

# KIC 007431887

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
007431887-01	OBS	No	1.553574	131.905139	28.2	7.875	8.7	8.2	1.12	6267	0.61	2533.10
007431887-02	OBS	No	411.636384	533.544629	1551.2	17.901	14.9	13.6	1.12	6267	4.94	1.49
007431887-03	OBS	No	388.494382	202.519206	2367.5	26.549	12.1	10.7	1.12	6267	5.49	1.61
007431887-04	OBS	No	109.082765	138.385429	221.7	5.894	11.8	5.1	1.12	6267	1.90	8.74
007431887-05	OBS	No	245.597955	237.614415	2208.8	30.194	10.9	10.8	1.12	6267	9.72	2.96
007431887-06	OBS	No	214.190439	249.997276	695.2	22.274	9.8	6.1	1.12	6267	5.65	3.56
007431887-07	OBS	No	159.383586	176.419960	452.5	10.999	9.2	6.0	1.12	6267	2.78	5.27

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
007431887-01	OBS	FP	0.00	1	0	0	0	LPP_DV—MOD_NONUNIQ_DV
007431887-02	OBS	FP	0.00	1	0	1	0	INDIV_TRANS_RUBBLE_MARSHALL_ZUMA—LPP_DV—ALL_TRANS_CHASES—INCONSISTENT_TRANS—CENT_FEW_DIFFS—HALO_GHOST
007431887-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_MARSHALL—LPP_DV—LPP_ALT—ALL_TRANS_CHASES
007431887-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_TRACKER—TRANS_GAPPED—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_ALT—MOD_POS_ALT—INCONSISTENT_TRANS
007431887-05	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_MARSHALL—TRANS_GAPPED—LPP_DV—ALL_TRANS_CHASES—INCONSISTENT_TRANS—CENT_FEW_DIFFS
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**Notes:** OBS = Observed. INJ = Injected. INV = Inverted. SCR = Scrambled.

