

KIC 009965184

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})
009965184-01	OBS	2428.01	16.227835	145.000375	513.8	4.701	16.3	18.0	0.88	5328	2.62	41.63
009965184-02	OBS	No	16.227583	136.635571	562.0	4.609	16.1	18.3	0.88	5328	2.84	41.63

Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009965184-01	OBS	FP	0.00	0	1	1	1	MOD_SEC_DV—MOD_SEC_ALT—HAS_SEC_TCE—CENT_RESOLVED_OFFSET—EPHEM_MATCH
009965184-02	OBS	FP	0.00	1	1	1	1	IS_SEC_TCE—CENT_RESOLVED_OFFSET—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 009965184-01

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
009965184-01	9965184	009965206-02	9965206	1:1	12.5	-3	0	15.90	15.39	325.62	Direct-PRF	0	0.57	0.14

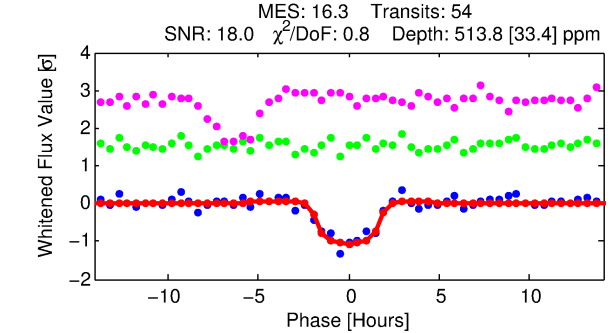
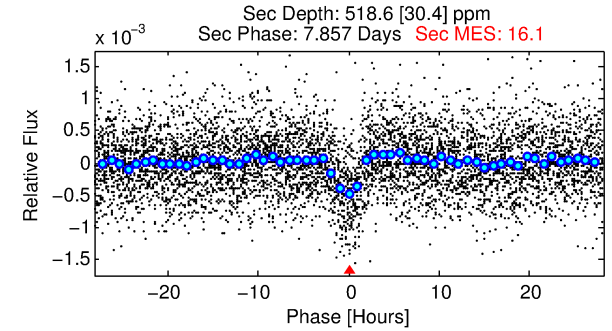
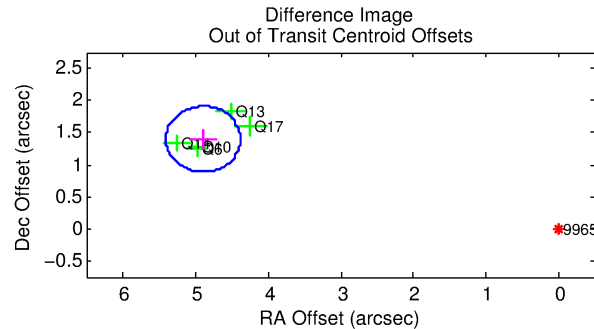
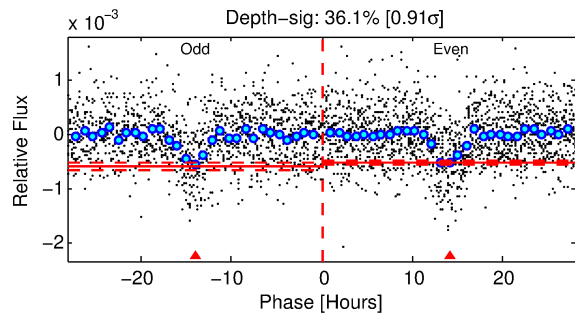
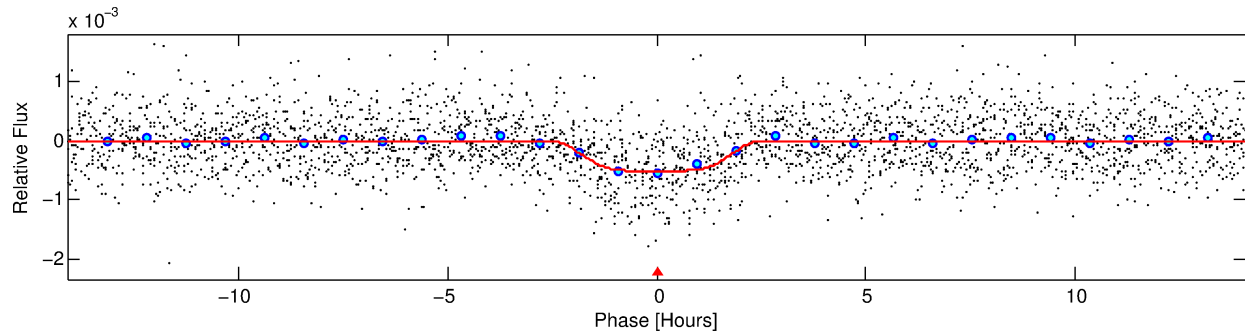
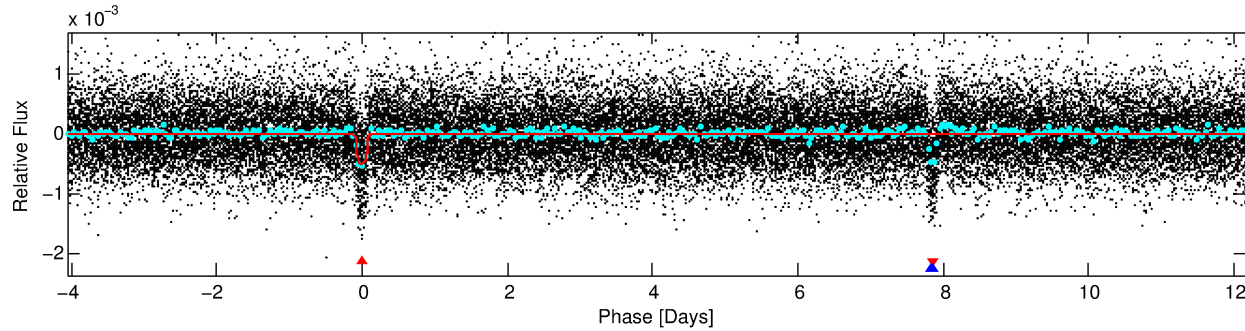
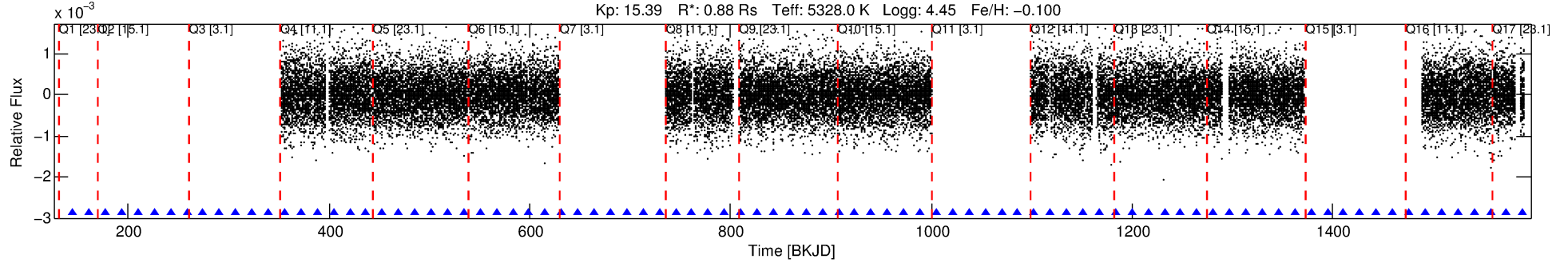
Notes: $P_1:P_2$ is the period ratio. Dist is the distance in arcseconds. Δ Row and Δ Col are the number of pixels apart in row and column. m_2 and m_1 are the magnitudes of the parent and child. D_2/D_1 is the parent's transit depth divided by the child's. σ_P and σ_T are the significance of the match 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: 9965184 Candidate: 1 of 2 Period: 16.228 d

KOI: K02428 Corr: No Ephemeris Match

Kp: 15.39 R*: 0.88 Rs Teff: 5328.0 K Logg: 4.45 Fe/H: -0.100



DV Fit Results:

Period = 16.22784 [0.00013] d
Epoch = 145.0004 [0.0073] BKJD
Rp/R* = 0.0271 [0.0016]
a/R* = 10.08 [1.82]
b = 0.95 [0.02]
Seff = 41.63 [14.12]
Teq = 648 [55] K
Rp = 2.62 [0.58] Re
a = 0.1163 [0.0227] AU
Ag = 564.04 [186.36] [3.02σ]
Teff = 4880 [247] K [16.70σ]

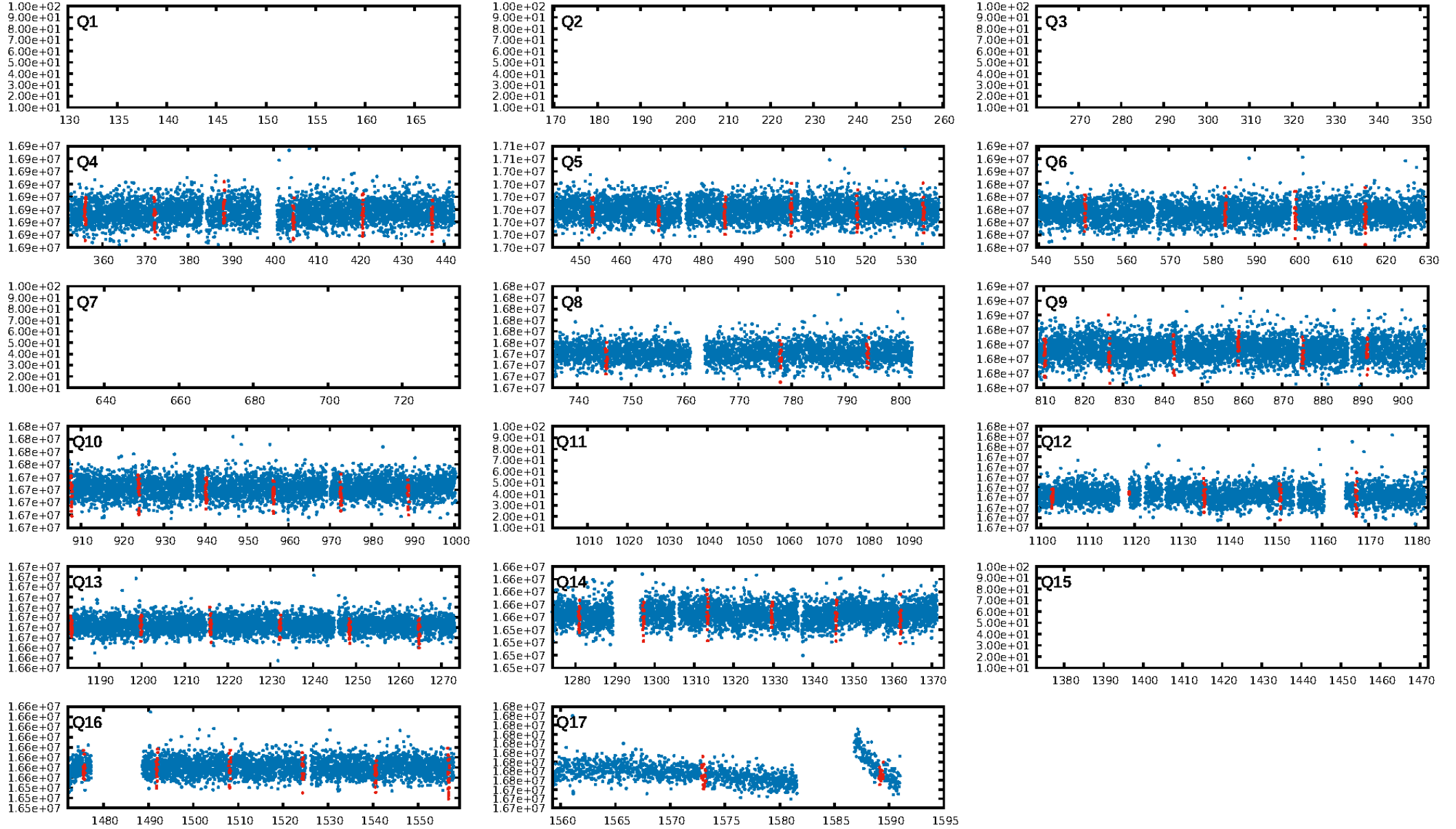
DV Diagnostic Results:

ShortPeriod-sig: 0.1% [0.00σ]
LongPeriod-sig: N/A
ModelChiSquare2-sig: 52.3%
ModelChiSquareGoF-sig: 100.0%
Bootstrap-pfa: 5.78e-58
RollingBand-fgt: 1.00 [52/52]
GhostDiagnostic-chr: -0.3726
Centroid-sig: 0.0%
Centroid-so: 35.138 arcsec [44.81σ]
OotOffset-rm: 5.089 arcsec [29.76σ]
KicOffset-rm: 5.401 arcsec [35.26σ]
OotOffset-st: 3/0/0/2 [5]
KicOffset-st: 3/0/0/2 [5]
DiffImageQuality-fgm: 1.00 [5/5]
DiffImageOverlap-fno: 1.00 [11/11]

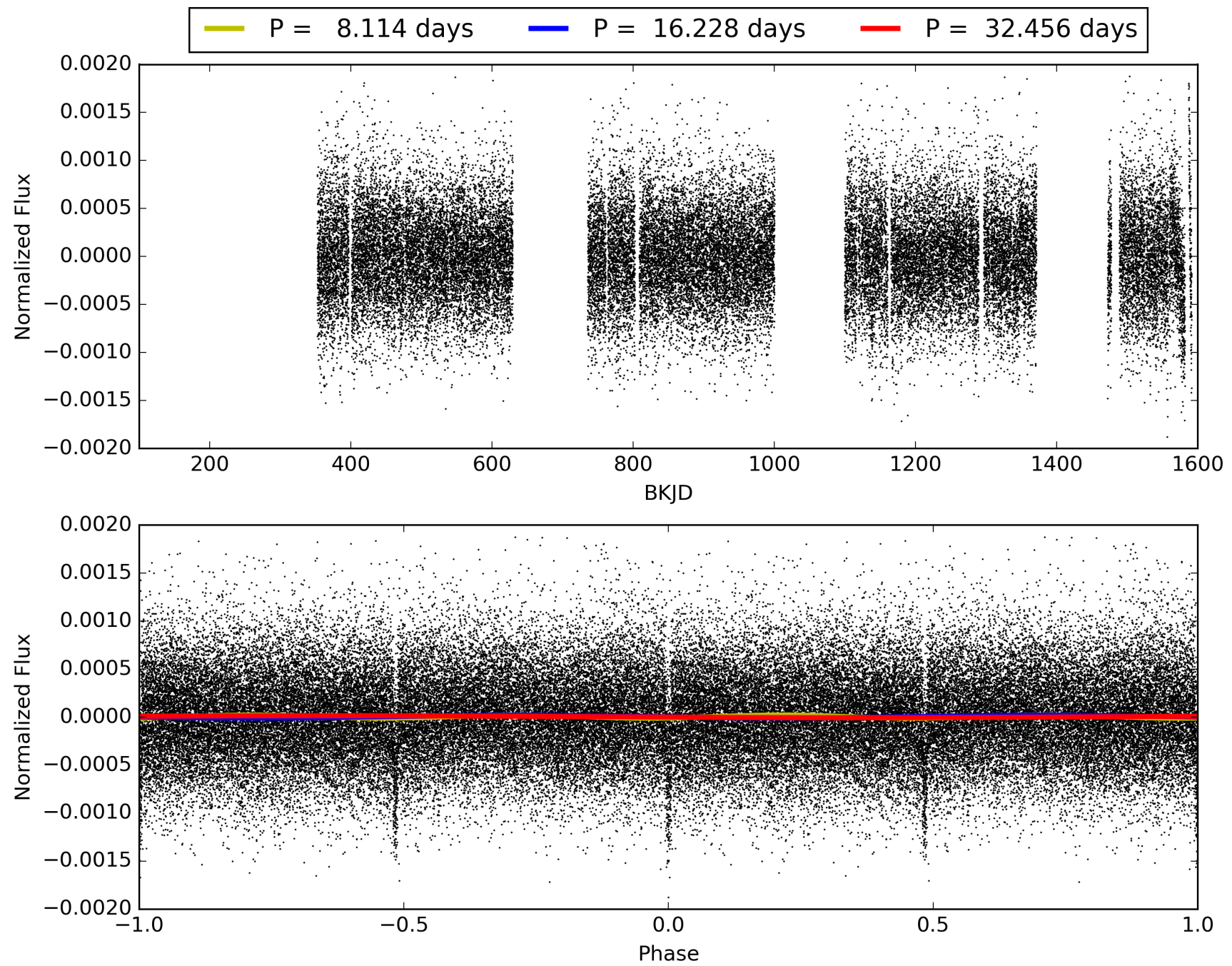
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This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

