

# KIC 005987404

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
005987404-01	OBS	No	1.835612	132.170942	19.0	11.159	7.5	8.9	1.12	6099	0.49	1718.47
005987404-03	OBS	No	45.962054	151.976692	170.9	11.015	13.0	6.0	1.12	6099	1.65	23.46
005987404-04	OBS	No	37.348754	148.451452	141.8	25.577	10.5	9.0	1.12	6099	1.44	30.94
005987404-05	OBS	No	52.708527	144.214024	138.8	10.164	8.7	7.4	1.12	6099	1.49	19.54
005987404-06	OBS	No	487.865266	531.109283	352.1	73.327	8.5	9.4	1.12	6099	2.44	1.01
005987404-07	OBS	No	153.872450	163.069223	179.6	10.495	8.8	6.7	1.12	6099	1.62	4.68

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
005987404-01	OBS	FP	0.00	1	0	1	0	LPP_DV—CENT_UNRESOLVED_OFFSET
005987404-03	OBS	FP	0.00	1	0	1	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—CENT_FEW_DIFFS—HALO_GHOST
005987404-04	OBS	FP	0.00	1	0	1	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_ALT—CENT_FEW_MEAS—HALO_GHOST
005987404-05	OBS	FP	0.00	1	0	1	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—CENT_FEW_DIFFS—HALO_GHOST
005987404-06	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_MARSHALL—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS
005987404-07	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_MARSHALL—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS

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

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

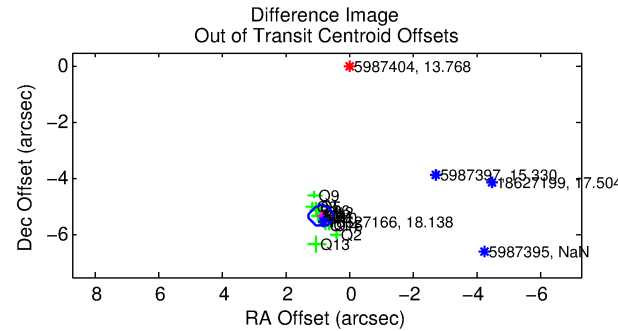
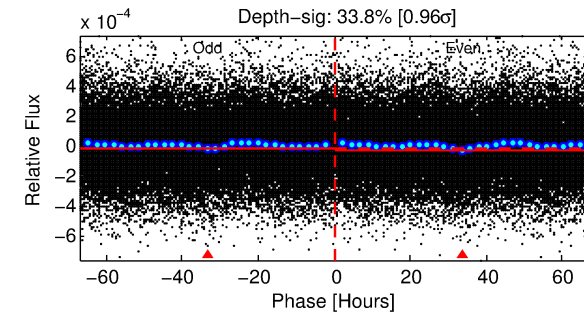
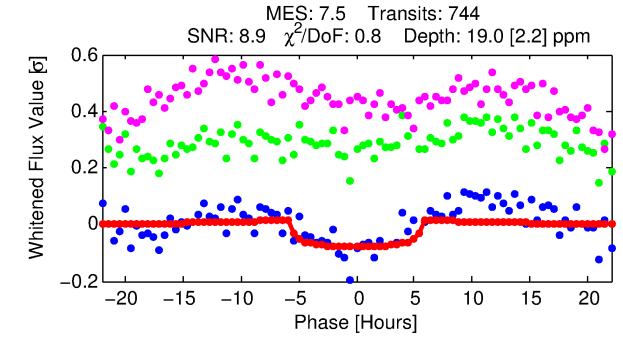
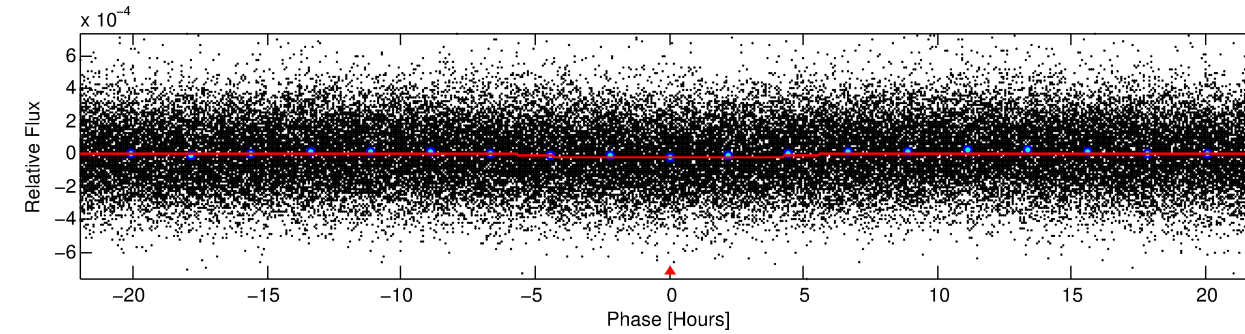
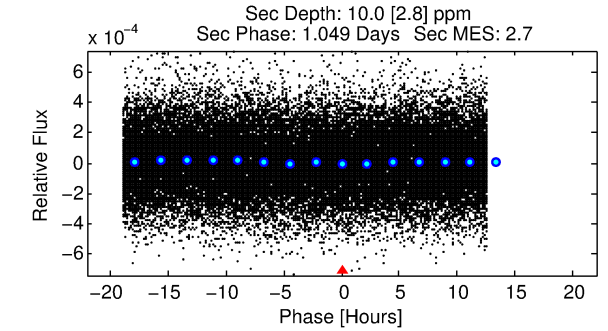
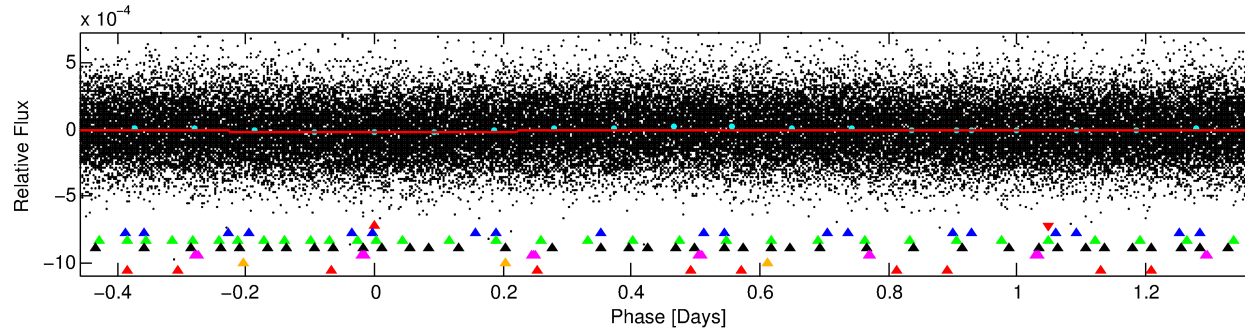
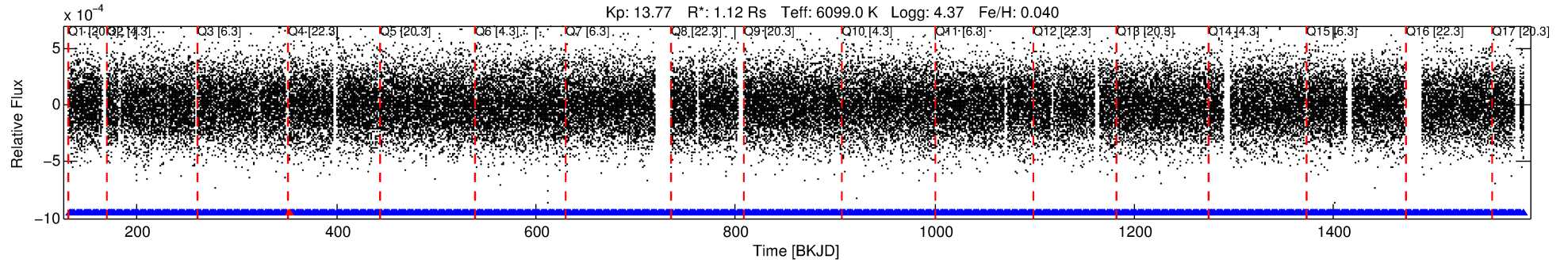
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 005987404-01

No Significant Match Found

# DV One-Page Summary

KIC: 5987404 Candidate: 1 of 7 Period: 1.836 d



## DV Fit Results:

Period = 1.83561 [0.00004] d  
Epoch = 132.1709 [0.0106] BKJD  
Rp/R\* = 0.0040 [0.0060]  
a/R\* = 1.40 [5.00]  
b = 0.06 [121.58]  
Seff = 1718.47 [712.58]  
Teq = 1642 [170] K  
Rp = 0.49 [0.76] Re  
a = 0.0302 [0.0082] AU  
Ag = 20.91 [64.09] [0.31σ]  
Teffp = 5428 [4130] K [0.92σ]

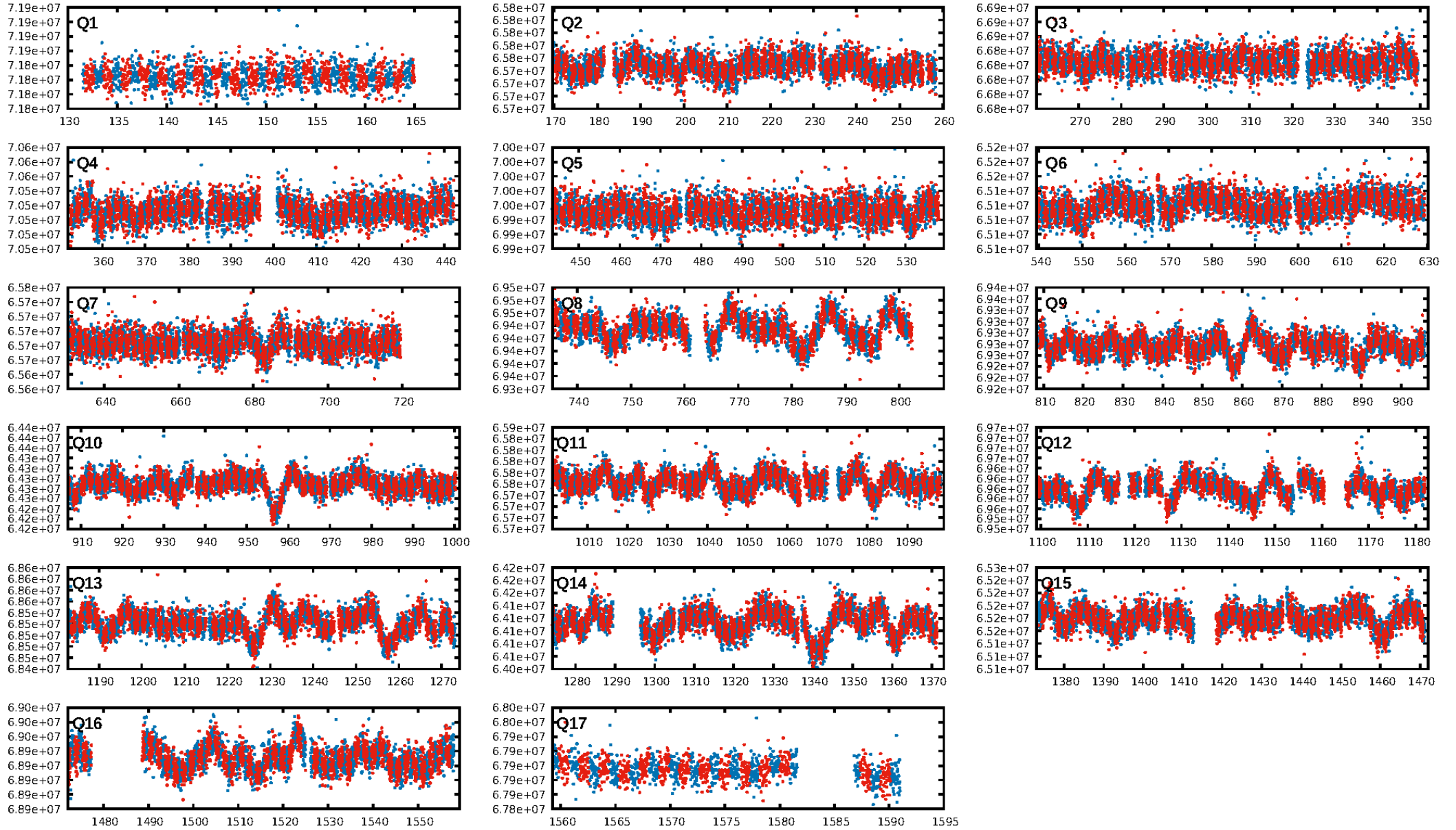
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 100.0% [30.54σ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: 2.10e-14  
RollingBand-fgt: 1.00 [710/711]  
GhostDiagnostic-chr: 0.7074  
Centroid-sig: 0.0%  
Centroid-so: 4.369 arcsec [3.29σ]  
OotOffset-rm: 5.408 arcsec [43.89σ]  
KicOffset-rm: 5.666 arcsec [40.25σ]  
OotOffset-st: 4/4/3/3 [14]  
KicOffset-st: 4/4/3/3 [14]  
DiffImageQuality-fgm: 0.86 [12/14]  
DiffImageOverlap-fno: 1.00 [17/17]

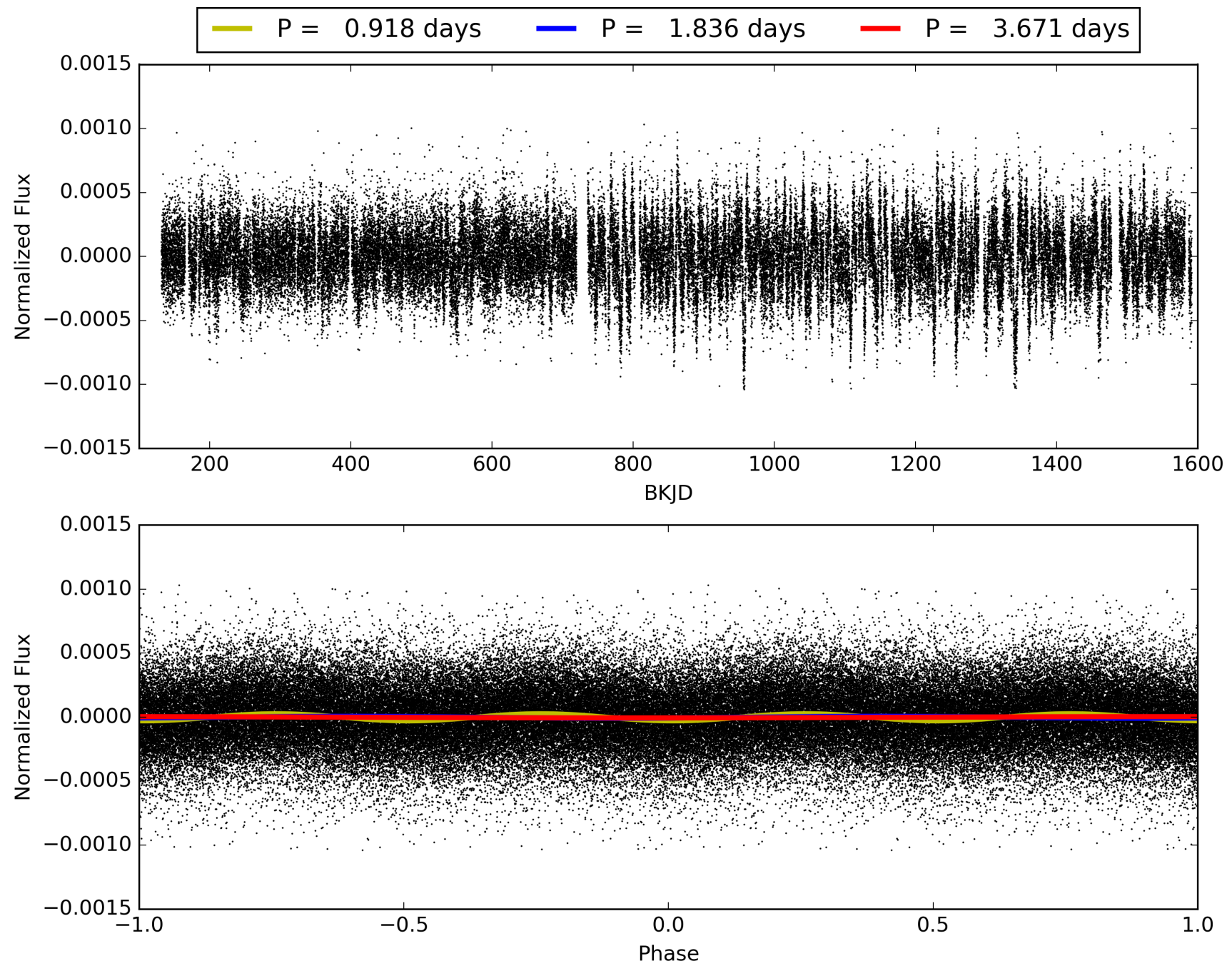
Software Revision: svn-ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 30-Jan-2016 03:17:03 Z

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

# TCE 005987404-01, PDC Light Curves



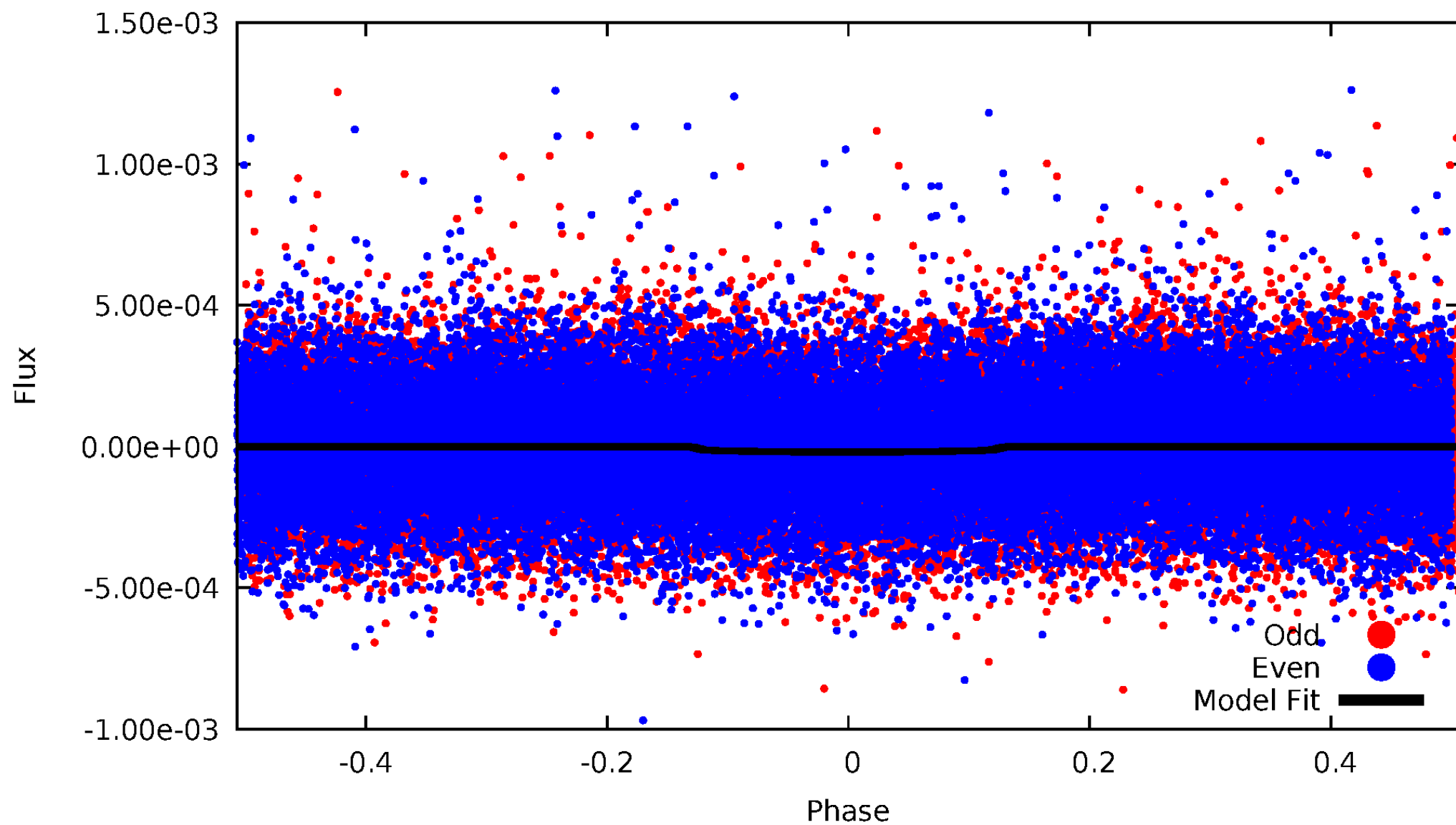
TCE 005987404-01





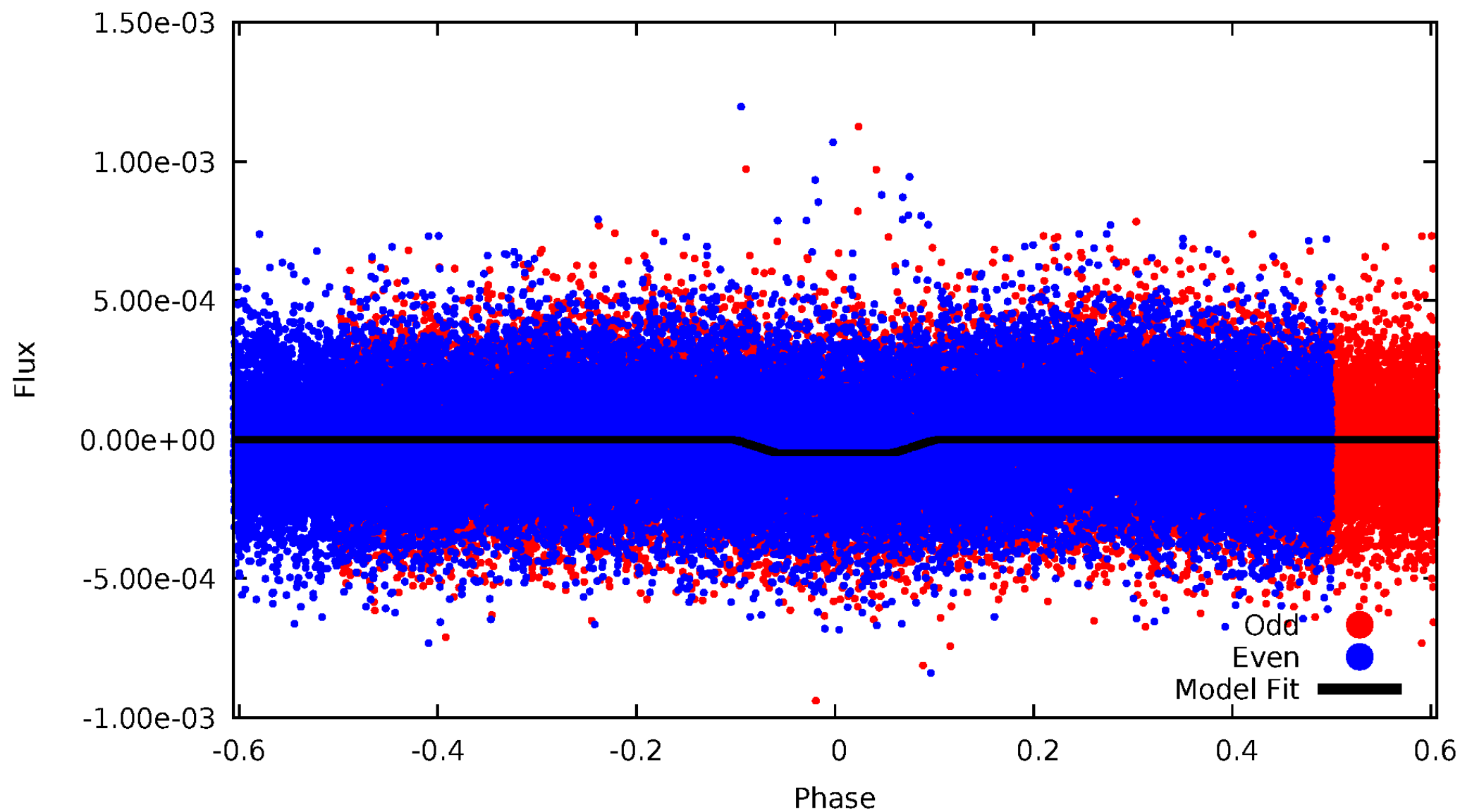
# DV Odd/Even

TCE 005987404-01

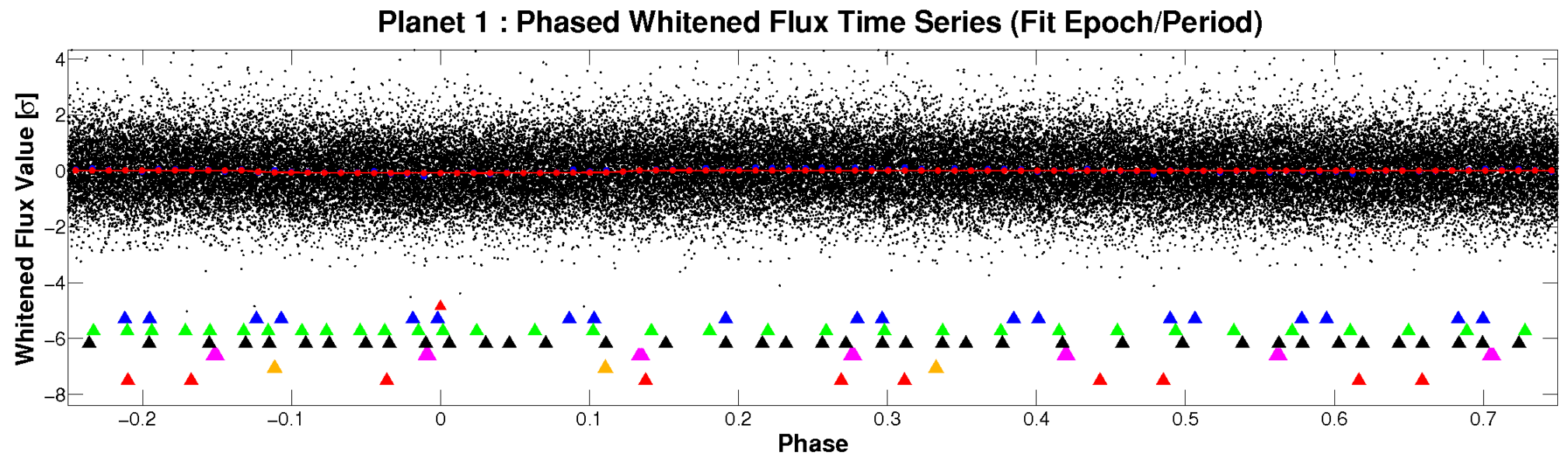
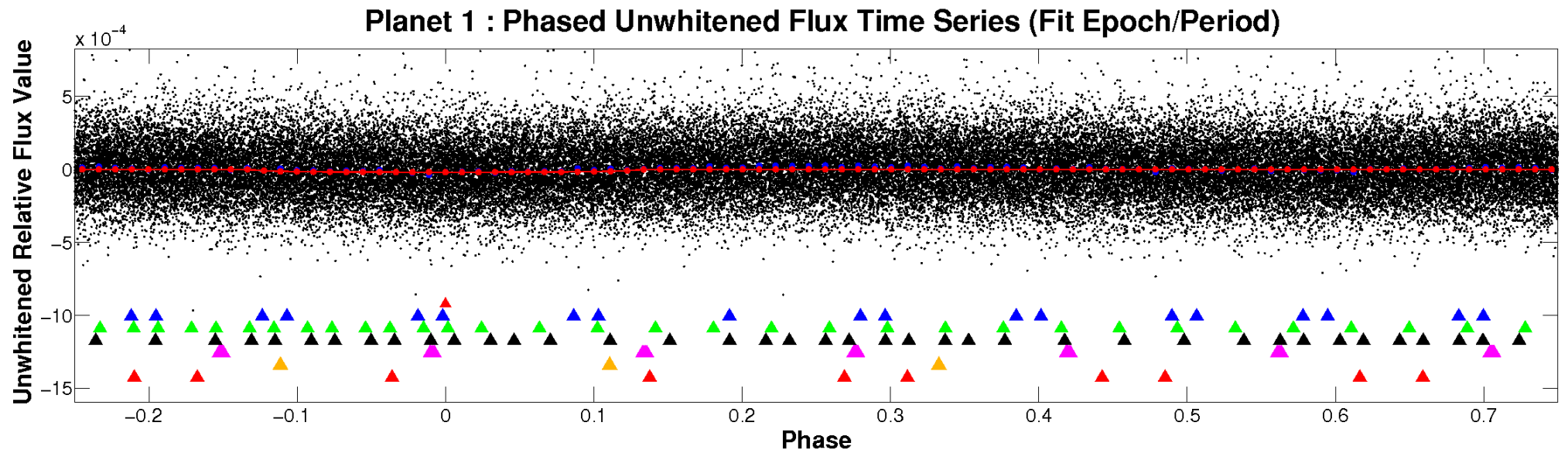


# ALT Odd/Even

TCE 005987404-01

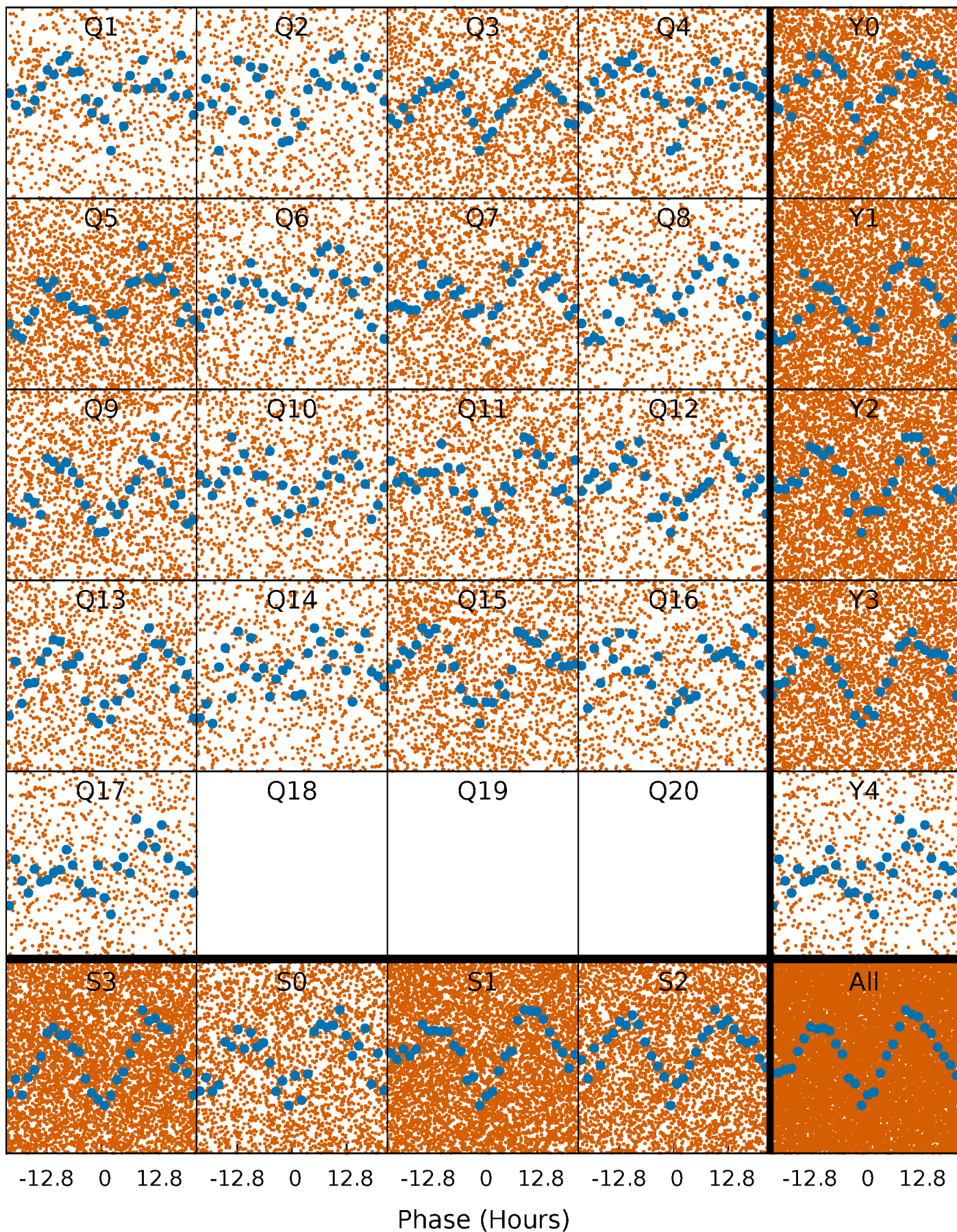


# Non-Whitened Vs. Whitened Light Curve



# PDC Quarter-Phased Transit Curves

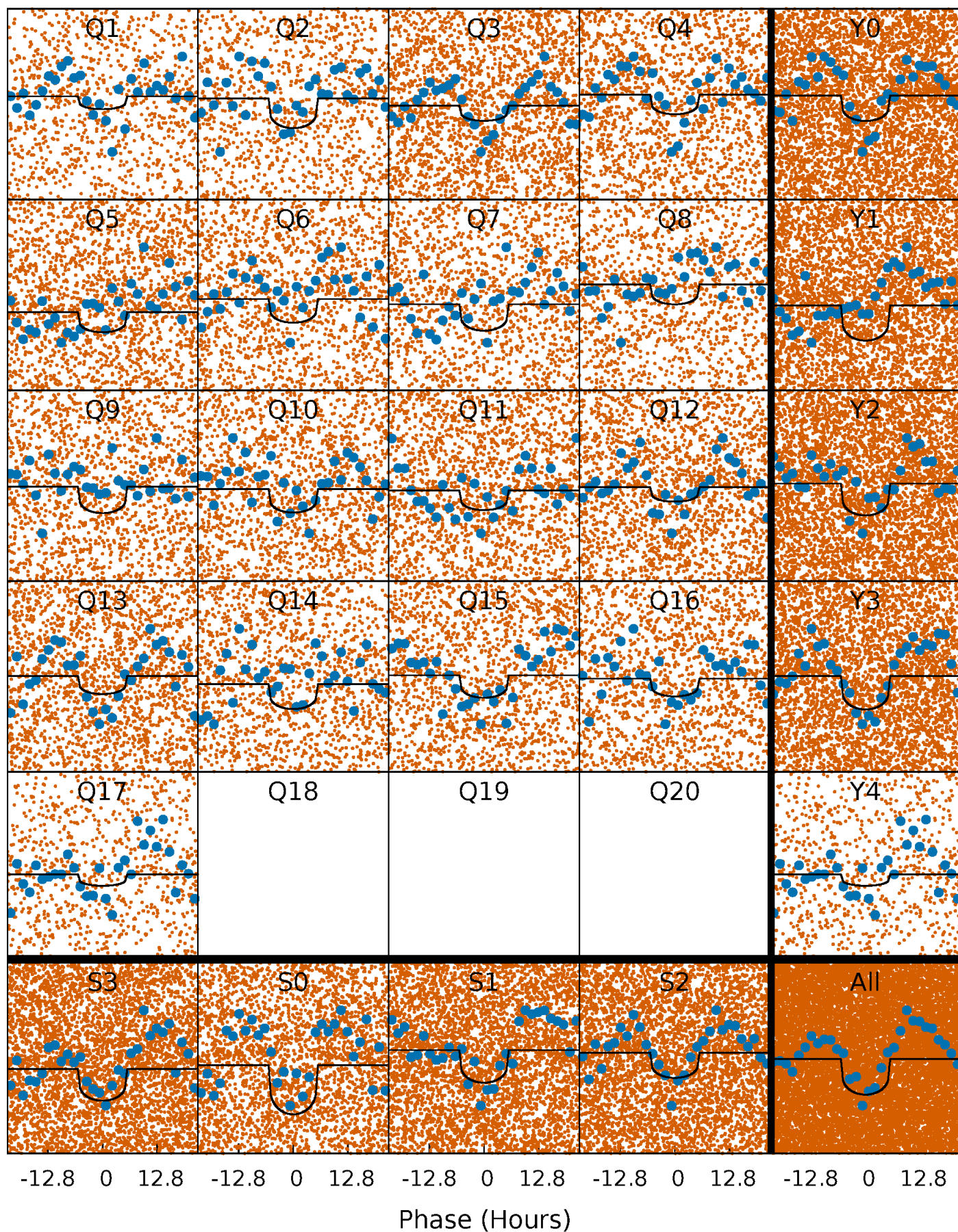
TCE 005987404-01 P= 1.835612 Days  $T_0=132.170942$  (BKJD)





# DV Quarter-Phased Transit Curves

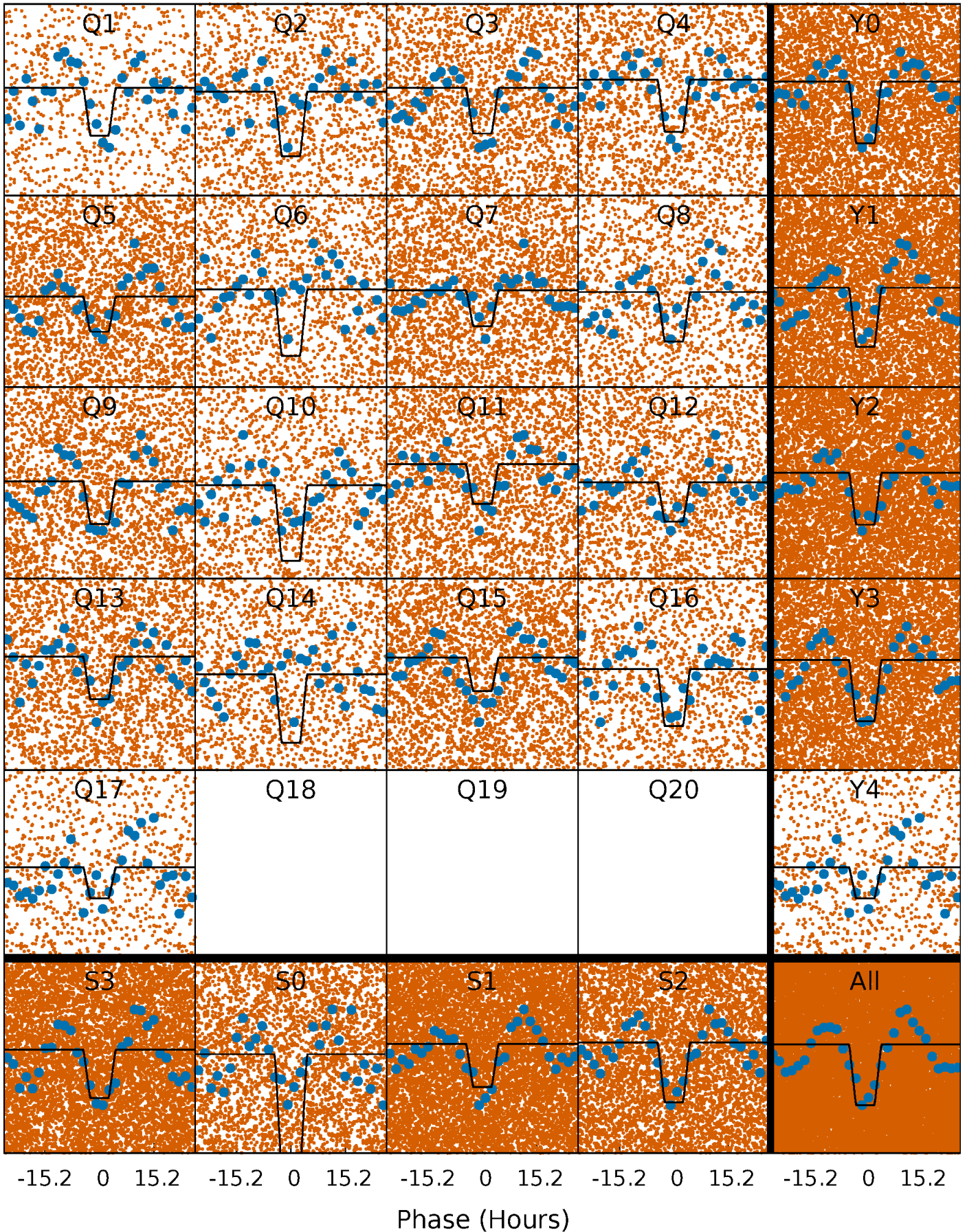
TCE 005987404-01 P= 1.835612 Days  $T_0=132.170942$  (BKJD)





# Alt. Detrend Quarter-Phased Transit Curves

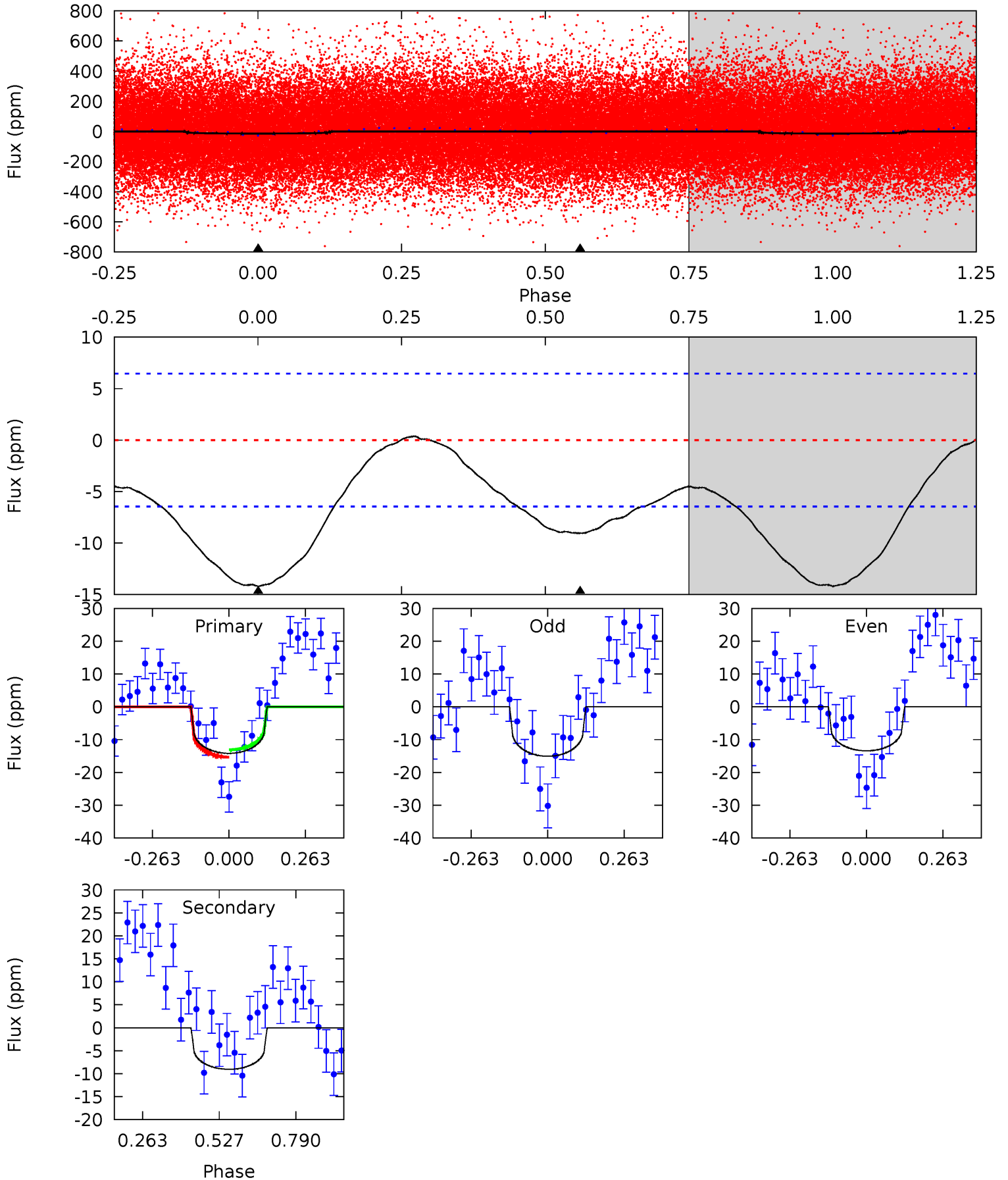
TCE 005987404-01 P= 1.835607 Days  $T_0=132.172906$  (BKJD)



# DV Model-Shift Uniqueness Test

005987404-01, P = 1.835612 Days, E = 130.335330 Days

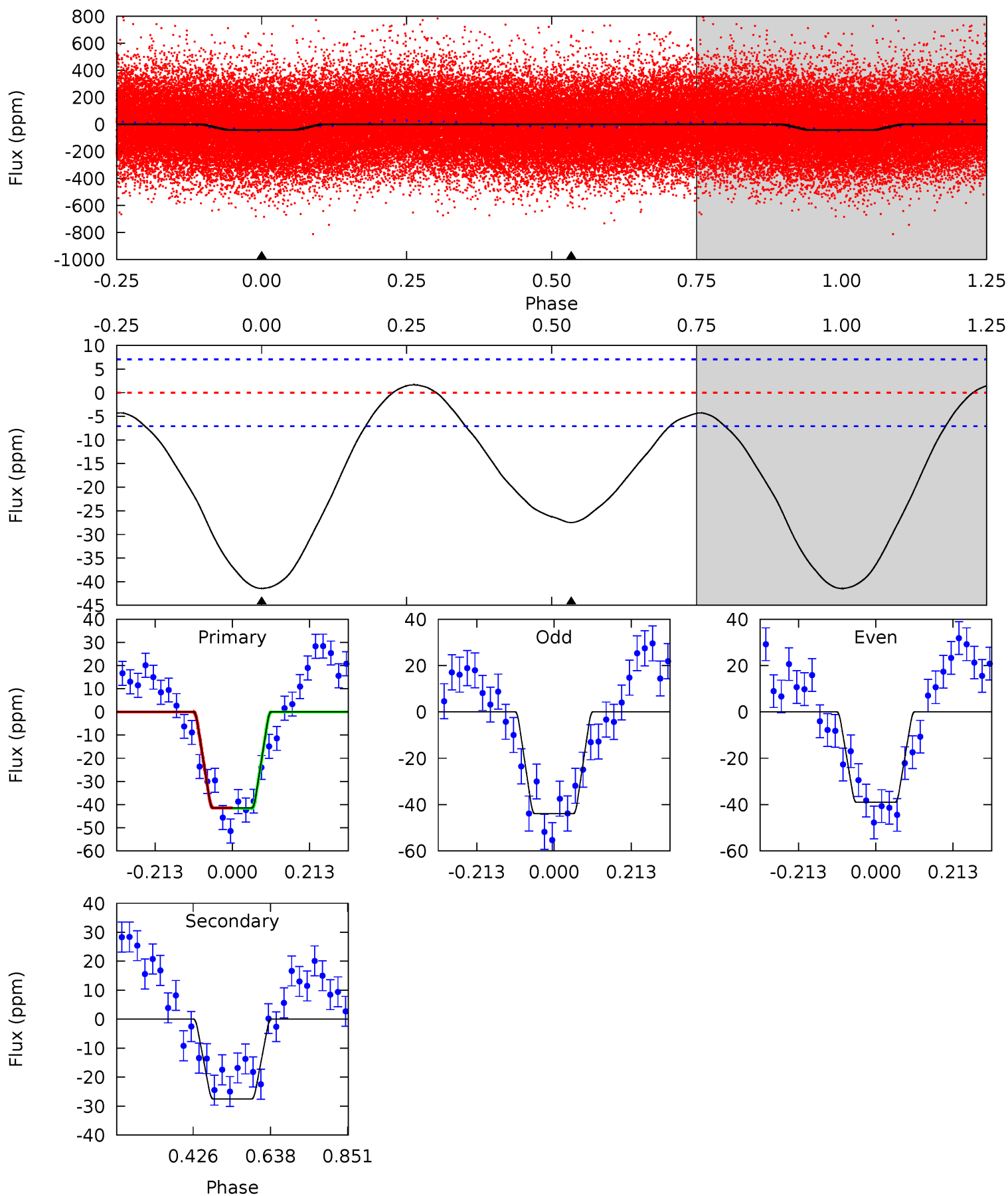
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
9.57	6.10	0	0	4.36	1.12	0.20	9.57	9.57	6.10	6.10	0.57	0.81	0.03	0.78



# Alt Model-Shift Uniqueness Test

005987404-01, P = 1.835607 Days, E = 130.337299 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
25.8	17.1	0	0	4.40	1.25	1.56	25.8	25.8	17.1	17.1	1.52	0.88	0.04	0.05





### Stellar Parameters For KIC 005987404

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$6099^{+184}_{-220}$	$4.373^{+0.090}_{-0.210}$	$0.040^{+0.250}_{-0.300}$	$1.123^{+0.366}_{-0.157}$	$1.085^{+0.166}_{-0.135}$	$1.078^{+0.500}_{-0.570}$
	+3%/-4%	+2%/-5%	+625%/-750%	+33%/-14%	+15%/-12%	+46%/-53%
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 005987404-01 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-9 \pm 1$	$0.71^{+0.68}_{-0.44}$	$2324^{+182}_{-132}$	$4579^{+2858}_{-1033}$	$8.598^{+58.866}_{-6.382}$
Alt.	$-27 \pm 2$	$1.02^{+0.71}_{-0.66}$	$2327^{+174}_{-134}$	$4994^{+3608}_{-954}$	$13^{+92}_{-8}$

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

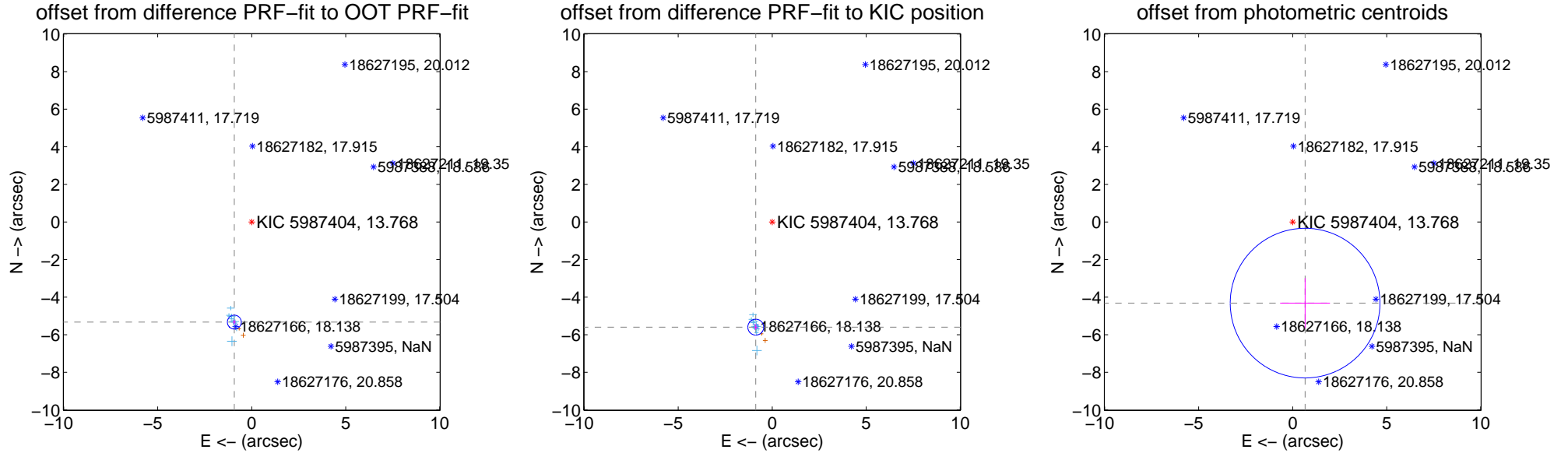
## DV Centroid Data

Supplemental centroid analysis for 005987404-01. Kepler magnitude: 13.77. Transit SNR 8.89

There are 12 quarters with good PRF difference image offsets

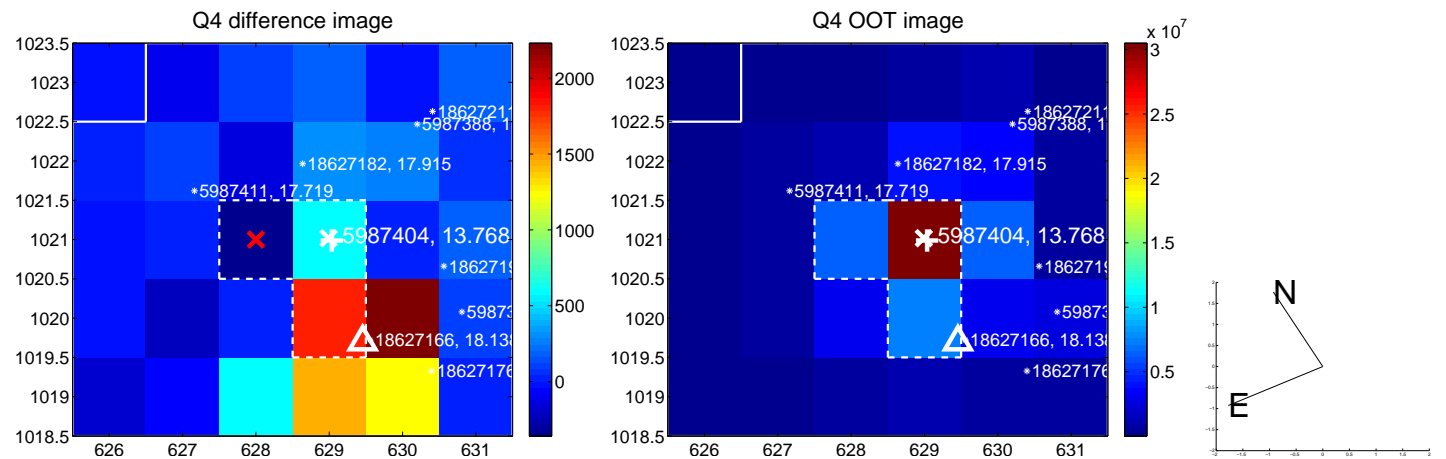
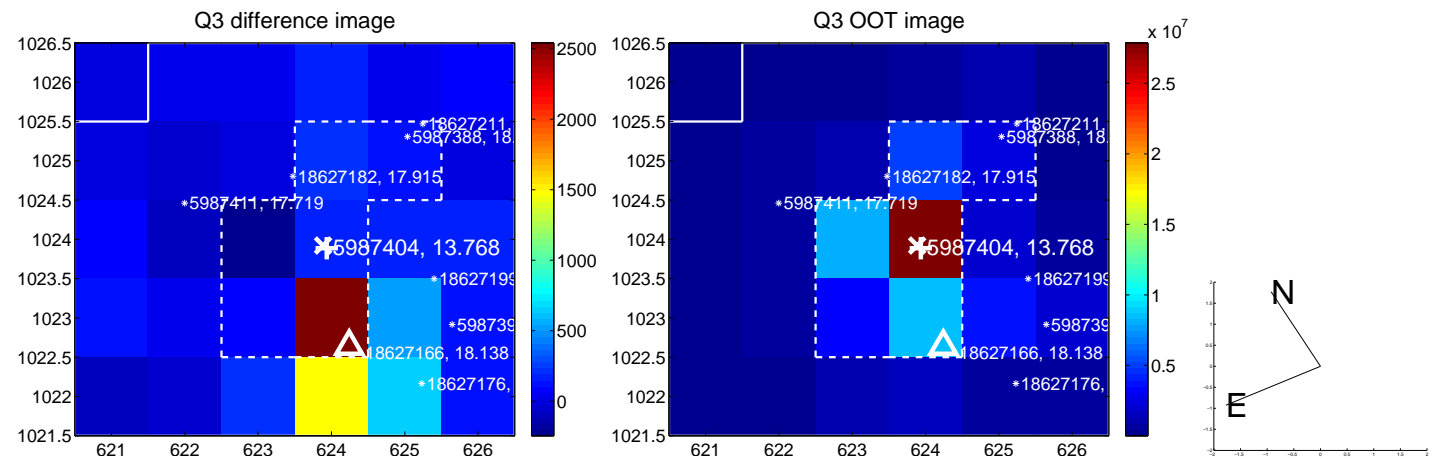
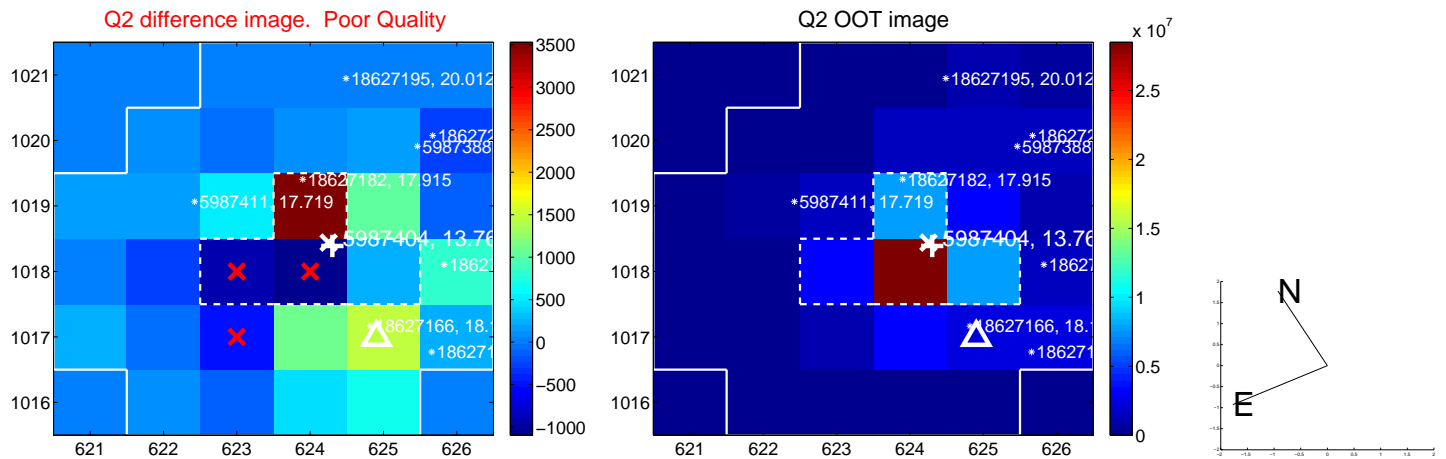
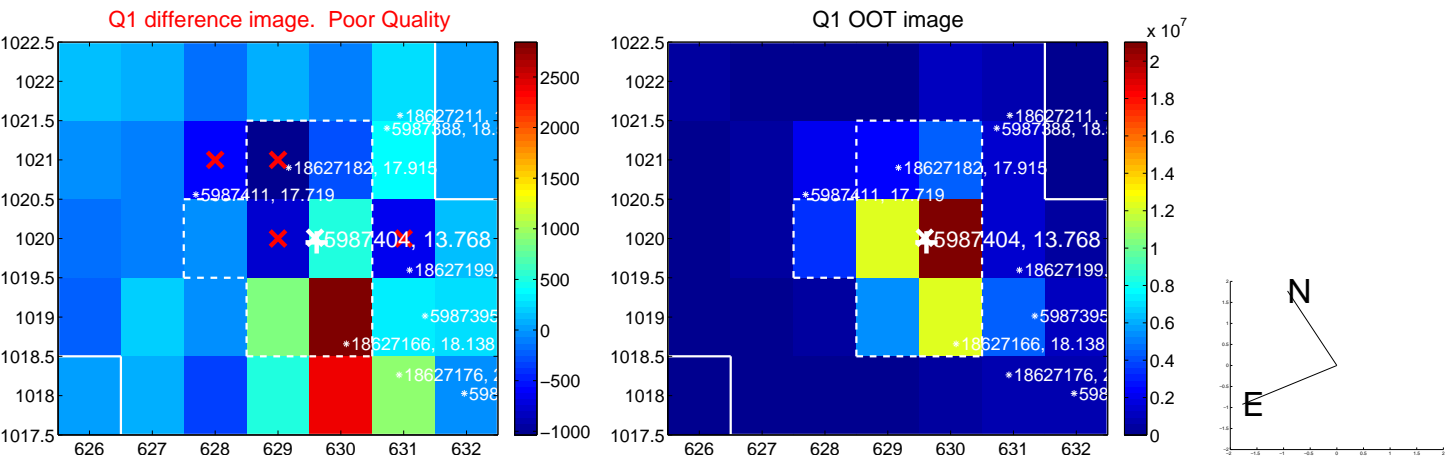
The direct PRF centroid is offset from the target star catalog position by about 0.22 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$5.408 \pm 0.123$	43.89	$0.926 \pm 0.085$	$-5.329 \pm 0.129$
PRF-fit source offset from KIC position	$5.666 \pm 0.141$	40.25	$0.874 \pm 0.083$	$-5.598 \pm 0.146$
photometric centroid source offset	$4.37 \pm 1.33$	3.29	$-0.66 \pm 1.32$	$-4.32 \pm 1.33$

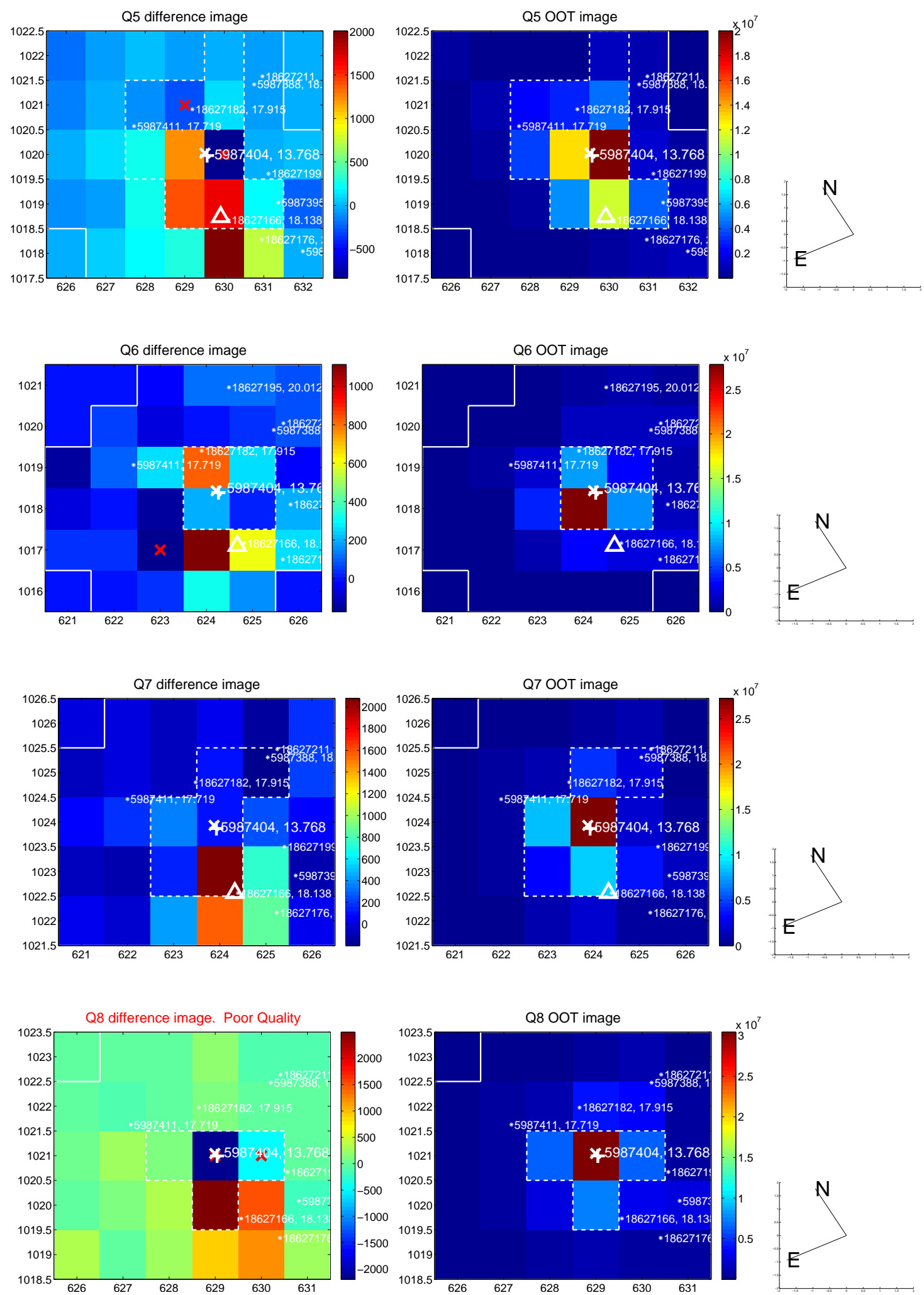


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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