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

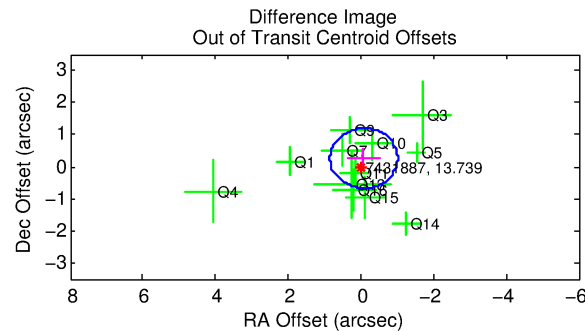
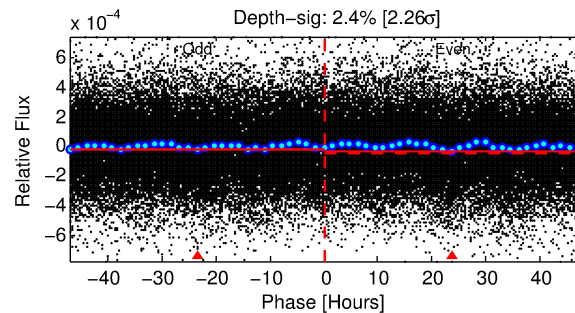
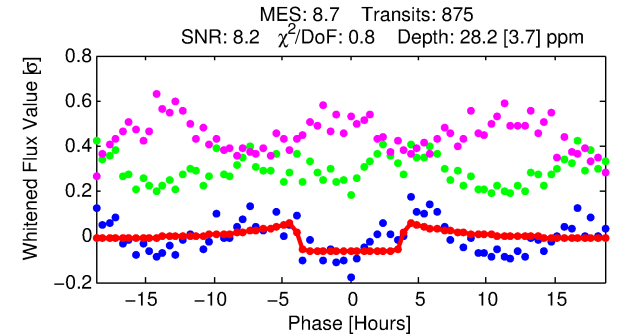
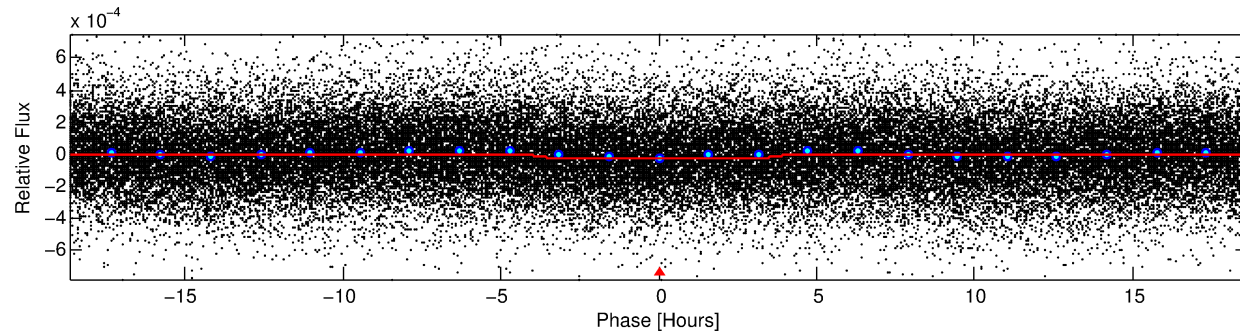
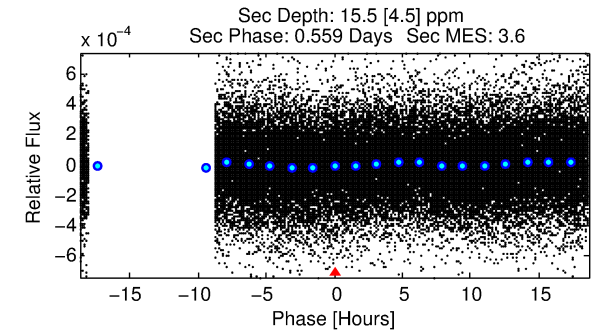
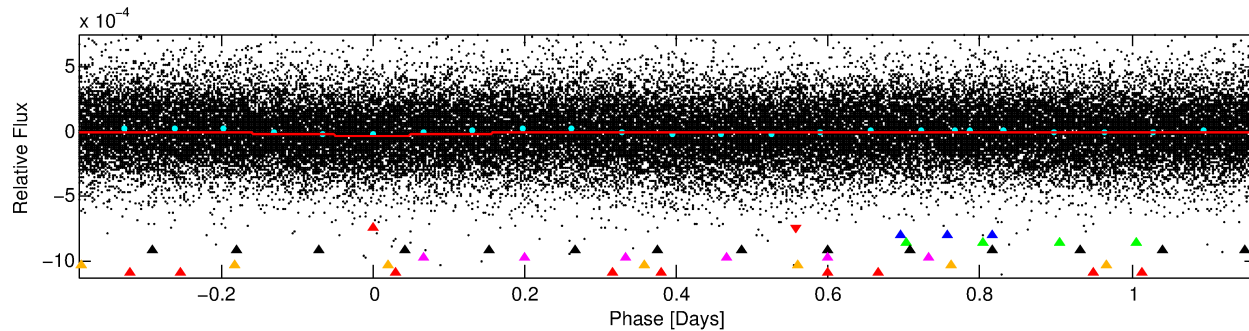
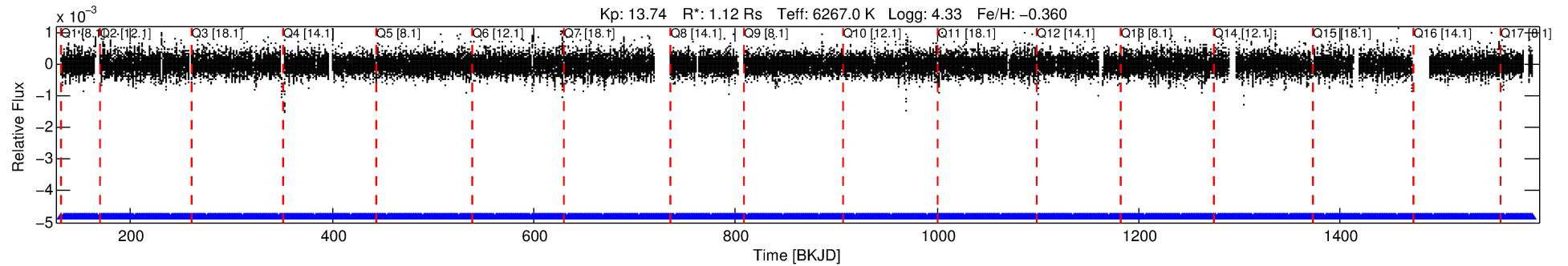
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 007431887-01

No Significant Match Found

# DV One-Page Summary

KIC: 7431887 Candidate: 1 of 7 Period: 1.554 d



## DV Fit Results:

Period = 1.55357 [0.00002] d  
Epoch = 131.9051 [0.0049] BKJD  
Rp/R\* = 0.0050 [0.0030]  
a/R\* = 1.55 [2.82]  
b = 0.40 [6.58]  
Seff = 2533.10 [974.12]  
Teq = 1809 [174] K  
Rp = 0.61 [0.41] Re  
a = 0.0261 [0.0066] AU  
Ag = 15.86 [20.45] [0.73σ]  
Teffp = 5582 [1733] K [2.17σ]

