

KIC 008520436

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})
008520436-01	OBS	No	1.024607	131.522096	93.5	1.765	10.1	12.0	1.82	6927	2.05	13265.63
008520436-02	OBS	No	4.463629	135.480994	116.3	29.554	8.8	13.2	1.82	6927	2.48	1864.46

Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
008520436-01	OBS	FP	0.00	1	0	1	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_POS_ALT—CENT_RESOLVED_OFFSET
008520436-02	OBS	FP	0.00	1	0	1	0	LPP_DV—LPP_ALT—CENT_RESOLVED_OFFSET

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

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

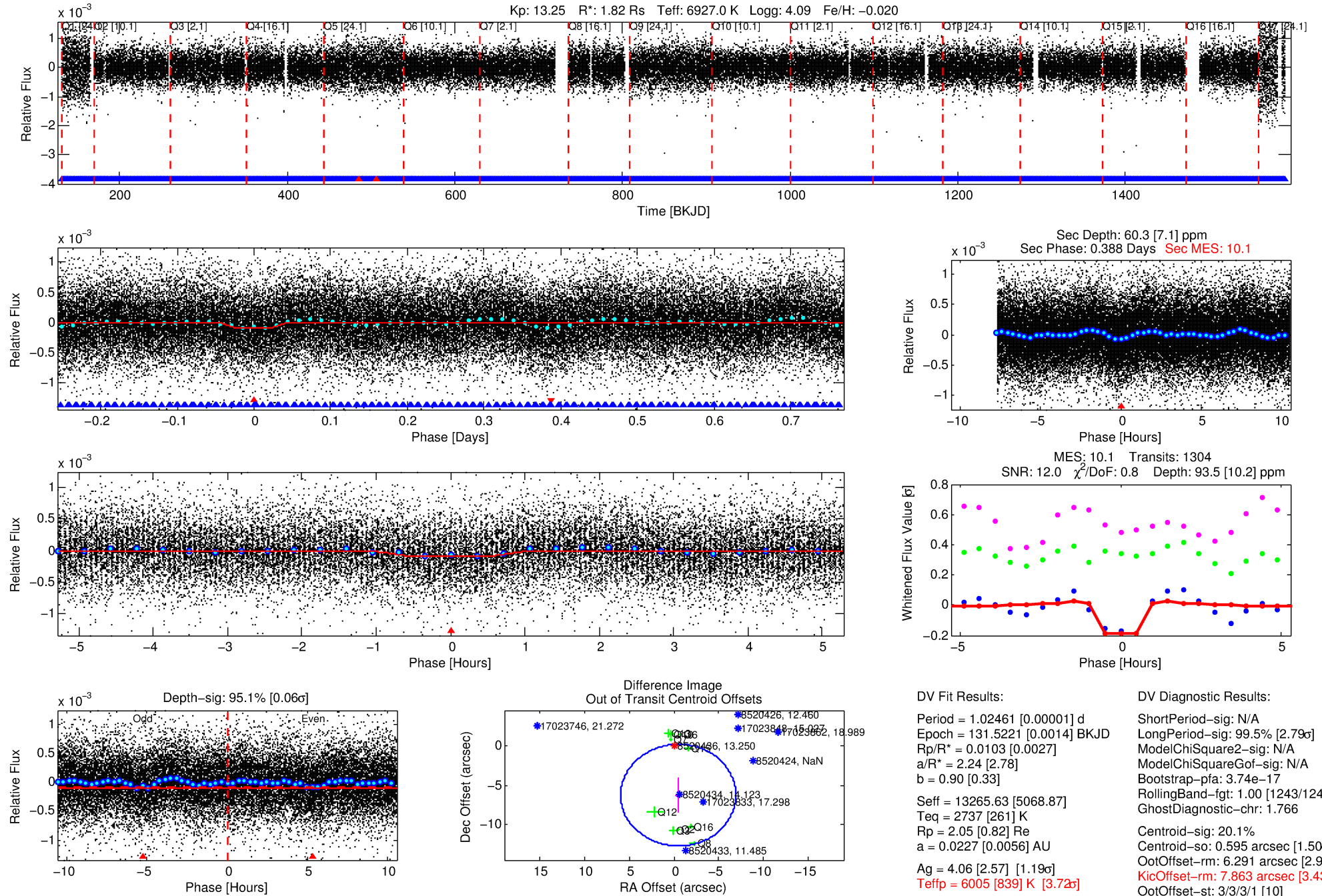
See http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col for comment definitions.

Ephemeris Match Information For 008520436-01

No Significant Match Found

DV One-Page Summary

KIC: 8520436 Candidate: 1 of 2 Period: 1.025 d



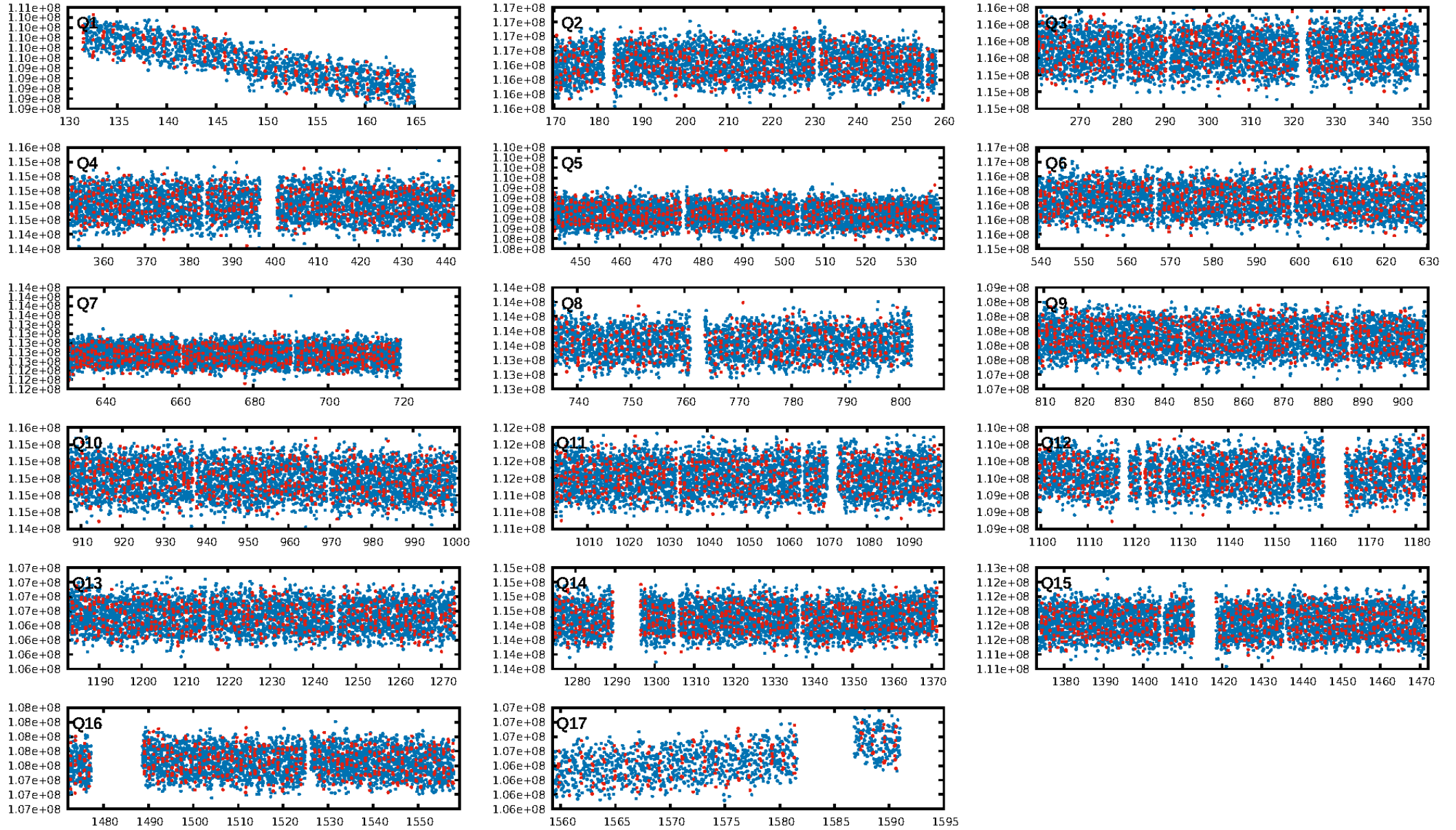
DV Fit Results:

Period = 1.02461 [0.00001] d
Epoch = 131.5221 [0.0014] BKJD
Rp/R* = 0.0103 [0.0027]
a/R* = 2.24 [2.78]
b = 0.90 [0.33]
Seff = 13265.63 [5068.87]
Teff = 2737 [261] K
Rp = 2.05 [0.82] Re
a = 0.0227 [0.0056] AU
Ag = 4.06 [2.57] [1.19 σ]
Teffp = 6005 [839] K [3.72 σ]

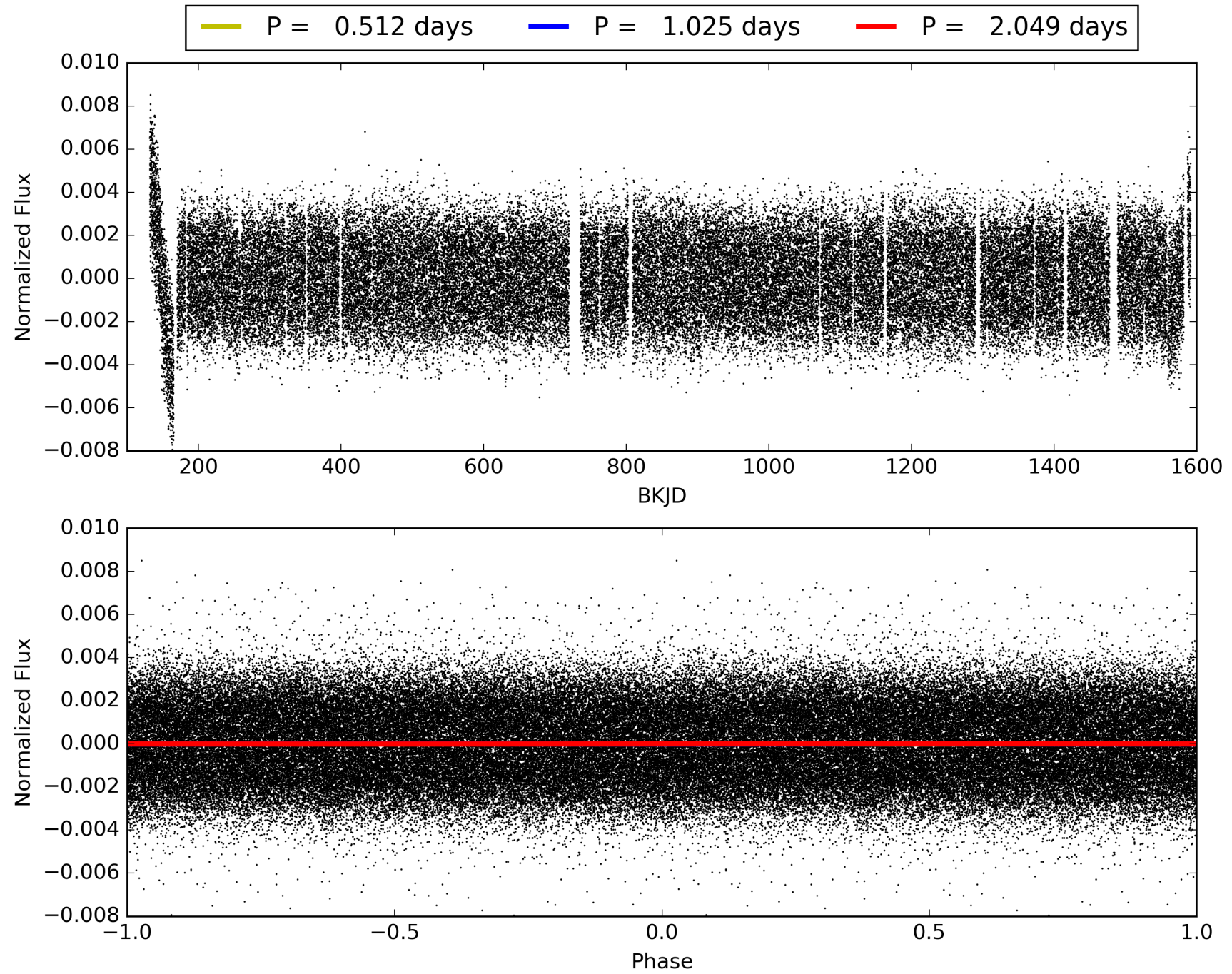
DV Diagnostic Results:

ShortPeriod-sig: N/A
LongPeriod-sig: 99.5% [2.79 σ]
ModelChiSquare2-sig: N/A
ModelChiSquareGof-sig: N/A
Bootstrap-pfa: 3.74e-17
RollingBand-fgt: 1.00 [1243/1245]
GhostDiagnostic-chr: 1.766
Centroid-sig: 20.1%
Centroid-so: 0.595 arcsec [1.50 σ]
OotOffset-rm: 6.291 arcsec [2.93 σ]
KicOffset-rm: 7.863 arcsec [3.43 σ]
OotOffset-st: 3/3/3/1 [10]
KicOffset-st: 3/3/3/1 [10]
DiffImageQuality-fgm: 0.30 [3/10]
DiffImageOverlap-fno: 1.00 [17/17]

