

## KIC 004058206

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
004058206-01	OBS	No	1.757664	133.121771	31.4	12.472	9.0	8.1	1.60	6849	0.93	5123.52
004058206-02	OBS	No	28.167409	133.654156	134.2	2.887	15.8	3.4	1.60	6849	2.16	126.81
004058206-03	OBS	No	28.165022	134.376281	31.7	5.936	15.3	0.8	1.60	6849	1.05	126.82
004058206-04	OBS	No	210.958911	133.974993	516.3	2.065	12.7	9.1	1.60	6849	3.92	8.65
004058206-05	OBS	No	29.540053	139.529398	217.0	6.800	11.4	5.6	1.60	6849	2.75	119.02
004058206-07	OBS	No	35.078211	148.902092	480.5	3.093	9.8	8.4	1.60	6849	3.83	94.64
004058206-08	OBS	No	47.891699	159.457155	501.9	2.608	9.7	8.2	1.60	6849	3.62	62.49
004058206-09	OBS	No	59.344057	134.337160	528.7	4.210	9.8	9.5	1.60	6849	3.81	46.95
004058206-10	OBS	No	38.068267	161.015373	572.3	6.023	9.5	12.0	1.60	6849	6.51	84.87

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
004058206-01	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_ALT
004058206-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_ZUMA_TRACKER—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT
004058206-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_ZUMA_TRACKER—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—SAME_NTL_PERIOD
004058206-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_MARSHALL—TRANS_GAPPED—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS
004058206-05	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT
004058206-07	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_SKYE—TRANS_GAPPED—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT
004058206-08	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV
004058206-09	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_SKYE—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT
004058206-10	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT

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

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

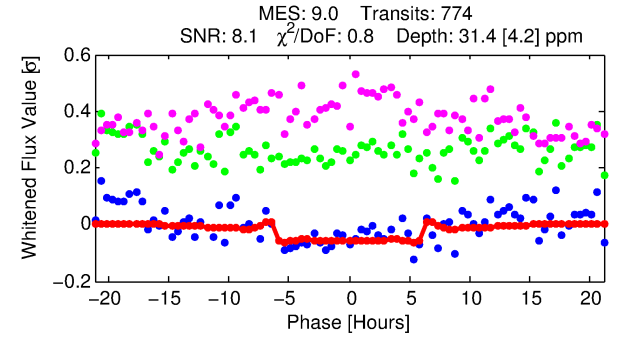
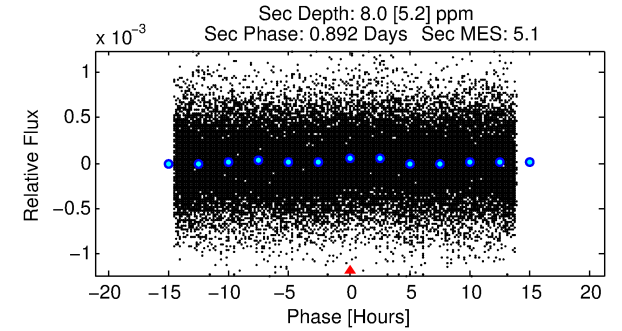
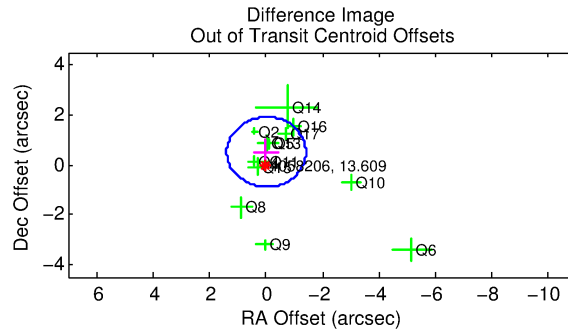
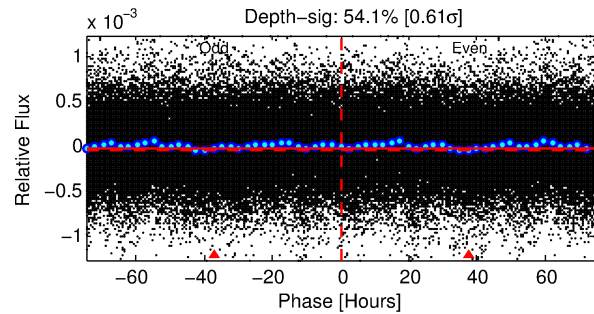
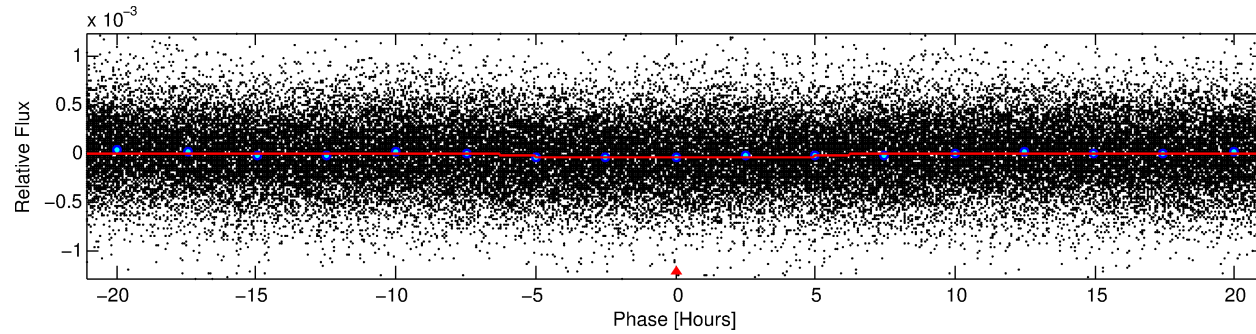
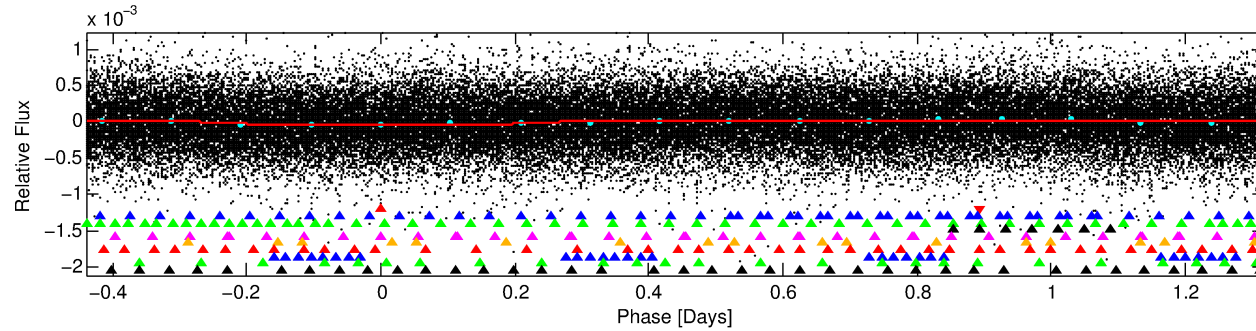
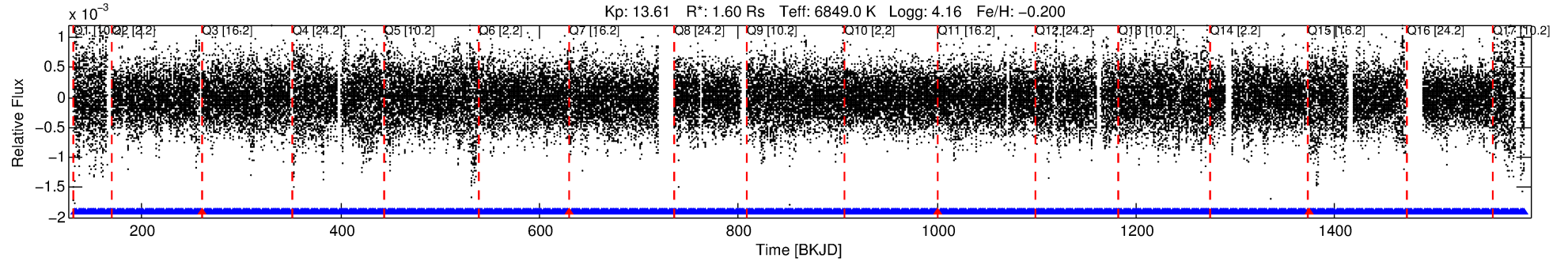
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 004058206-01

No Significant Match Found

# DV One-Page Summary

KIC: 4058206 Candidate: 1 of 10 Period: 1.758 d



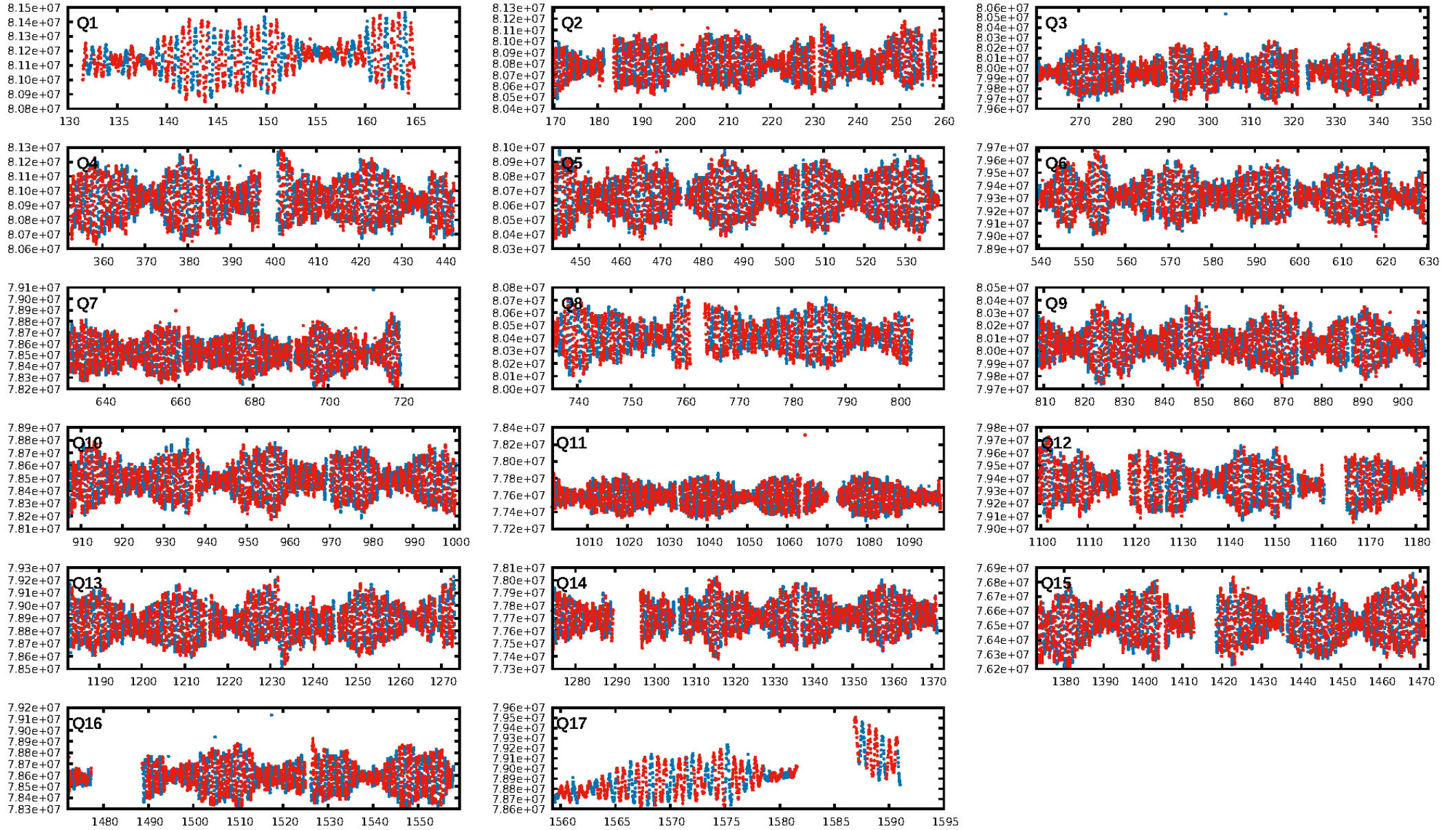
## DV Fit Results:

Period = 1.75766 [0.00003] d  
Epoch = 133.1218 [0.0062] BKJD  
Rp/R\* = 0.0053 [0.0042]  
a/R\* = 1.20 [1.65]  
b = 0.50 [6.84]  
Seff = 5123.52 [2032.77]  
Teff = 2157 [214] K  
Rp = 0.93 [0.79] Re  
a = 0.0314 [0.0082] AU  
Ag = 5.04 [8.78] [0.46 $\sigma$ ]  
Teffp = 4998 [2136] K [1.32 $\sigma$ ]

## DV Diagnostic Results:

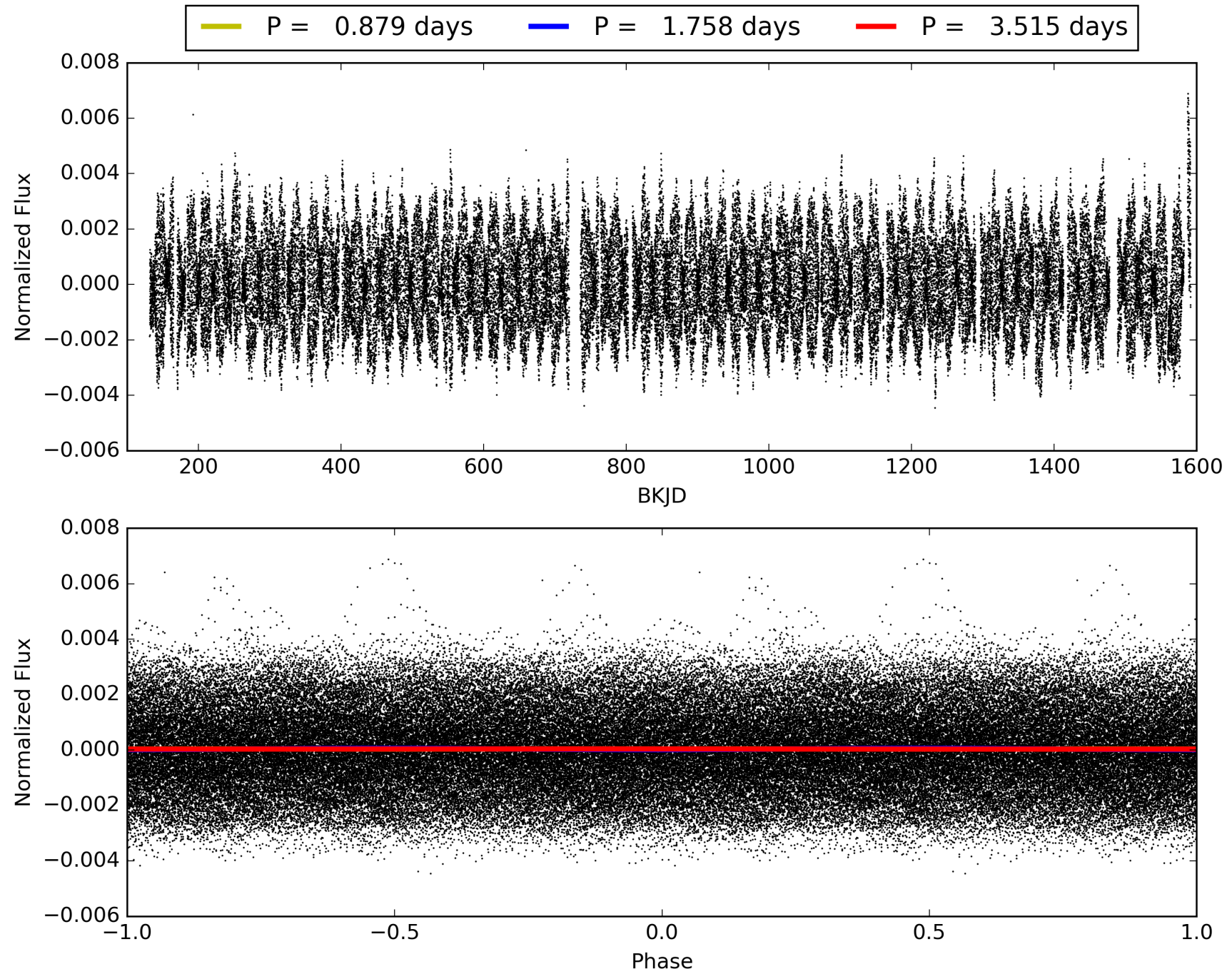
ShortPeriod-sig: N/A  
LongPeriod-sig: 100.0% [45.89 $\sigma$ ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: 3.80e-15  
RollingBand-fgt: 0.99 [734/738]  
GhostDiagnostic-chr: 4.357  
Centroid-sig: 4.1%  
Centroid-so: 1.215 arcsec [1.37 $\sigma$ ]  
OotOffset-rm: 0.507 arcsec [1.09 $\sigma$ ]  
KicOffset-rm: 0.438 arcsec [0.84 $\sigma$ ]  
OotOffset-st: 4/2/3/4 [13]  
KicOffset-st: 4/2/3/4 [13]  
DiffImageQuality-fgm: 0.46 [6/13]  
DiffImageOverlap-fno: 1.00 [17/17]

# TCE 004058206-01, PDC Light Curves





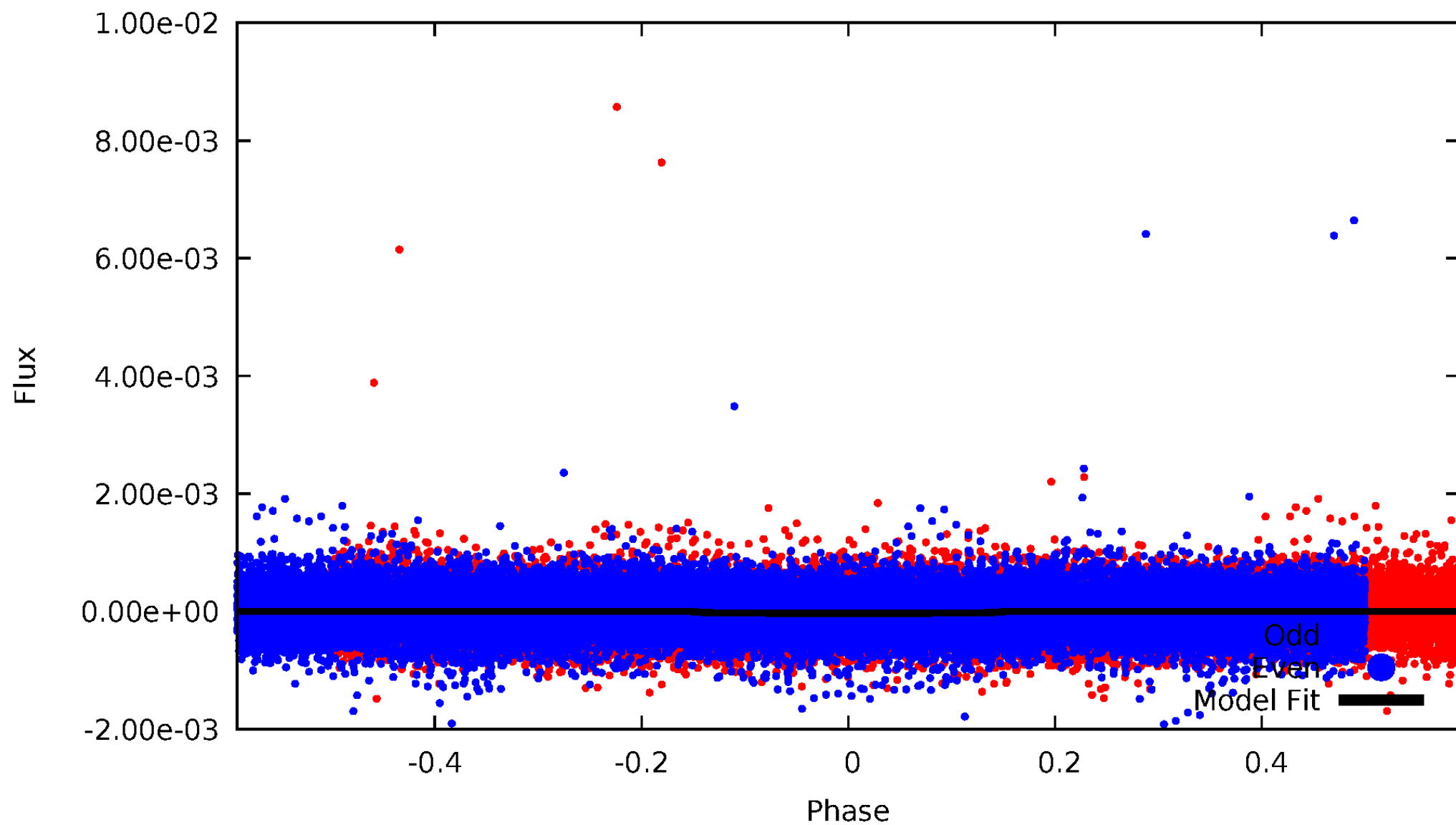
TCE 004058206-01





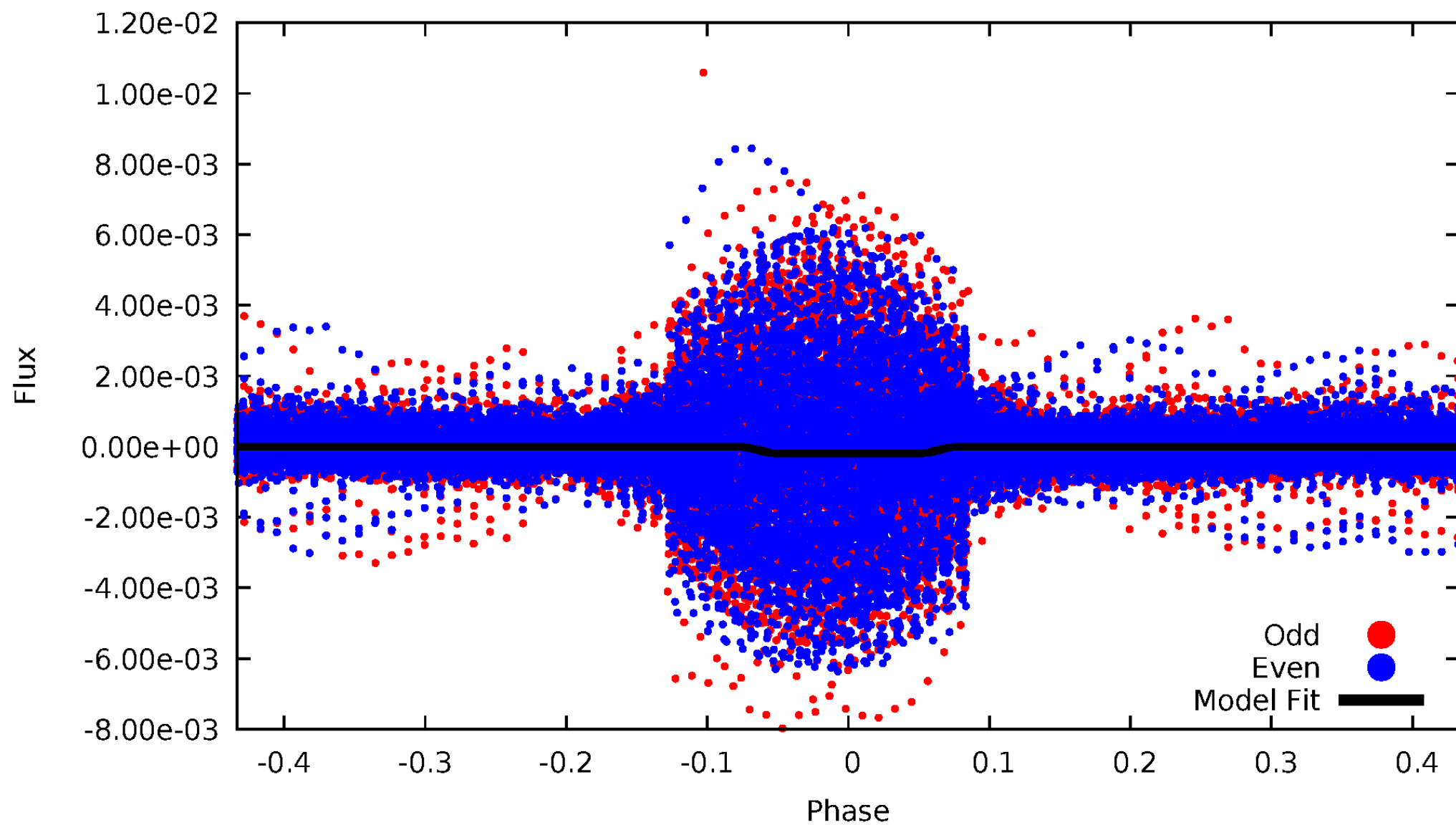
# DV Odd/Even

TCE 004058206-01

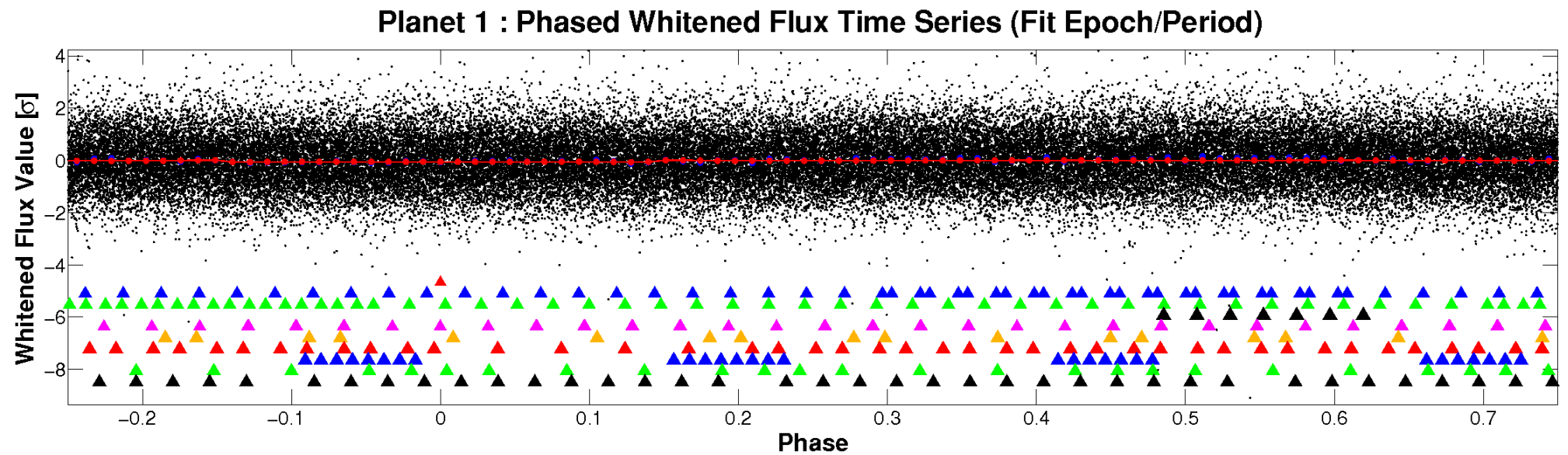
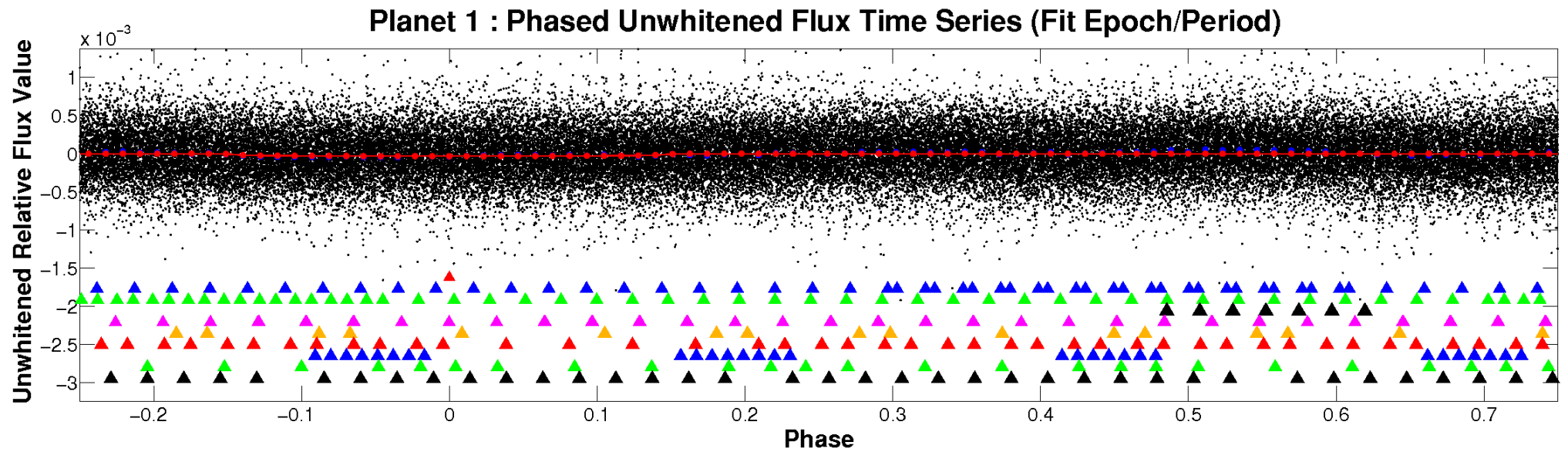


# ALT Odd/Even

TCE 004058206-01



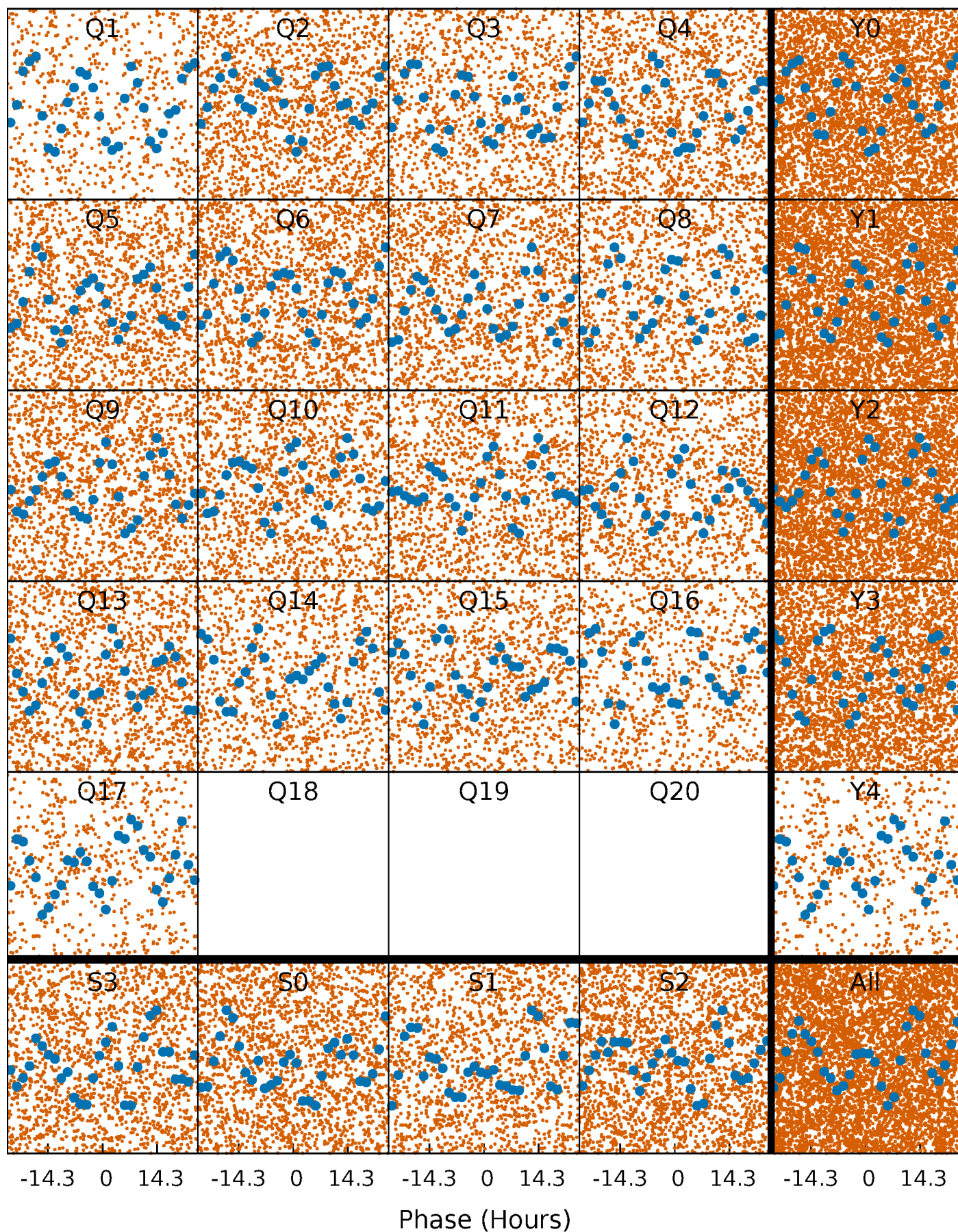
# Non-Whitened Vs. Whitened Light Curve





# PDC Quarter-Phased Transit Curves

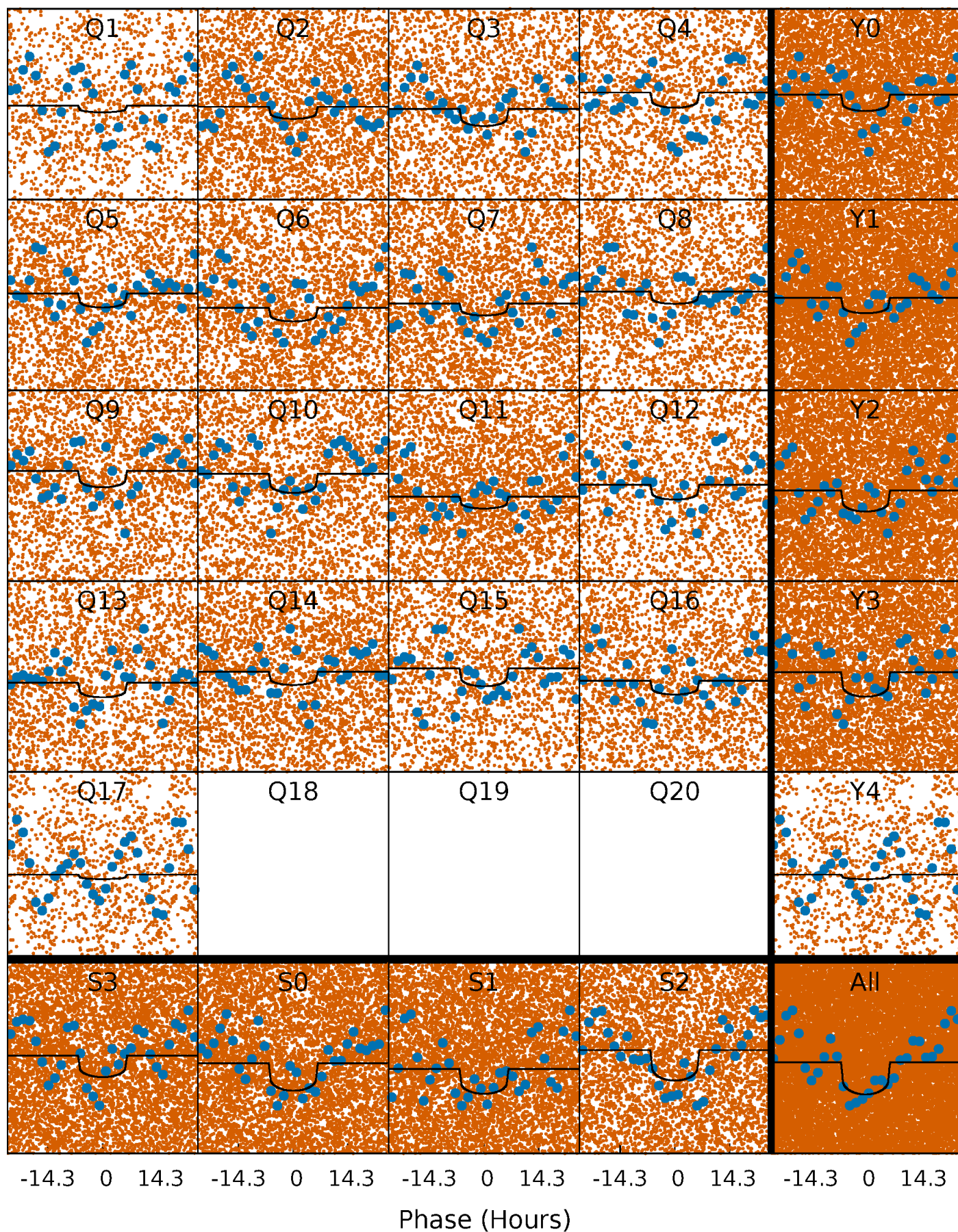
TCE 004058206-01 P= 1.757664 Days  $T_0=133.121771$  (BKJD)





# DV Quarter-Phased Transit Curves

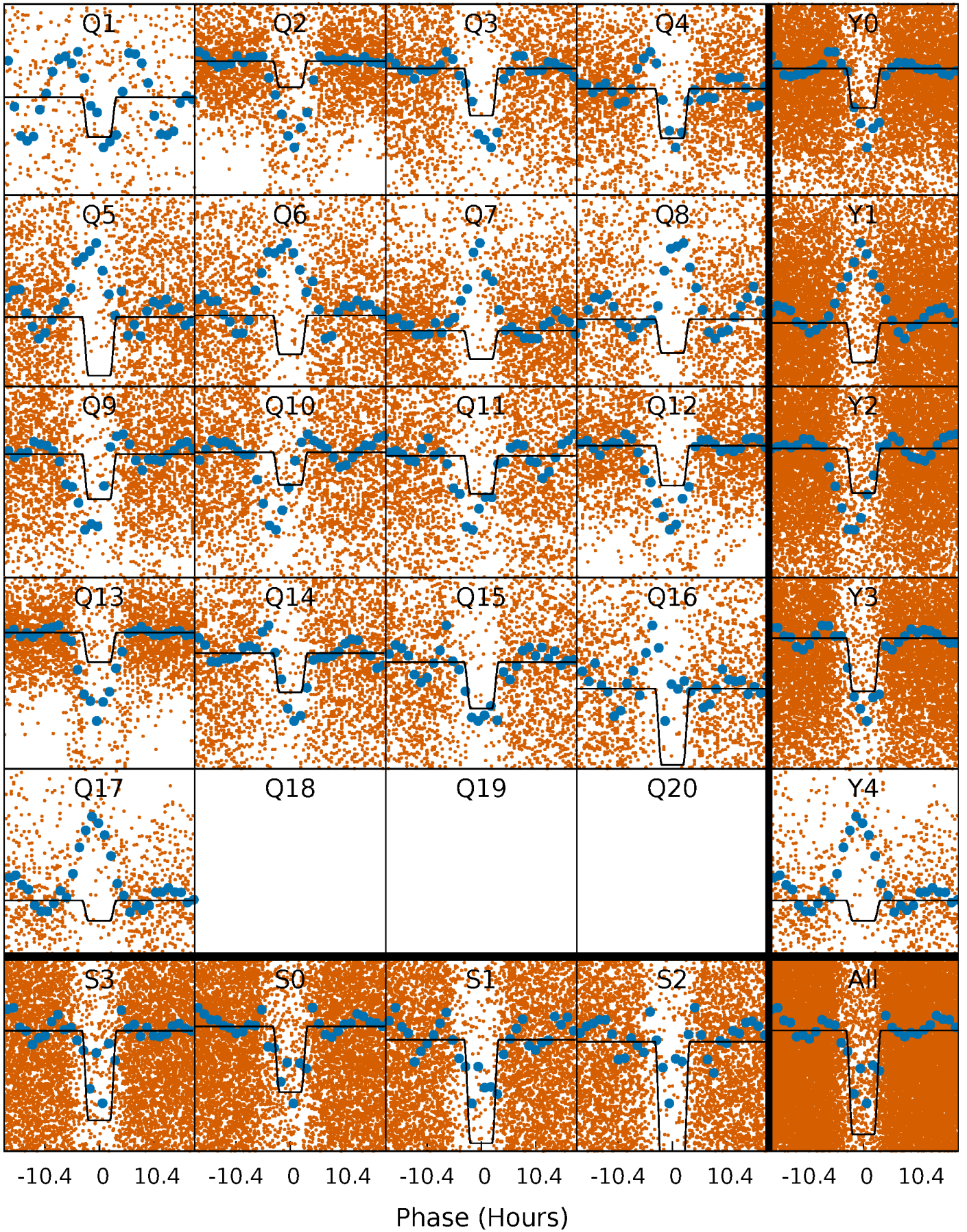
TCE 004058206-01 P= 1.757664 Days  $T_0=133.121771$  (BKJD)





# Alt. Detrend Quarter-Phased Transit Curves

TCE 004058206-01 P= 1.757324 Days  $T_0=133.164846$  (BKJD)

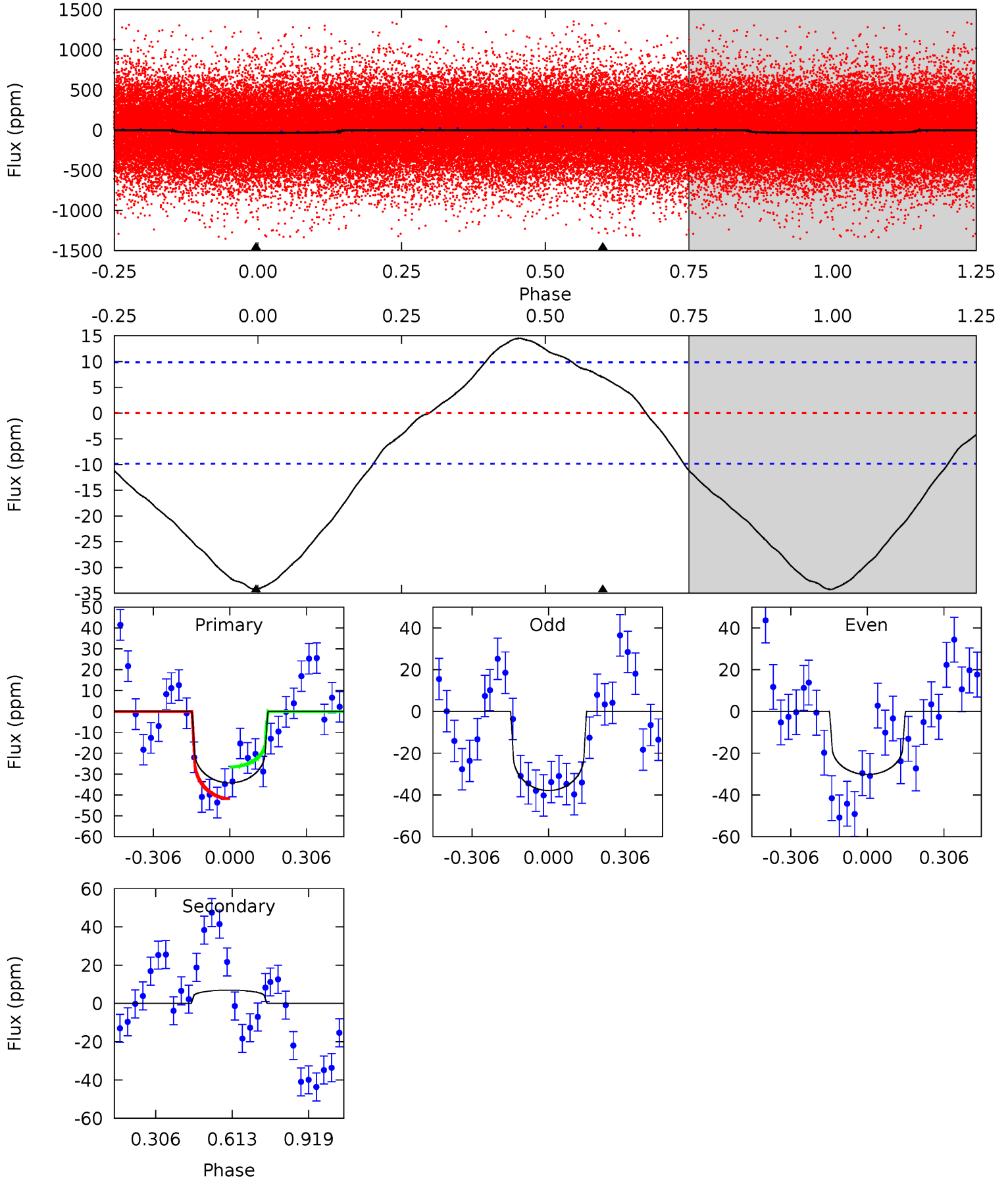




# DV Model-Shift Uniqueness Test

004058206-01, P = 1.757664 Days, E = 131.364107 Days

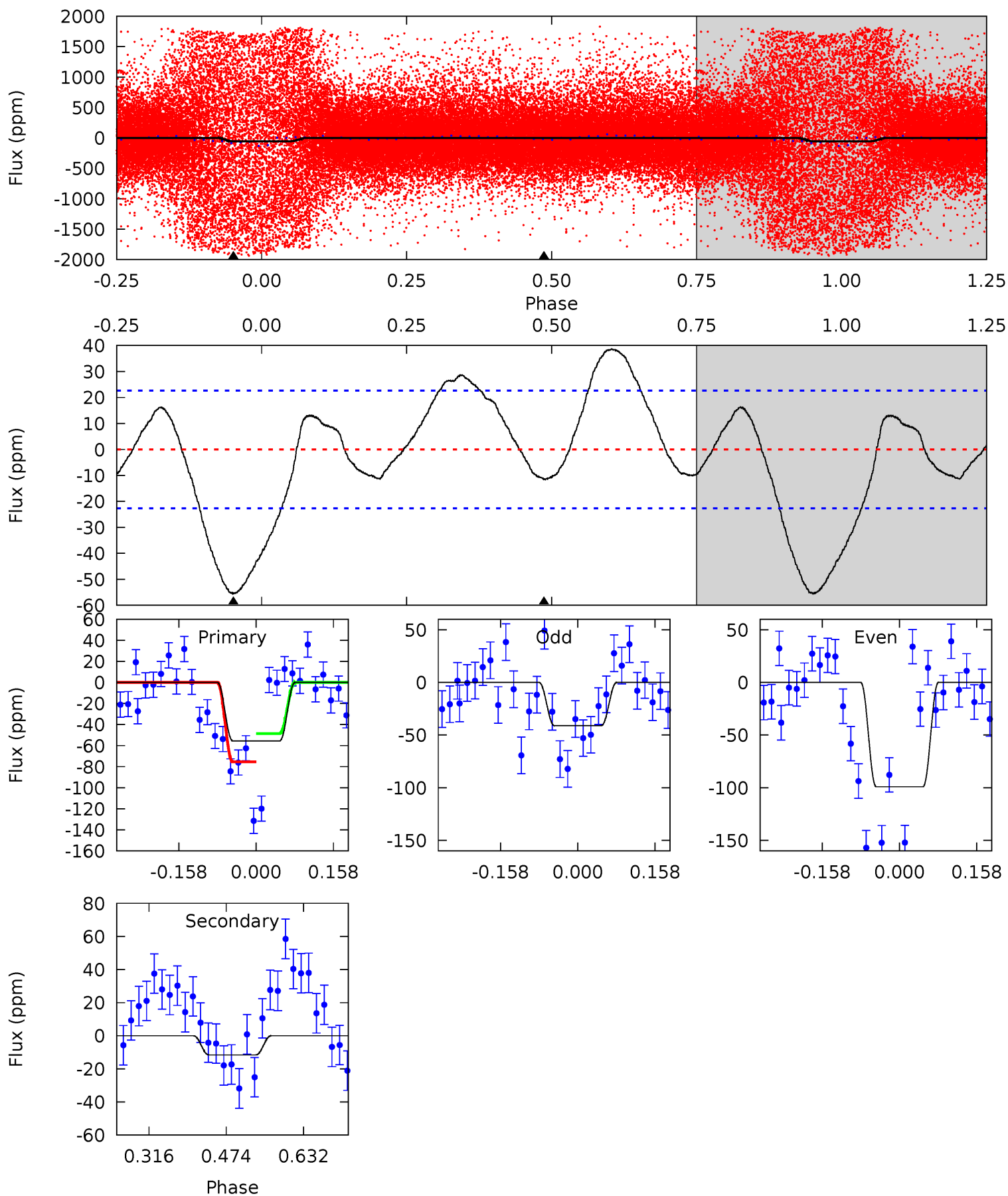
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
15.1	-3.07	0	0	4.32	1.02	1.04	15.1	15.1	-3.07	-3.07	1.68	1.10	0.30	3.31



# Alt Model-Shift Uniqueness Test

004058206-01, P = 1.757324 Days, E = 131.407522 Days

Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
11.0	2.29	0	0	4.47	1.41	2.23	11.0	11.0	2.29	2.29	5.63	1.57	0.41	2.67



### Stellar Parameters For KIC 004058206

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$6849^{+190}_{-262}$	$4.155^{+0.158}_{-0.193}$	$-0.200^{+0.250}_{-0.300}$	$1.600^{+0.516}_{-0.387}$	$1.345^{+0.189}_{-0.231}$	$0.462^{+0.435}_{-0.221}$
	+3%/-4%	+4%/-5%	+125%/-150%	+32%/-24%	+14%/-17%	+94%/-48%
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 004058206-01 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$7 \pm 2$	$1.05^{+0.80}_{-0.62}$	$3039^{+237}_{-214}$	$-4704^{+753}_{-2364}$	$-3.202^{+2.210}_{-15.586}$
Alt.	$-12 \pm 5$	$2.49^{+0.83}_{-0.79}$	$3035^{+243}_{-209}$	$3475^{+692}_{-716}$	$0.931^{+1.323}_{-0.510}$

$T_{\text{max}}$  = Theoretical Maximum Planetary Temperature

$T_{\text{obs}}$  = Observed Planetary Temperature (Assuming A=0.3)

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



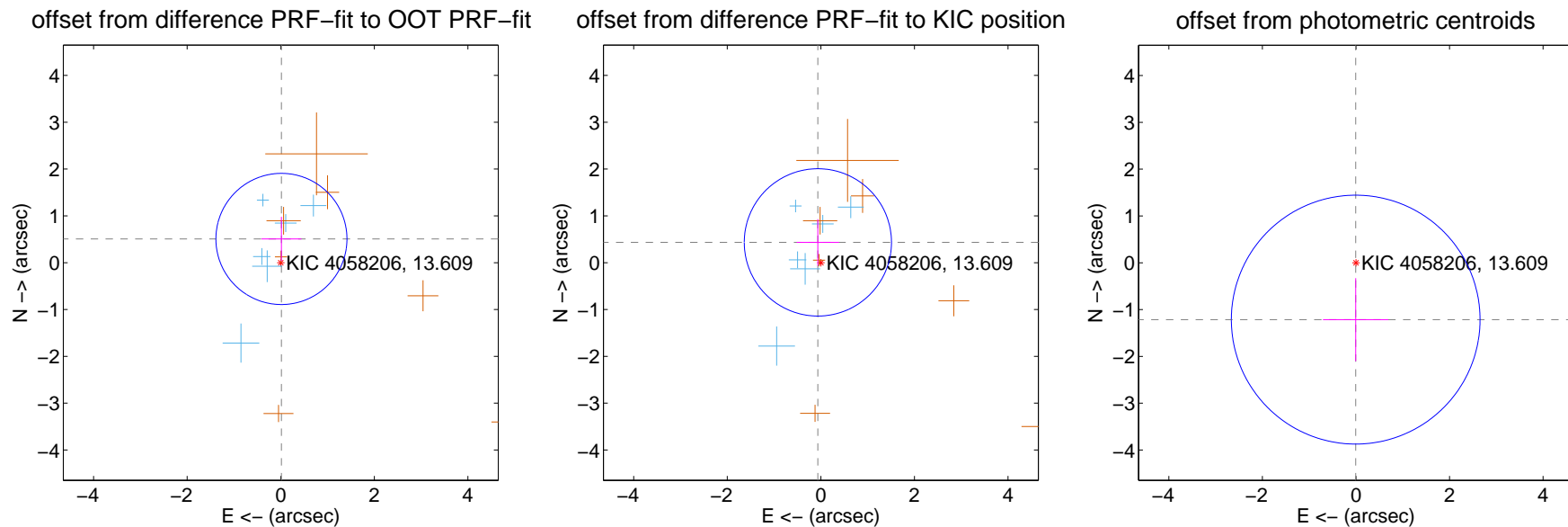
## DV Centroid Data

Supplemental centroid analysis for 004058206-01. Kepler magnitude: 13.61. Transit SNR 8.14

There are 6 quarters with good PRF difference image offsets

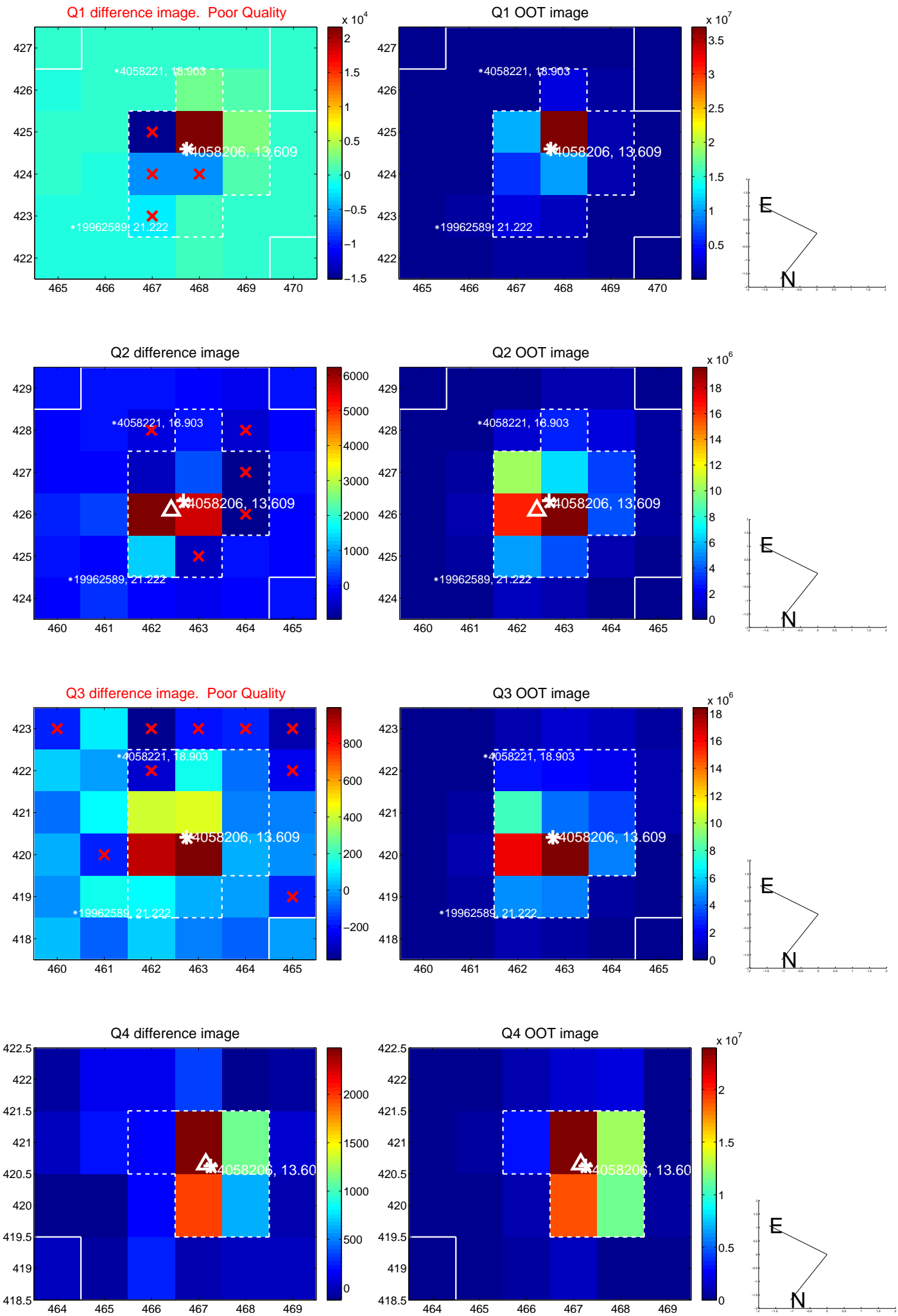
The direct PRF centroid is offset from the target star catalog position by about 0.07 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.507 \pm 0.467$	1.09	$-0.015 \pm 0.426$	$0.507 \pm 0.473$
PRF-fit source offset from KIC position	$0.438 \pm 0.524$	0.84	$0.064 \pm 0.451$	$0.433 \pm 0.496$
photometric centroid source offset	$1.21 \pm 0.89$	1.37	$0.01 \pm 0.70$	$-1.21 \pm 0.89$

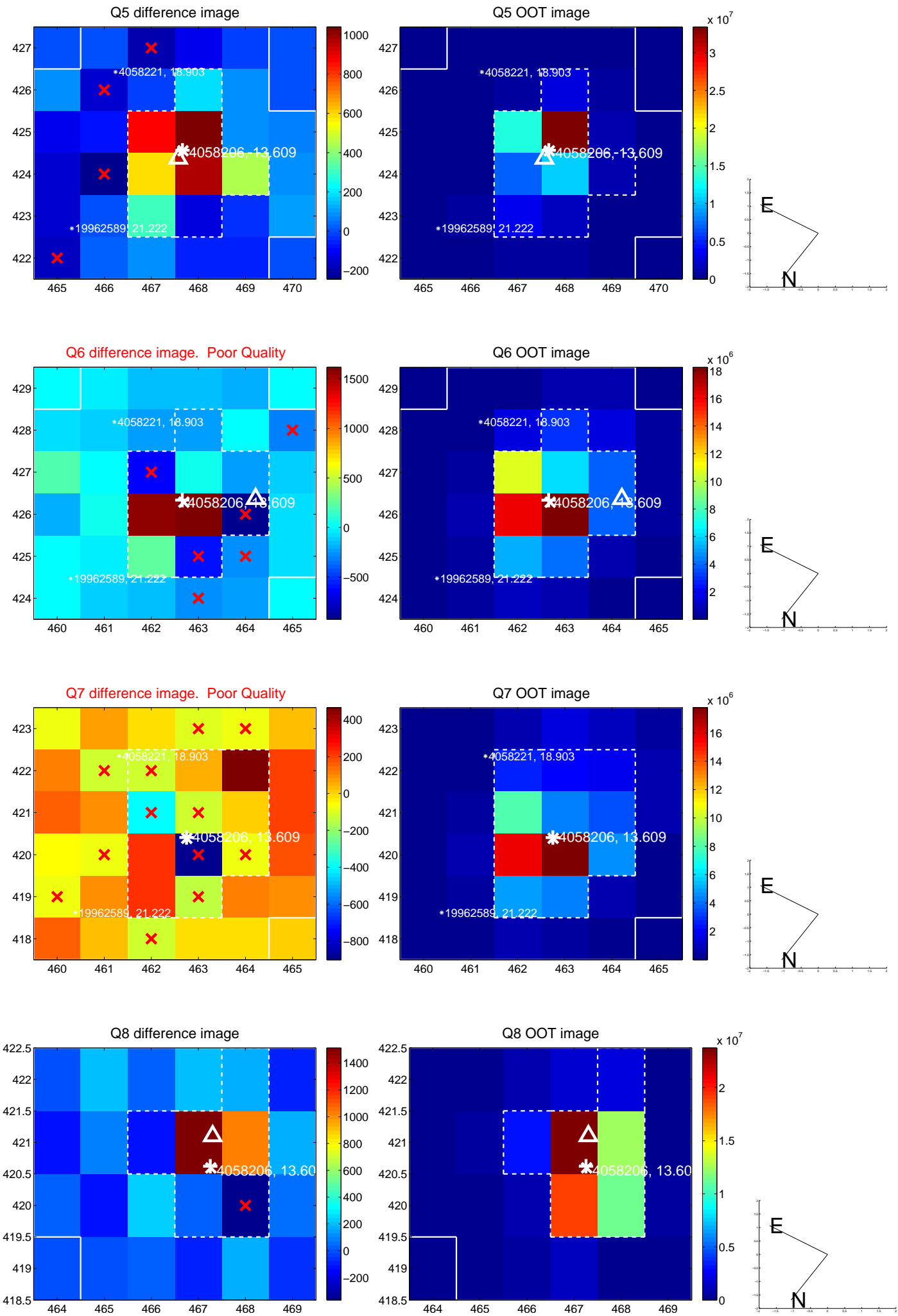


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses:** good quarterly centroid offsets; **Vermillion crosses:** bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

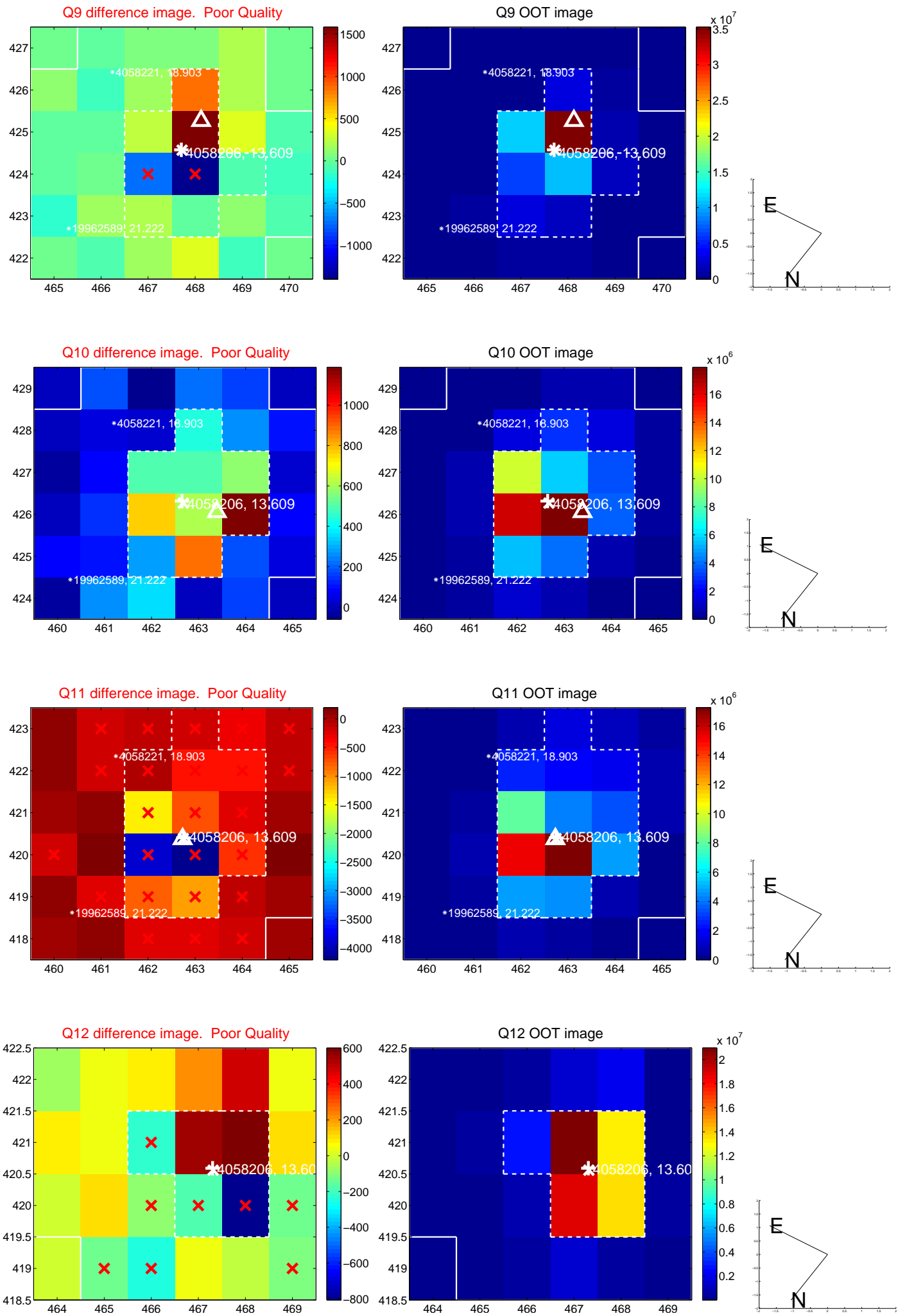


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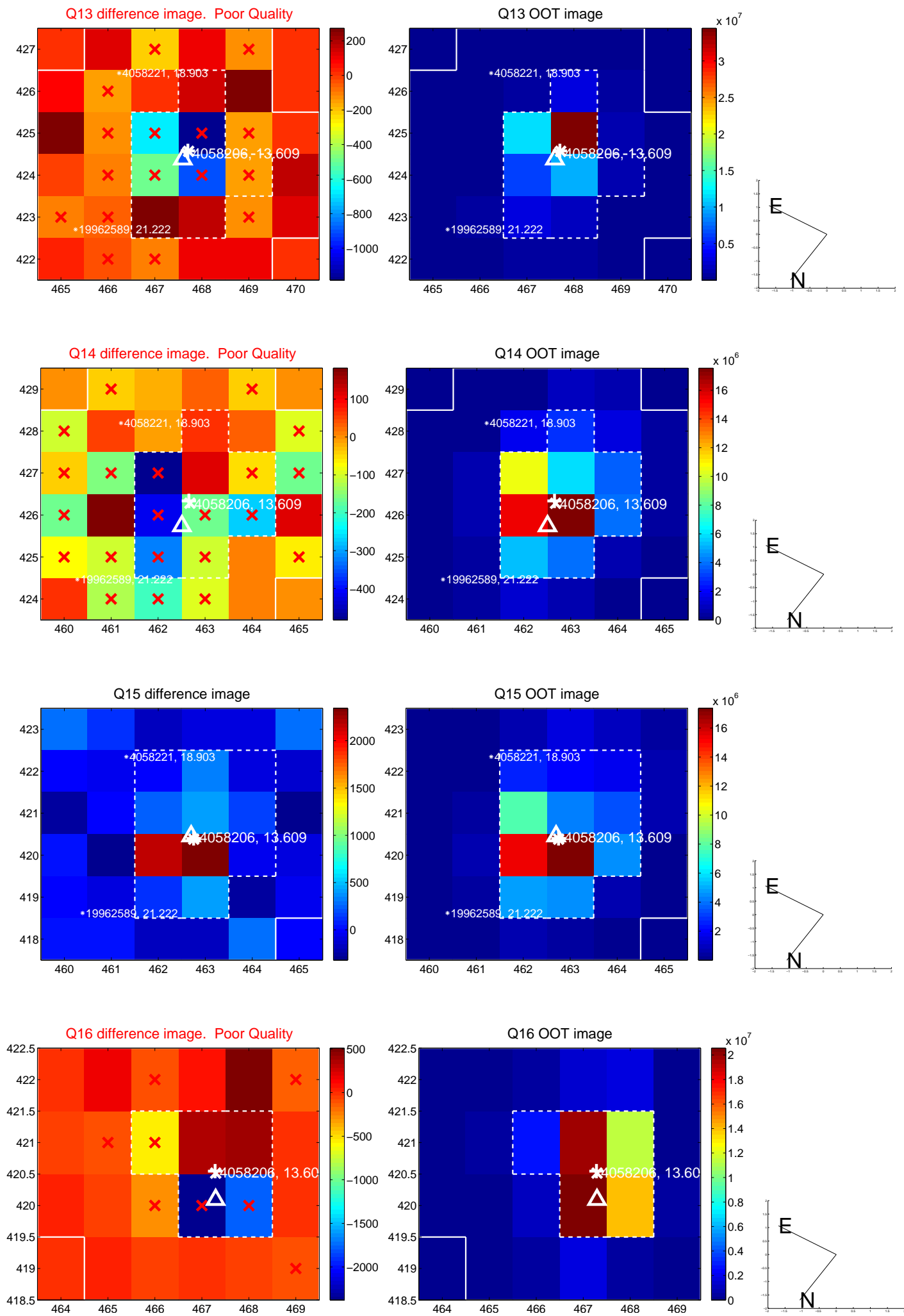




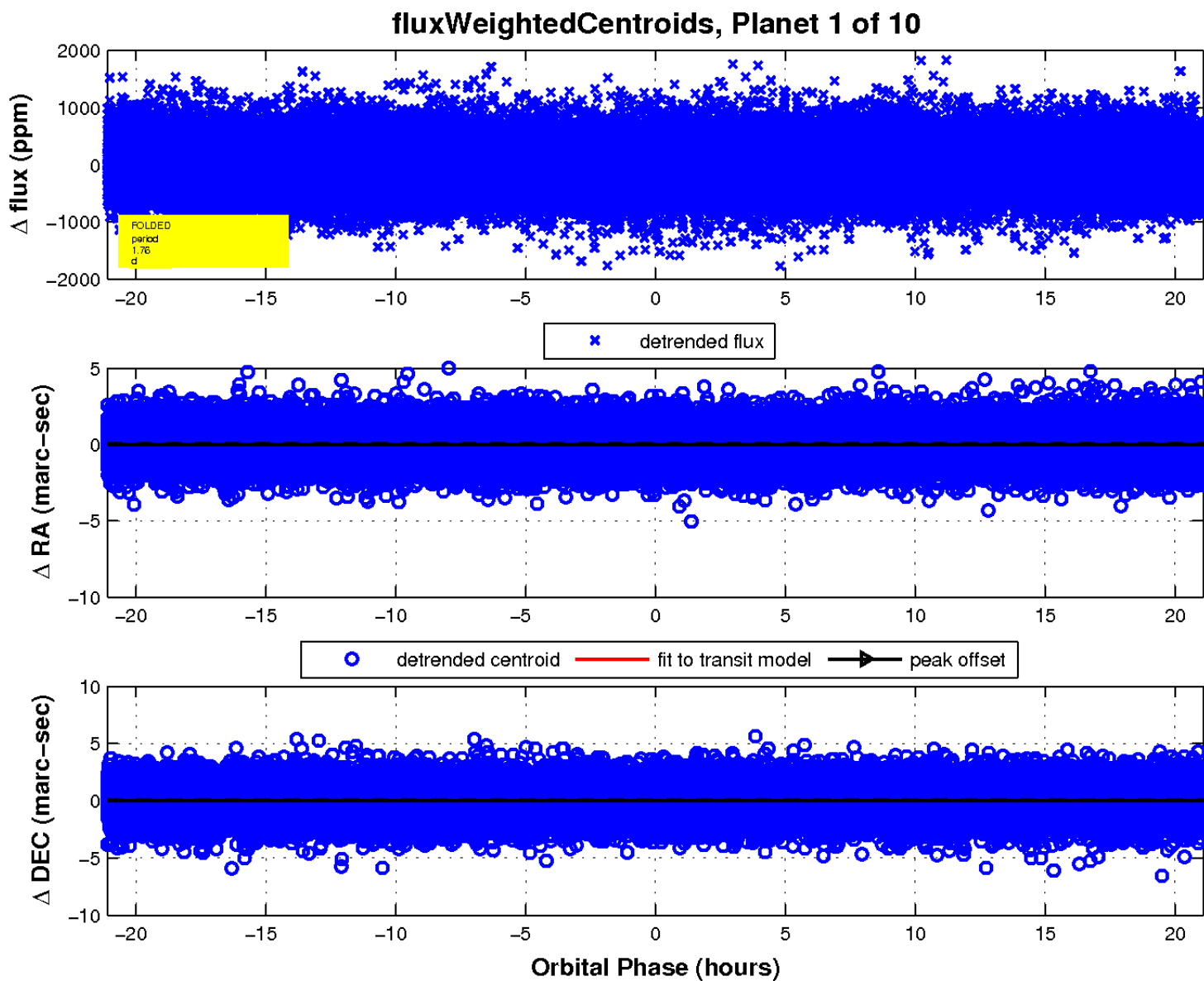
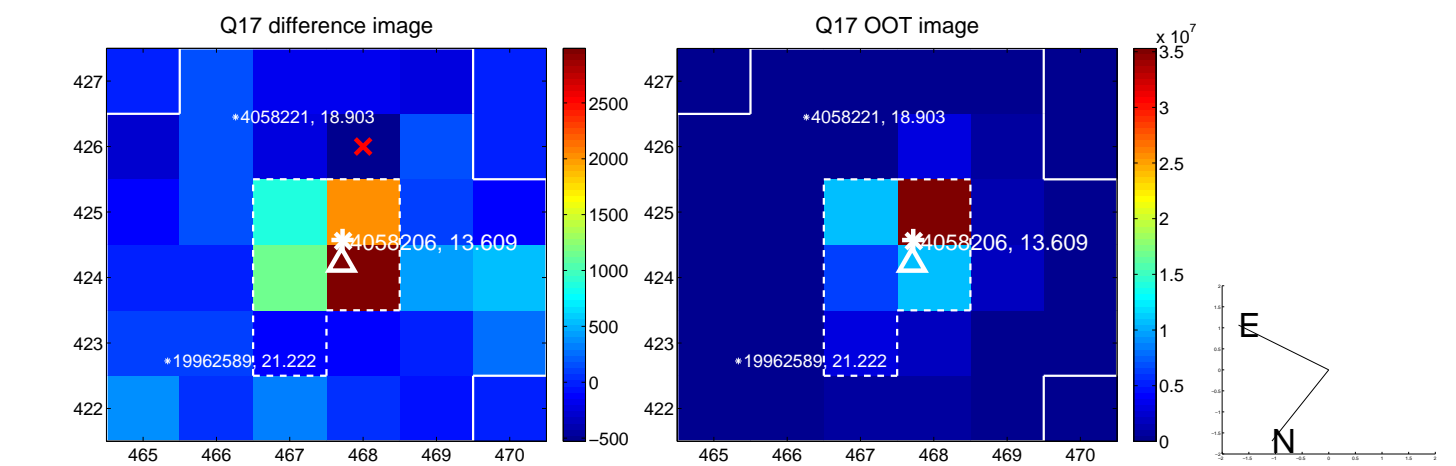
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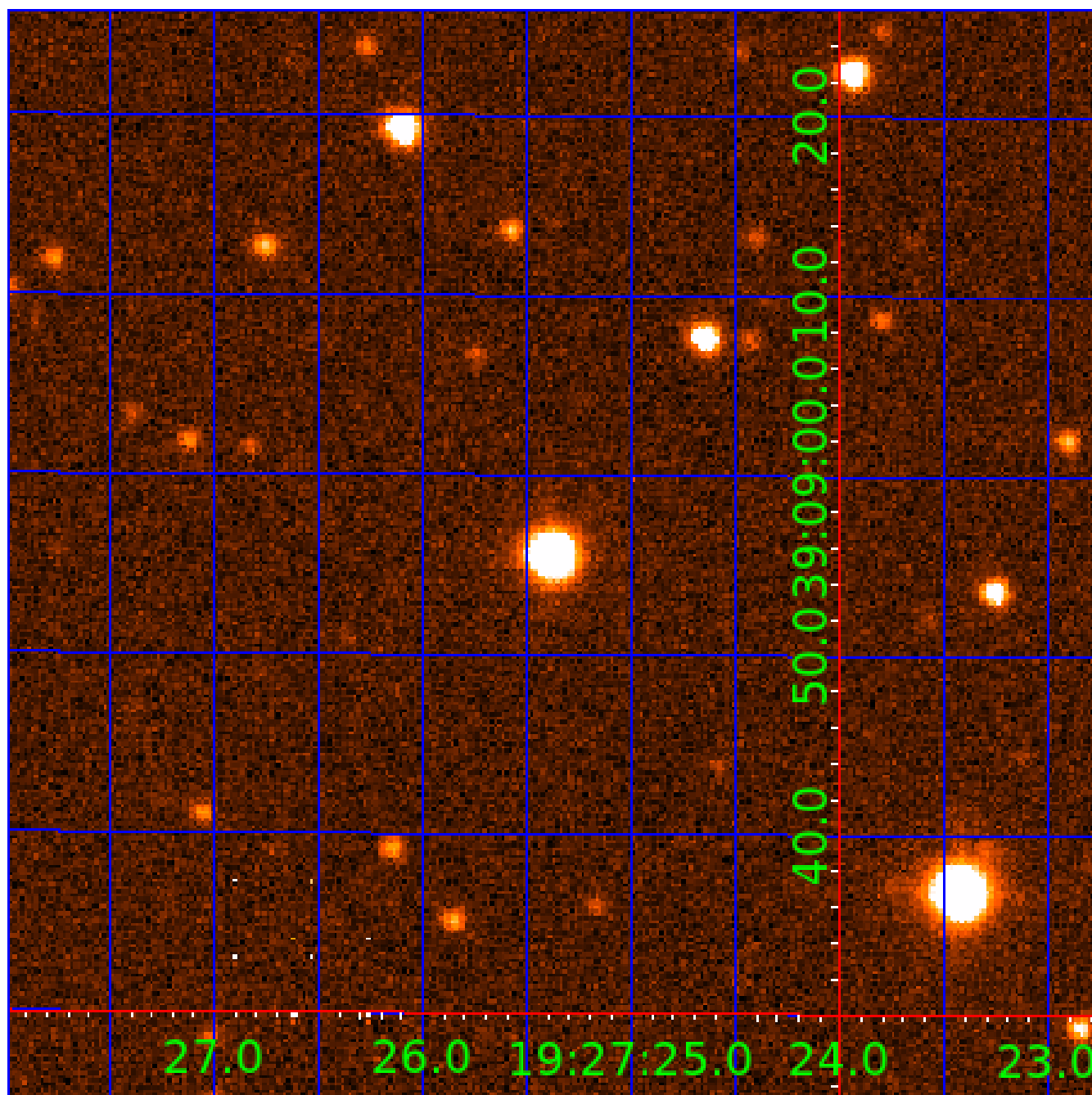


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UKIRT Image

Declination





# KIC 004058206

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
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## Robovetter Results

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004058206-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_ZUMA_TRACKER—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—SAME_NTL_PERIOD
004058206-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_MARSHALL—TRANS_GAPPED—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS
004058206-05	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT
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004058206-08	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV
004058206-09	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_SKYE—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT
004058206-10	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT

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

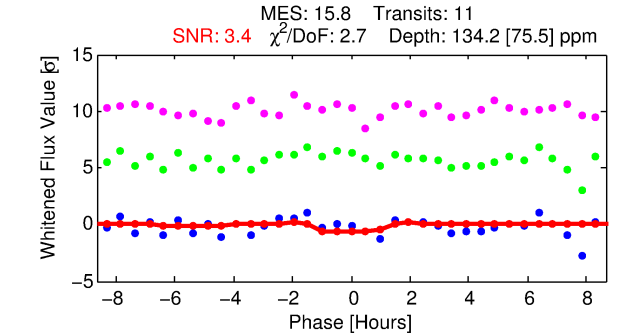
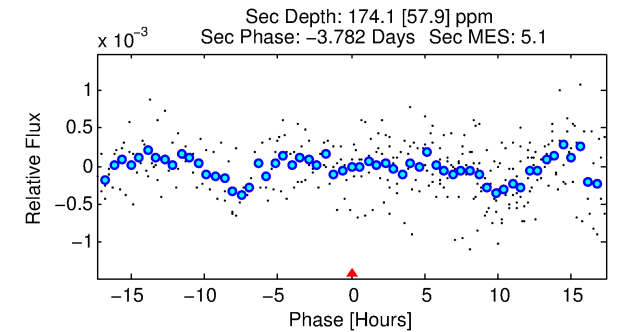
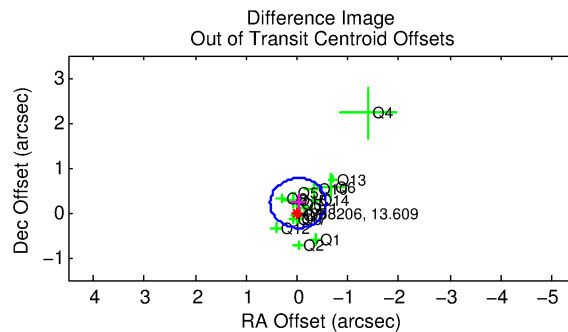
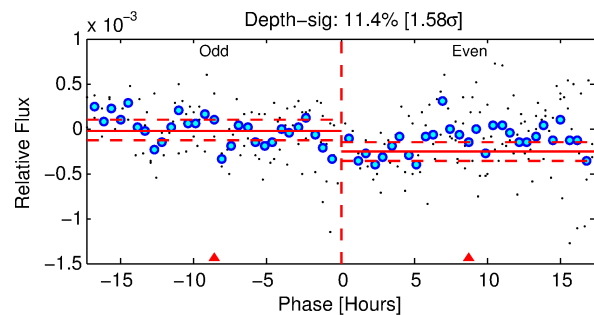
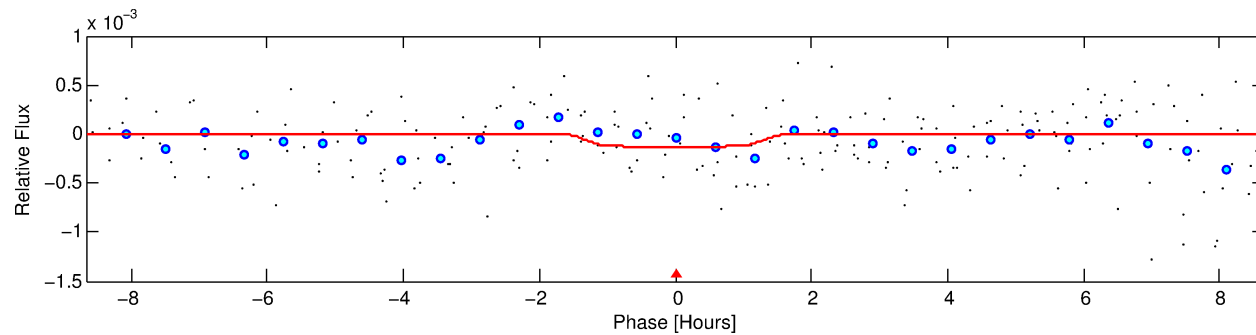
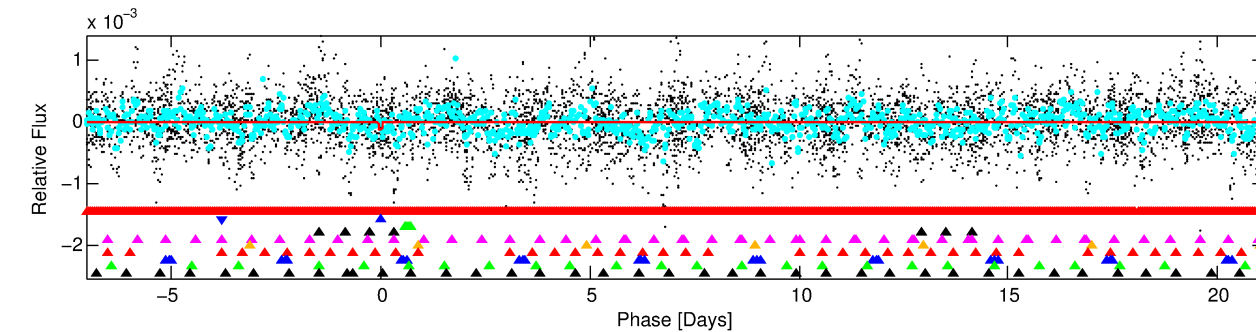
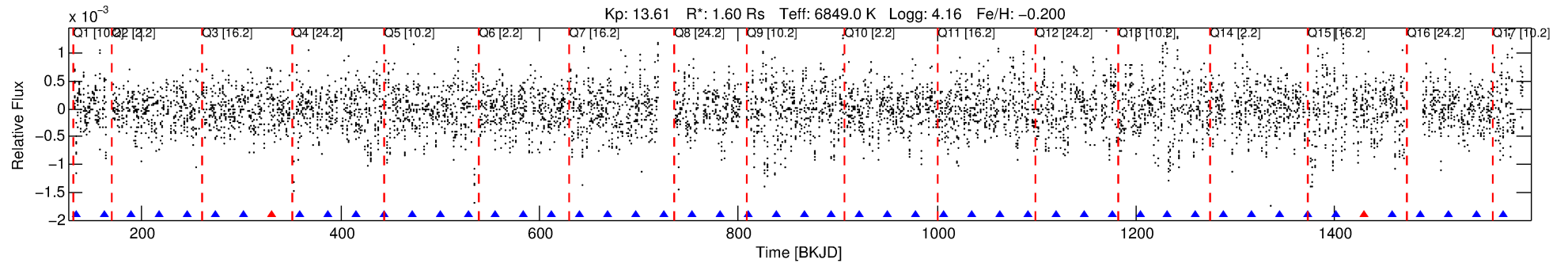
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 004058206-02

No Significant Match Found

# DV One-Page Summary

KIC: 4058206 Candidate: 2 of 10 Period: 28.167 d



## DV Fit Results:

Period = 28.16741 [0.00068] d  
Epoch = 133.6542 [0.0210] BKJD  
Rp/R\* = 0.0124 [0.0181]  
a/R\* = 34.33 [286.24]  
b = 0.90 [1.75]  
Seff = 126.81 [50.31]  
Teff = 856 [85] K  
Rp = 2.16 [3.23] Re  
a = 0.1995 [0.0521] AU  
Ag = 817.06 [2421.96] [0.34 $\sigma$ ]  
Teffp = 7073 [5209] K [1.19 $\sigma$ ]

