

KIC 004470415

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})
004470415-01	OBS	No	2.567535	132.730108	57.4	5.968	10.0	10.0	1.83	7390	1.90	5117.81
004470415-02	OBS	No	7.060377	133.434586	45.5	11.023	7.7	6.9	1.83	7390	1.43	1328.42

Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
004470415-01	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_ALT
004470415-02	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT

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

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

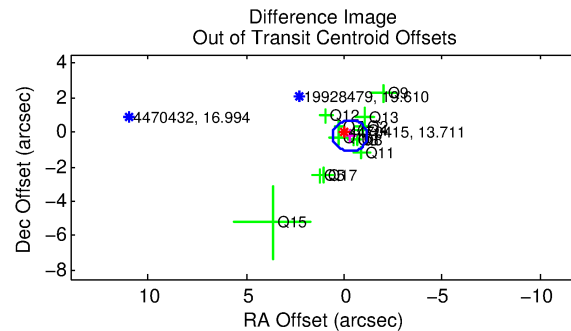
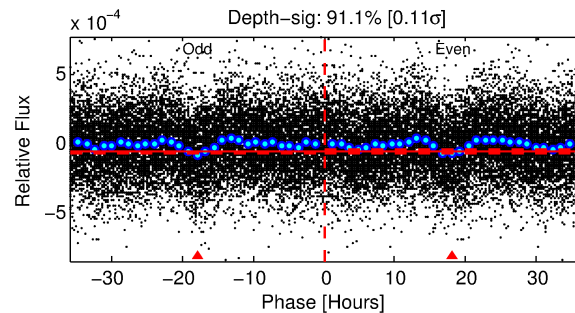
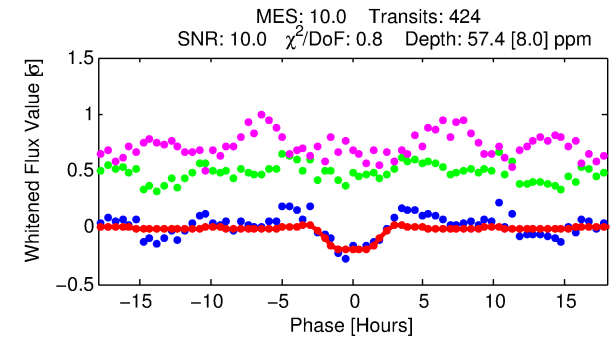
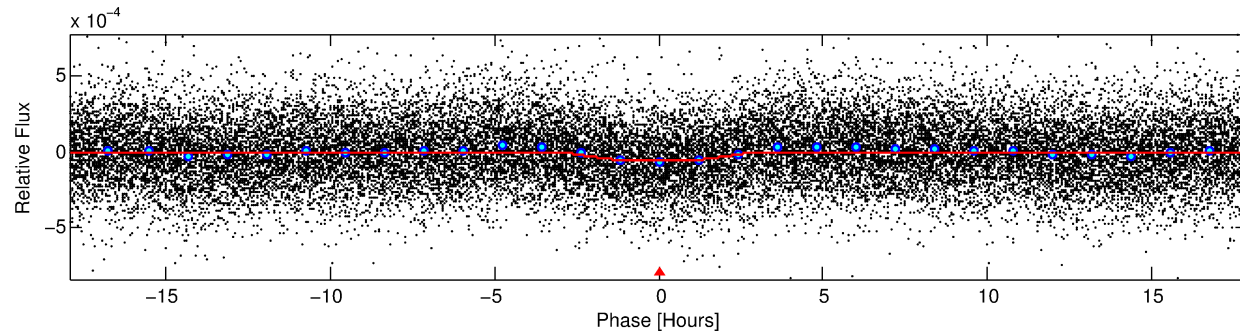
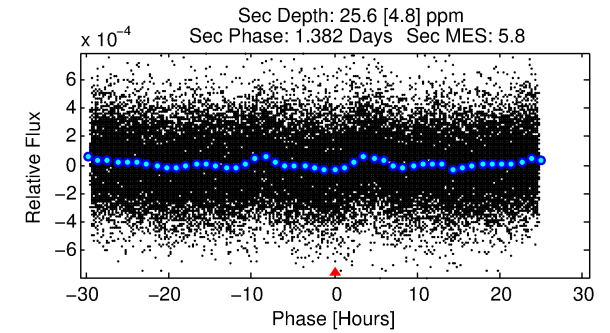
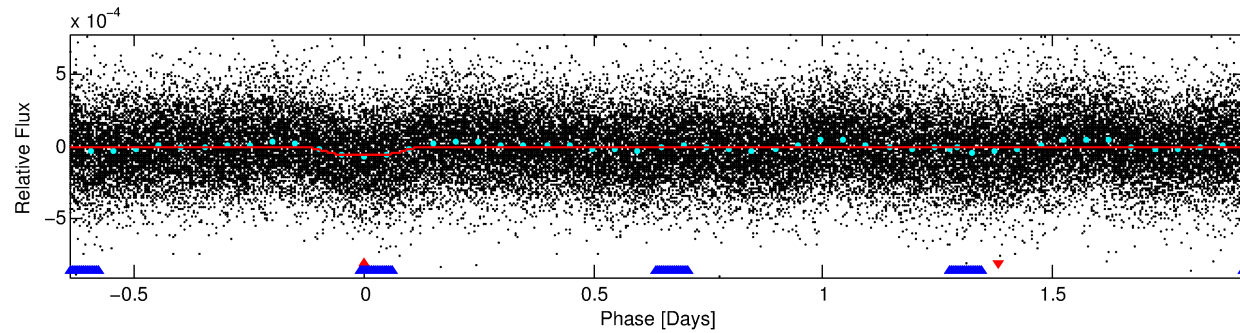
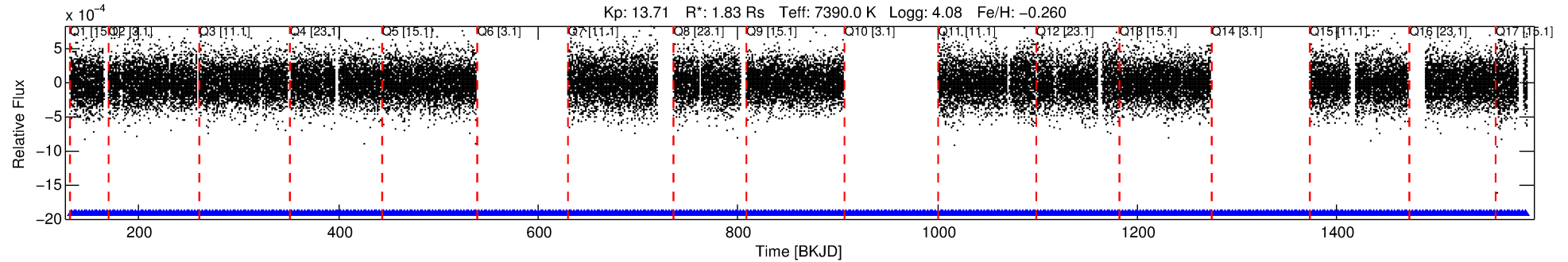
See http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col for comment definitions.

Ephemeris Match Information For 004470415-01

No Significant Match Found

DV One-Page Summary

KIC: 4470415 Candidate: 1 of 2 Period: 2.568 d



DV Fit Results:

Period = 2.56754 [0.00003] d
Epoch = 132.7301 [0.0090] BKJD
Rp/R* = 0.0095 [0.0008]
a/R* = 1.19 [0.05]
b = 0.99 [0.00]
Seff = 5117.81 [1897.45]
Teff = 2157 [200] K
Rp = 1.90 [0.57] Re
a = 0.0418 [0.0098] AU
Ag = 6.81 [2.85] [2.04σ]
Teffp = 5387 [411] K [7.06σ]

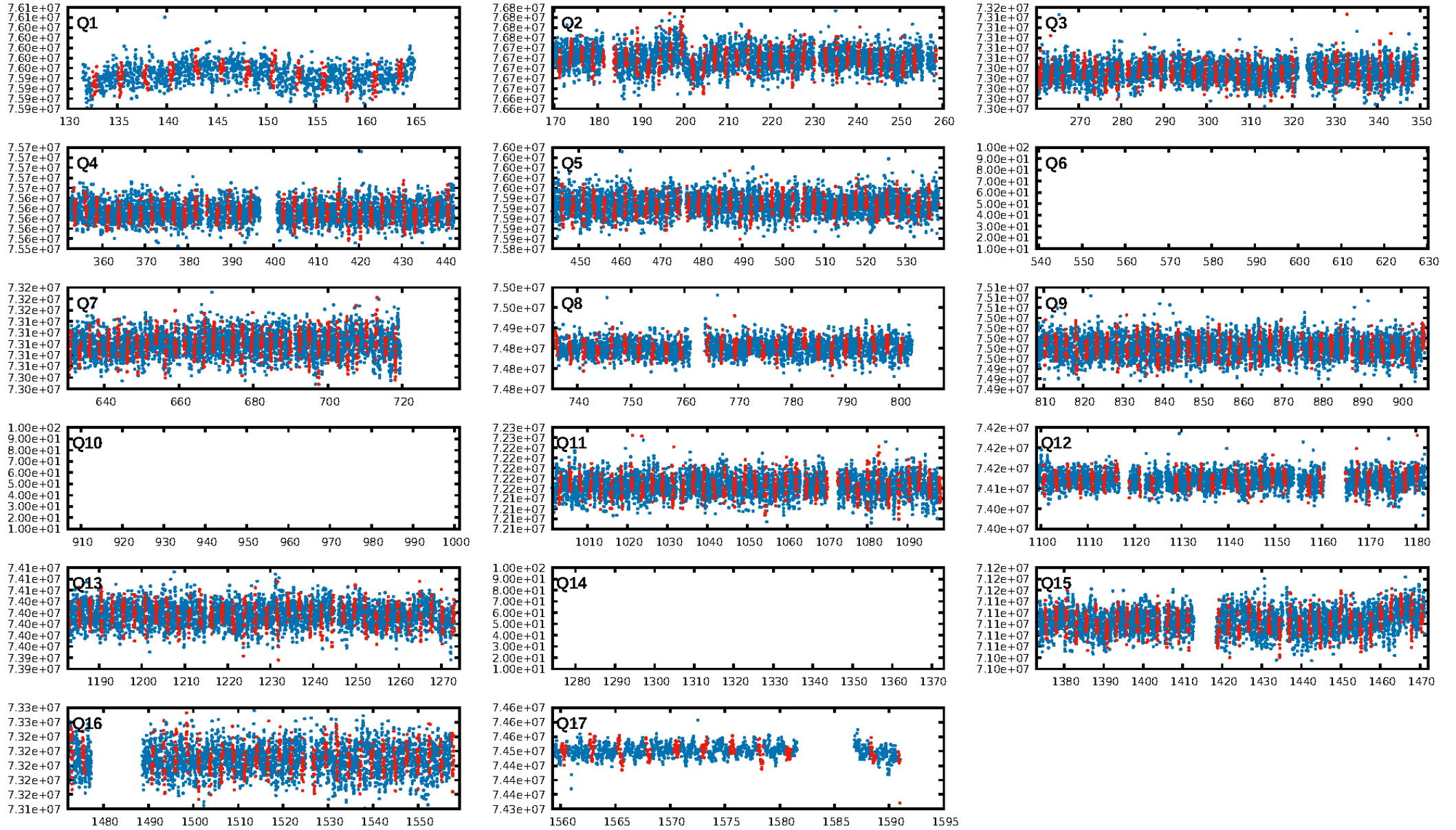
DV Diagnostic Results:

ShortPeriod-sig: N/A
LongPeriod-sig: 100.0% [8.60σ]
ModelChiSquare2-sig: N/A
ModelChiSquareGof-sig: N/A
Bootstrap-pfa: 5.44e-16
RollingBand-fgt: 1.00 [400/400]
GhostDiagnostic-chr: 0.5776
Centroid-sig: 46.3%
Centroid-so: 0.473 arcsec [0.63σ]
OotOffset-rm: 0.348 arcsec [1.17σ]
KicOffset-rm: 0.273 arcsec [1.01σ]
OotOffset-st: 1/4/4/4 [13]
KicOffset-st: 1/4/4/4 [13]
DiffImageQuality-fgm: 0.85 [11/13]
DiffImageOverlap-fno: 1.00 [14/14]

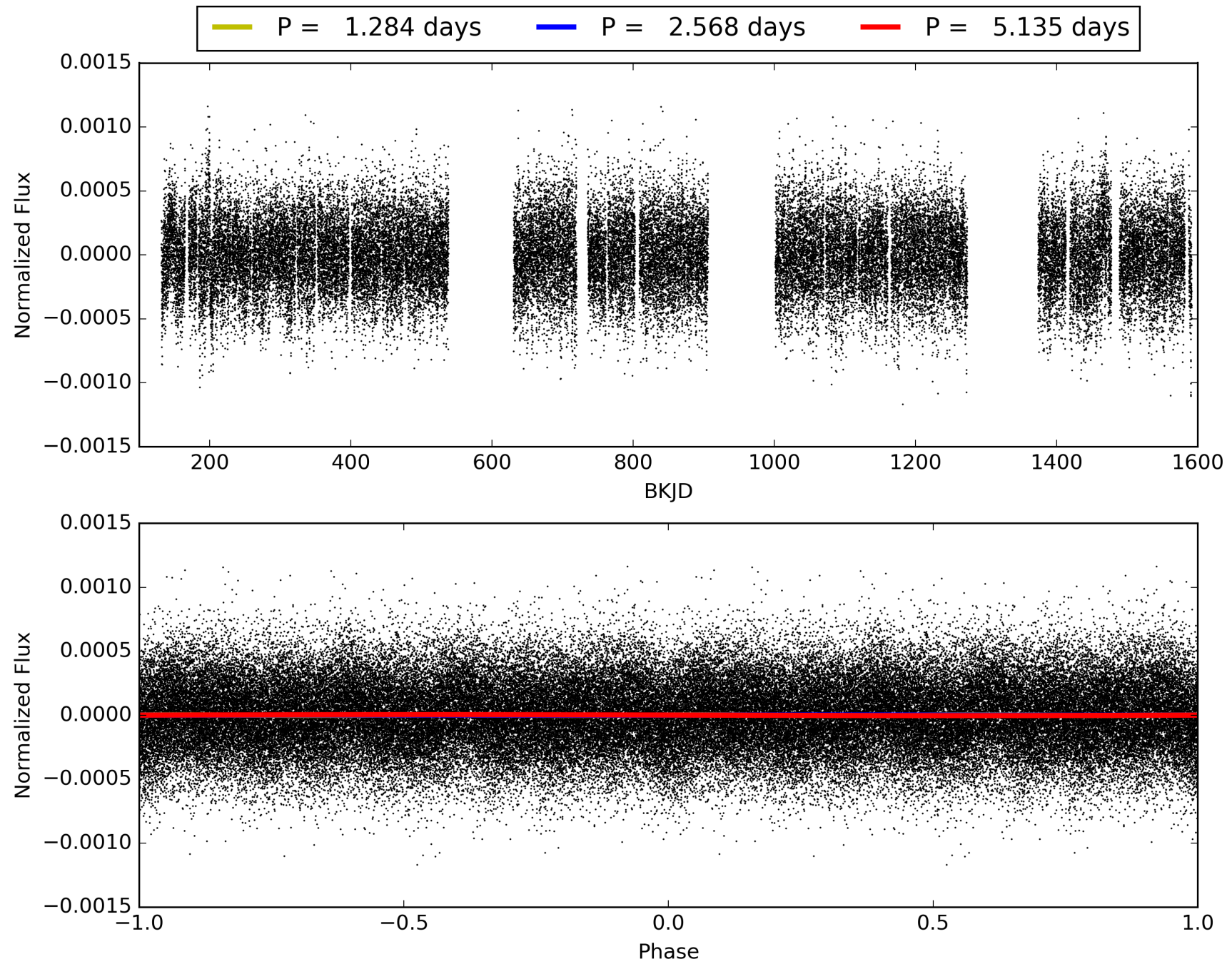
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 31-Jan-2016 16:24:02 Z