TCE 008520436-01, PDC Light Curves

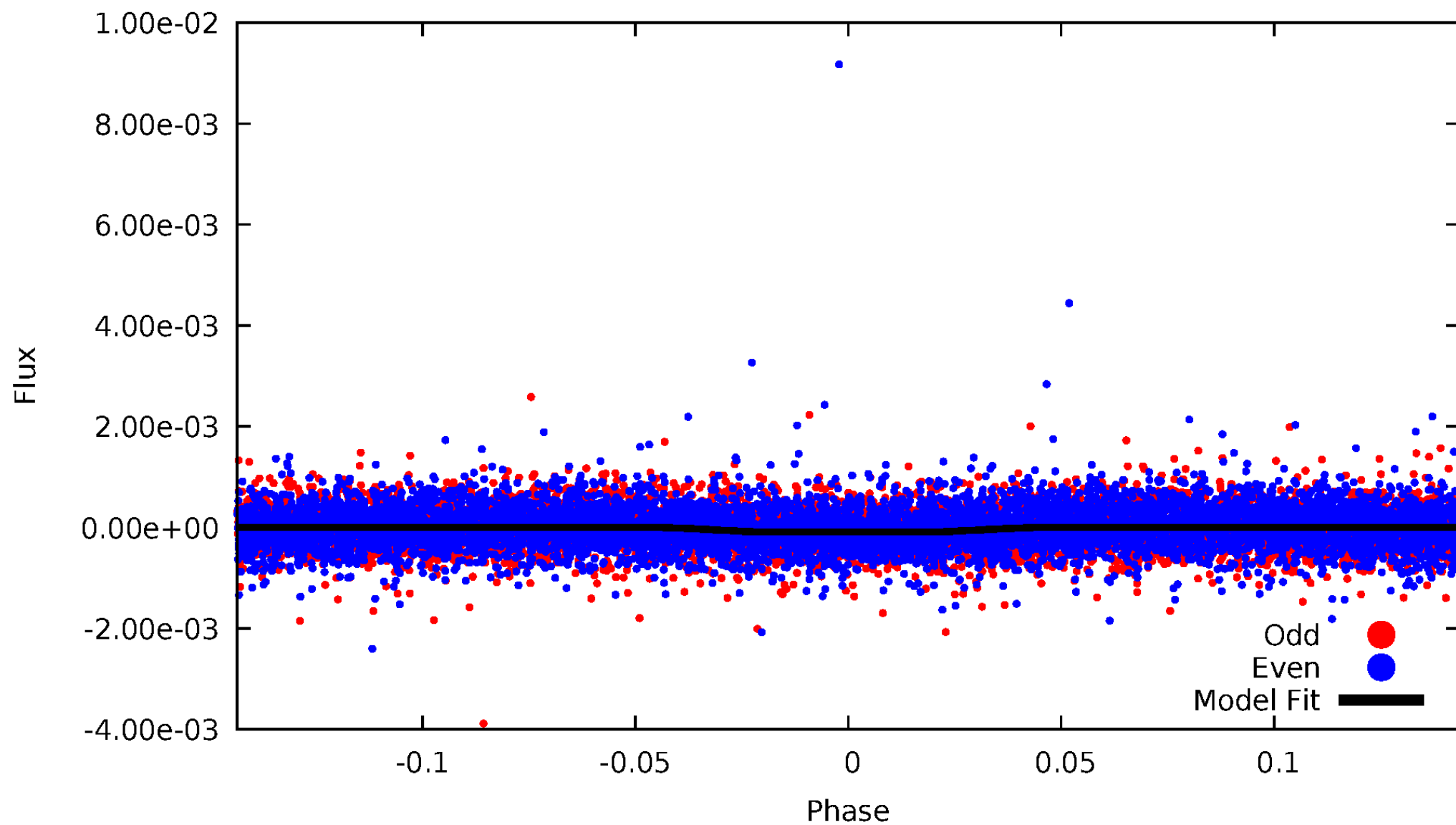


TCE 008520436-01



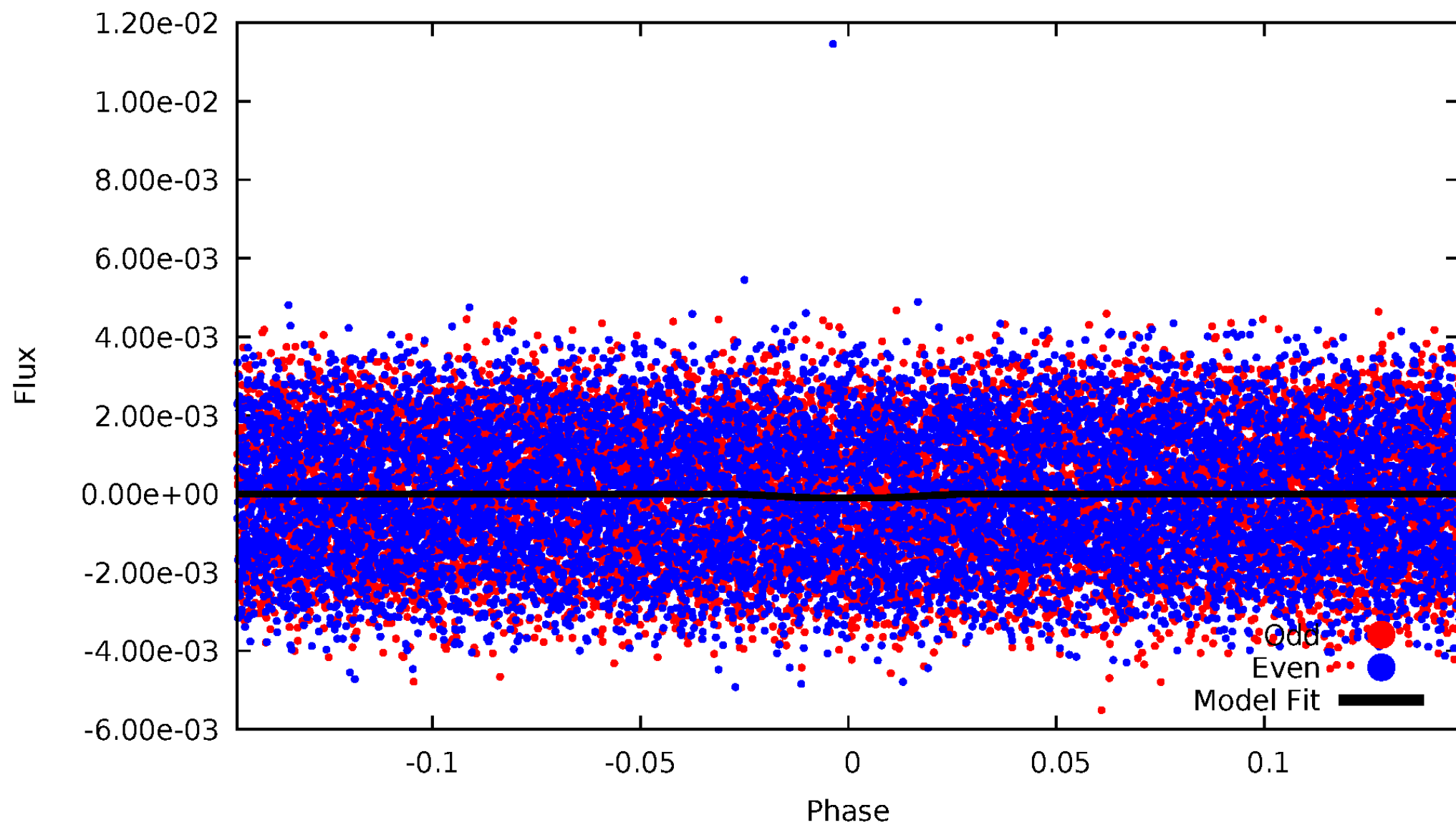
DV Odd/Even

TCE 008520436-01



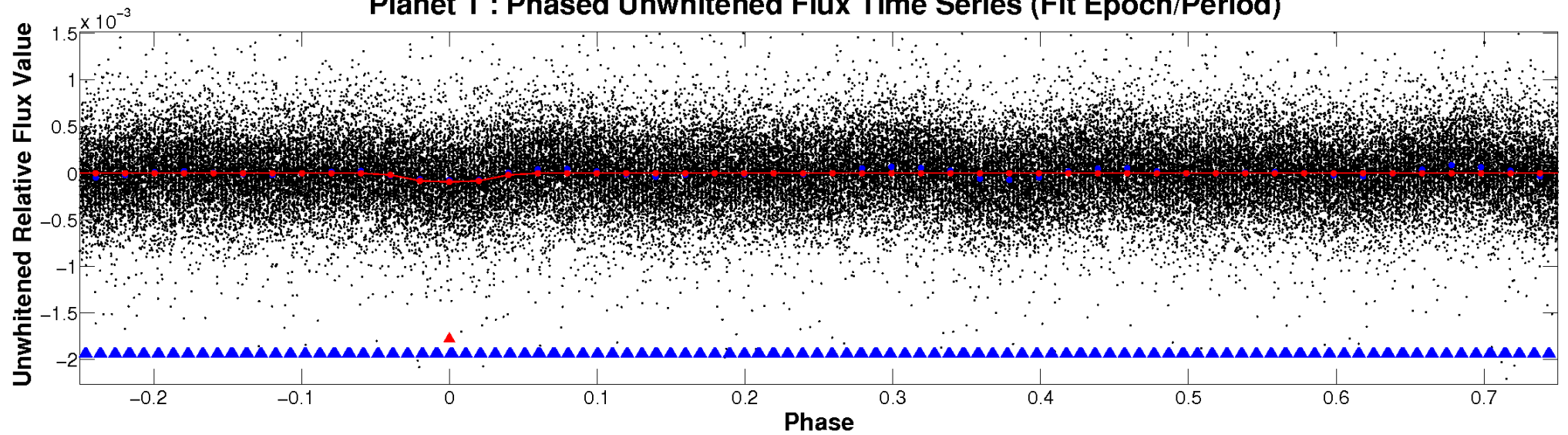
ALT Odd/Even

TCE 008520436-01

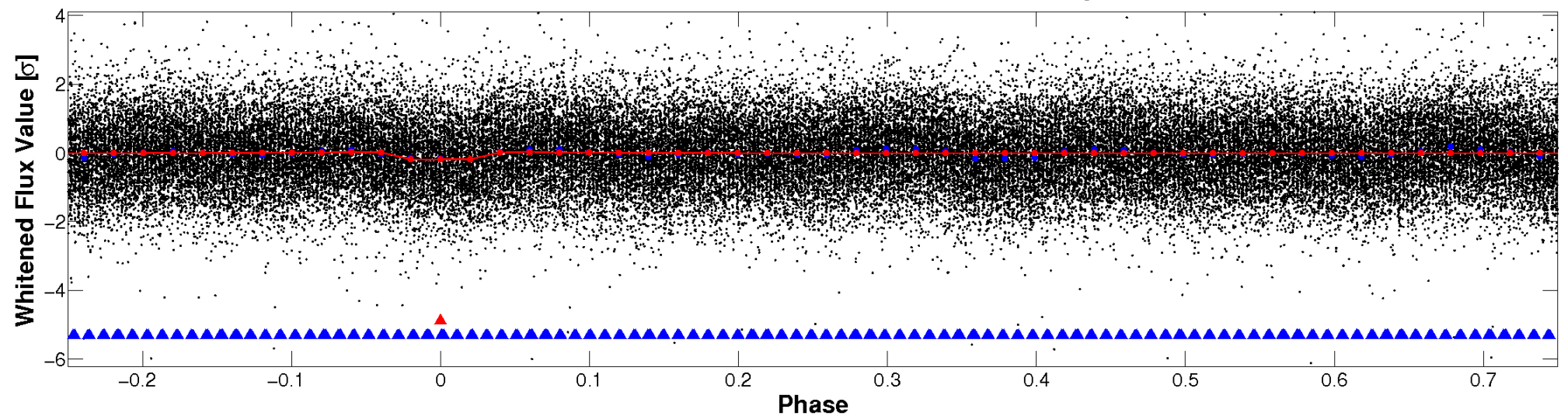


Non-Whitened Vs. Whitened Light Curve

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

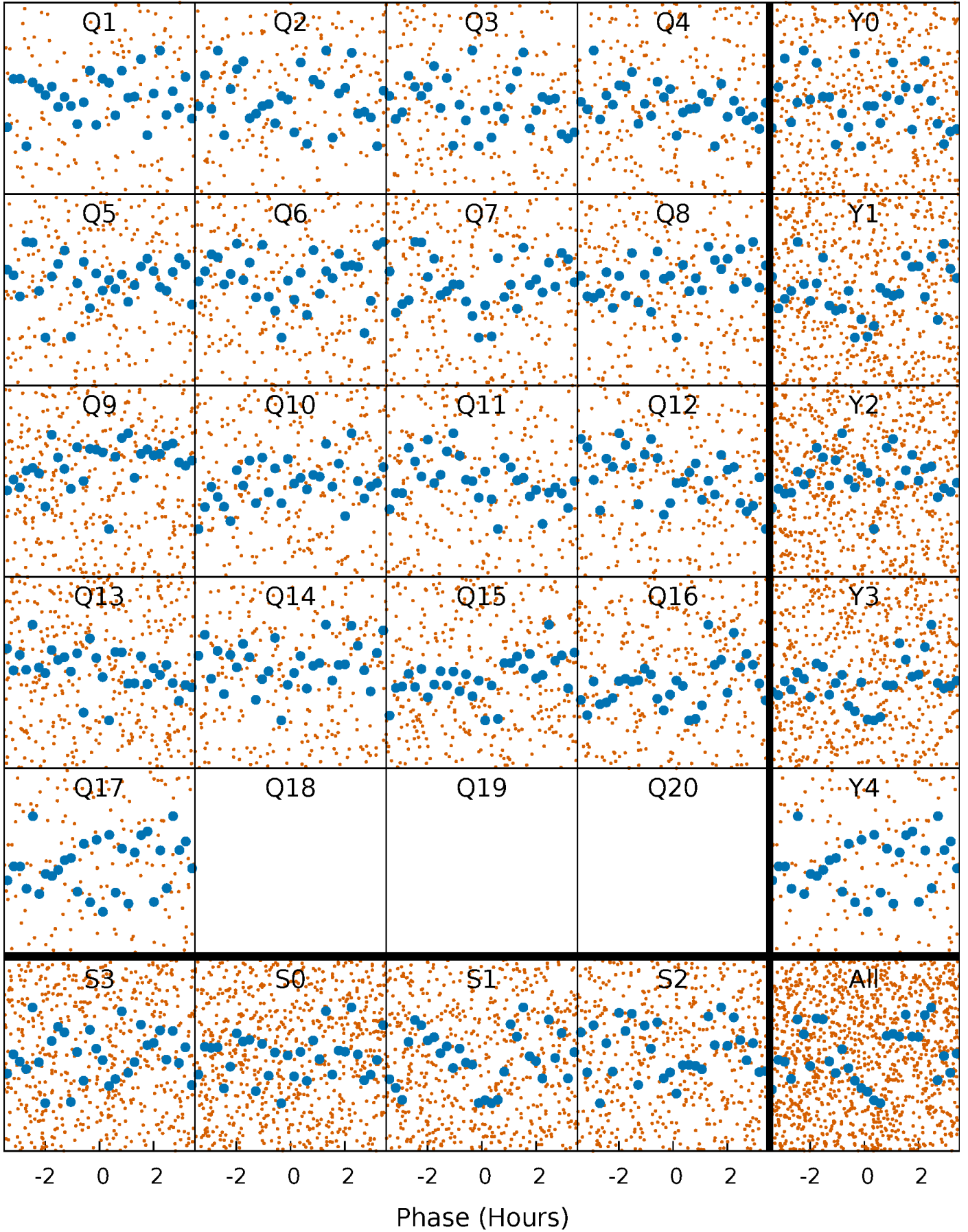


Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)



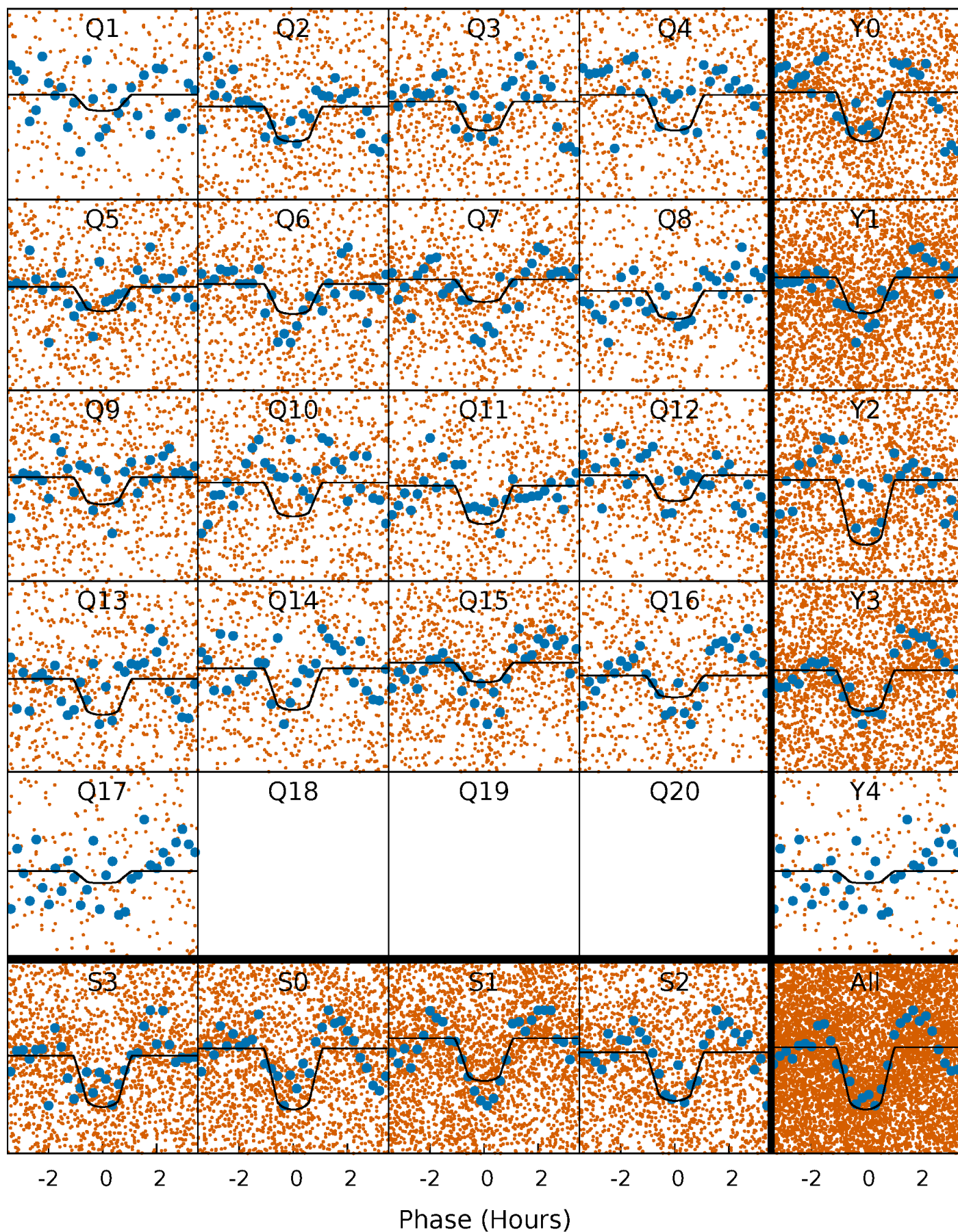
PDC Quarter-Phased Transit Curves

TCE 008520436-01 P= 1.024607 Days $T_0=131.522096$ (BKJD)



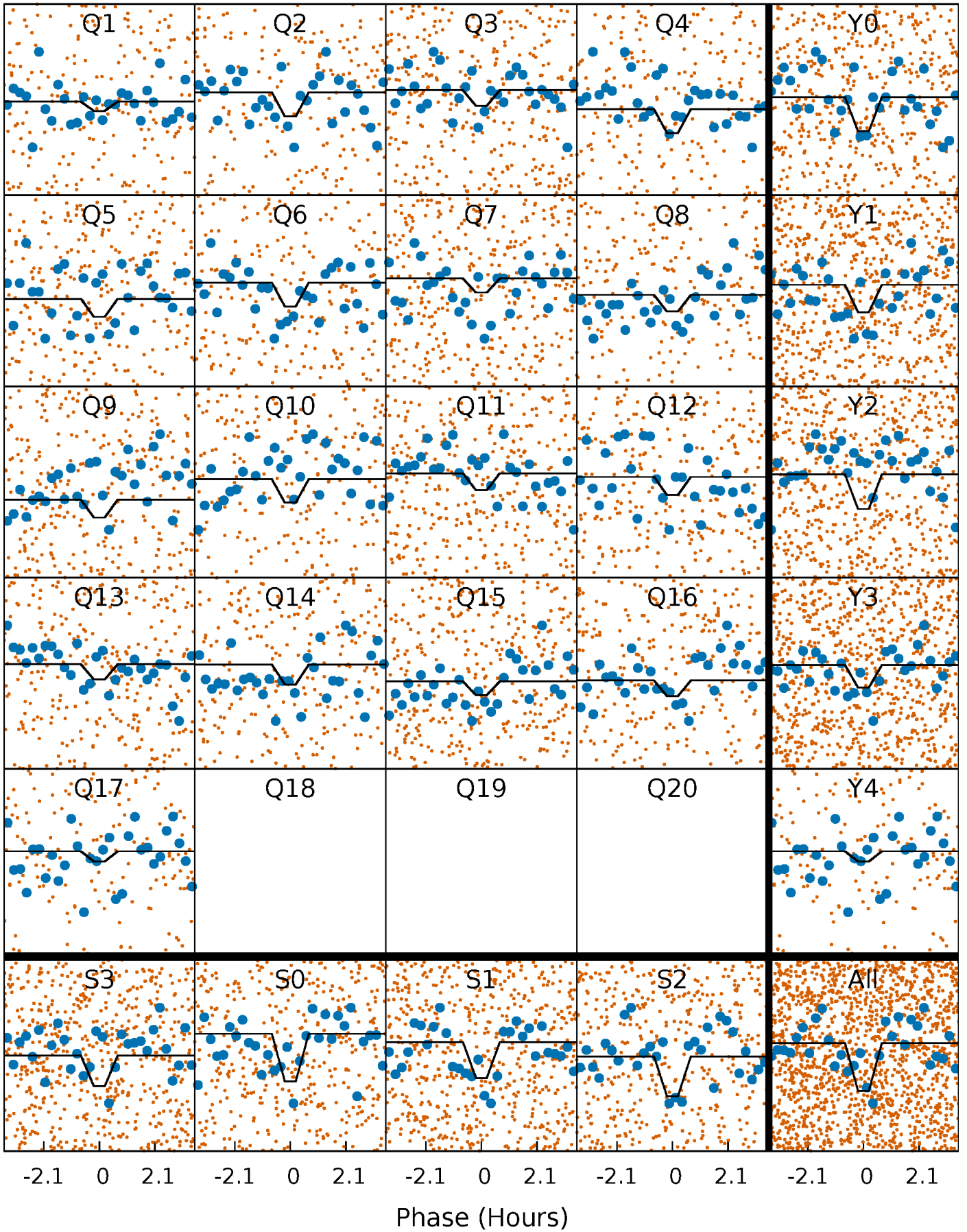
DV Quarter-Phased Transit Curves

TCE 008520436-01 P= 1.024607 Days $T_0=131.522096$ (BKJD)



Alt. Detrend Quarter-Phased Transit Curves

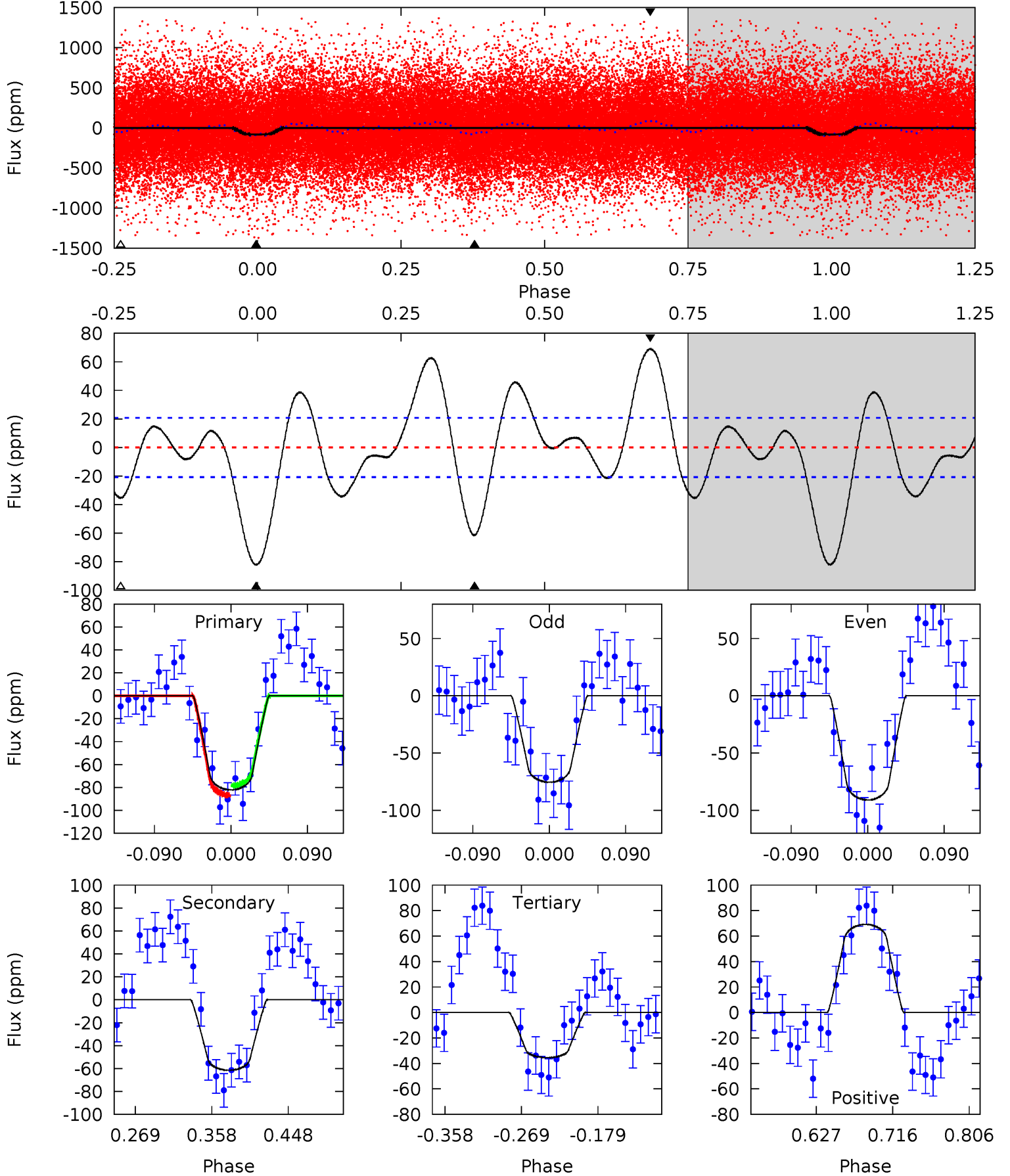
TCE 008520436-01 P= 1.024611 Days $T_0=131.522167$ (BKJD)