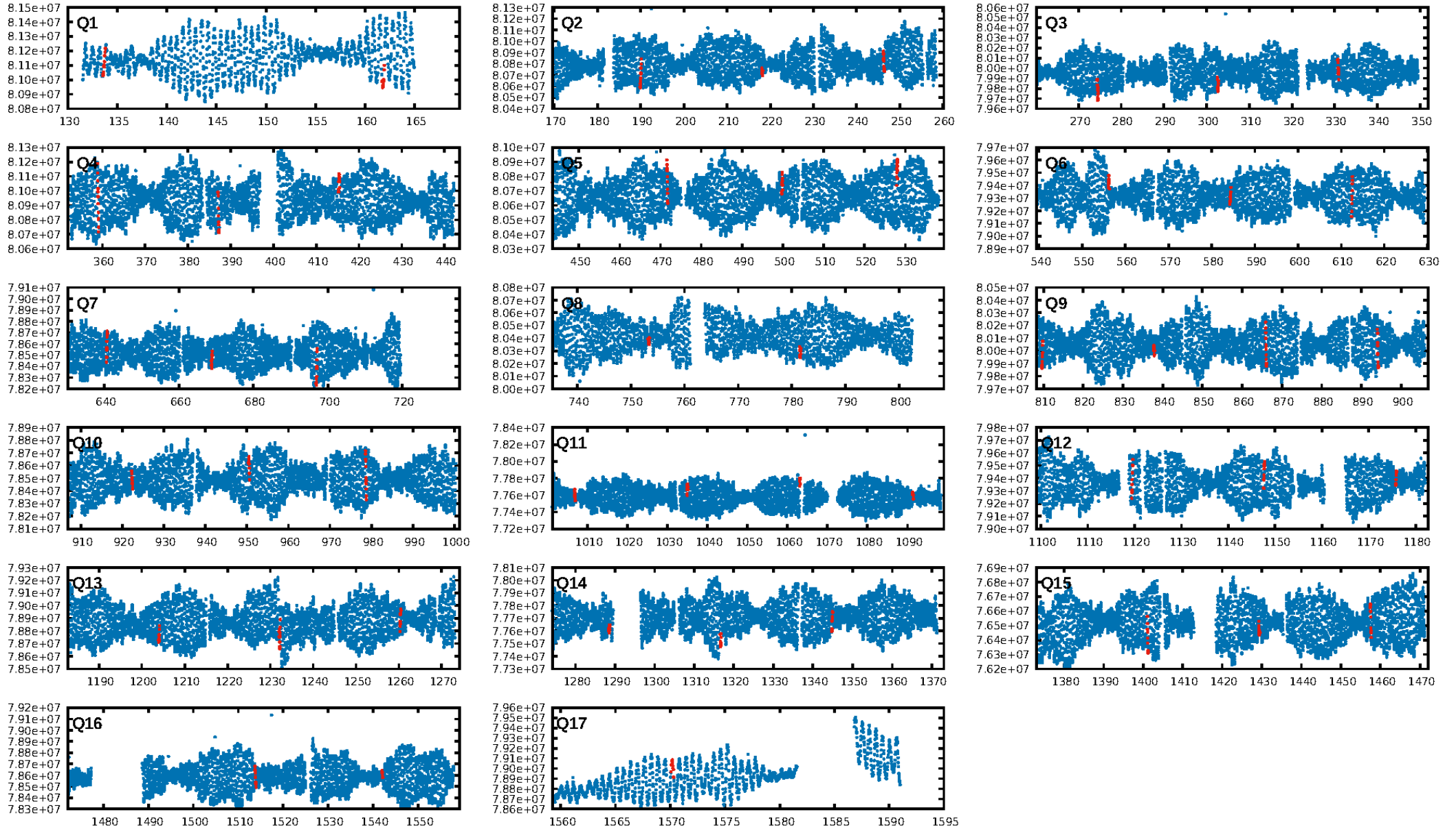
## DV Diagnostic Results:

ShortPeriod-sig: 0.7% [0.01 $\sigma$ ]  
LongPeriod-sig: 100.0% [4.46 $\sigma$ ]  
ModelChiSquare2-sig: 0.0%  
ModelChiSquareGof-sig: 11.2%  
Bootstrap-pfa: 1.65e-32  
RollingBand-fgt: 0.82 [9/11]  
GhostDiagnostic-chr: 0.9407  
Centroid-sig: 50.8%  
Centroid-so: 0.941 arcsec [0.66 $\sigma$ ]  
OotOffset-rm: 0.211 arcsec [1.14 $\sigma$ ]  
KicOffset-rm: 0.102 arcsec [1.05 $\sigma$ ]  
OotOffset-st: 4/4/3/5 [16]  
KicOffset-st: 4/4/3/5 [16]  
DiffImageQuality-fgm: 0.56 [9/16]  
DiffImageOverlap-fno: 0.47 [8/17]

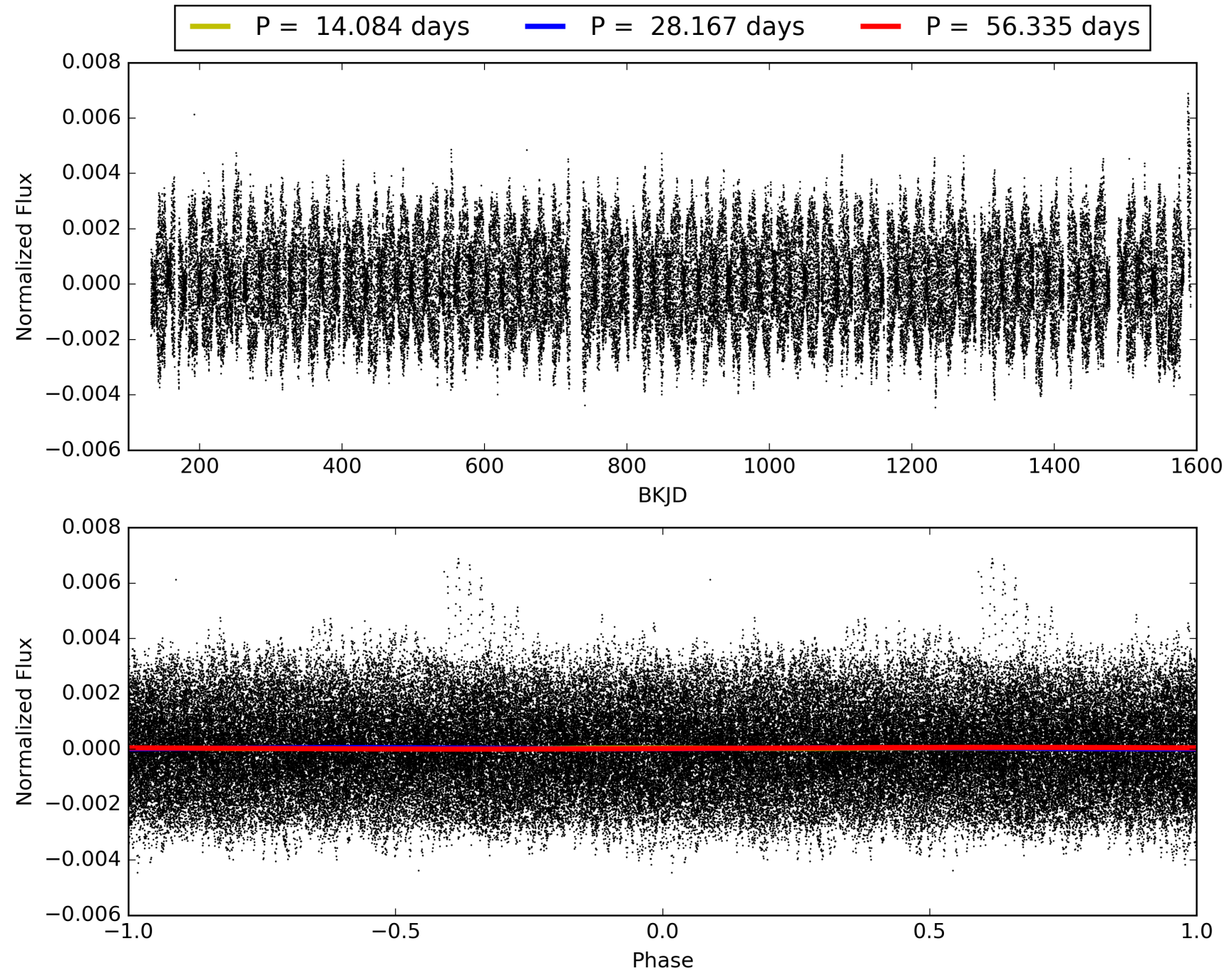
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 01-Feb-2016 03:22:01 Z

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

# TCE 004058206-02, PDC Light Curves



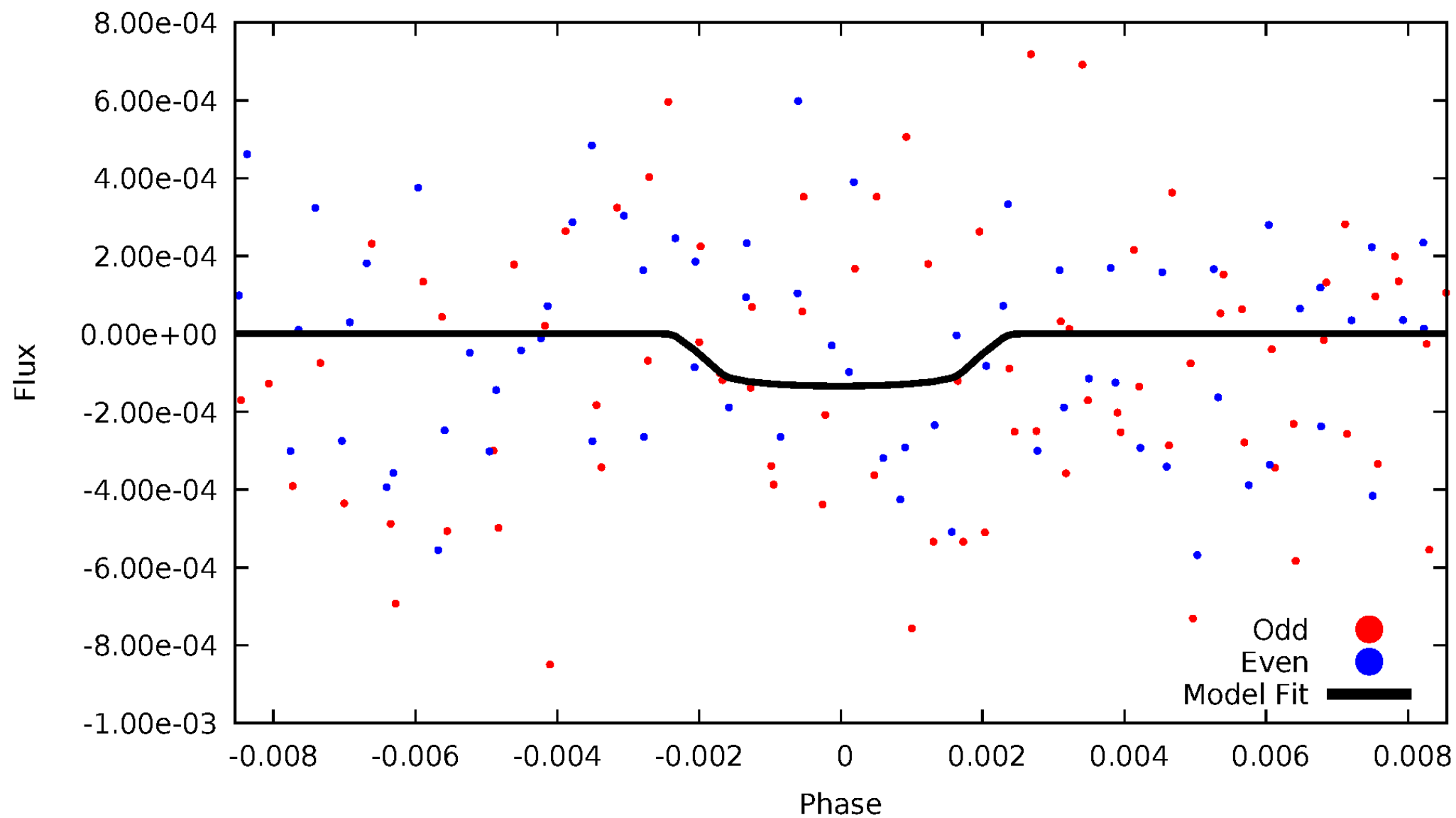
TCE 004058206-02





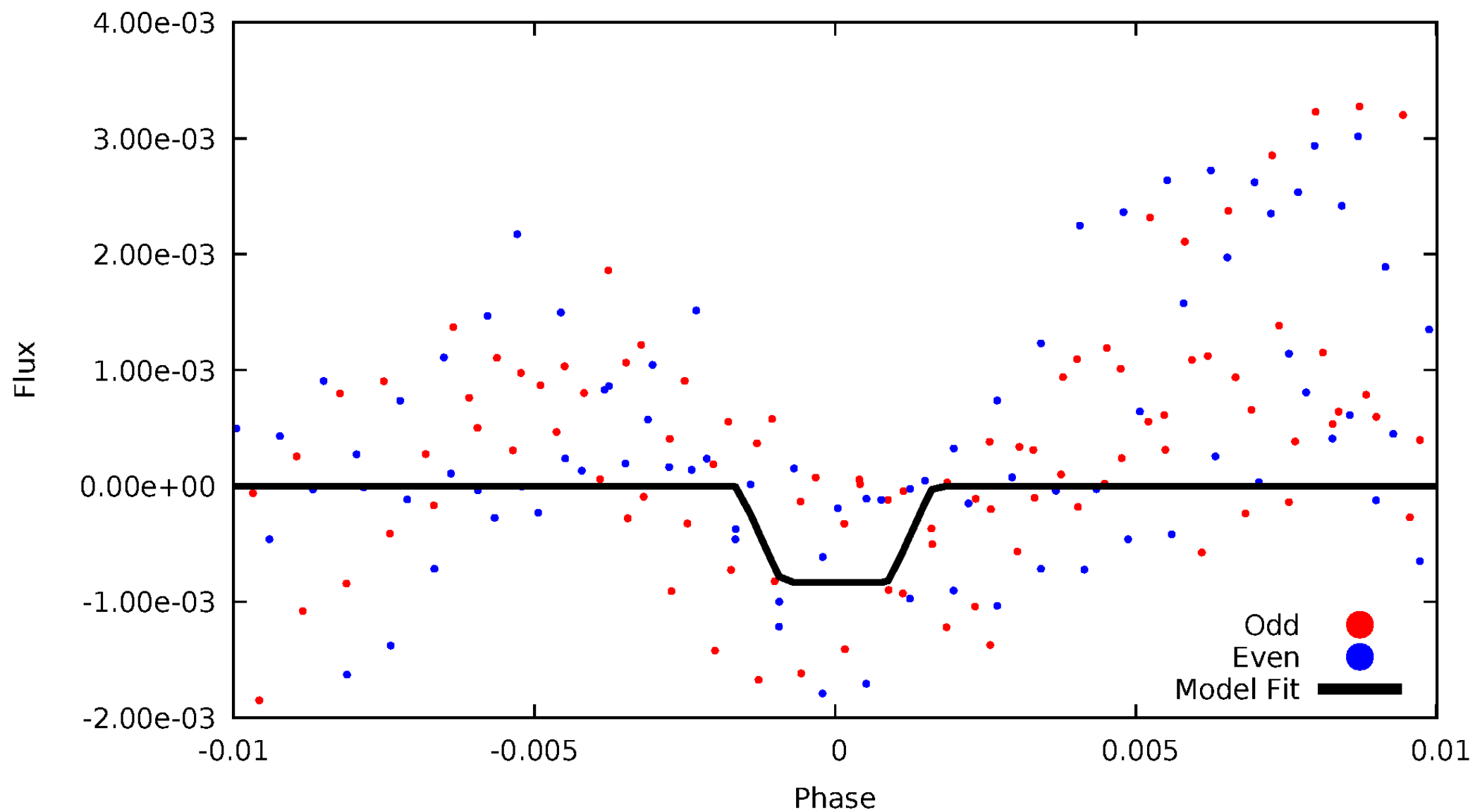
# DV Odd/Even

TCE 004058206-02



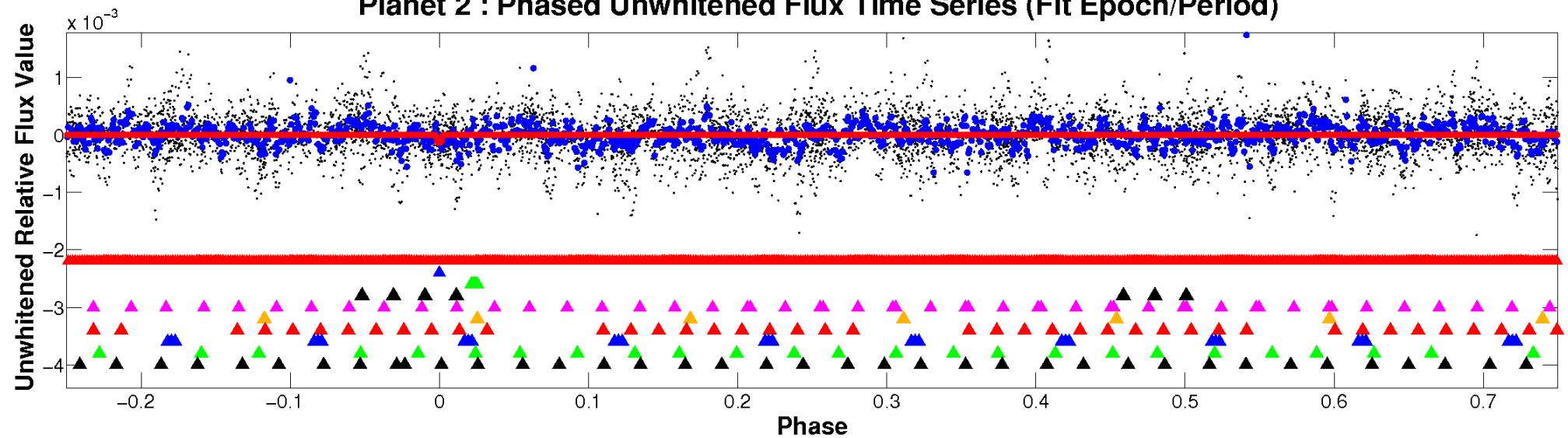
# ALT Odd/Even

TCE 004058206-02

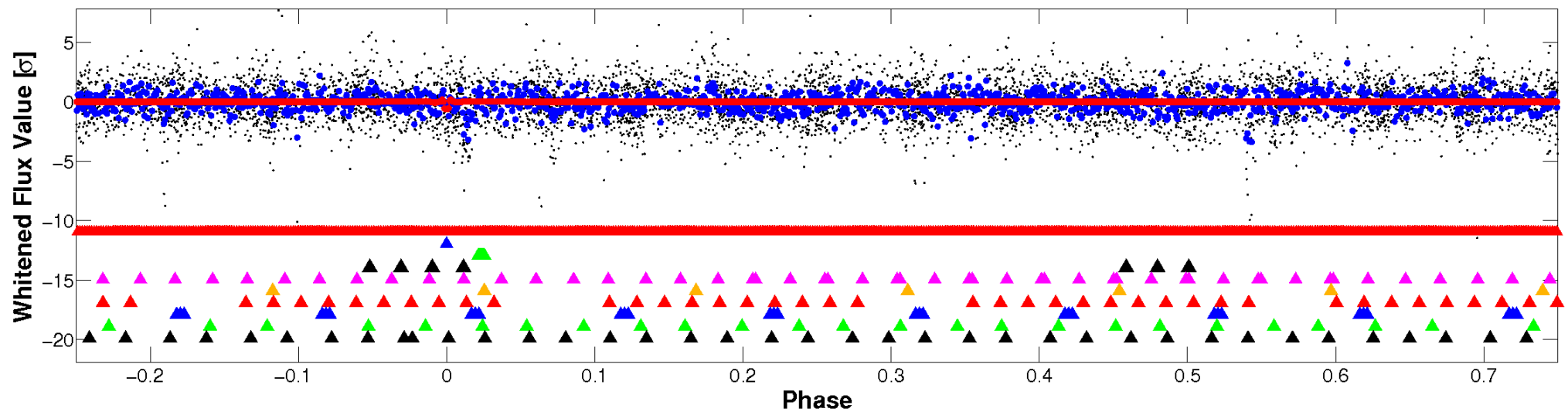


# Non-Whitened Vs. Whitened Light Curve

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

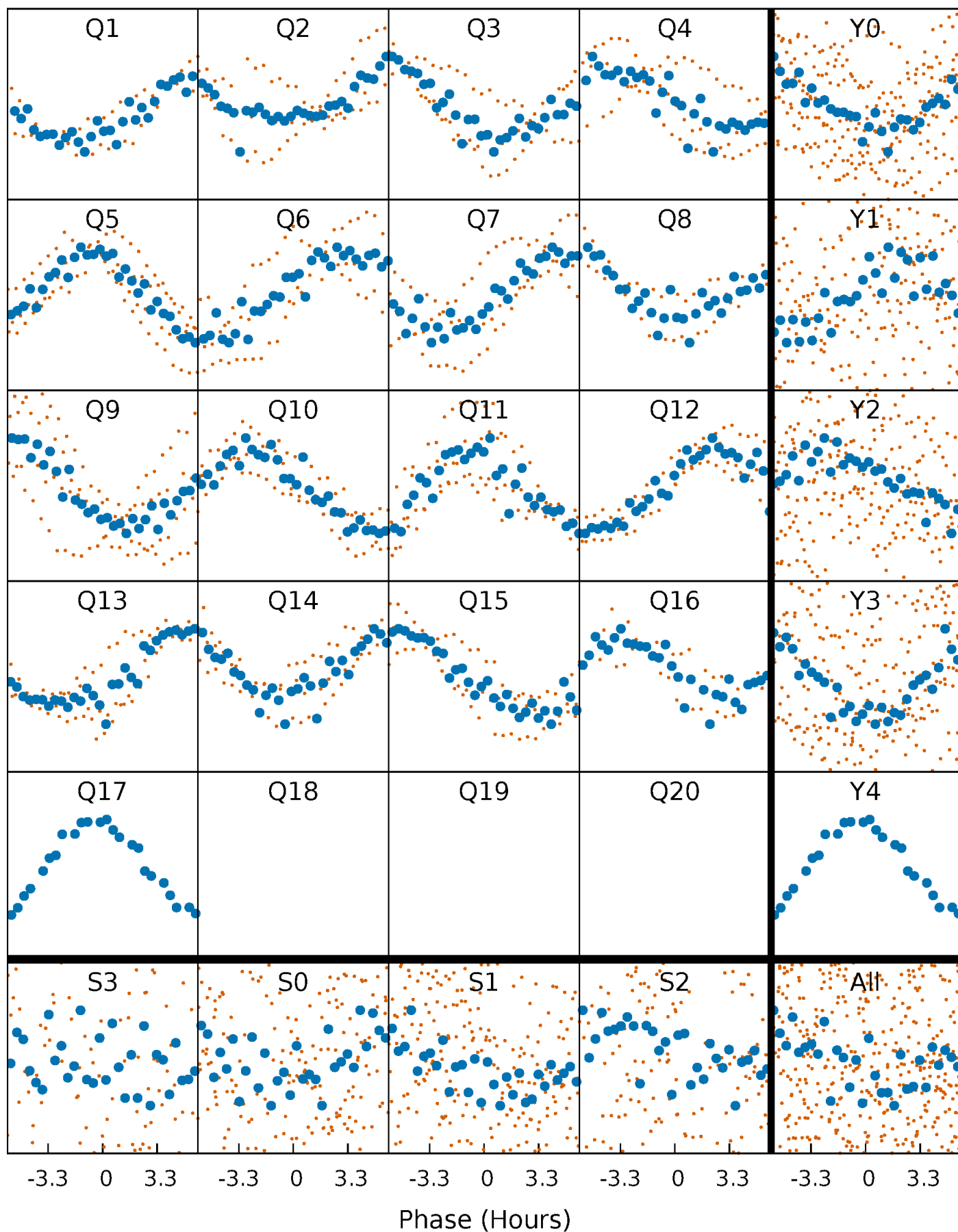


## Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



# PDC Quarter-Phased Transit Curves

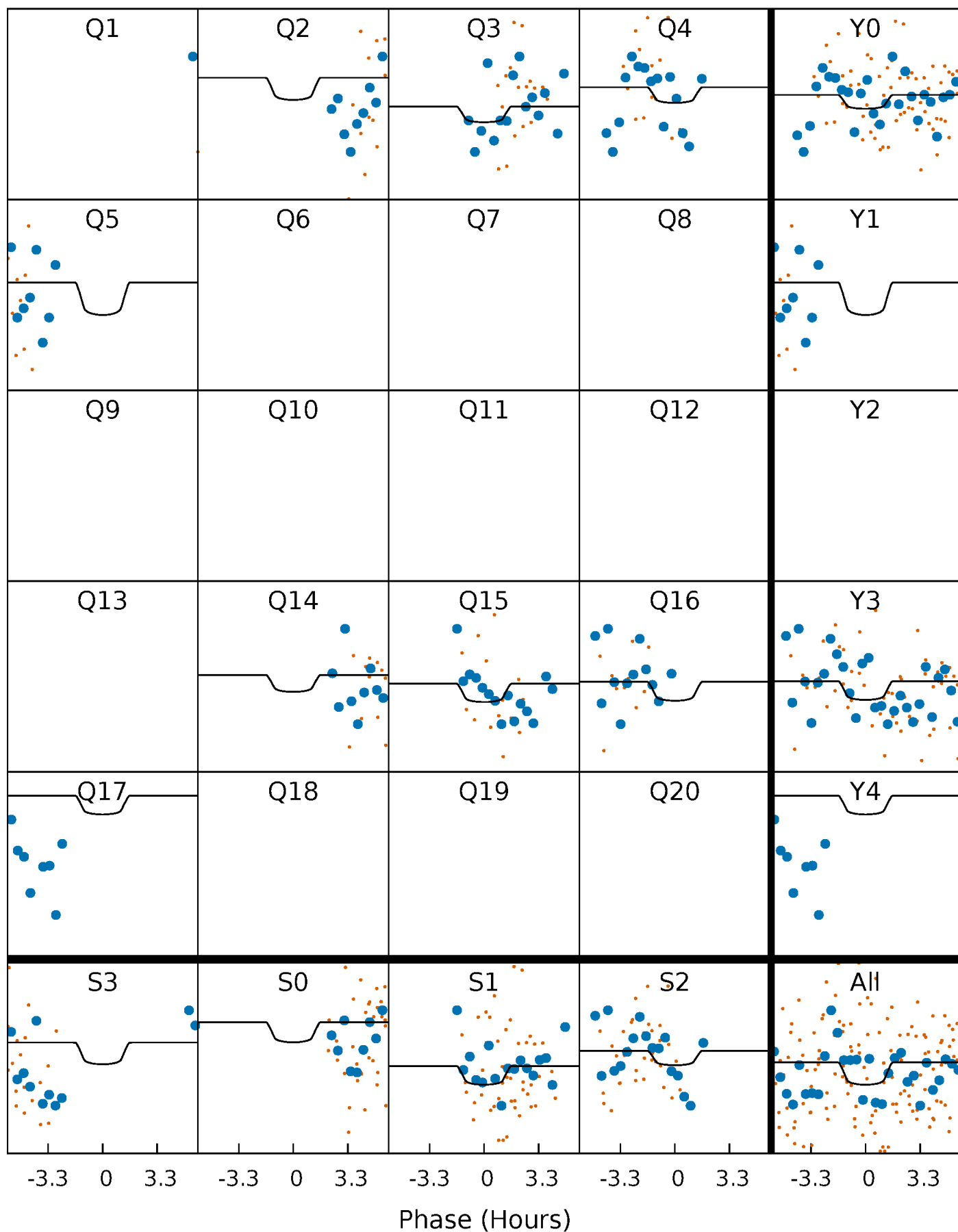
TCE 004058206-02 P= 28.167409 Days  $T_0=133.654156$  (BKJD)





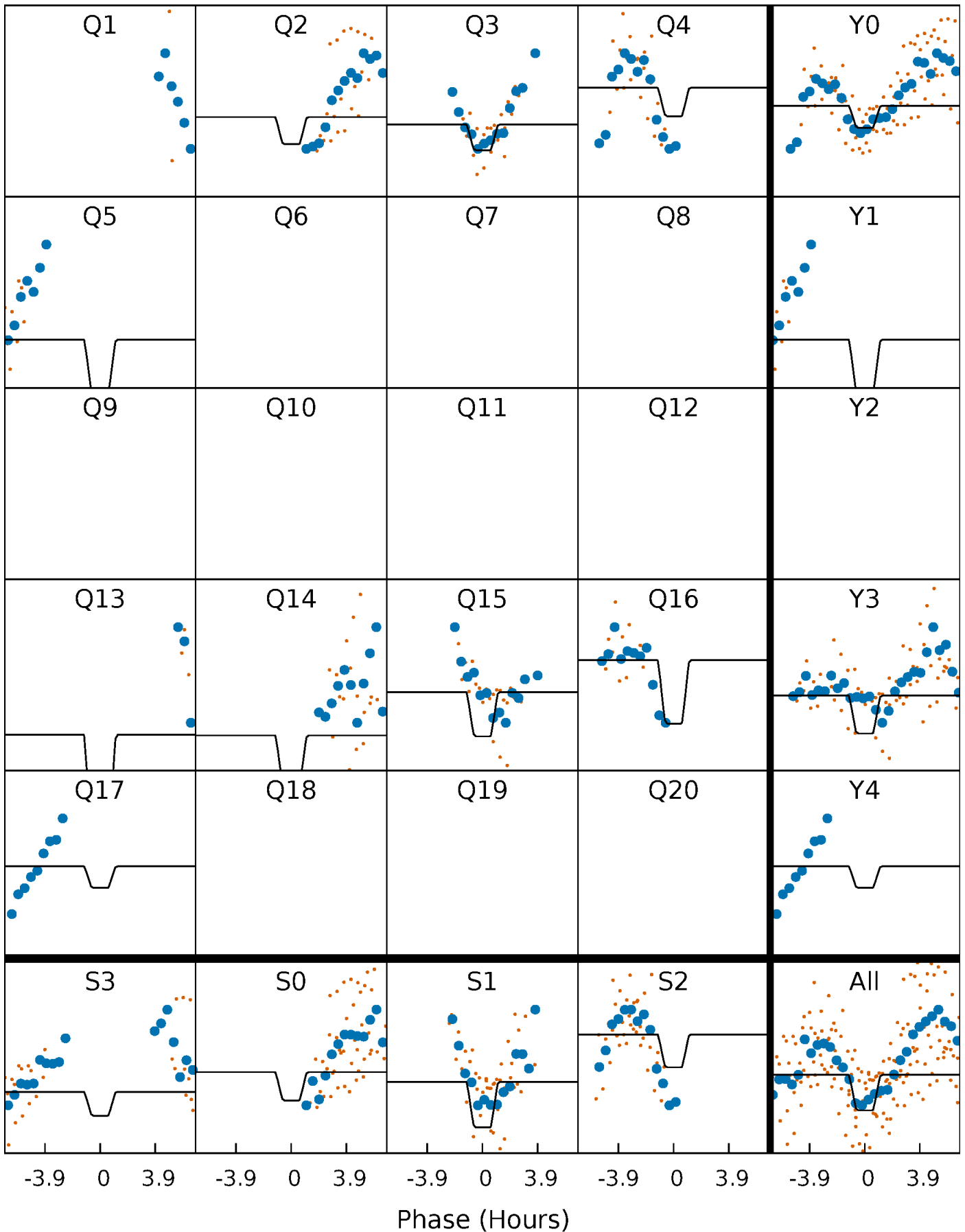
# DV Quarter-Phased Transit Curves

TCE 004058206-02   P= 28.167409 Days    $T_0=133.654156$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

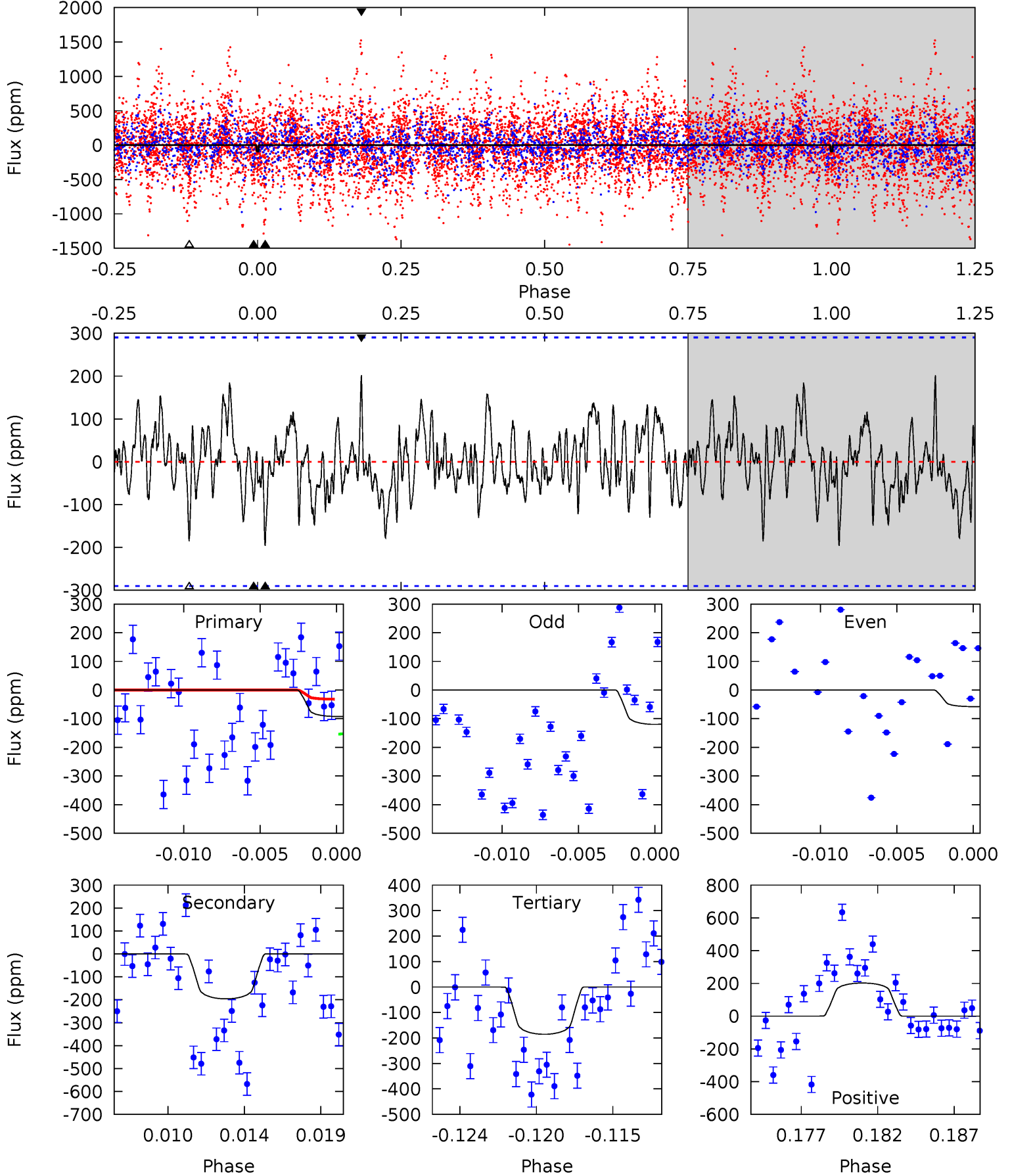
TCE 004058206-02   P= 28.166506 Days    $T_0=133.711329$  (BKJD)



# DV Model-Shift Uniqueness Test

004058206-02, P = 28.167409 Days, E = 105.486747 Days

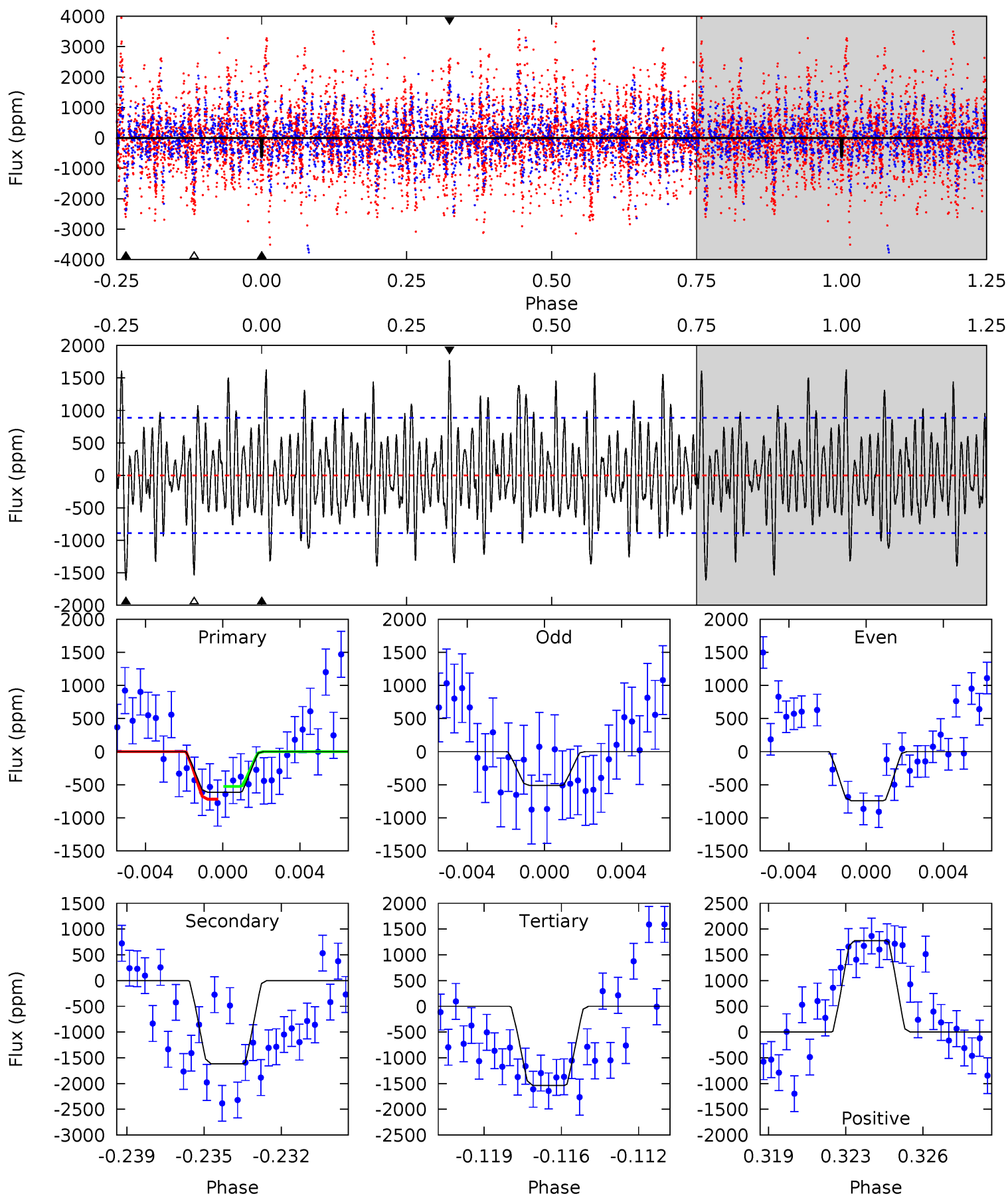
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
1.64	3.49	3.30	3.60	5.17	2.82	1.15	-1.66	-1.95	0.19	-0.11	0.55	1.46	0.51	1.09



# Alt Model-Shift Uniqueness Test

004058206-02, P = 28.166506 Days, E = 105.544823 Days

Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
3.61	9.51	9.03	10.4	5.22	2.92	3.46	-5.42	-6.81	0.47	-0.92	0.67	3.86	0.52	0.56





### Stellar Parameters For KIC 004058206

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$6849^{+190}_{-262}$	$4.155^{+0.158}_{-0.193}$	$-0.200^{+0.250}_{-0.300}$	$1.600^{+0.516}_{-0.387}$	$1.345^{+0.189}_{-0.231}$	$0.462^{+0.435}_{-0.221}$
	+3%/-4%	+4%/-5%	+125%/-150%	+32%/-24%	+14%/-17%	+94%/-48%
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 004058206-02 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$-196 \pm 56$	$3.18^{+2.84}_{-2.14}$	$1201^{+95}_{-80}$	$5999^{+6132}_{-1498}$	$431^{+3344}_{-321}$
Alt.	$-1616 \pm 170$	$5.24^{+3.43}_{-2.65}$	$1200^{+91}_{-84}$	$8082^{+5743}_{-1889}$	$1283^{+3920}_{-824}$

$T_{\text{max}}$  = Theoretical Maximum Planetary Temperature

$T_{\text{obs}}$  = Observed Planetary Temperature (Assuming  $A=0.3$ )

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

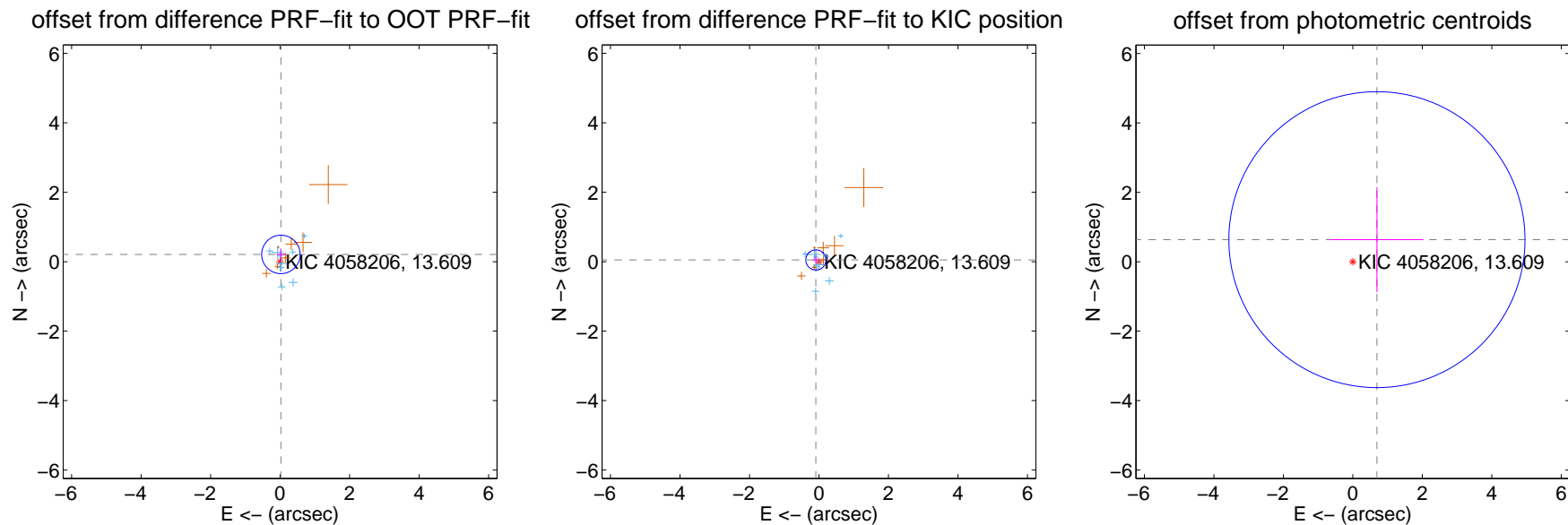
## DV Centroid Data

Supplemental centroid analysis for 004058206-02. Kepler magnitude: 13.61. Transit SNR 3.43

There are 9 quarters with good PRF difference image offsets

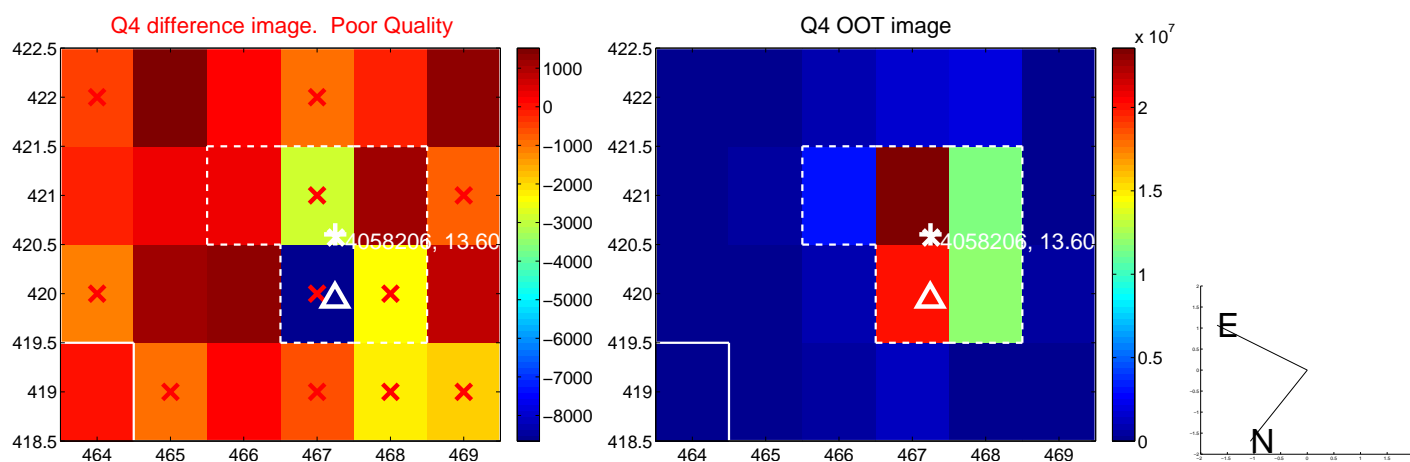
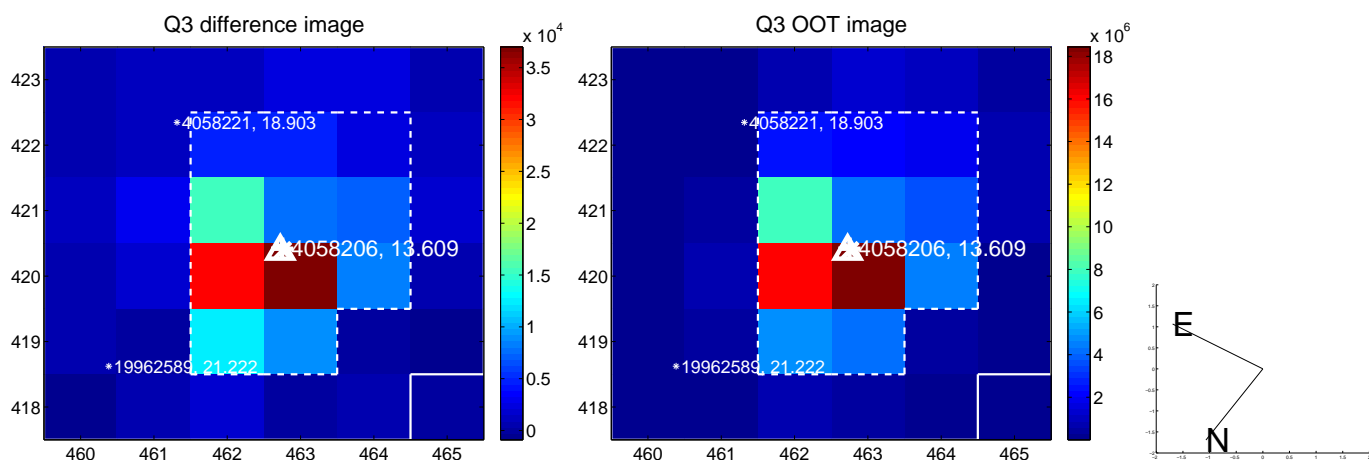
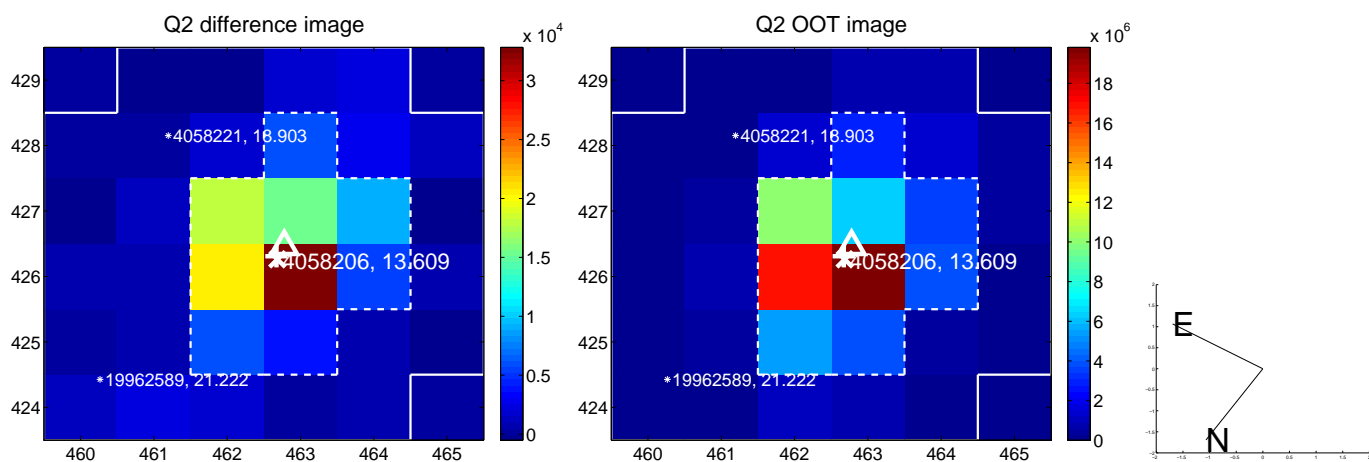
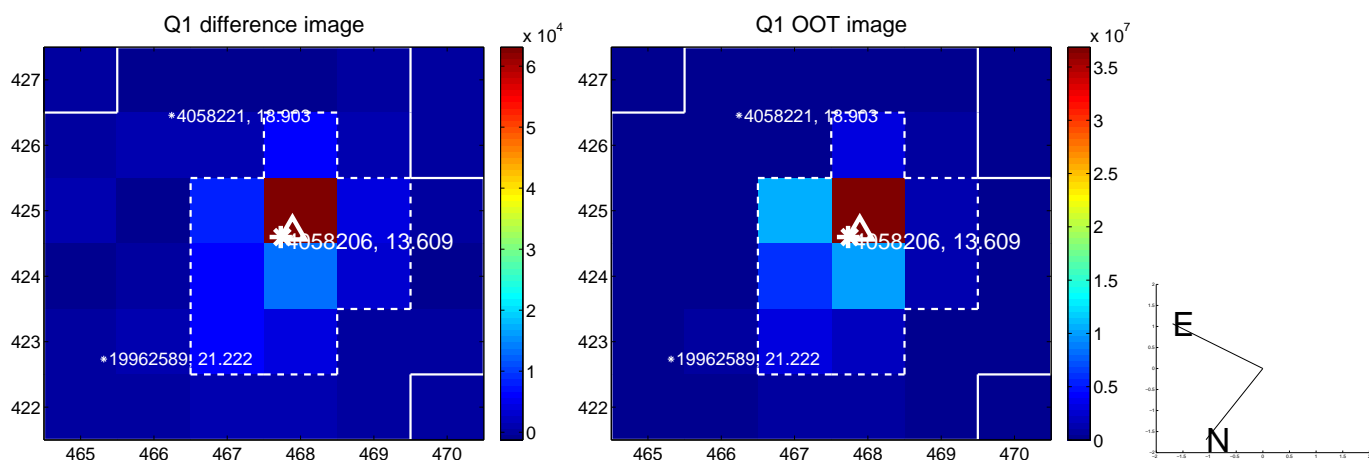
The direct PRF centroid is offset from the target star catalog position by about 0.07 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.211 \pm 0.185$	1.14	$-0.023 \pm 0.126$	$0.210 \pm 0.177$
PRF-fit source offset from KIC position	$0.102 \pm 0.097$	1.05	$0.089 \pm 0.088$	$0.050 \pm 0.120$
photometric centroid source offset	$0.94 \pm 1.42$	0.66	$-0.69 \pm 1.34$	$0.64 \pm 1.51$

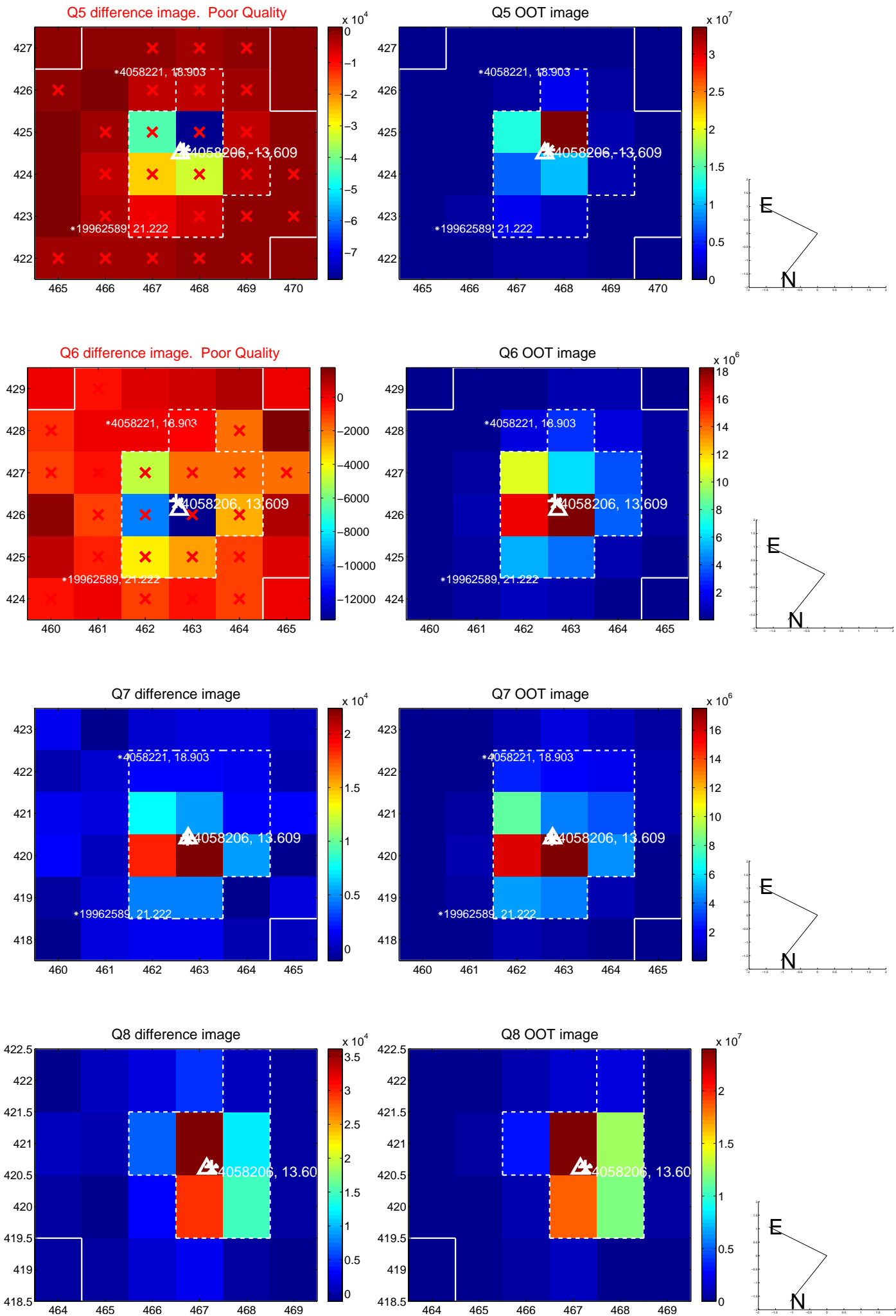


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets**; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

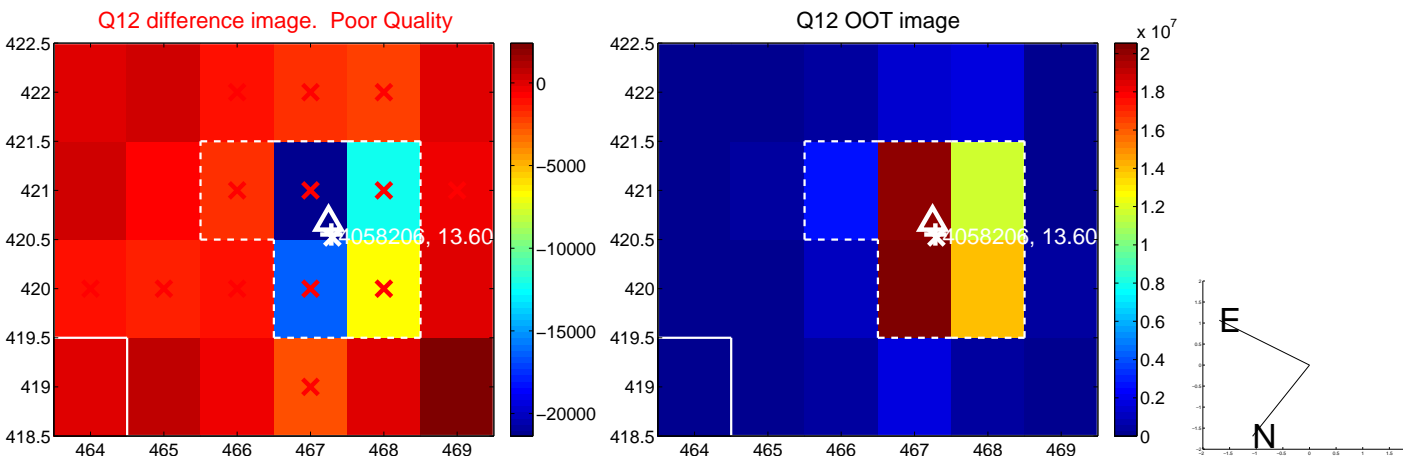
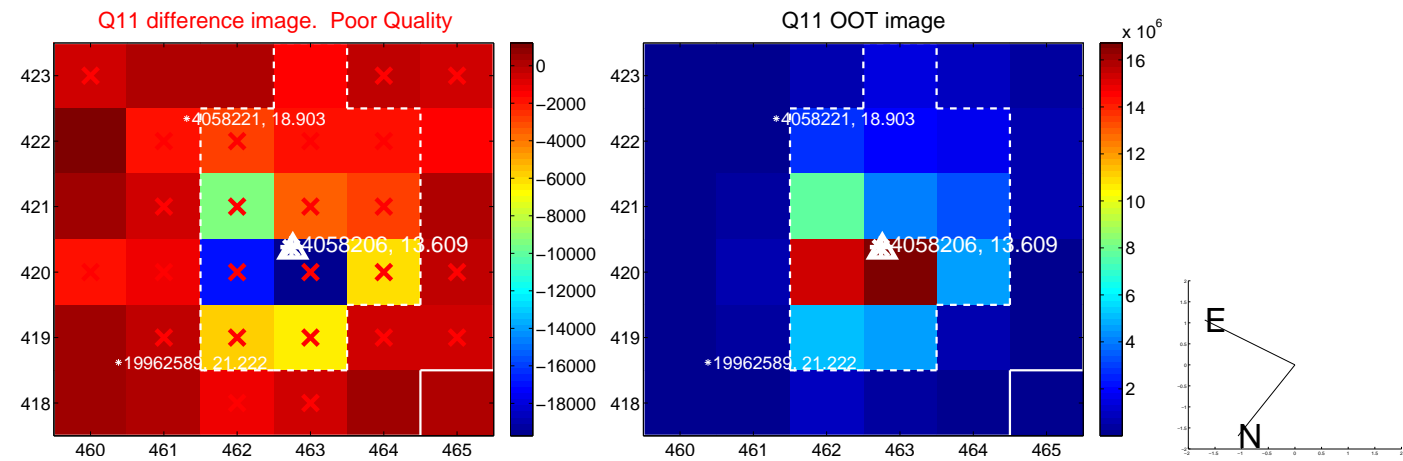
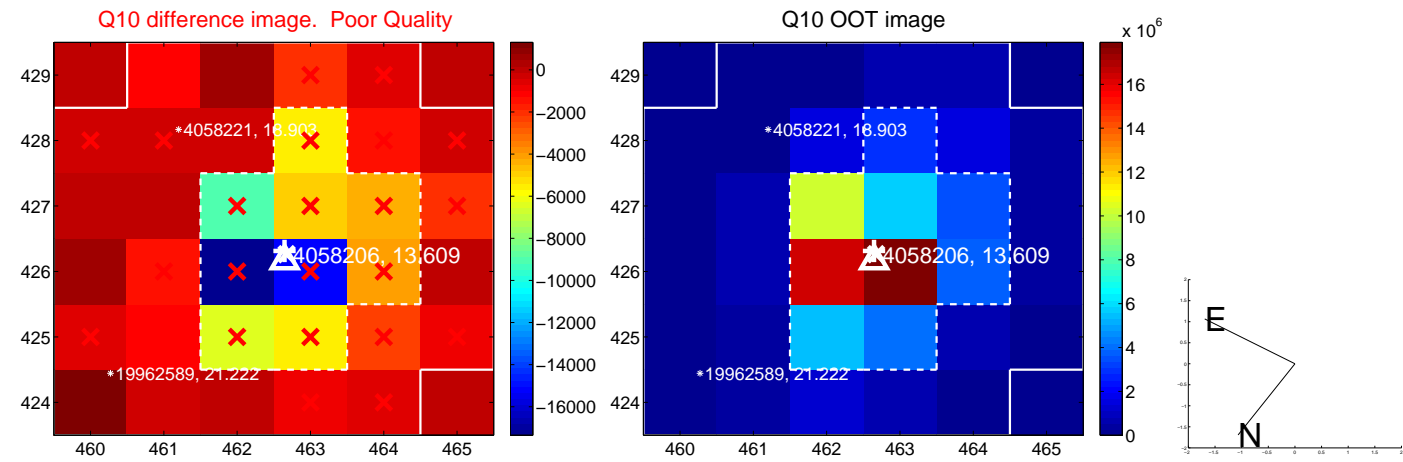
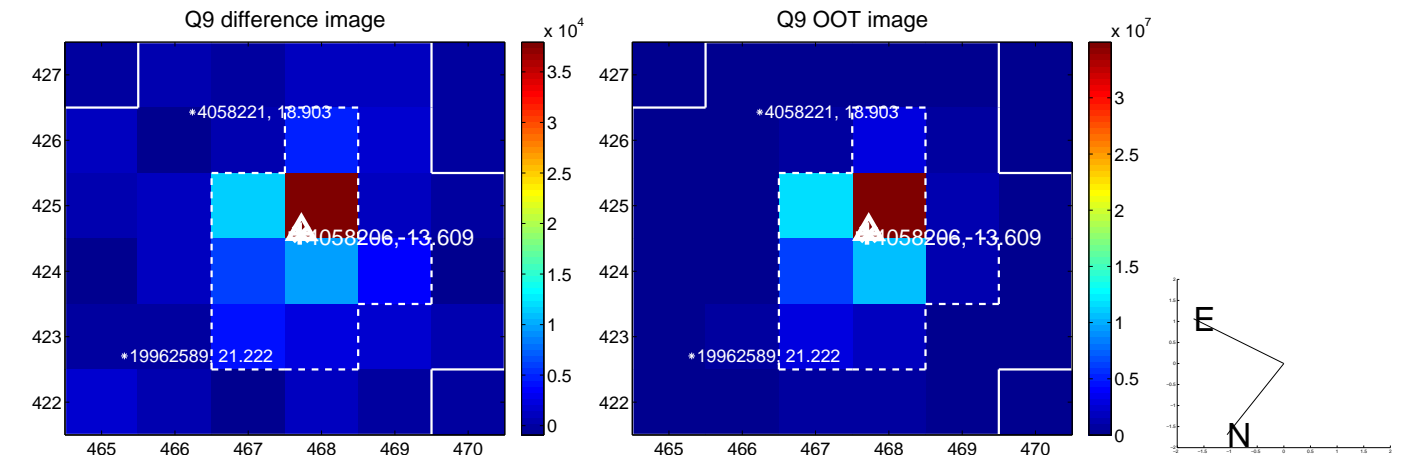
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

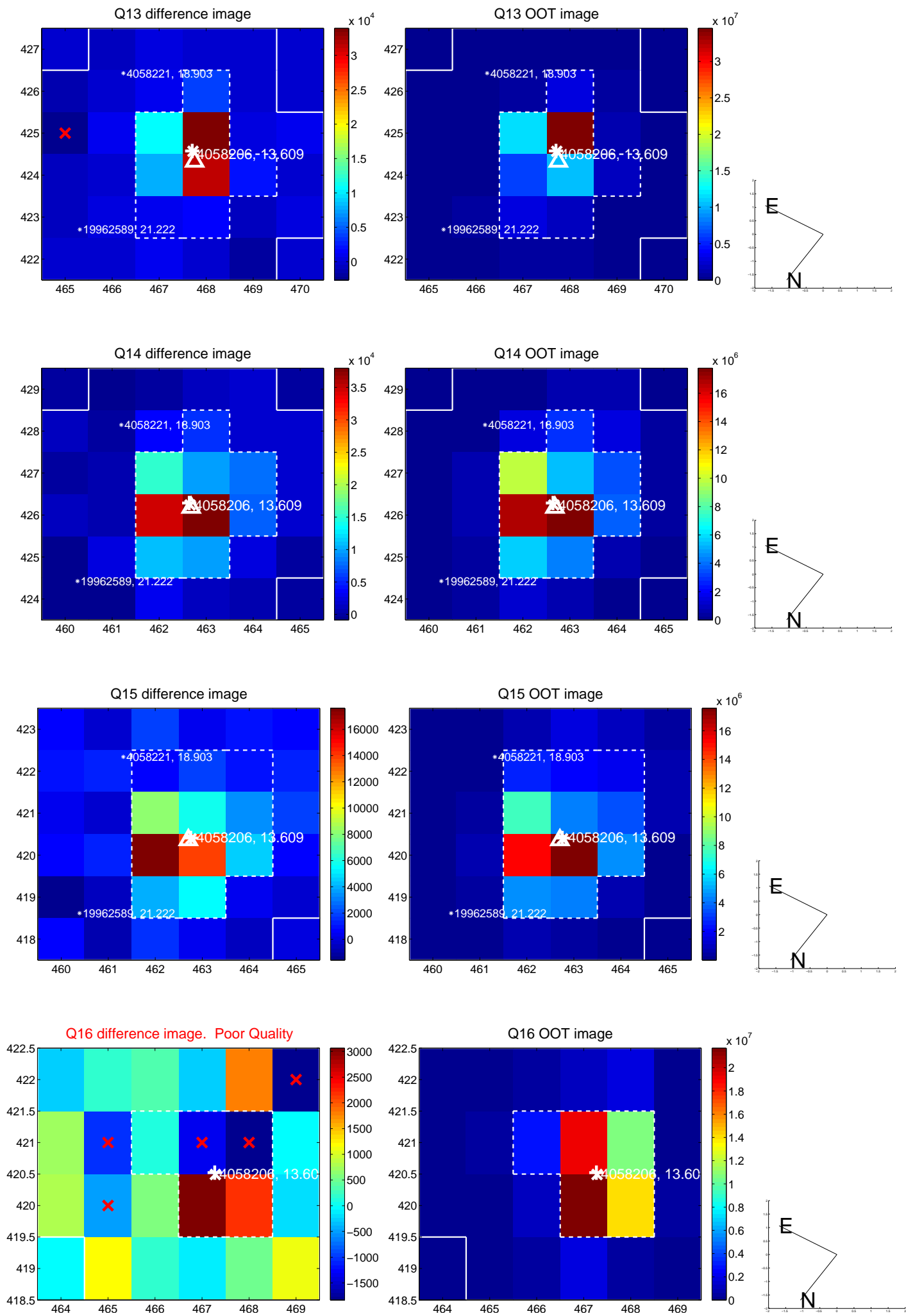


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

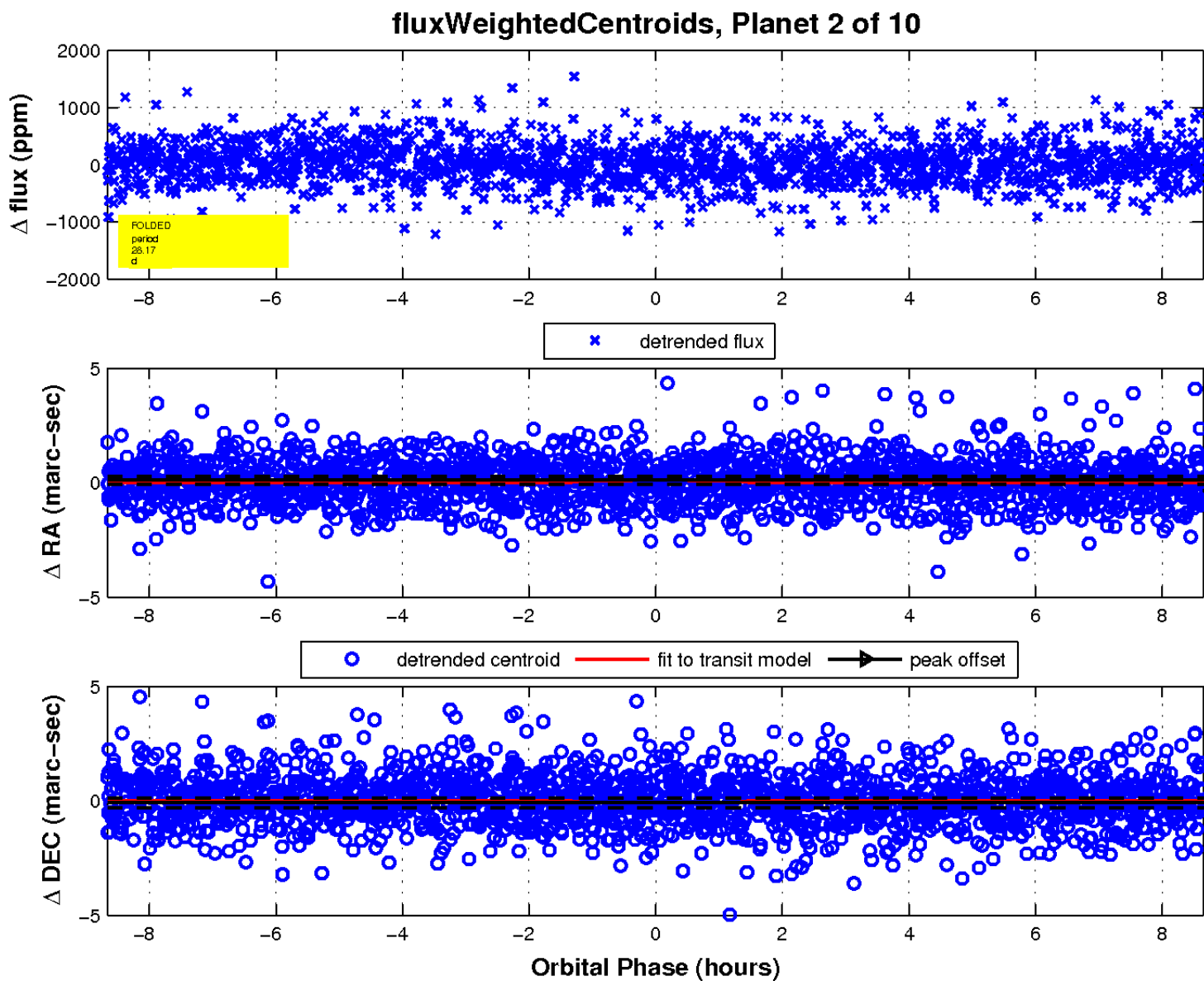
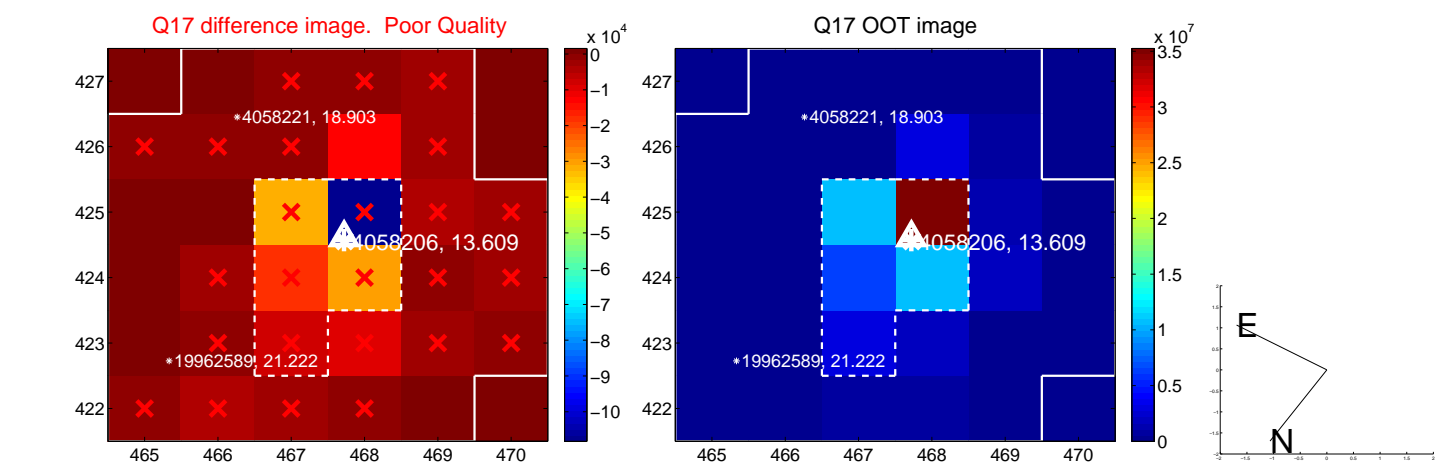




white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

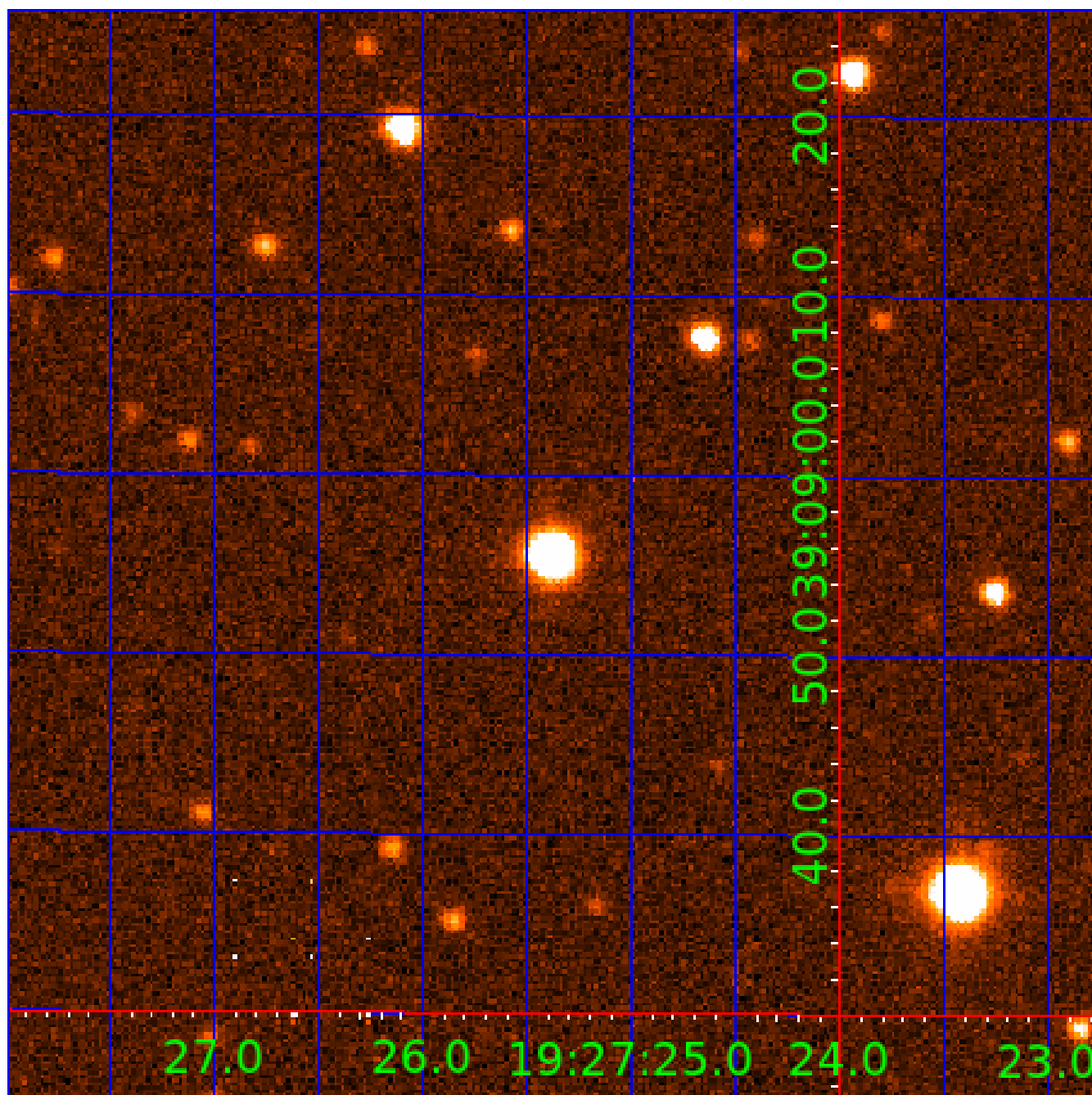


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination



## KIC 004058206

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
004058206-01	OBS	No	1.757664	133.121771	31.4	12.472	9.0	8.1	1.60	6849	0.93	5123.52
004058206-02	OBS	No	28.167409	133.654156	134.2	2.887	15.8	3.4	1.60	6849	2.16	126.81
004058206-03	OBS	No	28.165022	134.376281	31.7	5.936	15.3	0.8	1.60	6849	1.05	126.82
004058206-04	OBS	No	210.958911	133.974993	516.3	2.065	12.7	9.1	1.60	6849	3.92	8.65
004058206-05	OBS	No	29.540053	139.529398	217.0	6.800	11.4	5.6	1.60	6849	2.75	119.02
004058206-07	OBS	No	35.078211	148.902092	480.5	3.093	9.8	8.4	1.60	6849	3.83	94.64
004058206-08	OBS	No	47.891699	159.457155	501.9	2.608	9.7	8.2	1.60	6849	3.62	62.49
004058206-09	OBS	No	59.344057	134.337160	528.7	4.210	9.8	9.5	1.60	6849	3.81	46.95
004058206-10	OBS	No	38.068267	161.015373	572.3	6.023	9.5	12.0	1.60	6849	6.51	84.87

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
004058206-01	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_ALT
004058206-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_ZUMA_TRACKER—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT
004058206-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_ZUMA_TRACKER—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—SAME_NTL_PERIOD
004058206-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_MARSHALL—TRANS_GAPPED—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS
004058206-05	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT
004058206-07	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_SKYE—TRANS_GAPPED—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT
004058206-08	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV
004058206-09	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_SKYE—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT
004058206-10	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT

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

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

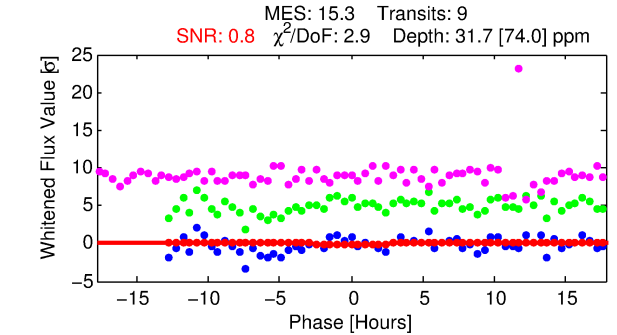
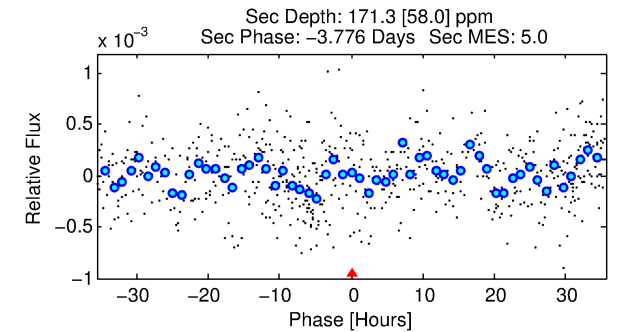
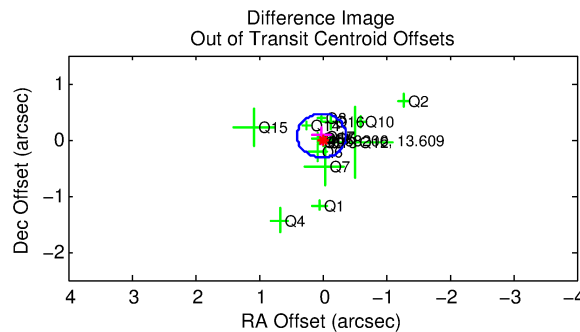
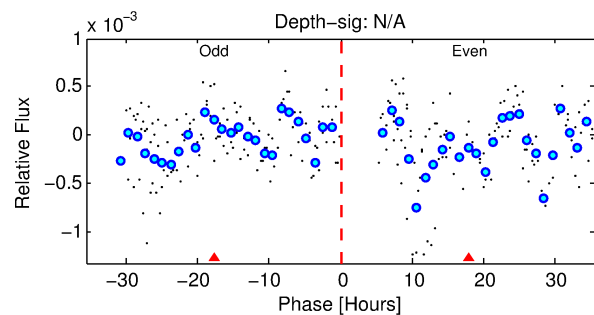
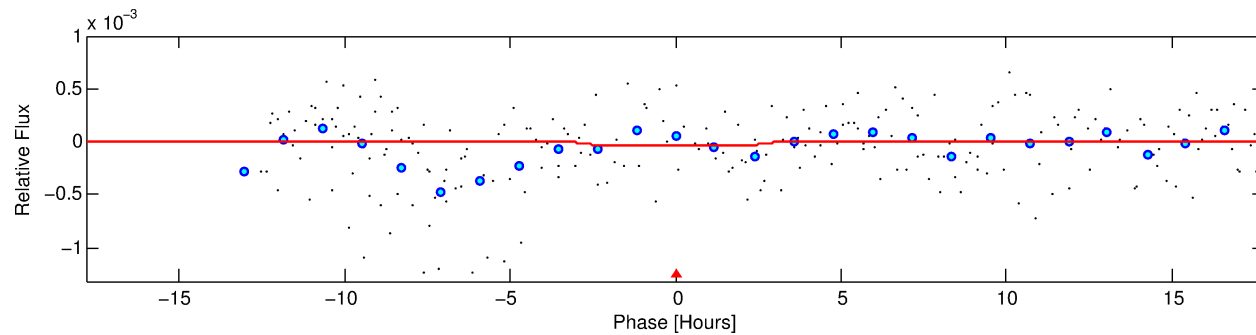
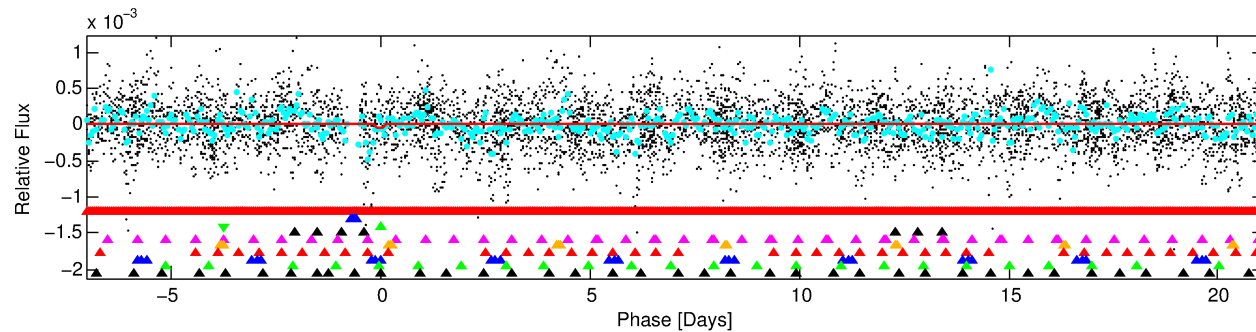
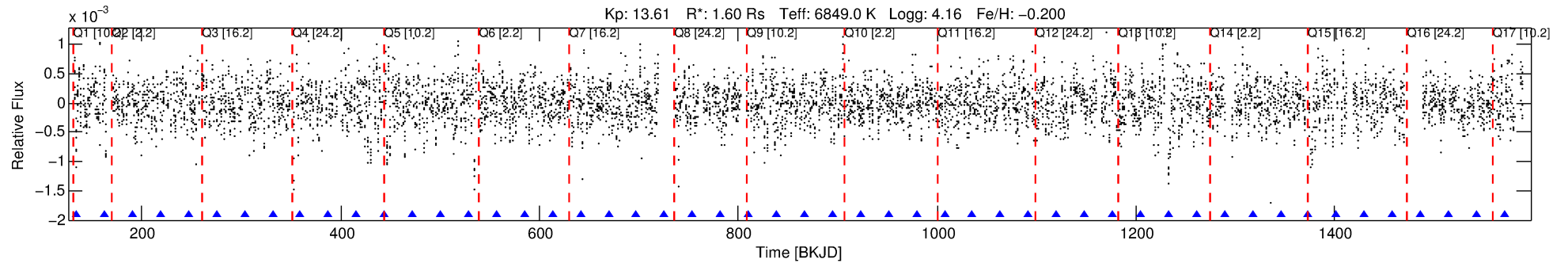
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 004058206-03

No Significant Match Found

# DV One-Page Summary

KIC: 4058206 Candidate: 3 of 10 Period: 28.165 d



## DV Fit Results:

Period = 28.16502 [0.04853] d  
Epoch = 134.3763 [1.5792] BKJD  
Rp/R\* = 0.0060 [0.0415]  
a/R\* = 16.40 [707.06]  
b = 0.90 [9.20]  
Seff = 126.82 [50.32]  
Teff = 856 [85] K  
Rp = 1.05 [7.26] Re  
a = 0.1995 [0.0521] AU  
Ag = 3420.29 [47418.39] [0.07] $\sigma$   
Teffp = 10118 [35061] K [0.26] $\sigma$