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

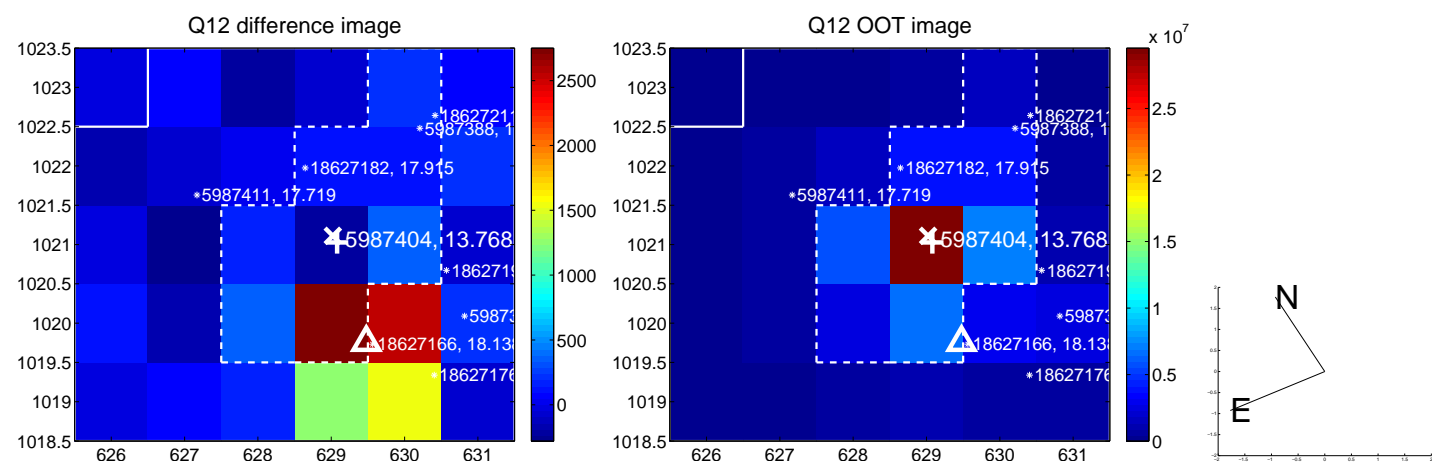
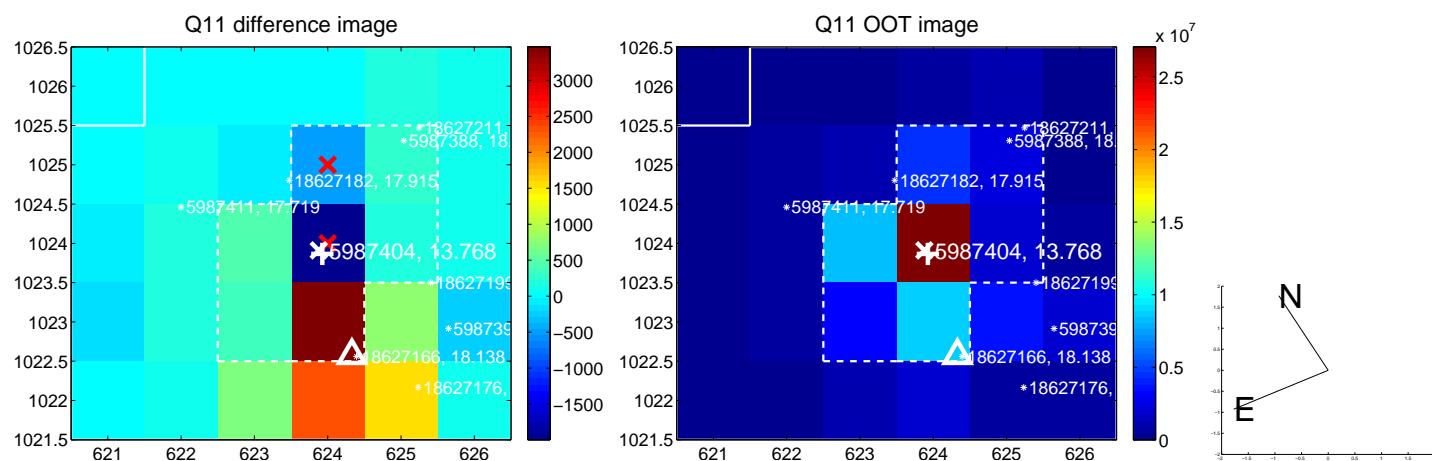
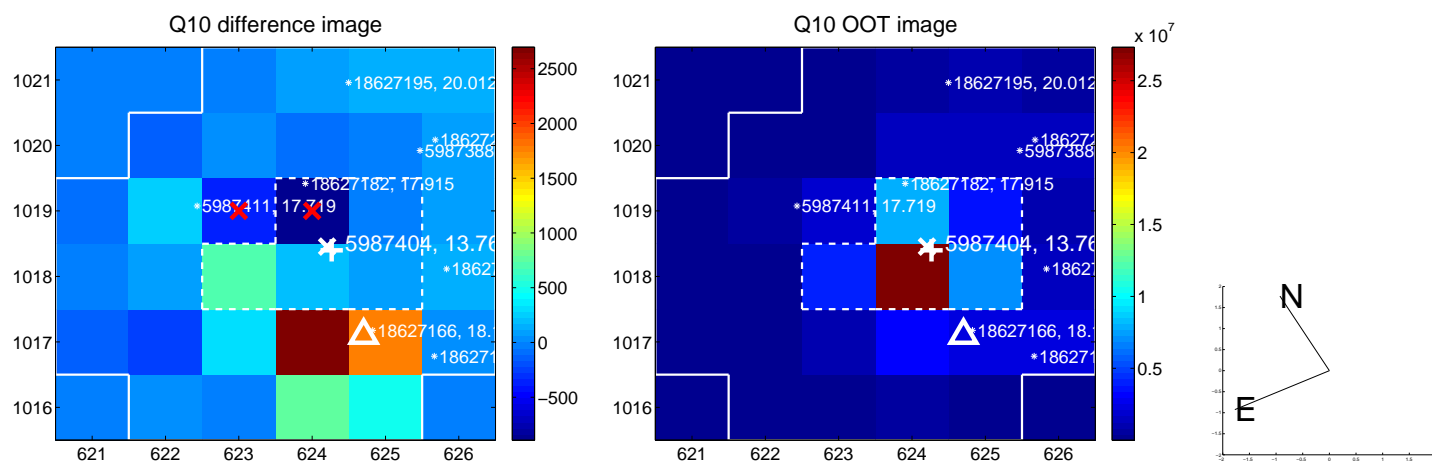
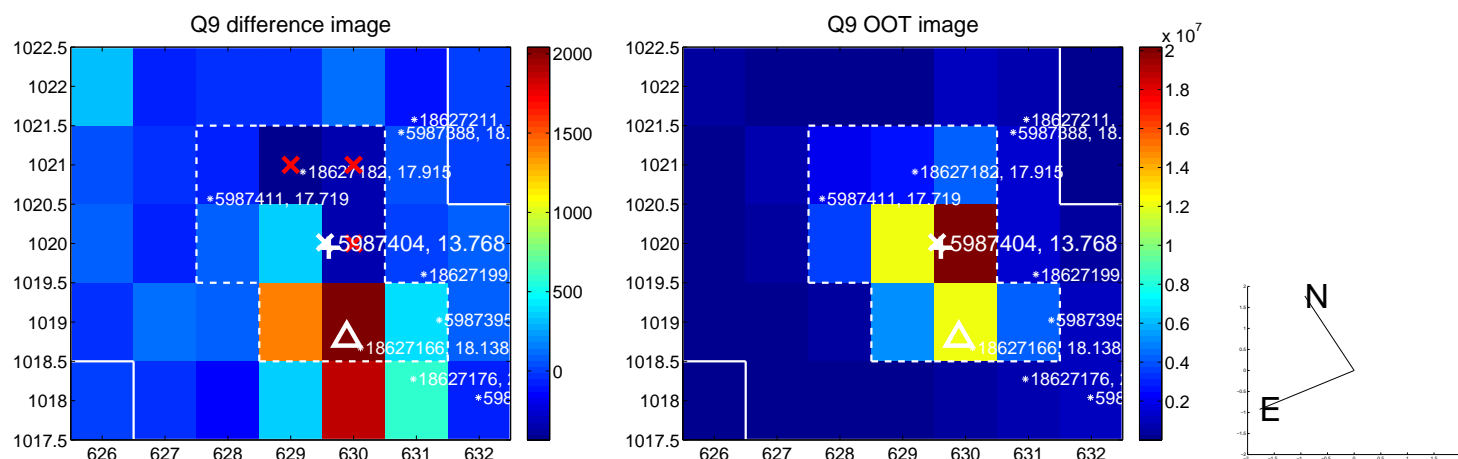


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

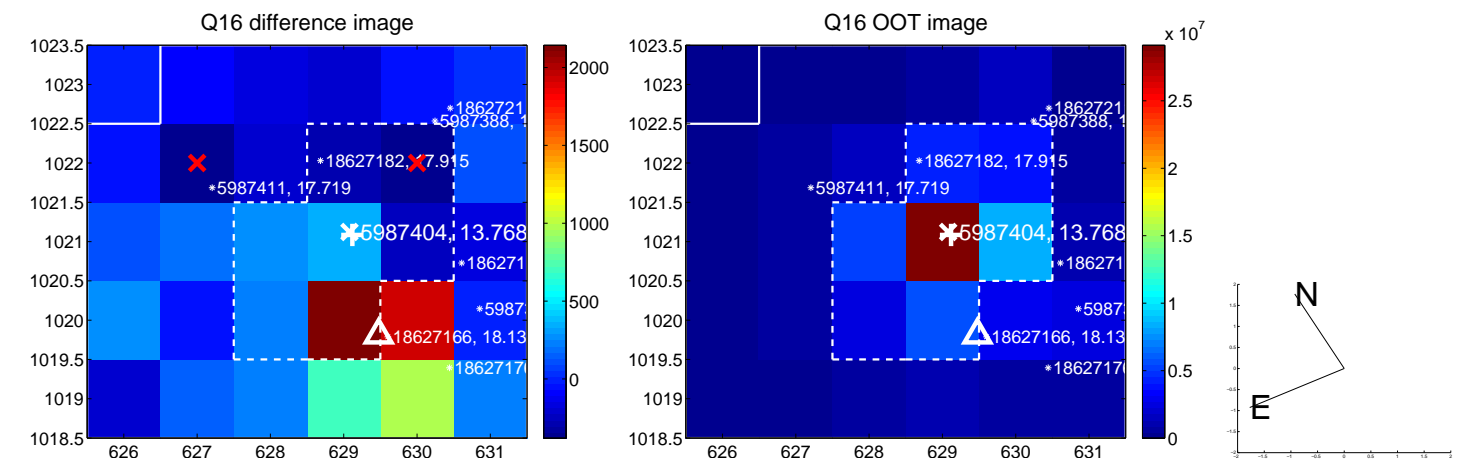
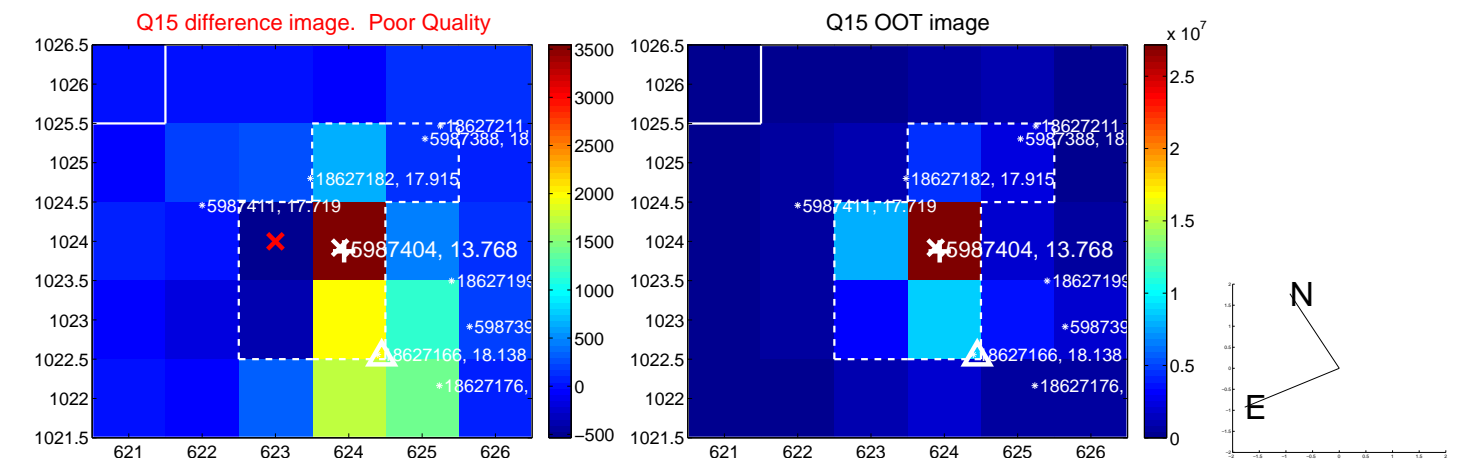
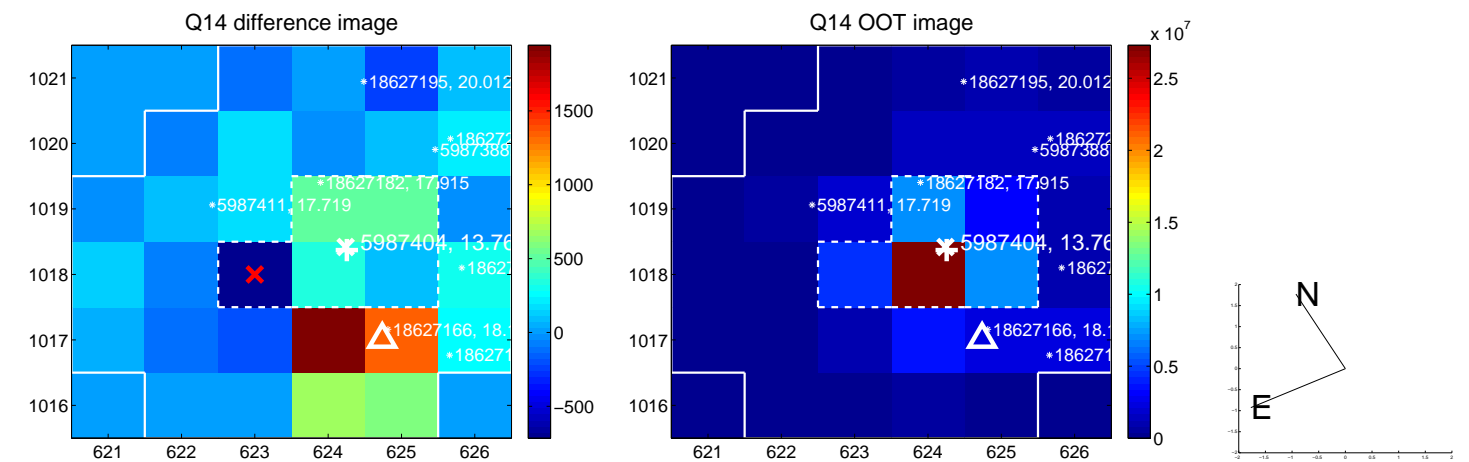
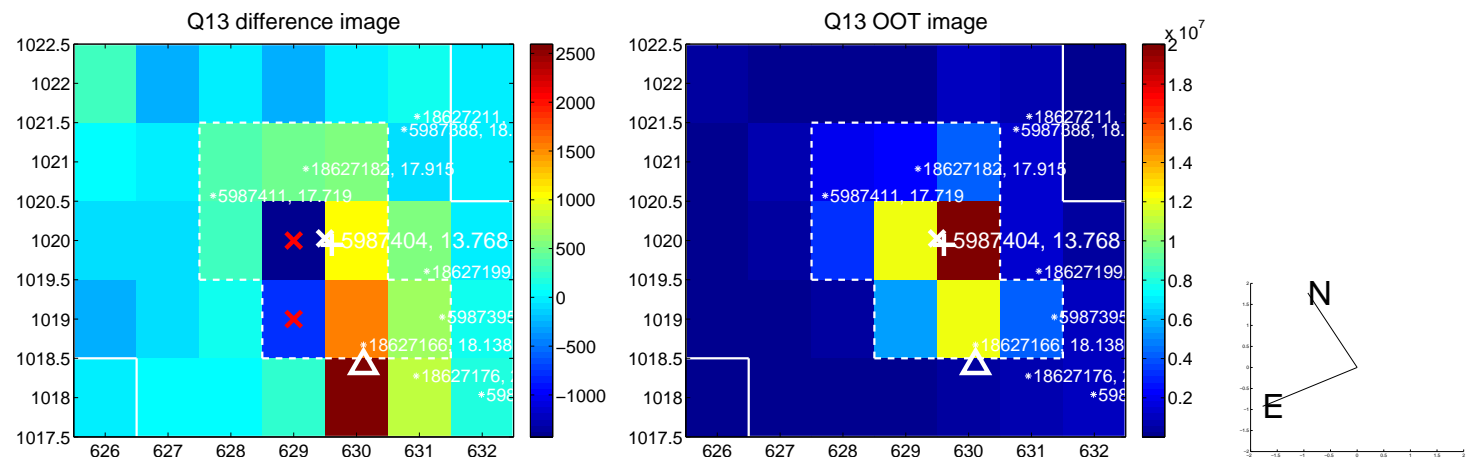




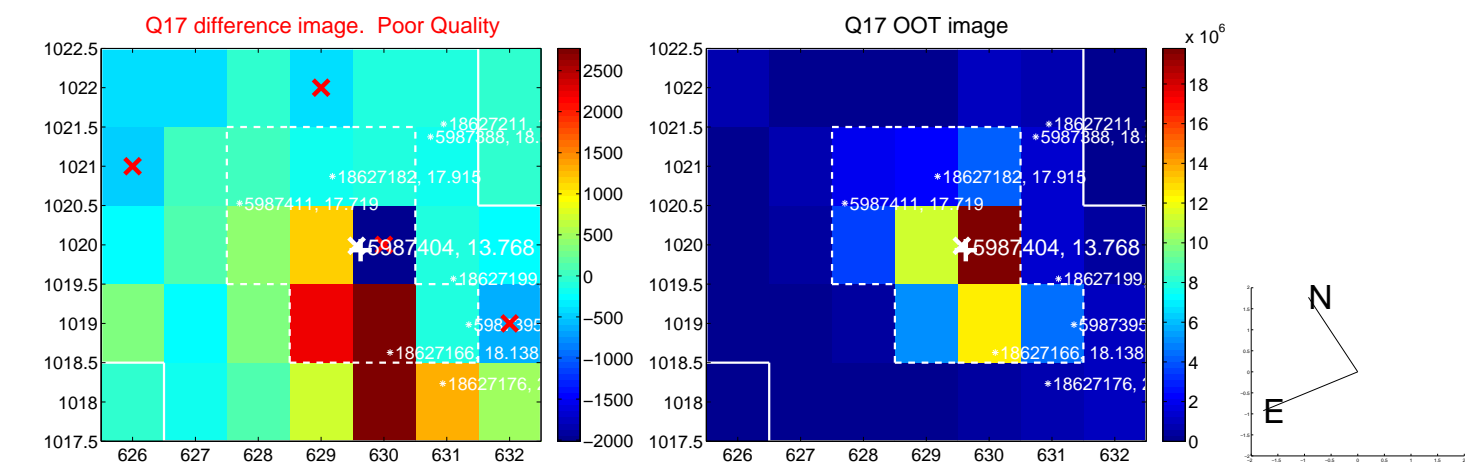
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



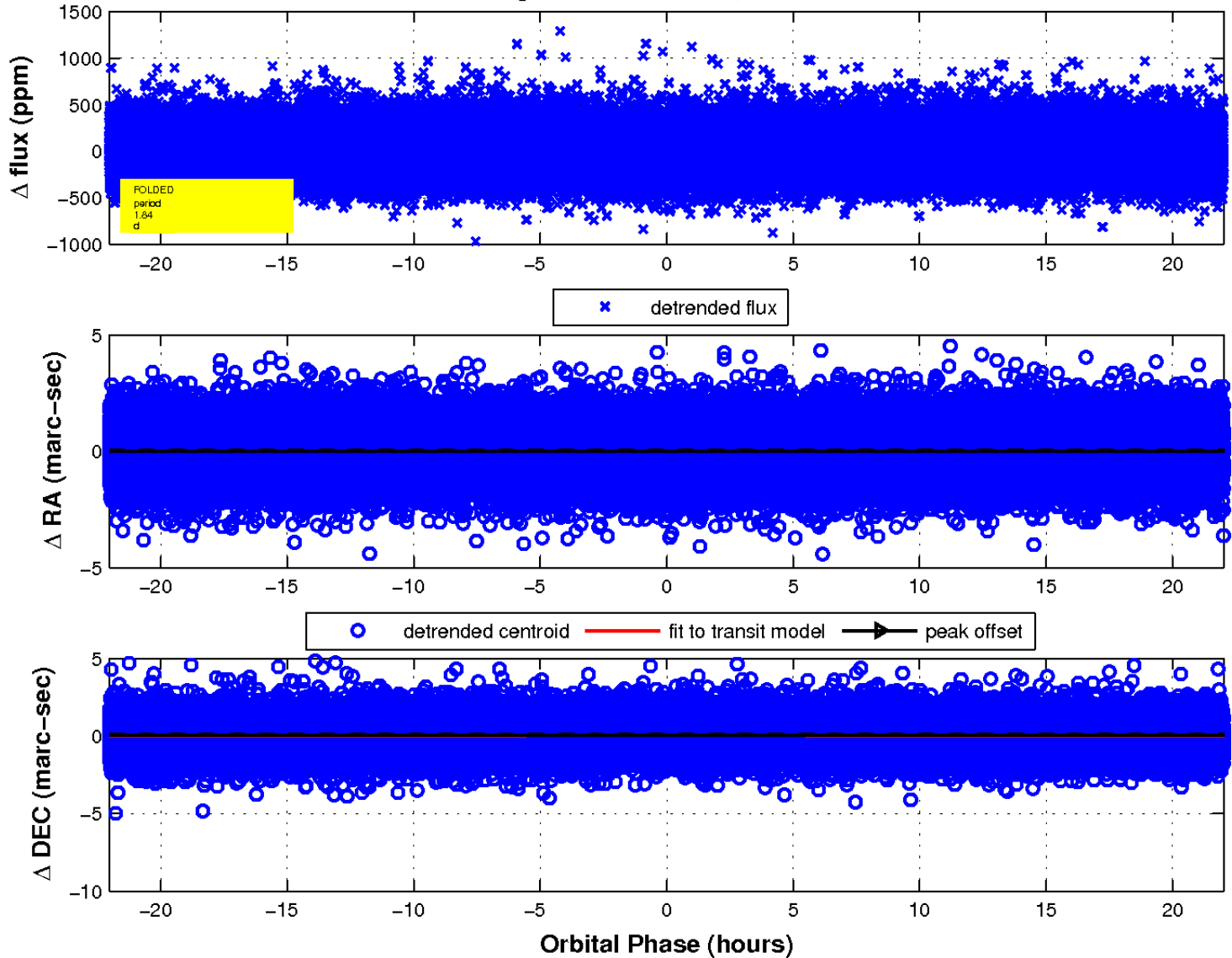
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

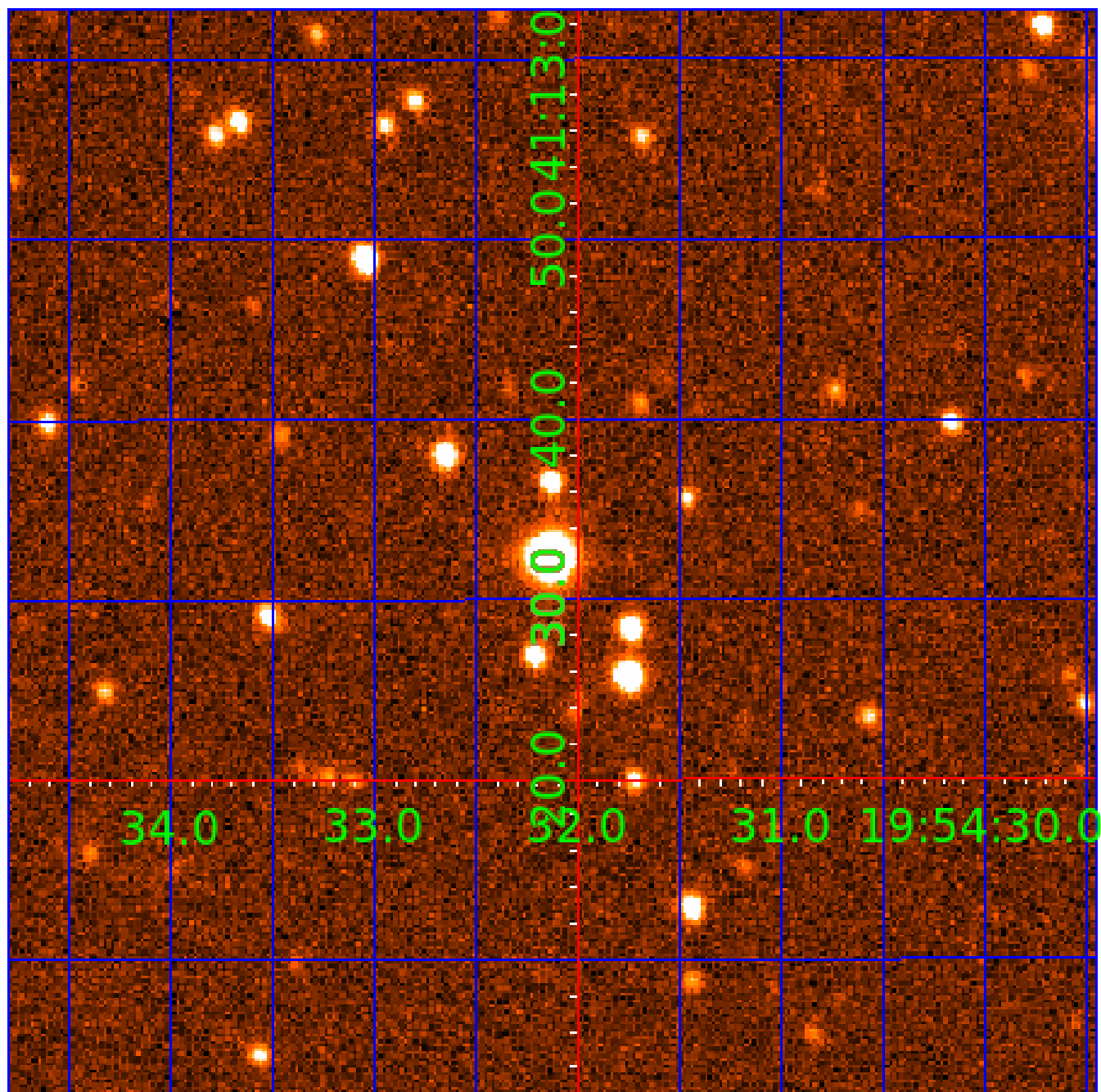


fluxWeightedCentroids, Planet 1 of 7



UKIRT Image

Declination





# KIC 005987404

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
005987404-01	OBS	No	1.835612	132.170942	19.0	11.159	7.5	8.9	1.12	6099	0.49	1718.47
005987404-03	OBS	No	45.962054	151.976692	170.9	11.015	13.0	6.0	1.12	6099	1.65	23.46
005987404-04	OBS	No	37.348754	148.451452	141.8	25.577	10.5	9.0	1.12	6099	1.44	30.94
005987404-05	OBS	No	52.708527	144.214024	138.8	10.164	8.7	7.4	1.12	6099	1.49	19.54
005987404-06	OBS	No	487.865266	531.109283	352.1	73.327	8.5	9.4	1.12	6099	2.44	1.01
005987404-07	OBS	No	153.872450	163.069223	179.6	10.495	8.8	6.7	1.12	6099	1.62	4.68

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
005987404-01	OBS	FP	0.00	1	0	1	0	LPP_DV—CENT_UNRESOLVED_OFFSET
005987404-03	OBS	FP	0.00	1	0	1	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—CENT_FEW_DIFFS—HALO_GHOST
005987404-04	OBS	FP	0.00	1	0	1	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_ALT—CENT_FEW_MEAS—HALO_GHOST
005987404-05	OBS	FP	0.00	1	0	1	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—CENT_FEW_DIFFS—HALO_GHOST
005987404-06	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_MARSHALL—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS
005987404-07	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_MARSHALL—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS

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

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

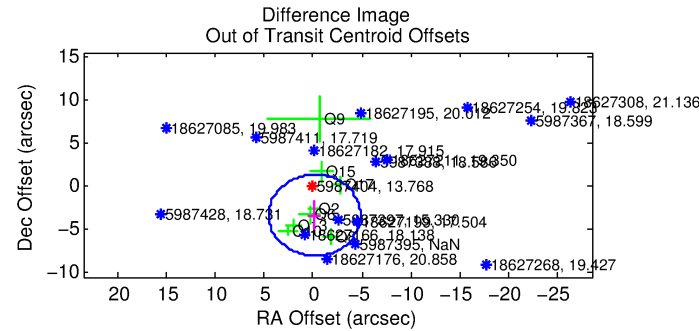
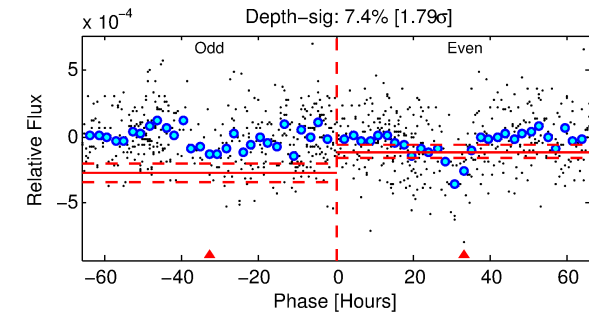
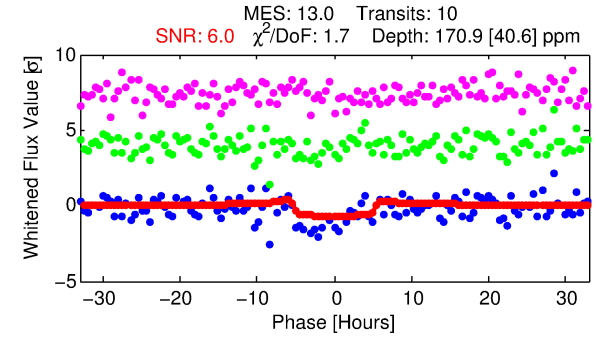
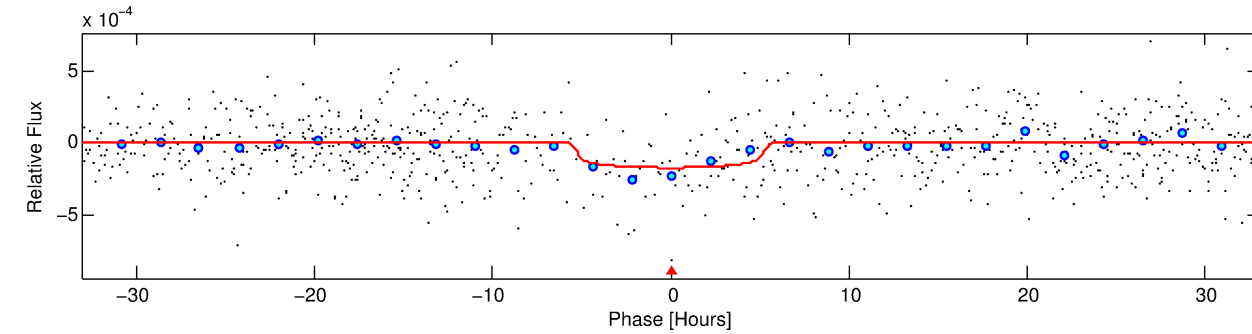
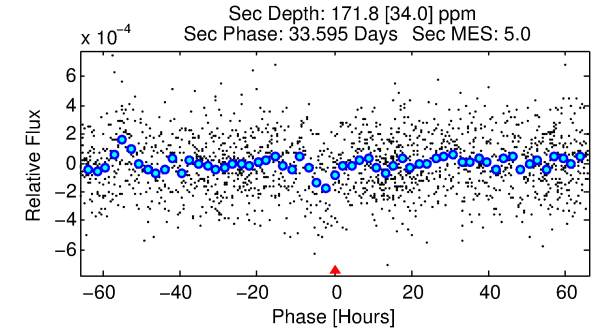
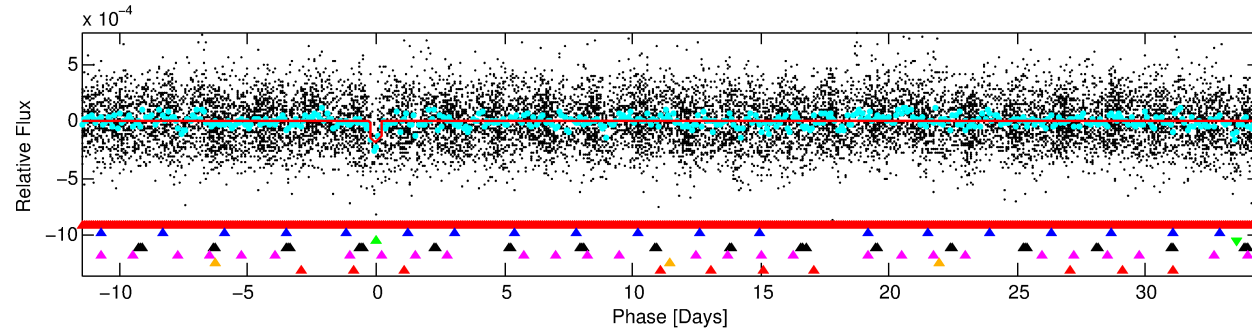
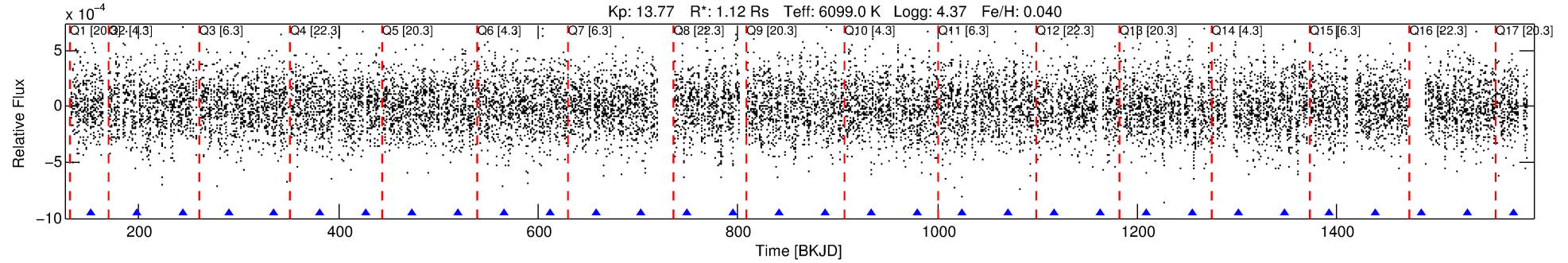
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 005987404-03

No Significant Match Found

# DV One-Page Summary

KIC: 5987404 Candidate: 3 of 7 Period: 45.962 d



## DV Fit Results:

Period = 45.96205 [0.00604] d  
Epoch = 151.9767 [0.1147] BKJD  
Rp/R\* = 0.0135 [0.0081]  
a/R\* = 18.57 [54.90]  
b = 0.83 [1.10]  
Seff = 23.46 [9.73]  
Teff = 561 [58] K  
Rp = 1.65 [1.13] Re  
a = 0.2582 [0.0698] AU  
Ag = 2315.86 [2974.69] [0.78σ]  
Teffp = 6019 [1855] K [2.94σ]

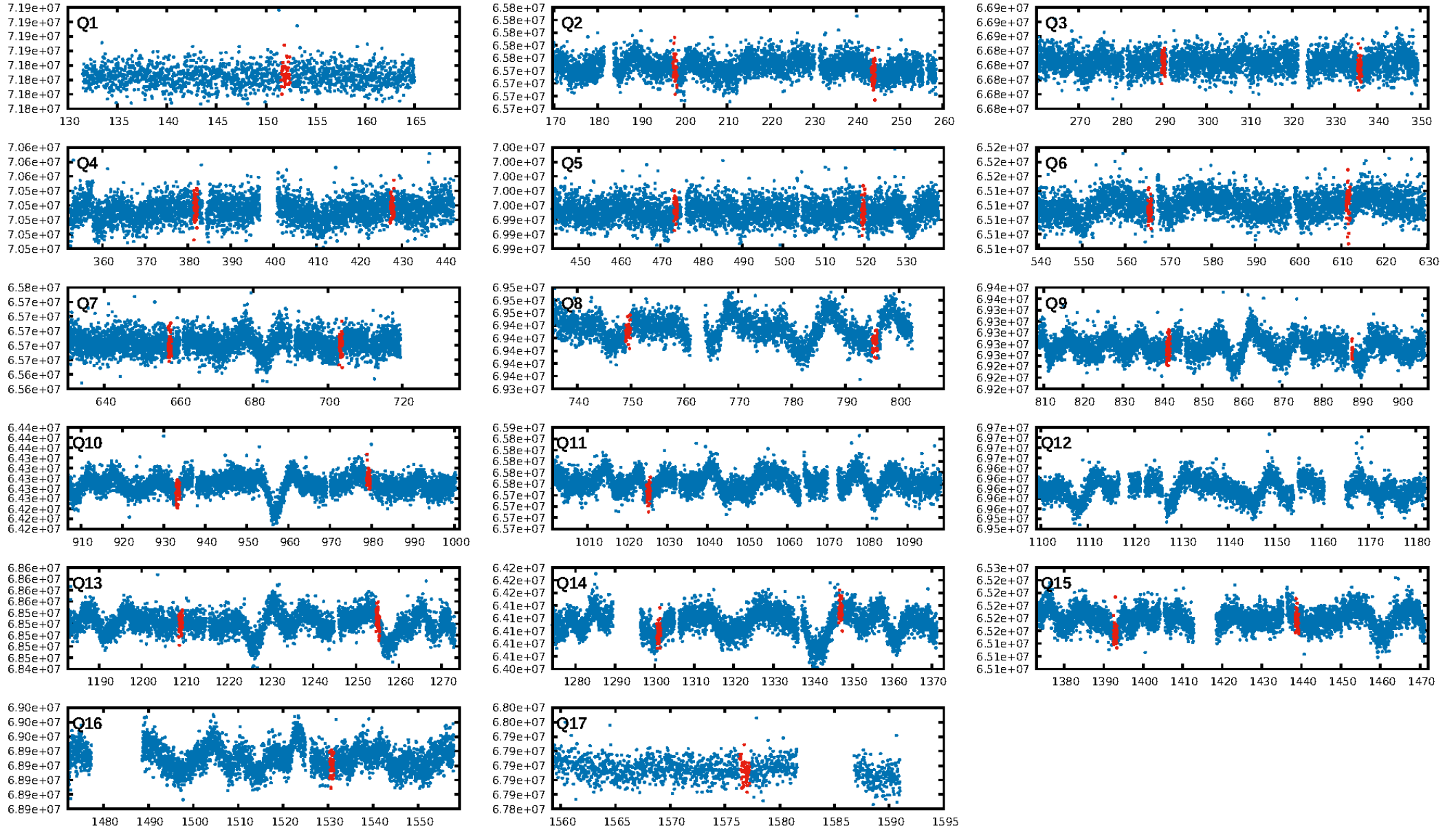
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [7.42σ]  
LongPeriod-sig: 100.0% [10.80σ]  
ModelChiSquare2-sig: 8.2%  
ModelChiSquareGof-sig: 100.0%  
Bootstrap-pfa: 1.21e-40  
RollingBand-fgt: 1.00 [10/10]  
GhostDiagnostic-chr: -0.06716  
Centroid-sig: 7.1%  
Centroid-so: 1.700 arcsec [2.11σ]  
OotOffset-rm: 3.354 arcsec [2.14σ]  
KicOffset-rm: 3.707 arcsec [2.53σ]  
OotOffset-st: 3/1/1/3 [8]  
KicOffset-st: 3/1/1/3 [8]  
DiffImageQuality-fgm: 0.00 [0/8]  
DiffImageOverlap-fno: 0.00 [0/16]

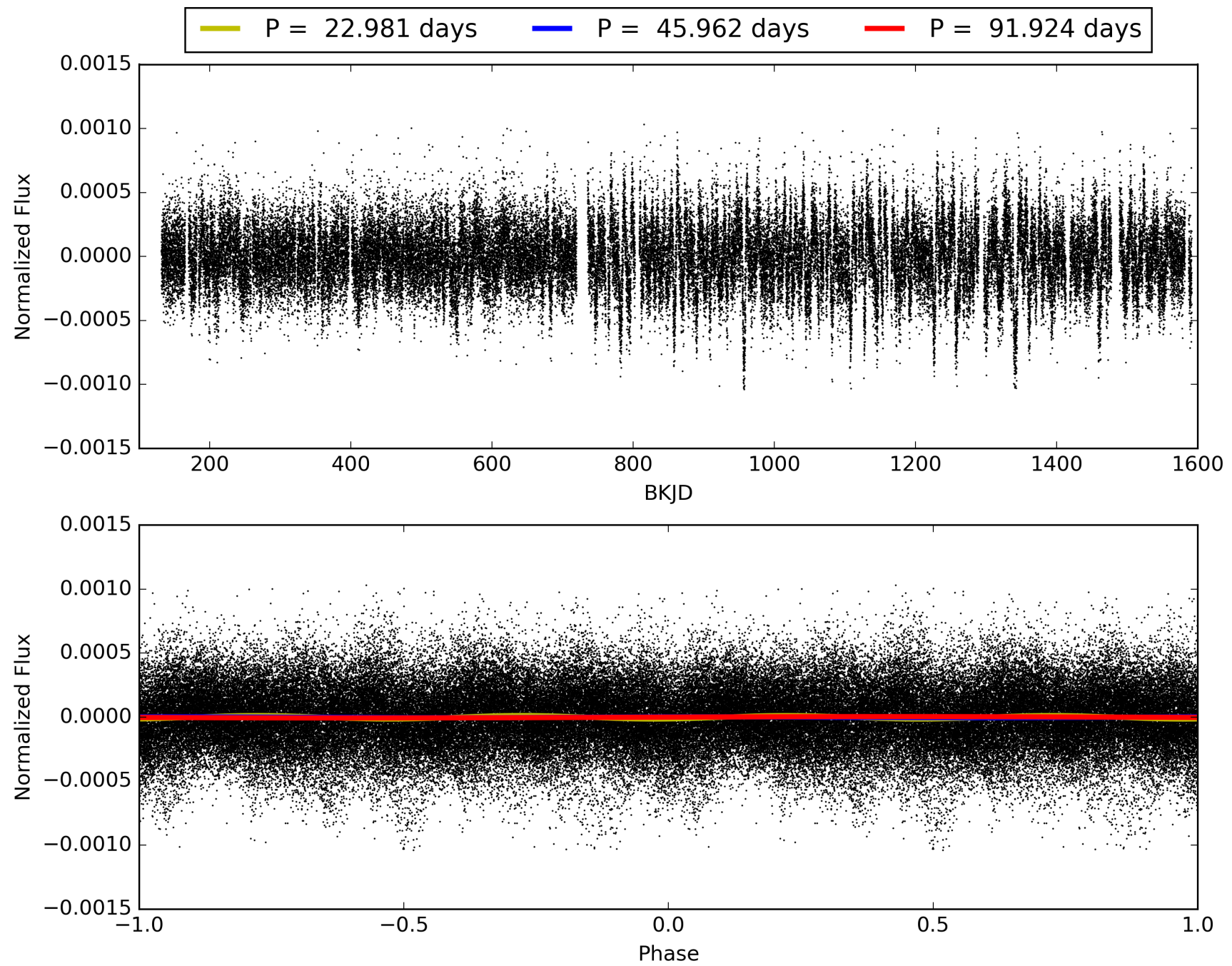
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 30-Jan-2016 03:17:18 Z

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

# TCE 005987404-03, PDC Light Curves

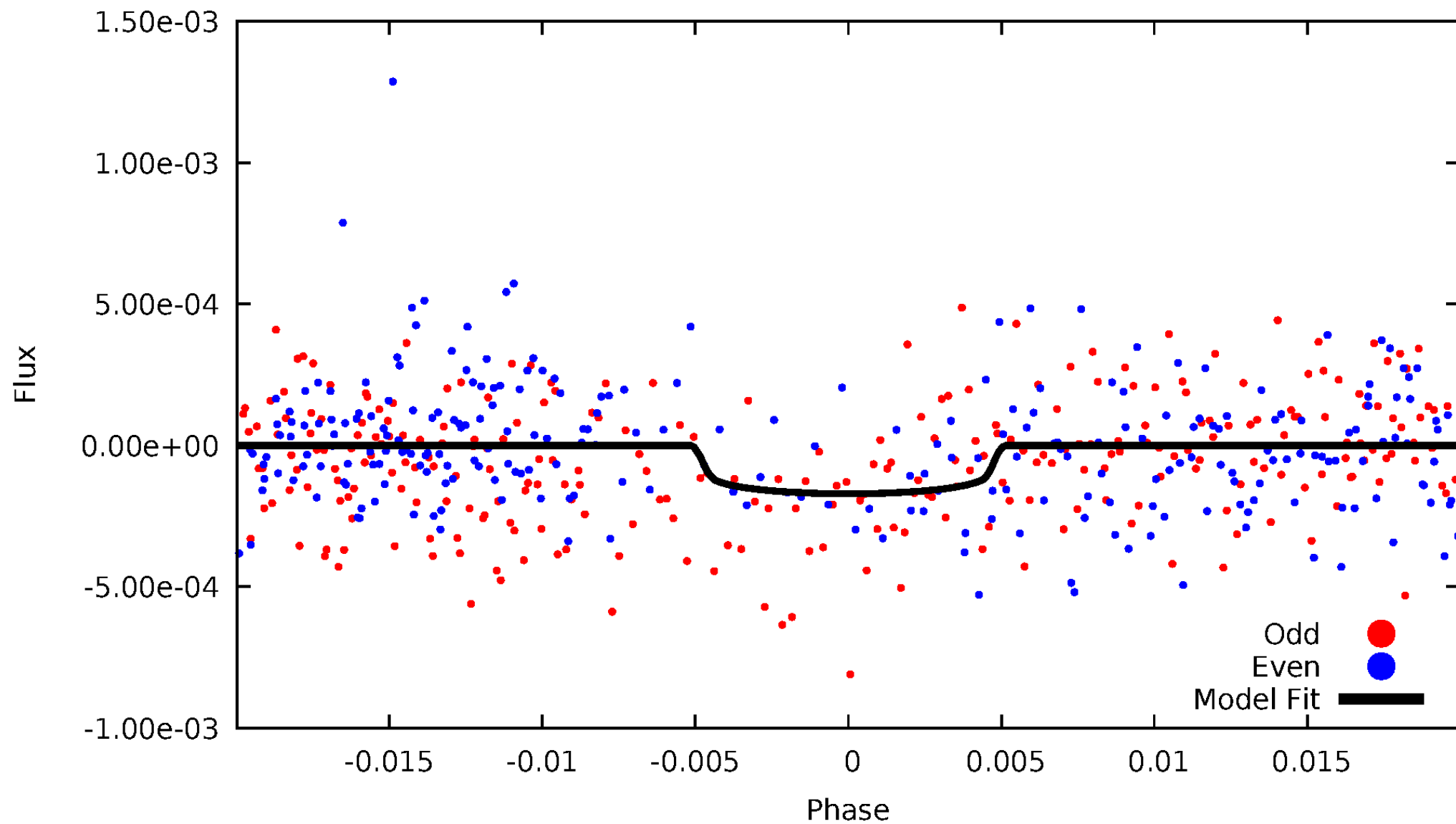


TCE 005987404-03



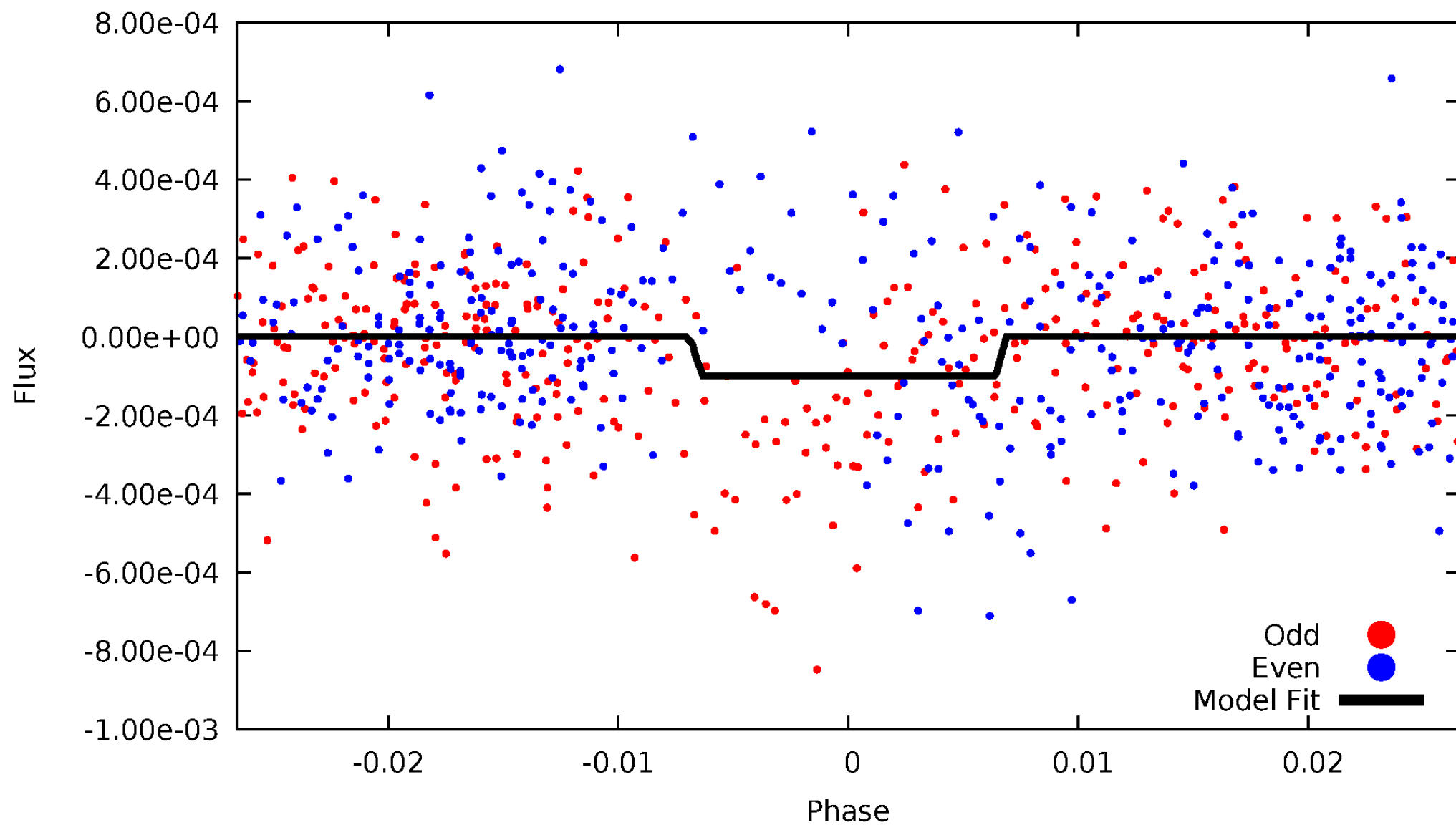
# DV Odd/Even

TCE 005987404-03



# ALT Odd/Even

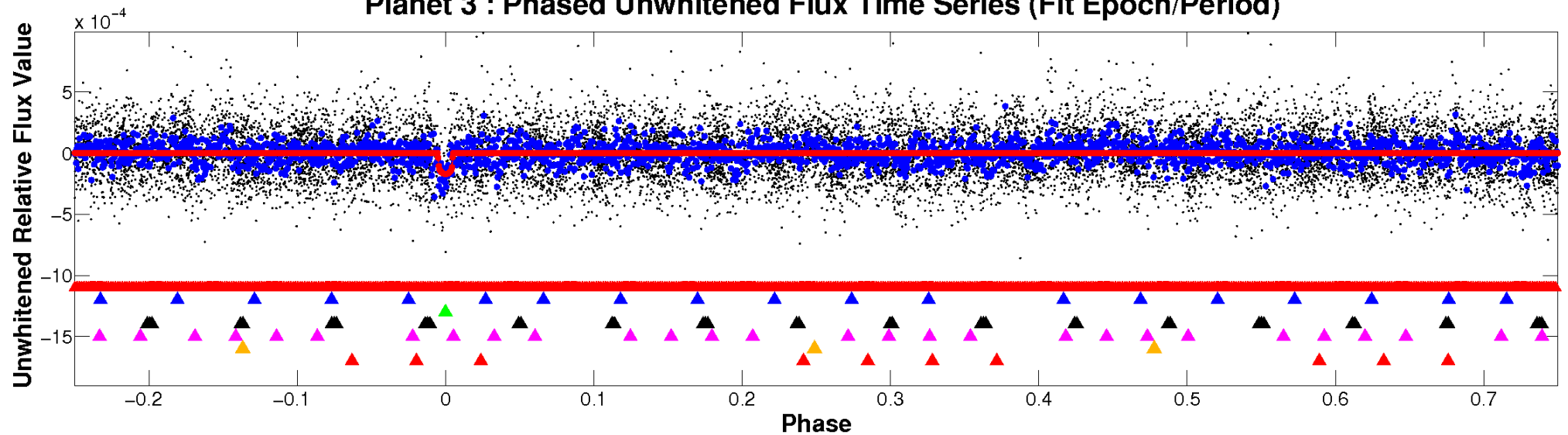
TCE 005987404-03



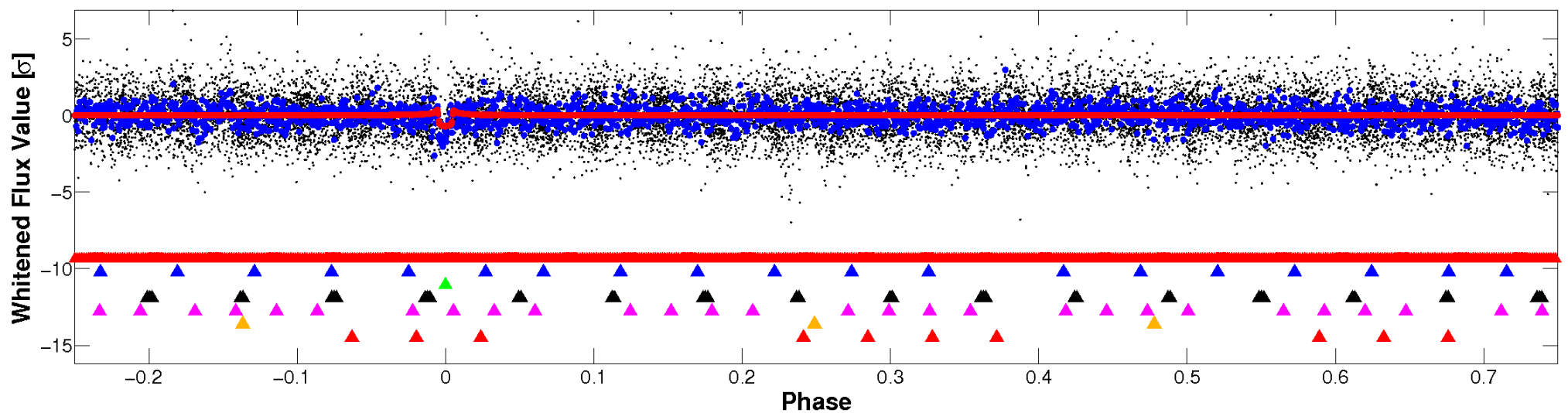


# Non-Whitened Vs. Whitened Light Curve

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

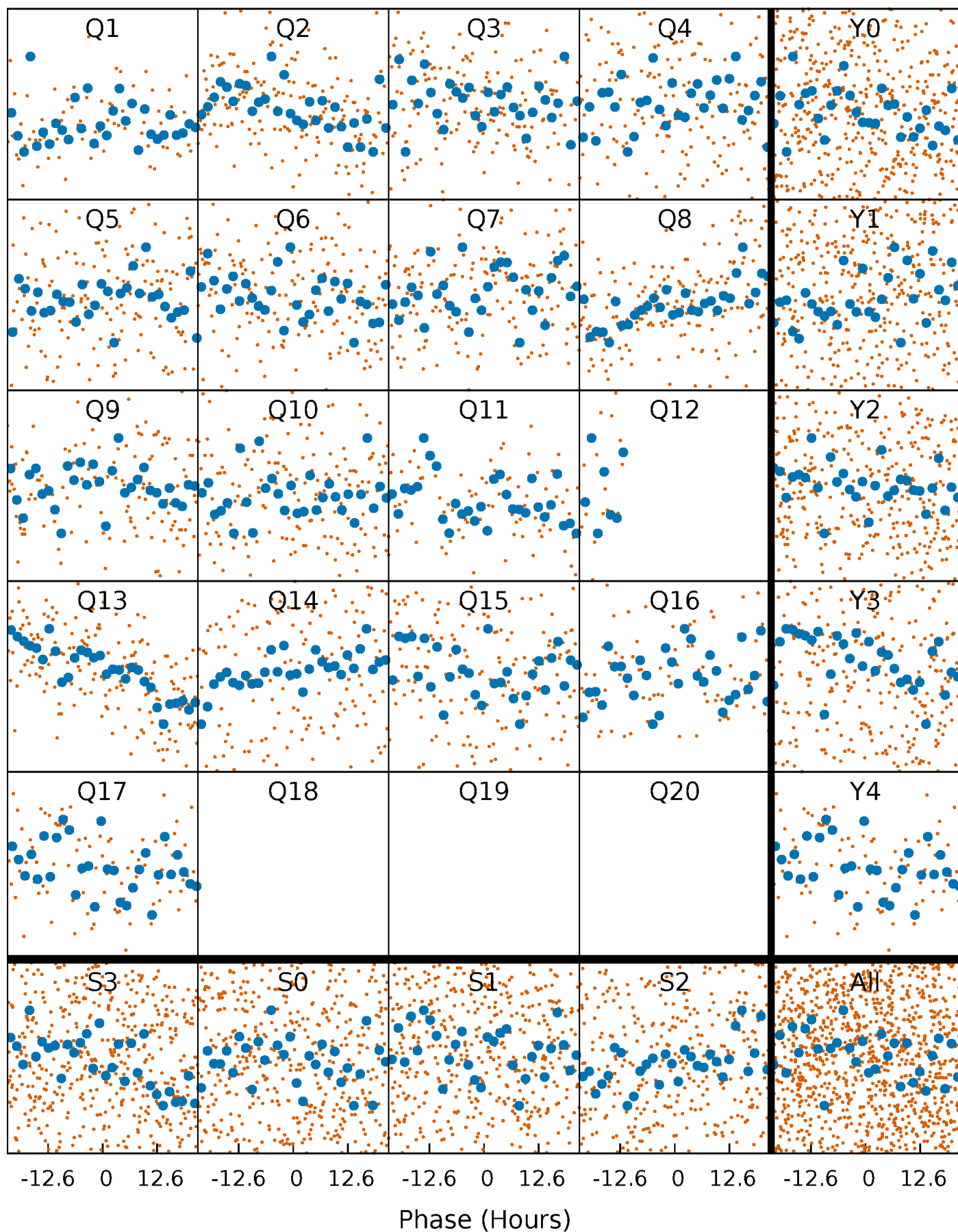


## Planet 3 : Phased Whitened Flux Time Series (Fit Epoch/Period)



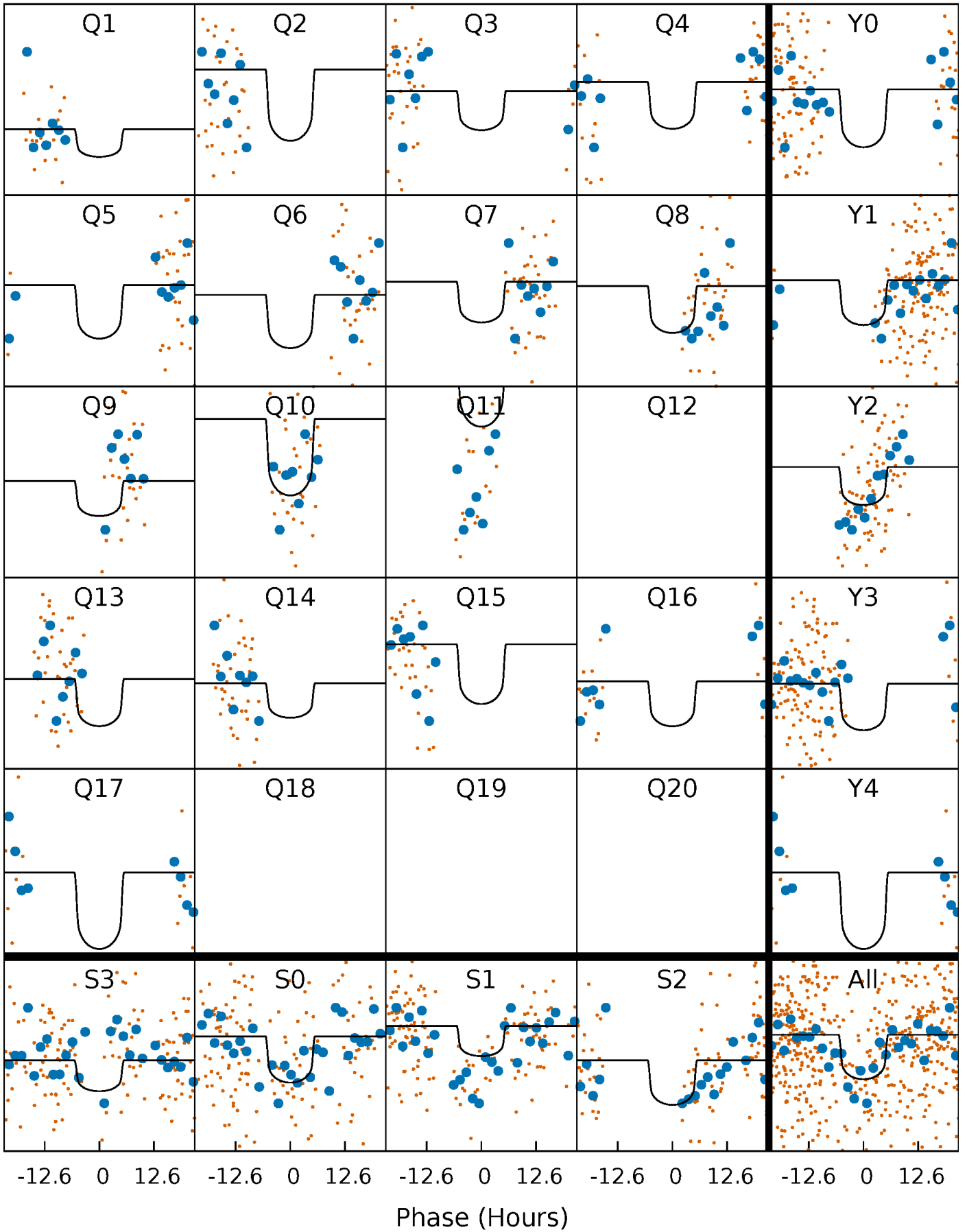
# PDC Quarter-Phased Transit Curves

TCE 005987404-03 P= 45.962054 Days  $T_0=151.976692$  (BKJD)



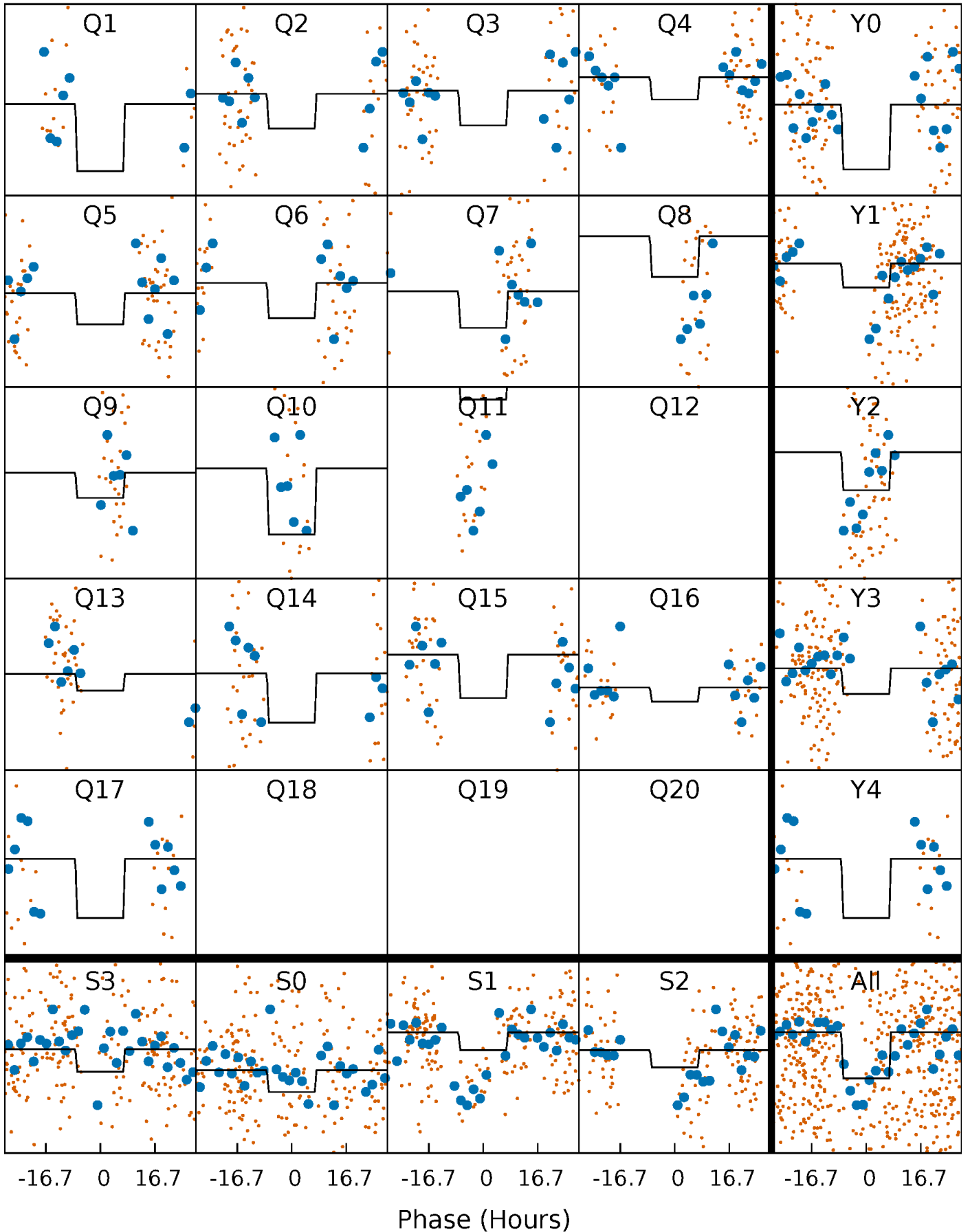
# DV Quarter-Phased Transit Curves

TCE 005987404-03   P= 45.962054 Days    $T_0=151.976692$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

