

# KIC 002988783

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
002988783-01	OBS	No	0.940229	132.078038	32.5	2.161	9.9	5.9	1.90	7384	1.25	19736.98
002988783-02	OBS	No	1.281548	131.987349	62.0	3.639	8.2	7.3	1.90	7384	2.05	13060.06
002988783-03	OBS	No	1.281660	131.603727	54.9	1.544	9.5	7.1	1.90	7384	1.63	13058.54
002988783-04	OBS	No	19.571654	135.244437	308.9	5.252	7.5	7.3	1.90	7384	6.31	344.69
002988783-05	OBS	No	70.903647	191.711667	275.0	6.000	7.2	-1.0	1.90	7384	3.19	61.95

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
002988783-01	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT
002988783-02	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT
002988783-03	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—SAME_NTL_PERIOD
002988783-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_SKYE_ZUMA—TRANS_GAPPED—LPP_ALT—MOD_NONUNIQ_ALT—MOD_TER_ALT
002988783-05	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—MOD_NONUNIQ_ALT—CENT_NOFITS

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

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

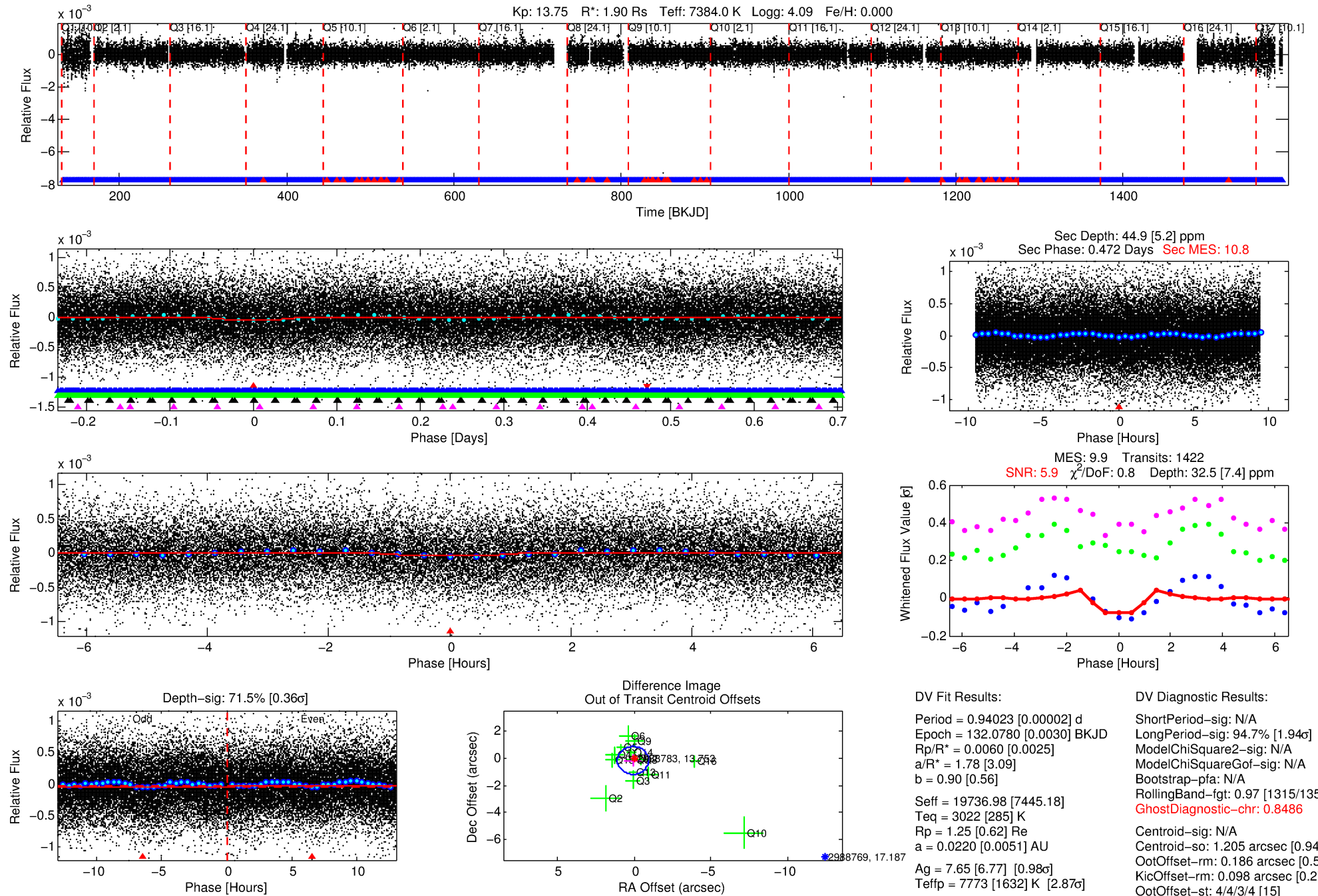
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 002988783-01

No Significant Match Found

# DV One-Page Summary

KIC: 2988783 Candidate: 1 of 5 Period: 0.940 d



## DV Fit Results:

Period = 0.94023 [0.00002] d  
Epoch = 132.0780 [0.0030] BKJD  
Rp/R\* = 0.0060 [0.0025]  
a/R\* = 1.78 [3.09]  
b = 0.90 [0.56]  
Seff = 19736.98 [7445.18]  
Teff = 3022 [285] K  
Rp = 1.25 [0.62] Re  
a = 0.0220 [0.0051] AU  
Ag = 7.65 [6.77] [0.98σ]  
Teffp = 7773 [1632] K [2.87σ]

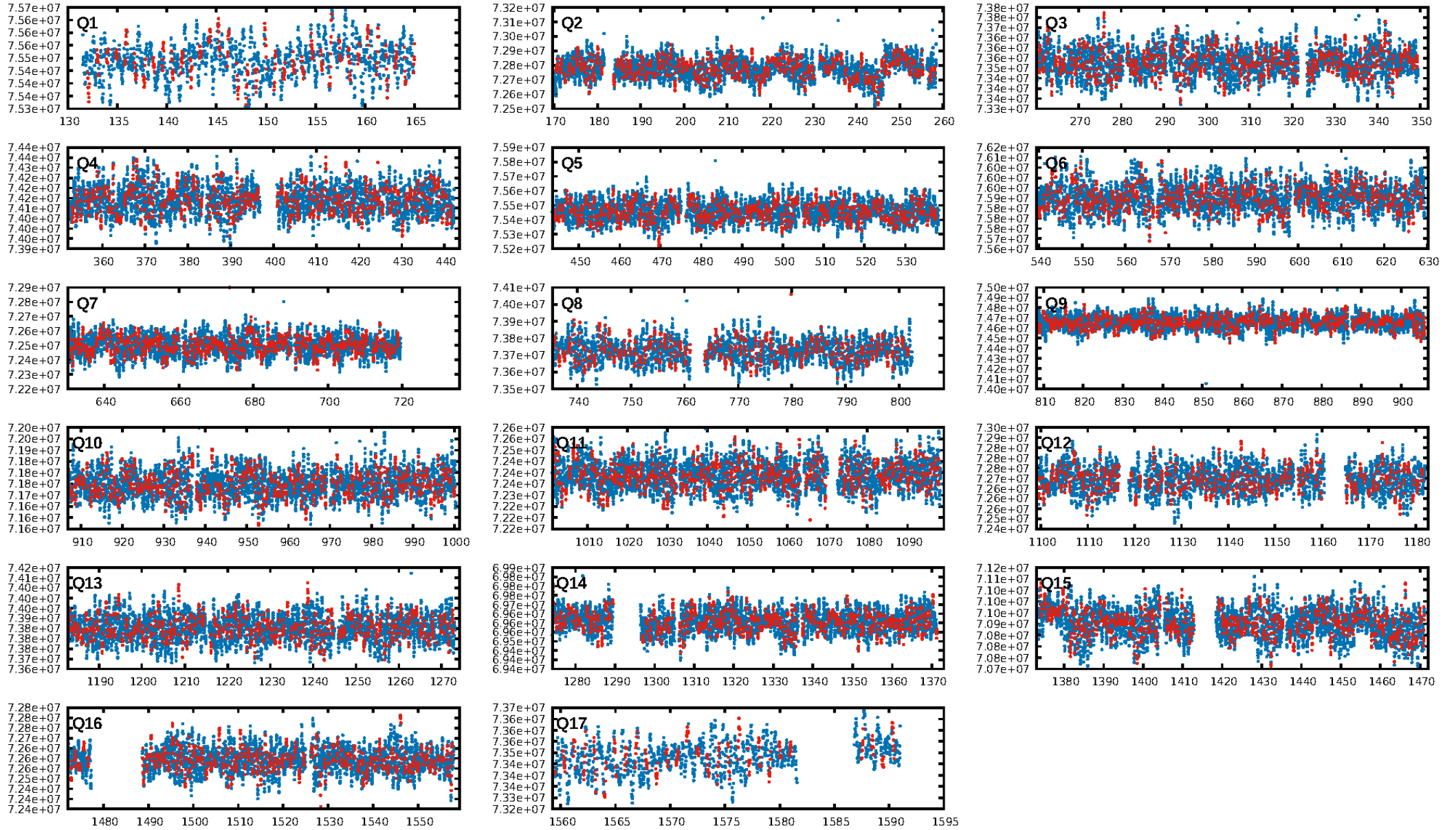
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 94.7% [1.94σ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: N/A  
RollingBand-fgt: 0.97 [1315/1358]  
GhostDiagnostic-chr: 0.8486  
Centroid-sig: N/A  
Centroid-so: 1.205 arcsec [0.94σ]  
OotOffset-rm: 0.186 arcsec [0.55σ]  
KicOffset-rm: 0.098 arcsec [0.27σ]  
OotOffset-st: 4/4/3/4 [15]  
KicOffset-st: 4/4/3/4 [15]  
DiffImageQuality-fgm: 0.67 [10/15]  
DiffImageOverlap-fno: 1.00 [17/17]

Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 03-Feb-2016 08:45:23 Z

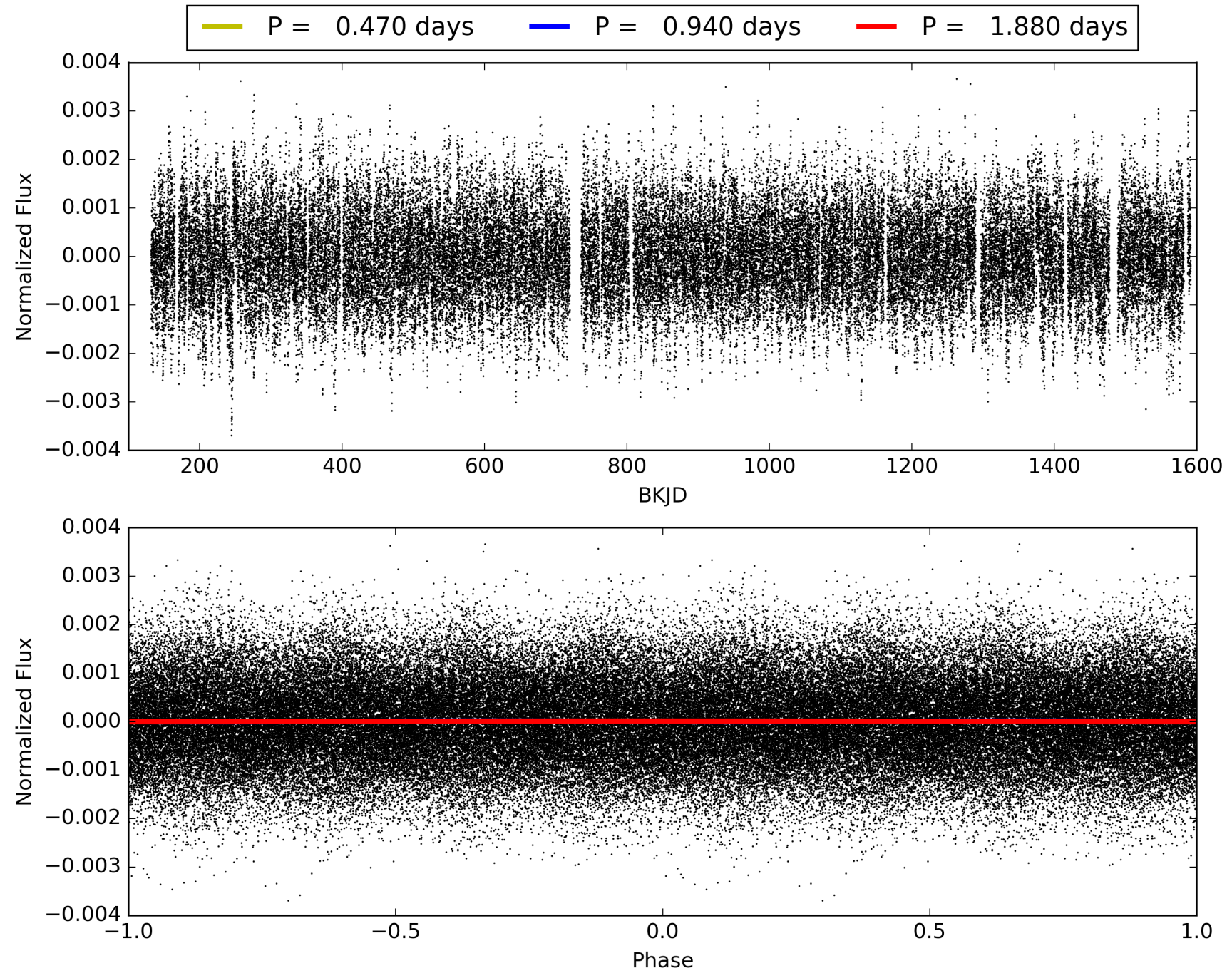
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

# TCE 002988783-01, PDC Light Curves





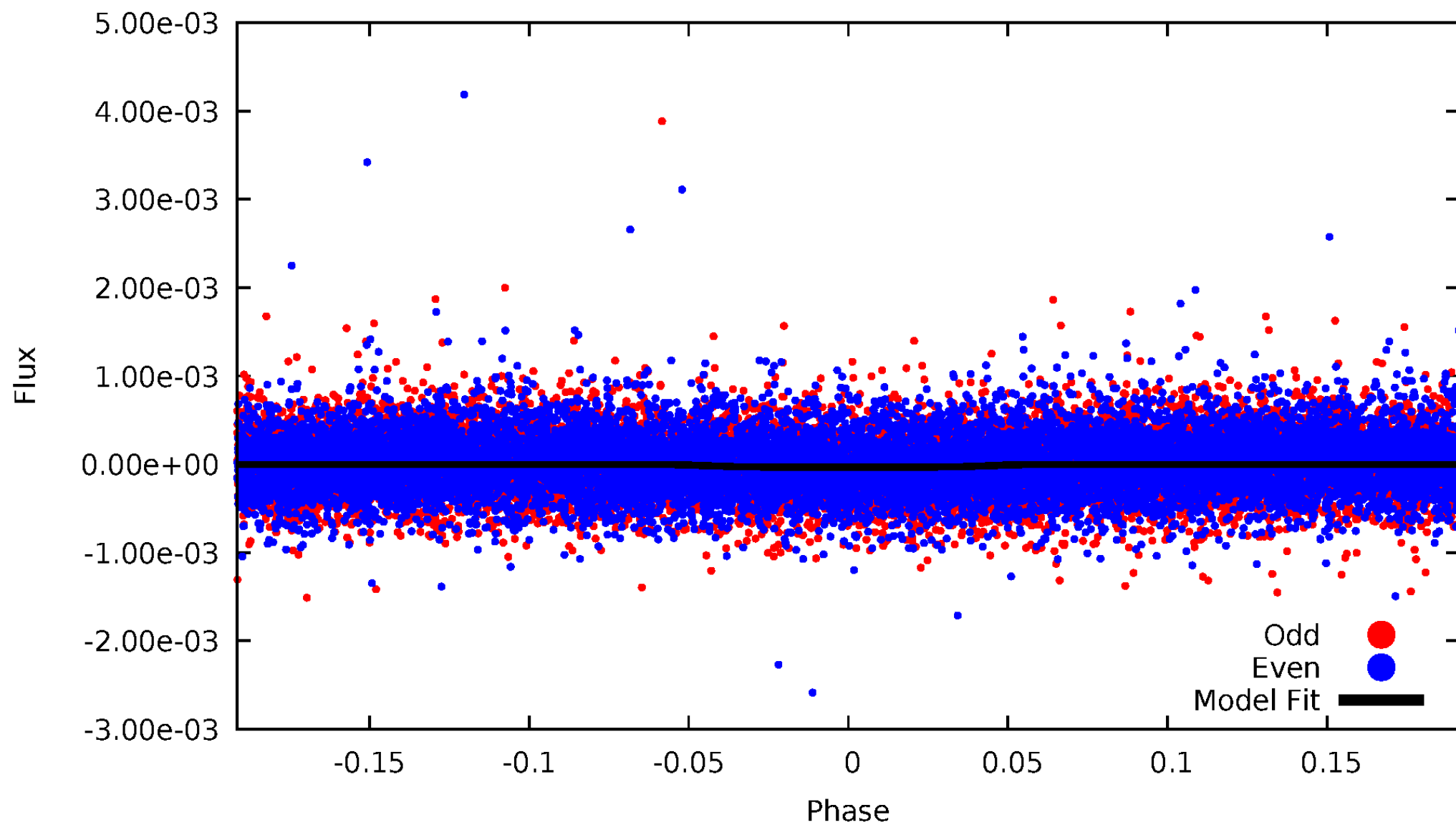
TCE 002988783-01





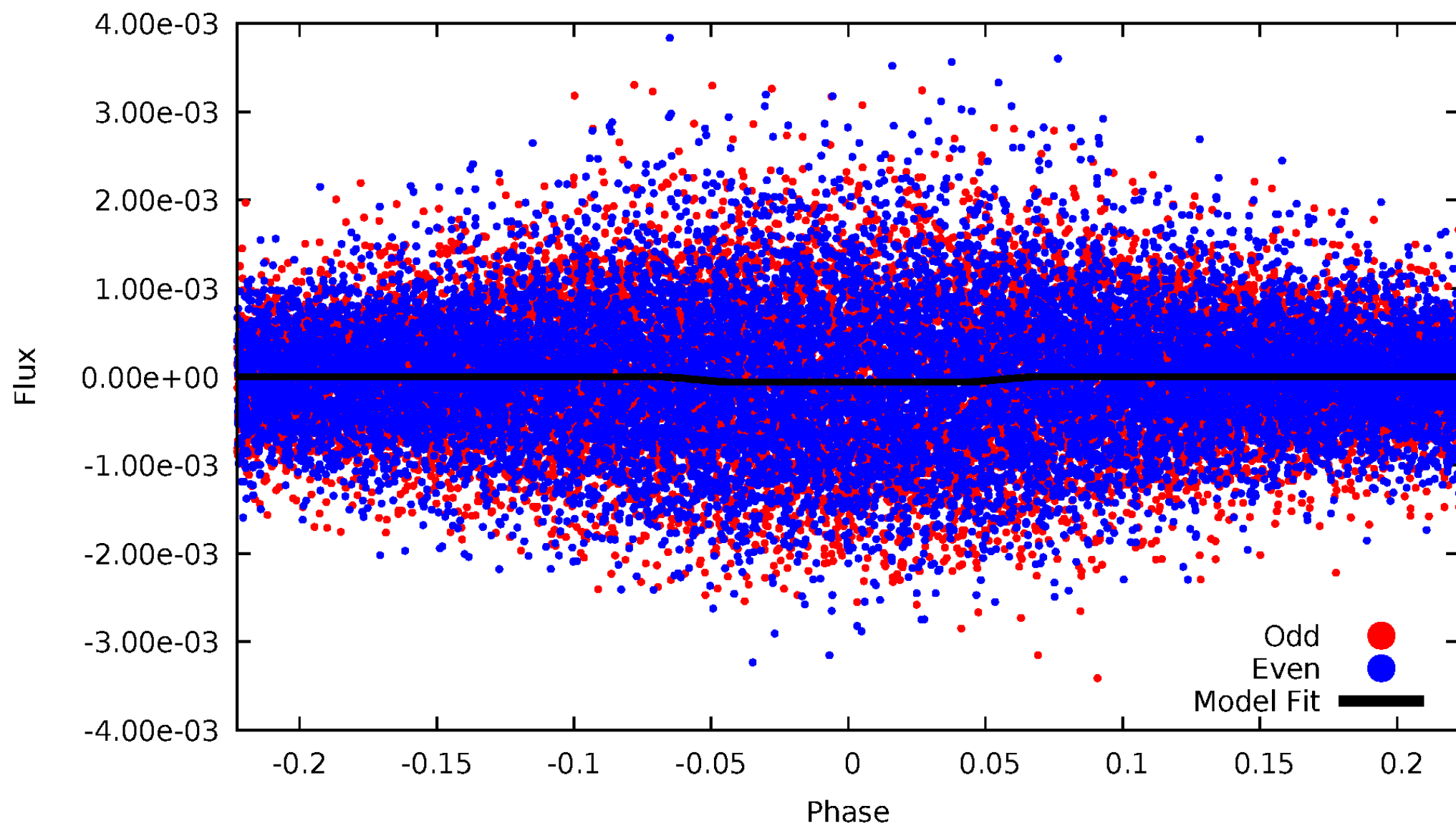
# DV Odd/Even

TCE 002988783-01

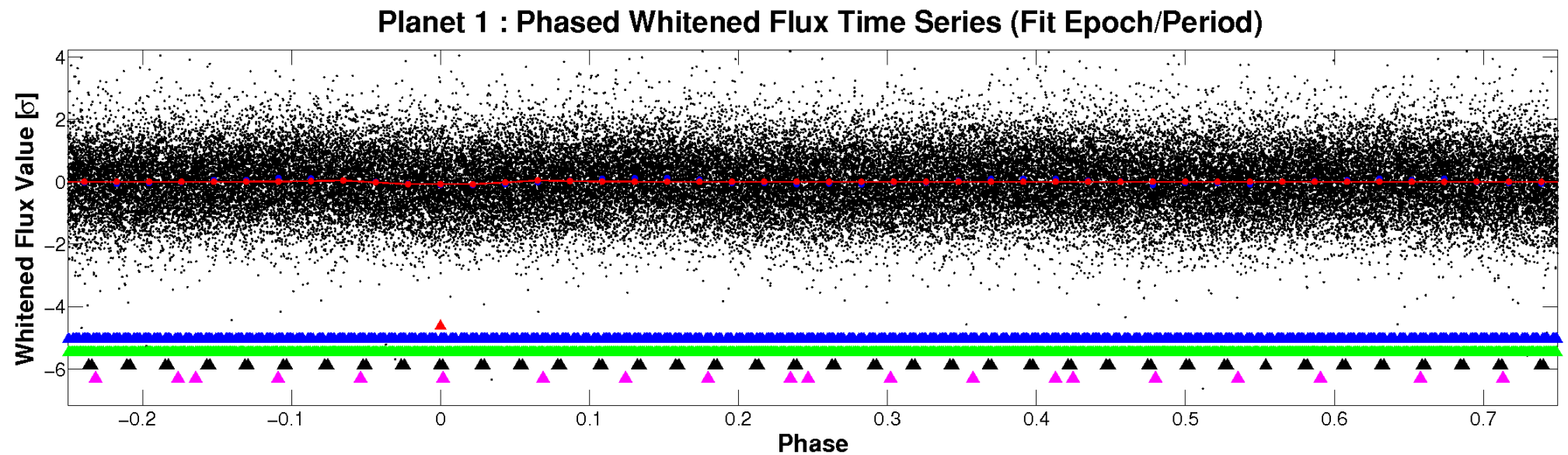
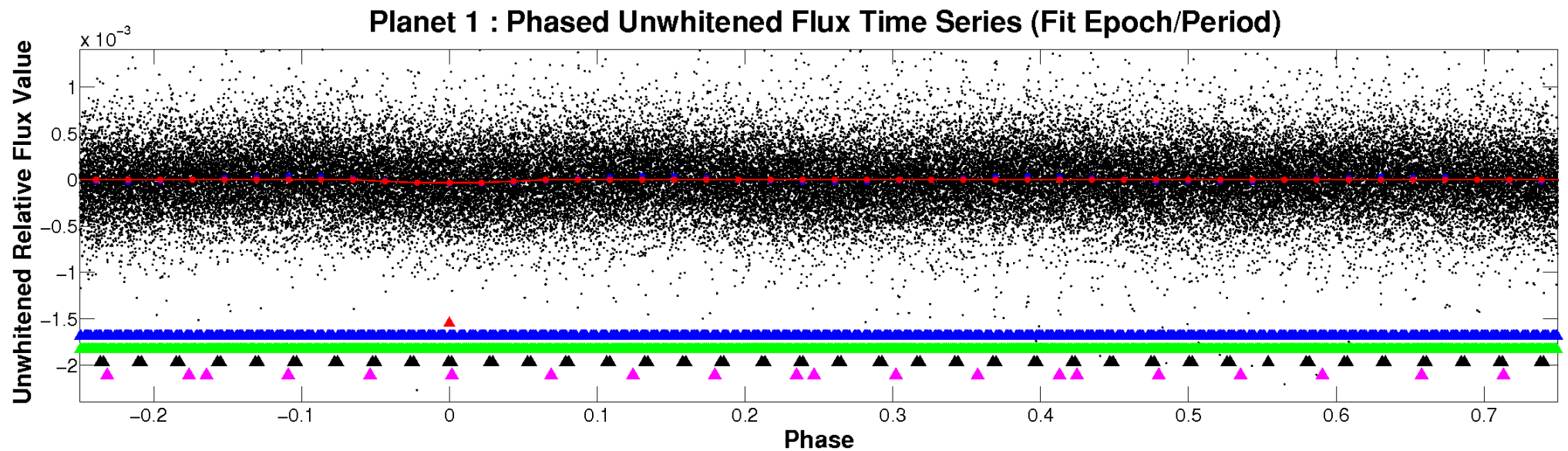


# ALT Odd/Even

TCE 002988783-01



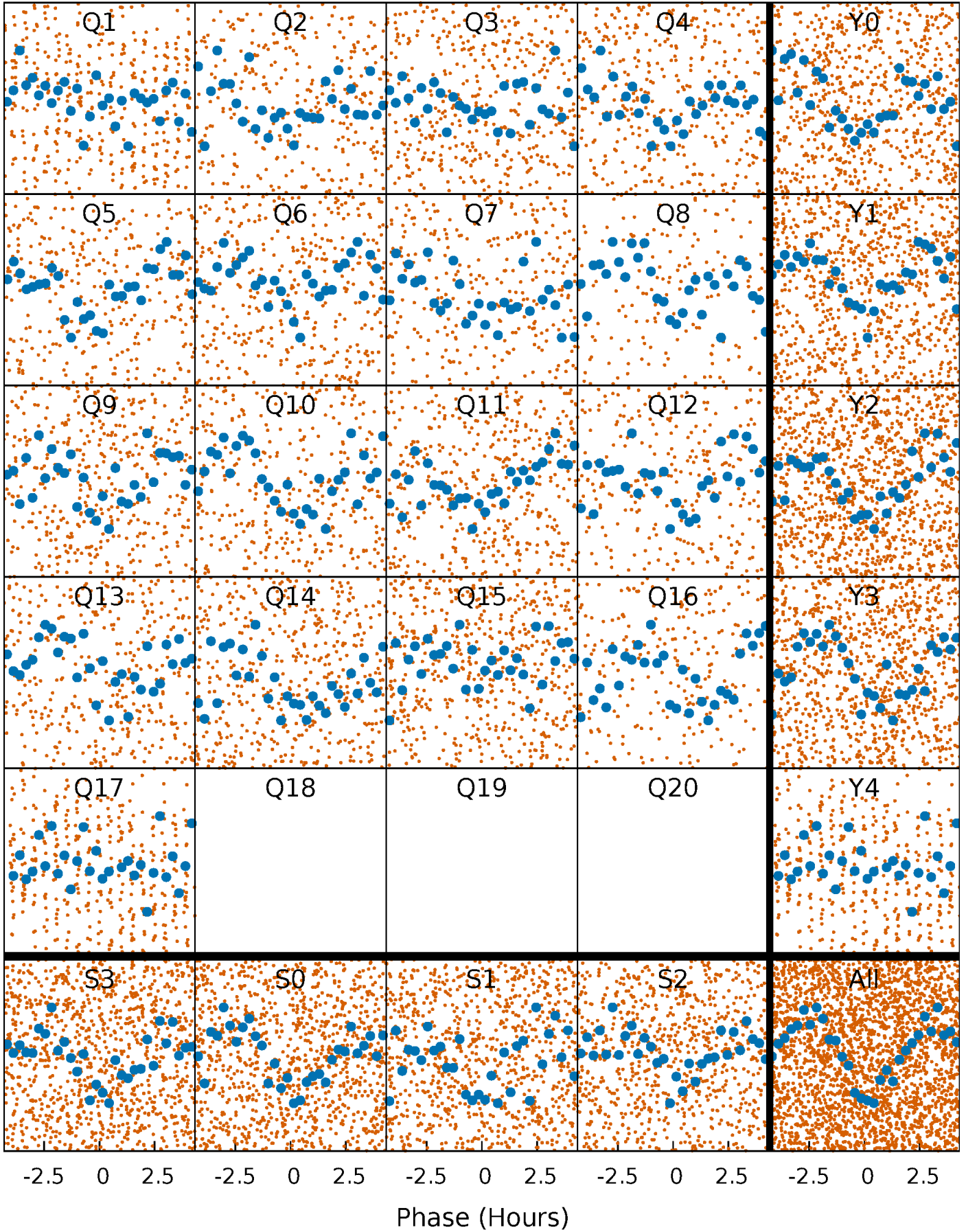
# Non-Whitened Vs. Whitened Light Curve





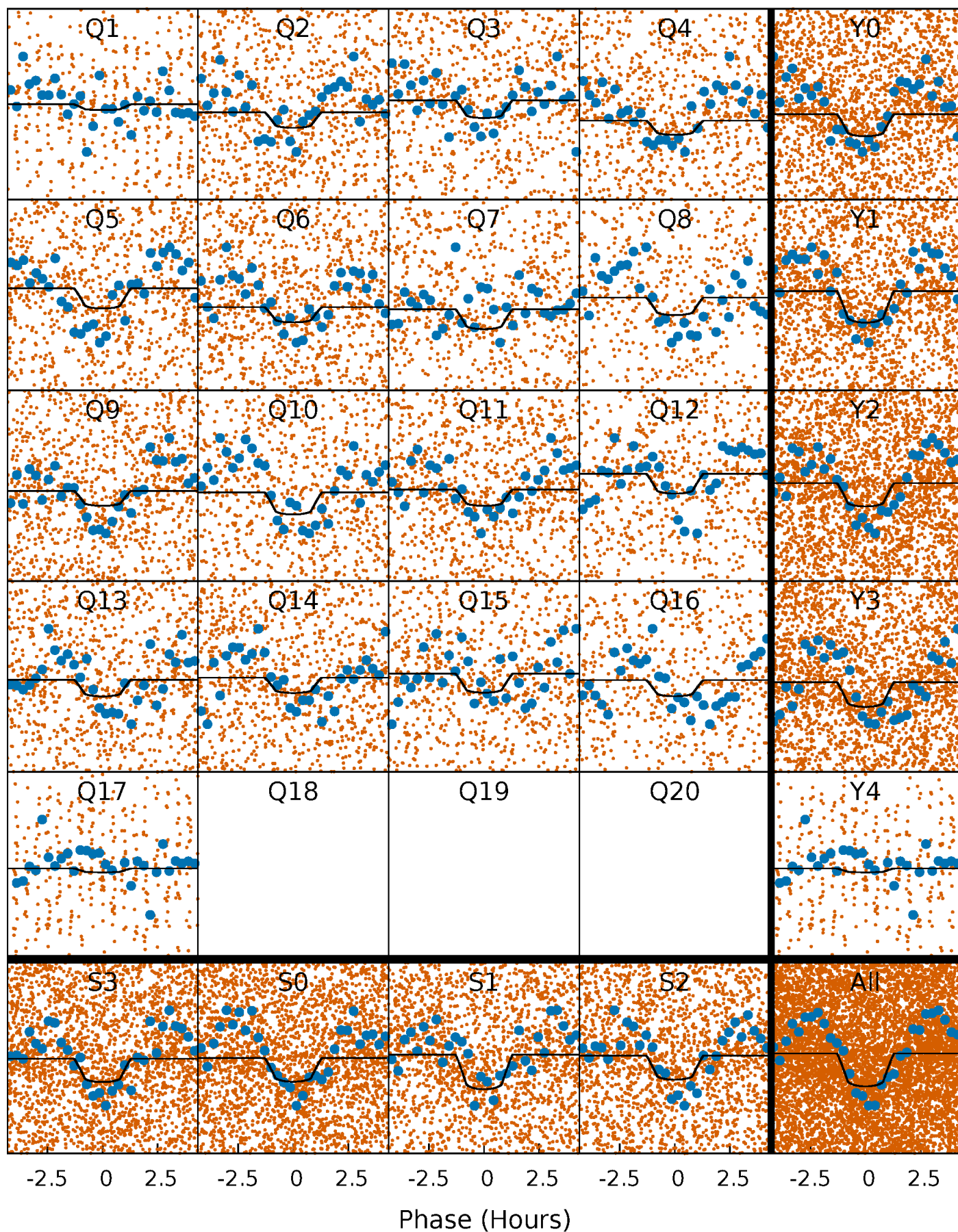
# PDC Quarter-Phased Transit Curves

TCE 002988783-01   P= 0.940229 Days    $T_0=132.078038$  (BKJD)



# DV Quarter-Phased Transit Curves

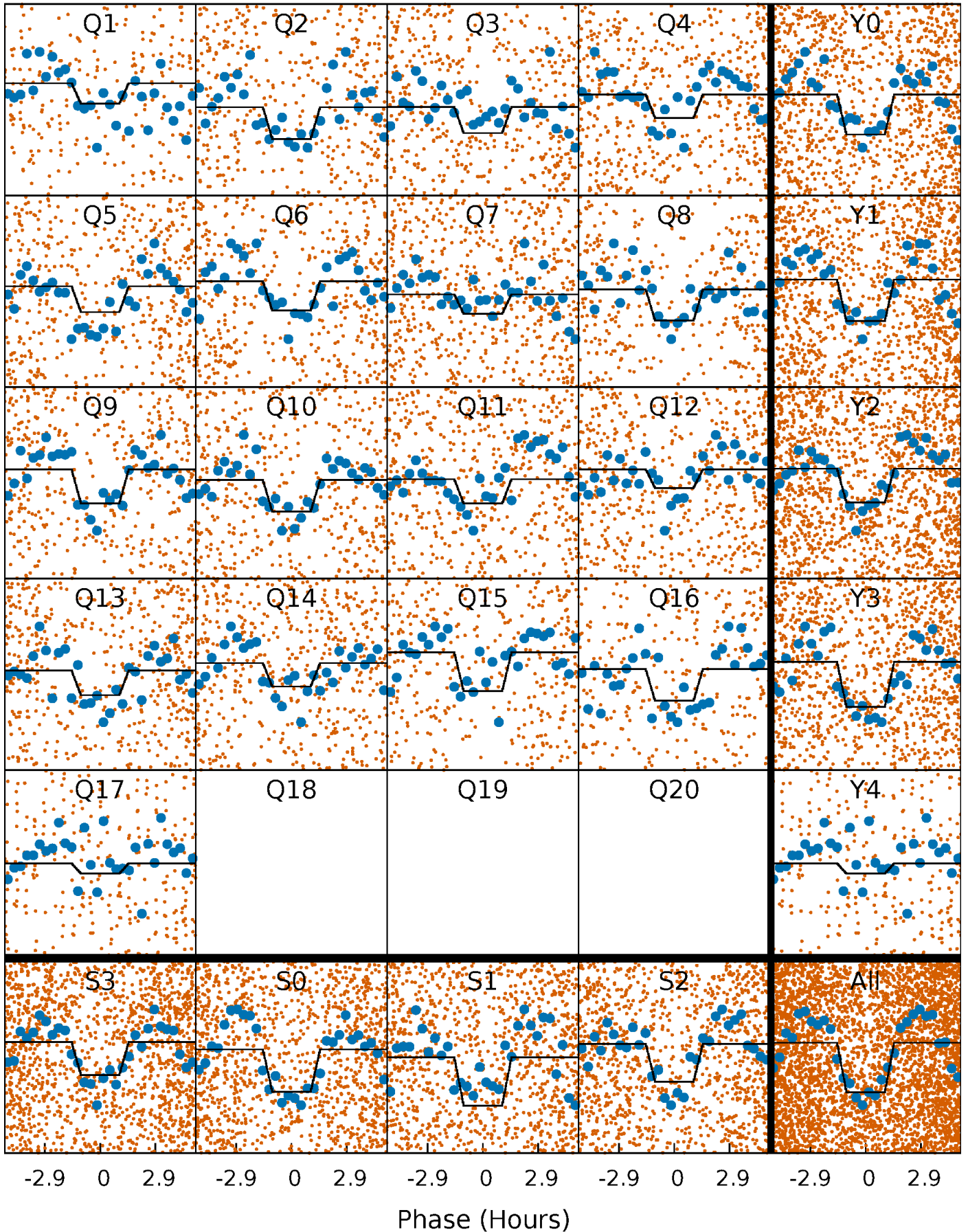
TCE 002988783-01 P= 0.940229 Days  $T_0=132.078038$  (BKJD)





# Alt. Detrend Quarter-Phased Transit Curves

TCE 002988783-01 P= 0.940262 Days  $T_0=132.067171$  (BKJD)

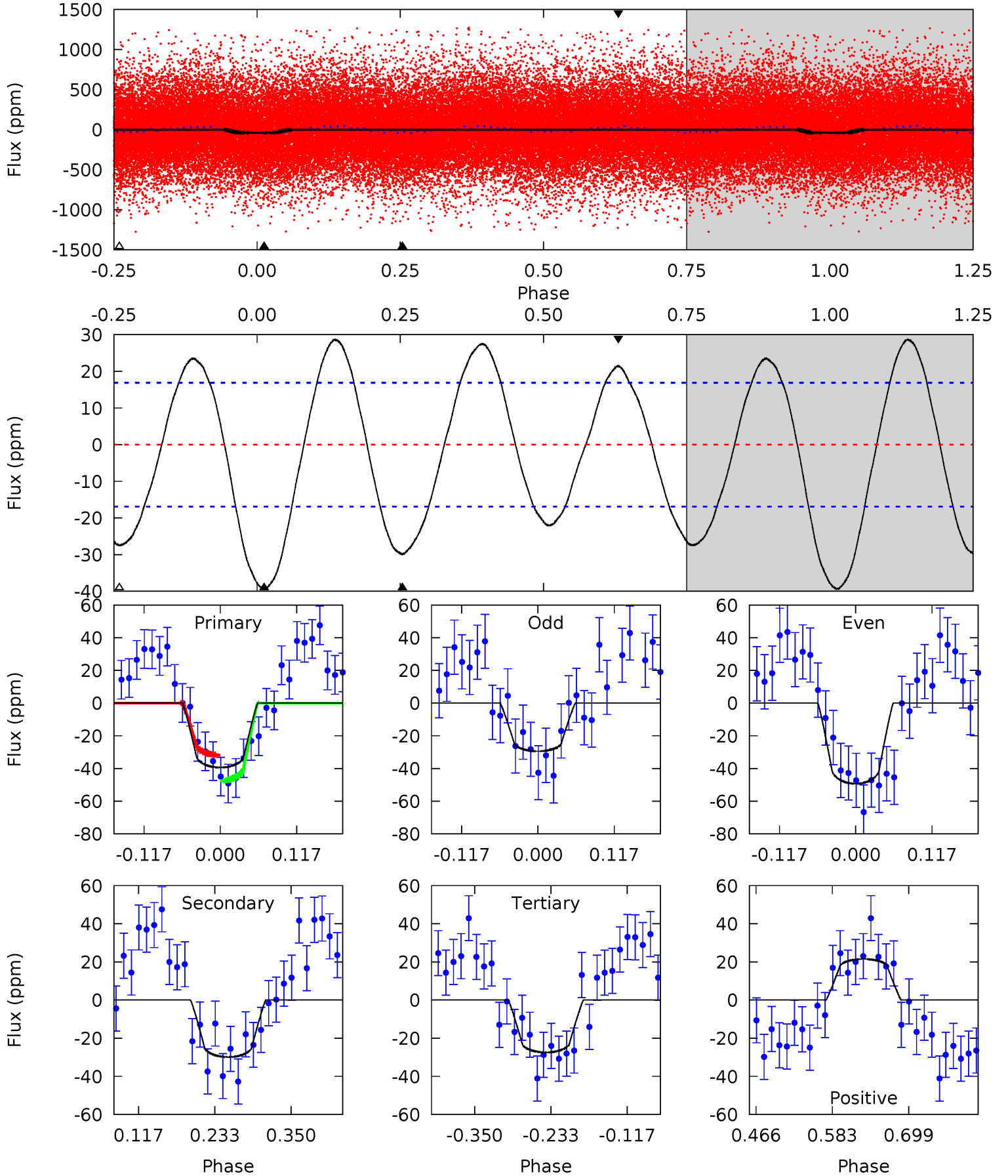




# DV Model-Shift Uniqueness Test

002988783-01, P = 0.940229 Days, E = 131.137809 Days

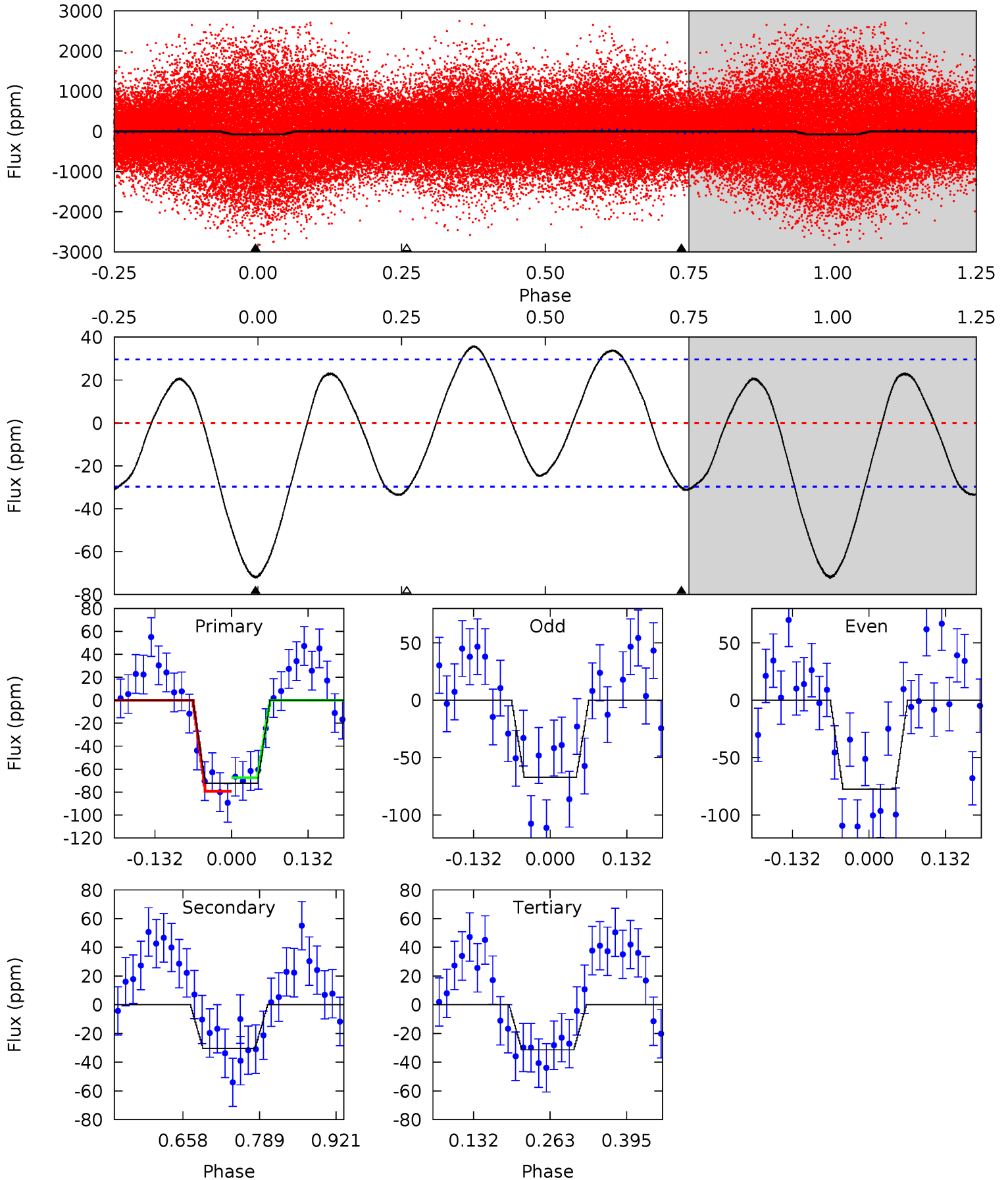
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
10.6	8.01	7.36	5.76	4.53	1.57	4.77	3.21	4.81	0.65	2.26	2.67	0.92	0.42	2.14



# Alt Model-Shift Uniqueness Test

002988783-01, P = 0.940262 Days, E = 131.126909 Days

Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
11.0	4.61	4.75	0	4.51	1.51	3.24	6.23	11.0	-0.14	4.61	0.79	0.58	0.33	0.94



### Stellar Parameters For KIC 002988783

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$7384^{+207}_{-337}$	$4.090^{+0.144}_{-0.176}$	$0.000^{+0.200}_{-0.350}$	$1.898^{+0.540}_{-0.393}$	$1.617^{+0.213}_{-0.260}$	$0.333^{+0.246}_{-0.163}$
	+3%/-5%	+4%/-4%	+inf%/-inf%	+28%/-21%	+13%/-16%	+74%/-49%
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 002988783-01 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$-30 \pm 4$	$1.23^{+0.60}_{-0.52}$	$4231^{+309}_{-313}$	$6884^{+2966}_{-1279}$	$5.240^{+11.045}_{-2.914}$
Alt.	$-30 \pm 7$	$1.62^{+0.59}_{-0.55}$	$4206^{+306}_{-273}$	$5949^{+1553}_{-924}$	$3.064^{+4.033}_{-1.520}$

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



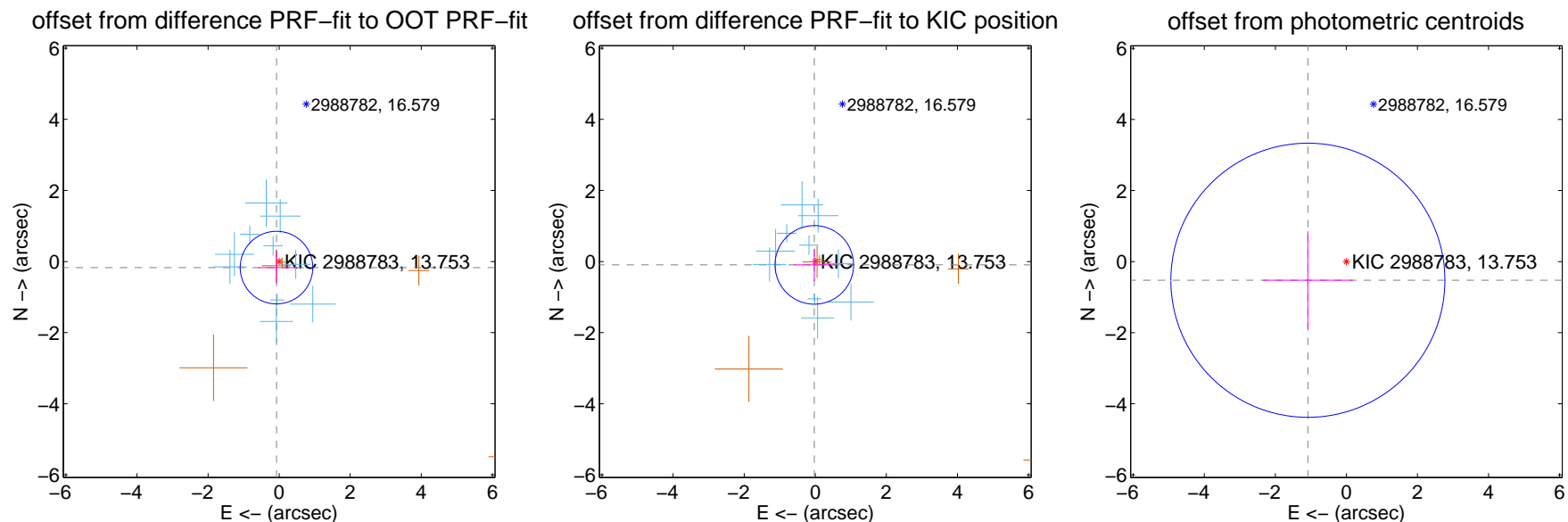
## DV Centroid Data

Supplemental centroid analysis for 002988783-01. Kepler magnitude: 13.75. Transit SNR 5.86