## DV Diagnostic Results:

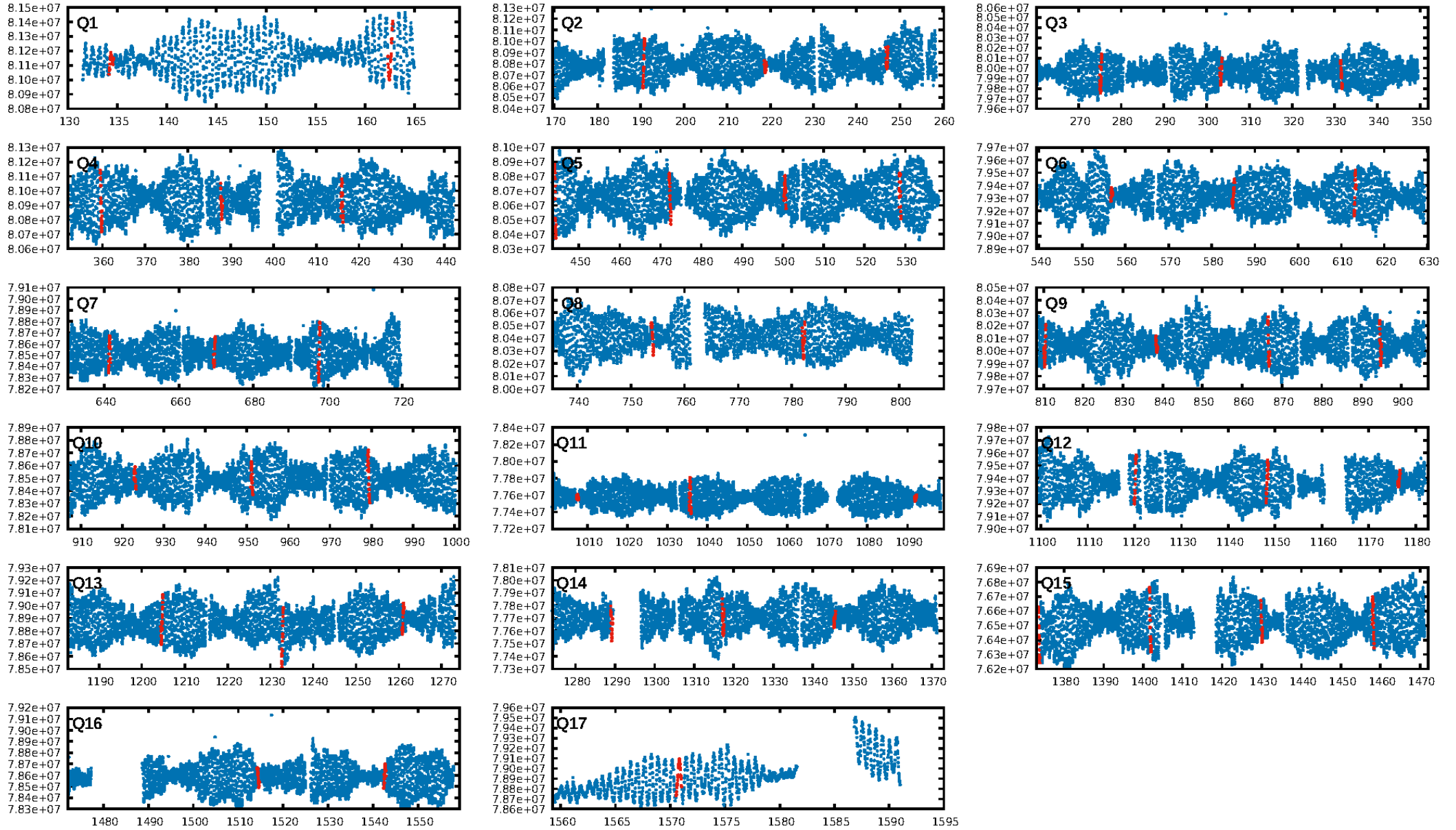
ShortPeriod-sig: 100.0% [45.89] $\sigma$   
LongPeriod-sig: 0.7% [0.01] $\sigma$   
ModelChiSquare2-sig: 28.9%  
ModelChiSquareGof-sig: 100.0%  
Bootstrap-pfa: 8.04e-31  
RollingBand-fgt: 1.00 [9/9]  
**GhostDiagnostic-chr: 0.955**  
Centroid-sig: 60.6%  
Centroid-so: 2.399 arcsec [0.52] $\sigma$   
OotOffset-rm: 0.071 arcsec [0.54] $\sigma$   
KicOffset-rm: 0.085 arcsec [0.78] $\sigma$   
OotOffset-st: 4/4/4/5 [17]  
KicOffset-st: 4/4/4/5 [17]  
DiffImageQuality-fgm: 0.65 [11/17]  
DiffImageOverlap-fno: 0.18 [3/17]

Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 01-Feb-2016 03:22:04 Z

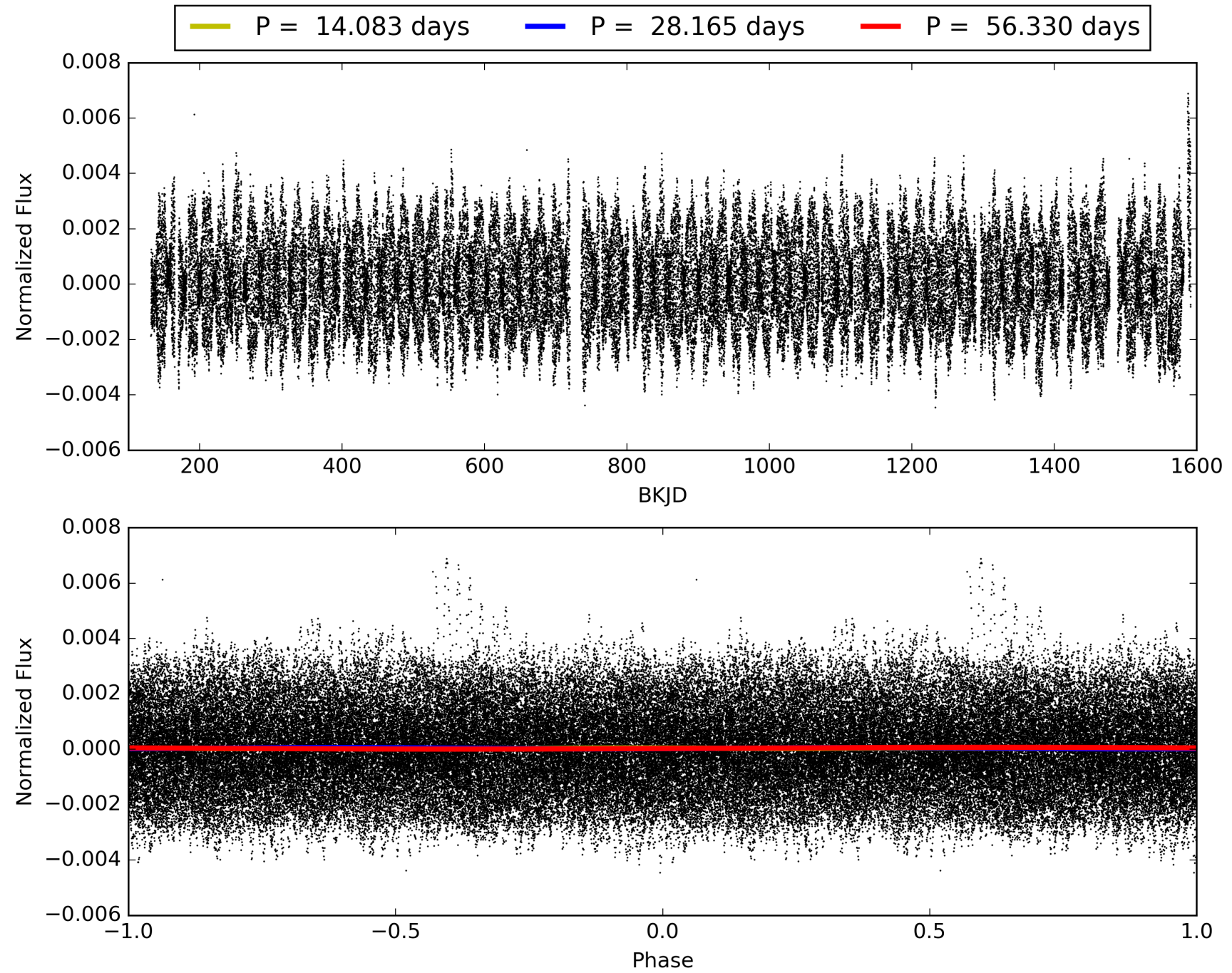
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center



# TCE 004058206-03, PDC Light Curves

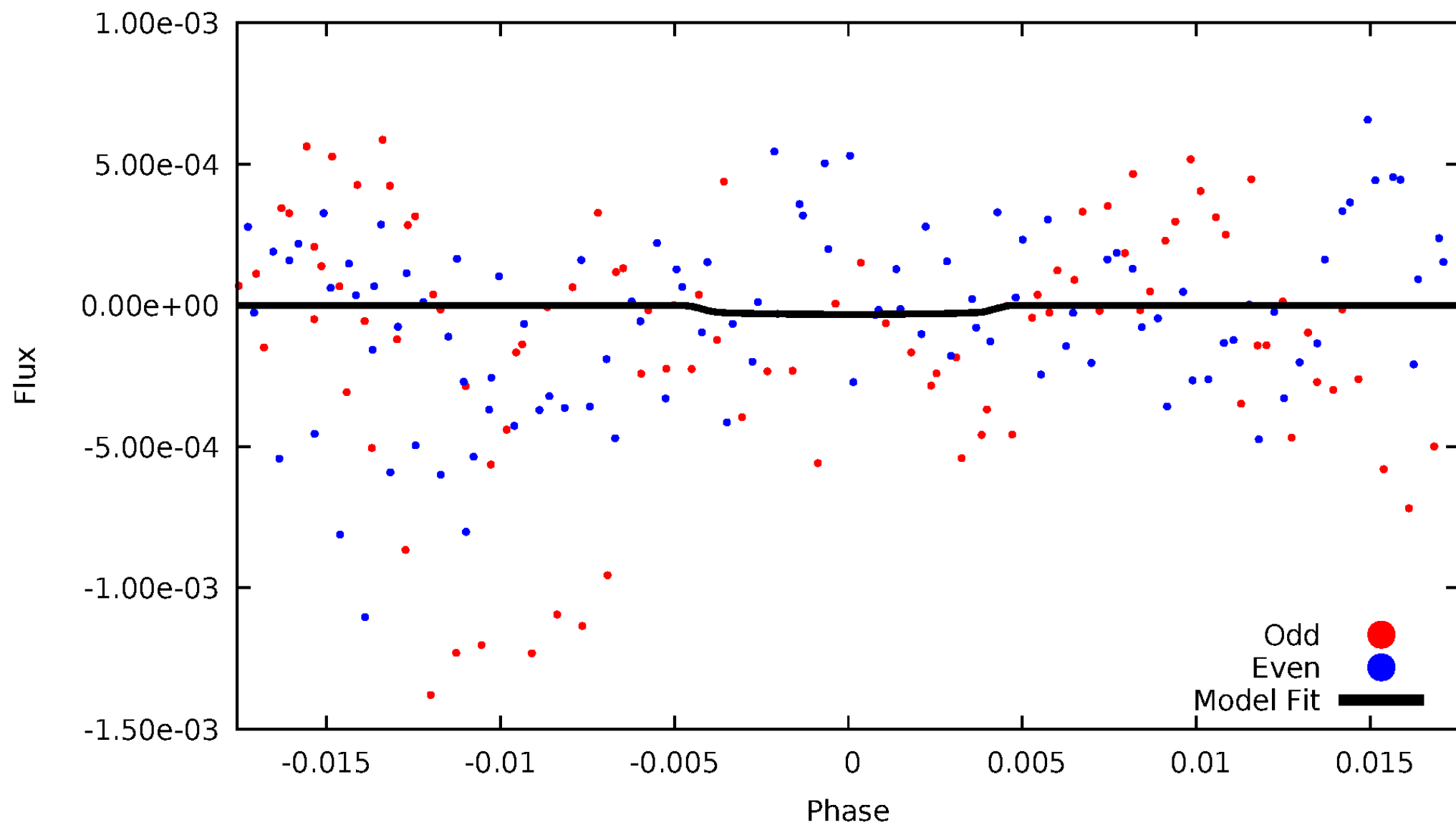


TCE 004058206-03



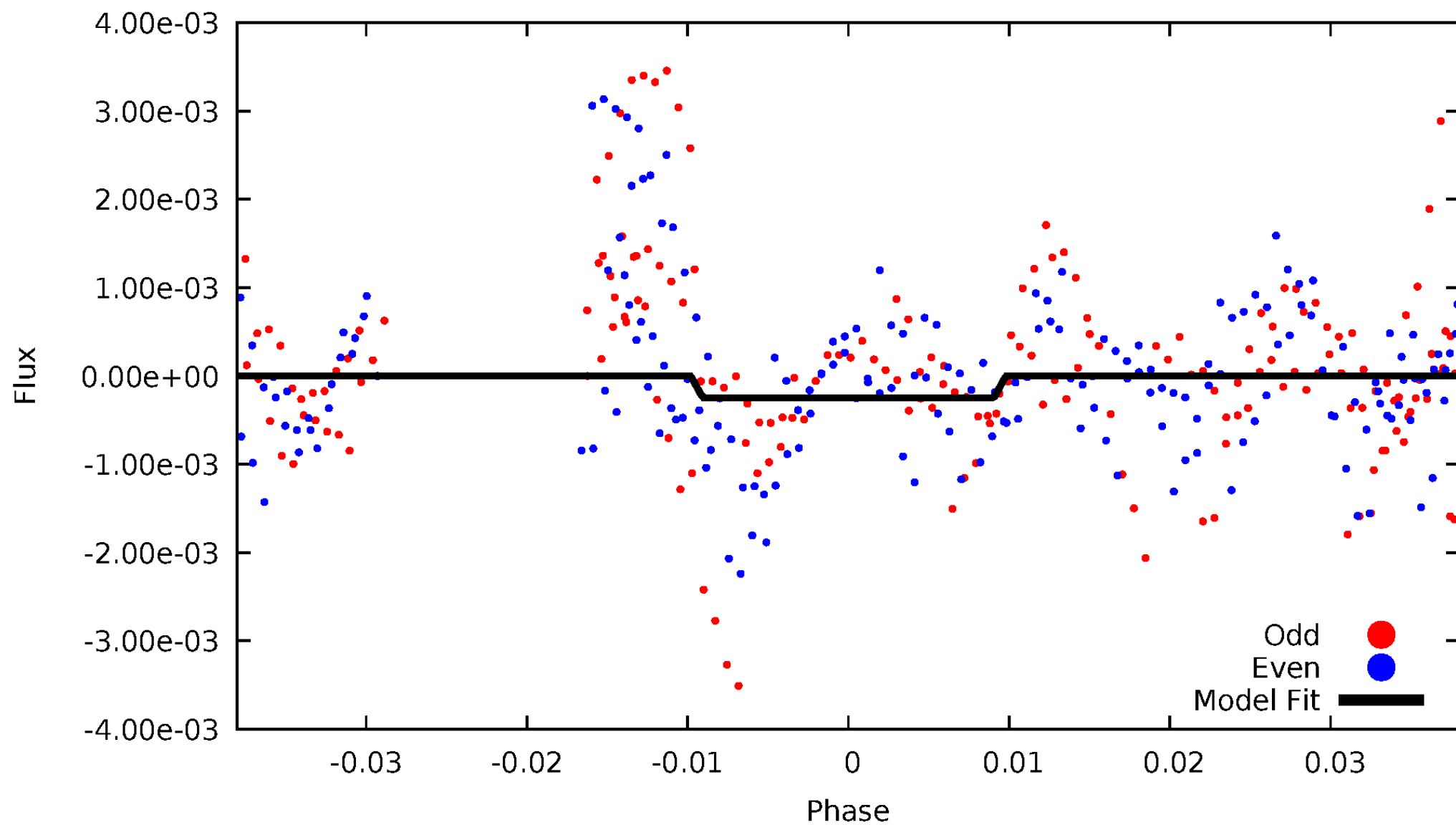
# DV Odd/Even

TCE 004058206-03



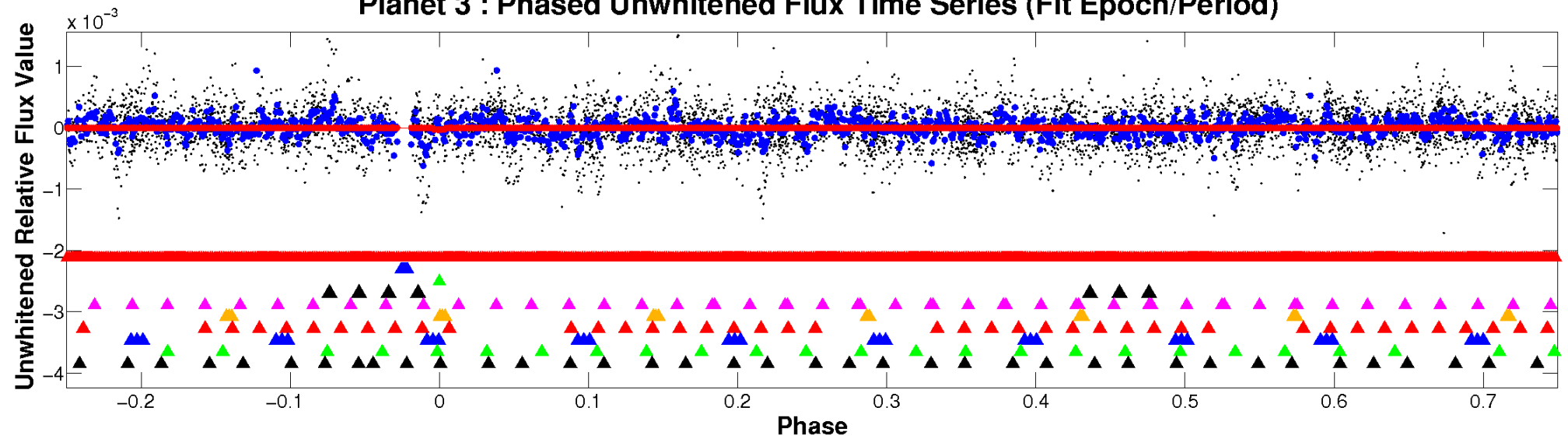
# ALT Odd/Even

TCE 004058206-03

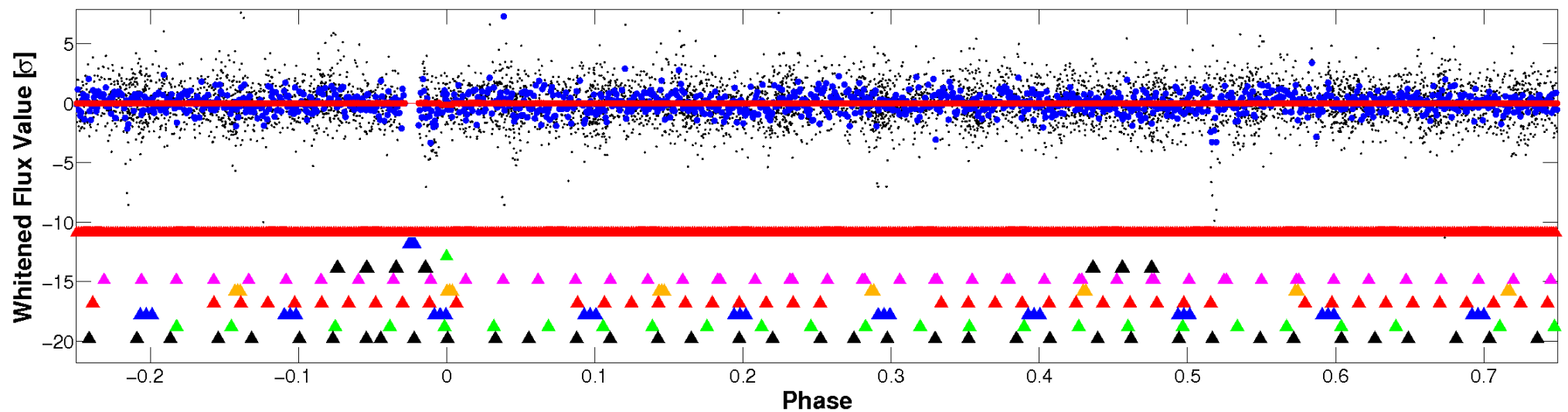


# Non-Whitened Vs. Whitened Light Curve

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

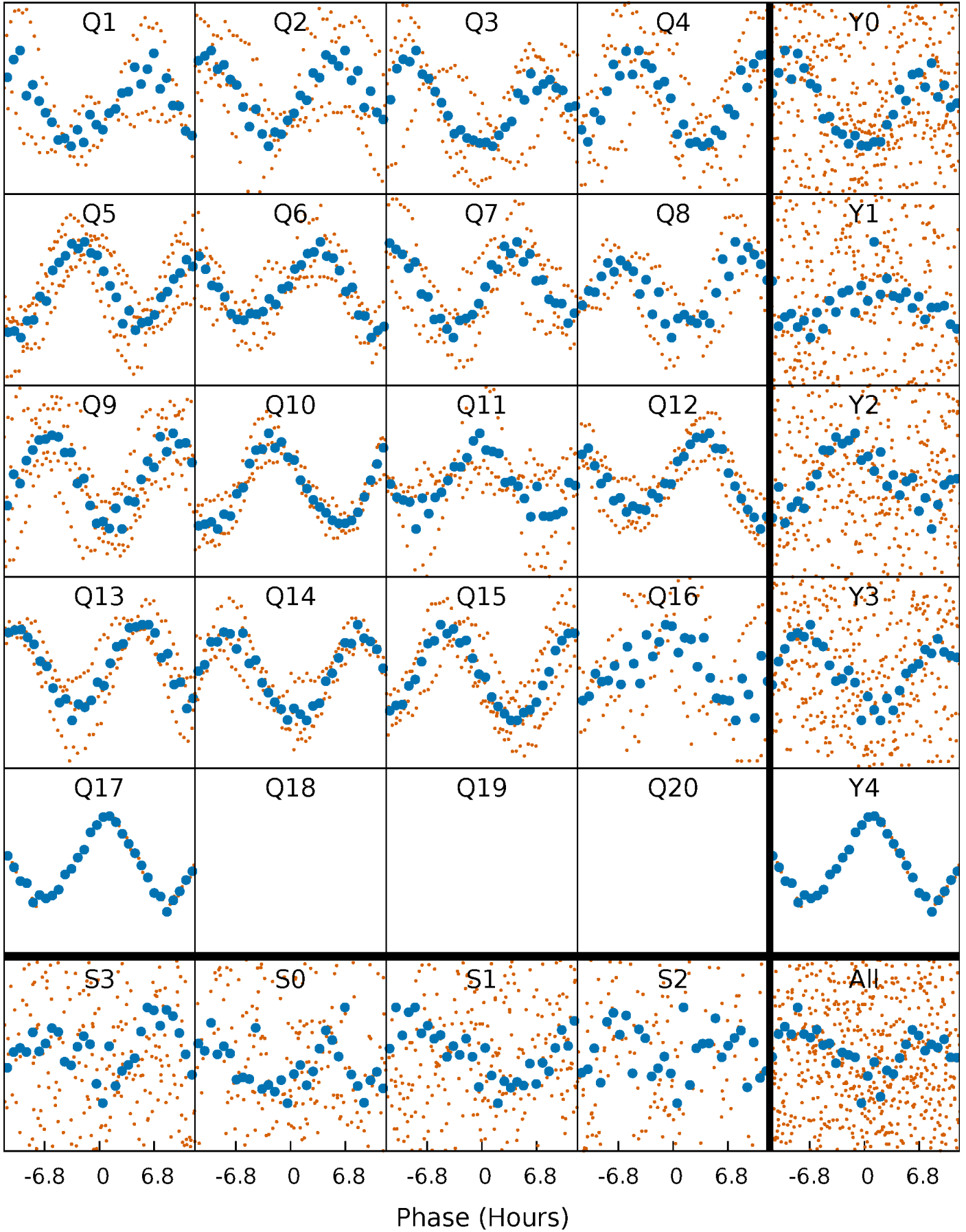


## Planet 3 : Phased Whitened Flux Time Series (Fit Epoch/Period)



# PDC Quarter-Phased Transit Curves

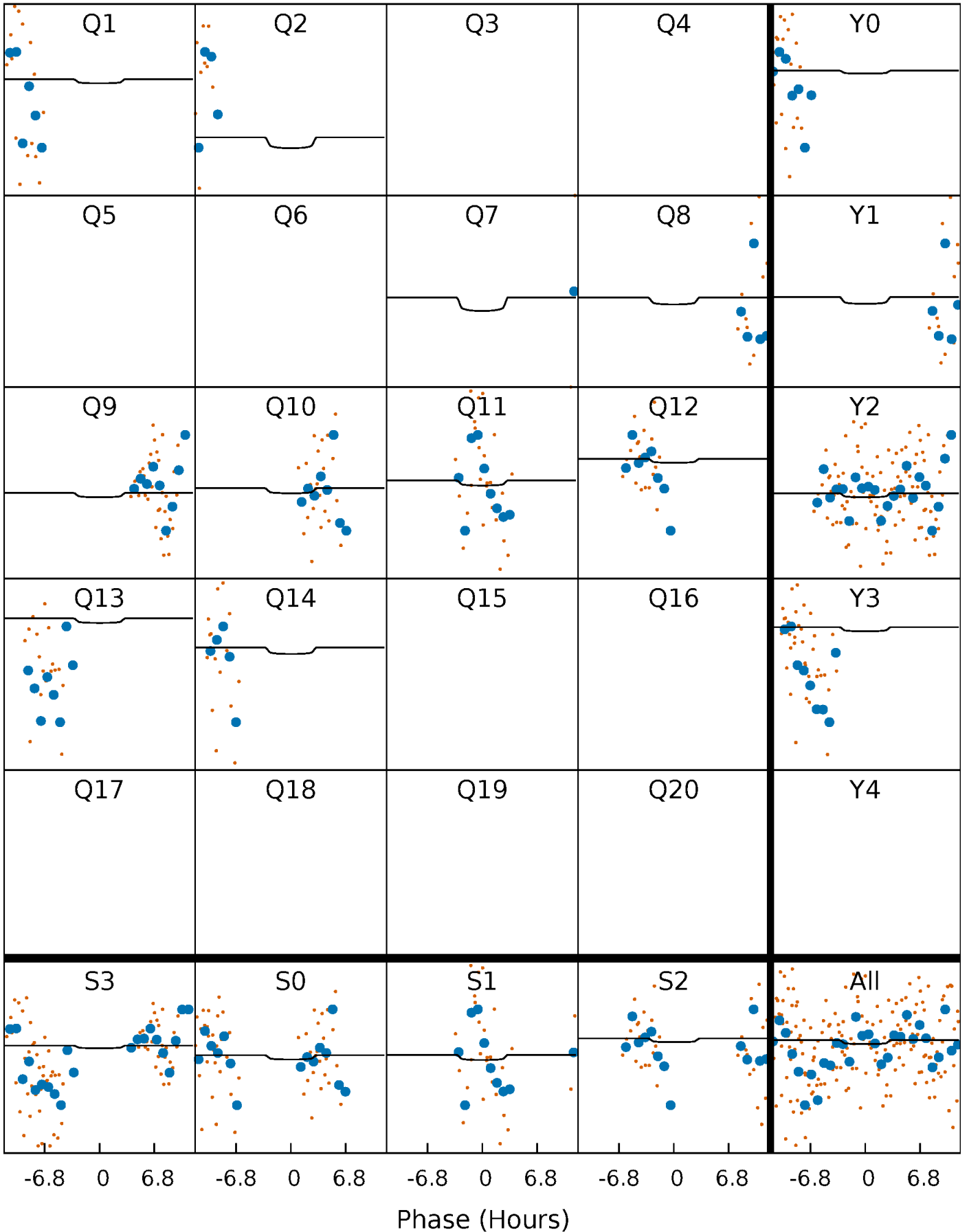
TCE 004058206-03   P= 28.165022 Days    $T_0=134.376281$  (BKJD)





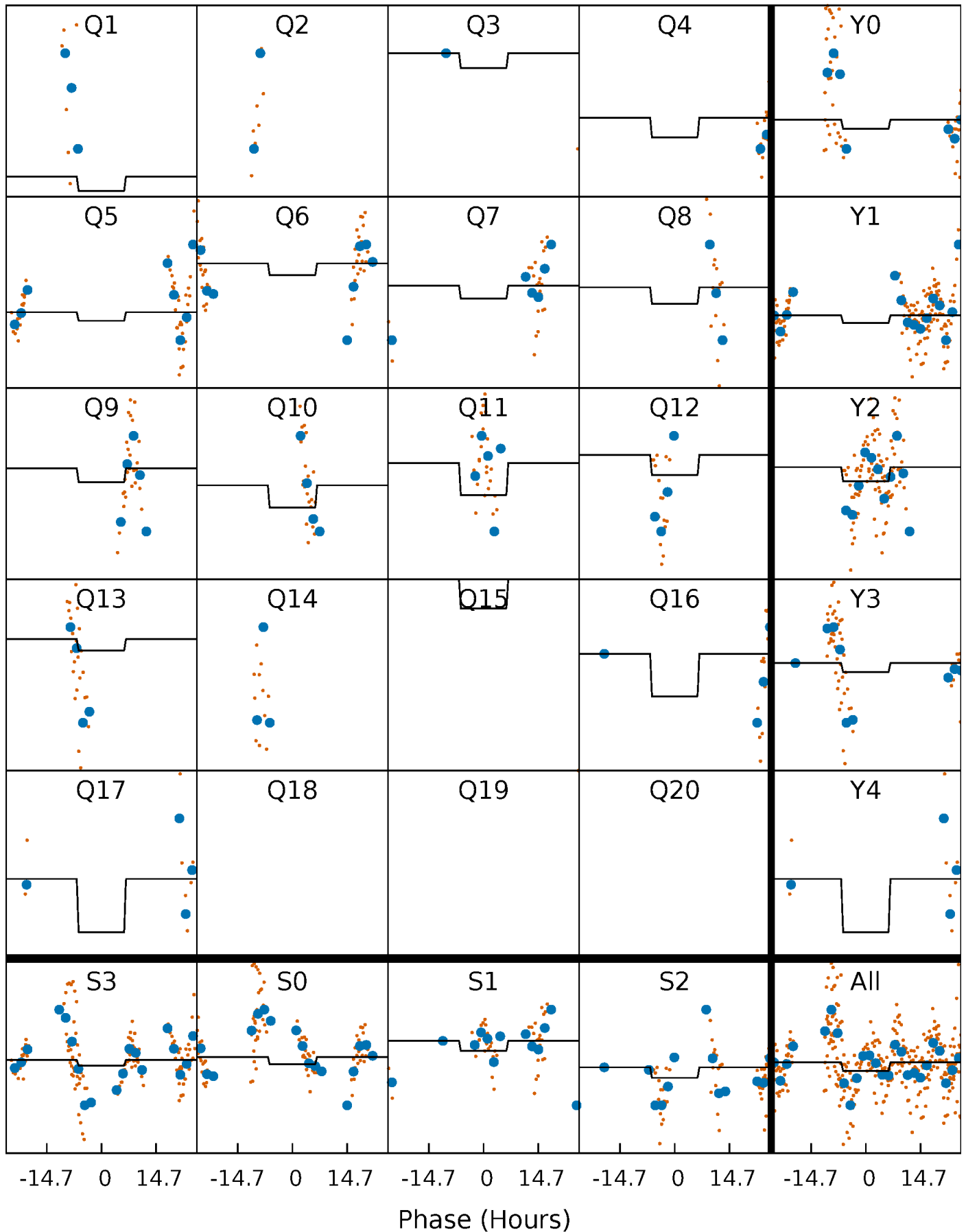
# DV Quarter-Phased Transit Curves

TCE 004058206-03   P= 28.165022 Days    $T_0=134.376281$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

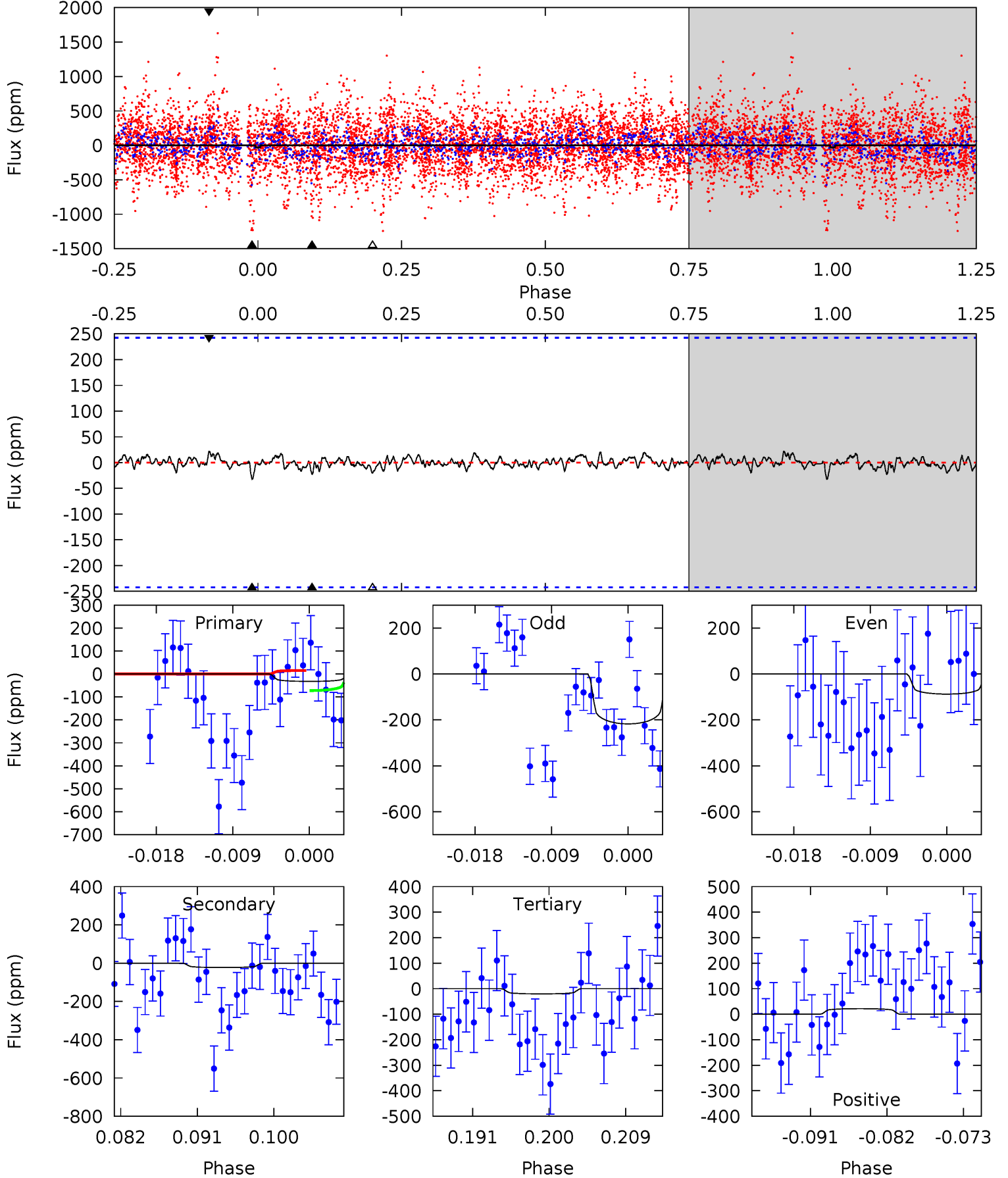
TCE 004058206-03 P= 28.166506 Days  $T_0=134.315869$  (BKJD)



# DV Model-Shift Uniqueness Test

004058206-03, P = 28.165022 Days, E = 106.211259 Days

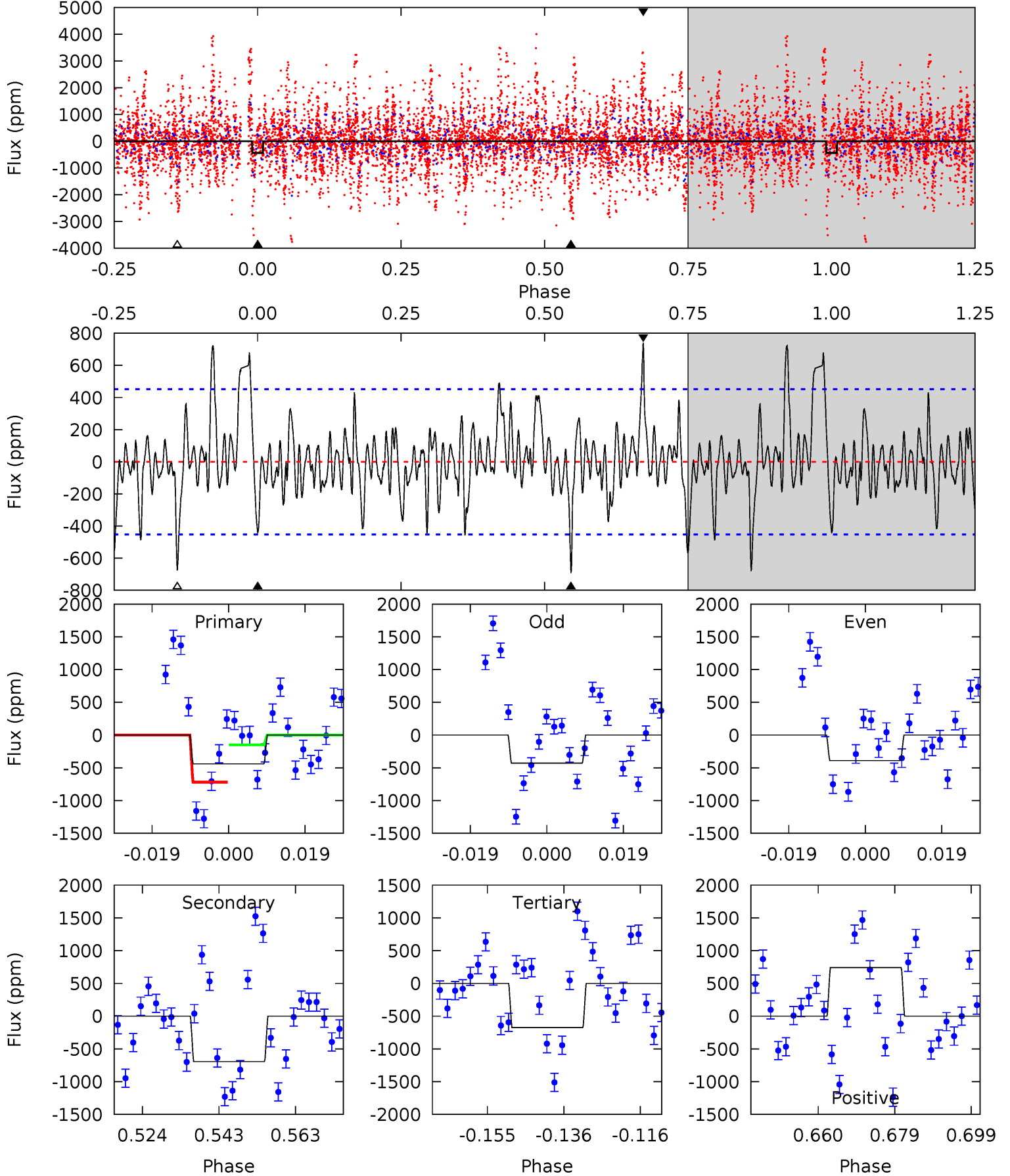
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
0.67	0.47	0.42	0.45	5.04	2.61	0.16	0.25	0.22	0.05	0.02	1.30	0.71	0.40	0.60



# Alt Model-Shift Uniqueness Test

004058206-03, P = 28.166506 Days, E = 106.149363 Days

Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
4.77	7.51	7.32	8.02	4.90	2.34	2.16	-2.56	-3.25	0.19	-0.50	0.22	1.33	0.52	3.10



### Stellar Parameters For KIC 004058206

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$6849^{+190}_{-262}$	$4.155^{+0.158}_{-0.193}$	$-0.200^{+0.250}_{-0.300}$	$1.600^{+0.516}_{-0.387}$	$1.345^{+0.189}_{-0.231}$	$0.462^{+0.435}_{-0.221}$
	+3%/-4%	+4%/-5%	+125%/-150%	+32%/-24%	+14%/-17%	+94%/-48%
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 004058206-03 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-23 \pm 48$	$5.04^{+5.50}_{-3.58}$	$1194^{+88}_{-77}$	$2963^{+2042}_{-6448}$	$9.070^{+188.710}_{-36.801}$
Alt.	$-693 \pm 92$	$5.99^{+6.46}_{-4.20}$	$1203^{+102}_{-90}$	$6009^{+6740}_{-1582}$	$420^{+4184}_{-322}$

$T_{max}$  = 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  $A_{obs} \gg 1.0$

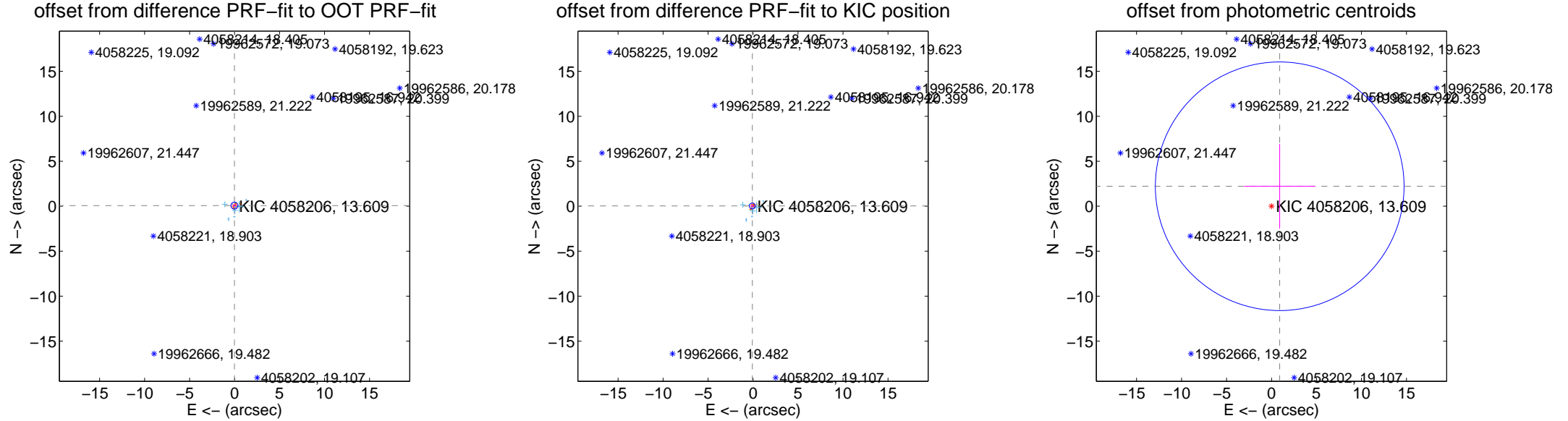
## DV Centroid Data

Supplemental centroid analysis for 004058206-03. Kepler magnitude: 13.61. Transit SNR 0.82

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

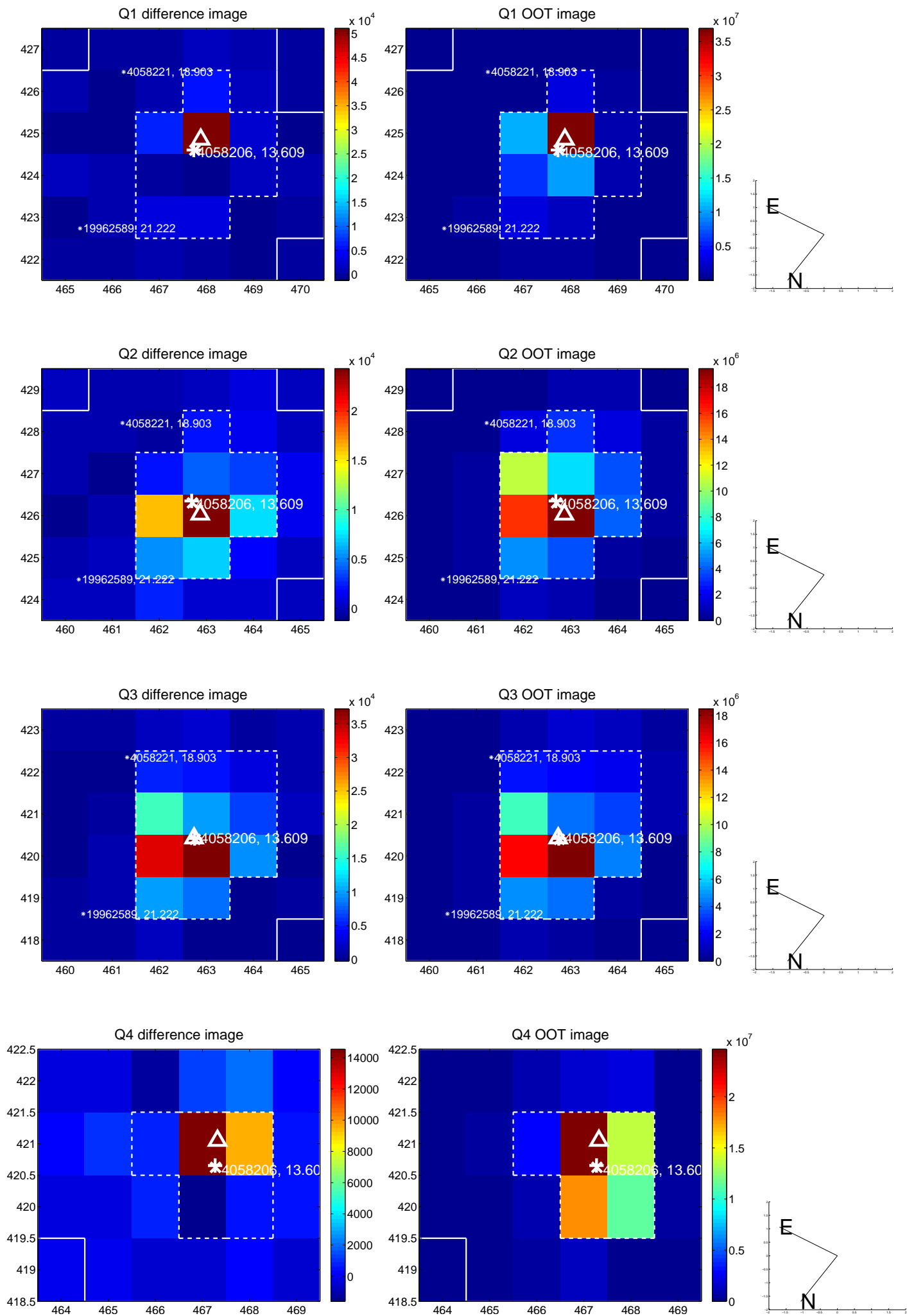
	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.071 \pm 0.130$	0.54	$0.016 \pm 0.134$	$0.069 \pm 0.140$
PRF-fit source offset from KIC position	$0.085 \pm 0.109$	0.78	$0.080 \pm 0.123$	$0.030 \pm 0.142$
photometric centroid source offset	$2.40 \pm 4.61$	0.52	$-0.91 \pm 3.96$	$2.22 \pm 4.71$



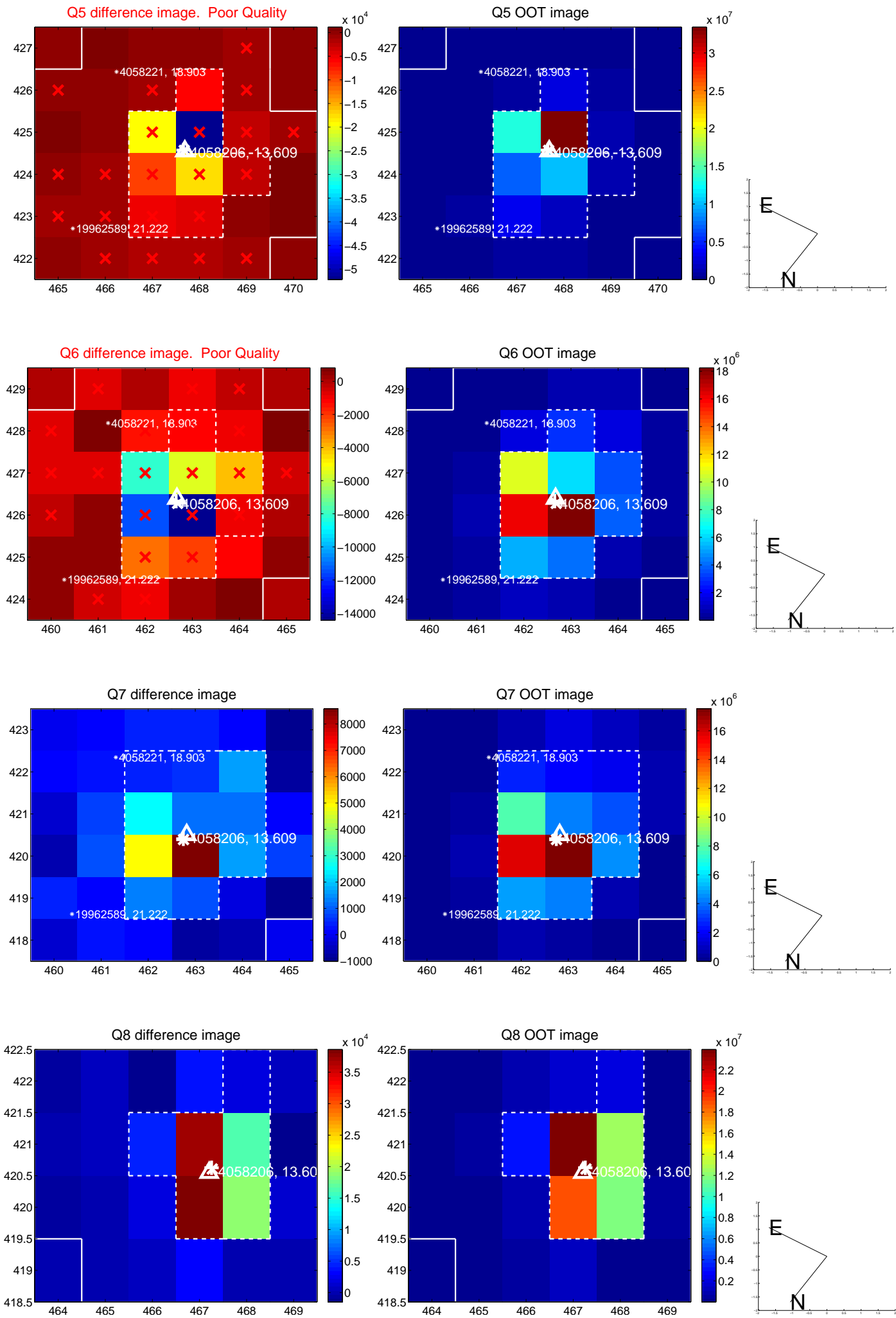
Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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



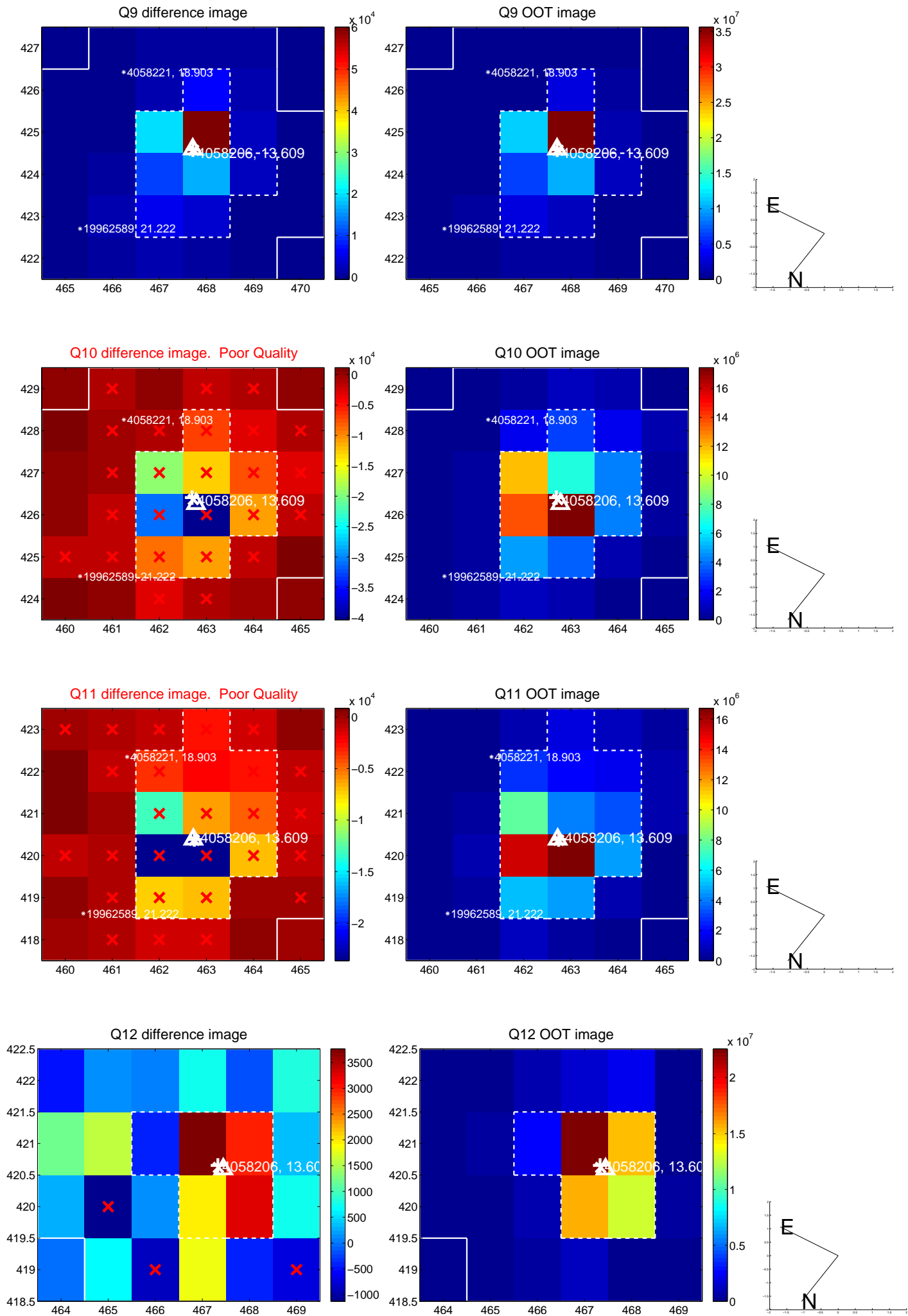
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



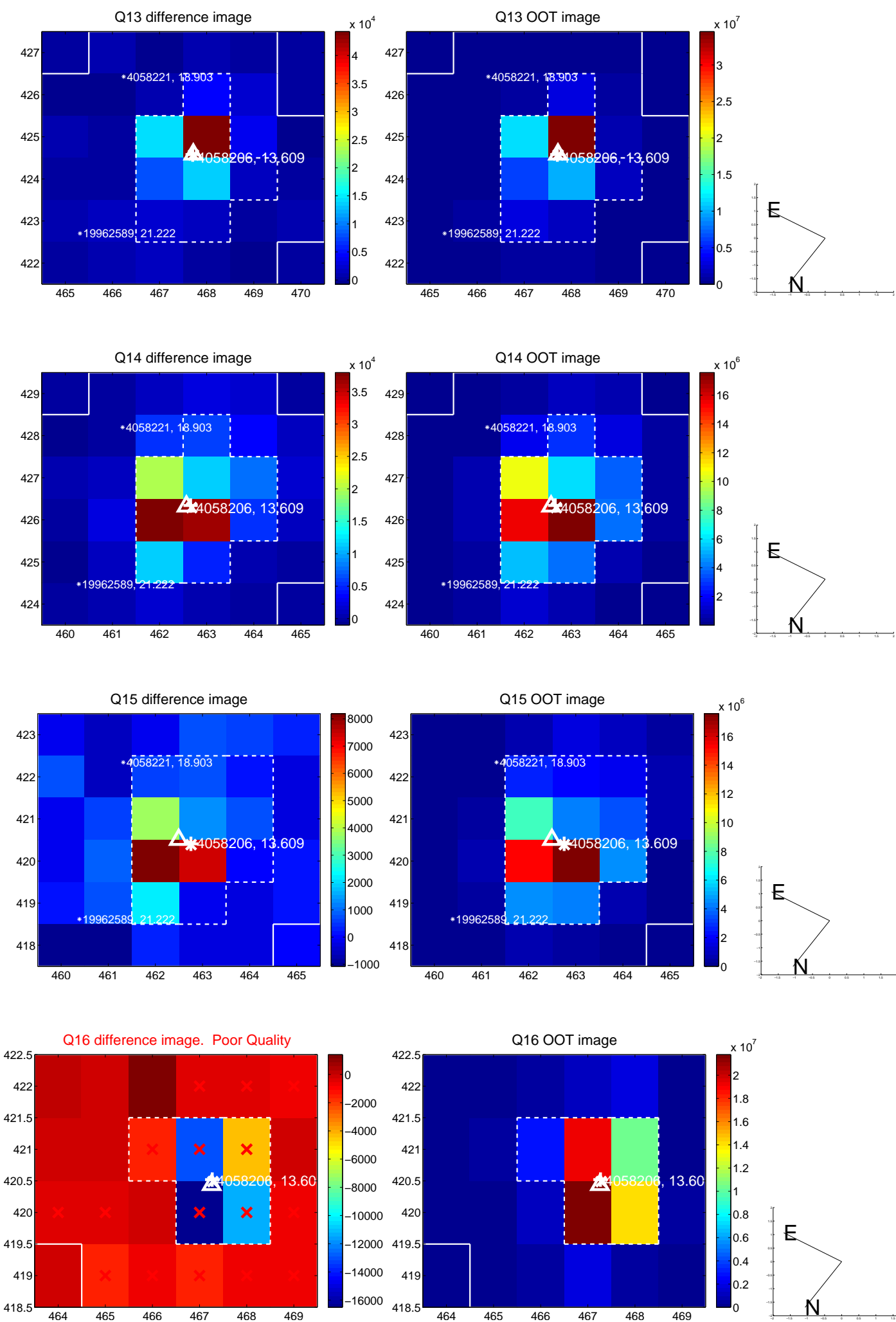
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



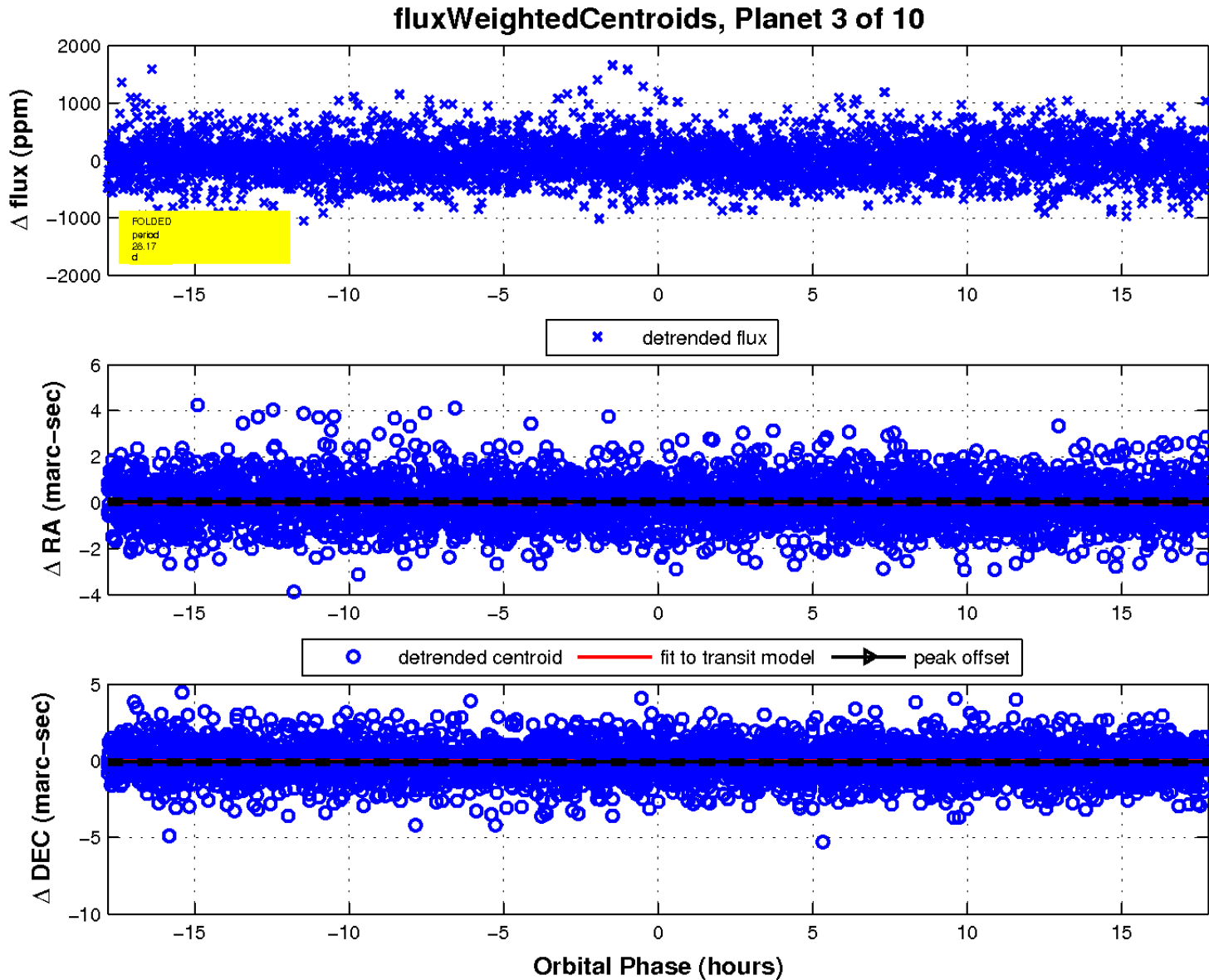
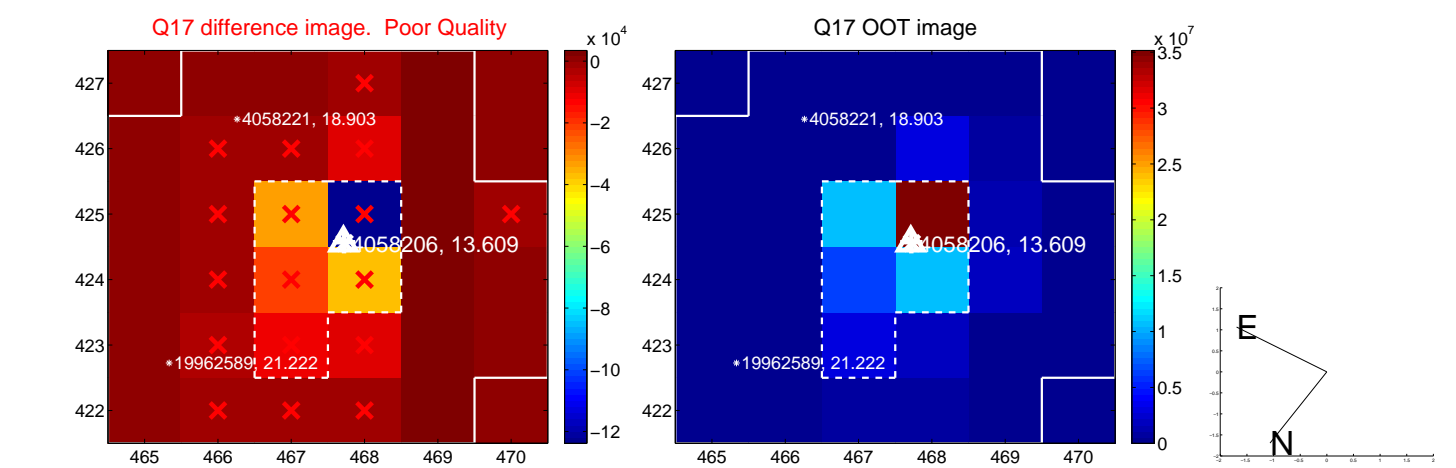
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

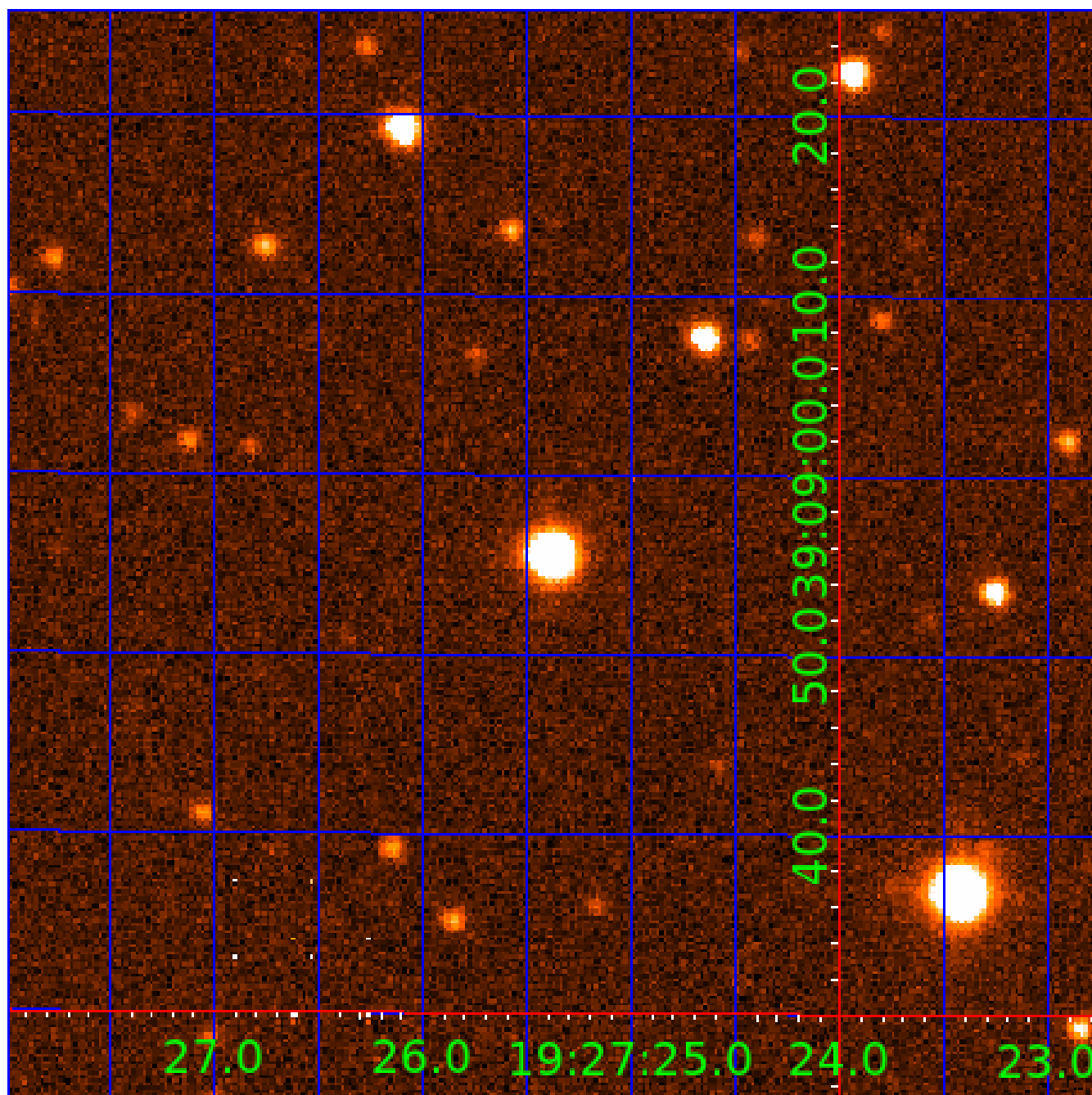


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination





## KIC 004058206

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
004058206-01	OBS	No	1.757664	133.121771	31.4	12.472	9.0	8.1	1.60	6849	0.93	5123.52
004058206-02	OBS	No	28.167409	133.654156	134.2	2.887	15.8	3.4	1.60	6849	2.16	126.81
004058206-03	OBS	No	28.165022	134.376281	31.7	5.936	15.3	0.8	1.60	6849	1.05	126.82
004058206-04	OBS	No	210.958911	133.974993	516.3	2.065	12.7	9.1	1.60	6849	3.92	8.65
004058206-05	OBS	No	29.540053	139.529398	217.0	6.800	11.4	5.6	1.60	6849	2.75	119.02
004058206-07	OBS	No	35.078211	148.902092	480.5	3.093	9.8	8.4	1.60	6849	3.83	94.64
004058206-08	OBS	No	47.891699	159.457155	501.9	2.608	9.7	8.2	1.60	6849	3.62	62.49
004058206-09	OBS	No	59.344057	134.337160	528.7	4.210	9.8	9.5	1.60	6849	3.81	46.95
004058206-10	OBS	No	38.068267	161.015373	572.3	6.023	9.5	12.0	1.60	6849	6.51	84.87

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
004058206-01	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_ALT
004058206-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_ZUMA_TRACKER—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT
004058206-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_ZUMA_TRACKER—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—SAME_NTL_PERIOD
004058206-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_MARSHALL—TRANS_GAPPED—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS
004058206-05	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT
004058206-07	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_SKYE—TRANS_GAPPED—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT
004058206-08	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV
004058206-09	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_SKYE—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT
004058206-10	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT

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

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

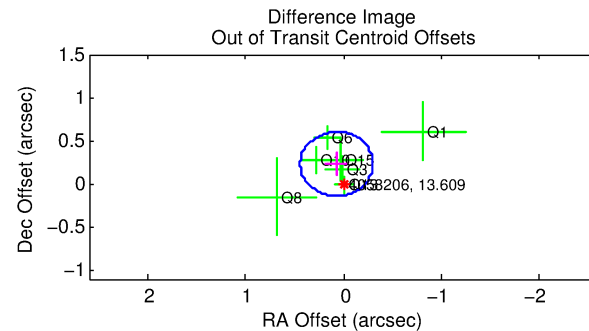
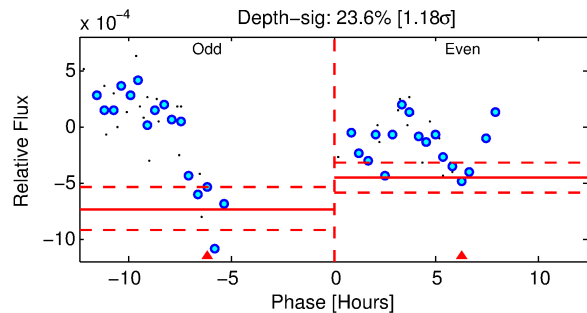
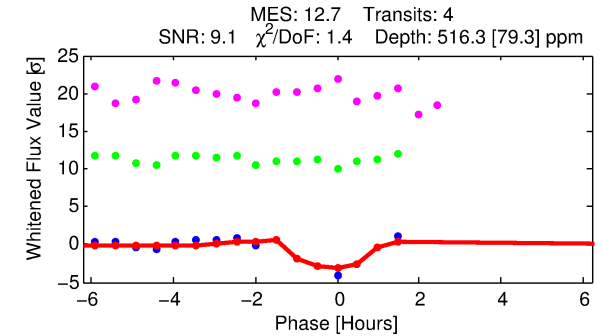
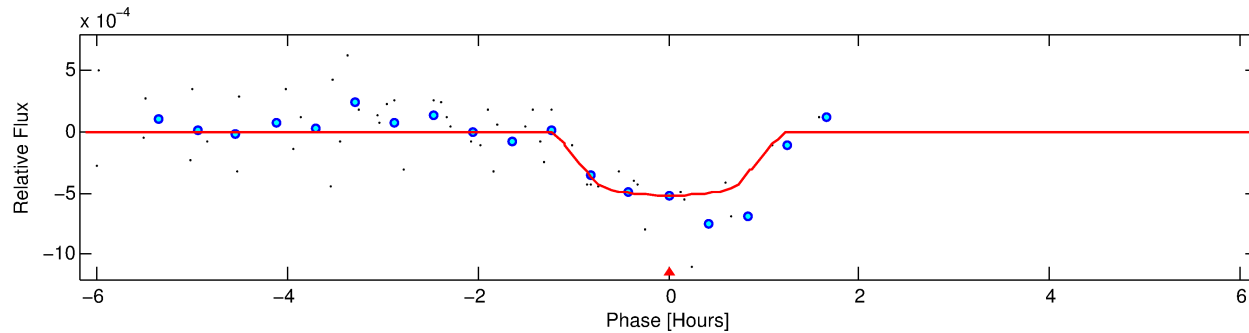
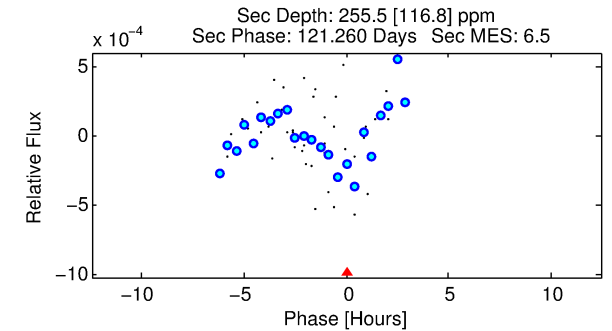
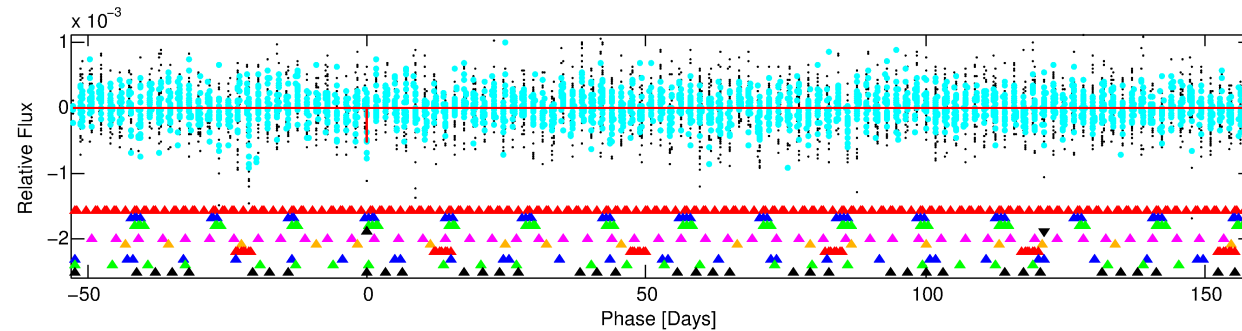
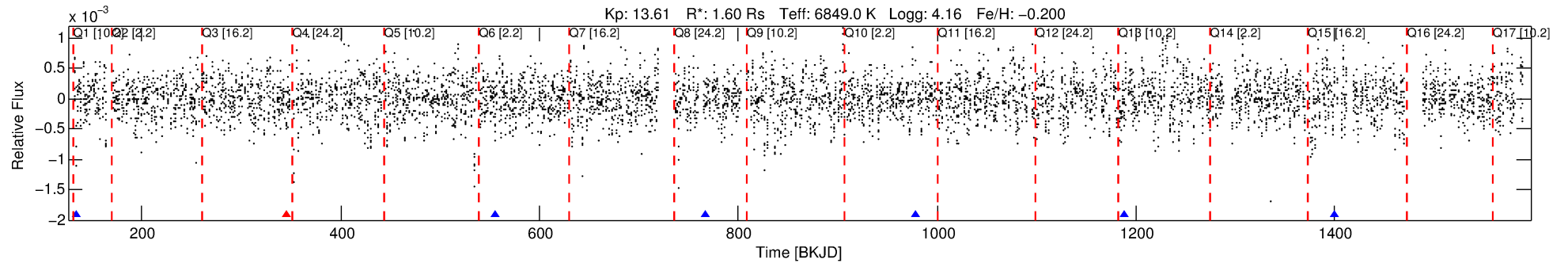
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 004058206-04

No Significant Match Found

# DV One-Page Summary

KIC: 4058206 Candidate: 4 of 10 Period: 210.959 d



## DV Fit Results:

Period = 210.95891 [0.00392] d  
Epoch = 133.9750 [0.0077] BKJD  
Rp/R\* = 0.0225 [0.0361]  
a/R\* = 563.22 [5222.80]  
b = 0.72 [6.12]  
Seff = 8.65 [3.43]  
Teff = 437 [43] K  
Rp = 3.92 [6.42] Re  
a = 0.7637 [0.1994] AU  
Ag = 5324.44 [17365.66] [0.31σ]  
Teffp = 5776 [4685] K [1.14σ]

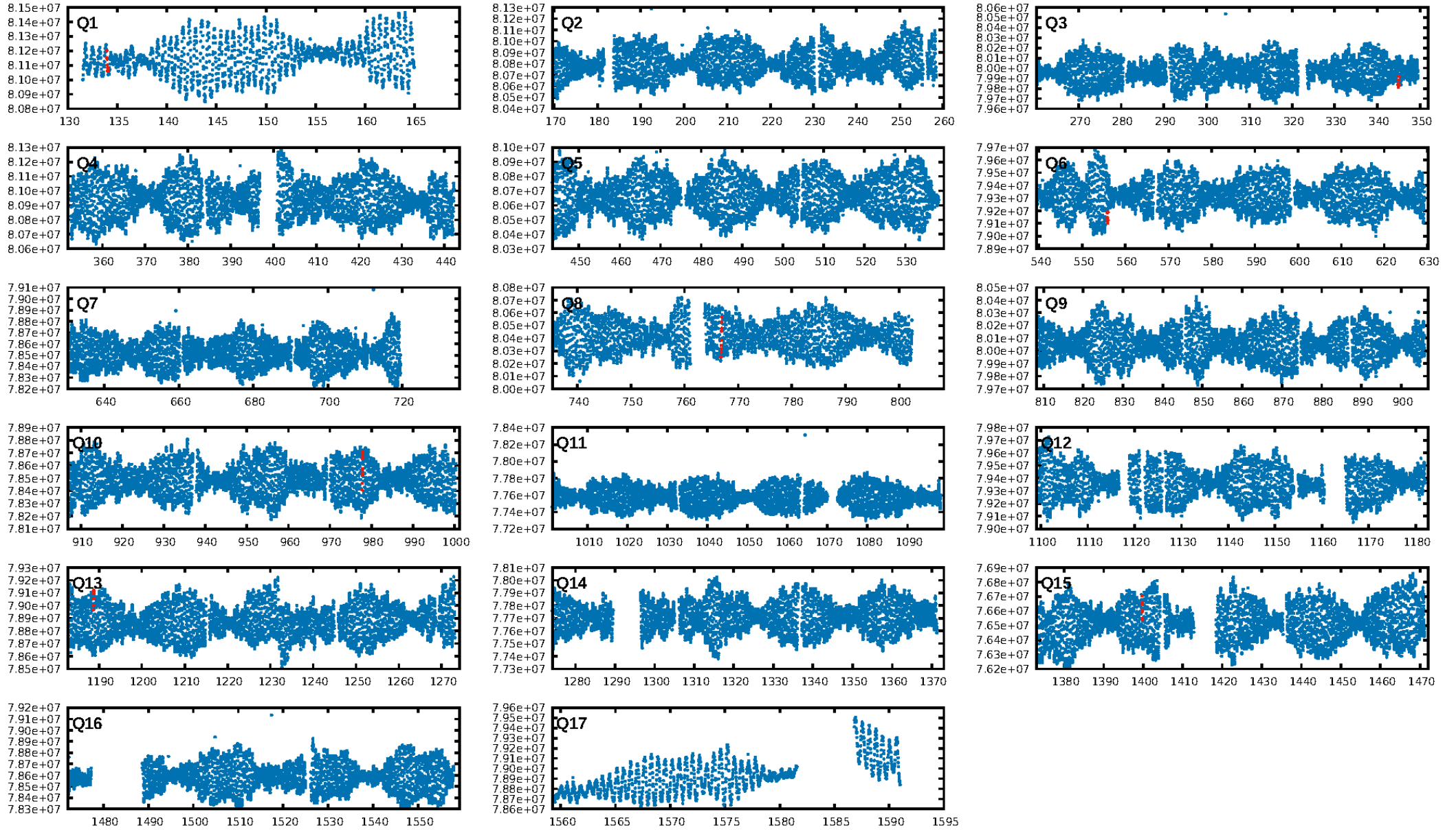
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [806.85σ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: 15.4%  
ModelChiSquareGof-sig: 97.3%  
**Bootstrap-pfa: 3.38e-12**  
**RollingBand-fgt: 0.67 [2/3]**  
GhostDiagnostic-chr: -19.54  
Centroid-sig: 31.3%  
Centroid-so: 0.997 arcsec [0.85σ]  
OotOffset-rm: 0.242 arcsec [1.95σ]  
OotOffset-st: 2/2/1/2 [7]  
KicOffset-rm: 0.240 arcsec [1.88σ]  
KicOffset-st: 2/2/1/2 [7]  
DiffImageQuality-fgm: 0.57 [4/7]  
DiffImageOverlap-fno: 0.57 [4/7]

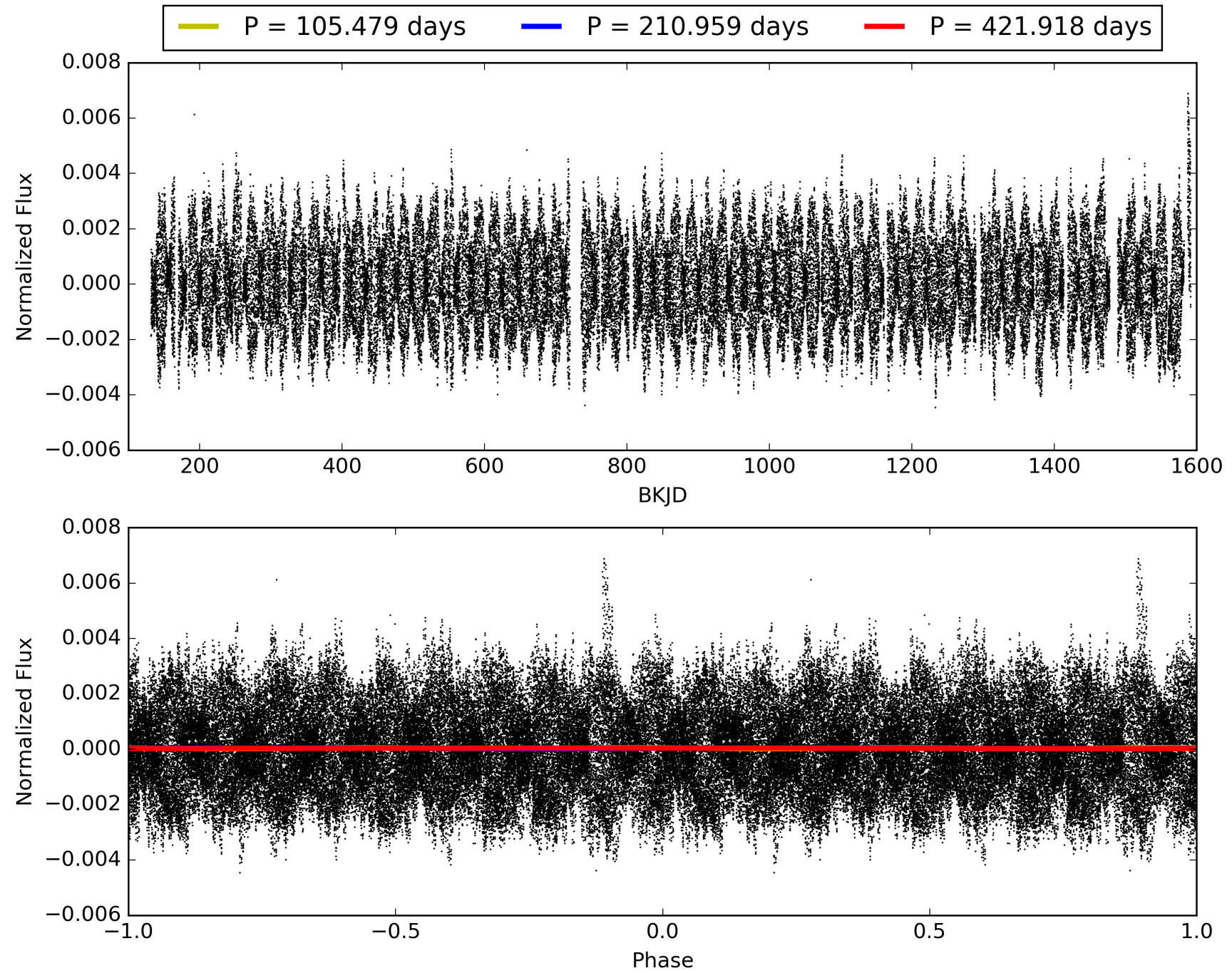
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 01-Feb-2016 03:22:09 Z

