

# KIC 005649964

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
005649964-01	OBS	No	1.016536	131.832643	187.5	3.129	10.7	10.6	1.69	6953	2.69	12017.65
005649964-02	OBS	No	0.538018	131.706724	206.2	1.550	9.4	10.6	1.69	6953	2.48	28070.74
005649964-03	OBS	No	164.679305	174.902737	1618.5	6.254	7.1	7.4	1.69	6953	7.00	13.61
005649964-04	OBS	No	118.680411	167.470654	272.6	6.000	7.4	-1.0	1.69	6953	2.81	21.06

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
005649964-01	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT
005649964-02	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT
005649964-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_CHASES_SKYE—TRANS_GAPPED—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT
005649964-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_NOFITS

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

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

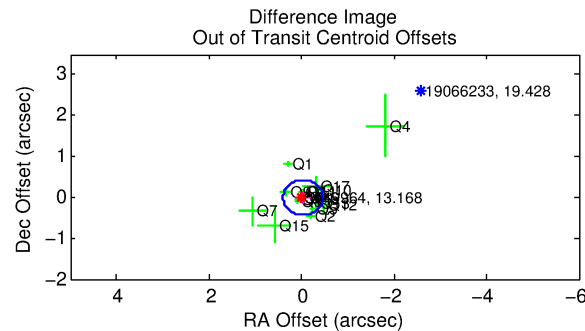
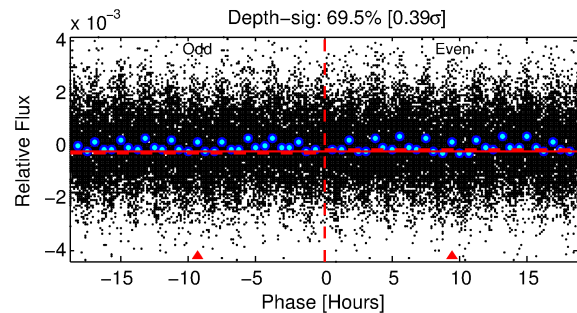
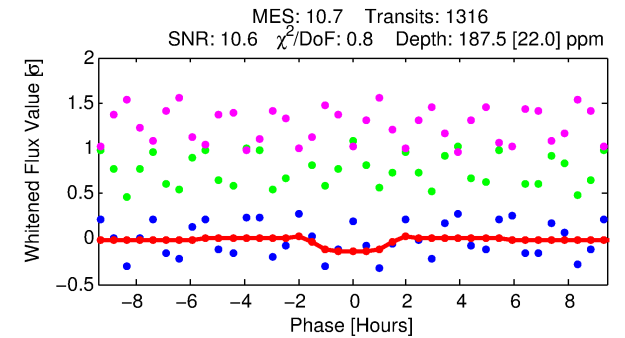
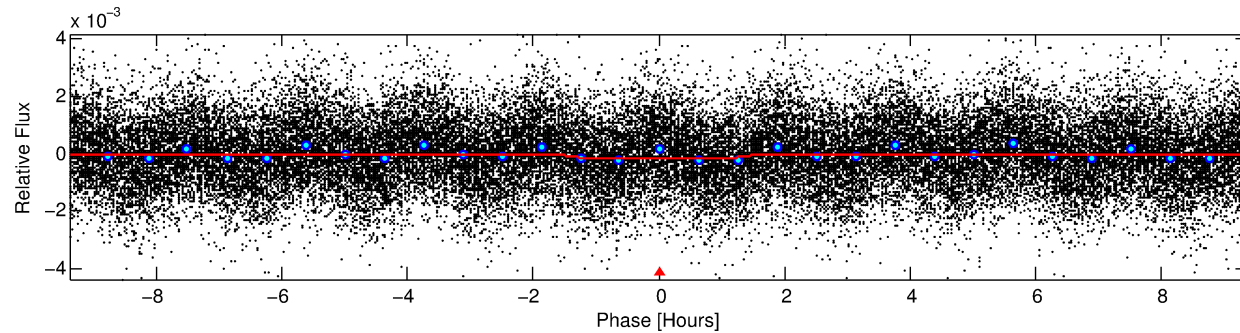
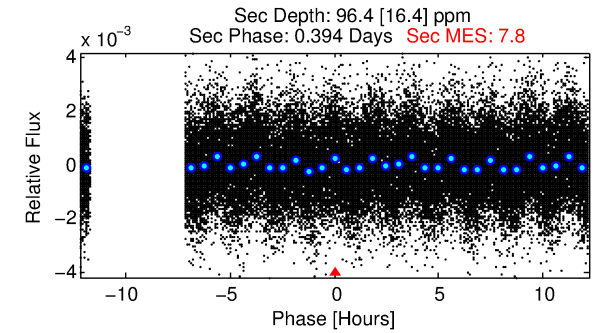
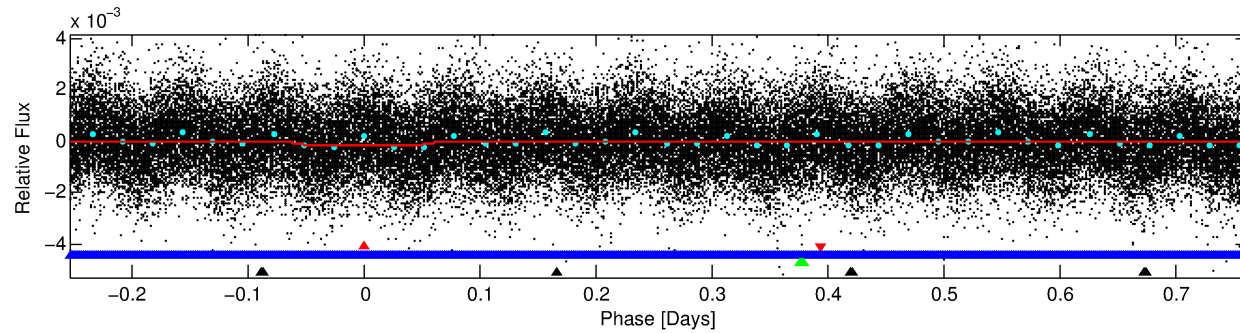
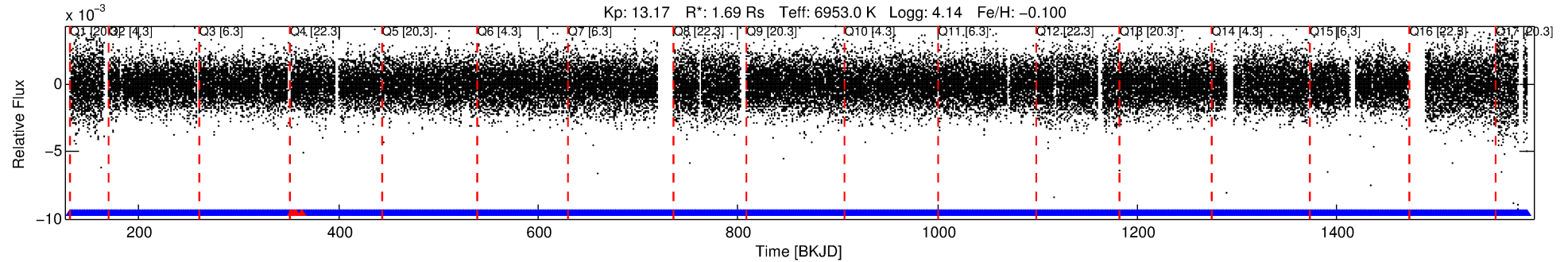
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 005649964-01

No Significant Match Found

# DV One-Page Summary

KIC: 5649964 Candidate: 1 of 4 Period: 1.017 d



## DV Fit Results:

Period = 1.01654 [0.00001] d  
Epoch = 131.8326 [0.0026] BKJD  
Rp/R\* = 0.0146 [0.0035]  
a/R\* = 1.49 [1.13]  
b = 0.90 [0.29]  
Seff = 12017.65 [4754.42]  
Teq = 2670 [264] K  
Rp = 2.69 [1.03] Re  
a = 0.0222 [0.0056] AU  
Ag = 3.63 [2.25] [1.17σ]  
Teffp = 5699 [757] K [3.78σ]

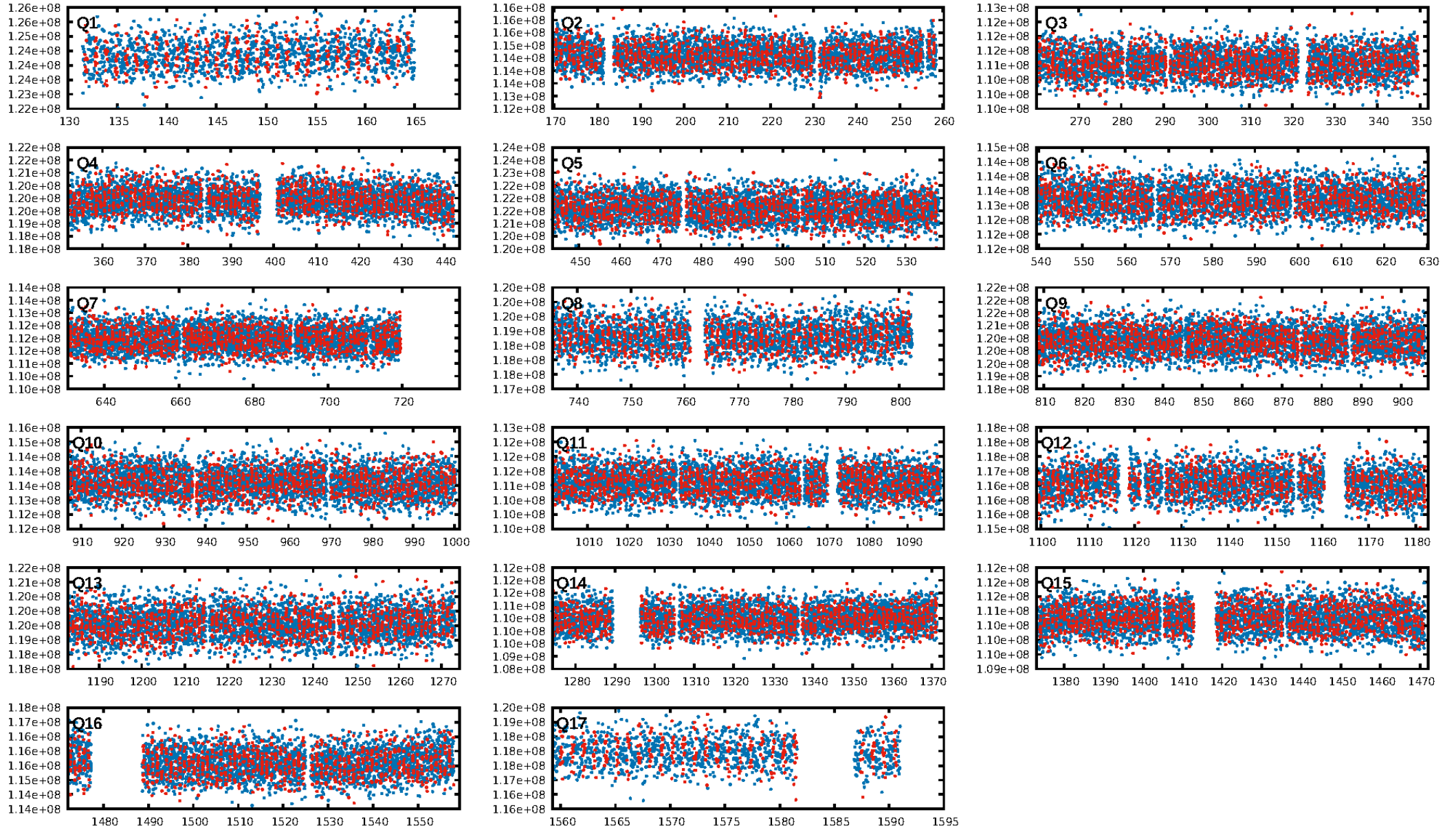
## DV Diagnostic Results:

ShortPeriod-sig: 99.9% [3.29σ]  
LongPeriod-sig: 100.0% [417.31σ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGoF-sig: N/A  
Bootstrap-pfa: N/A  
RollingBand-fgt: 1.00 [1253/1257]  
GhostDiagnostic-chr: 3.871  
Centroid-sig: 1.1%  
Centroid-so: 0.328 arcsec [2.03σ]  
OotOffset-rm: 0.027 arcsec [0.19σ]  
OotOffset-st: 4/4/4/5 [17]  
KicOffset-rm: 0.114 arcsec [0.60σ]  
KicOffset-st: 4/4/4/5 [17]  
DiffImageQuality-fgm: 0.94 [16/17]  
DiffImageOverlap-fno: 0.00 [0/17]

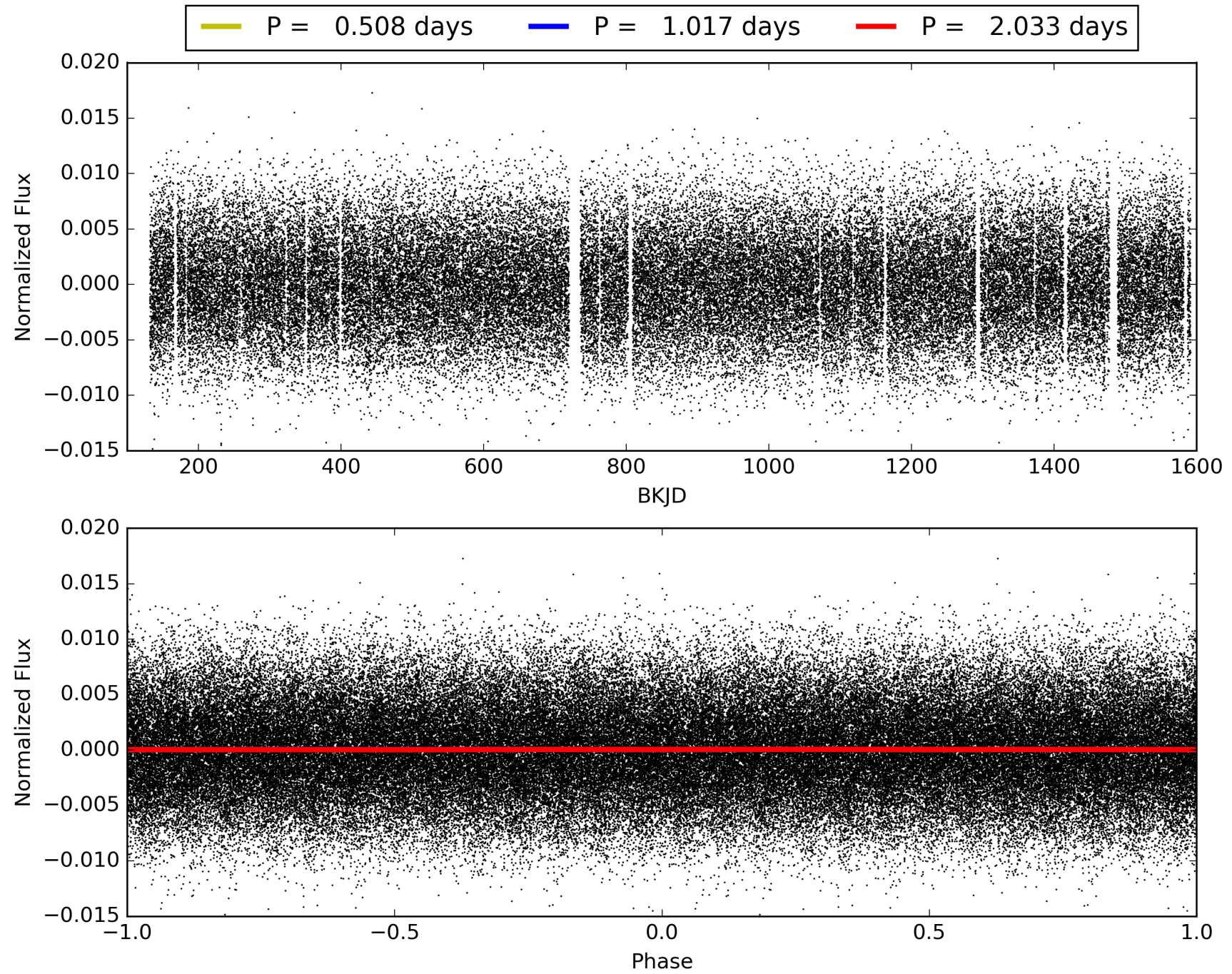
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 30-Jan-2016 16:18:44 Z

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

# TCE 005649964-01, PDC Light Curves

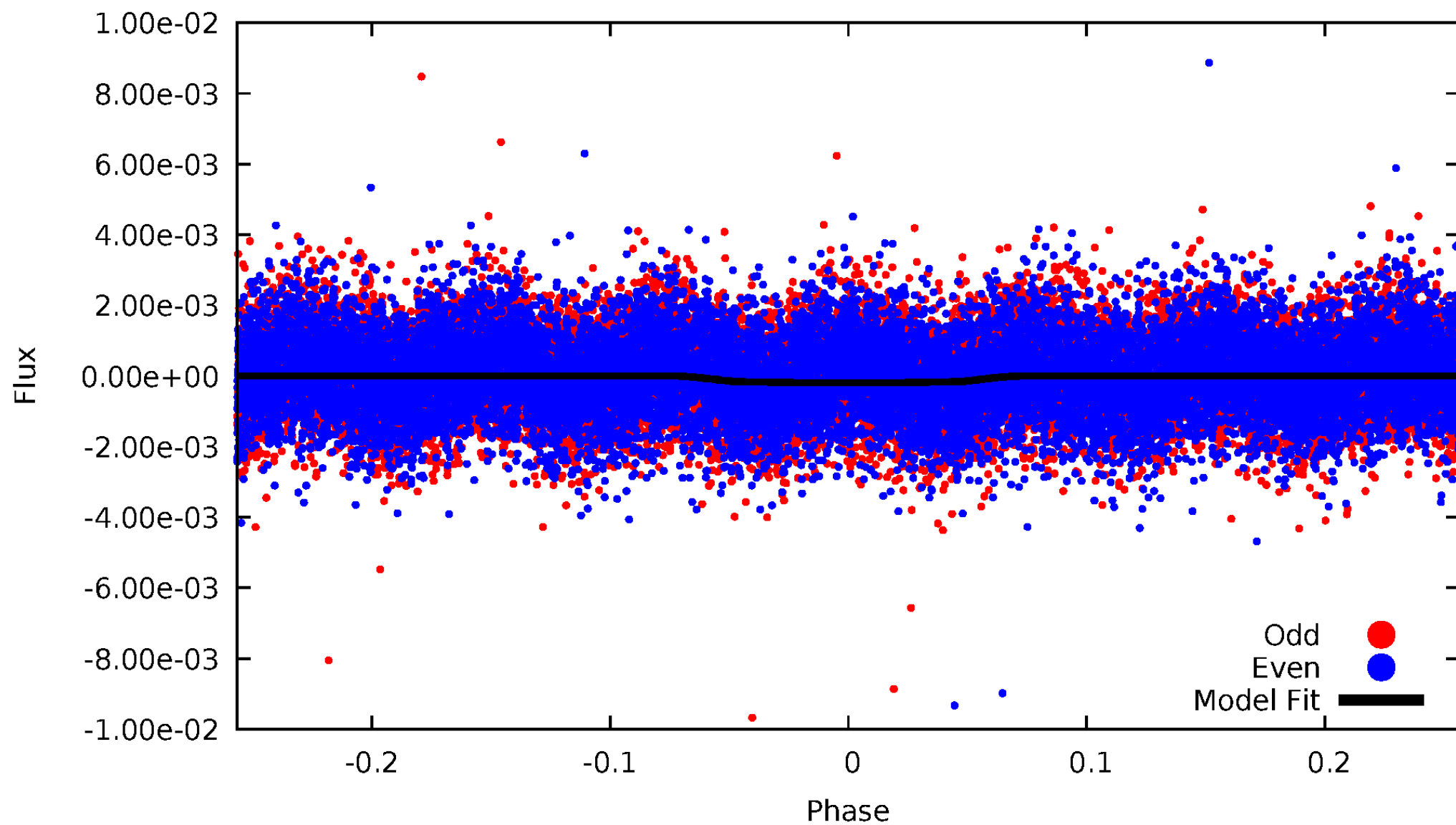


TCE 005649964-01



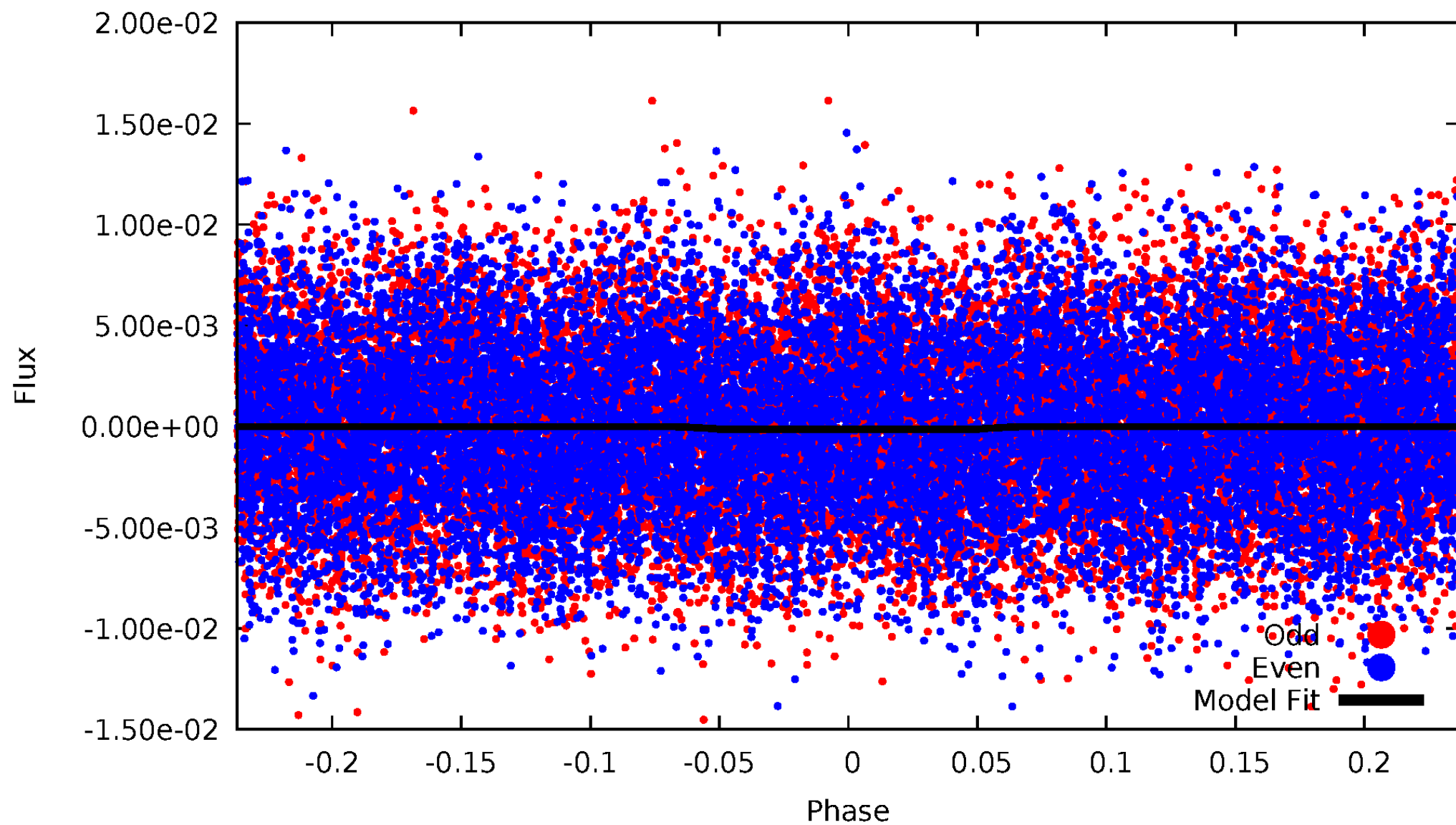
# DV Odd/Even

TCE 005649964-01



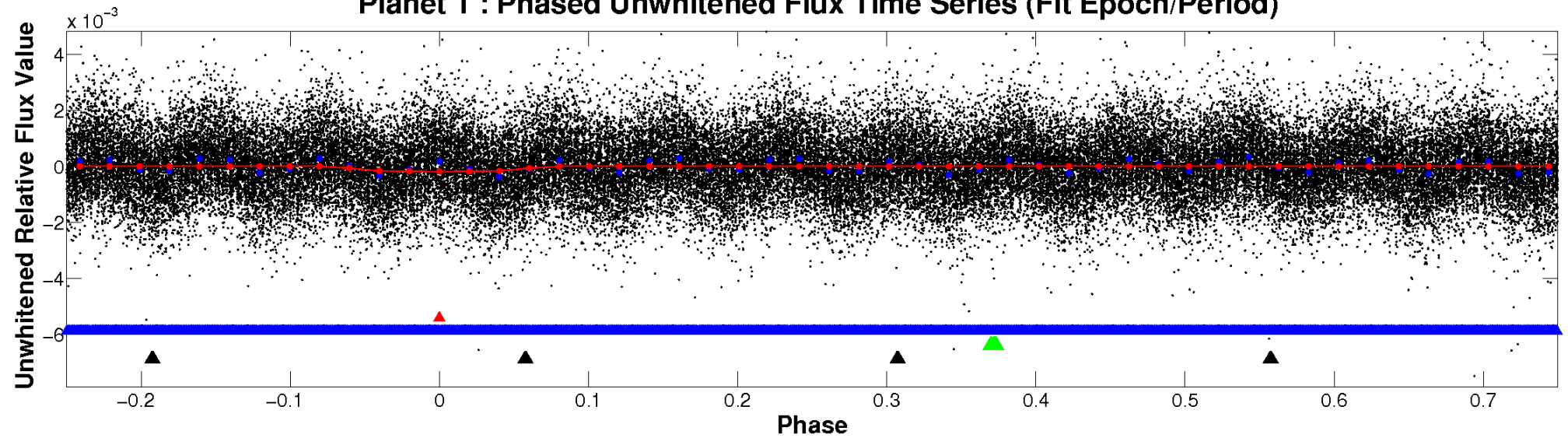
# ALT Odd/Even

TCE 005649964-01

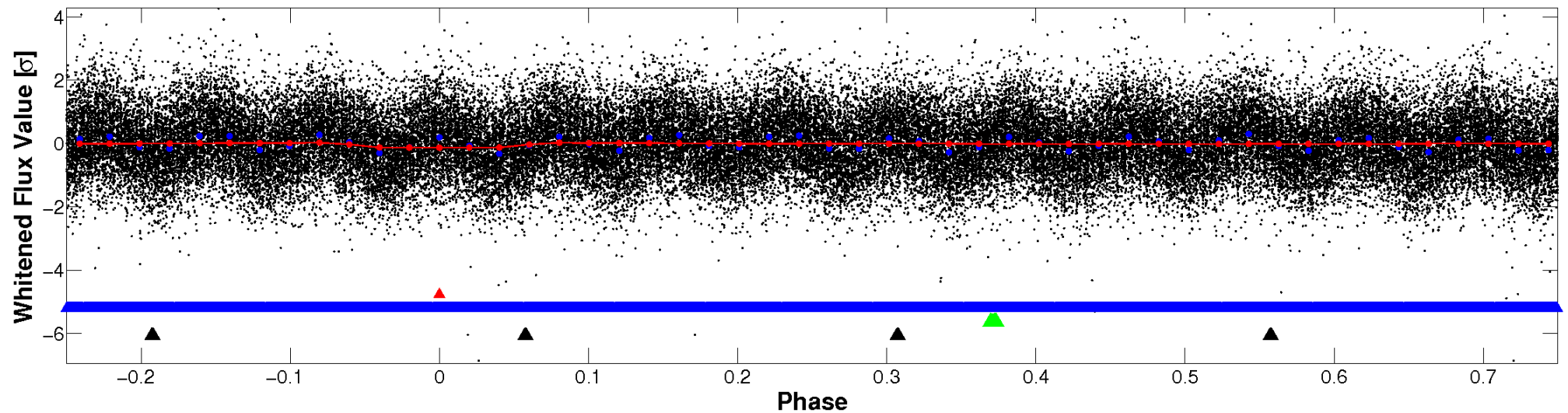


# Non-Whitened Vs. Whitened Light Curve

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

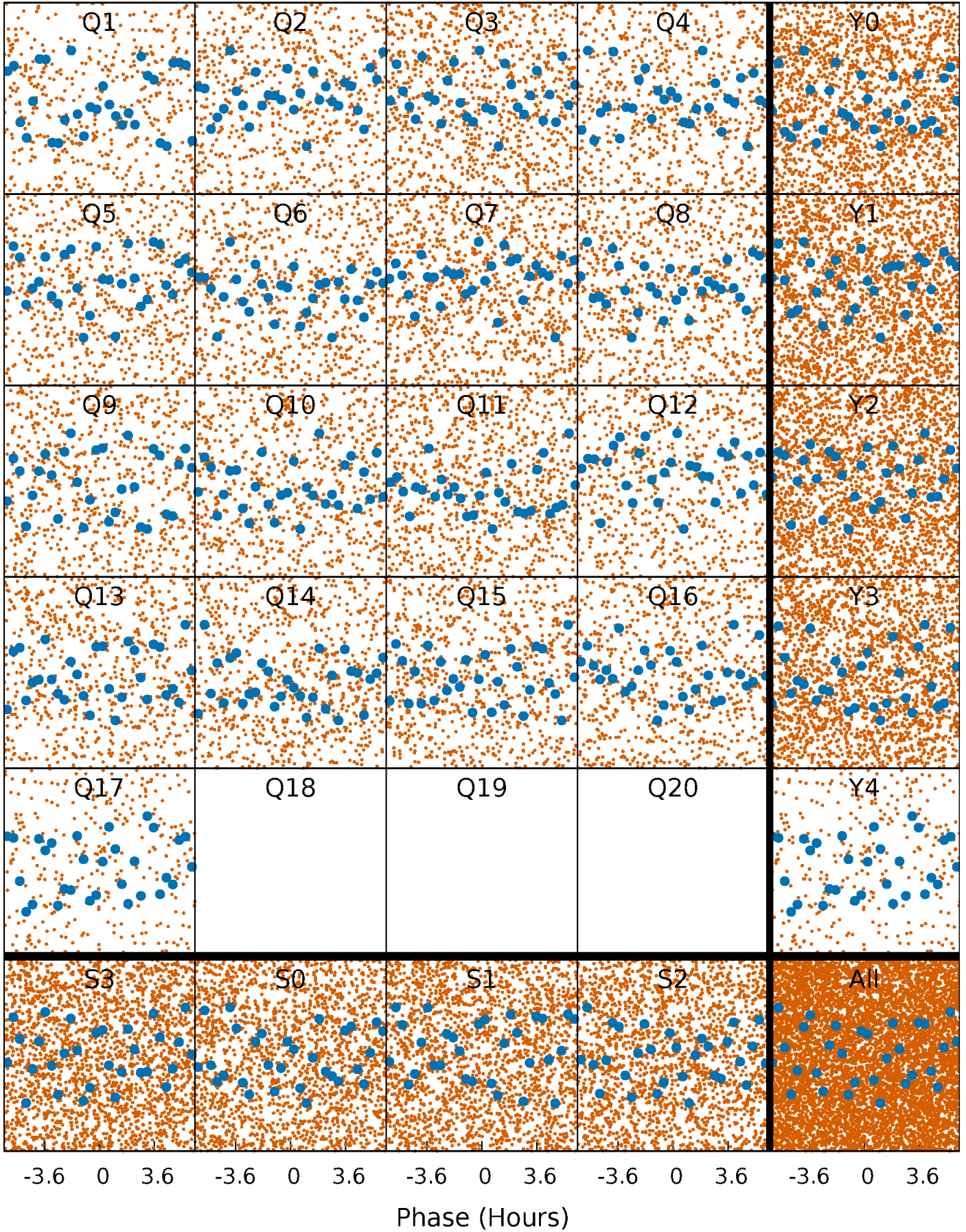


Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)



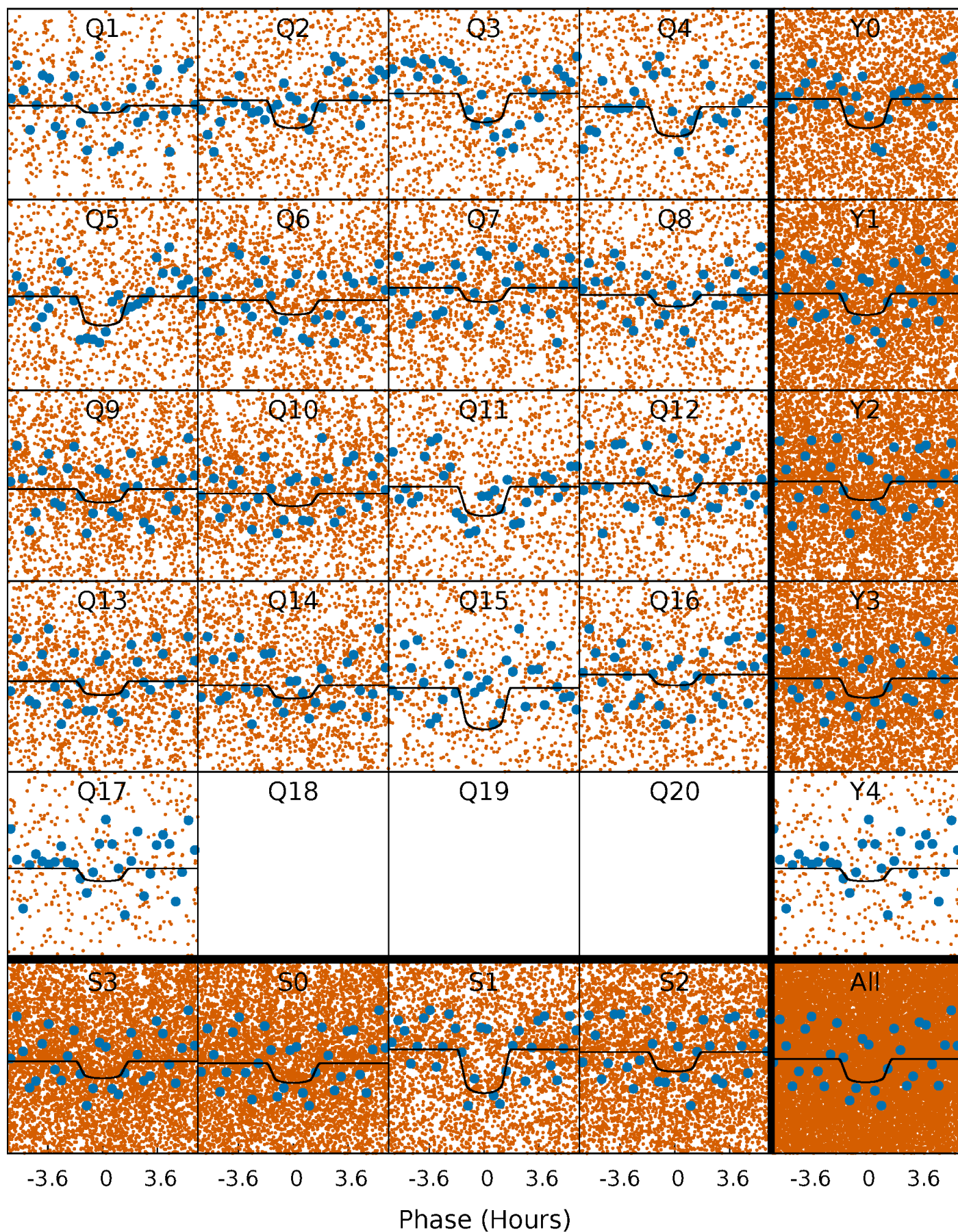
# PDC Quarter-Phased Transit Curves

TCE 005649964-01 P= 1.016536 Days  $T_0=131.832643$  (BKJD)



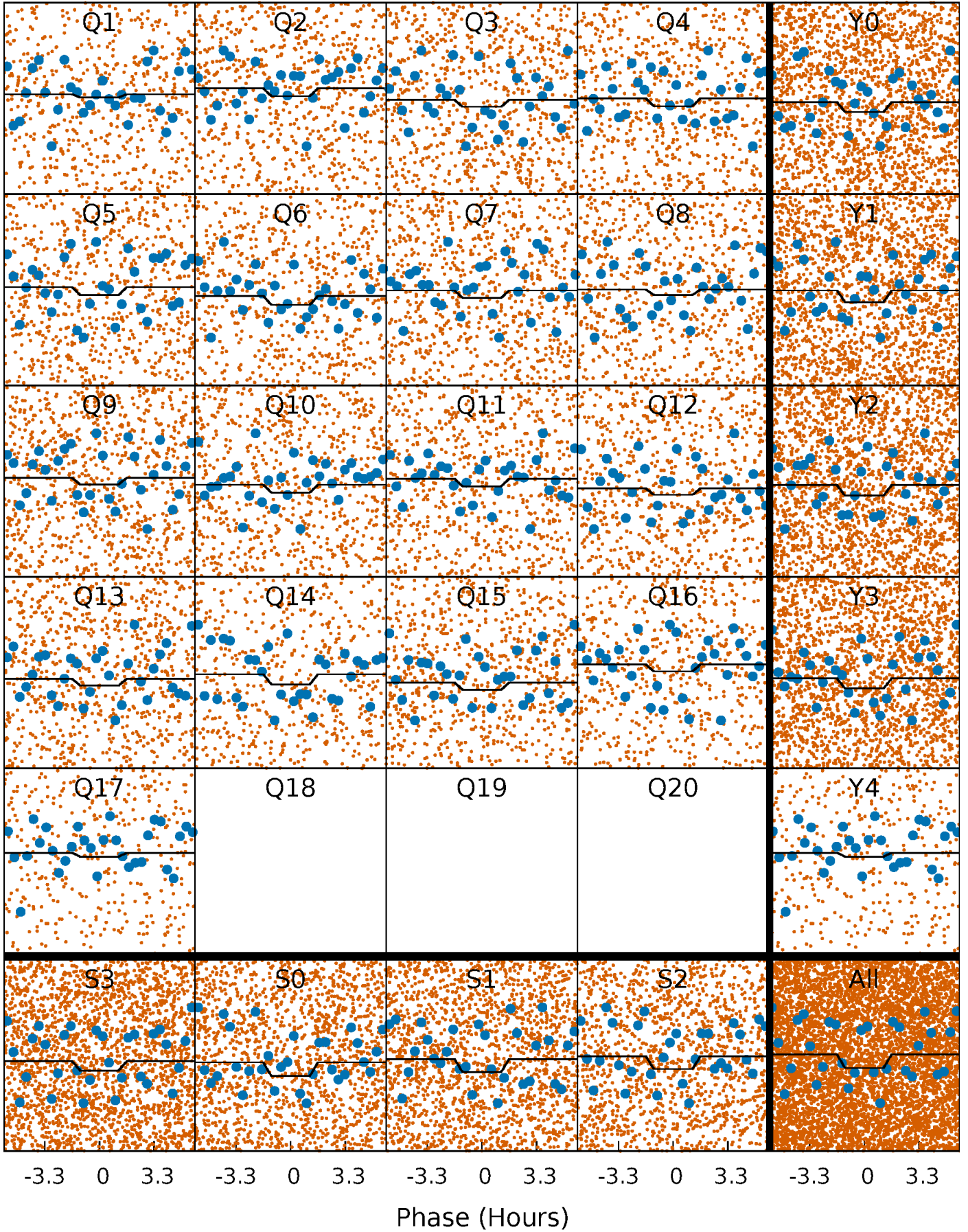
# DV Quarter-Phased Transit Curves

TCE 005649964-01 P= 1.016536 Days  $T_0=131.832643$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

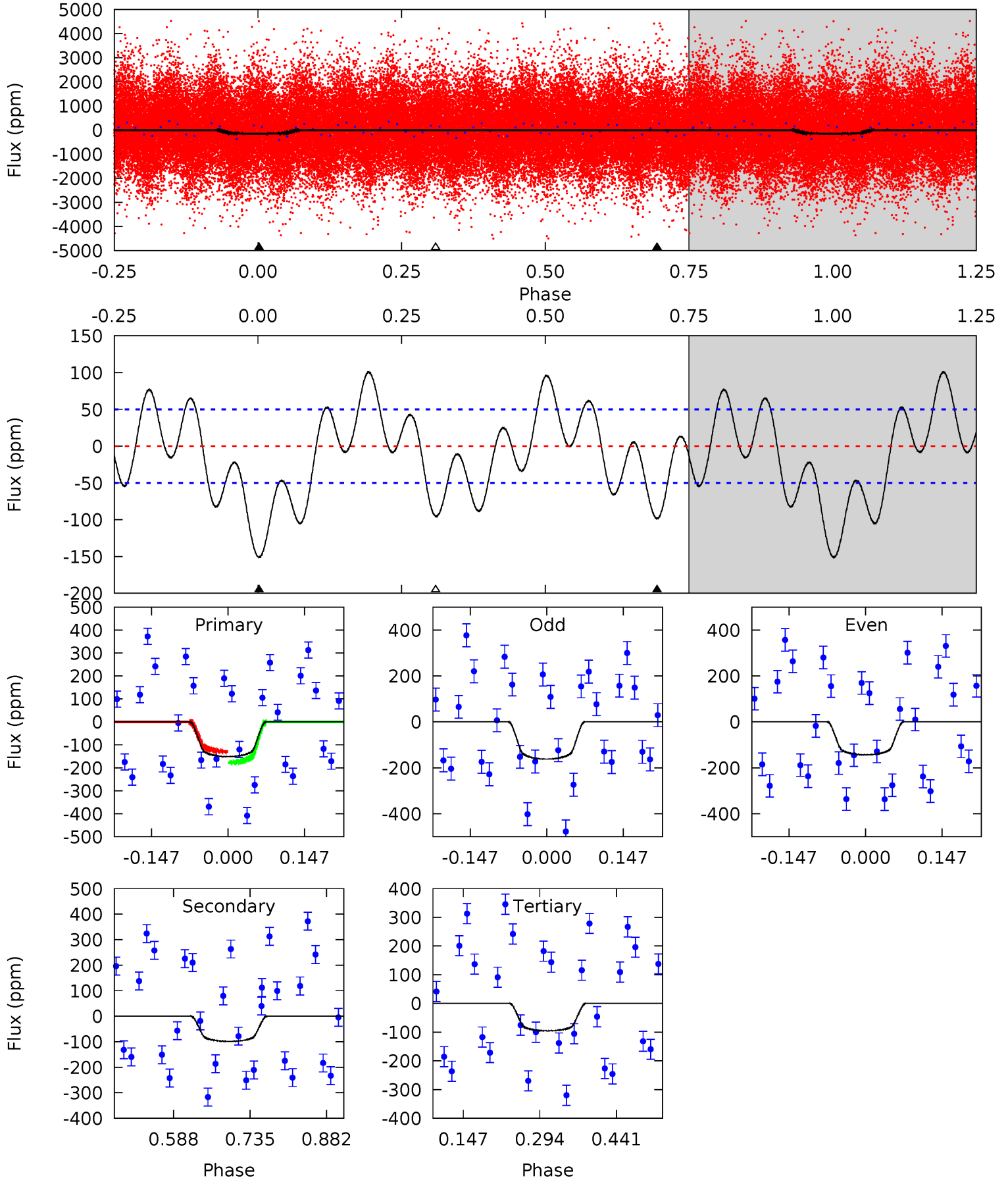
TCE 005649964-01 P= 1.016535 Days  $T_0=131.835617$  (BKJD)