There are 10 quarters with good PRF difference image offsets

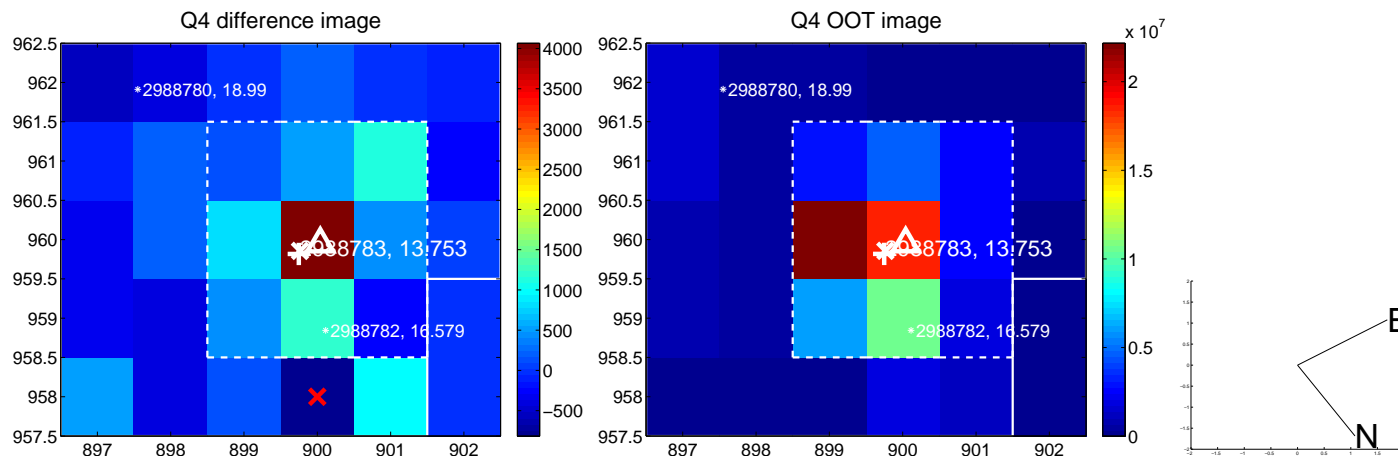
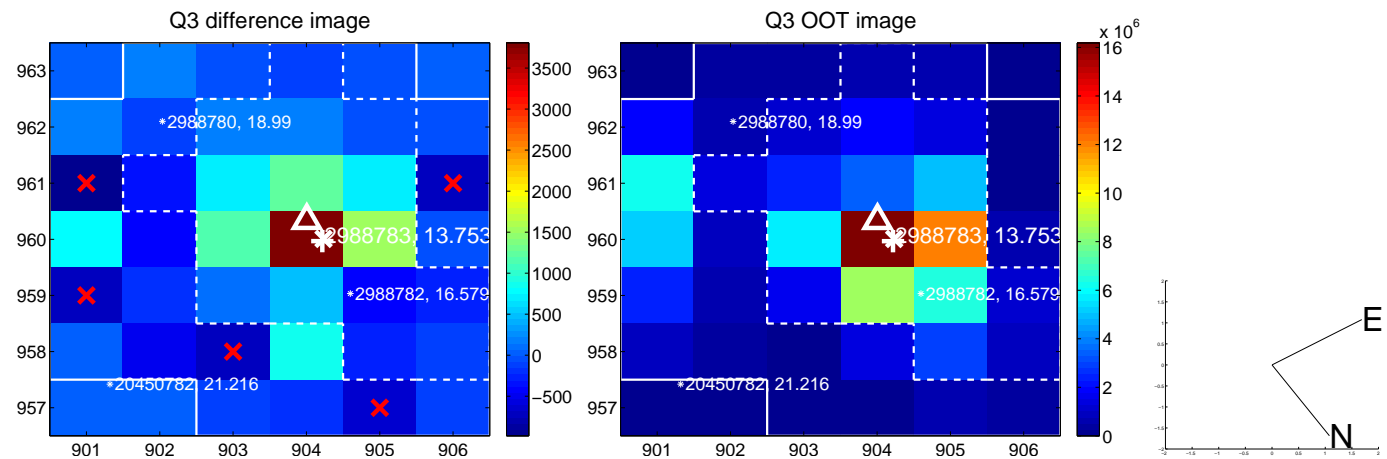
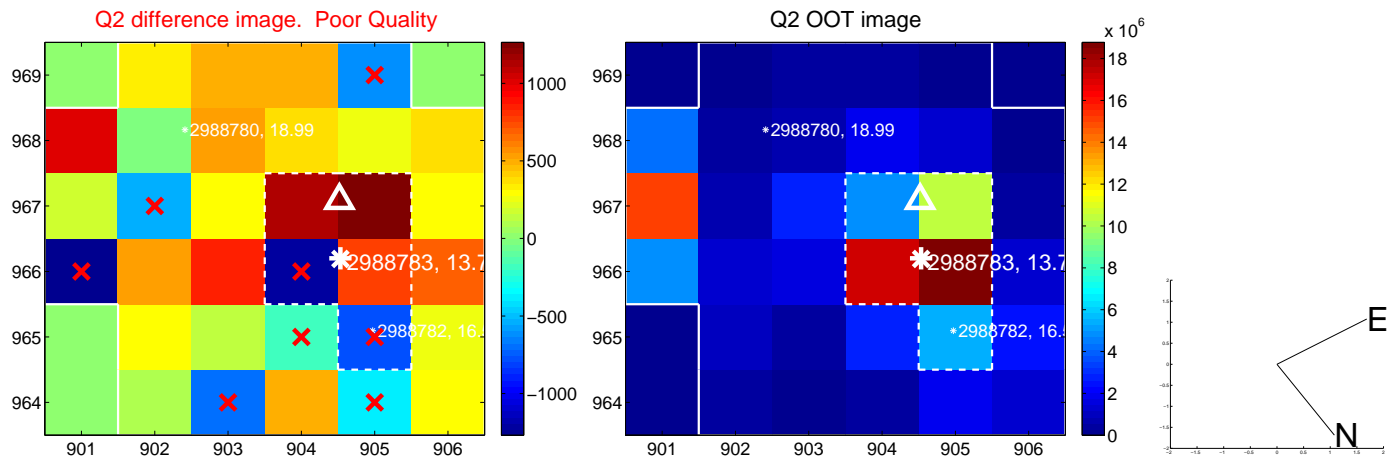
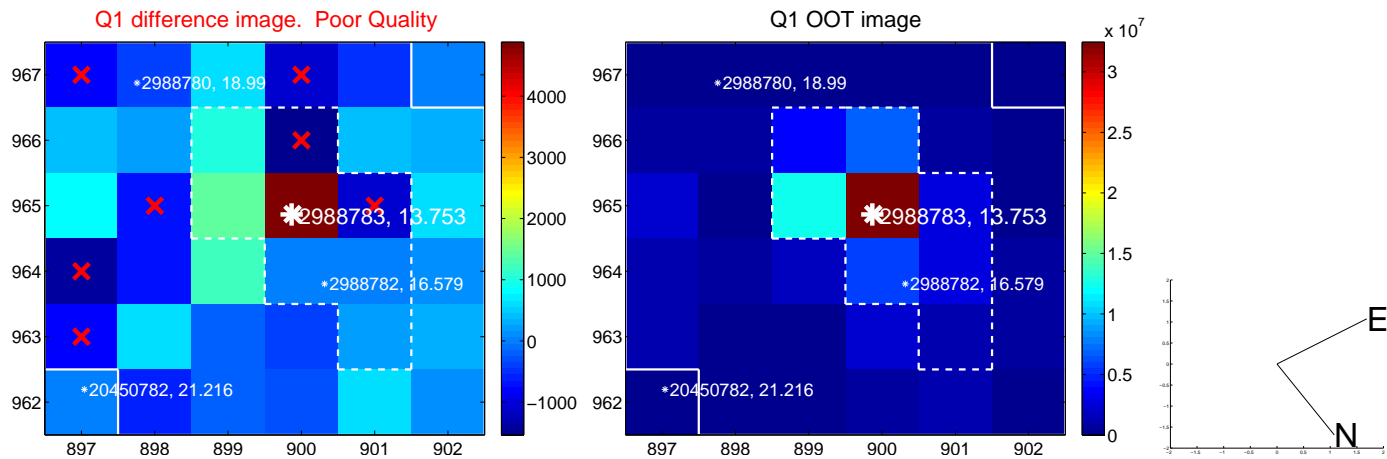
The direct PRF centroid is offset from the target star catalog position by about 0.08 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.186 \pm 0.340$	0.55	$0.075 \pm 0.521$	$-0.170 \pm 0.439$
PRF-fit source offset from KIC position	$0.098 \pm 0.368$	0.27	$0.027 \pm 0.582$	$-0.094 \pm 0.456$
photometric centroid source offset	$1.21 \pm 1.29$	0.94	$1.09 \pm 1.26$	$-0.52 \pm 1.38$

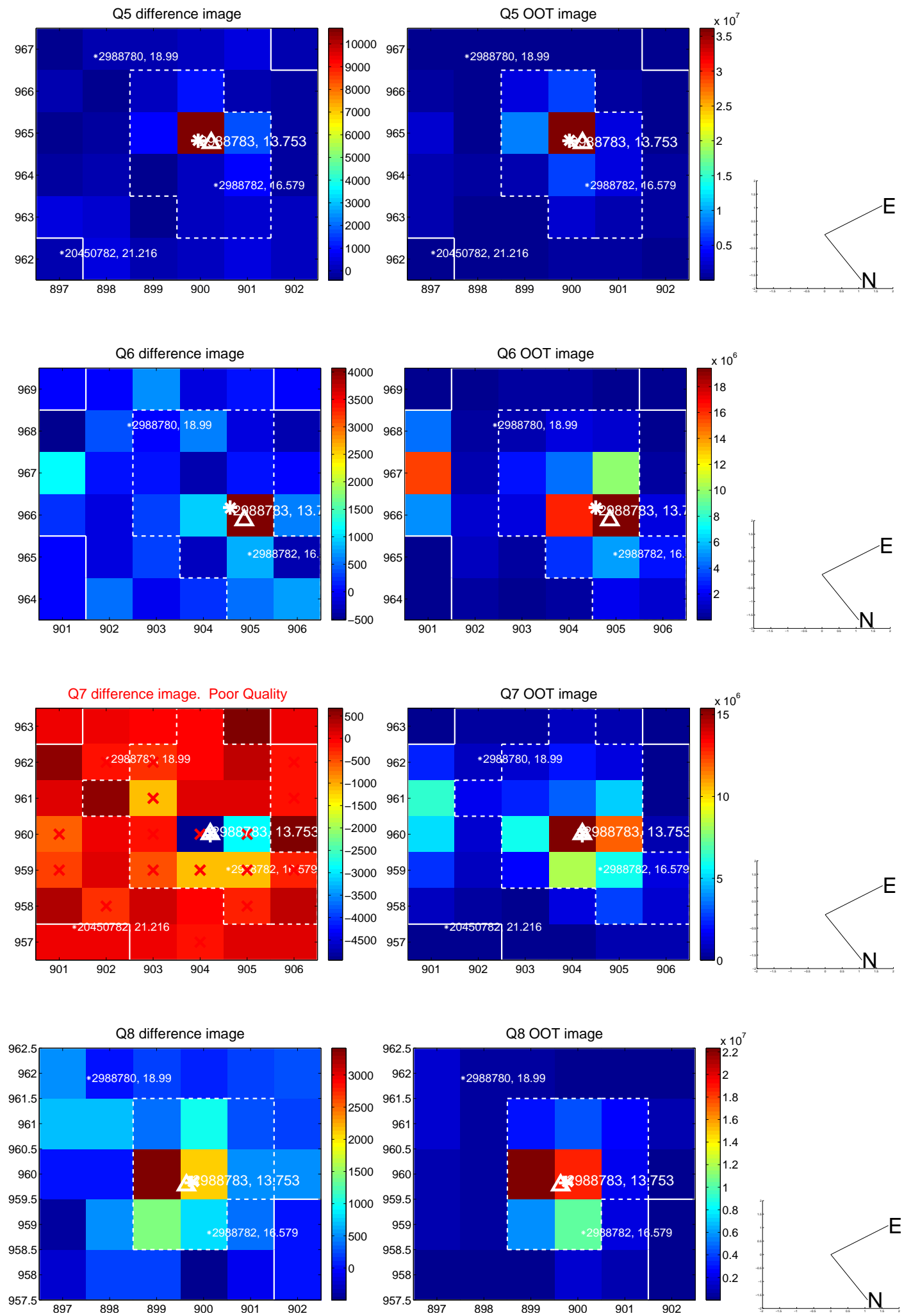


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets**; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

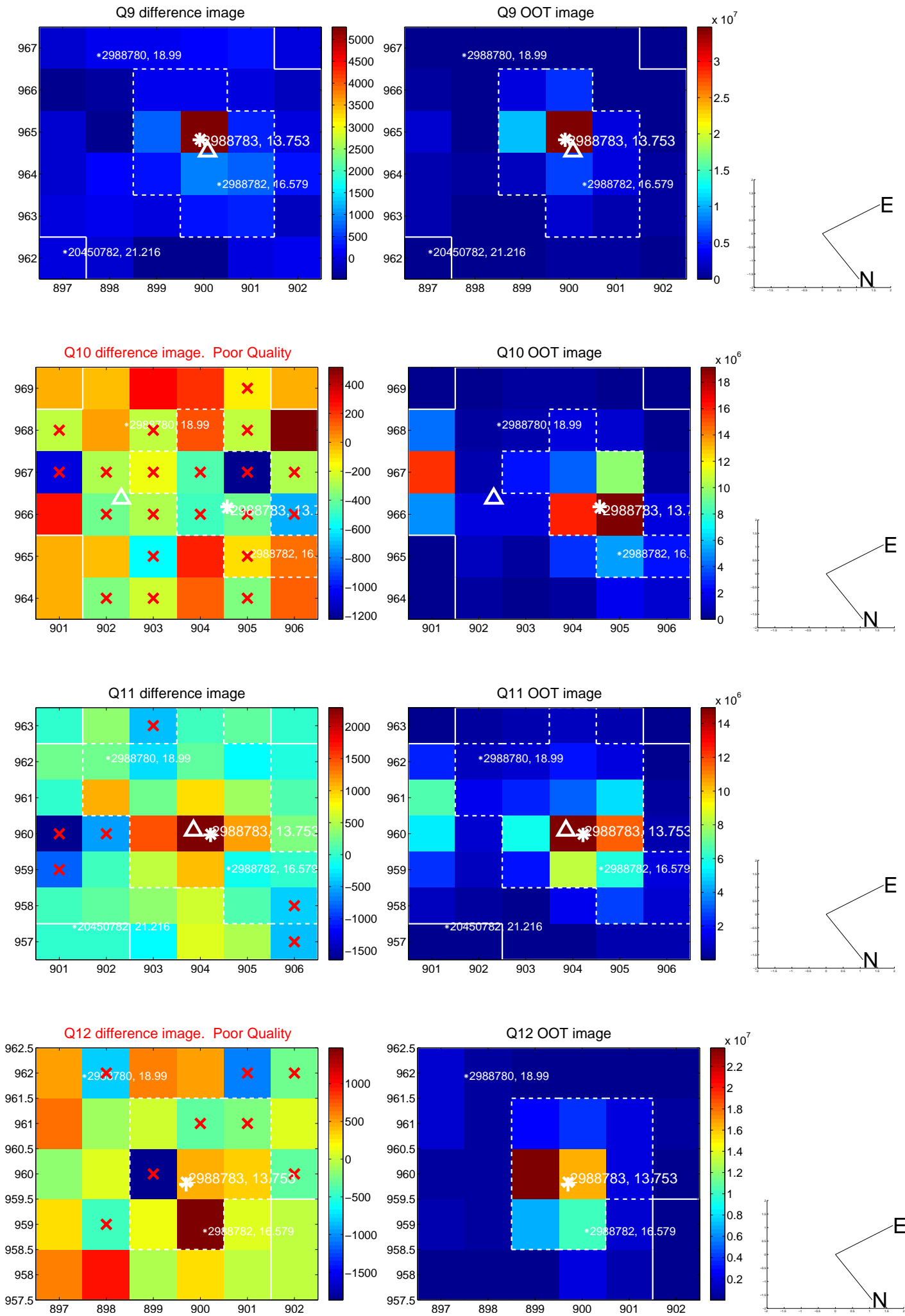


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

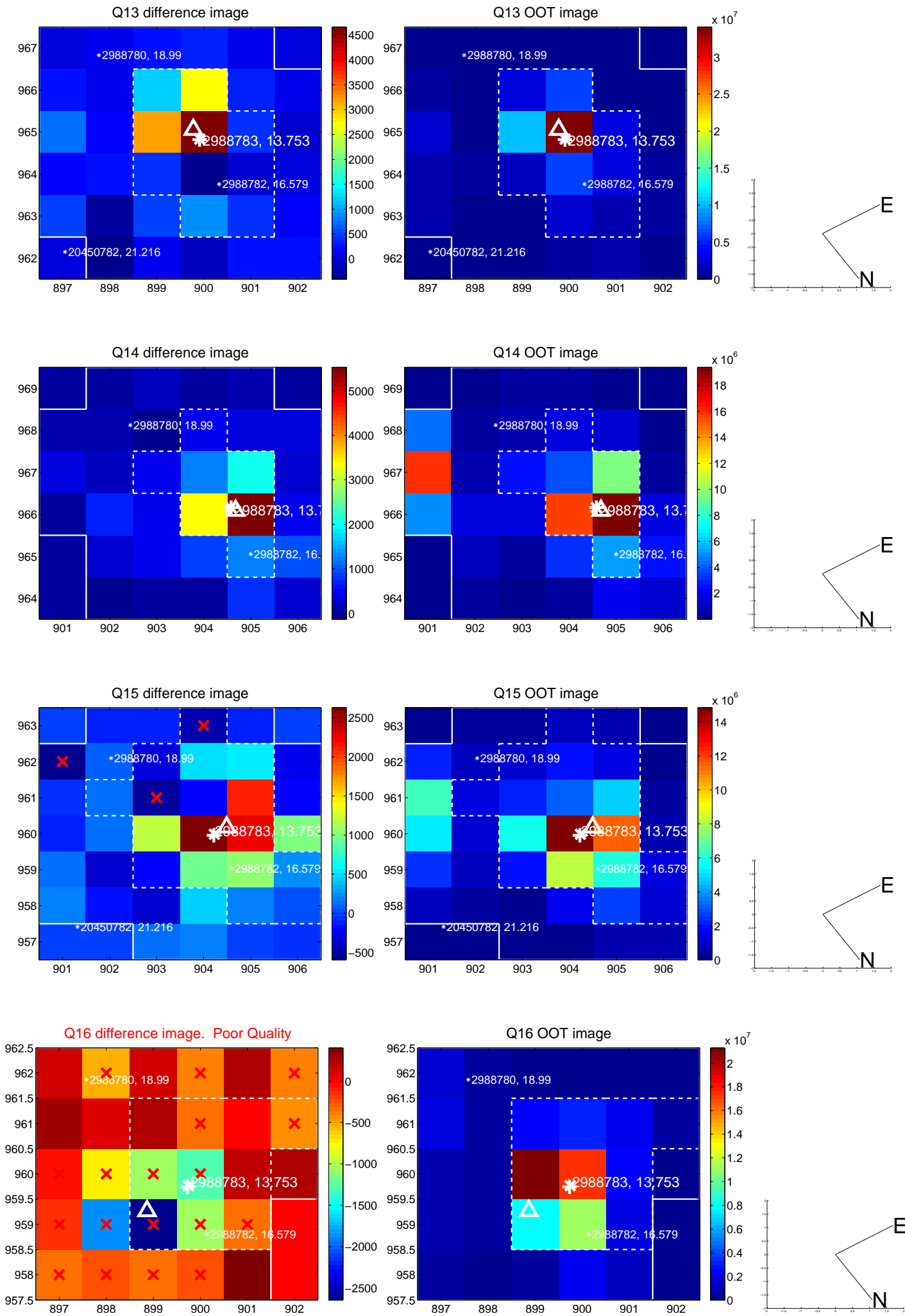




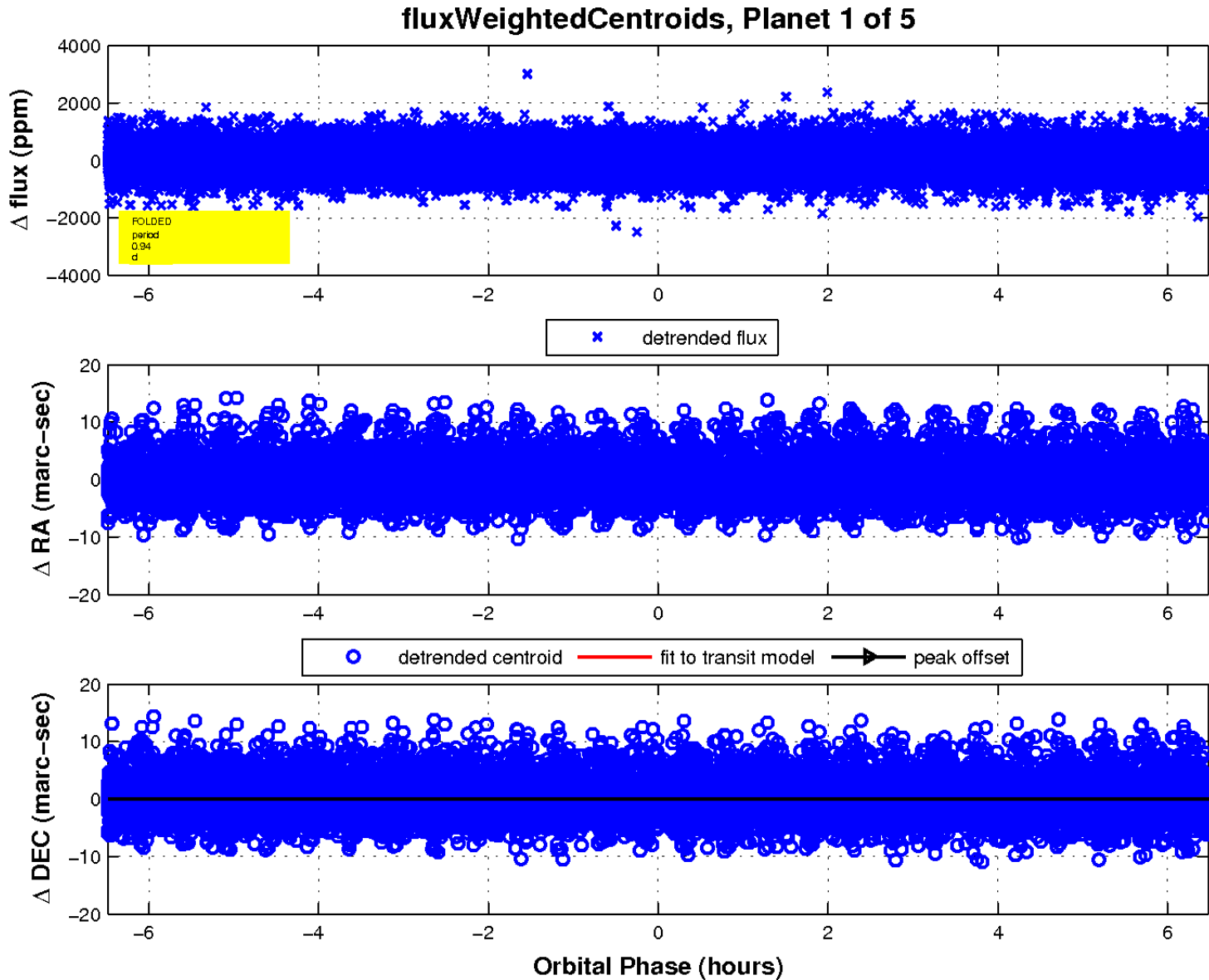
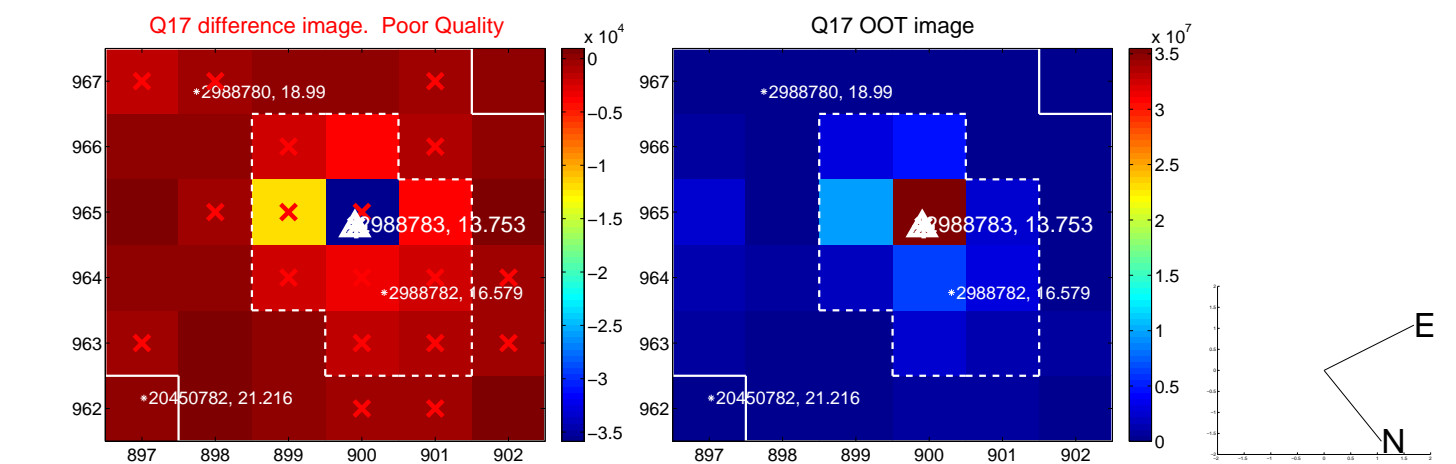
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

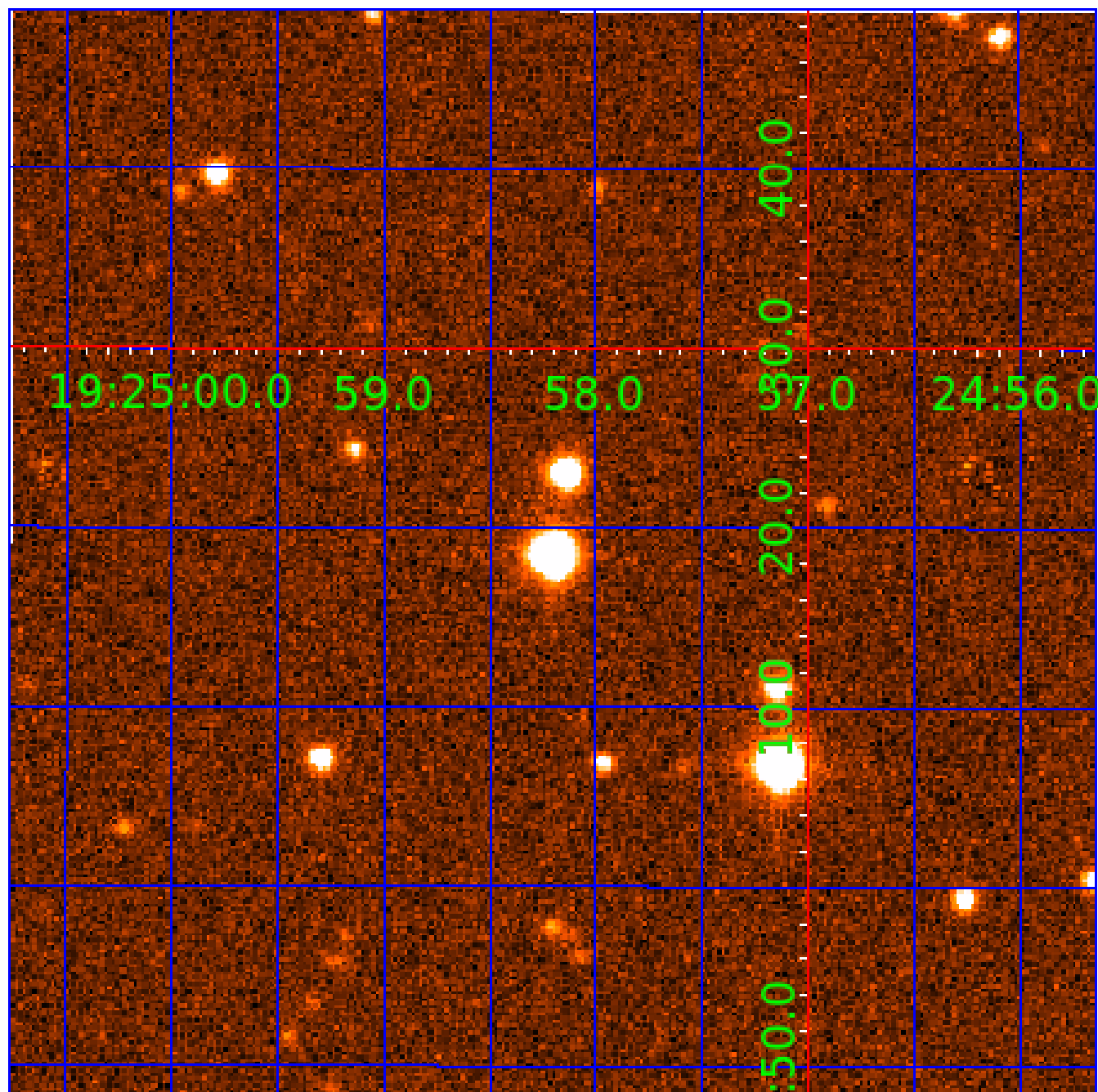


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination





# KIC 002988783

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
002988783-01	OBS	No	0.940229	132.078038	32.5	2.161	9.9	5.9	1.90	7384	1.25	19736.98
002988783-02	OBS	No	1.281548	131.987349	62.0	3.639	8.2	7.3	1.90	7384	2.05	13060.06
002988783-03	OBS	No	1.281660	131.603727	54.9	1.544	9.5	7.1	1.90	7384	1.63	13058.54
002988783-04	OBS	No	19.571654	135.244437	308.9	5.252	7.5	7.3	1.90	7384	6.31	344.69
002988783-05	OBS	No	70.903647	191.711667	275.0	6.000	7.2	-1.0	1.90	7384	3.19	61.95

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
002988783-01	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT
002988783-02	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT
002988783-03	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—SAME_NTL_PERIOD
002988783-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_SKYE_ZUMA—TRANS_GAPPED—LPP_ALT—MOD_NONUNIQ_ALT—MOD_TER_ALT
002988783-05	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—MOD_NONUNIQ_ALT—CENT_NOFITS

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

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

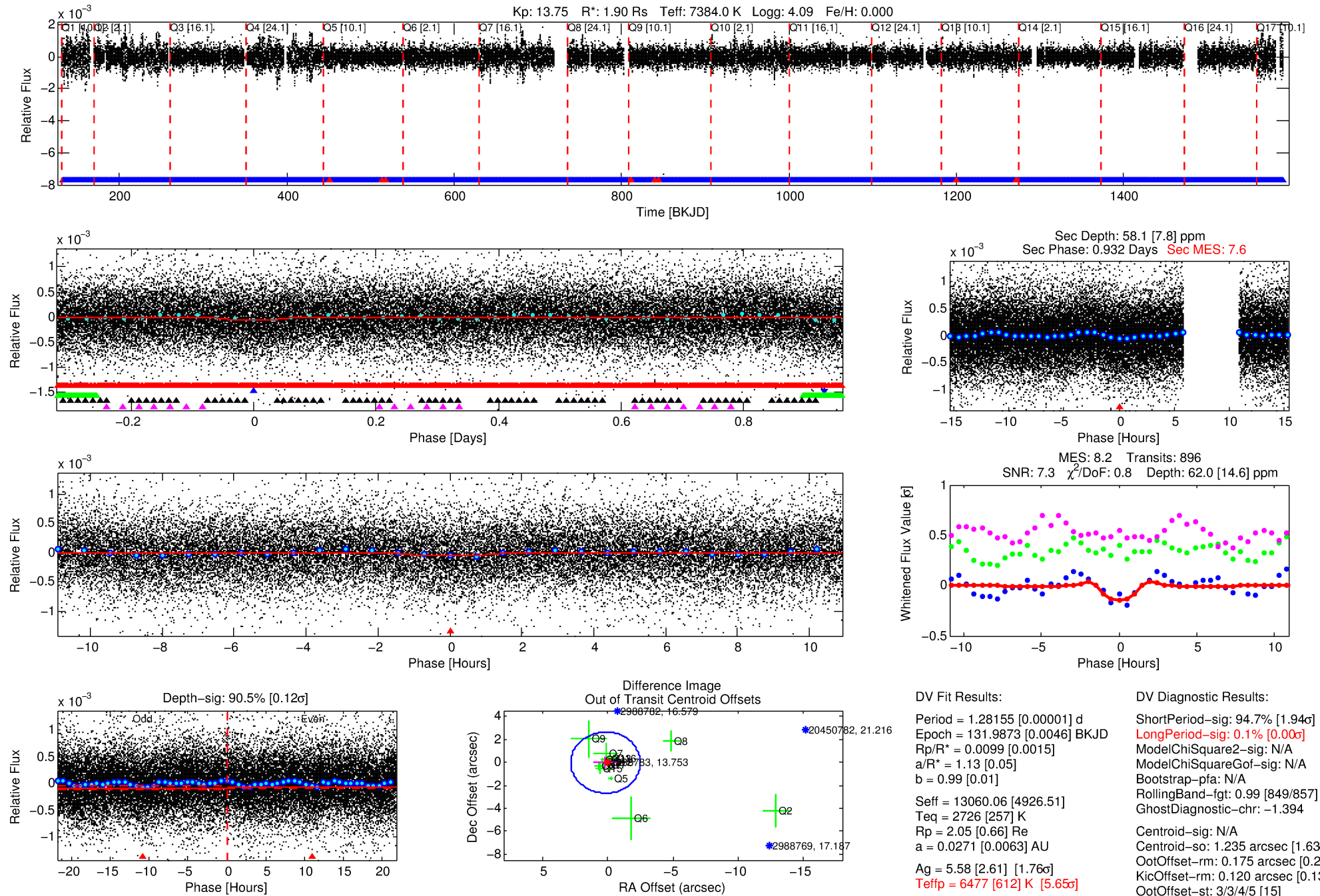
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 002988783-02

No Significant Match Found

# DV One-Page Summary

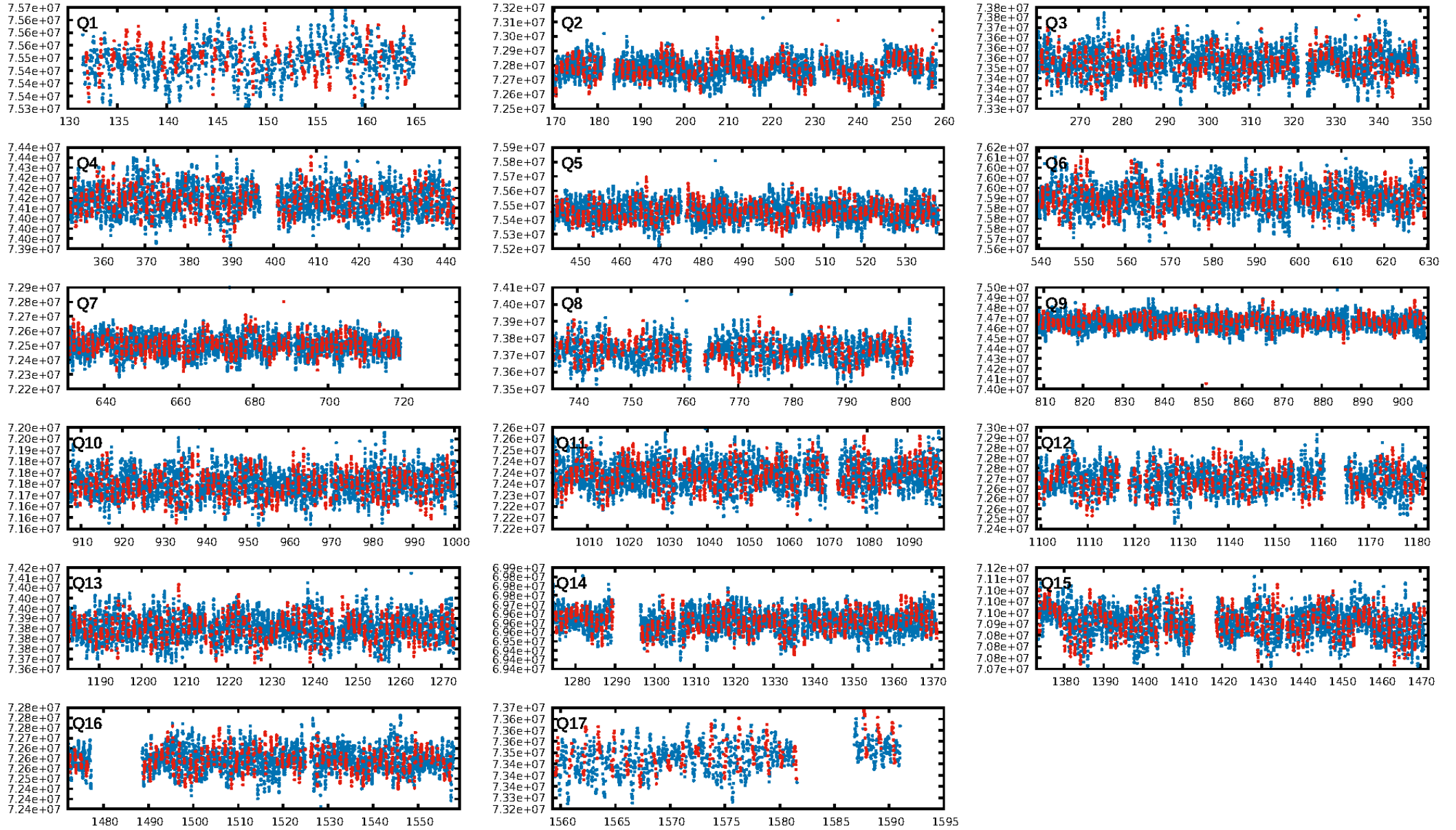
KIC: 2988783 Candidate: 2 of 5 Period: 1.282 d



Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 03-Feb-2016 08:45:34 Z

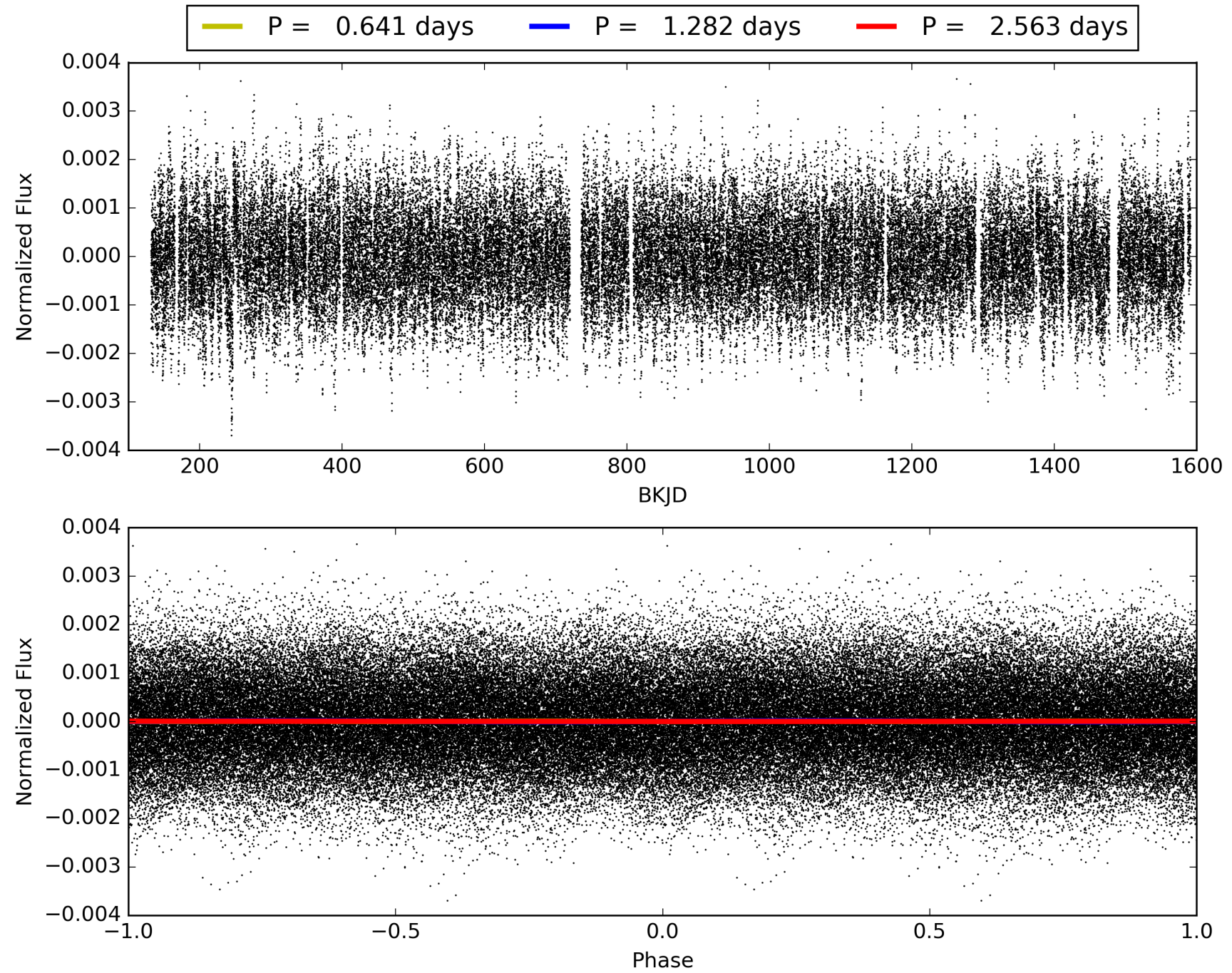
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