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

# TCE 004058206-04, PDC Light Curves

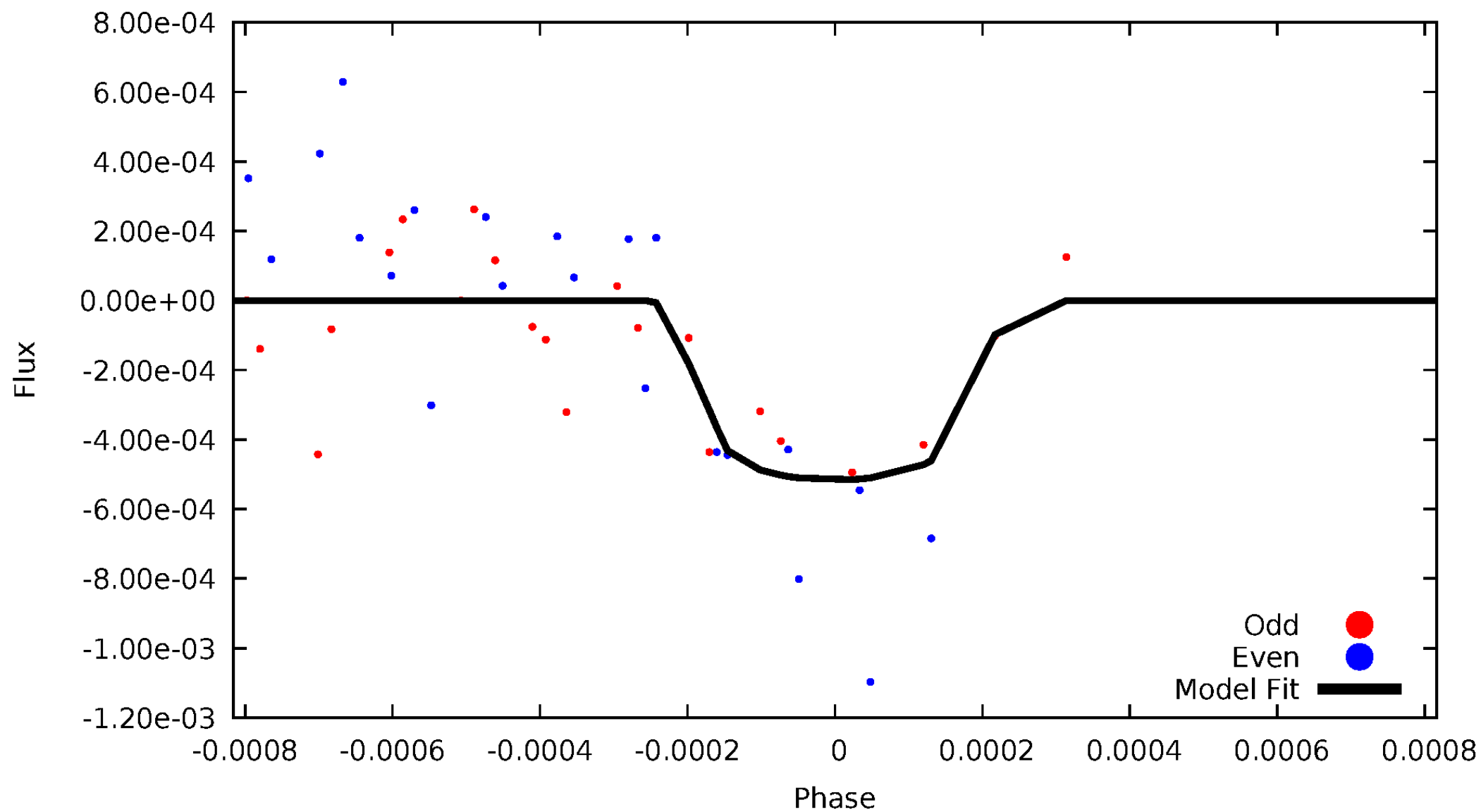


TCE 004058206-04



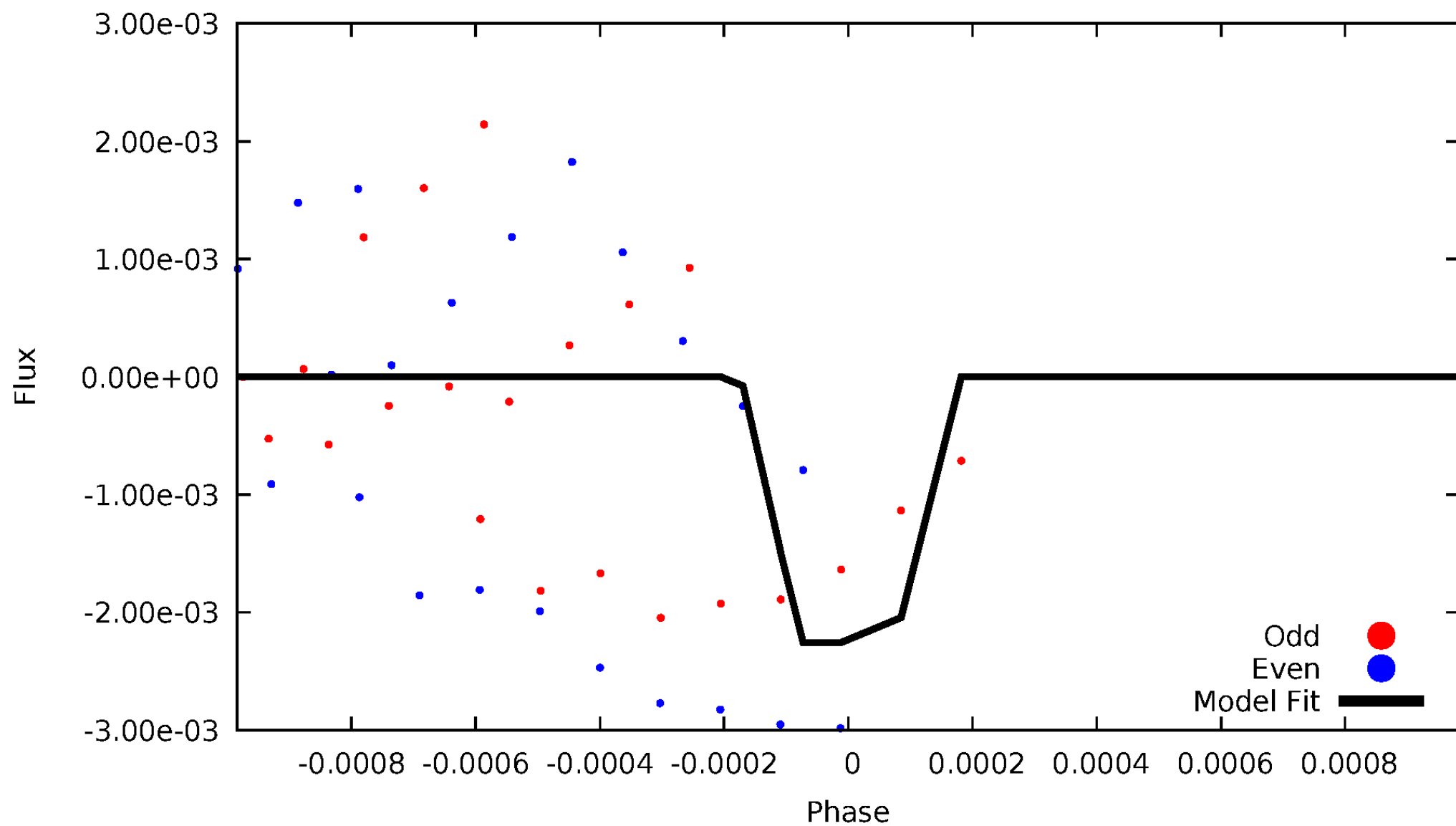
# DV Odd/Even

TCE 004058206-04



# ALT Odd/Even

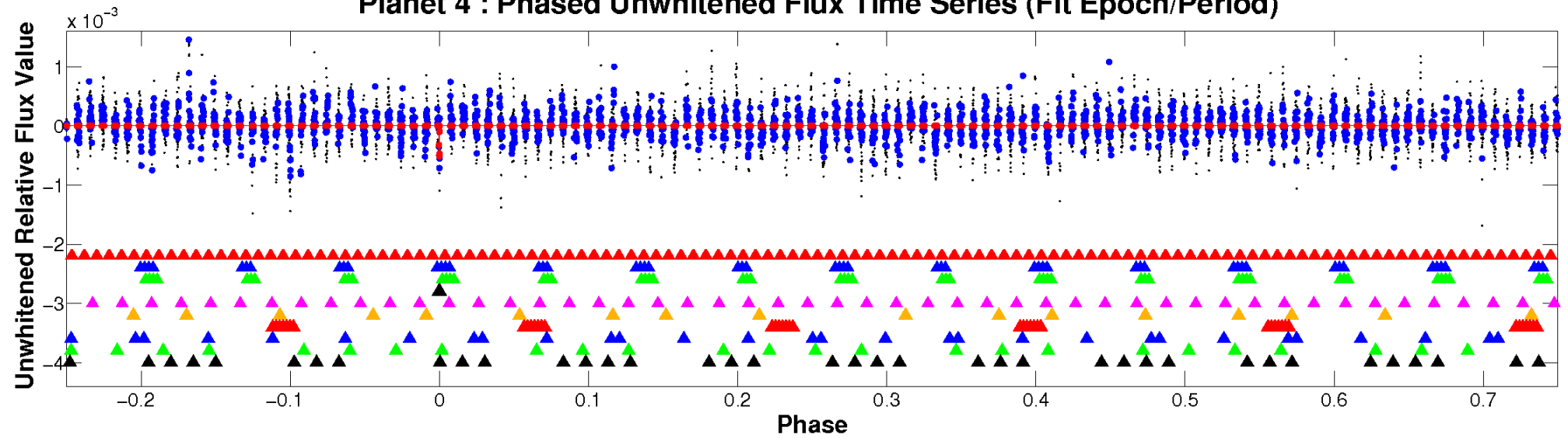
TCE 004058206-04



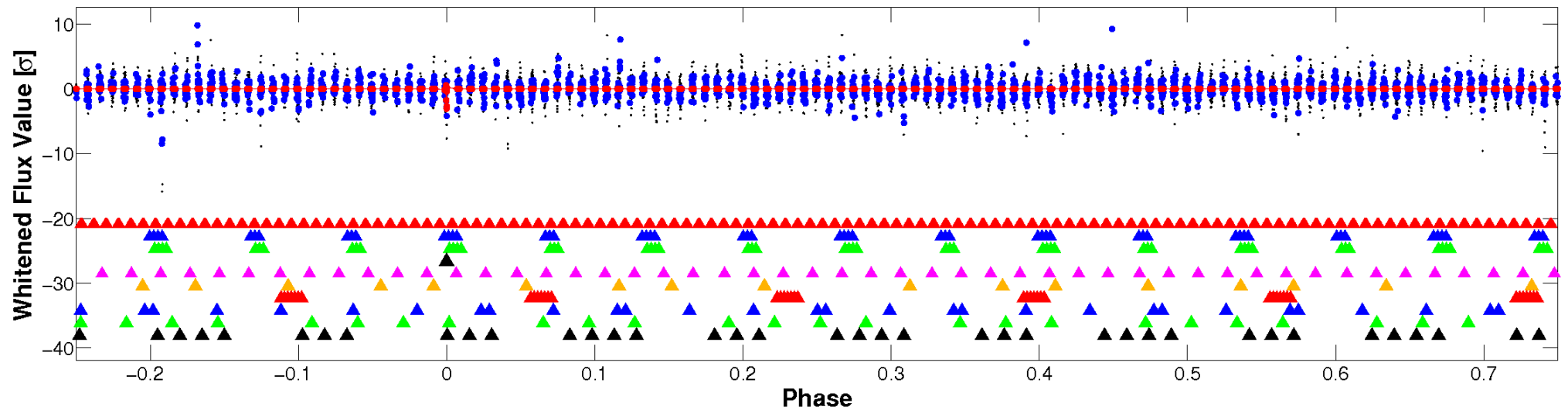


# Non-Whitened Vs. Whitened Light Curve

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



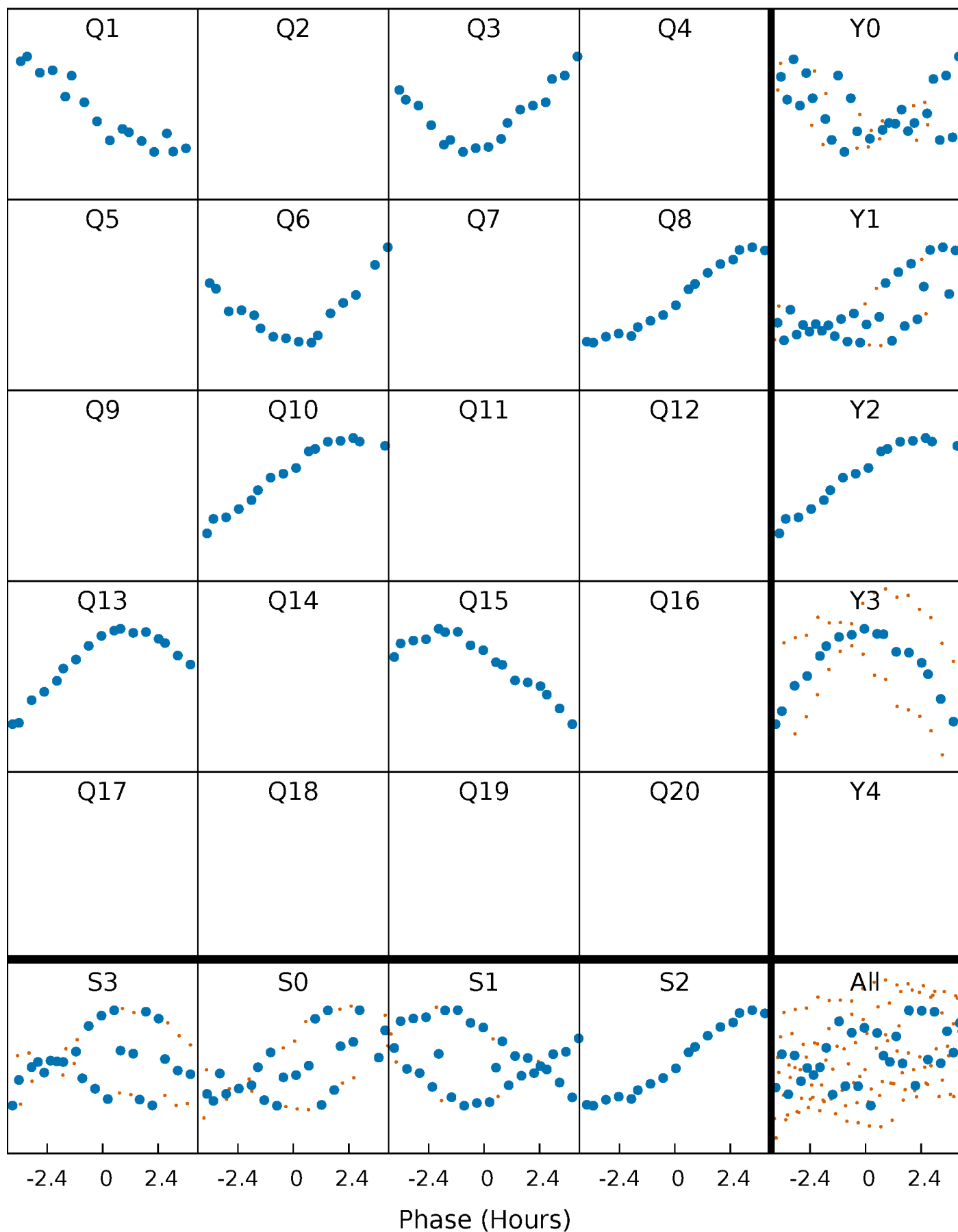
## Planet 4 : Phased Whitened Flux Time Series (Fit Epoch/Period)





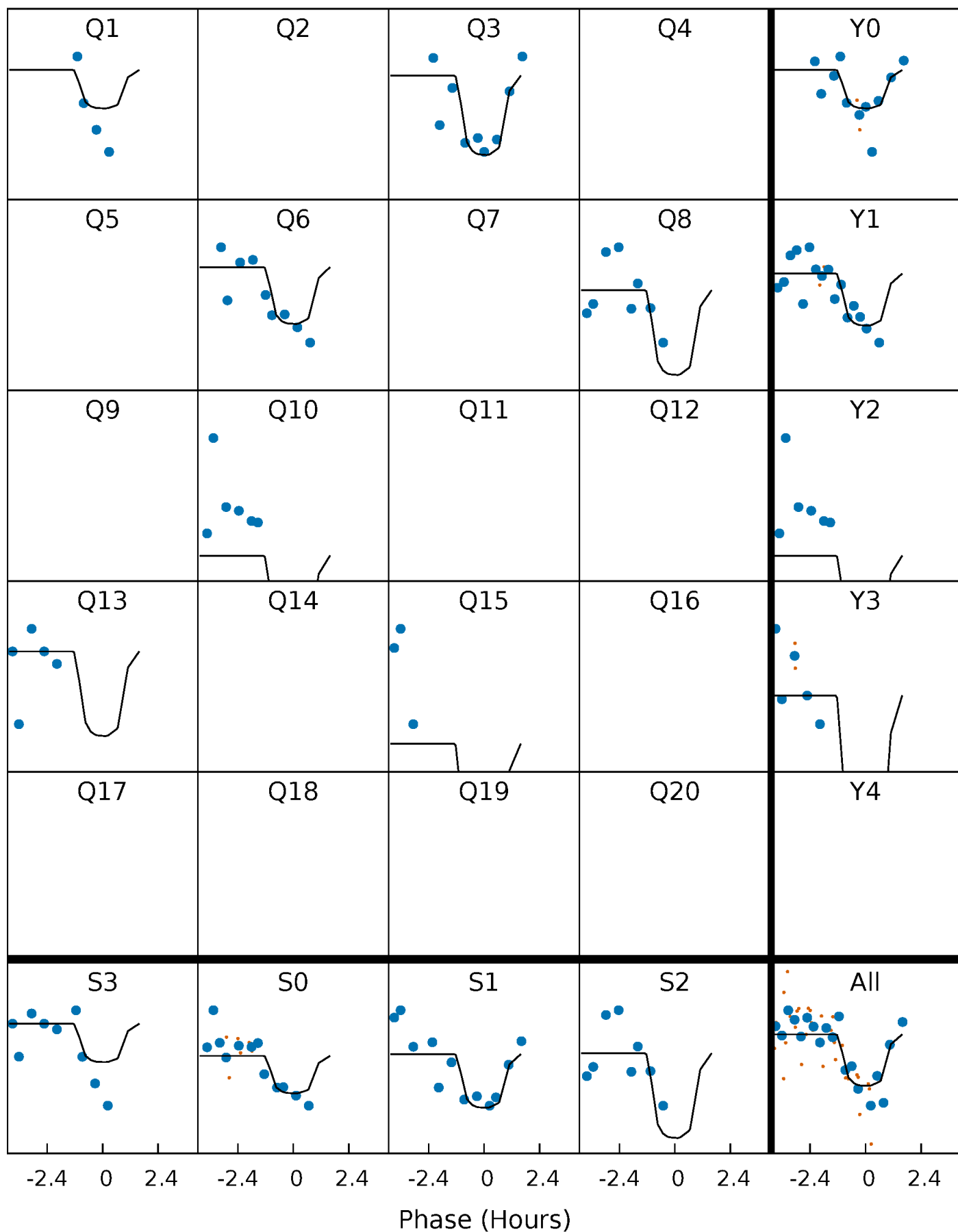
# PDC Quarter-Phased Transit Curves

TCE 004058206-04 P=210.958911 Days  $T_0=133.974993$  (BKJD)



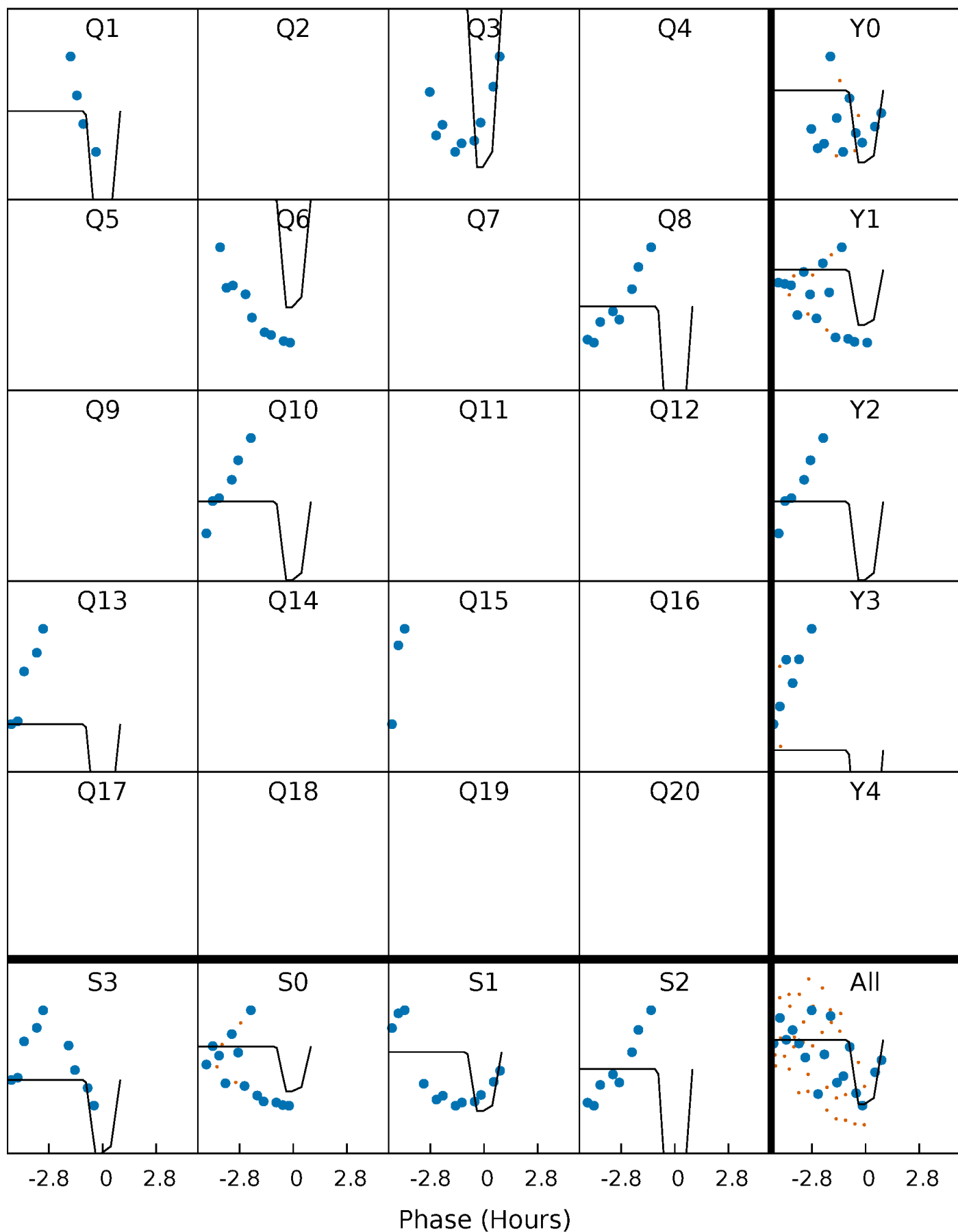
# DV Quarter-Phased Transit Curves

TCE 004058206-04 P=210.958911 Days  $T_0=133.974993$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

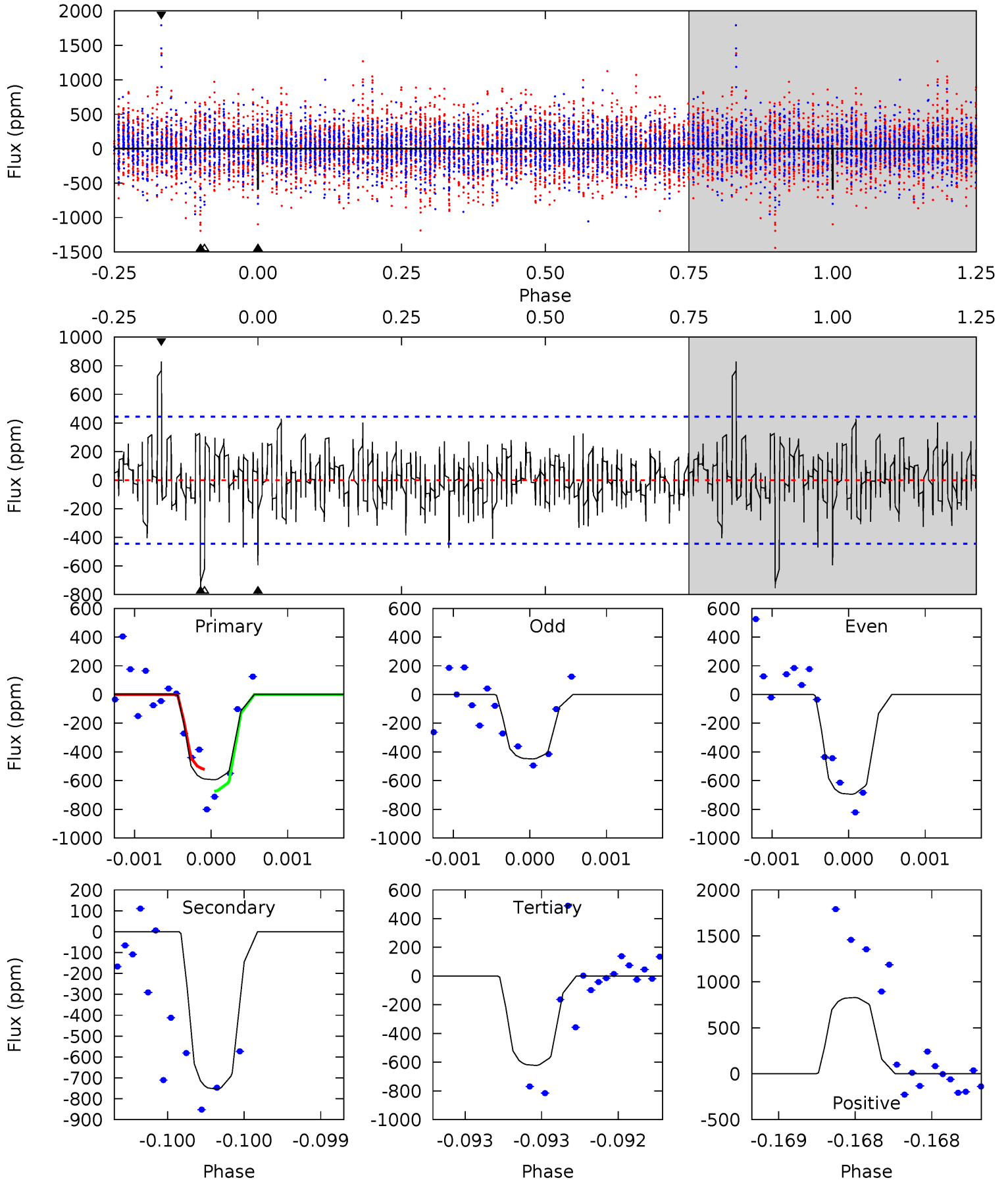
TCE 004058206-04 P=210.961265 Days  $T_0=134.000462$  (BKJD)



# DV Model-Shift Uniqueness Test

004058206-04, P = 210.958911 Days, E = 133.974993 Days

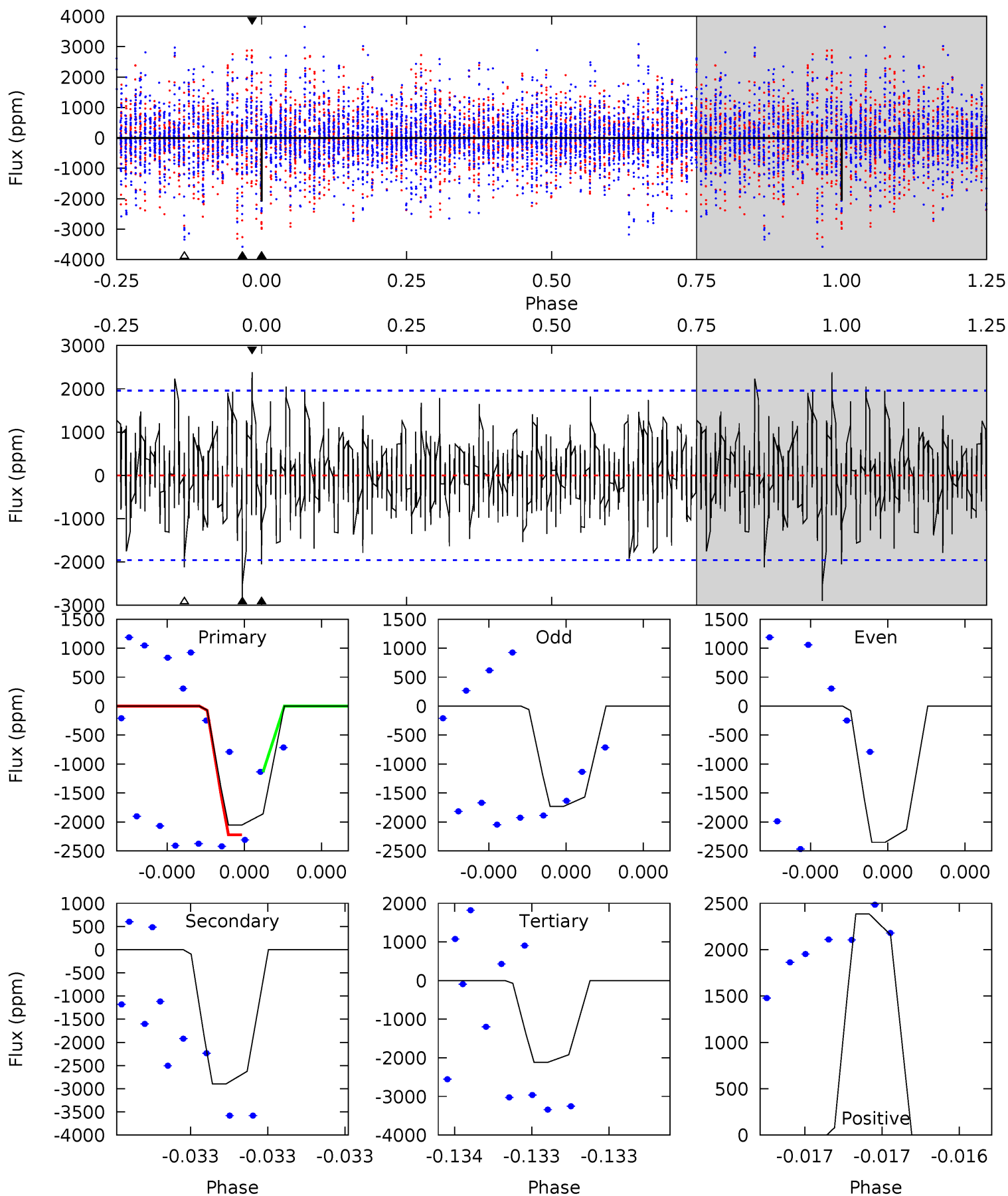
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
7.43	9.44	7.78	10.4	5.55	3.45	1.68	-0.35	-2.94	1.66	-0.93	1.54	1.05	0.52	0.94



# Alt Model-Shift Uniqueness Test

004058206-04, P = 210.961265 Days, E = 134.000462 Days

Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
5.91	8.35	6.10	6.86	5.63	3.57	1.47	-0.19	-0.95	2.24	1.48	0.87	1.15	0.45	1.20



### Stellar Parameters For KIC 004058206

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$6849^{+190}_{-262}$	$4.155^{+0.158}_{-0.193}$	$-0.200^{+0.250}_{-0.300}$	$1.600^{+0.516}_{-0.387}$	$1.345^{+0.189}_{-0.231}$	$0.462^{+0.435}_{-0.221}$
	+3%/-4%	+4%/-5%	+125%/-150%	+32%/-24%	+14%/-17%	+94%/-48%
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 004058206-04 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-755 \pm 80$	$6.12^{+5.04}_{-3.92}$	$615^{+49}_{-43}$	$6088^{+5552}_{-1455}$	$6562^{+40707}_{-4671}$
Alt.	$-2898 \pm 347$	$9.11^{+6.06}_{-5.46}$	$613^{+50}_{-45}$	$6979^{+6309}_{-1645}$	$11186^{+60371}_{-7297}$

$T_{max}$  = 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  $A_{obs} \gg 1.0$

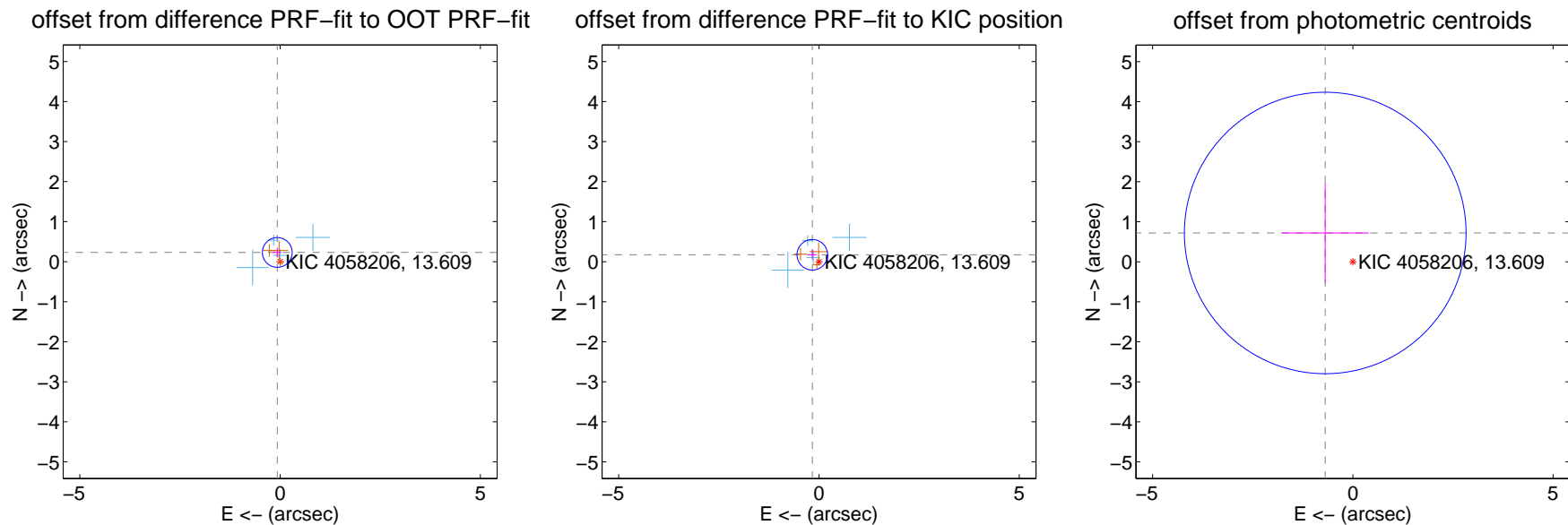
## DV Centroid Data

Supplemental centroid analysis for 004058206-04. Kepler magnitude: 13.61. Transit SNR 9.10

There are 4 quarters with good PRF difference image offsets

The direct PRF centroid is offset from the target star catalog position by about 0.03 arcsec

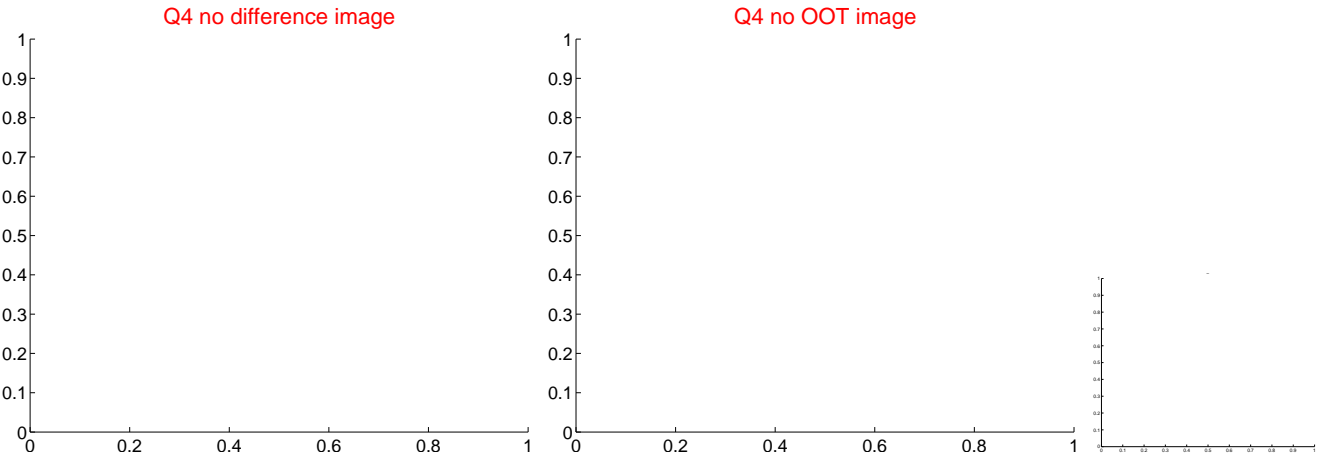
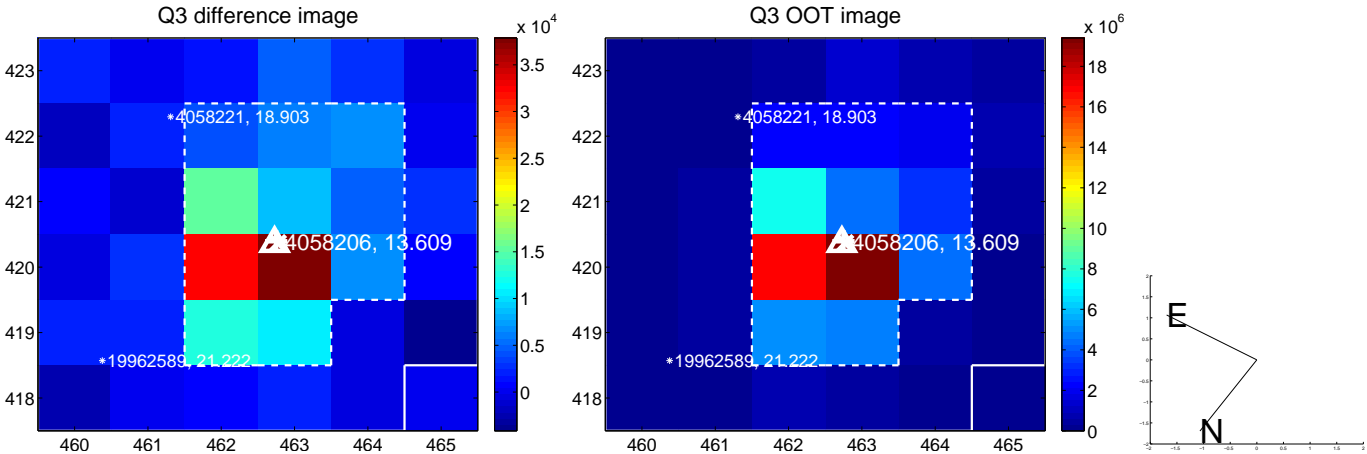
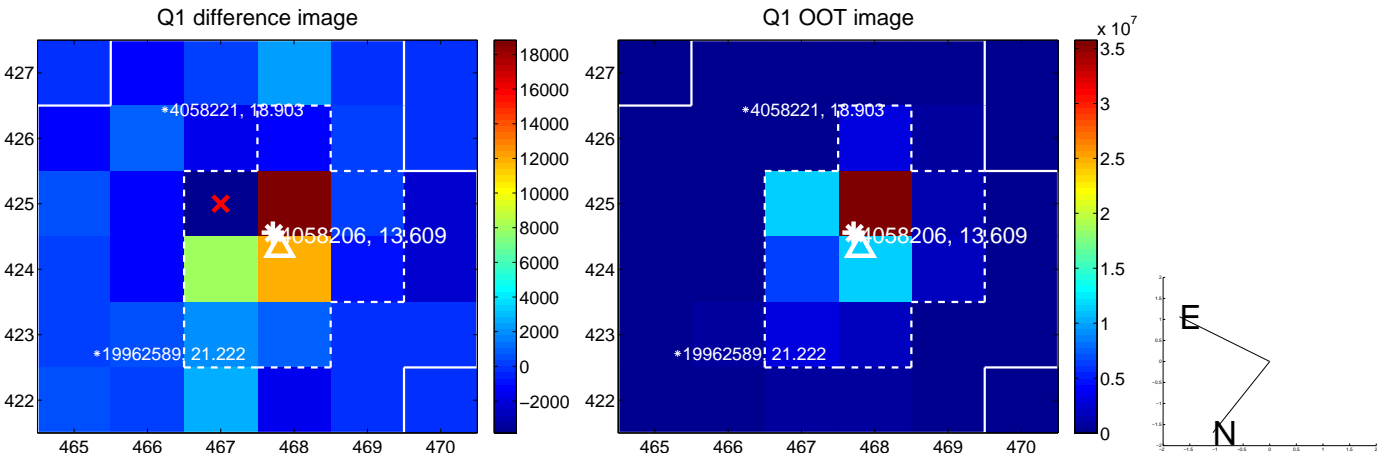
	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.242 \pm 0.124$	1.95	$0.070 \pm 0.107$	$0.231 \pm 0.125$
PRF-fit source offset from KIC position	$0.240 \pm 0.127$	1.88	$0.166 \pm 0.117$	$0.173 \pm 0.136$
photometric centroid source offset	$1.00 \pm 1.17$	0.85	$0.69 \pm 1.09$	$0.72 \pm 1.24$



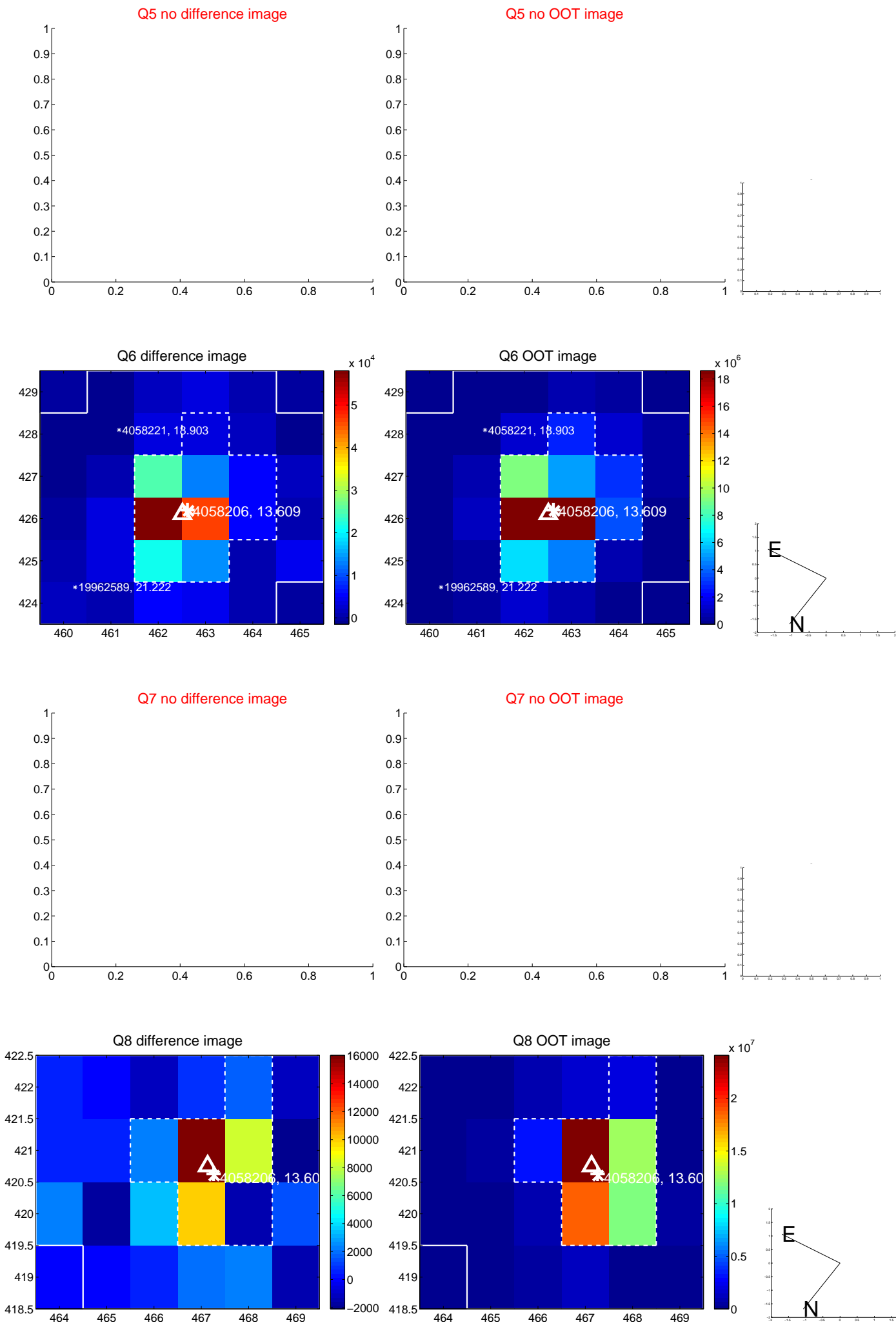
Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets**; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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



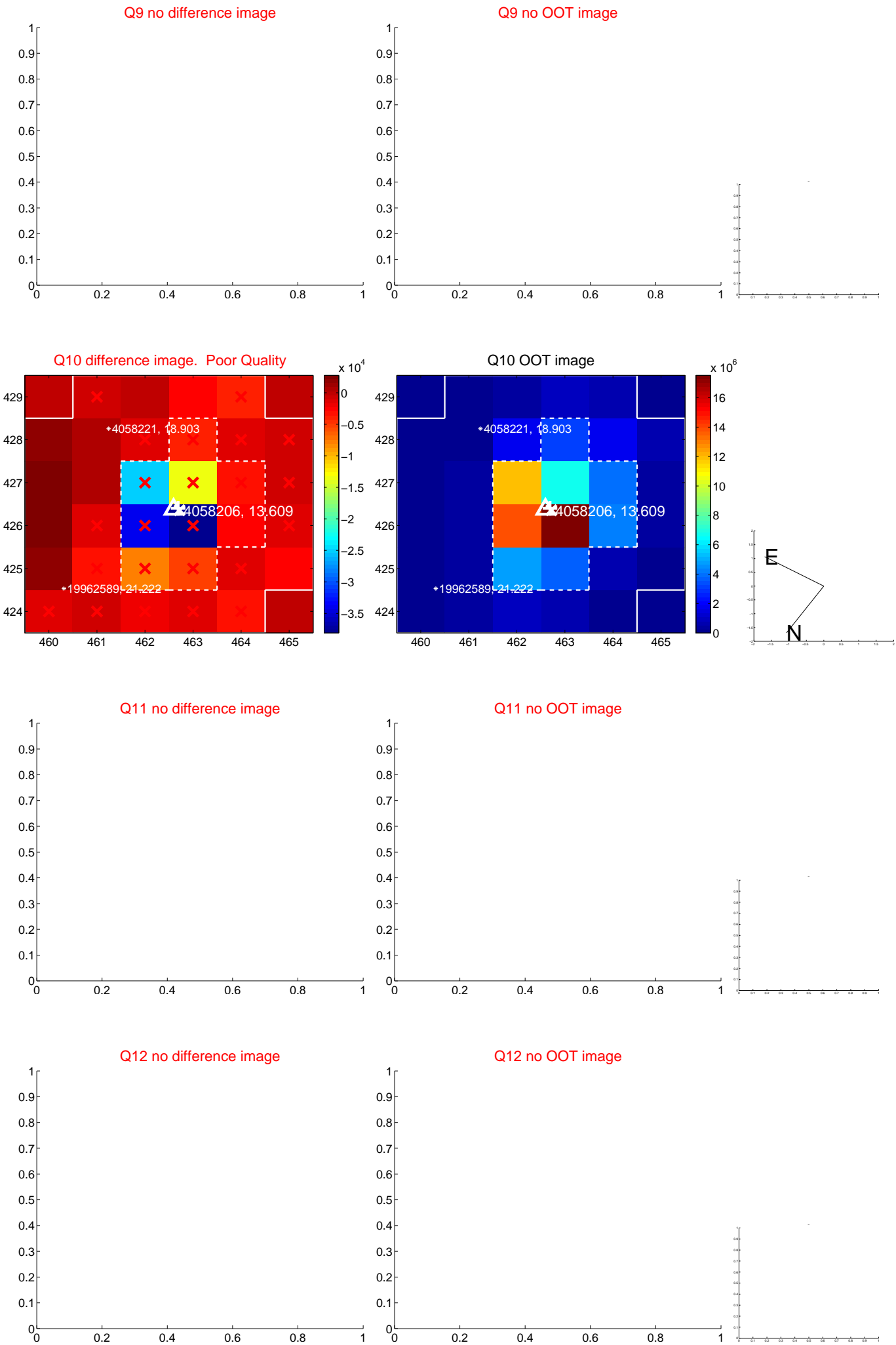
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



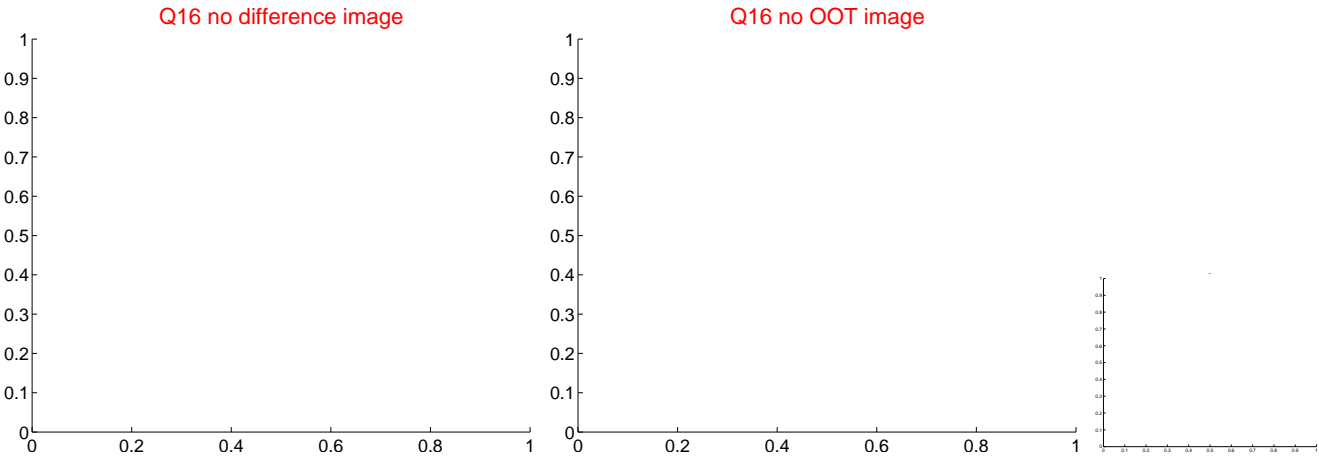
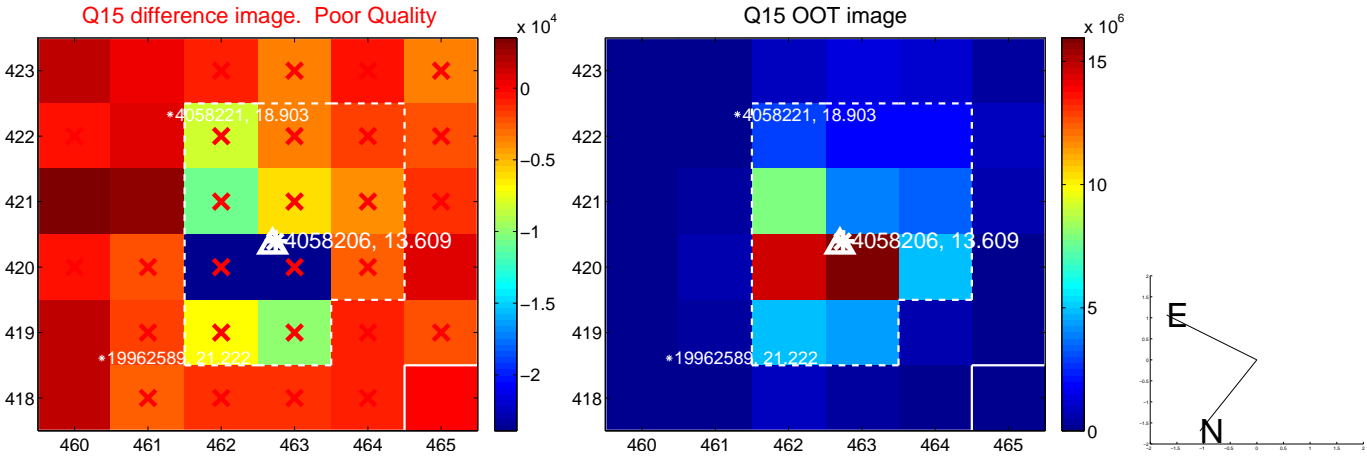
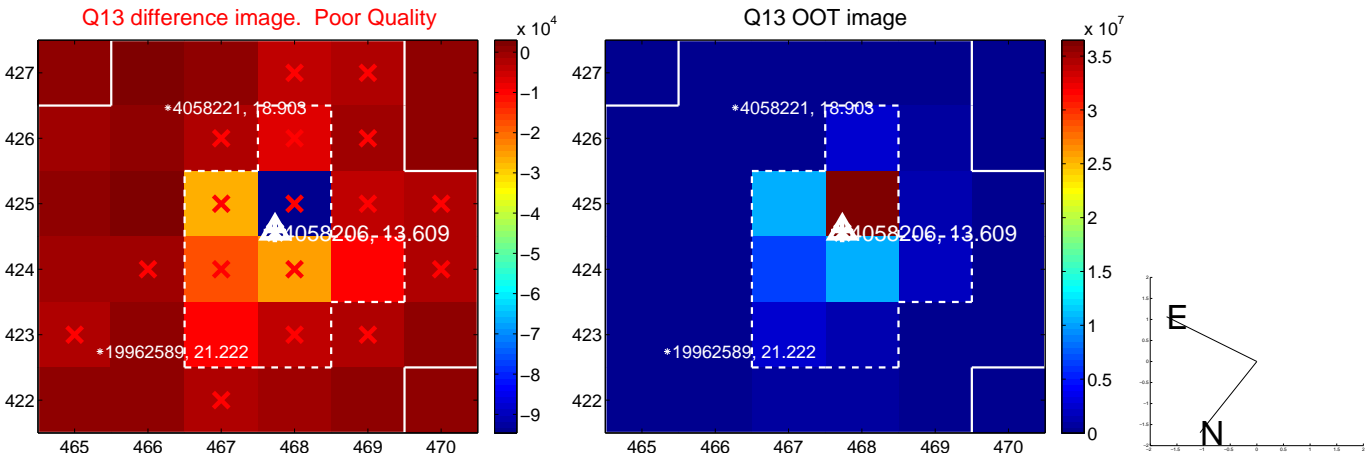
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



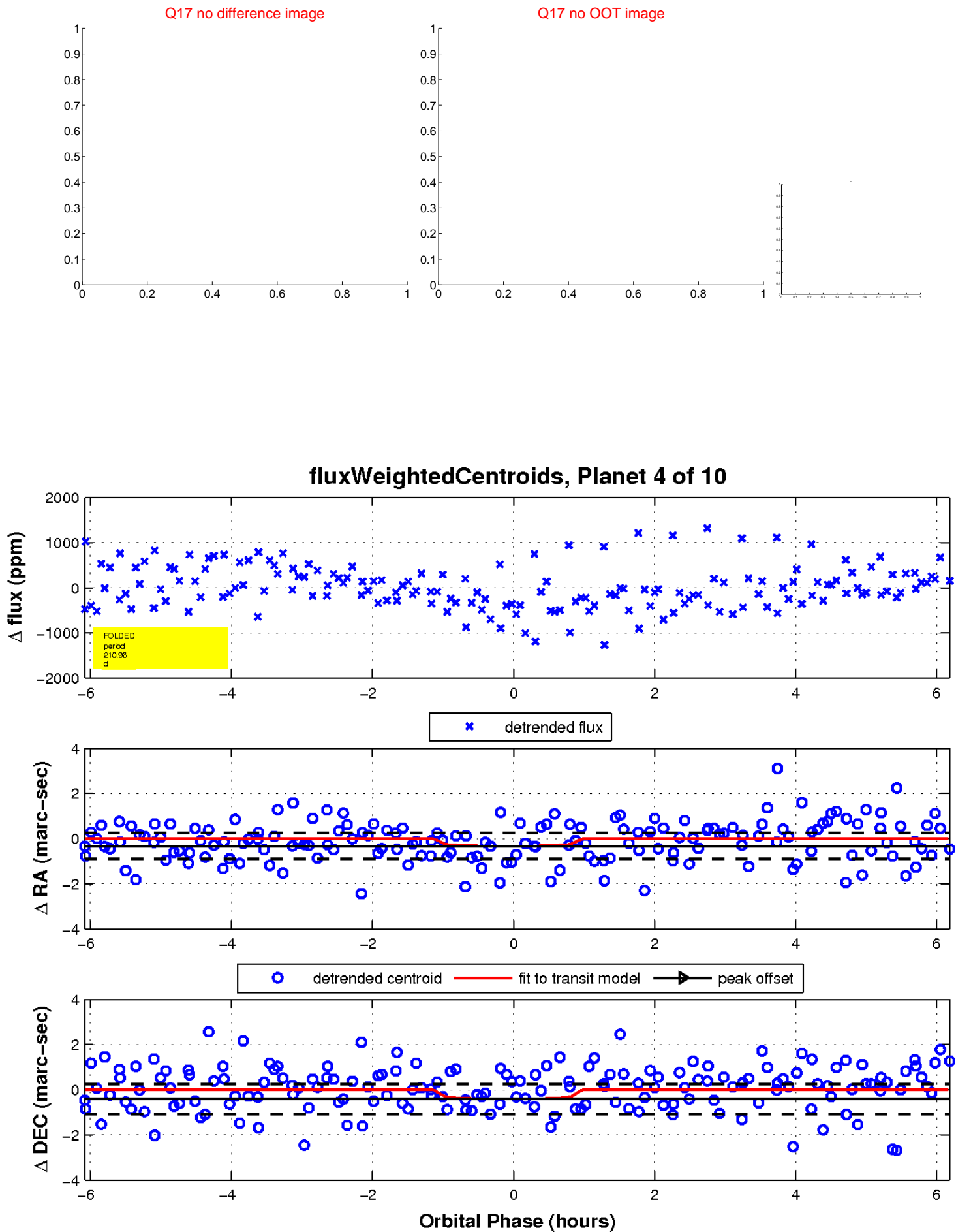
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

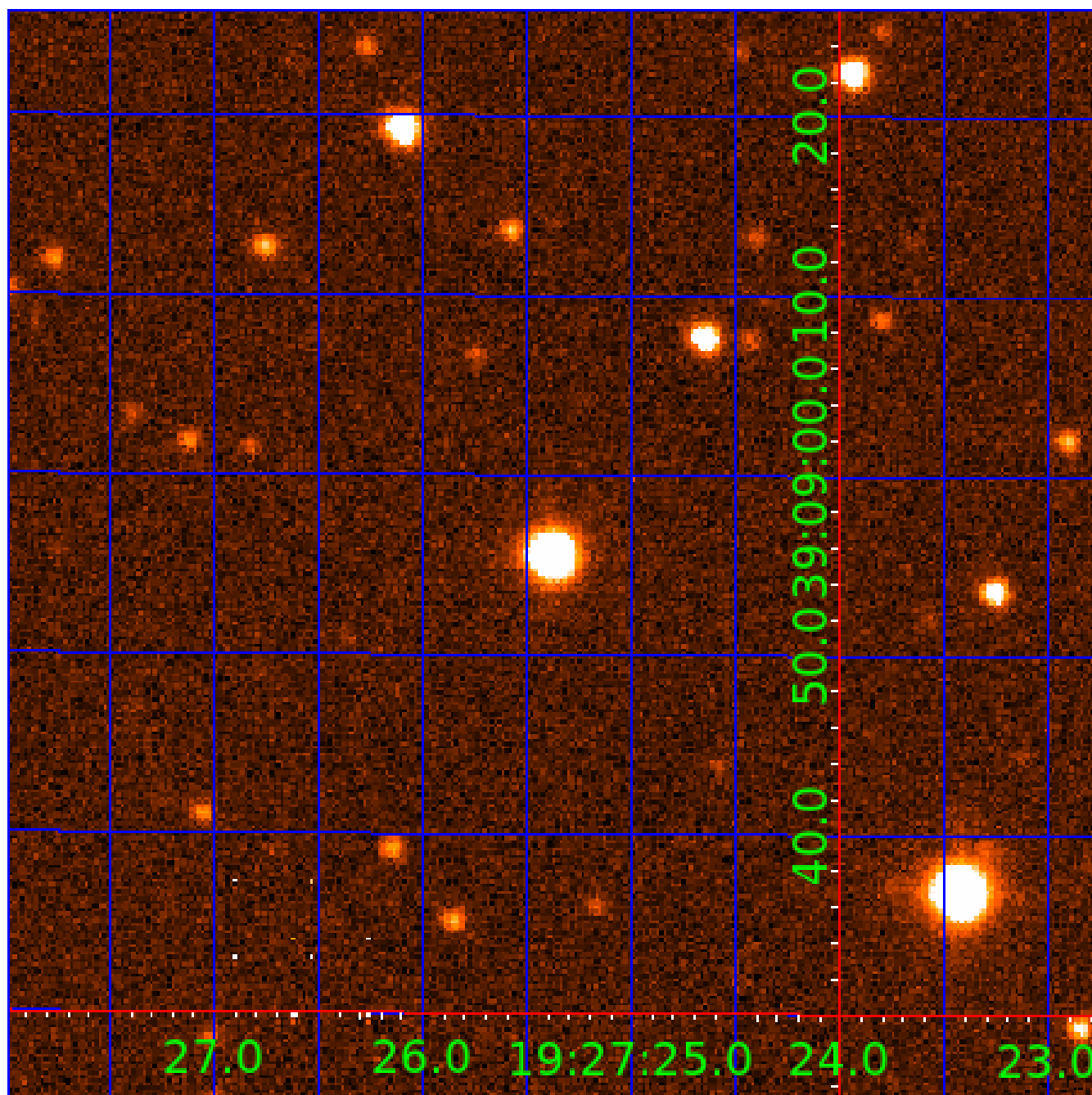


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination



## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
004058206-01	OBS	No	1.757664	133.121771	31.4	12.472	9.0	8.1	1.60	6849	0.93	5123.52
004058206-02	OBS	No	28.167409	133.654156	134.2	2.887	15.8	3.4	1.60	6849	2.16	126.81
004058206-03	OBS	No	28.165022	134.376281	31.7	5.936	15.3	0.8	1.60	6849	1.05	126.82
004058206-04	OBS	No	210.958911	133.974993	516.3	2.065	12.7	9.1	1.60	6849	3.92	8.65
004058206-05	OBS	No	29.540053	139.529398	217.0	6.800	11.4	5.6	1.60	6849	2.75	119.02
004058206-07	OBS	No	35.078211	148.902092	480.5	3.093	9.8	8.4	1.60	6849	3.83	94.64
004058206-08	OBS	No	47.891699	159.457155	501.9	2.608	9.7	8.2	1.60	6849	3.62	62.49
004058206-09	OBS	No	59.344057	134.337160	528.7	4.210	9.8	9.5	1.60	6849	3.81	46.95
004058206-10	OBS	No	38.068267	161.015373	572.3	6.023	9.5	12.0	1.60	6849	6.51	84.87

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
004058206-01	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_ALT
004058206-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_ZUMA_TRACKER—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT
004058206-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_ZUMA_TRACKER—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—SAME_NTL_PERIOD
004058206-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_MARSHALL—TRANS_GAPPED—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS
004058206-05	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT
004058206-07	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_SKYE—TRANS_GAPPED—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT
004058206-08	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV
004058206-09	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_SKYE—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT
004058206-10	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_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](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

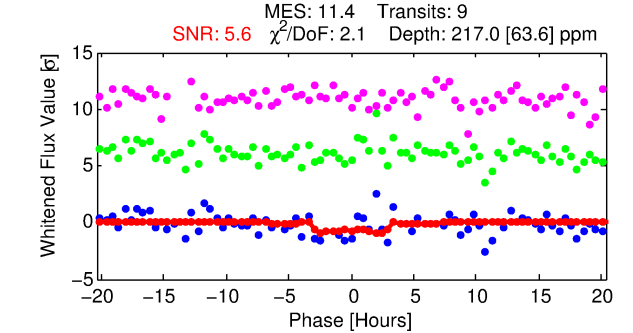
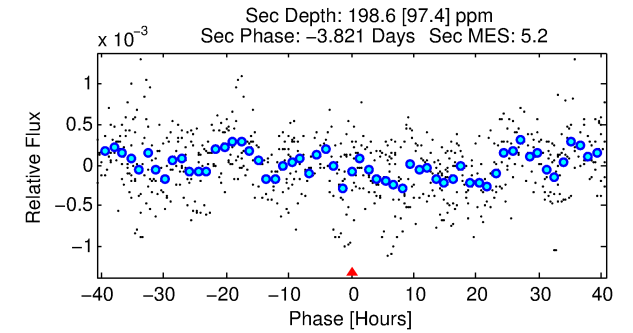
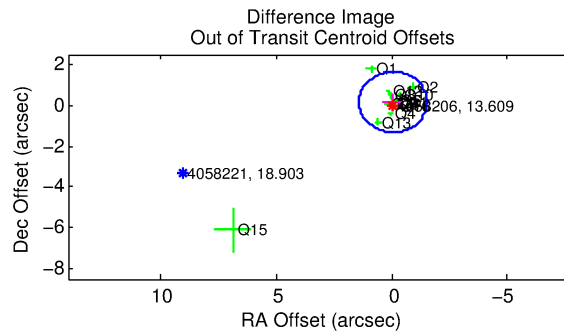
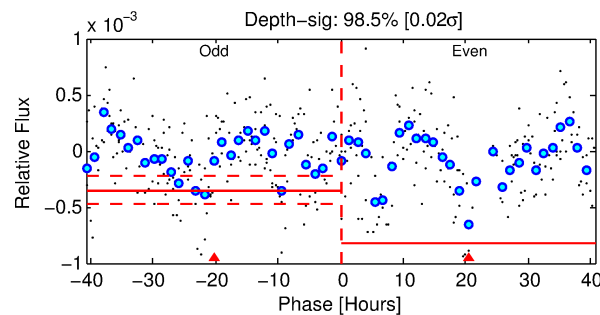
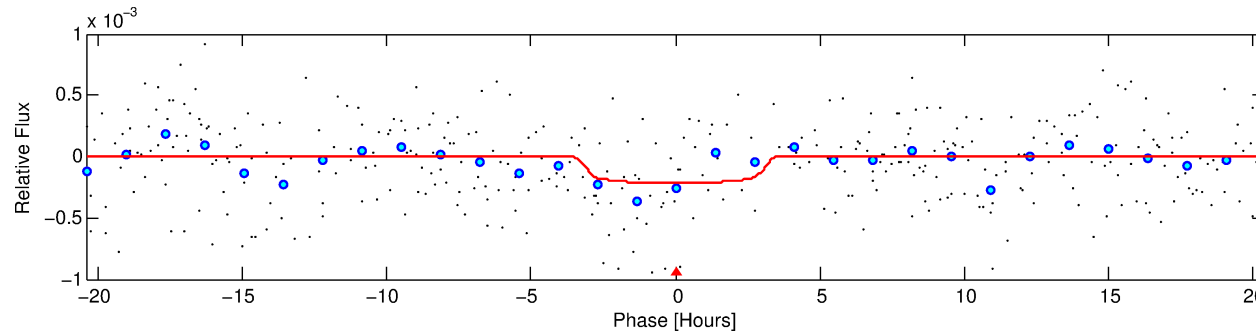
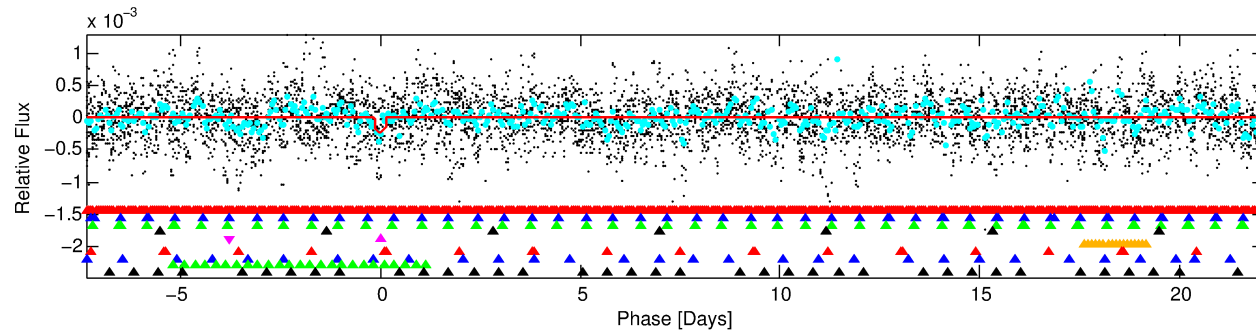
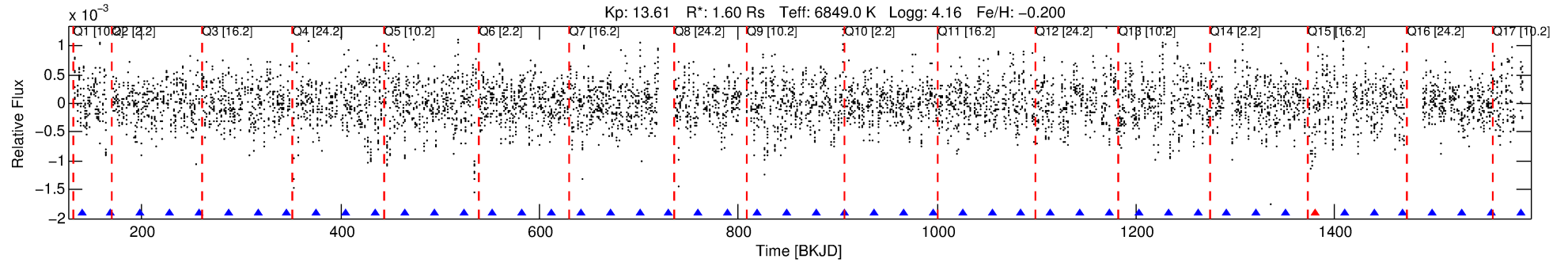
Ephemeris Match Information For 004058206-05

No Significant Match Found



# DV One-Page Summary

KIC: 4058206 Candidate: 5 of 10 Period: 29.540 d



## DV Fit Results:

Period = 29.54005 [0.00140] d  
Epoch = 139.5294 [0.0398] BKJD  
Rp/R\* = 0.0157 [0.0059]  
a/R\* = 15.55 [30.10]  
b = 0.90 [0.41]  
Seff = 119.01 [47.22]  
Teff = 842 [84] K  
Rp = 2.75 [1.36] Re  
a = 0.2059 [0.0538] AU  
Ag = 615.00 [595.90] [1.03 $\sigma$ ]  
Teffp = 6485 [1475] K [3.82 $\sigma$ ]

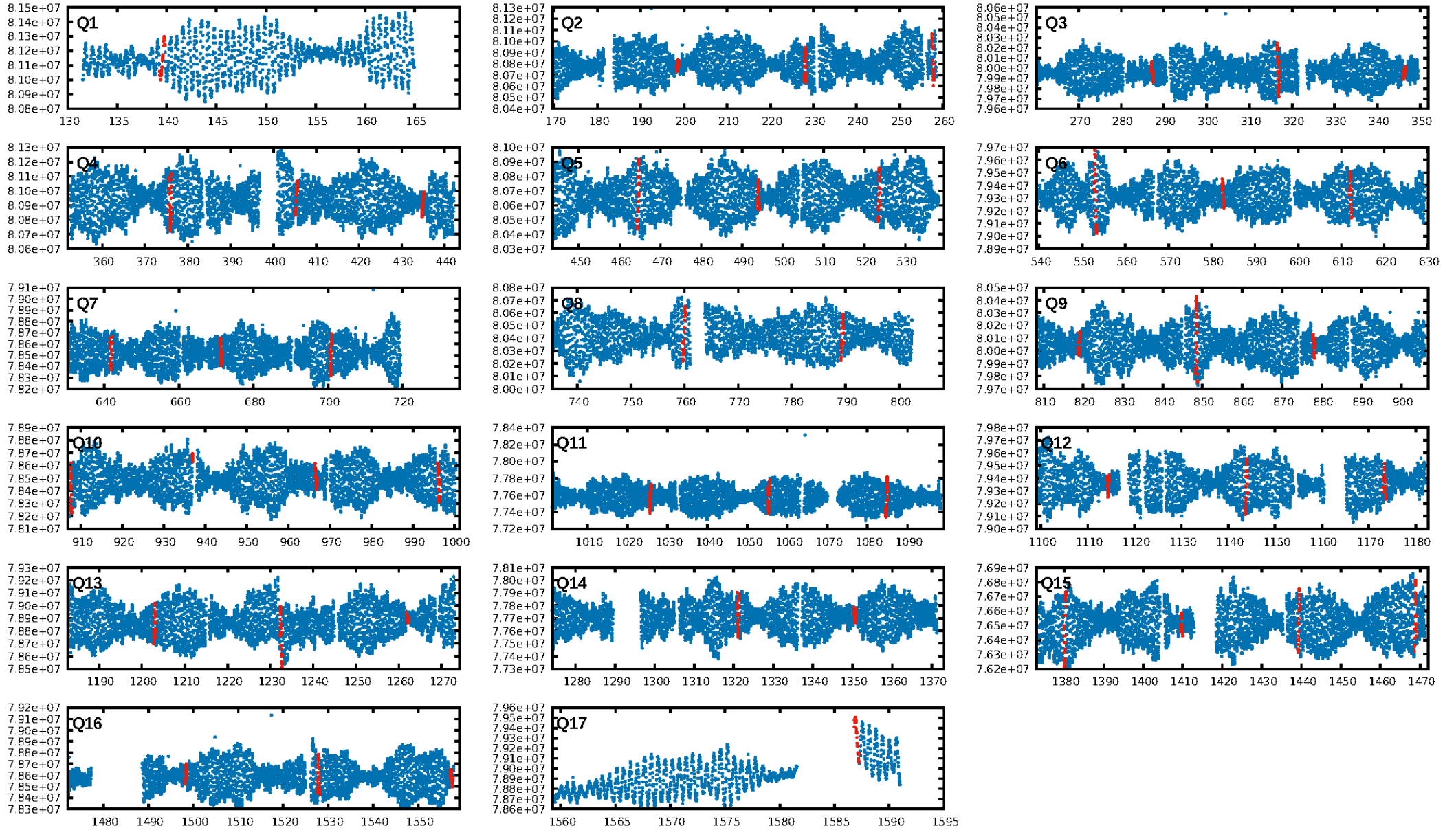
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [4.46 $\sigma$ ]  
LongPeriod-sig: 100.0% [17.79 $\sigma$ ]  
ModelChiSquare2-sig: 0.0%  
ModelChiSquareGof-sig: 99.9%  
Bootstrap-pfa: 4.11e-18  
RollingBand-fgt: 0.89 [8/9]  
GhostDiagnostic-chr: -1.023  
Centroid-sig: 0.5%  
Centroid-so: 1.081 arcsec [1.60 $\sigma$ ]  
OotOffset-rm: 0.169 arcsec [0.34 $\sigma$ ]  
KicOffset-rm: 0.119 arcsec [0.52 $\sigma$ ]  
OotOffset-st: 4/4/4/4 [16]  
KicOffset-st: 4/4/4/4 [16]  
DiffImageQuality-fgm: 0.44 [7/16]  
DiffImageOverlap-fno: 0.06 [1/16]

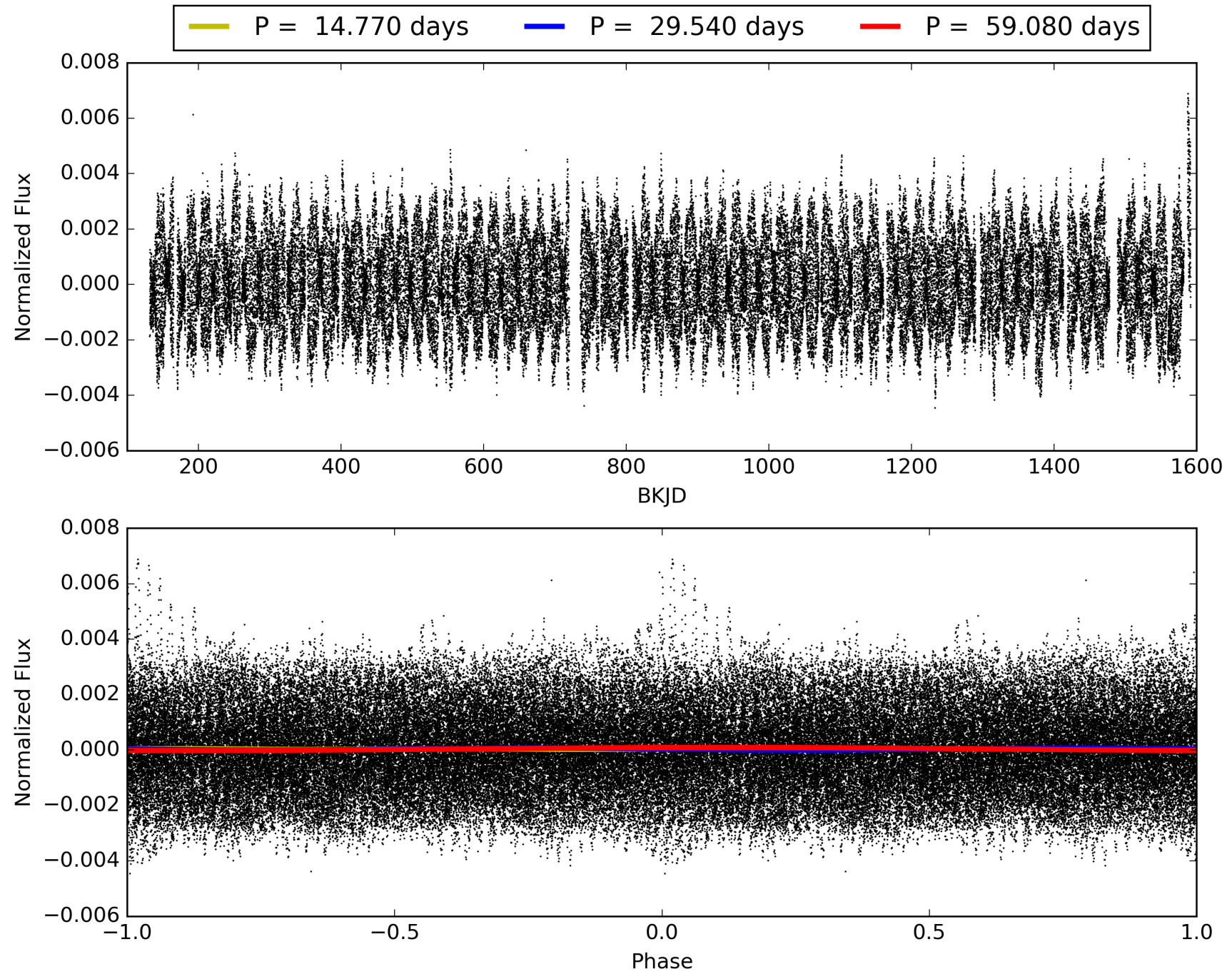
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 01-Feb-2016 03:22:12 Z