# DV Model-Shift Uniqueness Test

005649964-01, P = 1.016536 Days, E = 130.816107 Days

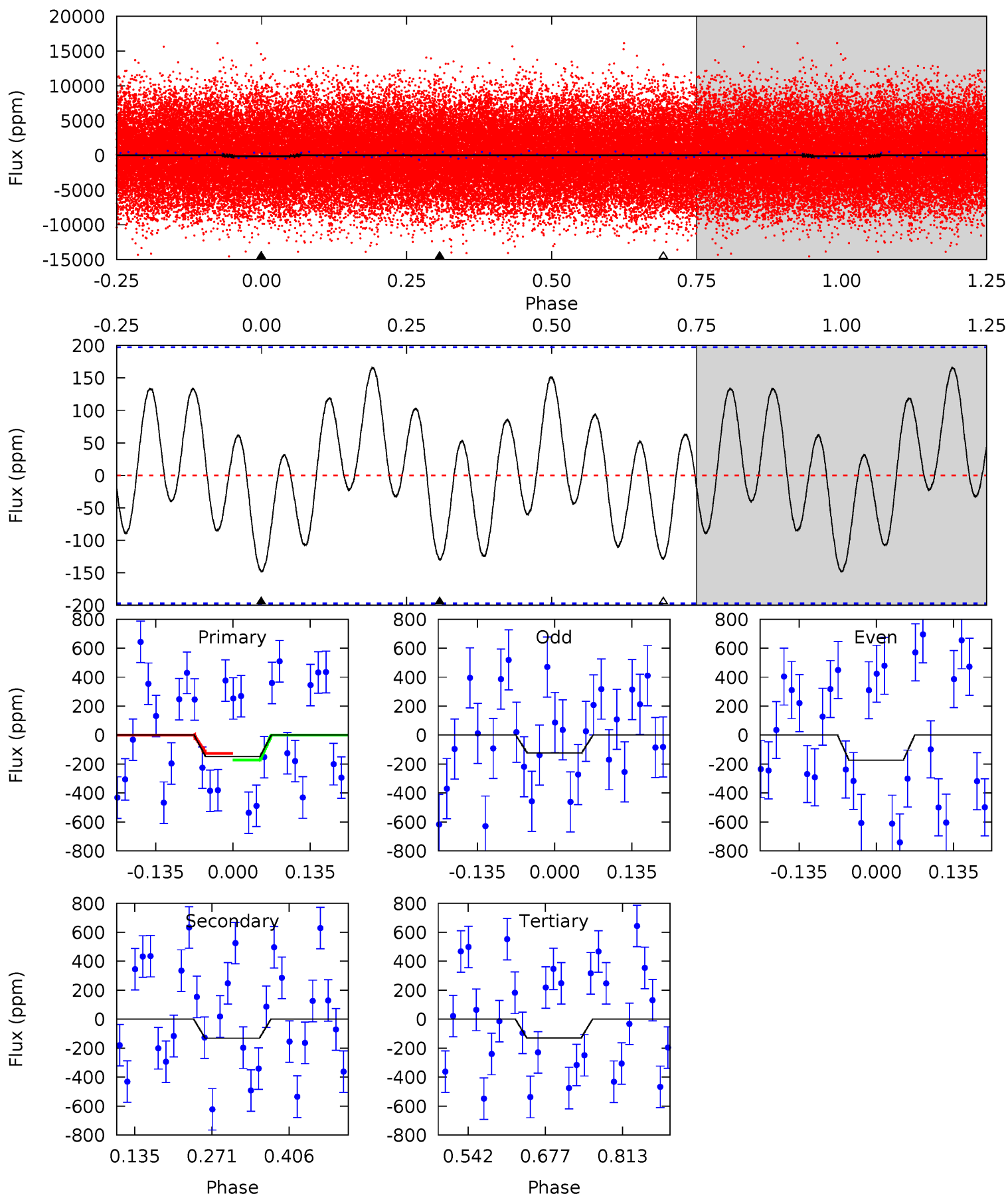
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
13.5	8.81	8.54	0	4.48	1.45	4.58	5.00	13.5	0.27	8.81	0.84	0.95	0.40	2.18



# Alt Model-Shift Uniqueness Test

005649964-01, P = 1.016535 Days, E = 130.819082 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
3.40	2.98	2.96	0	4.50	1.49	1.56	0.44	3.40	0.02	2.98	0.56	1.11	0.53	0.52



### Stellar Parameters For KIC 005649964

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$6953^{+194}_{-291}$	$4.137^{+0.158}_{-0.193}$	$-0.100^{+0.250}_{-0.350}$	$1.685^{+0.510}_{-0.371}$	$1.423^{+0.208}_{-0.254}$	$0.419^{+0.388}_{-0.215}$
	+3%/-4%	+4%/-5%	+250%/-350%	+30%/-22%	+15%/-18%	+92%/-51%
Source	PHO1	KIC0	KIC0	DSEP		

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

### Secondary Eclipse Parameters for KIC 005649964-01 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-99 \pm 11$	$2.70^{+0.78}_{-0.70}$	$3737^{+310}_{-262}$	$5564^{+912}_{-592}$	$3.621^{+2.898}_{-1.492}$
Alt.	$-131 \pm 44$	$2.26^{+0.70}_{-0.65}$	$3743^{+314}_{-265}$	$6568^{+1546}_{-1016}$	$6.779^{+7.052}_{-3.425}$

$T_{max}$  = 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

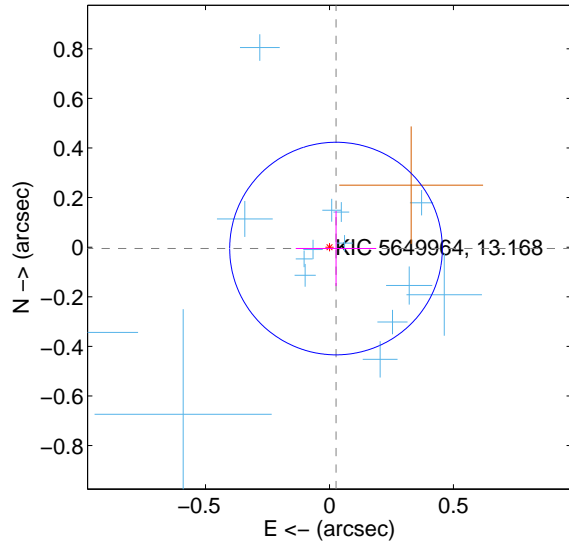
Supplemental centroid analysis for 005649964-01. Kepler magnitude: 13.17. Transit SNR 10.60

There are 16 quarters with good PRF difference image offsets

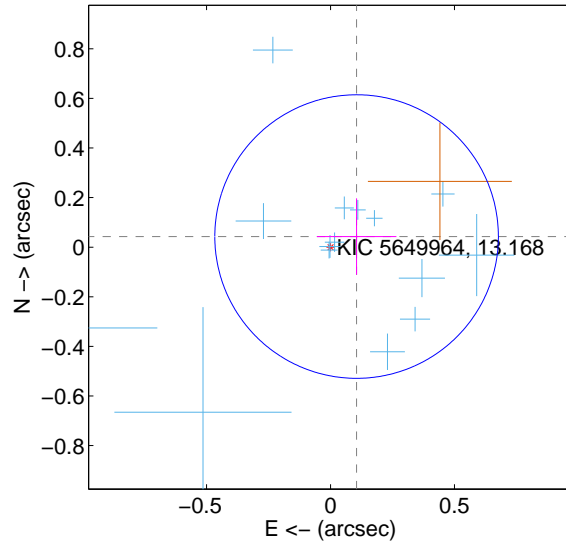
The direct PRF centroid is offset from the target star catalog position by about 0.11 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.027 \pm 0.143$	0.19	$-0.026 \pm 0.162$	$-0.006 \pm 0.151$
PRF-fit source offset from KIC position	$0.114 \pm 0.191$	0.60	$-0.105 \pm 0.161$	$0.043 \pm 0.154$
photometric centroid source offset	$0.33 \pm 0.16$	2.03	$0.33 \pm 0.16$	$-0.04 \pm 0.16$

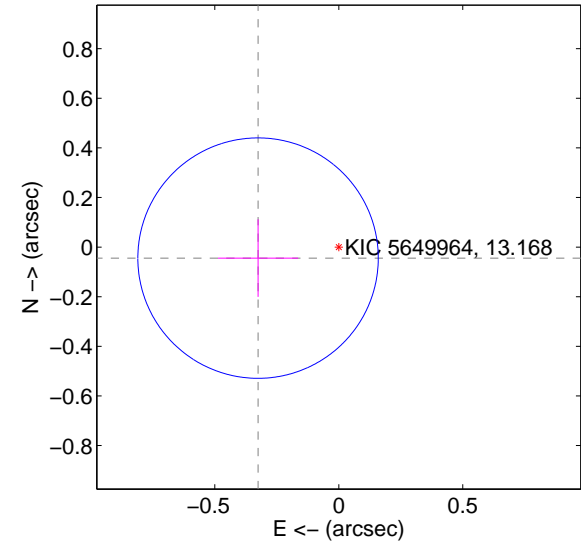
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position

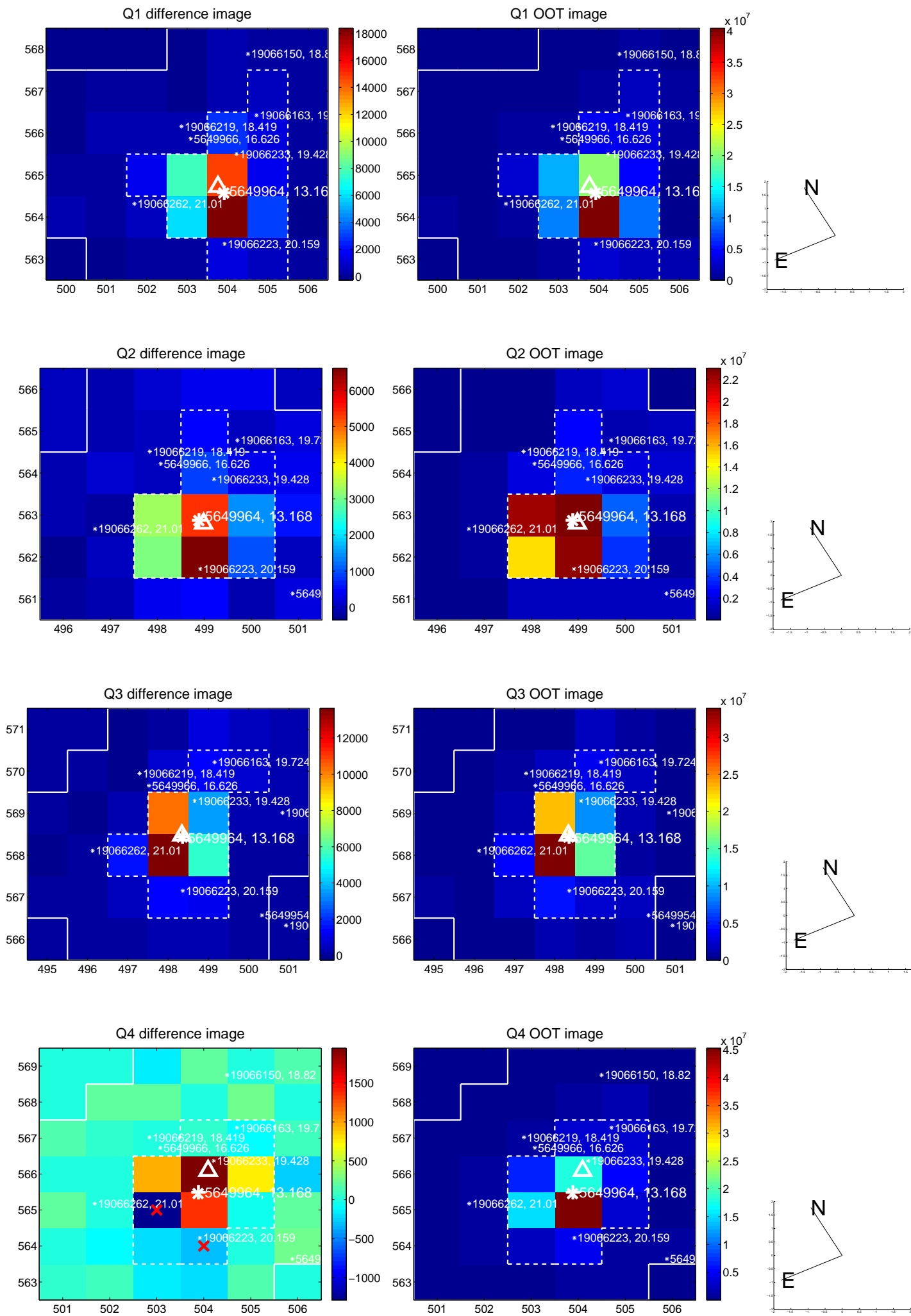


offset from photometric centroids

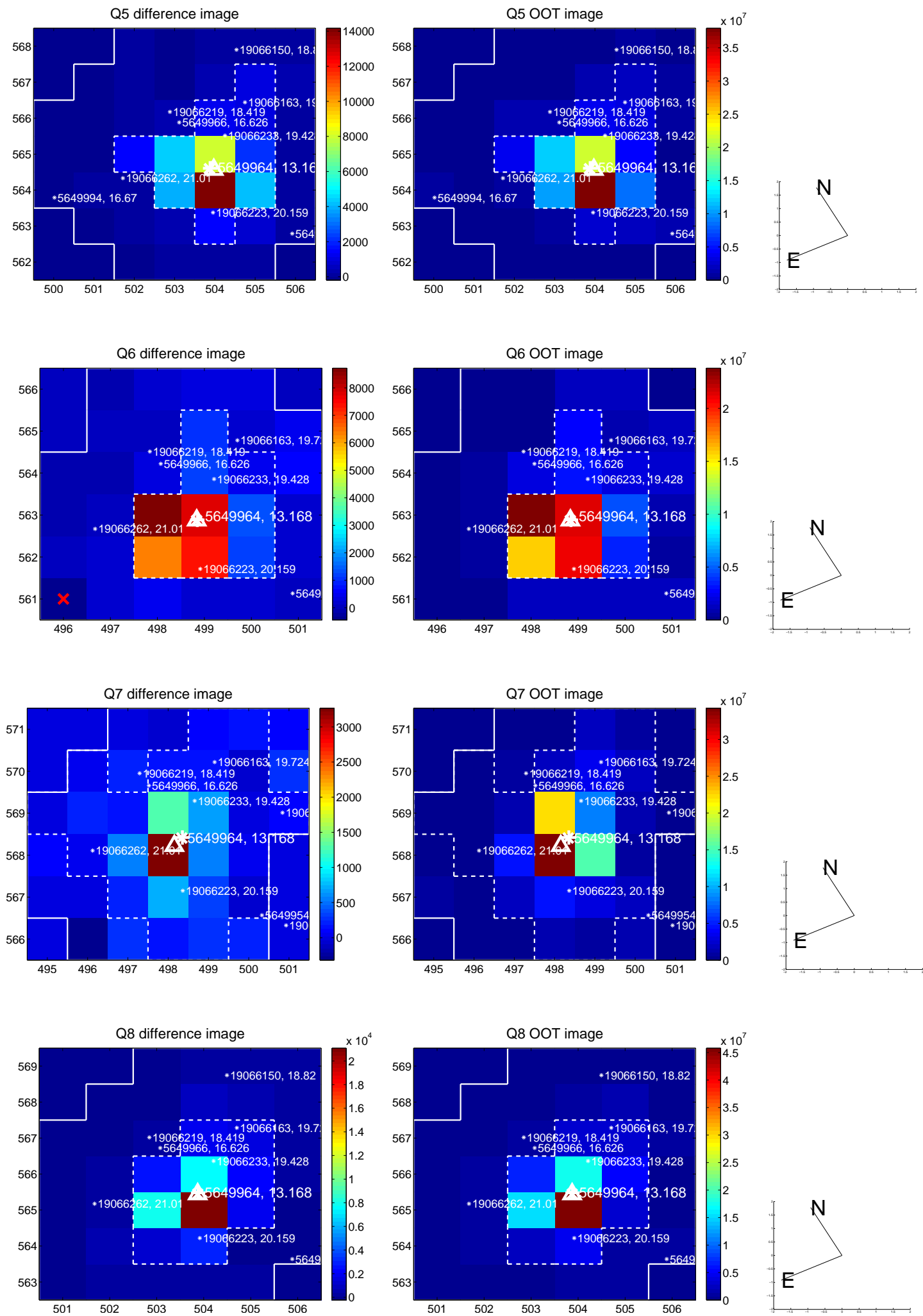


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses:** good quarterly centroid offsets; **Vermillion crosses:** bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

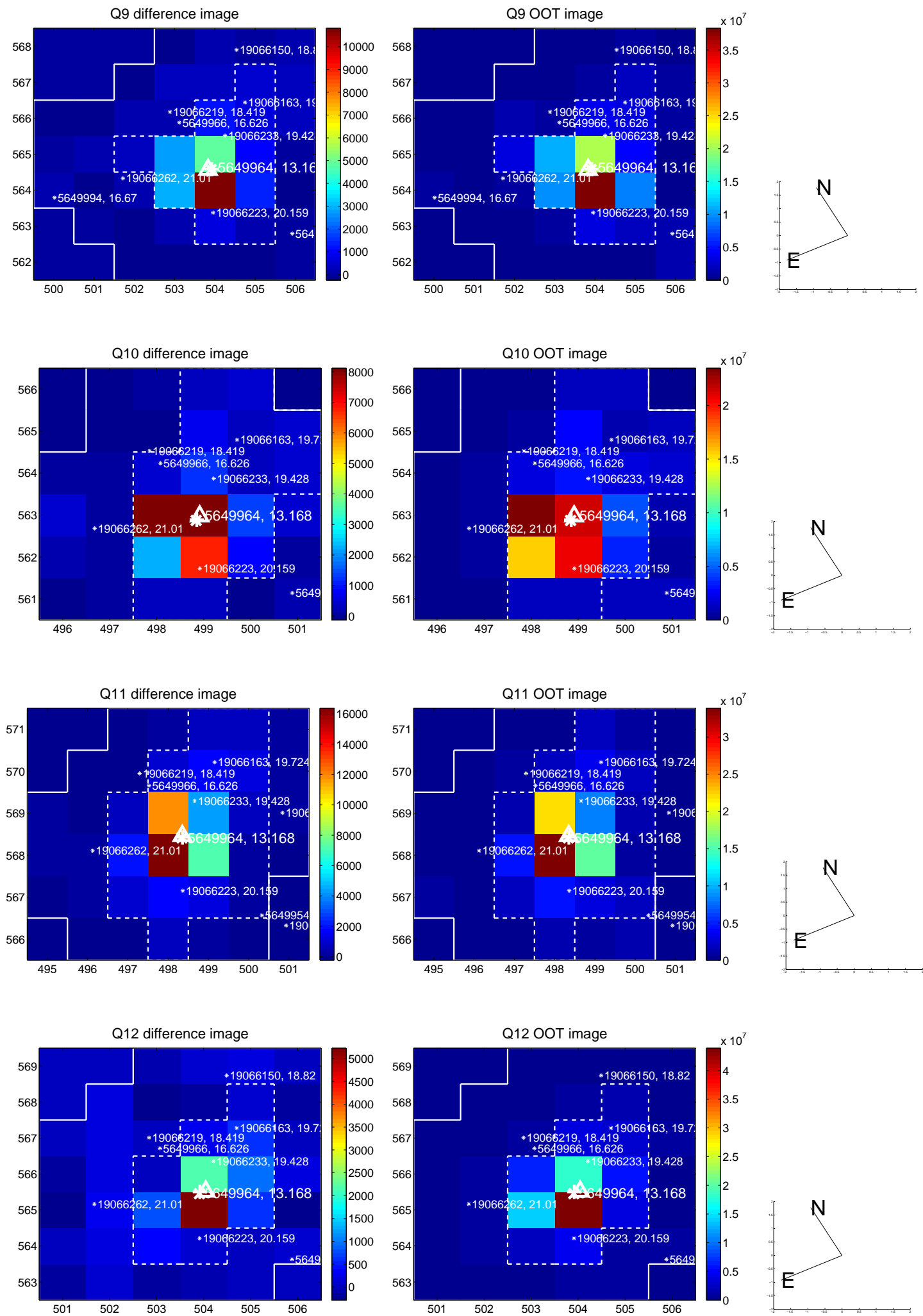
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



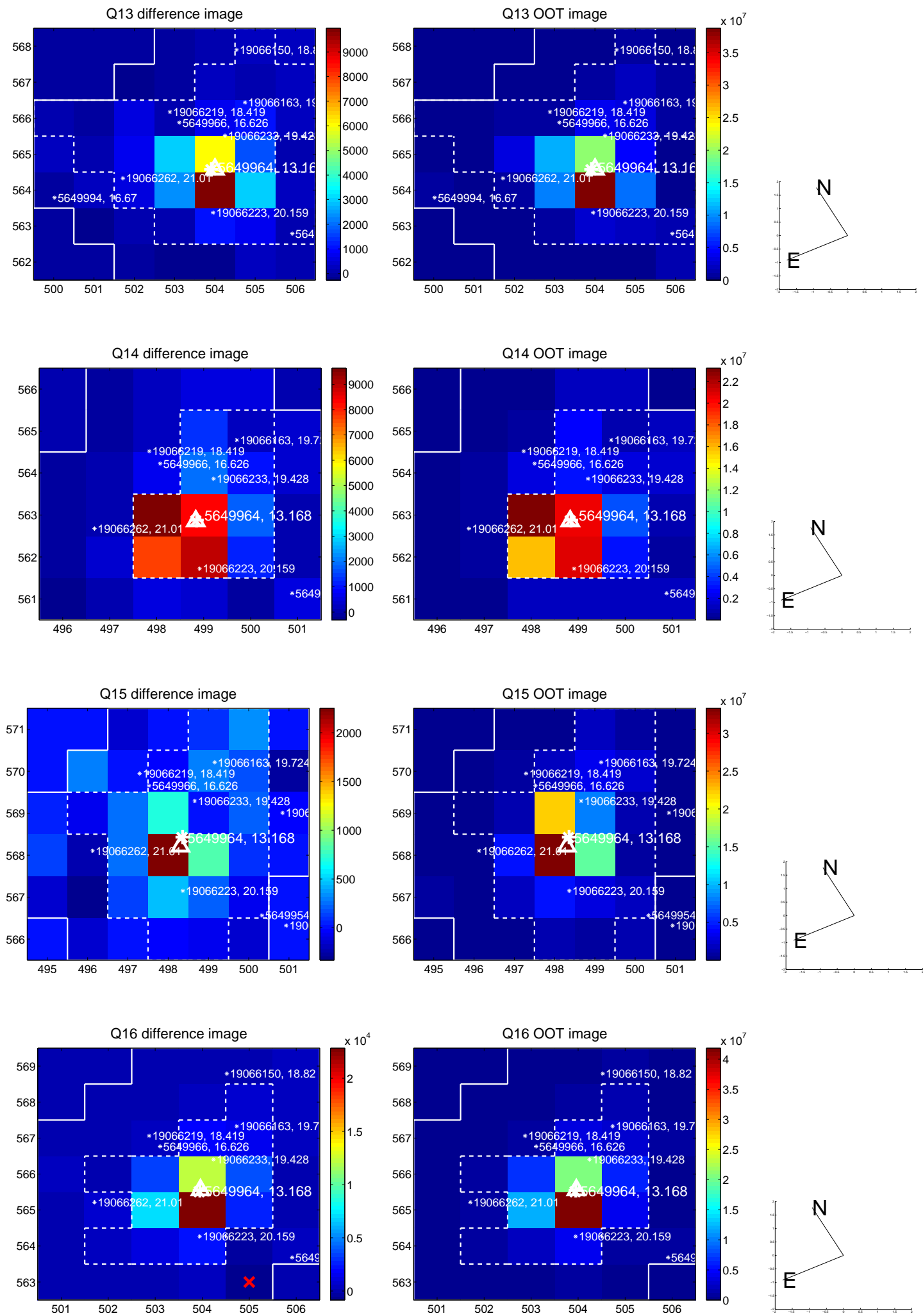
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



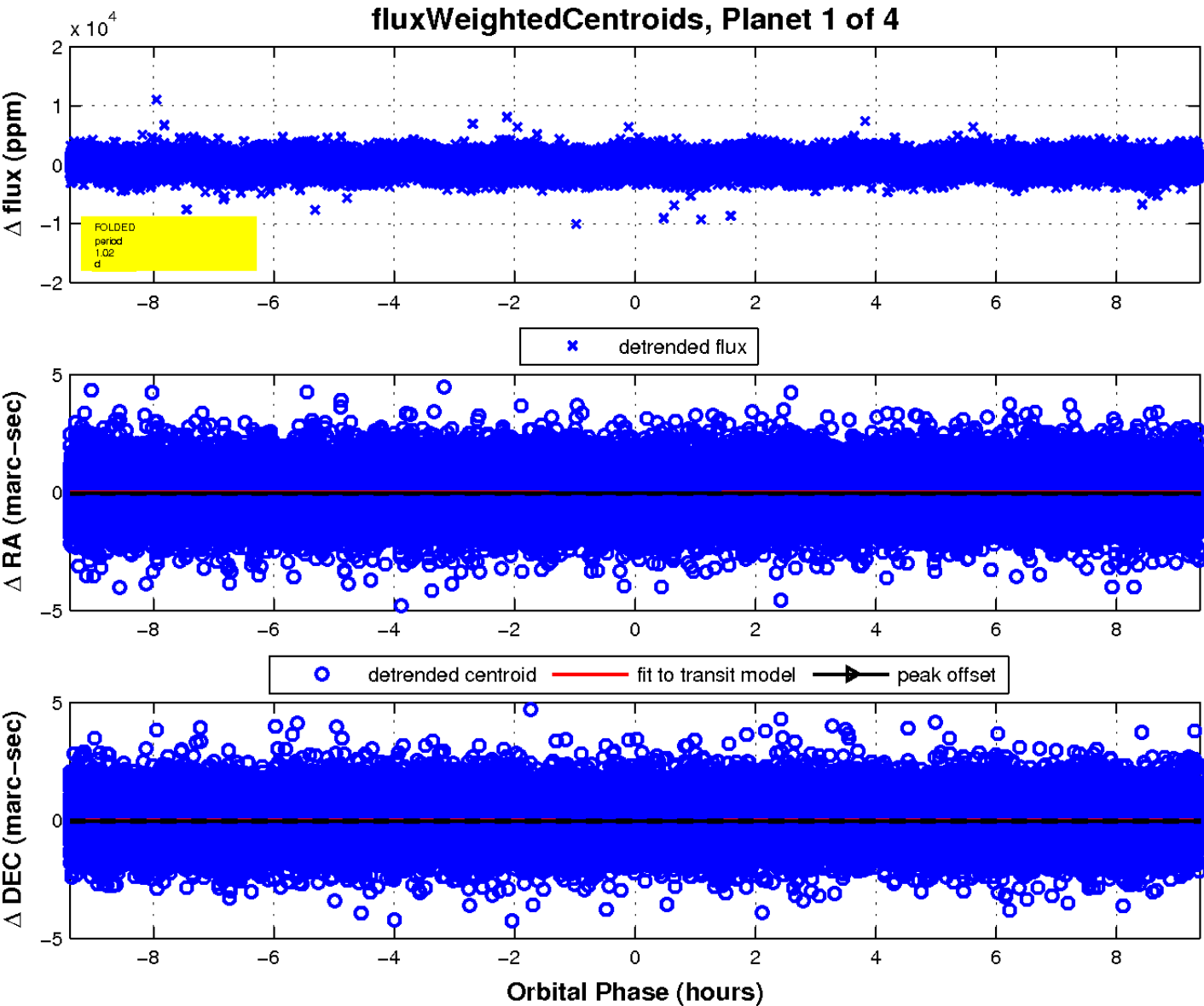
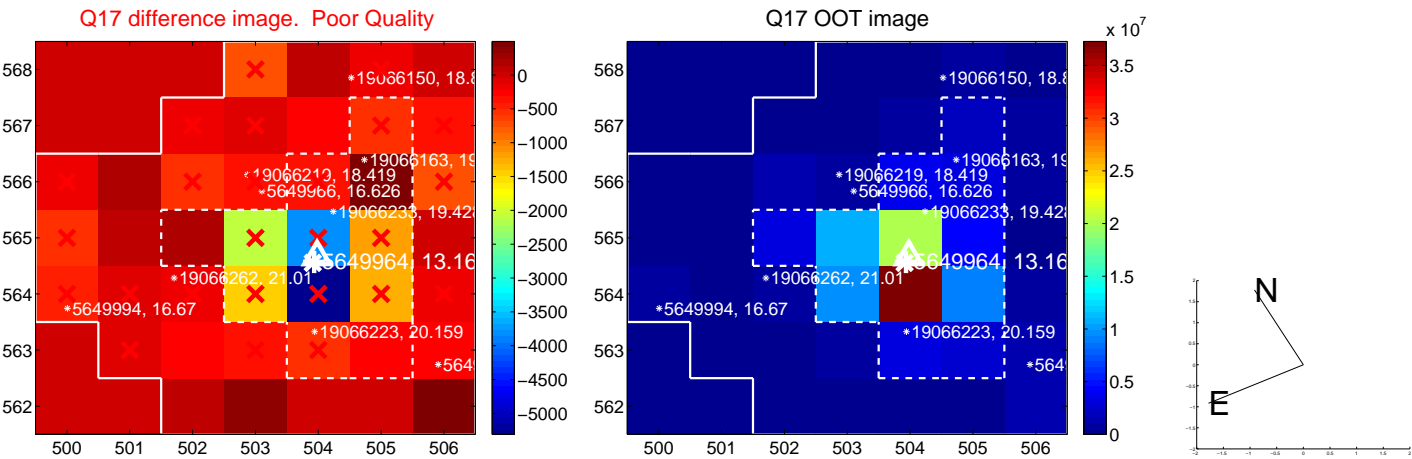
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

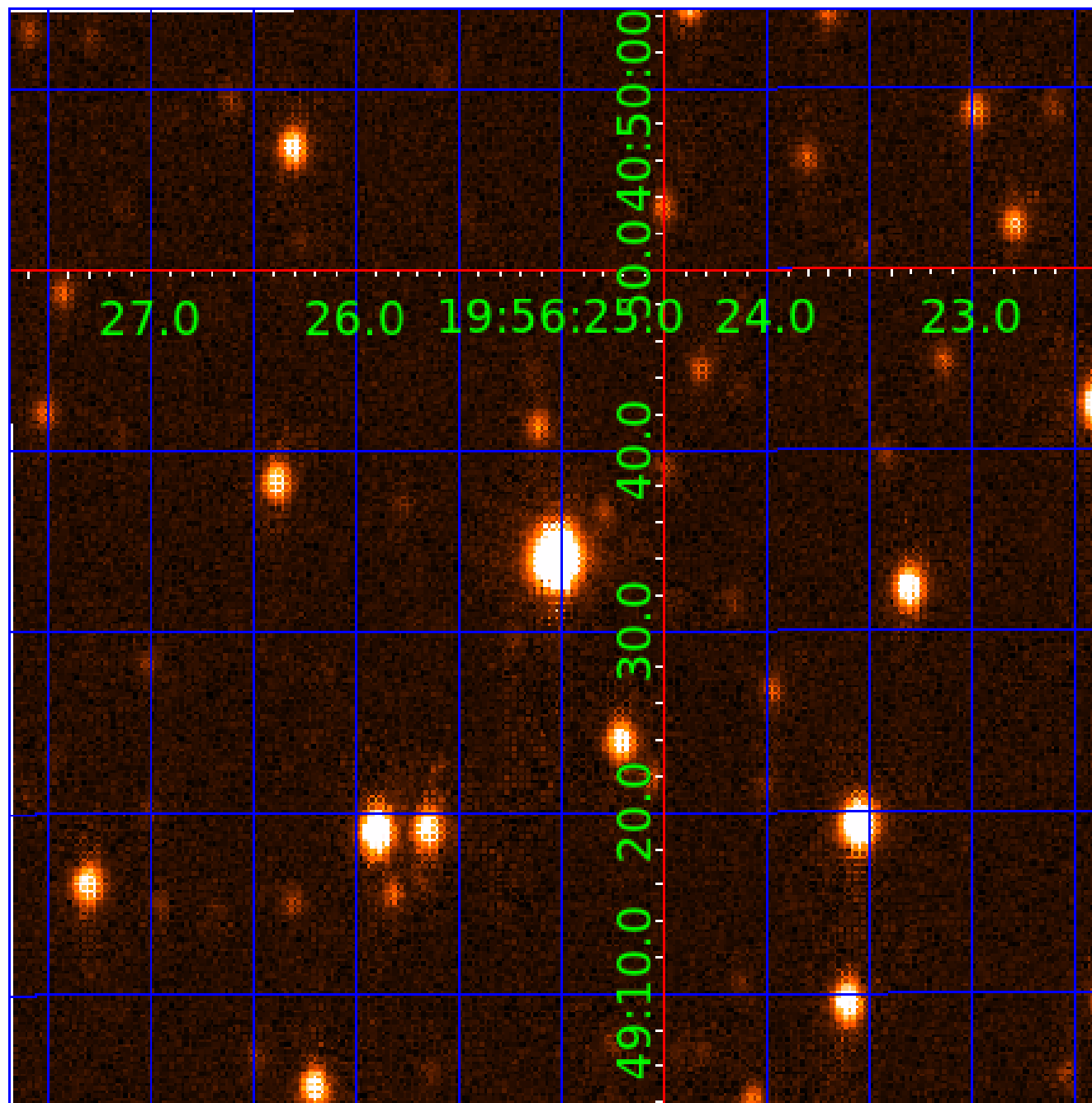


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination



# KIC 005649964

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
005649964-01	OBS	No	1.016536	131.832643	187.5	3.129	10.7	10.6	1.69	6953	2.69	12017.65
005649964-02	OBS	No	0.538018	131.706724	206.2	1.550	9.4	10.6	1.69	6953	2.48	28070.74
005649964-03	OBS	No	164.679305	174.902737	1618.5	6.254	7.1	7.4	1.69	6953	7.00	13.61
005649964-04	OBS	No	118.680411	167.470654	272.6	6.000	7.4	-1.0	1.69	6953	2.81	21.06

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
005649964-01	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT
005649964-02	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT
005649964-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_CHASES_SKYE—TRANS_GAPPED—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT
005649964-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_NOFITS

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

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

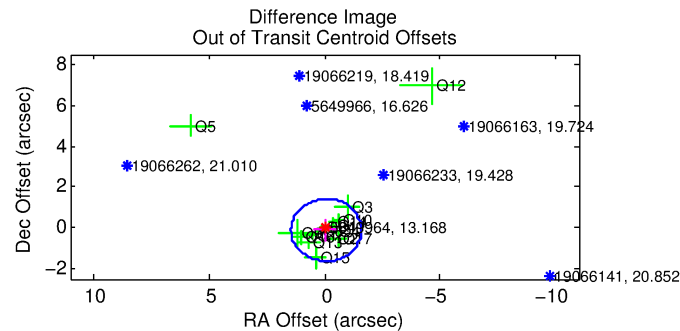
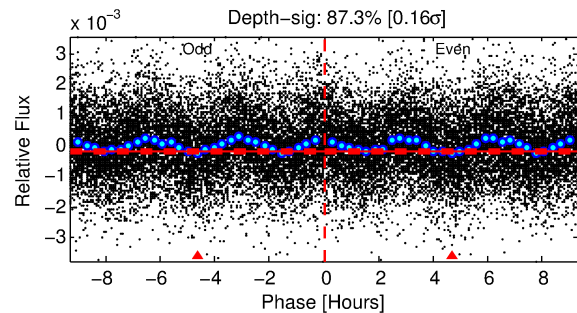
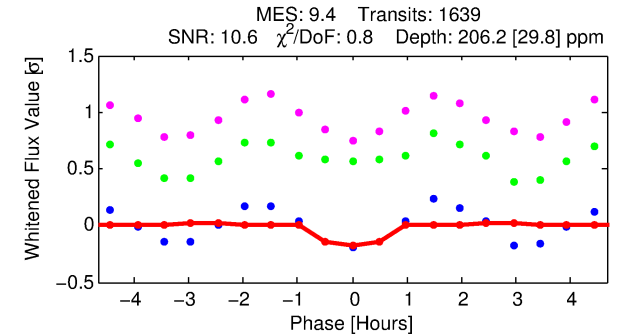
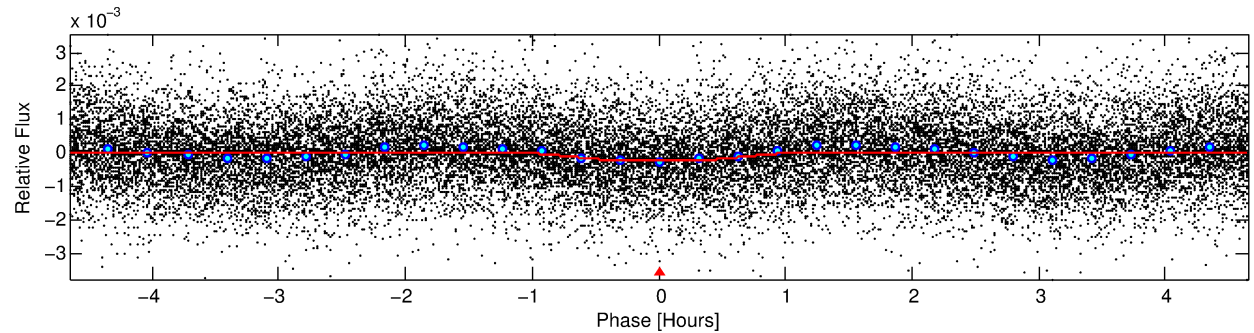
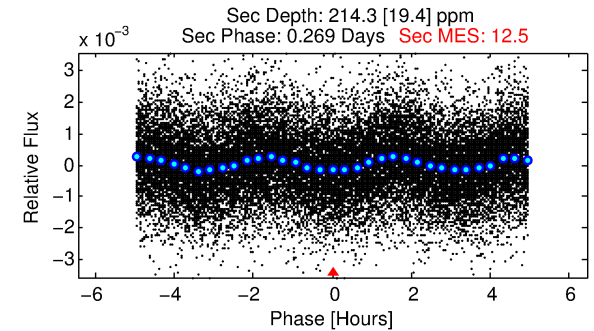
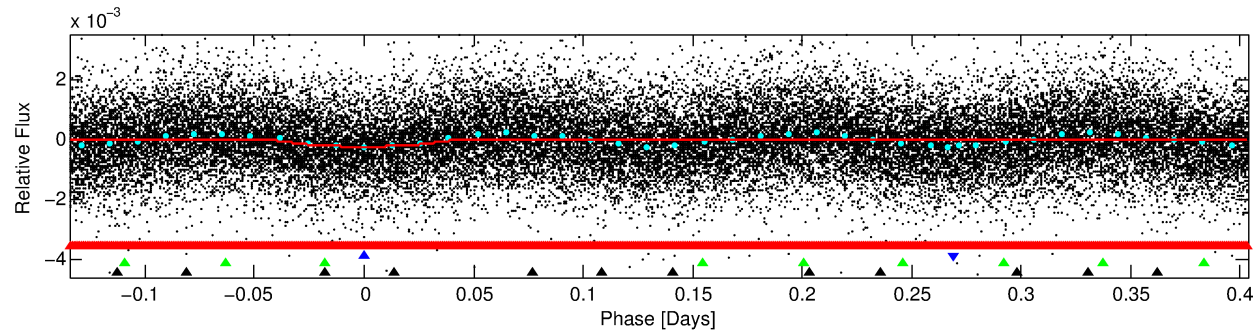
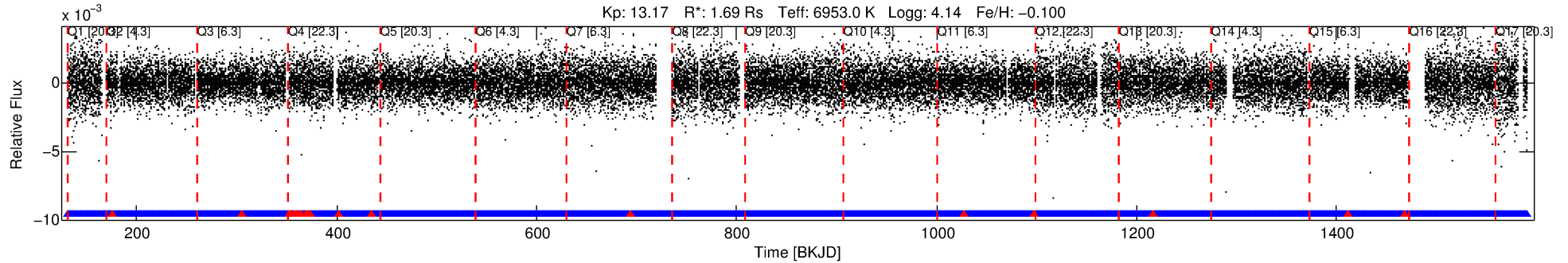
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 005649964-02