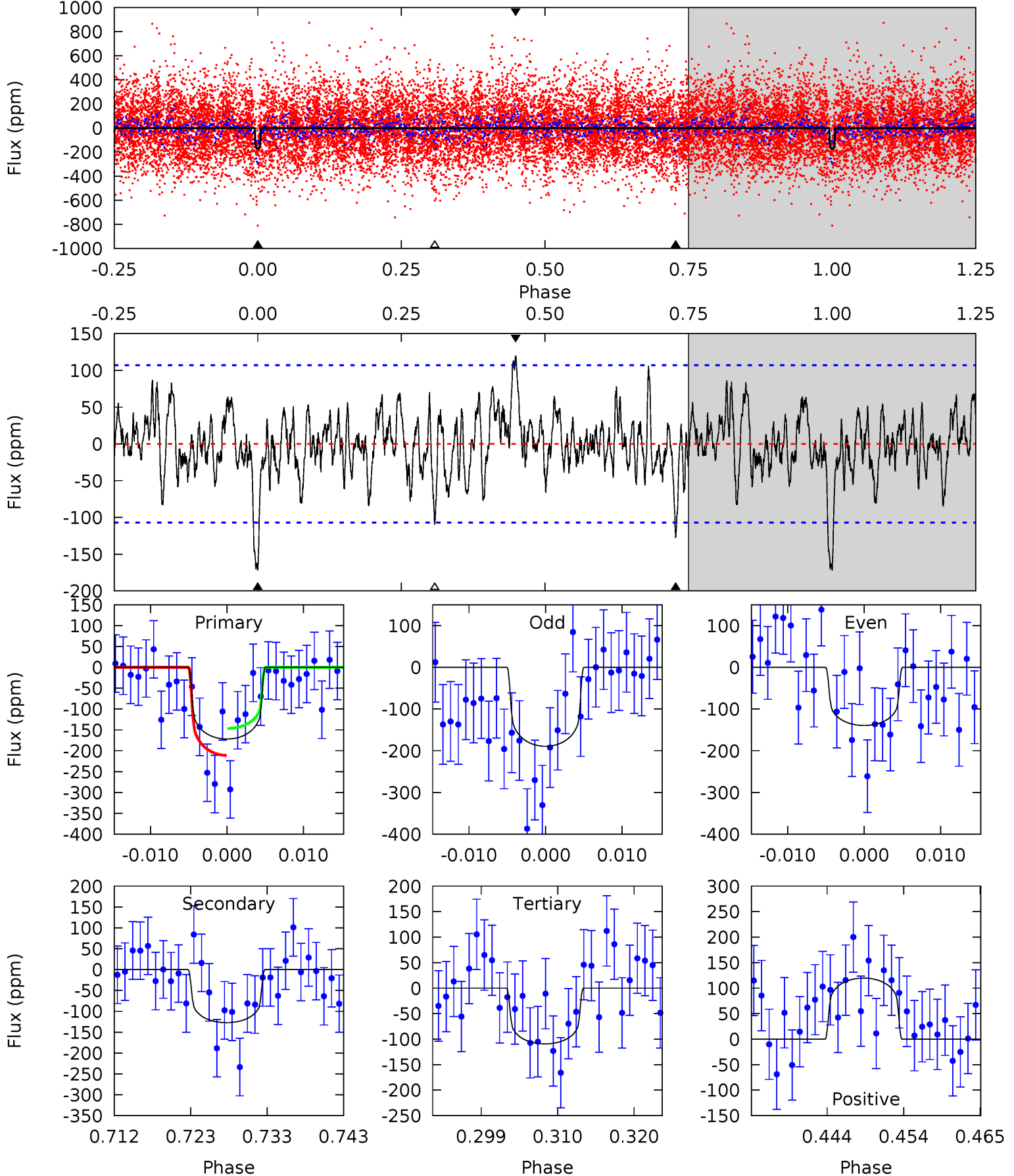
TCE 005987404-03     $P = 45.963746$  Days     $T_0 = 152.009905$  (BKJD)



# DV Model-Shift Uniqueness Test

005987404-03, P = 45.962054 Days, E = 106.014638 Days

Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
8.06	5.96	5.13	5.61	5.02	2.56	1.61	2.93	2.45	0.84	0.35	1.14	0.63	0.41	1.46

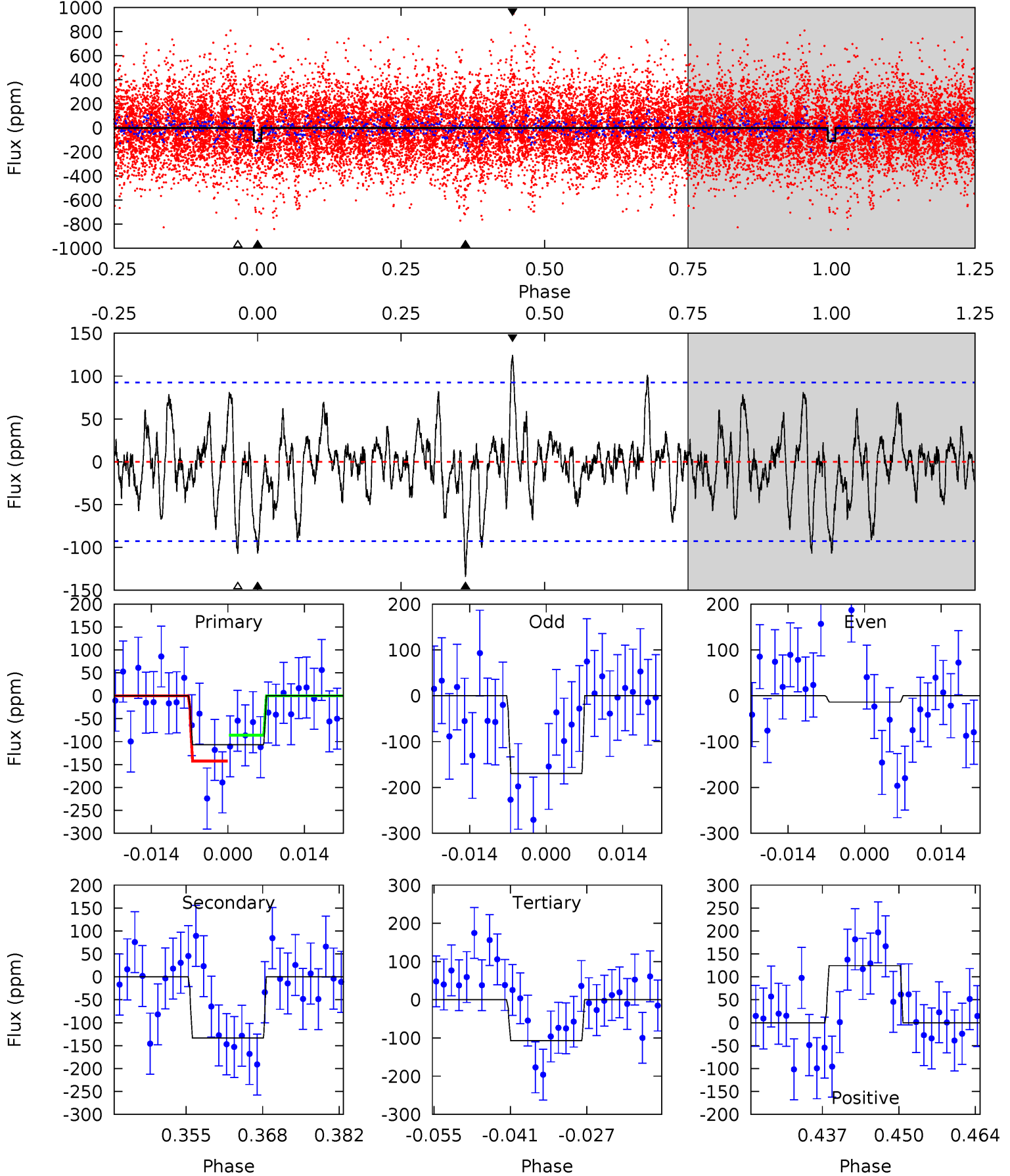




# Alt Model-Shift Uniqueness Test

005987404-03, P = 45.963746 Days, E = 106.046159 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
5.73	7.16	5.75	6.68	4.97	2.47	1.62	-0.02	-0.95	1.41	0.48	4.07	4.07	0.48	1.47



### Stellar Parameters For KIC 005987404

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$6099^{+184}_{-220}$	$4.373^{+0.090}_{-0.210}$	$0.040^{+0.250}_{-0.300}$	$1.123^{+0.366}_{-0.157}$	$1.085^{+0.166}_{-0.135}$	$1.078^{+0.500}_{-0.570}$
	+3%/-4%	+2%/-5%	+625%/-750%	+33%/-14%	+15%/-12%	+46%/-53%
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 005987404-03 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-127 \pm 21$	$1.76^{+1.03}_{-0.84}$	$790^{+61}_{-42}$	$5510^{+2294}_{-985}$	$1564^{+3809}_{-998}$
Alt.	$-133 \pm 19$	$1.39^{+1.06}_{-0.83}$	$796^{+61}_{-45}$	$6314^{+4818}_{-1462}$	$2518^{+11841}_{-1710}$

$T_{max}$  = 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

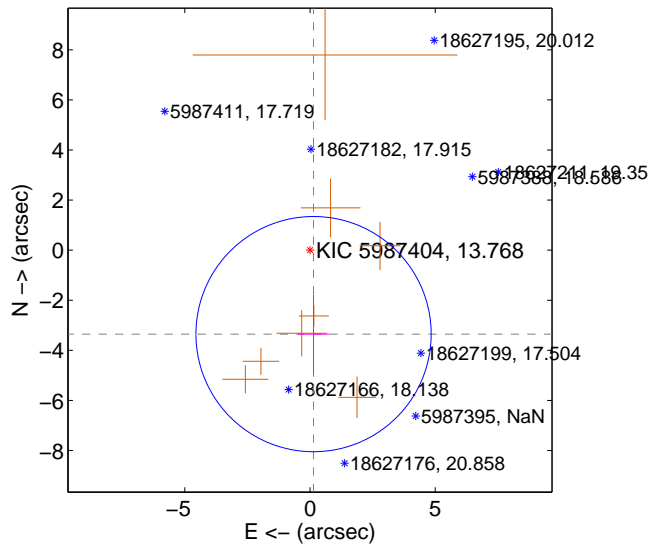
Supplemental centroid analysis for 005987404-03. Kepler magnitude: 13.77. Transit SNR 5.99

There are 0 quarters with good PRF difference image offsets

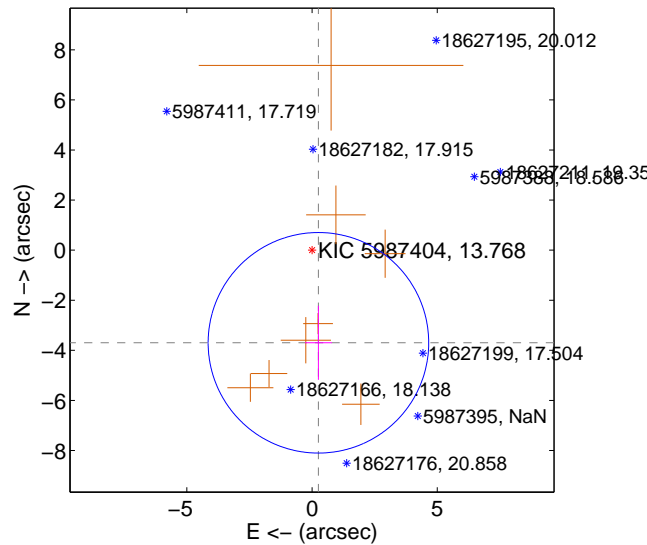
The direct PRF centroid is offset from the target star catalog position by about 0.34 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$3.354 \pm 1.565$	2.14	$-0.141 \pm 0.629$	$-3.351 \pm 1.574$
PRF-fit source offset from KIC position	$3.707 \pm 1.467$	2.53	$-0.255 \pm 0.536$	$-3.698 \pm 1.479$
photometric centroid source offset	$1.70 \pm 0.81$	2.11	$0.33 \pm 0.81$	$-1.67 \pm 0.81$

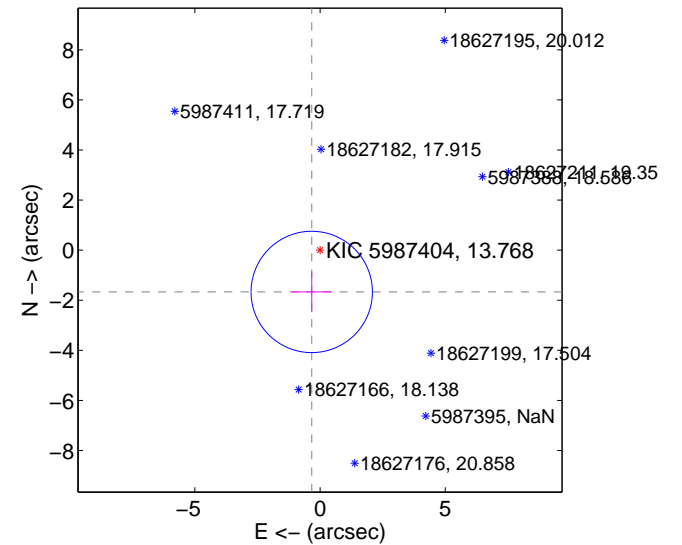
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position

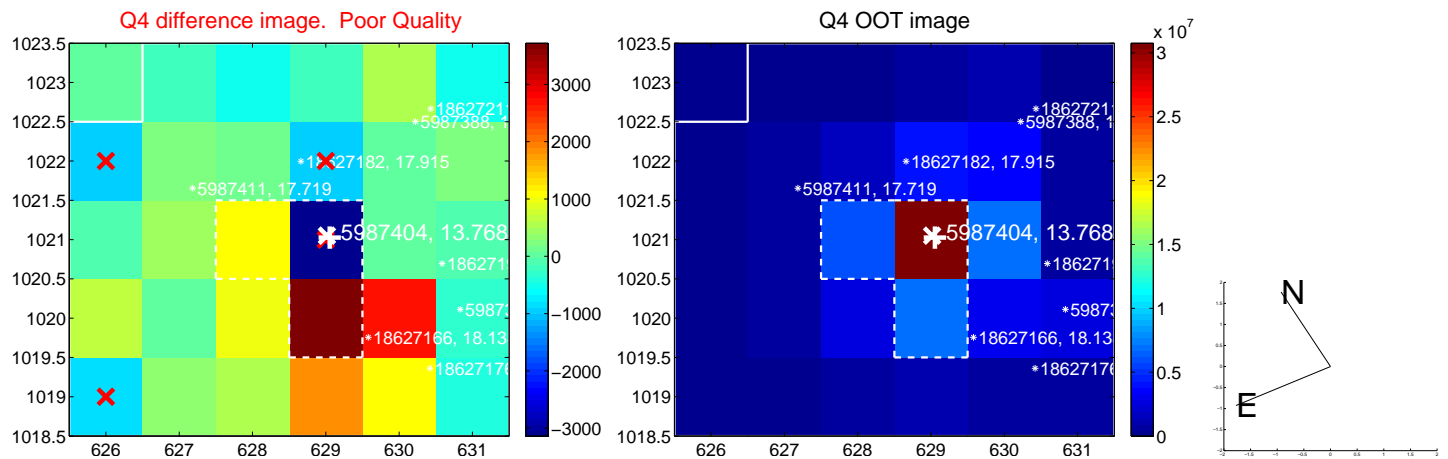
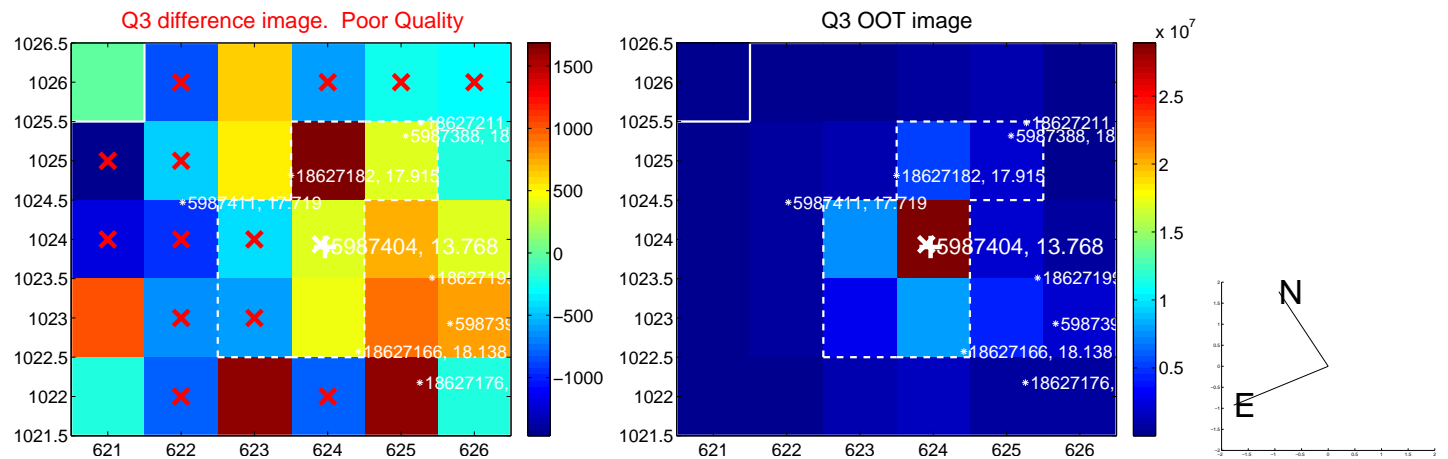
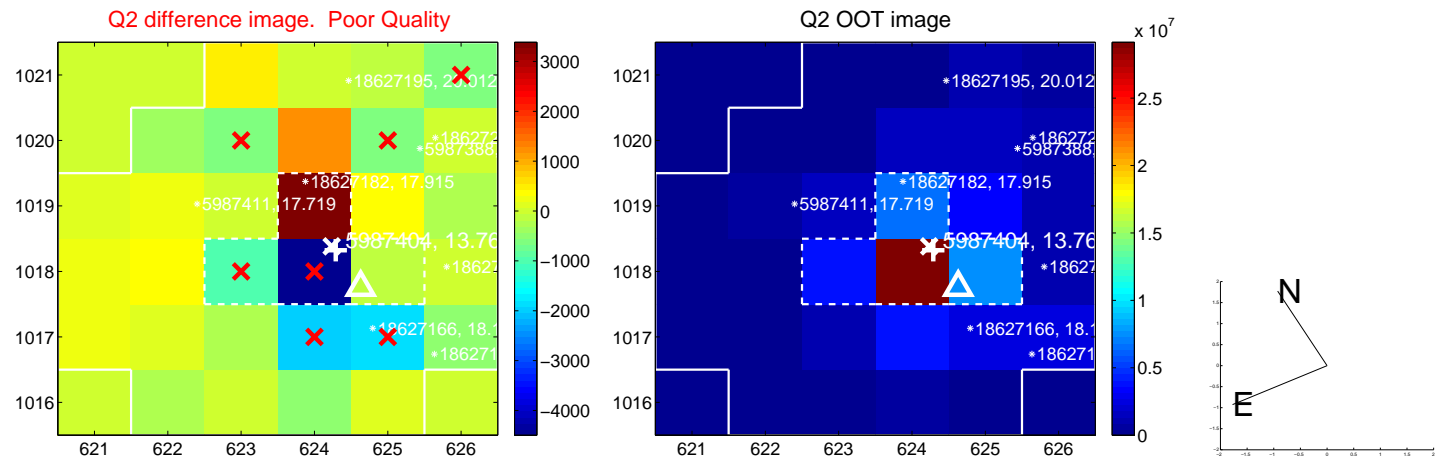
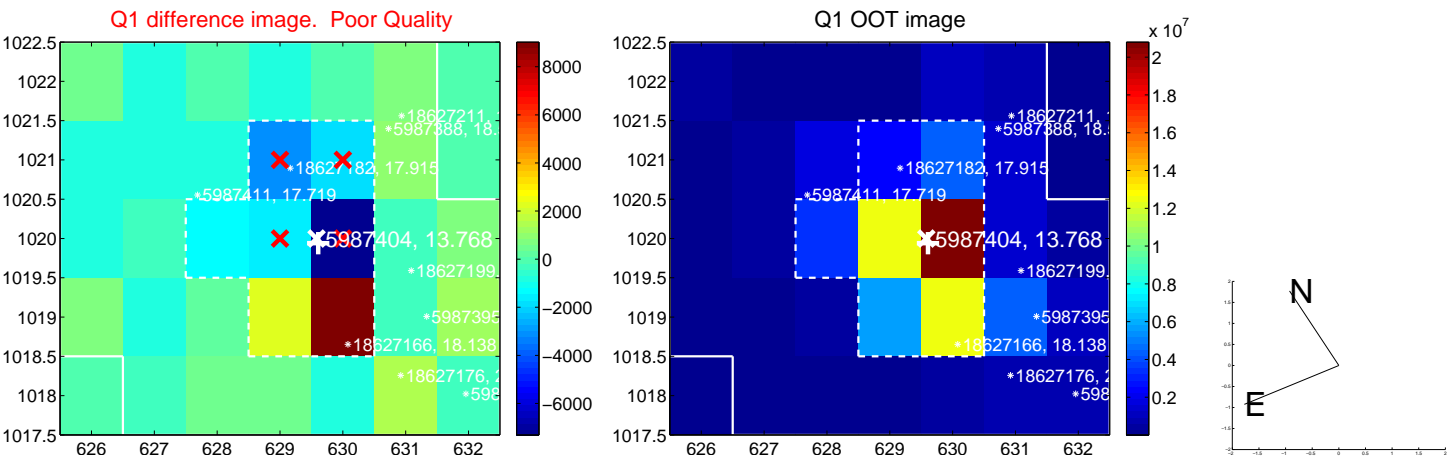


offset from photometric centroids

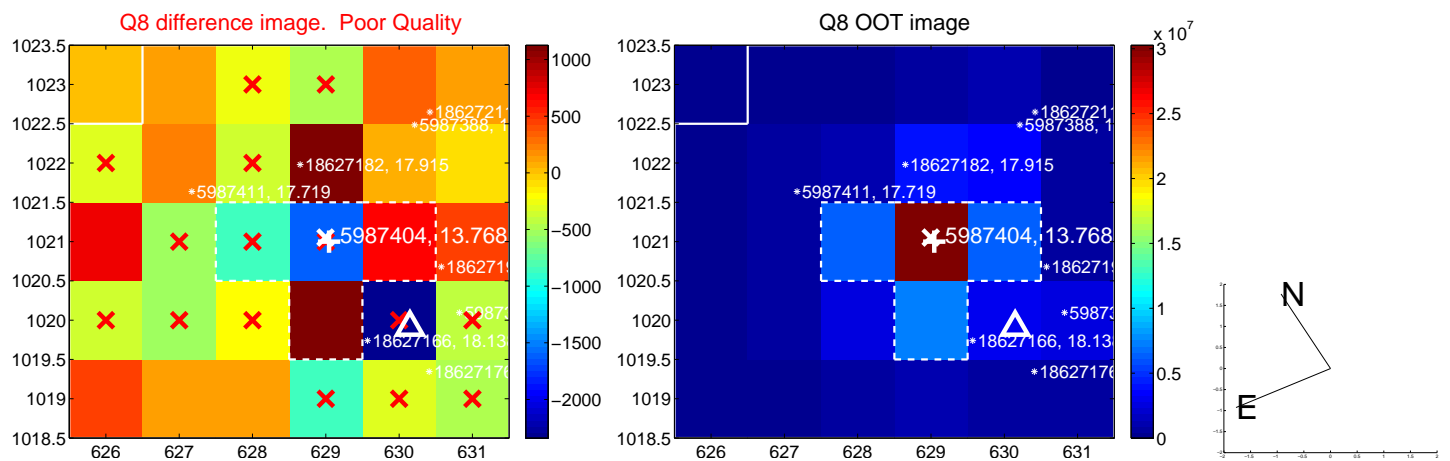
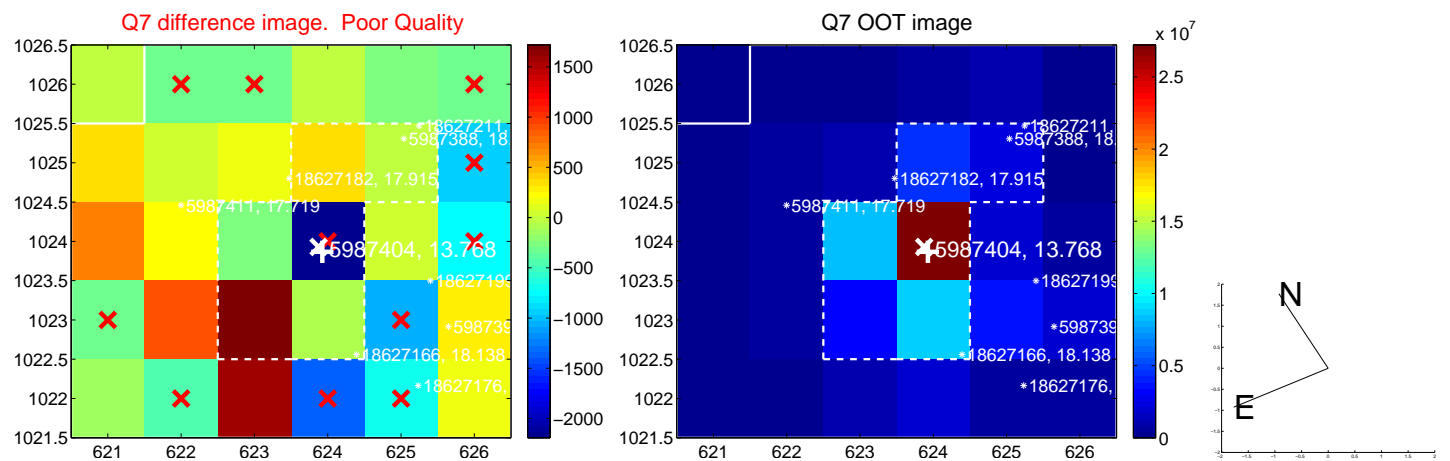
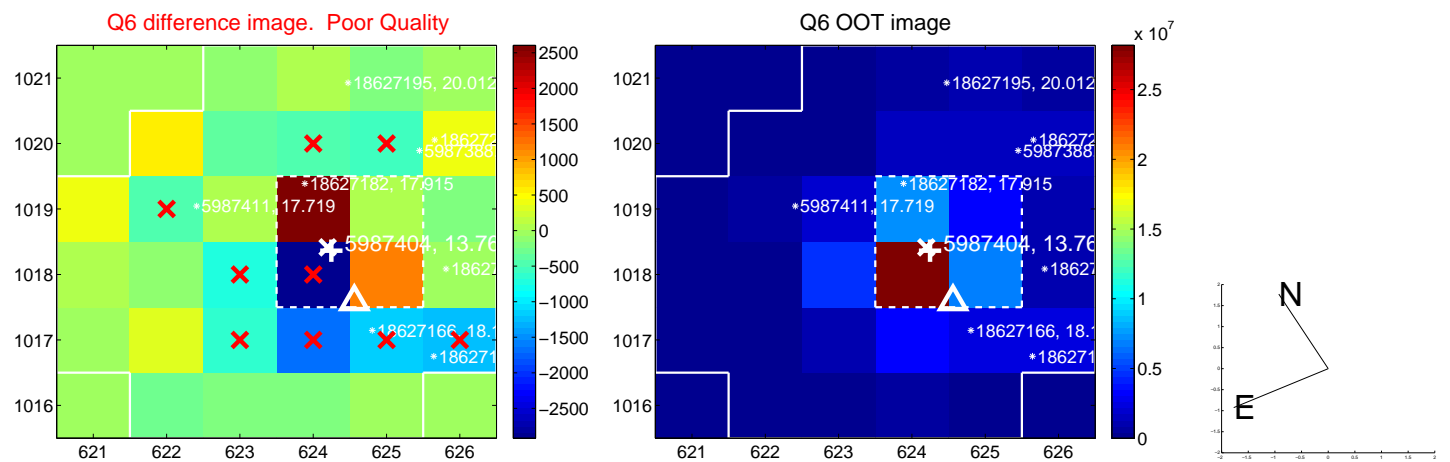
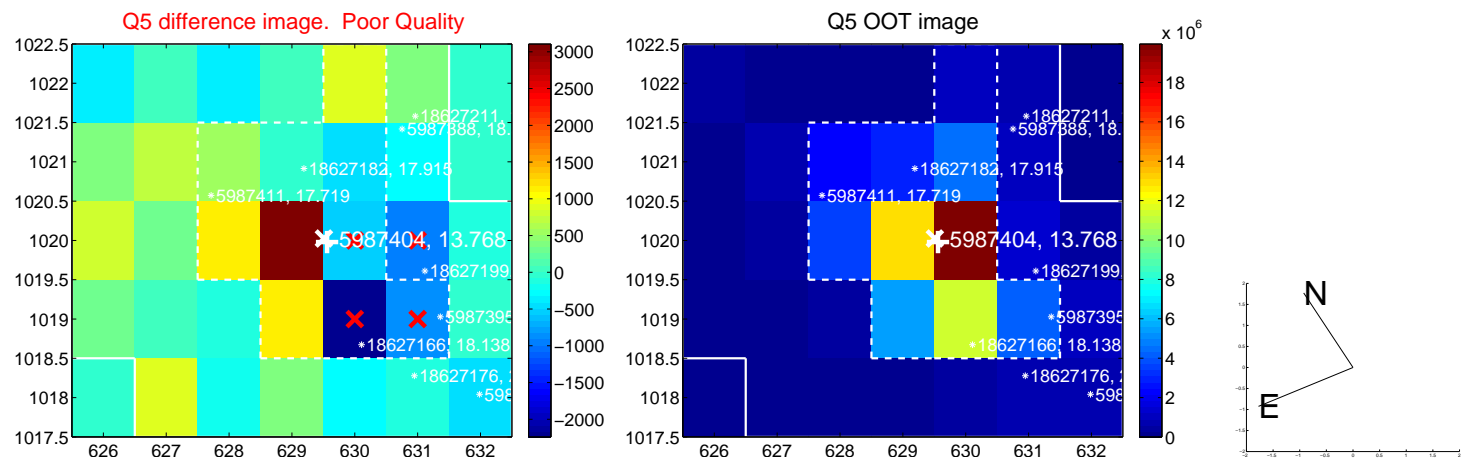


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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

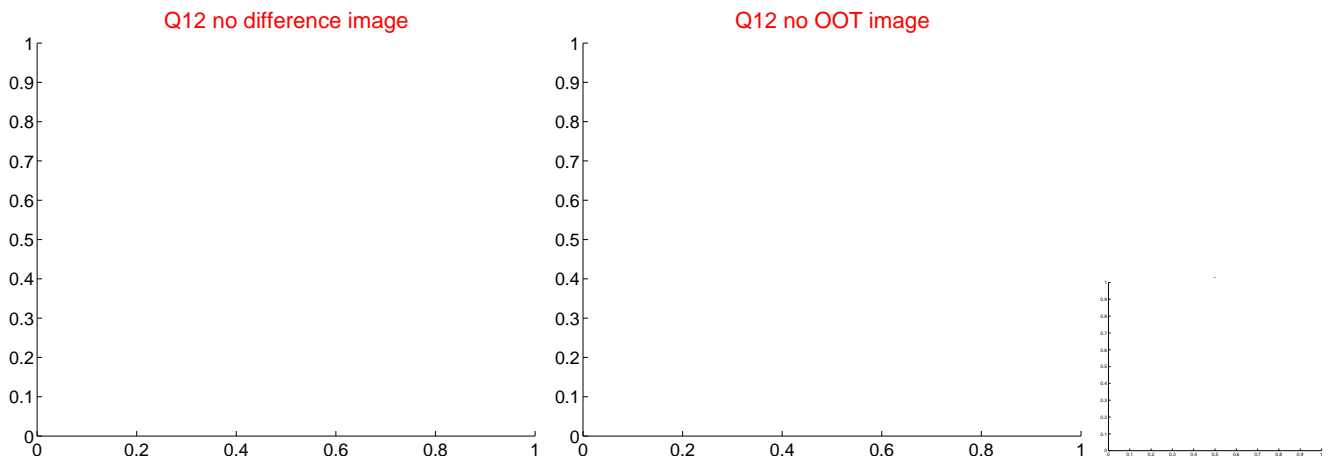
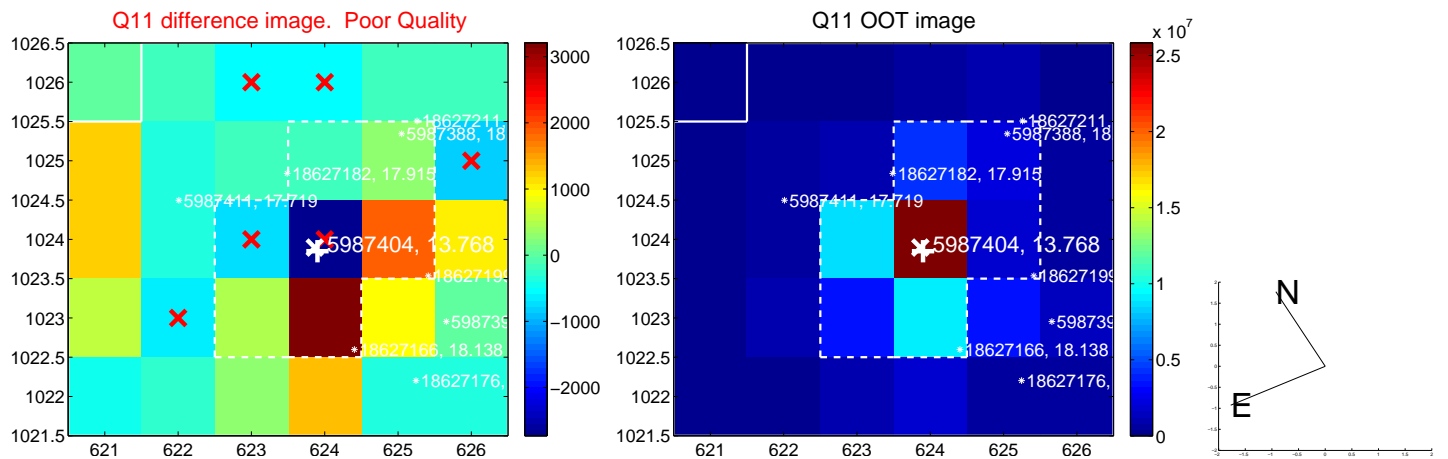
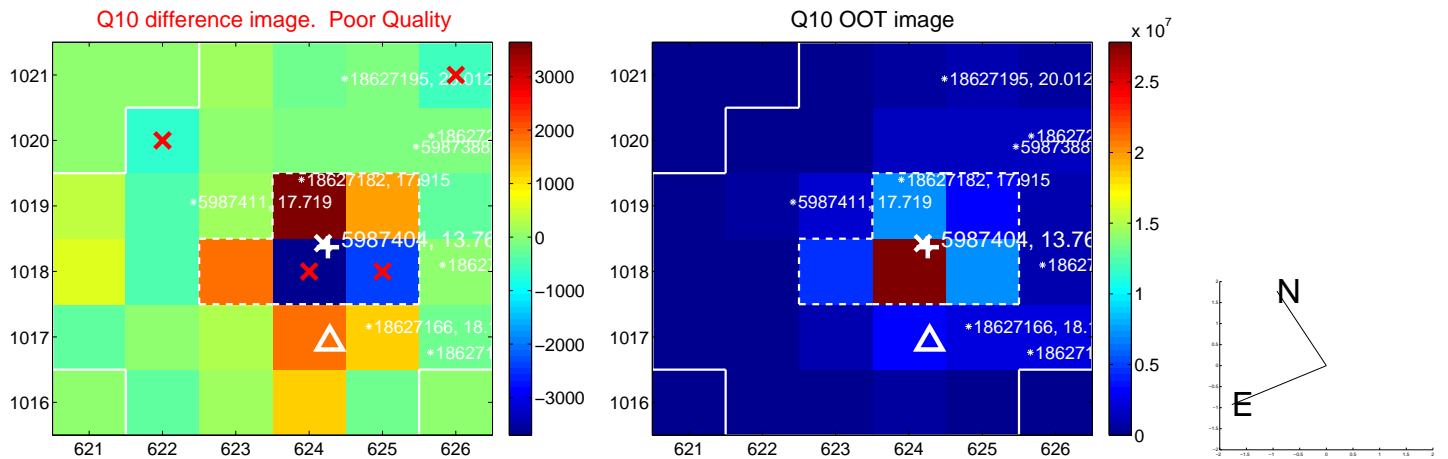
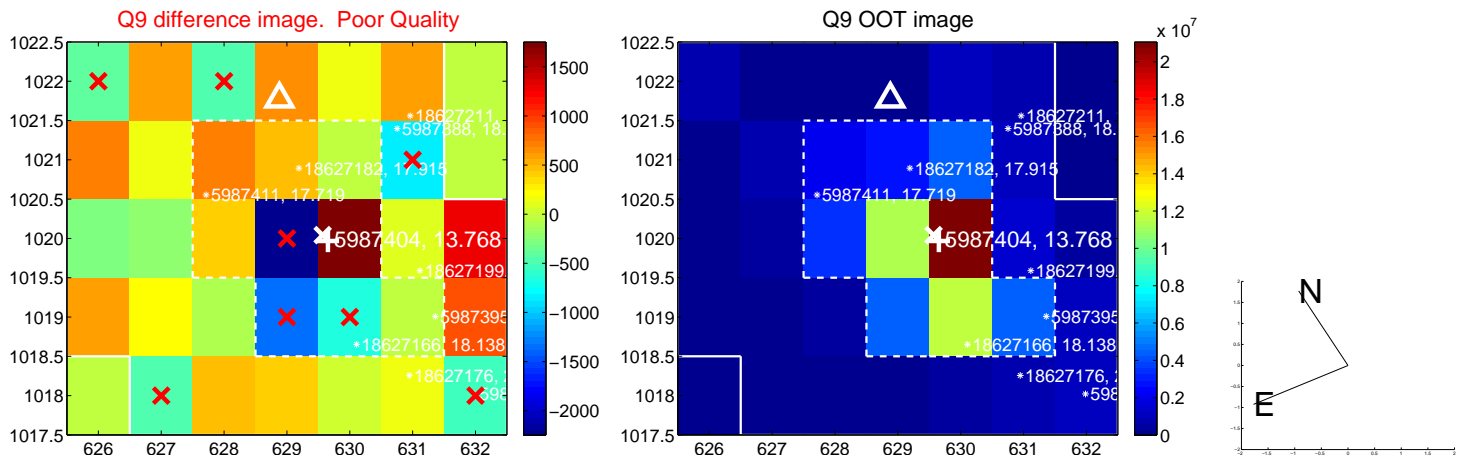


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

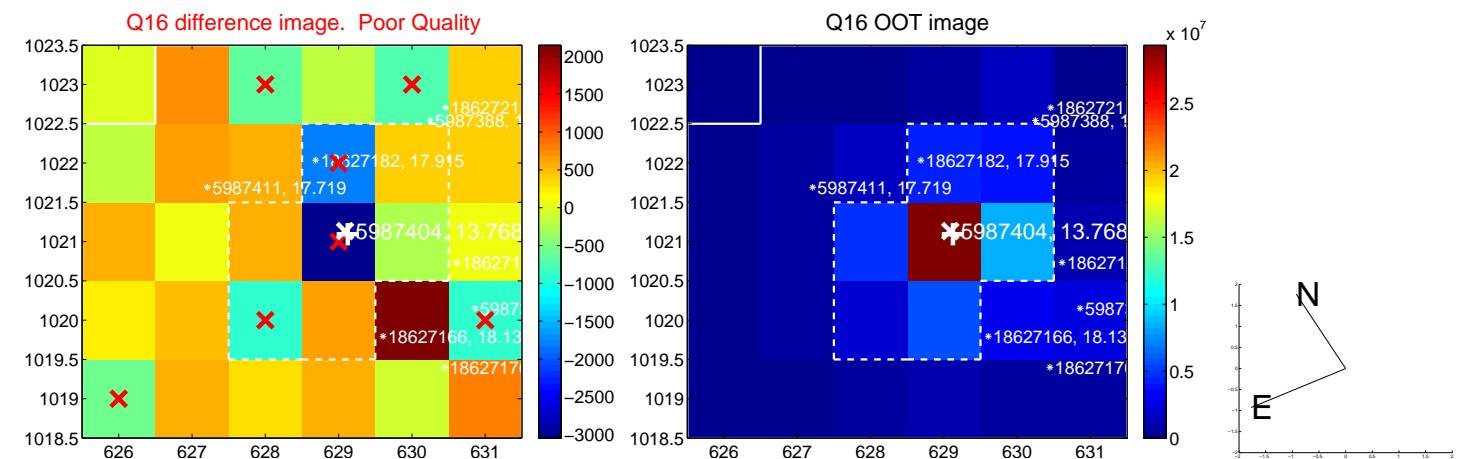
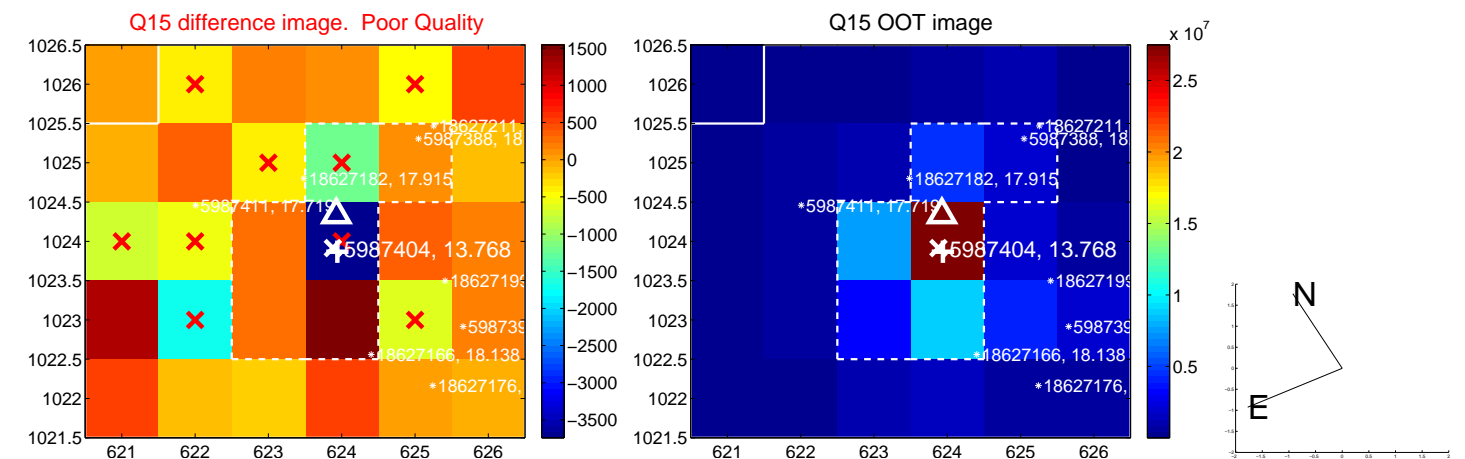
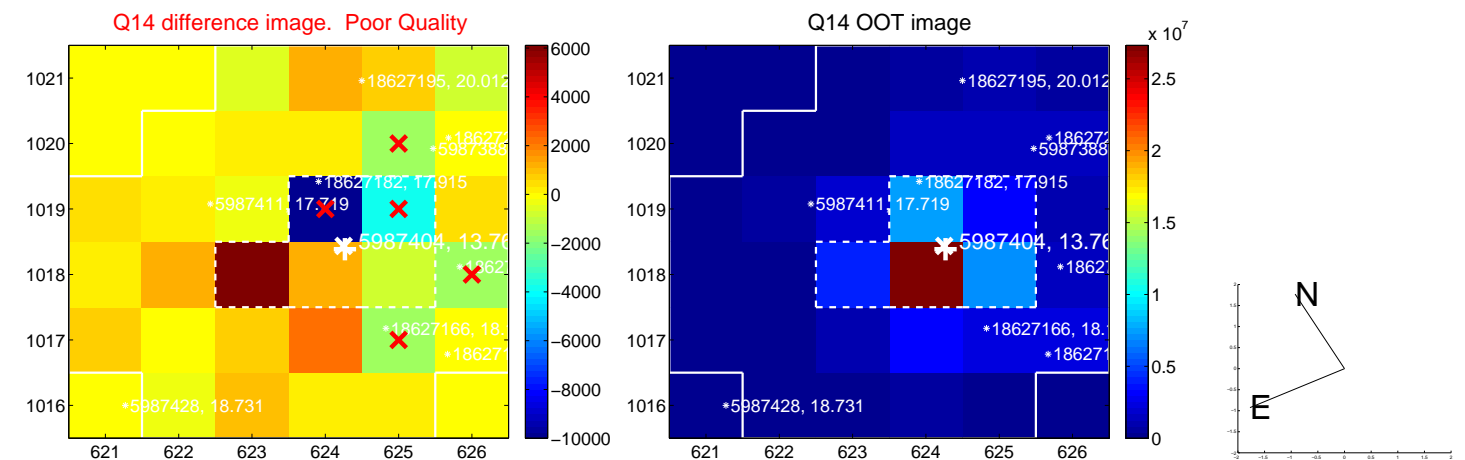
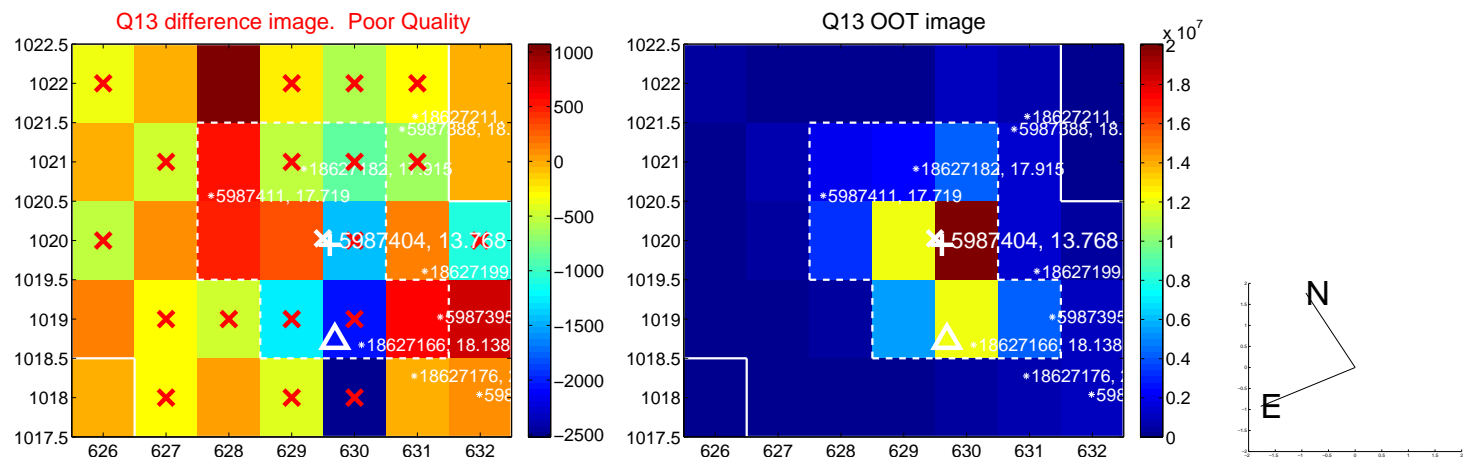




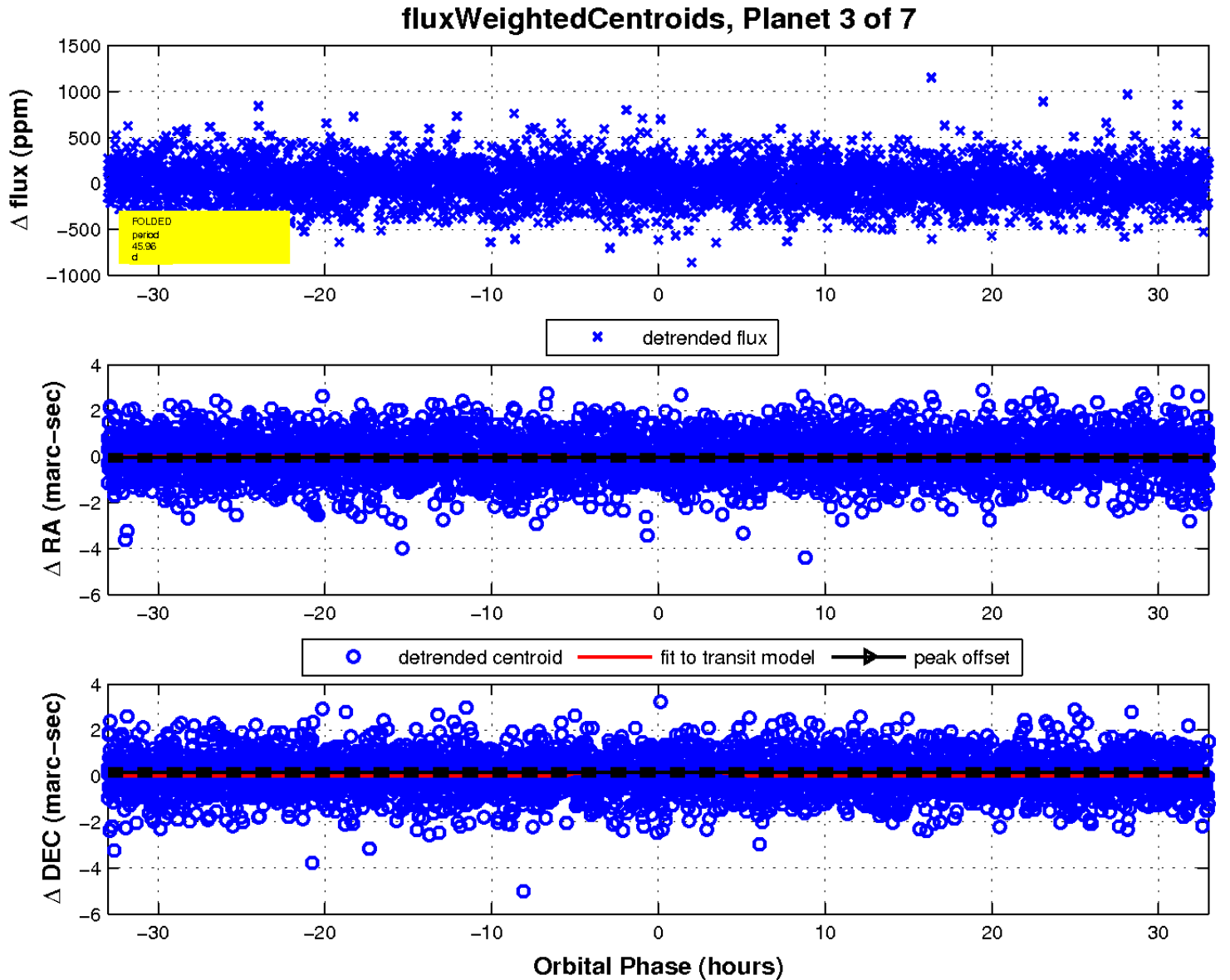
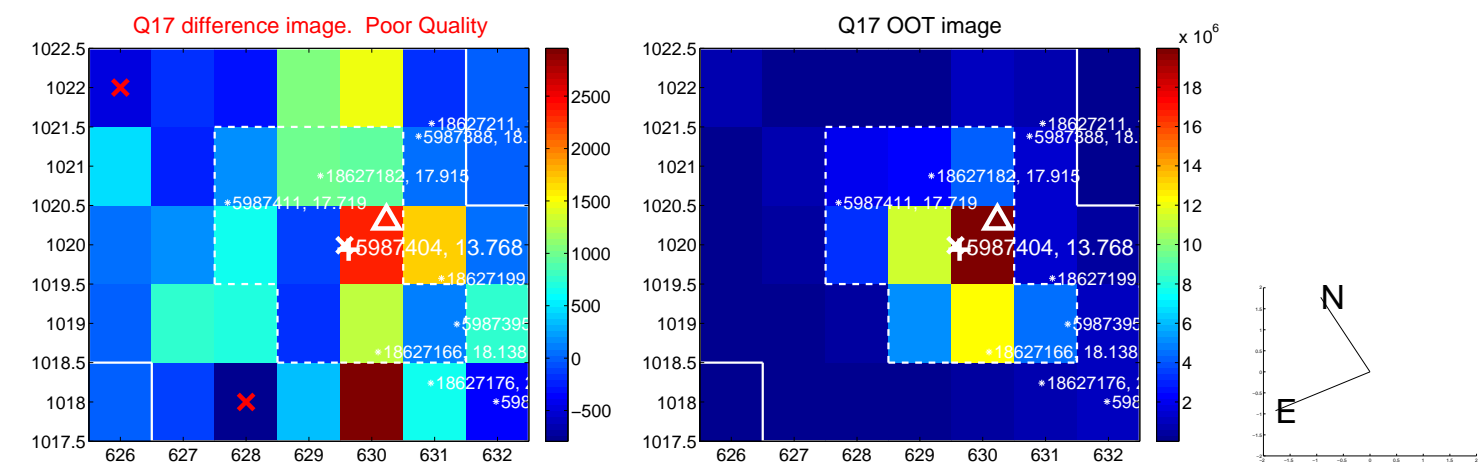
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

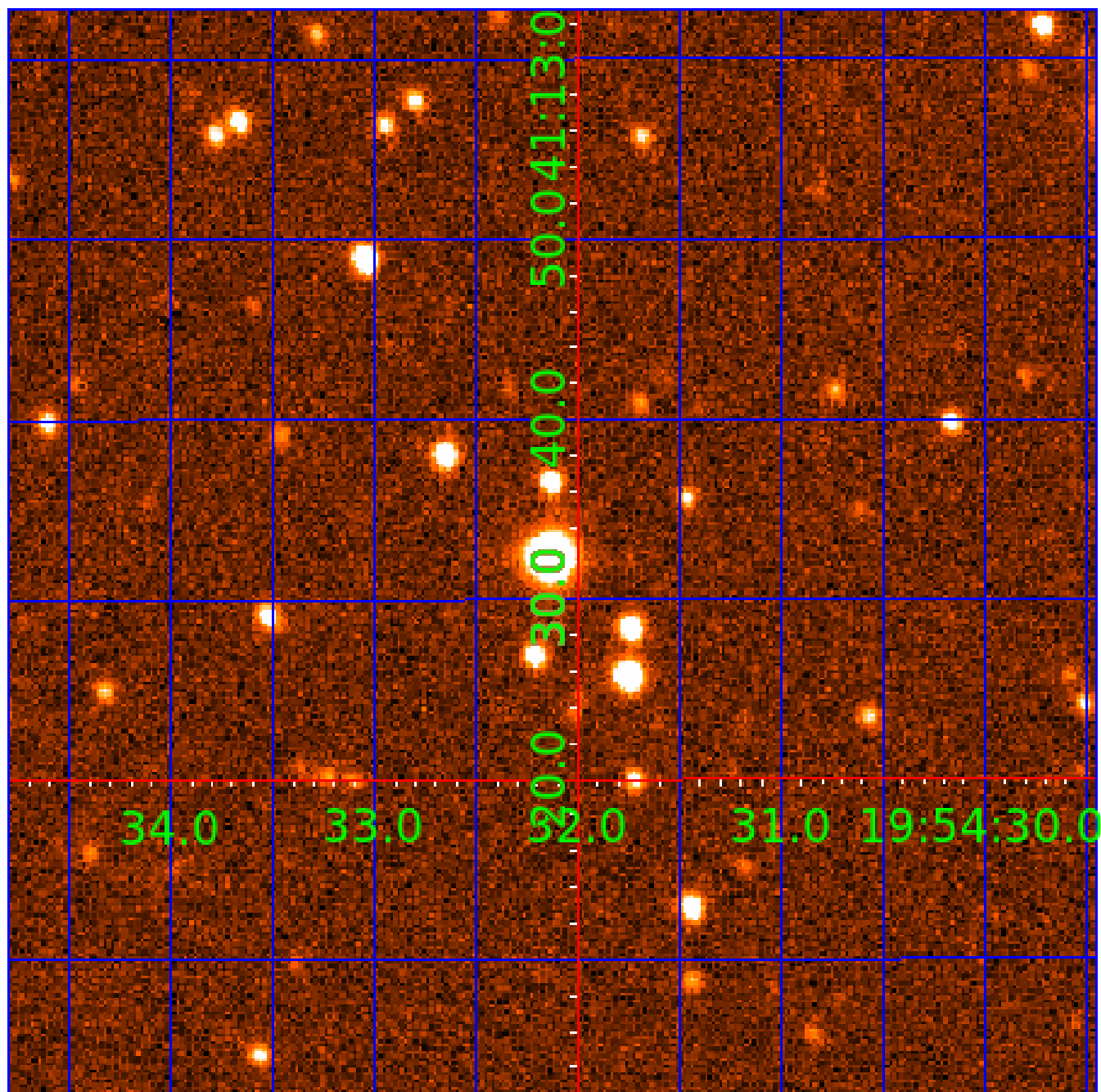


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\Delta$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination



# KIC 005987404

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
005987404-01	OBS	No	1.835612	132.170942	19.0	11.159	7.5	8.9	1.12	6099	0.49	1718.47
005987404-03	OBS	No	45.962054	151.976692	170.9	11.015	13.0	6.0	1.12	6099	1.65	23.46
005987404-04	OBS	No	37.348754	148.451452	141.8	25.577	10.5	9.0	1.12	6099	1.44	30.94
005987404-05	OBS	No	52.708527	144.214024	138.8	10.164	8.7	7.4	1.12	6099	1.49	19.54
005987404-06	OBS	No	487.865266	531.109283	352.1	73.327	8.5	9.4	1.12	6099	2.44	1.01
005987404-07	OBS	No	153.872450	163.069223	179.6	10.495	8.8	6.7	1.12	6099	1.62	4.68

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
005987404-01	OBS	FP	0.00	1	0	1	0	LPP_DV—CENT_UNRESOLVED_OFFSET
005987404-03	OBS	FP	0.00	1	0	1	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—CENT_FEW_DIFFS—HALO_GHOST
005987404-04	OBS	FP	0.00	1	0	1	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_ALT—CENT_FEW_MEAS—HALO_GHOST
005987404-05	OBS	FP	0.00	1	0	1	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—CENT_FEW_DIFFS—HALO_GHOST
005987404-06	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_MARSHALL—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS
005987404-07	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_MARSHALL—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS

**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.

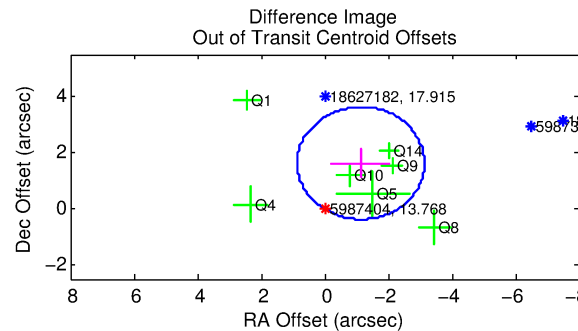
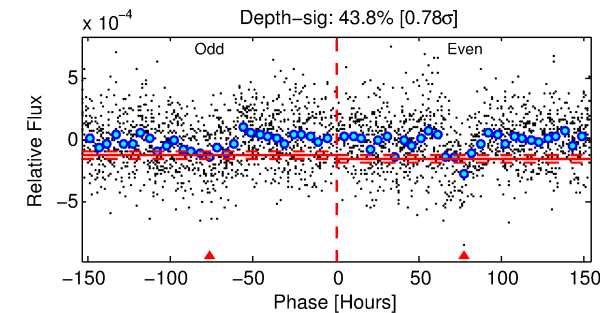
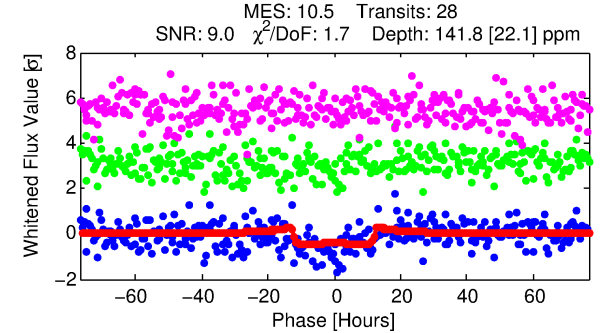
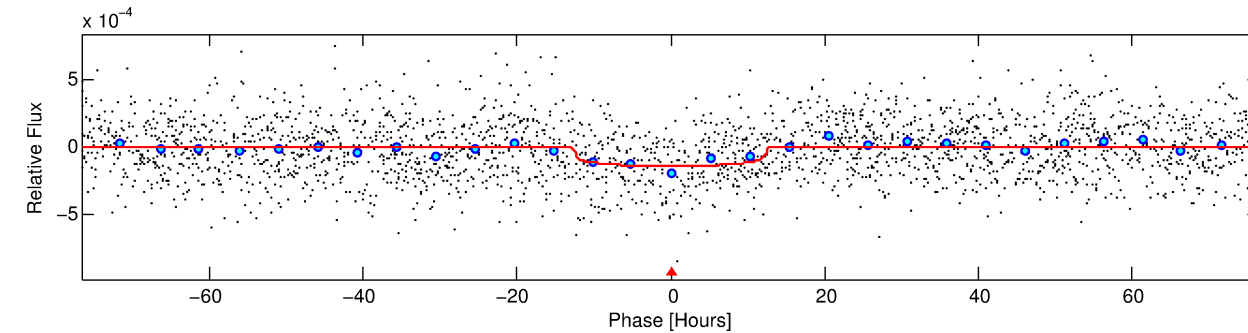
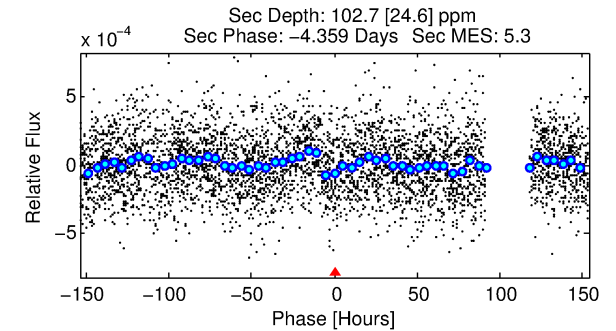
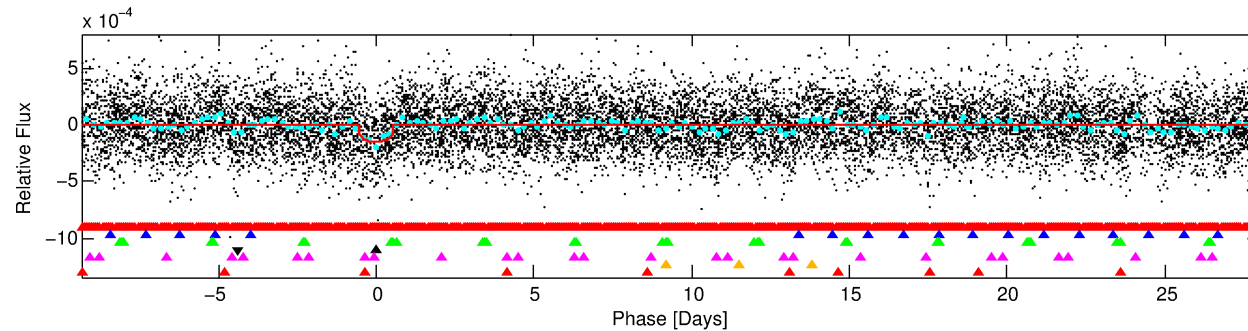
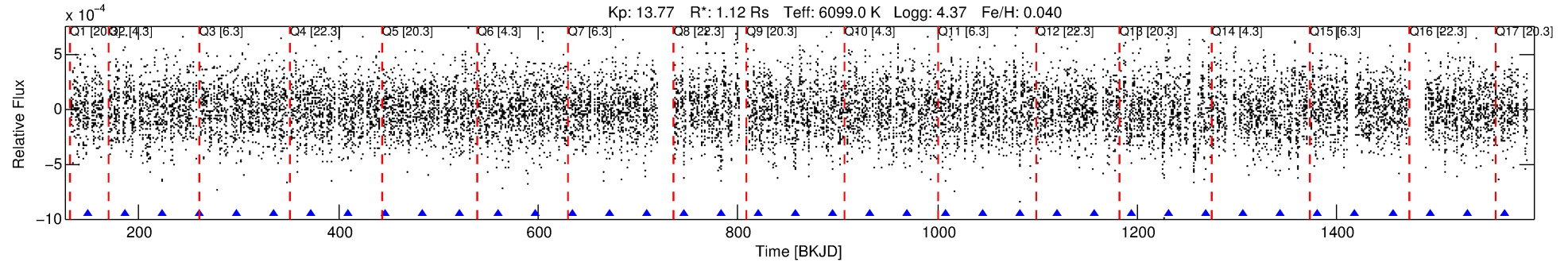
## Ephemeris Match Information For 005987404-04

