

# KIC 002168420

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
002168420-01	OBS	No	0.951969	131.864783	105.7	6.526	11.9	13.4	2.28	8026	2.37	34802.03
002168420-02	OBS	No	30.058510	150.331597	832.2	3.137	9.0	8.9	2.28	8026	7.15	348.72
002168420-03	OBS	No	39.645817	133.958759	1315.9	1.235	9.0	8.2	2.28	8026	8.89	241.09

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
002168420-01	OBS	FP	0.00	1	0	0	0	LPP_DV
002168420-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT
002168420-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—MOD_NONUNIQ_DV—MOD_TER_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.

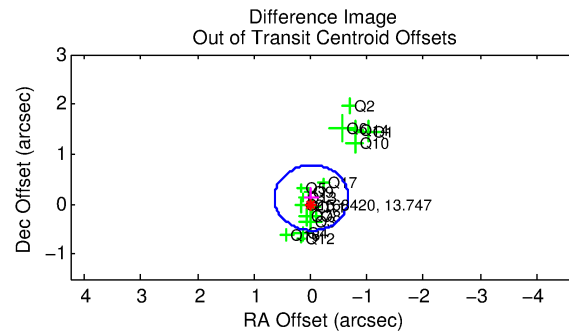
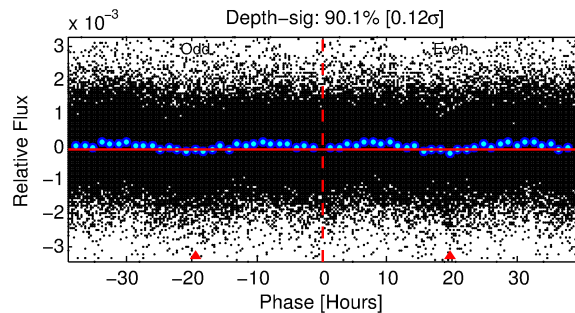
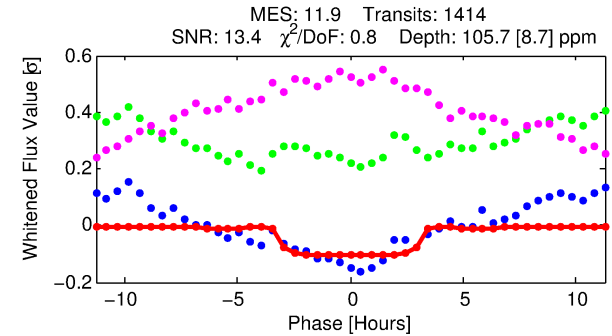
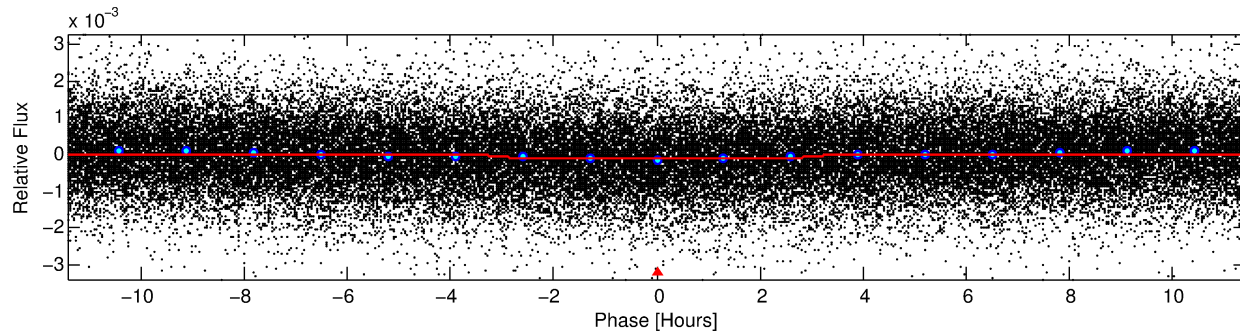
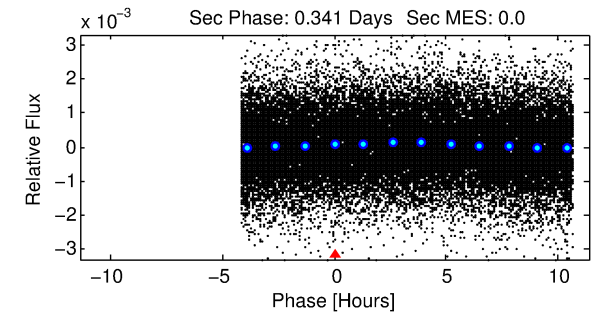
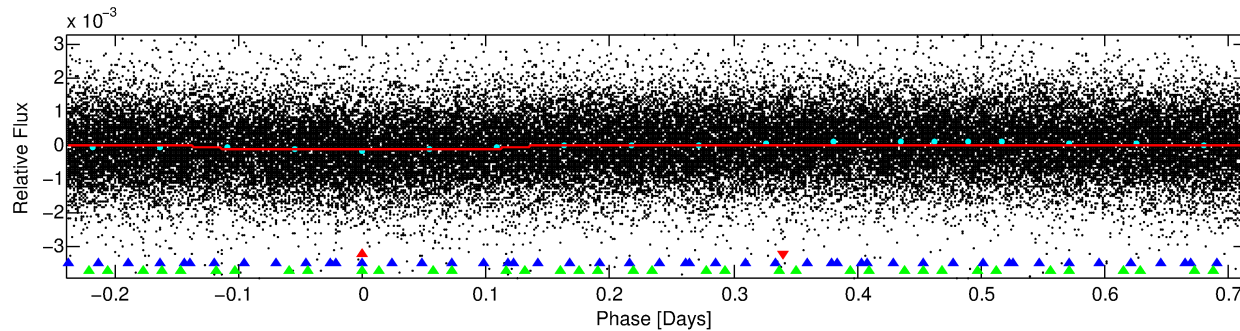
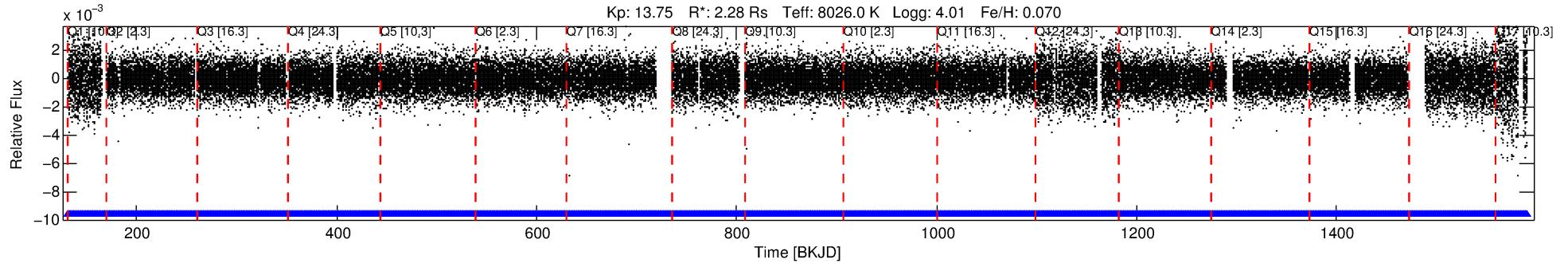
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 002168420-01

No Significant Match Found

# DV One-Page Summary

KIC: 2168420 Candidate: 1 of 3 Period: 0.952 d



## DV Fit Results:

Period = 0.95197 [0.00001] d  
Epoch = 131.8648 [0.0046] BKJD  
Rp/R\* = 0.0095 [0.0134]  
a/R\* = 1.29 [4.24]  
b = 0.01 [609.36]  
Seff = 34802.03 [13658.26]  
Teff = 3483 [342] K  
Rp = 2.37 [3.40] Re  
a = 0.0236 [0.0056] AU  
Ag = N/A  
Teffp = N/A

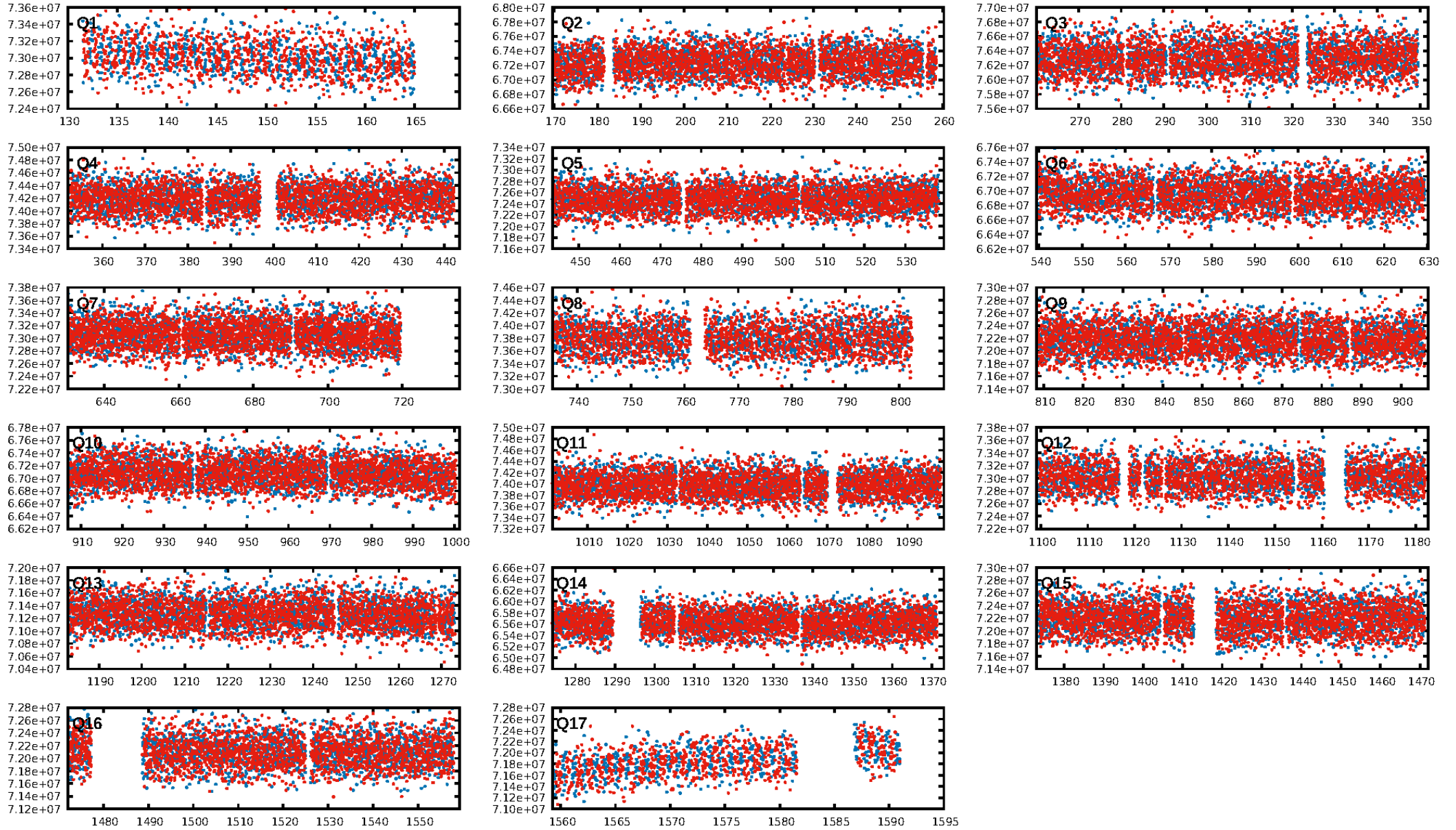
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 100.0% [96.48σ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: 4.78e-16  
RollingBand-fgt: 1.00 [1351/1351]  
GhostDiagnostic-chr: 1.364  
Centroid-sig: 3.4%  
Centroid-so: 0.464 arcsec [1.80σ]  
OotOffset-rm: 0.127 arcsec [0.58σ]  
KicOffset-rm: 0.217 arcsec [1.01σ]  
OotOffset-st: 4/4/4/5 [17]  
KicOffset-st: 4/4/4/5 [17]  
DiffImageQuality-fgm: 1.00 [17/17]  
DiffImageOverlap-fno: 1.00 [17/17]

Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 30-Jan-2016 13:01:05 Z

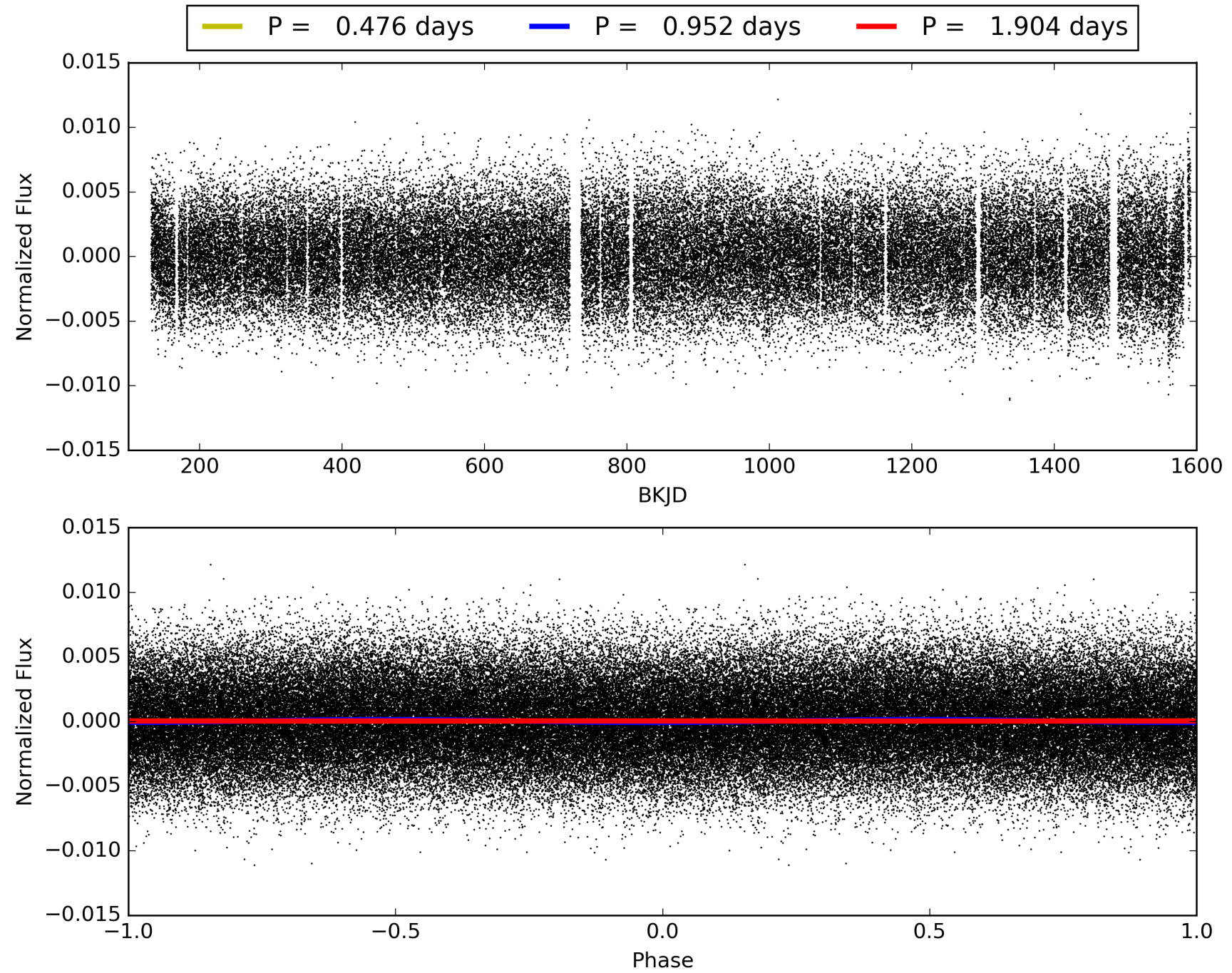
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

# TCE 002168420-01, PDC Light Curves





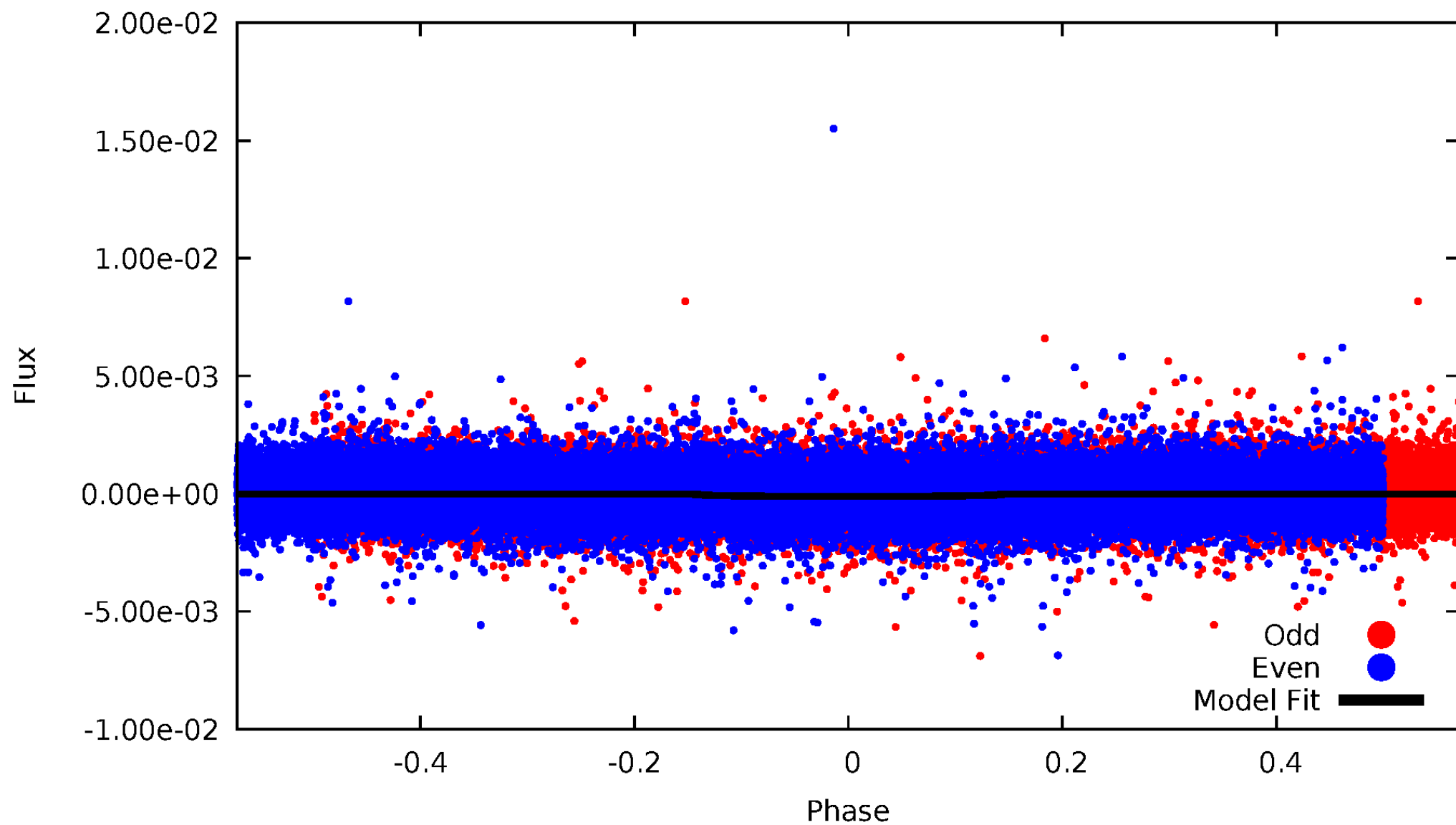
TCE 002168420-01





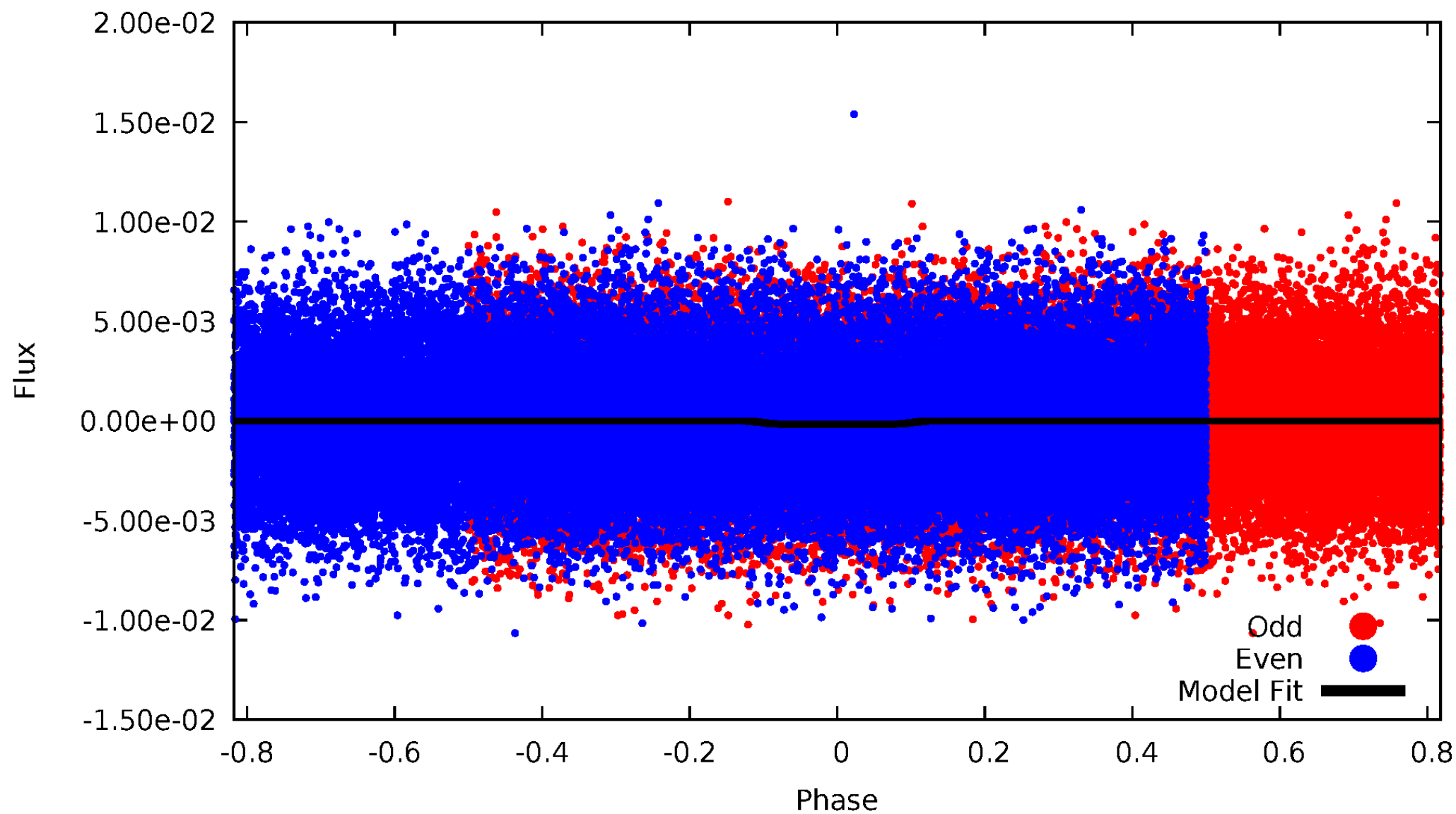
# DV Odd/Even

TCE 002168420-01



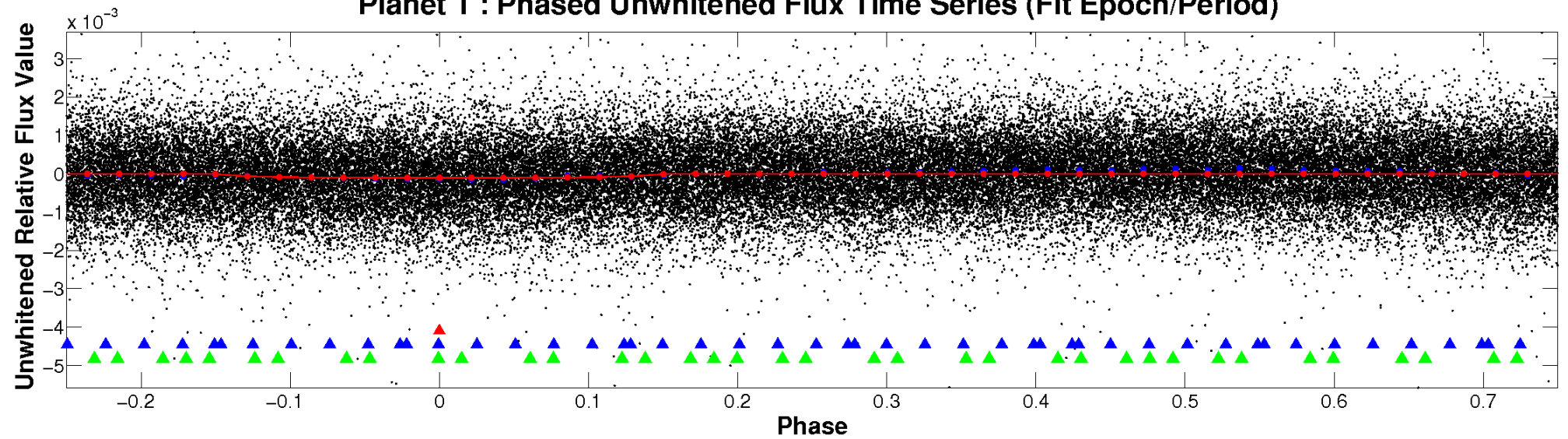
# ALT Odd/Even

TCE 002168420-01

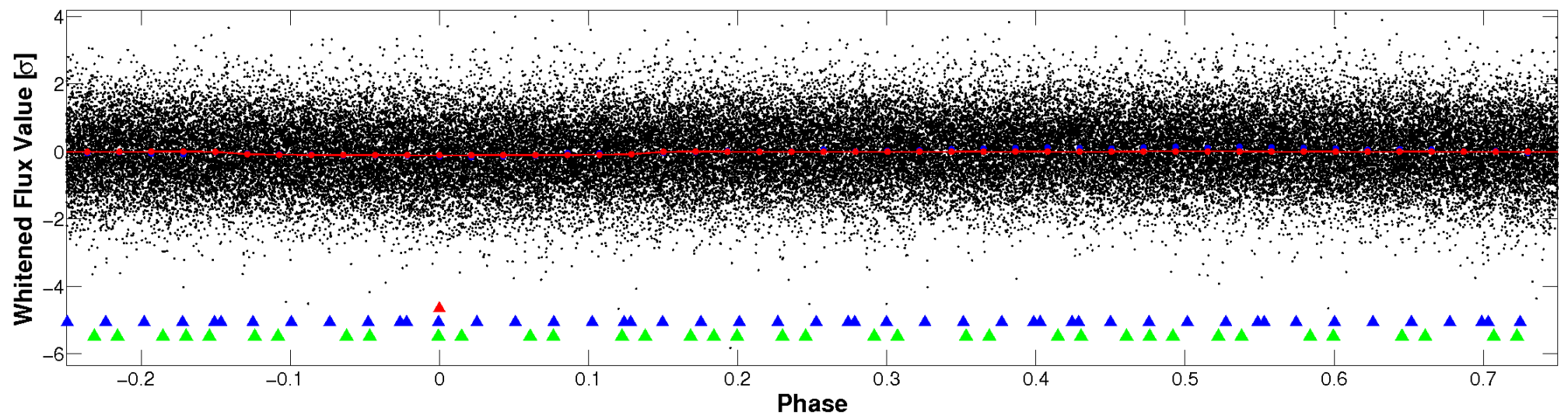


# Non-Whitened Vs. Whitened Light Curve

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



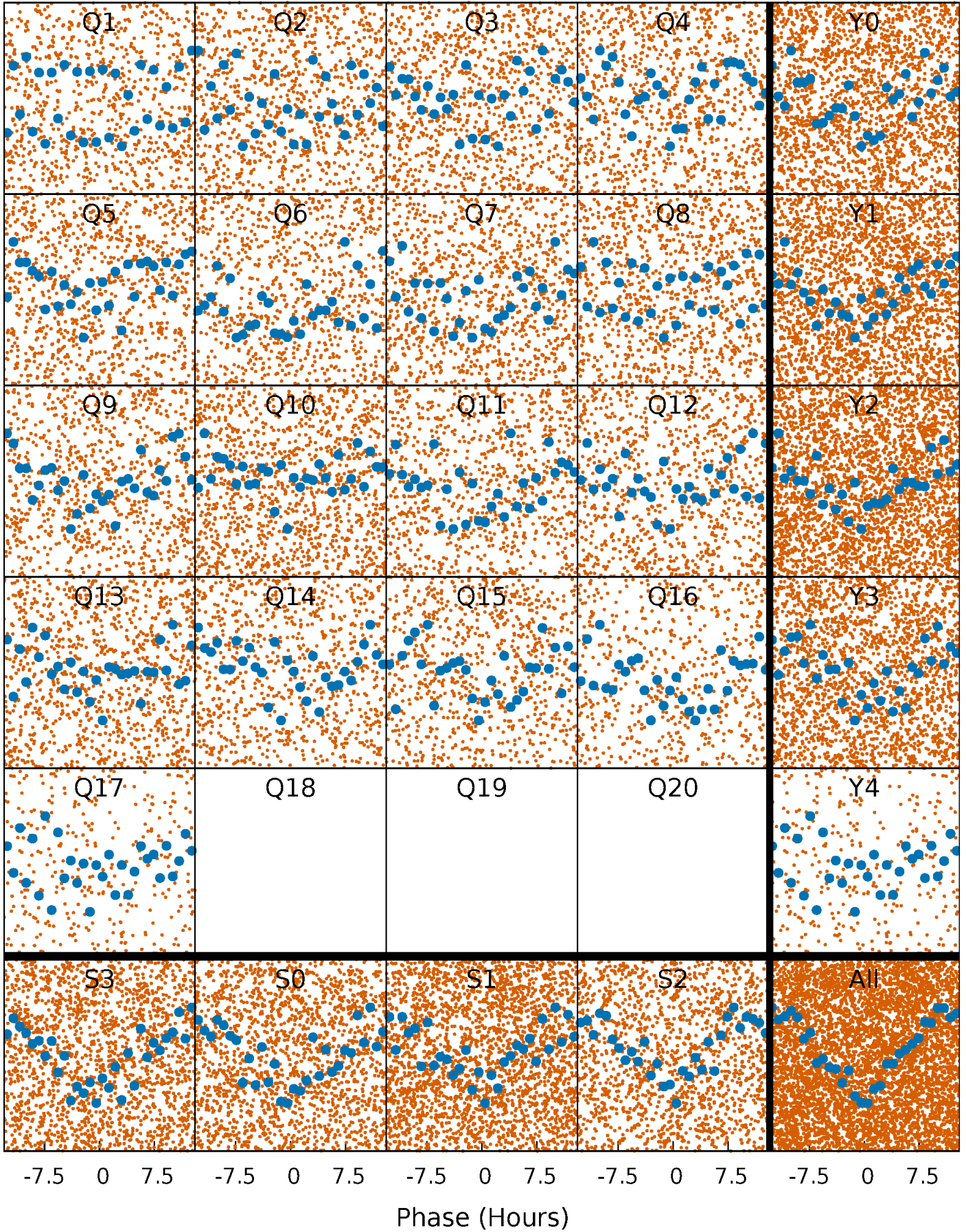
## Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)