# TCE 002988783-02, PDC Light Curves





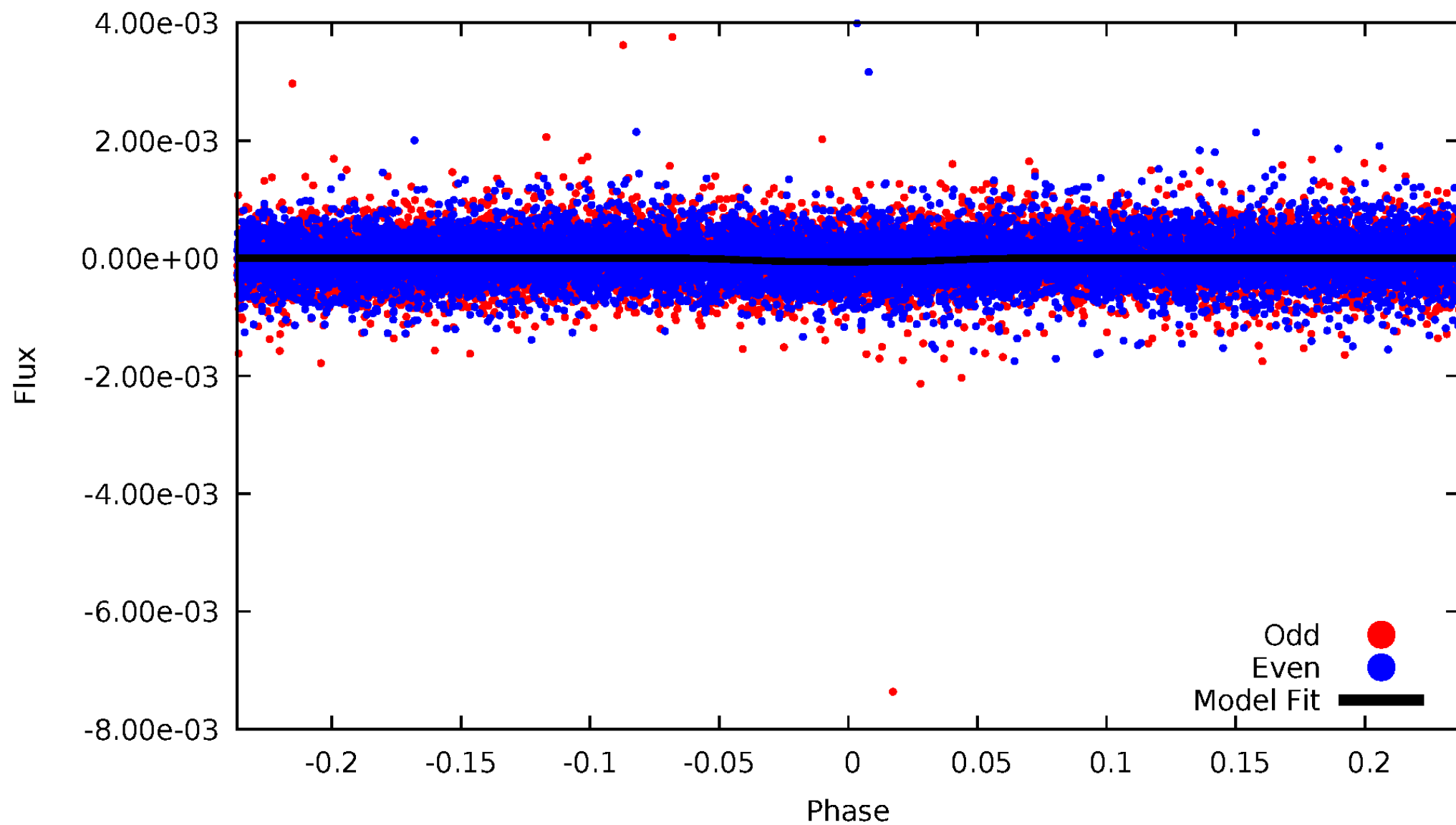
# TCE 002988783-02





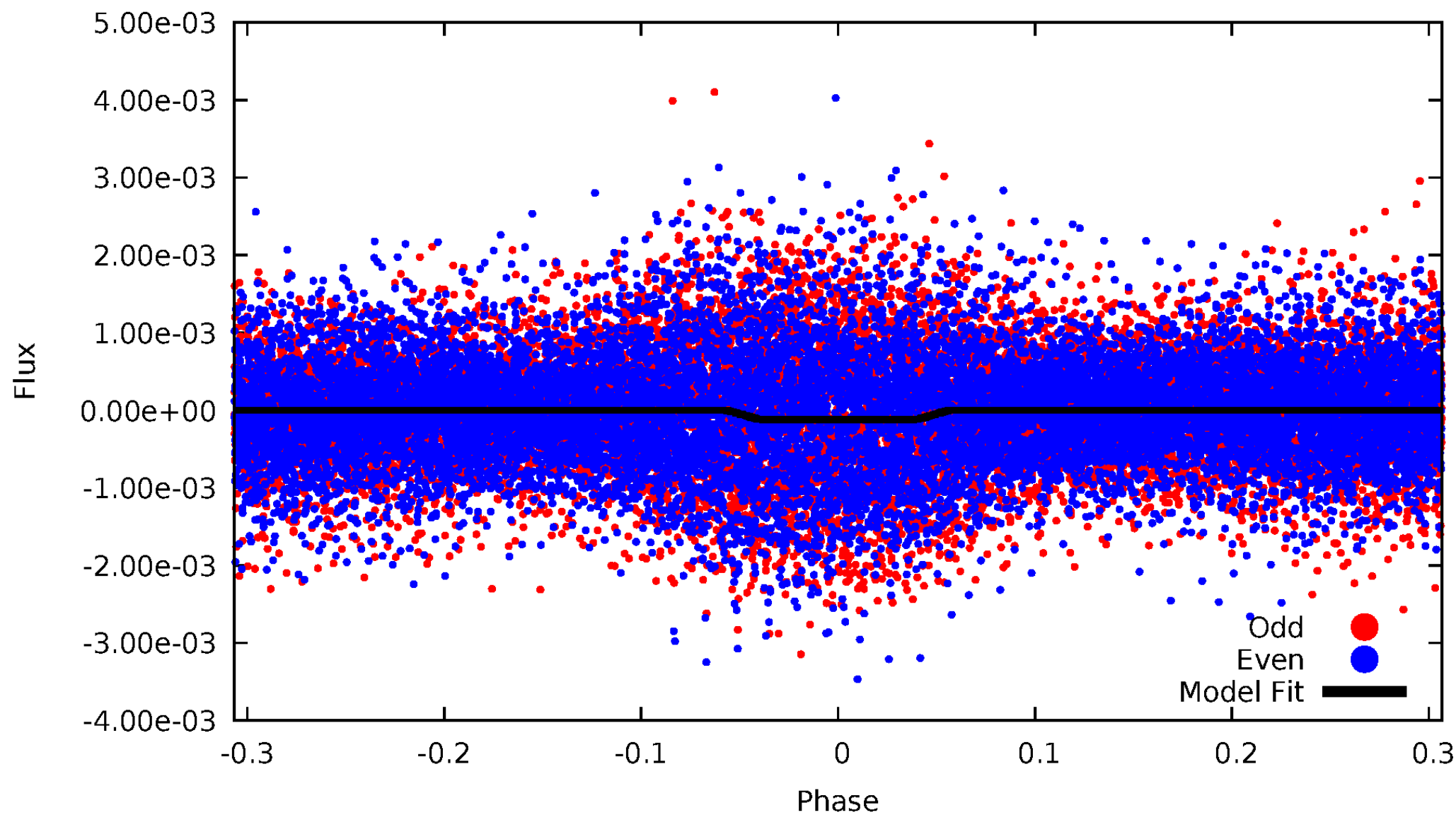
# DV Odd/Even

TCE 002988783-02



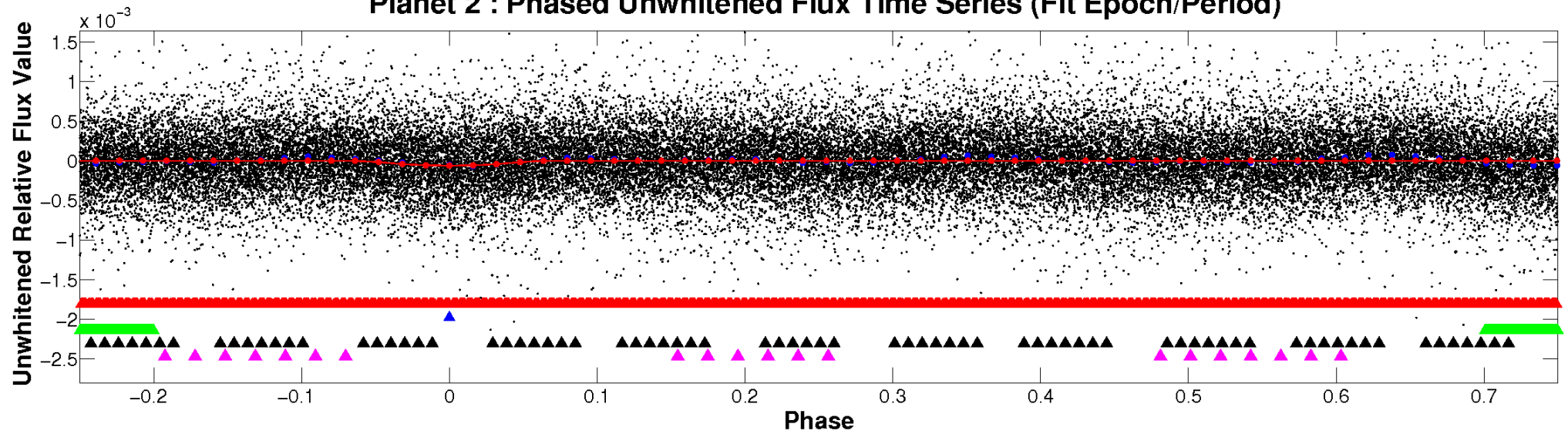
# ALT Odd/Even

TCE 002988783-02

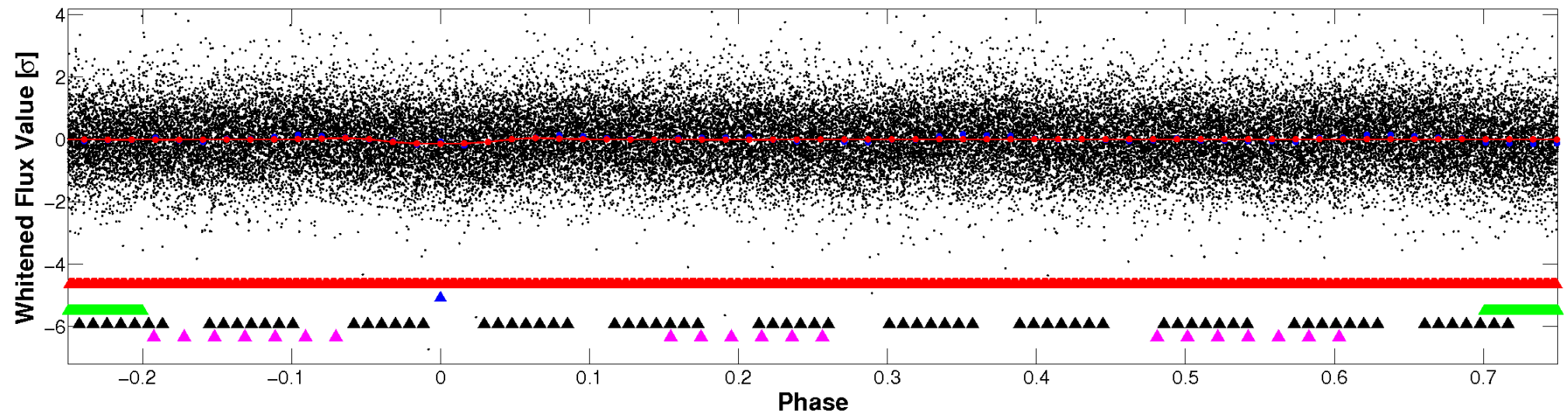


# Non-Whitened Vs. Whitened Light Curve

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

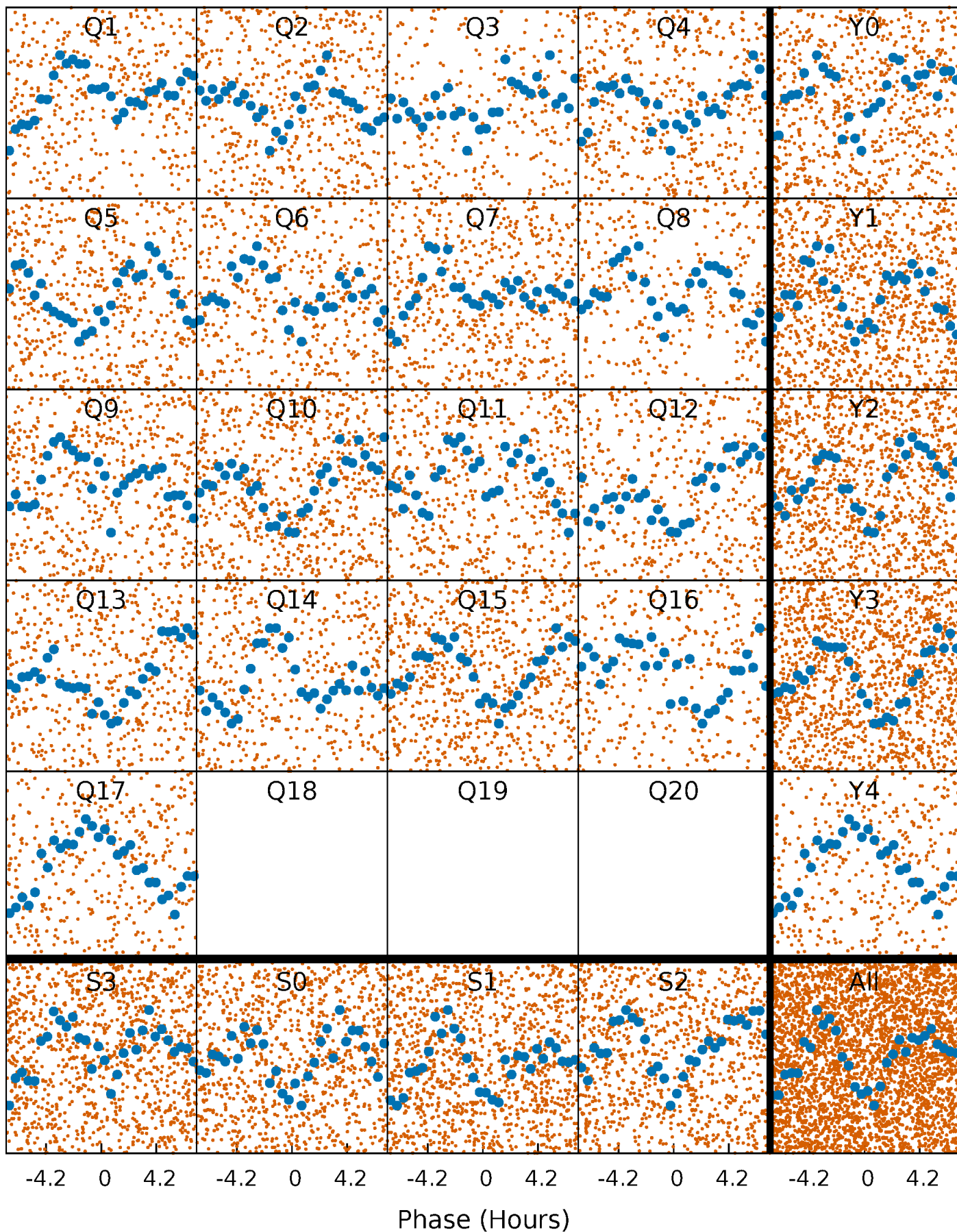


## Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



# PDC Quarter-Phased Transit Curves

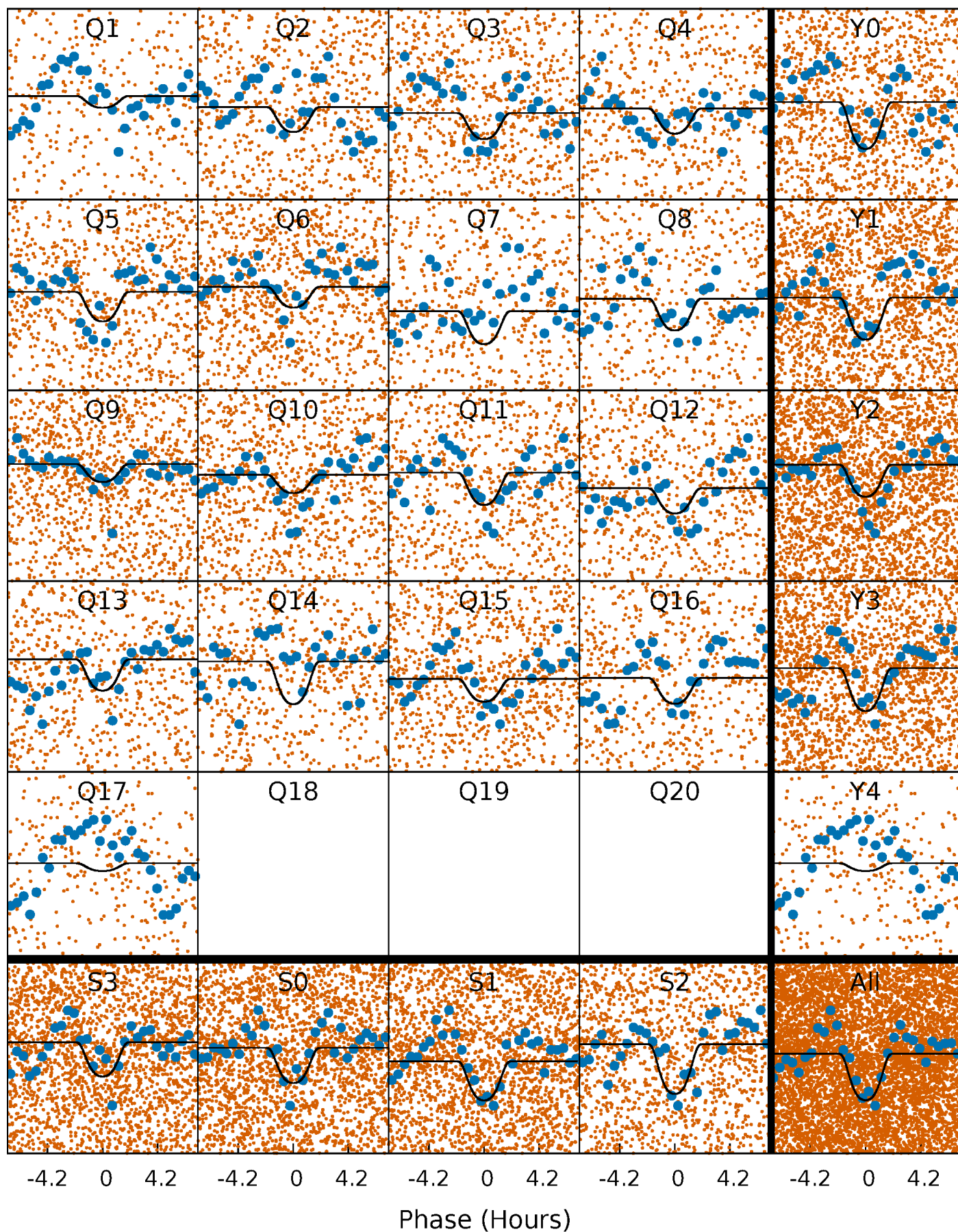
TCE 002988783-02 P= 1.281548 Days  $T_0=131.987349$  (BKJD)





# DV Quarter-Phased Transit Curves

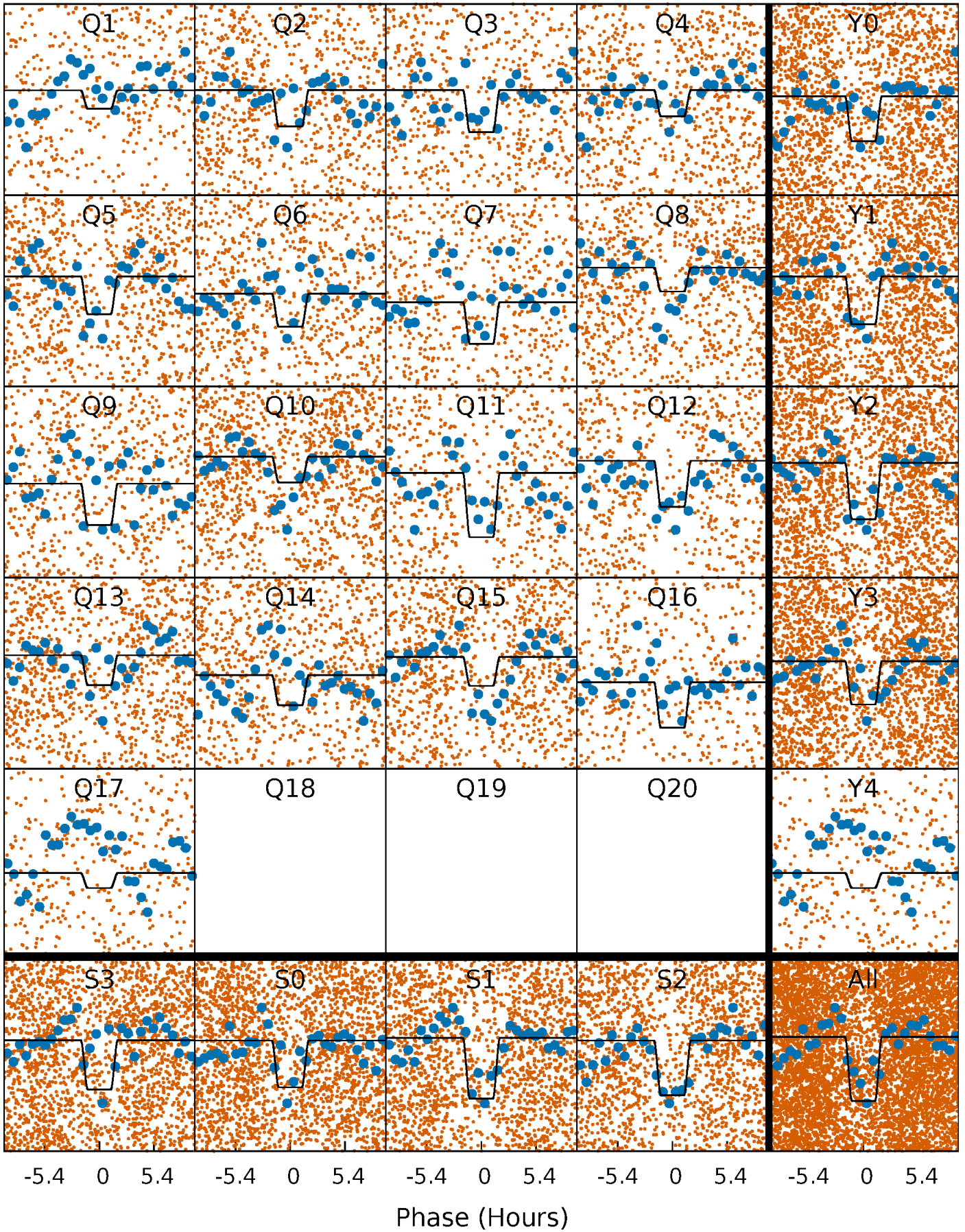
TCE 002988783-02   P= 1.281548 Days    $T_0=131.987349$  (BKJD)





# Alt. Detrend Quarter-Phased Transit Curves

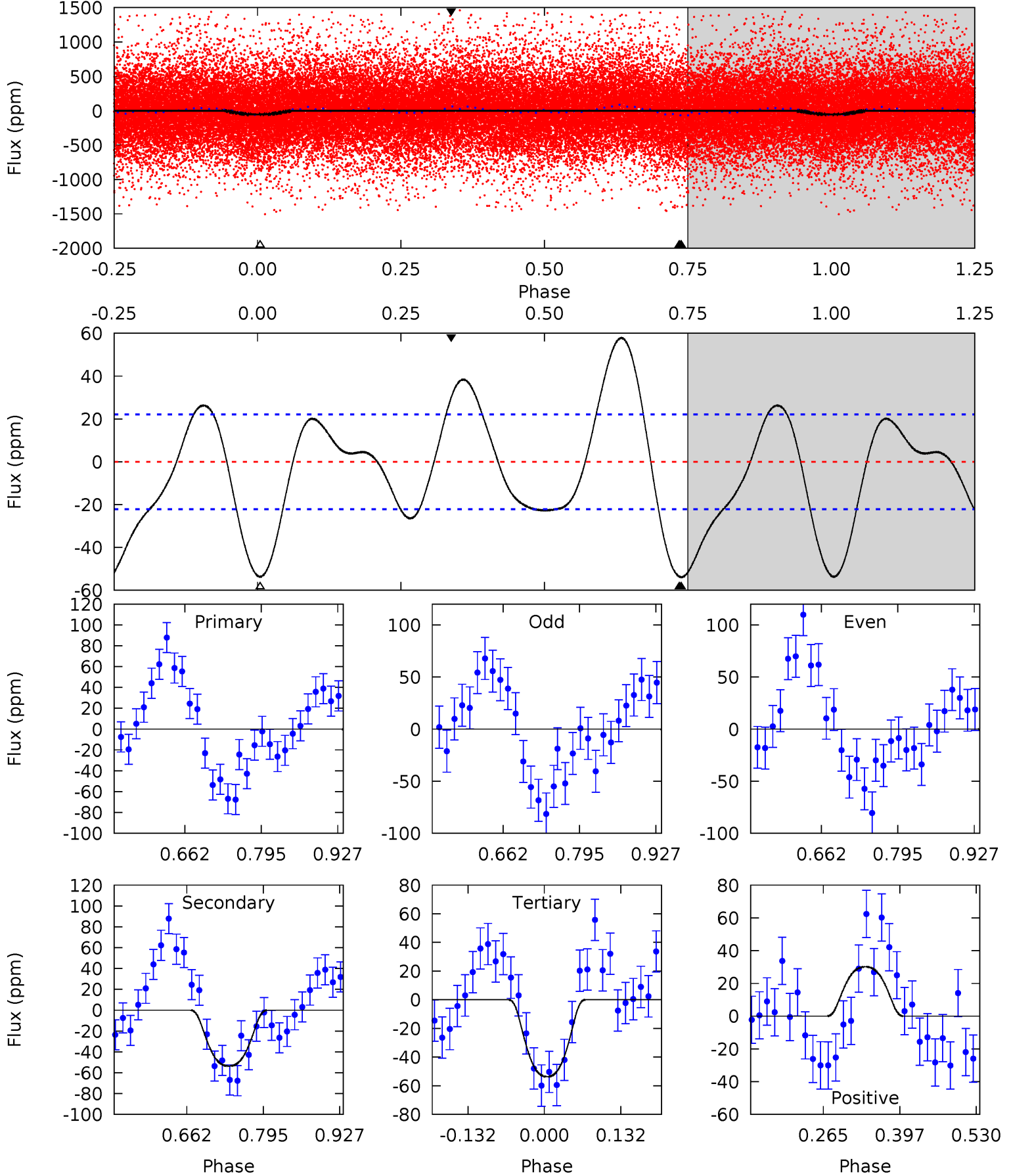
TCE 002988783-02   P= 1.281584 Days    $T_0=131.977531$  (BKJD)



# DV Model-Shift Uniqueness Test

002988783-02, P = 1.281548 Days, E = 130.705801 Days

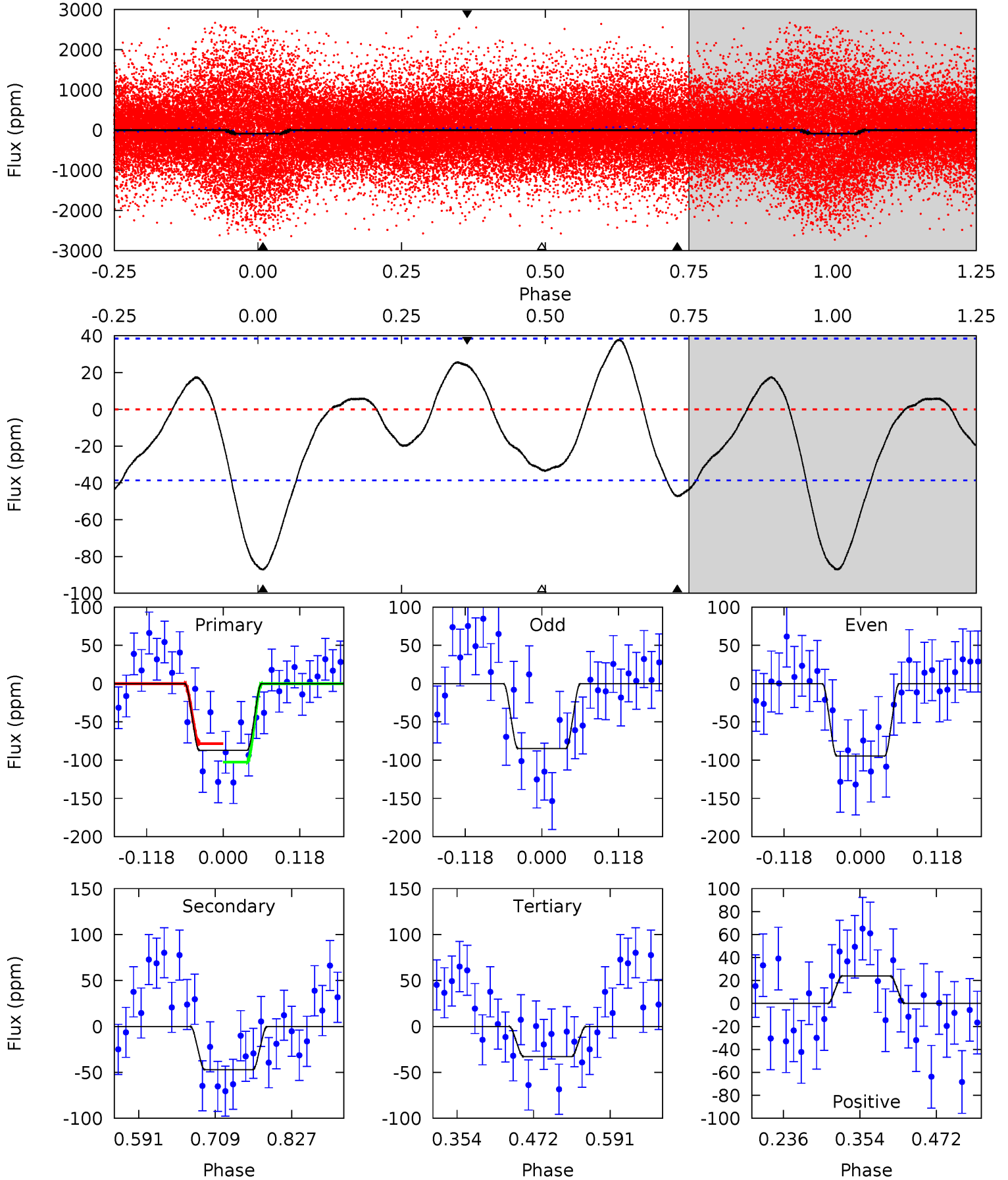
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
11.0	10.9	10.9	6.13	4.51	1.50	4.62	0.04	4.85	-0.01	4.79	4.81	0.92	0.52	1.29



# Alt Model-Shift Uniqueness Test

002988783-02, P = 1.281584 Days, E = 130.695947 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
10.2	5.53	3.86	2.82	4.53	1.56	2.08	6.37	7.41	1.68	2.72	0.57	1.10	0.30	1.41



### Stellar Parameters For KIC 002988783

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$7384^{+207}_{-337}$	$4.090^{+0.144}_{-0.176}$	$0.000^{+0.200}_{-0.350}$	$1.898^{+0.540}_{-0.393}$	$1.617^{+0.213}_{-0.260}$	$0.333^{+0.246}_{-0.163}$
	+3%/-5%	+4%/-4%	+inf%/-inf%	+28%/-21%	+13%/-16%	+74%/-49%
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 002988783-02 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$-54 \pm 5$	$2.06^{+0.44}_{-0.39}$	$3799^{+288}_{-254}$	$6108^{+673}_{-461}$	$5.081^{+2.484}_{-1.639}$
Alt.	$-47 \pm 9$	$2.29^{+0.48}_{-0.40}$	$3789^{+287}_{-248}$	$5578^{+566}_{-487}$	$3.576^{+1.875}_{-1.234}$

$T_{\text{max}}$  = 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

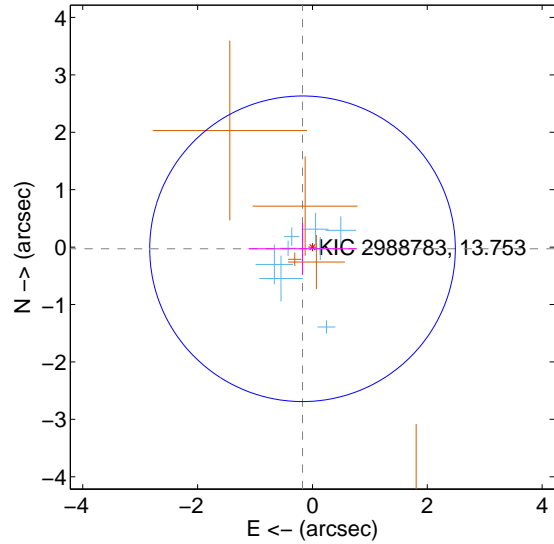
Supplemental centroid analysis for 002988783-02. Kepler magnitude: 13.75. Transit SNR 7.30

There are 8 quarters with good PRF difference image offsets

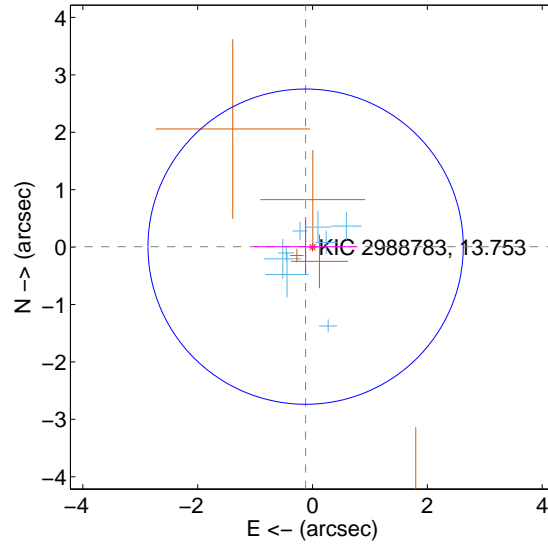
The direct PRF centroid is offset from the target star catalog position by about 0.08 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.175 \pm 0.887$	0.20	$0.173 \pm 0.941$	$-0.029 \pm 0.452$
PRF-fit source offset from KIC position	$0.120 \pm 0.915$	0.13	$0.120 \pm 0.903$	$0.008 \pm 0.471$
photometric centroid source offset	$1.23 \pm 0.76$	1.63	$-1.22 \pm 0.76$	$0.16 \pm 0.83$

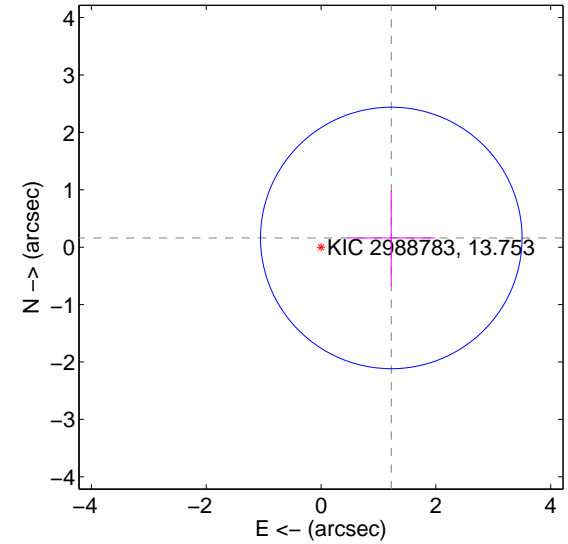
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position



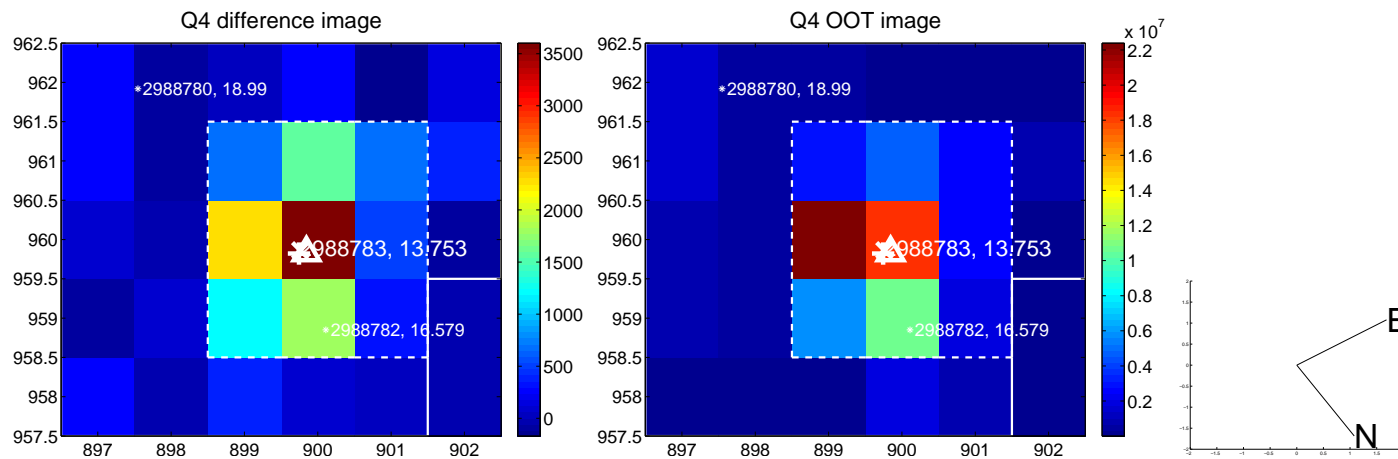
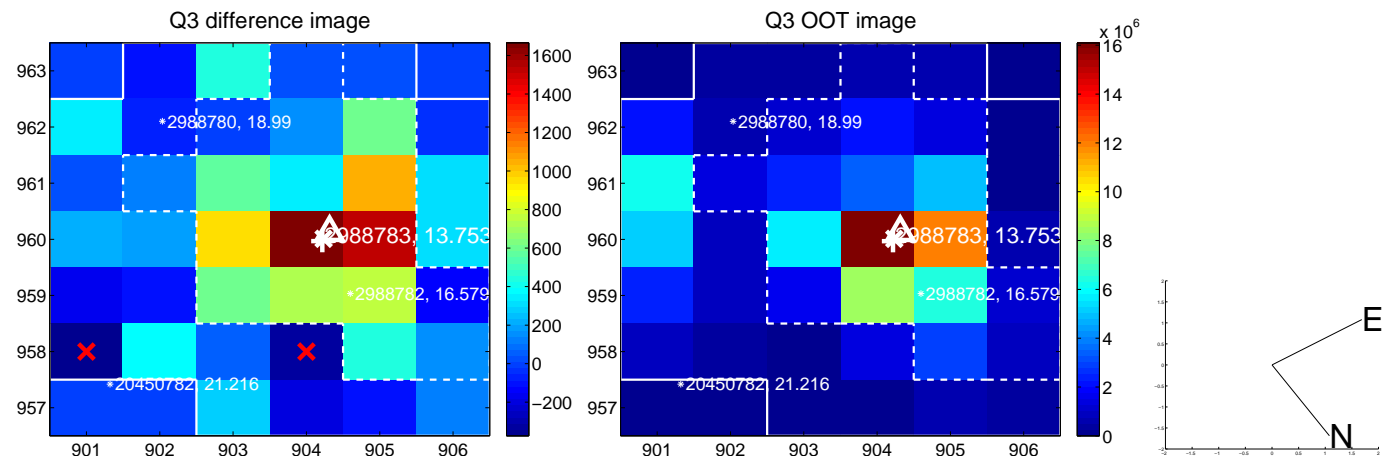
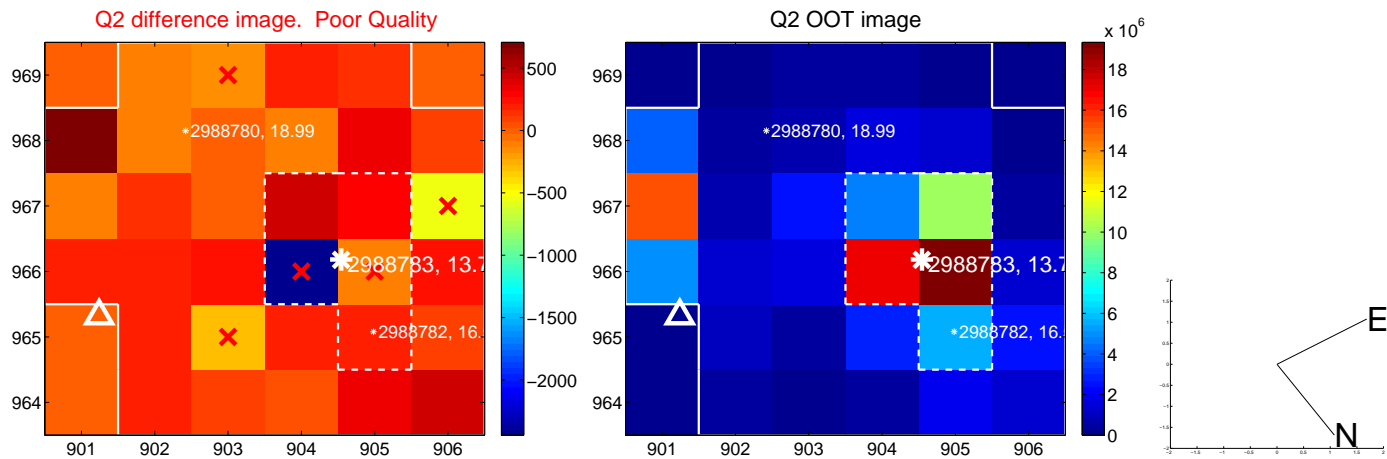
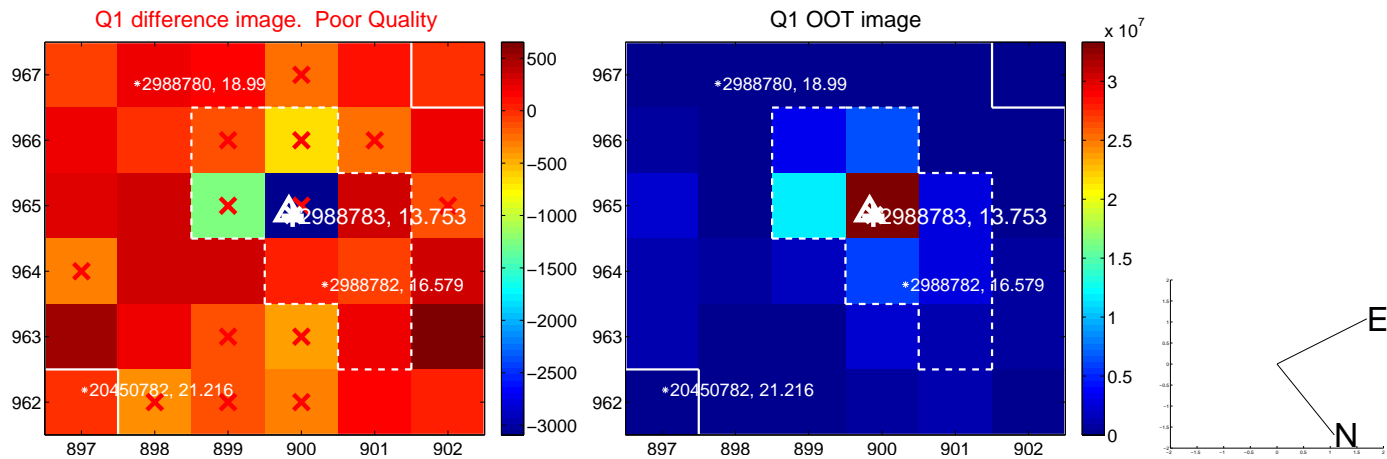
offset from photometric centroids



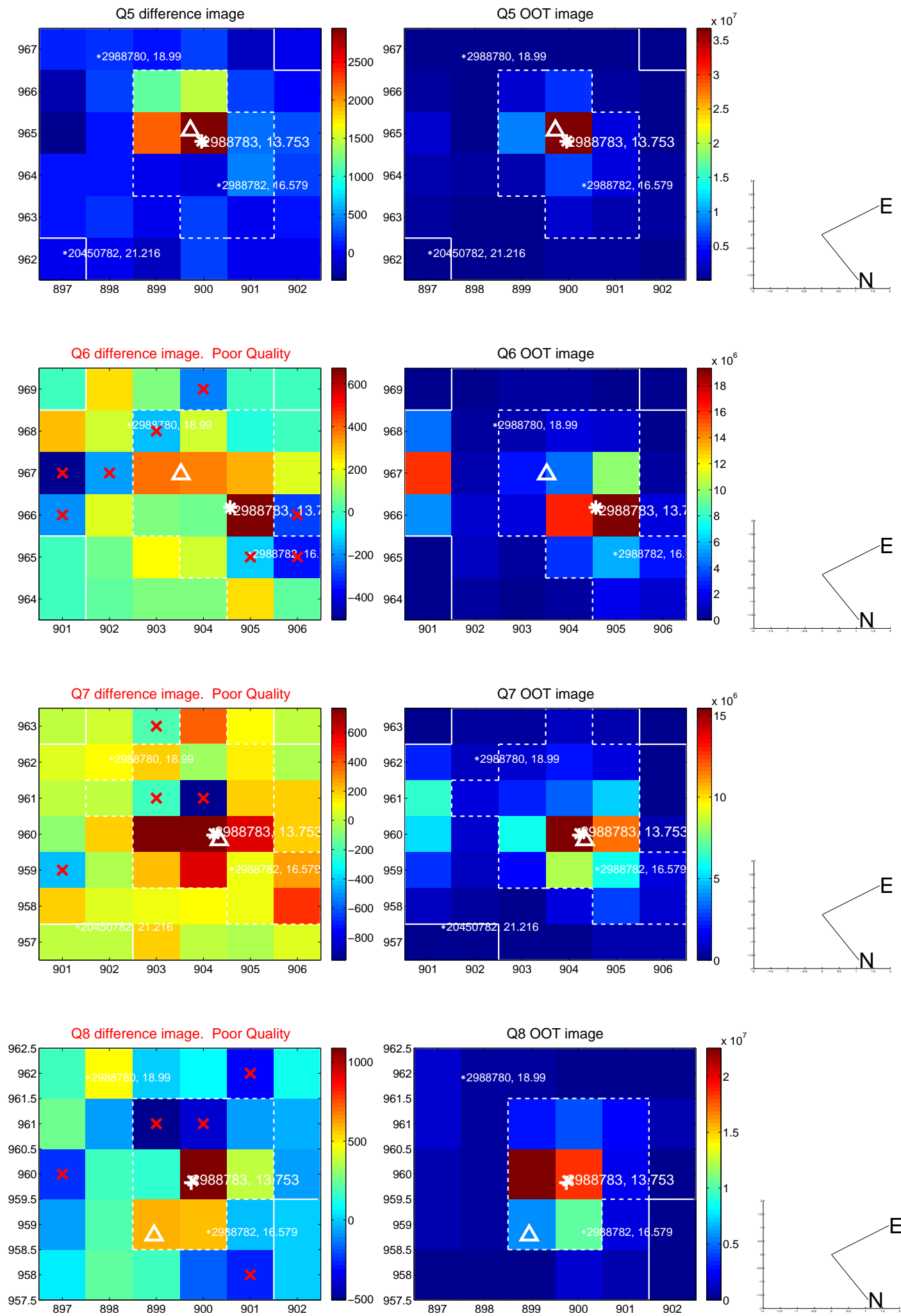
Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets**; **Vermillion crosses: bad quarterly centroid offsets**; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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



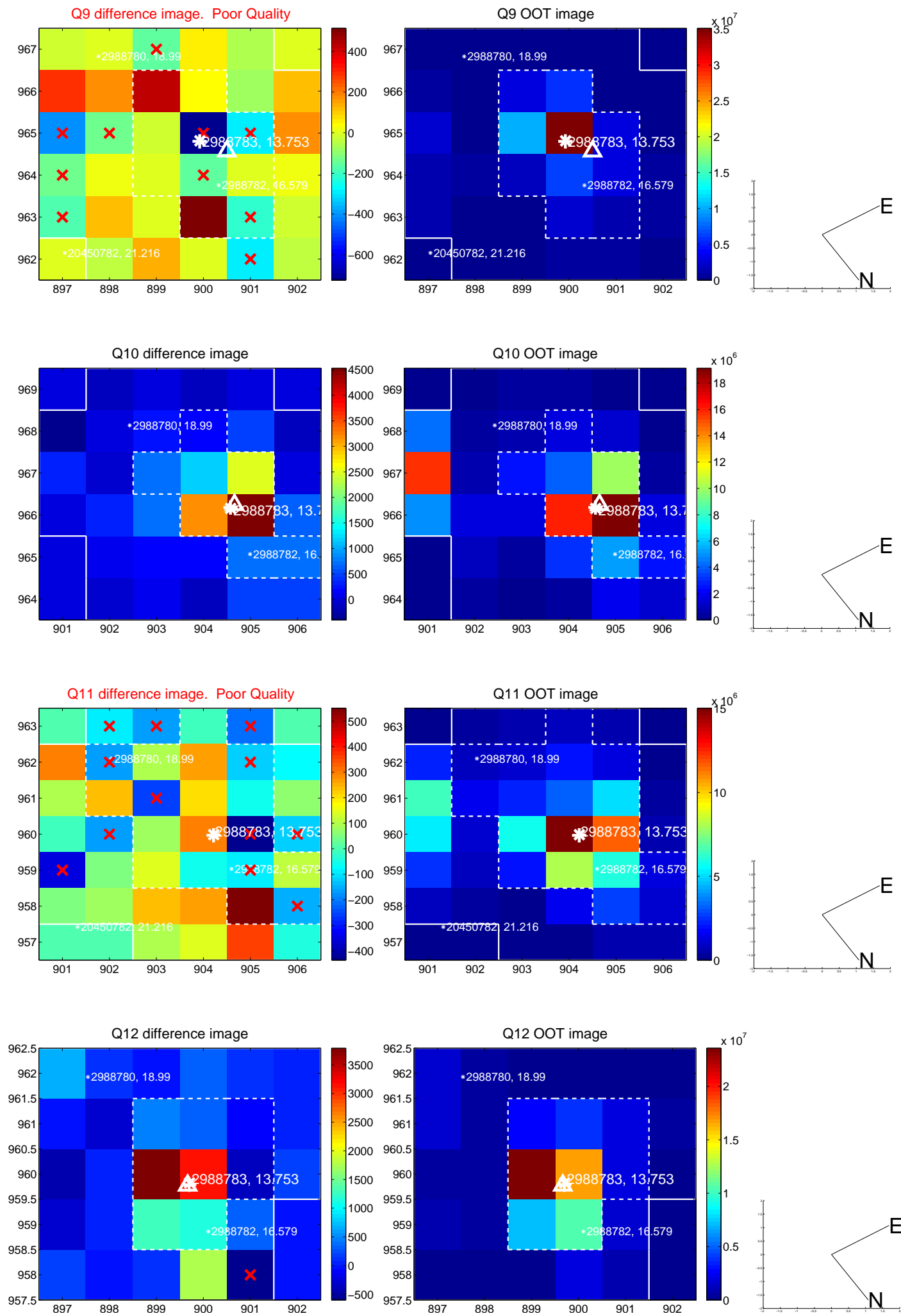
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



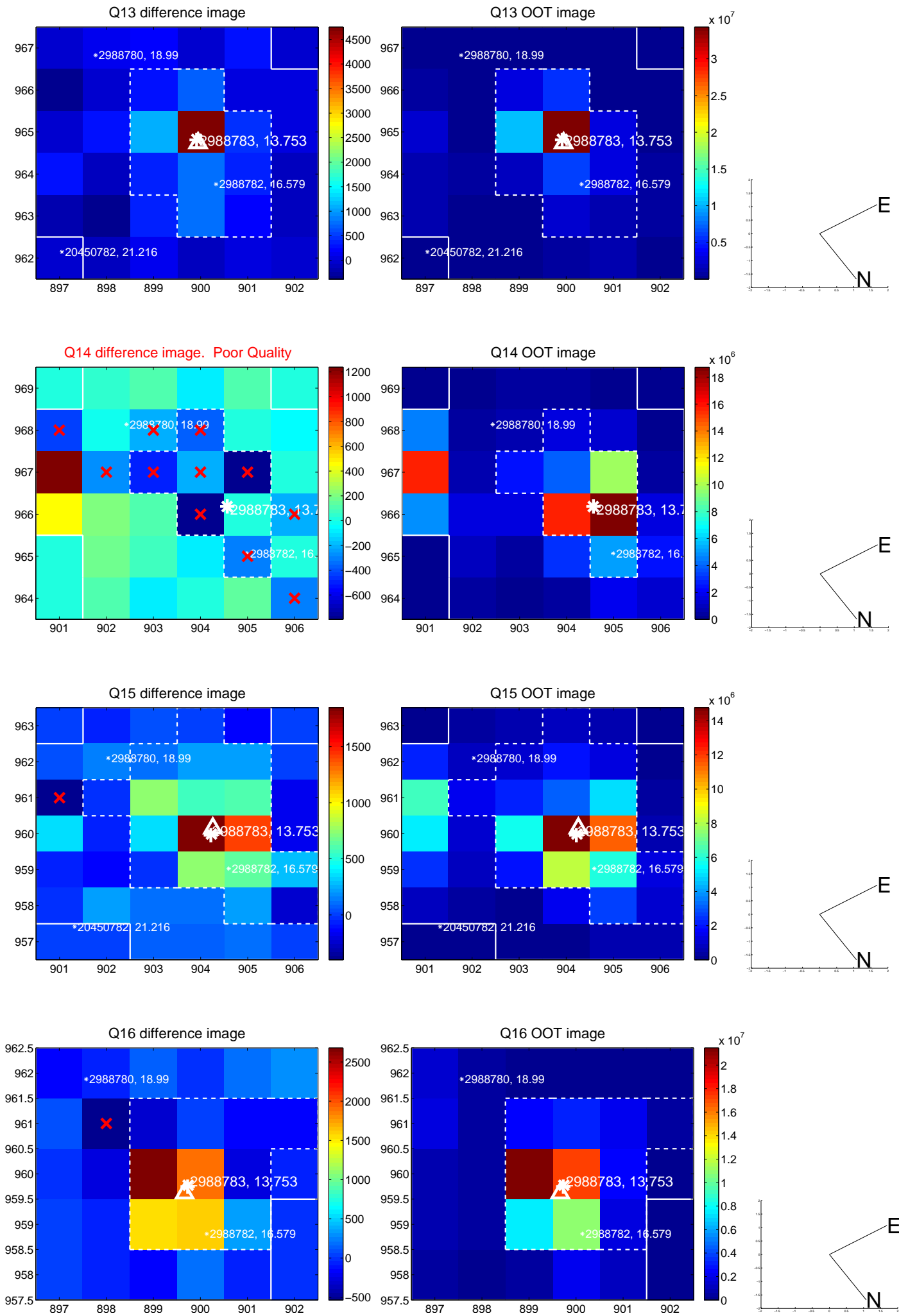
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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.

