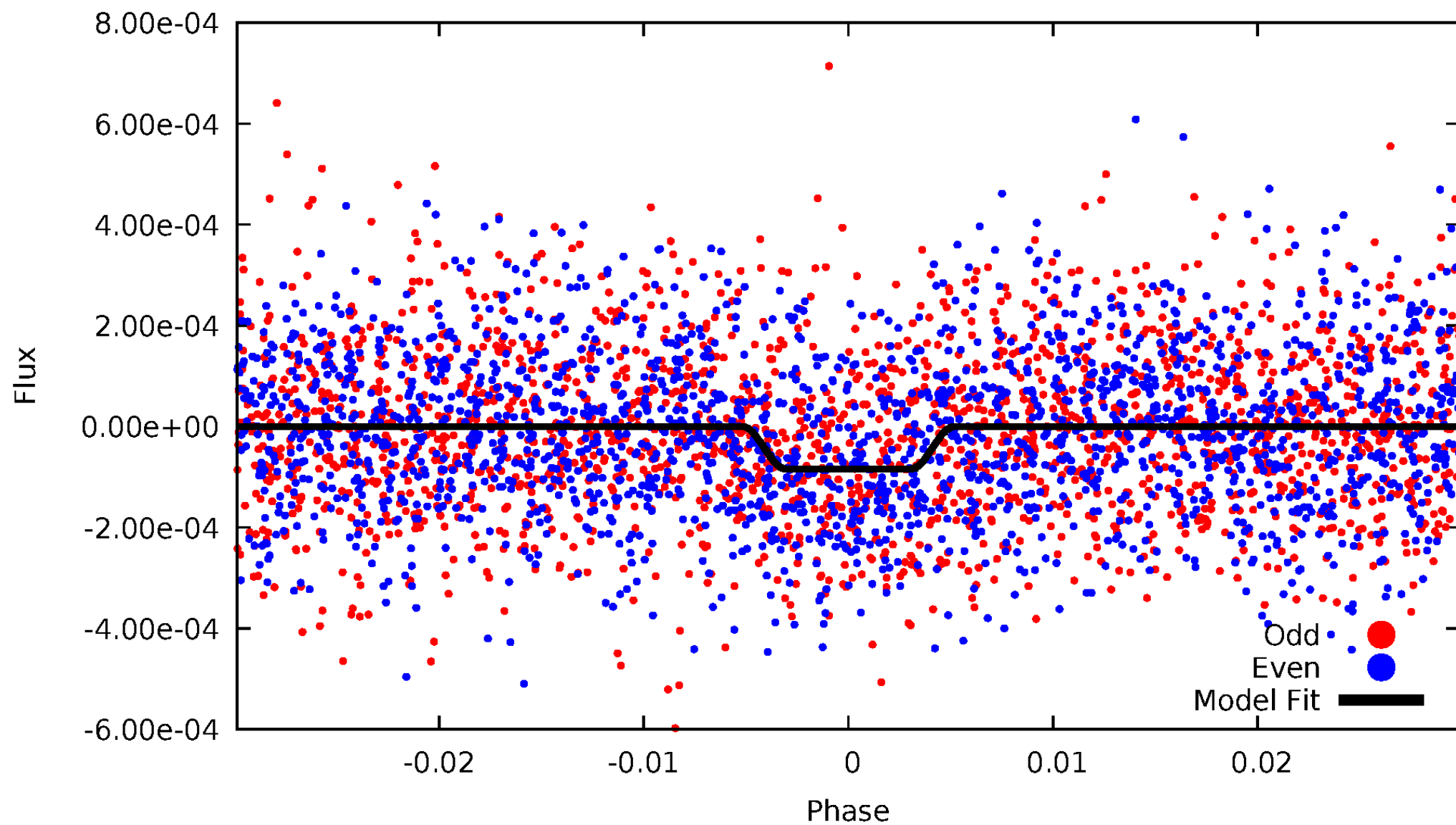
DV Odd/Even

TCE 009509223-02



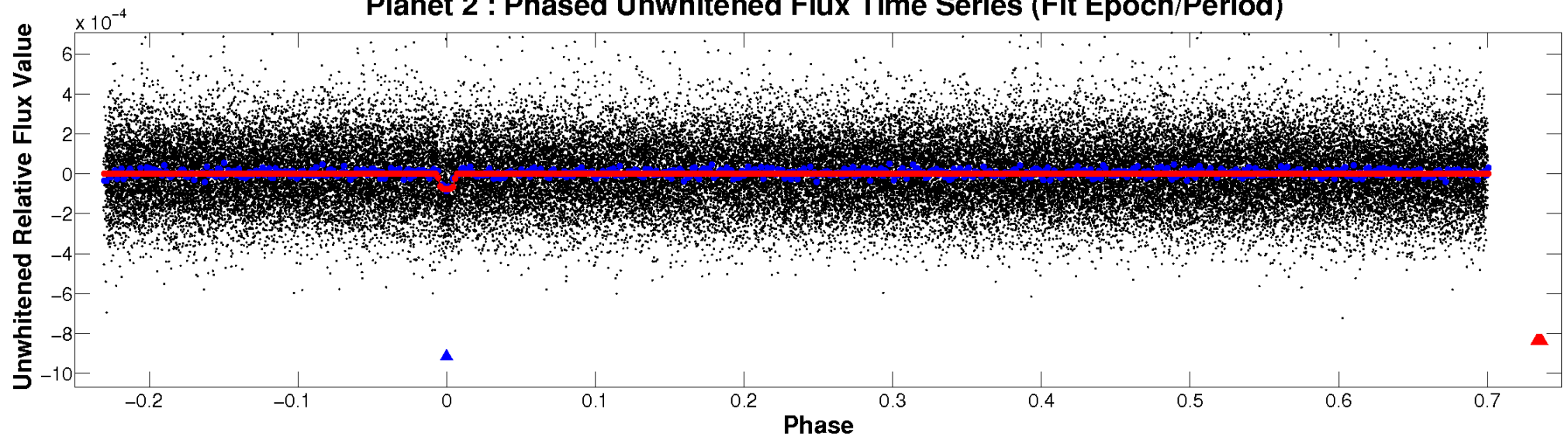
ALT Odd/Even

TCE 009509223-02

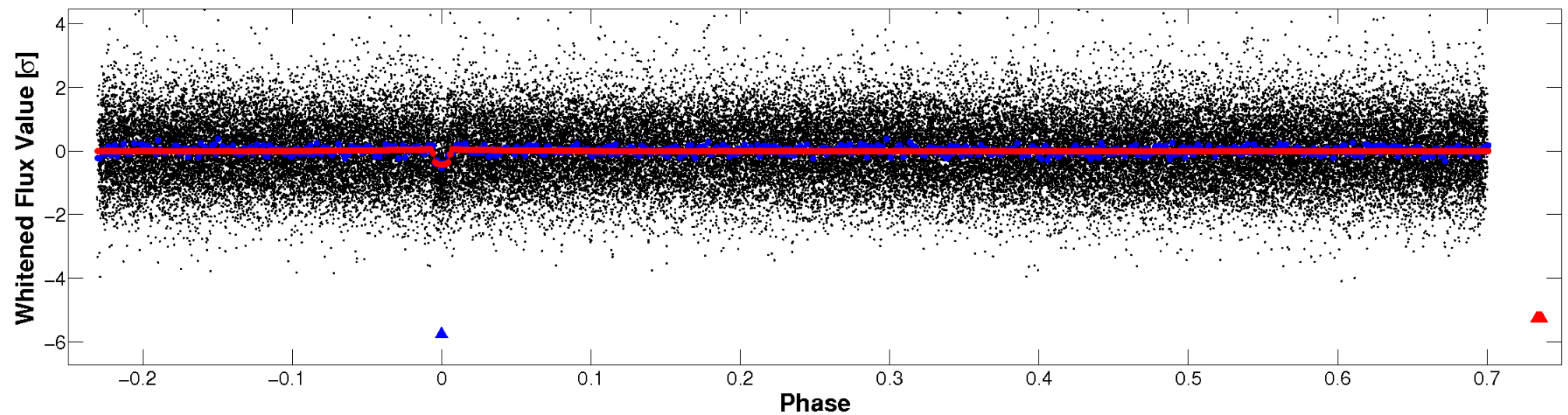


Non-Whitened Vs. Whitened Light Curve