# PDC Quarter-Phased Transit Curves

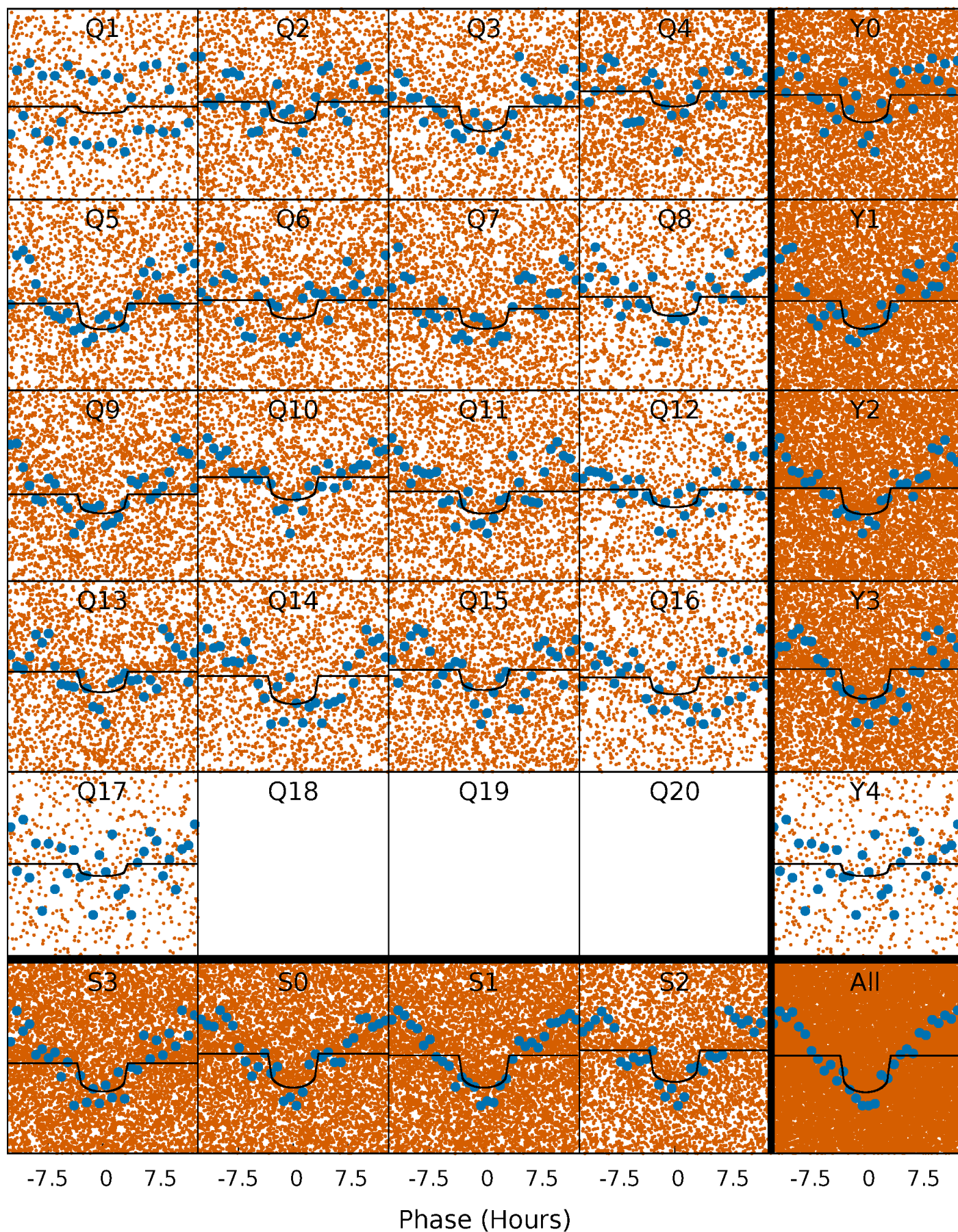
TCE 002168420-01 P= 0.951969 Days  $T_0=131.864783$  (BKJD)





# DV Quarter-Phased Transit Curves

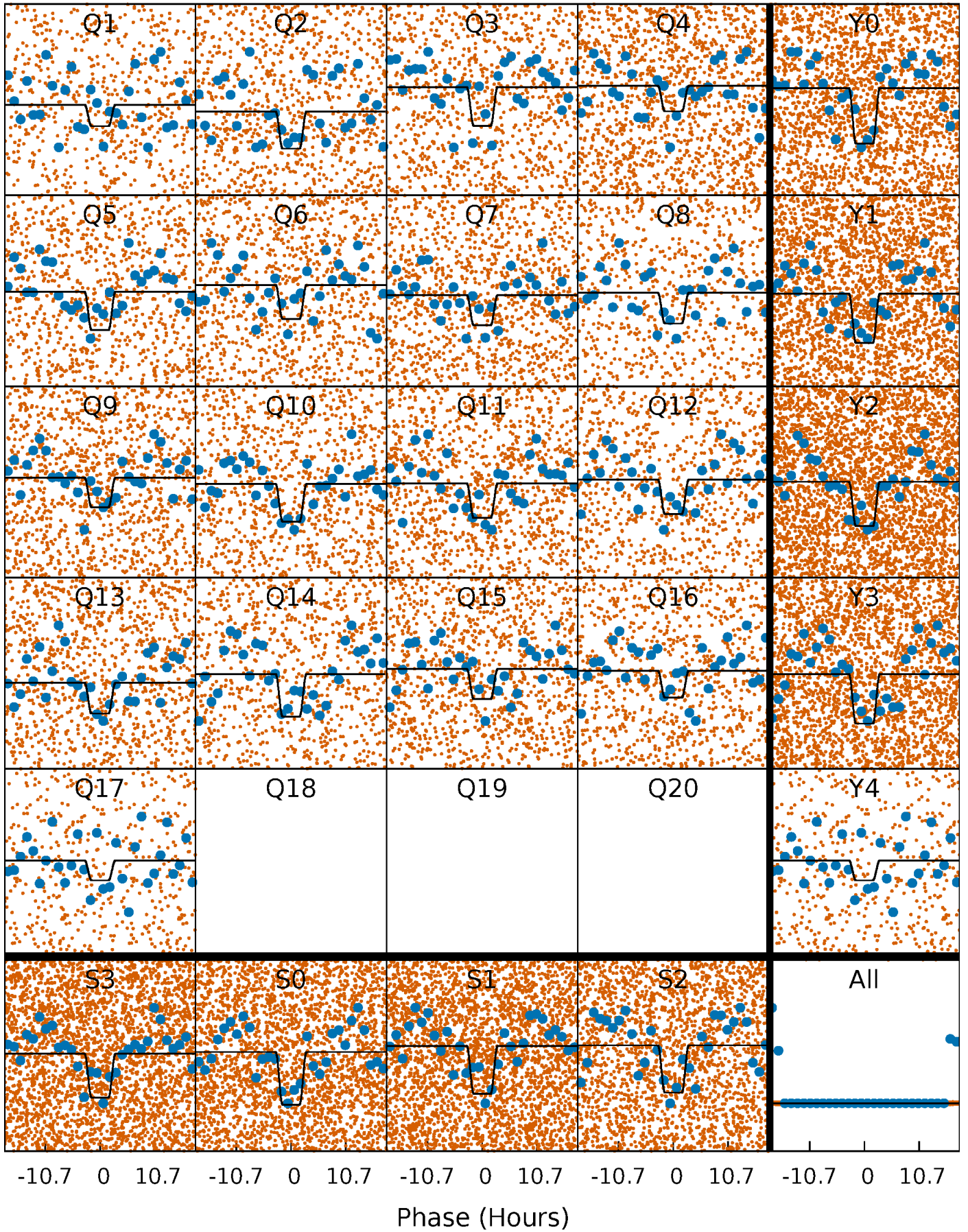
TCE 002168420-01 P= 0.951969 Days  $T_0=131.864783$  (BKJD)





# Alt. Detrend Quarter-Phased Transit Curves

TCE 002168420-01 P= 0.951916 Days  $T_0=131.894042$  (BKJD)

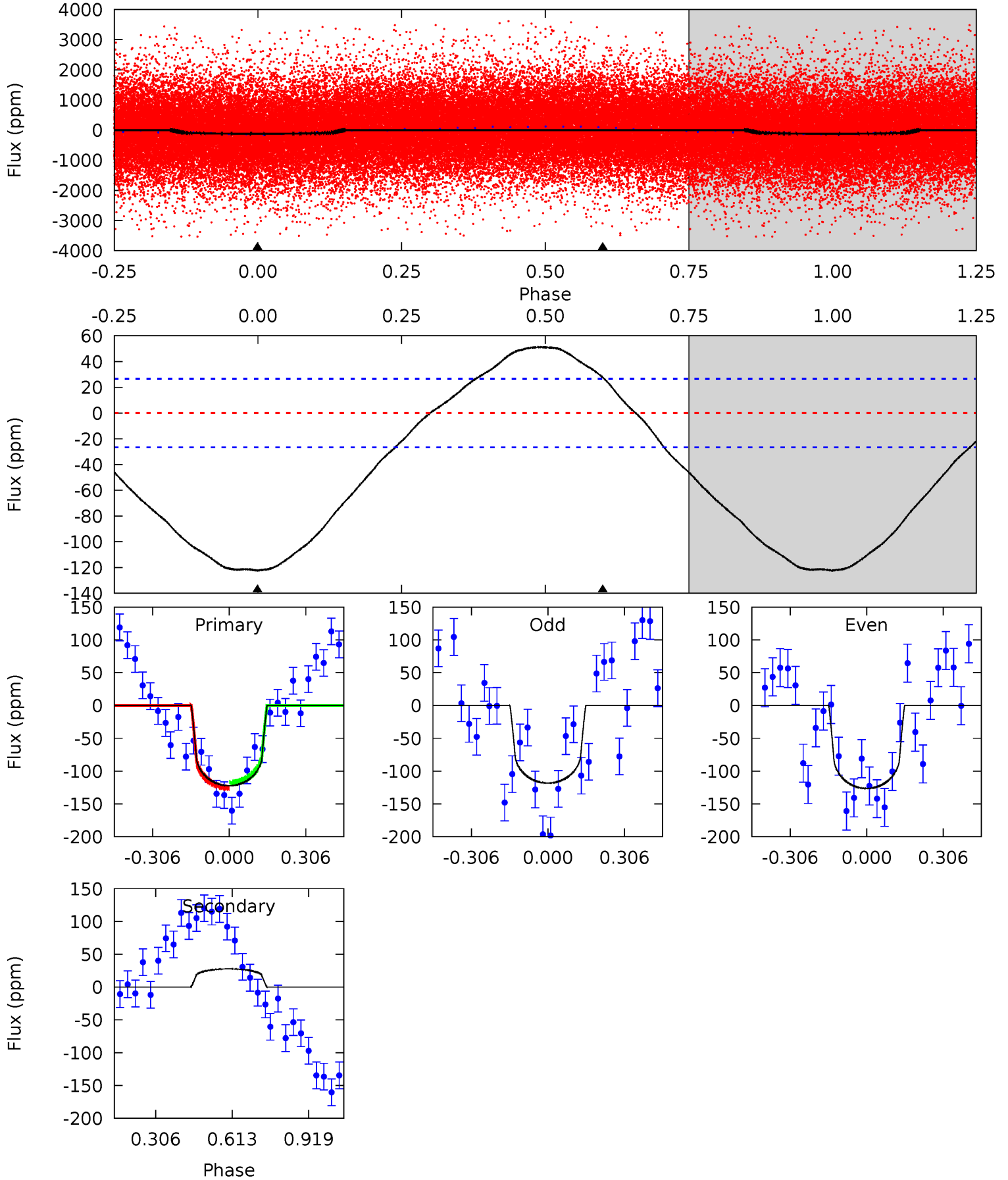




# DV Model-Shift Uniqueness Test

002168420-01, P = 0.951969 Days, E = 130.912814 Days

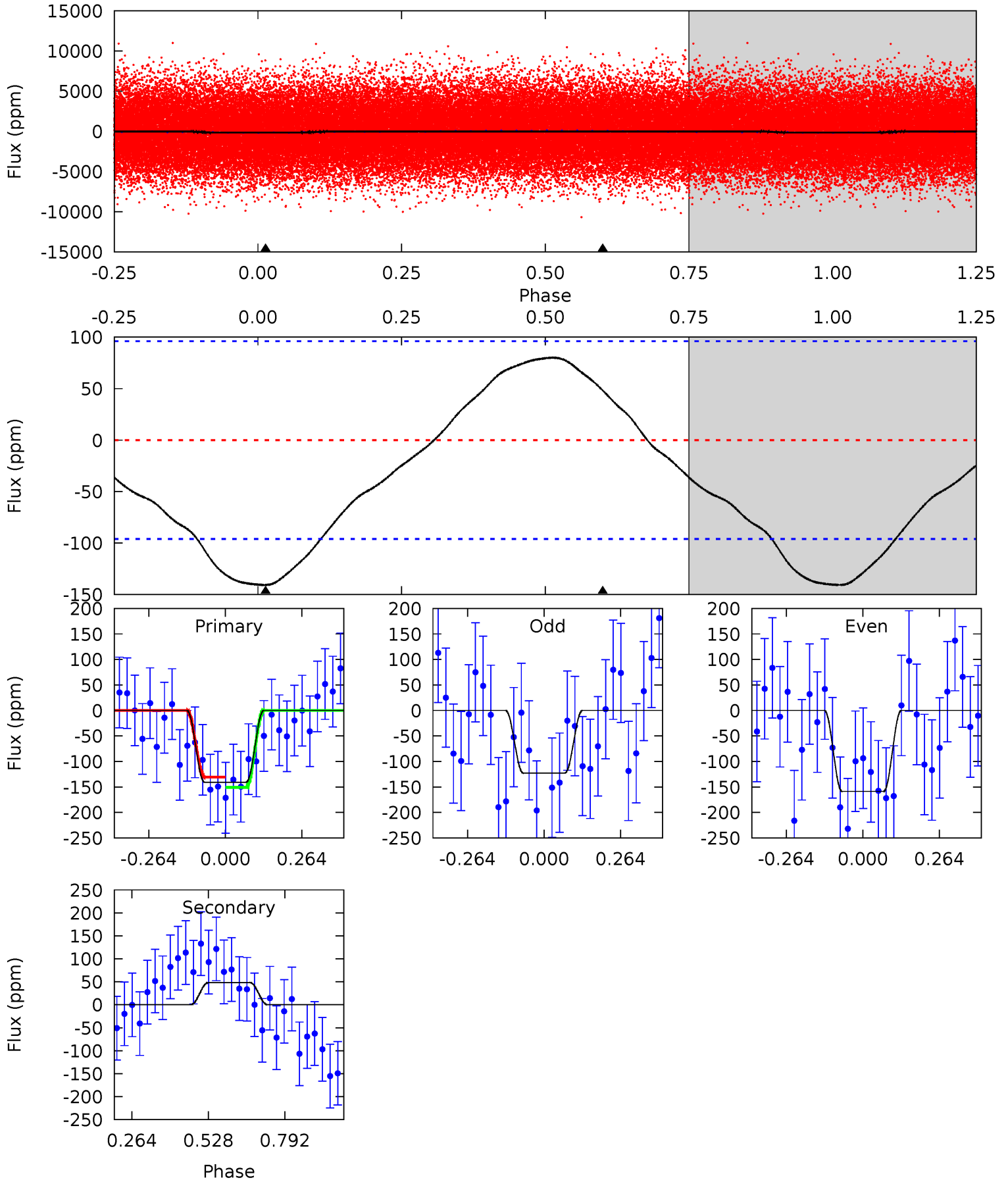
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
19.9	-4.50	0	0	4.32	1.02	1.79	19.9	19.9	-4.50	-4.50	0.68	1.06	0.30	0.61



# Alt Model-Shift Uniqueness Test

002168420-01, P = 0.951916 Days, E = 130.942126 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
6.39	-2.19	0	0	4.36	1.12	0.70	6.39	6.39	-2.19	-2.19	0.81	1.02	0.36	0.46



### Stellar Parameters For KIC 002168420

	$T_{\text{eff}}(K)$	$\log(g)$	$[\text{Fe}/\text{H}]$	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$8026^{+223}_{-335}$	$4.007^{+0.198}_{-0.132}$	$0.070^{+0.250}_{-0.450}$	$2.282^{+0.472}_{-0.629}$	$1.929^{+0.247}_{-0.401}$	$0.229^{+0.254}_{-0.089}$
	+3%/-4%	+5%/-3%	+357%/-643%	+21%/-28%	+13%/-21%	+111%/-39%
Source	KIC0	KIC0	KIC0	DSEP		

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

### Secondary Eclipse Parameters for KIC 002168420-01 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$28 \pm 6$	$3.52^{+2.89}_{-2.28}$	$4839^{+323}_{-350}$	$-5245^{+689}_{-3014}$	$-0.663^{+0.462}_{-4.789}$
Alt.	$48 \pm 22$	$3.94^{+3.08}_{-2.35}$	$4820^{+312}_{-347}$	$-5429^{+845}_{-2998}$	$-0.855^{+0.628}_{-4.840}$

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



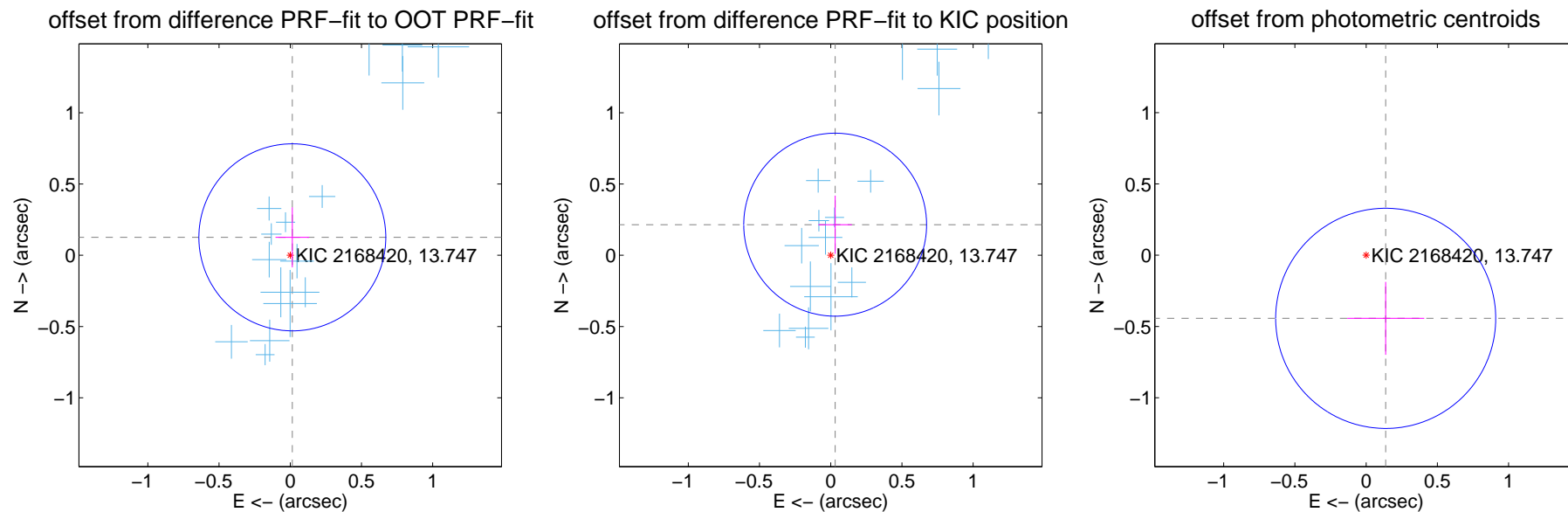
## DV Centroid Data

Supplemental centroid analysis for 002168420-01. Kepler magnitude: 13.75. Transit SNR 13.35

There are 17 quarters with good PRF difference image offsets

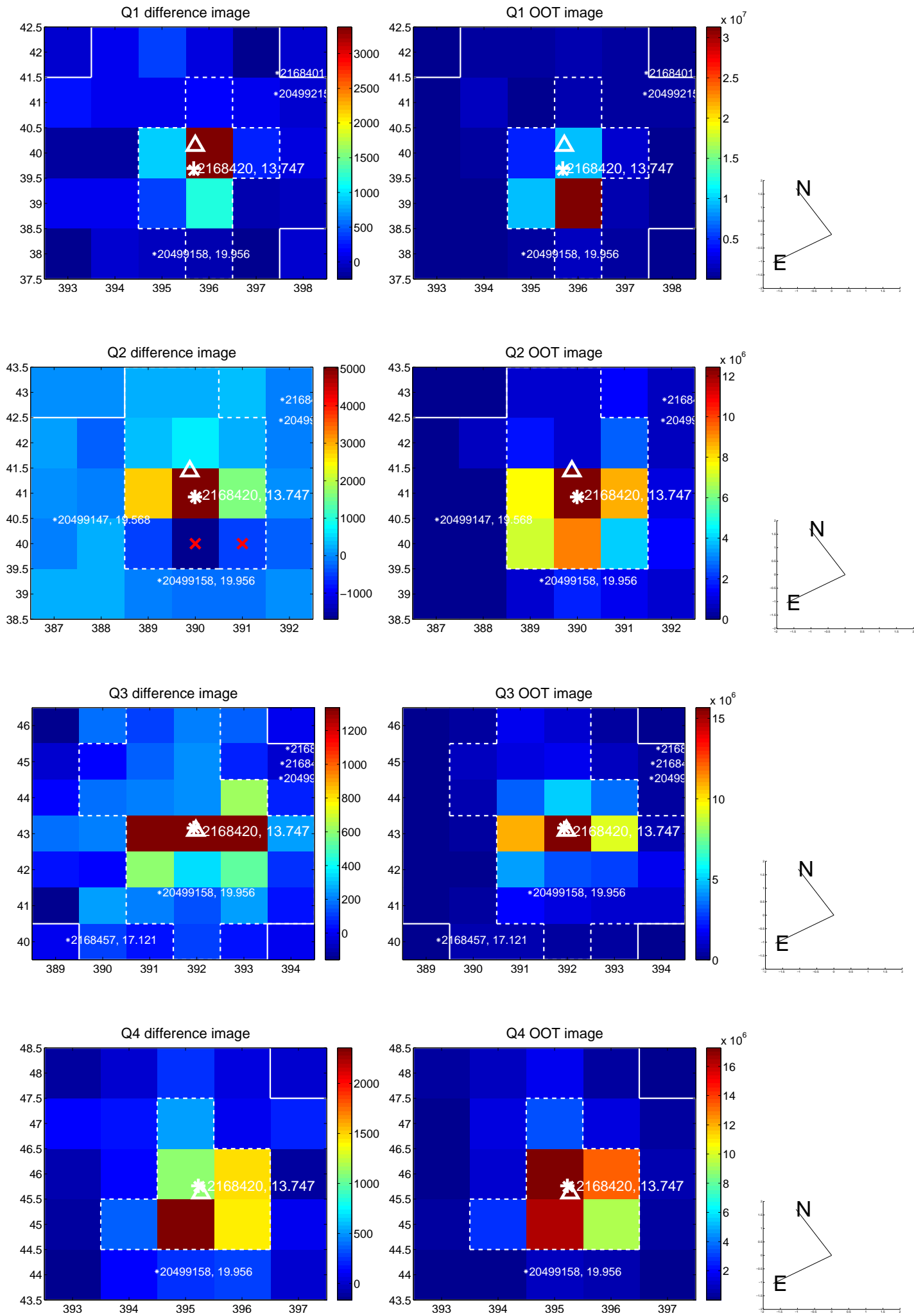
The direct PRF centroid is offset from the target star catalog position by about 0.12 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.127 \pm 0.219$	0.58	$-0.015 \pm 0.118$	$0.126 \pm 0.211$
PRF-fit source offset from KIC position	$0.217 \pm 0.214$	1.01	$-0.031 \pm 0.118$	$0.215 \pm 0.204$
photometric centroid source offset	$0.46 \pm 0.26$	1.80	$-0.14 \pm 0.27$	$-0.44 \pm 0.26$

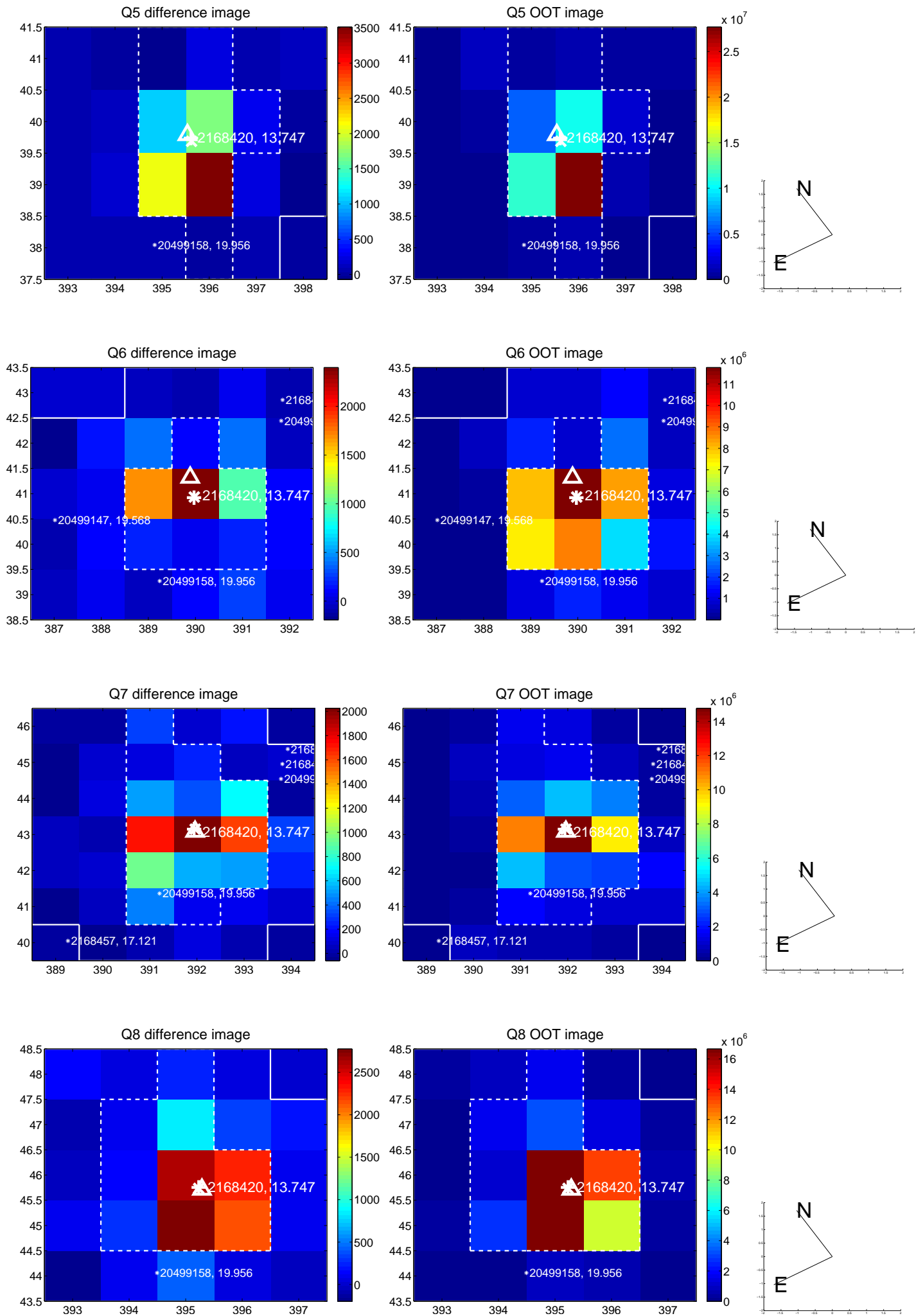


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses:** good quarterly centroid offsets; **Vermillion crosses:** bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