No Significant Match Found



# DV One-Page Summary

KIC: 5987404 Candidate: 4 of 7 Period: 37.349 d



## DV Fit Results:

Period = 37.34875 [0.00138] d  
Epoch = 148.4515 [0.0294] BKJD  
Rp/R\* = 0.0118 [0.0028]  
a/R\* = 7.85 [8.36]  
b = 0.73 [0.69]  
Seff = 30.94 [12.83]  
Teff = 601 [62] K  
Rp = 1.44 [0.58] Re  
a = 0.2248 [0.0608] AU  
Ag = 1373.29 [902.15] [1.52σ]  
Teffp = 5660 [777] K [6.49σ]

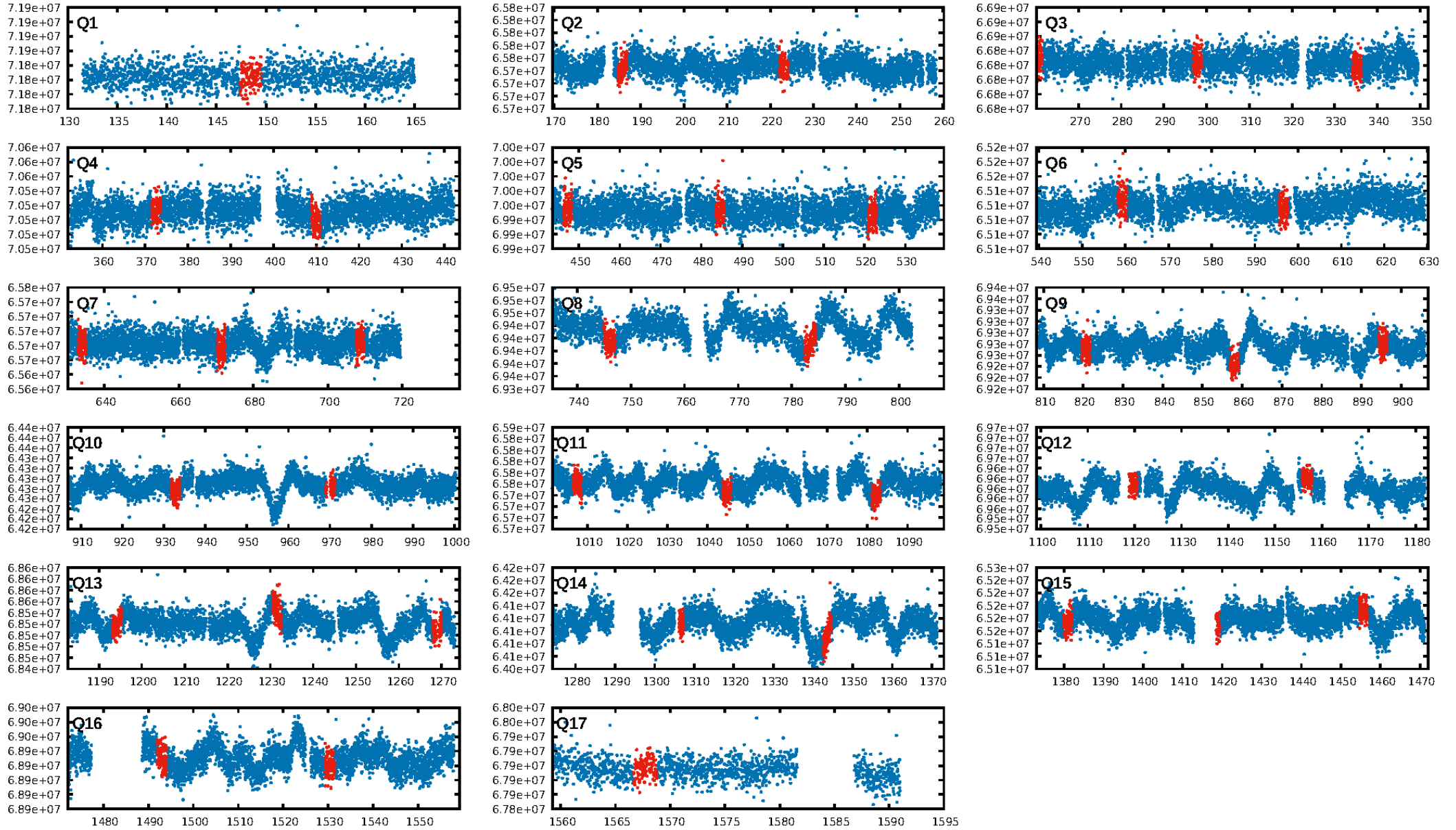
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [30.54σ]  
LongPeriod-sig: 100.0% [7.42σ]  
ModelChiSquare2-sig: 0.0%  
ModelChiSquareGof-sig: 100.0%  
Bootstrap-pfa: 3.40e-20  
RollingBand-fgt: 1.00 [27/27]  
GhostDiagnostic-chr: 0.1592  
Centroid-sig: 36.1%  
Centroid-so: 1.190 arcsec [1.79σ]  
OotOffset-rm: 1.982 arcsec [2.97σ]  
KicOffset-rm: 1.772 arcsec [2.48σ]  
OotOffset-st: 2/0/2/3 [7]  
KicOffset-st: 2/0/2/3 [7]  
DiffImageQuality-fgm: 0.29 [2/7]  
DiffImageOverlap-fno: 0.00 [0/14]

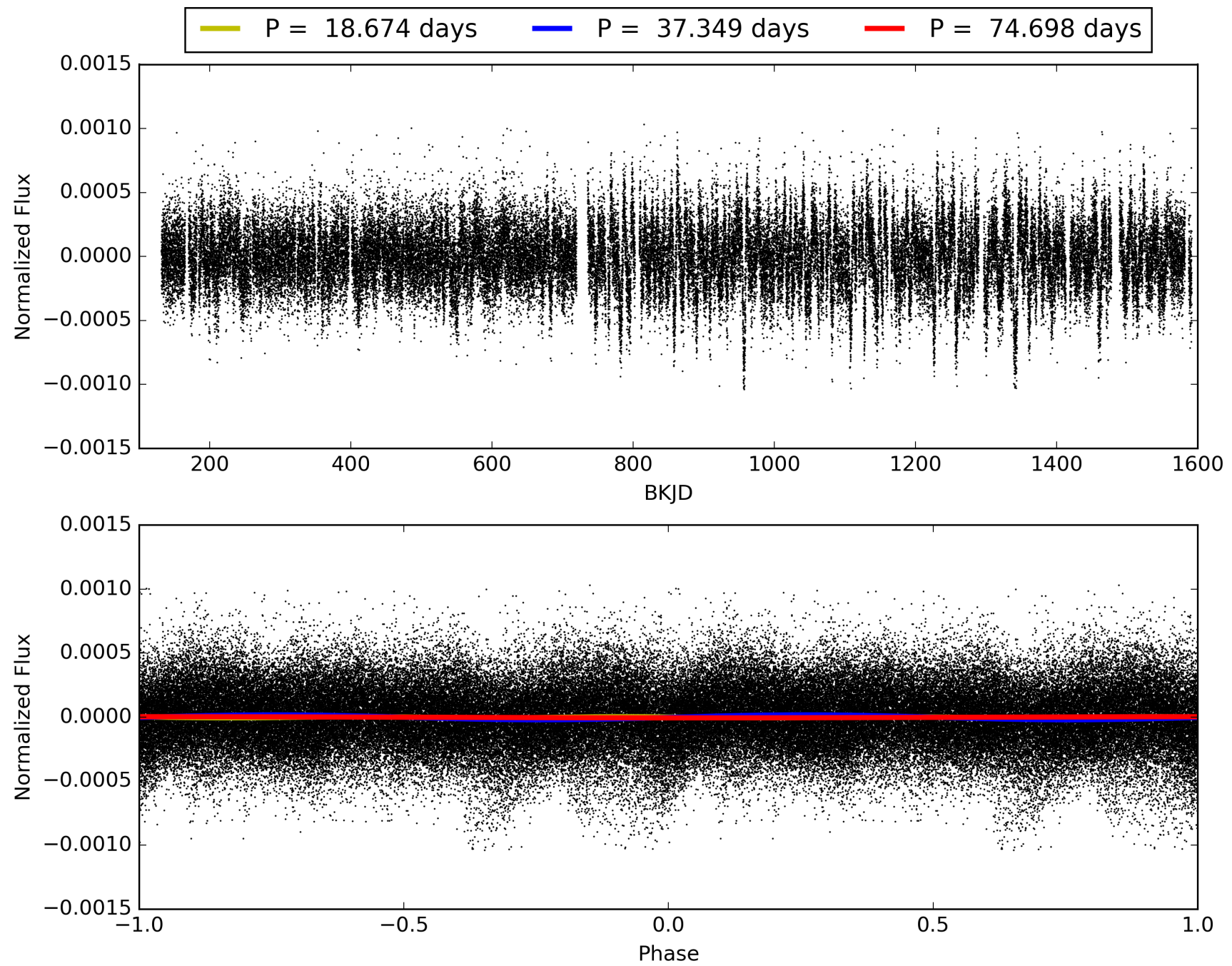
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 30-Jan-2016 03:17:23 Z

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

# TCE 005987404-04, PDC Light Curves

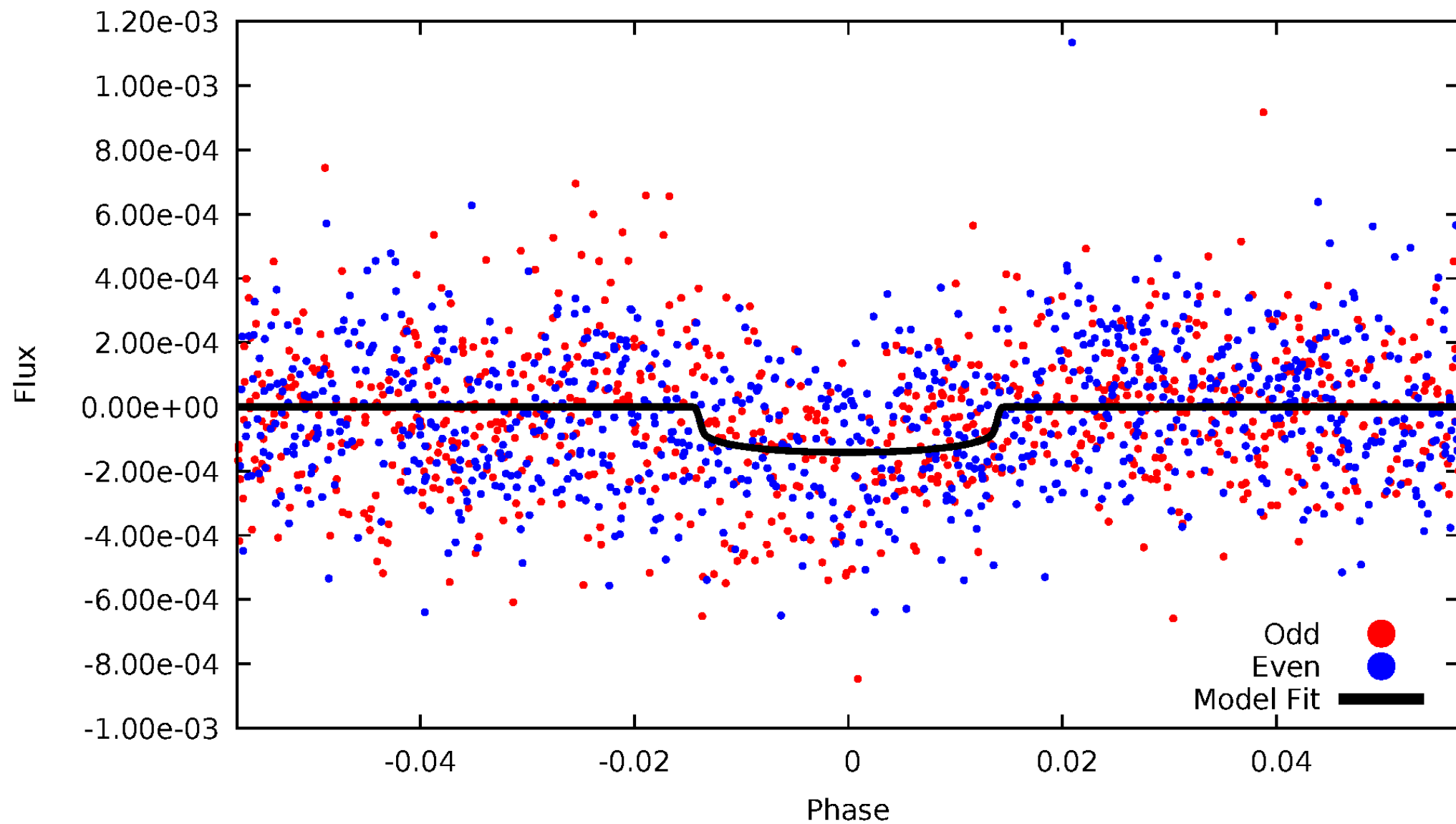


TCE 005987404-04



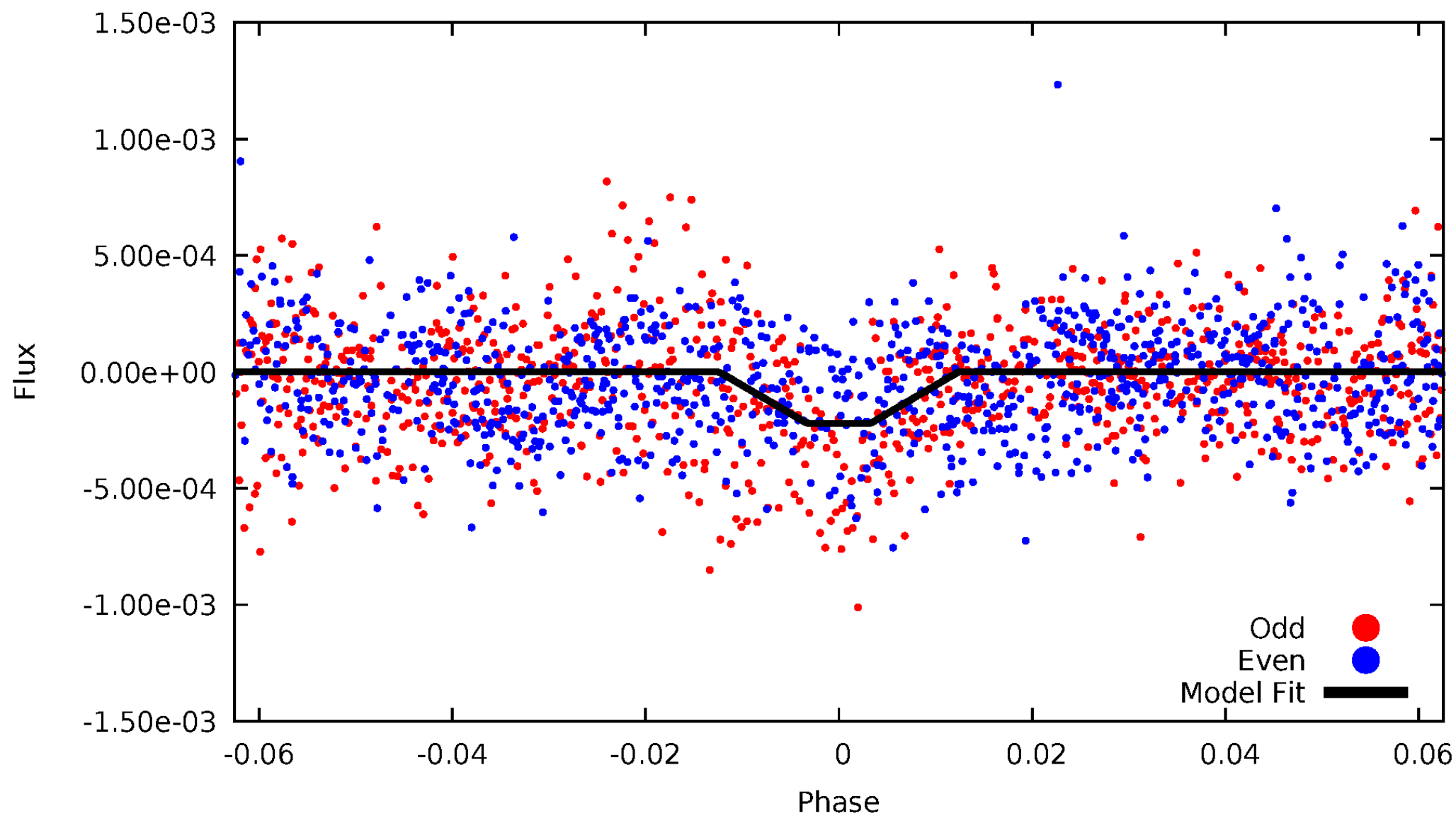
# DV Odd/Even

TCE 005987404-04



# ALT Odd/Even

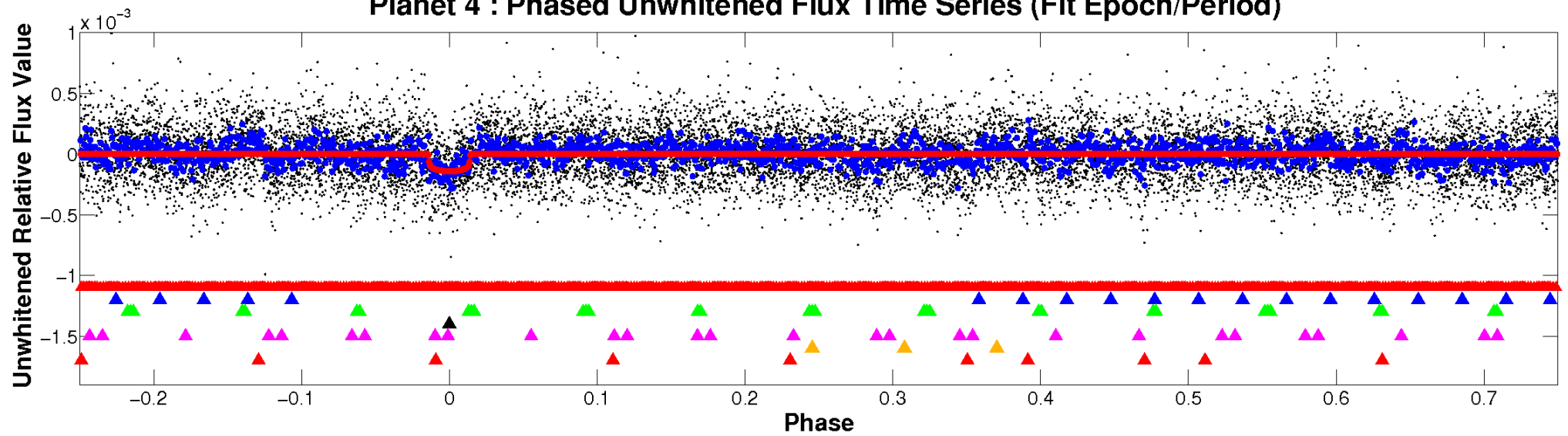
TCE 005987404-04



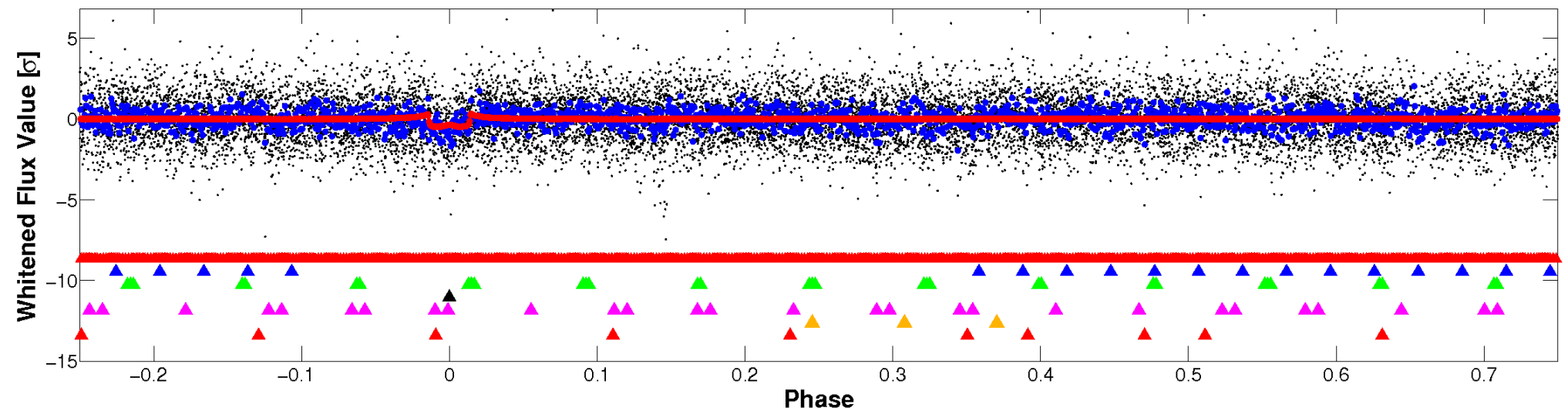


# Non-Whitened Vs. Whitened Light Curve

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



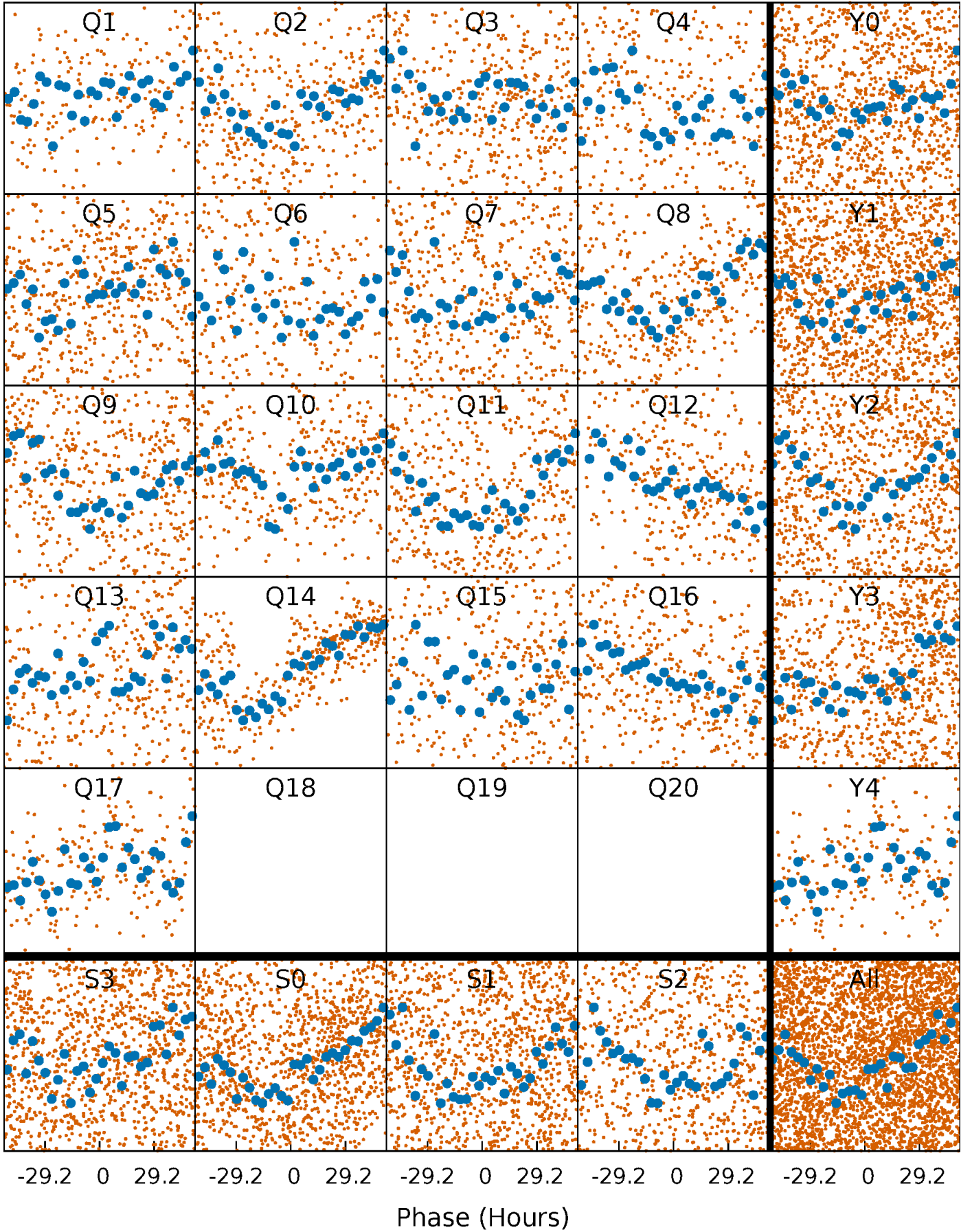
## Planet 4 : Phased Whitened Flux Time Series (Fit Epoch/Period)





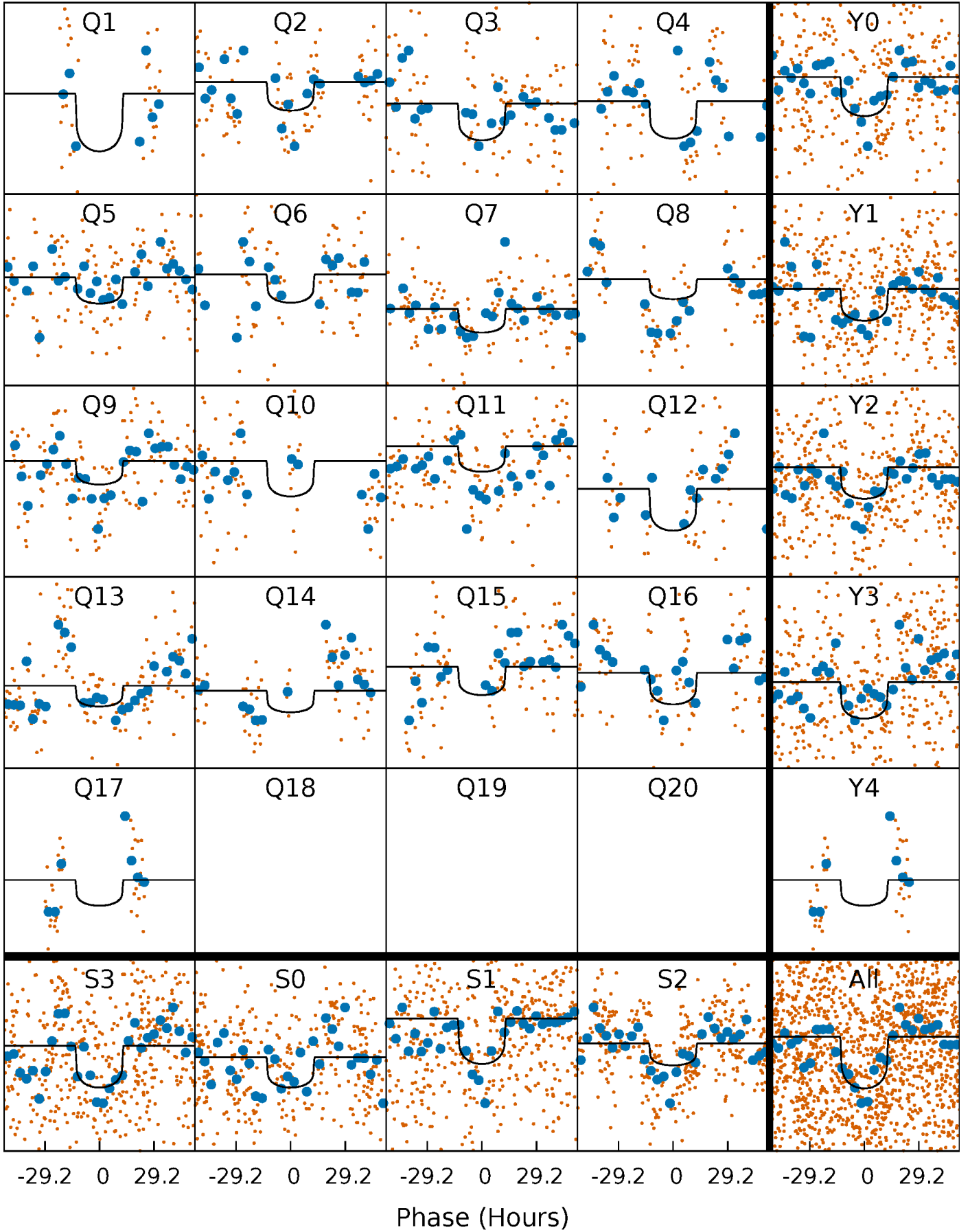
# PDC Quarter-Phased Transit Curves

TCE 005987404-04   P= 37.348754 Days    $T_0=148.451452$  (BKJD)



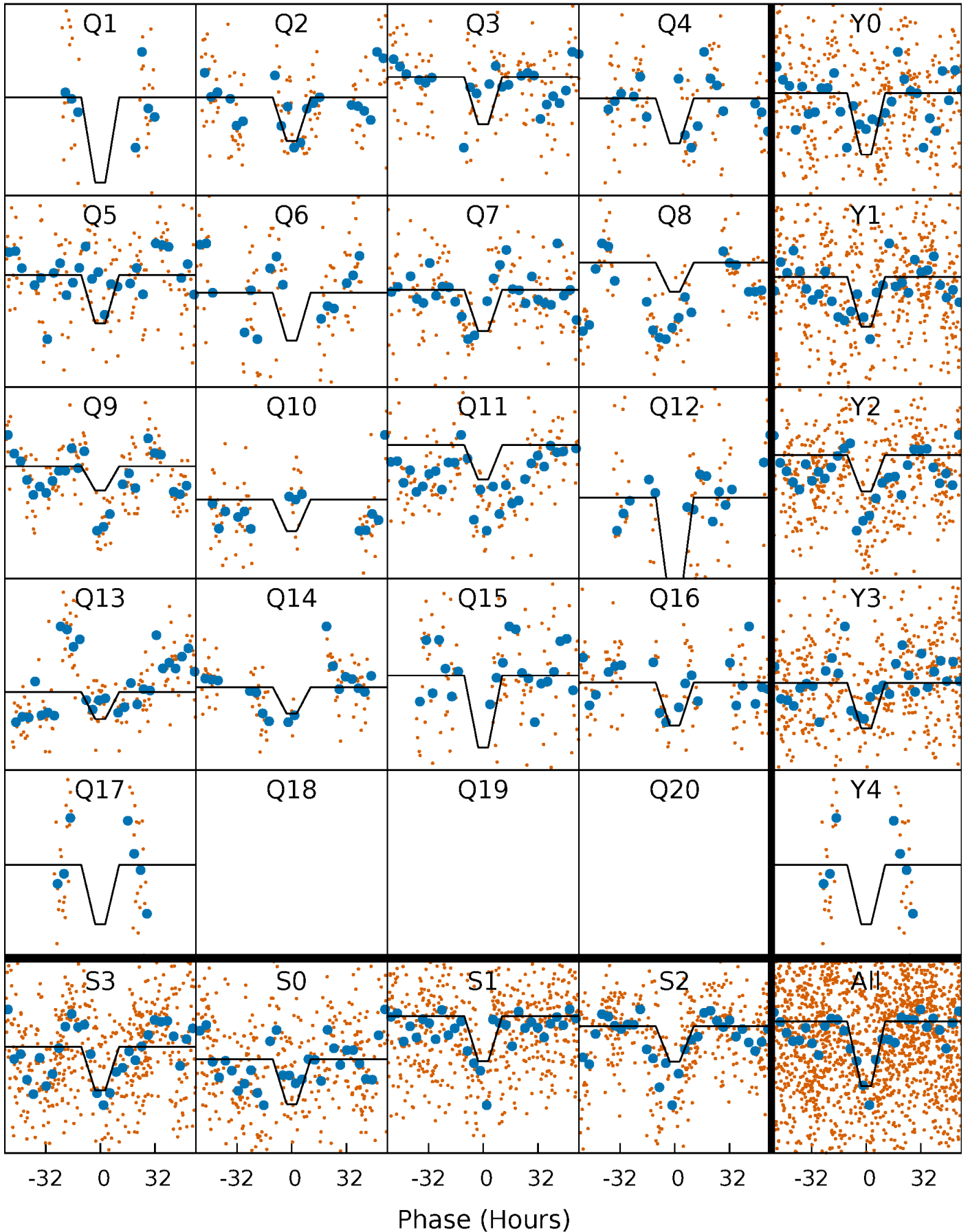
# DV Quarter-Phased Transit Curves

TCE 005987404-04     $P = 37.348754$  Days     $T_0 = 148.451452$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

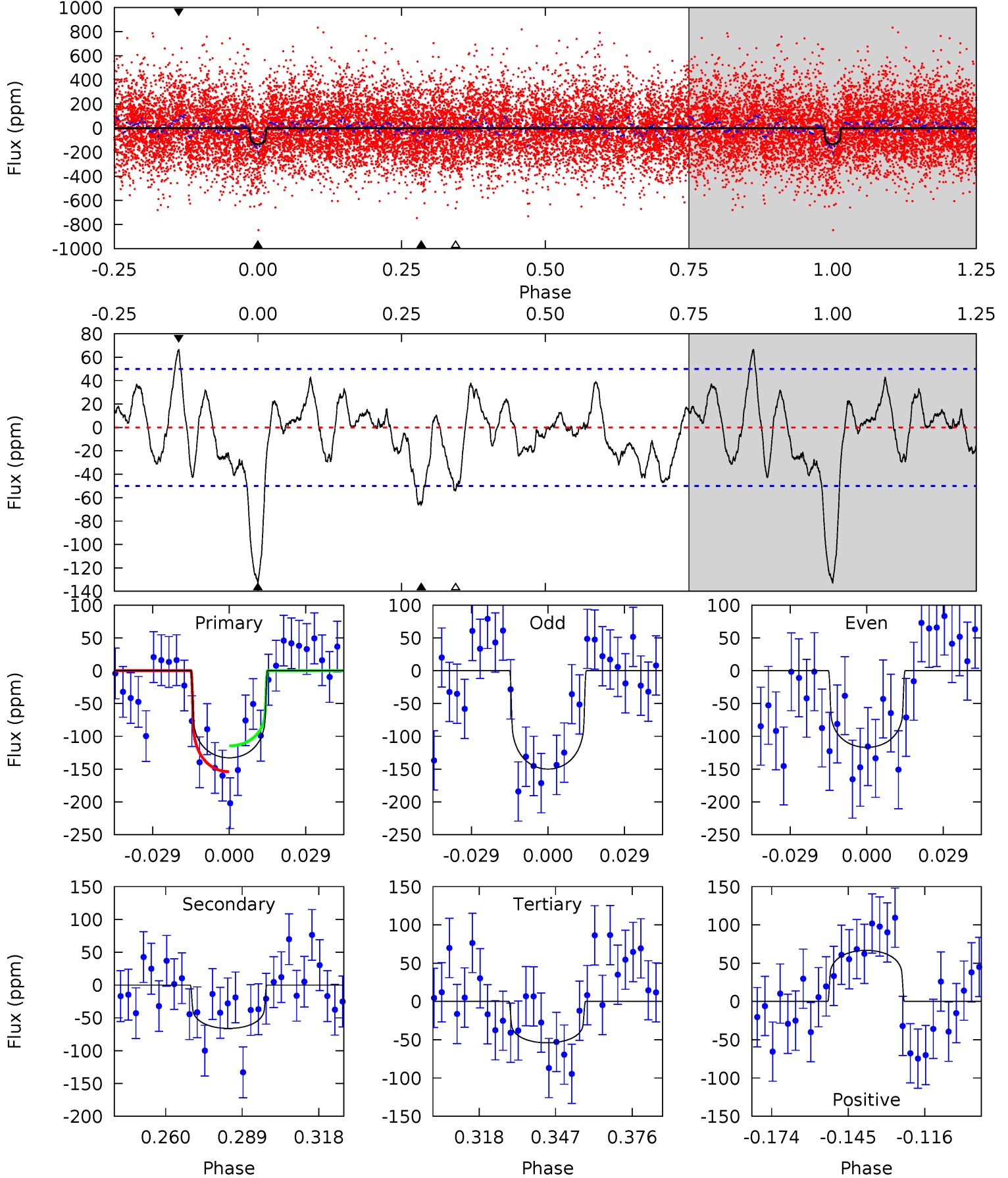
TCE 005987404-04 P= 37.345132 Days  $T_0=148.501929$  (BKJD)



# DV Model-Shift Uniqueness Test

005987404-04, P = 37.348754 Days, E = 111.102698 Days

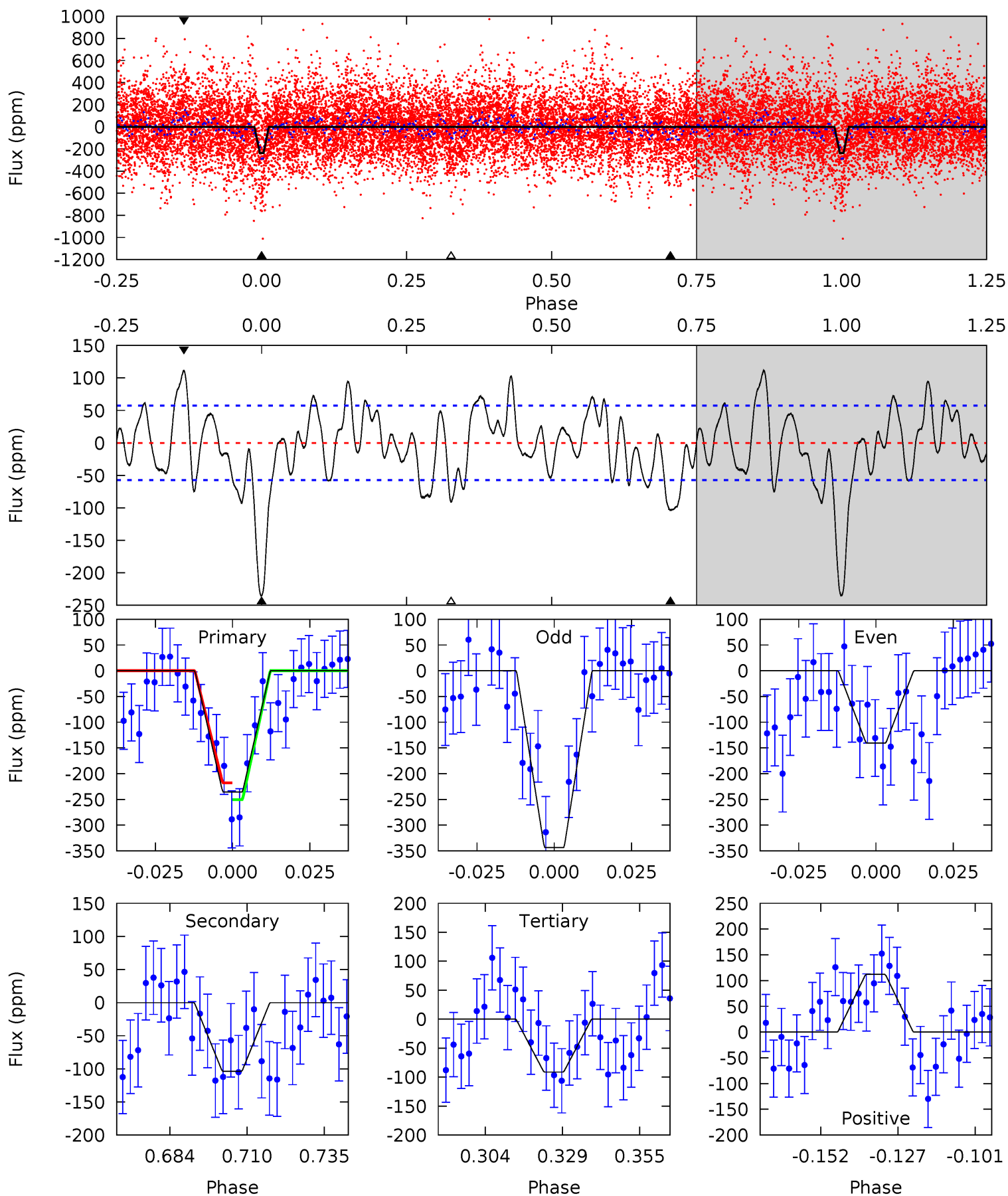
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
12.8	6.37	5.21	6.44	4.82	2.18	2.16	7.60	6.38	1.16	-0.06	1.60	1.07	0.33	1.90



# Alt Model-Shift Uniqueness Test

005987404-04, P = 37.345132 Days, E = 111.156797 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	8.75	7.71	9.46	4.84	2.24	3.75	12.2	10.4	1.04	-0.71	8.62	2.36	0.32	1.37



### Stellar Parameters For KIC 005987404

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$6099^{+184}_{-220}$	$4.373^{+0.090}_{-0.210}$	$0.040^{+0.250}_{-0.300}$	$1.123^{+0.366}_{-0.157}$	$1.085^{+0.166}_{-0.135}$	$1.078^{+0.500}_{-0.570}$
	+3%/-4%	+2%/-5%	+625%/-750%	+33%/-14%	+15%/-12%	+46%/-53%
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 005987404-04 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-66 \pm 10$	$1.48^{+0.44}_{-0.37}$	$853^{+65}_{-52}$	$5131^{+697}_{-466}$	$828^{+617}_{-330}$
Alt.	$-104 \pm 12$	$1.87^{+0.49}_{-0.42}$	$847^{+68}_{-46}$	$5103^{+546}_{-429}$	$827^{+514}_{-332}$

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



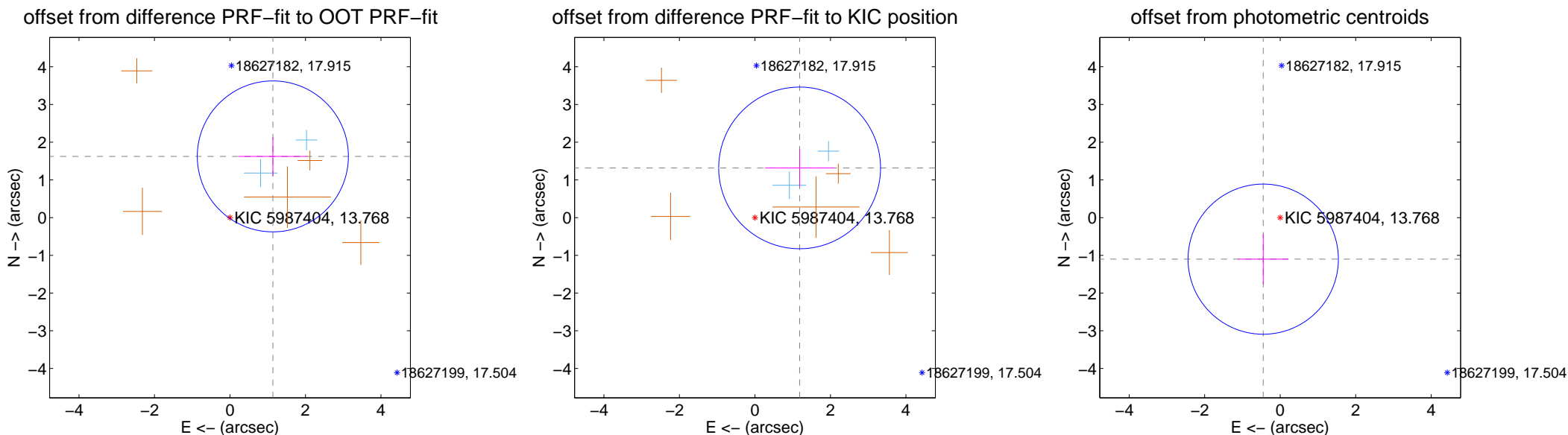
## DV Centroid Data

Supplemental centroid analysis for 005987404-04. Kepler magnitude: 13.77. Transit SNR 8.99

There are 2 quarters with good PRF difference image offsets

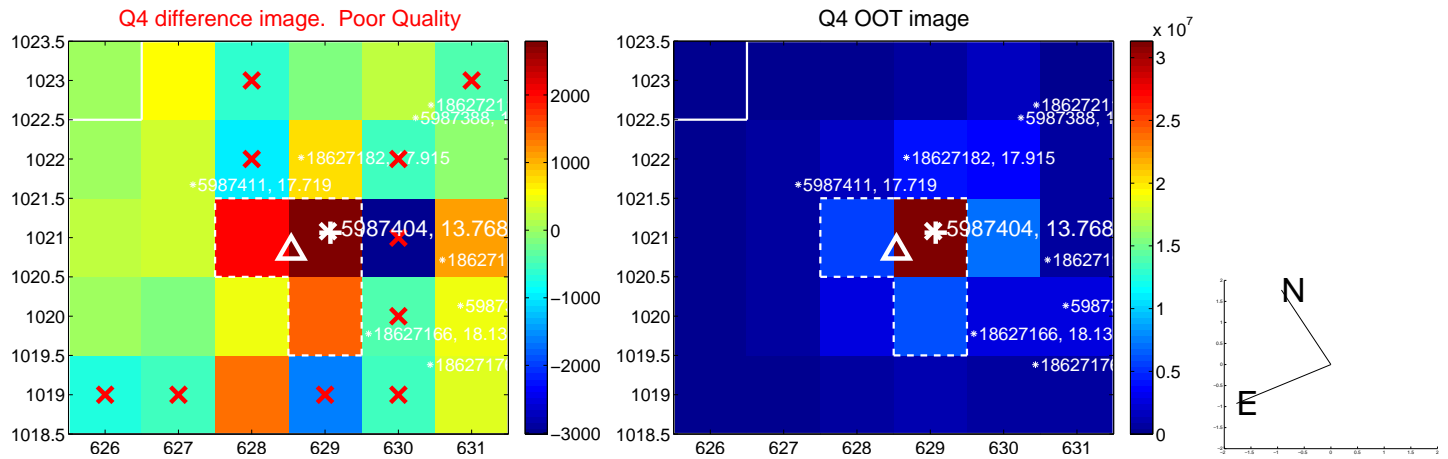
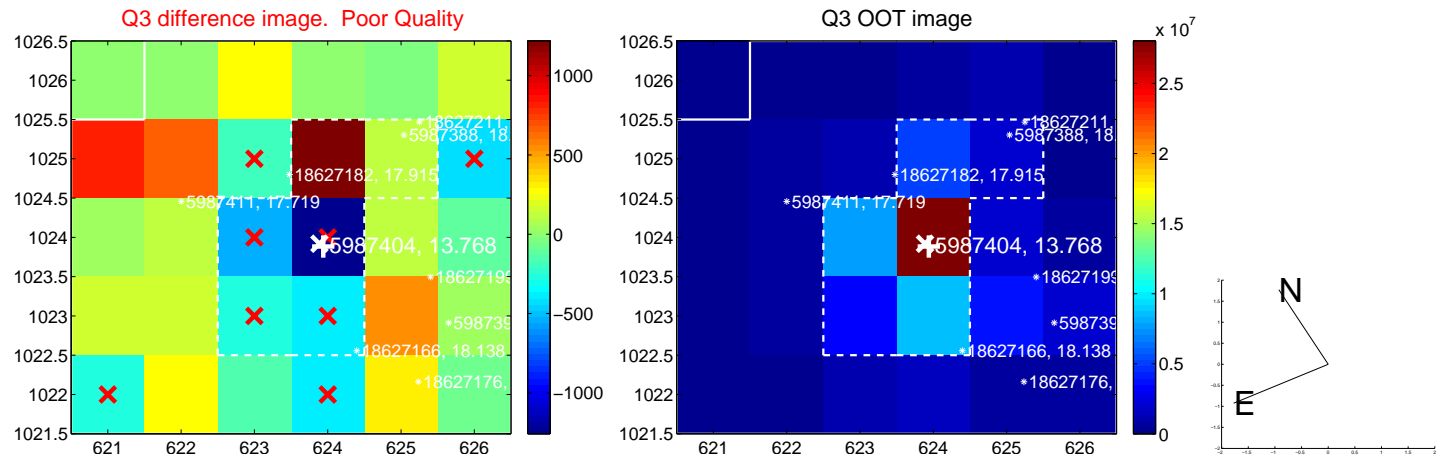
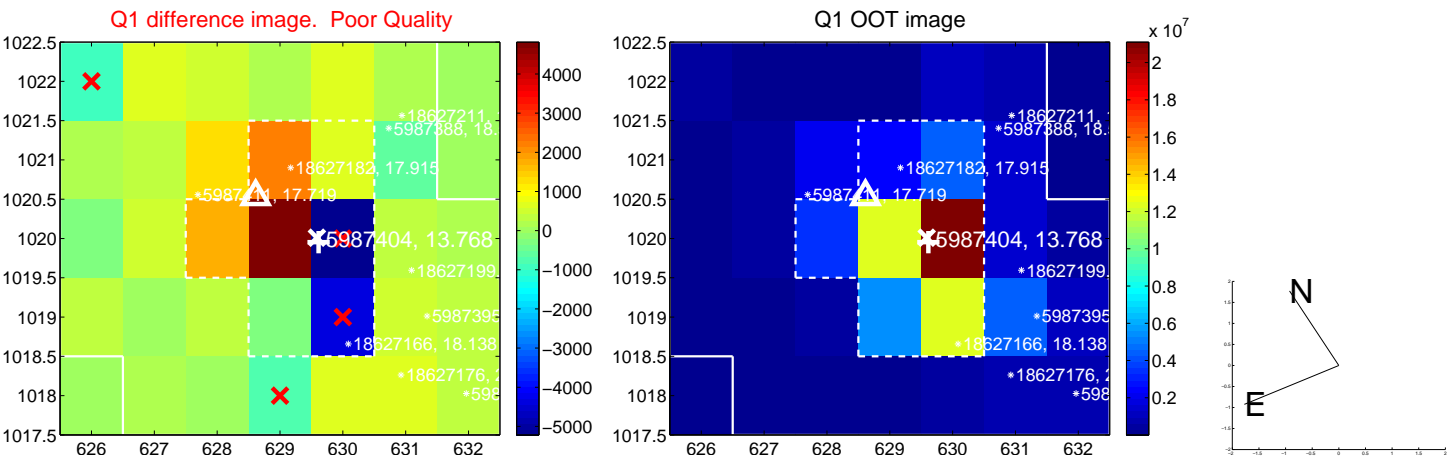
The direct PRF centroid is offset from the target star catalog position by about 0.31 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$1.982 \pm 0.667$	2.97	$-1.136 \pm 0.907$	$1.624 \pm 0.511$
PRF-fit source offset from KIC position	$1.772 \pm 0.715$	2.48	$-1.184 \pm 0.914$	$1.318 \pm 0.499$
photometric centroid source offset	$1.19 \pm 0.66$	1.79	$0.45 \pm 0.66$	$-1.10 \pm 0.66$

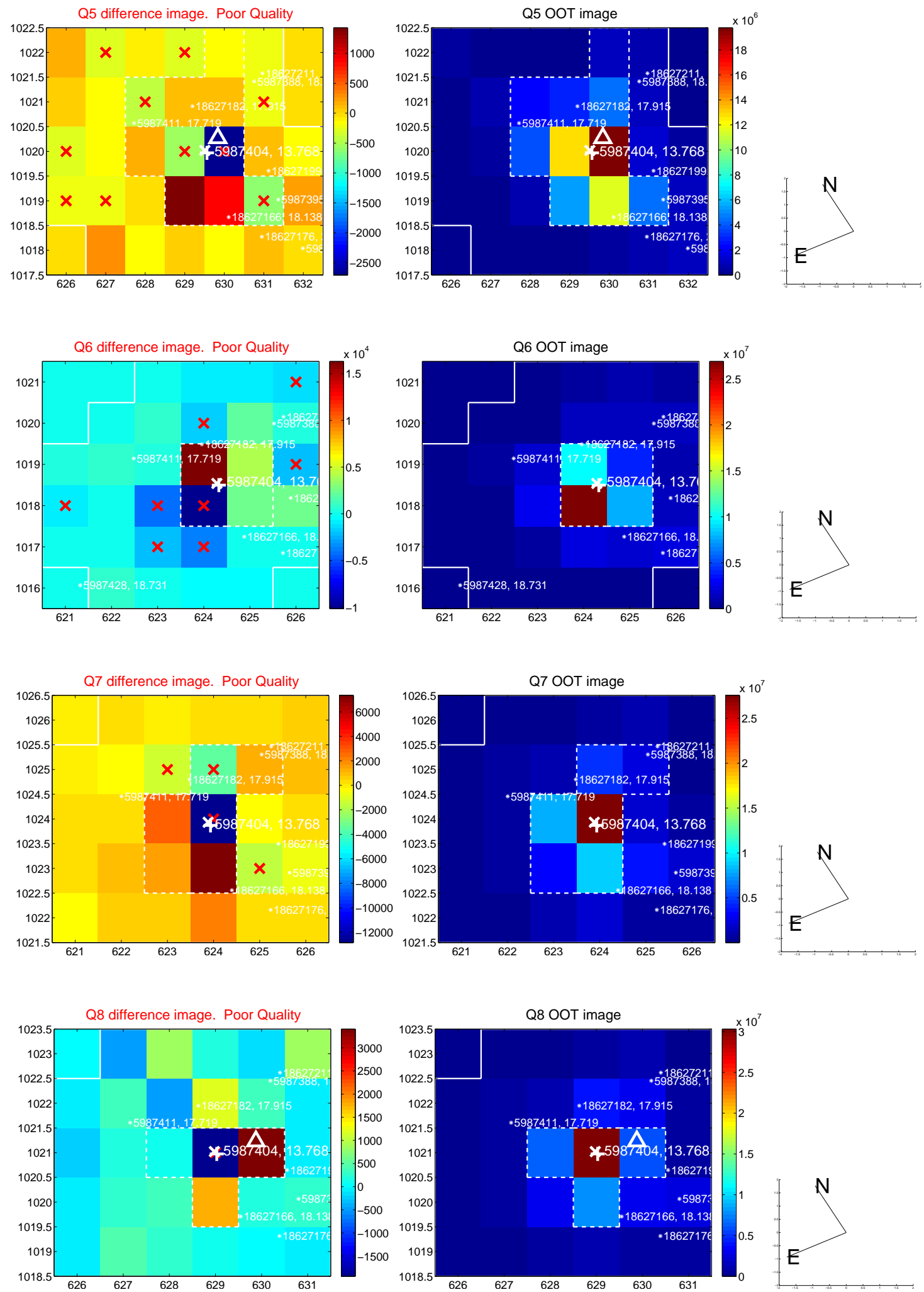


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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

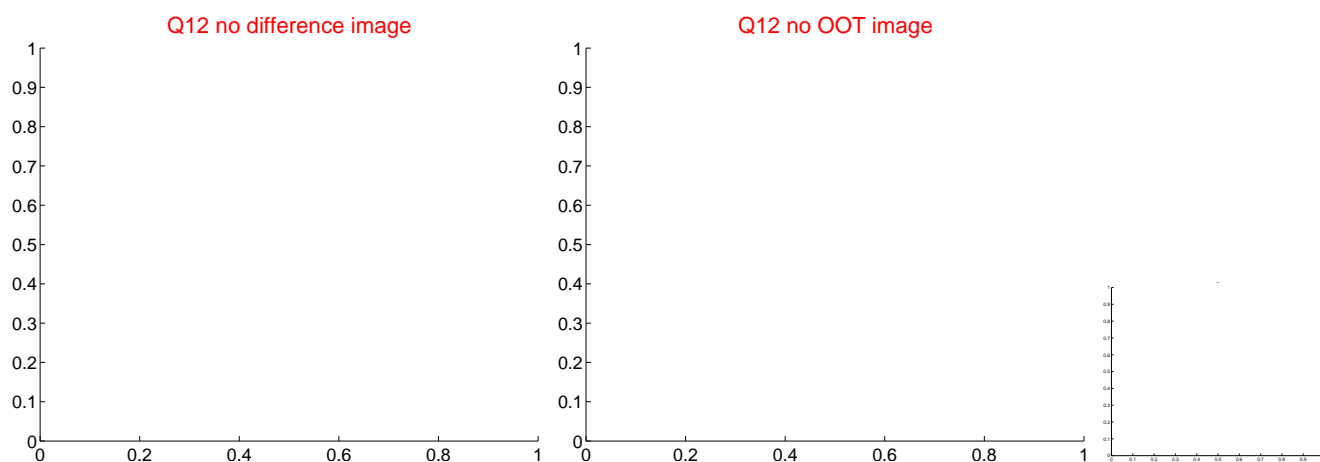
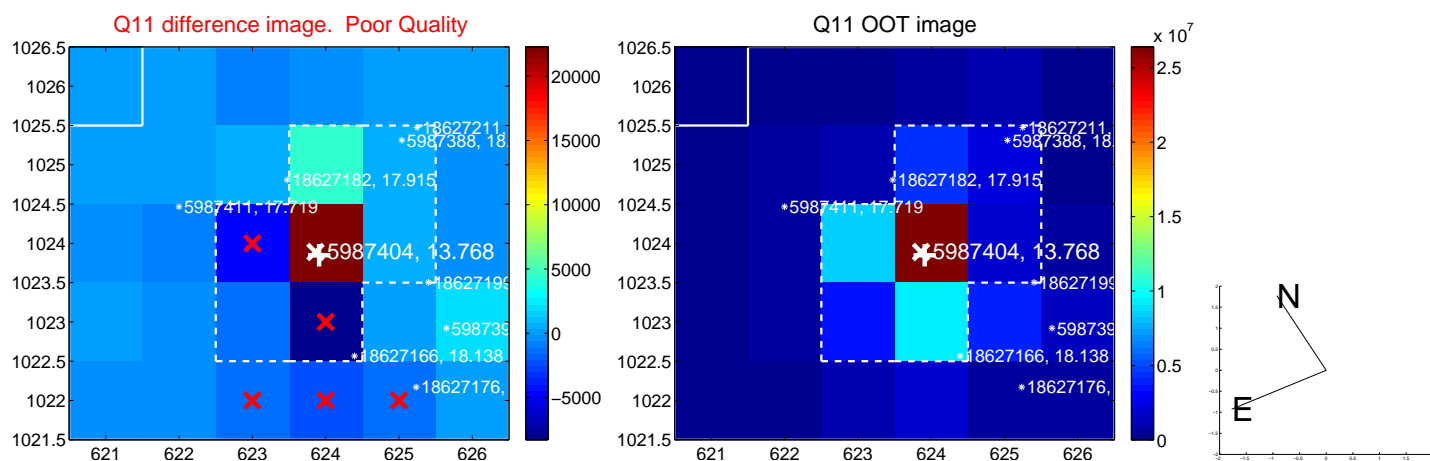
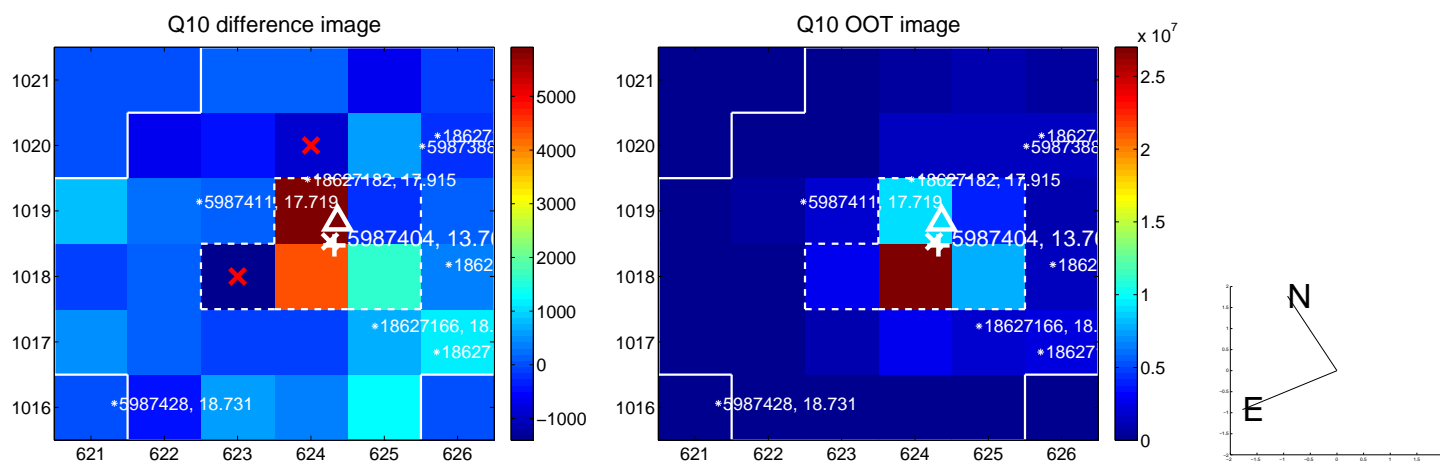
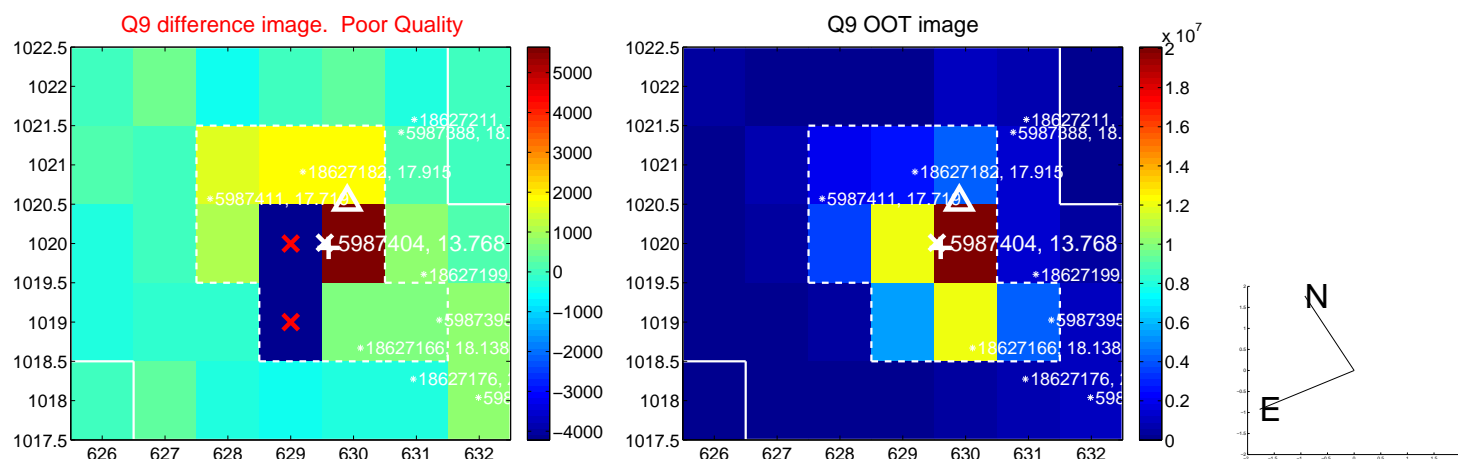
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