TCE 009965184-01, PDC Light Curves

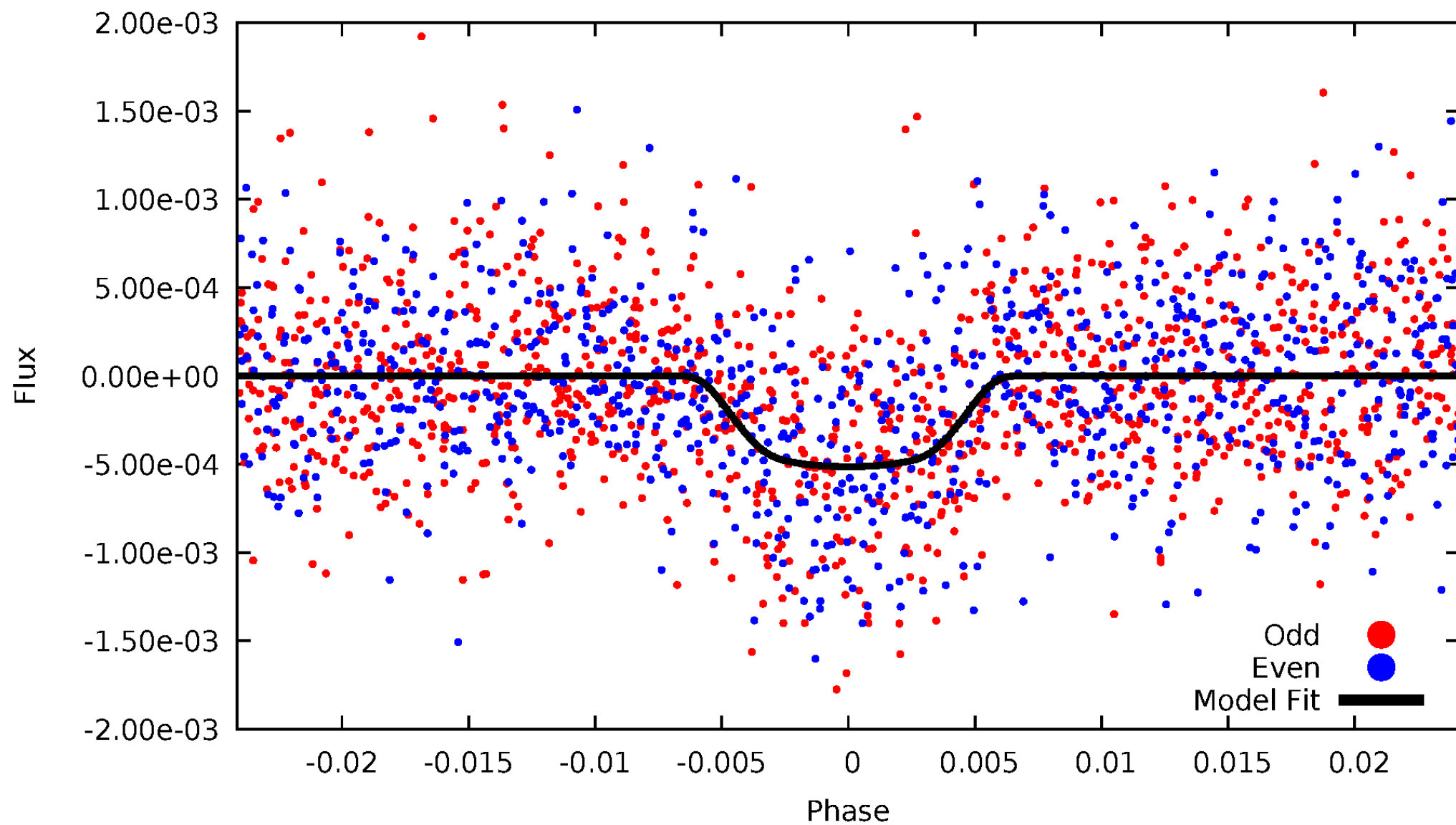


TCE 009965184-01



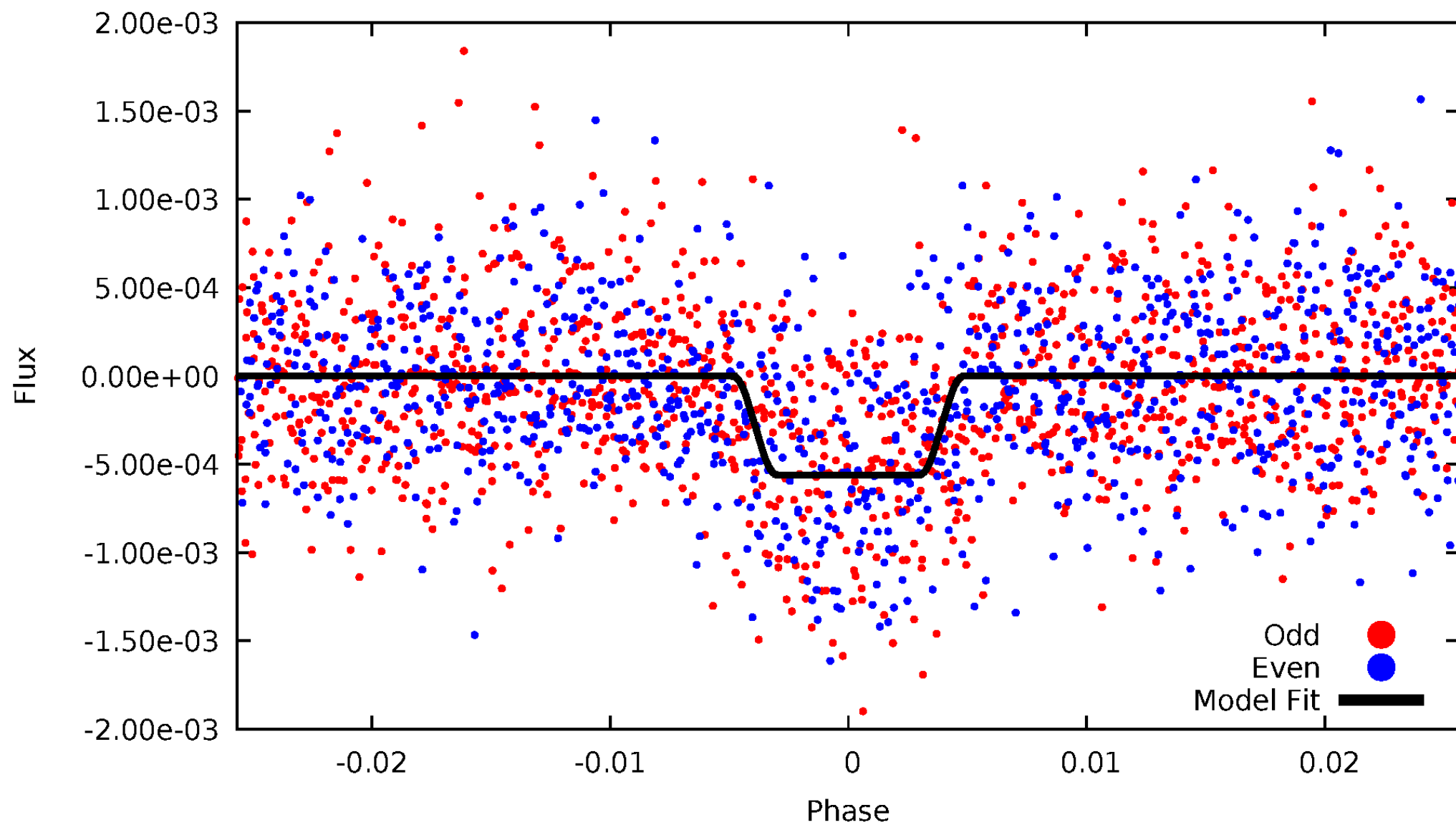
DV Odd/Even

TCE 009965184-01

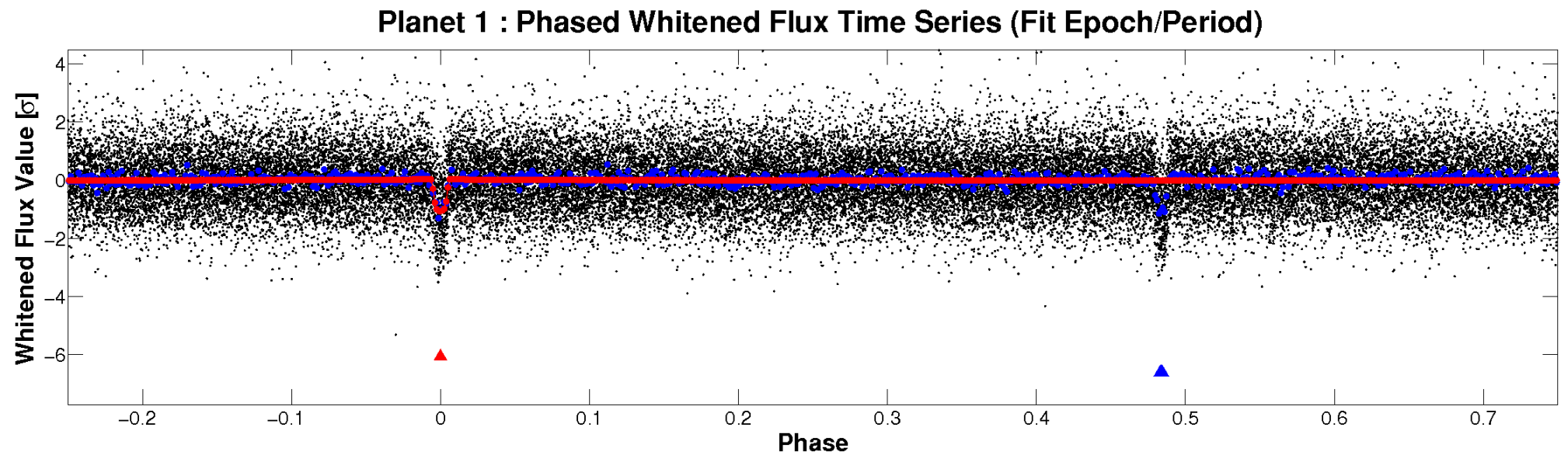
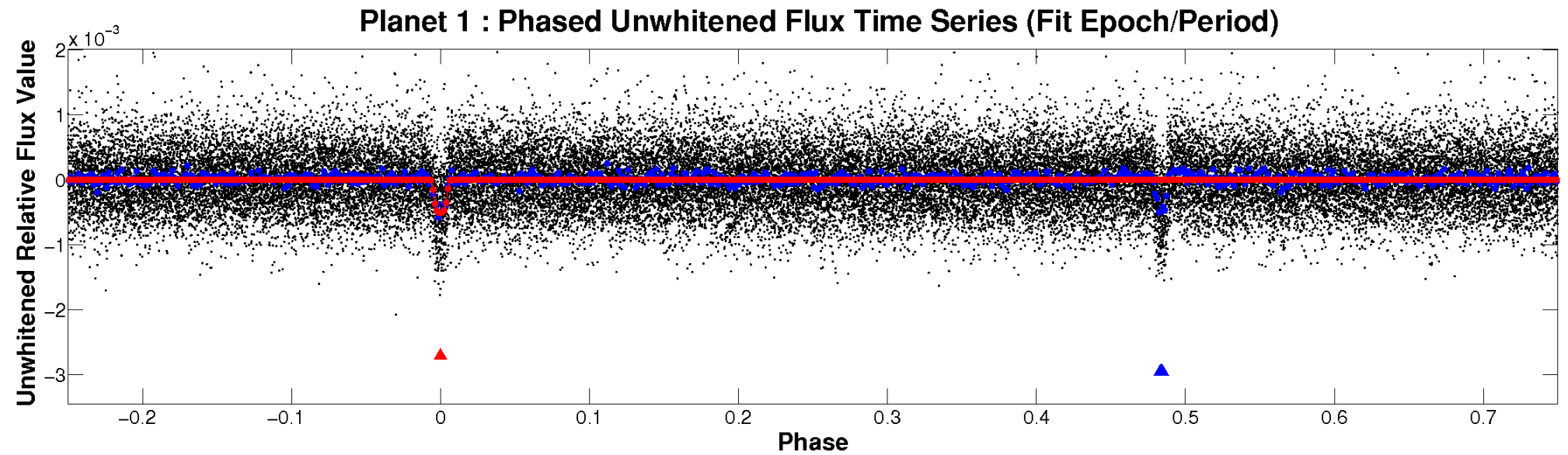


ALT Odd/Even

TCE 009965184-01

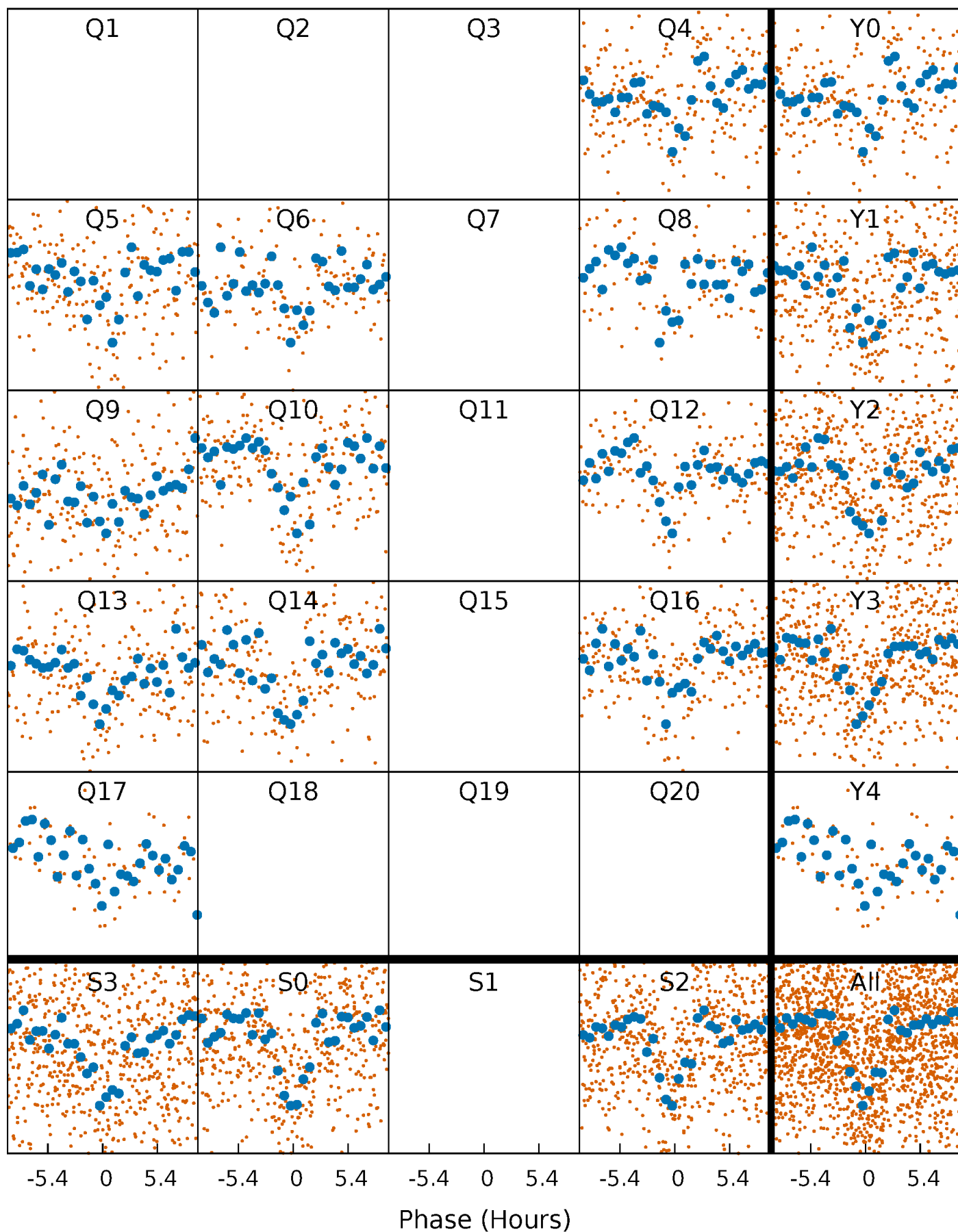


Non-Whitened Vs. Whitened Light Curve



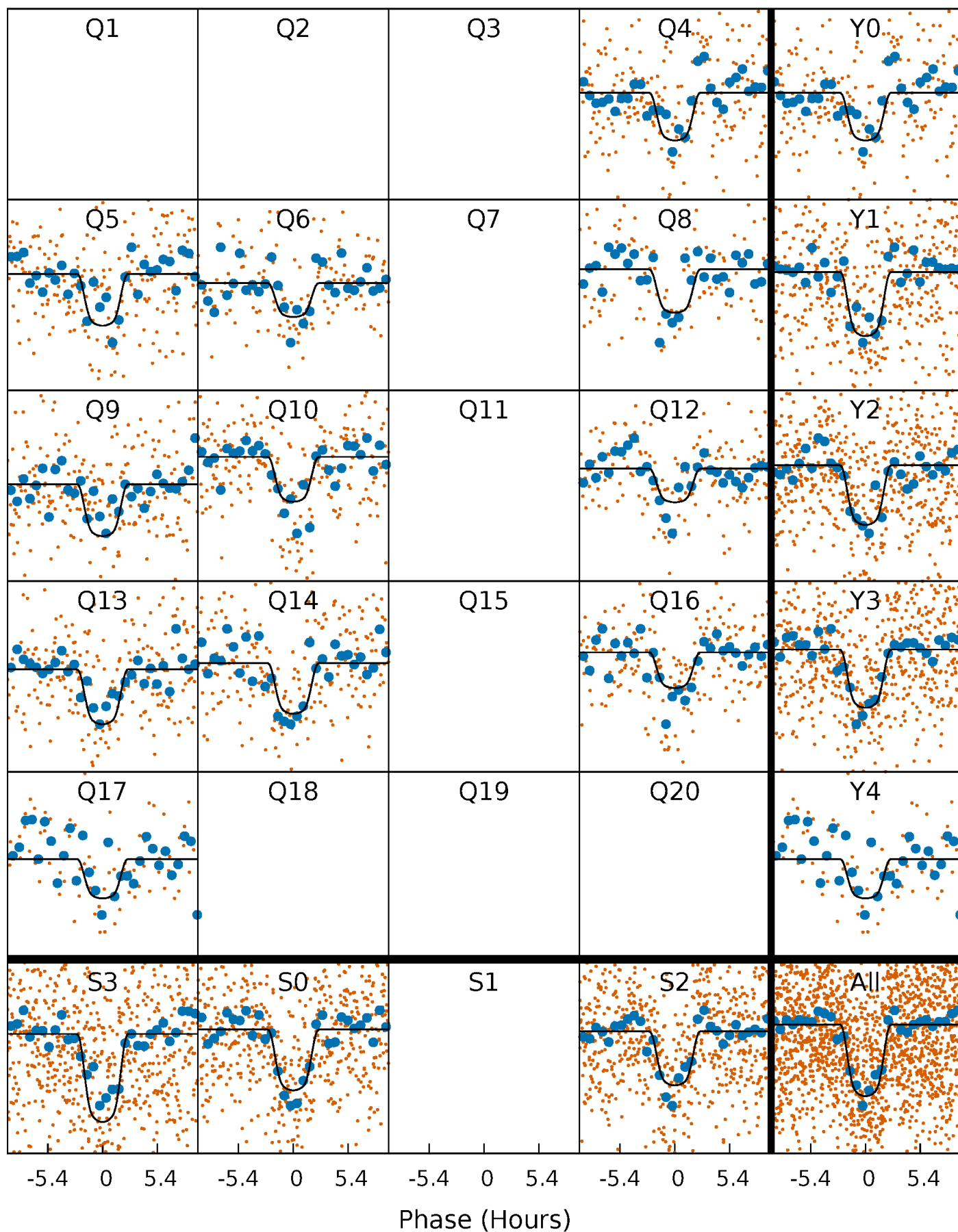
PDC Quarter-Phased Transit Curves

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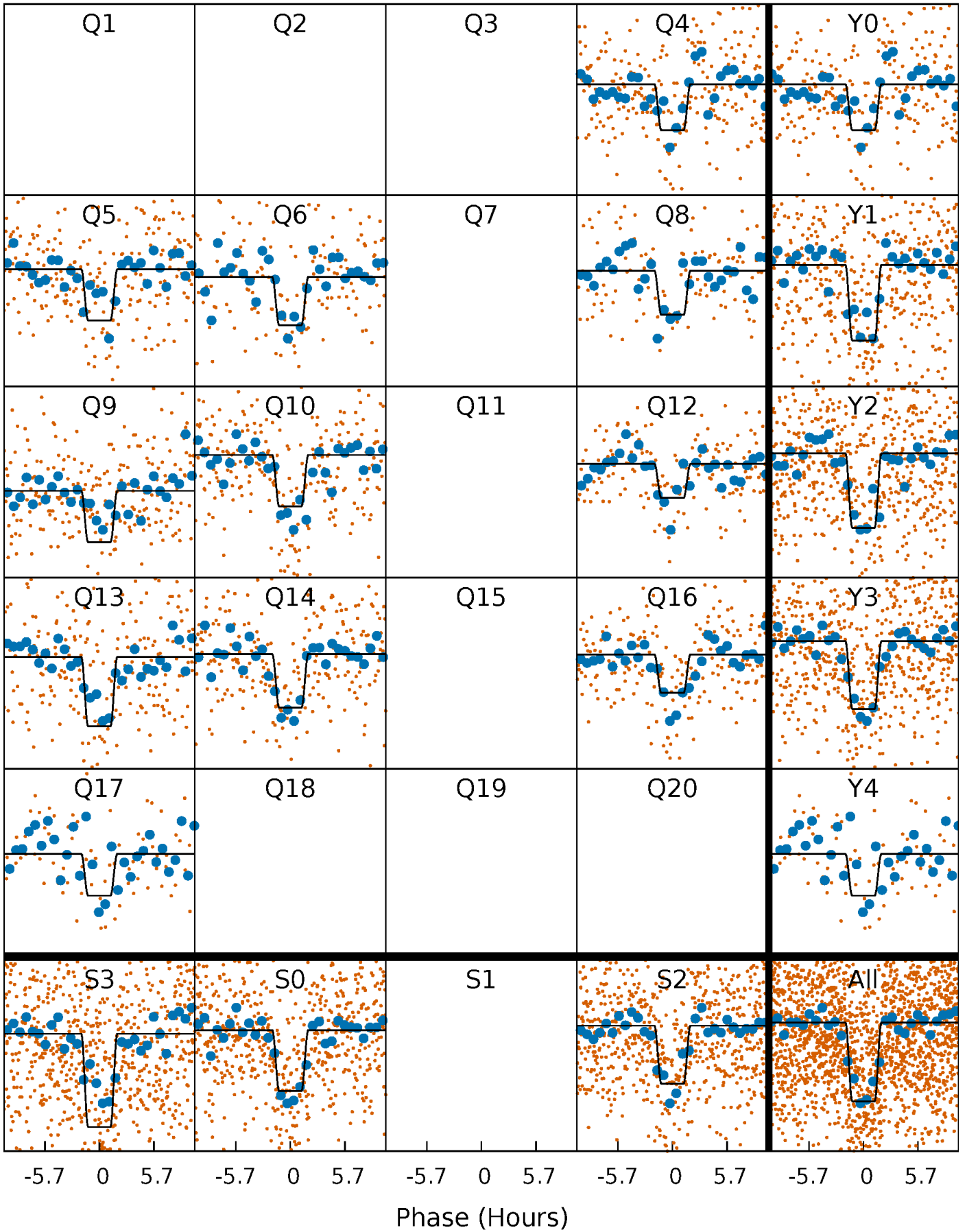
DV Quarter-Phased Transit Curves

TCE 009965184-01 P= 16.227835 Days $T_0=145.000375$ (BKJD)



Alt. Detrend Quarter-Phased Transit Curves

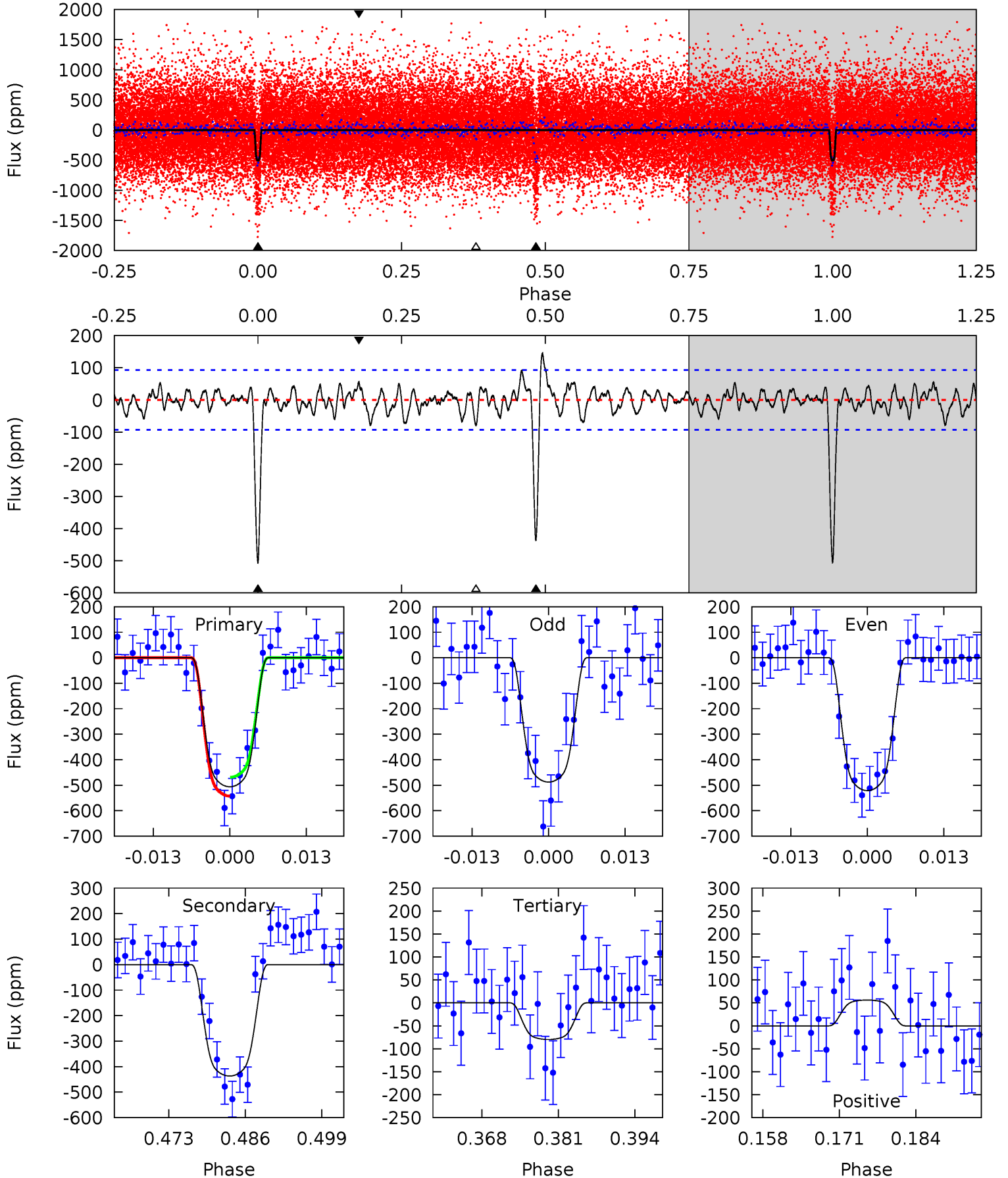
TCE 009965184-01 P= 16.227489 Days $T_0=145.012998$ (BKJD)