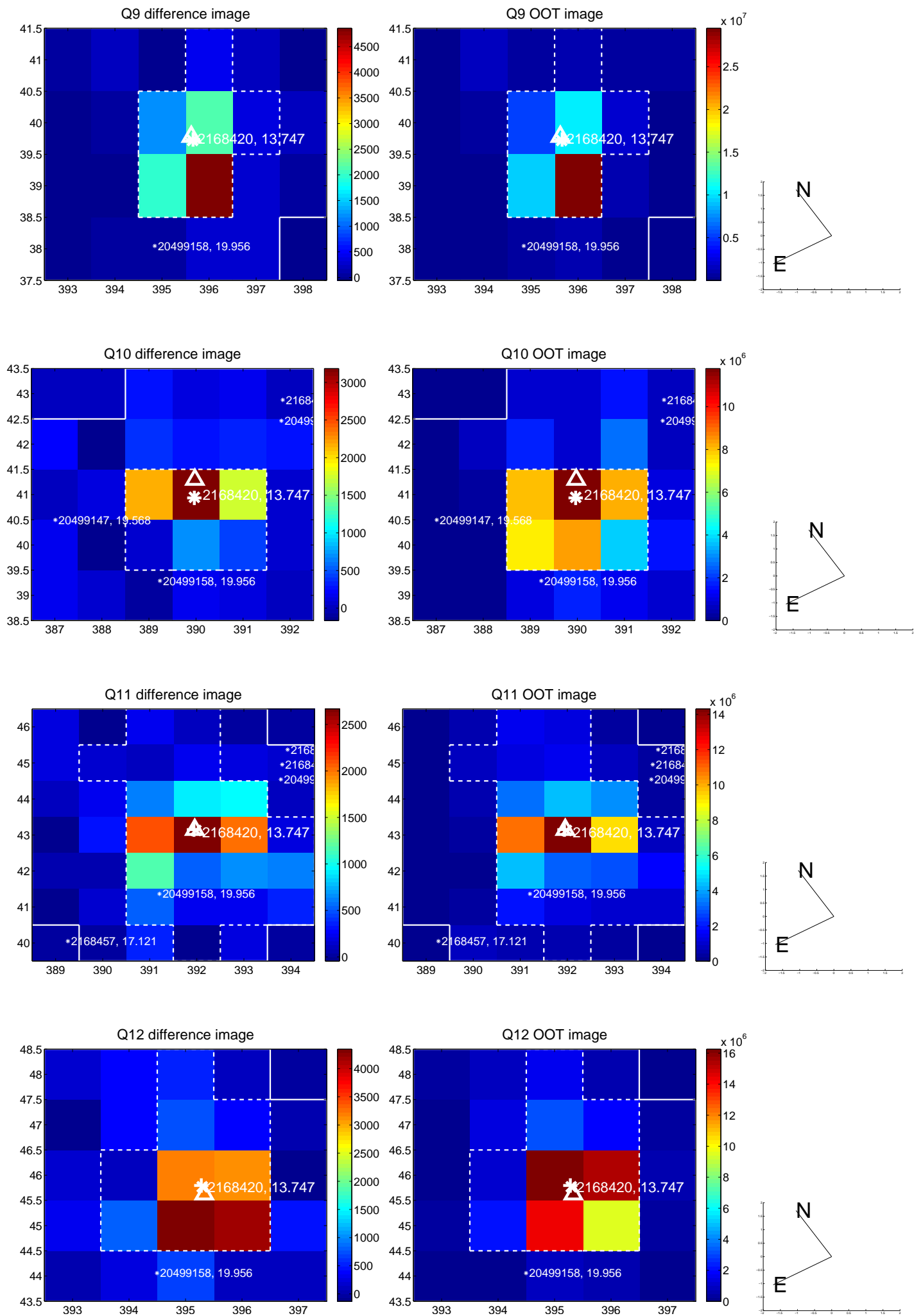


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

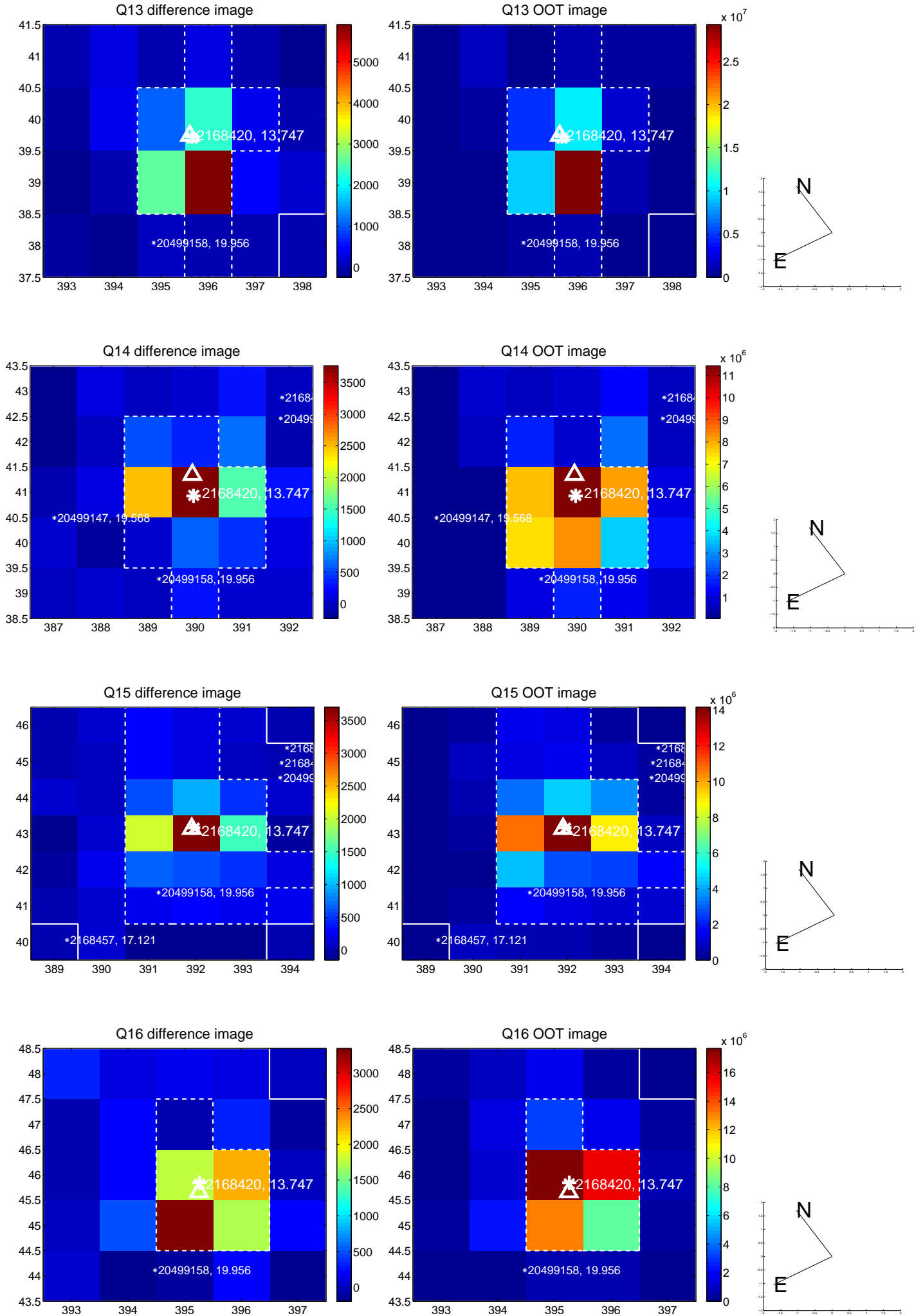




white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



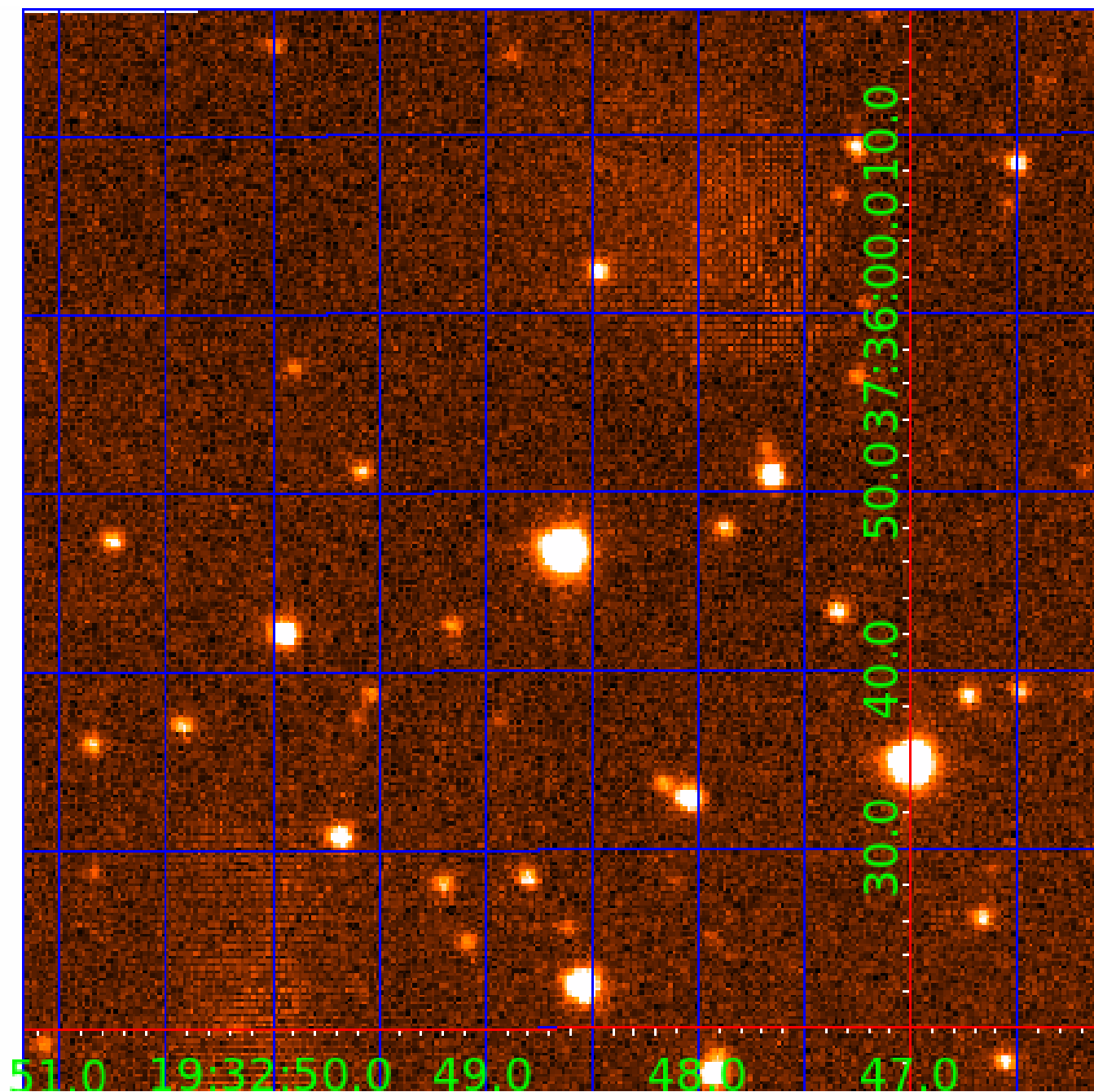
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.





UKIRT Image

Declination



# KIC 002168420

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
002168420-01	OBS	No	0.951969	131.864783	105.7	6.526	11.9	13.4	2.28	8026	2.37	34802.03
002168420-02	OBS	No	30.058510	150.331597	832.2	3.137	9.0	8.9	2.28	8026	7.15	348.72
002168420-03	OBS	No	39.645817	133.958759	1315.9	1.235	9.0	8.2	2.28	8026	8.89	241.09

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
002168420-01	OBS	FP	0.00	1	0	0	0	LPP_DV
002168420-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT
002168420-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—MOD_NONUNIQ_DV—MOD_TER_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.

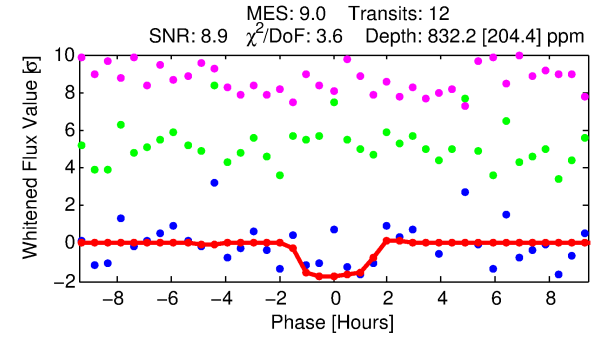
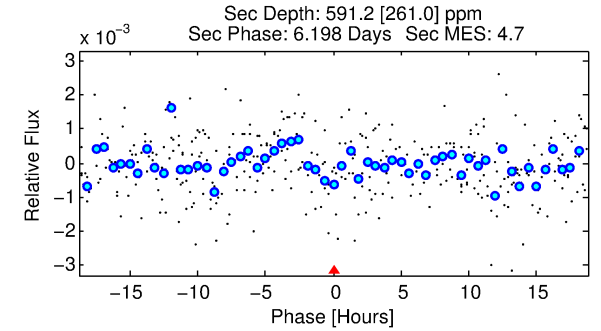
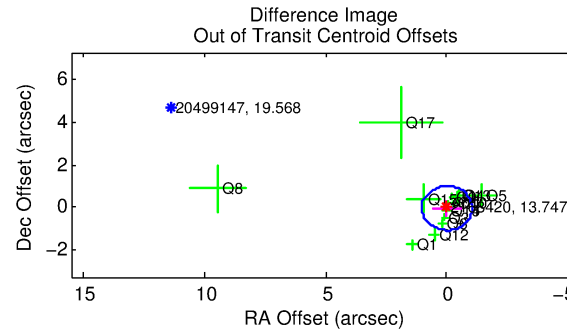
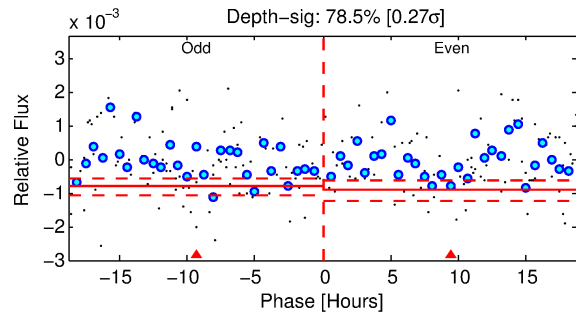
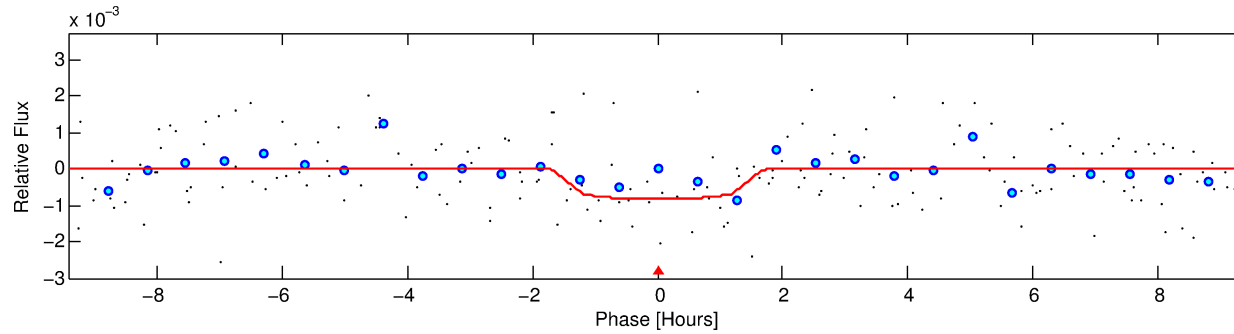
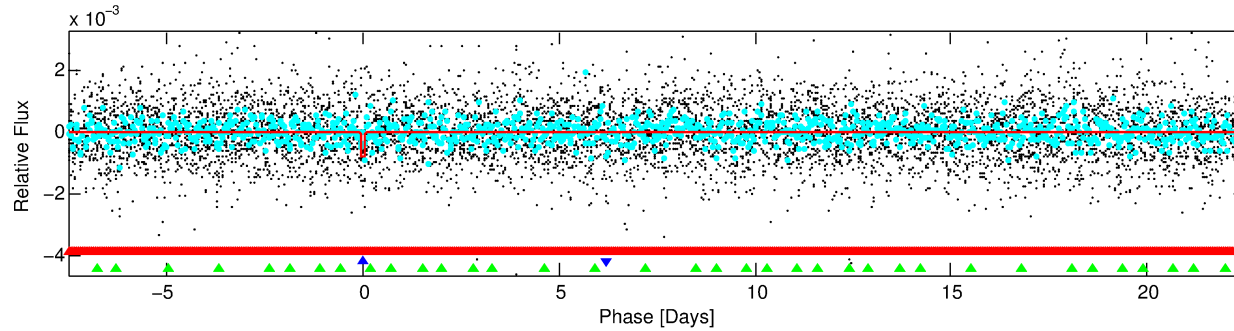
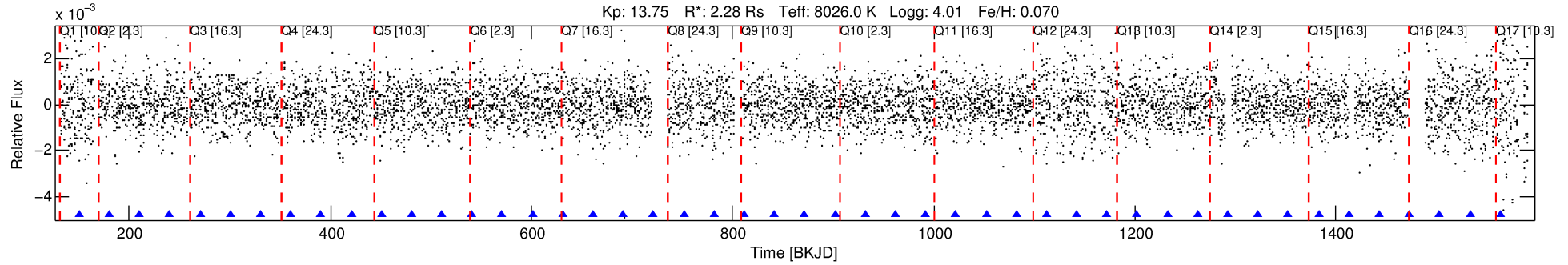
## Ephemeris Match Information For 002168420-02

No Significant Match Found



# DV One-Page Summary

KIC: 2168420 Candidate: 2 of 3 Period: 30.059 d



## DV Fit Results:

Period = 30.05851 [0.00057] d  
Epoch = 150.3316 [0.0157] BKJD  
Rp/R\* = 0.0287 [0.0311]  
a/R\* = 51.51 [321.67]  
b = 0.75 [3.67]  
Seff = 348.72 [136.86]  
Teq = 1102 [108] K  
Rp = 7.15 [8.00] Re  
a = 0.2356 [0.0562] AU  
Ag = 353.27 [792.21] [0.44 $\sigma$ ]  
Teffp = 7386 [4100] K [1.53 $\sigma$ ]

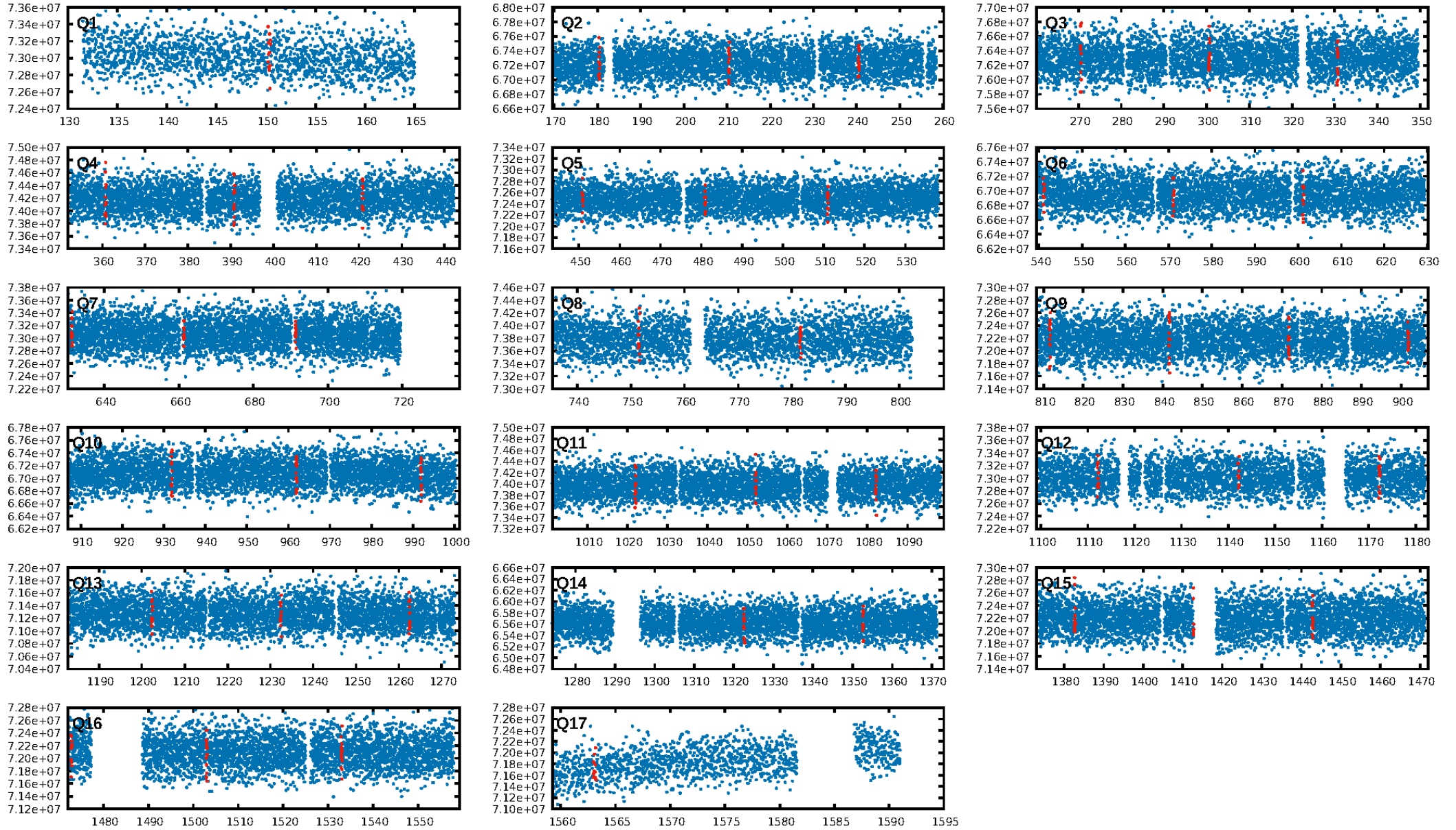
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [96.48 $\sigma$ ]  
LongPeriod-sig: 100.0% [68.25 $\sigma$ ]  
ModelChiSquare2-sig: 0.1%  
ModelChiSquareGof-sig: 49.3%  
Bootstrap-pfa: 2.86e-08  
RollingBand-fgt: 1.00 [10/10]  
GhostDiagnostic-chr: 0.2534  
Centroid-sig: 29.0%  
Centroid-so: 0.634 arcsec [2.36 $\sigma$ ]  
OotOffset-rm: 0.038 arcsec [0.11 $\sigma$ ]  
OotOffset-st: 3/3/4/5 [15]  
KicOffset-rm: 0.004 arcsec [0.01 $\sigma$ ]  
KicOffset-st: 3/3/4/5 [15]  
DiffImageQuality-fgm: 0.40 [6/15]  
DiffImageOverlap-fno: 0.06 [1/16]

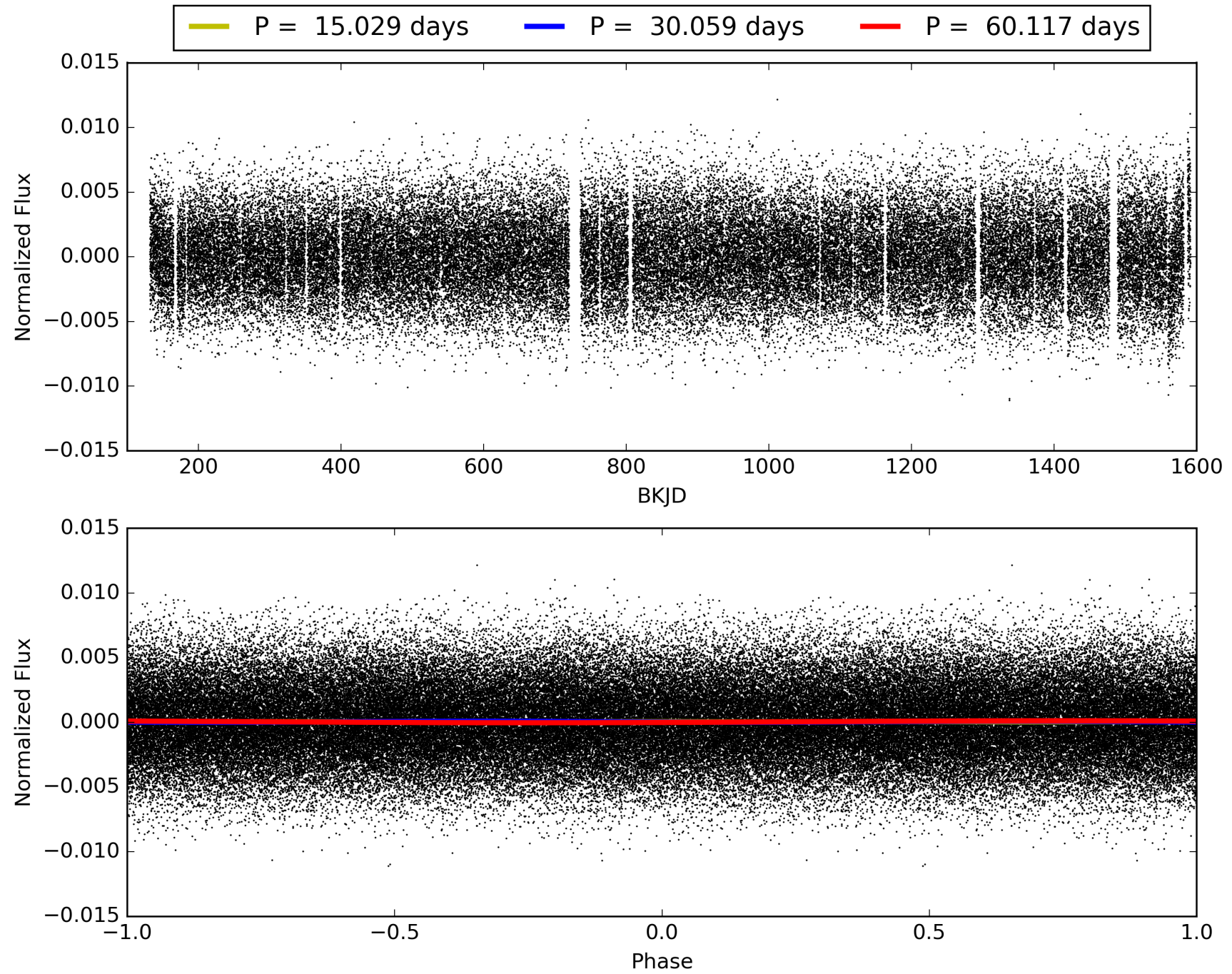
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 30-Jan-2016 13:01:16 Z