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

TCE 004470415-01, PDC Light Curves

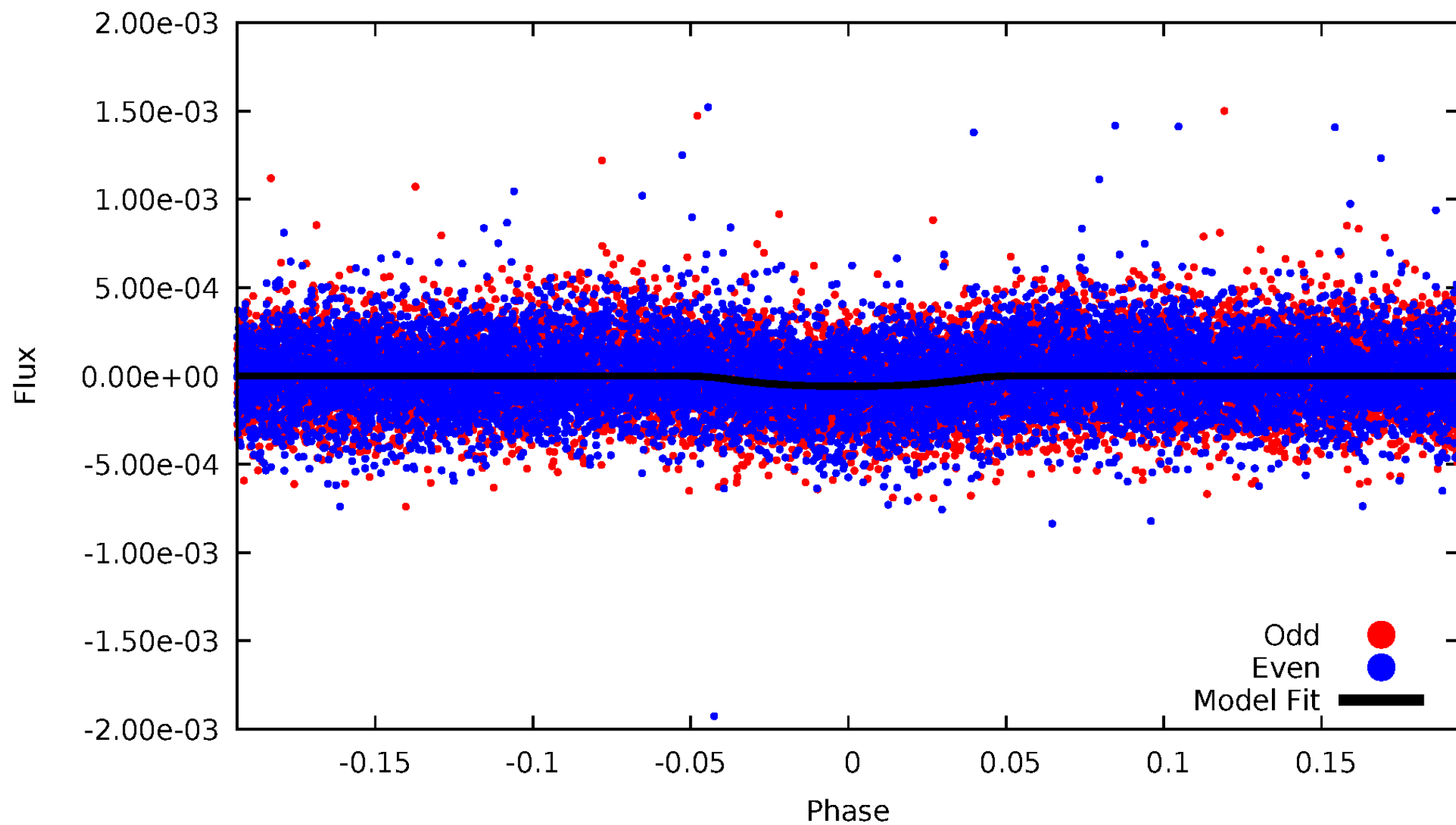


TCE 004470415-01



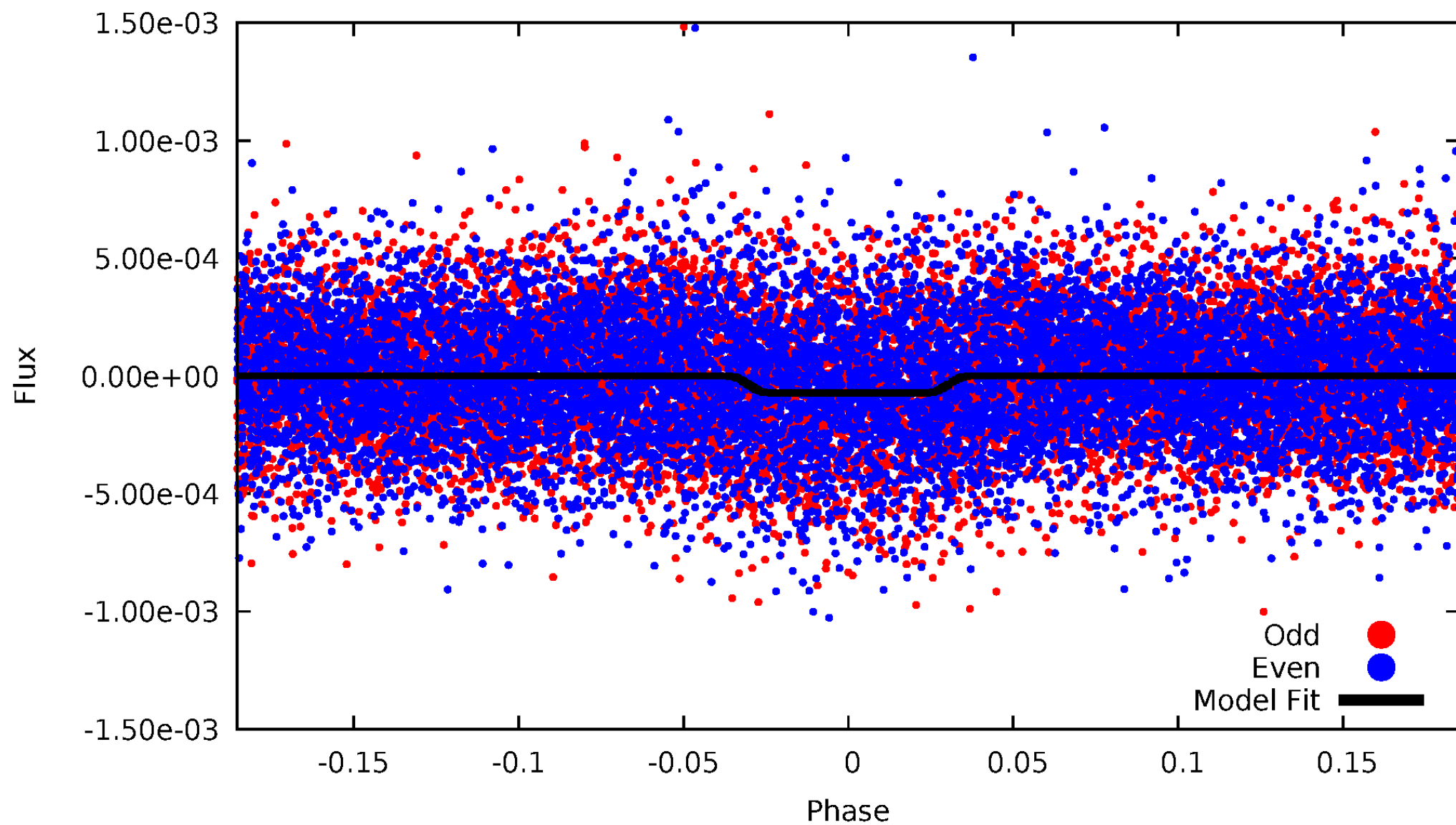
DV Odd/Even

TCE 004470415-01

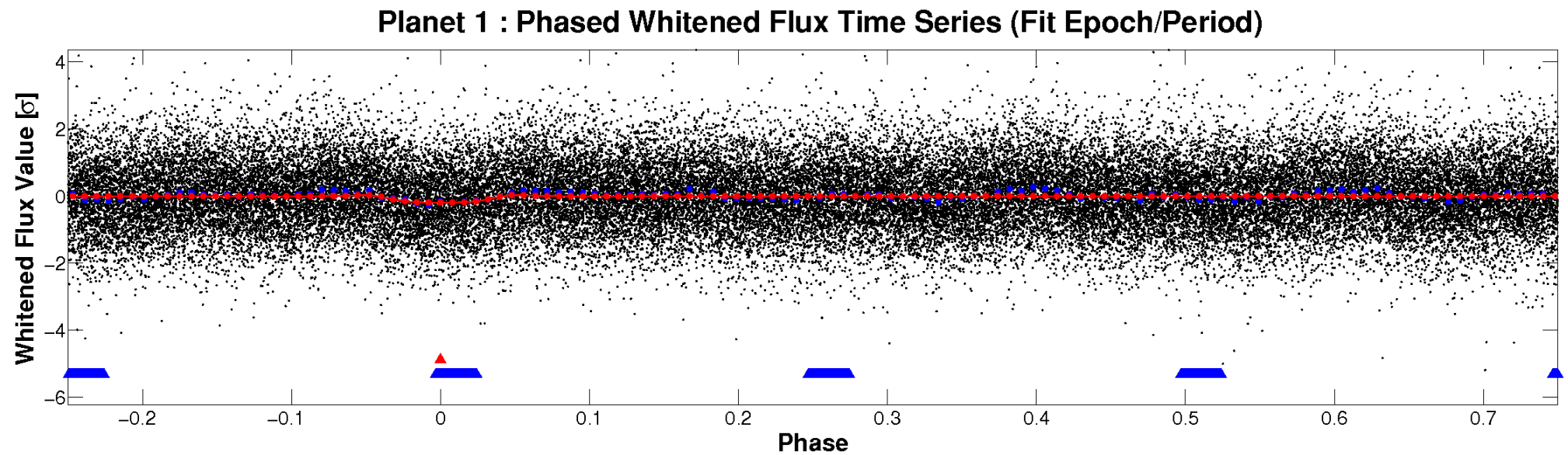
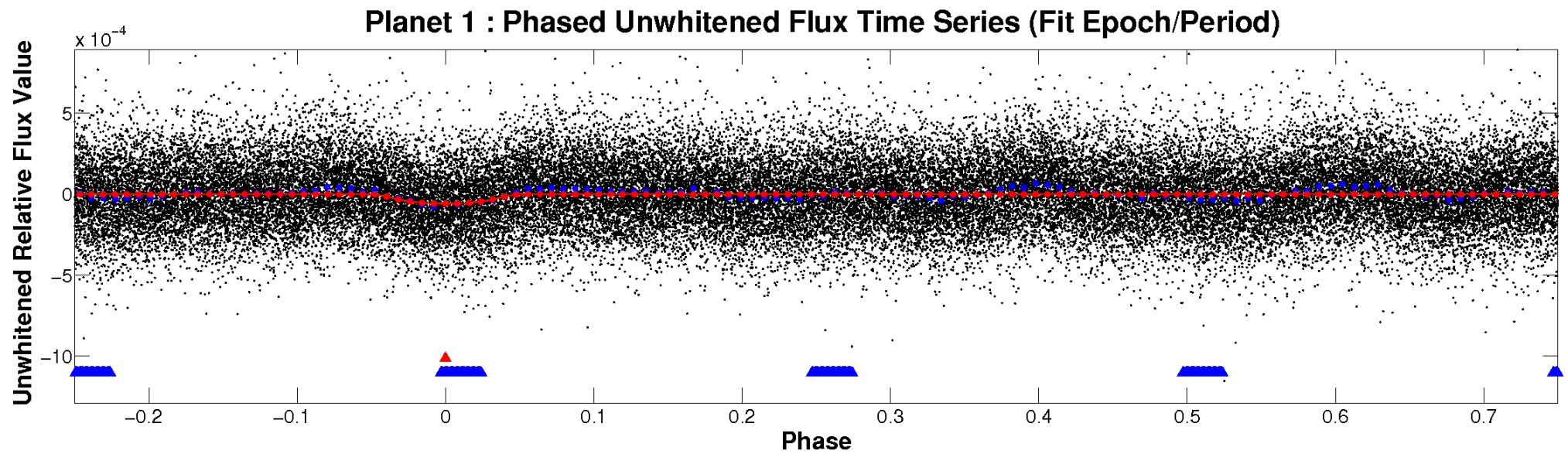


ALT Odd/Even

TCE 004470415-01

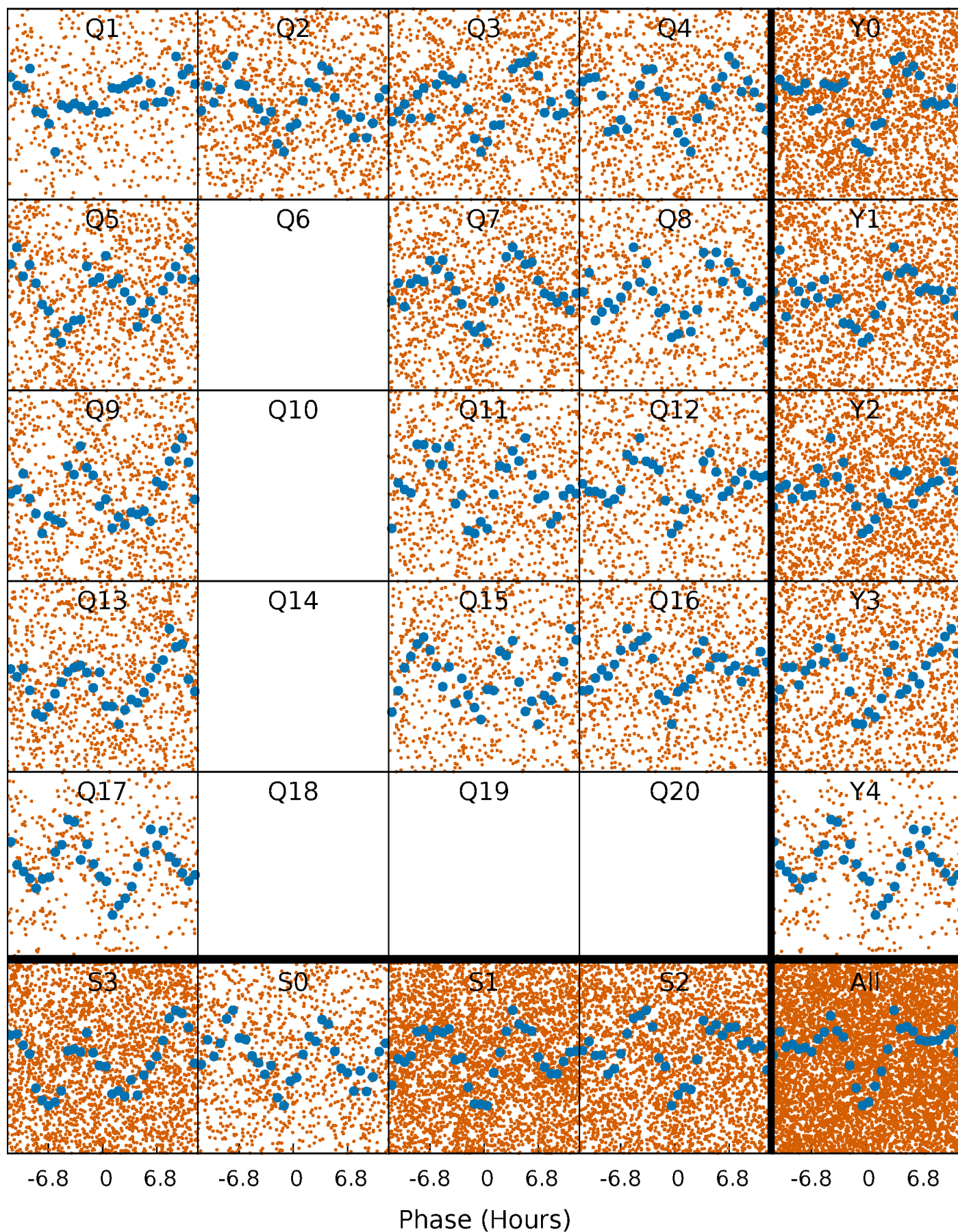


Non-Whitened Vs. Whitened Light Curve



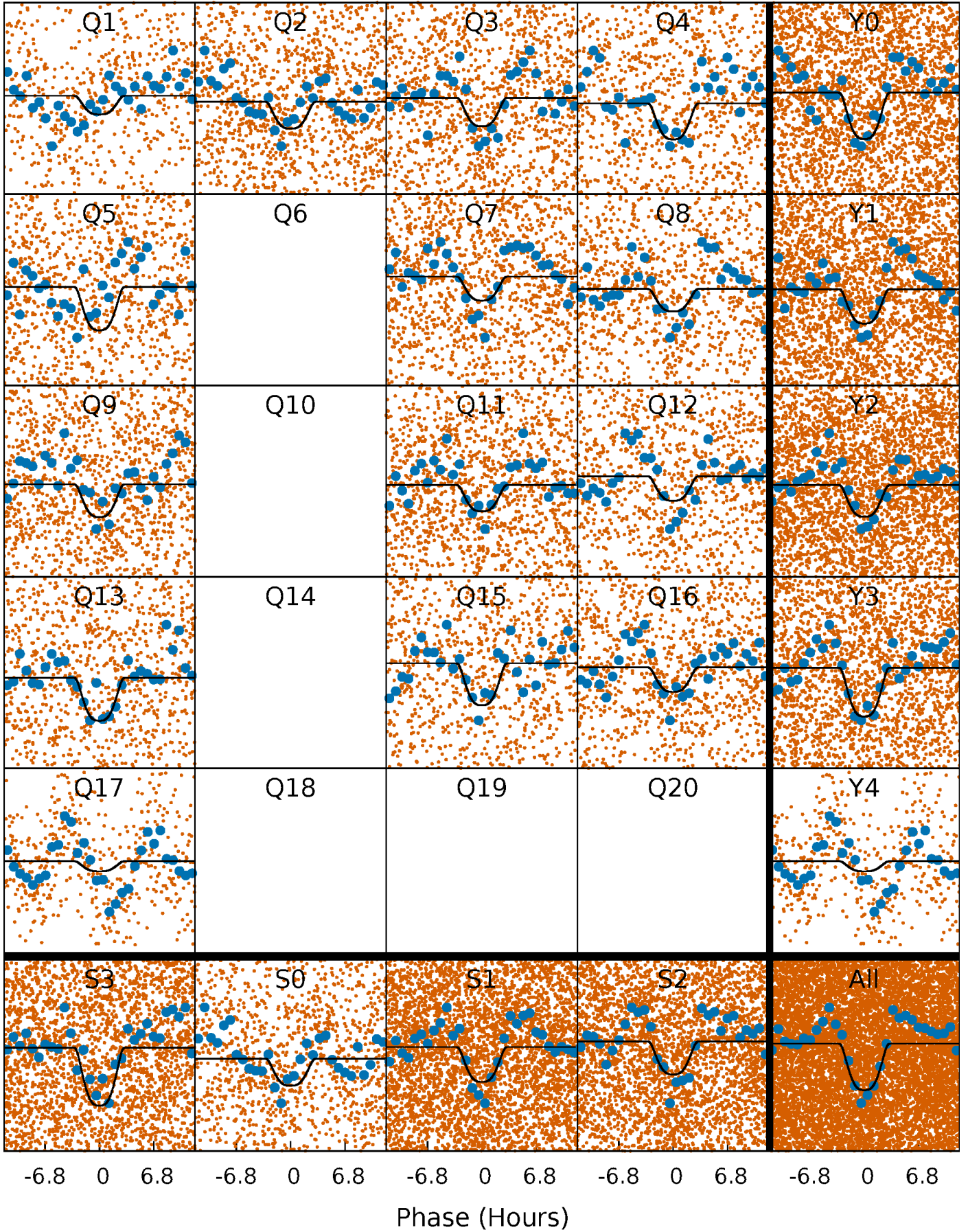
PDC Quarter-Phased Transit Curves

TCE 004470415-01 P= 2.567535 Days $T_0=132.730108$ (BKJD)



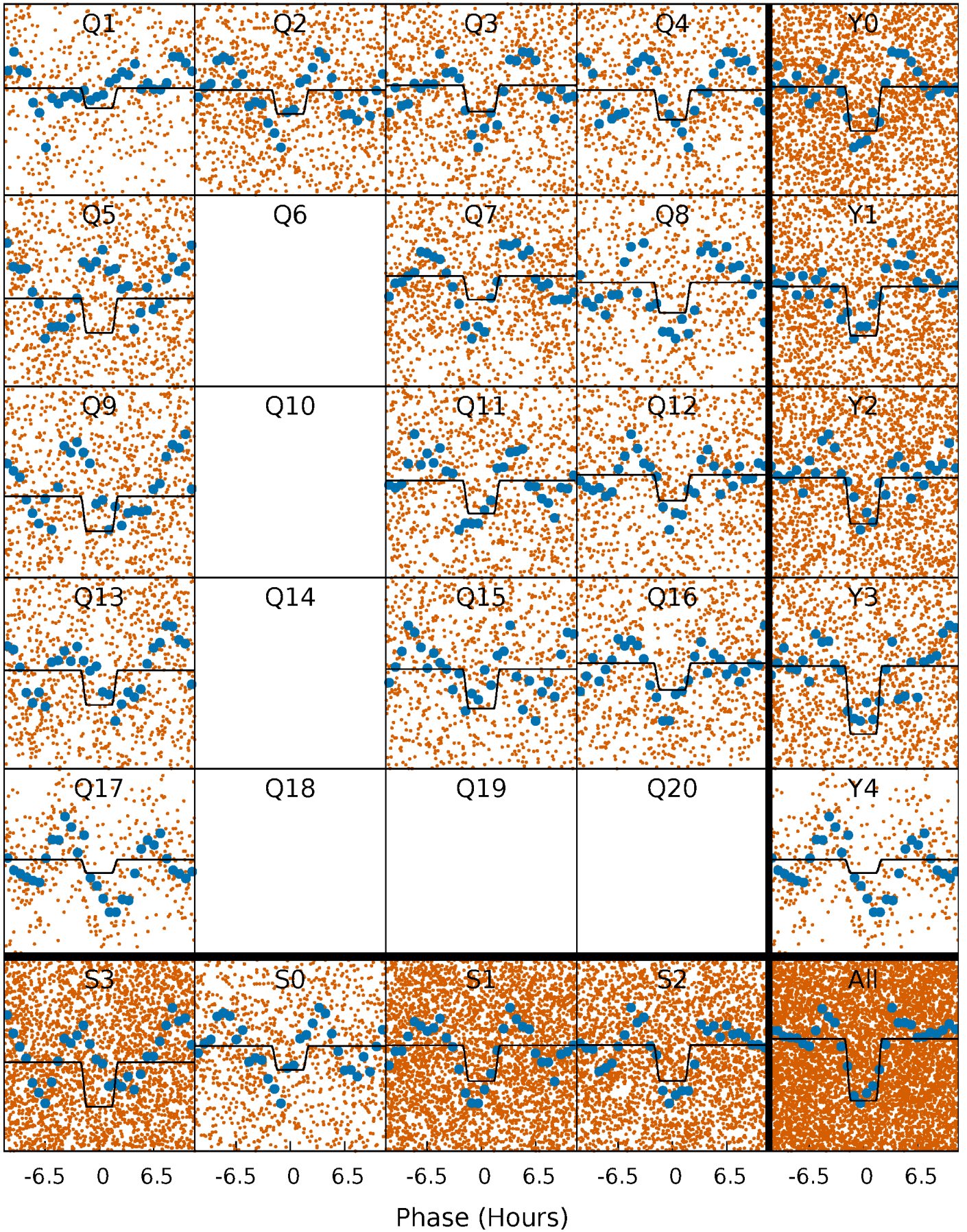
DV Quarter-Phased Transit Curves

TCE 004470415-01 P= 2.567535 Days $T_0=132.730108$ (BKJD)



