

KIC 009950612

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})
009950612-01	OBS	0719.01	9.034196	134.878101	560.4	1.612	85.0	84.7	0.64	4499	1.86	27.91
009950612-02	OBS	0719.03	45.902592	166.564365	397.8	5.496	36.9	39.6	0.64	4499	1.55	3.20
009950612-03	OBS	0719.04	4.159821	133.786140	152.4	1.642	32.7	36.7	0.64	4499	0.97	78.51
009950612-04	OBS	0719.02	28.122448	146.919273	203.8	4.506	22.9	25.4	0.64	4499	1.18	6.14

Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009950612-01	OBS	PC	1.00	0	0	0	0	NO_COMMENT
009950612-02	OBS	PC	1.00	0	0	0	0	NO_COMMENT
009950612-03	OBS	PC	1.00	0	0	0	0	NO_COMMENT
009950612-04	OBS	PC	1.00	0	0	0	0	CENT_KIC_POS

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.

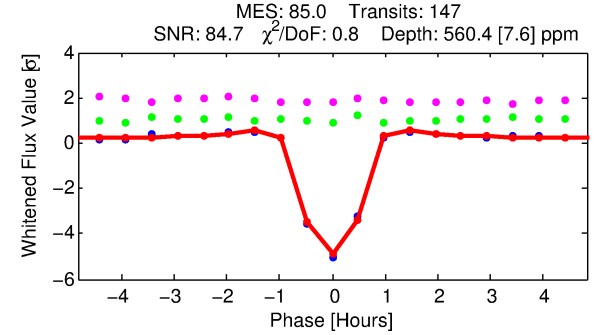
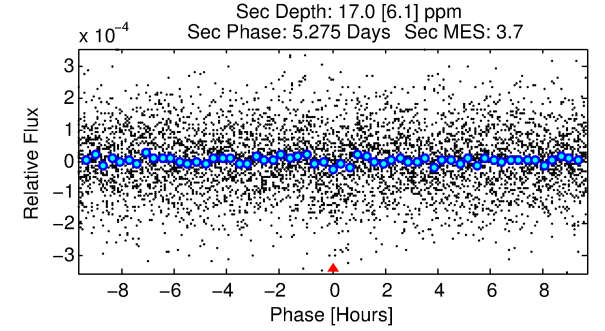
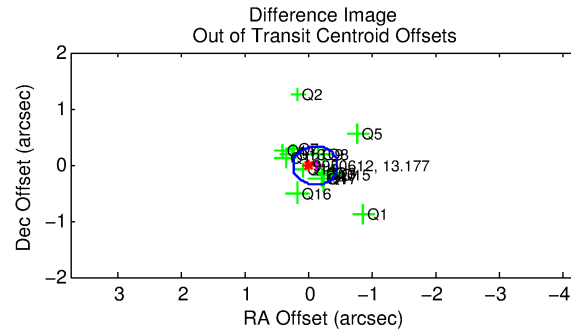
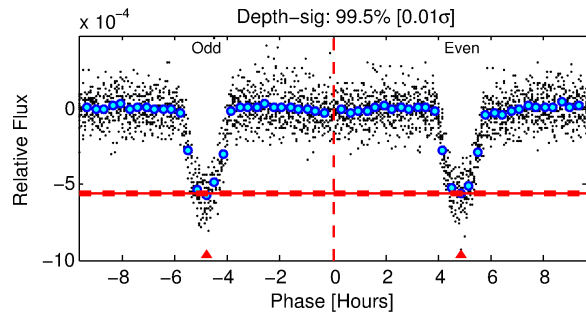
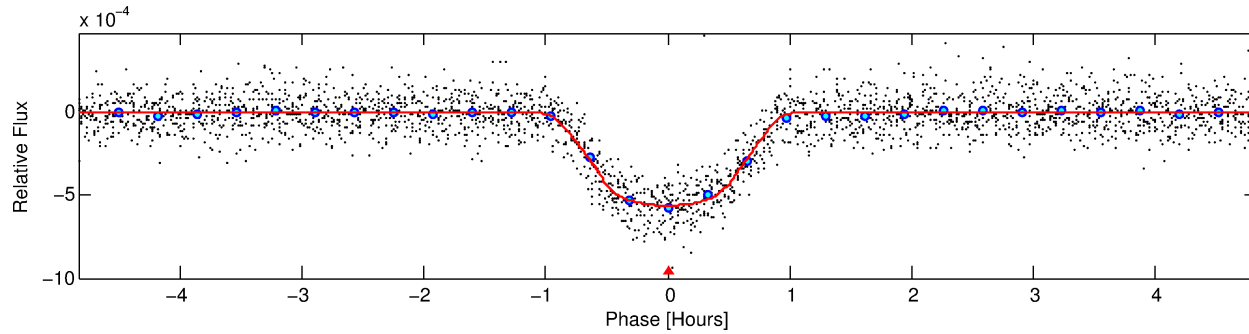
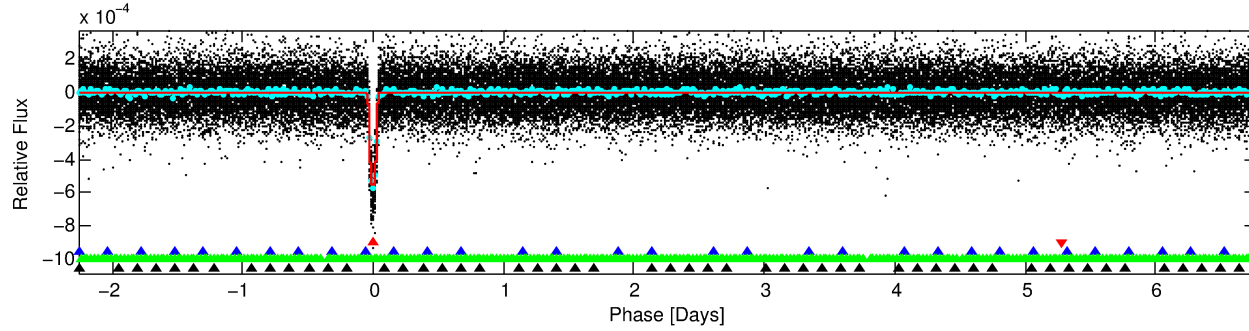
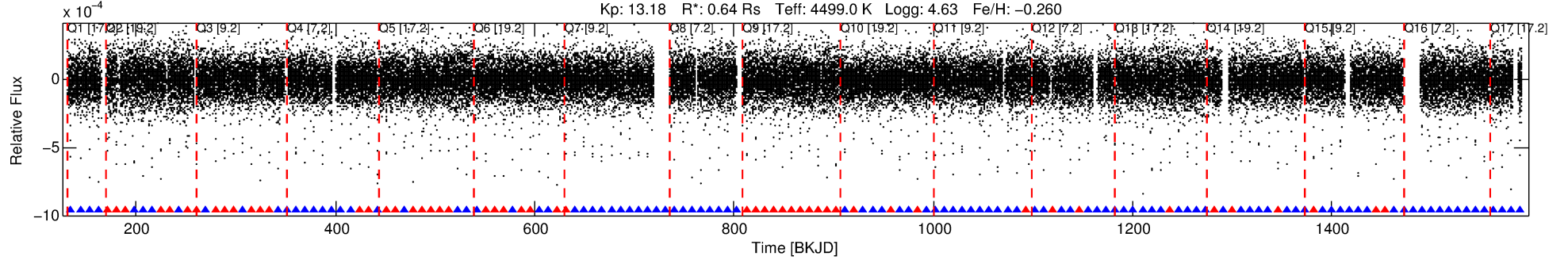
Ephemeris Match Information For 009950612-01

No Significant Match Found

DV One-Page Summary

KIC: 9950612 Candidate: 1 of 4 Period: 9.034 d
KOI: K00719.01 Name: Kepler-220c Corr: 0.961

Kp: 13.18 R*: 0.64 Rs Teff: 4499.0 K Logg: 4.63 Fe/H: -0.260



DV Fit Results:

Period = 9.03420 [0.00001] d
Epoch = 134.8781 [0.0004] BKJD
Rp/R* = 0.0268 [0.0024]
a/R* = 21.36 [6.95]
b = 0.90 [0.07]
Seff = 27.92 [2.76]
Teq = 586 [14] K
Rp = 1.87 [0.19] Re
a = 0.0733 [0.0030] AU
Ag = 14.41 [5.84] [2.30σ]
Teffp = 1766 [180] K [6.52σ]

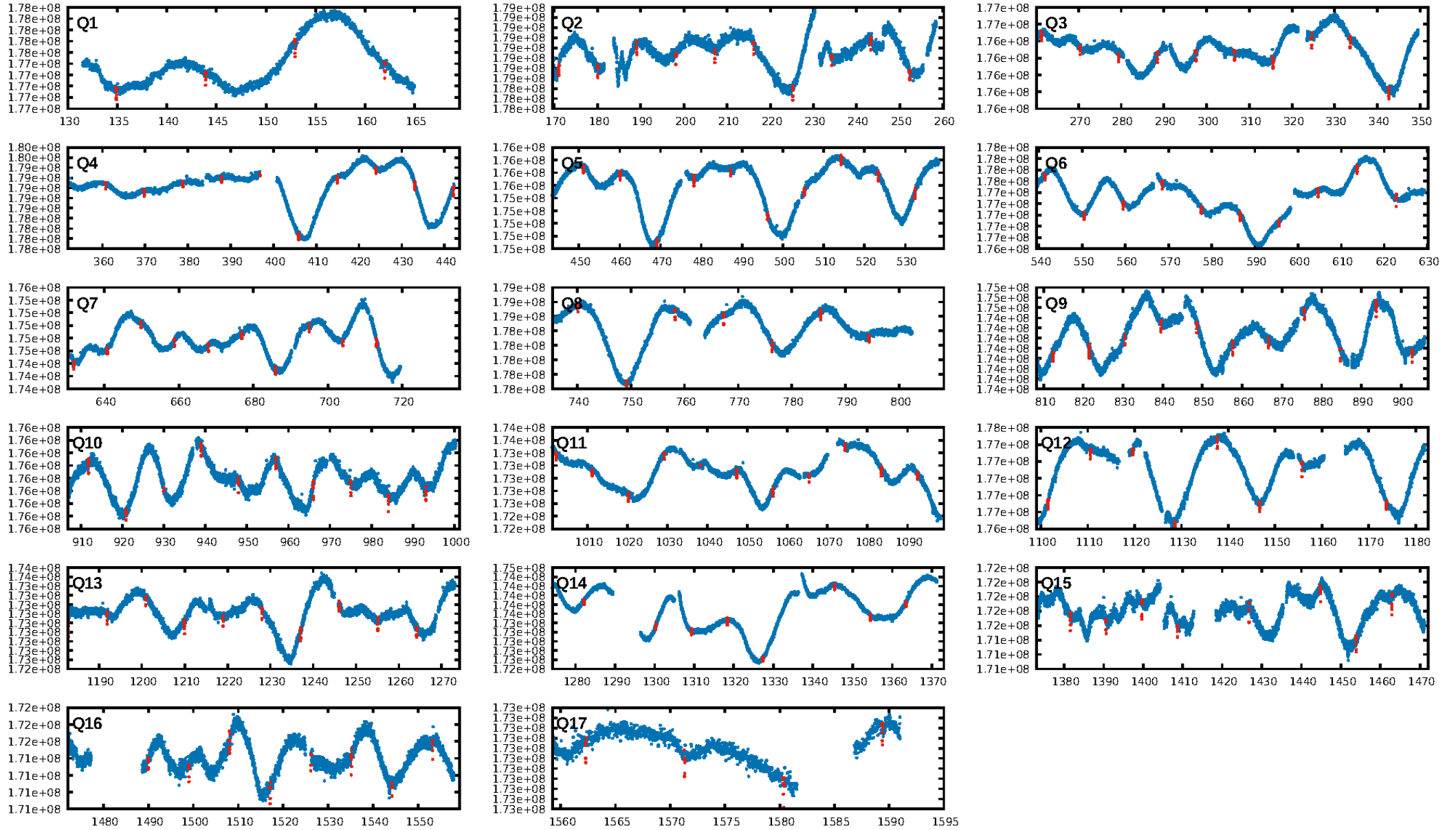
DV Diagnostic Results:

ShortPeriod-sig: 100.0% [50.83σ]
LongPeriod-sig: 100.0% [95.73σ]
ModelChiSquare2-sig: 97.9%
ModelChiSquareGof-sig: 100.0%
Bootstrap-pfa: 0.00e+00
RollingBand-fgt: 0.62 [86/139]
GhostDiagnostic-chr: 11.28
Centroid-sig: 8.2%
Centroid-so: 0.487 arcsec [3.91σ]
OotOffset-rm: 0.105 arcsec [0.91σ]
KicOffset-rm: 0.438 arcsec [3.21σ]
OotOffset-st: 4/4/4/5 [17]
KicOffset-st: 4/4/4/5 [17]
DiffImageQuality-fgm: 1.00 [17/17]
DiffImageOverlap-fno: 1.00 [17/17]

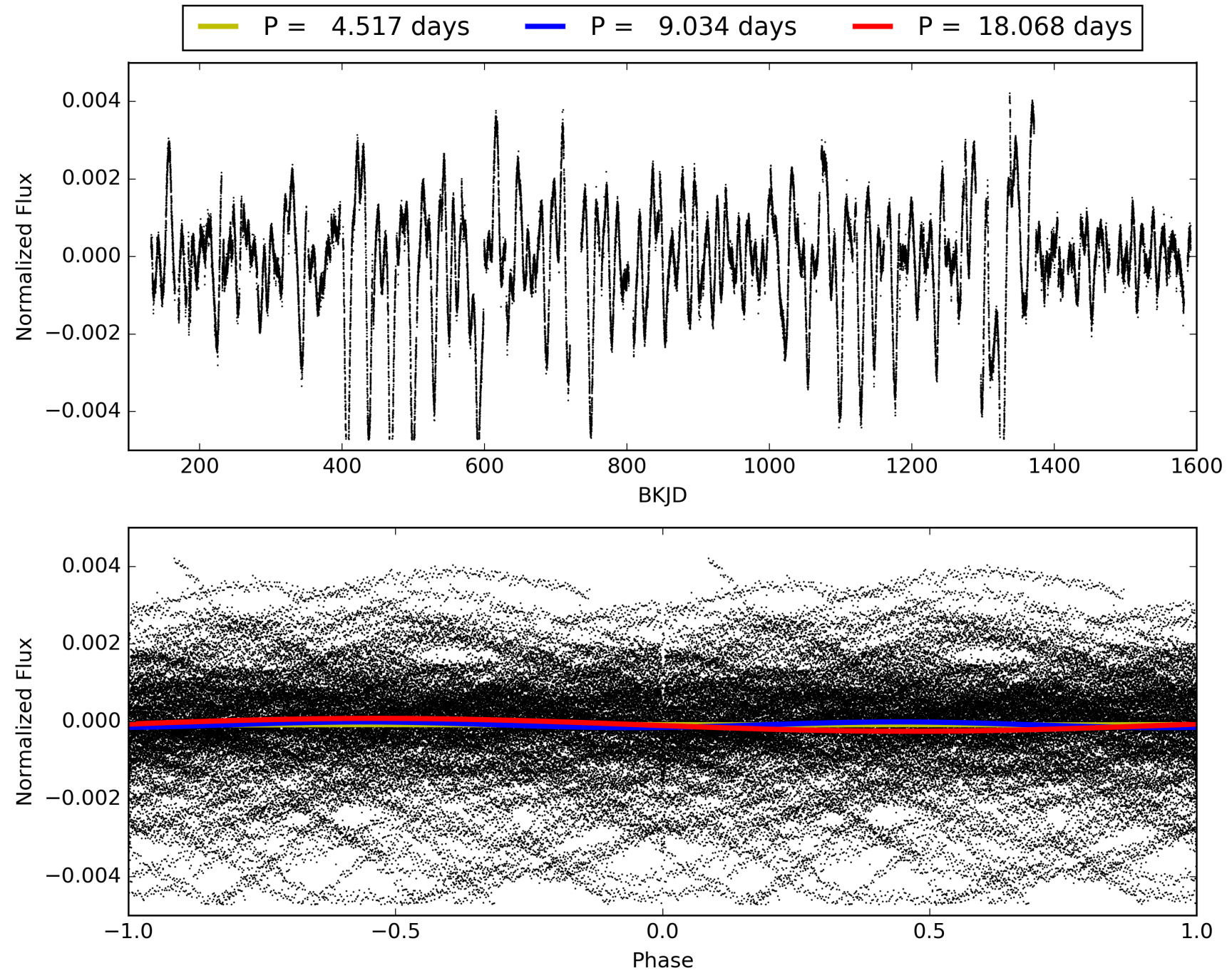
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 29-Jan-2016 10:40:23 Z

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

TCE 009950612-01, PDC Light Curves

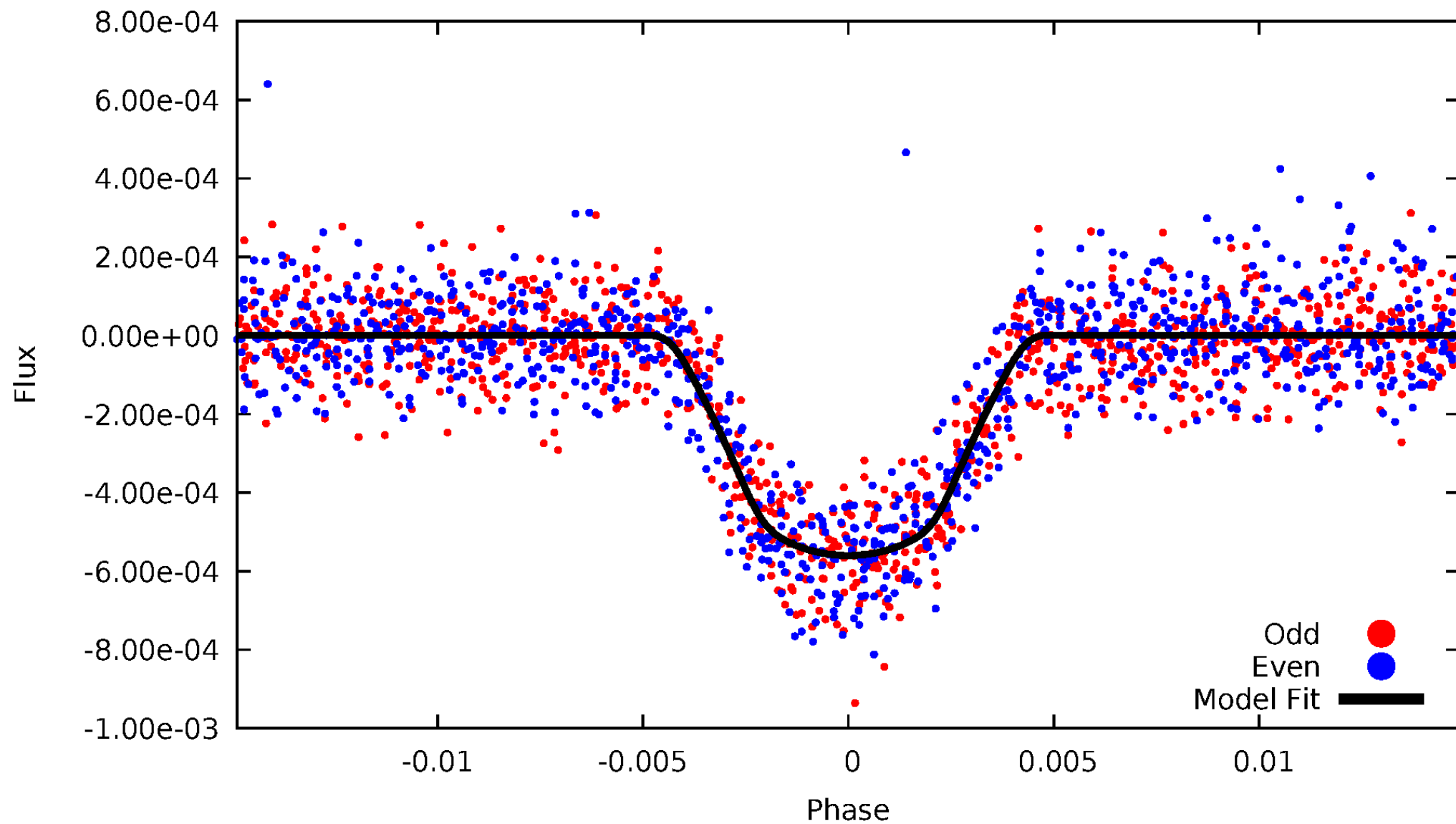


TCE 009950612-01



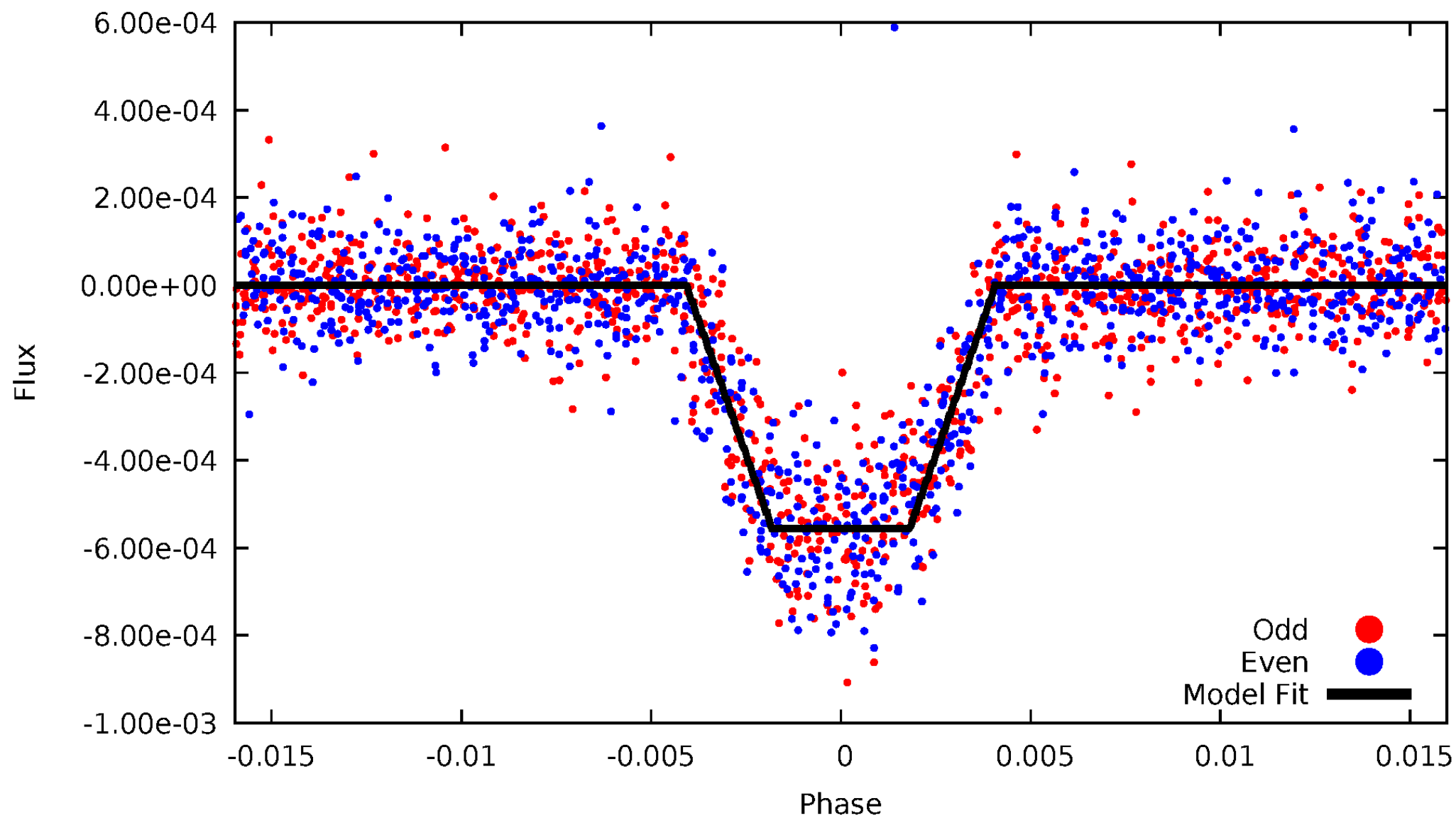
DV Odd/Even

TCE 009950612-01

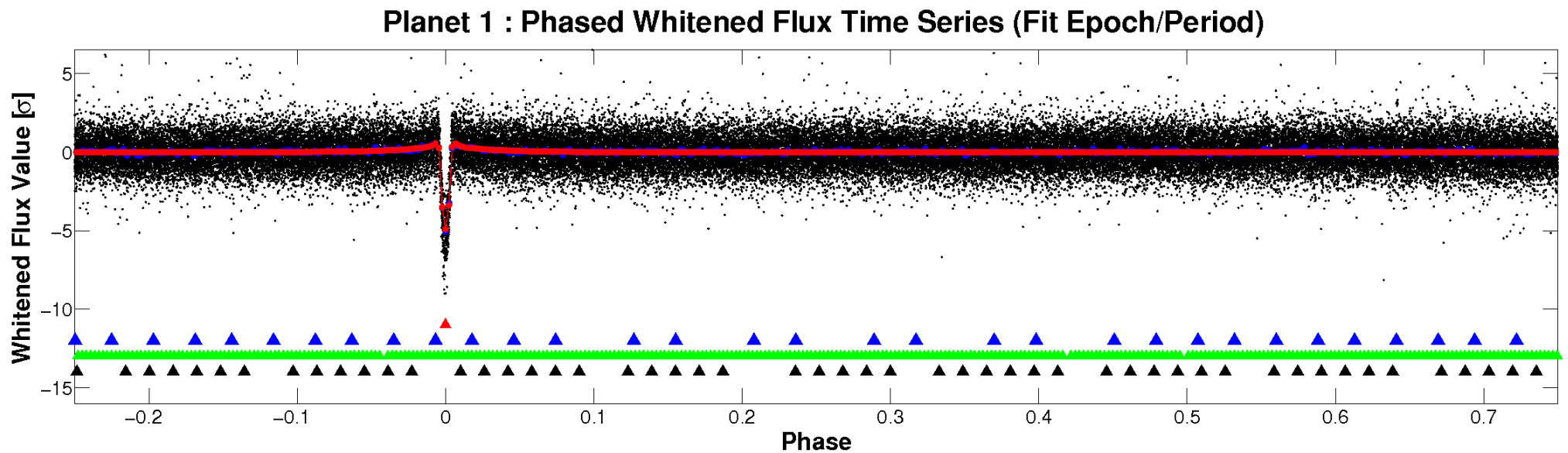
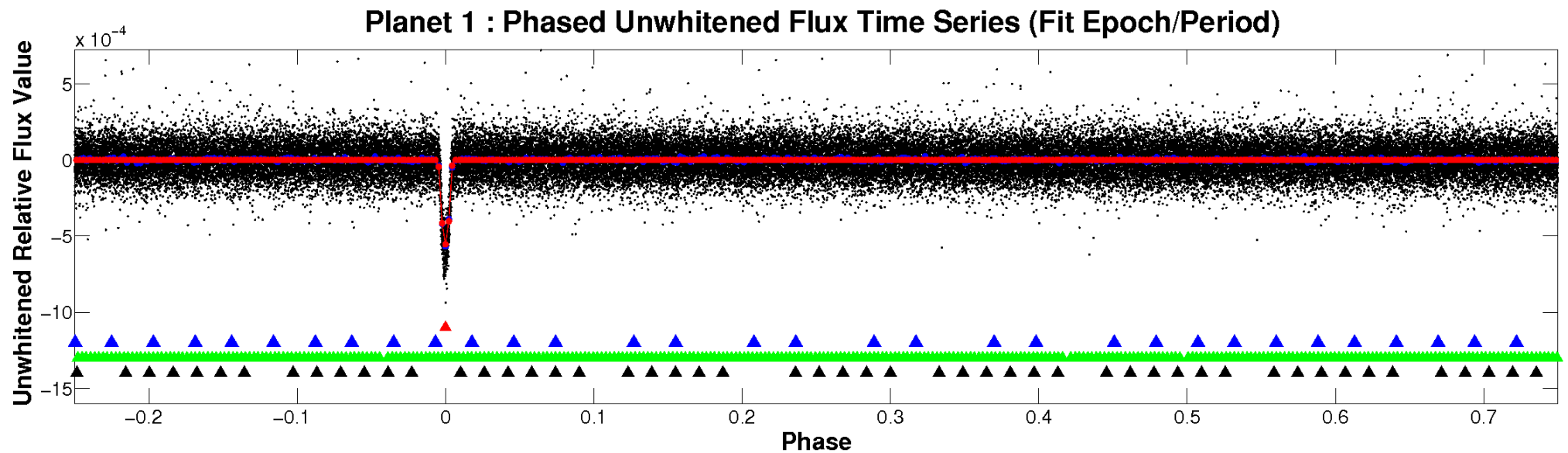


ALT Odd/Even

TCE 009950612-01

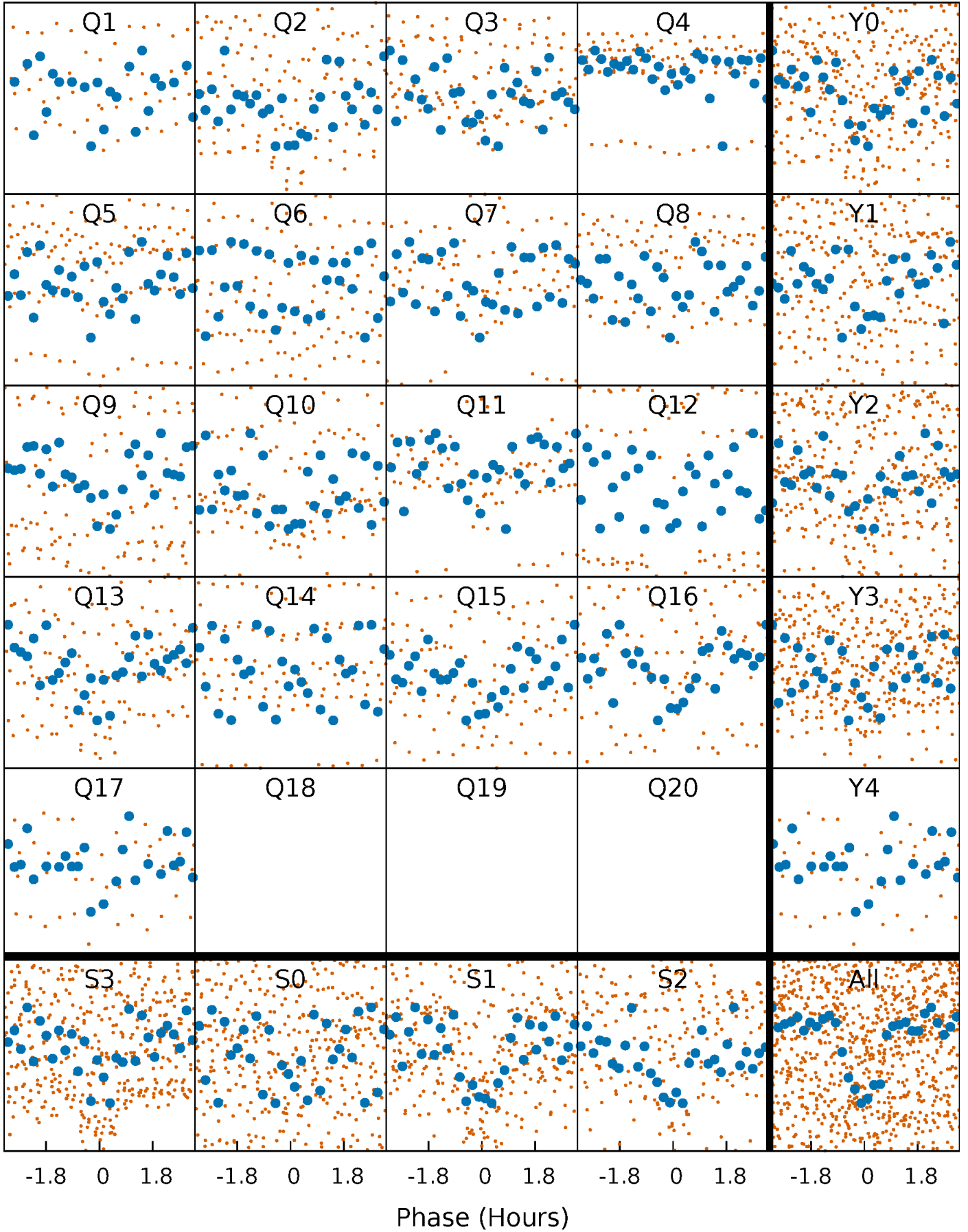


Non-Whitened Vs. Whitened Light Curve



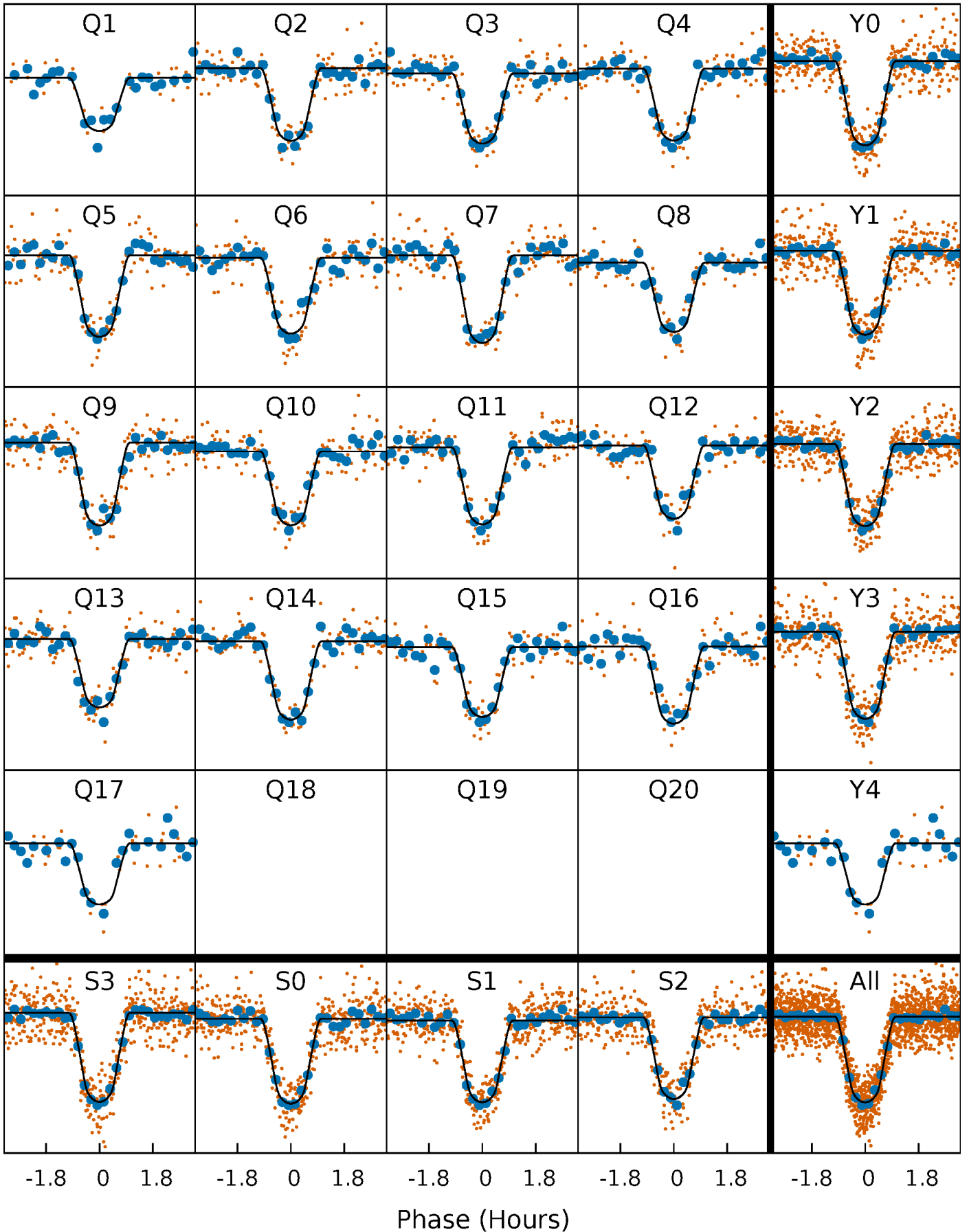
PDC Quarter-Phased Transit Curves

TCE 009950612-01 P= 9.034196 Days $T_0=134.878101$ (BKJD)



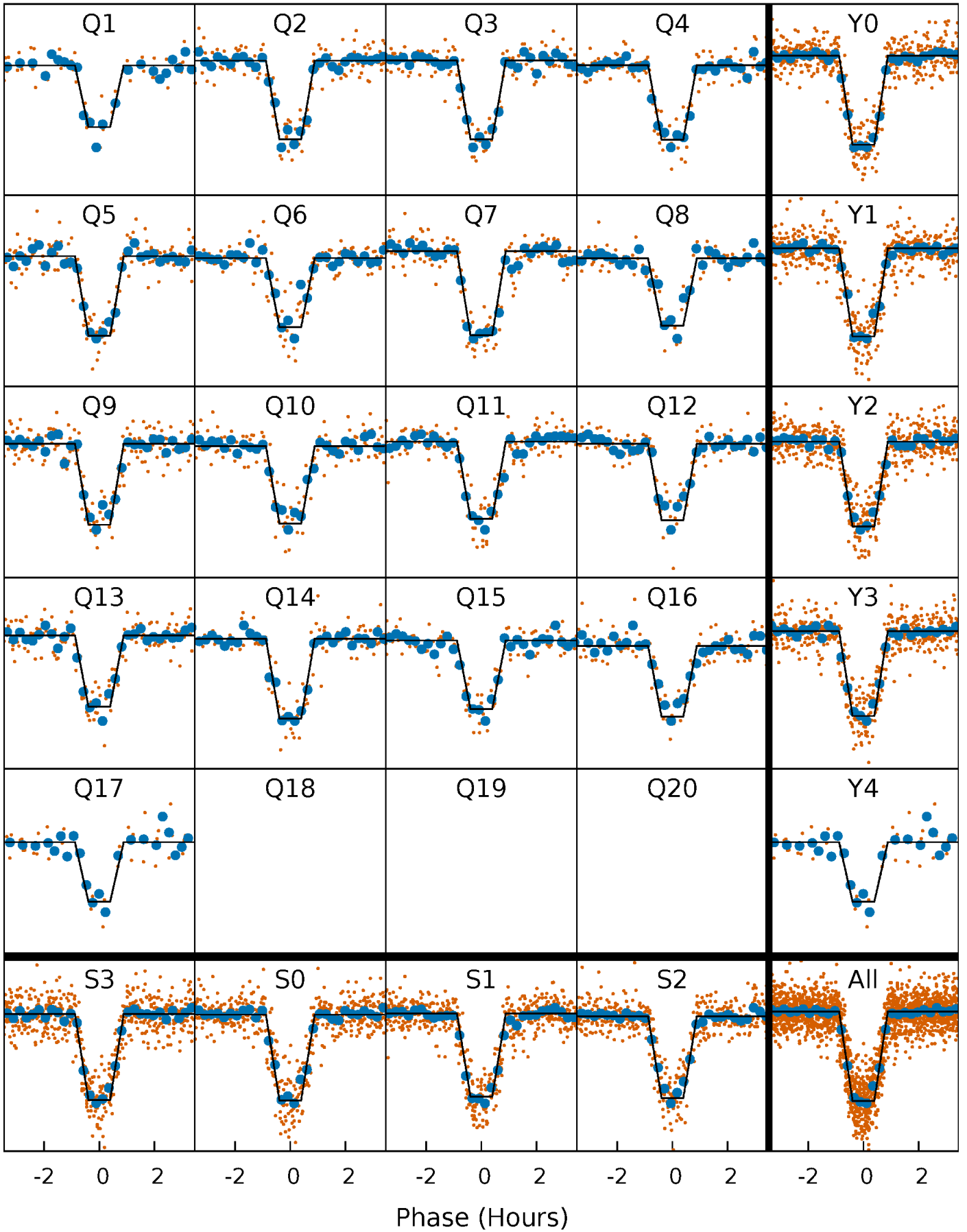
DV Quarter-Phased Transit Curves

TCE 009950612-01 P= 9.034196 Days $T_0=134.878101$ (BKJD)