No Significant Match Found

# DV One-Page Summary

KIC: 5649964 Candidate: 2 of 4 Period: 0.538 d



## DV Fit Results:

Period = 0.53802 [0.00001] d  
Epoch = 131.7067 [0.0019] BKJD  
Rp/R\* = 0.0135 [0.0080]  
a/R\* = 2.61 [7.45]  
b = 0.35 [8.42]  
Seff = 28070.74 [11105.34]  
Teq = 3301 [326] K  
Rp = 2.48 [1.66] Re  
a = 0.0146 [0.0036] AU  
Ag = 4.06 [5.07] [0.60σ]  
Teffp = 7244 [2186] K [1.78σ]

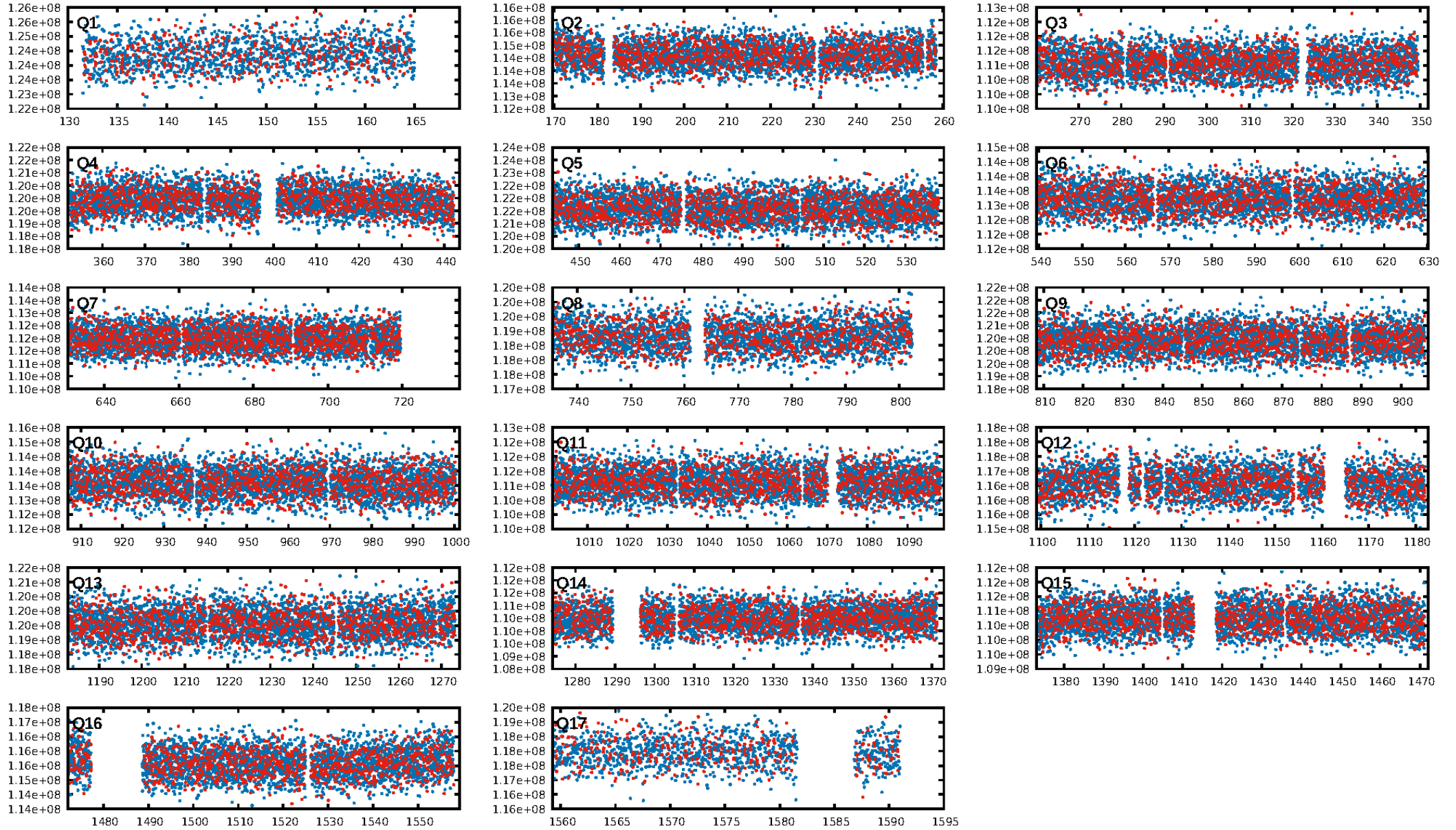
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 99.9% [3.29σ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: N/A  
RollingBand-fgt: 0.98 [1543/1567]  
**GhostDiagnostic-chr: 0.9837**  
Centroid-sig: 26.0%  
Centroid-so: 0.240 arcsec [1.65σ]  
OotOffset-rm: 0.129 arcsec [0.25σ]  
KicOffset-rm: 0.157 arcsec [0.34σ]  
OotOffset-st: 4/3/4/5 [16]  
KicOffset-st: 4/3/4/5 [16]  
DiffImageQuality-fgm: 0.56 [9/16]  
DiffImageOverlap-fno: 1.00 [17/17]

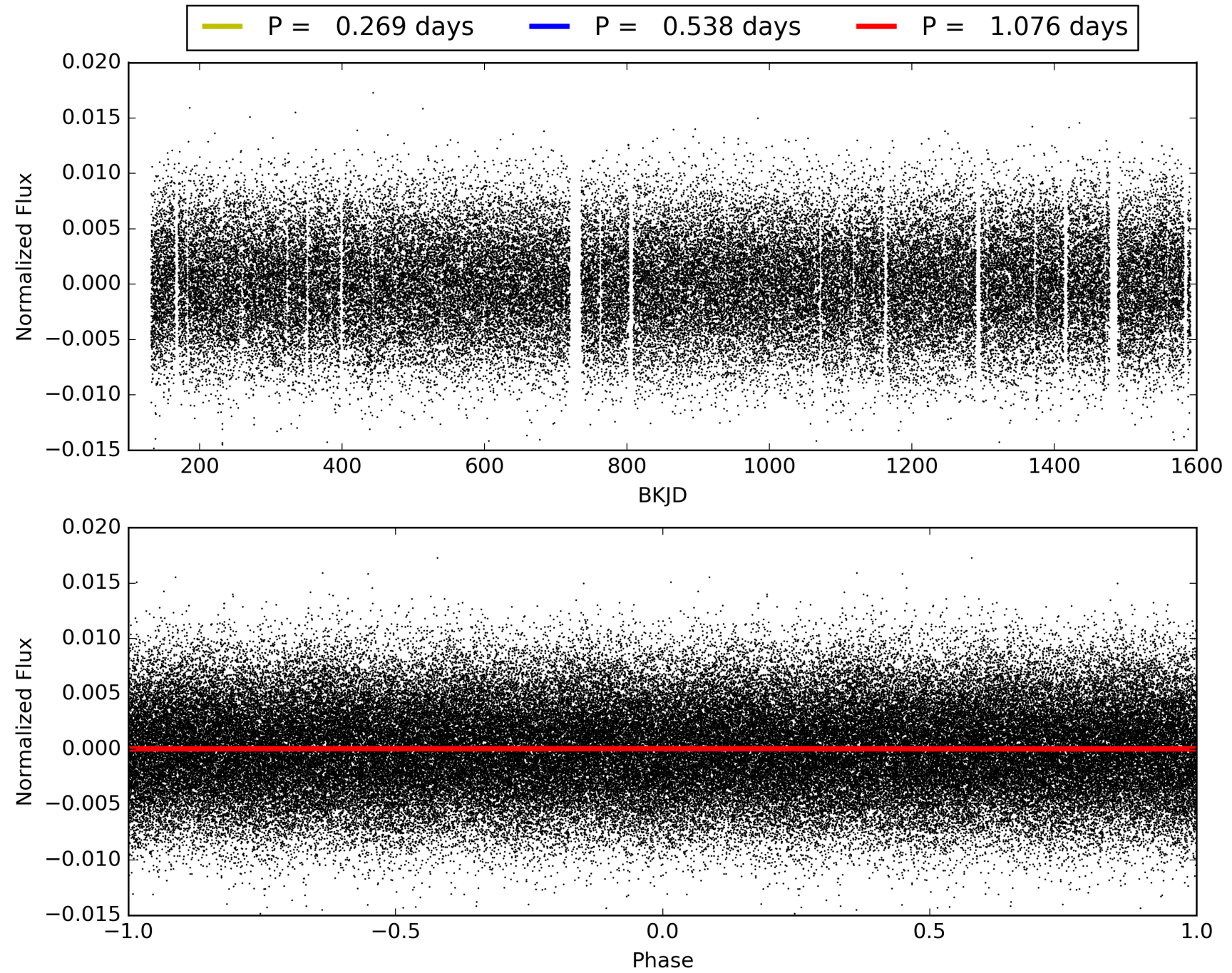
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 30-Jan-2016 16:18:56 Z

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

# TCE 005649964-02, PDC Light Curves

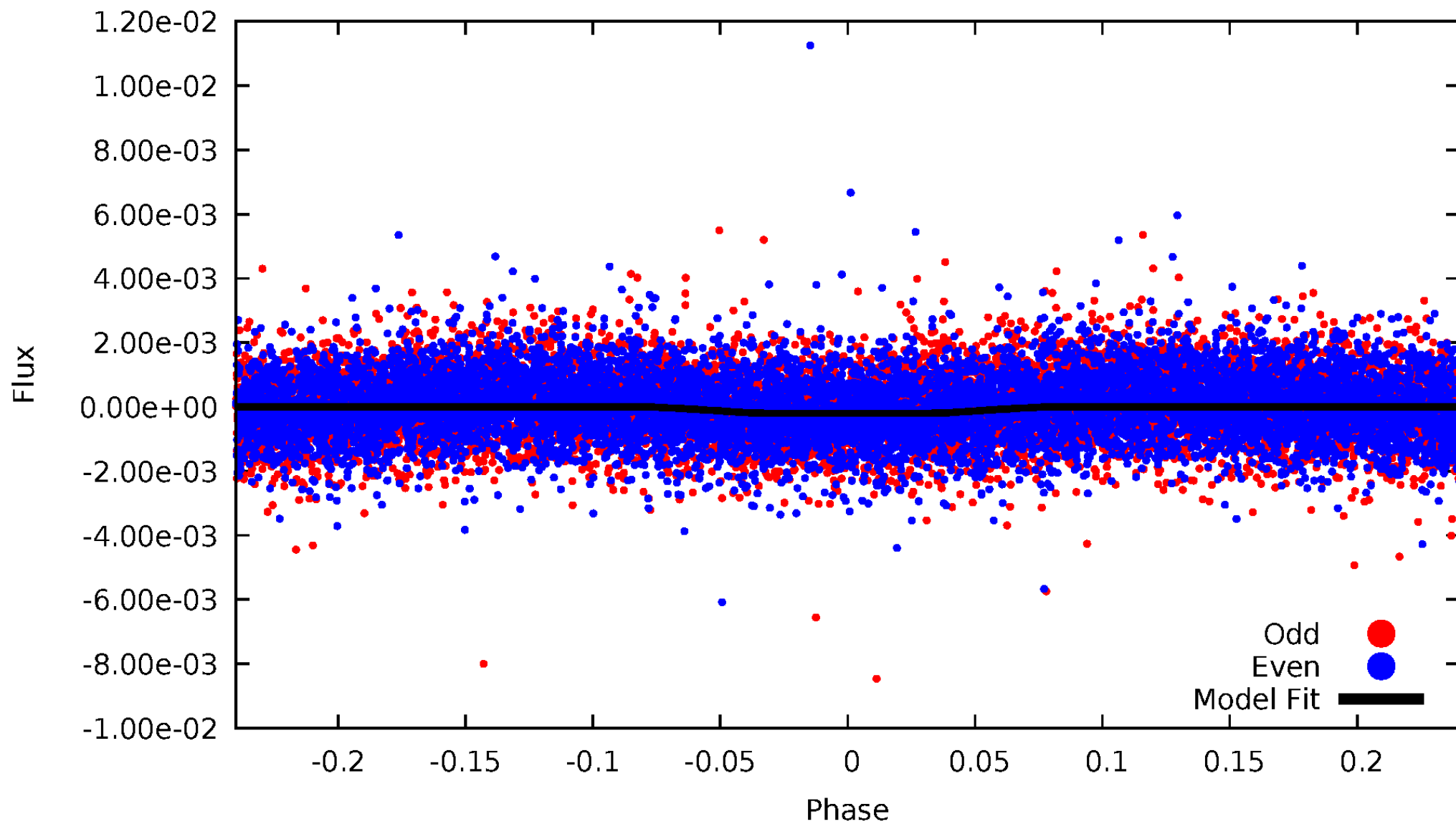


TCE 005649964-02



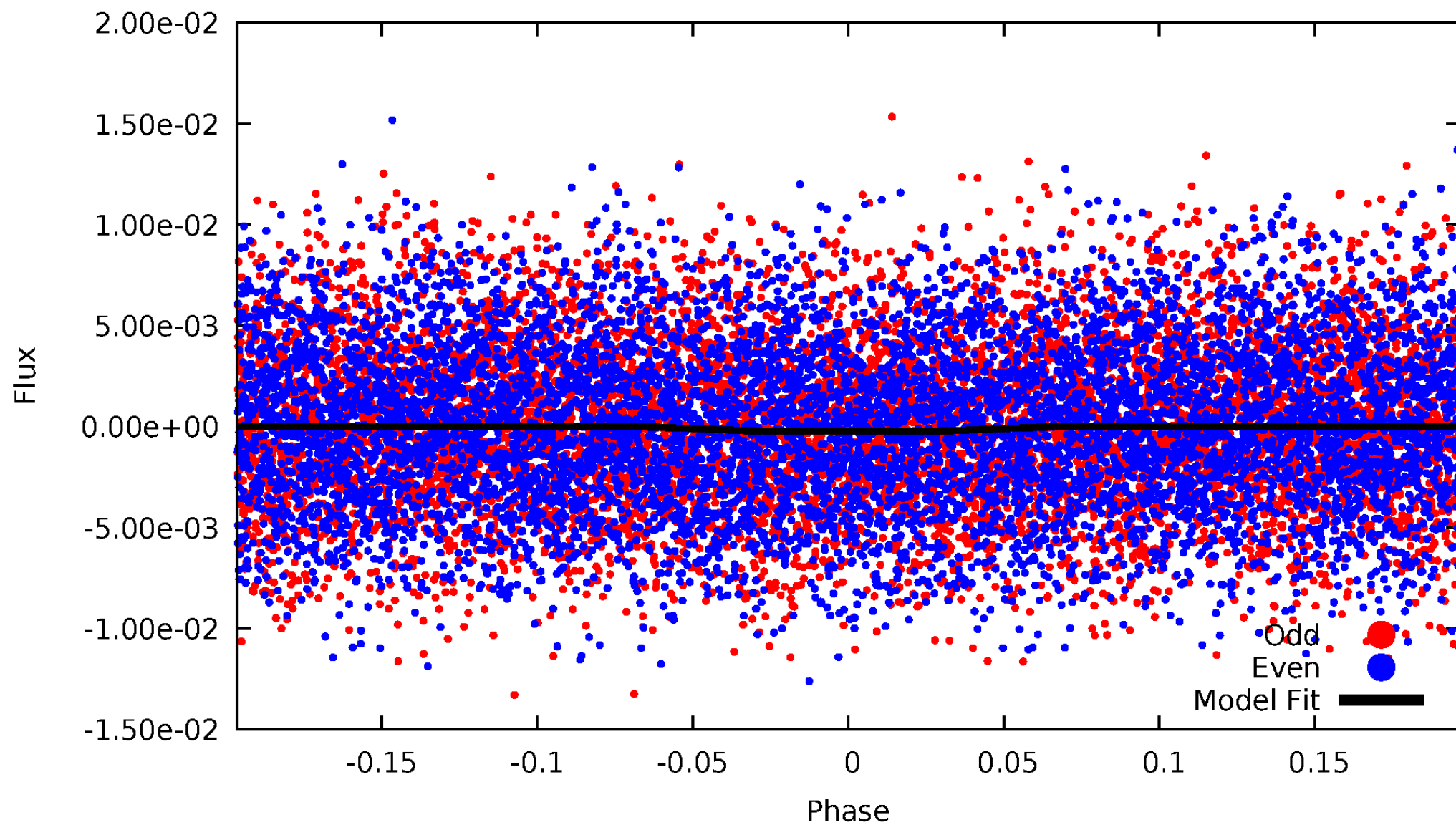
# DV Odd/Even

TCE 005649964-02



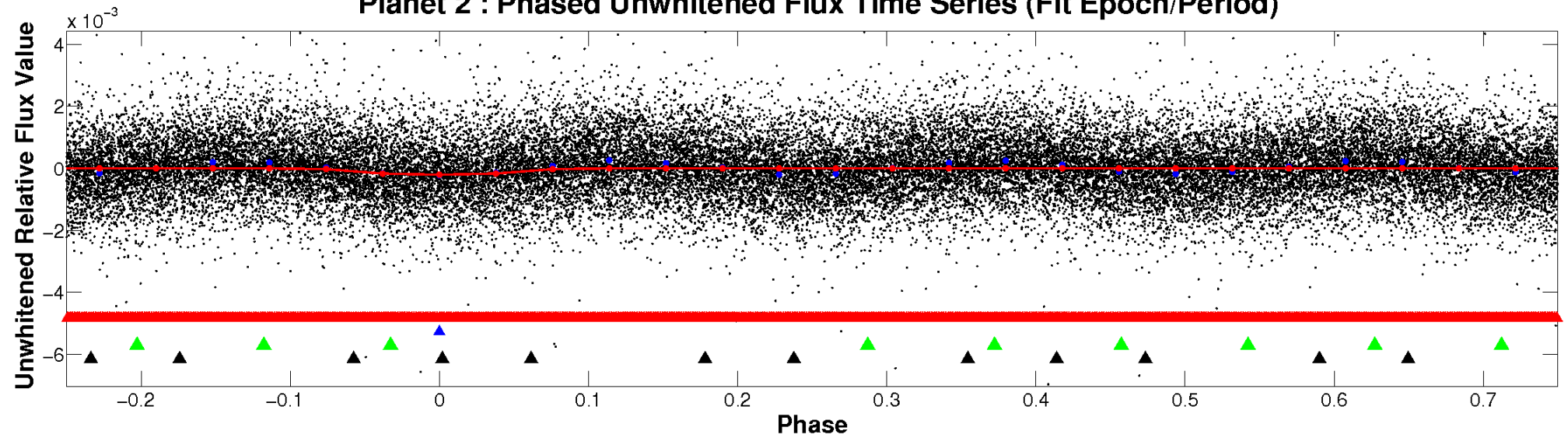
# ALT Odd/Even

TCE 005649964-02

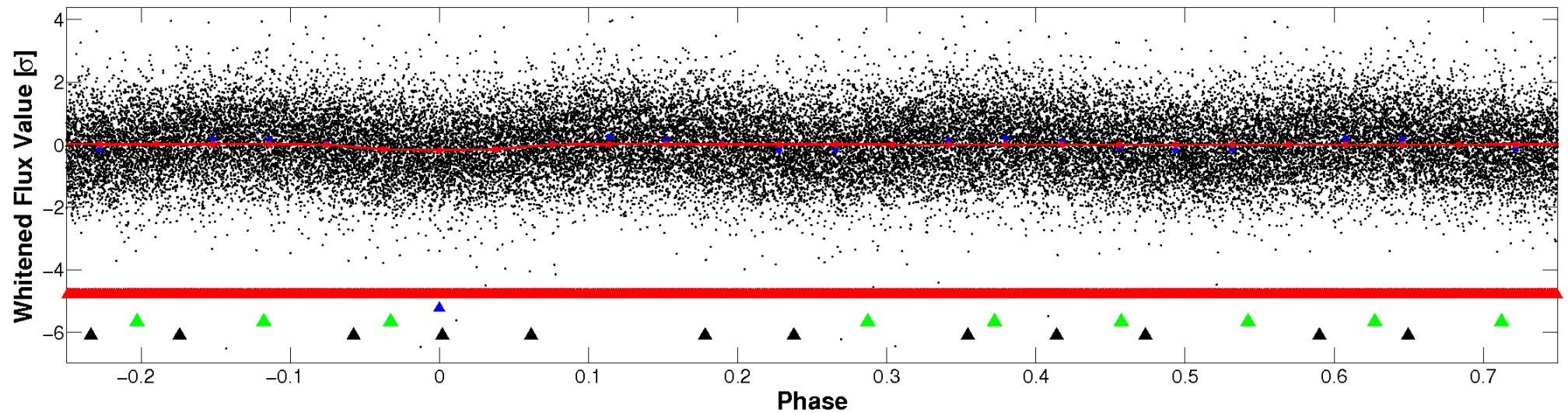


# Non-Whitened Vs. Whitened Light Curve

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

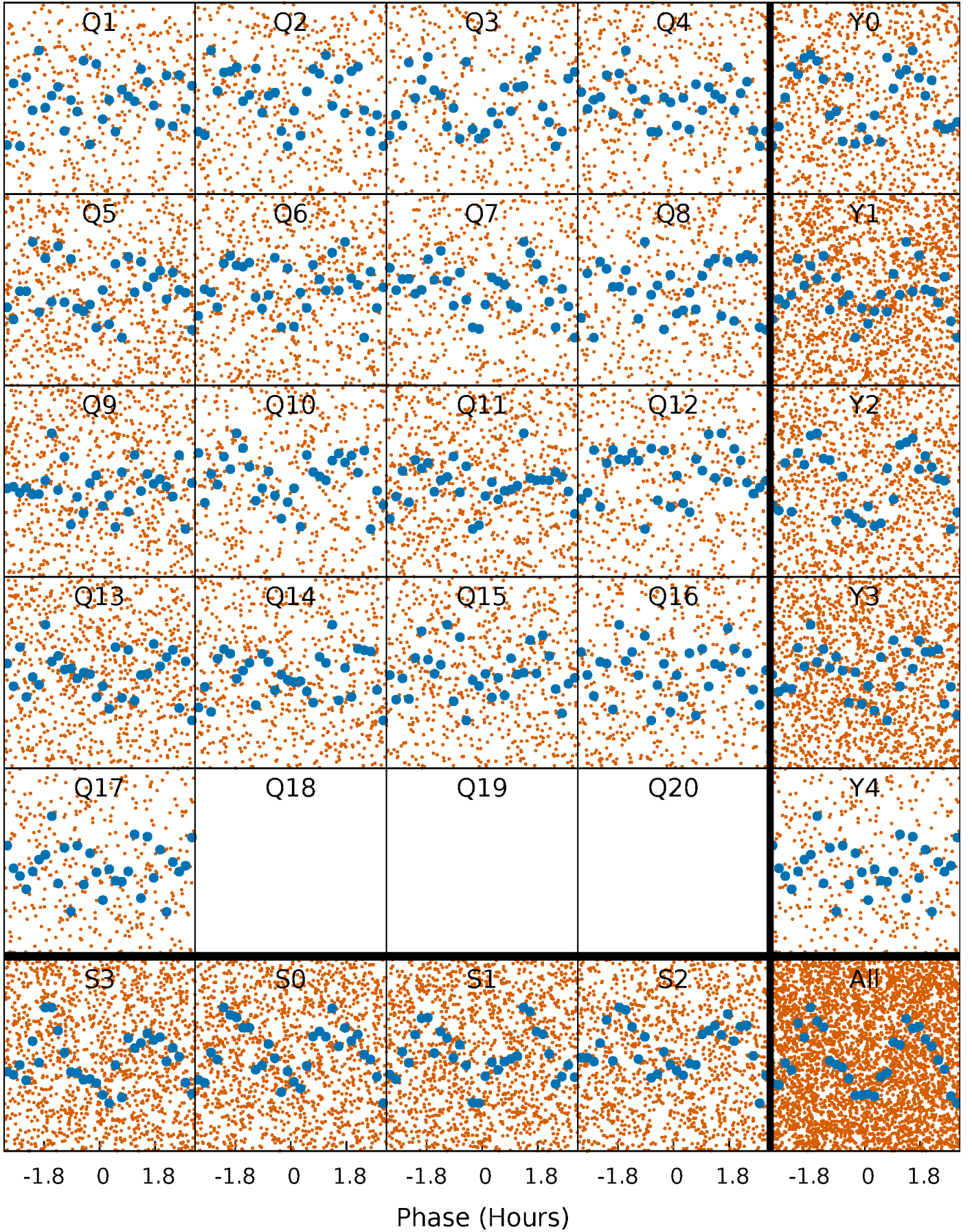


## Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



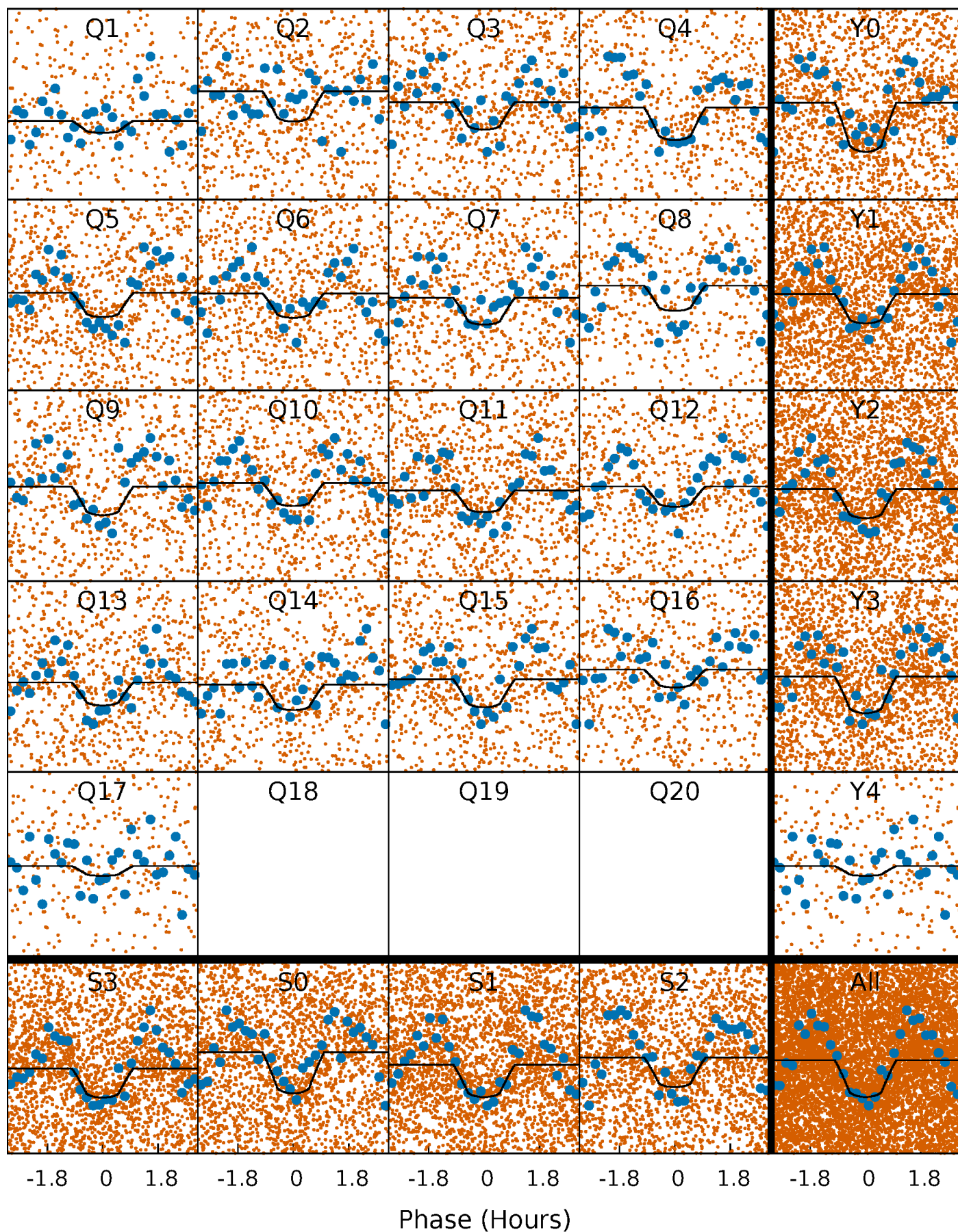
# PDC Quarter-Phased Transit Curves

TCE 005649964-02   P= 0.538018 Days    $T_0=131.706724$  (BKJD)



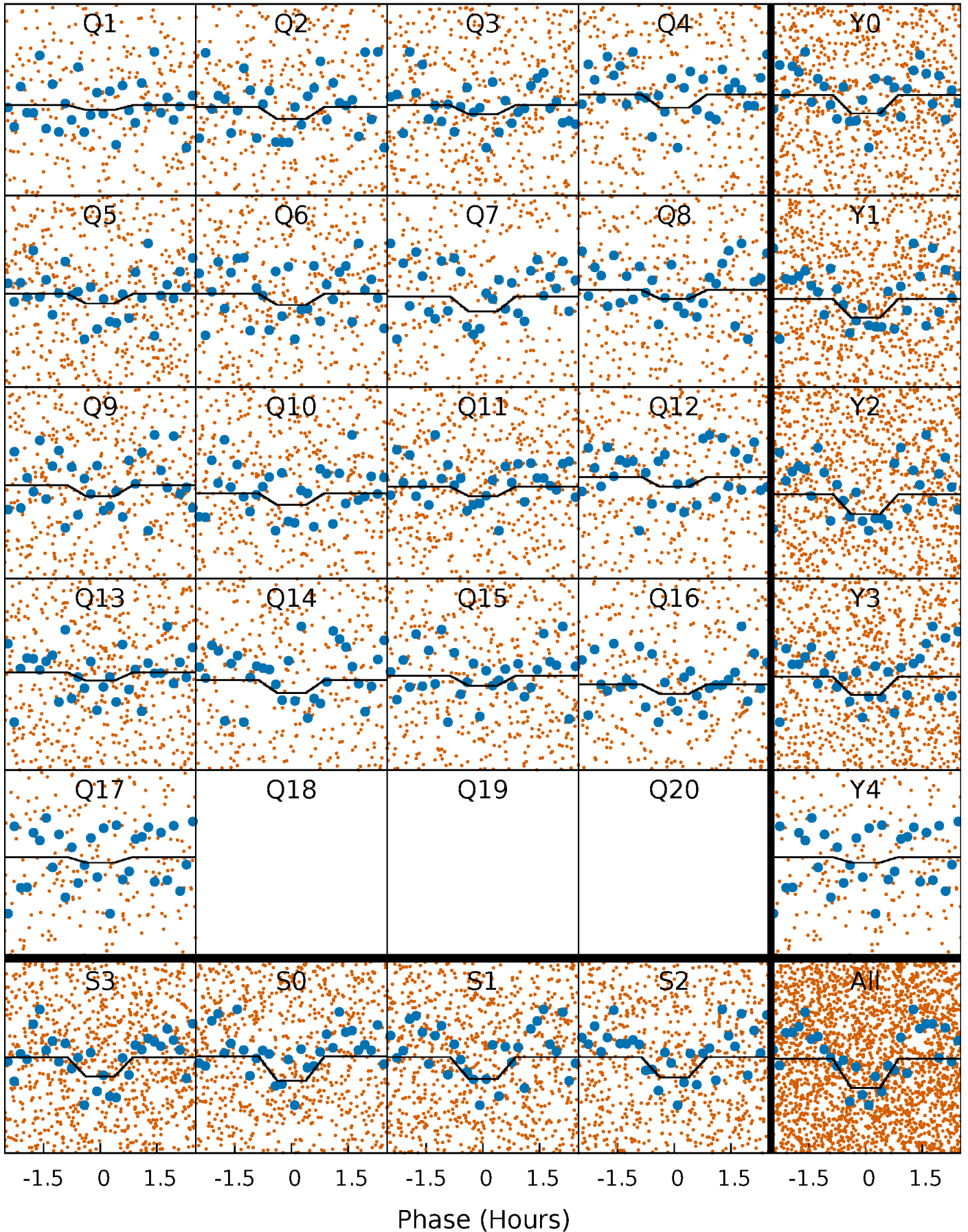
# DV Quarter-Phased Transit Curves

TCE 005649964-02   P= 0.538018 Days    $T_0=131.706724$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

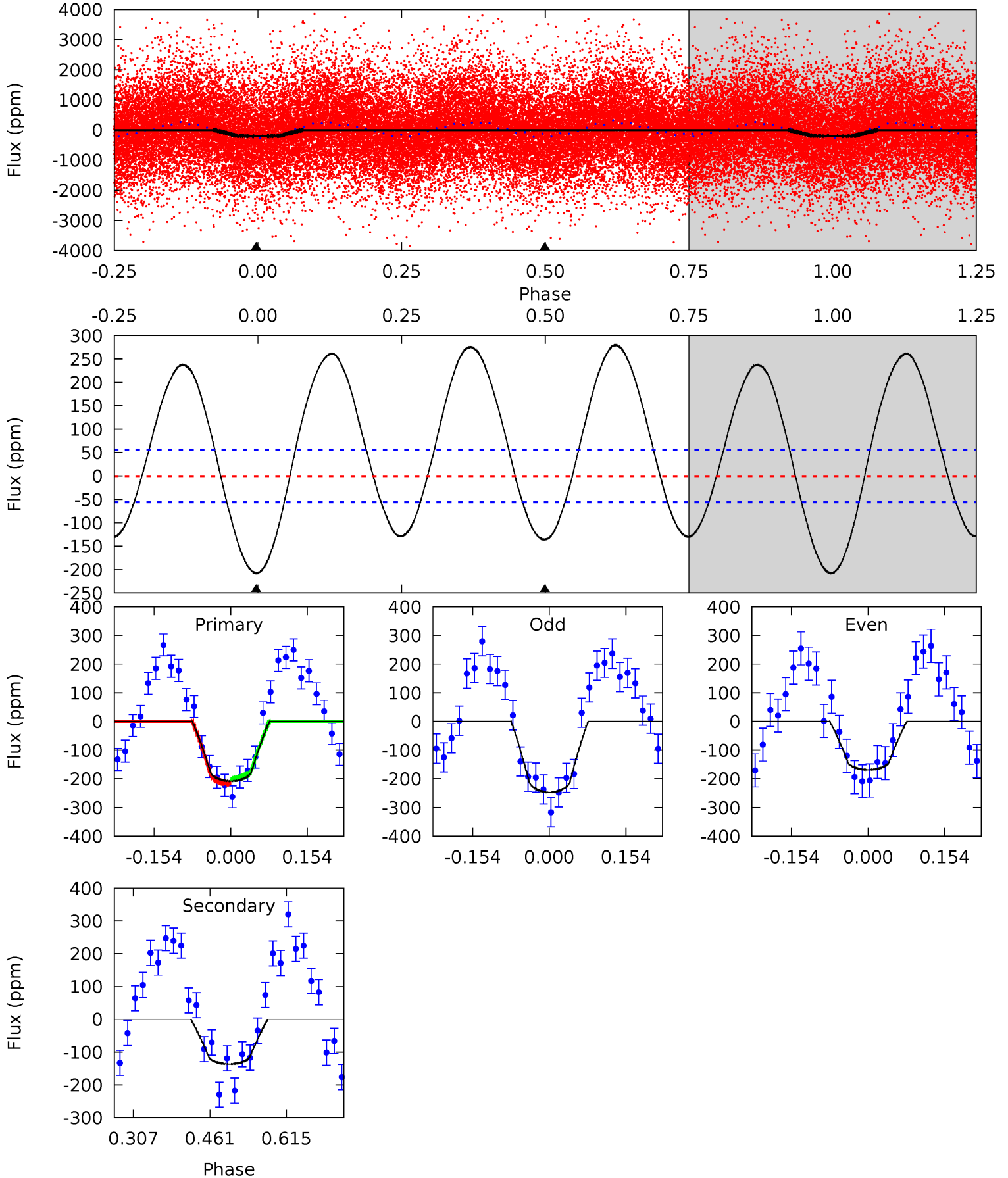
TCE 005649964-02   P= 0.538017 Days    $T_0=131.707700$  (BKJD)



# DV Model-Shift Uniqueness Test

005649964-02, P = 0.538018 Days, E = 131.168706 Days

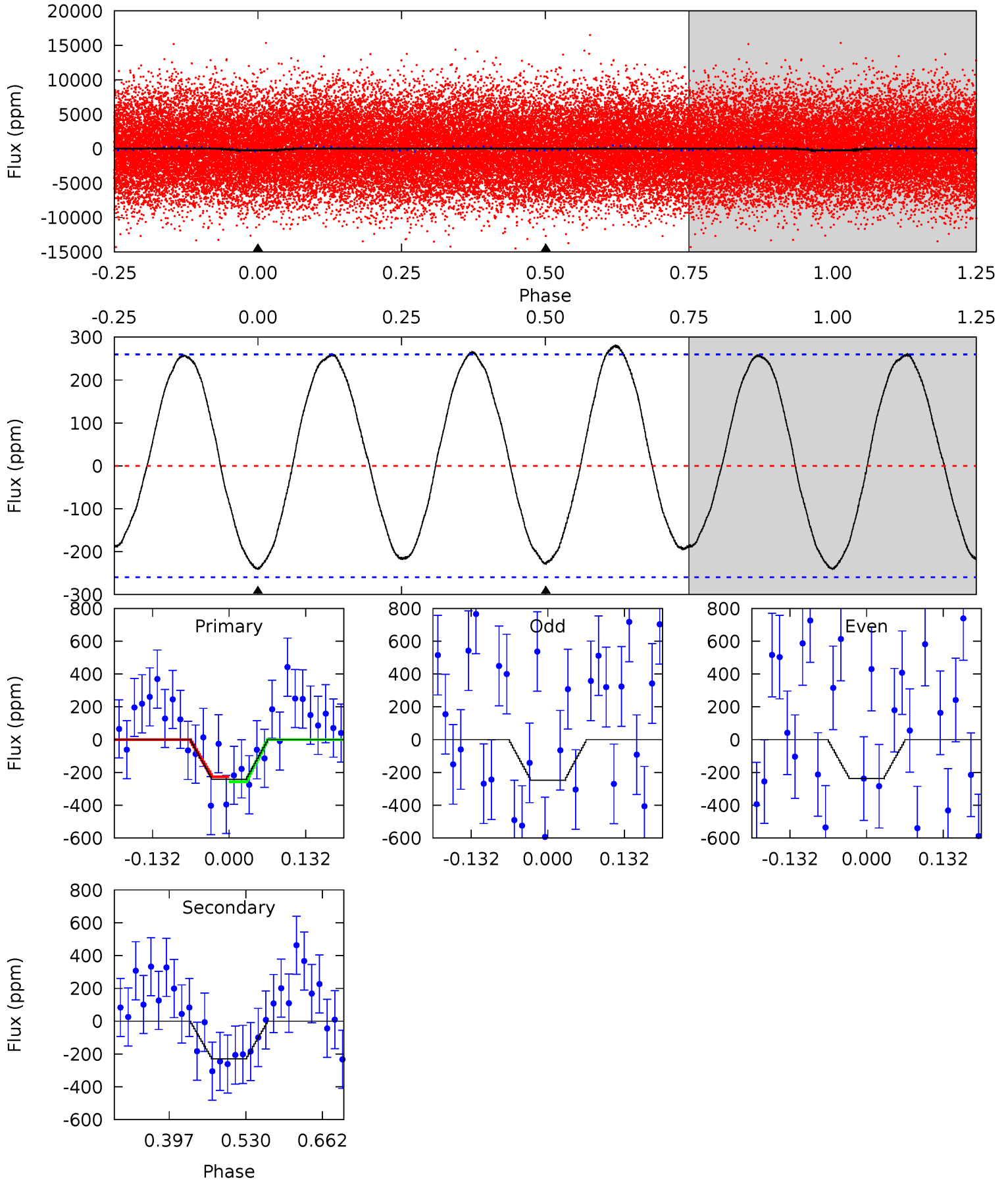
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
16.6	10.8	0	0	4.47	1.43	8.96	16.6	16.6	10.8	10.8	3.14	0.98	0.57	0.67



# Alt Model-Shift Uniqueness Test

005649964-02, P = 0.538017 Days, E = 131.169683 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
4.20	3.99	0	0	4.51	1.50	2.79	4.20	4.20	3.99	3.99	0.09	0.79	0.54	0.25



### Stellar Parameters For KIC 005649964

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$6953^{+194}_{-291}$	$4.137^{+0.158}_{-0.193}$	$-0.100^{+0.250}_{-0.350}$	$1.685^{+0.510}_{-0.371}$	$1.423^{+0.208}_{-0.254}$	$0.419^{+0.388}_{-0.215}$
	+3%/-4%	+4%/-5%	+250%/-350%	+30%/-22%	+15%/-18%	+92%/-51%
Source	PHO1	KIC0	KIC0	DSEP		

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

### Secondary Eclipse Parameters for KIC 005649964-02 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-136 \pm 13$	$2.60^{+1.57}_{-1.32}$	$4623^{+356}_{-310}$	$6029^{+3406}_{-1407}$	$2.324^{+7.145}_{-1.436}$
Alt.	$-230 \pm 58$	$2.84^{+1.59}_{-1.35}$	$4630^{+336}_{-333}$	$6684^{+3627}_{-1543}$	$3.333^{+8.569}_{-2.060}$

$T_{max}$  = 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

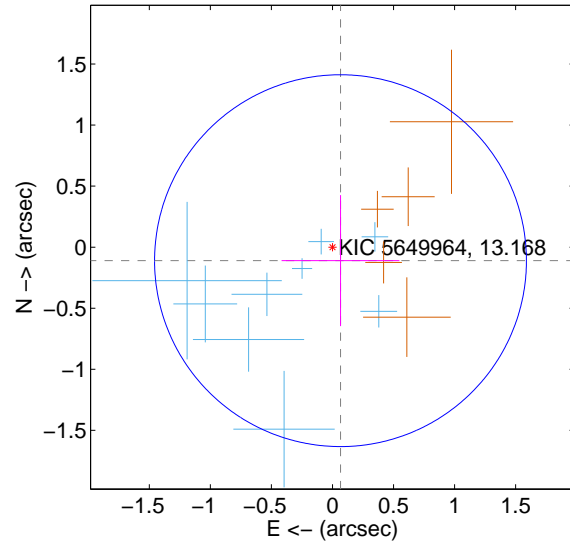
Supplemental centroid analysis for 005649964-02. Kepler magnitude: 13.17. Transit SNR 10.58

