

# KIC 002970580

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
002970580-02	OBS	No	559.218859	372.381799	2714.0	15.000	60.2	-1.0	7.84	4605	39.14	14.70
002970580-03	OBS	No	379.202643	360.883809	2067.1	10.177	13.5	5.7	7.84	4605	39.78	24.68
002970580-04	OBS	No	205.380057	278.372111	4114.7	1.706	14.2	7.4	7.84	4605	53.87	55.90
002970580-05	OBS	No	346.501959	144.918492	3227.9	1.526	13.2	8.4	7.84	4605	45.84	27.83
002970580-06	OBS	No	113.694880	155.675783	1876.7	2.000	14.9	-1.0	7.84	4605	32.66	122.98
002970580-07	OBS	No	366.881381	375.936823	9283.1	31.023	10.6	12.2	7.84	4605	76.30	25.79
002970580-08	OBS	No	312.830992	240.650043	321.9	12.000	8.4	-1.0	7.84	4605	13.48	31.90

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
002970580-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_CHASES_SKYE—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—INCONSISTENT_TRANS—CENT_NOFITS
002970580-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES—LPP_DV—ALL_TRANS_CHASES—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS
002970580-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS
002970580-05	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL_TRACKER—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_KIC_POS
002970580-06	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_NOFITS
002970580-07	OBS	FP	0.00	1	0	0	0	LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS
002970580-08	OBS	FP	0.00	1	0	1	0	INDIV_TRANS_RUBBLE_MARSHALL—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—CENT_NOFITS—HALO_GHOST

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

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

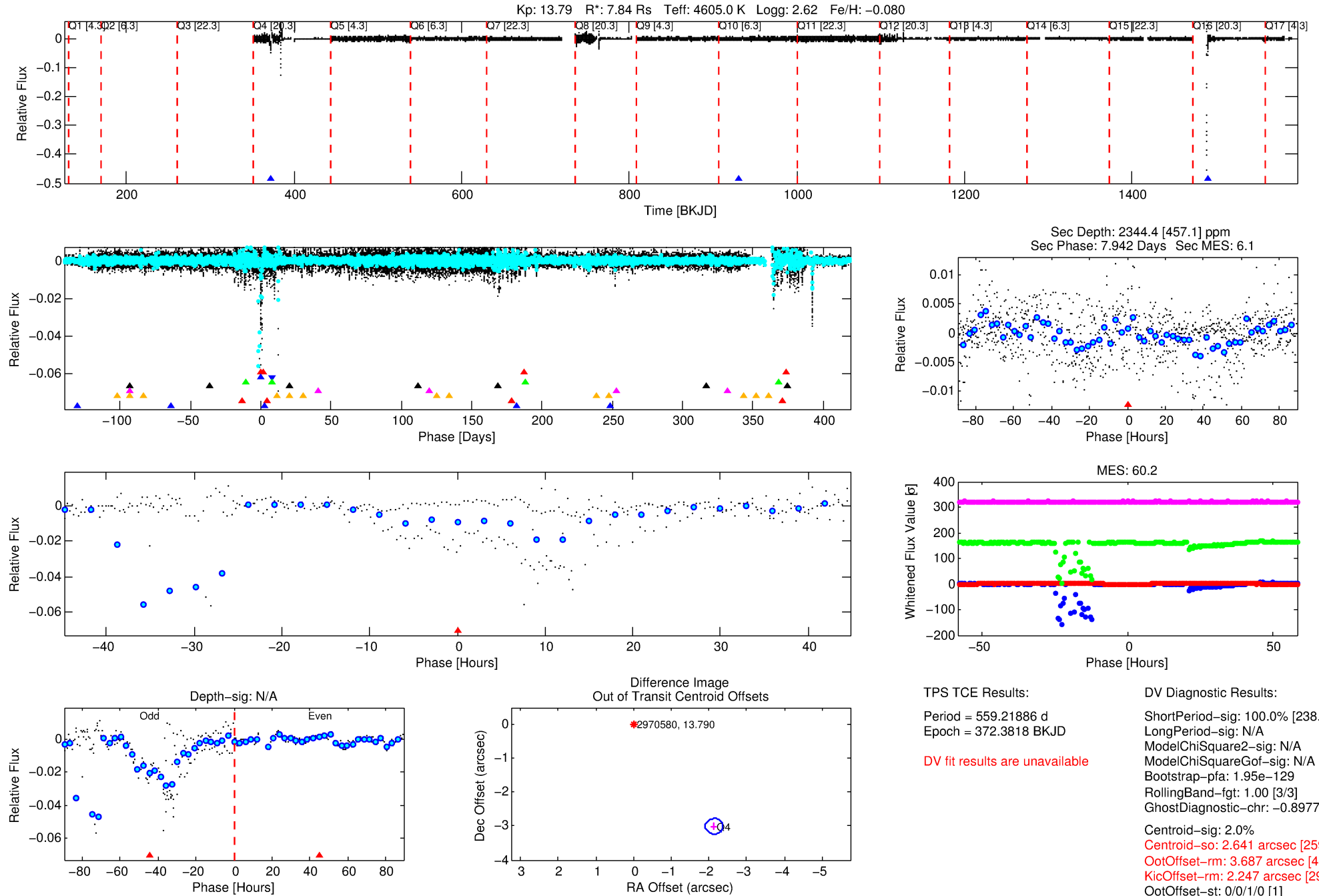
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 002970580-02

No Significant Match Found

# DV One-Page Summary

KIC: 2970580 Candidate: 2 of 8 Period: 559.219 d



## TPS TCE Results:

Period = 559.21886 d  
Epoch = 372.3818 BKJD

DV fit results are unavailable

## DV Diagnostic Results:

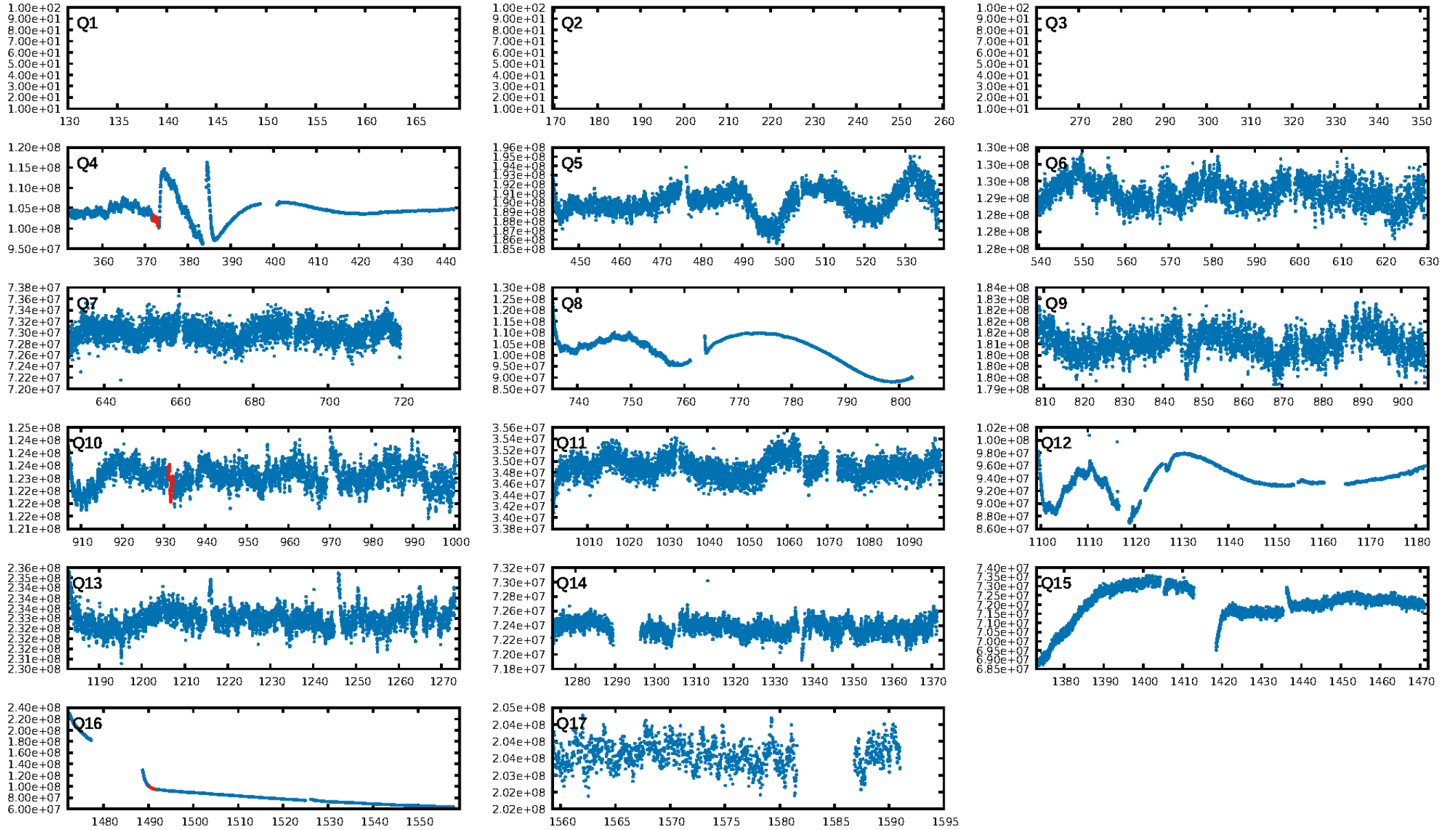
ShortPeriod-sig: 100.0% [238.35 $\sigma$ ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: 1.95e-129  
RollingBand-fgt: 1.00 [3/3]  
GhostDiagnostic-chr: -0.8977

Centroid-sig: 2.0%  
Centroid-so: 2.641 arcsec [259.80 $\sigma$ ]  
OotOffset-rm: 3.687 arcsec [48.55 $\sigma$ ]  
KicOffset-rm: 2.247 arcsec [29.23 $\sigma$ ]  
OotOffset-st: 0/0/1/0 [1]  
KicOffset-st: 0/0/1/0 [1]  
DiffImageQuality-fgm: 1.00 [1/1]  
DiffImageOverlap-fno: 1.00 [2/2]

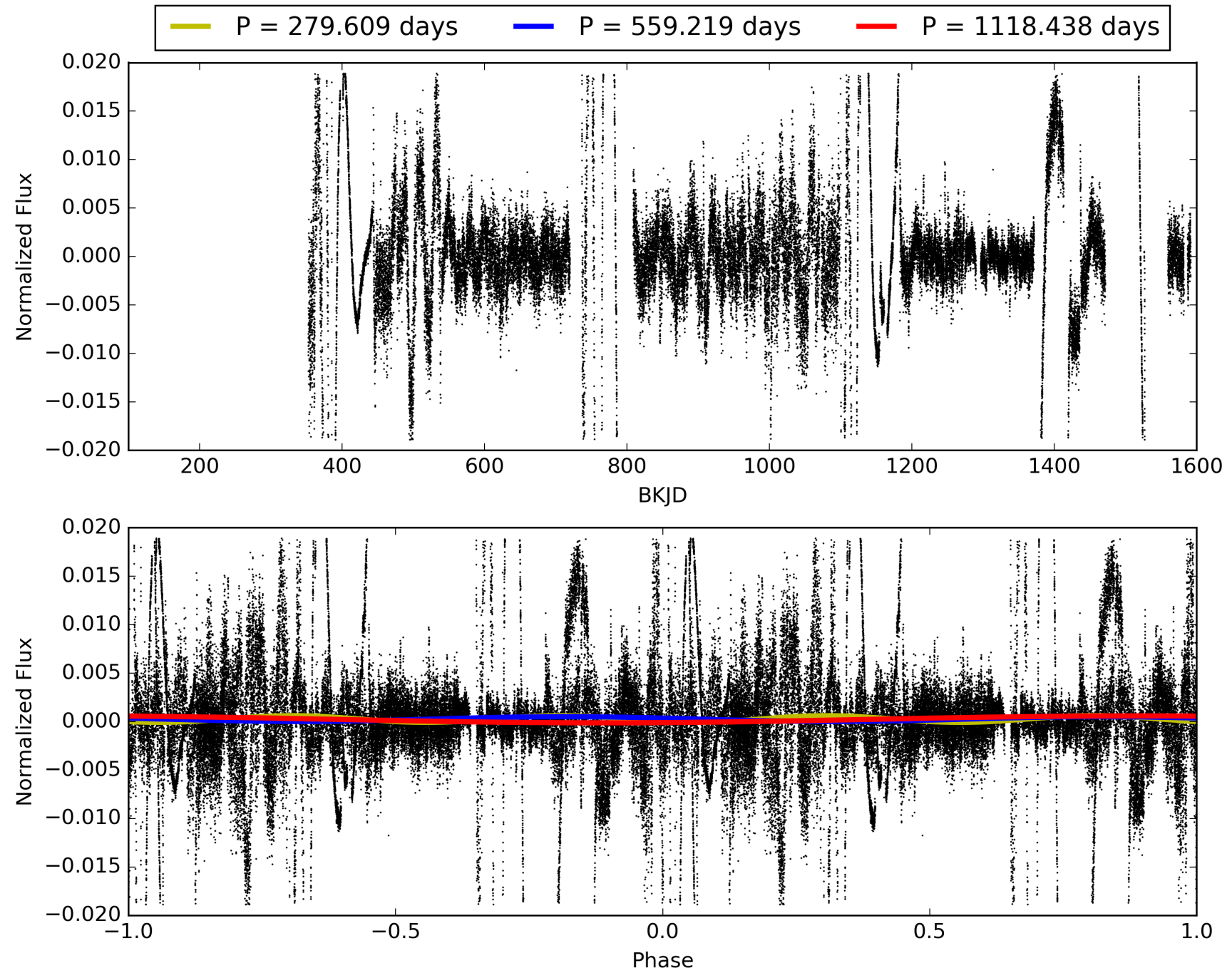
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This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

# TCE 002970580-02, PDC Light Curves

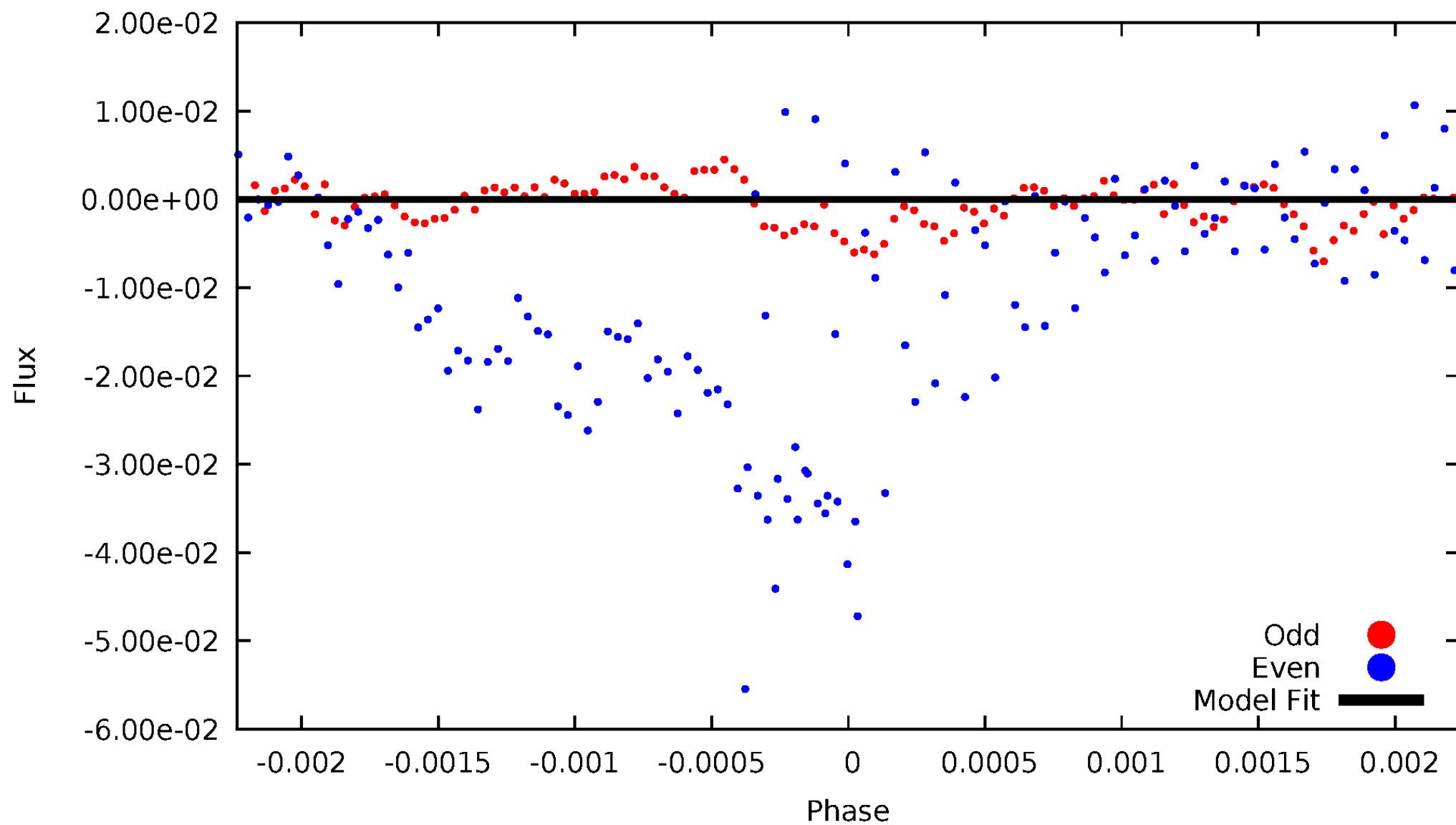


# TCE 002970580-02



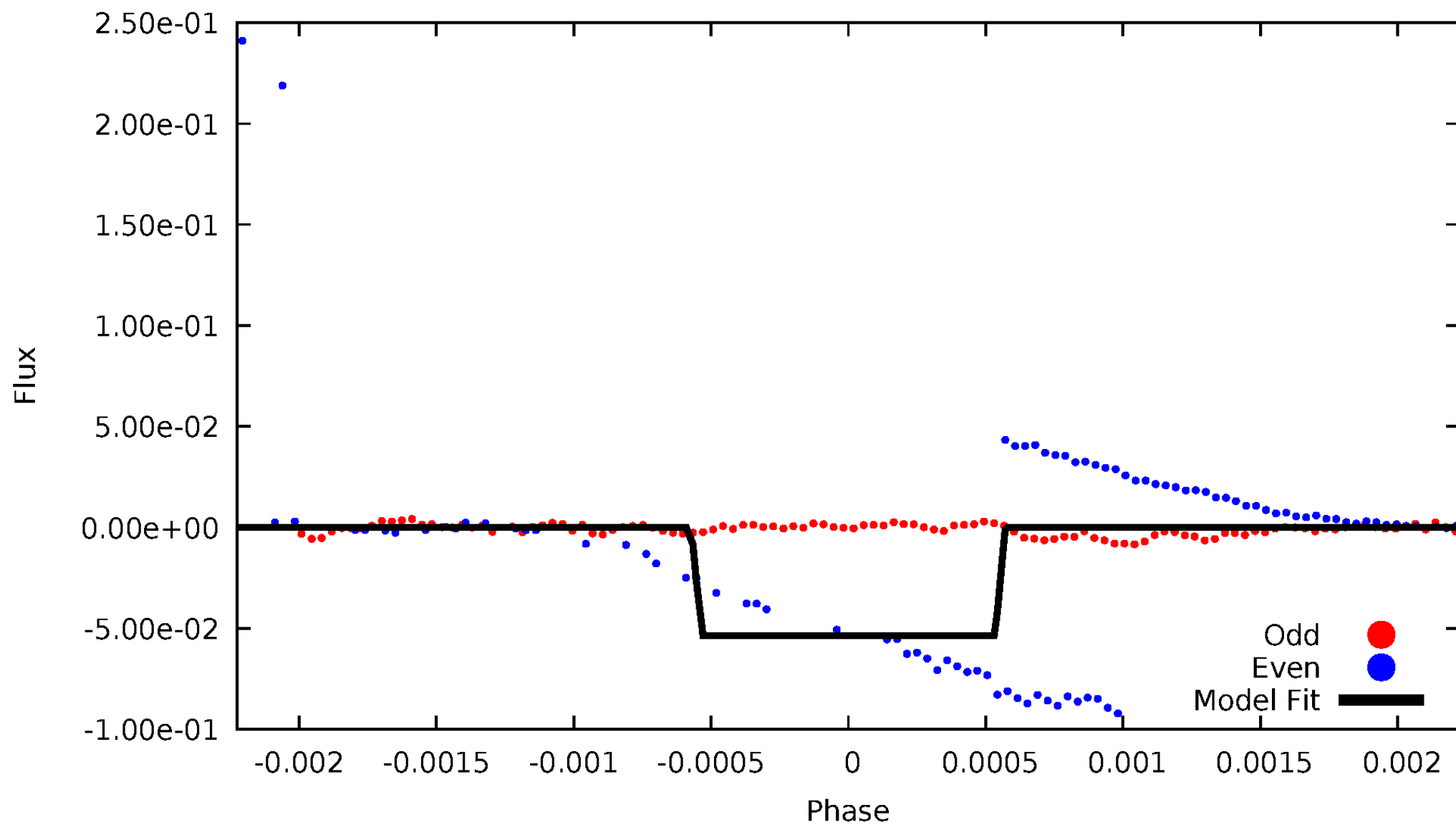
# DV Odd/Even

TCE 002970580-02



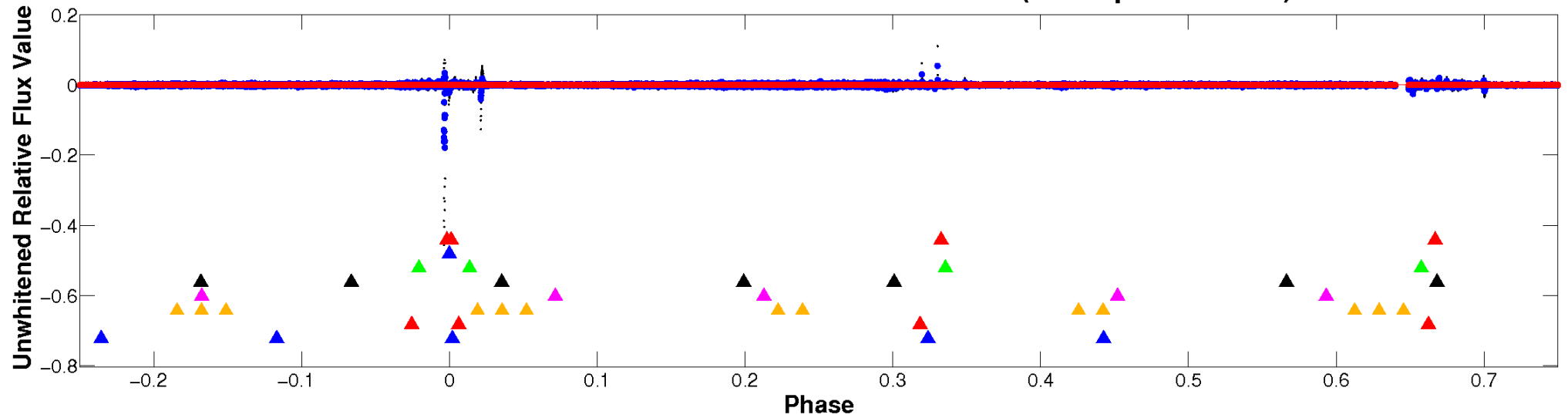
# ALT Odd/Even

TCE 002970580-02

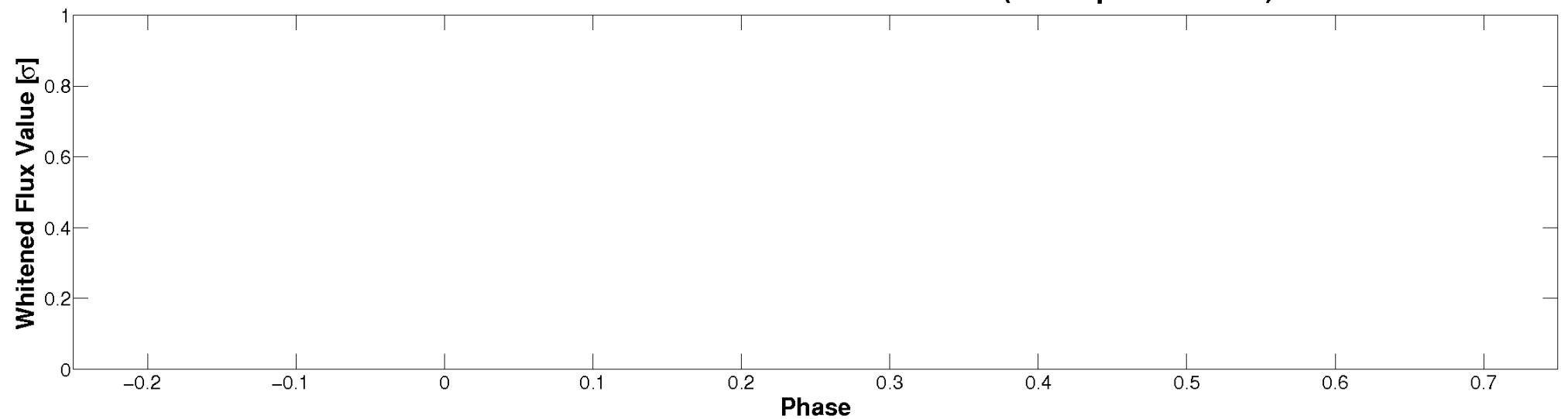


# Non-Whitened Vs. Whitened Light Curve

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

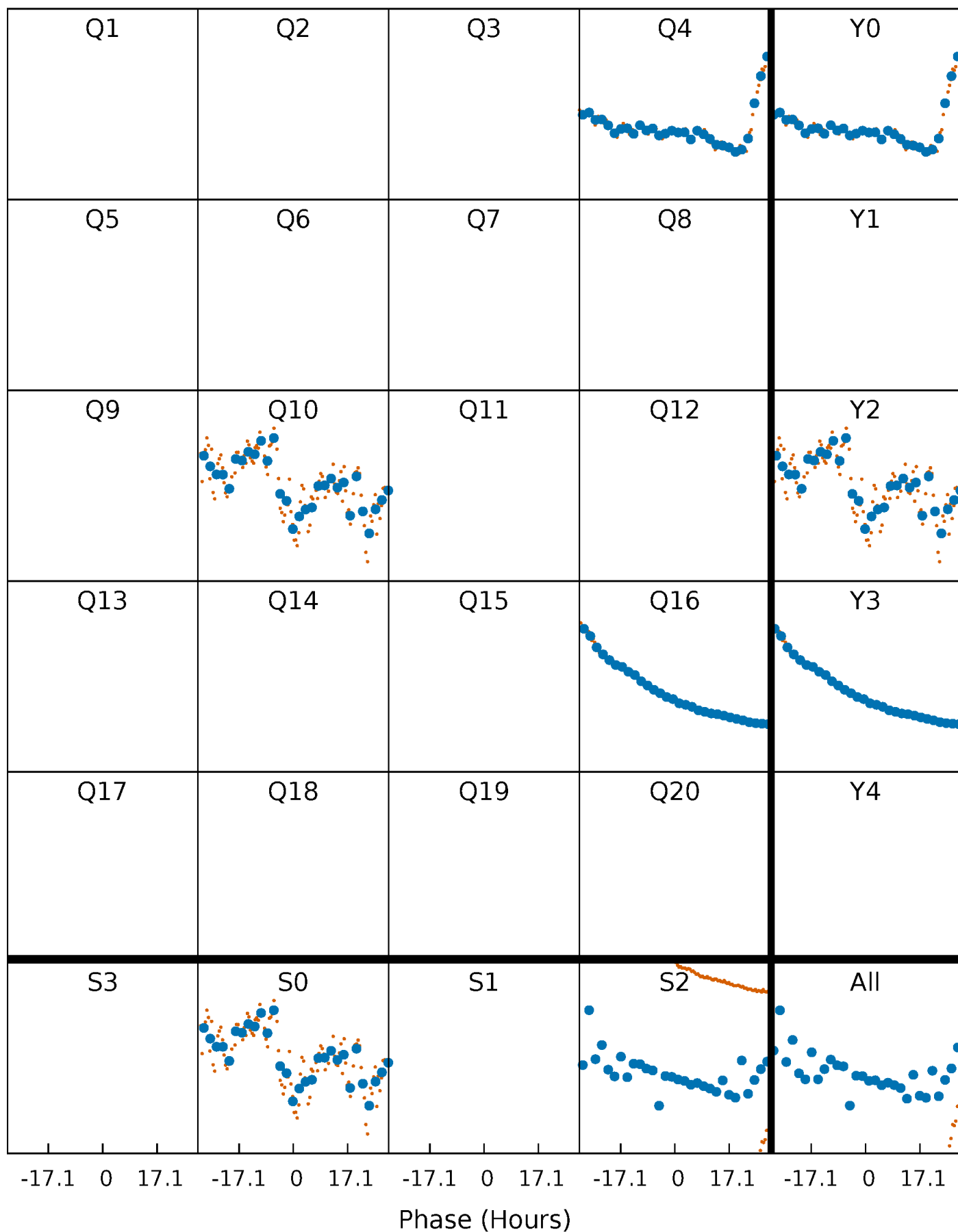


**Planet 2 : Phased Whitened Flux Time Series (TPS Epoch/Period)**



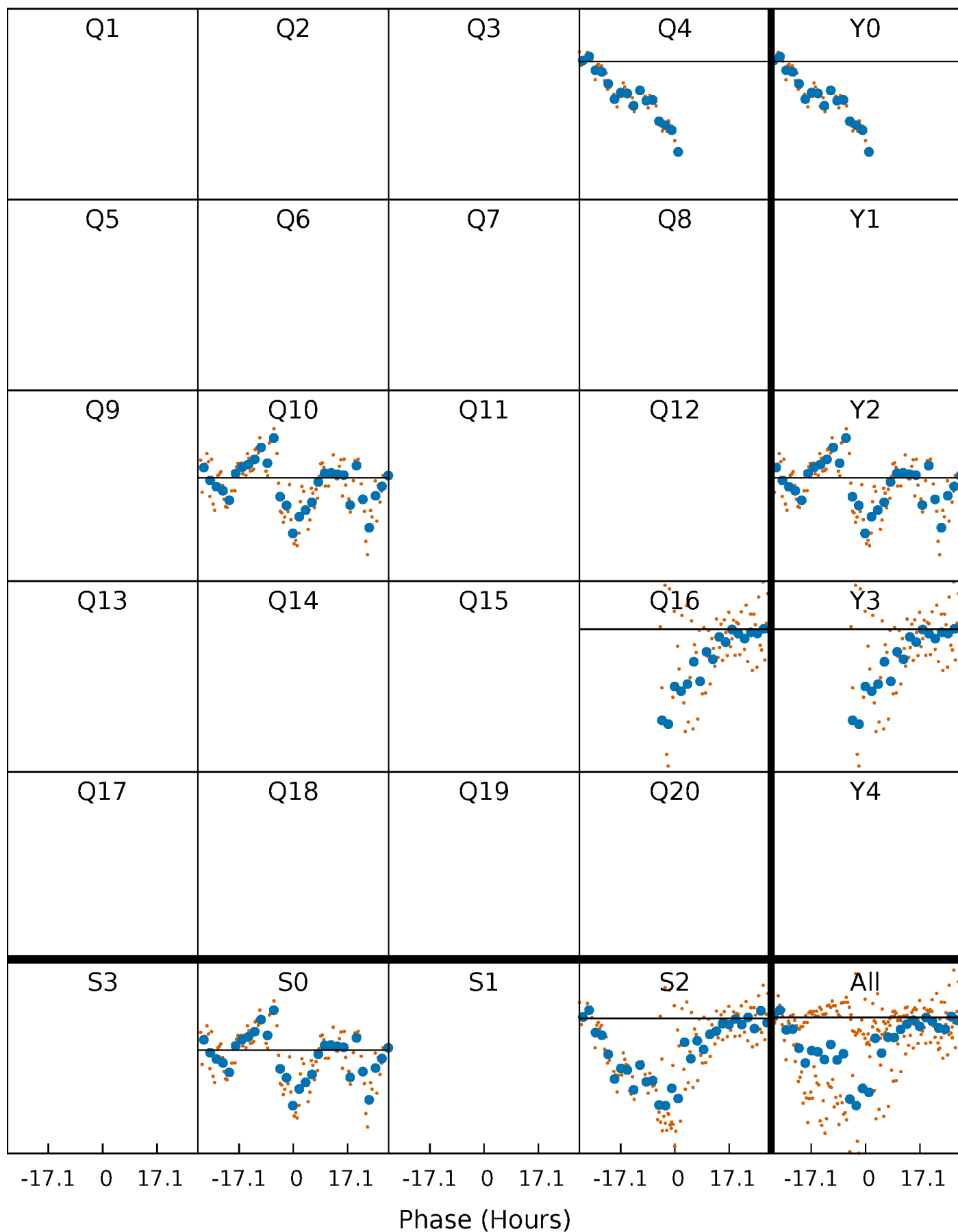
# PDC Quarter-Phased Transit Curves

TCE 002970580-02     $P=559.218859$  Days     $T_0=372.381799$  (BKJD)



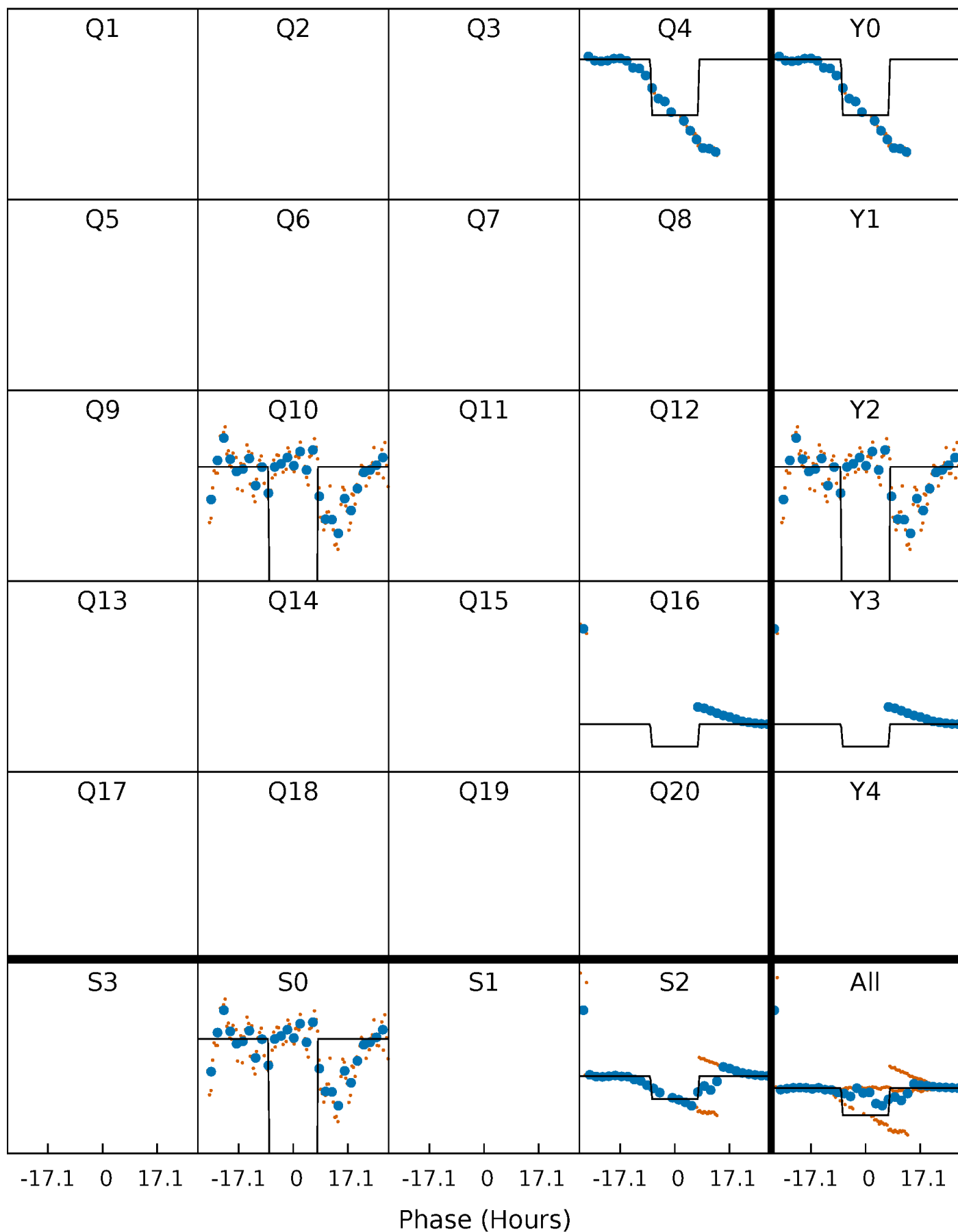
# DV Quarter-Phased Transit Curves

TCE 002970580-02 P=559.218859 Days  $T_0=372.381799$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

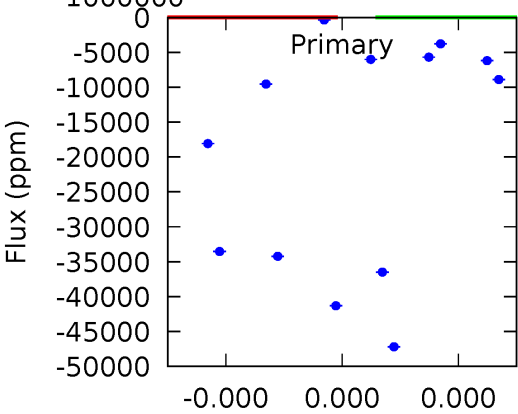
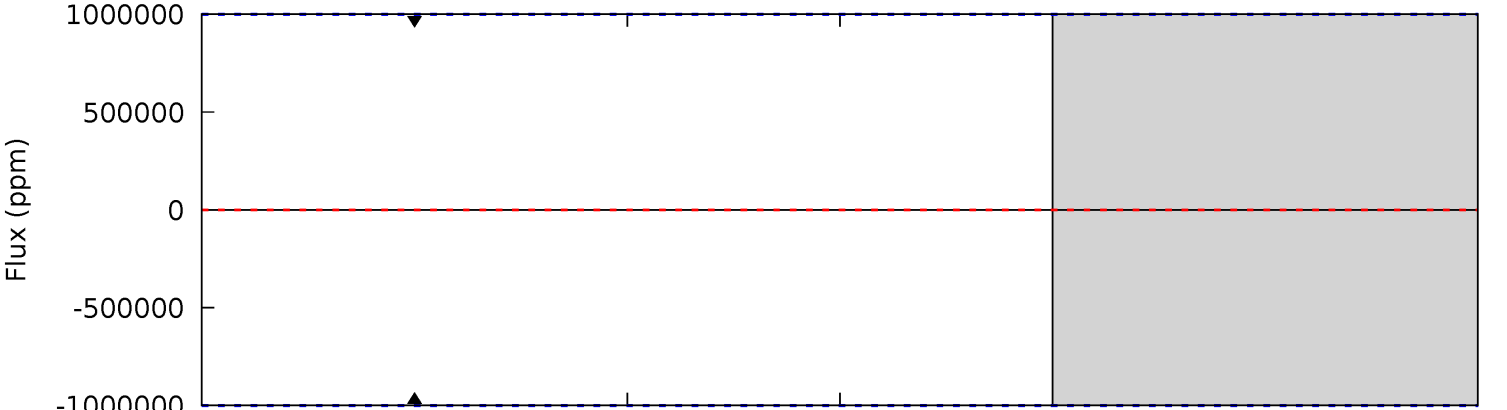
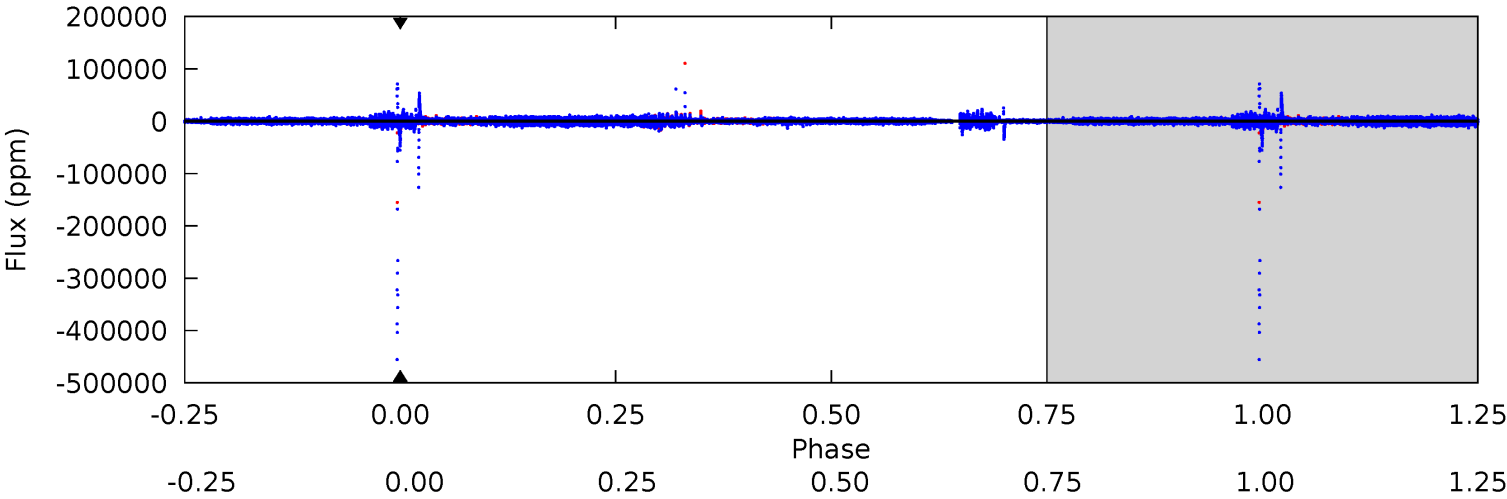
TCE 002970580-02 P=559.218859 Days  $T_0=371.851906$  (BKJD)



# DV Model-Shift Uniqueness Test

002970580-02, P = 559.218859 Days, E = 372.381799 Days

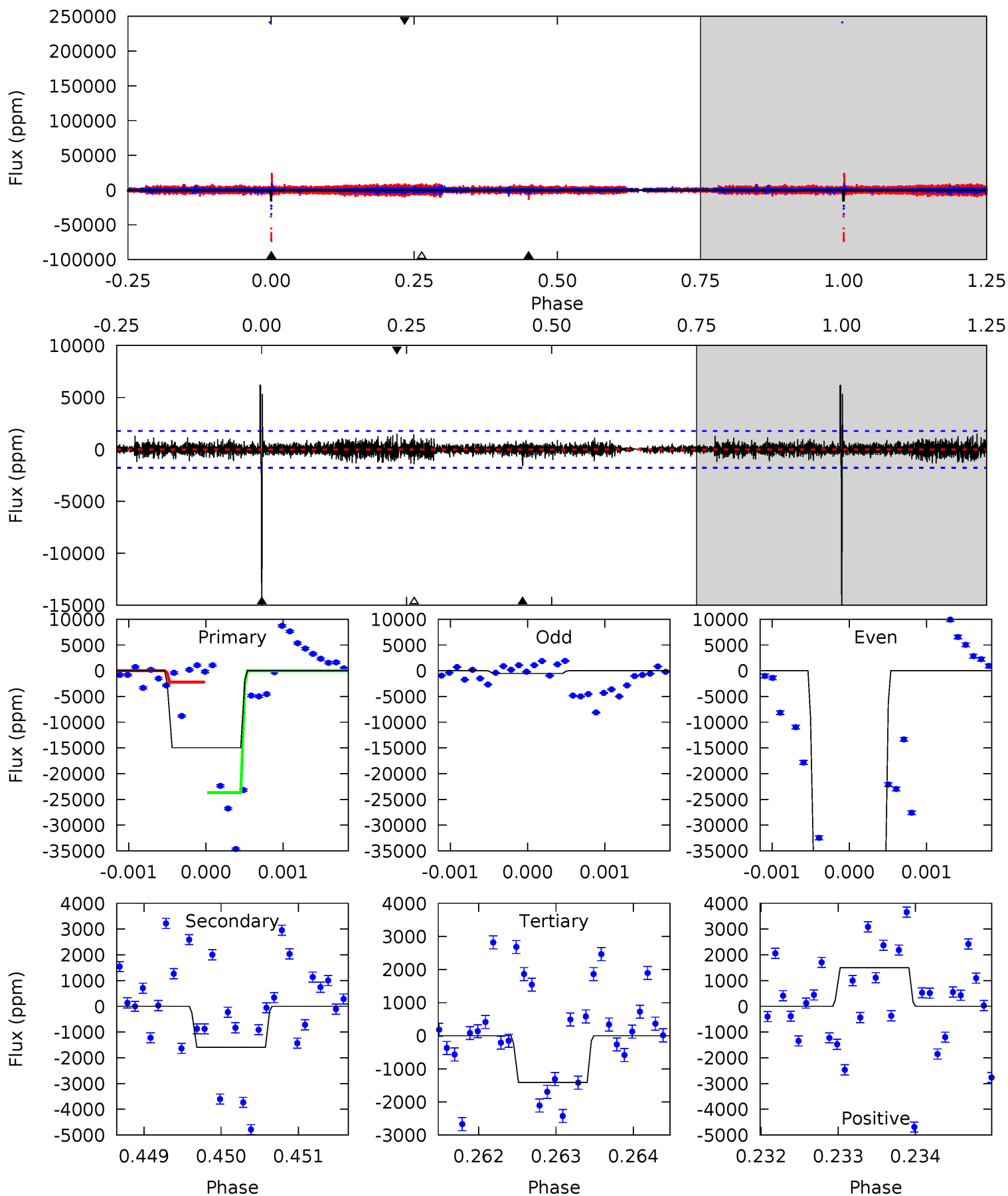
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
0	0	0	0	1.00	1.00	1.00	0	0	0	0	0	0	0	0



# Alt Model-Shift Uniqueness Test

002970580-02, P = 559.218859 Days, E = 371.851906 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
45.9	4.87	4.34	4.61	5.43	3.26	1.10	41.6	41.3	0.54	0.26	66.8	1.00	0.29	32.2



### Stellar Parameters For KIC 002970580

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$4605^{+69}_{-48}$	$2.619^{+0.120}_{-0.120}$	$-0.080^{+0.150}_{-0.100}$	$7.844^{+2.620}_{-0.936}$	$0.934^{+0.427}_{-0.022}$	$0.003^{+0.001}_{-0.001}$
	+1%/-1%	+5%/-5%	+188%/-125%	+33%/-12%	+46%/-2%	+48%/-45%
Source	SPE74	SPE74	SPE74	DSEP		

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

### Secondary Eclipse Parameters for KIC 002970580-02 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$0 \pm 1000000$	$73.94^{+73.03}_{-51.82}$	$695^{+39}_{-28}$	$-3562^{+14325}_{-7683}$	$-284.096^{+30075.967}_{-36553.007}$
Alt.	$-1587 \pm 326$	$201.93^{+86.80}_{-89.80}$	$695^{+40}_{-30}$	$2650^{+452}_{-234}$	$38^{+85}_{-20}$

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

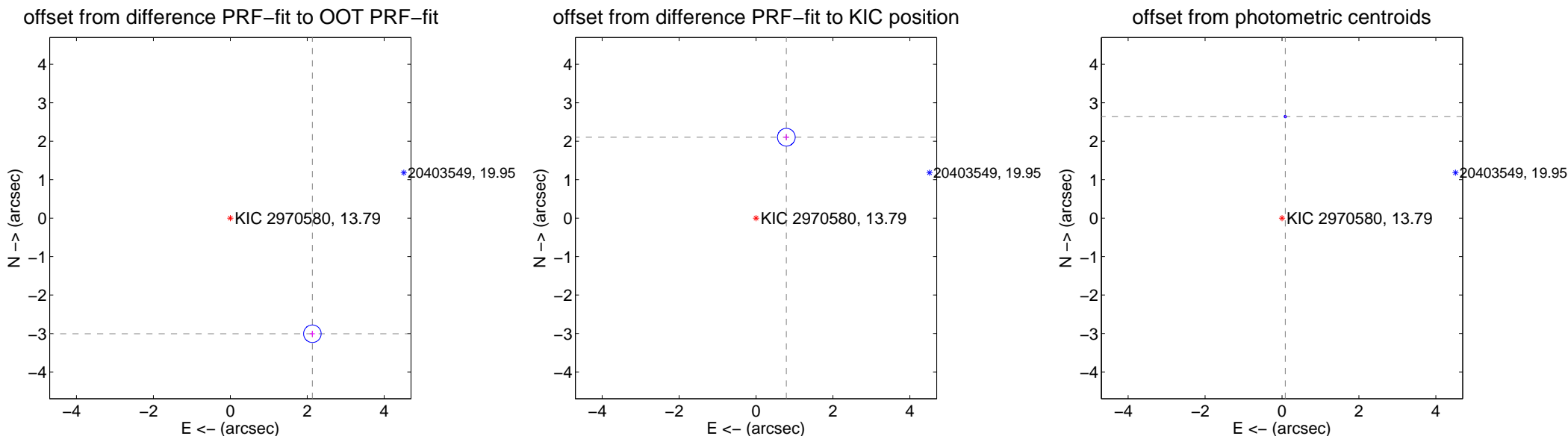
## DV Centroid Data

Supplemental centroid analysis for 002970580-02. Kepler magnitude: 13.79. Transit SNR -1.00

There are 1 quarters with good PRF difference image offsets

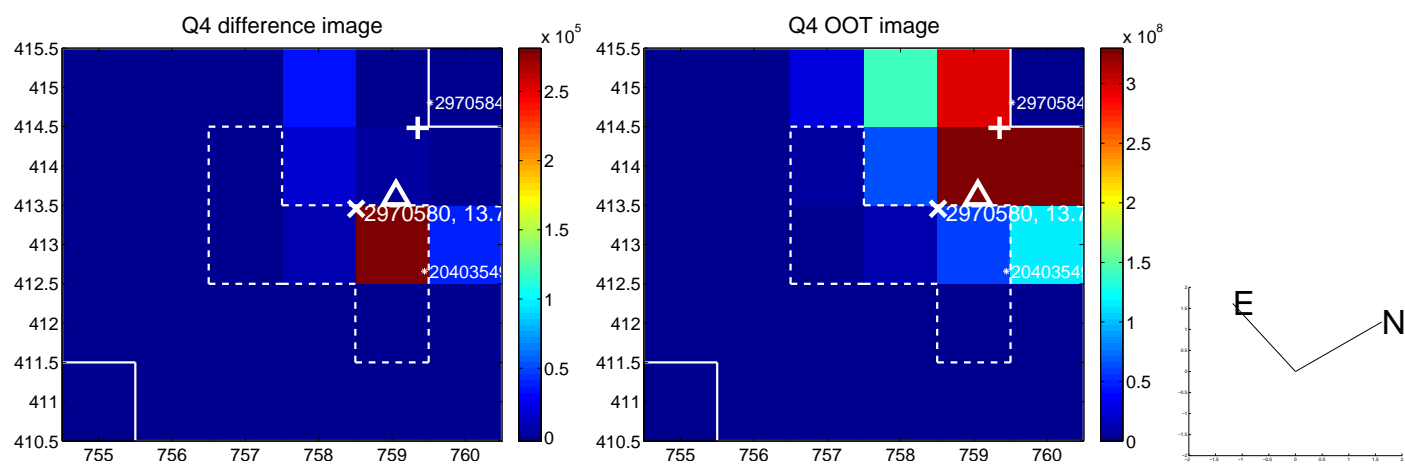
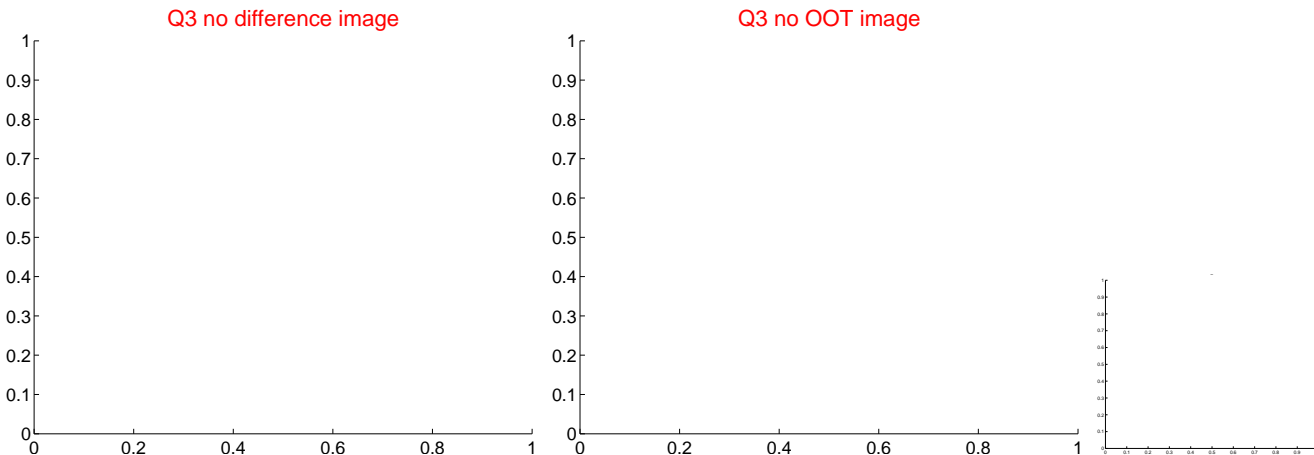
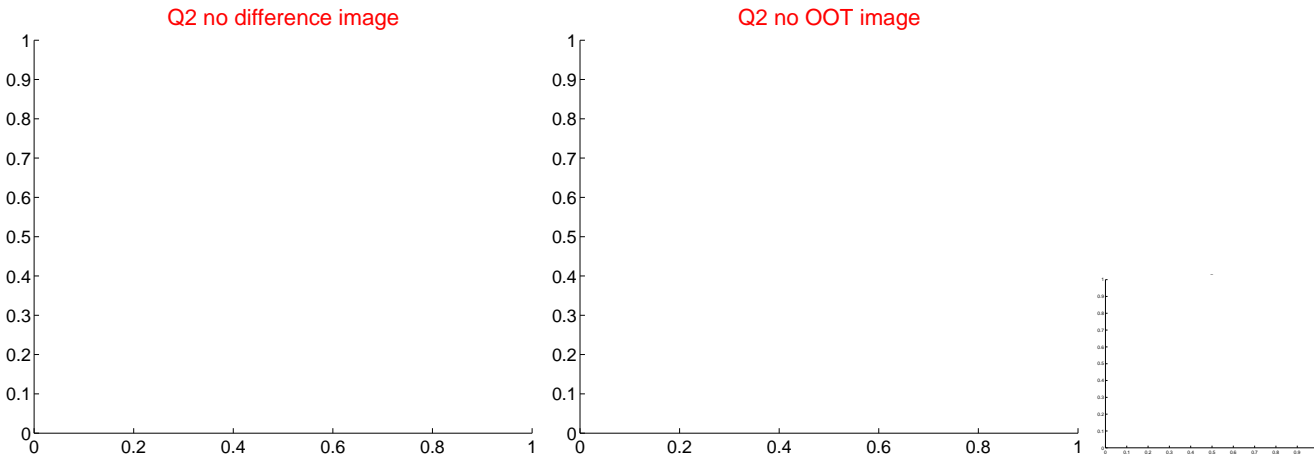
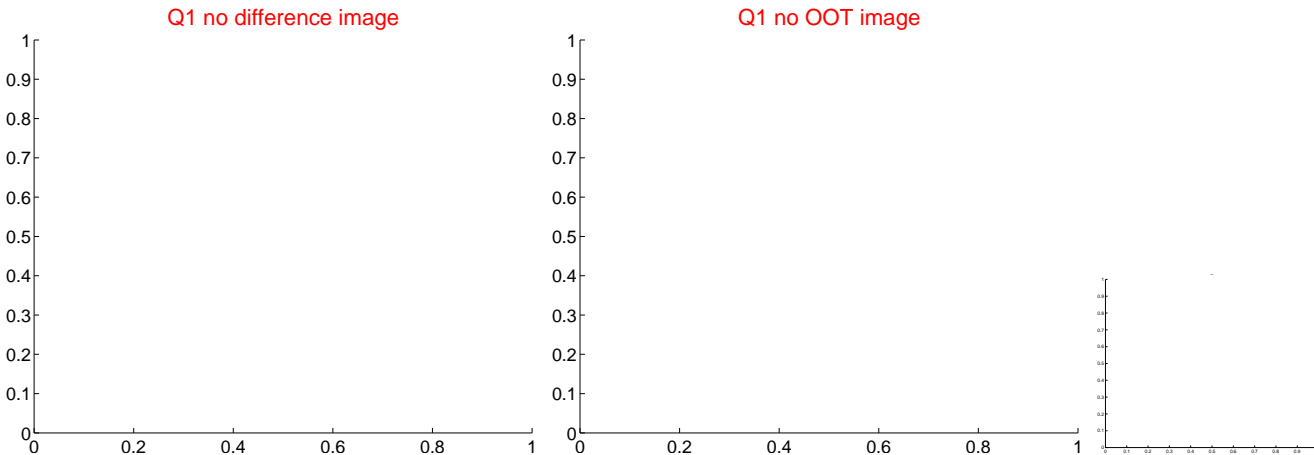
The OOT PRF centroid is offset from the target star catalog position by about 5.28 arcsec so the offset from difference PRF-fit to OOT-fit may be invalid.

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$3.687 \pm 0.076$	48.55	$-2.134 \pm 0.073$	$-3.007 \pm 0.077$
PRF-fit source offset from KIC position	$2.247 \pm 0.077$	29.23	$-0.788 \pm 0.073$	$2.104 \pm 0.077$
photometric centroid source offset	$2.64 \pm 0.01$	259.80	$-0.09 \pm 0.01$	$2.64 \pm 0.01$



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

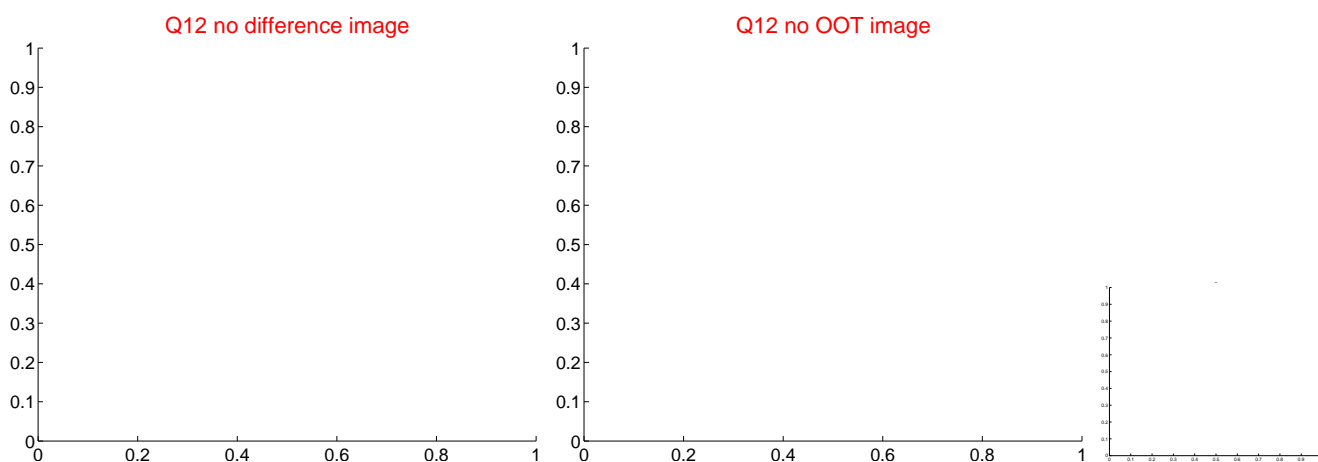
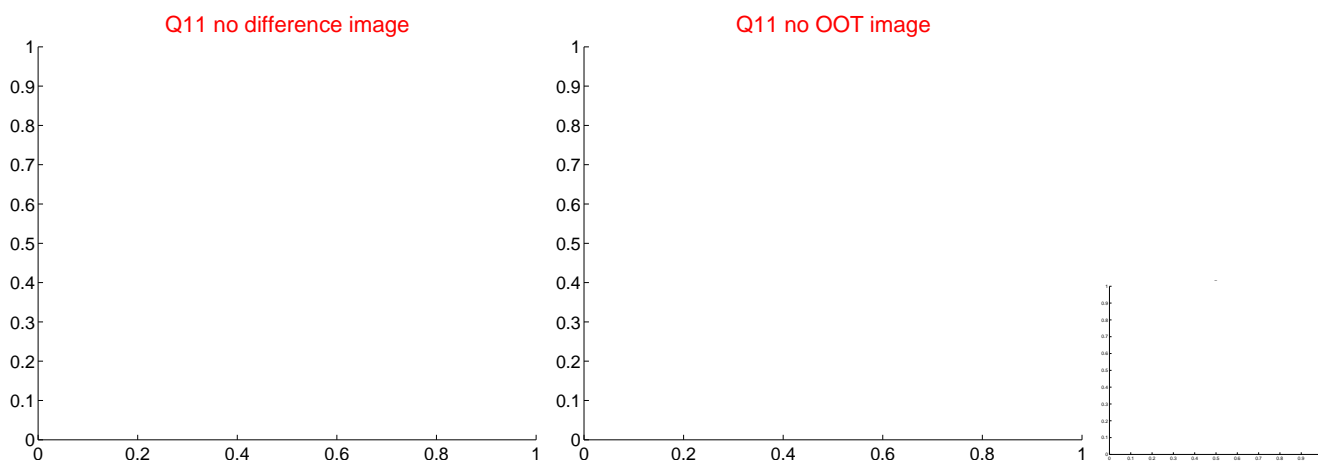
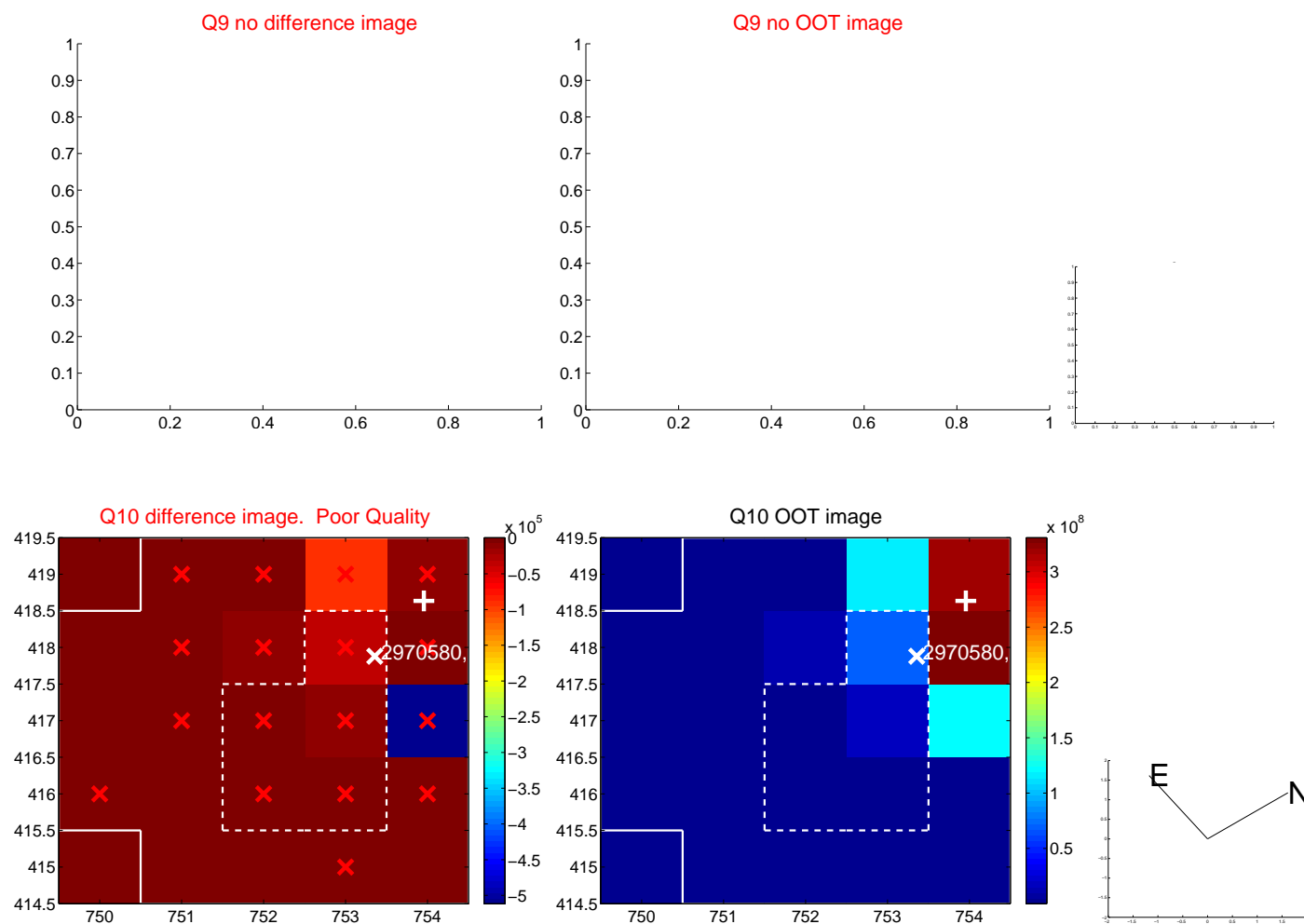
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value



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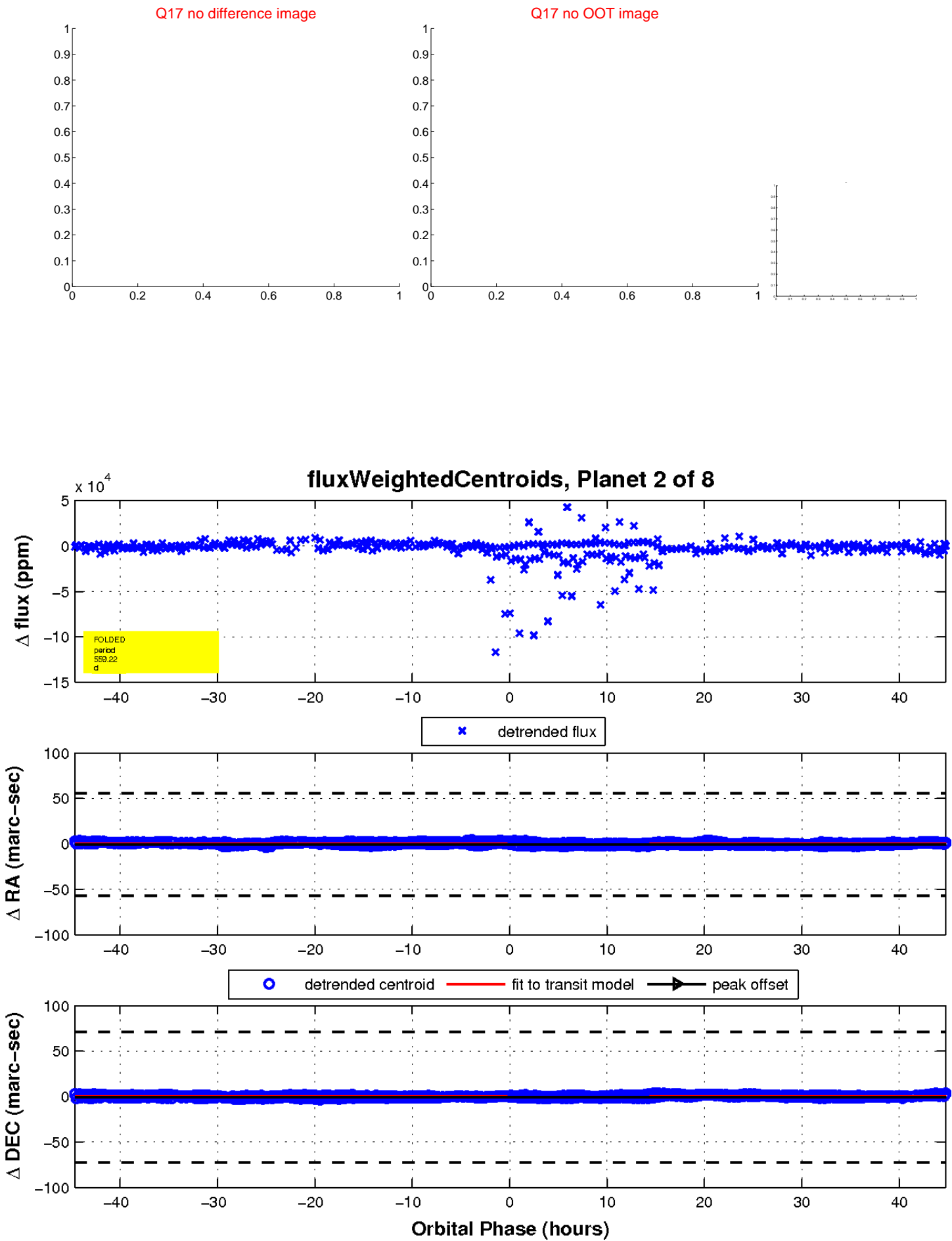
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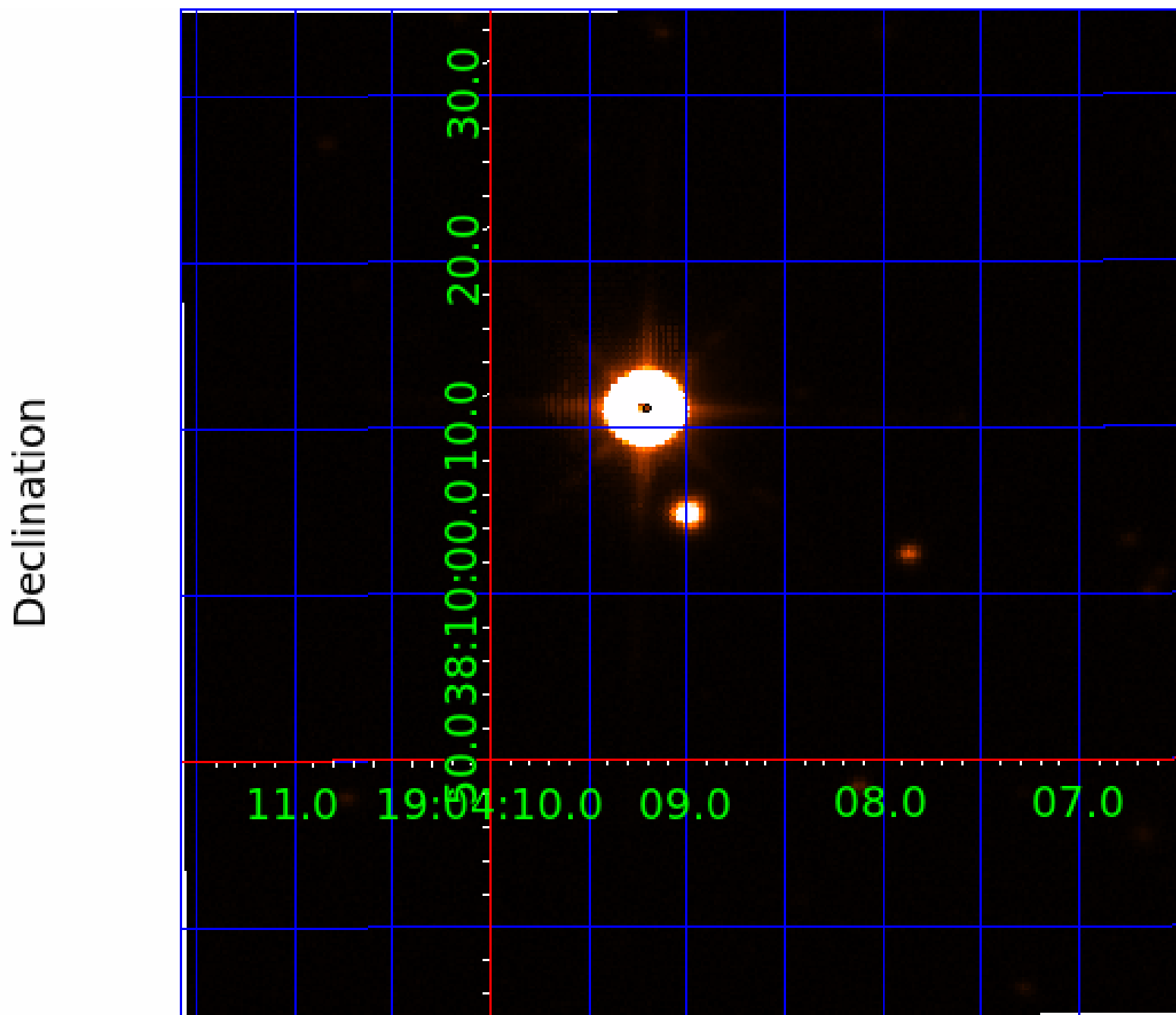
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UKIRT Image