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

# TCE 004058206-05, PDC Light Curves

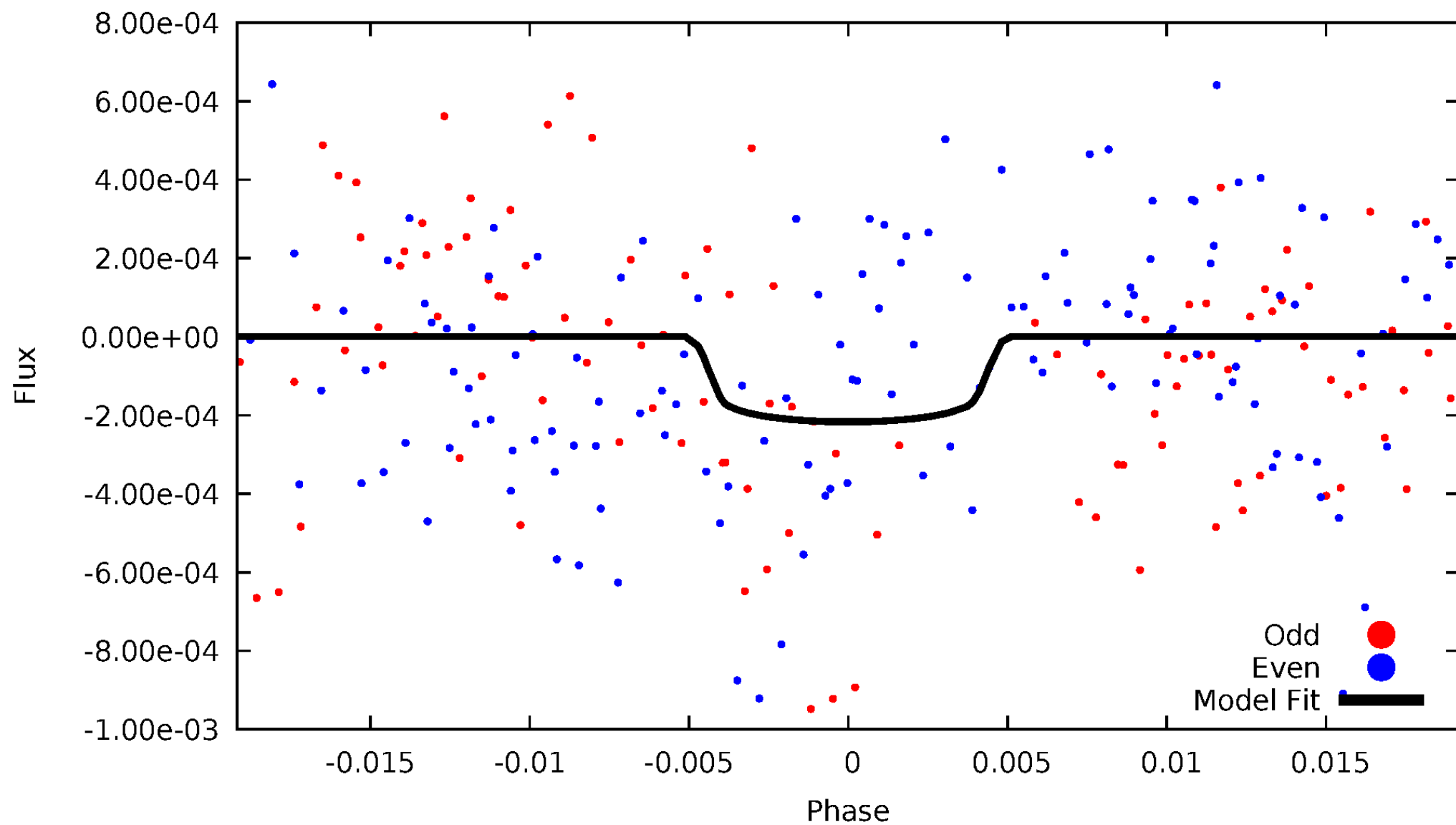


TCE 004058206-05



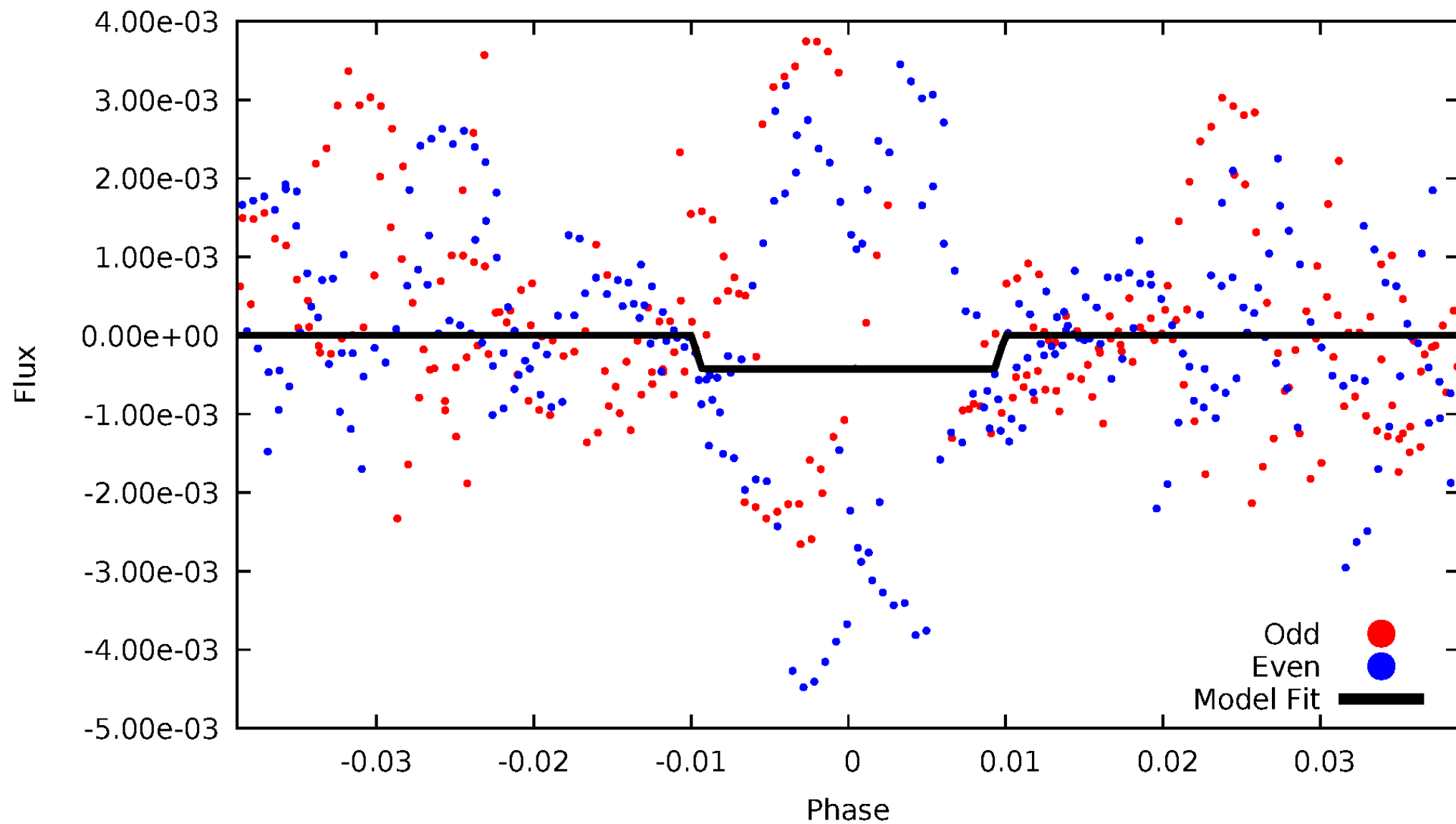
# DV Odd/Even

TCE 004058206-05



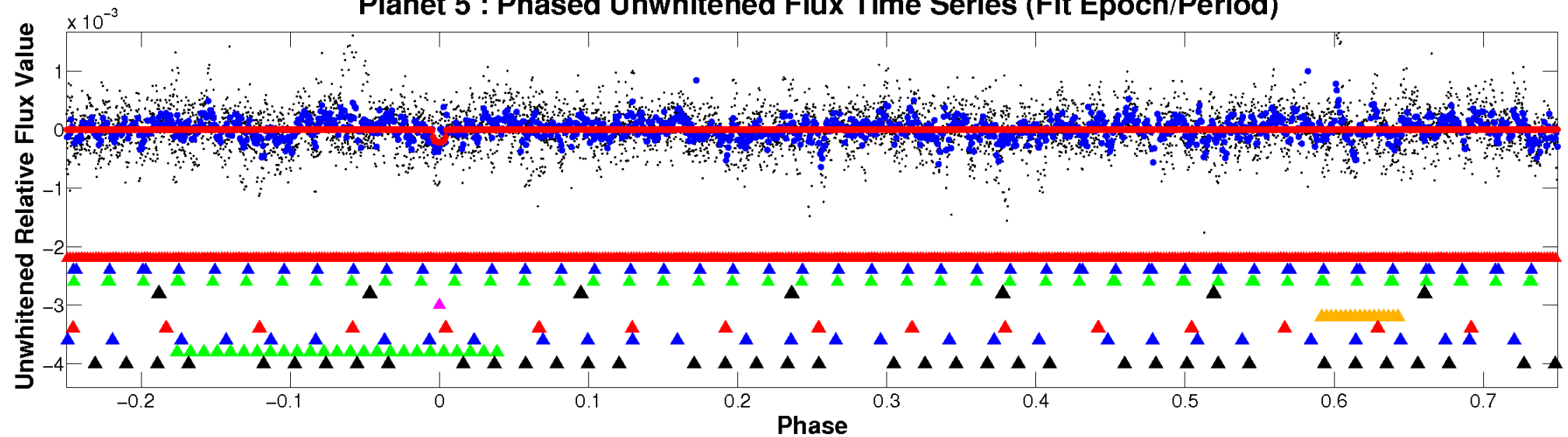
# ALT Odd/Even

TCE 004058206-05

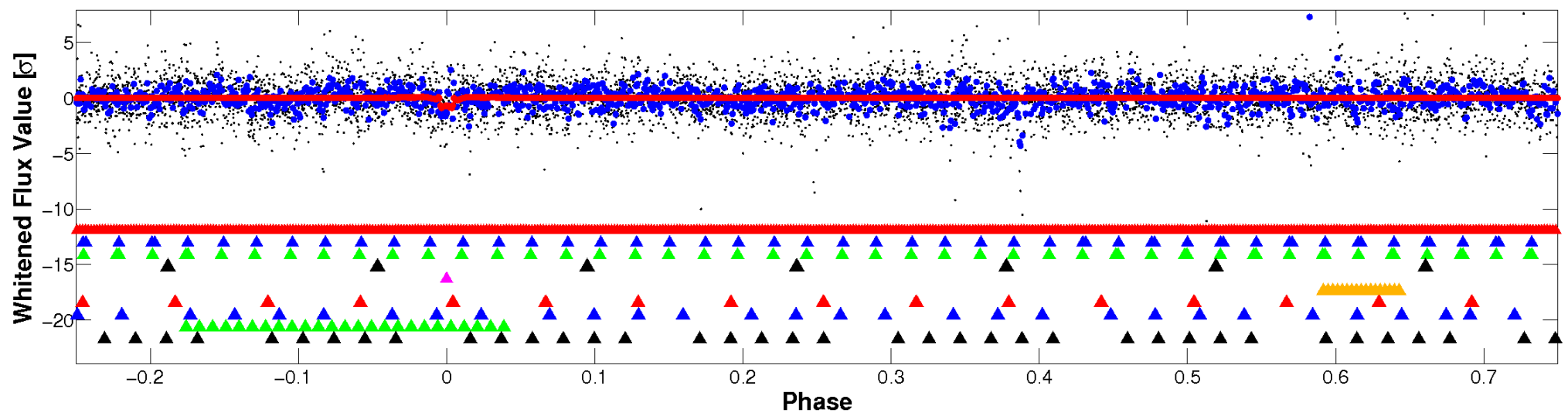


# Non-Whitened Vs. Whitened Light Curve

## Planet 5 : Phased Unwhitened Flux Time Series (Fit Epoch/Period)



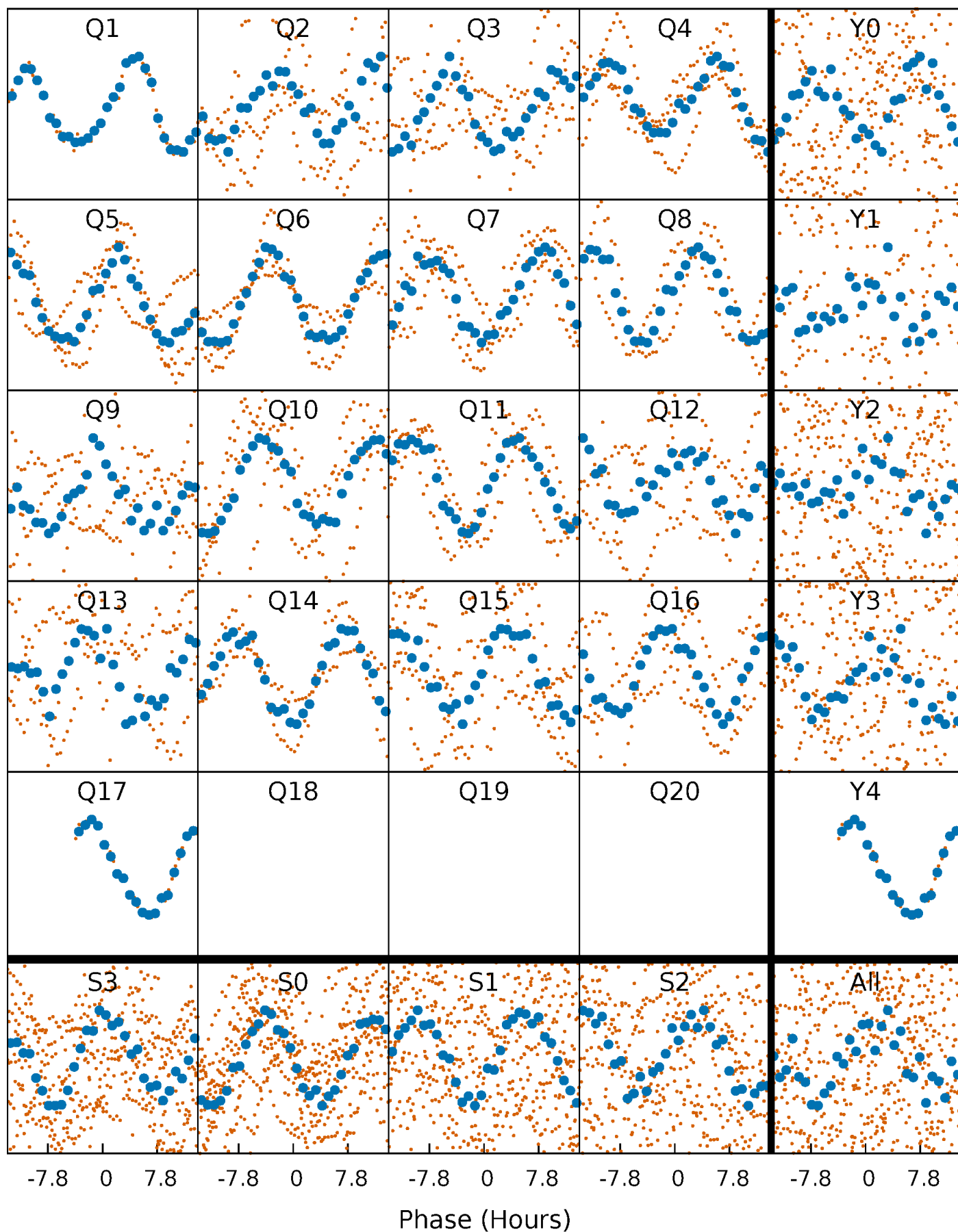
## Planet 5 : Phased Whitened Flux Time Series (Fit Epoch/Period)





# PDC Quarter-Phased Transit Curves

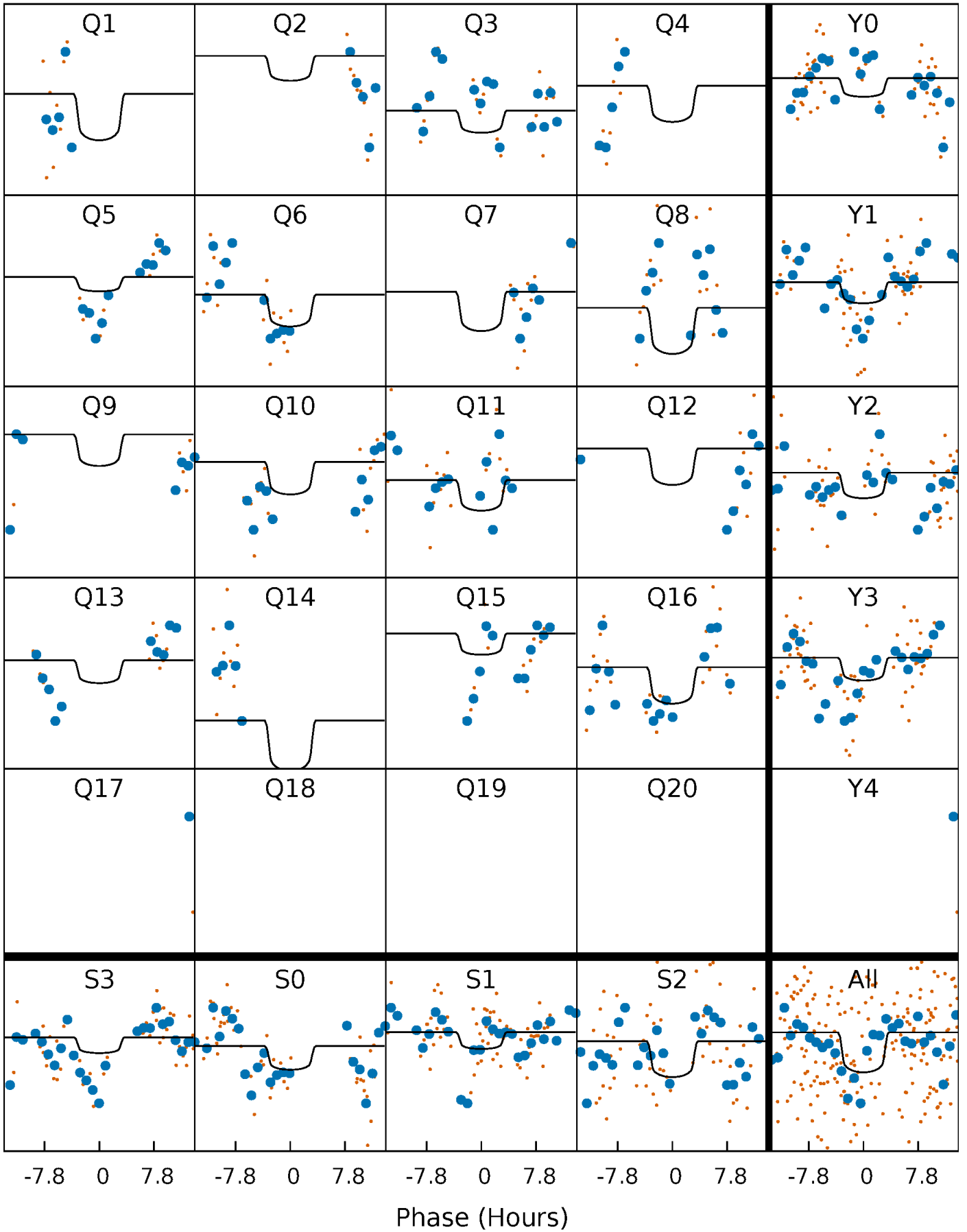
TCE 004058206-05    P= 29.540053 Days     $T_0=139.529398$  (BKJD)





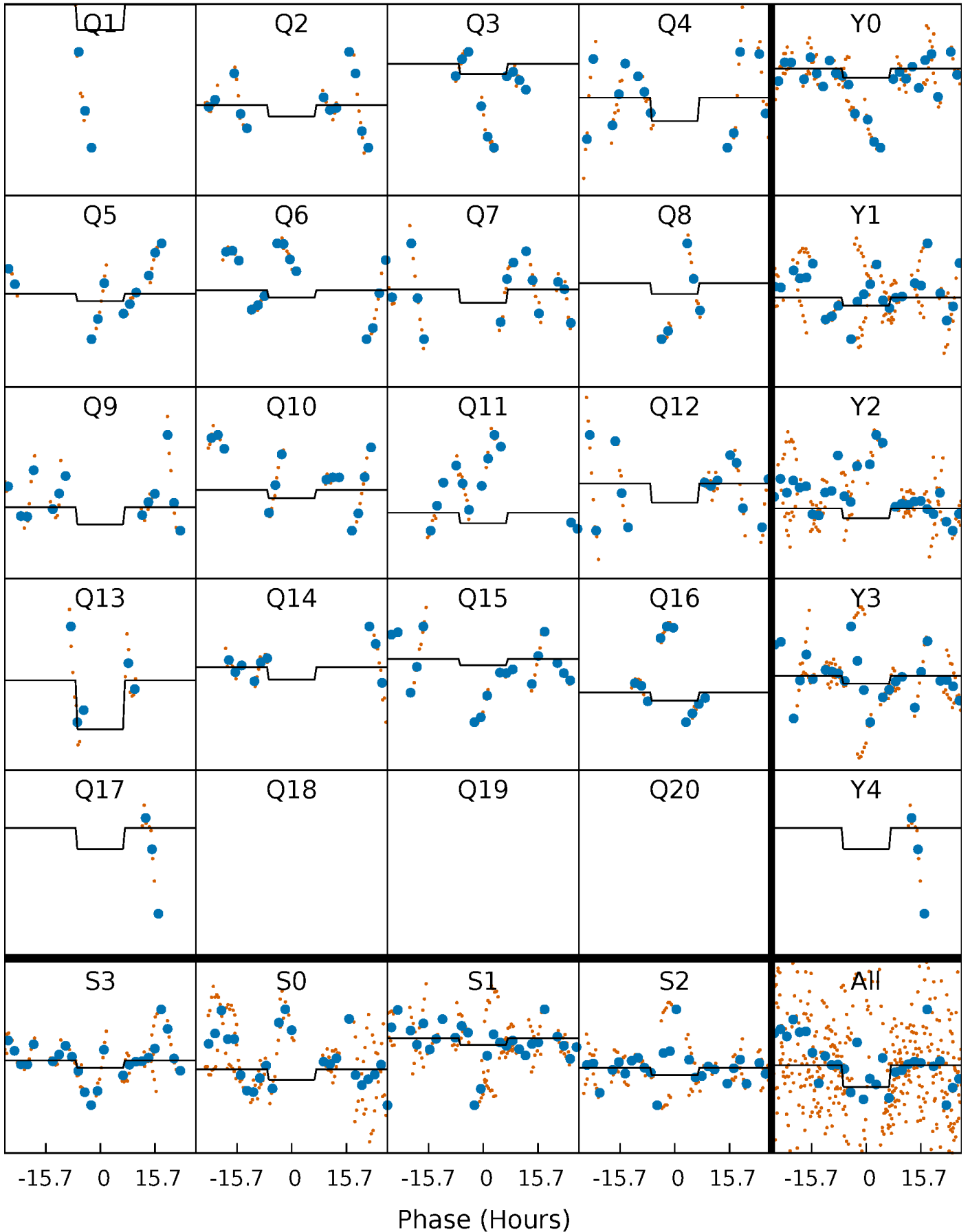
# DV Quarter-Phased Transit Curves

TCE 004058206-05     $P = 29.540053$  Days     $T_0 = 139.529398$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

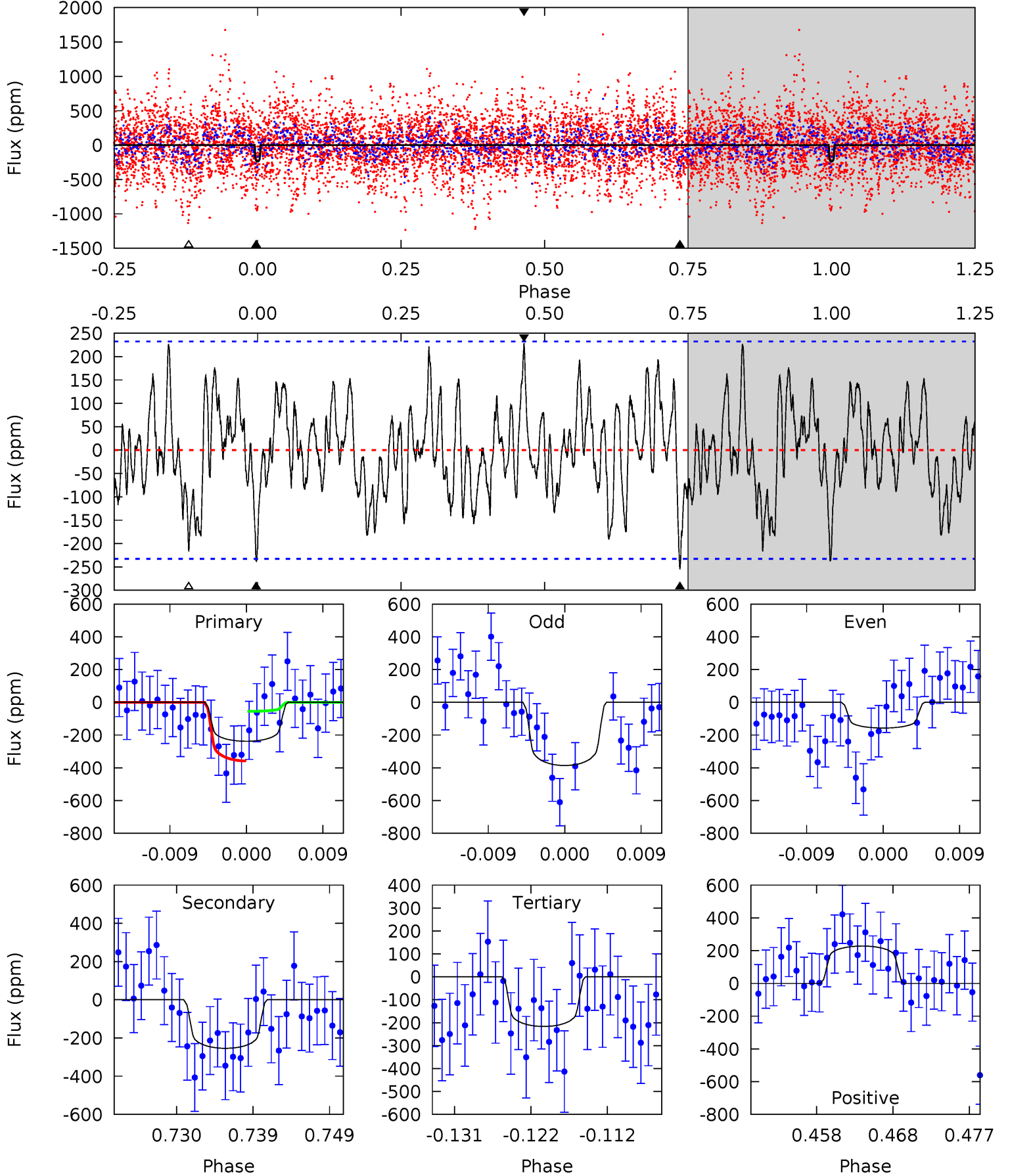
TCE 004058206-05     $P = 29.540979$  Days     $T_0 = 139.492272$  (BKJD)



# DV Model-Shift Uniqueness Test

004058206-05, P = 29.540053 Days, E = 109.989345 Days

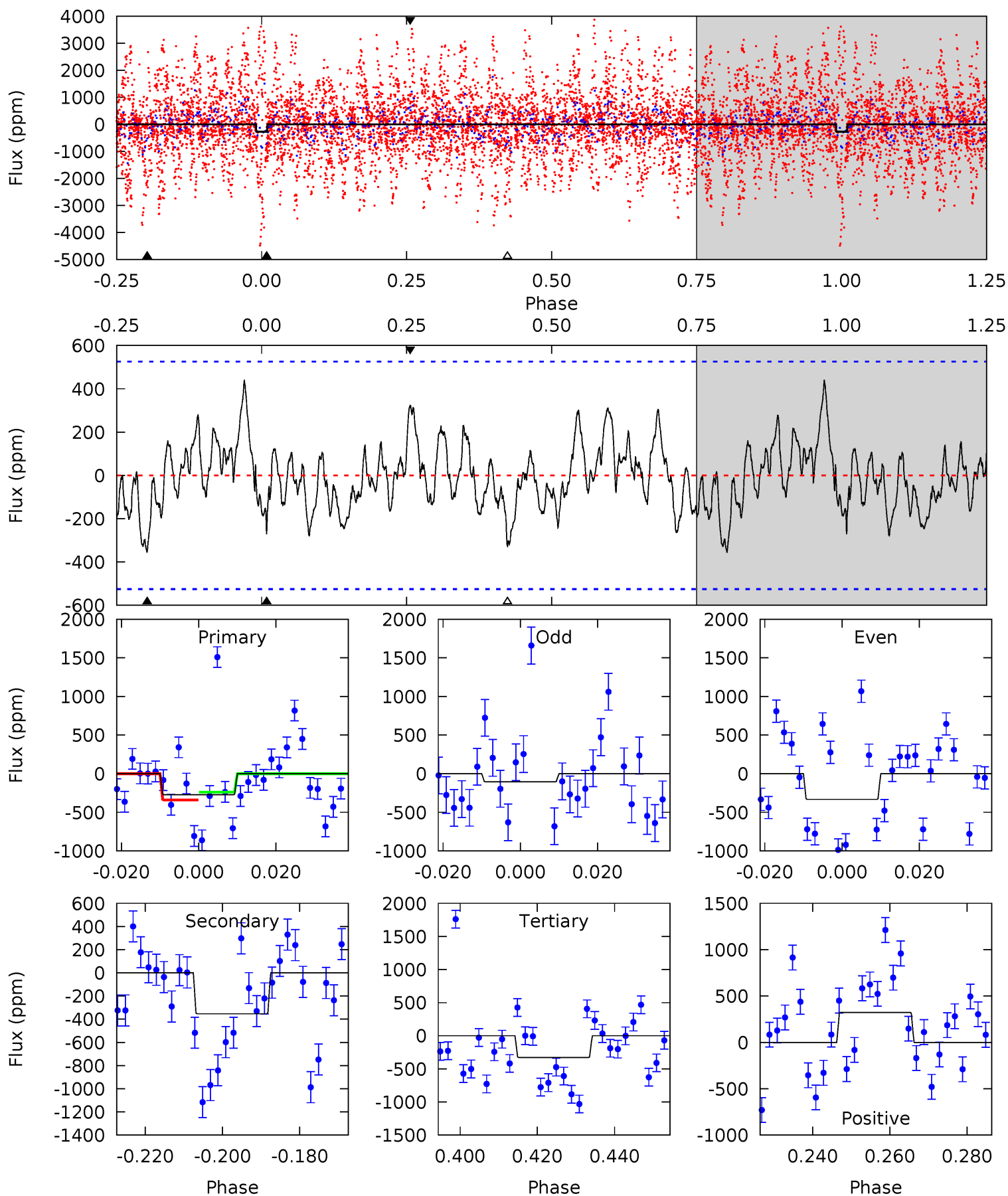
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
5.16	5.51	4.69	4.94	5.04	2.60	1.84	0.47	0.22	0.82	0.57	2.31	0.77	0.47	3.24



# Alt Model-Shift Uniqueness Test

004058206-05, P = 29.540979 Days, E = 109.951293 Days

Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
2.52	3.29	3.06	3.00	4.89	2.33	1.27	-0.54	-0.48	0.24	0.29	1.05	0.52	0.55	0.46



### Stellar Parameters For KIC 004058206

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$6849^{+190}_{-262}$	$4.155^{+0.158}_{-0.193}$	$-0.200^{+0.250}_{-0.300}$	$1.600^{+0.516}_{-0.387}$	$1.345^{+0.189}_{-0.231}$	$0.462^{+0.435}_{-0.221}$
	+3%/-4%	+4%/-5%	+125%/-150%	+32%/-24%	+14%/-17%	+94%/-48%
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 004058206-05 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-254 \pm 46$	$2.87^{+1.23}_{-1.21}$	$1184^{+86}_{-83}$	$6728^{+2368}_{-995}$	$708^{+1255}_{-359}$
Alt.	$-354 \pm 107$	$3.63^{+1.21}_{-1.14}$	$1180^{+91}_{-79}$	$6501^{+1617}_{-931}$	$607^{+777}_{-300}$

$T_{max}$  = 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

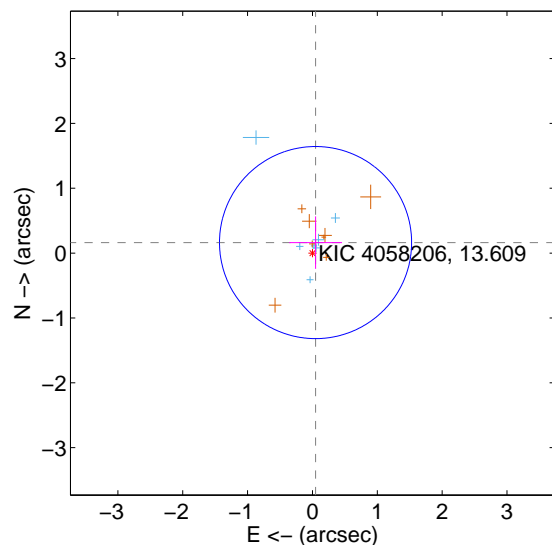
Supplemental centroid analysis for 004058206-05. Kepler magnitude: 13.61. Transit SNR 5.55

There are 7 quarters with good PRF difference image offsets

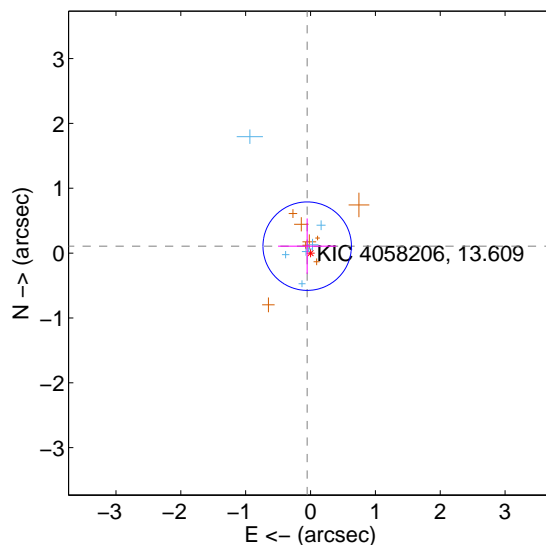
The direct PRF centroid is offset from the target star catalog position by about 0.14 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.169 \pm 0.494$	0.34	$-0.048 \pm 0.408$	$0.162 \pm 0.405$
PRF-fit source offset from KIC position	$0.119 \pm 0.227$	0.52	$0.051 \pm 0.450$	$0.107 \pm 0.426$
photometric centroid source offset	$1.08 \pm 0.68$	1.60	$-0.15 \pm 0.57$	$1.07 \pm 0.68$

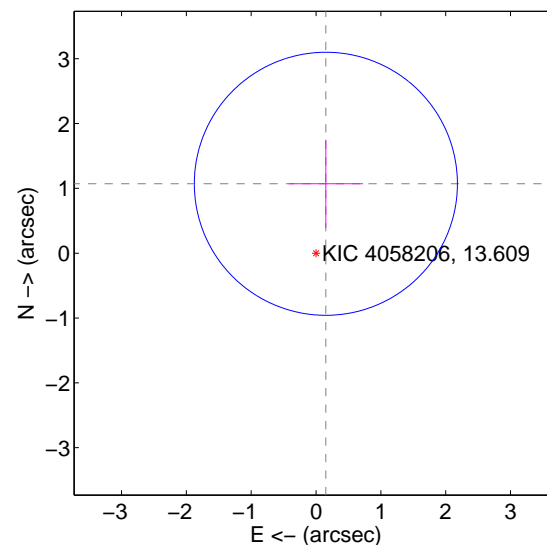
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position

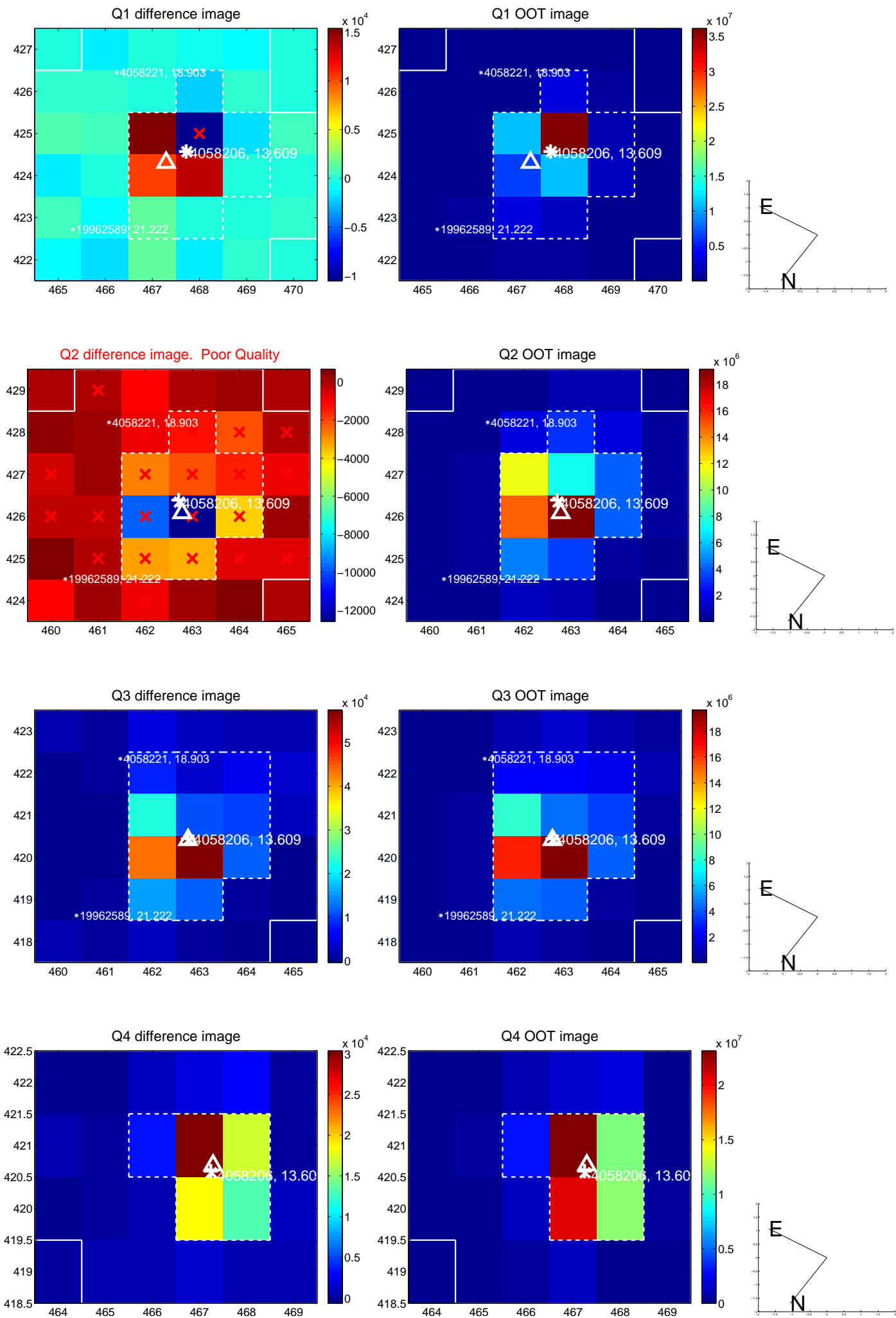


offset from photometric centroids



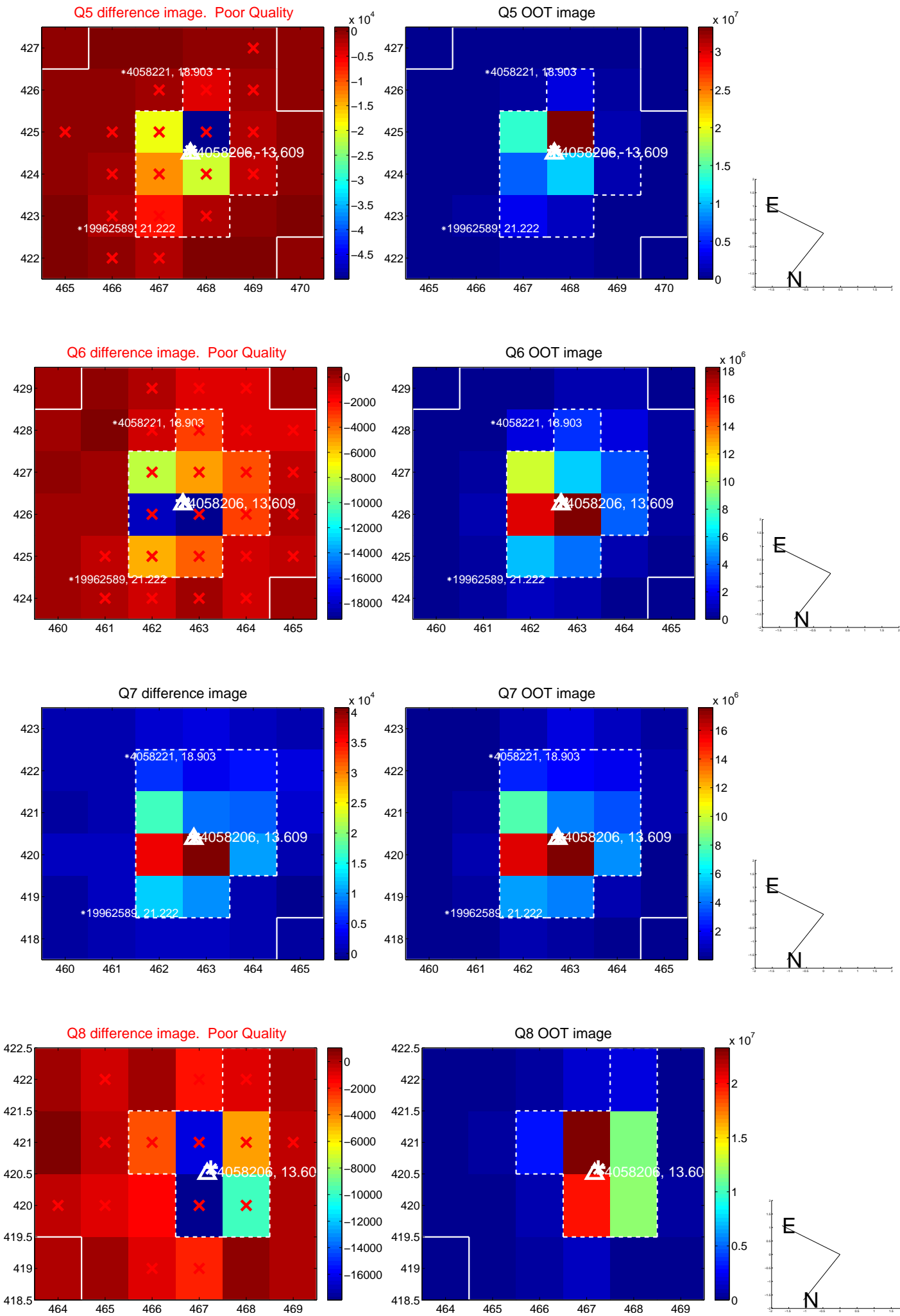
Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets**; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

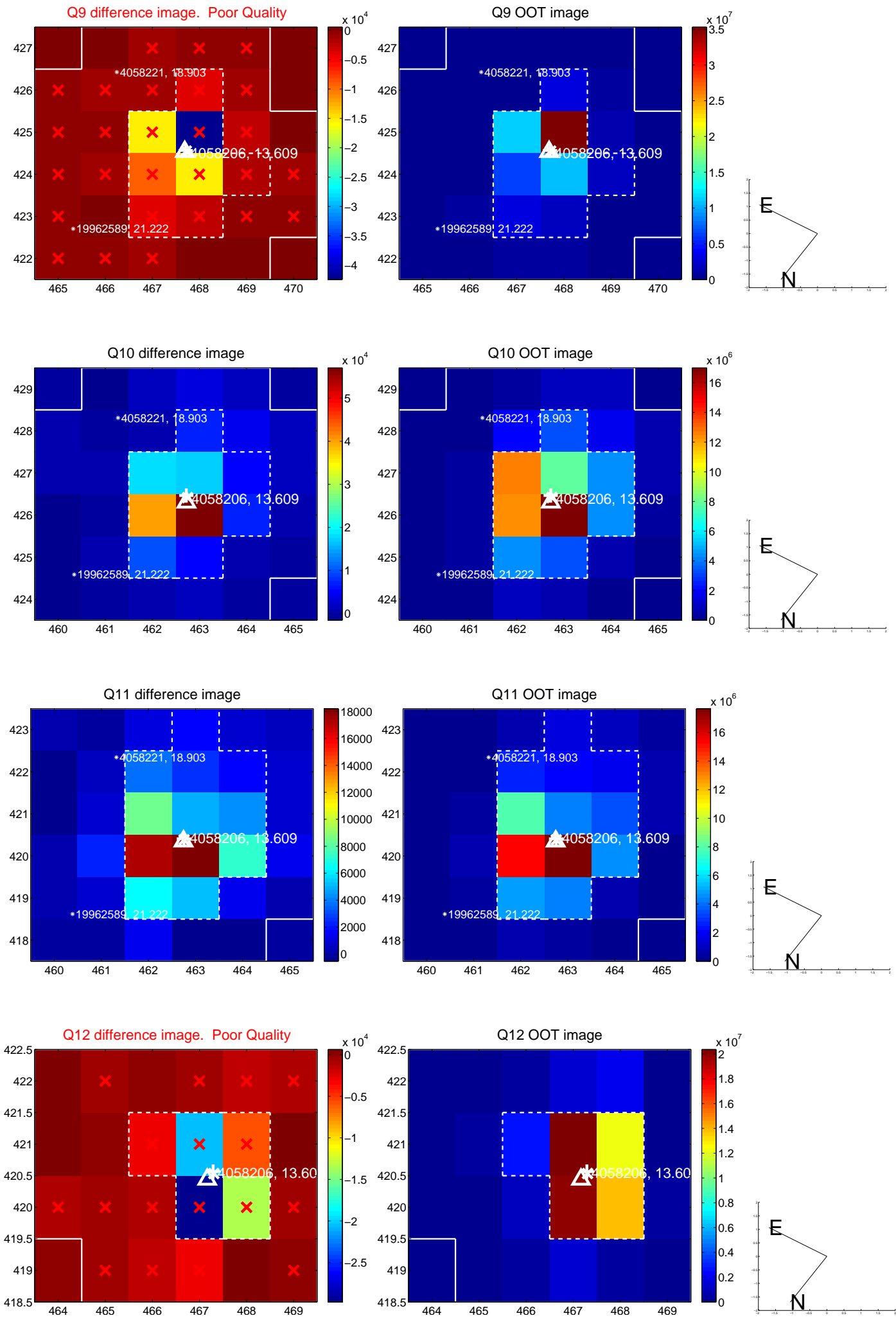




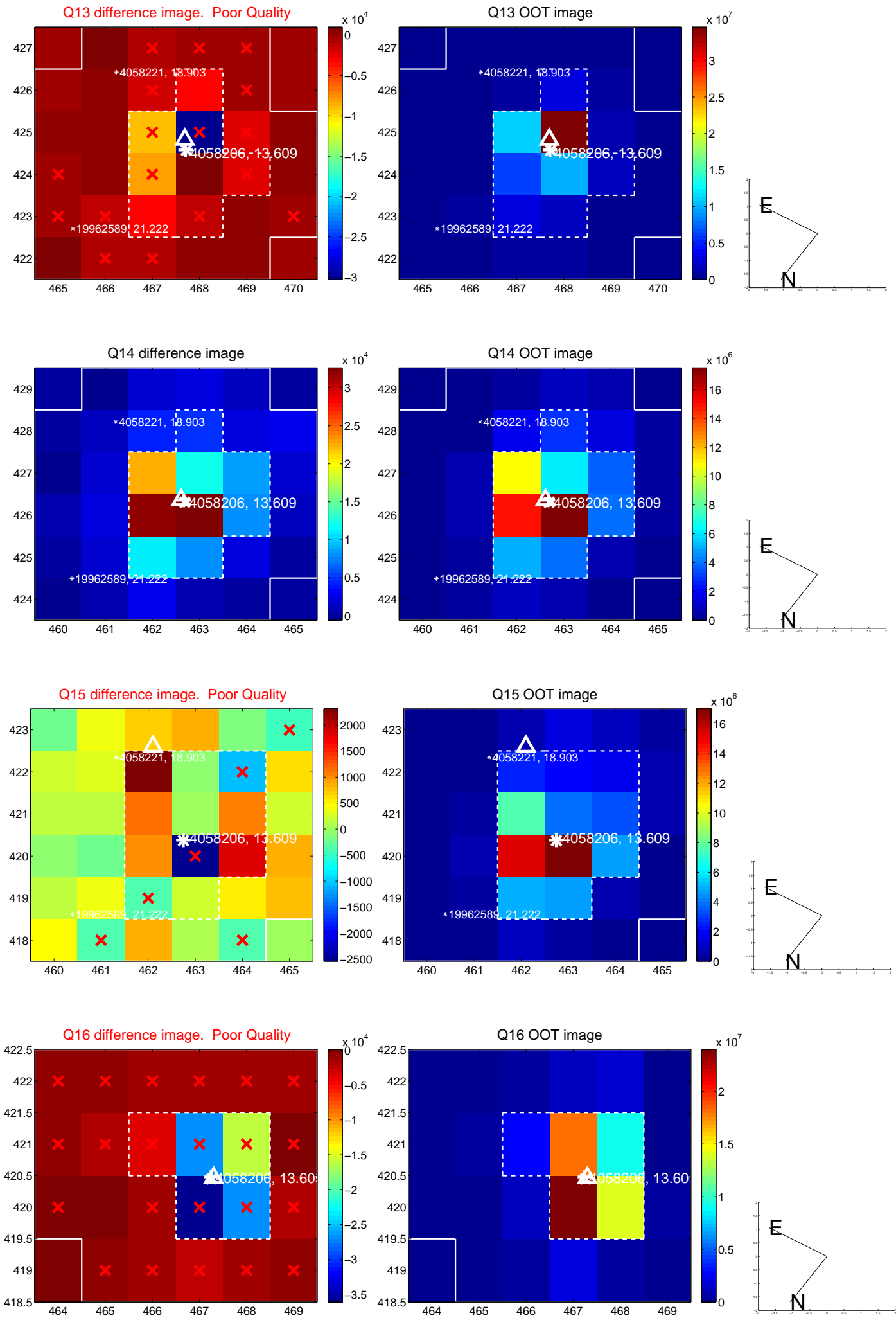
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



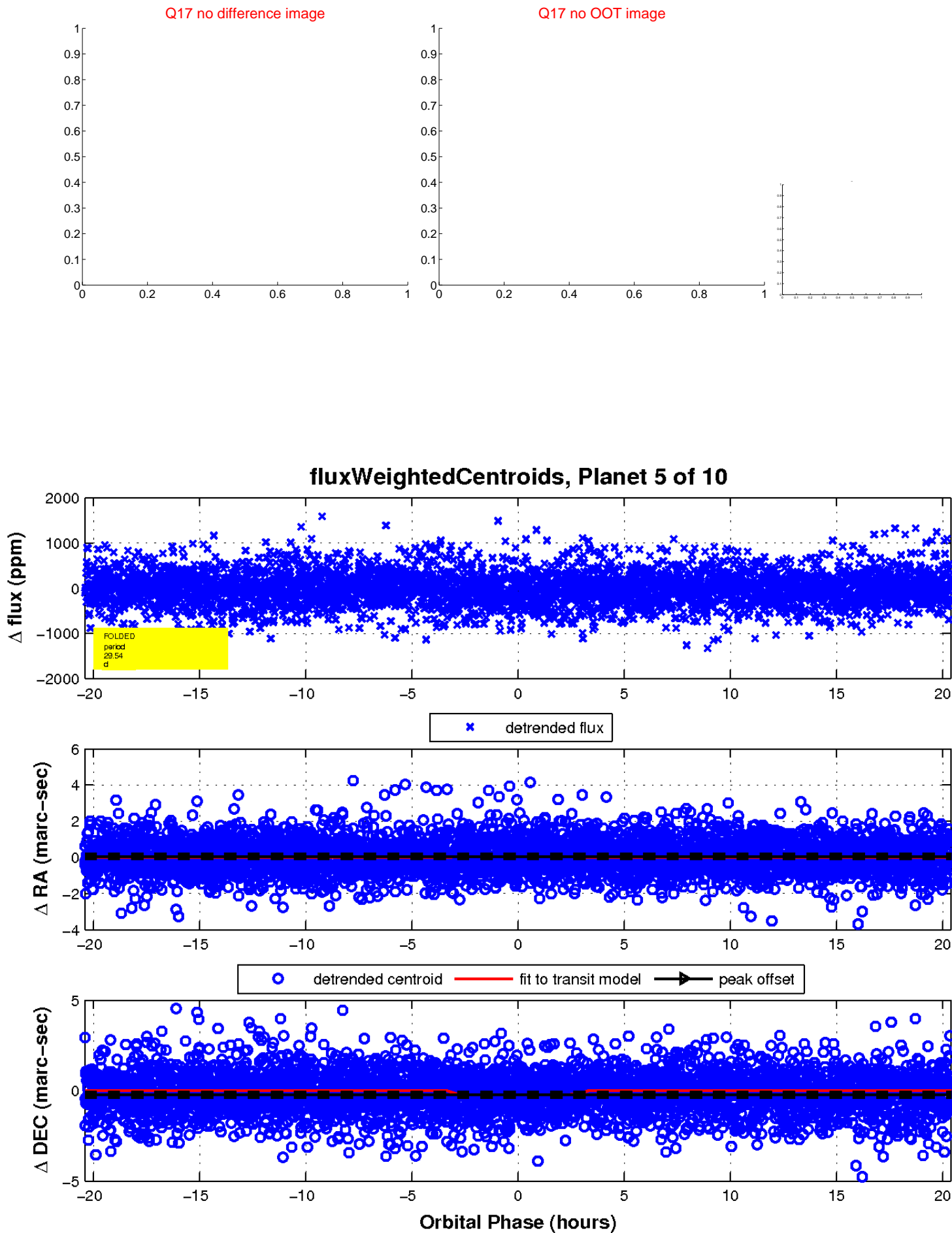
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

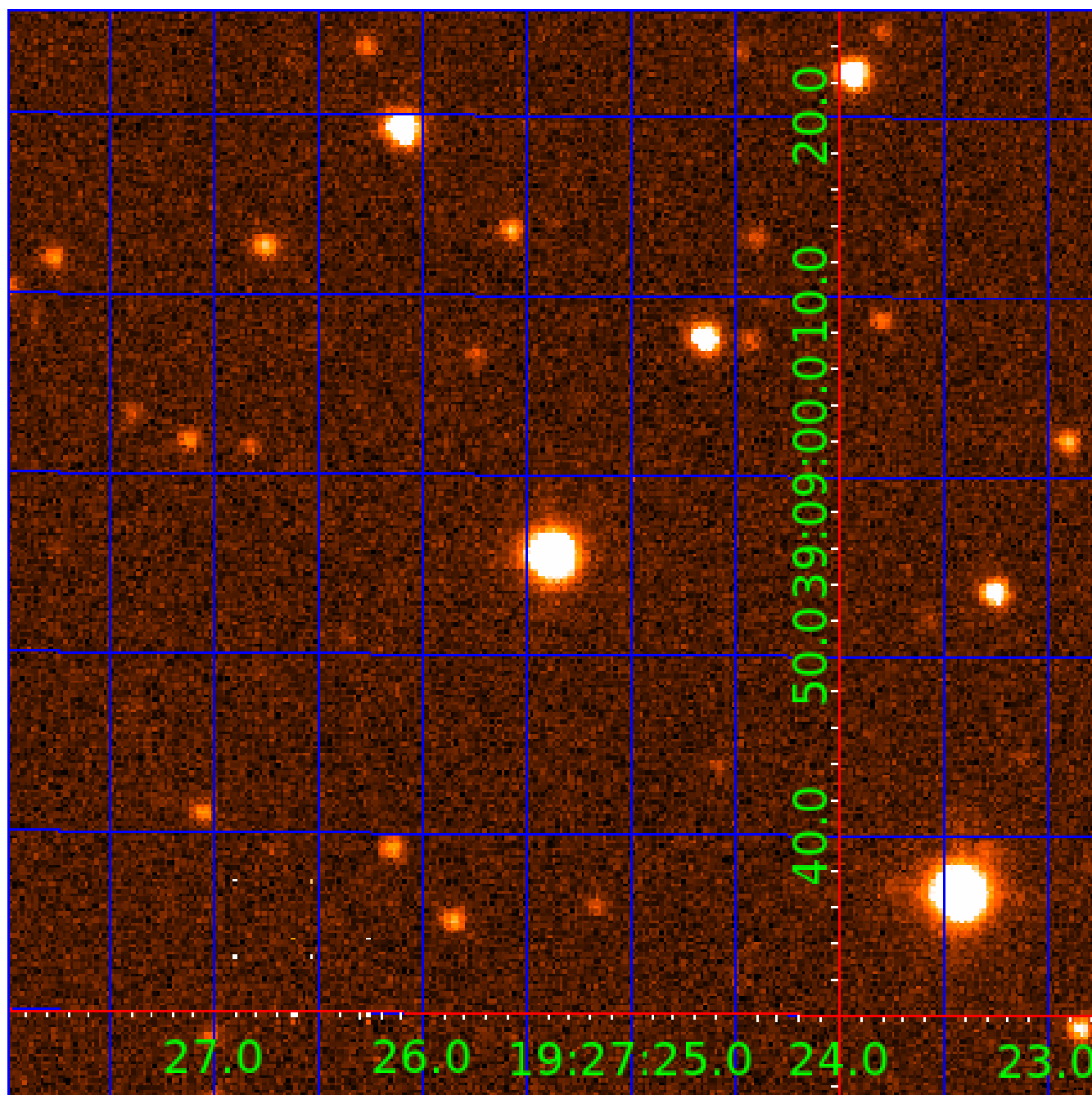


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination



## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
004058206-01	OBS	No	1.757664	133.121771	31.4	12.472	9.0	8.1	1.60	6849	0.93	5123.52
004058206-02	OBS	No	28.167409	133.654156	134.2	2.887	15.8	3.4	1.60	6849	2.16	126.81
004058206-03	OBS	No	28.165022	134.376281	31.7	5.936	15.3	0.8	1.60	6849	1.05	126.82
004058206-04	OBS	No	210.958911	133.974993	516.3	2.065	12.7	9.1	1.60	6849	3.92	8.65
004058206-05	OBS	No	29.540053	139.529398	217.0	6.800	11.4	5.6	1.60	6849	2.75	119.02
004058206-07	OBS	No	35.078211	148.902092	480.5	3.093	9.8	8.4	1.60	6849	3.83	94.64
004058206-08	OBS	No	47.891699	159.457155	501.9	2.608	9.7	8.2	1.60	6849	3.62	62.49
004058206-09	OBS	No	59.344057	134.337160	528.7	4.210	9.8	9.5	1.60	6849	3.81	46.95
004058206-10	OBS	No	38.068267	161.015373	572.3	6.023	9.5	12.0	1.60	6849	6.51	84.87

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
004058206-01	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_ALT
004058206-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_ZUMA_TRACKER—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT
004058206-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_ZUMA_TRACKER—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—SAME_NTL_PERIOD
004058206-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_MARSHALL—TRANS_GAPPED—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS
004058206-05	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT
004058206-07	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_SKYE—TRANS_GAPPED—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT
004058206-08	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV
004058206-09	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_SKYE—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT
004058206-10	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT

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

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

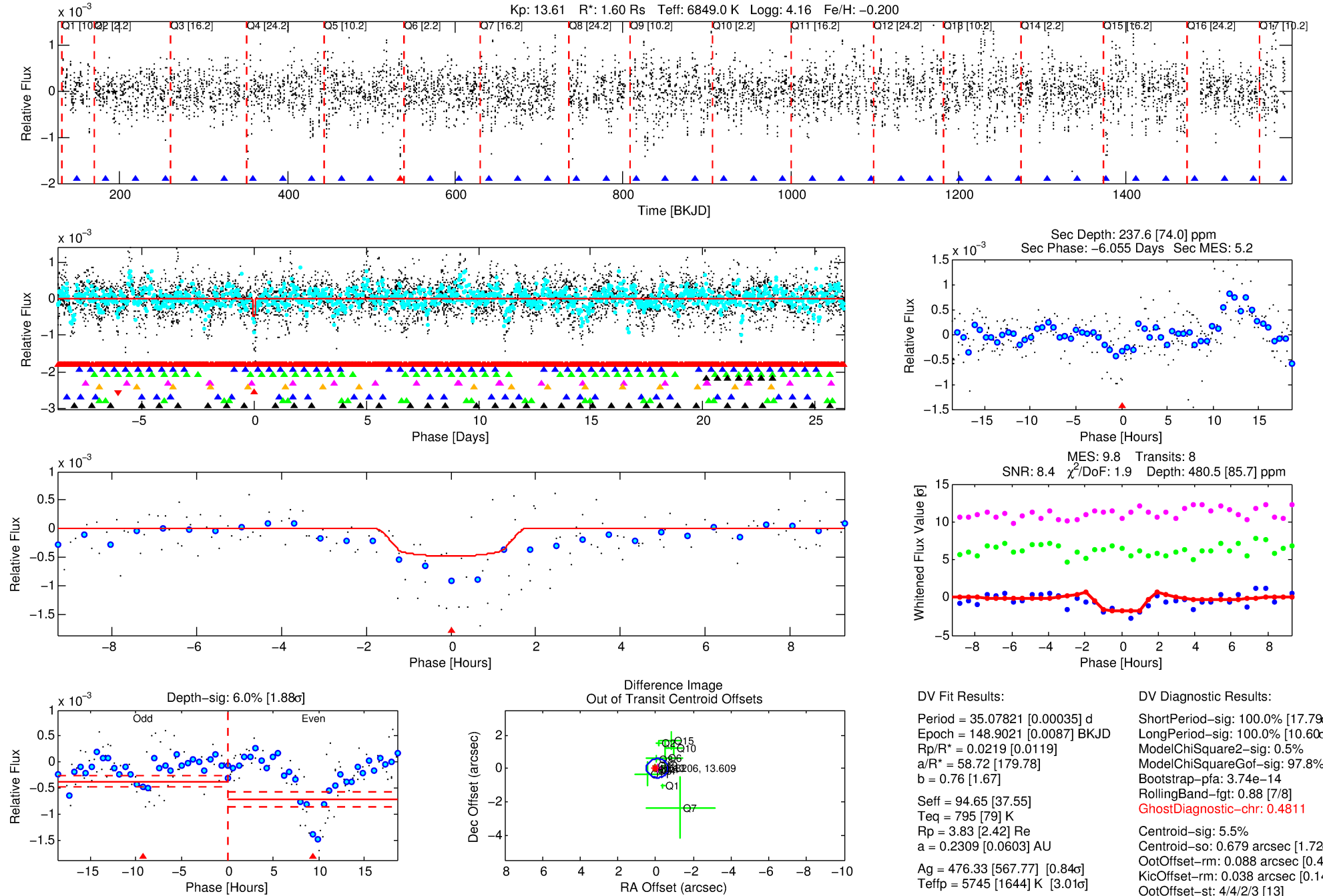
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 004058206-07

No Significant Match Found

# DV One-Page Summary

KIC: 4058206 Candidate: 7 of 10 Period: 35.078 d

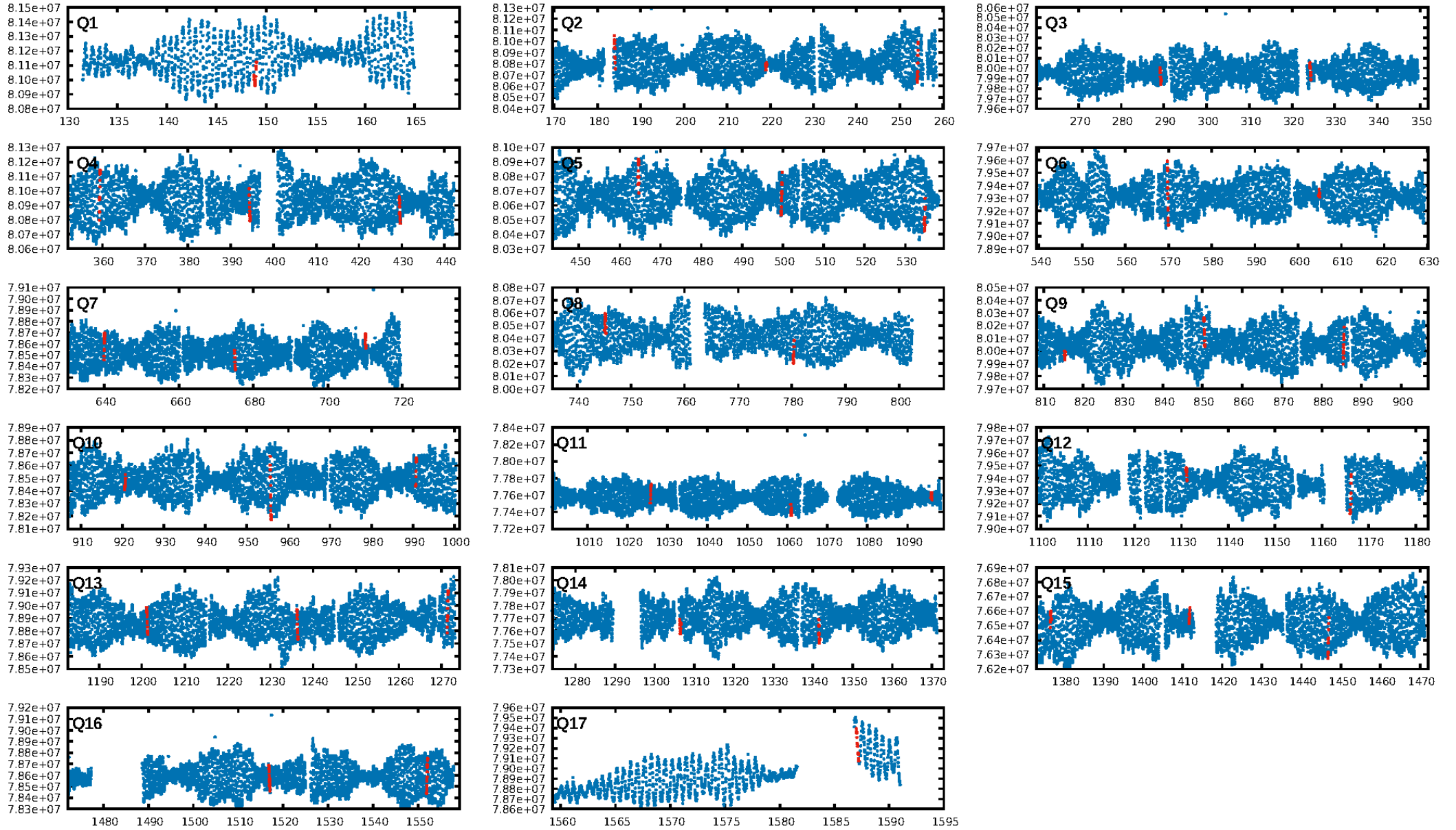


Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 01-Feb-2016 03:22:19 Z

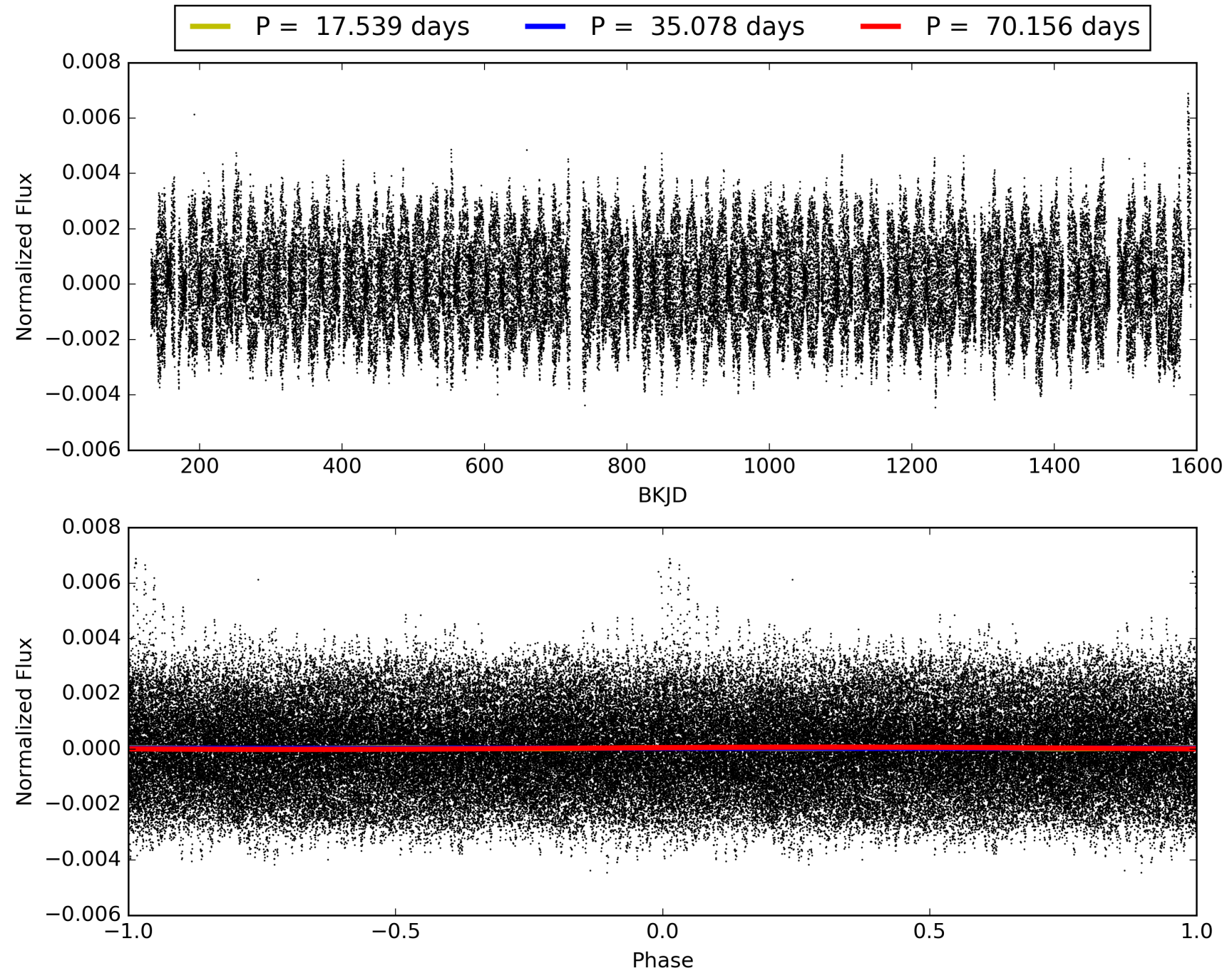
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center



# TCE 004058206-07, PDC Light Curves

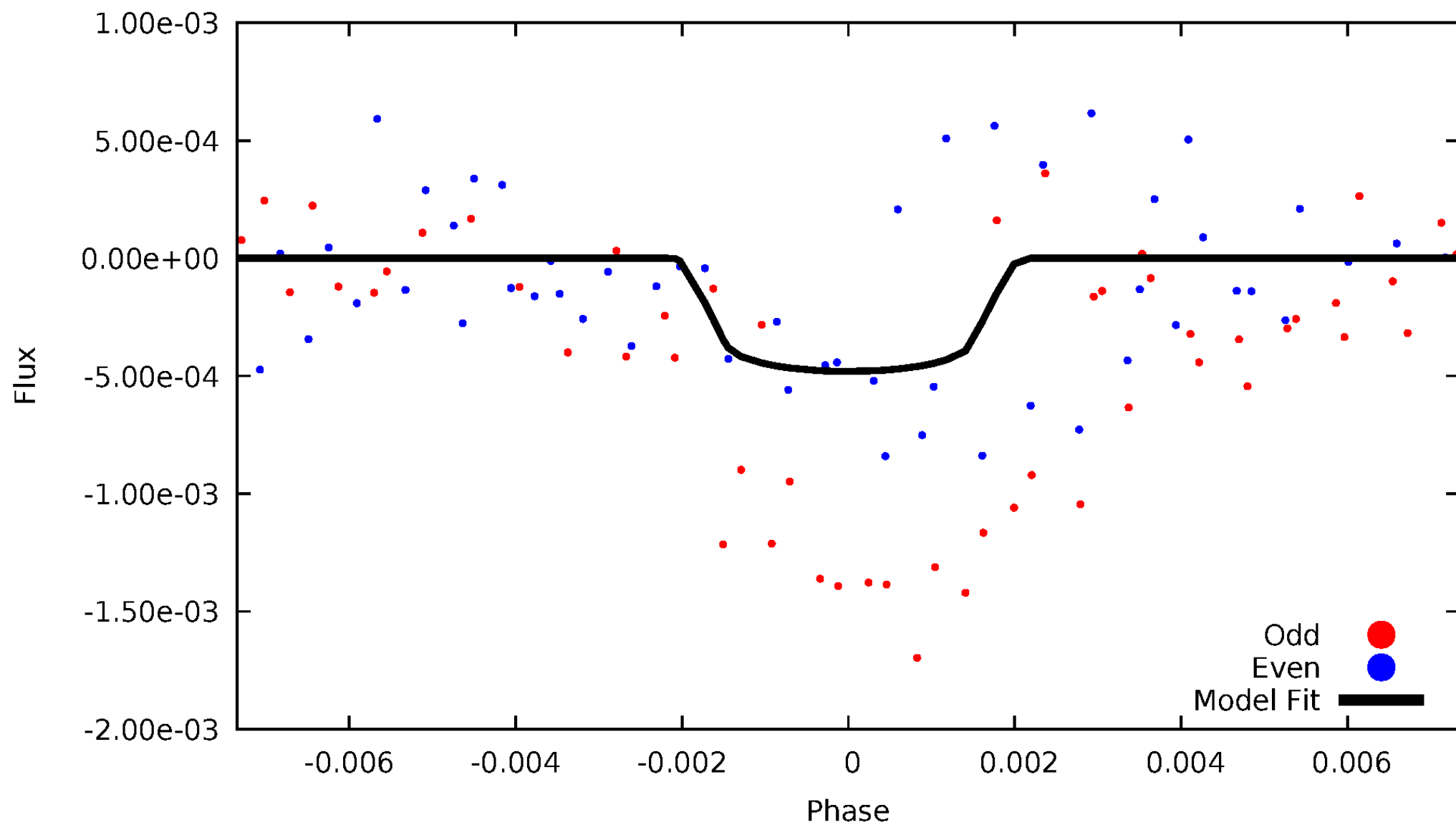


TCE 004058206-07



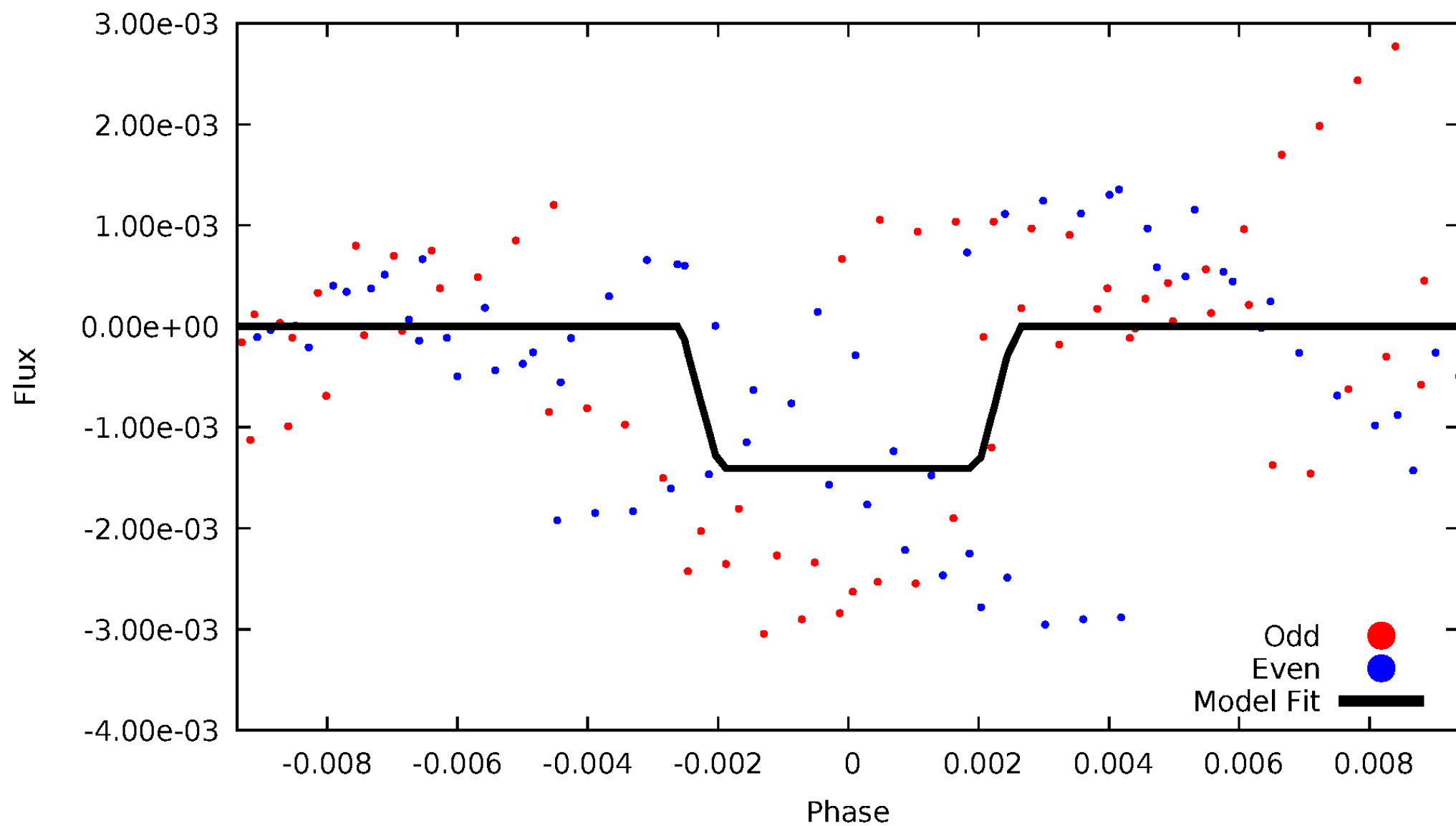
# DV Odd/Even

TCE 004058206-07



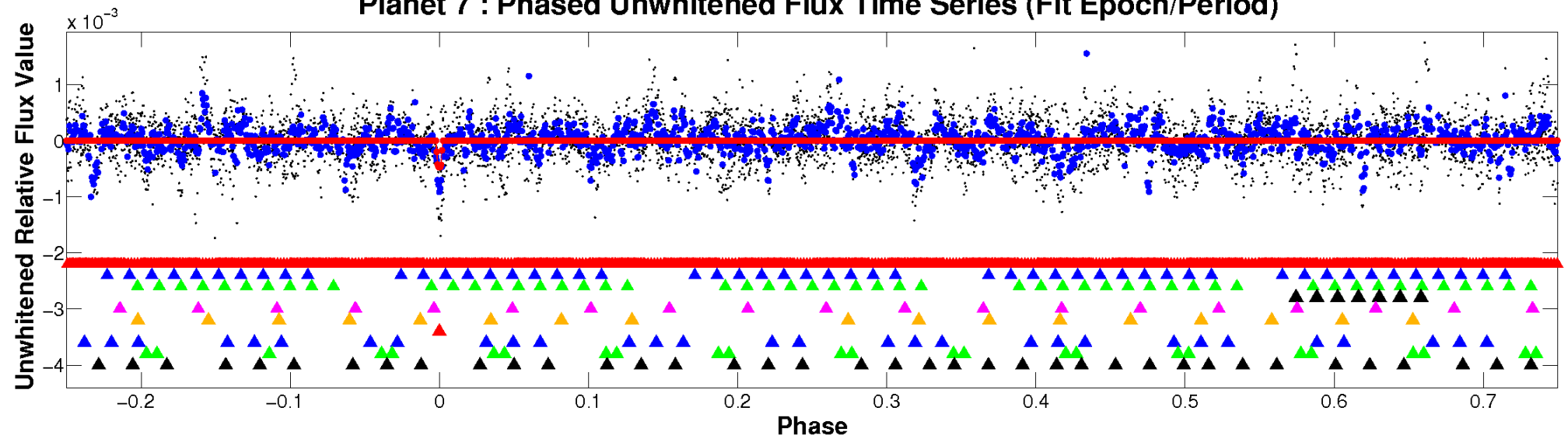
# ALT Odd/Even

TCE 004058206-07

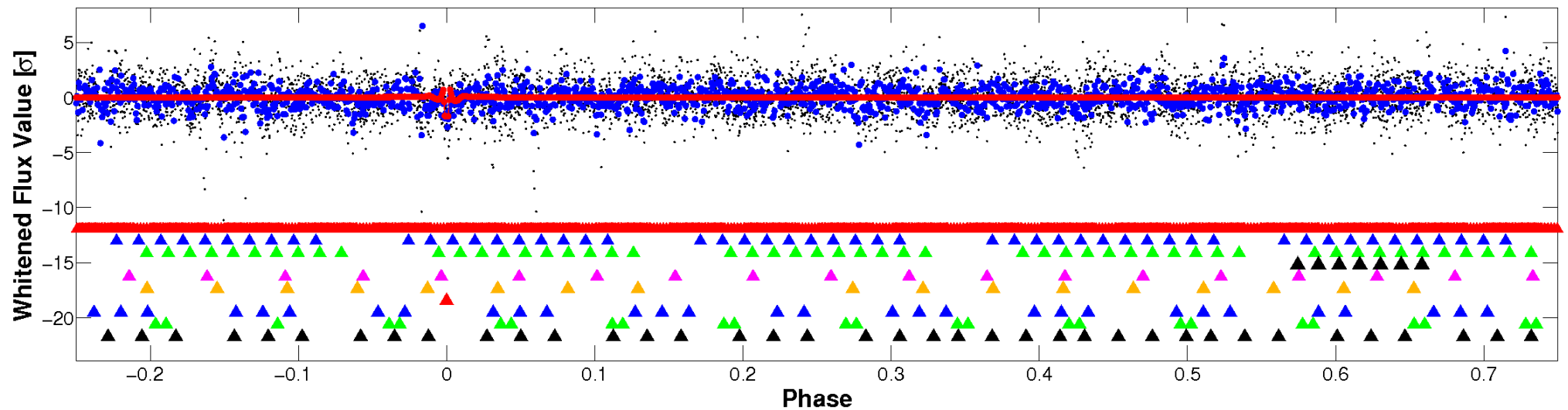


# Non-Whitened Vs. Whitened Light Curve

## Planet 7 : Phased Unwhitened Flux Time Series (Fit Epoch/Period)

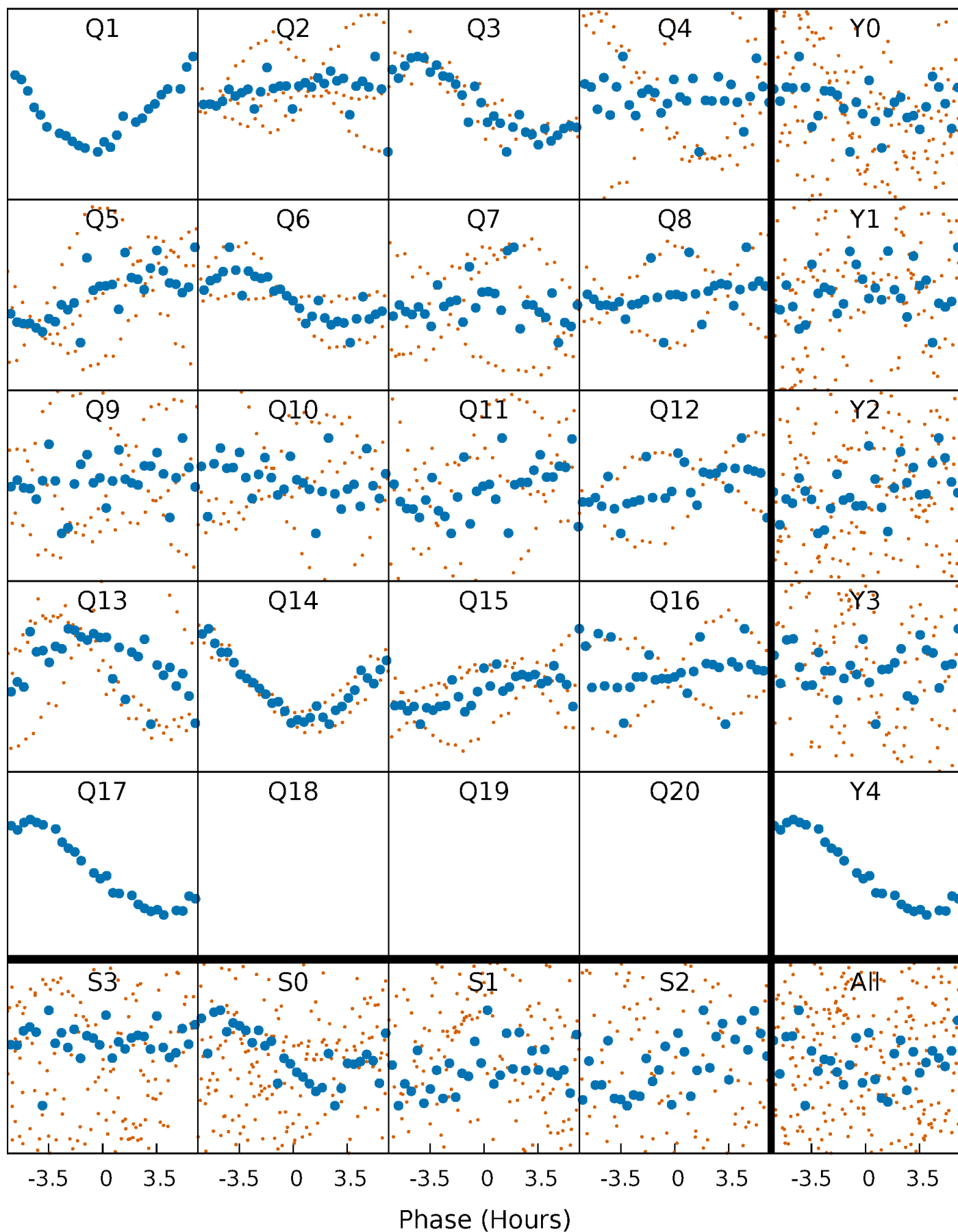


## Planet 7 : Phased Whitened Flux Time Series (Fit Epoch/Period)



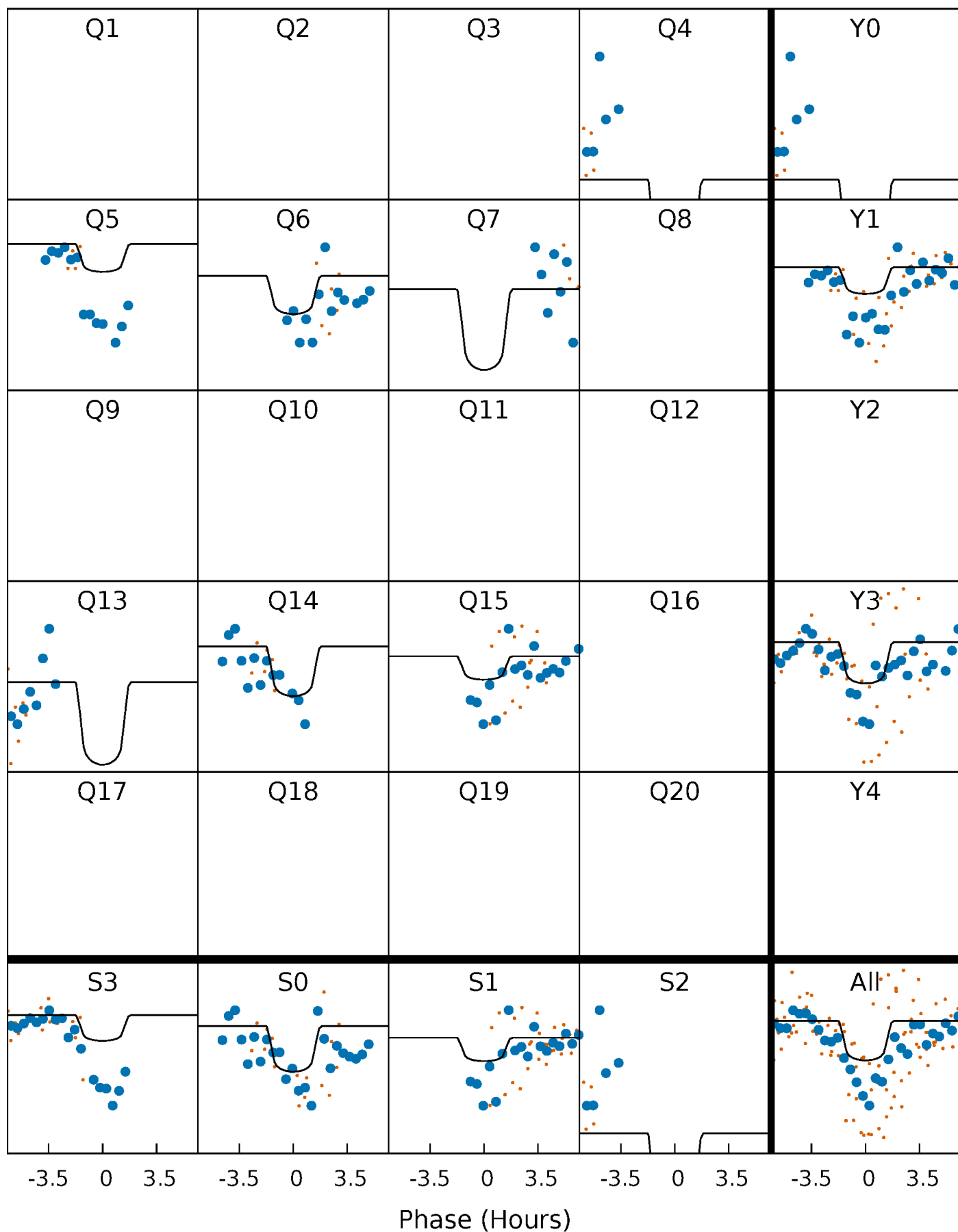
# PDC Quarter-Phased Transit Curves

TCE 004058206-07   P= 35.078211 Days    $T_0=148.902092$  (BKJD)



# DV Quarter-Phased Transit Curves

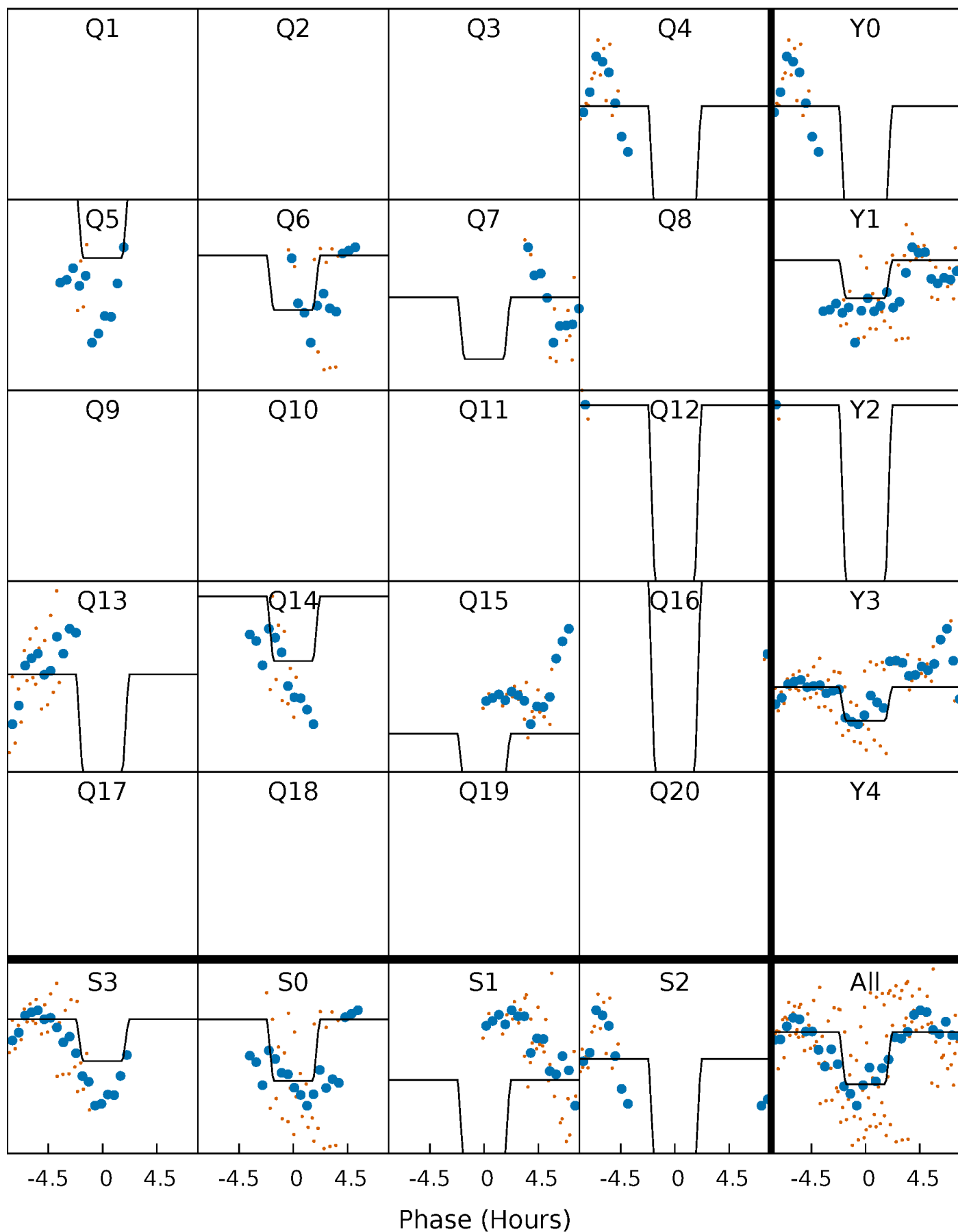
TCE 004058206-07   P= 35.078211 Days    $T_0=148.902092$  (BKJD)