DV Model-Shift Uniqueness Test

009965184-01, P = 16.227835 Days, E = 145.000375 Days

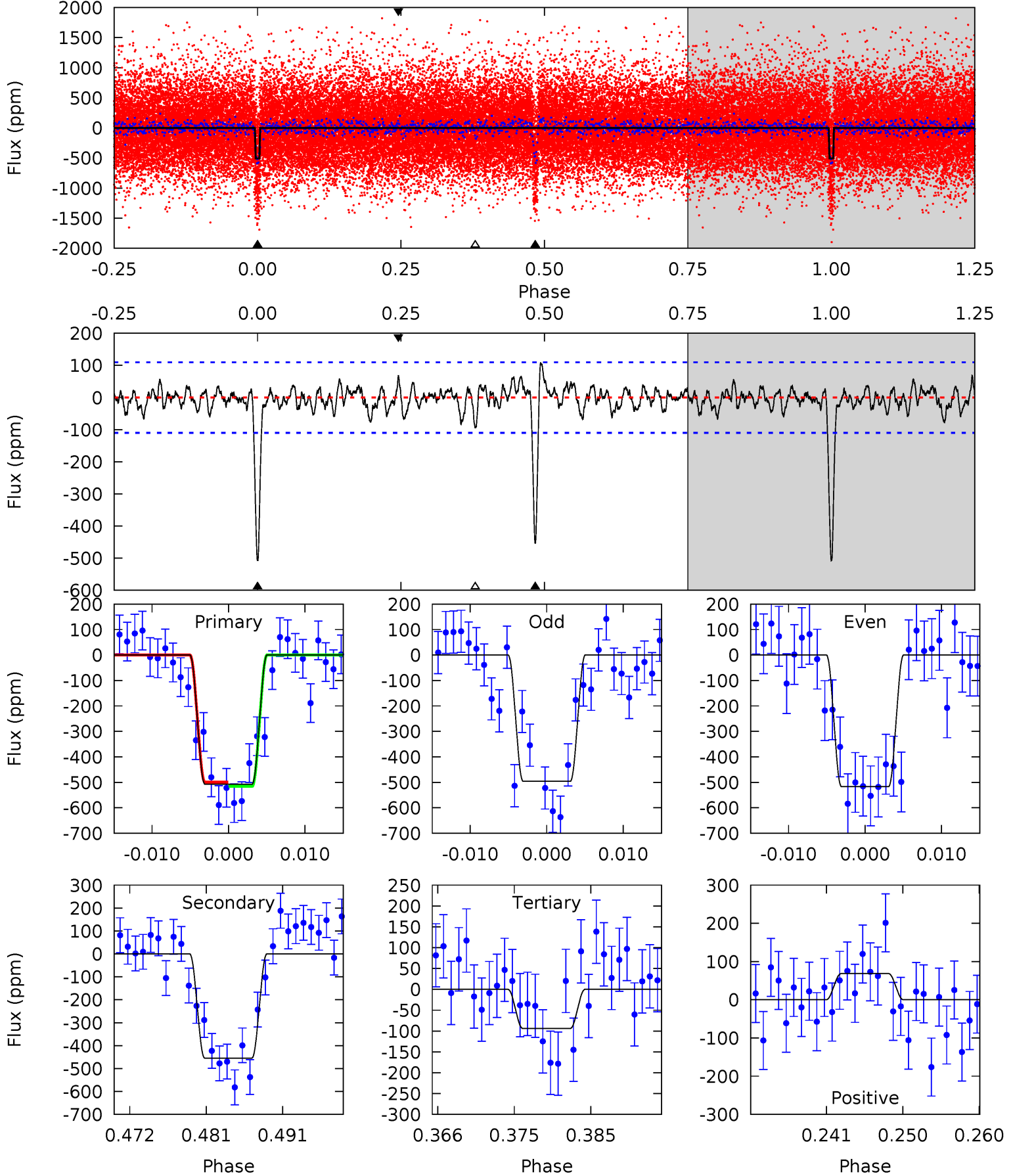
Pri	Sec	Ter	Pos	FA ₁	FA ₂	F _{Red}	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
27.1	23.4	4.28	3.01	4.97	2.48	1.55	22.8	24.1	19.1	20.4	0.90	1.00	0.22	1.98



Alt Model-Shift Uniqueness Test

009965184-01, P = 16.227489 Days, E = 145.012998 Days

Pri	Sec	Ter	Pos	FA ₁	FA ₂	F _{Red}	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
23.3	20.8	4.32	3.14	5.03	2.59	1.28	18.9	20.1	16.5	17.7	0.47	1.00	0.17	0.38



Stellar Parameters For KIC 009965184

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	5328^{+204}_{-185}	$4.447^{+0.130}_{-0.174}$	$-0.100^{+0.300}_{-0.300}$	$0.883^{+0.188}_{-0.126}$	$0.796^{+0.124}_{-0.057}$	$1.627^{+0.931}_{-0.734}$
	+4%/-3%	+3%/-4%	+300%/-300%	+21%/-14%	+16%/-7%	+57%/-45%
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 009965184-01 / KOI 2428.01

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	A_{obs}
DV	-437 ± 19	$2.67^{+0.39}_{-0.30}$	912^{+59}_{-54}	4769^{+214}_{-203}	461^{+123}_{-102}
Alt.	-454 ± 22	$2.32^{+0.33}_{-0.30}$	913^{+62}_{-56}	5098^{+271}_{-217}	639^{+189}_{-144}

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 $A_{obs} \gg 1.0$

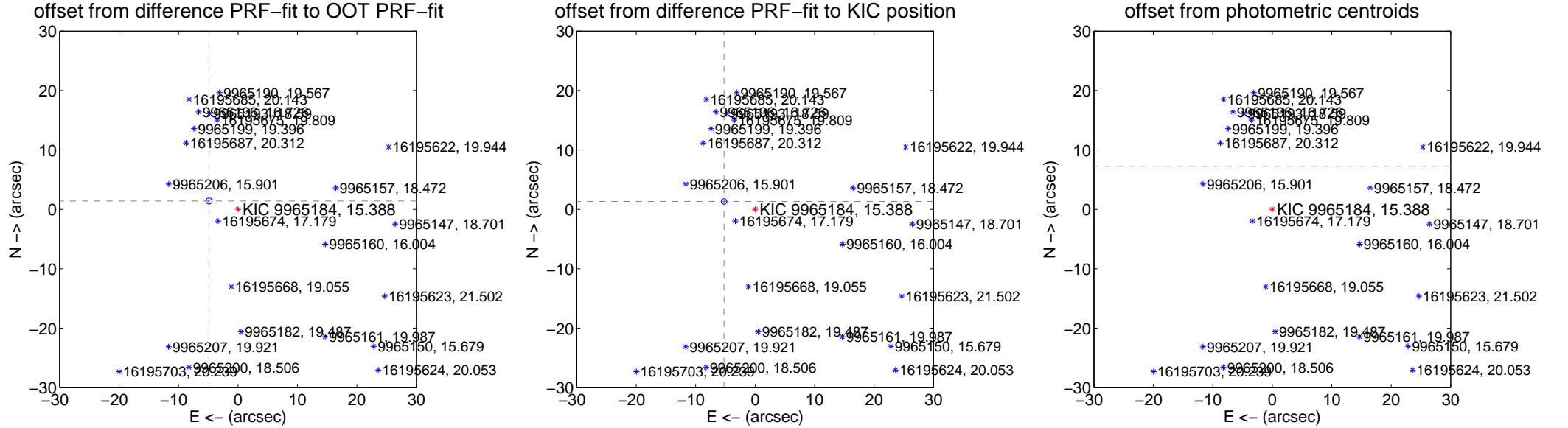
DV Centroid Data

Supplemental centroid analysis for 009965184-01. Kepler magnitude: 15.39. Transit SNR 18.04

There are 5 quarters with good PRF difference image offsets

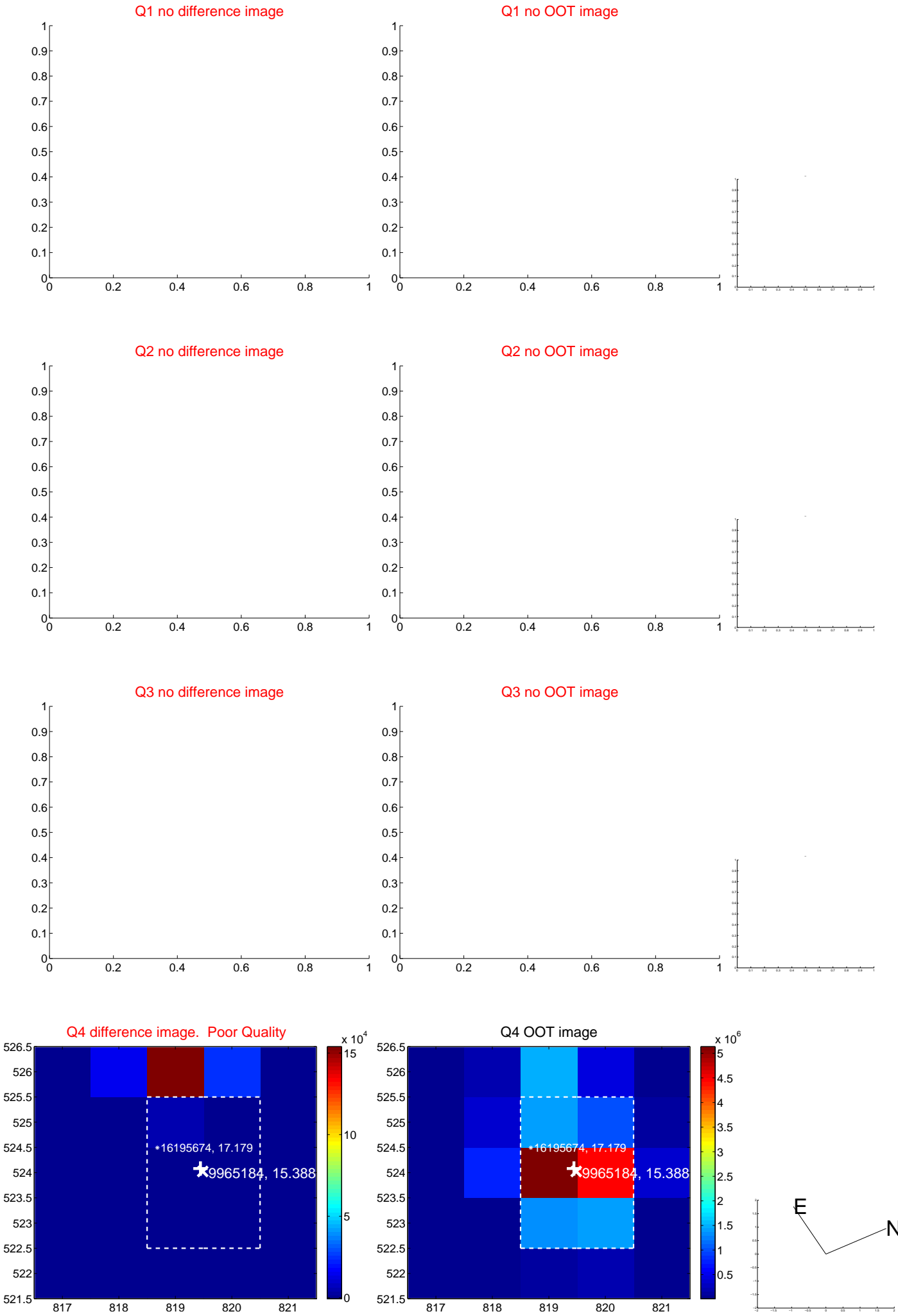
The direct PRF centroid is offset from the target star catalog position by about 0.56 arcsec

	Distance in arcsec	Distance / σ	Δ RA	Δ Dec
PRF-fit source offset from OOT	5.089 \pm 0.171	29.76	4.894 \pm 0.174	1.397 \pm 0.136
PRF-fit source offset from KIC position	5.401 \pm 0.153	35.26	5.235 \pm 0.154	1.327 \pm 0.071
photometric centroid source offset	35.14 \pm 0.78	44.81	34.38 \pm 0.78	7.24 \pm 0.77

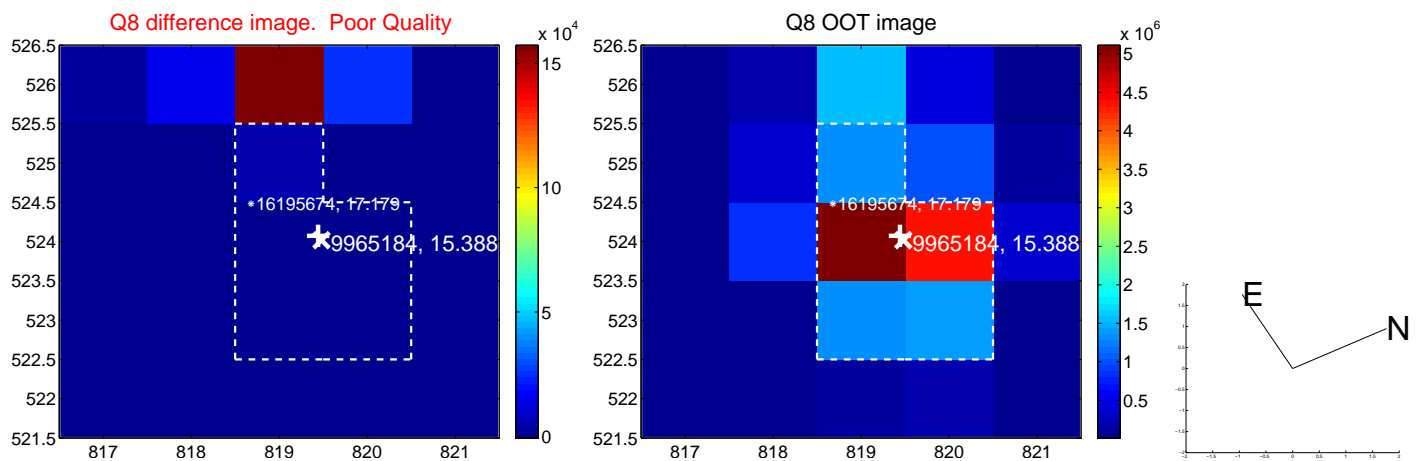
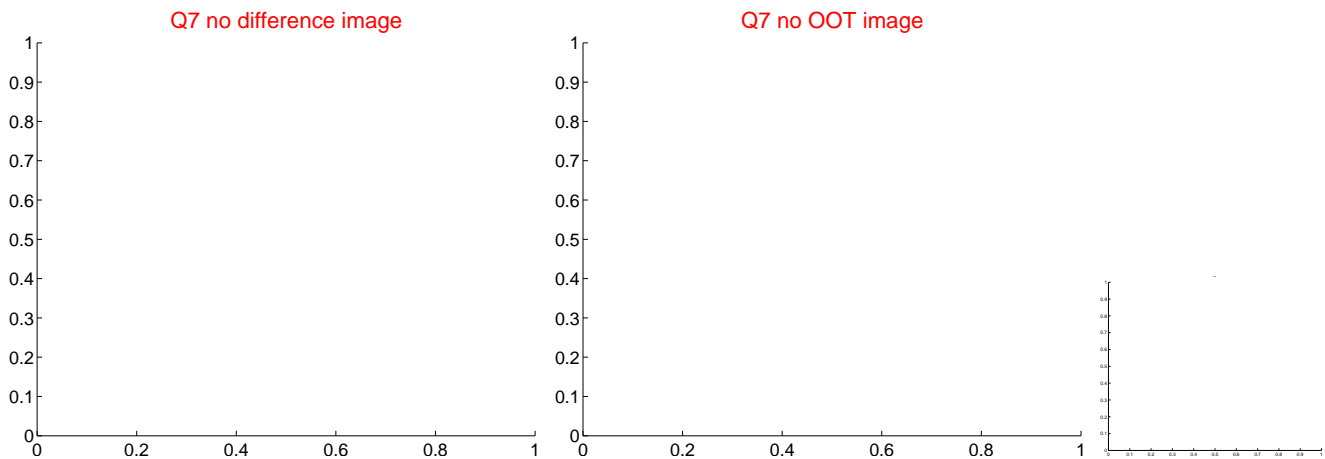
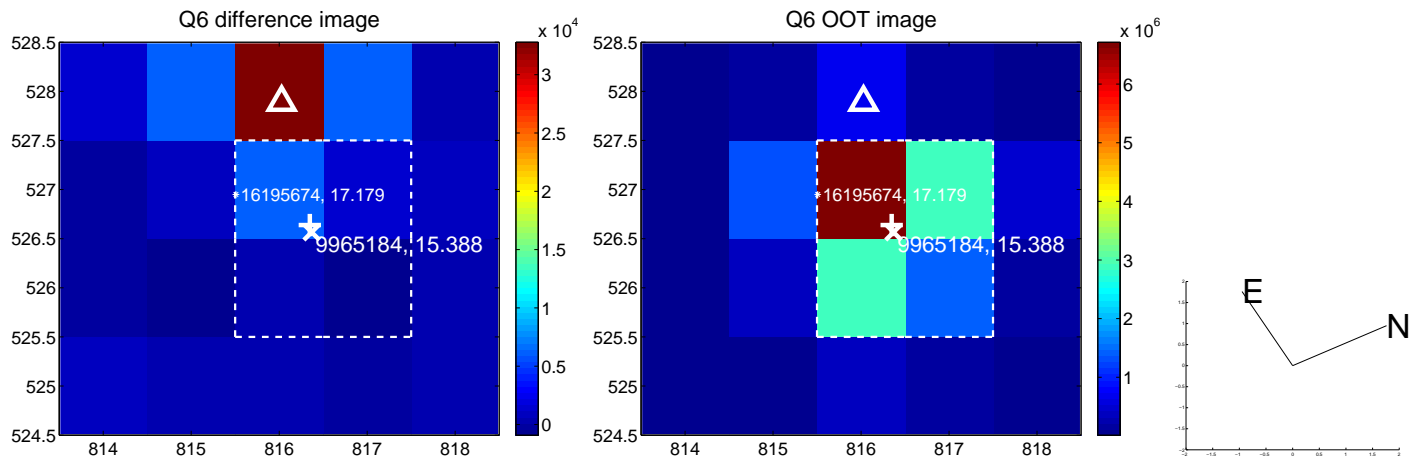
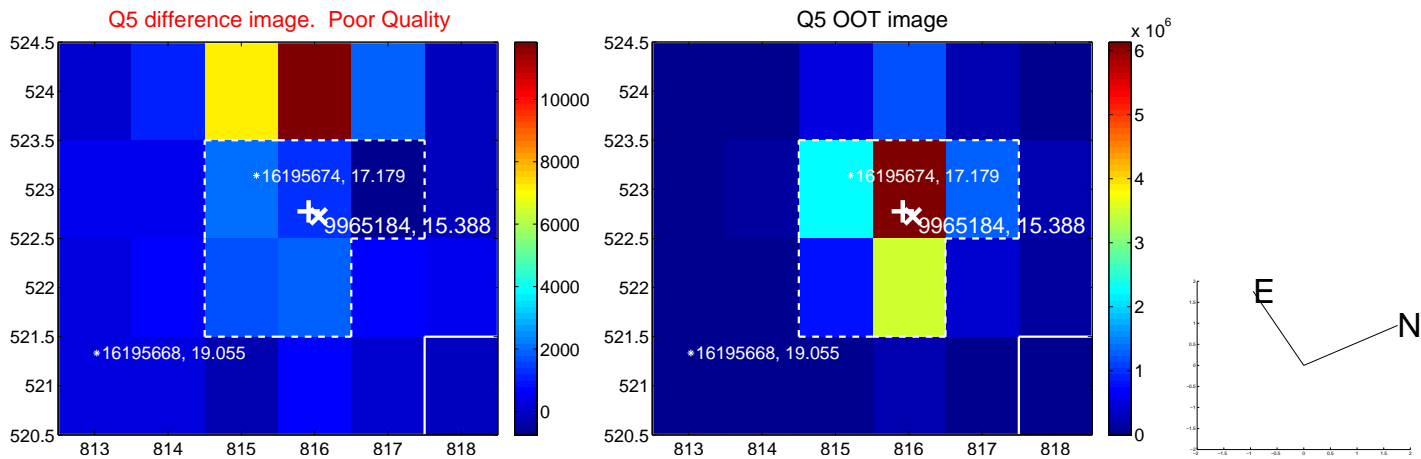


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets**; magenta cross: average over quarters. Length of the crosses: one- σ uncertainty. Blue circle: three-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