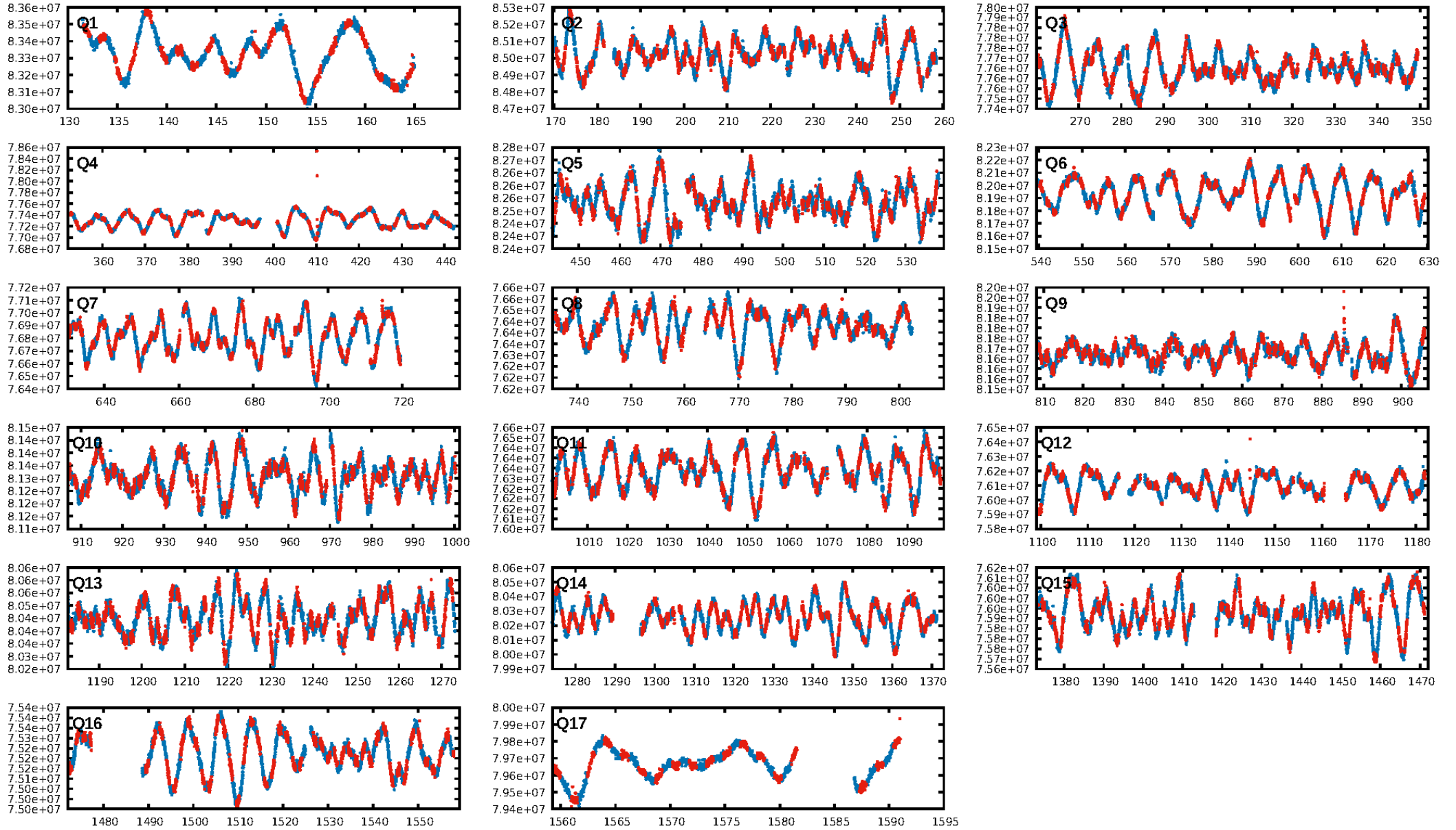
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 100.0% [262.37σ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: 7.51e-15  
RollingBand-fgt: 1.00 [835/835]  
GhostDiagnostic-chr: 3.012  
Centroid-sig: 29.9%  
Centroid-so: 0.676 arcsec [0.88σ]  
OotOffset-rm: 0.270 arcsec [0.87σ]  
KicOffset-rm: 0.152 arcsec [0.46σ]  
OotOffset-st: 2/4/2/4 [12]  
KicOffset-st: 2/4/2/4 [12]  
DiffImageQuality-fgm: 0.67 [8/12]  
DiffImageOverlap-fno: 1.00 [17/17]