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

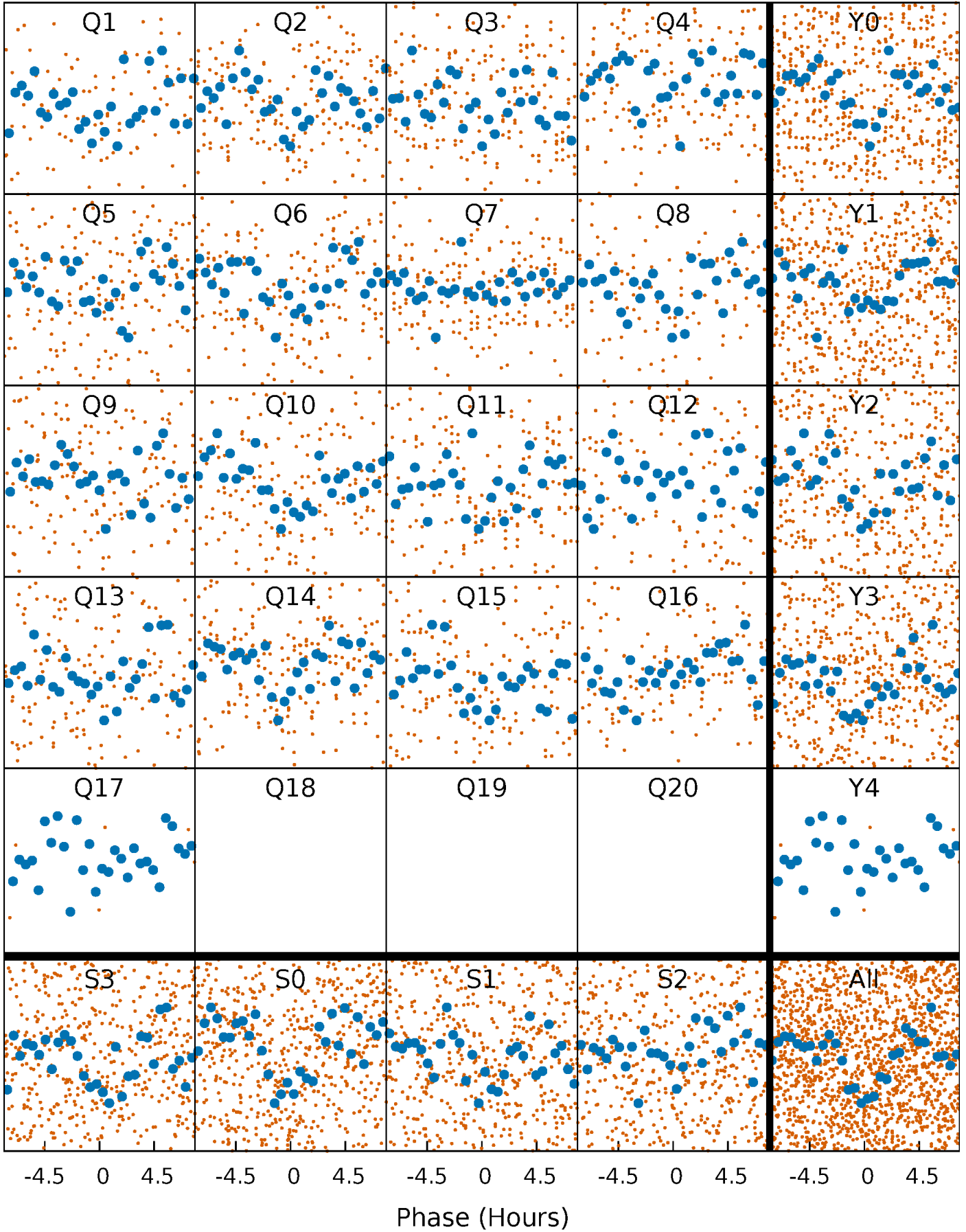


Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



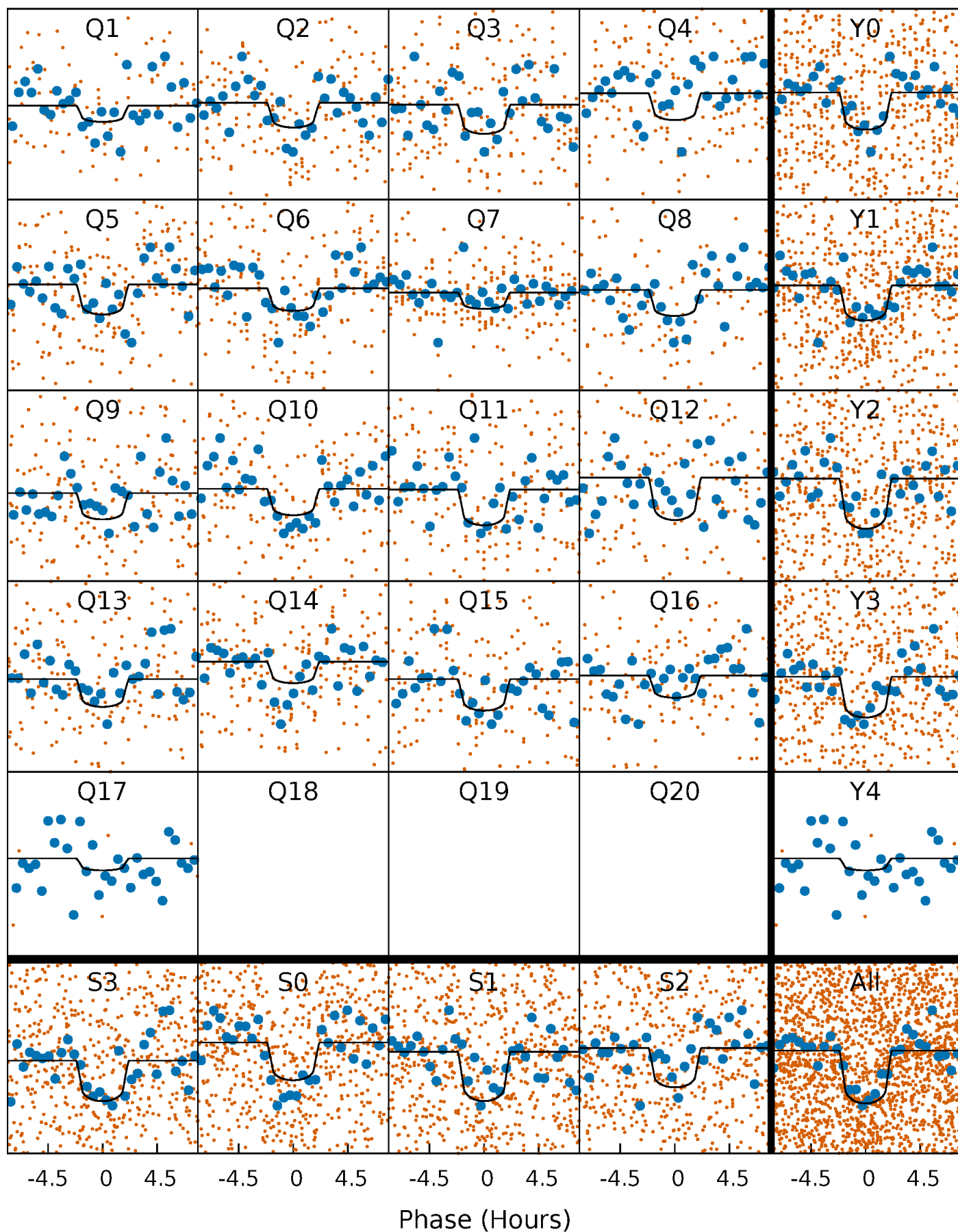