There are 9 quarters with good PRF difference image offsets

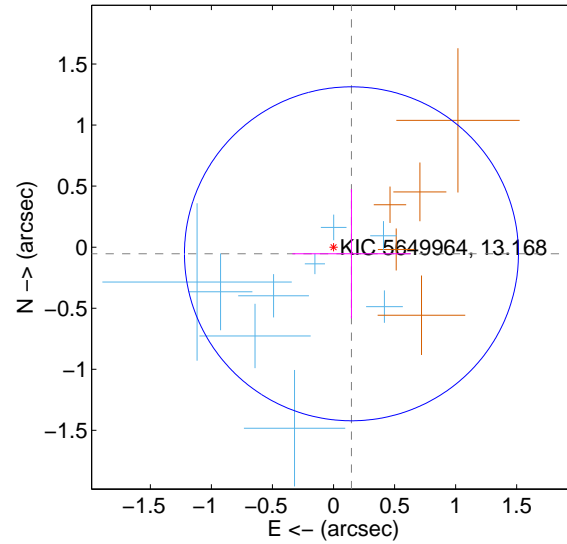
The direct PRF centroid is offset from the target star catalog position by about 0.11 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.129 \pm 0.507$	0.25	$-0.066 \pm 0.482$	$-0.110 \pm 0.536$
PRF-fit source offset from KIC position	$0.157 \pm 0.456$	0.34	$-0.147 \pm 0.484$	$-0.054 \pm 0.530$
photometric centroid source offset	$0.24 \pm 0.15$	1.65	$-0.15 \pm 0.15$	$-0.18 \pm 0.14$

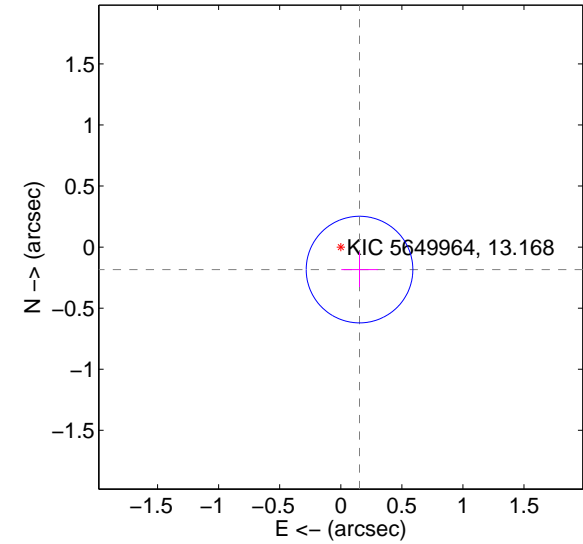
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position

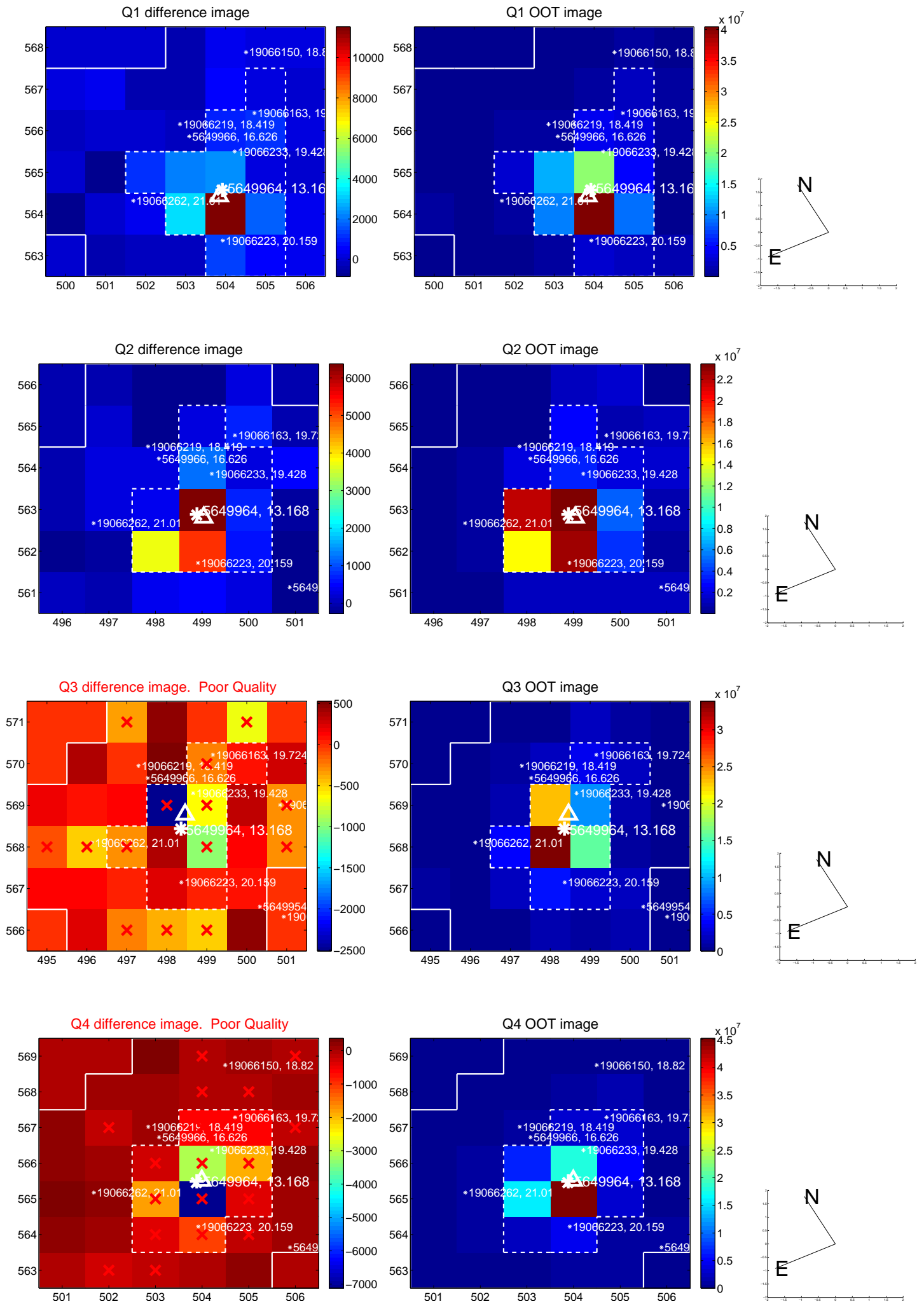


offset from photometric centroids

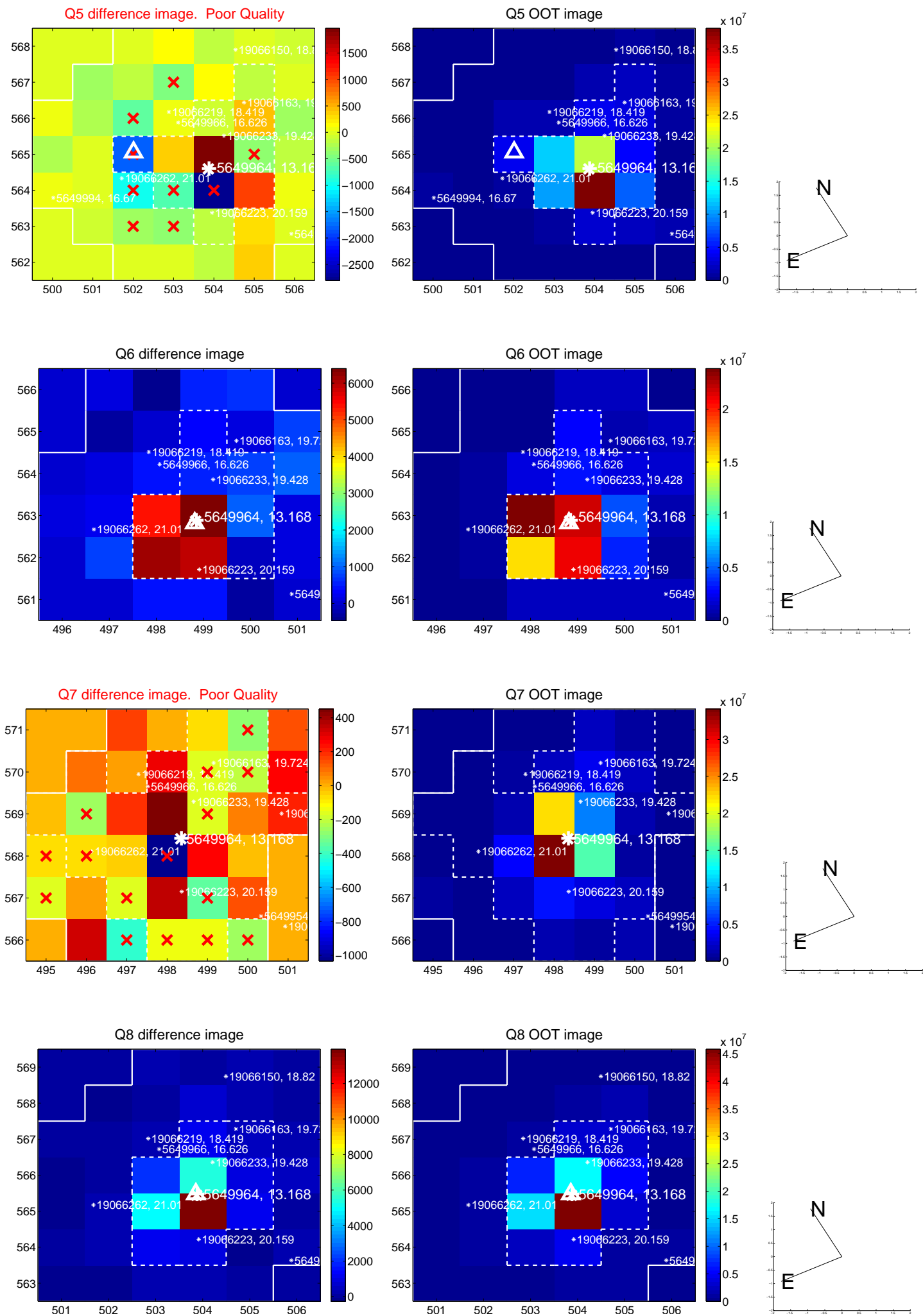


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses:** good quarterly centroid offsets; **Vermillion crosses:** bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

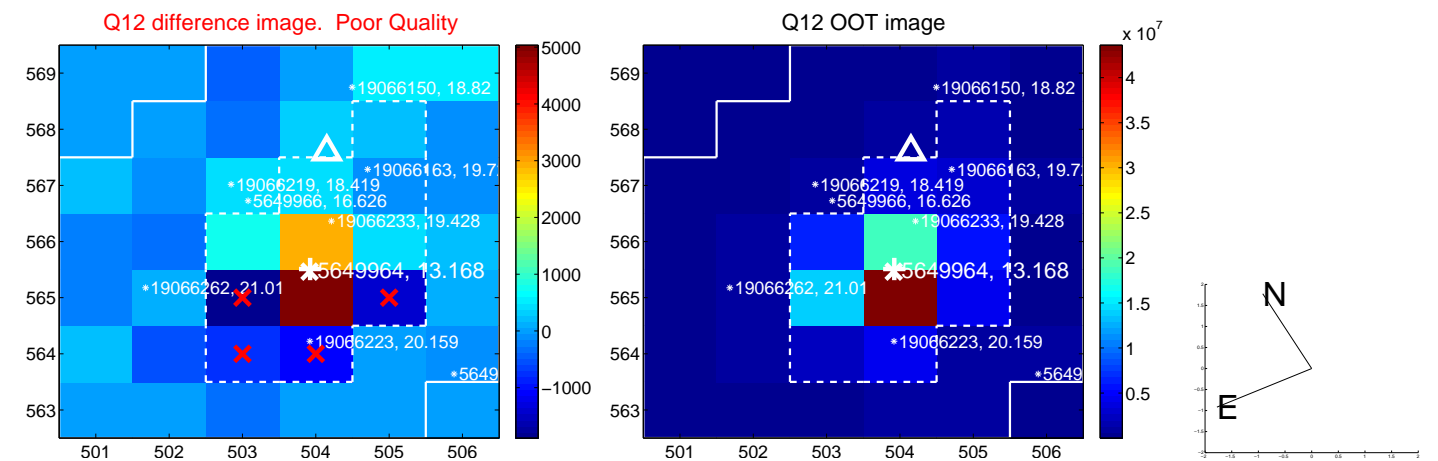
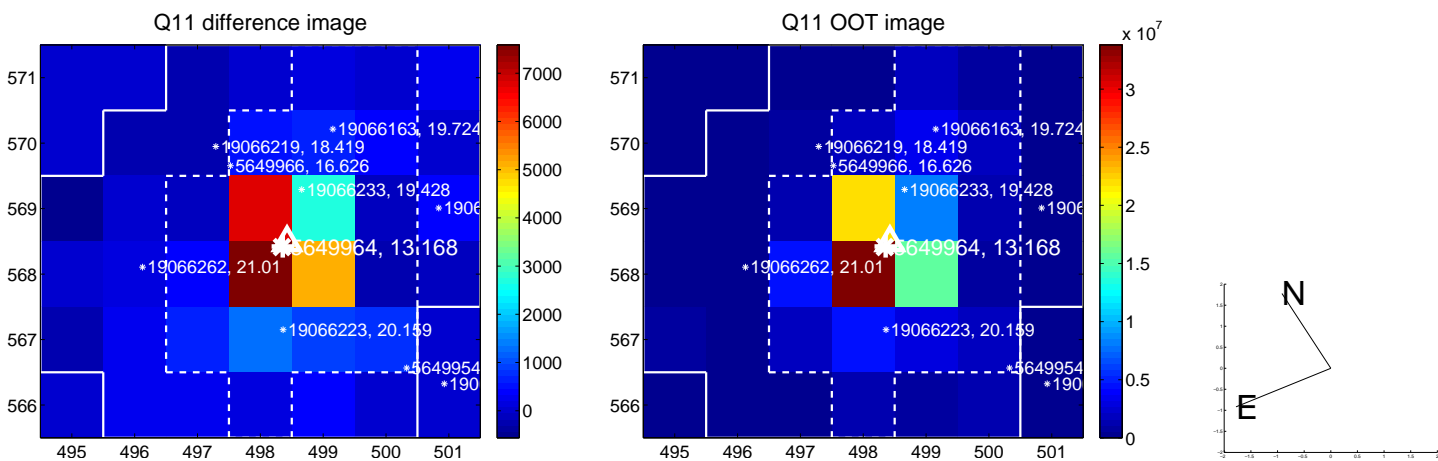
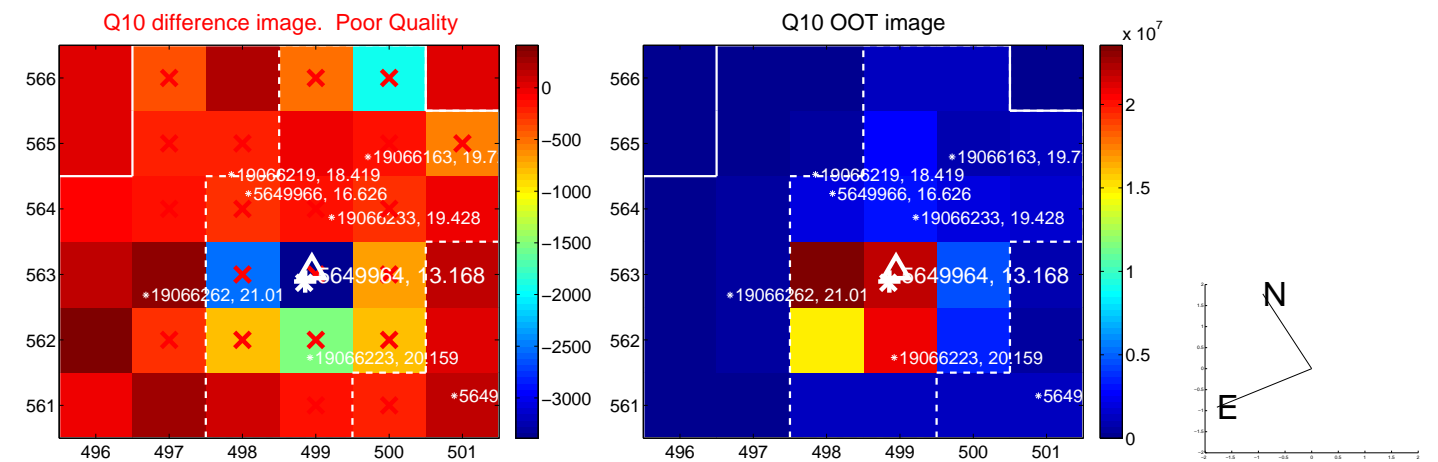
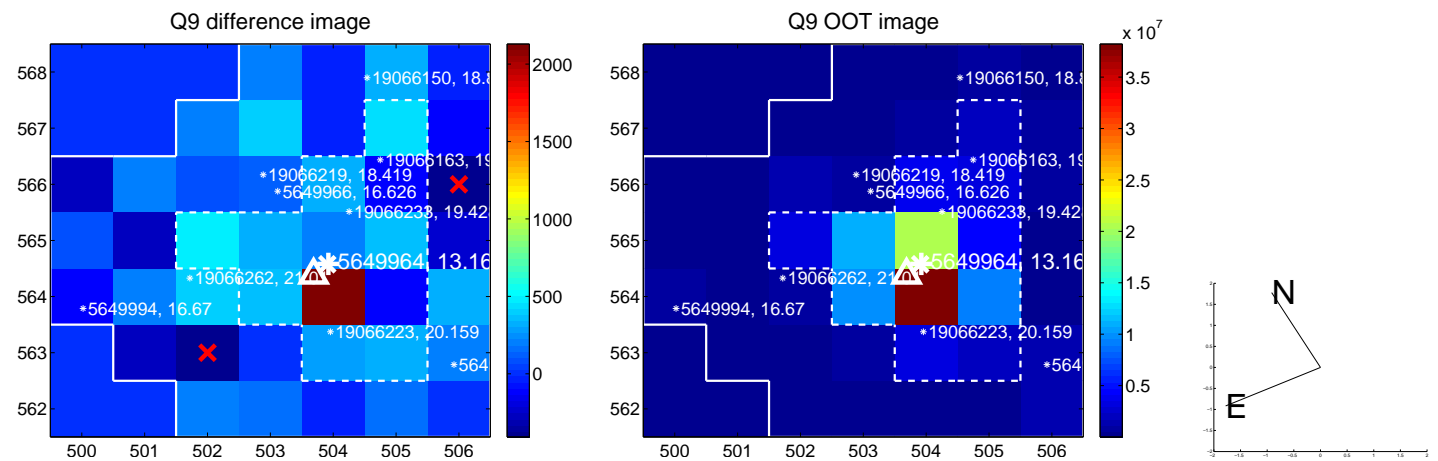
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



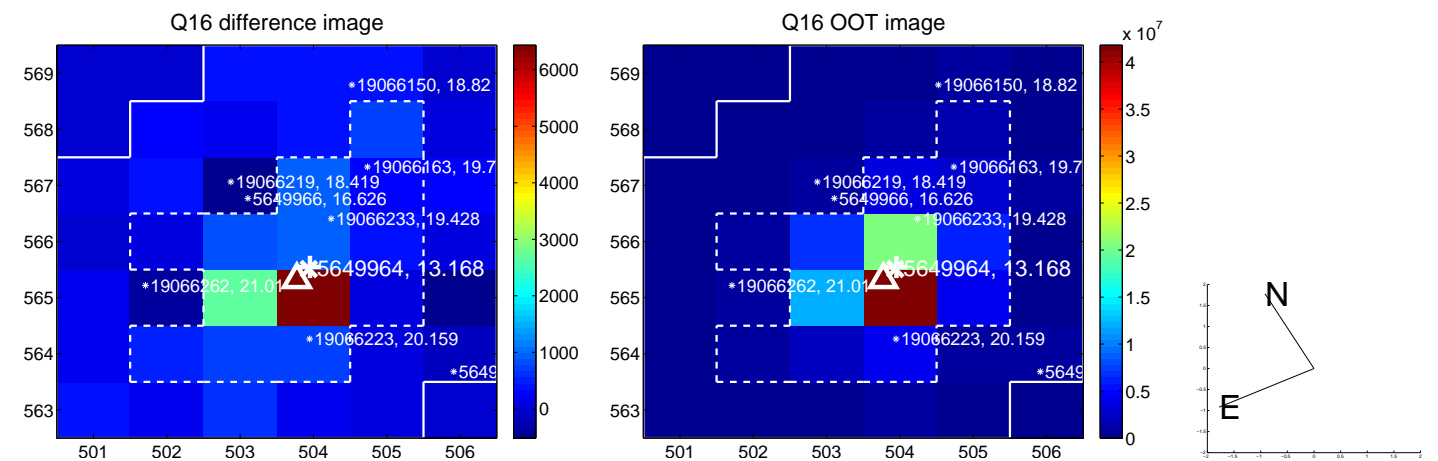
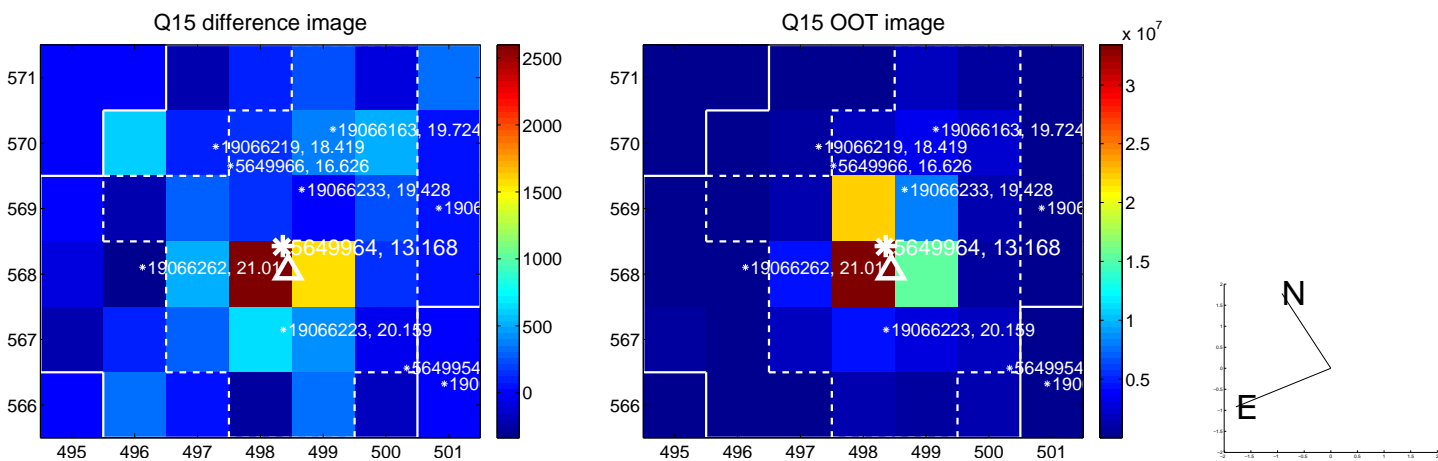
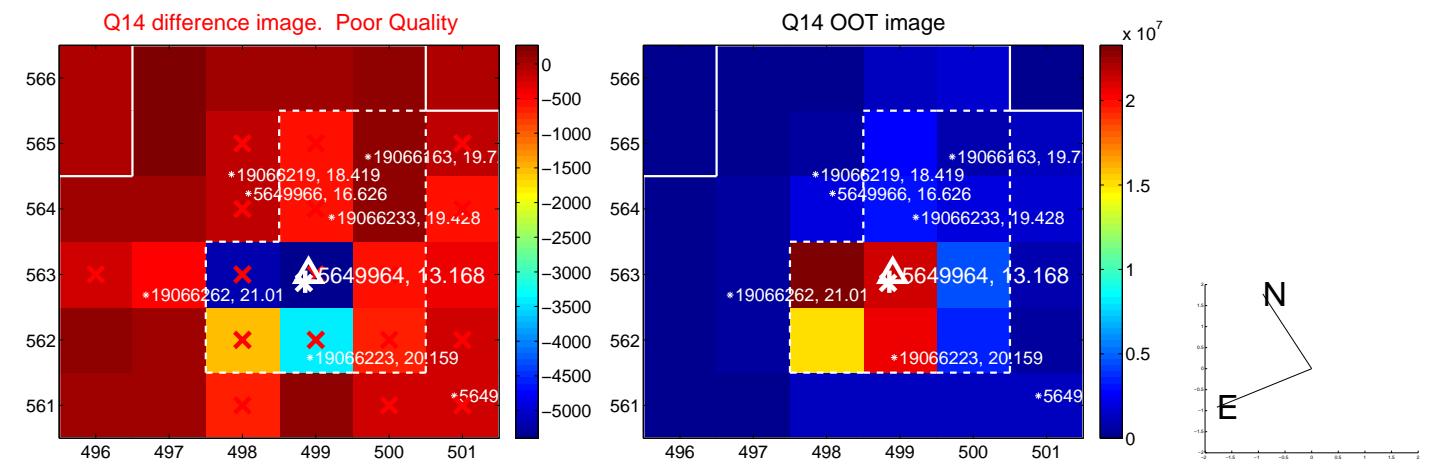
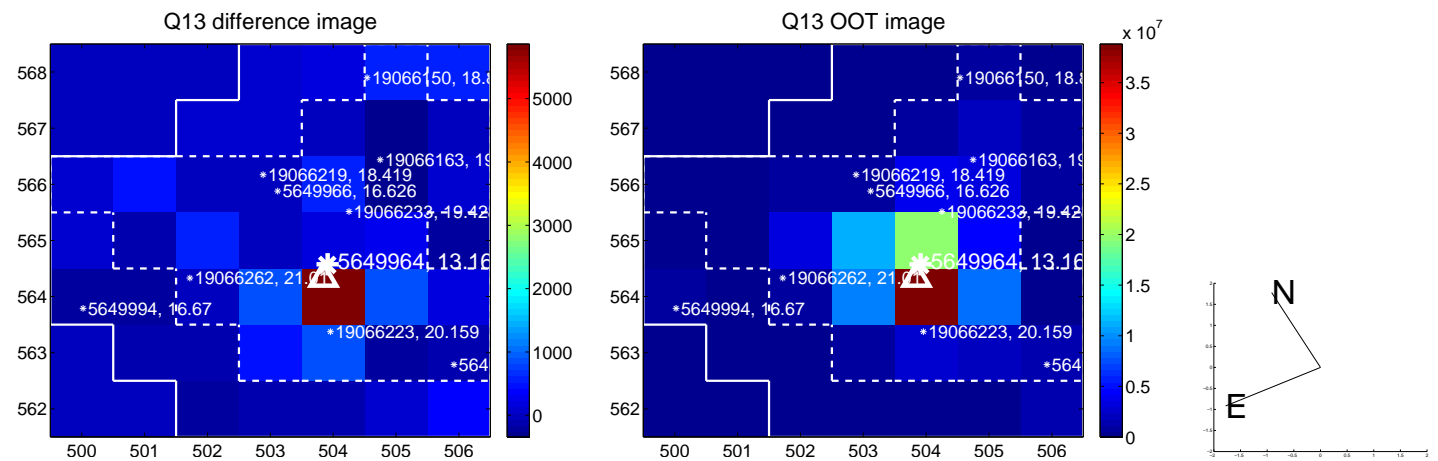
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



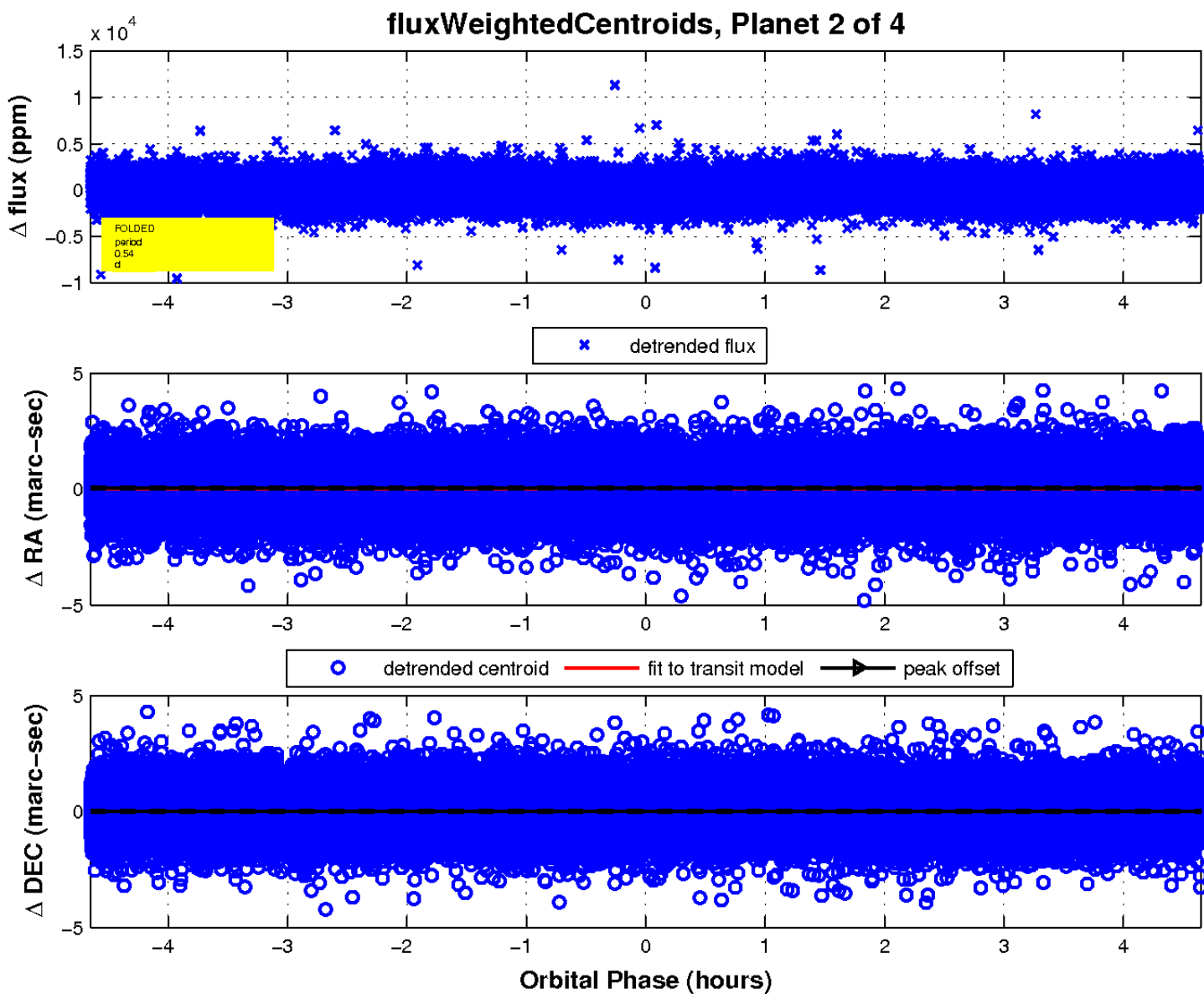
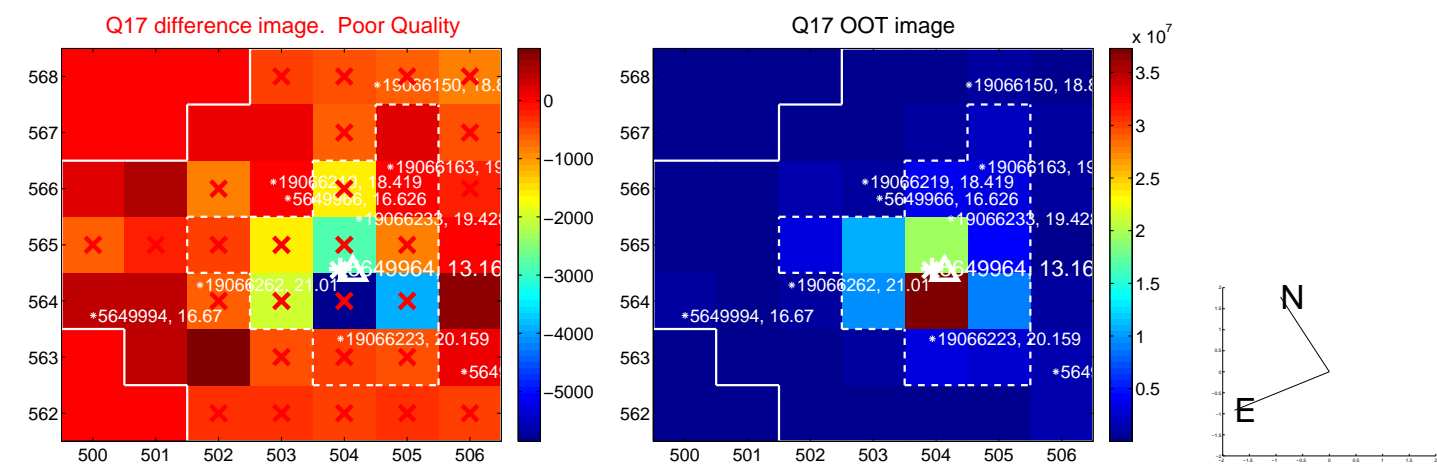
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

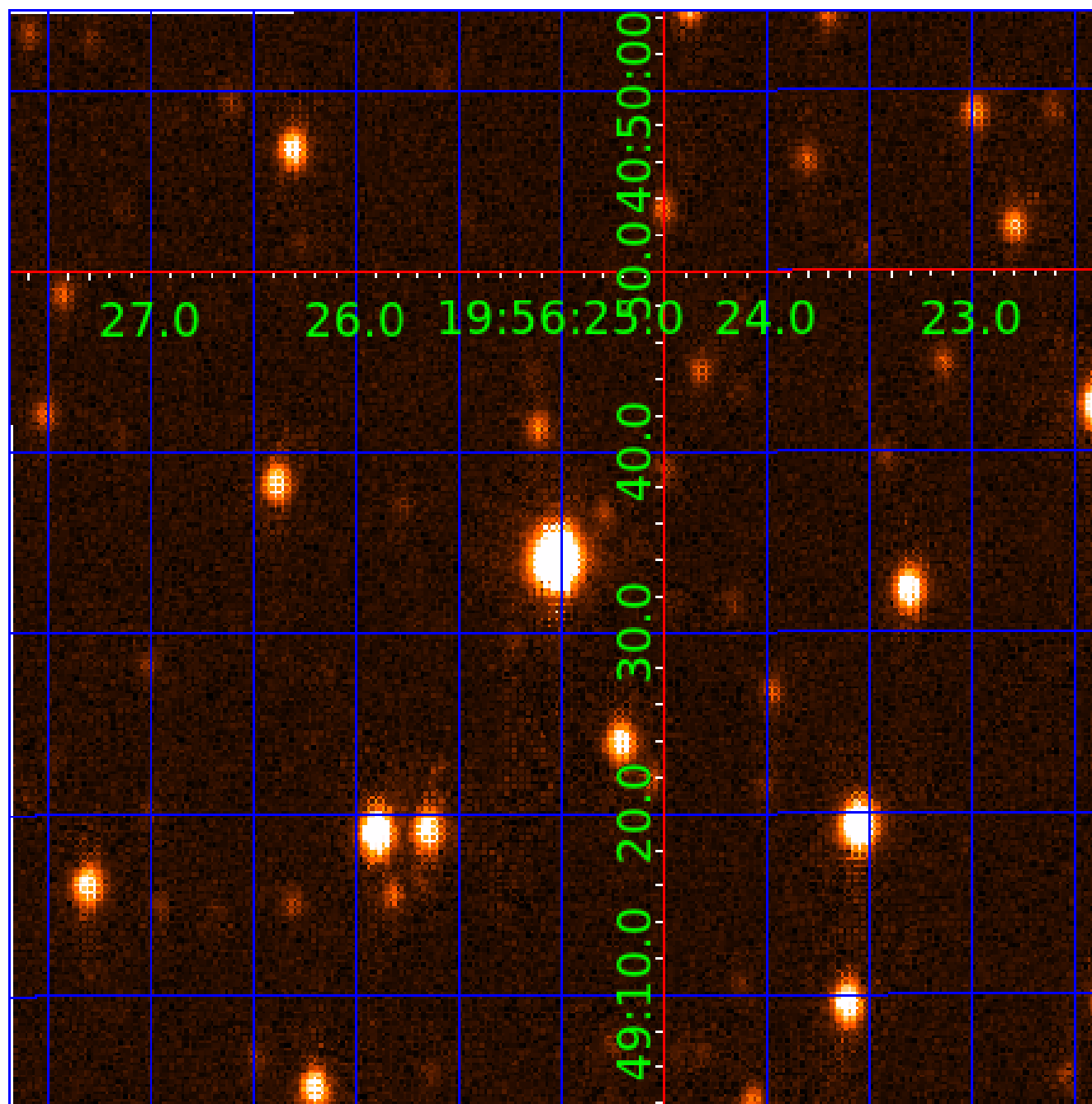


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination



# KIC 005649964

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
005649964-01	OBS	No	1.016536	131.832643	187.5	3.129	10.7	10.6	1.69	6953	2.69	12017.65
005649964-02	OBS	No	0.538018	131.706724	206.2	1.550	9.4	10.6	1.69	6953	2.48	28070.74
005649964-03	OBS	No	164.679305	174.902737	1618.5	6.254	7.1	7.4	1.69	6953	7.00	13.61
005649964-04	OBS	No	118.680411	167.470654	272.6	6.000	7.4	-1.0	1.69	6953	2.81	21.06

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
005649964-01	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT
005649964-02	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT
005649964-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_CHASES_SKYE—TRANS_GAPPED—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT
005649964-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_NOFITS

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

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

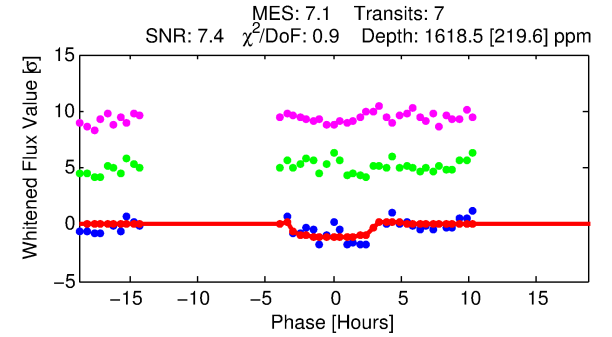
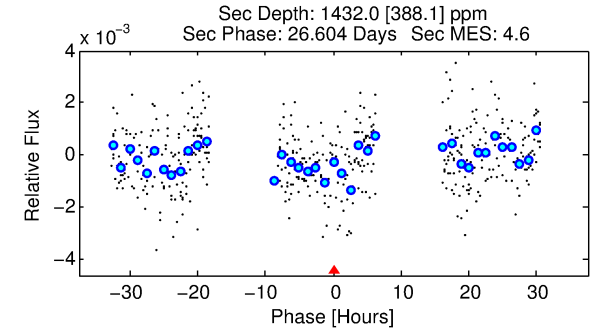
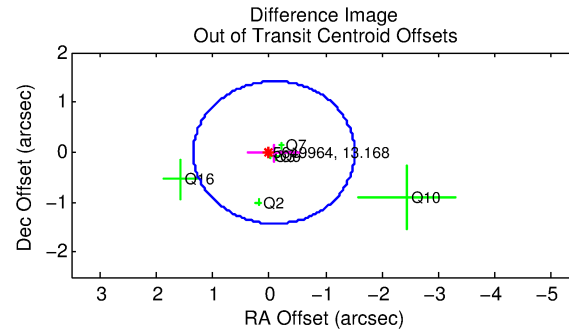
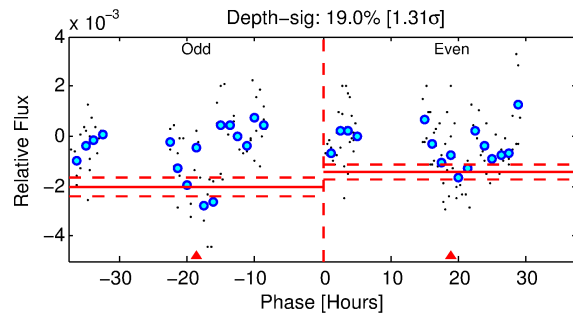
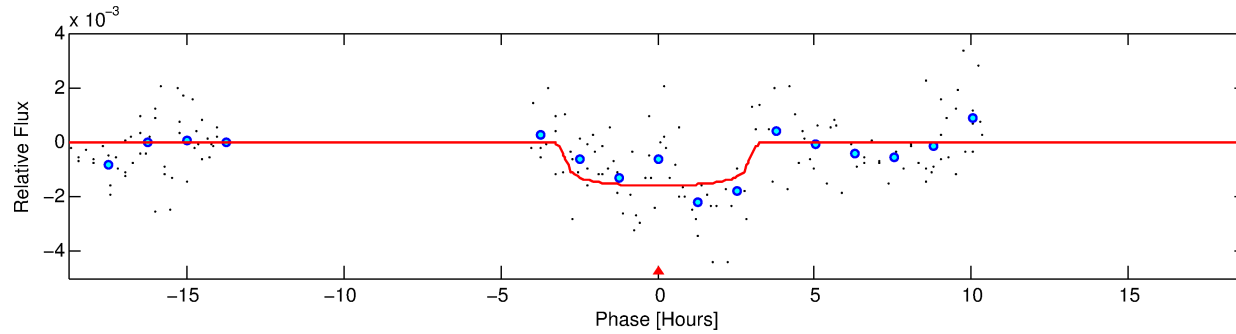
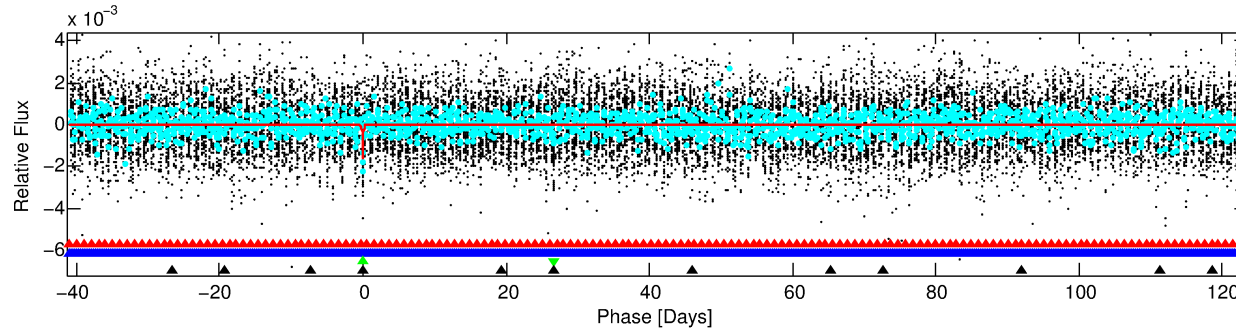
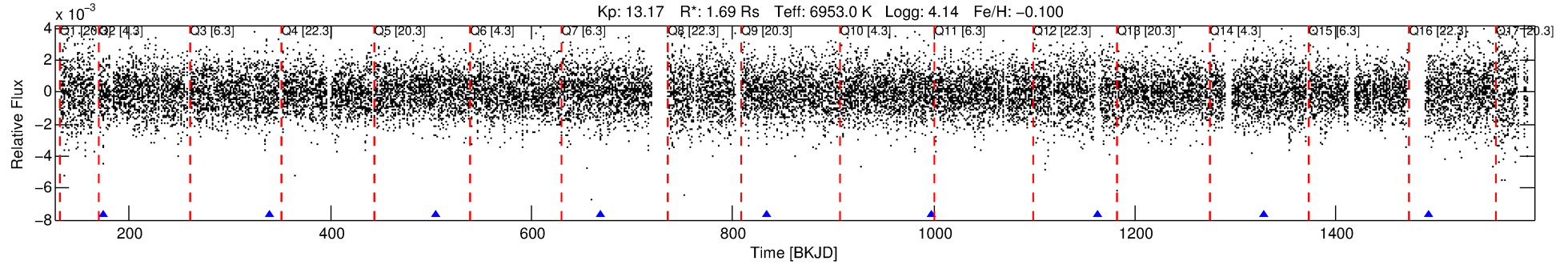
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 005649964-03