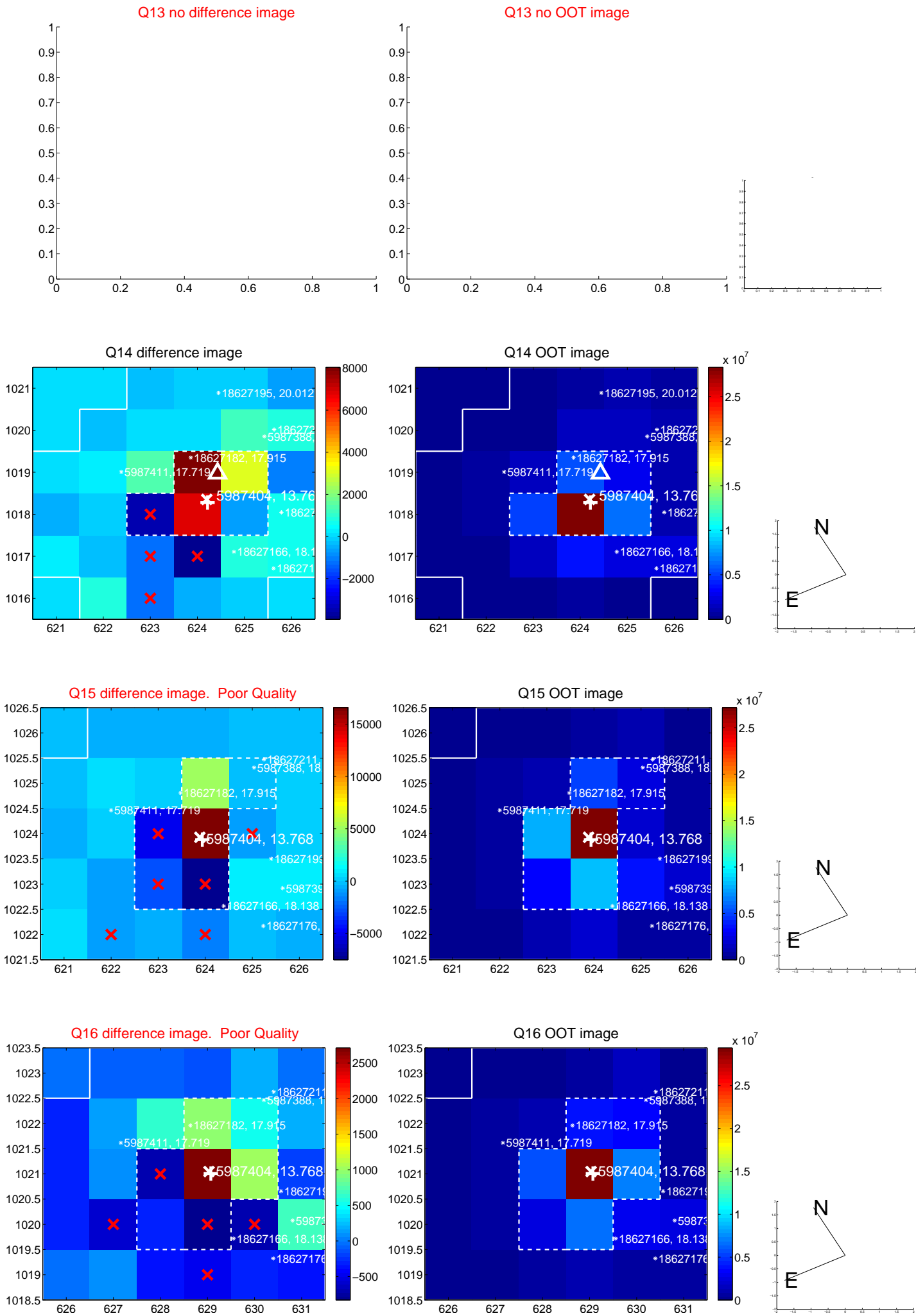
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



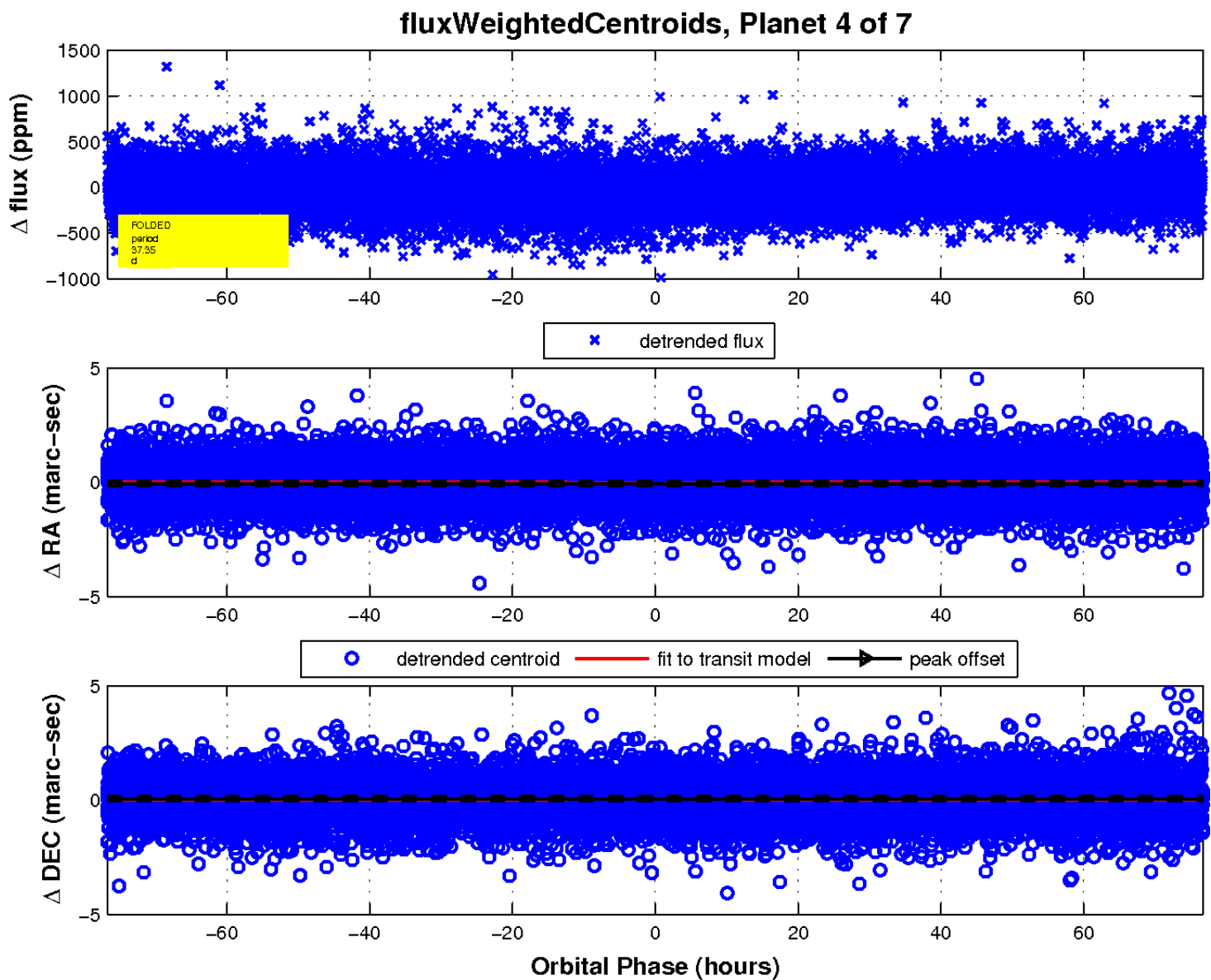
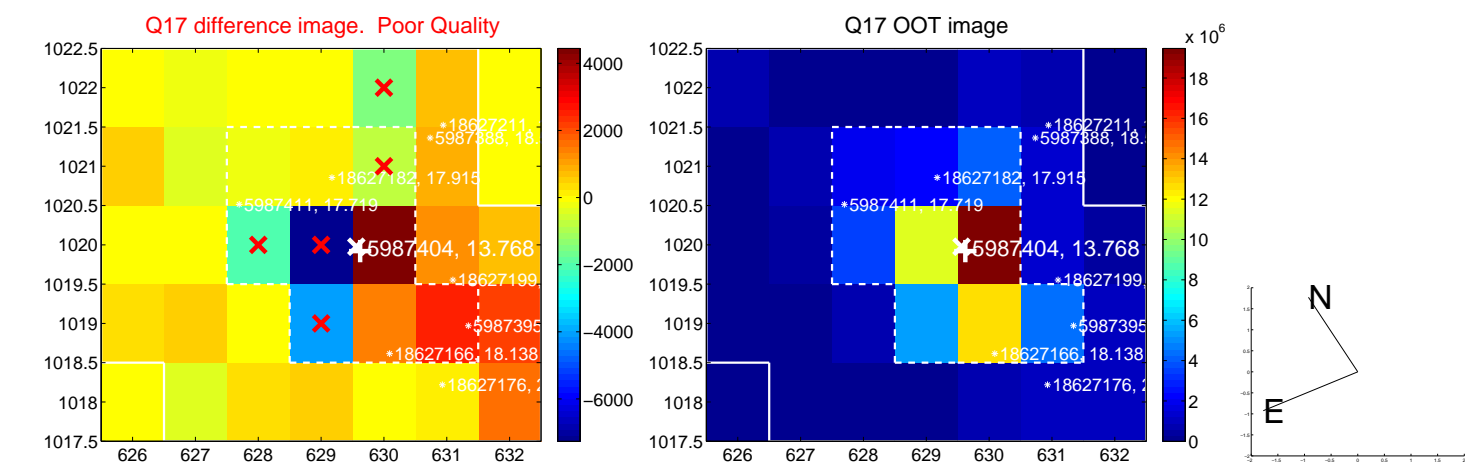
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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



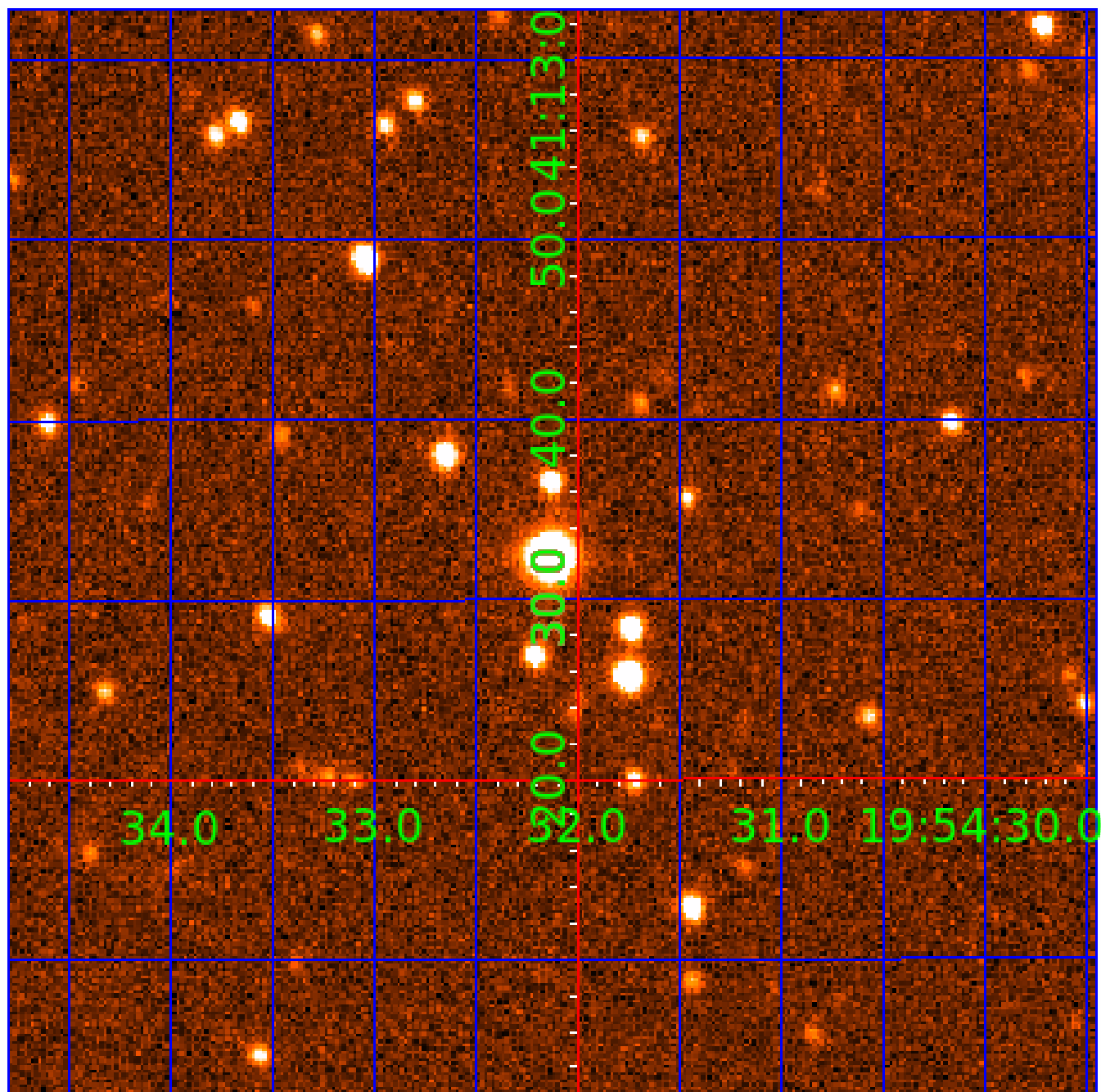
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.





UKIRT Image

Declination



# KIC 005987404

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
005987404-01	OBS	No	1.835612	132.170942	19.0	11.159	7.5	8.9	1.12	6099	0.49	1718.47
005987404-03	OBS	No	45.962054	151.976692	170.9	11.015	13.0	6.0	1.12	6099	1.65	23.46
005987404-04	OBS	No	37.348754	148.451452	141.8	25.577	10.5	9.0	1.12	6099	1.44	30.94
005987404-05	OBS	No	52.708527	144.214024	138.8	10.164	8.7	7.4	1.12	6099	1.49	19.54
005987404-06	OBS	No	487.865266	531.109283	352.1	73.327	8.5	9.4	1.12	6099	2.44	1.01
005987404-07	OBS	No	153.872450	163.069223	179.6	10.495	8.8	6.7	1.12	6099	1.62	4.68

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
005987404-01	OBS	FP	0.00	1	0	1	0	LPP_DV—CENT_UNRESOLVED_OFFSET
005987404-03	OBS	FP	0.00	1	0	1	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—CENT_FEW_DIFFS—HALO_GHOST
005987404-04	OBS	FP	0.00	1	0	1	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_ALT—CENT_FEW_MEAS—HALO_GHOST
005987404-05	OBS	FP	0.00	1	0	1	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—CENT_FEW_DIFFS—HALO_GHOST
005987404-06	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_MARSHALL—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS
005987404-07	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_MARSHALL—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS

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

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

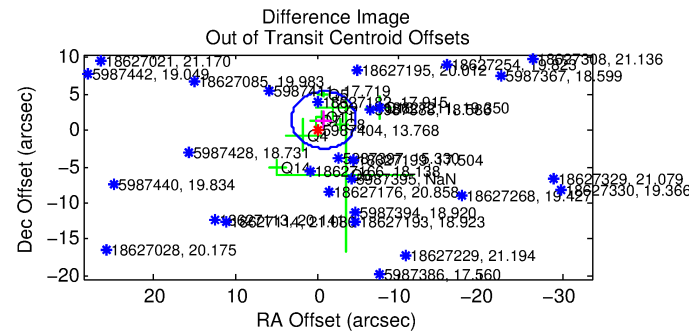
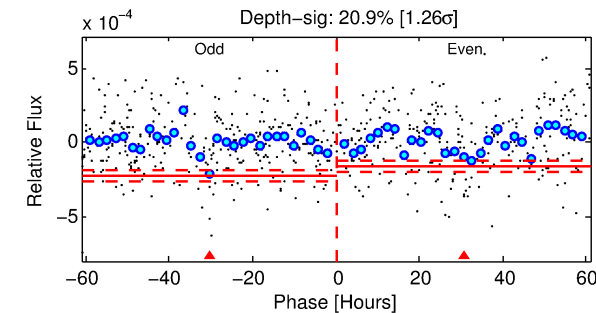
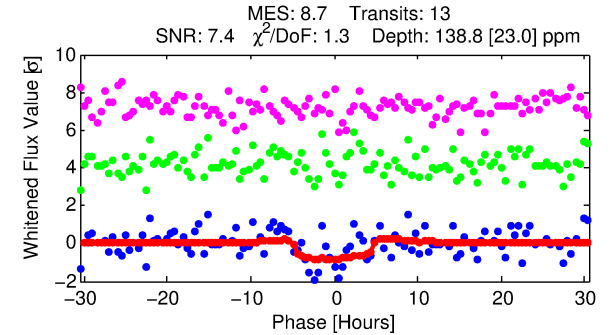
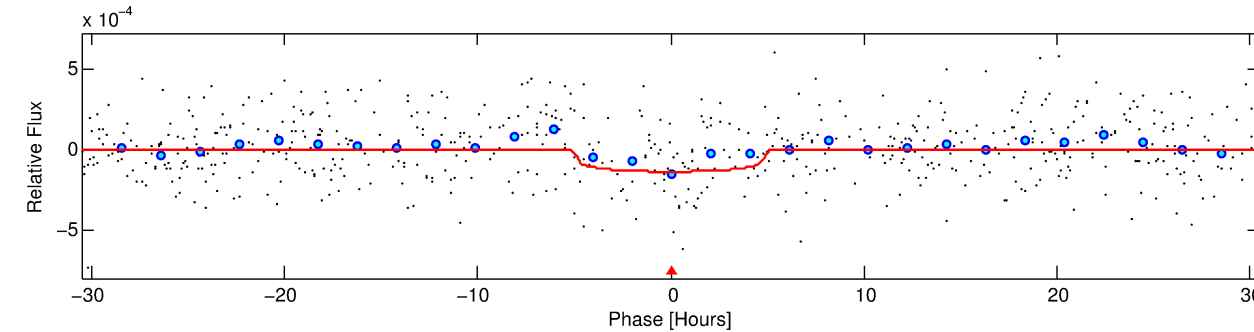
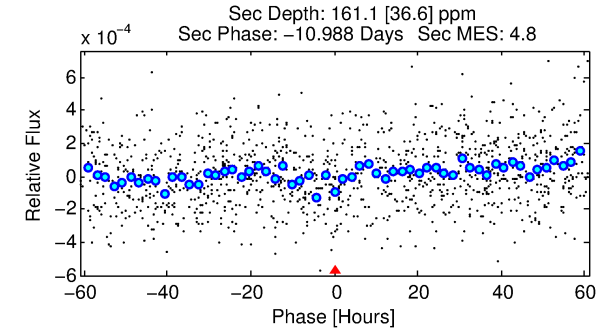
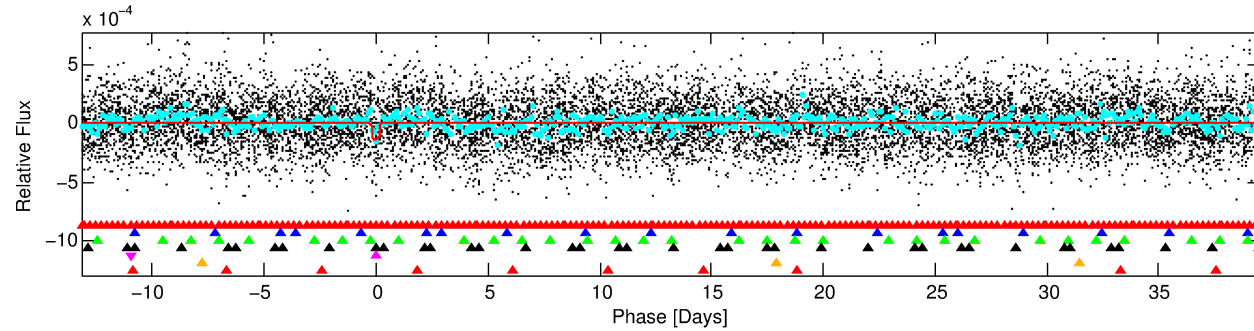
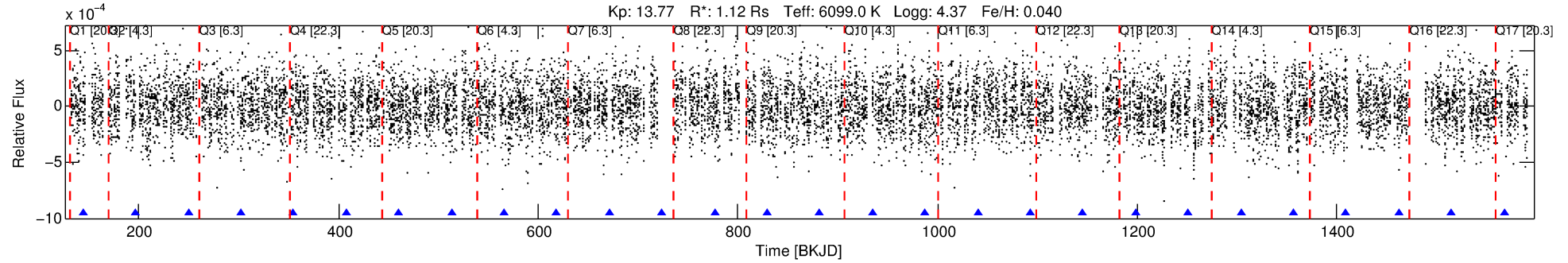
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 005987404-05

No Significant Match Found

# DV One-Page Summary

KIC: 5987404 Candidate: 5 of 7 Period: 52.709 d



## DV Fit Results:

Period = 52.70853 [0.00135] d  
Epoch = 144.2140 [0.0212] BKJD  
Rp/R\* = 0.0122 [0.0079]  
a/R\* = 22.66 [71.90]  
b = 0.84 [1.17]  
Seff = 19.54 [8.10]  
Teff = 536 [56] K  
Rp = 1.49 [1.08] Re  
a = 0.2828 [0.0765] AU  
Ag = 3191.94 [4381.47] [0.73σ]  
Teffp = 6231 [2063] K [2.76σ]

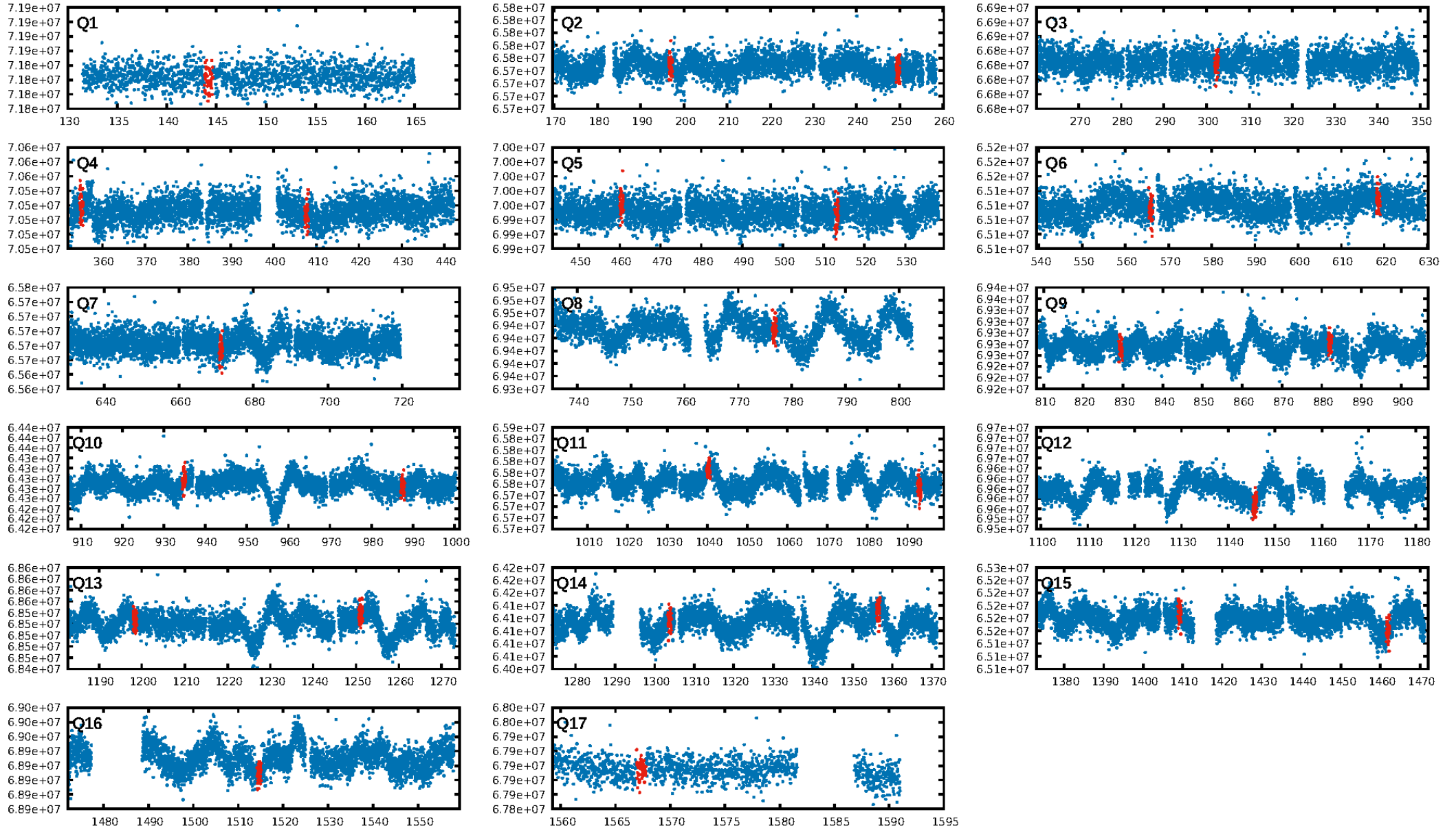
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [10.80σ]  
LongPeriod-sig: 100.0% [36.19σ]  
ModelChiSquare2-sig: 26.1%  
ModelChiSquareGof-sig: 100.0%  
**Bootstrap-pfa: 4.74e-11**  
**RollingBand-fgt: 1.00 [12/12]**  
**GhostDiagnostic-chr: 0.09348**  
Centroid-sig: 52.7%  
Centroid-so: 1.314 arcsec [1.27σ]  
OotOffset-rm: 1.643 arcsec [1.25σ]  
KicOffset-rm: 1.487 arcsec [1.00σ]  
OotOffset-st: 2/2/3/2 [9]  
KicOffset-st: 2/2/3/2 [9]  
DiffImageQuality-fgm: 0.00 [0/9]  
DiffImageOverlap-fno: 0.00 [0/17]

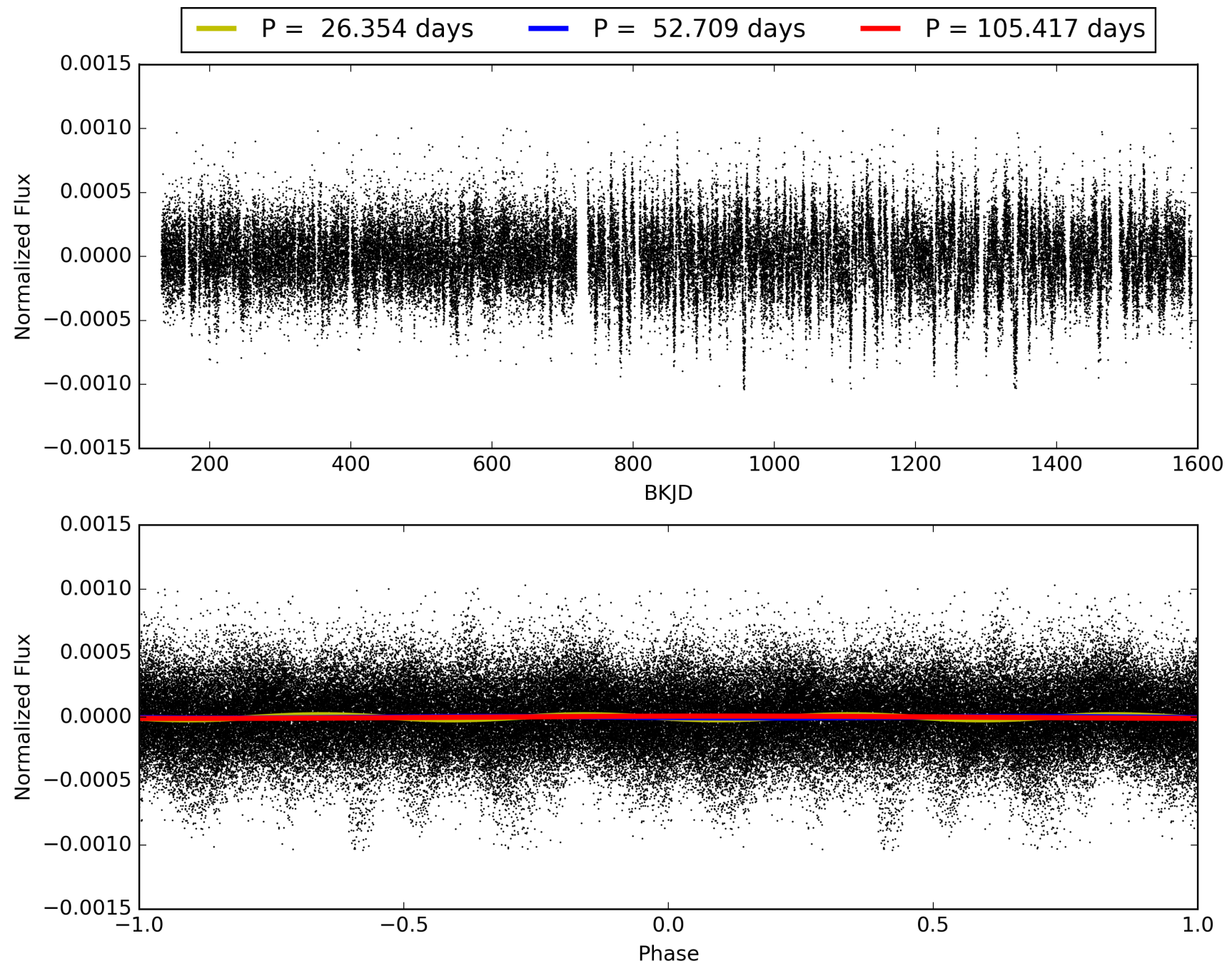
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 30-Jan-2016 03:17:27 Z

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

# TCE 005987404-05, PDC Light Curves

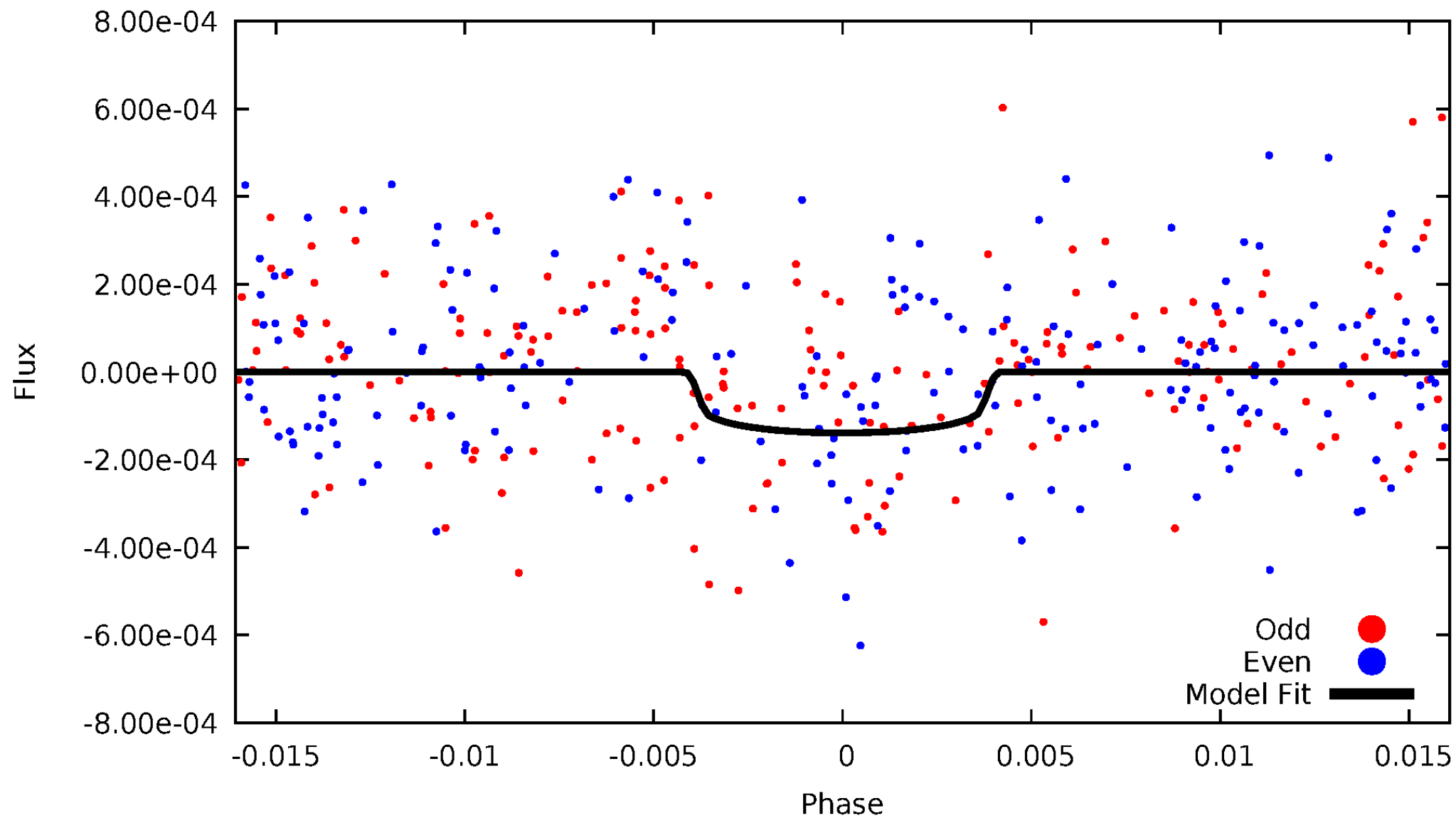


TCE 005987404-05



# DV Odd/Even

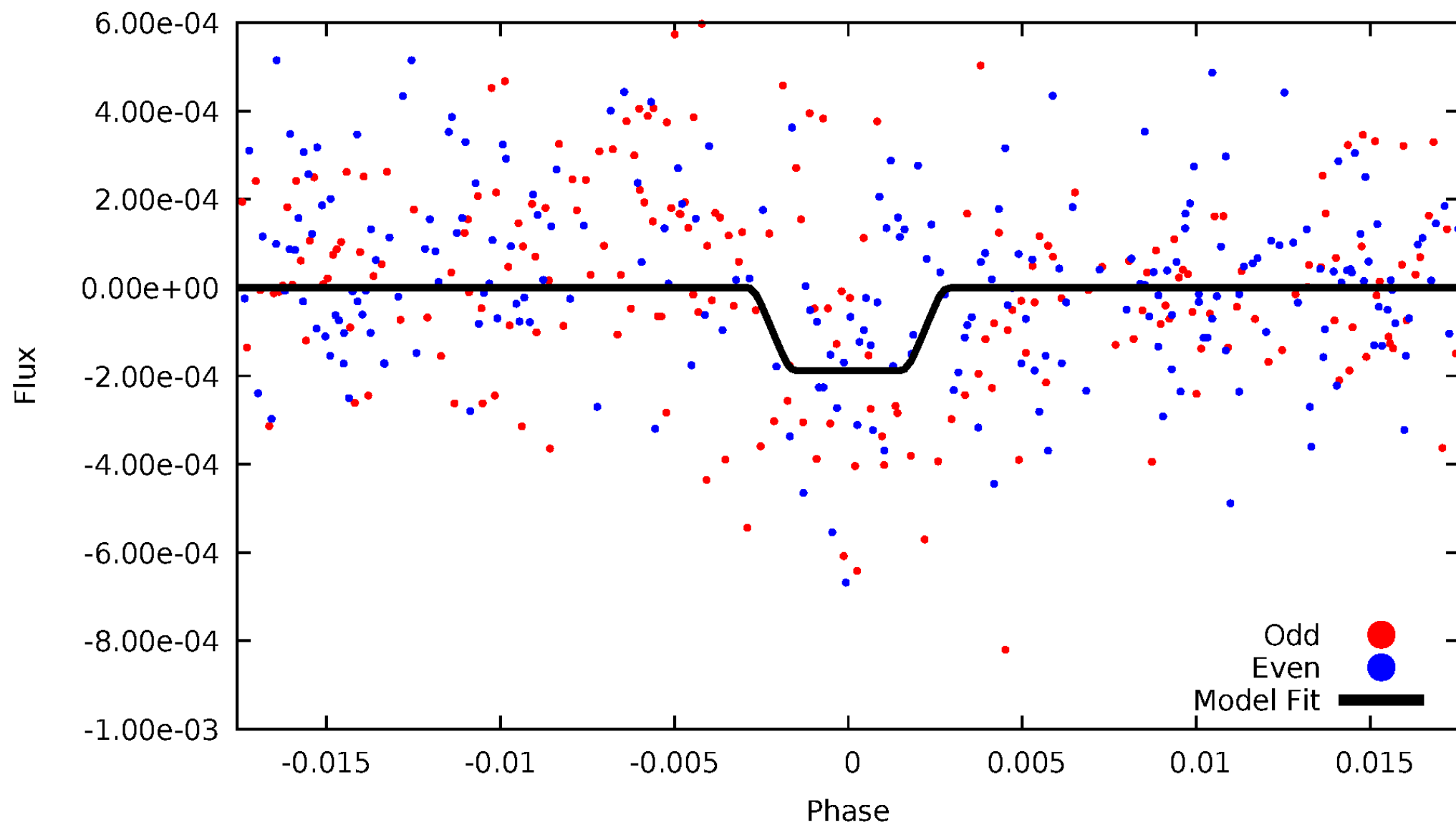
TCE 005987404-05





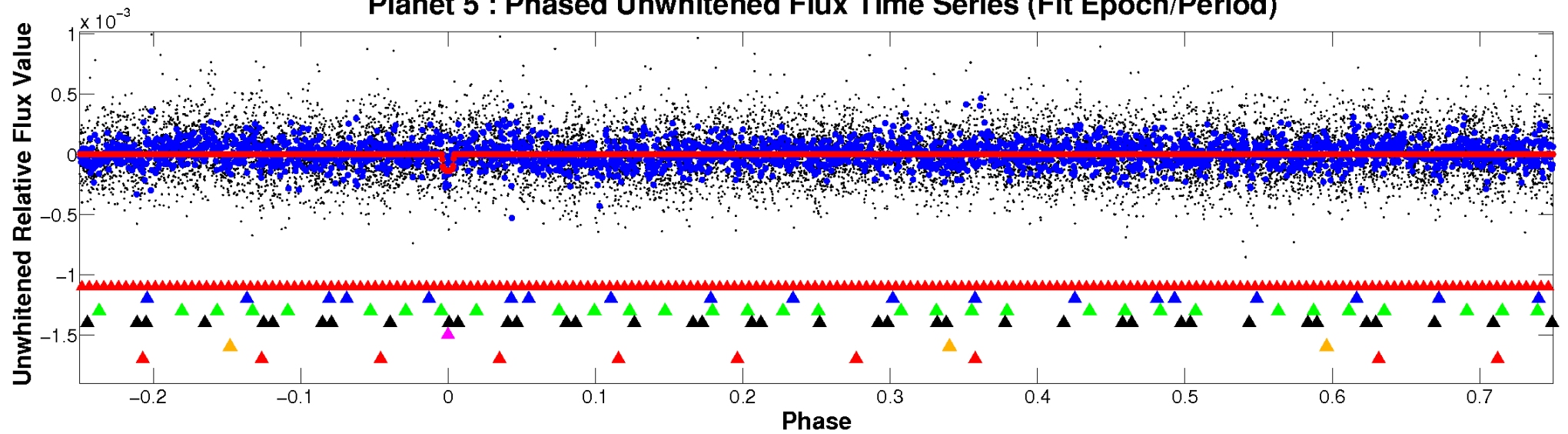
# ALT Odd/Even

TCE 005987404-05

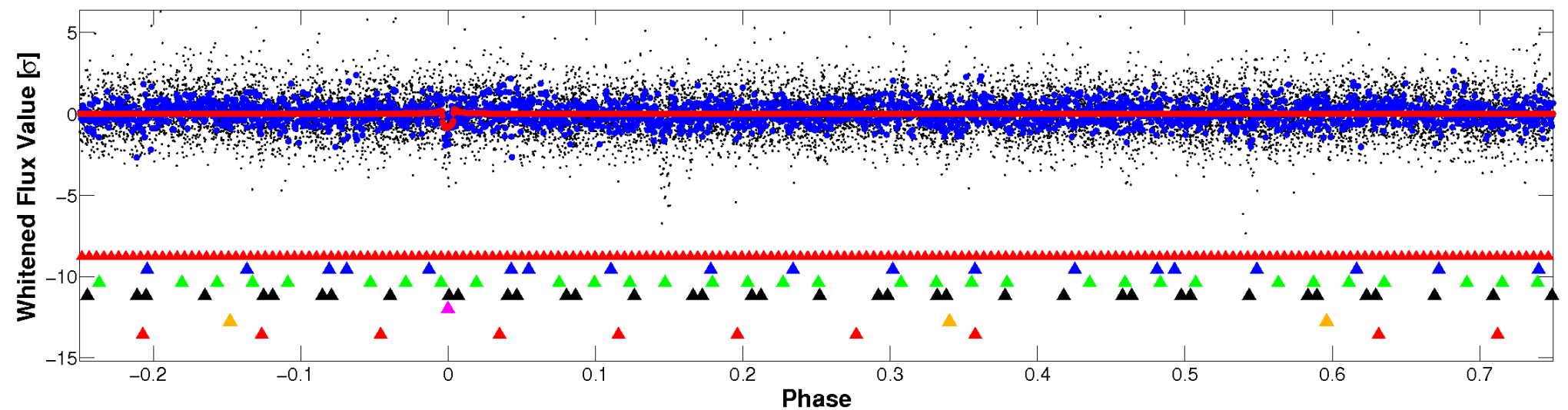


# Non-Whitened Vs. Whitened Light Curve

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

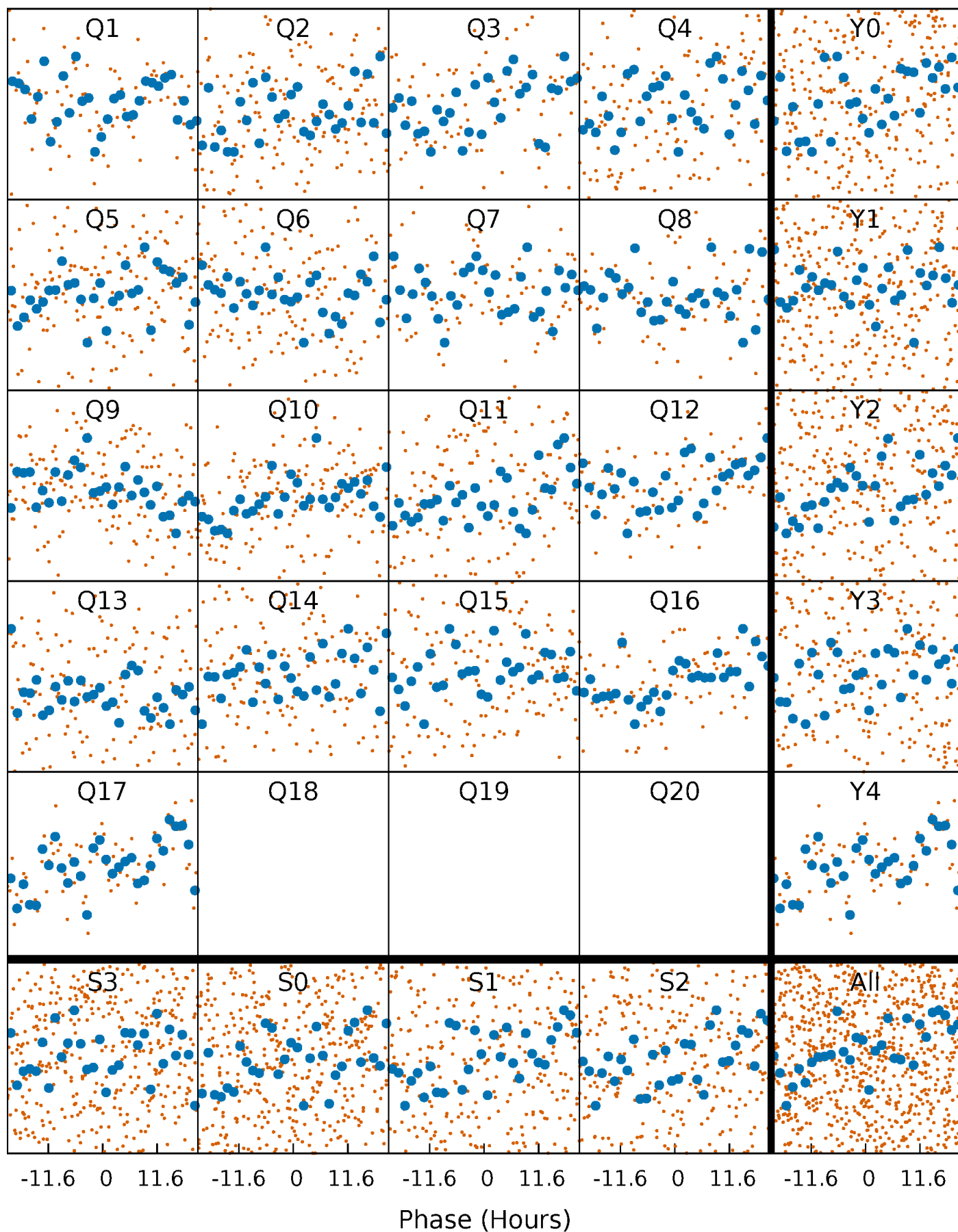


## Planet 5 : Phased Whitened Flux Time Series (Fit Epoch/Period)



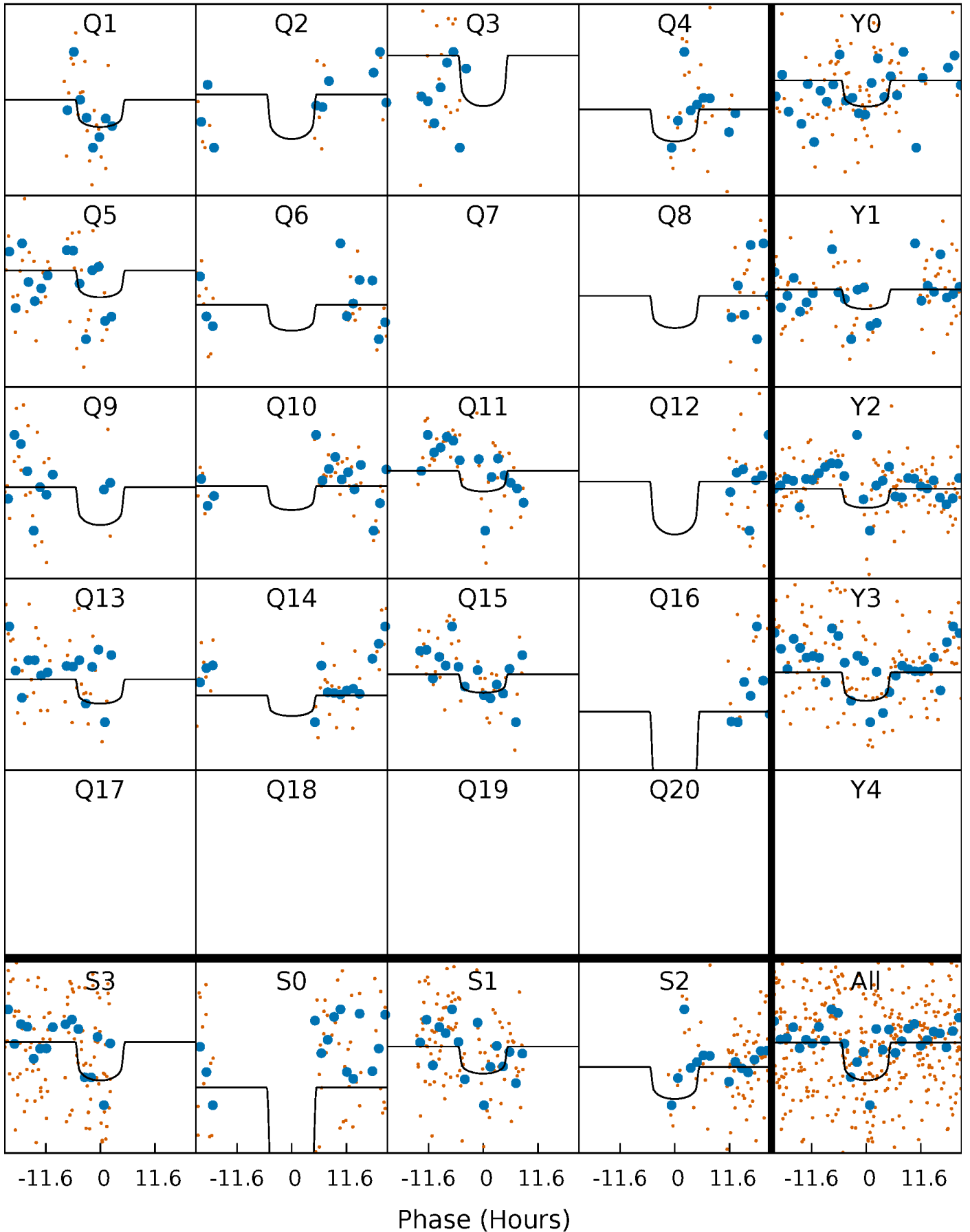
# PDC Quarter-Phased Transit Curves

TCE 005987404-05     $P = 52.708527$  Days     $T_0 = 144.214024$  (BKJD)



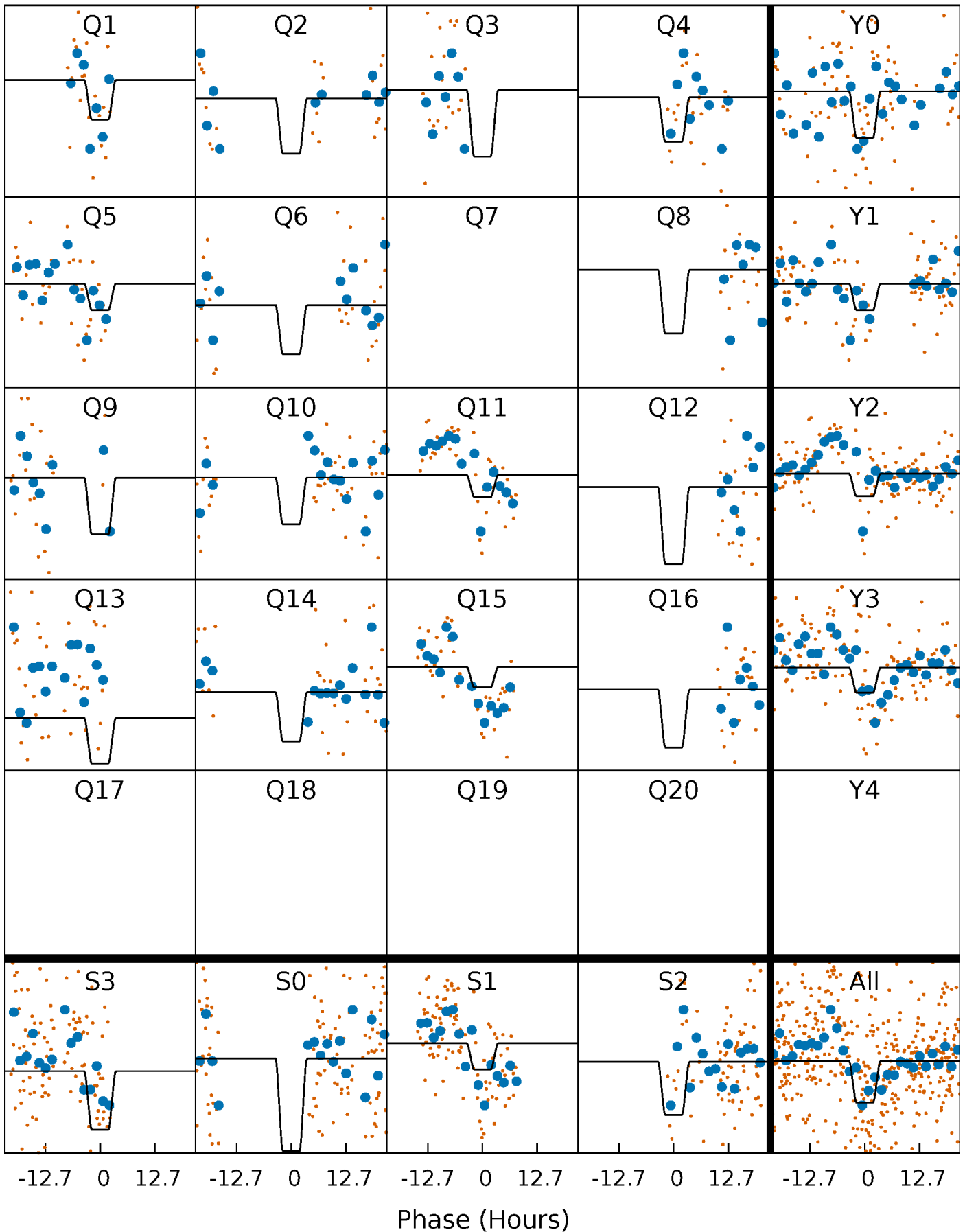
# DV Quarter-Phased Transit Curves

TCE 005987404-05     $P = 52.708527$  Days     $T_0 = 144.214024$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

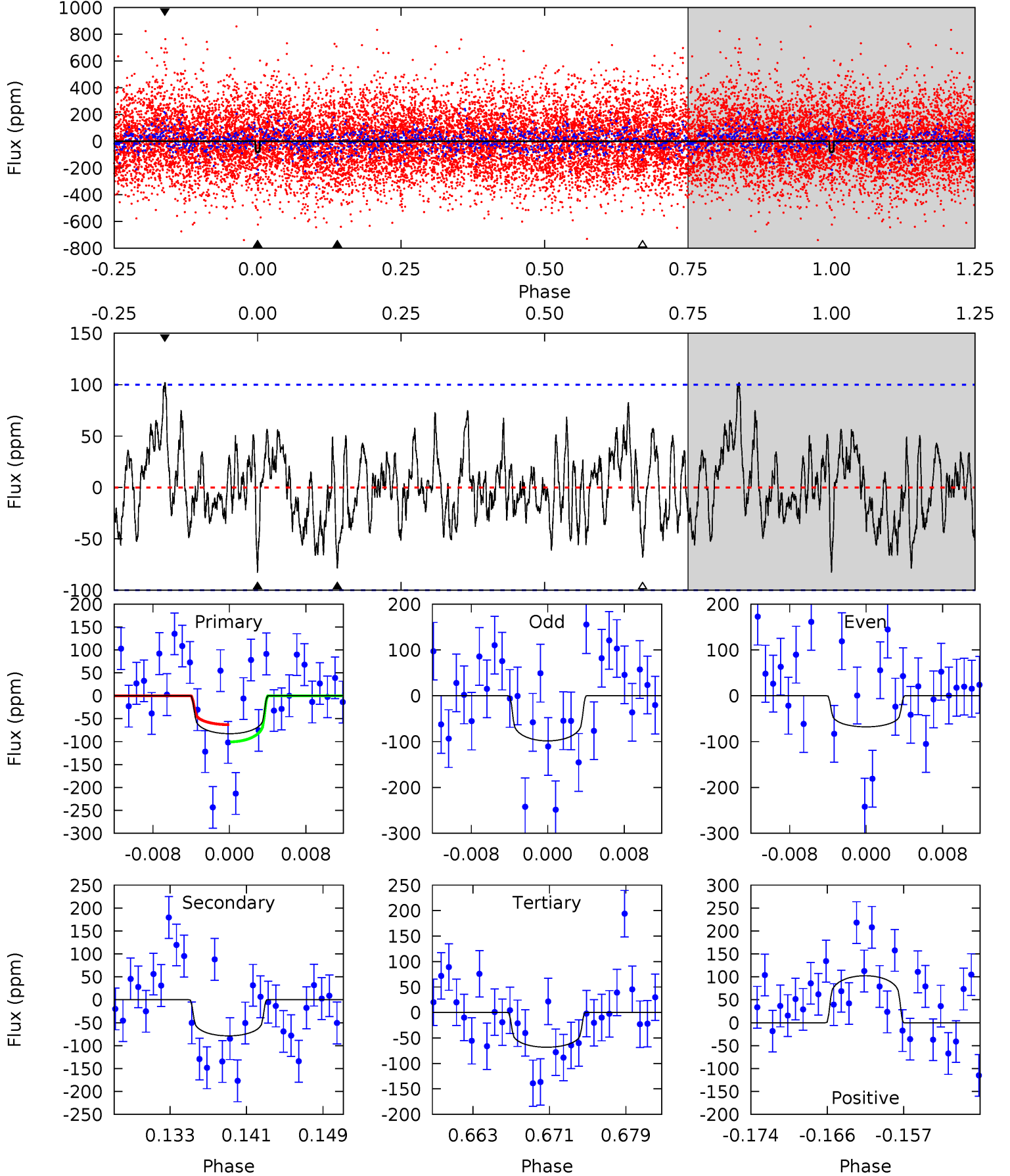
TCE 005987404-05   P= 52.710436 Days    $T_0=144.208525$  (BKJD)



# DV Model-Shift Uniqueness Test

005987404-05, P = 52.708527 Days, E = 91.505497 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
4.19	3.99	3.45	5.18	5.06	2.64	1.53	0.74	-0.99	0.54	-1.20	0.78	1.01	0.55	0.95

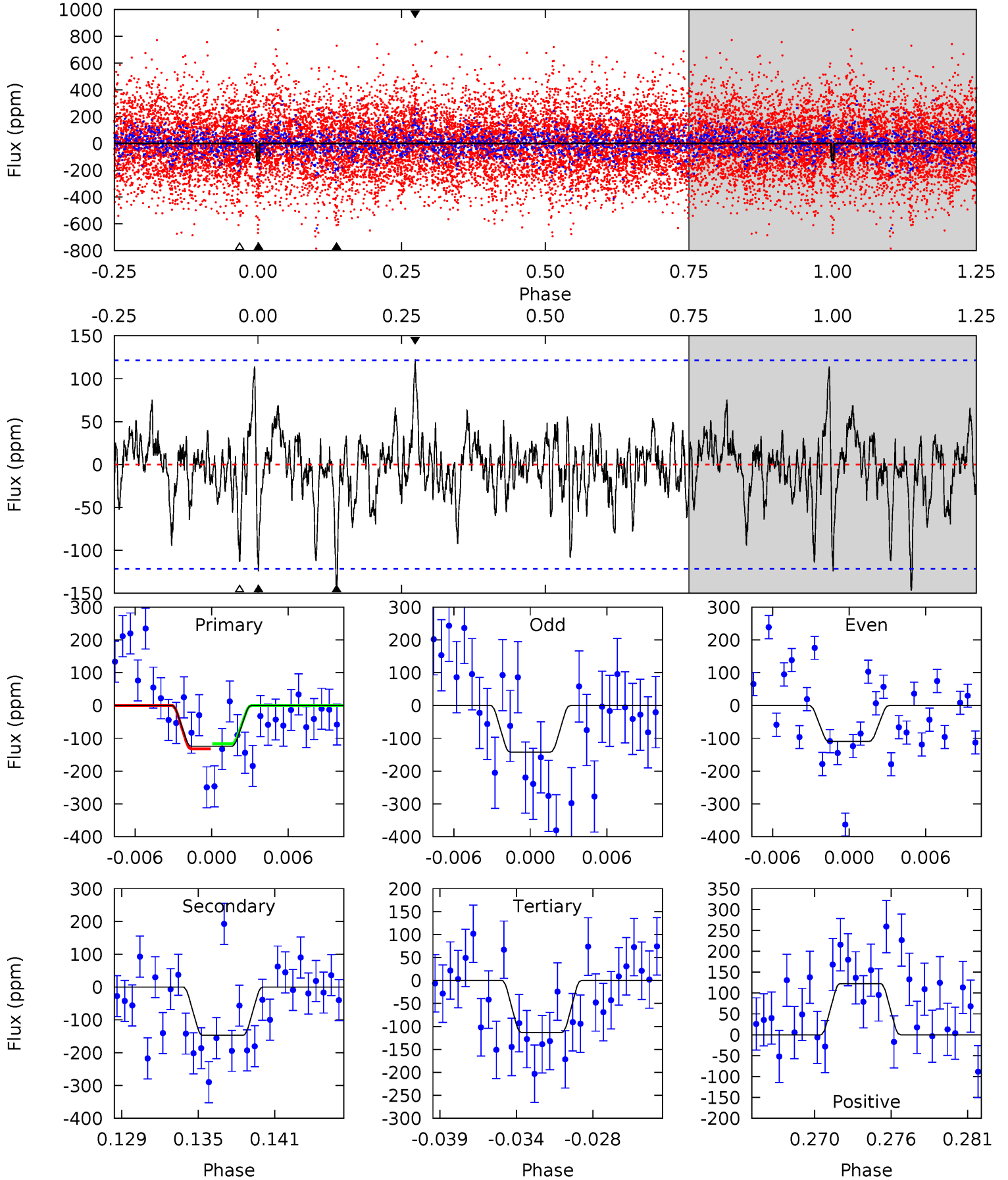




# Alt Model-Shift Uniqueness Test

005987404-05, P = 52.710436 Days, E = 91.498089 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
5.26	6.22	4.79	5.18	5.14	2.77	1.31	0.47	0.08	1.43	1.04	0.68	0.73	0.45	0.32



### Stellar Parameters For KIC 005987404

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$6099^{+184}_{-220}$	$4.373^{+0.090}_{-0.210}$	$0.040^{+0.250}_{-0.300}$	$1.123^{+0.366}_{-0.157}$	$1.085^{+0.166}_{-0.135}$	$1.078^{+0.500}_{-0.570}$
	+3%/-4%	+2%/-5%	+625%/-750%	+33%/-14%	+15%/-12%	+46%/-53%
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 005987404-05 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$-79 \pm 20$	$1.63^{+1.08}_{-0.86}$	$760^{+60}_{-45}$	$5104^{+2467}_{-884}$	$1258^{+4896}_{-795}$
Alt.	$-147 \pm 24$	$1.85^{+0.97}_{-0.97}$	$760^{+57}_{-41}$	$5587^{+2826}_{-972}$	$1824^{+6802}_{-1038}$

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

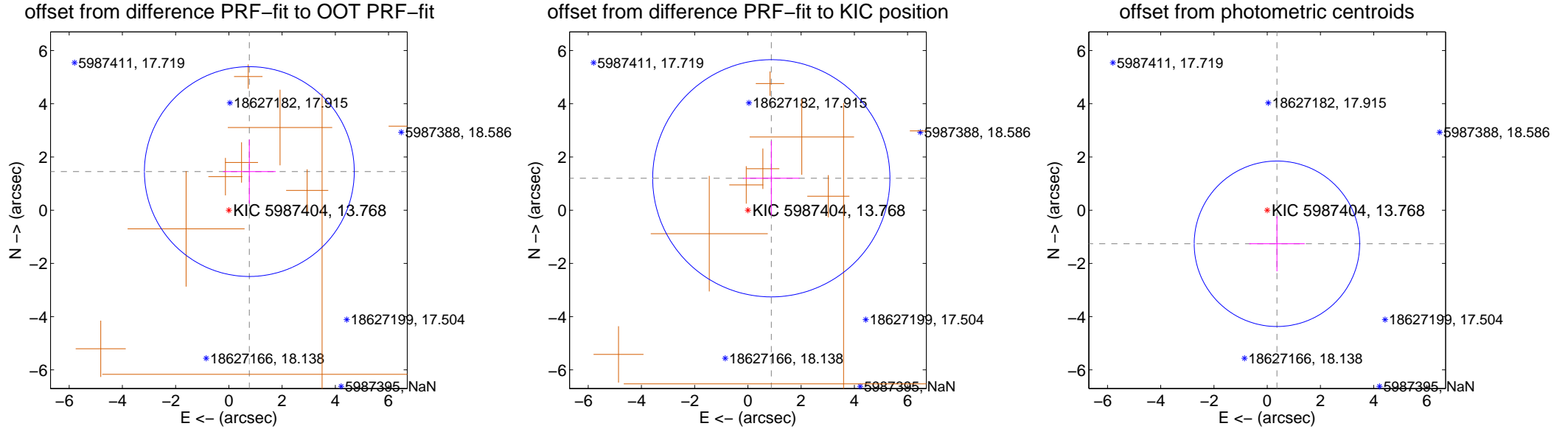
## DV Centroid Data

Supplemental centroid analysis for 005987404-05. Kepler magnitude: 13.77. Transit SNR 7.38