Alt. Detrend Quarter-Phased Transit Curves

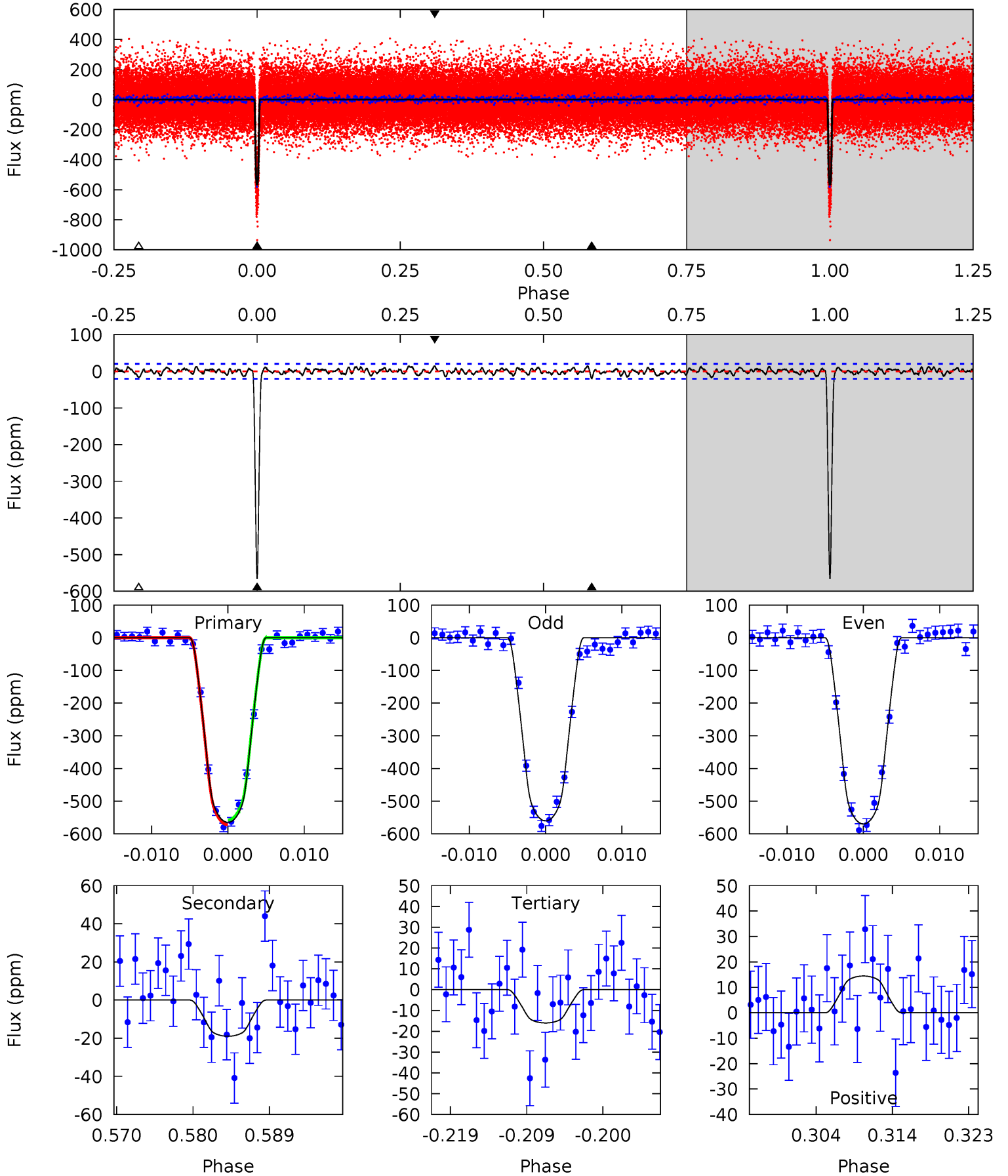
TCE 009950612-01 P= 9.034197 Days $T_0=134.877962$ (BKJD)



DV Model-Shift Uniqueness Test

009950612-01, P = 9.034196 Days, E = 125.843905 Days

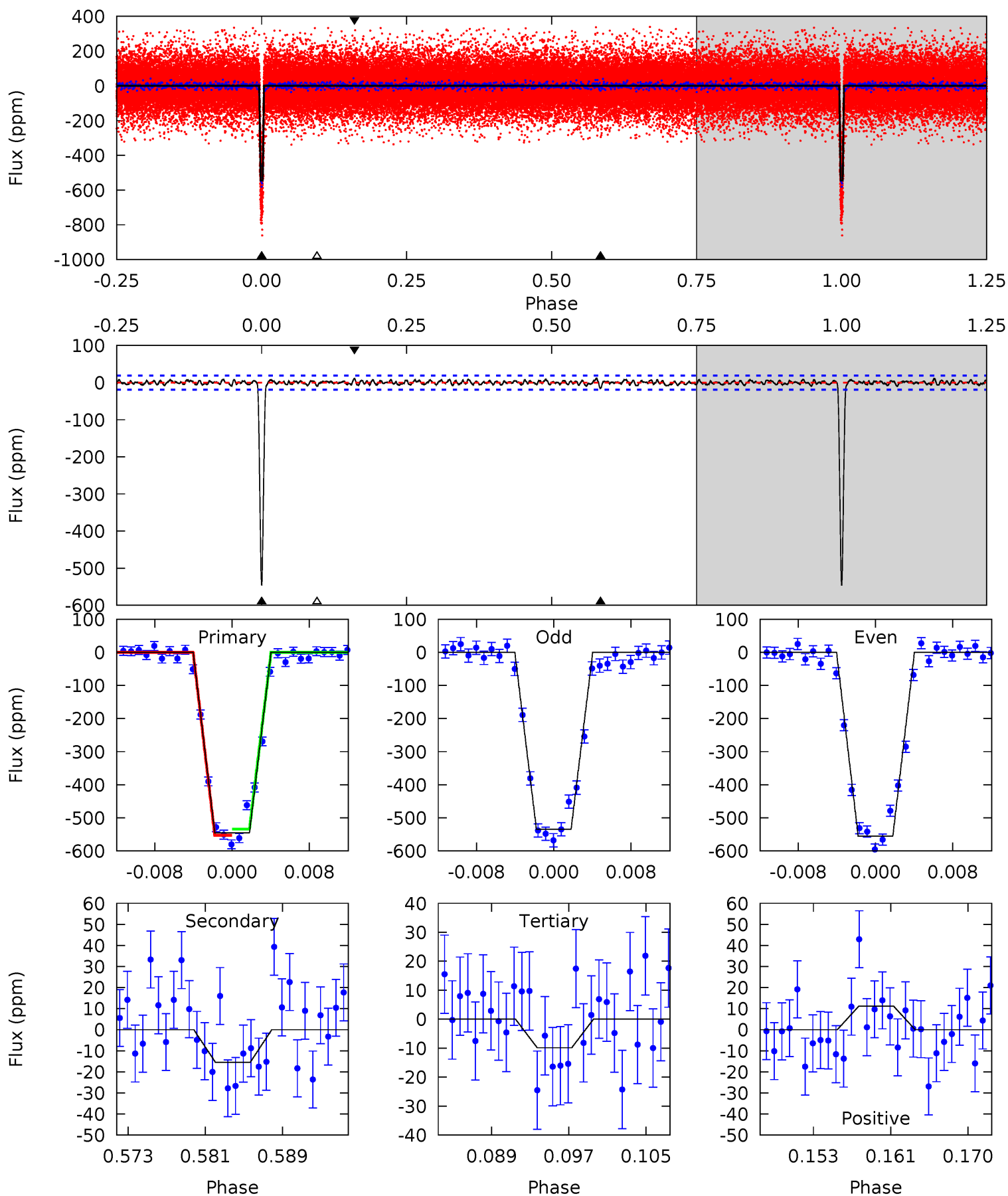
Pri	Sec	Ter	Pos	FA ₁	FA ₂	F _{Red}	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
138.9	4.67	3.93	3.55	5.04	2.59	1.40	135.0	135.3	0.73	1.11	1.16	0.99	0.03	1.78



Alt Model-Shift Uniqueness Test

009950612-01, P = 9.034197 Days, E = 125.843765 Days

Pri	Sec	Ter	Pos	FA ₁	FA ₂	F _{Red}	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
145.3	4.13	2.62	2.99	5.07	2.65	1.03	142.6	142.3	1.51	1.14	2.73	0.99	0.02	2.46



Stellar Parameters For KIC 009950612

	$T_{\text{eff}}(K)$	$\log(g)$	$[\text{Fe}/\text{H}]$	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	4499^{+89}_{-89}	$4.635^{+0.032}_{-0.020}$	$-0.260^{+0.150}_{-0.150}$	$0.639^{+0.025}_{-0.032}$	$0.643^{+0.035}_{-0.032}$	$3.466^{+0.459}_{-0.276}$
	+2%/-2%	+1%/-0%	+58%/-58%	+4%/-5%	+5%/-5%	+13%/-8%
Source	SPE60	SPE60	SPE60	DSEP		

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

Secondary Eclipse Parameters for KIC 009950612-01 / KOI 0719.01

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	A_{obs}
DV	-19 ± 4	$1.84^{+0.19}_{-0.17}$	816^{+19}_{-17}	2568^{+99}_{-102}	16^{+6}_{-4}
Alt.	-16 ± 4	$1.64^{+0.18}_{-0.18}$	817^{+19}_{-18}	2586^{+103}_{-117}	17^{+6}_{-5}

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

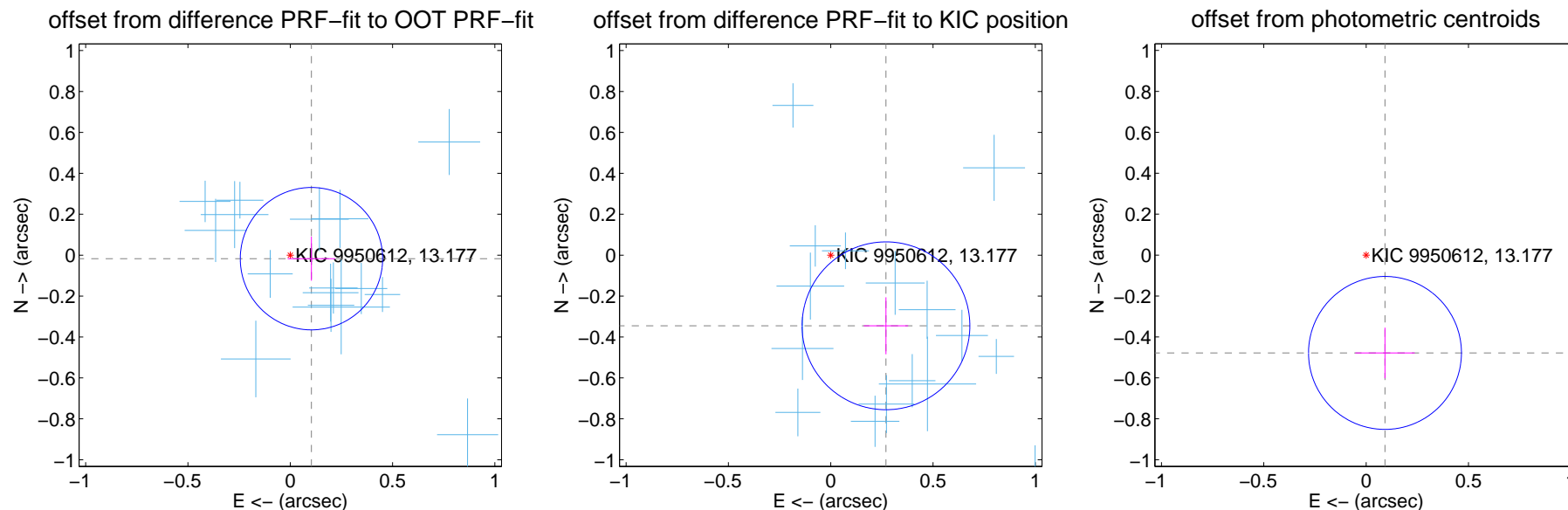
DV Centroid Data

Supplemental centroid analysis for 009950612-01. Kepler magnitude: 13.18. Transit SNR 84.69

There are 17 quarters with good PRF difference image offsets

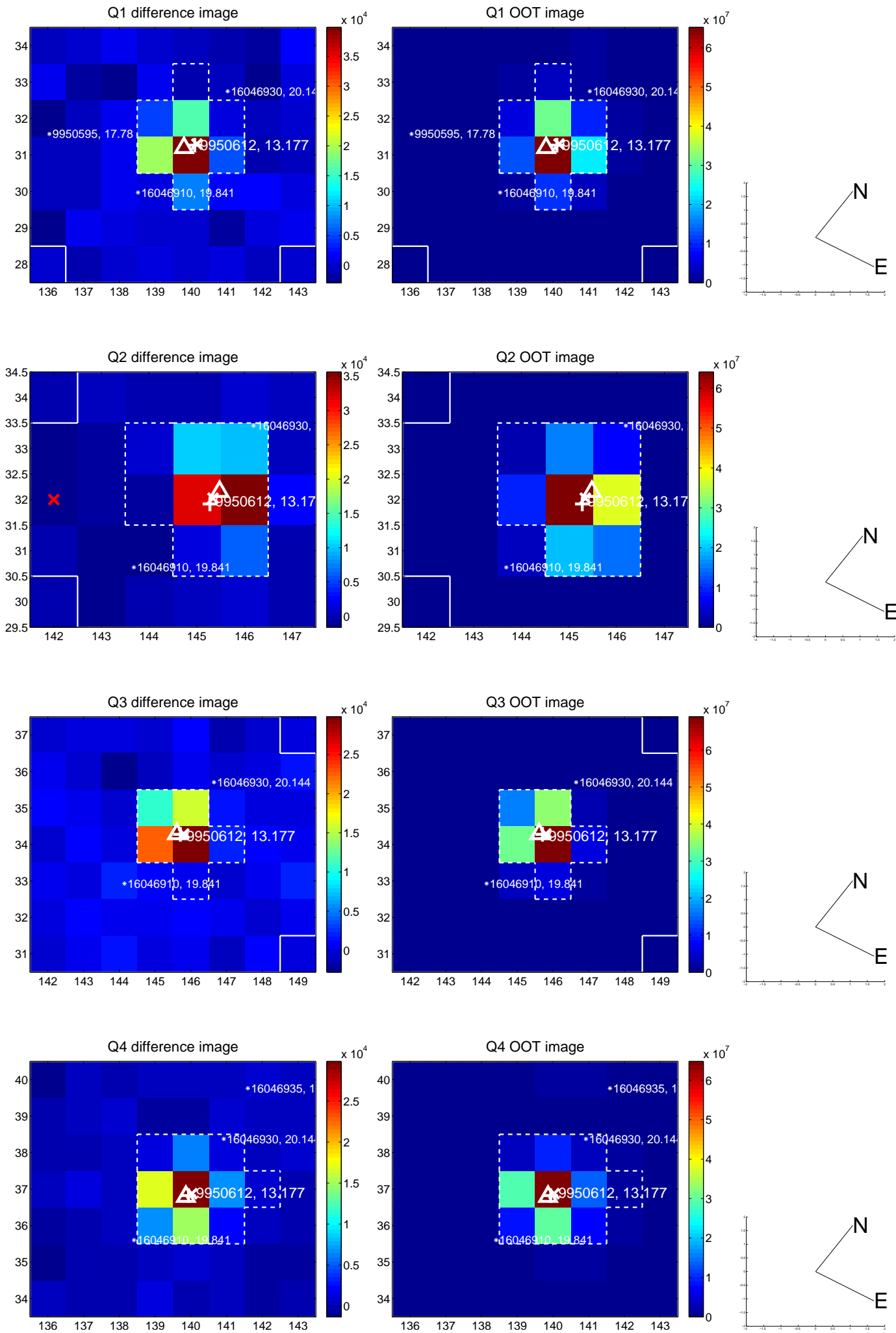
The direct PRF centroid is offset from the target star catalog position by about 0.44 arcsec

	Distance in arcsec	Distance / σ	Δ RA	Δ Dec
PRF-fit source offset from OOT	0.105 ± 0.116	0.91	-0.104 ± 0.116	-0.017 ± 0.108
PRF-fit source offset from KIC position	0.438 ± 0.137	3.21	-0.270 ± 0.109	-0.345 ± 0.139
photometric centroid source offset	0.49 ± 0.12	3.91	-0.09 ± 0.15	-0.48 ± 0.12

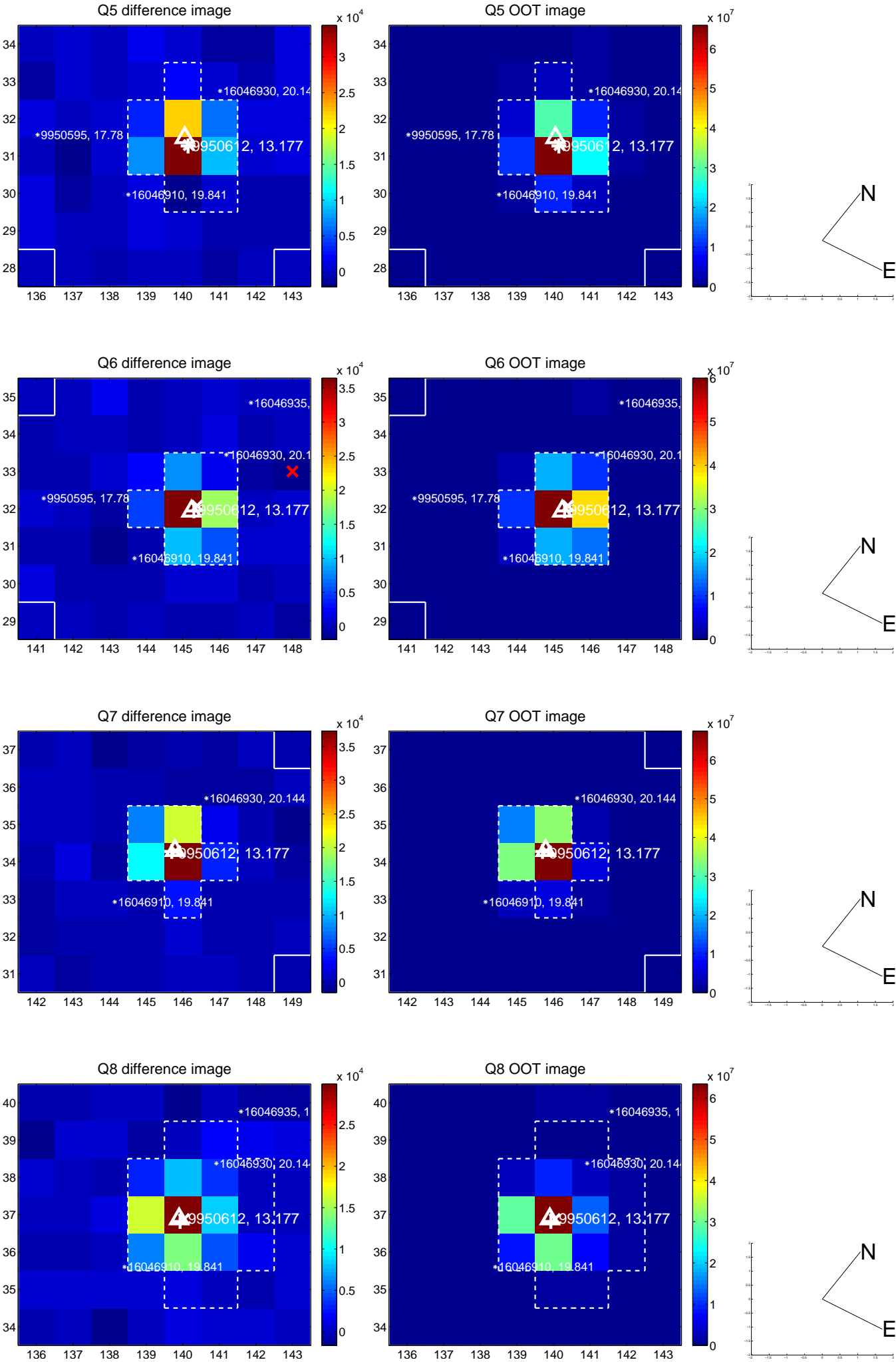


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses:** good quarterly centroid offsets; **Vermillion crosses:** bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- σ uncertainty. Blue circle: three-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

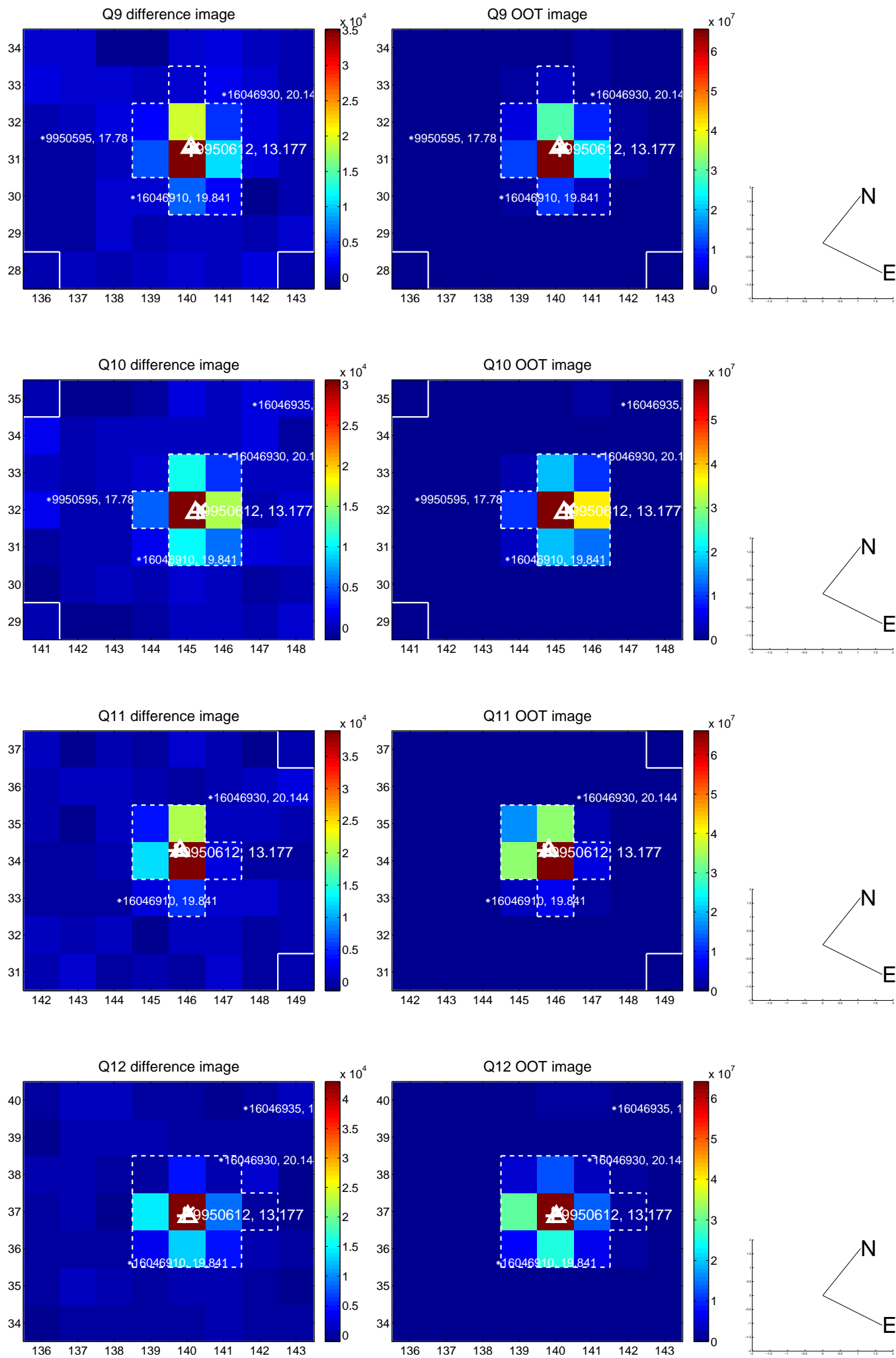
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



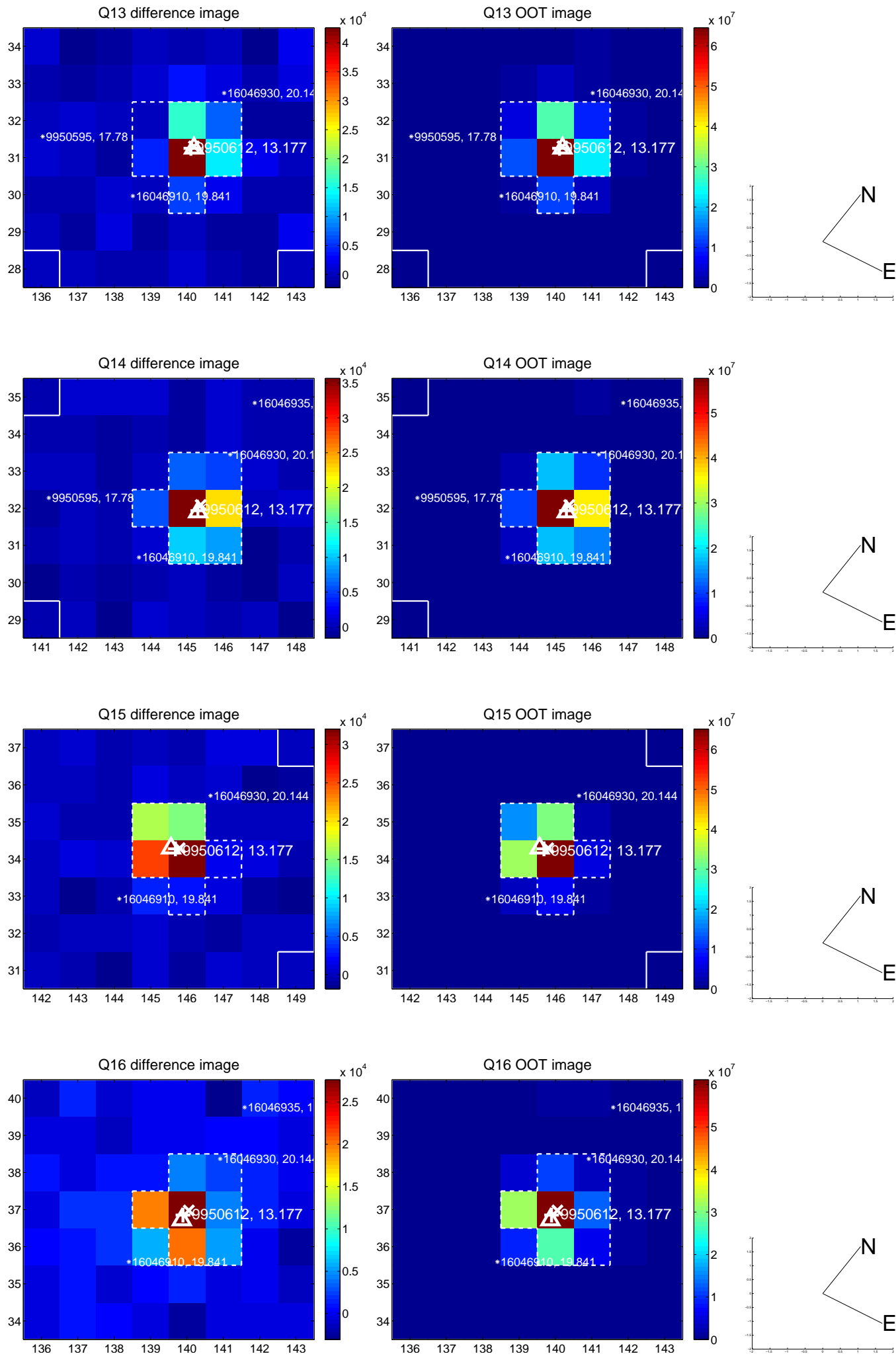
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



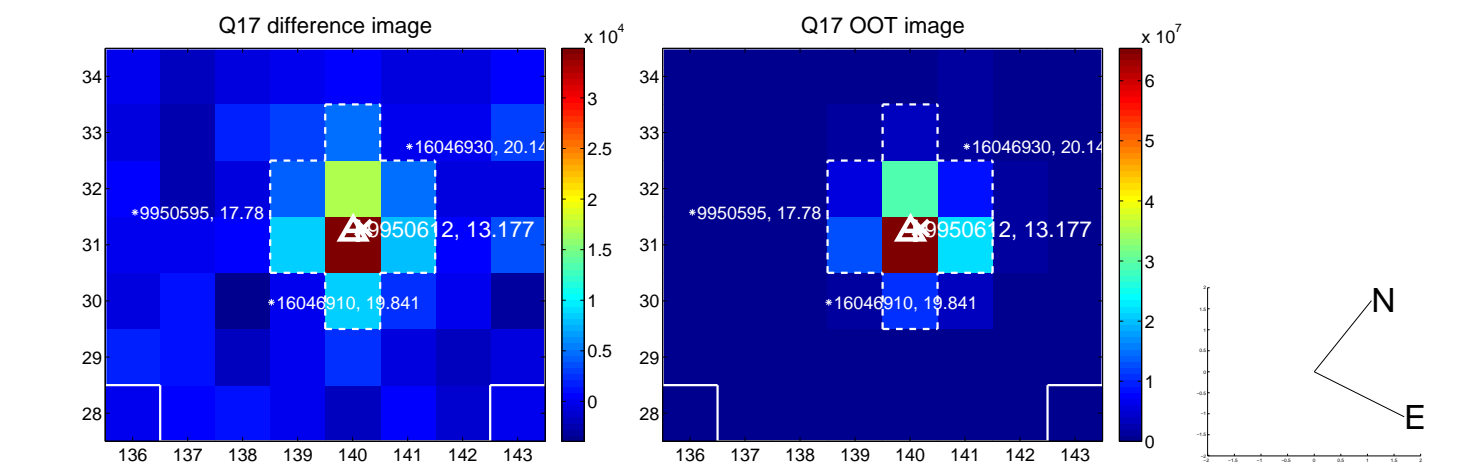
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



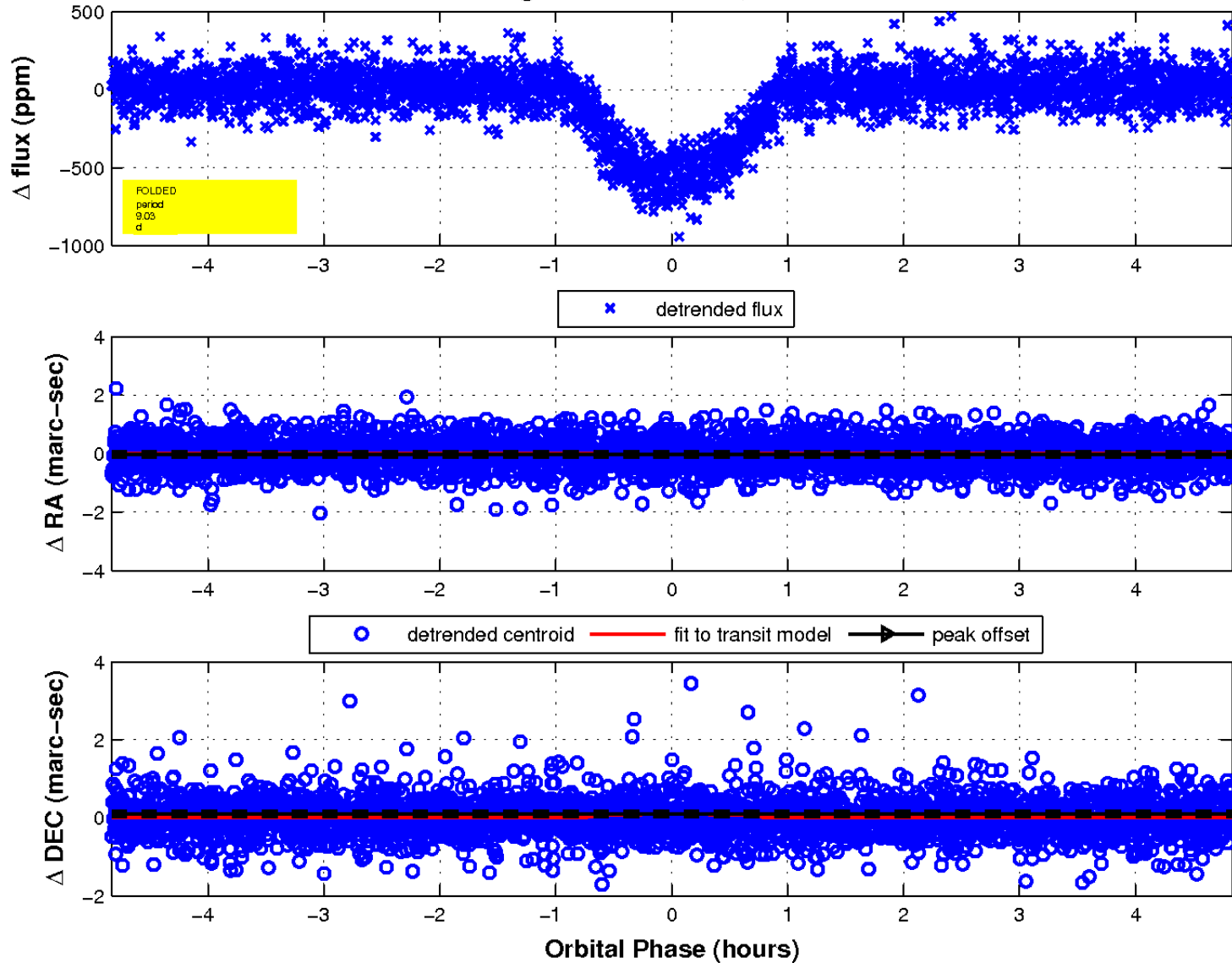
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



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

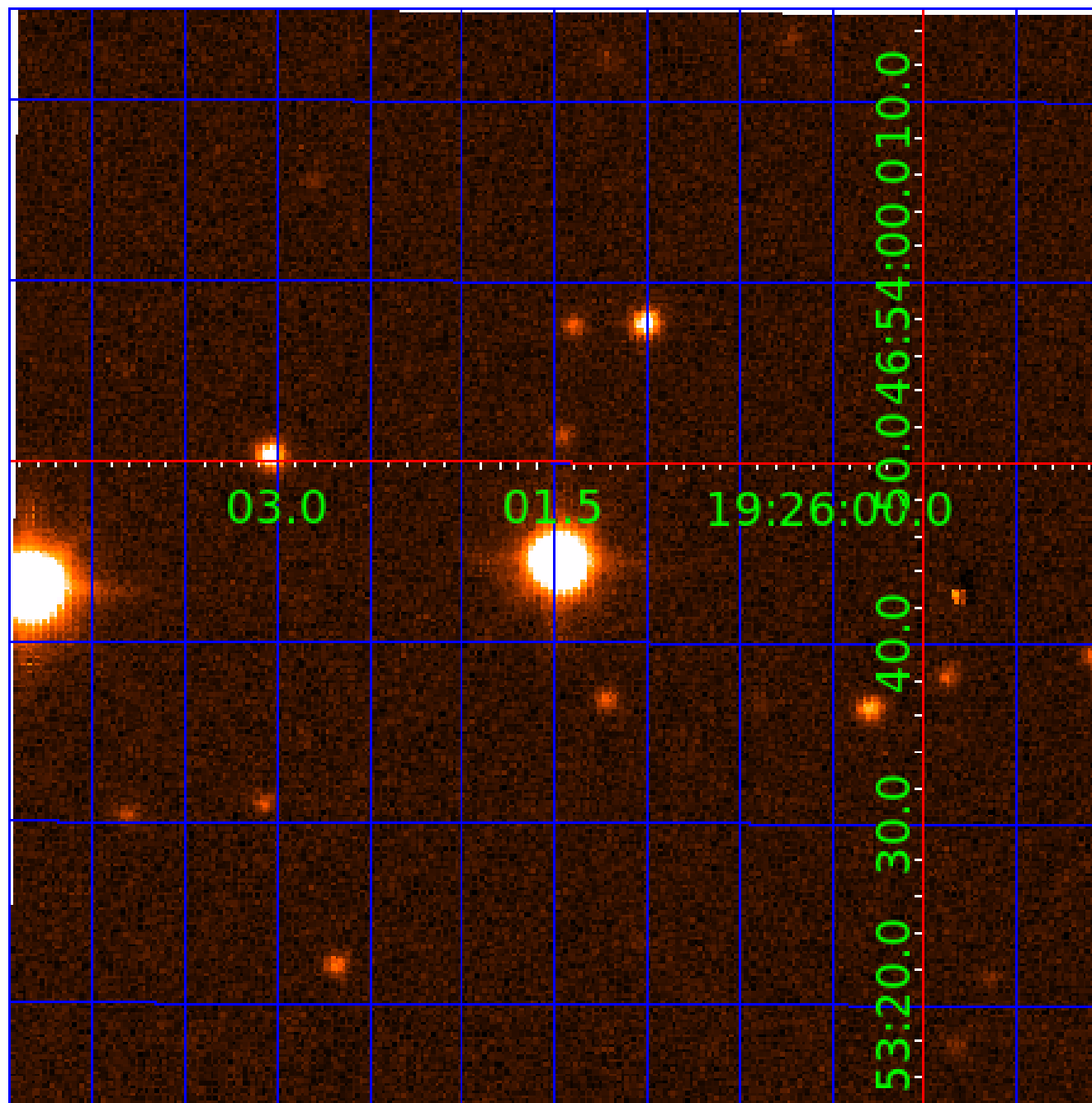


fluxWeightedCentroids, Planet 1 of 4



UKIRT Image

Declination



KIC 009950612

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})
009950612-01	OBS	0719.01	9.034196	134.878101	560.4	1.612	85.0	84.7	0.64	4499	1.86	27.91
009950612-02	OBS	0719.03	45.902592	166.564365	397.8	5.496	36.9	39.6	0.64	4499	1.55	3.20
009950612-03	OBS	0719.04	4.159821	133.786140	152.4	1.642	32.7	36.7	0.64	4499	0.97	78.51
009950612-04	OBS	0719.02	28.122448	146.919273	203.8	4.506	22.9	25.4	0.64	4499	1.18	6.14

Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009950612-01	OBS	PC	1.00	0	0	0	0	NO_COMMENT
009950612-02	OBS	PC	1.00	0	0	0	0	NO_COMMENT
009950612-03	OBS	PC	1.00	0	0	0	0	NO_COMMENT
009950612-04	OBS	PC	1.00	0	0	0	0	CENT_KIC_POS

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.