PDC Quarter-Phased Transit Curves

TCE 009509223-02 P= 14.200795 Days $T_0=135.716206$ (BKJD)



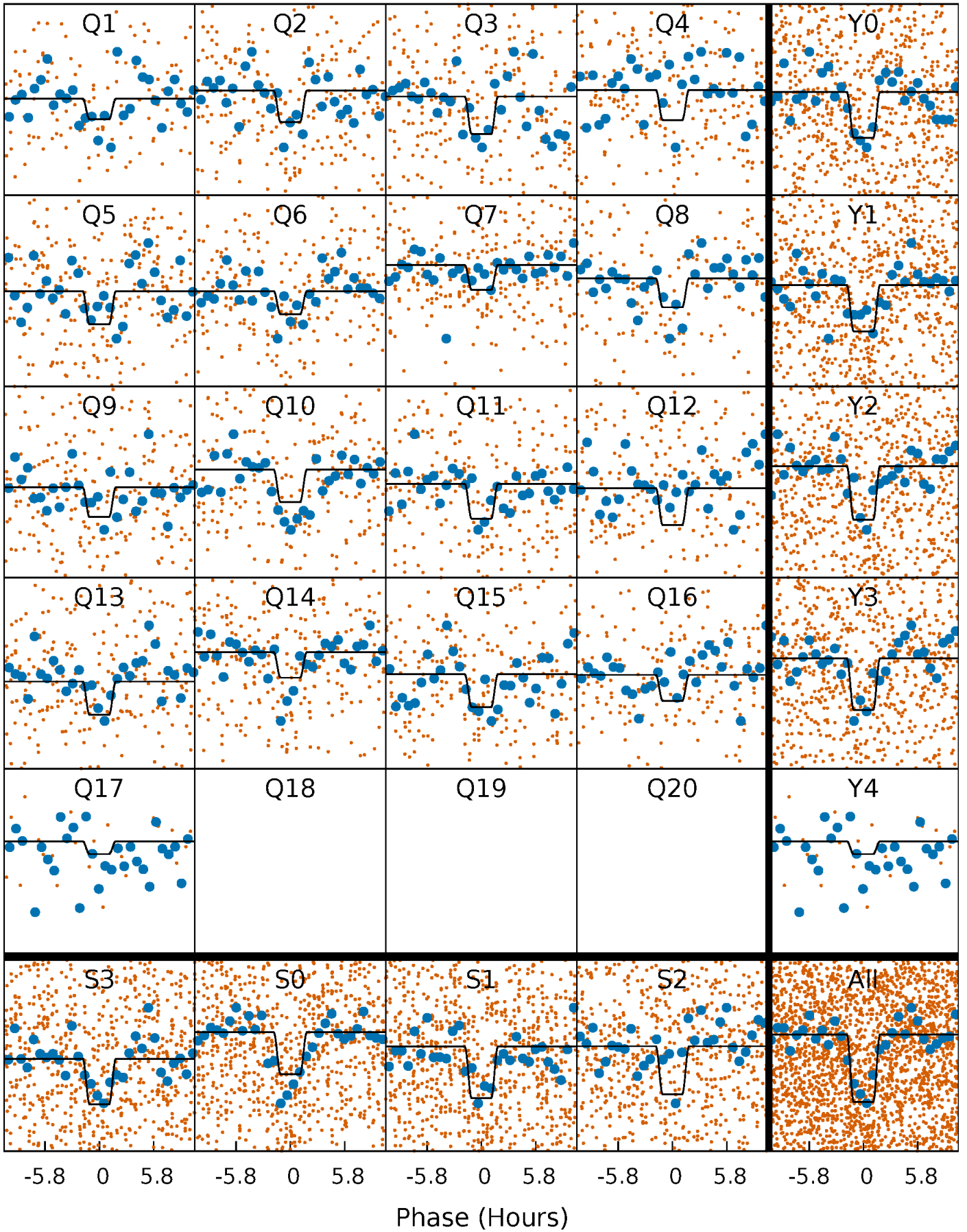
DV Quarter-Phased Transit Curves

TCE 009509223-02 P= 14.200795 Days $T_0=135.716206$ (BKJD)