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

# TCE 002168420-02, PDC Light Curves

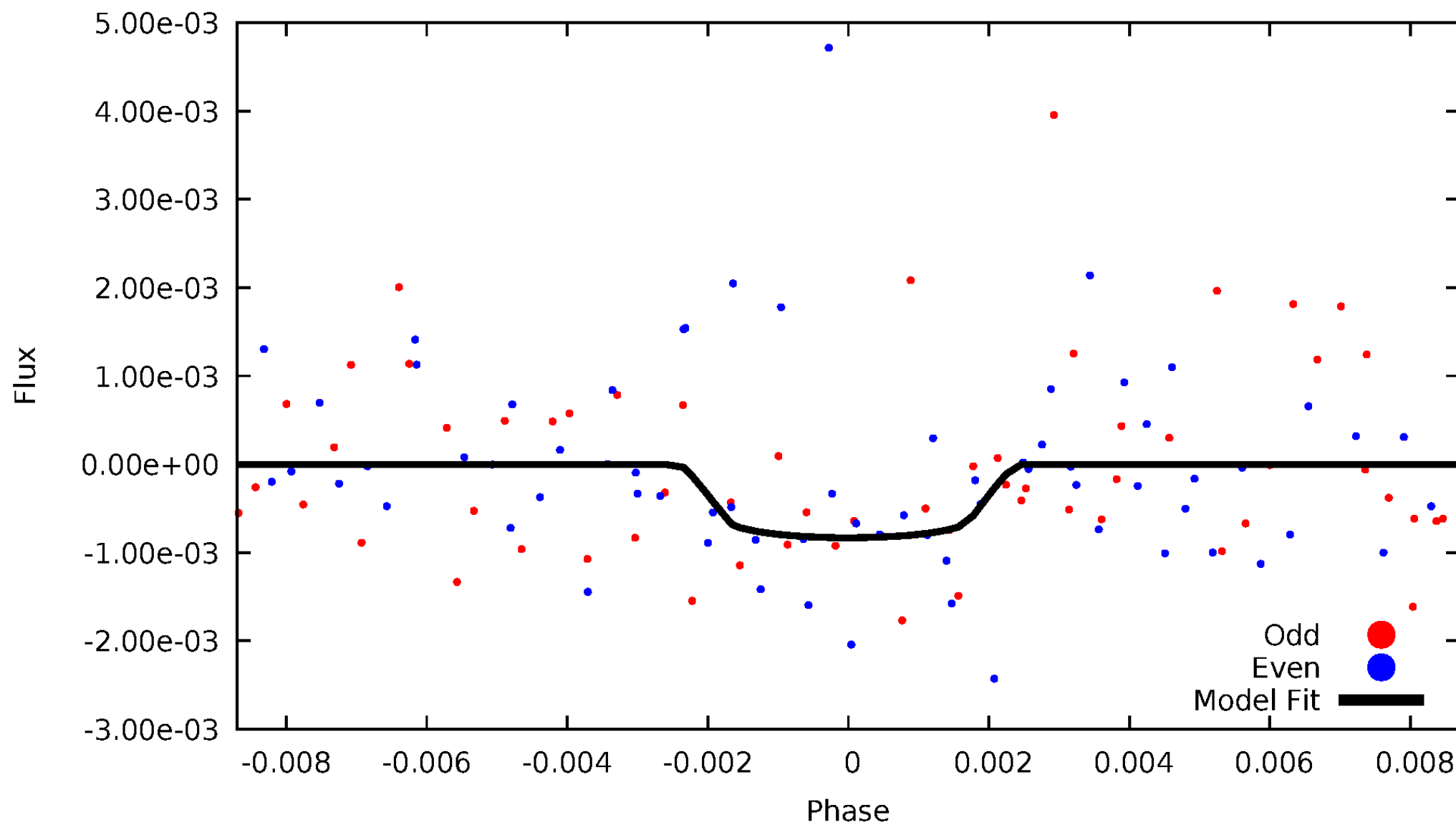


TCE 002168420-02



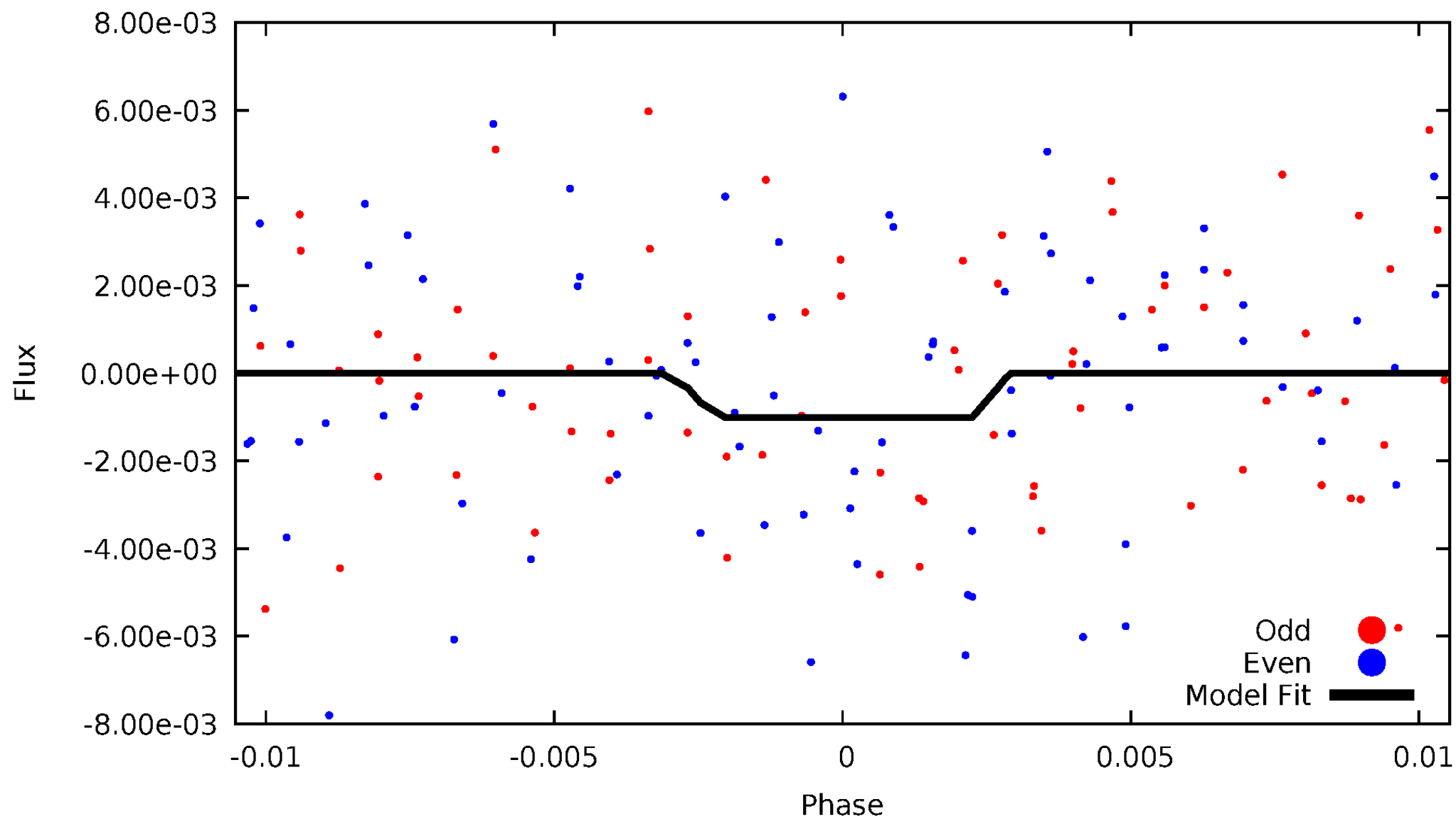
# DV Odd/Even

TCE 002168420-02



# ALT Odd/Even

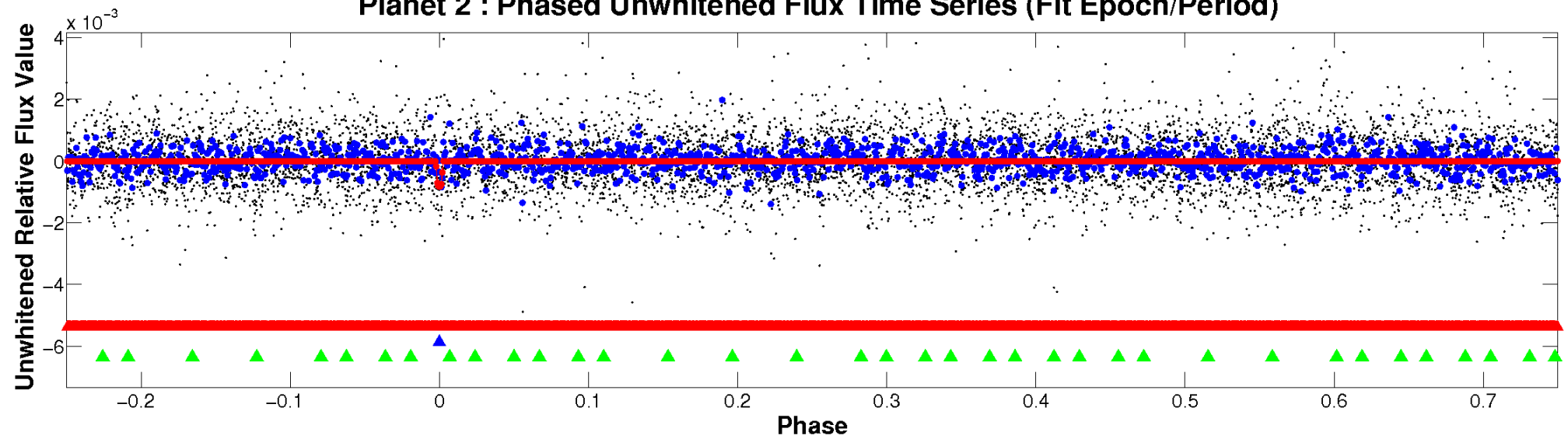
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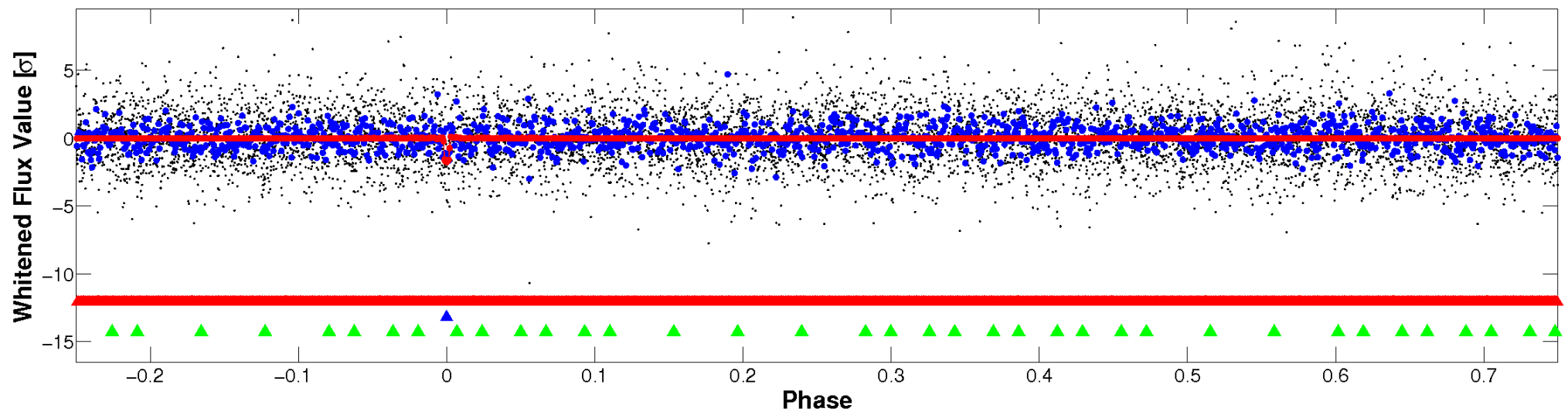


# Non-Whitened Vs. Whitened Light Curve

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

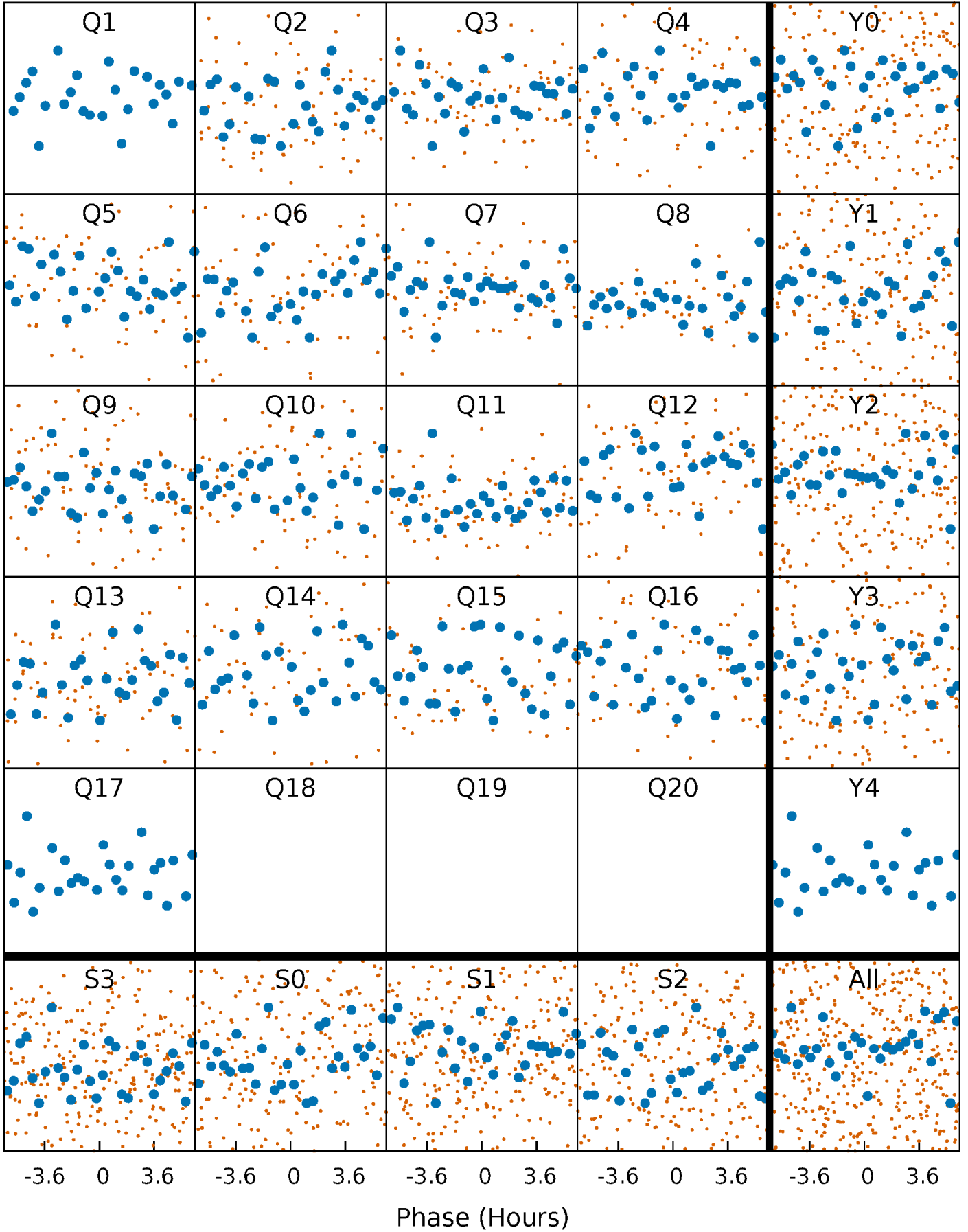


Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



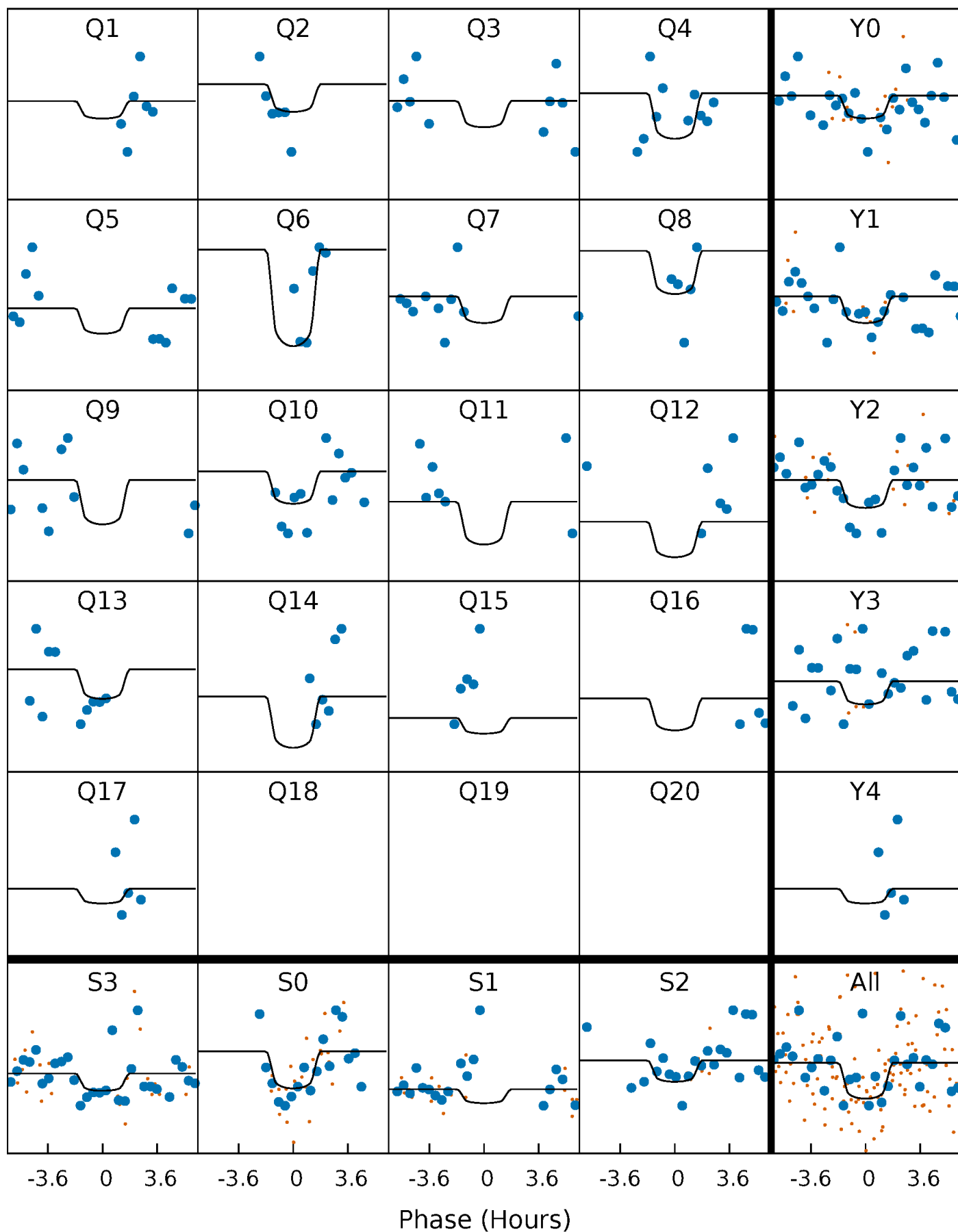
# PDC Quarter-Phased Transit Curves

TCE 002168420-02   P= 30.058510 Days    $T_0=150.331597$  (BKJD)



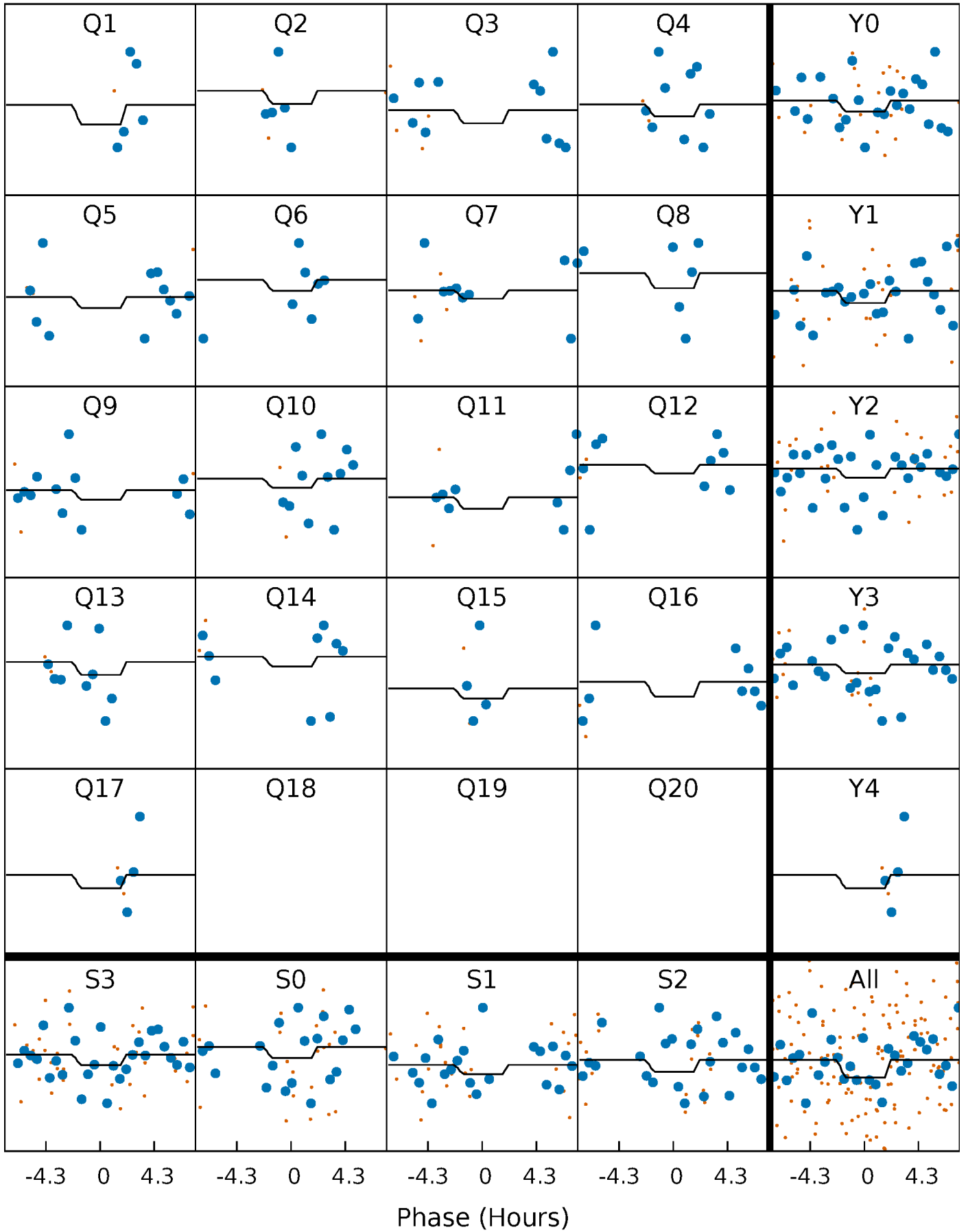
# DV Quarter-Phased Transit Curves

TCE 002168420-02   P= 30.058510 Days    $T_0=150.331597$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

TCE 002168420-02 P= 30.057946 Days  $T_0=150.326315$  (BKJD)

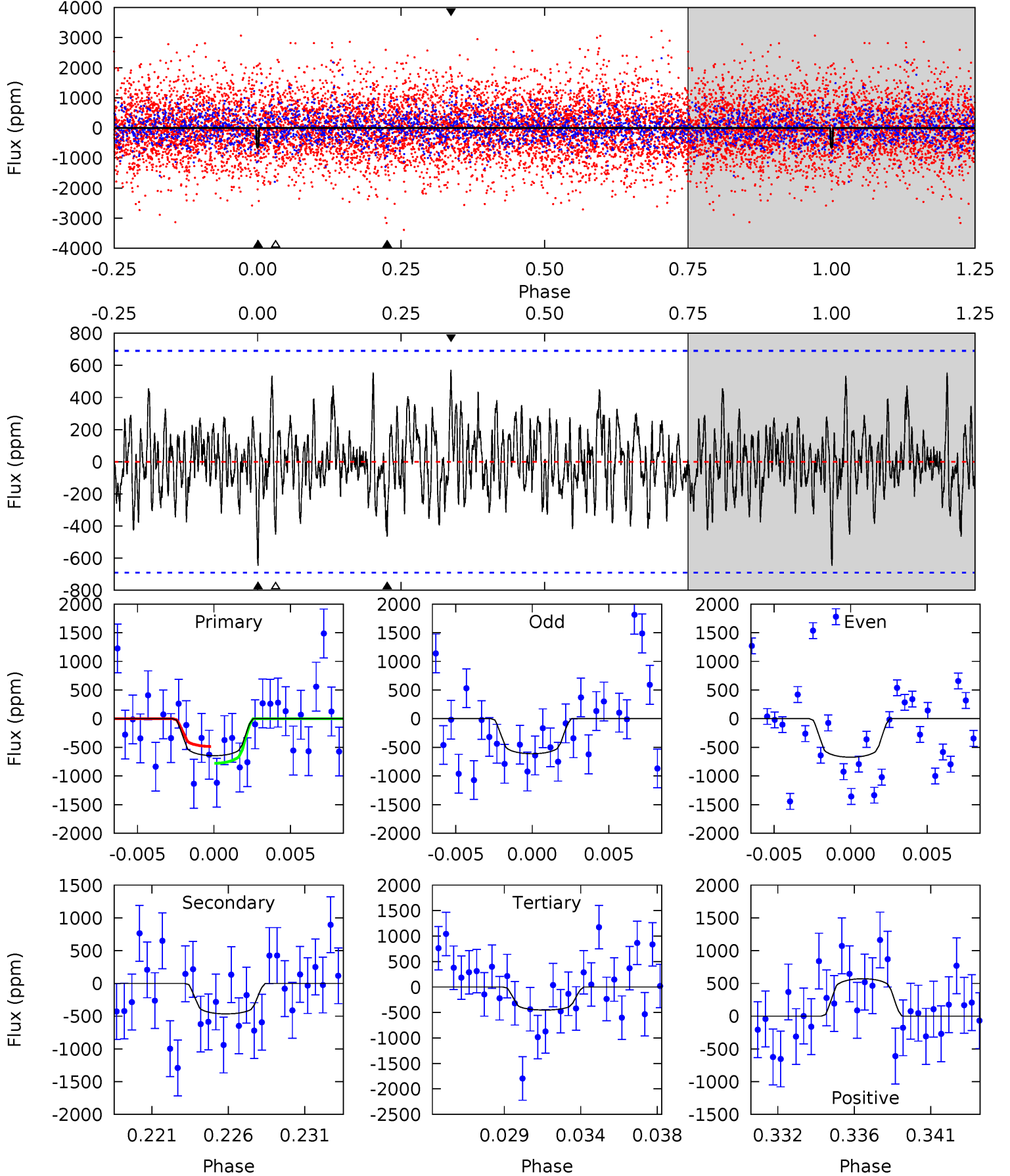




# DV Model-Shift Uniqueness Test

002168420-02, P = 30.058510 Days, E = 120.273087 Days

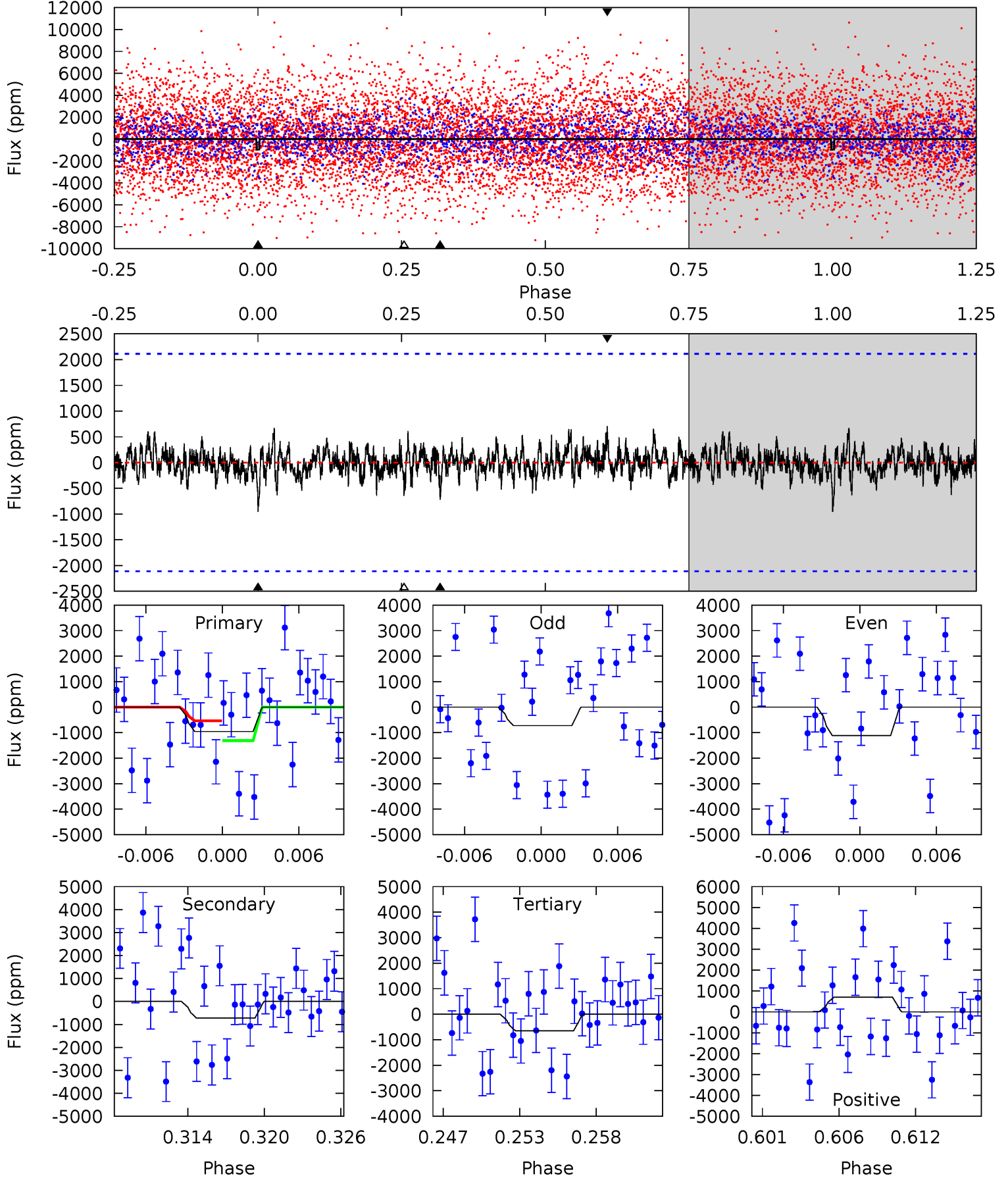
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
4.84	3.49	3.38	4.27	5.17	2.82	1.31	1.45	0.57	0.10	-0.79	0.23	0.68	0.47	1.09