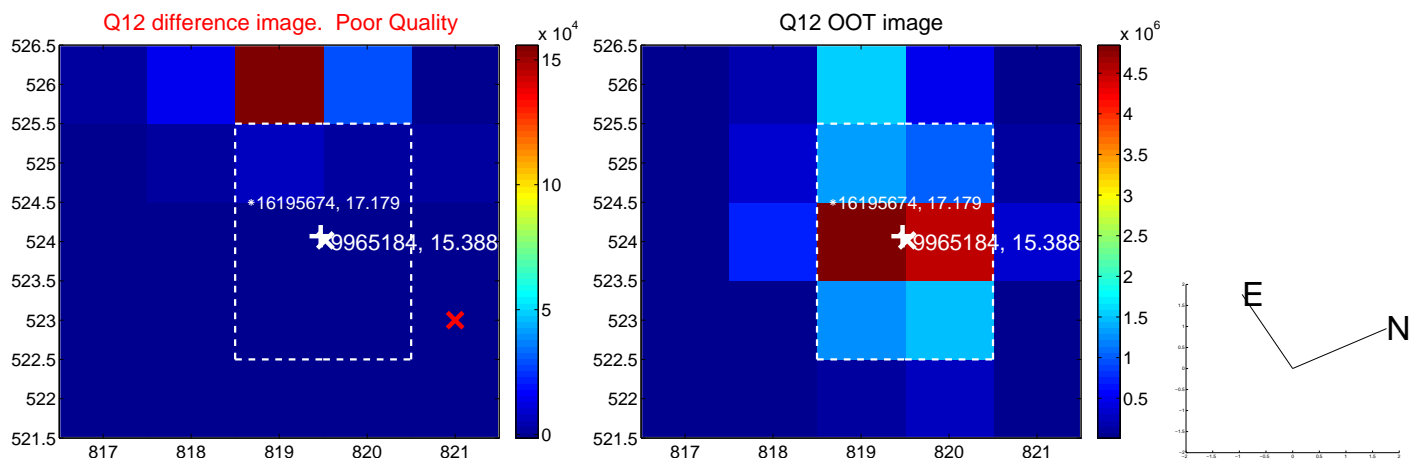
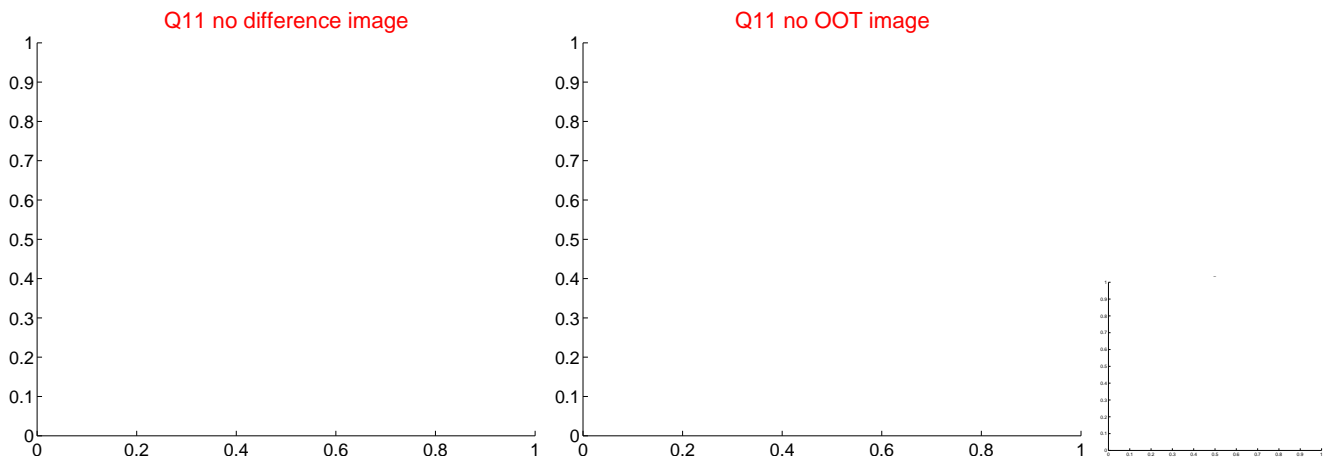
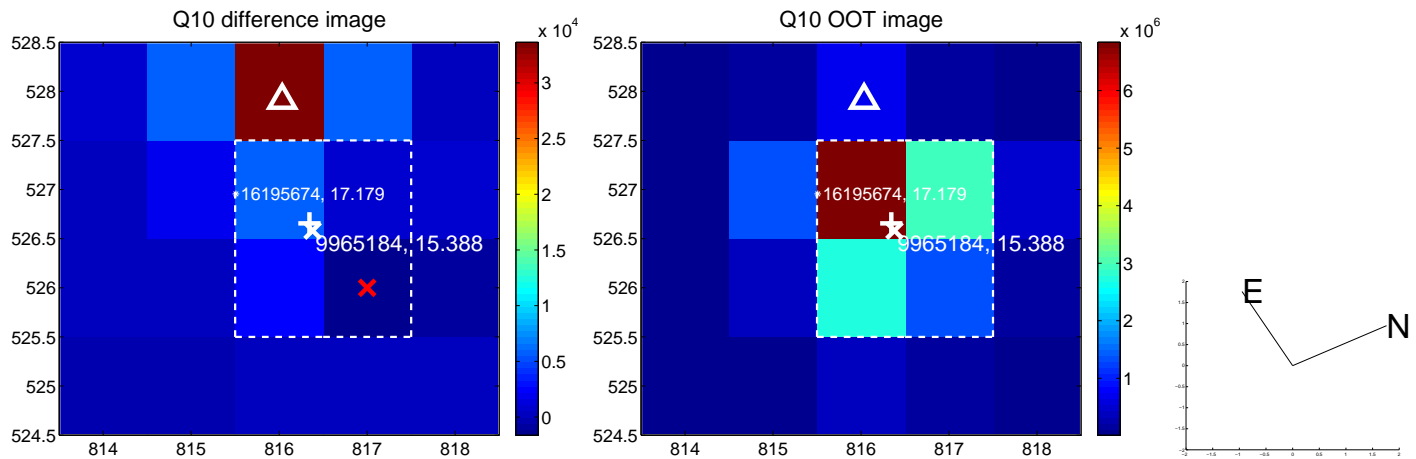
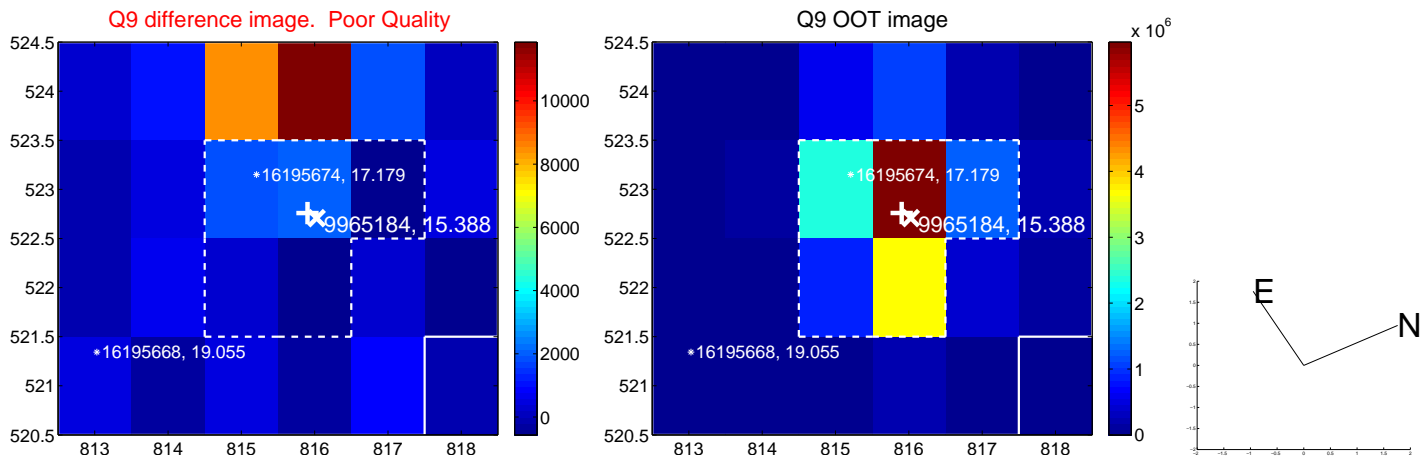
white ×: KIC target position; +: OOT centroid; △: difference centroid. red ✕: large negative pixel value.



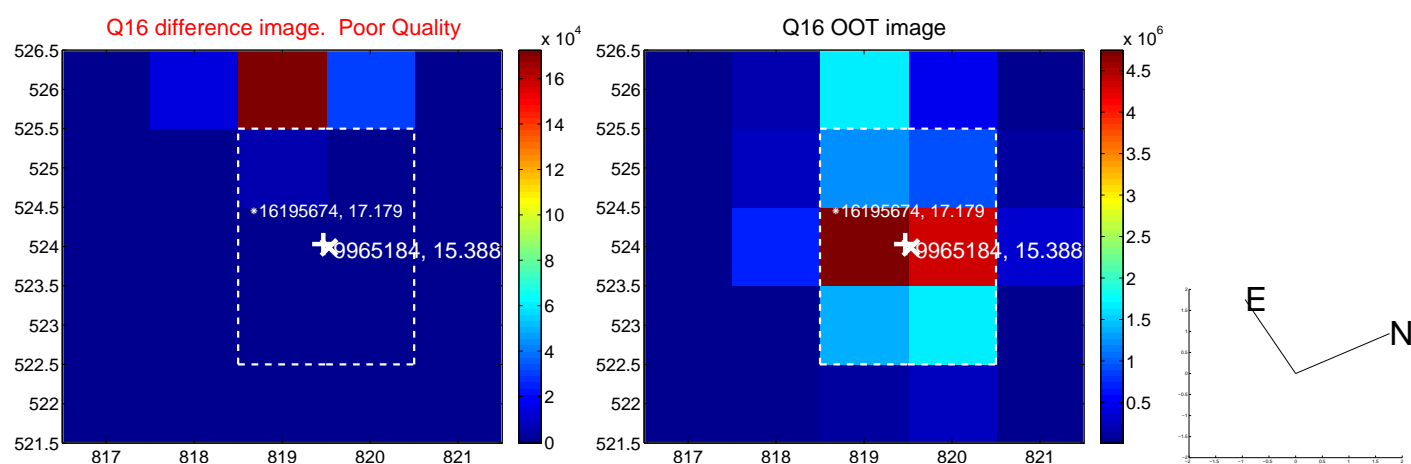
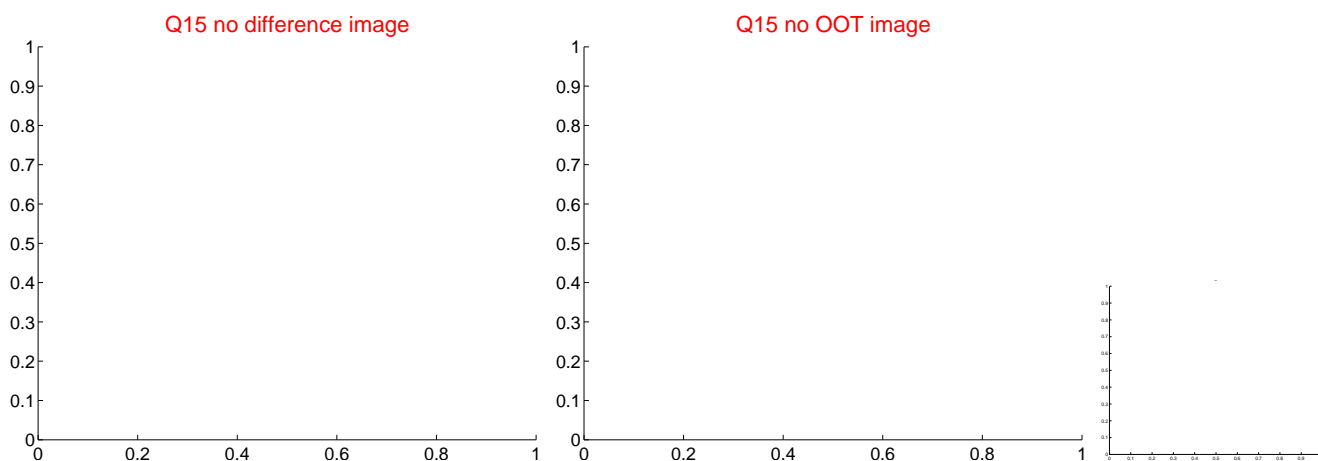
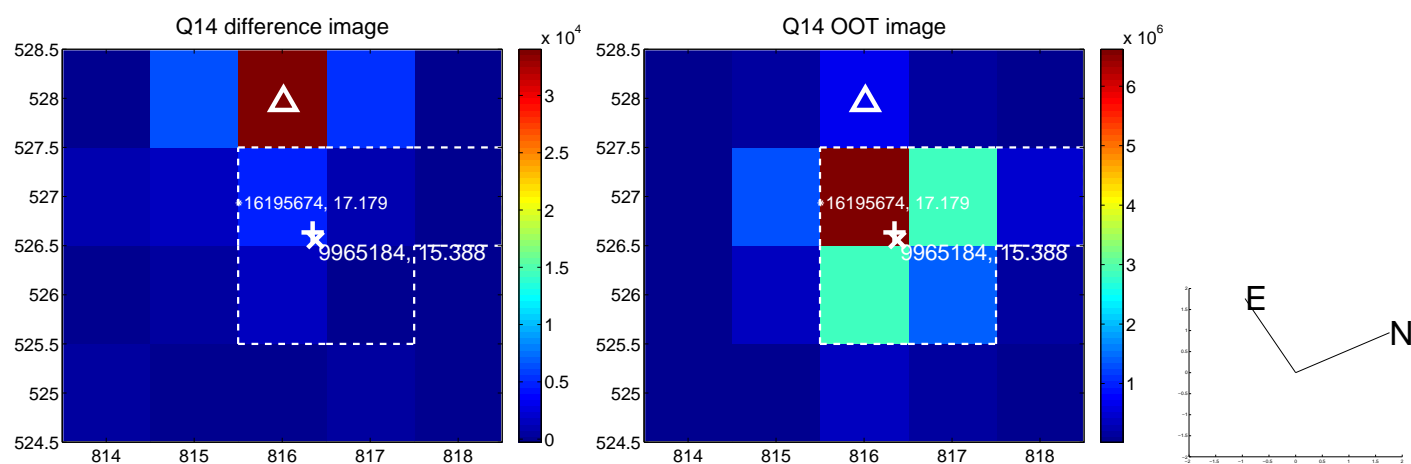
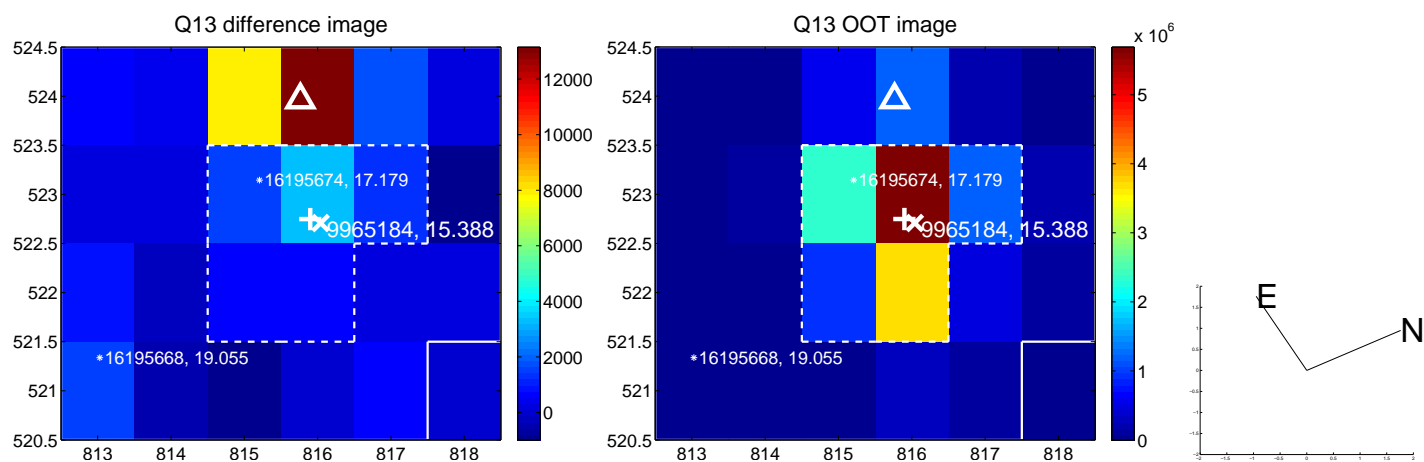
white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



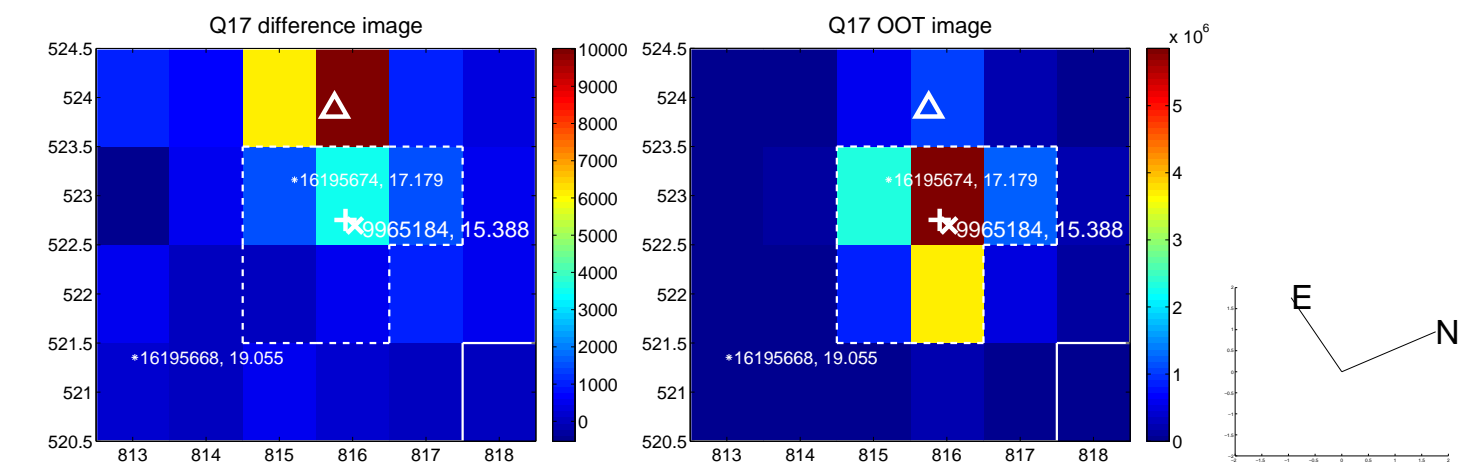
white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



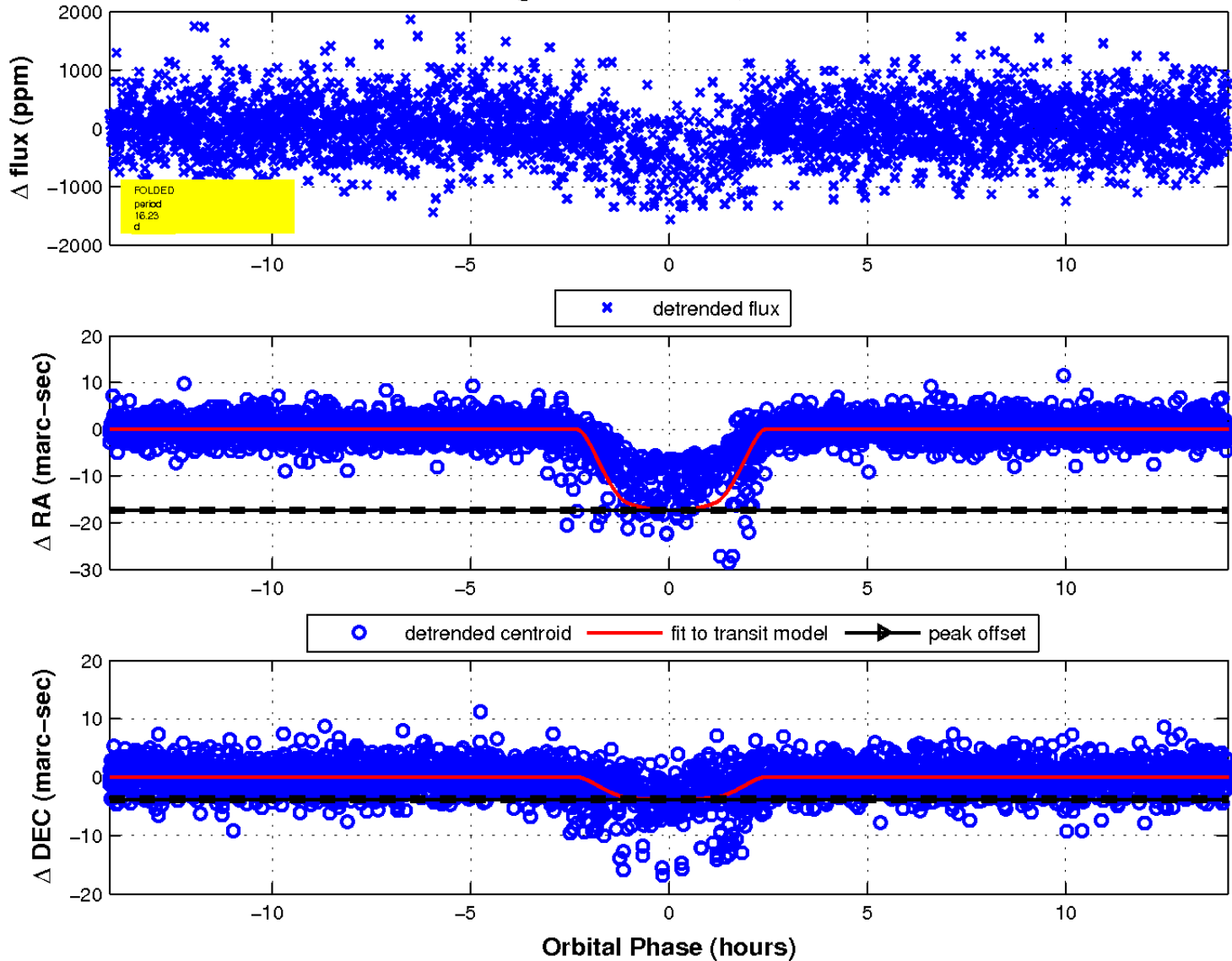
white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