There are 0 quarters with good PRF difference image offsets

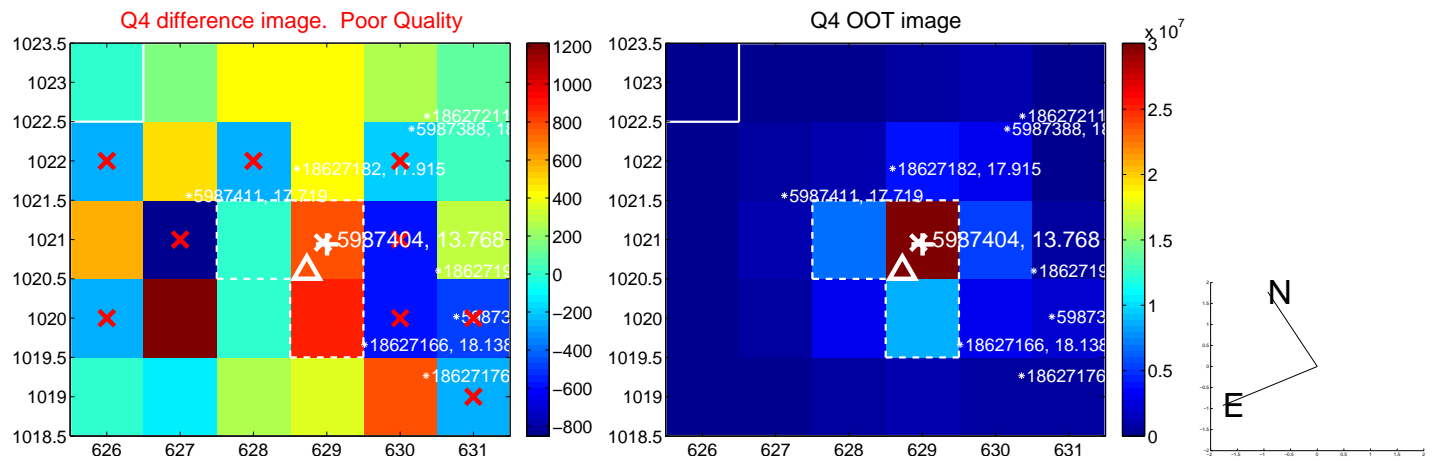
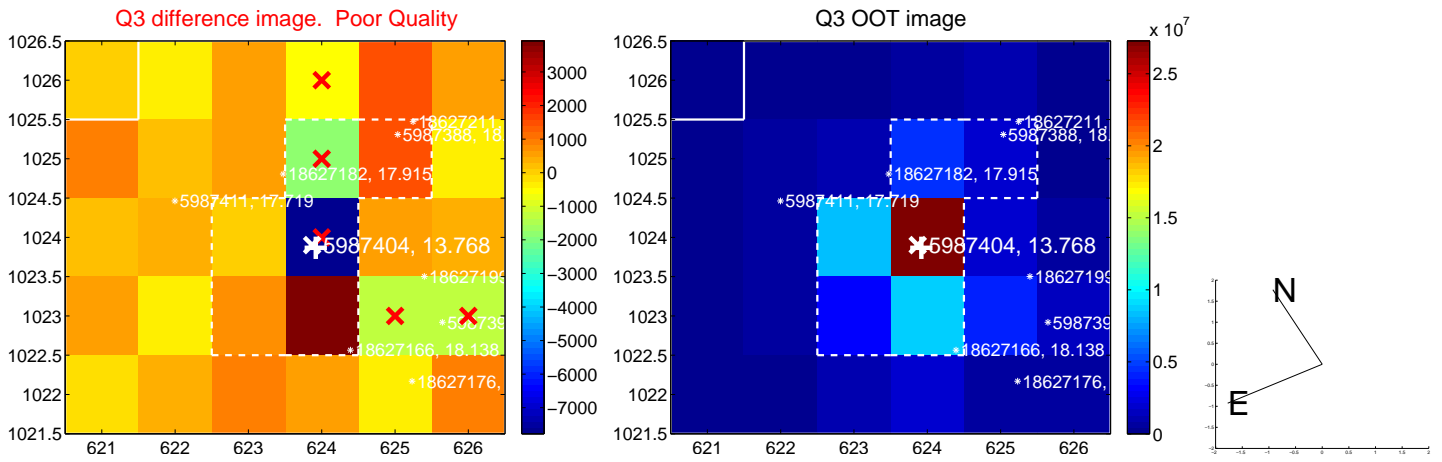
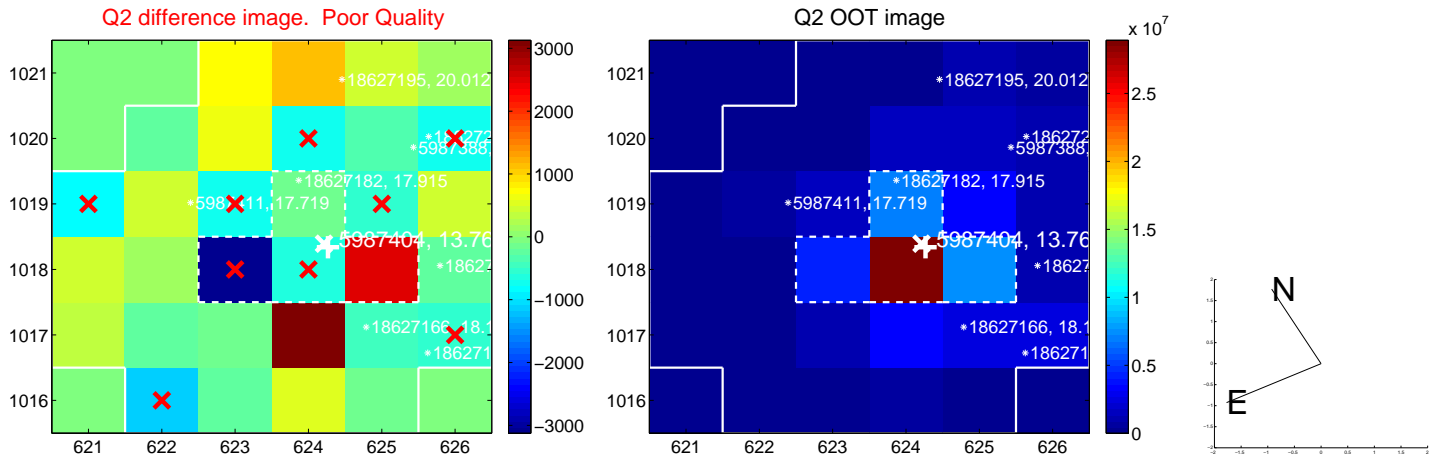
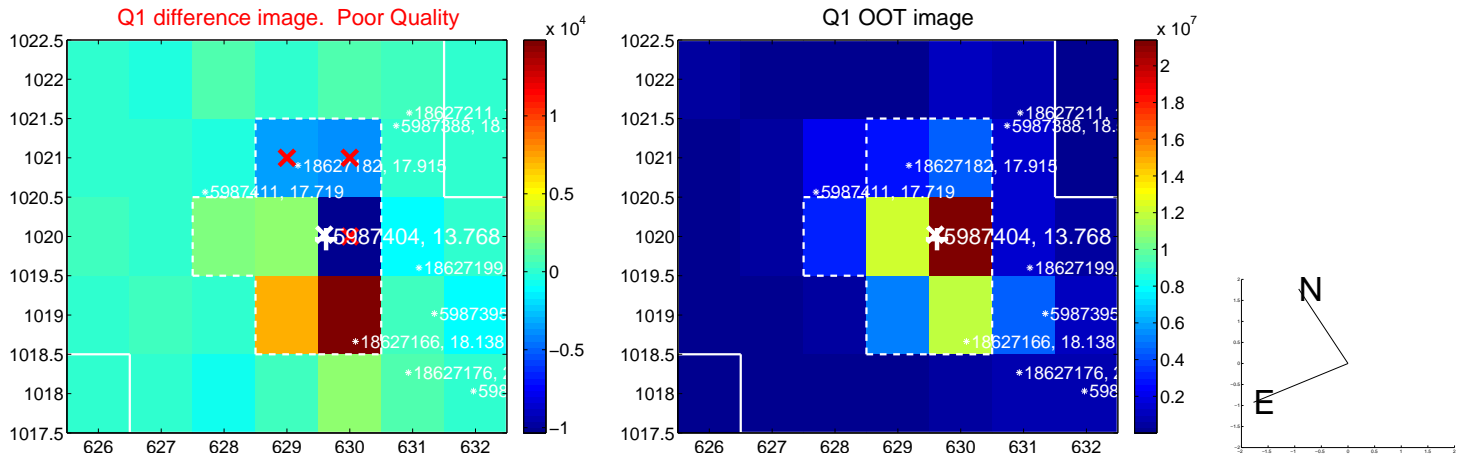
The direct PRF centroid is offset from the target star catalog position by about 0.20 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$1.643 \pm 1.314$	1.25	$-0.769 \pm 0.990$	$1.451 \pm 1.202$
PRF-fit source offset from KIC position	$1.487 \pm 1.486$	1.00	$-0.880 \pm 1.059$	$1.199 \pm 1.401$
photometric centroid source offset	$1.31 \pm 1.04$	1.27	$-0.37 \pm 1.04$	$-1.26 \pm 1.04$

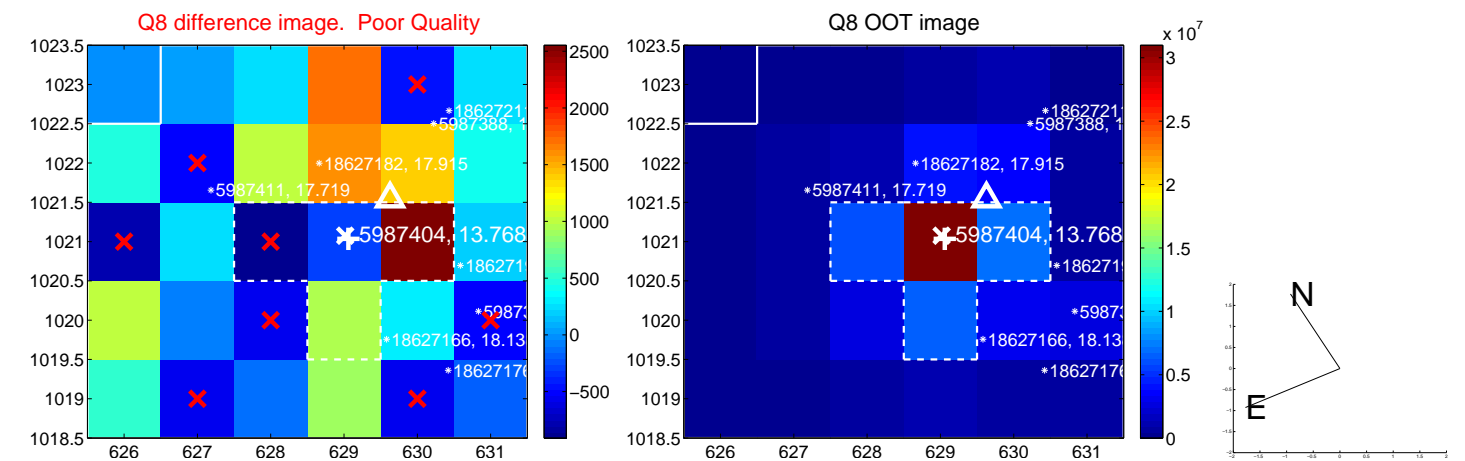
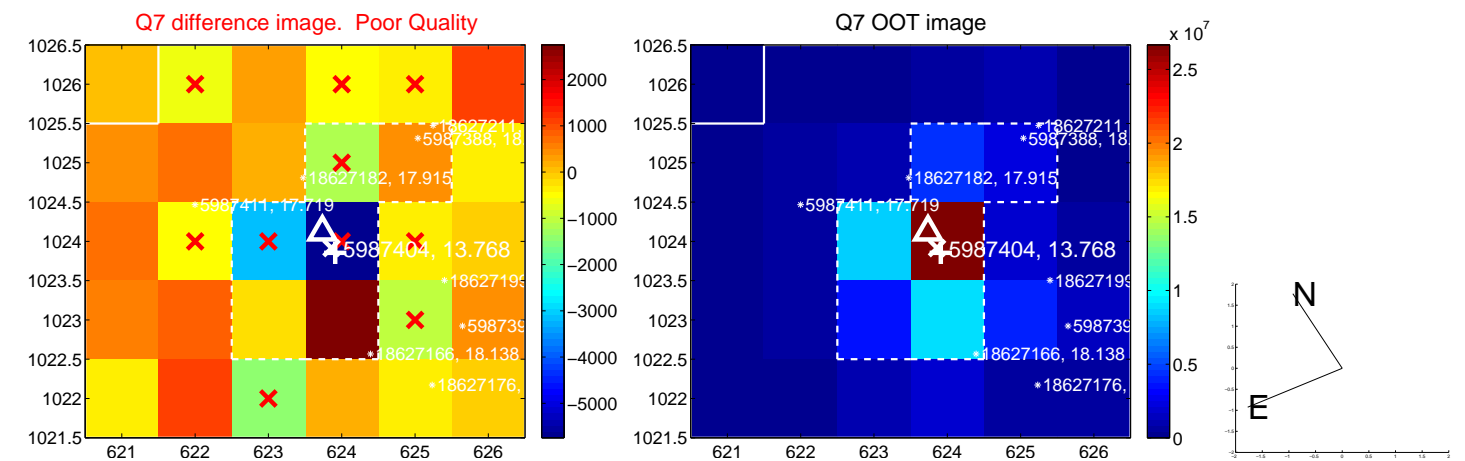
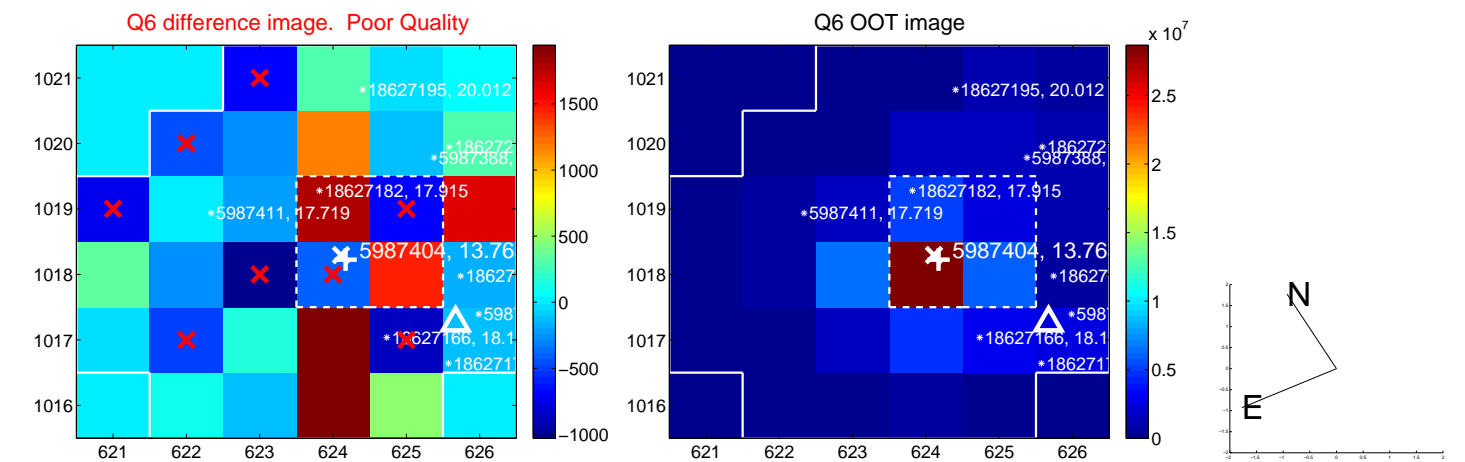
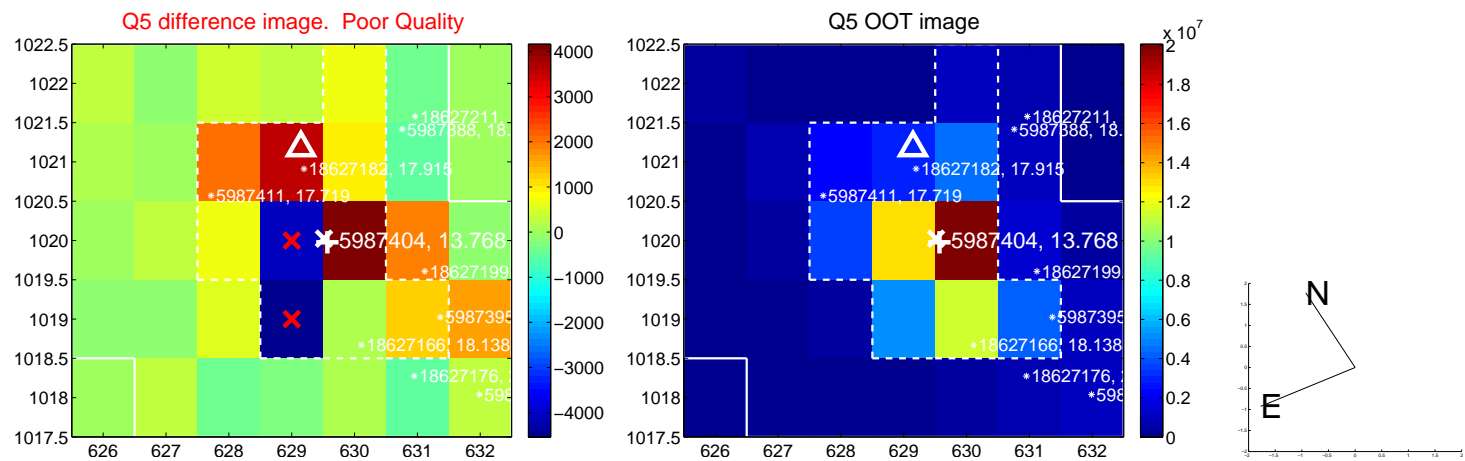


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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

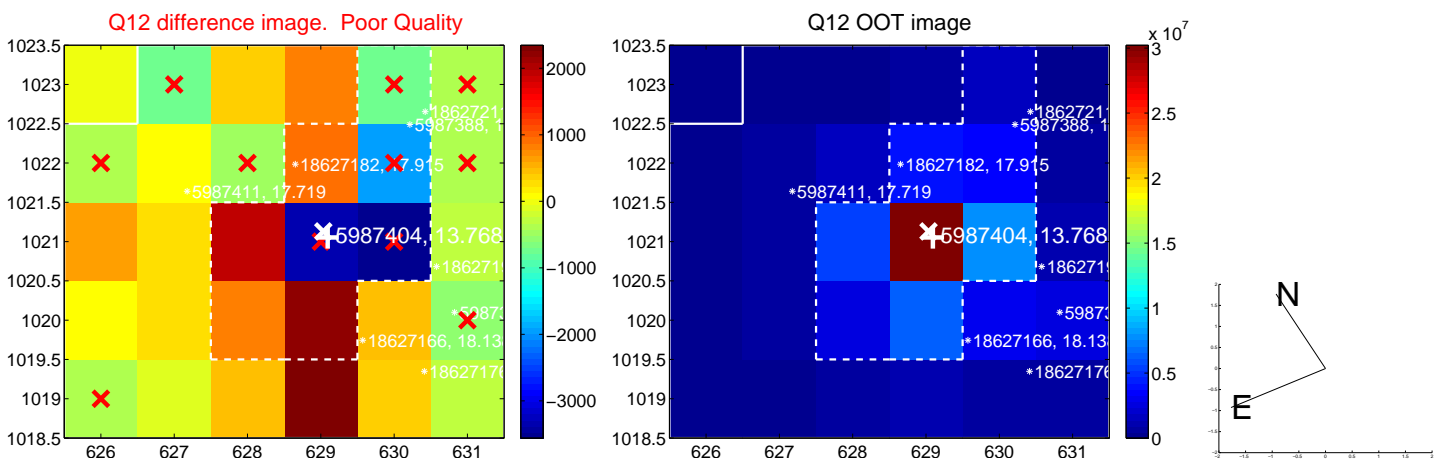
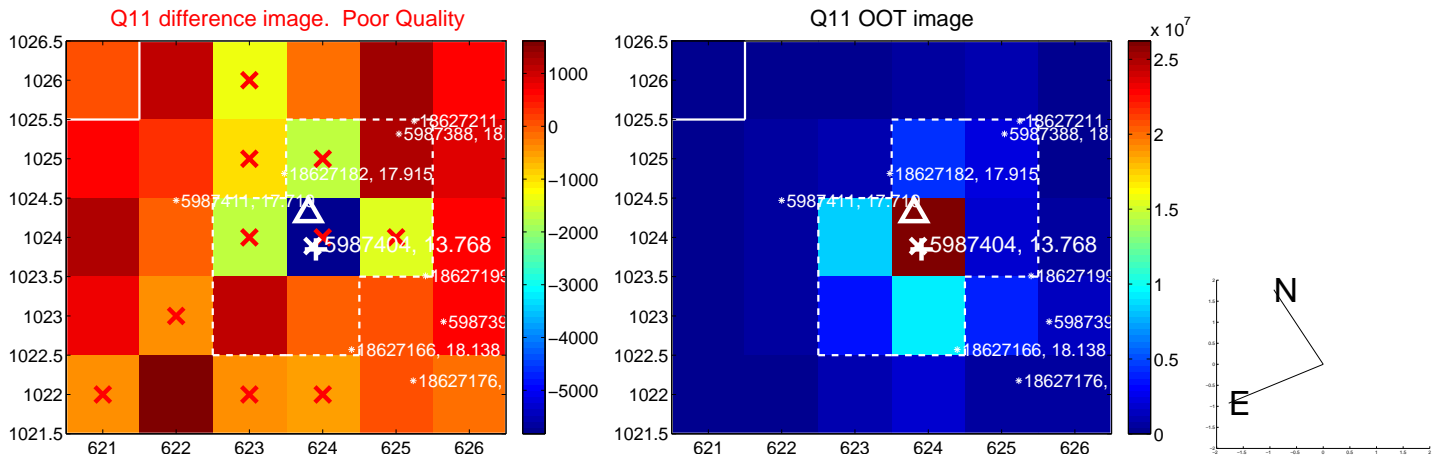
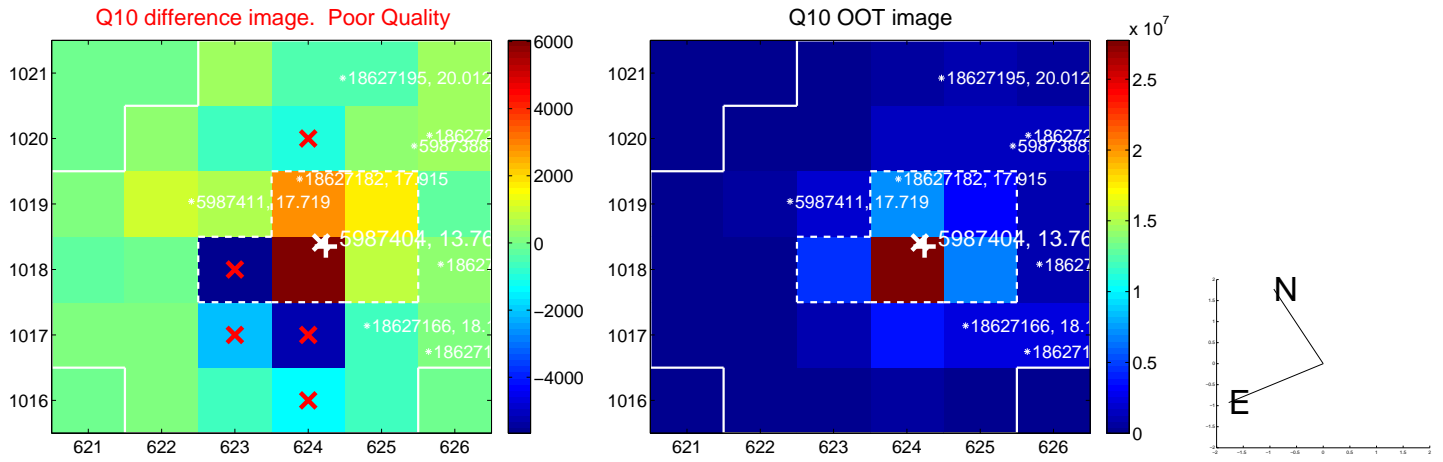
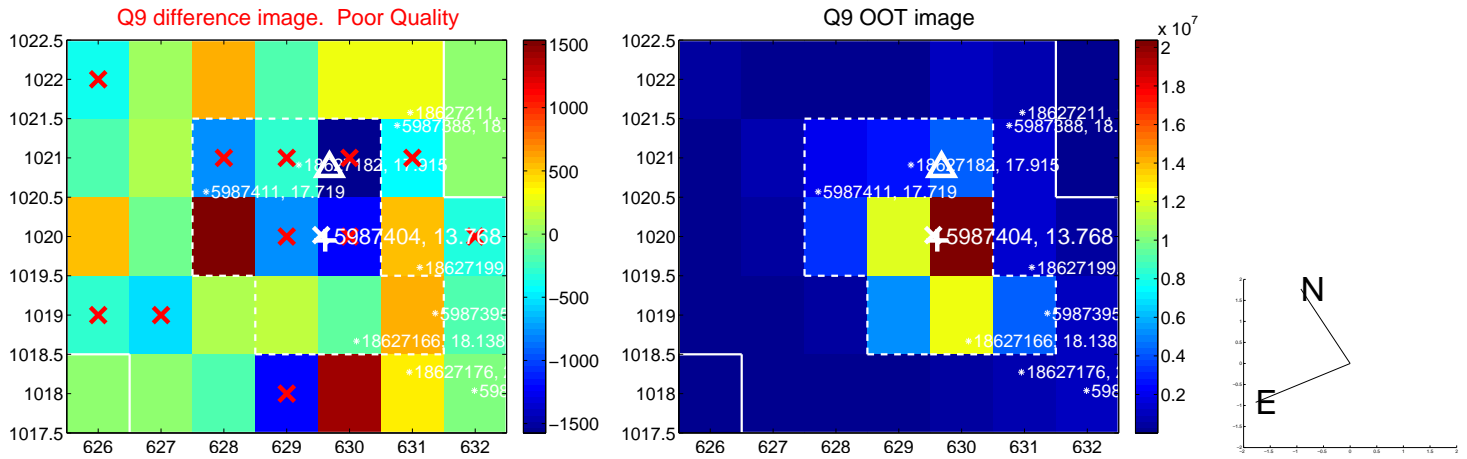
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

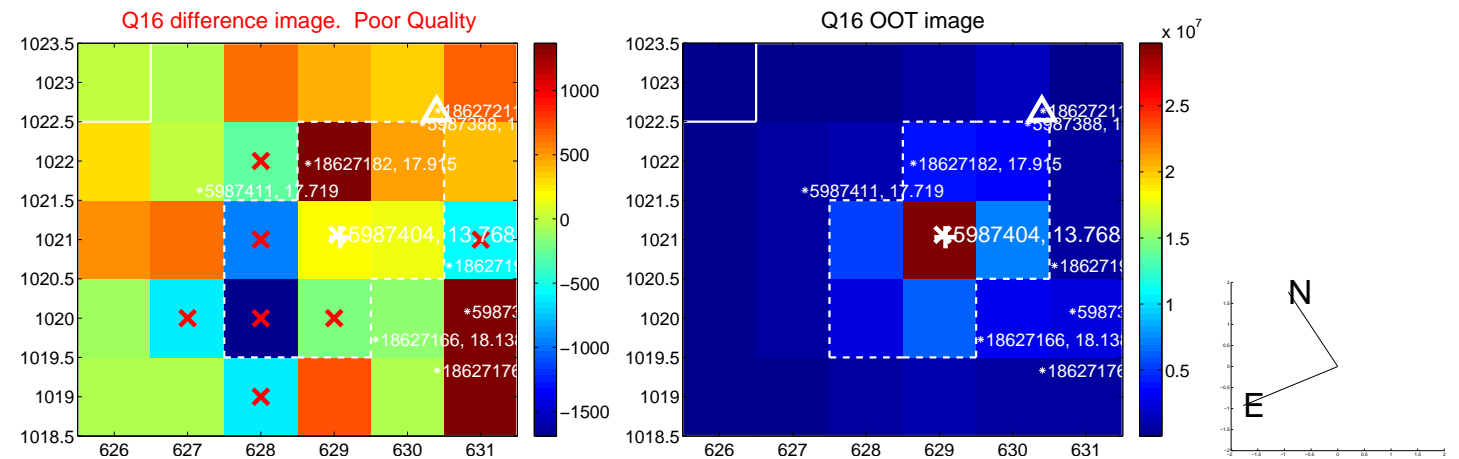
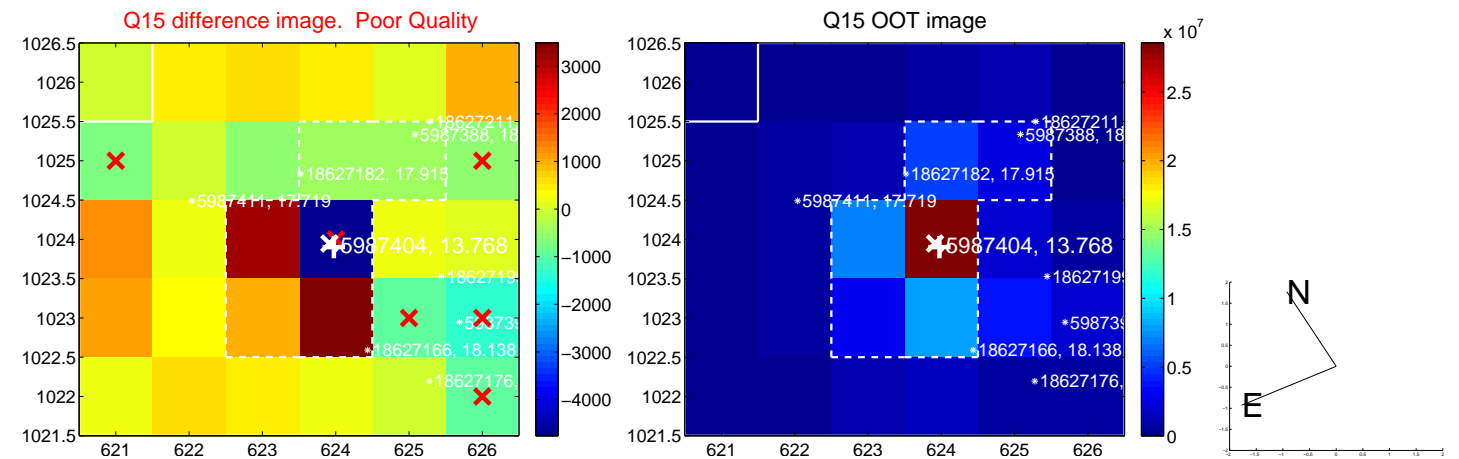
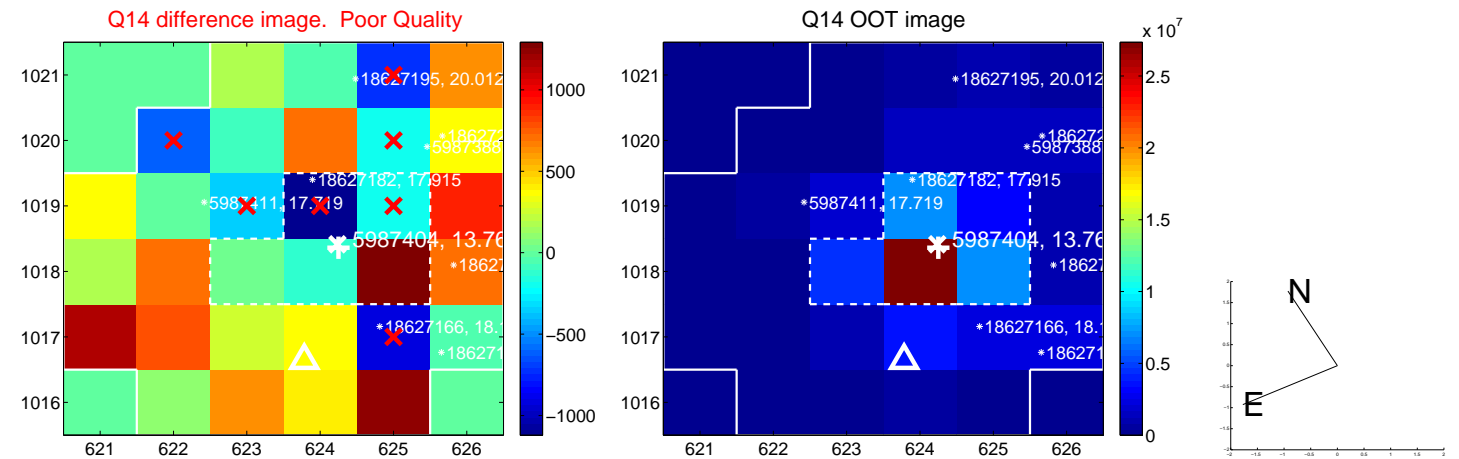
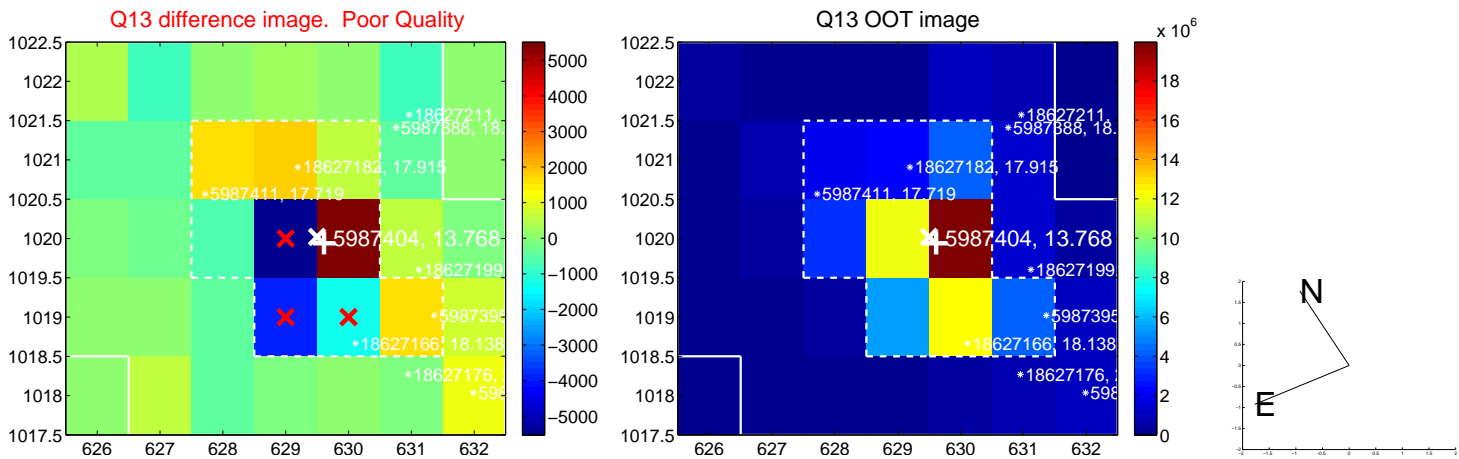


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

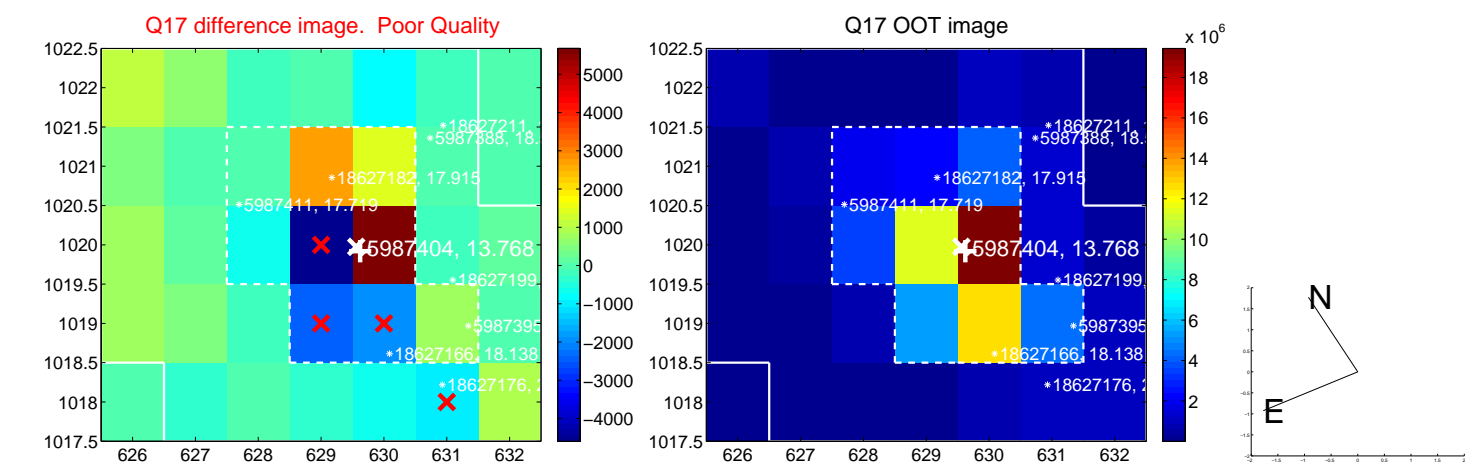




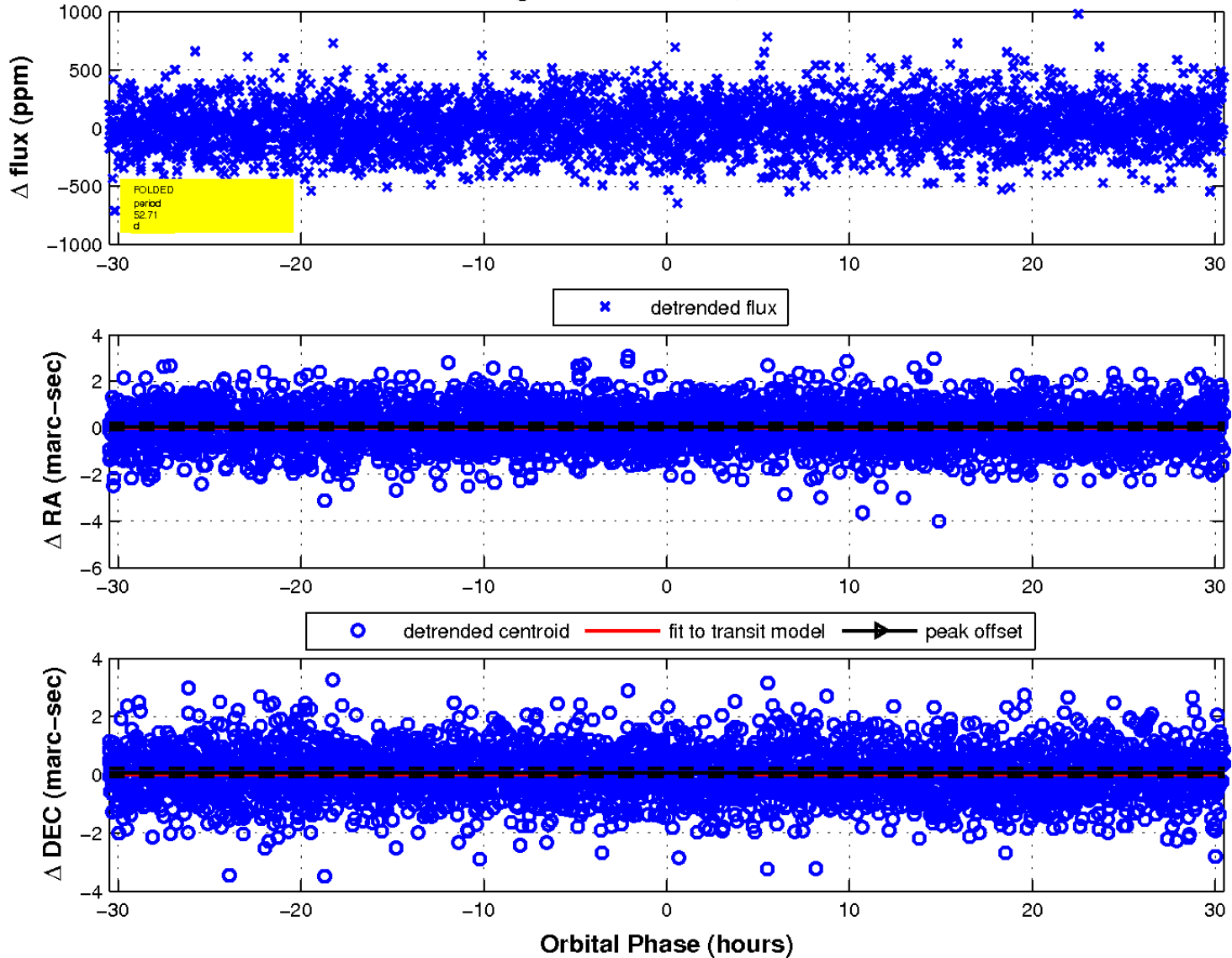
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

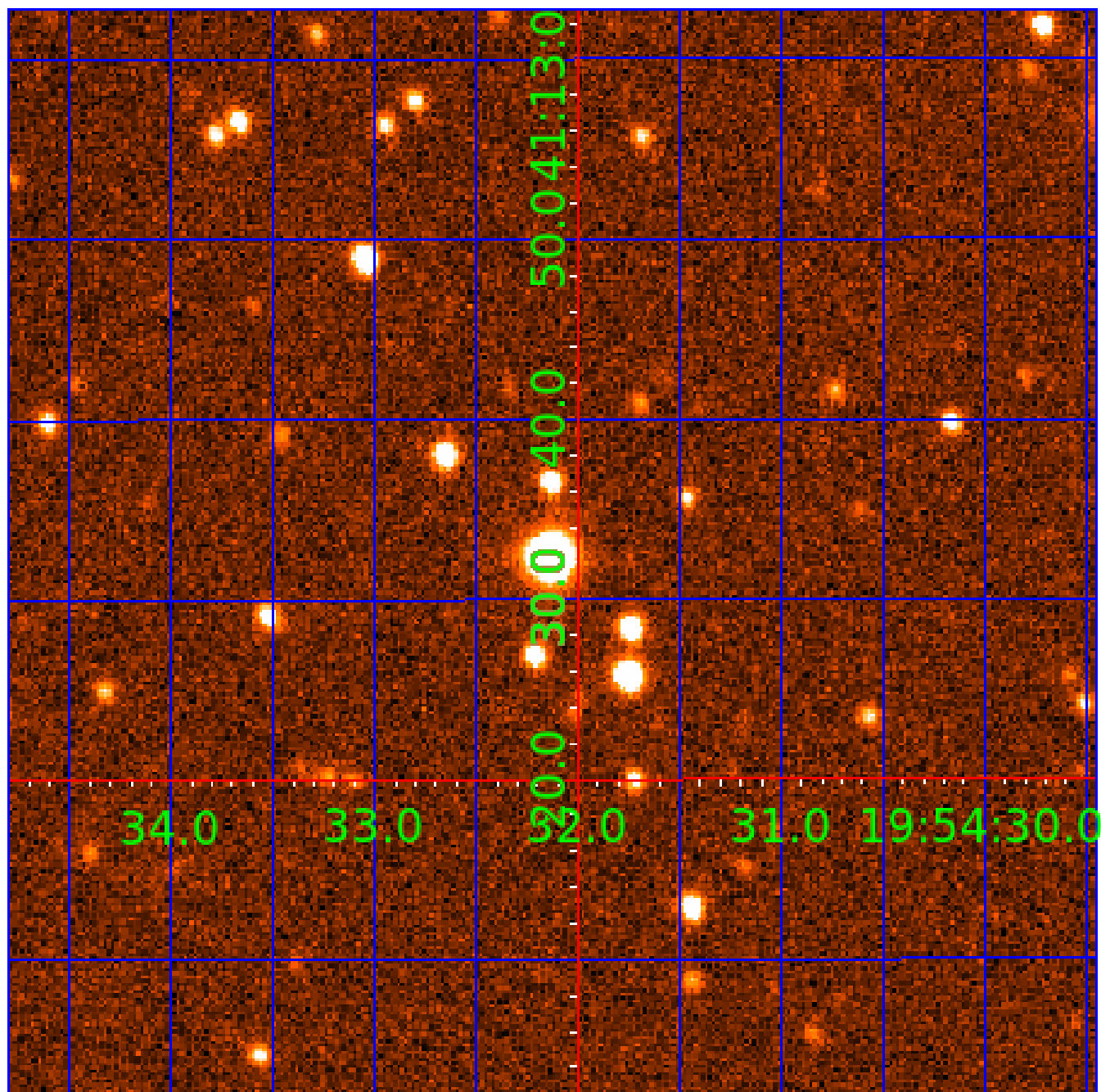


fluxWeightedCentroids, Planet 5 of 7



UKIRT Image

Declination



# KIC 005987404

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
005987404-01	OBS	No	1.835612	132.170942	19.0	11.159	7.5	8.9	1.12	6099	0.49	1718.47
005987404-03	OBS	No	45.962054	151.976692	170.9	11.015	13.0	6.0	1.12	6099	1.65	23.46
005987404-04	OBS	No	37.348754	148.451452	141.8	25.577	10.5	9.0	1.12	6099	1.44	30.94
005987404-05	OBS	No	52.708527	144.214024	138.8	10.164	8.7	7.4	1.12	6099	1.49	19.54
005987404-06	OBS	No	487.865266	531.109283	352.1	73.327	8.5	9.4	1.12	6099	2.44	1.01
005987404-07	OBS	No	153.872450	163.069223	179.6	10.495	8.8	6.7	1.12	6099	1.62	4.68

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
005987404-01	OBS	FP	0.00	1	0	1	0	LPP_DV—CENT_UNRESOLVED_OFFSET
005987404-03	OBS	FP	0.00	1	0	1	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—CENT_FEW_DIFFS—HALO_GHOST
005987404-04	OBS	FP	0.00	1	0	1	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_ALT—CENT_FEW_MEAS—HALO_GHOST
005987404-05	OBS	FP	0.00	1	0	1	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—CENT_FEW_DIFFS—HALO_GHOST
005987404-06	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_MARSHALL—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS
005987404-07	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_MARSHALL—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS

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

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

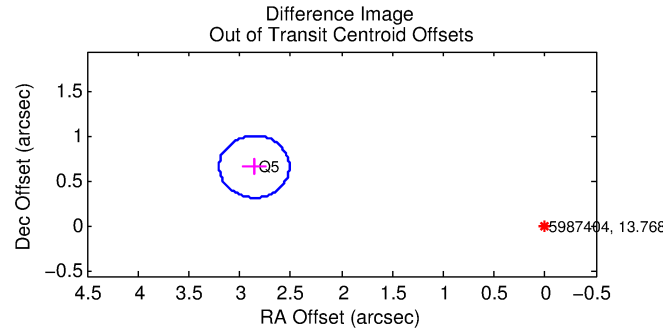
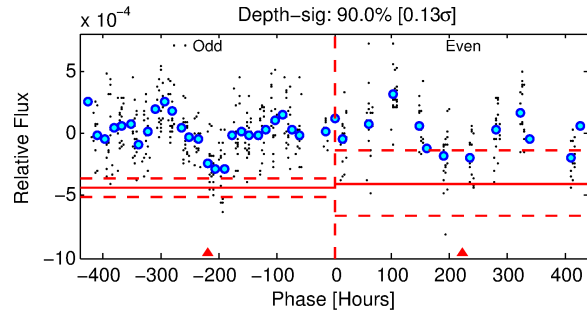
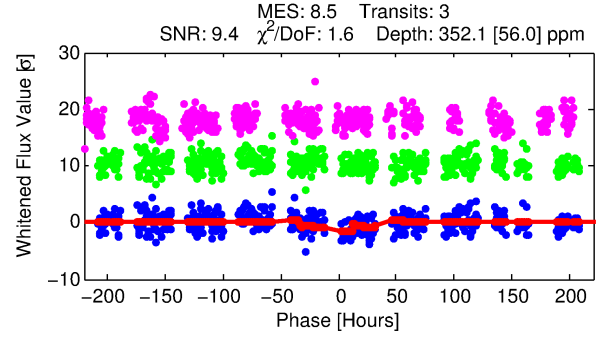
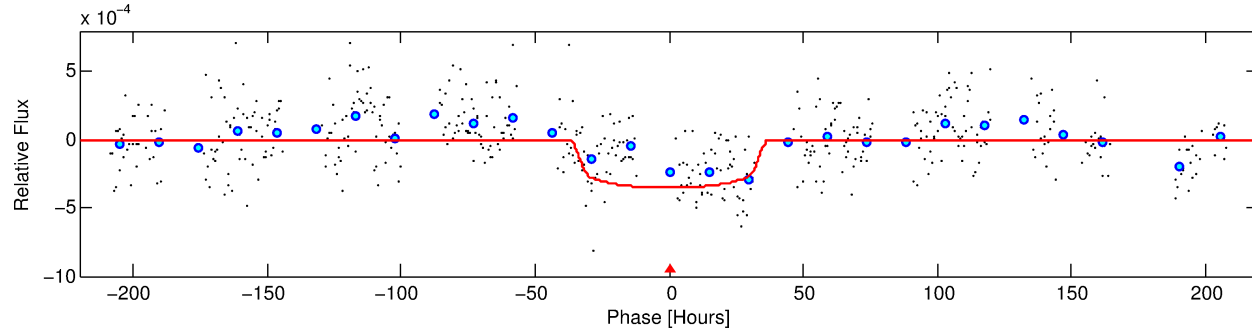
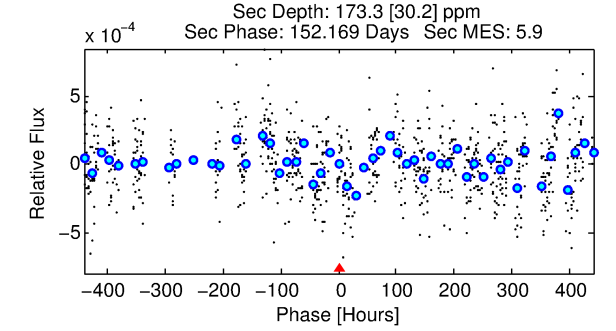
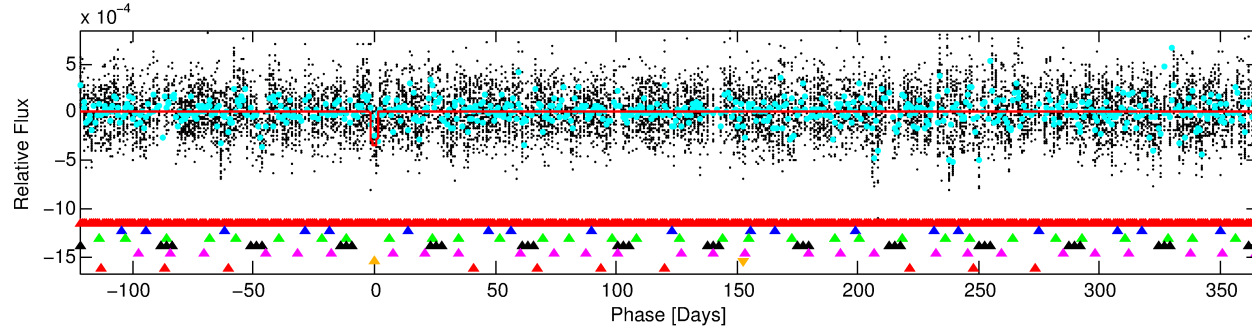
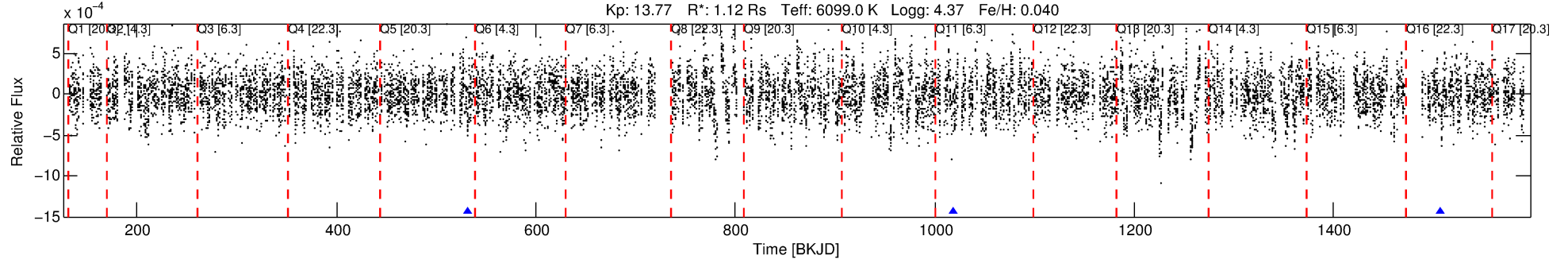
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 005987404-06

No Significant Match Found

# DV One-Page Summary

KIC: 5987404 Candidate: 6 of 7 Period: 487.865 d



## DV Fit Results:

Period = 487.86527 [0.26181] d  
Epoch = 531.1093 [0.3115] BKJD  
Rp/R\* = 0.0199 [0.0028]  
a/R\* = 26.36 [16.58]  
b = 0.88 [0.14]  
Seff = 1.01 [0.42]  
Teq = 255 [26] K  
Rp = 2.44 [0.87] Re  
a = 1.2469 [0.3373] AU  
Ag = 24880.94 [12714.82] [1.96σ]  
Teffp = 4958 [448] K [10.48σ]

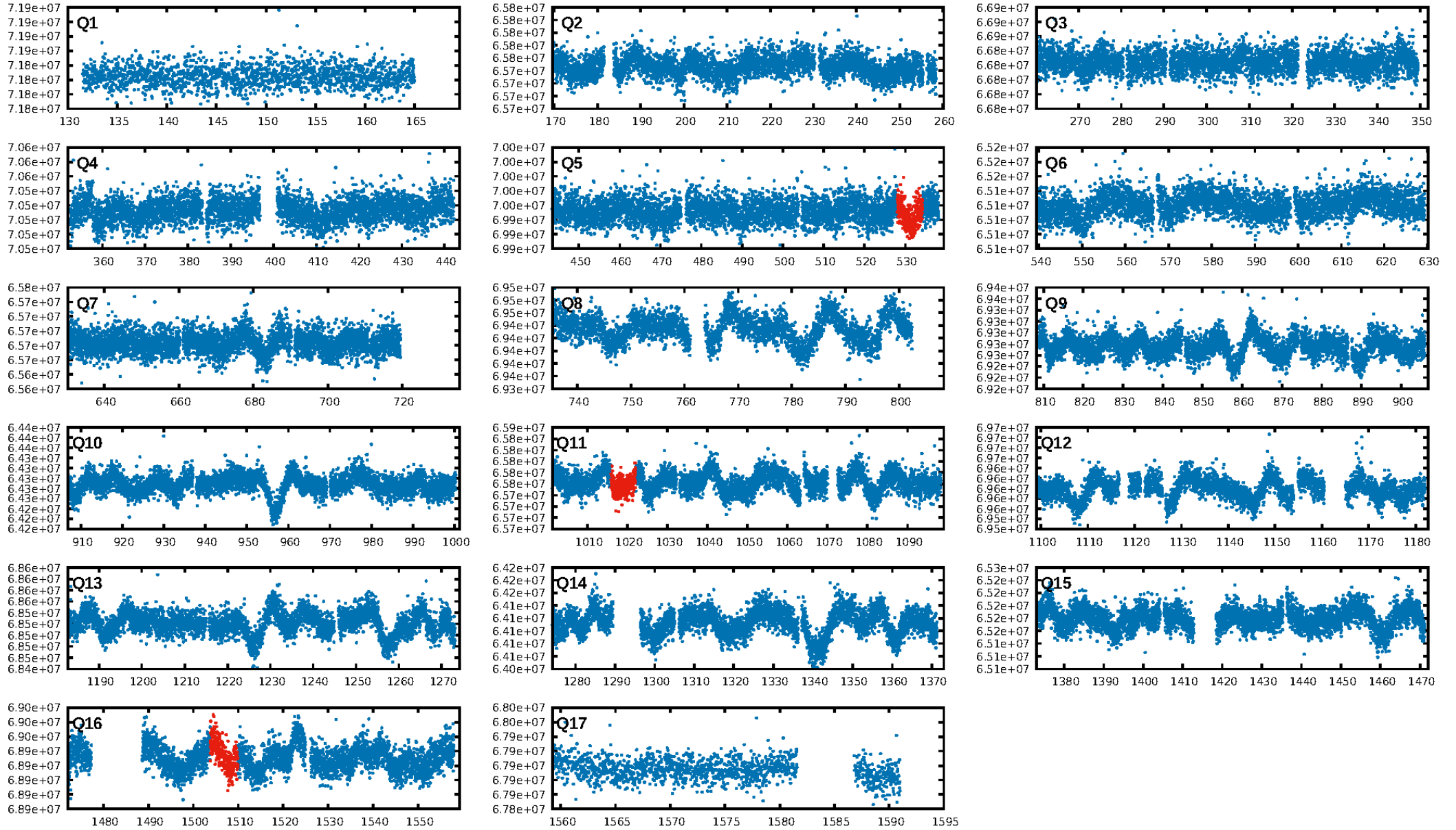
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [108.21σ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: 8.1%  
ModelChiSquareGof-sig: 100.0%  
Bootstrap-pfa: 2.01e-13  
RollingBand-fgt: 1.00 [3/3]  
GhostDiagnostic-chr: 2.336  
Centroid-sig: 55.1%  
Centroid-so: 0.461 arcsec [0.87σ]  
OotOffset-rm: 2.933 arcsec [25.55σ]  
KicOffset-rm: 2.838 arcsec [24.58σ]  
OotOffset-st: 0/0/0/1 [1]  
KicOffset-st: 0/0/0/1 [1]  
DiffImageQuality-fgm: 1.00 [1/1]  
DiffImageOverlap-fno: 0.00 [0/1]

Software Revision: svn-ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 30-Jan-2016 03:17:33 Z

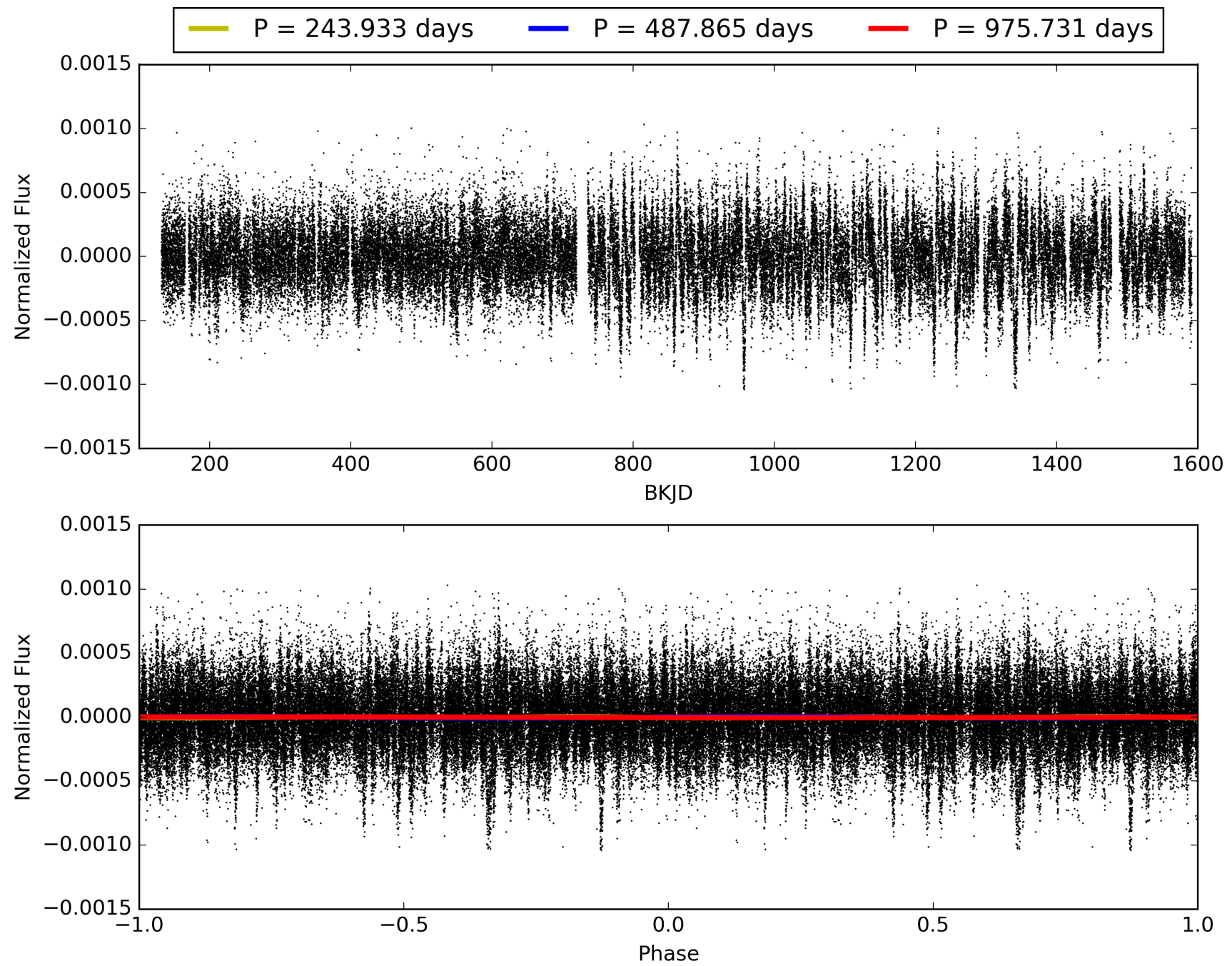
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