Alt. Detrend Quarter-Phased Transit Curves

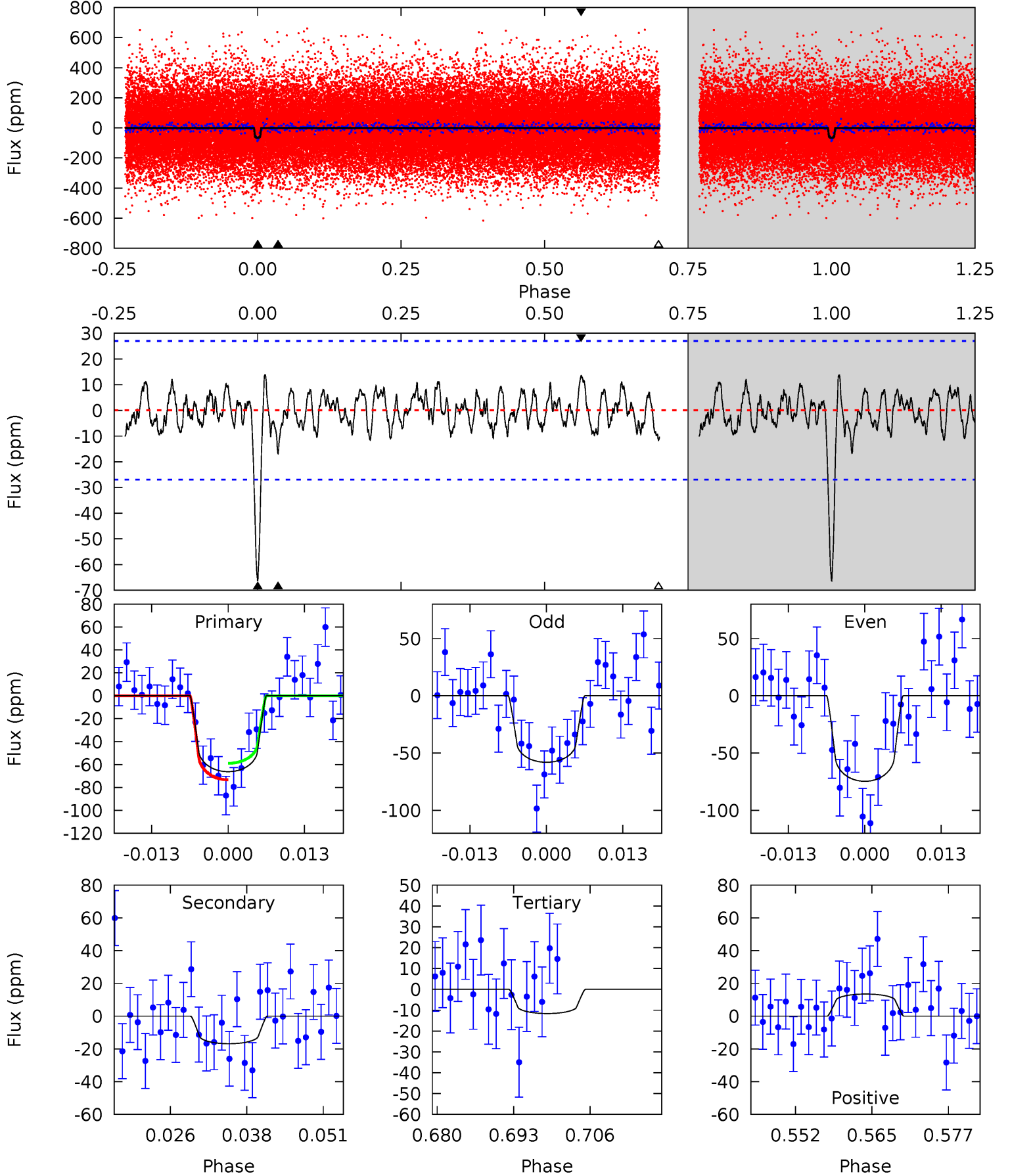
TCE 009509223-02 P= 14.200499 Days $T_0=135.728242$ (BKJD)



DV Model-Shift Uniqueness Test

009509223-02, P = 14.200795 Days, E = 121.515411 Days

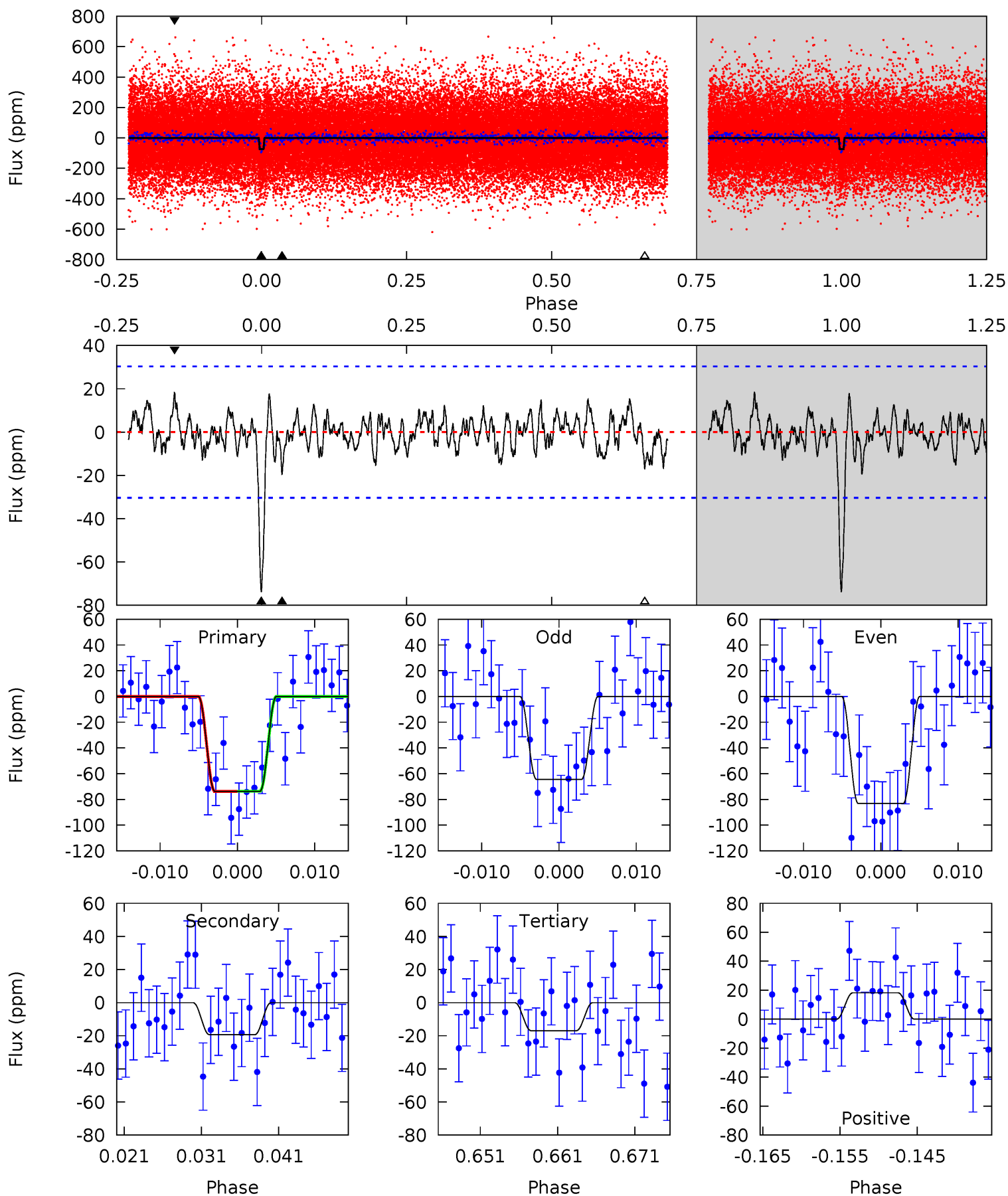
Pri	Sec	Ter	Pos	FA ₁	FA ₂	F _{Red}	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
12.2	3.11	2.15	2.49	4.98	2.49	1.00	10.1	9.75	0.97	0.62	1.53	0.97	0.17	1.33