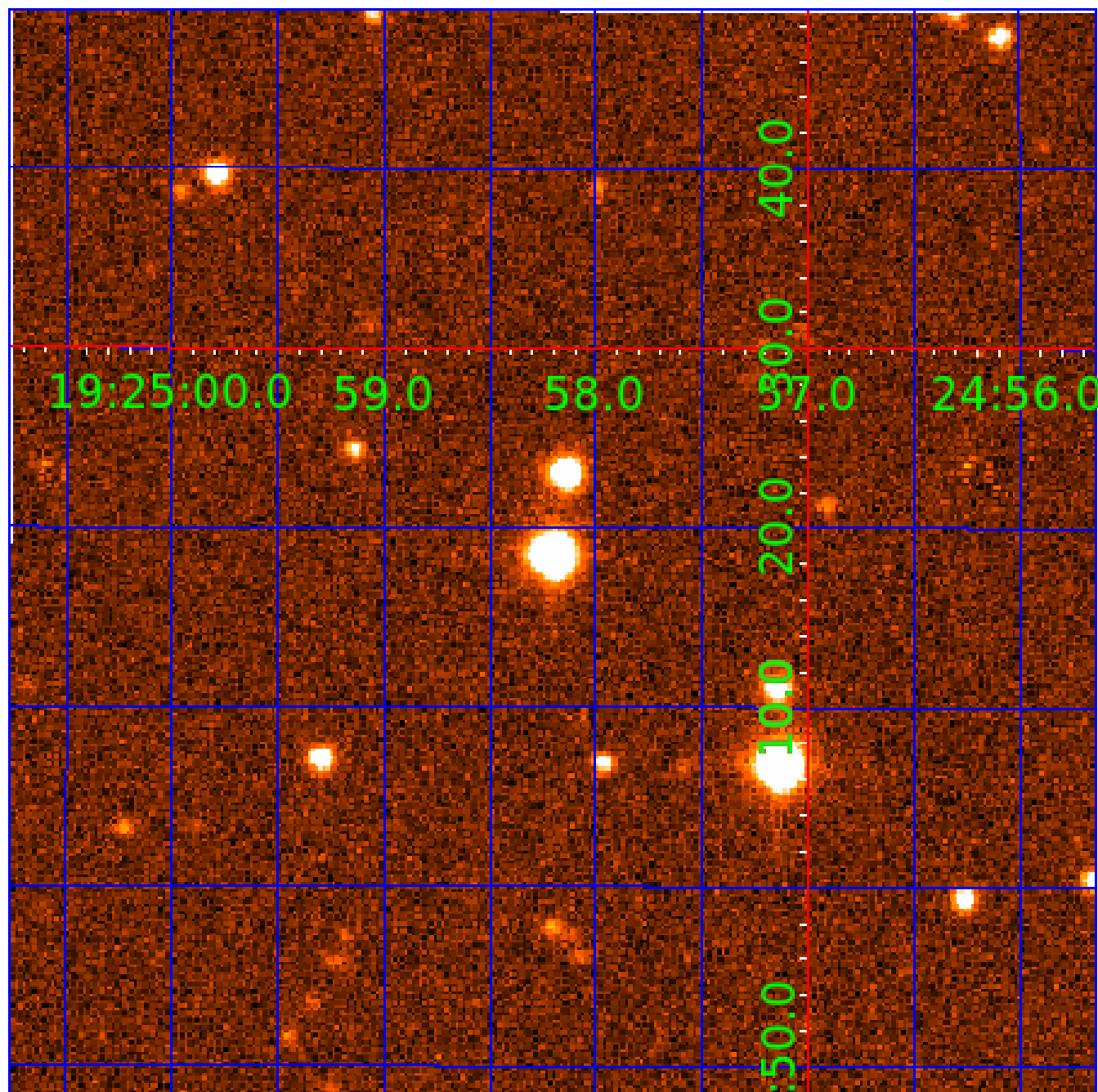






UKIRT Image

Declination



# KIC 002988783

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
002988783-01	OBS	No	0.940229	132.078038	32.5	2.161	9.9	5.9	1.90	7384	1.25	19736.98
002988783-02	OBS	No	1.281548	131.987349	62.0	3.639	8.2	7.3	1.90	7384	2.05	13060.06
002988783-03	OBS	No	1.281660	131.603727	54.9	1.544	9.5	7.1	1.90	7384	1.63	13058.54
002988783-04	OBS	No	19.571654	135.244437	308.9	5.252	7.5	7.3	1.90	7384	6.31	344.69
002988783-05	OBS	No	70.903647	191.711667	275.0	6.000	7.2	-1.0	1.90	7384	3.19	61.95

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
002988783-01	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT
002988783-02	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT
002988783-03	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—SAME_NTL_PERIOD
002988783-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_SKYE_ZUMA—TRANS_GAPPED—LPP_ALT—MOD_NONUNIQ_ALT—MOD_TER_ALT
002988783-05	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—MOD_NONUNIQ_ALT—CENT_NOFITS

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

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

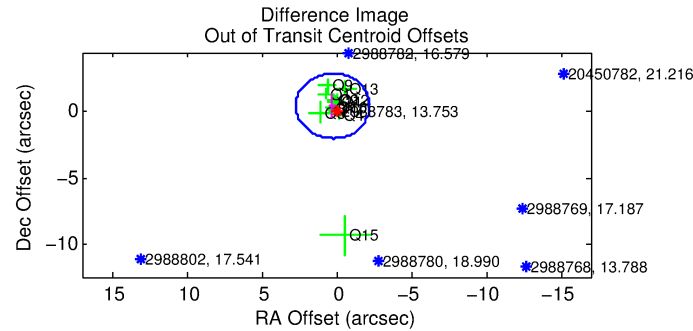
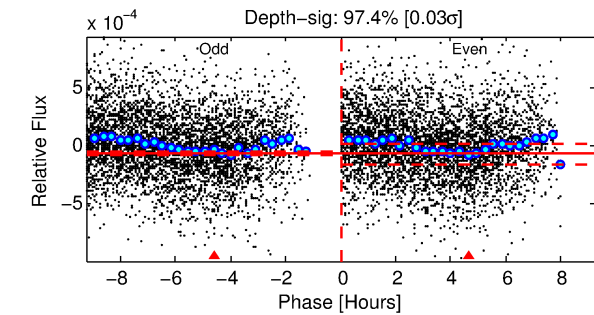
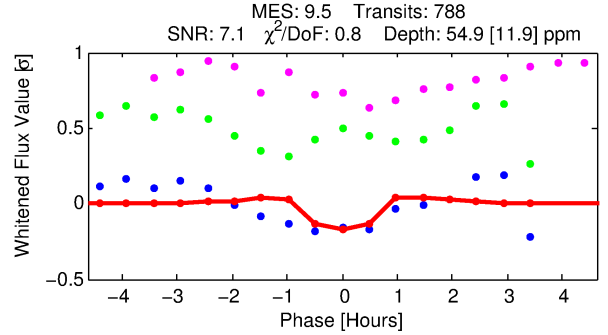
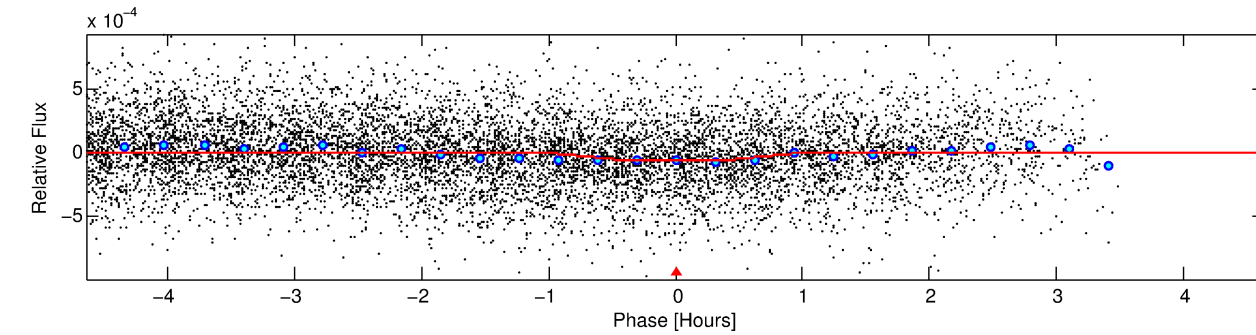
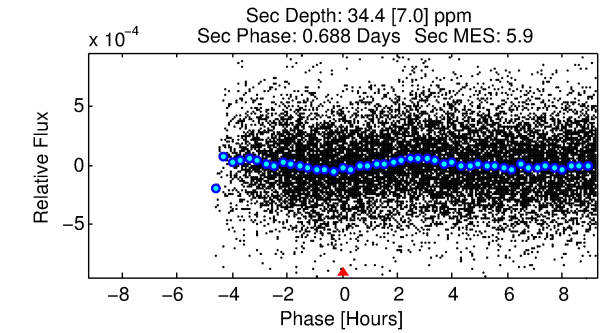
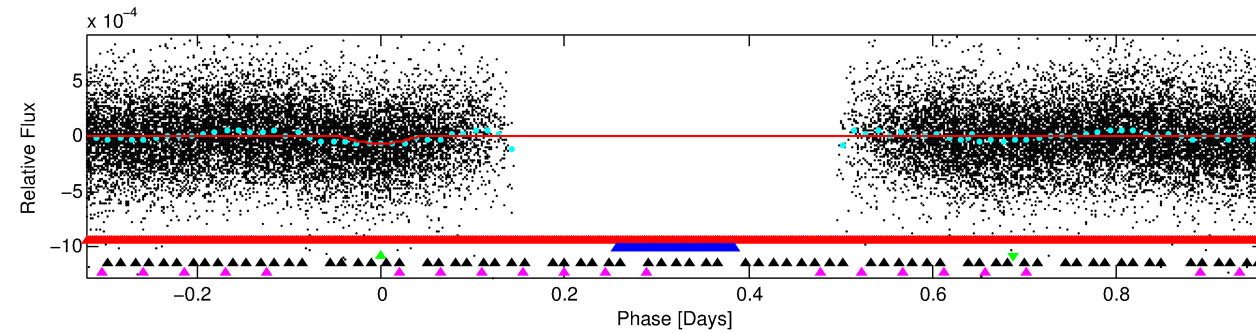
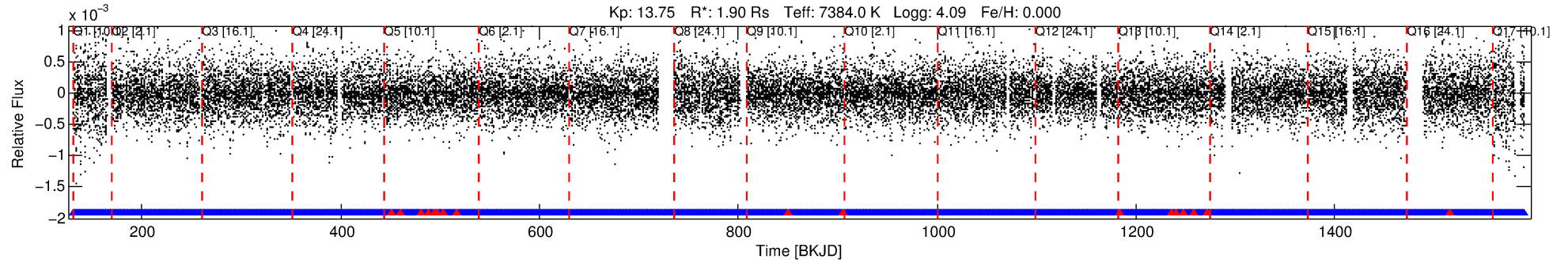
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 002988783-03

No Significant Match Found

# DV One-Page Summary

KIC: 2988783 Candidate: 3 of 5 Period: 1.282 d



## DV Fit Results:

Period = 1.28166 [0.00002] d  
Epoch = 131.6037 [0.0027] BKJD  
Rp/R\* = 0.0079 [0.0041]  
a/R\* = 3.06 [9.03]  
b = 0.90 [0.73]  
Seff = 13058.54 [4925.94]  
Teff = 2726 [257] K  
Rp = 1.63 [0.96] Re  
a = 0.0271 [0.0063] AU  
Ag = 5.24 [5.78] [0.73σ]  
Teffp = 6378 [1703] K [2.12σ]

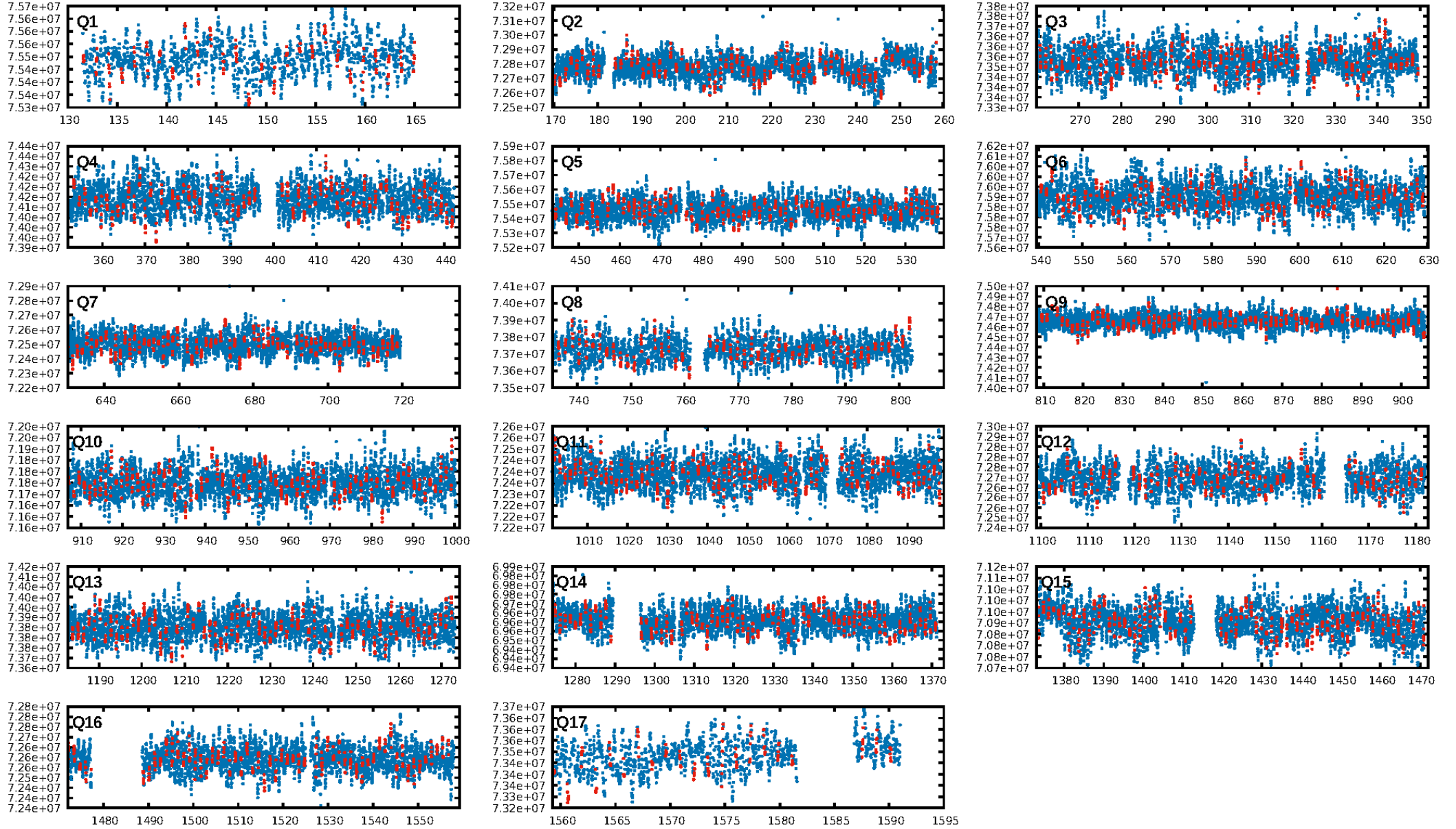
## DV Diagnostic Results:

ShortPeriod-sig: 0.1% [0.00σ]  
LongPeriod-sig: 100.0% [80.19σ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: N/A  
RollingBand-fgt: 0.98 [735/752]  
GhostDiagnostic-chr: -1.585  
Centroid-sig: N/A  
Centroid-so: 1.711 arcsec [1.53σ]  
OotOffset-rm: 0.511 arcsec [0.62σ]  
KicOffset-rm: 0.537 arcsec [0.70σ]  
OotOffset-st: 3/3/2/4 [12]  
KicOffset-st: 3/3/2/4 [12]  
DiffImageQuality-fgm: 0.58 [7/12]  
DiffImageOverlap-fno: 0.65 [11/17]

Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 03-Feb-2016 08:45:43 Z

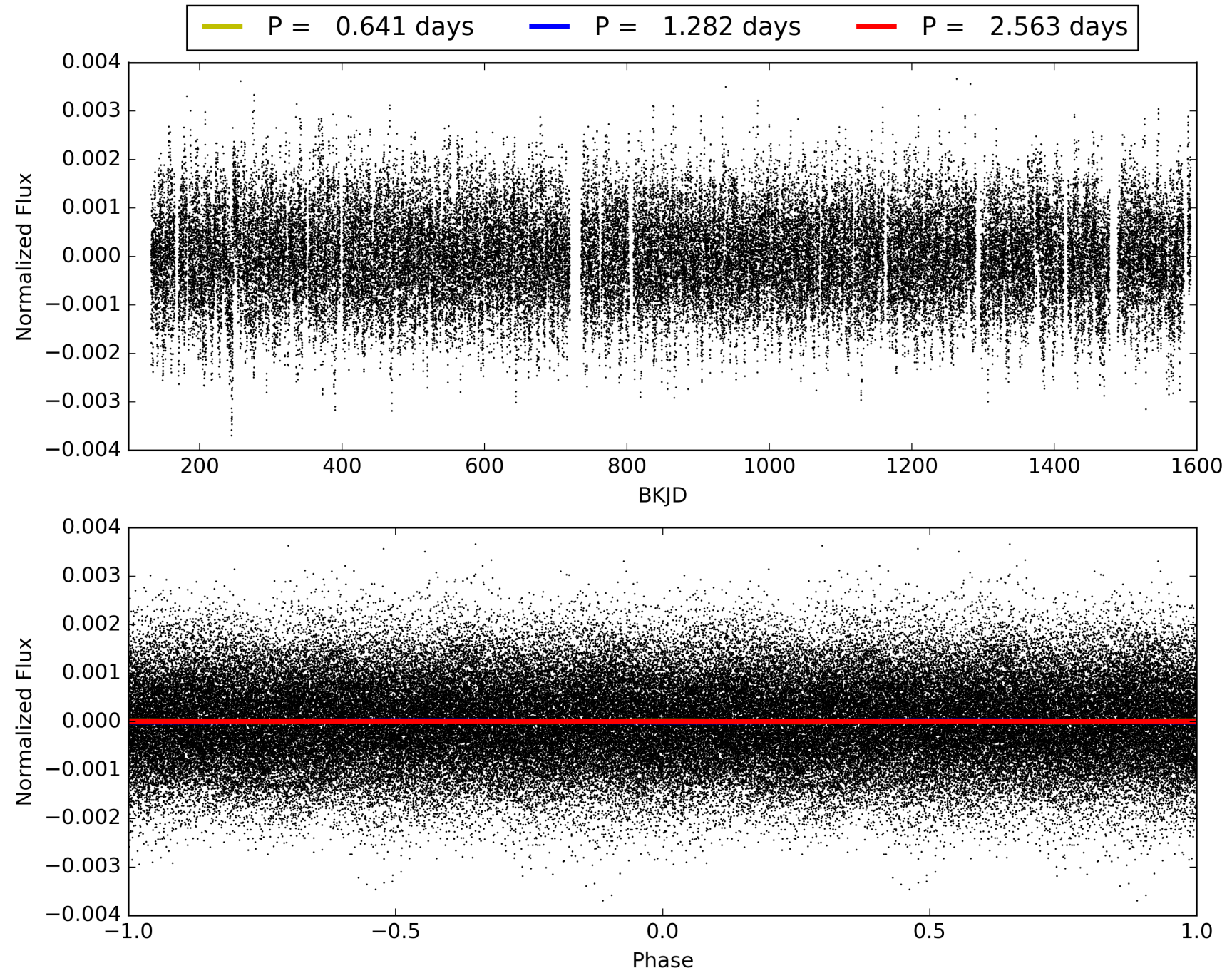
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

# TCE 002988783-03, PDC Light Curves





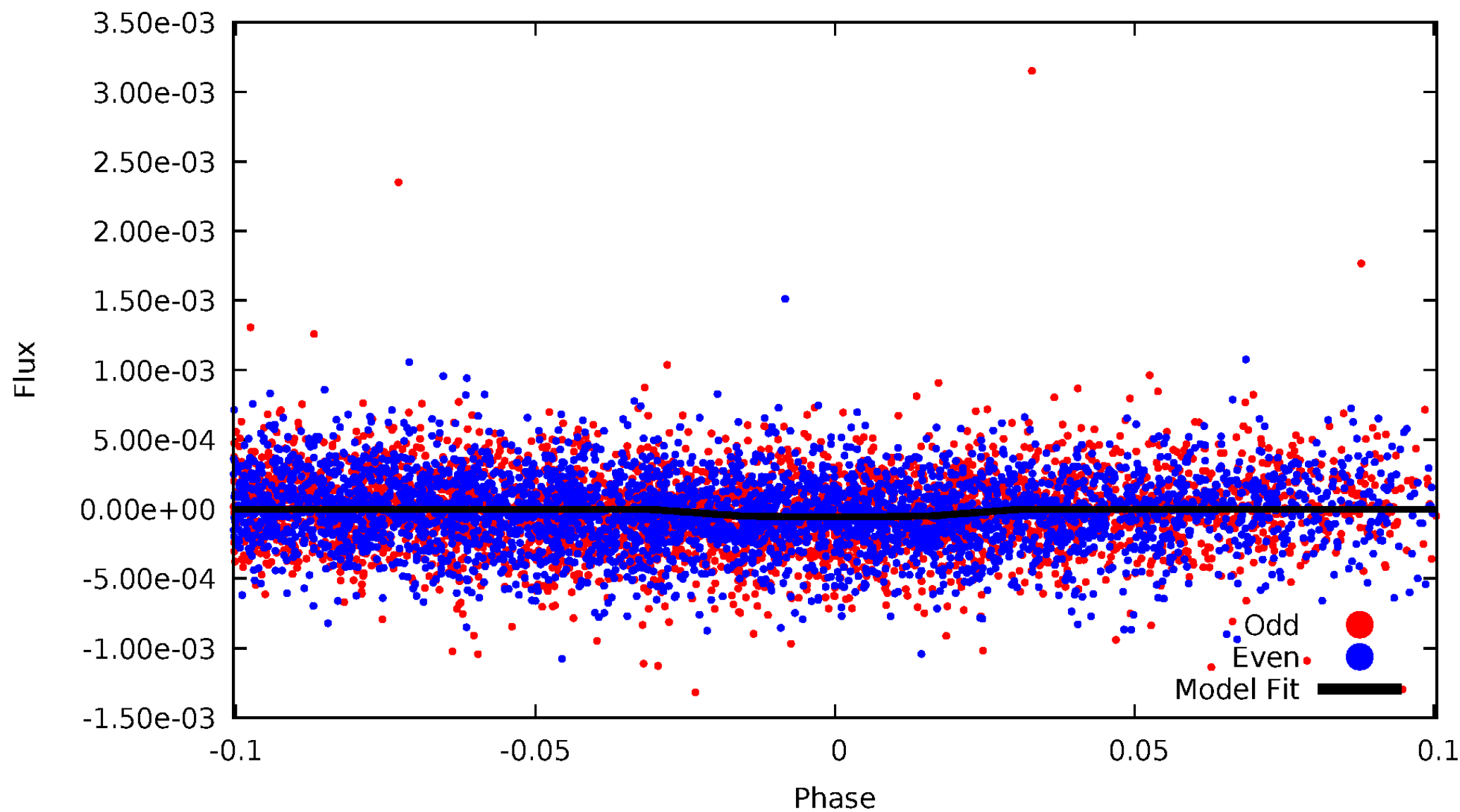
TCE 002988783-03





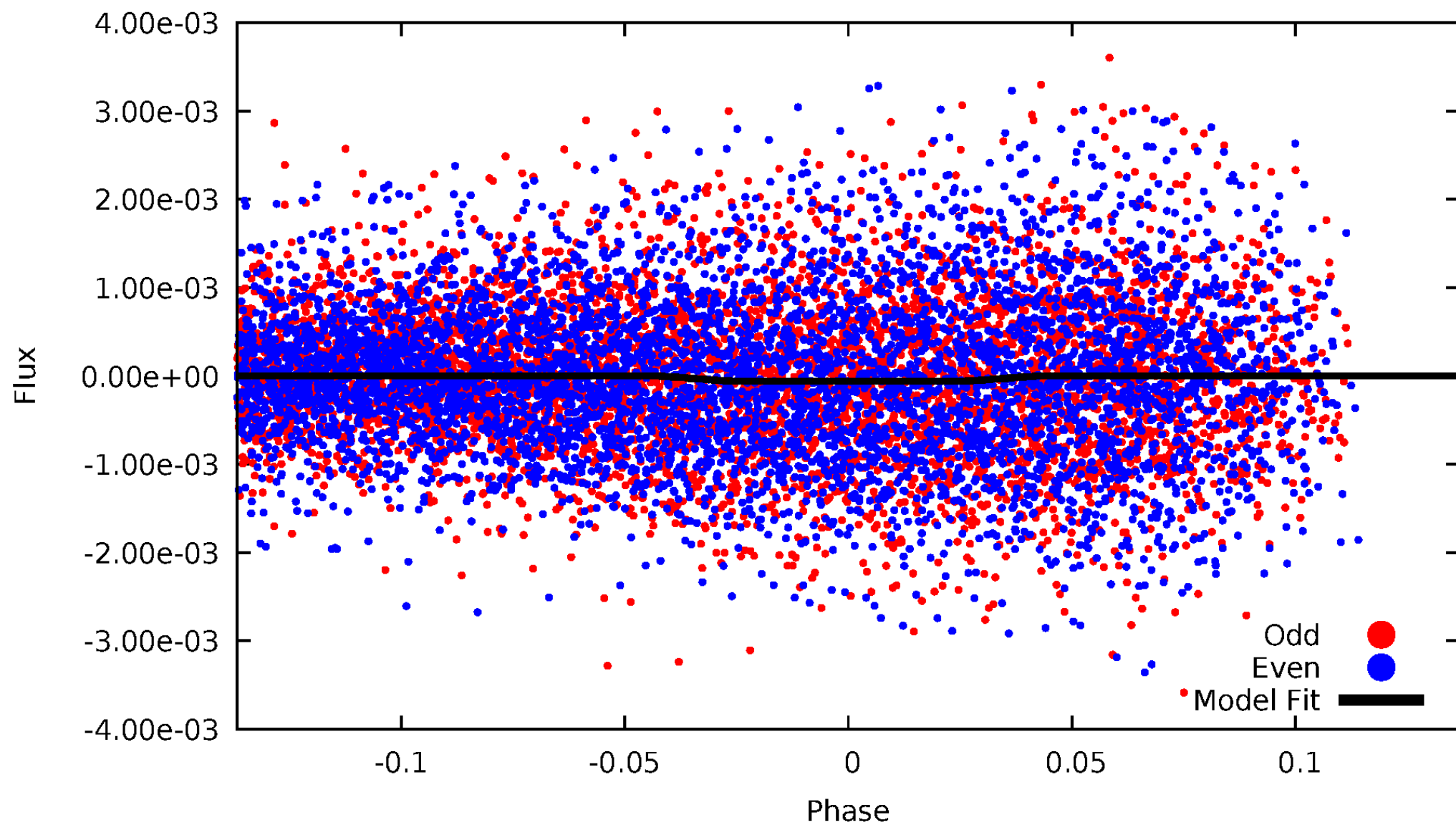
# DV Odd/Even

TCE 002988783-03



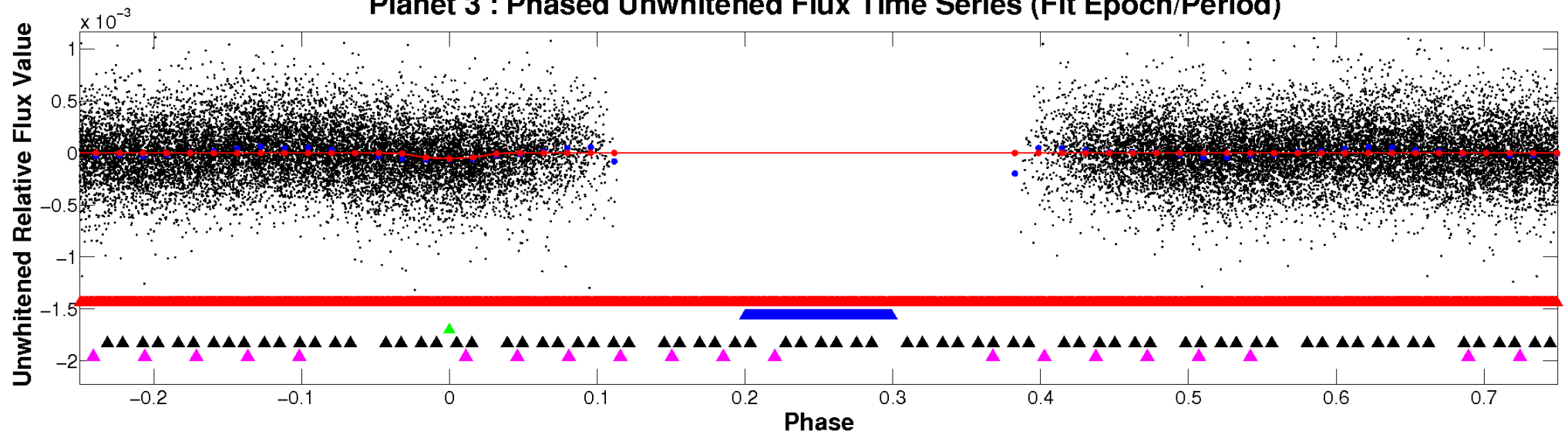
# ALT Odd/Even

TCE 002988783-03

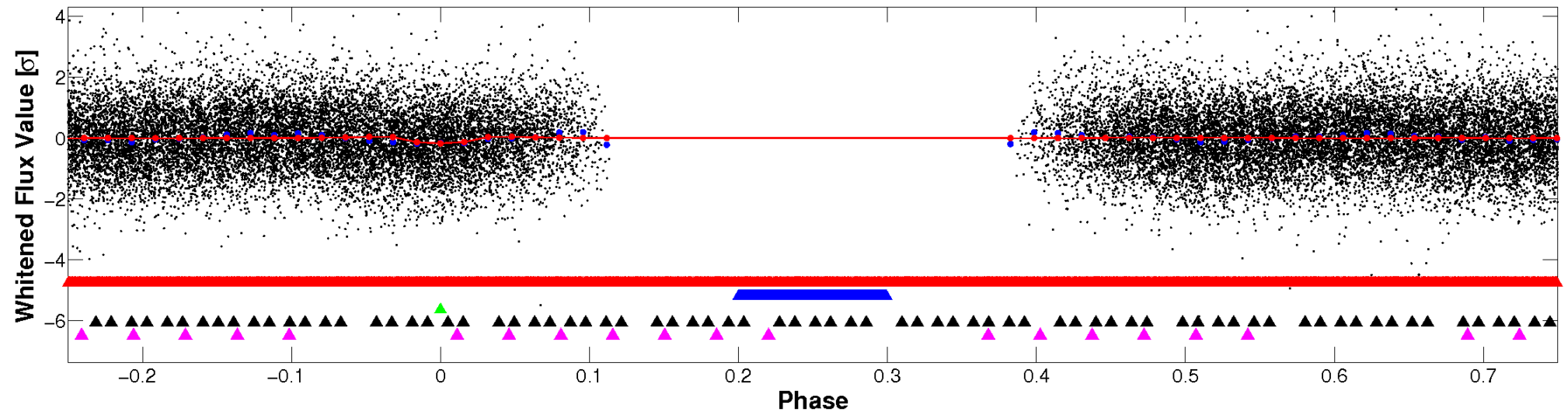


# Non-Whitened Vs. Whitened Light Curve

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

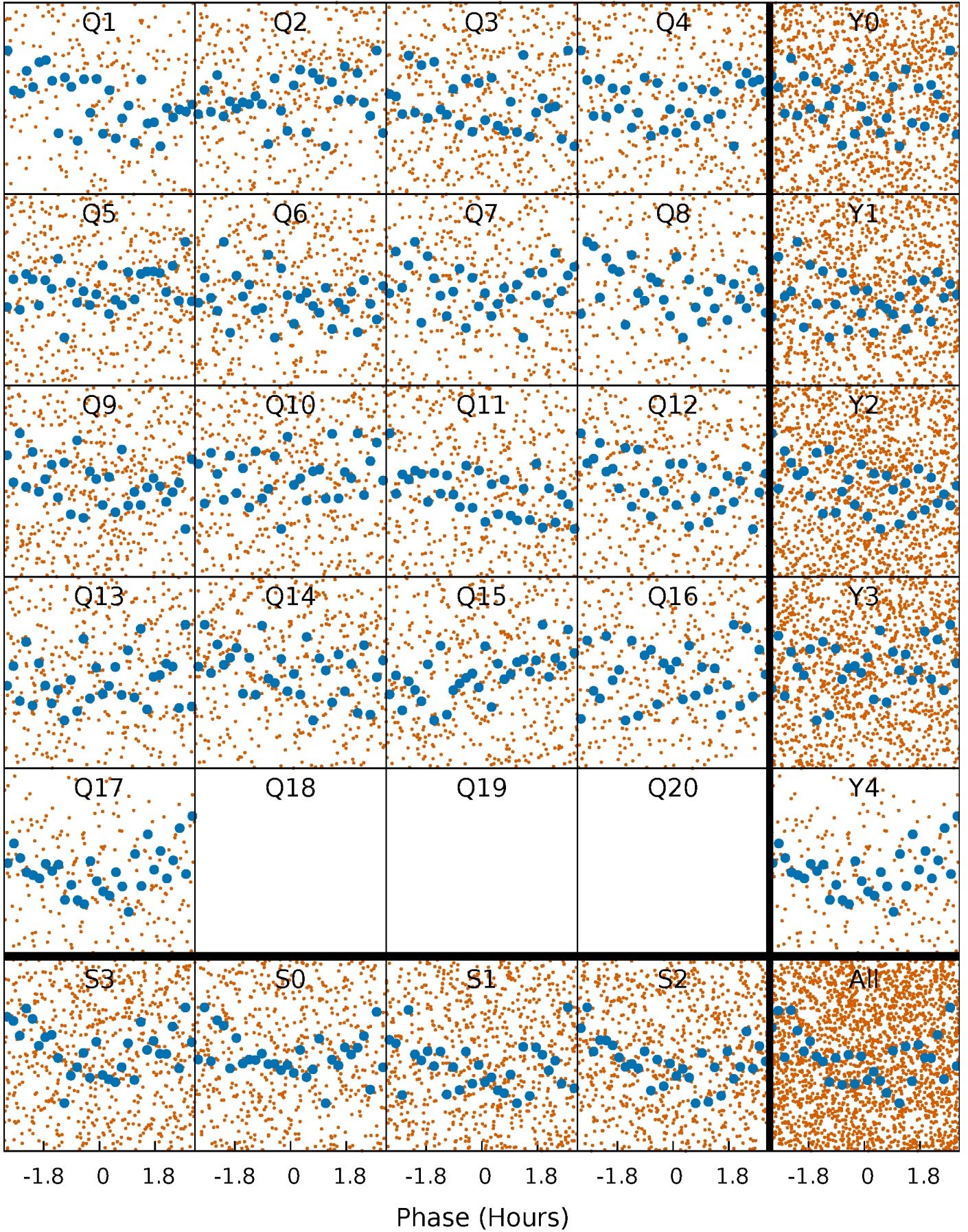


## Planet 3 : Phased Whitened Flux Time Series (Fit Epoch/Period)



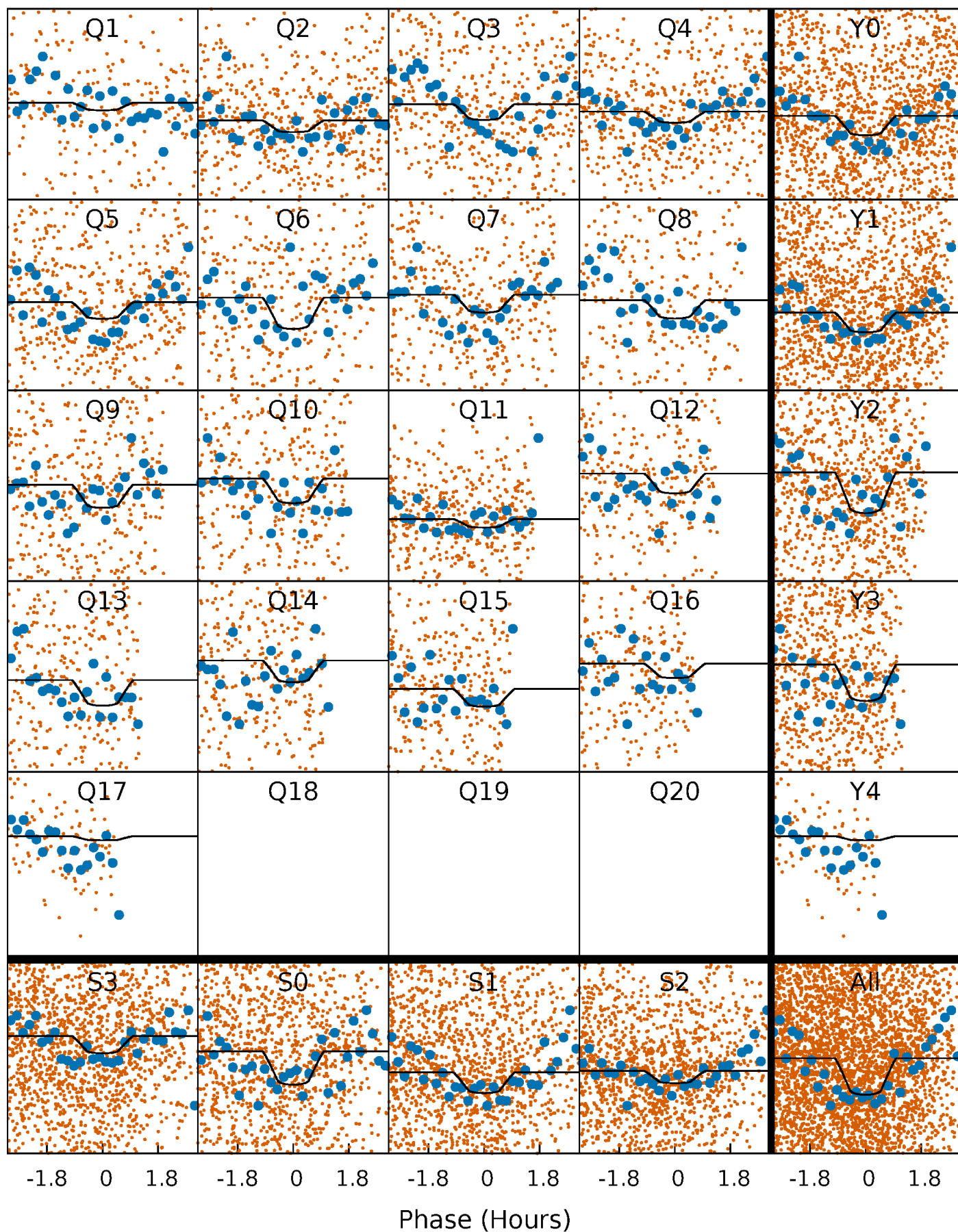
# PDC Quarter-Phased Transit Curves

TCE 002988783-03    P= 1.281660 Days     $T_0=131.603727$  (BKJD)



# DV Quarter-Phased Transit Curves

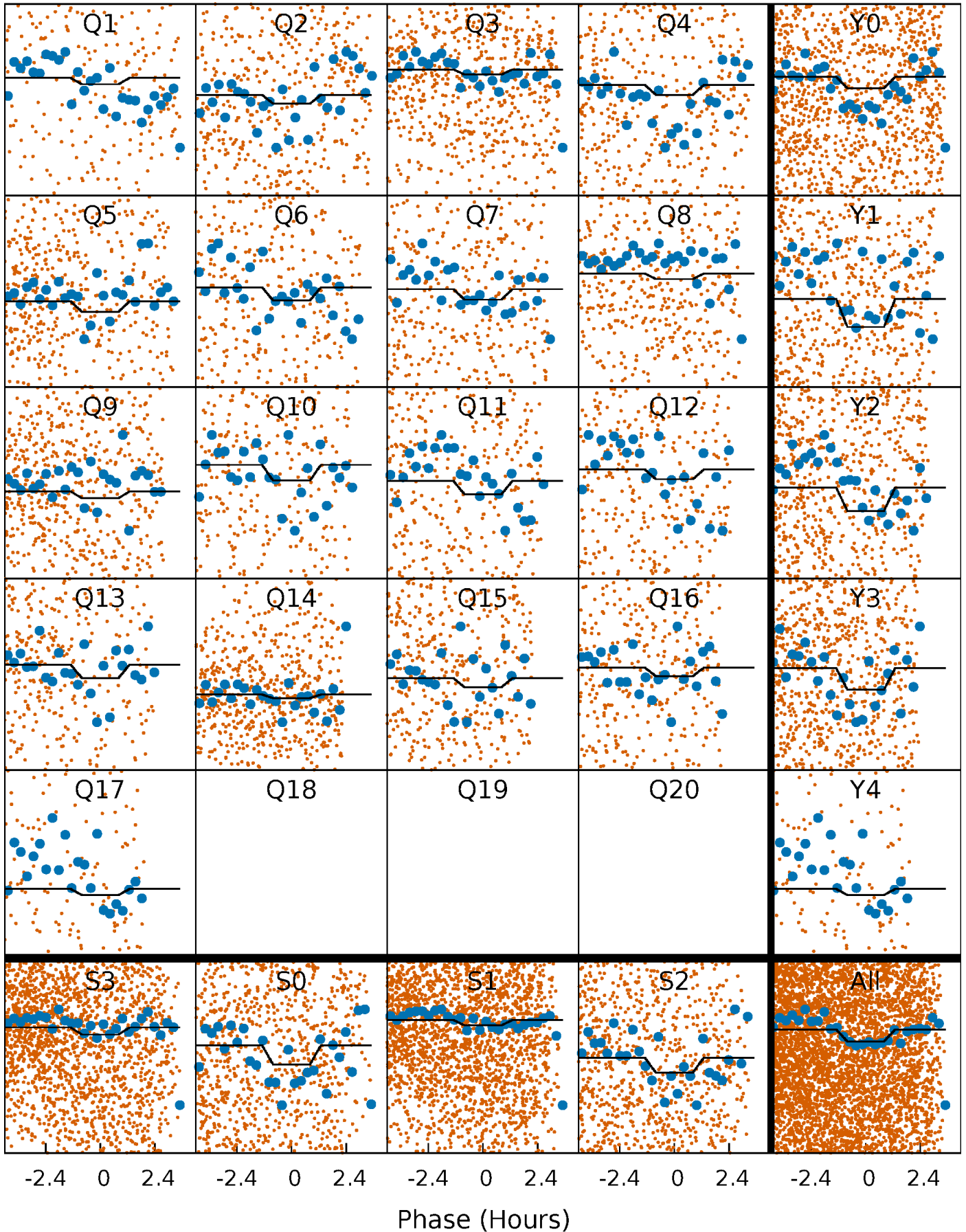
TCE 002988783-03 P= 1.281660 Days  $T_0=131.603727$  (BKJD)





# Alt. Detrend Quarter-Phased Transit Curves

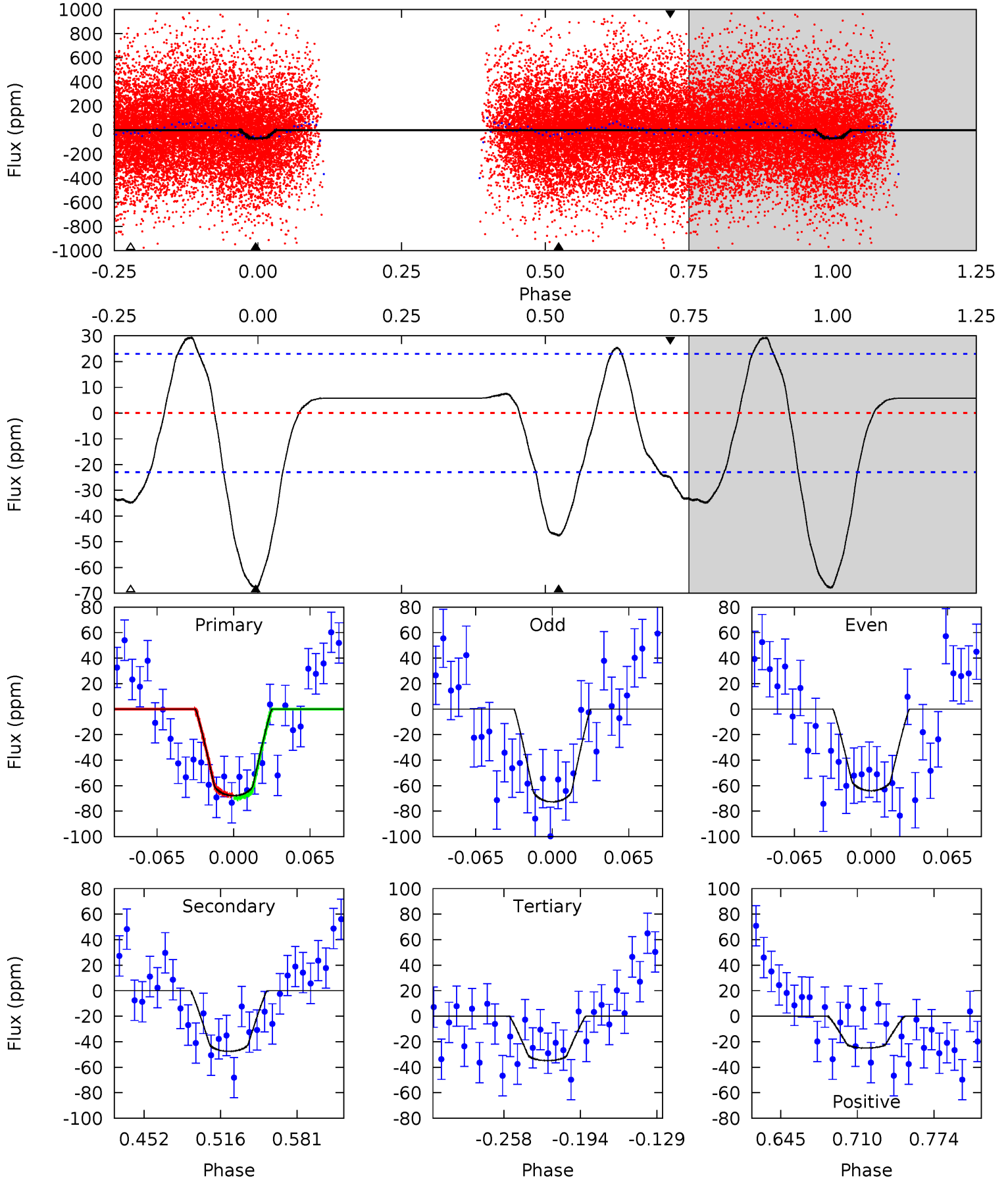
TCE 002988783-03 P= 1.281606 Days  $T_0=131.602704$  (BKJD)



# DV Model-Shift Uniqueness Test

002988783-03, P = 1.281660 Days, E = 130.322067 Days

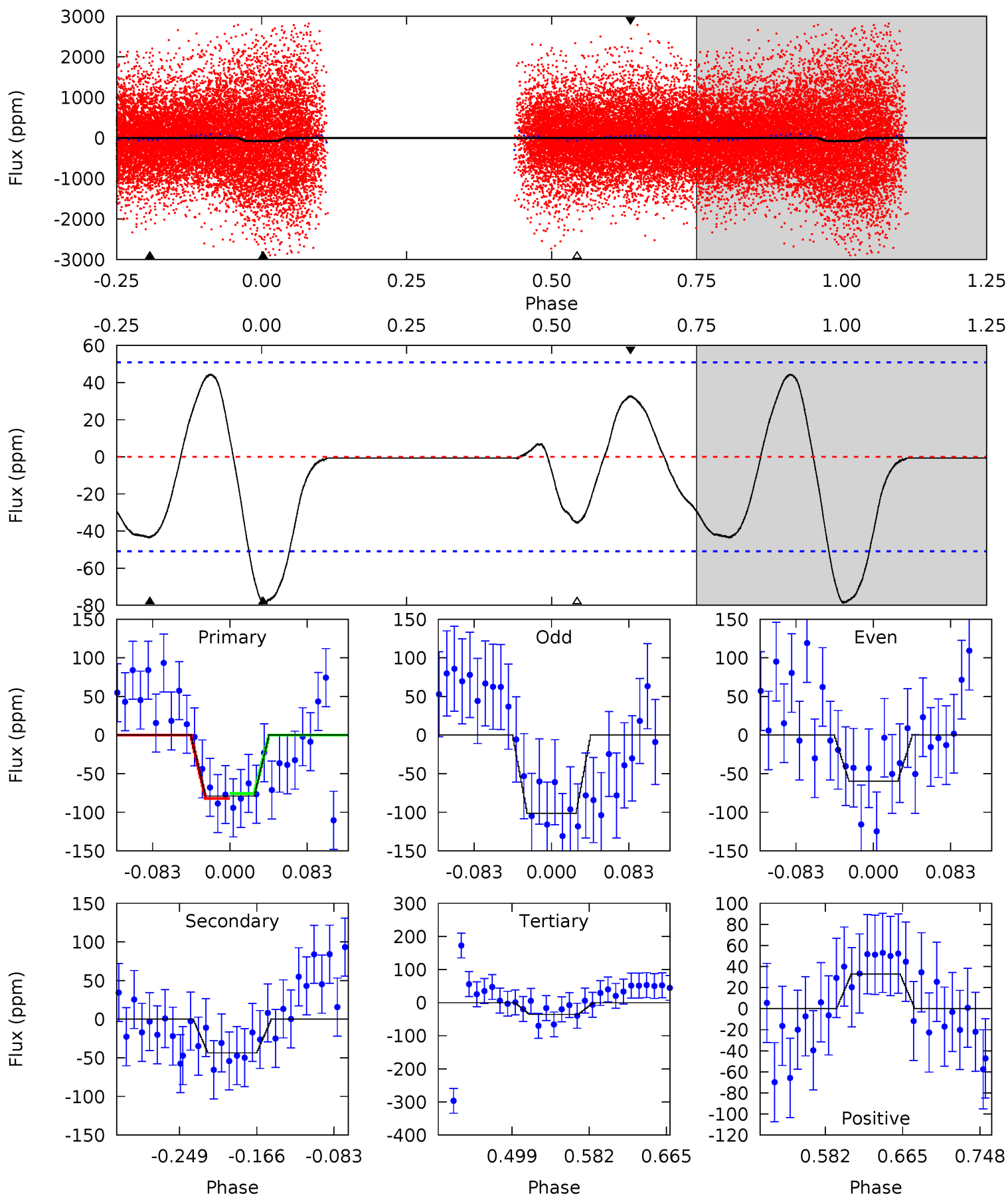
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
13.7	9.63	7.05	-5.06	4.66	1.85	4.32	6.69	18.8	2.58	14.7	0.89	0.96	0.30	0.23