# TCE 005987404-06, PDC Light Curves



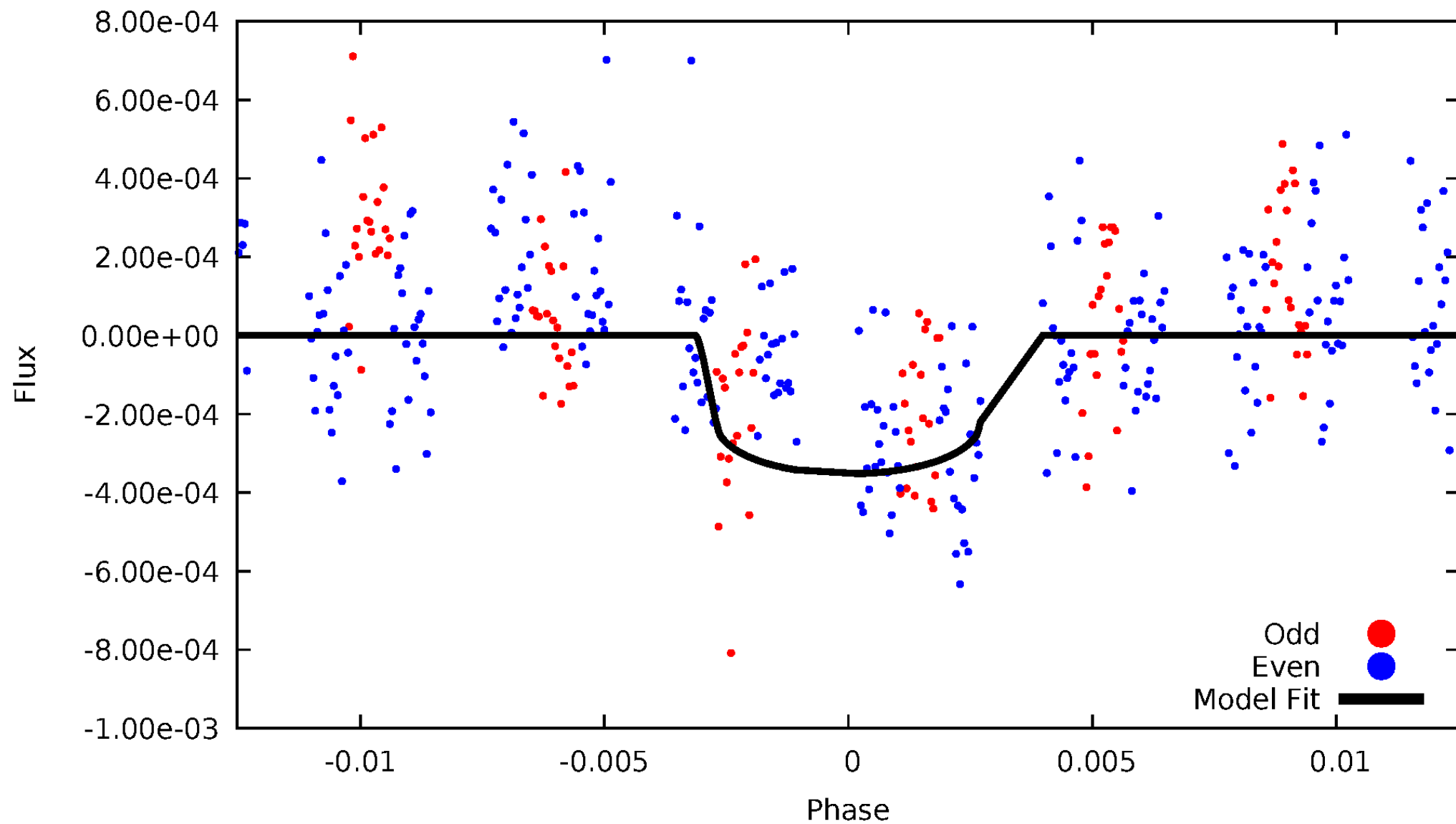


TCE 005987404-06



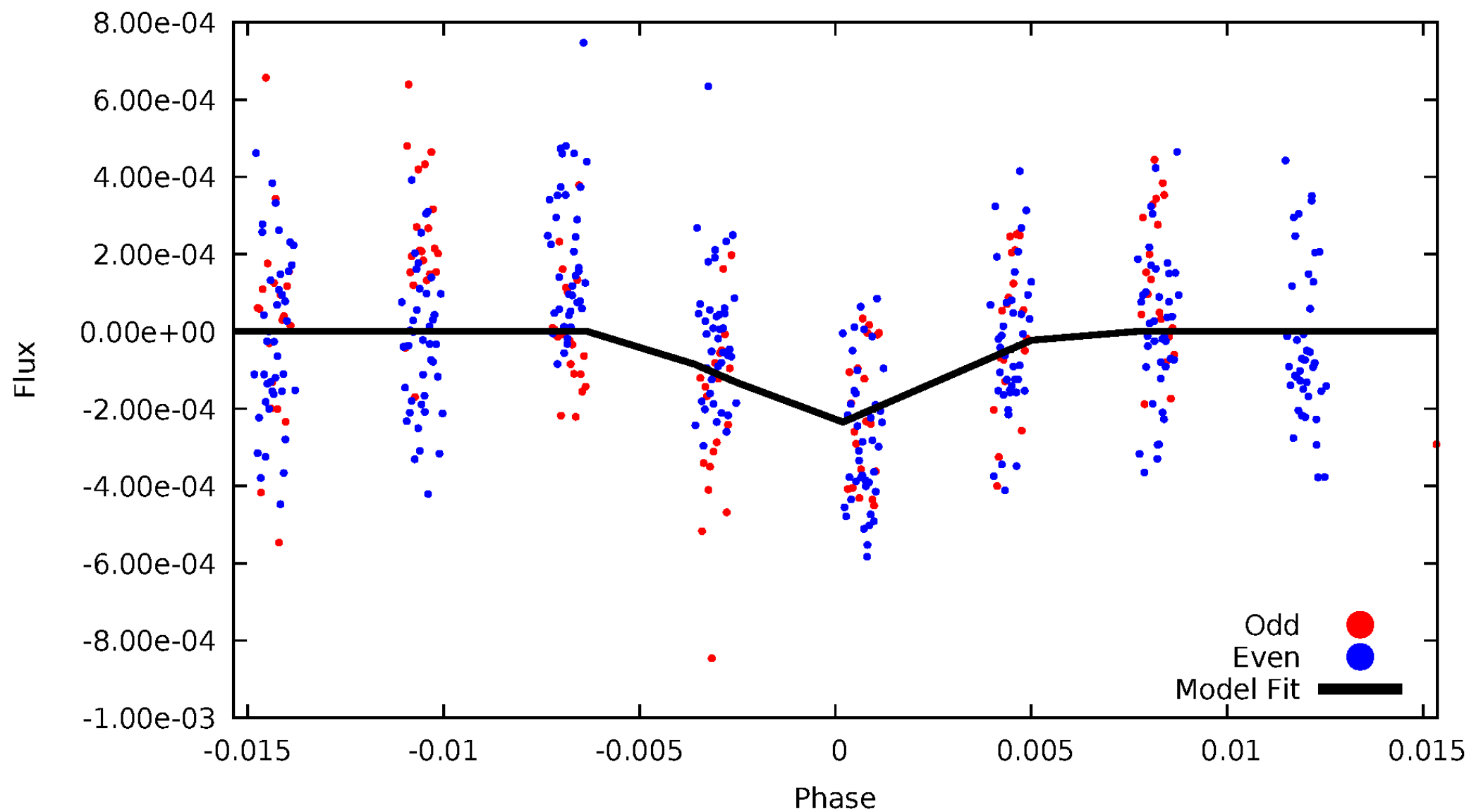
# DV Odd/Even

TCE 005987404-06



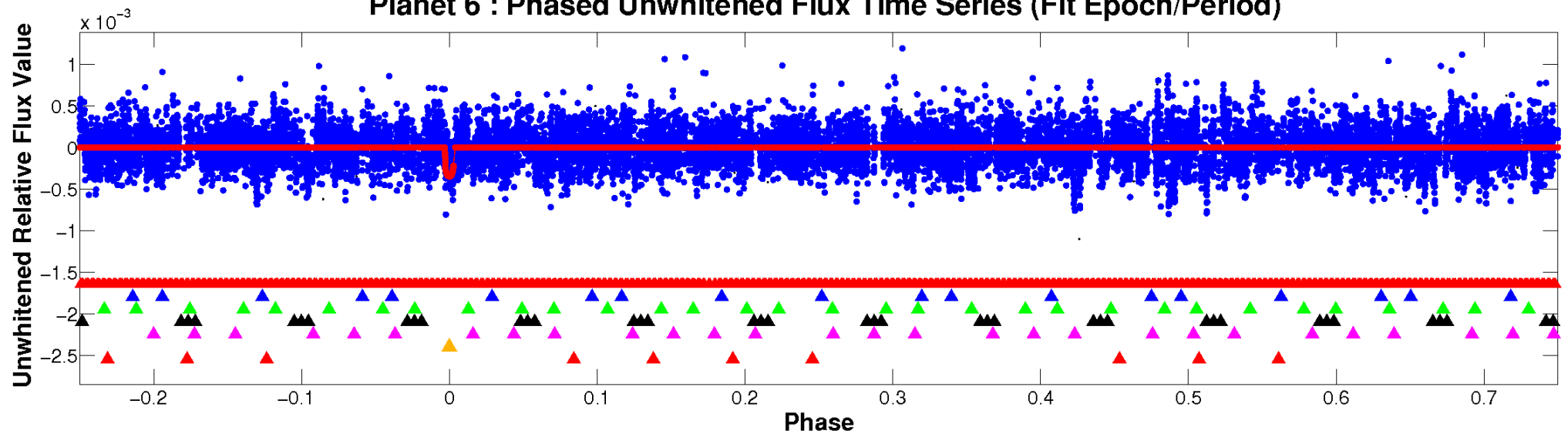
# ALT Odd/Even

TCE 005987404-06

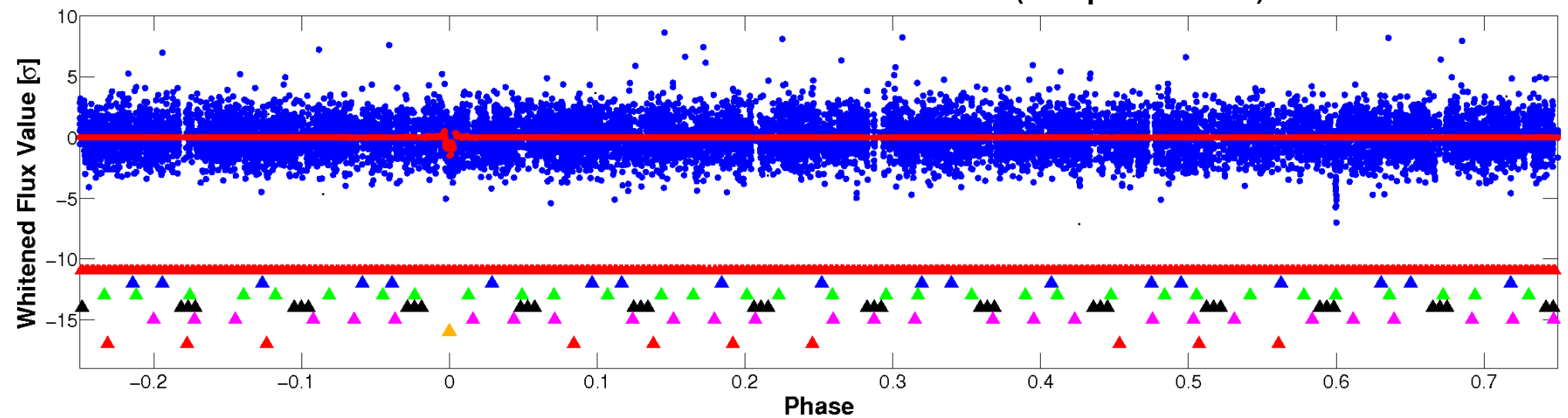


# Non-Whitened Vs. Whitened Light Curve

## Planet 6 : Phased Unwhitened Flux Time Series (Fit Epoch/Period)

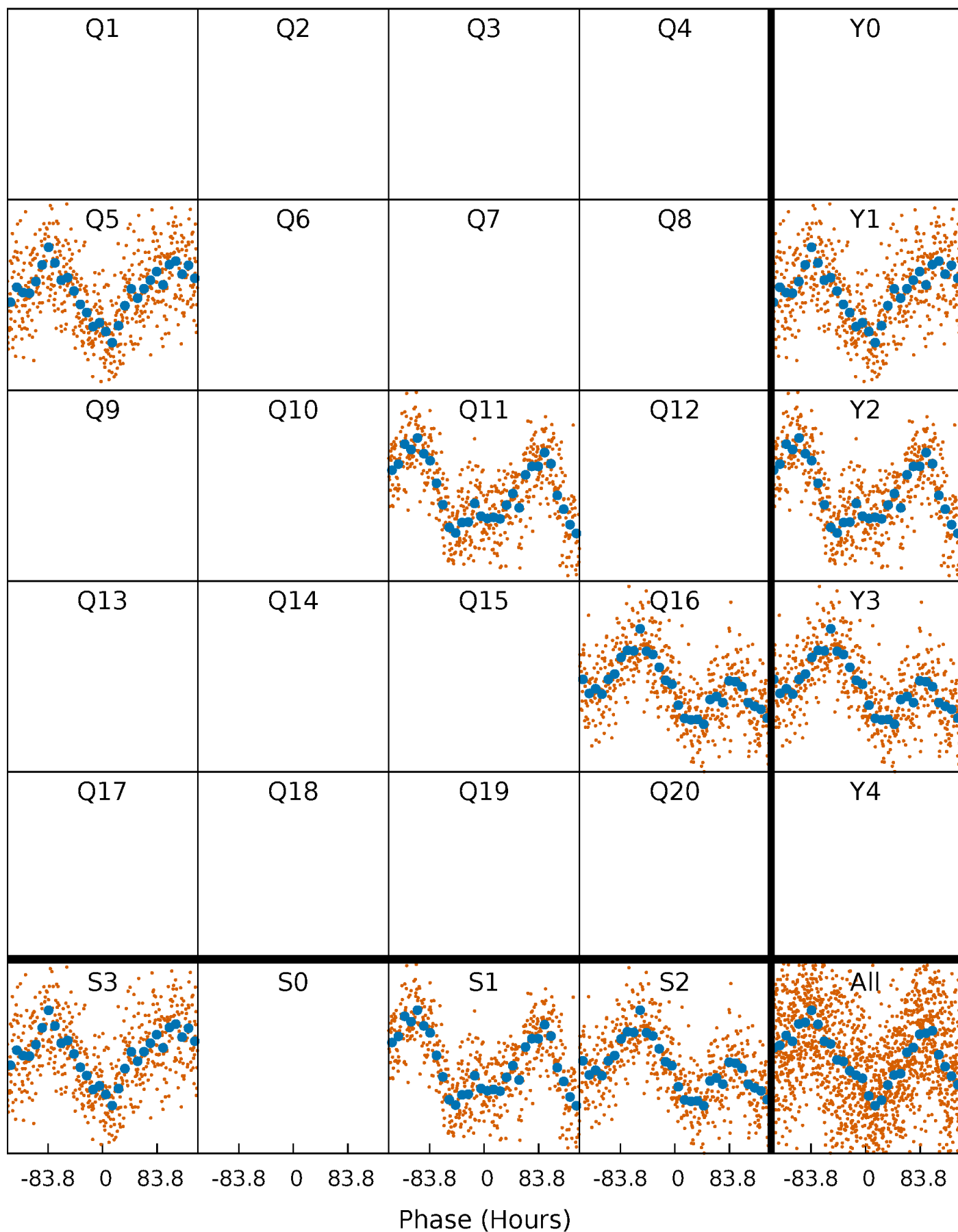


## Planet 6 : Phased Whitened Flux Time Series (Fit Epoch/Period)



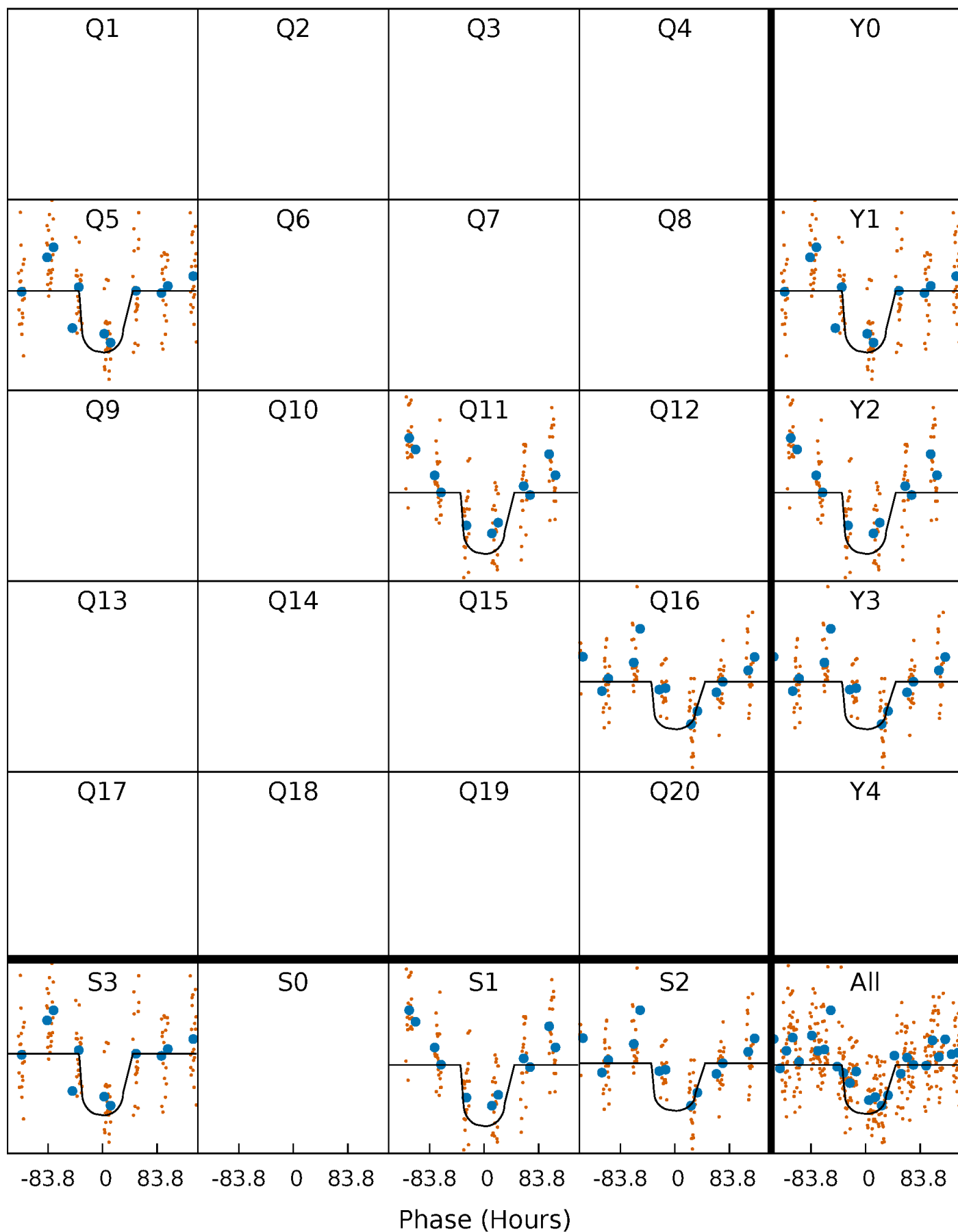
# PDC Quarter-Phased Transit Curves

TCE 005987404-06     $P=487.865266$  Days     $T_0=531.109283$  (BKJD)



# DV Quarter-Phased Transit Curves

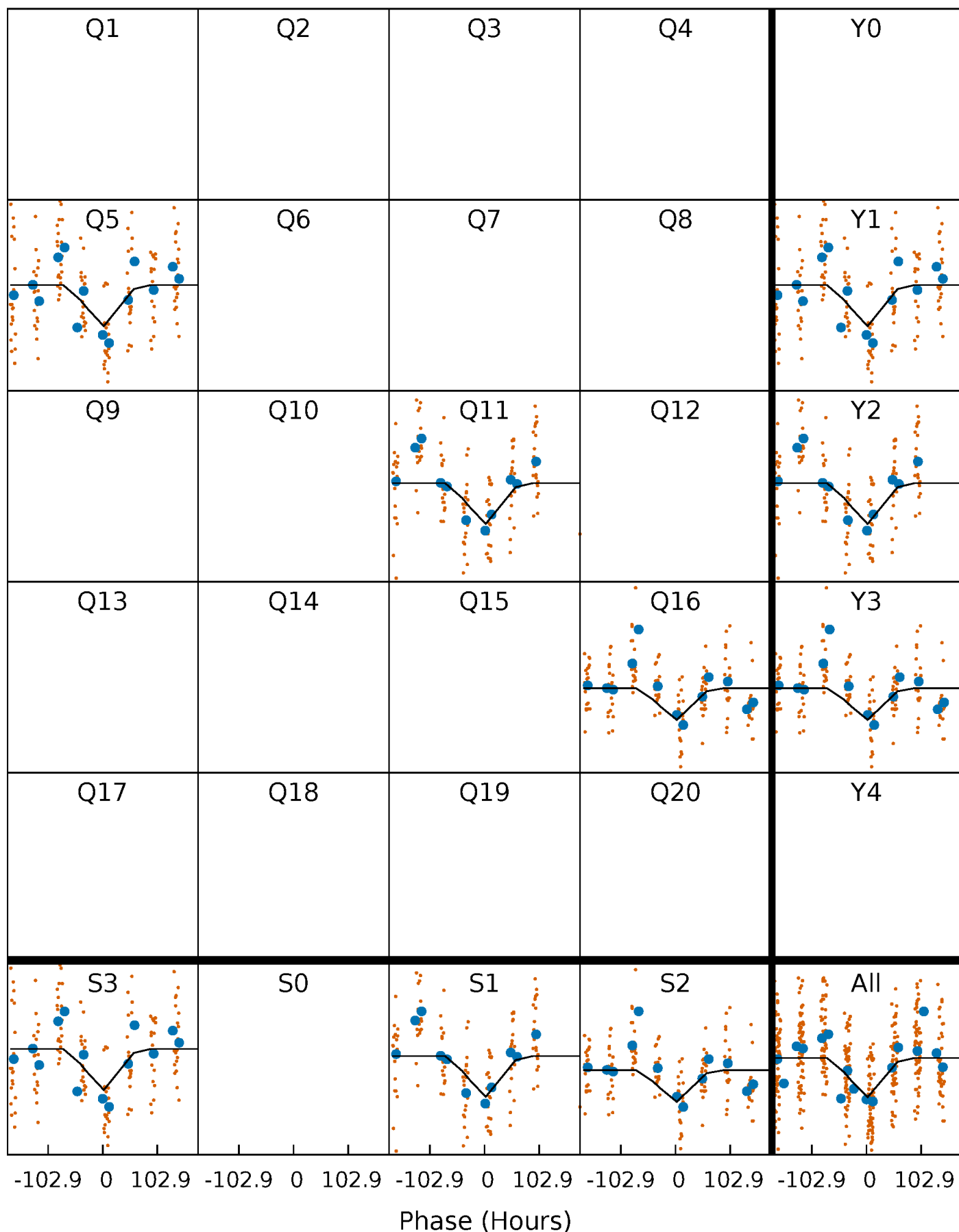
TCE 005987404-06 P=487.865266 Days  $T_0=531.109283$  (BKJD)





# Alt. Detrend Quarter-Phased Transit Curves

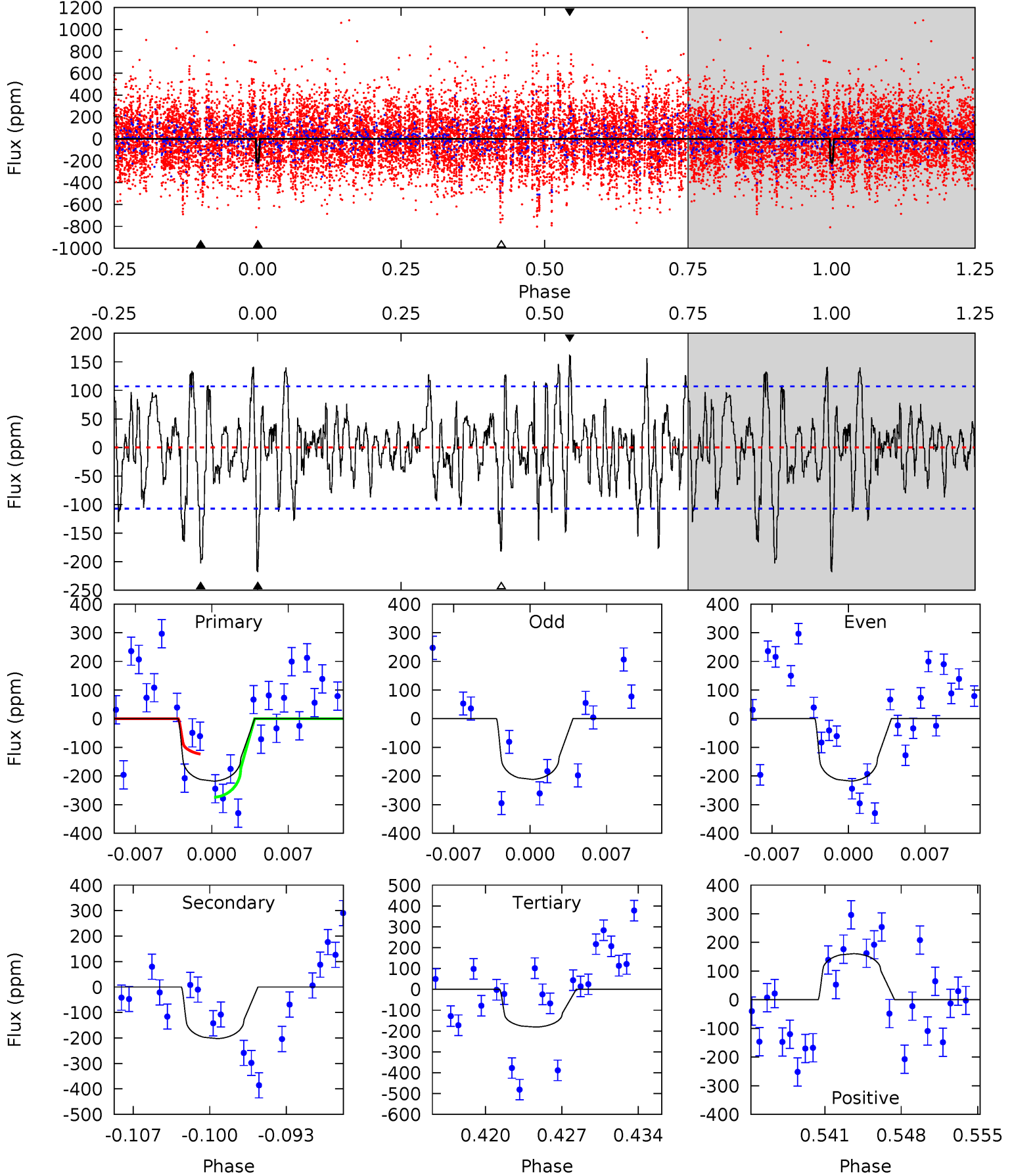
TCE 005987404-06 P=488.219049 Days  $T_0=531.121539$  (BKJD)



# DV Model-Shift Uniqueness Test

005987404-06, P = 487.865266 Days, E = 43.244017 Days

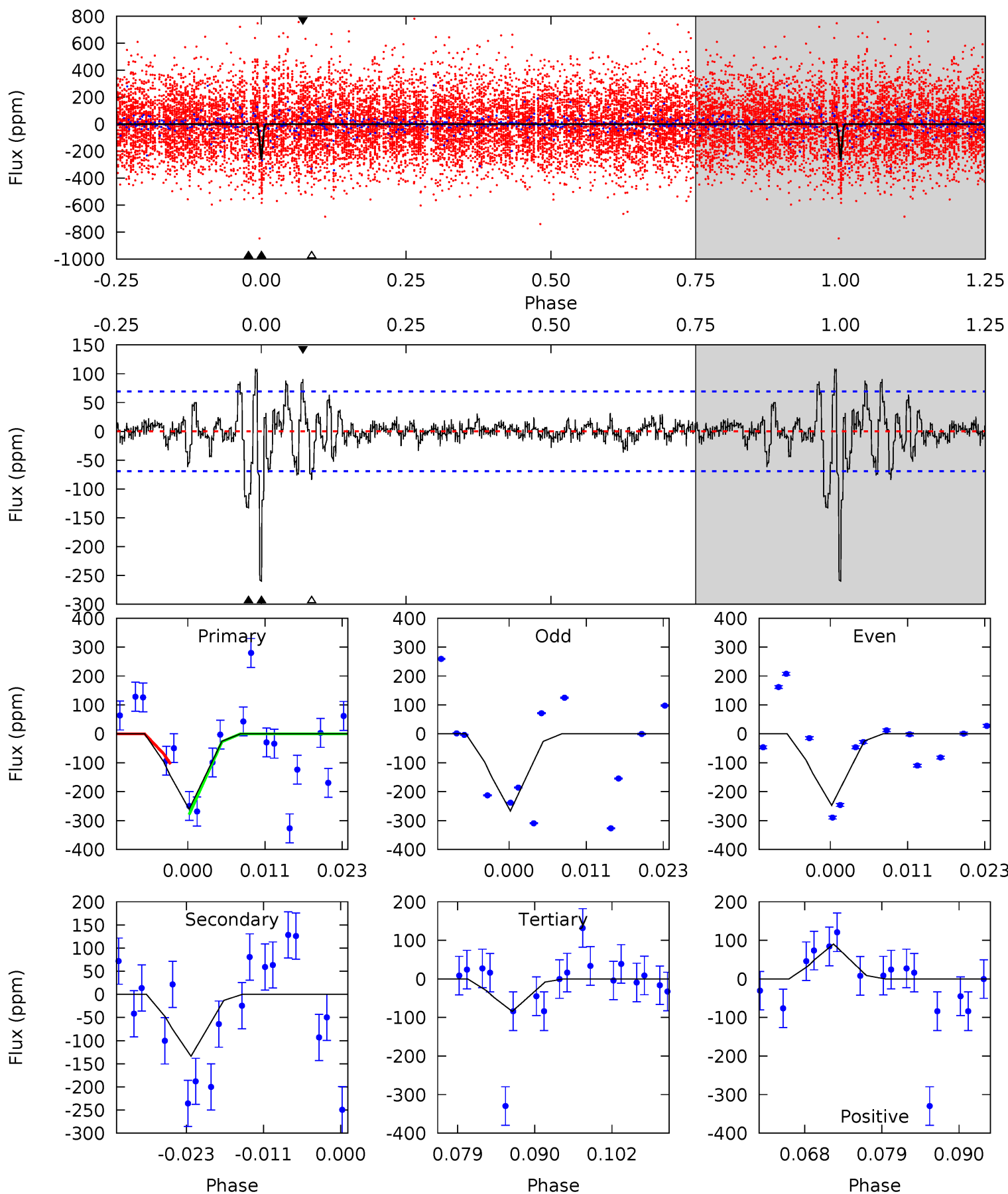
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
10.4	9.64	8.62	7.65	5.09	2.69	2.68	1.75	2.72	1.02	1.99	0.13	1.02	0.42	3.58



# Alt Model-Shift Uniqueness Test

005987404-06, P = 488.219049 Days, E = 42.902490 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
18.8	9.66	6.09	6.54	5.00	2.53	1.42	12.7	12.3	3.57	3.12	0.65	0.93	0.29	5.96



### Stellar Parameters For KIC 005987404

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$6099^{+184}_{-220}$	$4.373^{+0.090}_{-0.210}$	$0.040^{+0.250}_{-0.300}$	$1.123^{+0.366}_{-0.157}$	$1.085^{+0.166}_{-0.135}$	$1.078^{+0.500}_{-0.570}$
	+3%/-4%	+2%/-5%	+625%/-750%	+33%/-14%	+15%/-12%	+46%/-53%
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 005987404-06 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$-203 \pm 21$	$2.52^{+0.57}_{-0.42}$	$362^{+30}_{-19}$	$5214^{+387}_{-338}$	$26722^{+12250}_{-8899}$
Alt.	$-134 \pm 14$	$2.26^{+0.50}_{-0.42}$	$362^{+30}_{-21}$	$4996^{+422}_{-347}$	$21962^{+10777}_{-7274}$

$T_{\text{max}}$  = 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

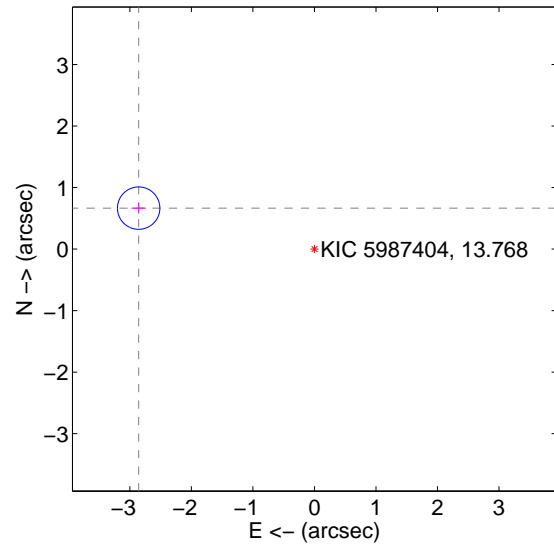
Supplemental centroid analysis for 005987404-06. Kepler magnitude: 13.77. Transit SNR 9.44

There are 1 quarters with good PRF difference image offsets

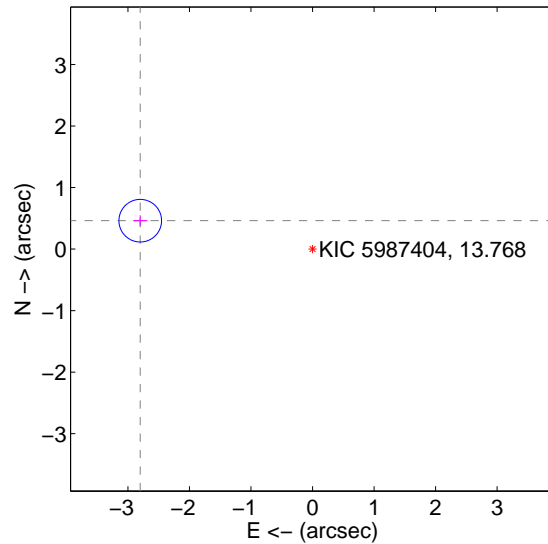
The direct PRF centroid is offset from the target star catalog position by about 0.21 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$2.933 \pm 0.115$	25.55	$2.857 \pm 0.116$	$0.666 \pm 0.088$
PRF-fit source offset from KIC position	$2.838 \pm 0.115$	24.58	$2.800 \pm 0.116$	$0.462 \pm 0.088$
photometric centroid source offset	$0.46 \pm 0.53$	0.87	$0.17 \pm 0.62$	$-0.43 \pm 0.52$

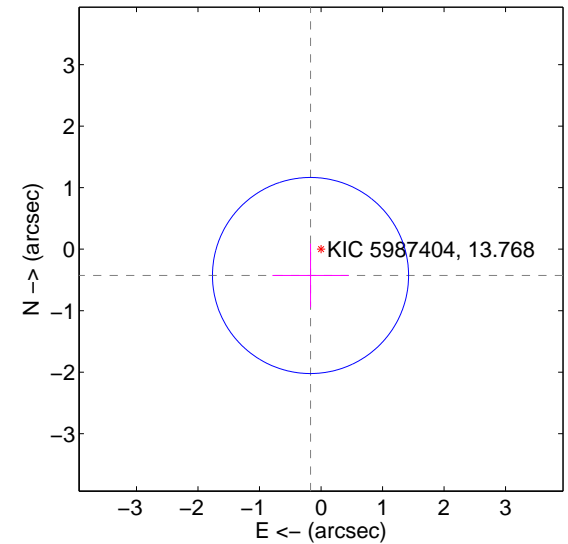
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position



offset from photometric centroids



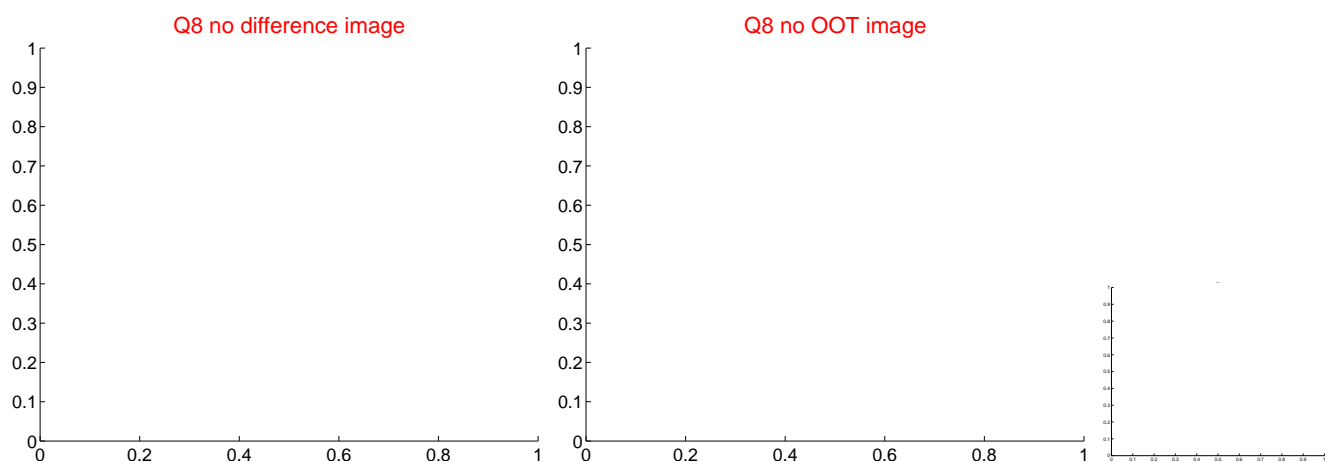
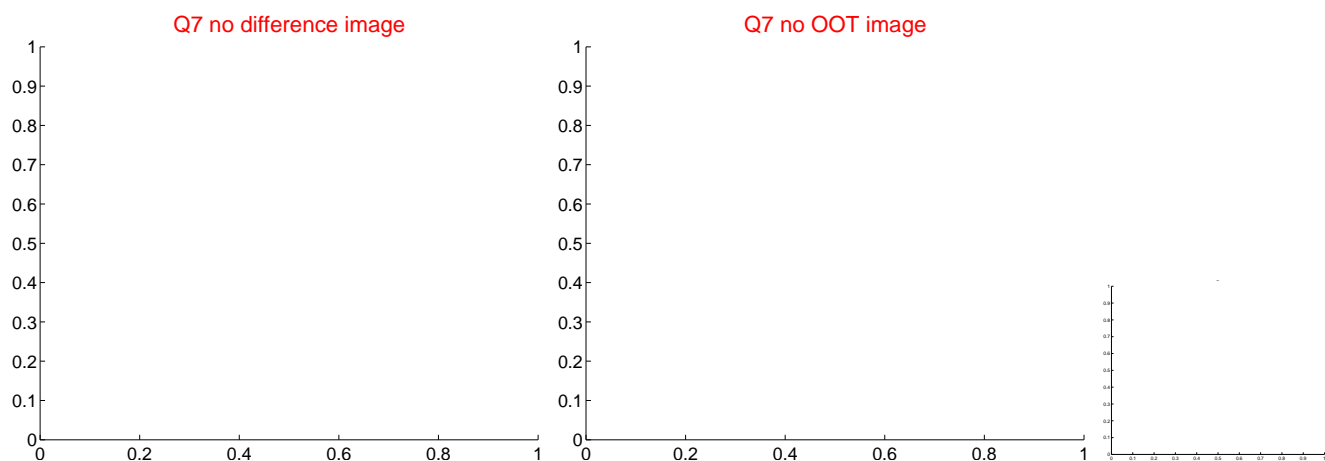
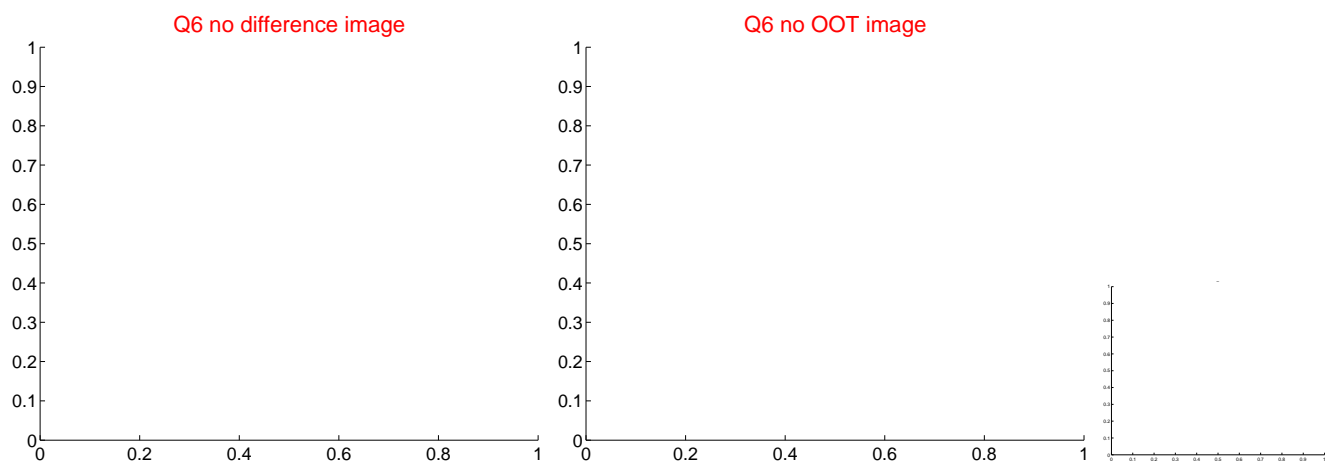
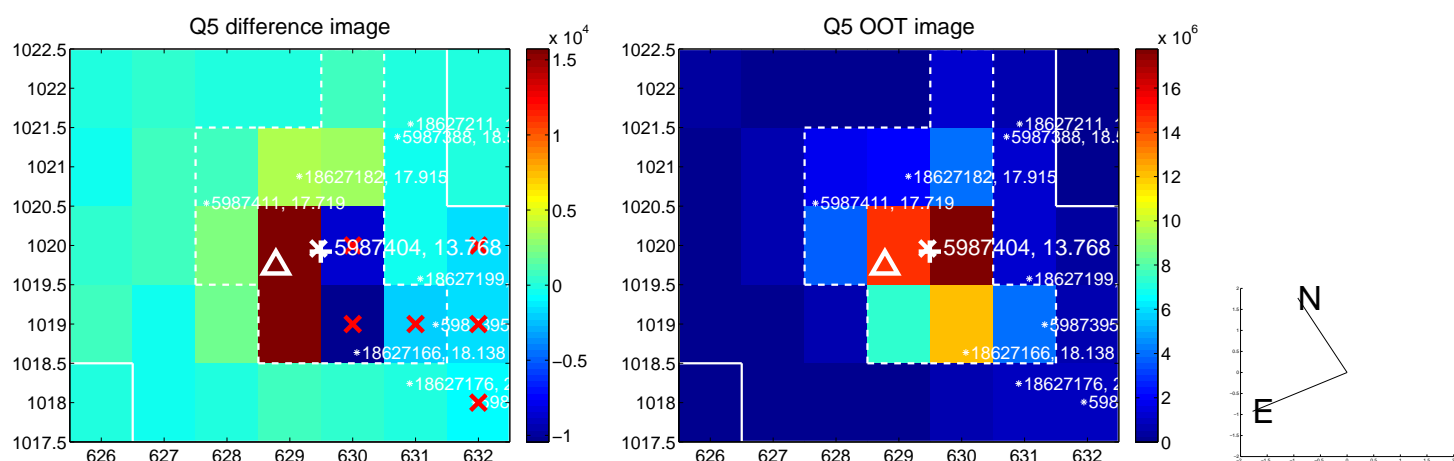
Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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



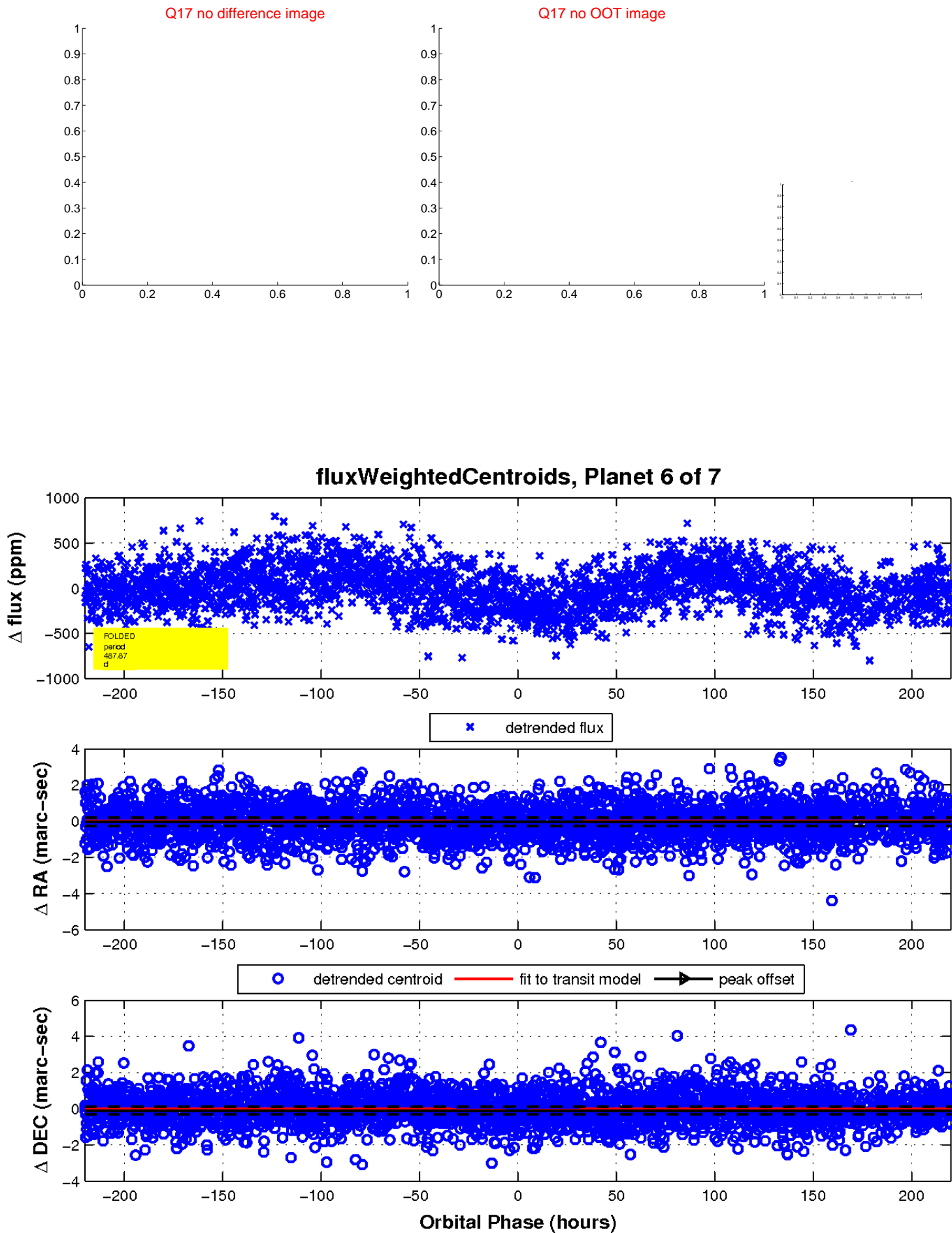
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

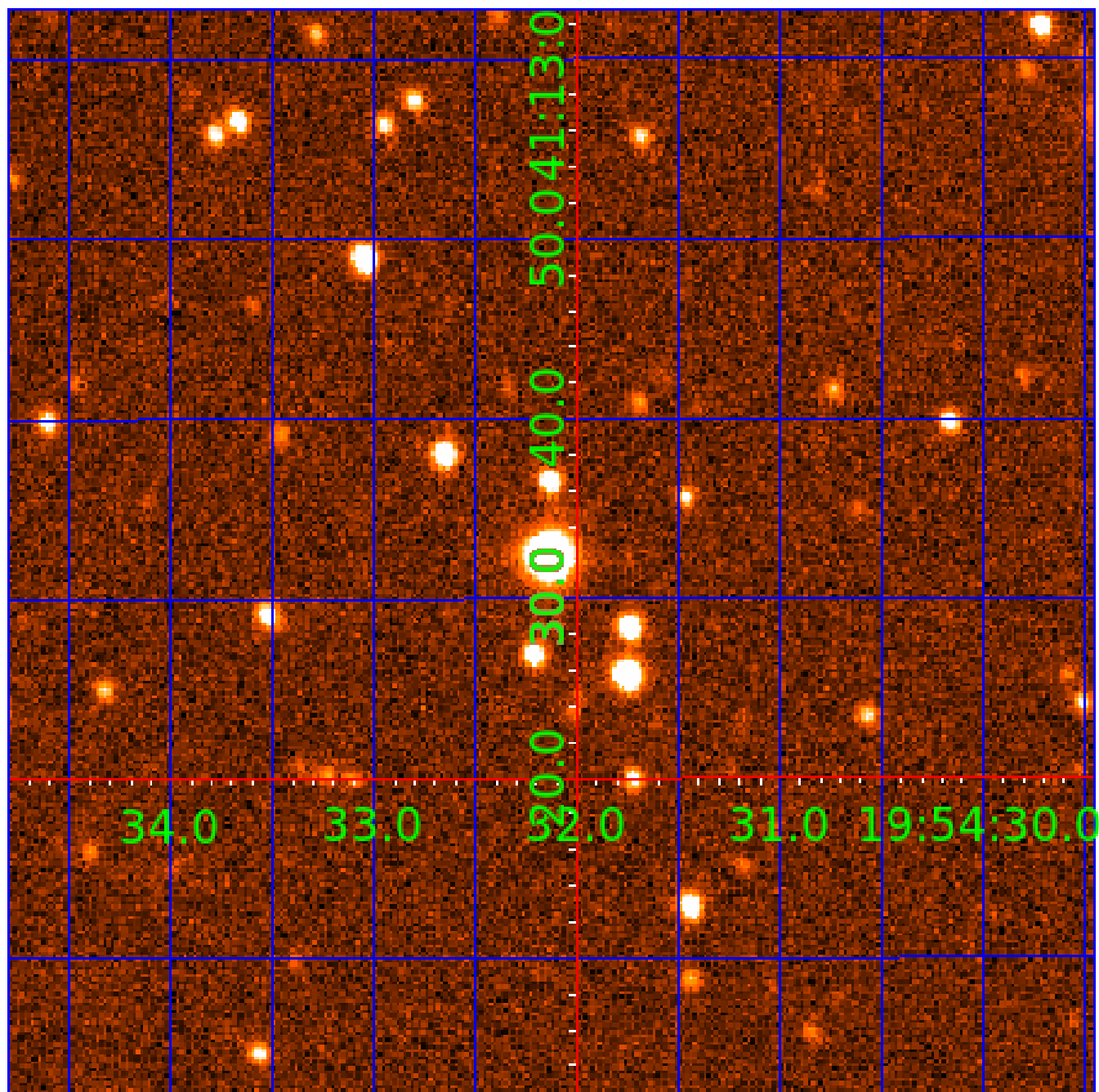


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination



# KIC 005987404

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
005987404-01	OBS	No	1.835612	132.170942	19.0	11.159	7.5	8.9	1.12	6099	0.49	1718.47
005987404-03	OBS	No	45.962054	151.976692	170.9	11.015	13.0	6.0	1.12	6099	1.65	23.46
005987404-04	OBS	No	37.348754	148.451452	141.8	25.577	10.5	9.0	1.12	6099	1.44	30.94
005987404-05	OBS	No	52.708527	144.214024	138.8	10.164	8.7	7.4	1.12	6099	1.49	19.54
005987404-06	OBS	No	487.865266	531.109283	352.1	73.327	8.5	9.4	1.12	6099	2.44	1.01
005987404-07	OBS	No	153.872450	163.069223	179.6	10.495	8.8	6.7	1.12	6099	1.62	4.68

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
005987404-01	OBS	FP	0.00	1	0	1	0	LPP_DV—CENT_UNRESOLVED_OFFSET
005987404-03	OBS	FP	0.00	1	0	1	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—CENT_FEW_DIFFS—HALO_GHOST
005987404-04	OBS	FP	0.00	1	0	1	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_ALT—CENT_FEW_MEAS—HALO_GHOST
005987404-05	OBS	FP	0.00	1	0	1	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—CENT_FEW_DIFFS—HALO_GHOST
005987404-06	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_MARSHALL—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS
005987404-07	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_MARSHALL—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS

**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.

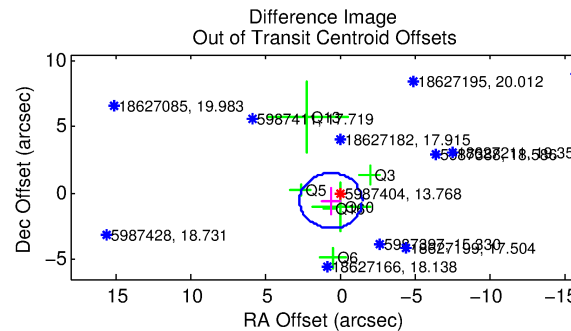
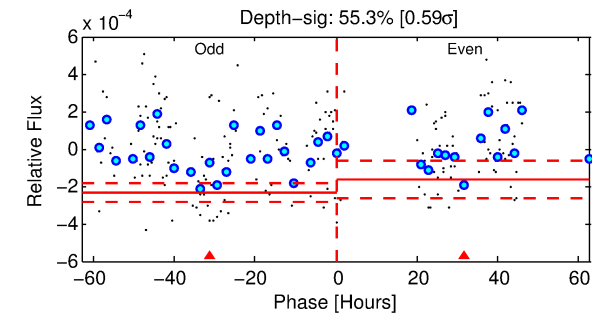
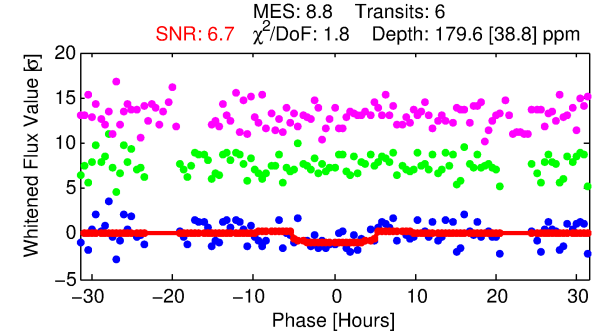
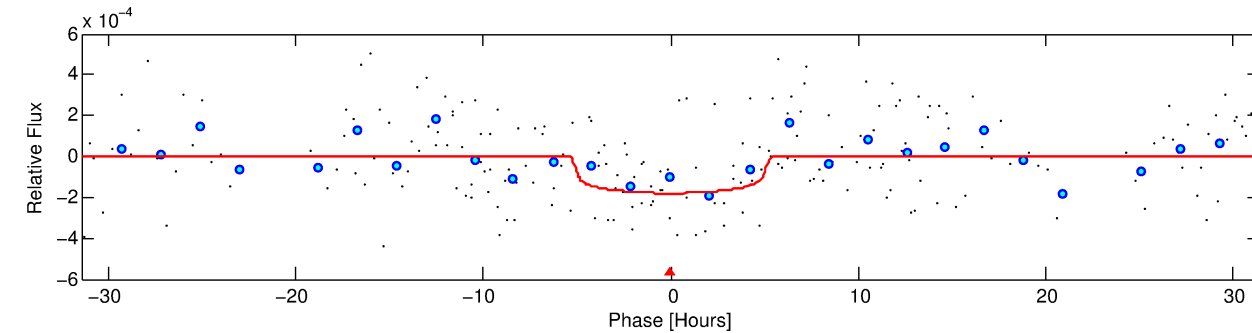
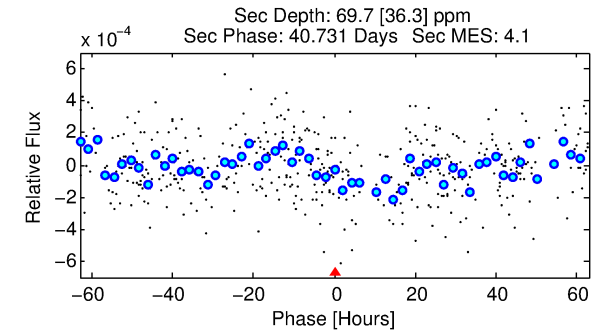
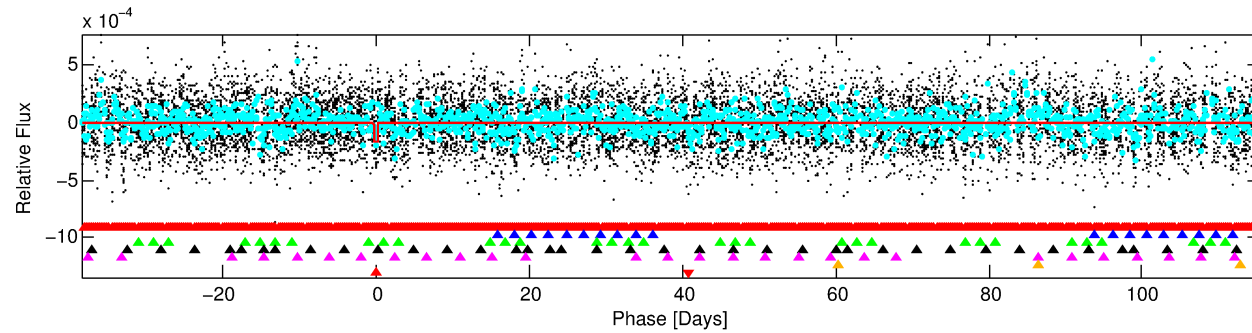
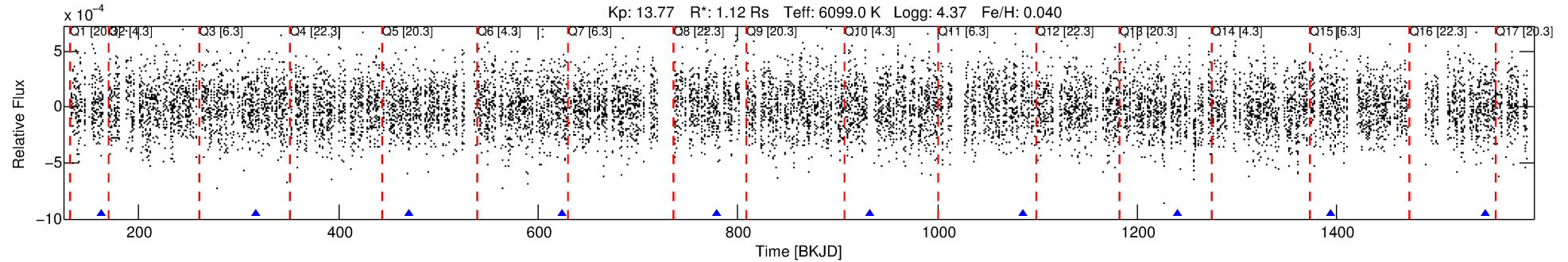
Ephemeris Match Information For 005987404-07

No Significant Match Found



# DV One-Page Summary

KIC: 5987404 Candidate: 7 of 7 Period: 153.872 d



## DV Fit Results:

Period = 153.87245 [0.00669] d  
Epoch = 163.0692 [0.0309] BKJD  
Rp/R\* = 0.0132 [0.0097]  
a/R\* = 79.59 [278.22]  
b = 0.72 [2.33]  
Seff = 4.68 [1.94]  
Teq = 375 [39] K  
Rp = 1.62 [1.30] Re  
a = 0.5777 [0.1563] AU  
Ag = 4887.21 [7852.76] [0.62σ]  
Teffp = 4849 [1898] K [2.36σ]

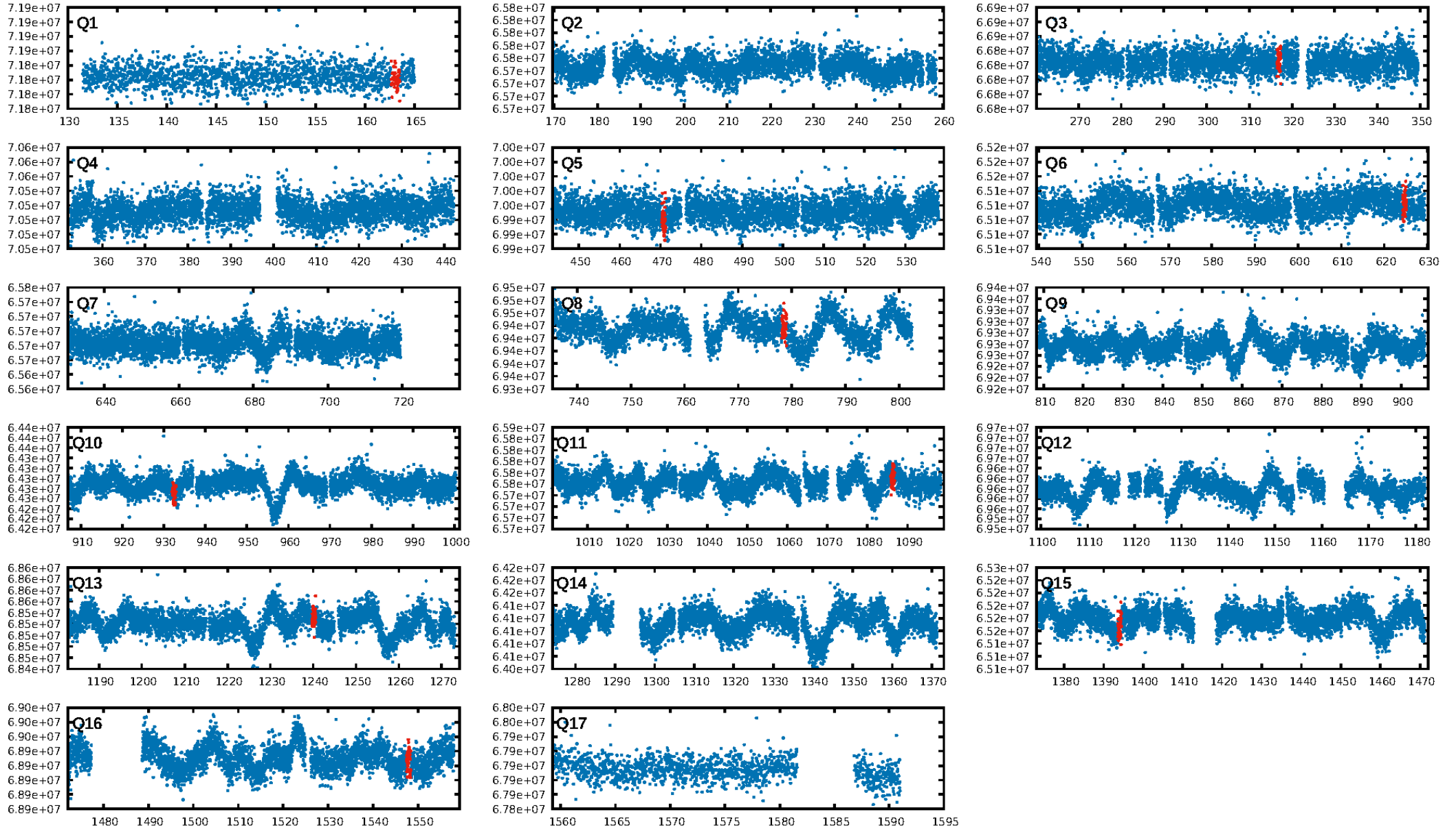
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [120.55σ]  
LongPeriod-sig: 100.0% [108.21σ]  
ModelChiSquare2-sig: 43.4%  
ModelChiSquareGof-sig: 100.0%  
**Bootstrap-pfa: 5.84e-12**  
RollingBand-fgt: 1.00 [6/6]  
GhostDiagnostic-chr: -0.7318  
Centroid-sig: 65.5%  
Centroid-so: 0.963 arcsec [0.77σ]  
OotOffset-rm: 0.819 arcsec [1.18σ]  
KicOffset-rm: 0.992 arcsec [0.81σ]  
OotOffset-st: 2/1/1/2 [6]  
KicOffset-st: 2/1/1/2 [6]  
DiffImageQuality-fgm: 0.00 [0/6]  
DiffImageOverlap-fno: 0.00 [0/9]

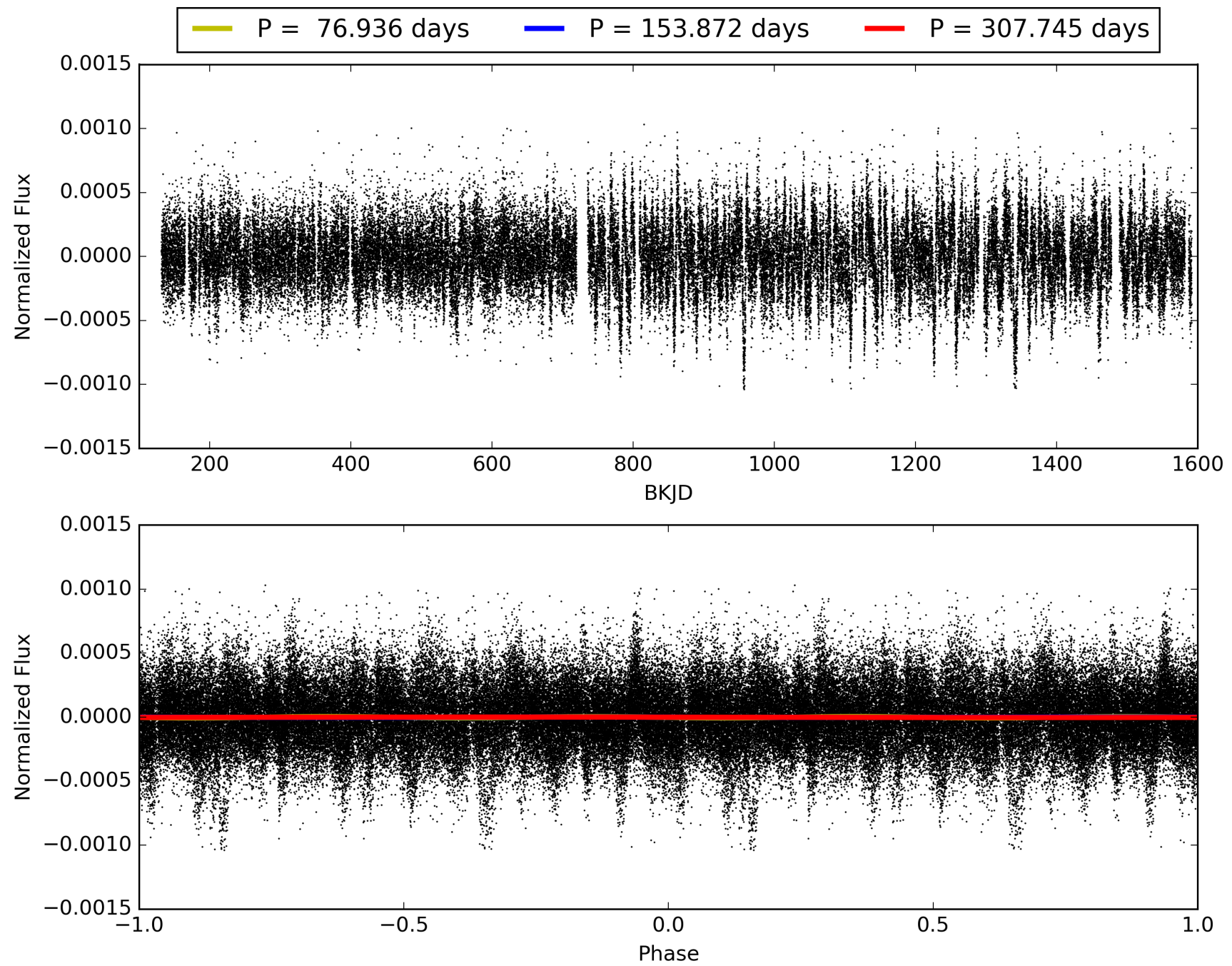
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 30-Jan-2016 03:17:37 Z