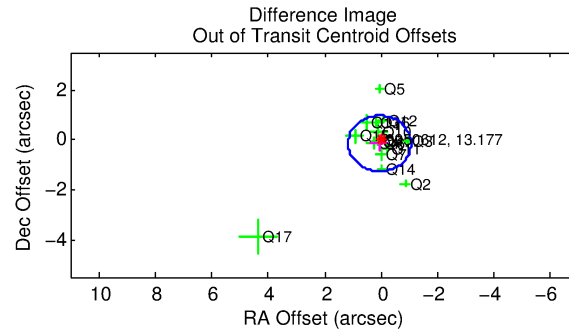
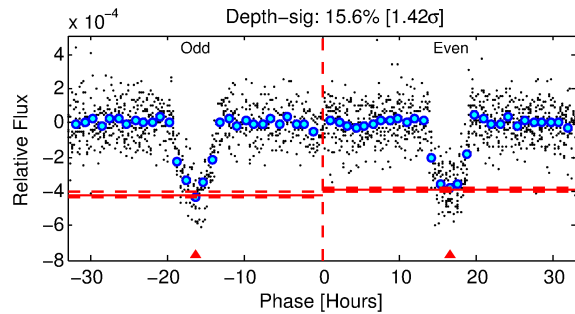
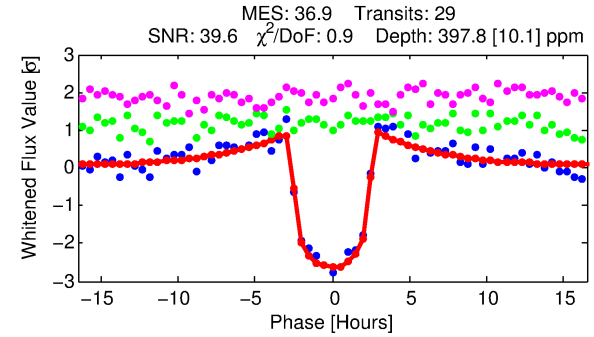
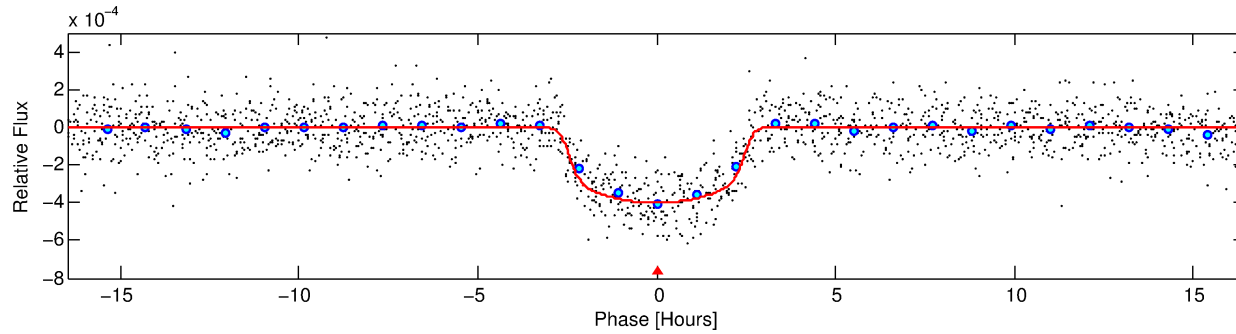
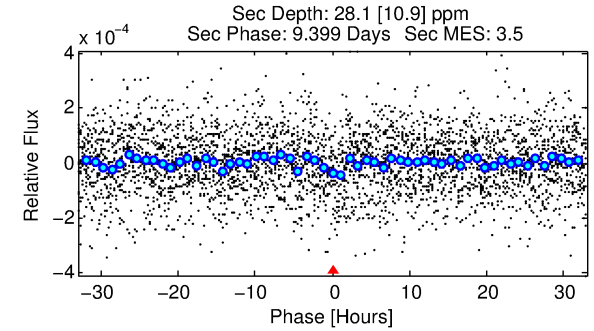
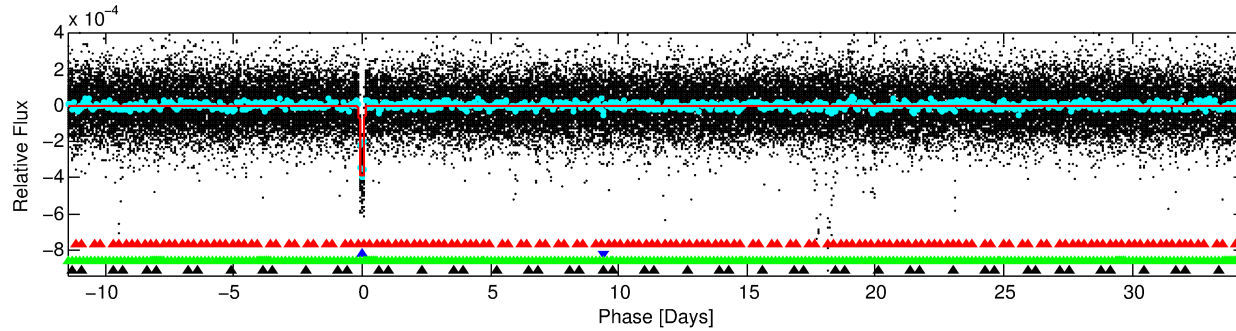
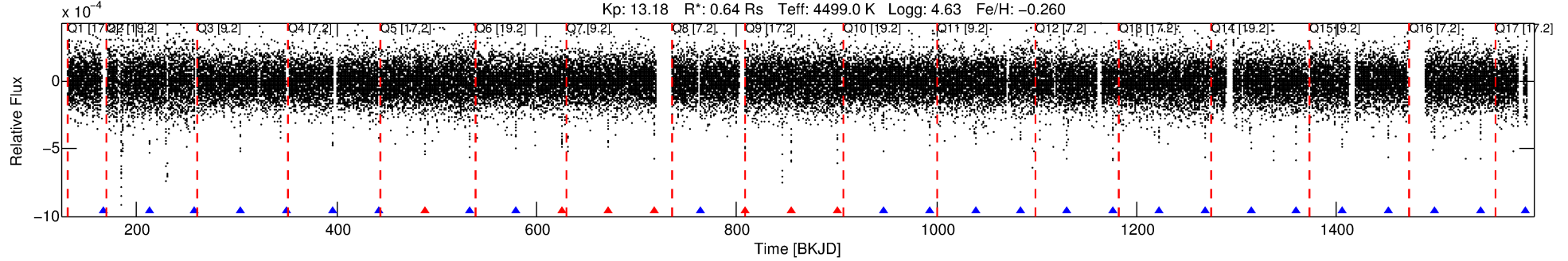
Ephemeris Match Information For 009950612-02

No Significant Match Found

DV One-Page Summary

KIC: 9950612 Candidate: 2 of 4 Period: 45.903 d
KOI: K00719.03 Name: Kepler-220e Corr: 0.966

Kp: 13.18 R*: 0.64 Rs Teff: 4499.0 K Logg: 4.63 Fe/H: -0.260



DV Fit Results:

Period = 45.90259 [0.00014] d
Epoch = 166.5644 [0.0026] BKJD
Rp/R* = 0.0222 [0.0014]
a/R* = 32.22 [7.24]
b = 0.89 [0.05]
Seff = 3.20 [0.32]
Teq = 341 [8] K
Rp = 1.55 [0.13] Re
a = 0.2166 [0.0090] AU
Ag = 303.07 [125.00] [2.42σ]
Teffp = 2199 [229] K [8.12σ]

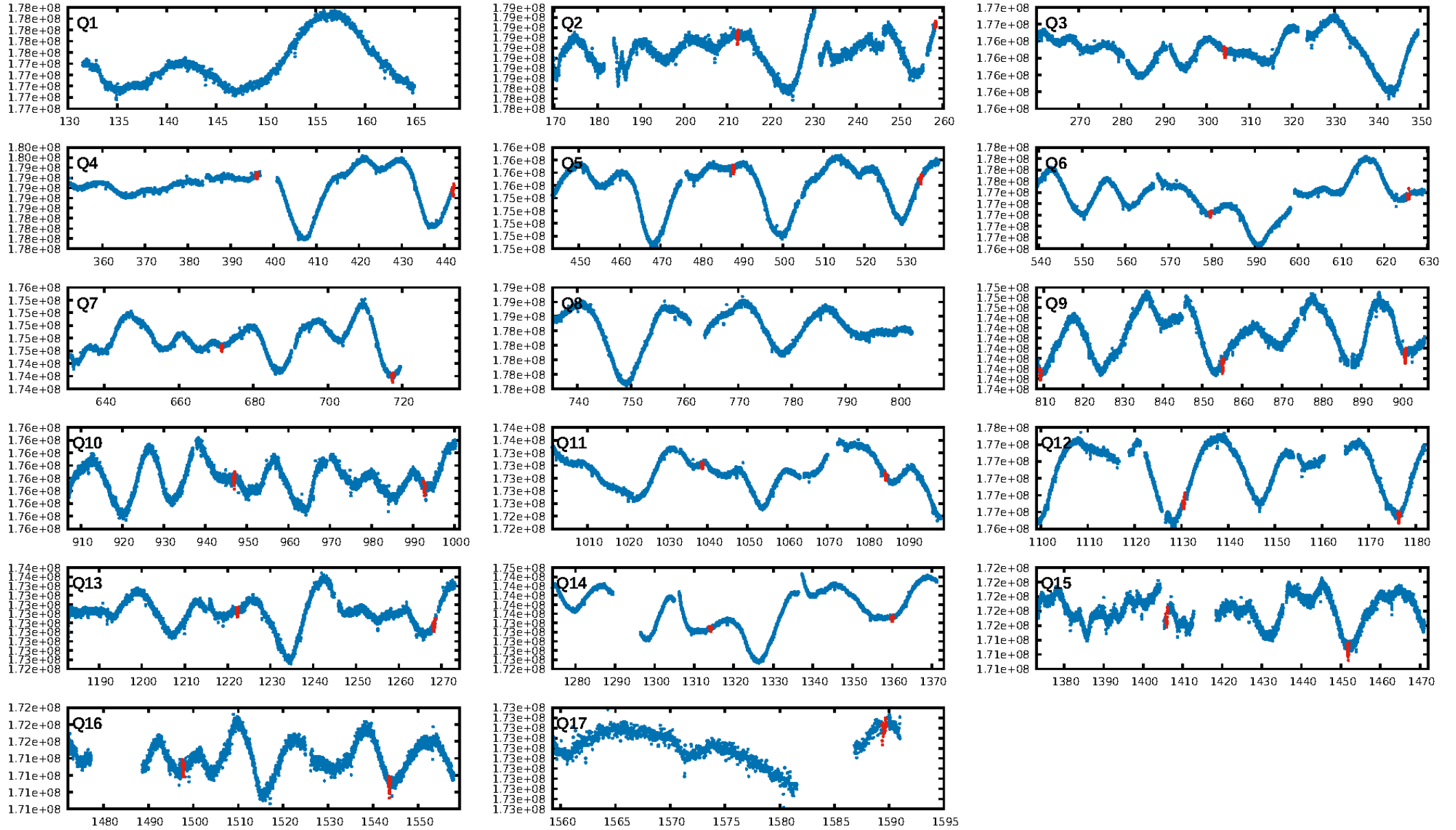
DV Diagnostic Results:

ShortPeriod-sig: 100.0% [60.04σ]
LongPeriod-sig: N/A
ModelChiSquare2-sig: 50.8%
ModelChiSquareGof-sig: 100.0%
Bootstrap-pfa: 3.18e-228
RollingBand-fgt: 0.75 [21/28]
GhostDiagnostic-chr: 2.909
Centroid-sig: 10.5%
Centroid-so: 0.197 arcsec [0.73σ]
OotOffset-rm: 0.163 arcsec [0.44σ]
KicOffset-rm: 0.352 arcsec [1.20σ]
OotOffset-st: 4/4/3/4 [15]
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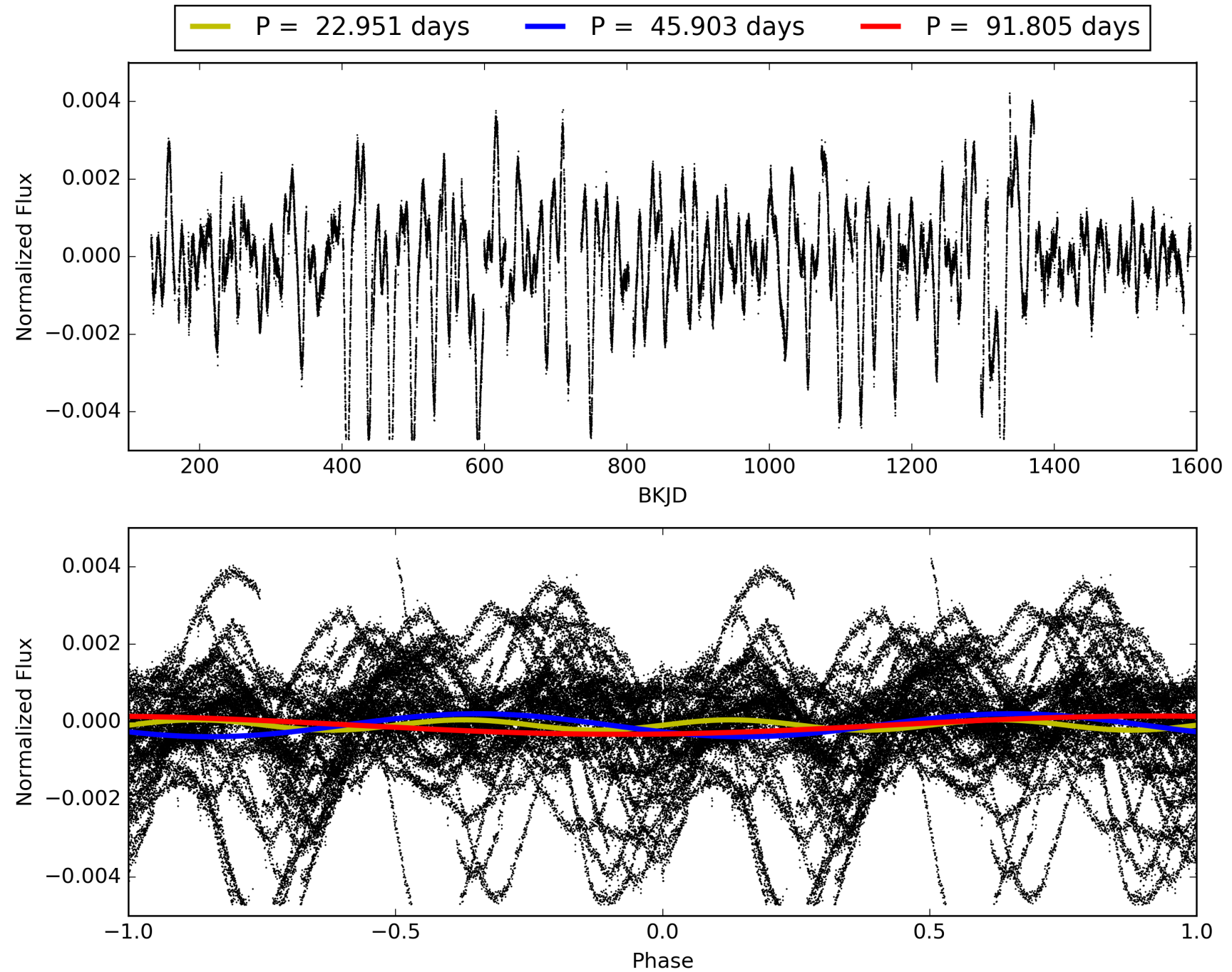
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This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

TCE 009950612-02, PDC Light Curves

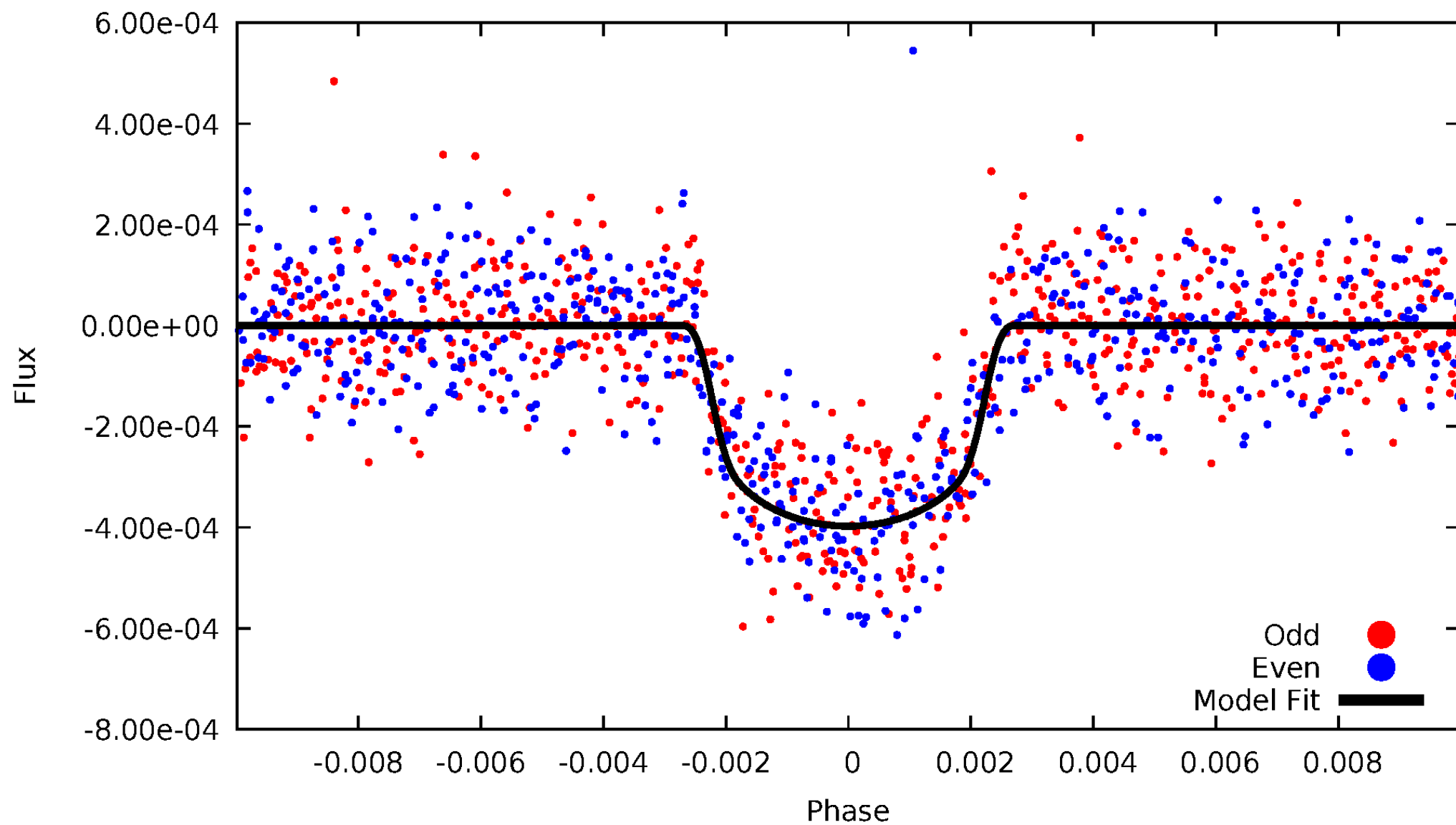


TCE 009950612-02



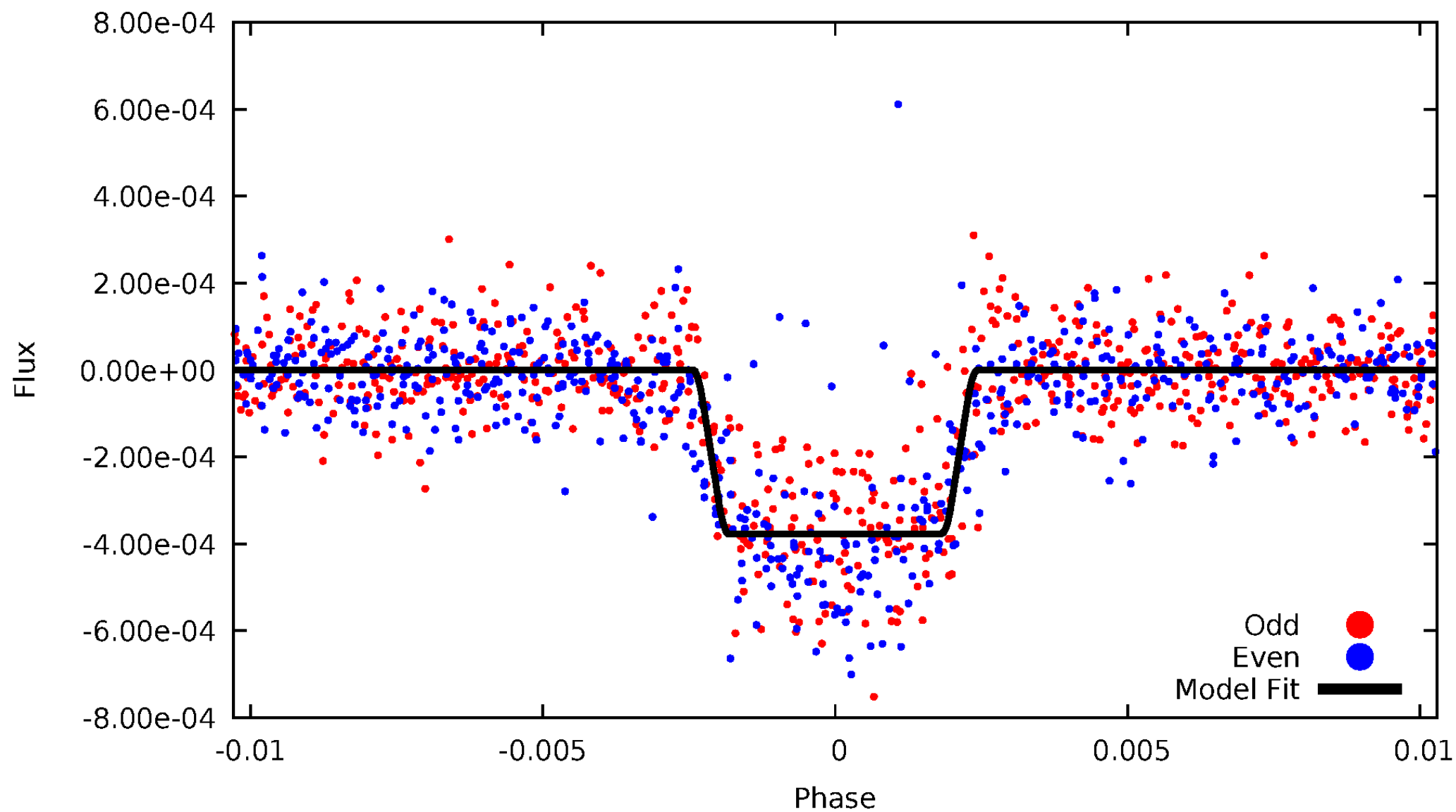
DV Odd/Even

TCE 009950612-02



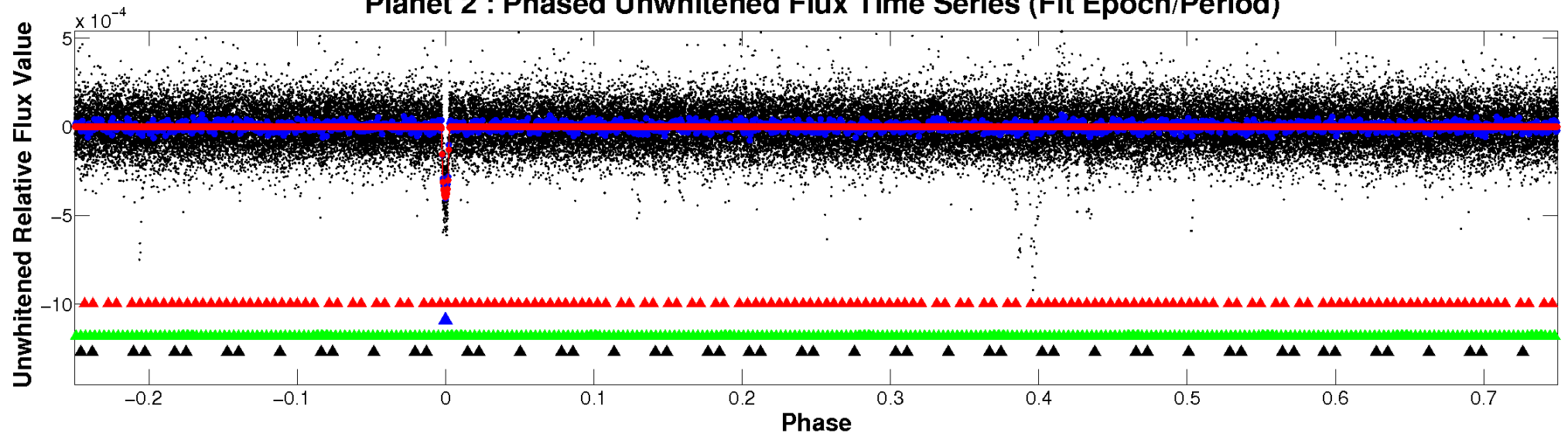
ALT Odd/Even

TCE 009950612-02

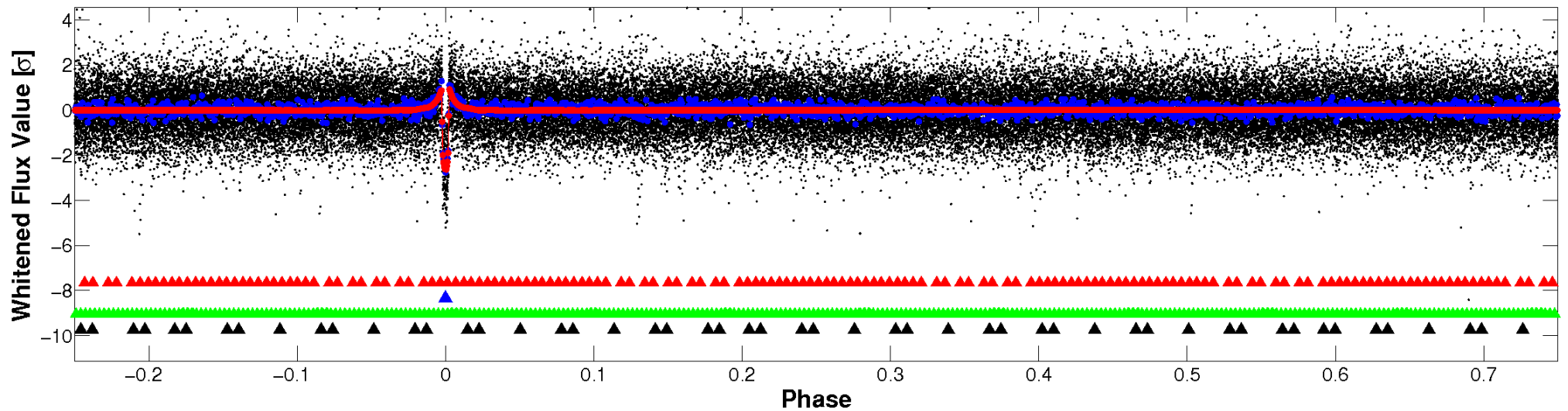


Non-Whitened Vs. Whitened Light Curve

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

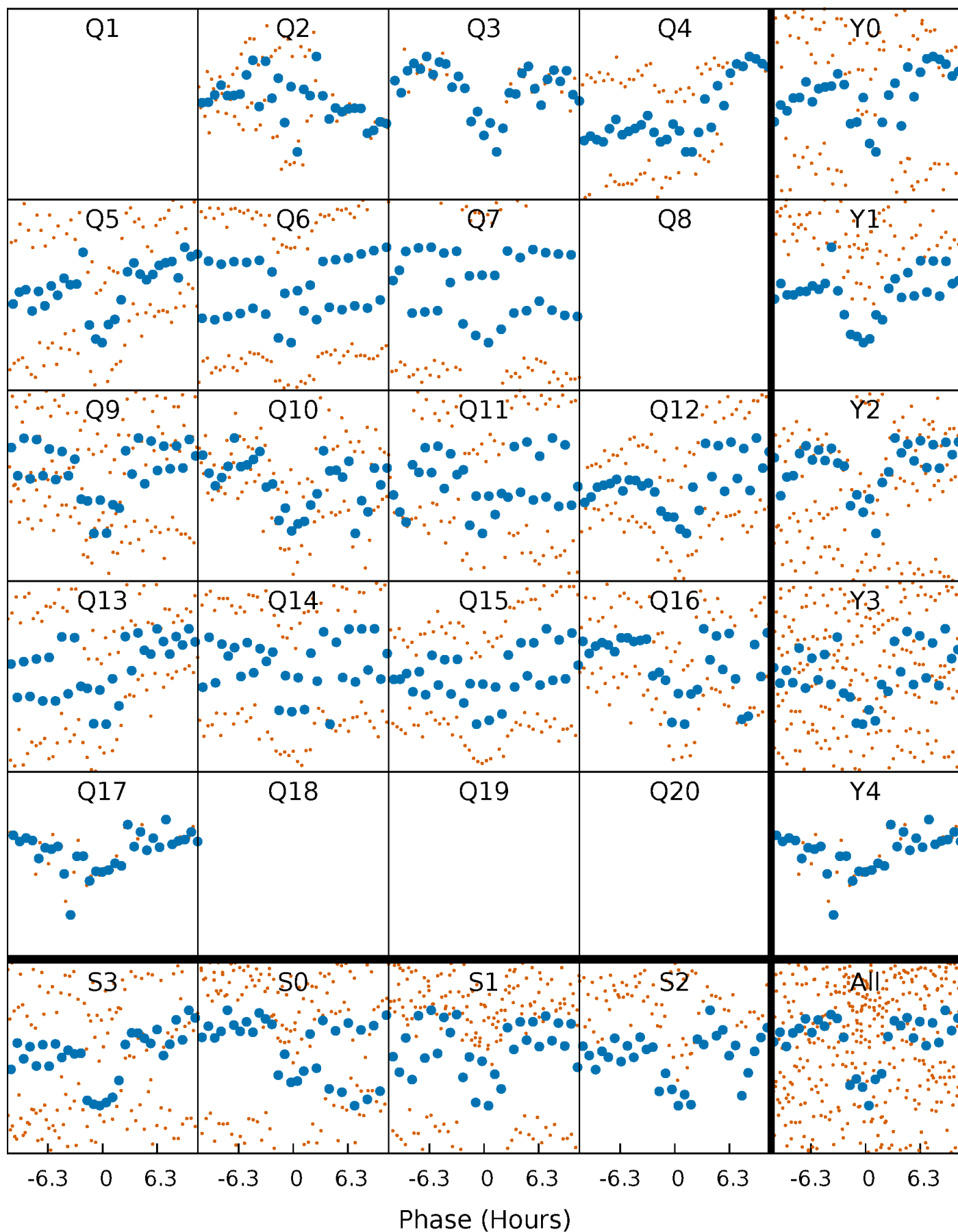


Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



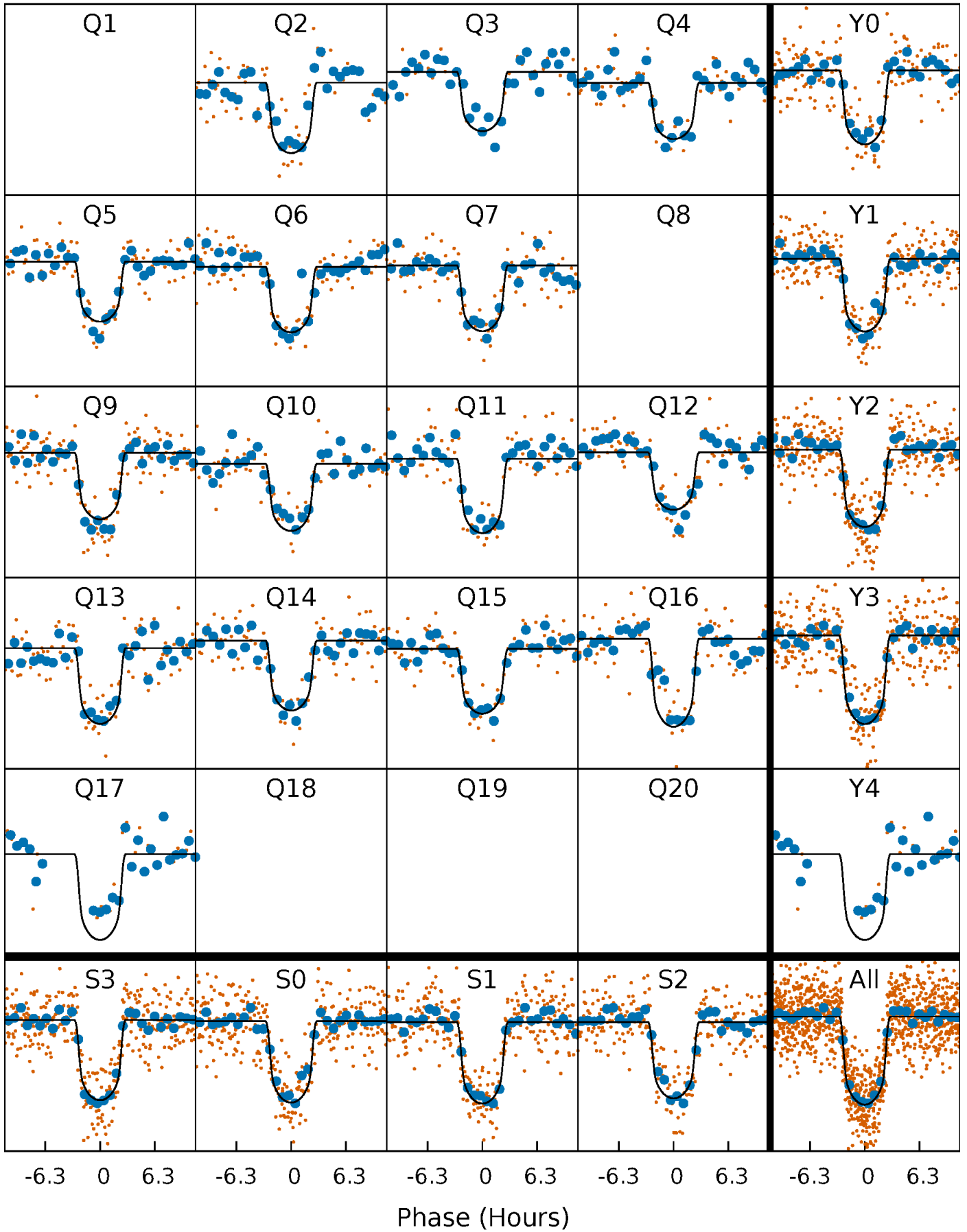
PDC Quarter-Phased Transit Curves

TCE 009950612-02 P= 45.902592 Days $T_0=166.564365$ (BKJD)



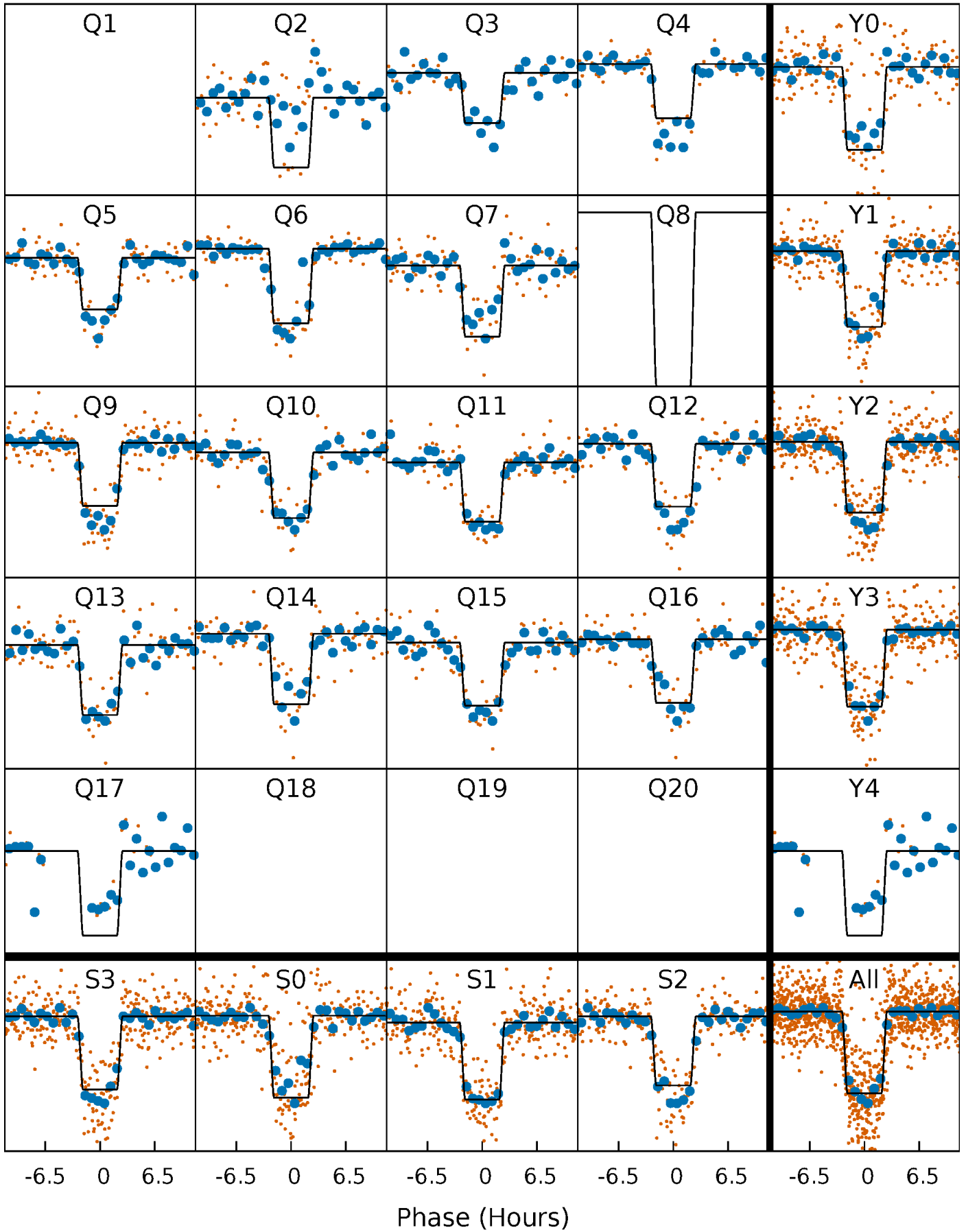
DV Quarter-Phased Transit Curves

TCE 009950612-02 P= 45.902592 Days $T_0=166.564365$ (BKJD)



Alt. Detrend Quarter-Phased Transit Curves

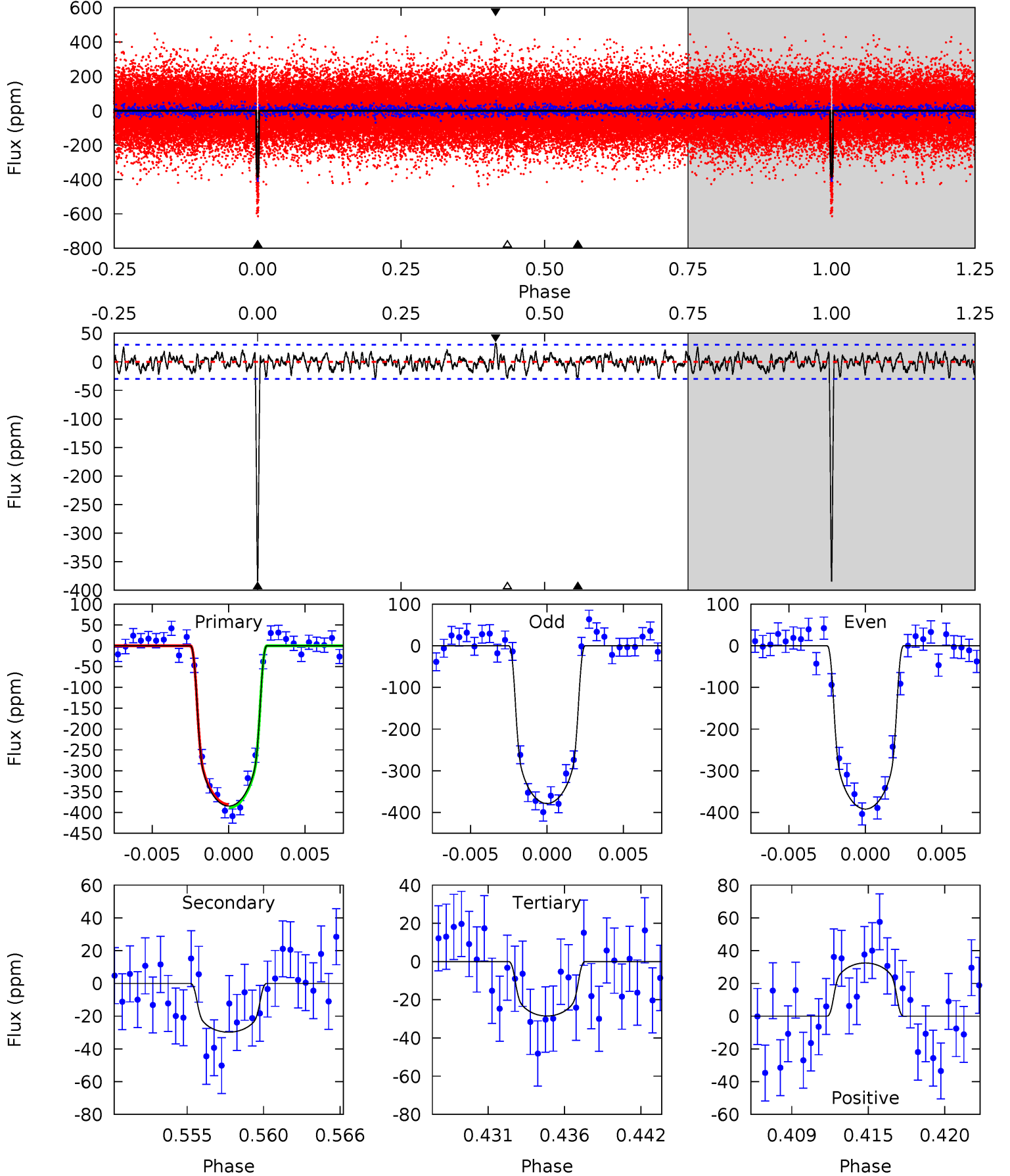
TCE 009950612-02 P= 45.902663 Days $T_0=166.562761$ (BKJD)