# Alt Model-Shift Uniqueness Test

002168420-02,  $P = 30.057946$  Days,  $E = 120.268369$  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
2.32	1.76	1.57	1.72	5.14	2.77	0.51	0.75	0.61	0.18	0.04	0.47	1.27	0.43	0.94



### Stellar Parameters For KIC 002168420

	$T_{\text{eff}} (K)$	$\log(g)$	$[\text{Fe}/\text{H}]$	$R (R_{\odot})$	$M (M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$8026^{+223}_{-335}$	$4.007^{+0.198}_{-0.132}$	$0.070^{+0.250}_{-0.450}$	$2.282^{+0.472}_{-0.629}$	$1.929^{+0.247}_{-0.401}$	$0.229^{+0.254}_{-0.089}$
	+3%/-4%	+5%/-3%	+357%/-643%	+21%/-28%	+13%/-21%	+111%/-39%
Source	KIC0	KIC0	KIC0	DSEP		

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

### Secondary Eclipse Parameters for KIC 002168420-02 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-466 \pm 134$	$8.23^{+6.60}_{-5.28}$	$1523^{+104}_{-111}$	$6207^{+5332}_{-1517}$	$205^{+1320}_{-147}$
Alt.	$-723 \pm 411$	$9.09^{+6.90}_{-5.39}$	$1525^{+100}_{-103}$	$6556^{+5521}_{-1915}$	$246^{+1537}_{-192}$

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

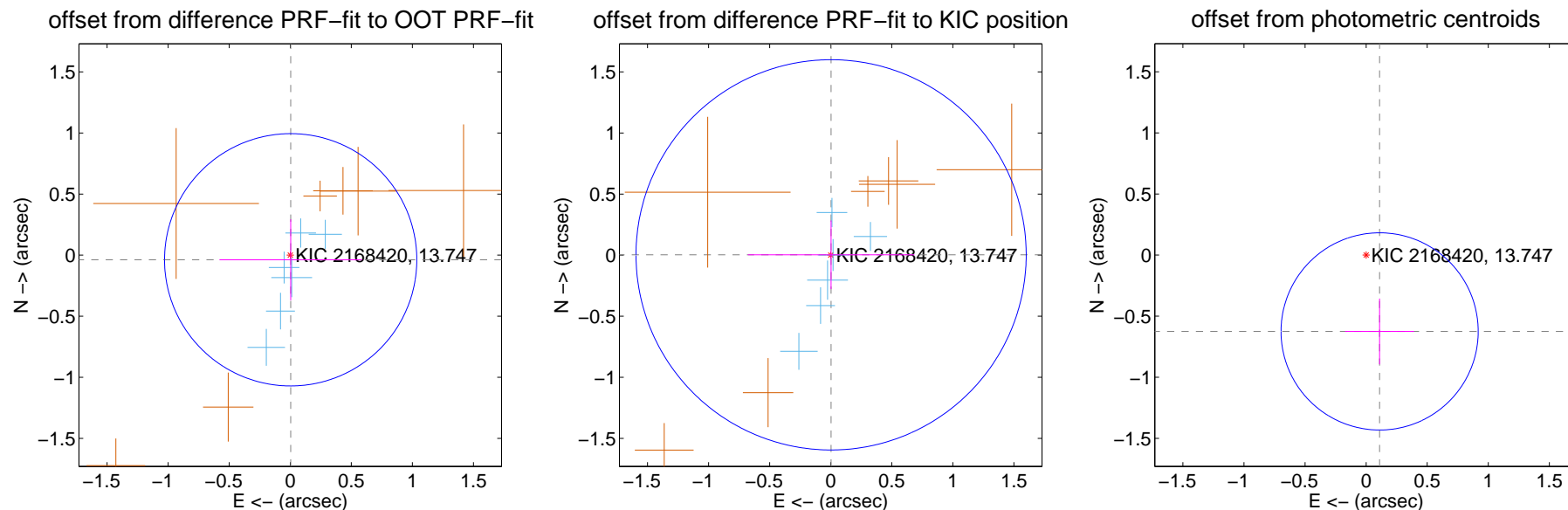
## DV Centroid Data

Supplemental centroid analysis for 002168420-02. Kepler magnitude: 13.75. Transit SNR 8.86

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

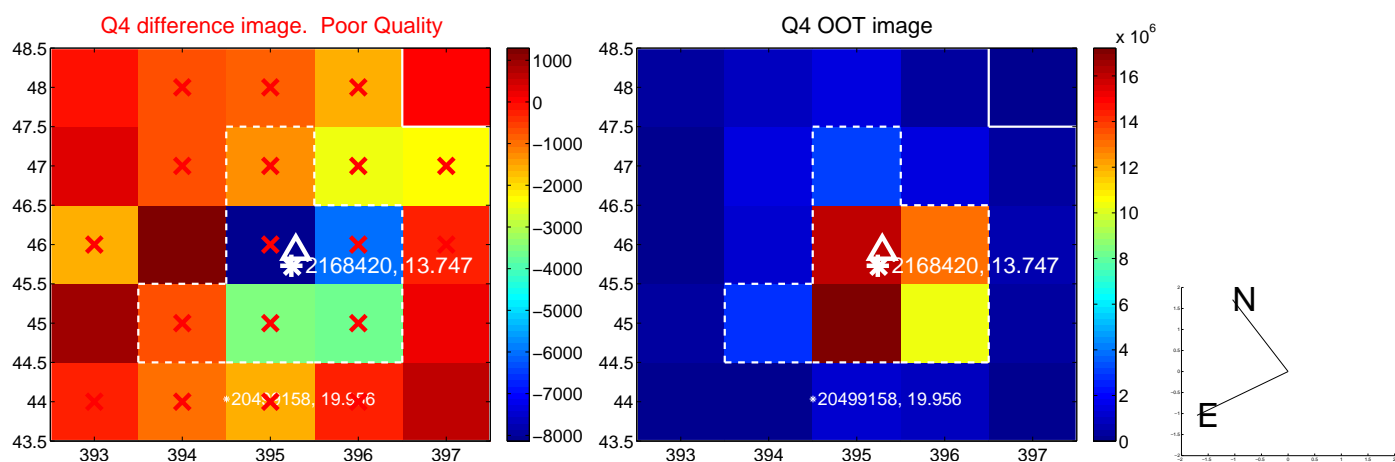
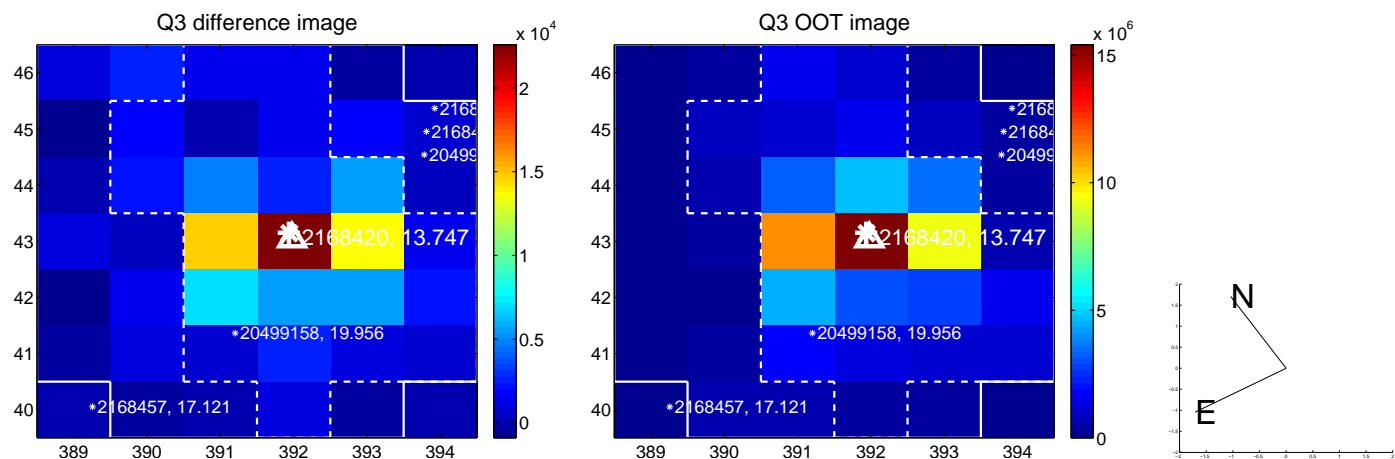
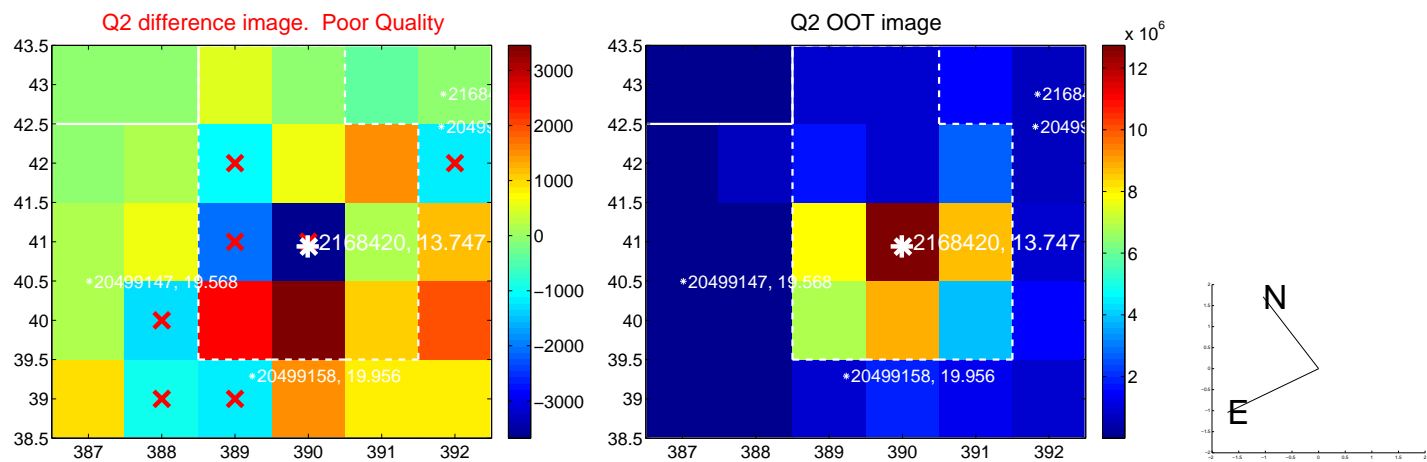
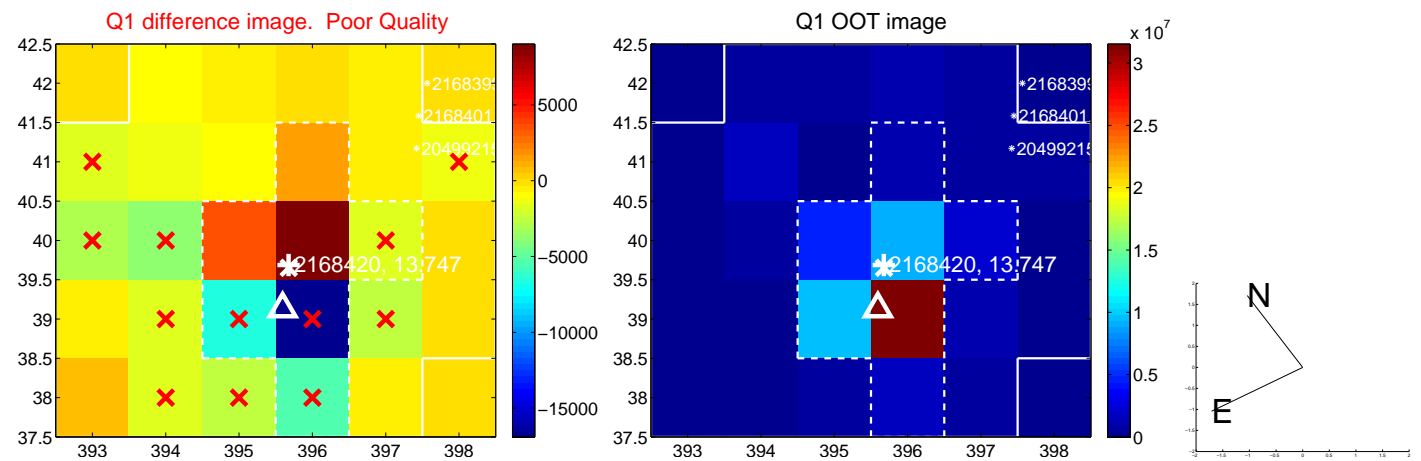
	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.038 \pm 0.344$	0.11	$-0.003 \pm 0.583$	$-0.038 \pm 0.332$
PRF-fit source offset from KIC position	$0.004 \pm 0.533$	0.01	$-0.003 \pm 0.682$	$0.003 \pm 0.281$
photometric centroid source offset	$0.63 \pm 0.27$	2.36	$-0.11 \pm 0.28$	$-0.62 \pm 0.27$



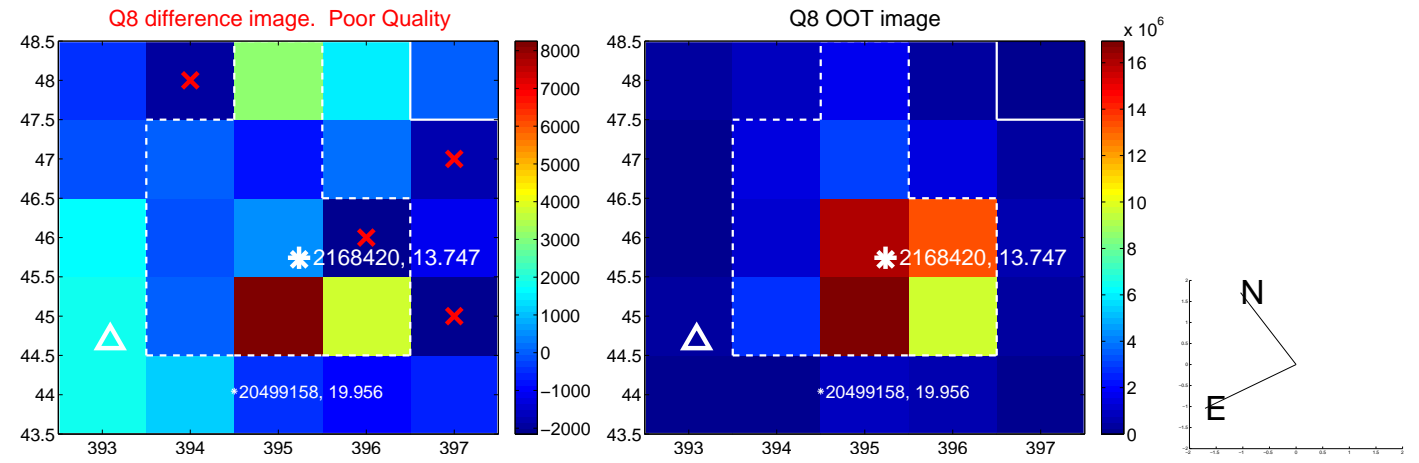
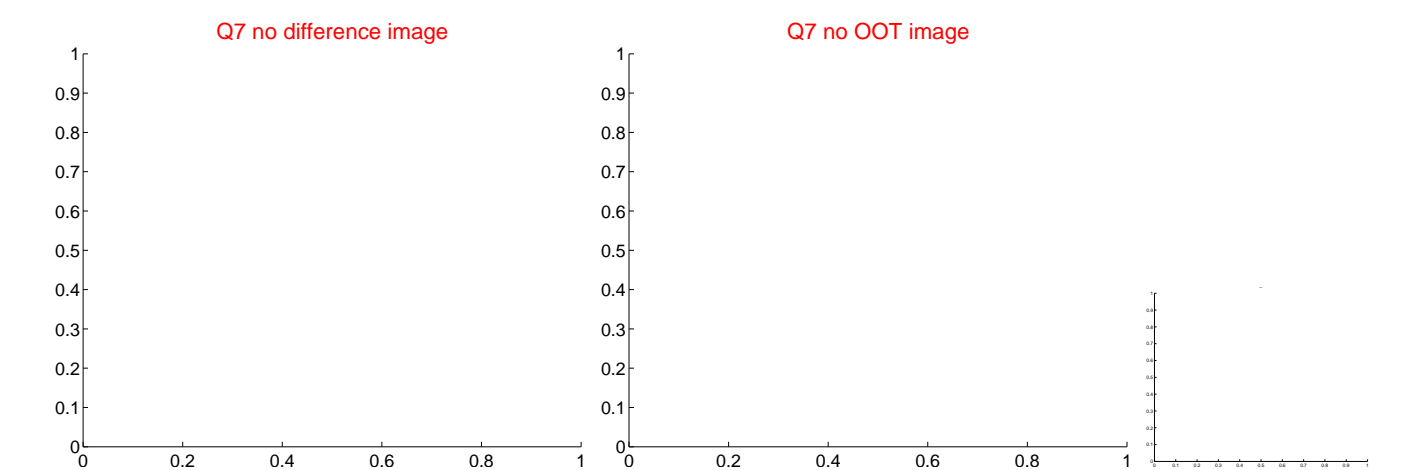
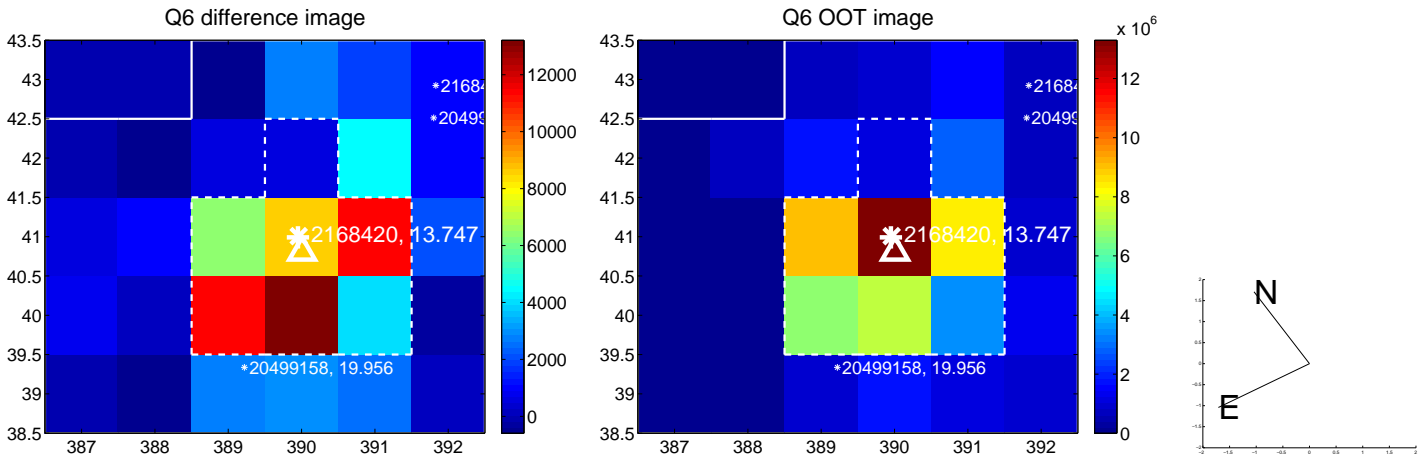
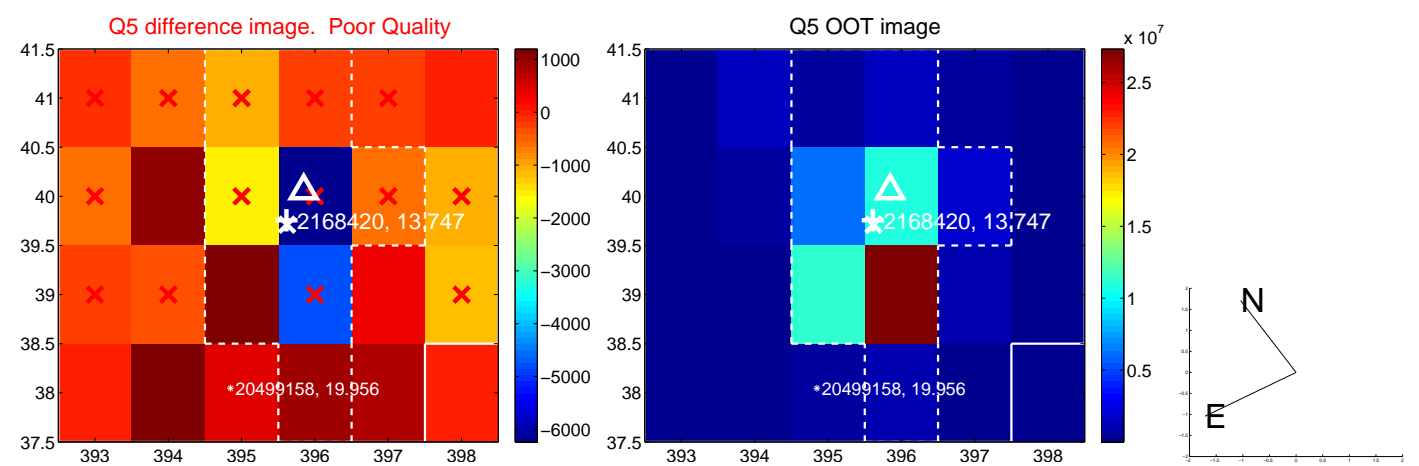
Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets**; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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



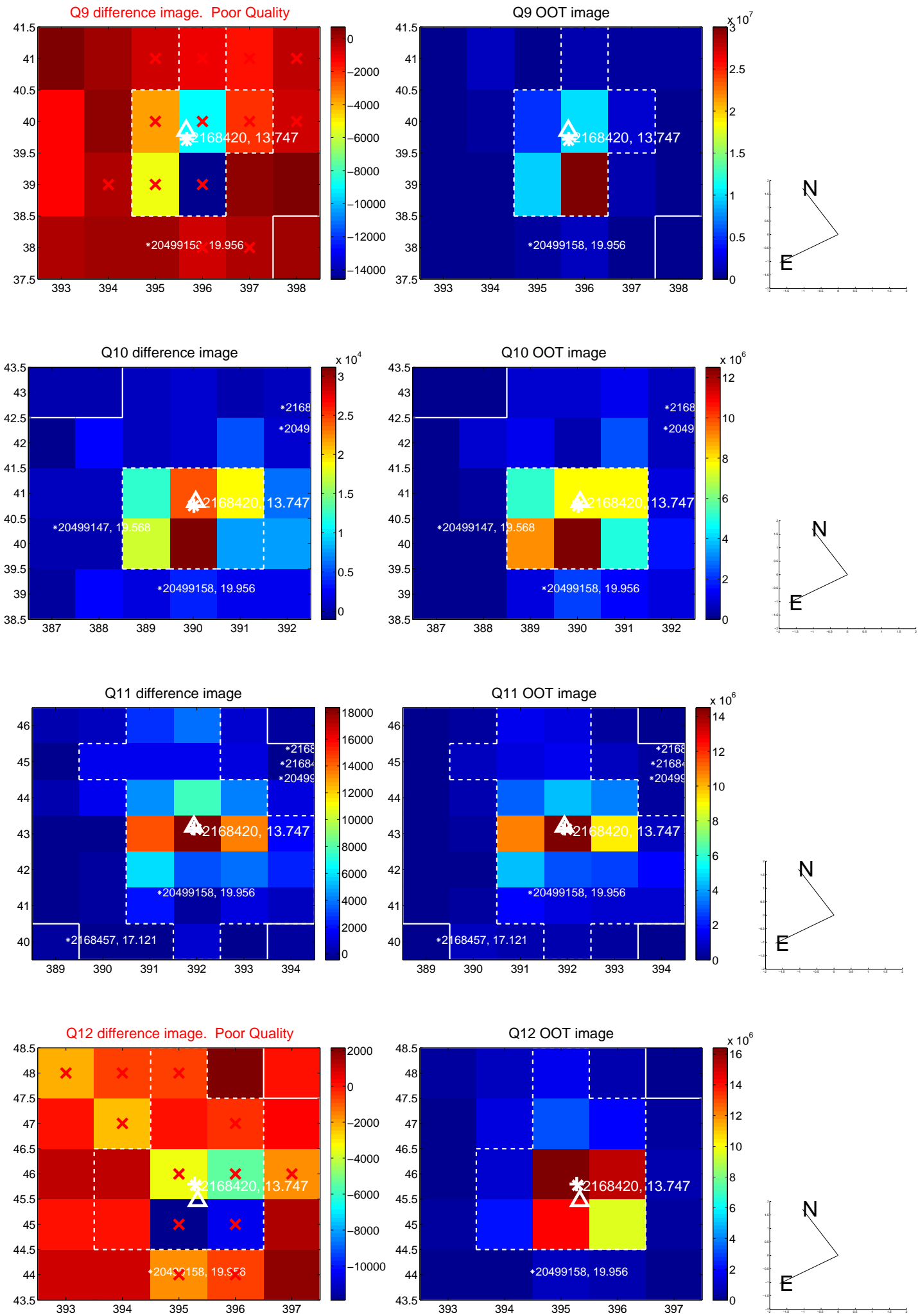
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