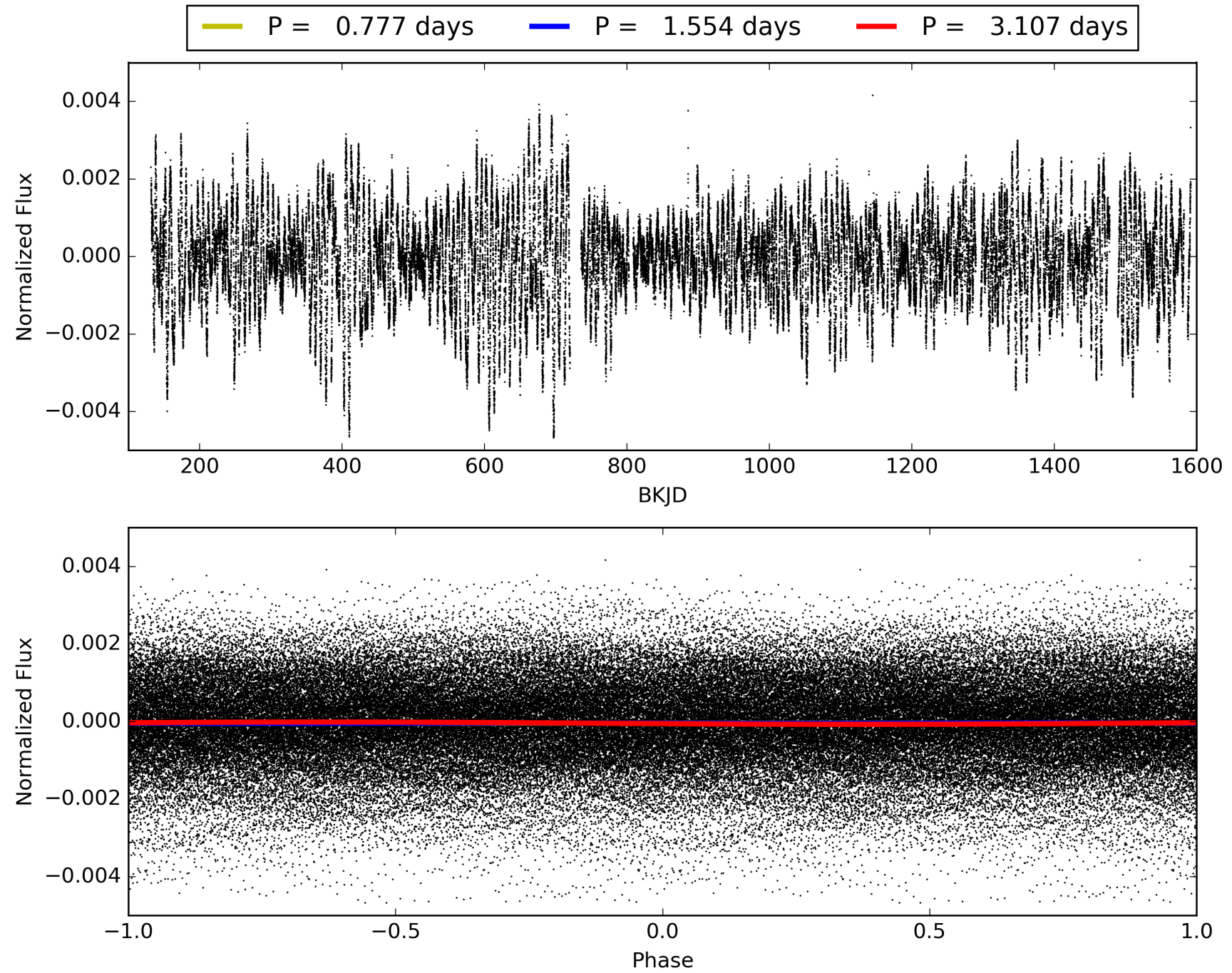
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This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