No Significant Match Found

# DV One-Page Summary

KIC: 5649964 Candidate: 3 of 4 Period: 164.679 d



## DV Fit Results:

Period = 164.67930 [0.00329] d  
Epoch = 174.9027 [0.0148] BKJD  
Rp/R\* = 0.0381 [0.0172]  
a/R\* = 185.68 [465.88]  
b = 0.47 [4.10]  
Seff = 13.61 [5.38]  
Teq = 490 [48] K  
Rp = 7.00 [3.81] Re  
a = 0.6610 [0.1655] AU  
Ag = 7018.79 [7082.73] [0.99 $\sigma$ ]  
Teff = 6931 [1660] K [3.88 $\sigma$ ]

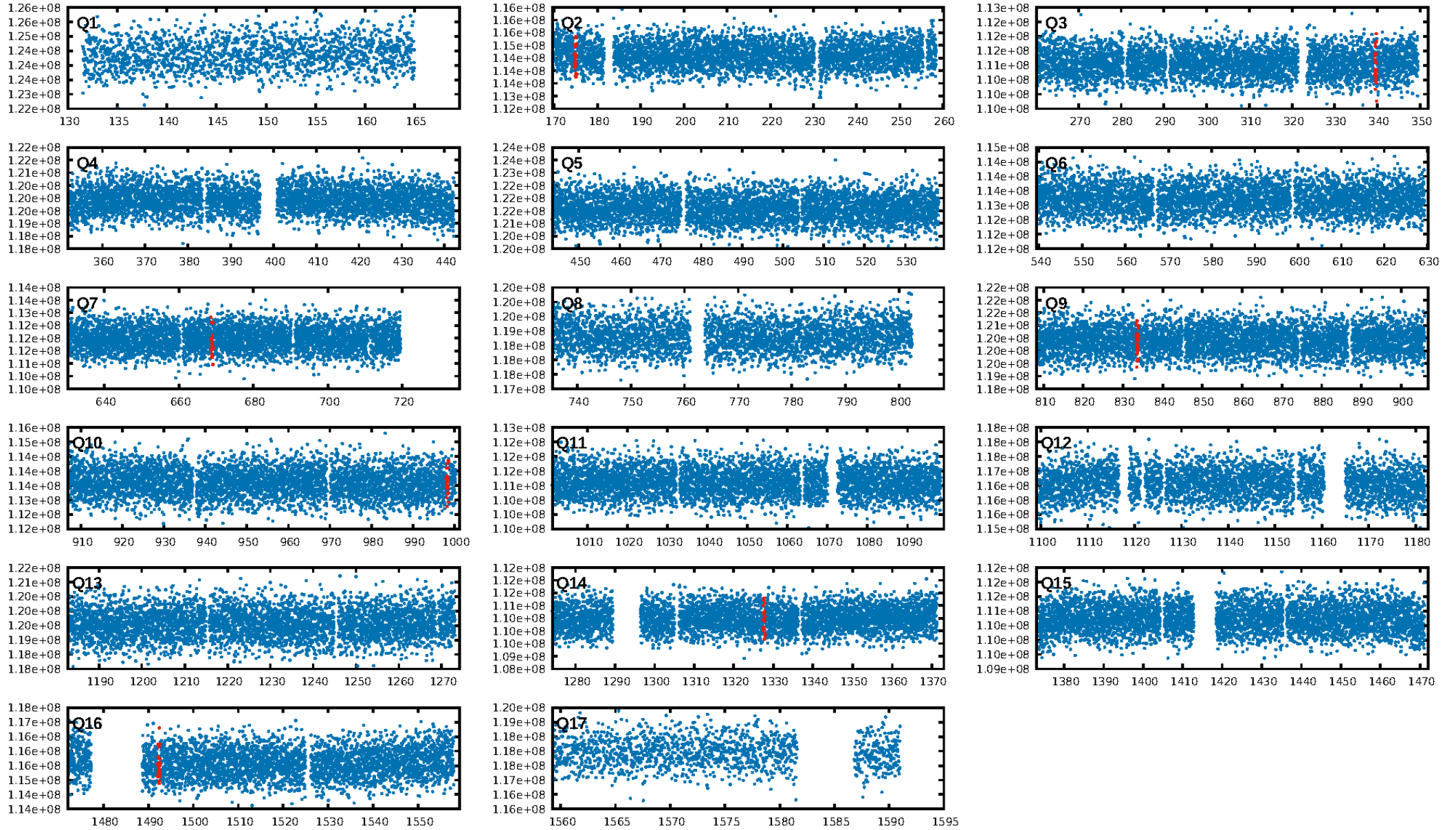
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [127.38 $\sigma$ ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: 36.3%  
ModelChiSquareGof-sig: 100.0%  
Bootstrap-pfa: N/A  
RollingBand-fgt: 1.00 [7/7]  
GhostDiagnostic-chr: -3.668  
Centroid-sig: 0.9%  
Centroid-so: 0.160 arcsec [0.85 $\sigma$ ]  
OotOffset-rm: 0.090 arcsec [0.19 $\sigma$ ]  
KicOffset-rm: 0.146 arcsec [0.31 $\sigma$ ]  
OotOffset-st: 2/2/1/1 [6]  
KicOffset-st: 2/2/1/1 [6]  
DiffImageQuality-fgm: 1.00 [6/6]  
DiffImageOverlap-fno: 0.00 [0/7]

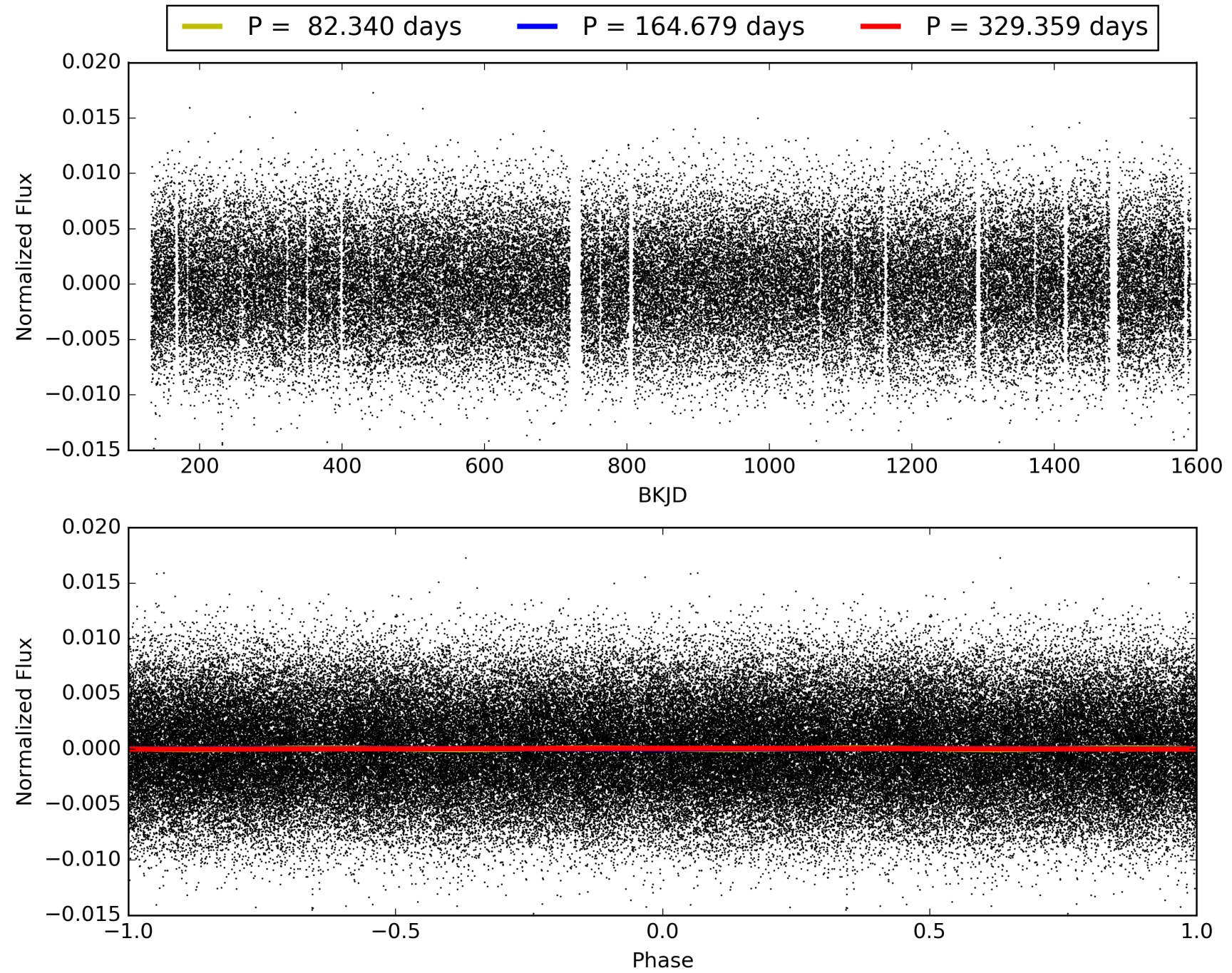
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 30-Jan-2016 16:19:04 Z

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

# TCE 005649964-03, PDC Light Curves

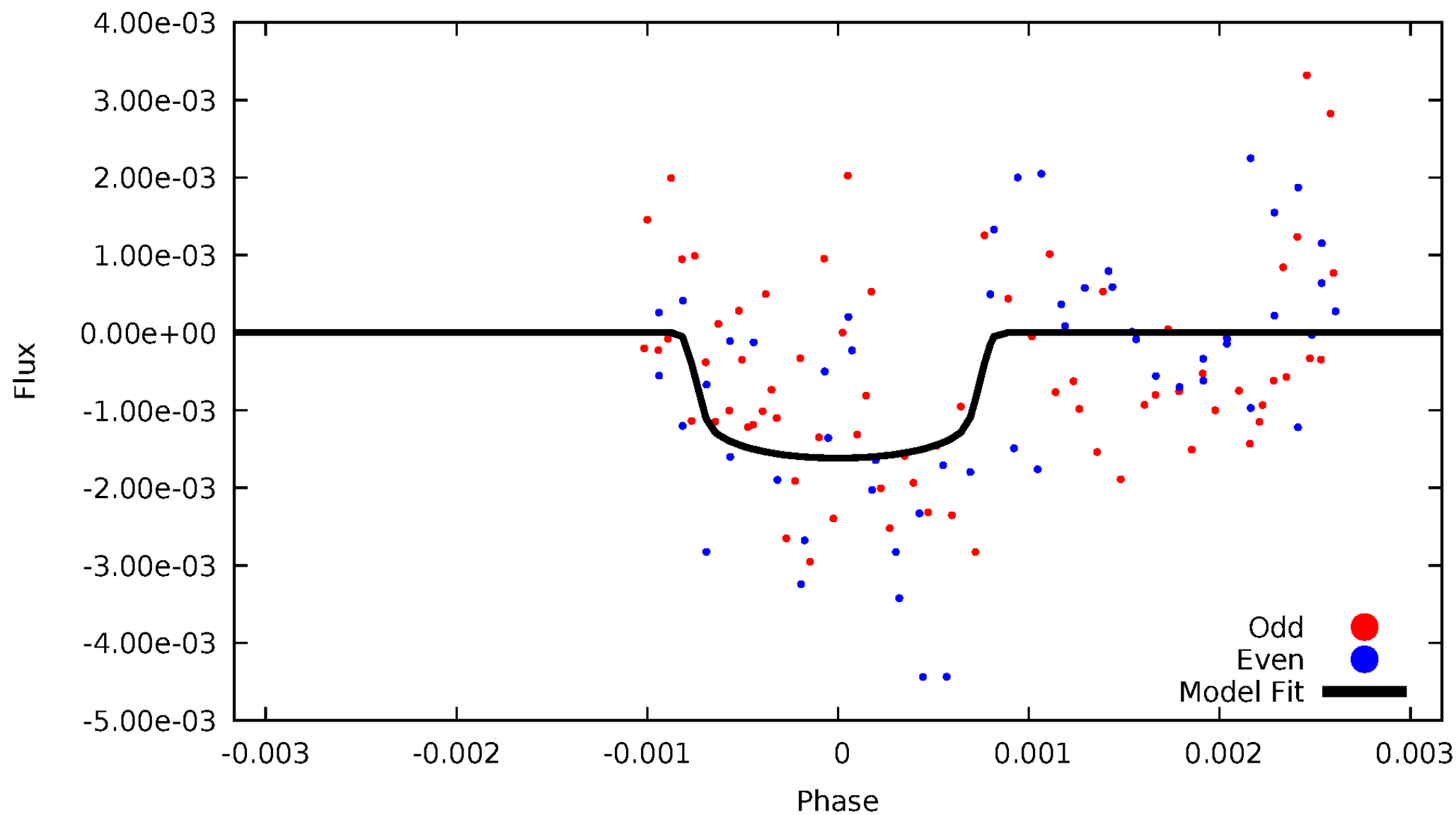


TCE 005649964-03



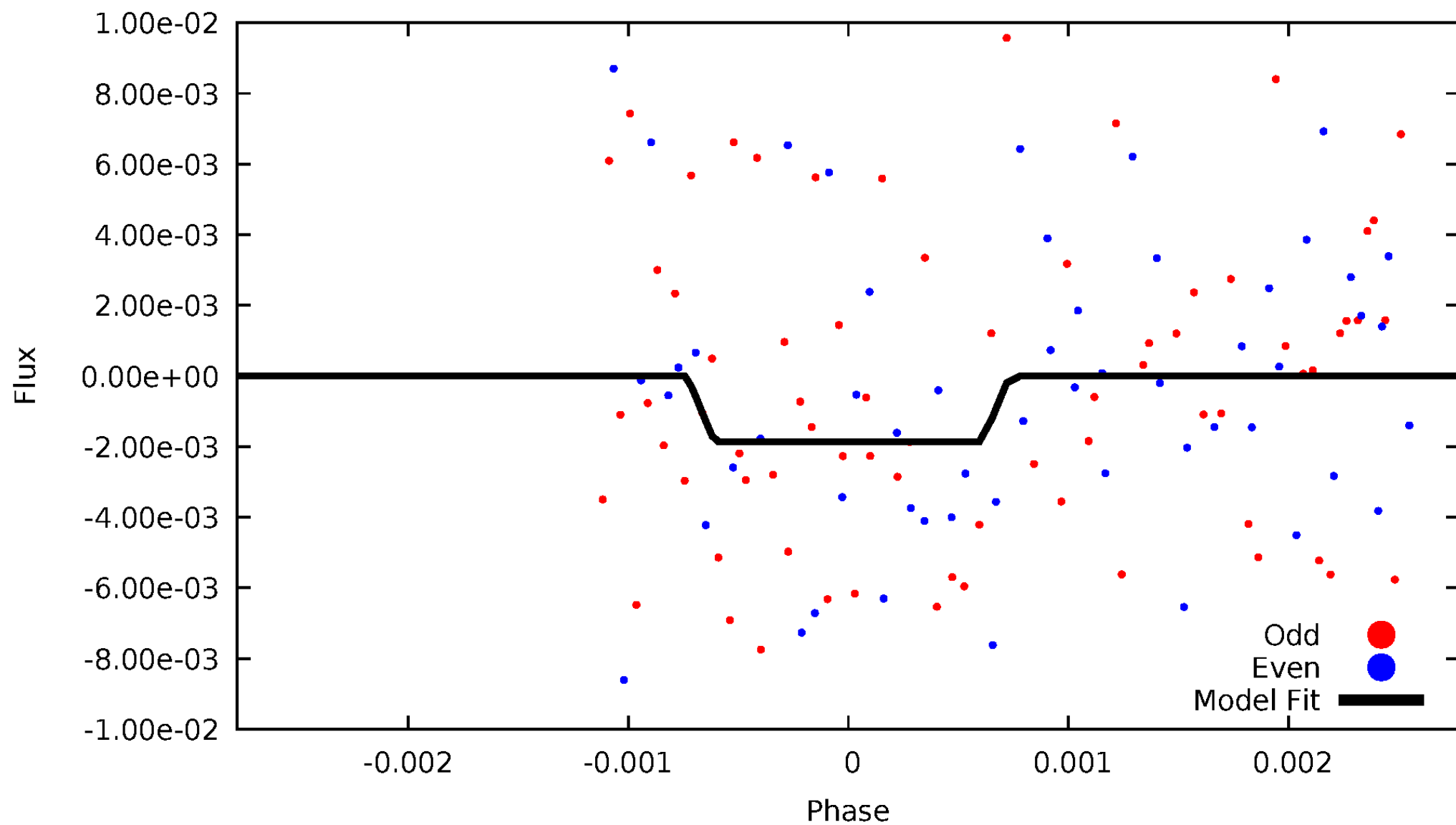
# DV Odd/Even

TCE 005649964-03



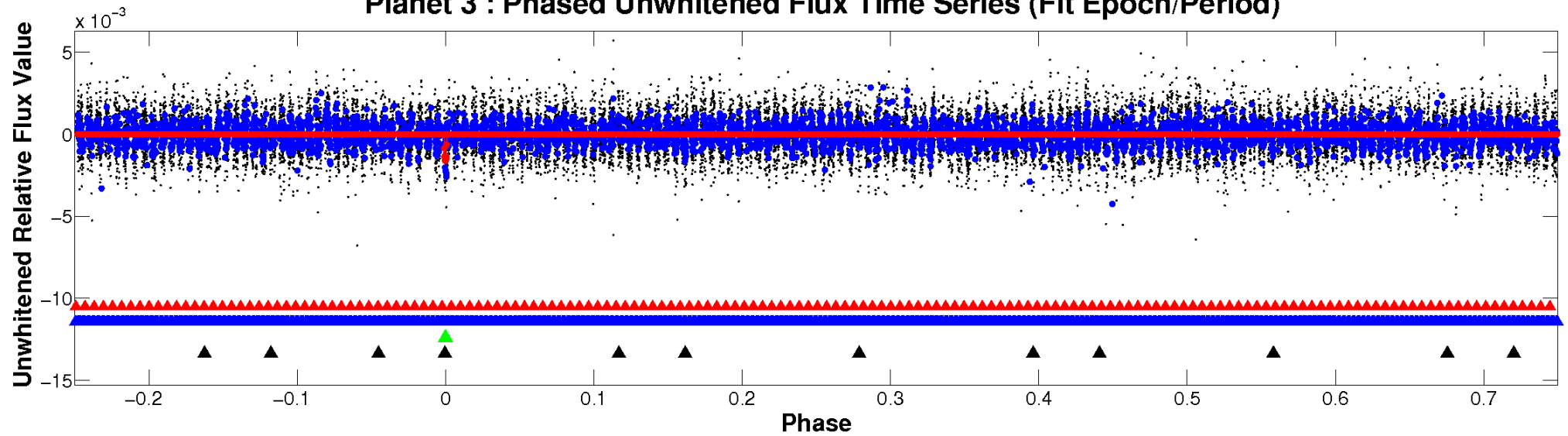
# ALT Odd/Even

TCE 005649964-03

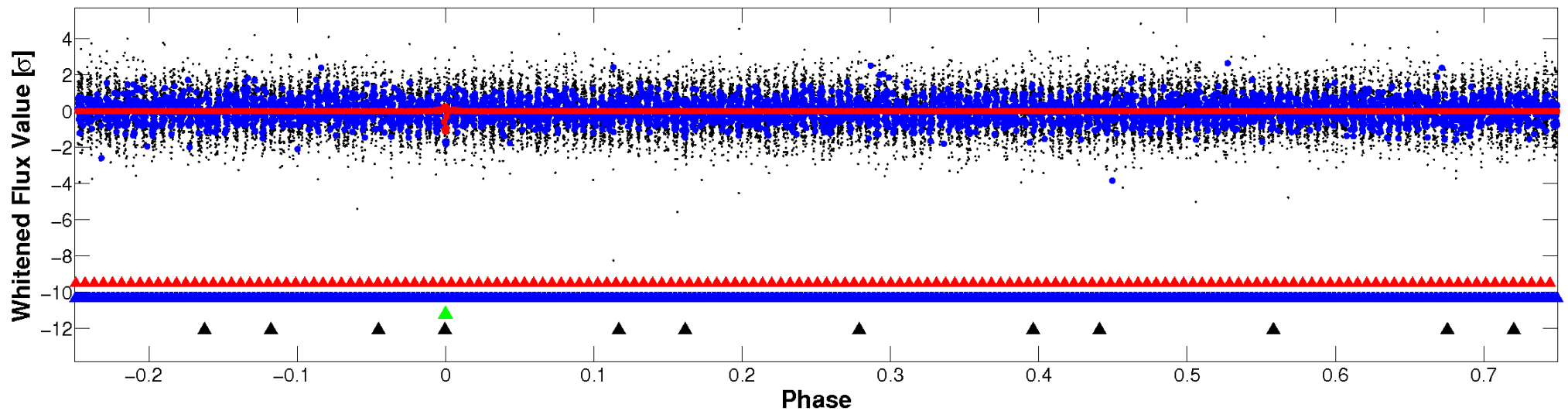


# Non-Whitened Vs. Whitened Light Curve

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

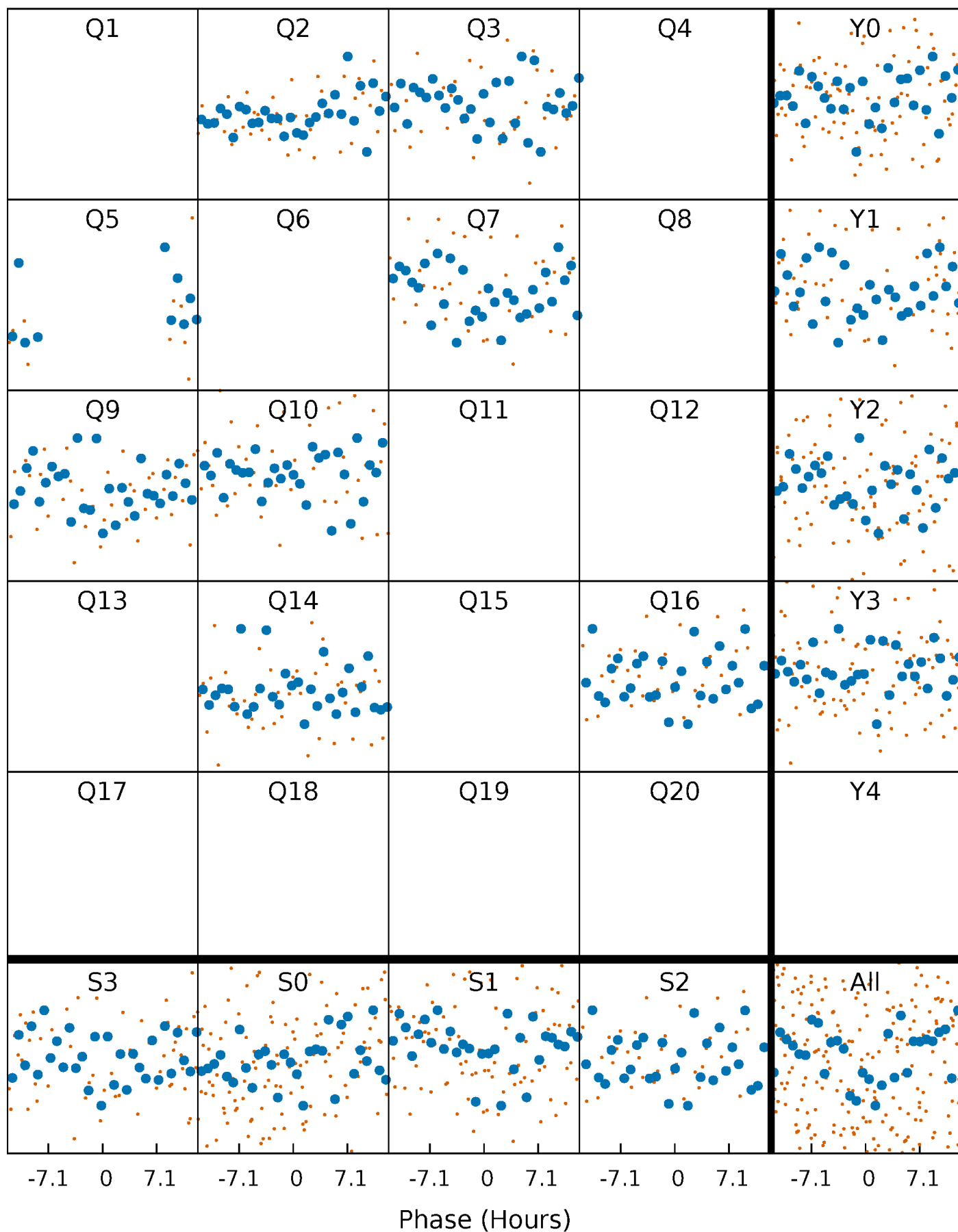


Planet 3 : Phased Whitened Flux Time Series (Fit Epoch/Period)



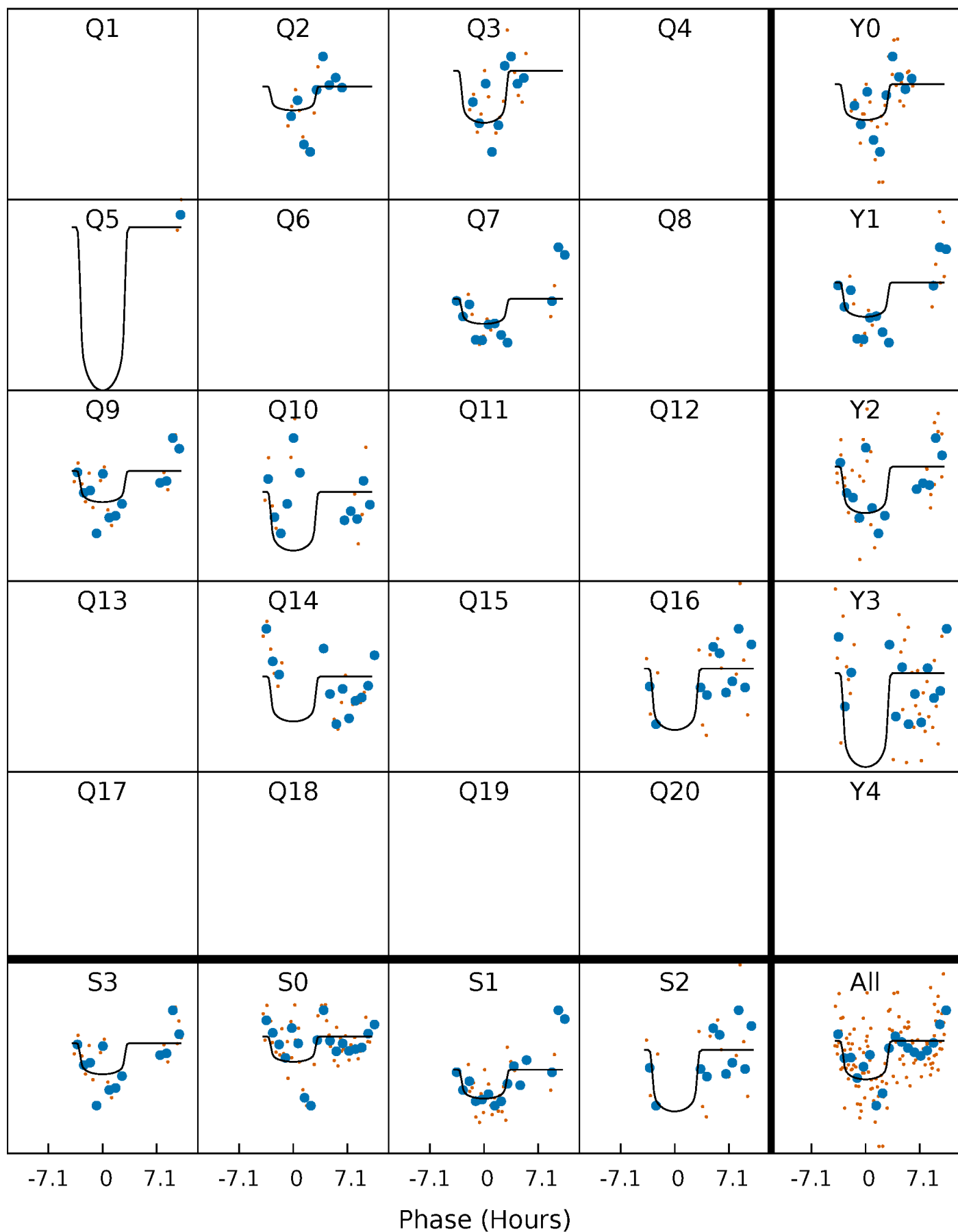
# PDC Quarter-Phased Transit Curves

TCE 005649964-03 P=164.679305 Days  $T_0=174.902737$  (BKJD)



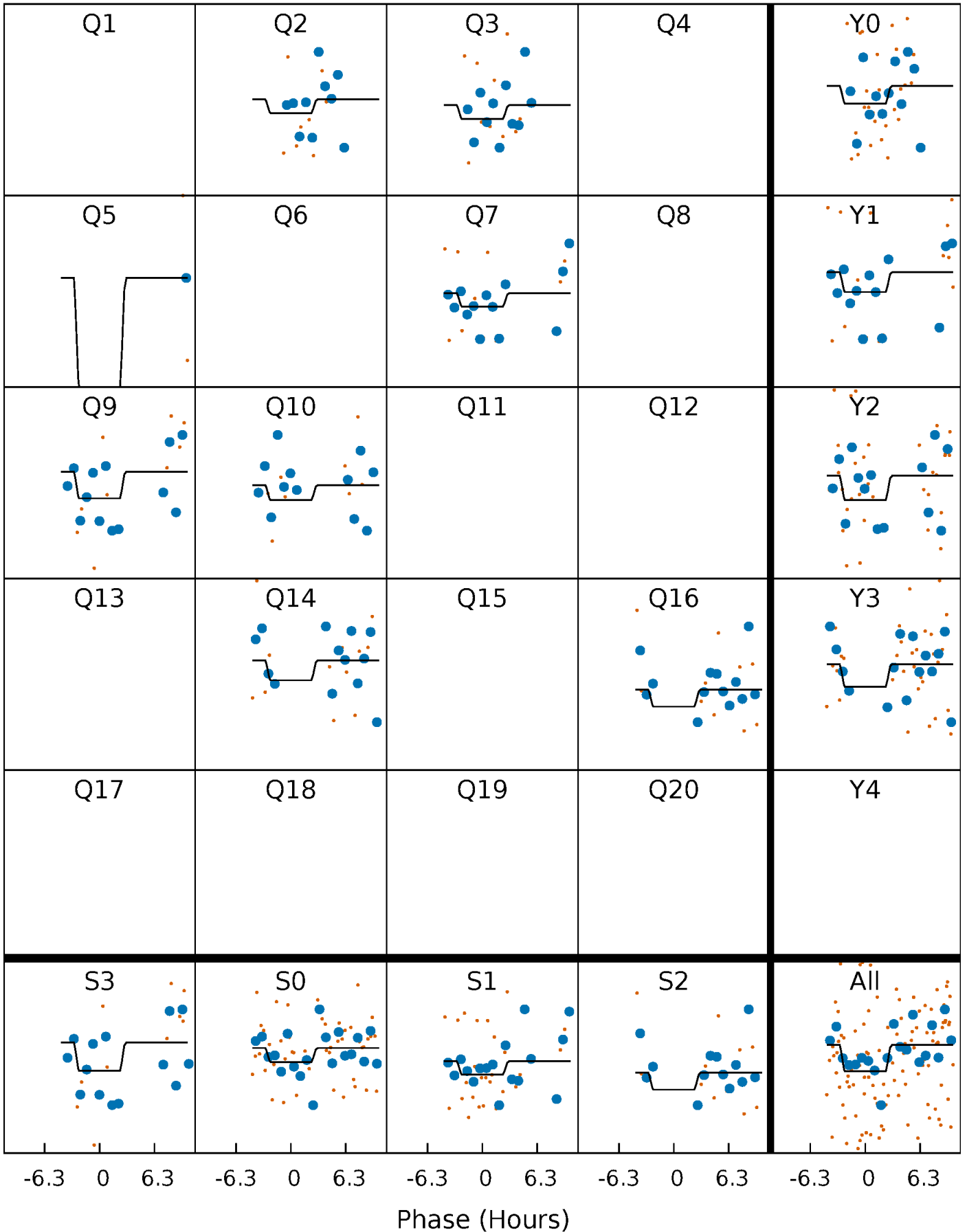
# DV Quarter-Phased Transit Curves

TCE 005649964-03 P=164.679305 Days  $T_0=174.902737$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

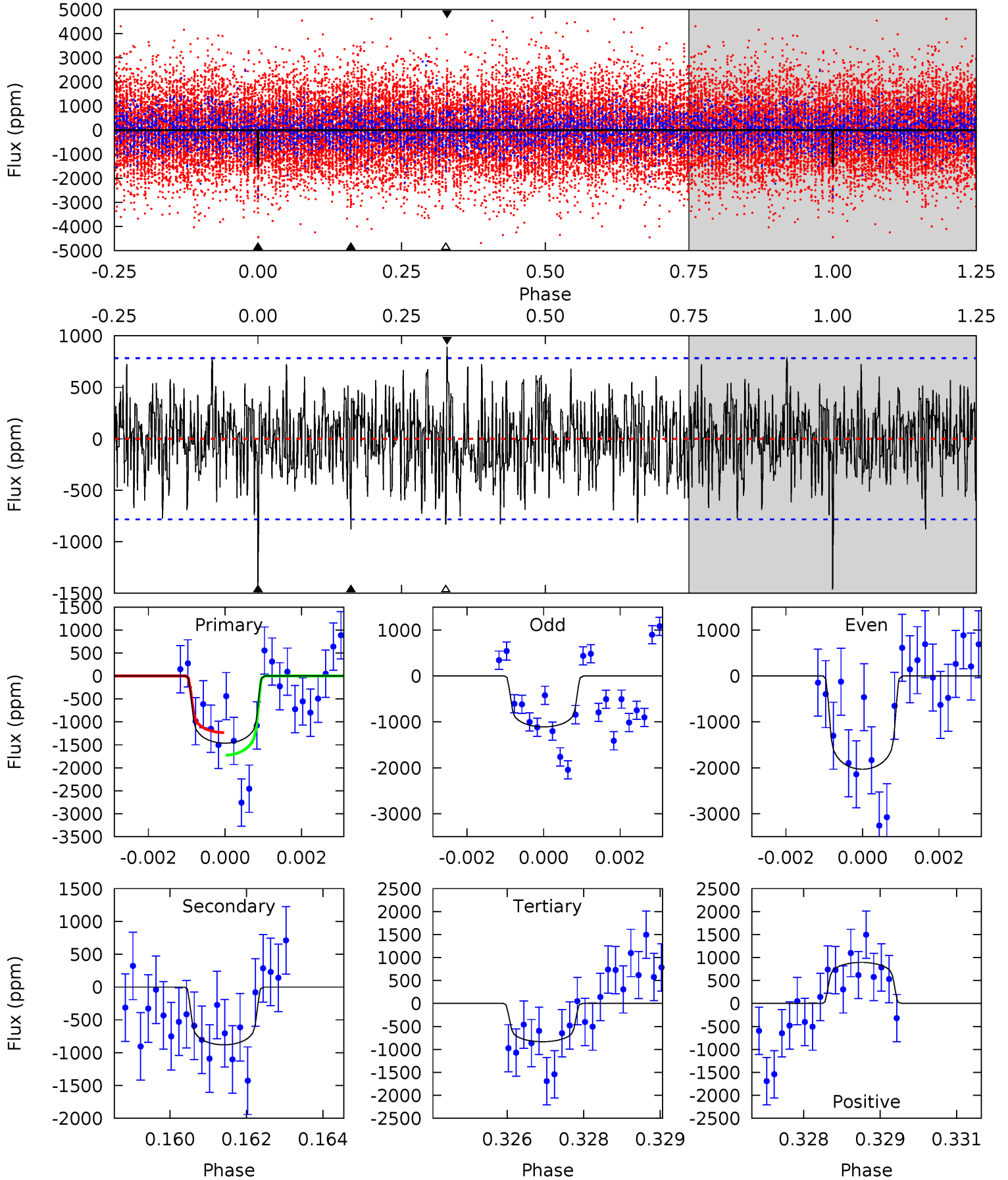
TCE 005649964-03 P=164.681161 Days  $T_0=174.908833$  (BKJD)



# DV Model-Shift Uniqueness Test

005649964-03, P = 164.679305 Days, E = 10.223432 Days

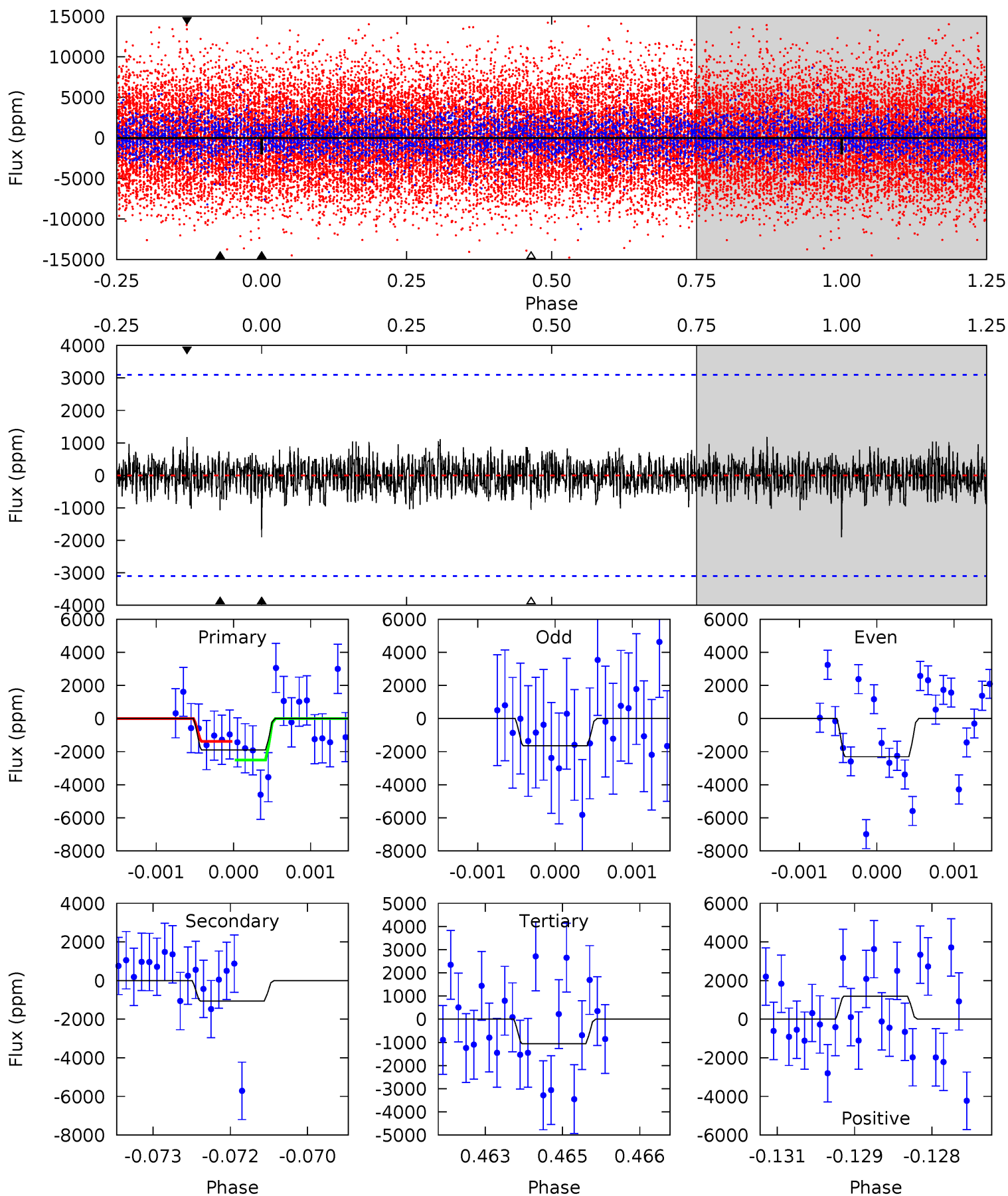
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
10.0	6.02	5.70	6.11	5.36	3.14	1.89	4.31	3.90	0.32	-0.08	3.09	0.79	0.38	1.68



# Alt Model-Shift Uniqueness Test

005649964-03,  $P = 164.681161$  Days,  $E = 10.227672$  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
3.30	1.85	1.84	2.06	5.39	3.19	0.56	1.46	1.25	0.01	-0.20	0.56	1.08	0.38	0.98