# KIC 002970580

## Q1-17 DR25 TCE Parameters

TCE	Run Type	KOI?	Period (Days)	Epoch (BKJD)	Depth (ppm)	Duration (Hours)	MES	SNR	$R_{\star}$ ( $R_{\odot}$ )	$T_{\star}$ (K)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
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## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
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002970580-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES—LPP_DV—ALL_TRANS_CHASES—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS
002970580-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS
002970580-05	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL_TRACKER—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_KIC_POS
002970580-06	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_NOFITS
002970580-07	OBS	FP	0.00	1	0	0	0	LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS
002970580-08	OBS	FP	0.00	1	0	1	0	INDIV_TRANS_RUBBLE_MARSHALL—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—CENT_NOFITS—HALO_GHOST

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

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

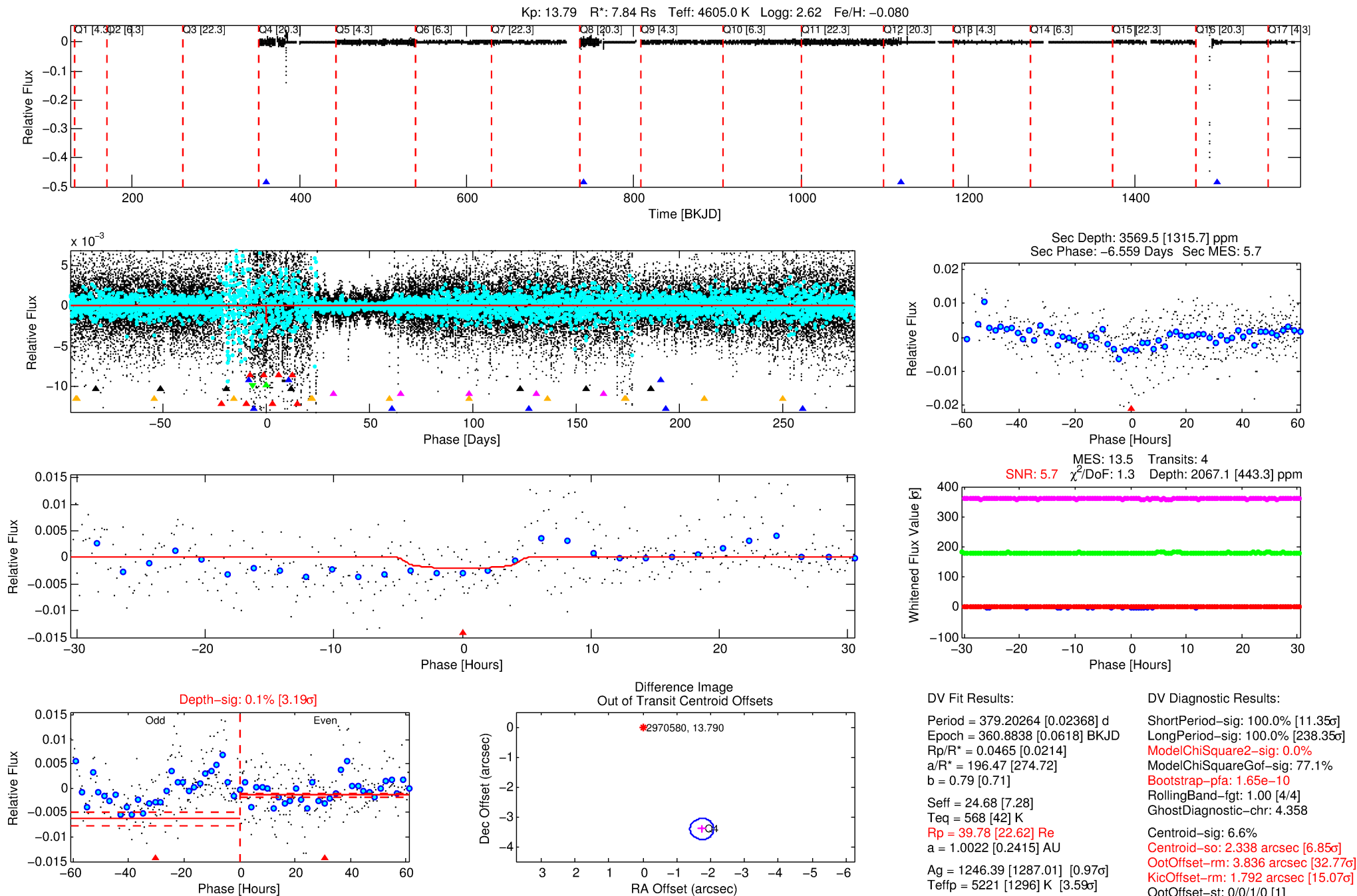
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 002970580-03

No Significant Match Found

# DV One-Page Summary

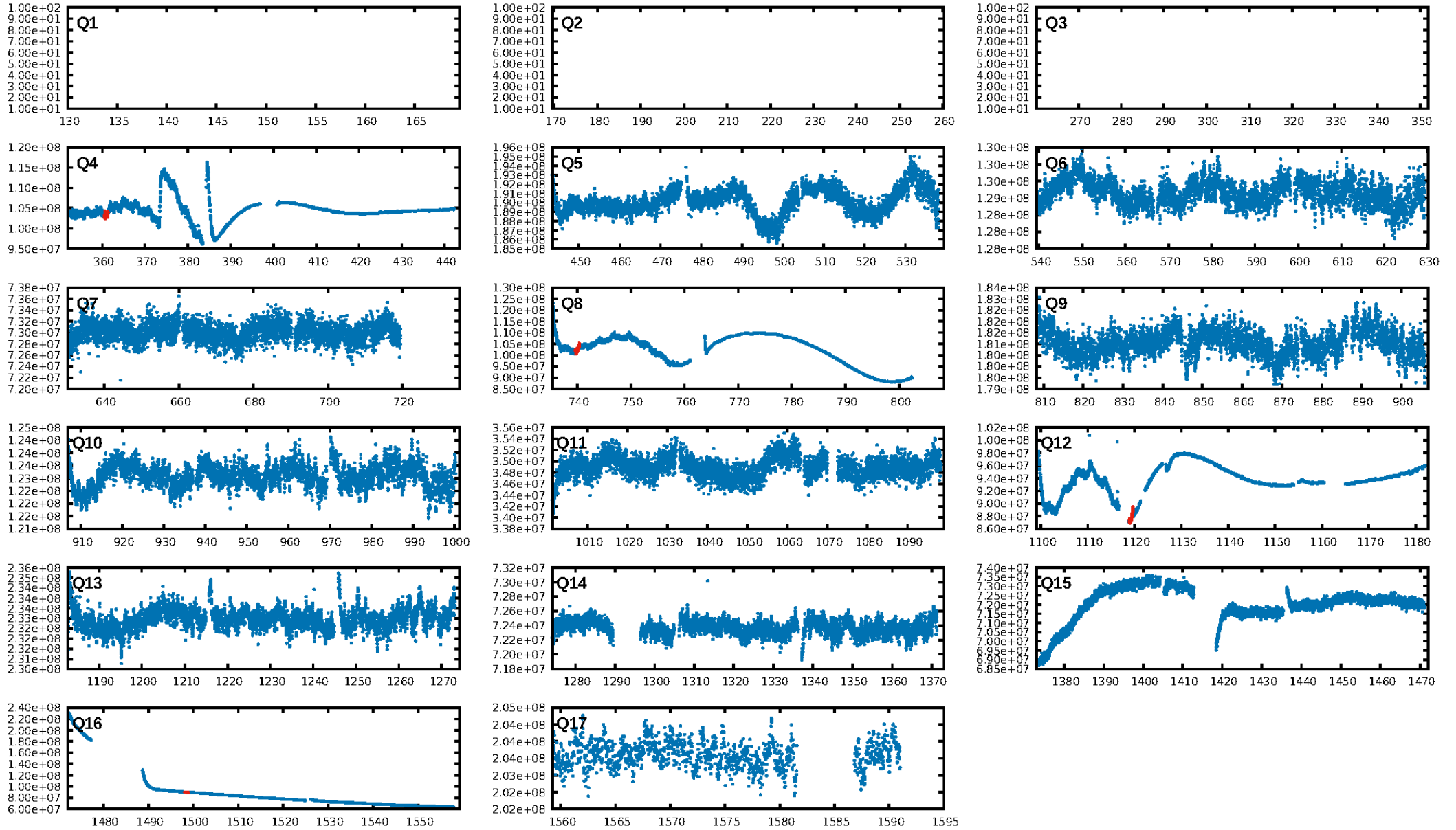
KIC: 2970580 Candidate: 3 of 8 Period: 379.203 d



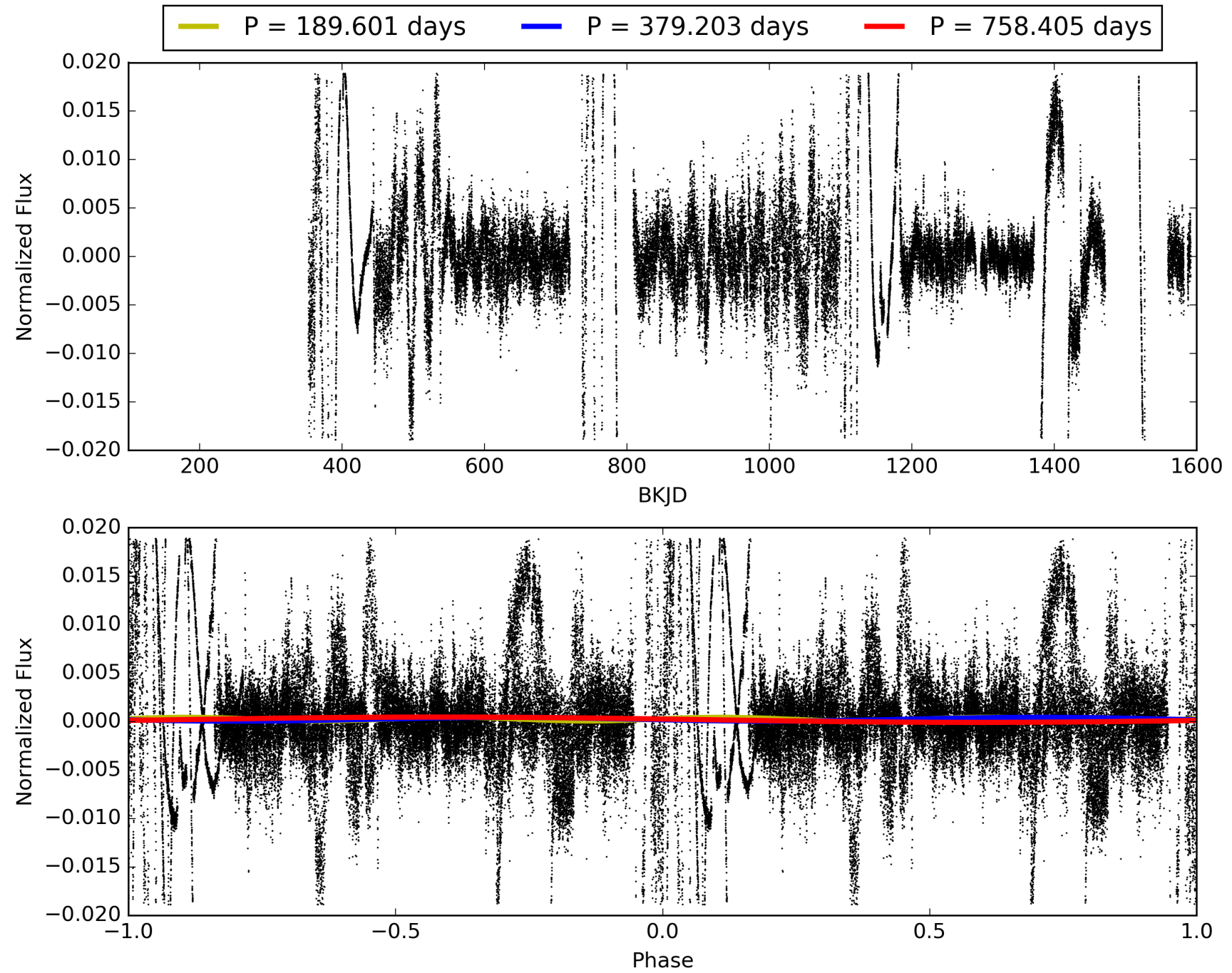
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 01-Feb-2016 22:40:38 Z

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

# TCE 002970580-03, PDC Light Curves

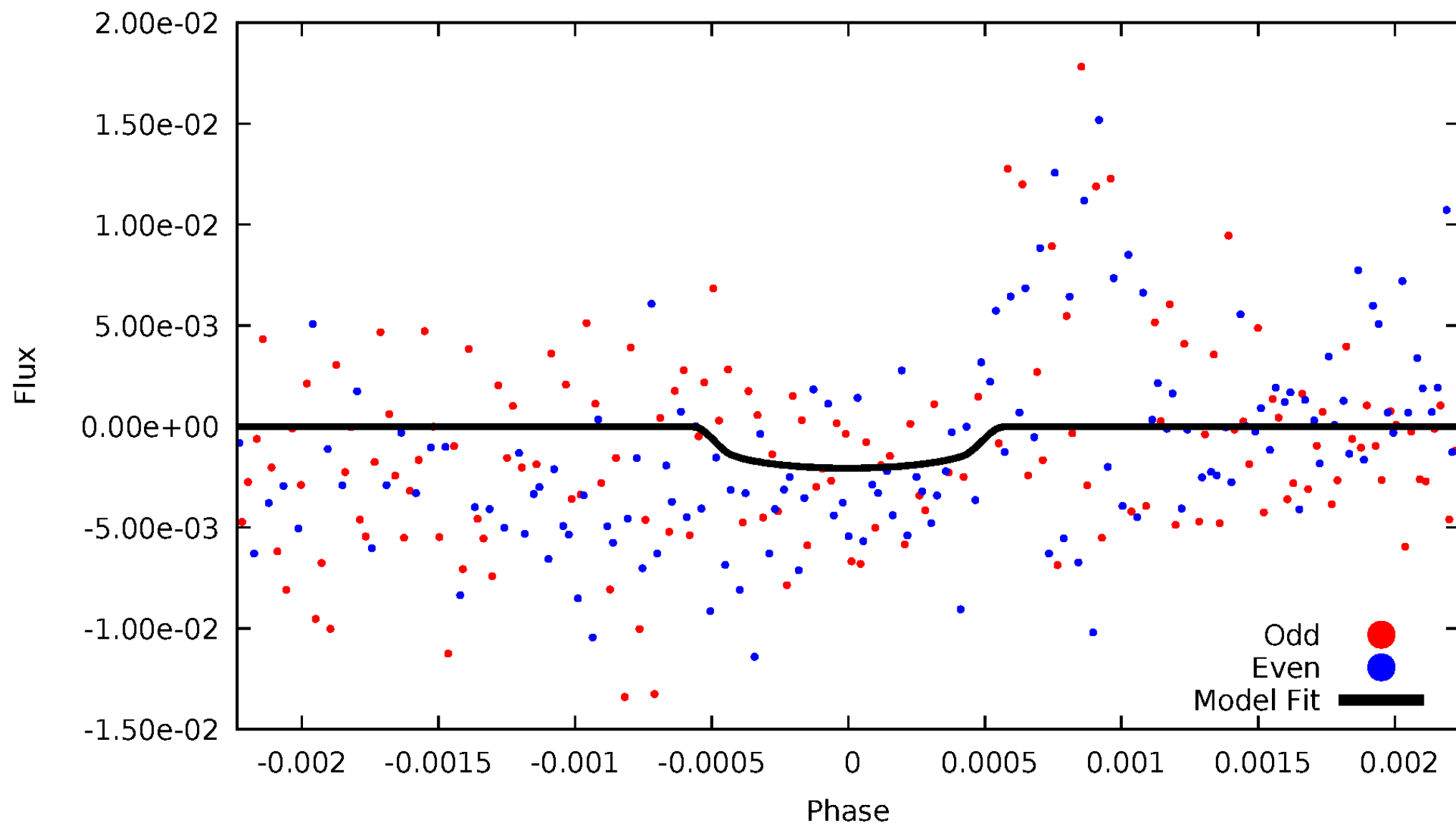


TCE 002970580-03



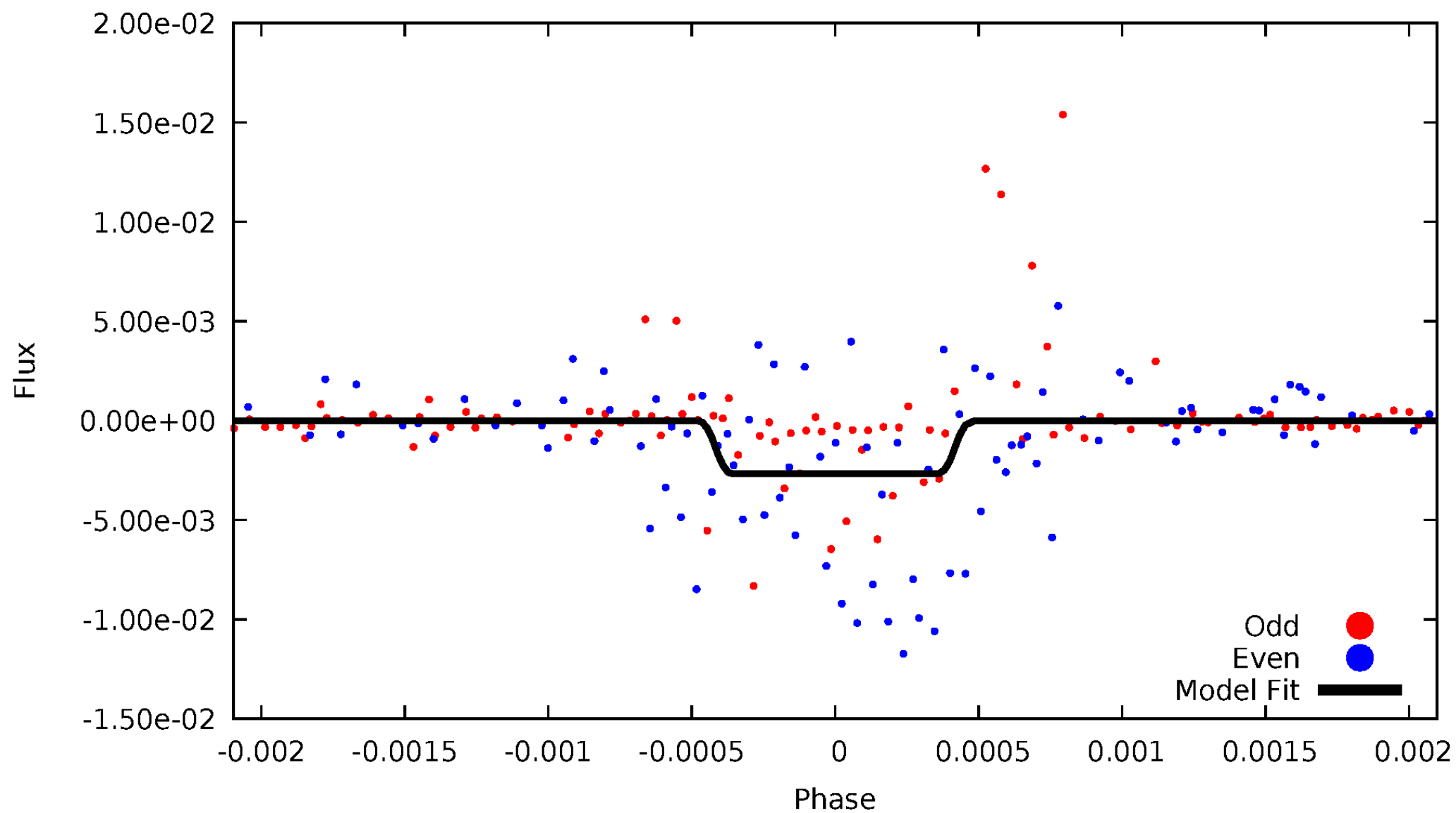
# DV Odd/Even

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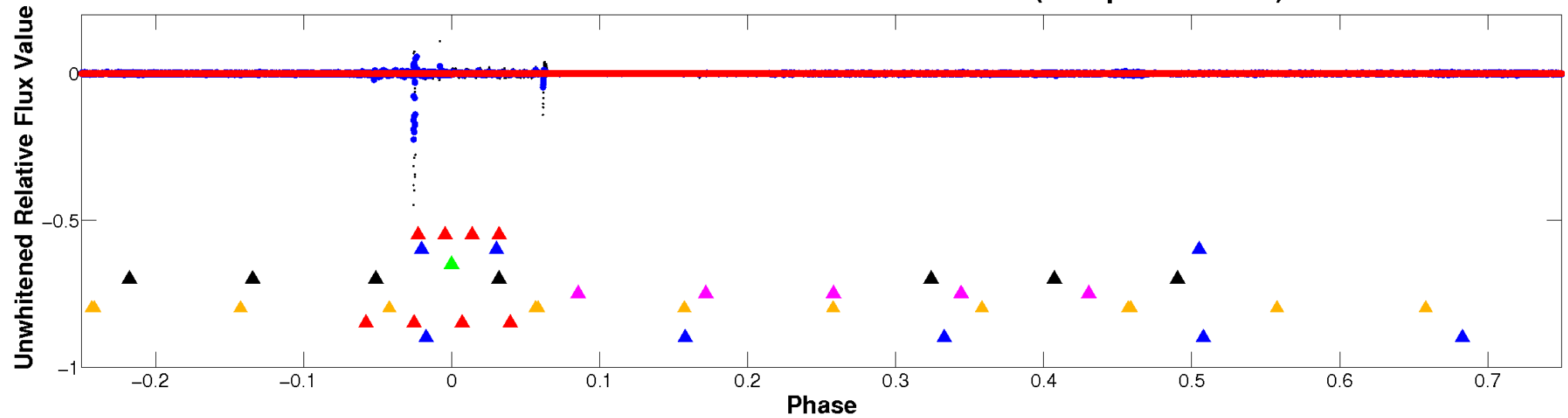
# ALT Odd/Even

TCE 002970580-03

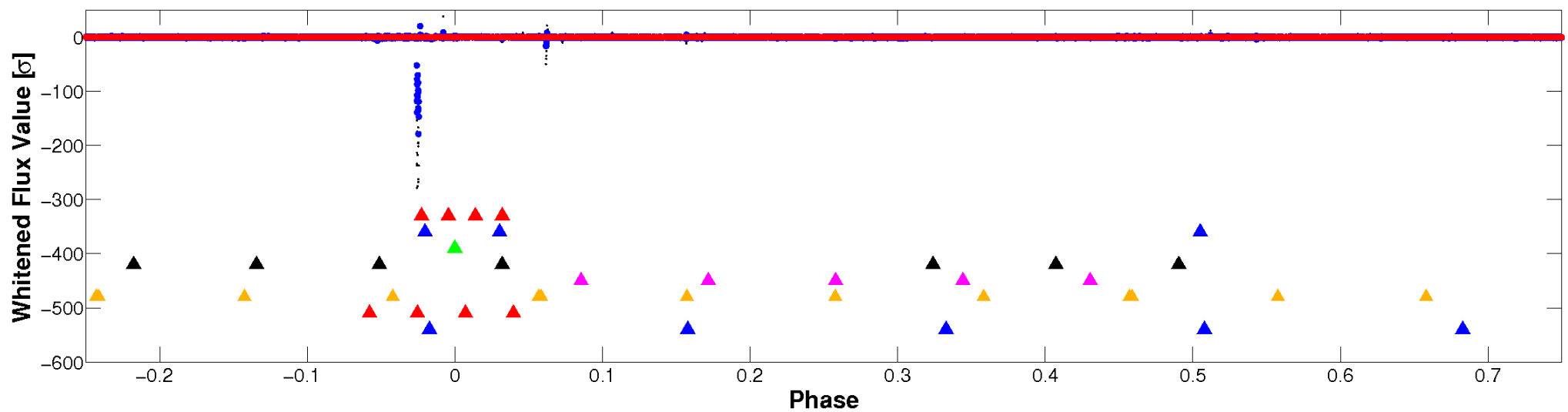


# Non-Whitened Vs. Whitened Light Curve

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

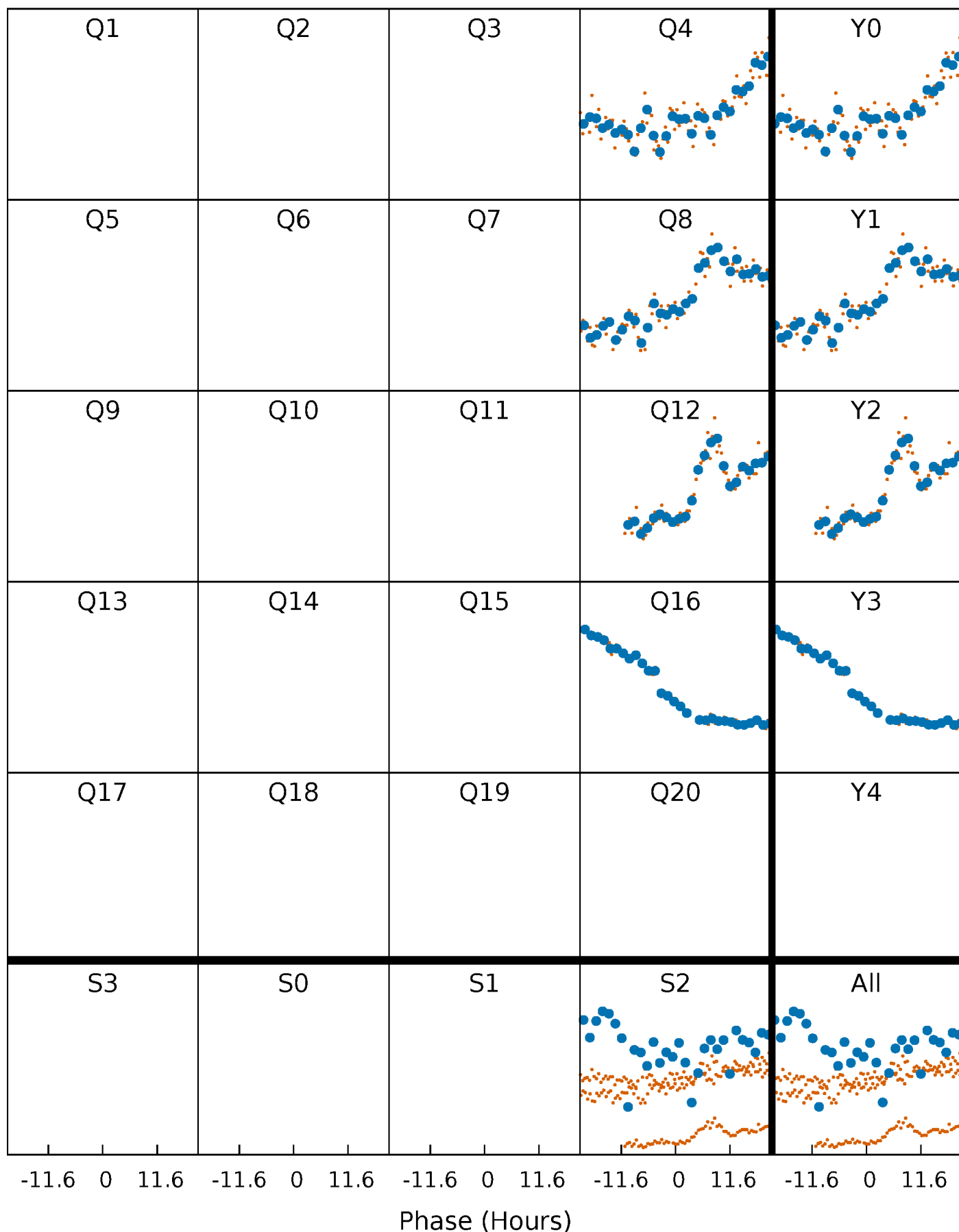


## Planet 3 : Phased Whitened Flux Time Series (Fit Epoch/Period)



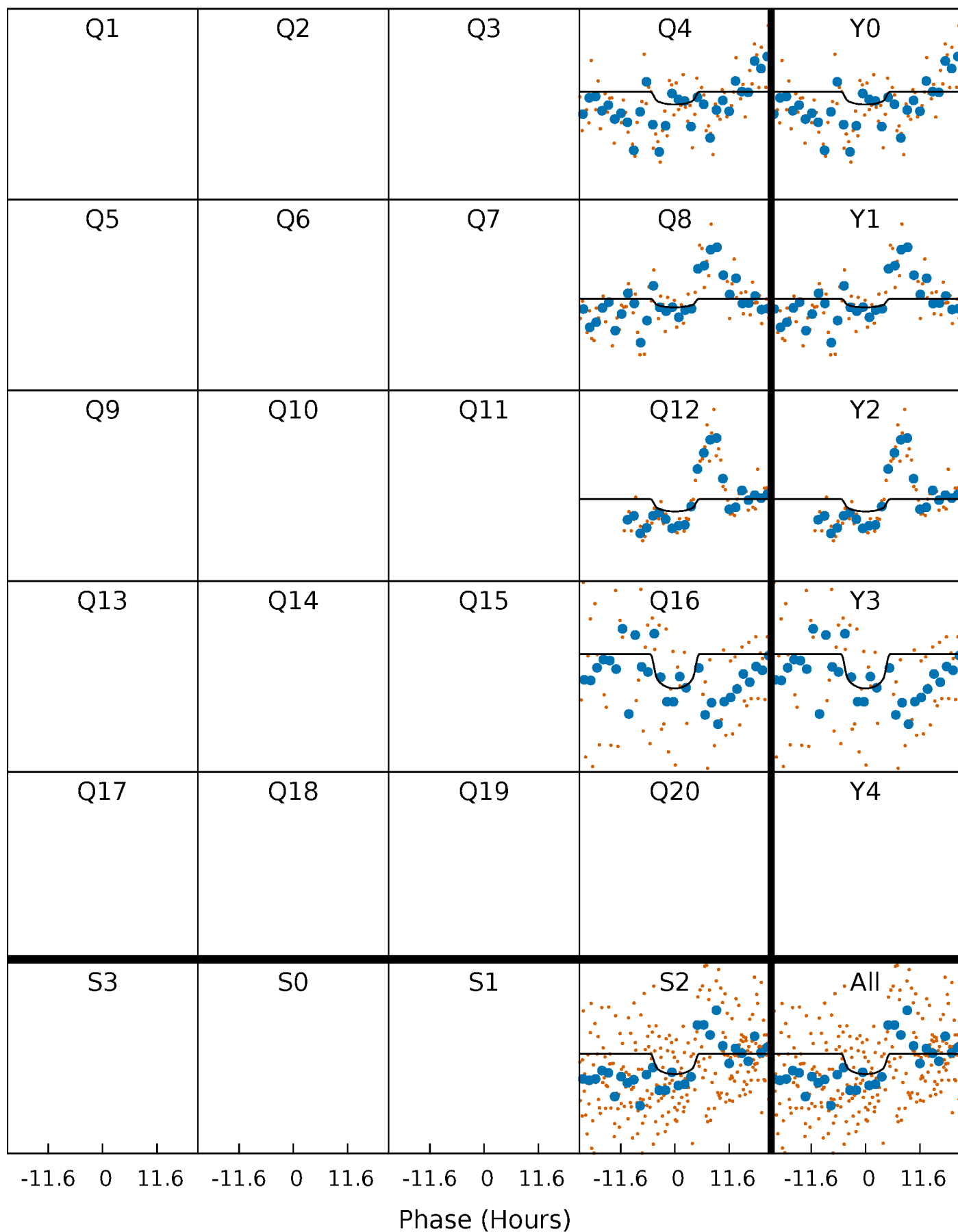
# PDC Quarter-Phased Transit Curves

TCE 002970580-03     $P=379.202643$  Days     $T_0=360.883809$  (BKJD)



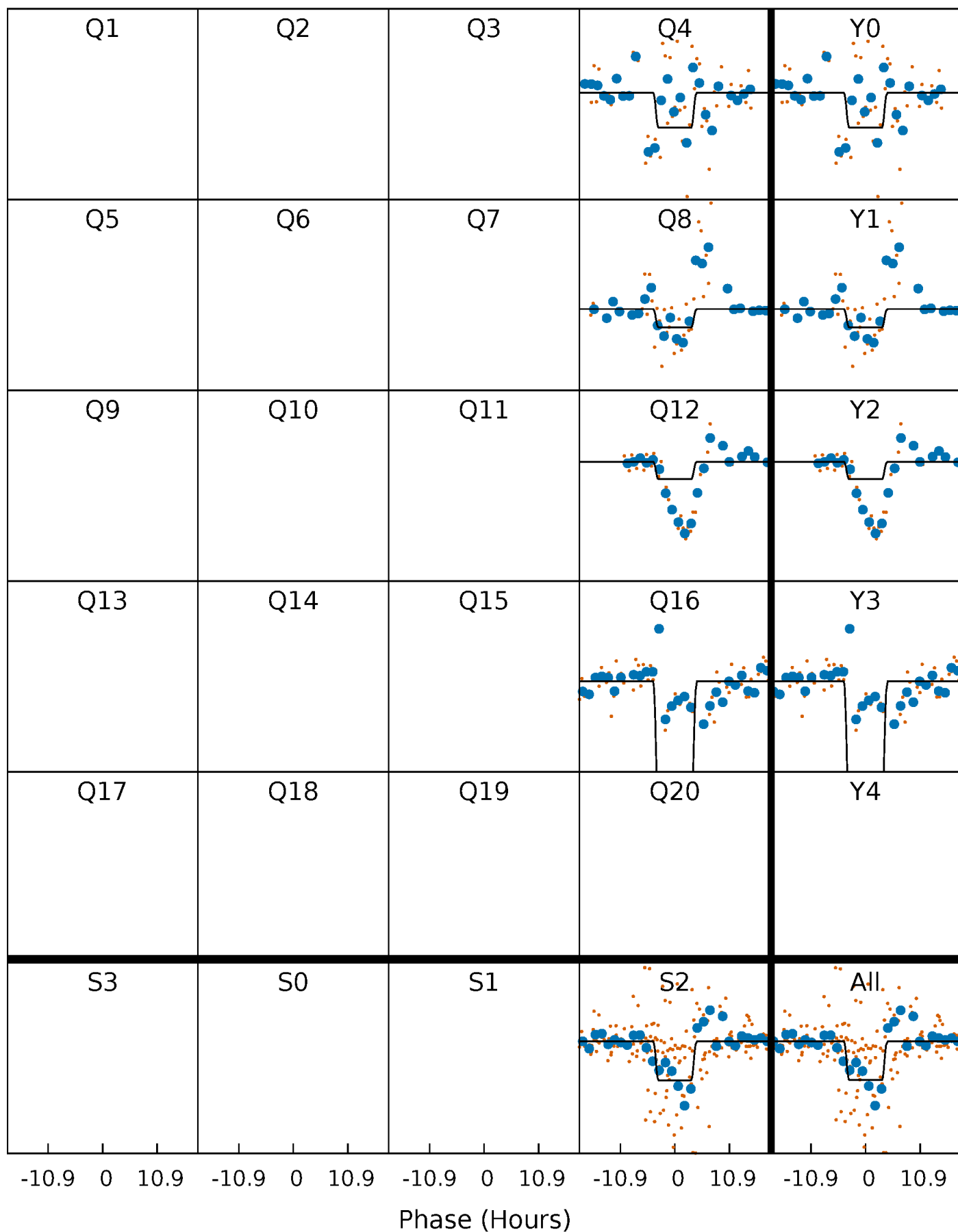
# DV Quarter-Phased Transit Curves

TCE 002970580-03     $P=379.202643$  Days     $T_0=360.883809$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

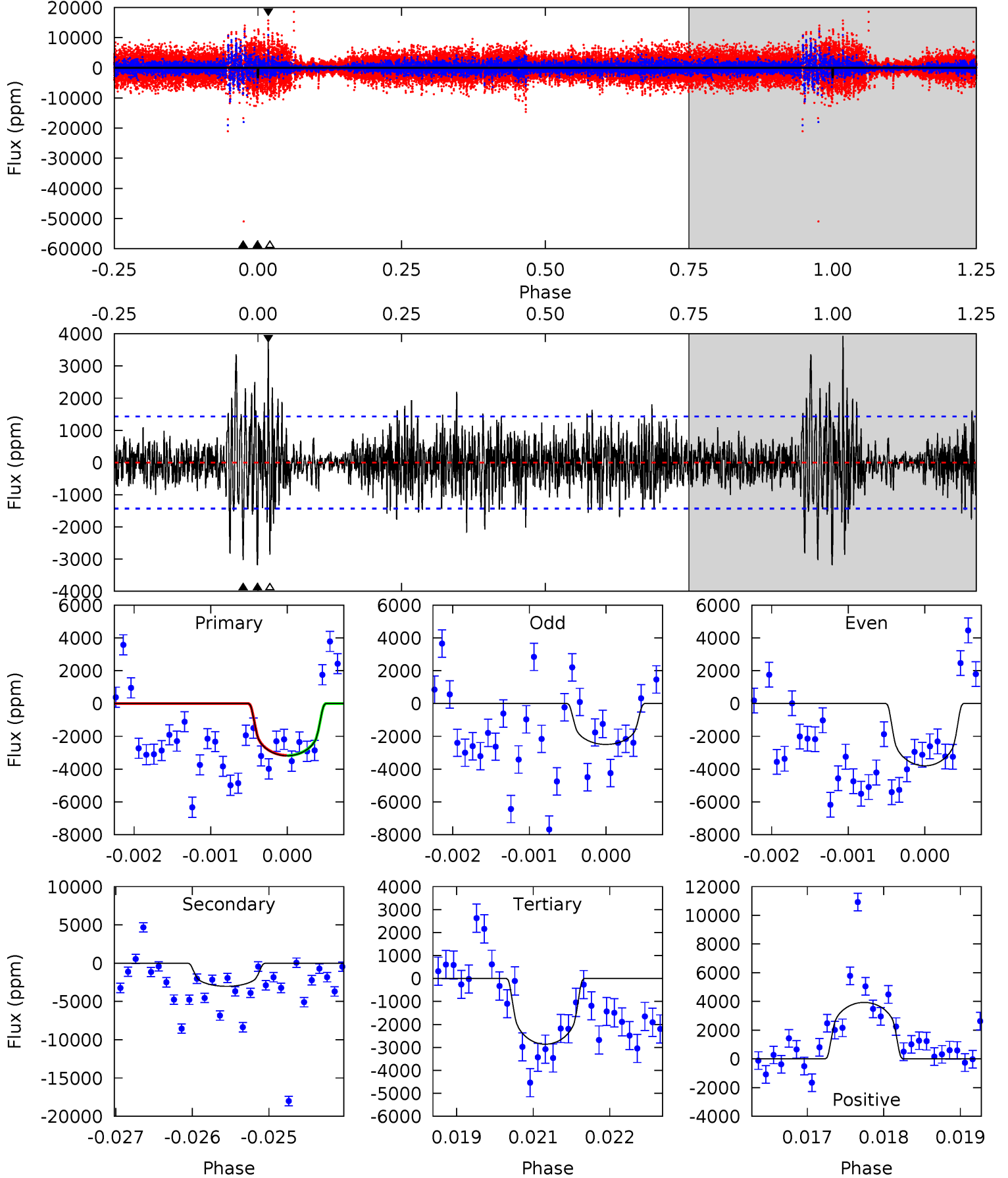
TCE 002970580-03 P=379.171950 Days  $T_0=360.936939$  (BKJD)



# DV Model-Shift Uniqueness Test

002970580-03, P = 379.202643 Days, E = 360.883809 Days

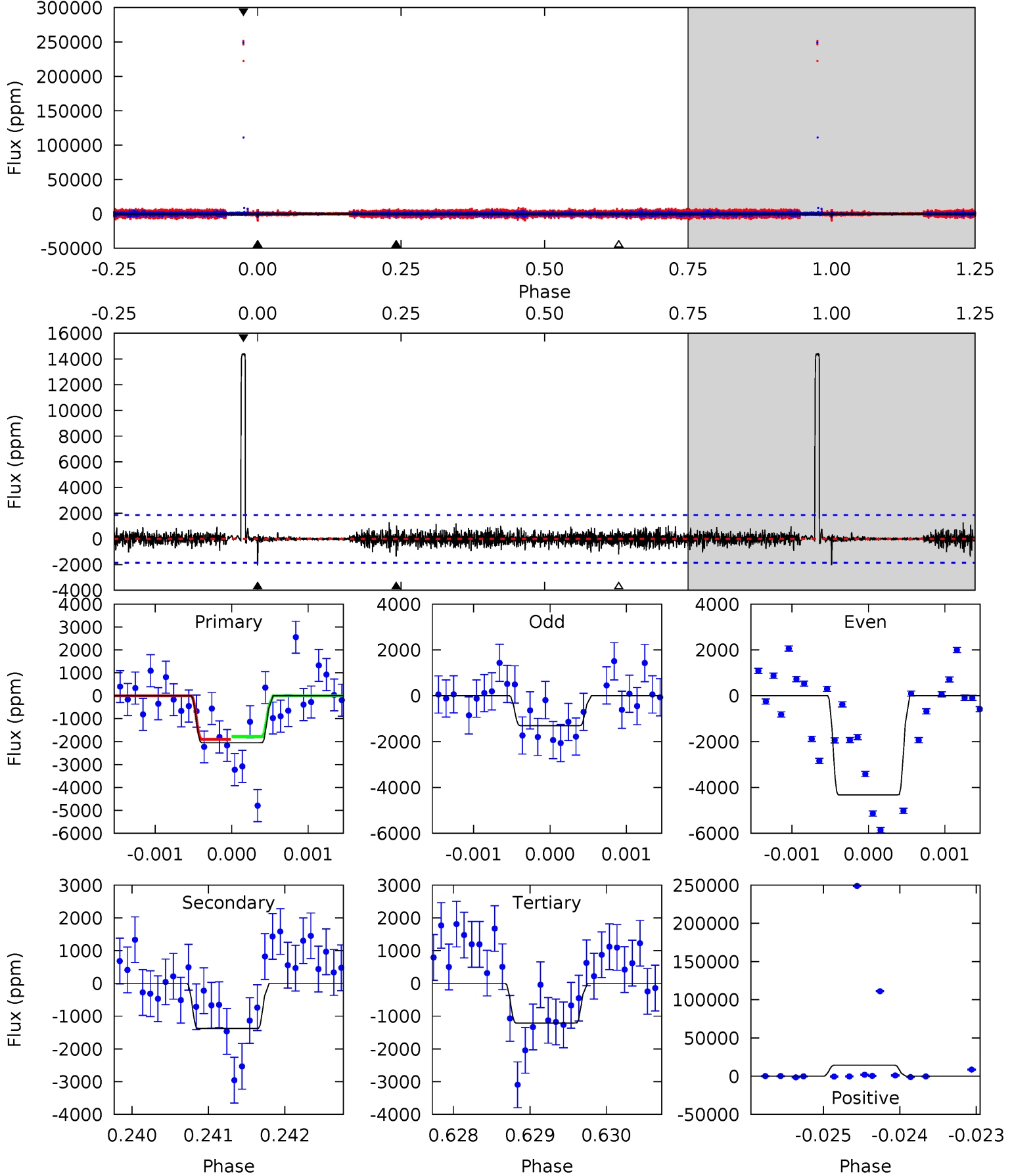
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
12.1	11.5	10.9	14.9	5.43	3.25	2.27	1.22	-2.84	0.62	-3.45	2.29	0.99	0.55	0.03



# Alt Model-Shift Uniqueness Test

002970580-03, P = 379.171950 Days, E = 360.936939 Days

Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
6.03	4.06	3.57	42.5	5.47	3.32	1.53	2.47	-36.5	0.49	-38.4	4.54	1.52	0.88	0.17



### Stellar Parameters For KIC 002970580

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$4605^{+69}_{-48}$	$2.619^{+0.120}_{-0.120}$	$-0.080^{+0.150}_{-0.100}$	$7.844^{+2.620}_{-0.936}$	$0.934^{+0.427}_{-0.022}$	$0.003^{+0.001}_{-0.001}$
	+1%/-1%	+5%/-5%	+188%/-125%	+33%/-12%	+46%/-2%	+48%/-45%
Source	SPE74	SPE74	SPE74	DSEP		

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

### Secondary Eclipse Parameters for KIC 002970580-03 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-3025 \pm 264$	$41.54^{+20.13}_{-18.16}$	$789^{+47}_{-31}$	$4914^{+1415}_{-698}$	$1037^{+2259}_{-561}$
Alt.	$-1378 \pm 340$	$45.76^{+19.21}_{-18.97}$	$793^{+44}_{-36}$	$4051^{+918}_{-493}$	$379^{+706}_{-203}$

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

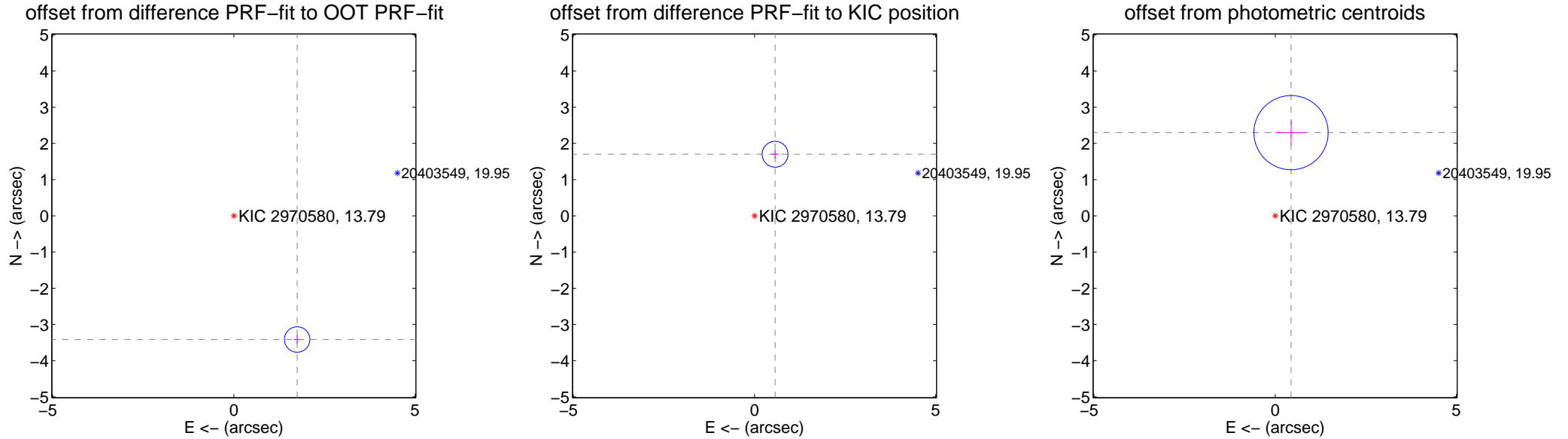
## DV Centroid Data

Supplemental centroid analysis for 002970580-03. Kepler magnitude: 13.79. Transit SNR 5.68

There are 1 quarters with good PRF difference image offsets

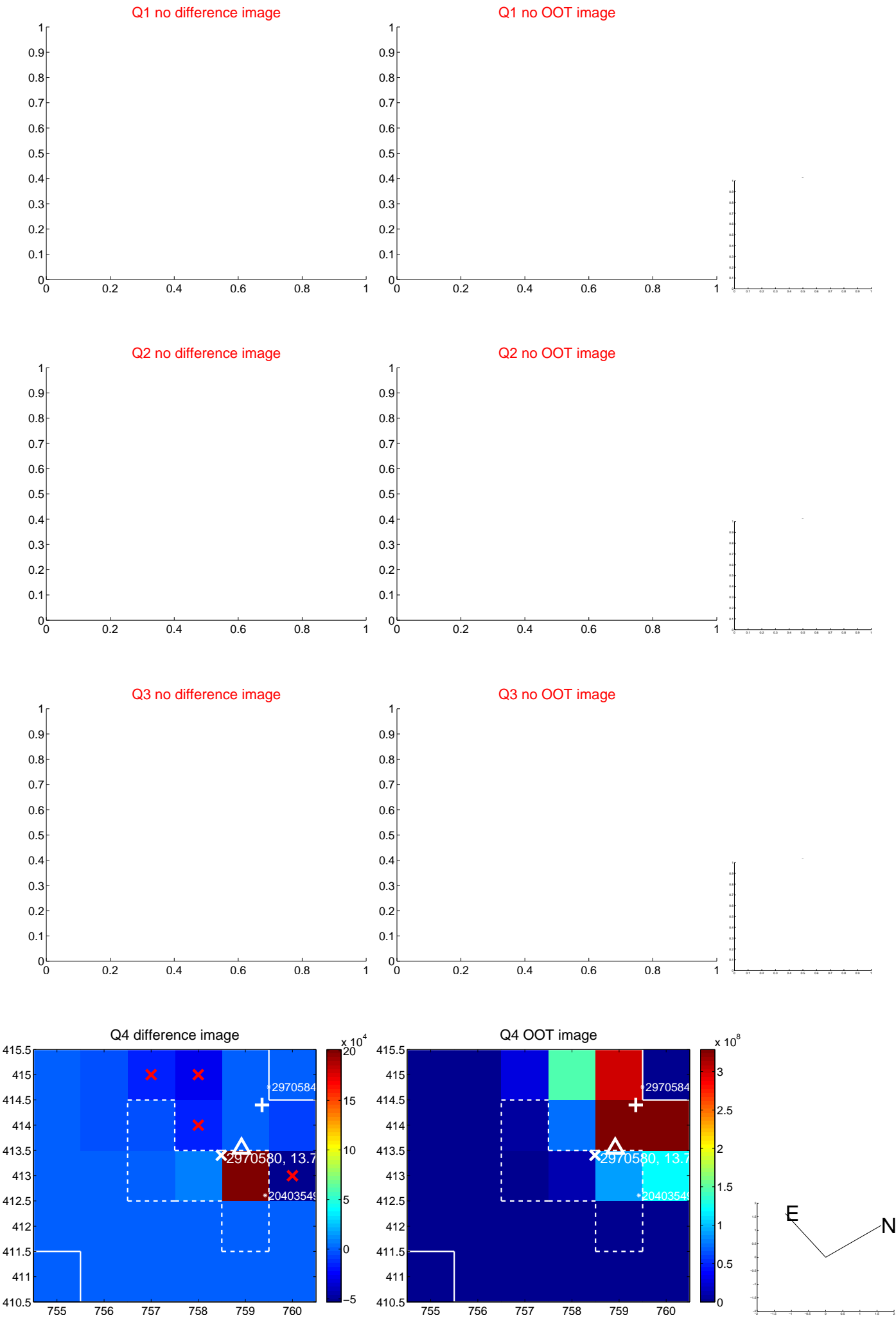
The OOT PRF centroid is offset from the target star catalog position by about 5.25 arcsec so the offset from difference PRF-fit to OOT-fit may be invalid.

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$3.836 \pm 0.117$	$32.77$	$-1.746 \pm 0.102$	$-3.416 \pm 0.121$
PRF-fit source offset from KIC position	$1.792 \pm 0.119$	$15.07$	$-0.567 \pm 0.102$	$1.700 \pm 0.121$
photometric centroid source offset	$2.34 \pm 0.34$	$6.85$	$-0.44 \pm 0.43$	$2.30 \pm 0.34$

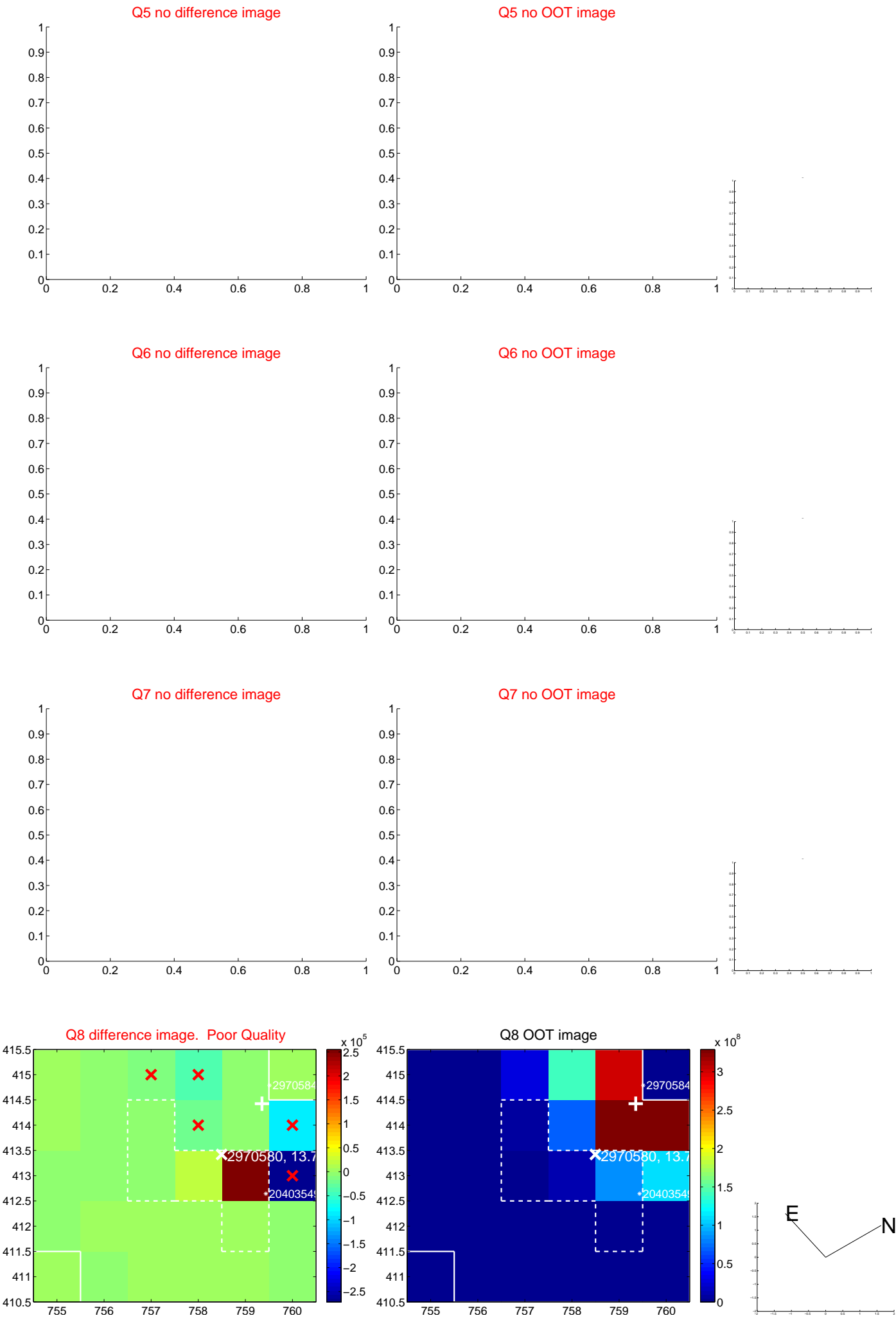


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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

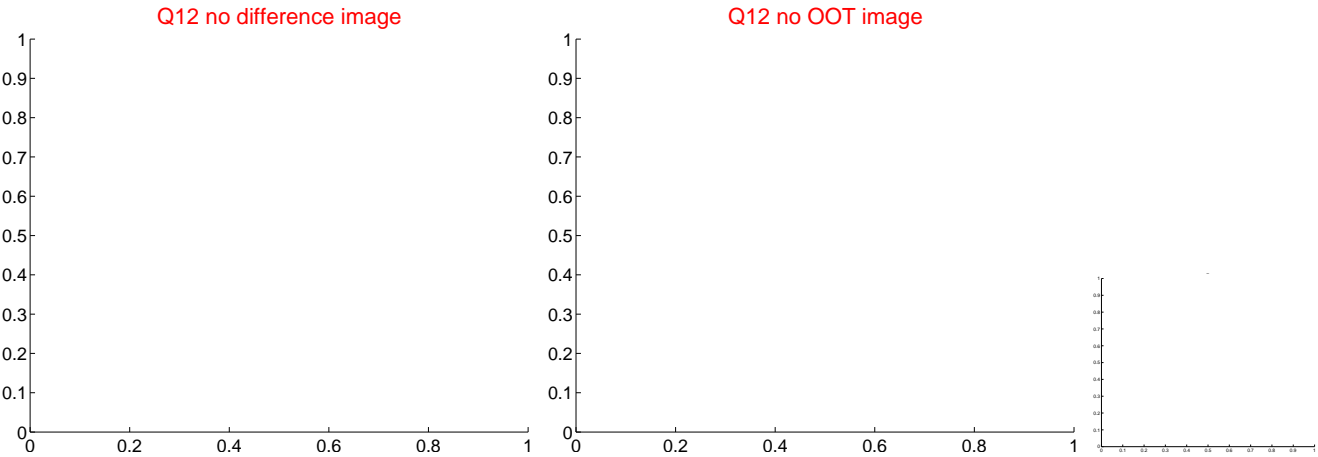
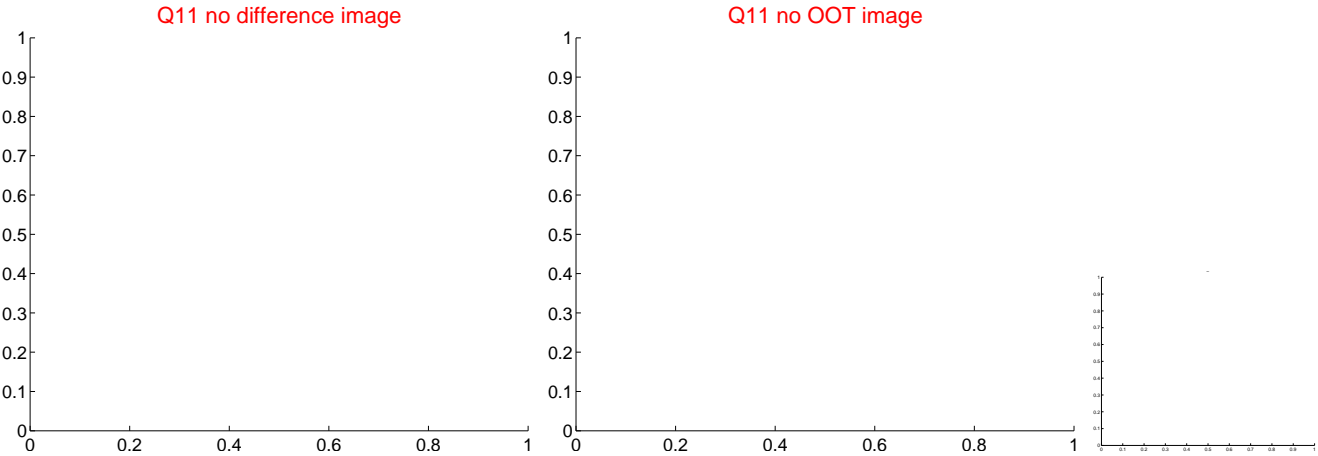
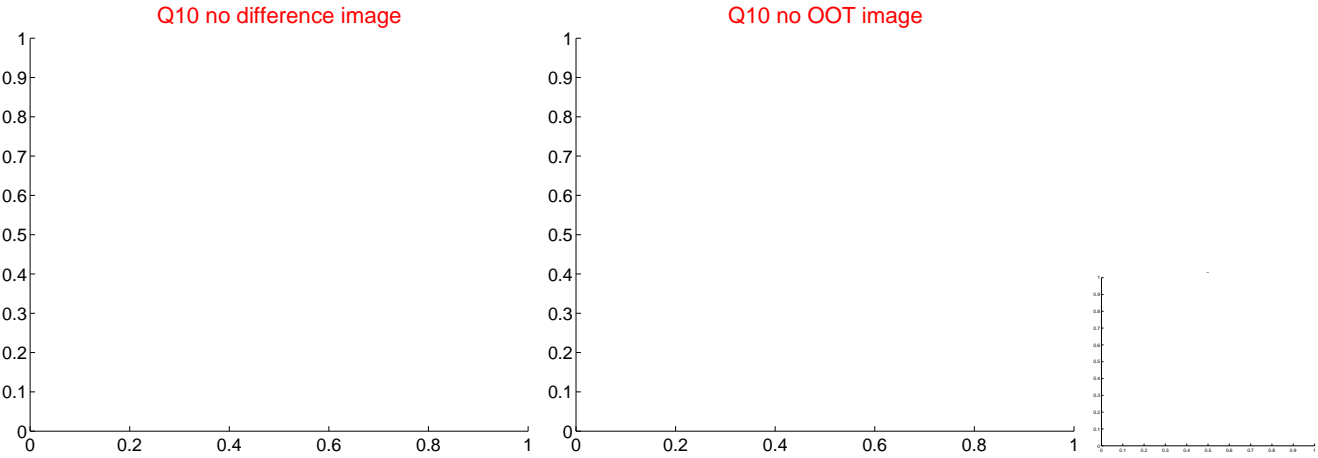
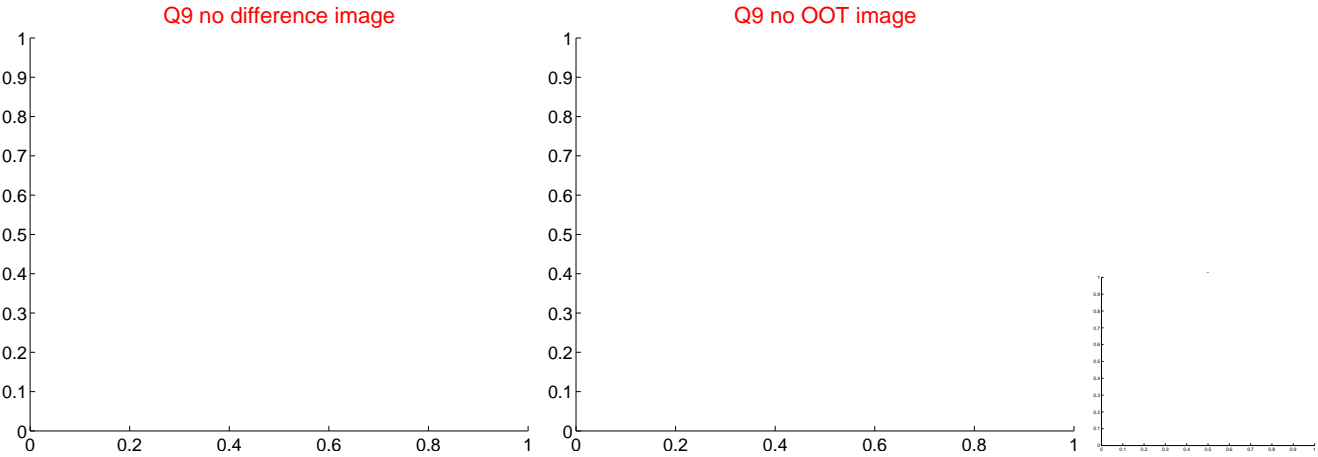
white ×: KIC target position; +: OOT centroid; △: difference centroid. red ✕: large negative pixel value.



white ×: KIC target position; +: OOT centroid; △: difference centroid. red ✕: large negative pixel value.