# TCE 007431887-01, PDC Light Curves



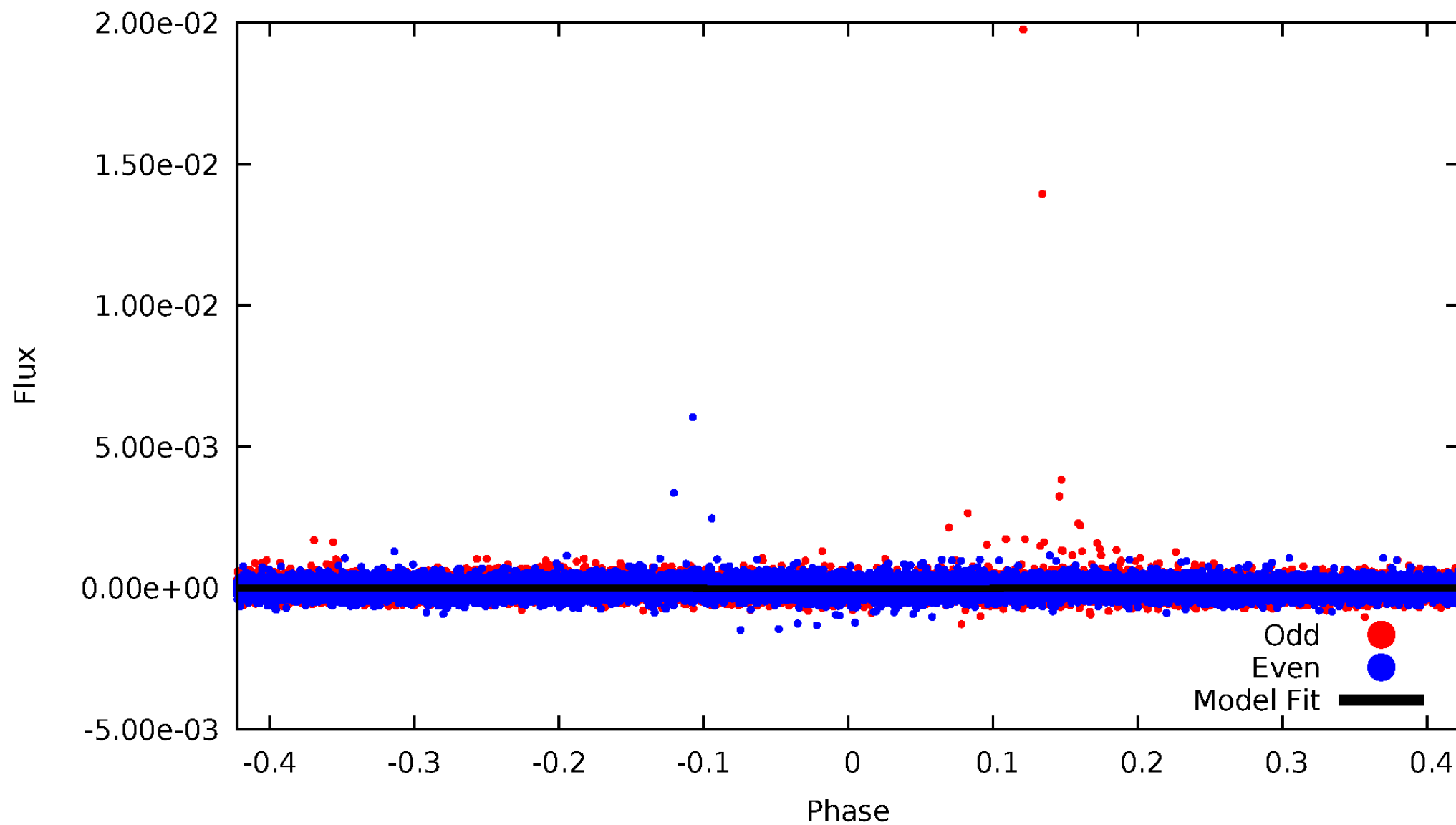
TCE 007431887-01





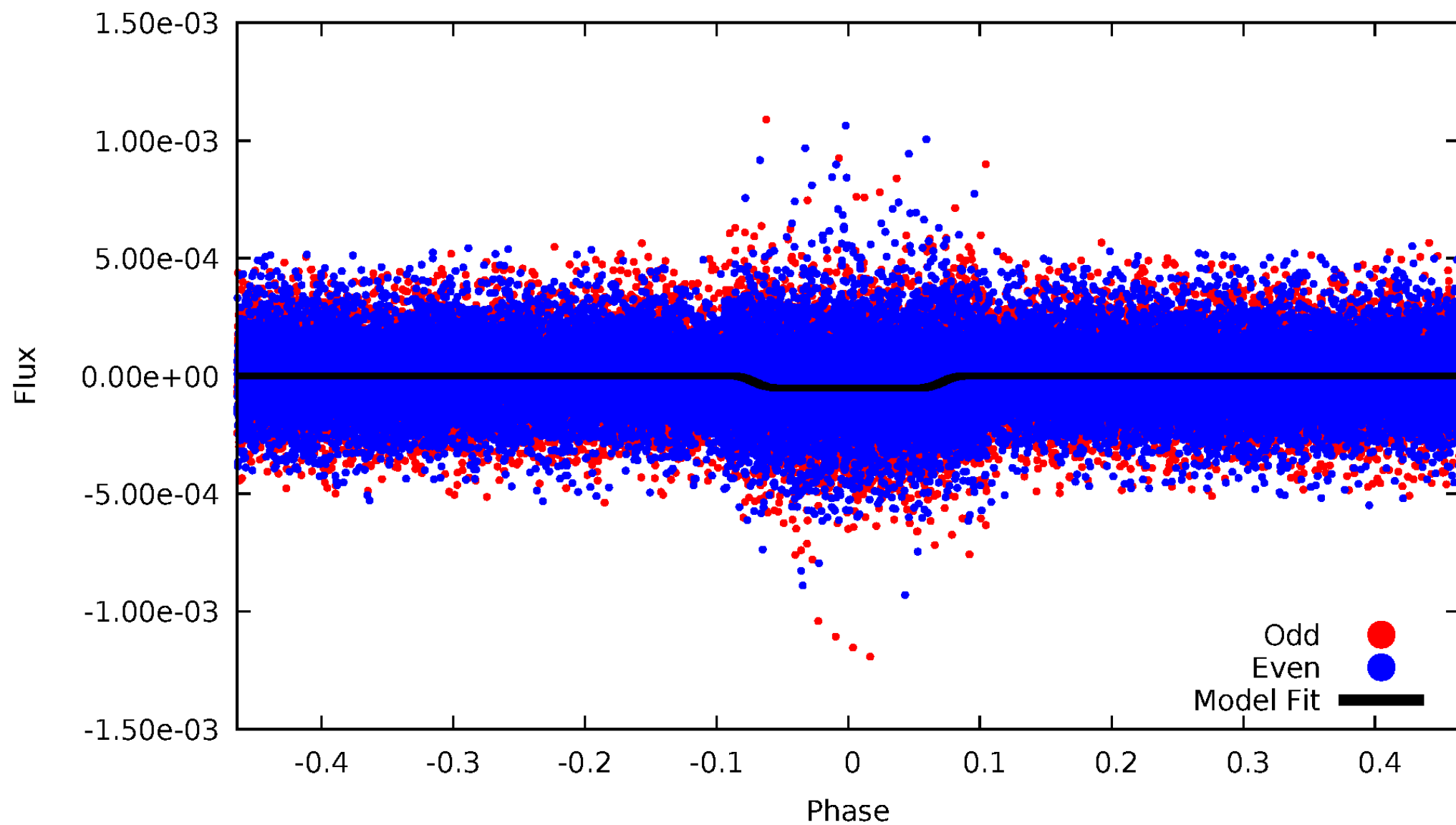
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TCE 007431887-01