### Stellar Parameters For KIC 005649964

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$6953^{+194}_{-291}$	$4.137^{+0.158}_{-0.193}$	$-0.100^{+0.250}_{-0.350}$	$1.685^{+0.510}_{-0.371}$	$1.423^{+0.208}_{-0.254}$	$0.419^{+0.388}_{-0.215}$
	+3%/-4%	+4%/-5%	+250%/-350%	+30%/-22%	+15%/-18%	+92%/-51%
Source	PHO1	KIC0	KIC0	DSEP		

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

### Secondary Eclipse Parameters for KIC 005649964-03 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-880 \pm 146$	$7.02^{+3.64}_{-3.17}$	$688^{+51}_{-50}$	$6077^{+2434}_{-1011}$	$4226^{+10080}_{-2402}$
Alt.	$-1066 \pm 575$	$7.79^{+3.63}_{-3.03}$	$684^{+52}_{-43}$	$5888^{+2123}_{-1284}$	$3837^{+7503}_{-2641}$

$T_{max}$  = 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

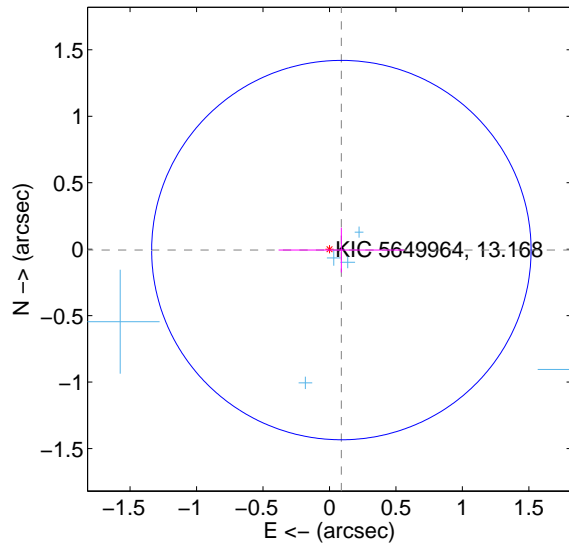
Supplemental centroid analysis for 005649964-03. Kepler magnitude: 13.17. Transit SNR 7.44

There are 6 quarters with good PRF difference image offsets

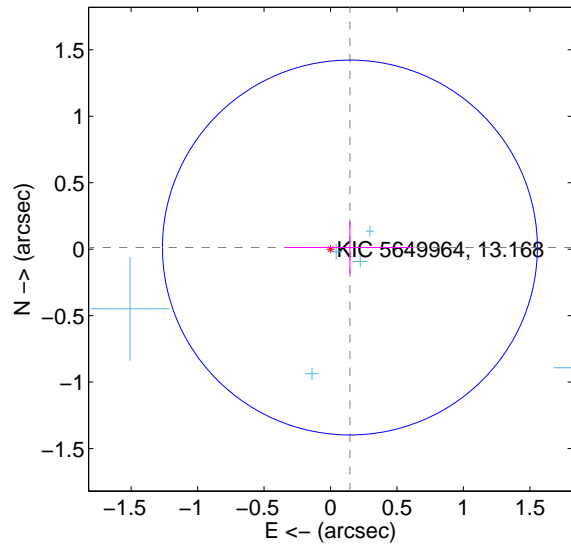
The direct PRF centroid is offset from the target star catalog position by about 0.12 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.090 \pm 0.476$	0.19	$-0.089 \pm 0.472$	$-0.007 \pm 0.169$
PRF-fit source offset from KIC position	$0.146 \pm 0.470$	0.31	$-0.146 \pm 0.477$	$0.012 \pm 0.195$
photometric centroid source offset	$0.16 \pm 0.19$	0.85	$-0.11 \pm 0.19$	$0.11 \pm 0.18$

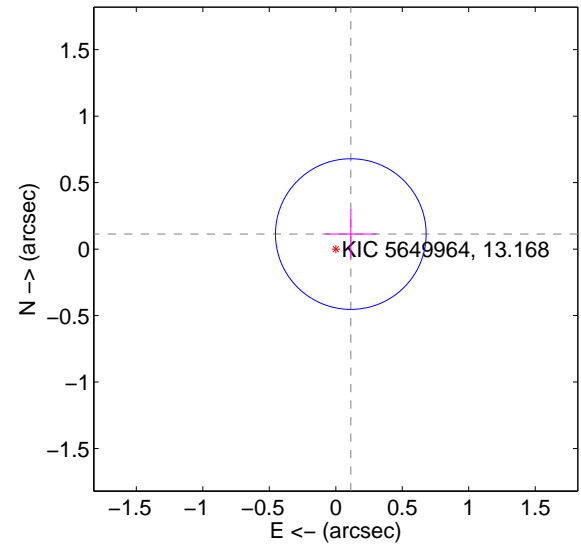
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position



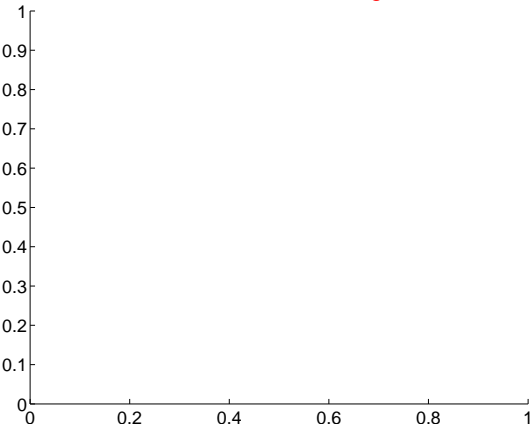
offset from photometric centroids



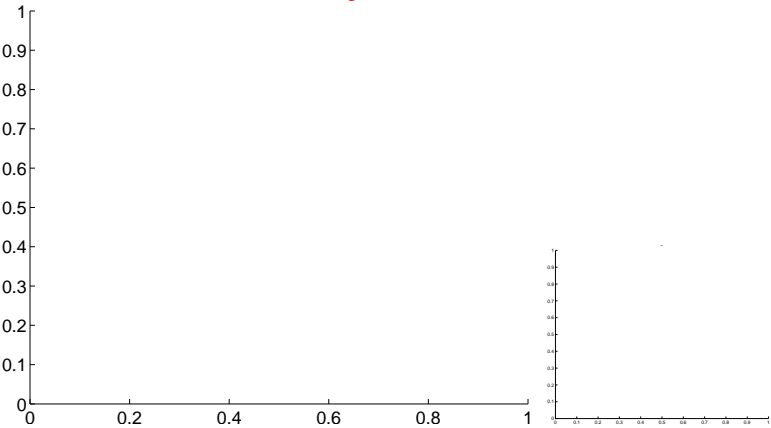
Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets**; **Vermillion crosses: bad quarterly centroid offsets**; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

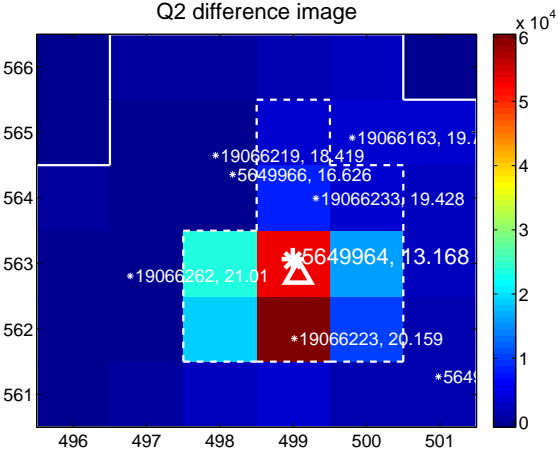
Q1 no difference image



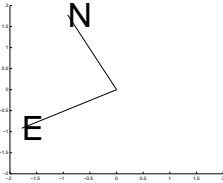
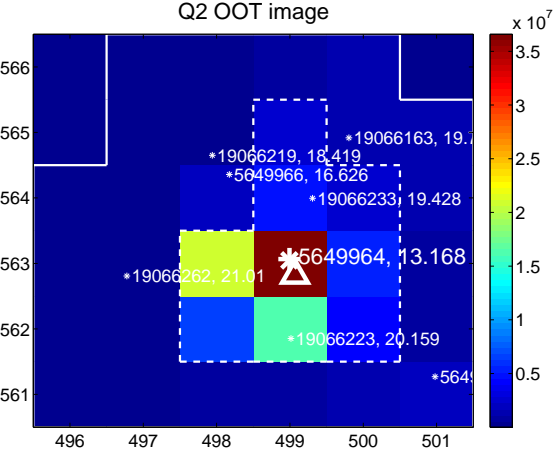
Q1 no OOT image



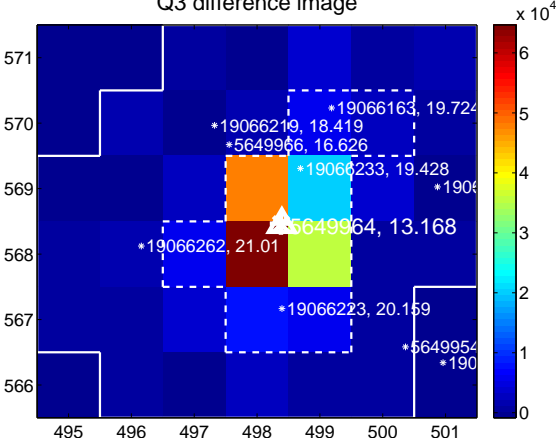
Q2 difference image



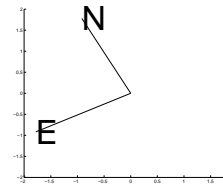
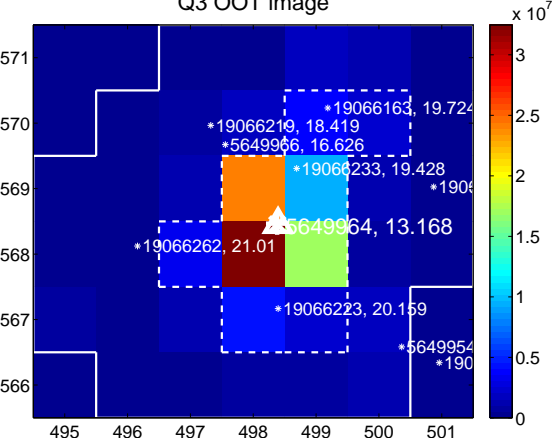
Q2 OOT image



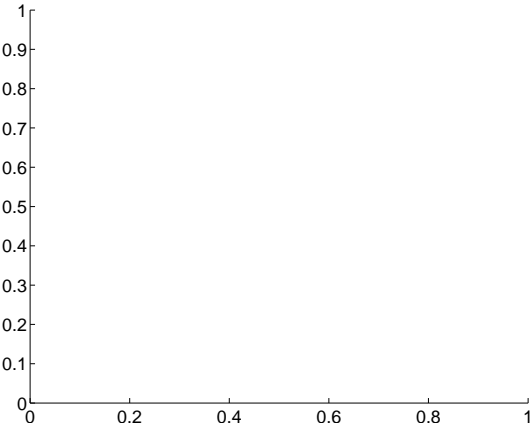
Q3 difference image



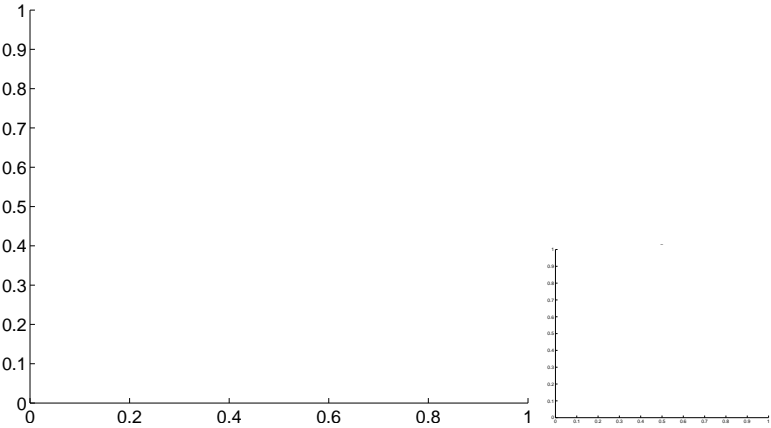
Q3 OOT image



Q4 no difference image

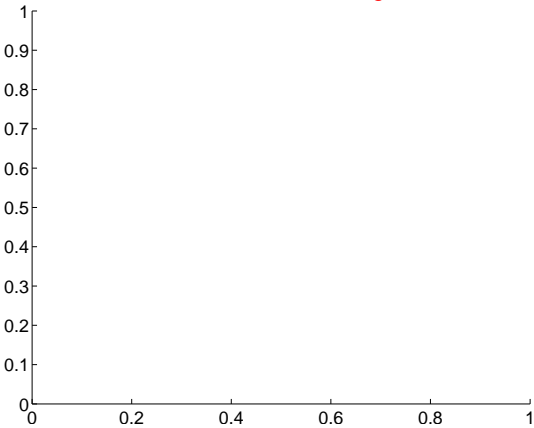


Q4 no OOT image

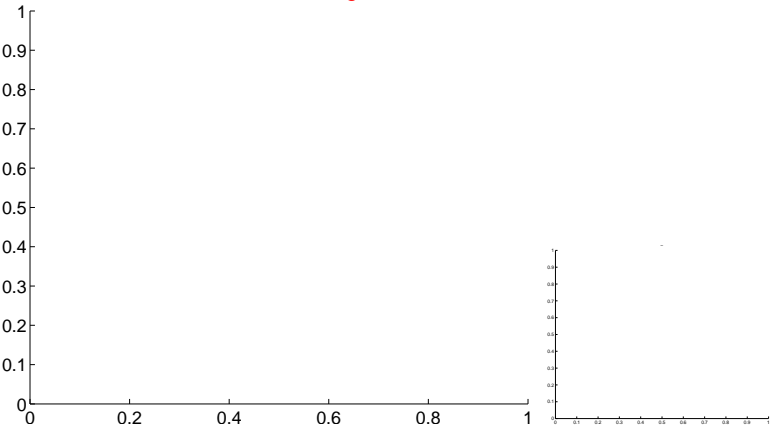


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

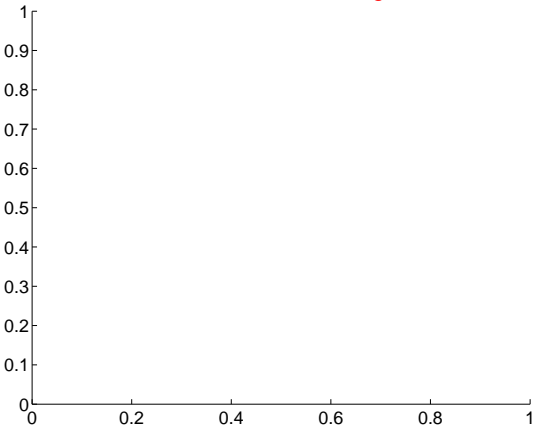
Q5 no difference image



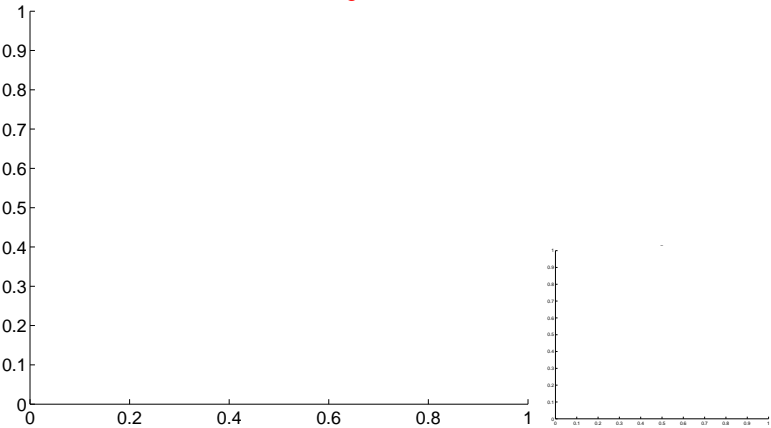
Q5 no OOT image



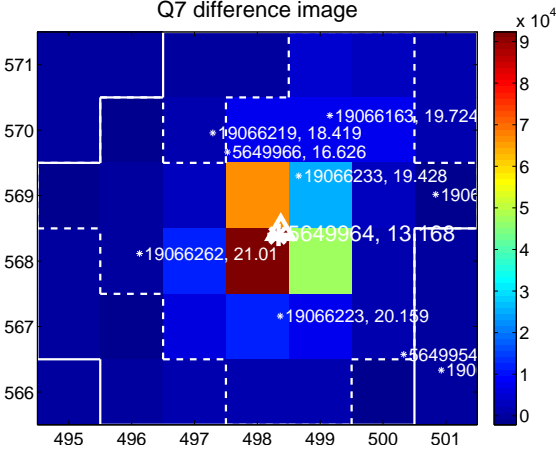
Q6 no difference image



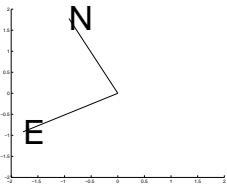
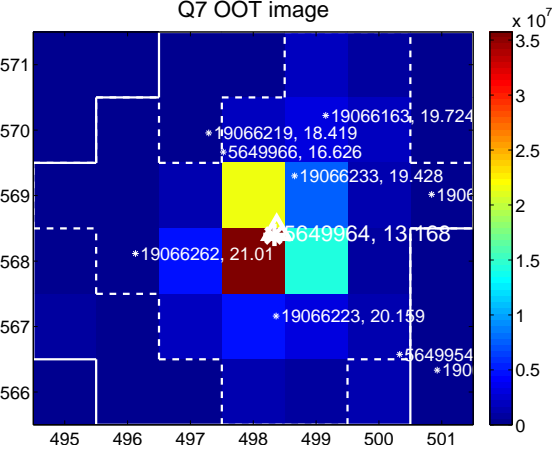
Q6 no OOT image



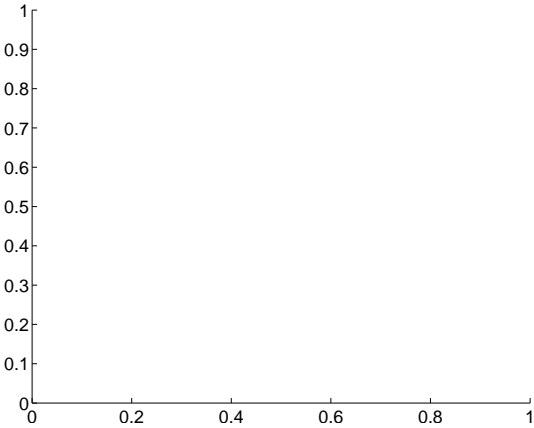
Q7 difference image



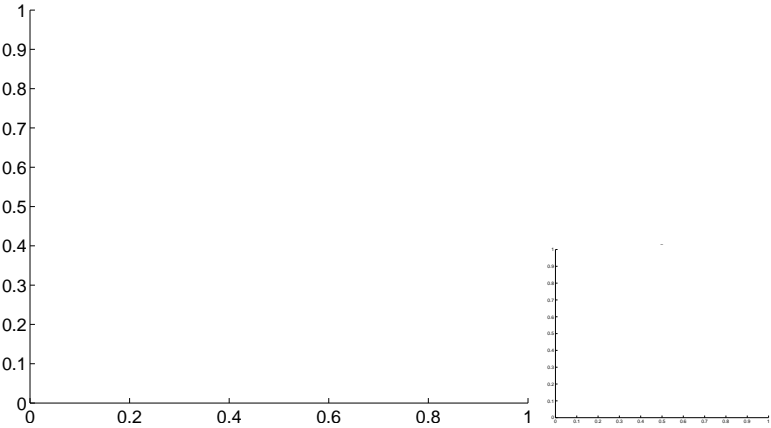
Q7 OOT image



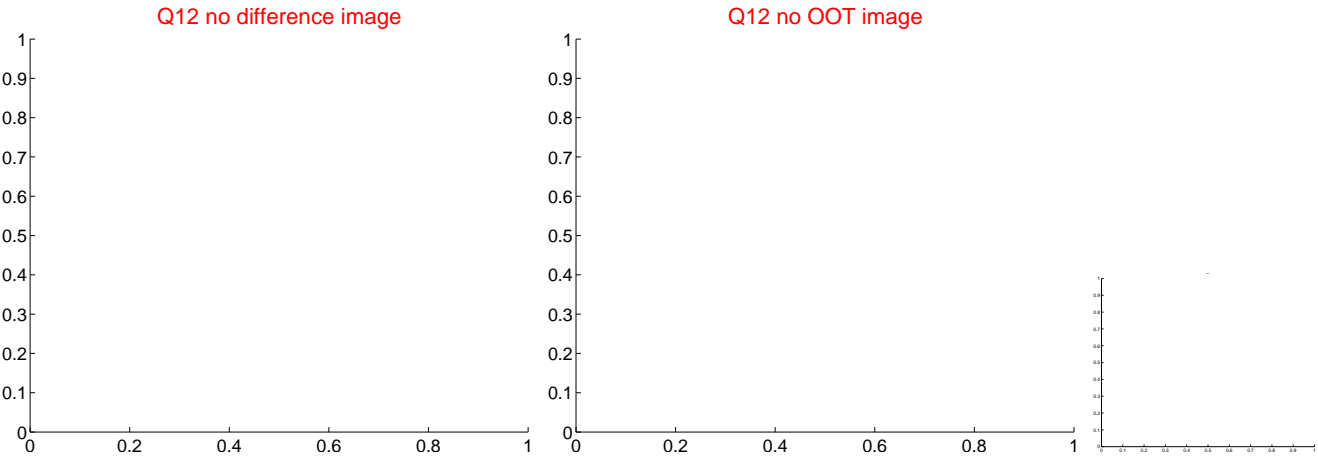
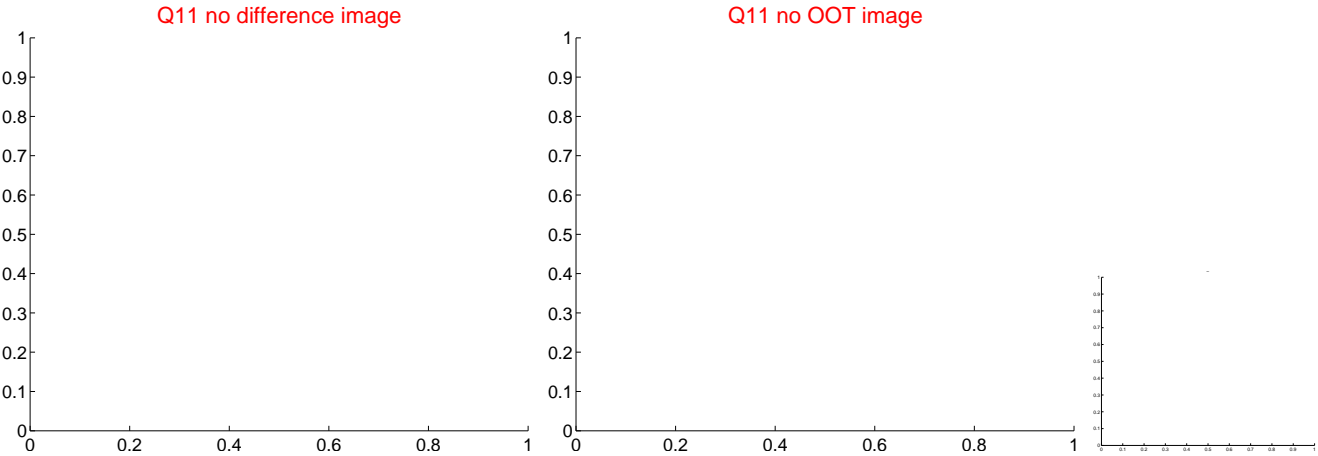
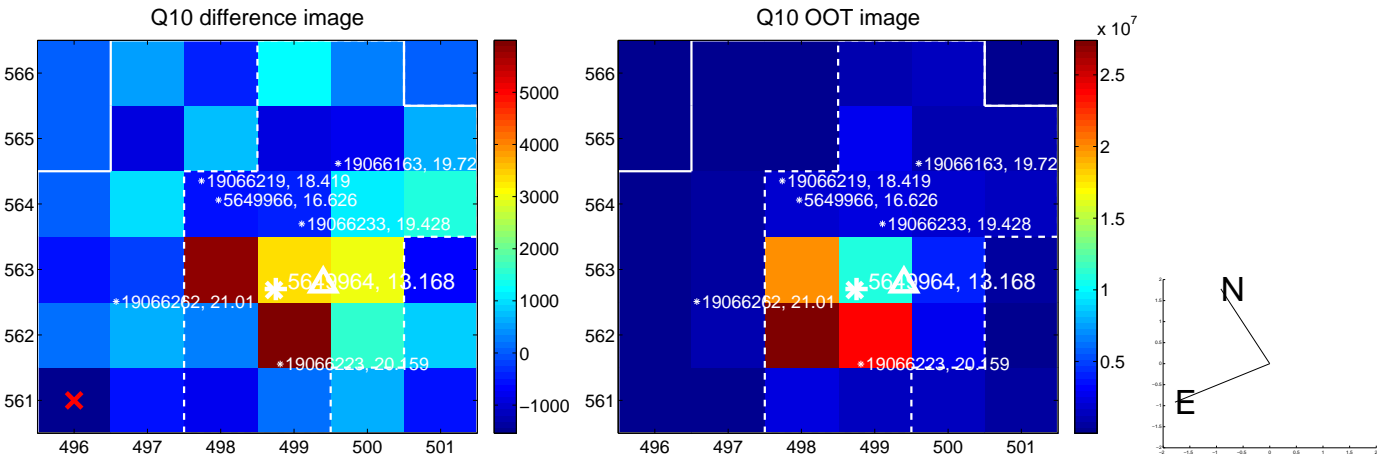
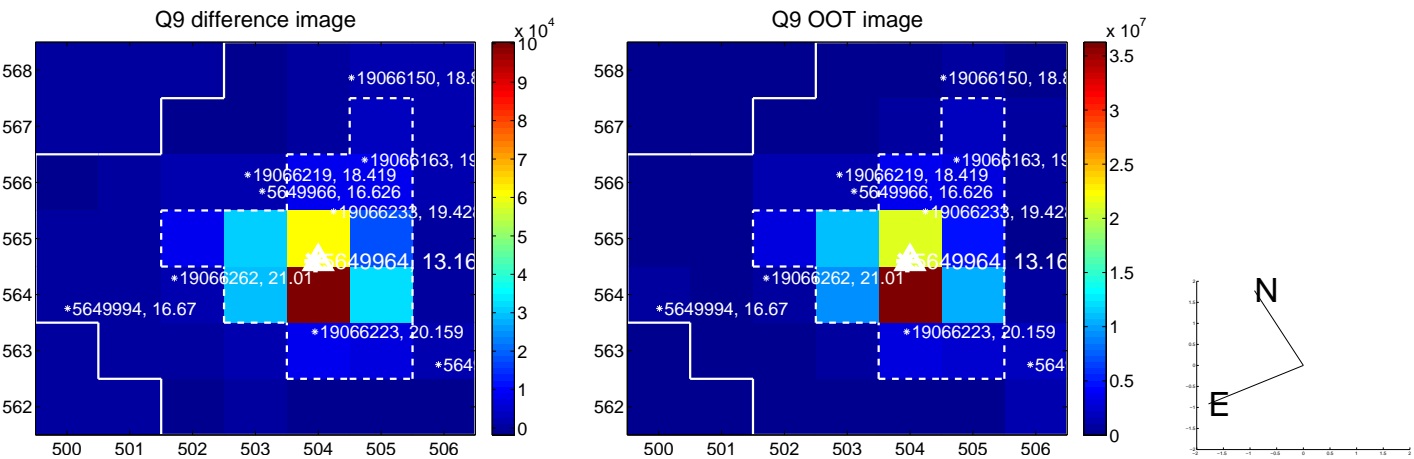
Q8 no difference image



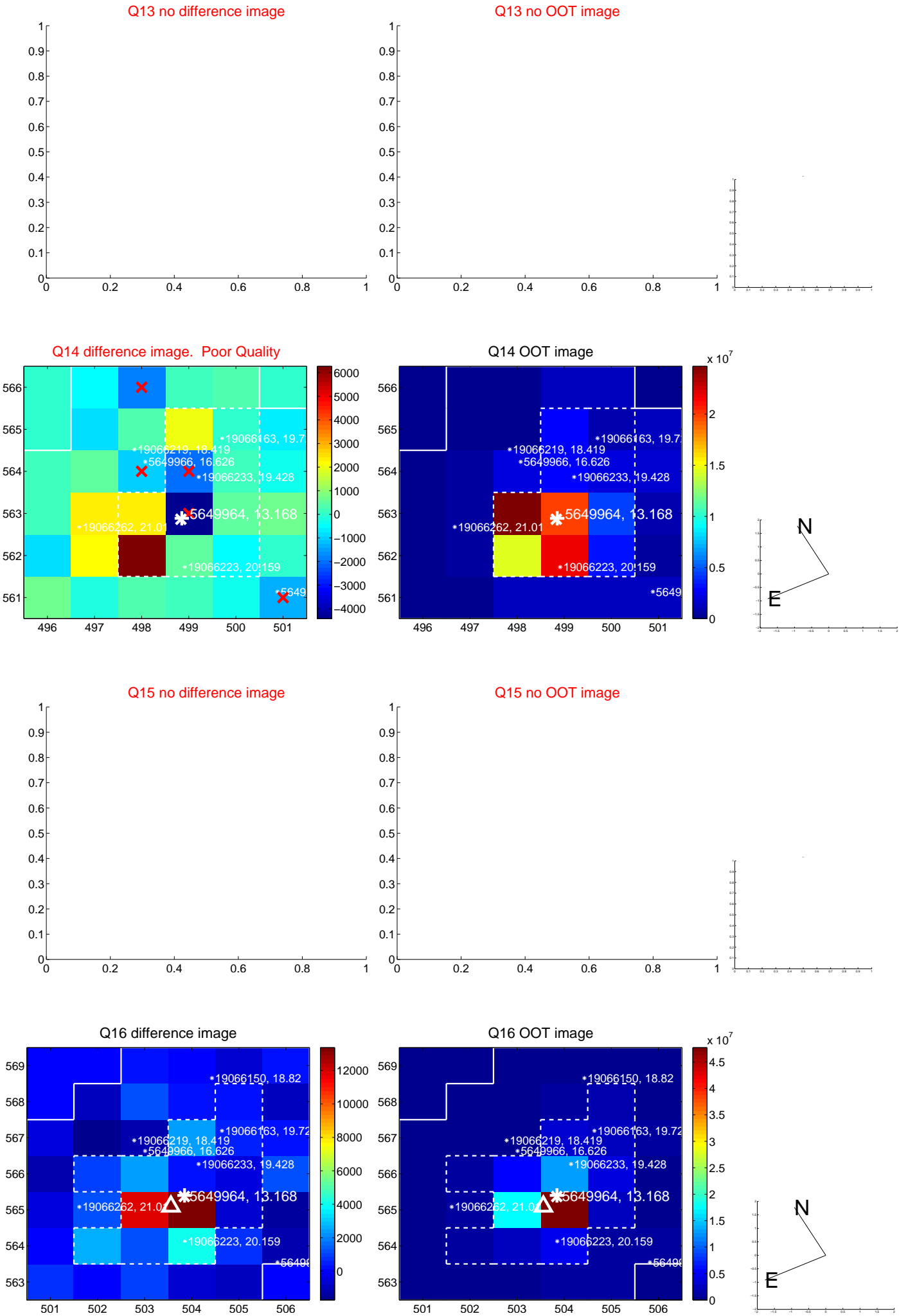
Q8 no OOT image



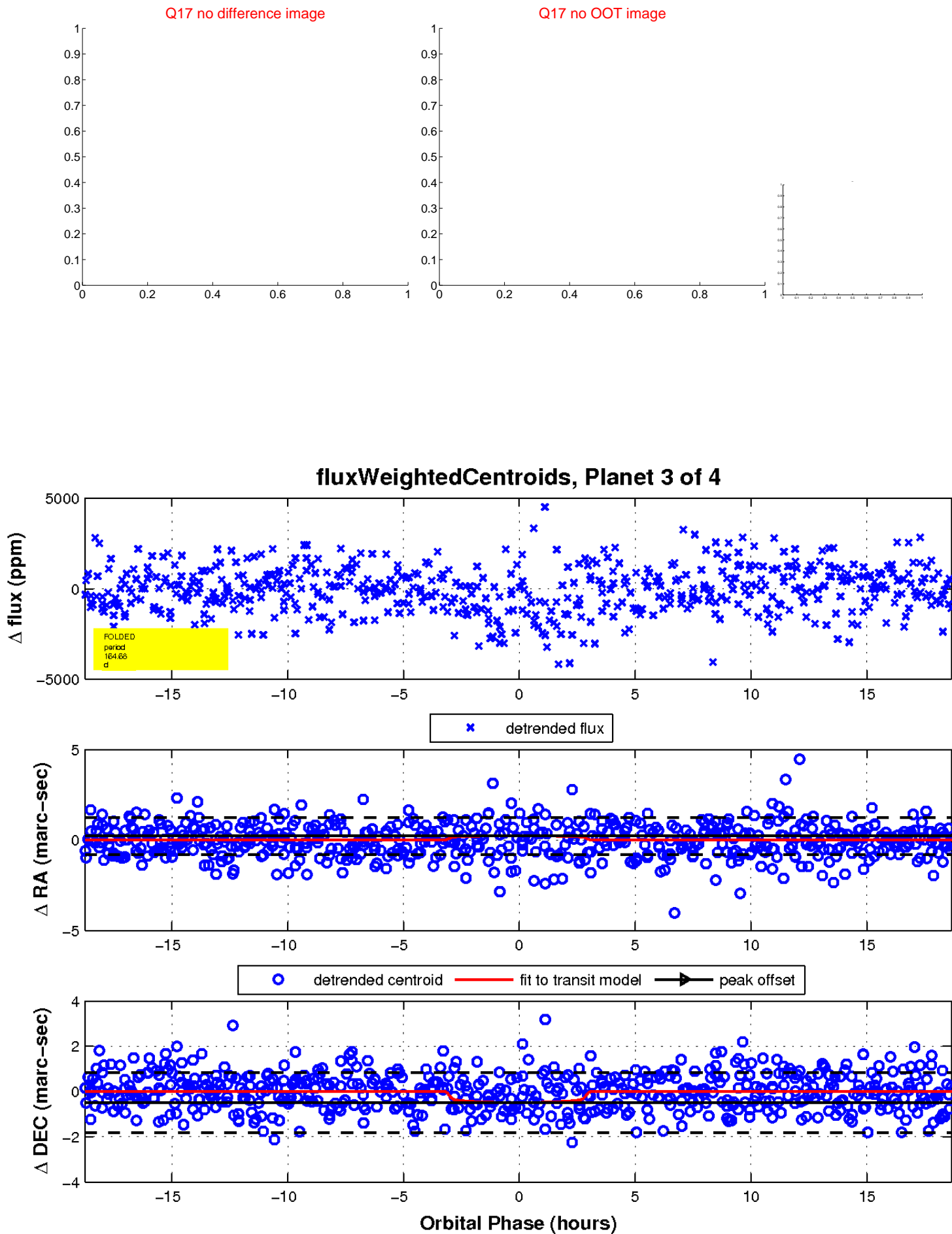
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

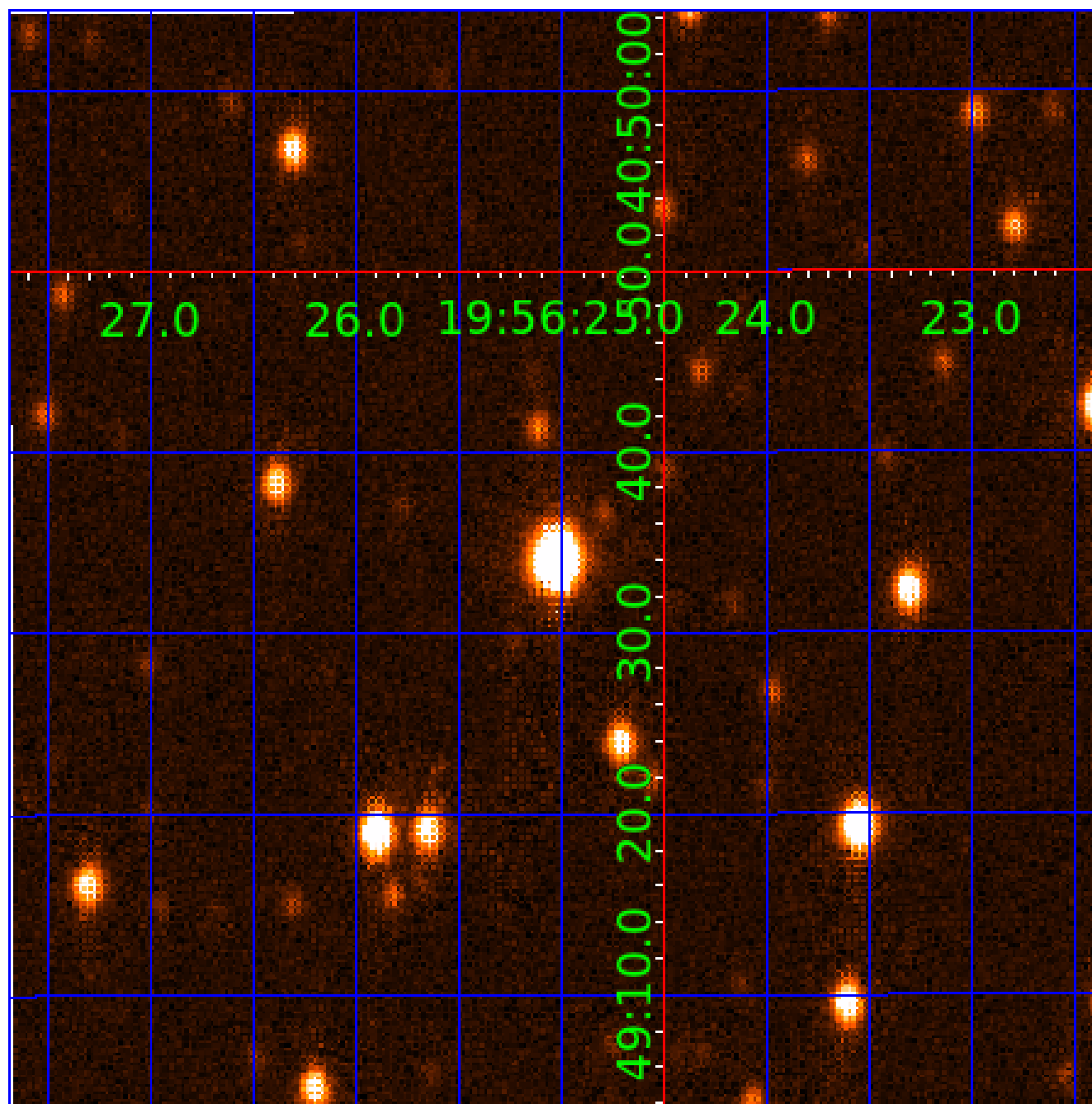


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination



# KIC 005649964

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
005649964-01	OBS	No	1.016536	131.832643	187.5	3.129	10.7	10.6	1.69	6953	2.69	12017.65
005649964-02	OBS	No	0.538018	131.706724	206.2	1.550	9.4	10.6	1.69	6953	2.48	28070.74
005649964-03	OBS	No	164.679305	174.902737	1618.5	6.254	7.1	7.4	1.69	6953	7.00	13.61
005649964-04	OBS	No	118.680411	167.470654	272.6	6.000	7.4	-1.0	1.69	6953	2.81	21.06

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
005649964-01	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT
005649964-02	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT
005649964-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_CHASES_SKYE—TRANS_GAPPED—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT
005649964-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_NOFITS