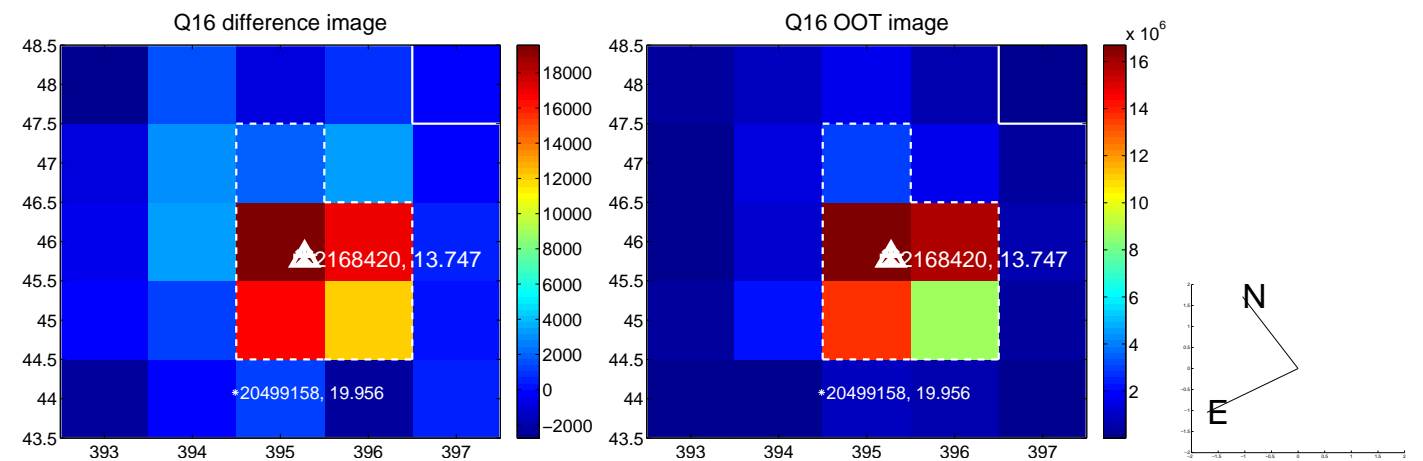
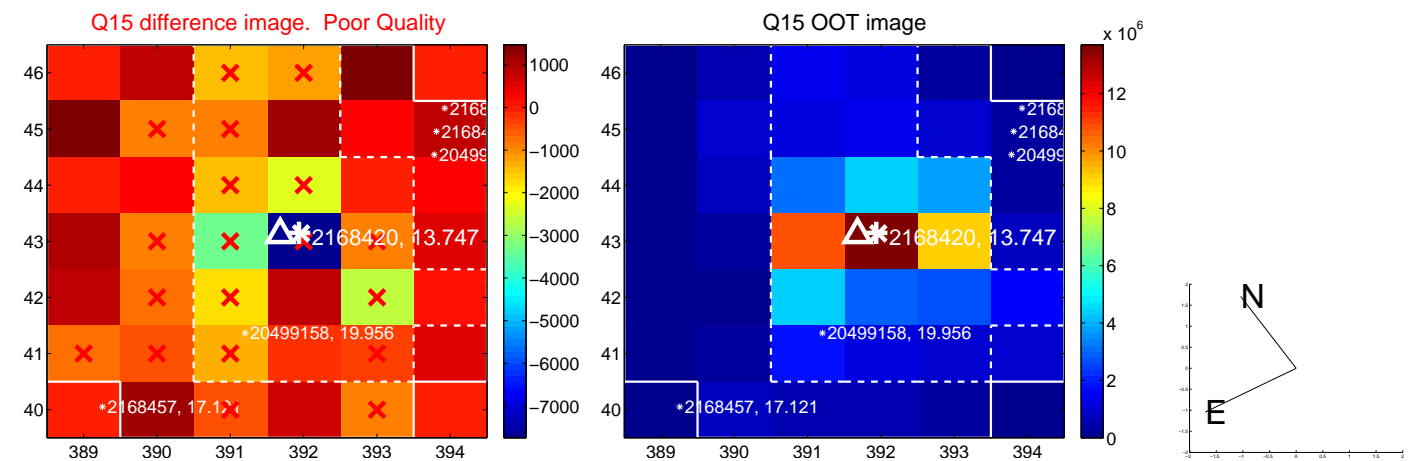
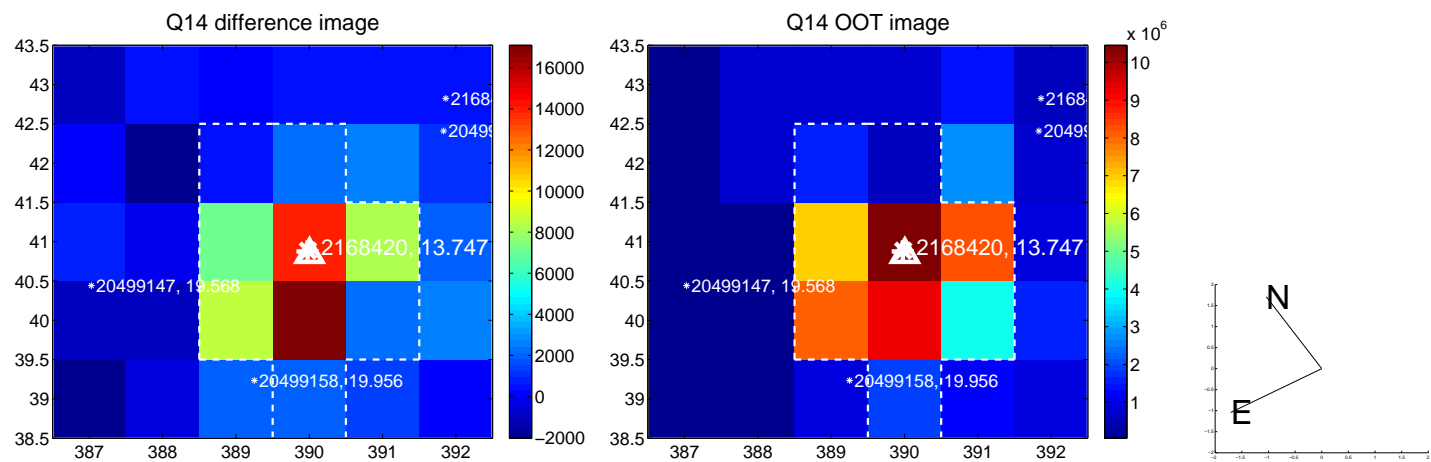
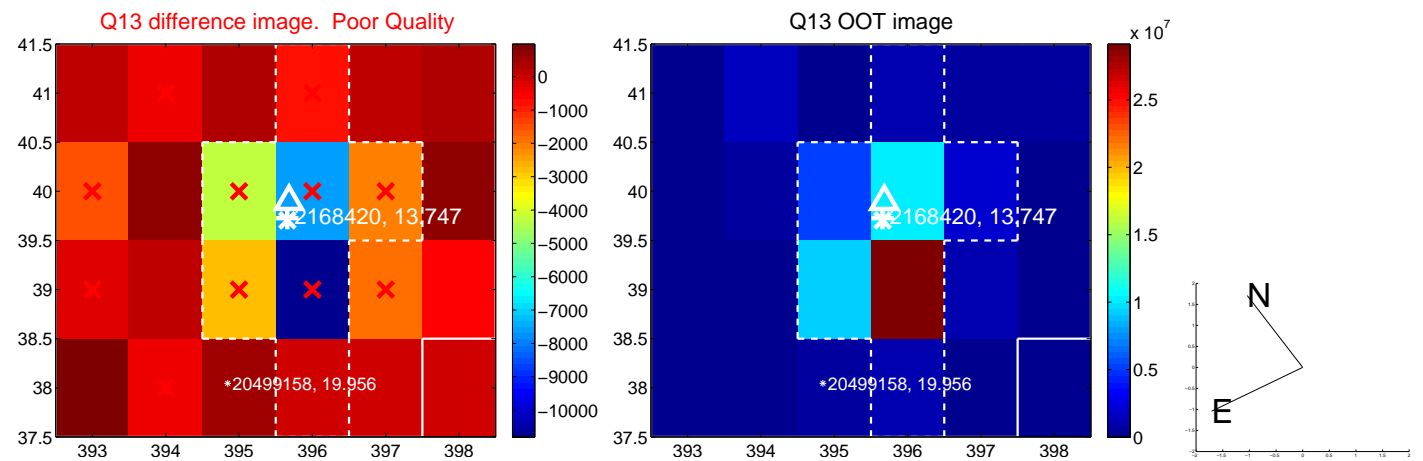
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



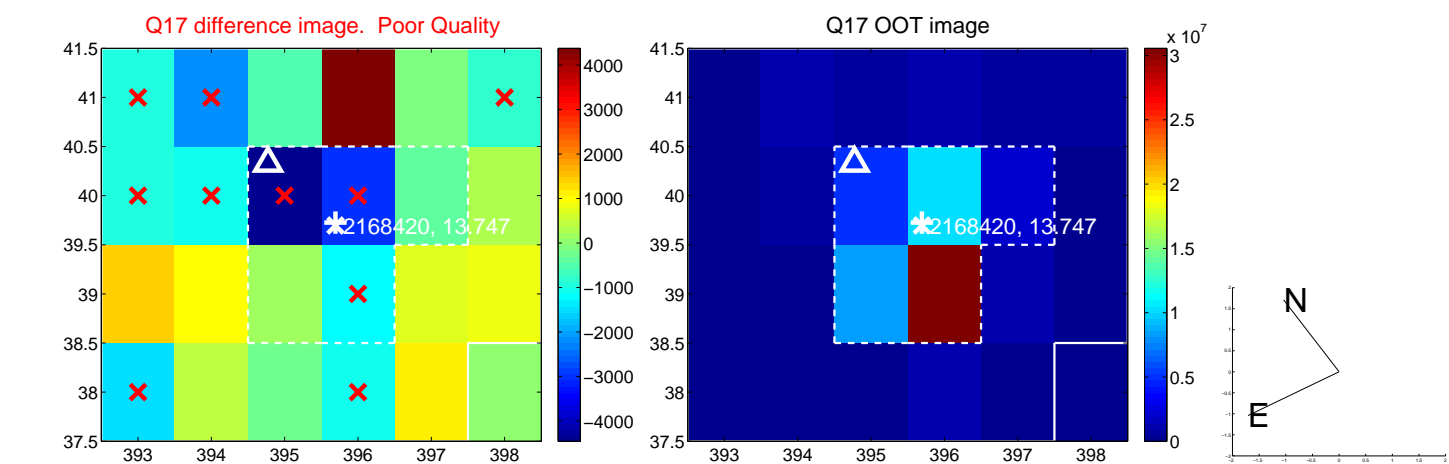
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



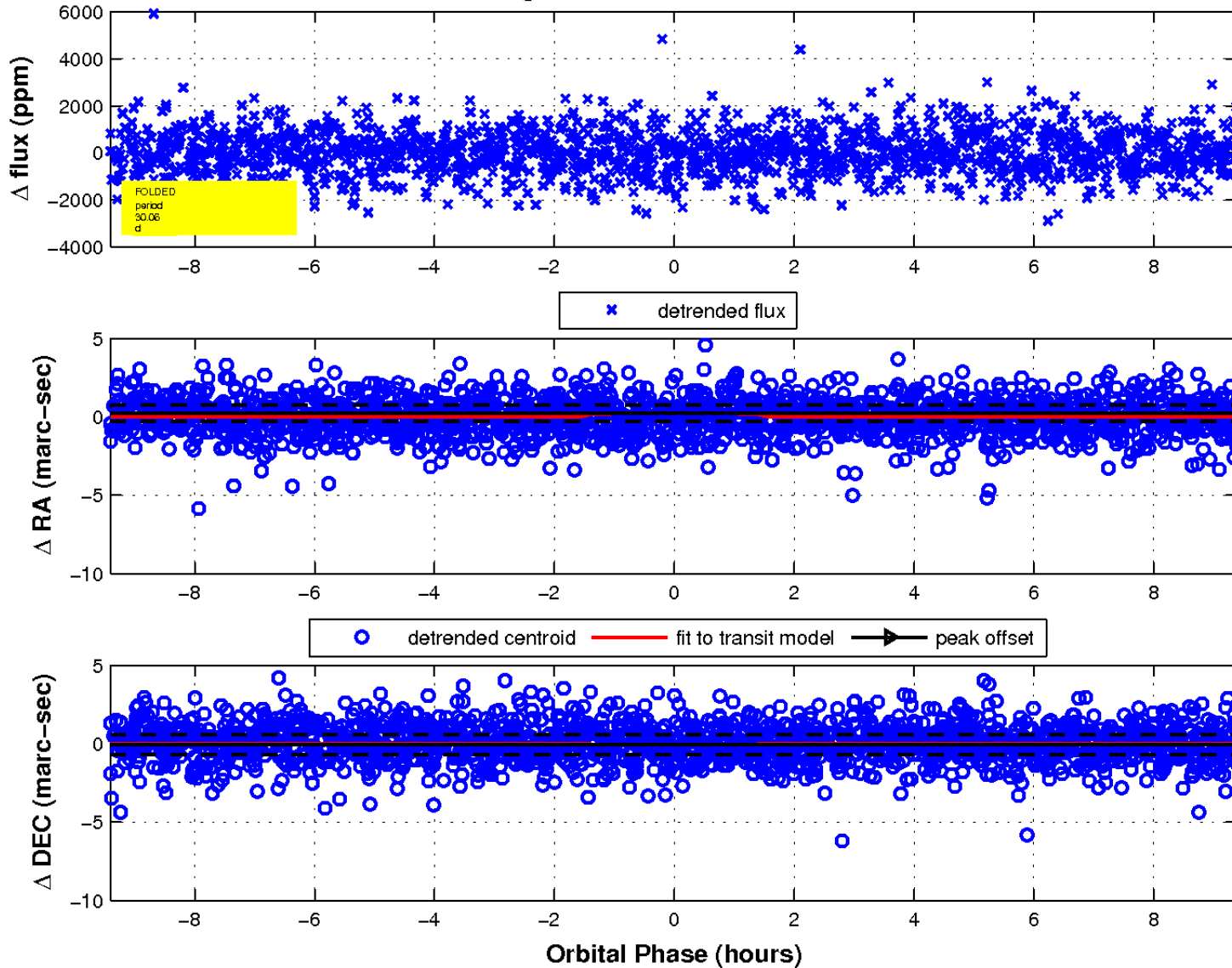
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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



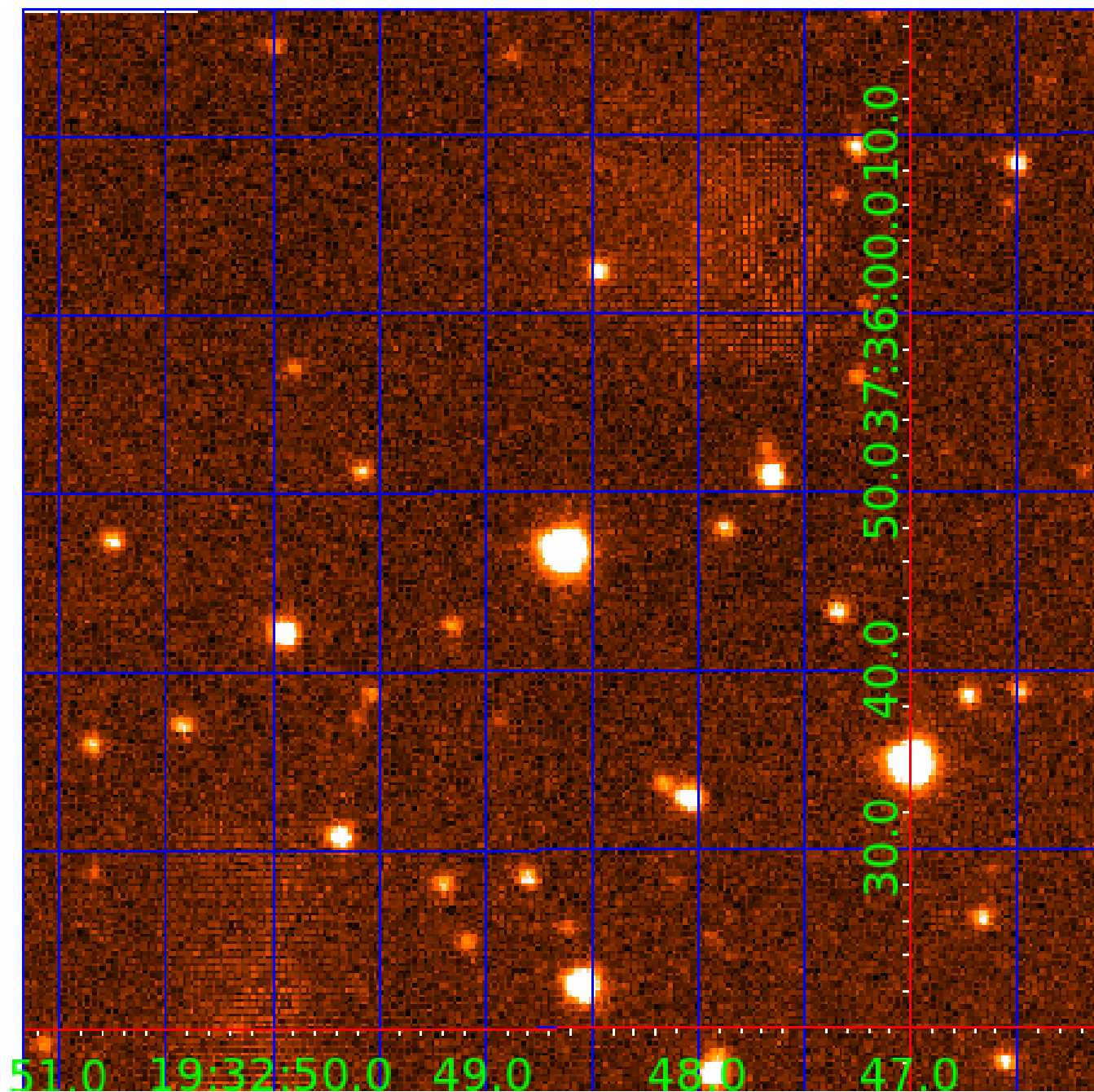
### fluxWeightedCentroids, Planet 2 of 3





UKIRT Image

Declination



# KIC 002168420

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
002168420-01	OBS	No	0.951969	131.864783	105.7	6.526	11.9	13.4	2.28	8026	2.37	34802.03
002168420-02	OBS	No	30.058510	150.331597	832.2	3.137	9.0	8.9	2.28	8026	7.15	348.72
002168420-03	OBS	No	39.645817	133.958759	1315.9	1.235	9.0	8.2	2.28	8026	8.89	241.09

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
002168420-01	OBS	FP	0.00	1	0	0	0	LPP_DV
002168420-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT
002168420-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—MOD_NONUNIQ_DV—MOD_TER_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.

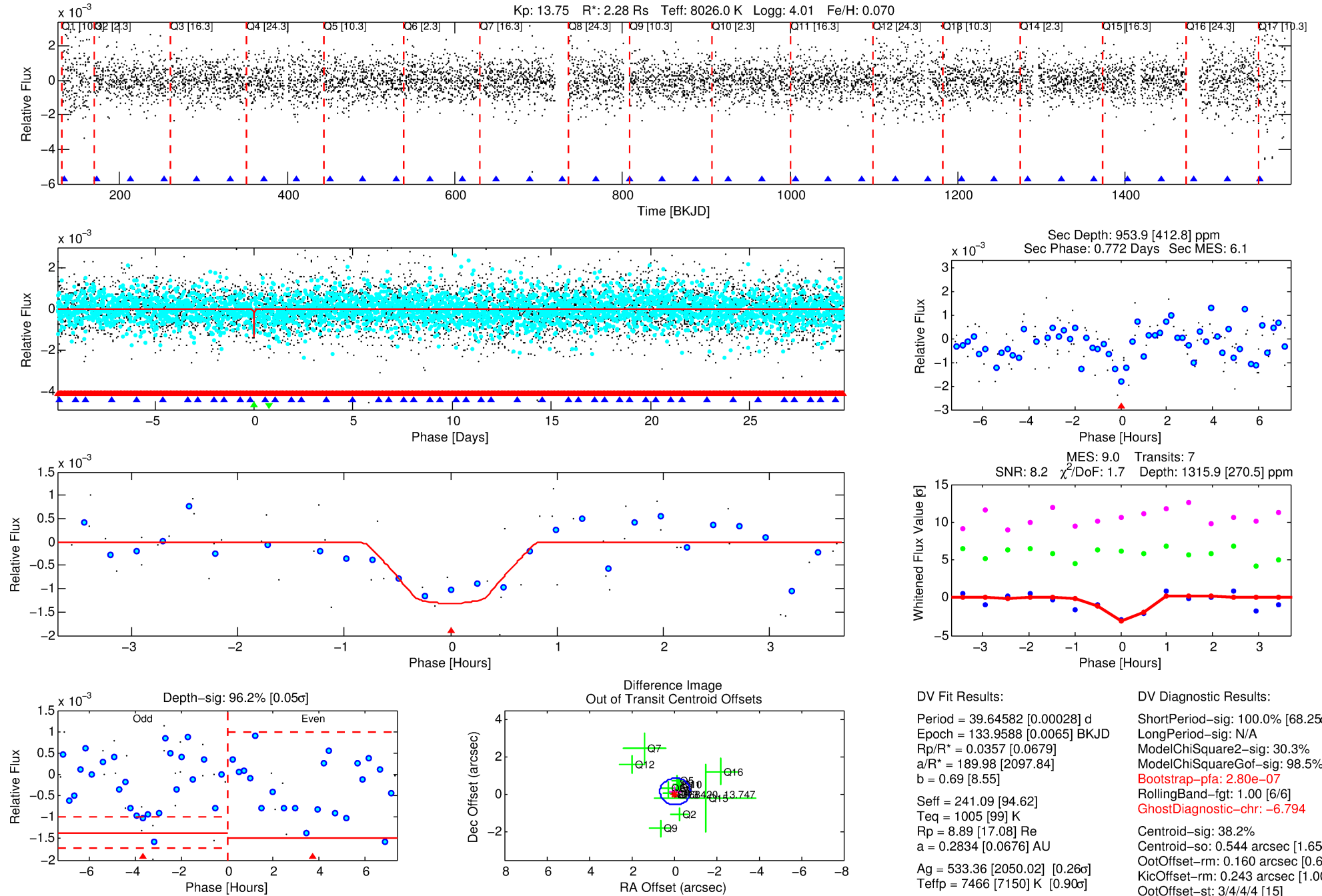
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 002168420-03

No Significant Match Found

# DV One-Page Summary

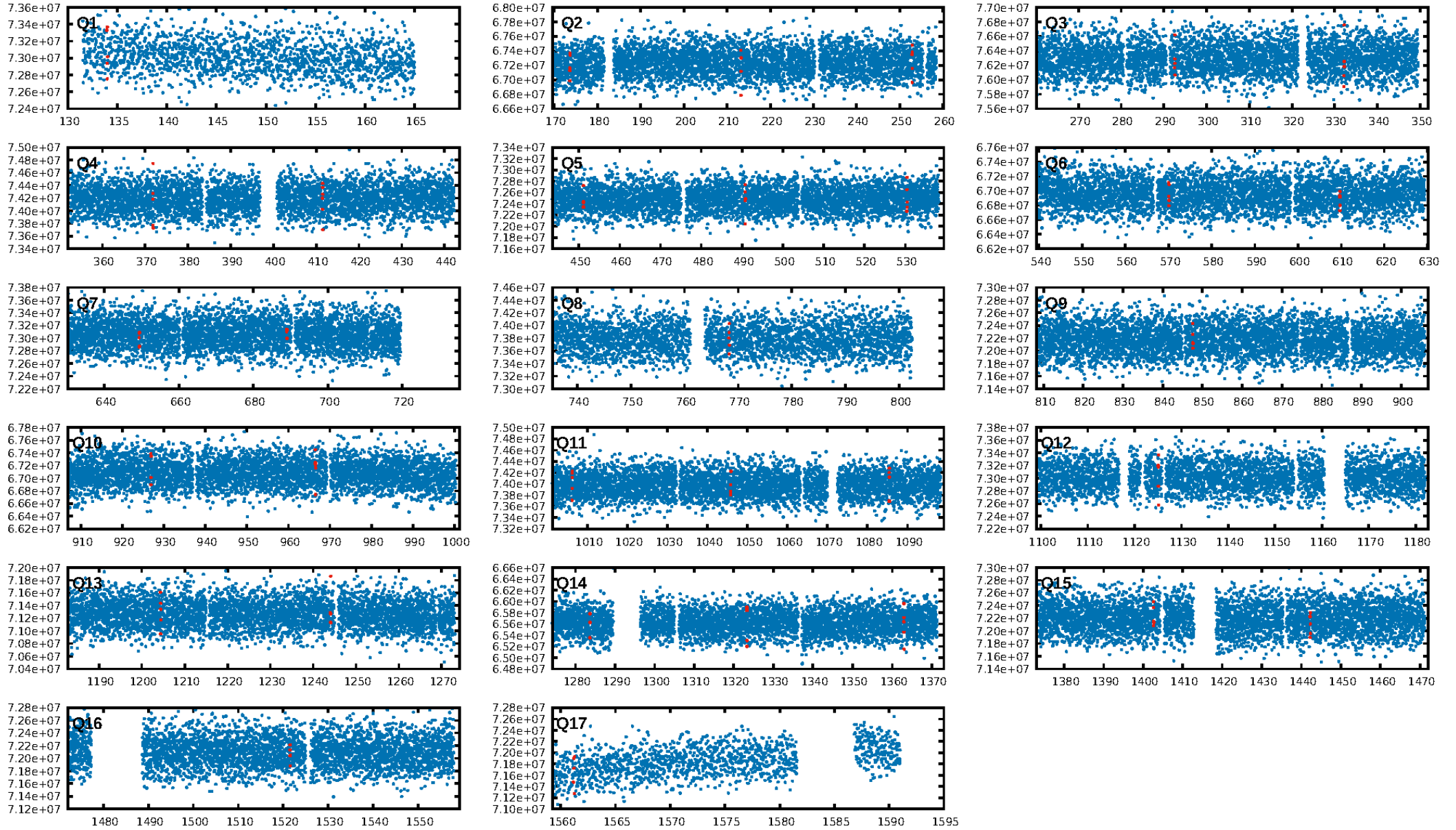
KIC: 2168420 Candidate: 3 of 3 Period: 39.646 d



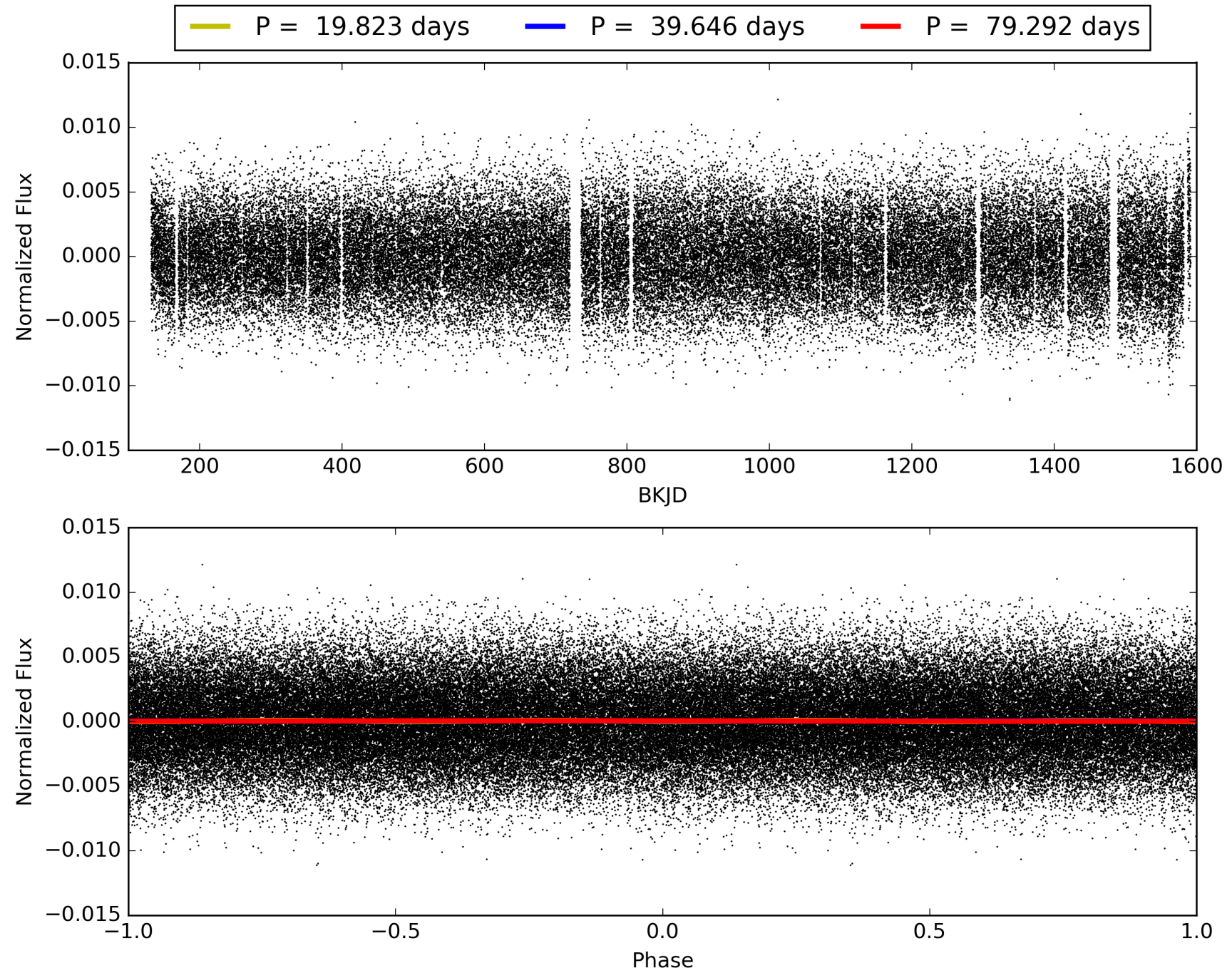
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 30-Jan-2016 13:01:19 Z