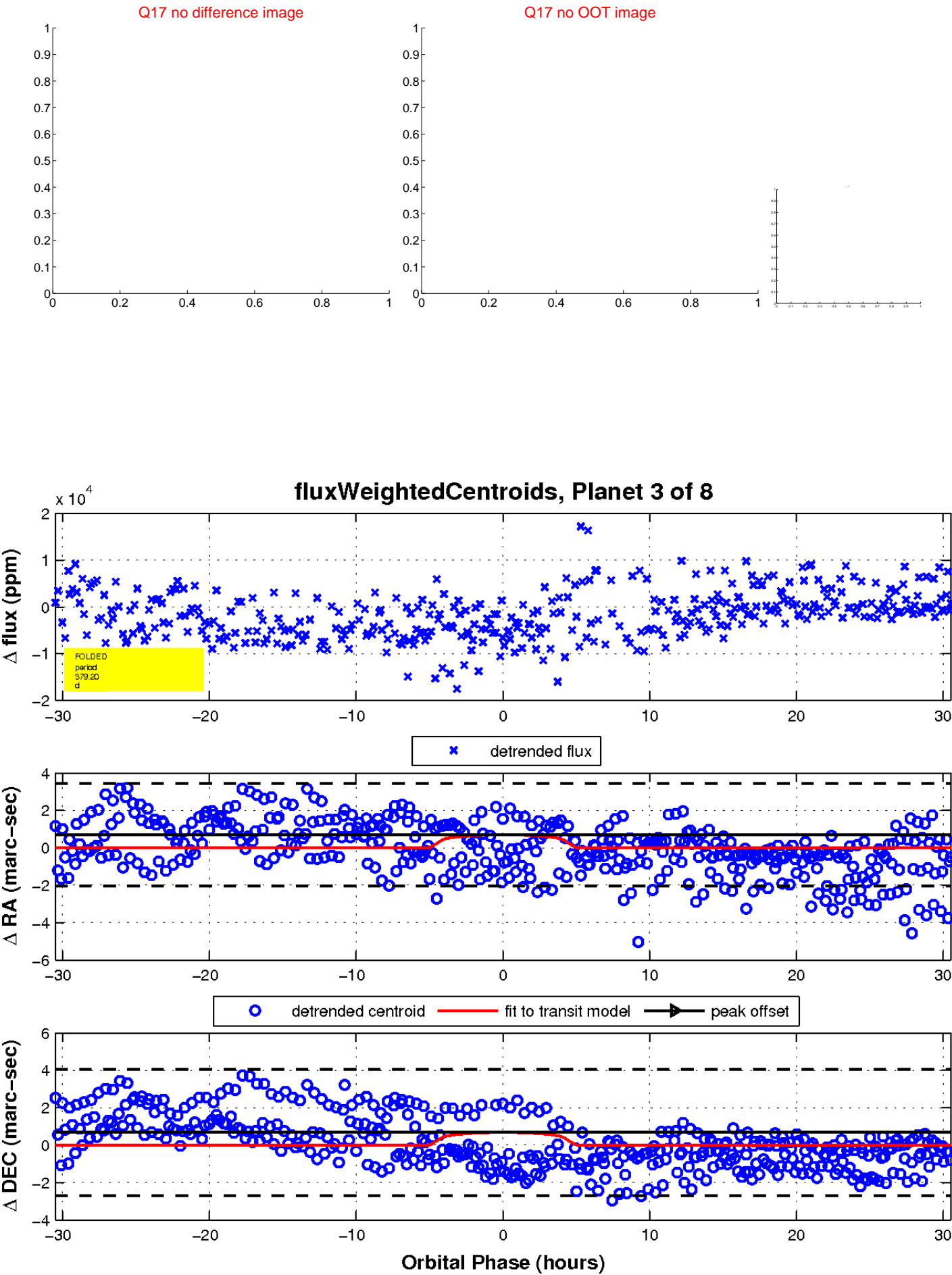
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



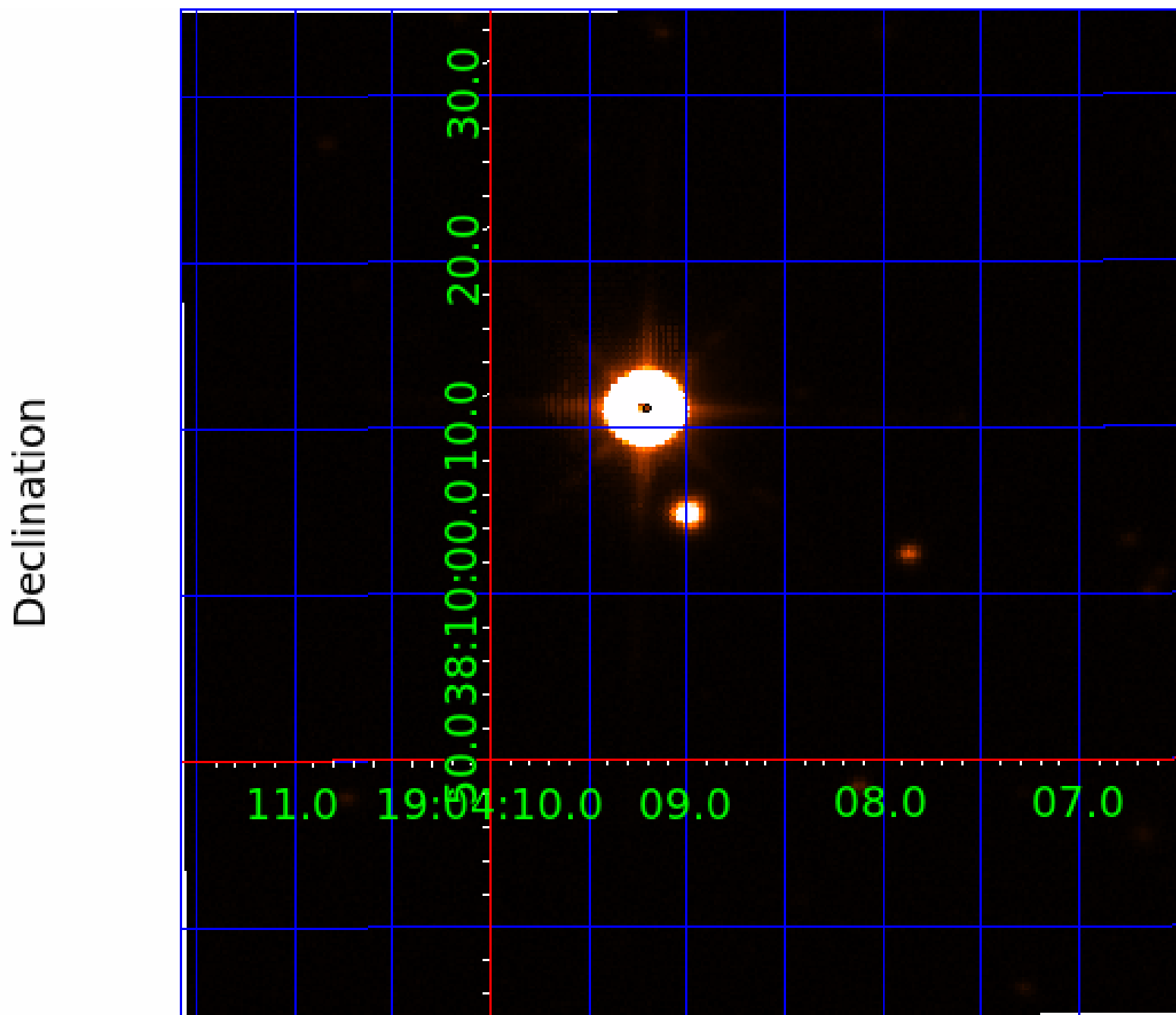
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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



UKIRT Image



# KIC 002970580

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
002970580-02	OBS	No	559.218859	372.381799	2714.0	15.000	60.2	-1.0	7.84	4605	39.14	14.70
002970580-03	OBS	No	379.202643	360.883809	2067.1	10.177	13.5	5.7	7.84	4605	39.78	24.68
002970580-04	OBS	No	205.380057	278.372111	4114.7	1.706	14.2	7.4	7.84	4605	53.87	55.90
002970580-05	OBS	No	346.501959	144.918492	3227.9	1.526	13.2	8.4	7.84	4605	45.84	27.83
002970580-06	OBS	No	113.694880	155.675783	1876.7	2.000	14.9	-1.0	7.84	4605	32.66	122.98
002970580-07	OBS	No	366.881381	375.936823	9283.1	31.023	10.6	12.2	7.84	4605	76.30	25.79
002970580-08	OBS	No	312.830992	240.650043	321.9	12.000	8.4	-1.0	7.84	4605	13.48	31.90

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
002970580-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_CHASES_SKYE—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—INCONSISTENT_TRANS—CENT_NOFITS
002970580-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES—LPP_DV—ALL_TRANS_CHASES—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS
002970580-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS
002970580-05	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL_TRACKER—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_KIC_POS
002970580-06	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_NOFITS
002970580-07	OBS	FP	0.00	1	0	0	0	LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS
002970580-08	OBS	FP	0.00	1	0	1	0	INDIV_TRANS_RUBBLE_MARSHALL—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—CENT_NOFITS—HALO_GHOST

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

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

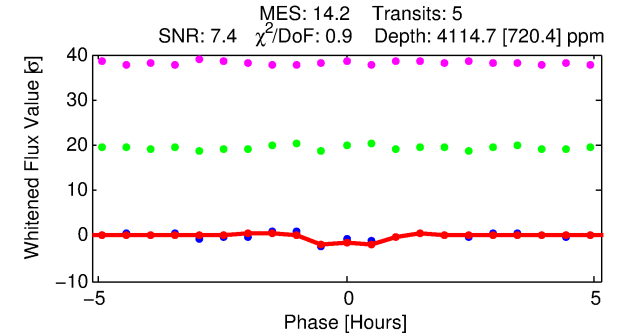
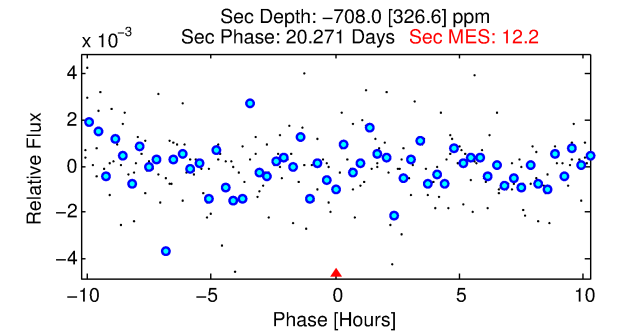
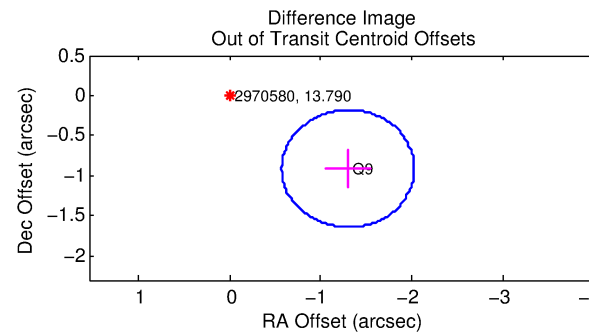
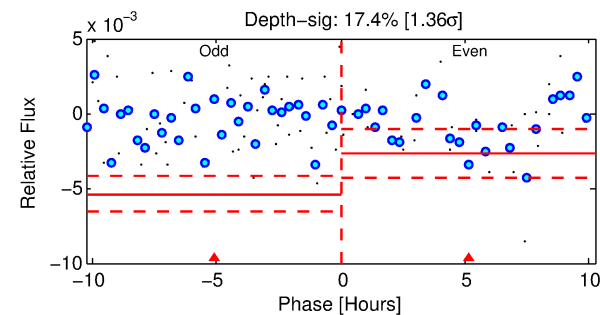
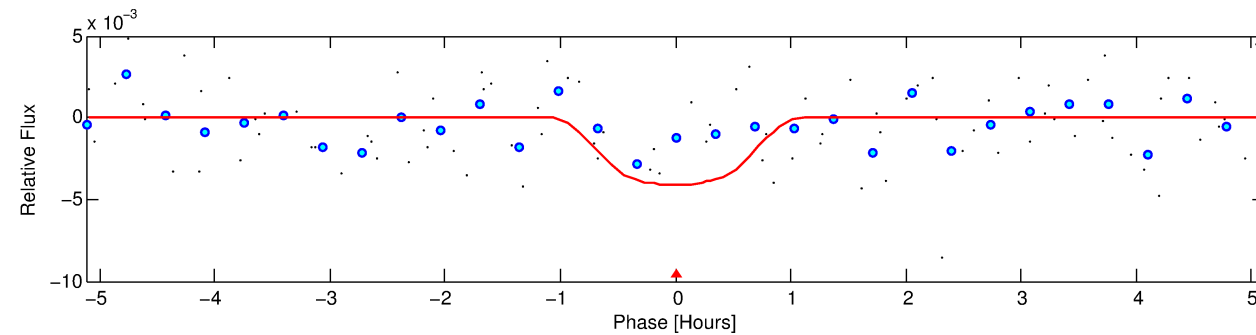
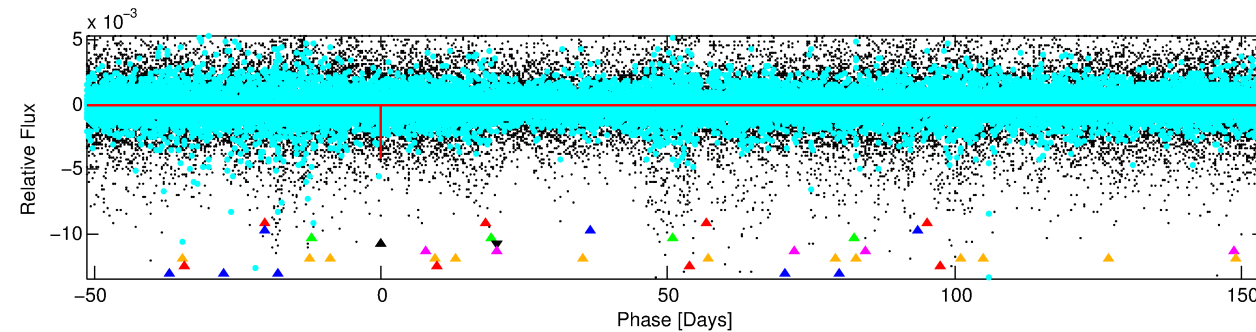
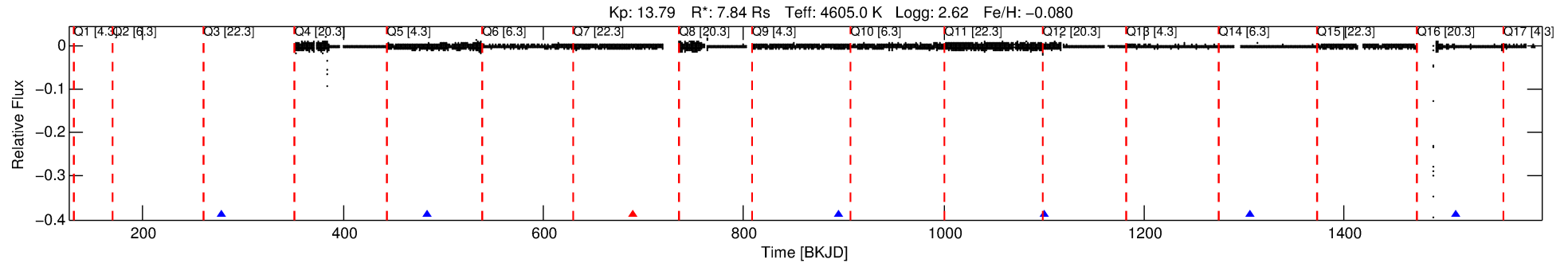
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 002970580-04

No Significant Match Found

# DV One-Page Summary

KIC: 2970580 Candidate: 4 of 8 Period: 205.380 d



## DV Fit Results:

Period = 205.38006 [0.00137] d  
Epoch = 278.3721 [0.0073] BKJD  
Rp/R\* = 0.0629 [0.1203]  
a/R\* = 740.04 [4163.37]  
b = 0.69 [4.42]  
Seff = 55.90 [16.50]  
Teq = 697 [51] K  
Rp = 53.87 [104.54] Re  
a = 0.6659 [0.1605] AU  
Ag = N/A  
Teffp = N/A

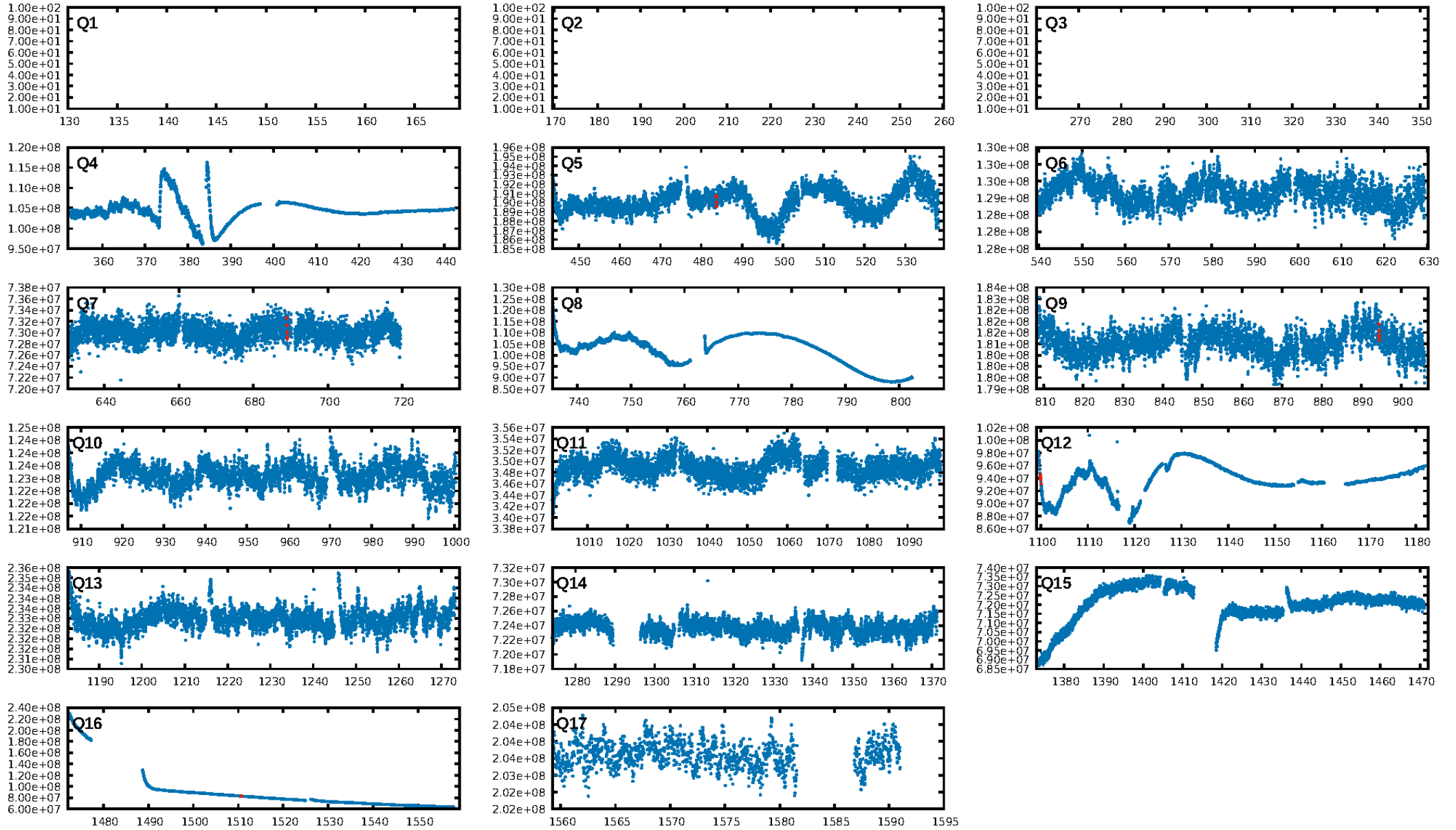
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [836.95σ]  
LongPeriod-sig: 100.0% [212.76σ]  
ModelChiSquare2-sig: 10.6%  
ModelChiSquareGof-sig: 91.0%  
Bootstrap-pfa: 1.33e-14  
RollingBand-fgt: 0.80 [4/5]  
GhostDiagnostic-chr: -1.78  
Centroid-sig: 65.7%  
Centroid-so: 2.688 arcsec [20.56σ]  
OotOffset-rm: 1.589 arcsec [6.53σ]  
KicOffset-rm: 4.501 arcsec [7.42σ]  
OotOffset-st: 0/0/0/1 [1]  
KicOffset-st: 0/1/0/1 [2]  
DiffImageQuality-fgm: 1.00 [2/2]  
DiffImageOverlap-fno: 1.00 [4/4]

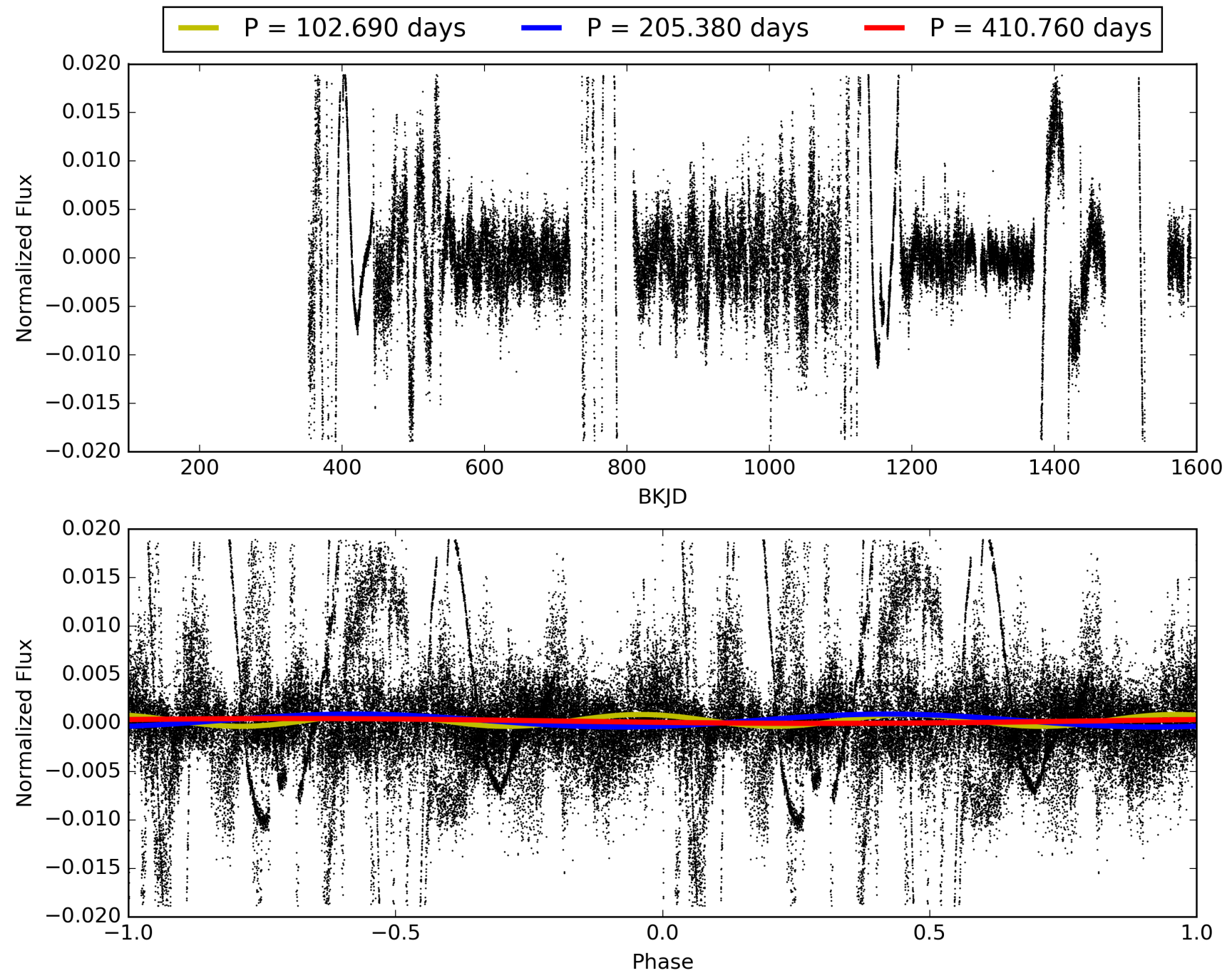
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 01-Feb-2016 22:40:53 Z

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

# TCE 002970580-04, PDC Light Curves

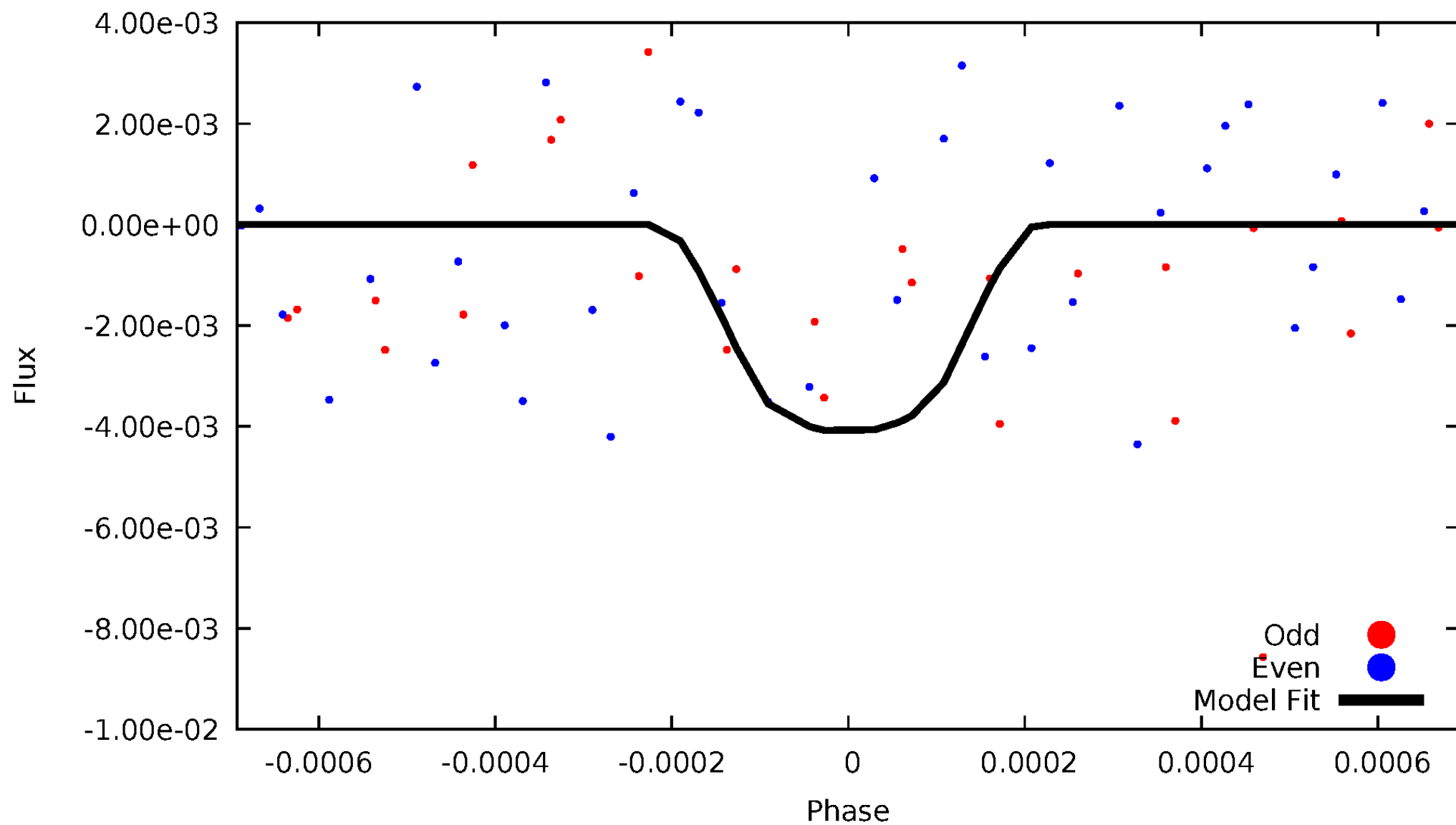


TCE 002970580-04



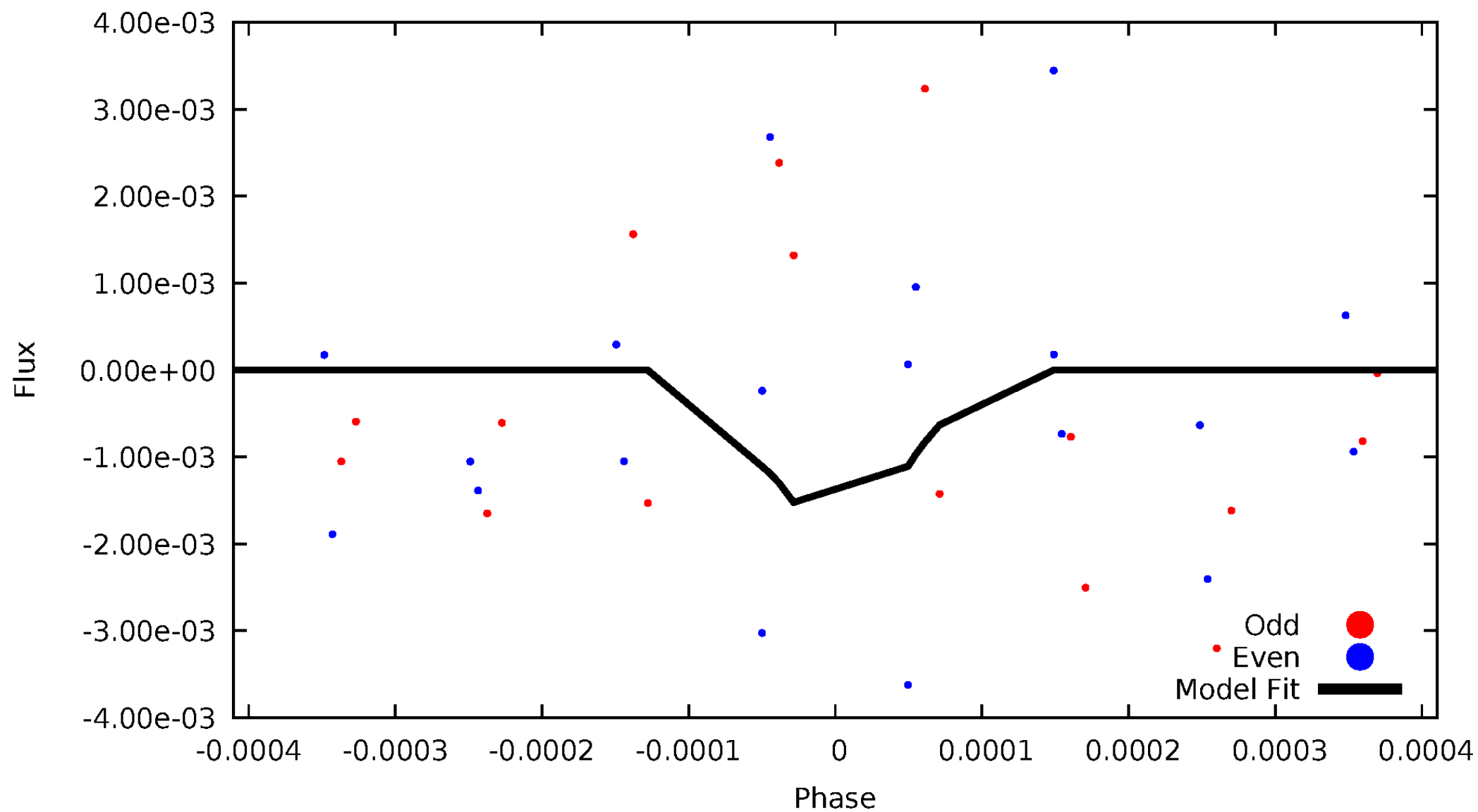
# DV Odd/Even

TCE 002970580-04



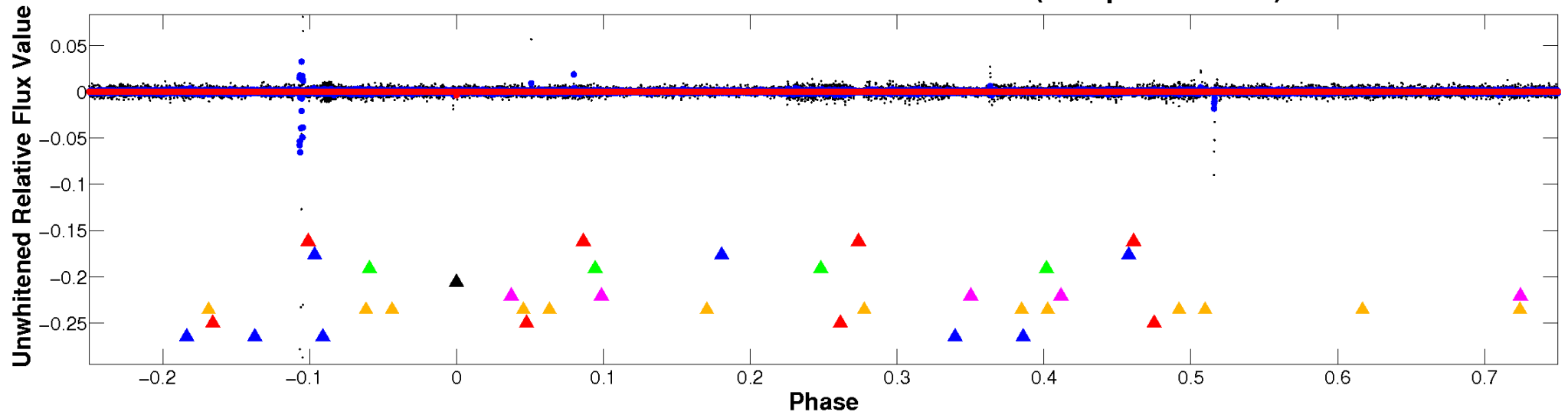
# ALT Odd/Even

TCE 002970580-04

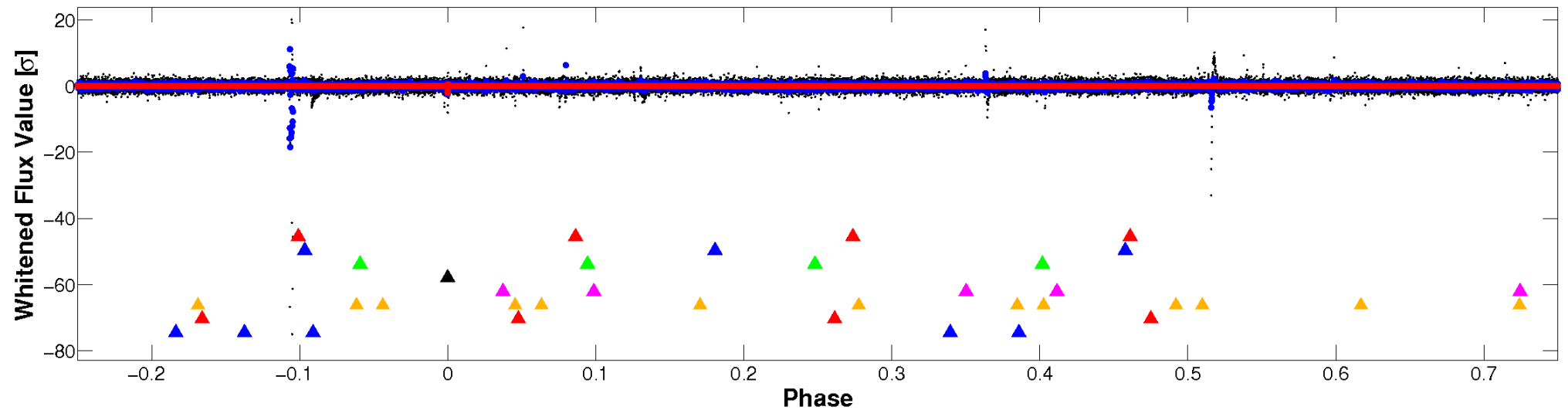


# Non-Whitened Vs. Whitened Light Curve

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

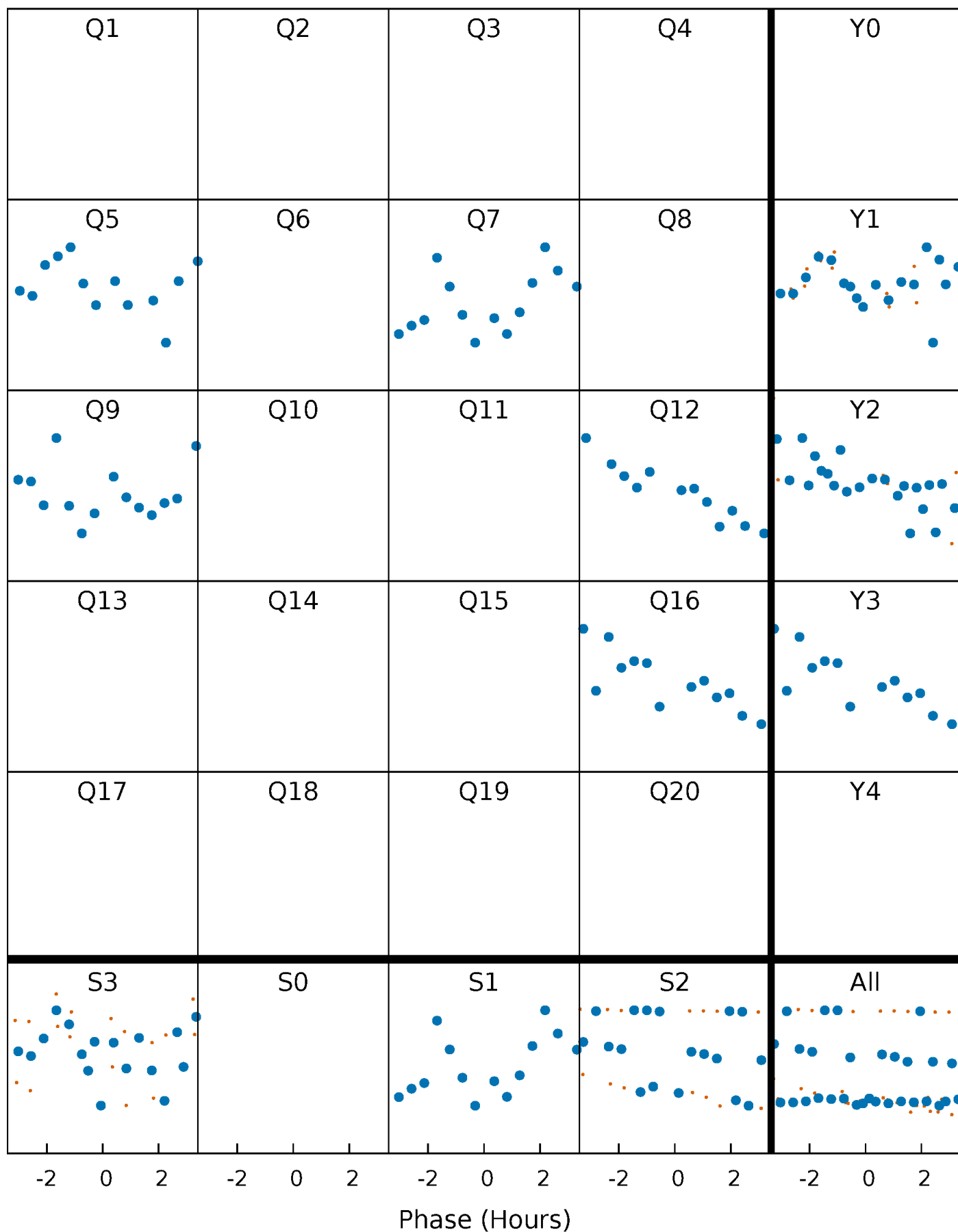


## Planet 4 : Phased Whitened Flux Time Series (Fit Epoch/Period)



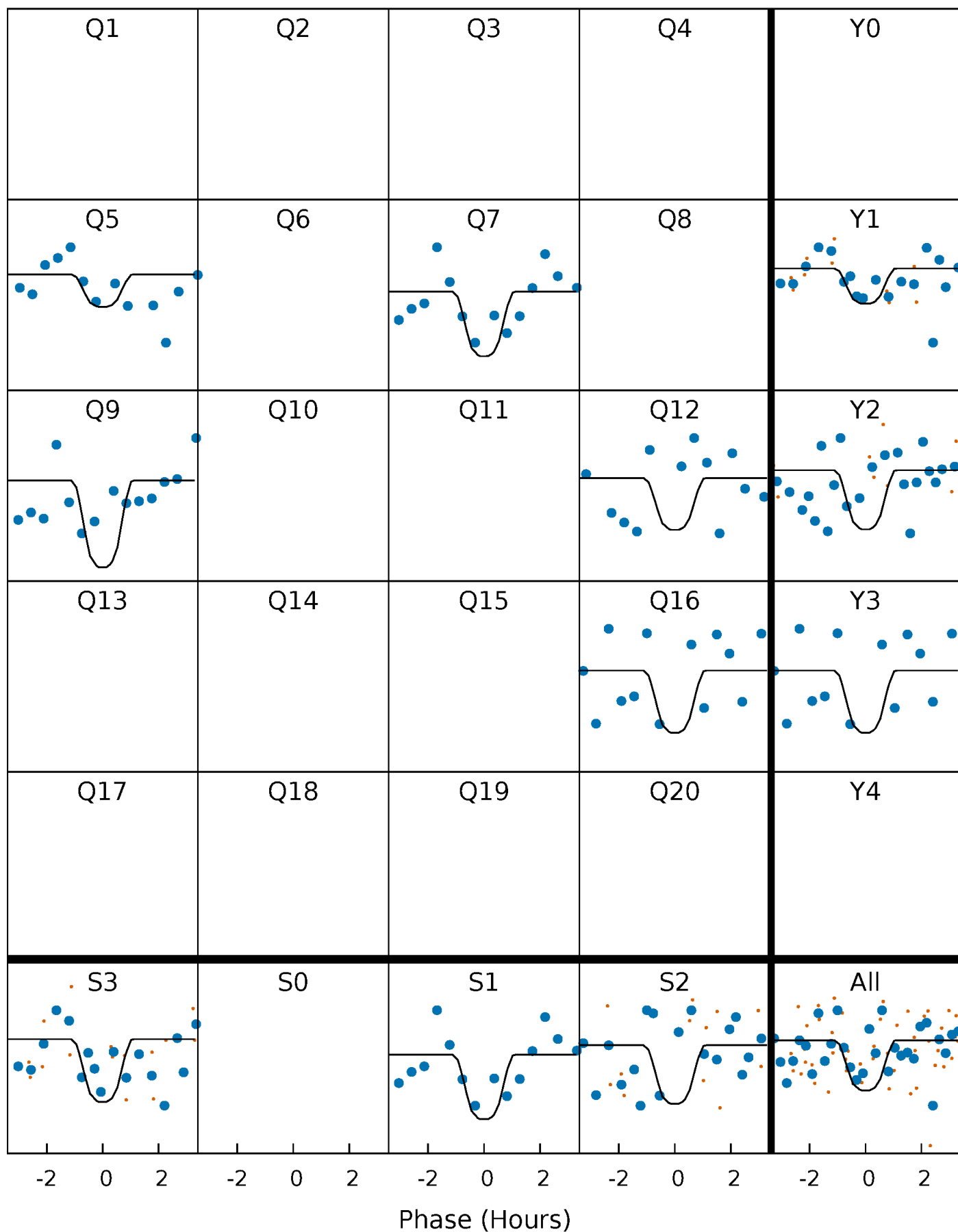
# PDC Quarter-Phased Transit Curves

TCE 002970580-04     $P=205.380057$  Days     $T_0=278.372111$  (BKJD)



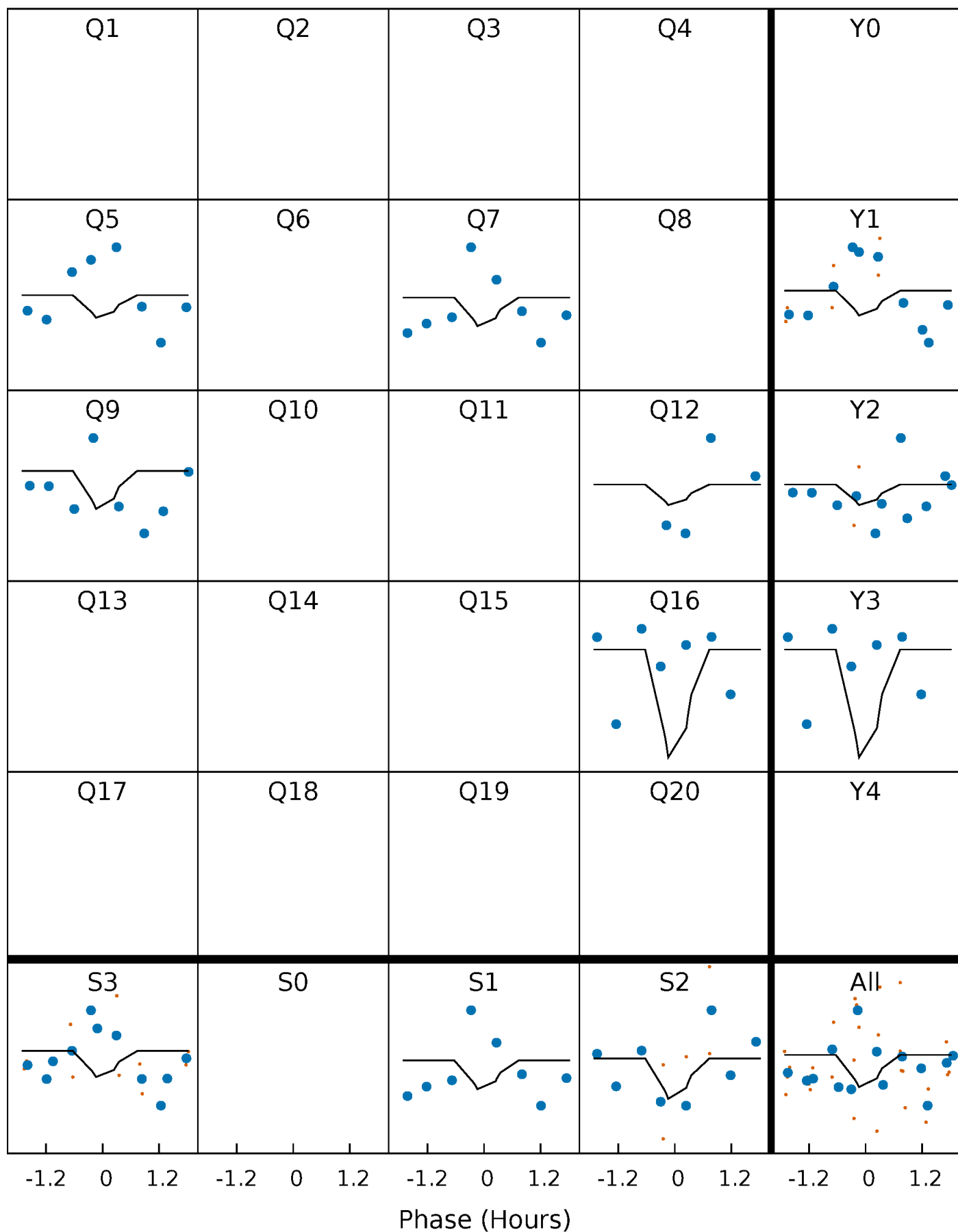
# DV Quarter-Phased Transit Curves

TCE 002970580-04 P=205.380057 Days  $T_0=278.372111$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

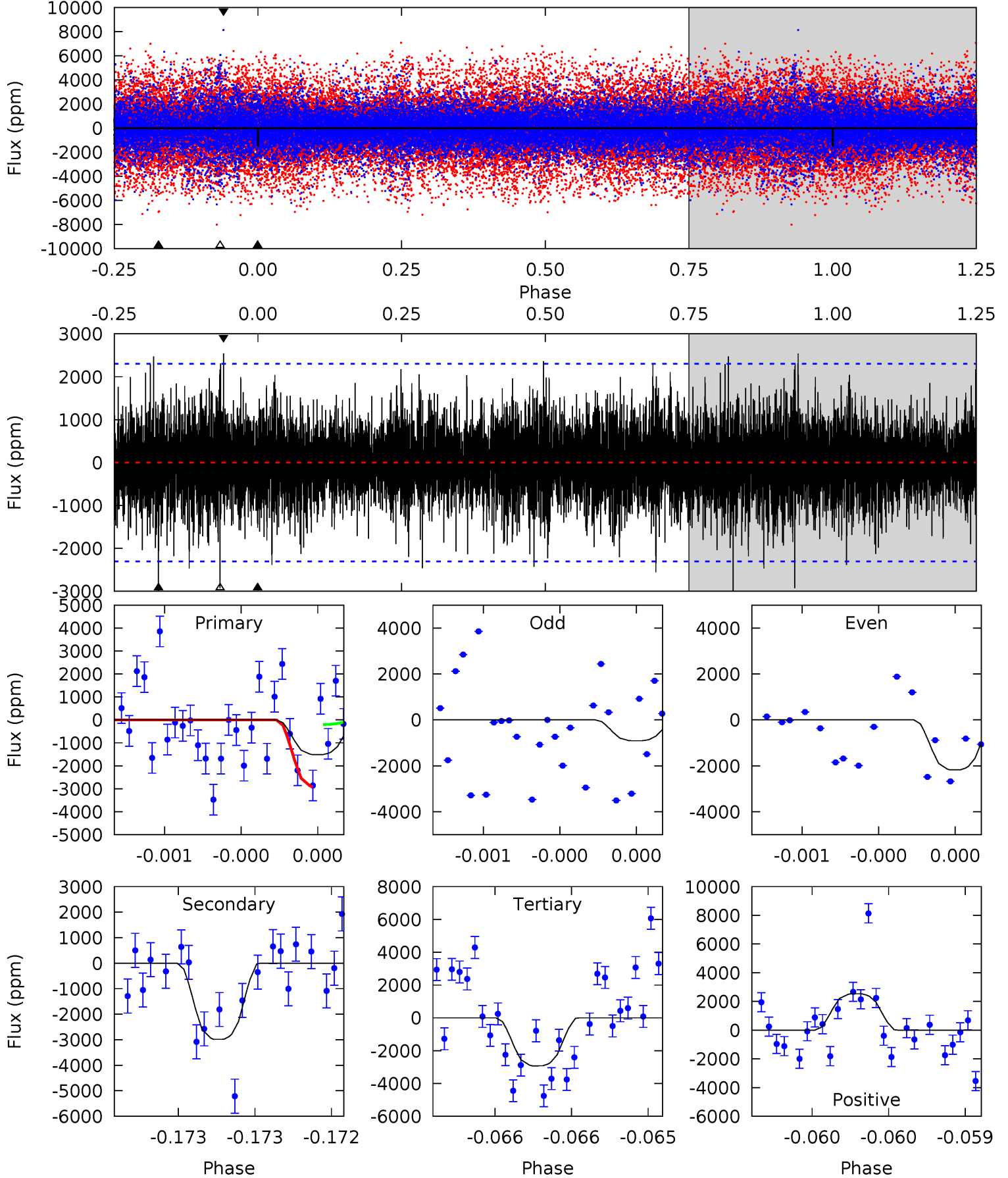
TCE 002970580-04 P=205.377930 Days  $T_0=278.315150$  (BKJD)



# DV Model-Shift Uniqueness Test

002970580-04, P = 205.380057 Days, E = 278.372111 Days

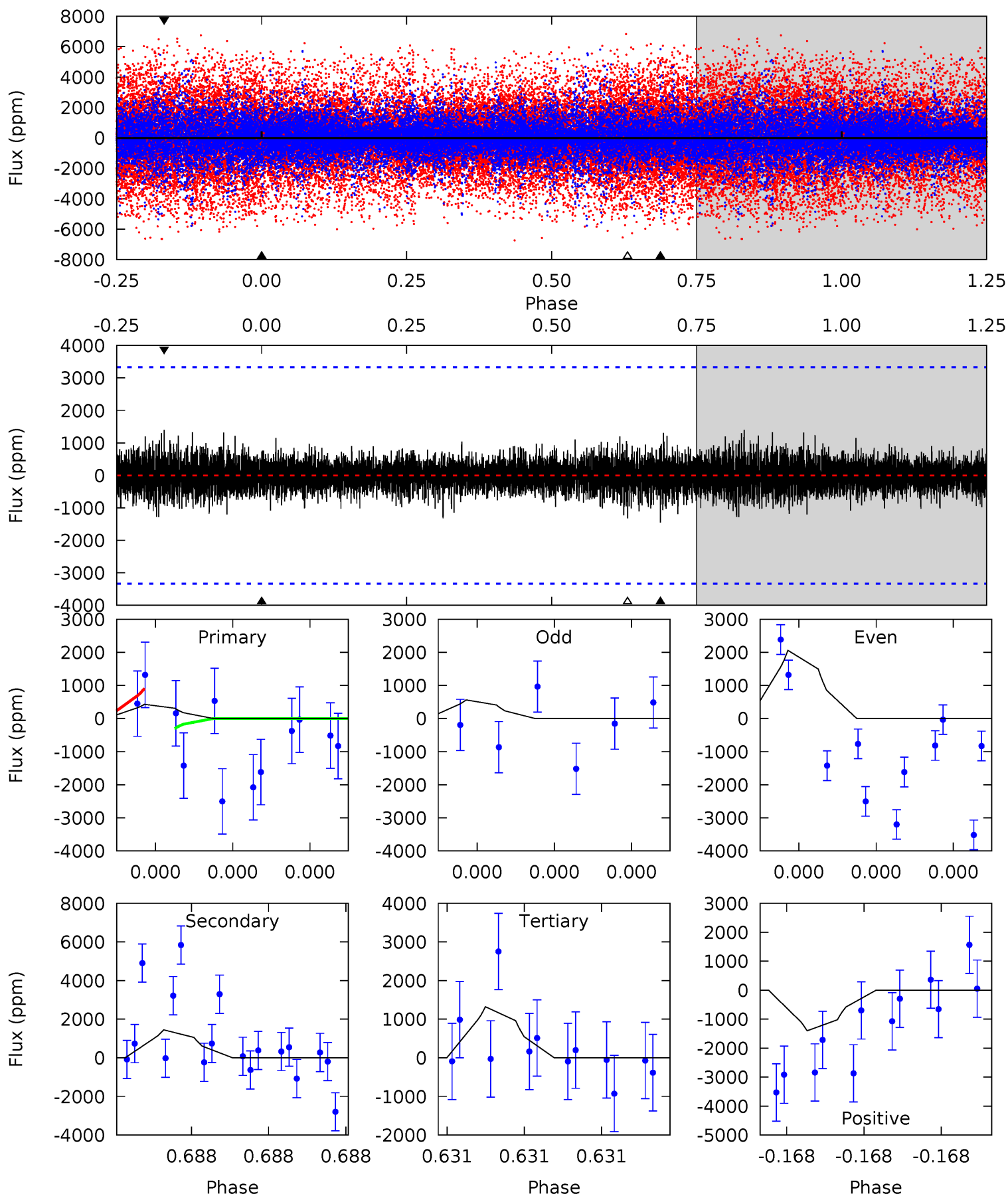
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
3.69	7.27	7.13	6.19	5.60	3.53	1.57	-3.44	-2.50	0.14	1.08	1.50	0.68	0.46	3.30



# Alt Model-Shift Uniqueness Test

002970580-04, P = 205.377930 Days, E = 278.315150 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
0.74	2.49	2.27	2.41	5.73	3.72	0.56	-1.54	-1.67	0.22	0.08	1.29	0.74	0.49	0.49



### Stellar Parameters For KIC 002970580

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$4605^{+69}_{-48}$	$2.619^{+0.120}_{-0.120}$	$-0.080^{+0.150}_{-0.100}$	$7.844^{+2.620}_{-0.936}$	$0.934^{+0.427}_{-0.022}$	$0.003^{+0.001}_{-0.001}$
	+1%/-1%	+5%/-5%	+188%/-125%	+33%/-12%	+46%/-2%	+48%/-45%
Source	SPE74	SPE74	SPE74	DSEP		

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

### Secondary Eclipse Parameters for KIC 002970580-04 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-2985 \pm 411$	$94.39^{+99.08}_{-60.39}$	$971^{+59}_{-42}$	$3603^{+1682}_{-682}$	$85^{+602}_{-65}$
Alt.	$-1448 \pm 582$	$86.88^{+82.05}_{-58.87}$	$971^{+53}_{-40}$	$3278^{+1520}_{-614}$	$45^{+349}_{-35}$

$T_{max}$  = 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

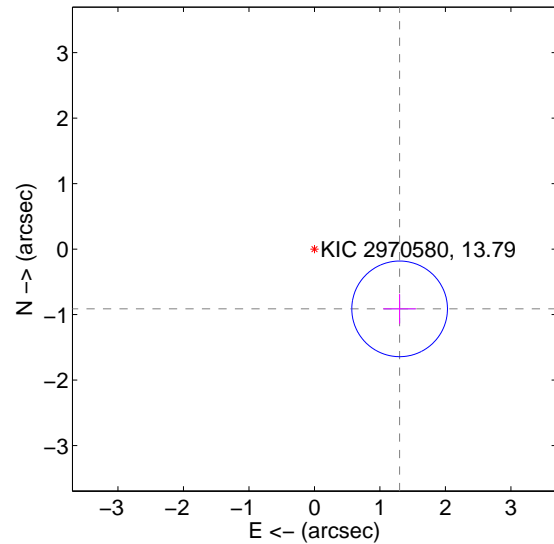
Supplemental centroid analysis for 002970580-04. Kepler magnitude: 13.79. Transit SNR 7.39

There are 2 quarters with good PRF difference image offsets

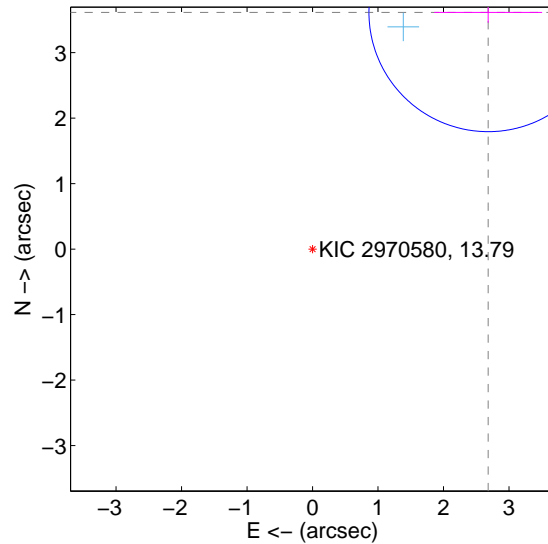
The OOT PRF centroid is offset from the target star catalog position by about 4.31 arcsec so the offset from difference PRF-fit to OOT-fit may be invalid.

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$1.589 \pm 0.243$	6.53	$-1.301 \pm 0.251$	$-0.913 \pm 0.227$
PRF-fit source offset from KIC position	$4.501 \pm 0.607$	7.42	$-2.682 \pm 0.824$	$3.614 \pm 0.157$
photometric centroid source offset	$2.69 \pm 0.13$	20.56	$-0.11 \pm 0.17$	$2.69 \pm 0.13$

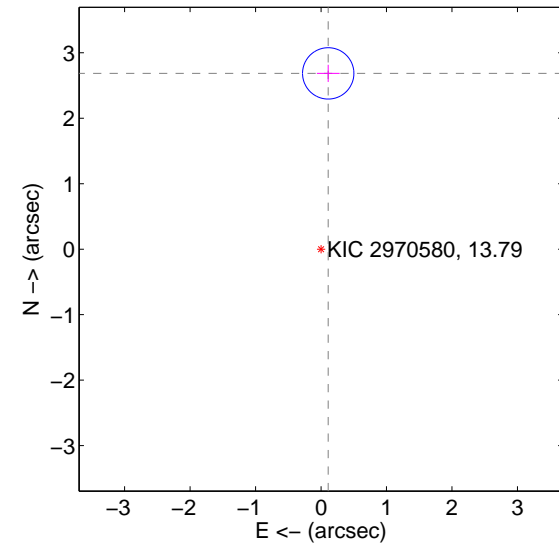
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position

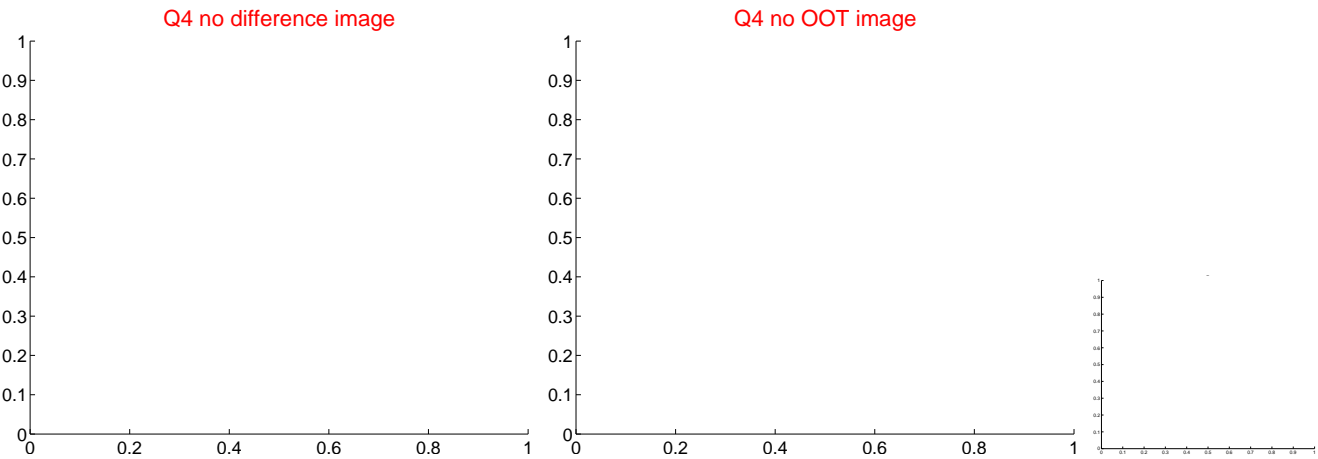
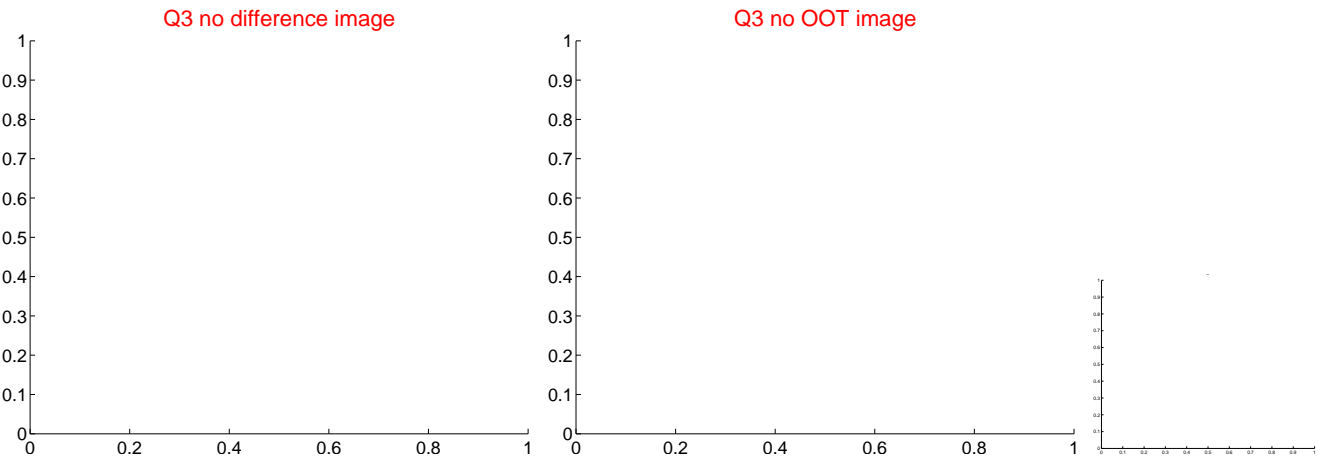
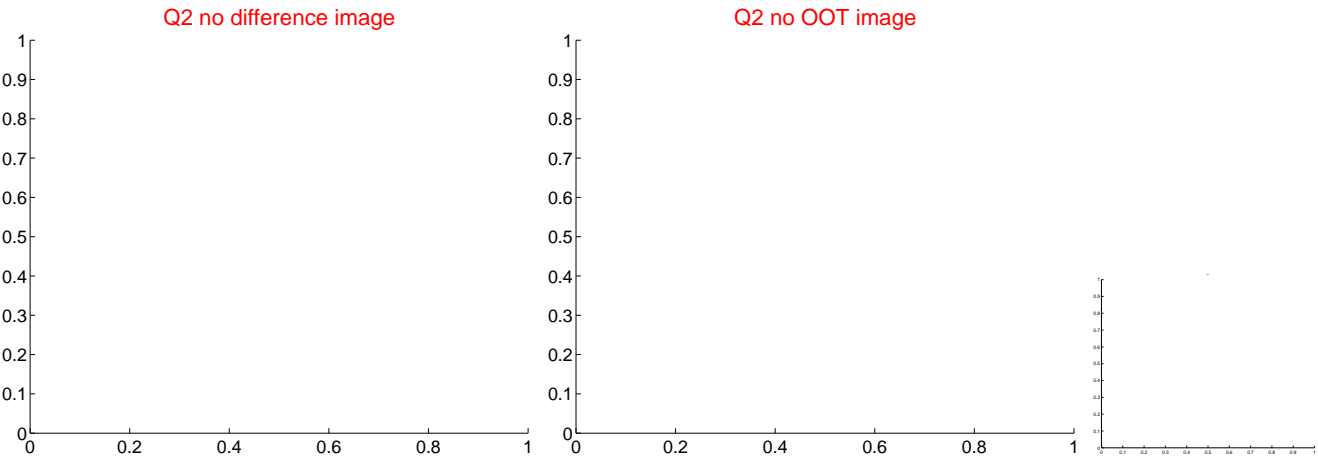
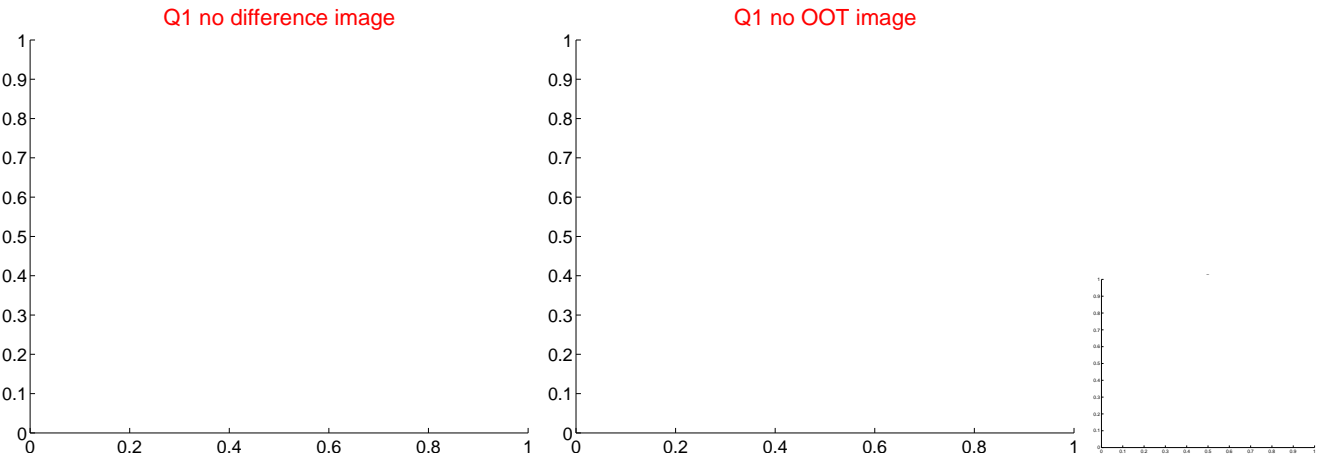


offset from photometric centroids

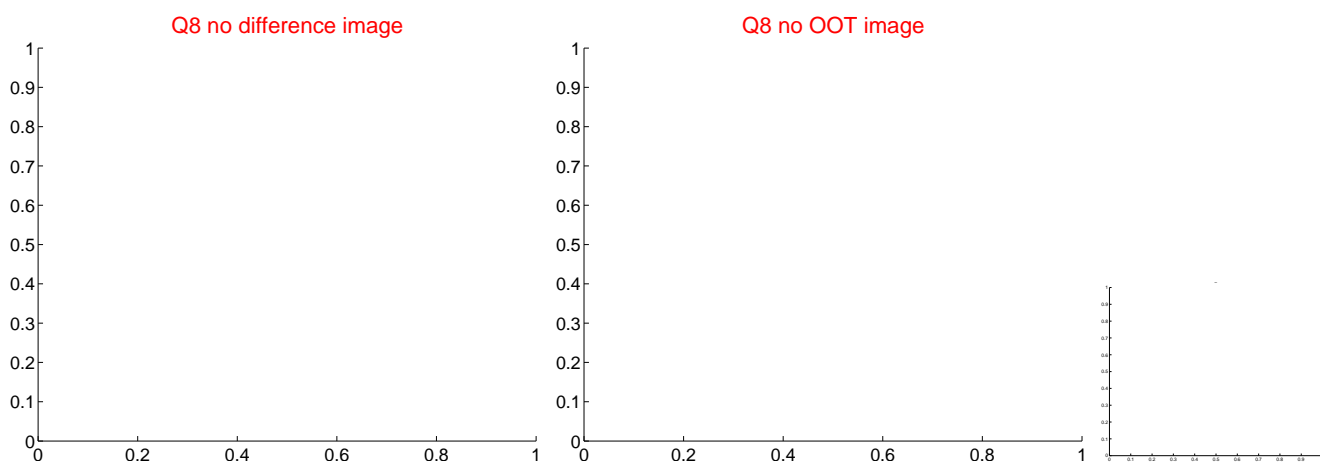
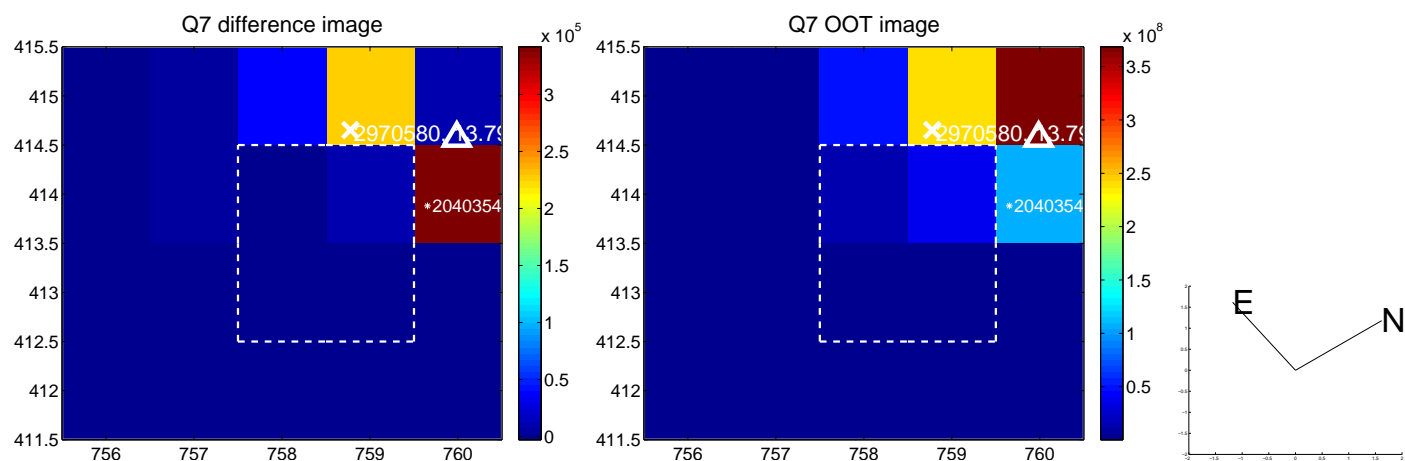
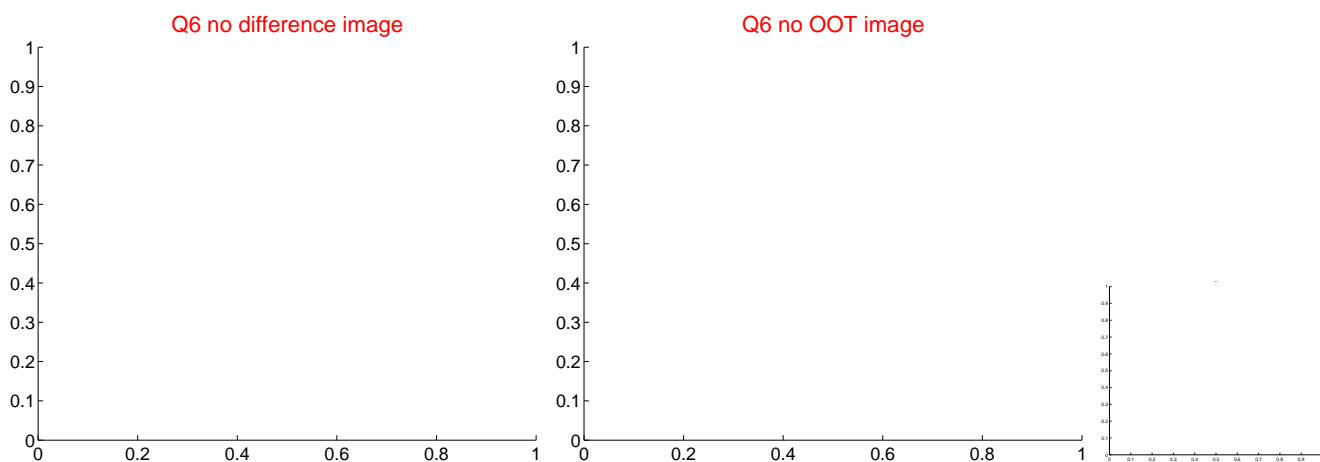
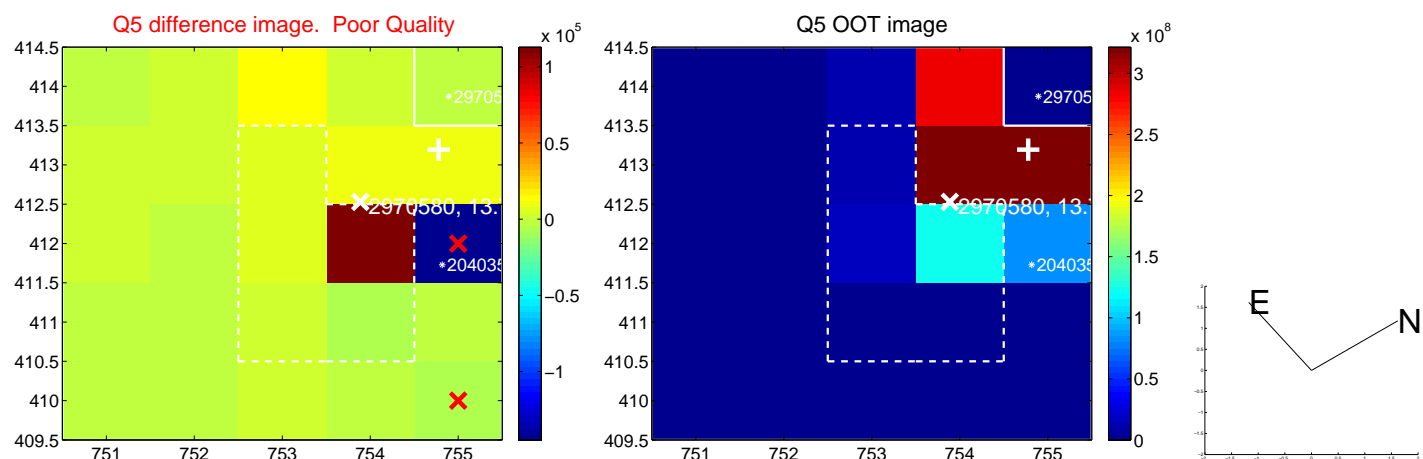


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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