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

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

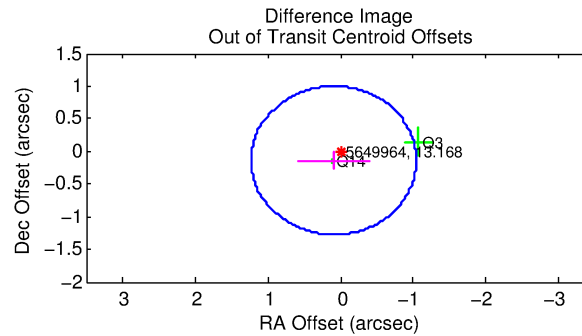
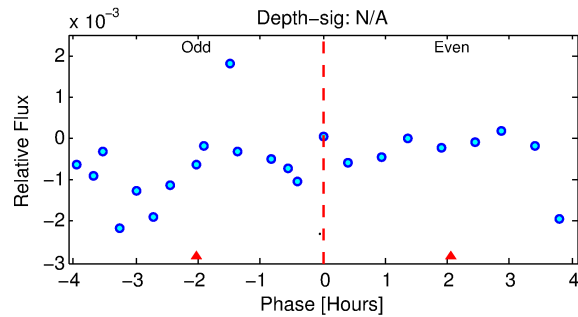
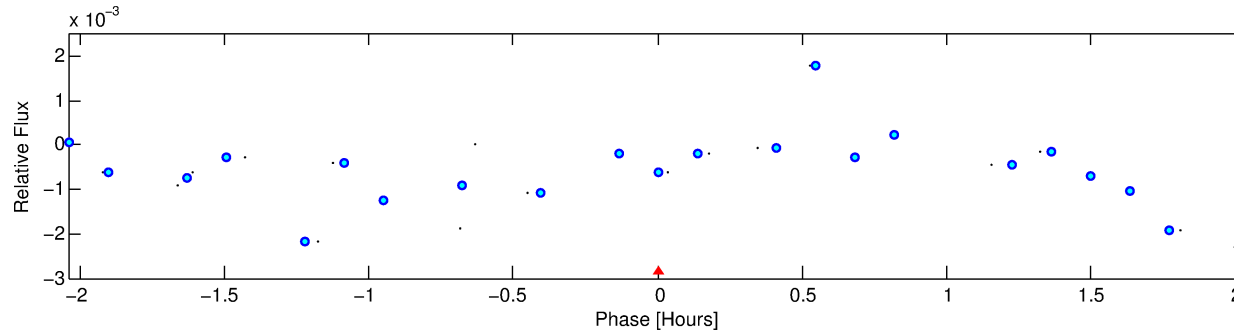
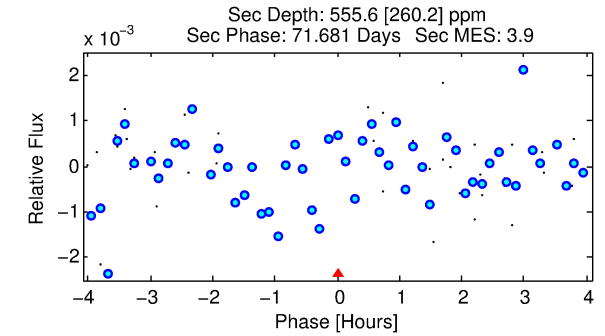
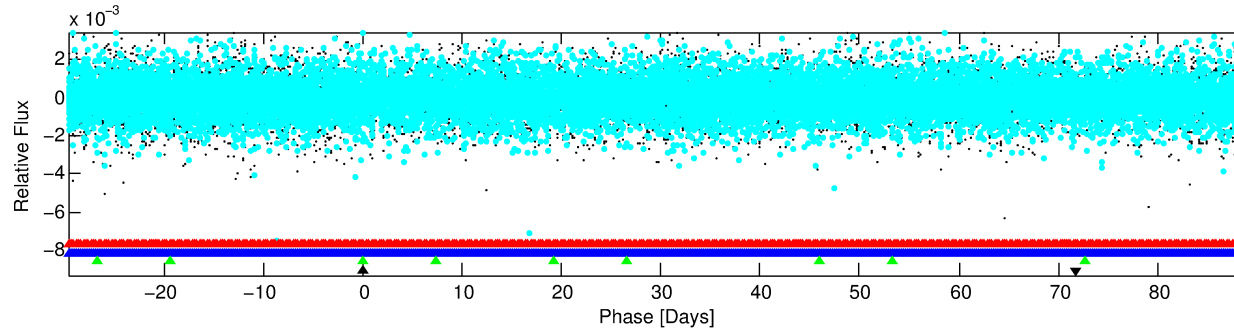
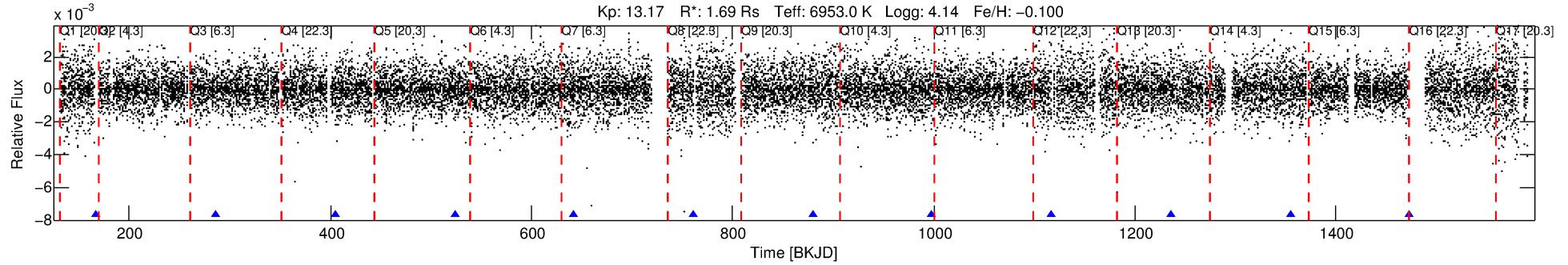
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 005649964-04

No Significant Match Found

# DV One-Page Summary

KIC: 5649964 Candidate: 4 of 4 Period: 118.680 d



## TPS TCE Results:

Period = 118.68041 d  
Epoch = 167.4707 BKJD

DV fit results are unavailable

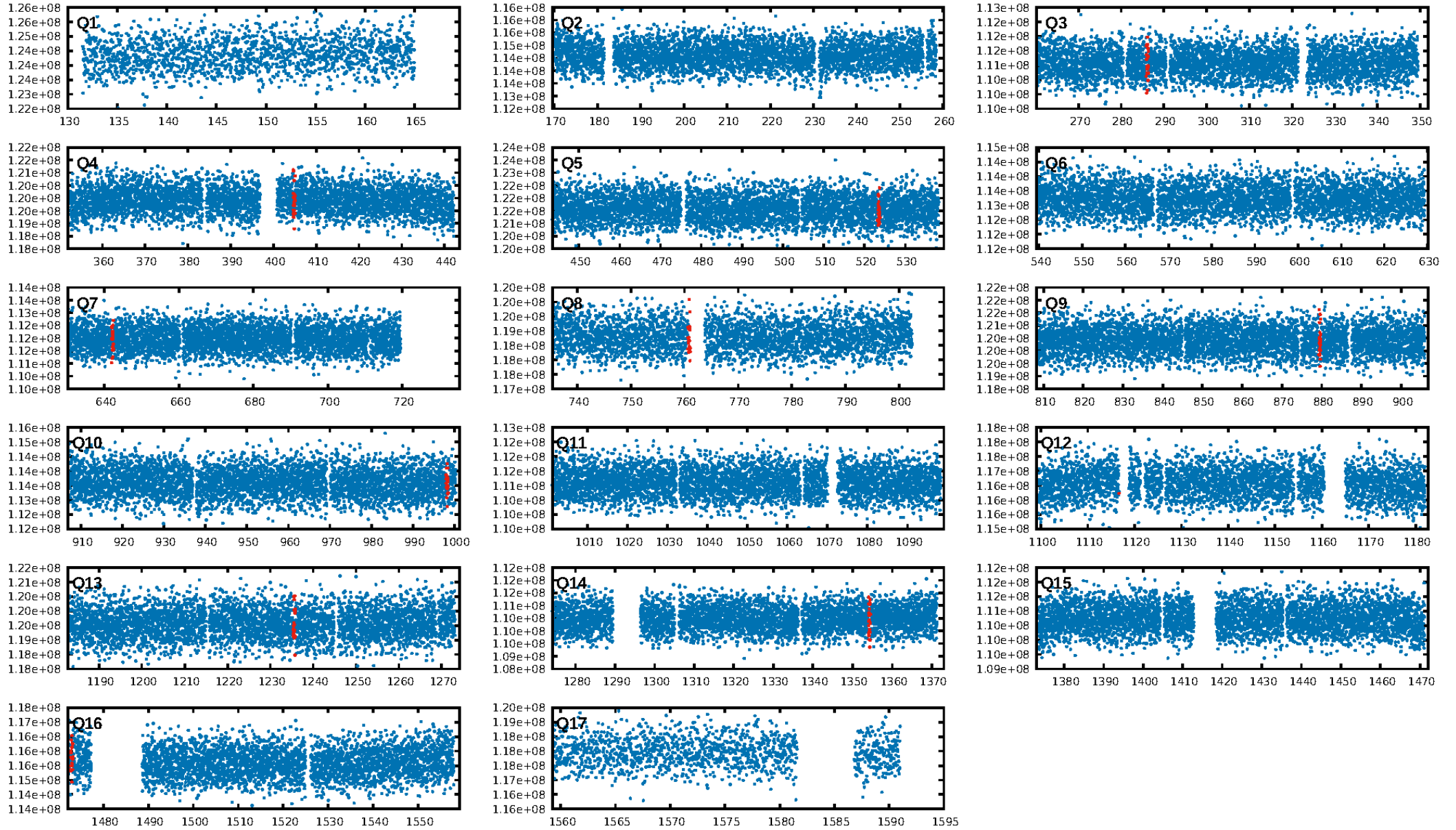
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [417.31 $\sigma$ ]  
LongPeriod-sig: 100.0% [127.38 $\sigma$ ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: N/A  
RollingBand-fgt: 1.00 [4/4]  
GhostDiagnostic-chr: -7.314  
Centroid-sig: 25.3%  
Centroid-so: 0.253 arcsec [2.02 $\sigma$ ]  
OotOffset-rm: 0.166 arcsec [0.44 $\sigma$ ]  
OotOffset-st: 1/1/0/0 [2]  
KicOffset-rm: 0.120 arcsec [0.97 $\sigma$ ]  
KicOffset-st: 1/1/0/0 [2]  
DiffImageQuality-fgm: 1.00 [2/2]  
DiffImageOverlap-fno: 0.00 [0/2]

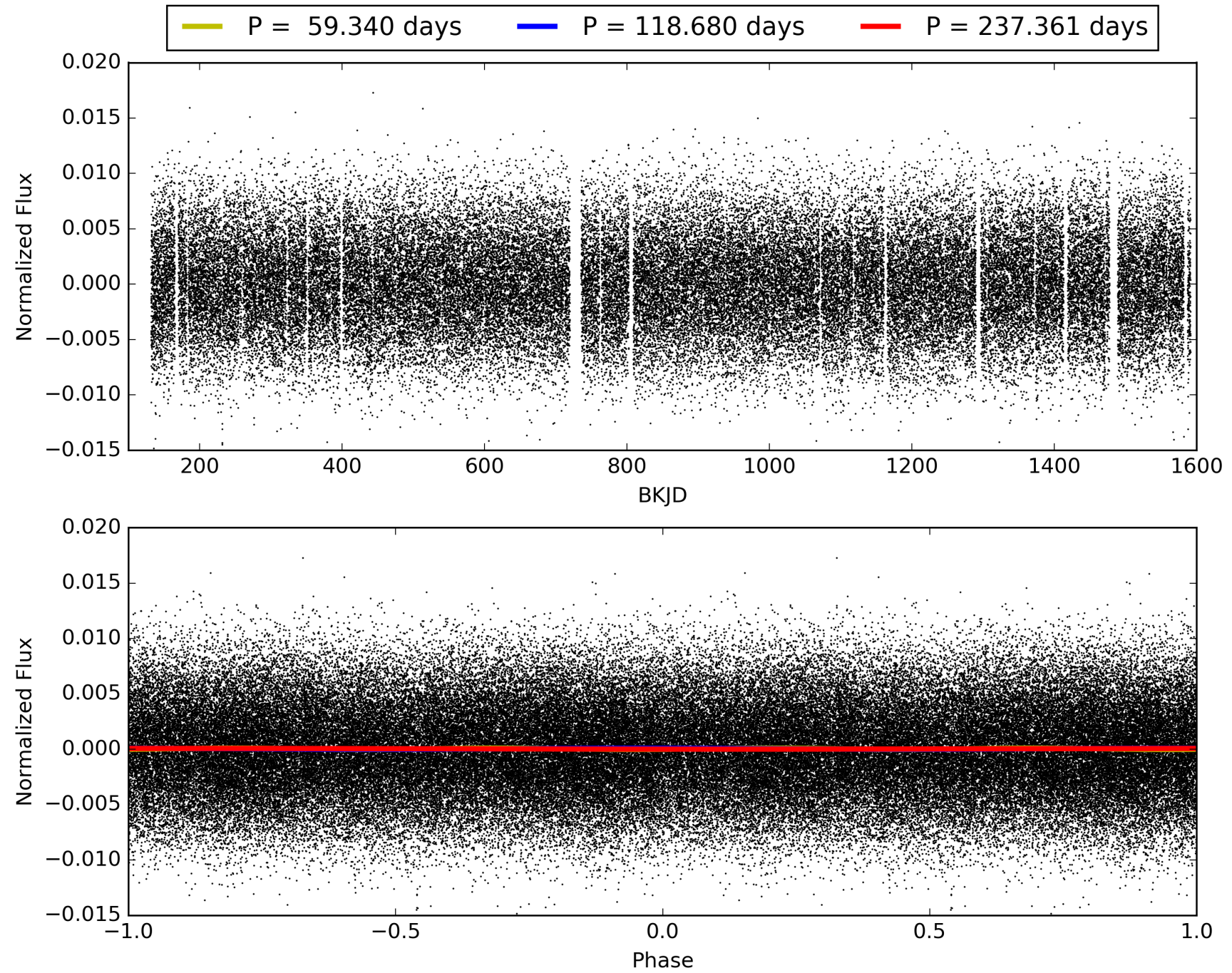
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 30-Jan-2016 16:19:15 Z

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

# TCE 005649964-04, PDC Light Curves

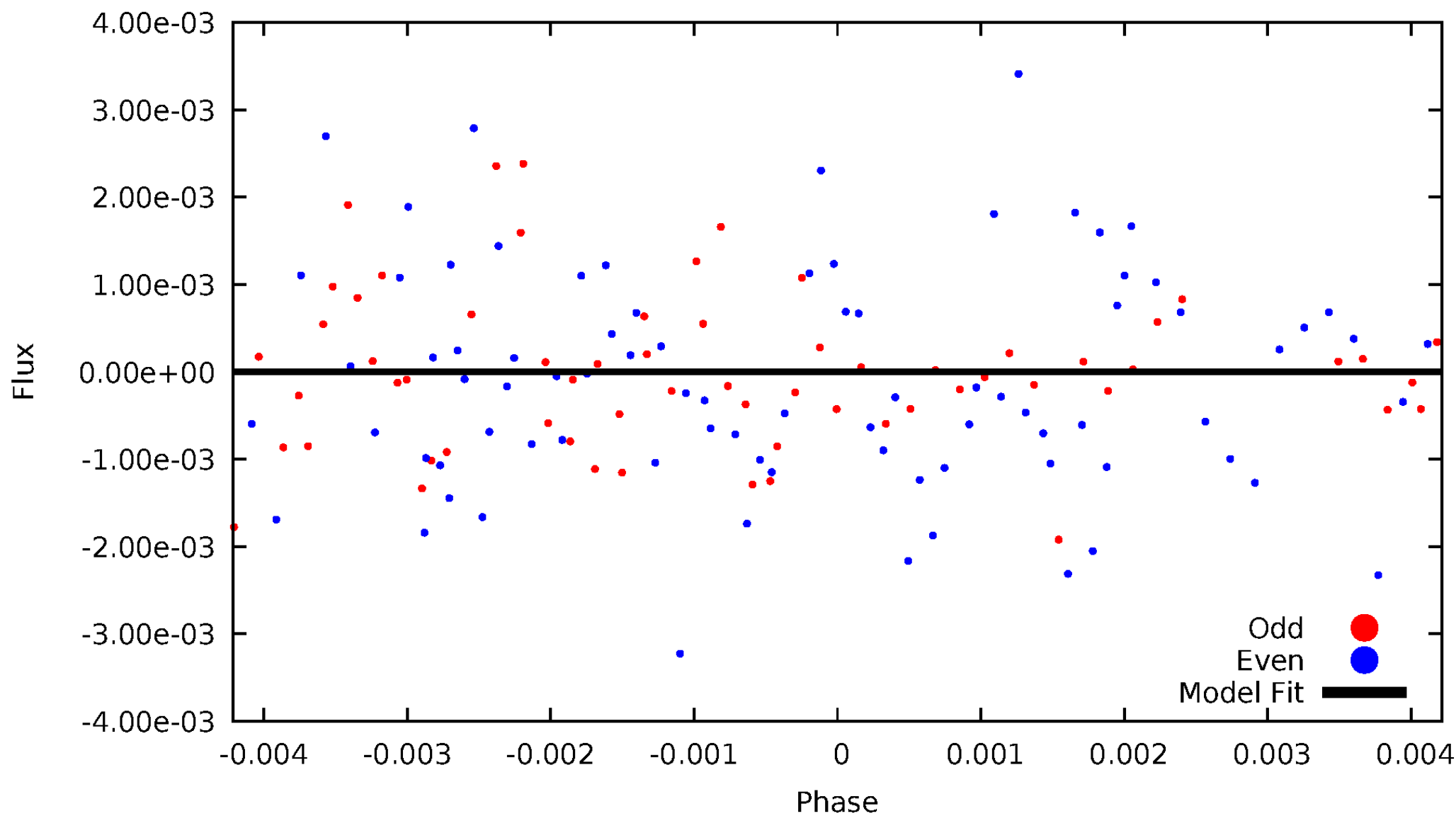


TCE 005649964-04



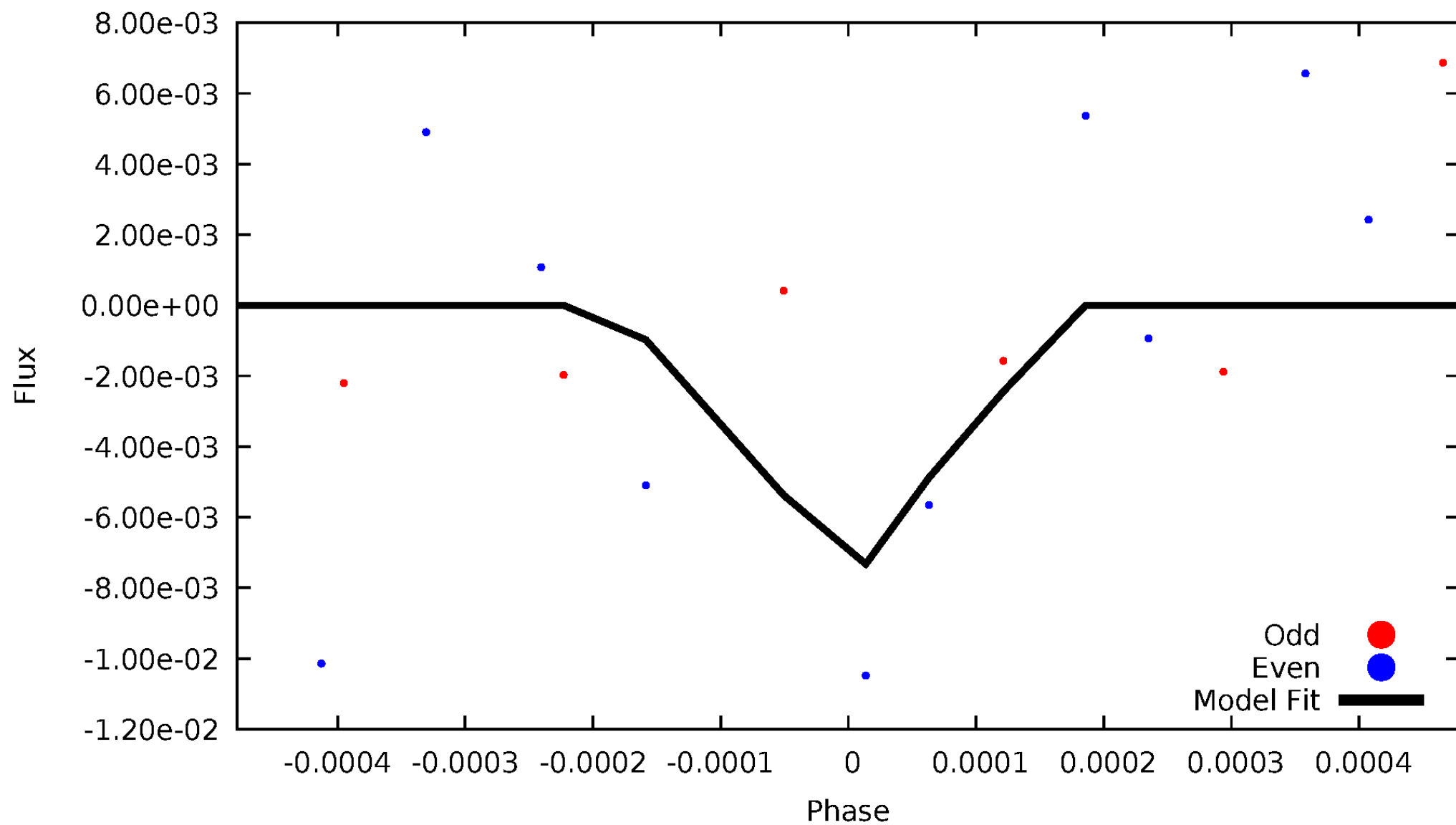
# DV Odd/Even

TCE 005649964-04



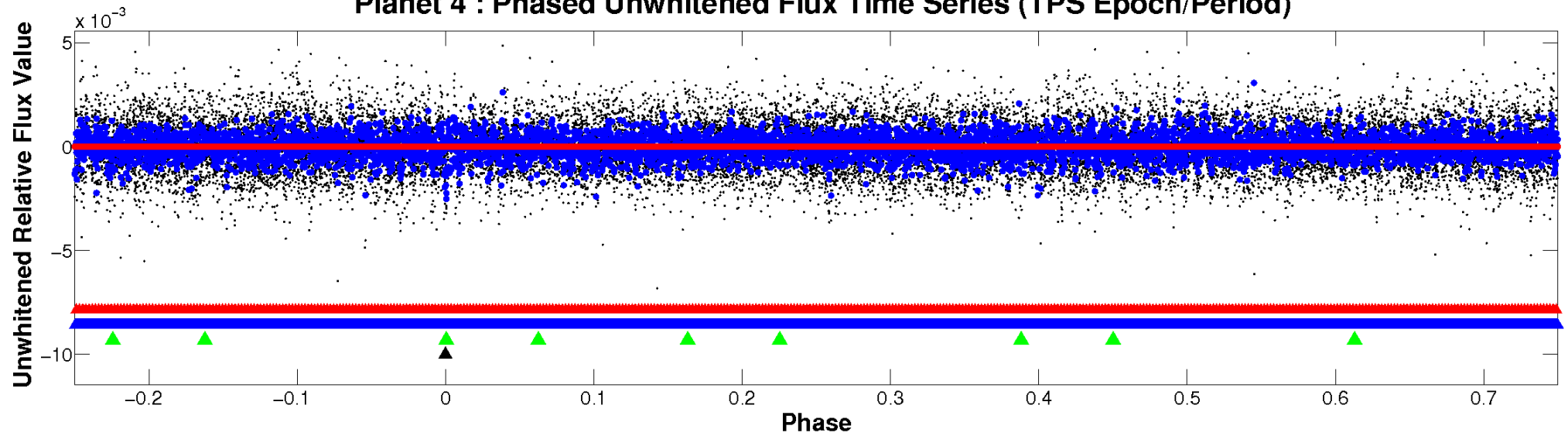
# ALT Odd/Even

TCE 005649964-04

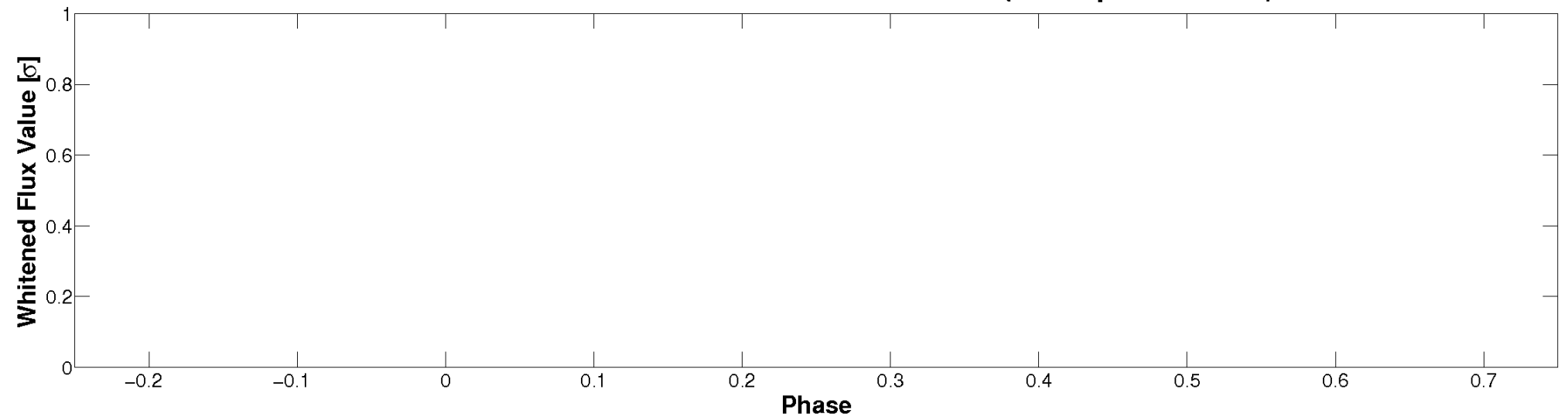


# Non-Whitened Vs. Whitened Light Curve

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

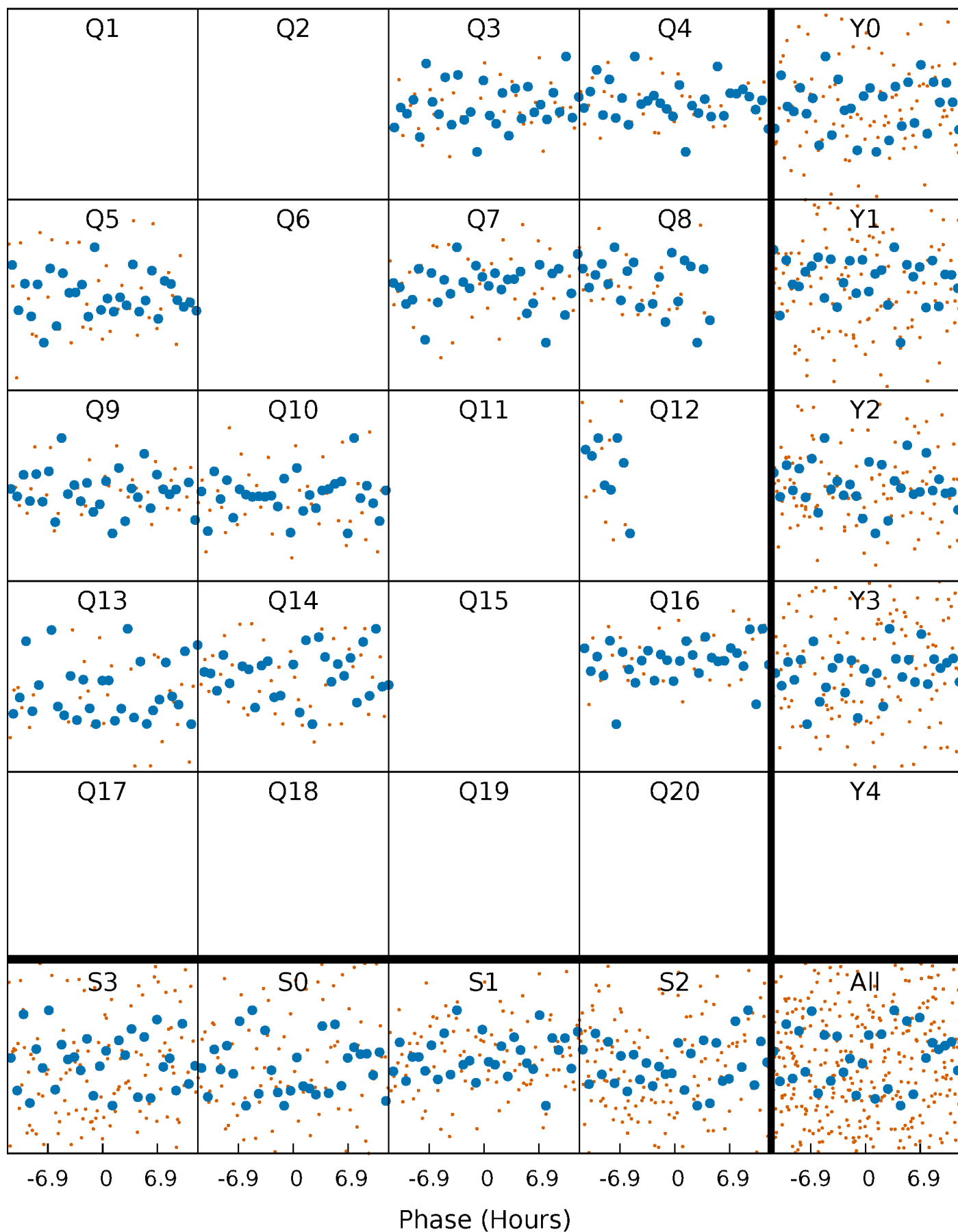


**Planet 4 : Phased Whitened Flux Time Series (TPS Epoch/Period)**



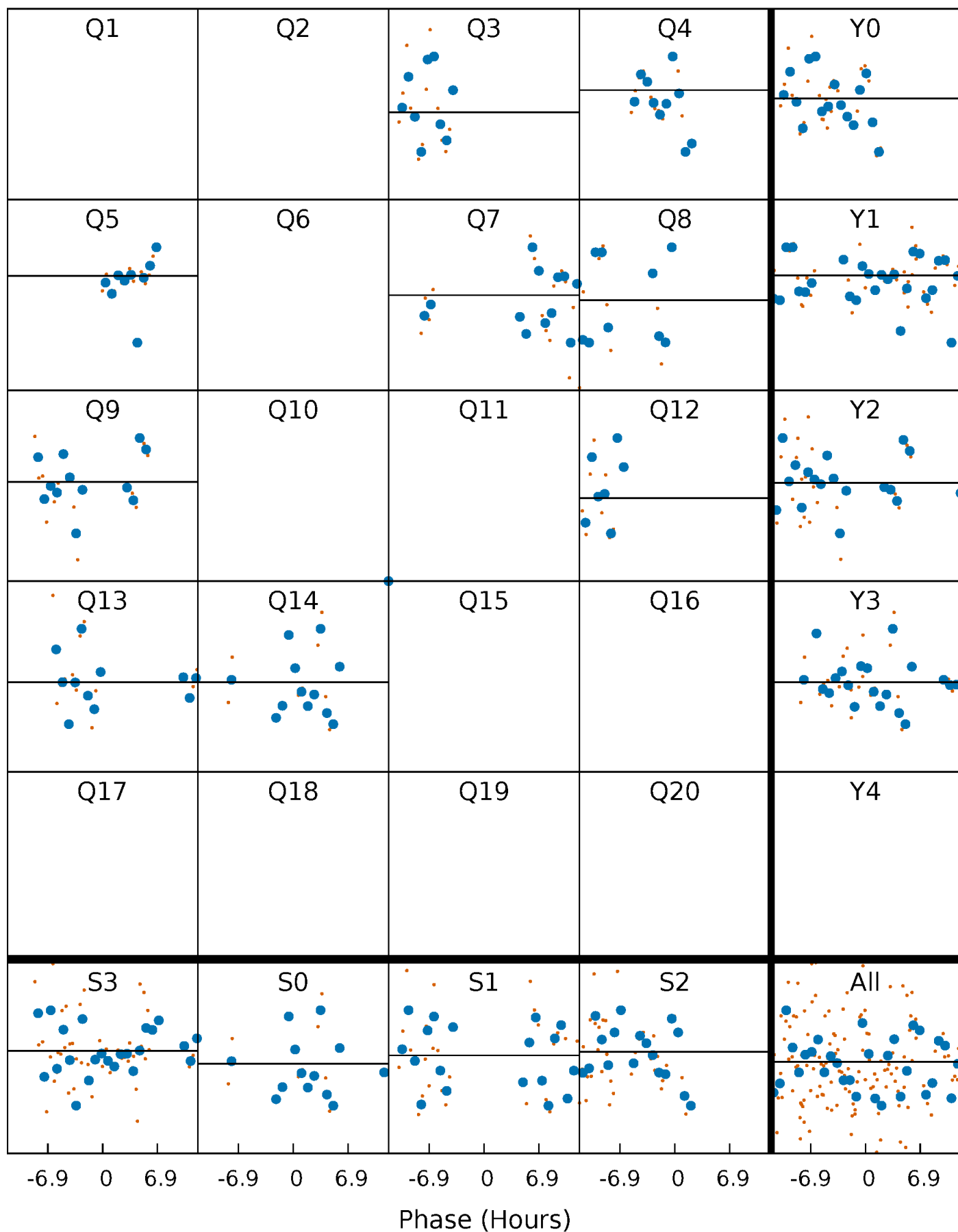
# PDC Quarter-Phased Transit Curves

TCE 005649964-04 P=118.680411 Days  $T_0=167.470654$  (BKJD)



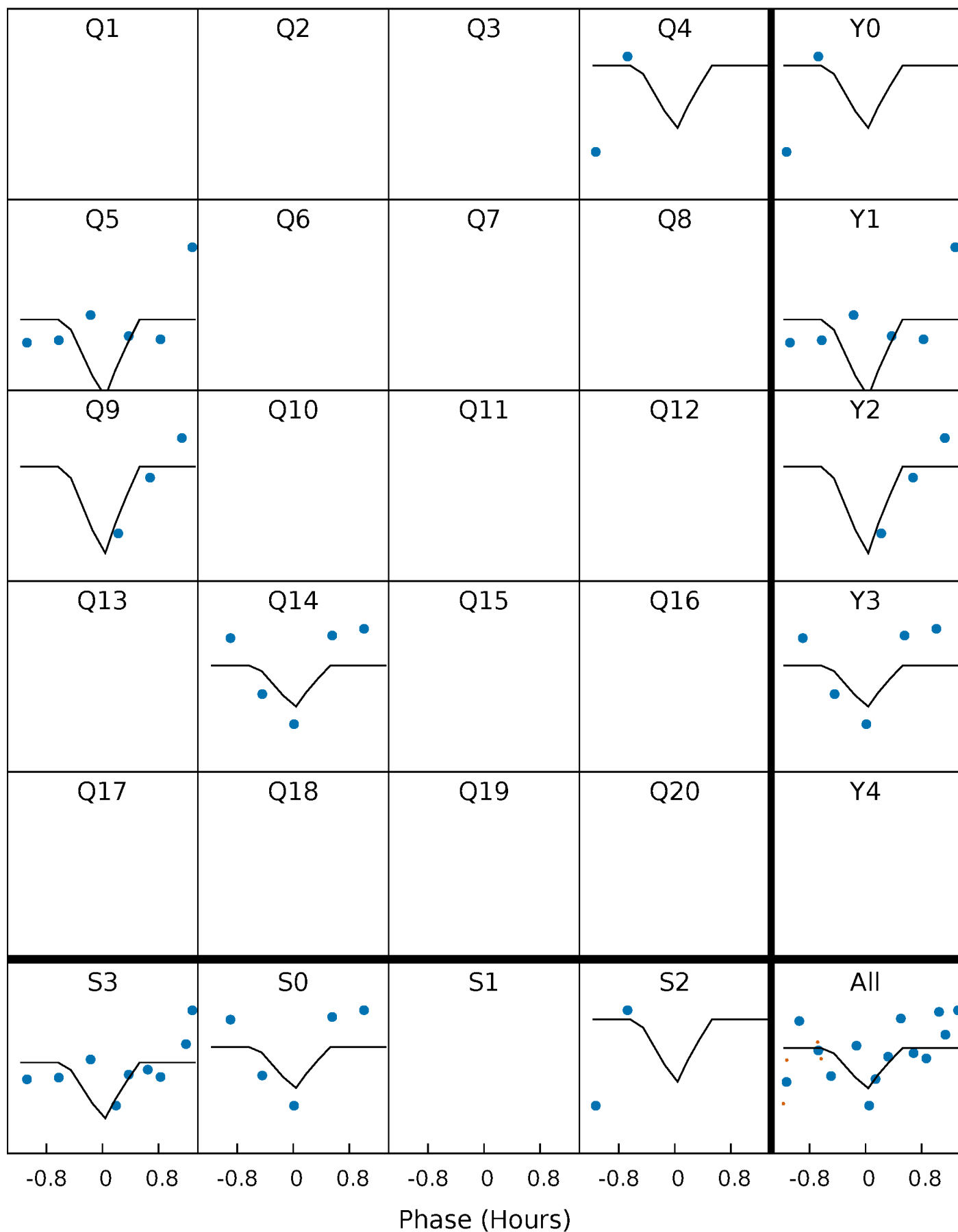
# DV Quarter-Phased Transit Curves

TCE 005649964-04     $P=118.680411$  Days     $T_0=167.470654$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

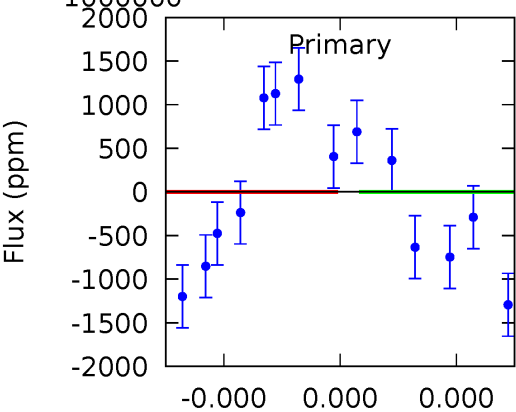
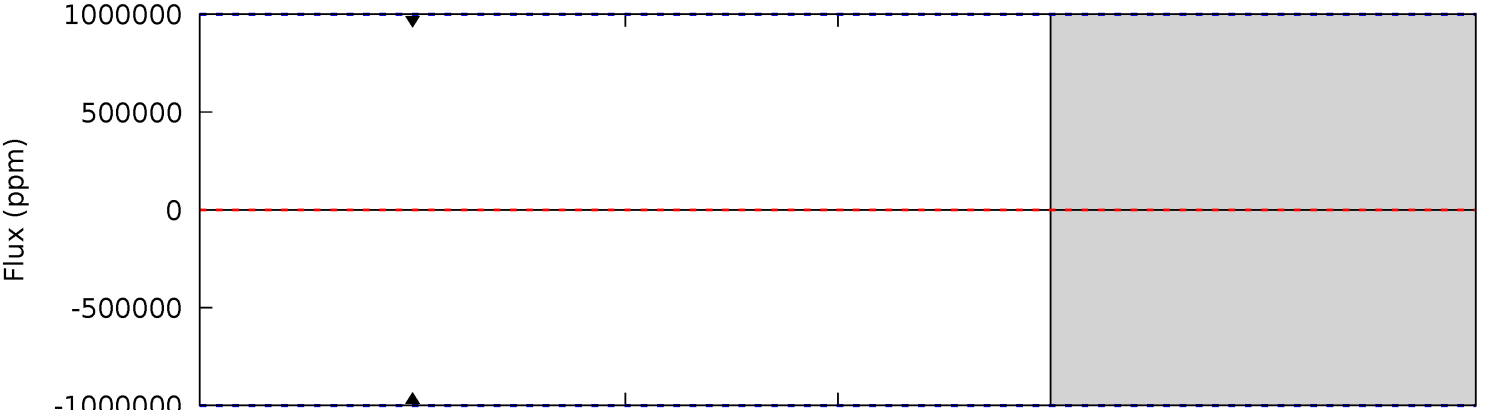
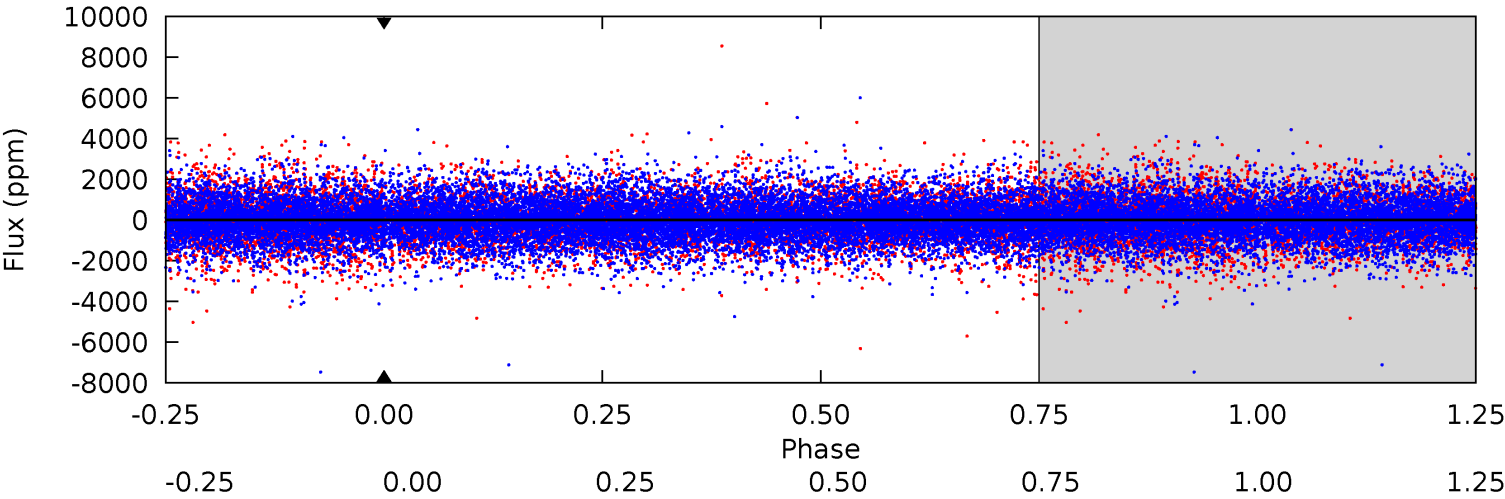
TCE 005649964-04 P=118.680411 Days  $T_0=167.578089$  (BKJD)



# DV Model-Shift Uniqueness Test

005649964-04, P = 118.680411 Days, E = 48.790243 Days

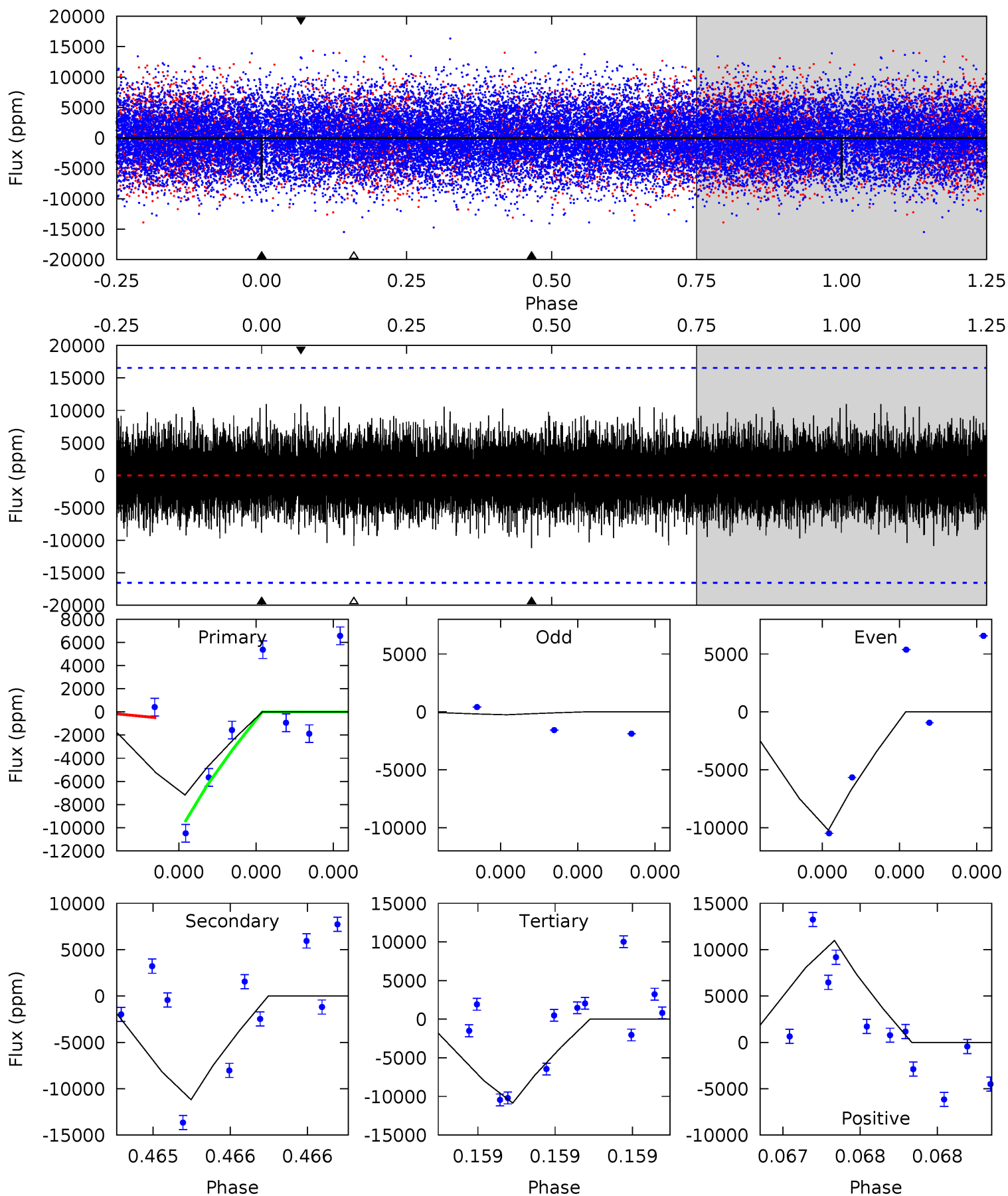
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
0	0	0	0	1.00	1.00	1.00	0	0	0	0	0	0	0	0