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

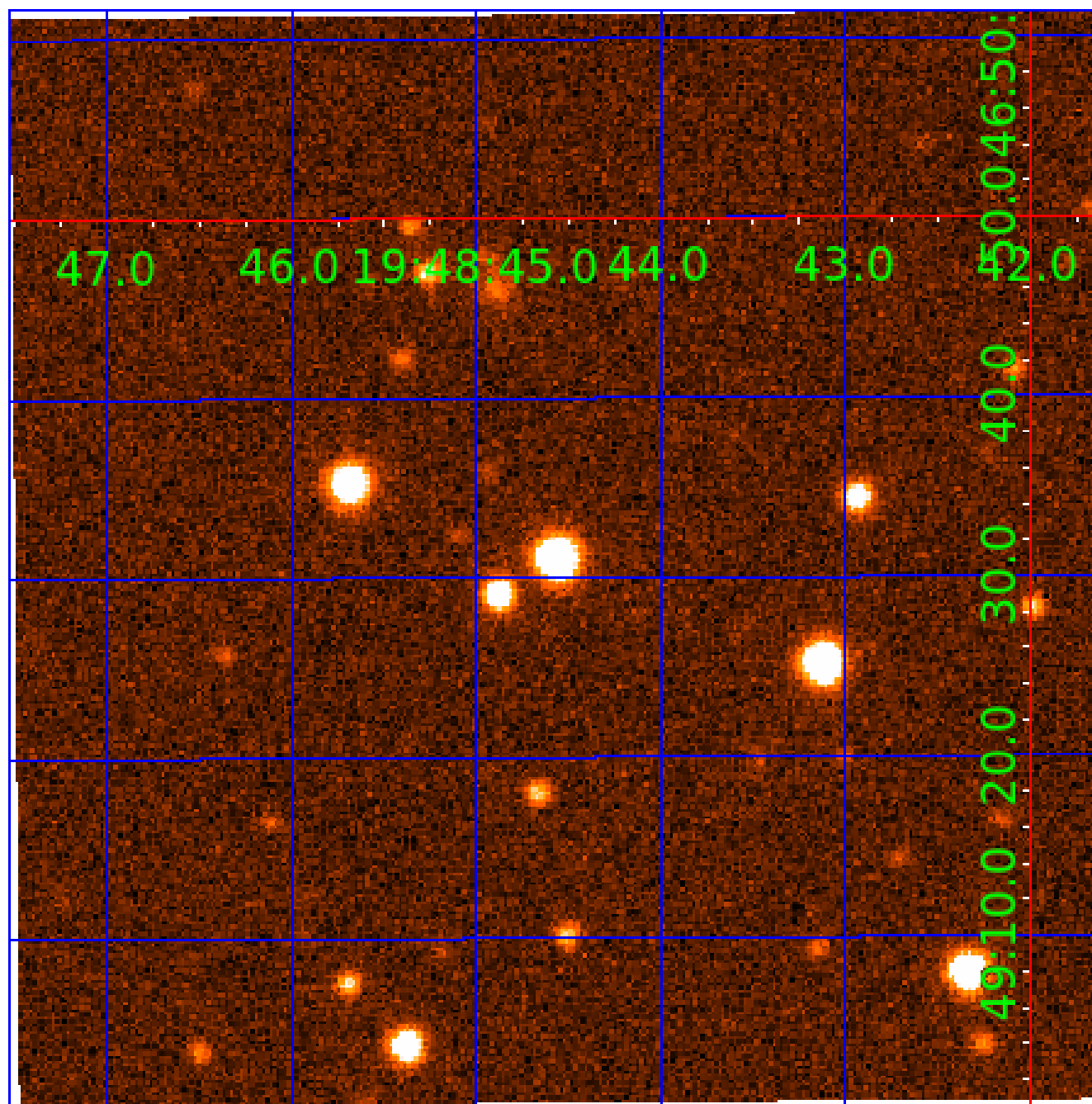


fluxWeightedCentroids, Planet 1 of 2



UKIRT Image

Declination



KIC 009965184

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})
009965184-01	OBS	2428.01	16.227835	145.000375	513.8	4.701	16.3	18.0	0.88	5328	2.62	41.63
009965184-02	OBS	No	16.227583	136.635571	562.0	4.609	16.1	18.3	0.88	5328	2.84	41.63

Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009965184-01	OBS	FP	0.00	0	1	1	1	MOD_SEC_DV—MOD_SEC_ALT—HAS_SEC_TCE—CENT_RESOLVED_OFFSET—EPHEM_MATCH
009965184-02	OBS	FP	0.00	1	1	1	1	IS_SEC_TCE—CENT_RESOLVED_OFFSET—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 009965184-02

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
009965184-02	9965184	3558.01	9965206	1:1	12.5	-3	0	15.90	15.39	426.60	Direct-PRF	0	0.07	0.11

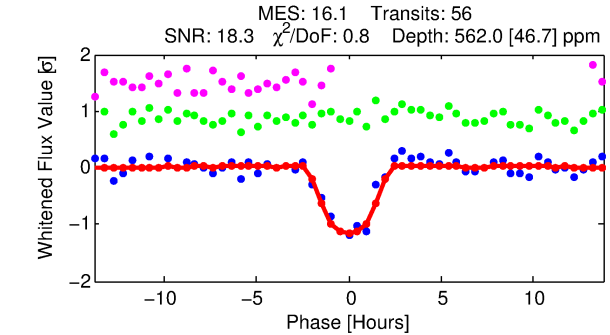
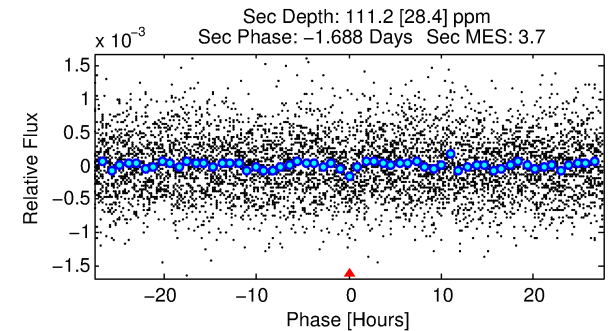
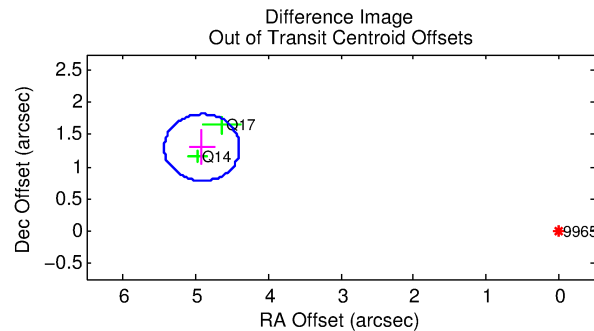
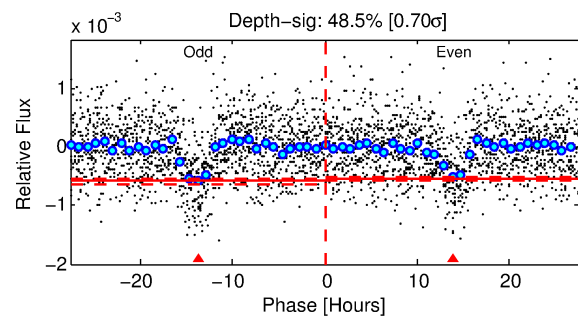
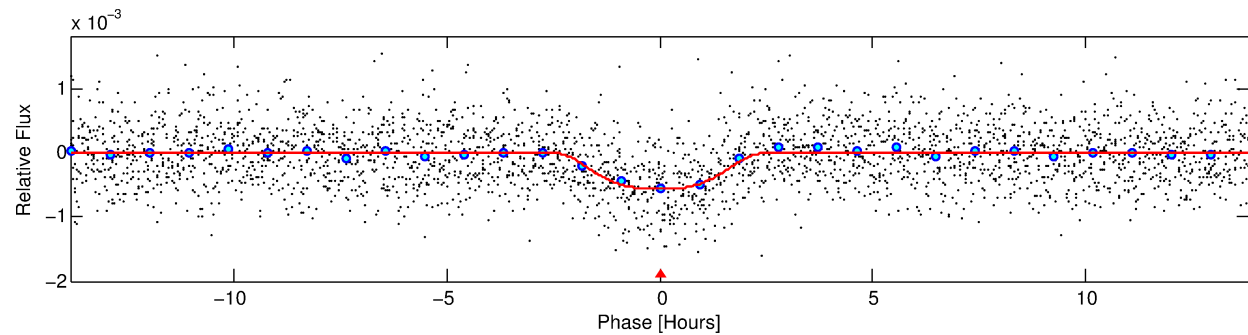
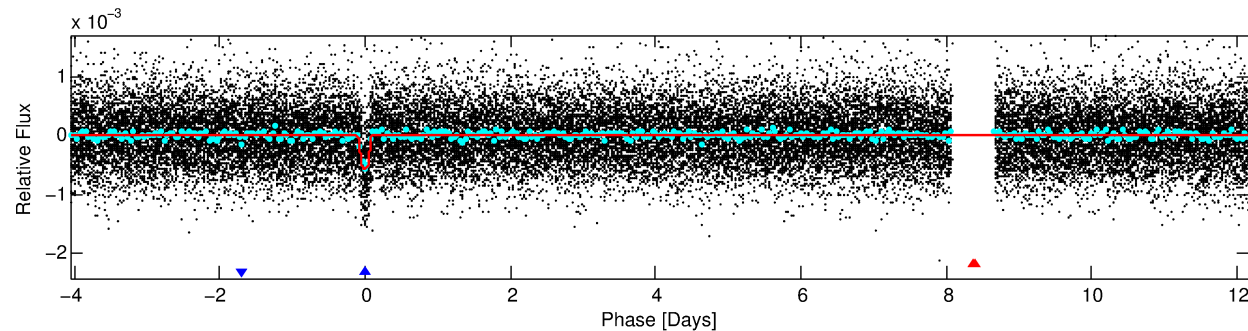
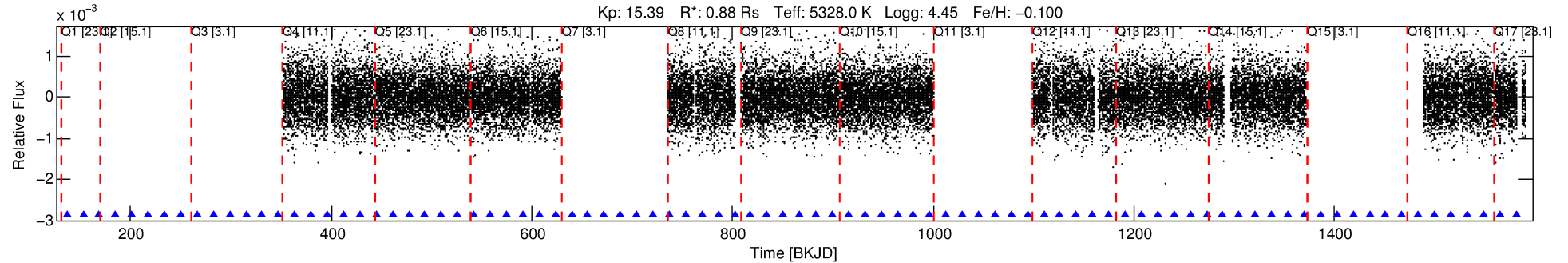
Notes: $P_1:P_2$ is the period ratio. Dist is the distance in arcseconds. Δ Row and Δ Col are the number of pixels apart in row and column. m_2 and m_1 are the magnitudes of the parent and child. D_2/D_1 is the parent's transit depth divided by the child's. σ_P and σ_T are the significance of the match 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: 9965184 Candidate: 2 of 2 Period: 16.228 d

KOI: K02428.01 Corr: 0.965

Kp: 15.39 R*: 0.88 Rs Teff: 5328.0 K Logg: 4.45 Fe/H: -0.100



DV Fit Results:

Period = 16.22758 [0.00014] d
Epoch = 136.6356 [0.0073] BKJD
Rp/R* = 0.0295 [0.0020]
a/R* = 9.49 [1.12]
b = 0.97 [0.01]
Seff = 41.63 [14.12]
Teq = 648 [55] K
Rp = 2.84 [0.63] Re
a = 0.1163 [0.0227] AU
Ag = 102.39 [42.74] [2.37σ]
Teff = 3186 [260] K [9.56σ]

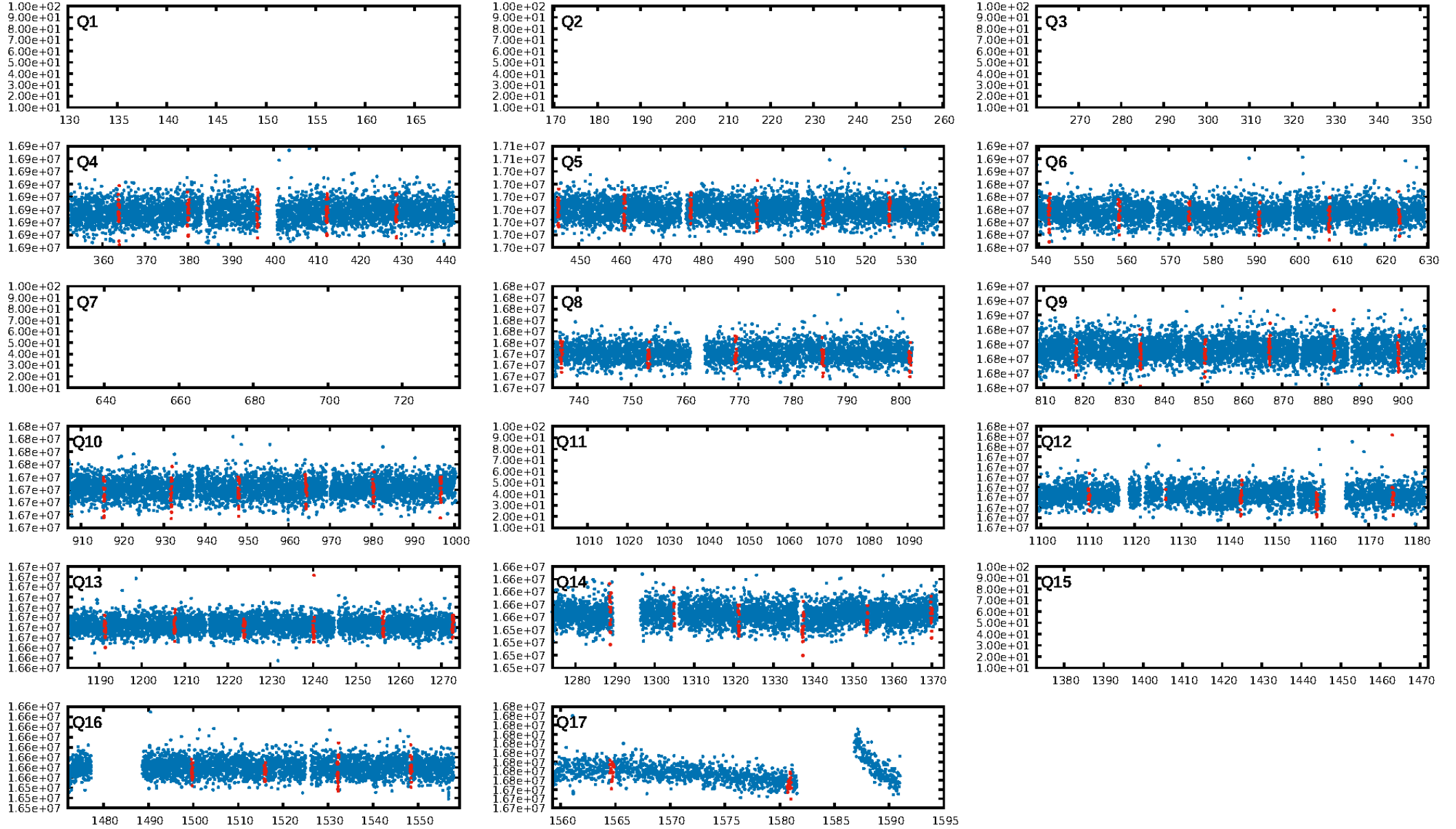
DV Diagnostic Results:

ShortPeriod-sig: N/A
LongPeriod-sig: 0.1% [0.00σ]
ModelChiSquare2-sig: 91.6%
ModelChiSquareGoF-sig: 100.0%
Bootstrap-pfa: 8.59e-57
RollingBand-fgt: 1.00 [54/54]
GhostDiagnostic-chr: -0.1991
Centroid-sig: 0.0%
Centroid-so: 35.847 arcsec [46.51σ]
OotOffset-rm: 5.078 arcsec [29.33σ]
KicOffset-rm: 5.375 arcsec [34.29σ]
OotOffset-st: 1/0/0/1 [2]
KicOffset-st: 1/0/0/1 [2]
DiffImageQuality-fgm: 1.00 [2/2]
DiffImageOverlap-fno: 1.00 [11/11]

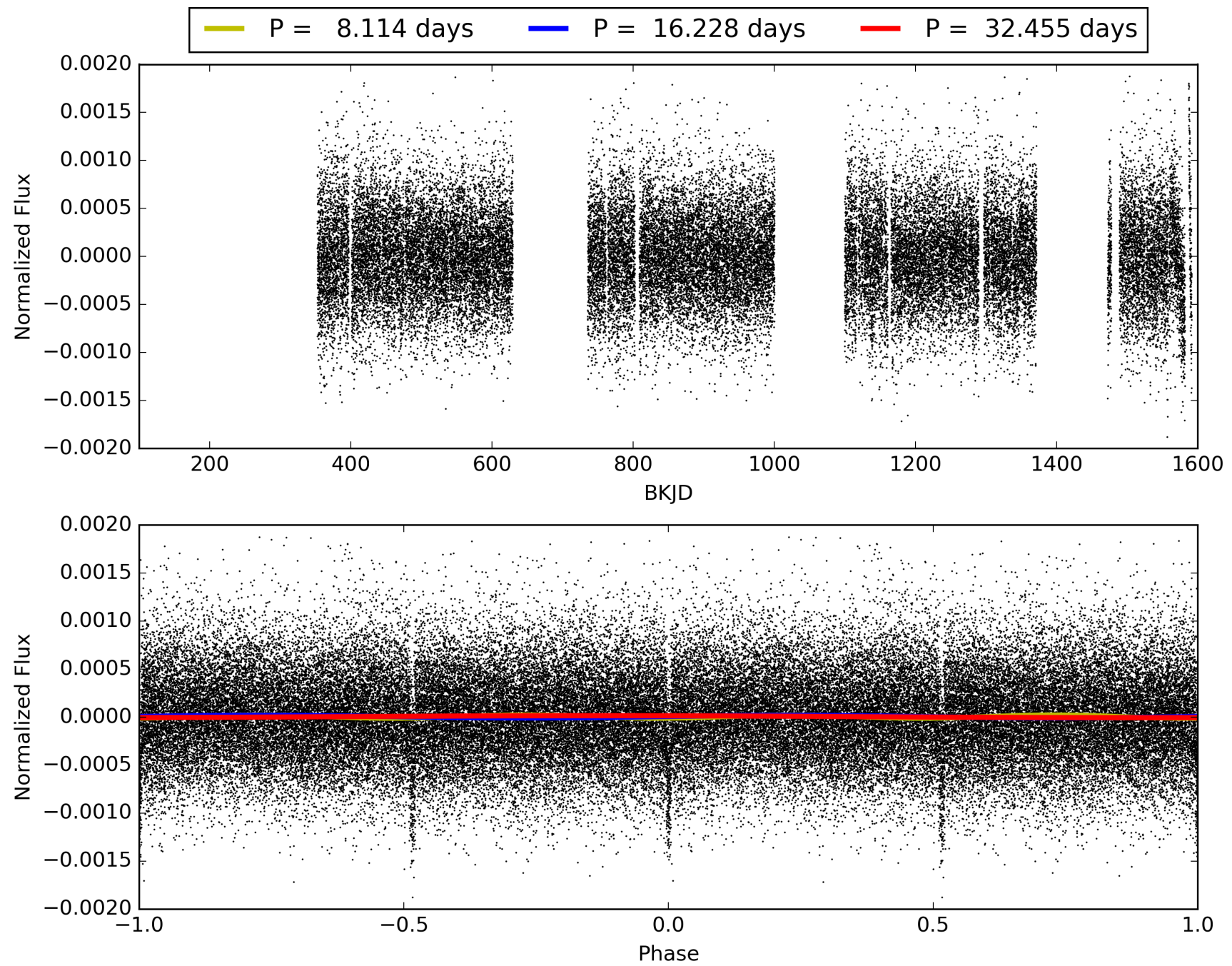
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 31-Jan-2016 13:03:17 Z

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TCE 009965184-02, PDC Light Curves