DV Model-Shift Uniqueness Test

008520436-01, P = 1.024607 Days, E = 130.497489 Days

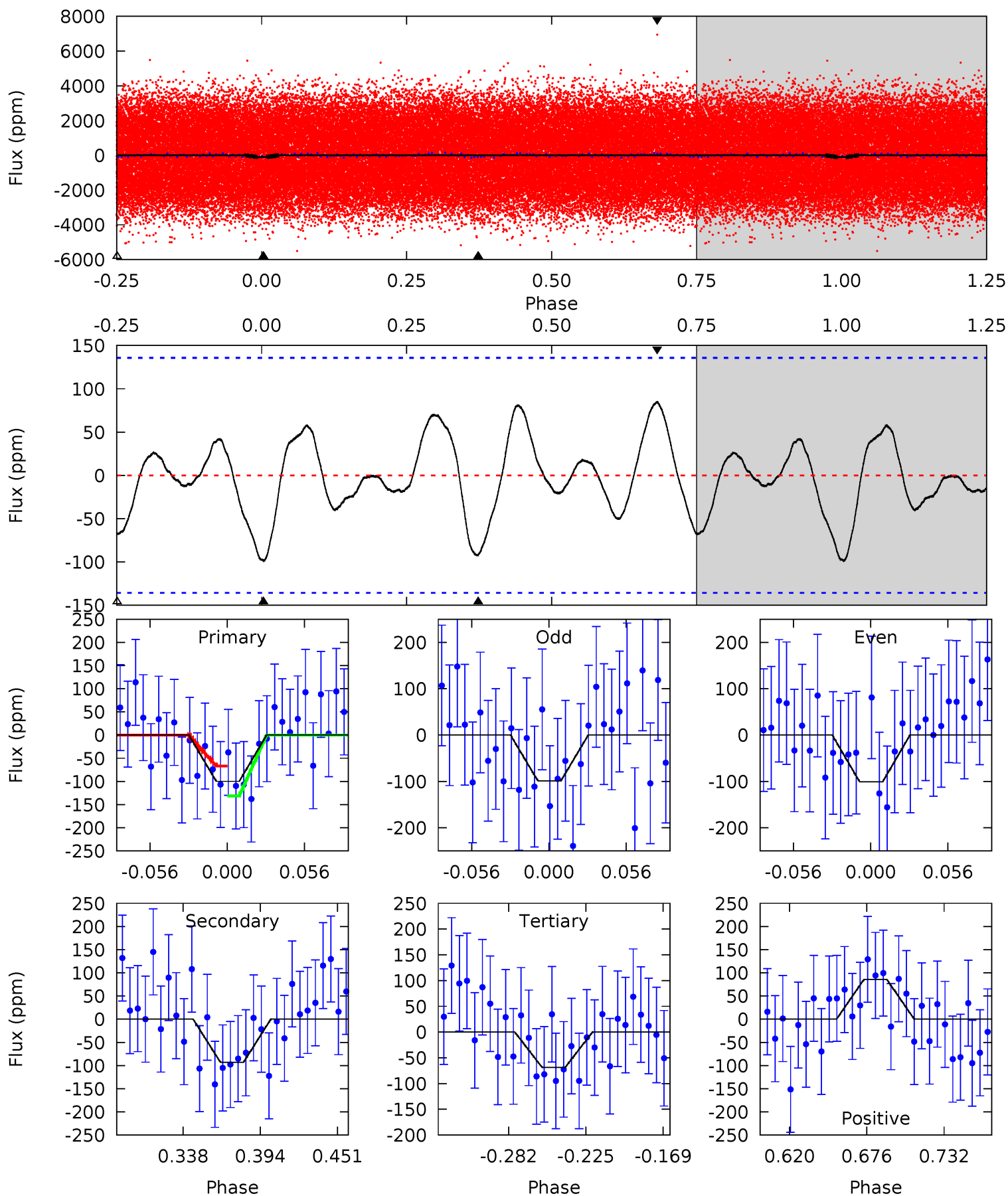
Pri	Sec	Ter	Pos	FA ₁	FA ₂	F _{Red}	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
18.2	13.6	7.83	15.3	4.59	1.70	5.45	10.3	2.89	5.76	-1.68	1.72	0.88	0.46	0.95



Alt Model-Shift Uniqueness Test

008520436-01, P = 1.024611 Days, E = 130.497556 Days

Pri	Sec	Ter	Pos	FA ₁	FA ₂	F _{Red}	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
3.45	3.22	2.37	2.96	4.68	1.91	1.25	1.08	0.49	0.84	0.26	0.04	1.18	0.46	1.11



Stellar Parameters For KIC 008520436

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	6927^{+194}_{-291}	$4.089^{+0.180}_{-0.180}$	$-0.020^{+0.250}_{-0.350}$	$1.818^{+0.555}_{-0.454}$	$1.480^{+0.207}_{-0.254}$	$0.347^{+0.353}_{-0.177}$
	+3%/-4%	+4%/-4%	+1250%/-1750%	+31%/-25%	+14%/-17%	+102%/-51%
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 008520436-01 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	A_{obs}
DV	-61 ± 5	$2.03^{+0.62}_{-0.56}$	3809^{+283}_{-302}	5862^{+1038}_{-672}	$4.260^{+3.830}_{-1.742}$
Alt.	-93 ± 29	$2.03^{+0.69}_{-0.55}$	3812^{+262}_{-286}	6462^{+1405}_{-971}	$6.025^{+6.740}_{-2.996}$

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

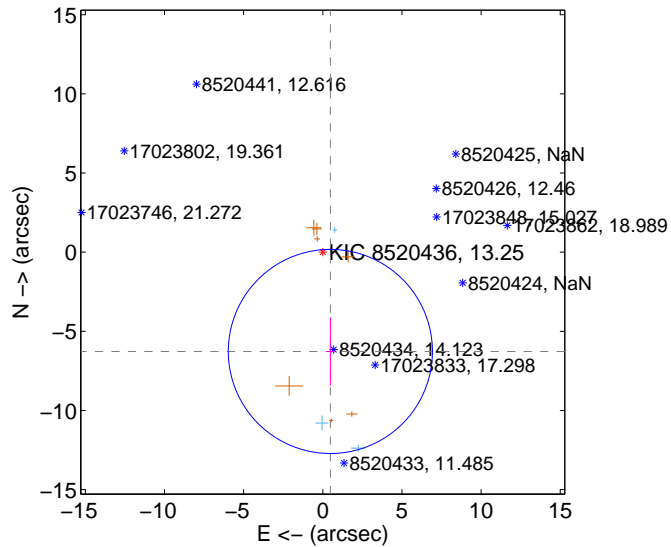
Supplemental centroid analysis for 008520436-01. Kepler magnitude: 13.25. Transit SNR 11.99

There are 3 quarters with good PRF difference image offsets

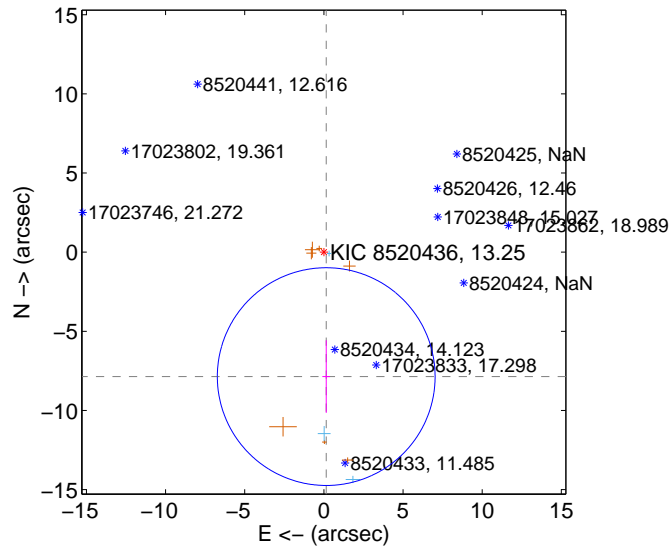
The OOT PRF centroid is offset from the target star catalog position by about 2.93 arcsec so the offset from difference PRF-fit to OOT-fit may be invalid.

	Distance in arcsec	Distance / σ	Δ RA	Δ Dec
PRF-fit source offset from OOT	6.291 ± 2.149	2.93	-0.479 ± 0.266	-6.273 ± 2.156
PRF-fit source offset from KIC position	7.863 ± 2.293	3.43	-0.147 ± 0.242	-7.862 ± 2.293
photometric centroid source offset	0.60 ± 0.40	1.50	0.55 ± 0.37	-0.23 ± 0.53

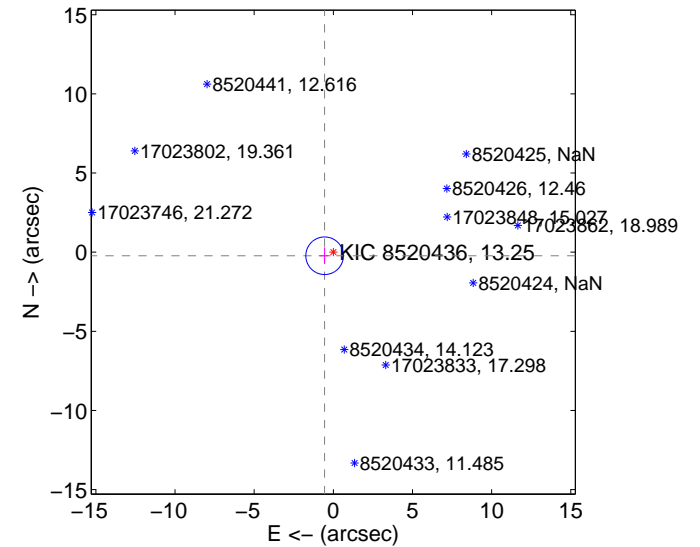
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position

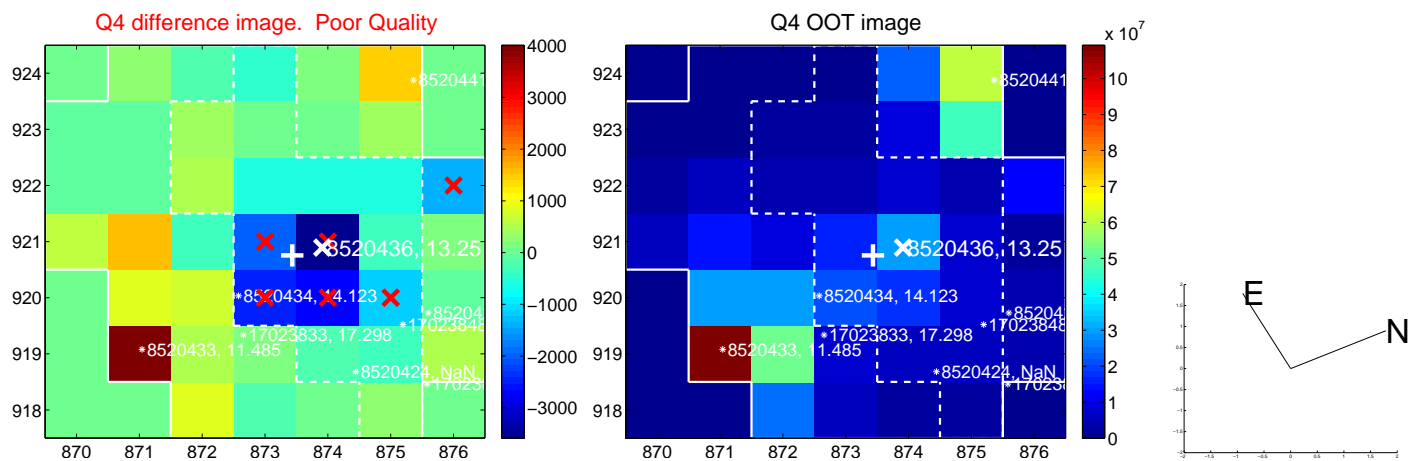
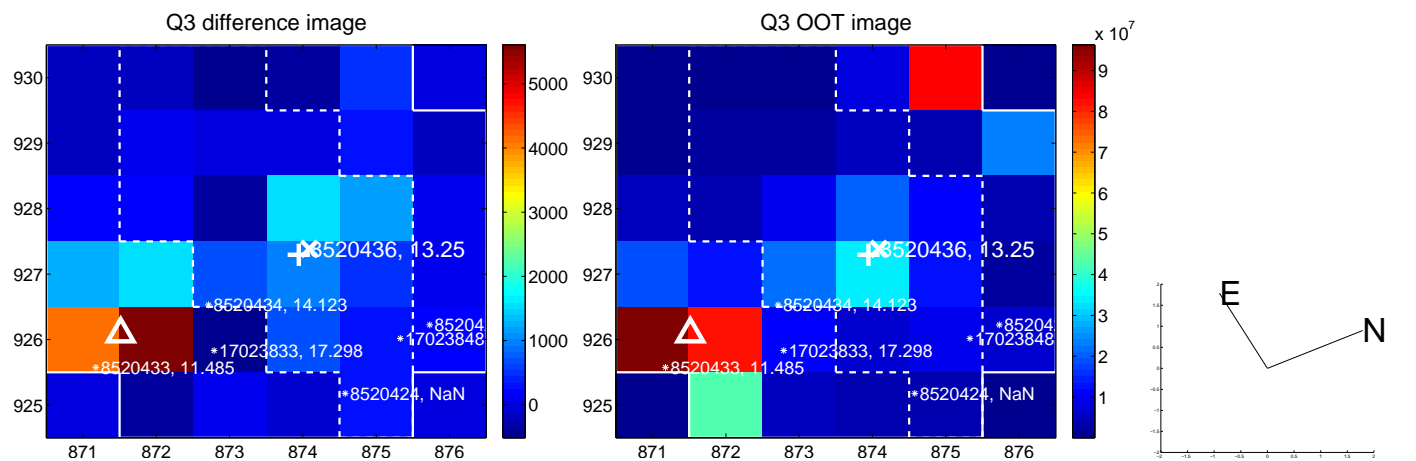
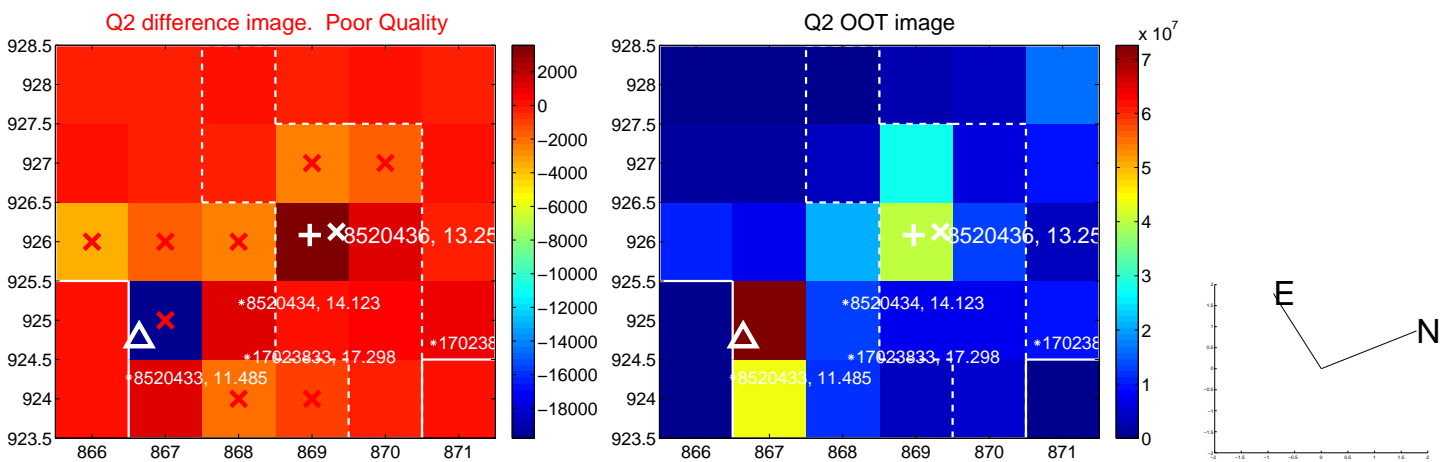
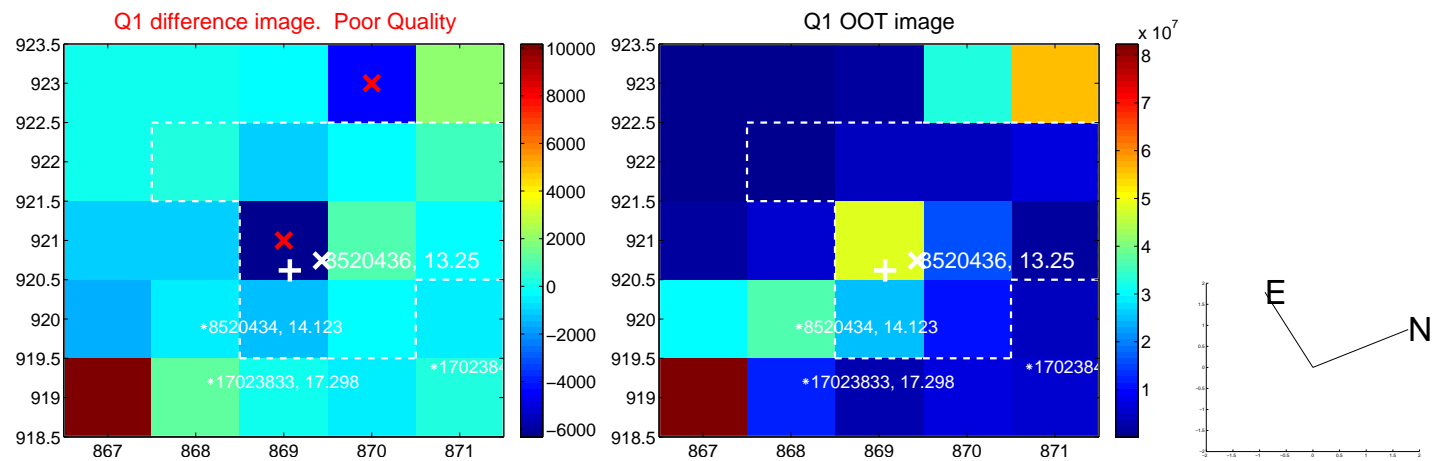


offset from photometric centroids

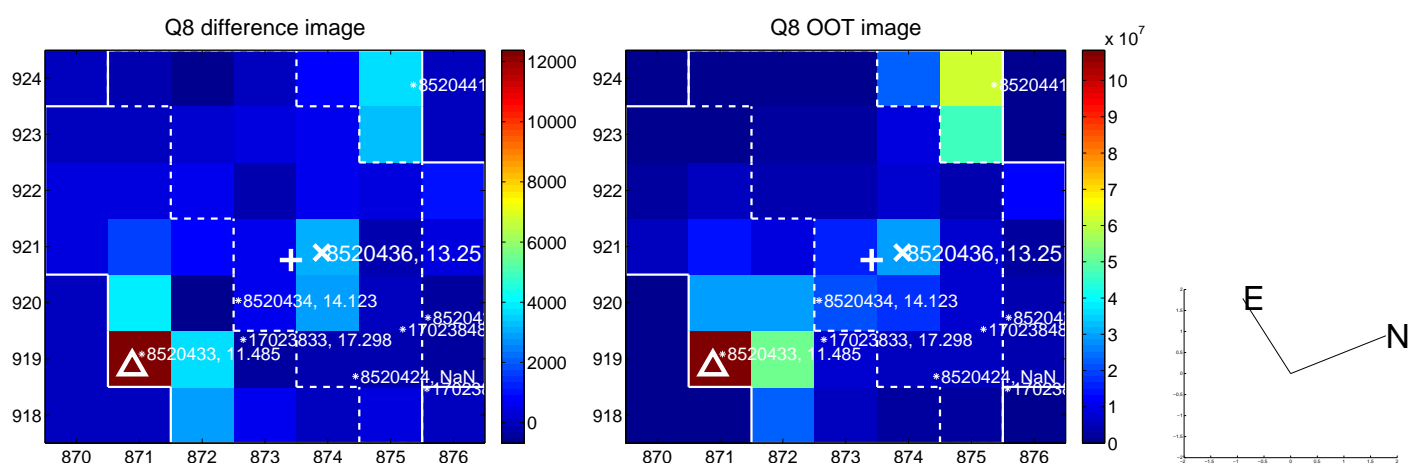
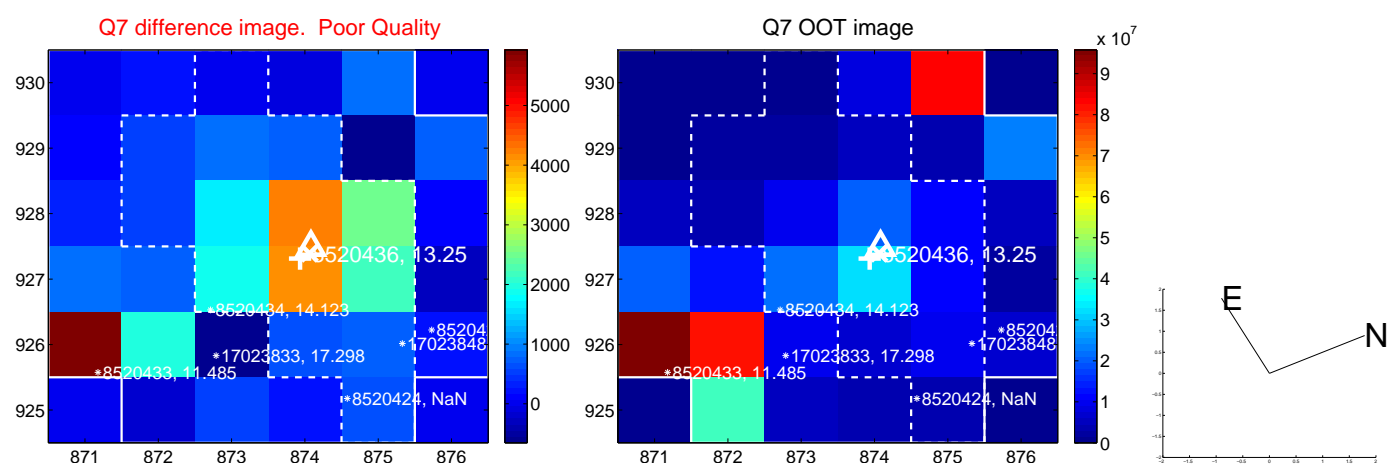
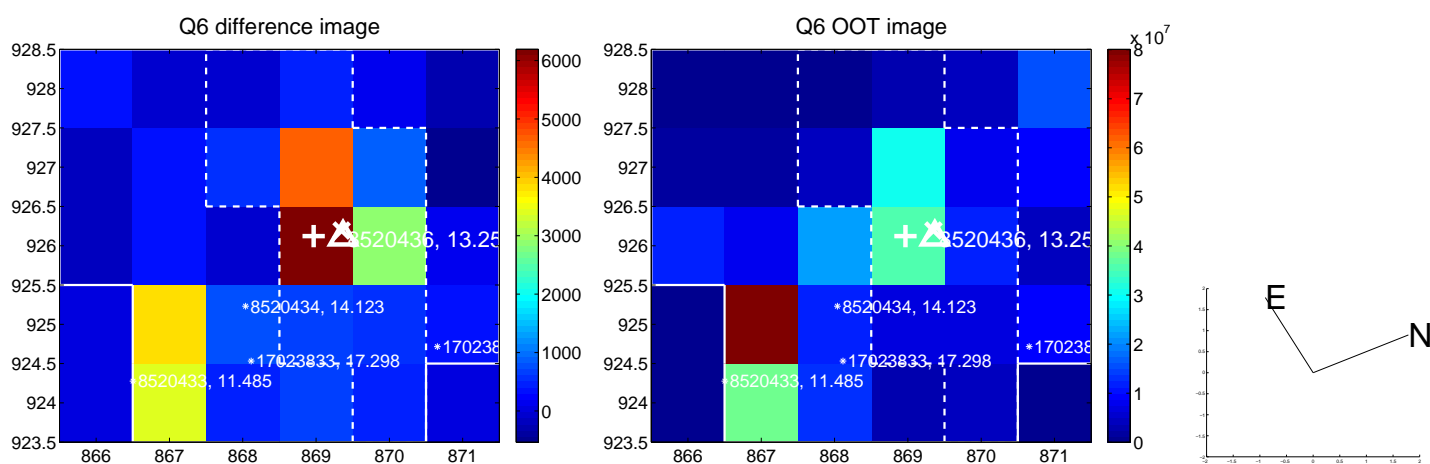
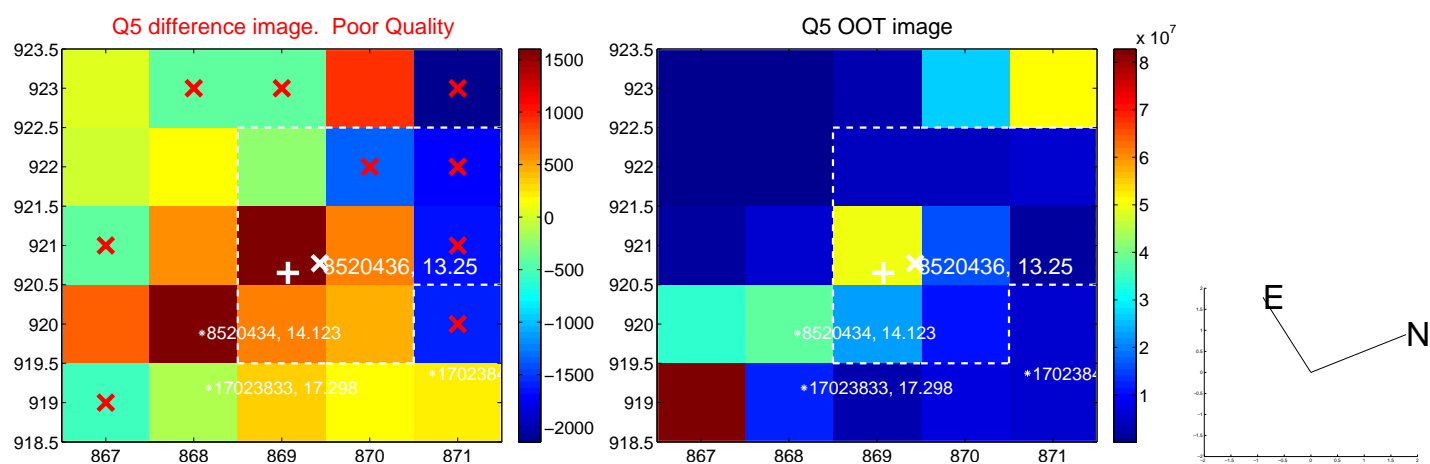