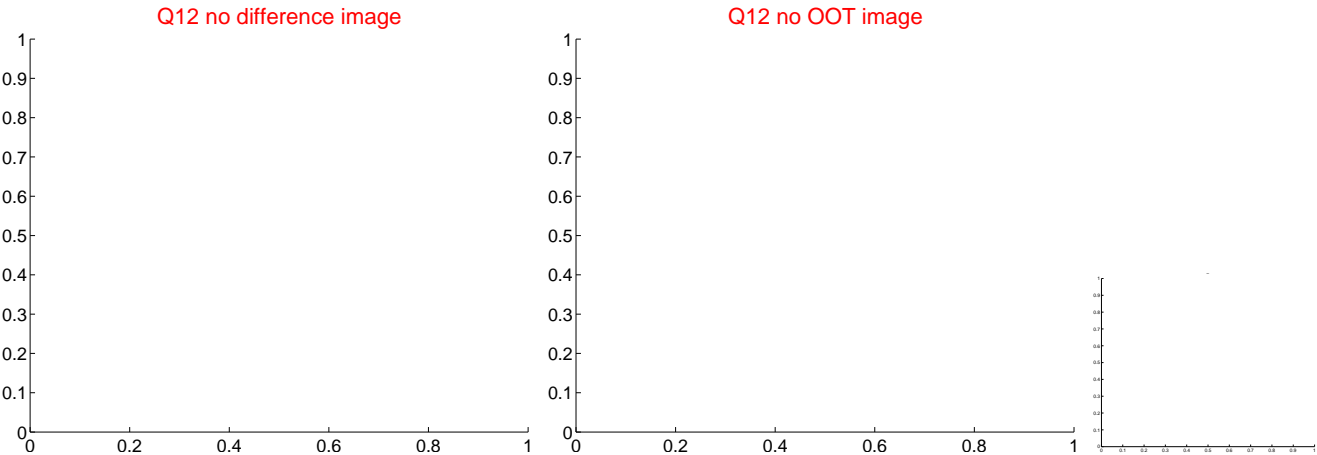
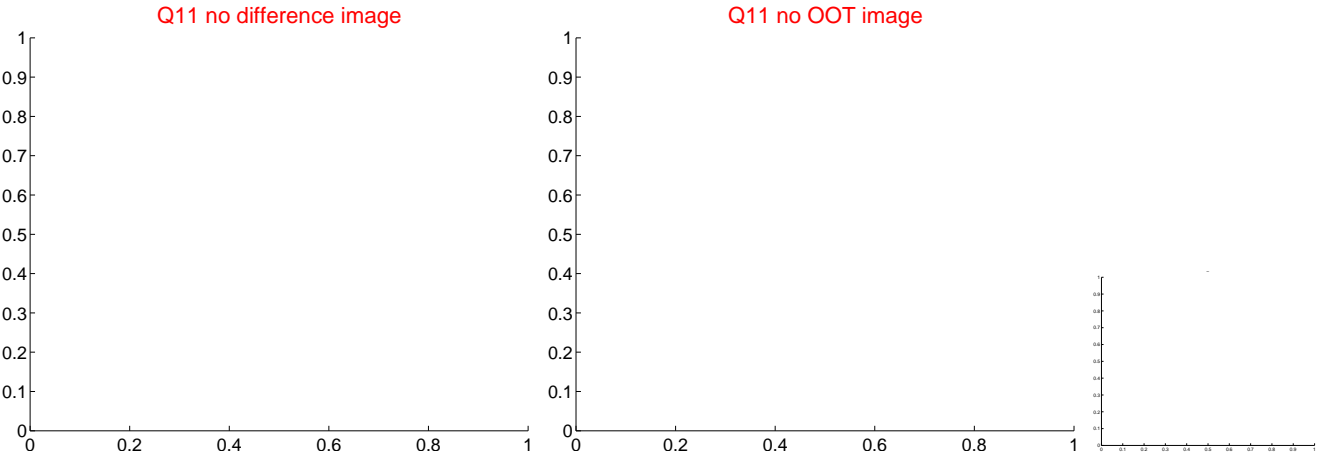
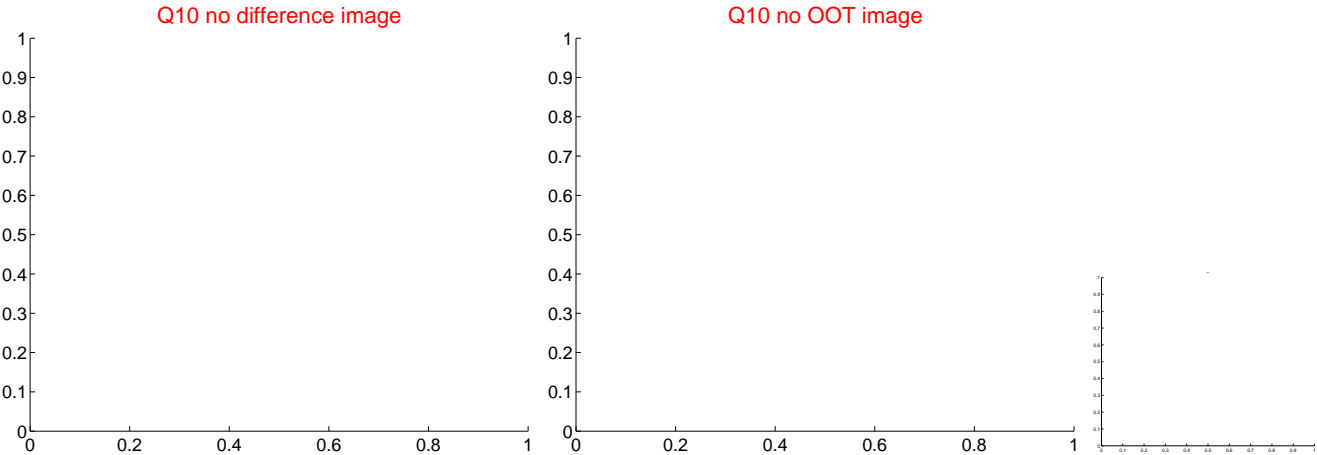
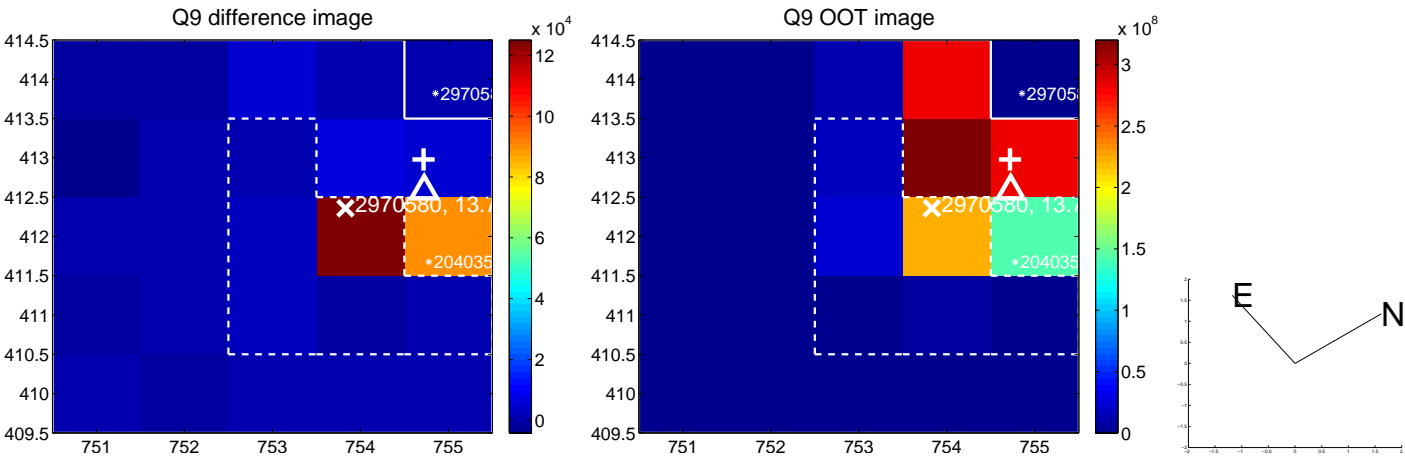
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



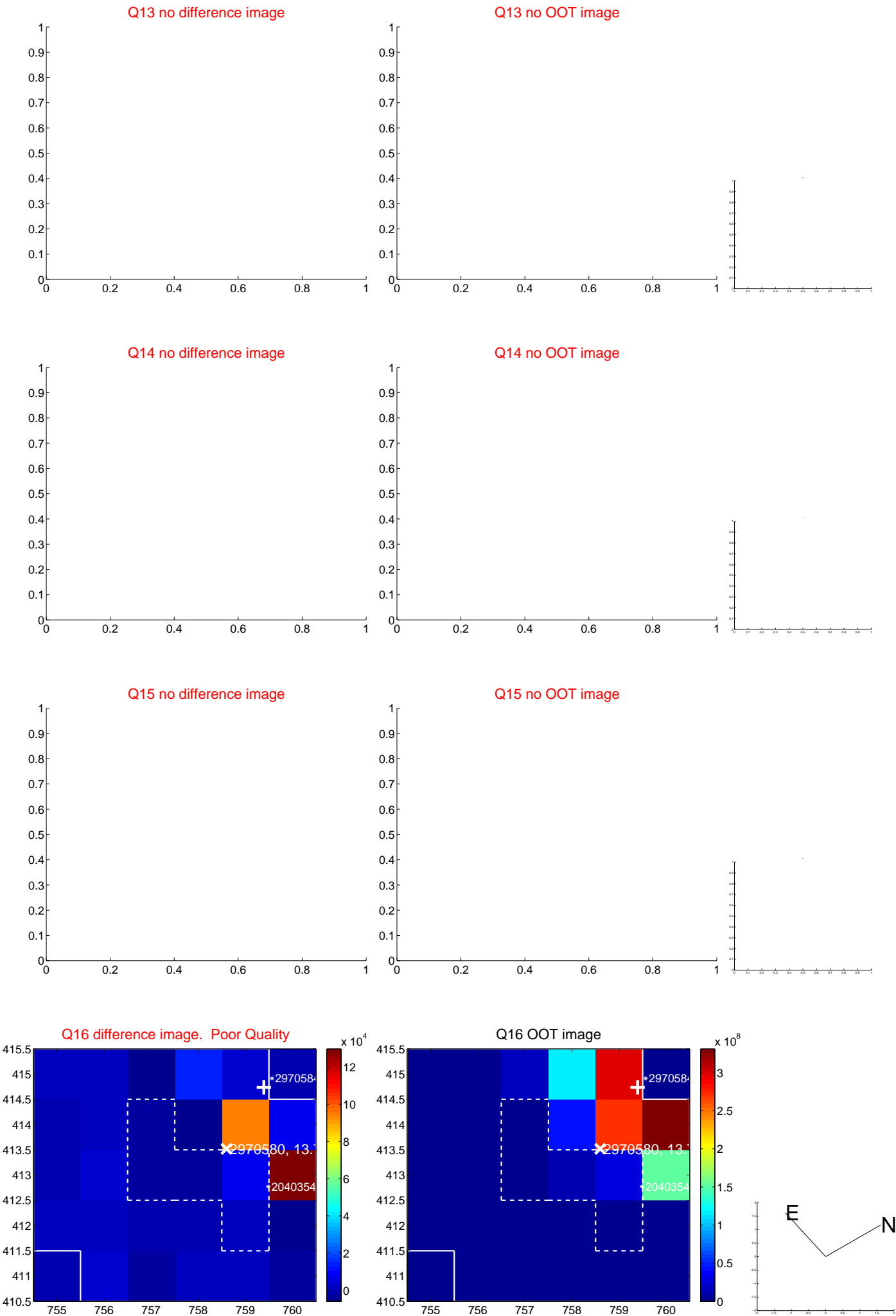
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



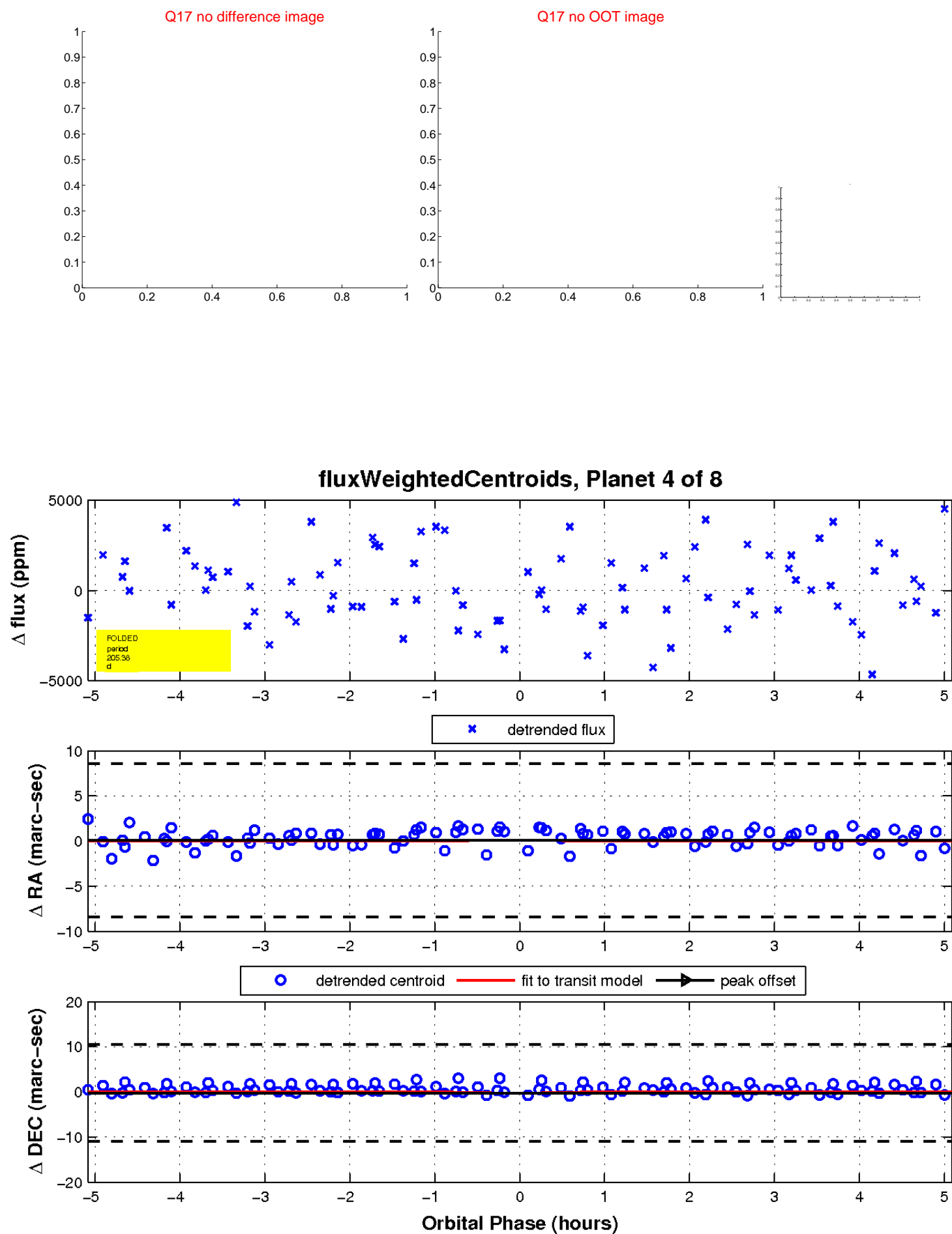
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



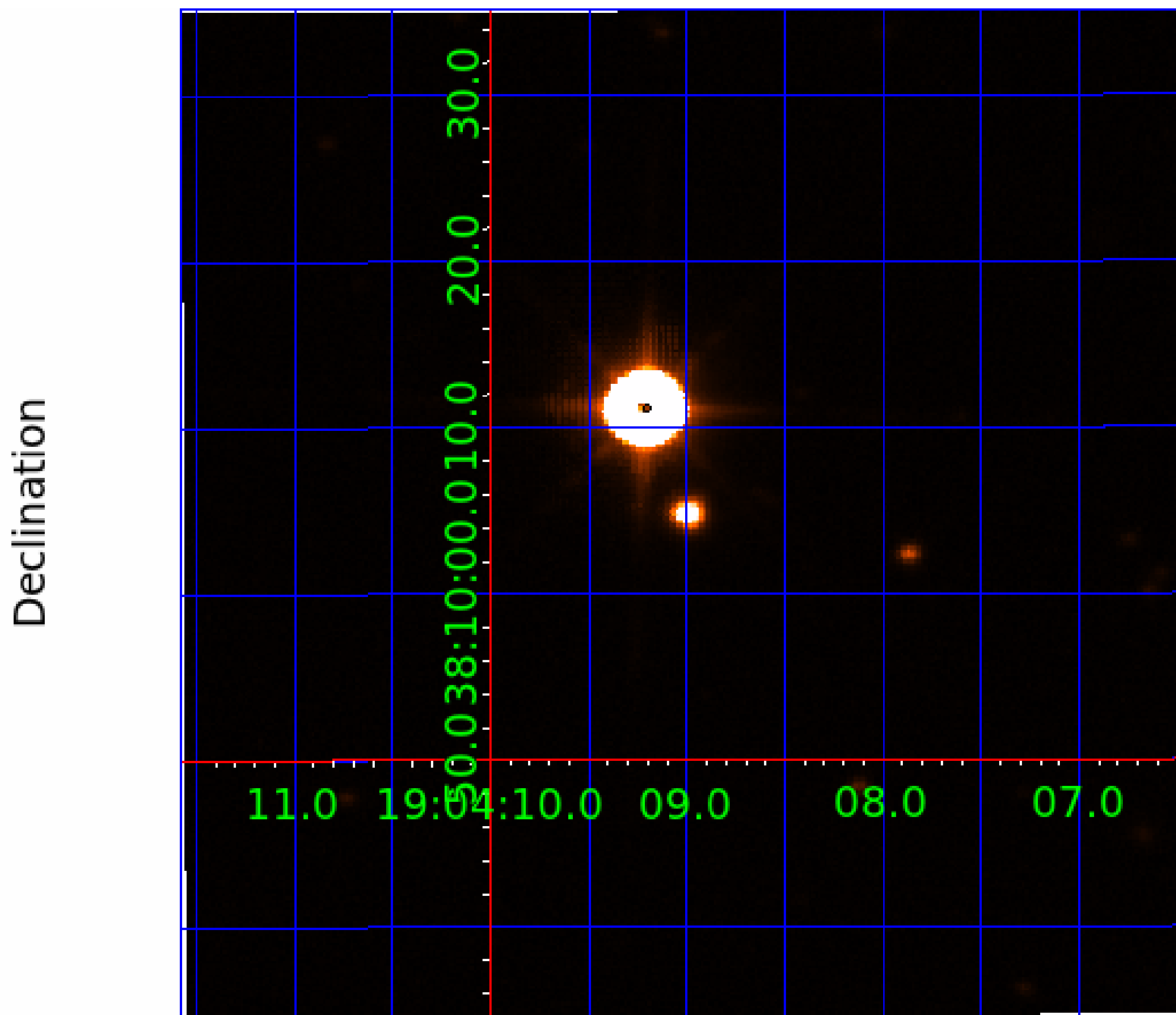
white ×: KIC target position; +: OOT centroid; △: difference centroid. red ✕: large negative pixel value.



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



UKIRT Image



# KIC 002970580

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
002970580-02	OBS	No	559.218859	372.381799	2714.0	15.000	60.2	-1.0	7.84	4605	39.14	14.70
002970580-03	OBS	No	379.202643	360.883809	2067.1	10.177	13.5	5.7	7.84	4605	39.78	24.68
002970580-04	OBS	No	205.380057	278.372111	4114.7	1.706	14.2	7.4	7.84	4605	53.87	55.90
002970580-05	OBS	No	346.501959	144.918492	3227.9	1.526	13.2	8.4	7.84	4605	45.84	27.83
002970580-06	OBS	No	113.694880	155.675783	1876.7	2.000	14.9	-1.0	7.84	4605	32.66	122.98
002970580-07	OBS	No	366.881381	375.936823	9283.1	31.023	10.6	12.2	7.84	4605	76.30	25.79
002970580-08	OBS	No	312.830992	240.650043	321.9	12.000	8.4	-1.0	7.84	4605	13.48	31.90

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
002970580-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_CHASES_SKYE—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—INCONSISTENT_TRANS—CENT_NOFITS
002970580-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES—LPP_DV—ALL_TRANS_CHASES—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS
002970580-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS
002970580-05	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL_TRACKER—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_KIC_POS
002970580-06	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_NOFITS
002970580-07	OBS	FP	0.00	1	0	0	0	LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS
002970580-08	OBS	FP	0.00	1	0	1	0	INDIV_TRANS_RUBBLE_MARSHALL—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—CENT_NOFITS—HALO_GHOST

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

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

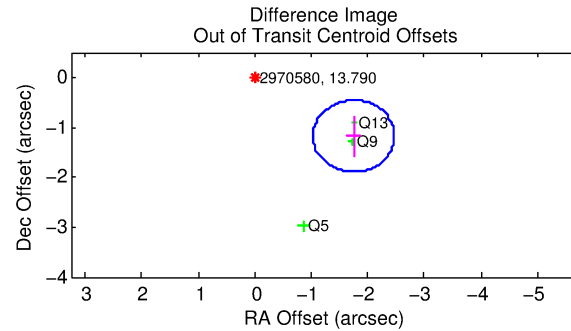
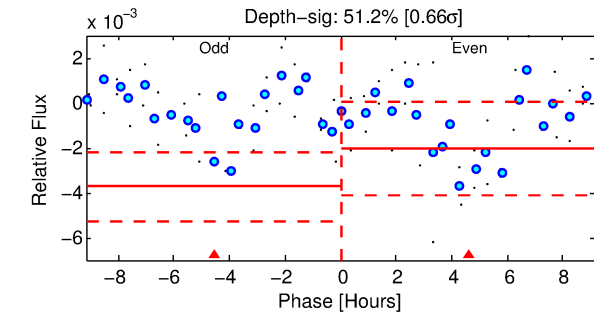
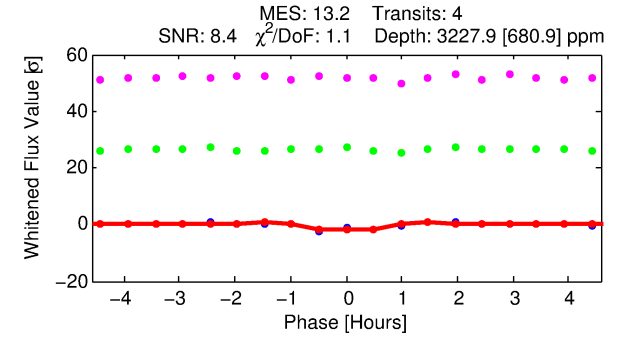
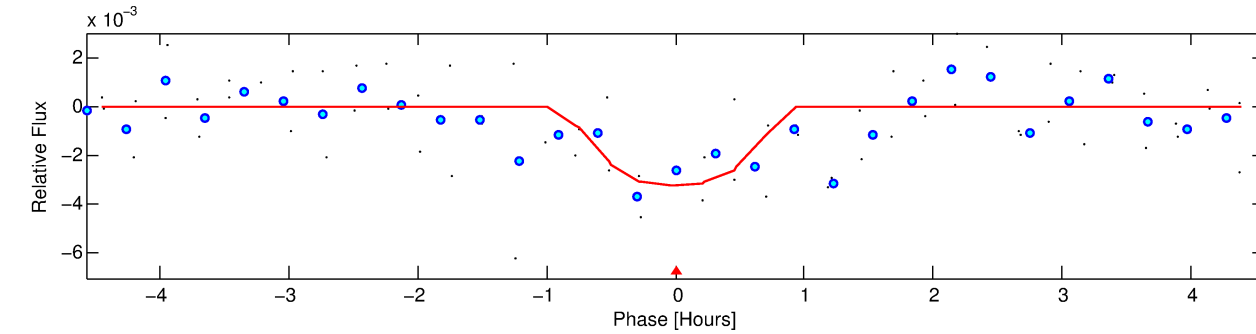
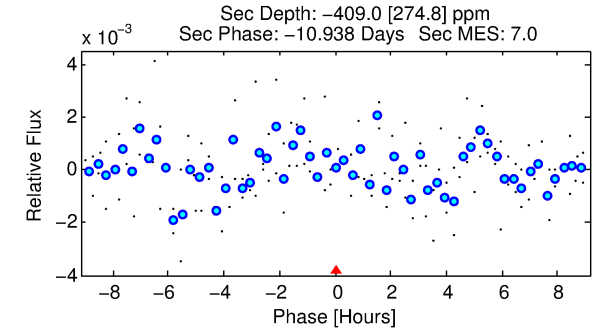
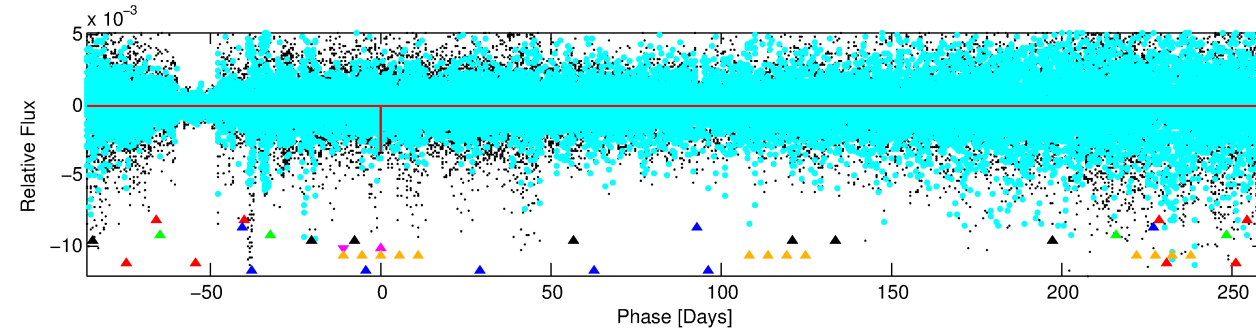
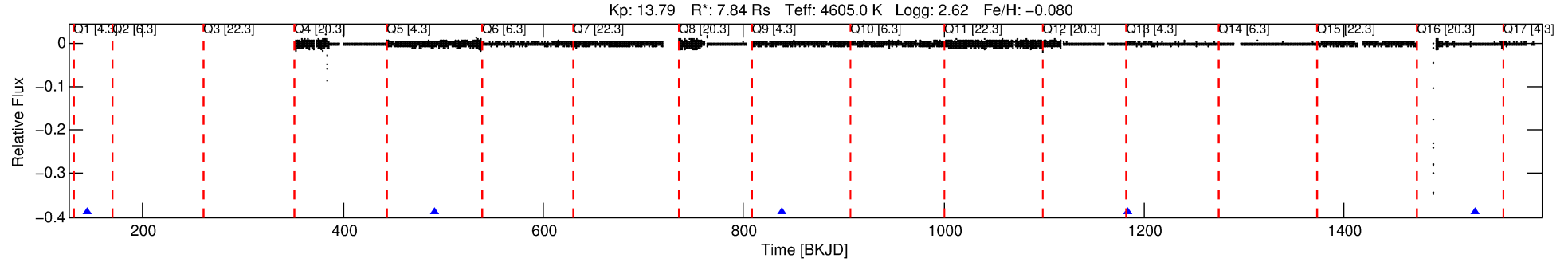
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 002970580-05

No Significant Match Found

# DV One-Page Summary

KIC: 2970580 Candidate: 5 of 8 Period: 346.502 d



## DV Fit Results:

Period = 346.50196 [0.00257] d  
Epoch = 144.9185 [0.0091] BKJD  
Rp/R\* = 0.0535 [0.2309]  
a/R\* = 1529.15 [19547.92]  
b = 0.58 [15.30]  
Seff = 27.83 [8.21]  
Teff = 586 [43] K  
Rp = 45.84 [198.20] Re  
a = 0.9438 [0.2274] AU  
Ag = N/A  
Teffp = N/A

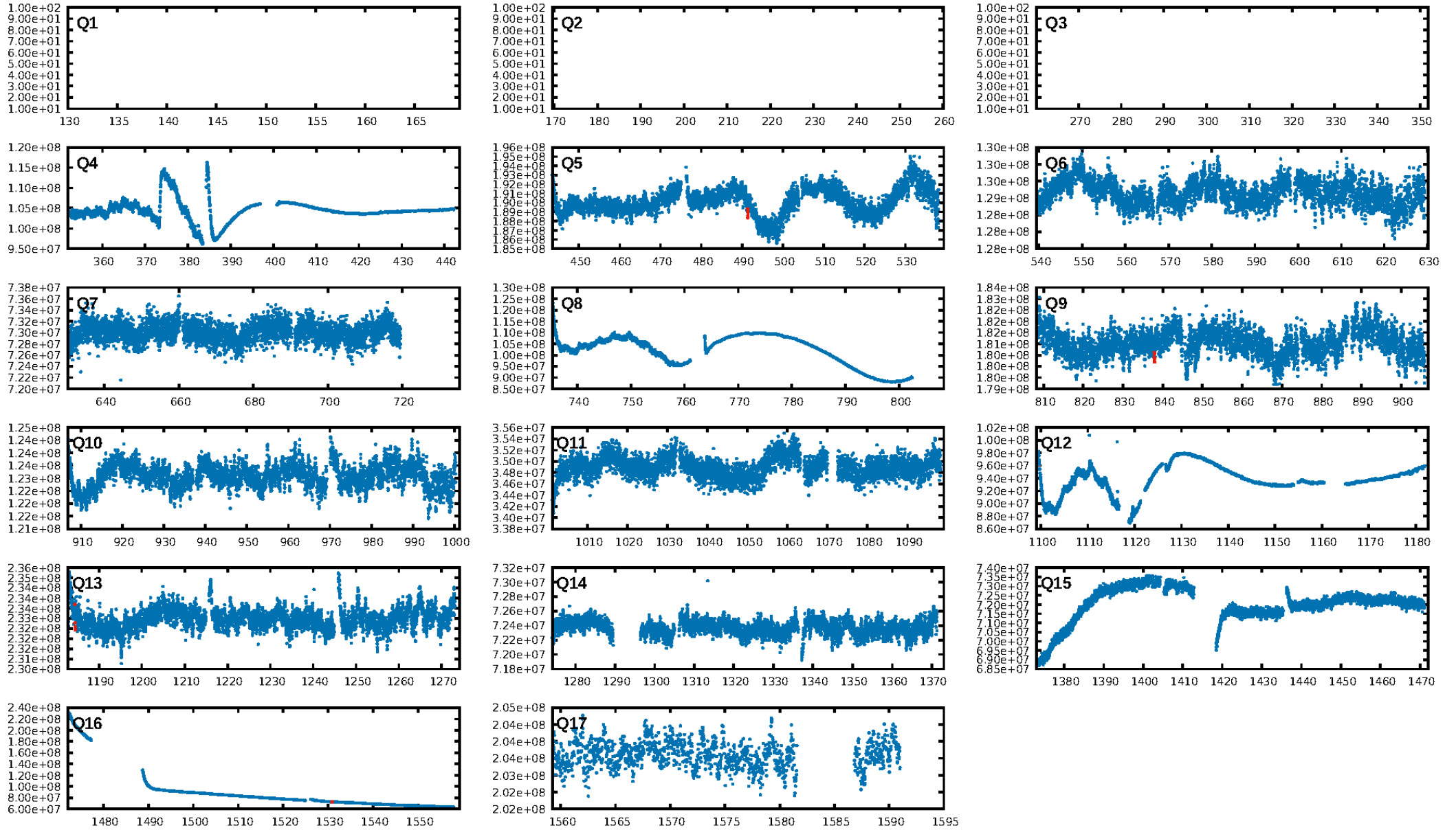
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [66.80σ]  
LongPeriod-sig: 100.0% [15.75σ]  
ModelChiSquare2-sig: 95.4%  
ModelChiSquareGof-sig: 97.0%  
Bootstrap-pfa: 5.30e-13  
RollingBand-fgt: 1.00 [4/4]  
GhostDiagnostic-chr: -0.9634  
Centroid-sig: 8.8%  
Centroid-so: 2.429 arcsec [12.02σ]  
OotOffset-rm: 2.108 arcsec [8.78σ]  
KicOffset-rm: 3.613 arcsec [8.02σ]  
OotOffset-st: 0/0/0/3 [3]  
KicOffset-st: 0/0/0/3 [3]  
DiffImageQuality-fgm: 1.00 [3/3]  
DiffImageOverlap-fno: 0.75 [3/4]

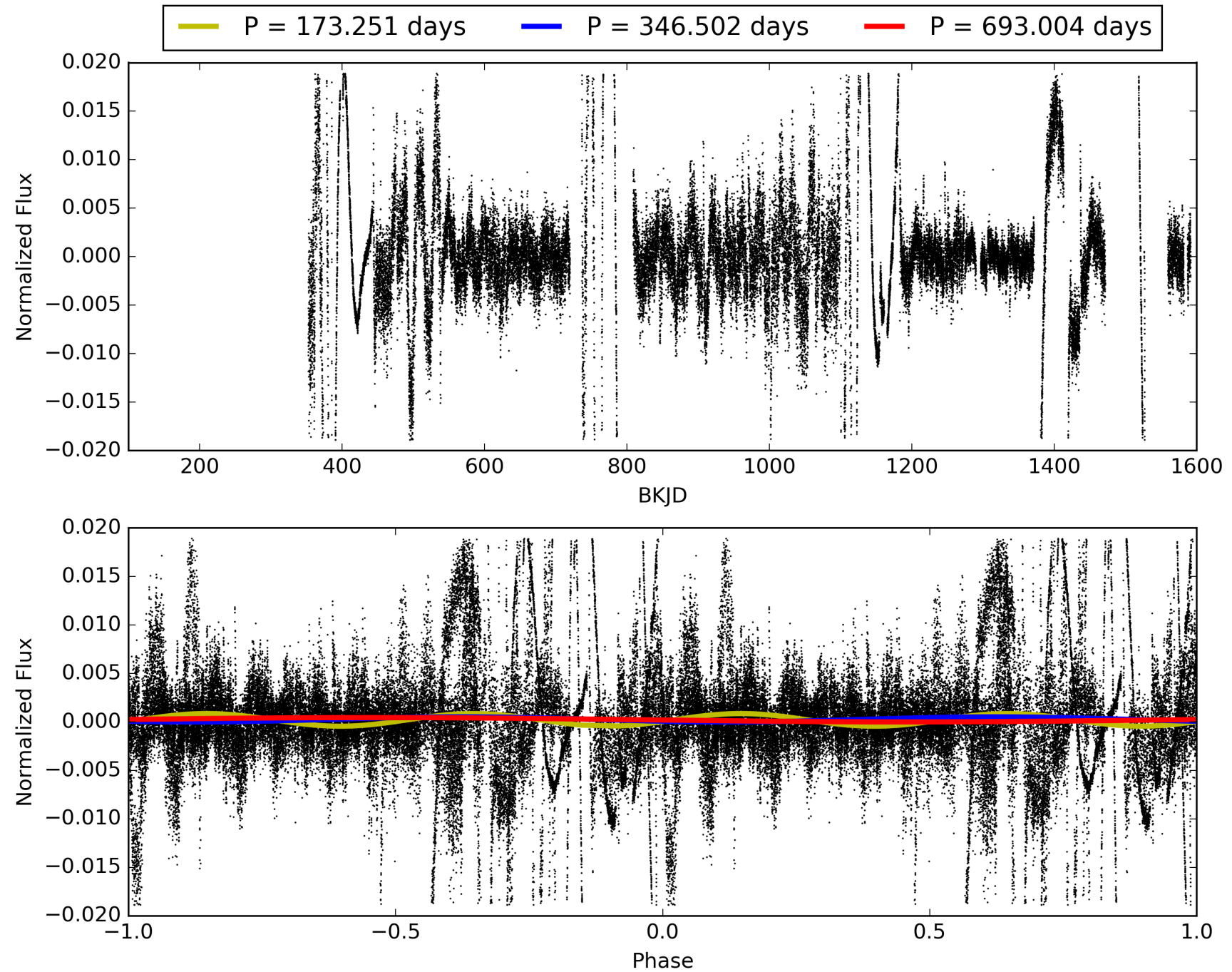
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 01-Feb-2016 22:41:17 Z

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

# TCE 002970580-05, PDC Light Curves

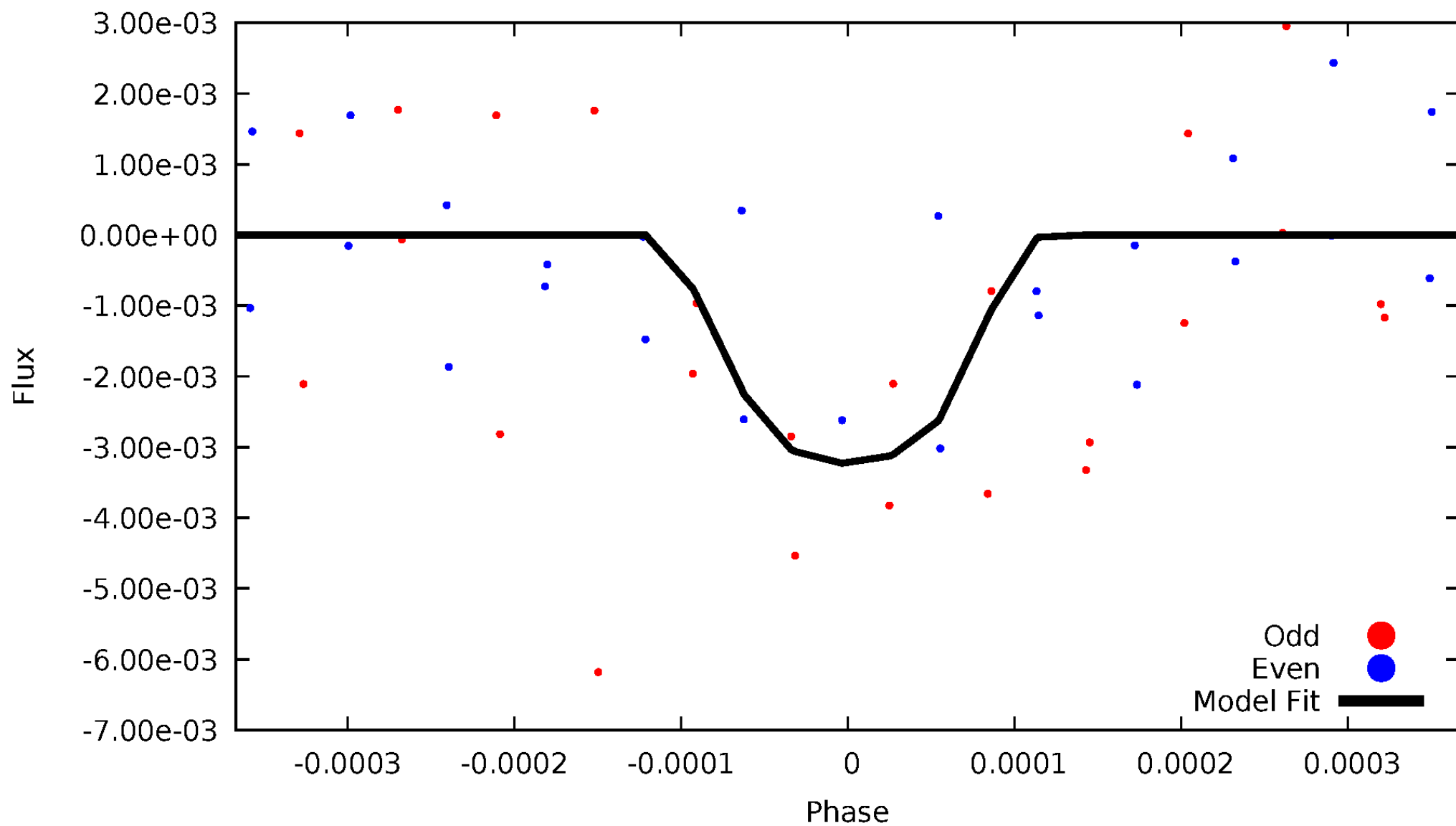


TCE 002970580-05



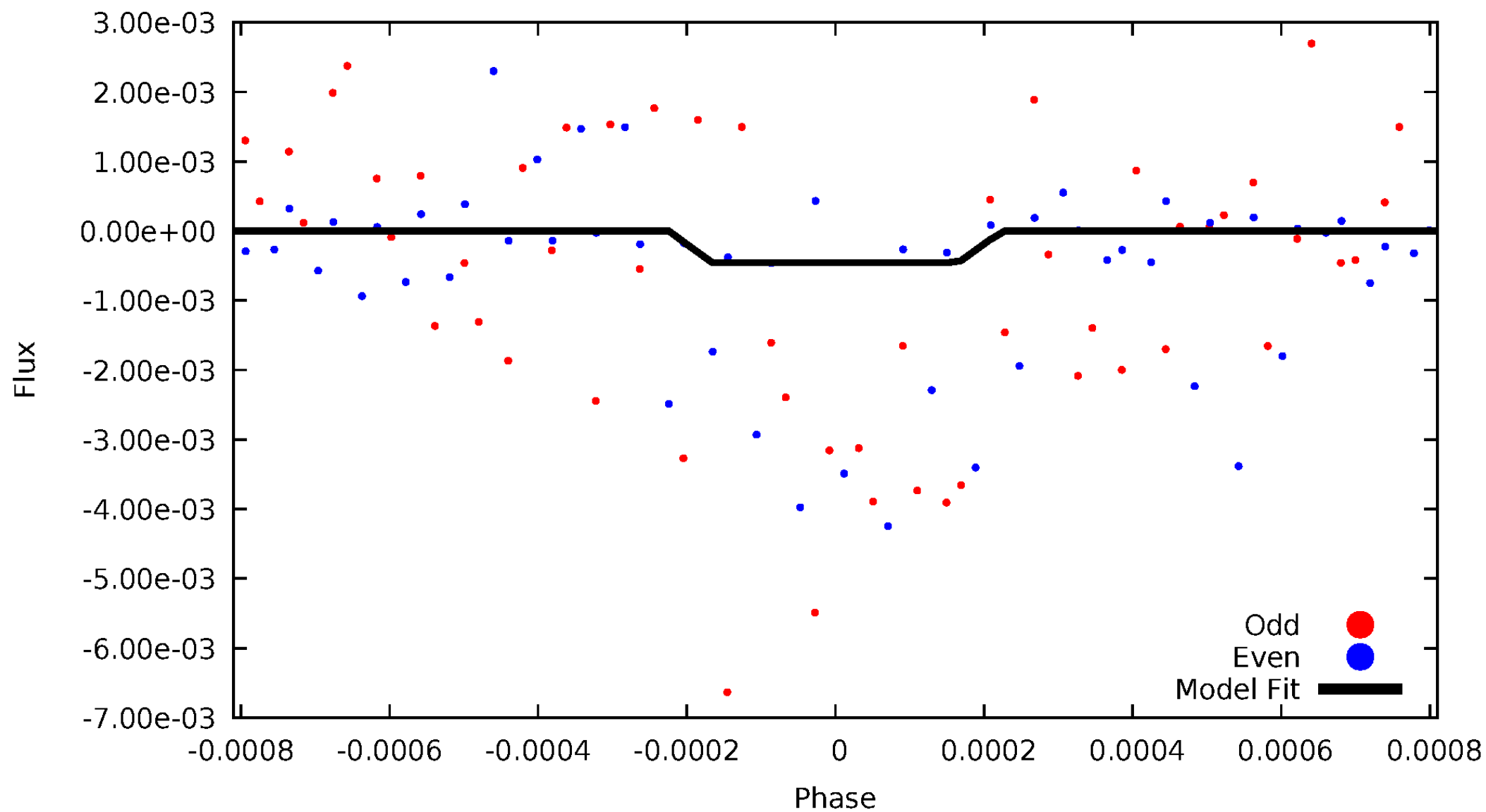
# DV Odd/Even

TCE 002970580-05



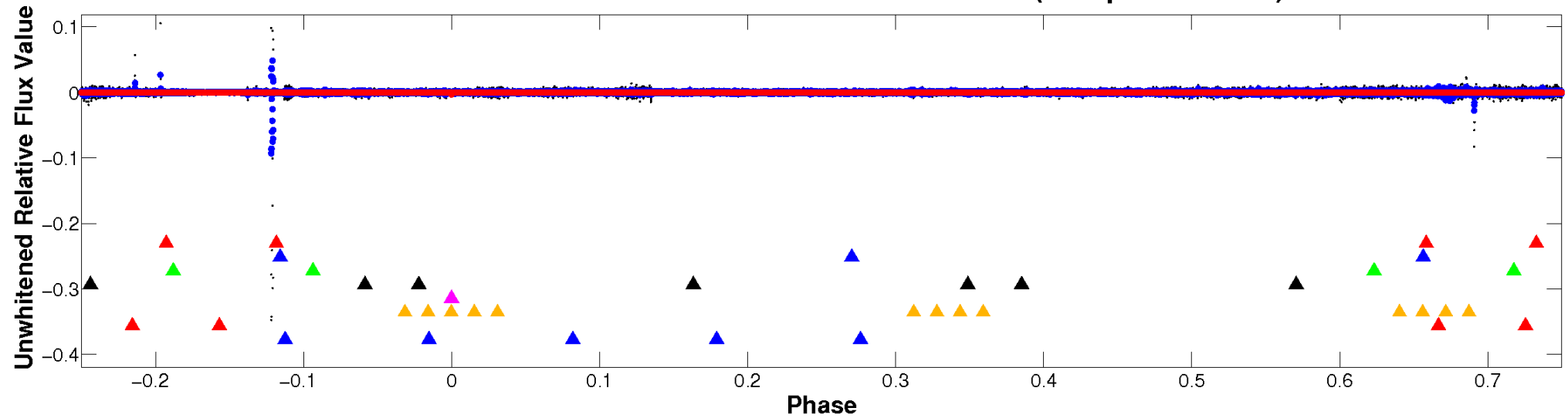
# ALT Odd/Even

TCE 002970580-05

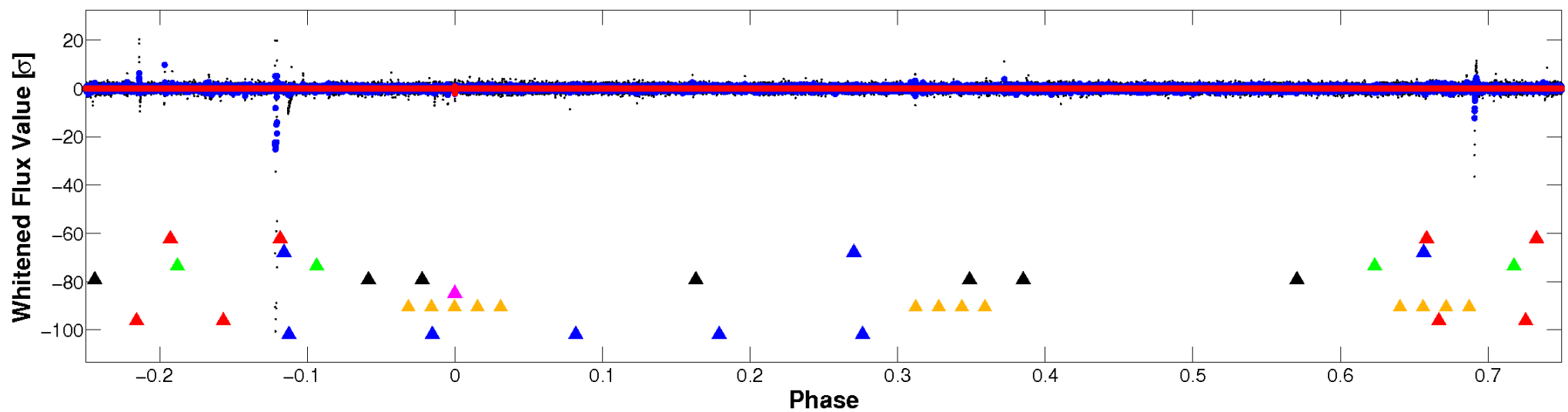


# Non-Whitened Vs. Whitened Light Curve

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

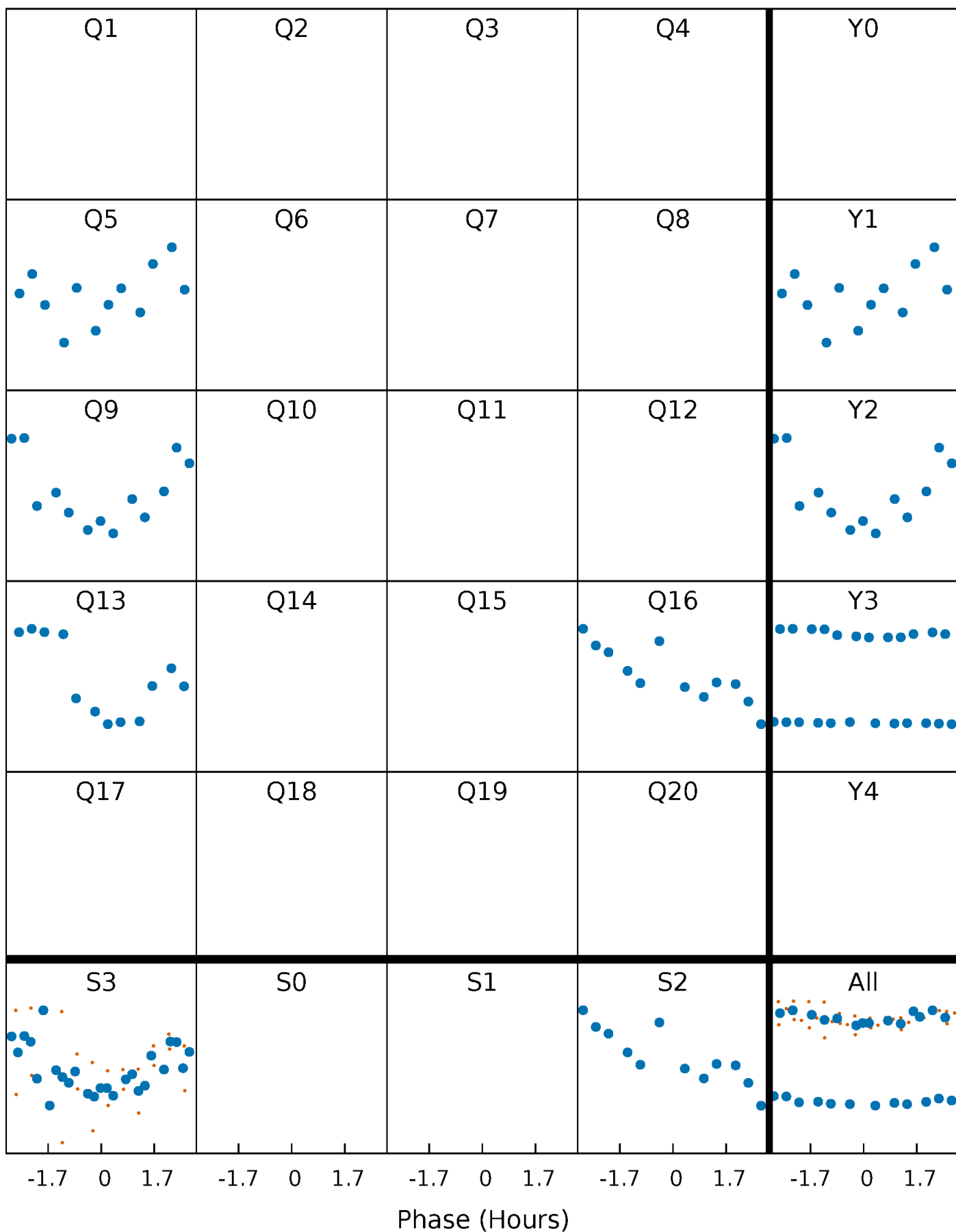


## Planet 5 : Phased Whitened Flux Time Series (Fit Epoch/Period)



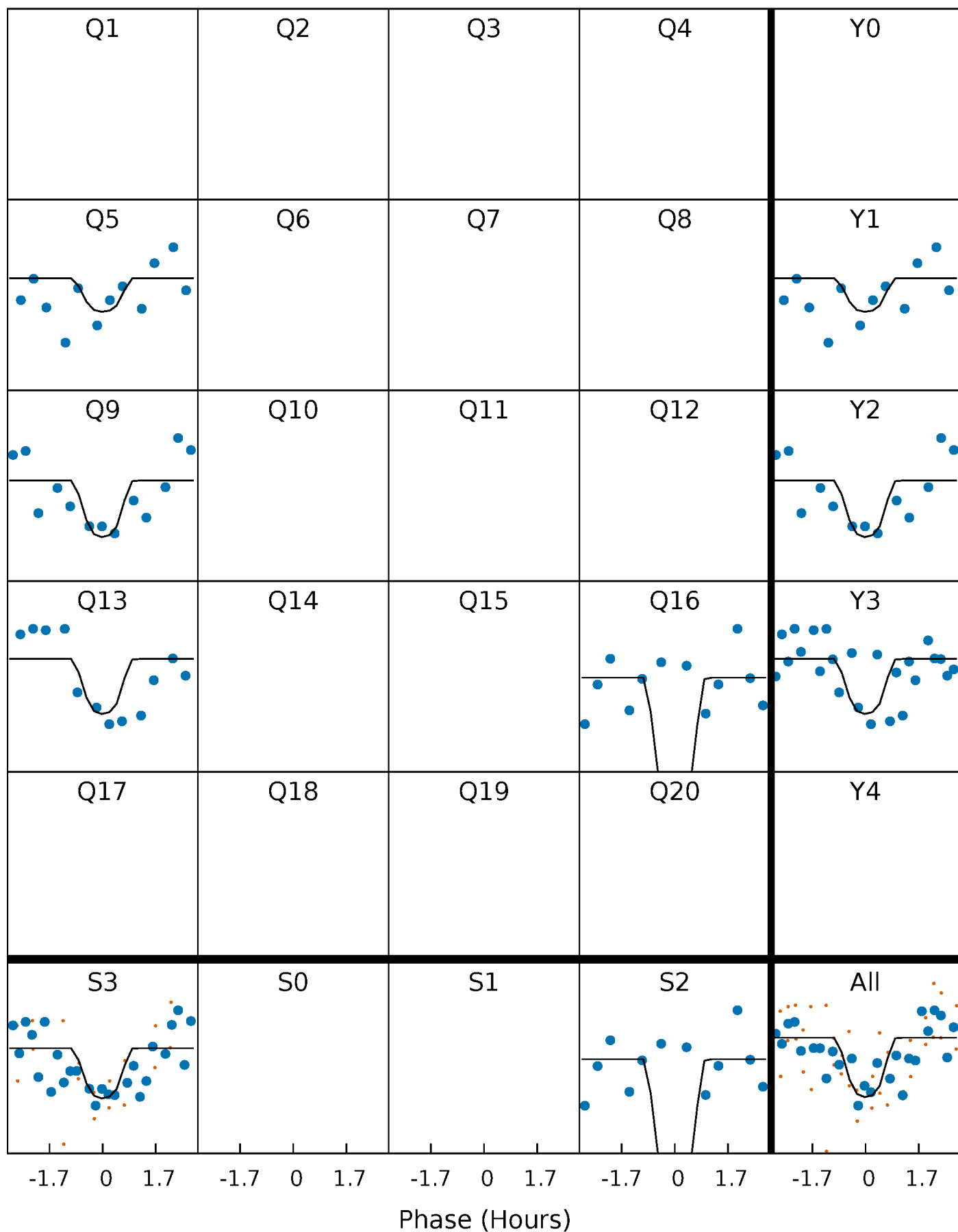
# PDC Quarter-Phased Transit Curves

TCE 002970580-05     $P=346.501959$  Days     $T_0=144.918492$  (BKJD)



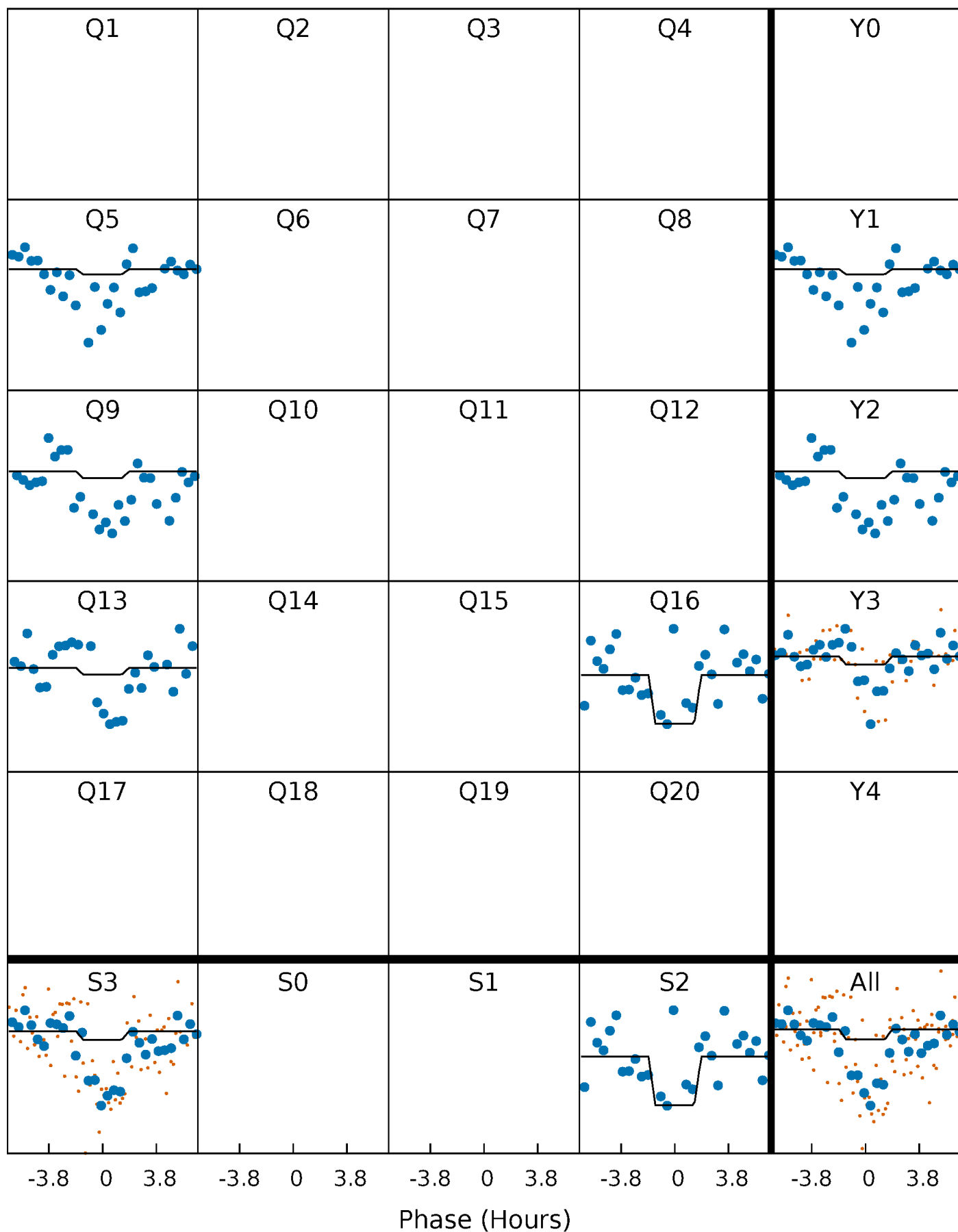
# DV Quarter-Phased Transit Curves

TCE 002970580-05     $P=346.501959$  Days     $T_0=144.918492$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

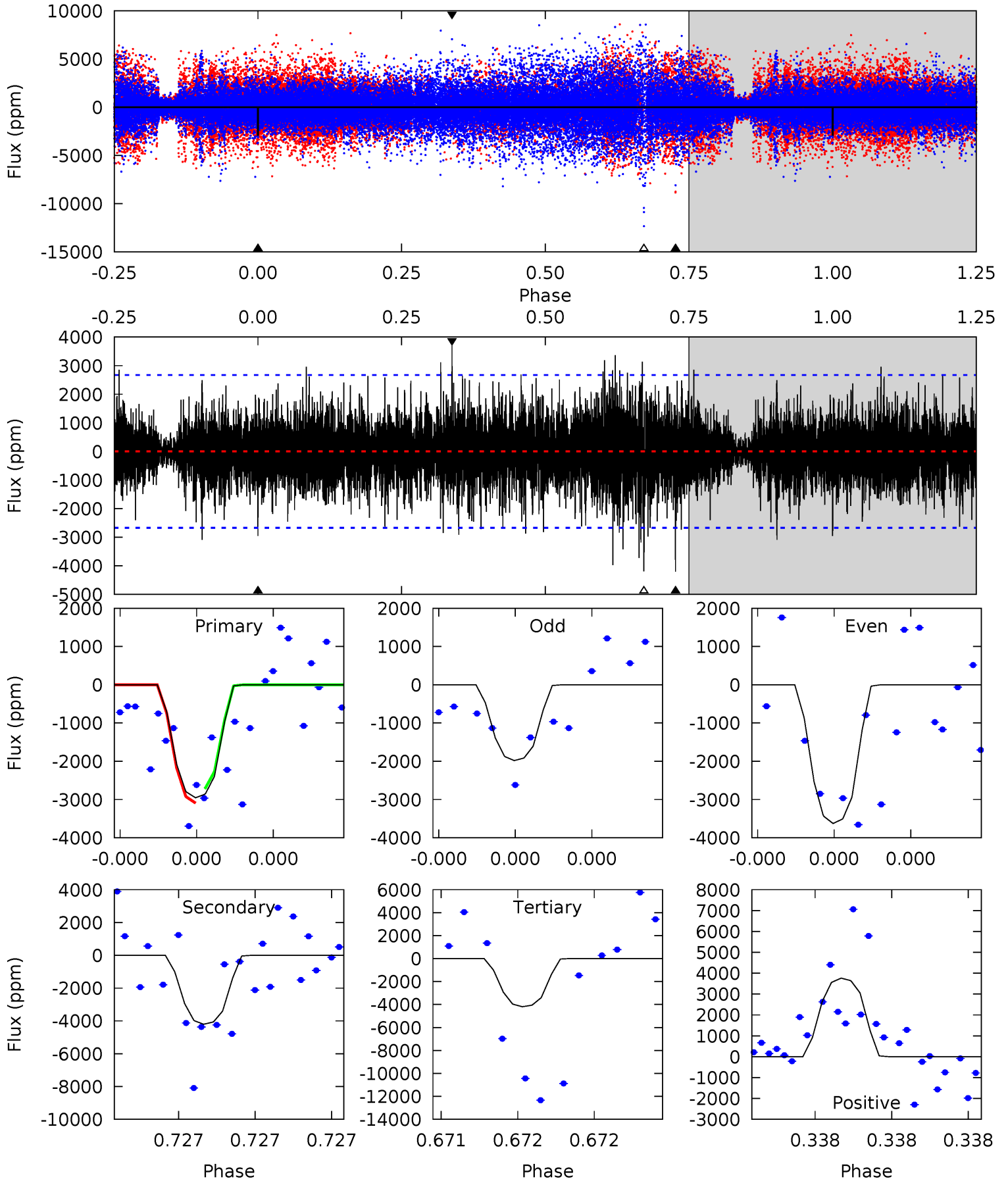
TCE 002970580-05     $P=346.498182$  Days     $T_0=144.920821$  (BKJD)



# DV Model-Shift Uniqueness Test

002970580-05, P = 346.501959 Days, E = 144.918492 Days

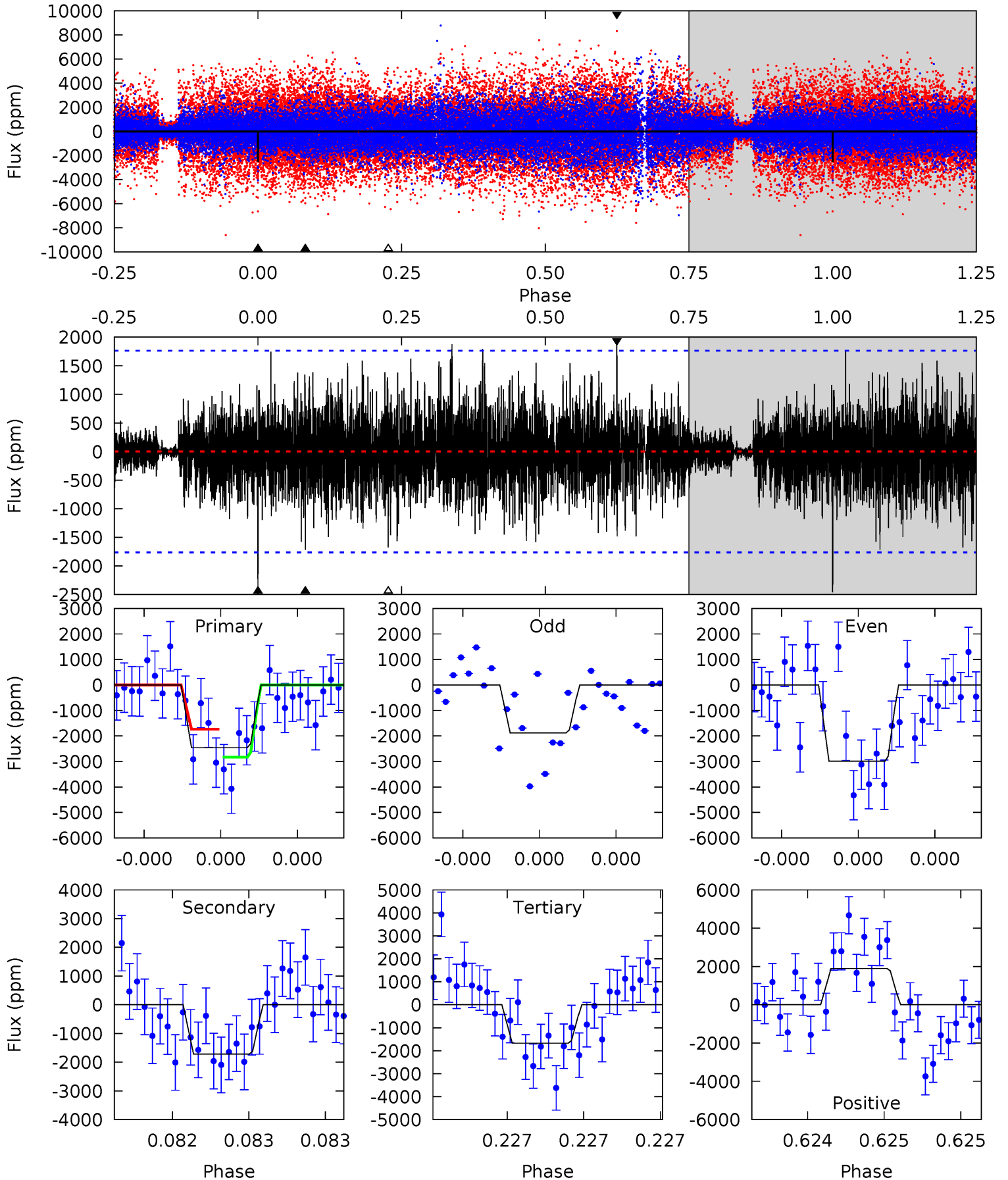
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
6.30	8.97	8.94	8.02	5.70	3.68	1.60	-2.64	-1.72	0.03	0.94	1.72	0.78	0.47	0.40



# Alt Model-Shift Uniqueness Test

002970580-05, P = 346.498182 Days, E = 144.920821 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
7.80	5.45	5.31	6.02	5.60	3.52	1.41	2.49	1.78	0.14	-0.57	1.71	0.86	0.44	1.80



### Stellar Parameters For KIC 002970580

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$4605^{+69}_{-48}$	$2.619^{+0.120}_{-0.120}$	$-0.080^{+0.150}_{-0.100}$	$7.844^{+2.620}_{-0.936}$	$0.934^{+0.427}_{-0.022}$	$0.003^{+0.001}_{-0.001}$
	+1%/-1%	+5%/-5%	+188%/-125%	+33%/-12%	+46%/-2%	+48%/-45%
Source	SPE74	SPE74	SPE74	DSEP		

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

### Secondary Eclipse Parameters for KIC 002970580-05 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-4206 \pm 469$	$146.41^{+160.12}_{-101.86}$	$814^{+43}_{-32}$	$3334^{+1726}_{-648}$	$100^{+976}_{-77}$
Alt.	$-1717 \pm 315$	$151.83^{+167.19}_{-108.47}$	$815^{+43}_{-32}$	$2898^{+1407}_{-509}$	$40^{+433}_{-31}$

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

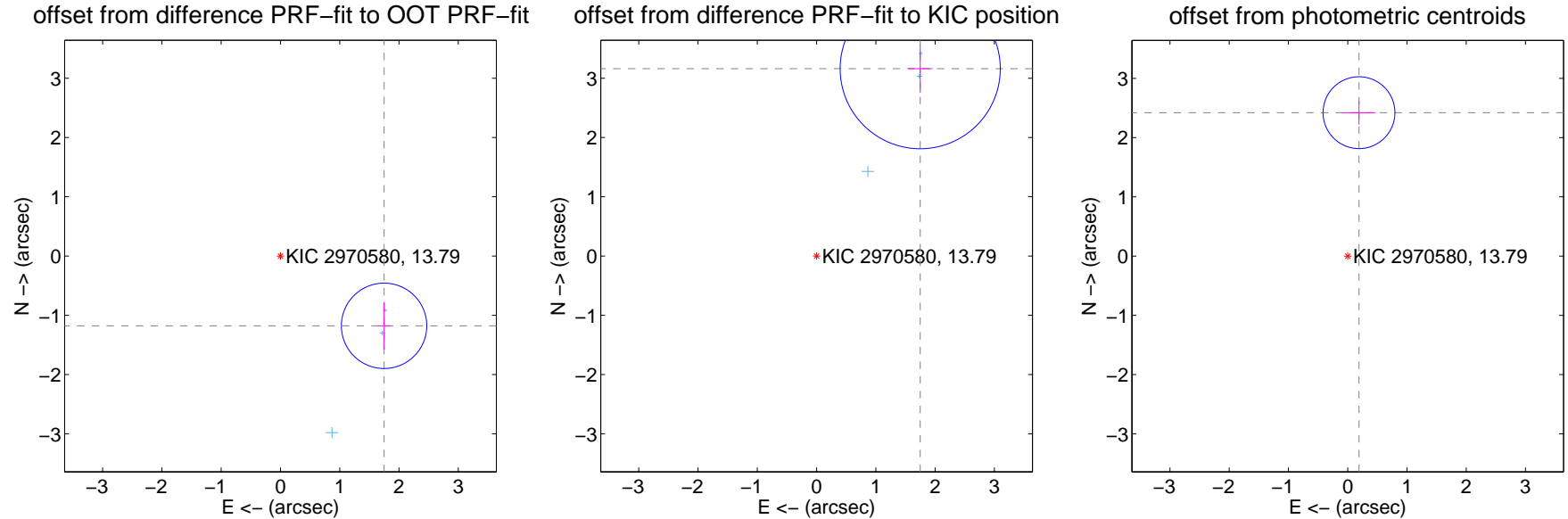
## DV Centroid Data

Supplemental centroid analysis for 002970580-05. Kepler magnitude: 13.79. Transit SNR 8.42

There are 3 quarters with good PRF difference image offsets

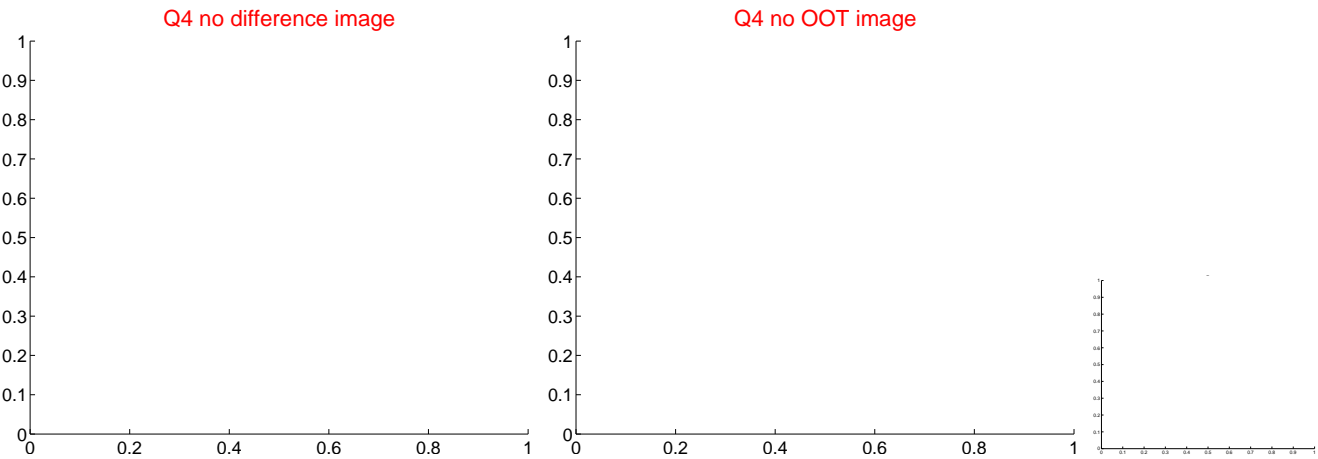
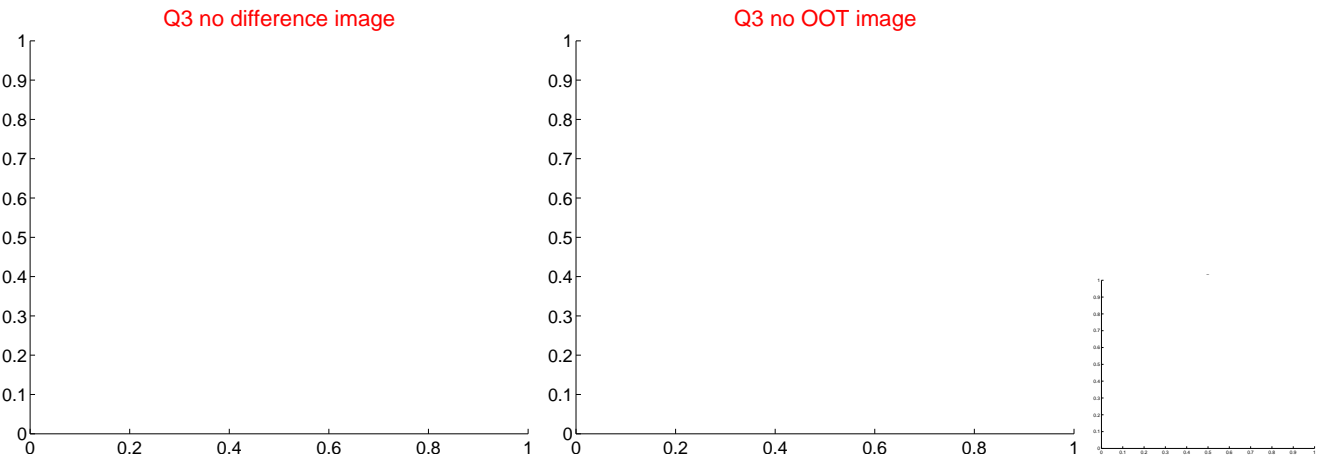
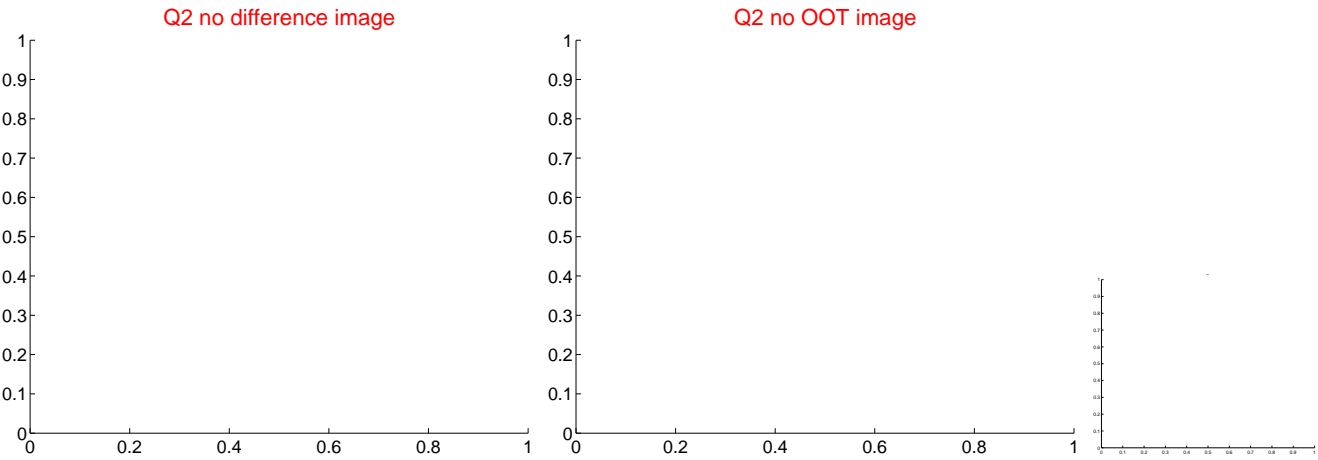
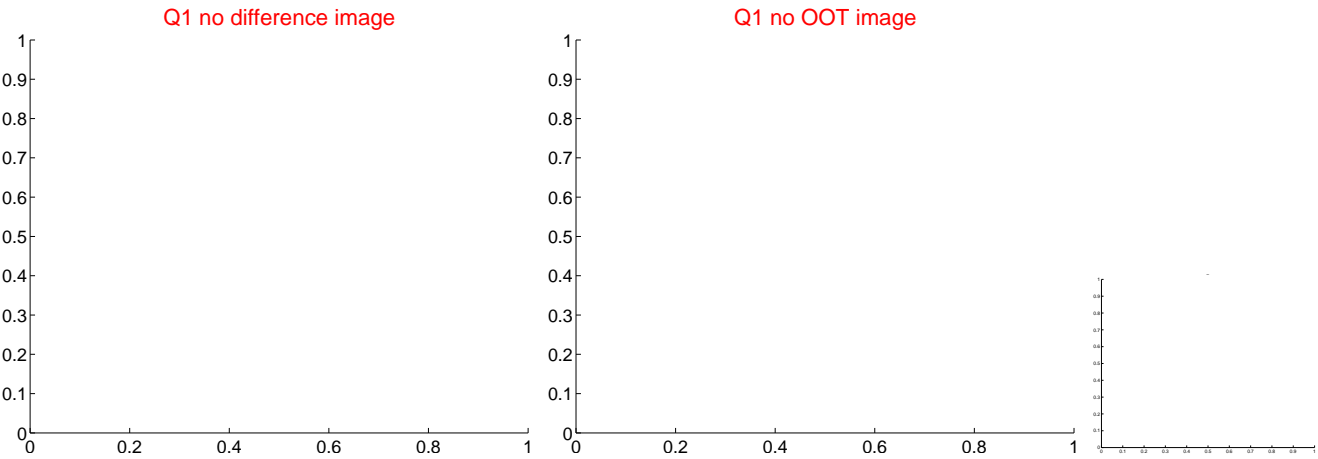
The OOT PRF centroid is offset from the target star catalog position by about 4.34 arcsec so the offset from difference PRF-fit to OOT-fit may be invalid.