Alt. Detrend Quarter-Phased Transit Curves

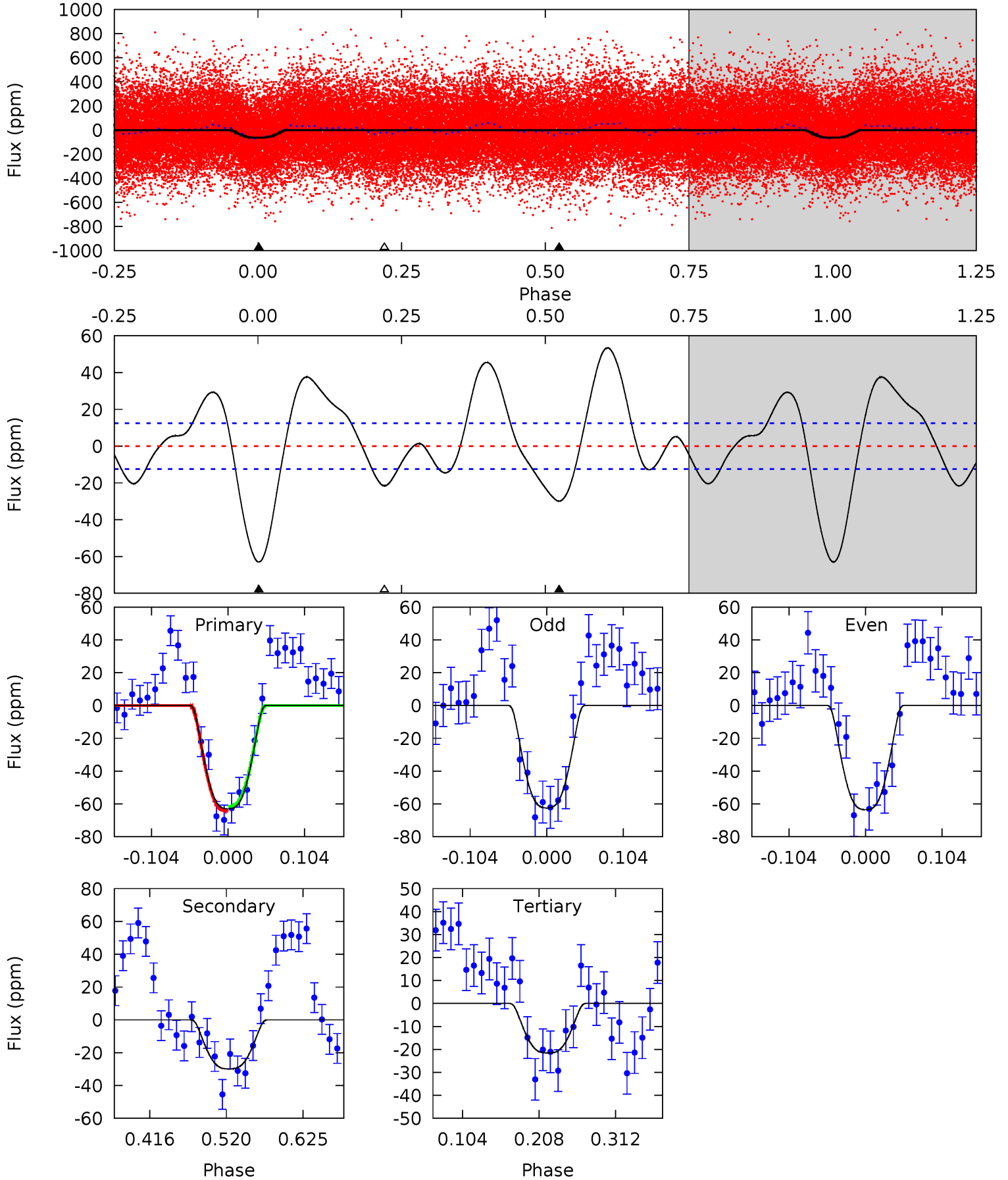
TCE 004470415-01 P= 2.567535 Days $T_0=132.735055$ (BKJD)



DV Model-Shift Uniqueness Test

004470415-01, P = 2.567535 Days, E = 130.162573 Days

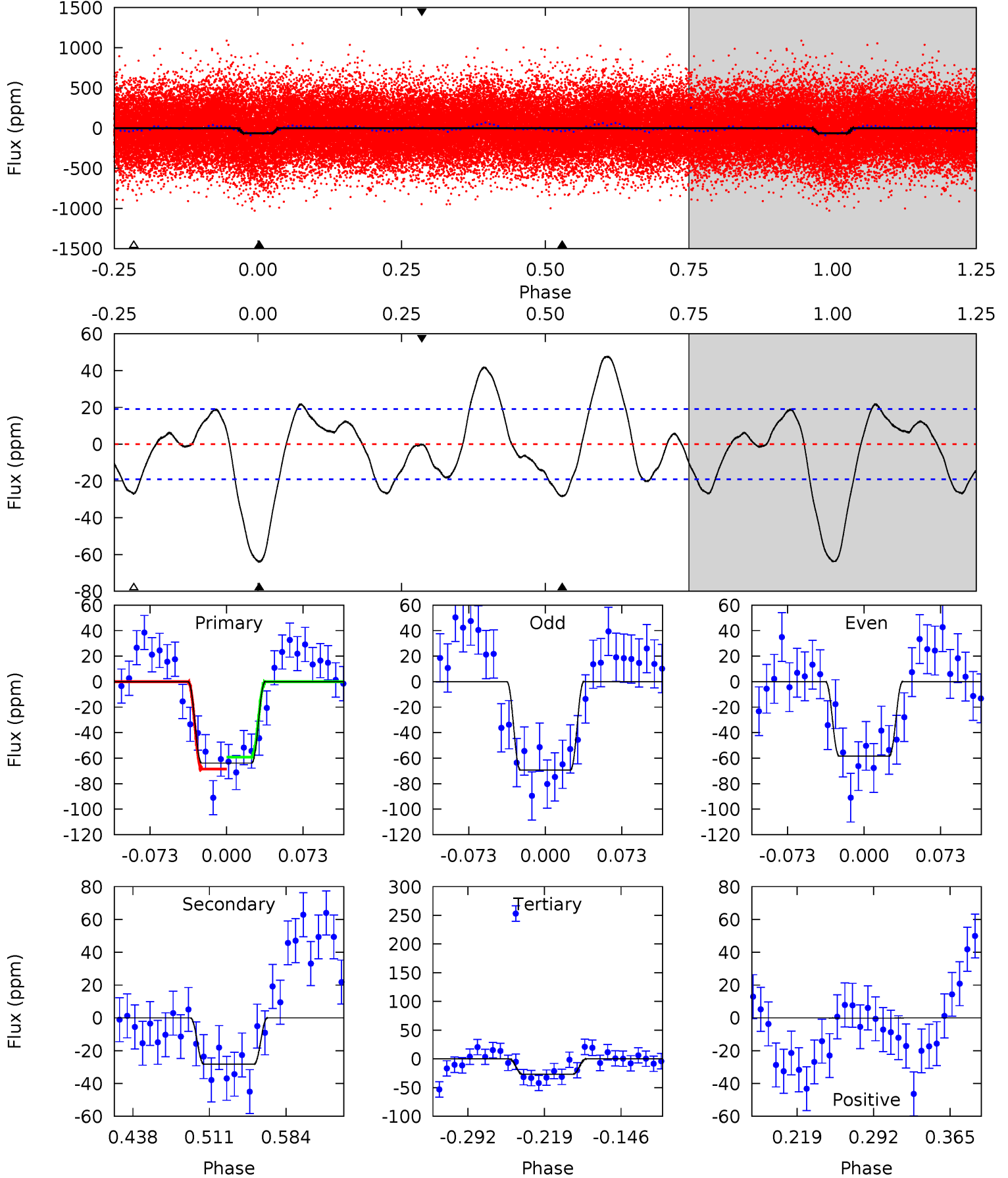
Pri	Sec	Ter	Pos	FA ₁	FA ₂	F _{Red}	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
23.1	11.0	7.90	0	4.56	1.63	6.37	15.2	23.1	3.06	11.0	0.20	1.04	0.46	0.52



Alt Model-Shift Uniqueness Test

004470415-01, P = 2.567535 Days, E = 130.167520 Days

Pri	Sec	Ter	Pos	FA ₁	FA ₂	F _{Red}	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
15.4	6.83	6.50	-0.04	4.63	1.79	4.28	8.95	15.5	0.33	6.87	1.34	1.32	0.43	1.12



Stellar Parameters For KIC 004470415

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	7390^{+232}_{-310}	$4.083^{+0.175}_{-0.175}$	$-0.260^{+0.250}_{-0.350}$	$1.830^{+0.529}_{-0.433}$	$1.477^{+0.230}_{-0.230}$	$0.339^{+0.327}_{-0.154}$
	+3%/-4%	+4%/-4%	+96%/-135%	+29%/-24%	+16%/-16%	+96%/-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 004470415-01 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	A_{obs}
DV	-30 ± 3	$1.92^{+0.33}_{-0.30}$	3005^{+233}_{-211}	5464^{+326}_{-281}	$7.801^{+3.046}_{-2.230}$
Alt.	-28 ± 4	$1.70^{+0.32}_{-0.25}$	3025^{+222}_{-208}	5740^{+384}_{-372}	$9.318^{+3.724}_{-2.732}$

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 $A_{obs} \gg 1.0$

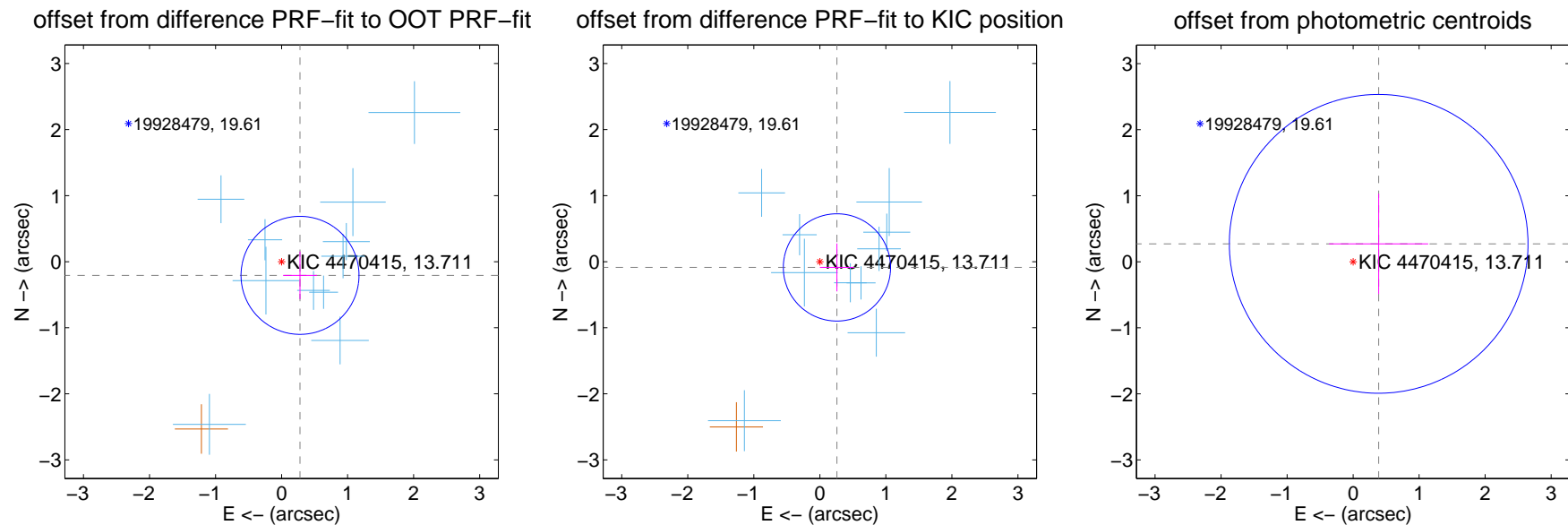
DV Centroid Data

Supplemental centroid analysis for 004470415-01. Kepler magnitude: 13.71. Transit SNR 9.98

There are 11 quarters with good PRF difference image offsets

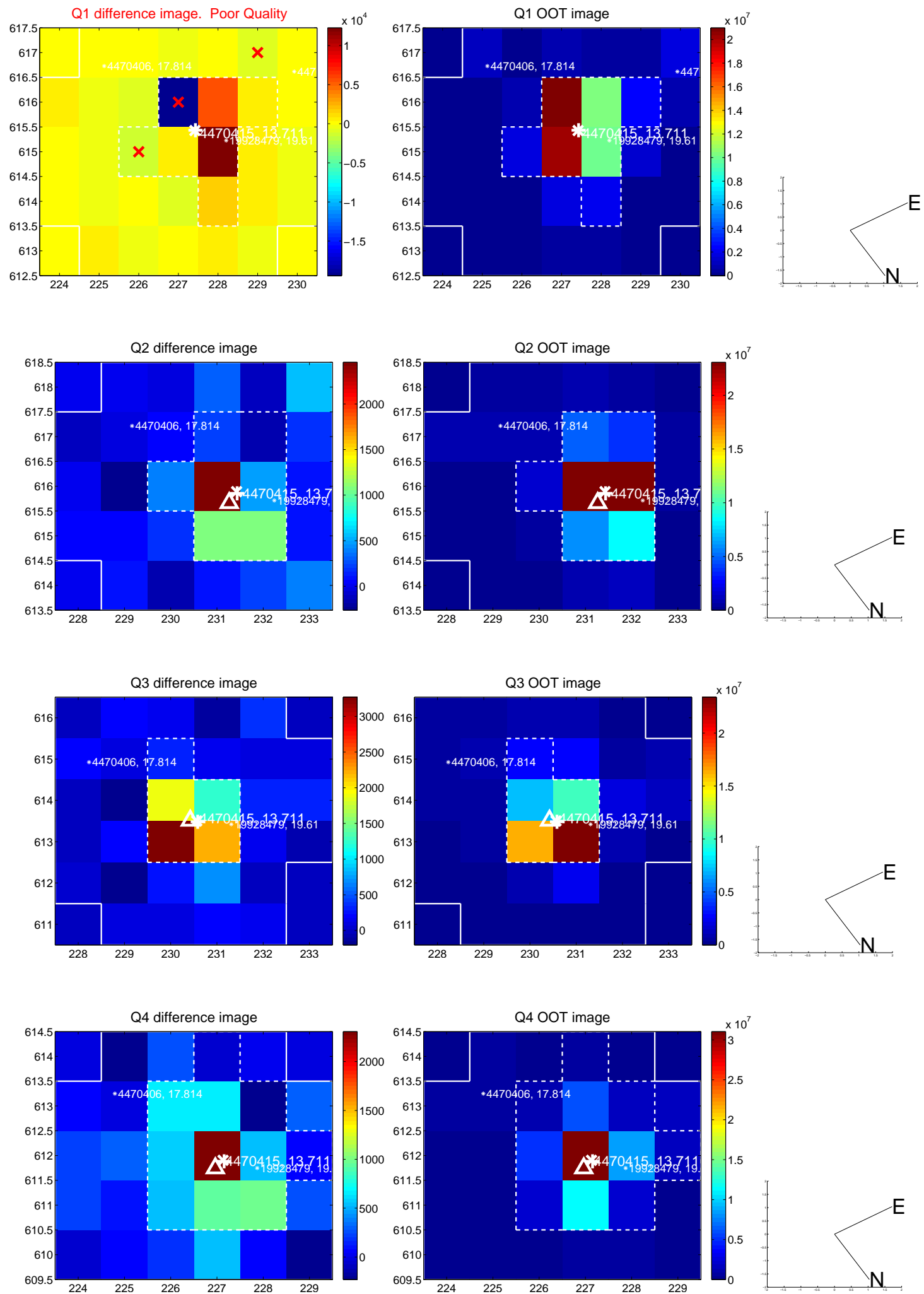
The direct PRF centroid is offset from the target star catalog position by about 0.07 arcsec

	Distance in arcsec	Distance / σ	Δ RA	Δ Dec
PRF-fit source offset from OOT	0.348 ± 0.298	1.17	-0.279 ± 0.257	-0.207 ± 0.361
PRF-fit source offset from KIC position	0.273 ± 0.271	1.01	-0.259 ± 0.258	-0.087 ± 0.362
photometric centroid source offset	0.47 ± 0.75	0.63	-0.39 ± 0.75	0.27 ± 0.76

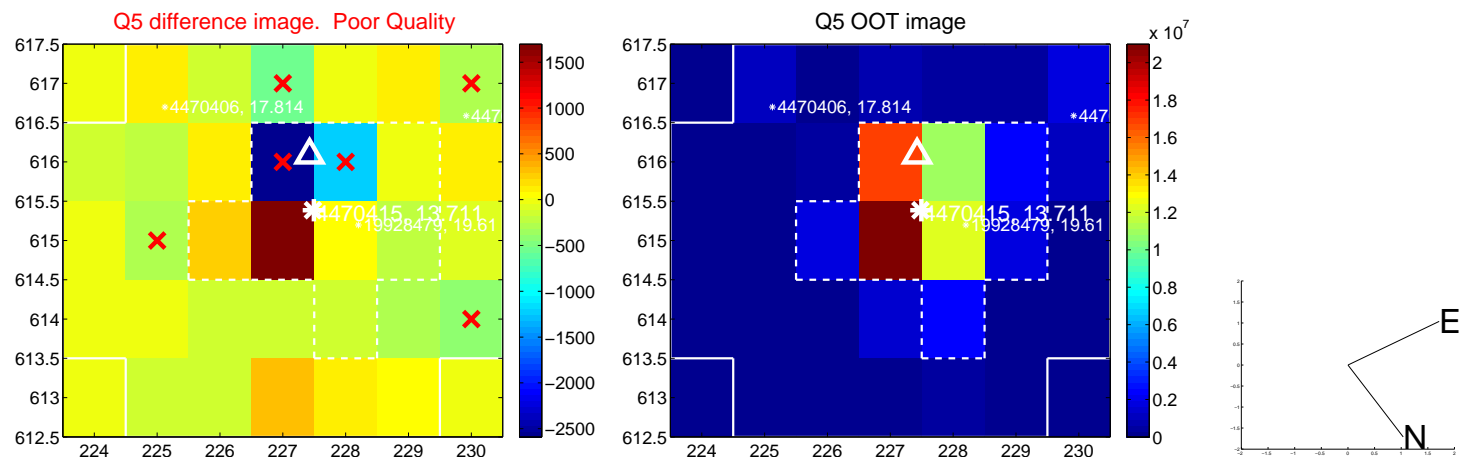


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets**; magenta cross: average over quarters. Length of the crosses: one- σ uncertainty. Blue circle: three-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