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- σ uncertainty. Blue circle: three- σ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

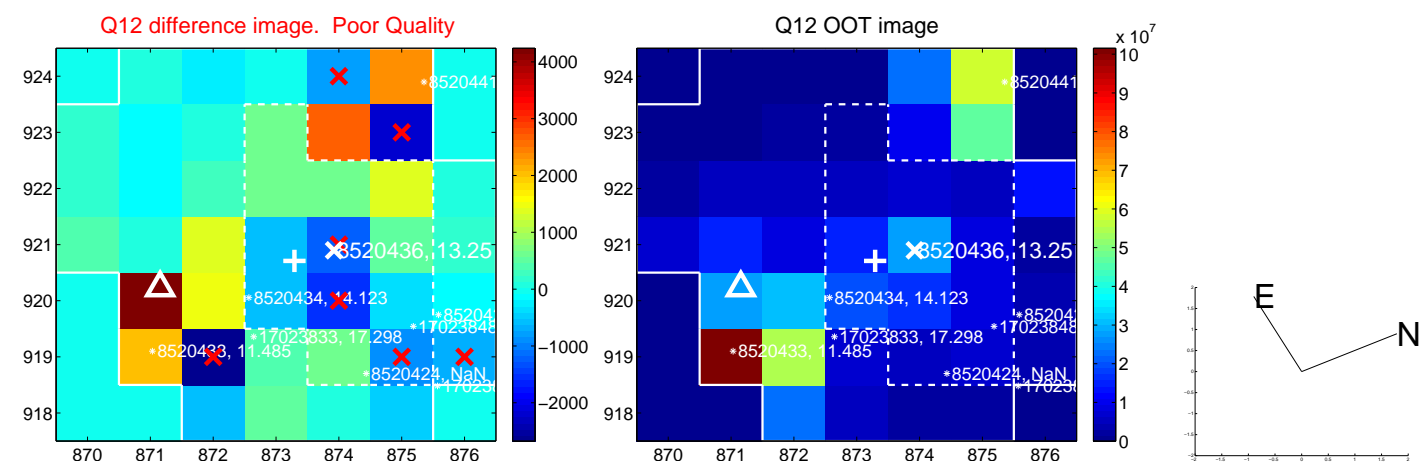
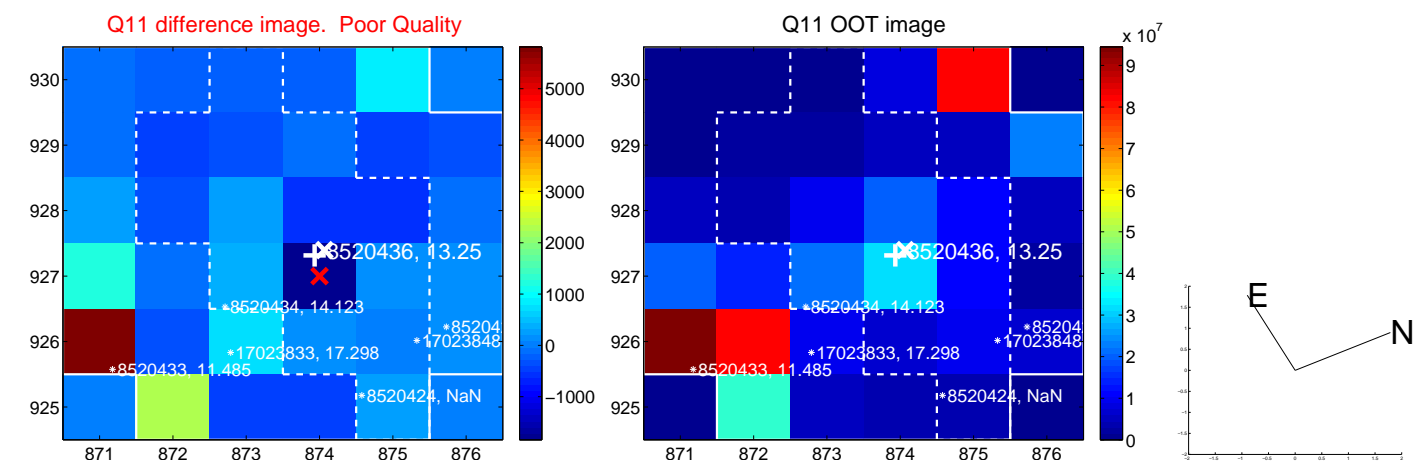
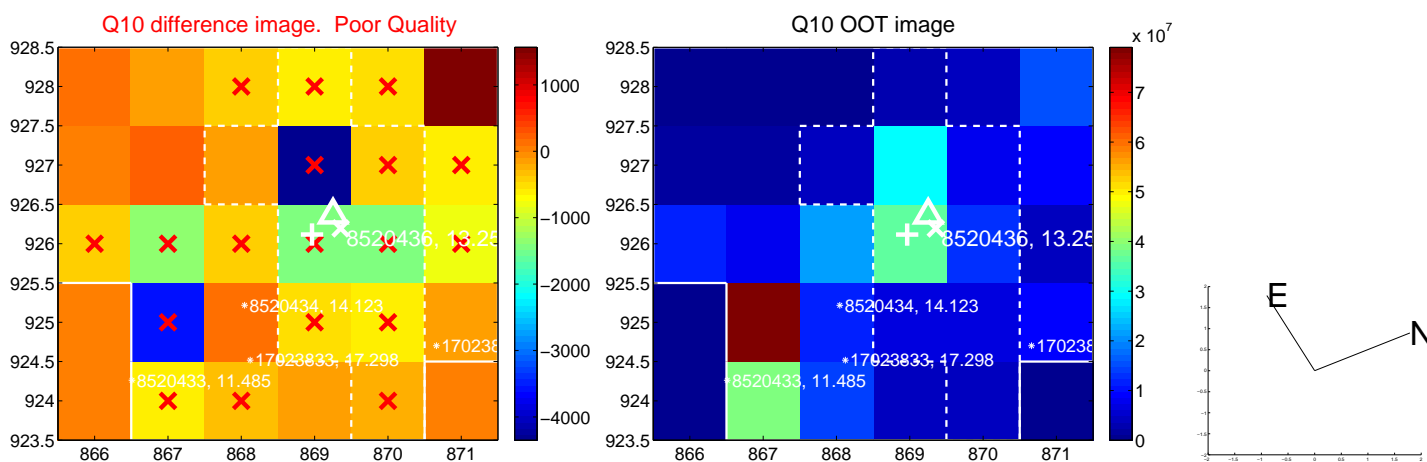
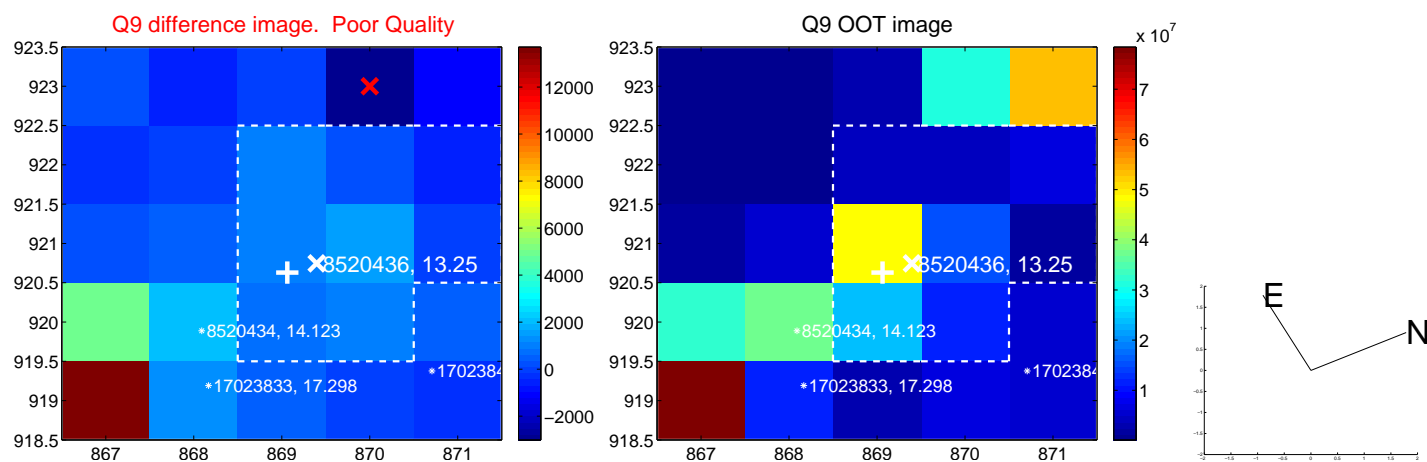
white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



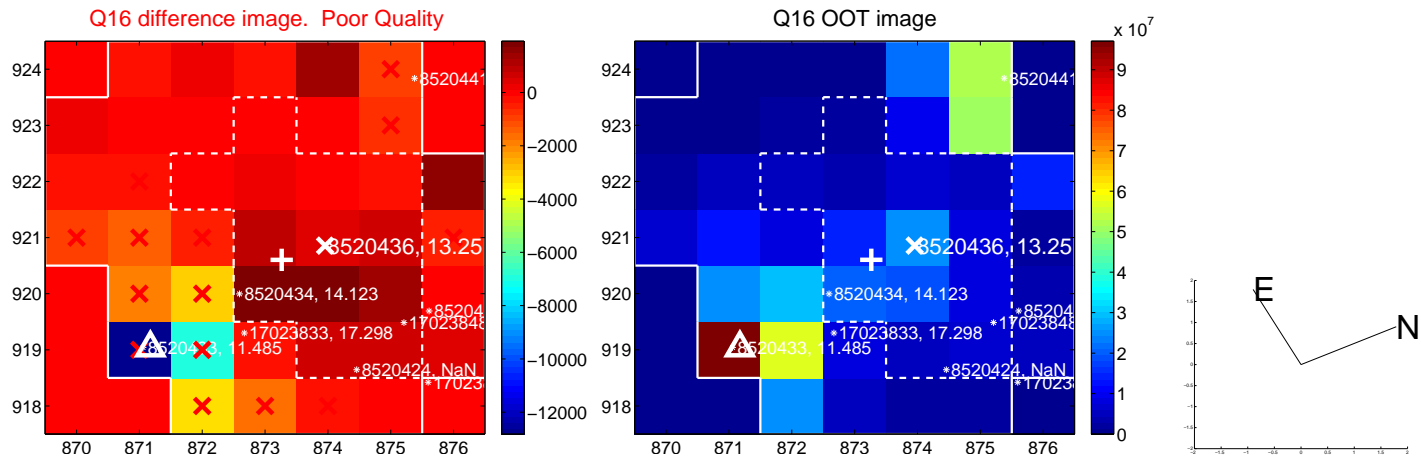
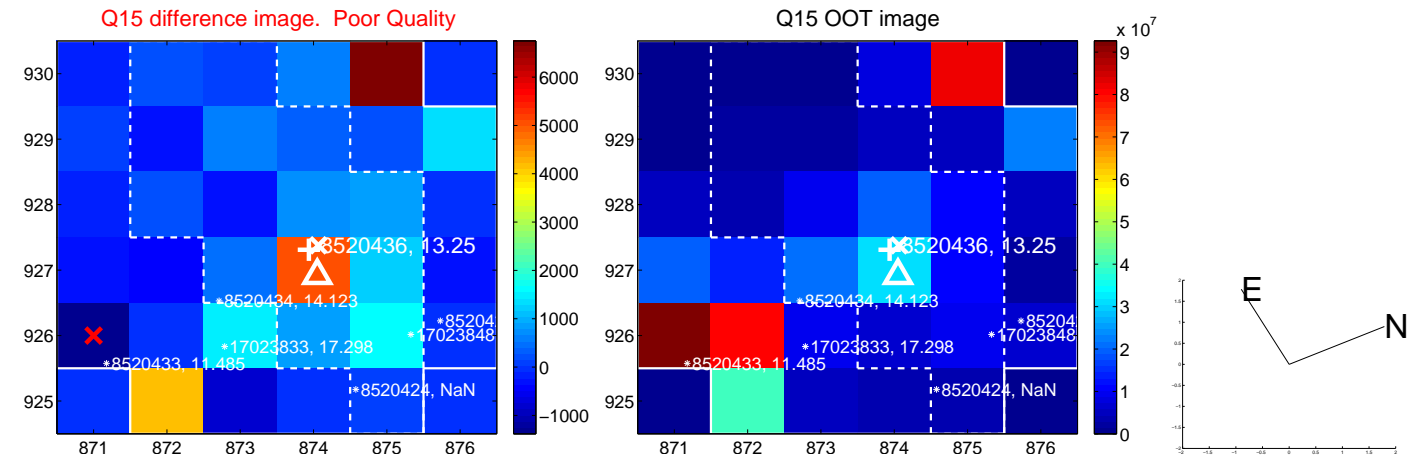
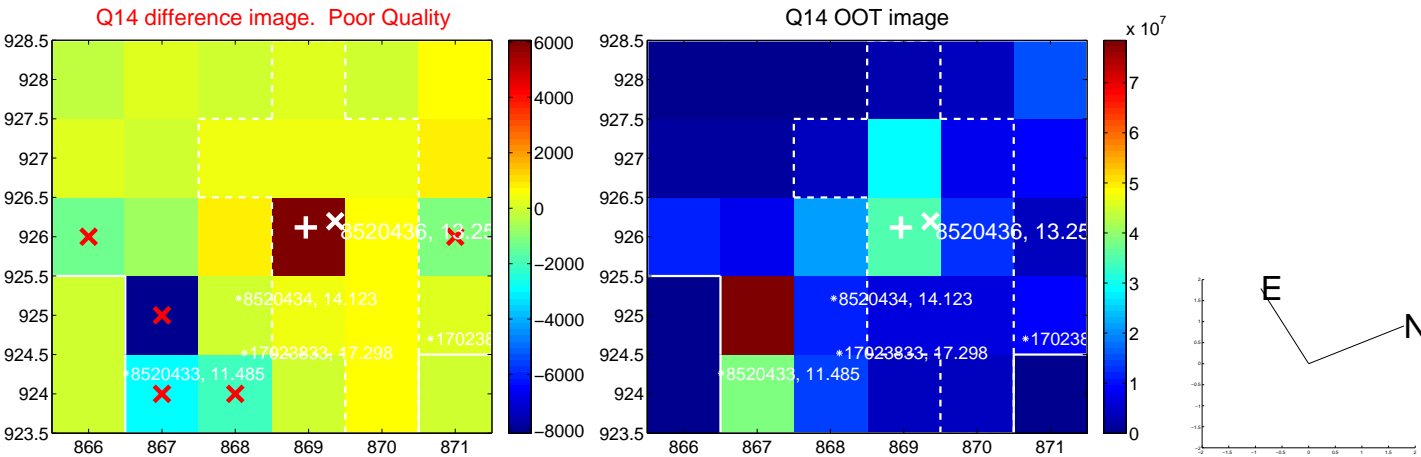
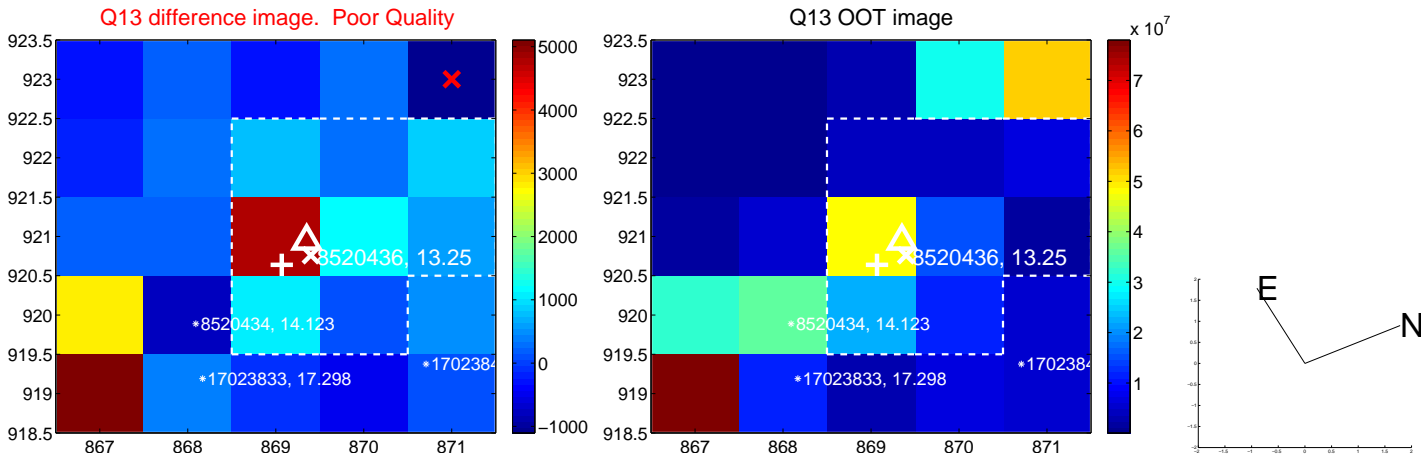
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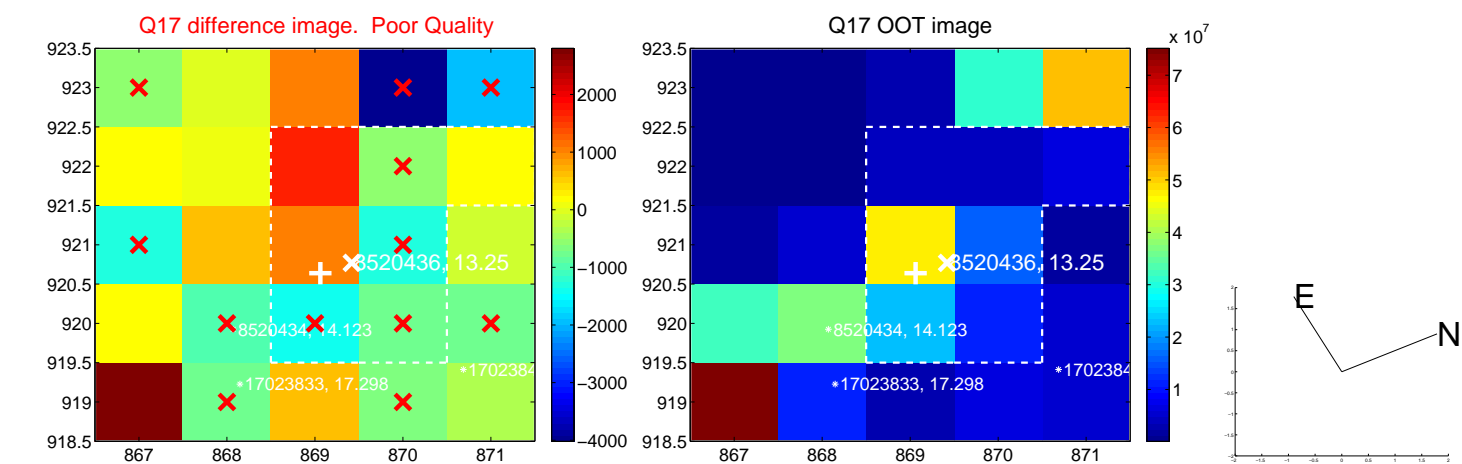
white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