# Alt. Detrend Quarter-Phased Transit Curves

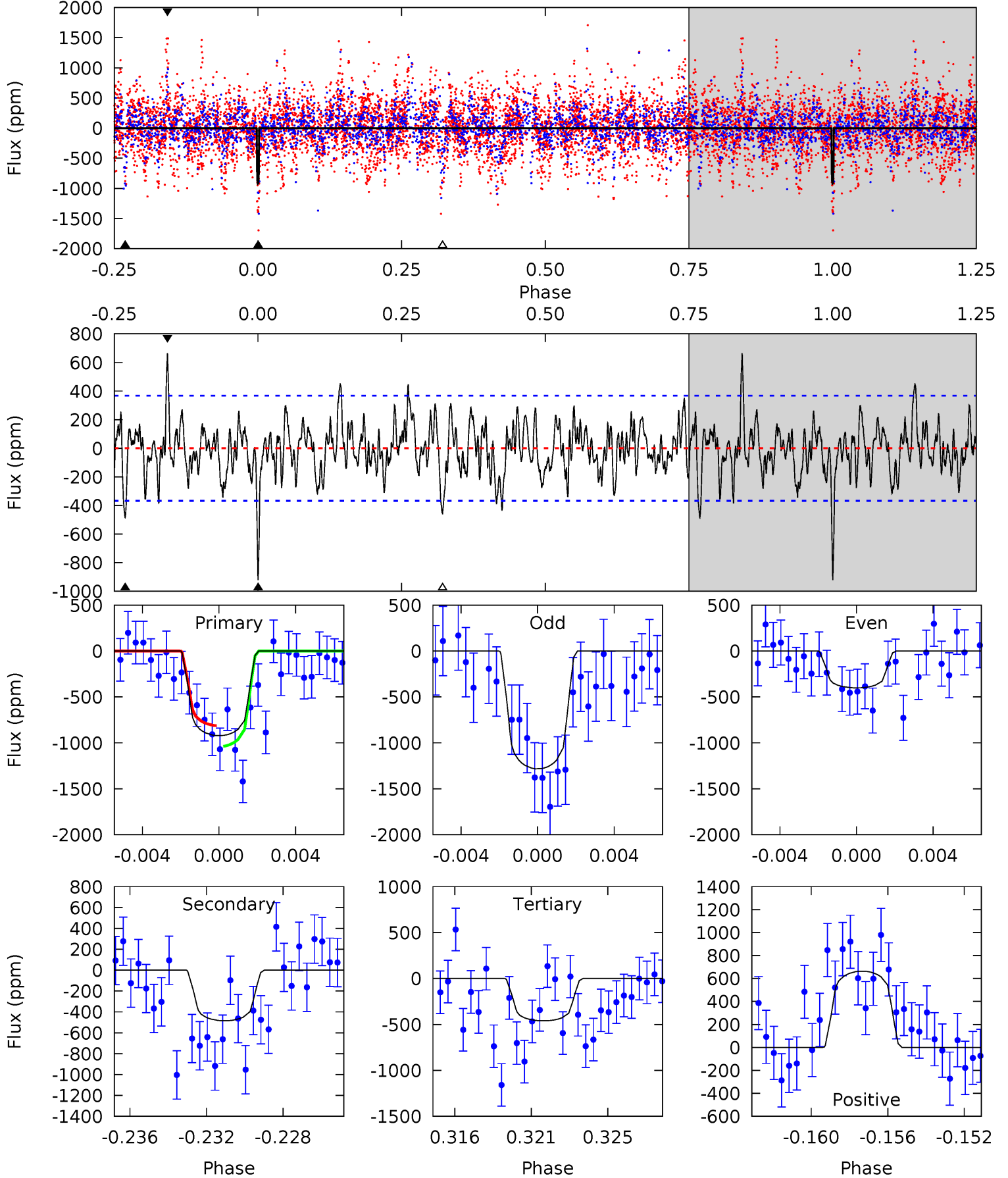
TCE 004058206-07 P= 35.076774 Days  $T_0=148.910636$  (BKJD)



# DV Model-Shift Uniqueness Test

004058206-07, P = 35.078211 Days, E = 113.823881 Days

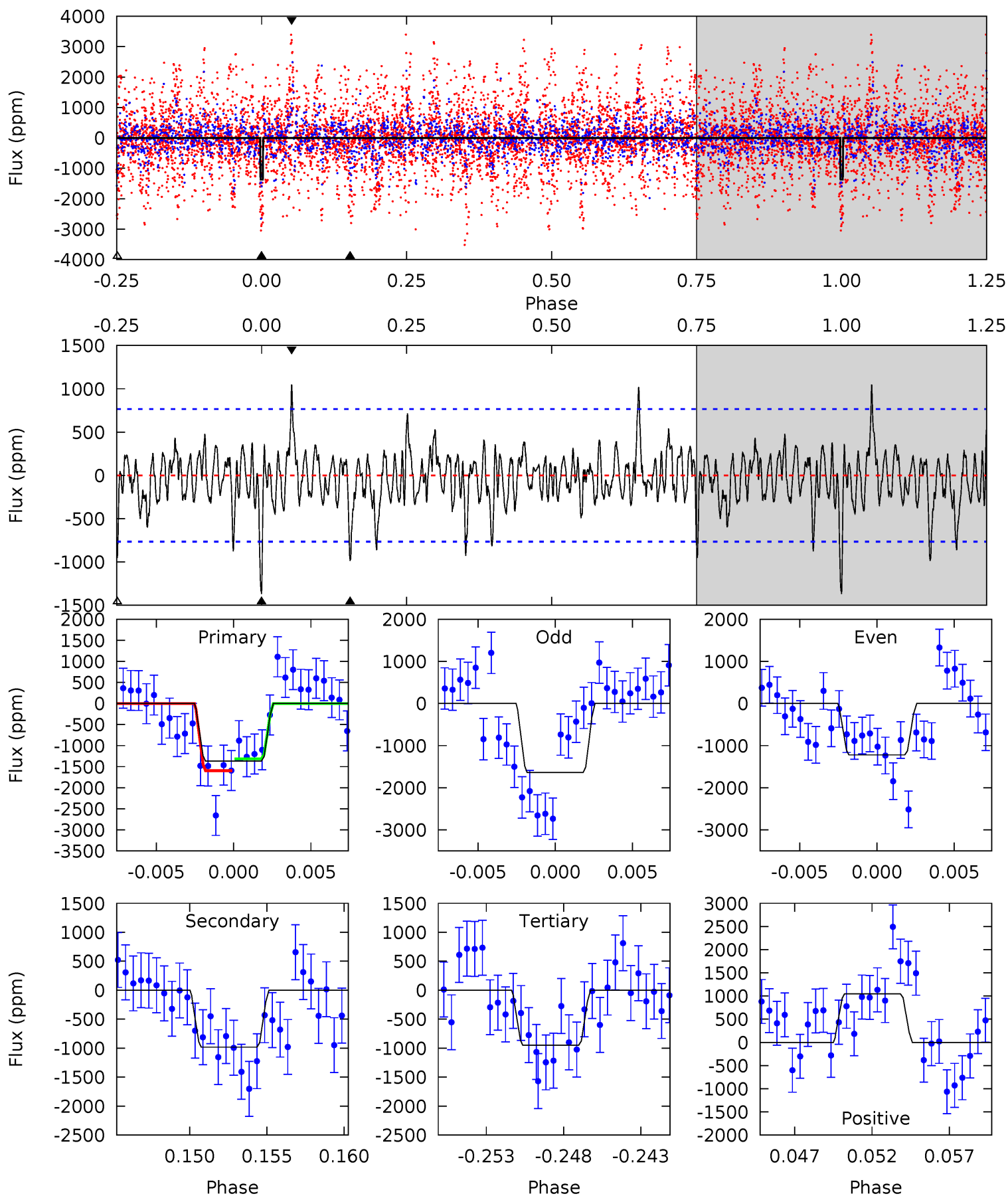
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
13.0	6.83	6.50	9.36	5.19	2.86	2.12	6.49	3.64	0.34	-2.52	6.43	1.07	0.42	1.58



# Alt Model-Shift Uniqueness Test

004058206-07,  $P = 35.076774$  Days,  $E = 113.833862$  Days

Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
9.20	6.60	6.39	7.04	5.15	2.80	1.75	2.81	2.16	0.21	-0.44	1.35	0.70	0.43	0.94



### Stellar Parameters For KIC 004058206

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$6849^{+190}_{-262}$	$4.155^{+0.158}_{-0.193}$	$-0.200^{+0.250}_{-0.300}$	$1.600^{+0.516}_{-0.387}$	$1.345^{+0.189}_{-0.231}$	$0.462^{+0.435}_{-0.221}$
	+3%/-4%	+4%/-5%	+125%/-150%	+32%/-24%	+14%/-17%	+94%/-48%
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 004058206-07 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-485 \pm 71$	$3.95^{+2.09}_{-2.02}$	$1112^{+89}_{-83}$	$6693^{+3852}_{-1275}$	$900^{+2906}_{-526}$
Alt.	$-982 \pm 149$	$6.32^{+2.63}_{-1.99}$	$1112^{+97}_{-82}$	$6359^{+1287}_{-941}$	$706^{+798}_{-350}$

$T_{max}$  = 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  $A_{obs} \gg 1.0$

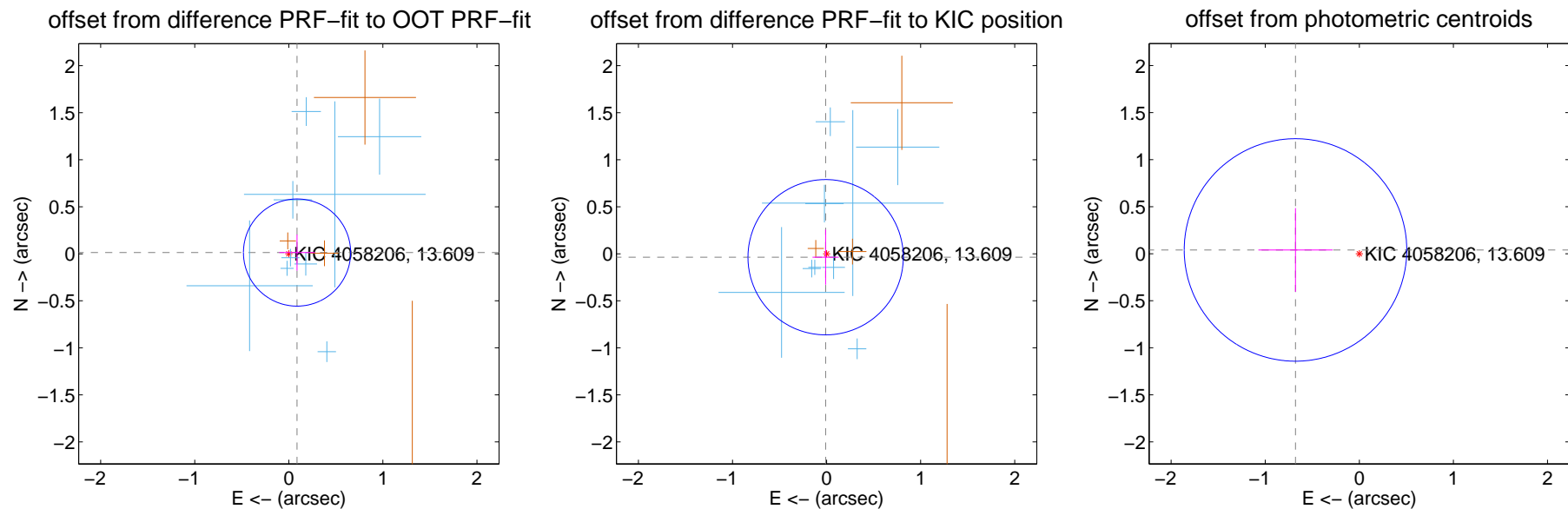
## DV Centroid Data

Supplemental centroid analysis for 004058206-07. Kepler magnitude: 13.61. Transit SNR 8.40

There are 9 quarters with good PRF difference image offsets

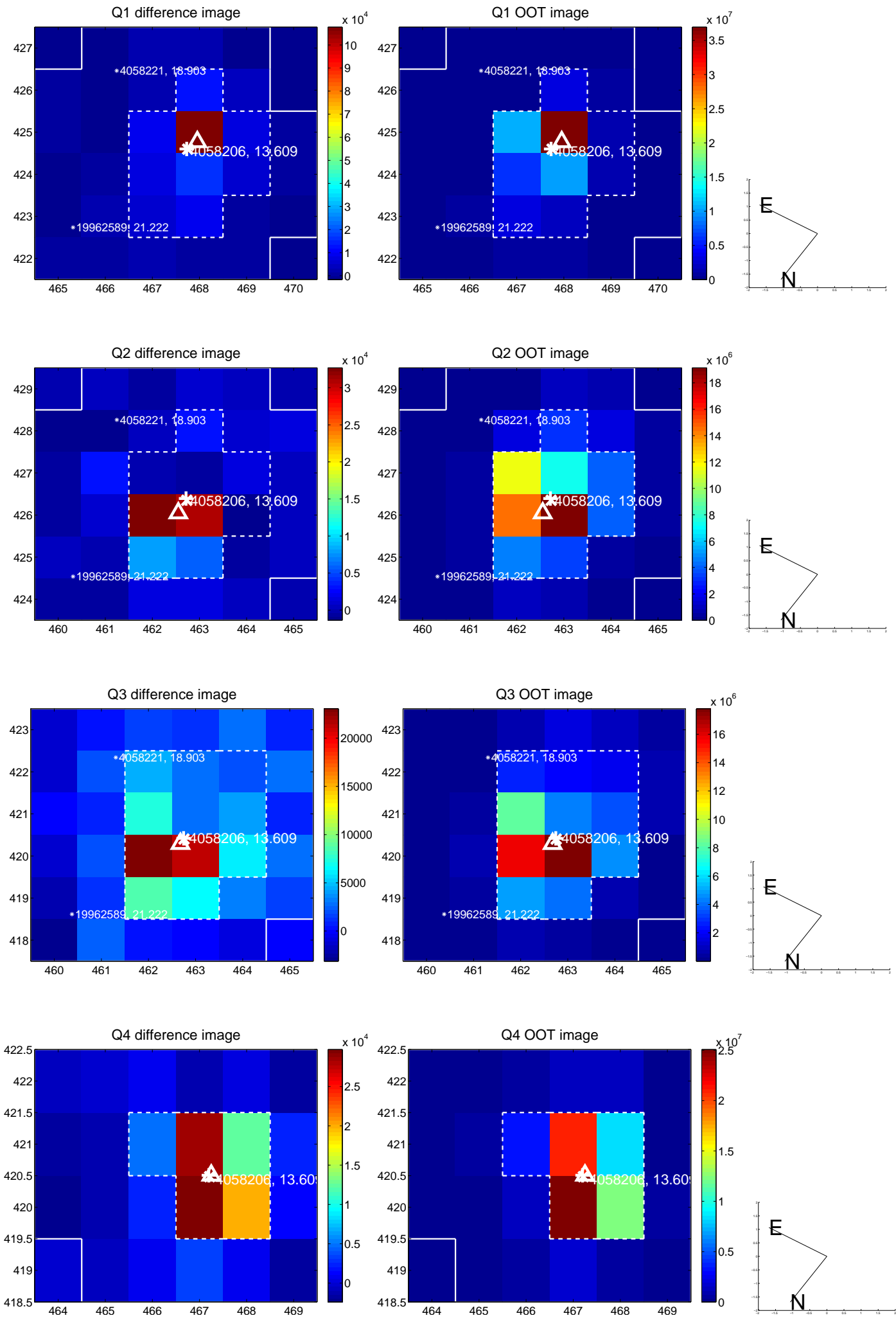
The direct PRF centroid is offset from the target star catalog position by about 0.06 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.088 \pm 0.190$	0.47	$-0.087 \pm 0.190$	$0.013 \pm 0.192$
PRF-fit source offset from KIC position	$0.038 \pm 0.275$	0.14	$0.010 \pm 0.139$	$-0.036 \pm 0.292$
photometric centroid source offset	$0.68 \pm 0.39$	1.72	$0.68 \pm 0.39$	$0.04 \pm 0.44$

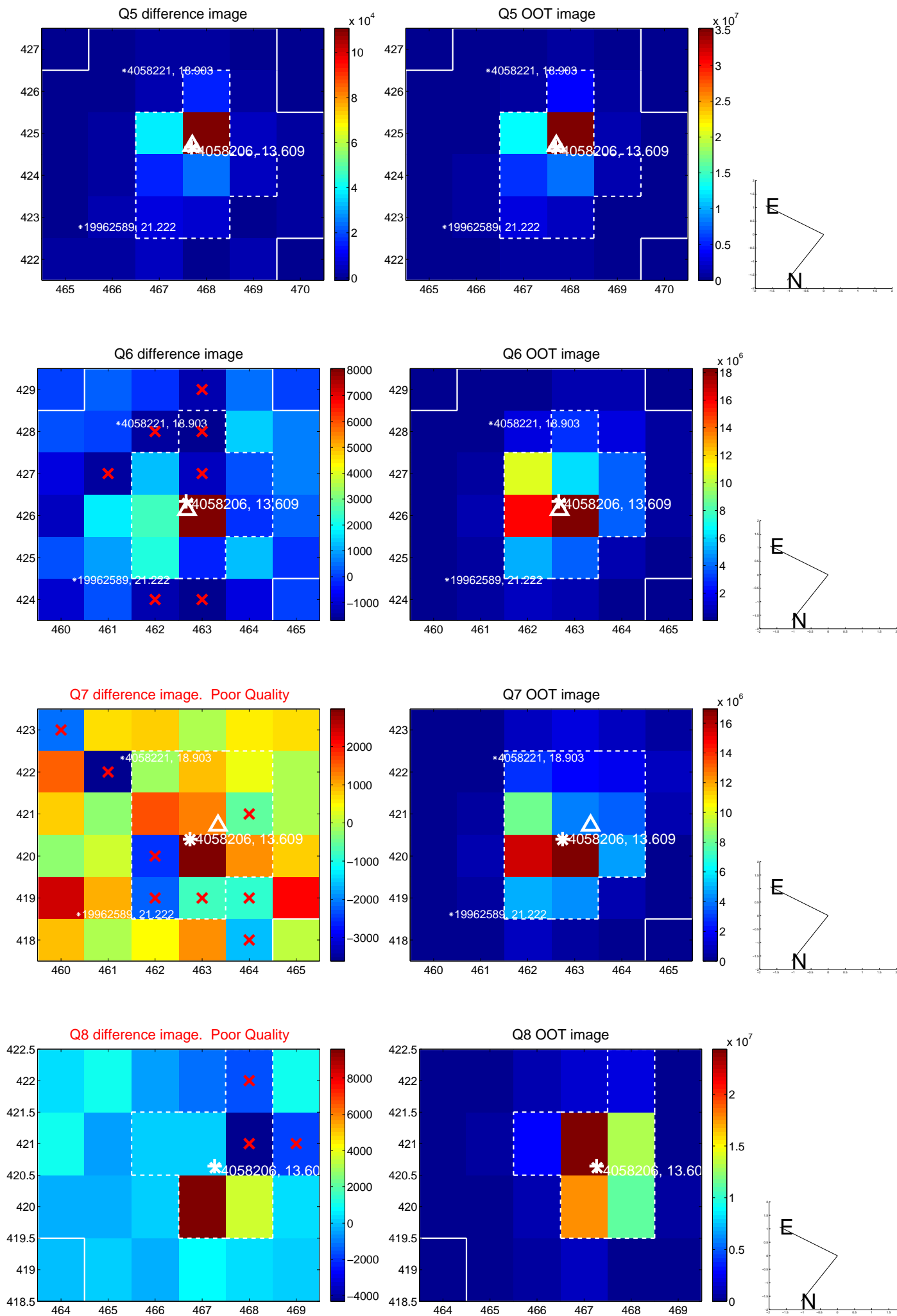


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses:** good quarterly centroid offsets; **Vermillion crosses:** bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

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

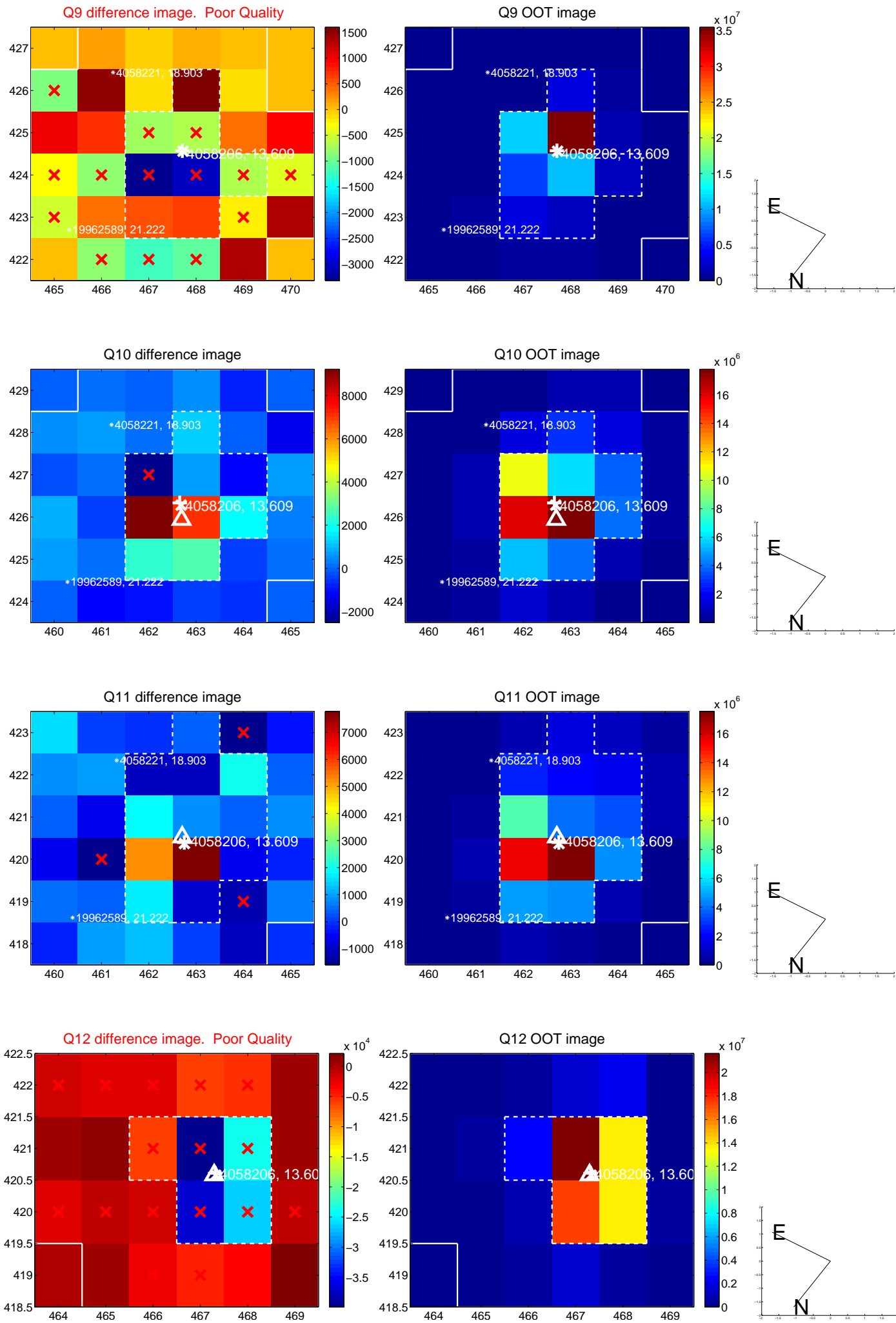


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

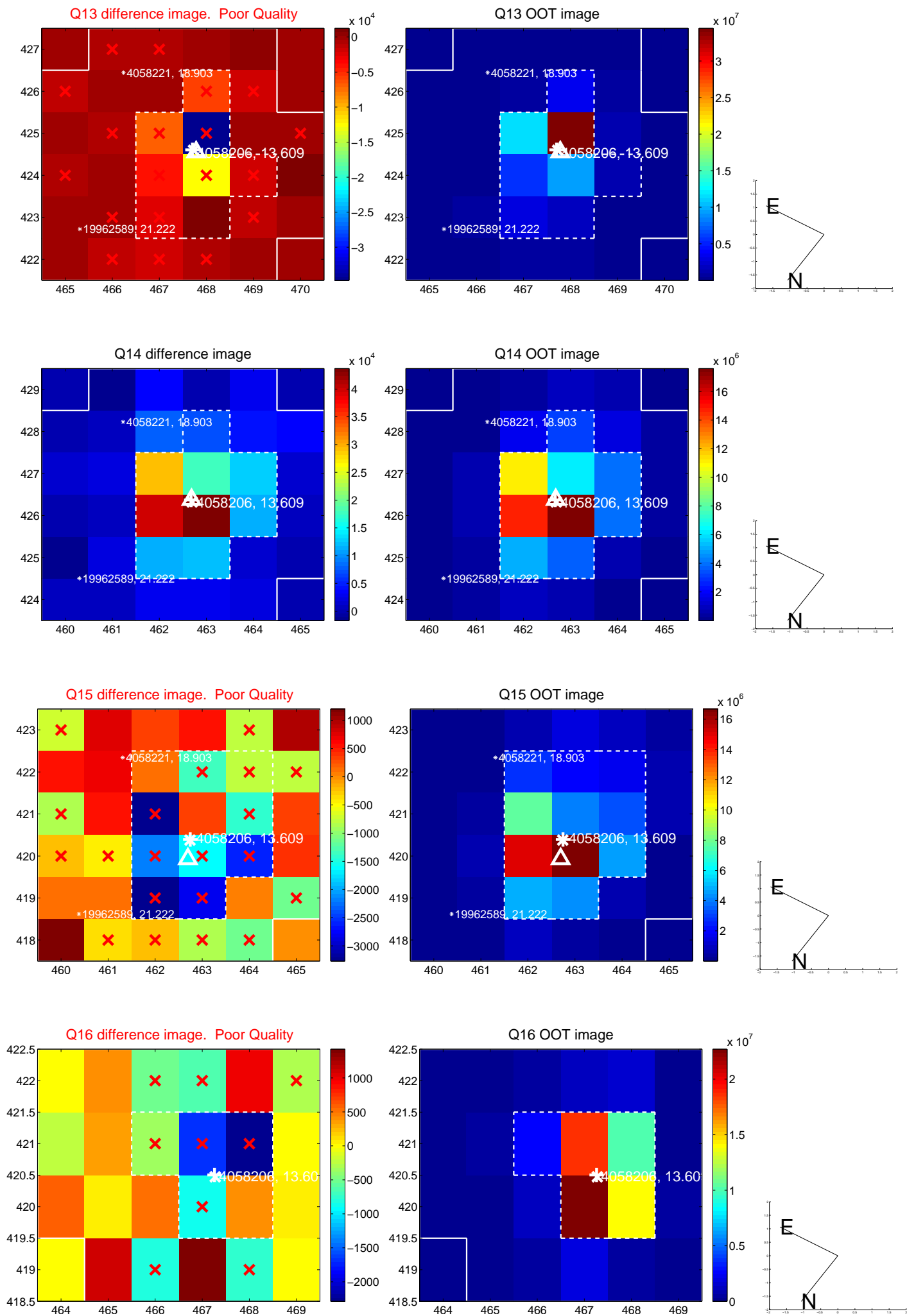




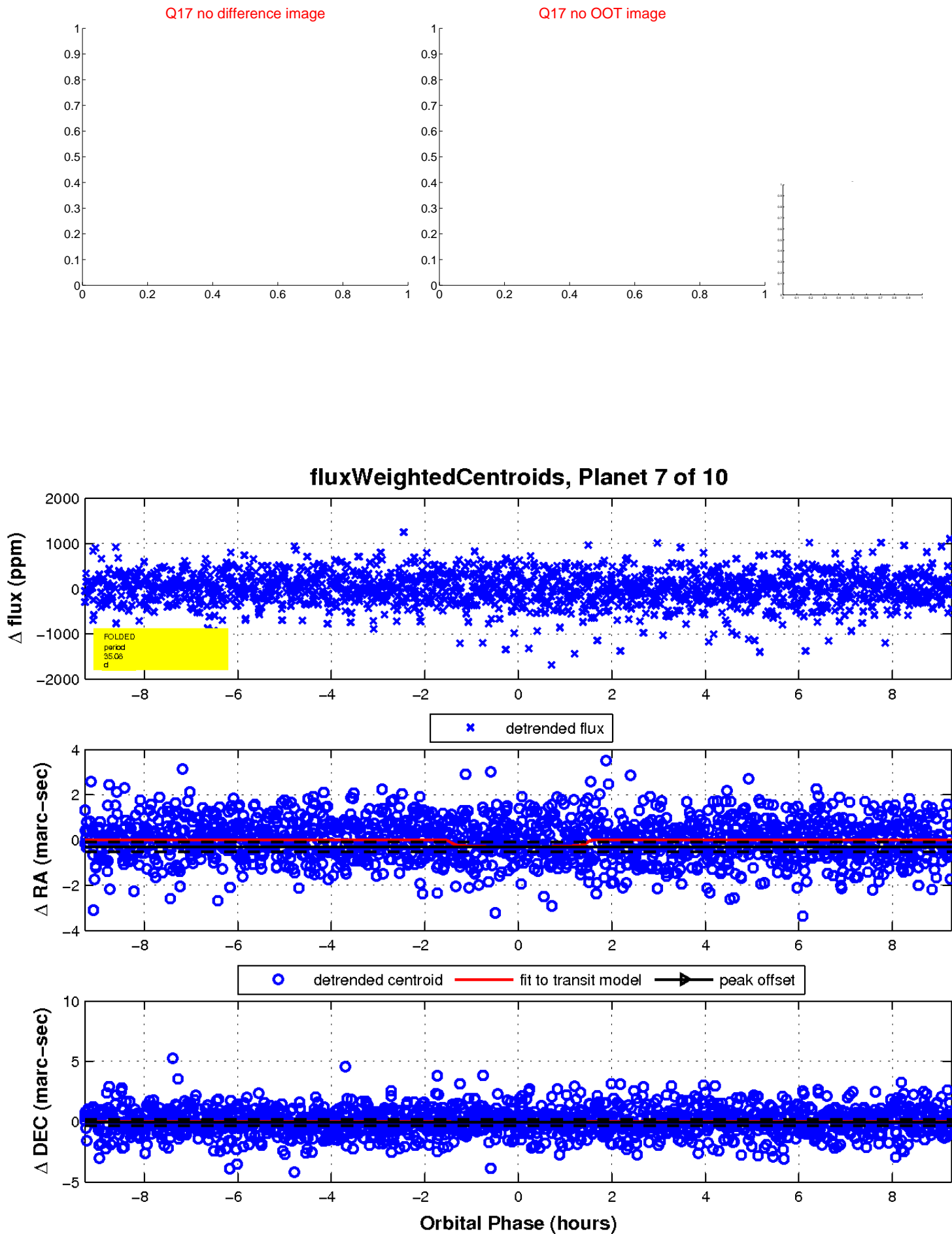
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

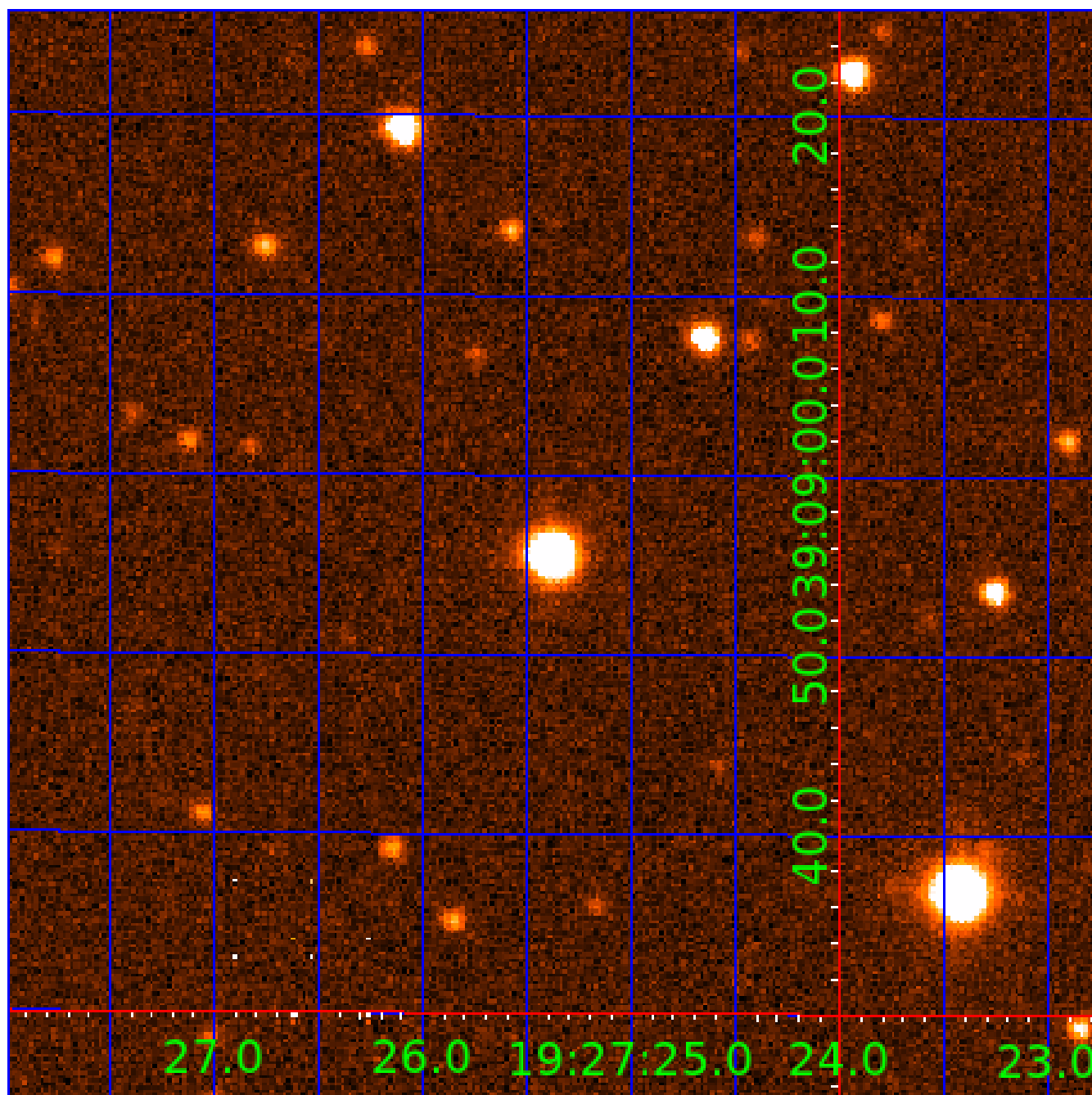


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination



## KIC 004058206

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
004058206-01	OBS	No	1.757664	133.121771	31.4	12.472	9.0	8.1	1.60	6849	0.93	5123.52
004058206-02	OBS	No	28.167409	133.654156	134.2	2.887	15.8	3.4	1.60	6849	2.16	126.81
004058206-03	OBS	No	28.165022	134.376281	31.7	5.936	15.3	0.8	1.60	6849	1.05	126.82
004058206-04	OBS	No	210.958911	133.974993	516.3	2.065	12.7	9.1	1.60	6849	3.92	8.65
004058206-05	OBS	No	29.540053	139.529398	217.0	6.800	11.4	5.6	1.60	6849	2.75	119.02
004058206-07	OBS	No	35.078211	148.902092	480.5	3.093	9.8	8.4	1.60	6849	3.83	94.64
004058206-08	OBS	No	47.891699	159.457155	501.9	2.608	9.7	8.2	1.60	6849	3.62	62.49
004058206-09	OBS	No	59.344057	134.337160	528.7	4.210	9.8	9.5	1.60	6849	3.81	46.95
004058206-10	OBS	No	38.068267	161.015373	572.3	6.023	9.5	12.0	1.60	6849	6.51	84.87

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
004058206-01	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_ALT
004058206-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_ZUMA_TRACKER—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT
004058206-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_ZUMA_TRACKER—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—SAME_NTL_PERIOD
004058206-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_MARSHALL—TRANS_GAPPED—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS
004058206-05	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT
004058206-07	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_SKYE—TRANS_GAPPED—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT
004058206-08	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV
004058206-09	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_SKYE—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT
004058206-10	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT

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

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

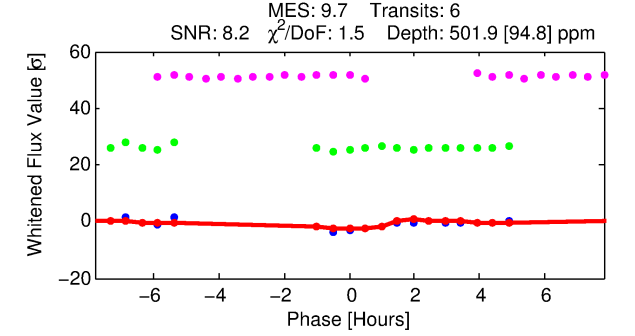
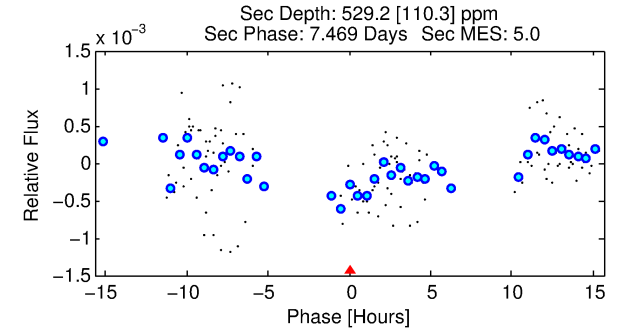
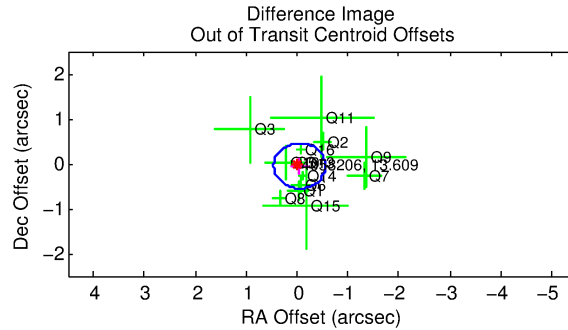
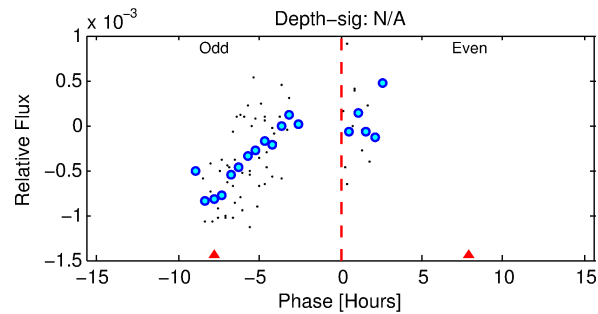
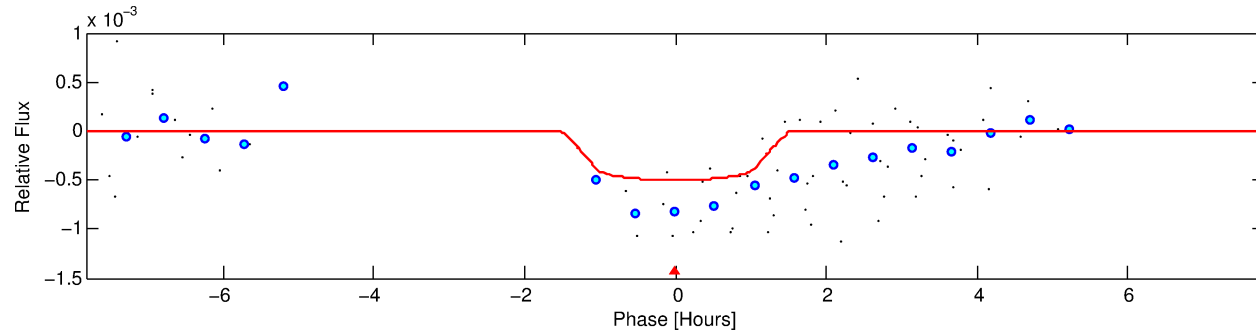
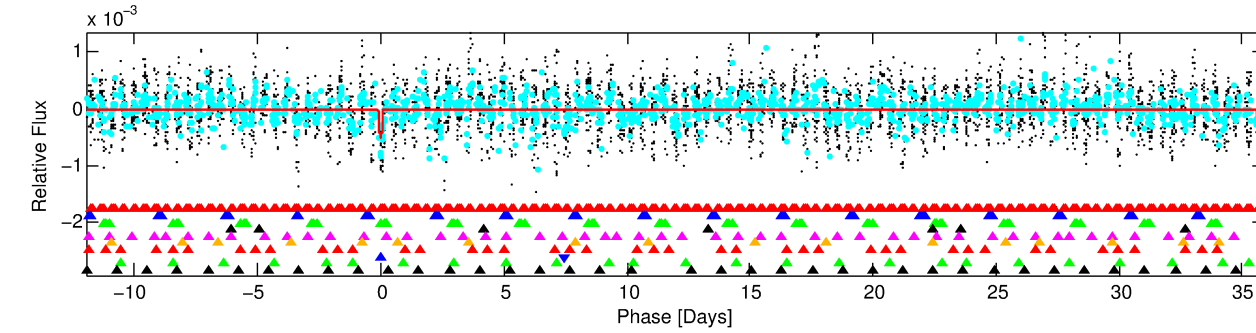
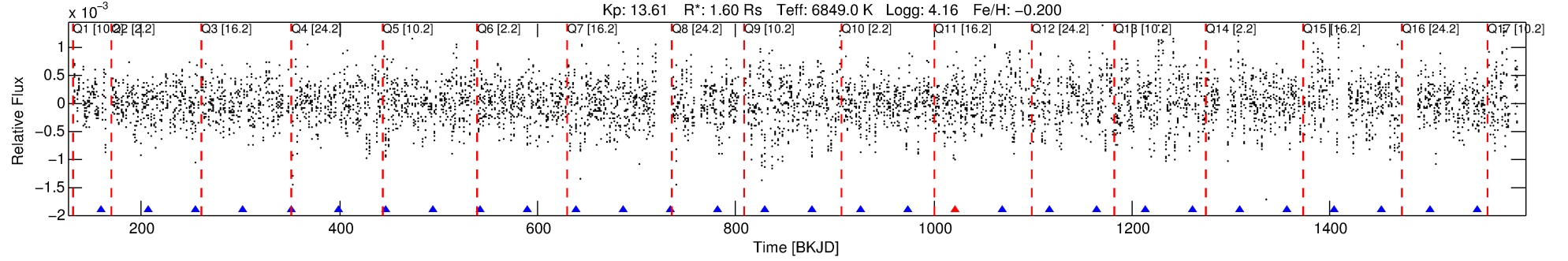
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 004058206-08

No Significant Match Found

# DV One-Page Summary

KIC: 4058206 Candidate: 8 of 10 Period: 47.892 d



## DV Fit Results:

Period = 47.89170 [0.00099] d  
Epoch = 159.4572 [0.0106] BKJD  
Rp/R\* = 0.0207 [0.0435]  
a/R\* = 143.07 [1652.57]  
b = 0.04 [305.97]  
Seff = 62.49 [24.79]  
Teff = 717 [71] K  
Rp = 3.62 [7.69] Re  
a = 0.2842 [0.0742] AU  
Ag = 1795.08 [7578.72] [0.24 $\sigma$ ]  
Teffp = 7215 [7592] K [0.86 $\sigma$ ]

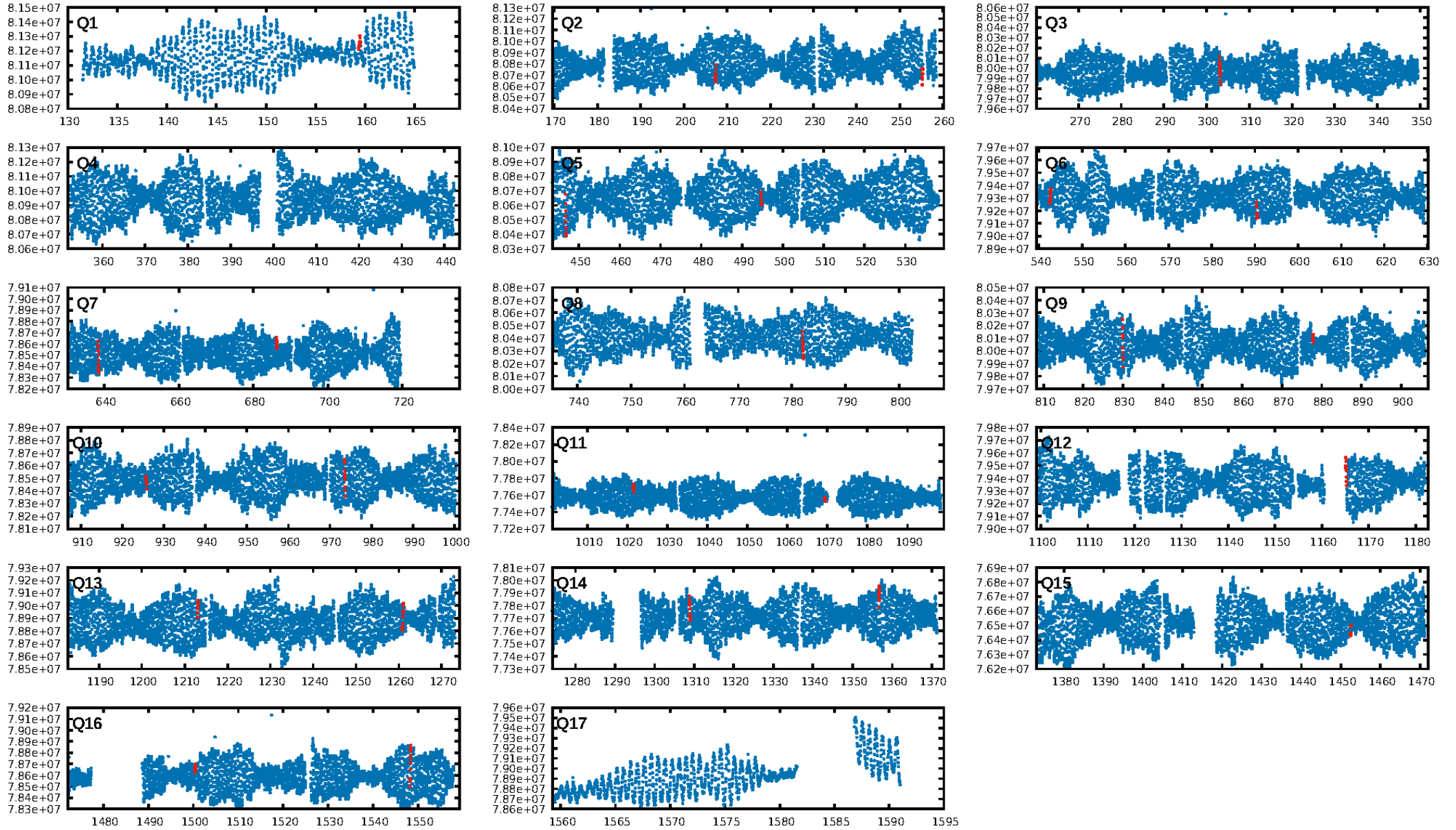
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [35.92 $\sigma$ ]  
LongPeriod-sig: 100.0% [55.49 $\sigma$ ]  
ModelChiSquare2-sig: 24.9%  
ModelChiSquareGof-sig: 99.9%  
**Bootstrap-pfa: 3.57e-10**  
RollingBand-fgt: 0.83 [5/6]  
**GhostDiagnostic-chr: -0.3547**  
Centroid-sig: 27.3%  
Centroid-so: 0.424 arcsec [0.75 $\sigma$ ]  
OotOffset-rm: 0.070 arcsec [0.41 $\sigma$ ]  
OotOffset-st: 4/4/2/4 [14]  
KicOffset-rm: 0.118 arcsec [0.70 $\sigma$ ]  
KicOffset-st: 4/4/2/4 [14]  
DiffImageQuality-fgm: 0.50 [7/14]  
DiffImageOverlap-fno: 0.43 [6/14]

Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 01-Feb-2016 03:22:22 Z

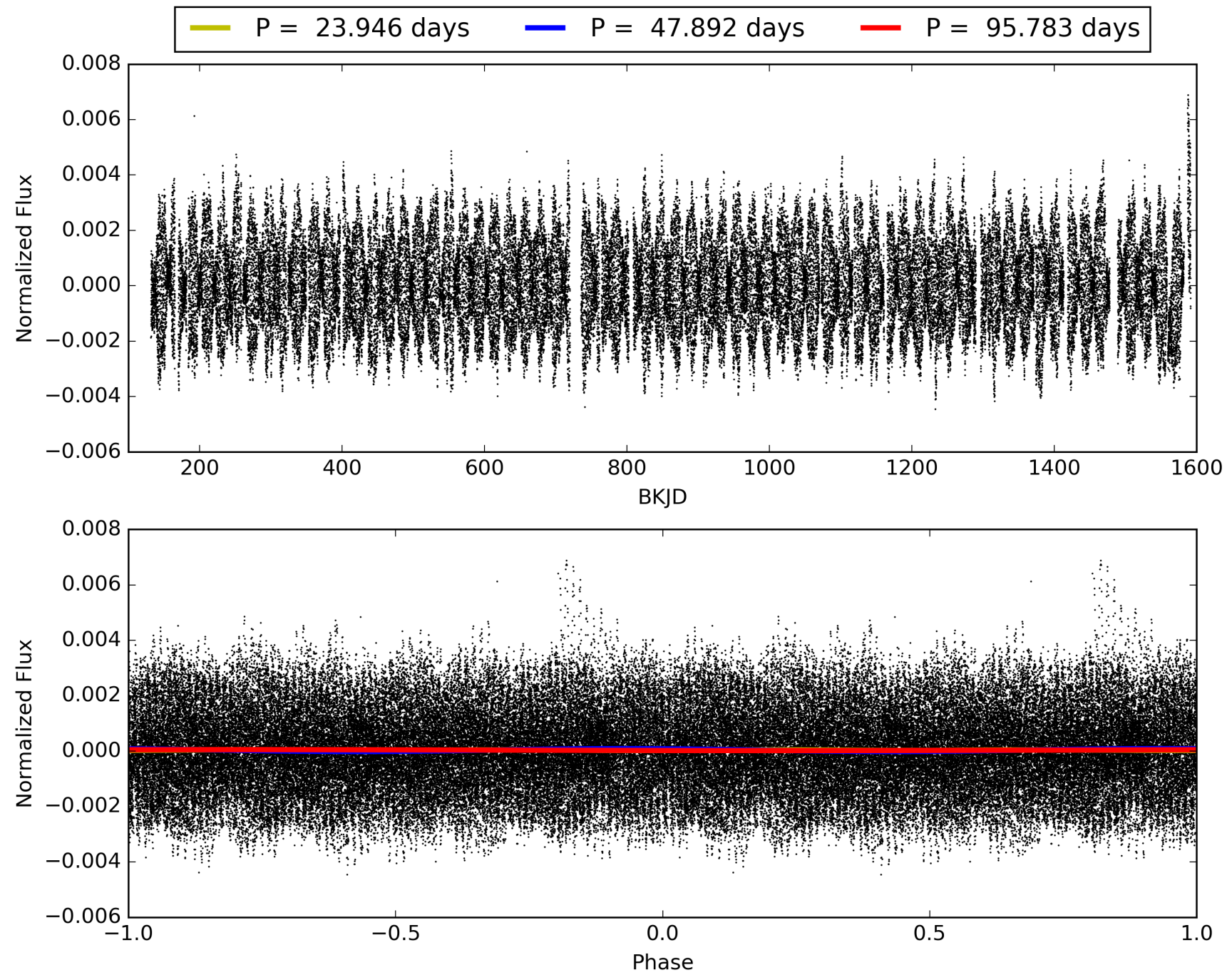
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

# TCE 004058206-08, PDC Light Curves



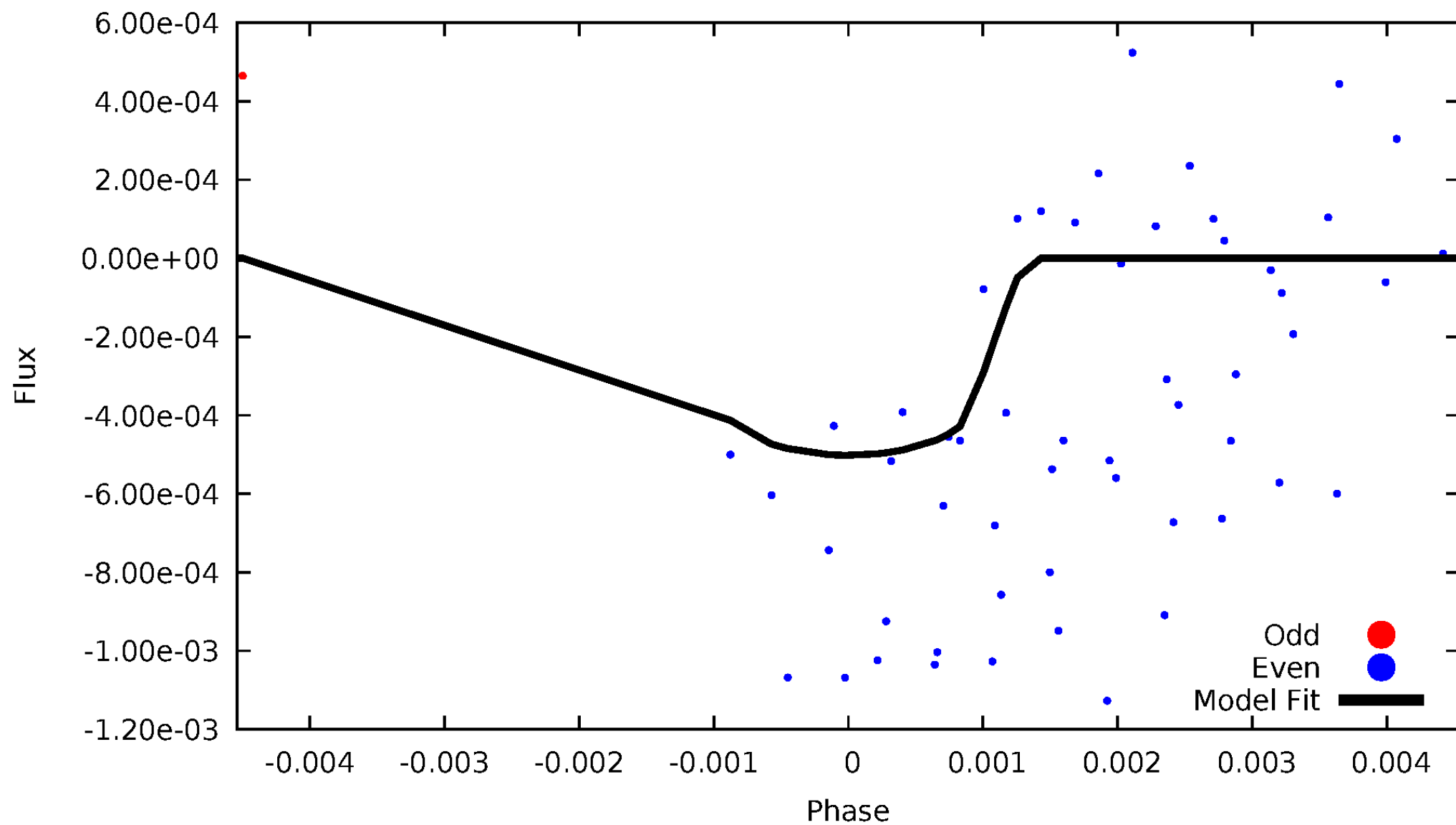


TCE 004058206-08



# DV Odd/Even

TCE 004058206-08



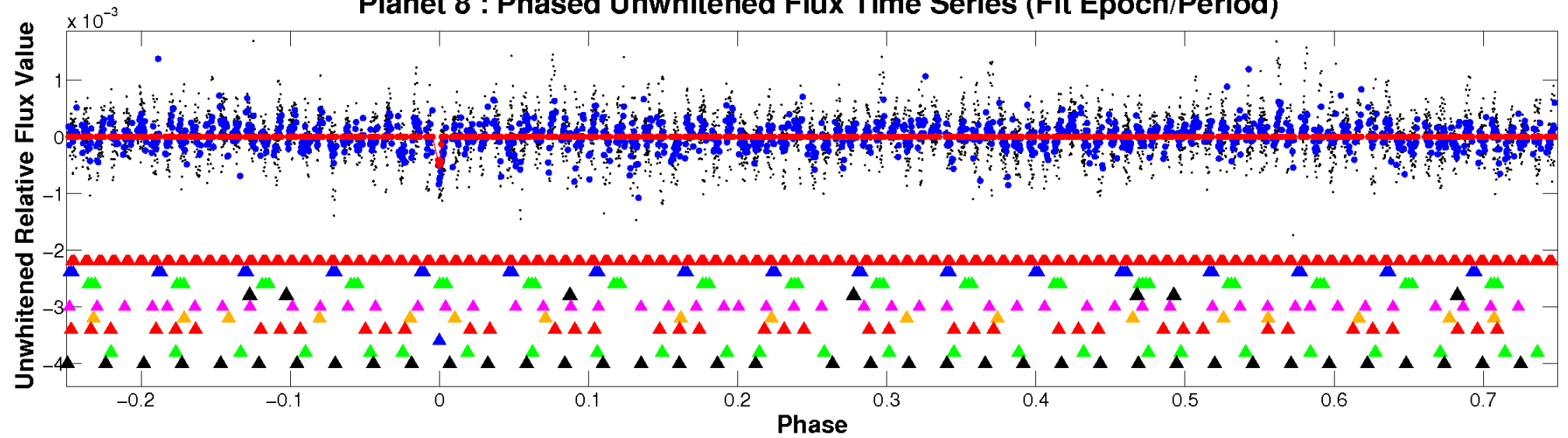


ALT Odd/Even

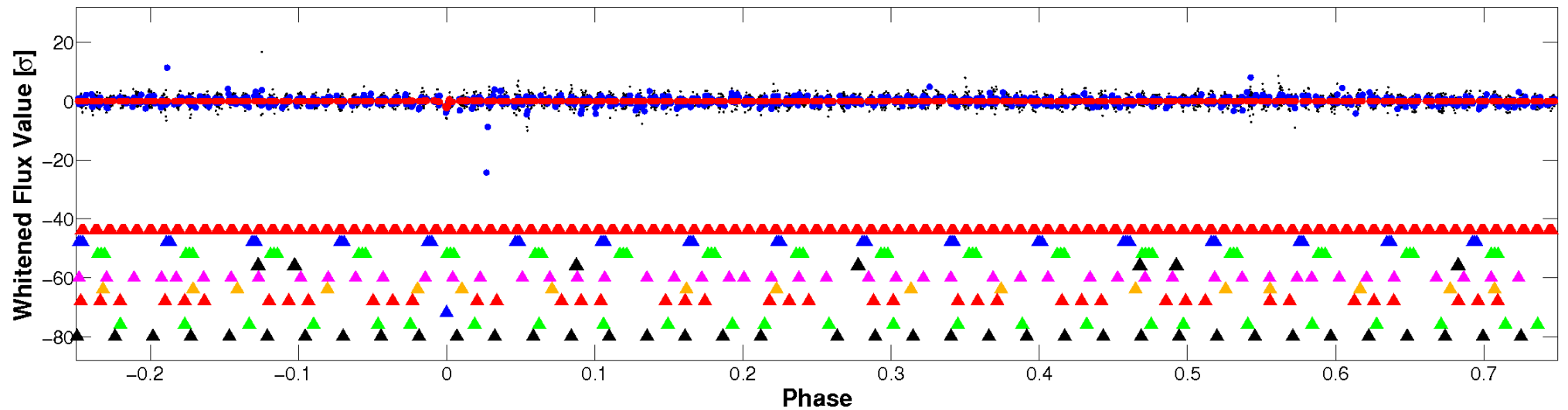
This plot does not exist for this TCE.

# Non-Whitened Vs. Whitened Light Curve

## Planet 8 : Phased Unwhitened Flux Time Series (Fit Epoch/Period)

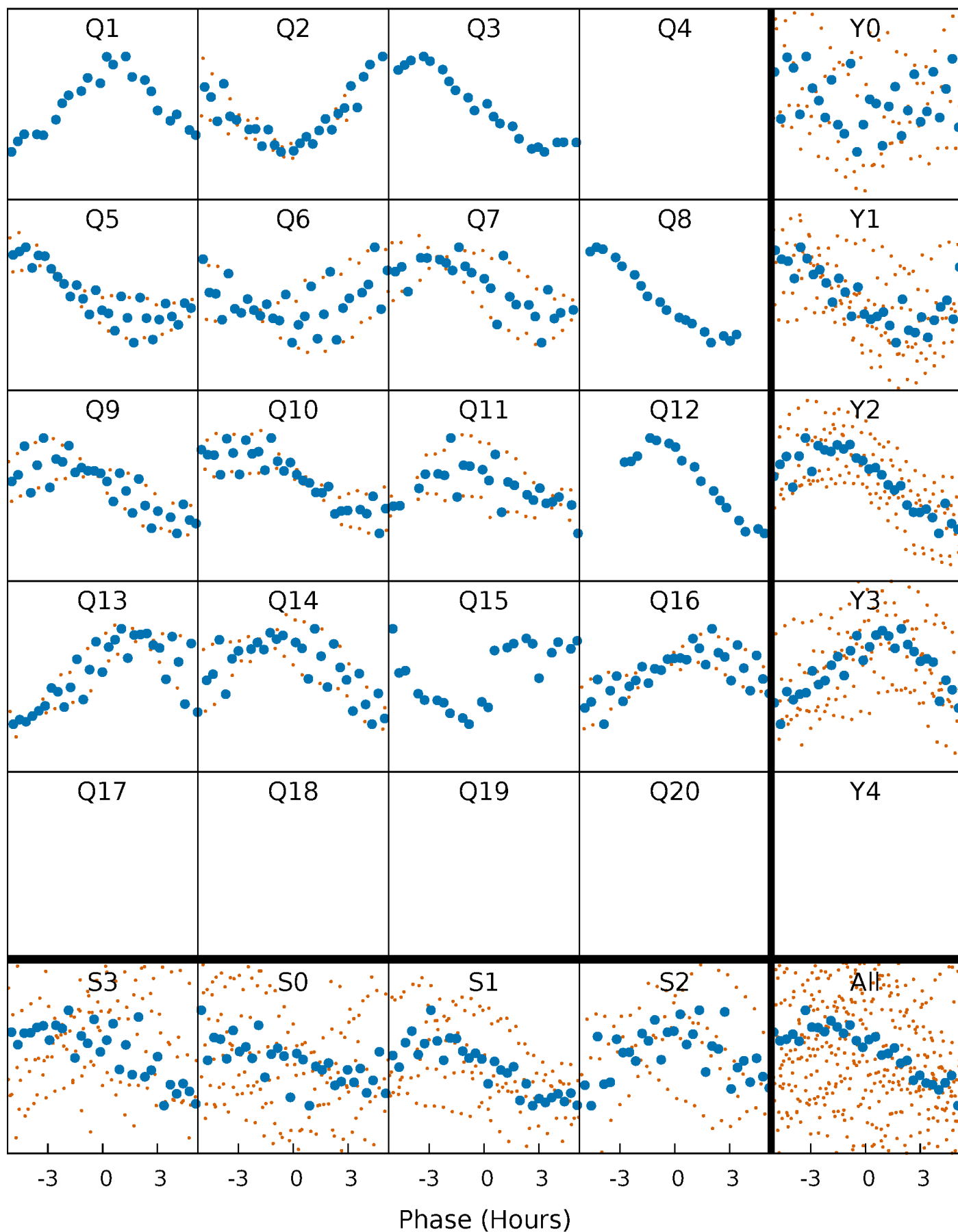


## Planet 8 : Phased Whitened Flux Time Series (Fit Epoch/Period)



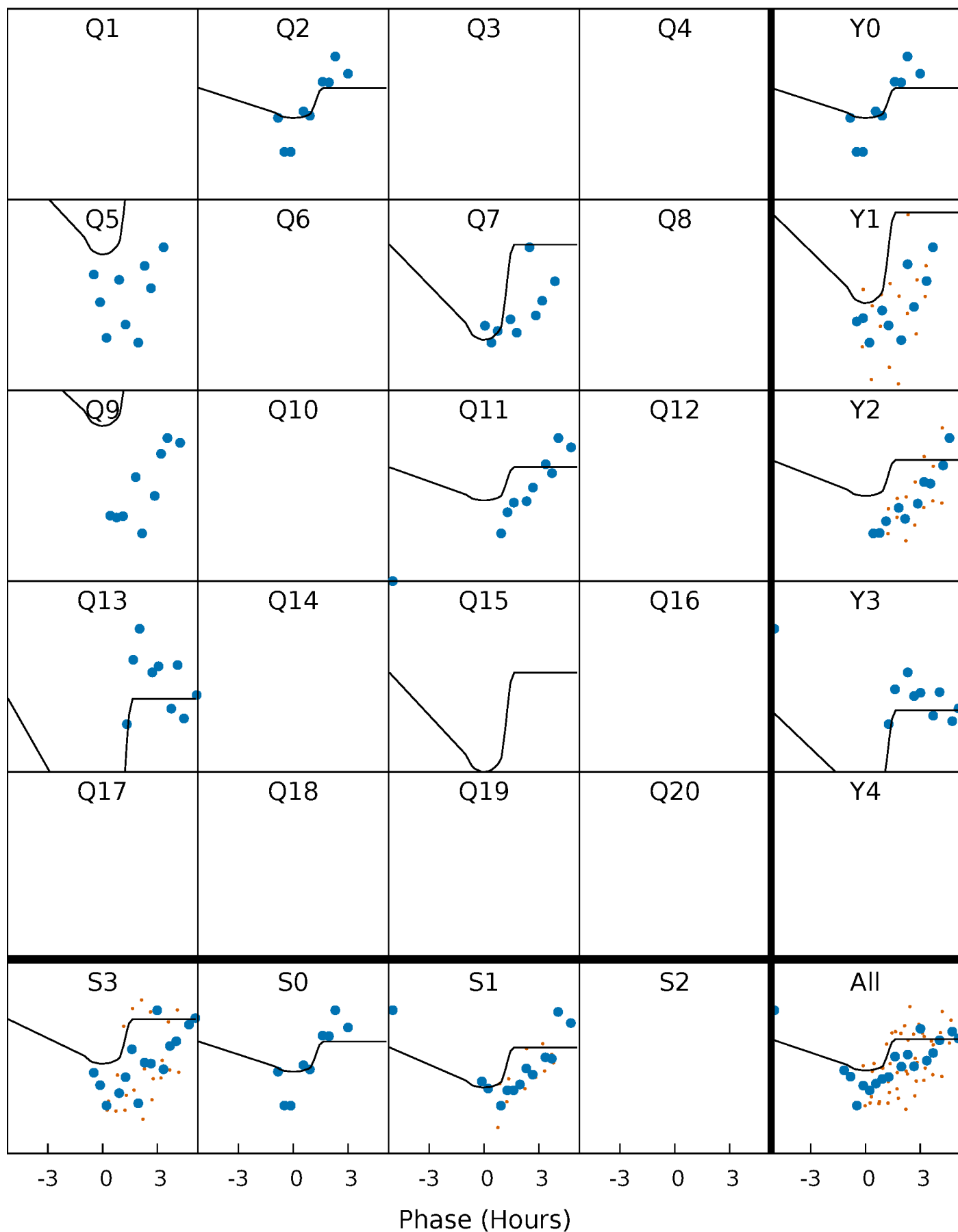
# PDC Quarter-Phased Transit Curves

TCE 004058206-08 P= 47.891699 Days  $T_0=159.457155$  (BKJD)



# DV Quarter-Phased Transit Curves

TCE 004058206-08     $P = 47.891699$  Days     $T_0 = 159.457155$  (BKJD)



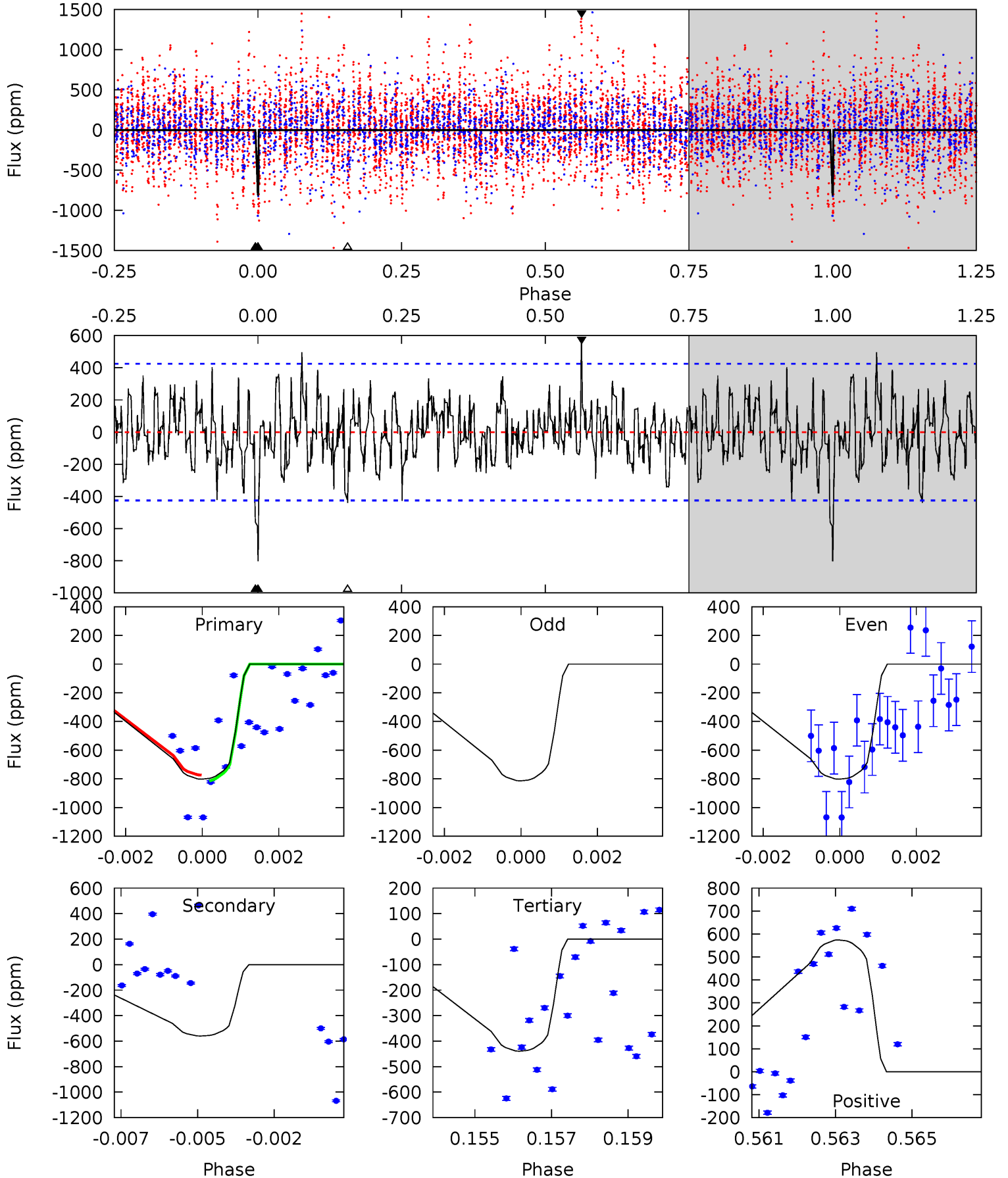
This plot does not exist for this TCE.



# DV Model-Shift Uniqueness Test

004058206-08, P = 47.891699 Days, E = 111.565456 Days

Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
10.0	6.99	5.48	7.16	5.30	3.05	1.86	4.53	2.84	1.50	-0.18	0.10	1.10	0.42	0.22



## Alt Model-Shift Uniqueness Test

This plot does not exist for this TCE.

### Stellar Parameters For KIC 004058206

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$\rho_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$6849^{+190}_{-262}$	$4.155^{+0.158}_{-0.193}$	$-0.200^{+0.250}_{-0.300}$	$1.600^{+0.516}_{-0.387}$	$1.345^{+0.189}_{-0.231}$	$0.462^{+0.435}_{-0.221}$
	+3%/-4%	+4%/-5%	+125%/-150%	+32%/-24%	+14%/-17%	+94%/-48%
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 004058206-08 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-560 \pm 80$	$6.74^{+6.37}_{-4.66}$	$1005^{+82}_{-67}$	$5327^{+5101}_{-1168}$	$539^{+5013}_{-399}$
Alt.	N/A	N/A	N/A	N/A	N/A

$T_{max}$  = 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  $A_{obs} \gg 1.0$

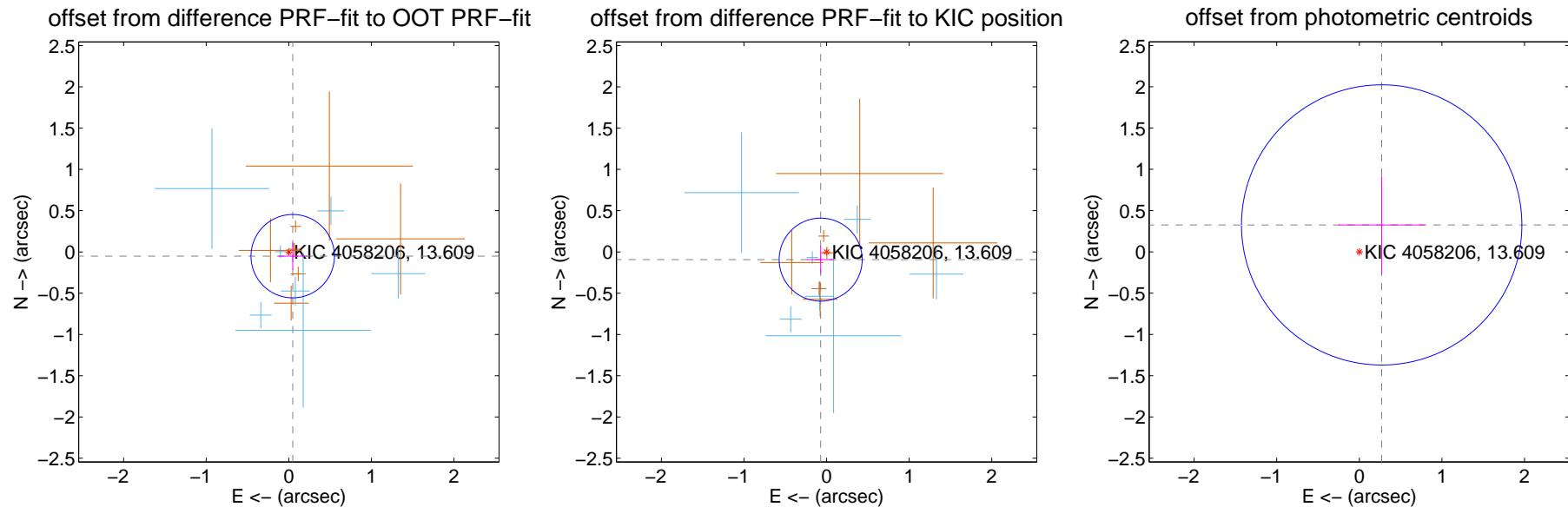
## DV Centroid Data

Supplemental centroid analysis for 004058206-08. Kepler magnitude: 13.61. Transit SNR 8.23

There are 7 quarters with good PRF difference image offsets

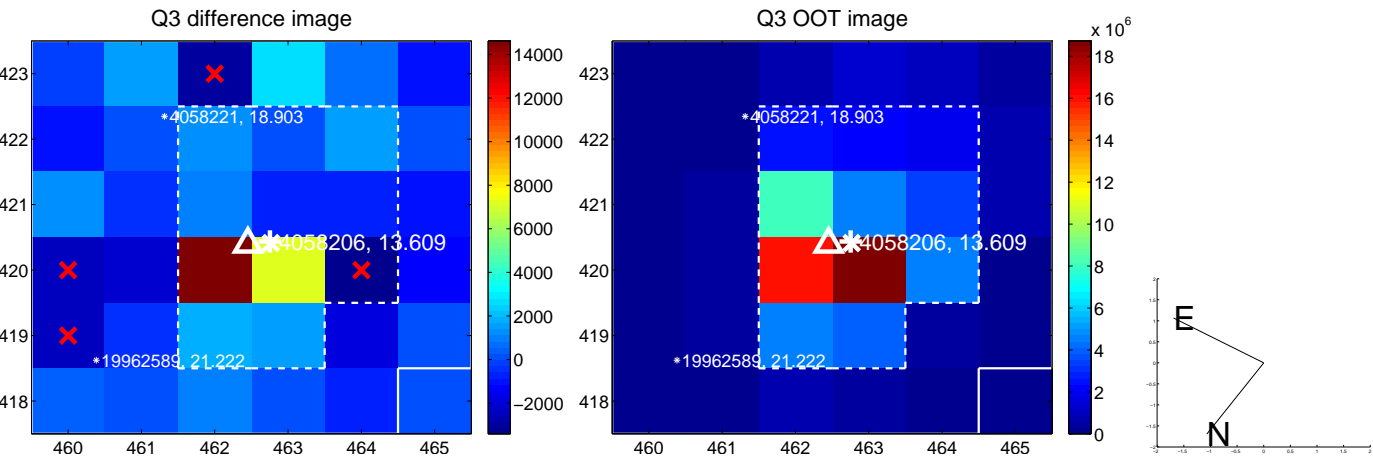
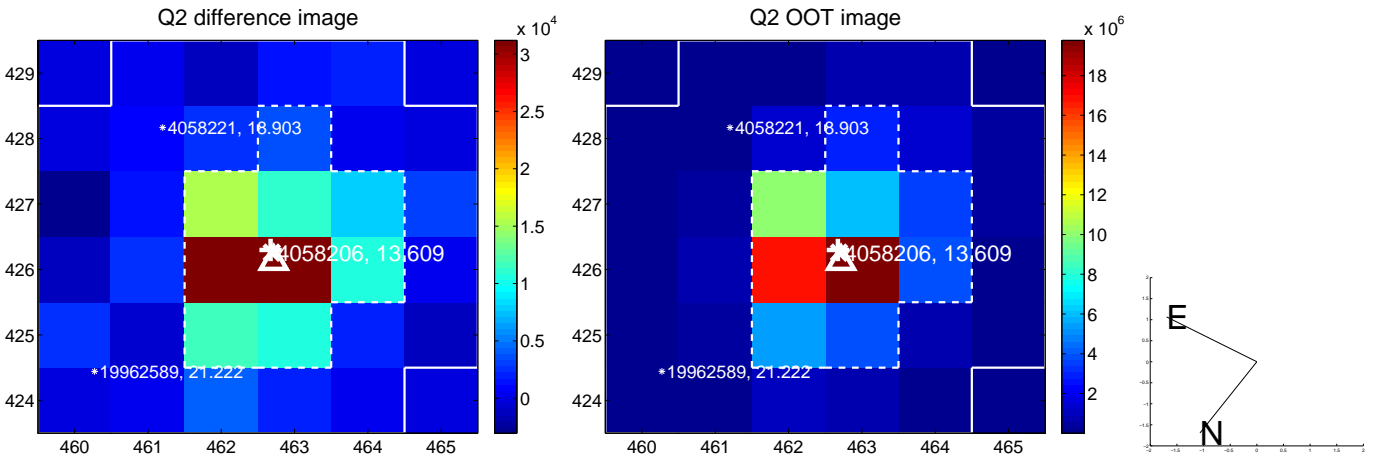
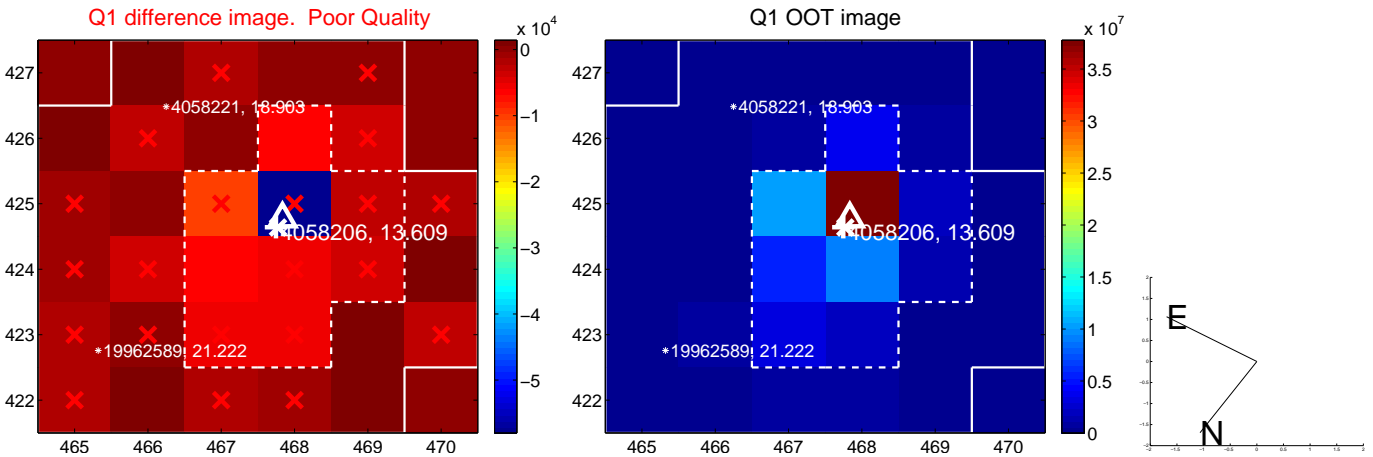
The direct PRF centroid is offset from the target star catalog position by about 0.17 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.070 \pm 0.168$	0.41	$-0.047 \pm 0.172$	$-0.051 \pm 0.165$
PRF-fit source offset from KIC position	$0.118 \pm 0.168$	0.70	$0.072 \pm 0.165$	$-0.093 \pm 0.166$
photometric centroid source offset	$0.42 \pm 0.57$	0.75	$-0.27 \pm 0.52$	$0.33 \pm 0.59$

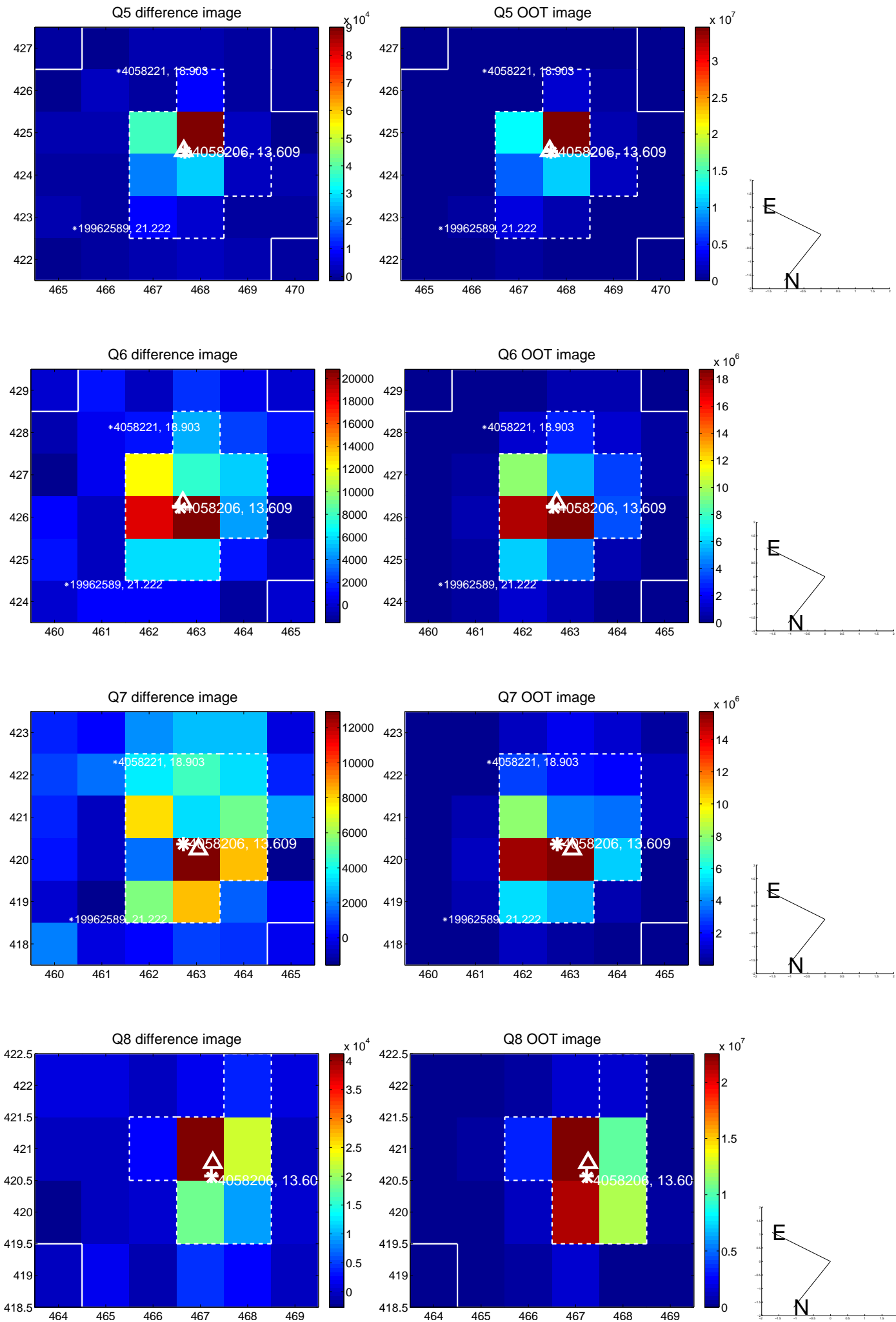


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses:** good quarterly centroid offsets; **Vermillion crosses:** bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