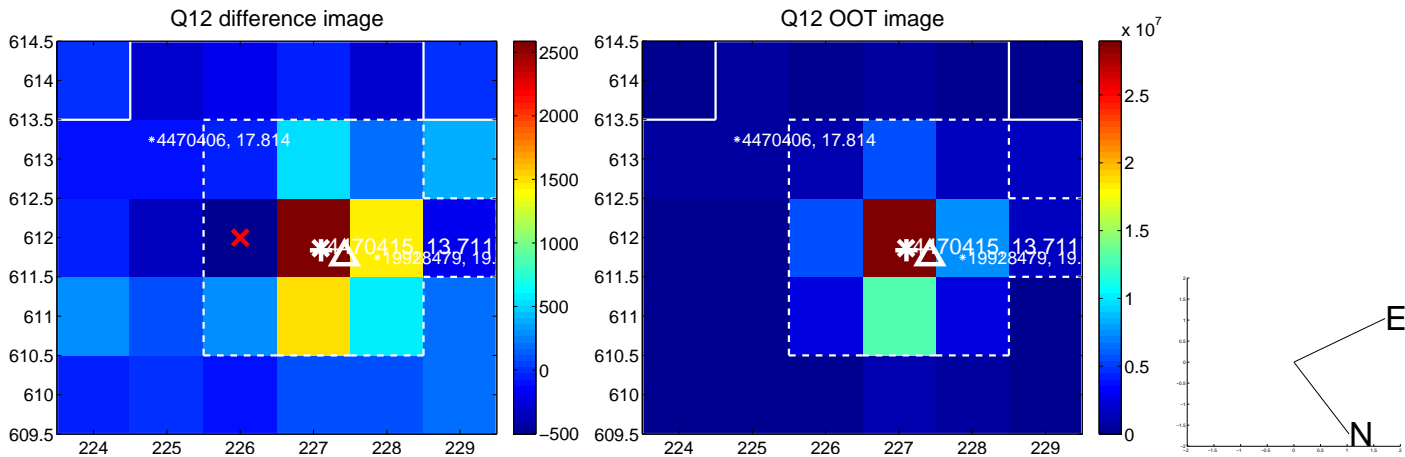
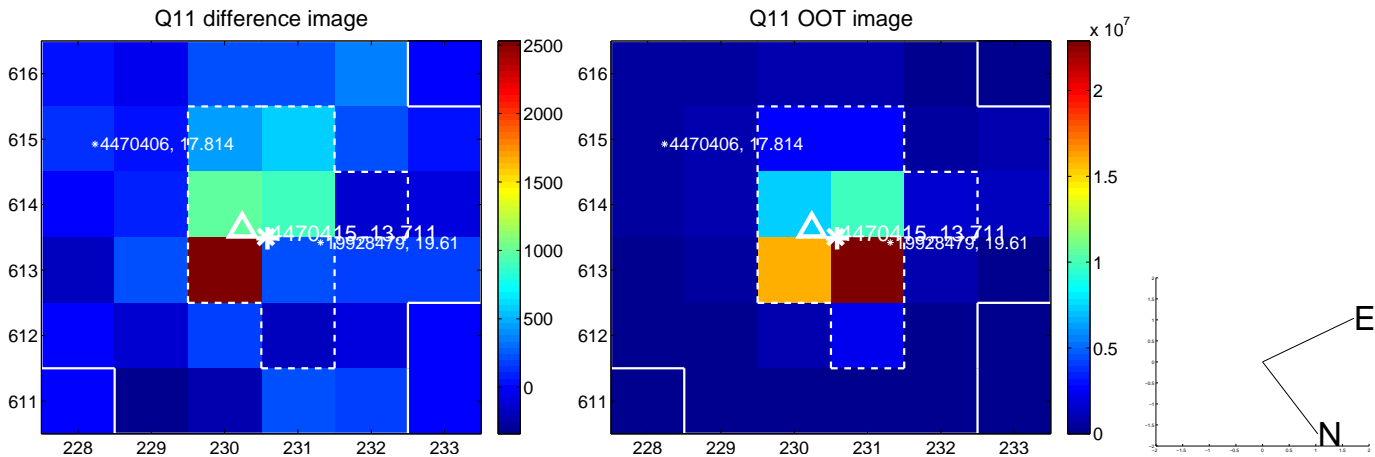
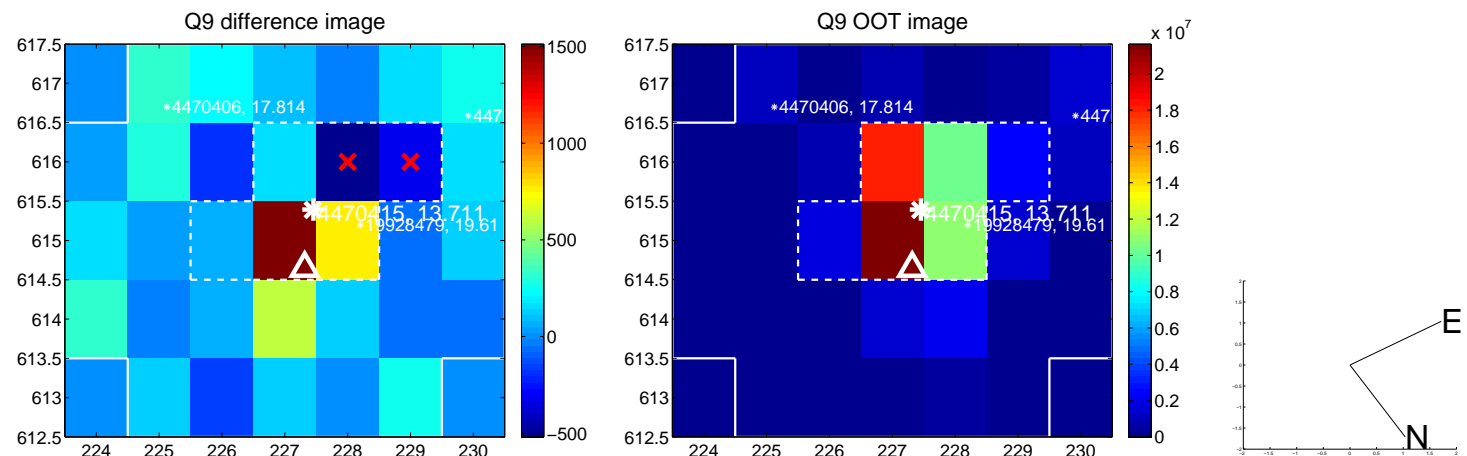
white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



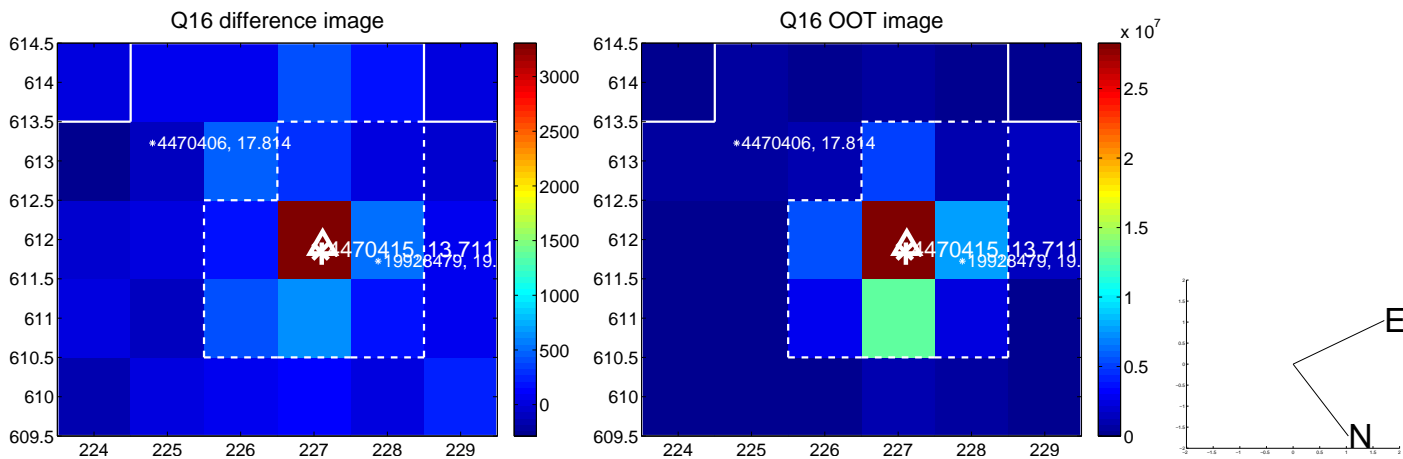
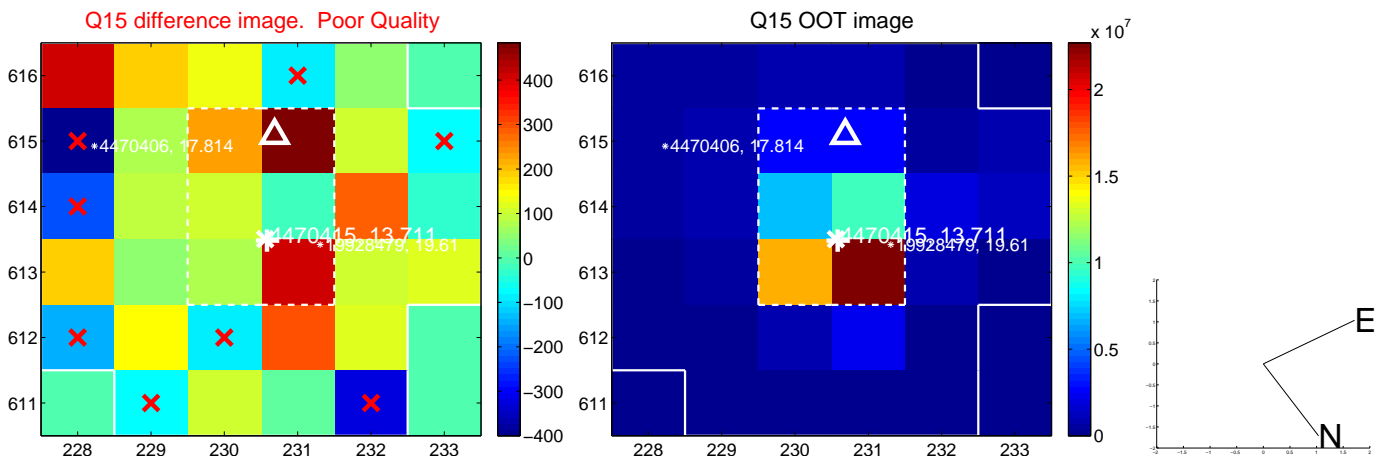
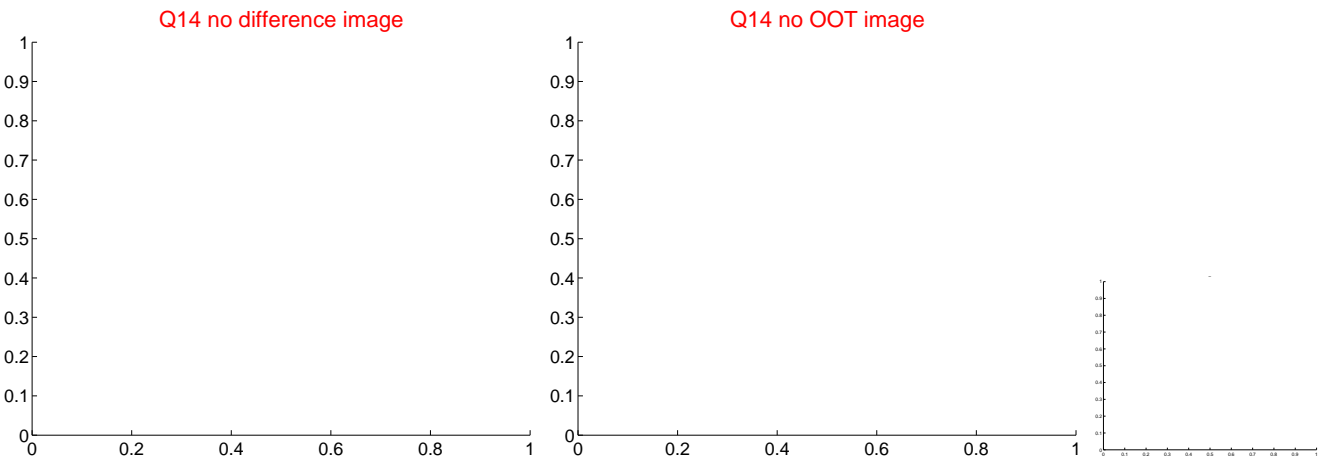
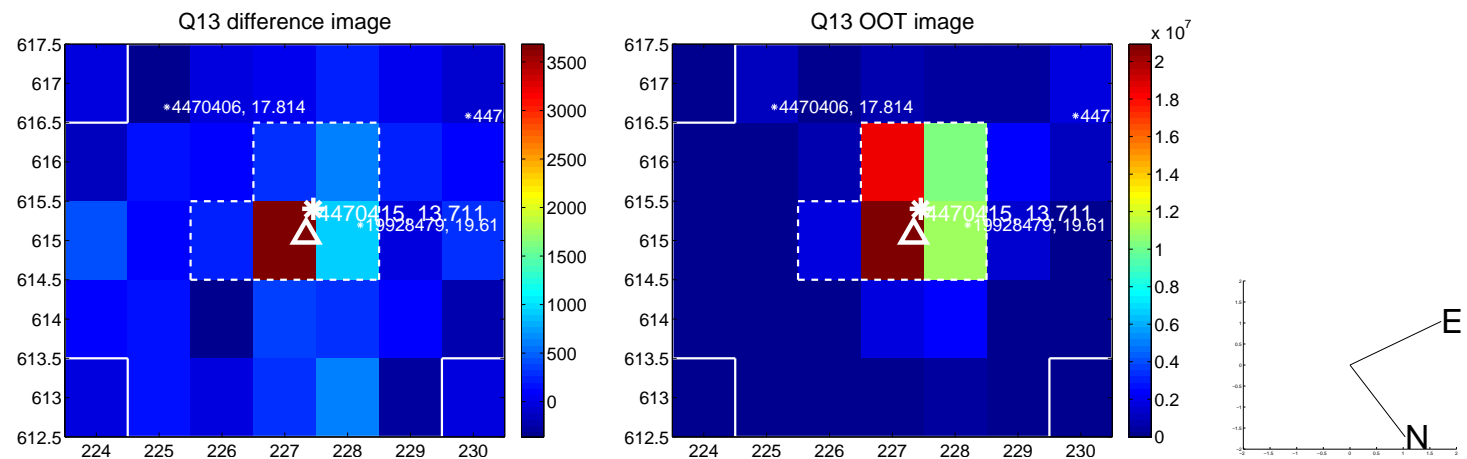
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



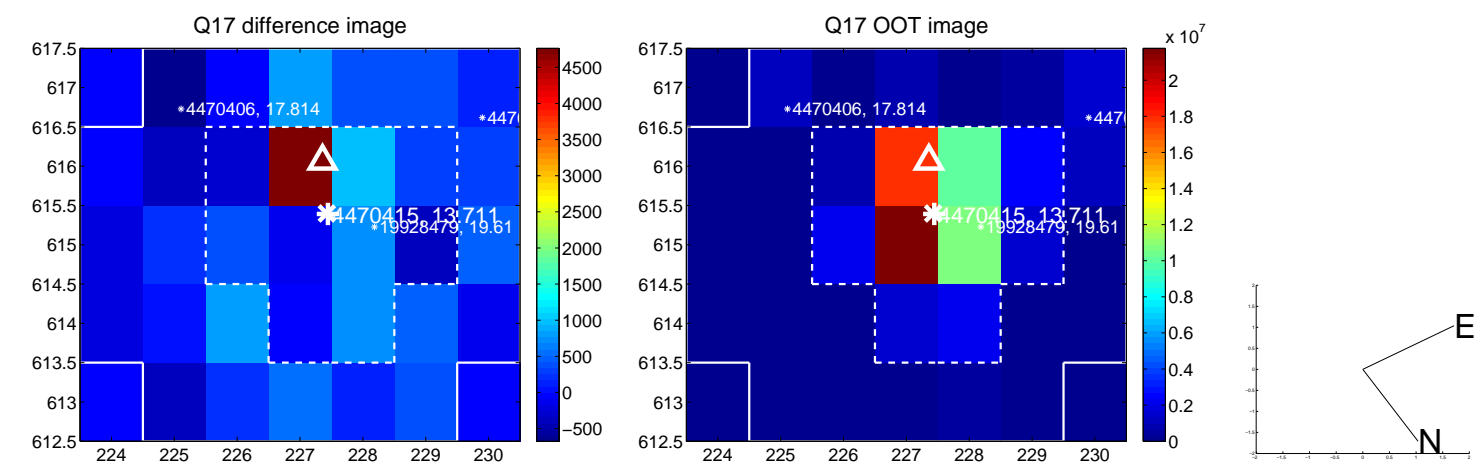
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



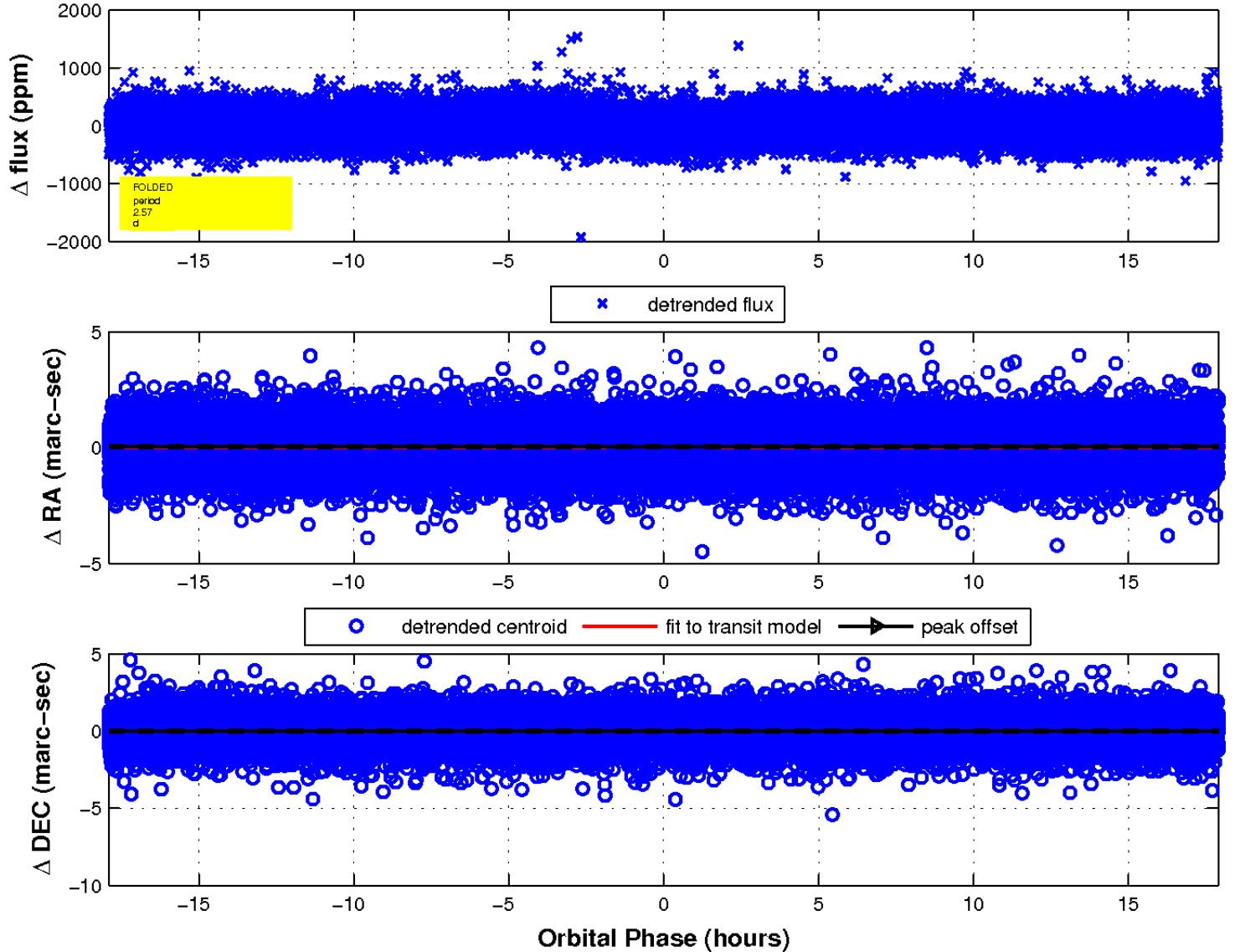
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



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

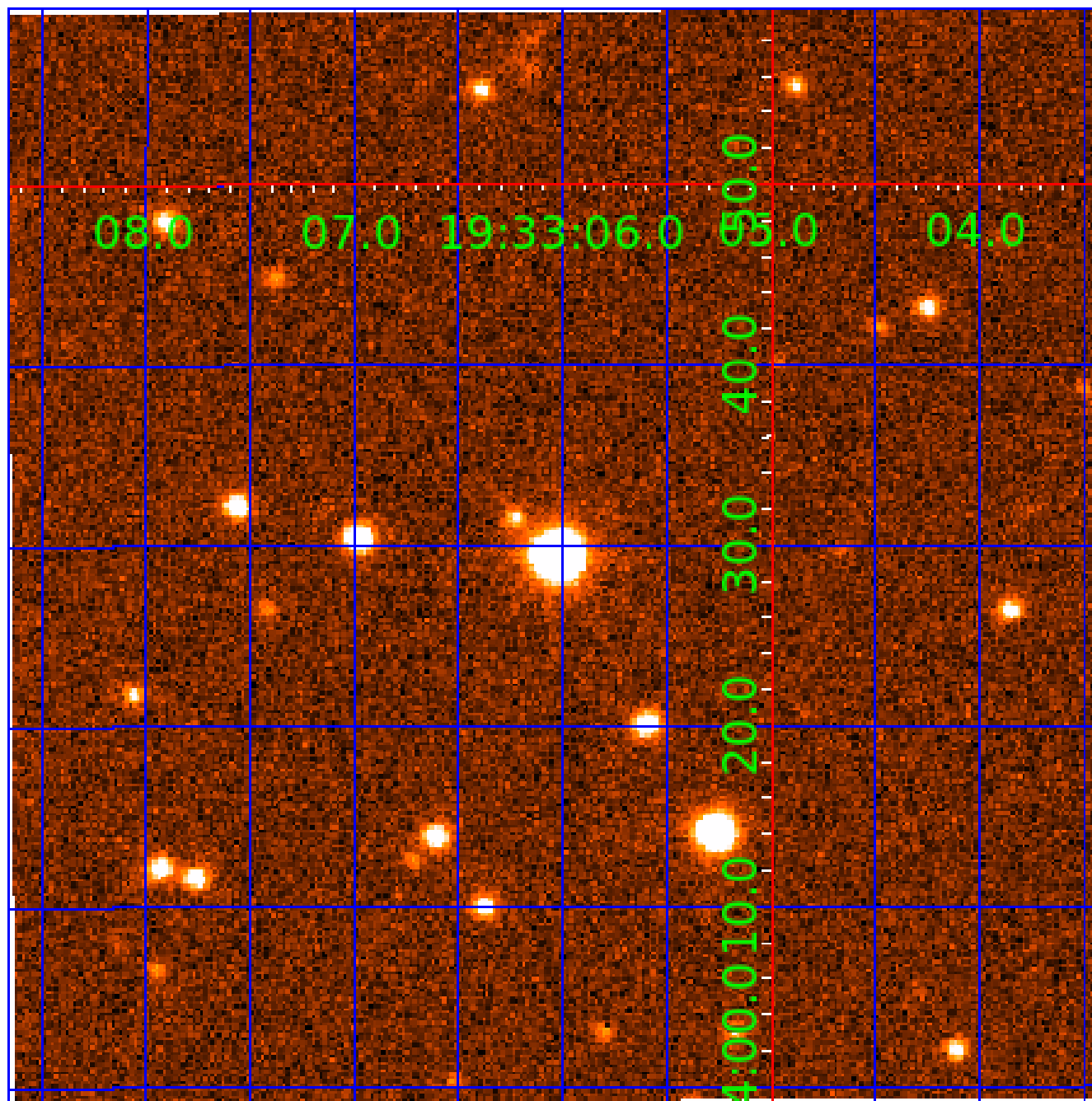


fluxWeightedCentroids, Planet 1 of 2



UKIRT Image

Declination



KIC 004470415

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})
004470415-01	OBS	No	2.567535	132.730108	57.4	5.968	10.0	10.0	1.83	7390	1.90	5117.81
004470415-02	OBS	No	7.060377	133.434586	45.5	11.023	7.7	6.9	1.83	7390	1.43	1328.42

Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
004470415-01	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_ALT
004470415-02	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT

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

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

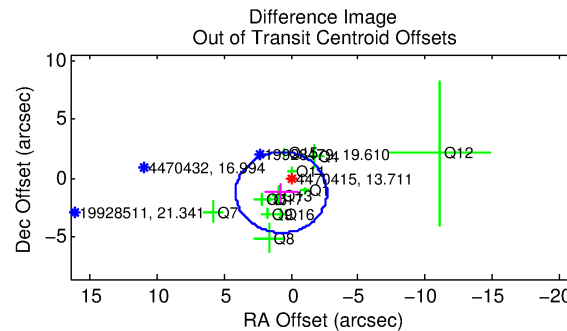
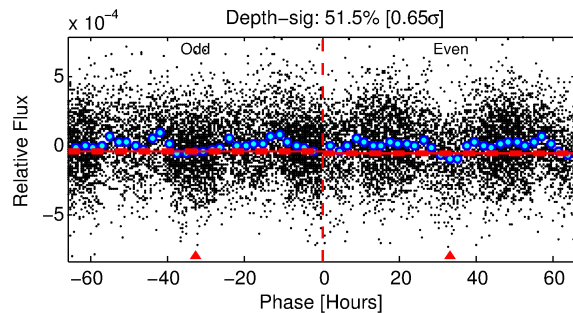
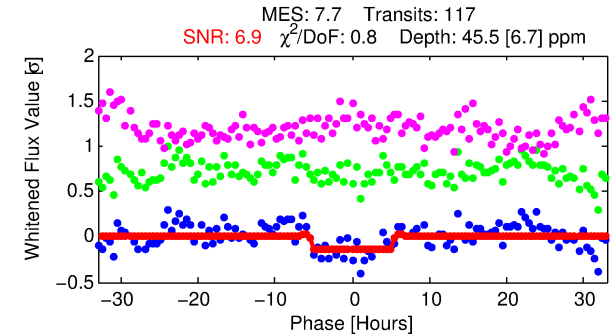
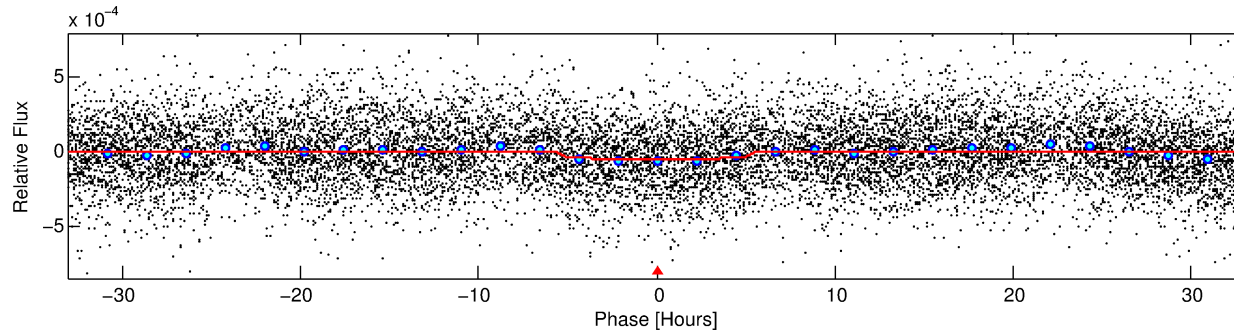
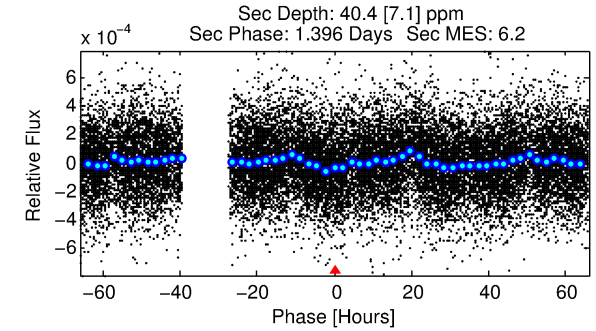
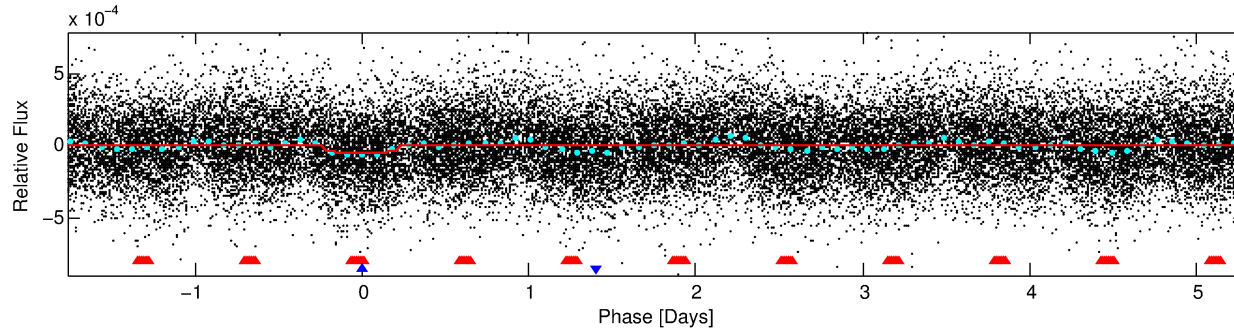
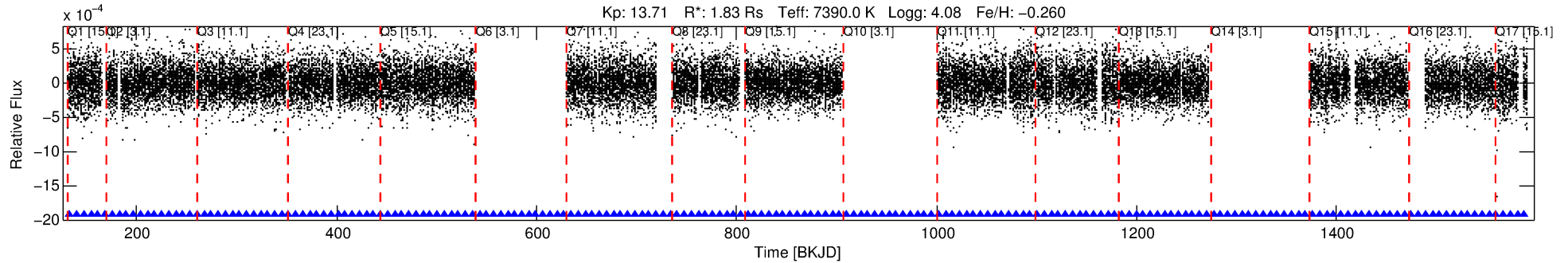
See http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col for comment definitions.

Ephemeris Match Information For 004470415-02

No Significant Match Found

DV One-Page Summary

KIC: 4470415 Candidate: 2 of 2 Period: 7.060 d



DV Fit Results:

Period = 7.06038 [0.00015] d
Epoch = 133.4346 [0.0153] BKJD
Rp/R* = 0.0072 [0.0016]
a/R* = 2.40 [2.60]
b = 0.90 [0.28]
Seff = 1328.42 [492.52]
Teq = 1539 [143] K
Rp = 1.43 [0.52] Re
a = 0.0821 [0.0193] AU
Ag = 72.81 [42.39] [1.69σ]
Teffp = 6953 [882] K [6.06σ]

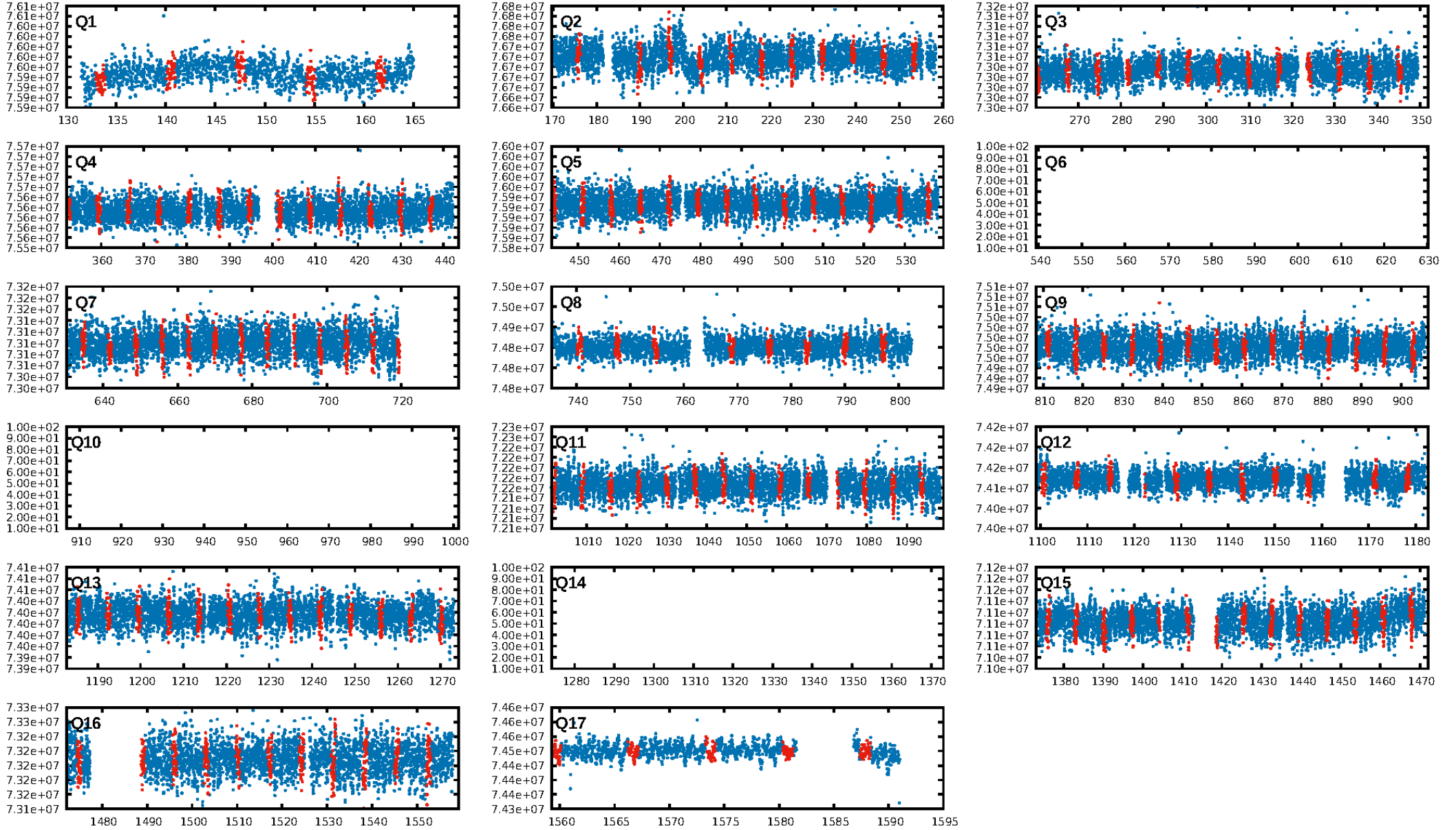
DV Diagnostic Results:

ShortPeriod-sig: 100.0% [8.60σ]
LongPeriod-sig: N/A
ModelChiSquare2-sig: 80.8%
ModelChiSquareGof-sig: 100.0%
Bootstrap-pfa: 4.59e-10
RollingBand-fgt: 1.00 [109/109]
GhostDiagnostic-chr: -23.69
Centroid-sig: 0.0%
Centroid-so: 3.158 arcsec [3.07σ]
OotOffset-rm: 1.393 arcsec [1.23σ]
KicOffset-rm: 1.520 arcsec [1.60σ]
OotOffset-st: 0/3/4/5 [12]
KicOffset-st: 0/3/4/5 [12]
DiffImageQuality-fgm: 0.50 [6/12]
DiffImageOverlap-fno: 1.00 [14/14]

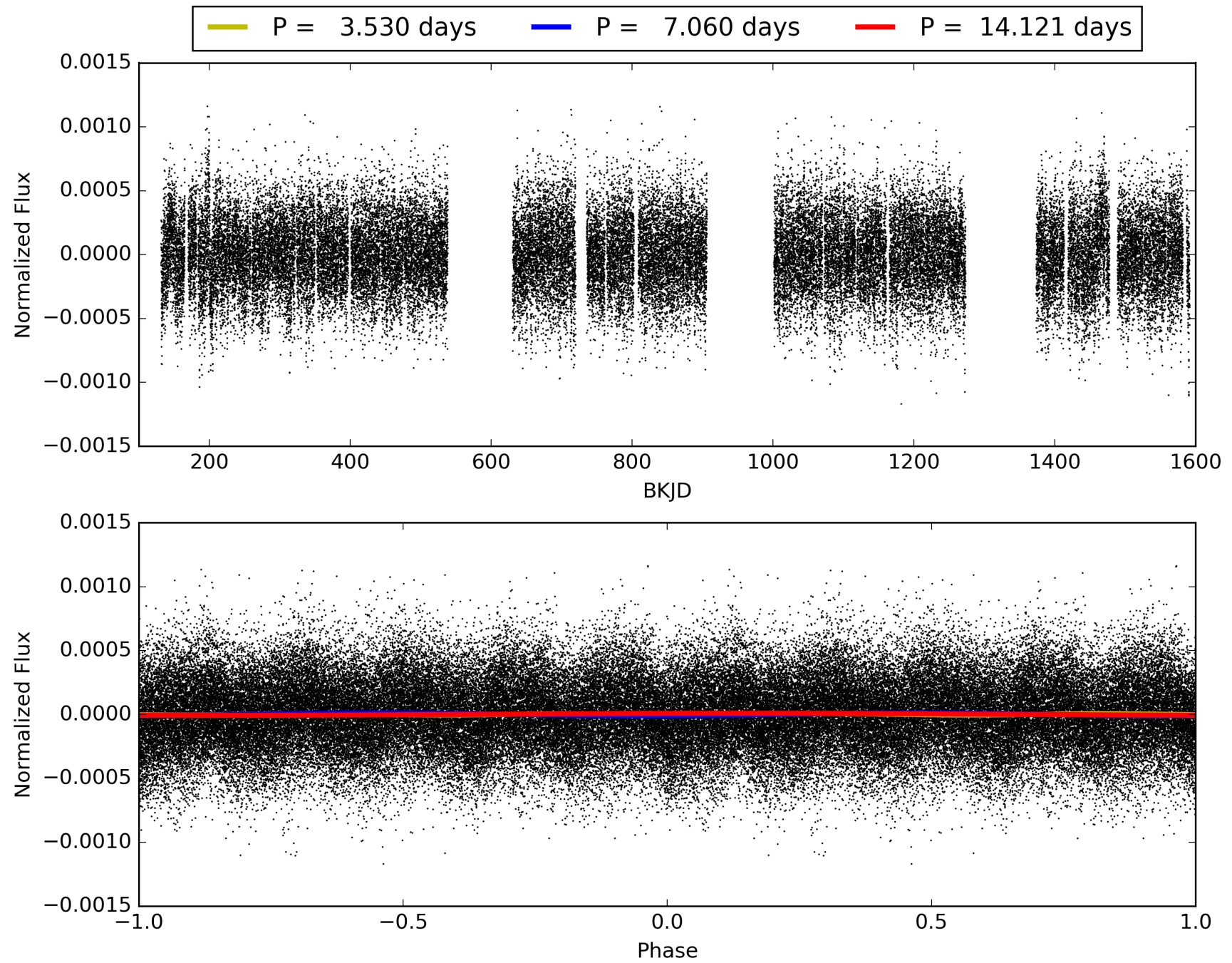
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 31-Jan-2016 16:24:12 Z