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

# TCE 002168420-03, PDC Light Curves

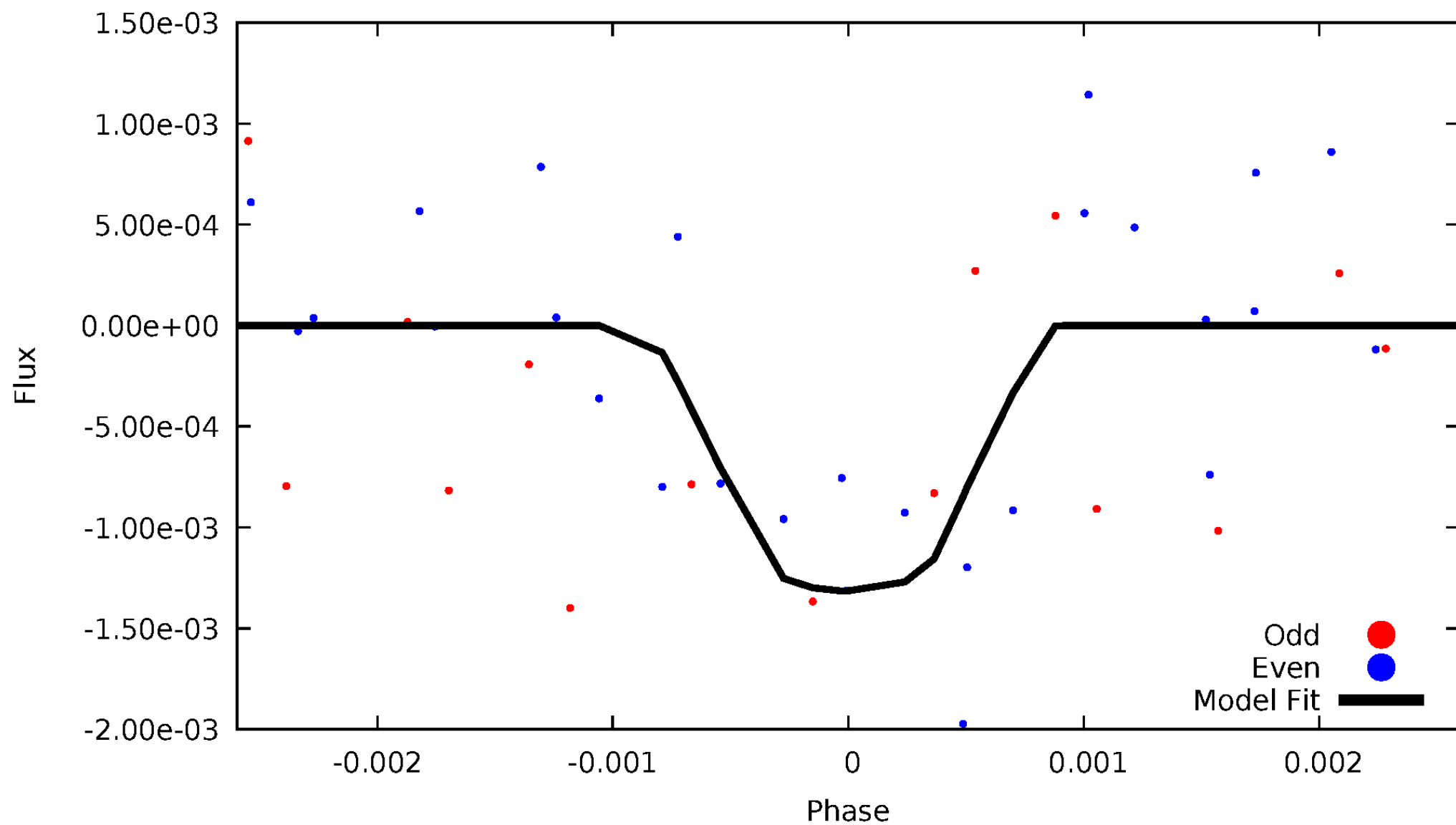


TCE 002168420-03



# DV Odd/Even

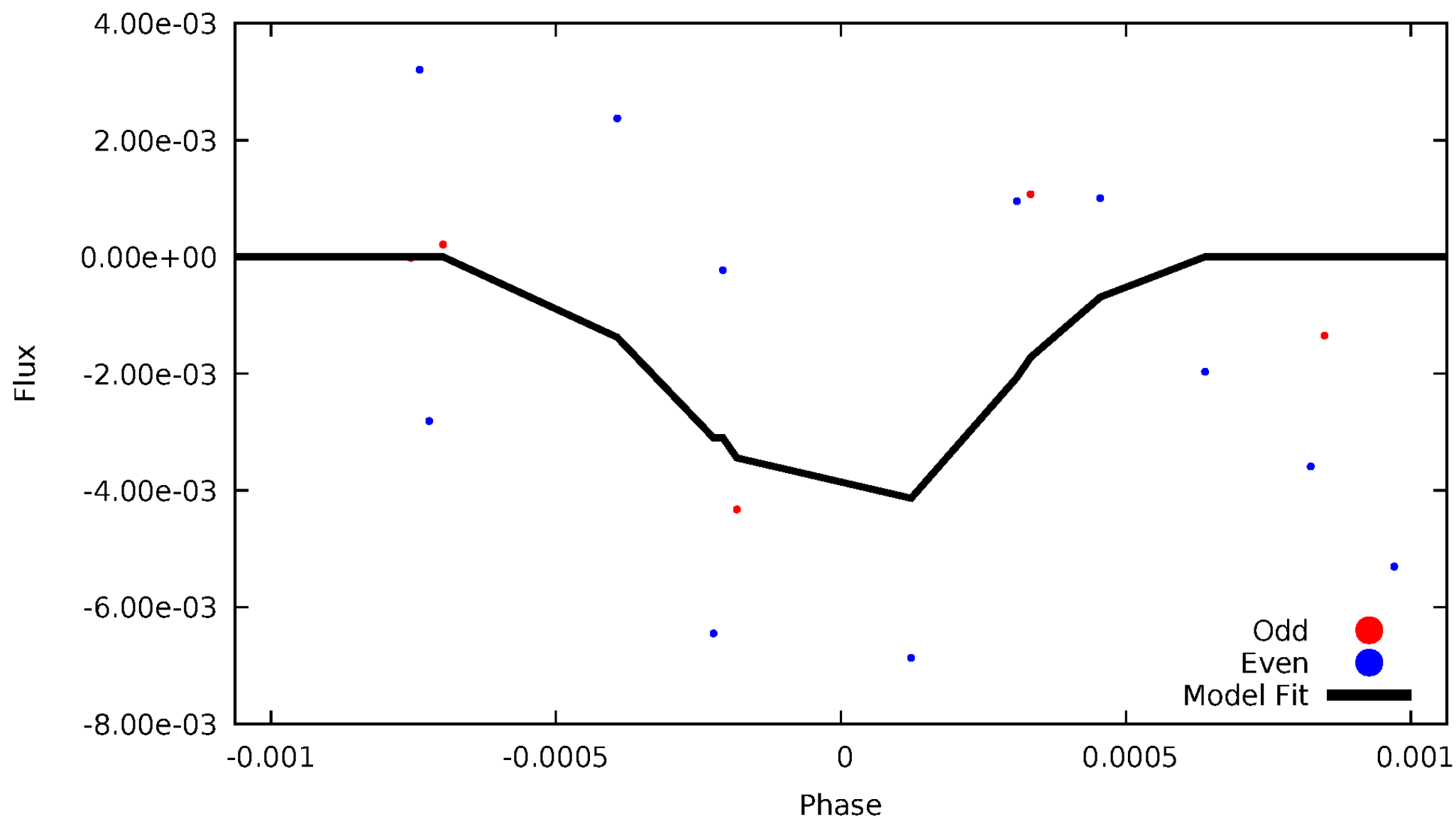
TCE 002168420-03





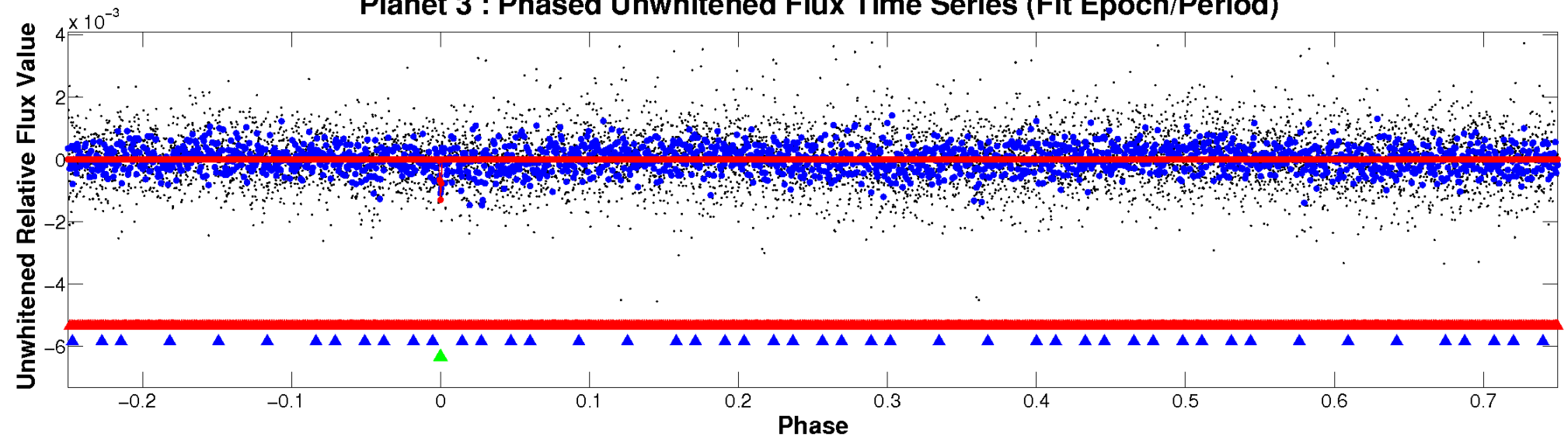
# ALT Odd/Even

TCE 002168420-03

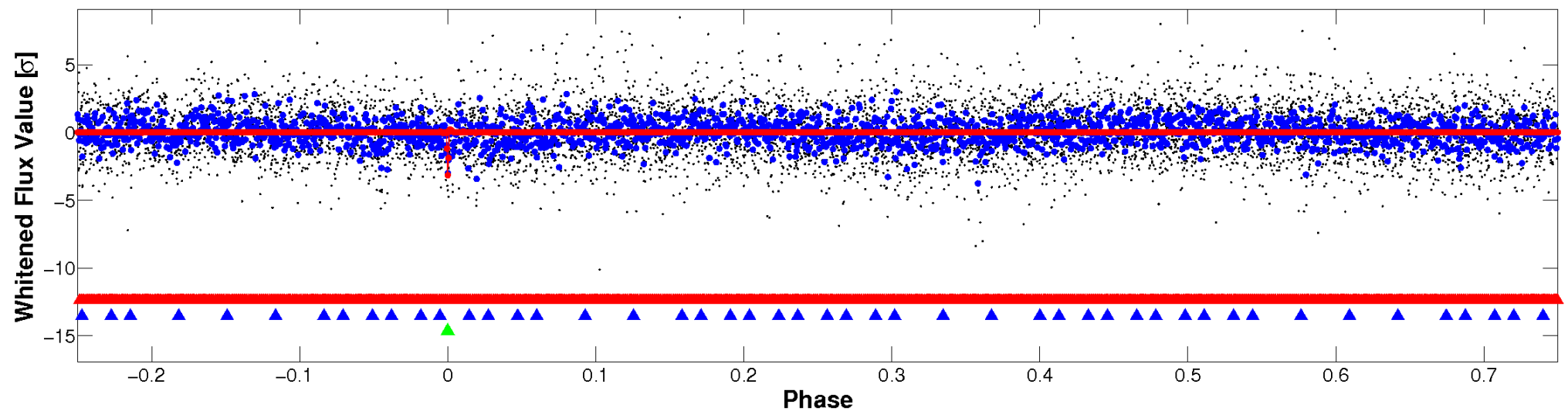


# Non-Whitened Vs. Whitened Light Curve

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

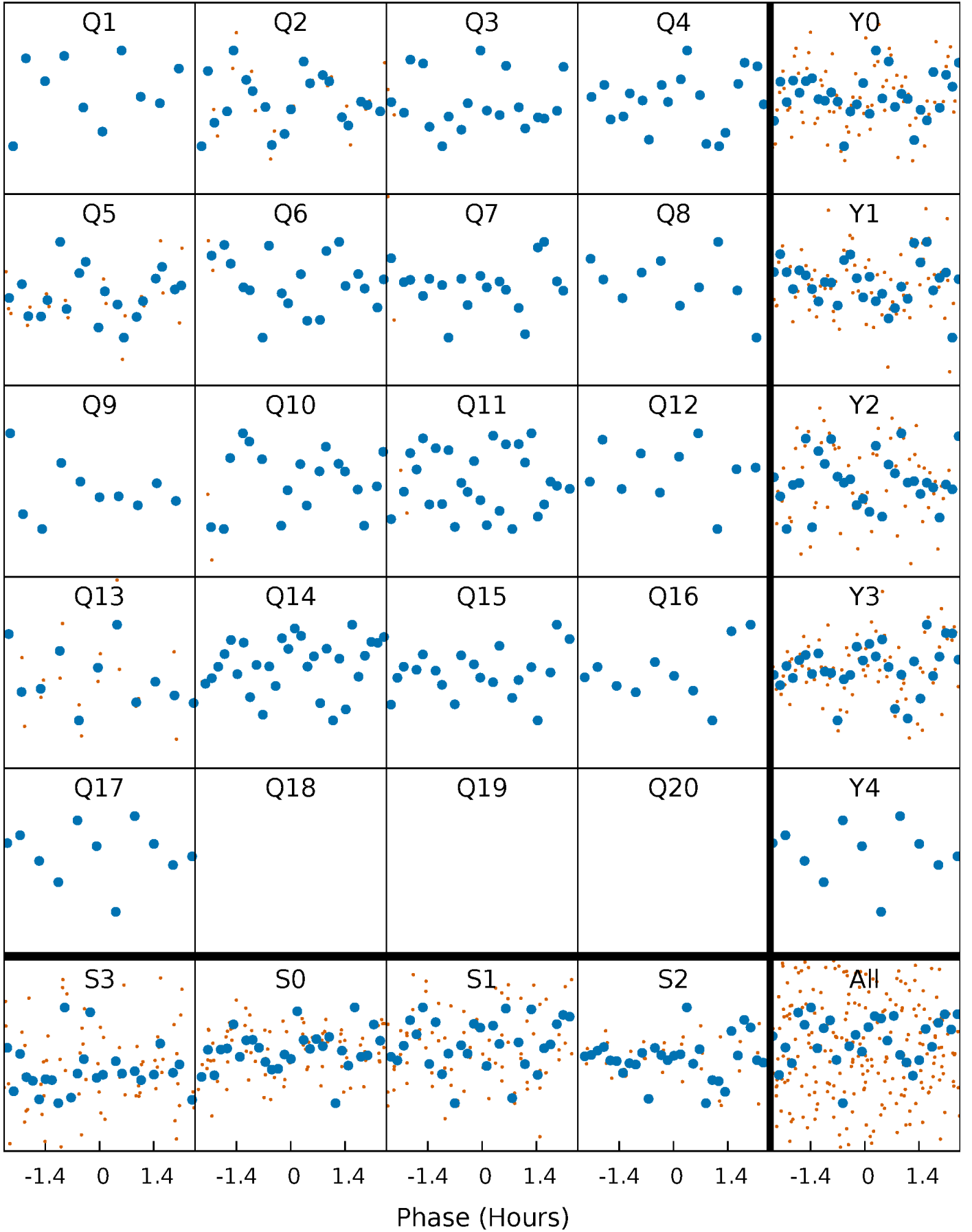


Planet 3 : Phased Whitened Flux Time Series (Fit Epoch/Period)



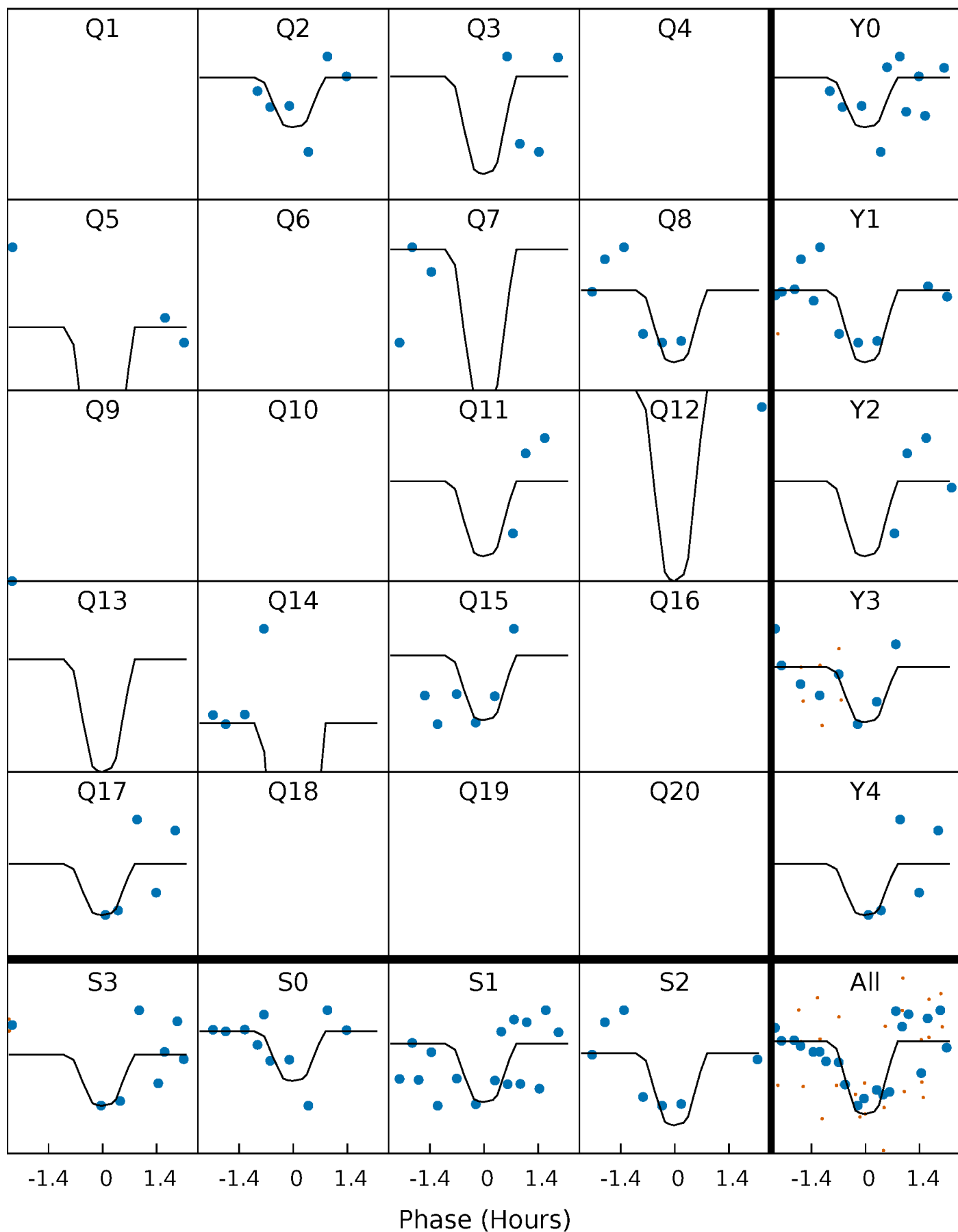
# PDC Quarter-Phased Transit Curves

TCE 002168420-03   P= 39.645817 Days    $T_0=133.958759$  (BKJD)



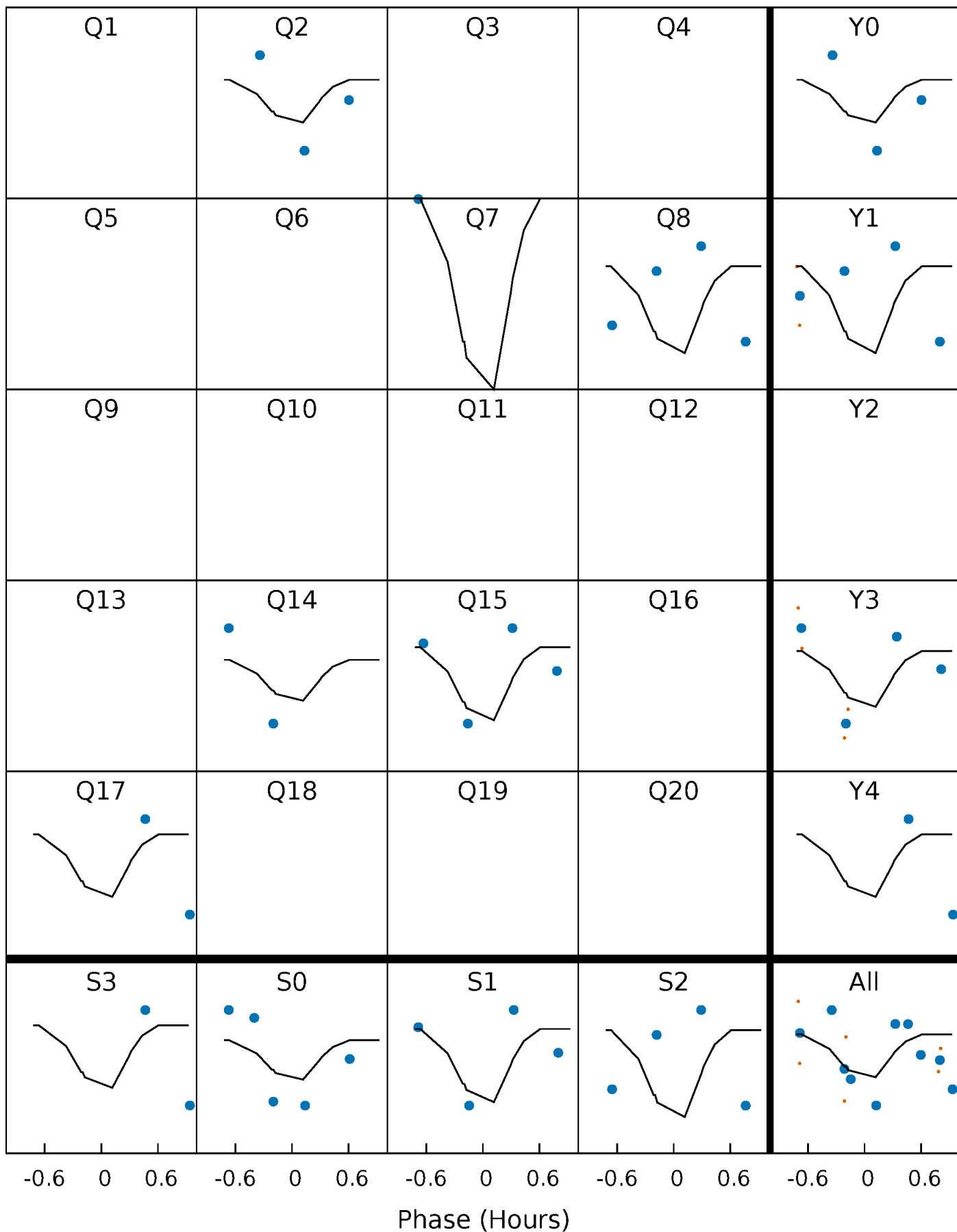
# DV Quarter-Phased Transit Curves

TCE 002168420-03 P= 39.645817 Days  $T_0=133.958759$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

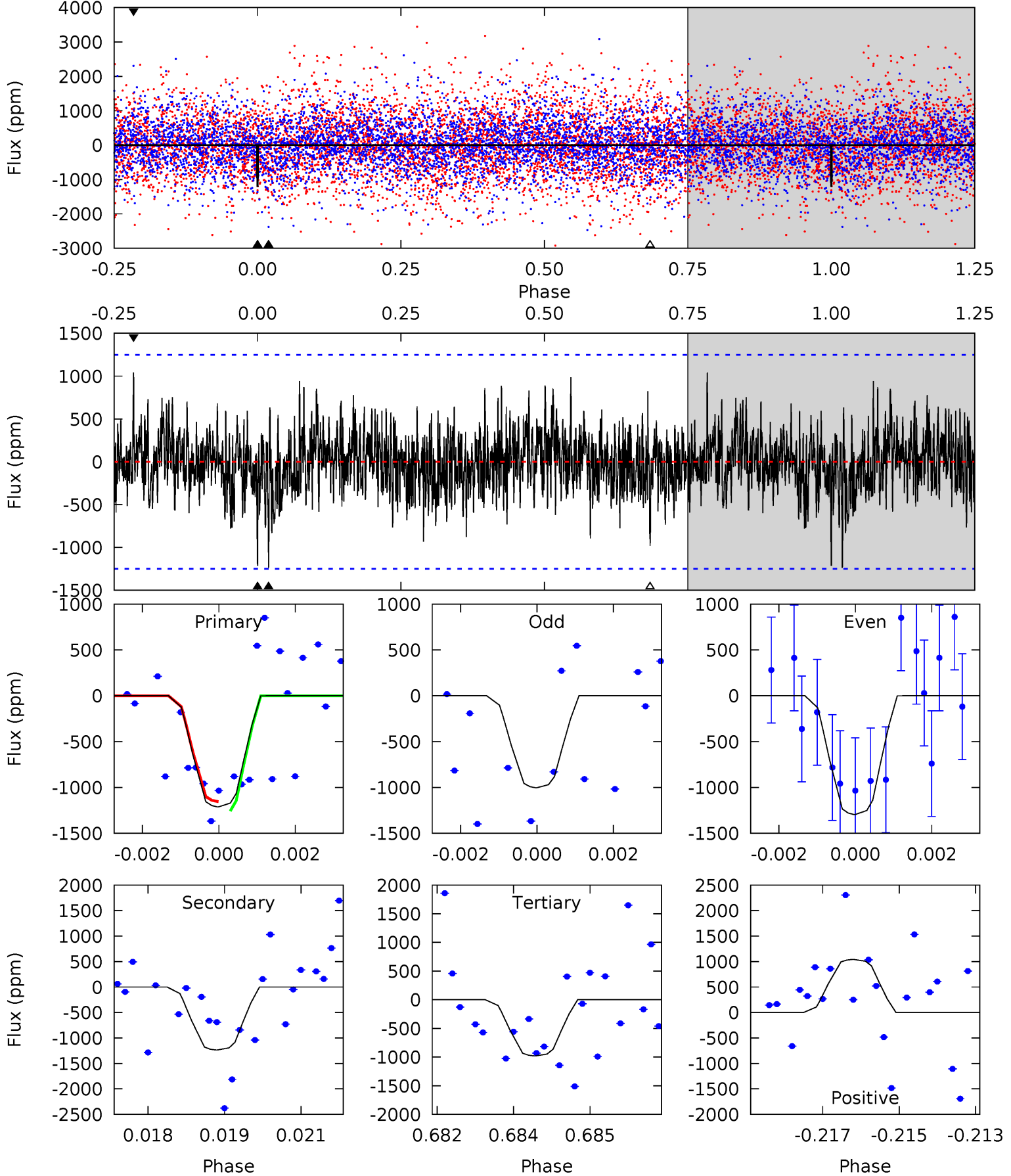
TCE 002168420-03 P= 39.646051 Days  $T_0=133.931868$  (BKJD)



# DV Model-Shift Uniqueness Test

002168420-03, P = 39.645817 Days, E = 94.312942 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
5.21	5.31	4.21	4.48	5.37	3.16	1.25	1.00	0.73	1.10	0.83	0.61	0.97	0.46	0.22