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$2.108 \pm 0.240$	8.78	$-1.748 \pm 0.105$	$-1.178 \pm 0.400$
PRF-fit source offset from KIC position	$3.613 \pm 0.450$	8.02	$-1.749 \pm 0.206$	$3.161 \pm 0.408$
photometric centroid source offset	$2.43 \pm 0.20$	12.02	$-0.19 \pm 0.28$	$2.42 \pm 0.20$

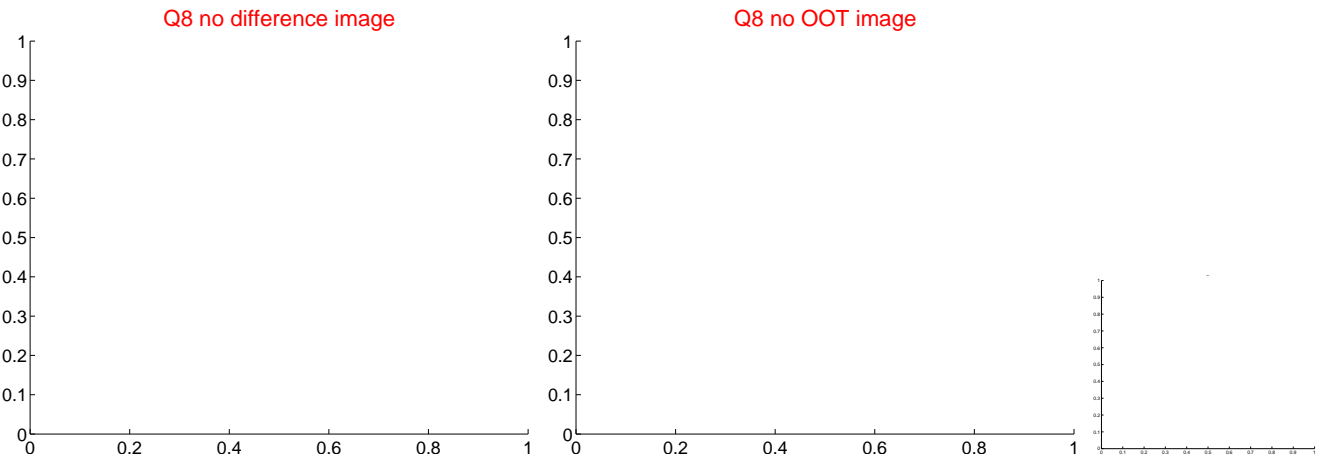
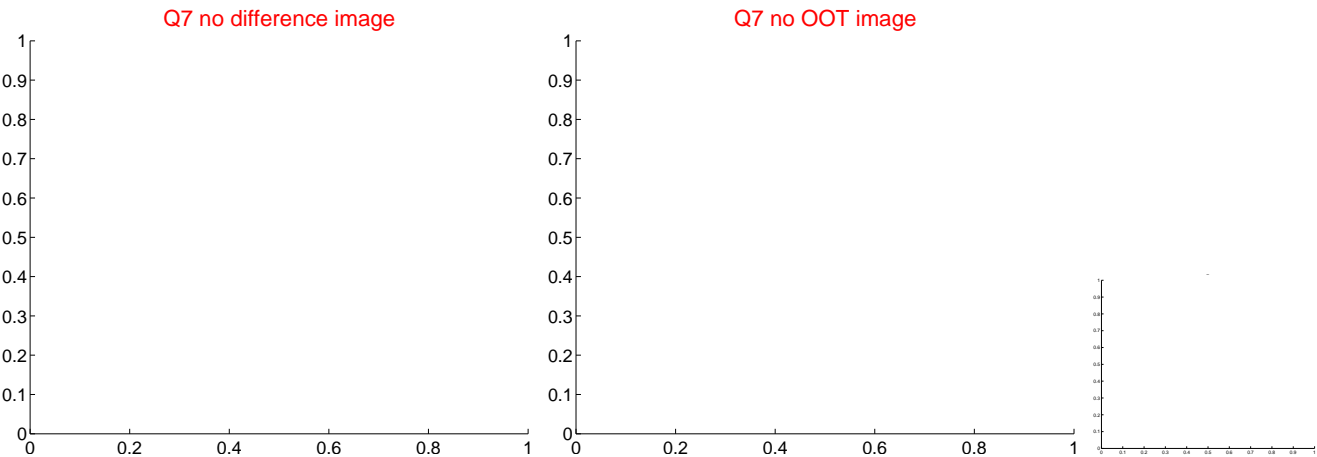
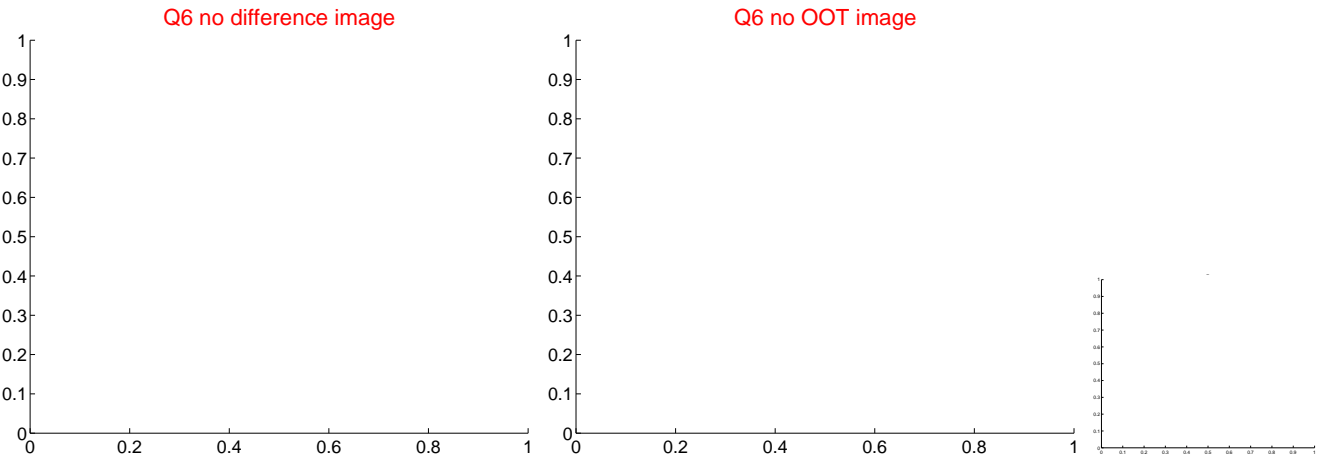
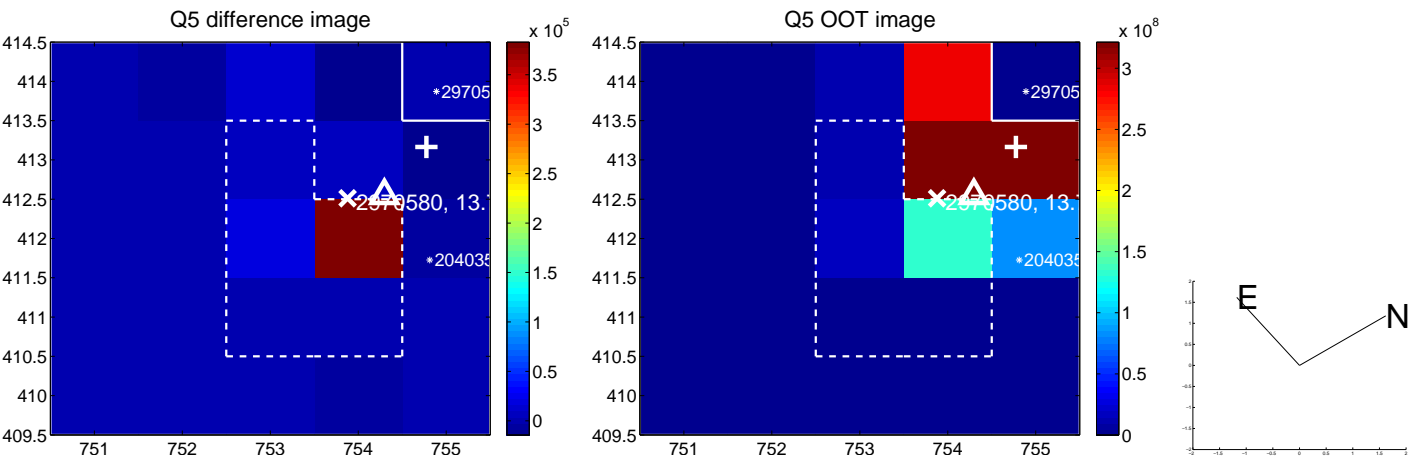


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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

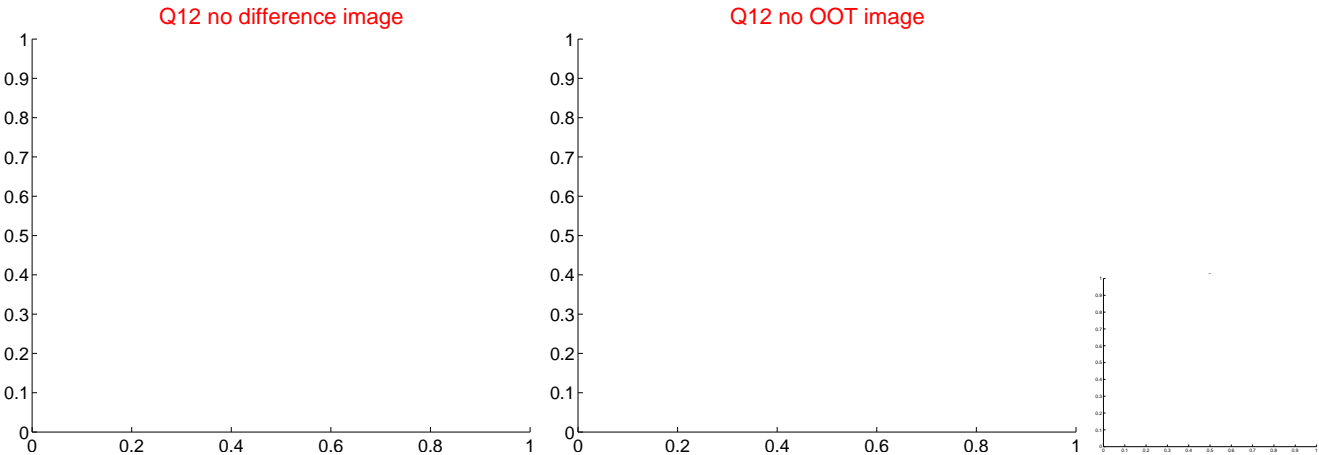
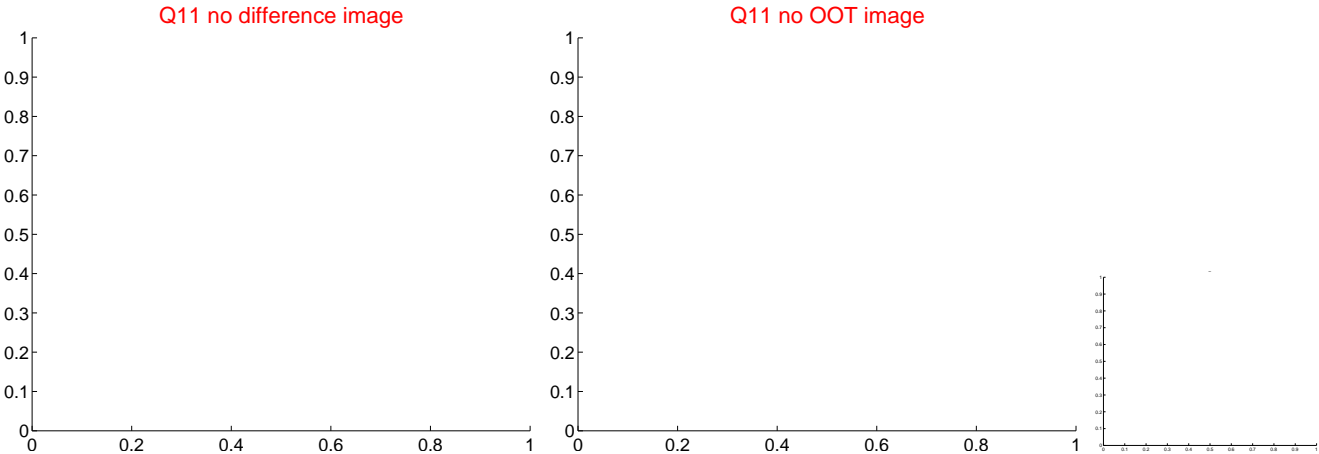
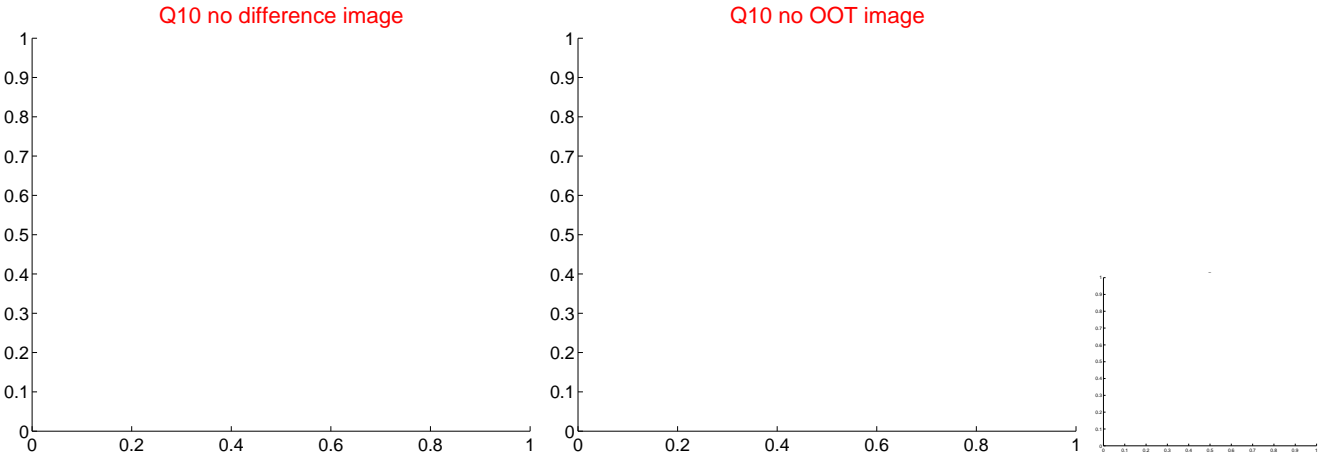
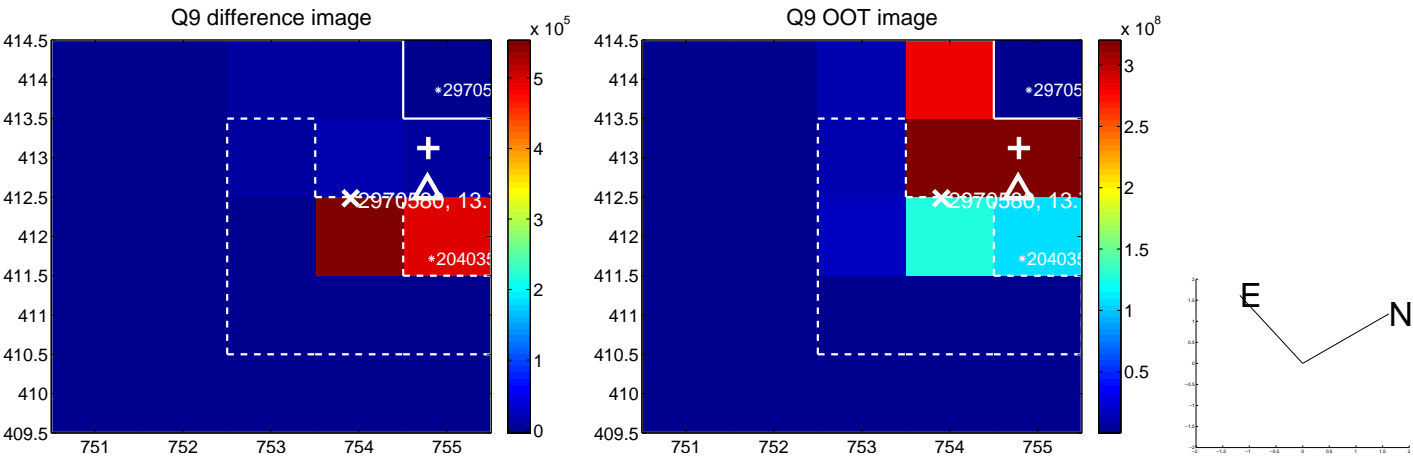
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



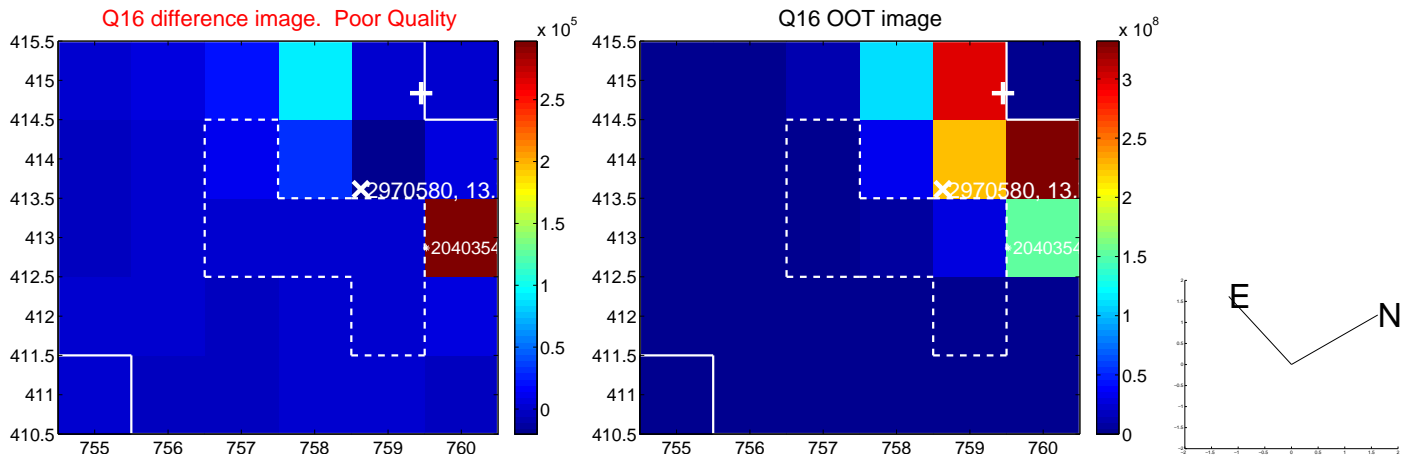
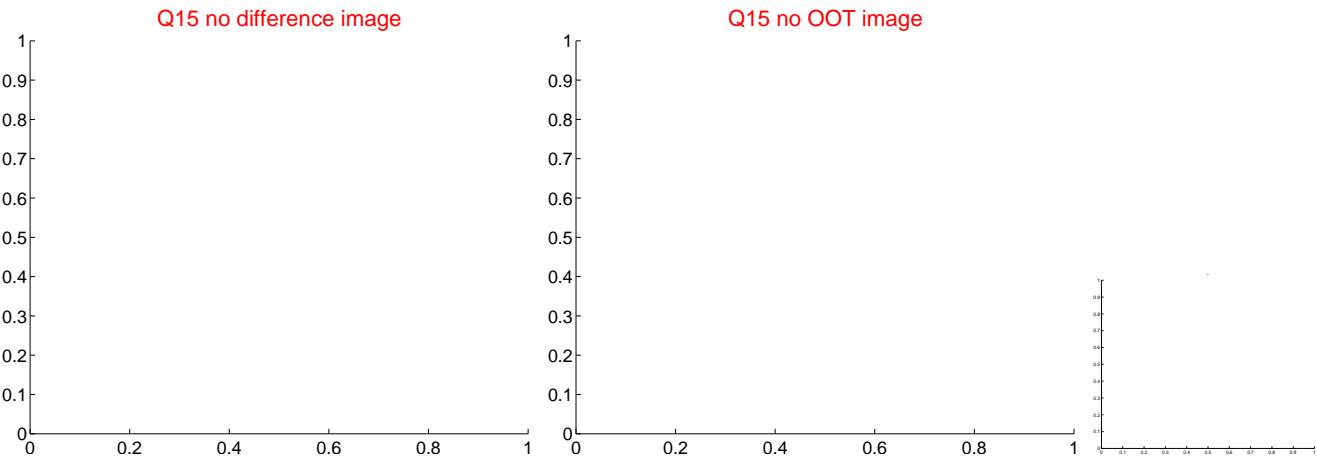
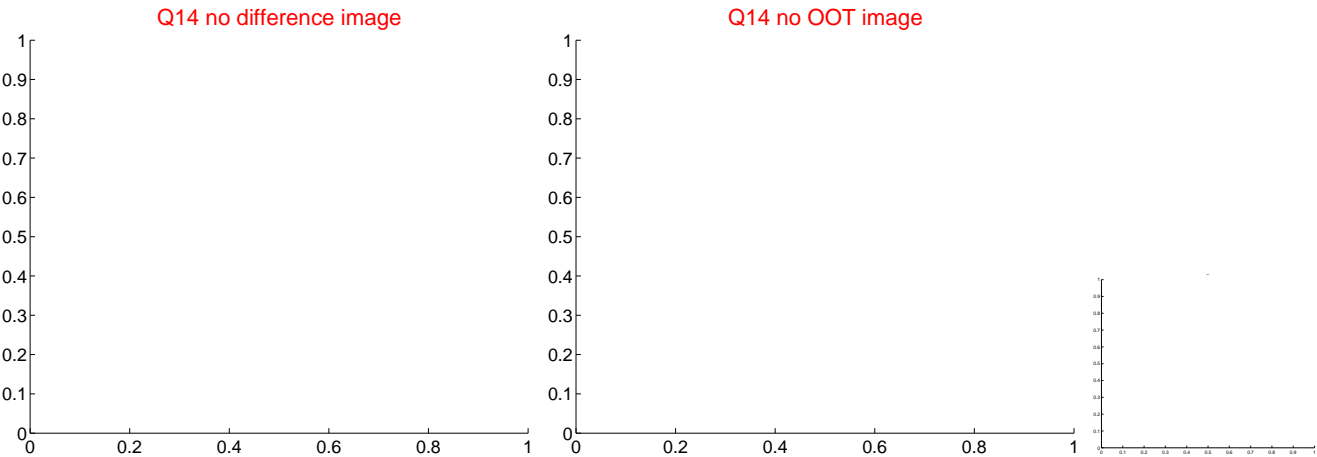
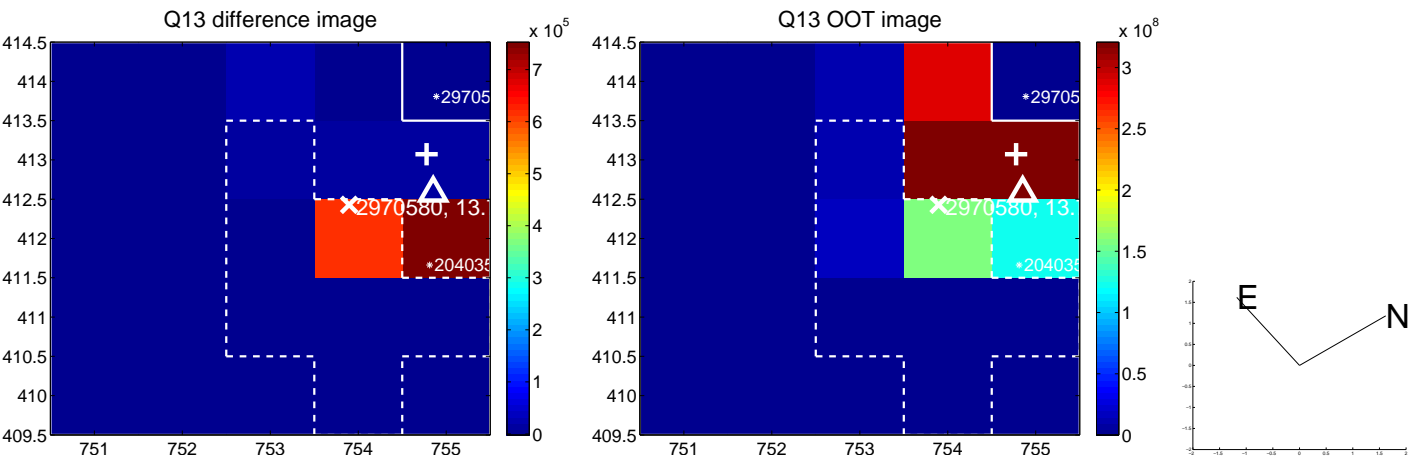
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



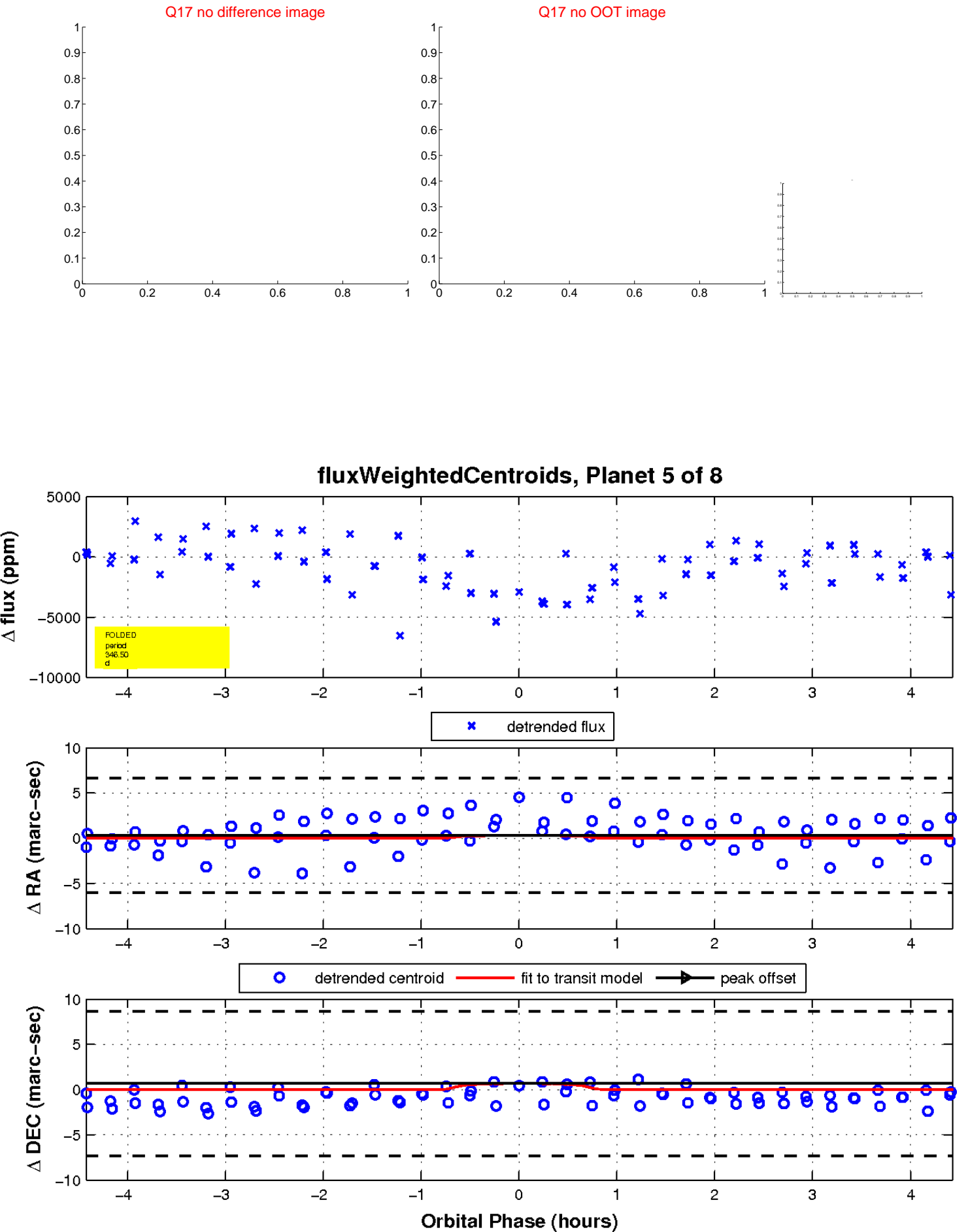
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



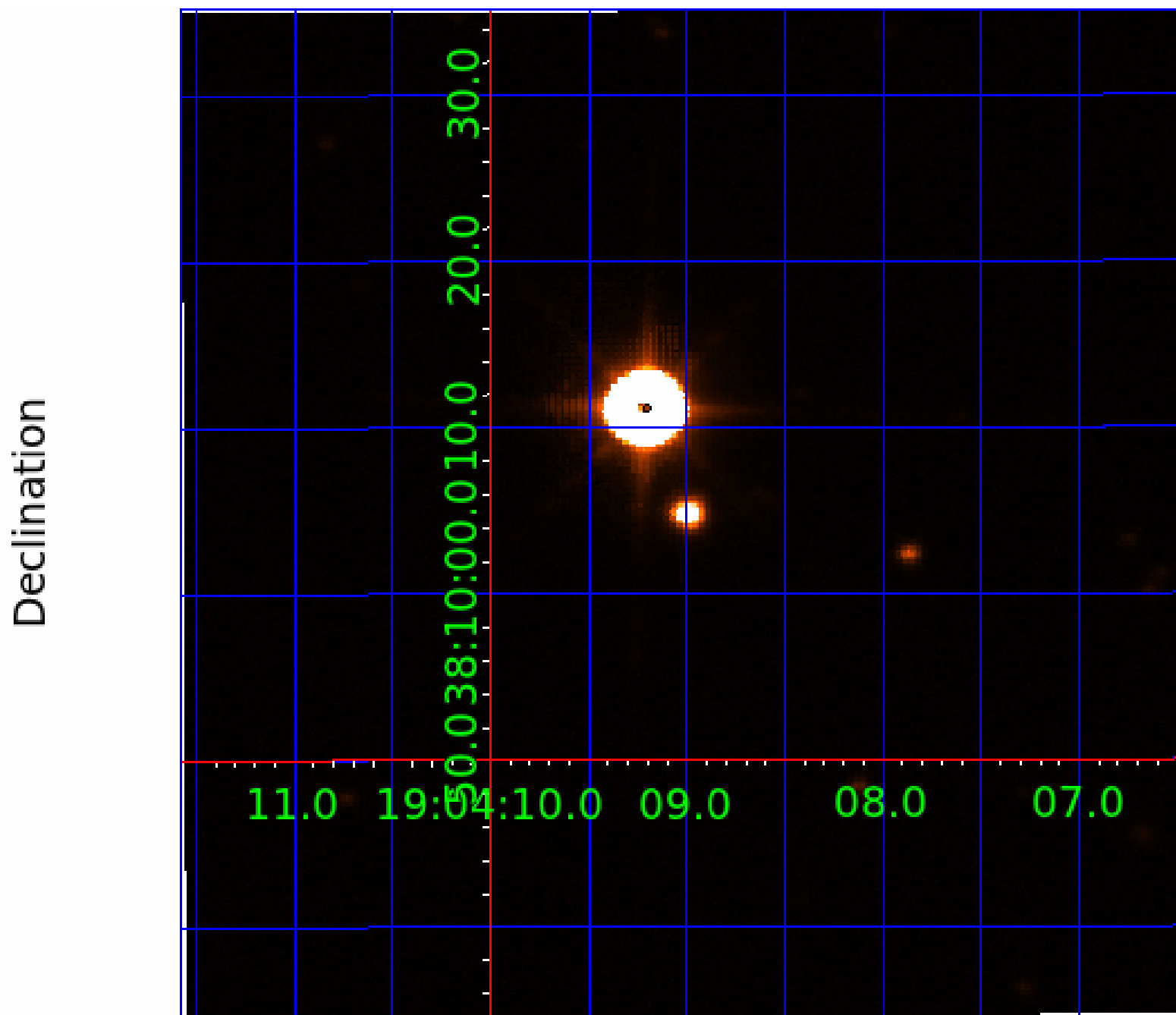
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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



UKIRT Image



# KIC 002970580

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
002970580-02	OBS	No	559.218859	372.381799	2714.0	15.000	60.2	-1.0	7.84	4605	39.14	14.70
002970580-03	OBS	No	379.202643	360.883809	2067.1	10.177	13.5	5.7	7.84	4605	39.78	24.68
002970580-04	OBS	No	205.380057	278.372111	4114.7	1.706	14.2	7.4	7.84	4605	53.87	55.90
002970580-05	OBS	No	346.501959	144.918492	3227.9	1.526	13.2	8.4	7.84	4605	45.84	27.83
002970580-06	OBS	No	113.694880	155.675783	1876.7	2.000	14.9	-1.0	7.84	4605	32.66	122.98
002970580-07	OBS	No	366.881381	375.936823	9283.1	31.023	10.6	12.2	7.84	4605	76.30	25.79
002970580-08	OBS	No	312.830992	240.650043	321.9	12.000	8.4	-1.0	7.84	4605	13.48	31.90

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
002970580-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_CHASES_SKYE—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—INCONSISTENT_TRANS—CENT_NOFITS
002970580-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES—LPP_DV—ALL_TRANS_CHASES—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS
002970580-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS
002970580-05	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL_TRACKER—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_KIC_POS
002970580-06	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_NOFITS
002970580-07	OBS	FP	0.00	1	0	0	0	LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS
002970580-08	OBS	FP	0.00	1	0	1	0	INDIV_TRANS_RUBBLE_MARSHALL—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—CENT_NOFITS—HALO_GHOST

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

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

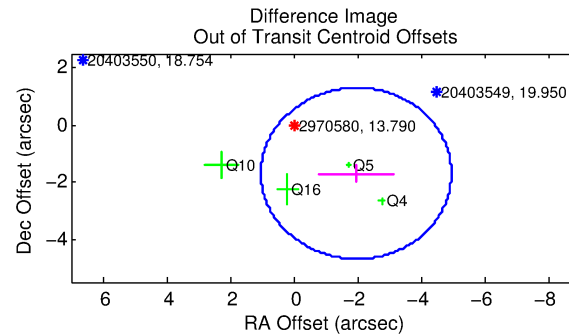
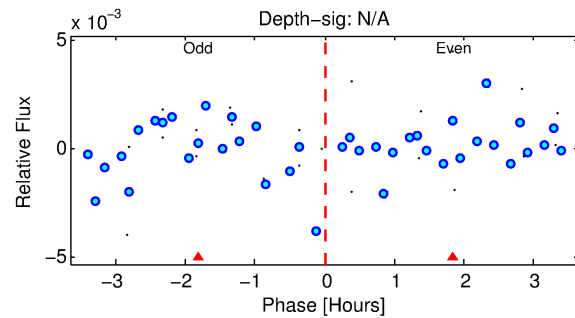
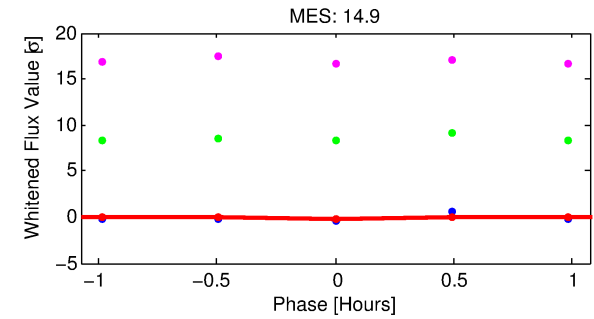
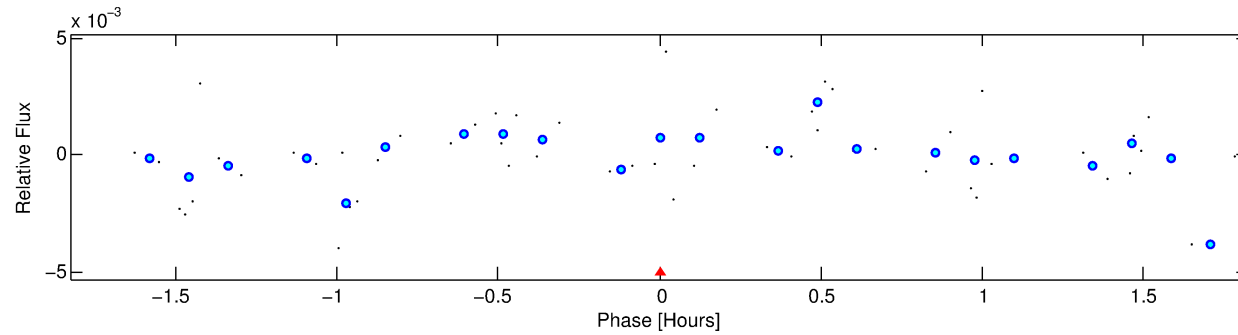
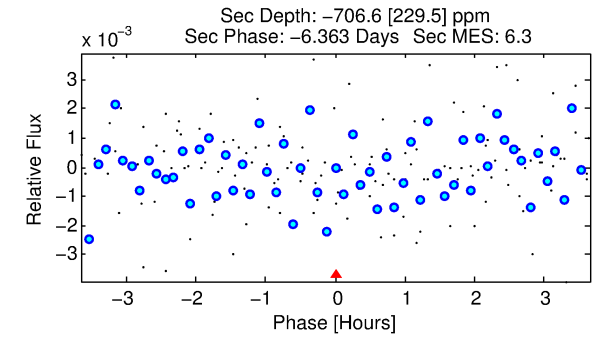
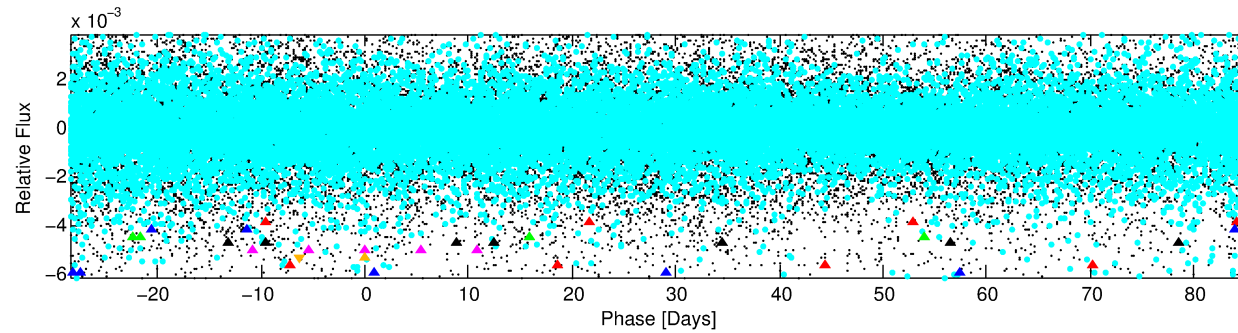
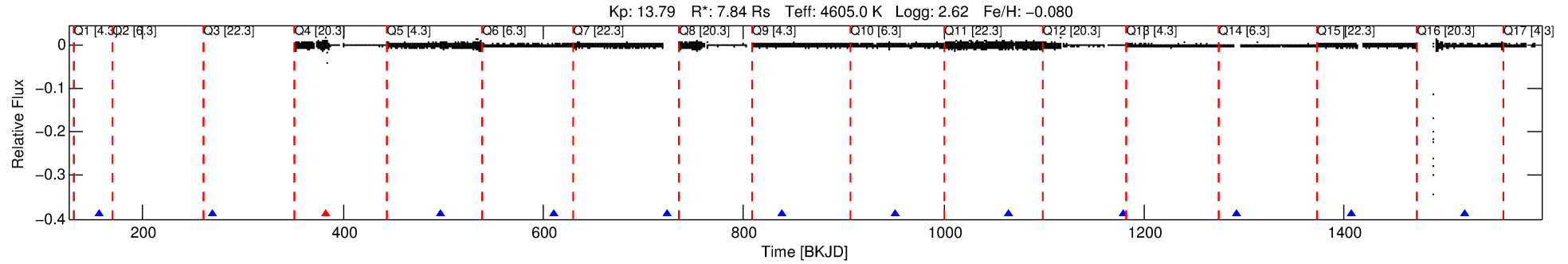
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 002970580-06

No Significant Match Found

# DV One-Page Summary

KIC: 2970580 Candidate: 6 of 8 Period: 113.695 d



## TPS TCE Results:

Period = 113.69488 d  
Epoch = 155.6758 BKJD

DV fit results are unavailable

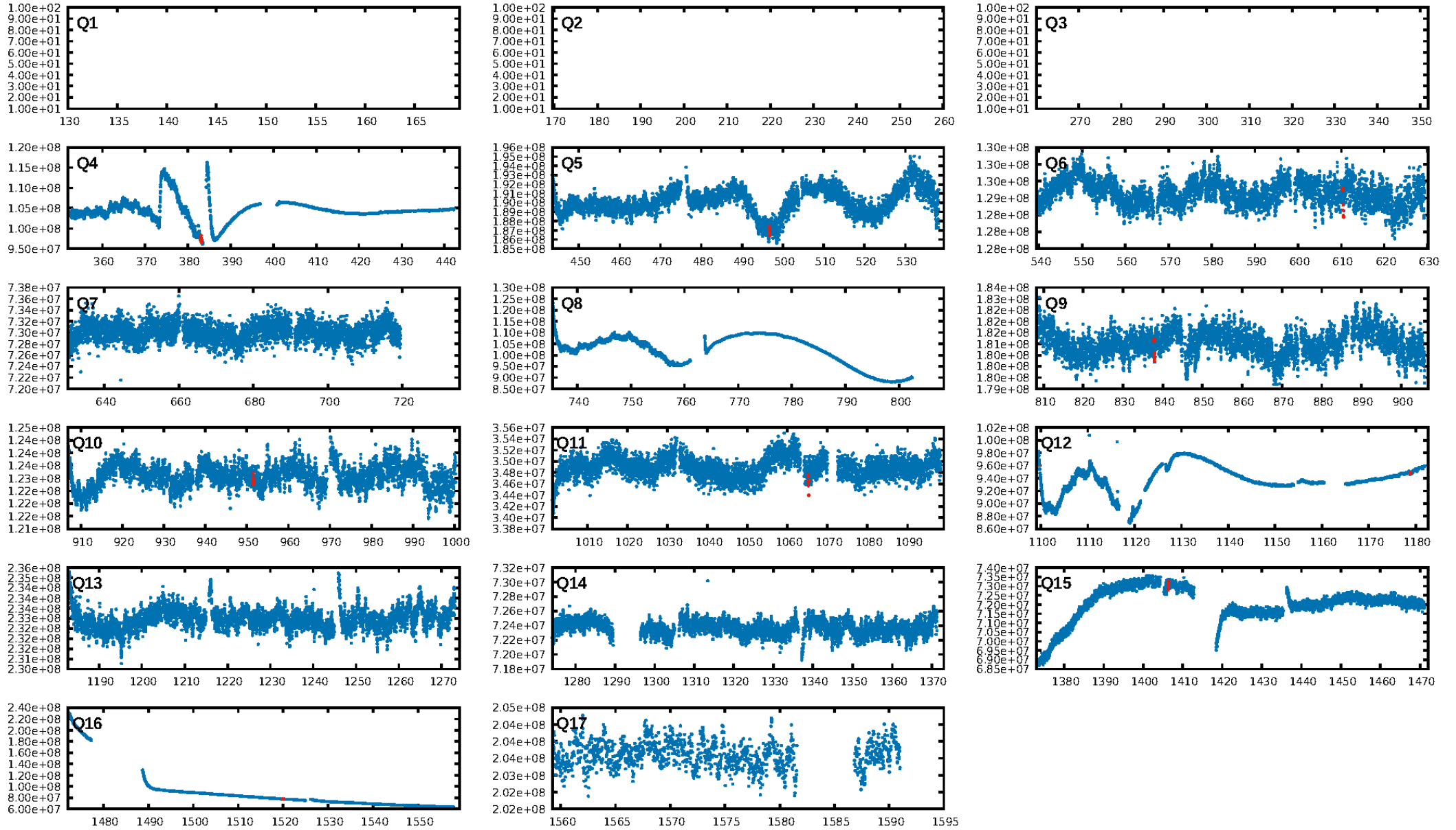
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 100.0% [836.95σ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: 4.97e-10  
RollingBand-fgt: 0.88 [7/8]  
GhostDiagnostic-chr: -0.3935  
Centroid-sig: 45.0%  
Centroid-so: 2.976 arcsec [0.79σ]  
OotOffset-rm: 2.600 arcsec [2.60σ]  
KicOffset-rm: 3.223 arcsec [5.04σ]  
OotOffset-st: 1/0/2/1 [4]  
KicOffset-st: 1/0/2/1 [4]  
DiffImageQuality-fgm: 0.50 [2/4]  
DiffImageOverlap-fno: 1.00 [6/6]

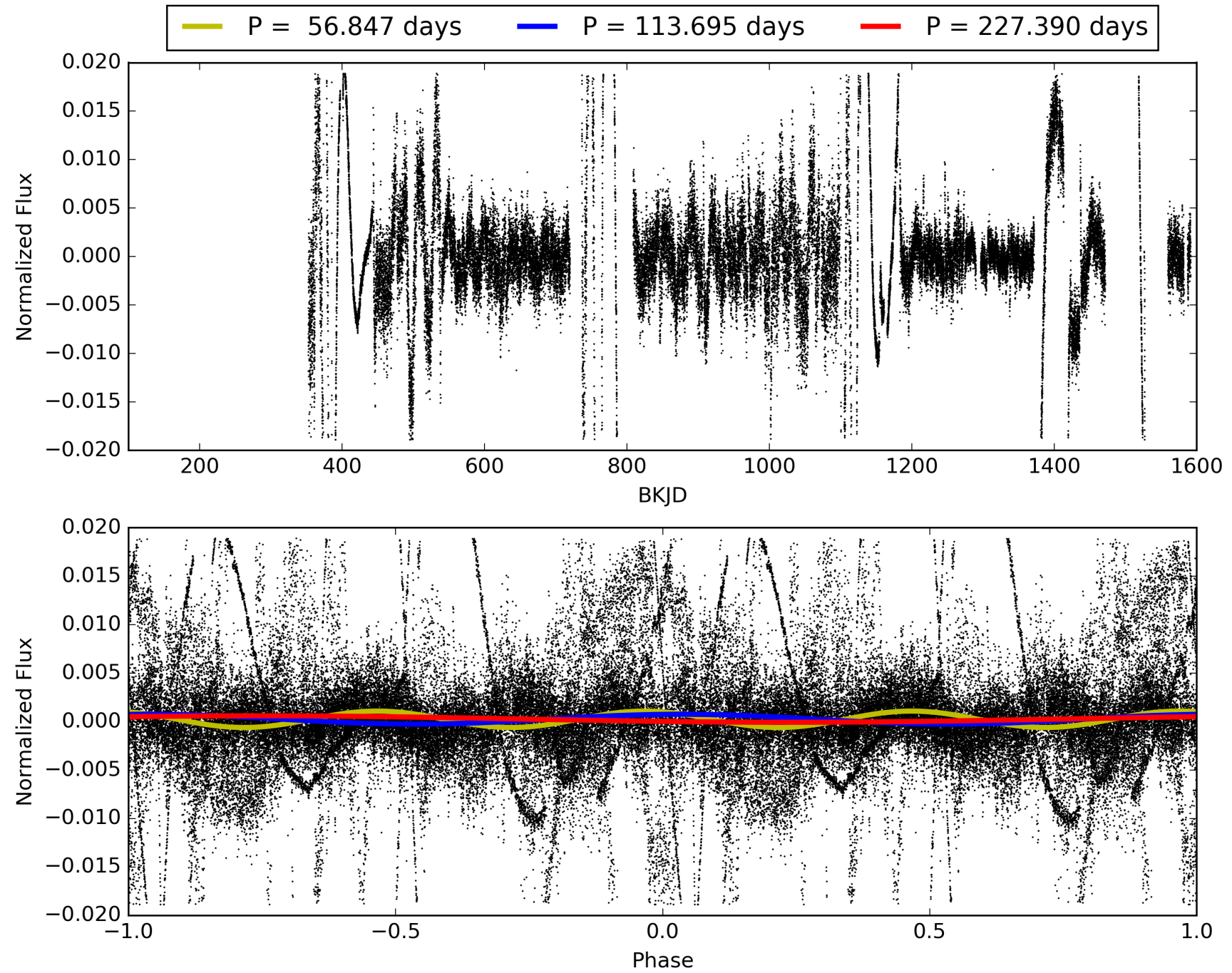
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 01-Feb-2016 22:41:39 Z

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

# TCE 002970580-06, PDC Light Curves

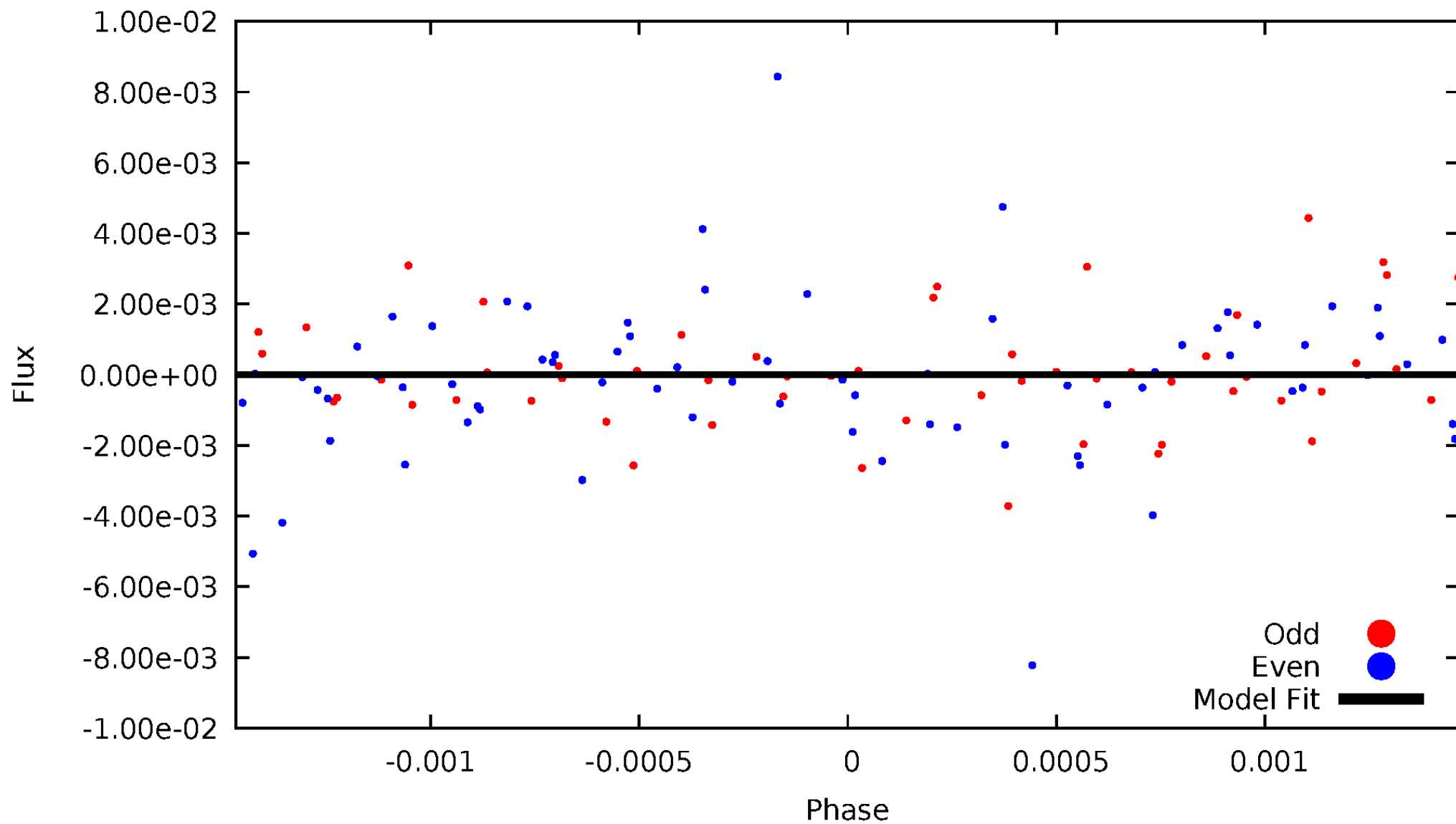


TCE 002970580-06



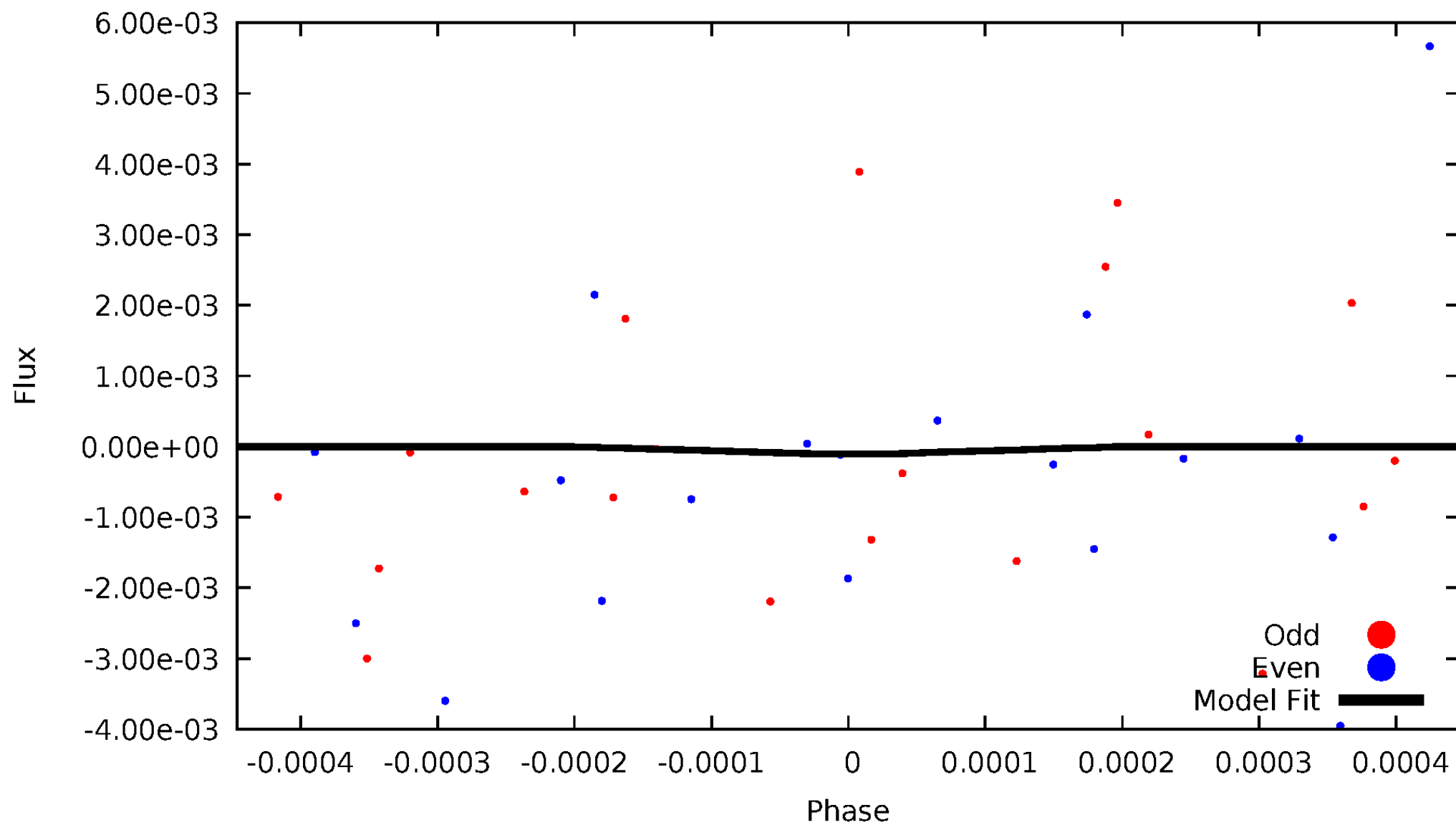
# DV Odd/Even

TCE 002970580-06



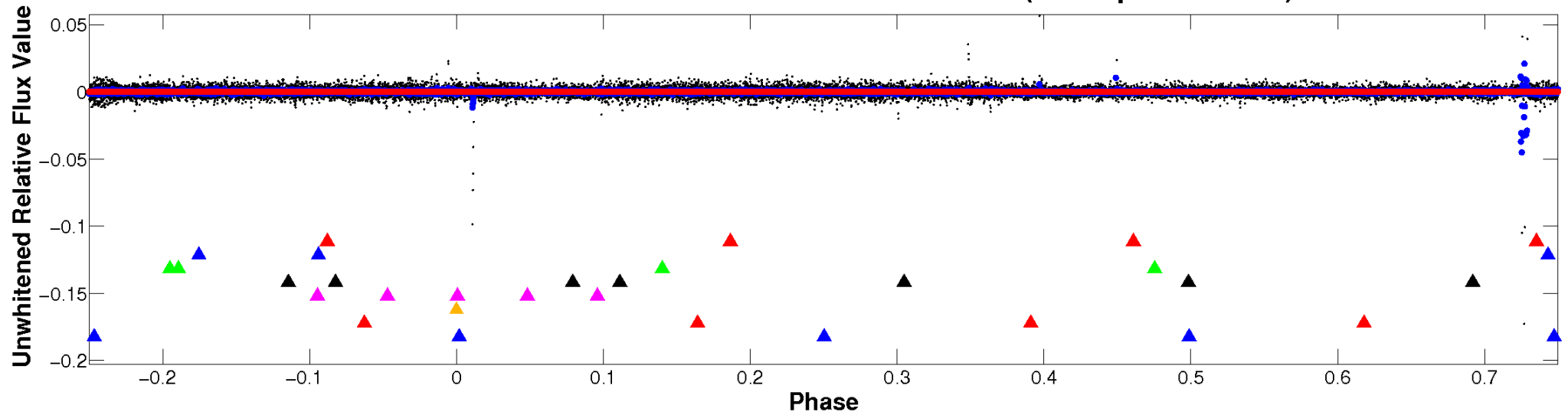
# ALT Odd/Even

TCE 002970580-06

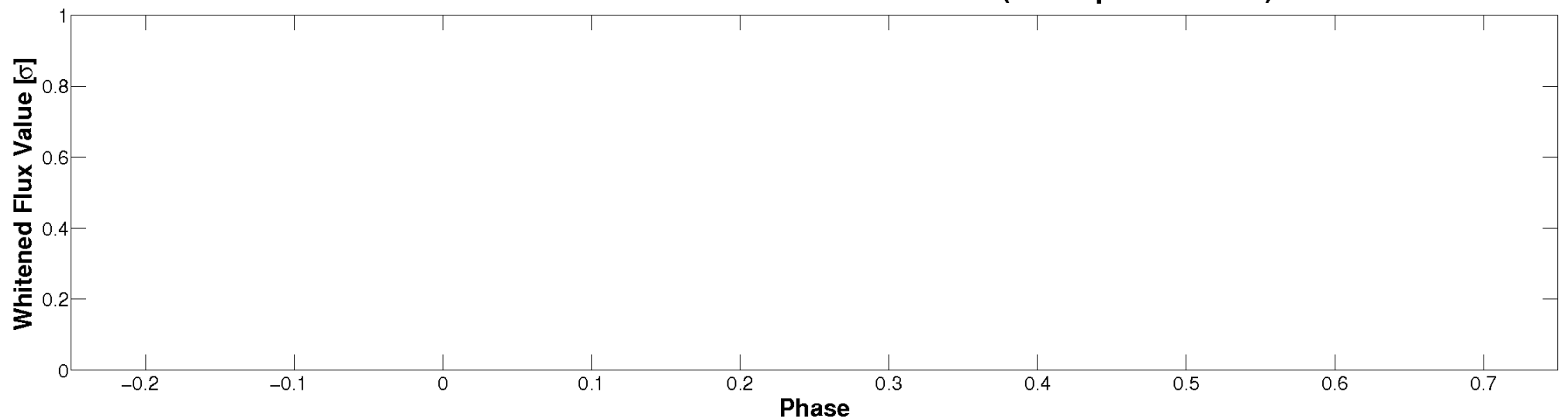


# Non-Whitened Vs. Whitened Light Curve

**Planet 6 : Phased Unwhitened Flux Time Series (TPS Epoch/Period)**

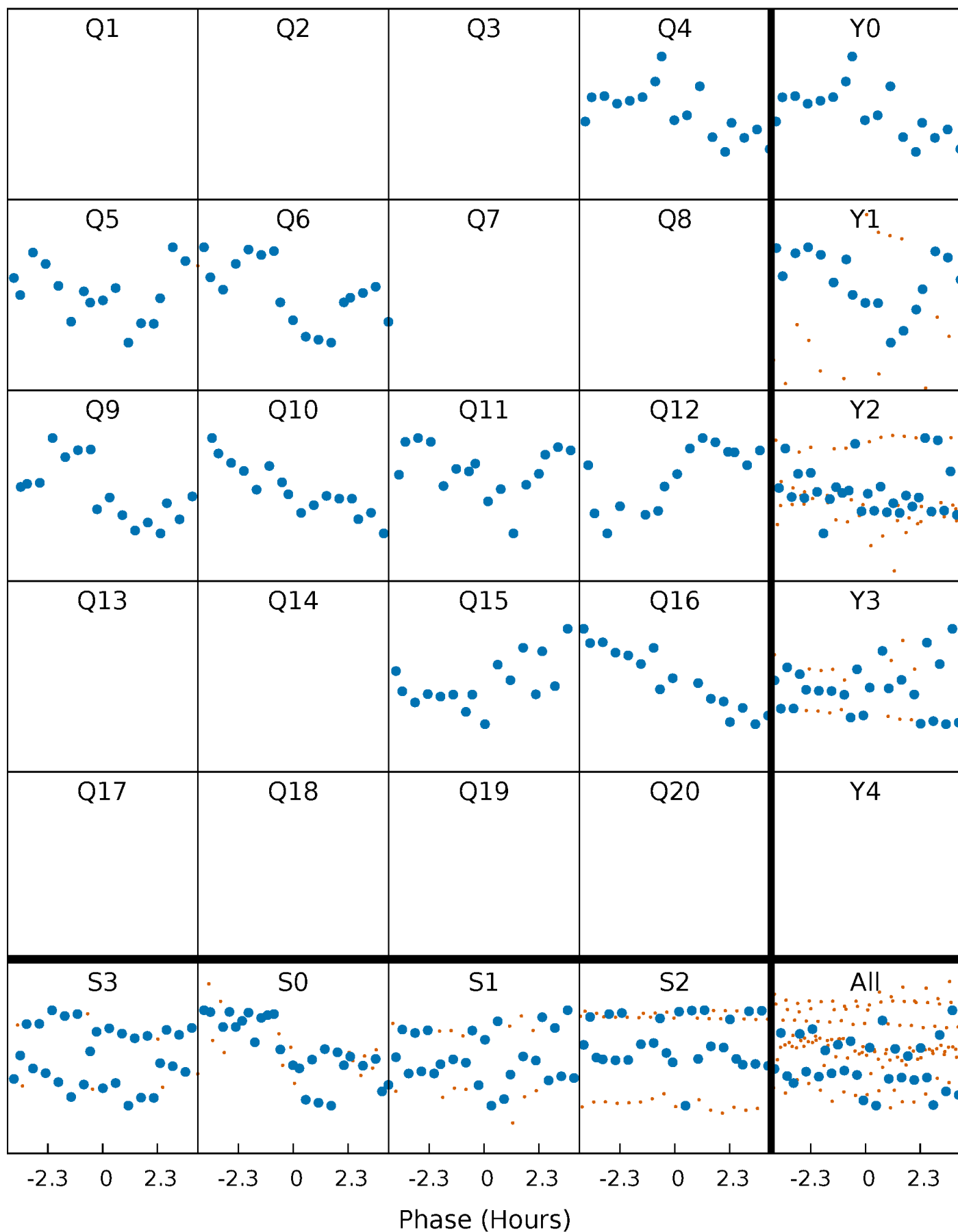


**Planet 6 : Phased Whitened Flux Time Series (TPS Epoch/Period)**



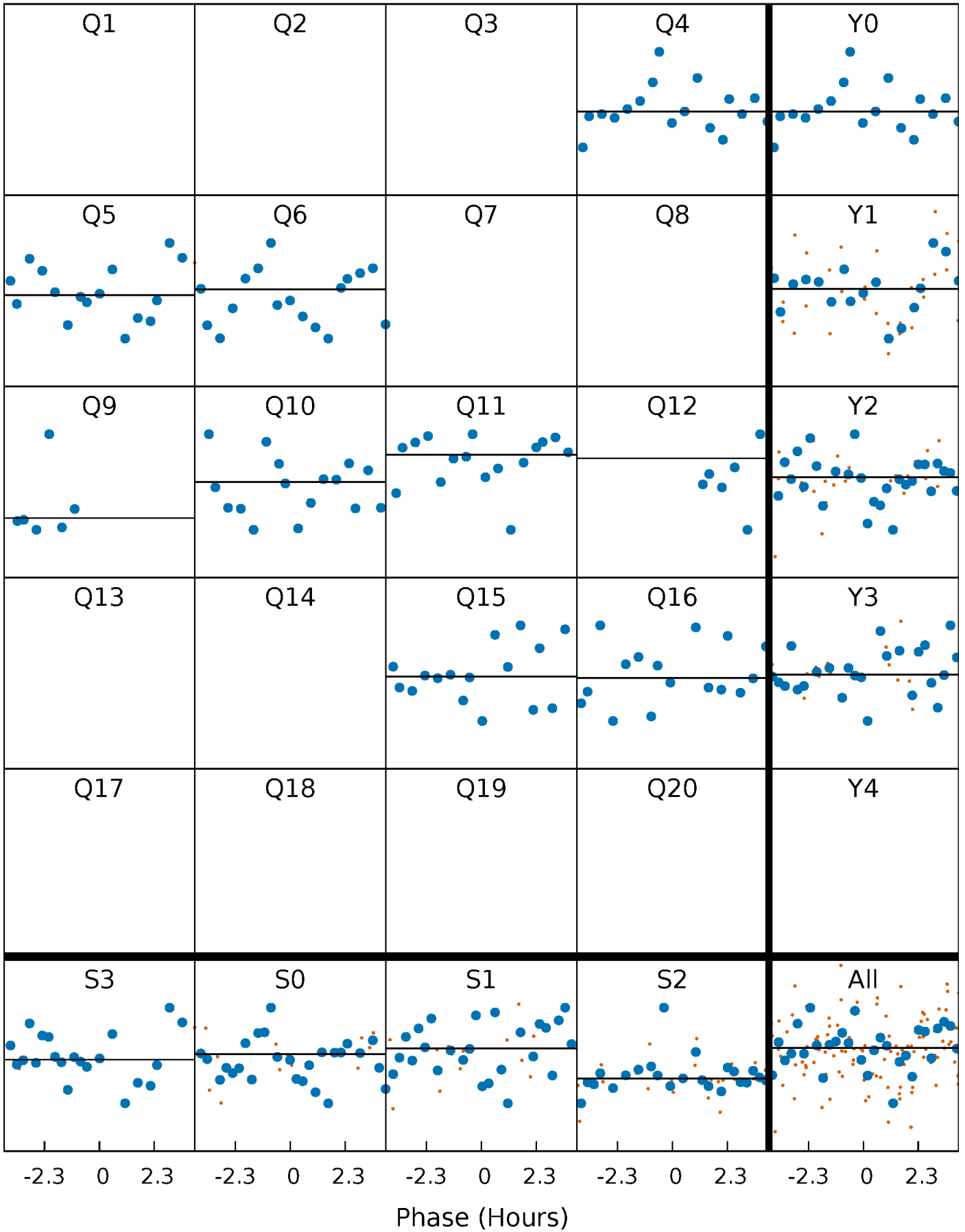
# PDC Quarter-Phased Transit Curves

TCE 002970580-06 P=113.694880 Days  $T_0=155.675783$  (BKJD)