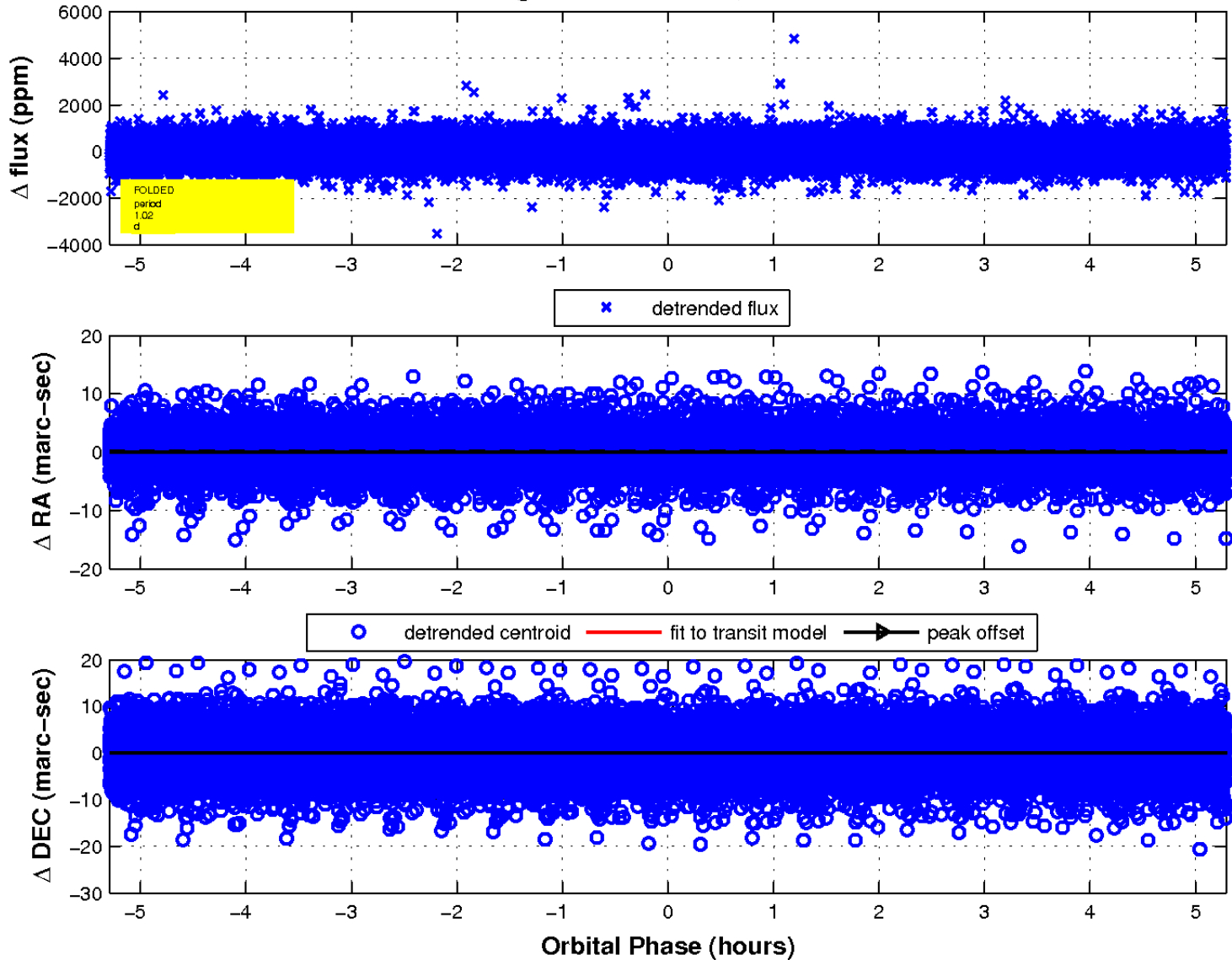
white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



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

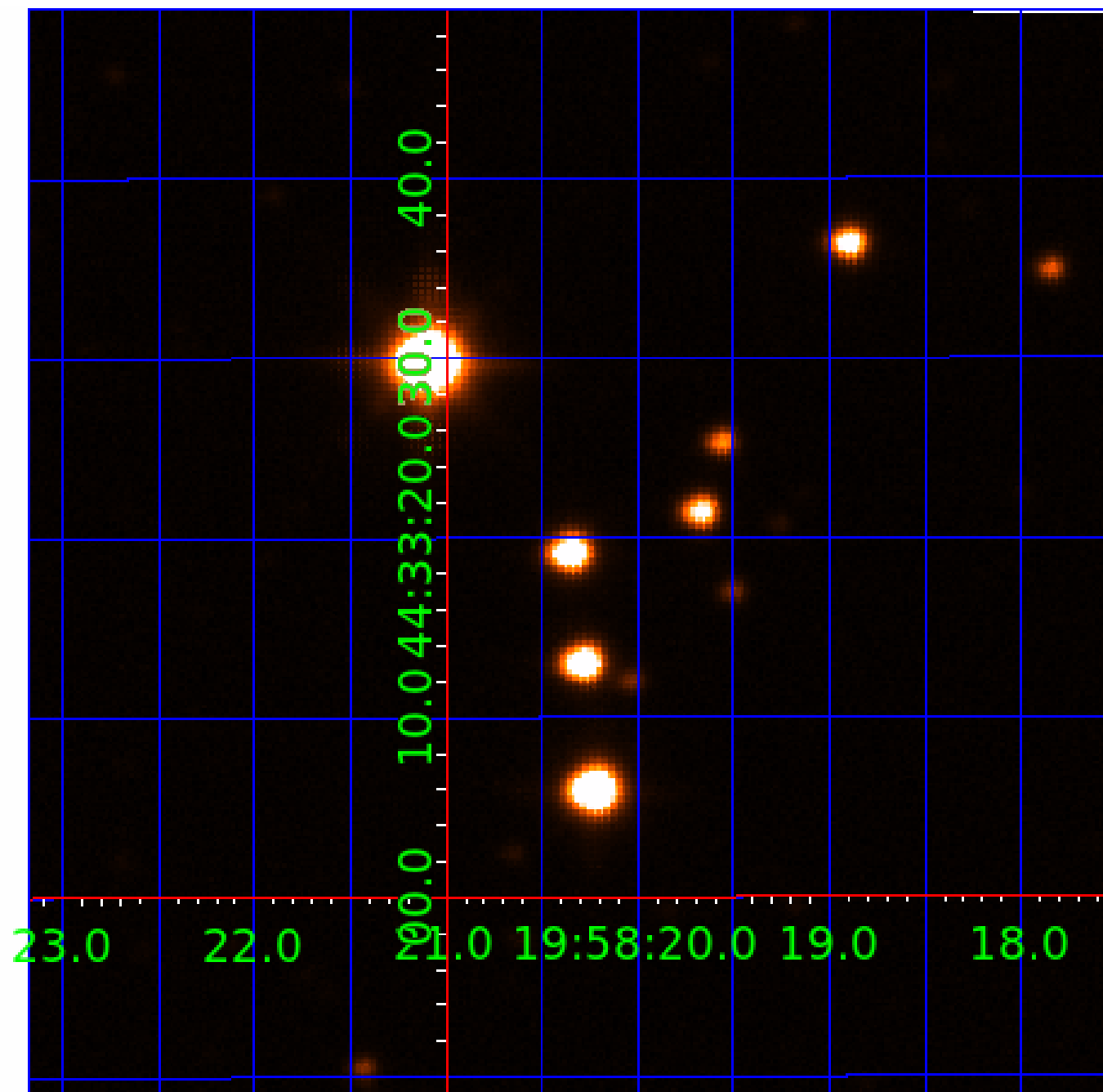


fluxWeightedCentroids, Planet 1 of 2



UKIRT Image

Declination



KIC 008520436

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})
008520436-01	OBS	No	1.024607	131.522096	93.5	1.765	10.1	12.0	1.82	6927	2.05	13265.63
008520436-02	OBS	No	4.463629	135.480994	116.3	29.554	8.8	13.2	1.82	6927	2.48	1864.46

Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
008520436-01	OBS	FP	0.00	1	0	1	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_POS_ALT—CENT_RESOLVED_OFFSET
008520436-02	OBS	FP	0.00	1	0	1	0	LPP_DV—LPP_ALT—CENT_RESOLVED_OFFSET

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

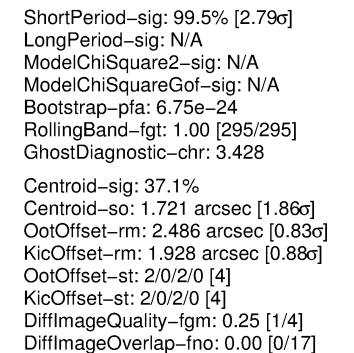
N = Not Transit-Like. S = Stellar Eclipse. C = Centroid Offset. E = Ephemeris Match.

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

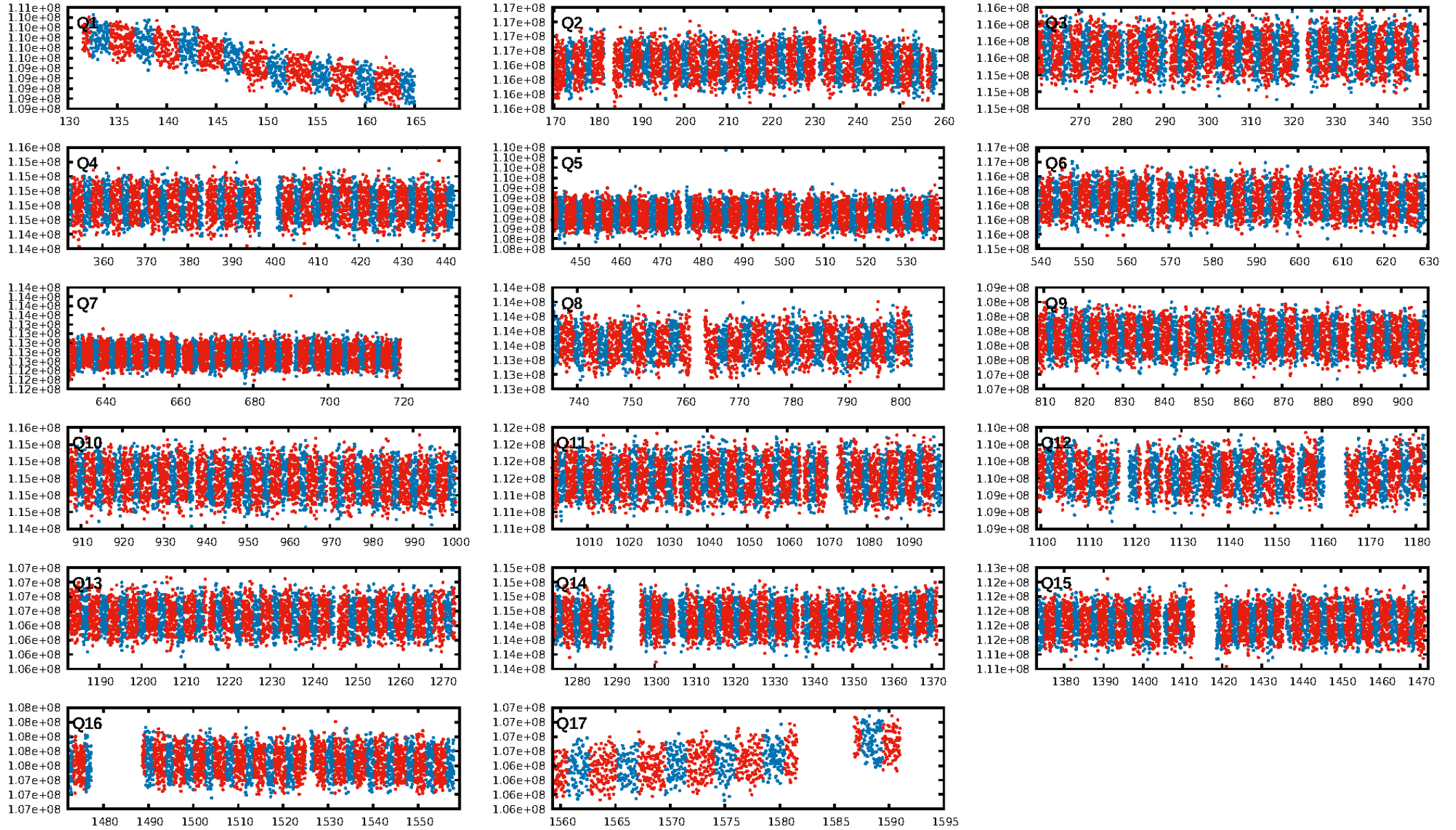
Ephemeris Match Information For 008520436-02

No Significant Match Found

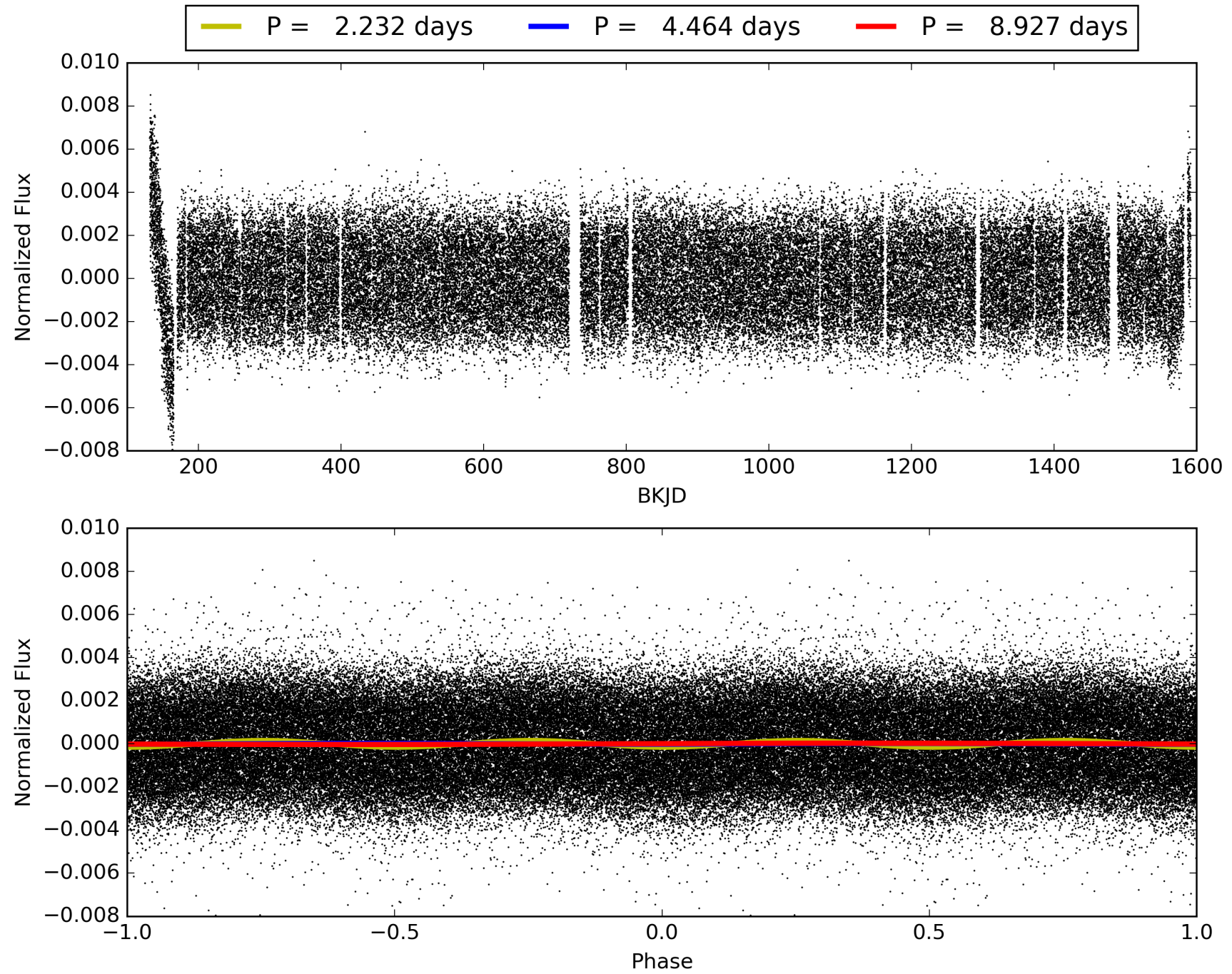
KIC: 8520436 Candidate: 2 of 2 Period: 4.464 d