Alt Model-Shift Uniqueness Test

009509223-02, P = 14.200499 Days, E = 121.527743 Days

Pri	Sec	Ter	Pos	FA ₁	FA ₂	F _{Red}	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
12.2	3.21	2.81	3.01	5.02	2.56	1.09	9.39	9.19	0.41	0.20	1.56	0.93	0.20	0.01



Stellar Parameters For KIC 009509223

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	6332^{+169}_{-188}	$4.406^{+0.070}_{-0.210}$	$-0.240^{+0.250}_{-0.300}$	$1.065^{+0.349}_{-0.116}$	$1.048^{+0.172}_{-0.115}$	$1.223^{+0.448}_{-0.664}$
	+3%/-3%	+2%/-5%	+104%/-125%	+33%/-11%	+16%/-11%	+37%/-54%
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 009509223-02 / KOI 4867.01

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	A_{obs}
DV	-17 ± 5	$1.12^{+0.58}_{-0.50}$	1198^{+94}_{-59}	4383^{+1301}_{-640}	94^{+242}_{-55}
Alt.	-19 ± 6	$1.09^{+0.59}_{-0.51}$	1195^{+98}_{-57}	4570^{+1525}_{-721}	120^{+295}_{-73}

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

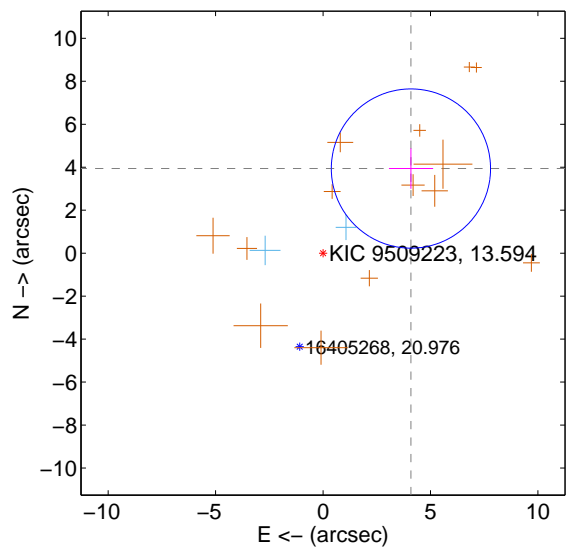
Supplemental centroid analysis for 009509223-02. Kepler magnitude: 13.59. Transit SNR 10.50

There are 2 quarters with good PRF difference image offsets

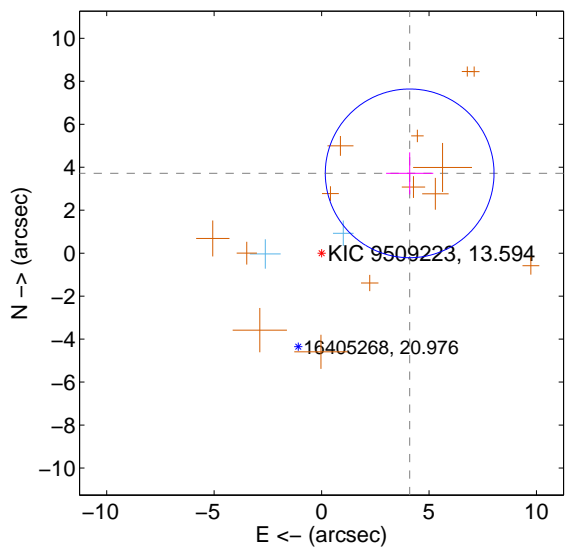
The direct PRF centroid is offset from the target star catalog position by about 0.21 arcsec

	Distance in arcsec	Distance / σ	Δ RA	Δ Dec
PRF-fit source offset from OOT	5.678 ± 1.235	4.60	-4.090 ± 1.024	3.938 ± 0.939
PRF-fit source offset from KIC position	5.532 ± 1.309	4.23	-4.099 ± 1.097	3.715 ± 0.977
photometric centroid source offset	2.87 ± 1.34	2.14	-1.97 ± 1.36	2.08 ± 1.33

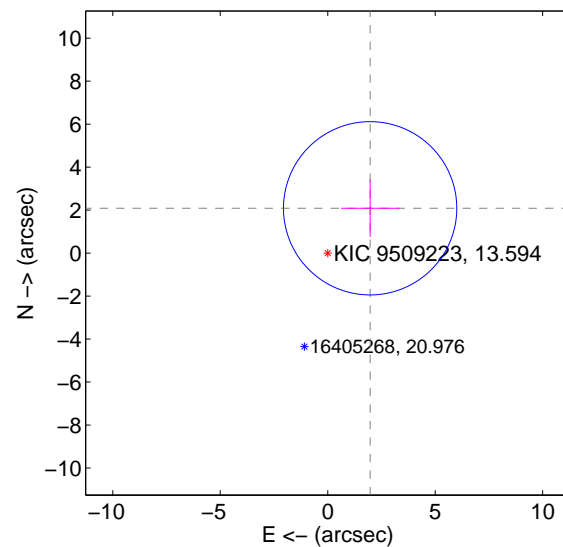
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position