DV Model-Shift Uniqueness Test

009950612-02, $P = 45.902592$ Days, $E = 120.661773$ Days

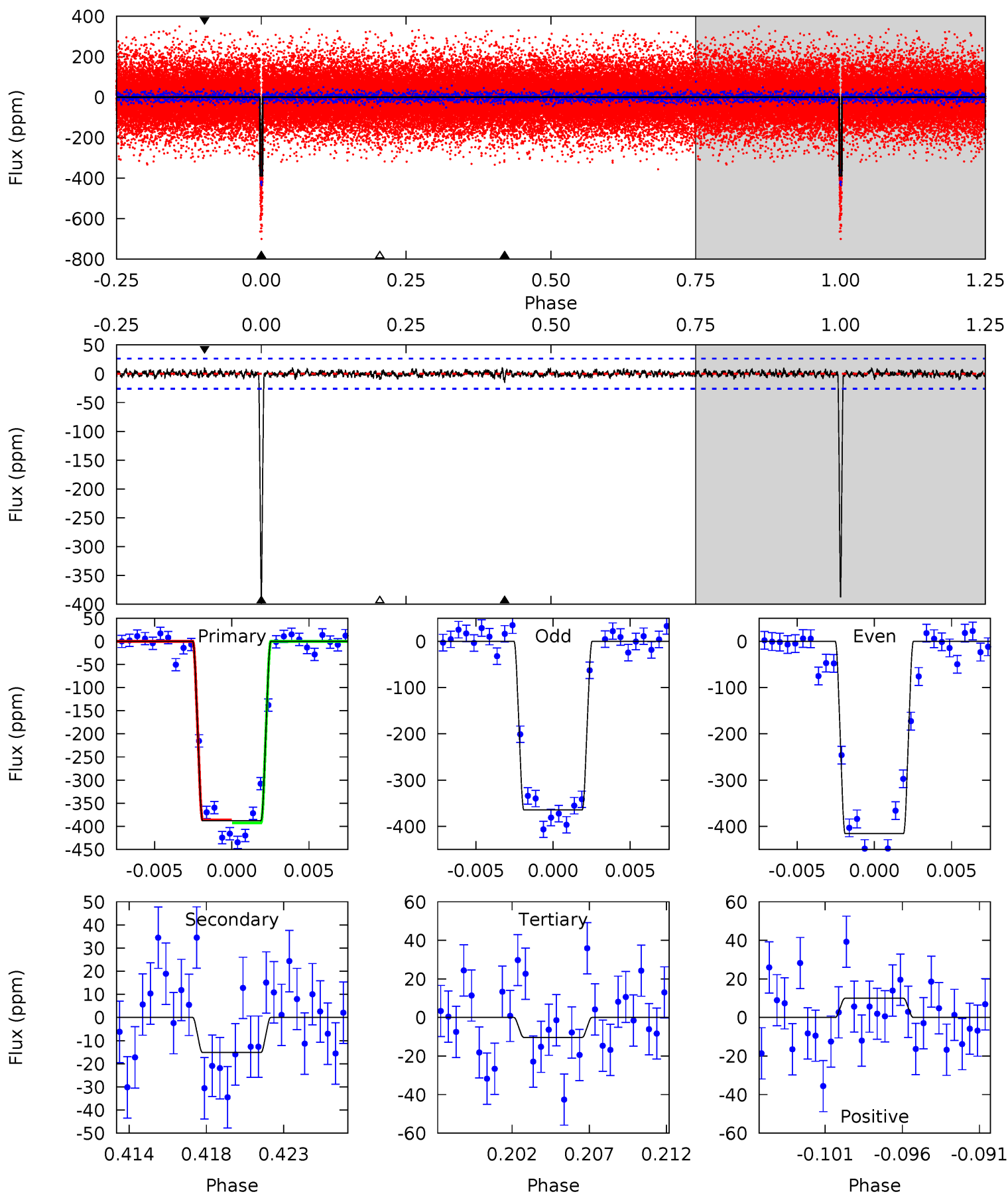
Pri	Sec	Ter	Pos	FA ₁	FA ₂	F _{Red}	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
66.2	5.13	4.91	5.58	5.14	2.78	1.59	61.3	60.6	0.22	-0.46	1.15	0.98	0.08	0.66



Alt Model-Shift Uniqueness Test

009950612-02, $P = 45.902663$ Days, $E = 120.660098$ Days

Pri	Sec	Ter	Pos	FA ₁	FA ₂	F _{Red}	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
76.7	3.00	2.04	1.97	5.16	2.82	0.60	74.7	74.7	0.96	1.03	5.09	0.92	0.03	0.61



Stellar Parameters For KIC 009950612

	$T_{\text{eff}}(K)$	$\log(g)$	$[\text{Fe}/\text{H}]$	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	4499^{+89}_{-89}	$4.635^{+0.032}_{-0.020}$	$-0.260^{+0.150}_{-0.150}$	$0.639^{+0.025}_{-0.032}$	$0.643^{+0.035}_{-0.032}$	$3.466^{+0.459}_{-0.276}$
	+2%/-2%	+1%/-0%	+58%/-58%	+4%/-5%	+5%/-5%	+13%/-8%
Source	SPE60	SPE60	SPE60	DSEP		

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

Secondary Eclipse Parameters for KIC 009950612-02 / KOI 0719.03

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	A_{obs}
DV	-30 ± 6	$1.55^{+0.10}_{-0.11}$	475^{+11}_{-10}	2859^{+101}_{-95}	326^{+78}_{-73}
Alt.	-15 ± 5	$1.36^{+0.11}_{-0.10}$	475^{+11}_{-10}	2708^{+124}_{-144}	212^{+86}_{-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 $T_{\text{obs}} \gg T_{\text{max}}$ AND $A_{\text{obs}} \gg 1.0$

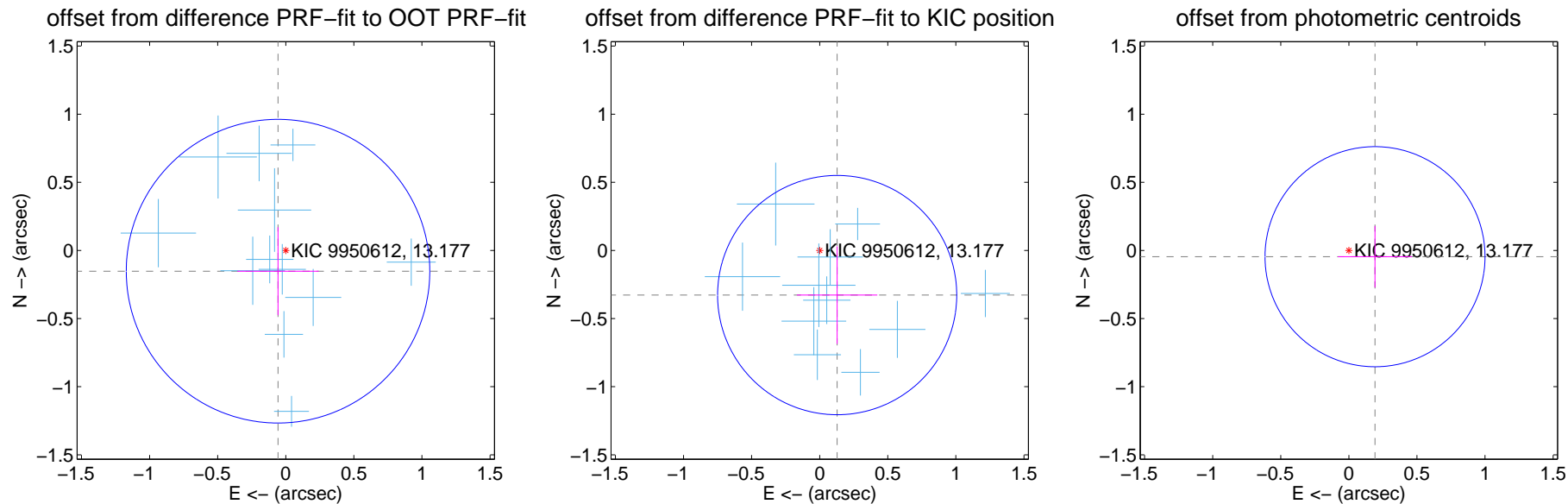
DV Centroid Data

Supplemental centroid analysis for 009950612-02. Kepler magnitude: 13.18. Transit SNR 39.57

There are 14 quarters with good PRF difference image offsets

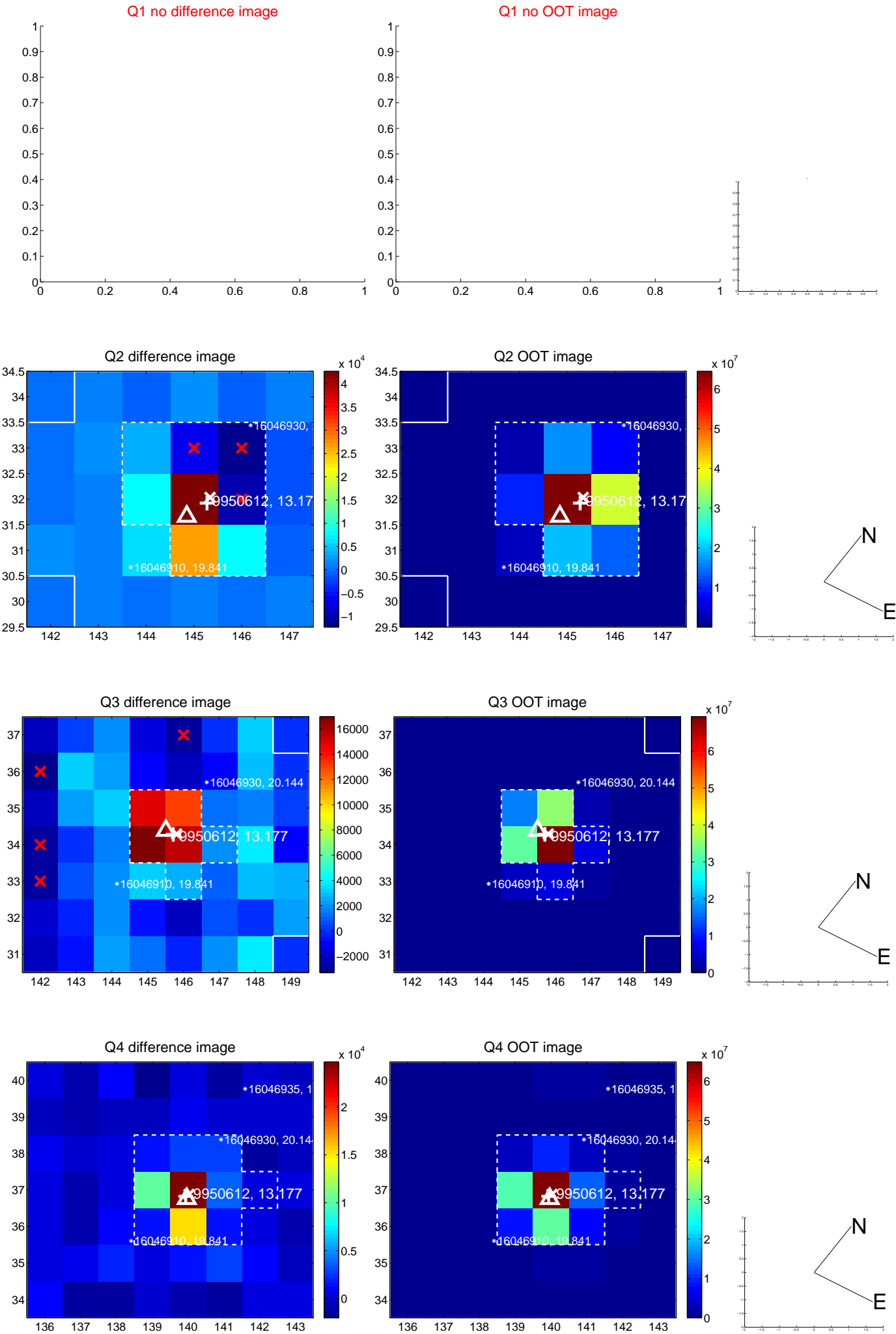
The direct PRF centroid is offset from the target star catalog position by about 0.45 arcsec

	Distance in arcsec	Distance / σ	Δ RA	Δ Dec
PRF-fit source offset from OOT	0.163 ± 0.371	0.44	0.057 ± 0.299	-0.152 ± 0.322
PRF-fit source offset from KIC position	0.352 ± 0.293	1.20	-0.128 ± 0.295	-0.328 ± 0.358
photometric centroid source offset	0.20 ± 0.27	0.73	-0.19 ± 0.27	-0.05 ± 0.23

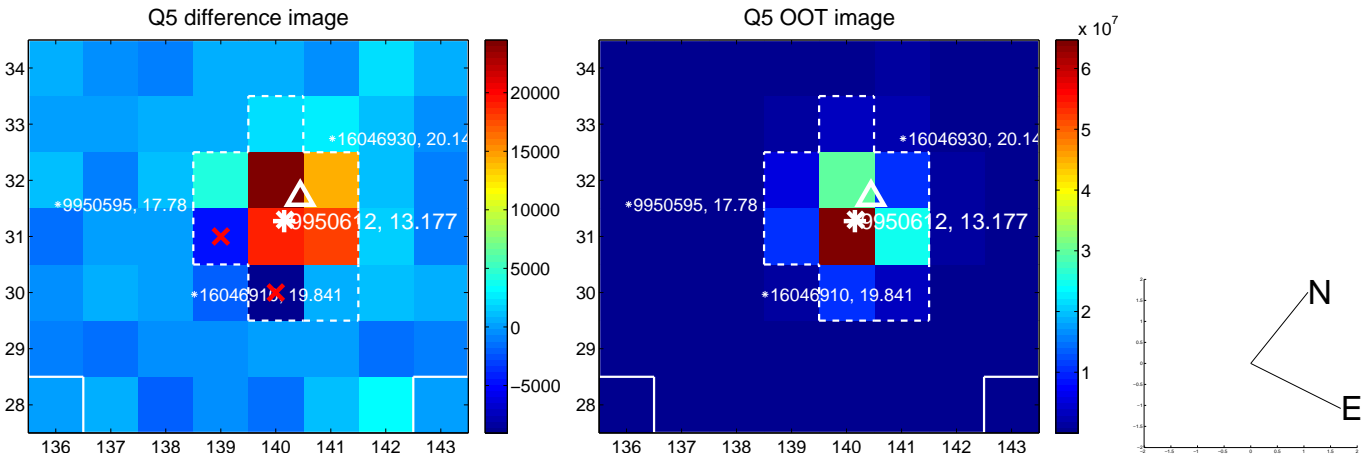


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses:** good quarterly centroid offsets; **Vermillion crosses:** bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- σ uncertainty. Blue circle: three-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

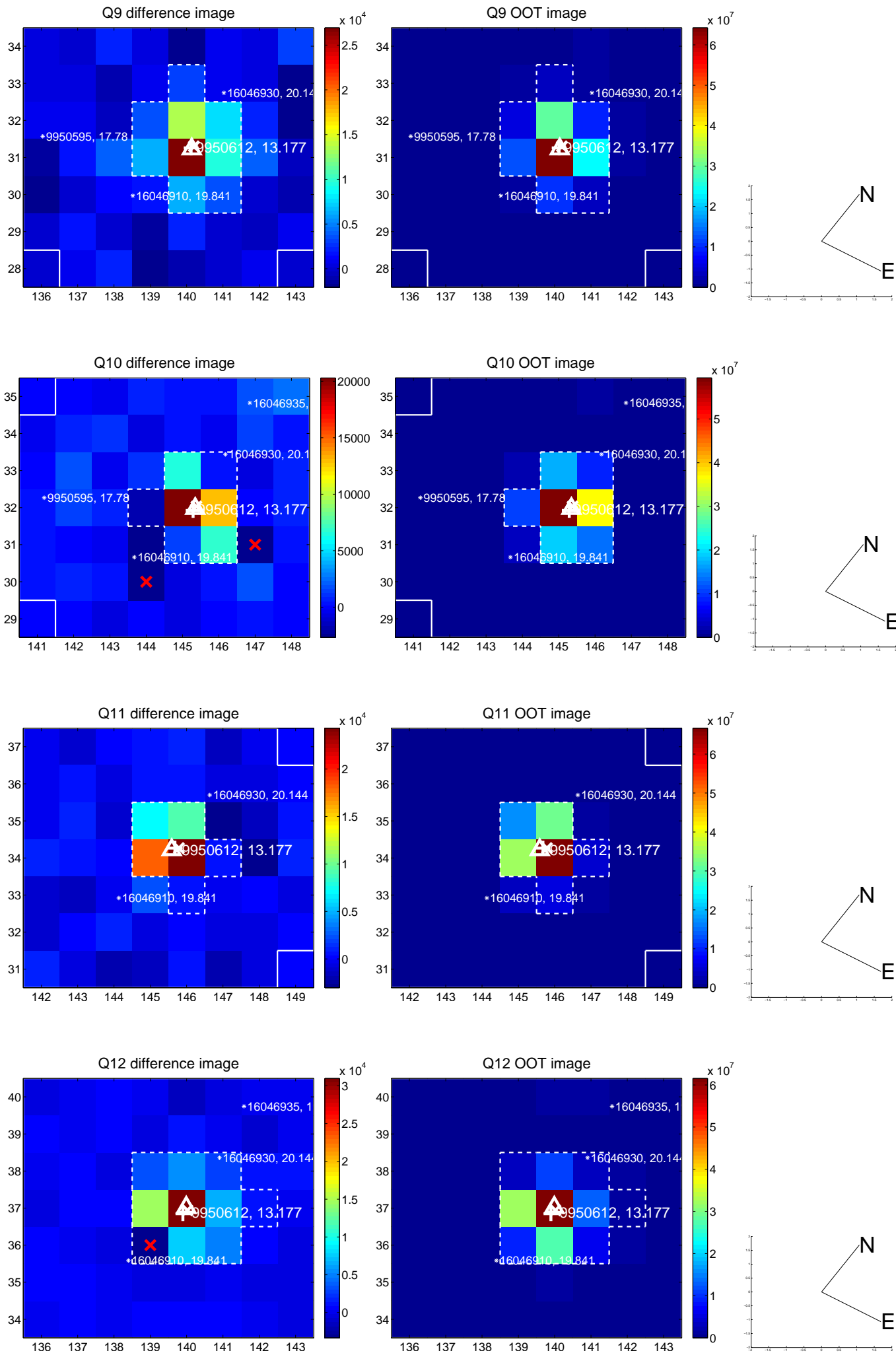
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



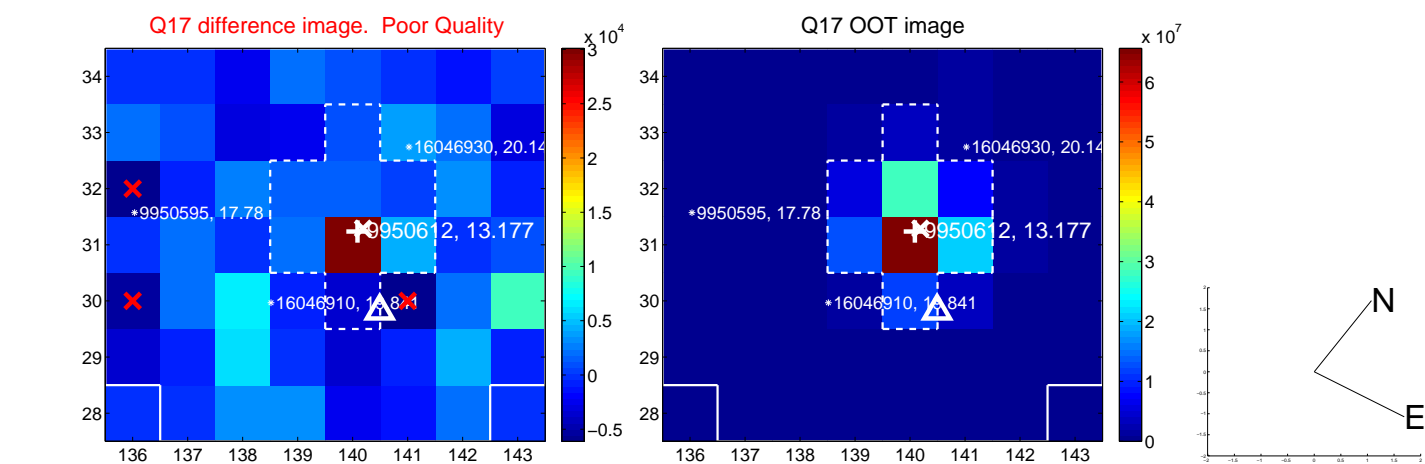
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



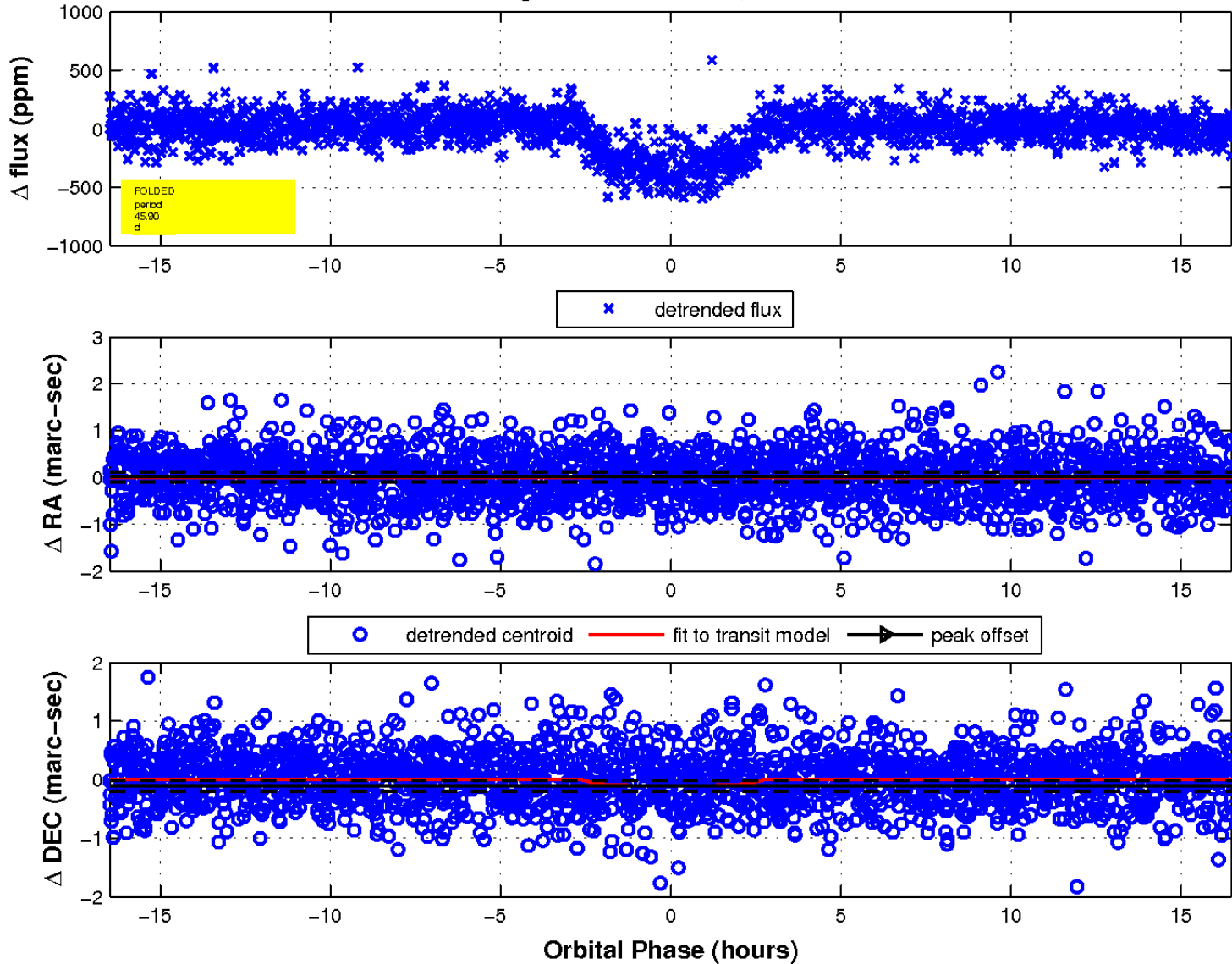
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



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

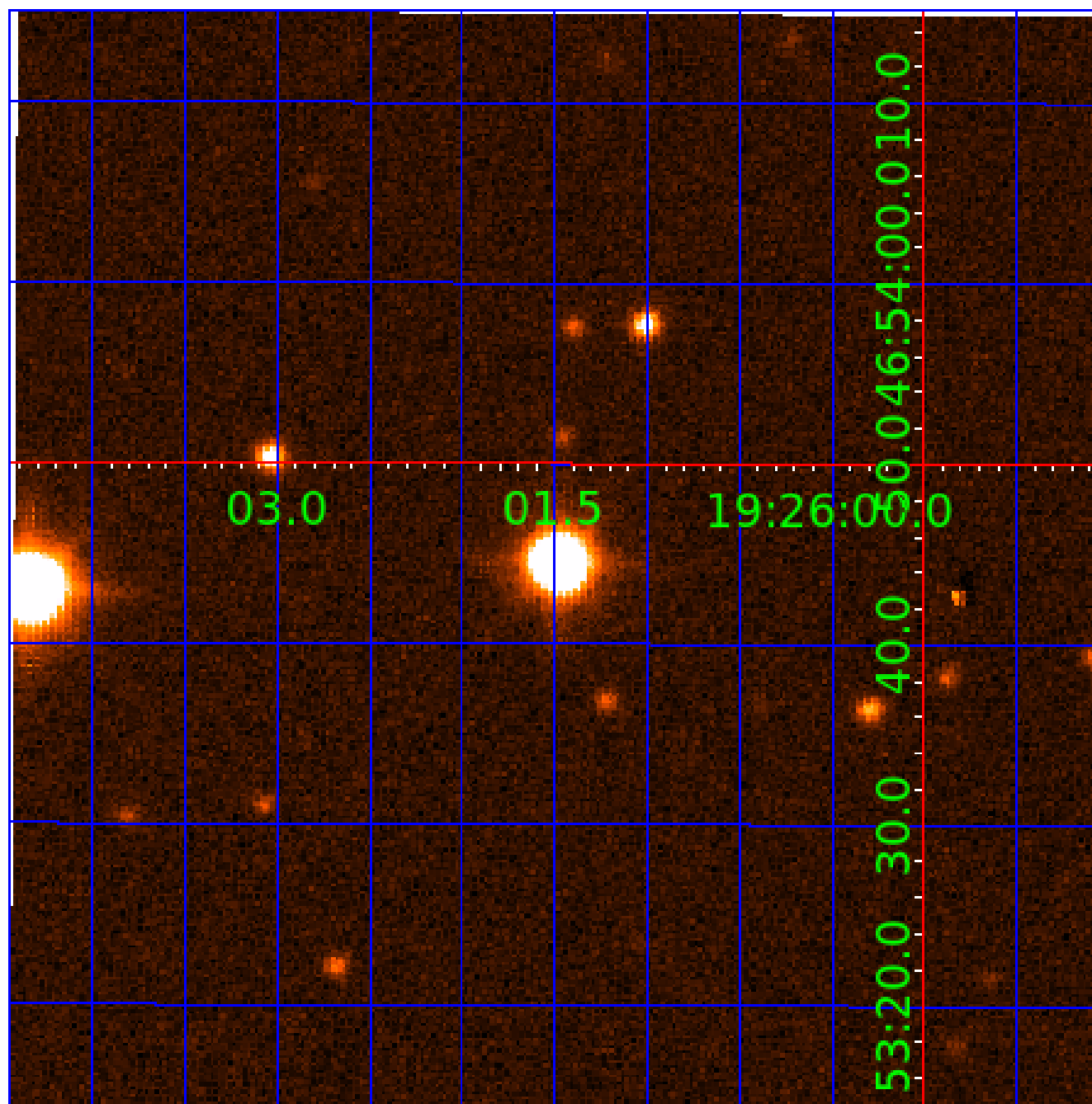


fluxWeightedCentroids, Planet 2 of 4



UKIRT Image

Declination



KIC 009950612

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})
009950612-01	OBS	0719.01	9.034196	134.878101	560.4	1.612	85.0	84.7	0.64	4499	1.86	27.91
009950612-02	OBS	0719.03	45.902592	166.564365	397.8	5.496	36.9	39.6	0.64	4499	1.55	3.20
009950612-03	OBS	0719.04	4.159821	133.786140	152.4	1.642	32.7	36.7	0.64	4499	0.97	78.51
009950612-04	OBS	0719.02	28.122448	146.919273	203.8	4.506	22.9	25.4	0.64	4499	1.18	6.14

Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009950612-01	OBS	PC	1.00	0	0	0	0	NO_COMMENT
009950612-02	OBS	PC	1.00	0	0	0	0	NO_COMMENT
009950612-03	OBS	PC	1.00	0	0	0	0	NO_COMMENT
009950612-04	OBS	PC	1.00	0	0	0	0	CENT_KIC_POS

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.

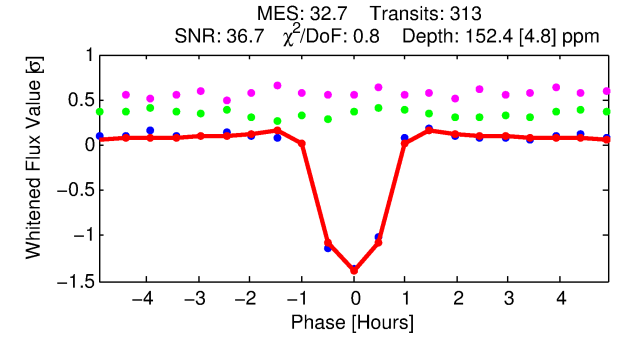
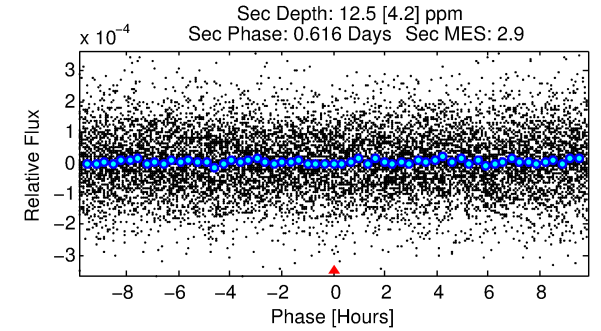
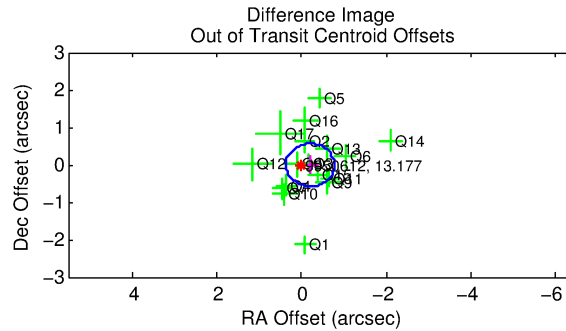
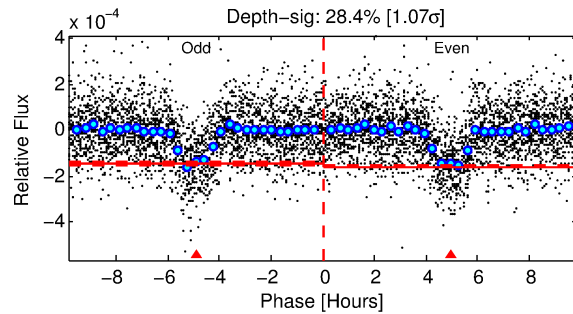
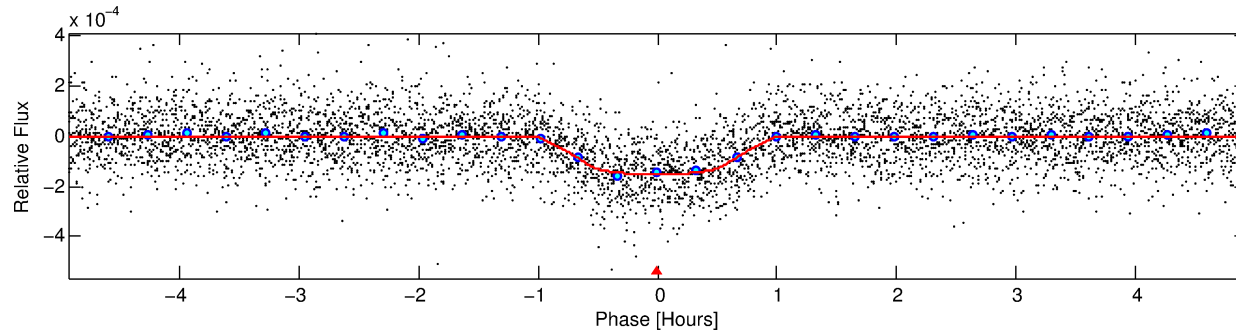
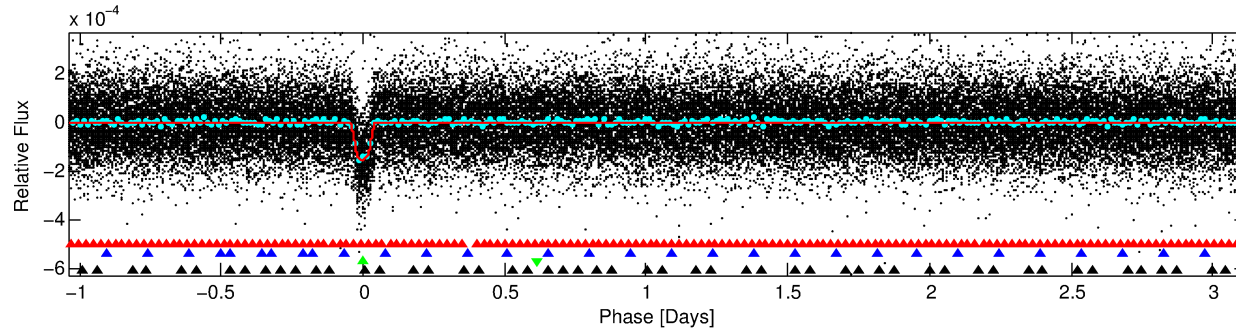
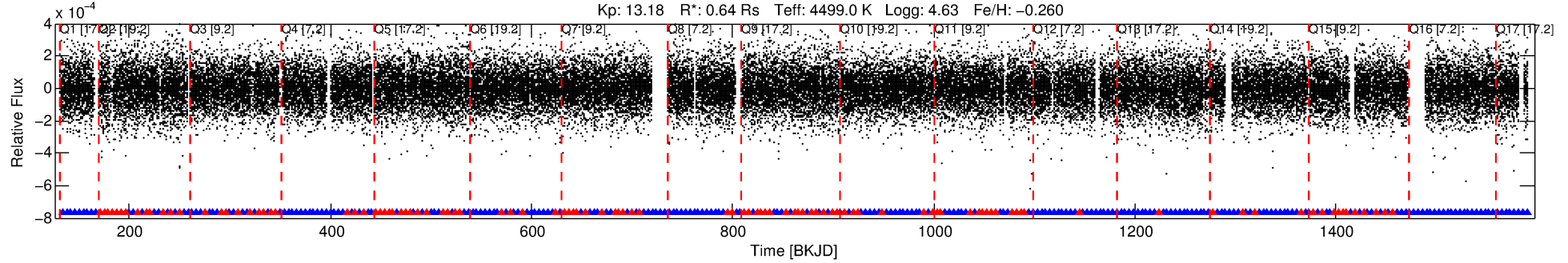
Ephemeris Match Information For 009950612-03

No Significant Match Found

DV One-Page Summary

KIC: 9950612 Candidate: 3 of 4 Period: 4.160 d
KOI: K00719.04 Name: Kepler-220b Corr: 0.985

Kp: 13.18 R*: 0.64 Rs Teff: 4499.0 K Logg: 4.63 Fe/H: -0.260



DV Fit Results:

Period = 4.15982 [0.00001] d
Epoch = 133.7861 [0.0008] BKJD
Rp/R* = 0.0140 [0.0041]
a/R* = 9.13 [9.88]
b = 0.90 [0.24]
Seff = 78.51 [7.77]
Teq = 759 [19] K
Rp = 0.97 [0.29] Re
a = 0.0437 [0.0018] AU
Ag = 13.85 [9.36] [1.37σ]
Teffp = 2264 [384] K [3.92σ]

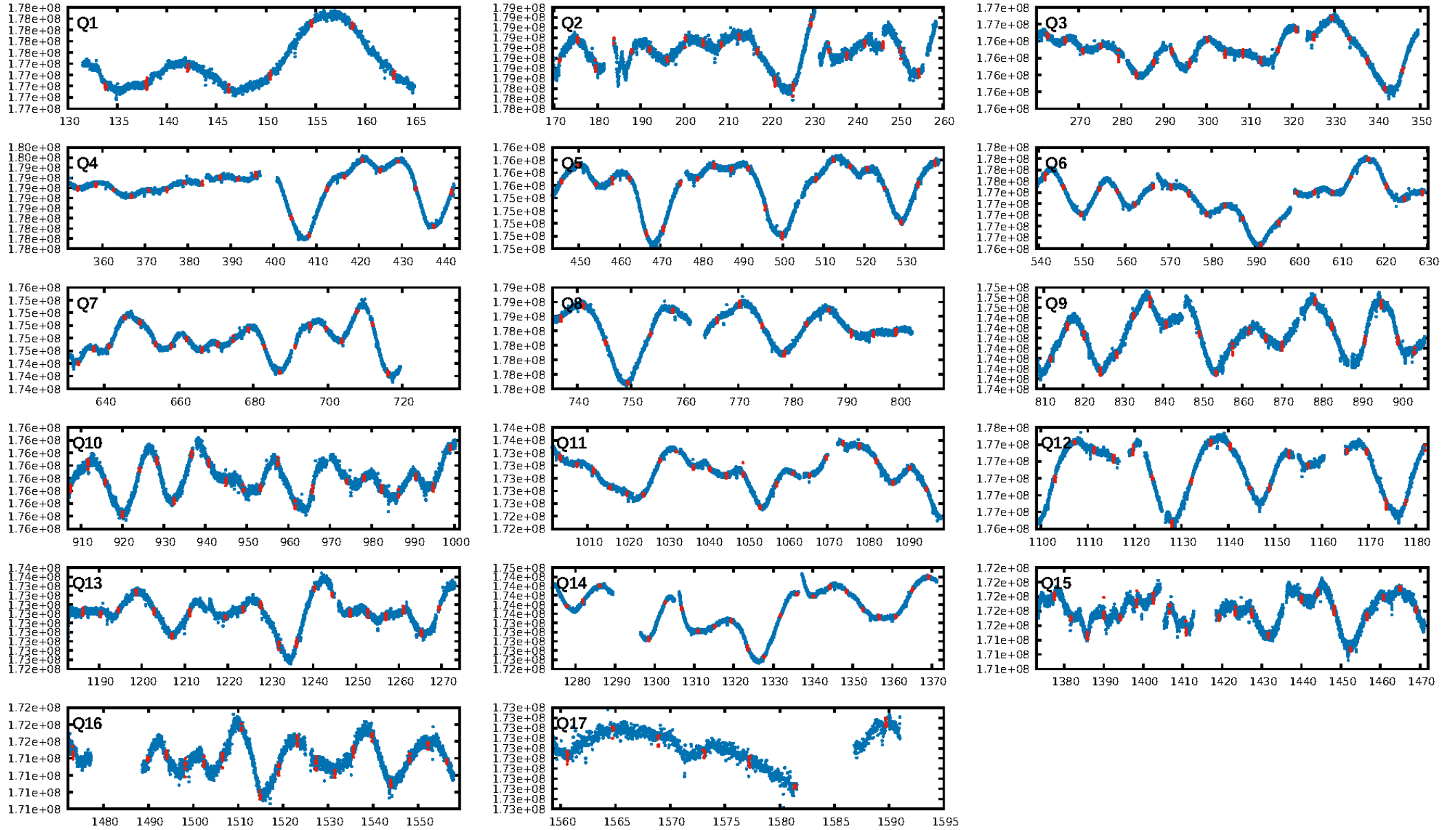
DV Diagnostic Results:

ShortPeriod-sig: N/A
LongPeriod-sig: 100.0% [50.83σ]
ModelChiSquare2-sig: N/A
ModelChiSquareGof-sig: N/A
Bootstrap-pfa: 3.96e-219
RollingBand-fgt: 0.65 [193/299]
GhostDiagnostic-chr: 4.25
Centroid-sig: 13.4%
Centroid-so: 0.771 arcsec [2.42σ]
OotOffset-rm: 0.206 arcsec [1.08σ]
KicOffset-rm: 0.594 arcsec [3.12σ]
OotOffset-st: 4/4/4/5 [17]
KicOffset-st: 4/4/4/5 [17]
DiffImageQuality-fgm: 1.00 [17/17]
DiffImageOverlap-fno: 1.00 [17/17]

Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 29-Jan-2016 10:40:36 Z

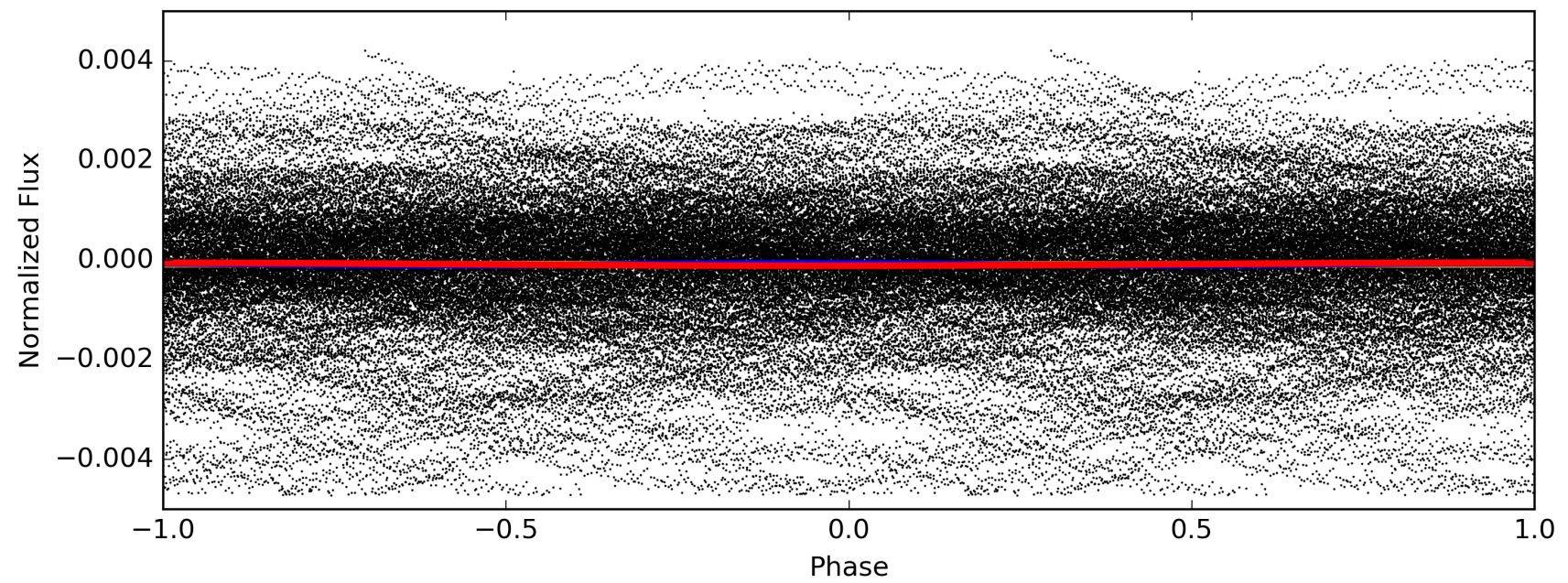
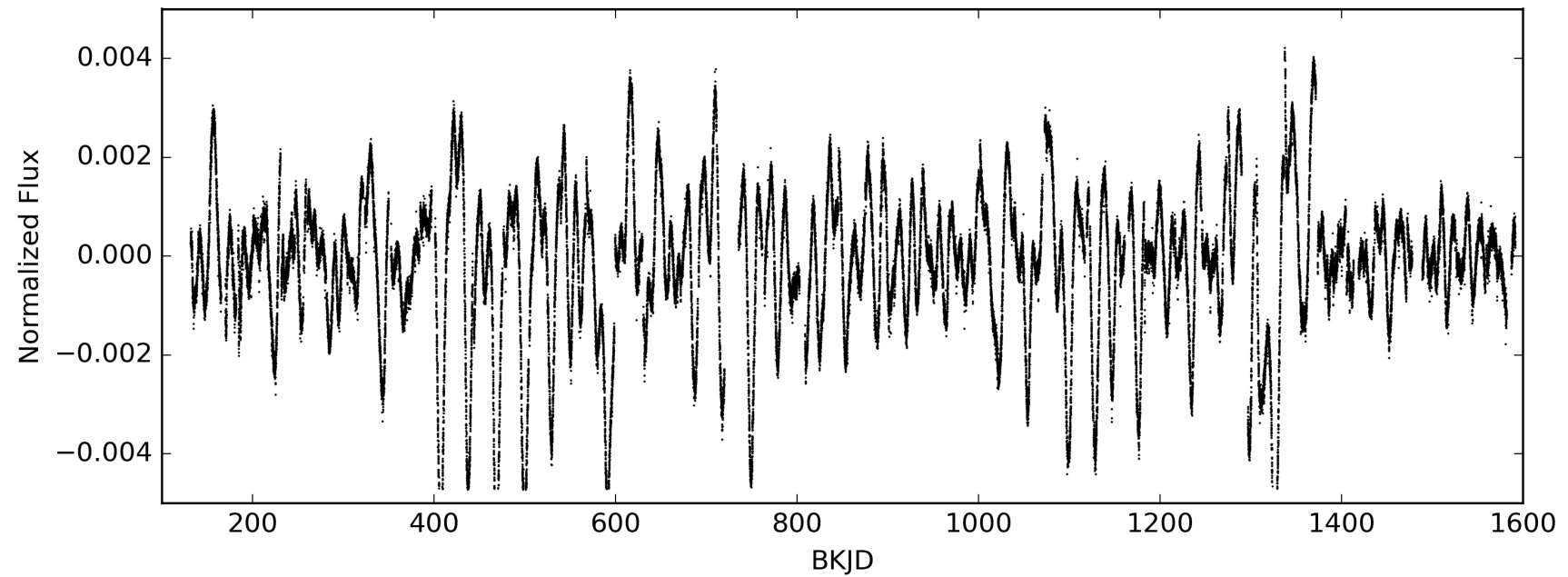
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

TCE 009950612-03, PDC Light Curves



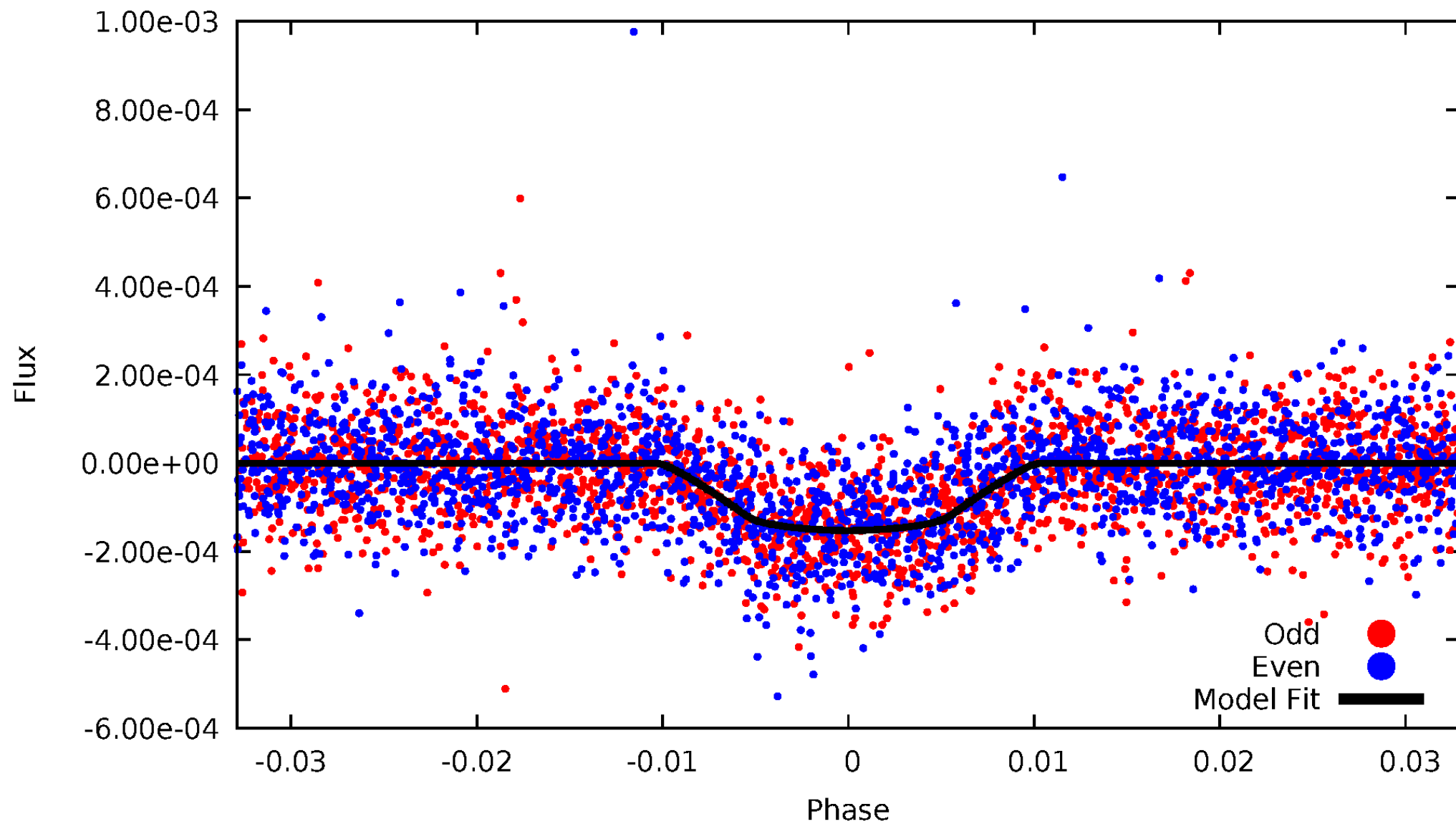
TCE 009950612-03

— P = 2.080 days — P = 4.160 days — P = 8.320 days



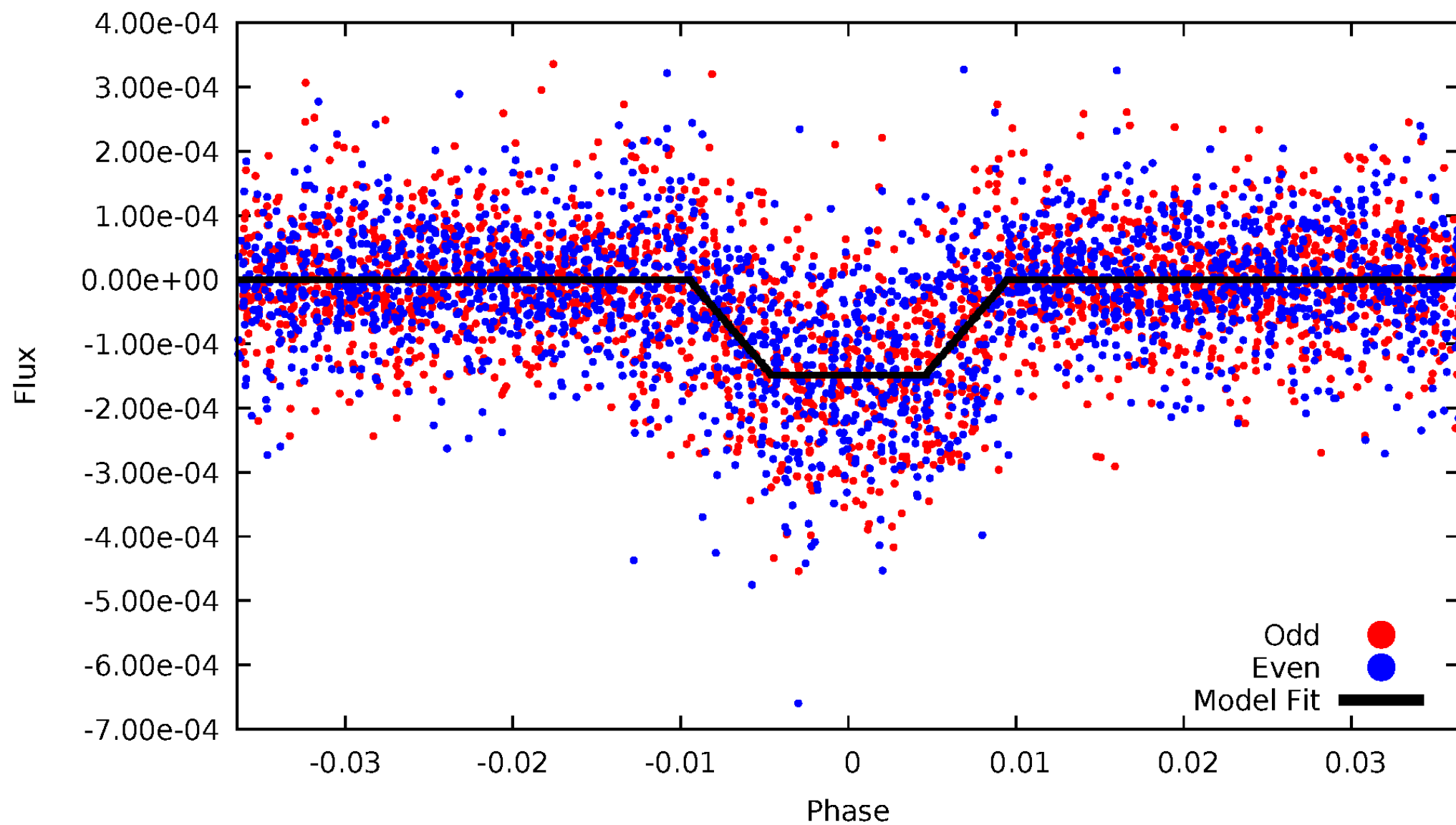
DV Odd/Even

TCE 009950612-03



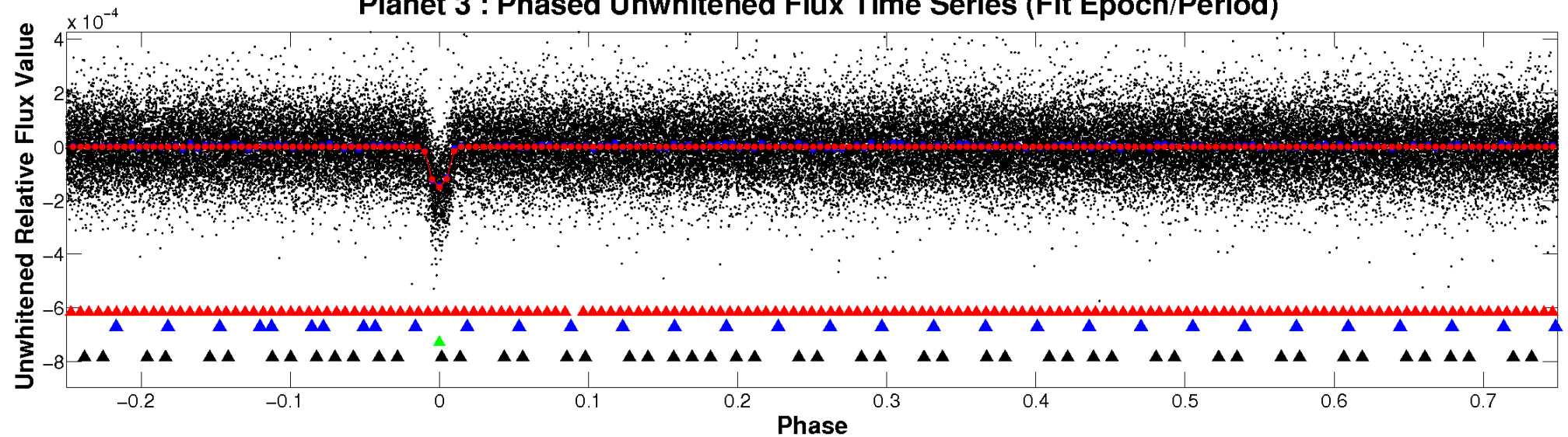
ALT Odd/Even

TCE 009950612-03

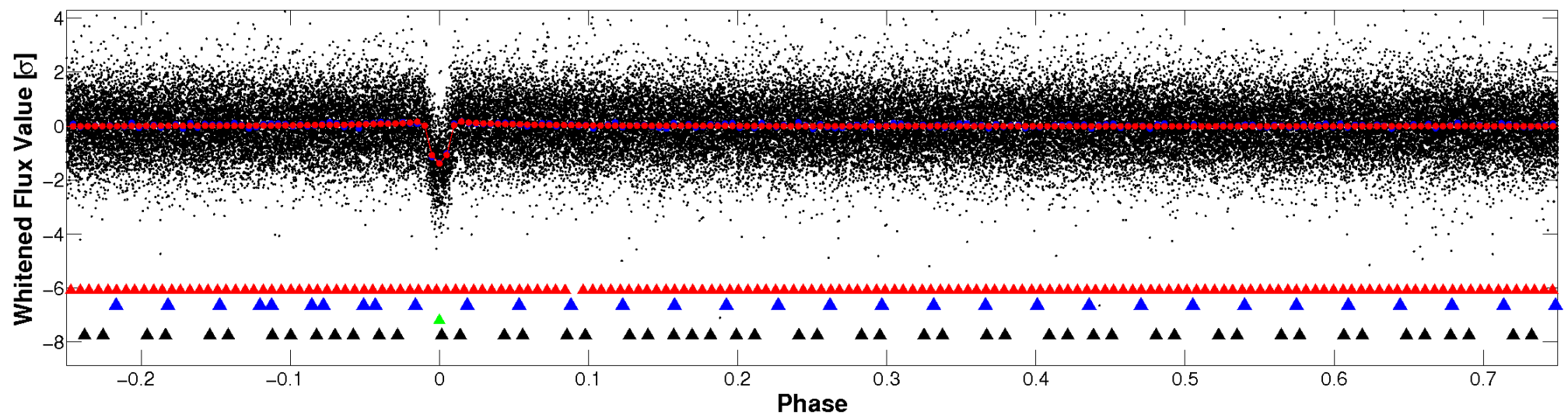


Non-Whitened Vs. Whitened Light Curve

Planet 3 : Phased Unwhitened Flux Time Series (Fit Epoch/Period)

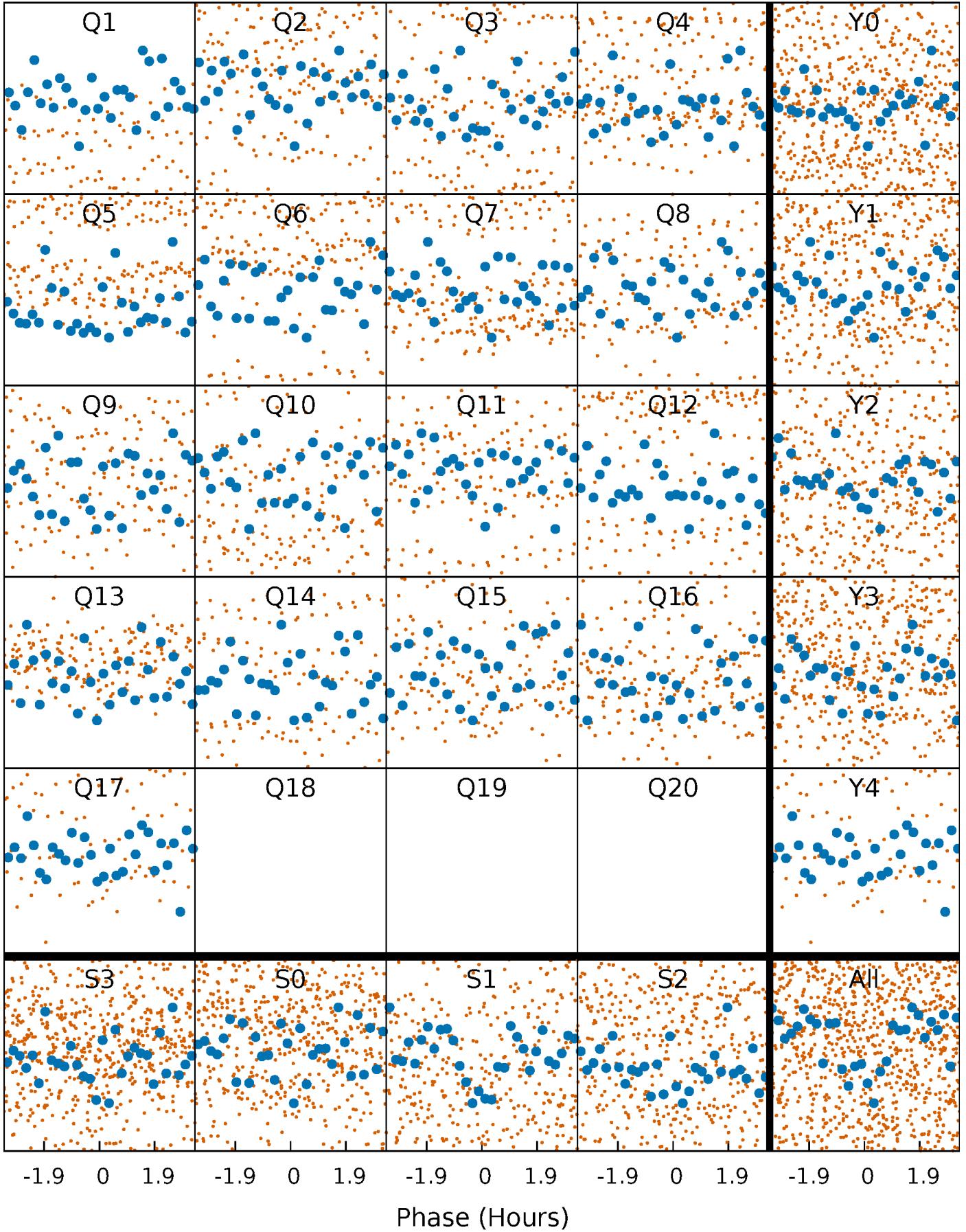


Planet 3 : Phased Whitened Flux Time Series (Fit Epoch/Period)



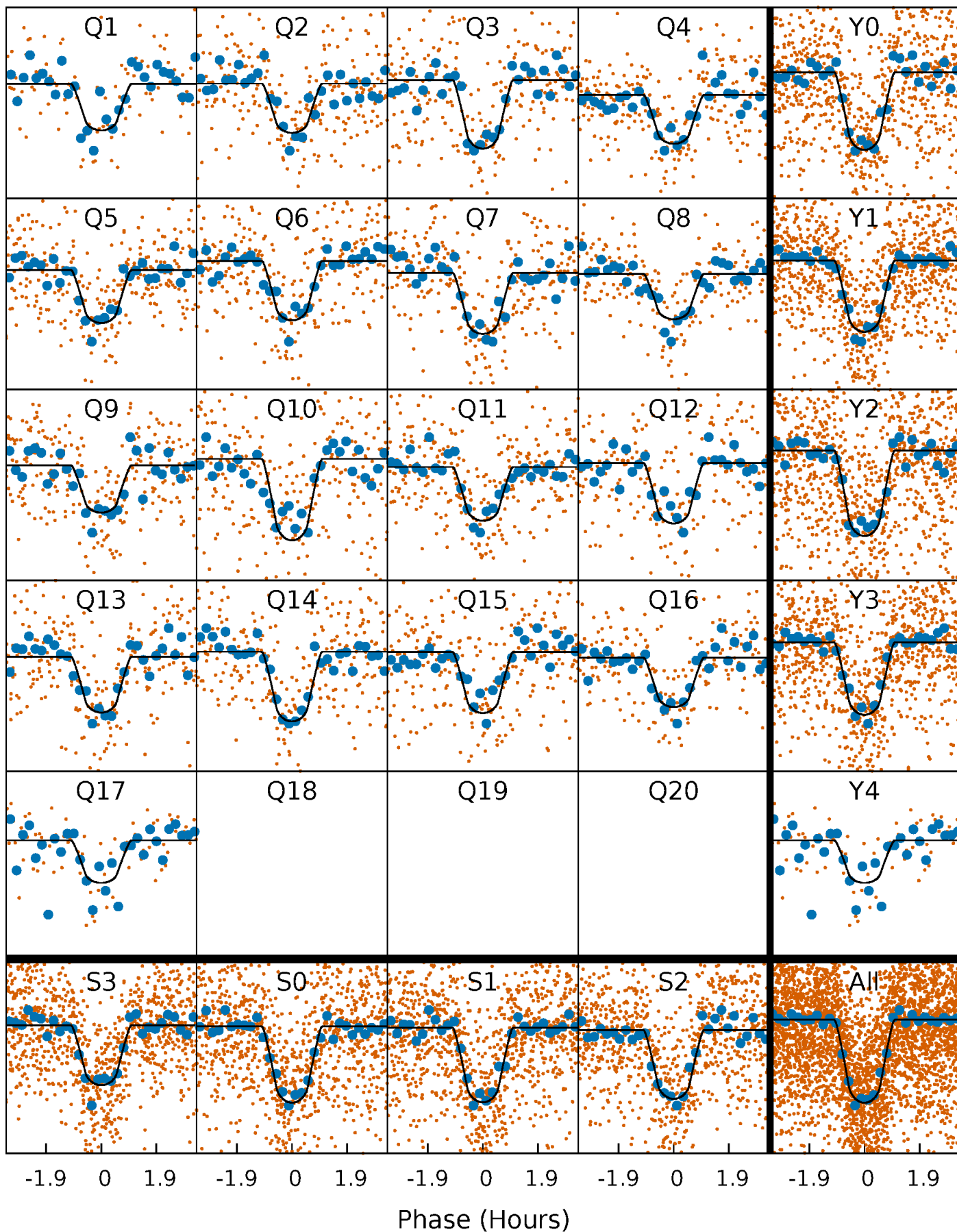
PDC Quarter-Phased Transit Curves

TCE 009950612-03 P= 4.159821 Days $T_0=133.786140$ (BKJD)



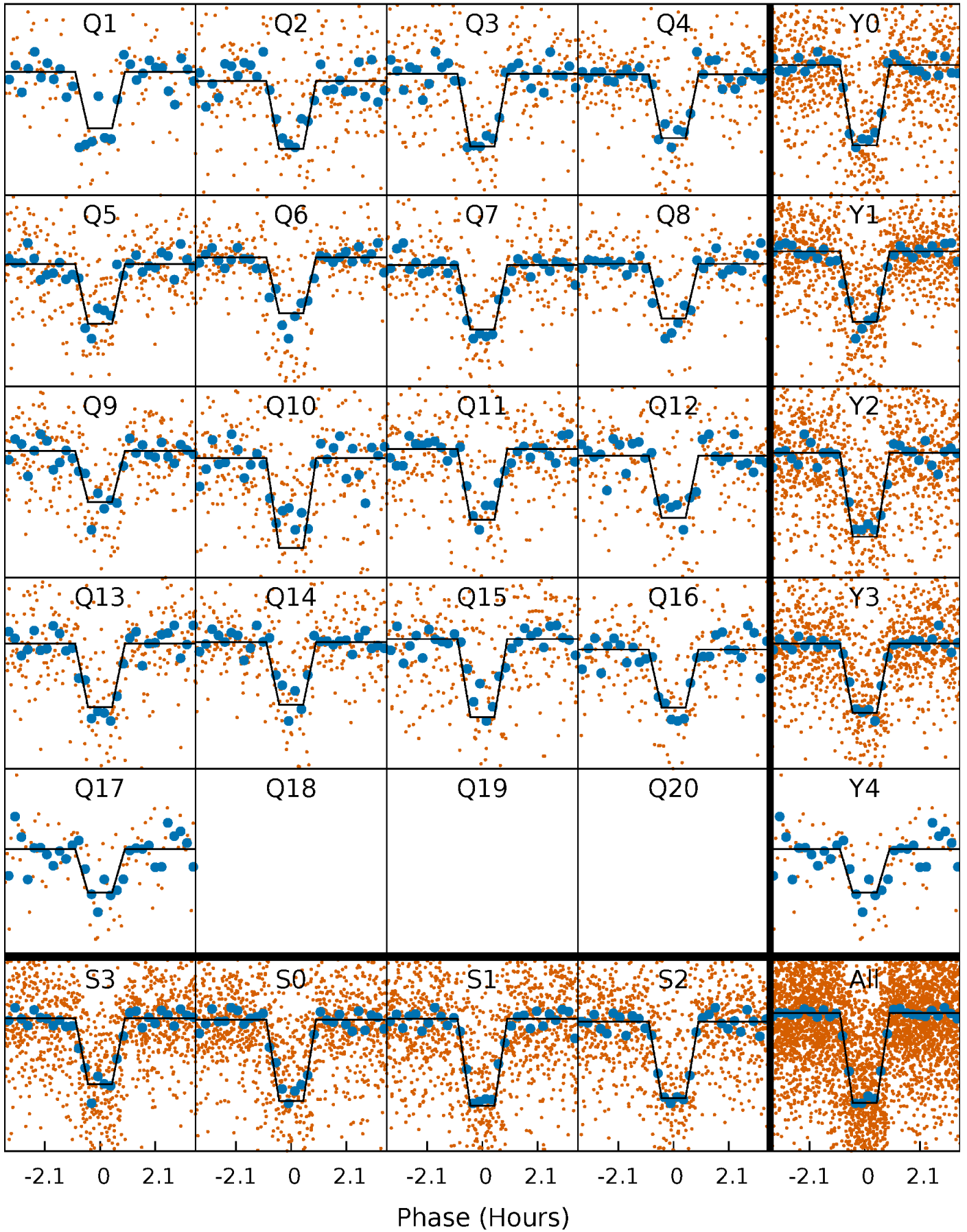
DV Quarter-Phased Transit Curves

TCE 009950612-03 P= 4.159821 Days $T_0=133.786140$ (BKJD)



Alt. Detrend Quarter-Phased Transit Curves

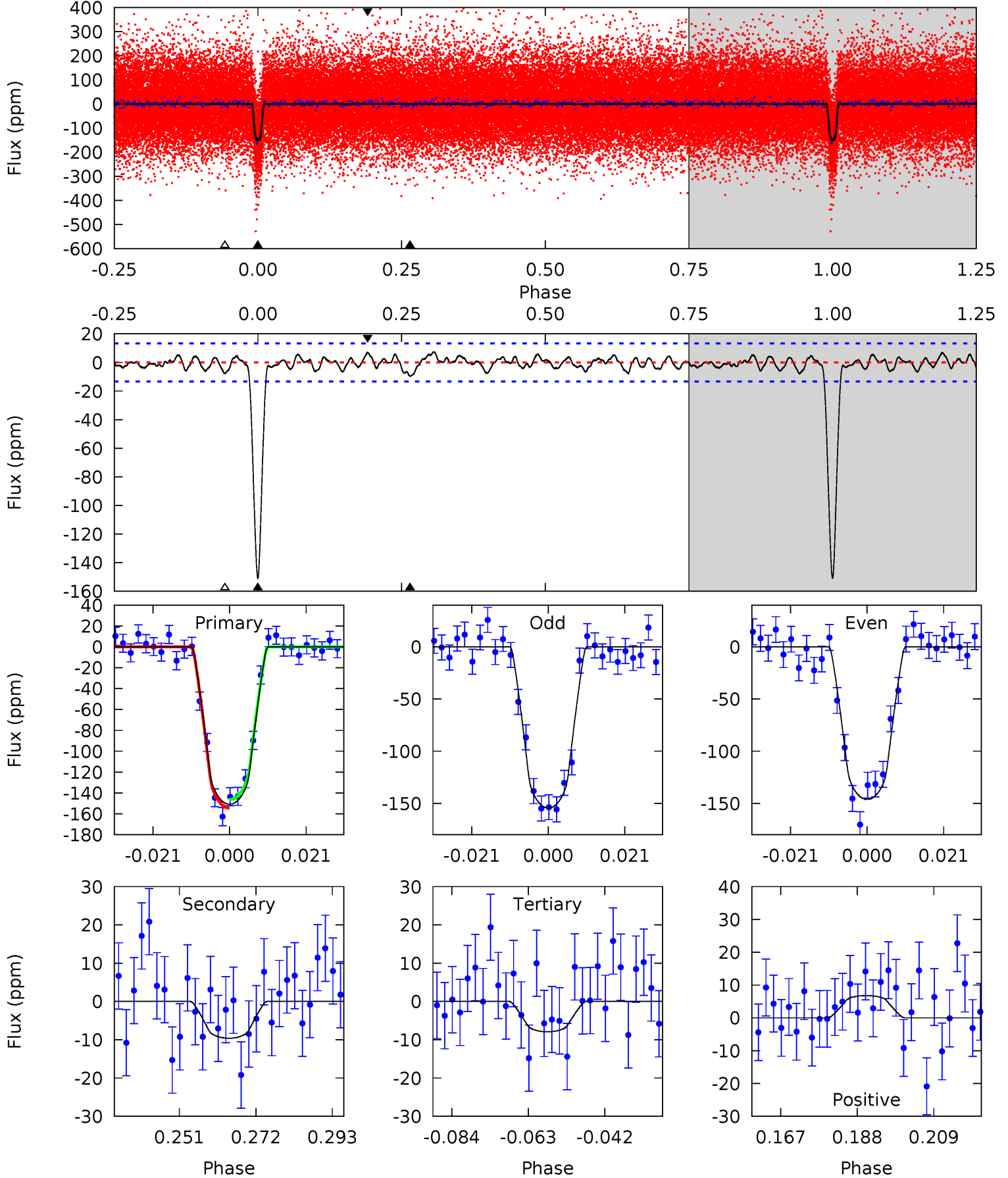
TCE 009950612-03 P= 4.159795 Days $T_0=133.789641$ (BKJD)



DV Model-Shift Uniqueness Test

009950612-03, P = 4.159821 Days, E = 129.626319 Days

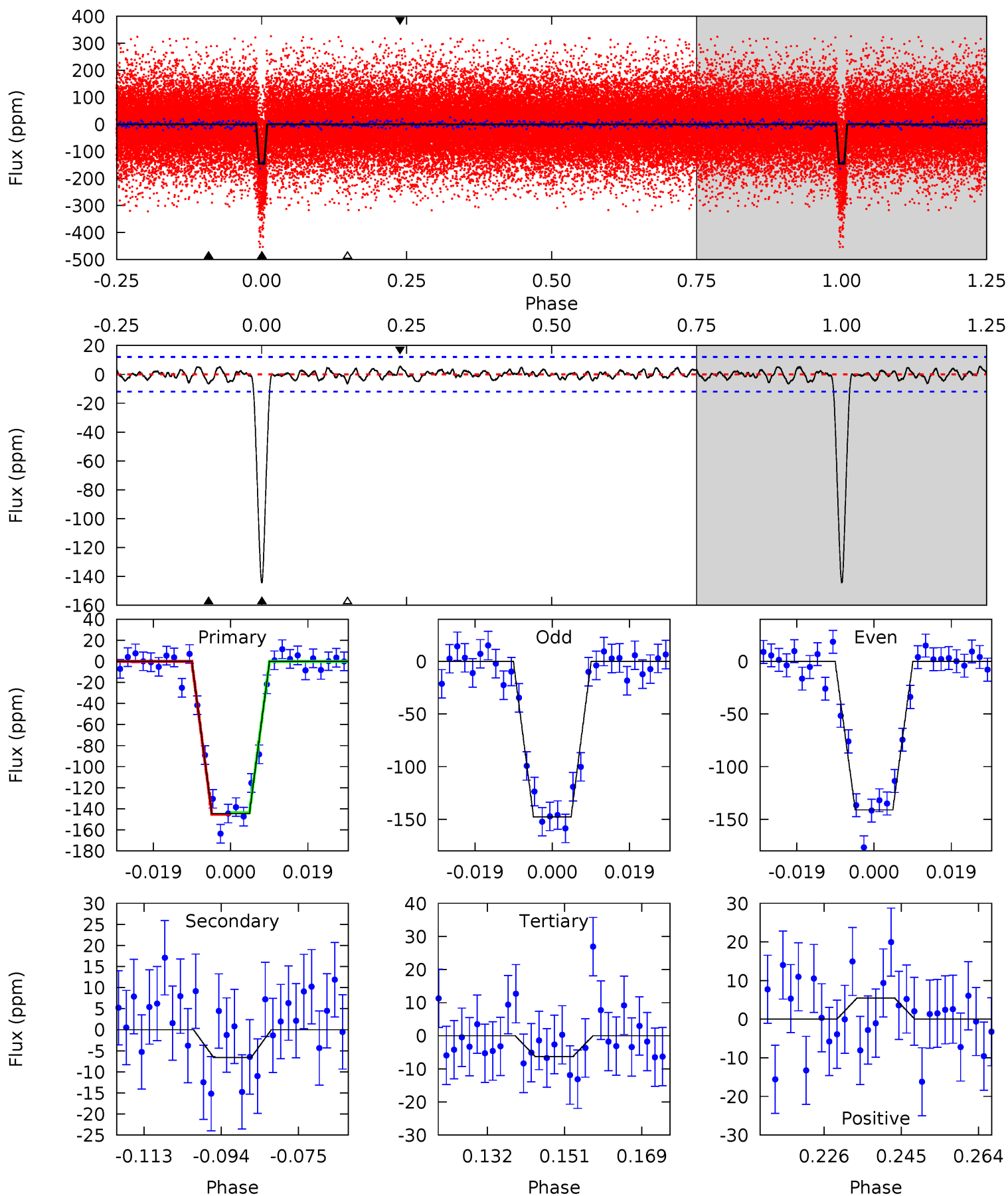
Pri	Sec	Ter	Pos	FA ₁	FA ₂	F _{Red}	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
55.2	3.52	2.90	2.49	4.88	2.31	1.13	52.3	52.7	0.61	1.03	1.51	0.98	0.05	1.53



Alt Model-Shift Uniqueness Test

009950612-03, P = 4.159795 Days, E = 129.629846 Days

Pri	Sec	Ter	Pos	FA ₁	FA ₂	F _{Red}	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
58.8	2.69	2.57	2.23	4.90	2.35	0.89	56.2	56.6	0.12	0.45	1.39	1.01	0.04	0.35



Stellar Parameters For KIC 009950612

	$T_{\text{eff}}(K)$	$\log(g)$	$[\text{Fe}/\text{H}]$	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	4499^{+89}_{-89}	$4.635^{+0.032}_{-0.020}$	$-0.260^{+0.150}_{-0.150}$	$0.639^{+0.025}_{-0.032}$	$0.643^{+0.035}_{-0.032}$	$3.466^{+0.459}_{-0.276}$
	+2%/-2%	+1%/-0%	+58%/-58%	+4%/-5%	+5%/-5%	+13%/-8%
Source	SPE60	SPE60	SPE60	DSEP		

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

Secondary Eclipse Parameters for KIC 009950612-03 / KOI 0719.04

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	A_{obs}
DV	-10 ± 3	$0.98^{+0.27}_{-0.31}$	1059^{+23}_{-25}	2769^{+317}_{-208}	11^{+13}_{-5}
Alt.	-7 ± 2	$0.86^{+0.28}_{-0.29}$	1057^{+25}_{-24}	2710^{+346}_{-247}	$9.103^{+12.224}_{-4.688}$

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

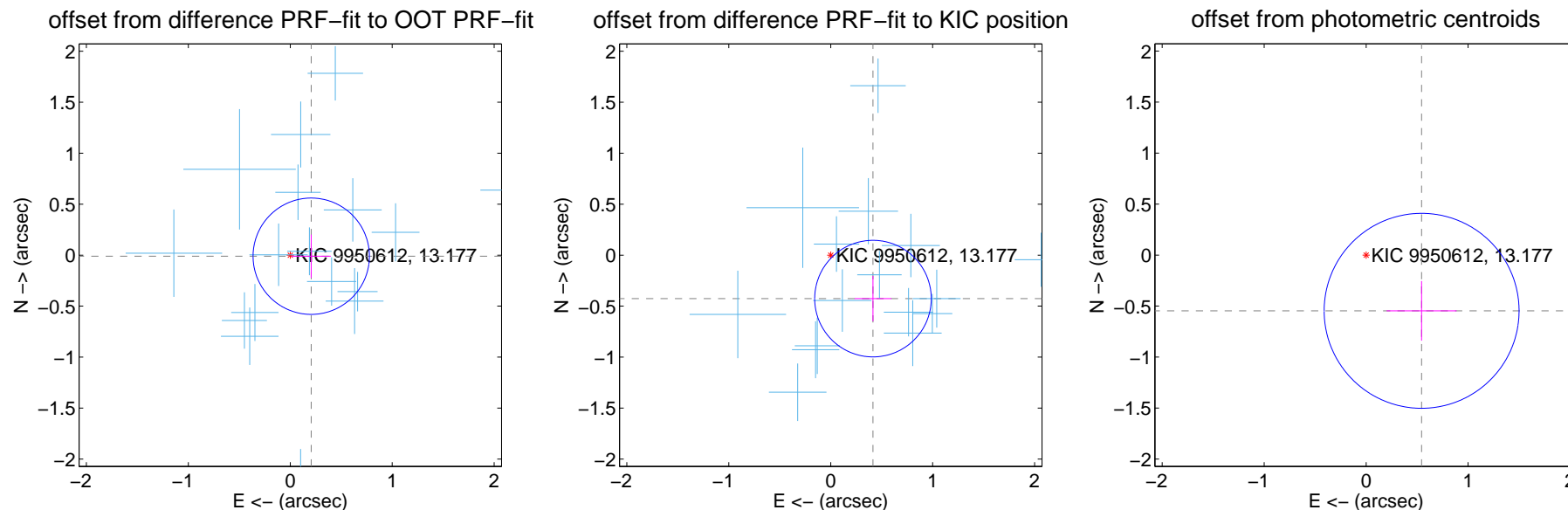
DV Centroid Data

Supplemental centroid analysis for 009950612-03. Kepler magnitude: 13.18. Transit SNR 36.65