TCE 008520436-02, PDC Light Curves

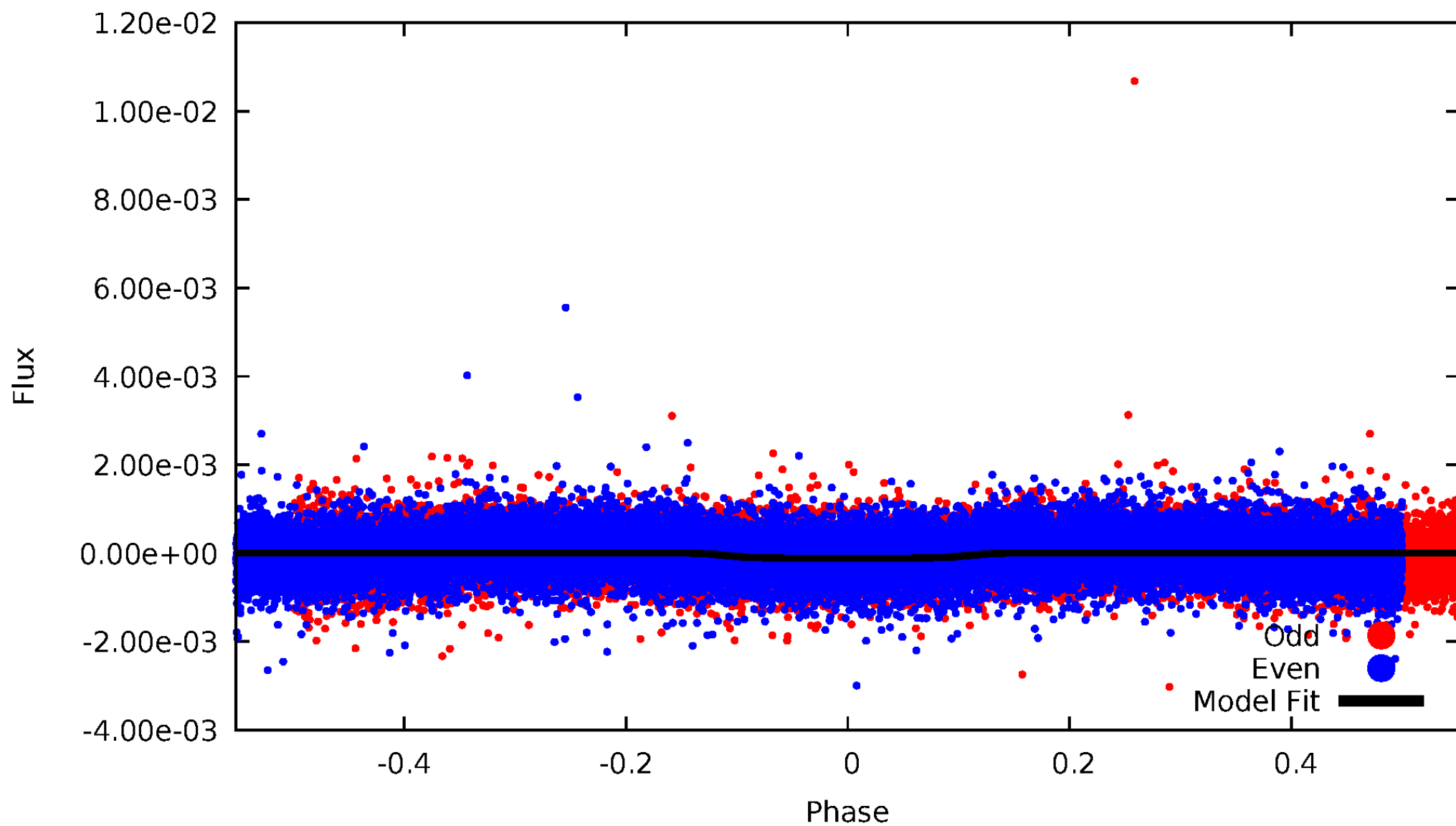


TCE 008520436-02



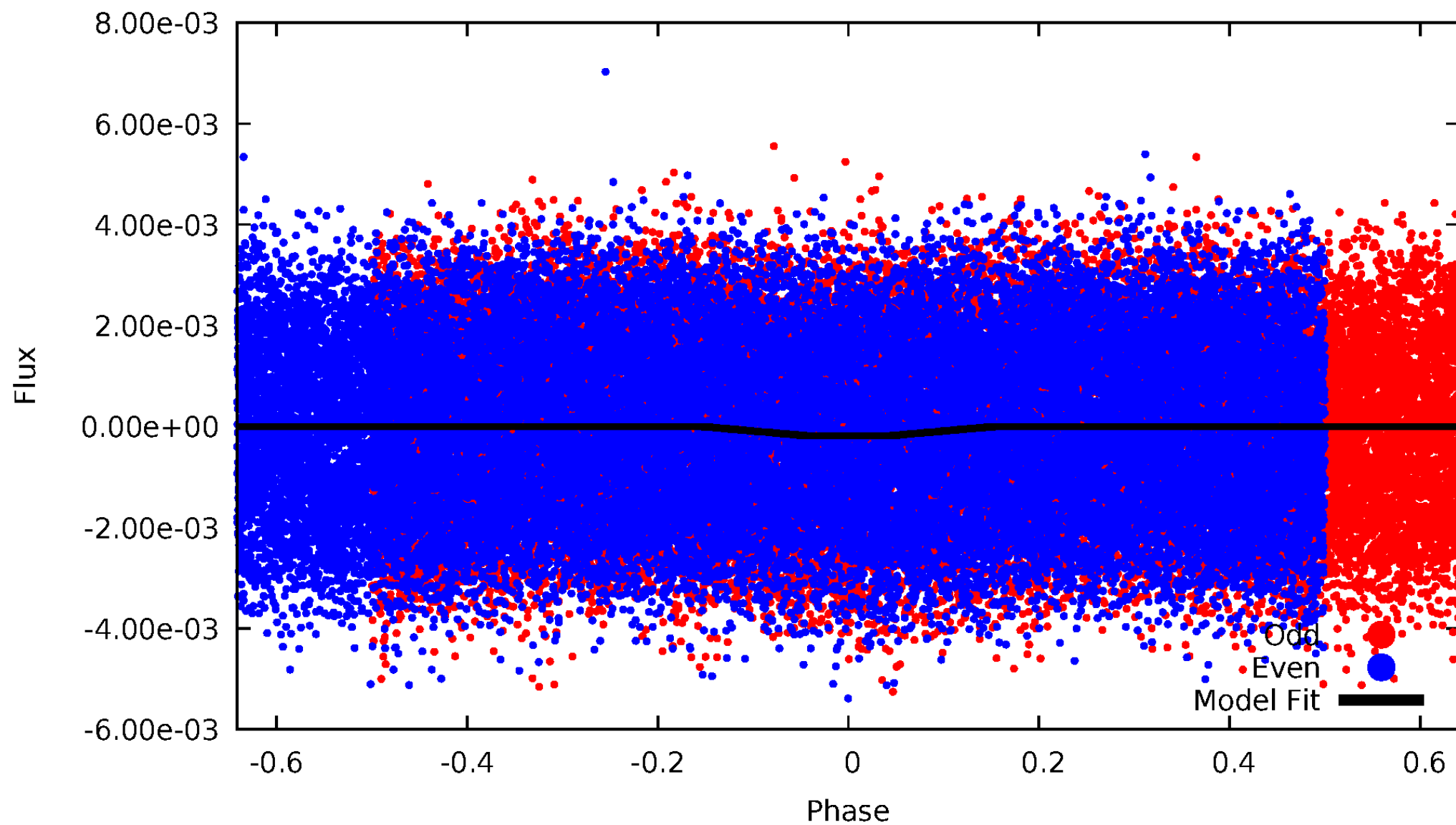
DV Odd/Even

TCE 008520436-02



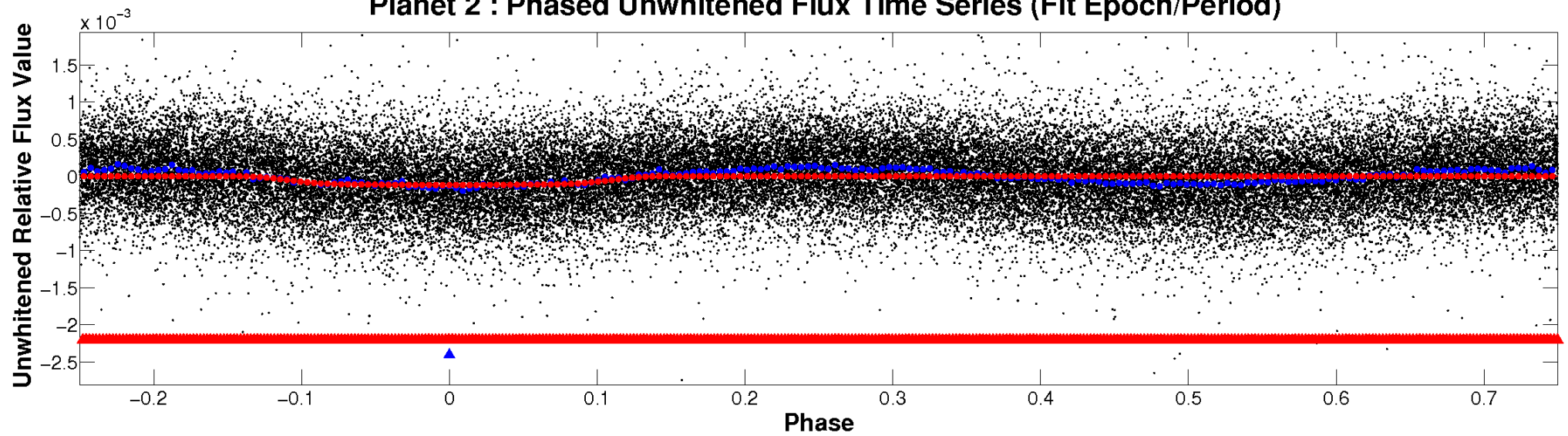
ALT Odd/Even

TCE 008520436-02

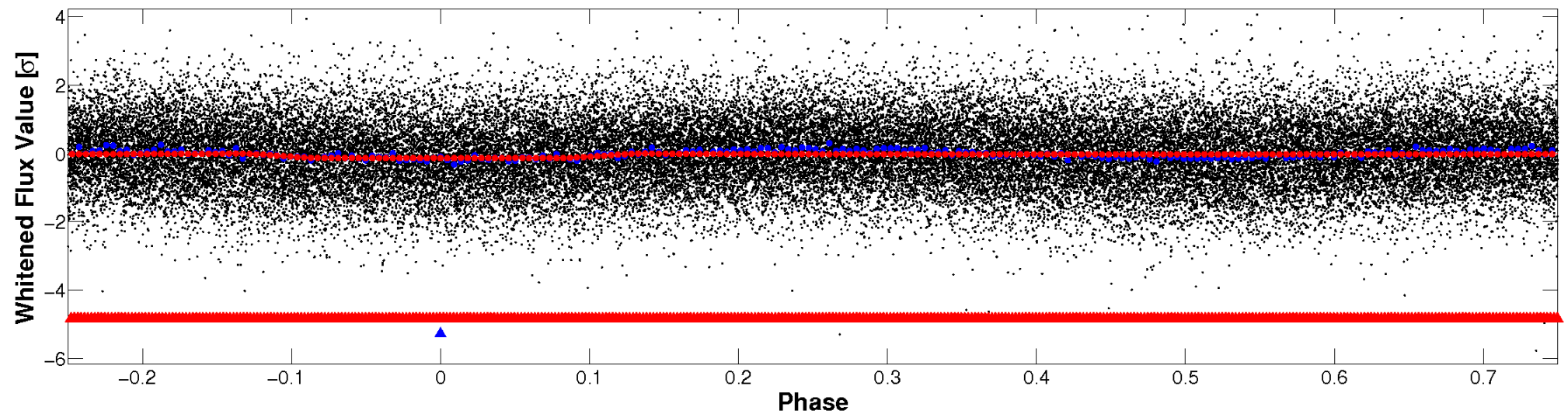


Non-Whitened Vs. Whitened Light Curve

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

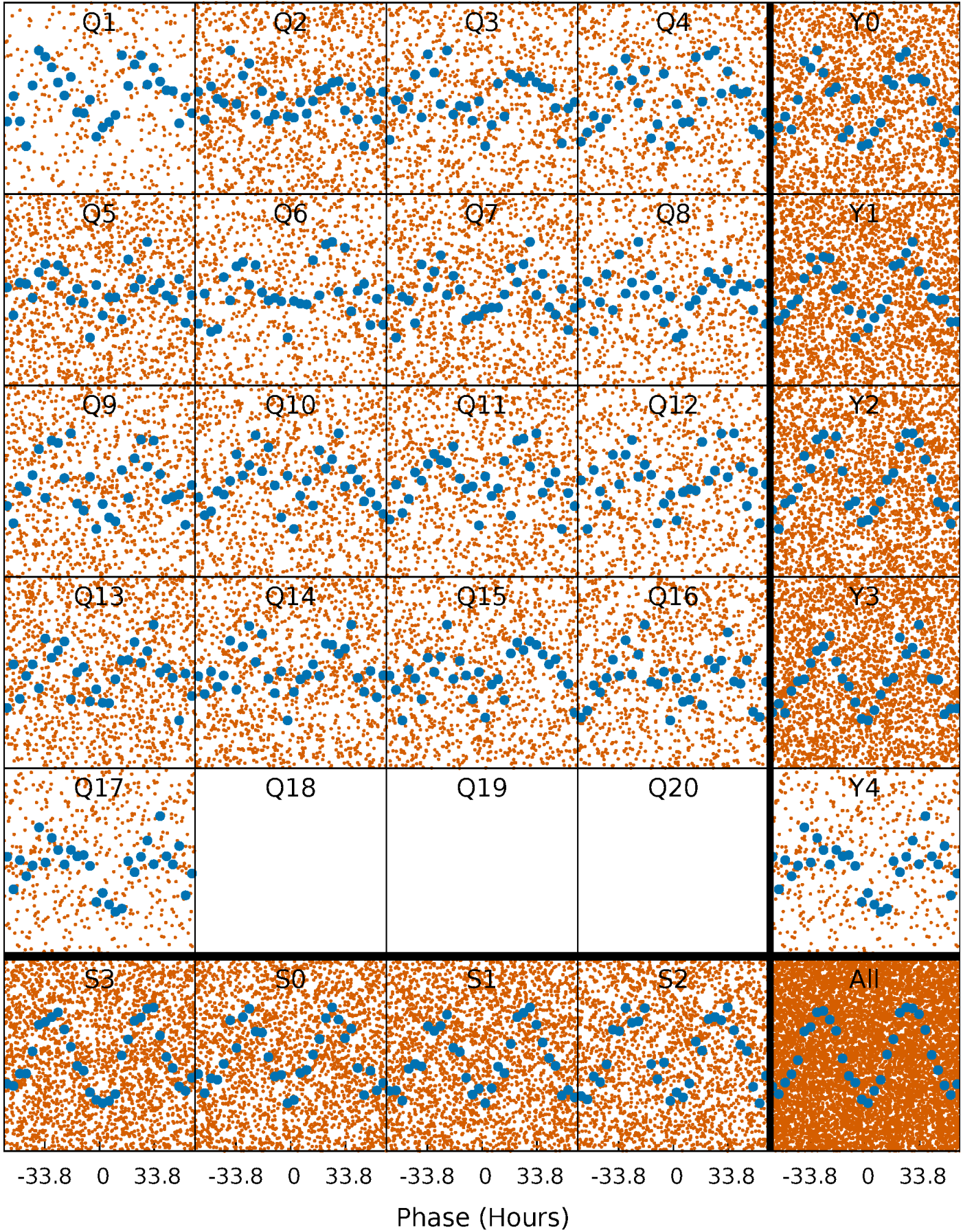


Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



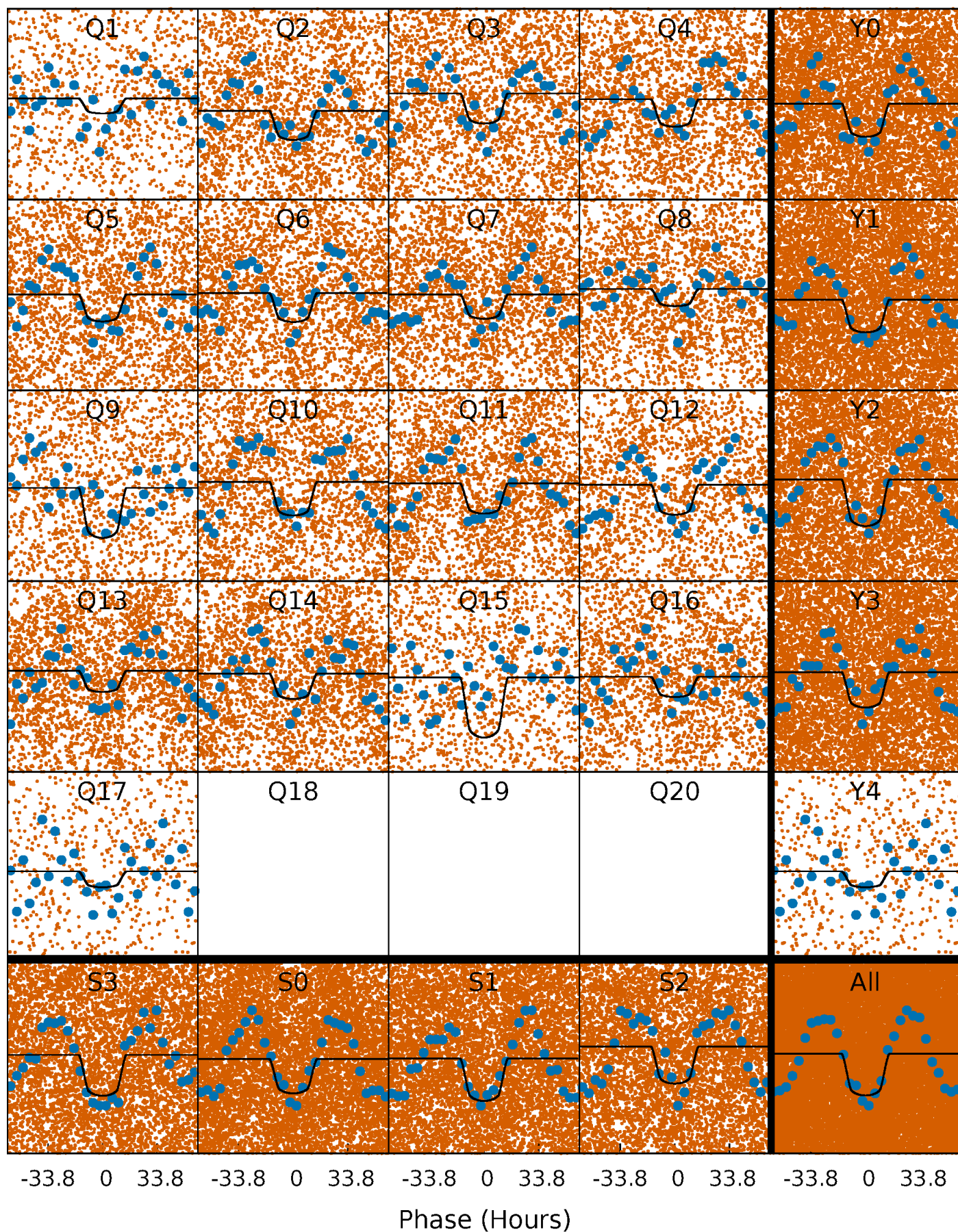
PDC Quarter-Phased Transit Curves

TCE 008520436-02 P= 4.463629 Days $T_0=135.480994$ (BKJD)



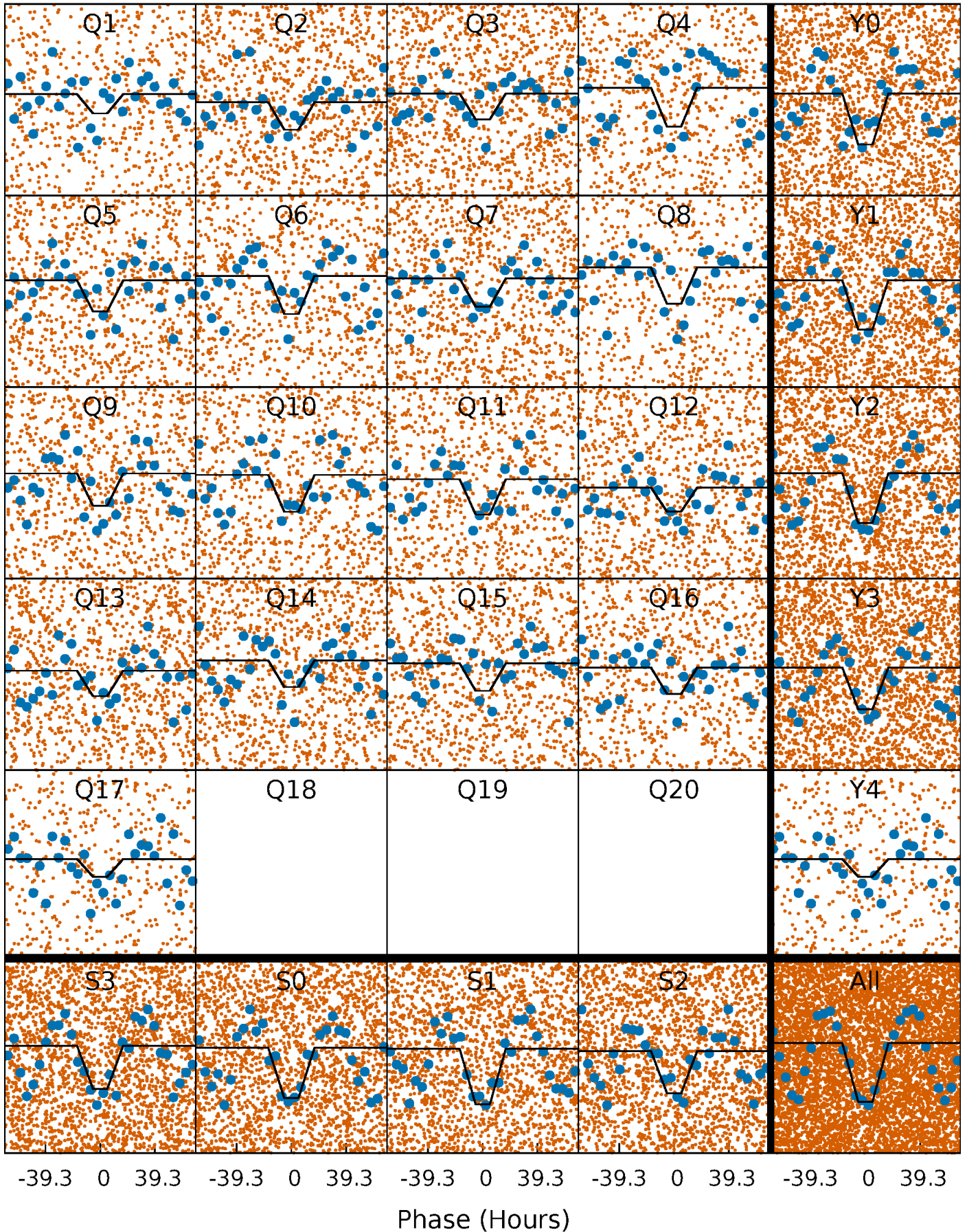
DV Quarter-Phased Transit Curves

TCE 008520436-02 P= 4.463629 Days $T_0=135.480994$ (BKJD)