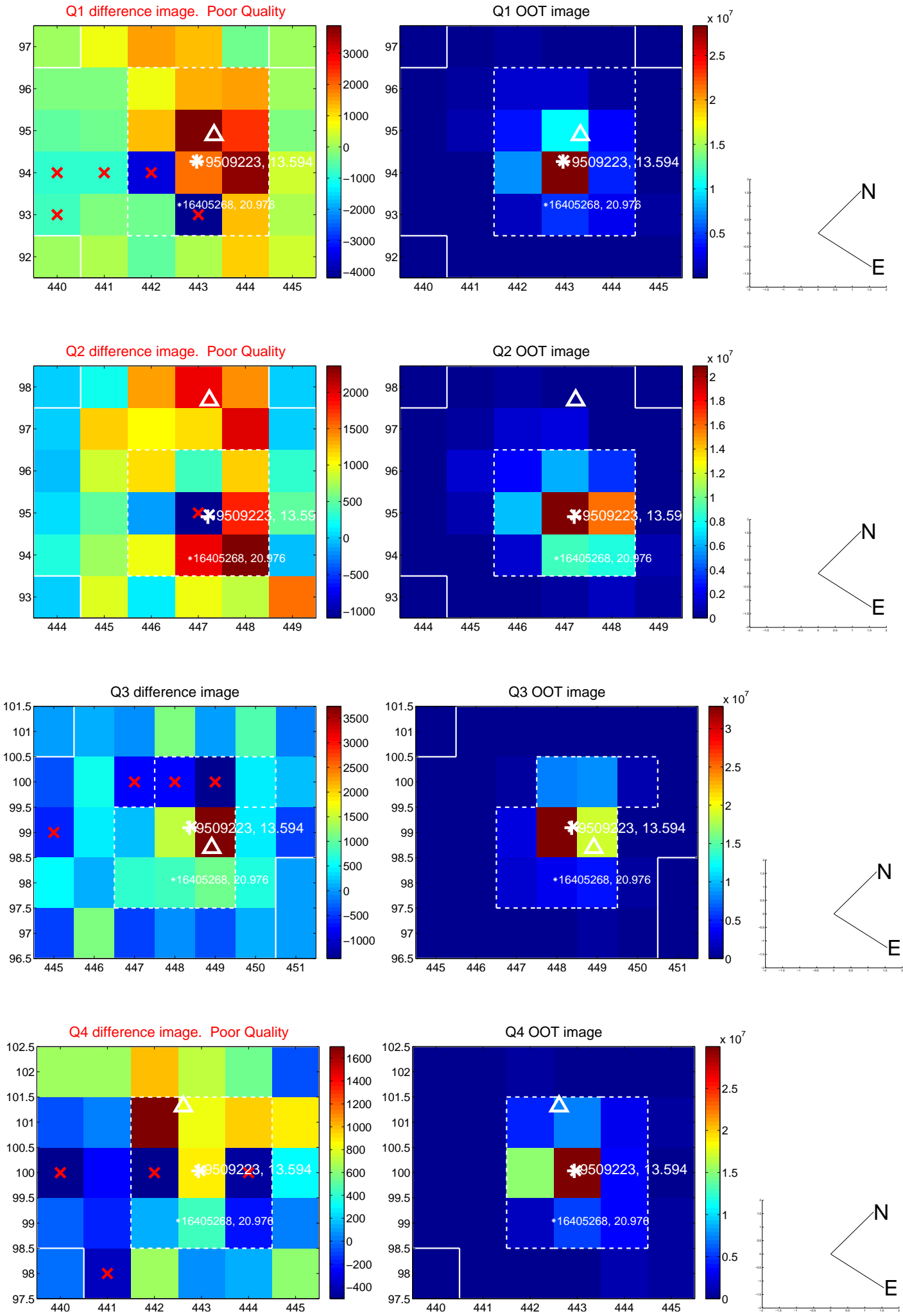


offset from photometric centroids

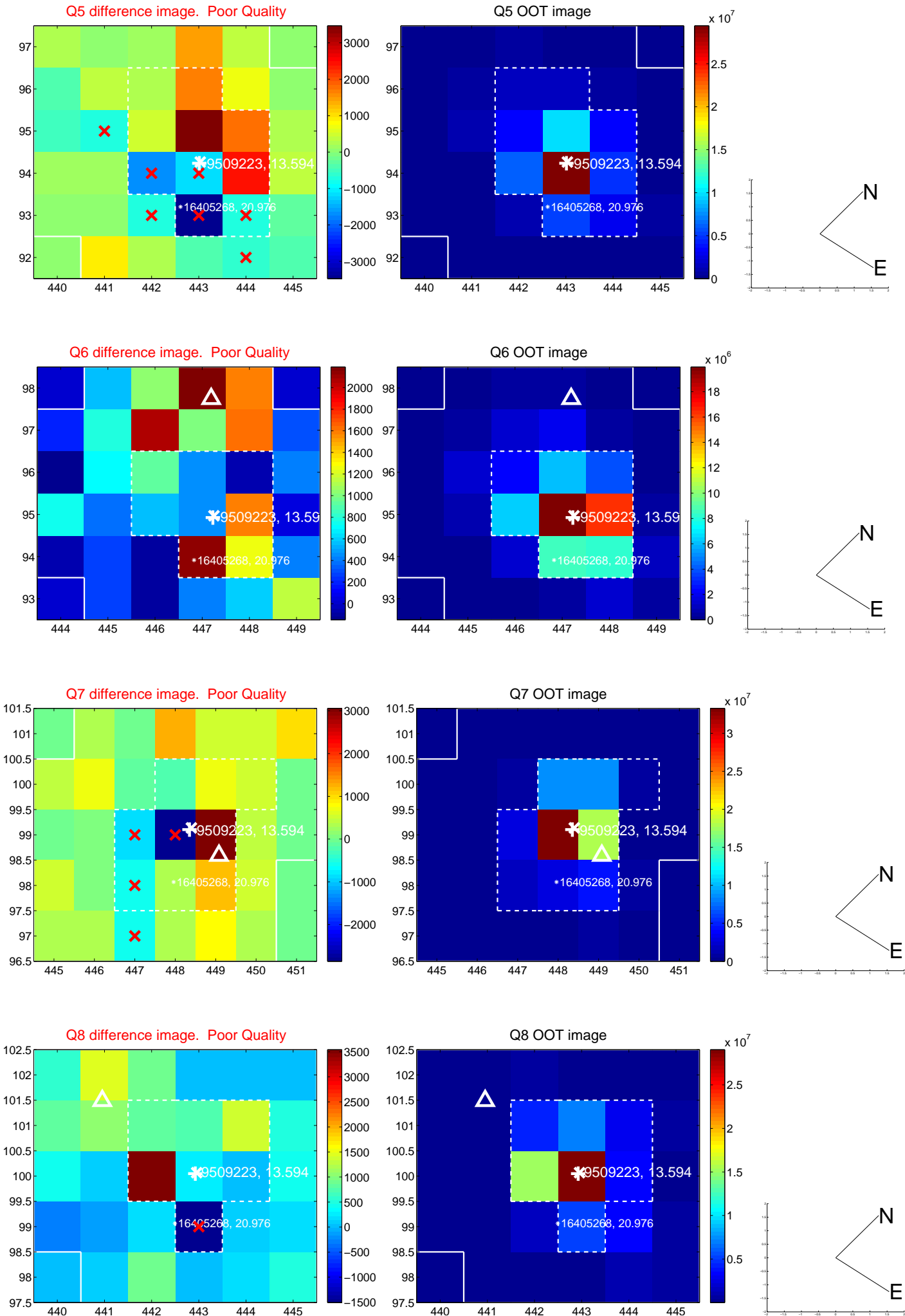


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- σ uncertainty. Blue circle: three- σ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