There are 17 quarters with good PRF difference image offsets

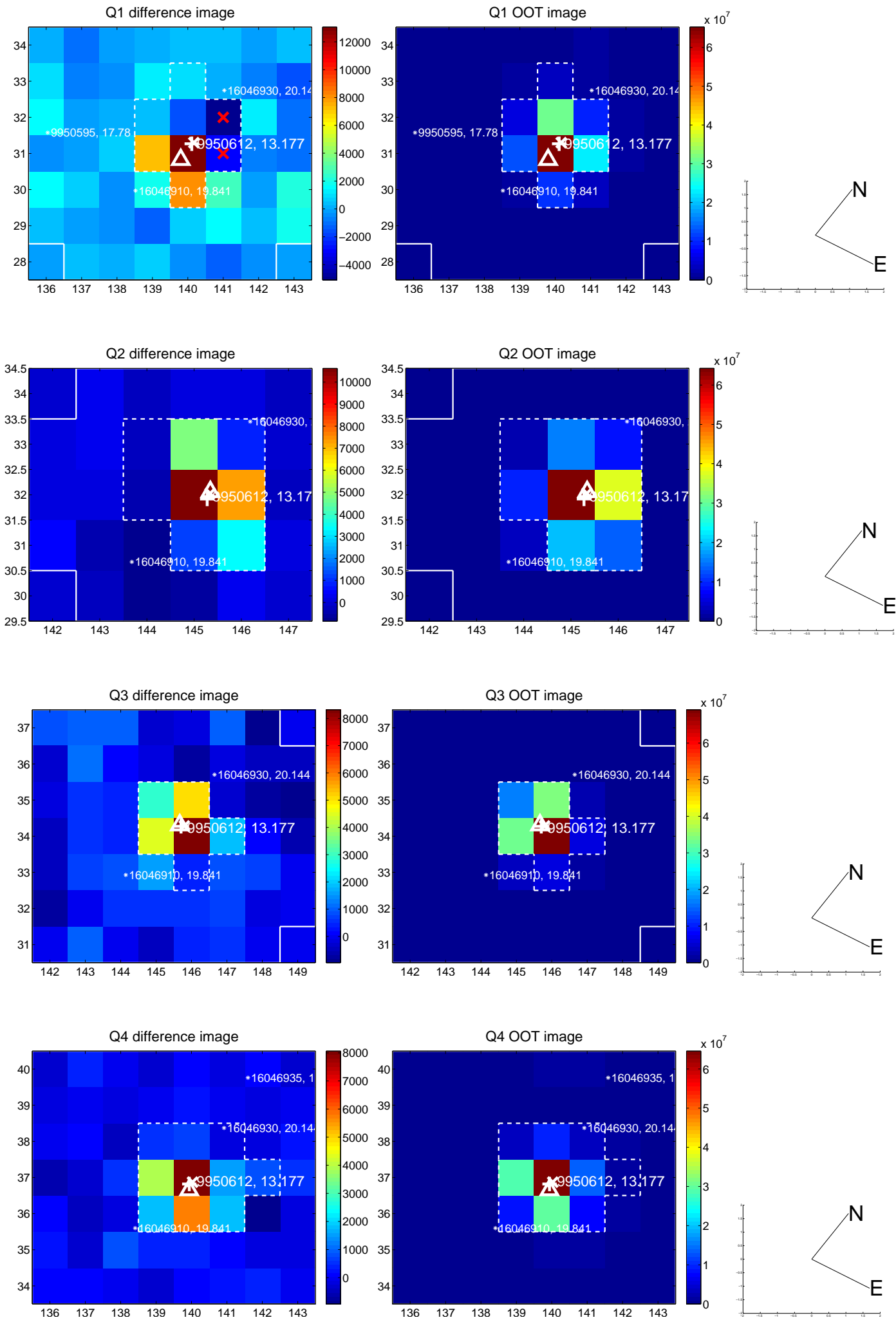
The direct PRF centroid is offset from the target star catalog position by about 0.44 arcsec

	Distance in arcsec	Distance / σ	Δ RA	Δ Dec
PRF-fit source offset from OOT	0.206 ± 0.190	1.08	-0.206 ± 0.192	-0.010 ± 0.212
PRF-fit source offset from KIC position	0.594 ± 0.191	3.12	-0.415 ± 0.181	-0.426 ± 0.223
photometric centroid source offset	0.77 ± 0.32	2.42	-0.54 ± 0.34	-0.55 ± 0.29

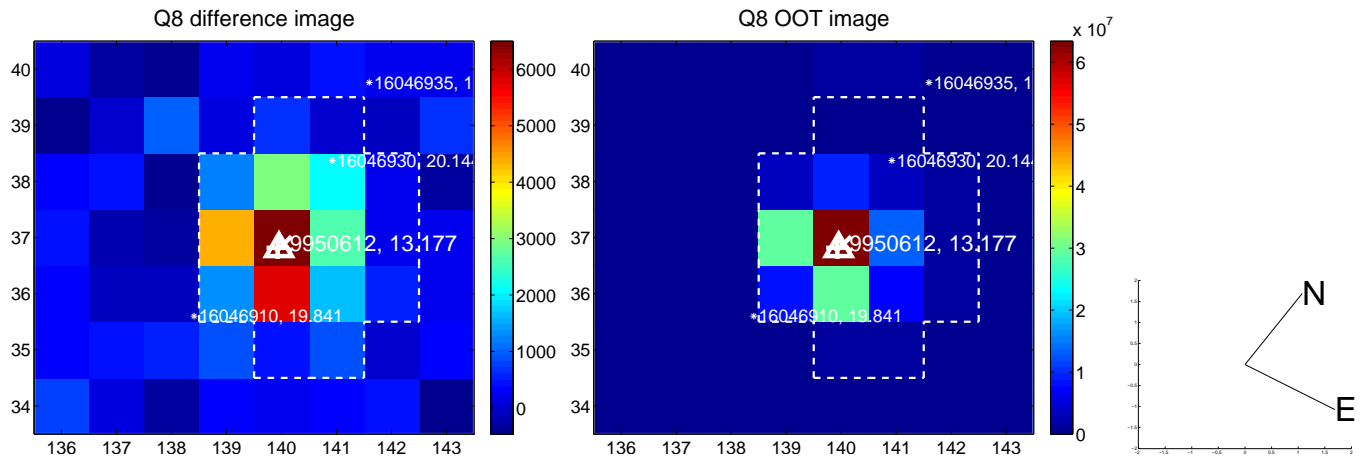
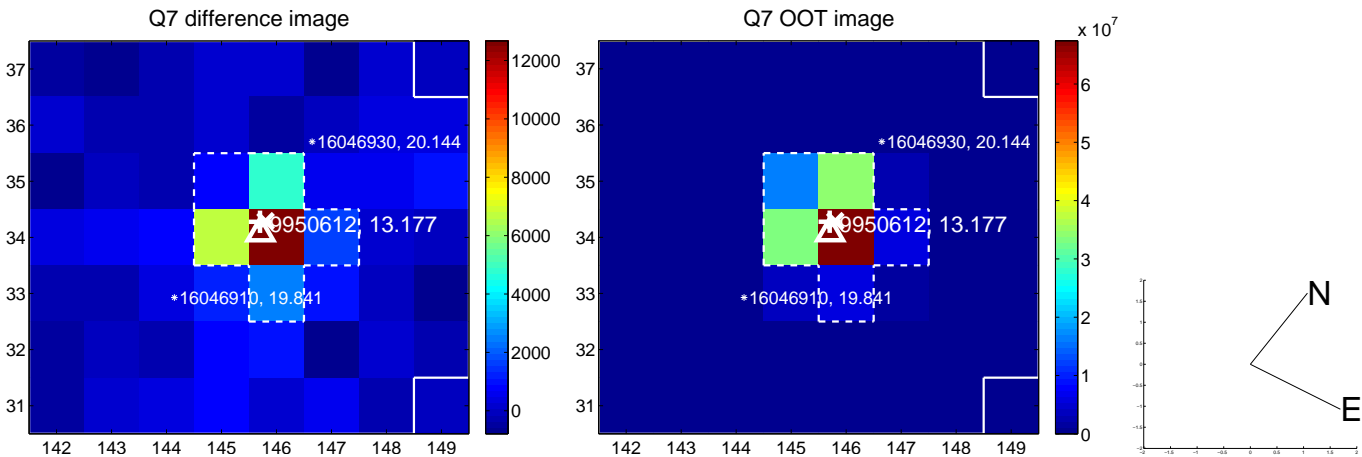
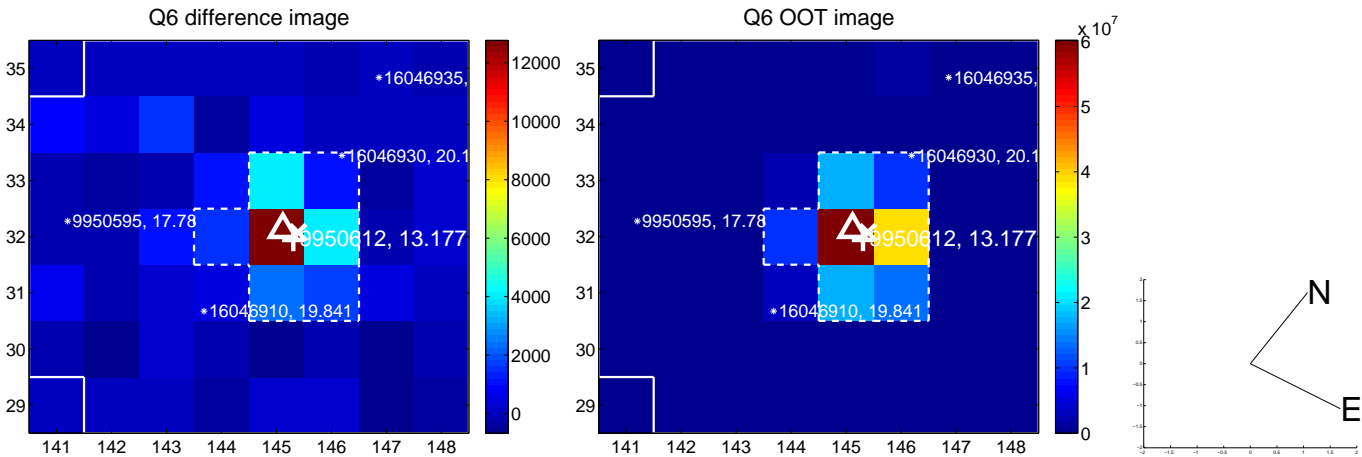
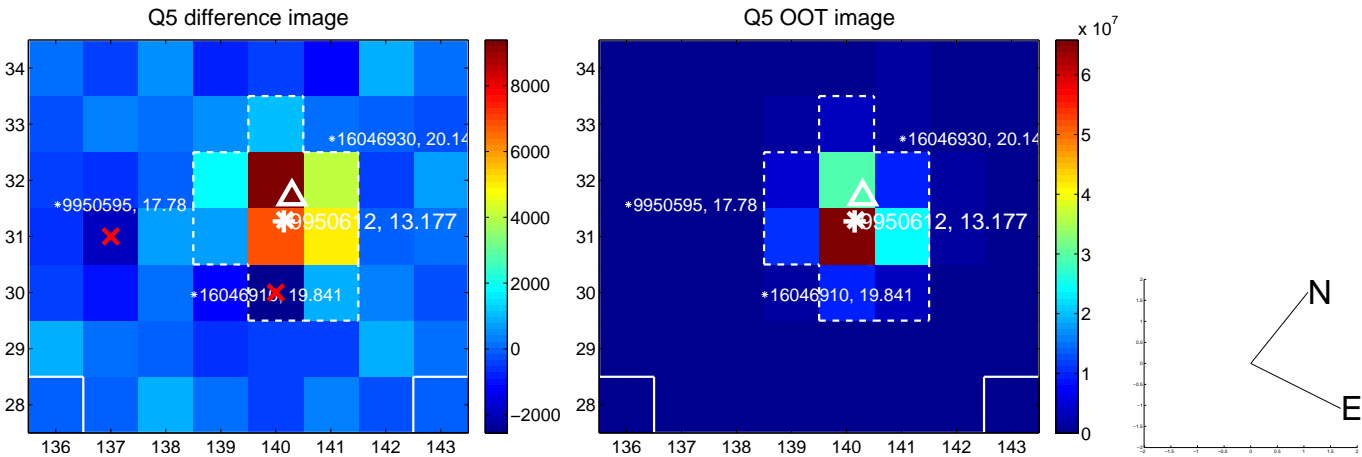


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses:** good quarterly centroid offsets; **Vermillion crosses:** bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- σ uncertainty. Blue circle: three-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

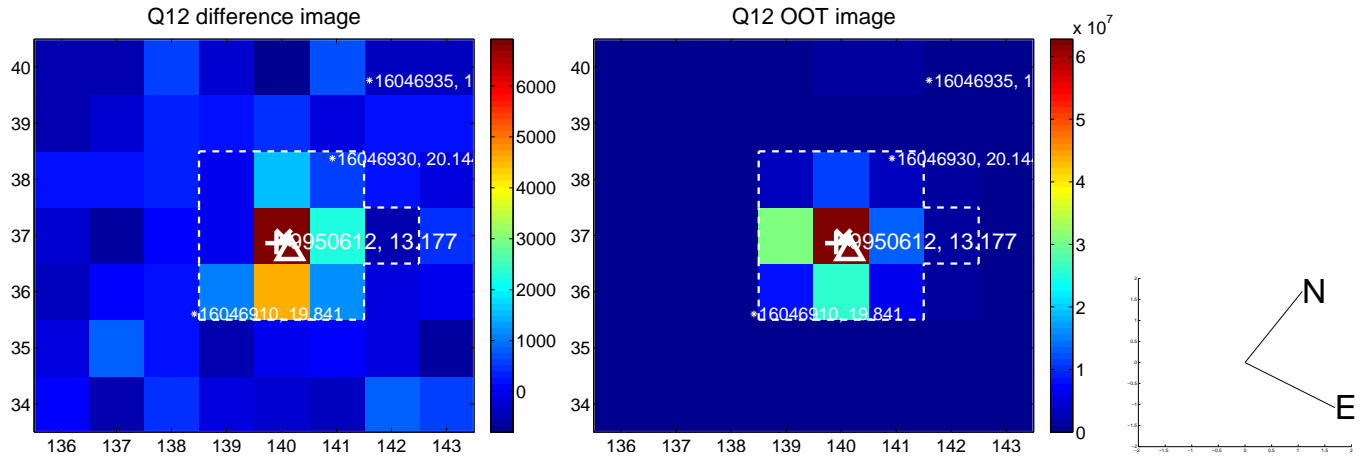
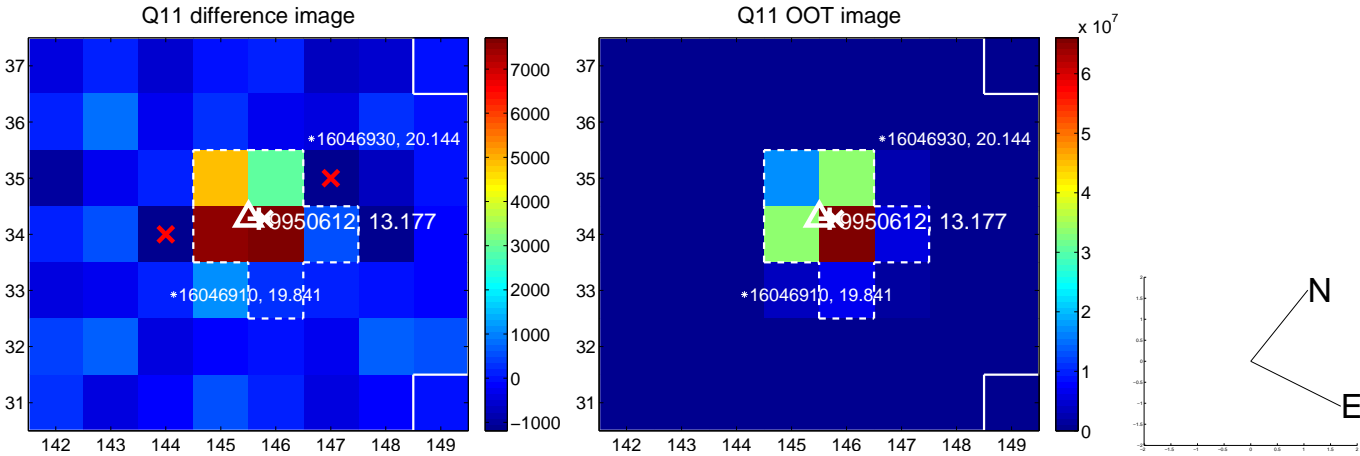
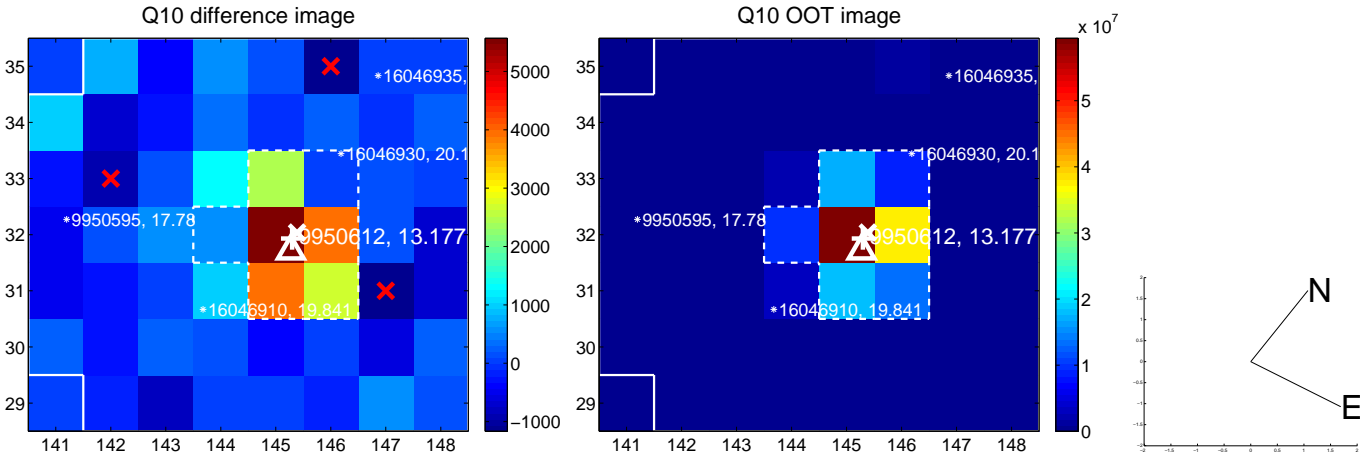
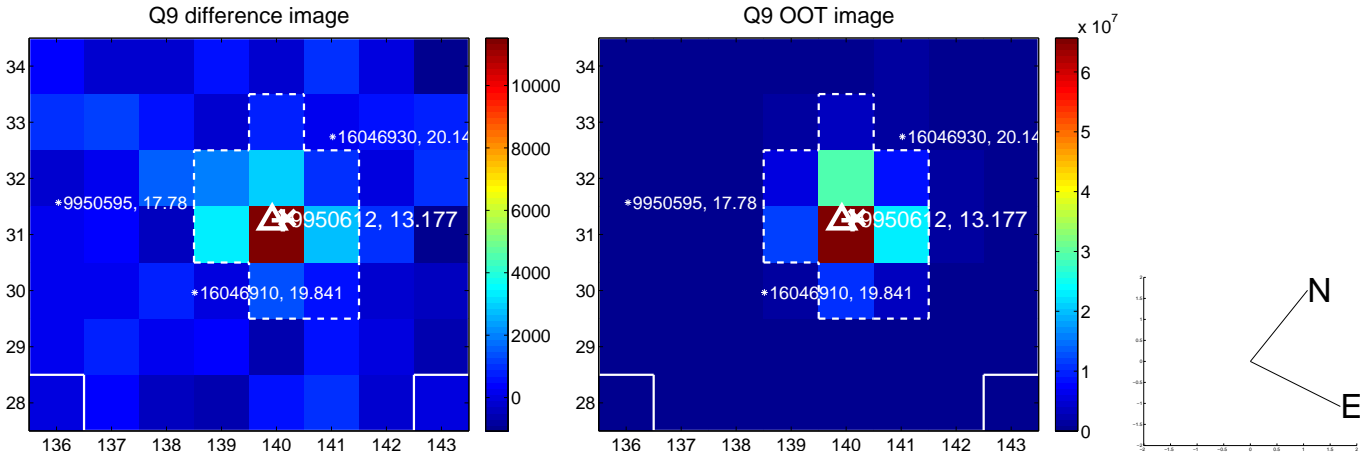
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



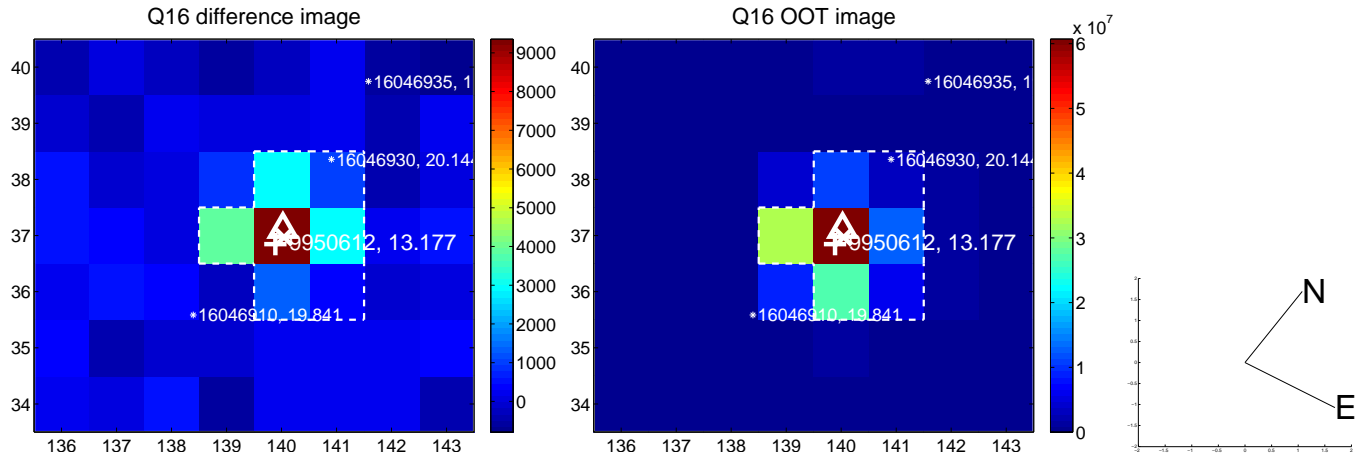
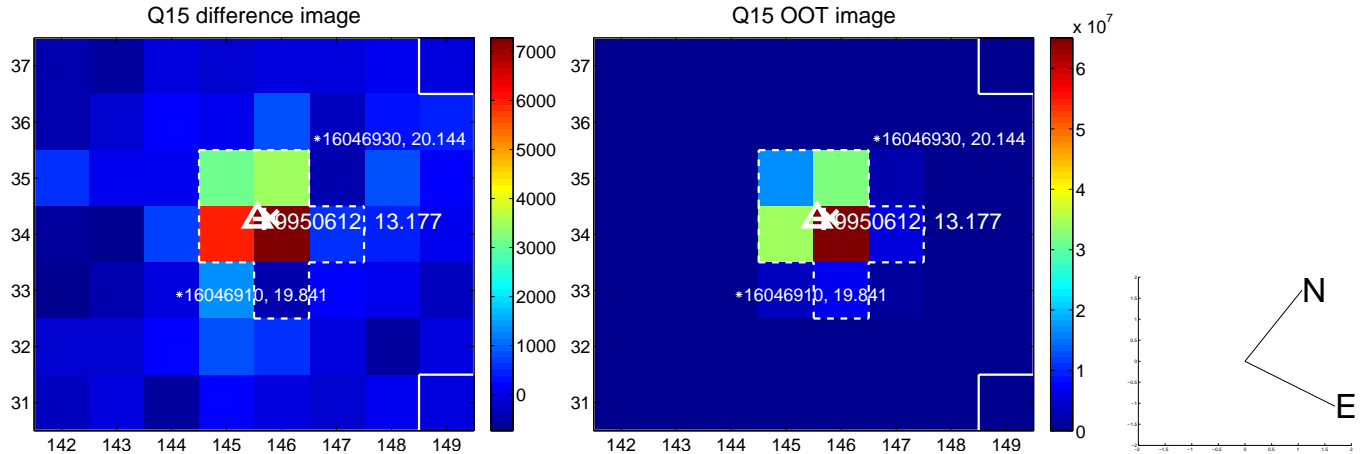
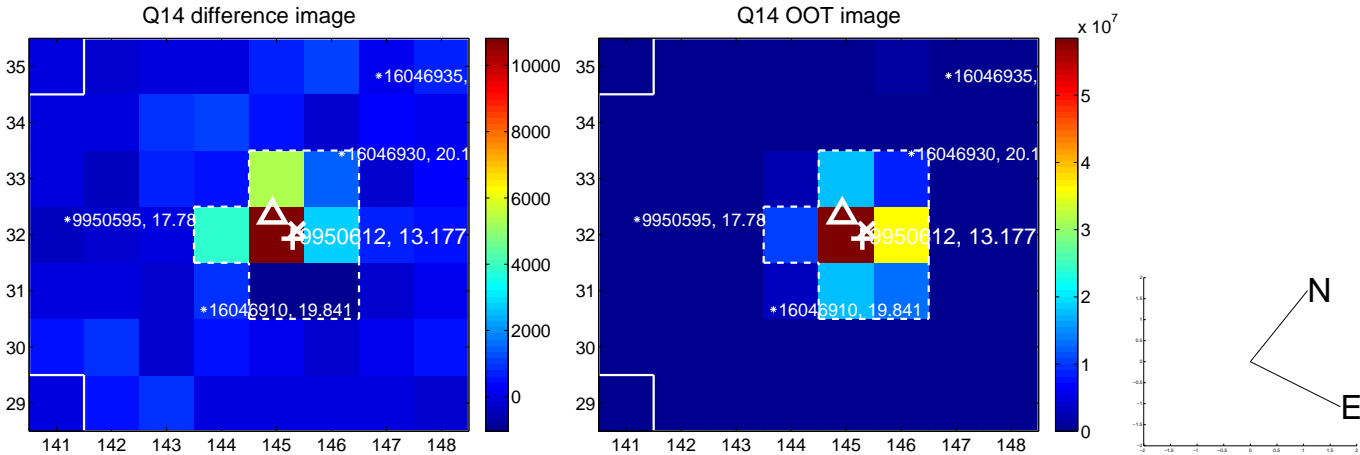
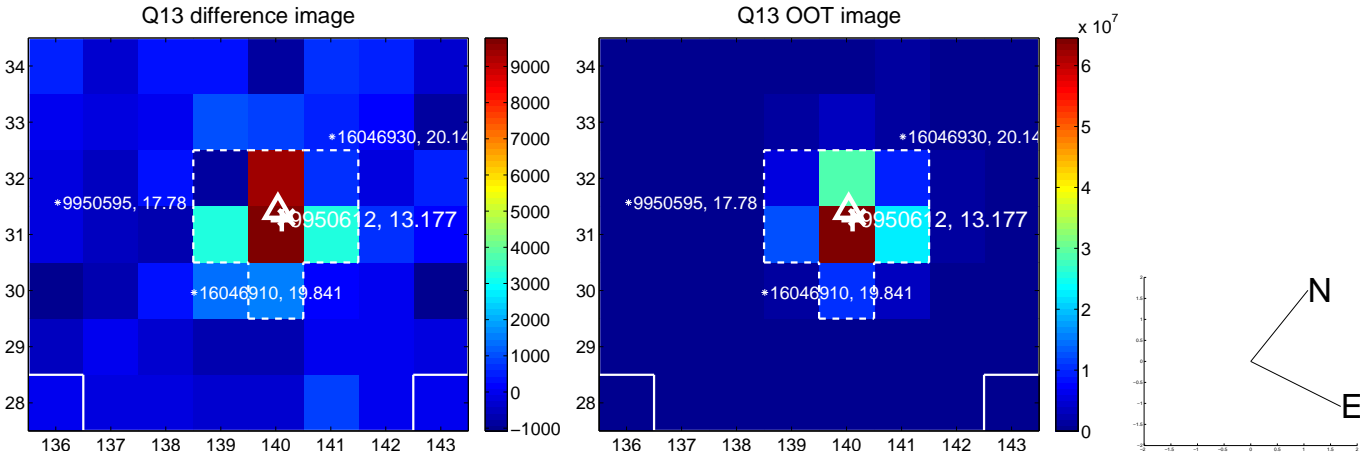
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



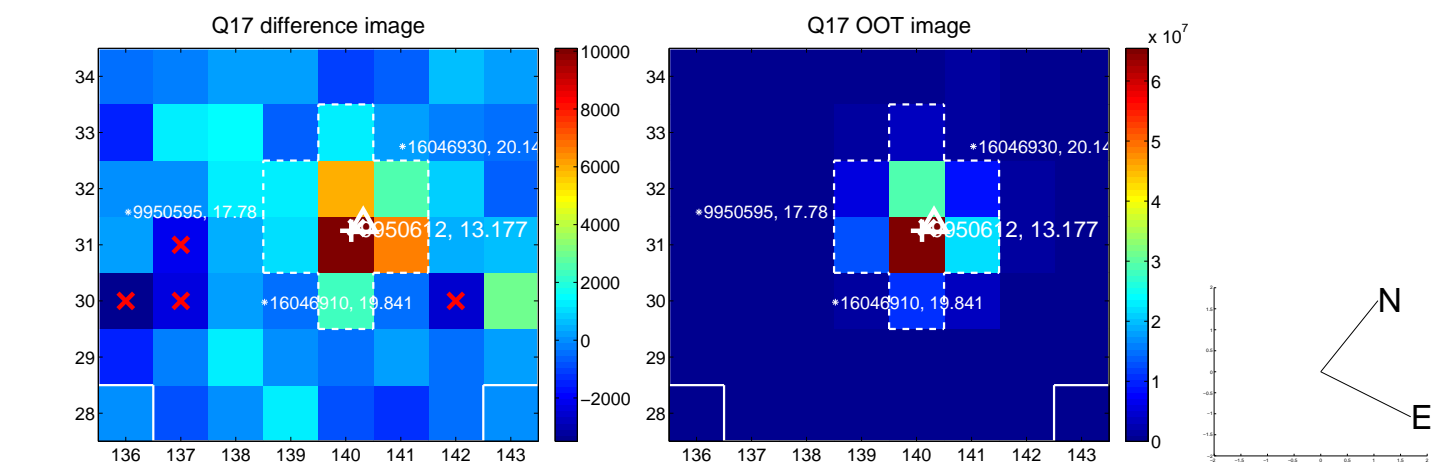
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



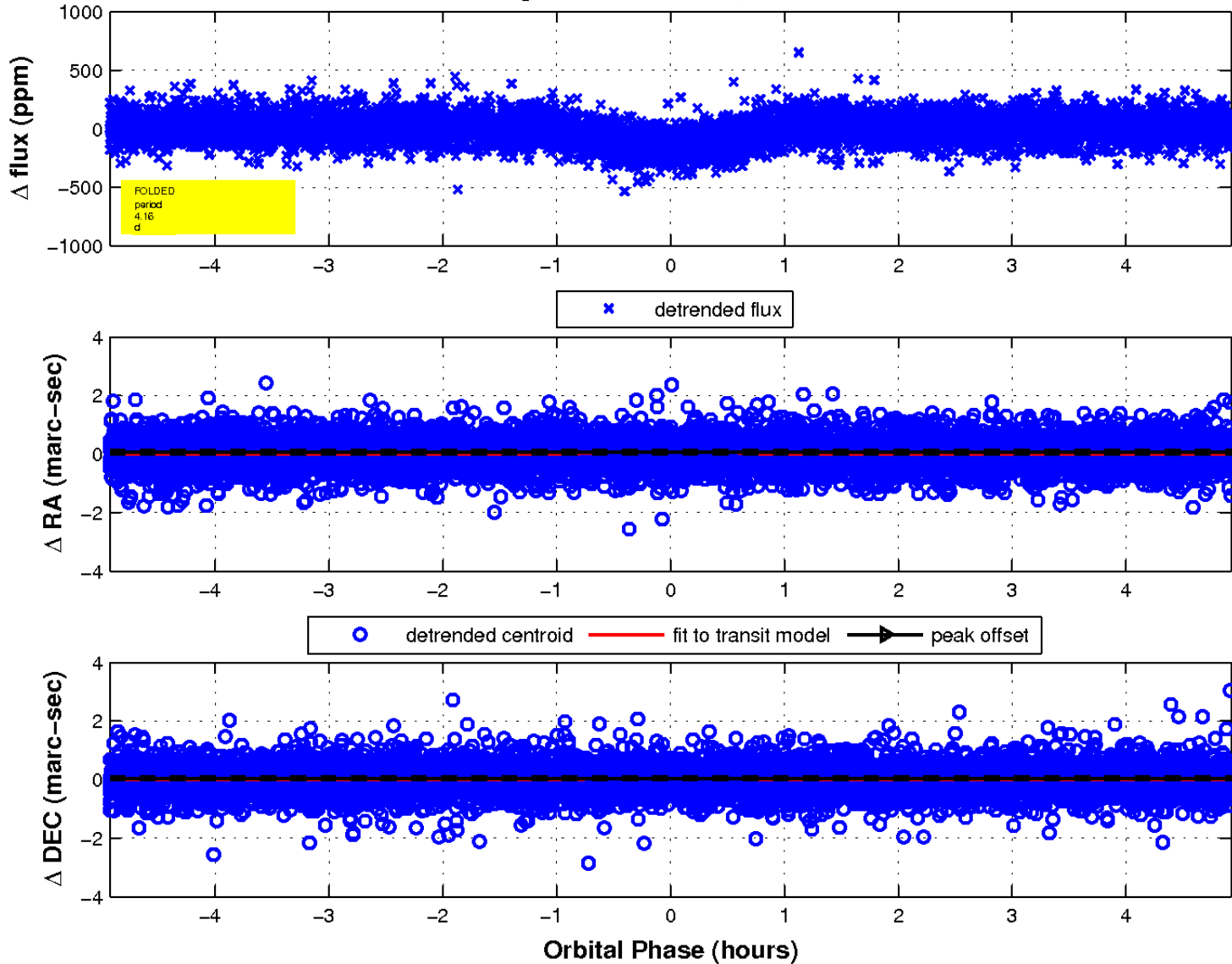
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



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

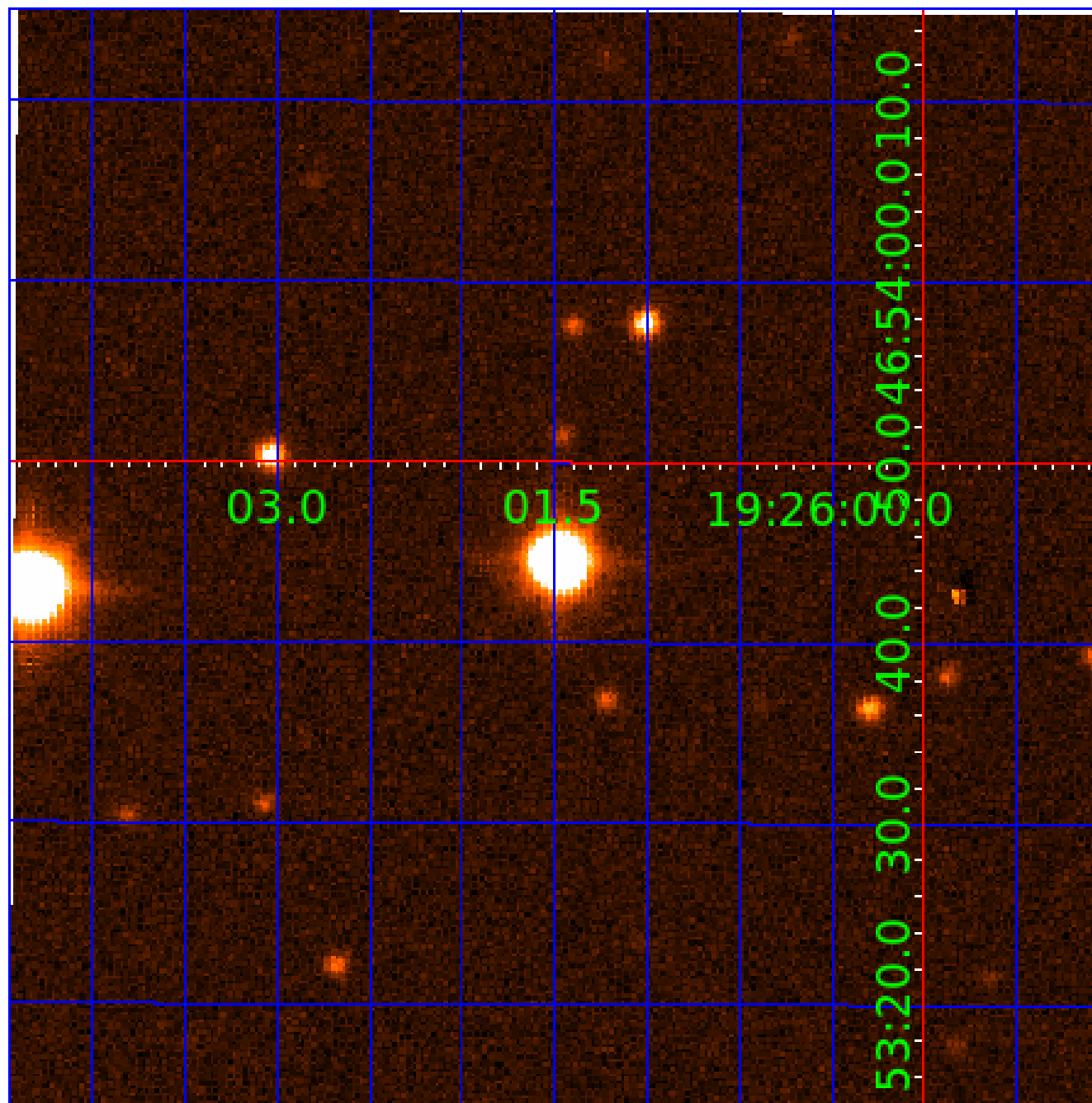


fluxWeightedCentroids, Planet 3 of 4



UKIRT Image

Declination



KIC 009950612

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})
009950612-01	OBS	0719.01	9.034196	134.878101	560.4	1.612	85.0	84.7	0.64	4499	1.86	27.91
009950612-02	OBS	0719.03	45.902592	166.564365	397.8	5.496	36.9	39.6	0.64	4499	1.55	3.20
009950612-03	OBS	0719.04	4.159821	133.786140	152.4	1.642	32.7	36.7	0.64	4499	0.97	78.51
009950612-04	OBS	0719.02	28.122448	146.919273	203.8	4.506	22.9	25.4	0.64	4499	1.18	6.14

Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009950612-01	OBS	PC	1.00	0	0	0	0	NO_COMMENT
009950612-02	OBS	PC	1.00	0	0	0	0	NO_COMMENT
009950612-03	OBS	PC	1.00	0	0	0	0	NO_COMMENT
009950612-04	OBS	PC	1.00	0	0	0	0	CENT_KIC_POS

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.