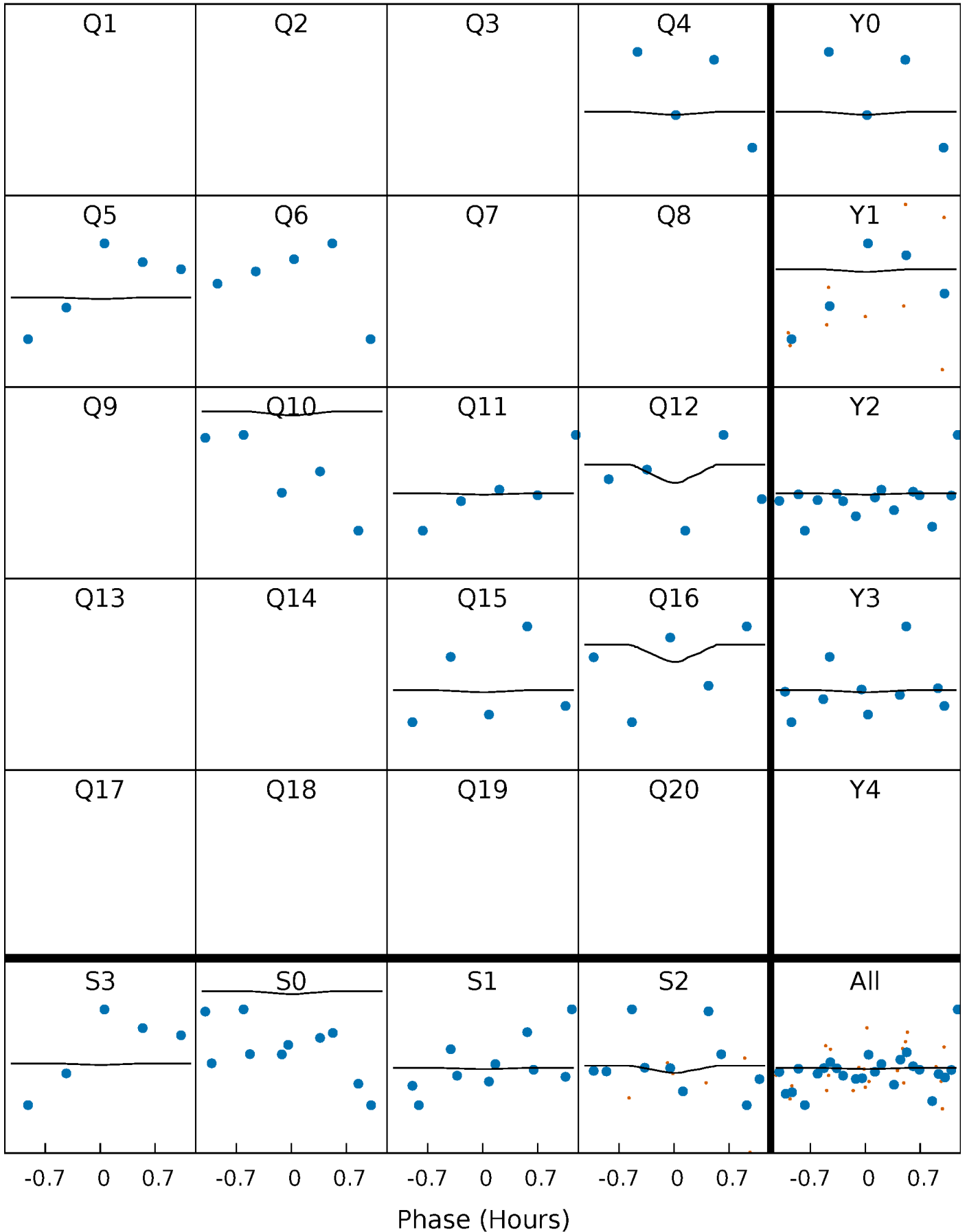
# DV Quarter-Phased Transit Curves

TCE 002970580-06     $P=113.694880$  Days     $T_0=155.675783$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

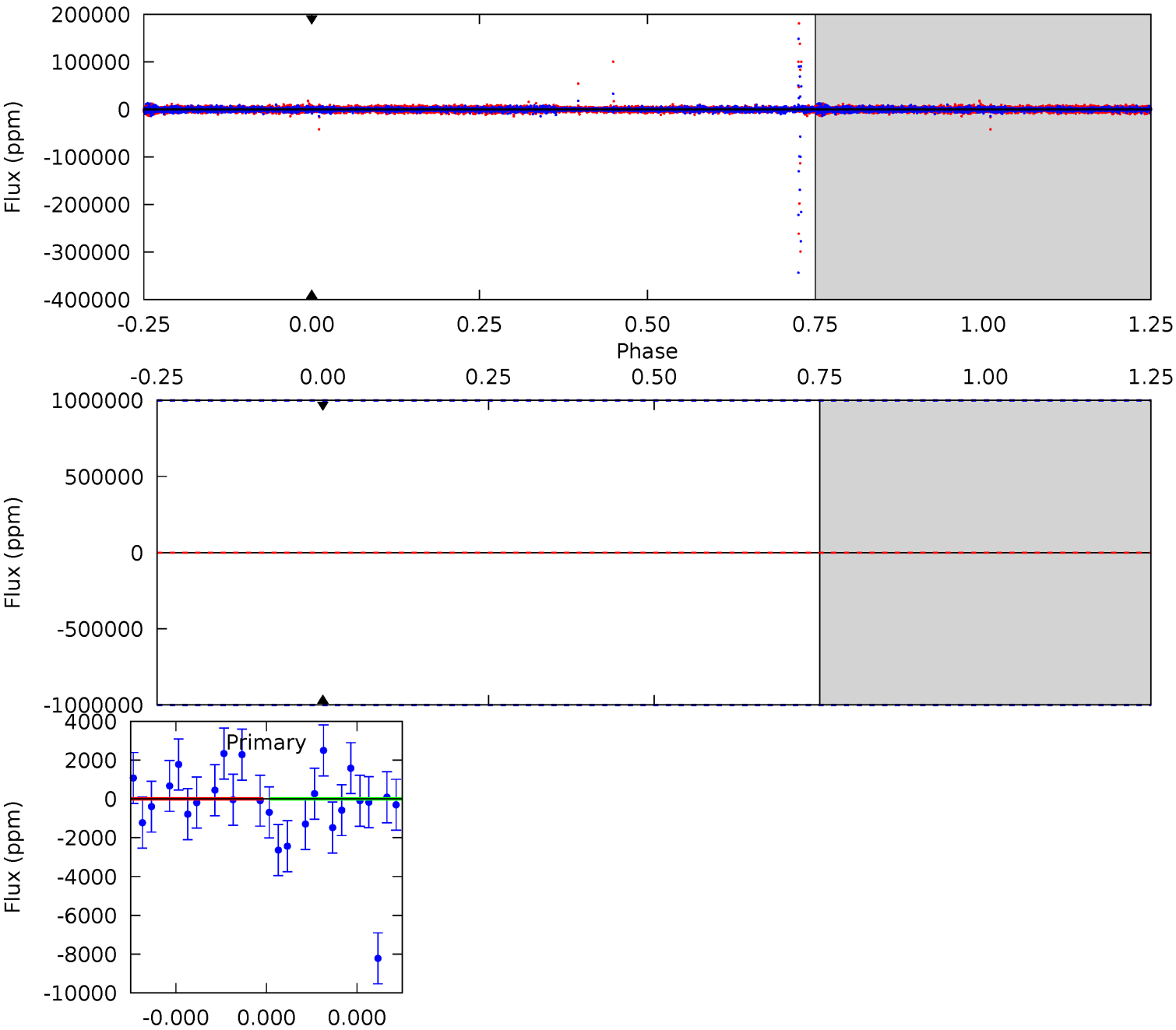
TCE 002970580-06     $P=113.694880$  Days     $T_0=155.800386$  (BKJD)



# DV Model-Shift Uniqueness Test

002970580-06, P = 113.694880 Days, E = 155.675783 Days

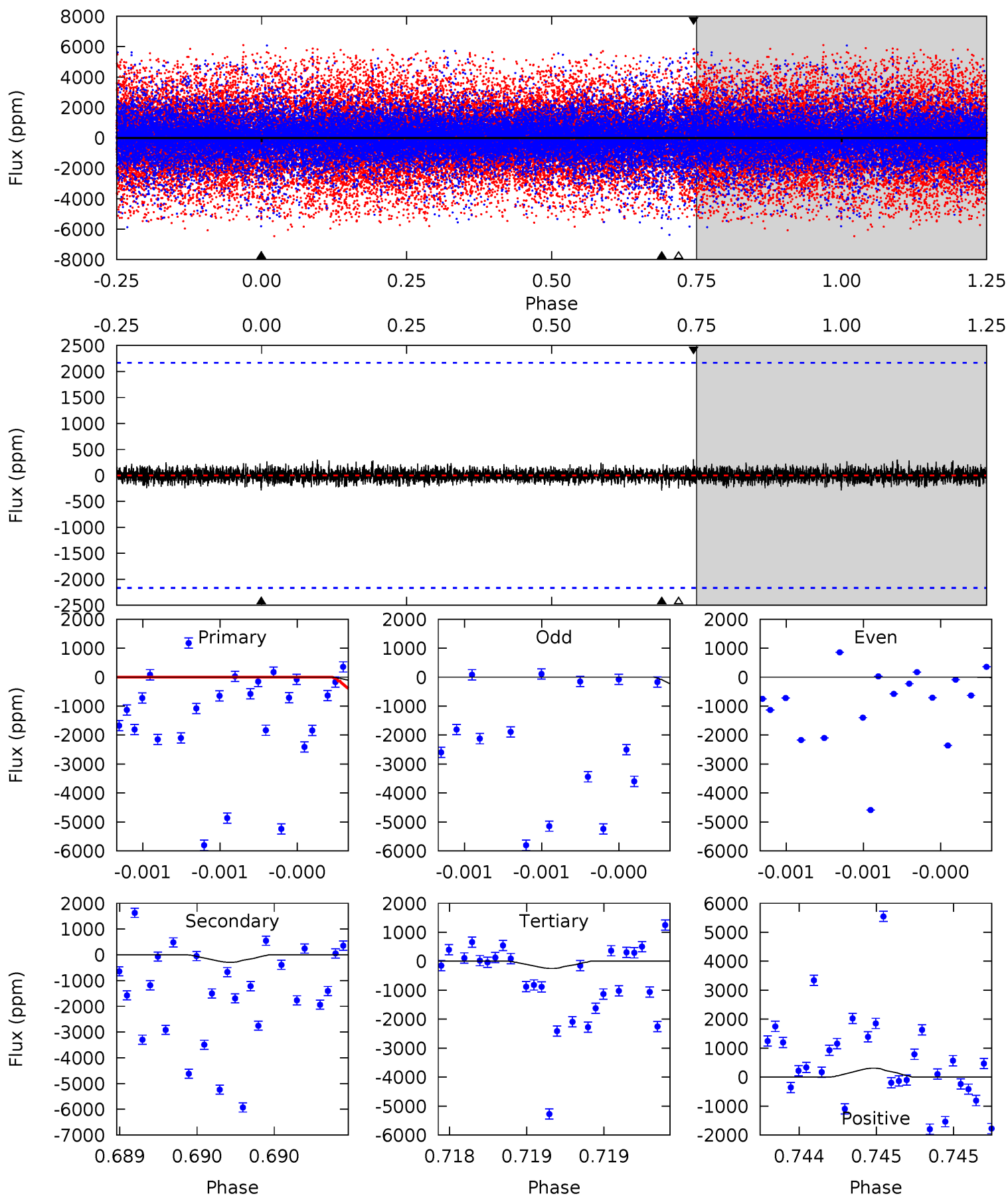
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
0	0	0	0	1.00	1.00	1.00	0	0	0	0	0	0	0	0



# Alt Model-Shift Uniqueness Test

002970580-06, P = 113.694880 Days, E = 155.800386 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
0.69	0.76	0.65	0.80	5.62	3.55	0.19	0.04	-0.11	0.11	-0.04	0.71	1.30	0.51	0.65



### Stellar Parameters For KIC 002970580

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$4605^{+69}_{-48}$	$2.619^{+0.120}_{-0.120}$	$-0.080^{+0.150}_{-0.100}$	$7.844^{+2.620}_{-0.936}$	$0.934^{+0.427}_{-0.022}$	$0.003^{+0.001}_{-0.001}$
	+1%/-1%	+5%/-5%	+188%/-125%	+33%/-12%	+46%/-2%	+48%/-45%
Source	SPE74	SPE74	SPE74	DSEP		

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

### Secondary Eclipse Parameters for KIC 002970580-06 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$0 \pm 1000000$	$74.27^{+74.61}_{-51.81}$	$1182^{+62}_{-49}$	$3960^{+8454}_{-13602}$	$56^{+4967}_{-2755}$
Alt.	$-294 \pm 385$	$61.38^{+65.43}_{-44.22}$	$1182^{+67}_{-44}$	$2752^{+1371}_{-5036}$	$6.293^{+82.944}_{-7.281}$

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

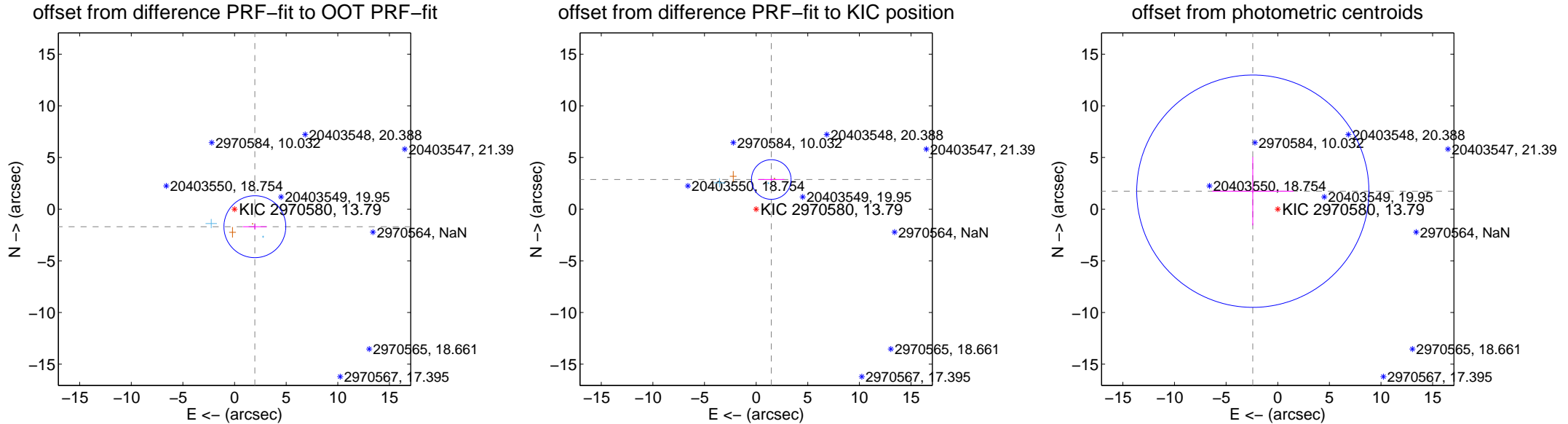
## DV Centroid Data

Supplemental centroid analysis for 002970580-06. Kepler magnitude: 13.79. Transit SNR -1.00

There are 2 quarters with good PRF difference image offsets

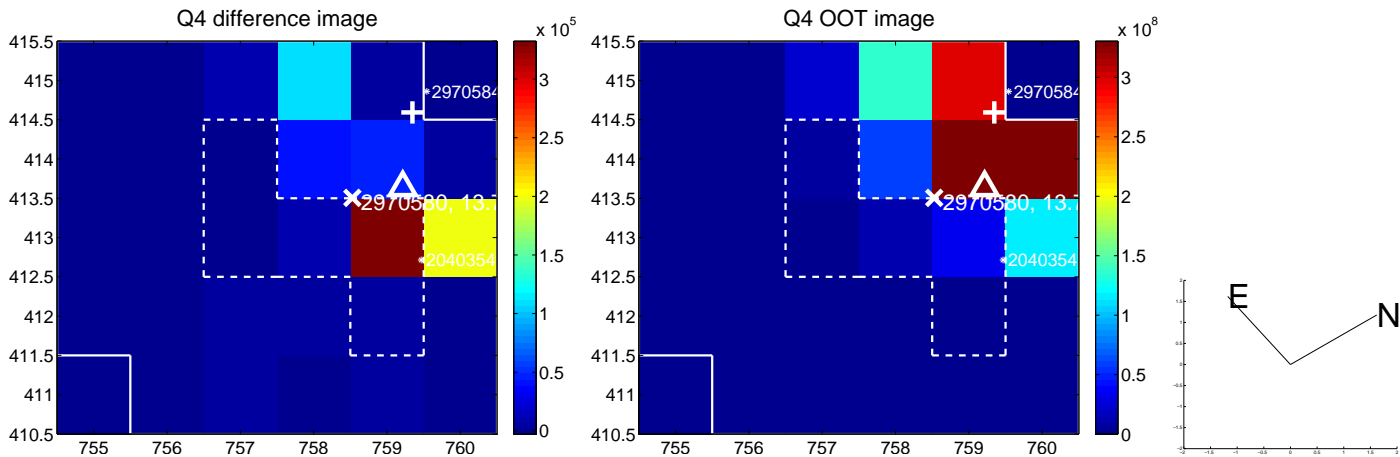
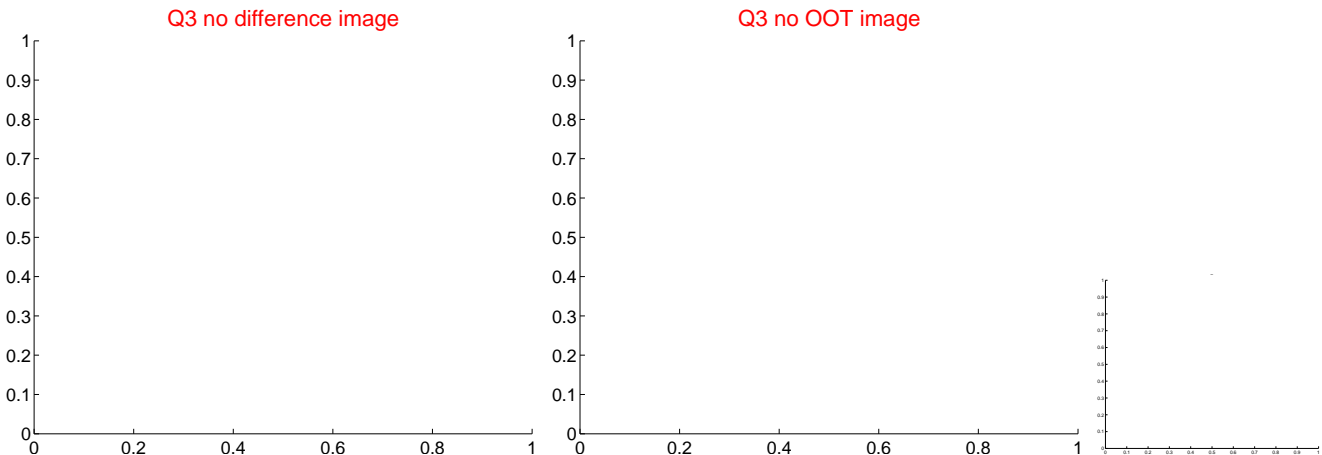
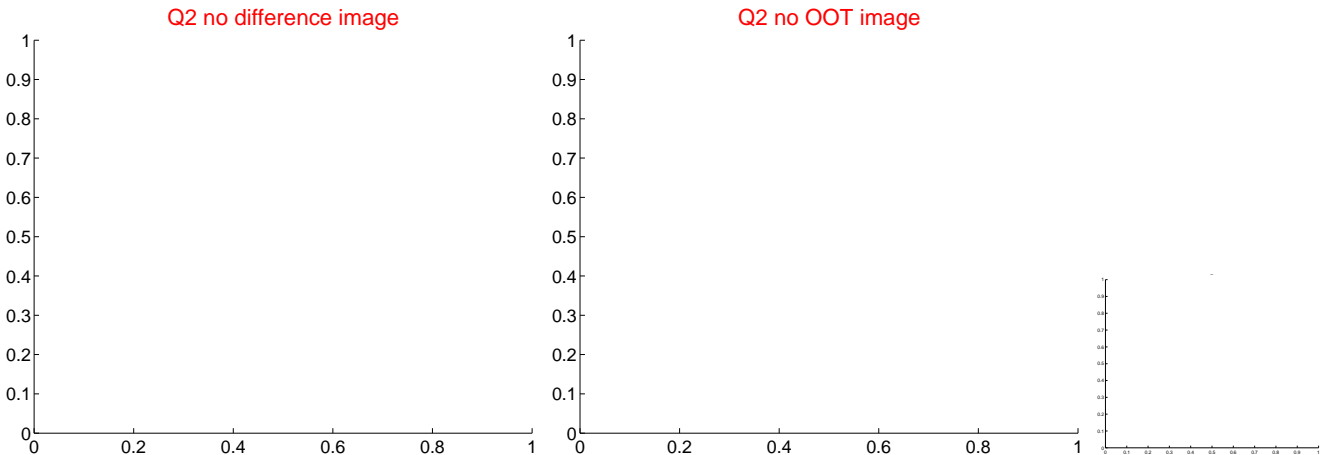
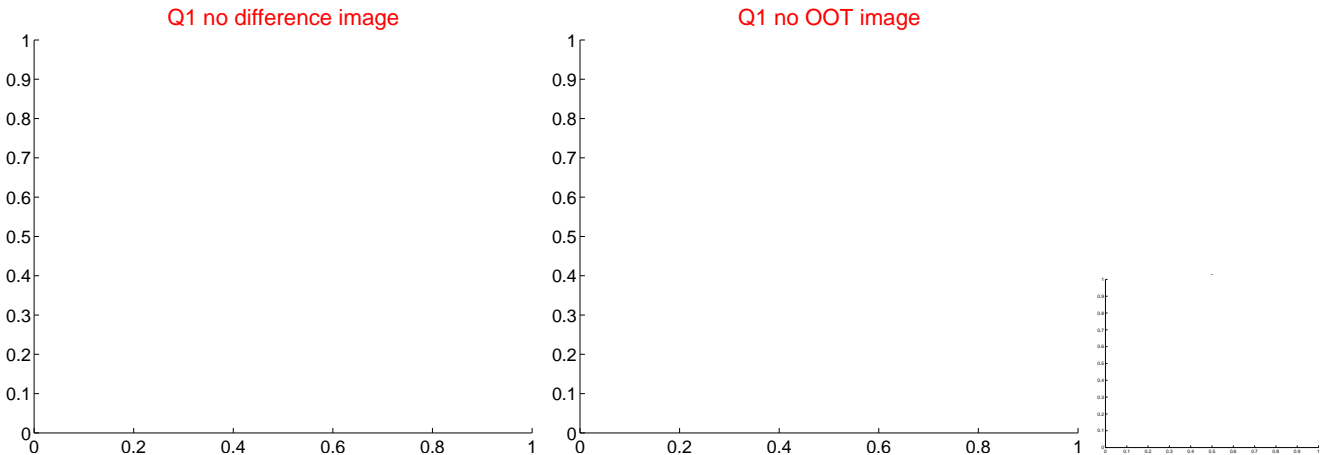
The OOT PRF centroid is offset from the target star catalog position by about 5.79 arcsec so the offset from difference PRF-fit to OOT-fit may be invalid.

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$2.600 \pm 0.999$	2.60	$-1.969 \pm 1.155$	$-1.698 \pm 0.275$
PRF-fit source offset from KIC position	<b><math>3.223 \pm 0.639</math></b>	<b>5.04</b>	$-1.466 \pm 1.259$	$2.870 \pm 0.146$
photometric centroid source offset	$2.98 \pm 3.75$	0.79	$2.42 \pm 3.96$	$1.74 \pm 3.31$

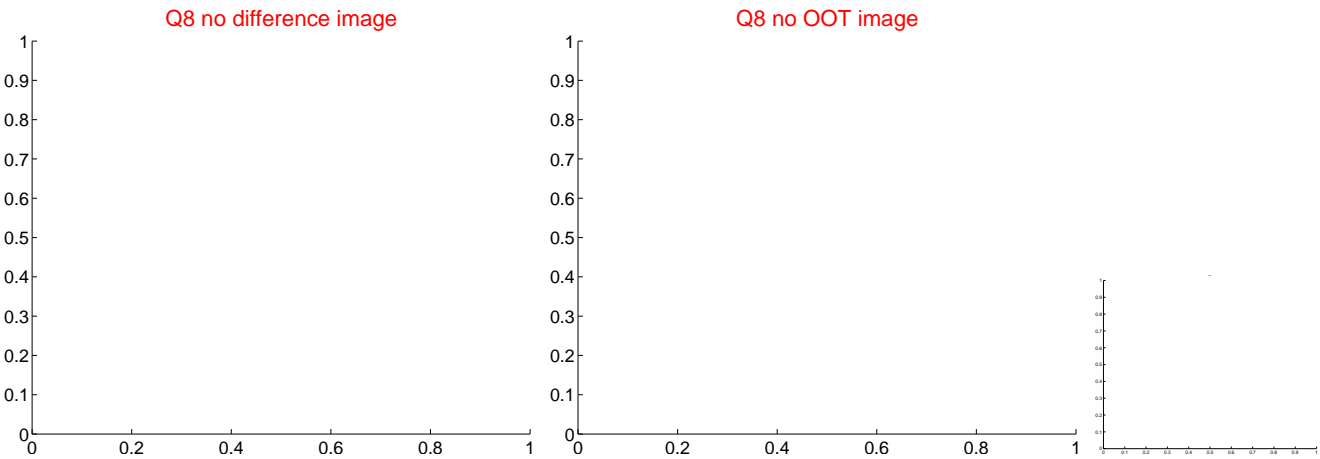
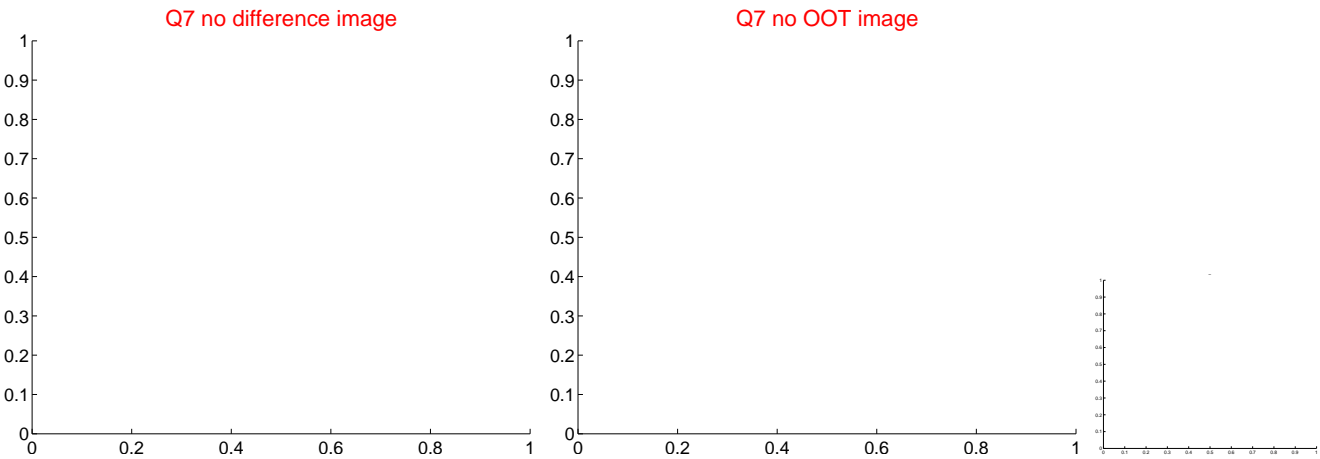
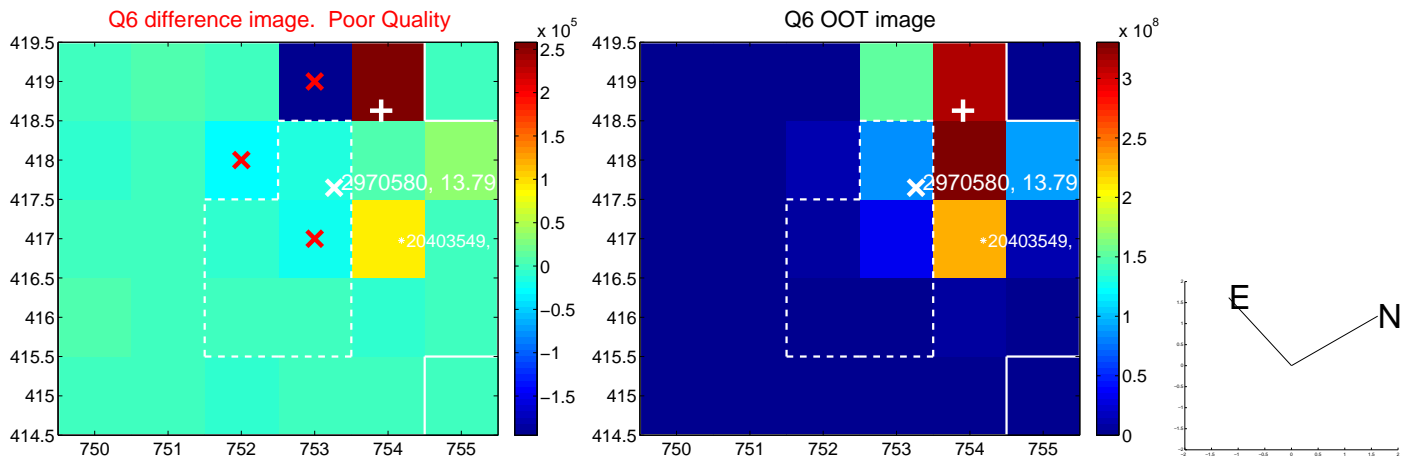
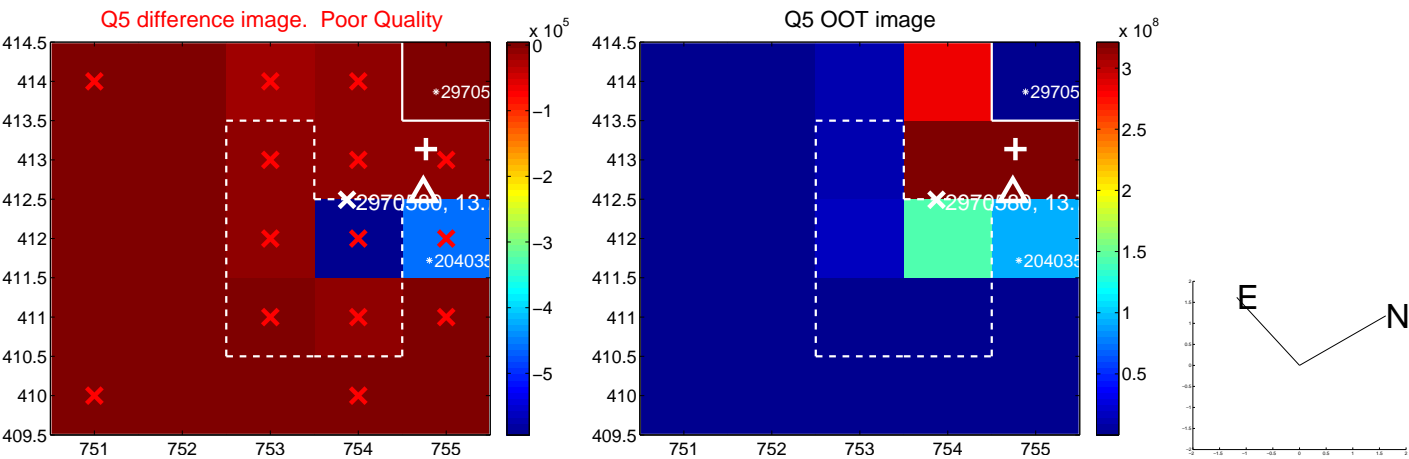


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets**; **Vermillion crosses: bad quarterly centroid offsets**; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

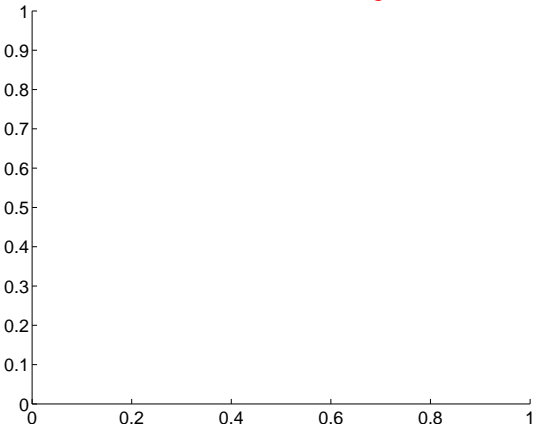


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

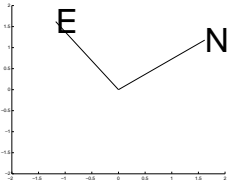
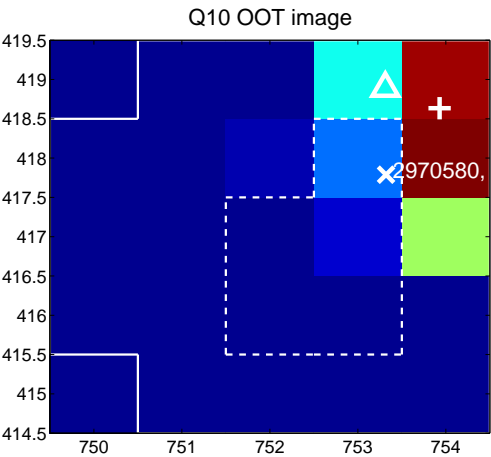
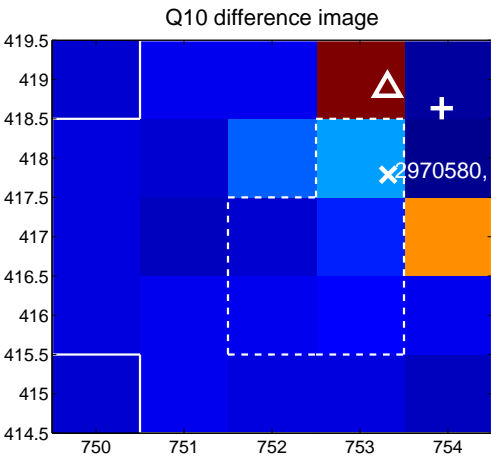
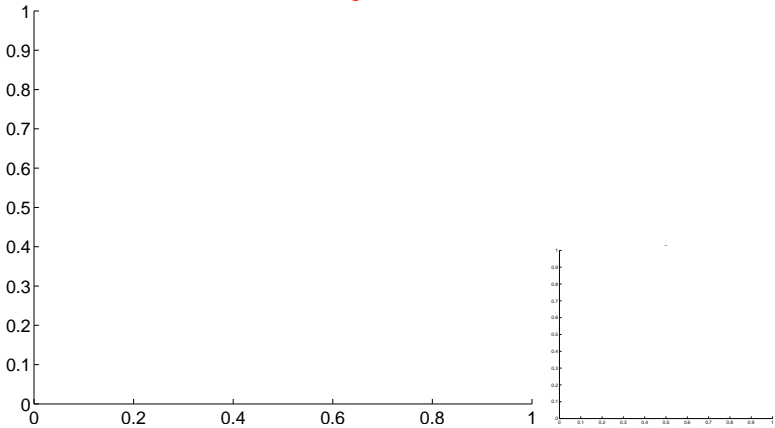


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

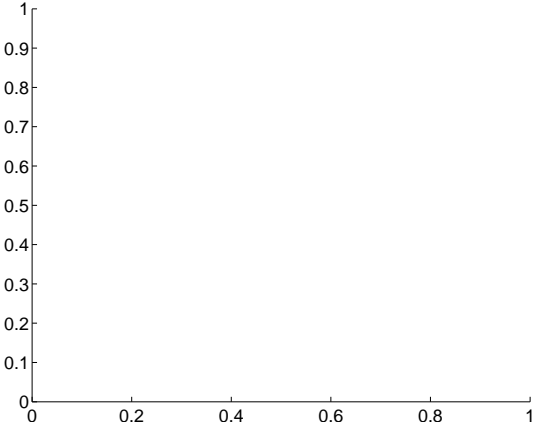
Q9 no difference image



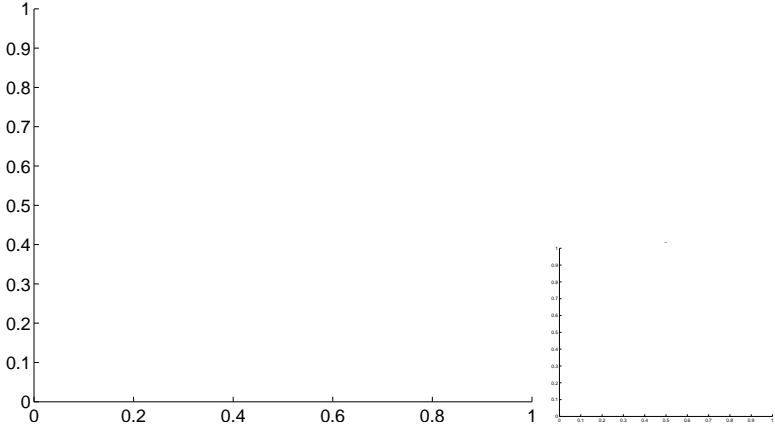
Q9 no OOT image



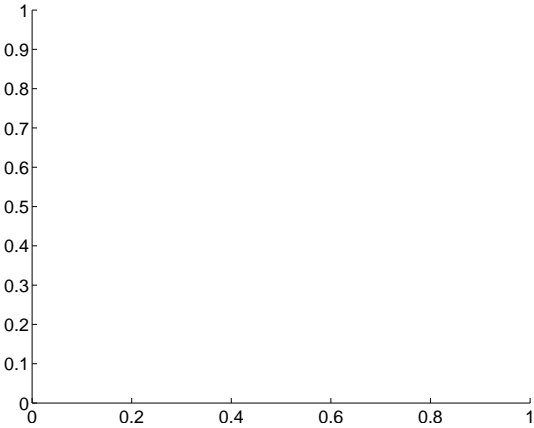
Q11 no difference image



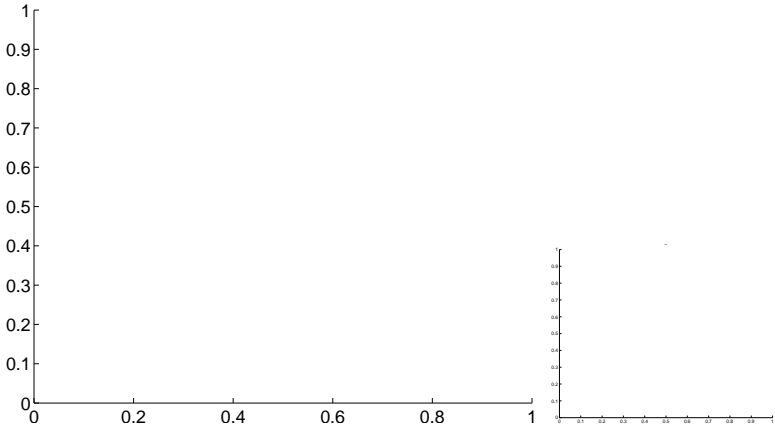
Q11 no OOT image



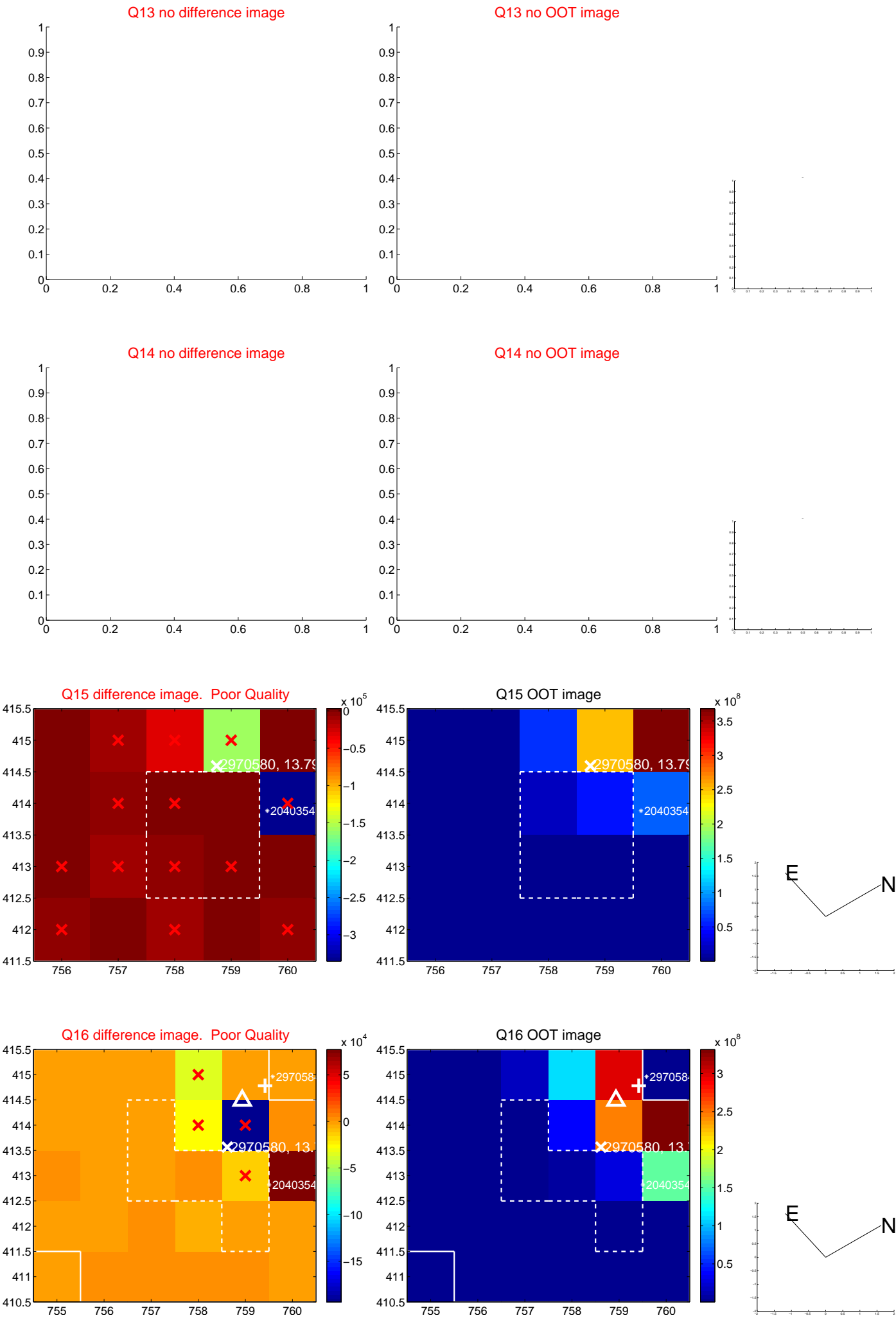
Q12 no difference image



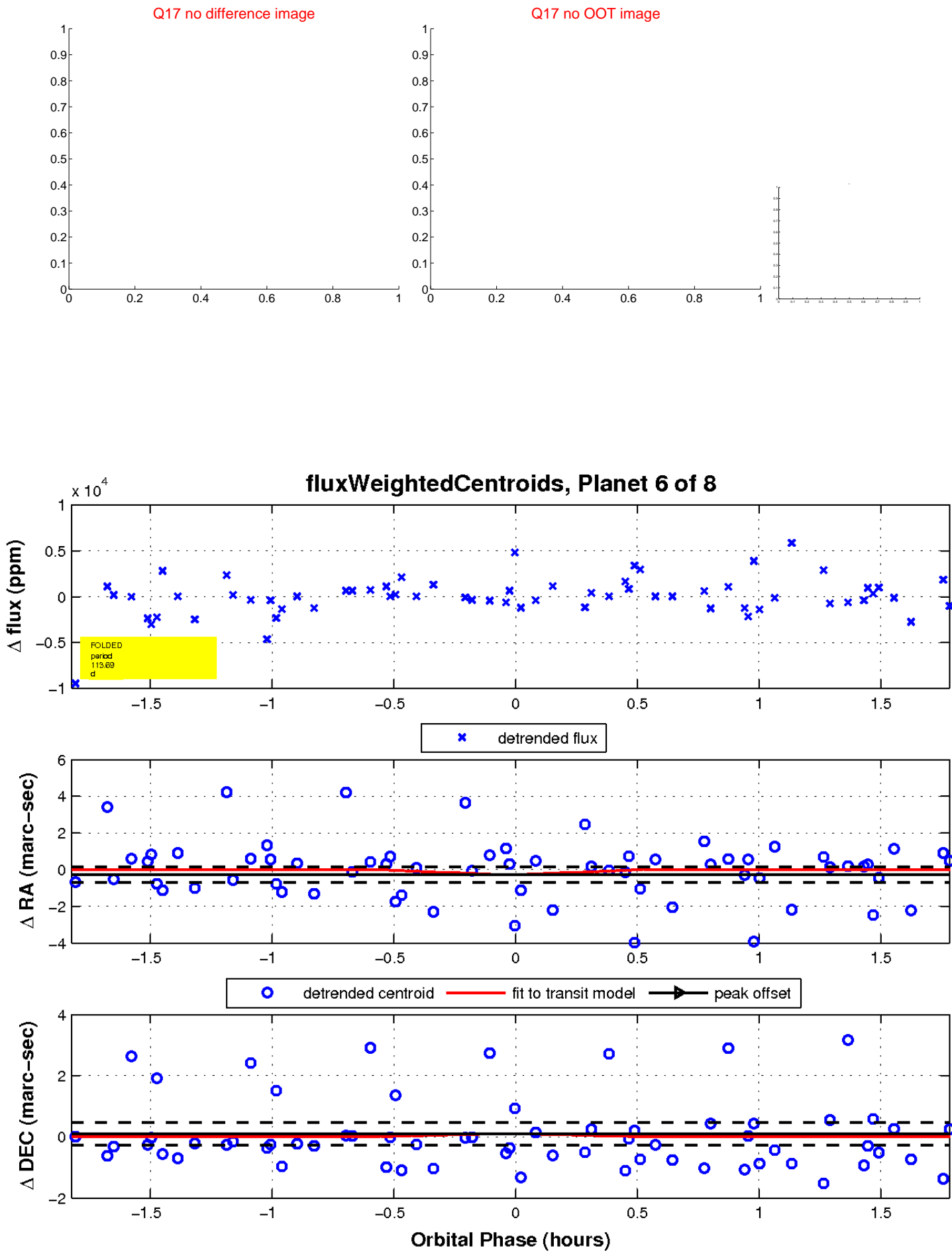
Q12 no OOT image



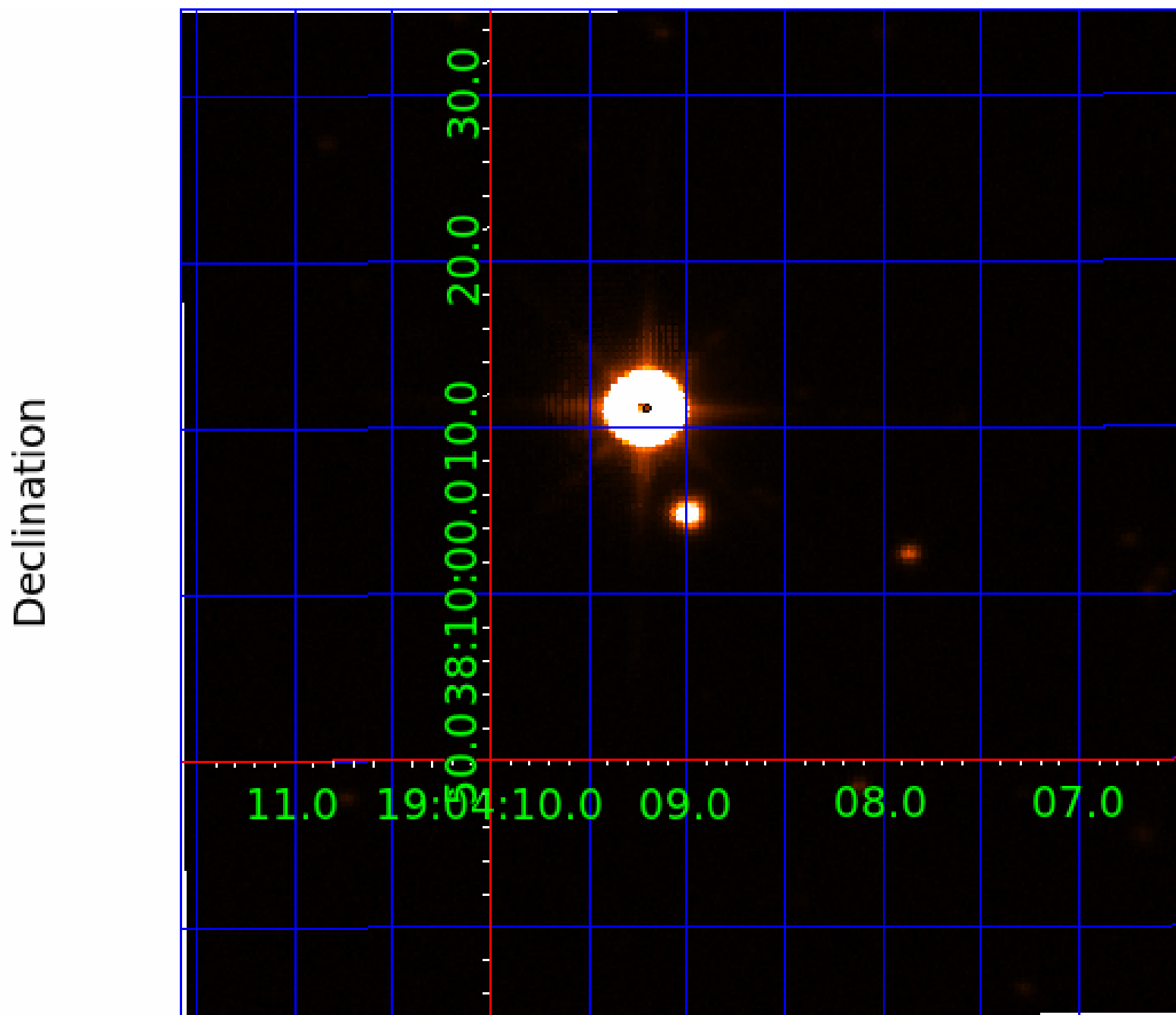
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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



UKIRT Image



# KIC 002970580

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
002970580-02	OBS	No	559.218859	372.381799	2714.0	15.000	60.2	-1.0	7.84	4605	39.14	14.70
002970580-03	OBS	No	379.202643	360.883809	2067.1	10.177	13.5	5.7	7.84	4605	39.78	24.68
002970580-04	OBS	No	205.380057	278.372111	4114.7	1.706	14.2	7.4	7.84	4605	53.87	55.90
002970580-05	OBS	No	346.501959	144.918492	3227.9	1.526	13.2	8.4	7.84	4605	45.84	27.83
002970580-06	OBS	No	113.694880	155.675783	1876.7	2.000	14.9	-1.0	7.84	4605	32.66	122.98
002970580-07	OBS	No	366.881381	375.936823	9283.1	31.023	10.6	12.2	7.84	4605	76.30	25.79
002970580-08	OBS	No	312.830992	240.650043	321.9	12.000	8.4	-1.0	7.84	4605	13.48	31.90

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
002970580-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_CHASES_SKYE—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—INCONSISTENT_TRANS—CENT_NOFITS
002970580-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES—LPP_DV—ALL_TRANS_CHASES—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS
002970580-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS
002970580-05	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL_TRACKER—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_KIC_POS
002970580-06	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_NOFITS
002970580-07	OBS	FP	0.00	1	0	0	0	LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS
002970580-08	OBS	FP	0.00	1	0	1	0	INDIV_TRANS_RUBBLE_MARSHALL—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—CENT_NOFITS—HALO_GHOST

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

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

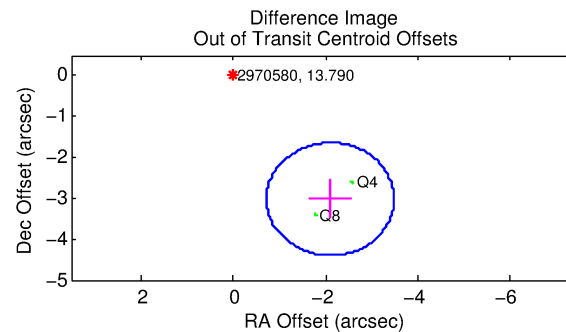
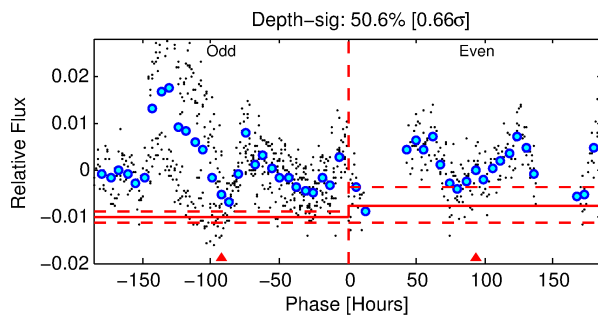
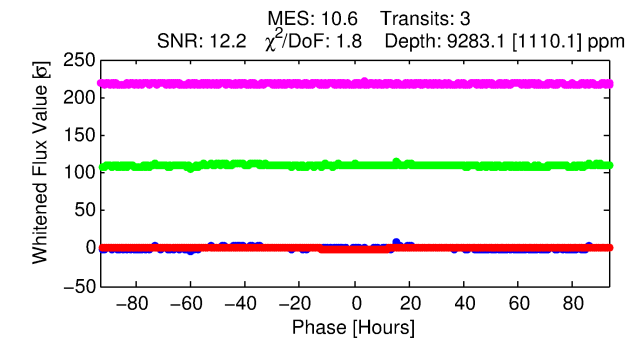
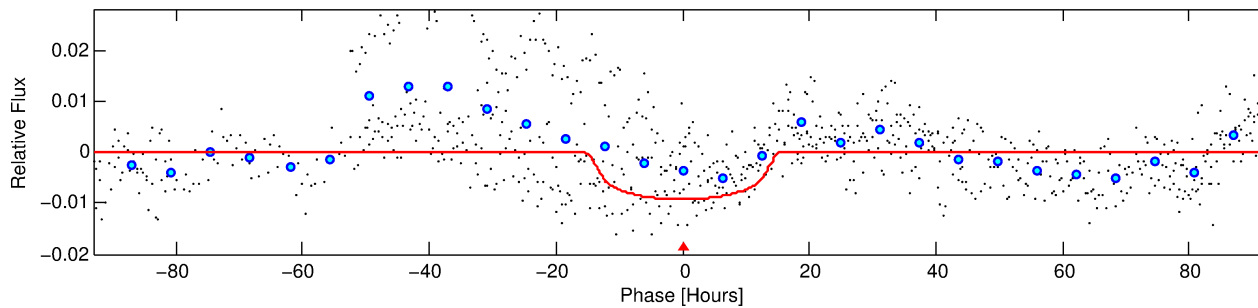
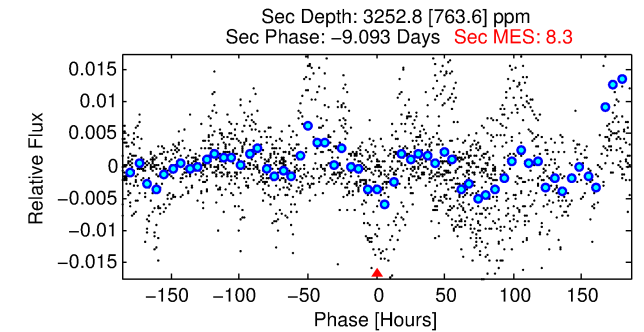
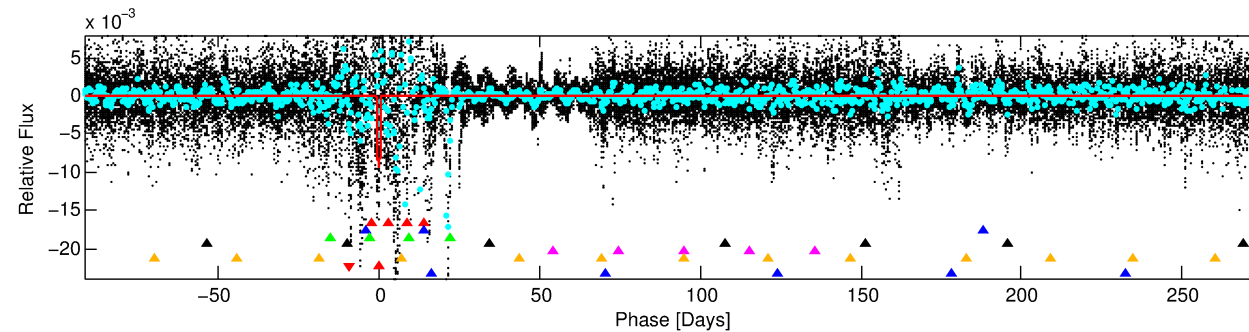
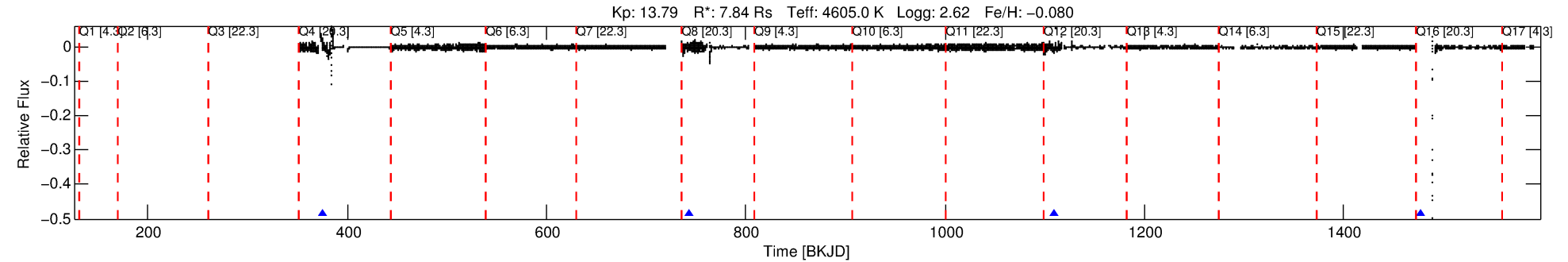
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 002970580-07

No Significant Match Found

# DV One-Page Summary

KIC: 2970580 Candidate: 7 of 8 Period: 366.881 d



## DV Fit Results:

Period = 366.88138 [0.02618] d  
Epoch = 375.9368 [0.0371] BKJD  
Rp/R\* = 0.0891 [0.0121]  
a/R\* = 86.06 [30.33]  
b = 0.53 [0.49]  
Seff = 25.79 [7.61]  
Teff = 575 [42] K  
Rp = 76.30 [27.50] Re  
a = 0.9804 [0.2363] AU  
Ag = 295.47 [136.08] [2.16σ]  
Teffp = 3684 [335] K [9.21σ]

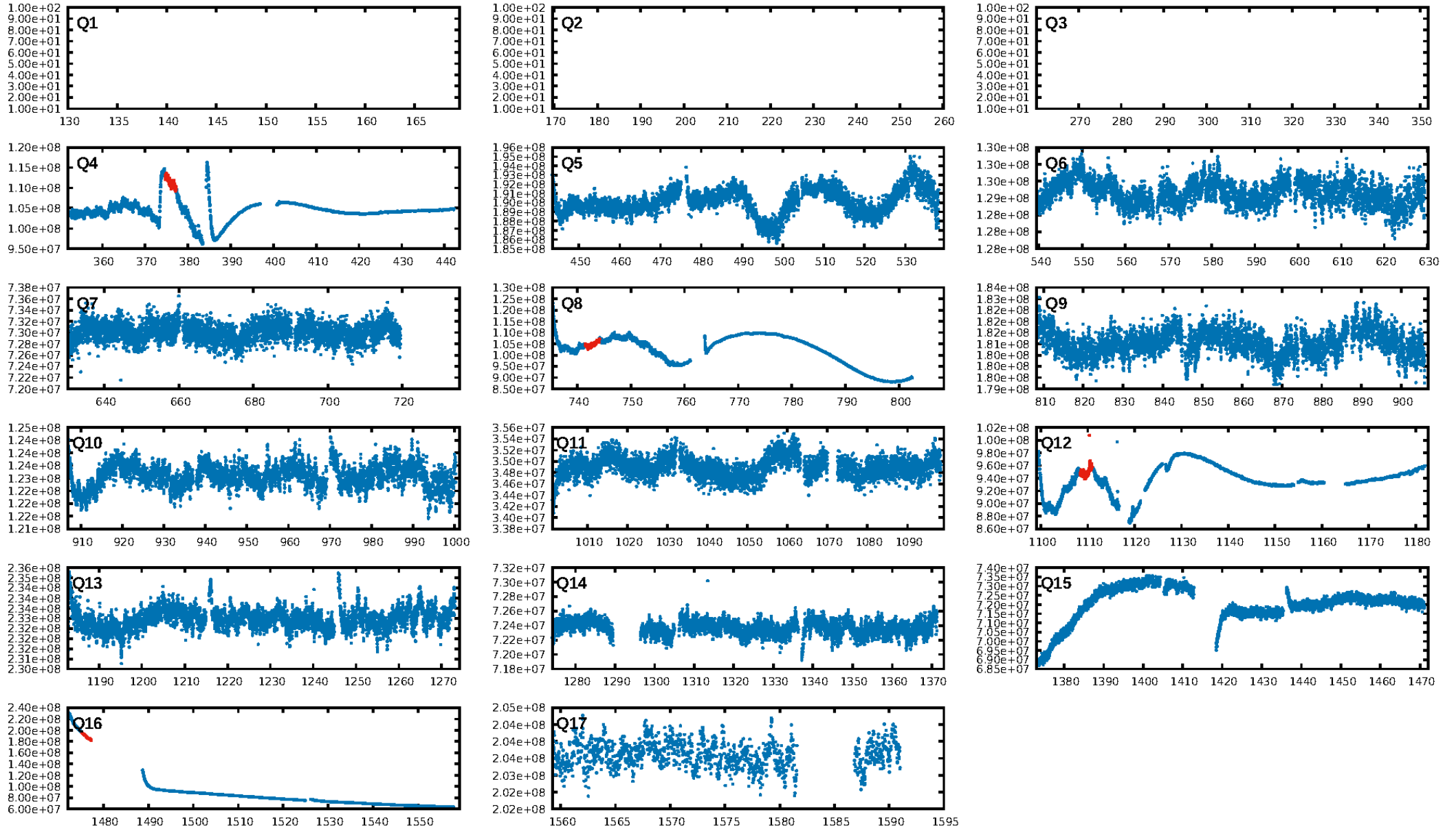
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [15.75σ]  
LongPeriod-sig: 100.0% [3.96σ]  
ModelChiSquare2-sig: 3.0%  
ModelChiSquareGof-sig: 80.5%  
Bootstrap-pfa: 1.43e-05  
RollingBand-fgt: 1.00 [3/3]  
GhostDiagnostic-chr: 1.142  
Centroid-sig: 3.5%  
Centroid-so: 2.483 arcsec [21.41σ]  
OotOffset-rm: 3.679 arcsec [8.00σ]  
KicOffset-rm: 2.239 arcsec [4.80σ]  
OotOffset-st: 0/0/2/0 [2]  
KicOffset-st: 0/0/2/0 [2]  
DiffImageQuality-fgm: 1.00 [2/2]  
DiffImageOverlap-fno: 1.00 [2/2]

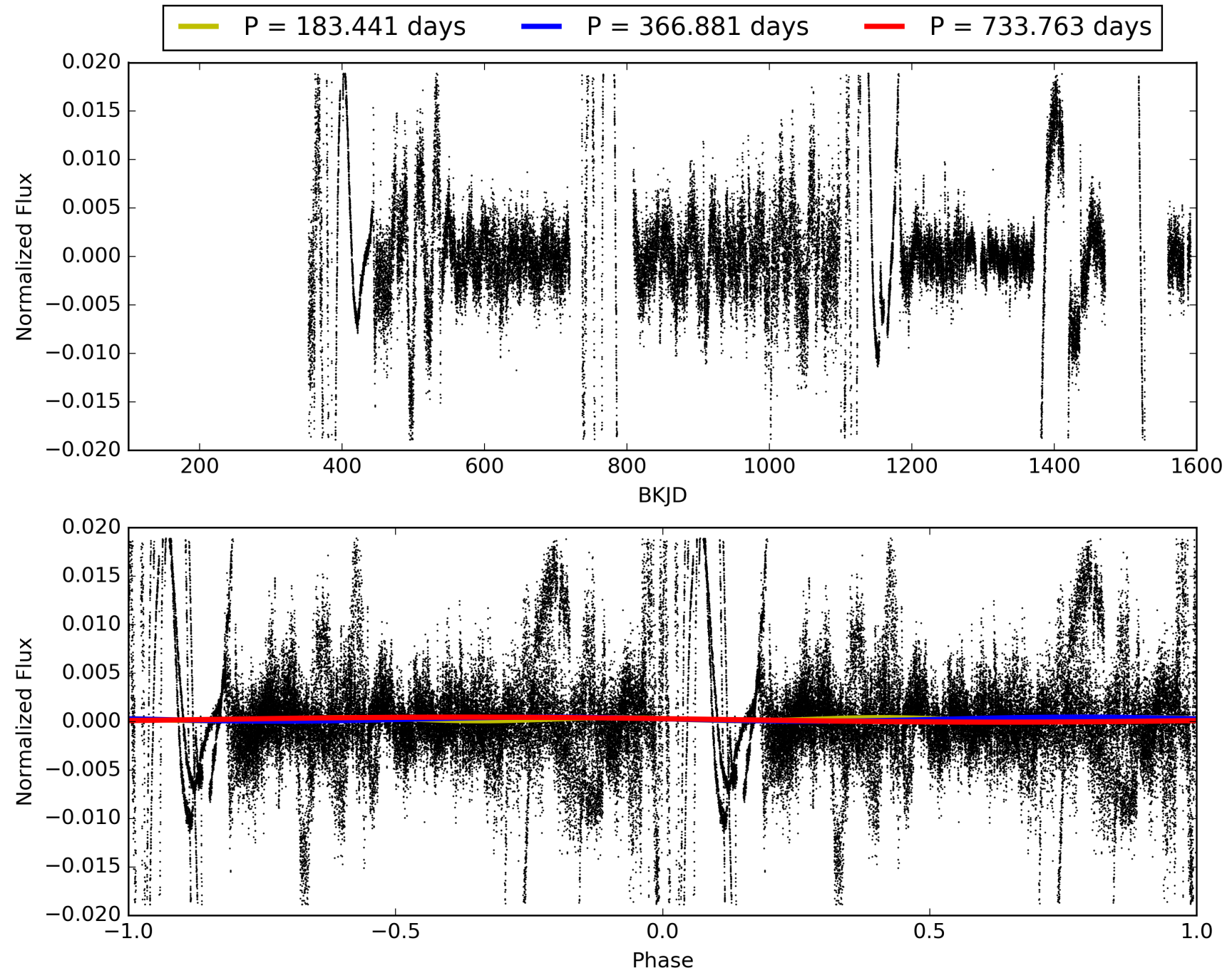
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 01-Feb-2016 22:41:46 Z