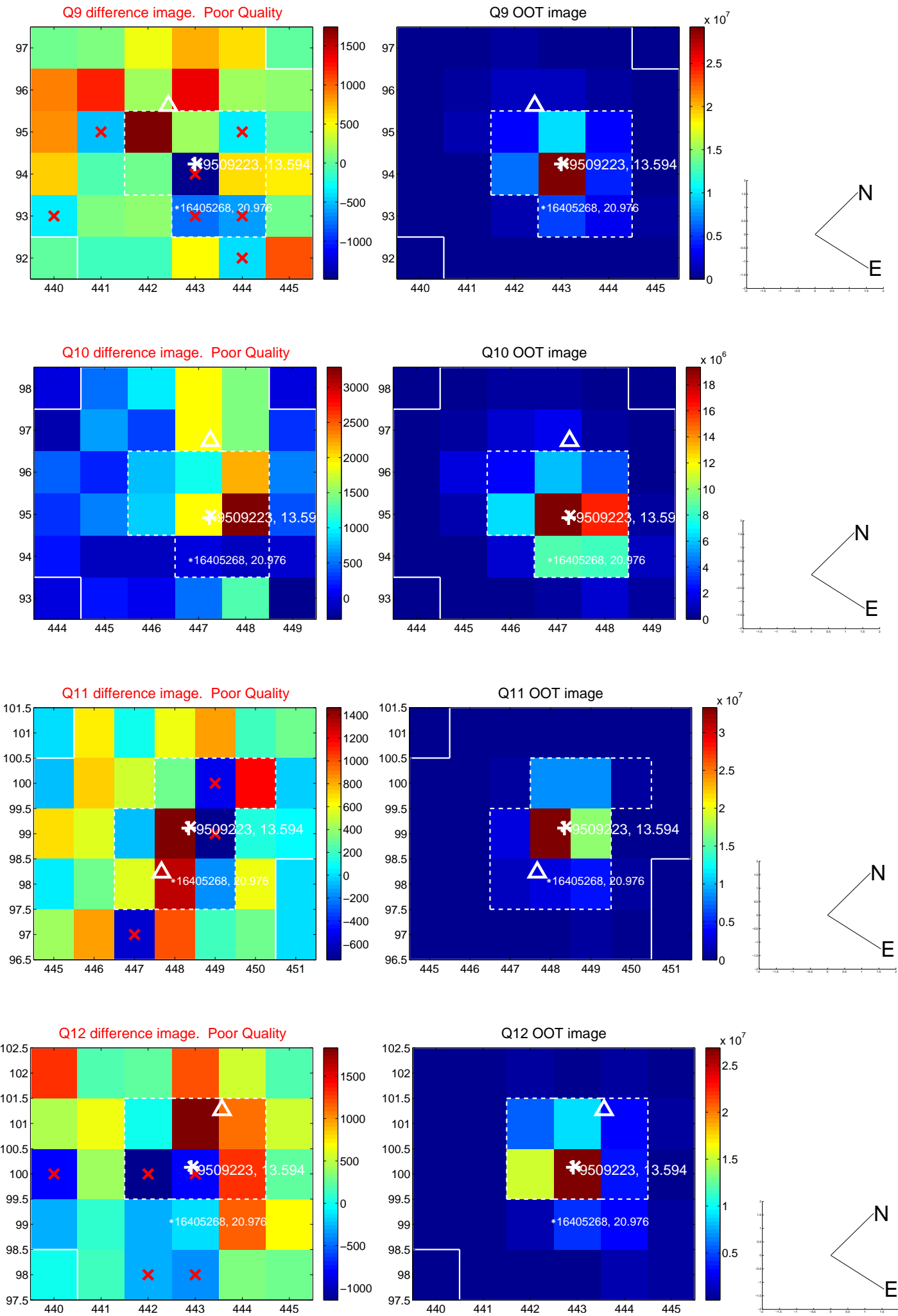
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



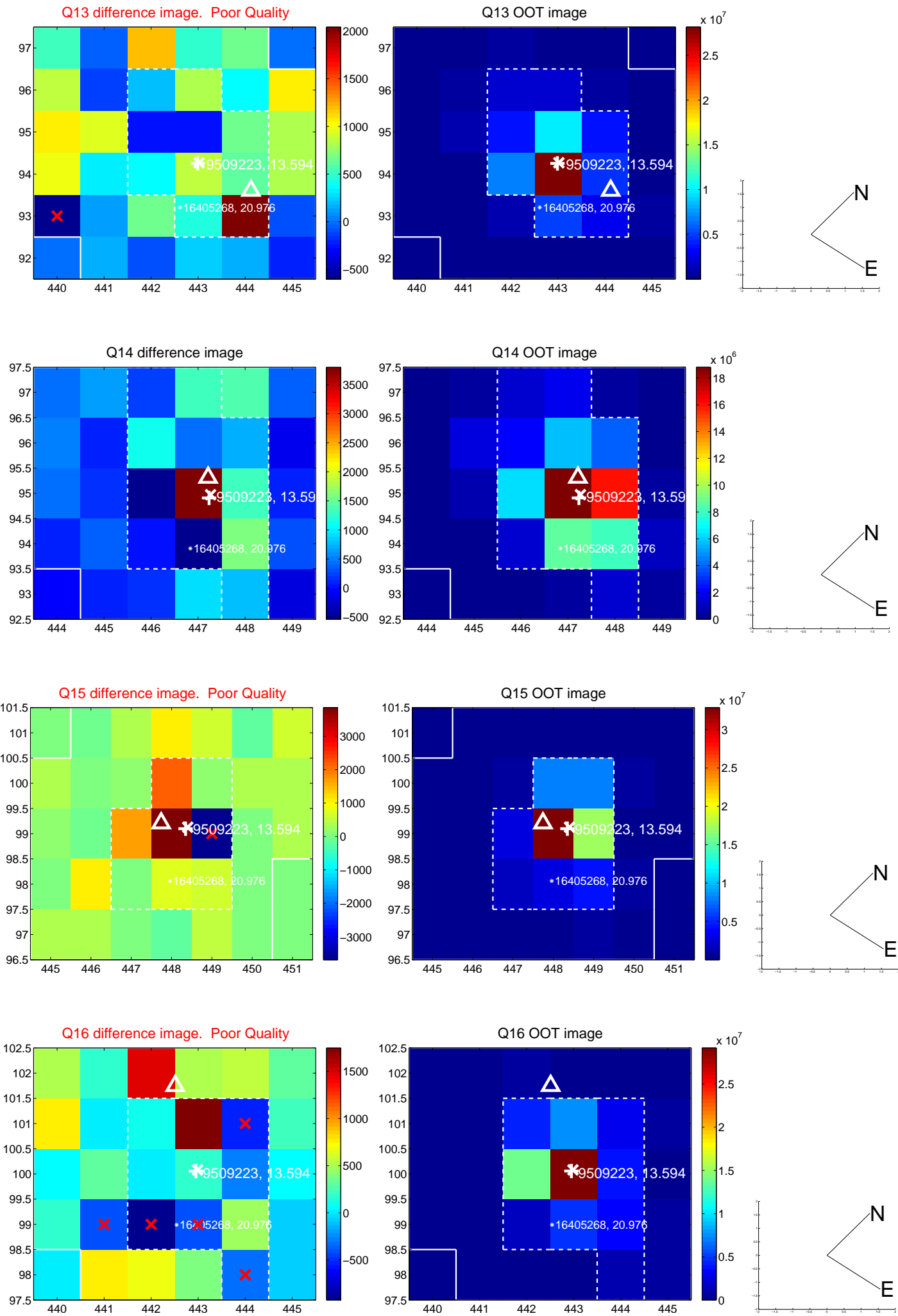
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