# Alt Model-Shift Uniqueness Test

002988783-03, P = 1.281606 Days, E = 130.321098 Days

Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
7.15	3.95	3.22	2.98	4.60	1.73	2.15	3.93	4.18	0.72	0.97	1.89	0.57	0.36	0.24



### Stellar Parameters For KIC 002988783

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$7384^{+207}_{-337}$	$4.090^{+0.144}_{-0.176}$	$0.000^{+0.200}_{-0.350}$	$1.898^{+0.540}_{-0.393}$	$1.617^{+0.213}_{-0.260}$	$0.333^{+0.246}_{-0.163}$
	+3%/-5%	+4%/-4%	+inf%/-inf%	+28%/-21%	+13%/-16%	+74%/-49%
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 002988783-03 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-48 \pm 5$	$1.63^{+0.92}_{-0.76}$	$3808^{+255}_{-284}$	$6673^{+3276}_{-1295}$	$6.972^{+17.973}_{-4.064}$
Alt.	$-44 \pm 11$	$1.68^{+0.78}_{-0.87}$	$3797^{+293}_{-253}$	$6503^{+3472}_{-1267}$	$6.158^{+21.010}_{-3.429}$

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

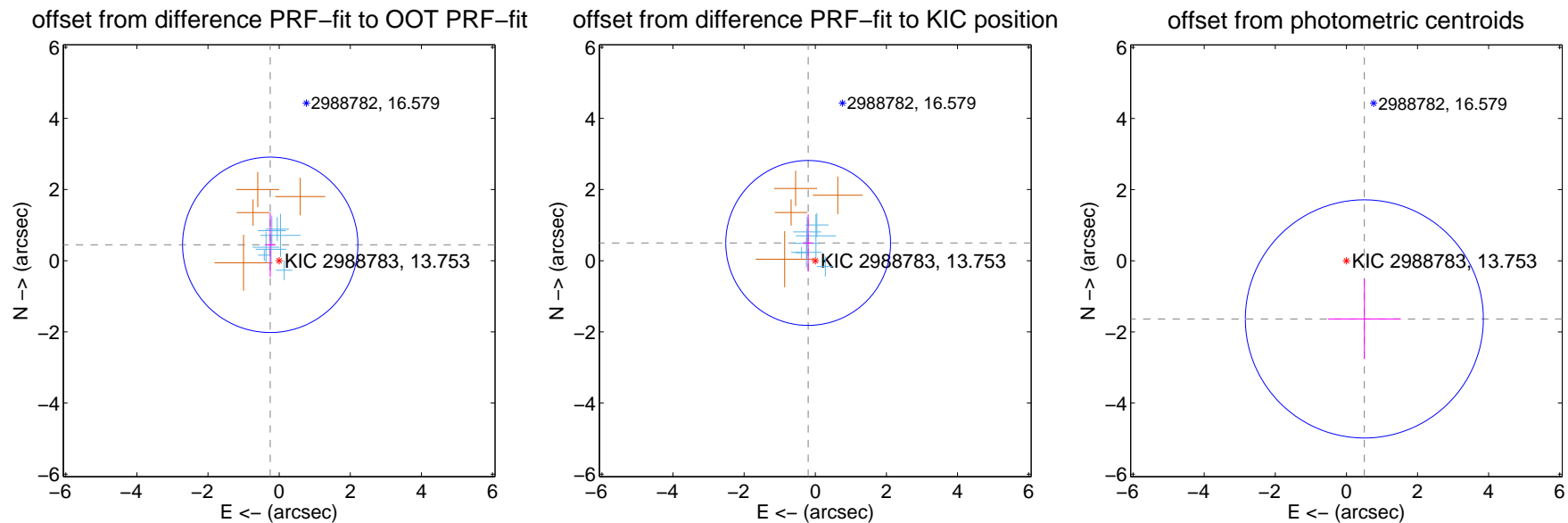
## DV Centroid Data

Supplemental centroid analysis for 002988783-03. Kepler magnitude: 13.75. Transit SNR 7.13

There are 7 quarters with good PRF difference image offsets

The direct PRF centroid is offset from the target star catalog position by about 0.08 arcsec

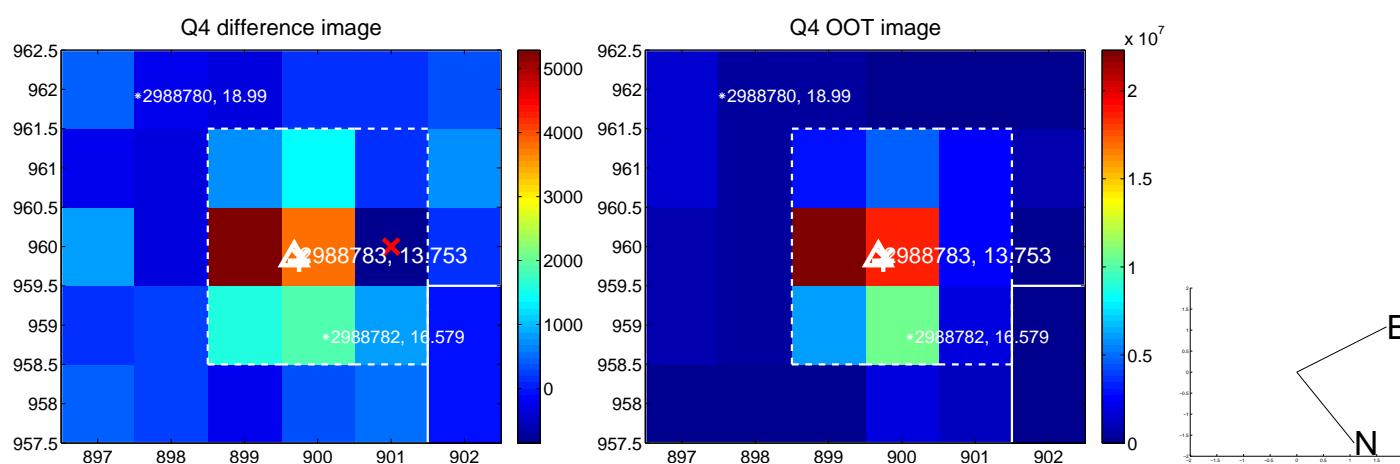
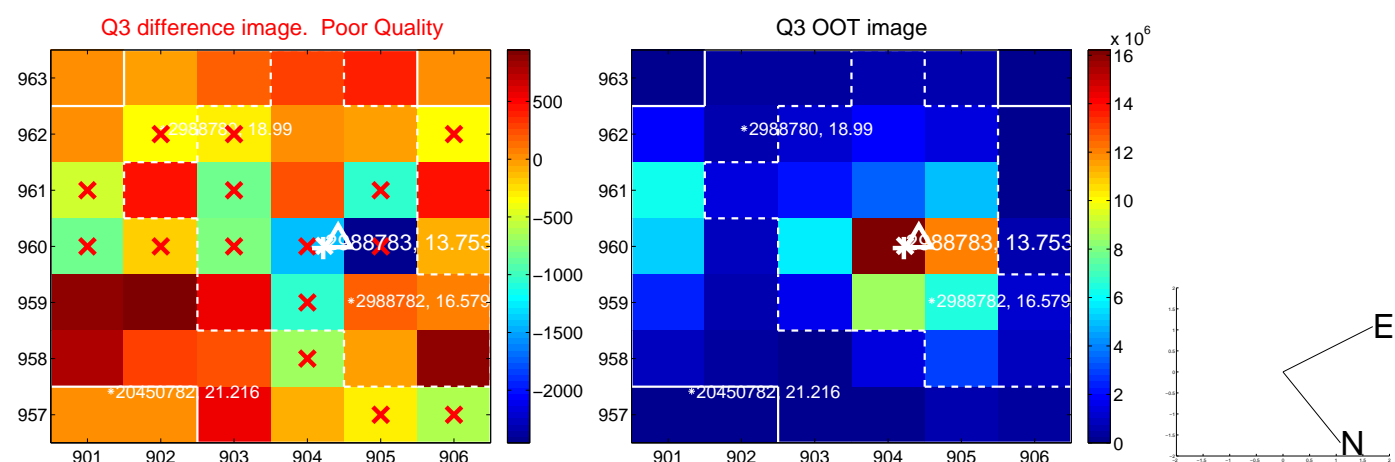
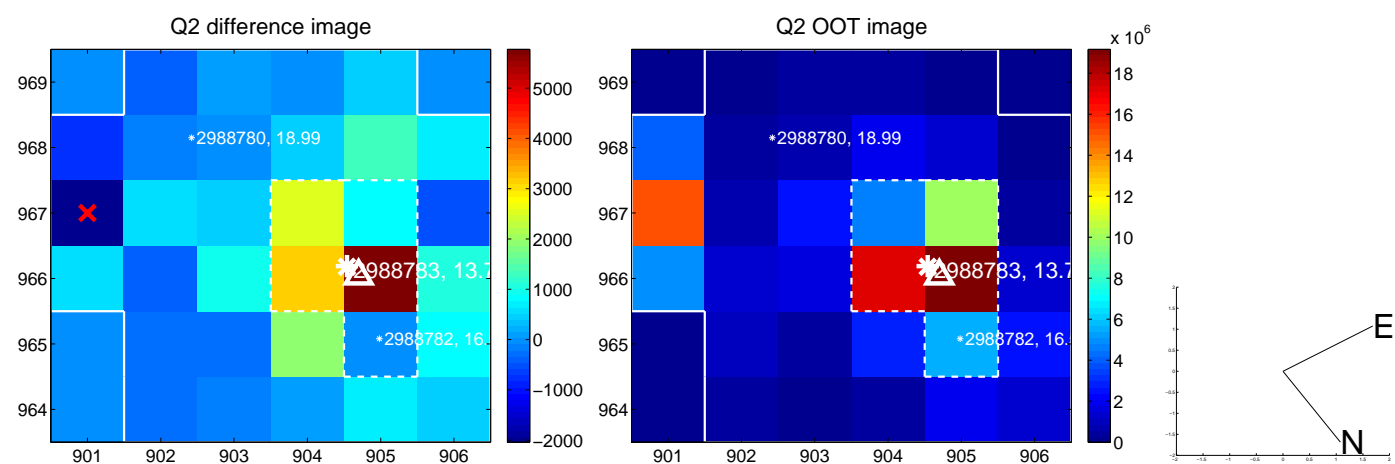
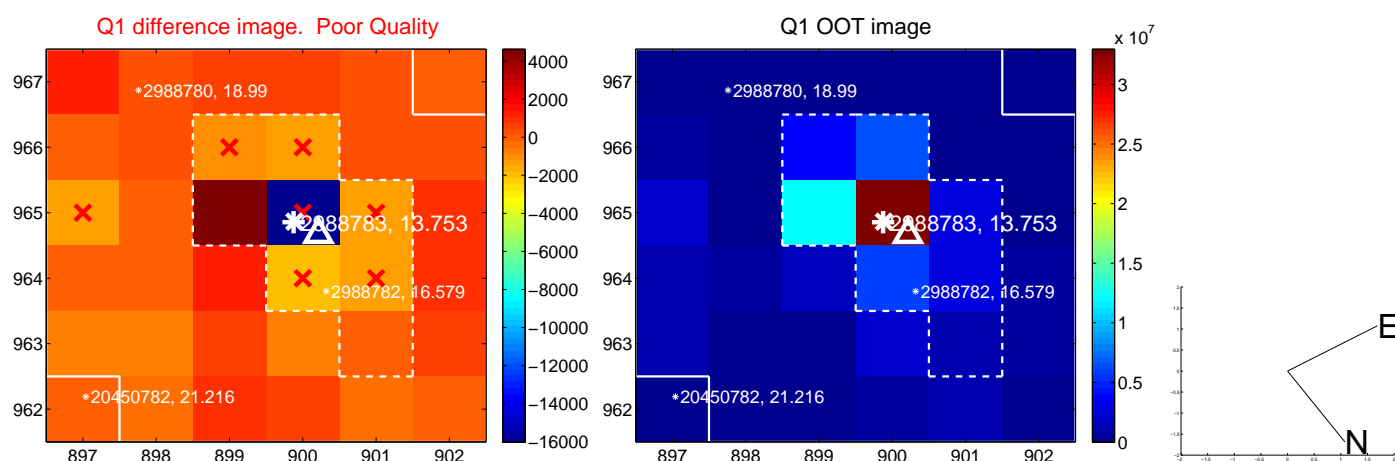
	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.511 \pm 0.821$	0.62	$0.251 \pm 0.156$	$0.446 \pm 0.901$
PRF-fit source offset from KIC position	$0.537 \pm 0.772$	0.70	$0.200 \pm 0.146$	$0.499 \pm 0.806$
photometric centroid source offset	$1.71 \pm 1.12$	1.53	$-0.50 \pm 1.02$	$-1.63 \pm 1.12$



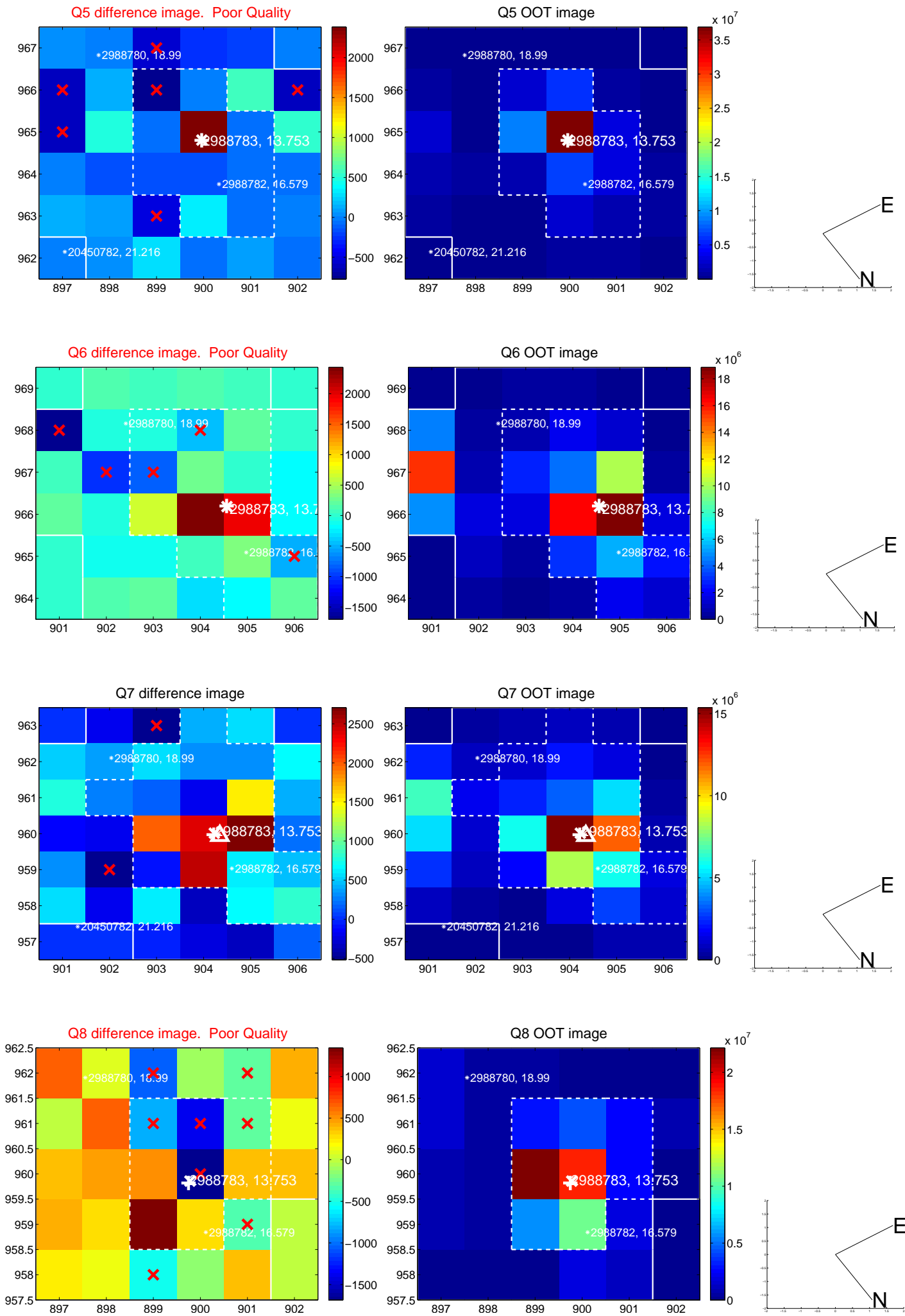
Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets**; **Vermillion crosses: bad quarterly centroid offsets**; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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



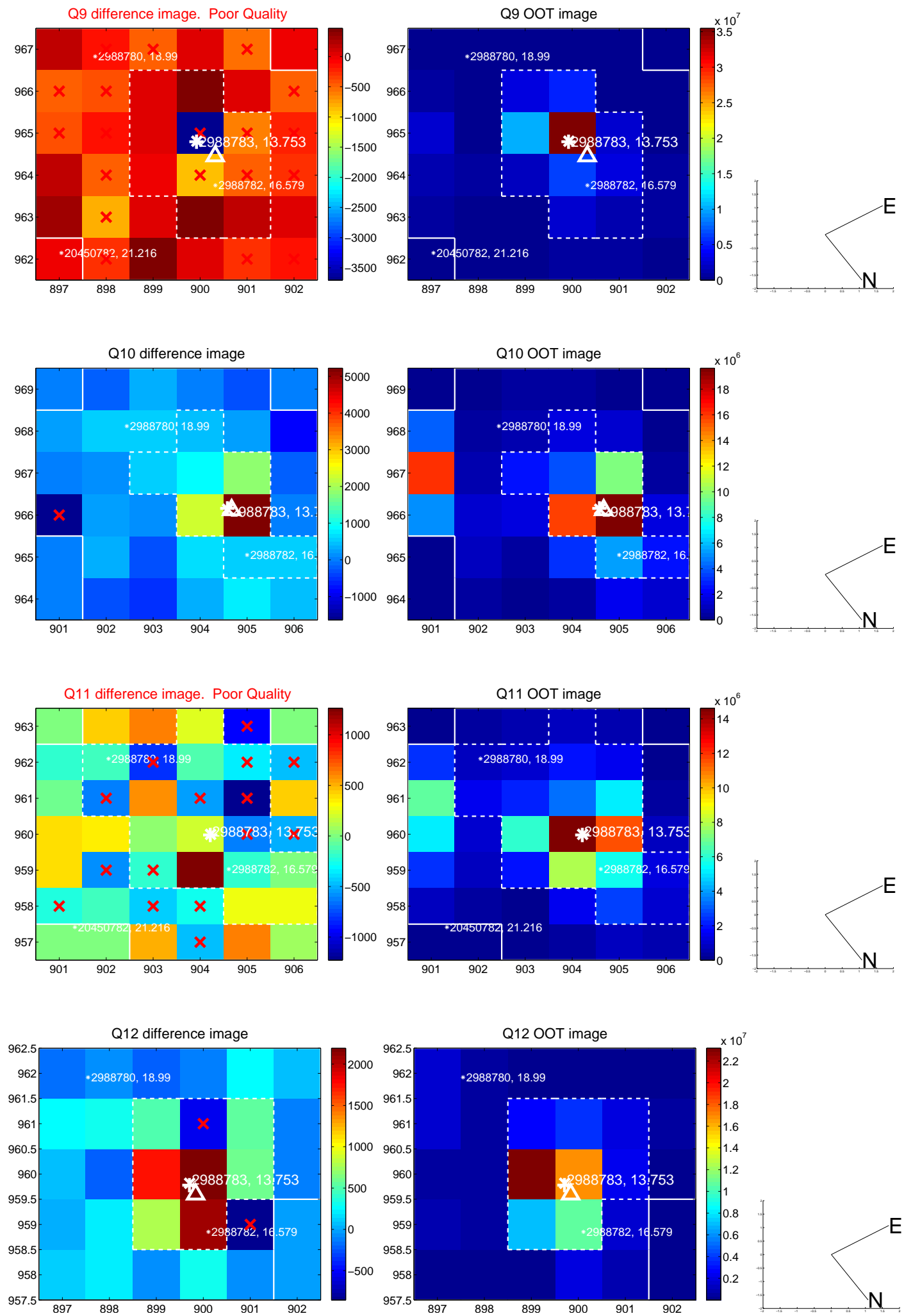
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



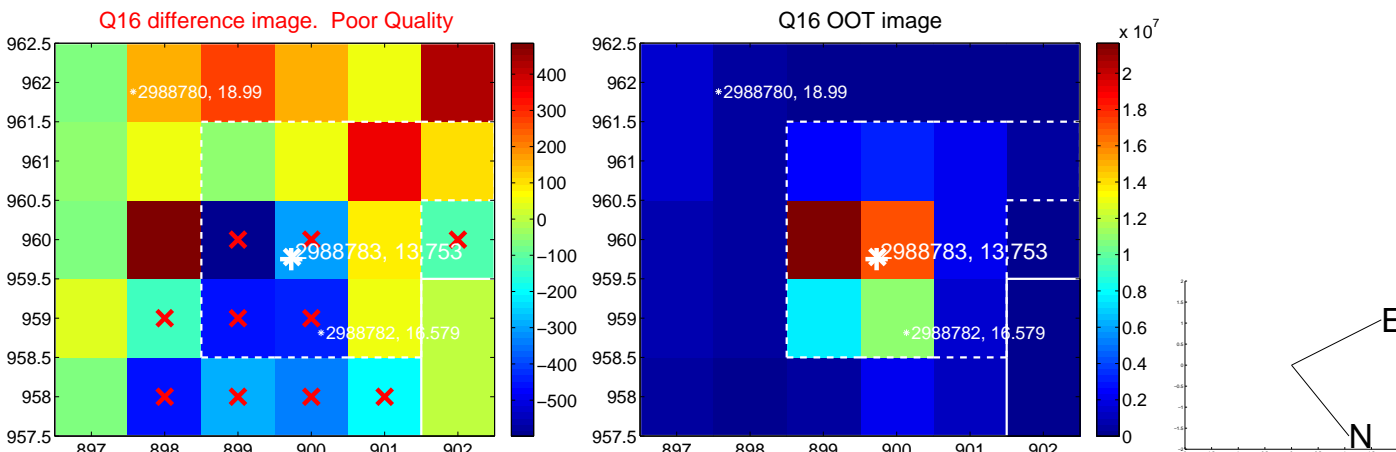
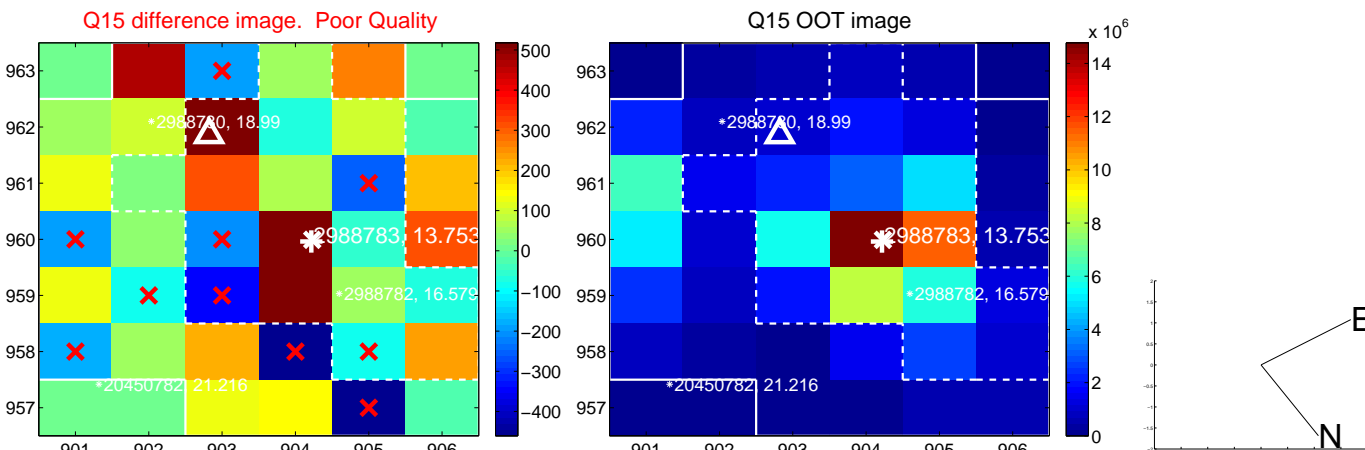
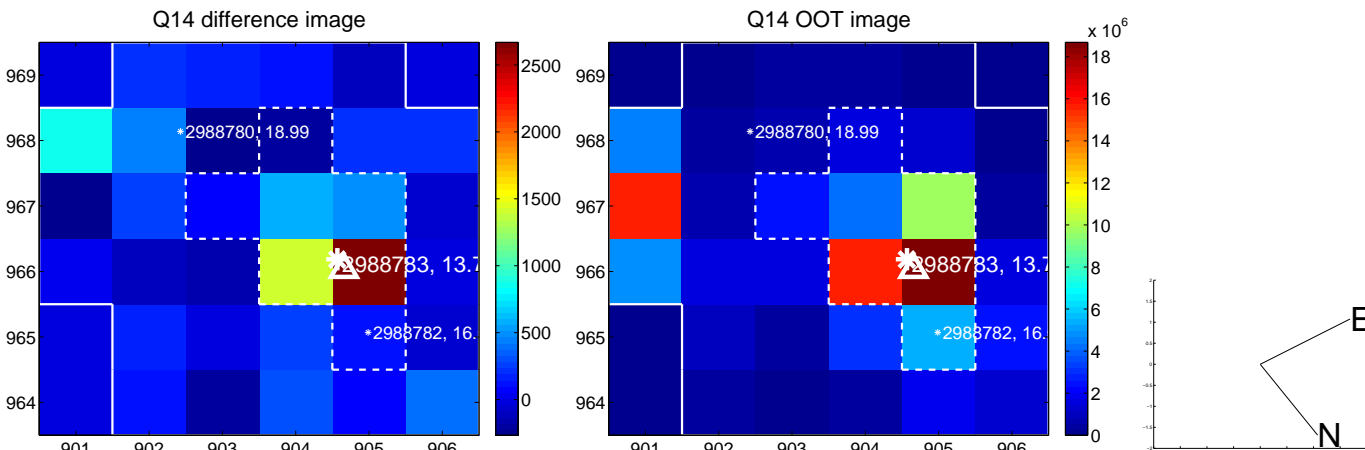
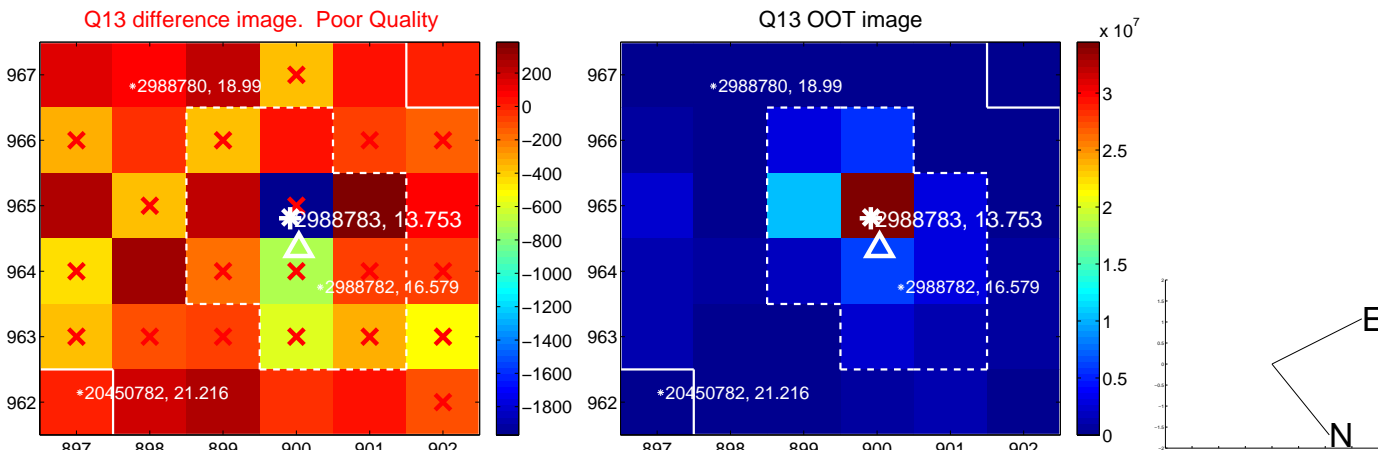
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



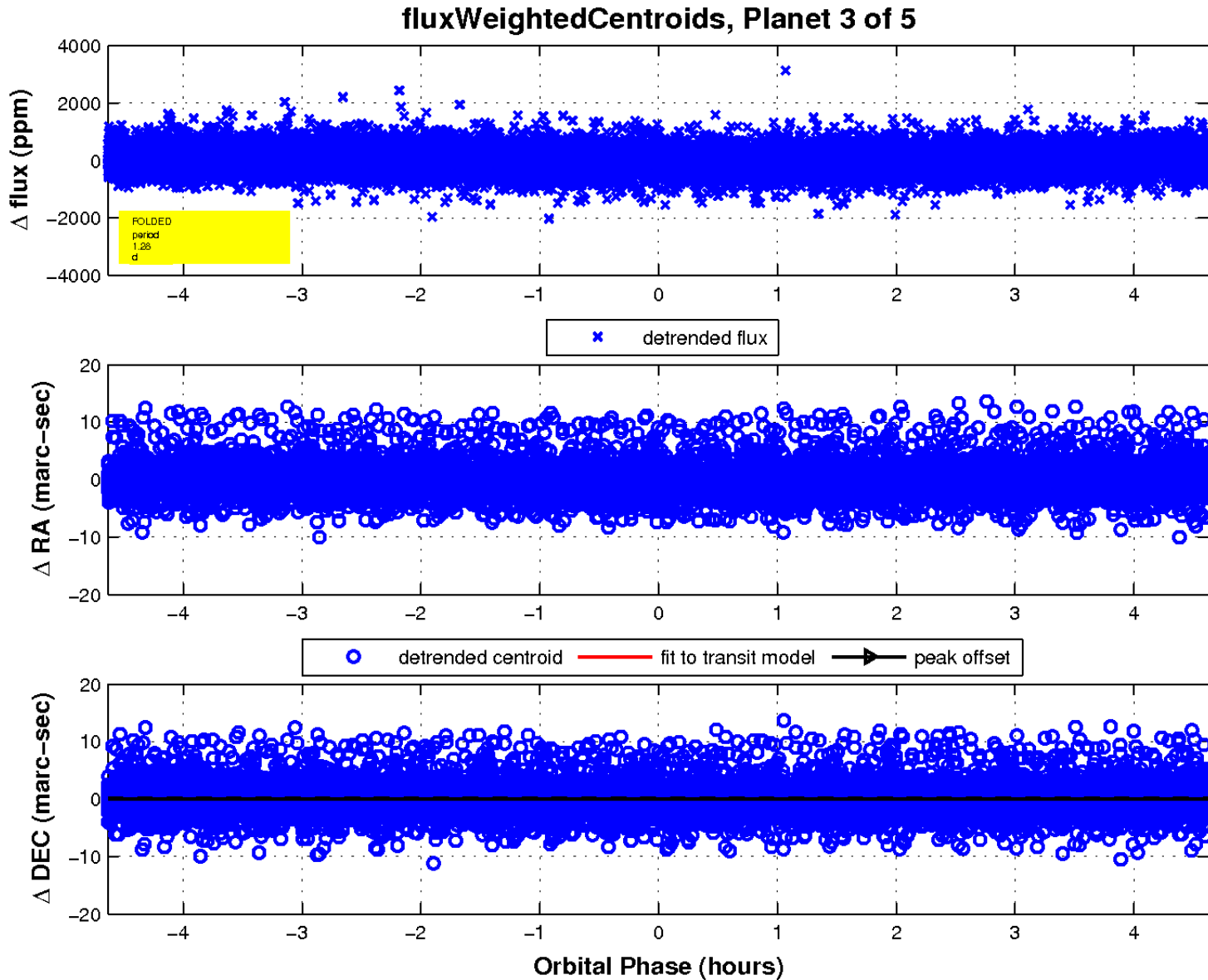
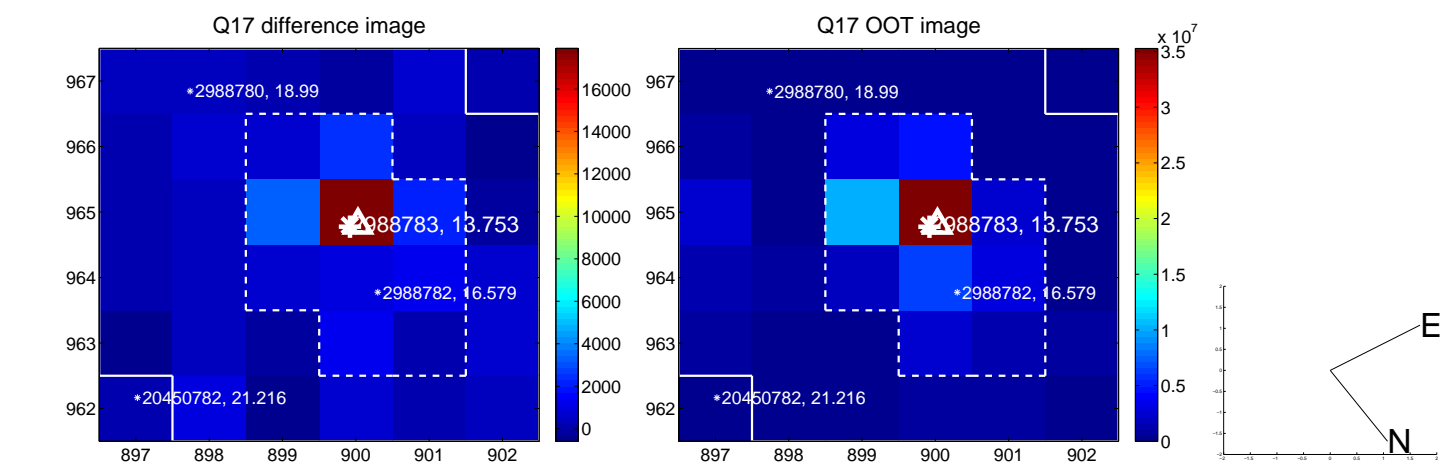
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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



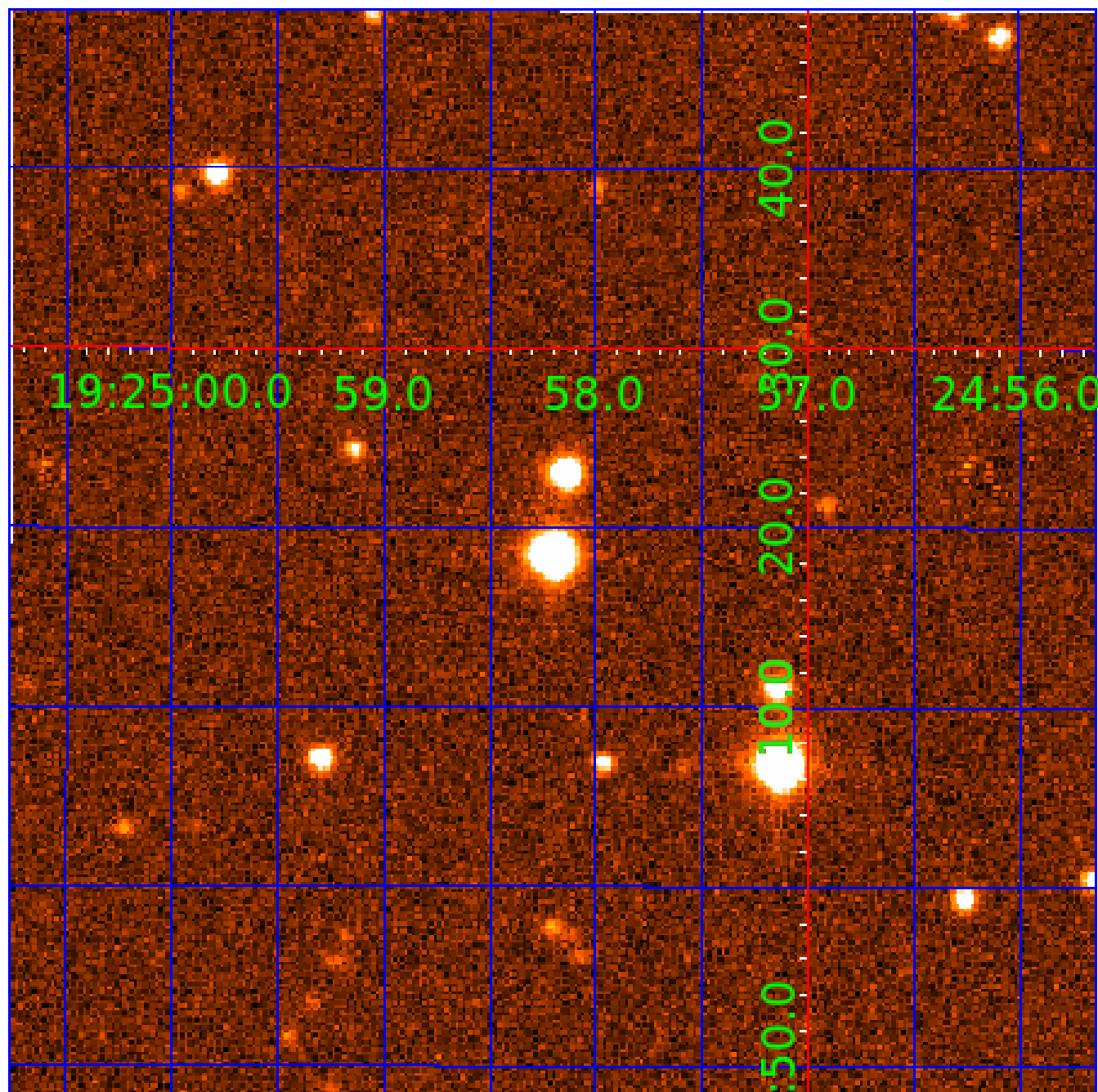
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.





UKIRT Image

Declination



# KIC 002988783

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
002988783-01	OBS	No	0.940229	132.078038	32.5	2.161	9.9	5.9	1.90	7384	1.25	19736.98
002988783-02	OBS	No	1.281548	131.987349	62.0	3.639	8.2	7.3	1.90	7384	2.05	13060.06
002988783-03	OBS	No	1.281660	131.603727	54.9	1.544	9.5	7.1	1.90	7384	1.63	13058.54
002988783-04	OBS	No	19.571654	135.244437	308.9	5.252	7.5	7.3	1.90	7384	6.31	344.69
002988783-05	OBS	No	70.903647	191.711667	275.0	6.000	7.2	-1.0	1.90	7384	3.19	61.95

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
002988783-01	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT
002988783-02	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT
002988783-03	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—SAME_NTL_PERIOD
002988783-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_SKYE_ZUMA—TRANS_GAPPED—LPP_ALT—MOD_NONUNIQ_ALT—MOD_TER_ALT
002988783-05	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—MOD_NONUNIQ_ALT—CENT_NOFITS

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

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

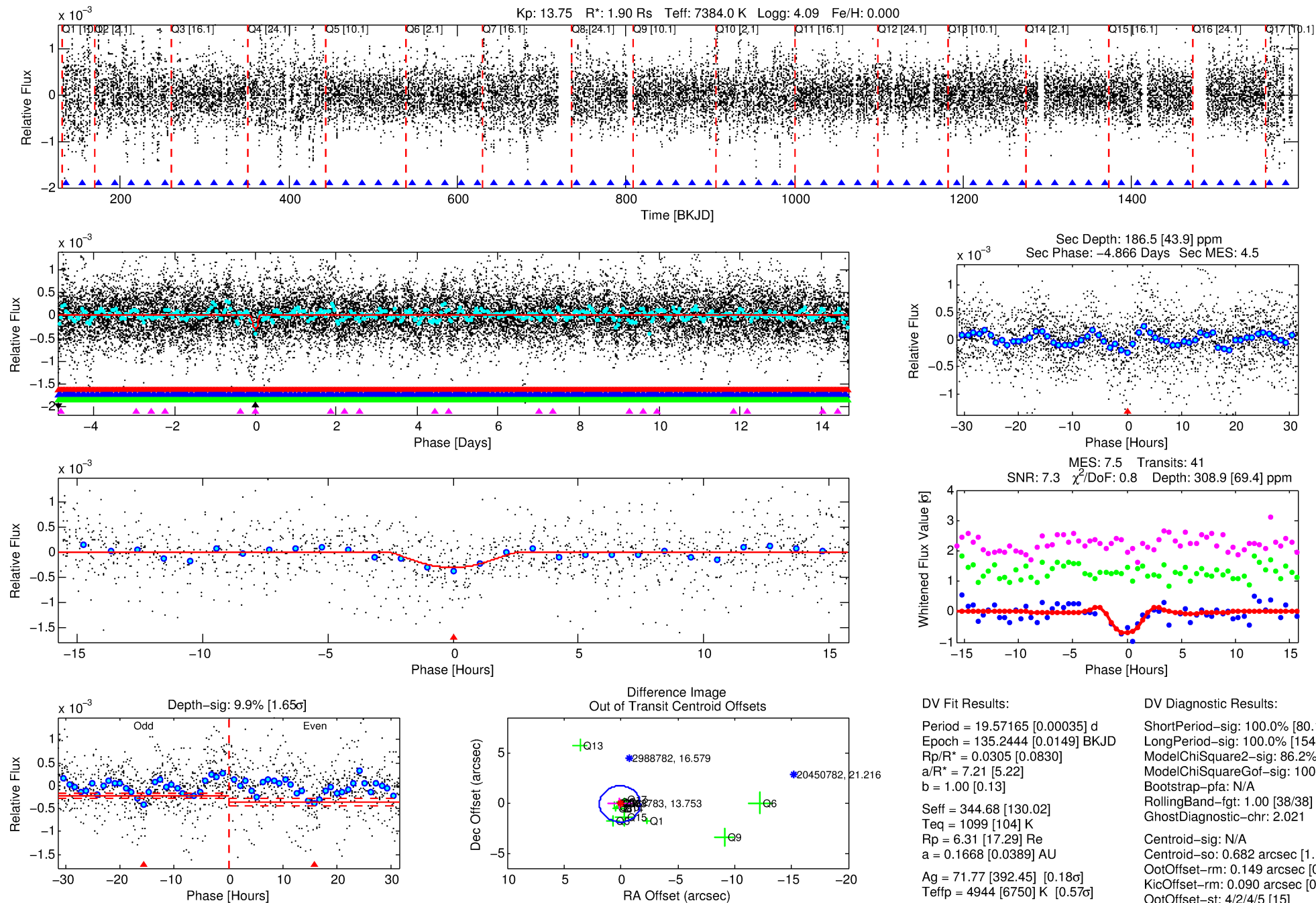
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 002988783-04

No Significant Match Found

# DV One-Page Summary

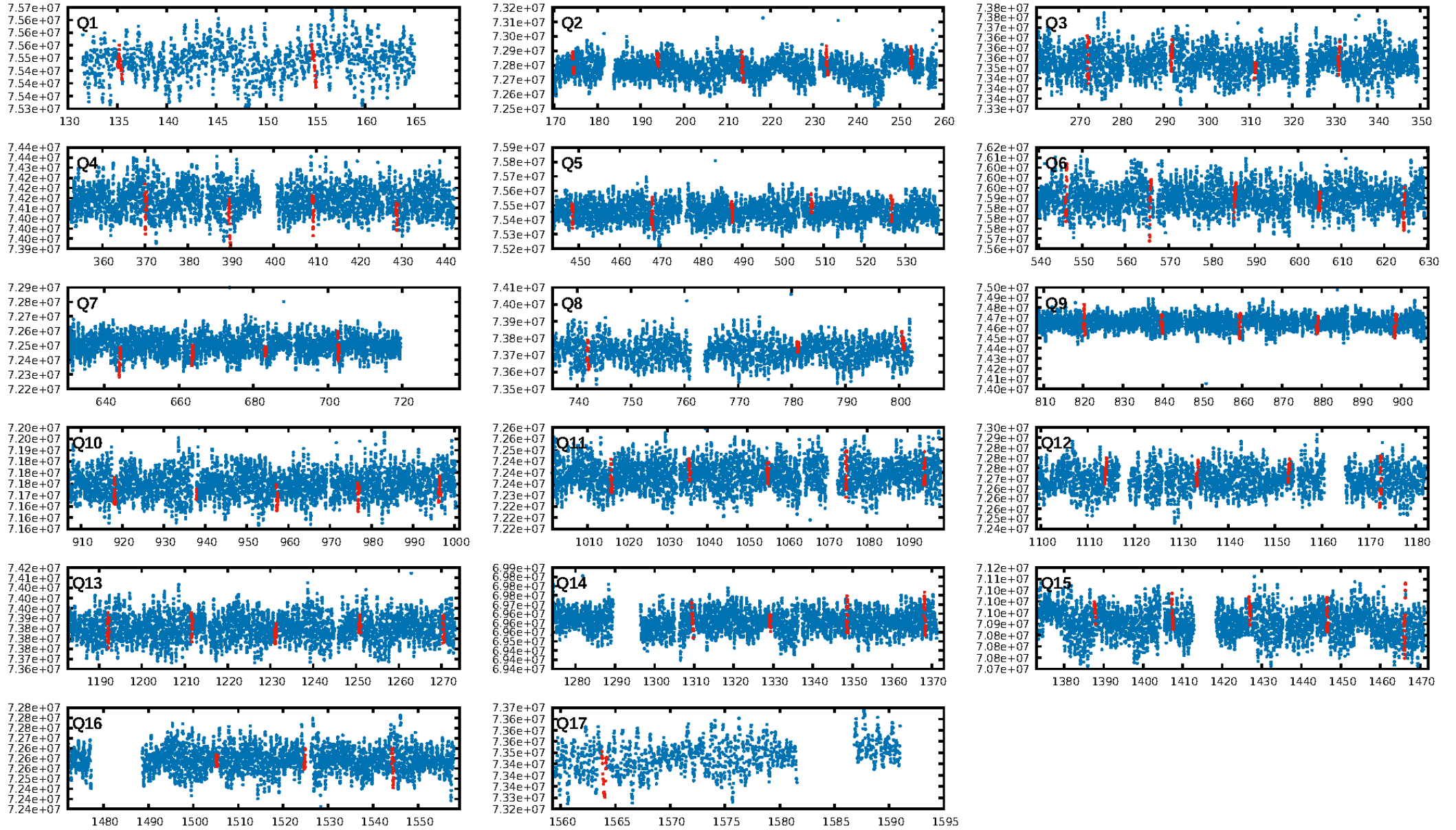
KIC: 2988783 Candidate: 4 of 5 Period: 19.572 d



Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 03-Feb-2016 08:45:48 Z

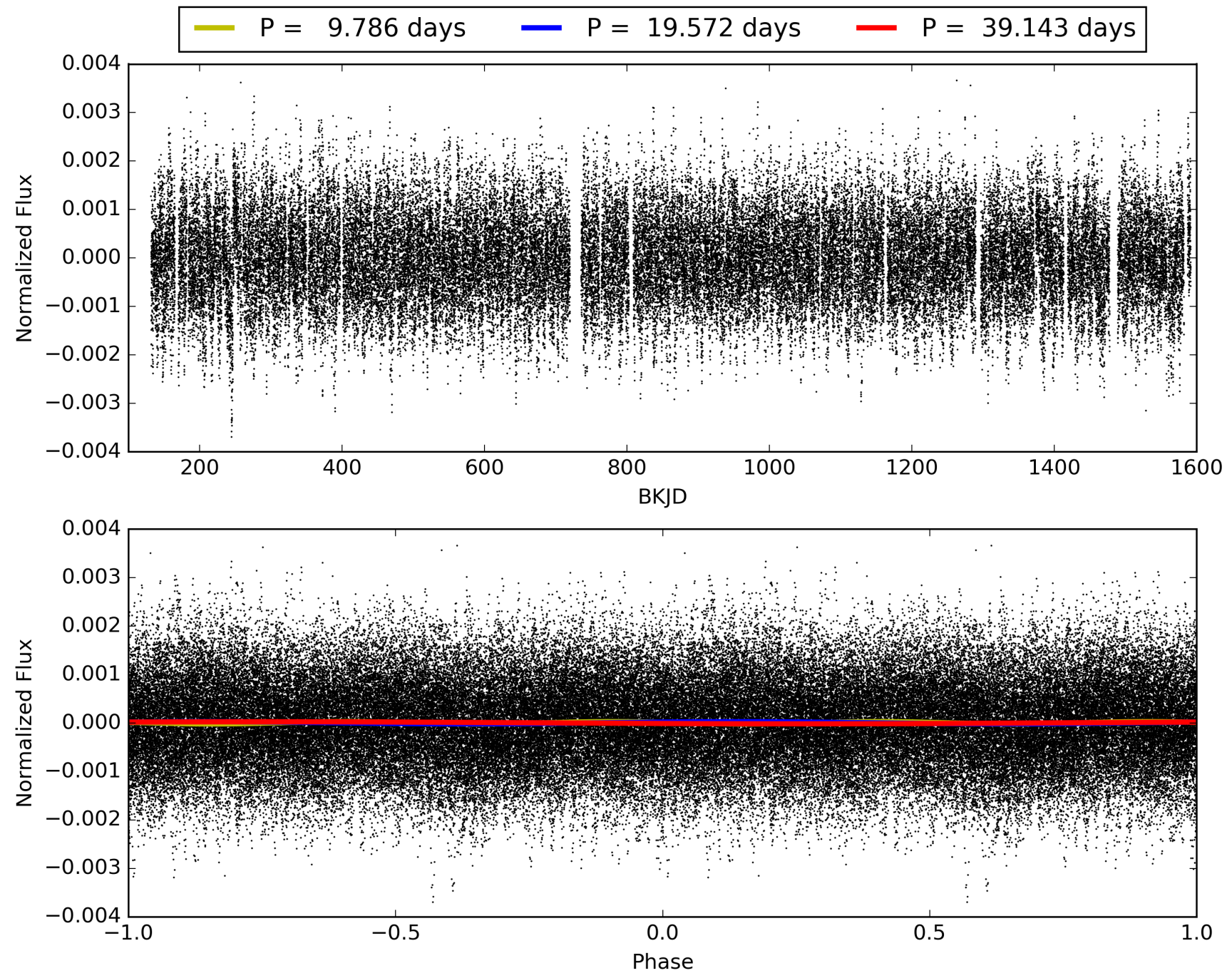
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

# TCE 002988783-04, PDC Light Curves





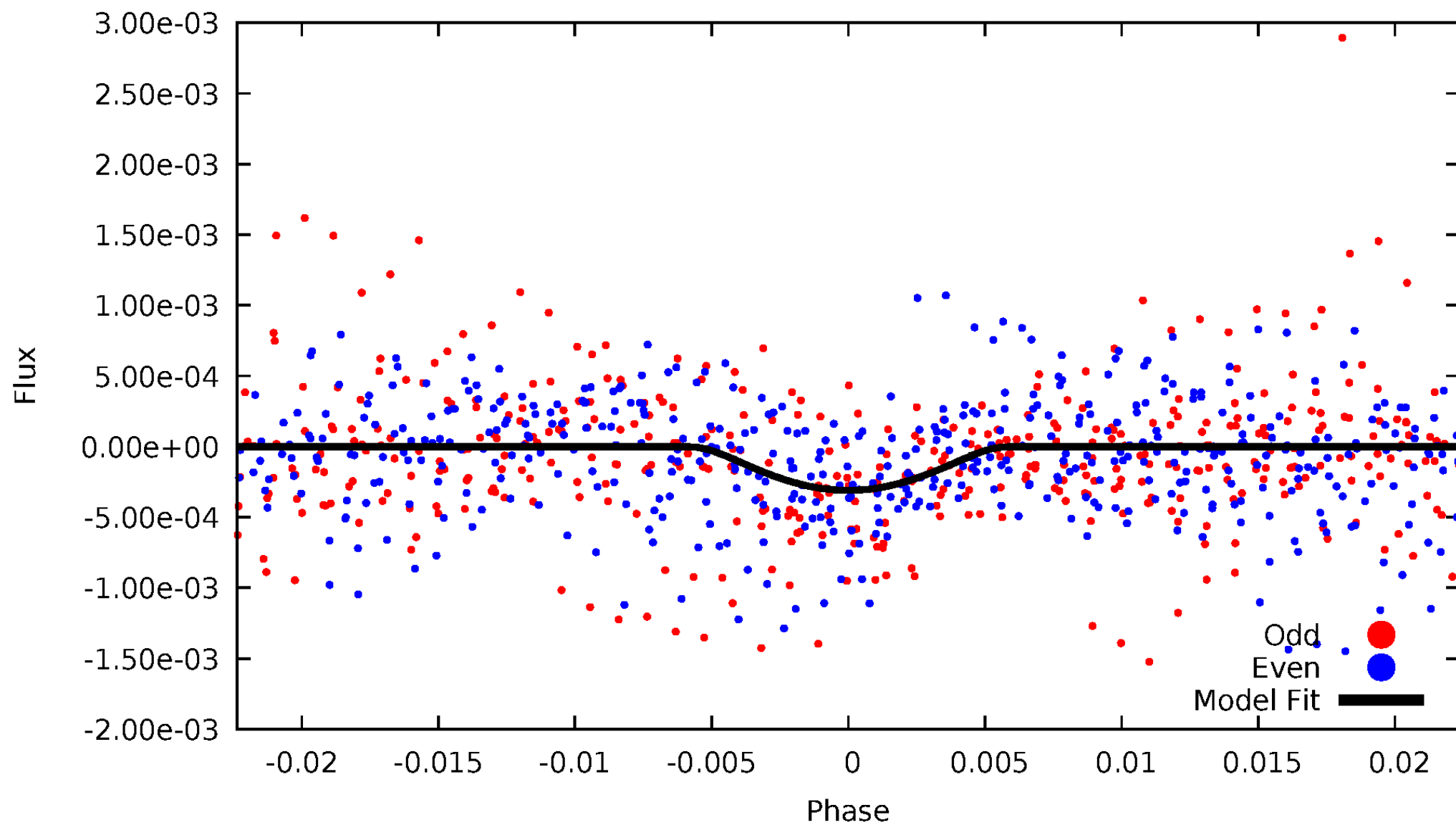
# TCE 002988783-04





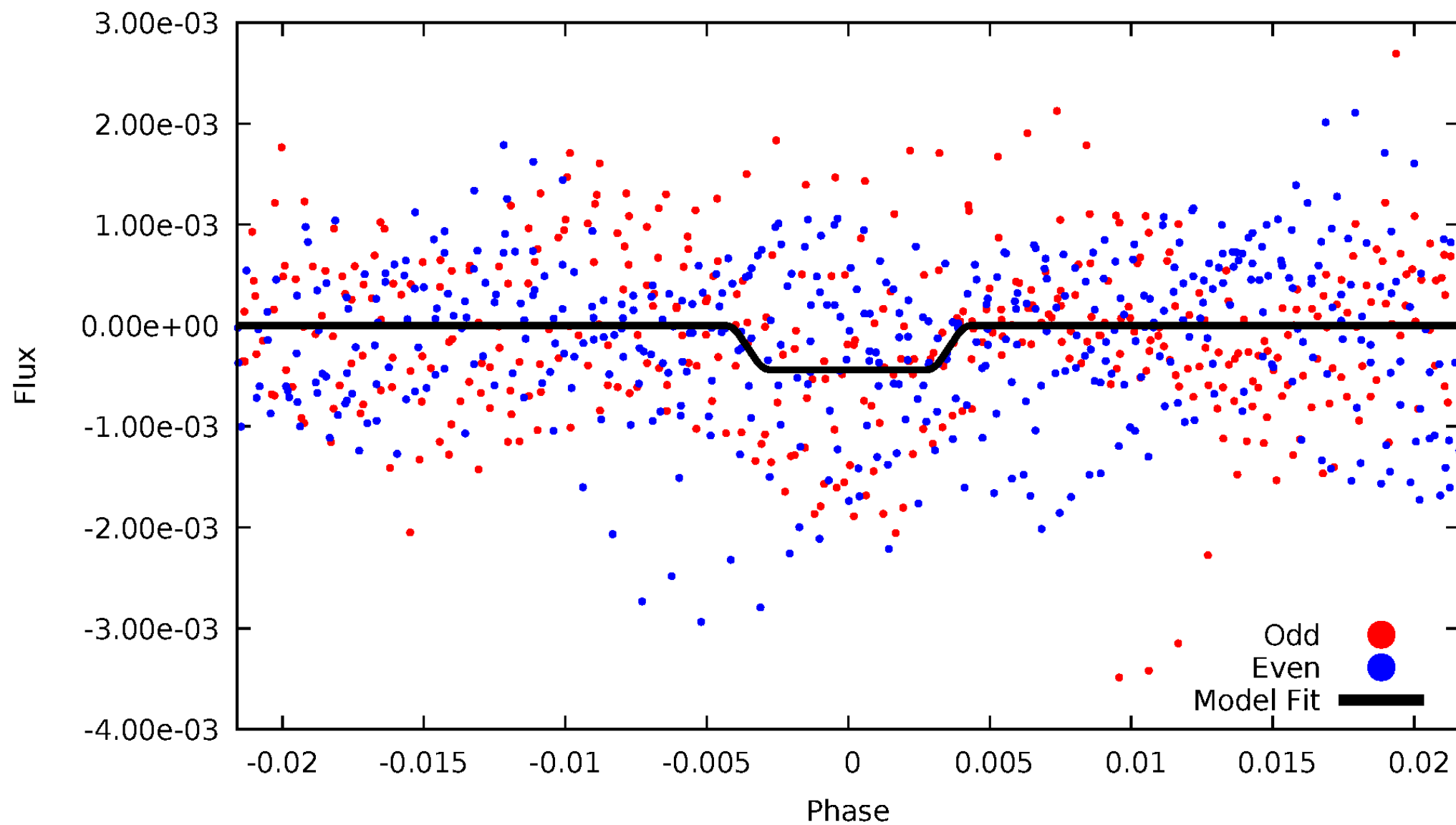
# DV Odd/Even

TCE 002988783-04



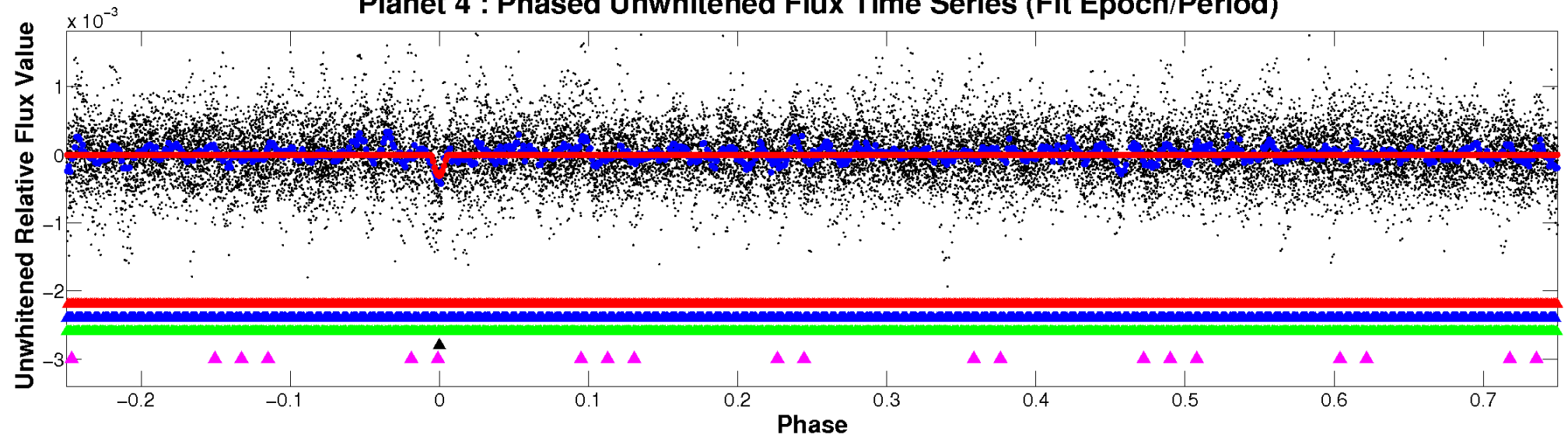
# ALT Odd/Even

TCE 002988783-04

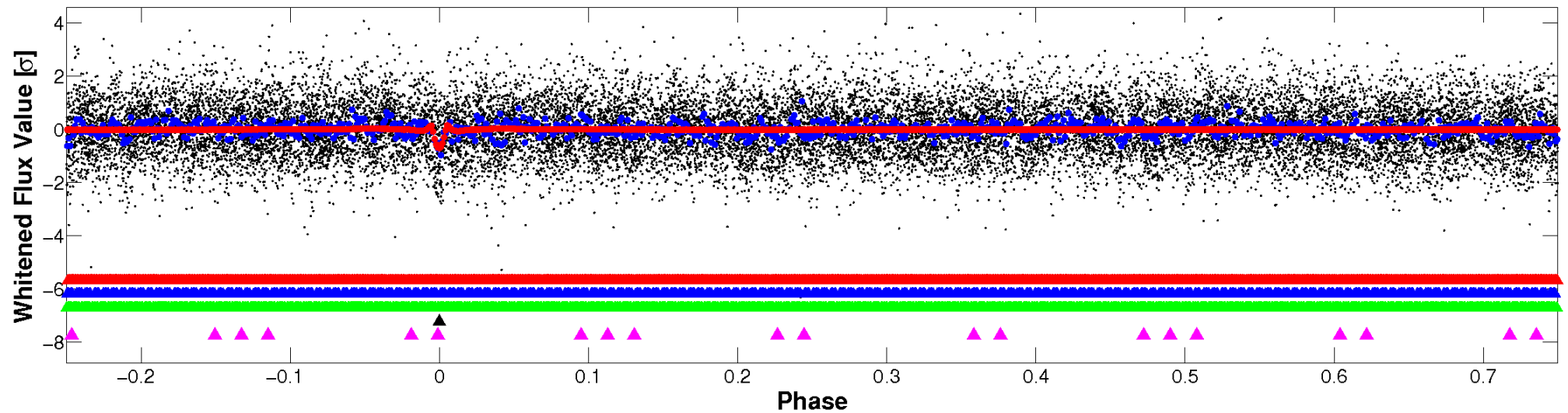


# Non-Whitened Vs. Whitened Light Curve

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

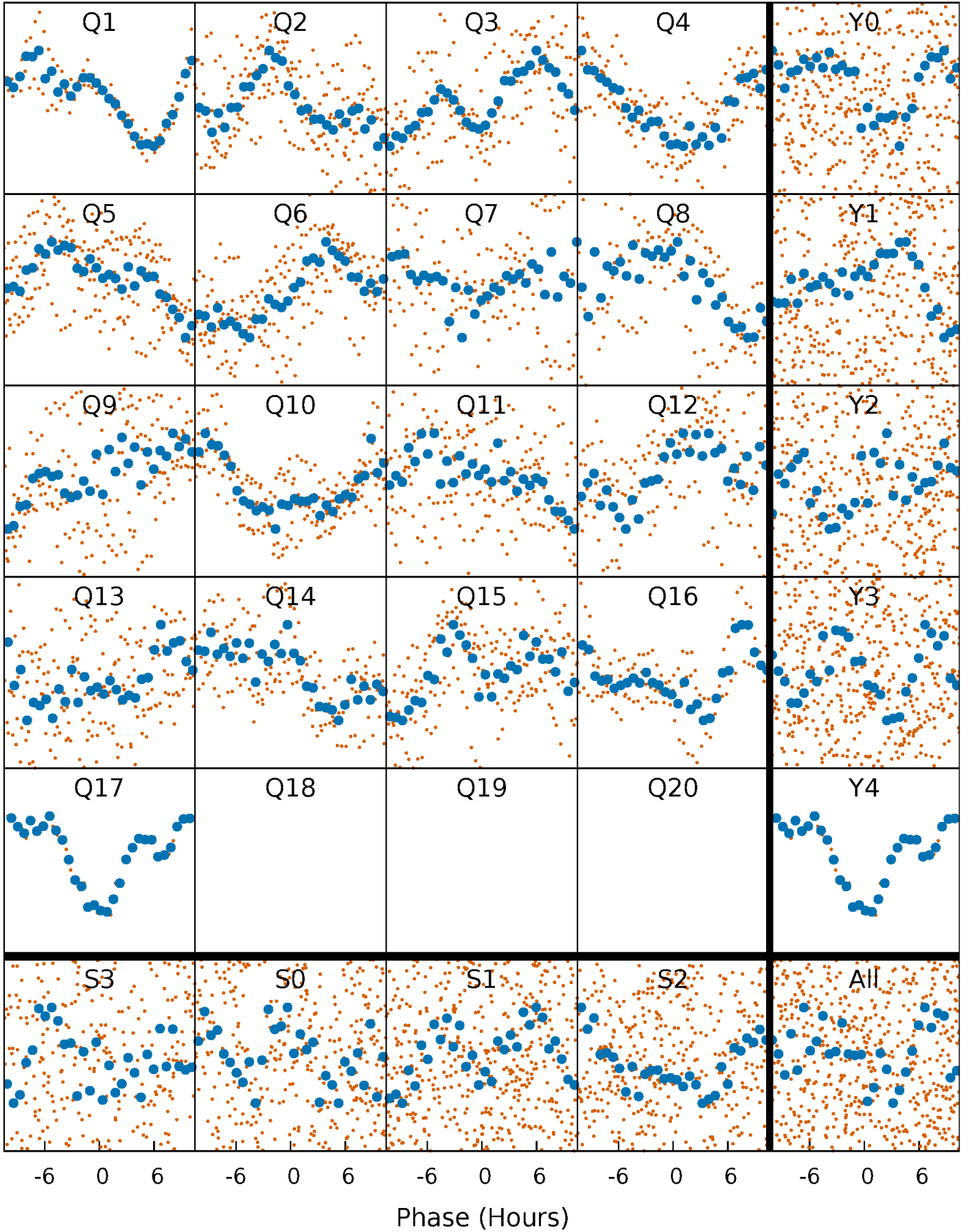


## Planet 4 : Phased Whitened Flux Time Series (Fit Epoch/Period)



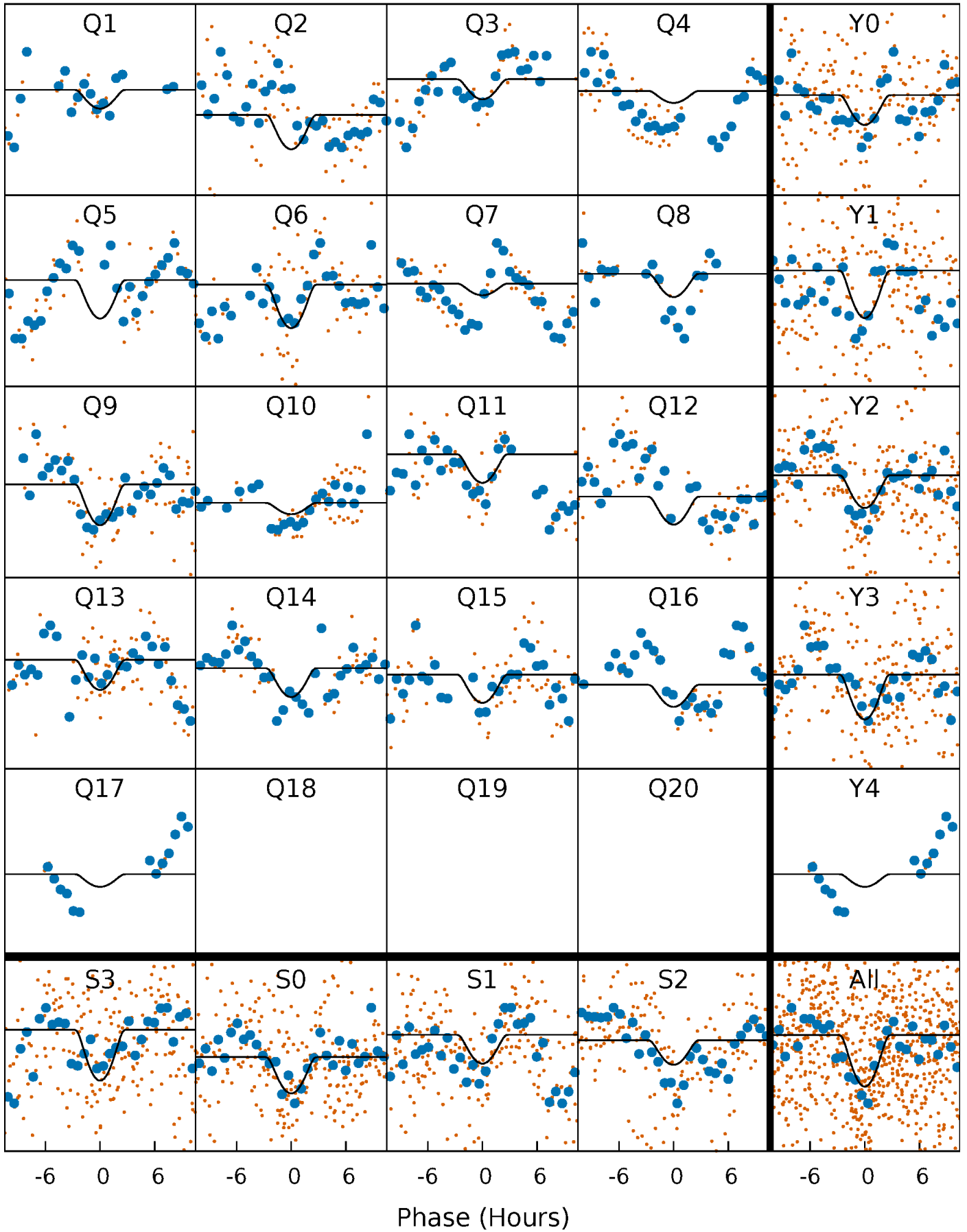
# PDC Quarter-Phased Transit Curves

TCE 002988783-04   P= 19.571654 Days    $T_0=135.244437$  (BKJD)



# DV Quarter-Phased Transit Curves

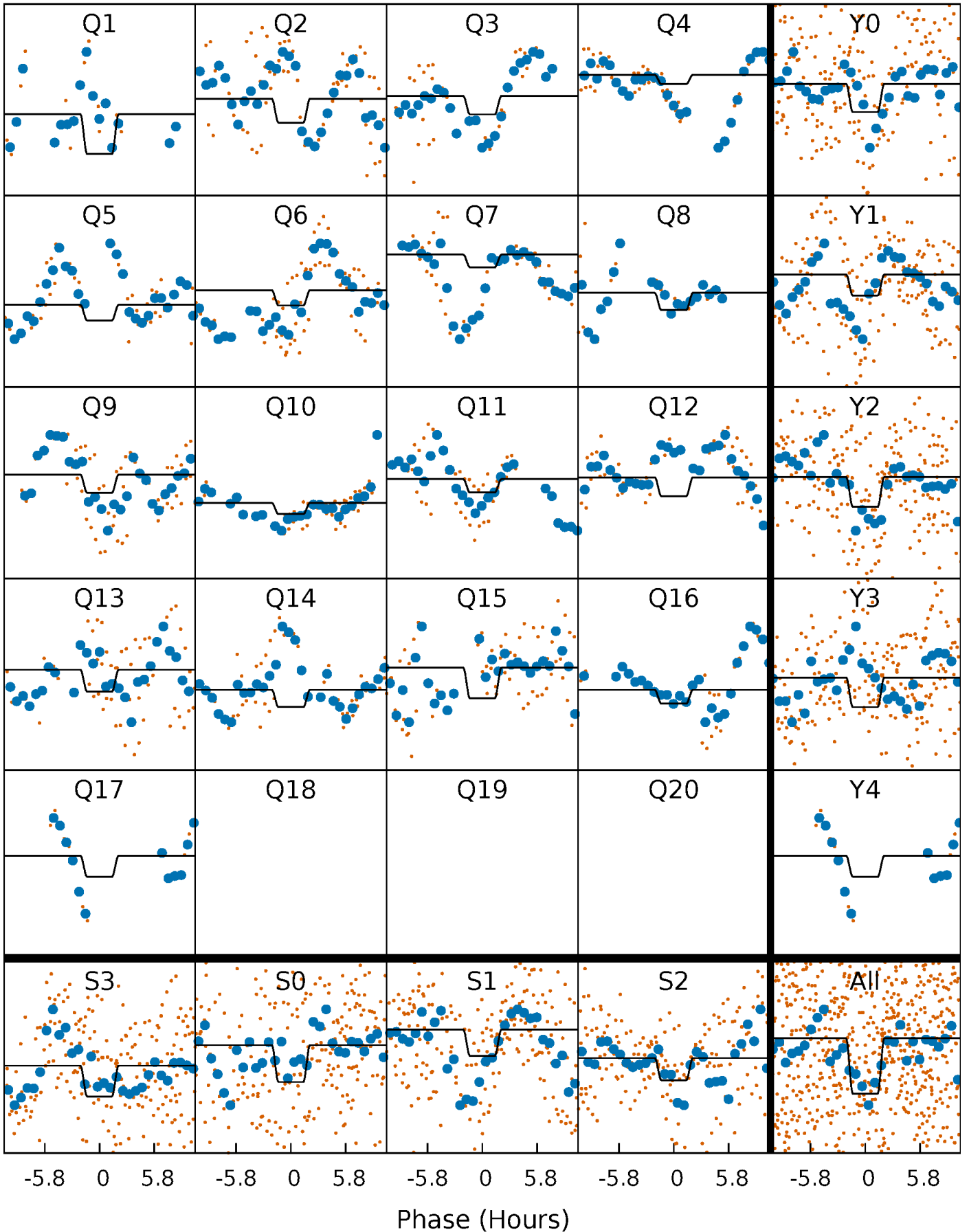
TCE 002988783-04 P= 19.571654 Days  $T_0=135.244437$  (BKJD)





# Alt. Detrend Quarter-Phased Transit Curves

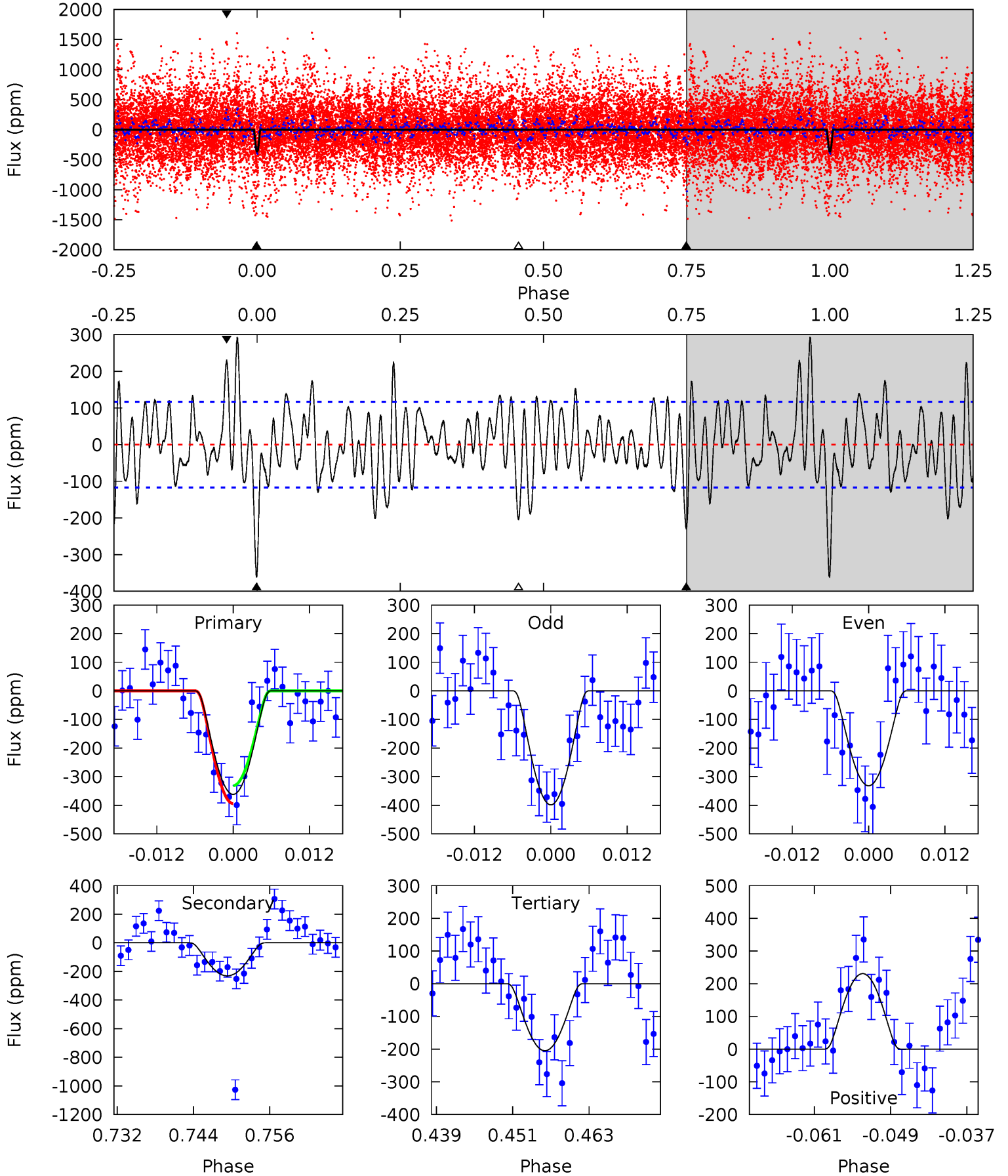
TCE 002988783-04 P= 19.571246 Days  $T_0=135.237286$  (BKJD)



# DV Model-Shift Uniqueness Test

002988783-04, P = 19.571654 Days, E = 115.672783 Days

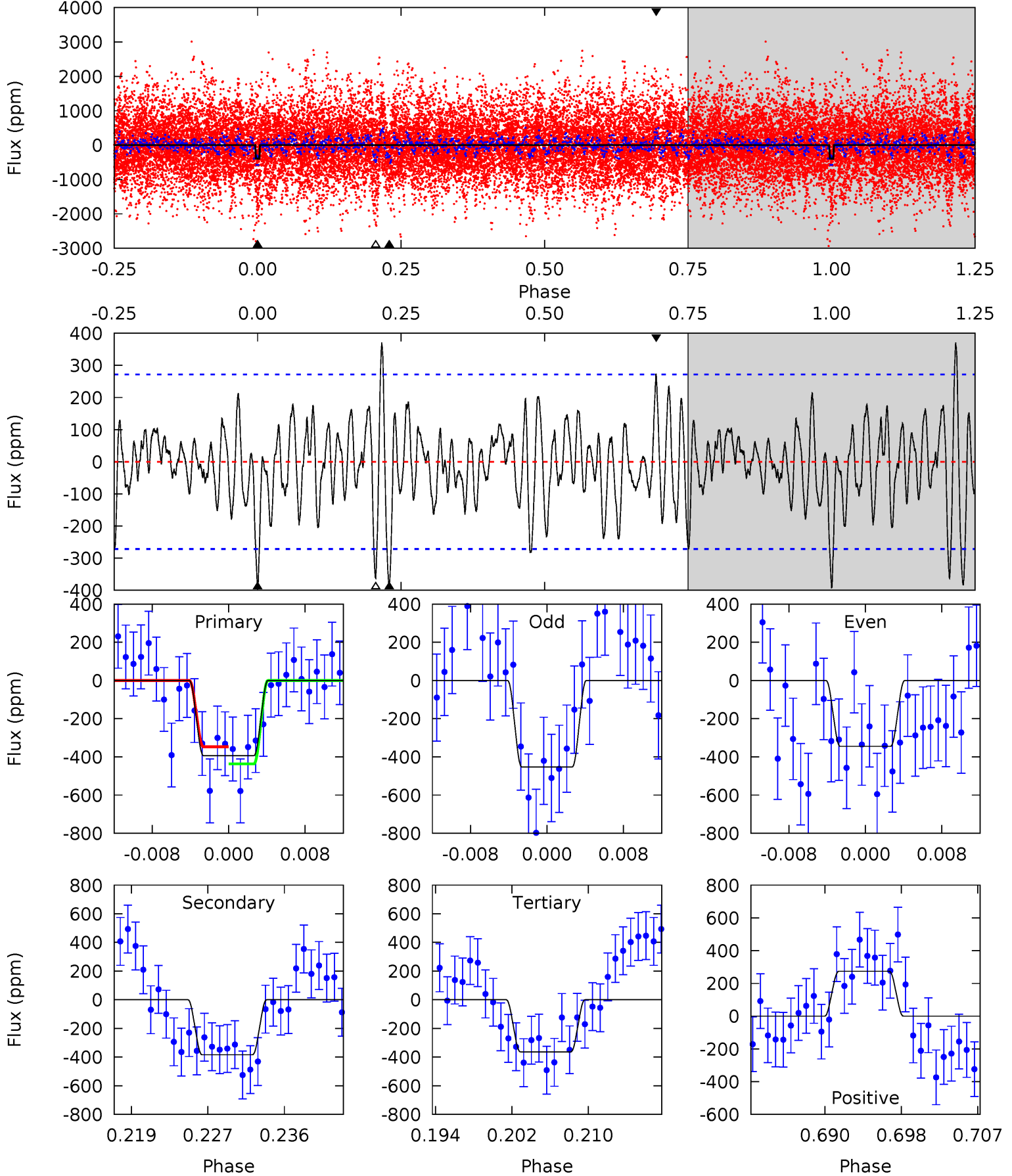
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
15.5	9.87	8.76	9.87	4.99	2.51	3.31	6.71	5.61	1.11	0.00	1.42	1.36	0.45	1.33



# Alt Model-Shift Uniqueness Test

002988783-04, P = 19.571246 Days, E = 115.666040 Days

Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
7.33	7.15	6.77	5.11	5.06	2.63	1.92	0.56	2.22	0.38	2.04	1.00	1.17	0.49	0.83



### Stellar Parameters For KIC 002988783

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$7384^{+207}_{-337}$	$4.090^{+0.144}_{-0.176}$	$0.000^{+0.200}_{-0.350}$	$1.898^{+0.540}_{-0.393}$	$1.617^{+0.213}_{-0.260}$	$0.333^{+0.246}_{-0.163}$
	+3%/-5%	+4%/-4%	+inf%/-inf%	+28%/-21%	+13%/-16%	+74%/-49%
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 002988783-04 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-231 \pm 23$	$14.96^{+14.00}_{-10.37}$	$1530^{+114}_{-104}$	$3716^{+2198}_{-697}$	$16^{+157}_{-12}$
Alt.	$-384 \pm 54$	$12.90^{+14.42}_{-8.76}$	$1529^{+111}_{-105}$	$4244^{+3110}_{-923}$	$34^{+311}_{-26}$

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

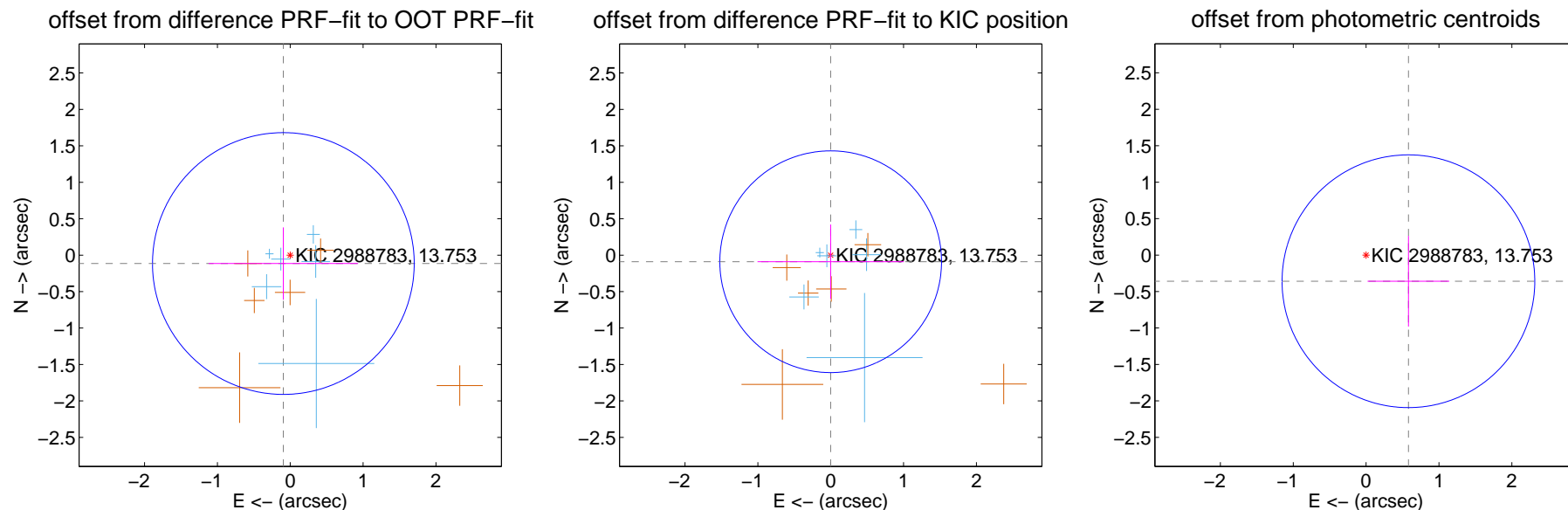
## DV Centroid Data

Supplemental centroid analysis for 002988783-04. Kepler magnitude: 13.75. Transit SNR 7.29

There are 6 quarters with good PRF difference image offsets

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

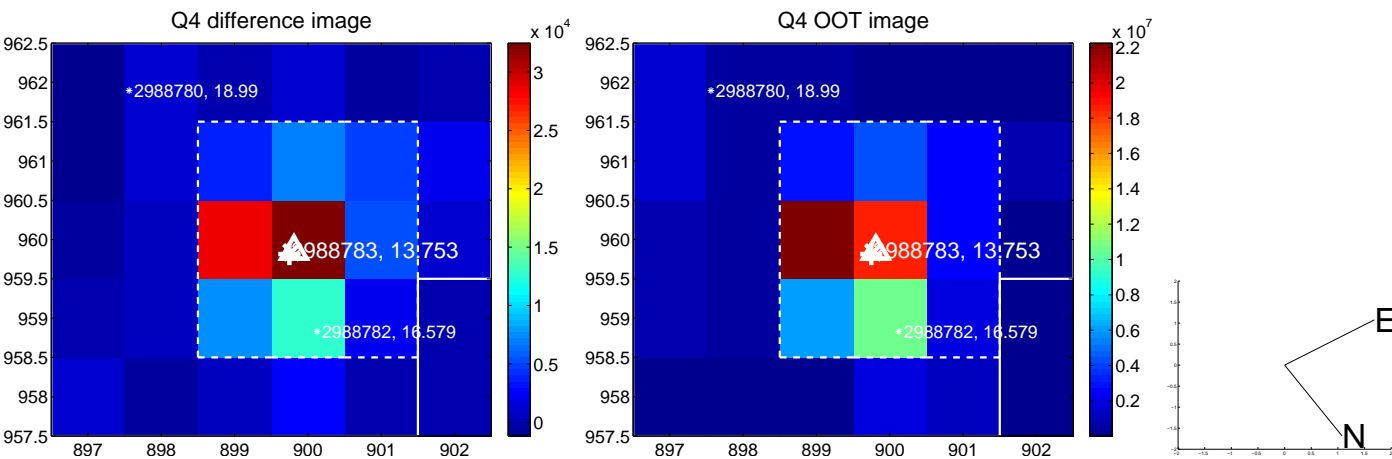
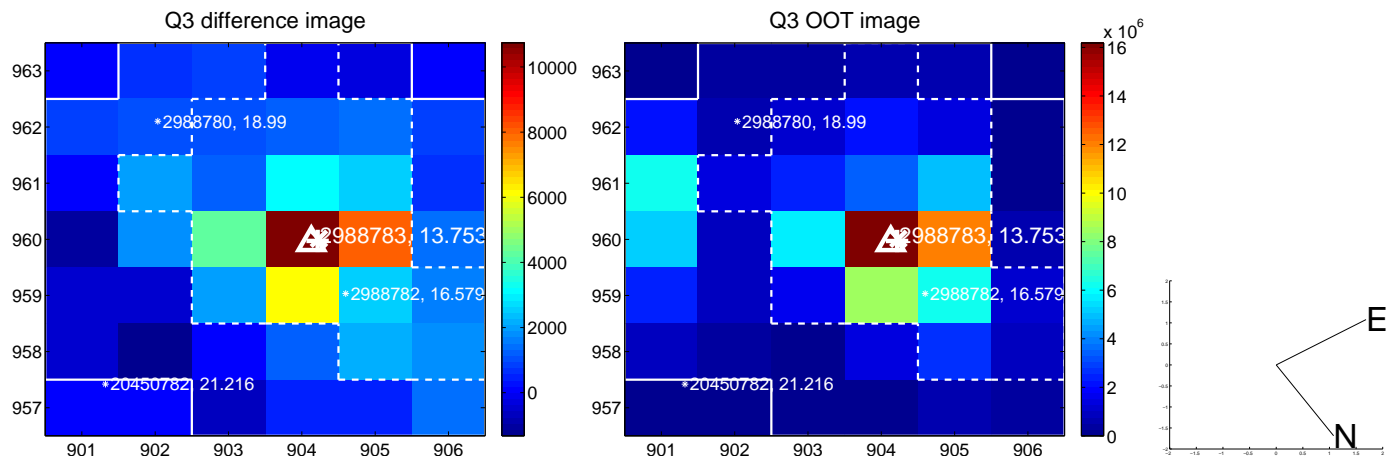
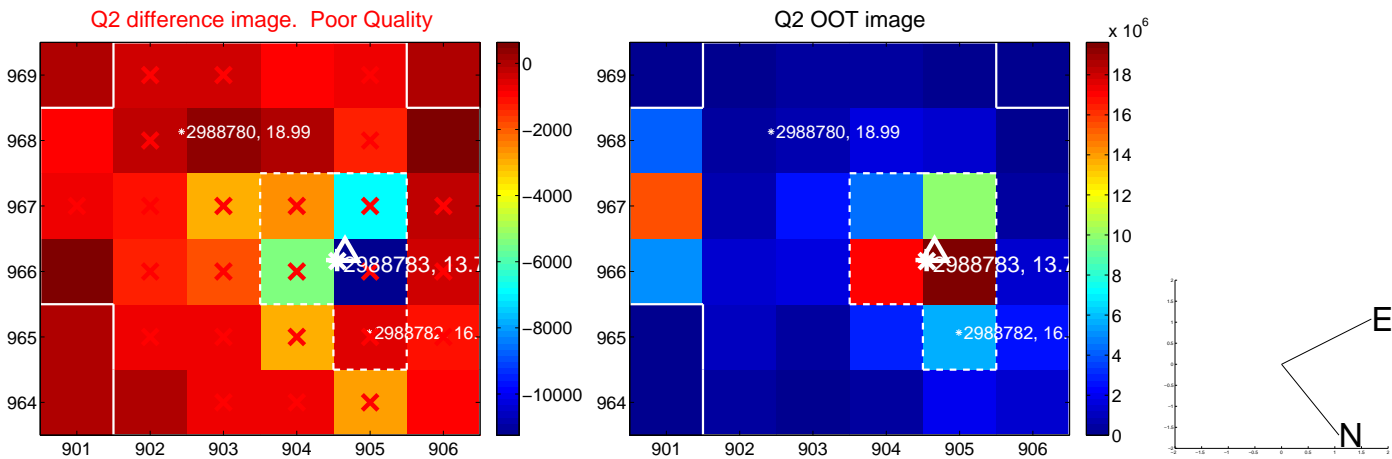
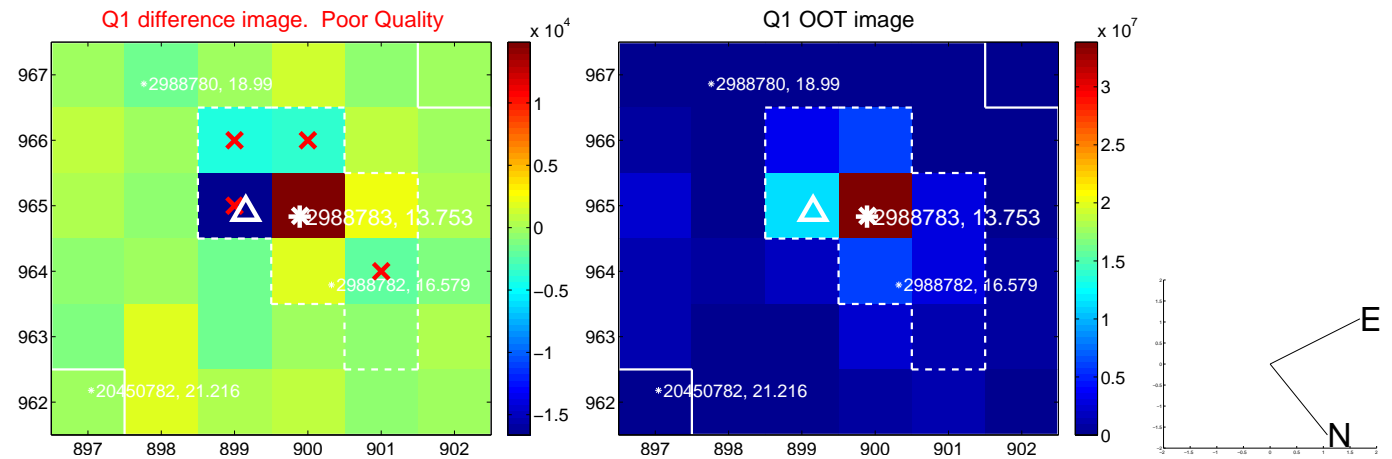
	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.149 \pm 0.599$	0.25	$0.095 \pm 1.025$	$-0.115 \pm 0.496$
PRF-fit source offset from KIC position	$0.090 \pm 0.507$	0.18	$0.001 \pm 1.004$	$-0.090 \pm 0.510$
photometric centroid source offset	$0.68 \pm 0.58$	1.18	$-0.58 \pm 0.56$	$-0.36 \pm 0.62$