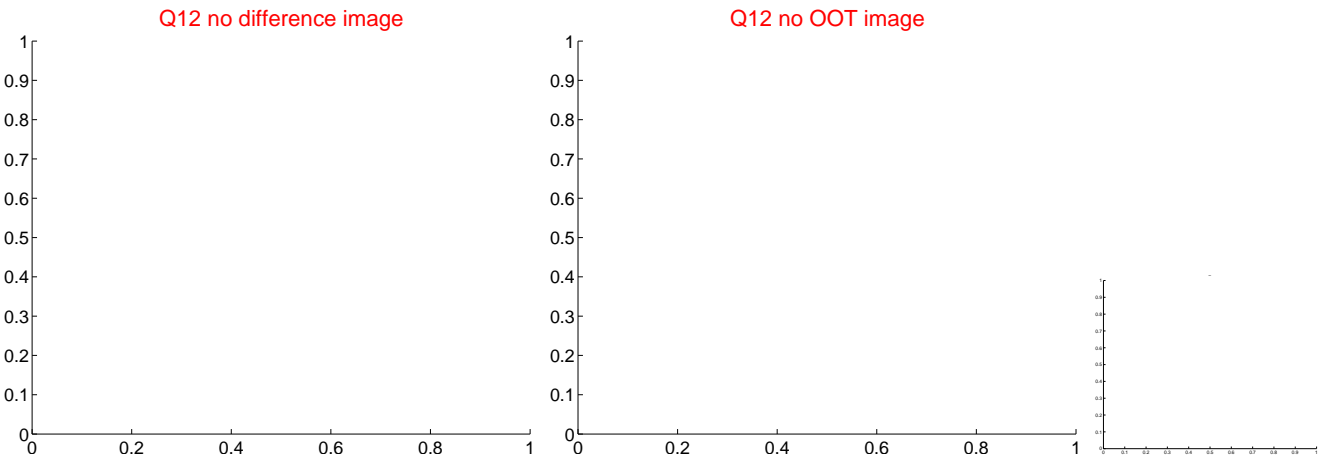
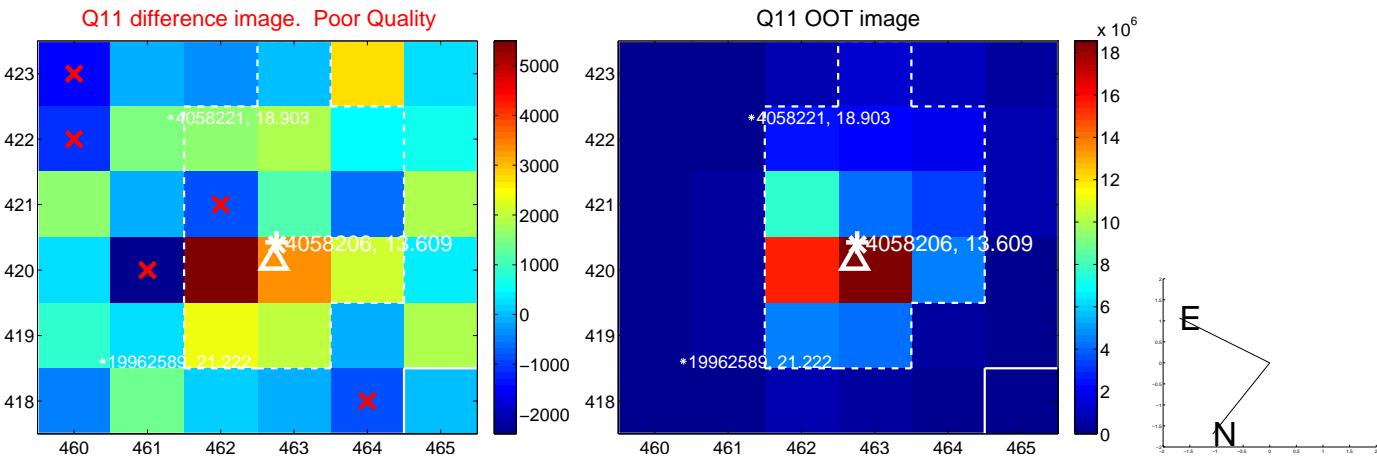
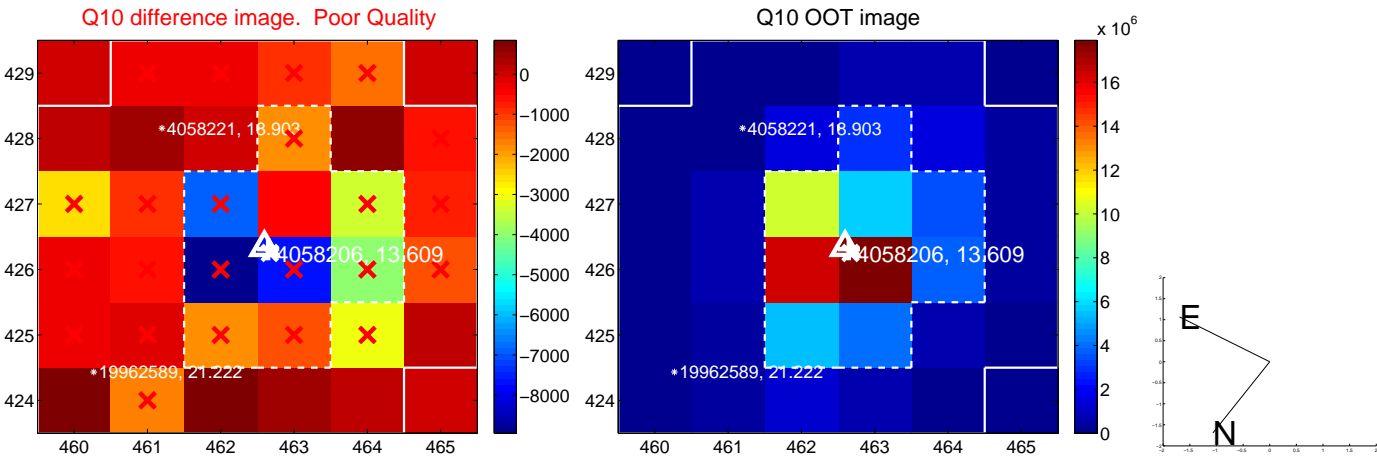
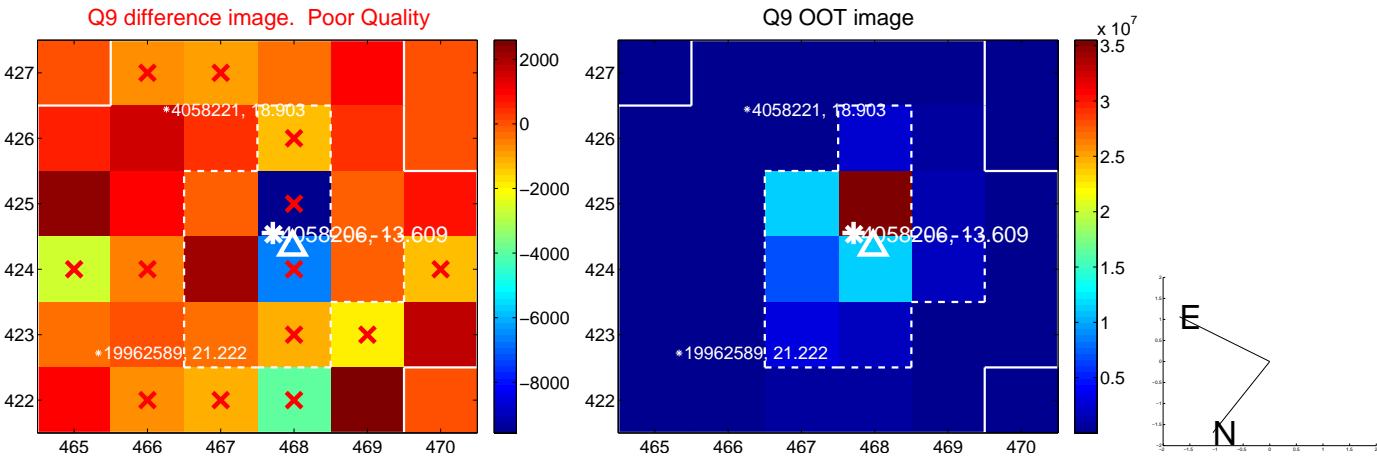
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



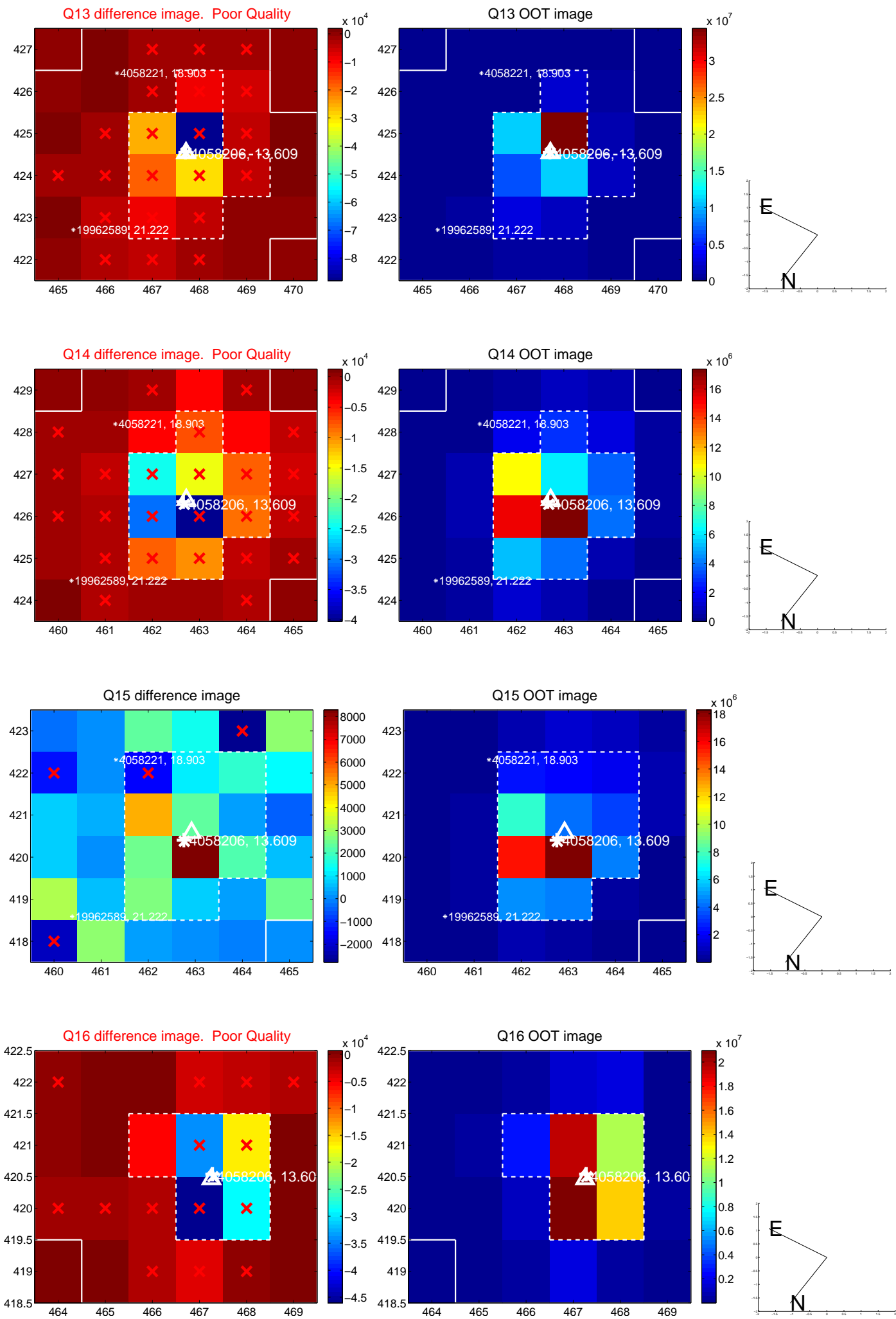
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

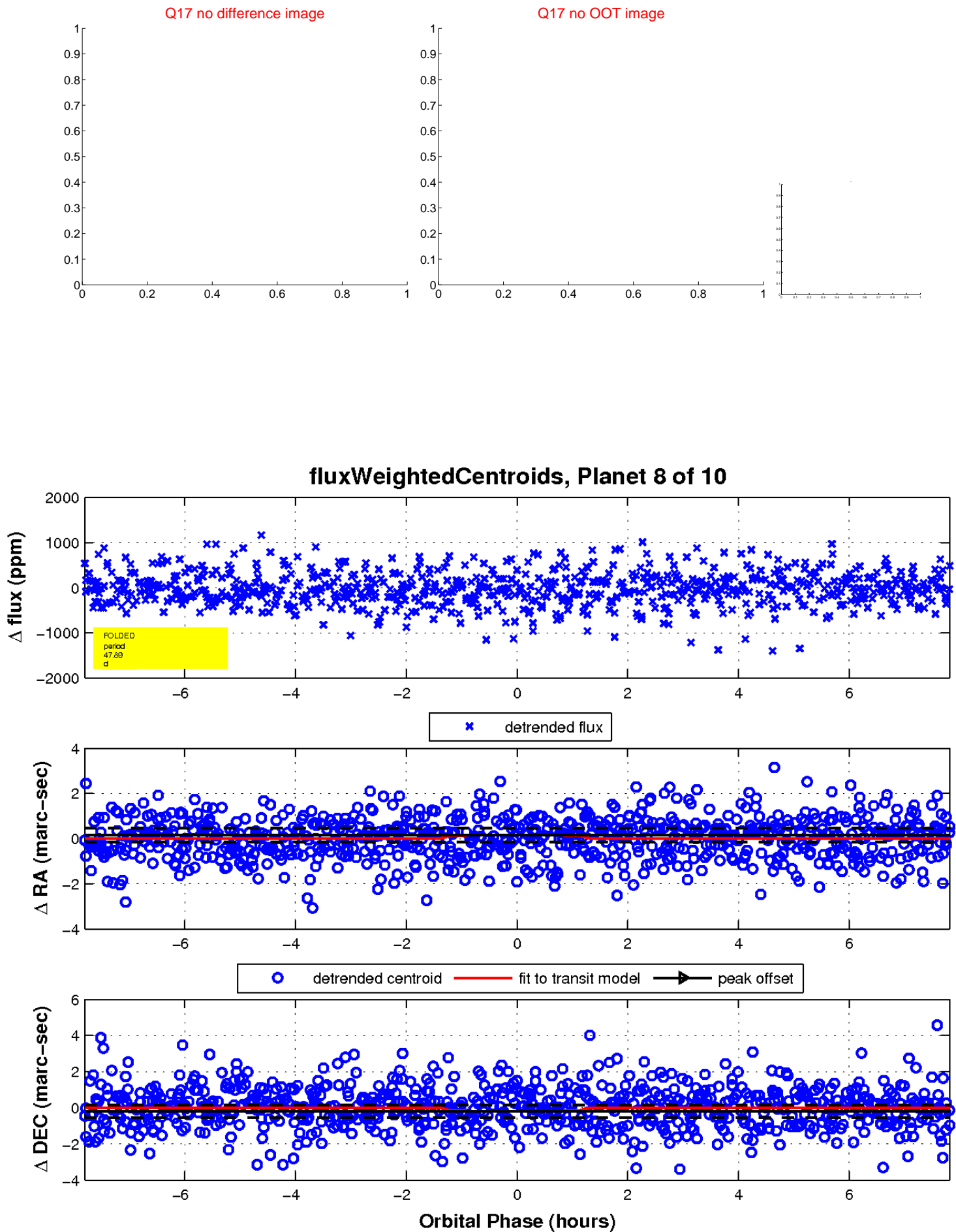


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



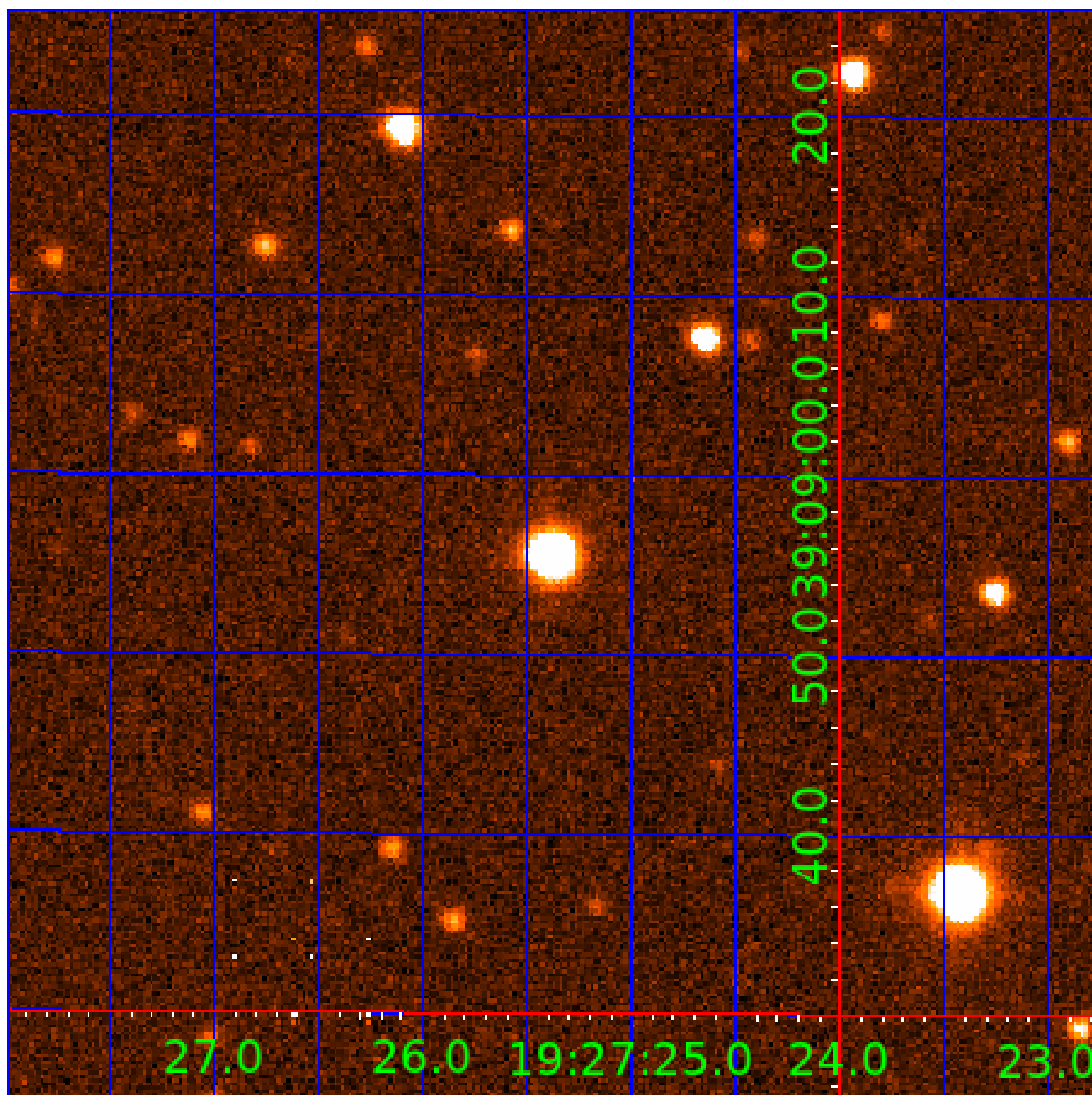


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination



## KIC 004058206

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
004058206-01	OBS	No	1.757664	133.121771	31.4	12.472	9.0	8.1	1.60	6849	0.93	5123.52
004058206-02	OBS	No	28.167409	133.654156	134.2	2.887	15.8	3.4	1.60	6849	2.16	126.81
004058206-03	OBS	No	28.165022	134.376281	31.7	5.936	15.3	0.8	1.60	6849	1.05	126.82
004058206-04	OBS	No	210.958911	133.974993	516.3	2.065	12.7	9.1	1.60	6849	3.92	8.65
004058206-05	OBS	No	29.540053	139.529398	217.0	6.800	11.4	5.6	1.60	6849	2.75	119.02
004058206-07	OBS	No	35.078211	148.902092	480.5	3.093	9.8	8.4	1.60	6849	3.83	94.64
004058206-08	OBS	No	47.891699	159.457155	501.9	2.608	9.7	8.2	1.60	6849	3.62	62.49
004058206-09	OBS	No	59.344057	134.337160	528.7	4.210	9.8	9.5	1.60	6849	3.81	46.95
004058206-10	OBS	No	38.068267	161.015373	572.3	6.023	9.5	12.0	1.60	6849	6.51	84.87

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
004058206-01	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_ALT
004058206-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_ZUMA_TRACKER—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT
004058206-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_ZUMA_TRACKER—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—SAME_NTL_PERIOD
004058206-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_MARSHALL—TRANS_GAPPED—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS
004058206-05	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT
004058206-07	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_SKYE—TRANS_GAPPED—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT
004058206-08	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV
004058206-09	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_SKYE—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT
004058206-10	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT

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

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

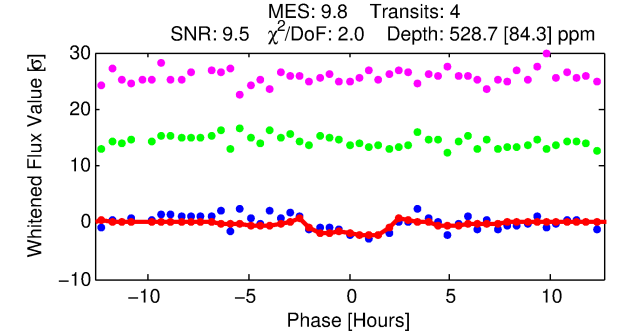
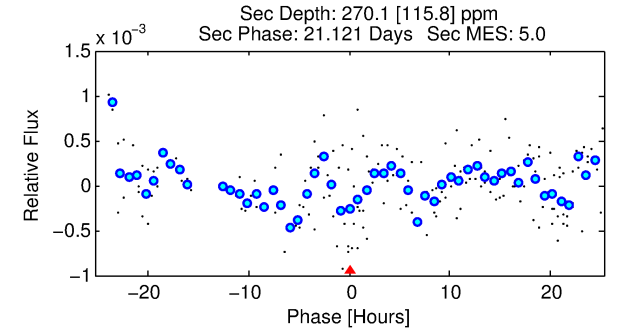
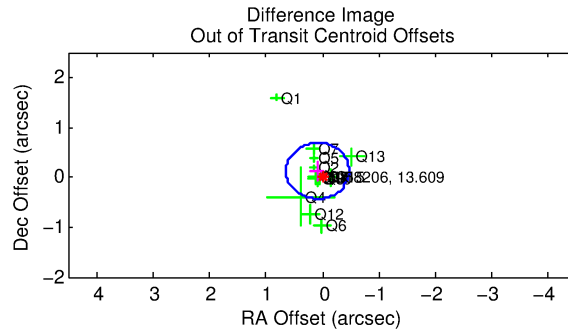
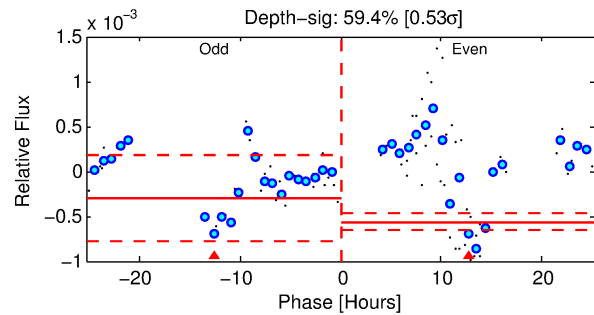
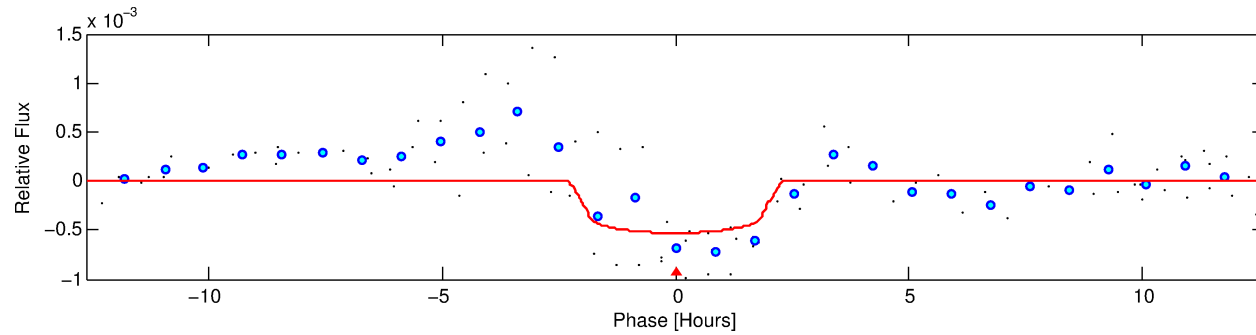
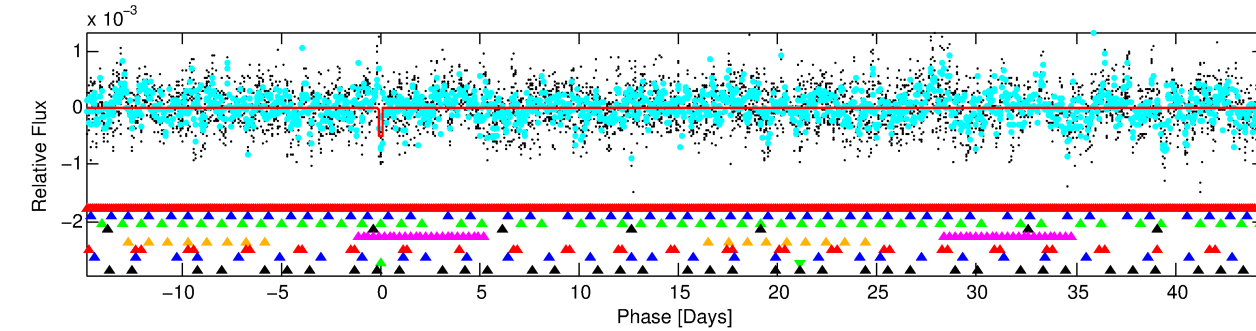
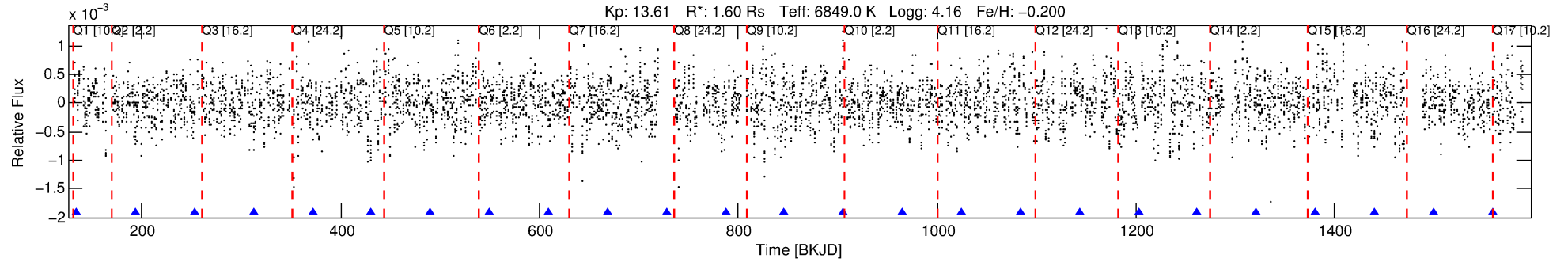
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 004058206-09

No Significant Match Found

# DV One-Page Summary

KIC: 4058206 Candidate: 9 of 10 Period: 59.344 d



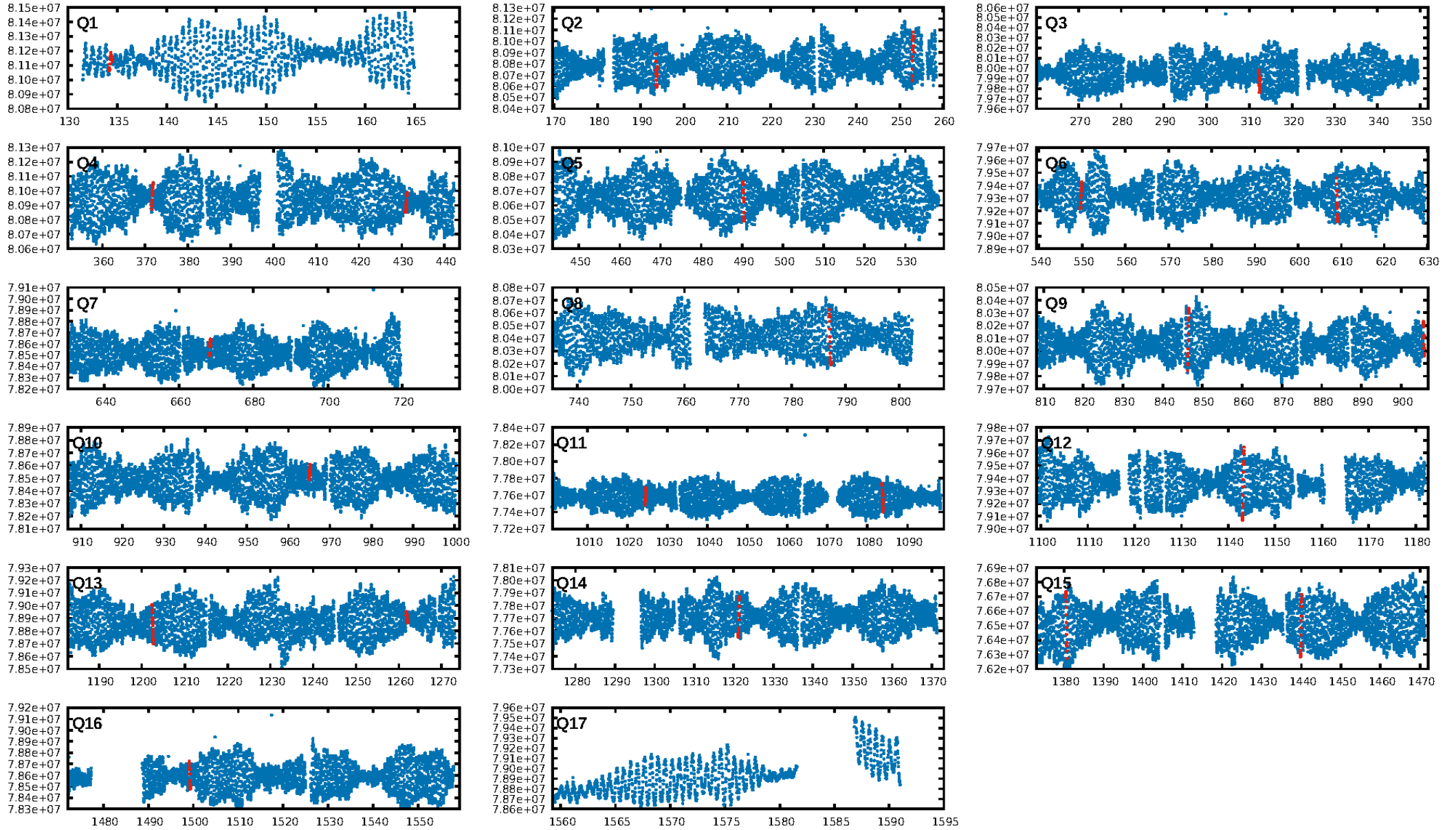
## DV Fit Results:

Period = 59.34406 [0.00079] d  
Epoch = 134.3372 [0.0091] BKJD  
Rp/R\* = 0.0218 [0.0218]  
a/R\* = 95.81 [536.65]  
b = 0.50 [8.40]  
Seff = 46.95 [18.63]  
Teff = 667 [66] K  
Rp = 3.81 [4.00] Re  
a = 0.3279 [0.0856] AU  
Ag = 1099.82 [2282.28] [0.48 $\sigma$ ]  
Teffp = 5943 [3043] K [1.73 $\sigma$ ]

## DV Diagnostic Results:

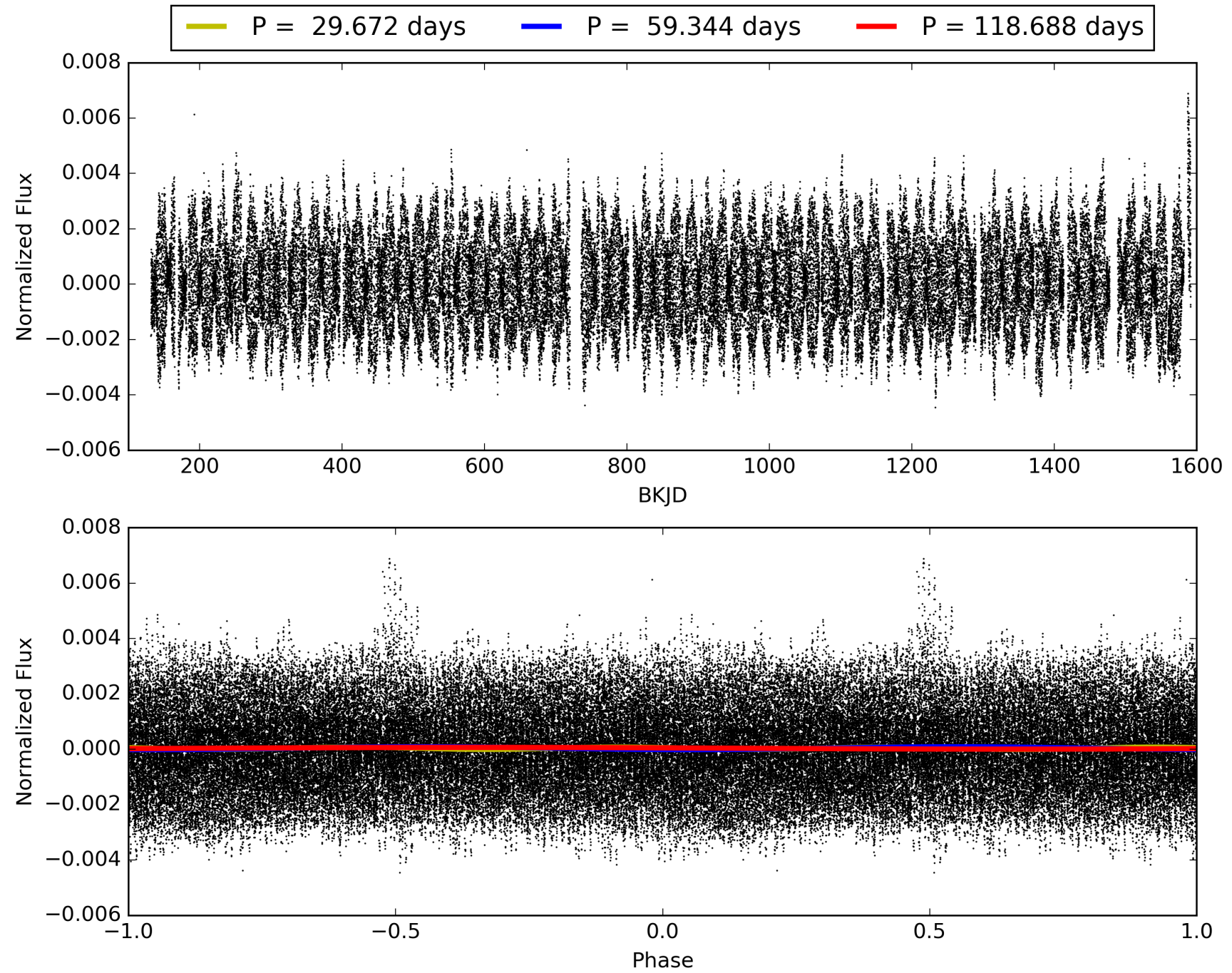
ShortPeriod-sig: 100.0% [55.49 $\sigma$ ]  
LongPeriod-sig: 100.0% [135.47 $\sigma$ ]  
ModelChiSquare2-sig: 0.0%  
ModelChiSquareGof-sig: 71.0%  
Bootstrap-pfa: 2.12e-10  
RollingBand-fgt: 1.00 [4/4]  
GhostDiagnostic-chr: -1.418  
Centroid-sig: 15.3%  
Centroid-so: 0.562 arcsec [1.24 $\sigma$ ]  
OotOffset-rm: 0.154 arcsec [0.83 $\sigma$ ]  
KicOffset-rm: 0.218 arcsec [1.78 $\sigma$ ]  
OotOffset-st: 4/3/3/3 [13]  
KicOffset-st: 4/3/3/3 [13]  
DiffImageQuality-fgm: 0.69 [9/13]  
DiffImageOverlap-fno: 0.29 [4/14]

# TCE 004058206-09, PDC Light Curves



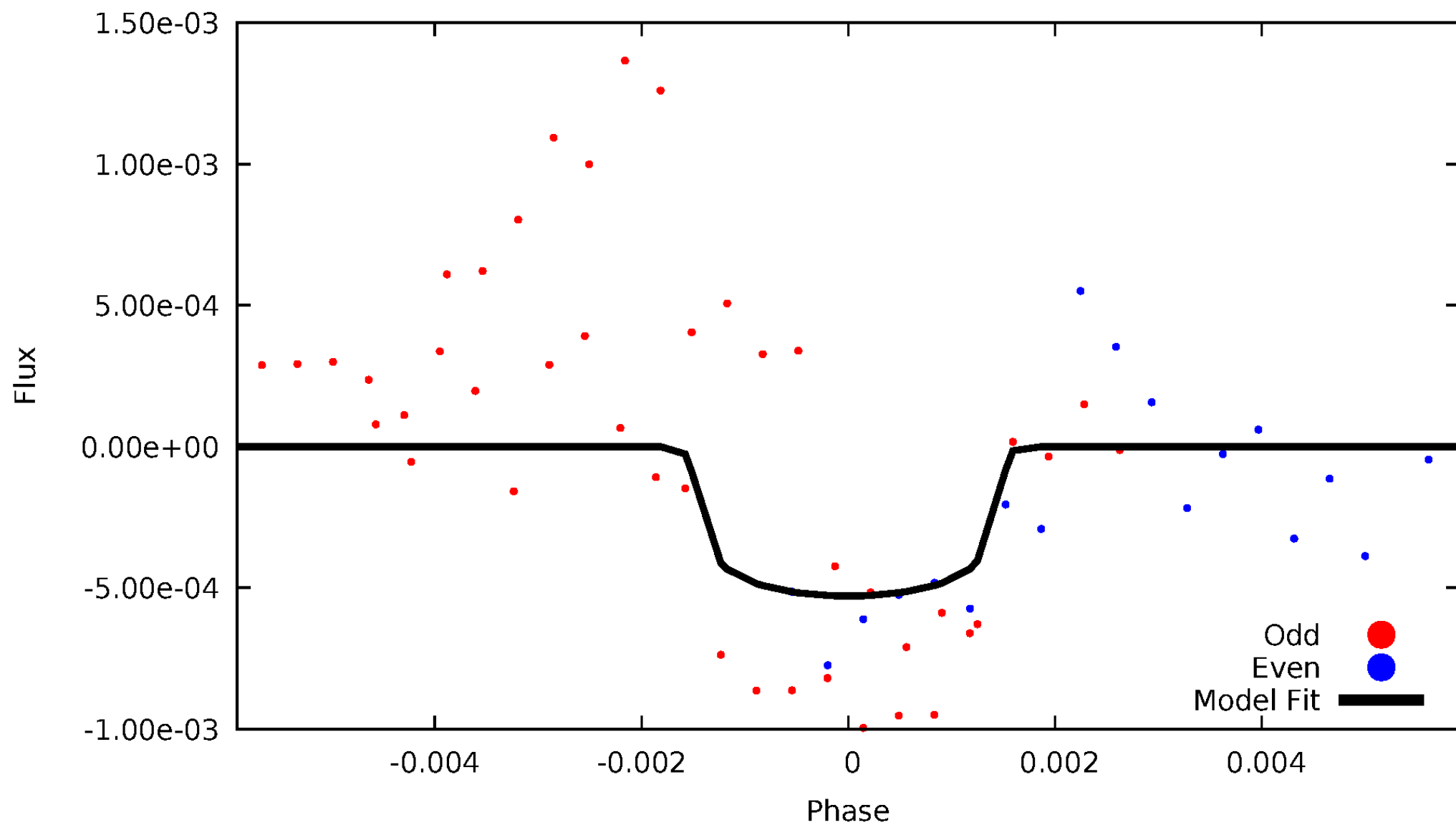


TCE 004058206-09



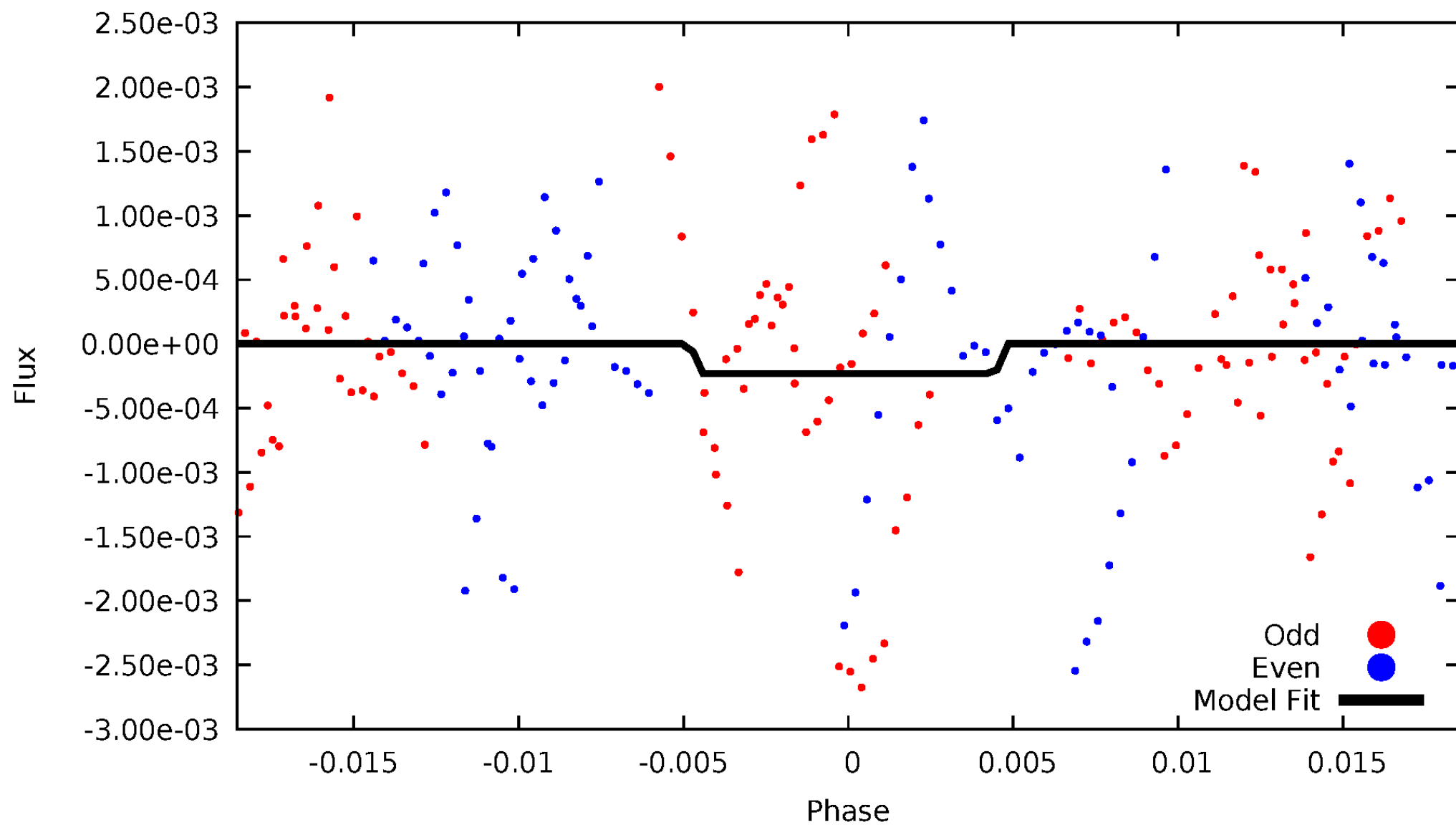
# DV Odd/Even

TCE 004058206-09



# ALT Odd/Even

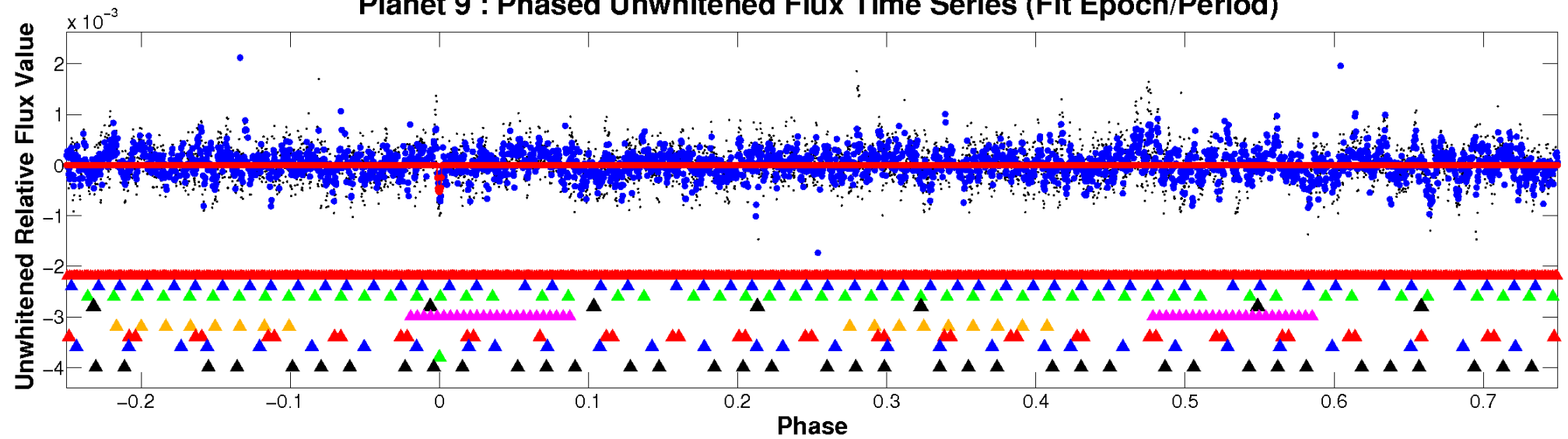
TCE 004058206-09



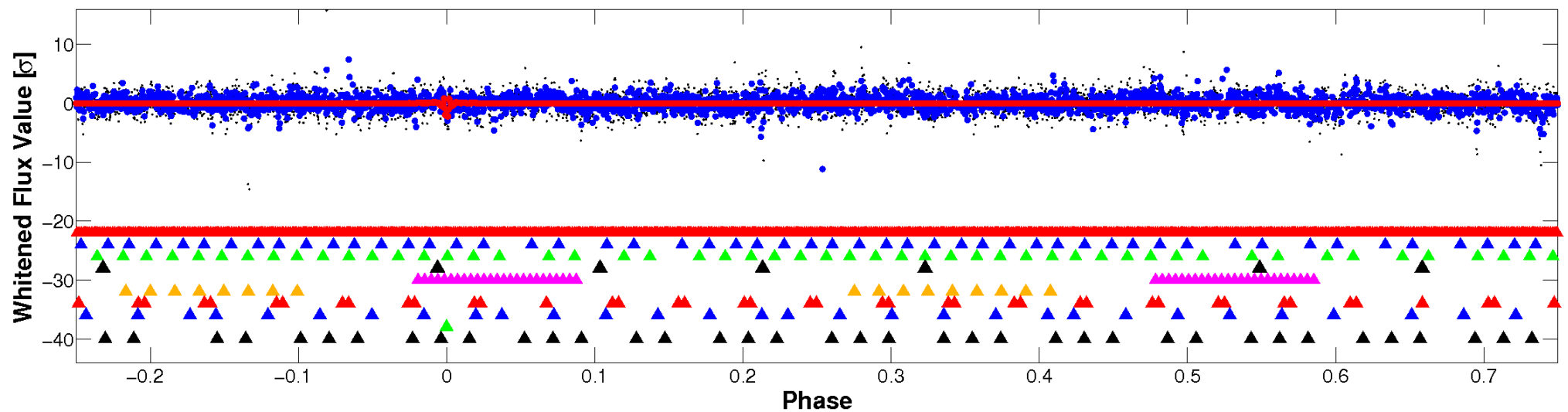


# Non-Whitened Vs. Whitened Light Curve

## Planet 9 : Phased Unwhitened Flux Time Series (Fit Epoch/Period)

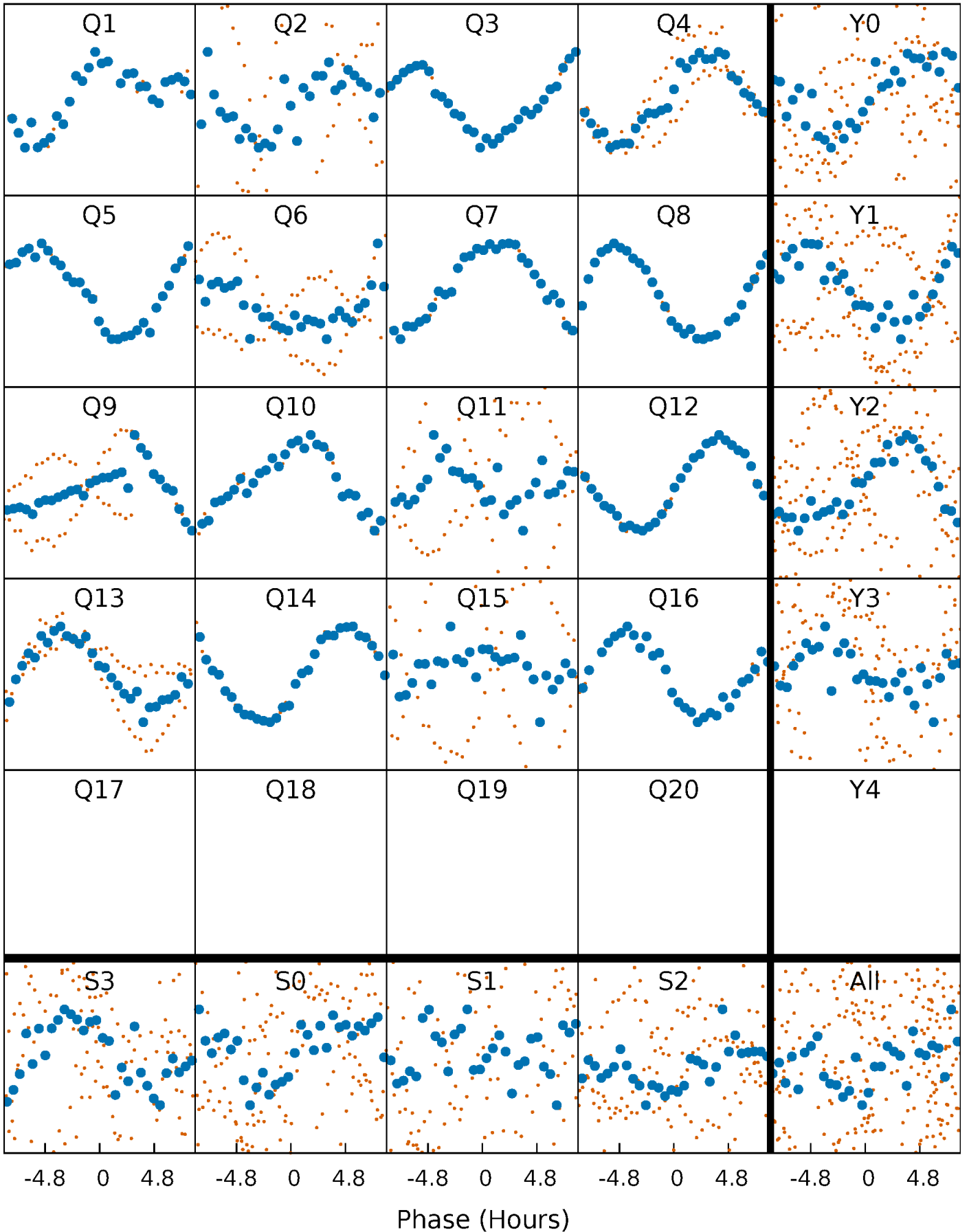


## Planet 9 : Phased Whitened Flux Time Series (Fit Epoch/Period)



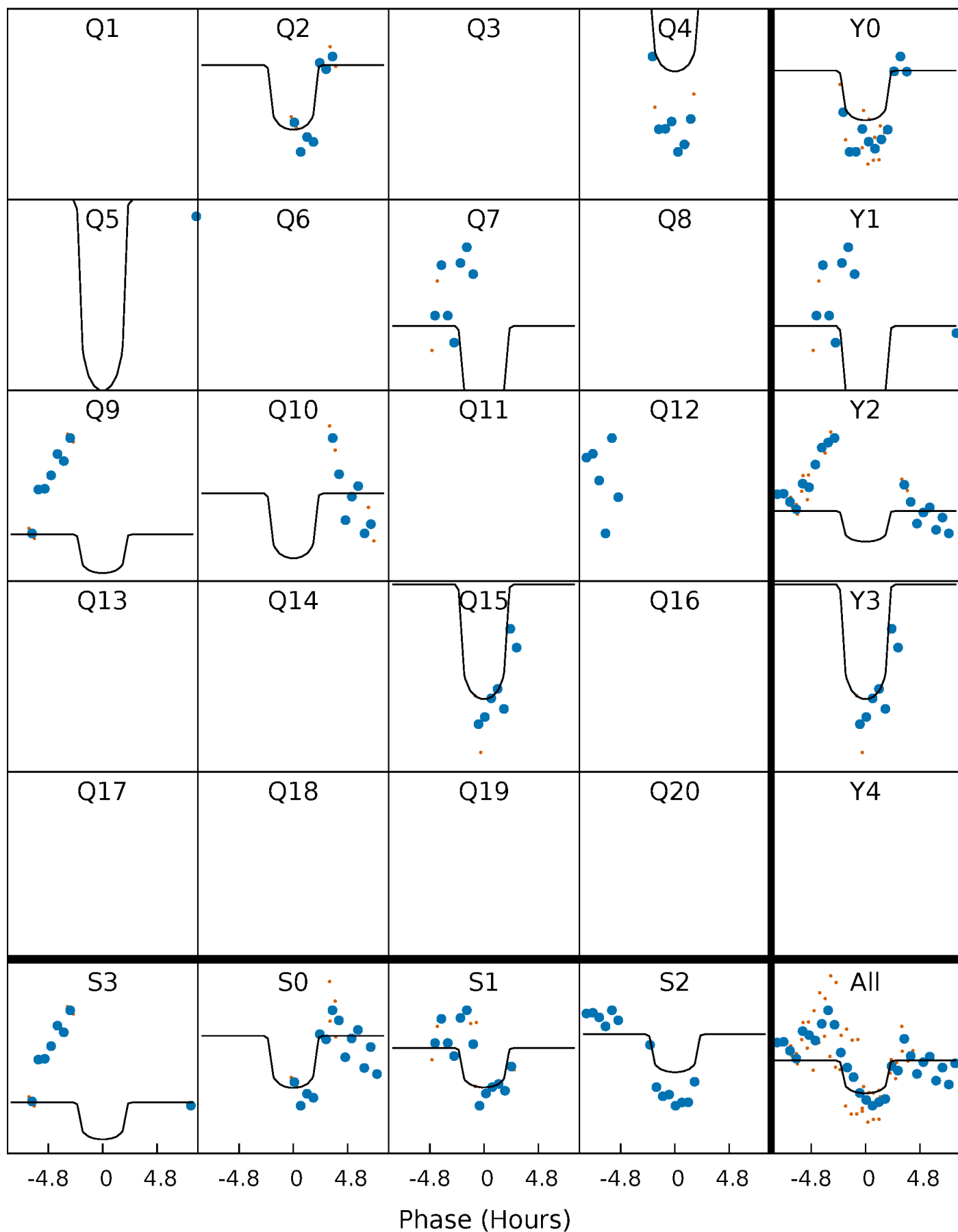
# PDC Quarter-Phased Transit Curves

TCE 004058206-09   P= 59.344057 Days    $T_0=134.337160$  (BKJD)



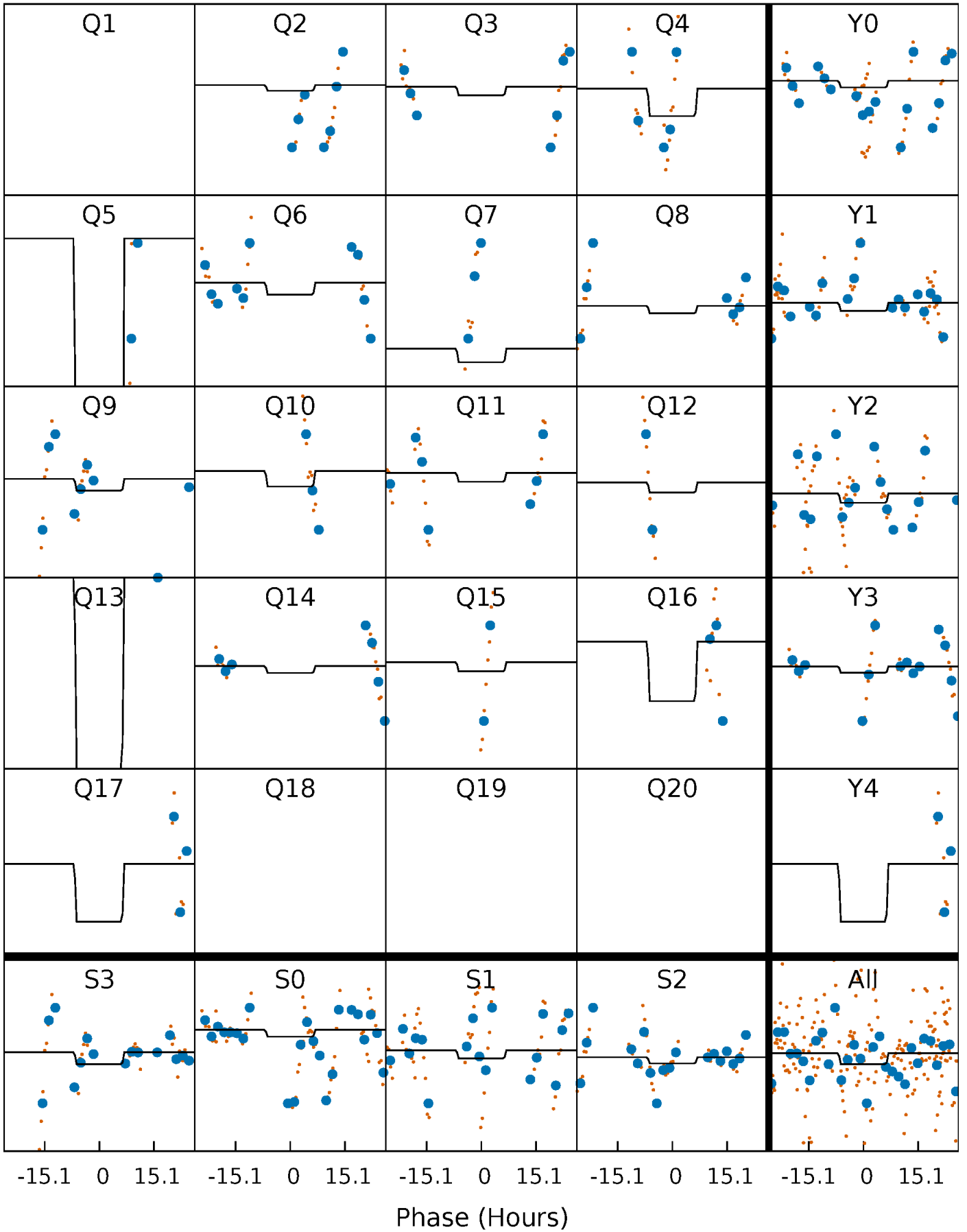
# DV Quarter-Phased Transit Curves

TCE 004058206-09   P= 59.344057 Days    $T_0=134.337160$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

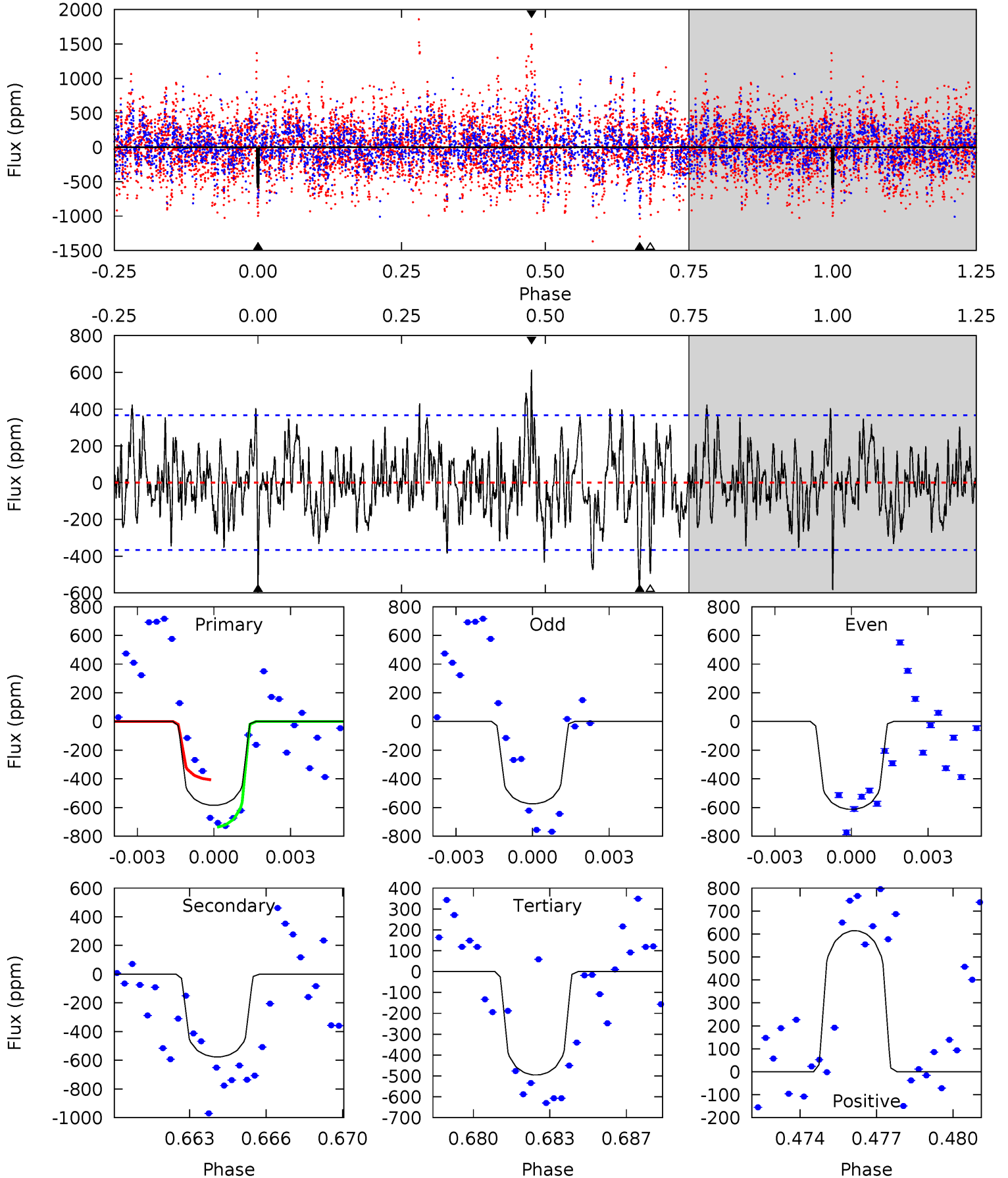
TCE 004058206-09     $P = 59.342436$  Days     $T_0 = 134.348021$  (BKJD)



# DV Model-Shift Uniqueness Test

004058206-09, P = 59.344057 Days, E = 74.993103 Days

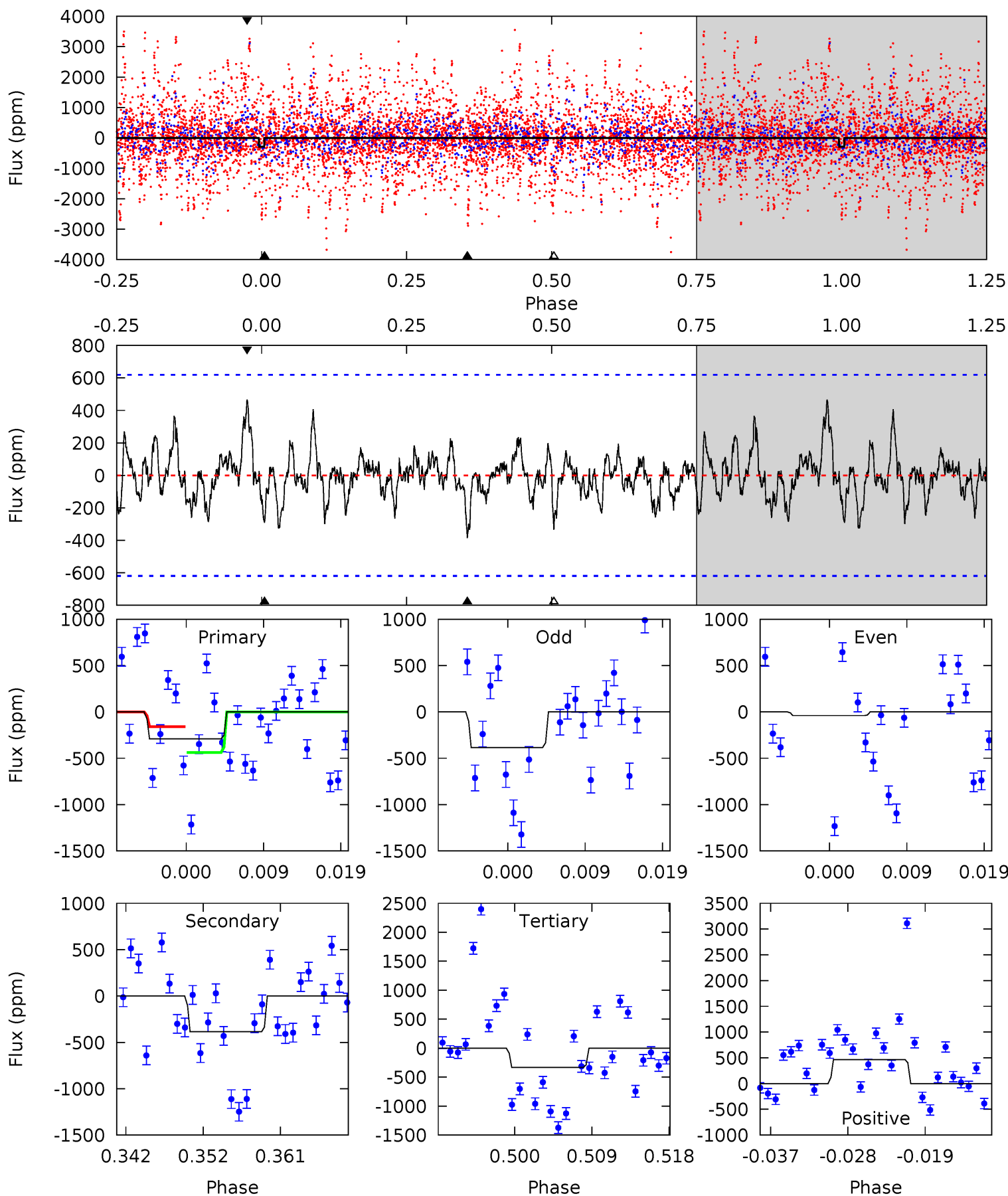
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
8.34	8.22	7.06	8.76	5.23	2.93	2.22	1.27	-0.42	1.16	-0.54	0.25	0.70	0.51	2.34



# Alt Model-Shift Uniqueness Test

004058206-09, P = 59.342436 Days, E = 75.005585 Days

Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
2.37	3.14	2.72	3.79	5.04	2.60	0.95	-0.35	-1.42	0.42	-0.65	1.22	2.07	0.55	1.15



### Stellar Parameters For KIC 004058206

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$6849^{+190}_{-262}$	$4.155^{+0.158}_{-0.193}$	$-0.200^{+0.250}_{-0.300}$	$1.600^{+0.516}_{-0.387}$	$1.345^{+0.189}_{-0.231}$	$0.462^{+0.435}_{-0.221}$
	+3%/-4%	+4%/-5%	+125%/-150%	+32%/-24%	+14%/-17%	+94%/-48%
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 004058206-09 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-576 \pm 70$	$4.67^{+3.58}_{-2.83}$	$934^{+75}_{-66}$	$6486^{+4910}_{-1471}$	$1584^{+8278}_{-1090}$
Alt.	$-386 \pm 123$	$3.86^{+3.50}_{-2.62}$	$936^{+78}_{-60}$	$6467^{+7320}_{-1792}$	$1491^{+12225}_{-1129}$

$T_{max}$  = 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  $A_{obs} \gg 1.0$

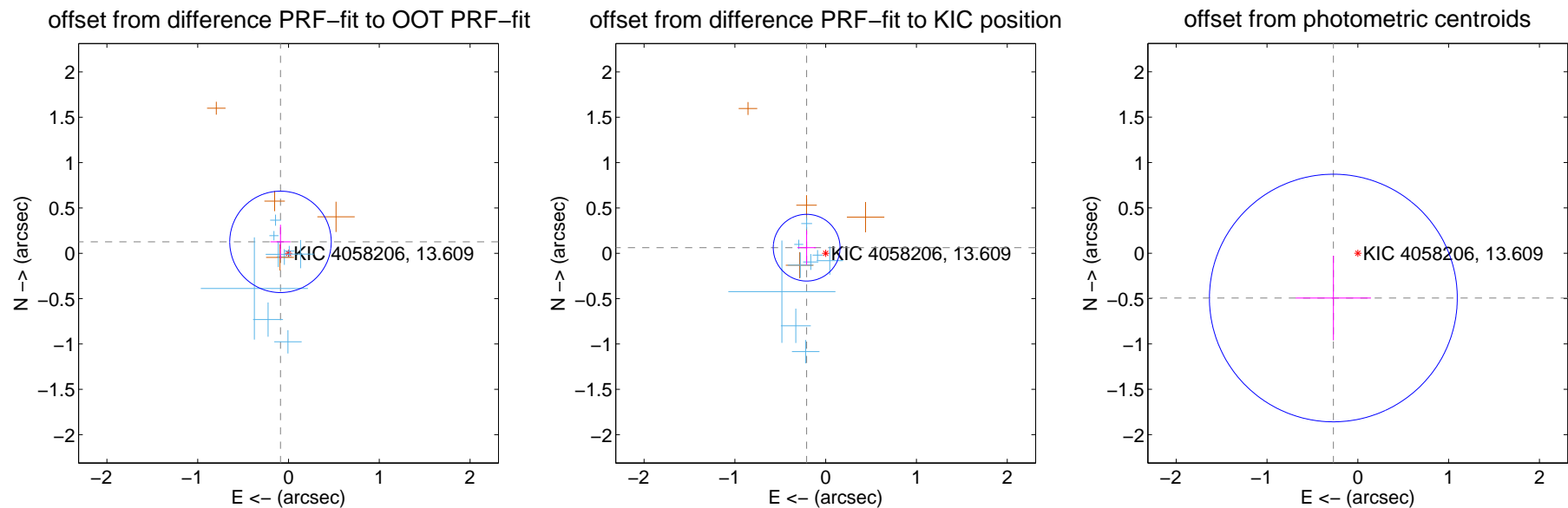
## DV Centroid Data

Supplemental centroid analysis for 004058206-09. Kepler magnitude: 13.61. Transit SNR 9.51

There are 9 quarters with good PRF difference image offsets

The direct PRF centroid is offset from the target star catalog position by about 0.11 arcsec

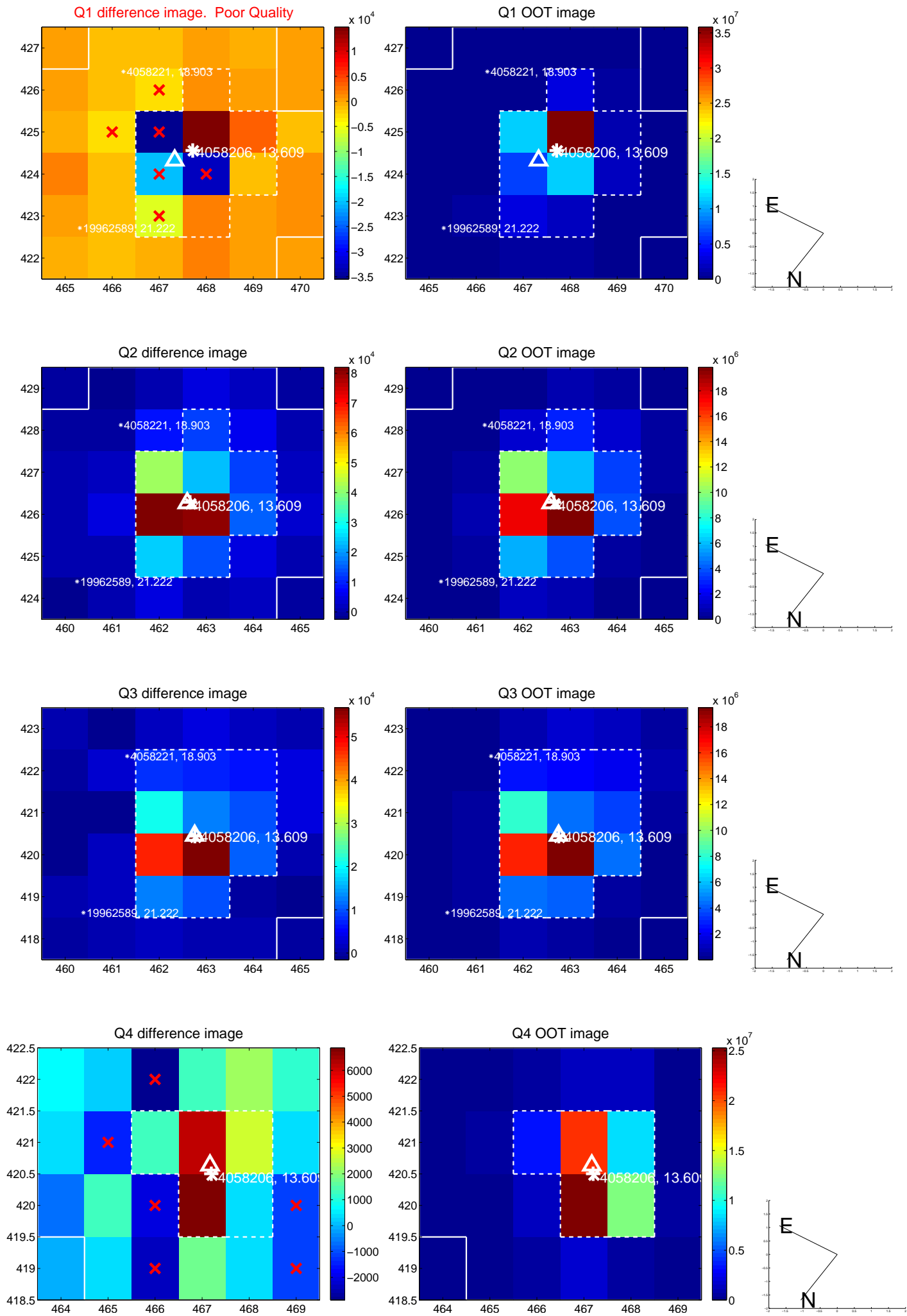
	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.154 \pm 0.186$	0.83	$0.088 \pm 0.111$	$0.126 \pm 0.189$
PRF-fit source offset from KIC position	$0.218 \pm 0.123$	1.78	$0.209 \pm 0.103$	$0.062 \pm 0.189$
photometric centroid source offset	$0.56 \pm 0.45$	1.24	$0.27 \pm 0.41$	$-0.49 \pm 0.47$



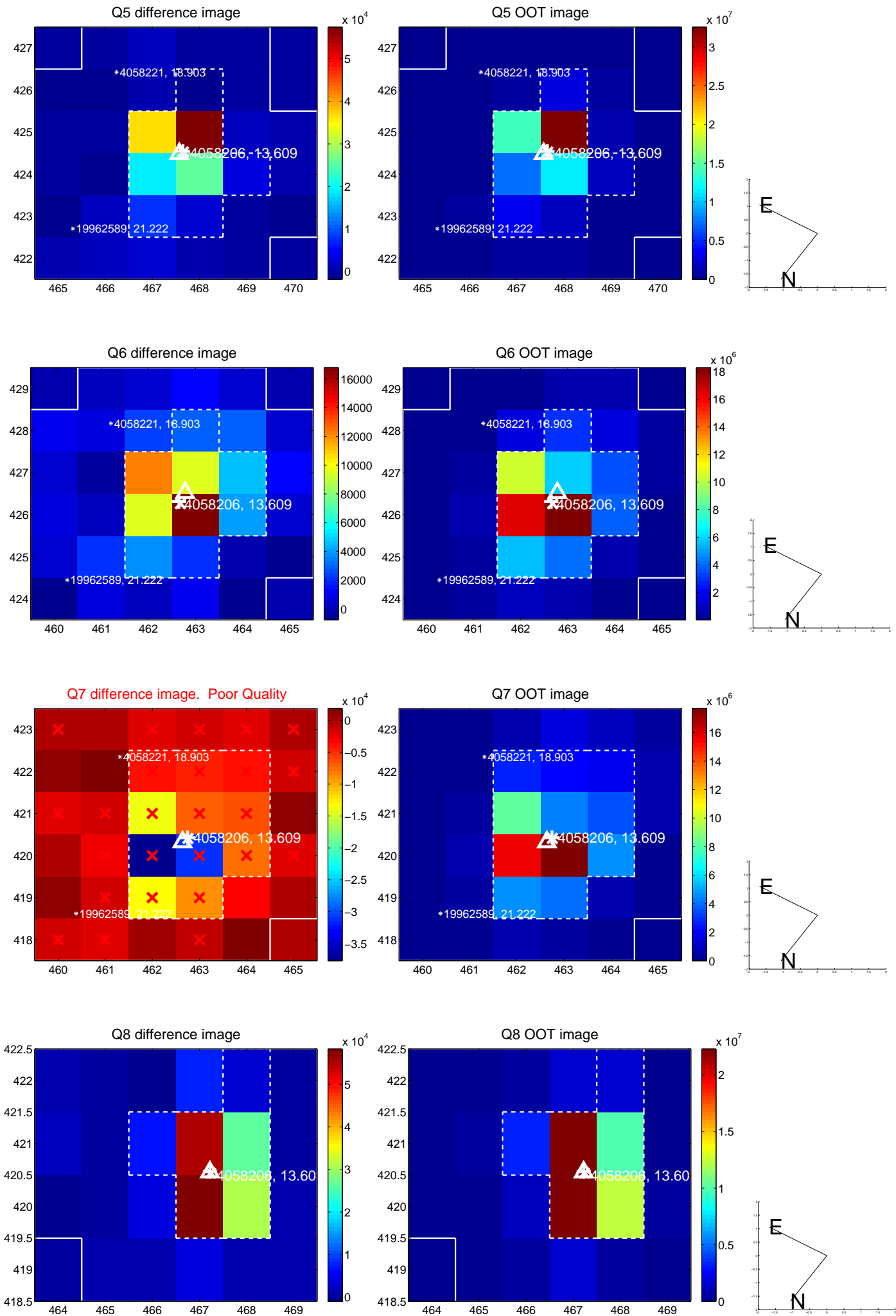
Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets**; **Vermillion crosses: bad quarterly centroid offsets**; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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



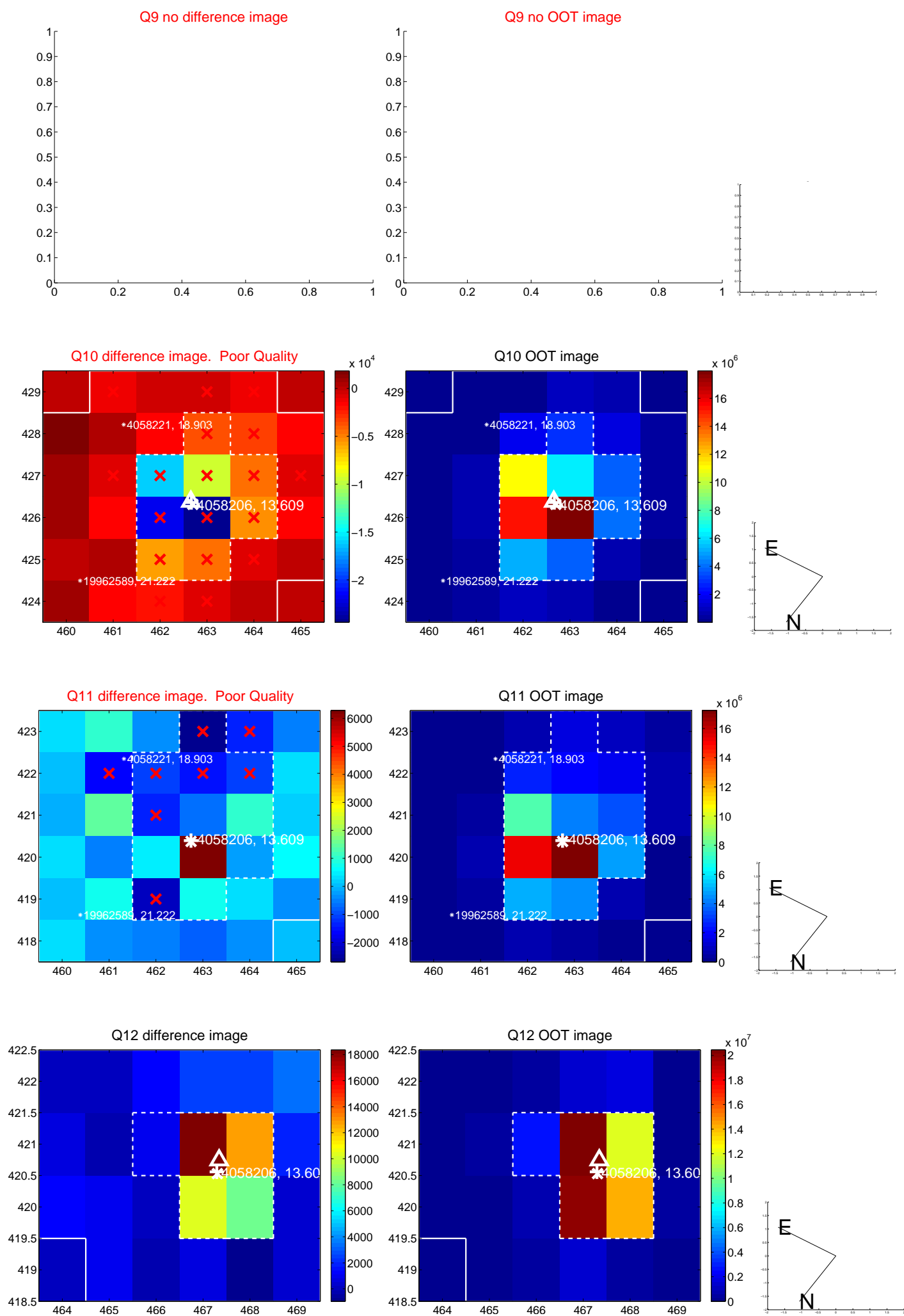
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