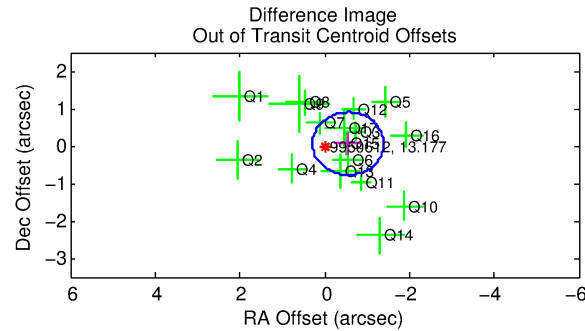
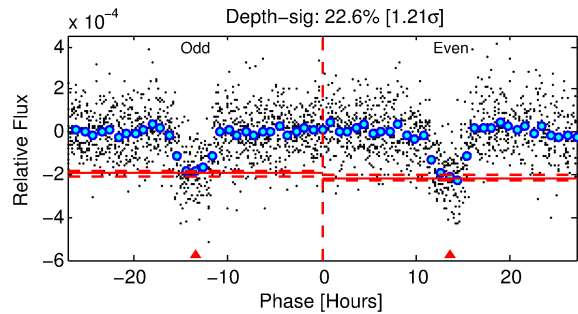
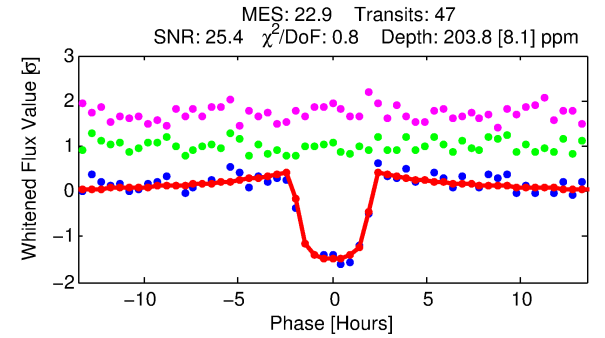
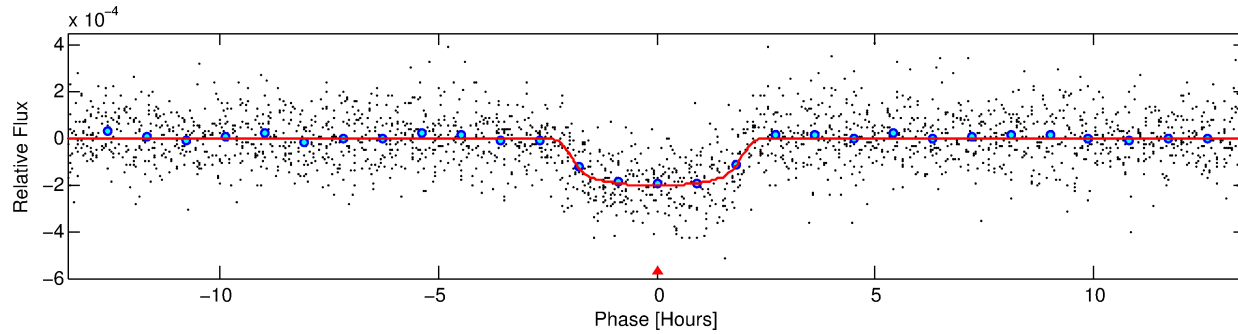
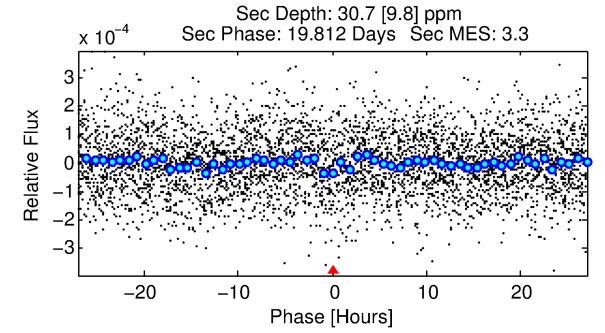
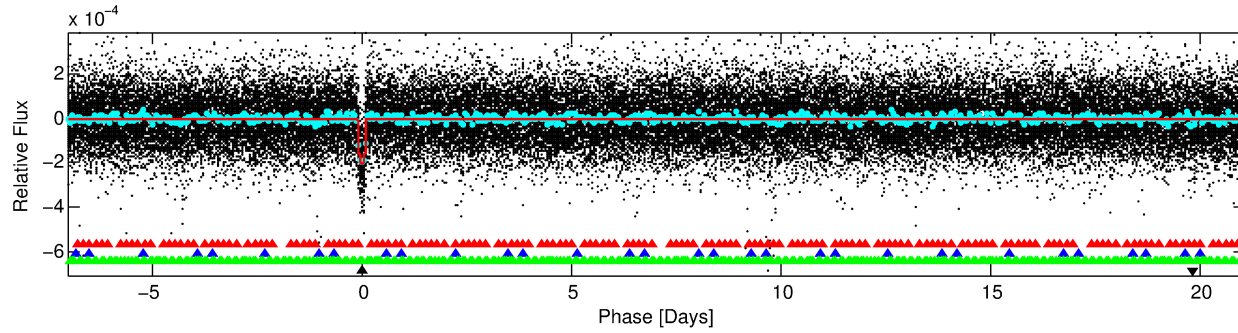
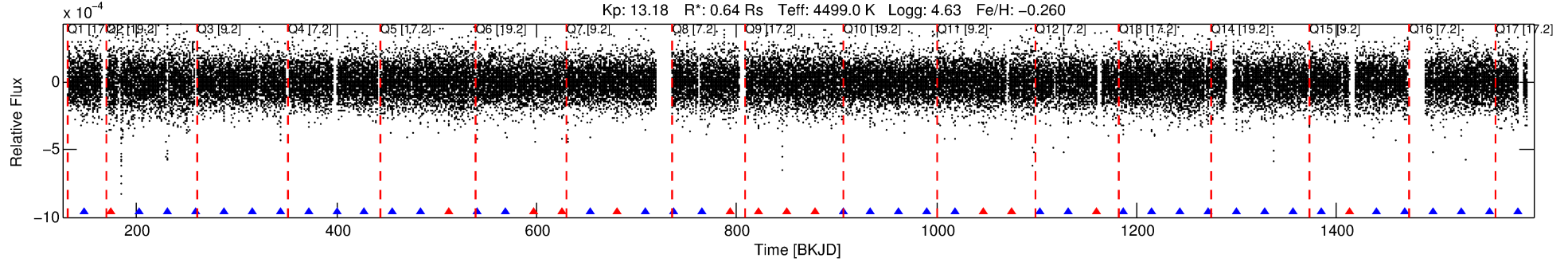
Ephemeris Match Information For 009950612-04

No Significant Match Found

DV One-Page Summary

KIC: 9950612 Candidate: 4 of 4 Period: 28.122 d
KOI: K00719.02 Name: Kepler-220d Corr: 0.969

Kp: 13.18 R*: 0.64 Rs Teff: 4499.0 K Logg: 4.63 Fe/H: -0.260



DV Fit Results:

Period = 28.12245 [0.00012] d
Epoch = 146.9193 [0.0036] BKJD
Rp/R* = 0.0170 [0.0013]
a/R* = 19.08 [5.56]
b = 0.94 [0.04]
Seff = 6.14 [0.61]
Teq = 401 [10] K
Rp = 1.18 [0.11] Re
a = 0.1562 [0.0065] AU
Ag = 294.68 [105.90] [2.77σ]
Teffp = 2571 [233] K [9.29σ]

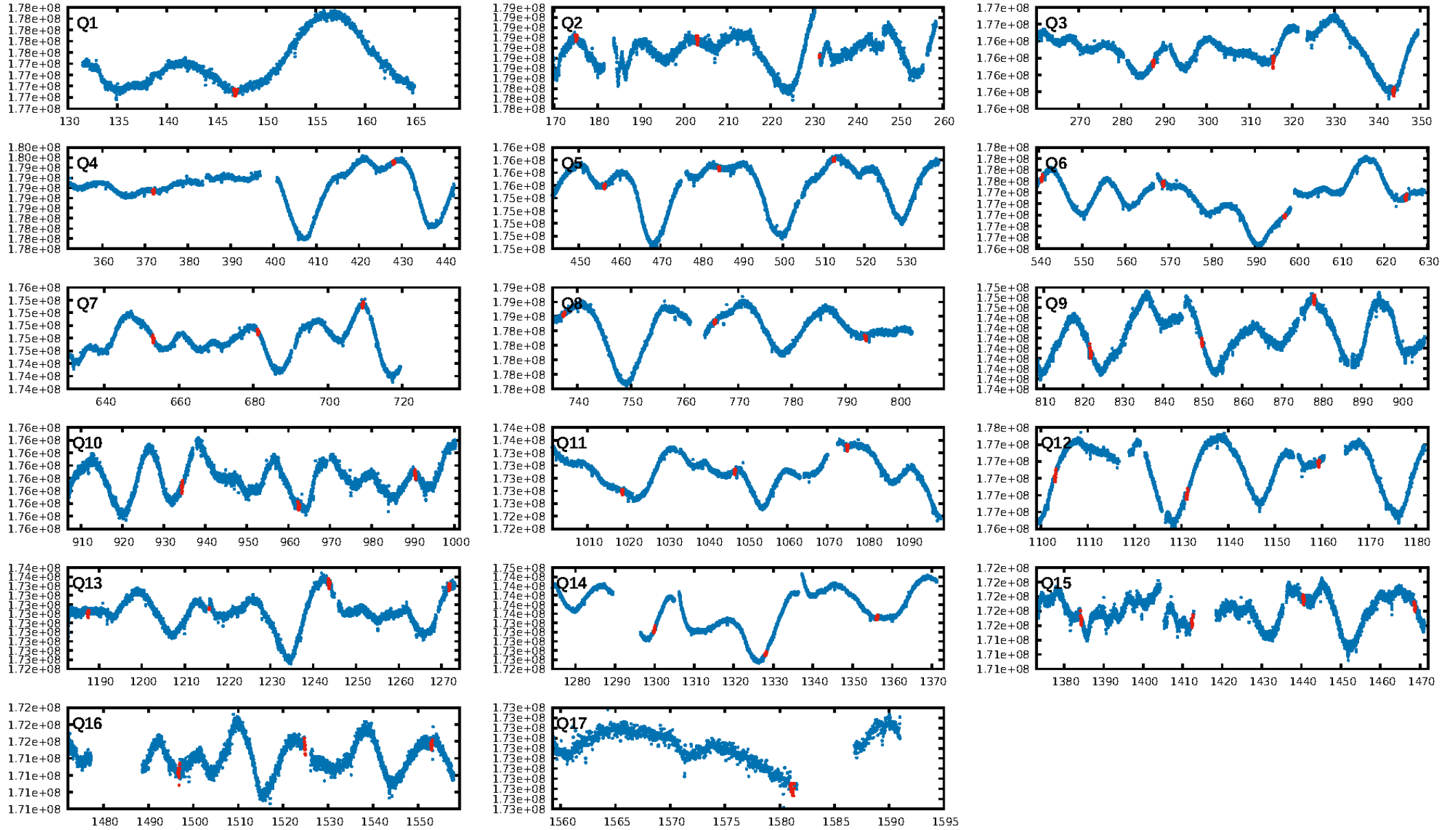
DV Diagnostic Results:

ShortPeriod-sig: 100.0% [95.73σ]
LongPeriod-sig: 100.0% [60.04σ]
ModelChiSquare2-sig: 96.6%
ModelChiSquareGof-sig: 100.0%
Bootstrap-pfa: 2.15e-100
RollingBand-fgt: 0.71 [32/45]
GhostDiagnostic-chr: 17.9
Centroid-sig: 13.6%
Centroid-so: 0.243 arcsec [0.56σ]
OotOffset-rm: 0.555 arcsec [1.99σ]
KicOffset-rm: 0.855 arcsec [2.71σ]
OotOffset-st: 4/4/4/5 [17]
KicOffset-st: 4/4/4/5 [17]
DiffImageQuality-fgm: 1.00 [17/17]
DiffImageOverlap-fno: 0.94 [16/17]

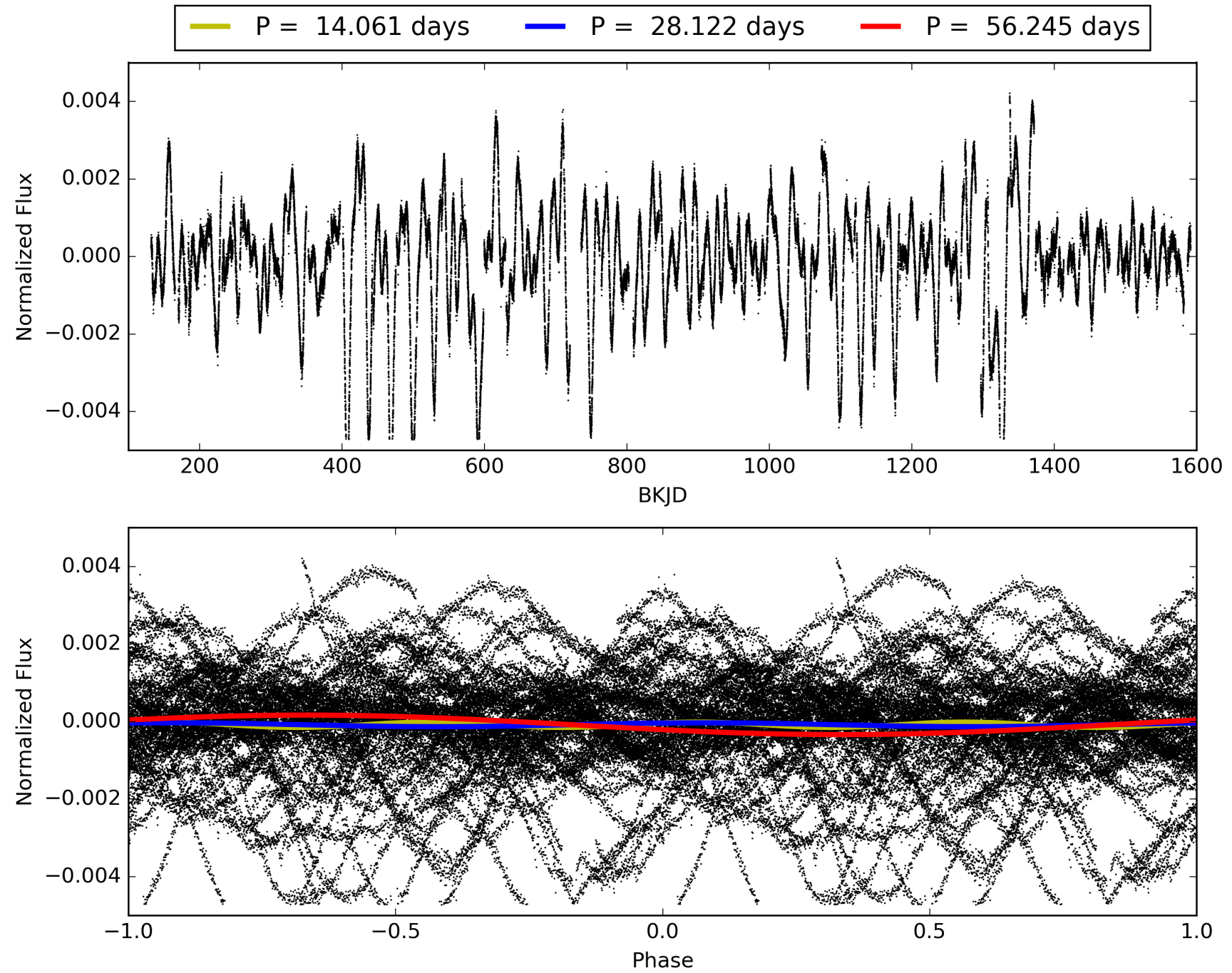
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 29-Jan-2016 10:40:43 Z

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

TCE 009950612-04, PDC Light Curves

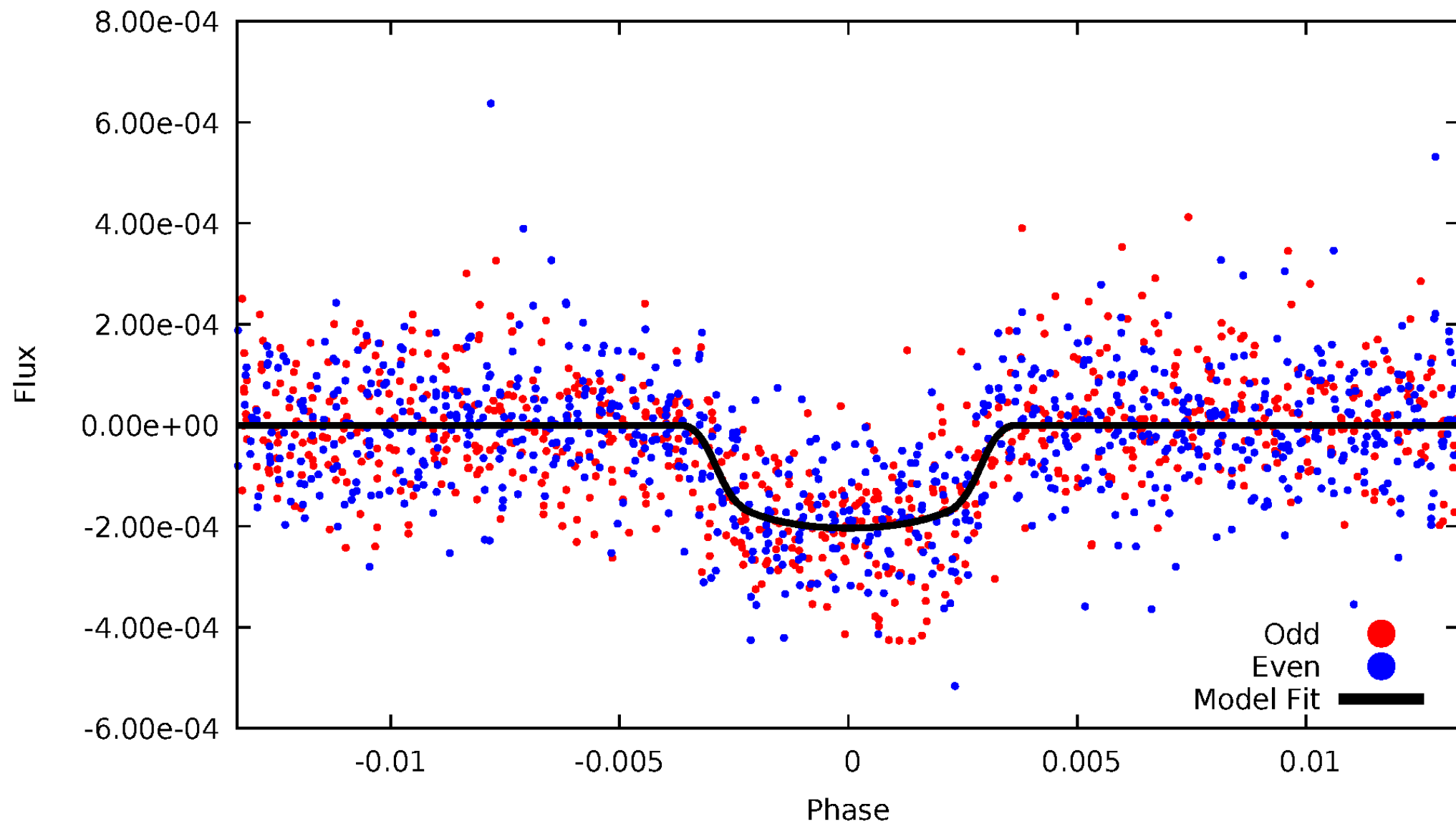


TCE 009950612-04



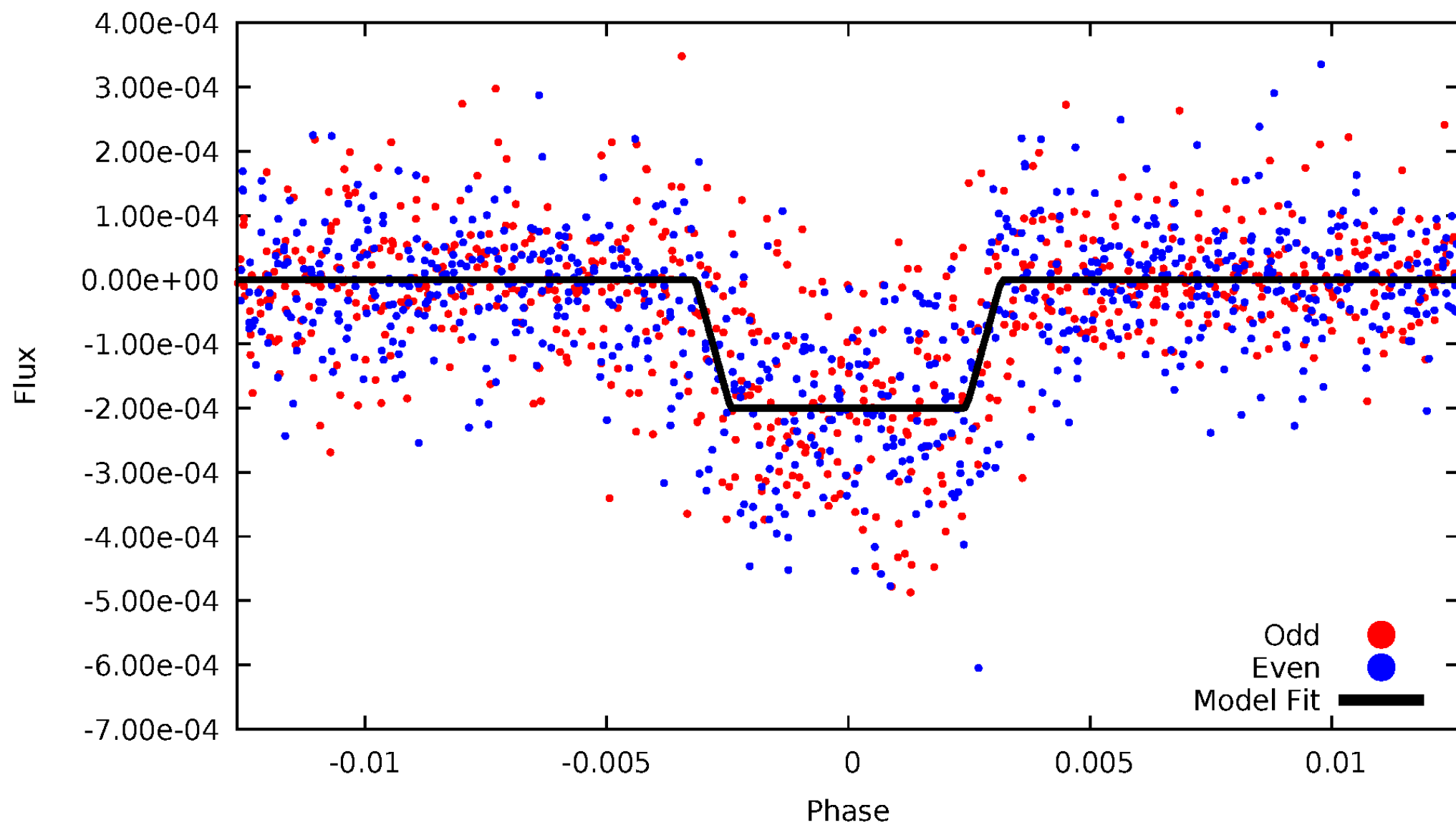
DV Odd/Even

TCE 009950612-04



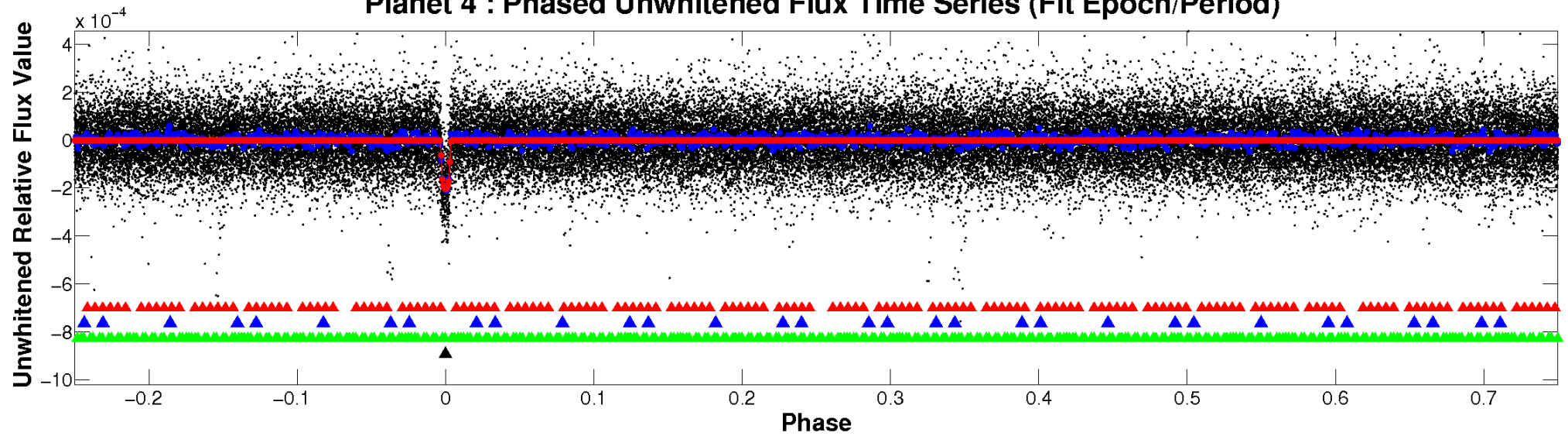
ALT Odd/Even

TCE 009950612-04

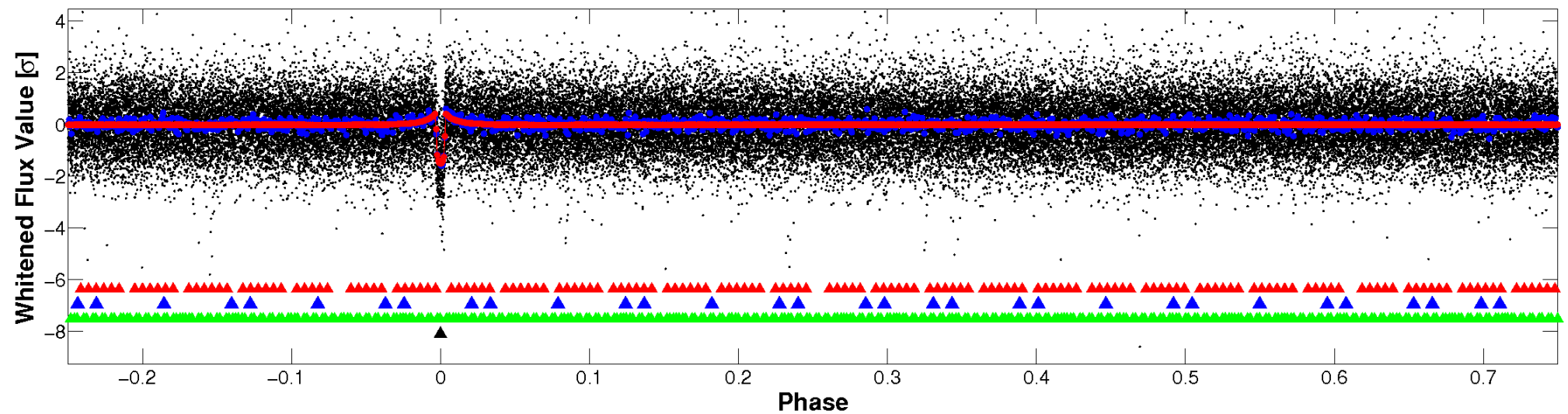


Non-Whitened Vs. Whitened Light Curve

Planet 4 : Phased Unwhitened Flux Time Series (Fit Epoch/Period)

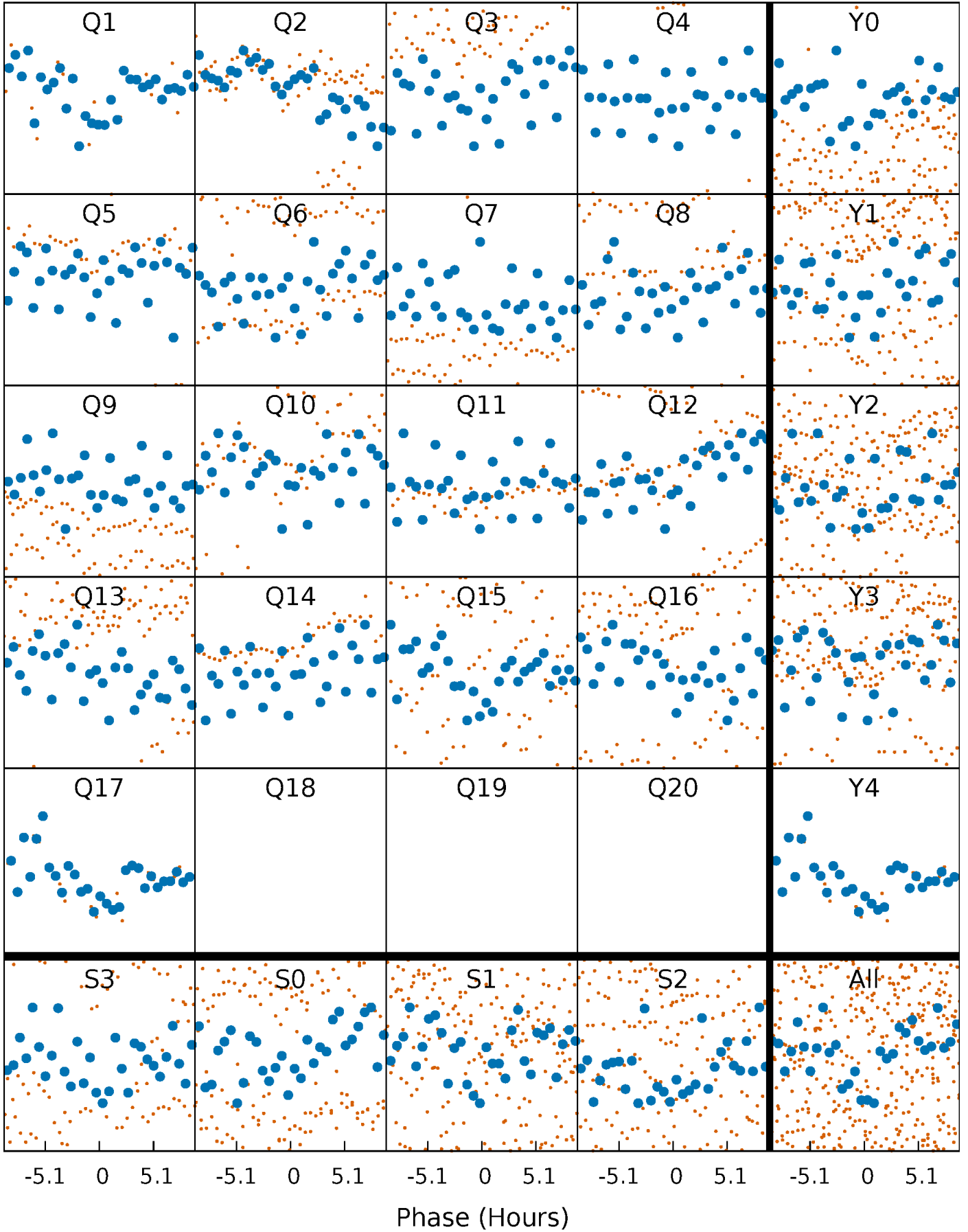


Planet 4 : Phased Whitened Flux Time Series (Fit Epoch/Period)



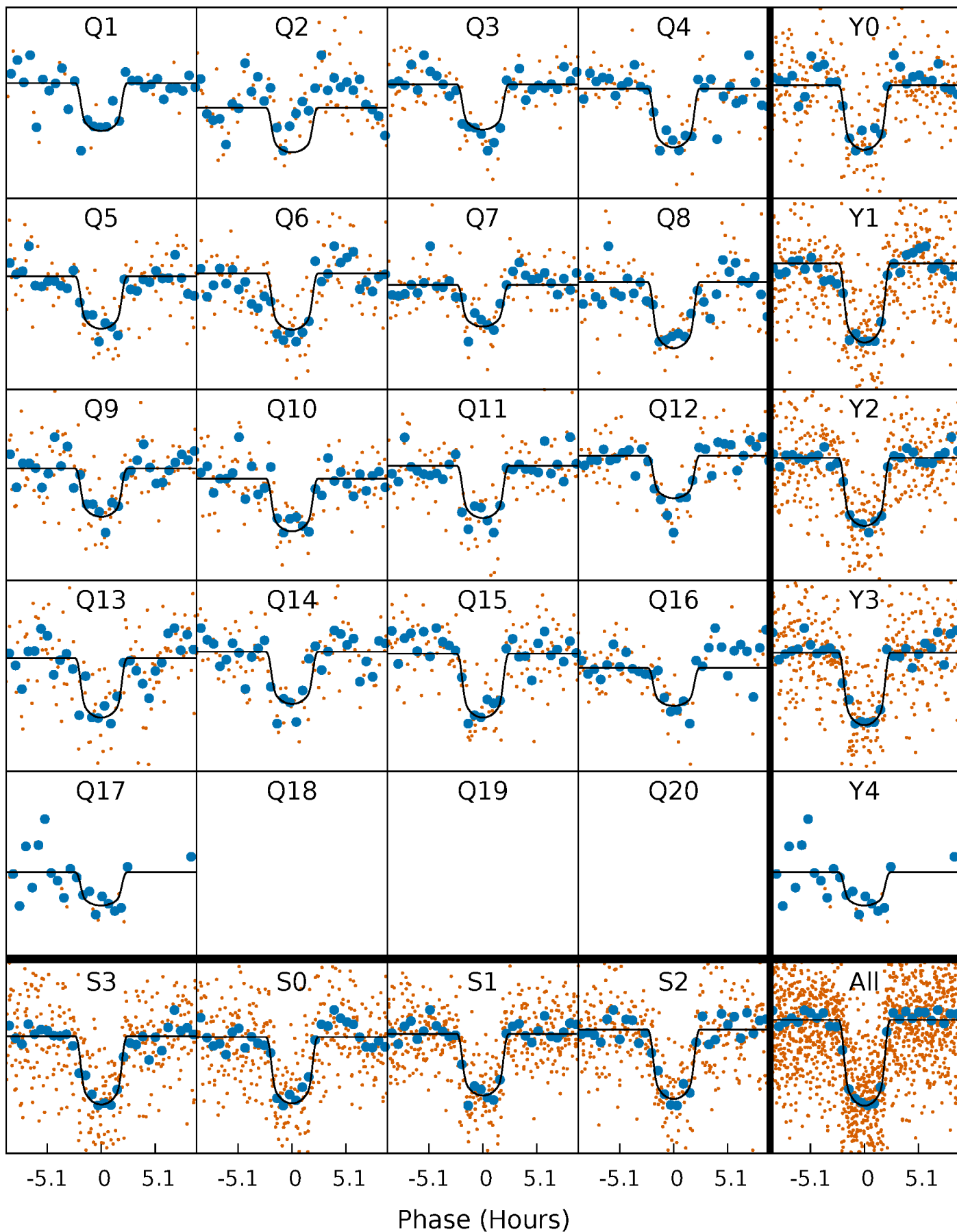
PDC Quarter-Phased Transit Curves

TCE 009950612-04 P= 28.122448 Days $T_0=146.919273$ (BKJD)



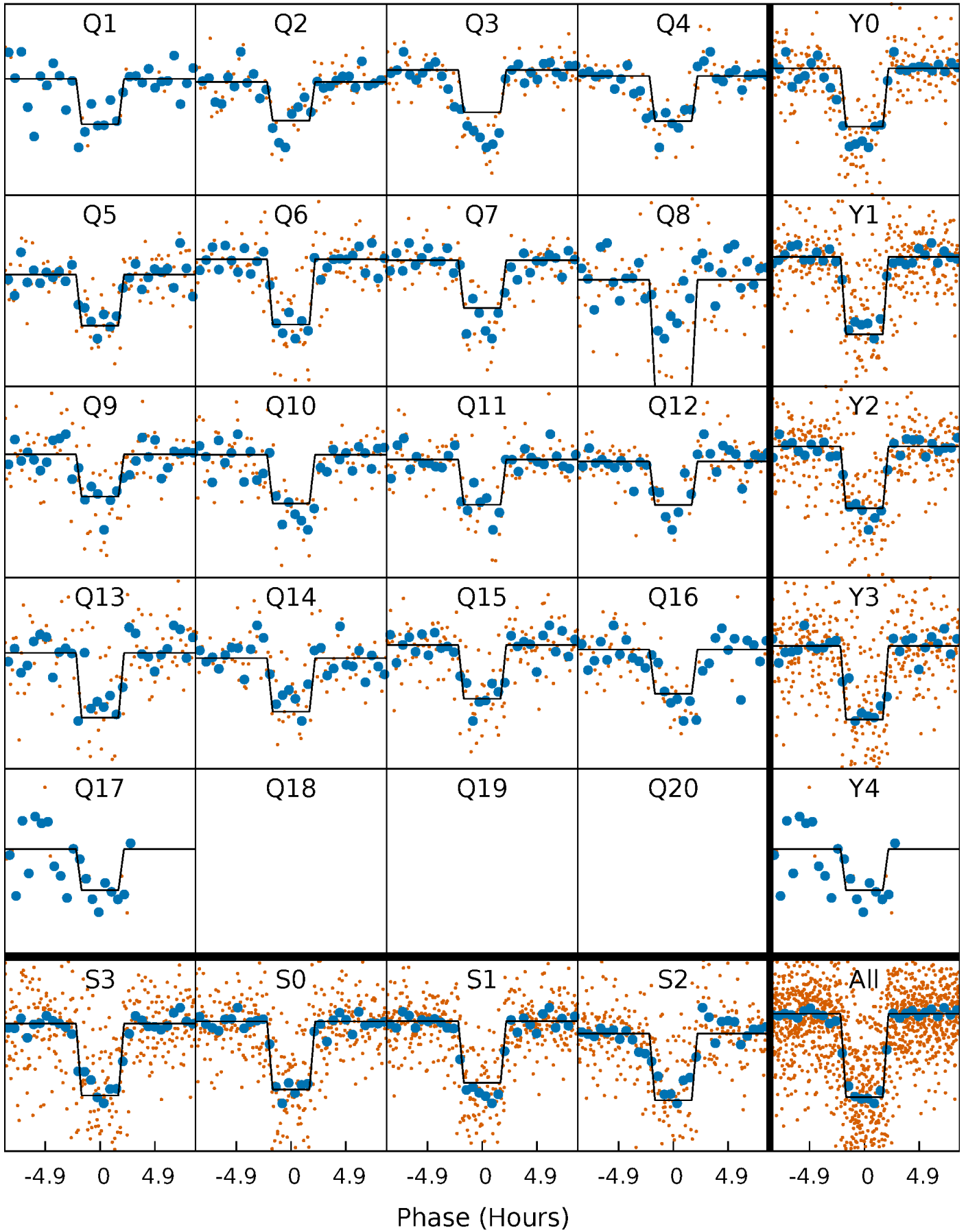
DV Quarter-Phased Transit Curves

TCE 009950612-04 P= 28.122448 Days $T_0=146.919273$ (BKJD)



Alt. Detrend Quarter-Phased Transit Curves

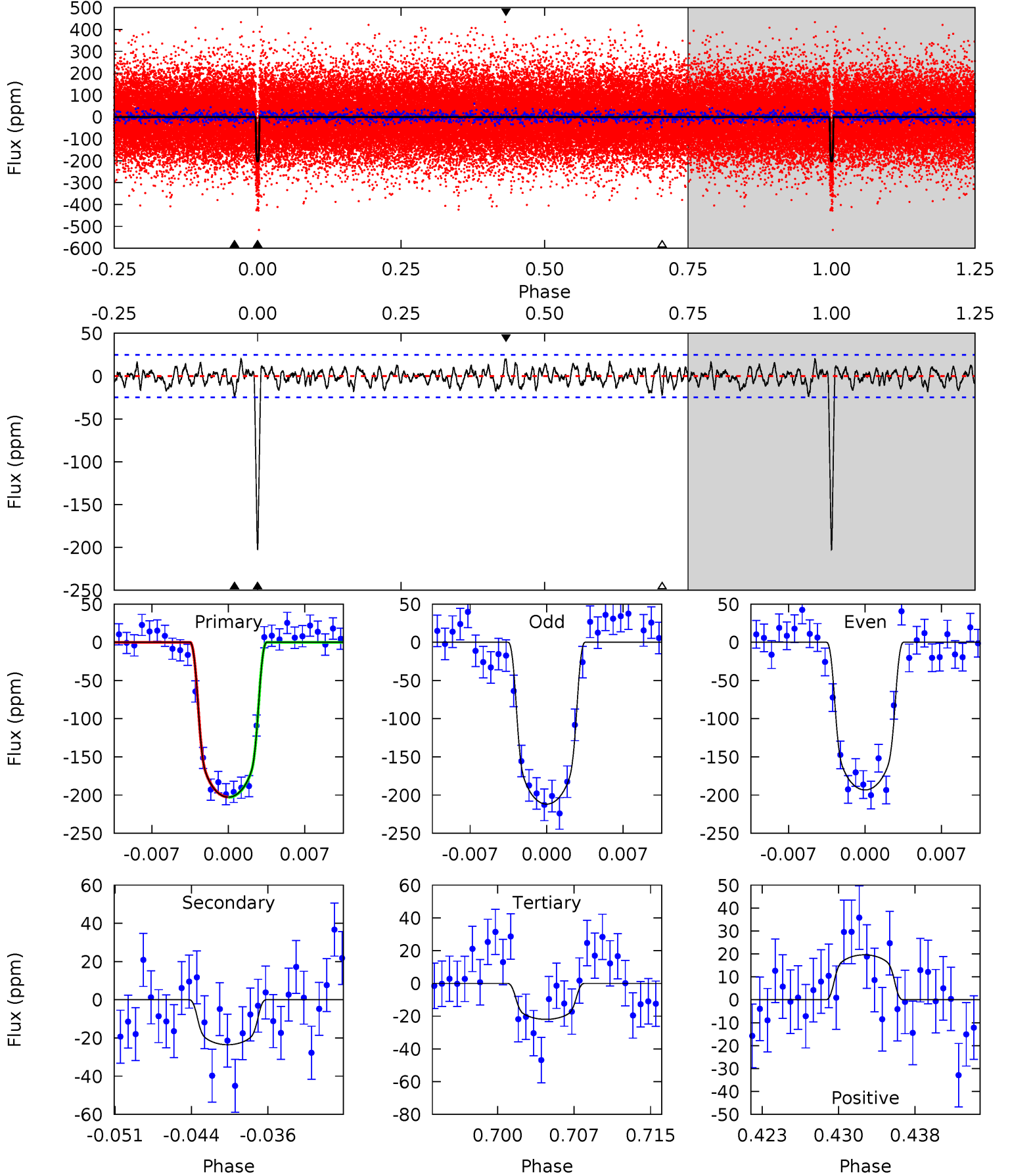
TCE 009950612-04 P= 28.122125 Days $T_0=146.924492$ (BKJD)