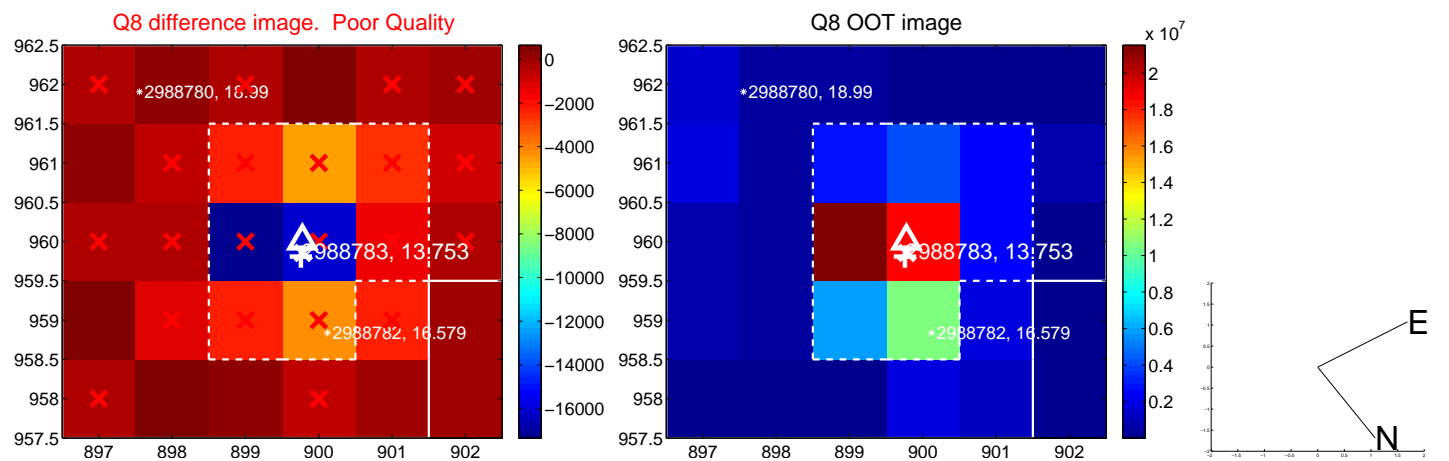
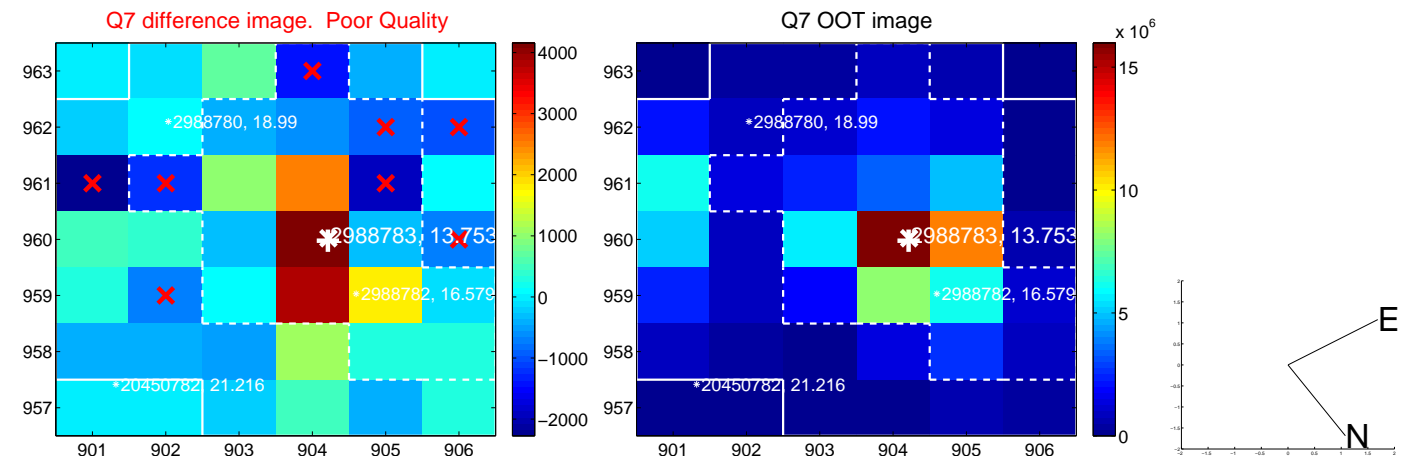
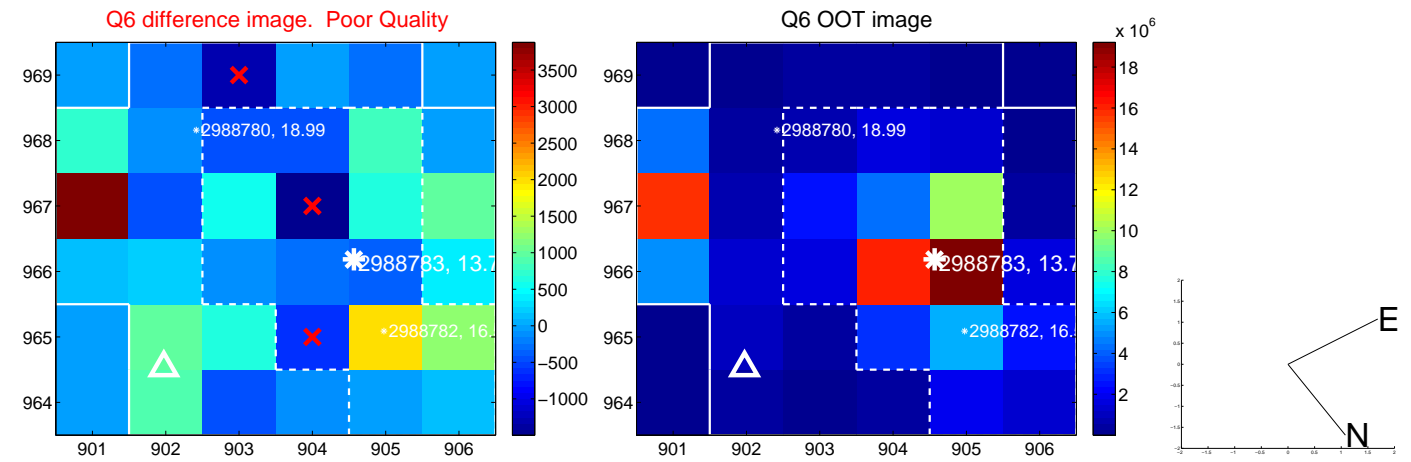
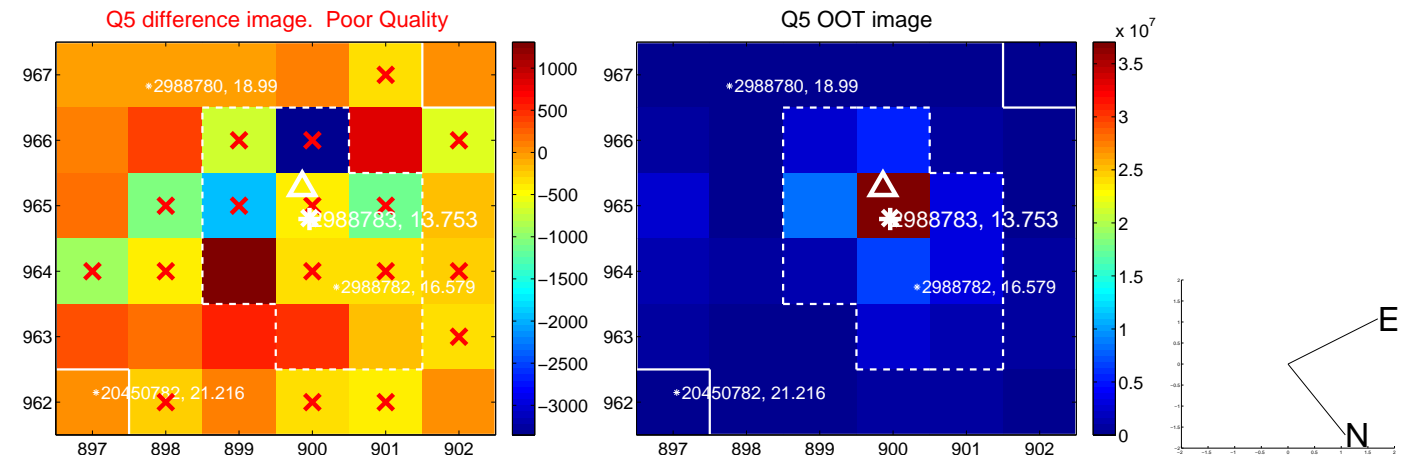
Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses:** good quarterly centroid offsets; **Vermillion crosses:** bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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



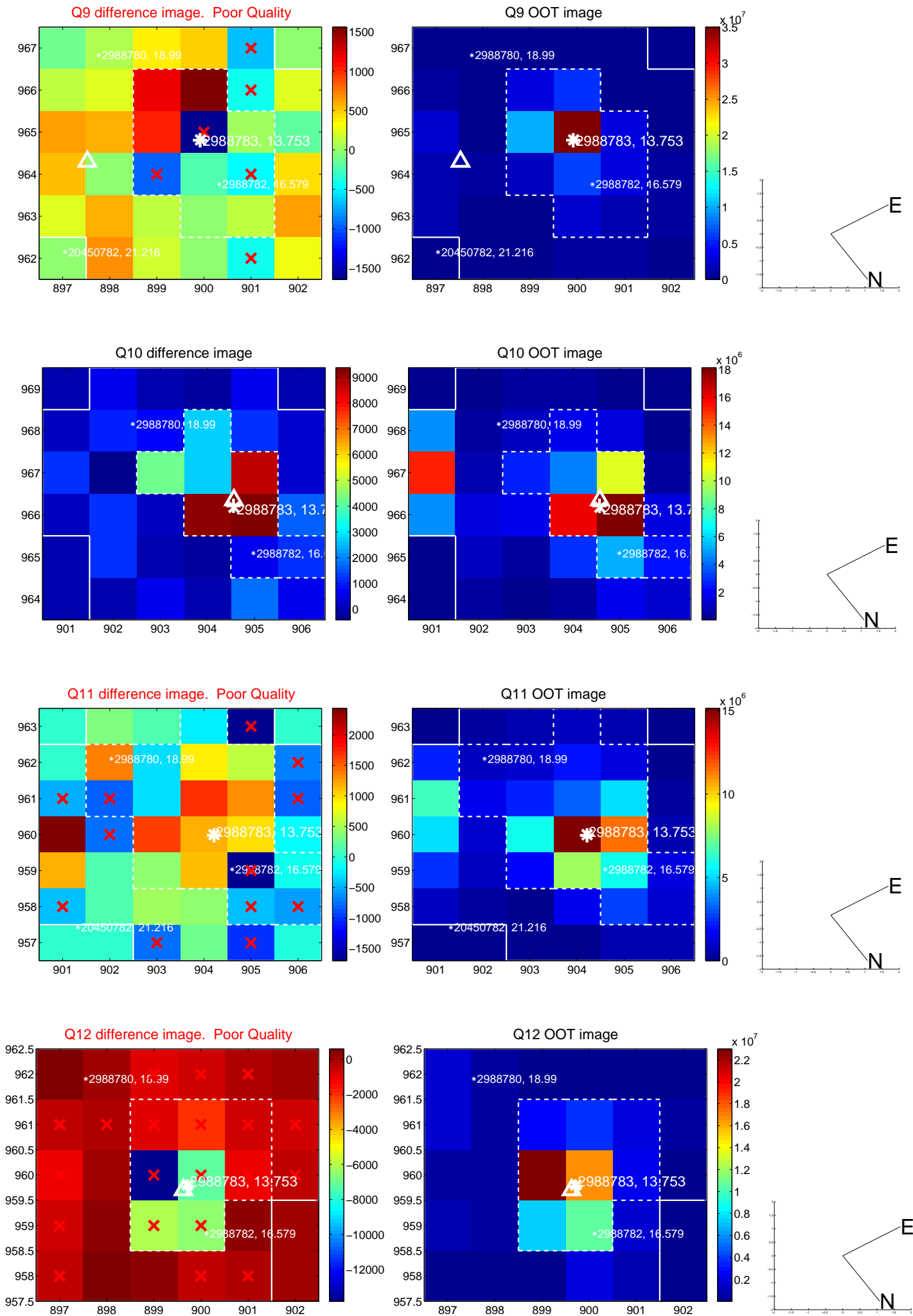
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



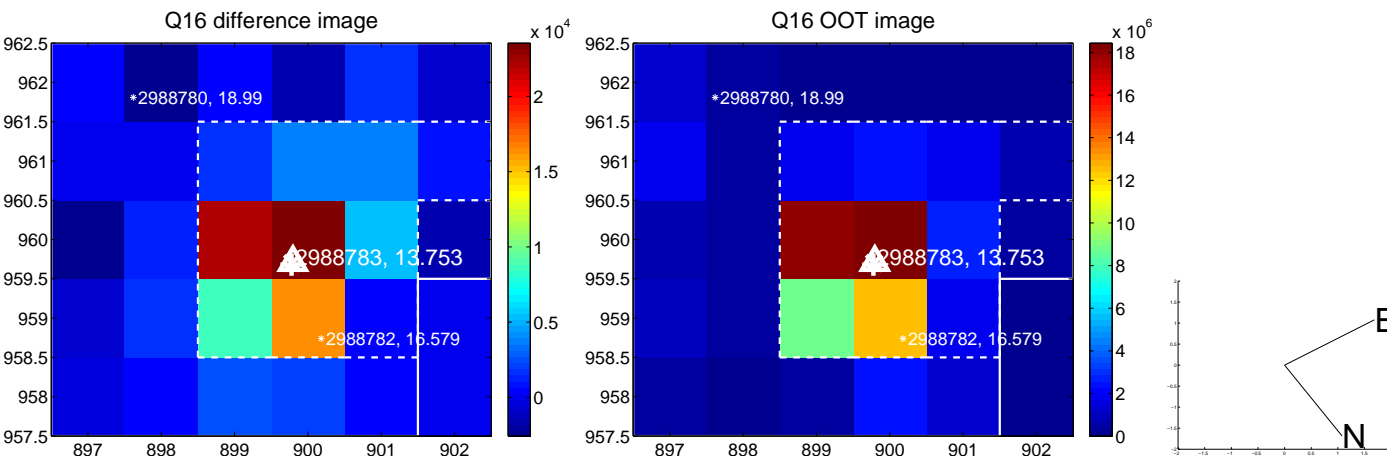
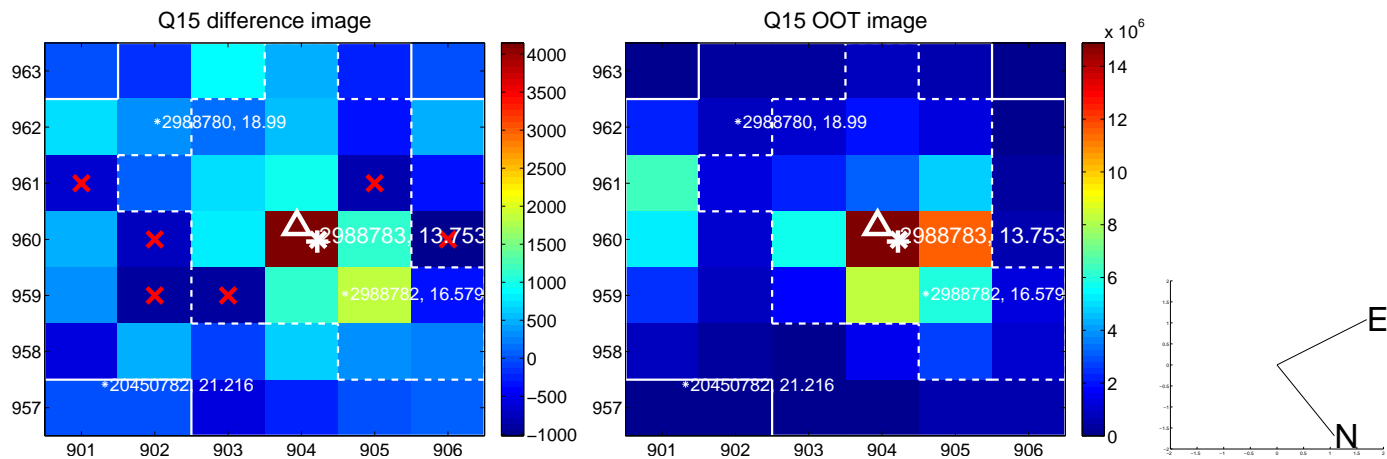
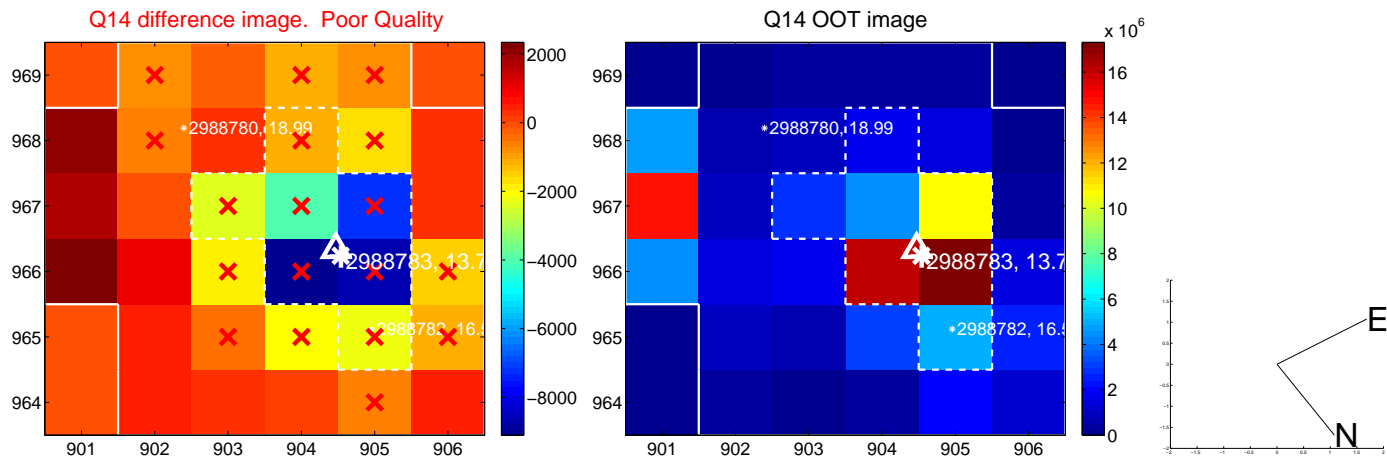
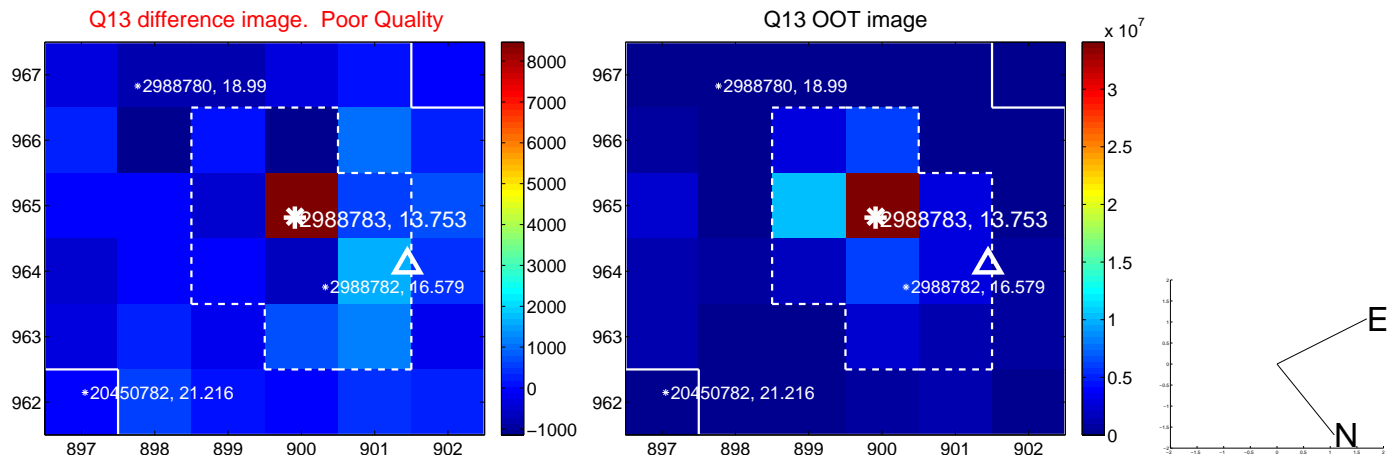
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



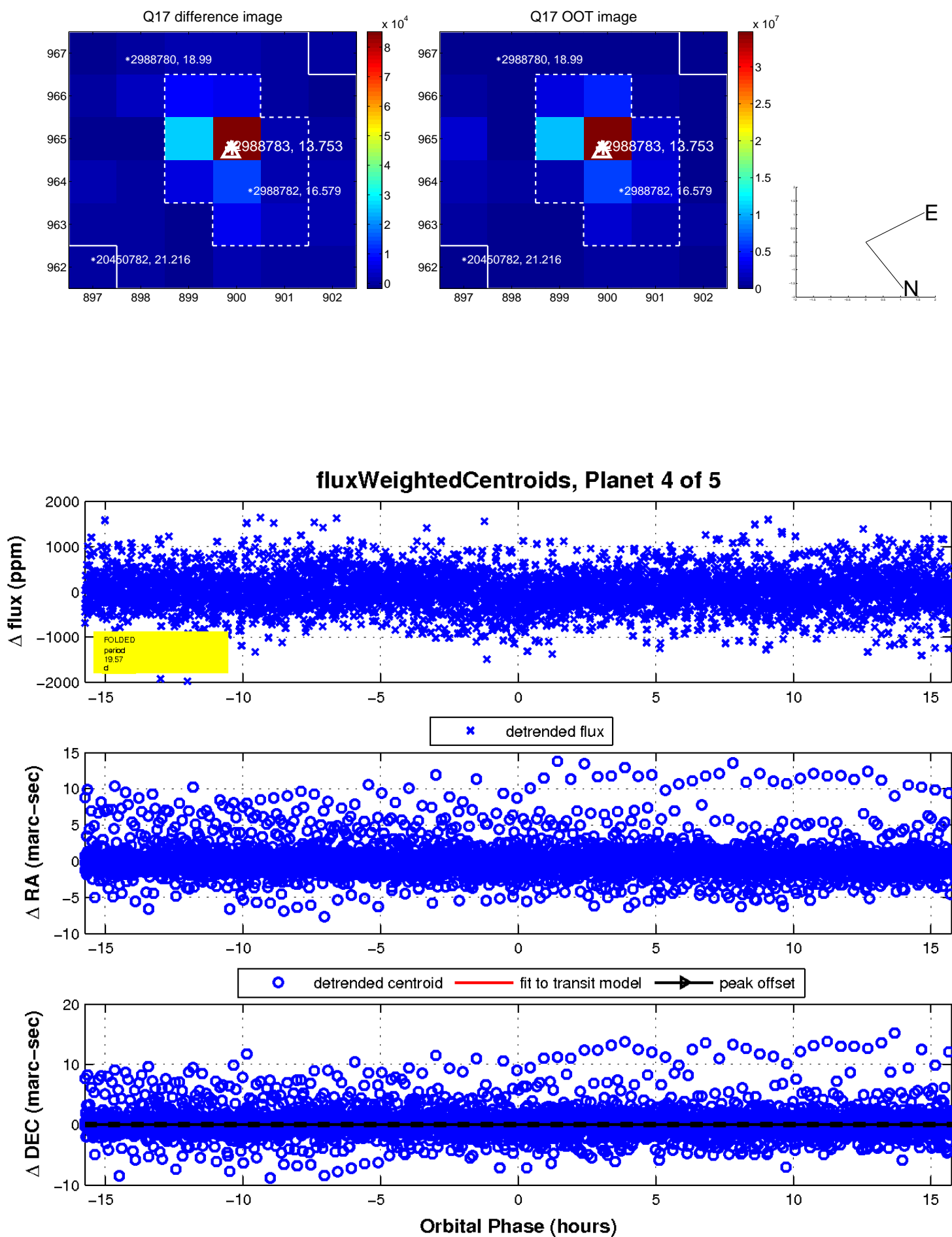
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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



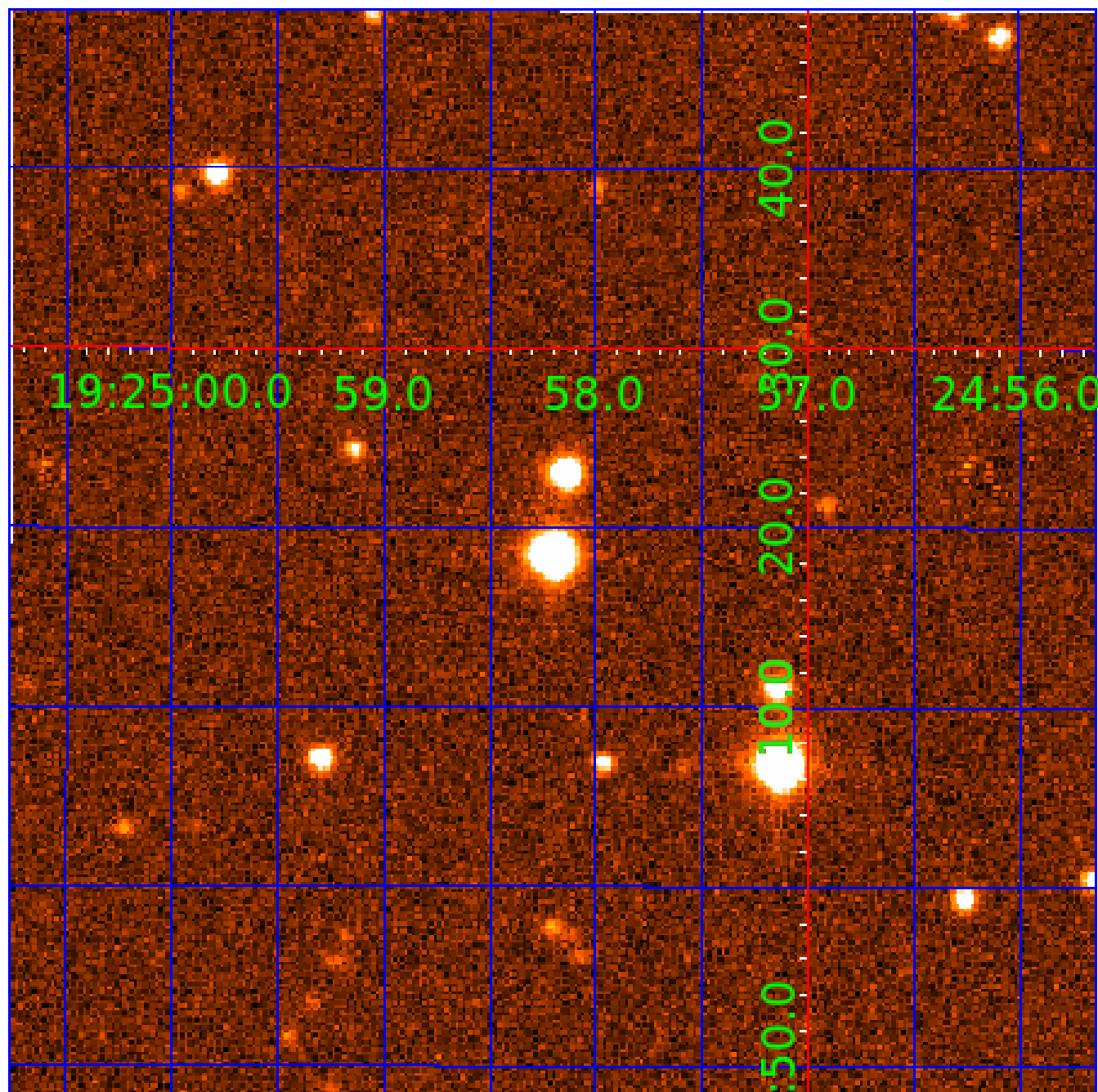
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.





UKIRT Image

Declination



# KIC 002988783

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
002988783-01	OBS	No	0.940229	132.078038	32.5	2.161	9.9	5.9	1.90	7384	1.25	19736.98
002988783-02	OBS	No	1.281548	131.987349	62.0	3.639	8.2	7.3	1.90	7384	2.05	13060.06
002988783-03	OBS	No	1.281660	131.603727	54.9	1.544	9.5	7.1	1.90	7384	1.63	13058.54
002988783-04	OBS	No	19.571654	135.244437	308.9	5.252	7.5	7.3	1.90	7384	6.31	344.69
002988783-05	OBS	No	70.903647	191.711667	275.0	6.000	7.2	-1.0	1.90	7384	3.19	61.95

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
002988783-01	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT
002988783-02	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT
002988783-03	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—SAME_NTL_PERIOD
002988783-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_SKYE_ZUMA—TRANS_GAPPED—LPP_ALT—MOD_NONUNIQ_ALT—MOD_TER_ALT
002988783-05	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—MOD_NONUNIQ_ALT—CENT_NOFITS

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

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

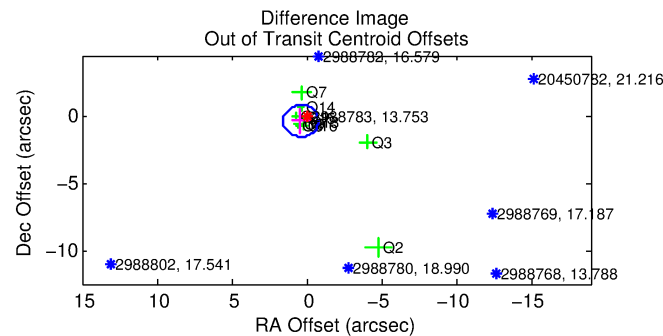
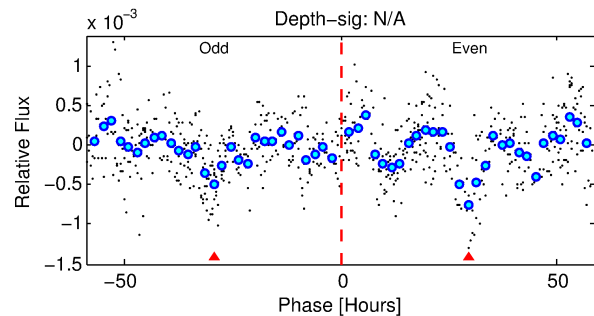
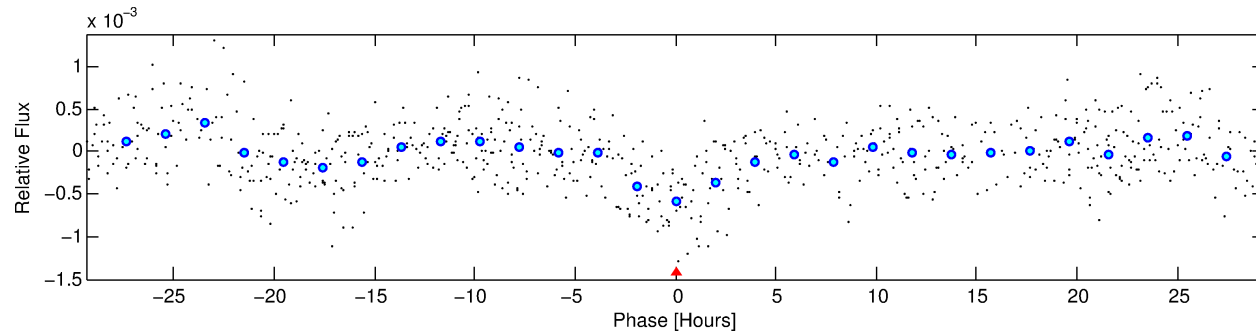
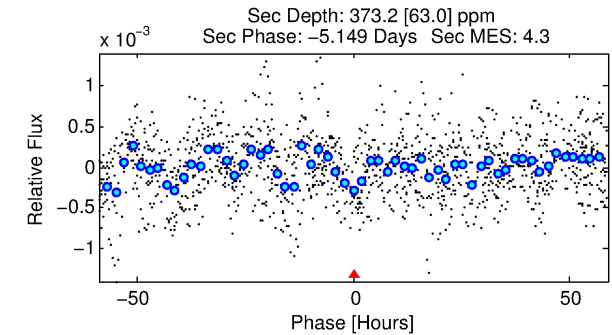
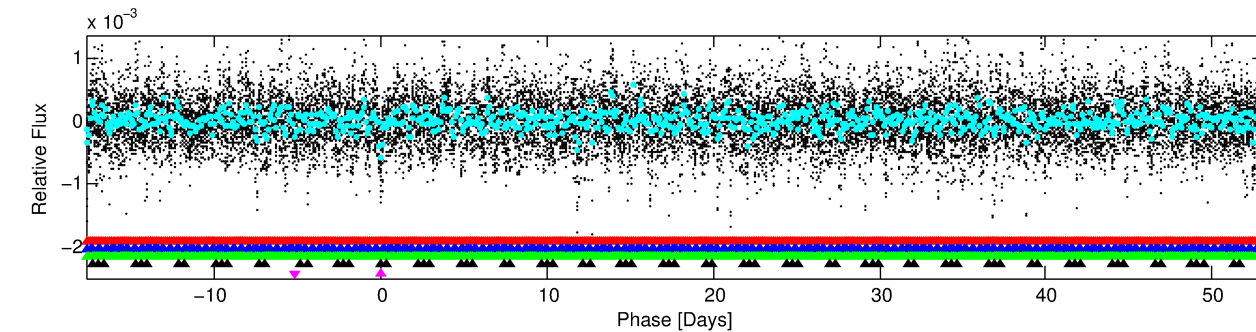
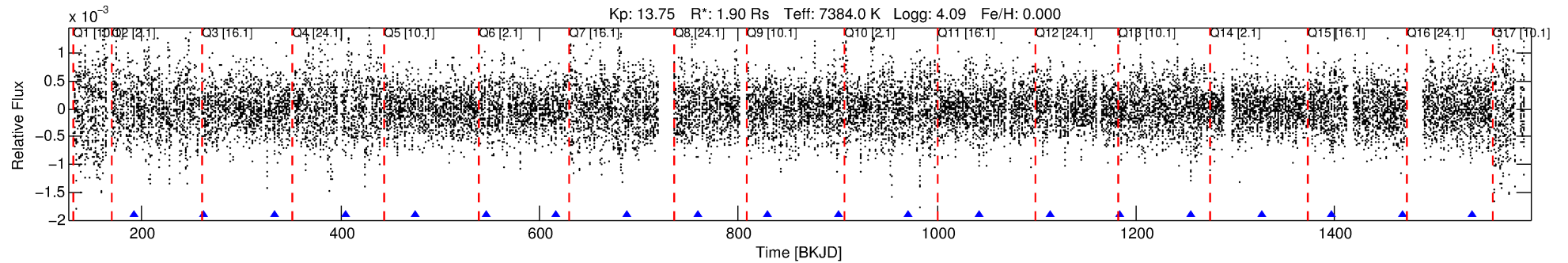
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 002988783-05

No Significant Match Found

# DV One-Page Summary

KIC: 2988783 Candidate: 5 of 5 Period: 70.904 d



## TPS TCE Results:

Period = 70.90365 d  
Epoch = 191.7117 BKJD

DV fit results are unavailable

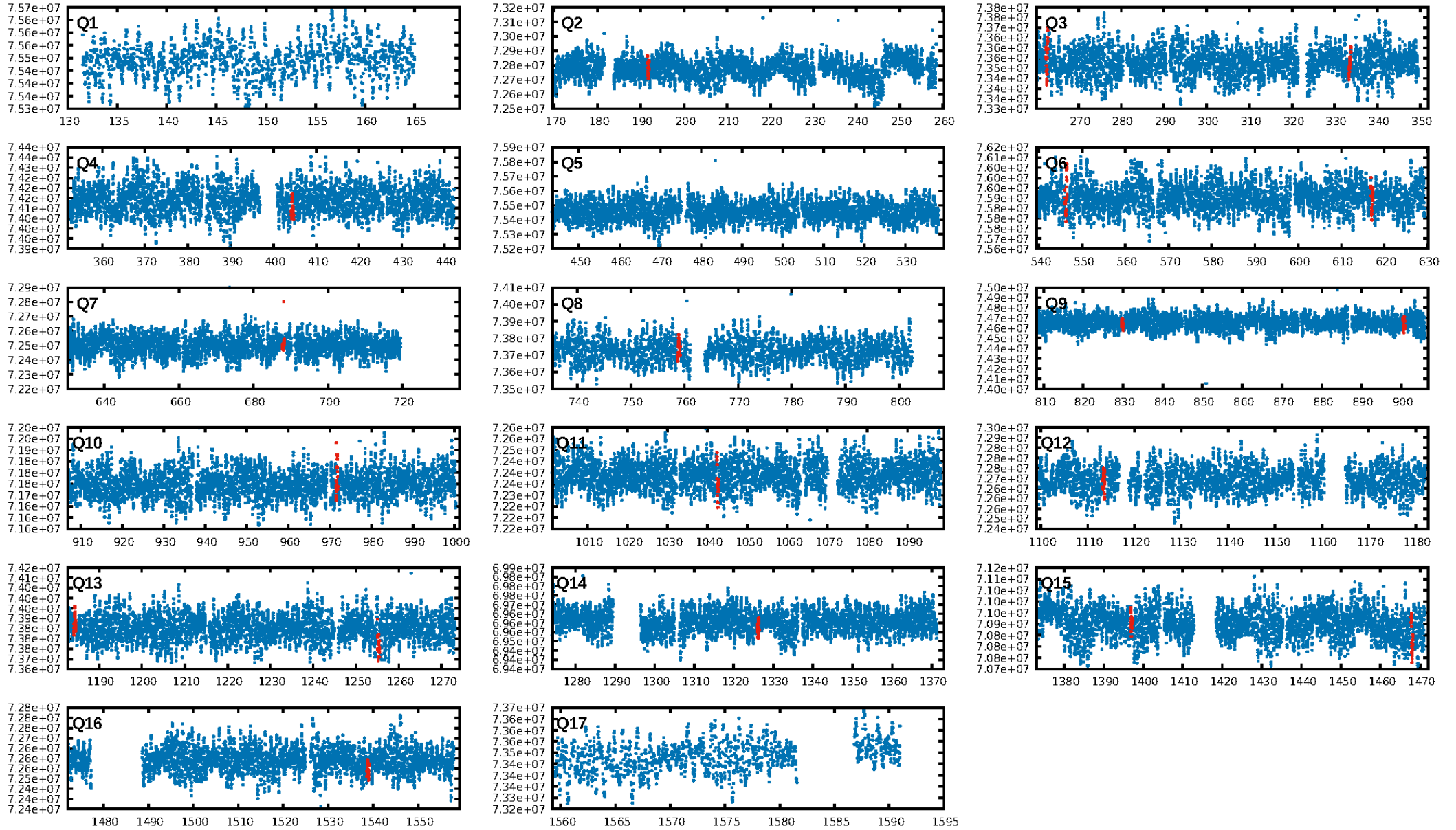
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [154.50 $\sigma$ ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: N/A  
RollingBand-fgt: 1.00 [14/14]  
GhostDiagnostic-chr: 1.168  
Centroid-sig: N/A  
Centroid-so: 0.582 arcsec [1.56 $\sigma$ ]  
OotOffset-rm: 0.536 arcsec [1.37 $\sigma$ ]  
KicOffset-rm: 0.451 arcsec [1.01 $\sigma$ ]  
OotOffset-st: 2/4/2/2 [10]  
KicOffset-st: 2/4/2/2 [10]  
DiffImageQuality-fgm: 0.60 [6/10]  
DiffImageOverlap-fno: 0.00 [0/12]

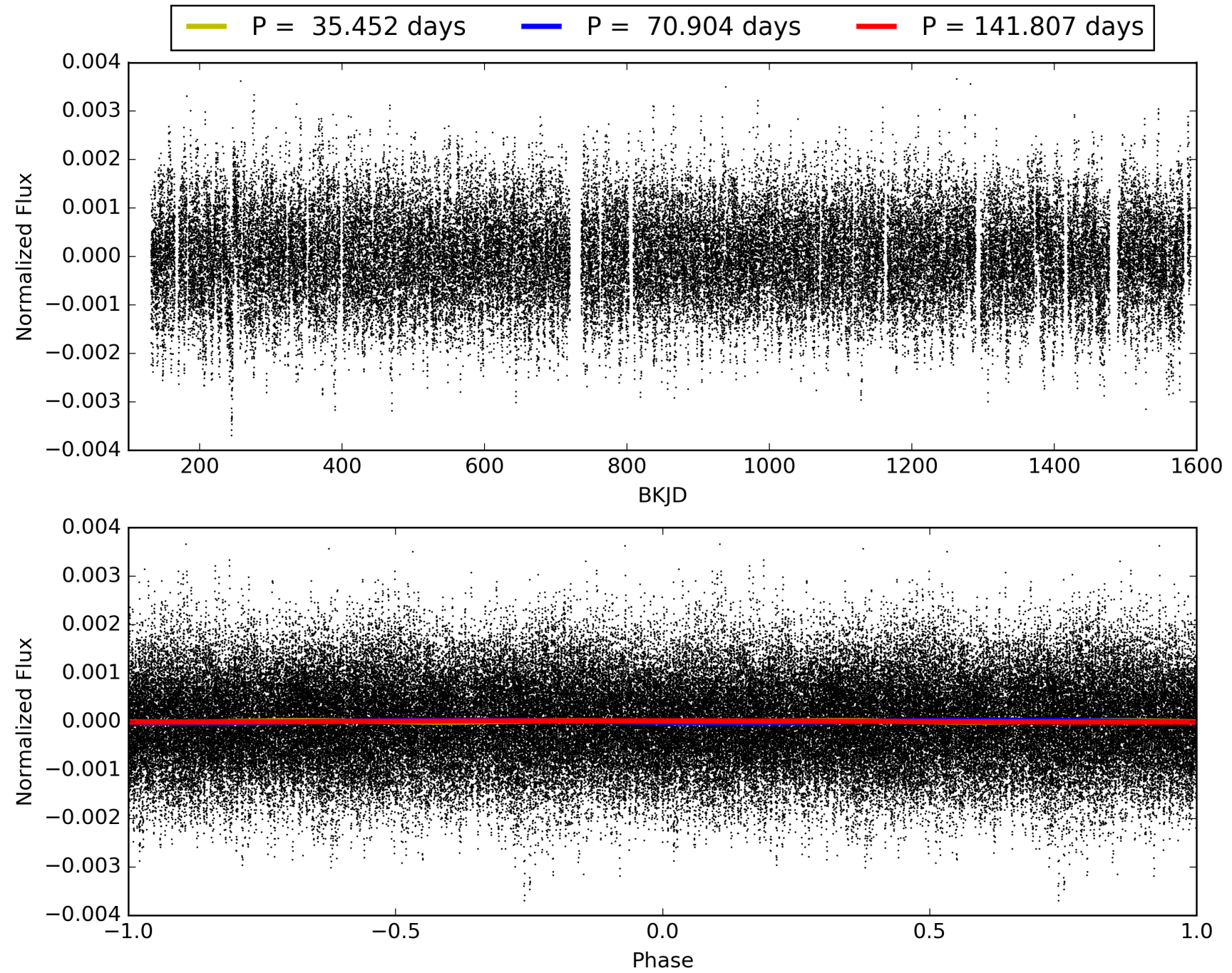
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 03-Feb-2016 08:45:53 Z

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

# TCE 002988783-05, PDC Light Curves



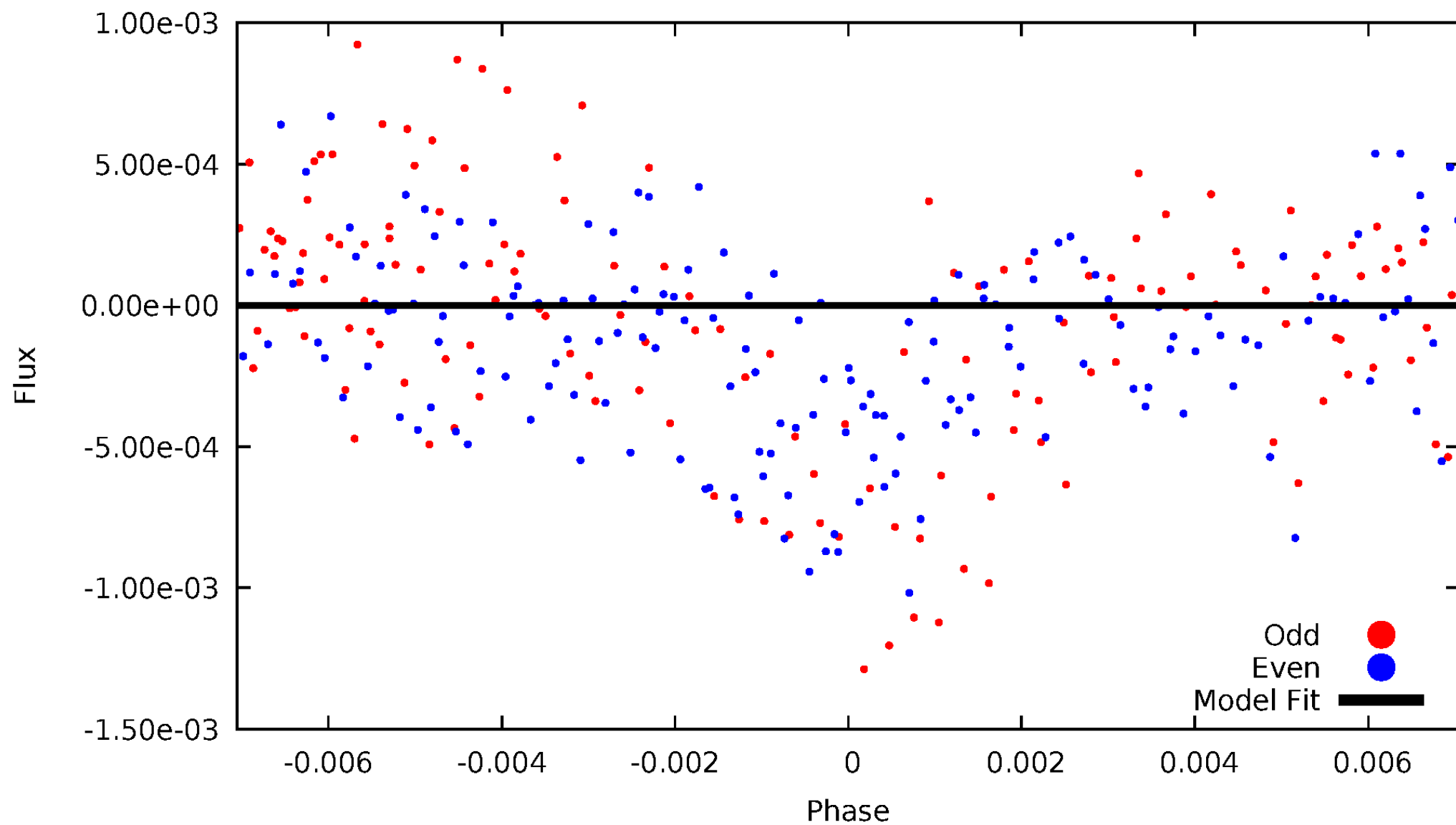
# TCE 002988783-05





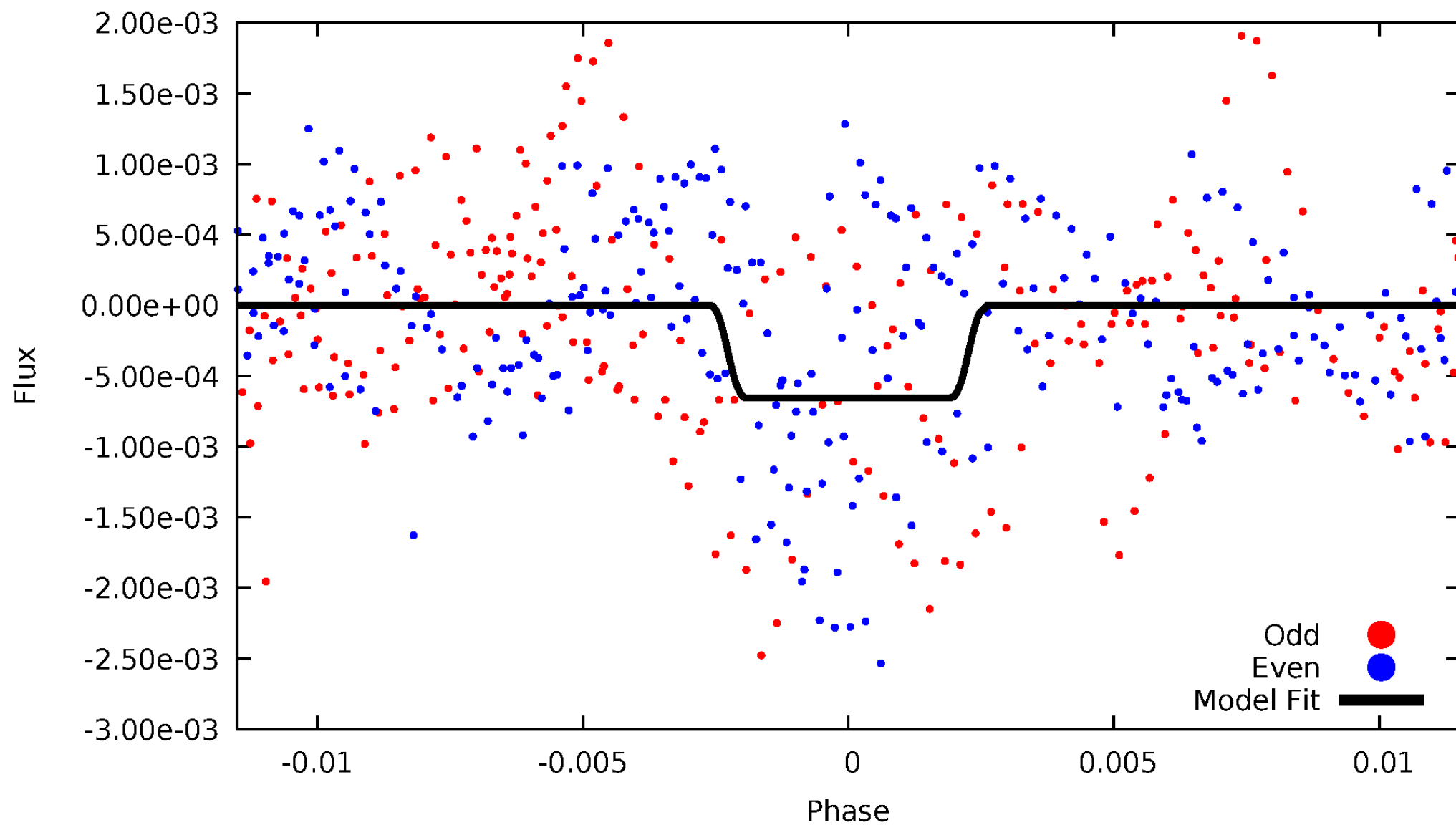
# DV Odd/Even

TCE 002988783-05



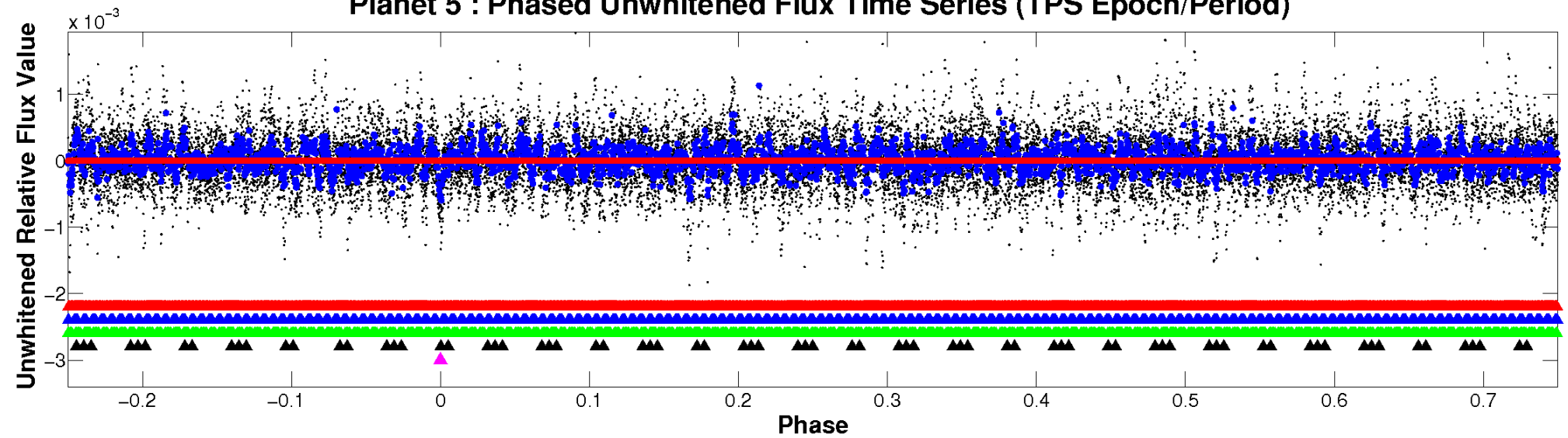
# ALT Odd/Even

TCE 002988783-05



# Non-Whitened Vs. Whitened Light Curve

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

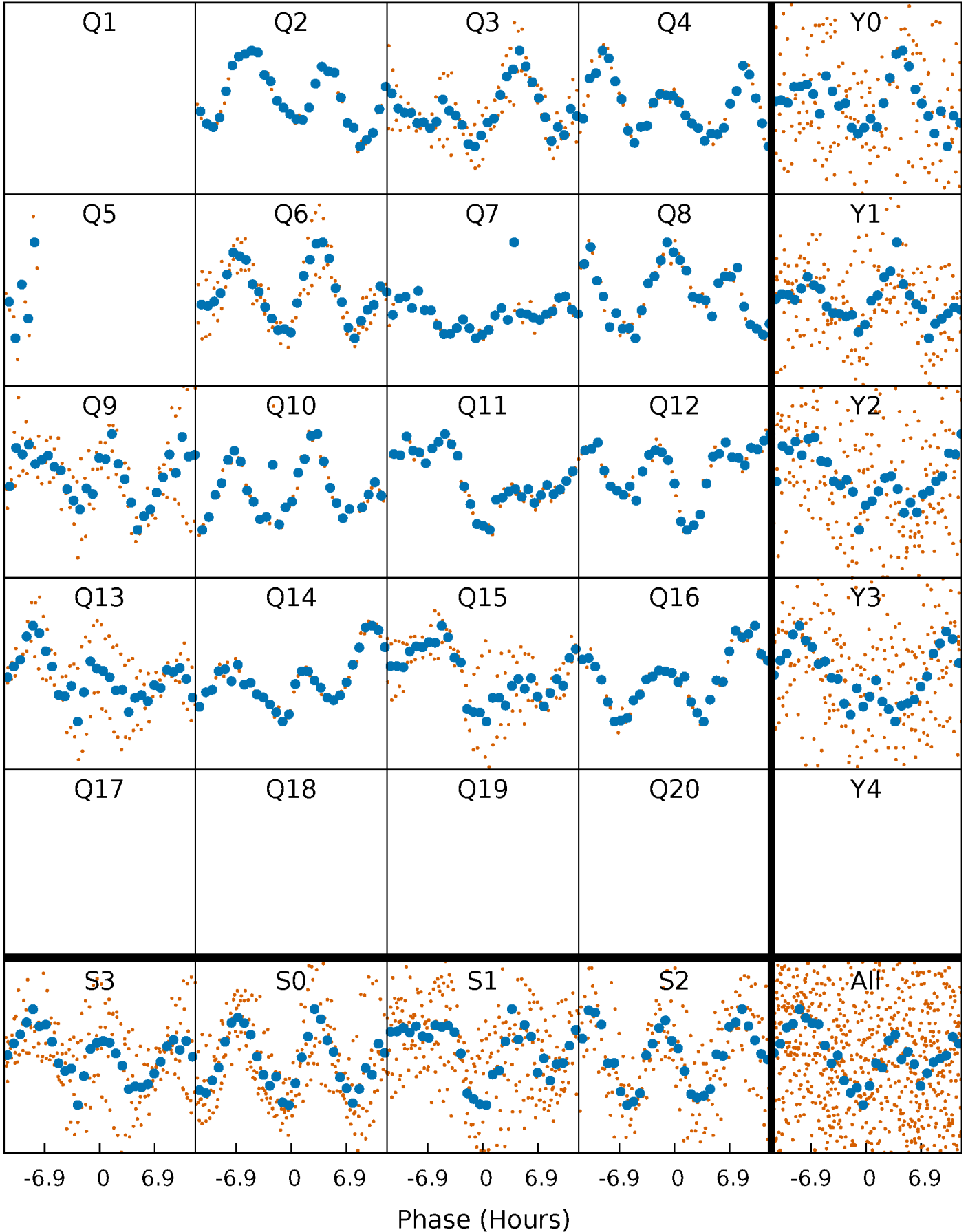


Planet 5 : Phased Whitened Flux Time Series (TPS Epoch/Period)