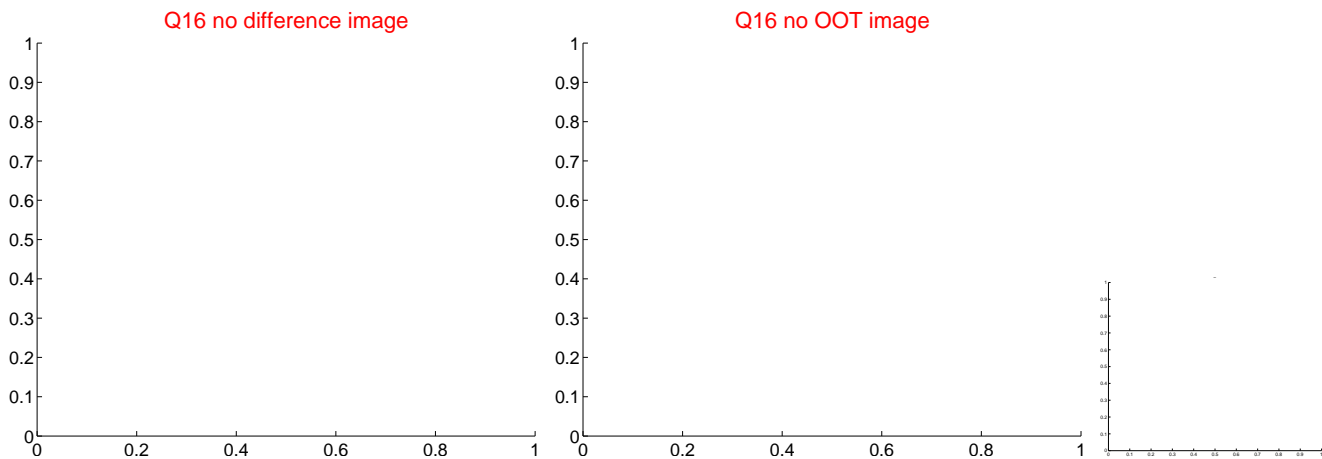
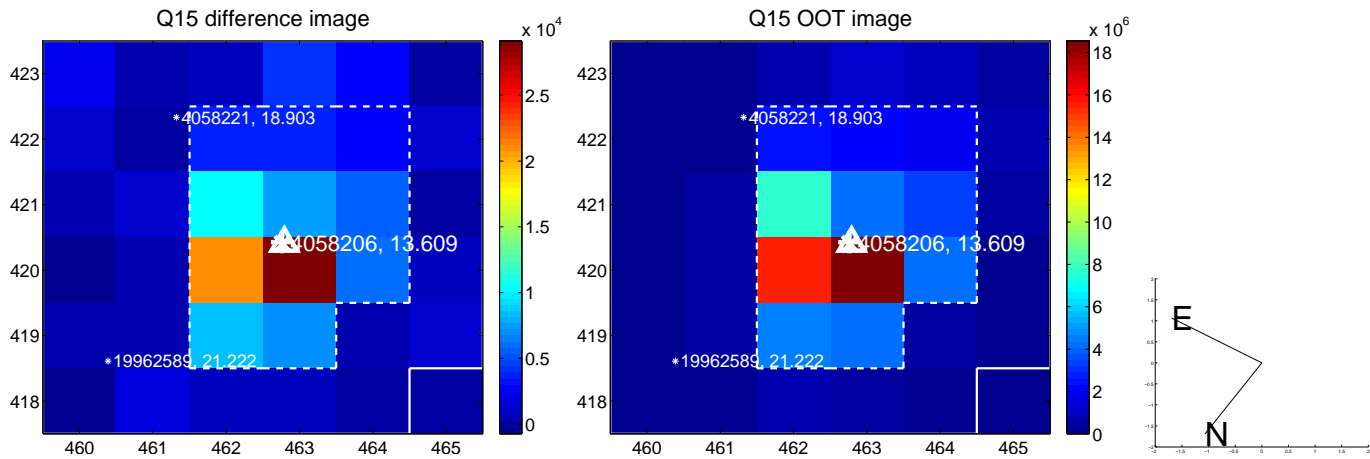
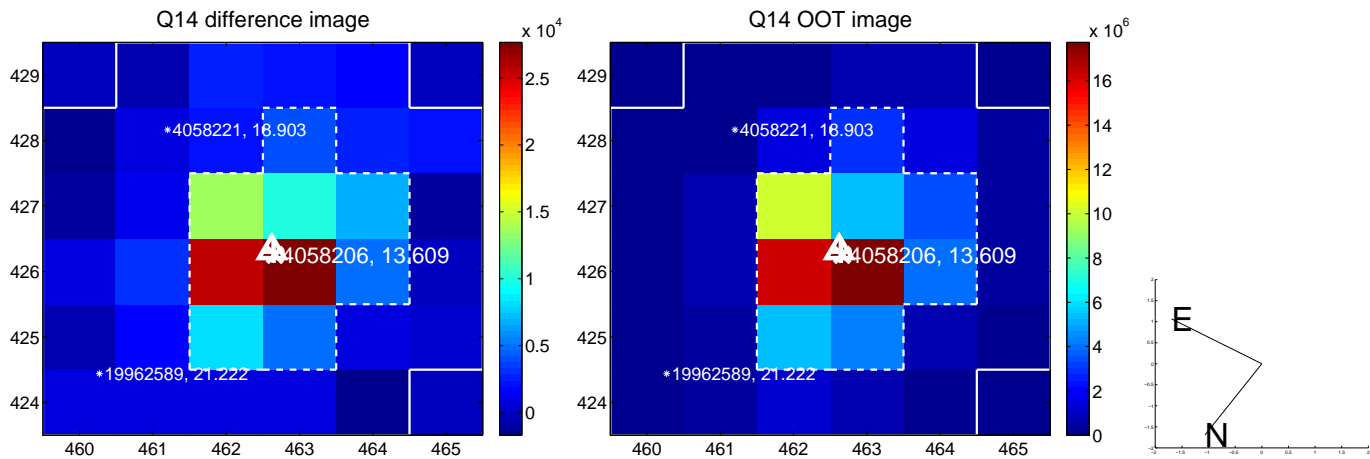
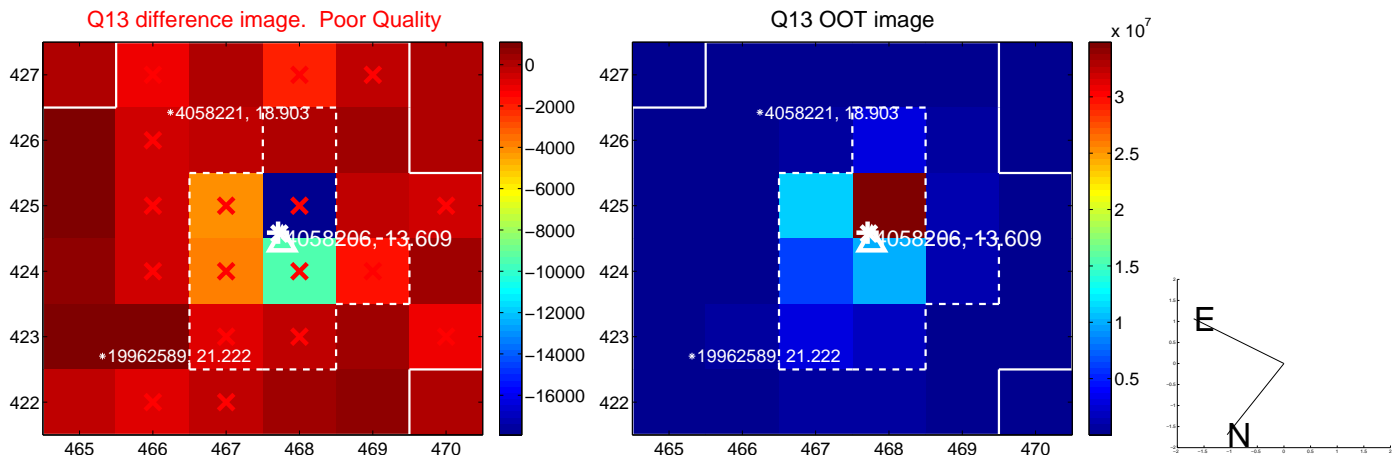
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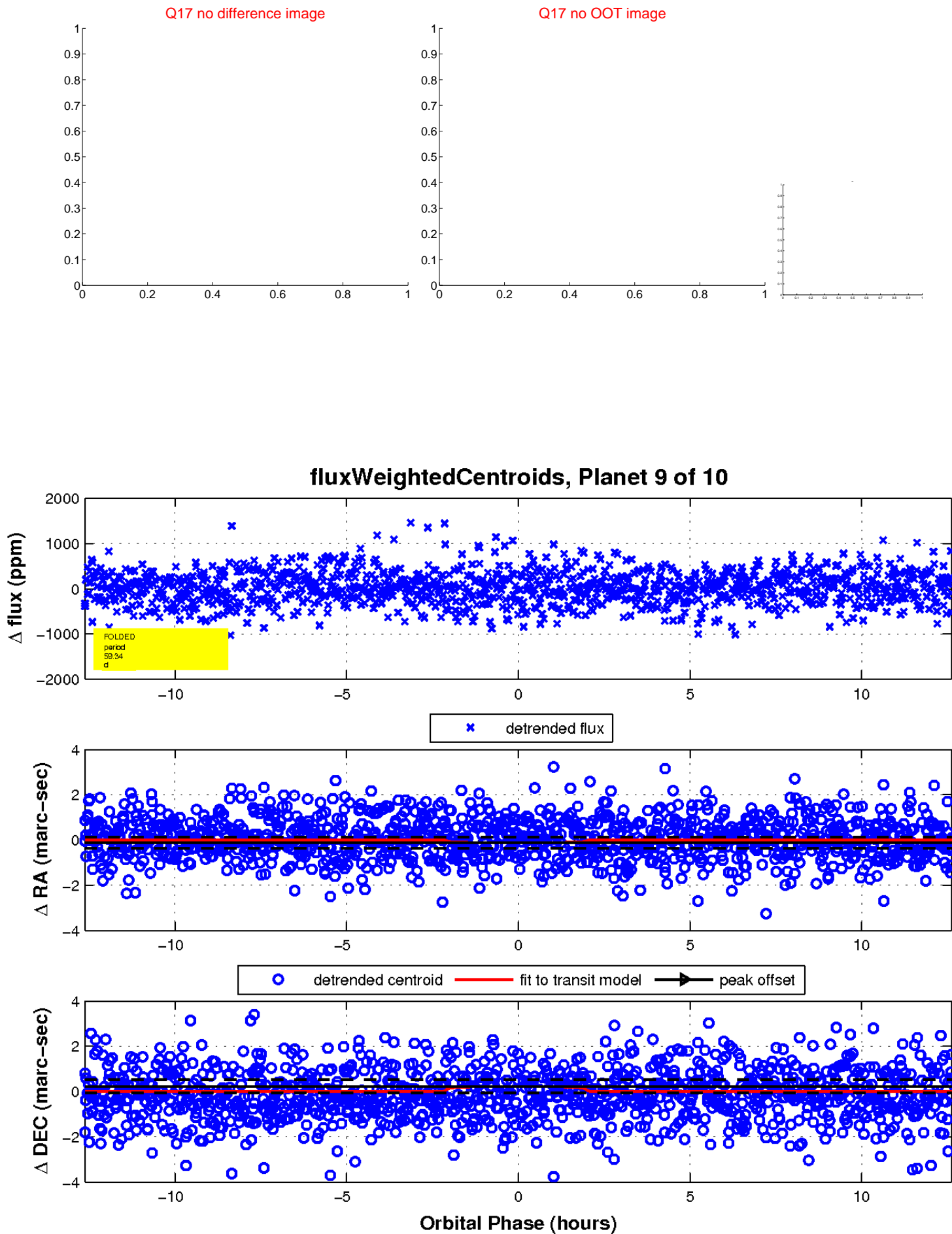
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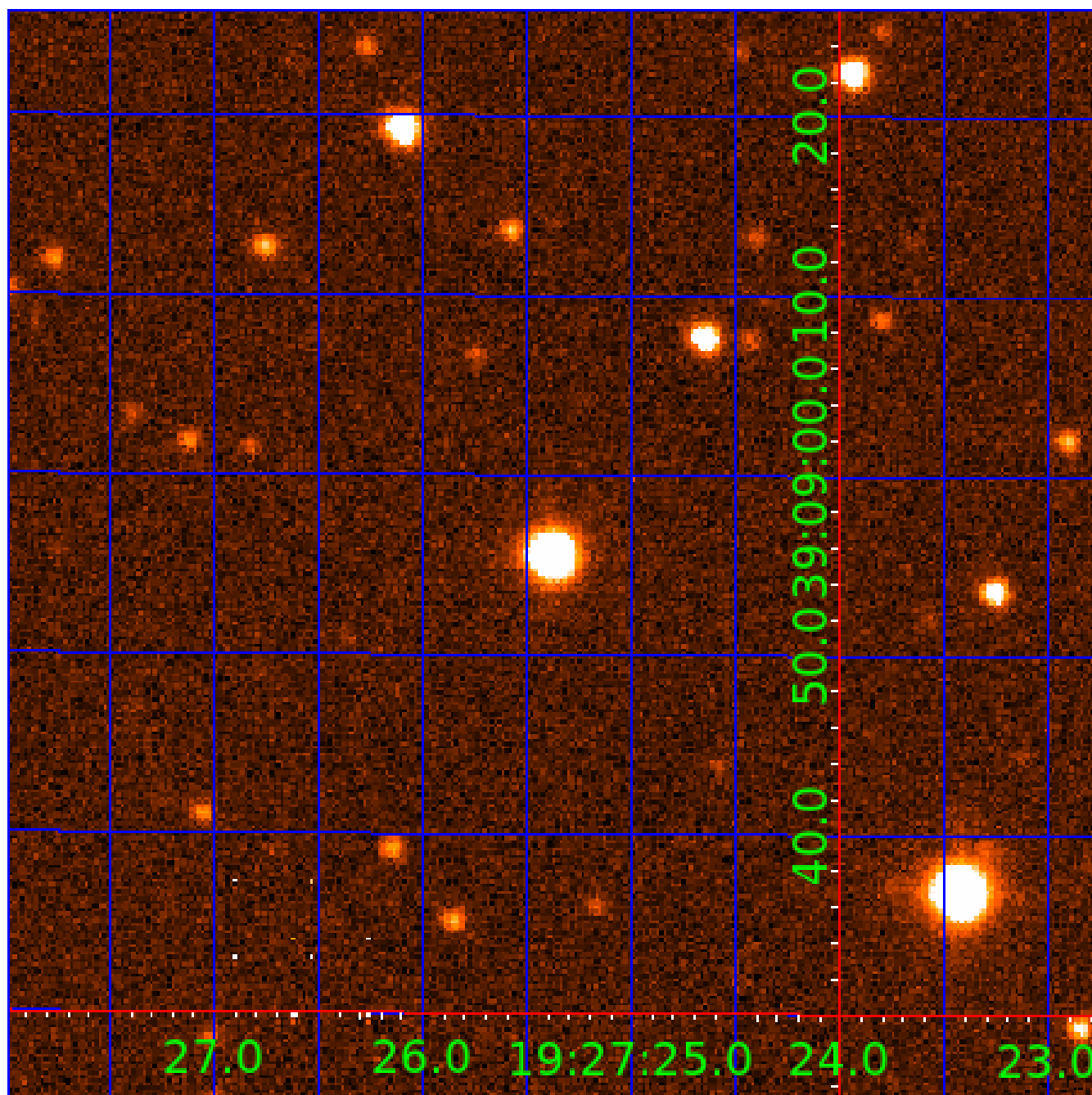


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UKIRT Image

Declination



## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
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## Robovetter Results

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004058206-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_ZUMA_TRACKER—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT
004058206-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_ZUMA_TRACKER—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—SAME_NTL_PERIOD
004058206-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_MARSHALL—TRANS_GAPPED—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS
004058206-05	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT
004058206-07	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_SKYE—TRANS_GAPPED—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT
004058206-08	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV
004058206-09	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_SKYE—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT
004058206-10	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT

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

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

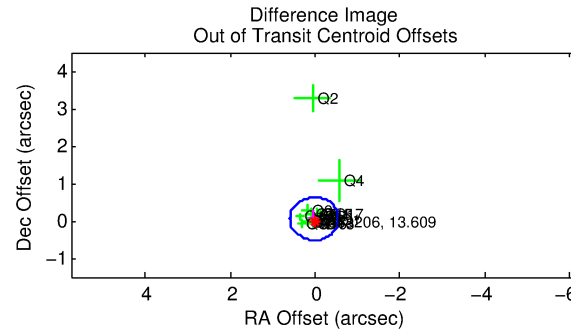
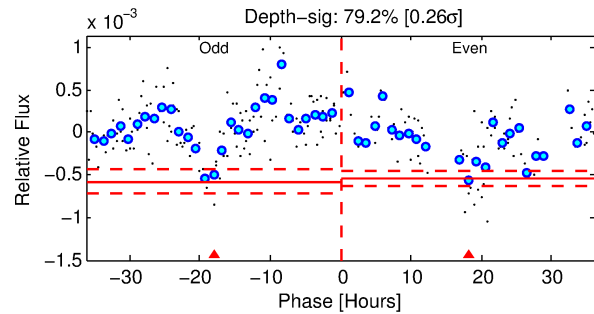
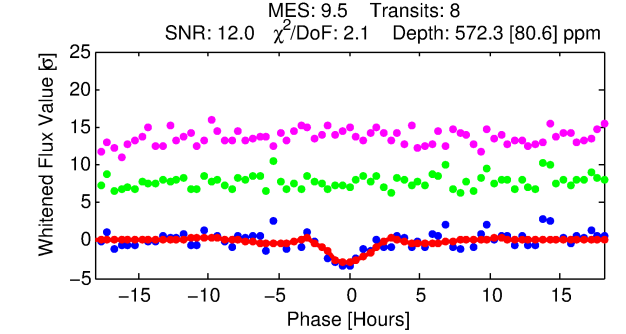
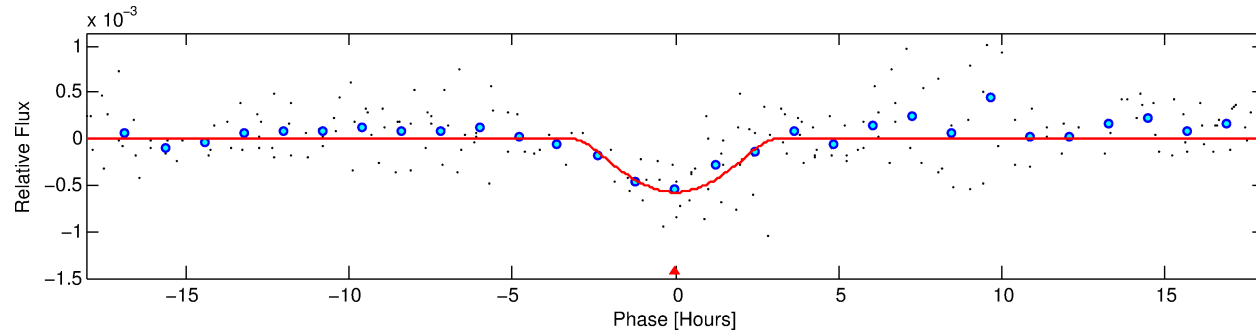
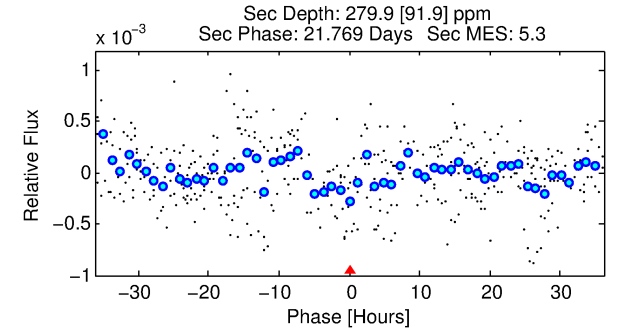
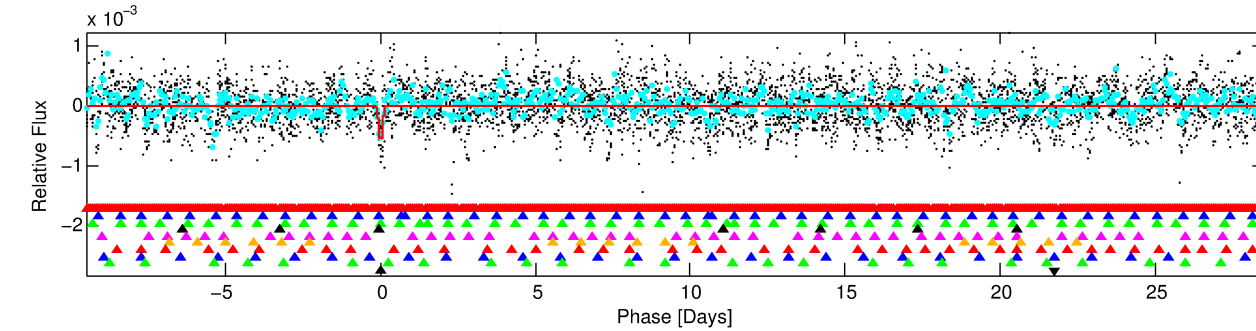
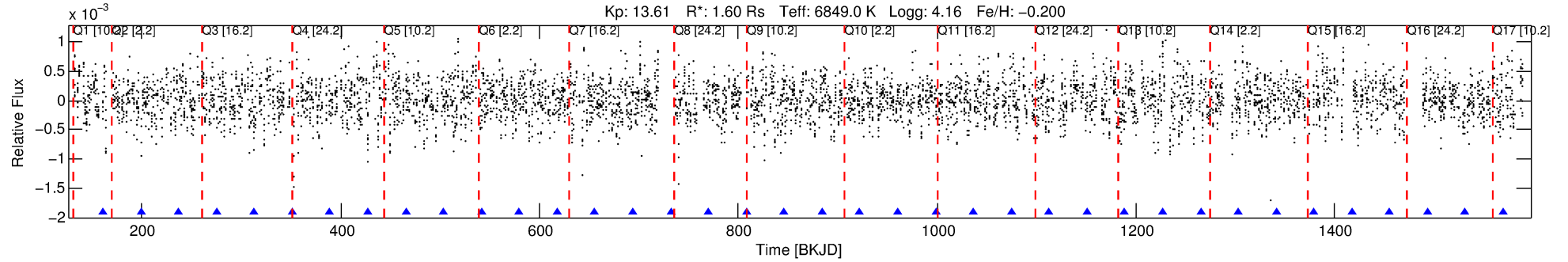
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 004058206-10

No Significant Match Found

# DV One-Page Summary

KIC: 4058206 Candidate: 10 of 10 Period: 38.068 d



## DV Fit Results:

Period = 38.06827 [0.00111] d  
Epoch = 161.0154 [0.0161] BKJD  
Rp/R\* = 0.0373 [0.0922]  
a/R\* = 14.50 [11.27]  
b = 0.99 [0.15]  
Seff = 84.87 [33.67]  
Teff = 774 [77] K  
Rp = 6.51 [16.23] Re  
a = 0.2439 [0.0637] AU  
Ag = 216.22 [1074.48] [0.20σ]  
Teffp = 4589 [5688] K [0.67σ]

## DV Diagnostic Results:

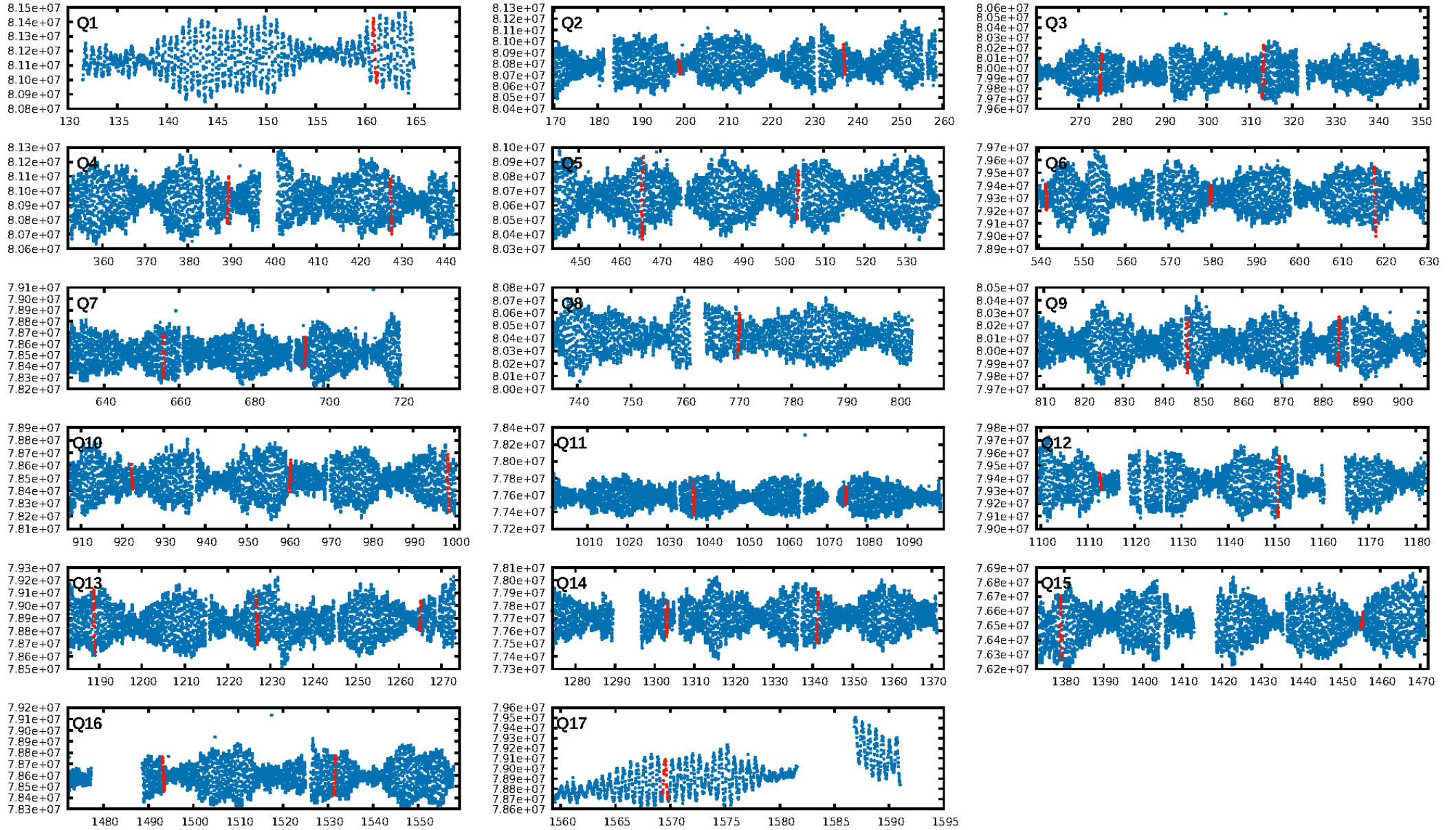
ShortPeriod-sig: 100.0% [10.60σ]  
LongPeriod-sig: 100.0% [35.92σ]  
ModelChiSquare2-sig: 13.5%  
ModelChiSquareGof-sig: 100.0%  
**Bootstrap-pfa: 6.76e-09**  
RollingBand-fgt: 1.00 [8/8]  
GhostDiagnostic-chr: 1.676  
Centroid-sig: 3.2%  
Centroid-so: 0.624 arcsec [1.79σ]  
OotOffset-rm: 0.058 arcsec [0.30σ]  
KicOffset-rm: 0.098 arcsec [1.07σ]  
OotOffset-st: 4/4/4/5 [17]  
KicOffset-st: 4/4/4/5 [17]  
DiffImageQuality-fgm: 0.53 [9/17]  
DiffImageOverlap-fno: 0.18 [3/17]

Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 01-Feb-2016 03:22:29 Z

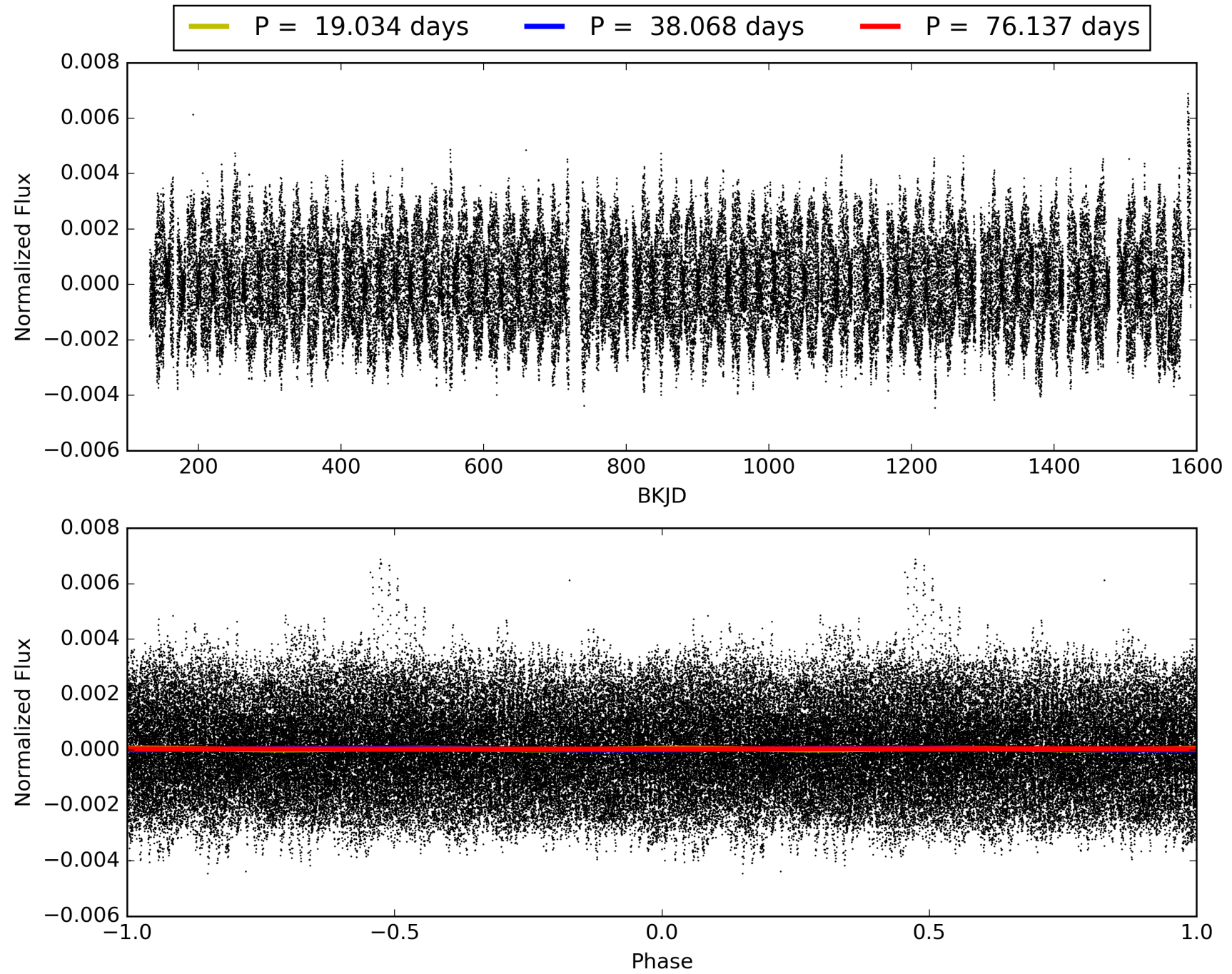
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center



# TCE 004058206-10, PDC Light Curves

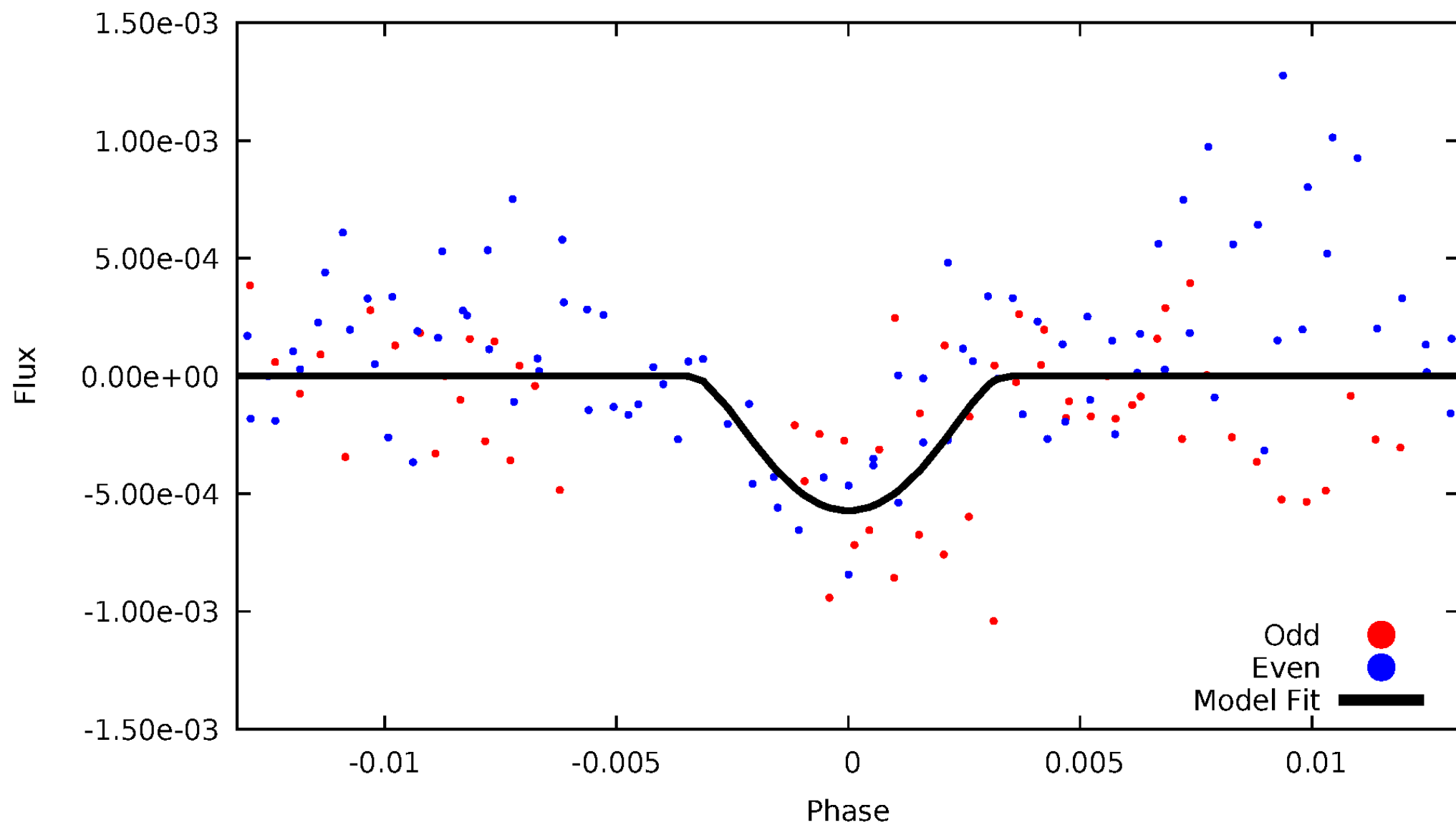


TCE 004058206-10



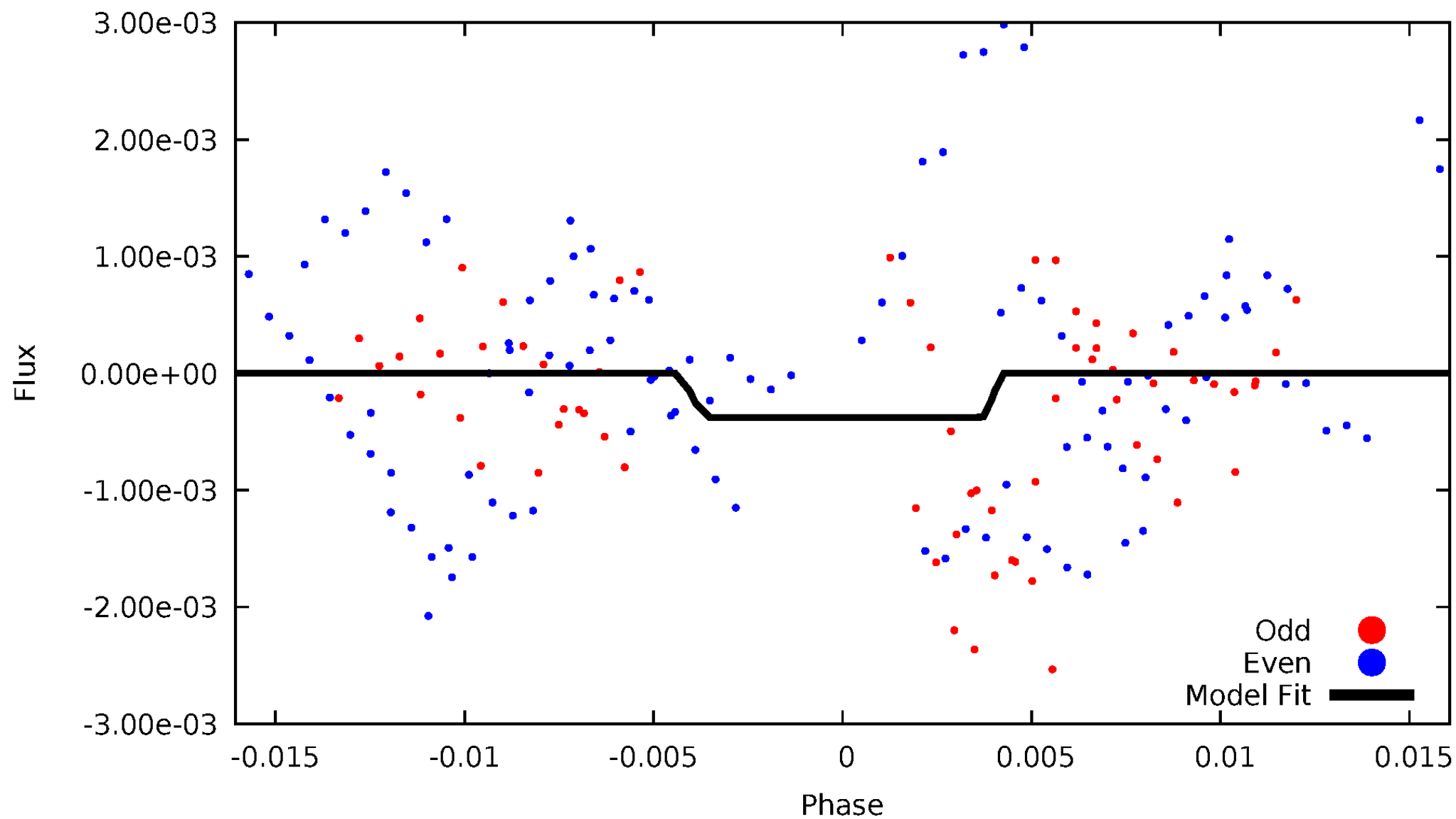
# DV Odd/Even

TCE 004058206-10



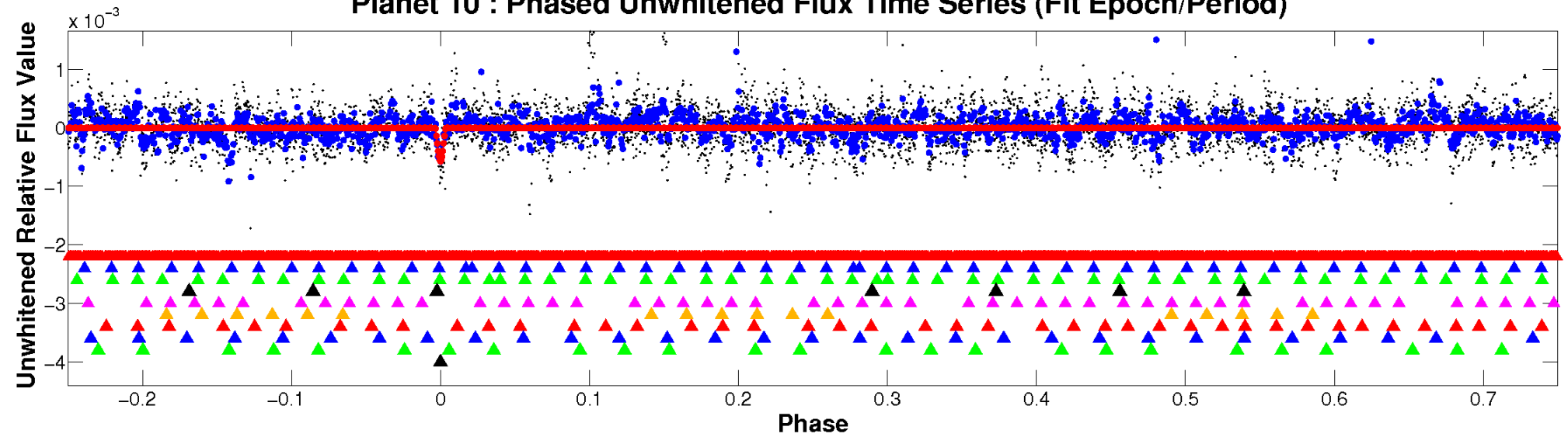
# ALT Odd/Even

TCE 004058206-10

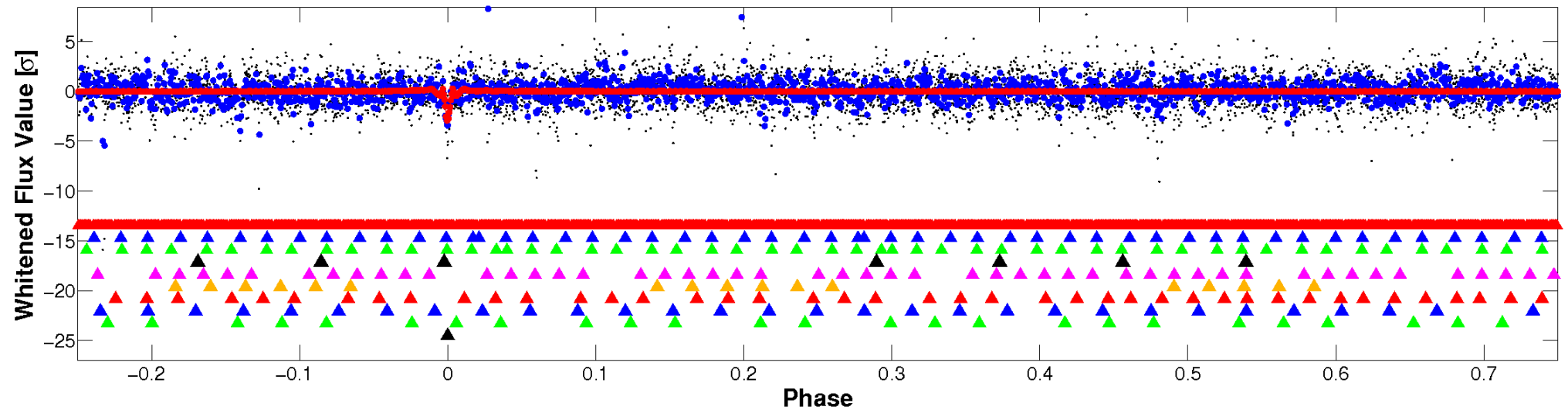


# Non-Whitened Vs. Whitened Light Curve

Planet 10 : Phased Unwhitened Flux Time Series (Fit Epoch/Period)

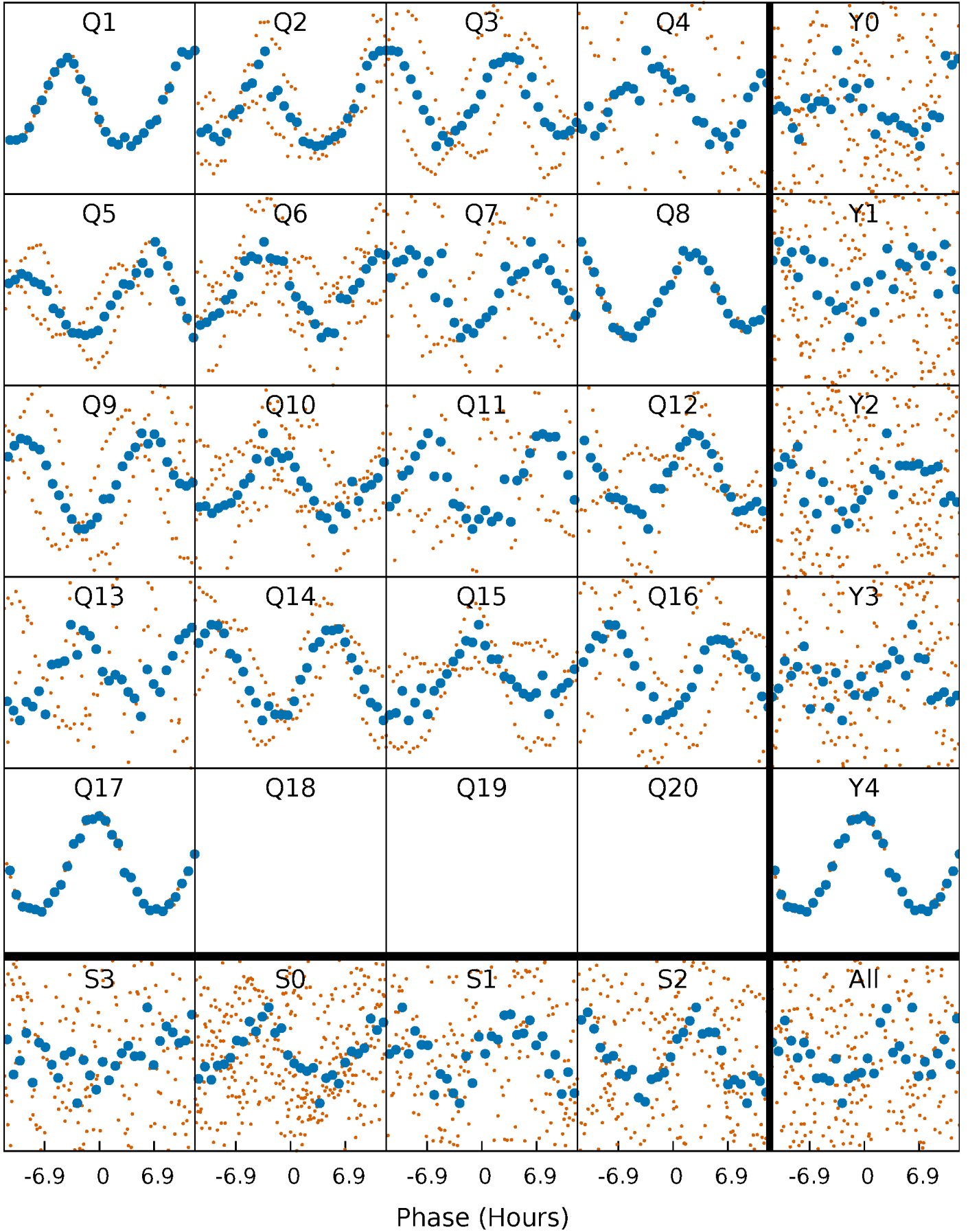


Planet 10 : Phased Whitened Flux Time Series (Fit Epoch/Period)



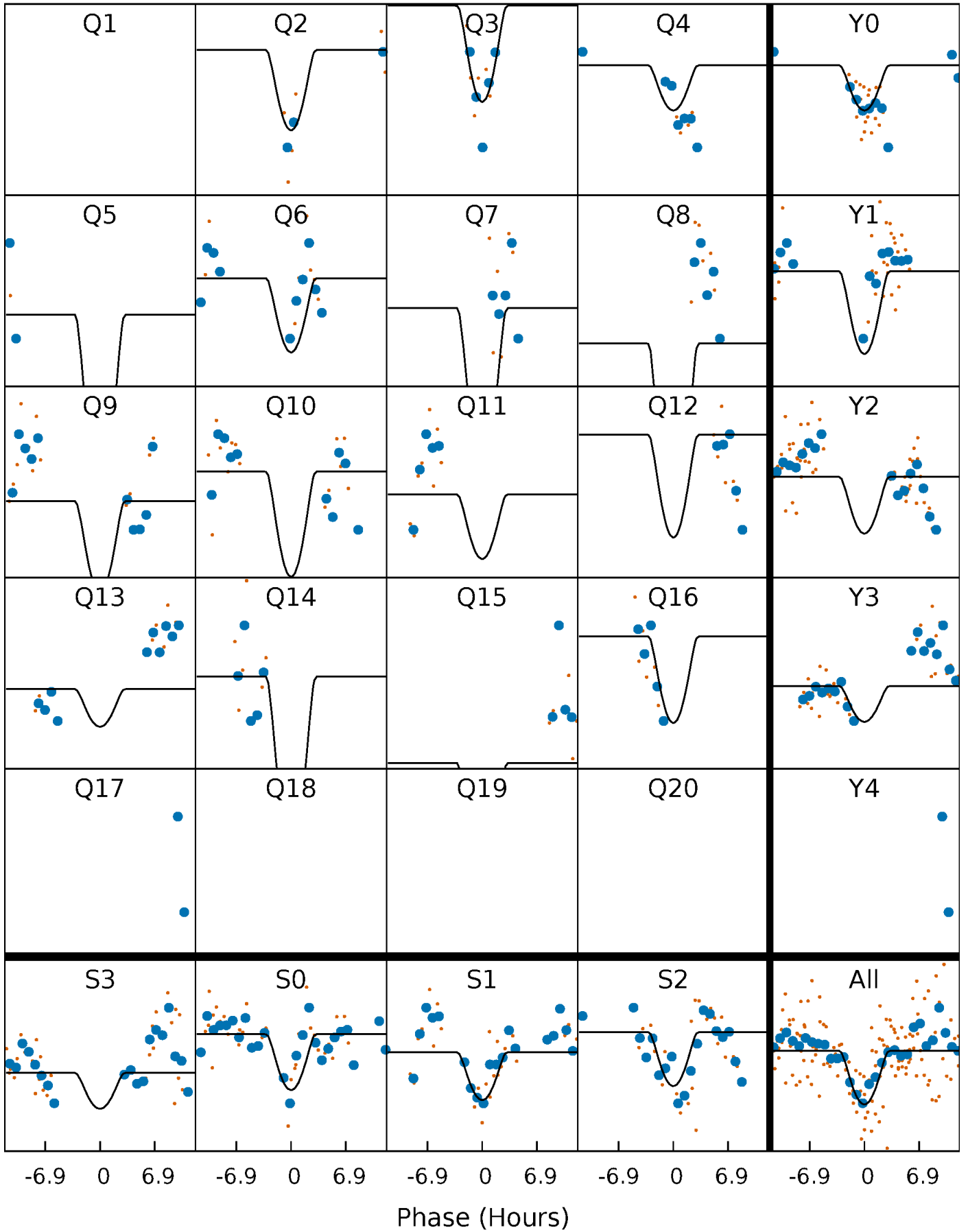
# PDC Quarter-Phased Transit Curves

TCE 004058206-10 P= 38.068267 Days  $T_0=161.015373$  (BKJD)



# DV Quarter-Phased Transit Curves

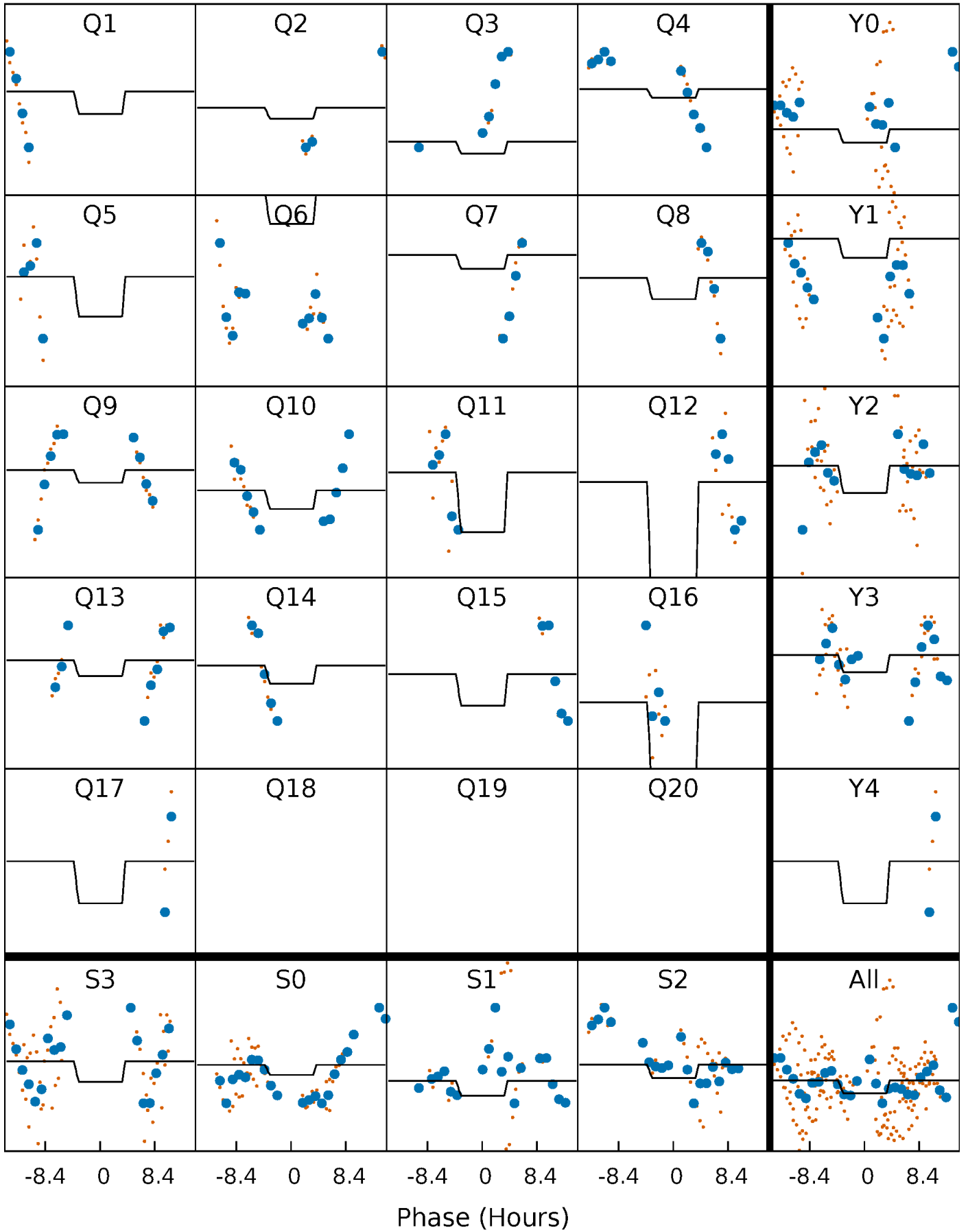
TCE 004058206-10 P= 38.068267 Days  $T_0=161.015373$  (BKJD)





# Alt. Detrend Quarter-Phased Transit Curves

TCE 004058206-10 P= 38.071223 Days  $T_0=160.902671$  (BKJD)

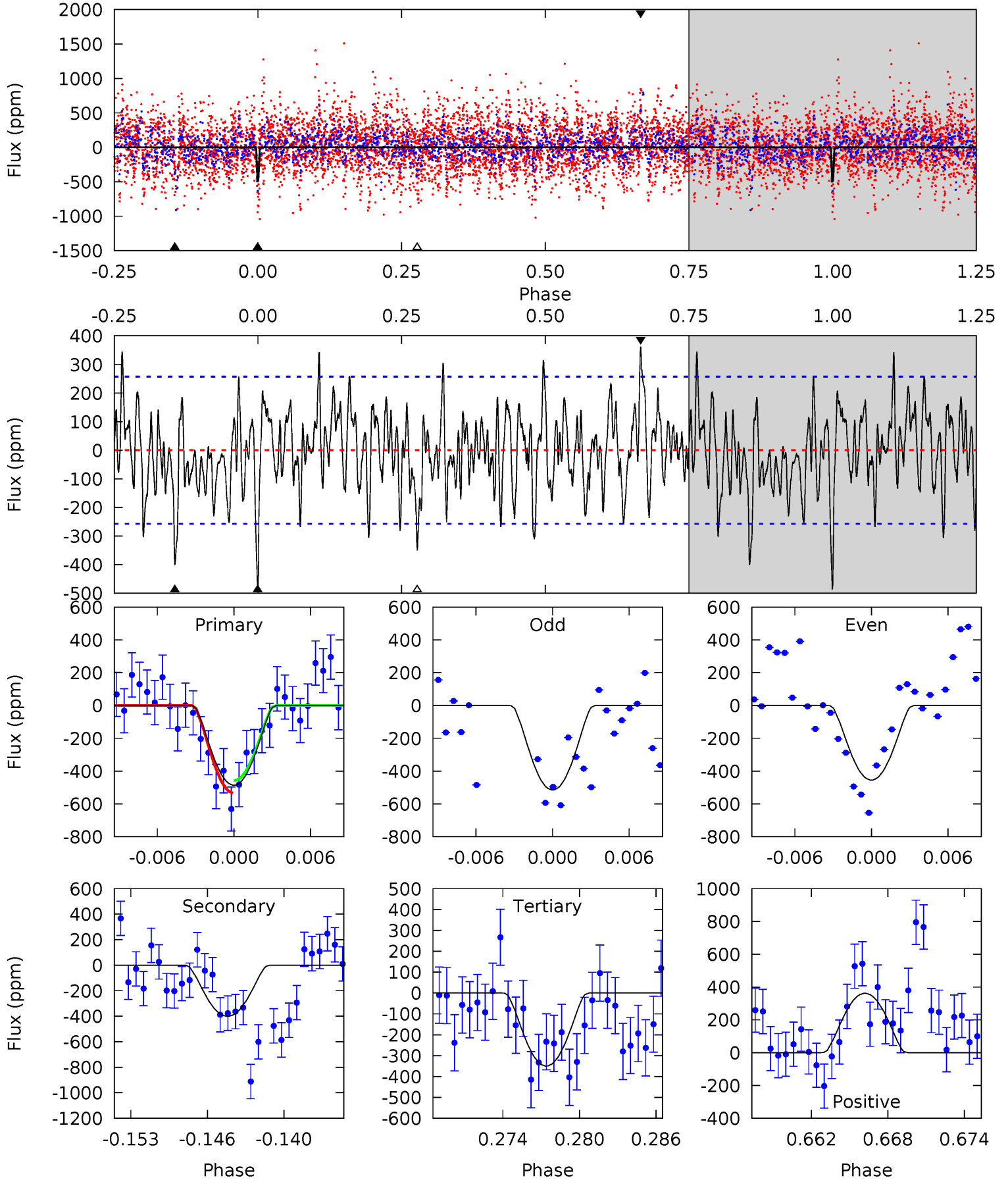




# DV Model-Shift Uniqueness Test

004058206-10, P = 38.068267 Days, E = 122.947106 Days

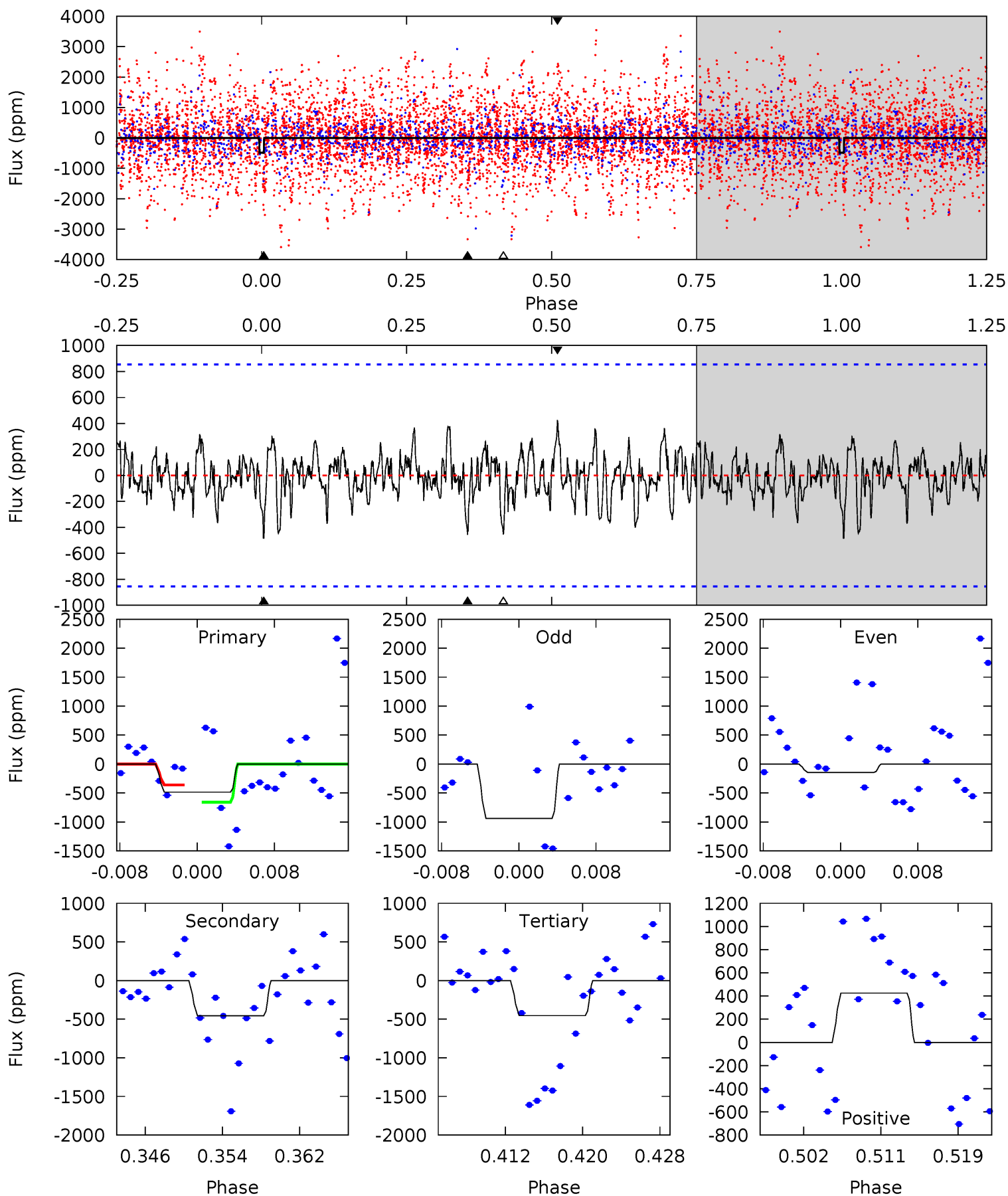
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
9.67	7.97	6.96	7.20	5.11	2.73	2.34	2.71	2.47	1.01	0.77	0.59	0.52	0.43	0.72



# Alt Model-Shift Uniqueness Test

004058206-10, P = 38.071223 Days, E = 122.831448 Days

Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
2.88	2.71	2.69	2.52	5.06	2.64	0.80	0.20	0.36	0.02	0.19	2.31	0.67	0.47	0.79



### Stellar Parameters For KIC 004058206

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$6849^{+190}_{-262}$	$4.155^{+0.158}_{-0.193}$	$-0.200^{+0.250}_{-0.300}$	$1.600^{+0.516}_{-0.387}$	$1.345^{+0.189}_{-0.231}$	$0.462^{+0.435}_{-0.221}$
	+3%/-4%	+4%/-5%	+125%/-150%	+32%/-24%	+14%/-17%	+94%/-48%
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 004058206-10 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-401 \pm 50$	$14.26^{+12.79}_{-9.32}$	$1084^{+90}_{-74}$	$3786^{+1969}_{-710}$	$66^{+473}_{-48}$
Alt.	$-457 \pm 169$	$12.83^{+13.07}_{-9.21}$	$1084^{+89}_{-73}$	$4007^{+2818}_{-868}$	$89^{+948}_{-69}$

$T_{max}$  = 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  $A_{obs} \gg 1.0$

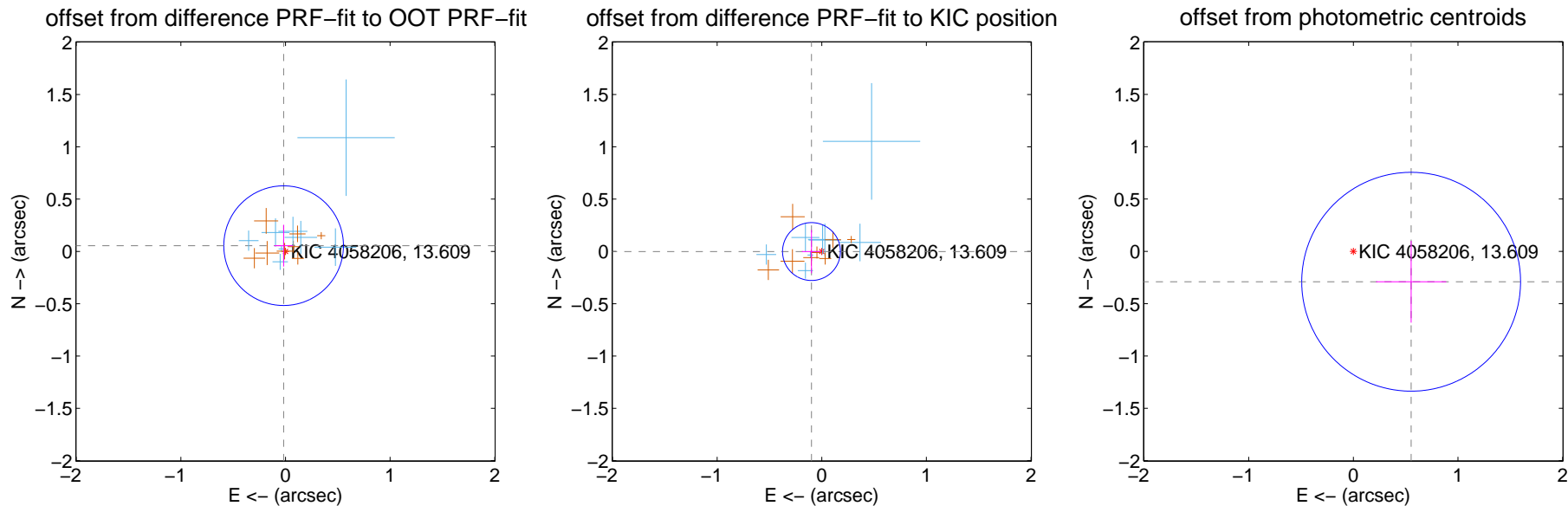
## DV Centroid Data

Supplemental centroid analysis for 004058206-10. Kepler magnitude: 13.61. Transit SNR 11.99

There are 9 quarters with good PRF difference image offsets

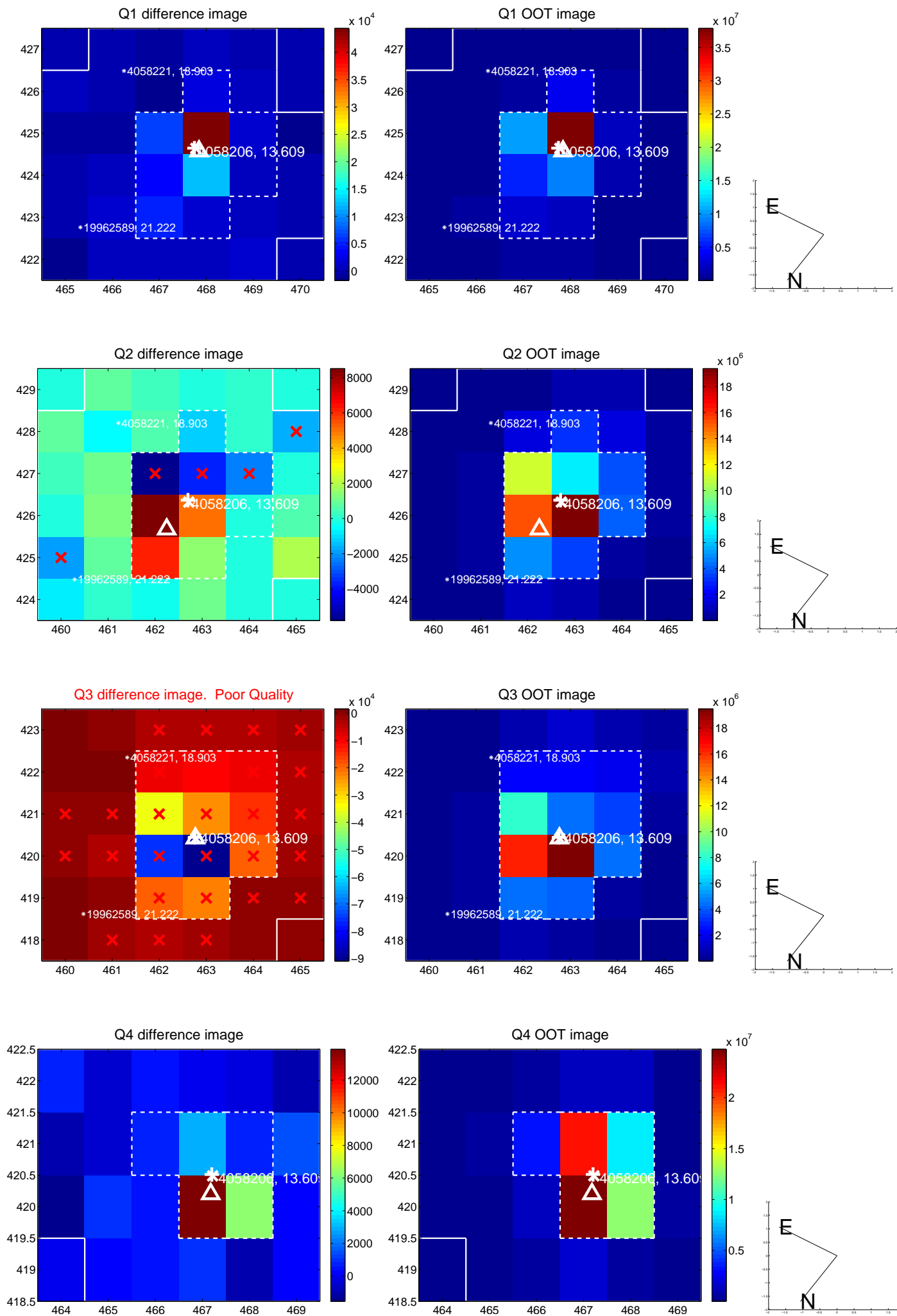
The direct PRF centroid is offset from the target star catalog position by about 0.07 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.058 \pm 0.191$	0.30	$0.018 \pm 0.089$	$0.055 \pm 0.199$
PRF-fit source offset from KIC position	$0.098 \pm 0.092$	1.07	$0.098 \pm 0.092$	$-0.001 \pm 0.207$
photometric centroid source offset	$0.62 \pm 0.35$	1.79	$-0.55 \pm 0.34$	$-0.29 \pm 0.39$

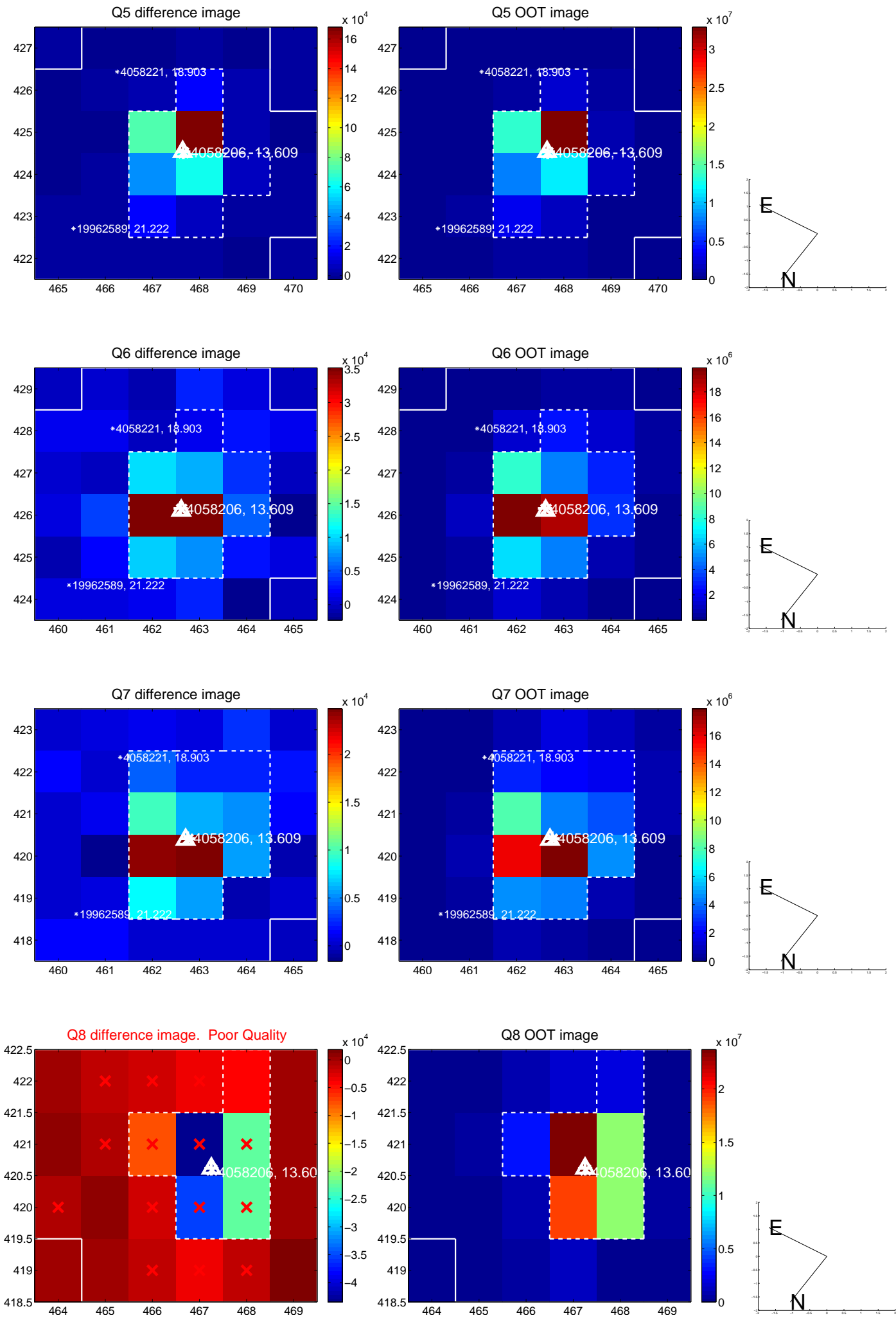


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses:** good quarterly centroid offsets; **Vermillion crosses:** bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

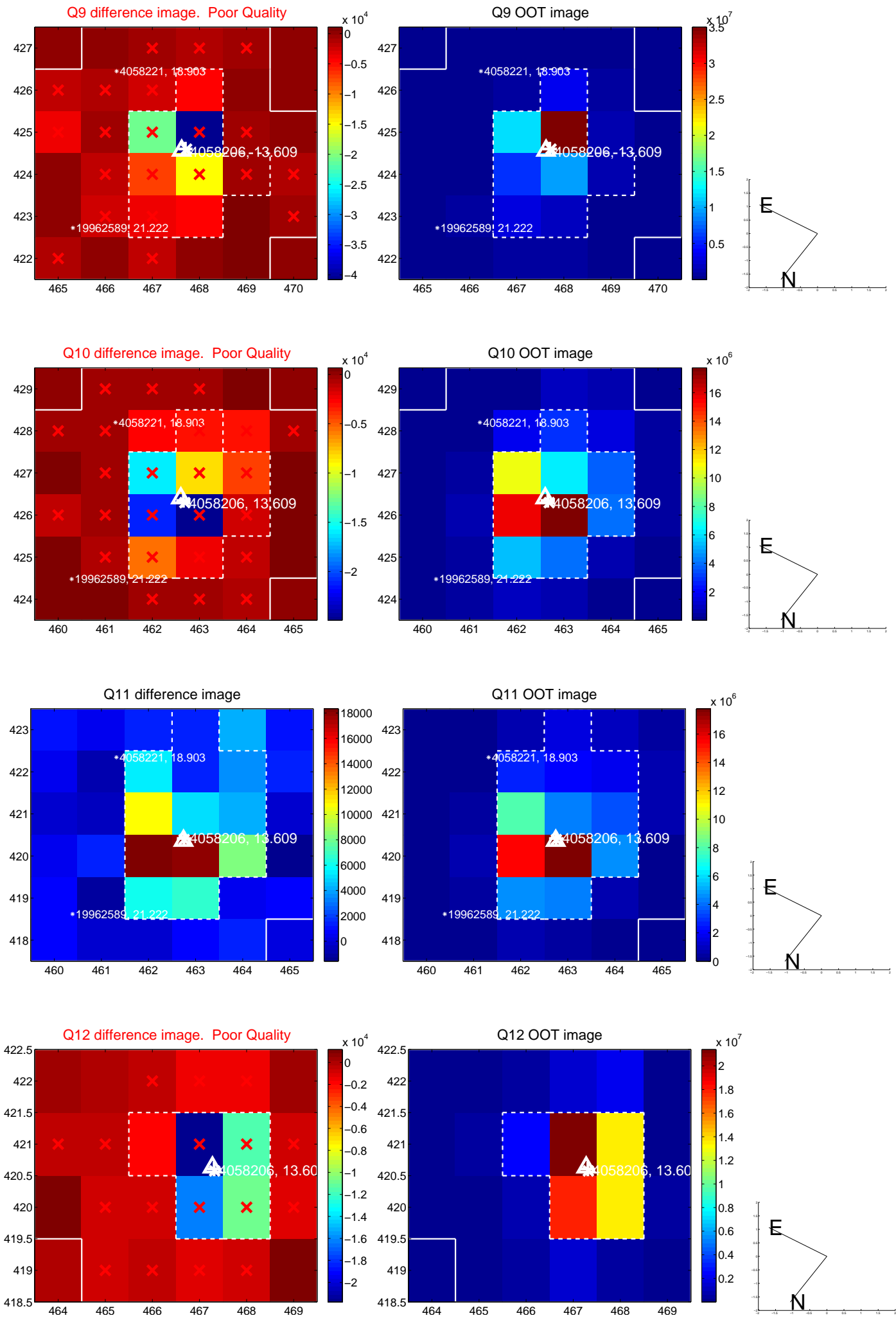
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



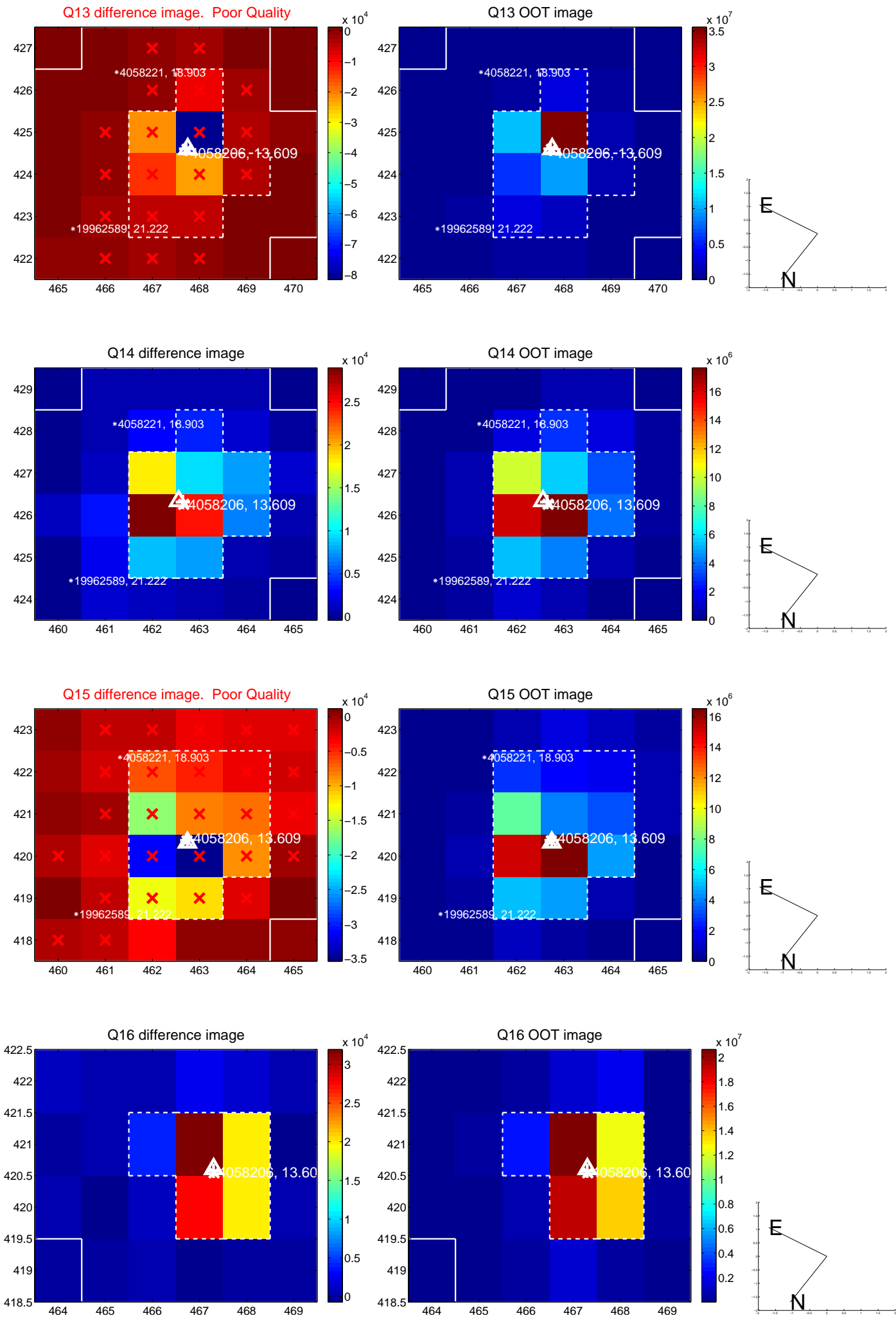
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

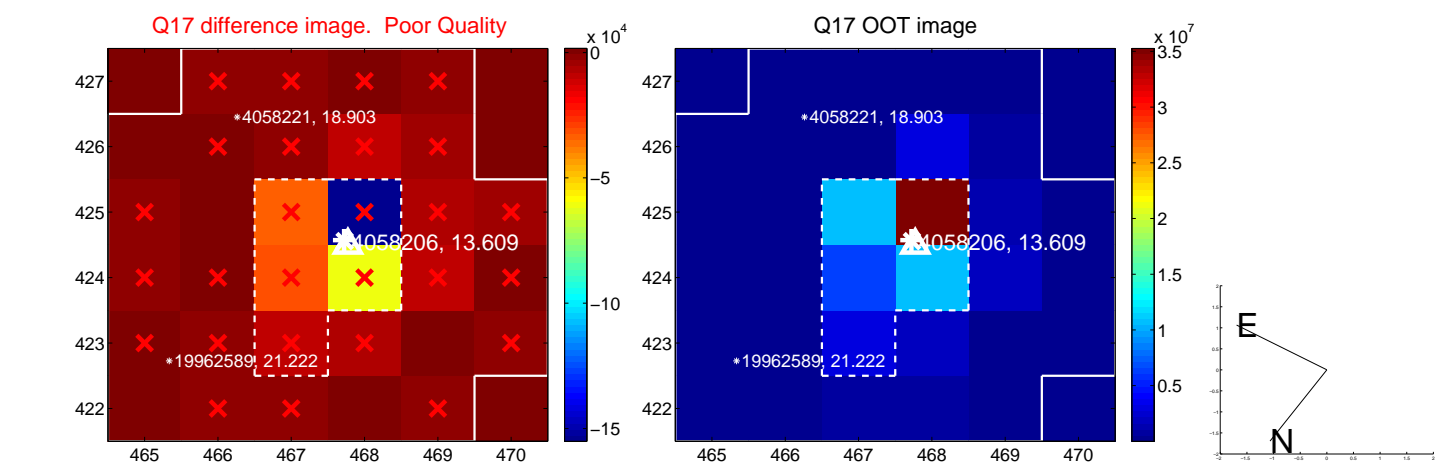


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

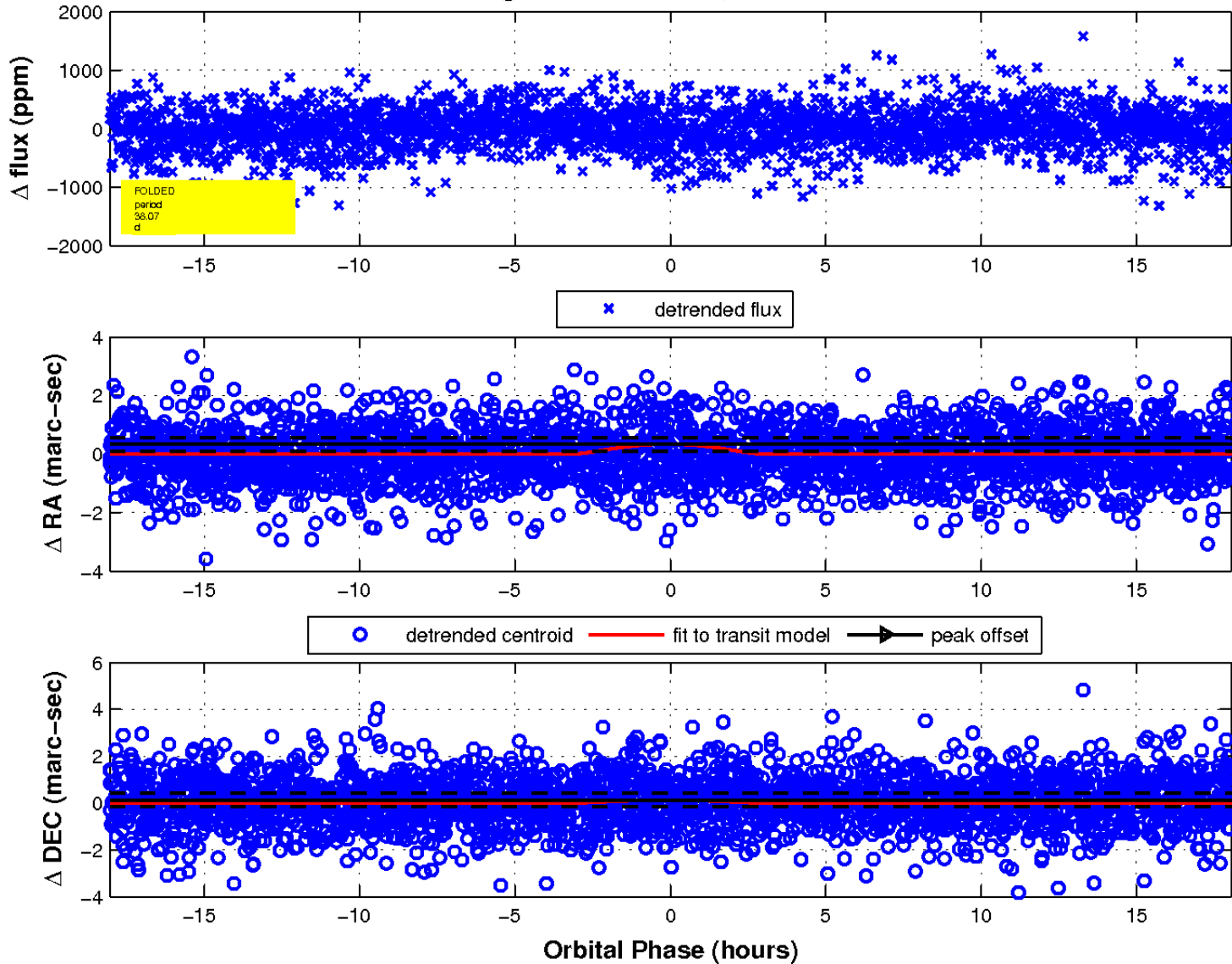




white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



fluxWeightedCentroids, Planet 10 of 10



UKIRT Image

Declination