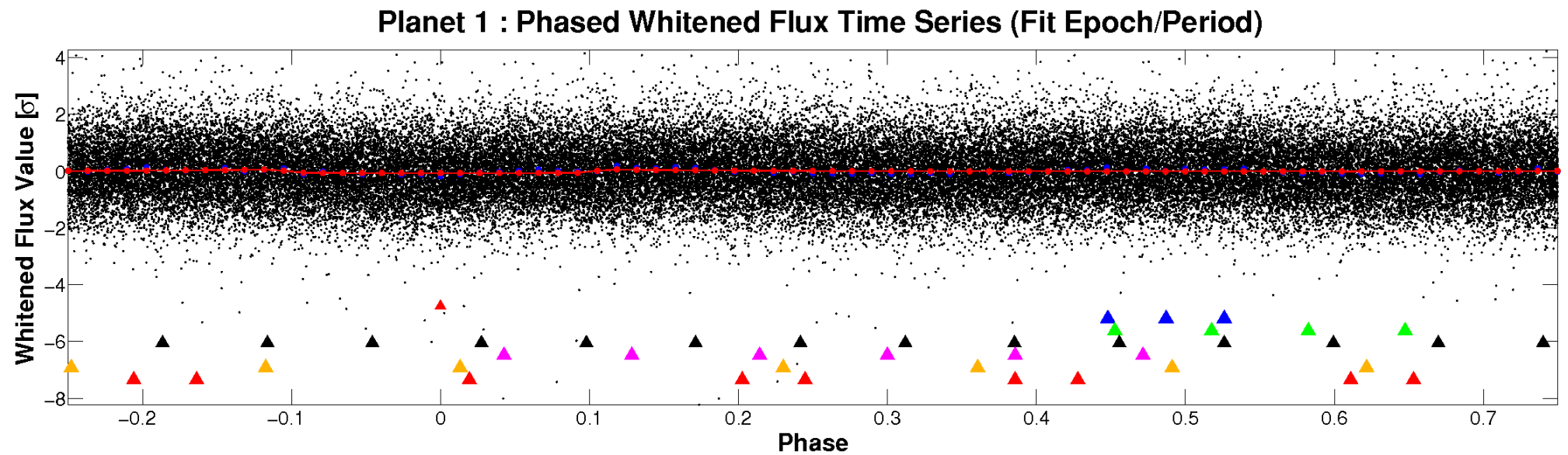
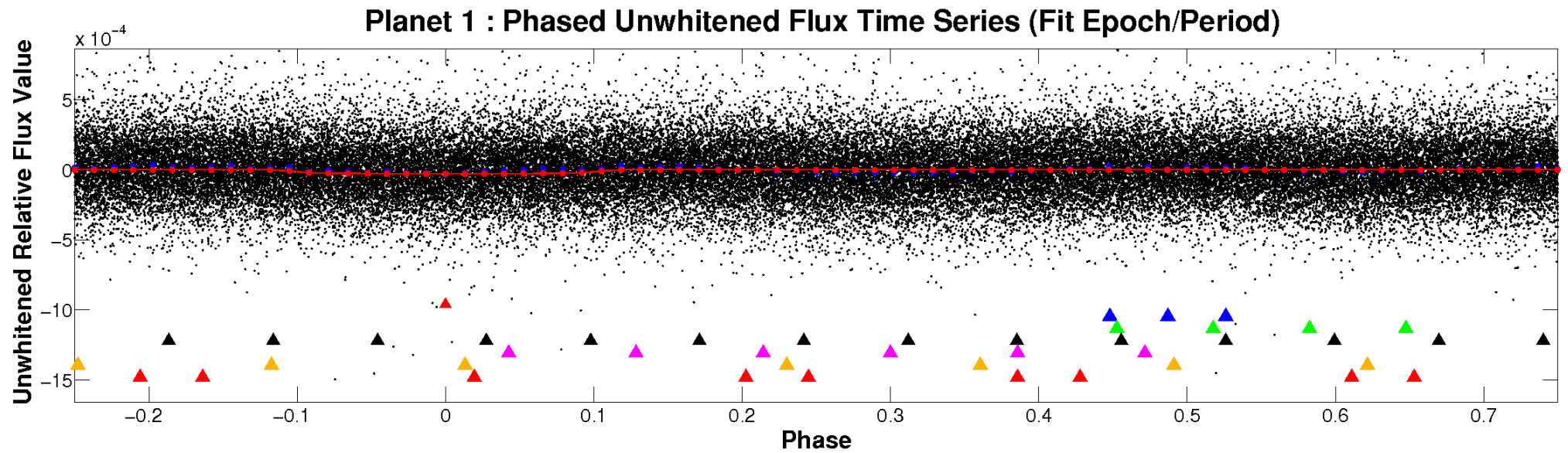