Alt. Detrend Quarter-Phased Transit Curves

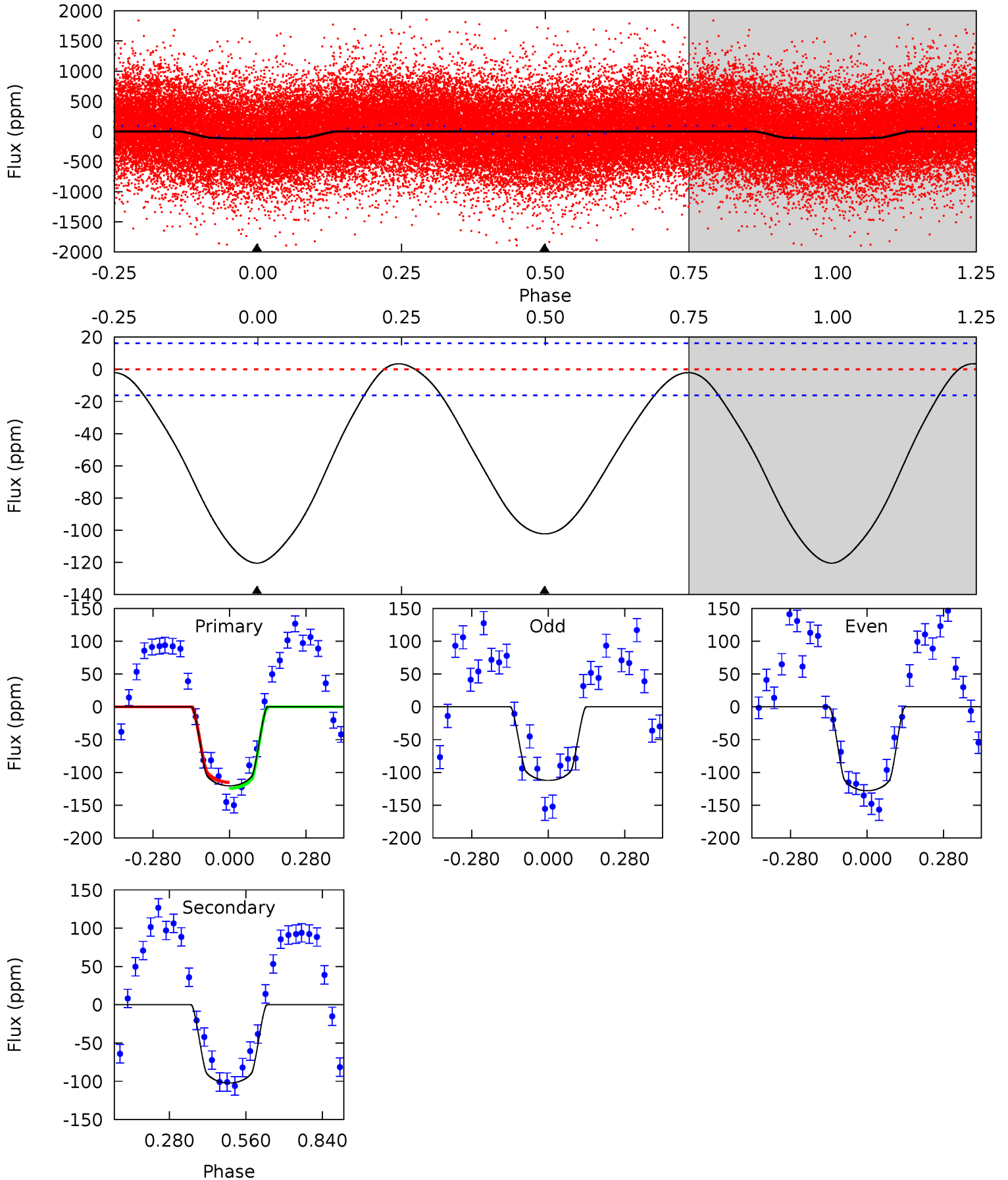
TCE 008520436-02 P= 4.462592 Days $T_0=135.600487$ (BKJD)



DV Model-Shift Uniqueness Test

008520436-02, P = 4.463629 Days, E = 131.017365 Days

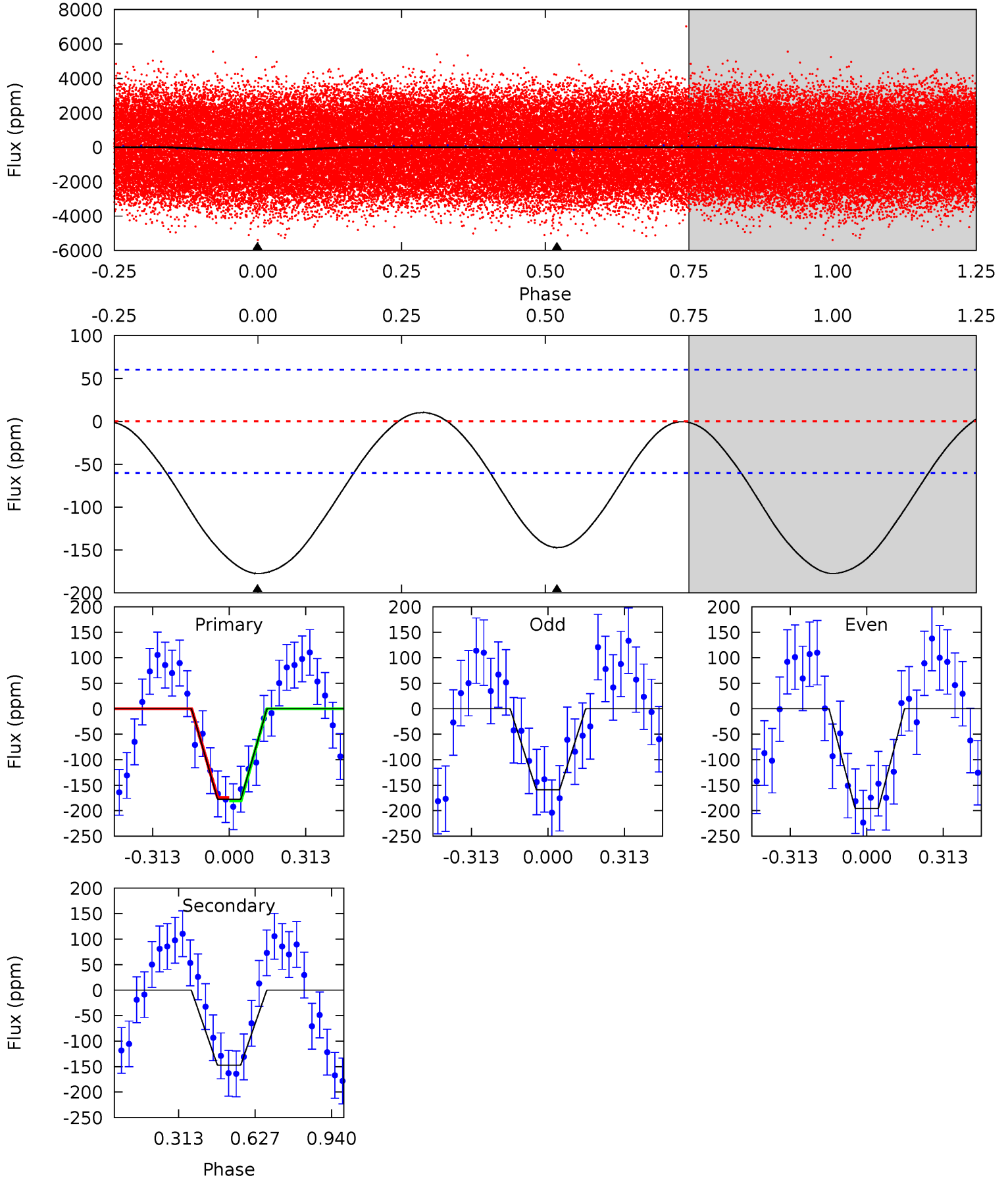
Pri	Sec	Ter	Pos	FA ₁	FA ₂	F _{Red}	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
32.3	27.4	0	0	4.34	1.08	0.77	32.3	32.3	27.4	27.4	2.10	0.81	0.03	1.22



Alt Model-Shift Uniqueness Test

008520436-02, P = 4.462592 Days, E = 131.137895 Days

Pri	Sec	Ter	Pos	FA ₁	FA ₂	F _{Red}	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
12.7	10.5	0	0	4.32	1.01	0.49	12.7	12.7	10.5	10.5	1.32	1.09	0.06	0.25



Stellar Parameters For KIC 008520436

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} \text{ (g}\cdot\text{cm}^{-3}\text{)}$
	6927^{+194}_{-291}	$4.089^{+0.180}_{-0.180}$	$-0.020^{+0.250}_{-0.350}$	$1.818^{+0.555}_{-0.454}$	$1.480^{+0.207}_{-0.254}$	$0.347^{+0.353}_{-0.177}$
	+3%/-4%	+4%/-4%	+1250%/-1750%	+31%/-25%	+14%/-17%	+102%/-51%
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 008520436-02 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} \text{ (K)}$	$T_{obs} \text{ (K)}$	A_{obs}
DV	-102±4	$2.48^{+0.45}_{-0.33}$	2346^{+177}_{-181}	6147^{+267}_{-248}	33^{+10}_{-8}
Alt.	-147±14	$2.64^{+0.44}_{-0.36}$	2336^{+176}_{-186}	6520^{+320}_{-312}	42^{+14}_{-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 $A_{obs} \gg 1.0$

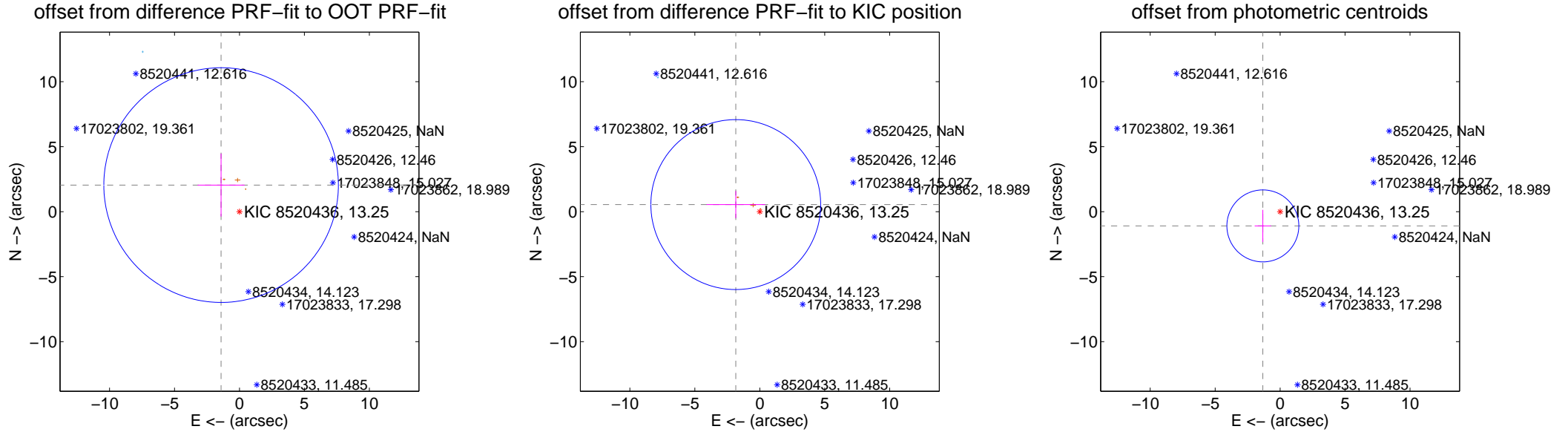
DV Centroid Data

Supplemental centroid analysis for 008520436-02. Kepler magnitude: 13.25. Transit SNR 13.17

There are 1 quarters with good PRF difference image offsets

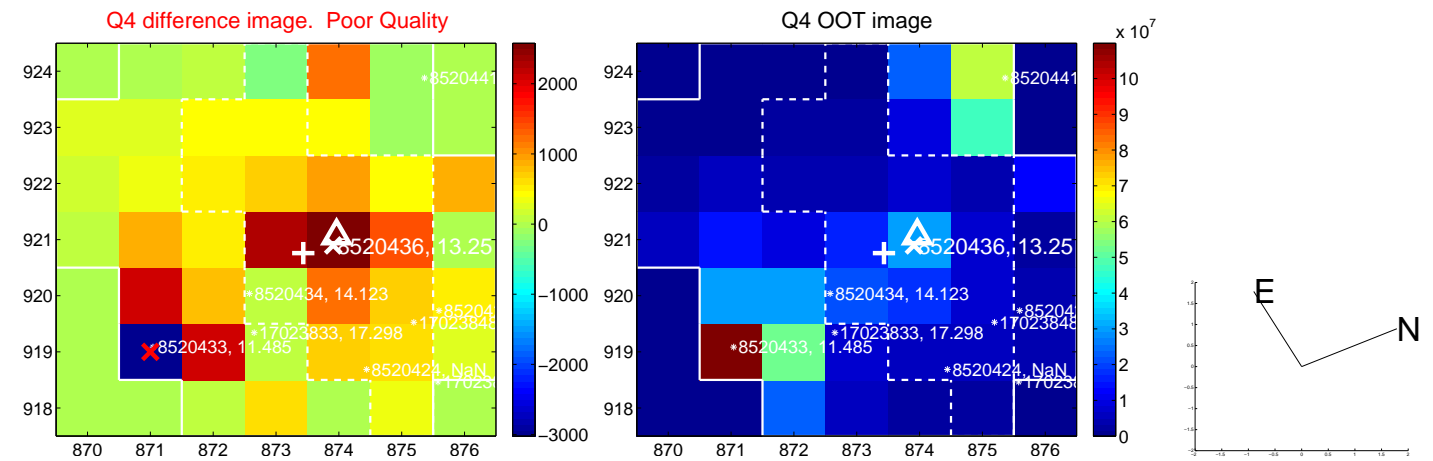
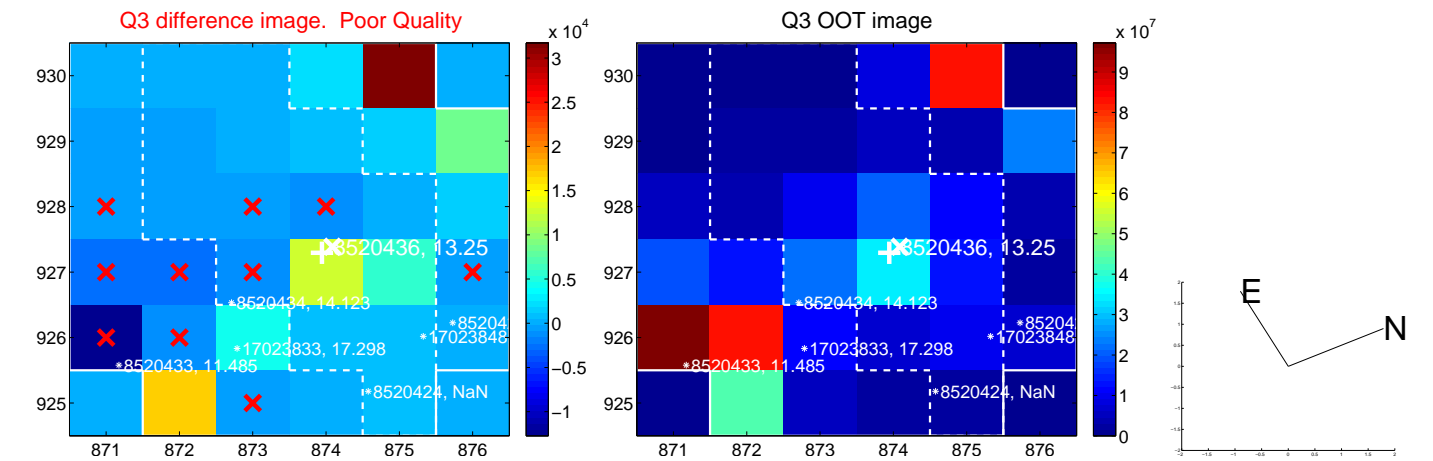
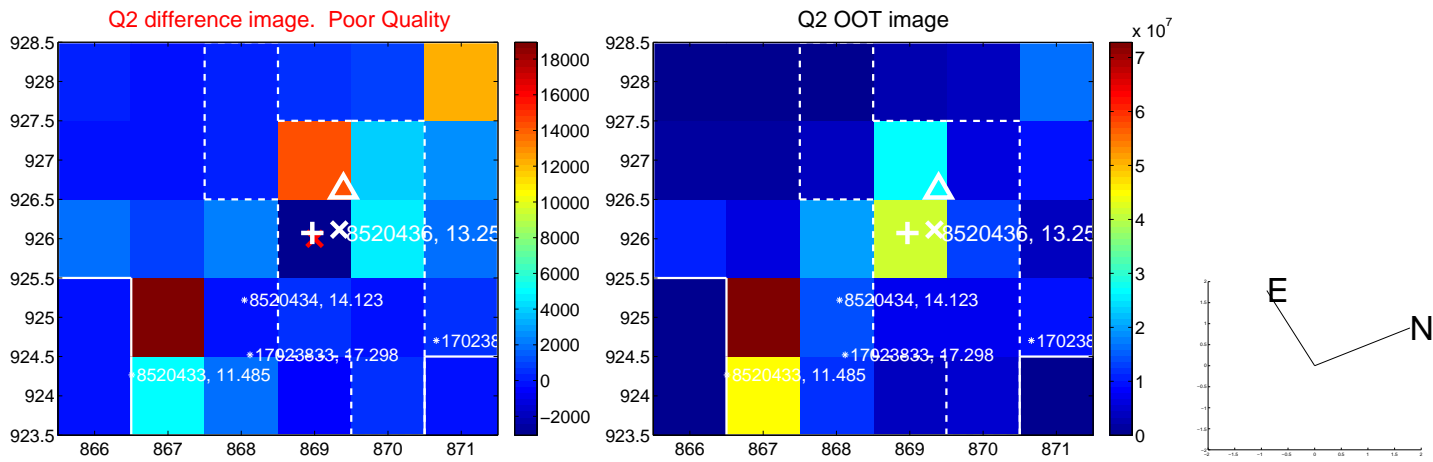
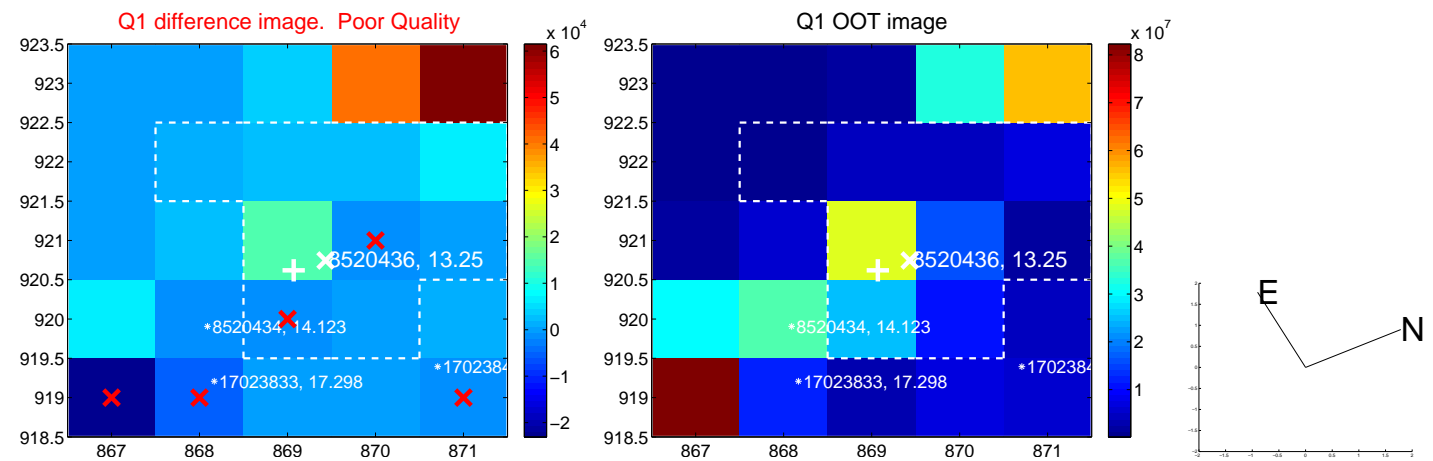
The direct PRF centroid is offset from the target star catalog position by about 1.57 arcsec

	Distance in arcsec	Distance / σ	Δ RA	Δ Dec
PRF-fit source offset from OOT	2.486 ± 3.010	0.83	1.413 ± 1.804	2.045 ± 2.424
PRF-fit source offset from KIC position	1.928 ± 2.179	0.88	1.849 ± 2.251	0.546 ± 1.045
photometric centroid source offset	1.72 ± 0.92	1.86	1.33 ± 0.63	-1.09 ± 1.23