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

# TCE 002970580-07, PDC Light Curves

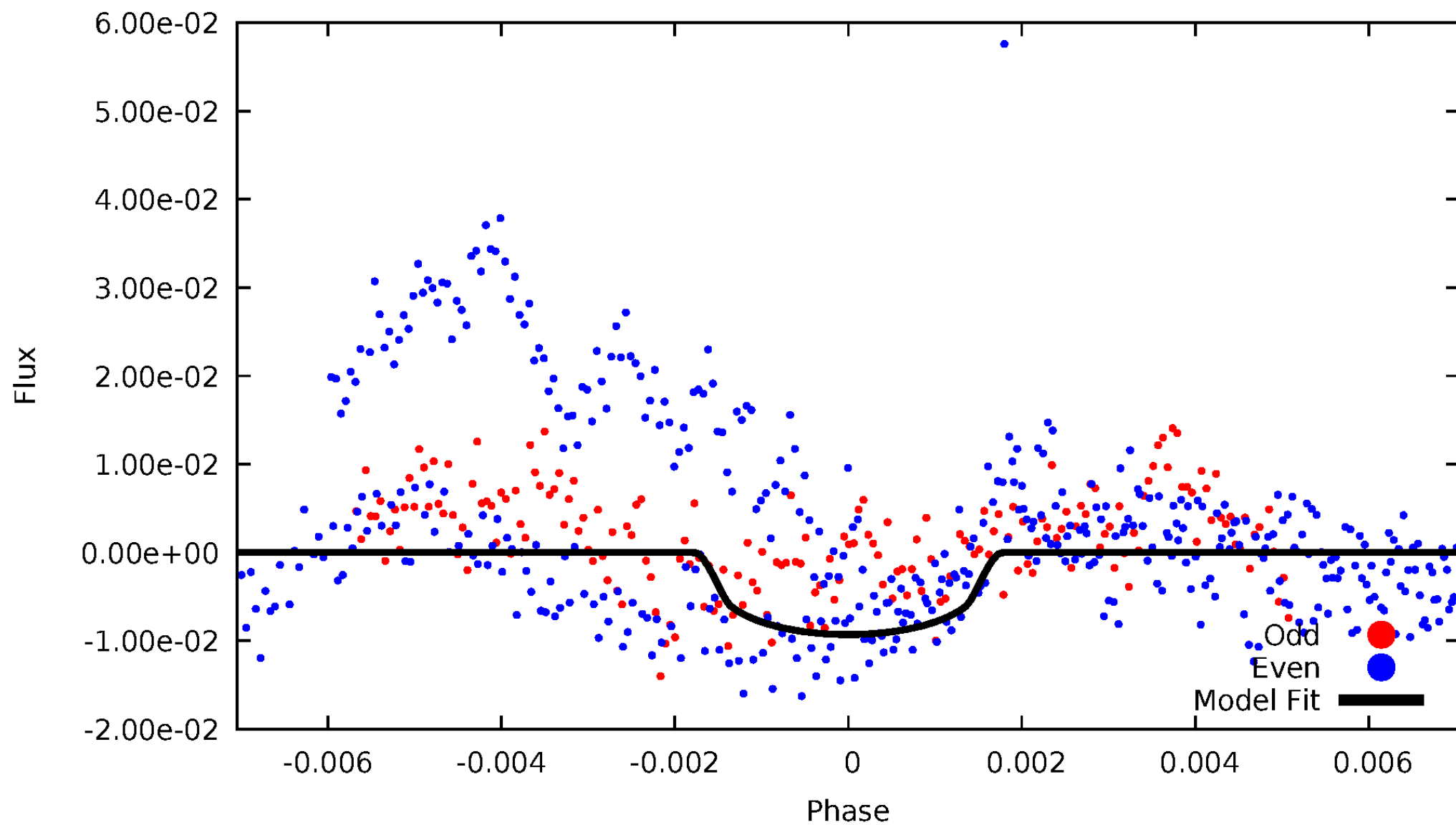


TCE 002970580-07



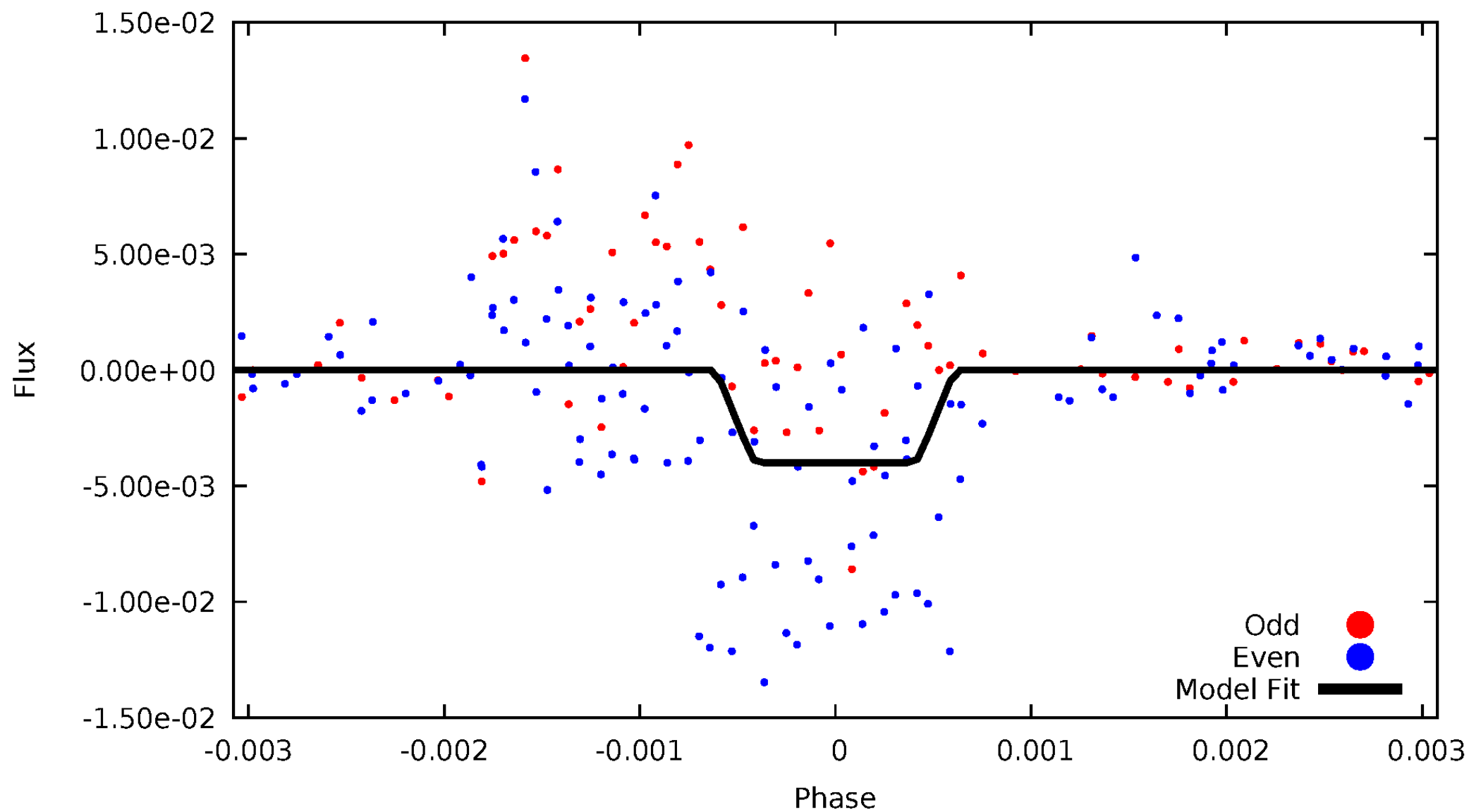
# DV Odd/Even

TCE 002970580-07



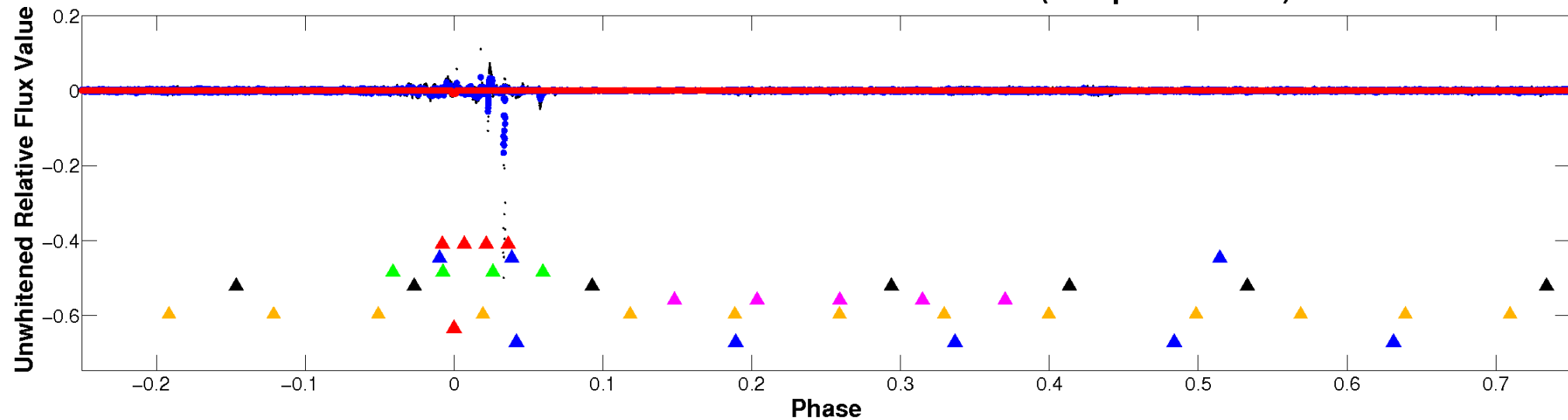
# ALT Odd/Even

TCE 002970580-07

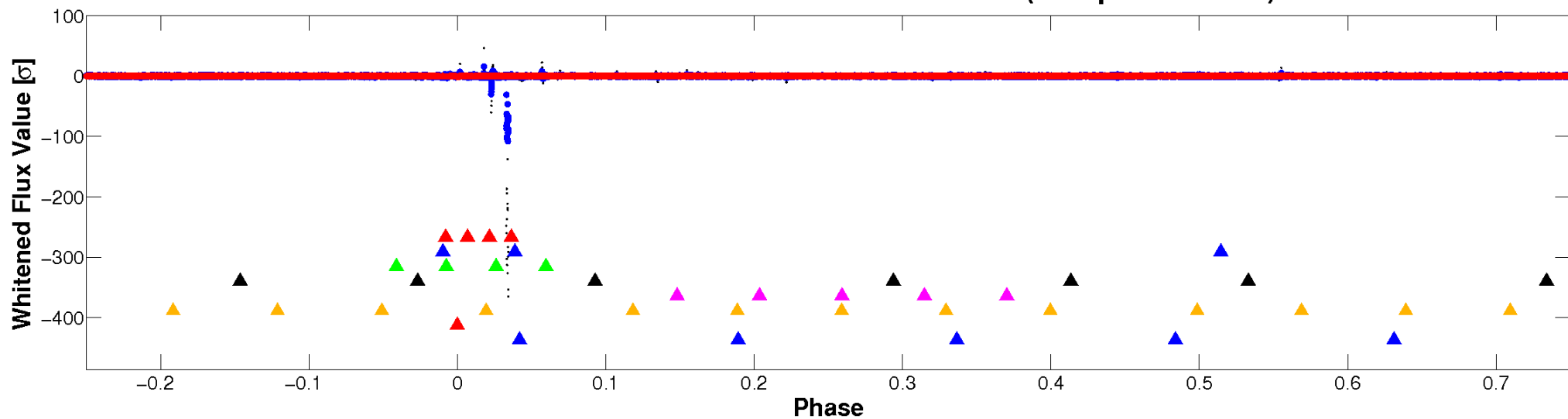


# Non-Whitened Vs. Whitened Light Curve

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

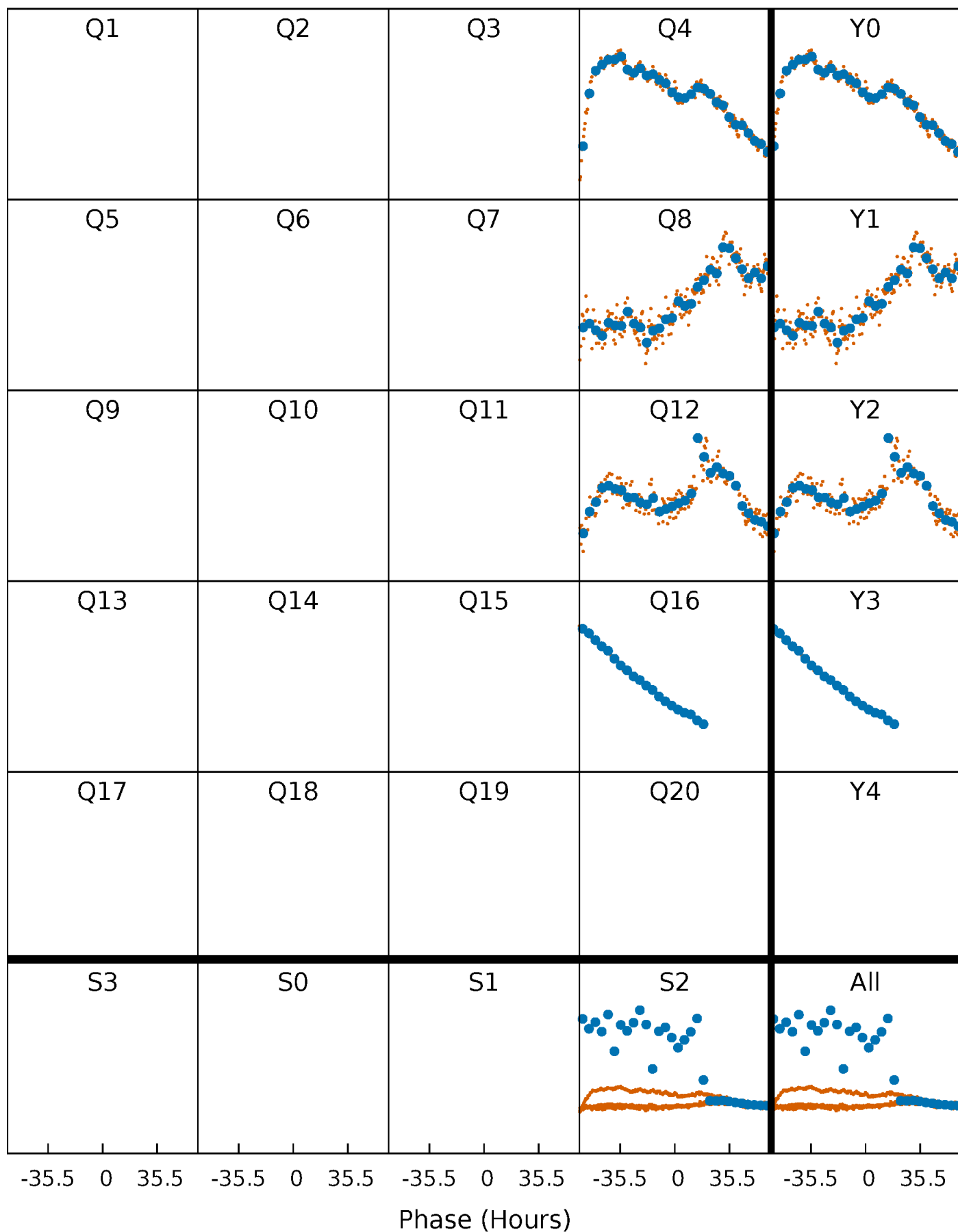


## Planet 7 : Phased Whitened Flux Time Series (Fit Epoch/Period)



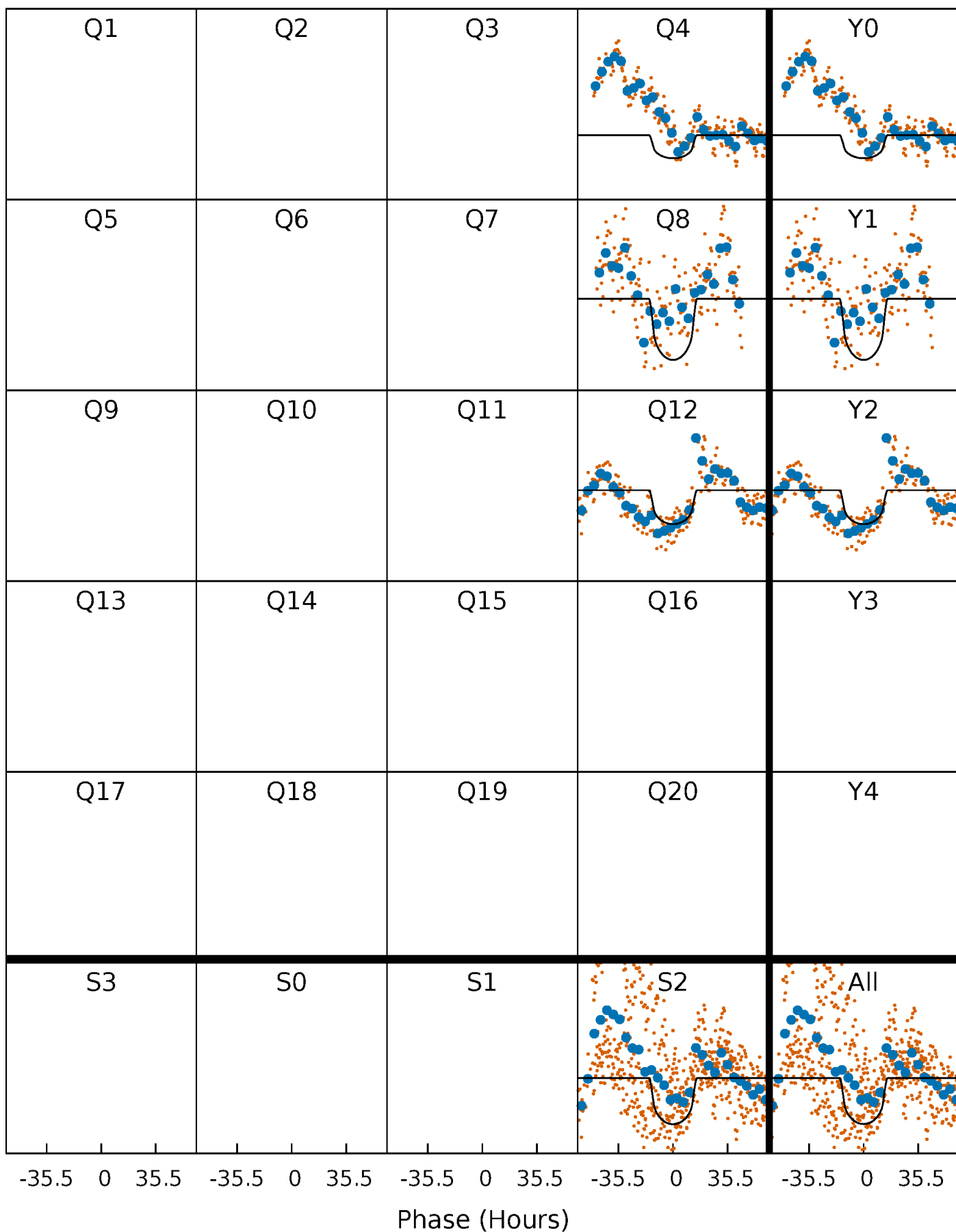
# PDC Quarter-Phased Transit Curves

TCE 002970580-07     $P=366.881381$  Days     $T_0=375.936823$  (BKJD)



# DV Quarter-Phased Transit Curves

TCE 002970580-07     $P=366.881381$  Days     $T_0=375.936823$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

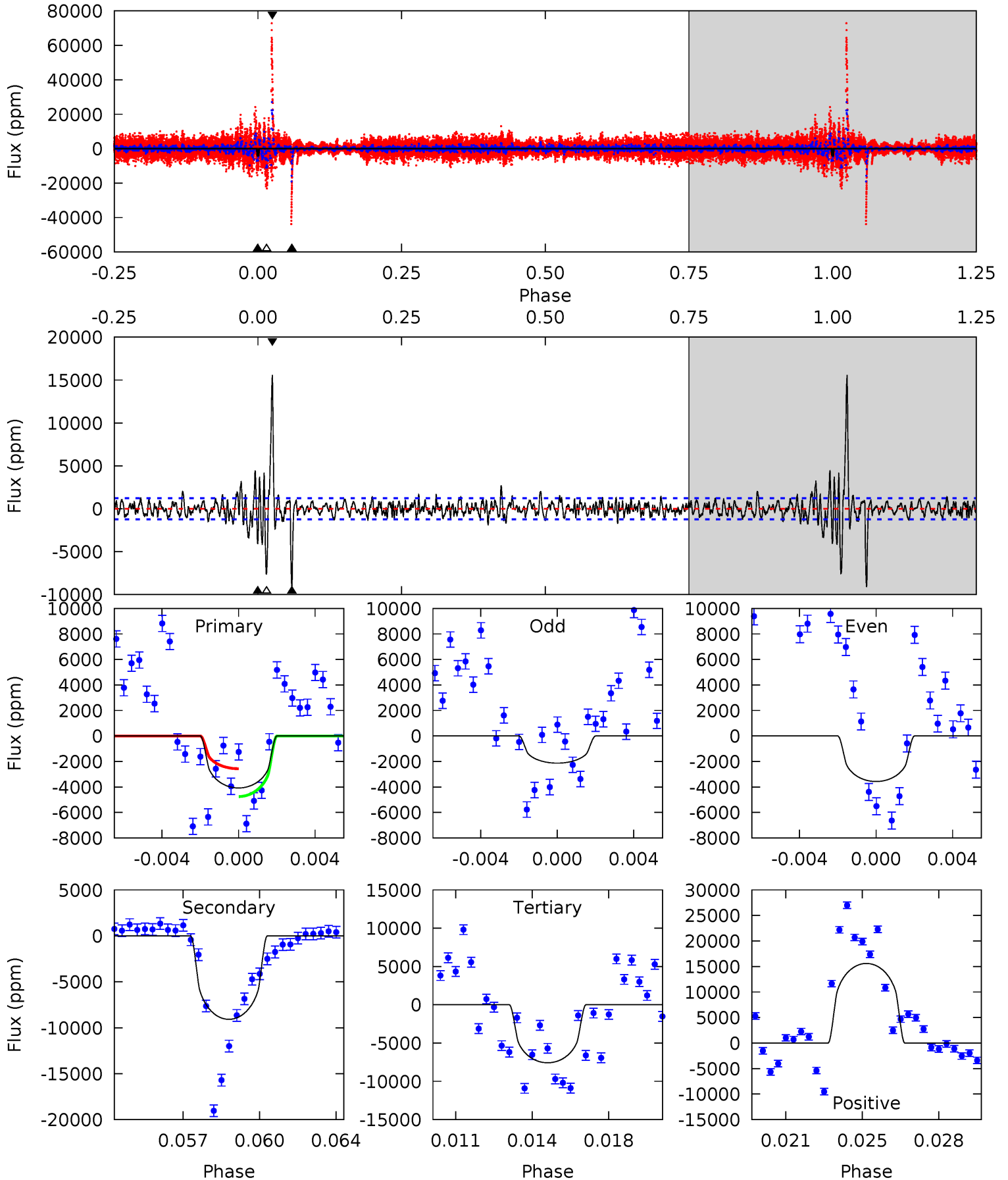
TCE 002970580-07     $P=366.884570$  Days     $T_0=376.272993$  (BKJD)



# DV Model-Shift Uniqueness Test

002970580-07, P = 366.881381 Days, E = 9.055442 Days

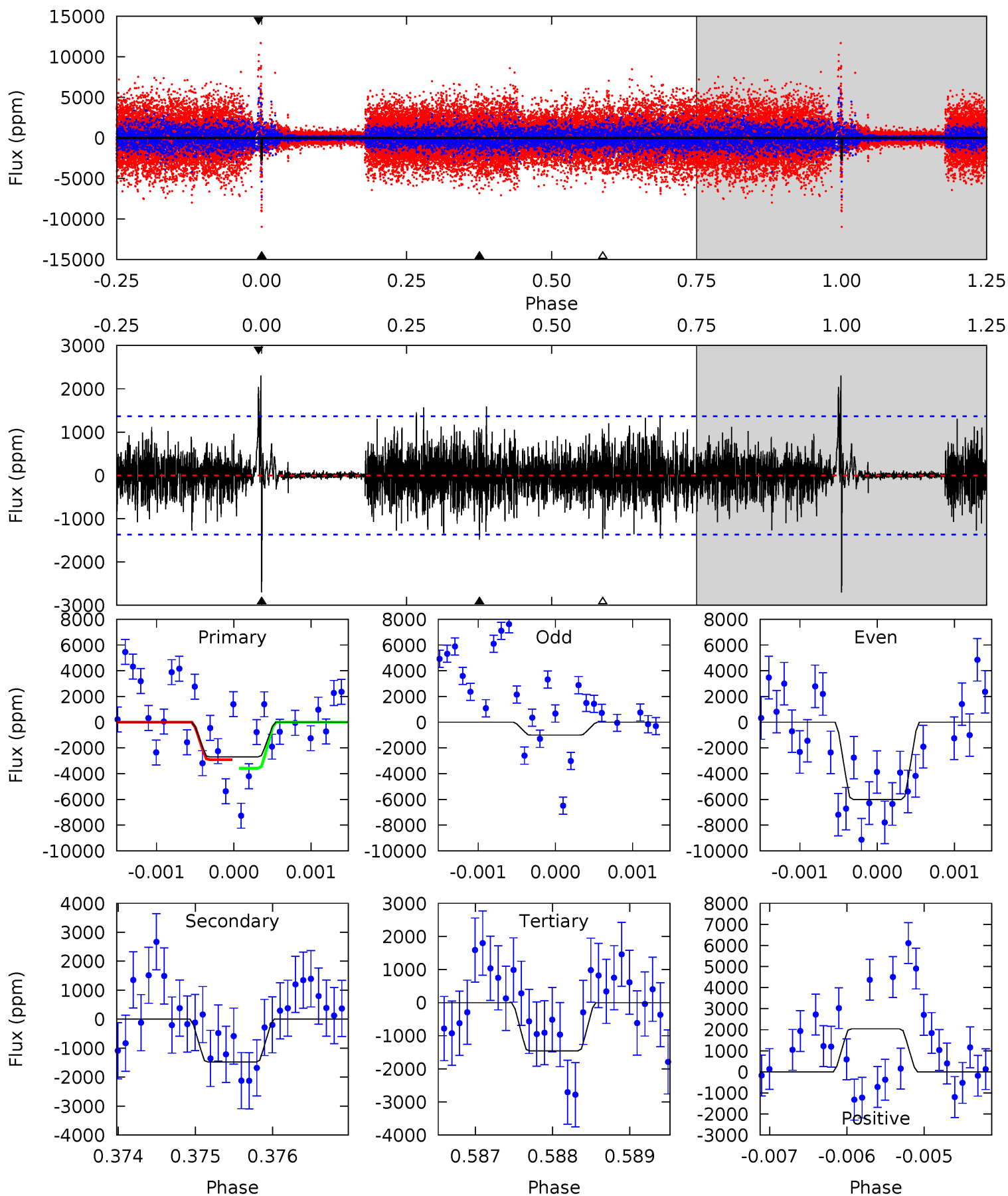
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
17.3	38.4	32.1	66.0	5.22	2.92	4.38	-14.8	-48.7	6.39	-27.5	2.91	1.67	0.63	4.81



# Alt Model-Shift Uniqueness Test

002970580-07, P = 366.884570 Days, E = 9.388423 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
10.7	5.87	5.79	8.09	5.42	3.25	1.44	4.93	2.63	0.08	-2.22	9.82	2.84	0.46	1.27



### Stellar Parameters For KIC 002970580

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$4605^{+69}_{-48}$	$2.619^{+0.120}_{-0.120}$	$-0.080^{+0.150}_{-0.100}$	$7.844^{+2.620}_{-0.936}$	$0.934^{+0.427}_{-0.022}$	$0.003^{+0.001}_{-0.001}$
	+1%/-1%	+5%/-5%	+188%/-125%	+33%/-12%	+46%/-2%	+48%/-45%
Source	SPE74	SPE74	SPE74	DSEP		

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

### Secondary Eclipse Parameters for KIC 002970580-07 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-9085 \pm 236$	$78.82^{+16.04}_{-14.19}$	$800^{+44}_{-32}$	$4737^{+297}_{-230}$	$837^{+357}_{-240}$
Alt.	$-1480 \pm 252$	$55.19^{+12.73}_{-10.54}$	$799^{+48}_{-31}$	$3847^{+312}_{-242}$	$271^{+149}_{-96}$

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

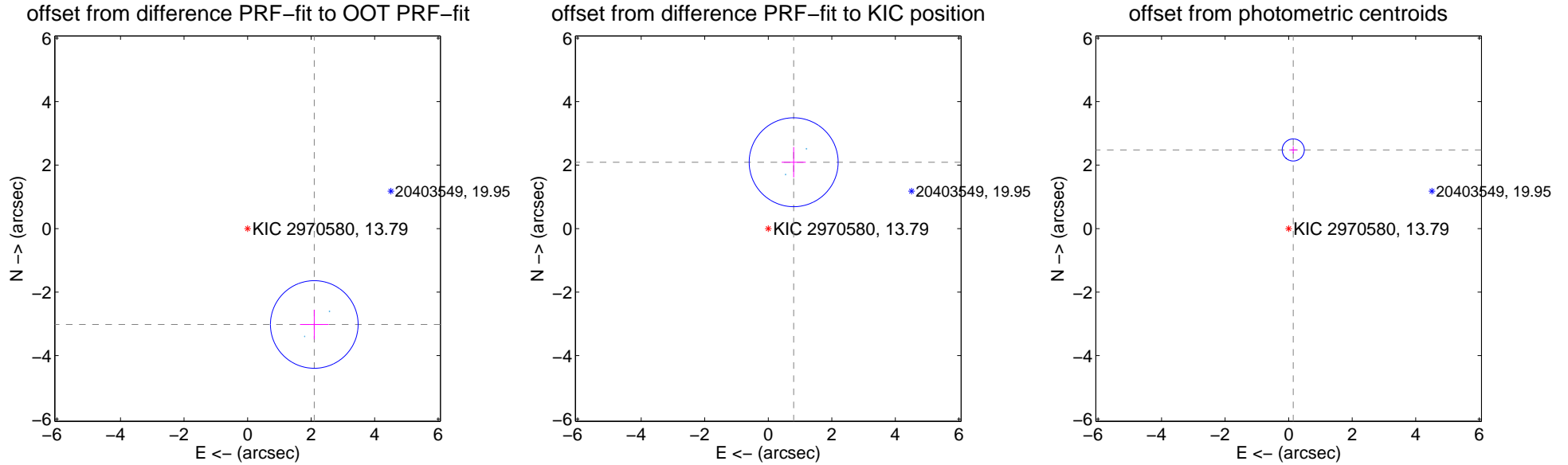
## DV Centroid Data

Supplemental centroid analysis for 002970580-07. Kepler magnitude: 13.79. Transit SNR 12.24

There are 2 quarters with good PRF difference image offsets

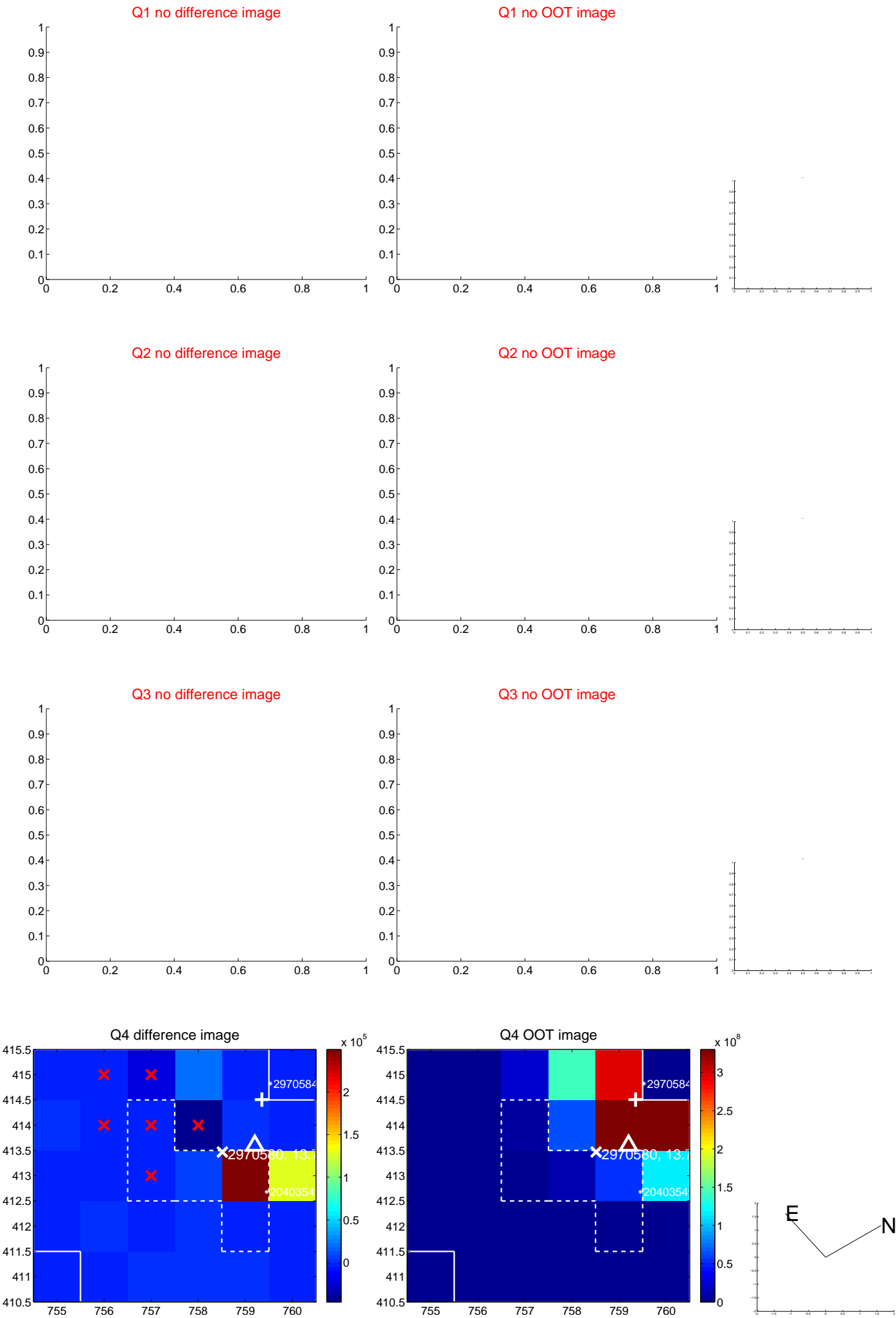
The OOT PRF centroid is offset from the target star catalog position by about 5.25 arcsec so the offset from difference PRF-fit to OOT-fit may be invalid.

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$3.679 \pm 0.460$	8.00	$-2.100 \pm 0.450$	$-3.021 \pm 0.465$
PRF-fit source offset from KIC position	$2.239 \pm 0.467$	4.80	$-0.800 \pm 0.379$	$2.091 \pm 0.478$
photometric centroid source offset	$2.48 \pm 0.12$	21.41	$-0.15 \pm 0.13$	$2.48 \pm 0.12$

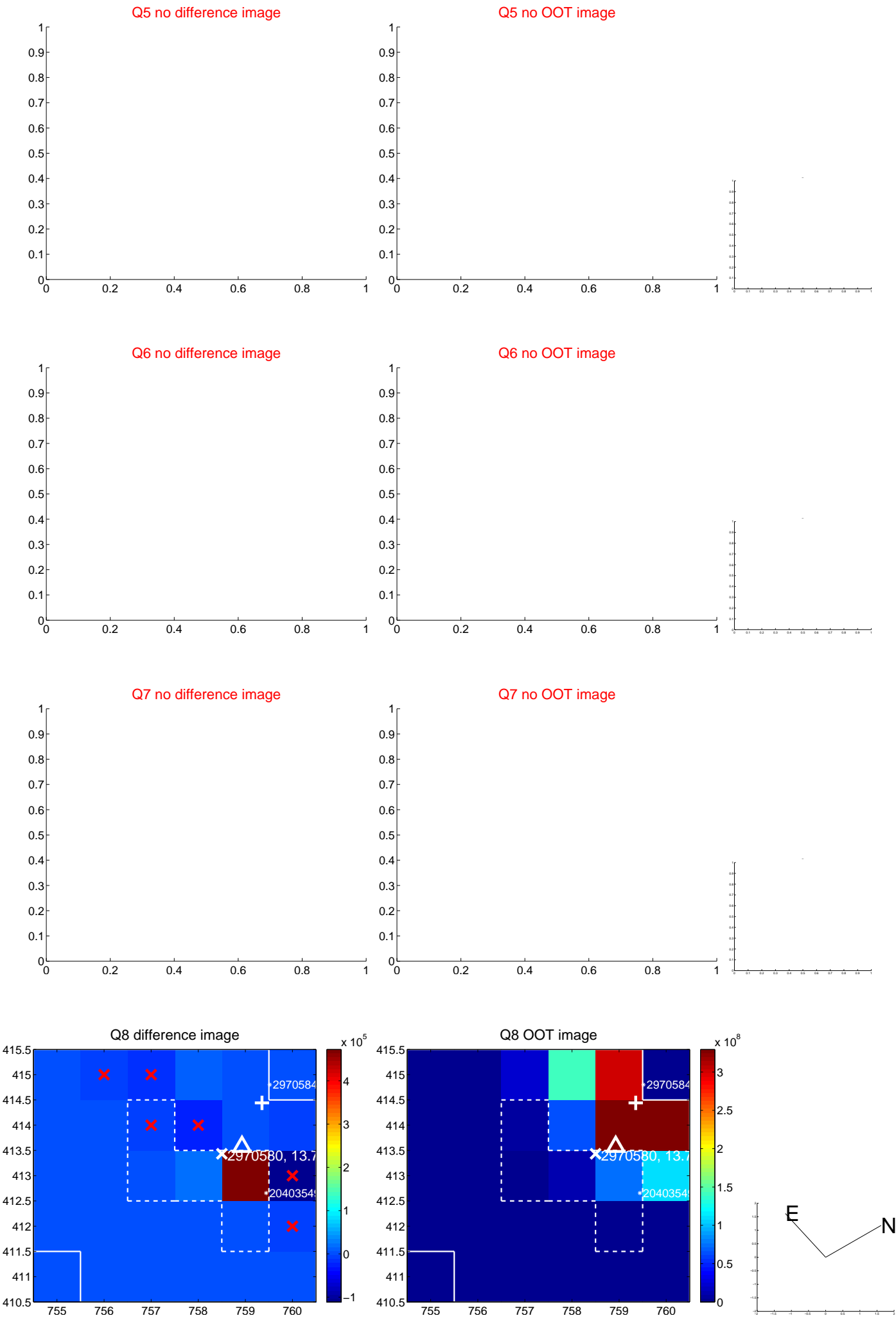


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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

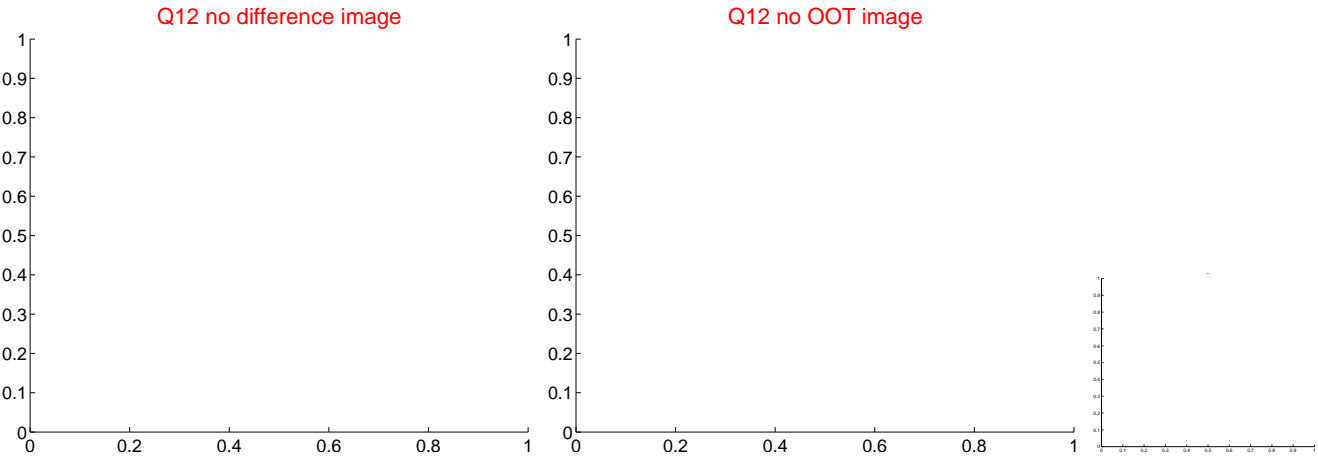
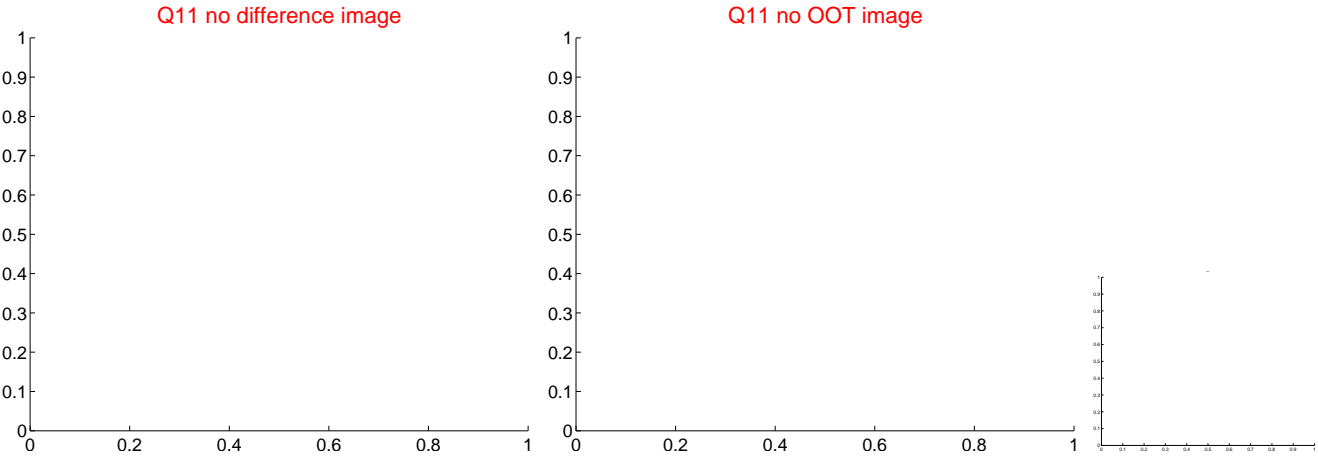
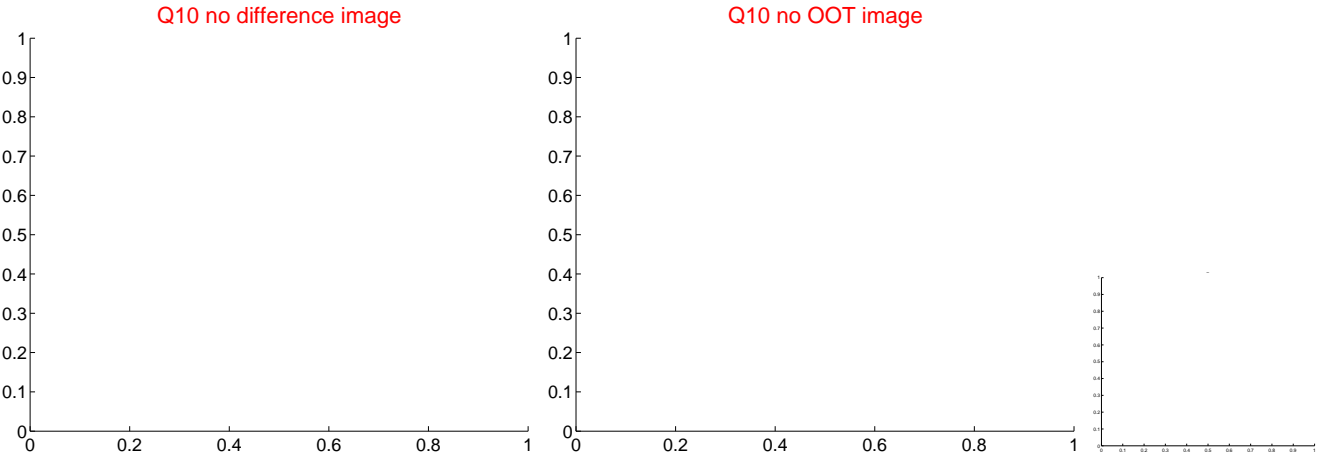
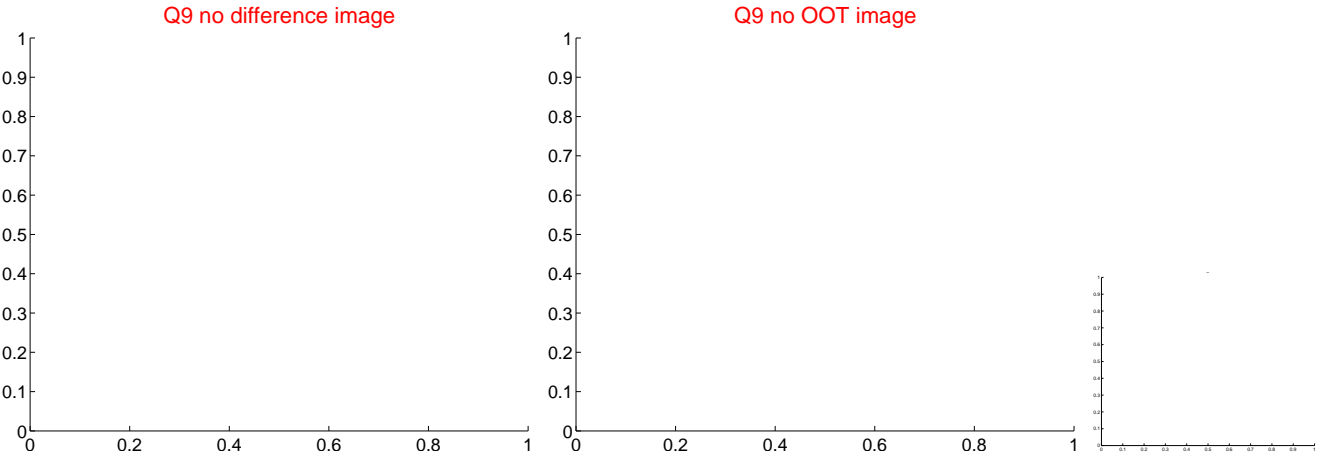
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



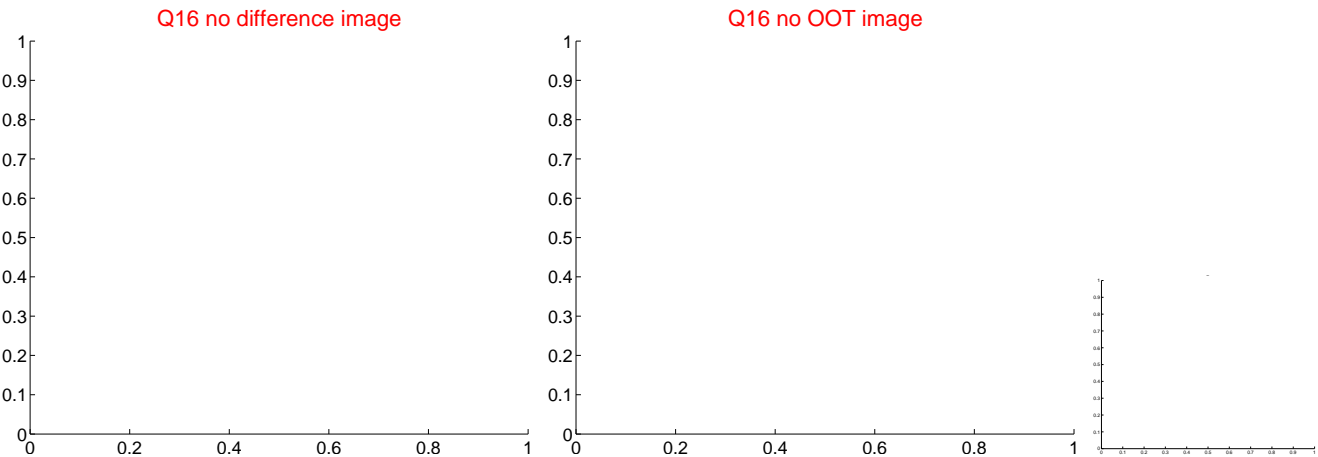
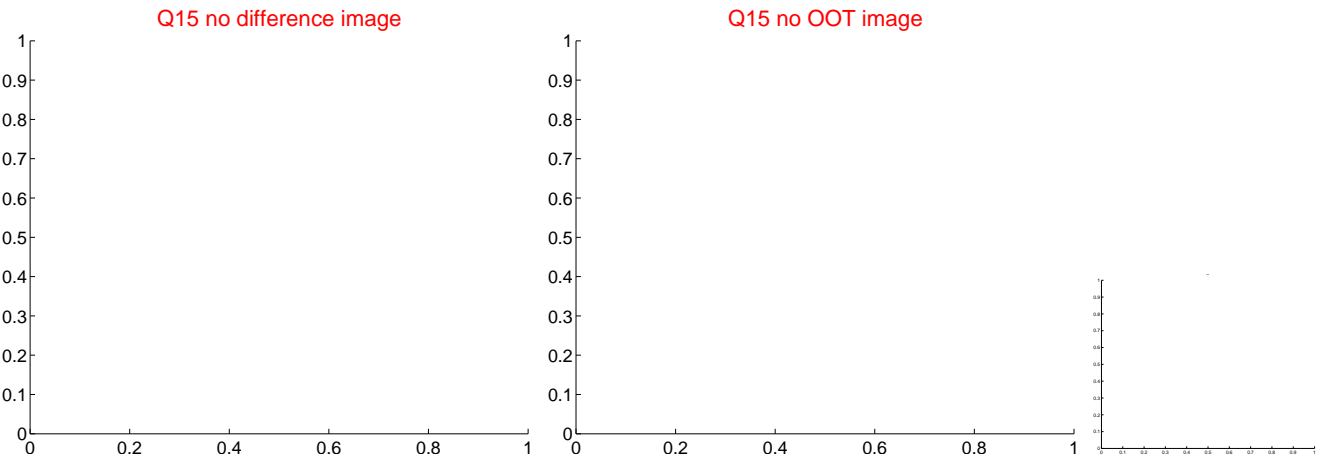
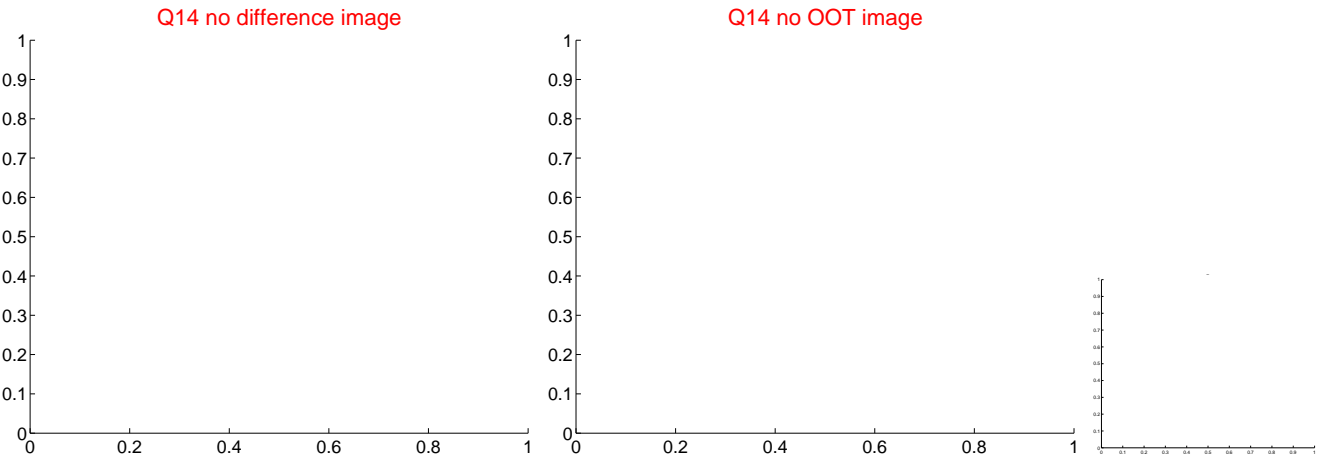
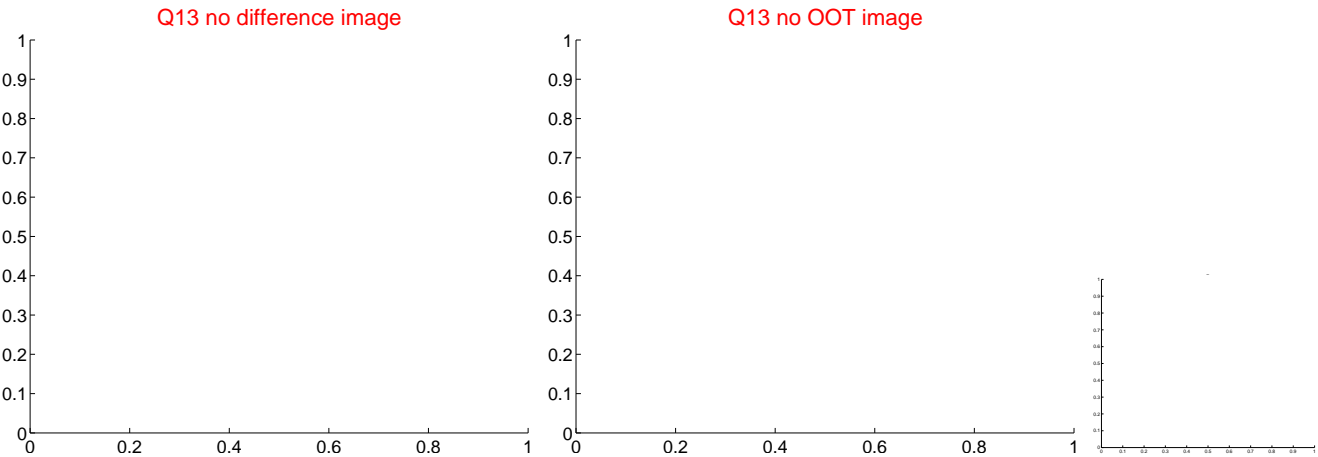
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



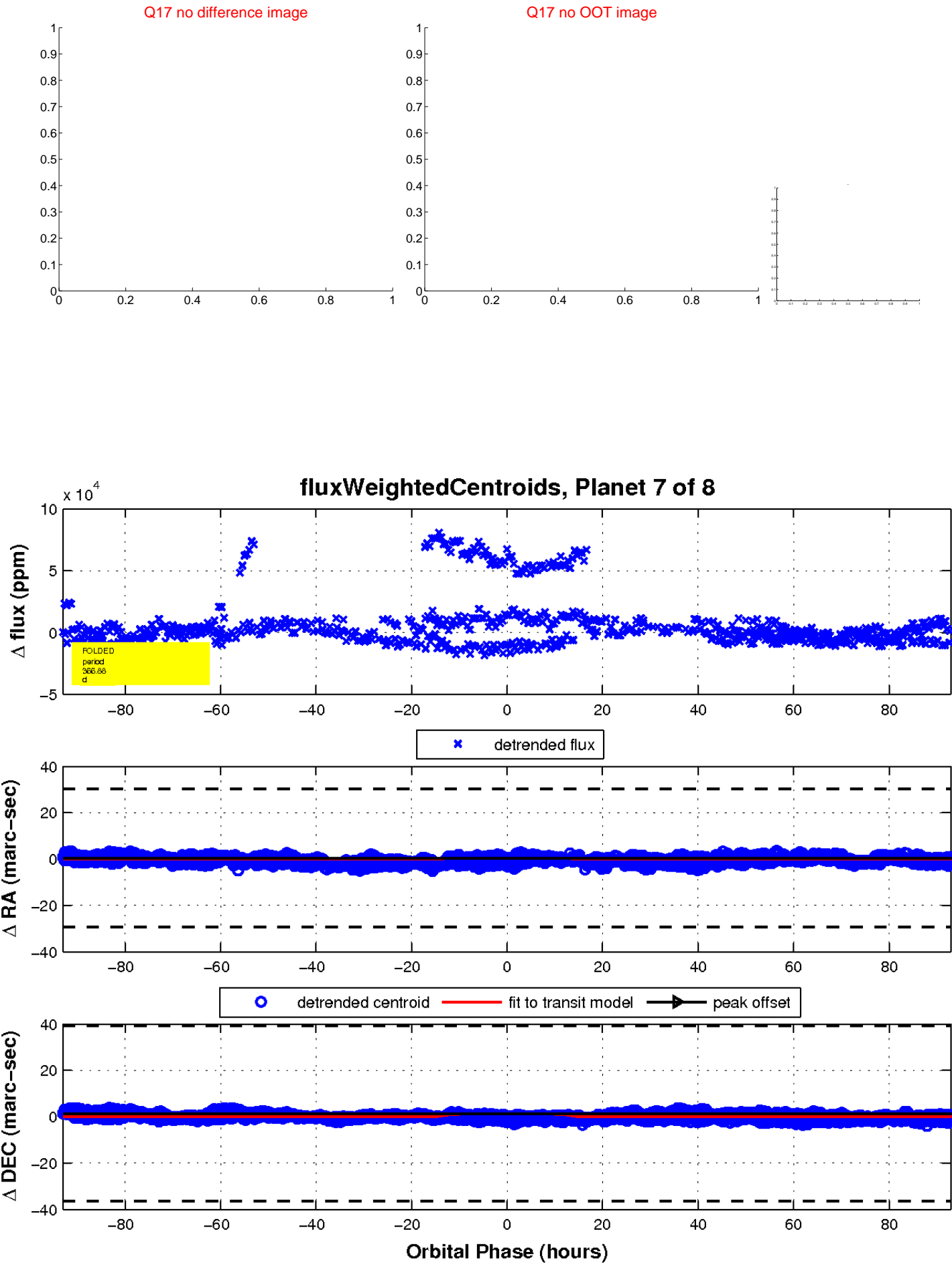
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



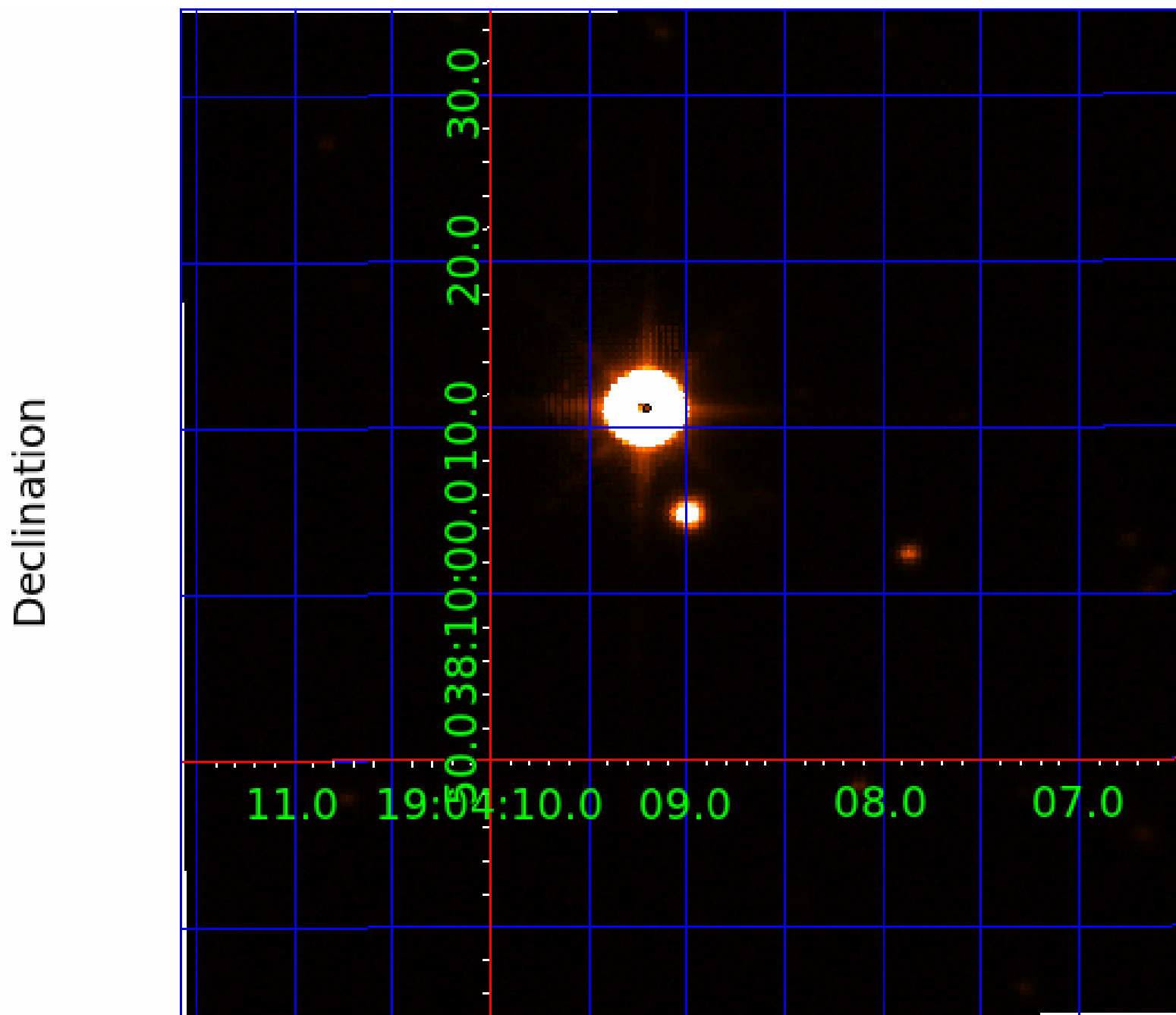
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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



UKIRT Image



# KIC 002970580

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
002970580-02	OBS	No	559.218859	372.381799	2714.0	15.000	60.2	-1.0	7.84	4605	39.14	14.70
002970580-03	OBS	No	379.202643	360.883809	2067.1	10.177	13.5	5.7	7.84	4605	39.78	24.68
002970580-04	OBS	No	205.380057	278.372111	4114.7	1.706	14.2	7.4	7.84	4605	53.87	55.90
002970580-05	OBS	No	346.501959	144.918492	3227.9	1.526	13.2	8.4	7.84	4605	45.84	27.83
002970580-06	OBS	No	113.694880	155.675783	1876.7	2.000	14.9	-1.0	7.84	4605	32.66	122.98
002970580-07	OBS	No	366.881381	375.936823	9283.1	31.023	10.6	12.2	7.84	4605	76.30	25.79
002970580-08	OBS	No	312.830992	240.650043	321.9	12.000	8.4	-1.0	7.84	4605	13.48	31.90

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
002970580-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_CHASES_SKYE—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—INCONSISTENT_TRANS—CENT_NOFITS
002970580-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES—LPP_DV—ALL_TRANS_CHASES—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS
002970580-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS
002970580-05	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL_TRACKER—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_KIC_POS
002970580-06	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_NOFITS
002970580-07	OBS	FP	0.00	1	0	0	0	LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS
002970580-08	OBS	FP	0.00	1	0	1	0	INDIV_TRANS_RUBBLE_MARSHALL—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—CENT_NOFITS—HALO_GHOST

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

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

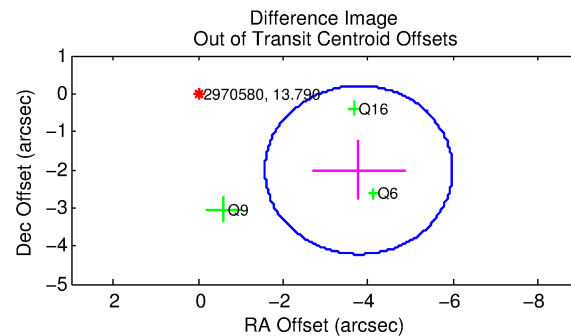
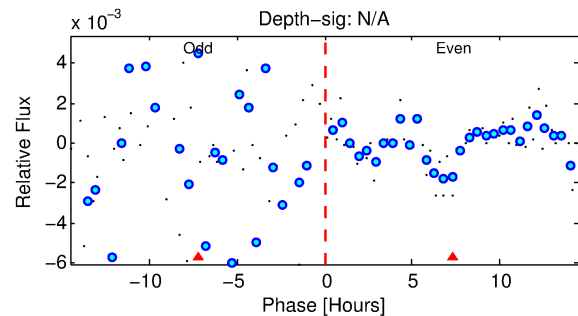
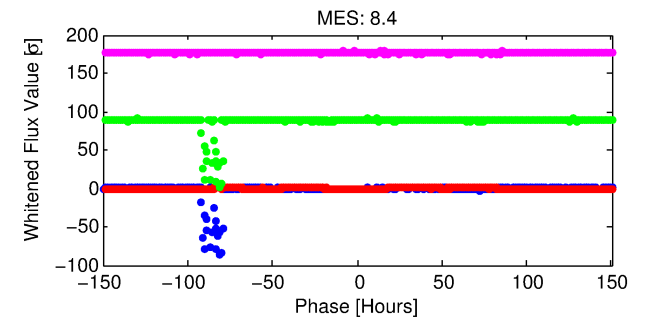
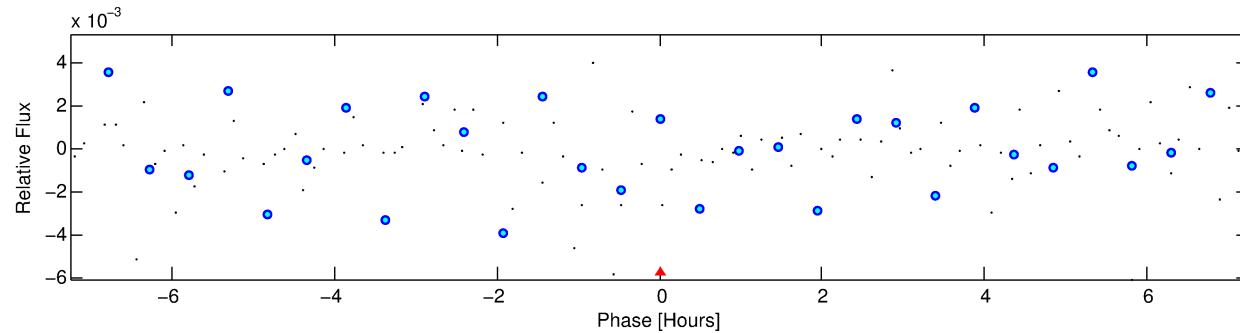
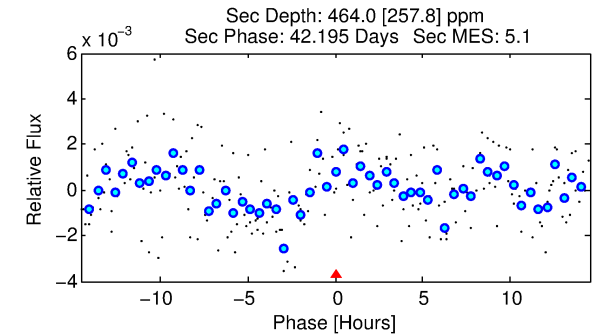
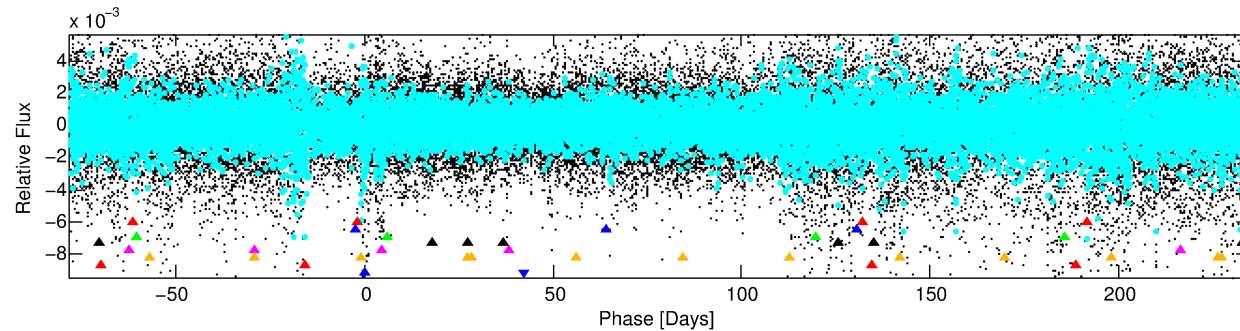
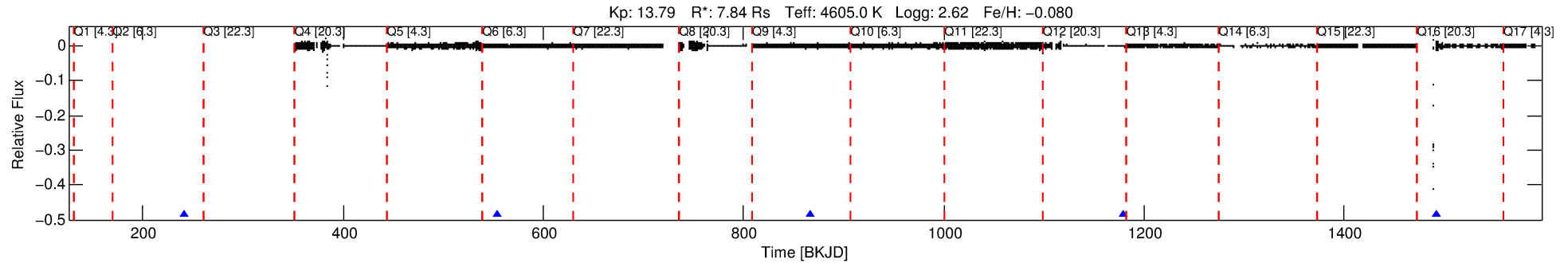
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 002970580-08

No Significant Match Found

# DV One-Page Summary

KIC: 2970580 Candidate: 8 of 8 Period: 312.831 d



## TPS TCE Results:

Period = 312.83099 d  
Epoch = 240.6500 BKJD

DV fit results are unavailable

## DV Diagnostic Results:

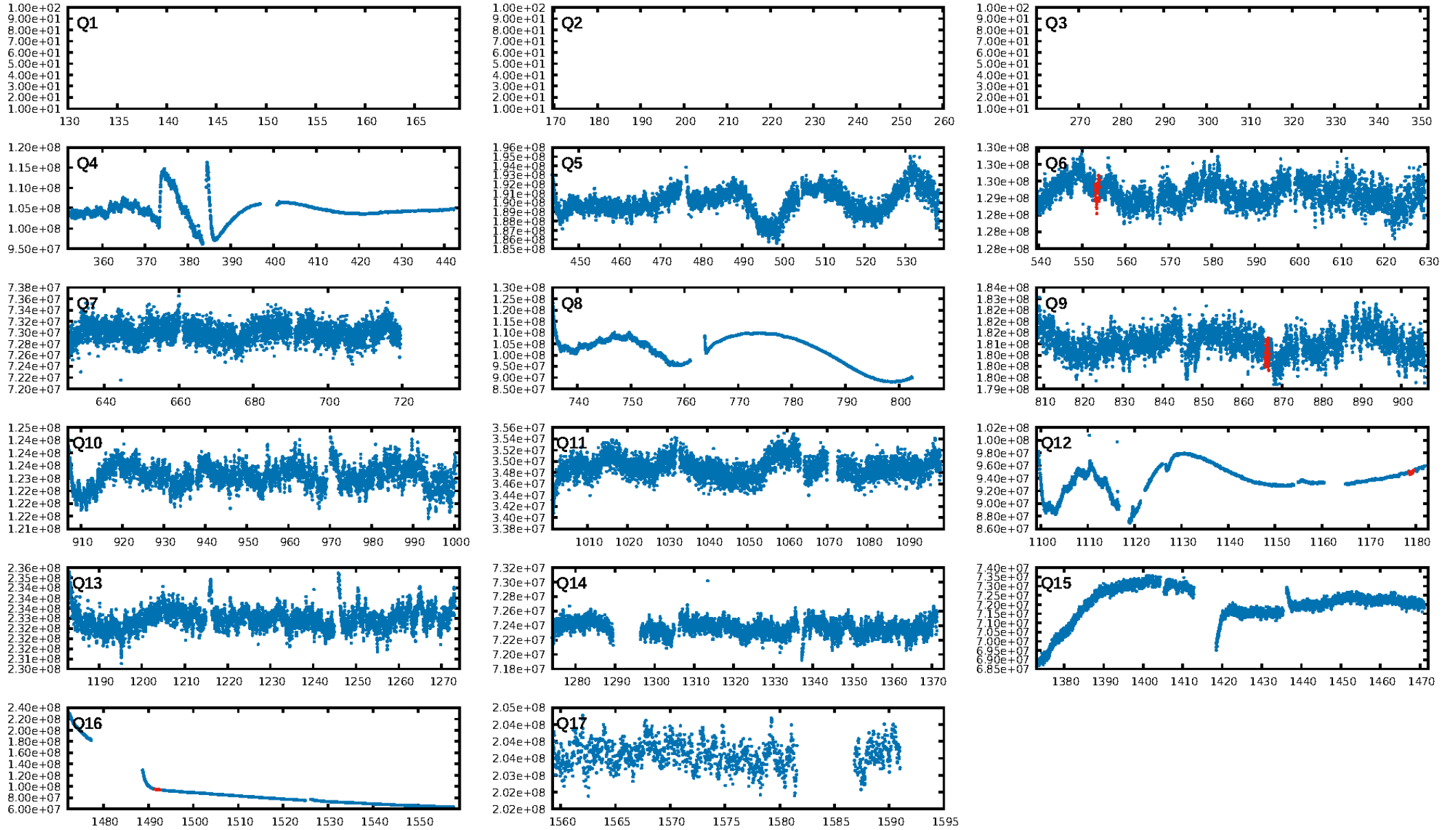
ShortPeriod-sig: 100.0% [212.76σ]  
LongPeriod-sig: 100.0% [66.80σ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: 4.49e-07  
RollingBand-fgt: 1.00 [4/4]  
GhostDiagnostic-chr: -0.1621

Centroid-sig: 3.4%  
Centroid-so: 1.773 arcsec [1.87σ]  
OotOffset-rm: 4.283 arcsec [5.81σ]  
KicOffset-rm: 3.320 arcsec [3.35σ]  
OotOffset-st: 1/0/1/1 [3]  
KicOffset-st: 1/0/1/1 [3]  
DiffImageQuality-fgm: 0.67 [2/3]  
DiffImageOverlap-fno: 1.00 [4/4]