DV Model-Shift Uniqueness Test

009950612-04, P = 28.122448 Days, E = 118.796825 Days

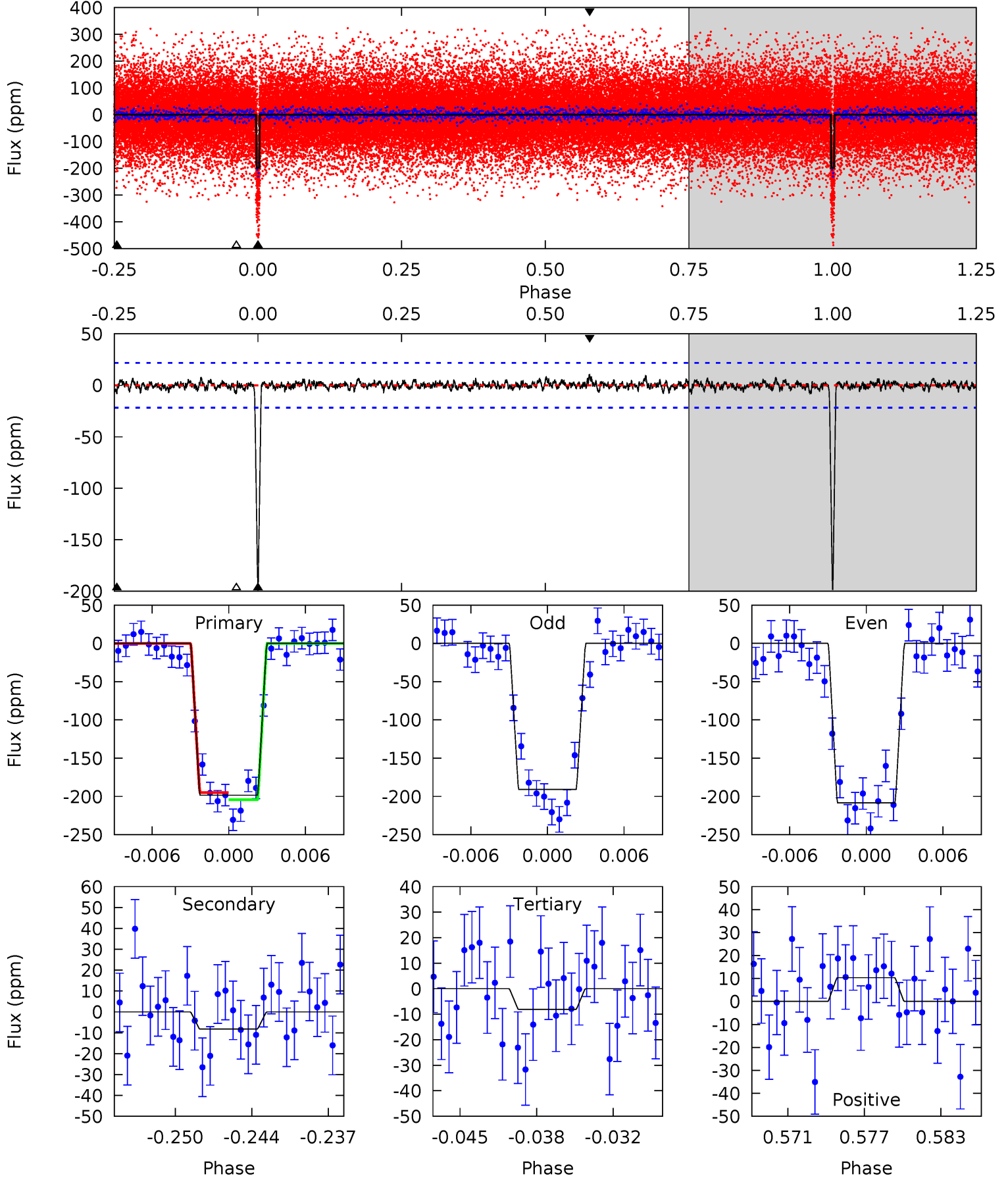
Pri	Sec	Ter	Pos	FA ₁	FA ₂	F _{Red}	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
41.5	4.81	4.49	4.01	5.09	2.68	1.48	37.0	37.5	0.32	0.81	1.91	0.97	0.09	0.05



Alt Model-Shift Uniqueness Test

009950612-04, P = 28.122125 Days, E = 118.802367 Days

Pri	Sec	Ter	Pos	FA ₁	FA ₂	F _{Red}	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
46.7	1.93	1.91	2.44	5.11	2.73	0.60	44.8	44.3	0.02	-0.51	2.05	0.94	0.05	1.11



Stellar Parameters For KIC 009950612

	$T_{\text{eff}}(K)$	$\log(g)$	$[\text{Fe}/\text{H}]$	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	4499^{+89}_{-89}	$4.635^{+0.032}_{-0.020}$	$-0.260^{+0.150}_{-0.150}$	$0.639^{+0.025}_{-0.032}$	$0.643^{+0.035}_{-0.032}$	$3.466^{+0.459}_{-0.276}$
	+2%/-2%	+1%/-0%	+58%/-58%	+4%/-5%	+5%/-5%	+13%/-8%
Source	SPE60	SPE60	SPE60	DSEP		

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

Secondary Eclipse Parameters for KIC 009950612-04 / KOI 0719.02

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	A_{obs}
DV	-24 ± 5	$1.18^{+0.09}_{-0.09}$	559^{+14}_{-13}	2984^{+118}_{-132}	228^{+67}_{-57}
Alt.	-8 ± 4	$0.98^{+0.10}_{-0.10}$	560^{+13}_{-12}	2712^{+189}_{-255}	113^{+72}_{-61}

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

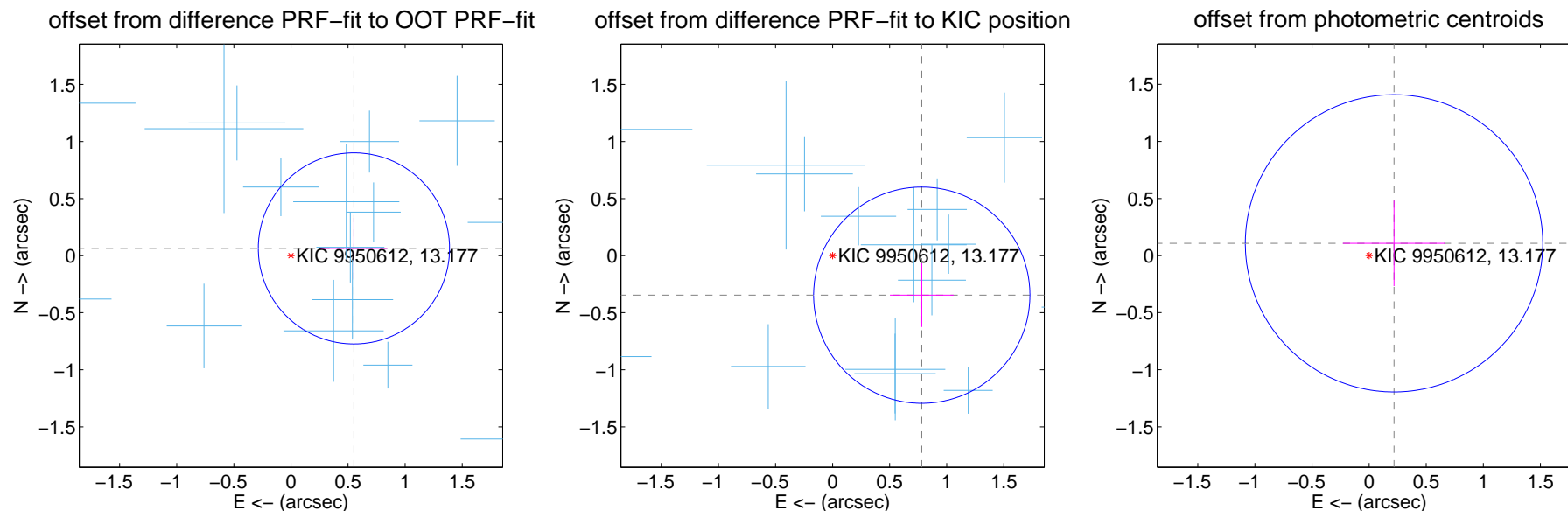
DV Centroid Data

Supplemental centroid analysis for 009950612-04. Kepler magnitude: 13.18. Transit SNR 25.35

There are 17 quarters with good PRF difference image offsets

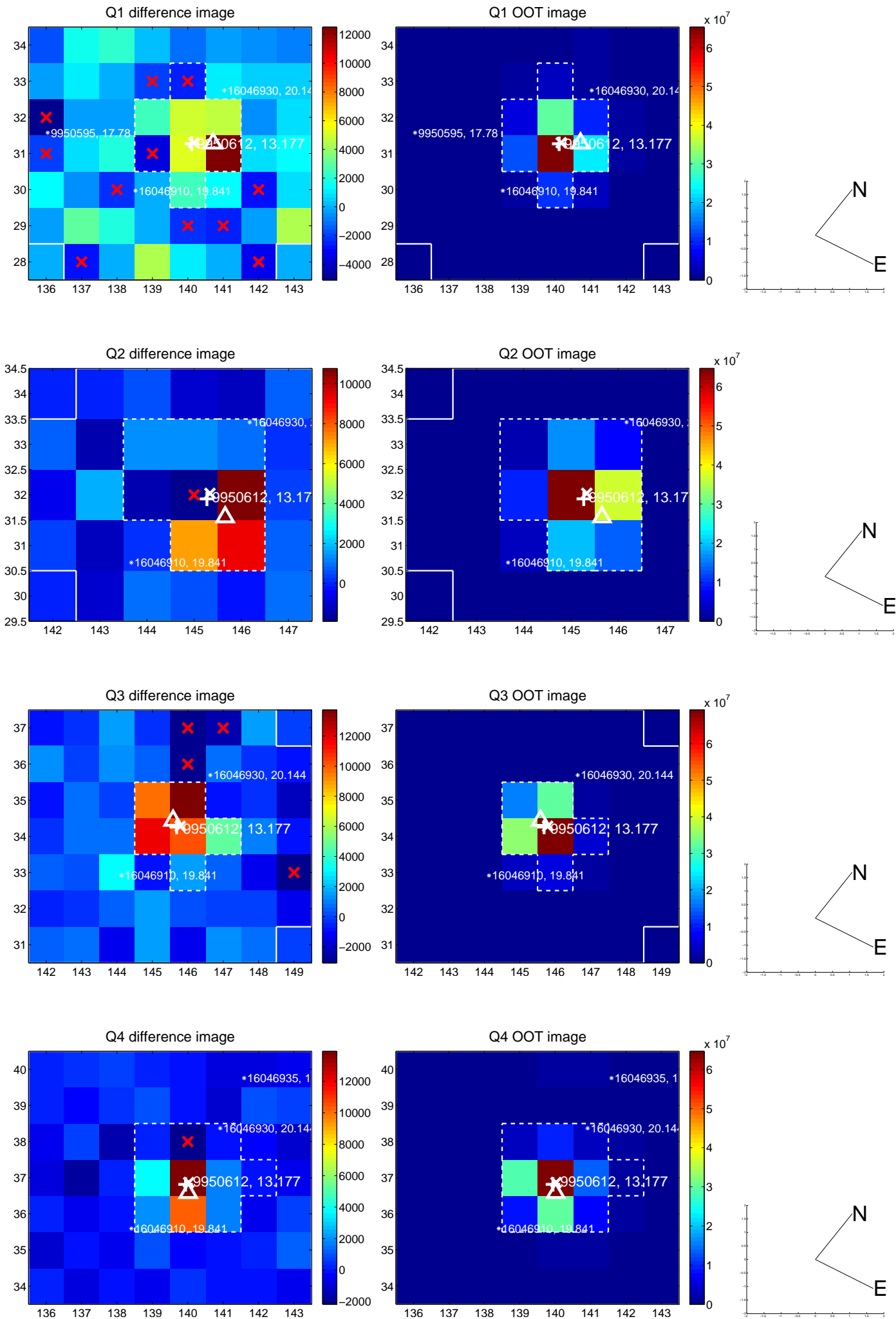
The direct PRF centroid is offset from the target star catalog position by about 0.44 arcsec

	Distance in arcsec	Distance / σ	Δ RA	Δ Dec
PRF-fit source offset from OOT	0.555 ± 0.279	1.99	-0.552 ± 0.292	0.063 ± 0.267
PRF-fit source offset from KIC position	0.855 ± 0.316	2.71	-0.781 ± 0.279	-0.346 ± 0.279
photometric centroid source offset	0.24 ± 0.43	0.56	-0.22 ± 0.45	0.11 ± 0.38

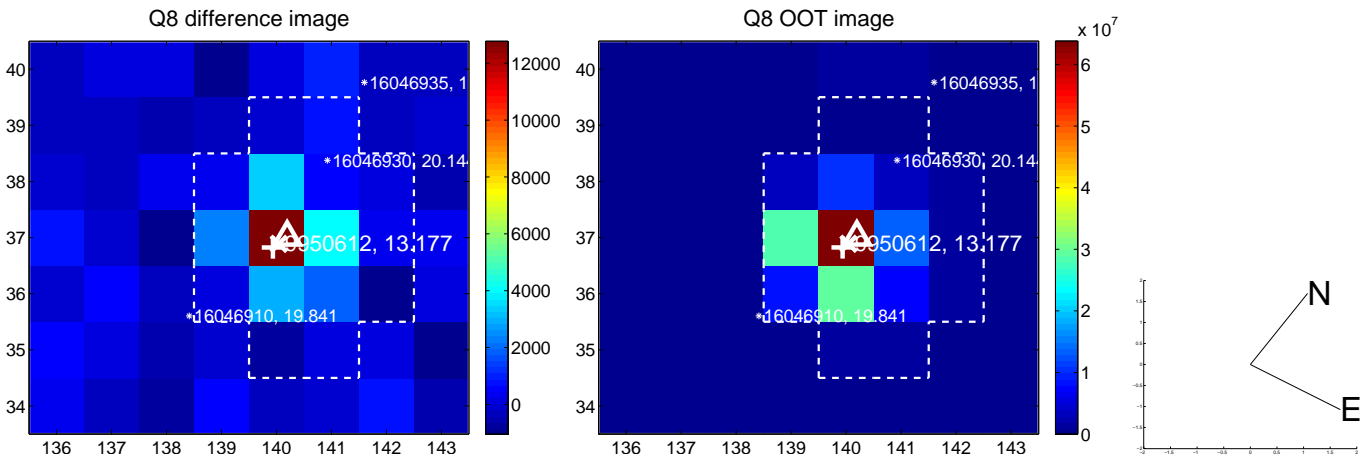
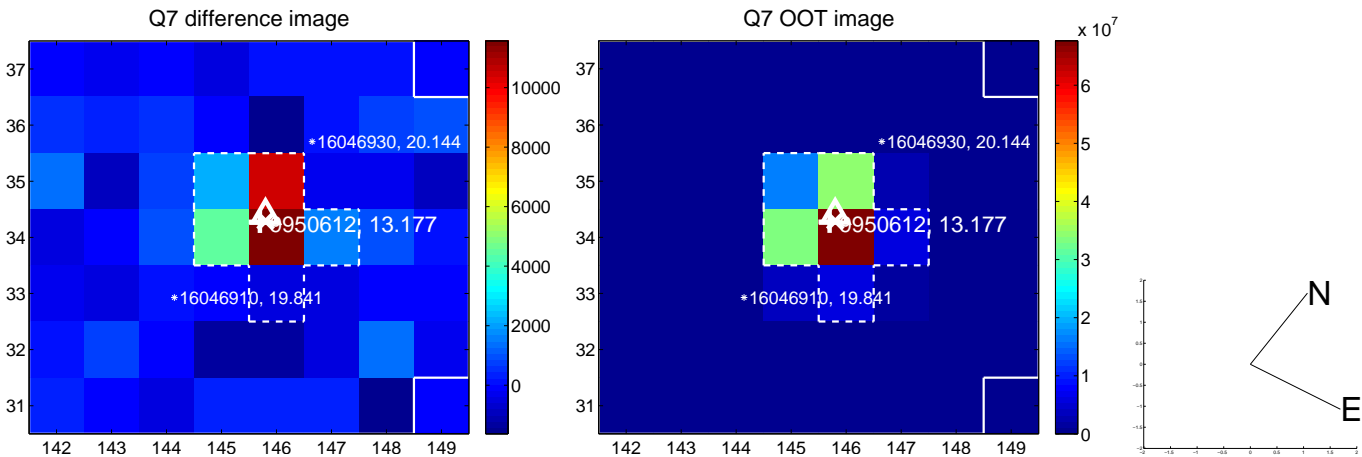
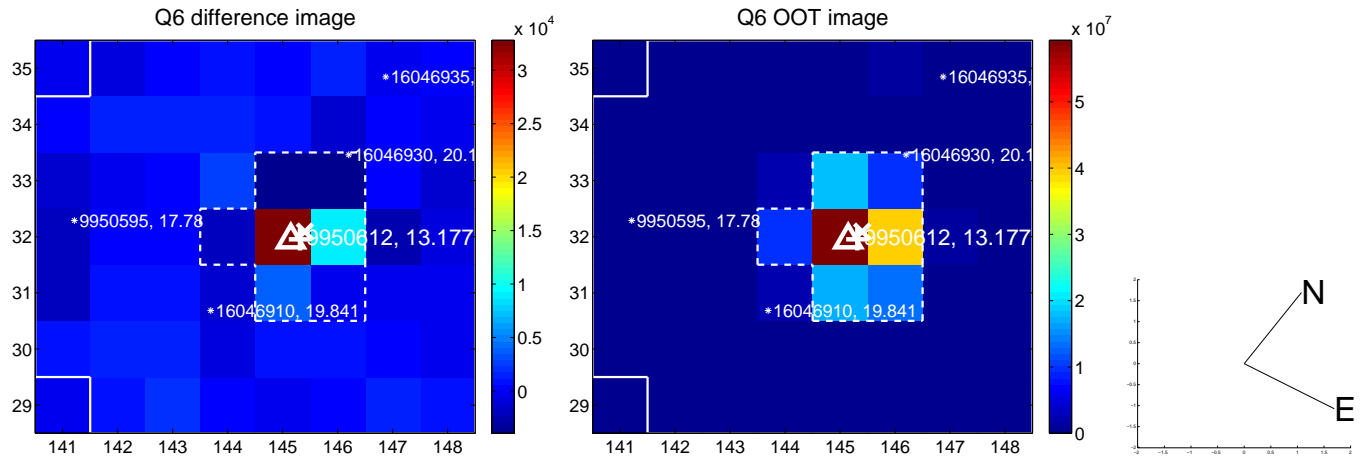
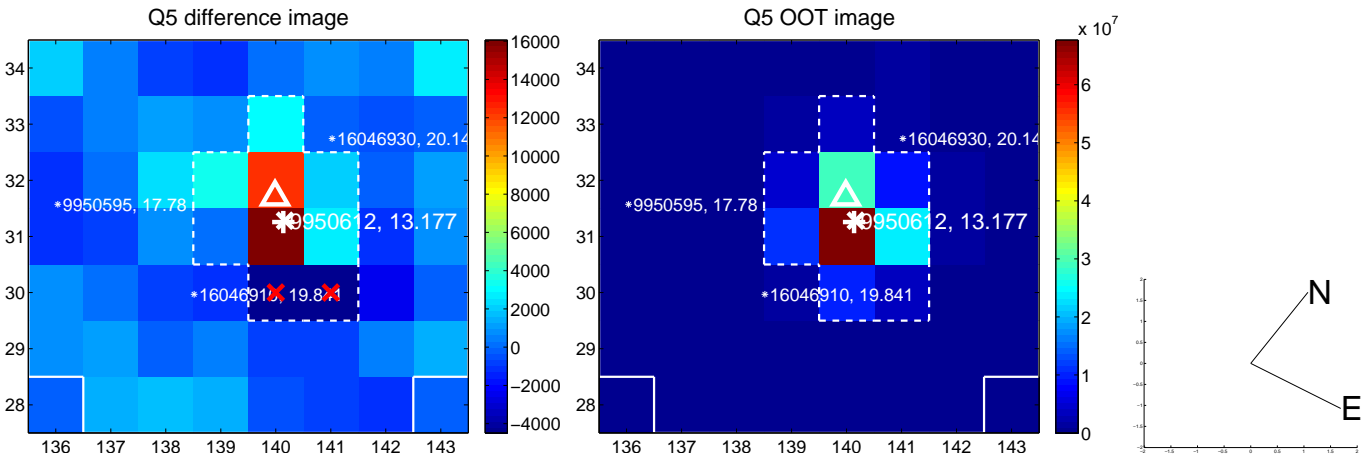


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses:** good quarterly centroid offsets; **Vermillion crosses:** bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- σ uncertainty. Blue circle: three-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

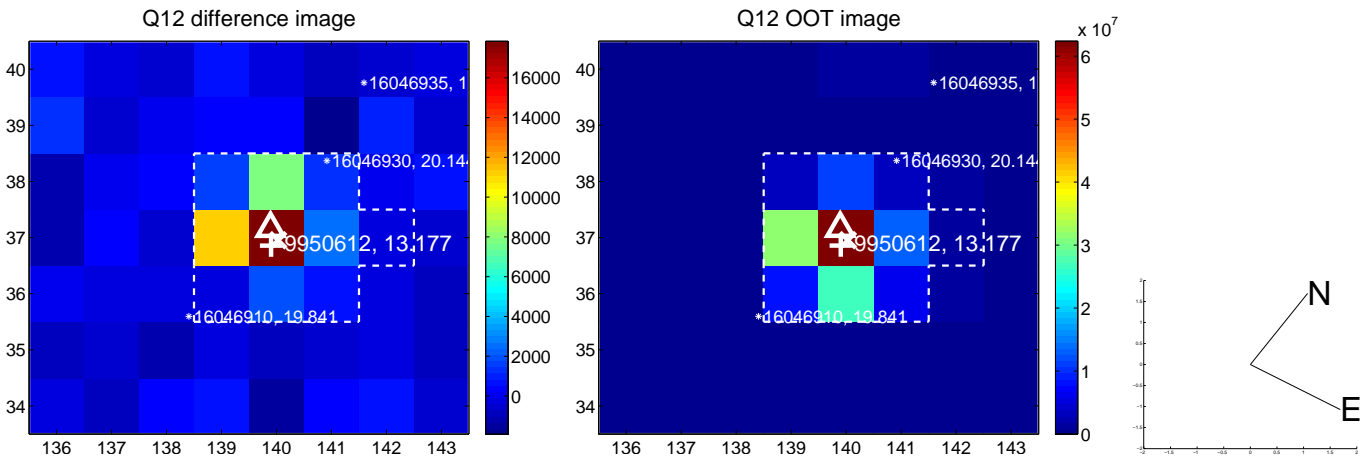
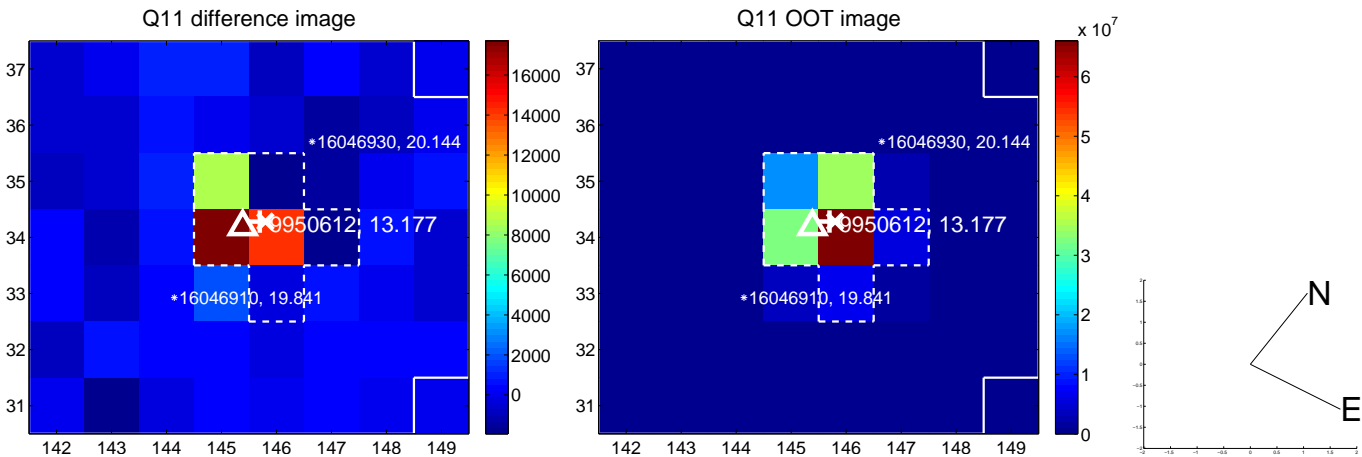
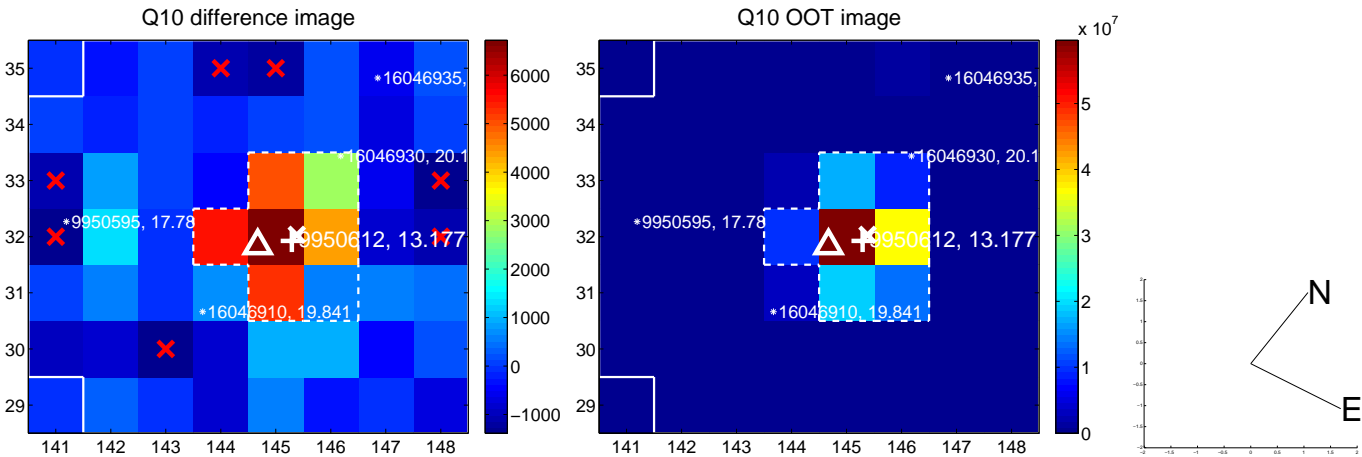
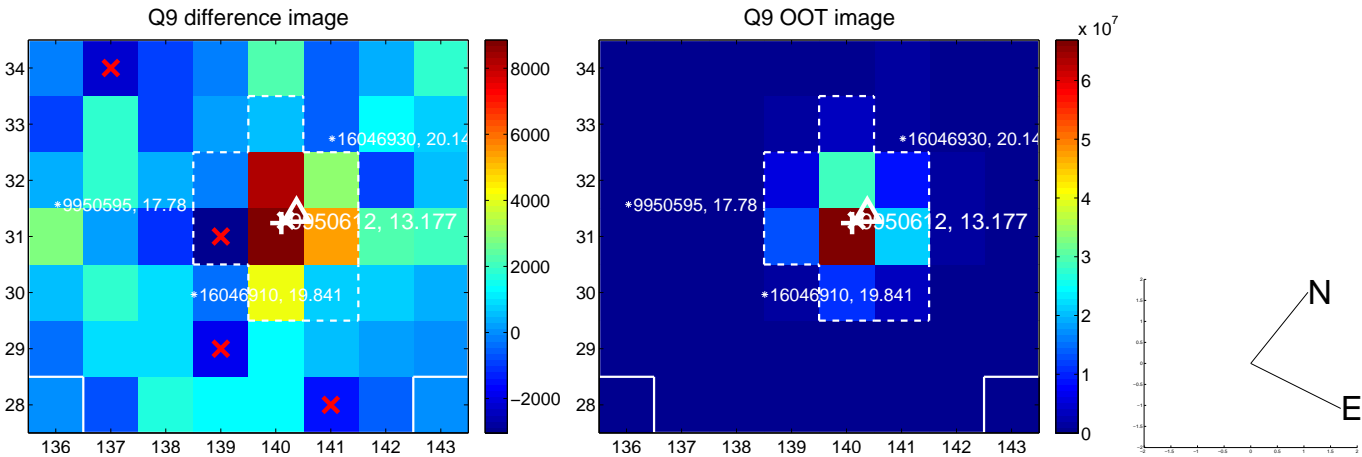
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



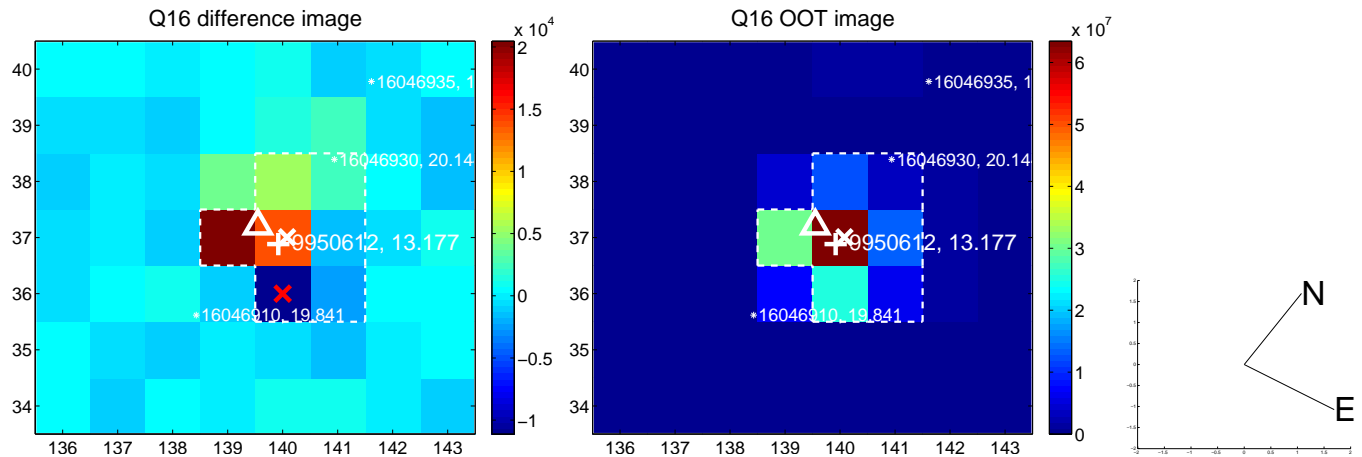
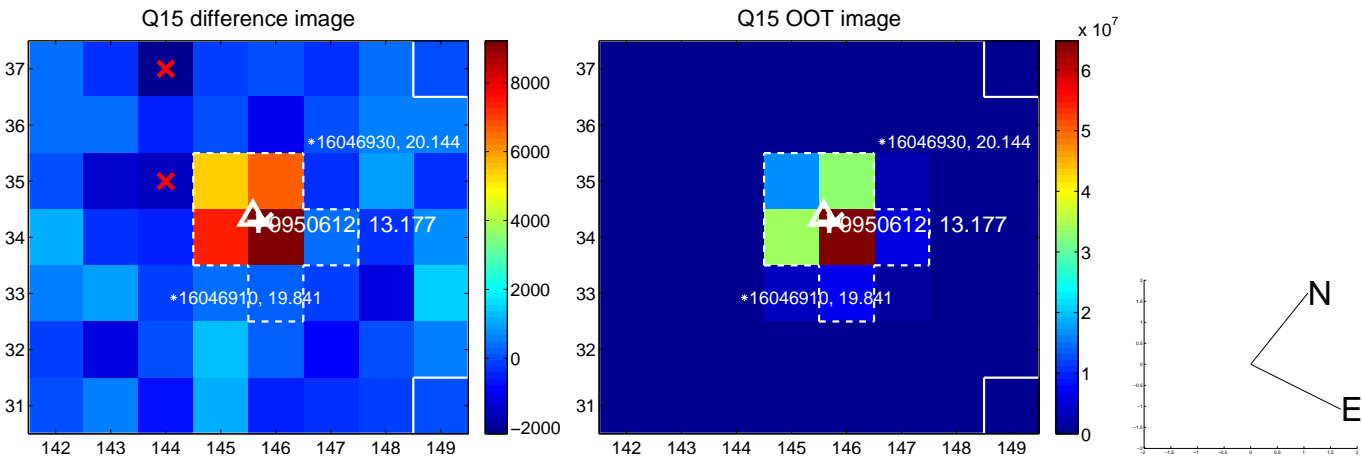
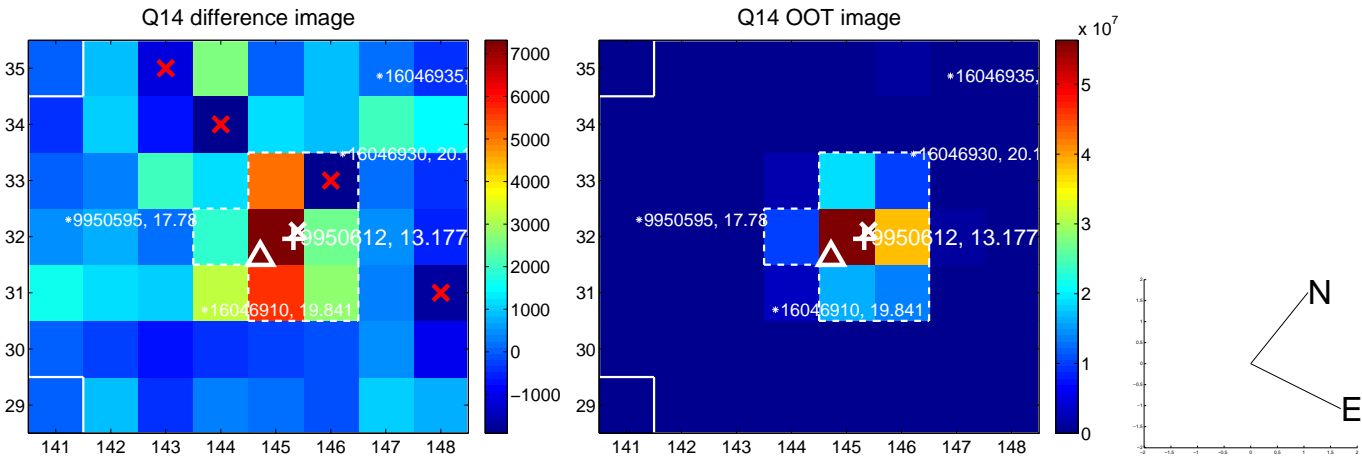
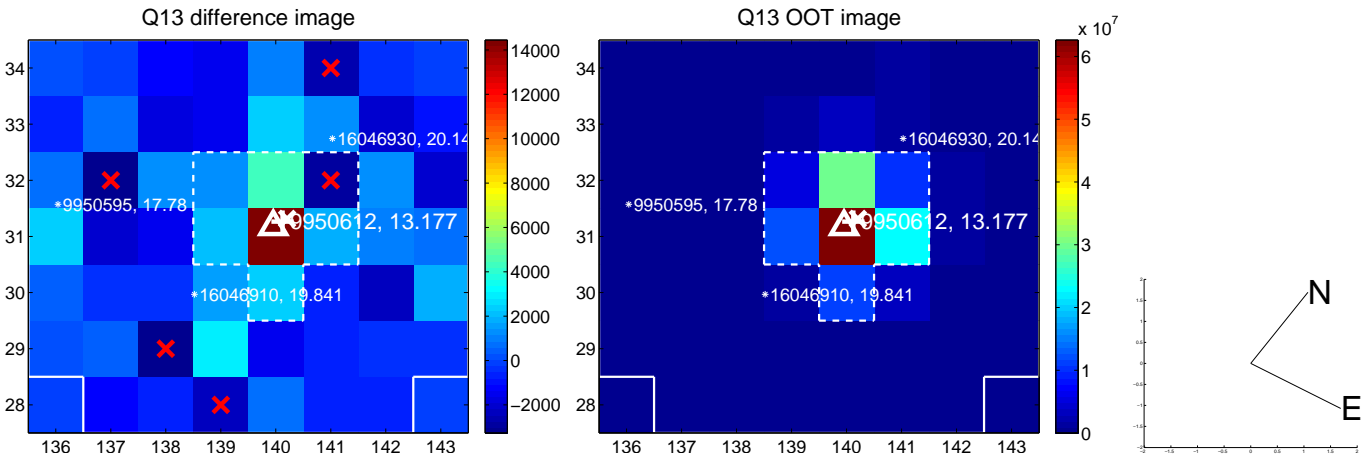
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



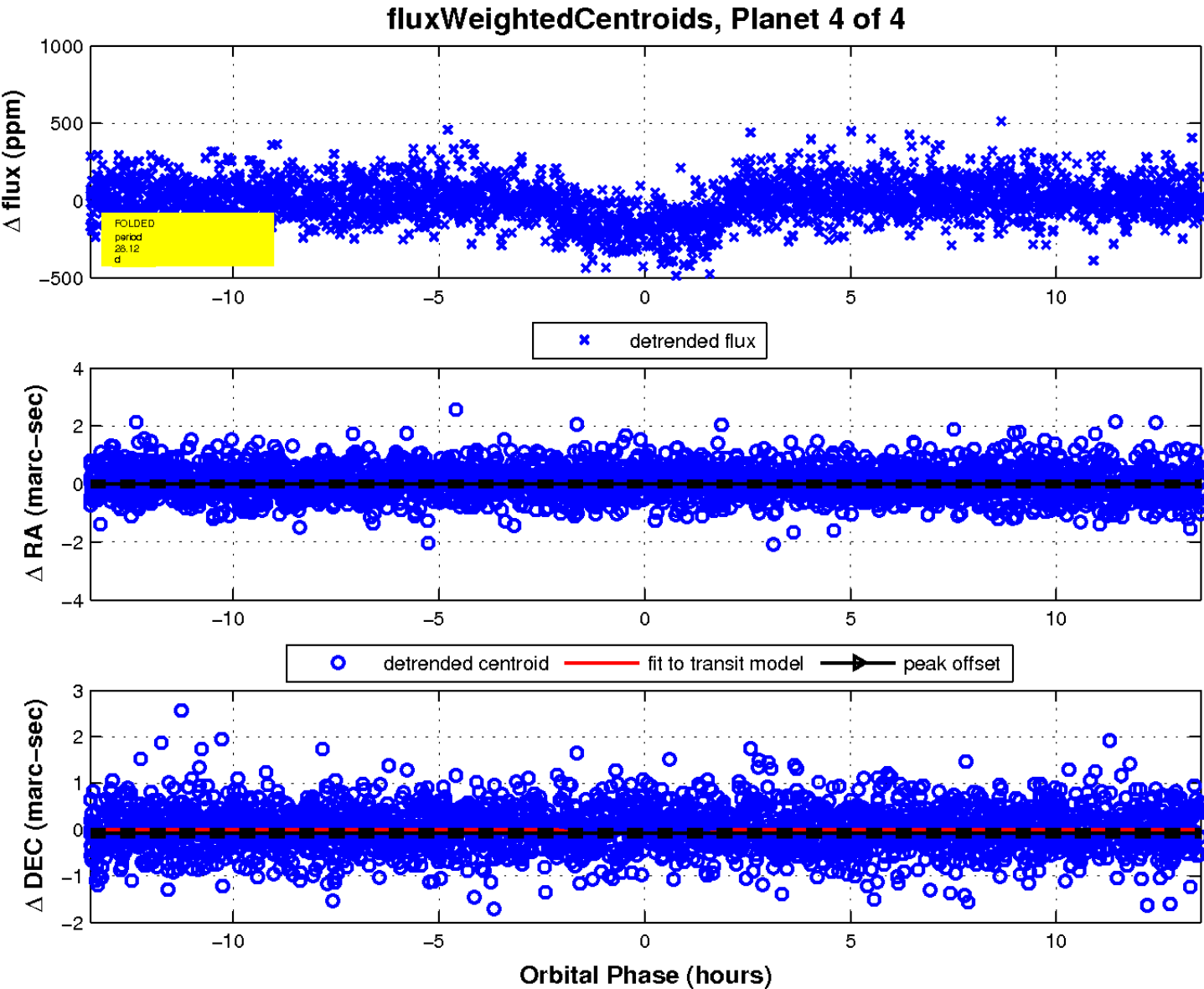
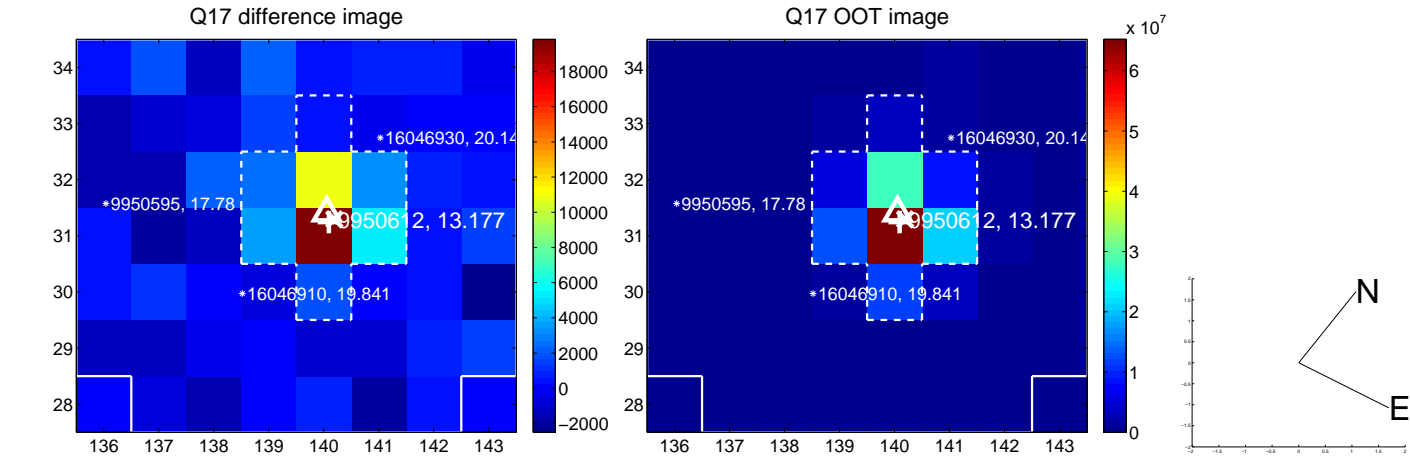
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



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