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

TCE 004470415-02, PDC Light Curves

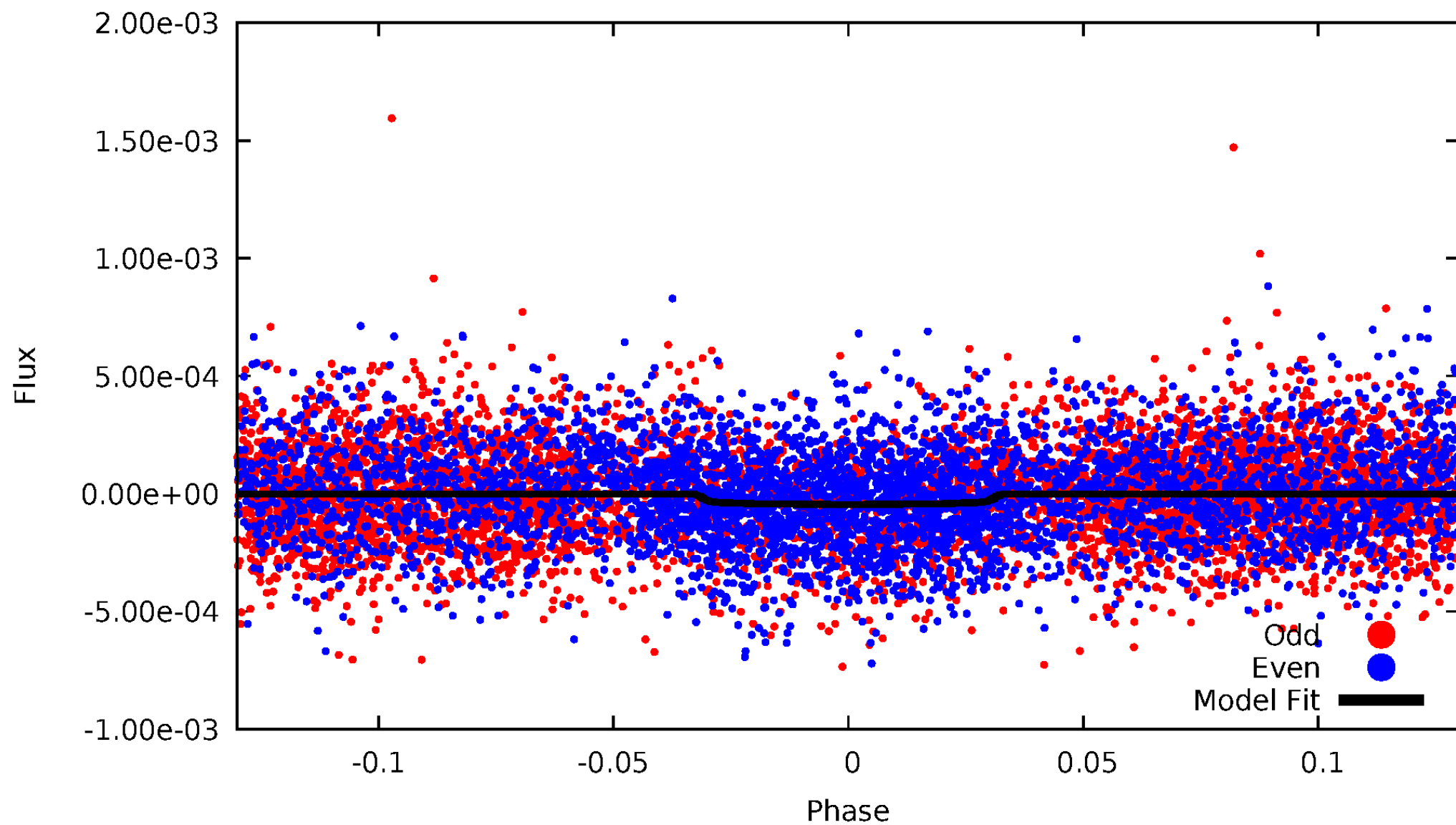


TCE 004470415-02



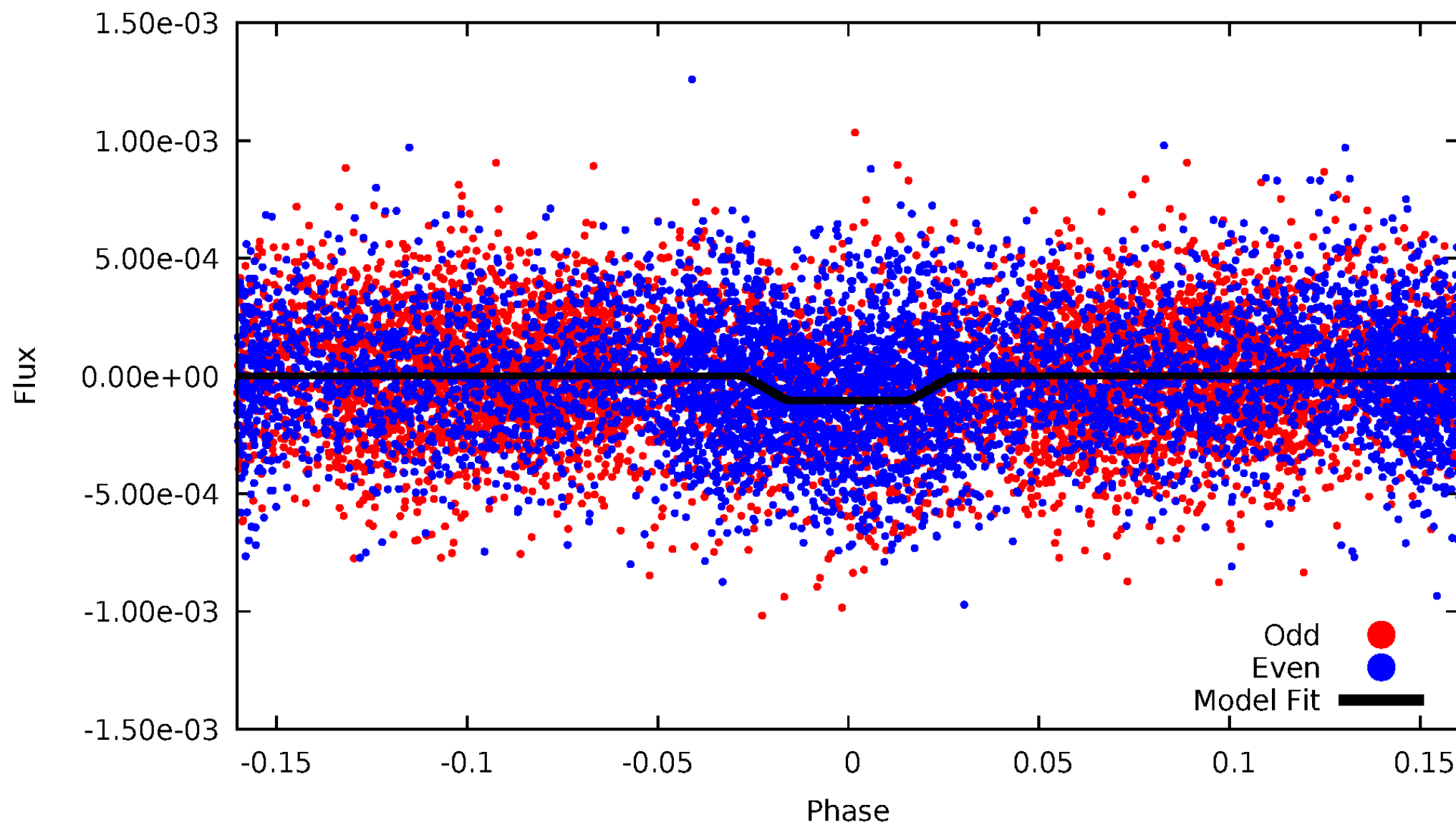
DV Odd/Even

TCE 004470415-02



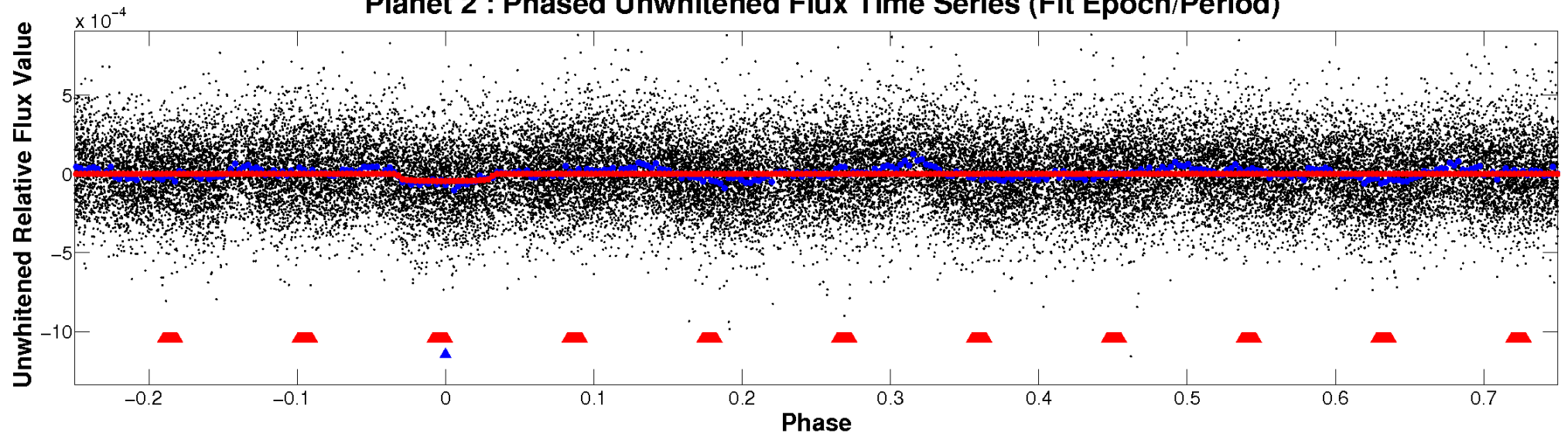
ALT Odd/Even

TCE 004470415-02

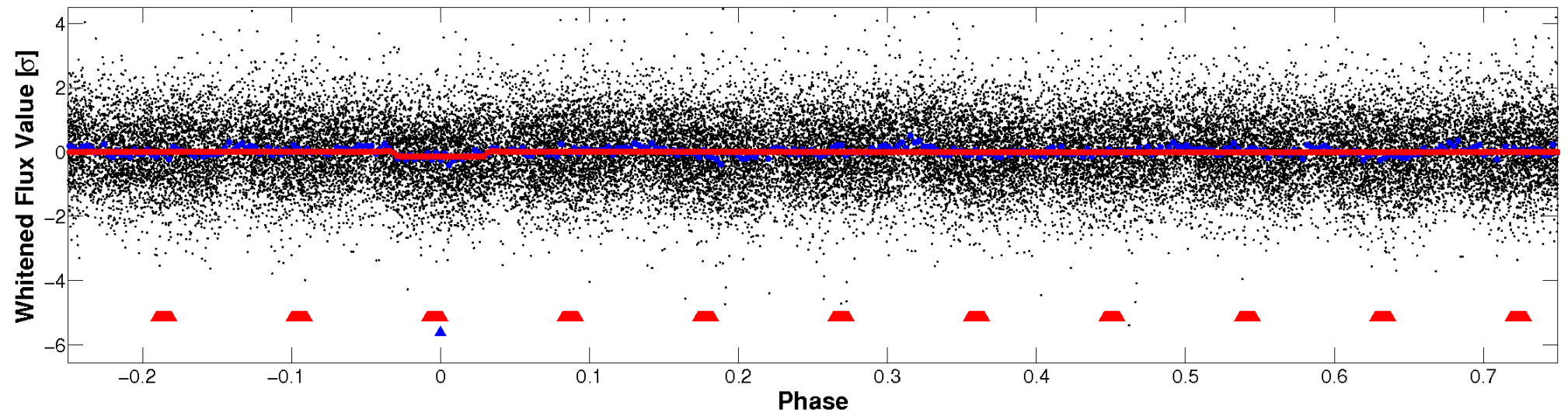


Non-Whitened Vs. Whitened Light Curve

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

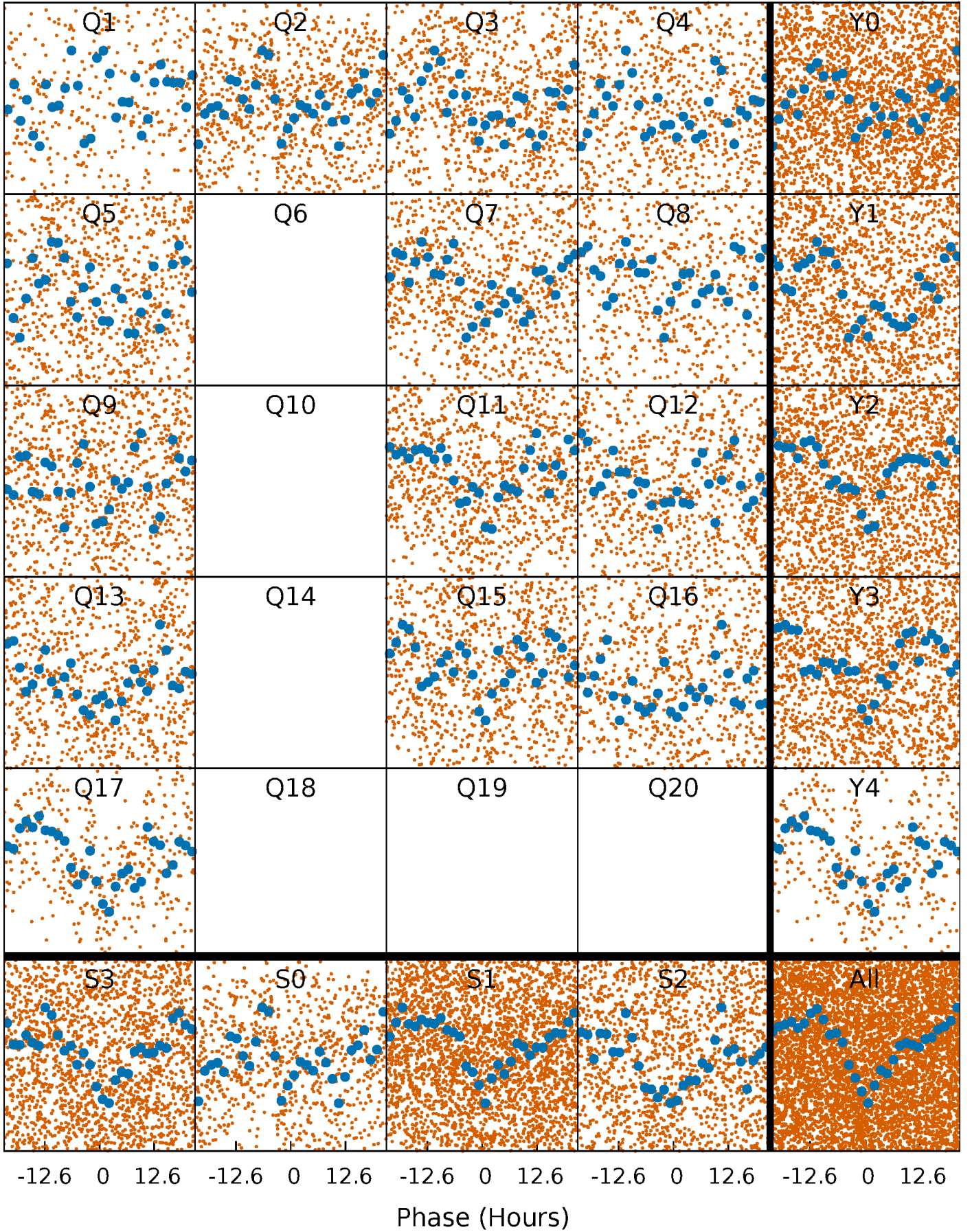


Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



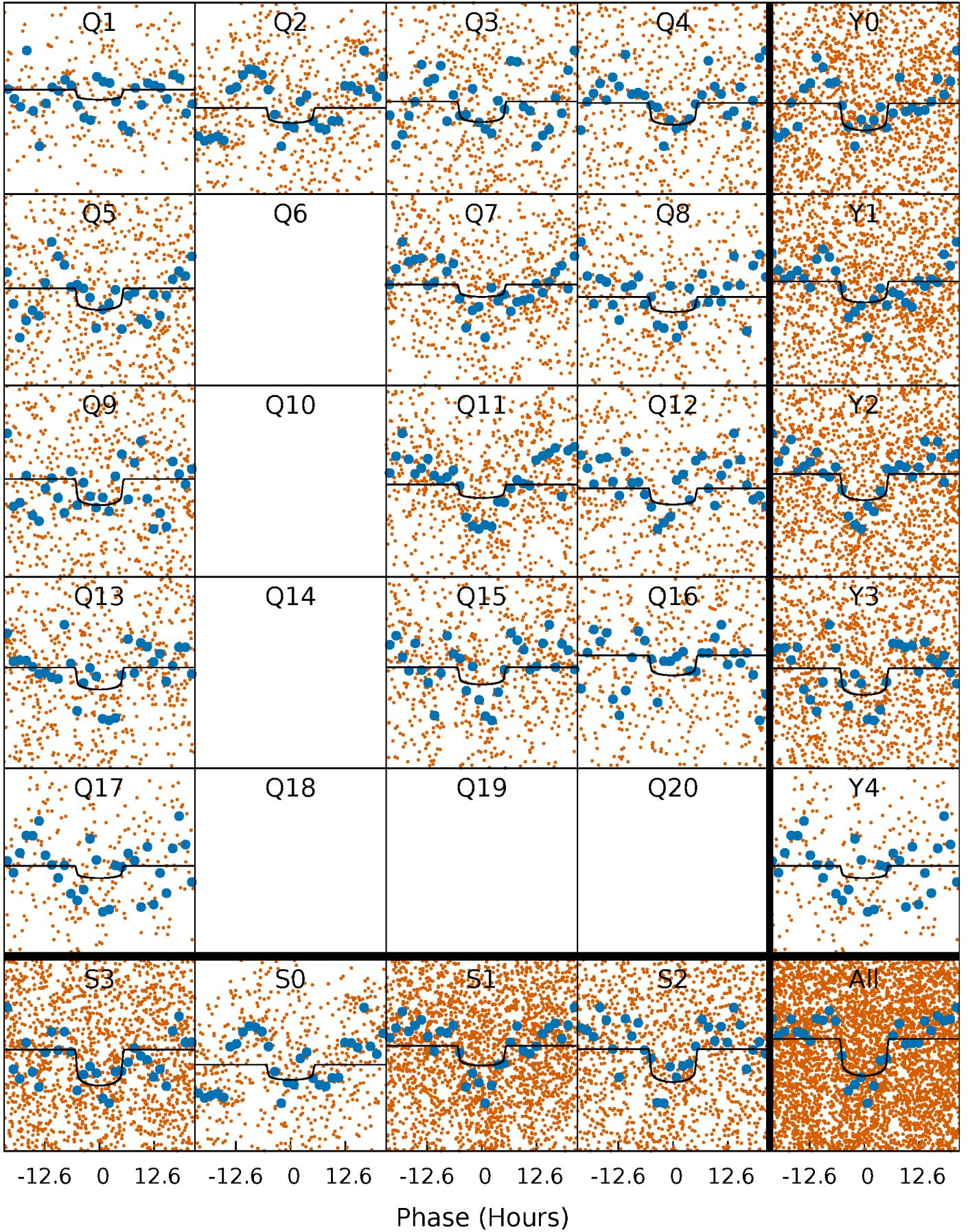
PDC Quarter-Phased Transit Curves

TCE 004470415-02 P= 7.060377 Days $T_0=133.434586$ (BKJD)



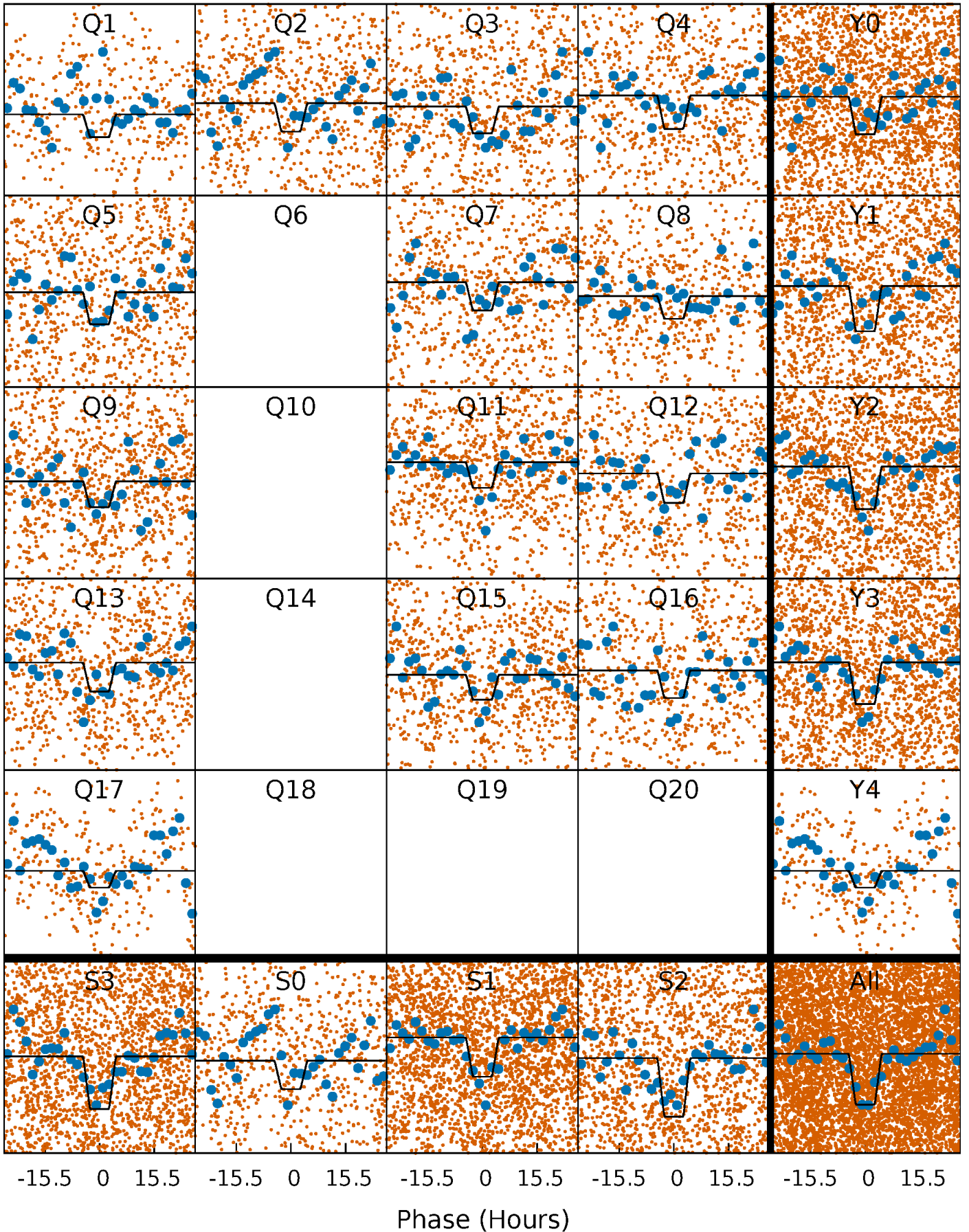
DV Quarter-Phased Transit Curves

TCE 004470415-02 P= 7.060377 Days $T_0=133.434586$ (BKJD)