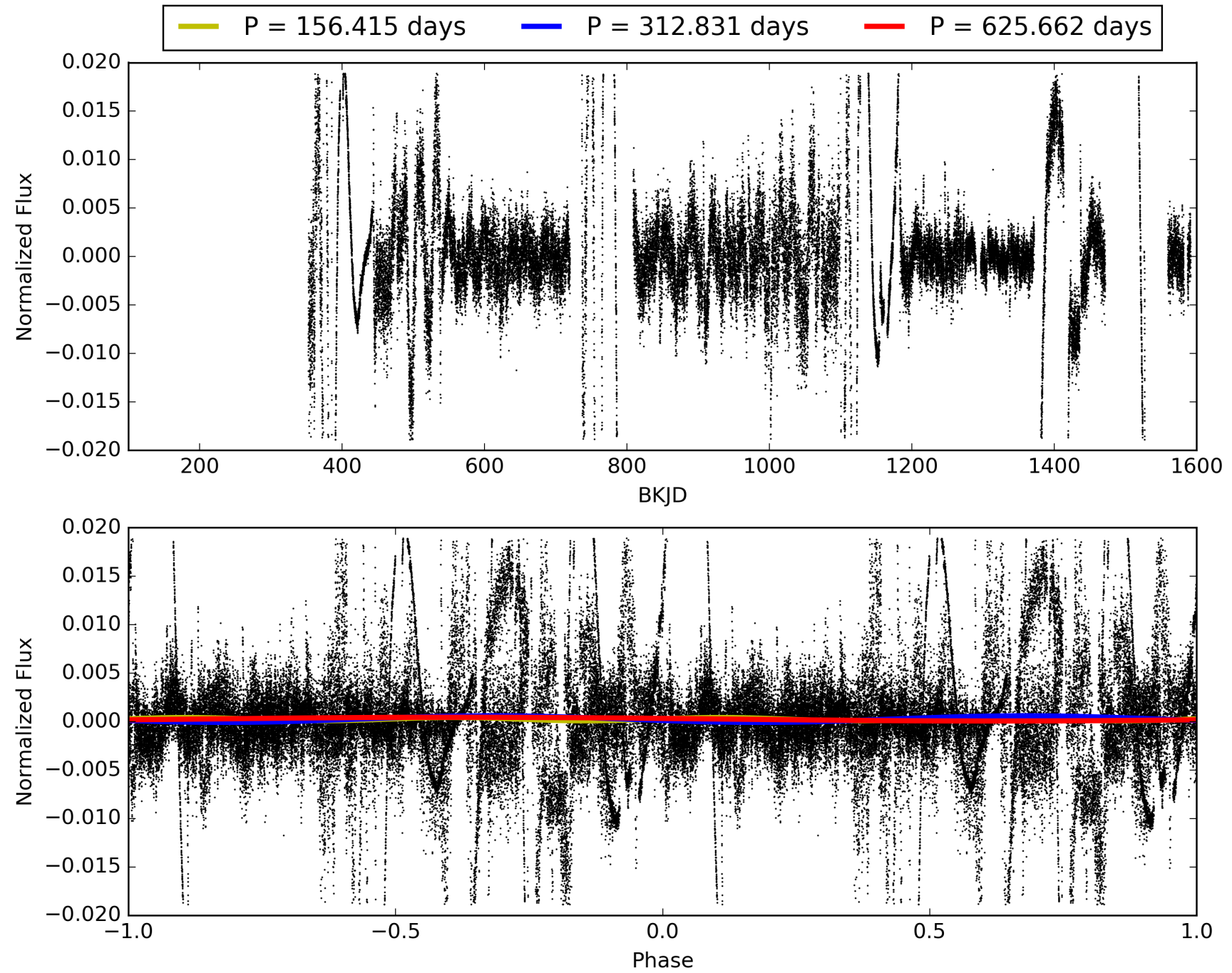
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 01-Feb-2016 22:42:01 Z

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

# TCE 002970580-08, PDC Light Curves

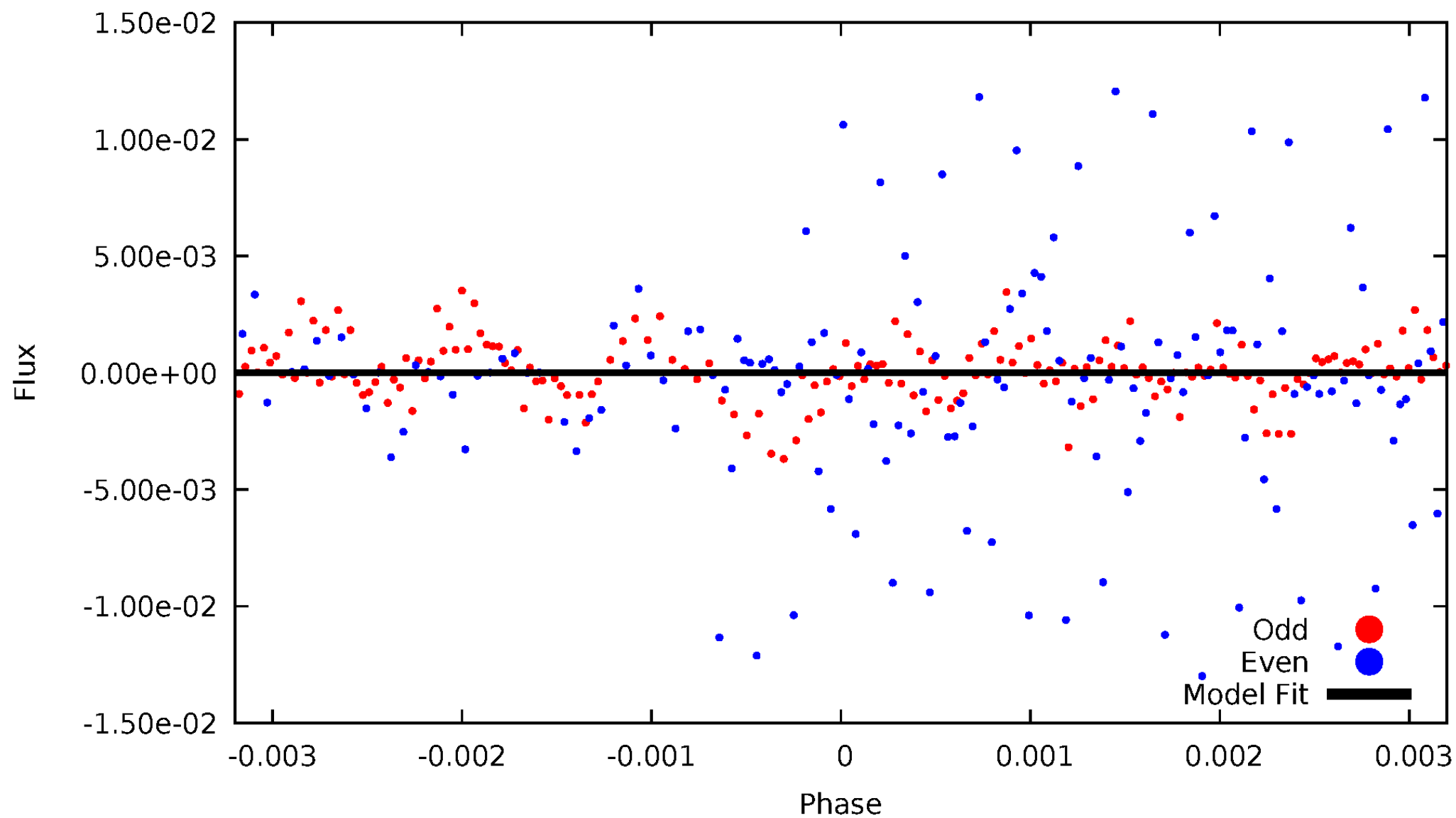


TCE 002970580-08



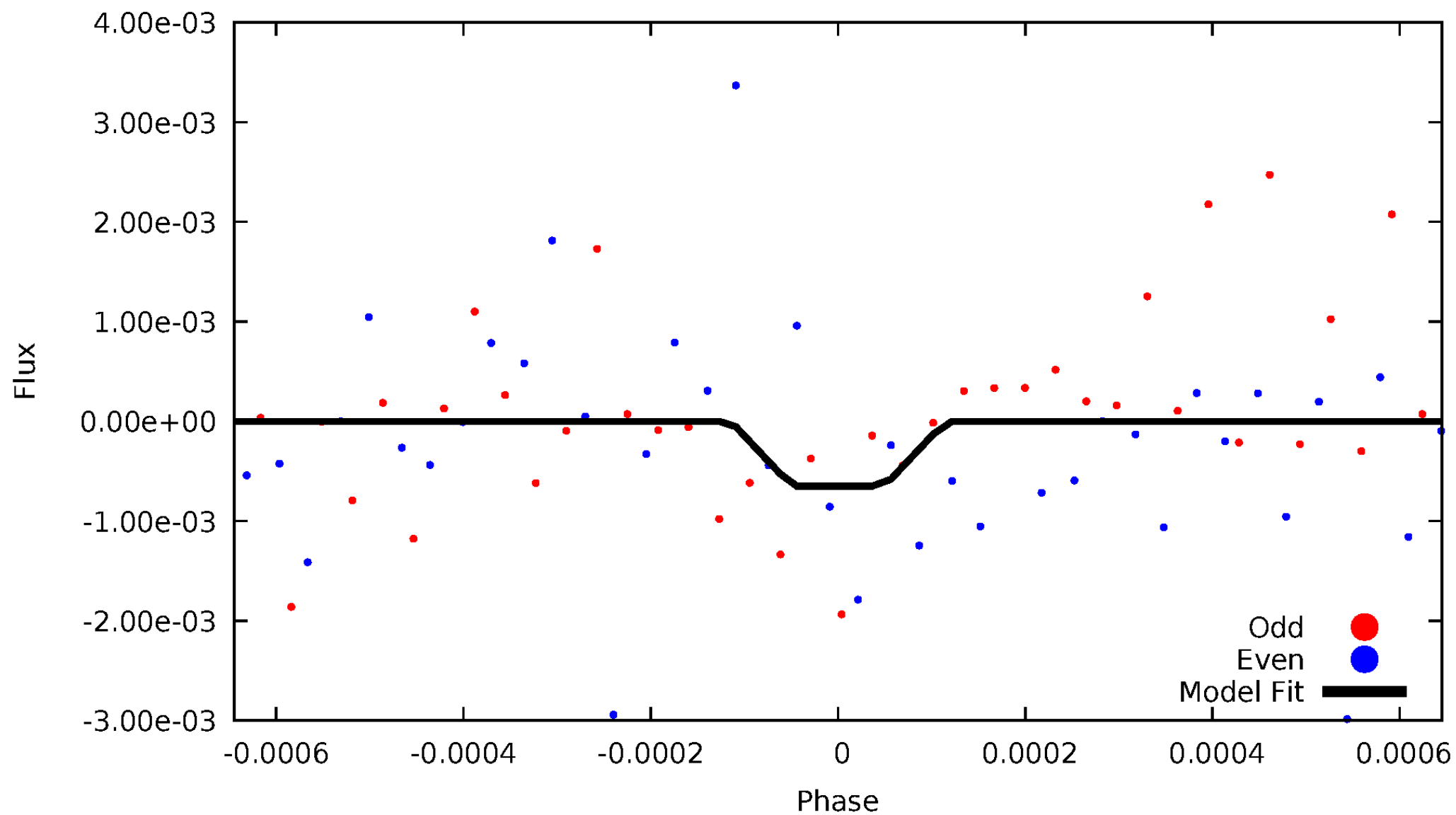
# DV Odd/Even

TCE 002970580-08



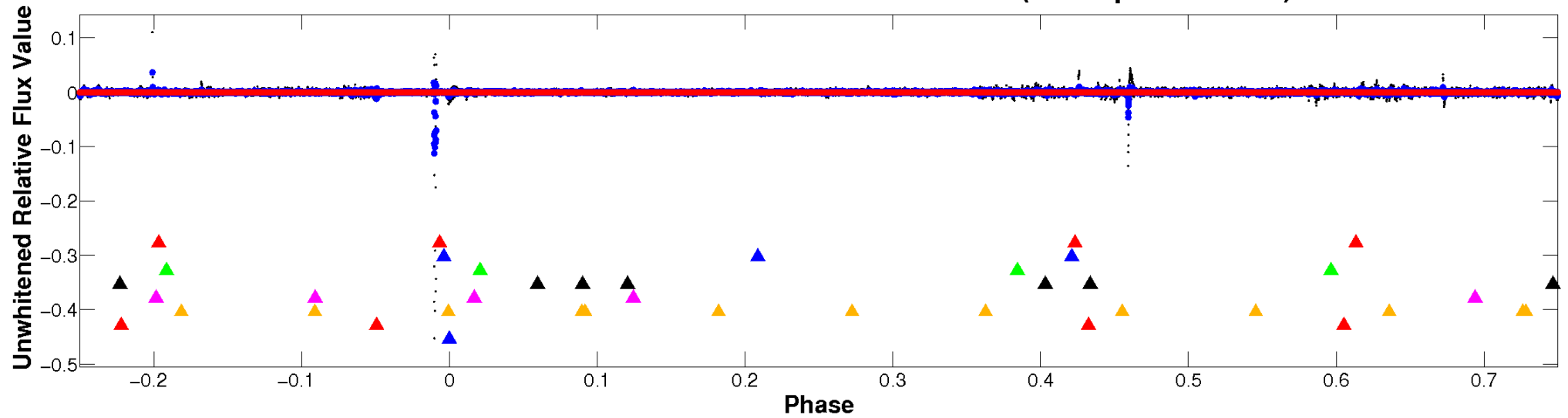
# ALT Odd/Even

TCE 002970580-08

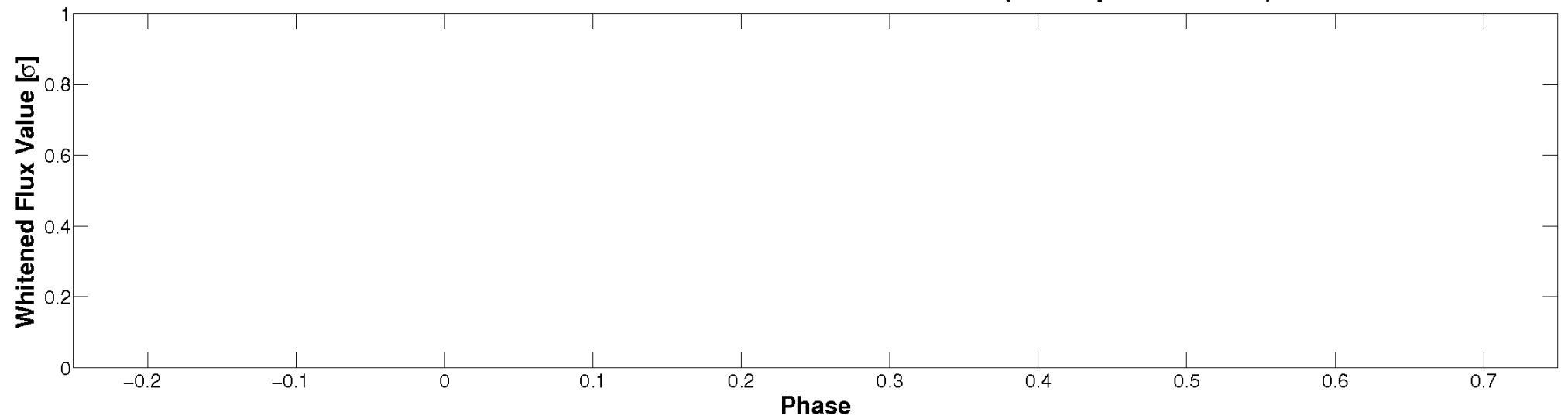


# Non-Whitened Vs. Whitened Light Curve

**Planet 8 : Phased Unwhitened Flux Time Series (TPS Epoch/Period)**

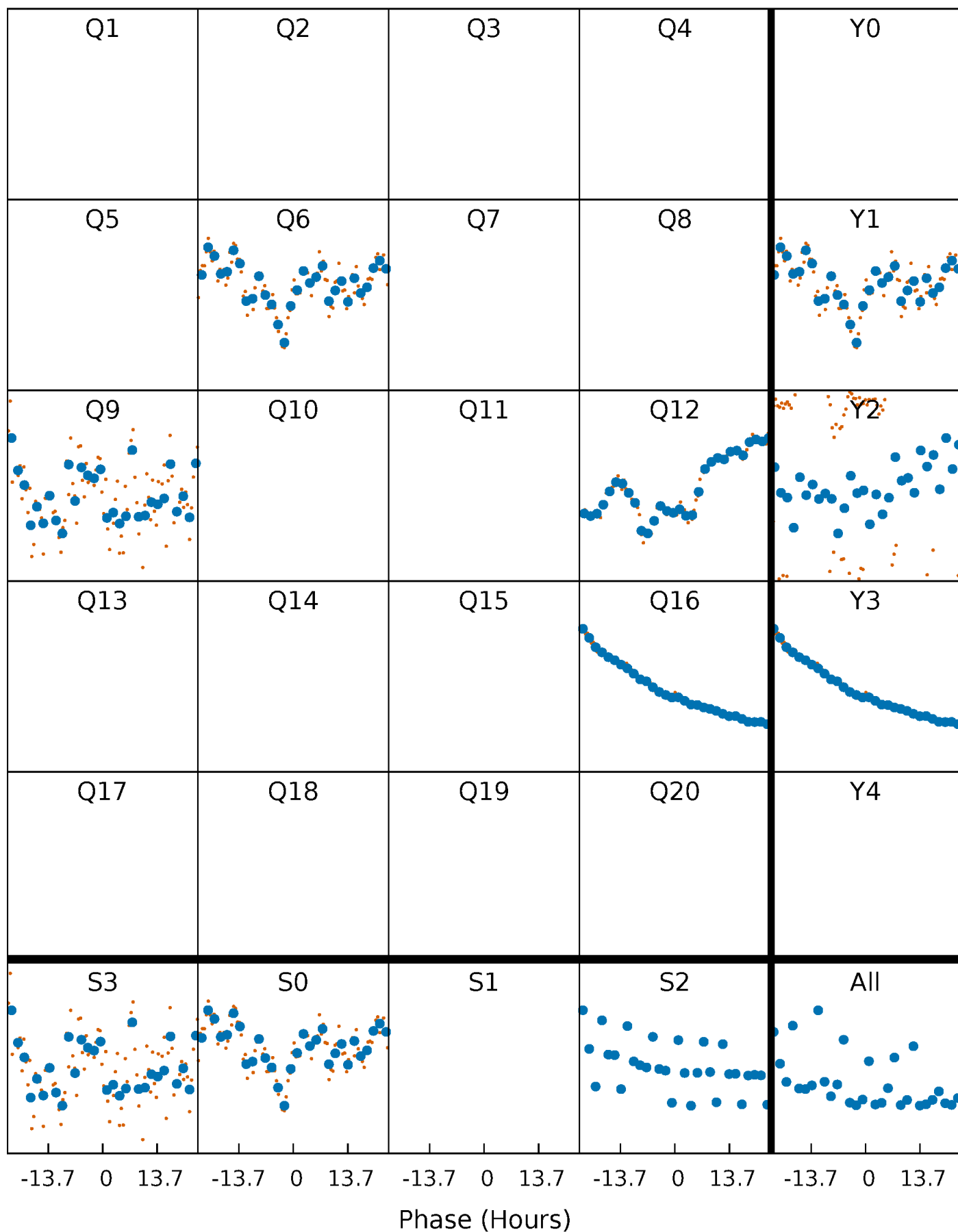


**Planet 8 : Phased Whitened Flux Time Series (TPS Epoch/Period)**



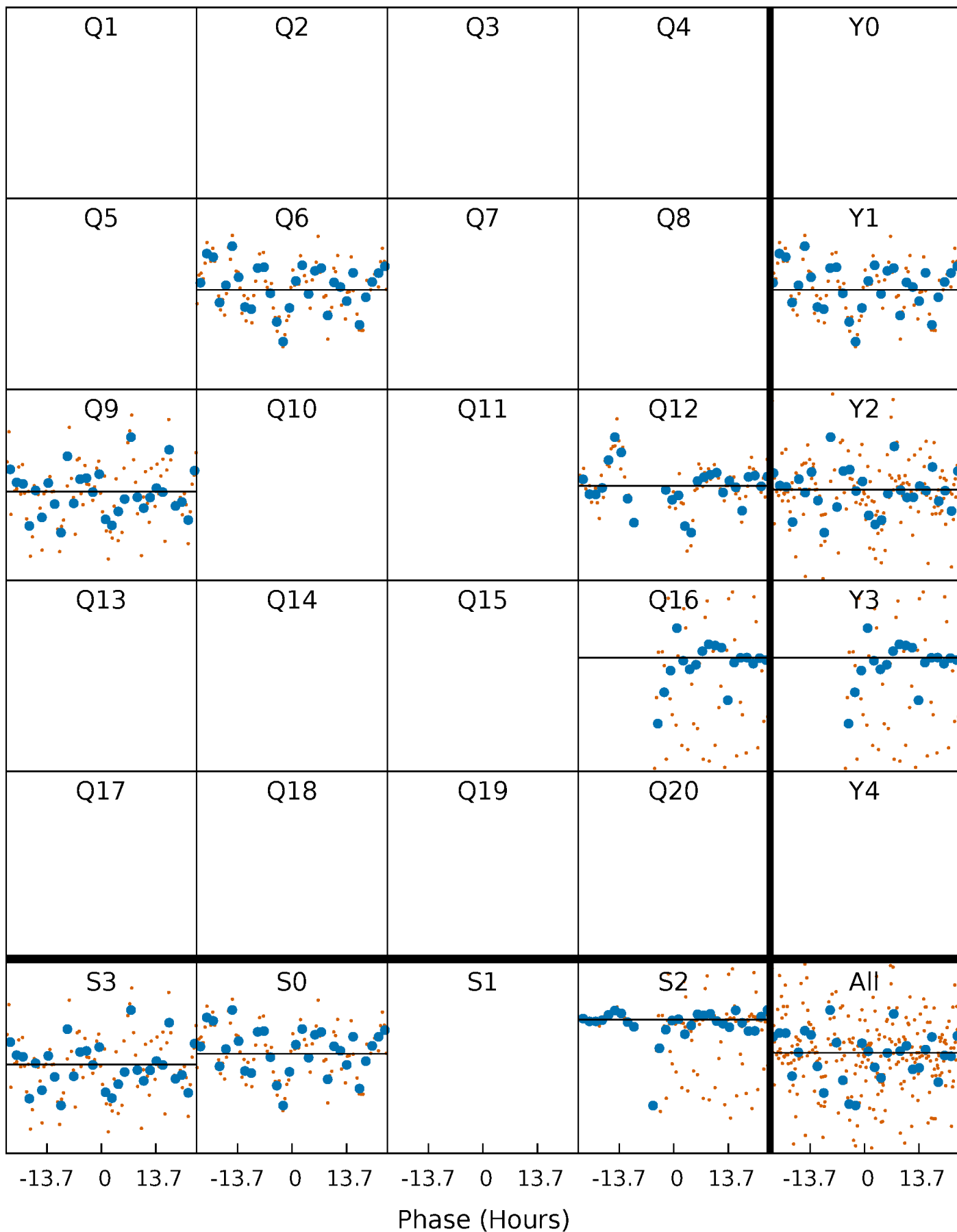
# PDC Quarter-Phased Transit Curves

TCE 002970580-08     $P=312.830992$  Days     $T_0=240.650043$  (BKJD)



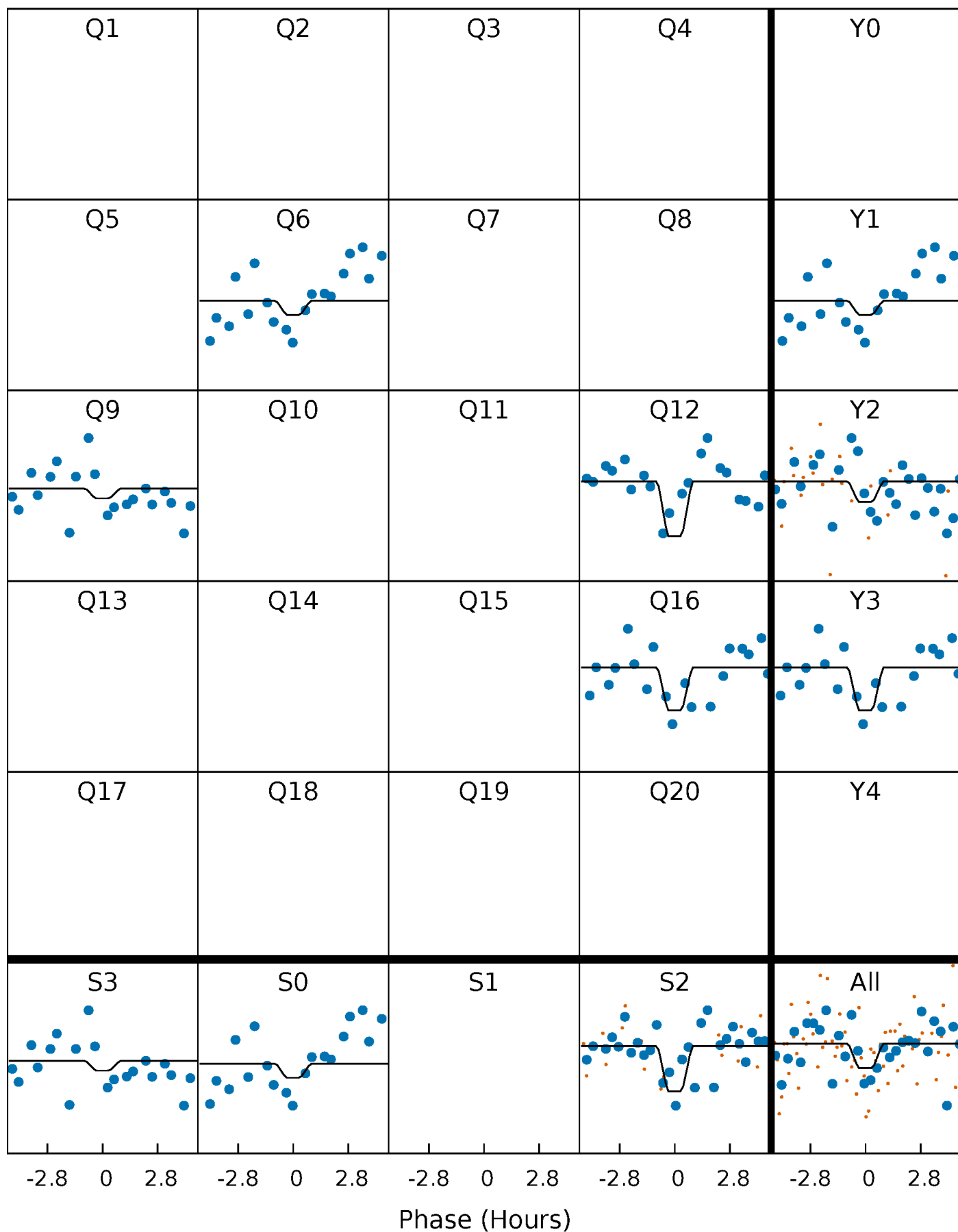
# DV Quarter-Phased Transit Curves

TCE 002970580-08     $P=312.830992$  Days     $T_0=240.650043$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

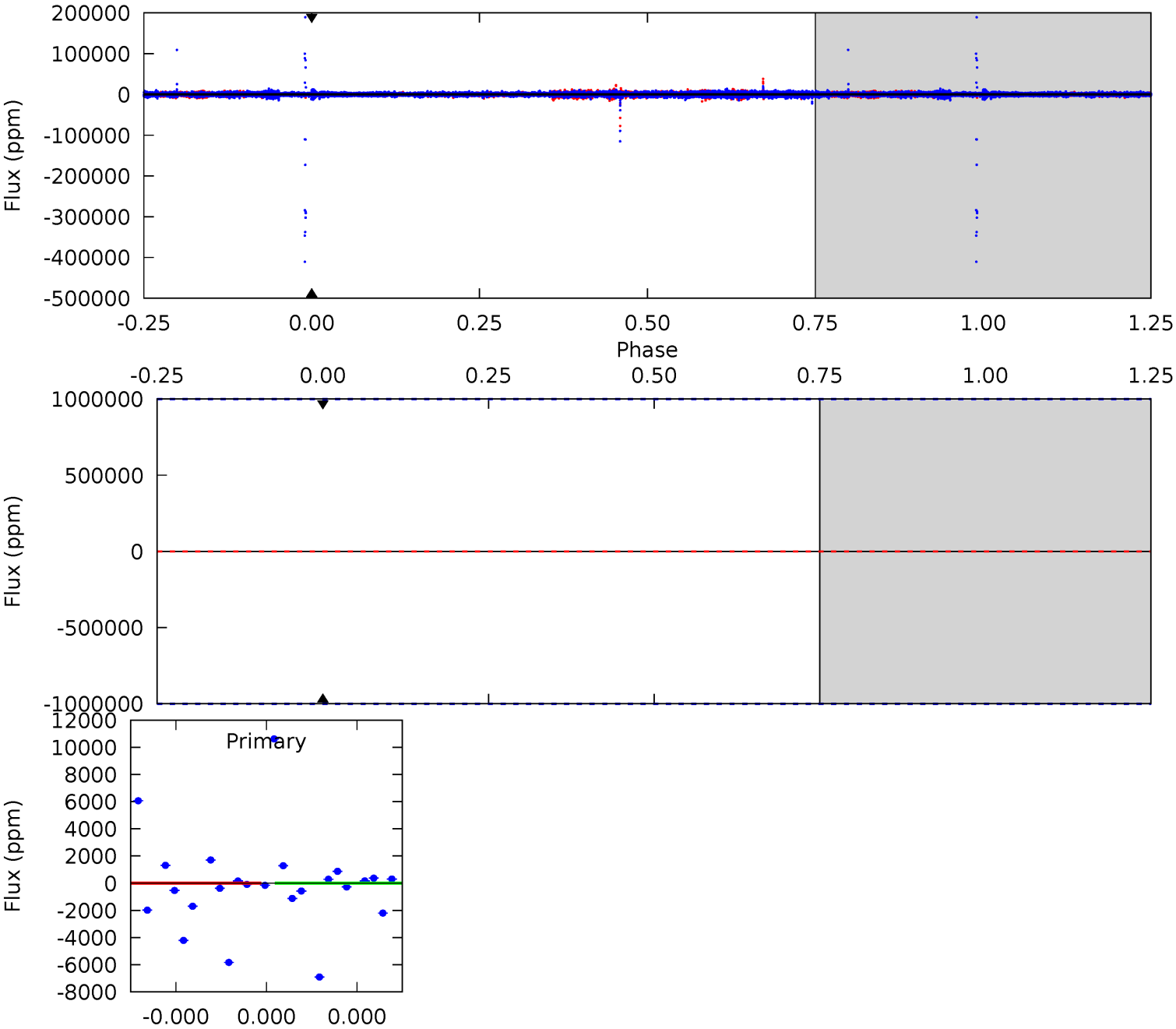
TCE 002970580-08     $P=312.830992$  Days     $T_0=241.392282$  (BKJD)



# DV Model-Shift Uniqueness Test

002970580-08, P = 312.830992 Days, E = 240.650043 Days

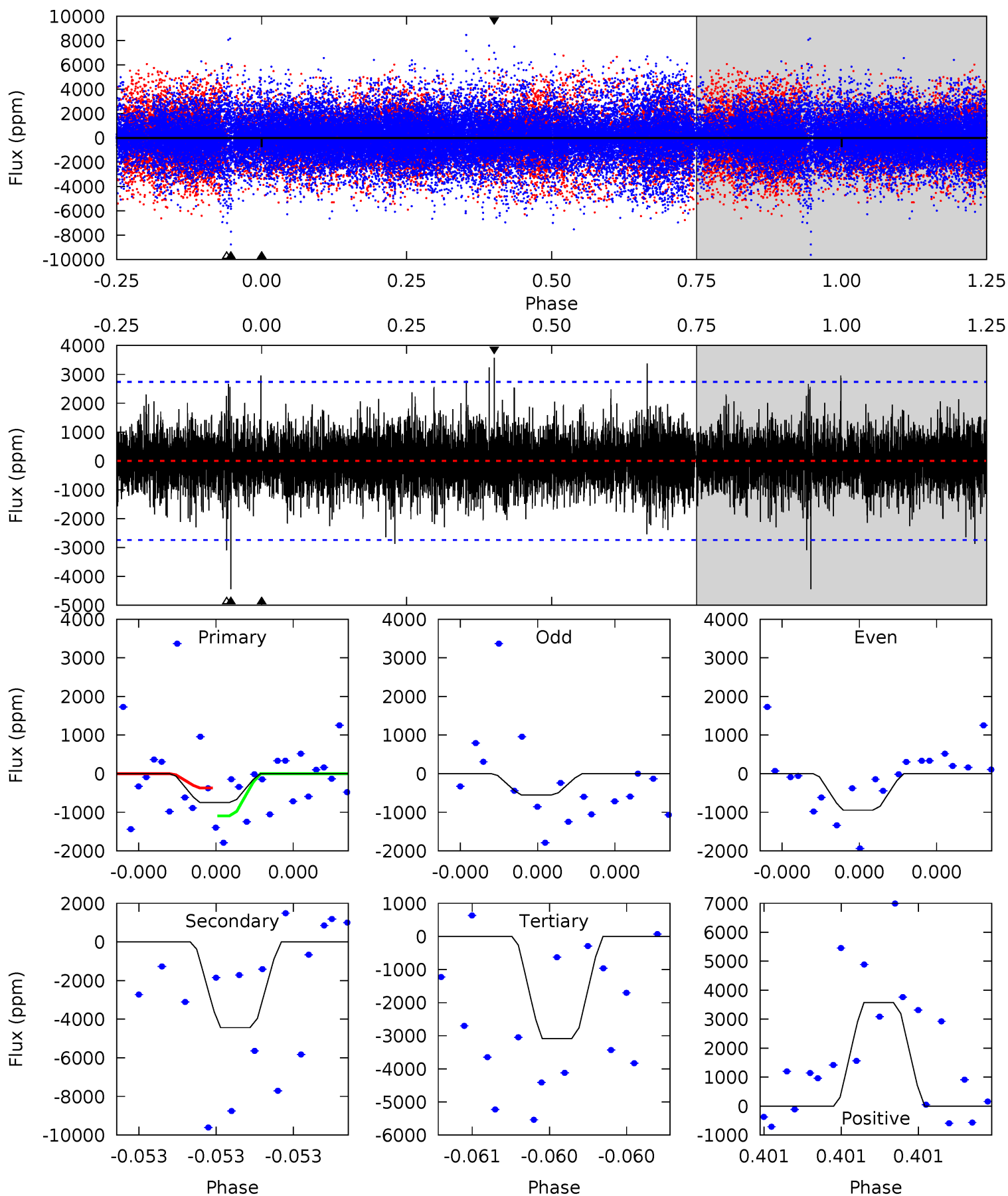
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
0	0	0	0	1.00	1.00	1.00	0	0	0	0	0	0	0	0



# Alt Model-Shift Uniqueness Test

002970580-08, P = 312.830992 Days, E = 241.392282 Days

Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
1.56	9.27	6.46	7.47	5.72	3.71	1.39	-4.89	-5.91	2.82	1.80	0.41	1.35	0.45	0.77



### Stellar Parameters For KIC 002970580

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$4605^{+69}_{-48}$	$2.619^{+0.120}_{-0.120}$	$-0.080^{+0.150}_{-0.100}$	$7.844^{+2.620}_{-0.936}$	$0.934^{+0.427}_{-0.022}$	$0.003^{+0.001}_{-0.001}$
	+1%/-1%	+5%/-5%	+188%/-125%	+33%/-12%	+46%/-2%	+48%/-45%
Source	SPE74	SPE74	SPE74	DSEP		

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

### Secondary Eclipse Parameters for KIC 002970580-08 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$0 \pm 1000000$	$68.26^{+65.03}_{-48.51}$	$843^{+43}_{-36}$	$4032^{+9293}_{-15751}$	$291^{+21377}_{-16748}$
Alt.	$-4437 \pm 478$	$70.99^{+65.83}_{-49.46}$	$843^{+48}_{-32}$	$4265^{+3163}_{-814}$	$394^{+3920}_{-286}$

$T_{max}$  = 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

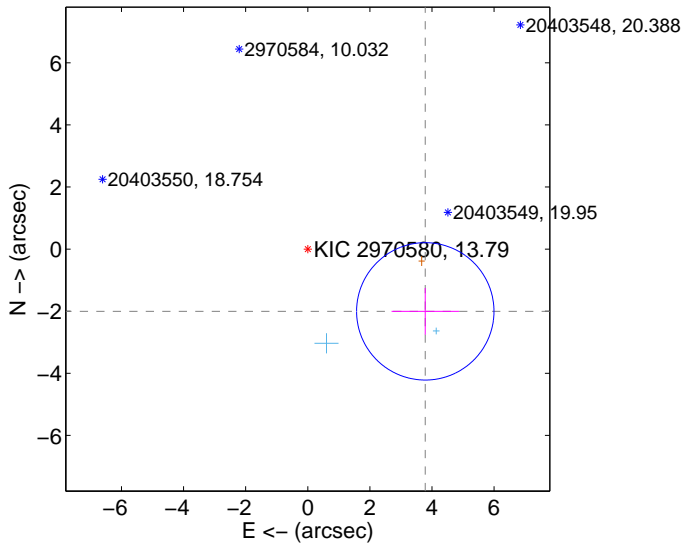
Supplemental centroid analysis for 002970580-08. Kepler magnitude: 13.79. Transit SNR -1.00

There are 2 quarters with good PRF difference image offsets

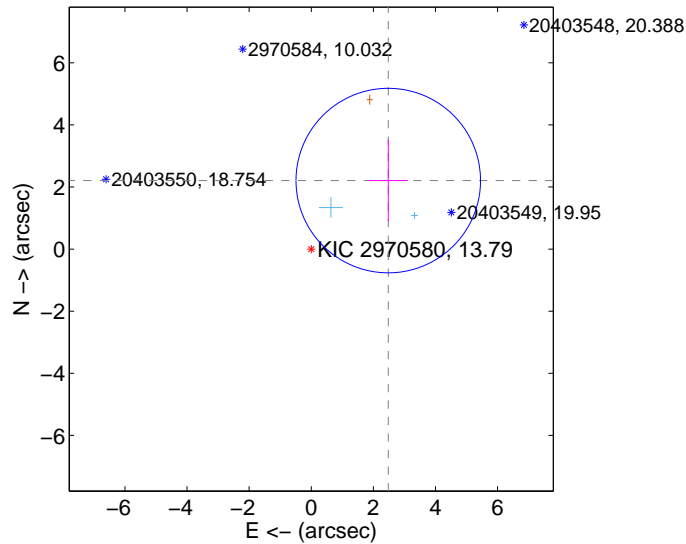
The OOT PRF centroid is offset from the target star catalog position by about 5.50 arcsec so the offset from difference PRF-fit to OOT-fit may be invalid.

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$4.283 \pm 0.737$	5.81	$-3.785 \pm 1.087$	$-2.005 \pm 0.754$
PRF-fit source offset from KIC position	$3.320 \pm 0.990$	3.35	$-2.480 \pm 0.630$	$2.207 \pm 1.311$
photometric centroid source offset	$1.77 \pm 0.95$	1.87	$-0.76 \pm 1.18$	$1.60 \pm 0.89$

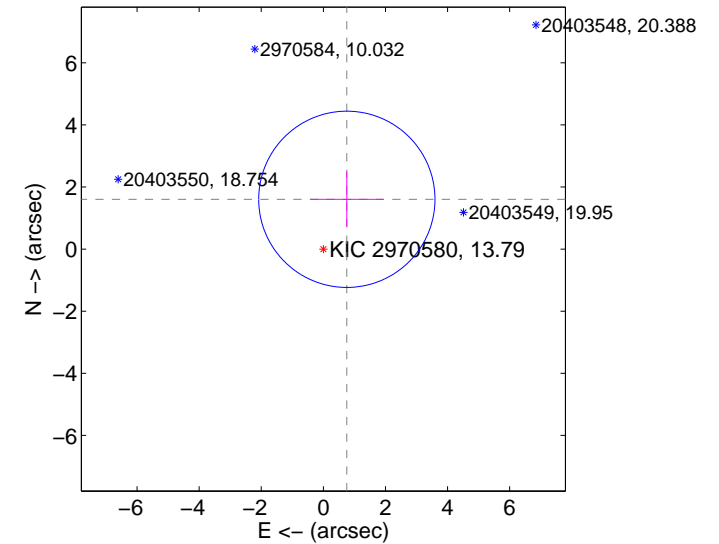
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position

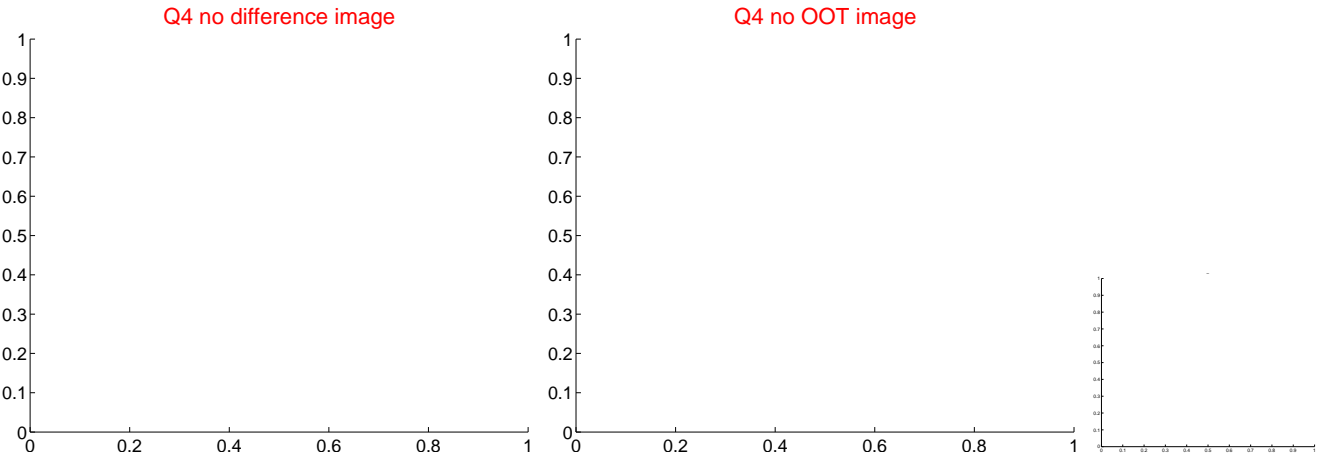
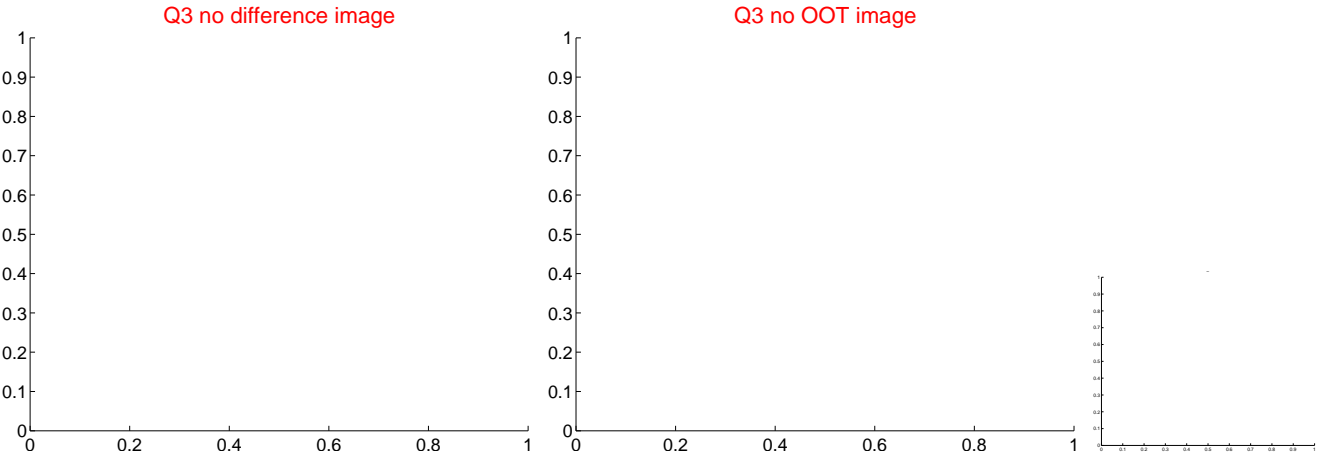
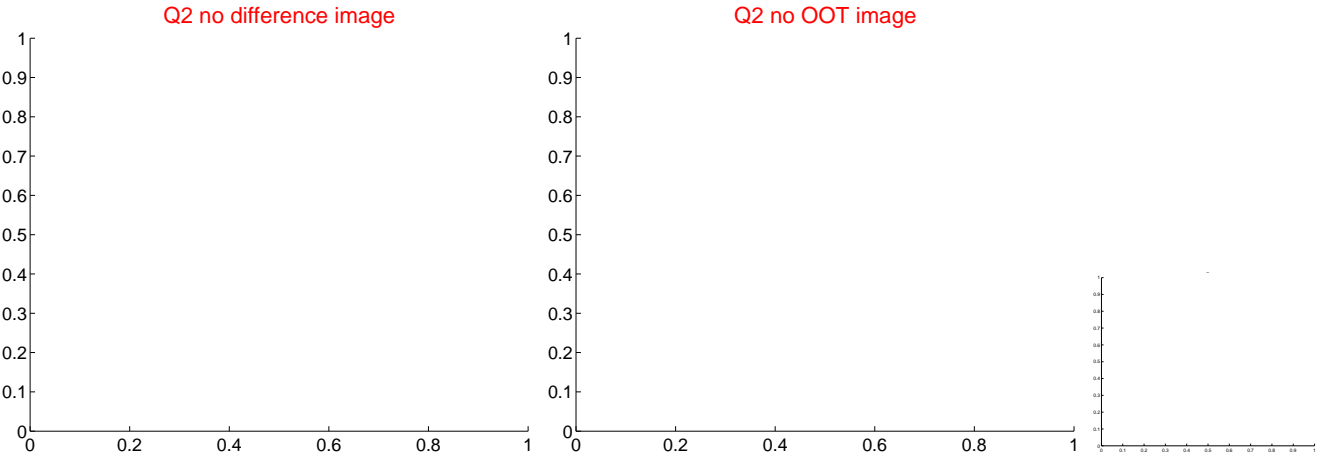
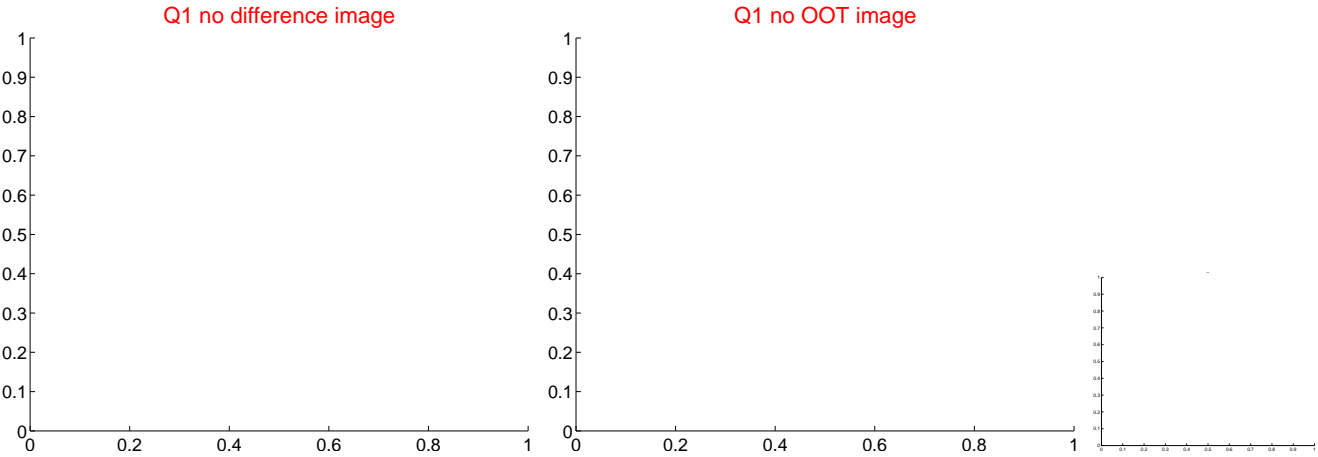


offset from photometric centroids



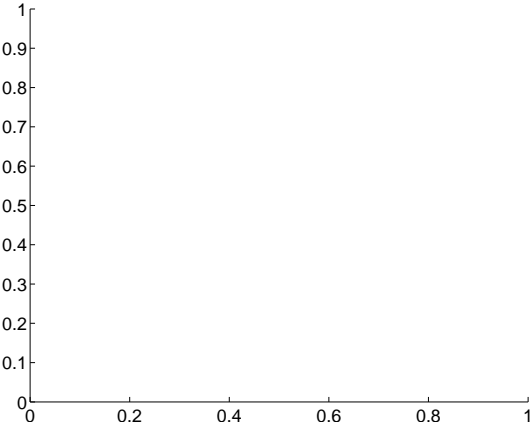
Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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

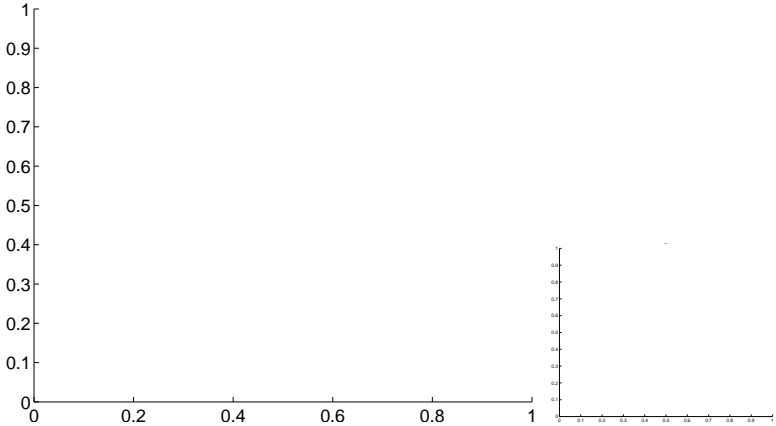


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

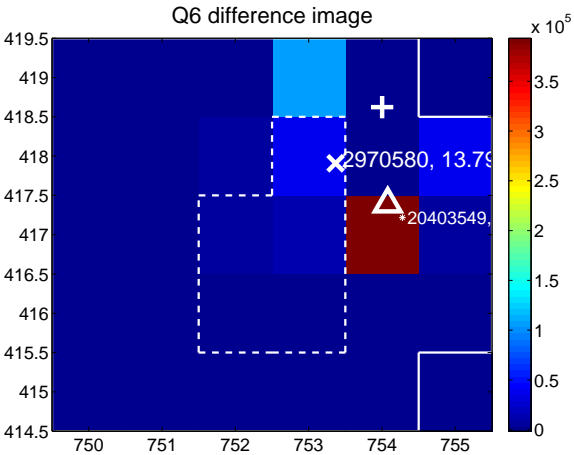
Q5 no difference image



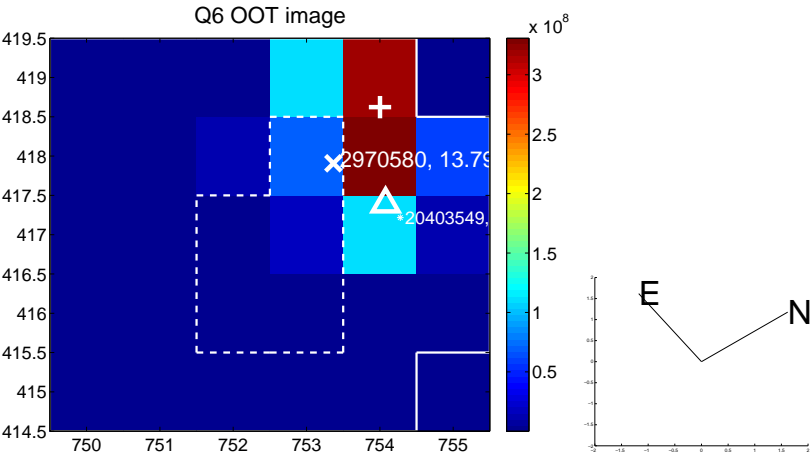
Q5 no OOT image



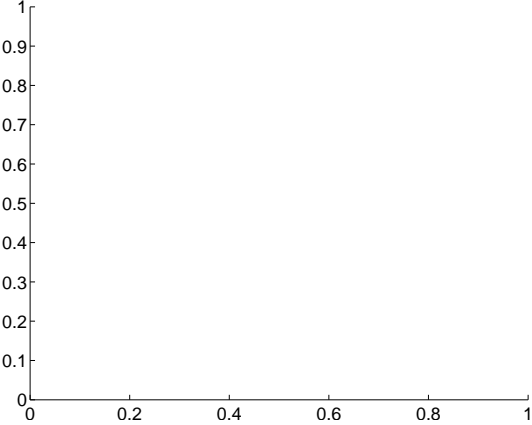
Q6 difference image



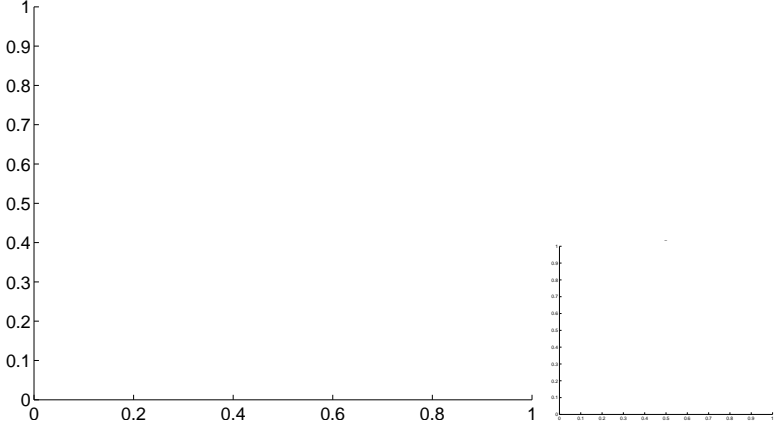
Q6 OOT image



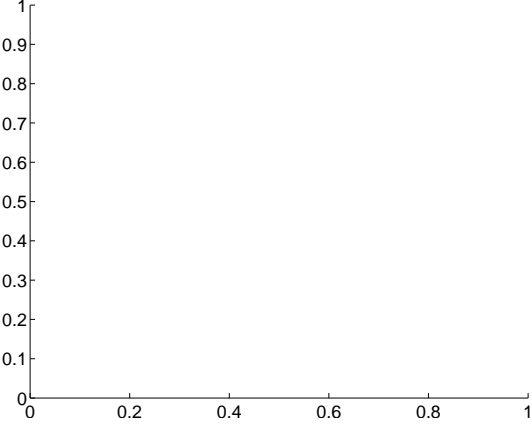
Q7 no difference image



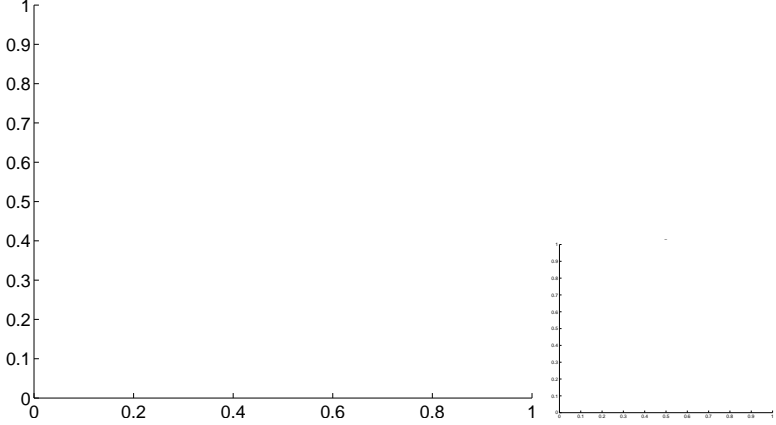
Q7 no OOT image



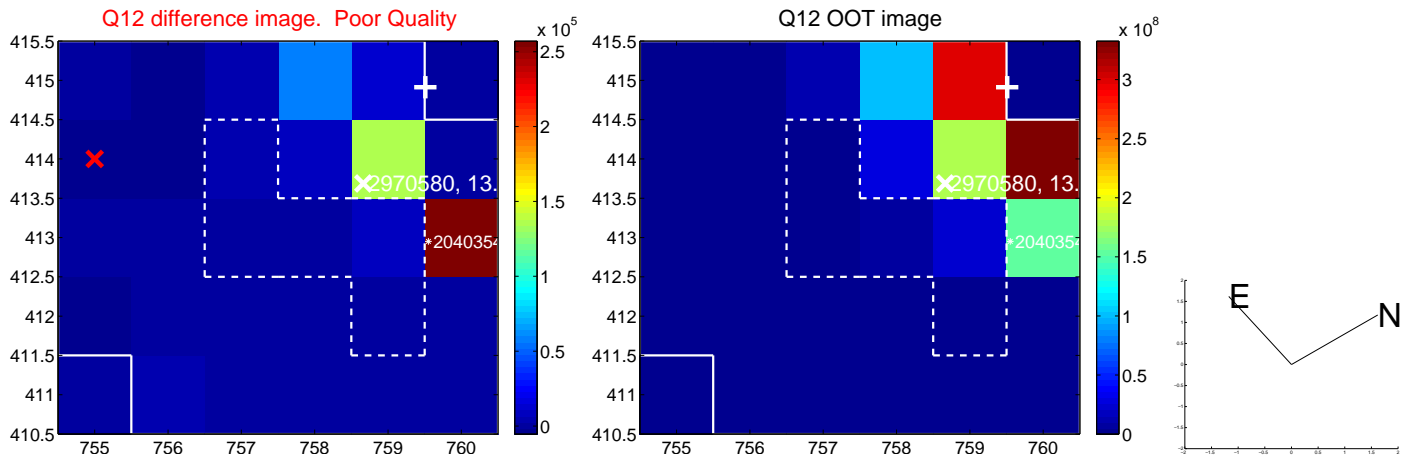
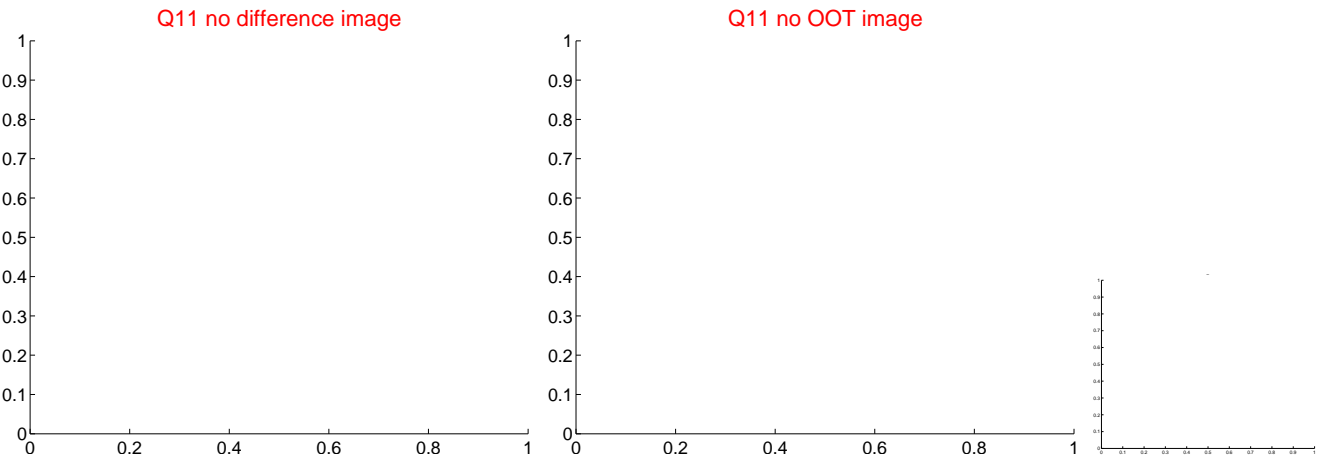
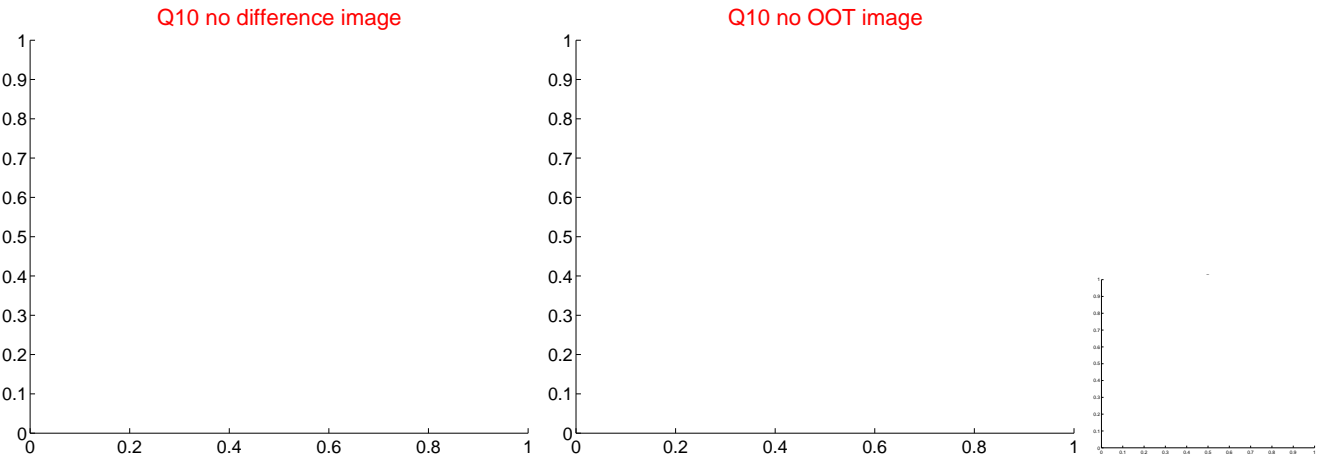
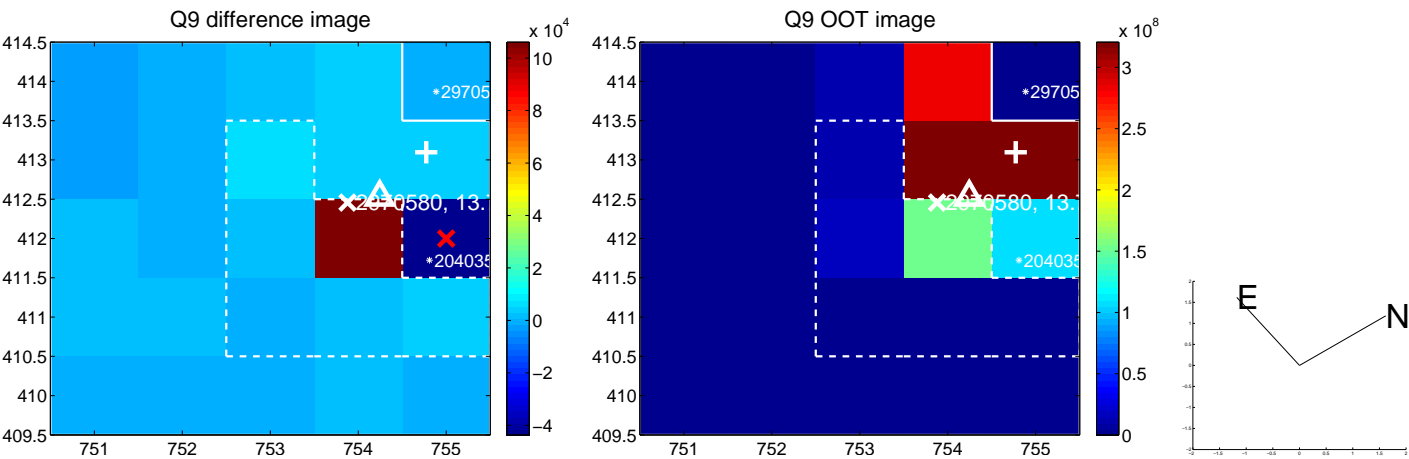
Q8 no difference image



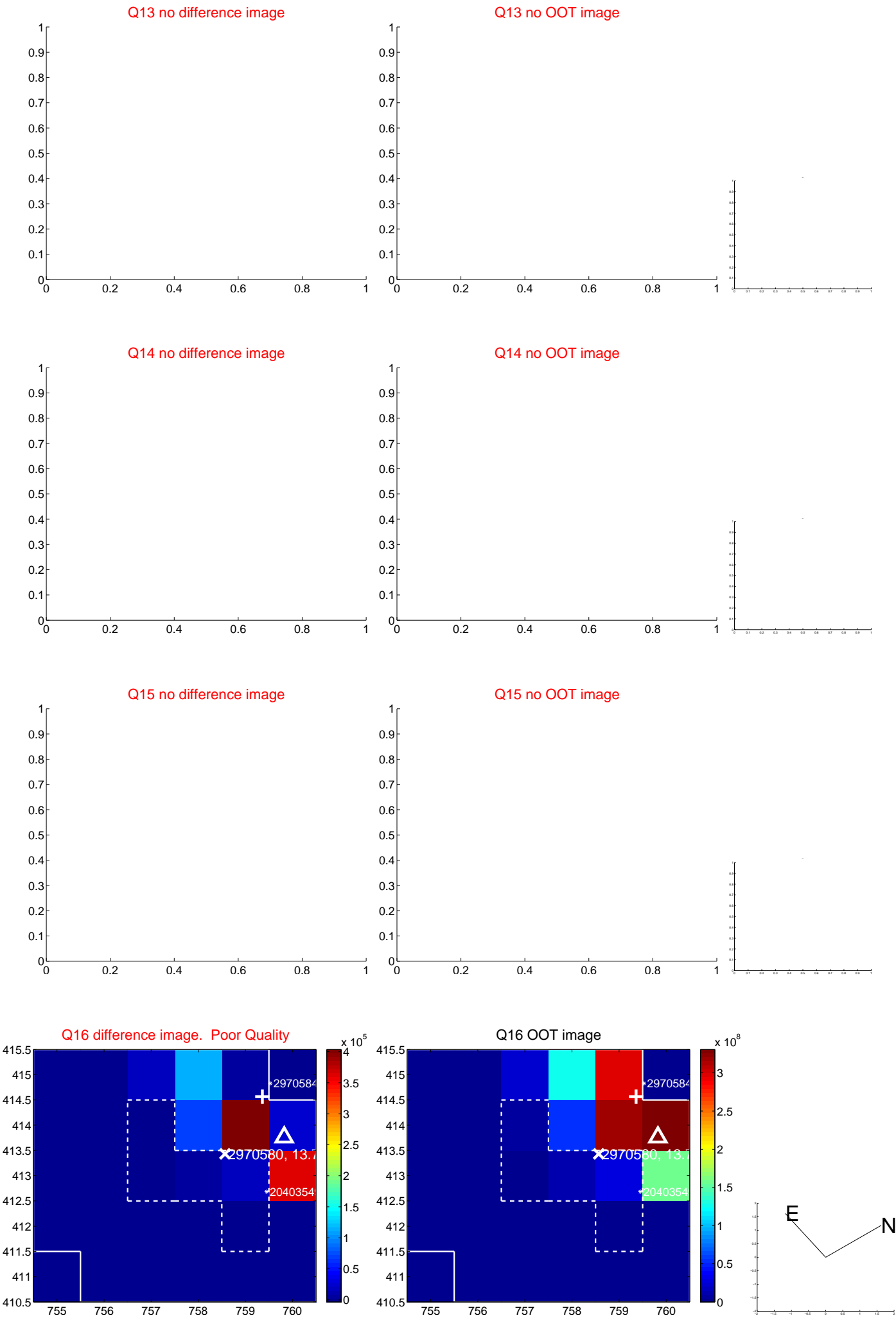
Q8 no OOT image



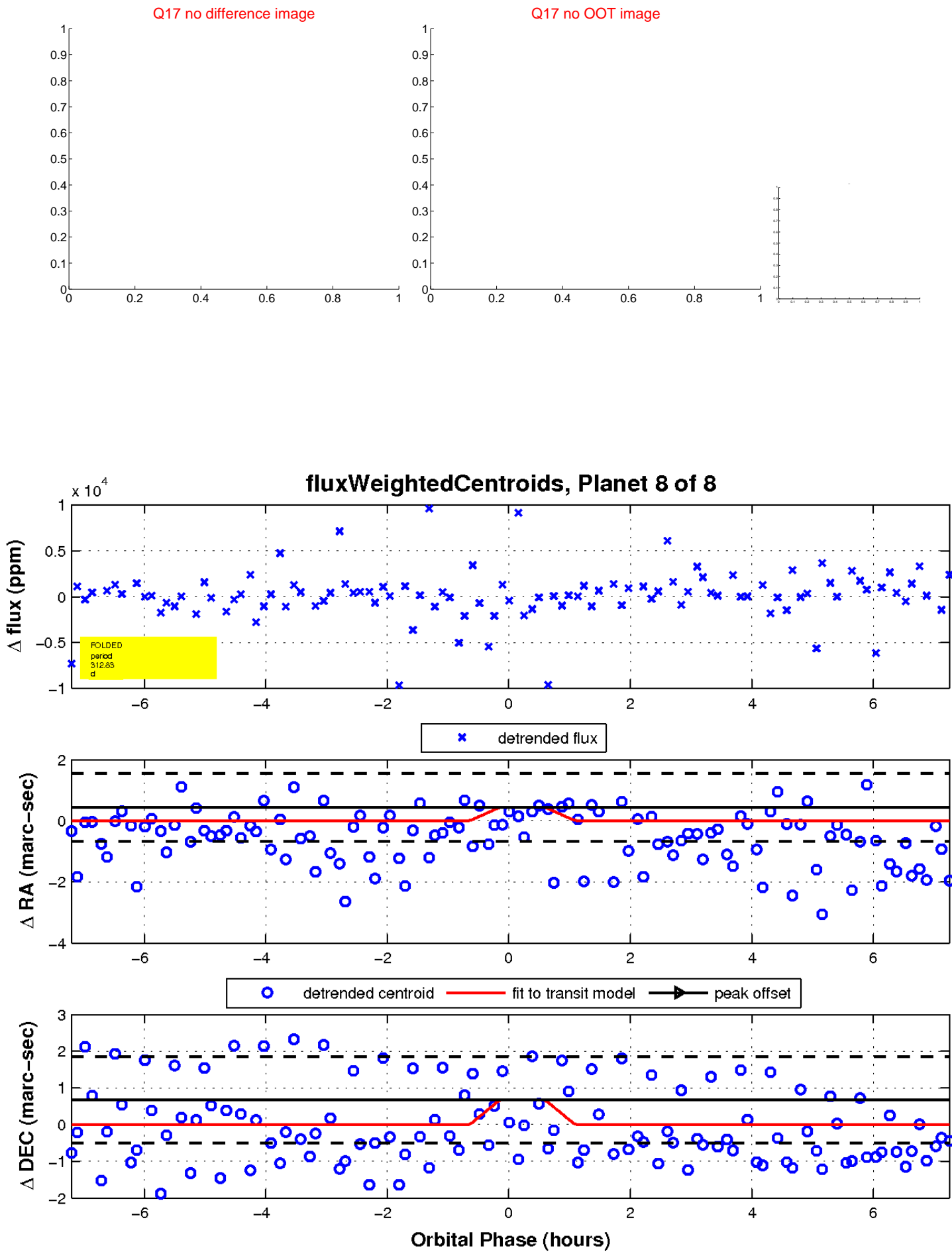
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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



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



UKIRT Image