# ALT Odd/Even

TCE 007431887-01

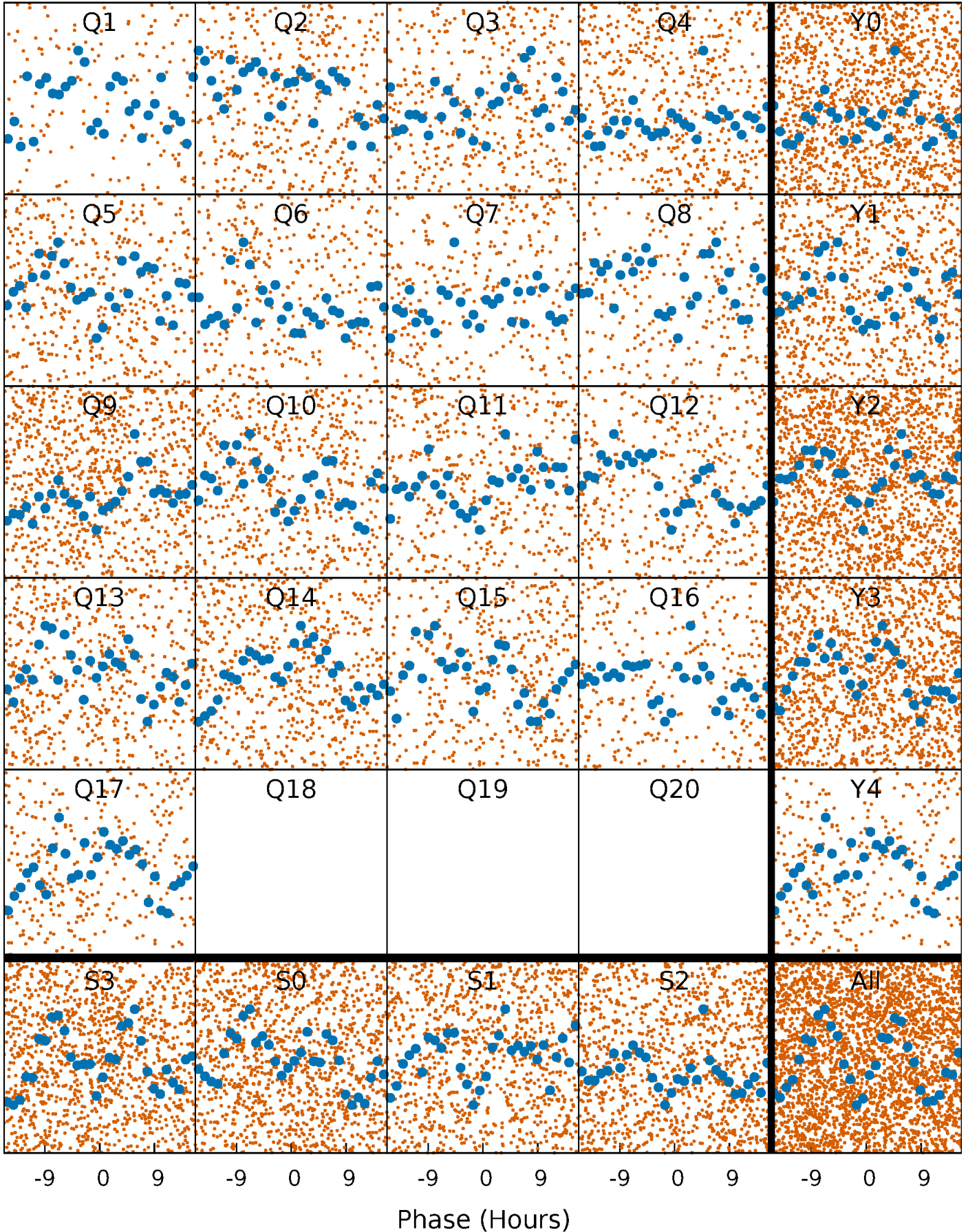


# Non-Whitened Vs. Whitened Light Curve



# PDC Quarter-Phased Transit