Alt. Detrend Quarter-Phased Transit Curves

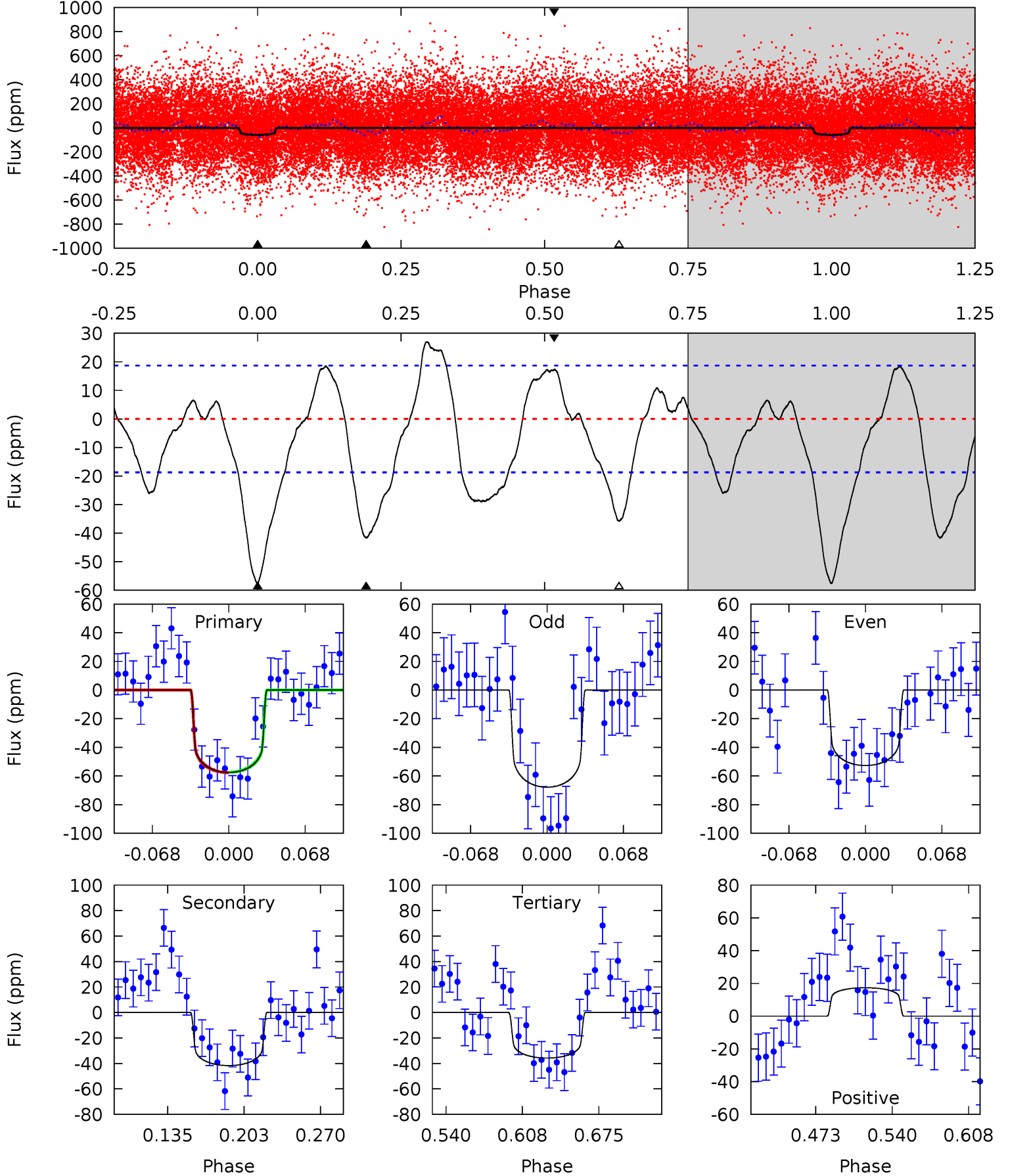
TCE 004470415-02 P= 7.060895 Days $T_0=133.408231$ (BKJD)



DV Model-Shift Uniqueness Test

004470415-02, P = 7.060377 Days, E = 126.374209 Days

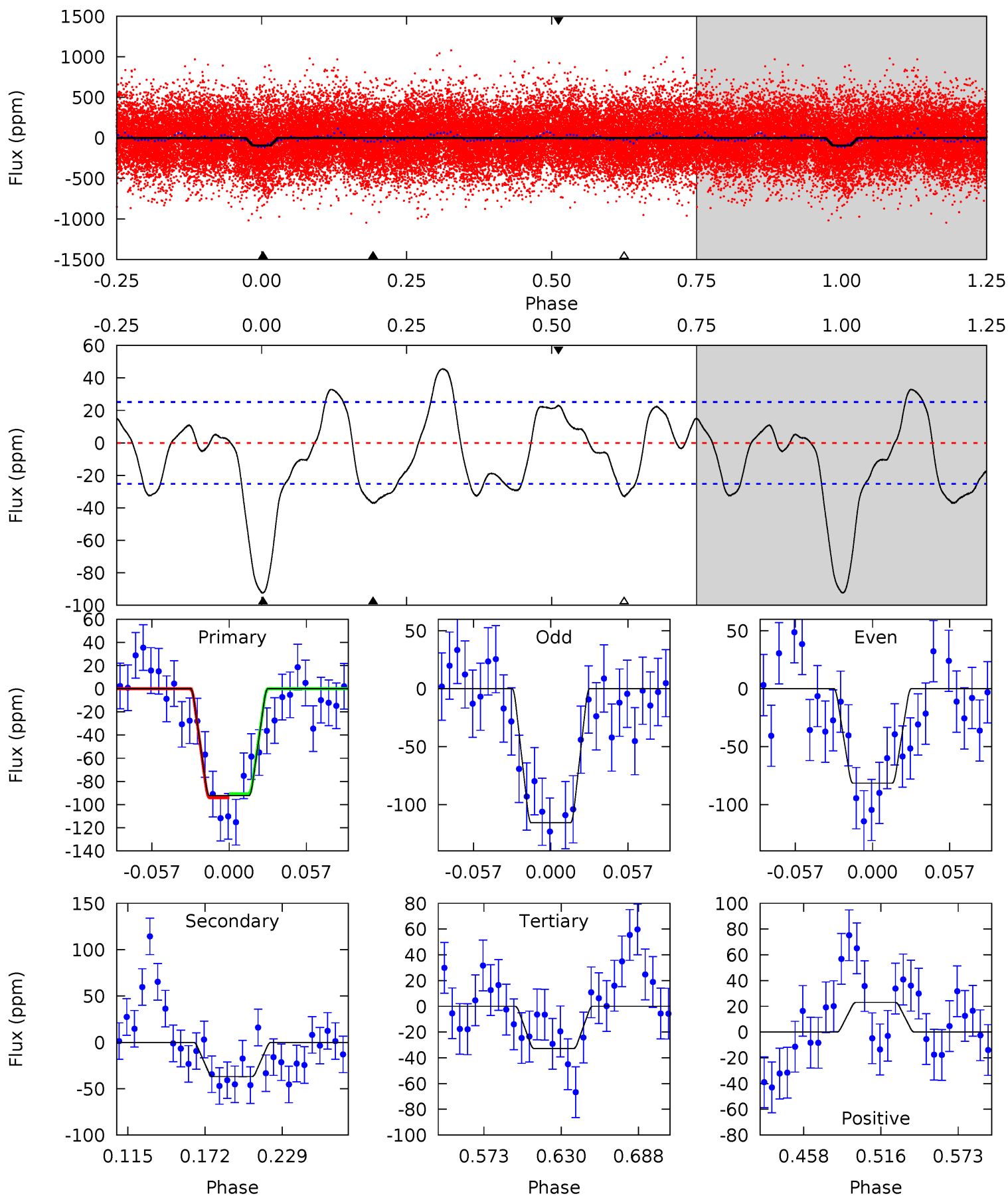
Pri	Sec	Ter	Pos	FA ₁	FA ₂	F _{Red}	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
14.3	10.3	8.88	4.31	4.65	1.83	3.89	5.41	9.98	1.47	6.04	1.76	1.02	0.32	0.03



Alt Model-Shift Uniqueness Test

004470415-02, P = 7.060895 Days, E = 126.347336 Days

Pri	Sec	Ter	Pos	FA ₁	FA ₂	F _{Red}	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
17.1	6.86	6.09	4.28	4.68	1.90	3.58	11.0	12.9	0.77	2.58	2.95	1.01	0.33	0.31



Stellar Parameters For KIC 004470415

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	R (R_{\odot})	M (M_{\odot})	p_{\star} ($\text{g}\cdot\text{cm}^{-3}$)
	7390^{+232}_{-310}	$4.083^{+0.175}_{-0.175}$	$-0.260^{+0.250}_{-0.350}$	$1.830^{+0.529}_{-0.433}$	$1.477^{+0.230}_{-0.230}$	$0.339^{+0.327}_{-0.154}$
	+3%/-4%	+4%/-4%	+96%/-135%	+29%/-24%	+16%/-16%	+96%/-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 004470415-02 / KOI

Detrend	Depth (ppm)	R_p (R_{\oplus})	T_{max} (K)	T_{obs} (K)	A_{obs}
DV	-42 ± 4	$1.42^{+0.39}_{-0.35}$	2143^{+158}_{-154}	6951^{+1052}_{-769}	76^{+55}_{-30}
Alt.	-37 ± 5	$2.06^{+0.47}_{-0.42}$	2144^{+192}_{-147}	5609^{+537}_{-450}	32^{+18}_{-11}

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

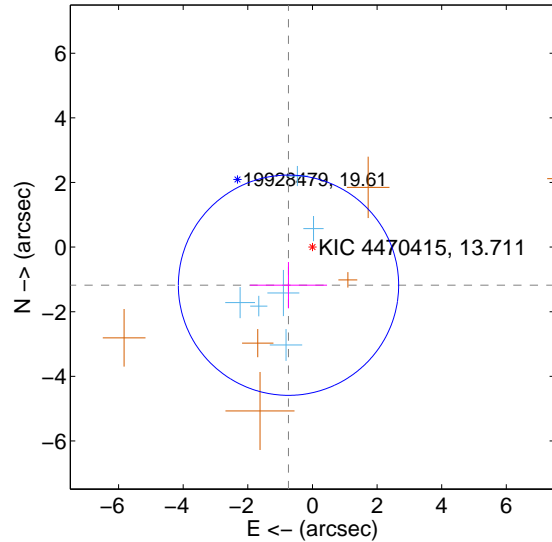
Supplemental centroid analysis for 004470415-02. Kepler magnitude: 13.71. Transit SNR 6.88

There are 6 quarters with good PRF difference image offsets

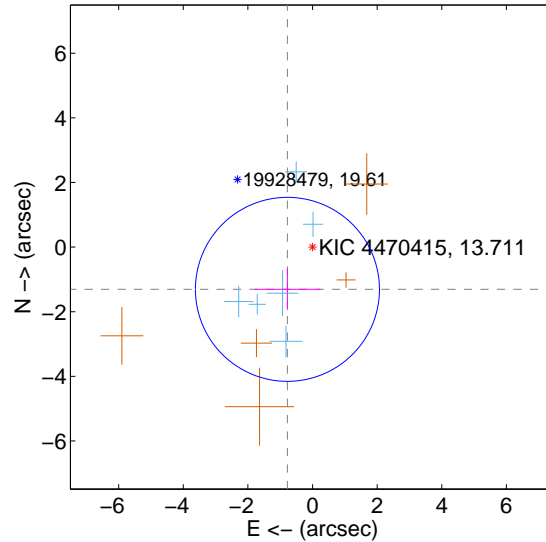
The direct PRF centroid is offset from the target star catalog position by about 0.08 arcsec

	Distance in arcsec	Distance / σ	Δ RA	Δ Dec
PRF-fit source offset from OOT	1.393 ± 1.136	1.23	0.741 ± 1.192	-1.179 ± 0.715
PRF-fit source offset from KIC position	1.520 ± 0.949	1.60	0.777 ± 1.016	-1.307 ± 0.633
photometric centroid source offset	3.16 ± 1.03	3.07	0.48 ± 0.98	-3.12 ± 1.03

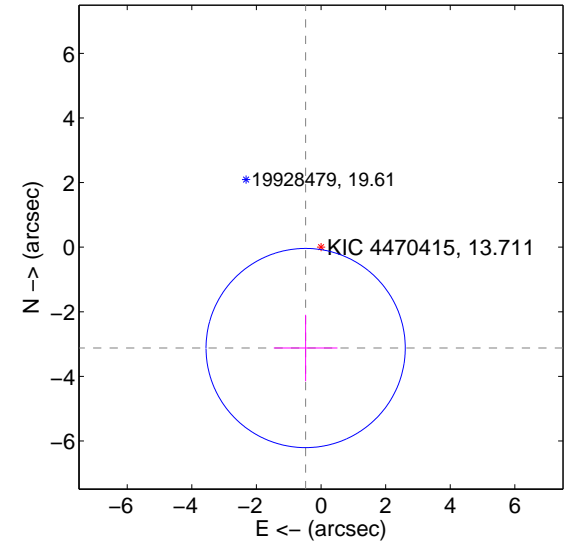
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position

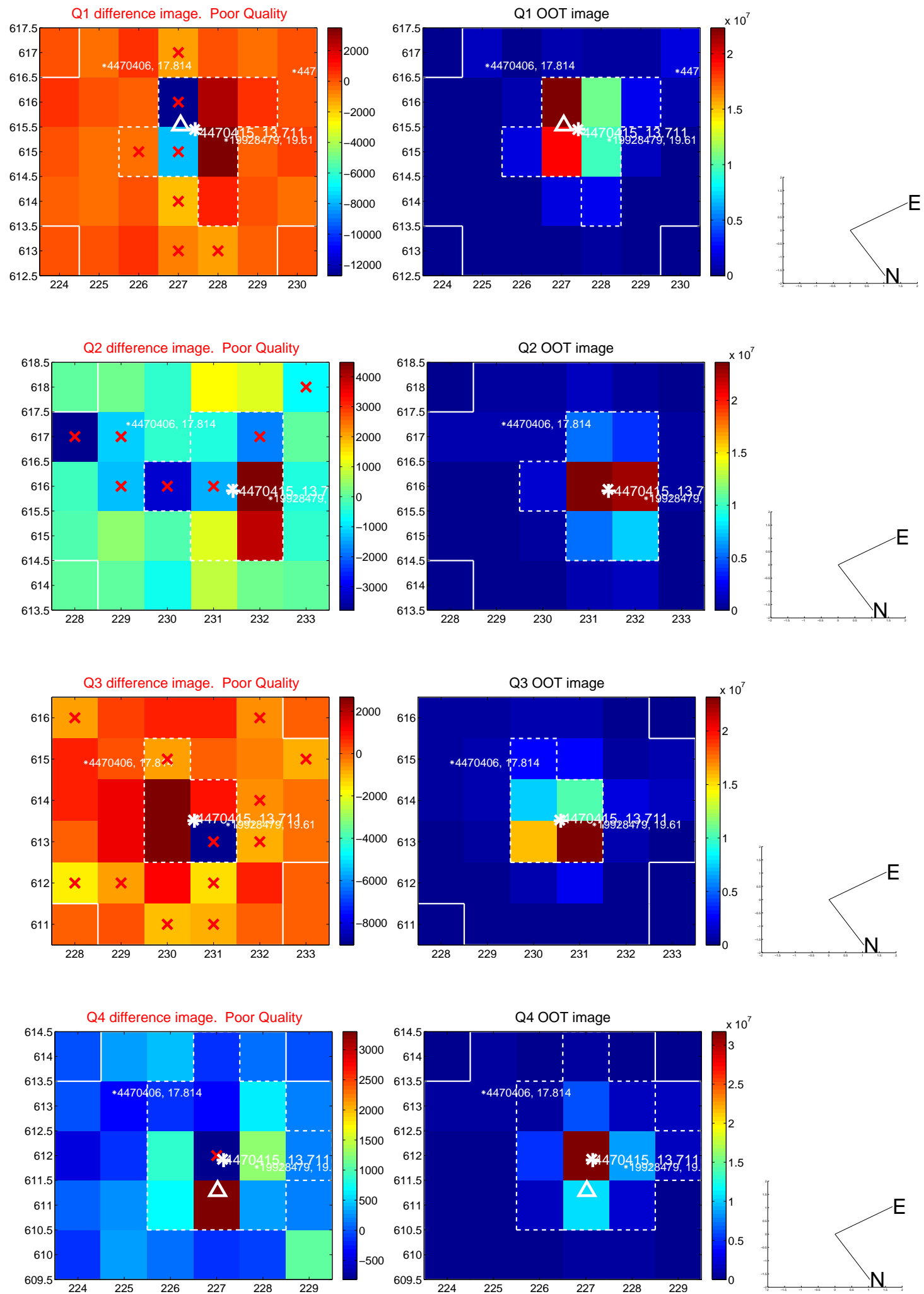


offset from photometric centroids

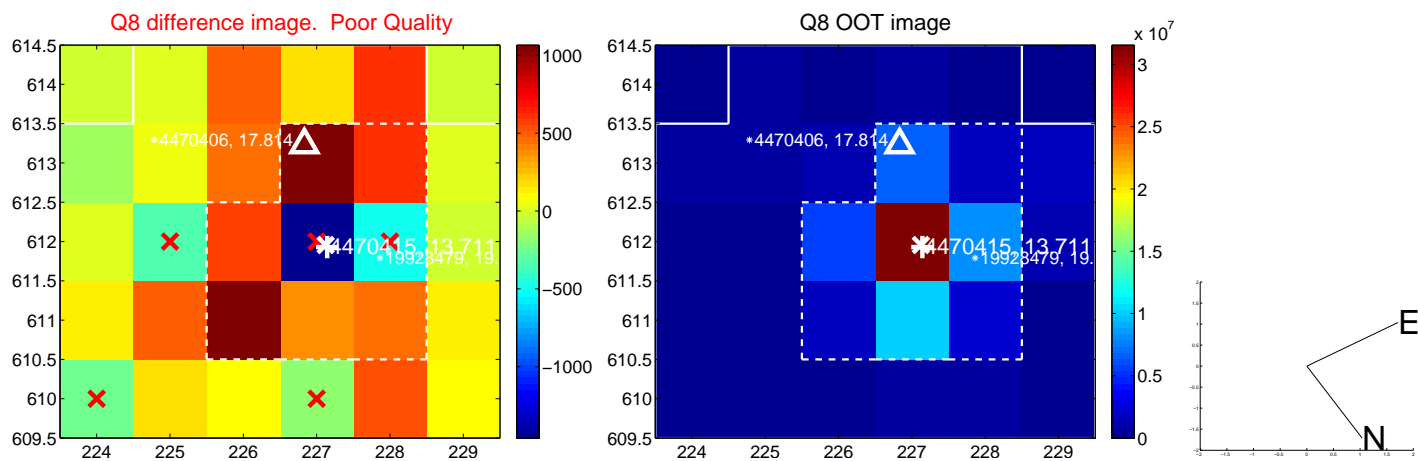
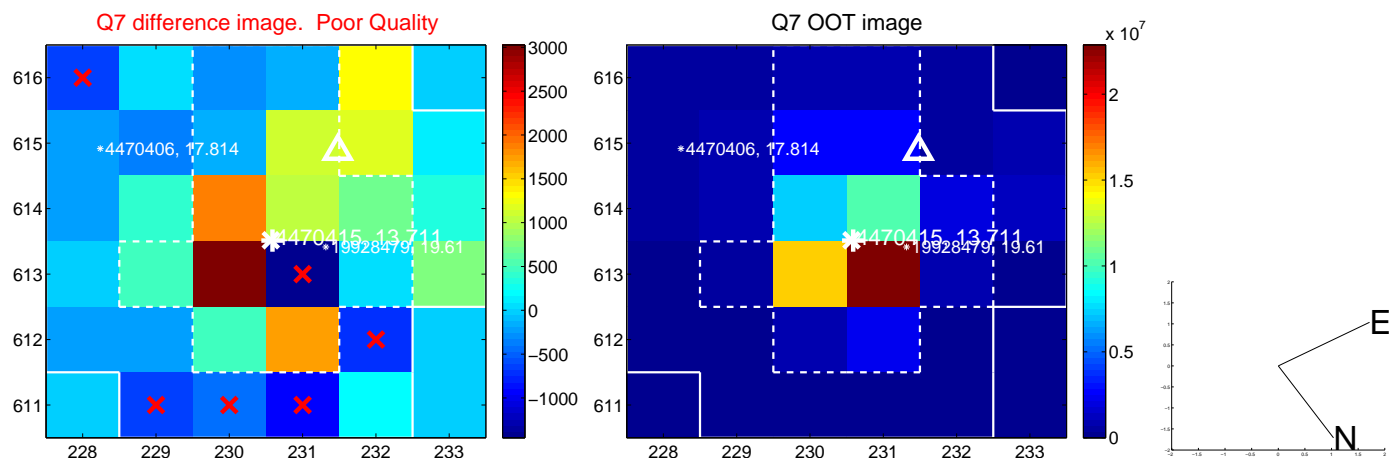
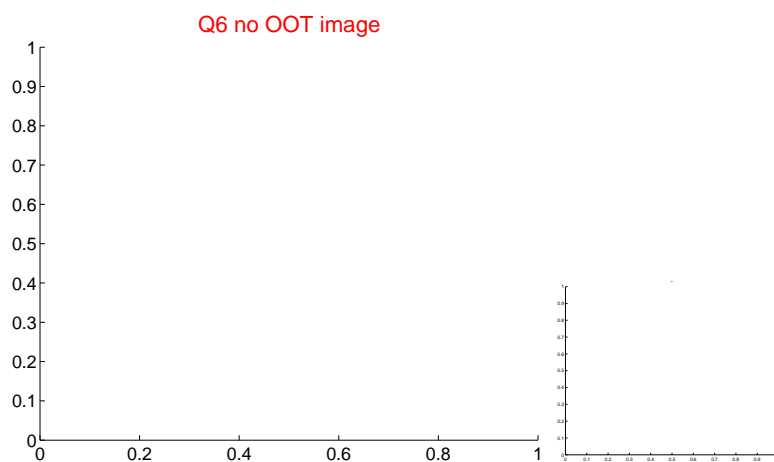
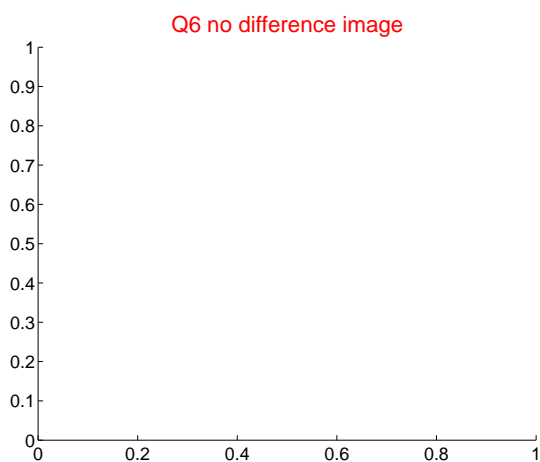
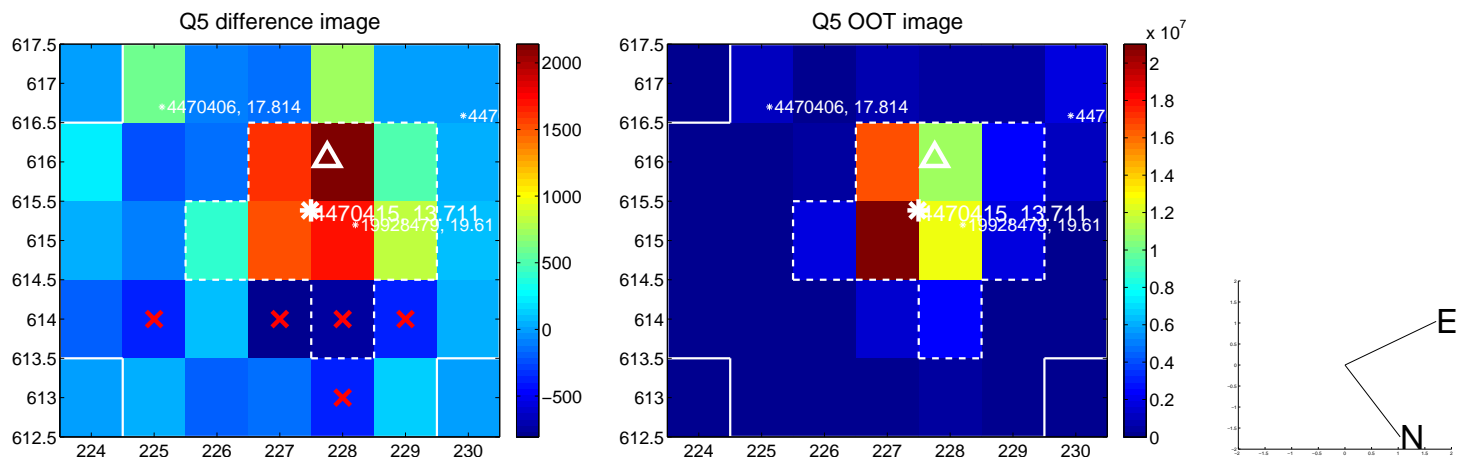