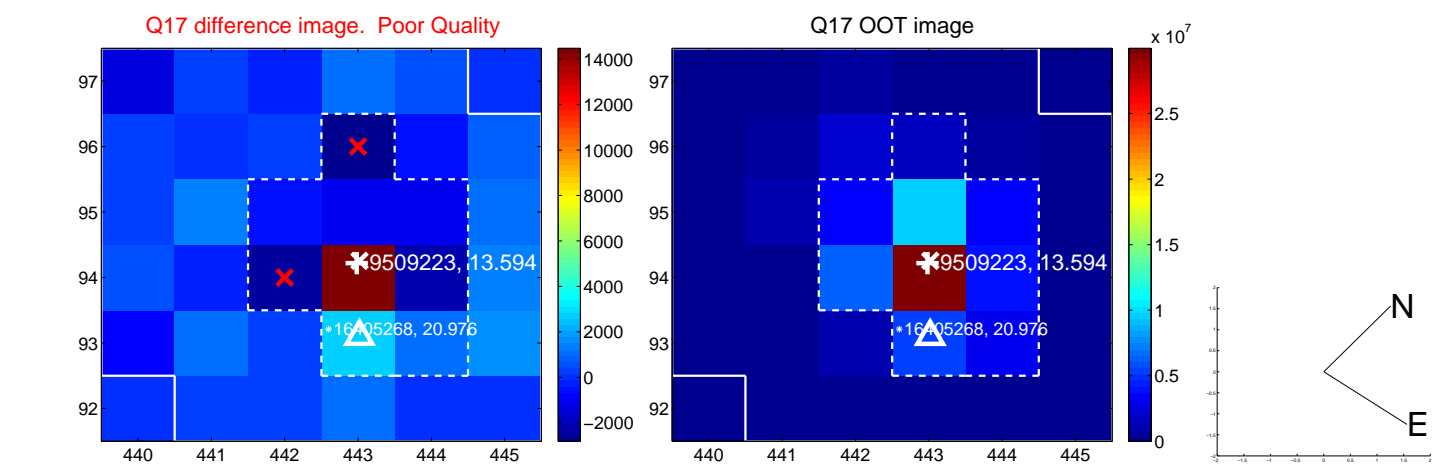
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



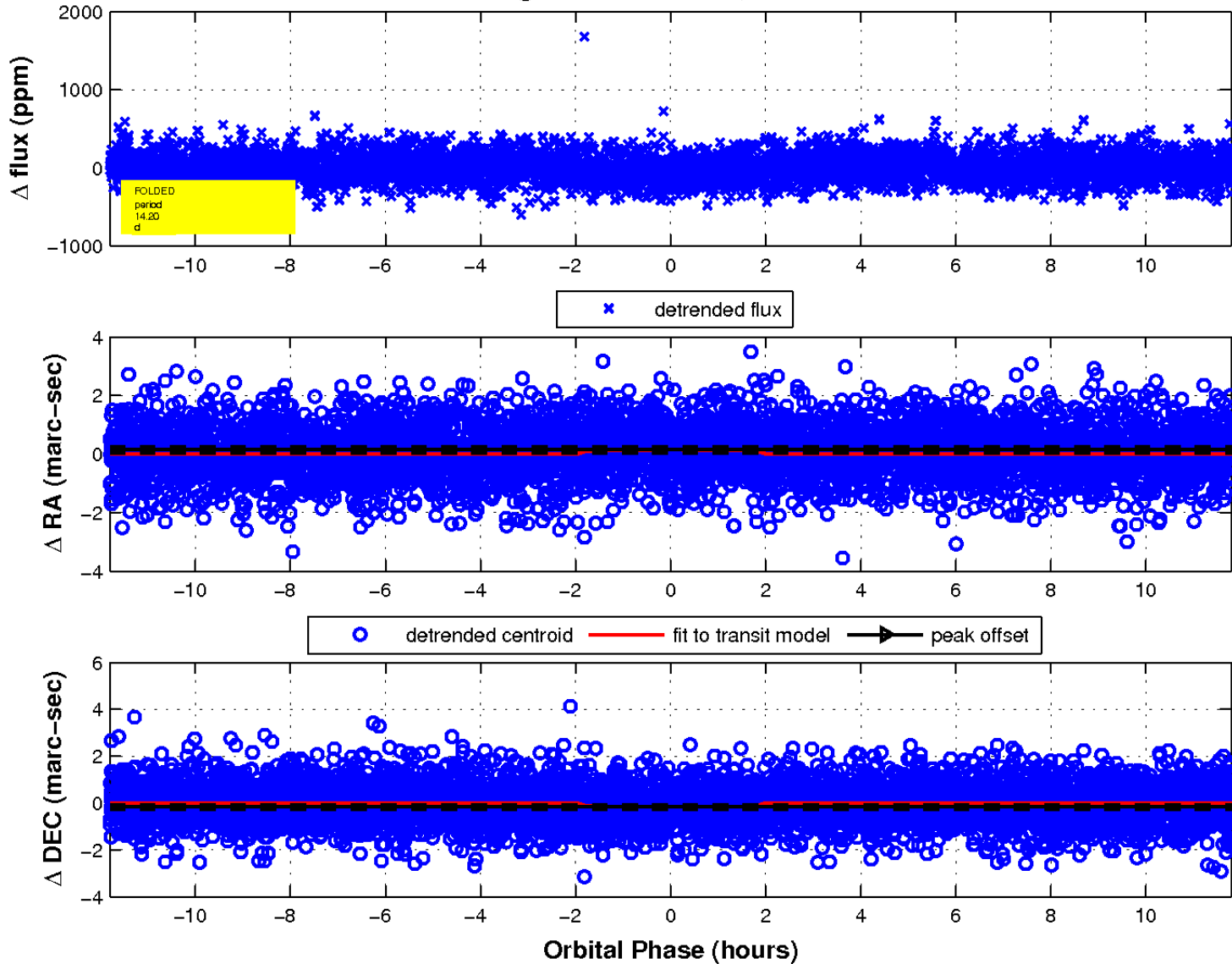
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



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



fluxWeightedCentroids, Planet 2 of 2



UKIRT Image

Declination