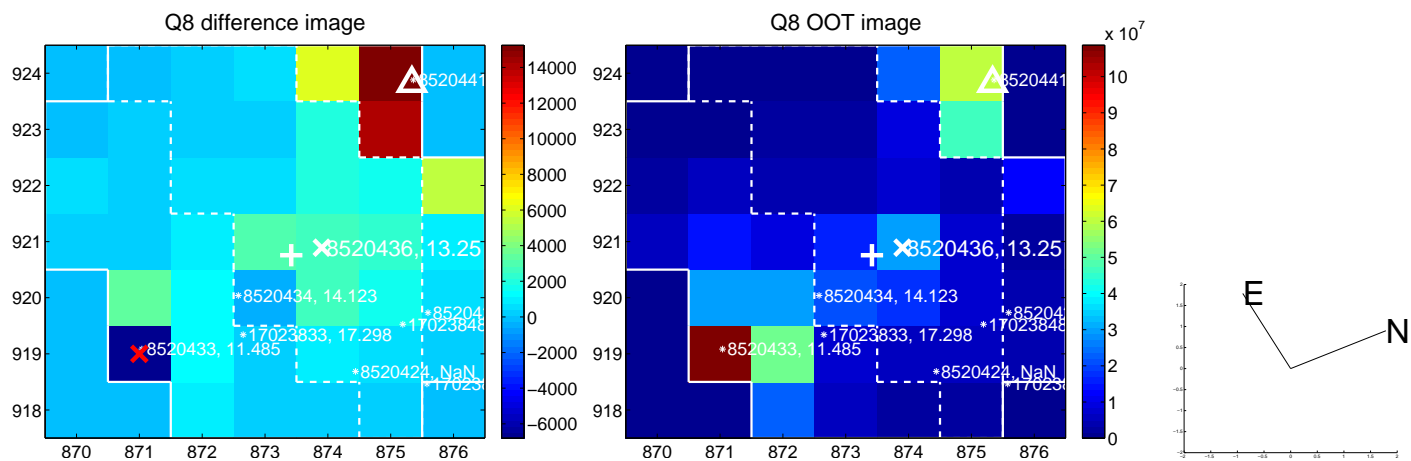
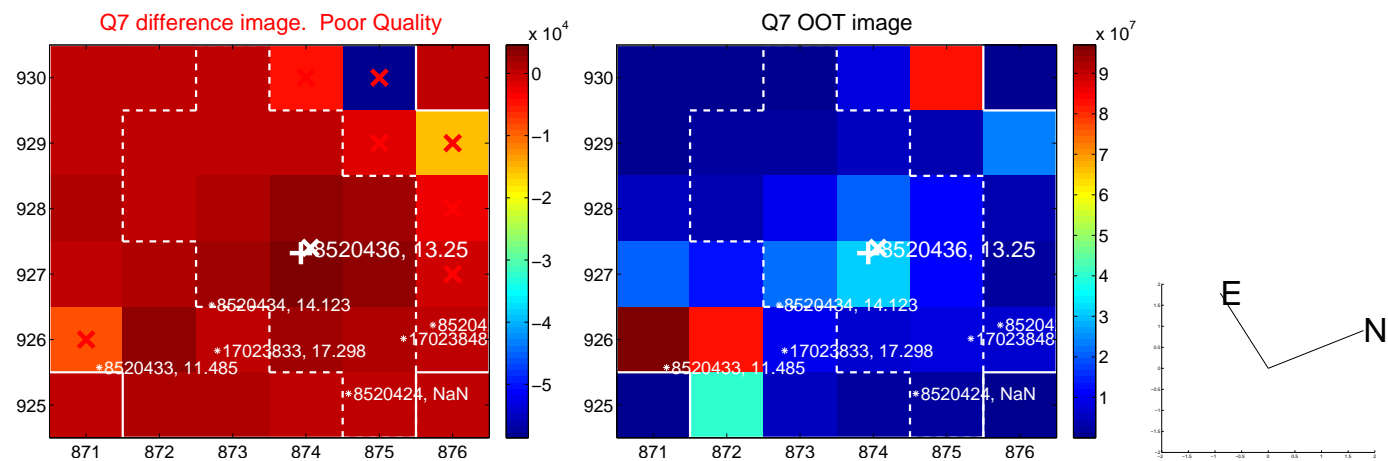
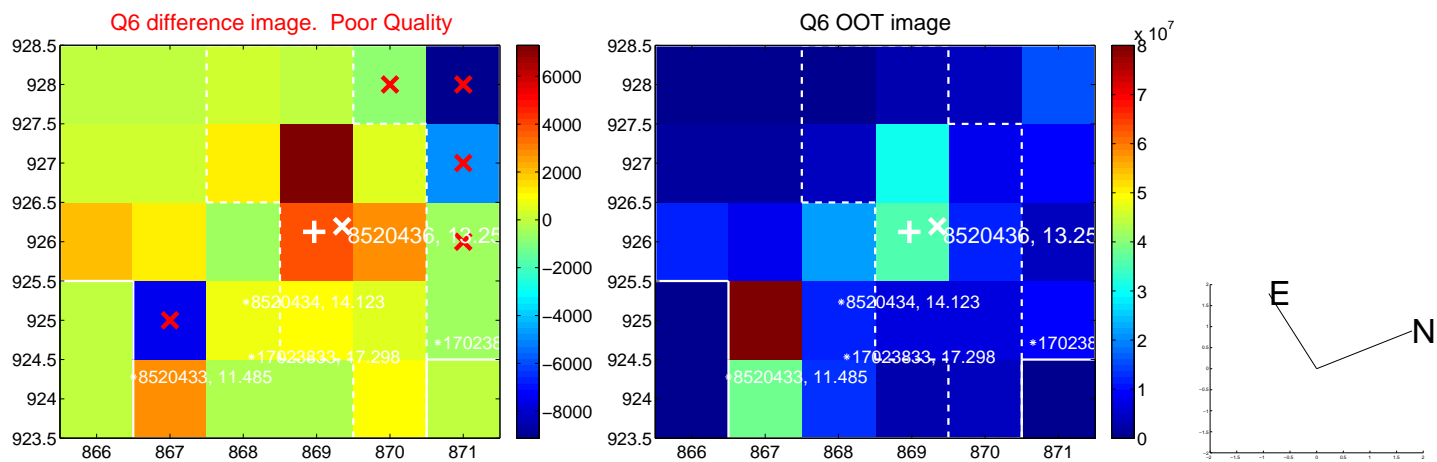
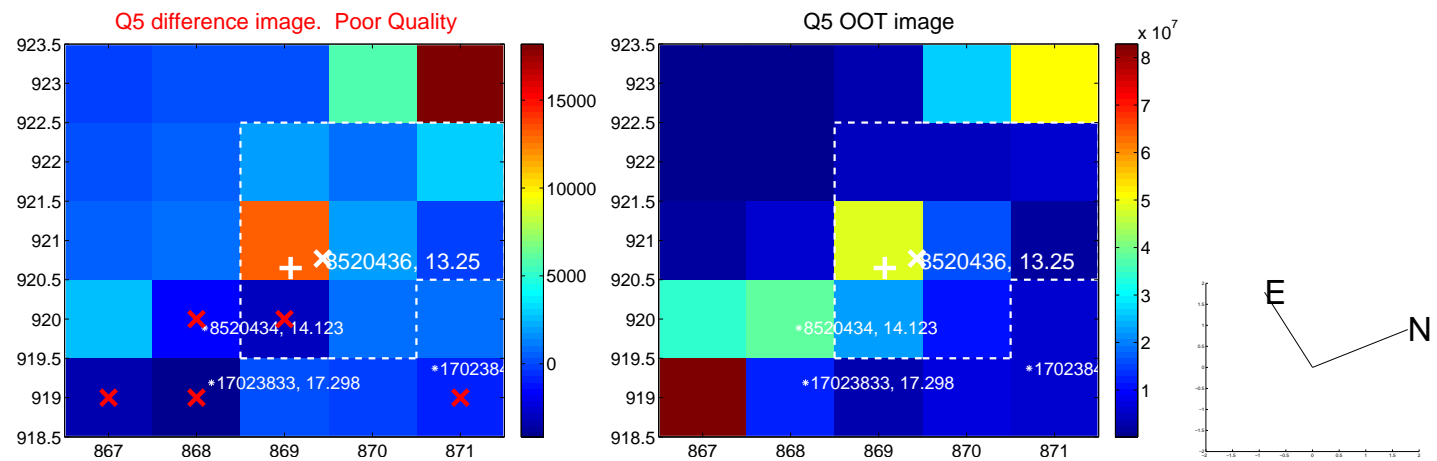


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- σ uncertainty. Blue circle: three- σ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

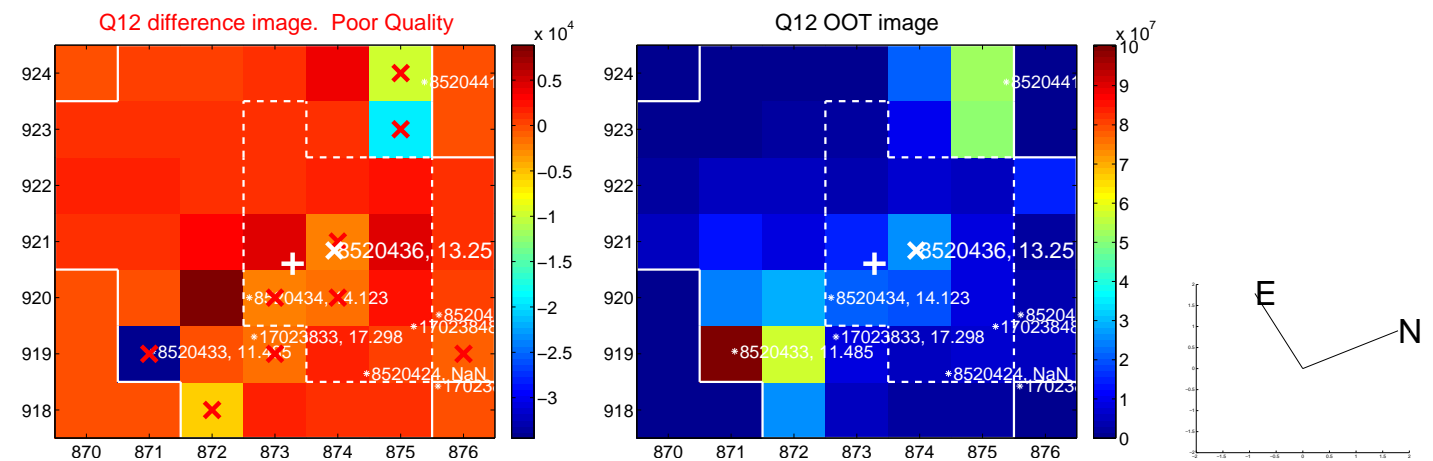
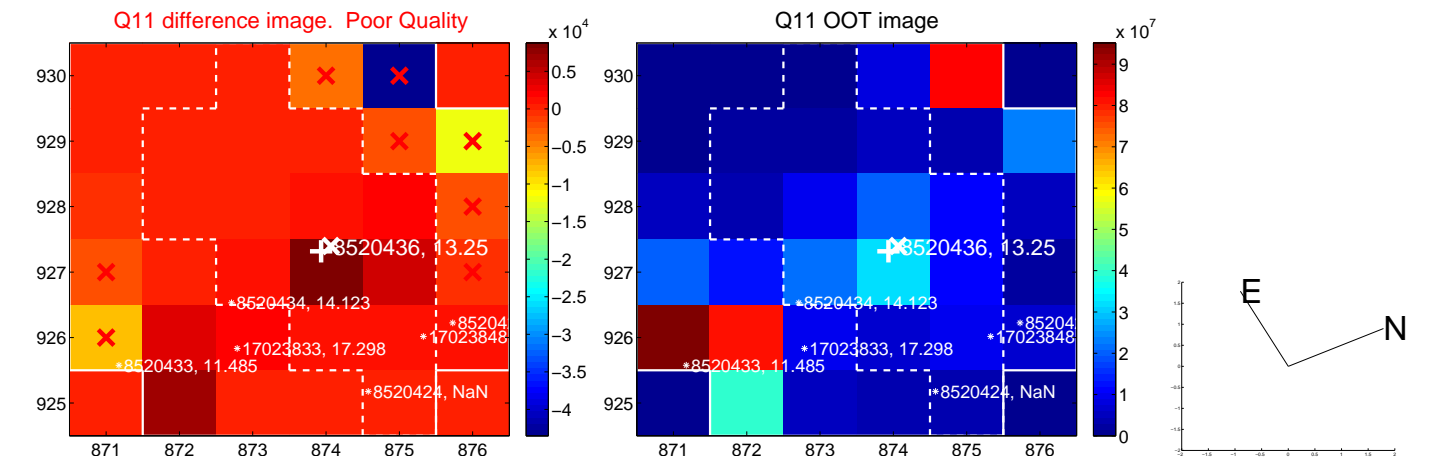
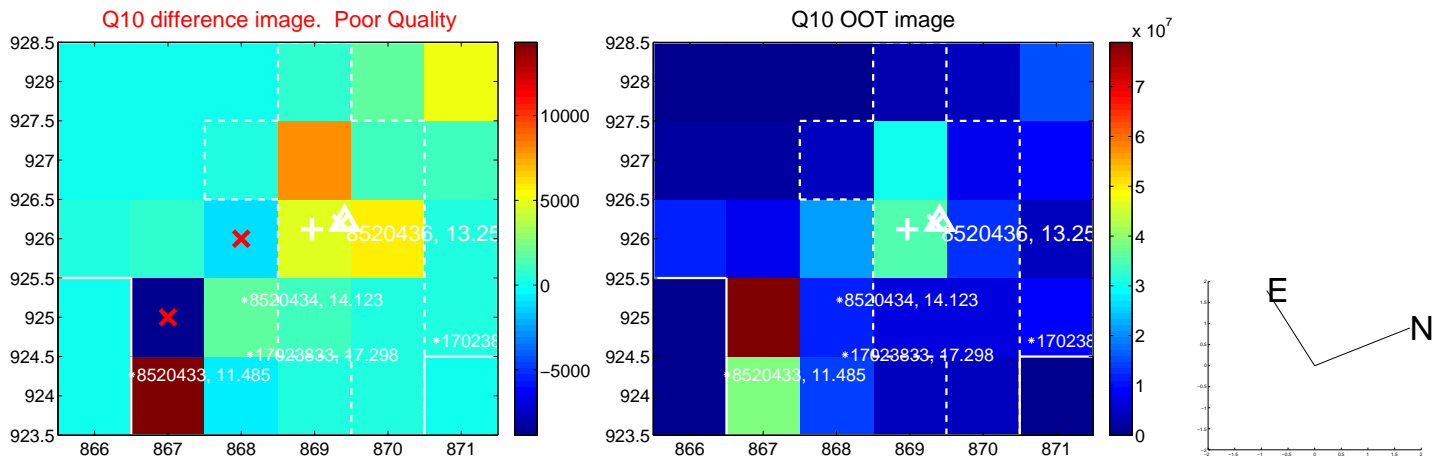
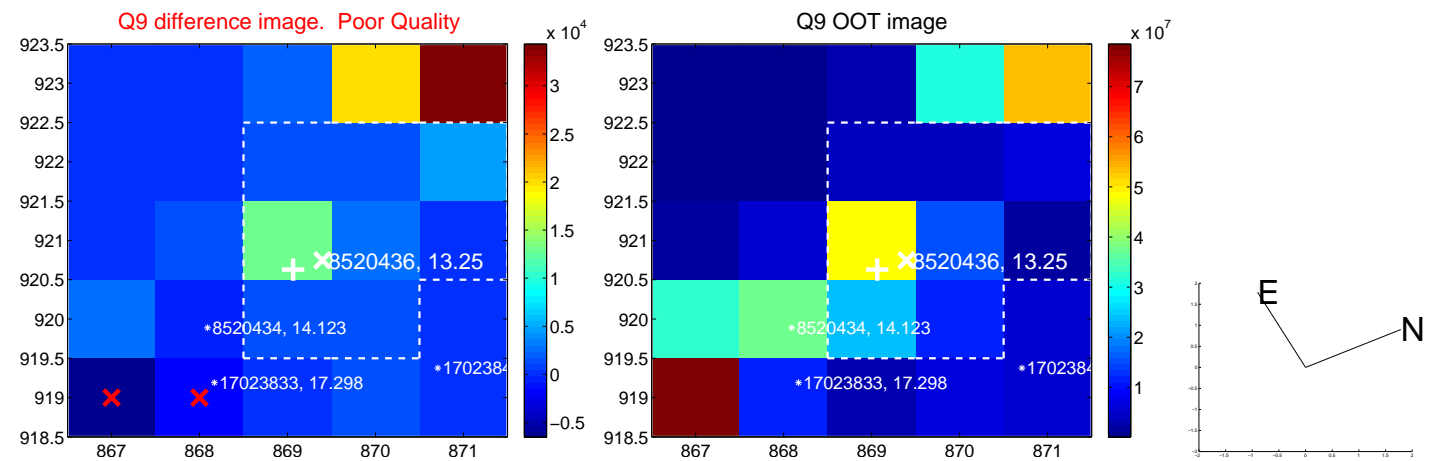
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



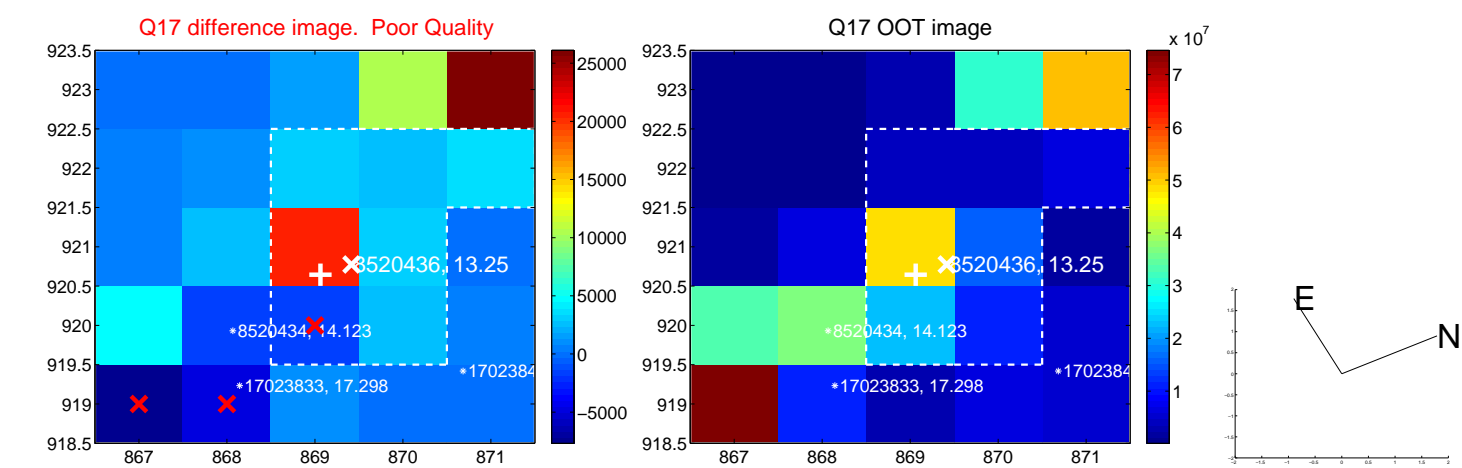
white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



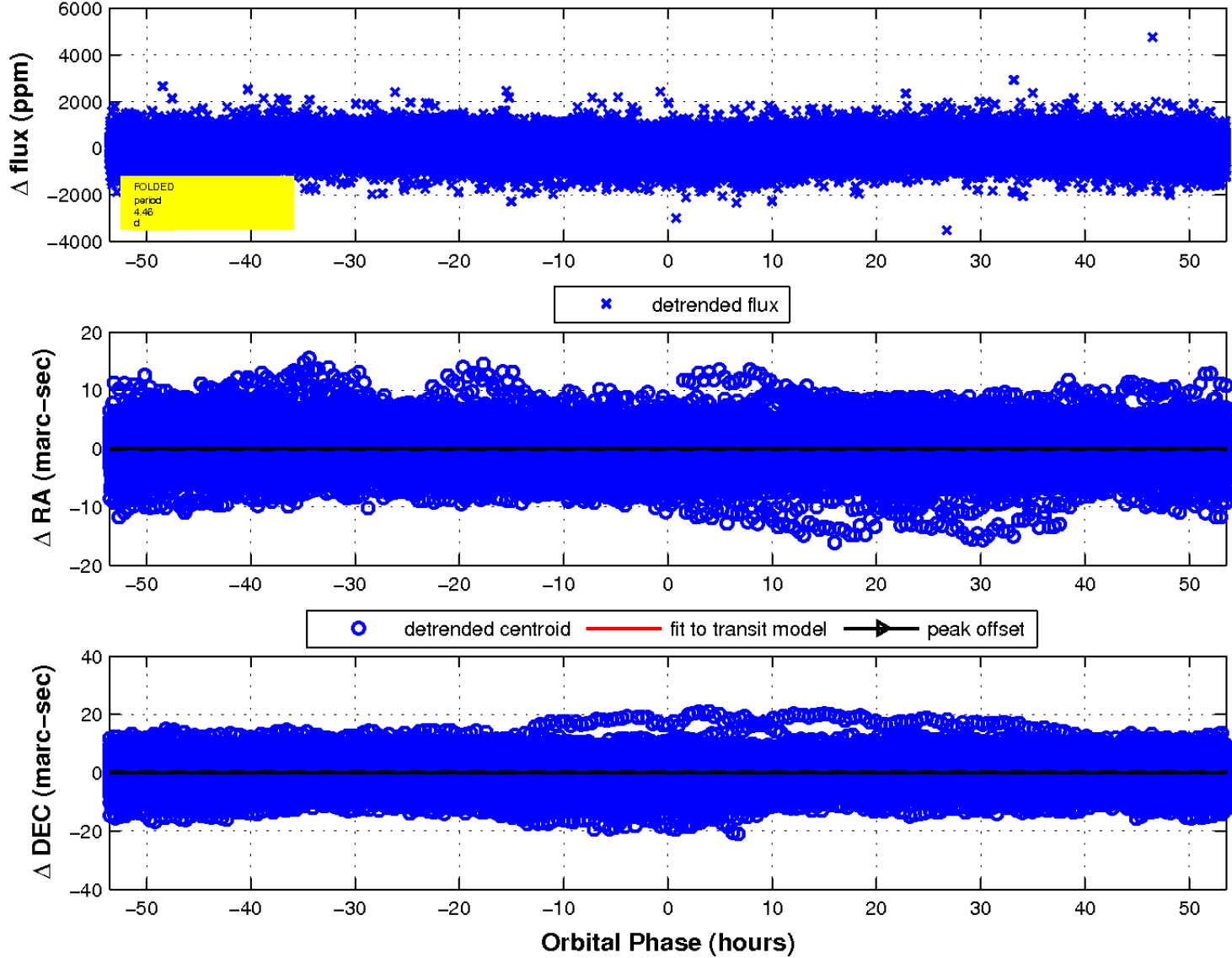
white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



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



fluxWeightedCentroids, Planet 2 of 2



UKIRT Image

Declination