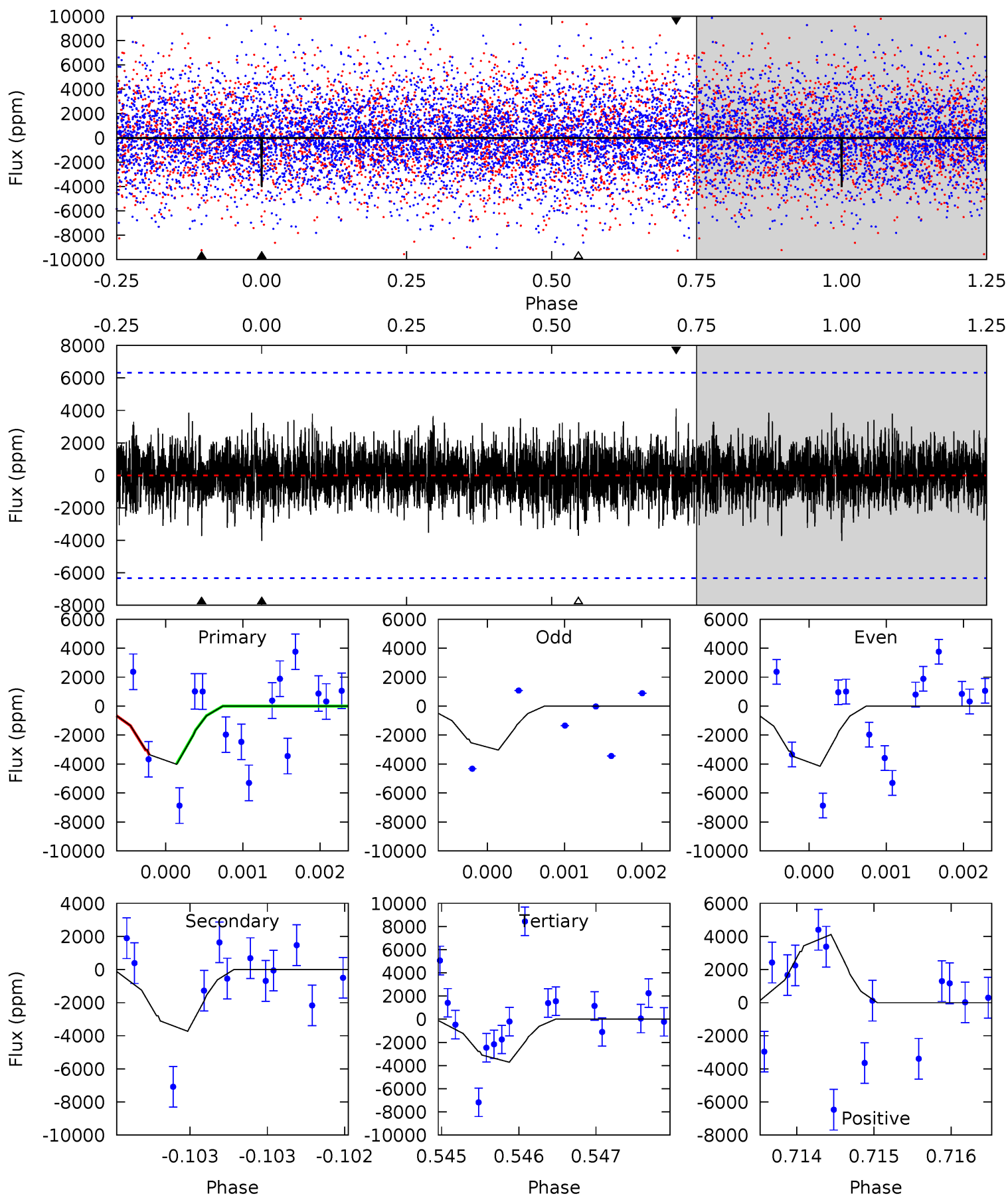




# Alt Model-Shift Uniqueness Test

002168420-03, P = 39.646051 Days, E = 94.285817 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
3.48	3.23	3.22	3.56	5.48	3.33	0.98	0.26	-0.08	0.01	-0.33	0.46	0.80	0.51	0.25



### Stellar Parameters For KIC 002168420

	$T_{\text{eff}} (K)$	$\log(g)$	$[\text{Fe}/\text{H}]$	$R (R_{\odot})$	$M (M_{\odot})$	$\rho_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$8026^{+223}_{-335}$	$4.007^{+0.198}_{-0.132}$	$0.070^{+0.250}_{-0.450}$	$2.282^{+0.472}_{-0.629}$	$1.929^{+0.247}_{-0.401}$	$0.229^{+0.254}_{-0.089}$
	+3%/-4%	+5%/-3%	+357%/-643%	+21%/-28%	+13%/-21%	+111%/-39%
Source	KIC0	KIC0	KIC0	DSEP		

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

### Secondary Eclipse Parameters for KIC 002168420-03 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$-1237 \pm 233$	$14.48^{+13.72}_{-9.91}$	$1383^{+93}_{-97}$	$5950^{+6440}_{-1491}$	$254^{+2324}_{-189}$
Alt.	$-3728 \pm 1155$	$19.02^{+16.55}_{-10.92}$	$1386^{+93}_{-94}$	$6746^{+5487}_{-1736}$	$423^{+2108}_{-309}$

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

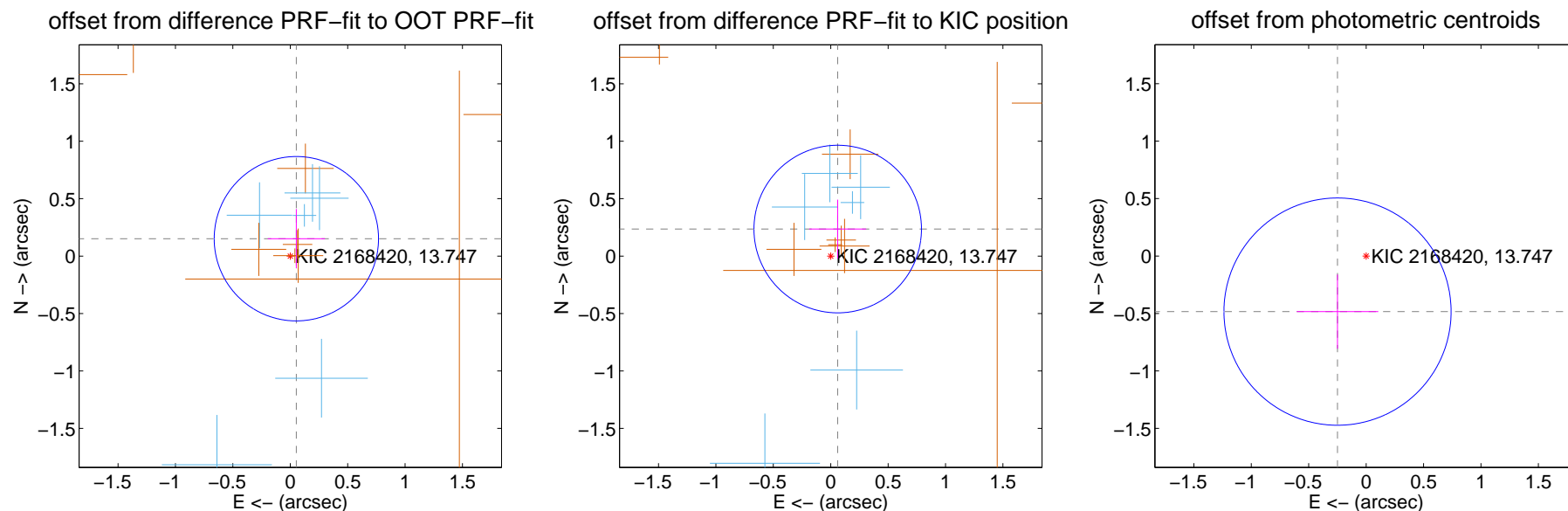
## DV Centroid Data

Supplemental centroid analysis for 002168420-03. Kepler magnitude: 13.75. Transit SNR 8.16

There are 6 quarters with good PRF difference image offsets

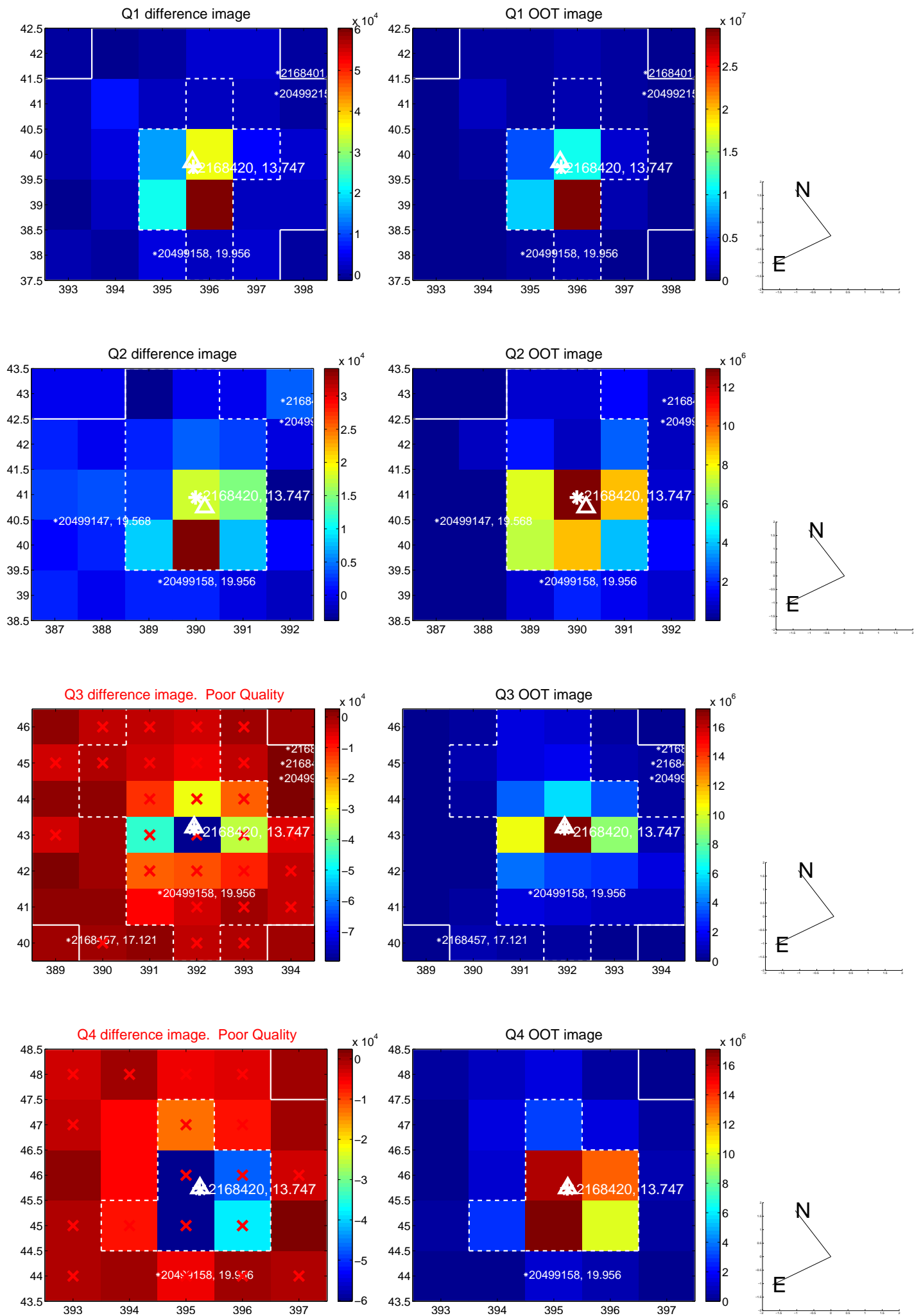
The direct PRF centroid is offset from the target star catalog position by about 0.12 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.160 \pm 0.239$	0.67	$-0.053 \pm 0.249$	$0.151 \pm 0.258$
PRF-fit source offset from KIC position	$0.243 \pm 0.243$	1.00	$-0.061 \pm 0.248$	$0.235 \pm 0.256$
photometric centroid source offset	$0.54 \pm 0.33$	1.65	$0.25 \pm 0.35$	$-0.48 \pm 0.32$

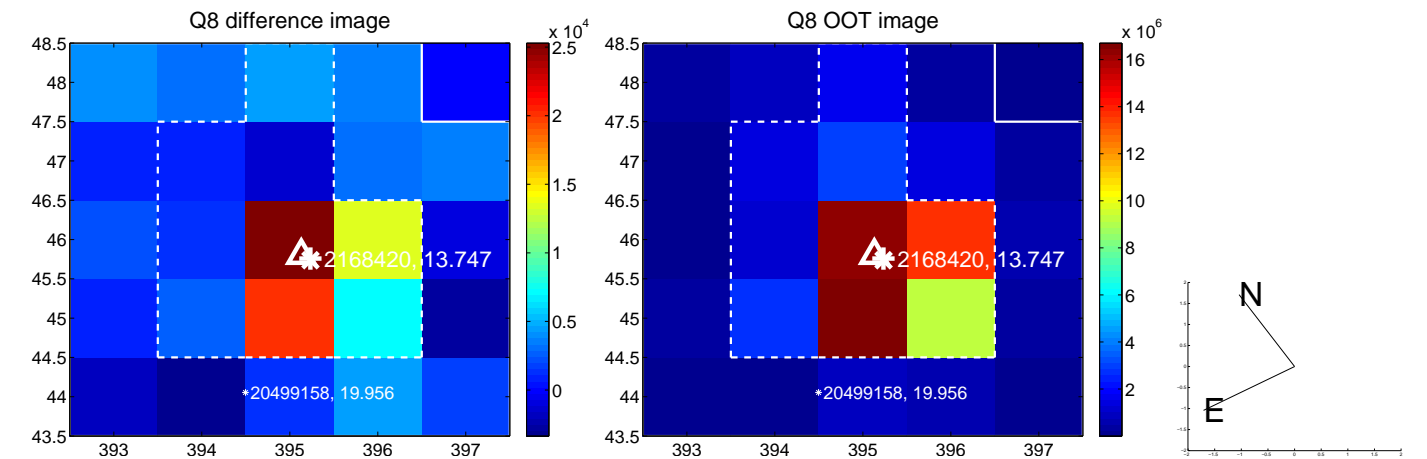
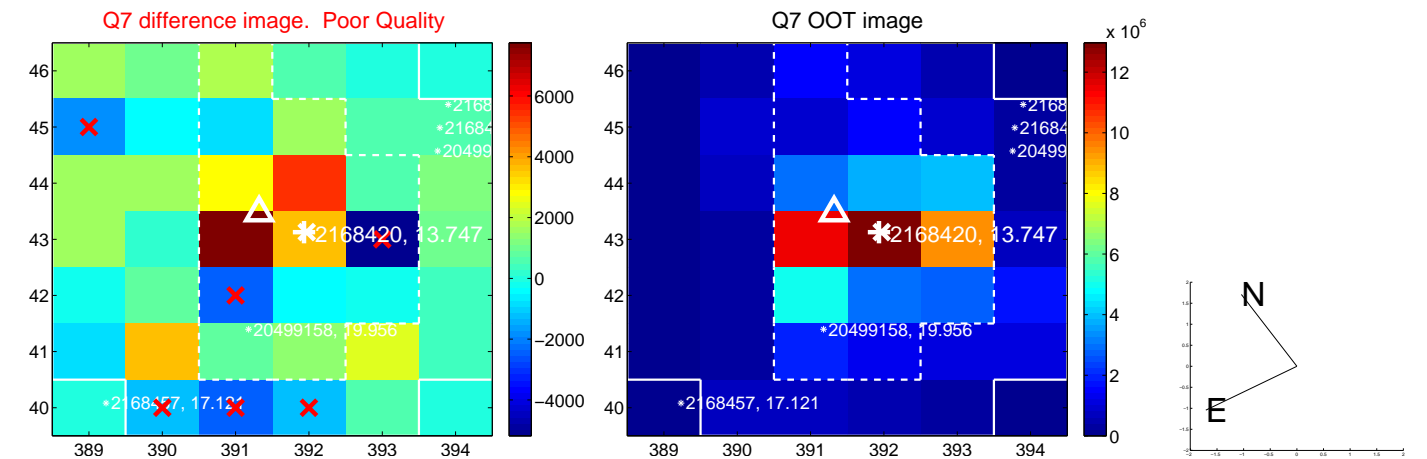
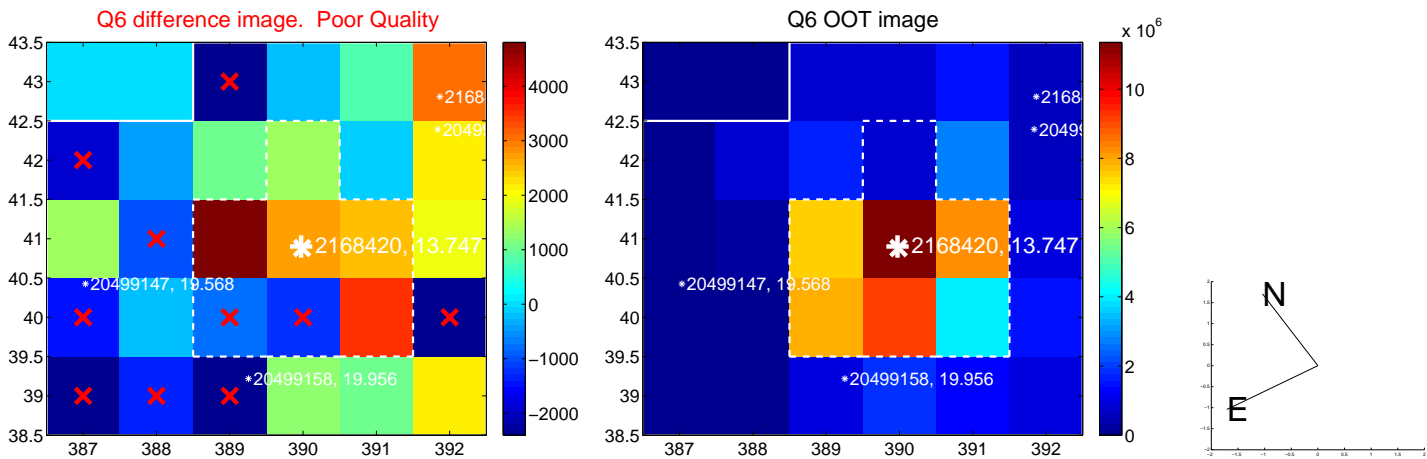
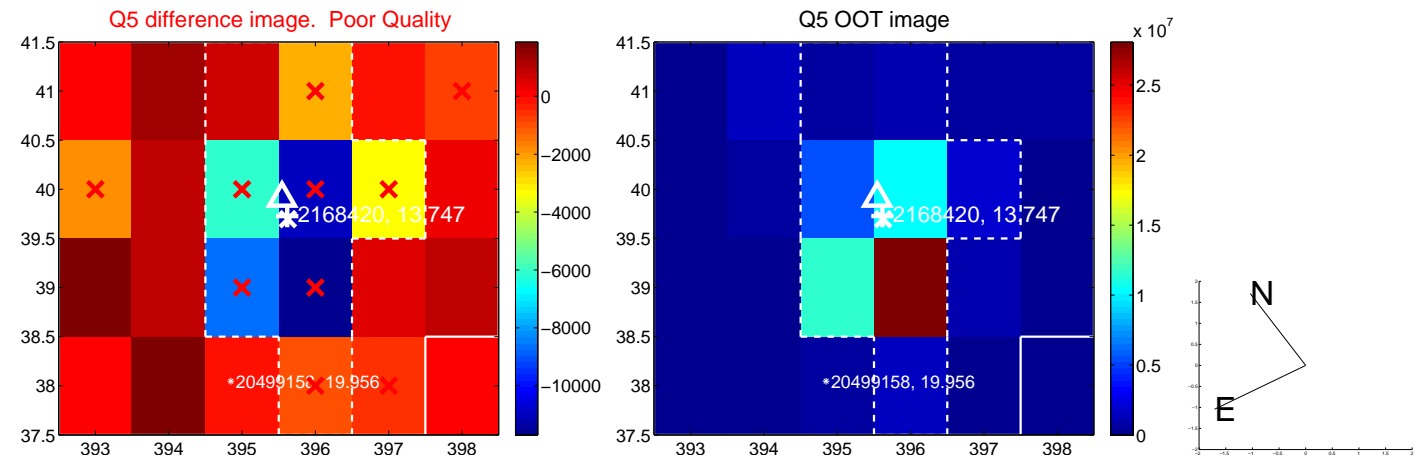


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses:** good quarterly centroid offsets; **Vermillion crosses:** bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

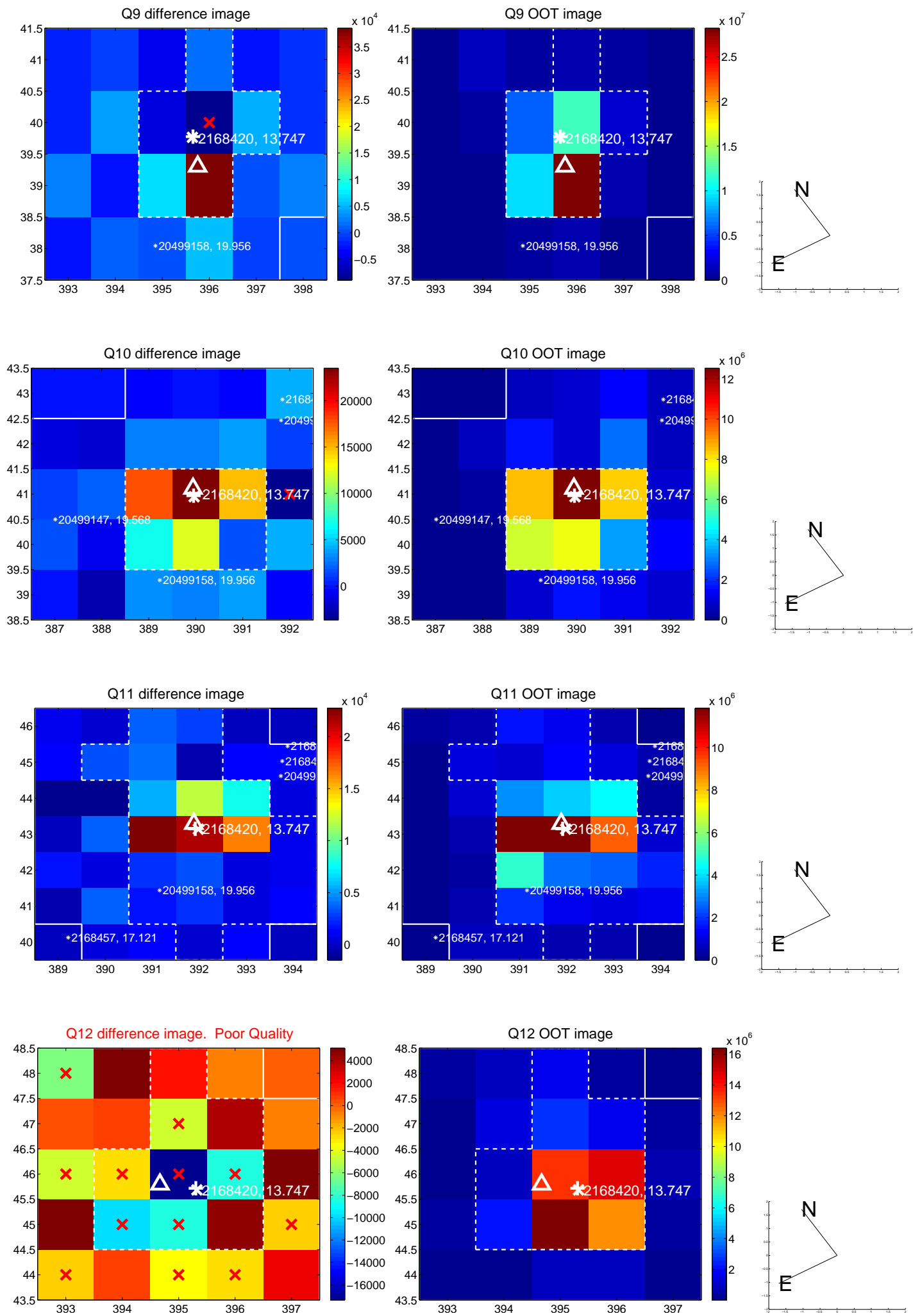
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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



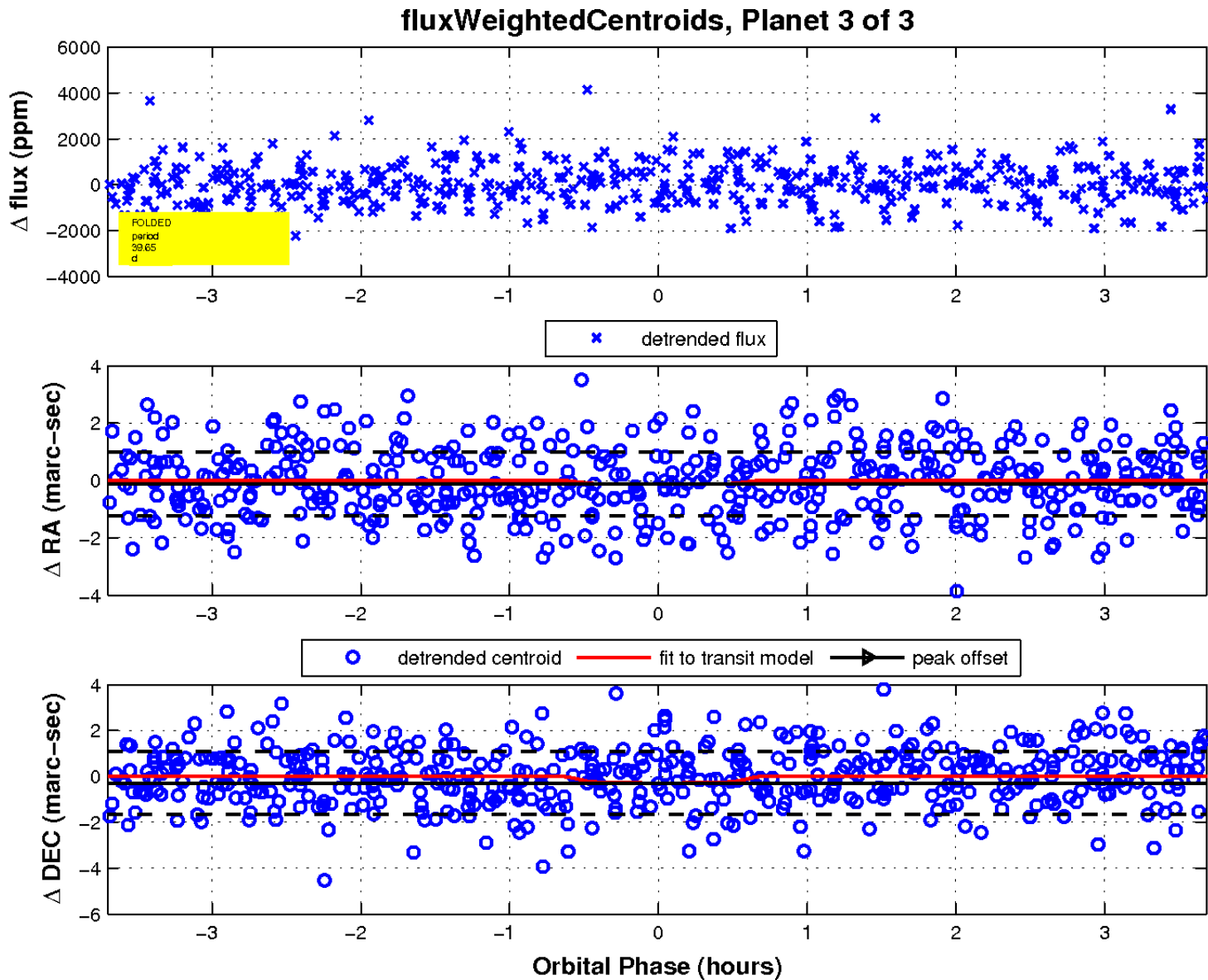
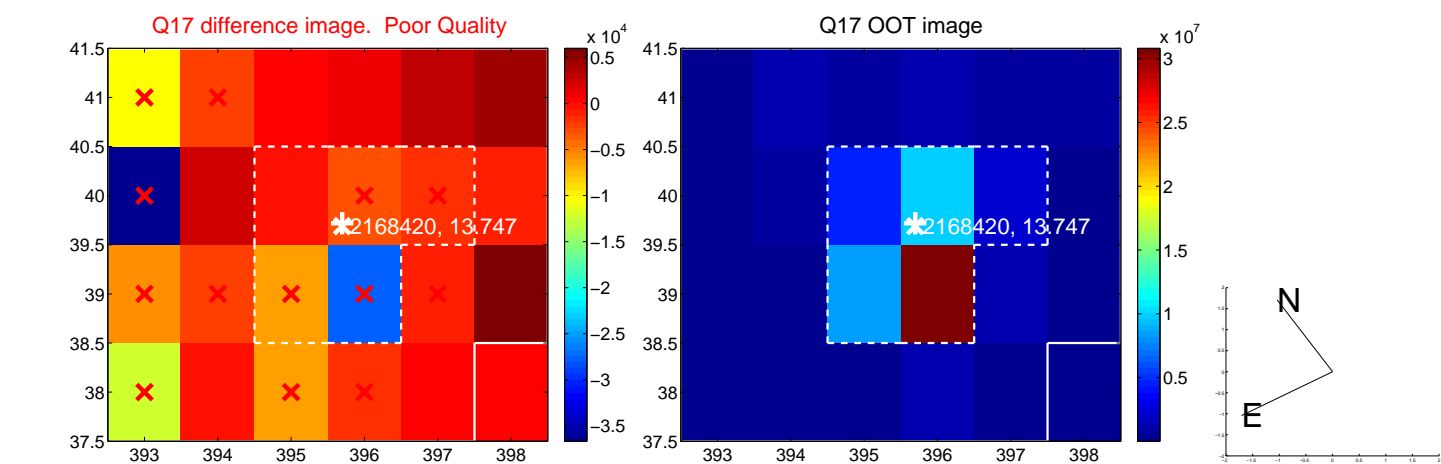
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.







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



UKIRT Image

Declination