# Alt Model-Shift Uniqueness Test

005649964-04, P = 118.680411 Days, E = 48.897678 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
2.50	3.89	3.78	3.82	5.76	3.76	1.08	-1.28	-1.33	0.12	0.07	2.46	1.00	0.50	0.01



### Stellar Parameters For KIC 005649964

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$6953^{+194}_{-291}$	$4.137^{+0.158}_{-0.193}$	$-0.100^{+0.250}_{-0.350}$	$1.685^{+0.510}_{-0.371}$	$1.423^{+0.208}_{-0.254}$	$0.419^{+0.388}_{-0.215}$
	+3%/-4%	+4%/-5%	+250%/-350%	+30%/-22%	+15%/-18%	+92%/-51%
Source	PHO1	KIC0	KIC0	DSEP		

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

### Secondary Eclipse Parameters for KIC 005649964-04 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$0 \pm 1000000$	$13.16^{+14.85}_{-9.12}$	$764^{+60}_{-54}$	$4327^{+32585}_{-29219}$	$471^{+167025}_{-100378}$
Alt.	$-11186 \pm 2874$	$20.46^{+16.68}_{-13.04}$	$762^{+61}_{-54}$	$6734^{+6647}_{-1713}$	$4058^{+25123}_{-2863}$

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

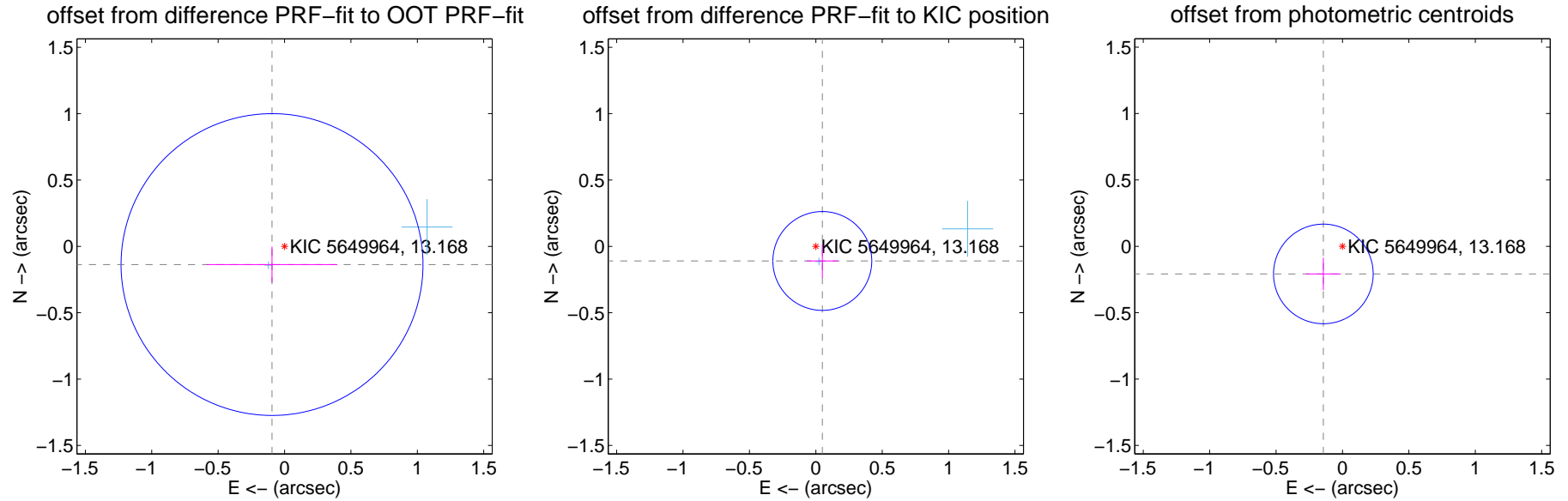
## DV Centroid Data

Supplemental centroid analysis for 005649964-04. Kepler magnitude: 13.17. Transit SNR -1.00

There are 2 quarters with good PRF difference image offsets

The direct PRF centroid is offset from the target star catalog position by about 0.15 arcsec

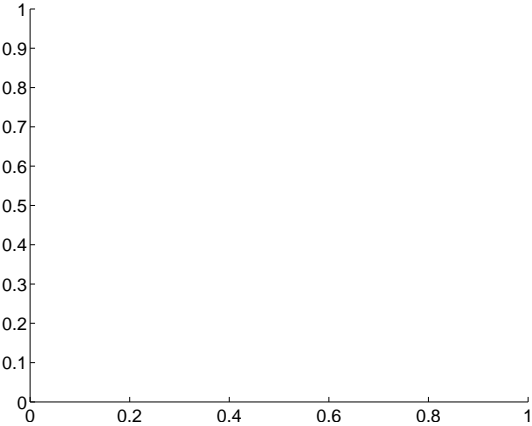
	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.166 \pm 0.379$	0.44	$0.094 \pm 0.492$	$-0.137 \pm 0.135$
PRF-fit source offset from KIC position	$0.120 \pm 0.124$	0.97	$-0.049 \pm 0.118$	$-0.110 \pm 0.125$
photometric centroid source offset	$0.25 \pm 0.13$	2.02	$0.14 \pm 0.13$	$-0.21 \pm 0.12$



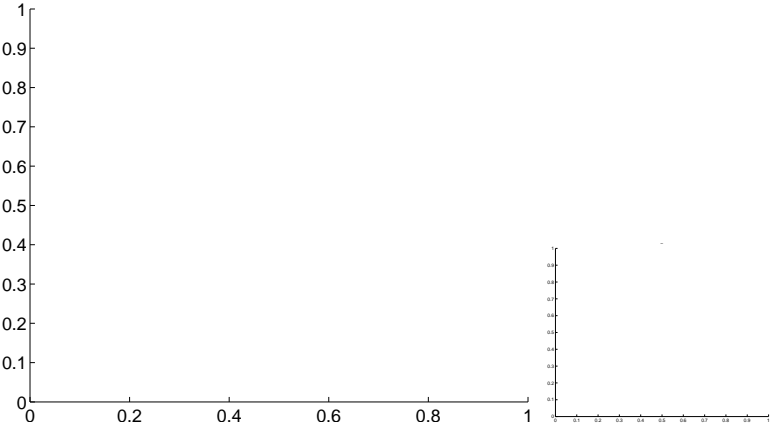
Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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

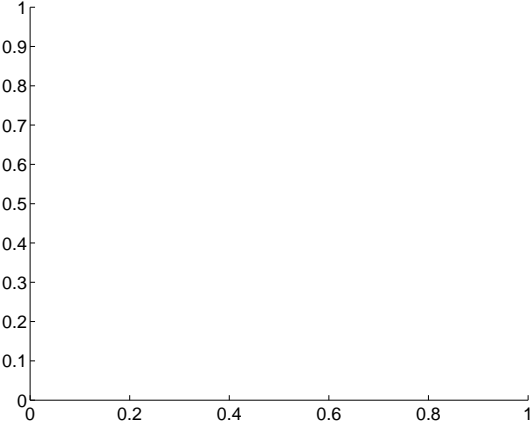
Q1 no difference image



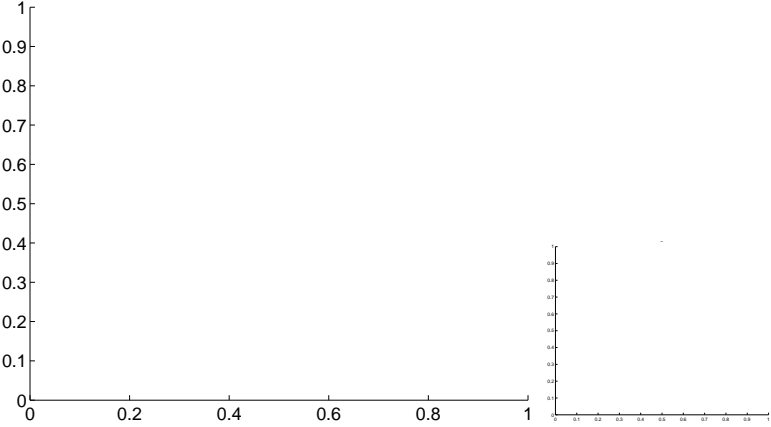
Q1 no OOT image



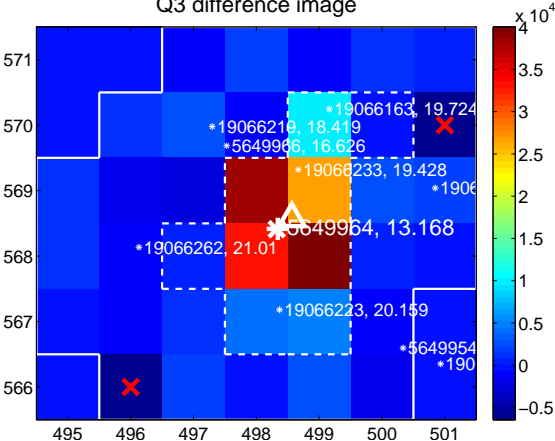
Q2 no difference image



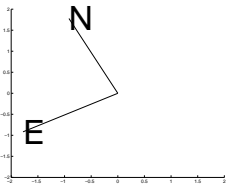
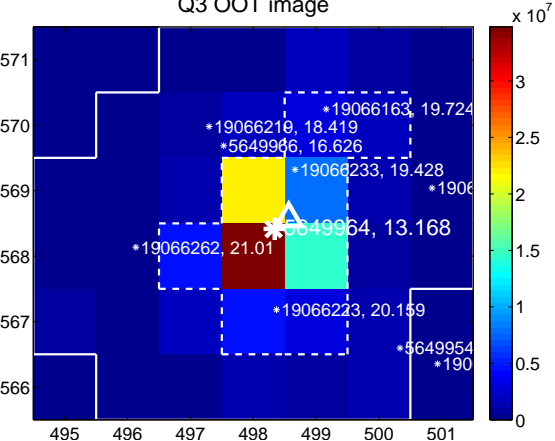
Q2 no OOT image



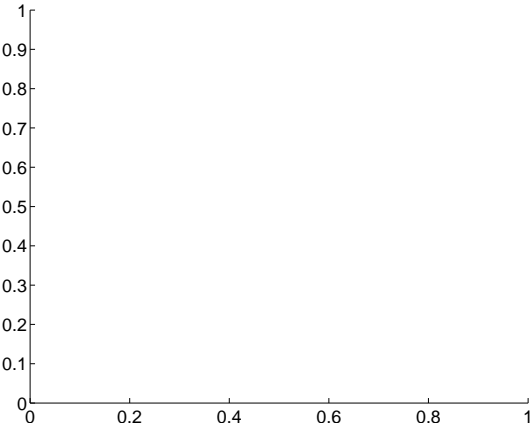
Q3 difference image



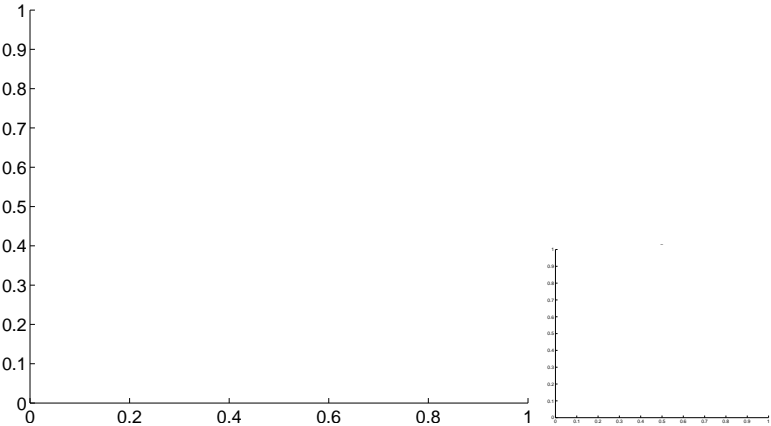
Q3 OOT image



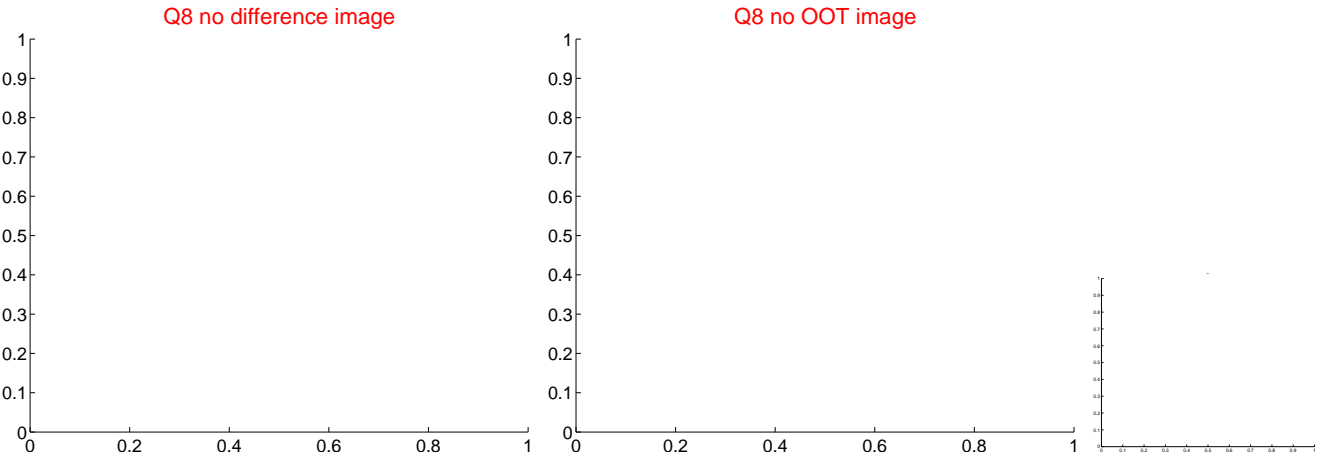
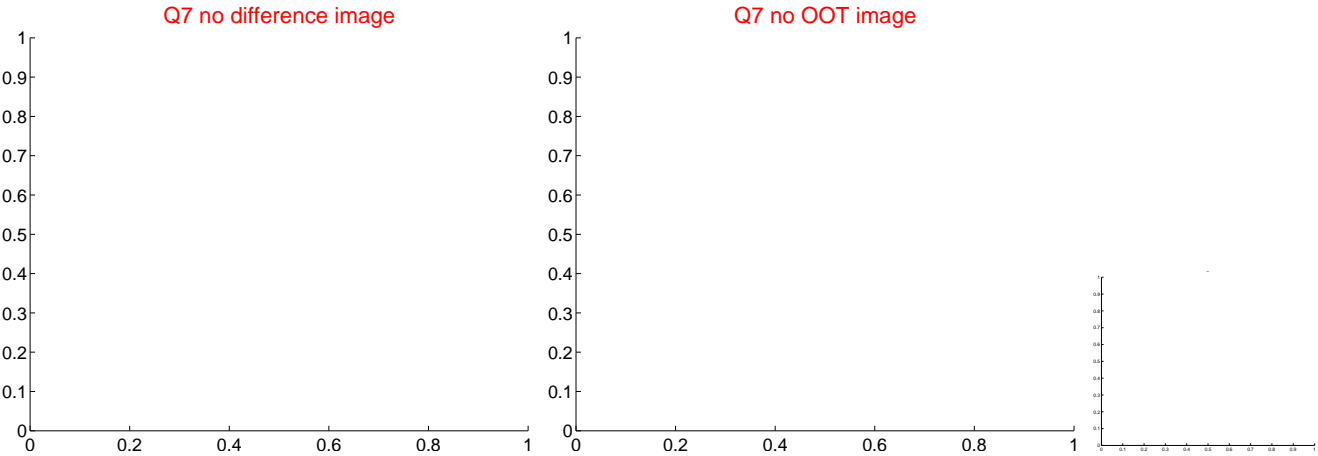
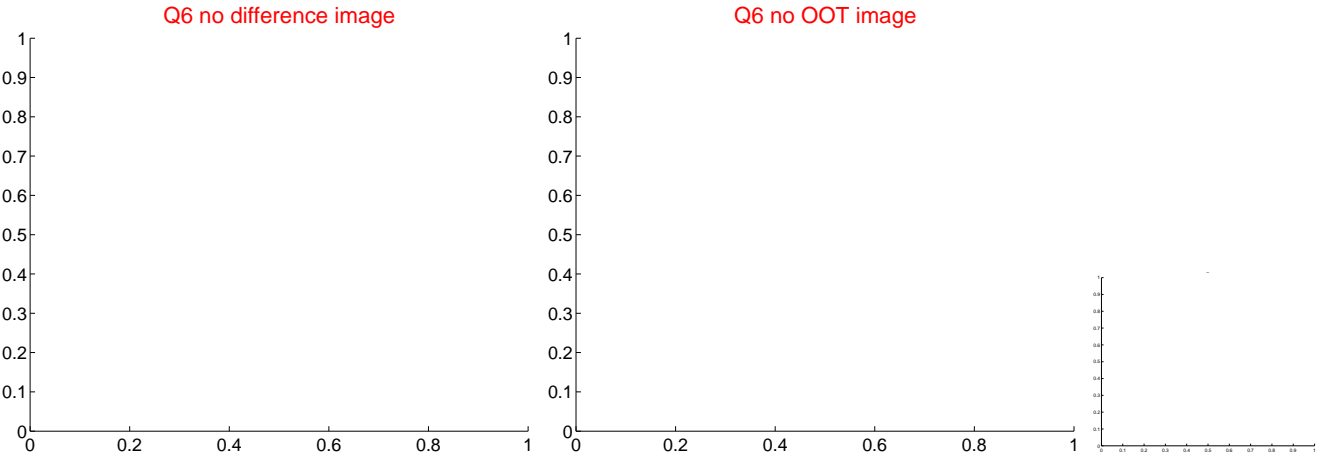
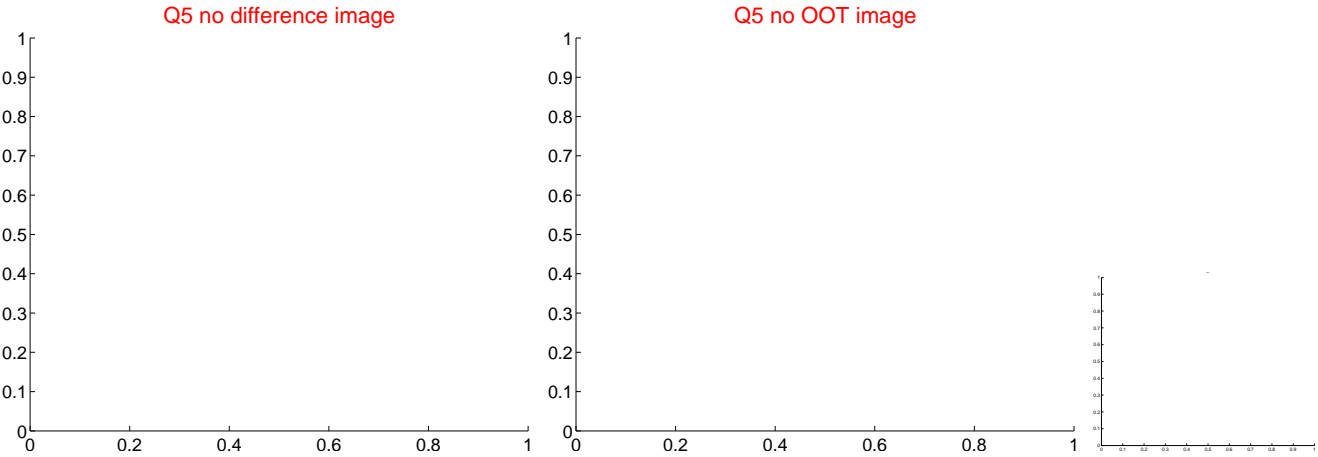
Q4 no difference image



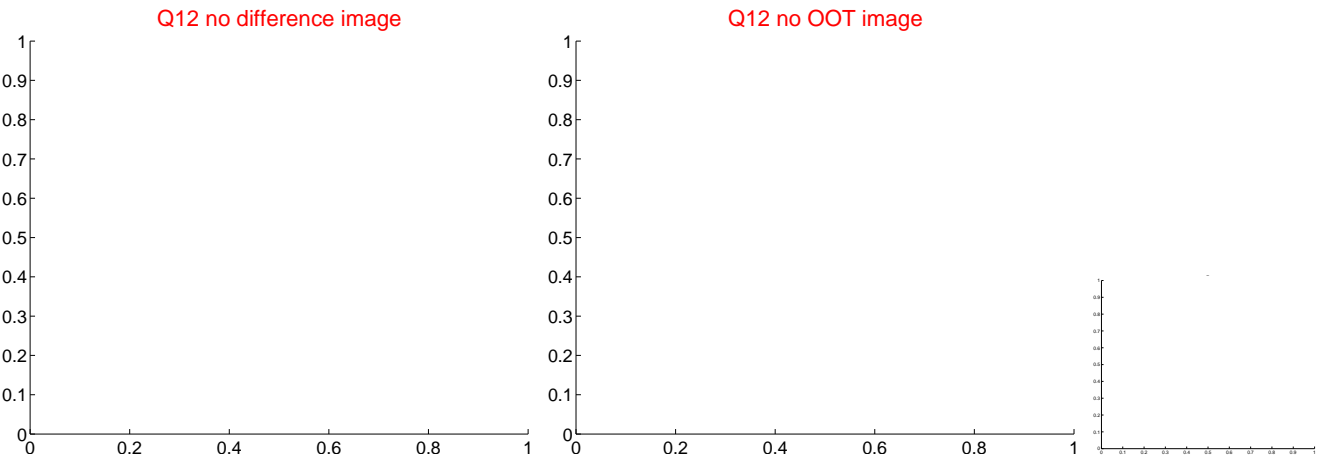
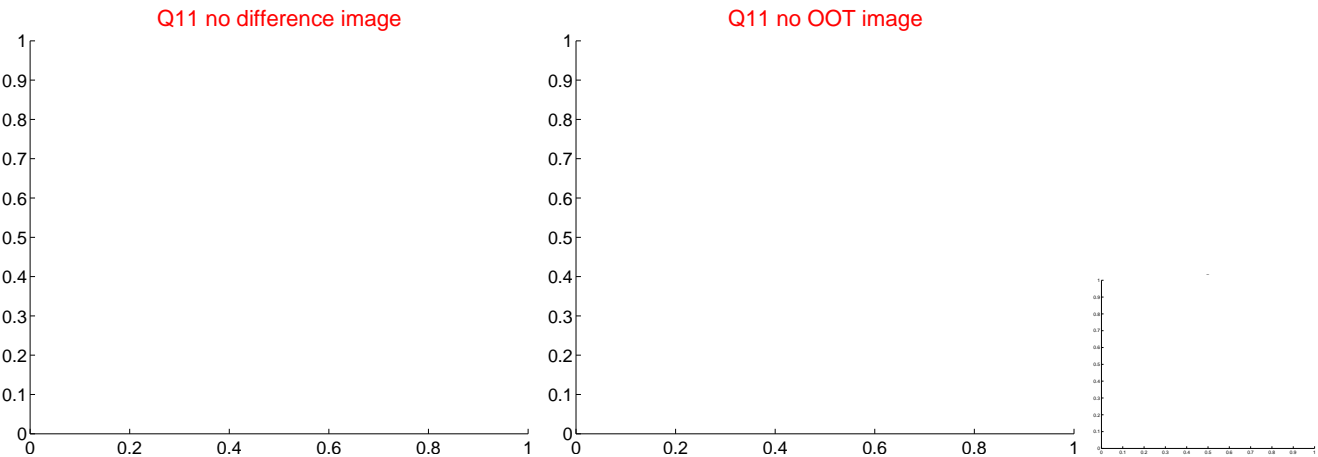
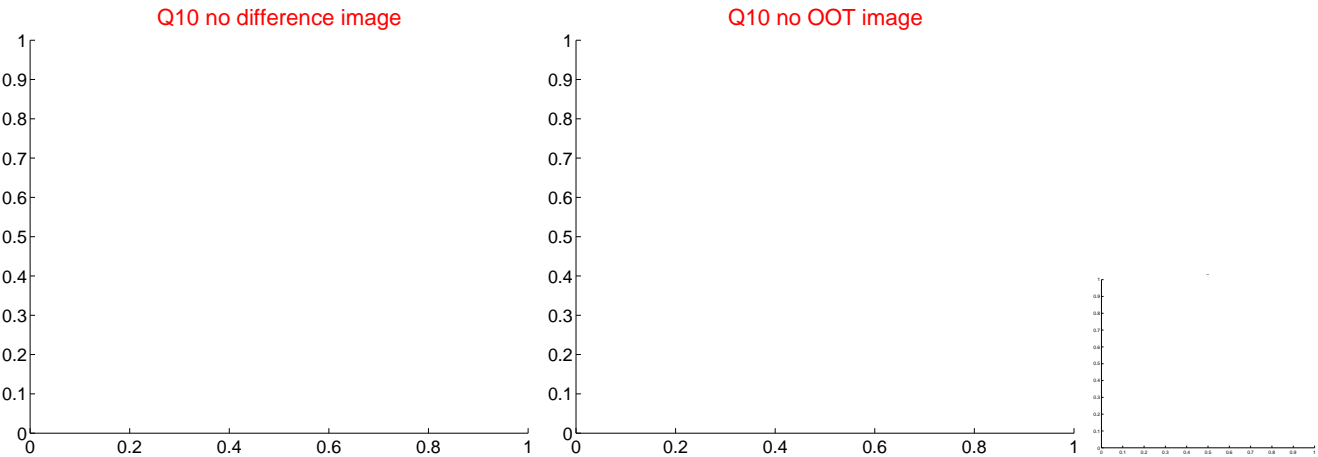
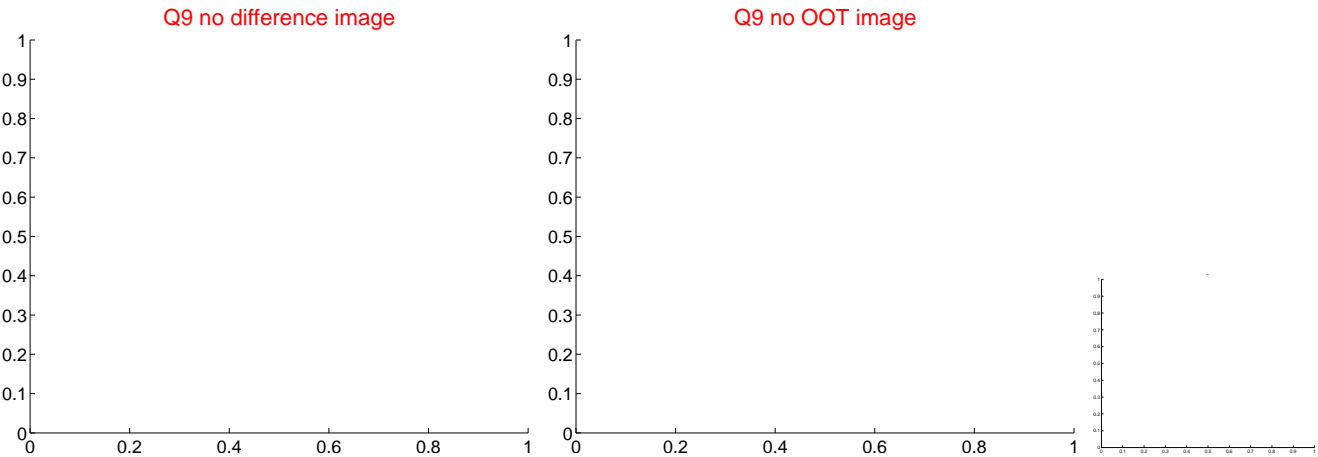
Q4 no OOT image



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

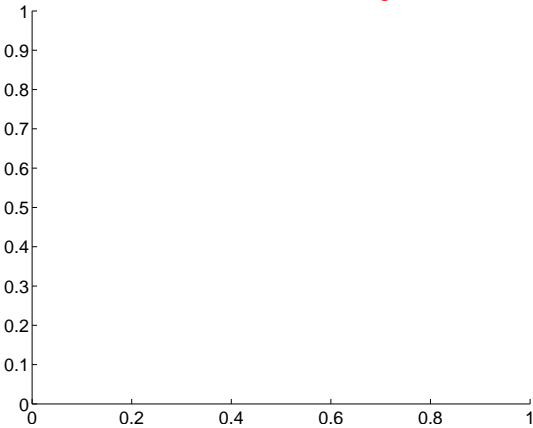


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

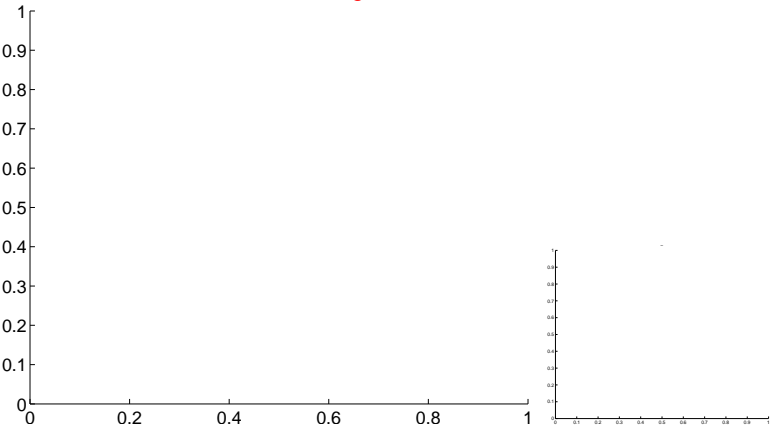


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

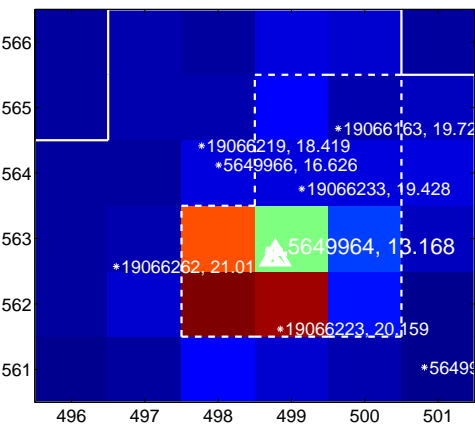
Q13 no difference image



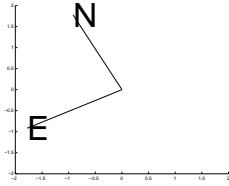
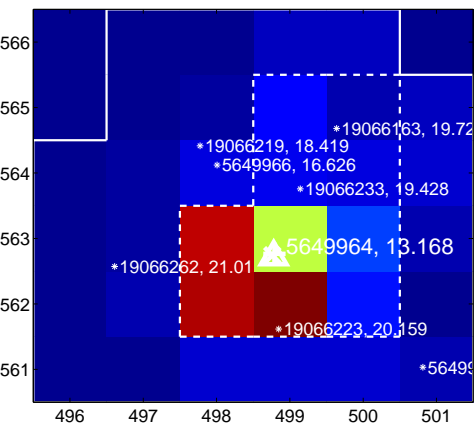
Q13 no OOT image



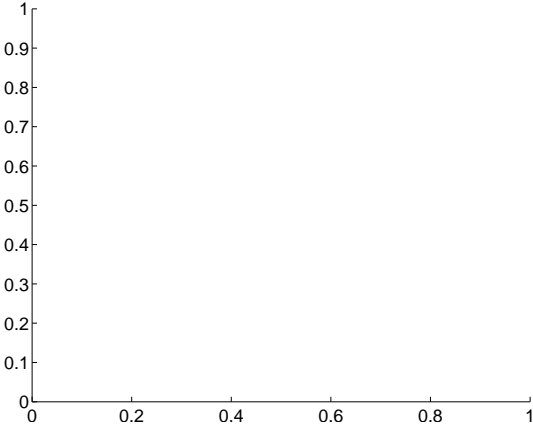
Q14 difference image



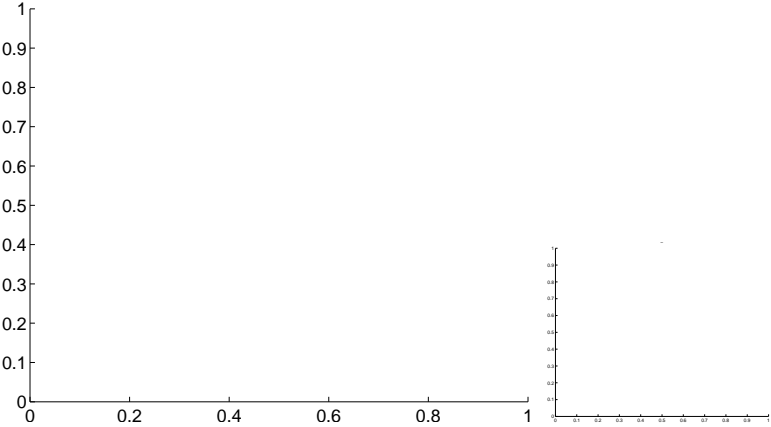
Q14 OOT image



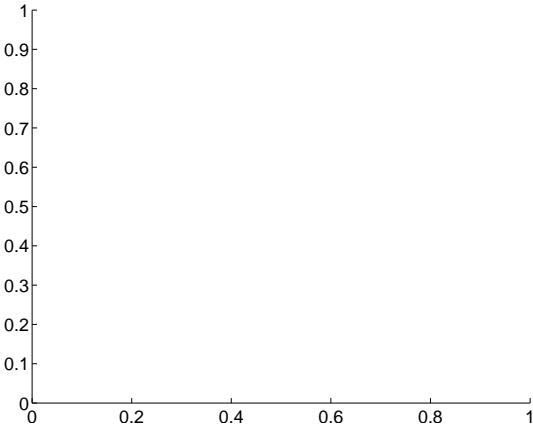
Q15 no difference image



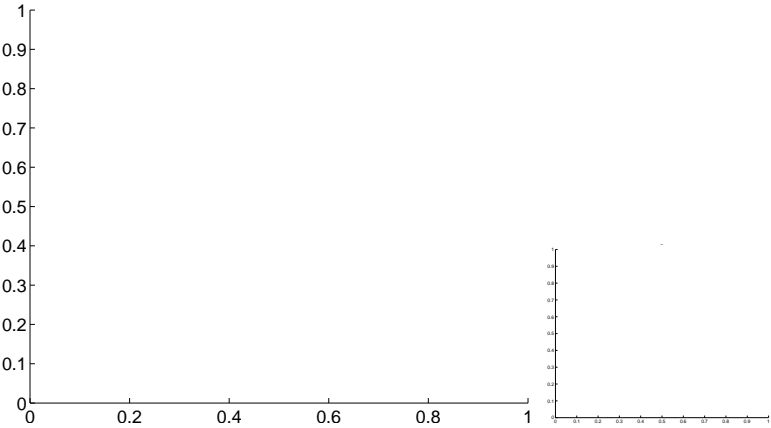
Q15 no OOT image



Q16 no difference image

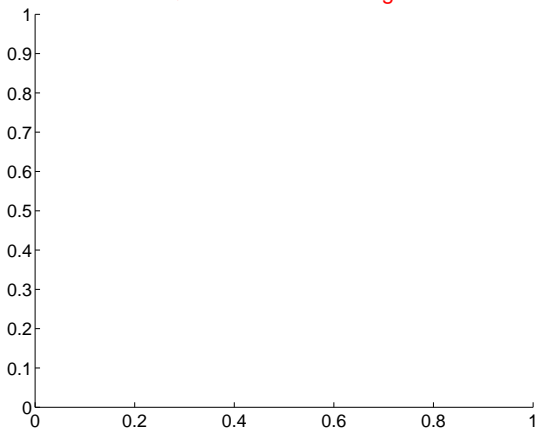


Q16 no OOT image

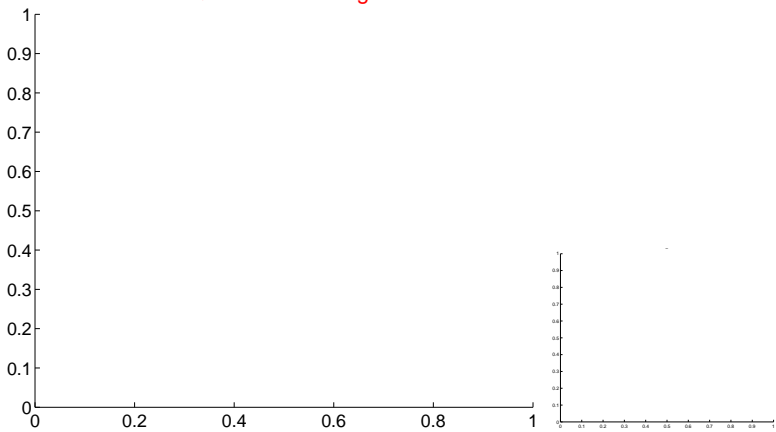


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

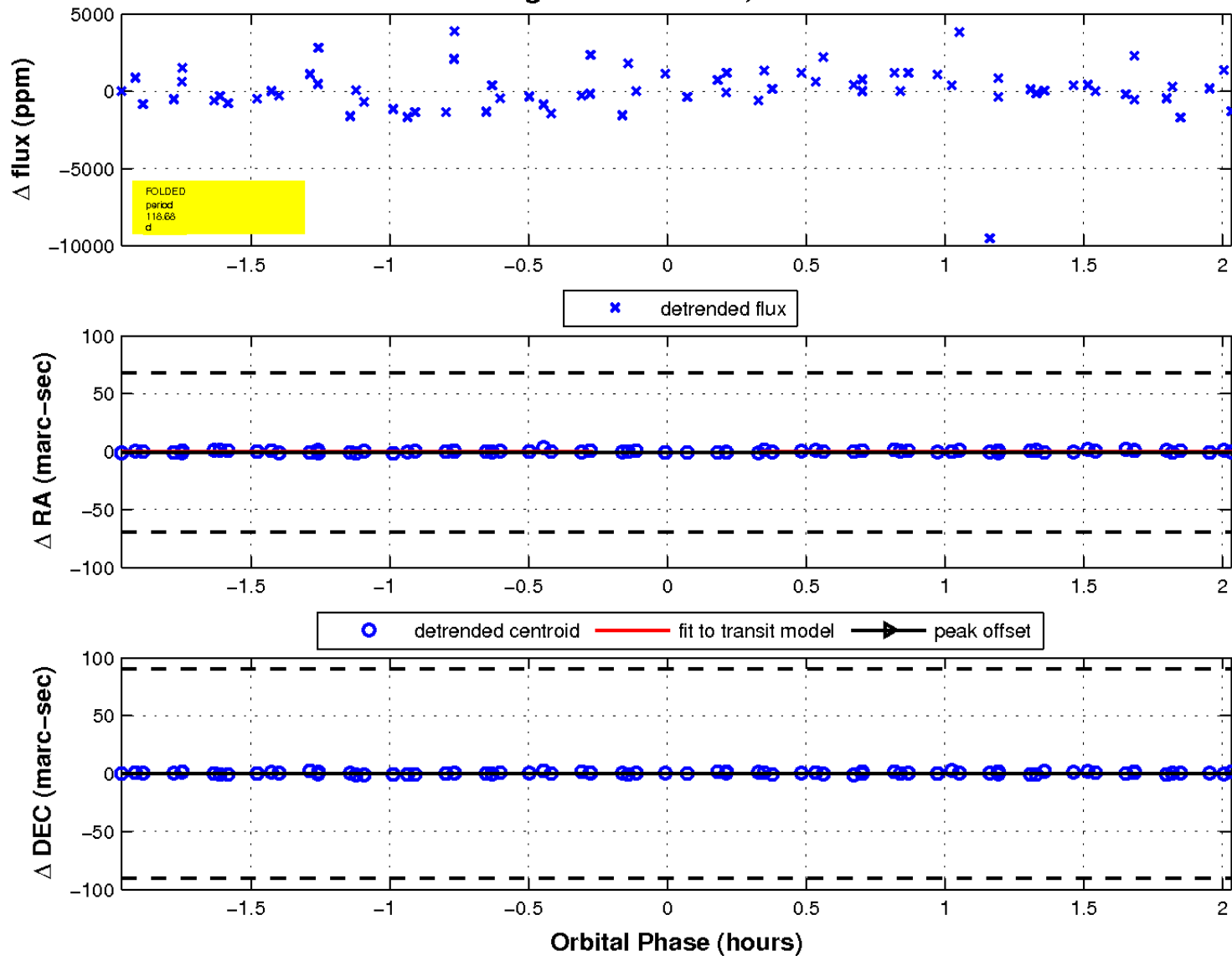
Q17 no difference image



Q17 no OOT image



fluxWeightedCentroids, Planet 4 of 4



UKIRT Image

Declination