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets**; magenta cross: average over quarters. Length of the crosses: one- σ uncertainty. Blue circle: three-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

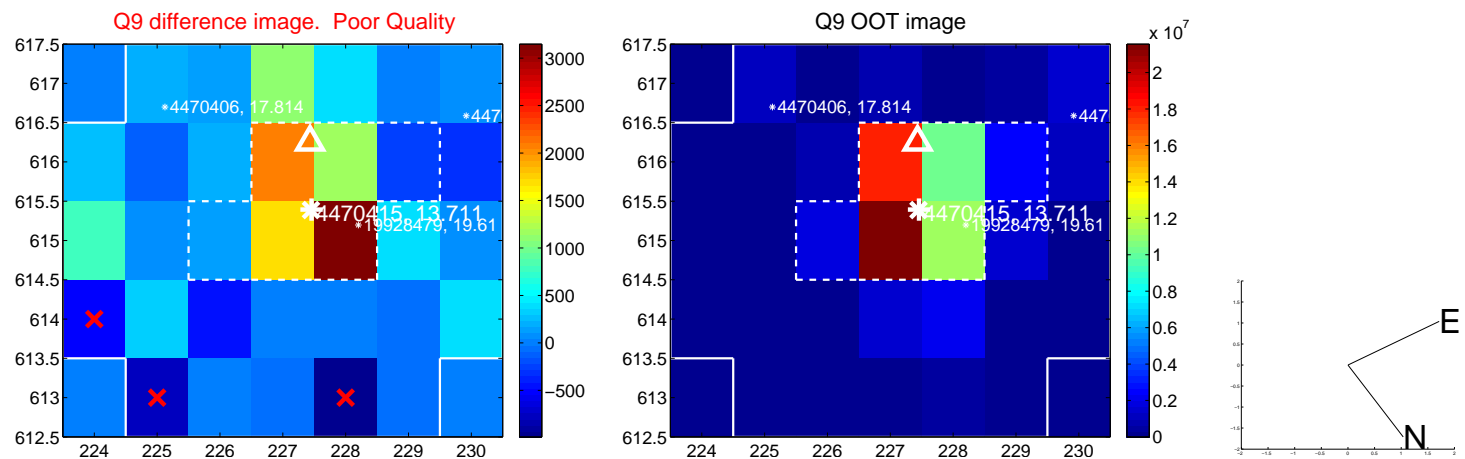
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



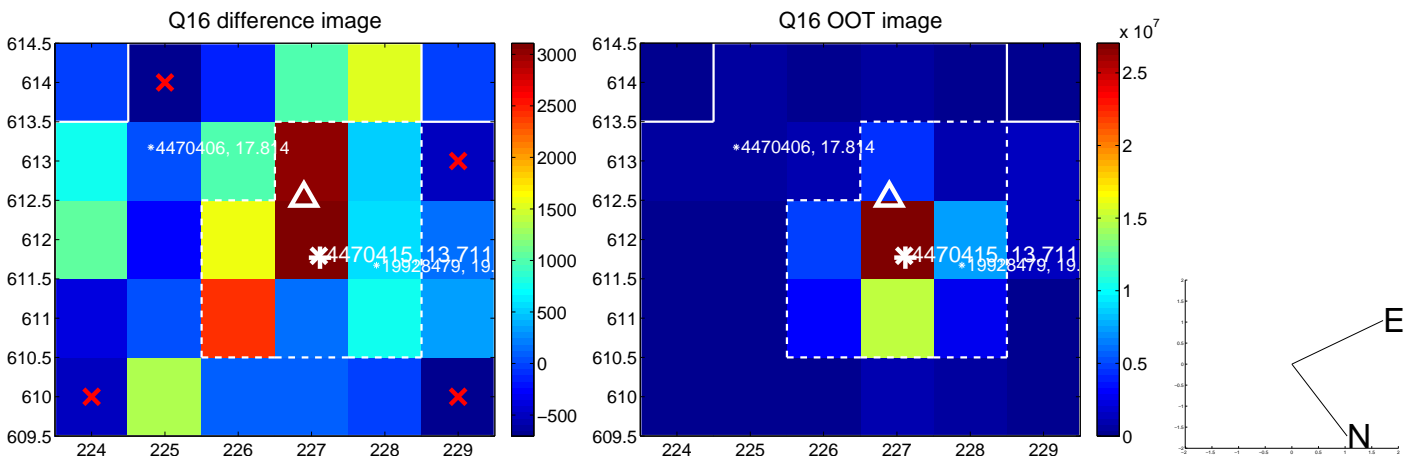
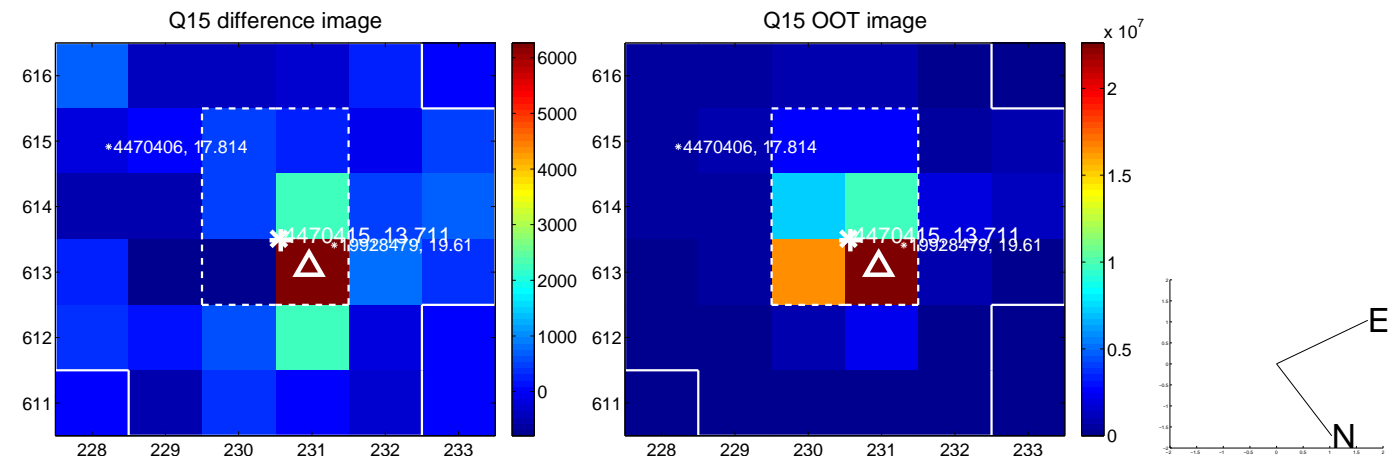
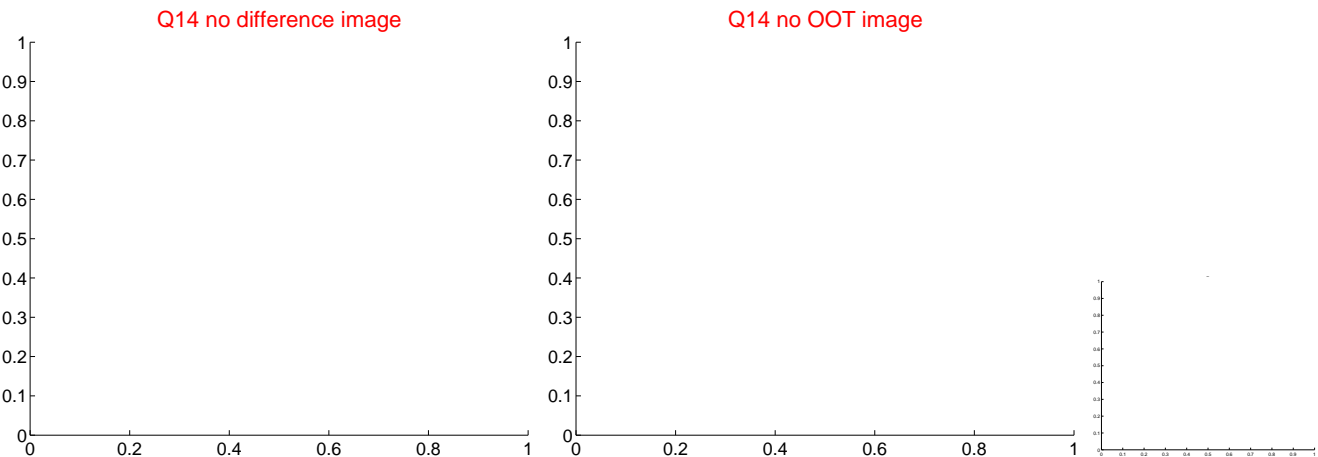
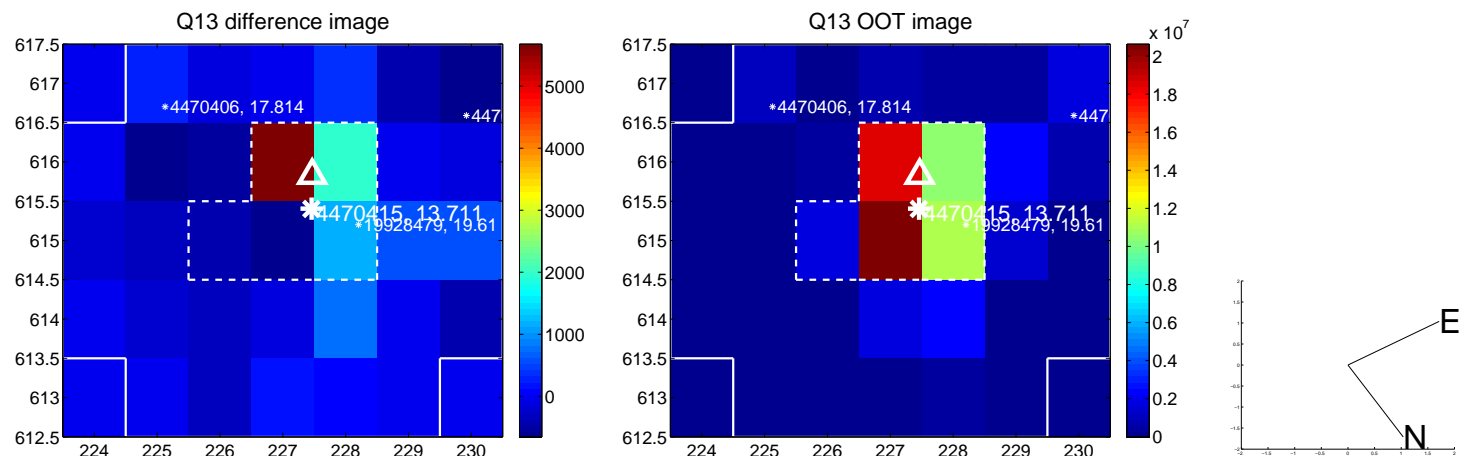
white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



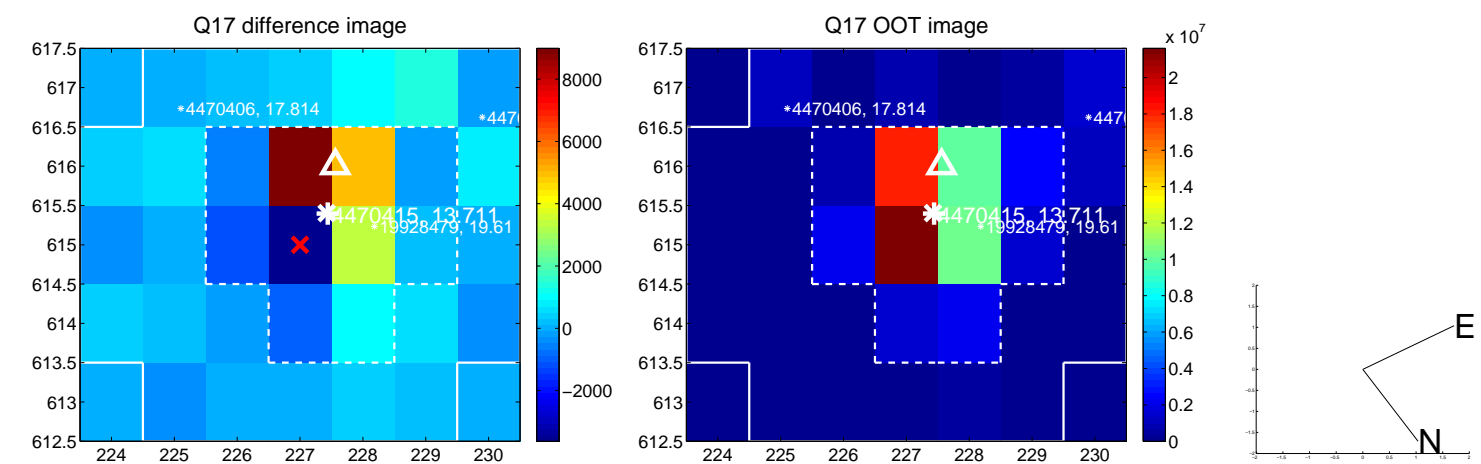
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



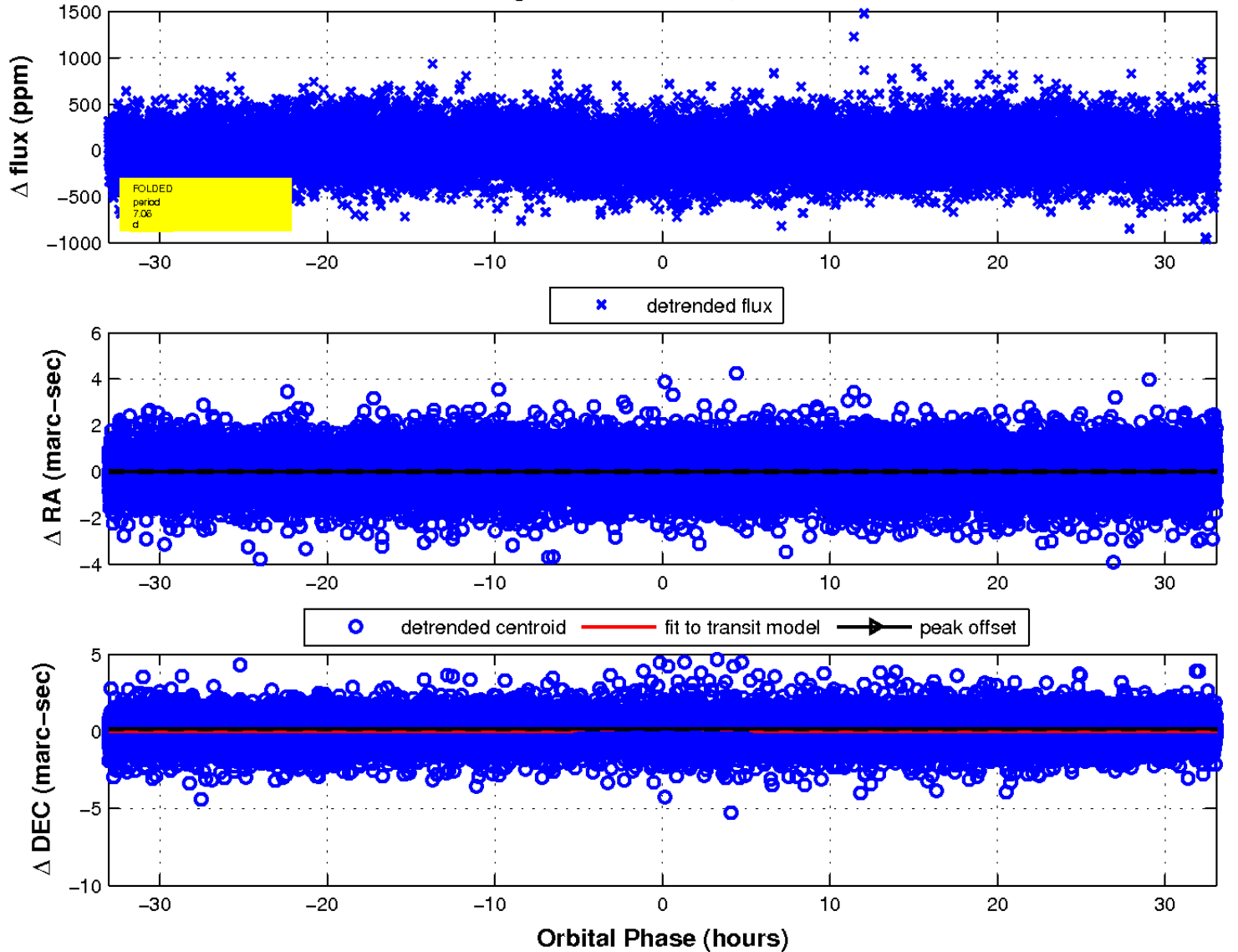
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



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



fluxWeightedCentroids, Planet 2 of 2



UKIRT Image

Declination