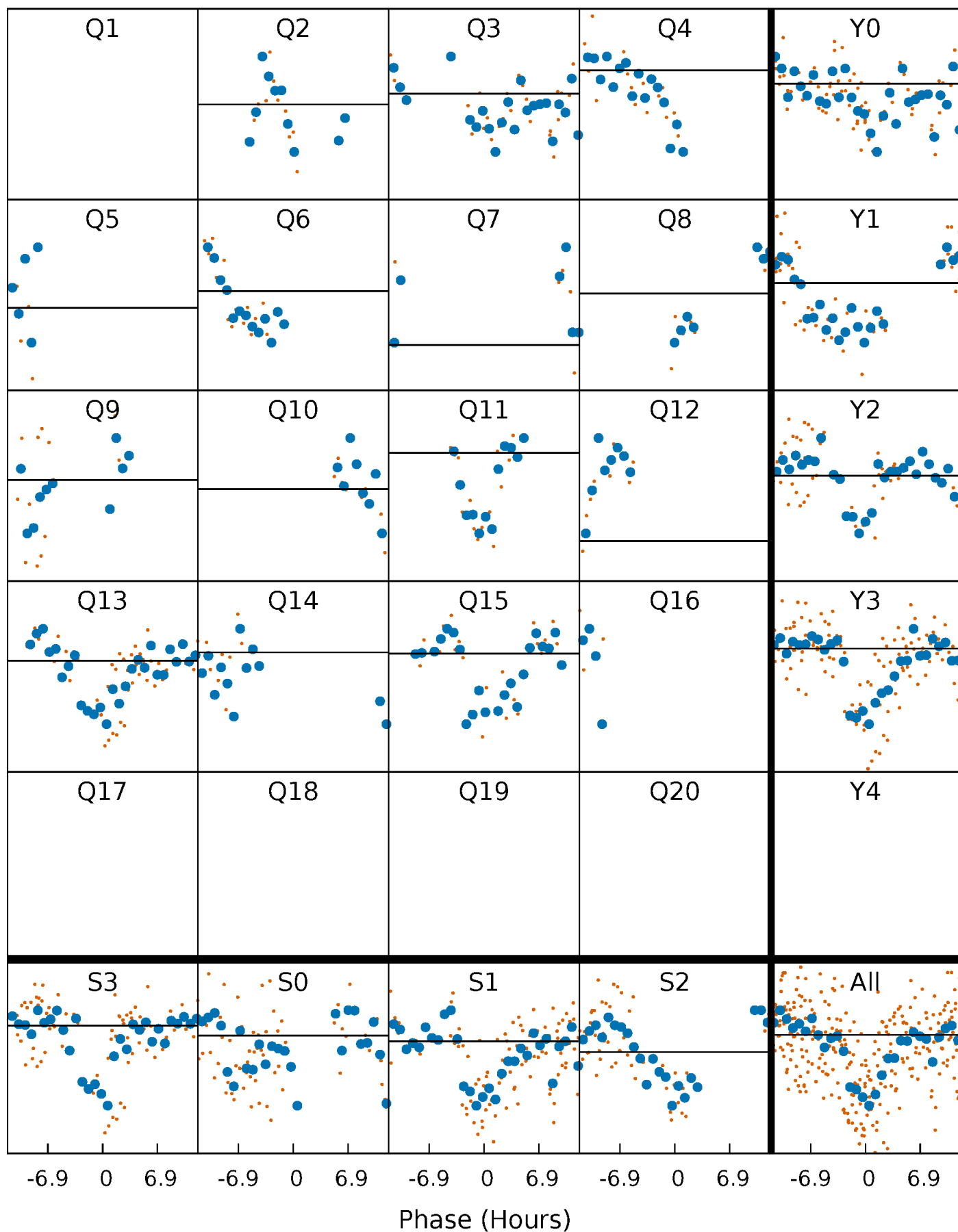
# PDC Quarter-Phased Transit Curves

TCE 002988783-05     $P = 70.903647$  Days     $T_0 = 191.711667$  (BKJD)



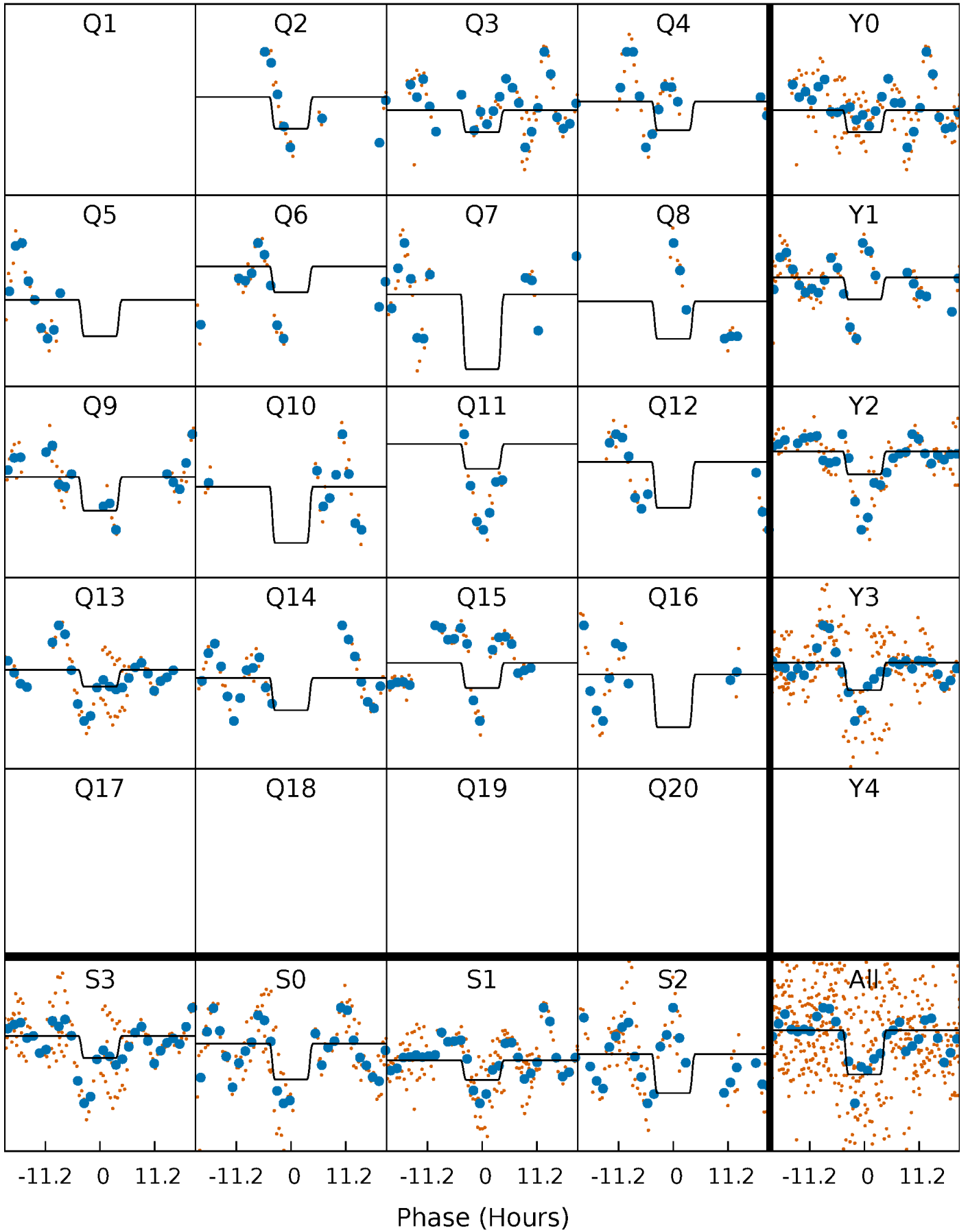
# DV Quarter-Phased Transit Curves

TCE 002988783-05     $P = 70.903647$  Days     $T_0 = 191.711667$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

TCE 002988783-05     $P = 70.903647$  Days     $T_0 = 191.718125$  (BKJD)

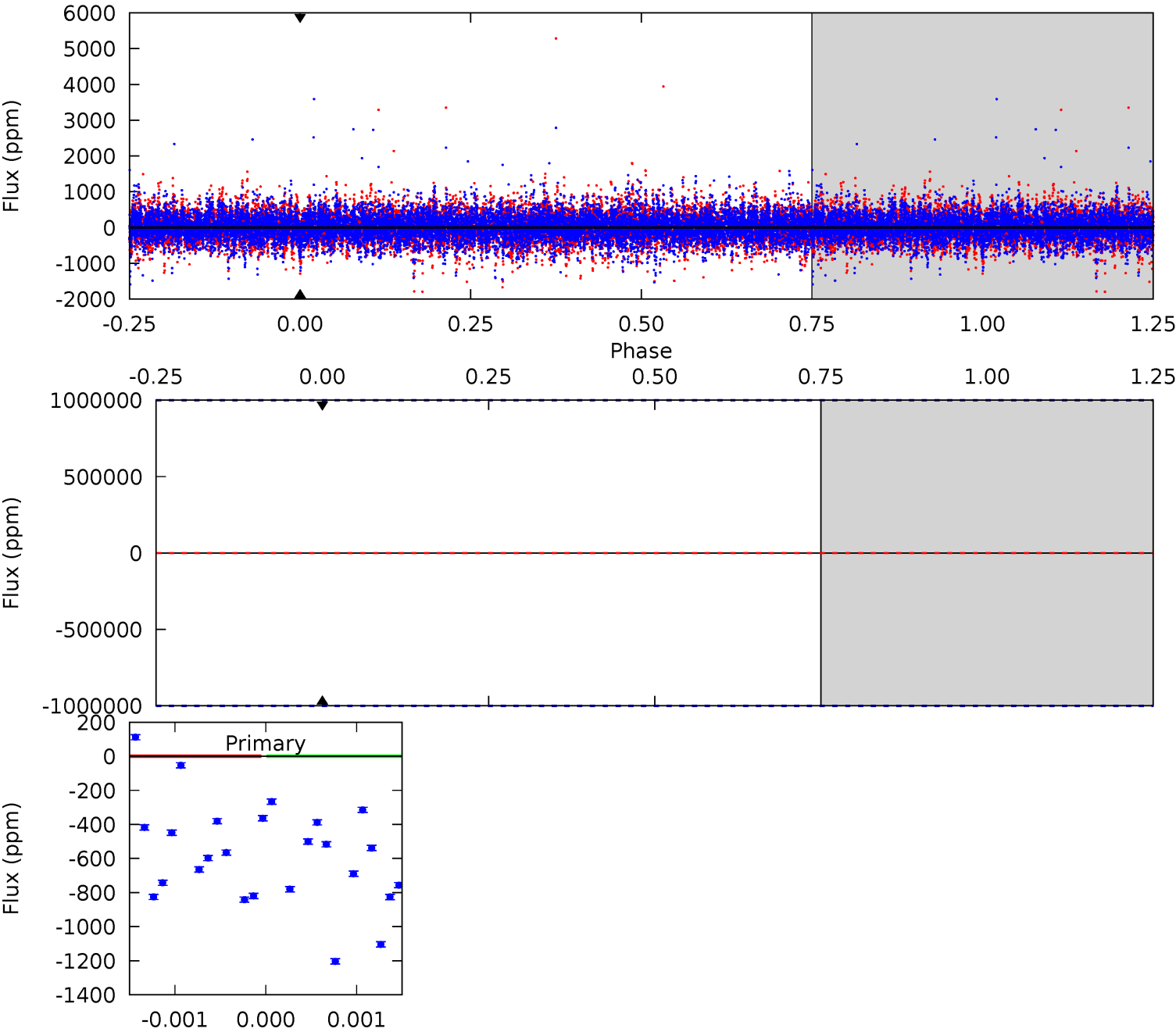




# DV Model-Shift Uniqueness Test

002988783-05, P = 70.903647 Days, E = 120.808020 Days

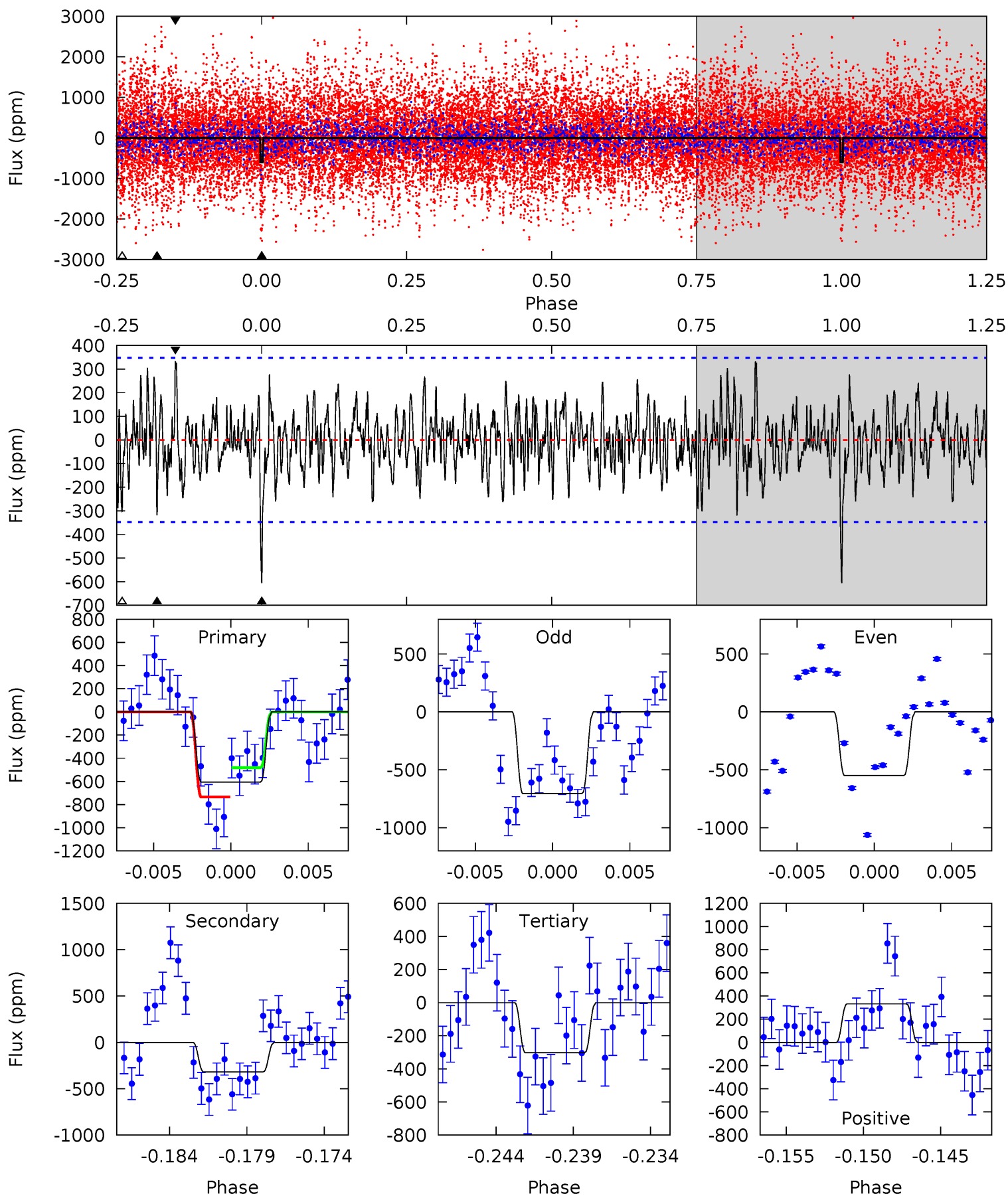
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
0	0	0	0	1.00	1.00	1.00	0	0	0	0	0	0	0	0



# Alt Model-Shift Uniqueness Test

002988783-05,  $P = 70.903647$  Days,  $E = 120.814478$  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
8.99	4.73	4.48	4.92	5.16	2.81	1.54	4.51	4.06	0.26	-0.19	1.12	0.91	0.35	1.87



### Stellar Parameters For KIC 002988783

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$7384^{+207}_{-337}$	$4.090^{+0.144}_{-0.176}$	$0.000^{+0.200}_{-0.350}$	$1.898^{+0.540}_{-0.393}$	$1.617^{+0.213}_{-0.260}$	$0.333^{+0.246}_{-0.163}$
	+3%/-5%	+4%/-4%	+inf%/-inf%	+28%/-21%	+13%/-16%	+74%/-49%
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 002988783-05 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$0 \pm 1000000$	$15.57^{+16.35}_{-10.15}$	$1002^{+76}_{-68}$	$5160^{+31338}_{-41434}$	$388^{+52081}_{-57743}$
Alt.	$-319 \pm 67$	$15.64^{+16.10}_{-11.34}$	$1003^{+73}_{-72}$	$3947^{+2662}_{-867}$	$112^{+1443}_{-86}$

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

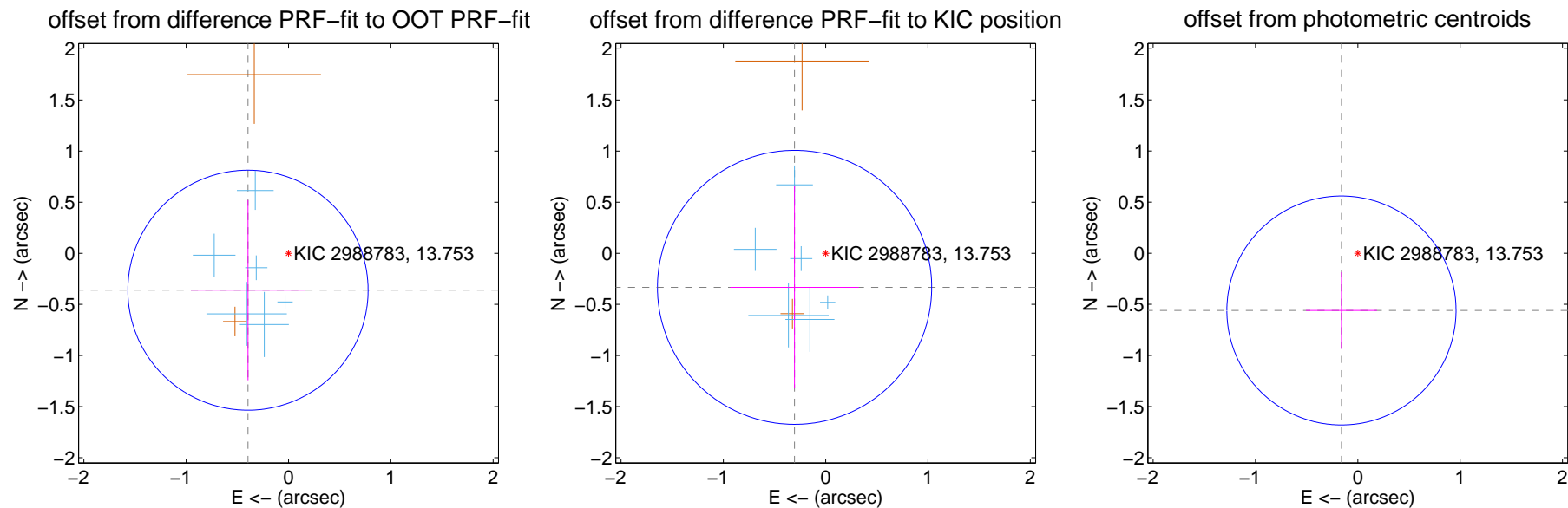
## DV Centroid Data

Supplemental centroid analysis for 002988783-05. Kepler magnitude: 13.75. Transit SNR -1.00

There are 6 quarters with good PRF difference image offsets

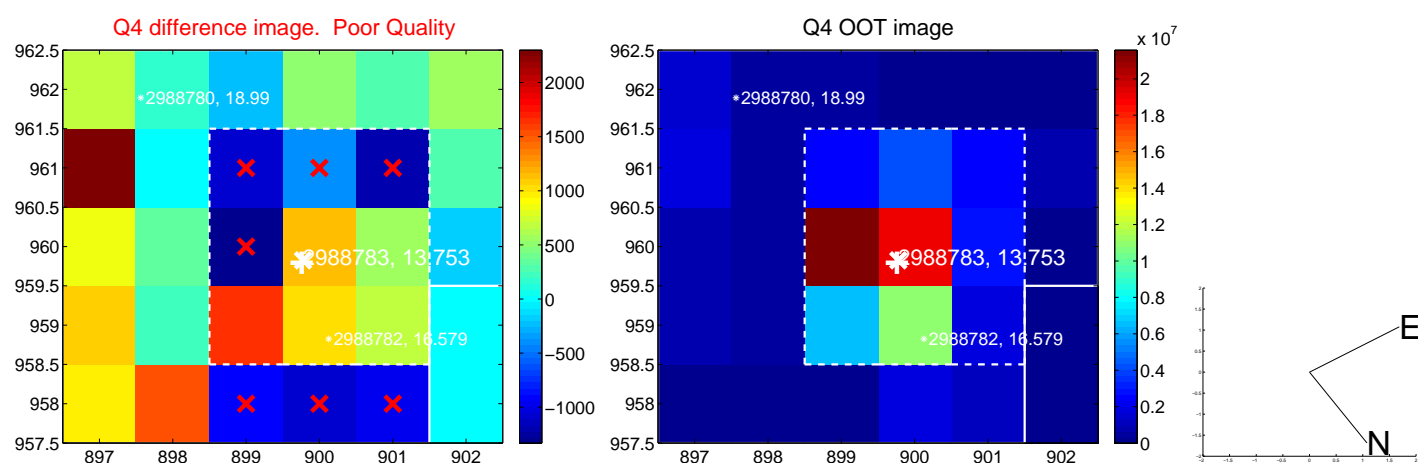
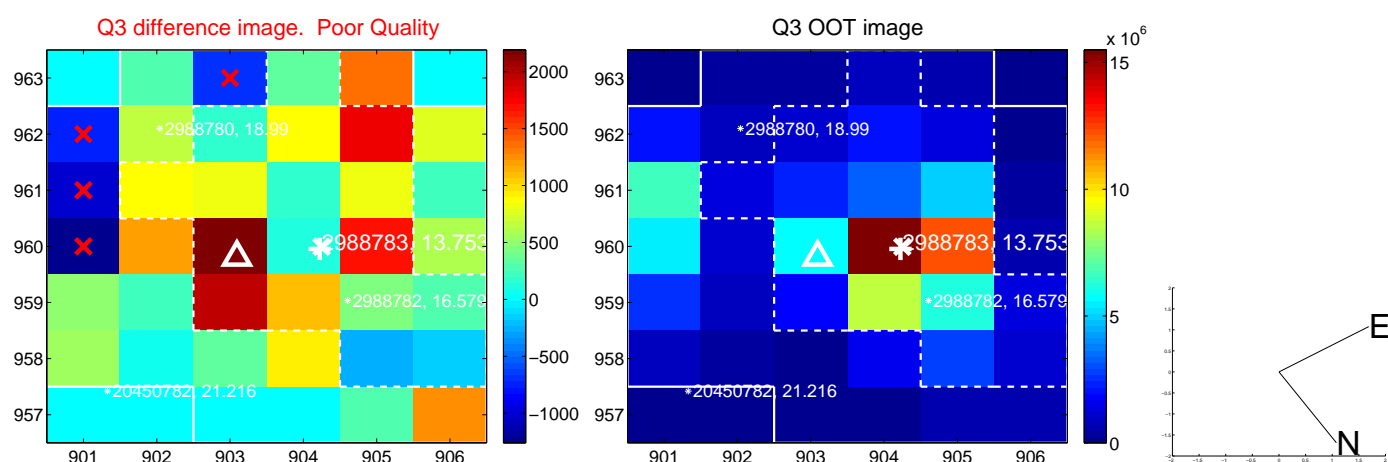
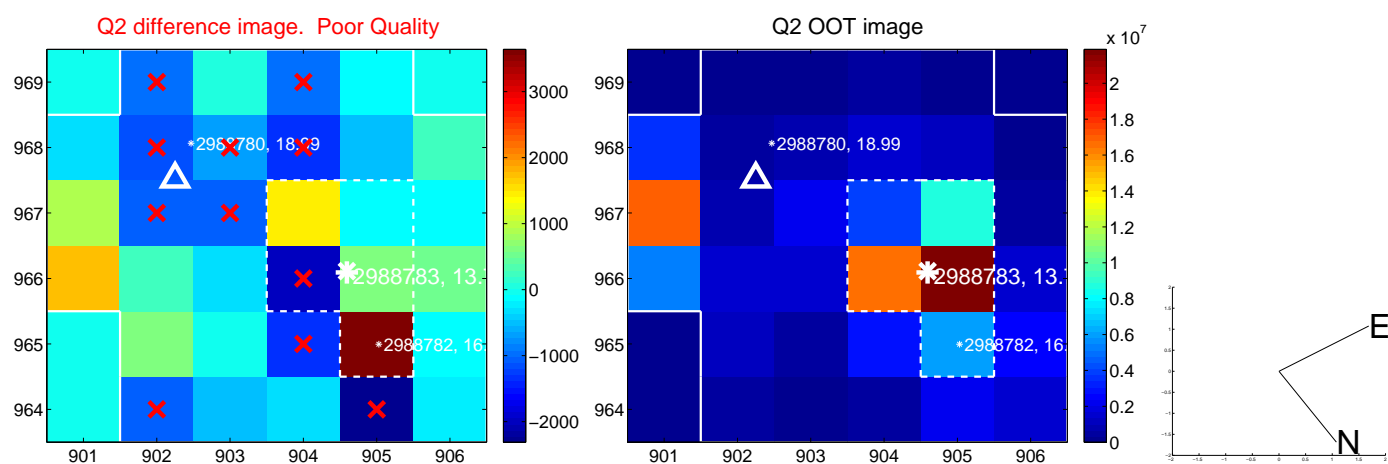
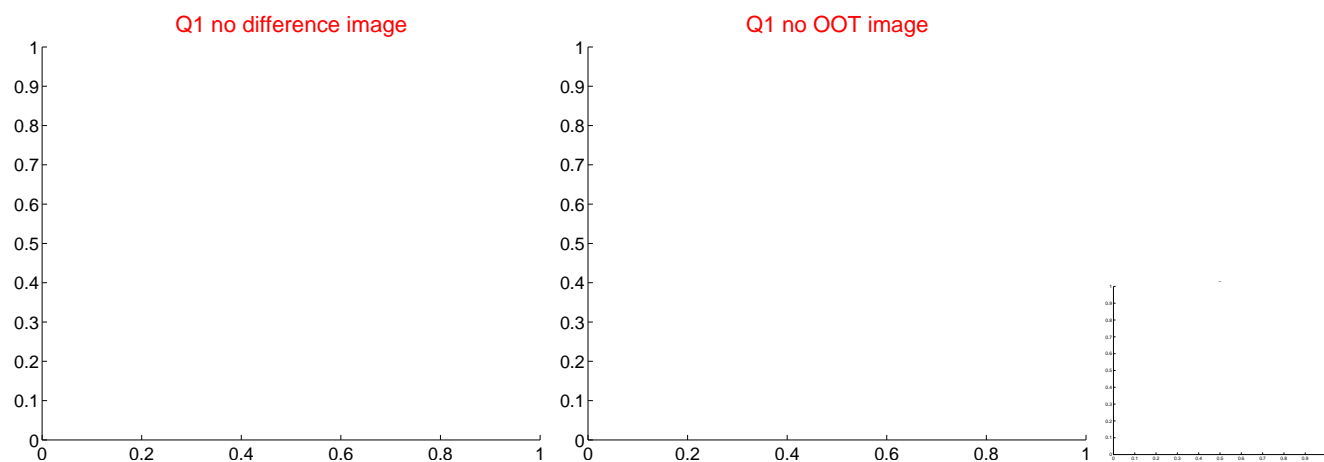
The direct PRF centroid is offset from the target star catalog position by about 0.10 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.536 \pm 0.391$	1.37	$0.396 \pm 0.558$	$-0.361 \pm 0.881$
PRF-fit source offset from KIC position	$0.451 \pm 0.447$	1.01	$0.304 \pm 0.628$	$-0.333 \pm 0.989$
photometric centroid source offset	$0.58 \pm 0.37$	1.56	$0.16 \pm 0.35$	$-0.56 \pm 0.38$

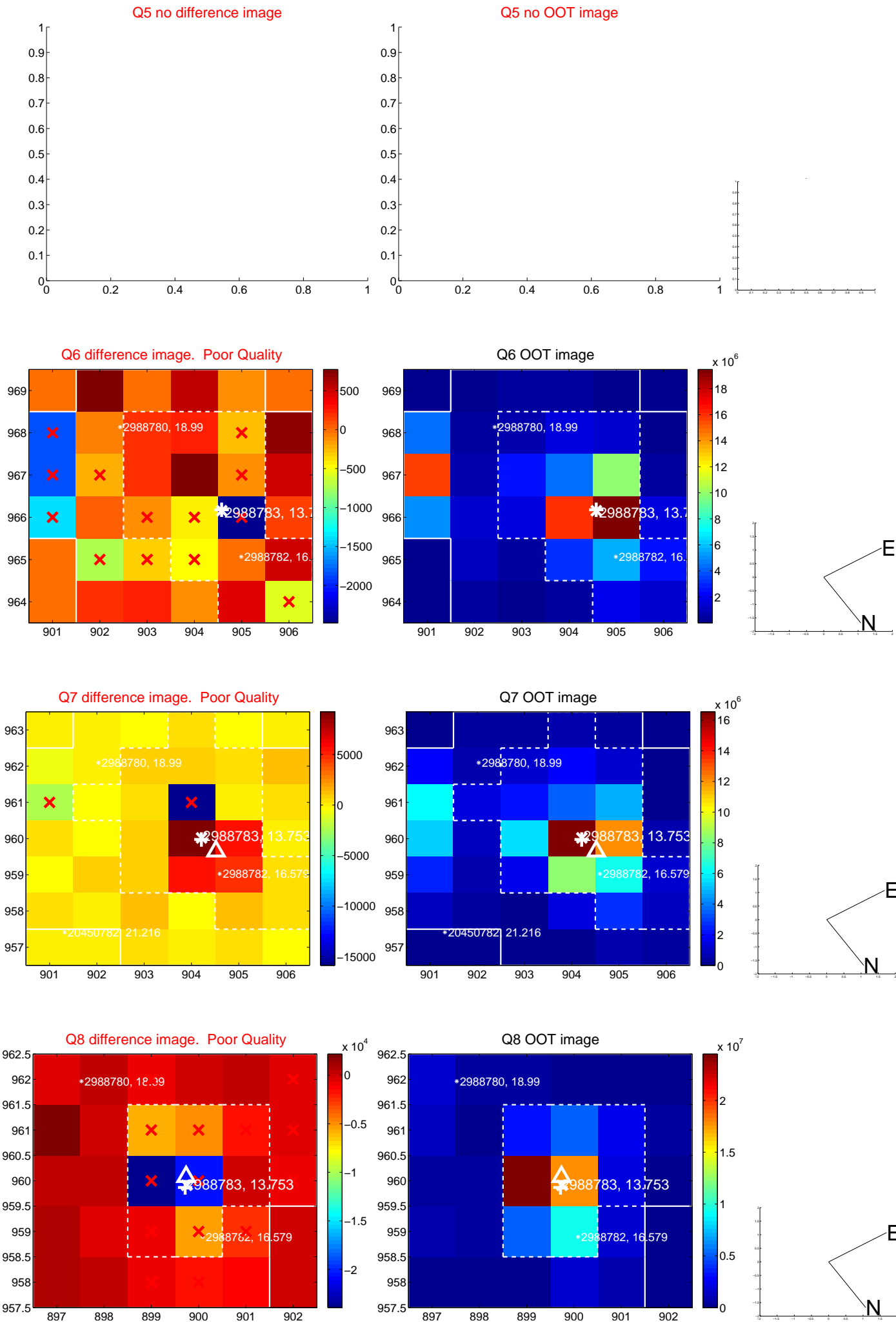


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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

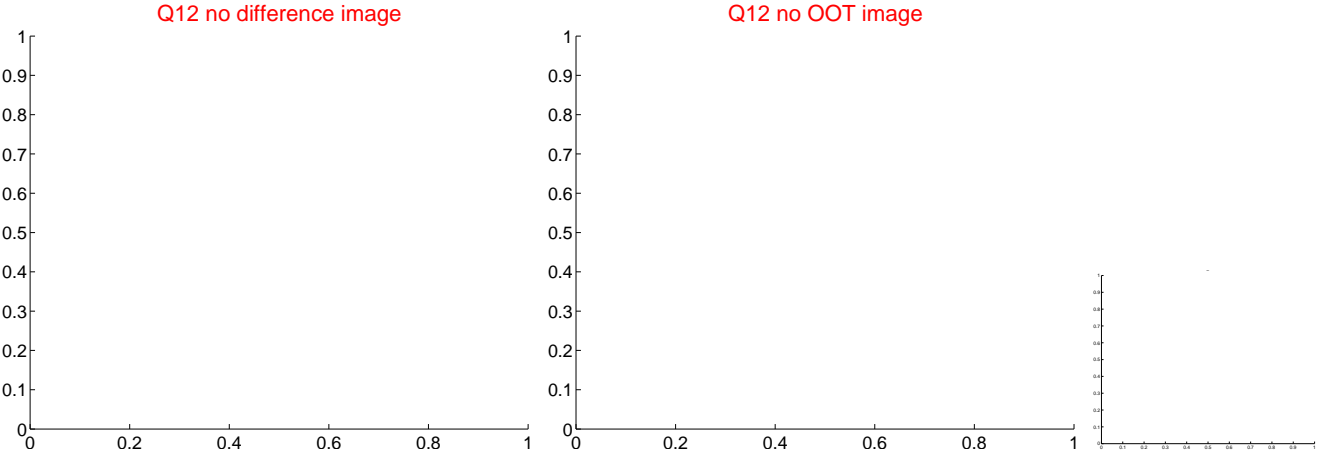
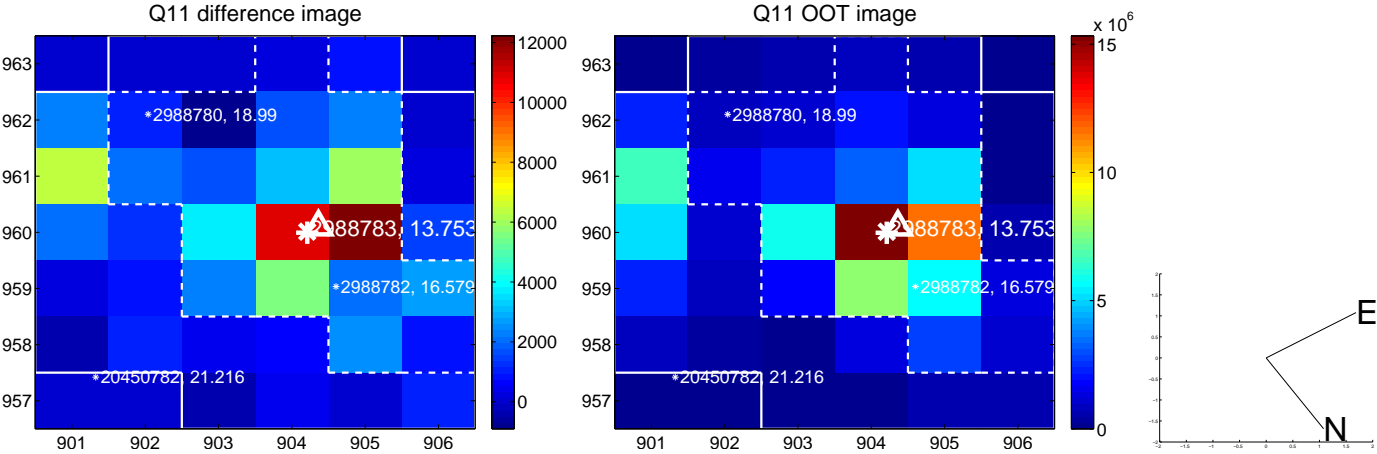
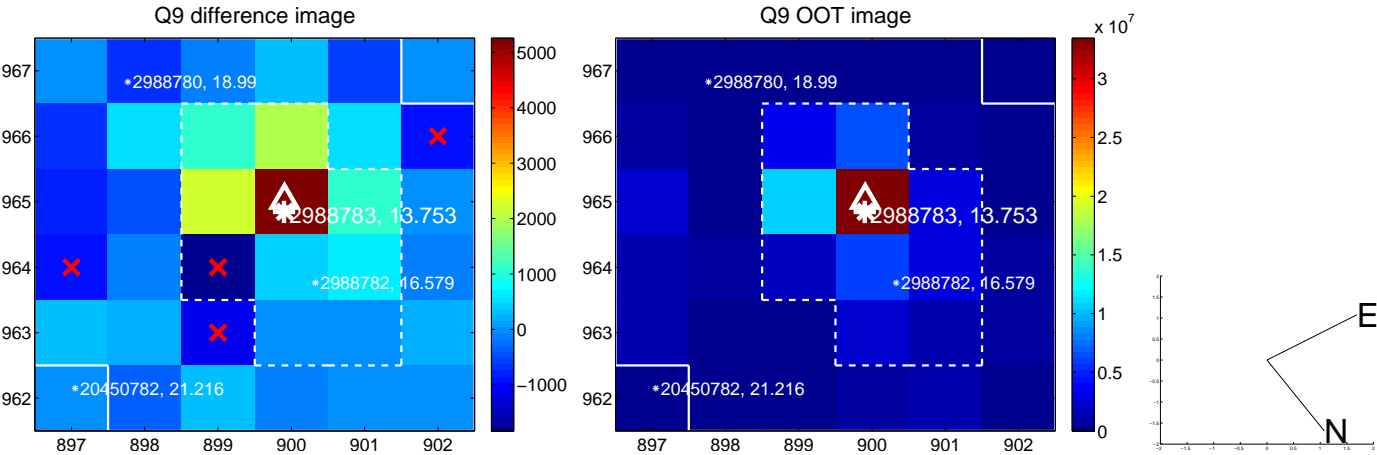


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

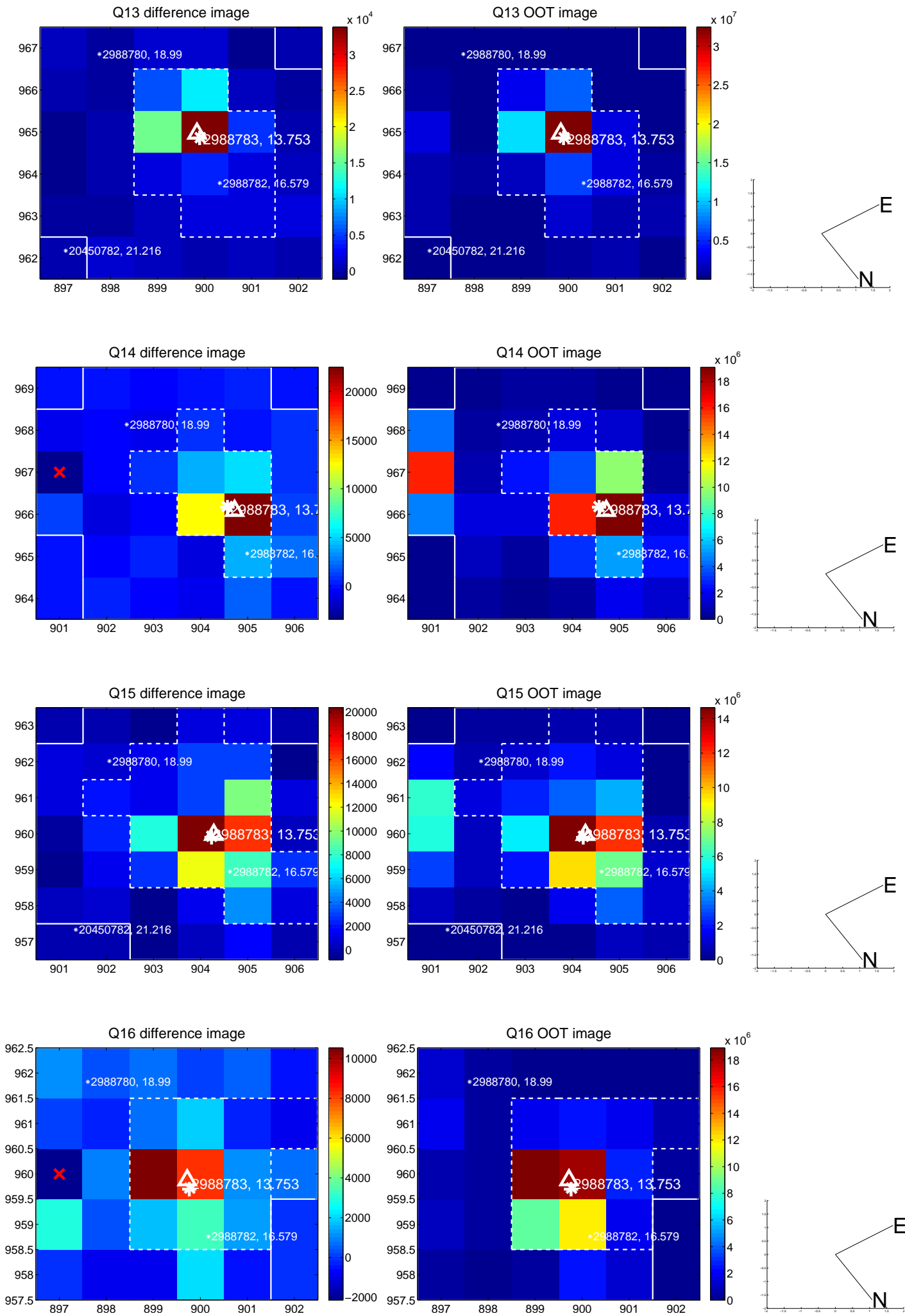




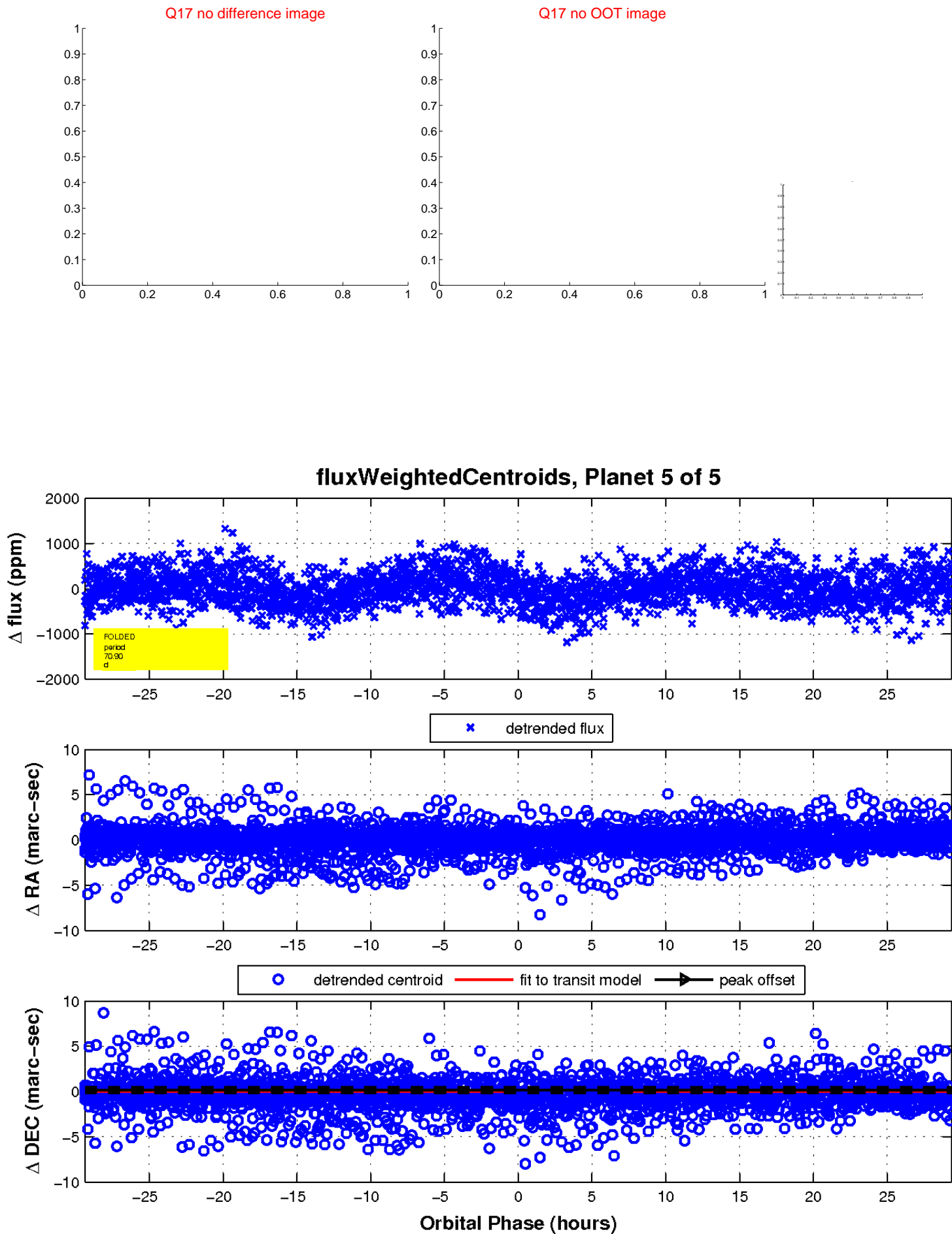
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