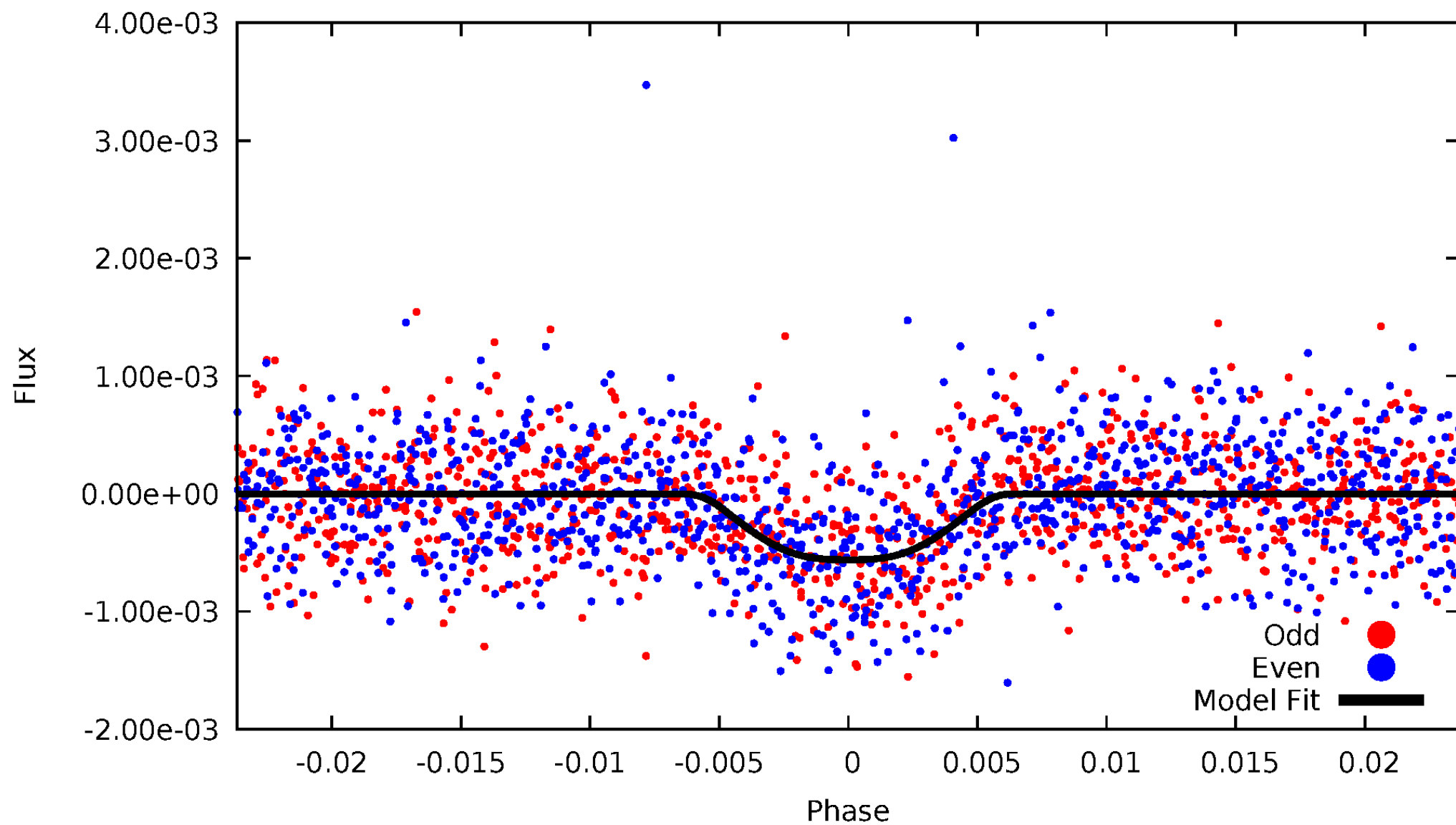


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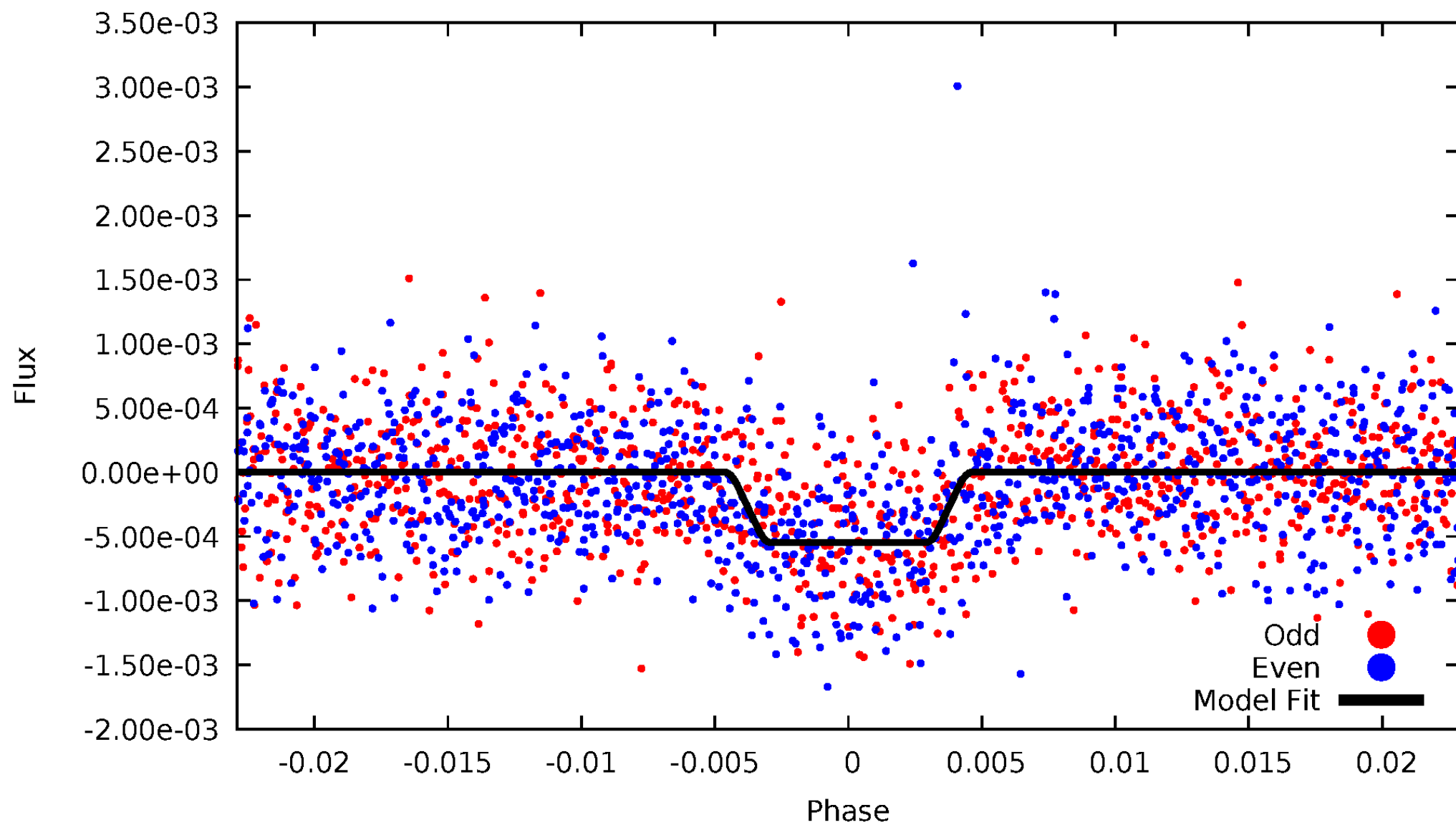
DV Odd/Even

TCE 009965184-02



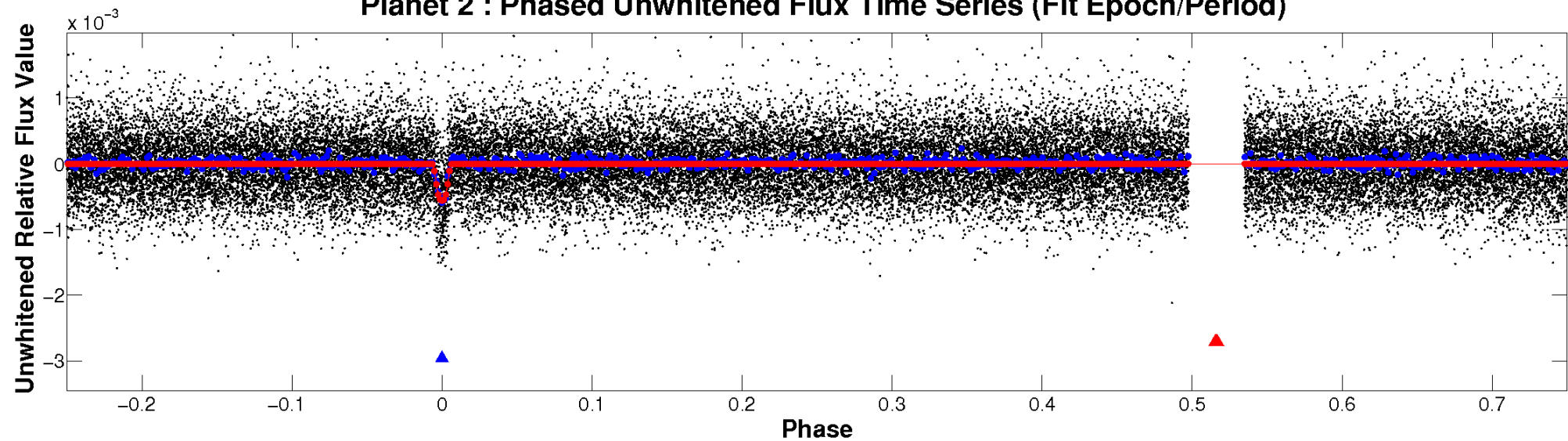
ALT Odd/Even

TCE 009965184-02

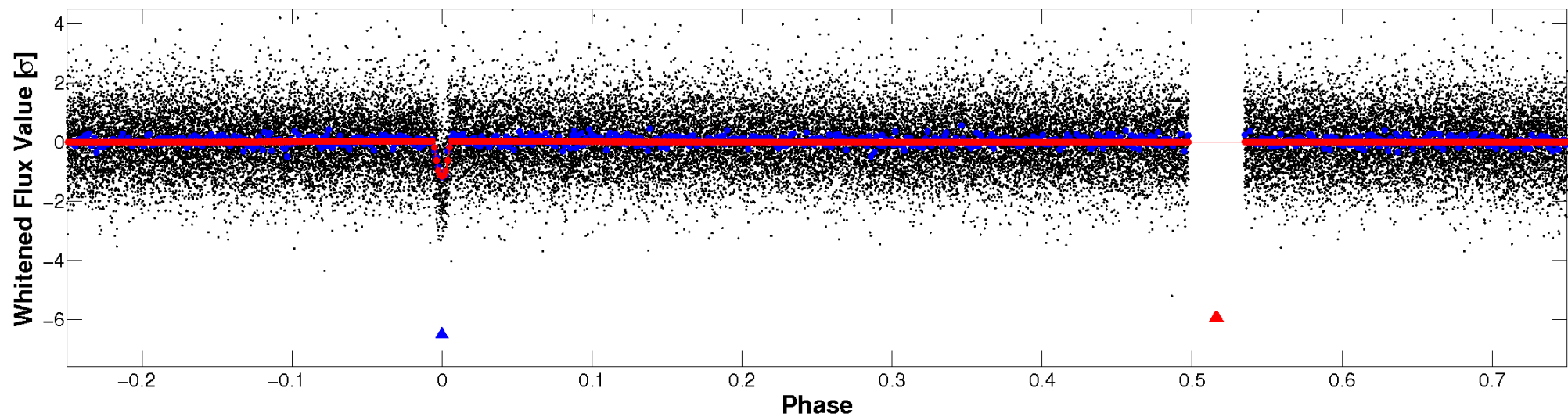


Non-Whitened Vs. Whitened Light Curve

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

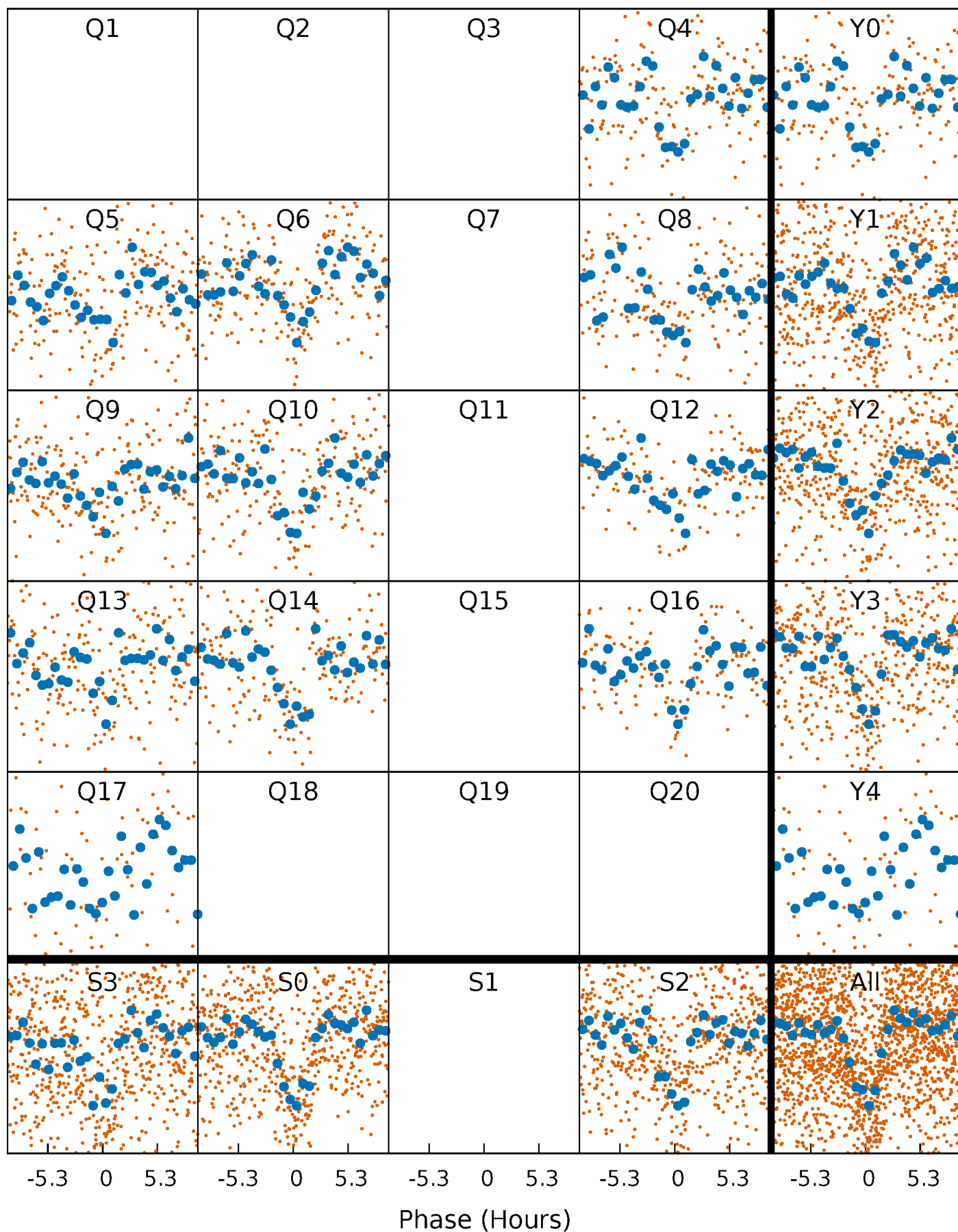


Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



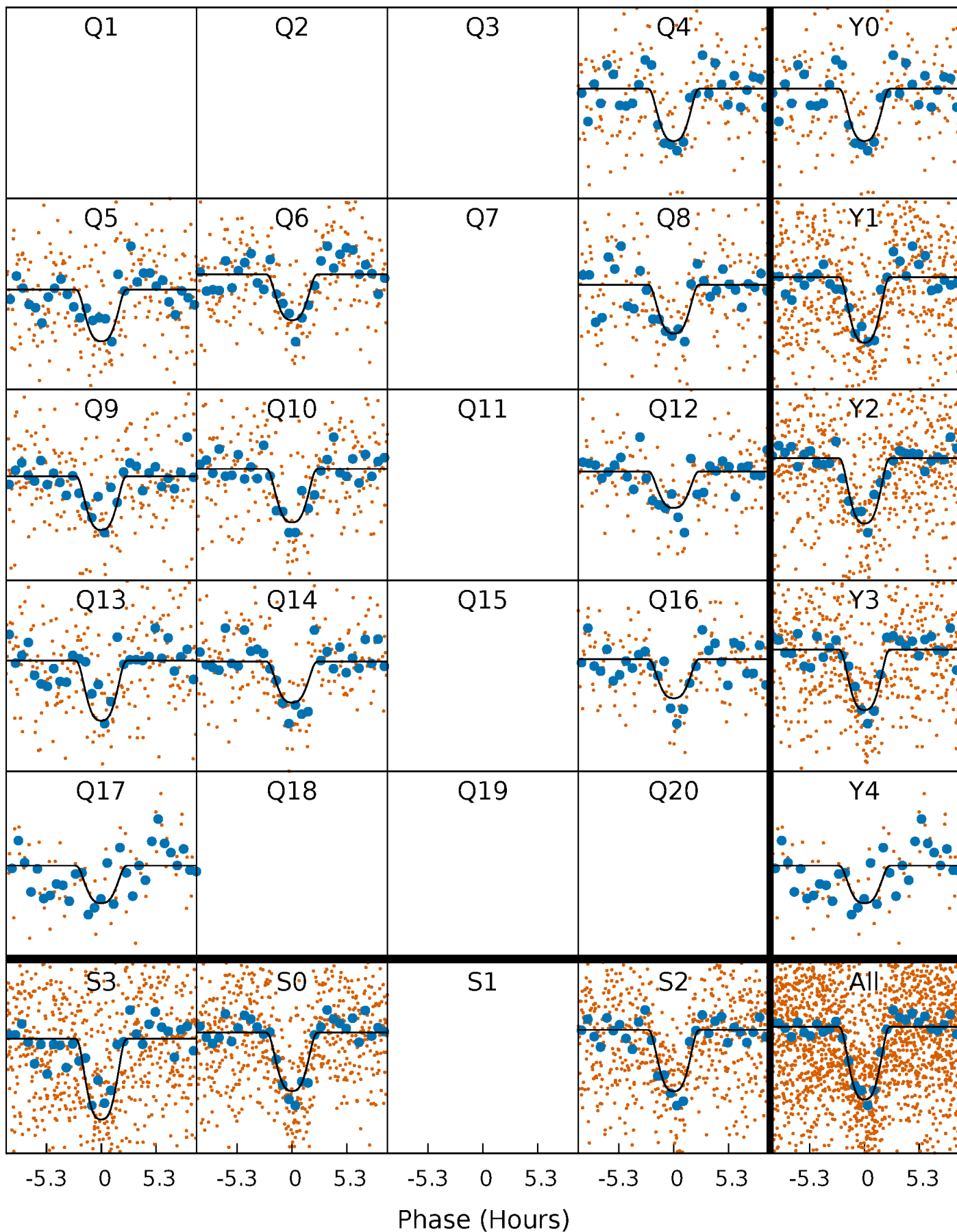
PDC Quarter-Phased Transit Curves

TCE 009965184-02 P= 16.227583 Days $T_0=136.635571$ (BKJD)



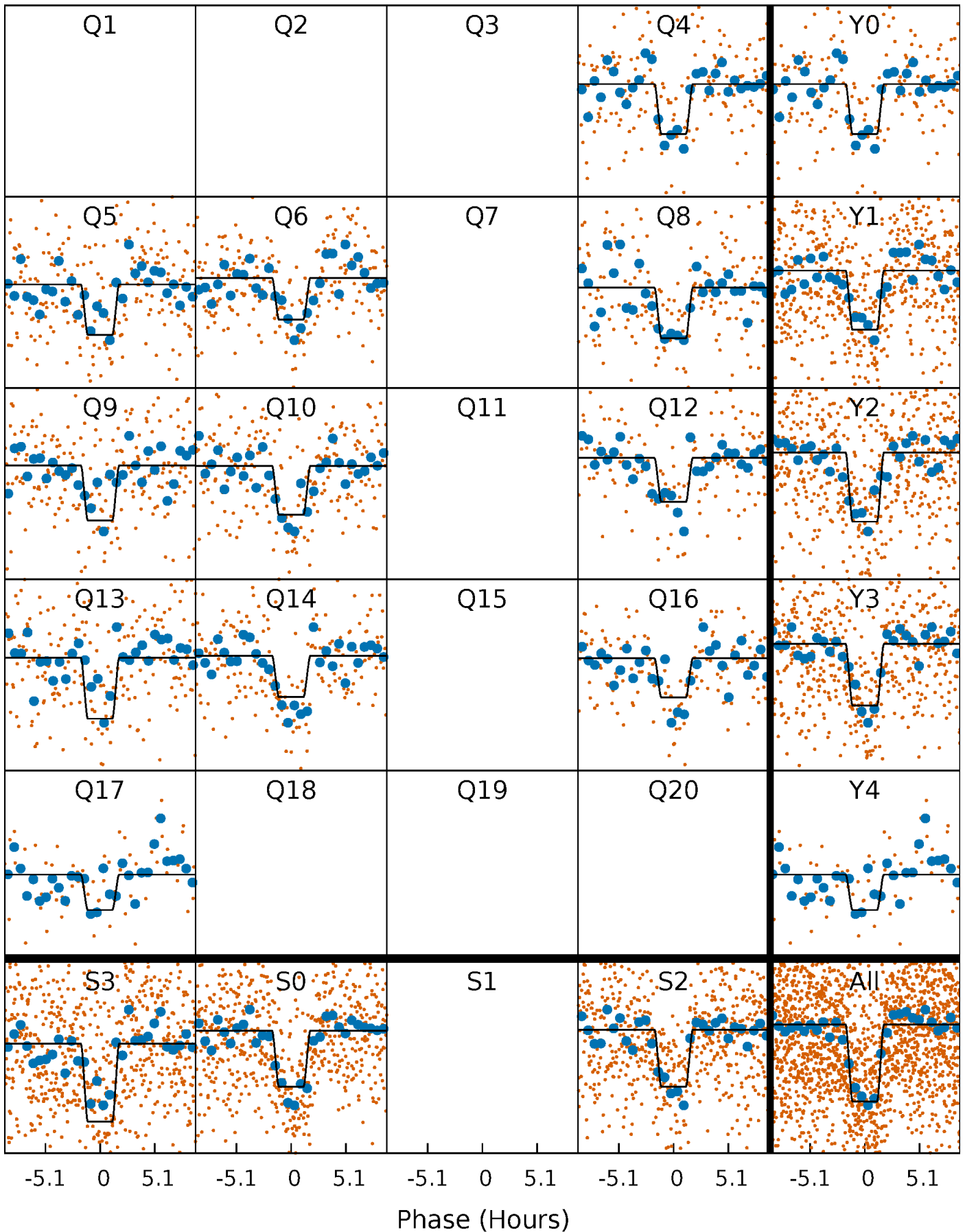
DV Quarter-Phased Transit Curves

TCE 009965184-02 P= 16.227583 Days $T_0=136.635571$ (BKJD)



Alt. Detrend Quarter-Phased Transit Curves

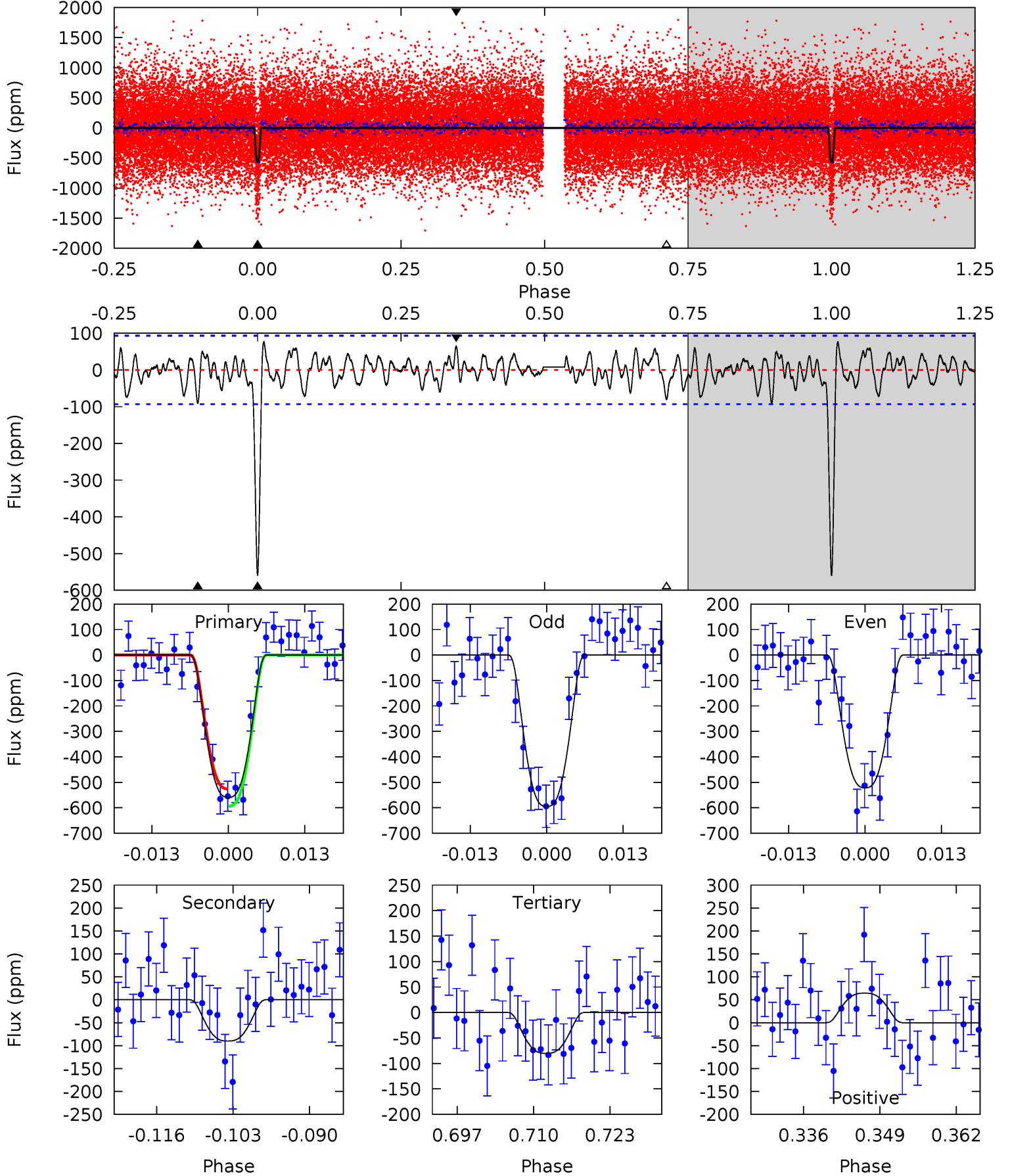
TCE 009965184-02 P= 16.227665 Days $T_0=136.629828$ (BKJD)