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

# TCE 005987404-07, PDC Light Curves

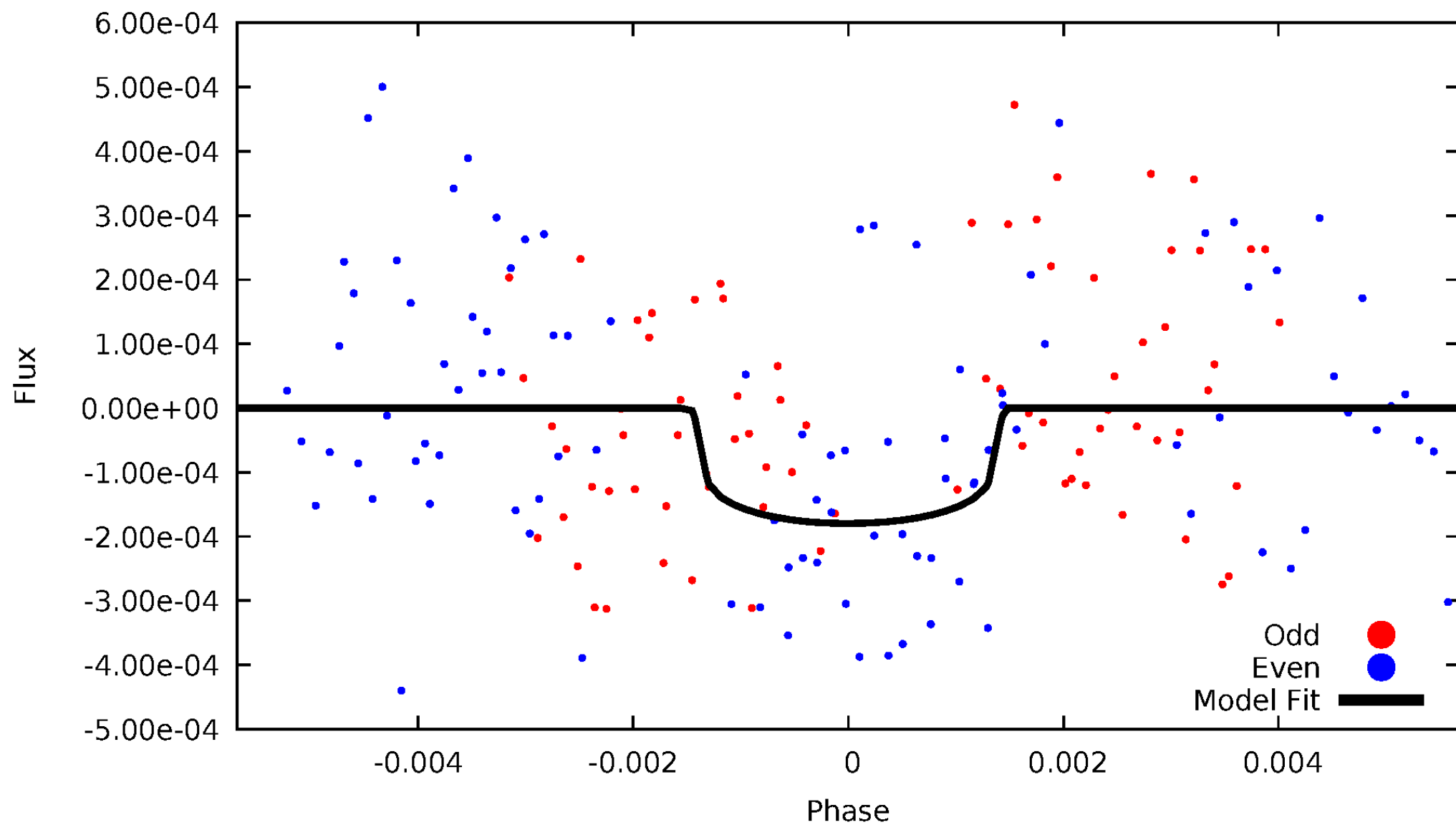


TCE 005987404-07



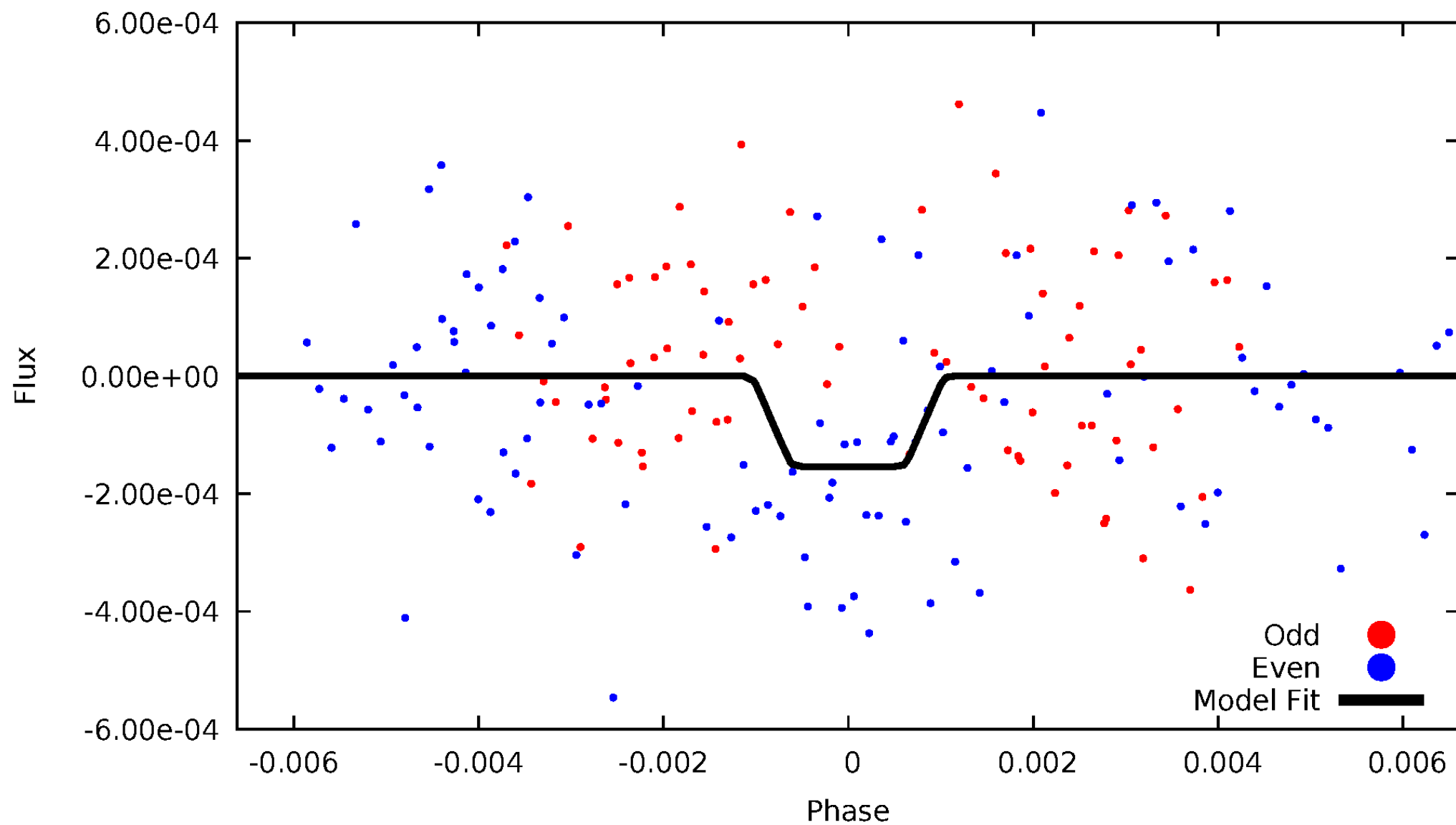
# DV Odd/Even

TCE 005987404-07

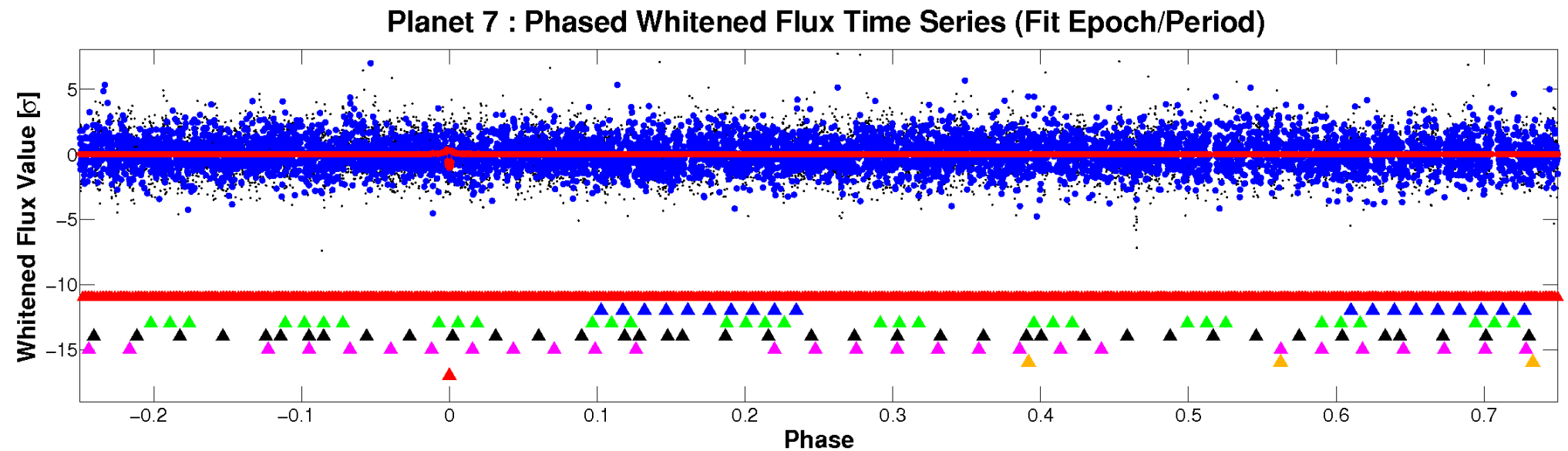
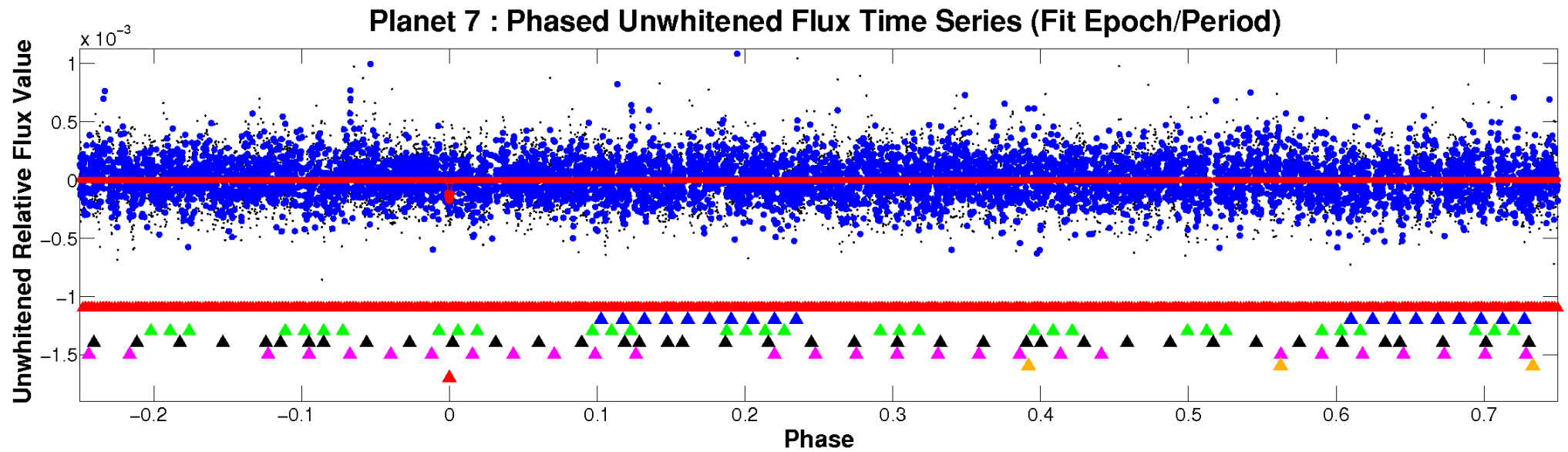


# ALT Odd/Even

TCE 005987404-07



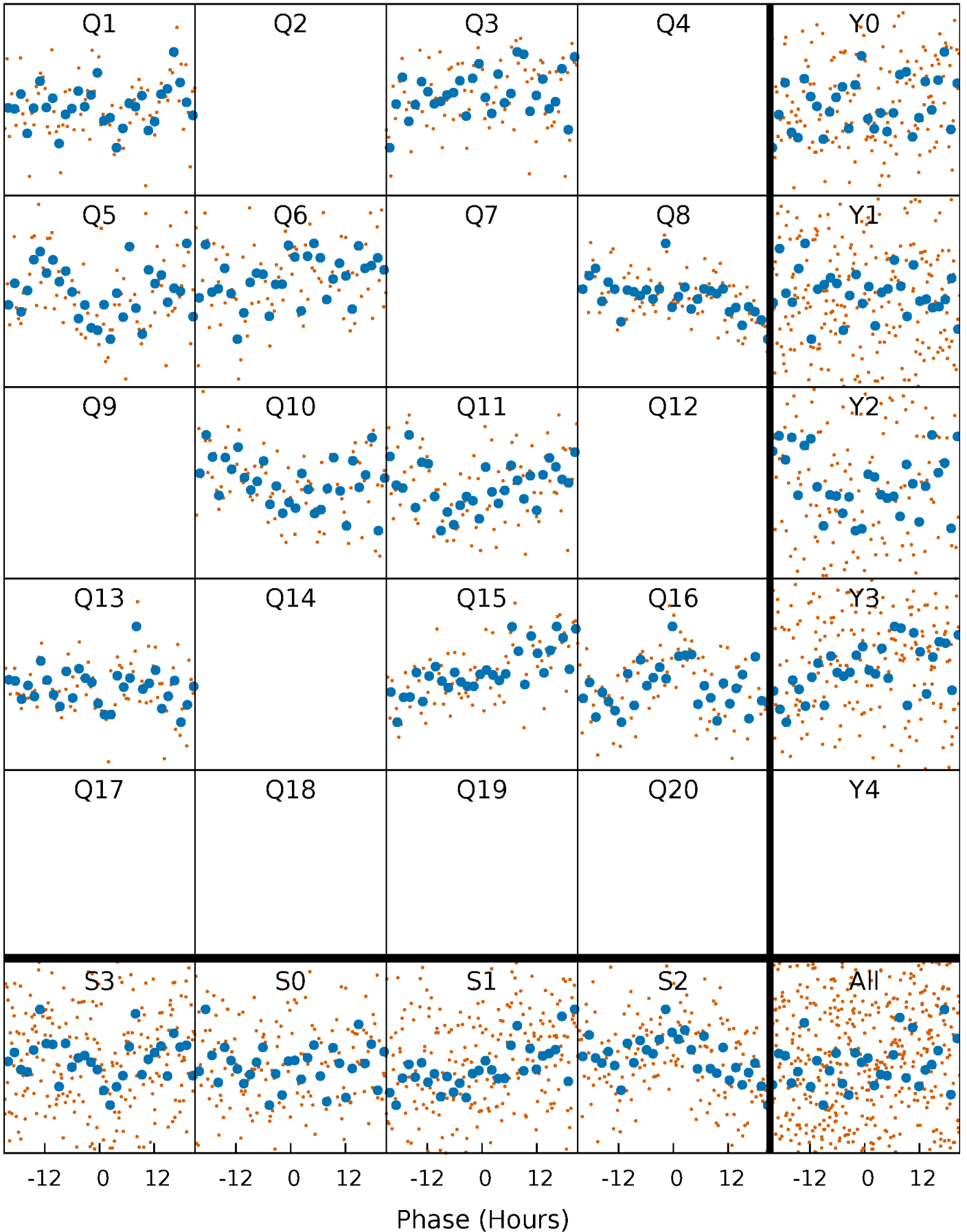
# Non-Whitened Vs. Whitened Light Curve





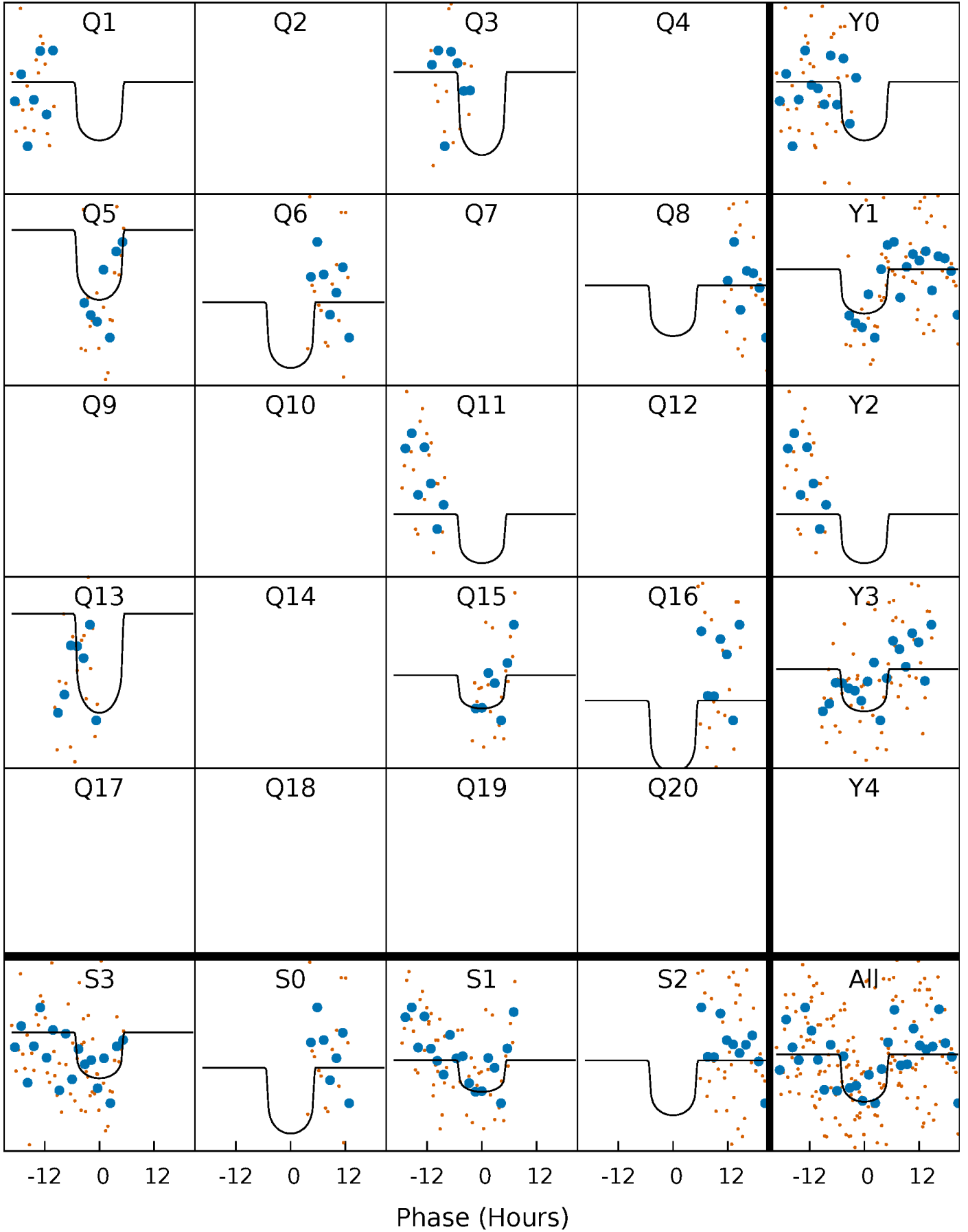
# PDC Quarter-Phased Transit Curves

TCE 005987404-07     $P=153.872450$  Days     $T_0=163.069223$  (BKJD)



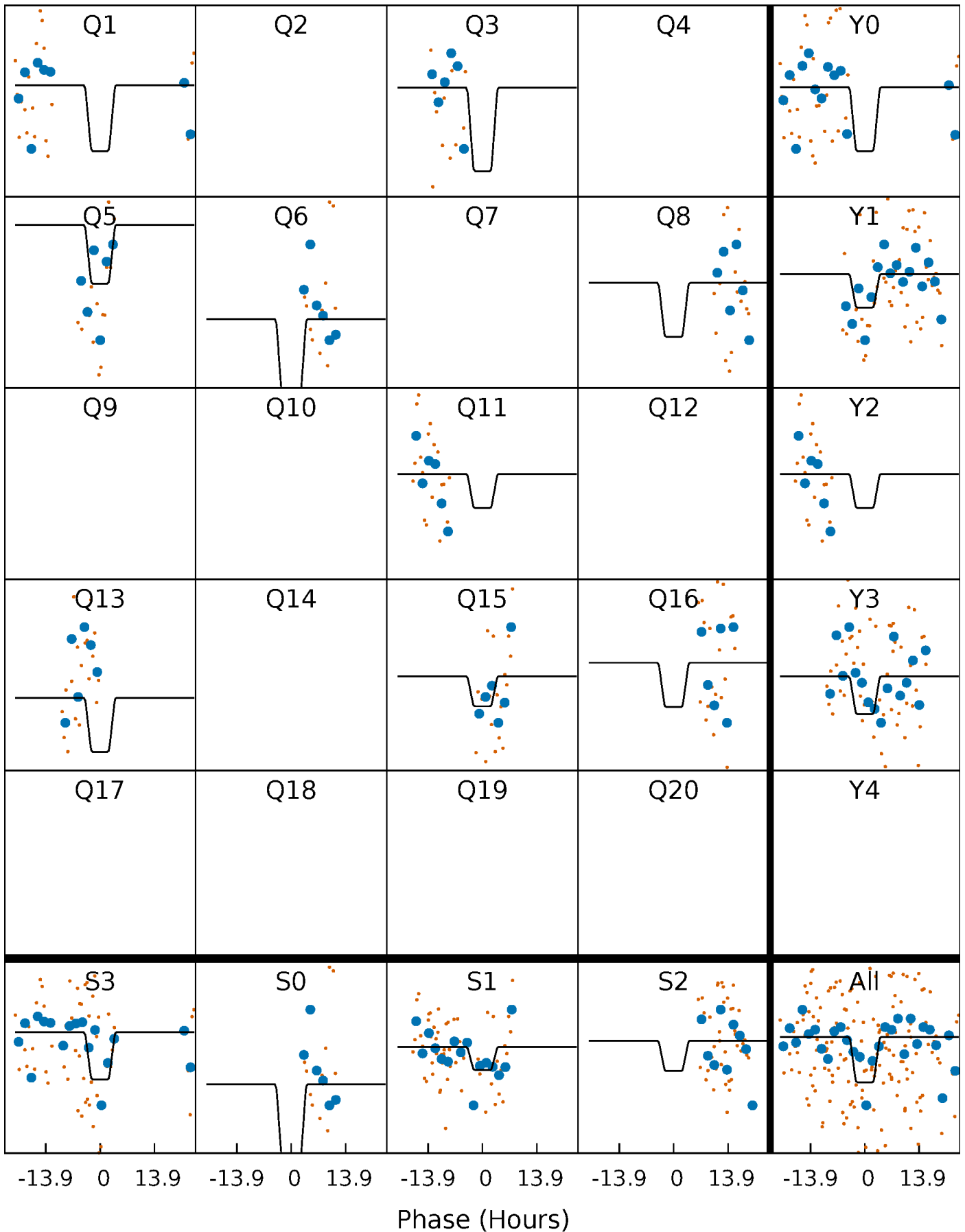
# DV Quarter-Phased Transit Curves

TCE 005987404-07     $P=153.872450$  Days     $T_0=163.069223$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

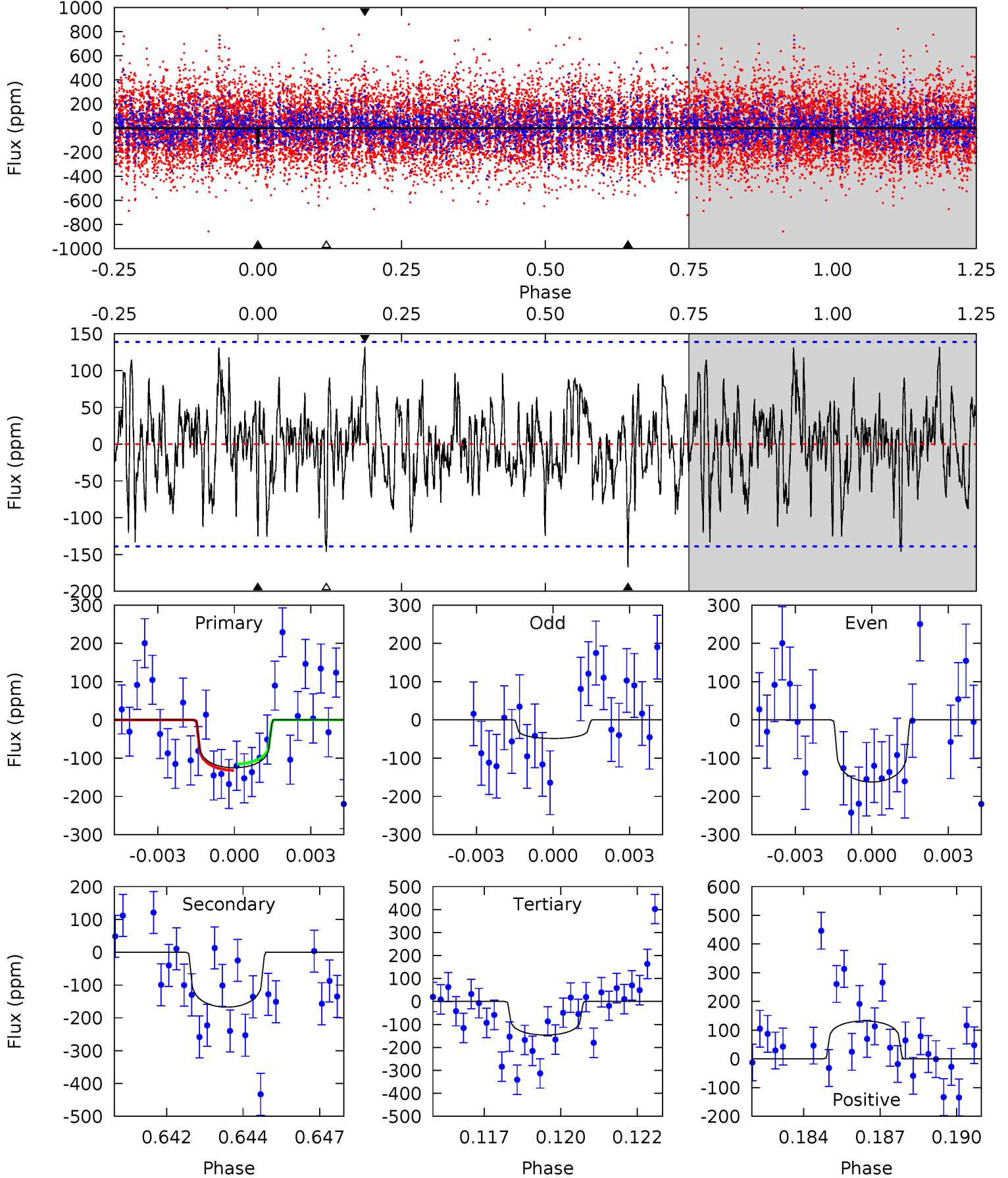
TCE 005987404-07     $P=153.857896$  Days     $T_0=163.166819$  (BKJD)



# DV Model-Shift Uniqueness Test

005987404-07, P = 153.872450 Days, E = 9.196773 Days

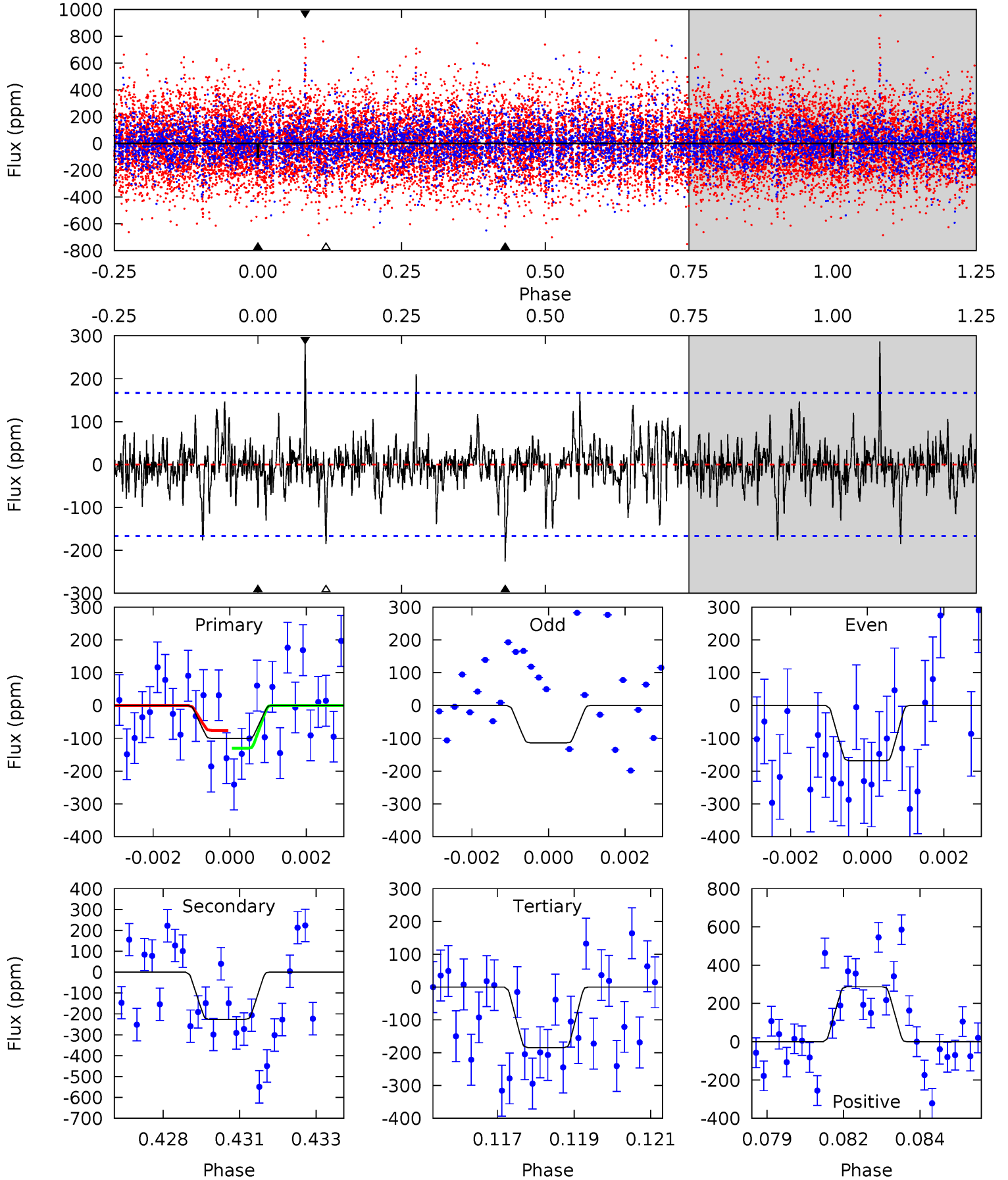
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
4.73	6.33	5.53	5.00	5.26	2.98	1.63	-0.80	-0.26	0.80	1.34	2.06	1.02	0.44	0.31



# Alt Model-Shift Uniqueness Test

005987404-07, P = 153.857896 Days, E = 9.308923 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
3.21	7.21	5.89	9.15	5.32	3.08	1.40	-2.68	-5.94	1.32	-1.94	0.76	0.76	0.56	0.87



### Stellar Parameters For KIC 005987404

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$6099^{+184}_{-220}$	$4.373^{+0.090}_{-0.210}$	$0.040^{+0.250}_{-0.300}$	$1.123^{+0.366}_{-0.157}$	$1.085^{+0.166}_{-0.135}$	$1.078^{+0.500}_{-0.570}$
	+3%/-4%	+2%/-5%	+625%/-750%	+33%/-14%	+15%/-12%	+46%/-53%
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 005987404-07 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-167 \pm 26$	$1.79^{+1.31}_{-1.04}$	$531^{+43}_{-31}$	$5795^{+3762}_{-1149}$	$9563^{+42919}_{-6406}$
Alt.	$-226 \pm 31$	$1.79^{+1.19}_{-1.09}$	$530^{+44}_{-30}$	$6251^{+4790}_{-1306}$	$12697^{+70601}_{-8090}$

$T_{max}$  = 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

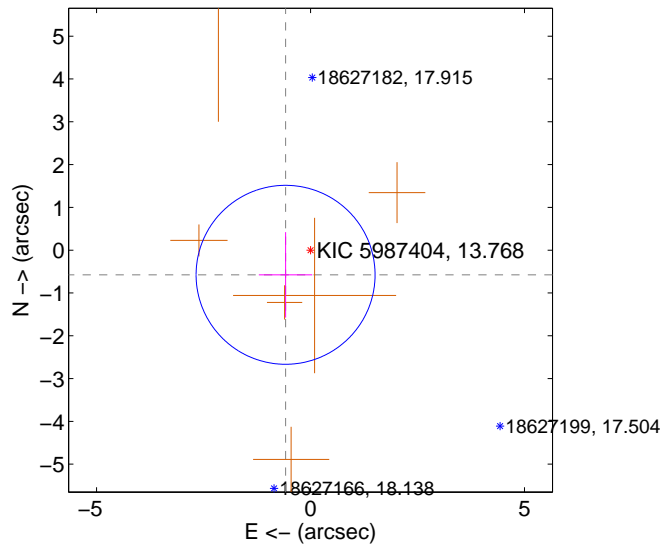
Supplemental centroid analysis for 005987404-07. Kepler magnitude: 13.77. Transit SNR 6.73

There are 0 quarters with good PRF difference image offsets

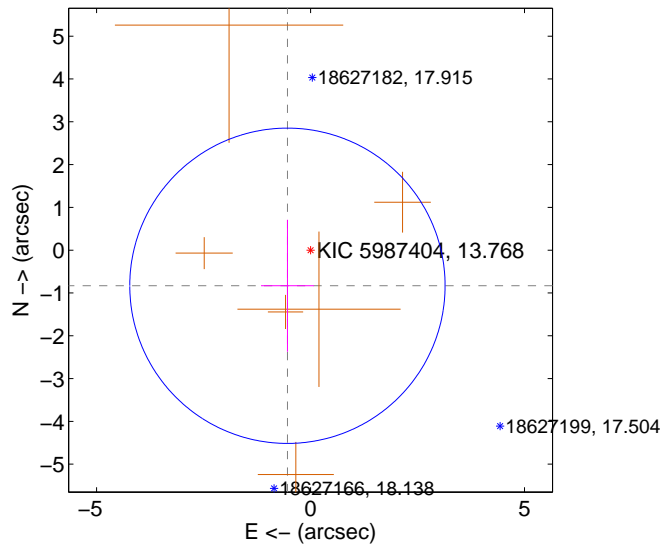
The direct PRF centroid is offset from the target star catalog position by about 0.22 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.819 \pm 0.697$	1.18	$0.583 \pm 0.625$	$-0.576 \pm 0.998$
PRF-fit source offset from KIC position	$0.992 \pm 1.228$	0.81	$0.540 \pm 0.618$	$-0.832 \pm 1.542$
photometric centroid source offset	$0.96 \pm 1.25$	0.77	$-0.77 \pm 1.26$	$-0.57 \pm 1.23$

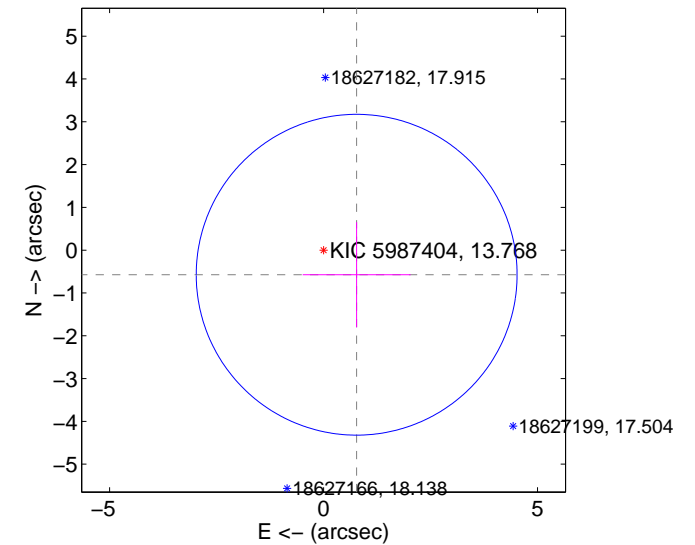
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position

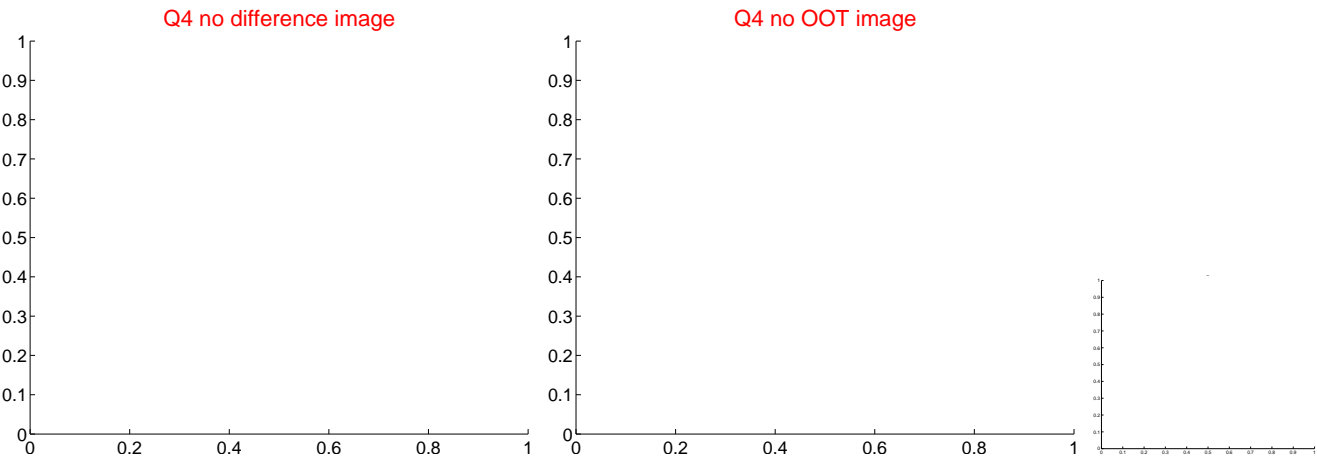
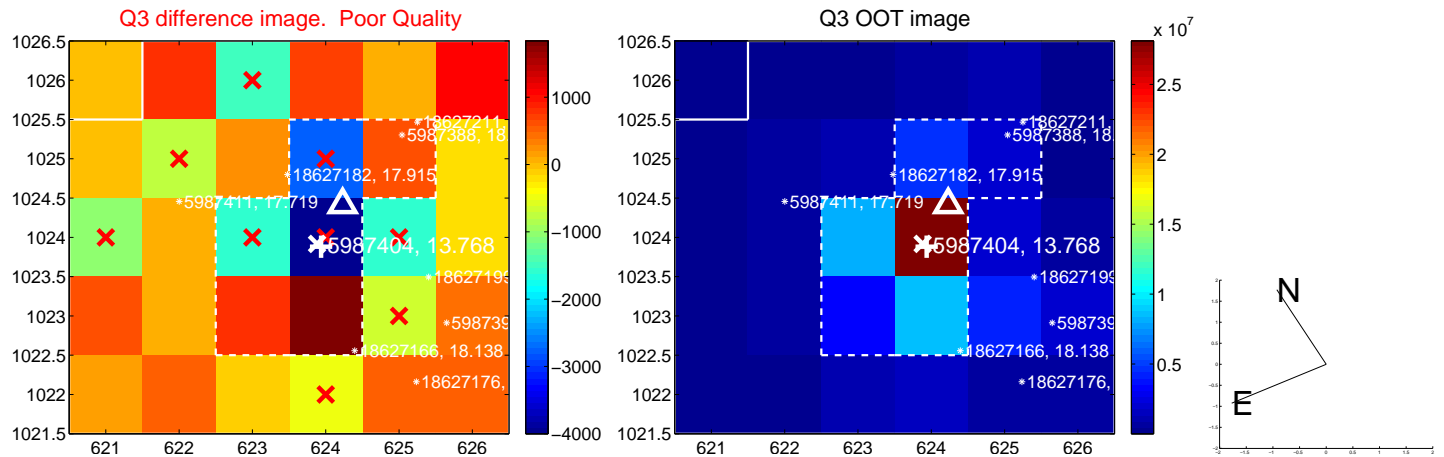
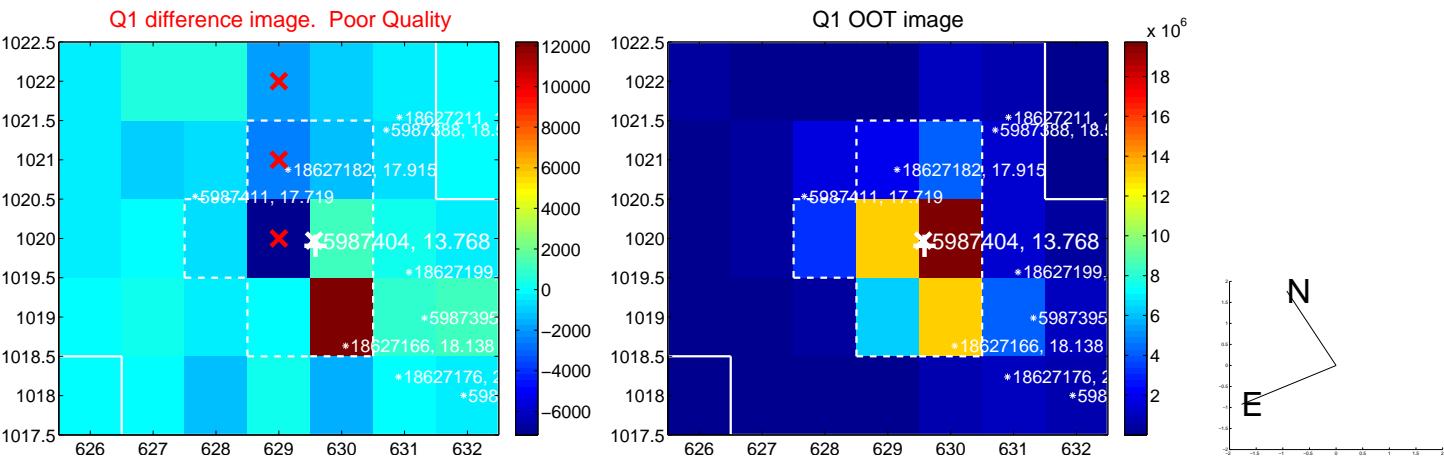


offset from photometric centroids

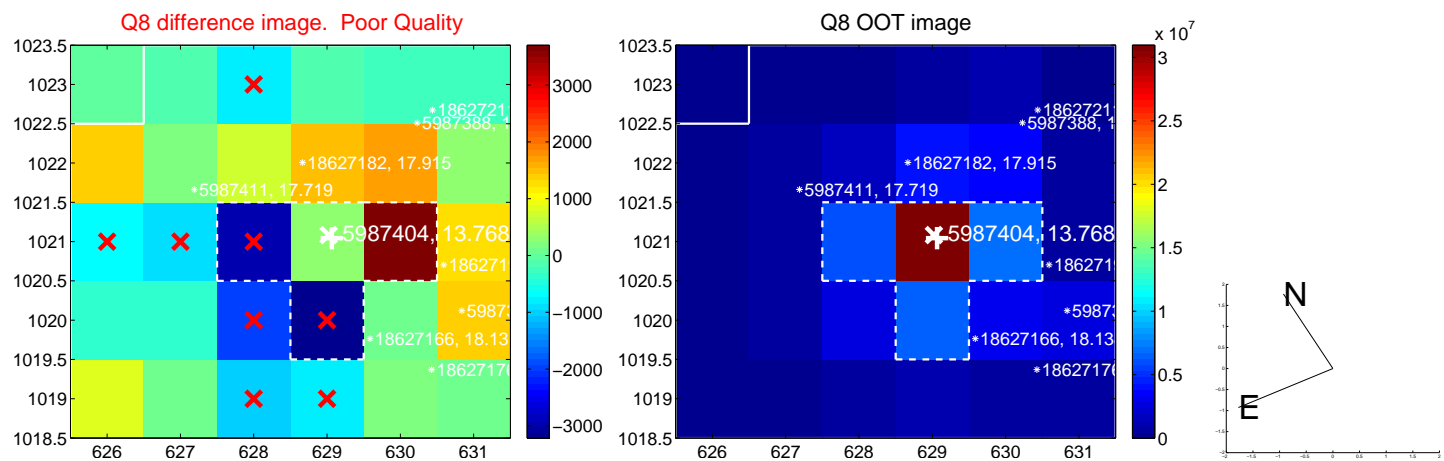
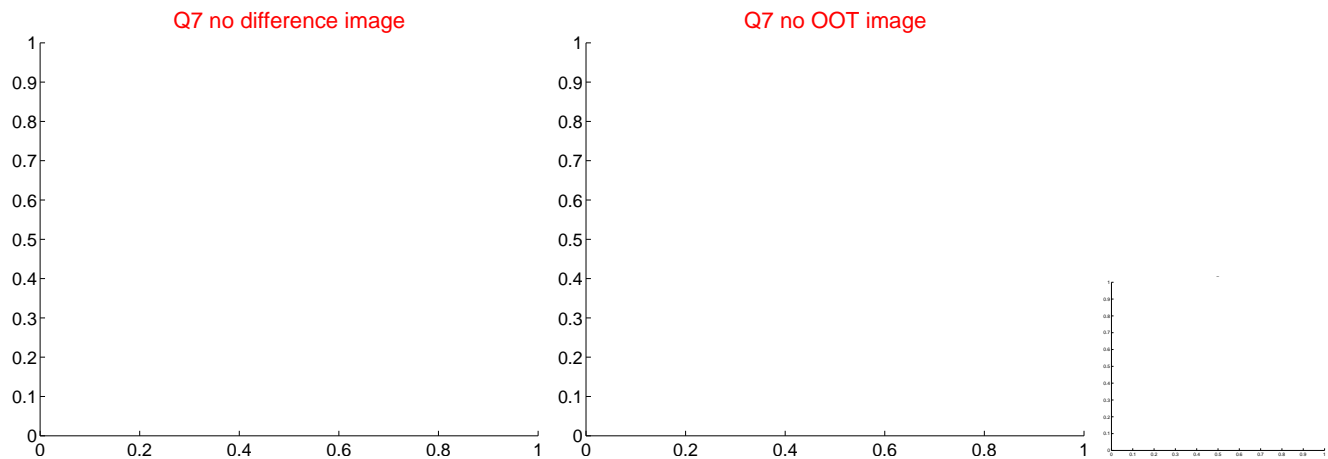
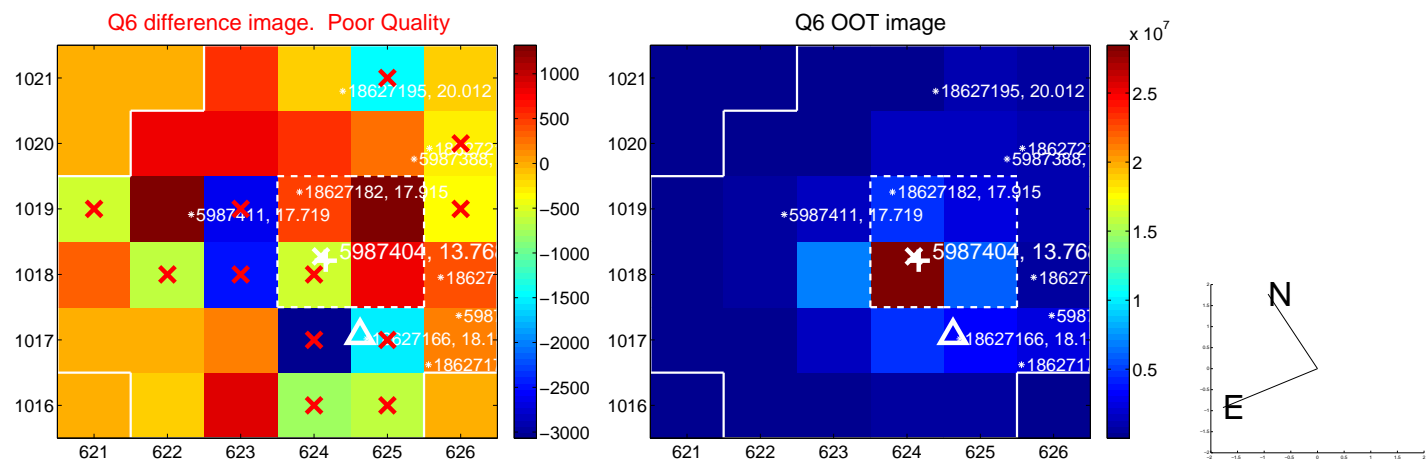
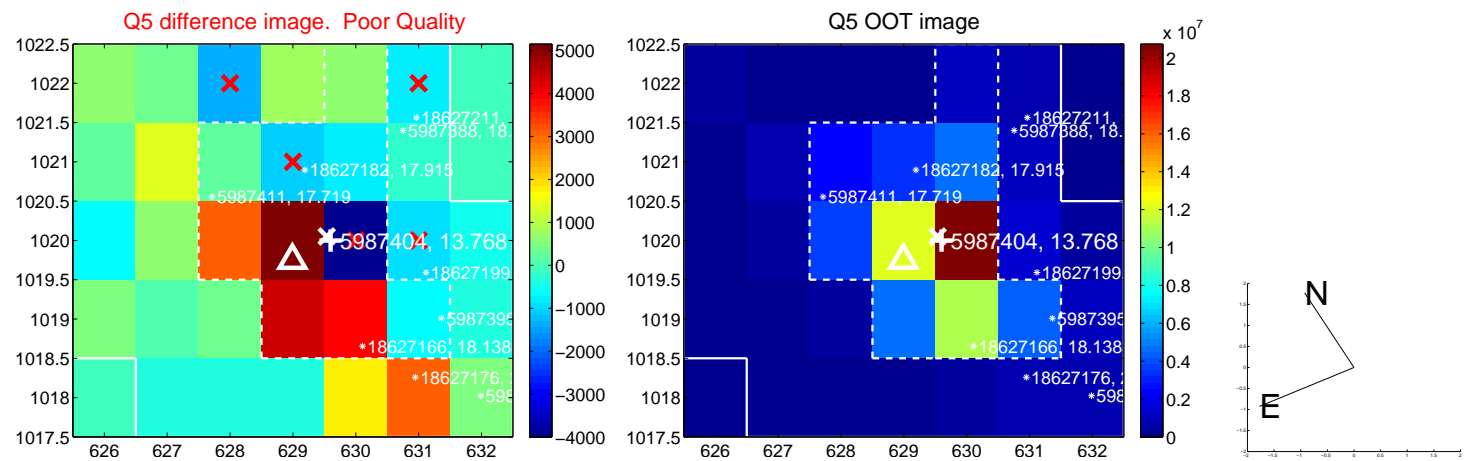


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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

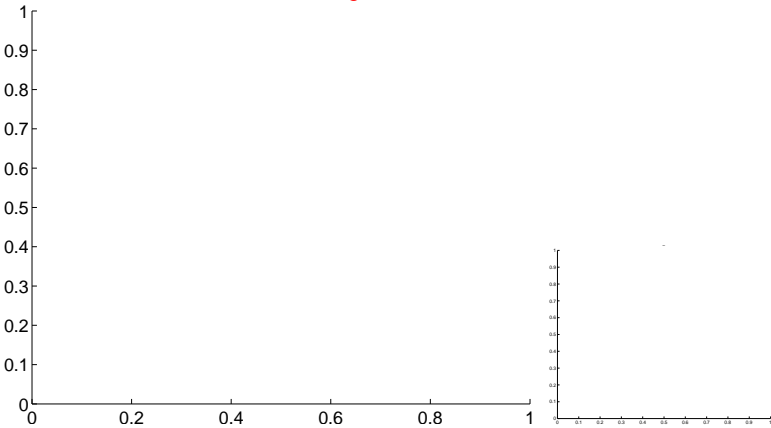


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

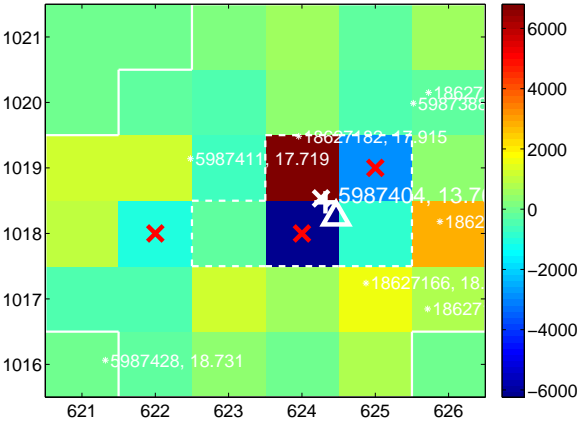
Q9 no difference image



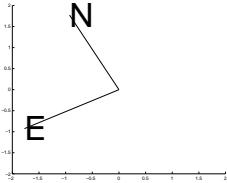
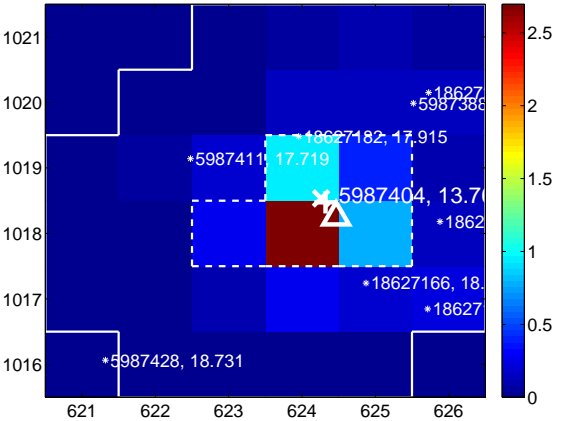
Q9 no OOT image



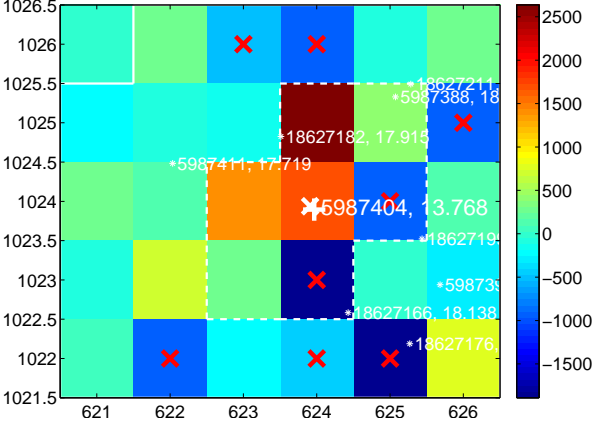
Q10 difference image. Poor Quality



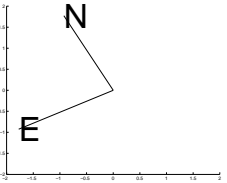
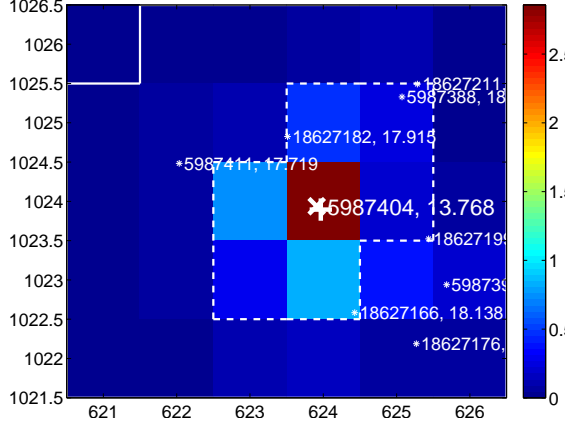
Q10 OOT image



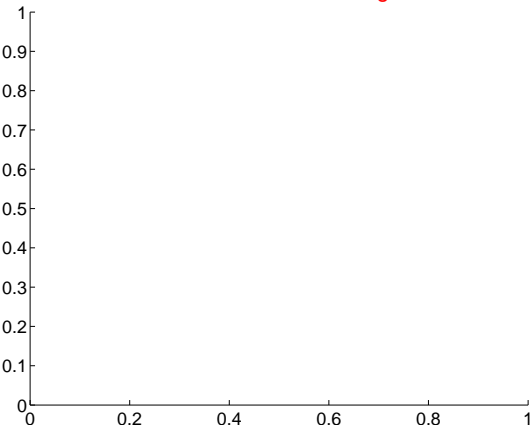
Q11 difference image. Poor Quality



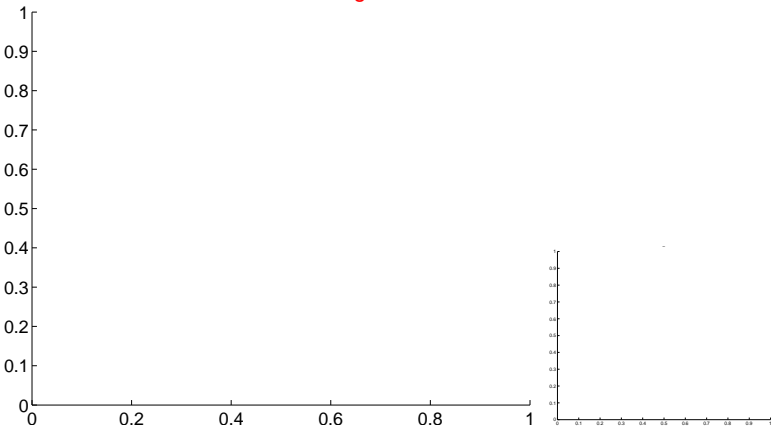
Q11 OOT image



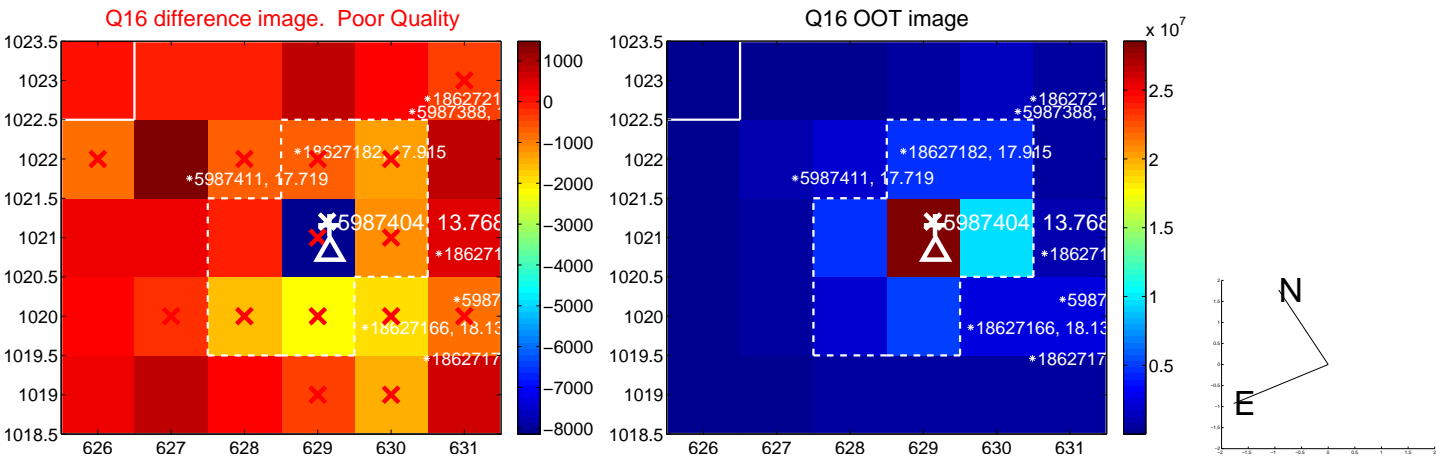
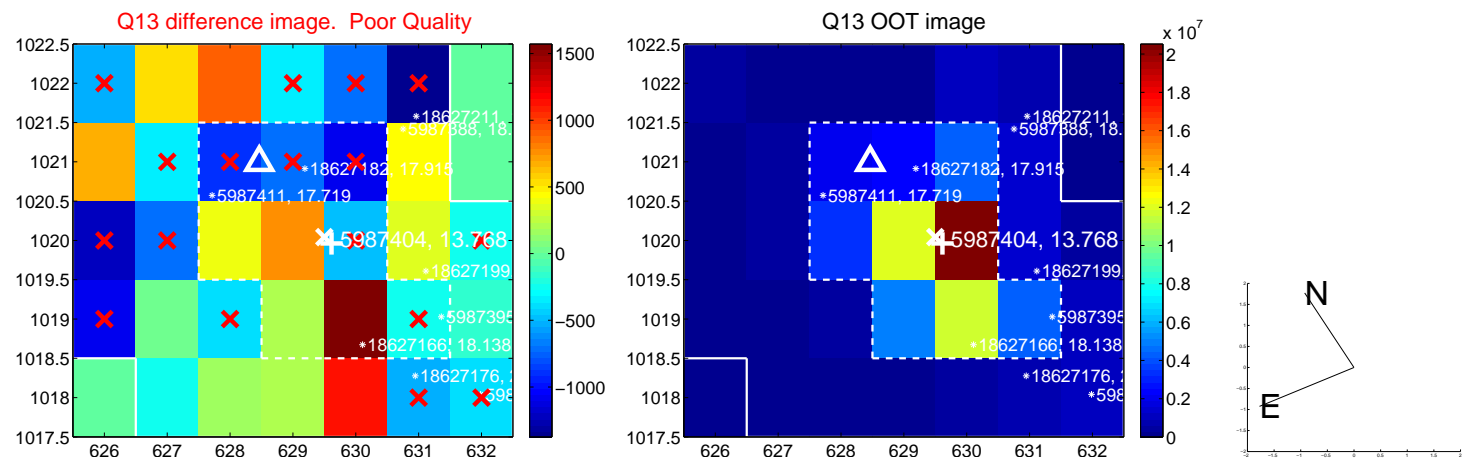
Q12 no difference image



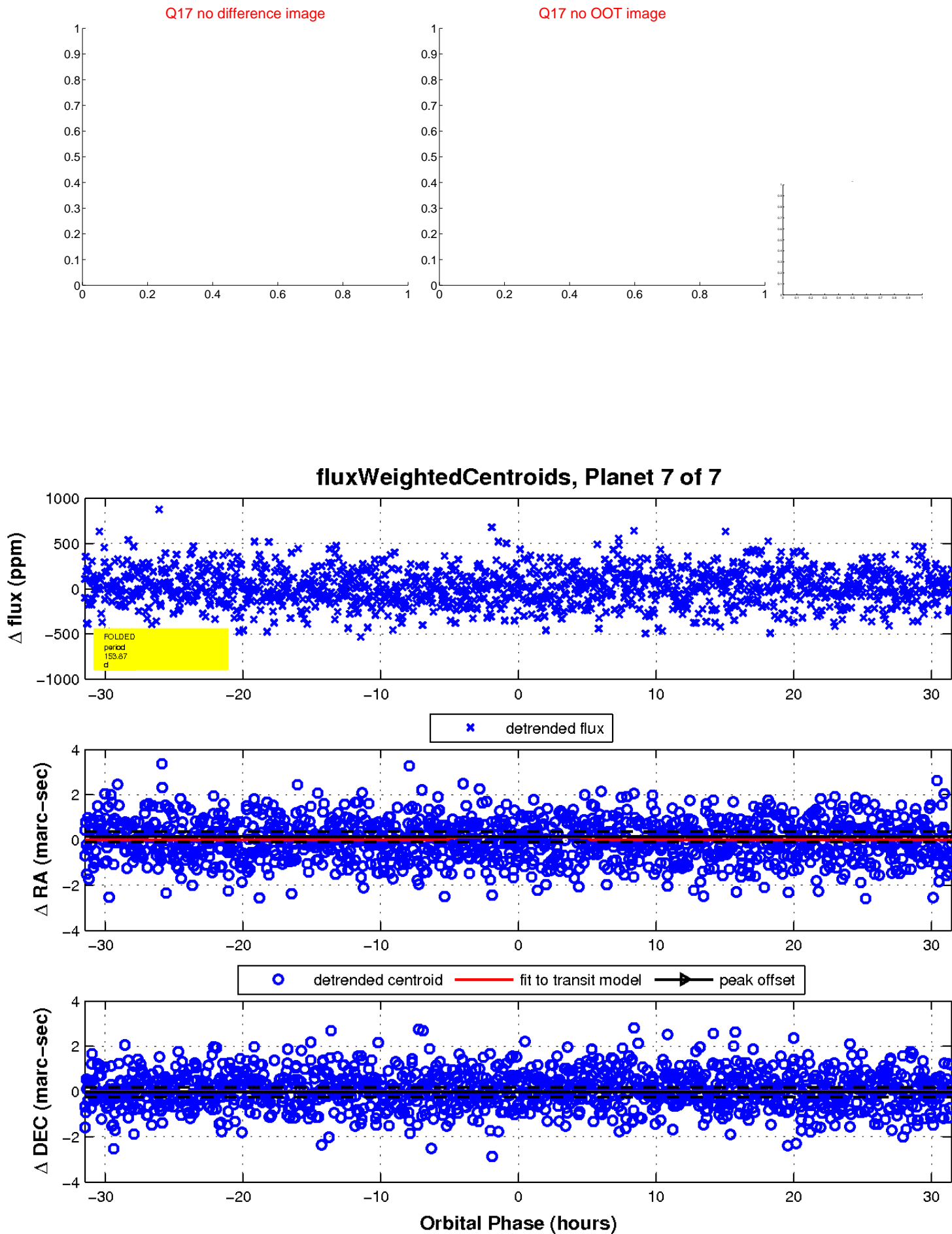
Q12 no OOT image



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.



UKIRT Image

Declination