DV Model-Shift Uniqueness Test

009965184-02, P = 16.227583 Days, E = 136.635571 Days

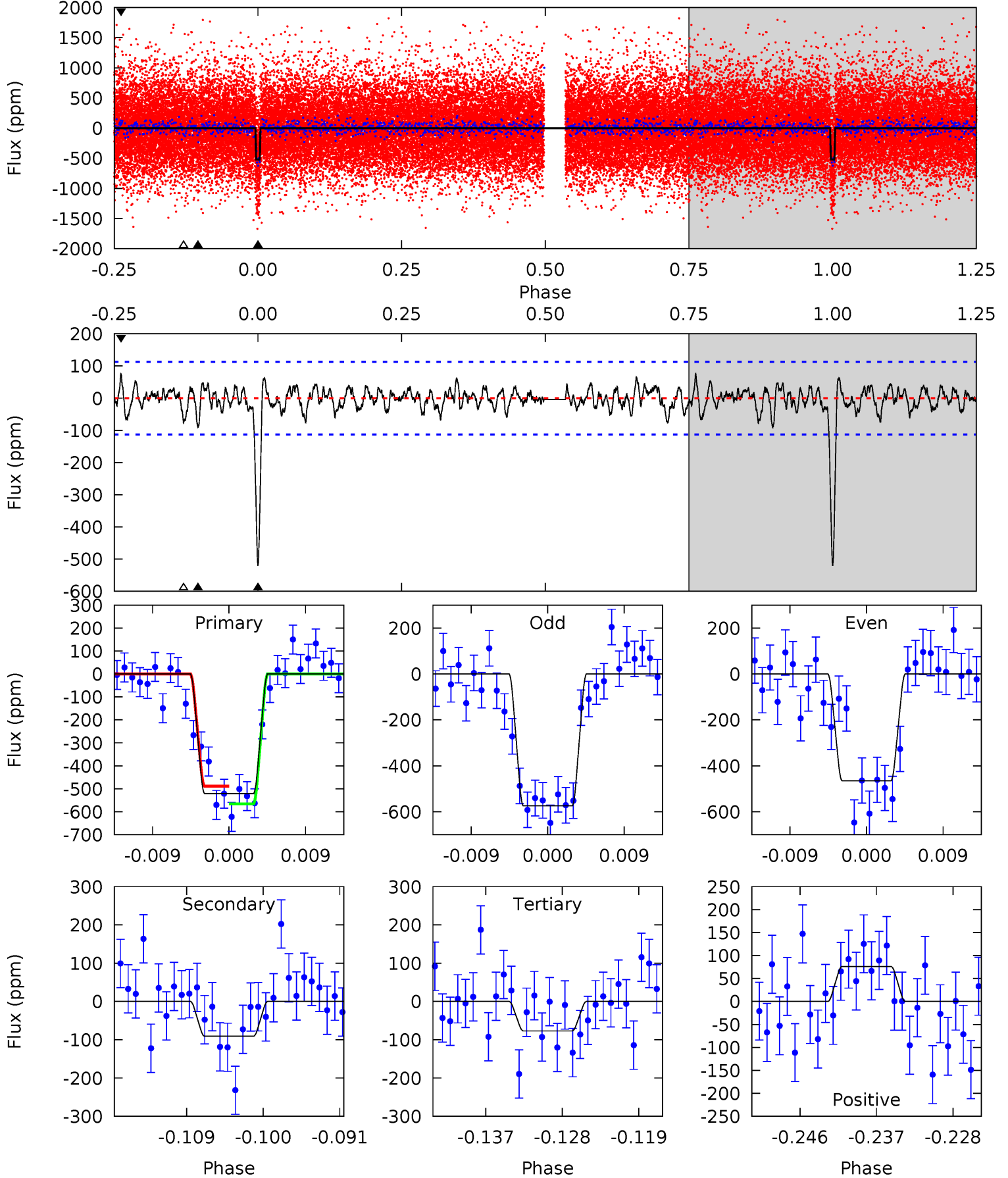
Pri	Sec	Ter	Pos	FA ₁	FA ₂	F _{Red}	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
29.9	4.81	4.28	3.44	4.98	2.49	1.50	25.6	26.4	0.53	1.37	1.96	1.00	0.12	1.82



Alt Model-Shift Uniqueness Test

009965184-02, P = 16.227665 Days, E = 136.629828 Days

Pri	Sec	Ter	Pos	FA ₁	FA ₂	F _{Red}	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
23.3	4.06	3.45	3.41	5.04	2.61	1.18	19.8	19.9	0.61	0.65	2.46	1.03	0.13	1.71



Stellar Parameters For KIC 009965184

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	5328^{+204}_{-185}	$4.447^{+0.130}_{-0.174}$	$-0.100^{+0.300}_{-0.300}$	$0.883^{+0.188}_{-0.126}$	$0.796^{+0.124}_{-0.057}$	$1.627^{+0.931}_{-0.734}$
	+4%/-3%	+3%/-4%	+300%/-300%	+21%/-14%	+16%/-7%	+57%/-45%
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 009965184-02 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	A_{obs}
DV	-90 ± 19	$2.90^{+0.46}_{-0.36}$	912^{+60}_{-55}	3478^{+181}_{-165}	79^{+29}_{-24}
Alt.	-91 ± 22	$2.31^{+0.32}_{-0.29}$	911^{+59}_{-53}	3757^{+217}_{-222}	128^{+51}_{-41}

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

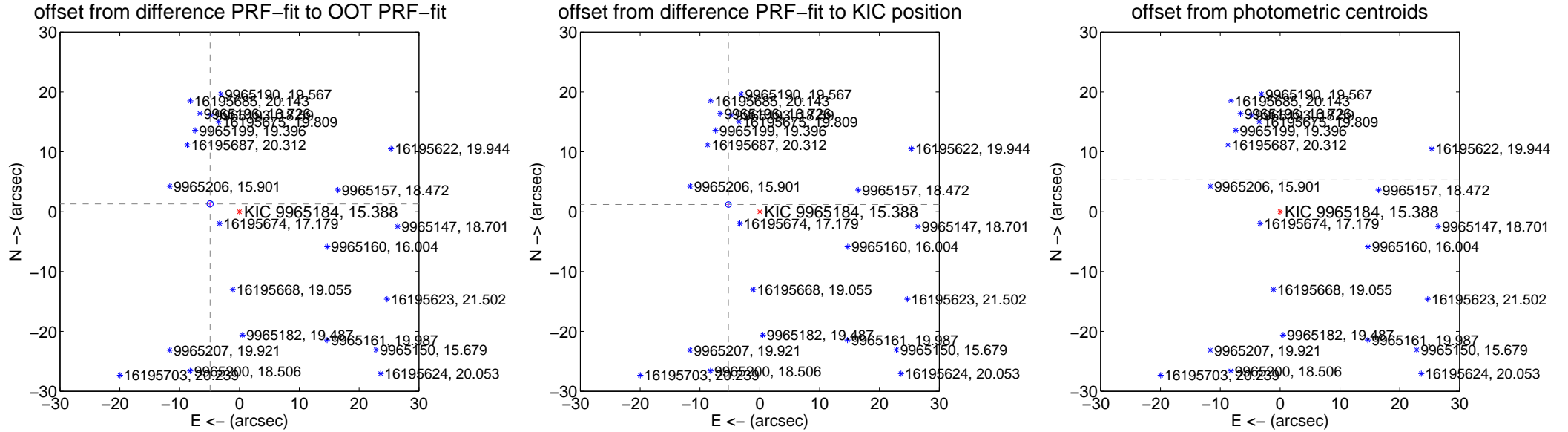
DV Centroid Data

Supplemental centroid analysis for 009965184-02. Kepler magnitude: 15.39. Transit SNR 18.33

There are 2 quarters with good PRF difference image offsets

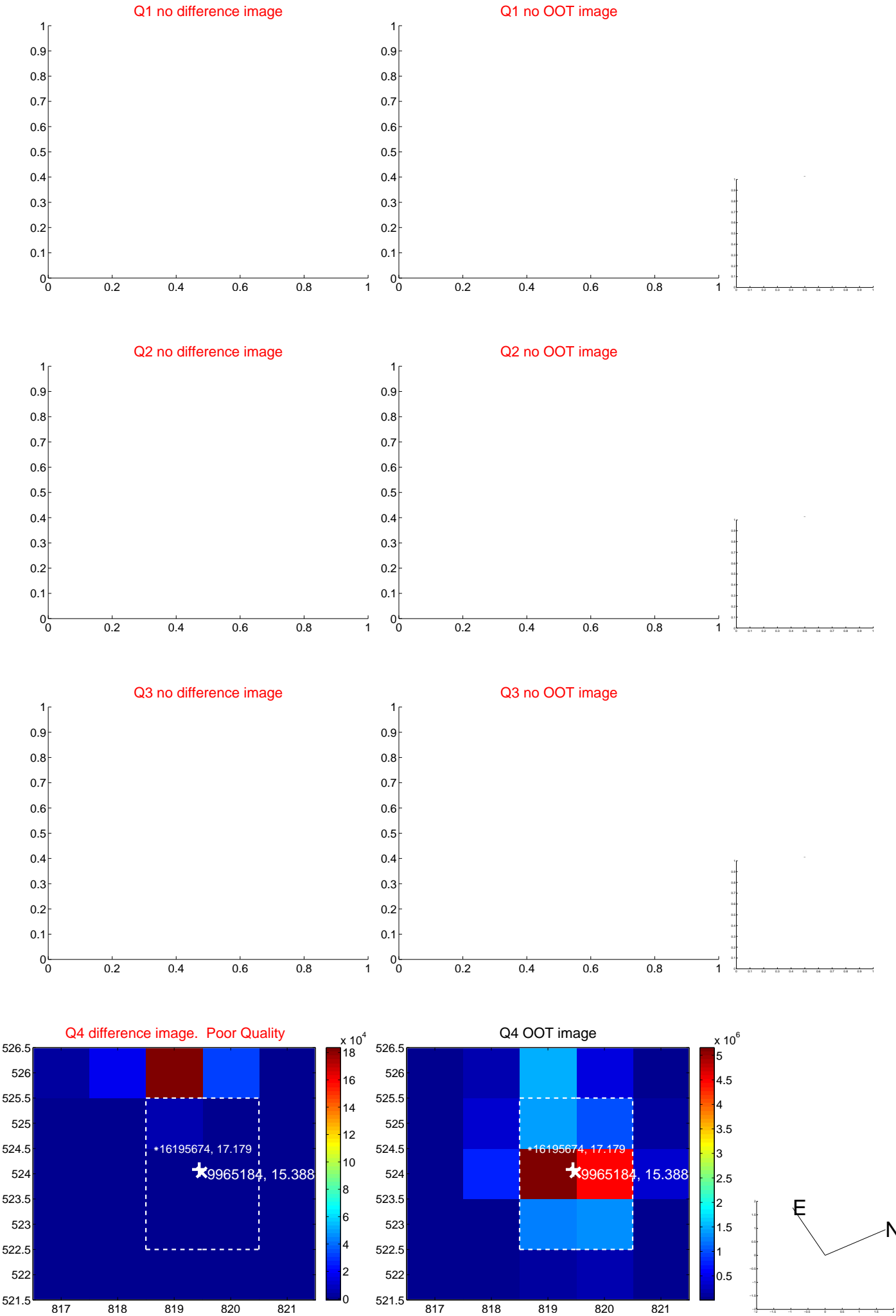
The direct PRF centroid is offset from the target star catalog position by about 0.56 arcsec

	Distance in arcsec	Distance / σ	Δ RA	Δ Dec
PRF-fit source offset from OOT	5.078 \pm 0.173	29.33	4.909 \pm 0.164	1.299 \pm 0.270
PRF-fit source offset from KIC position	5.375 \pm 0.157	34.29	5.240 \pm 0.159	1.199 \pm 0.107
photometric centroid source offset	35.85 \pm 0.77	46.51	35.45 \pm 0.77	5.31 \pm 0.75

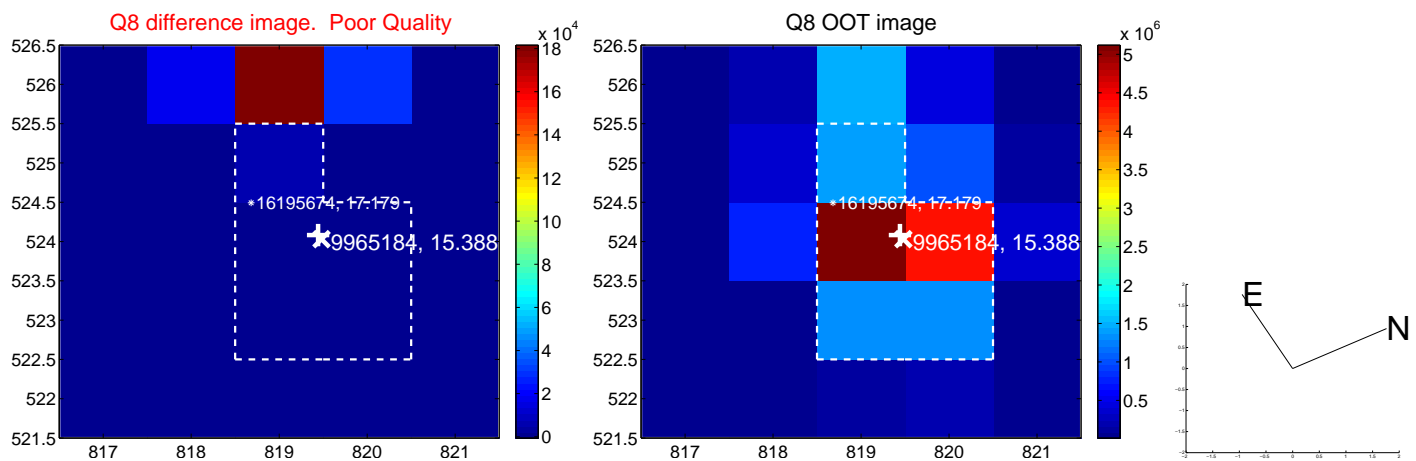
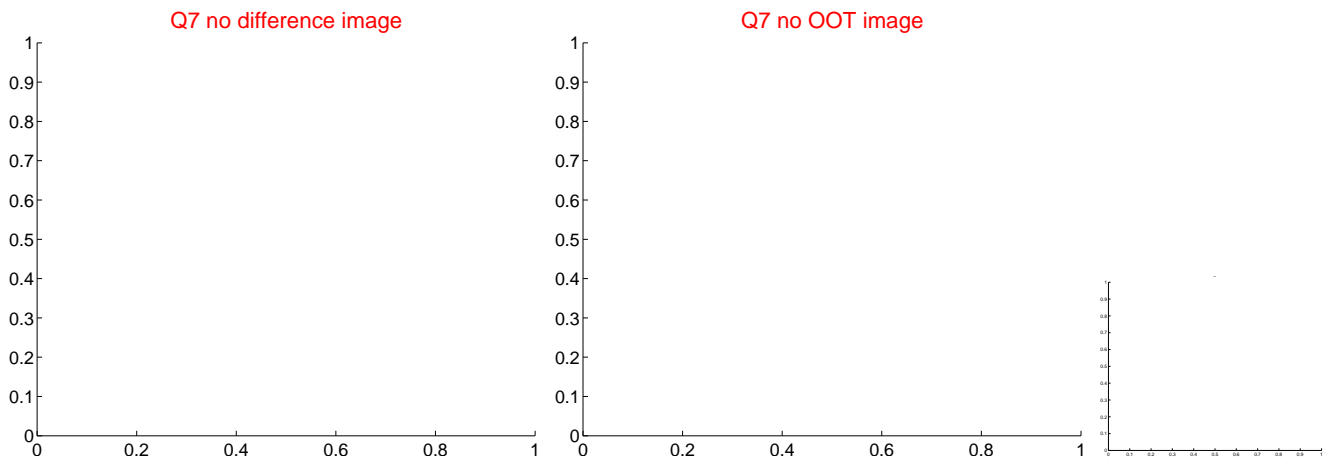
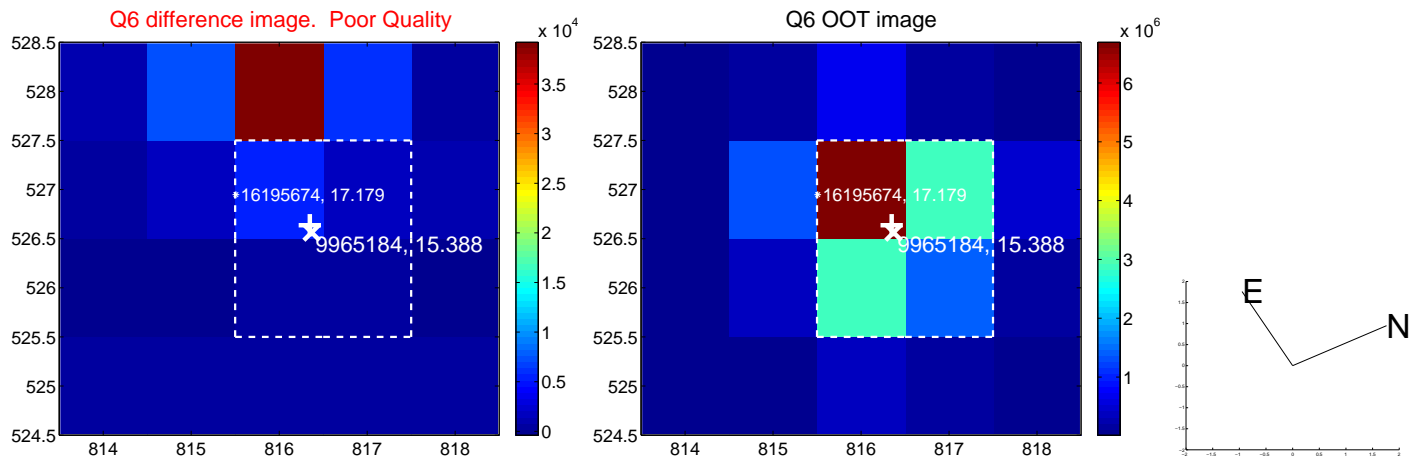
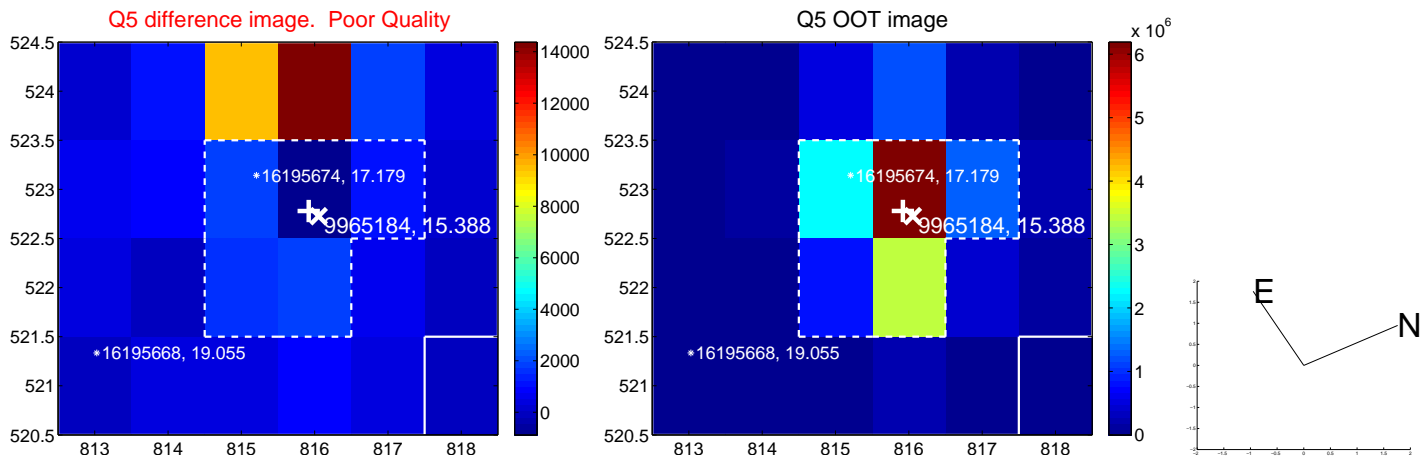


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- σ uncertainty. Blue circle: three- σ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

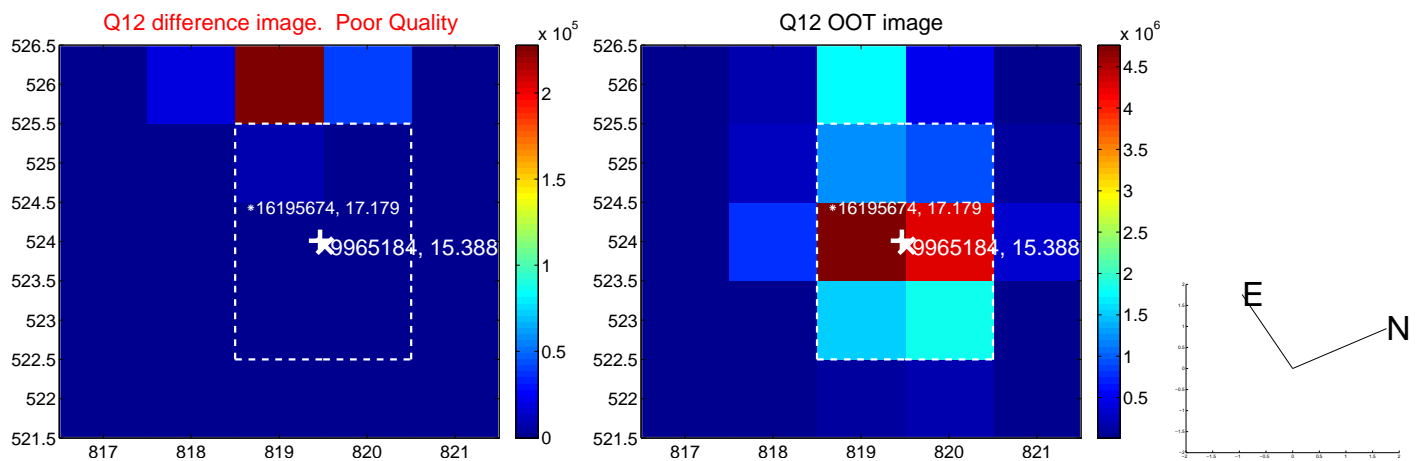
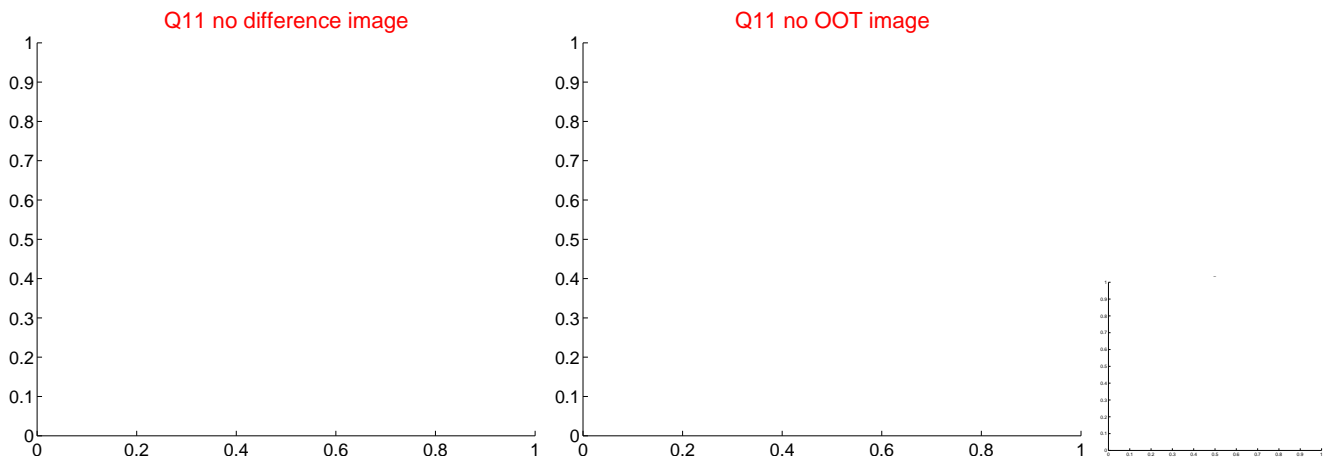
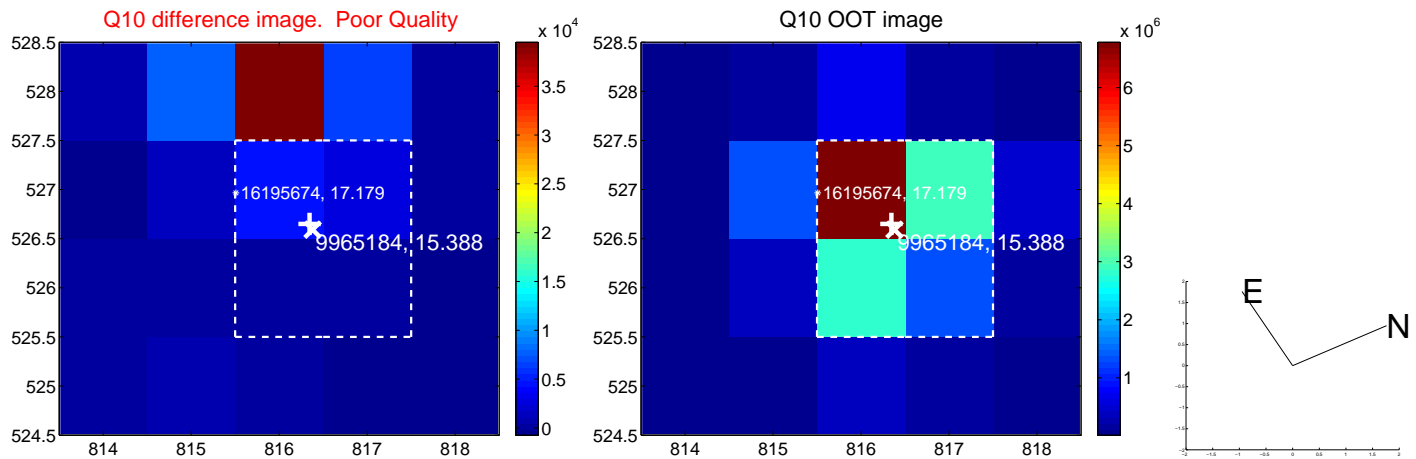
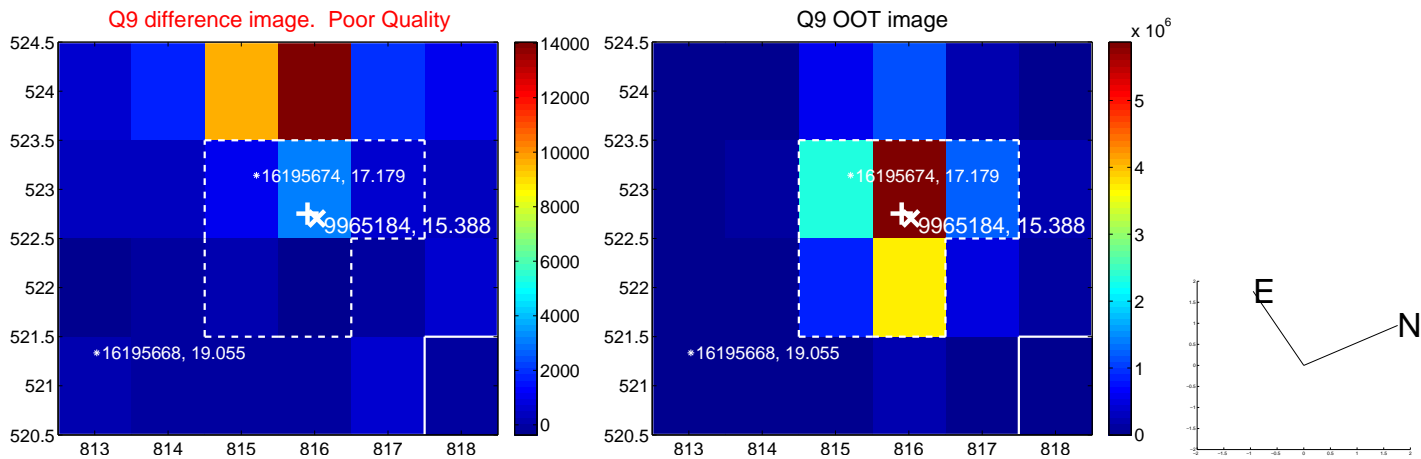
white ×: KIC target position; +: OOT centroid; △: difference centroid. red ✕: large negative pixel value.



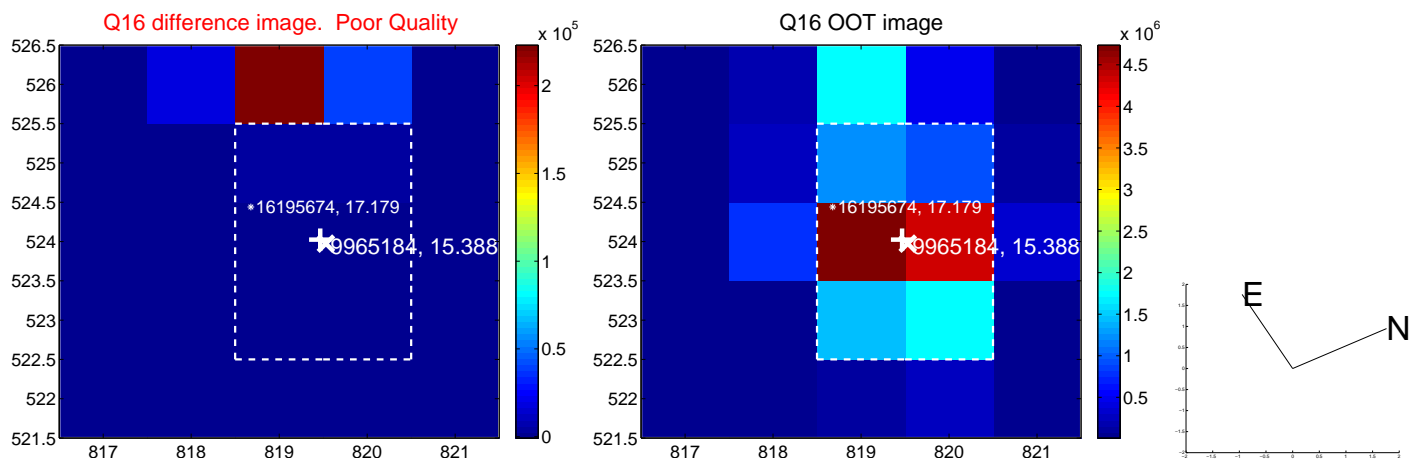
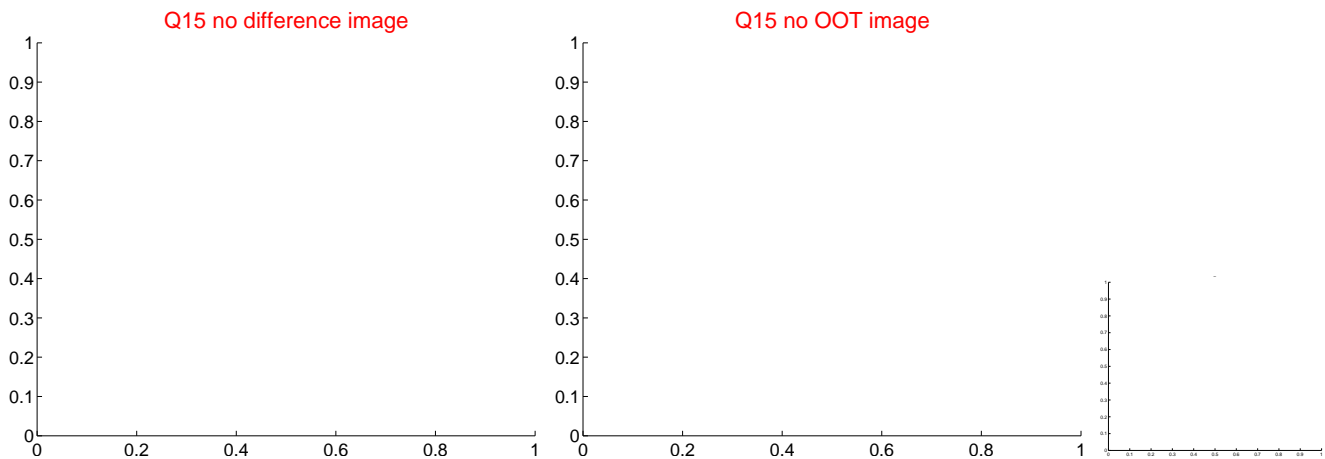
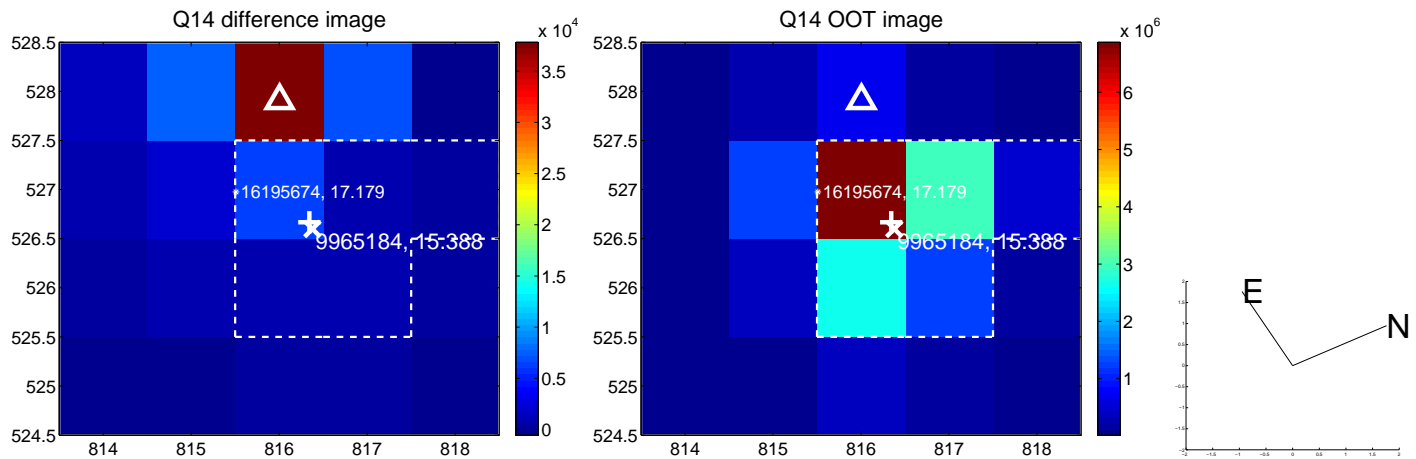
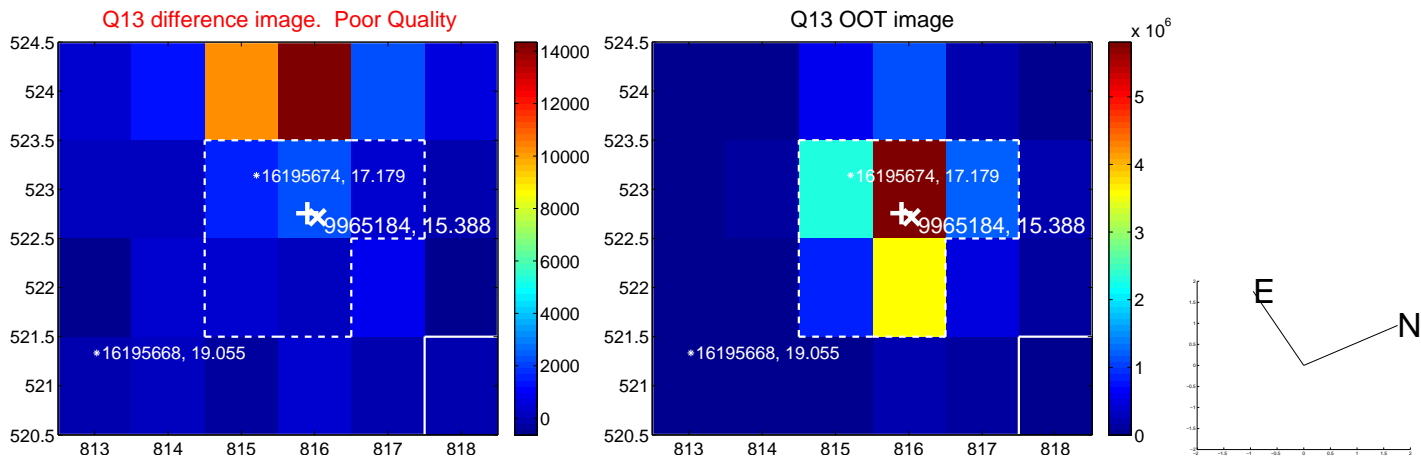
white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



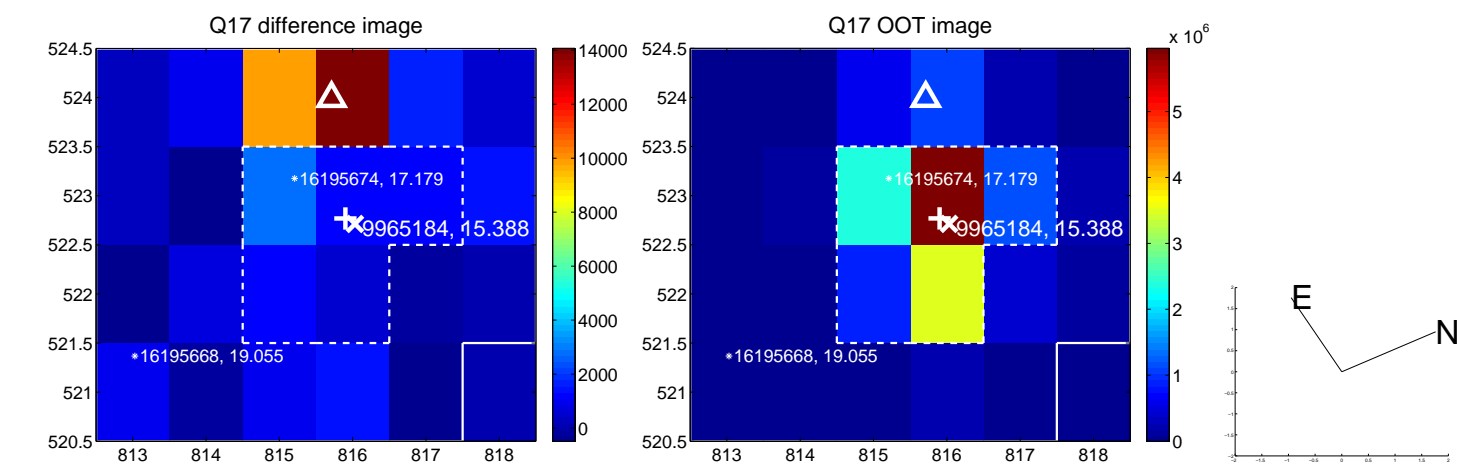
white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



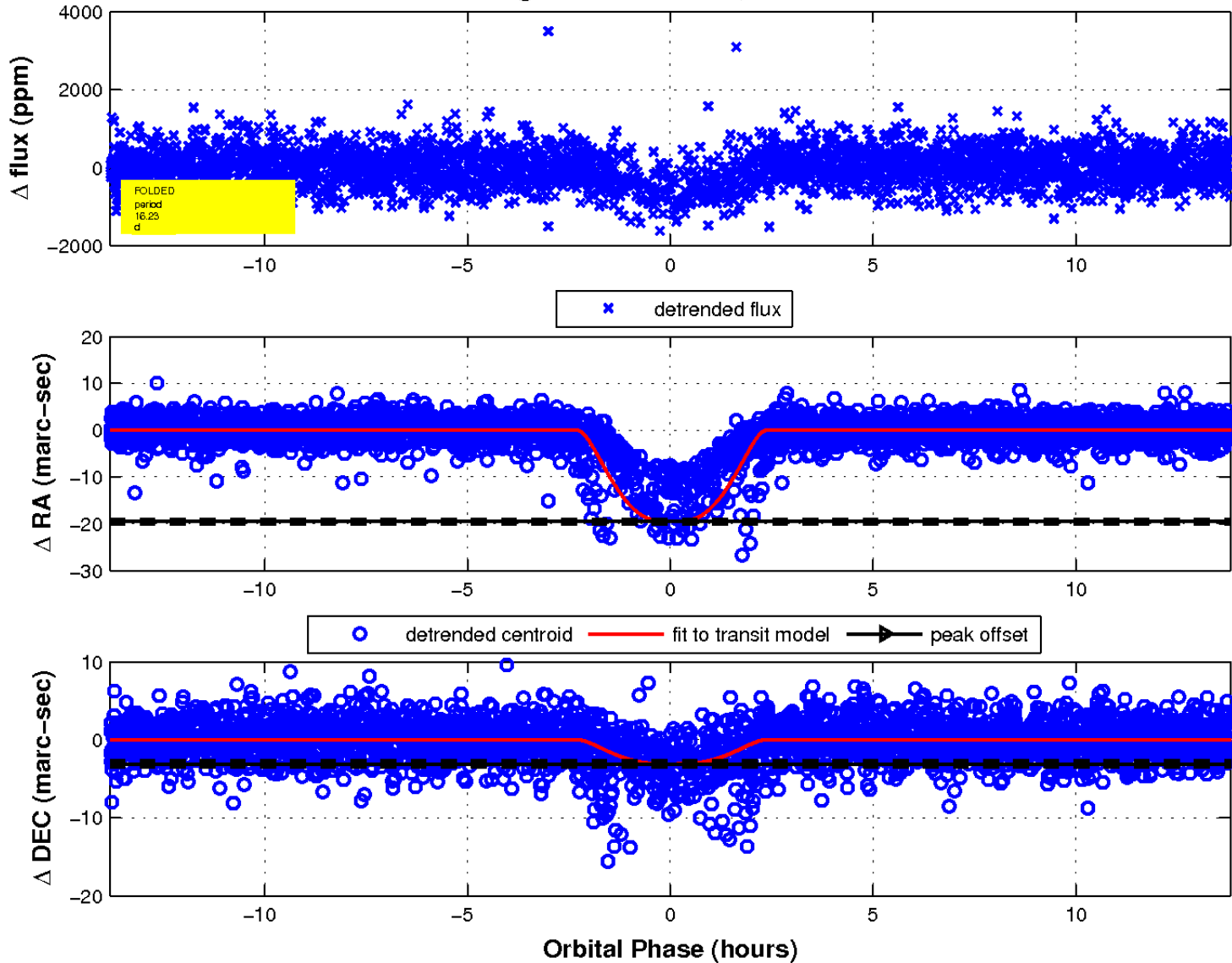
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



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



fluxWeightedCentroids, Planet 2 of 2



UKIRT Image

Declination