Curves

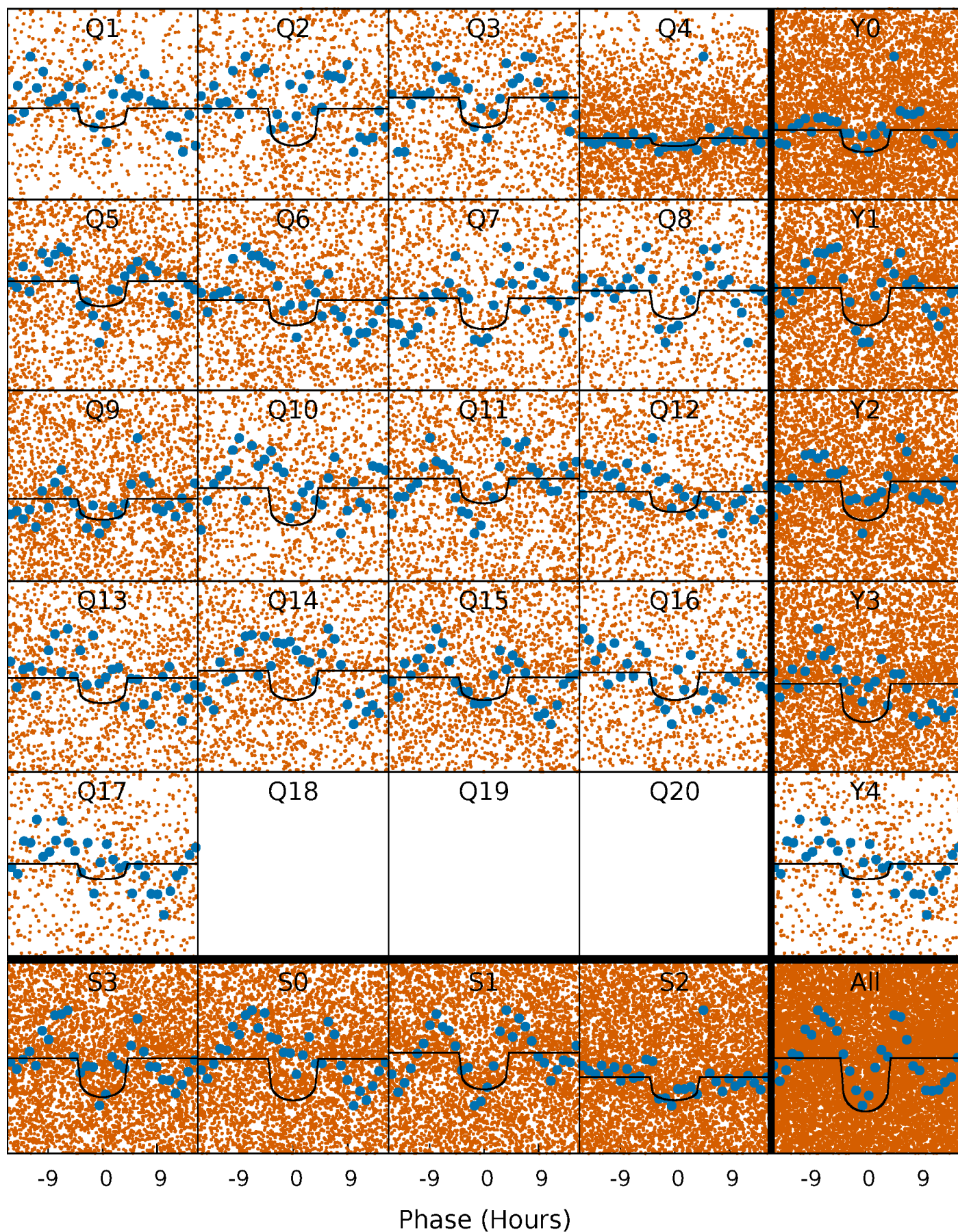
TCE 007431887-01 P= 1.553574 Days  $T_0=131.905139$  (BKJD)





# DV Quarter-Phased Transit Curves

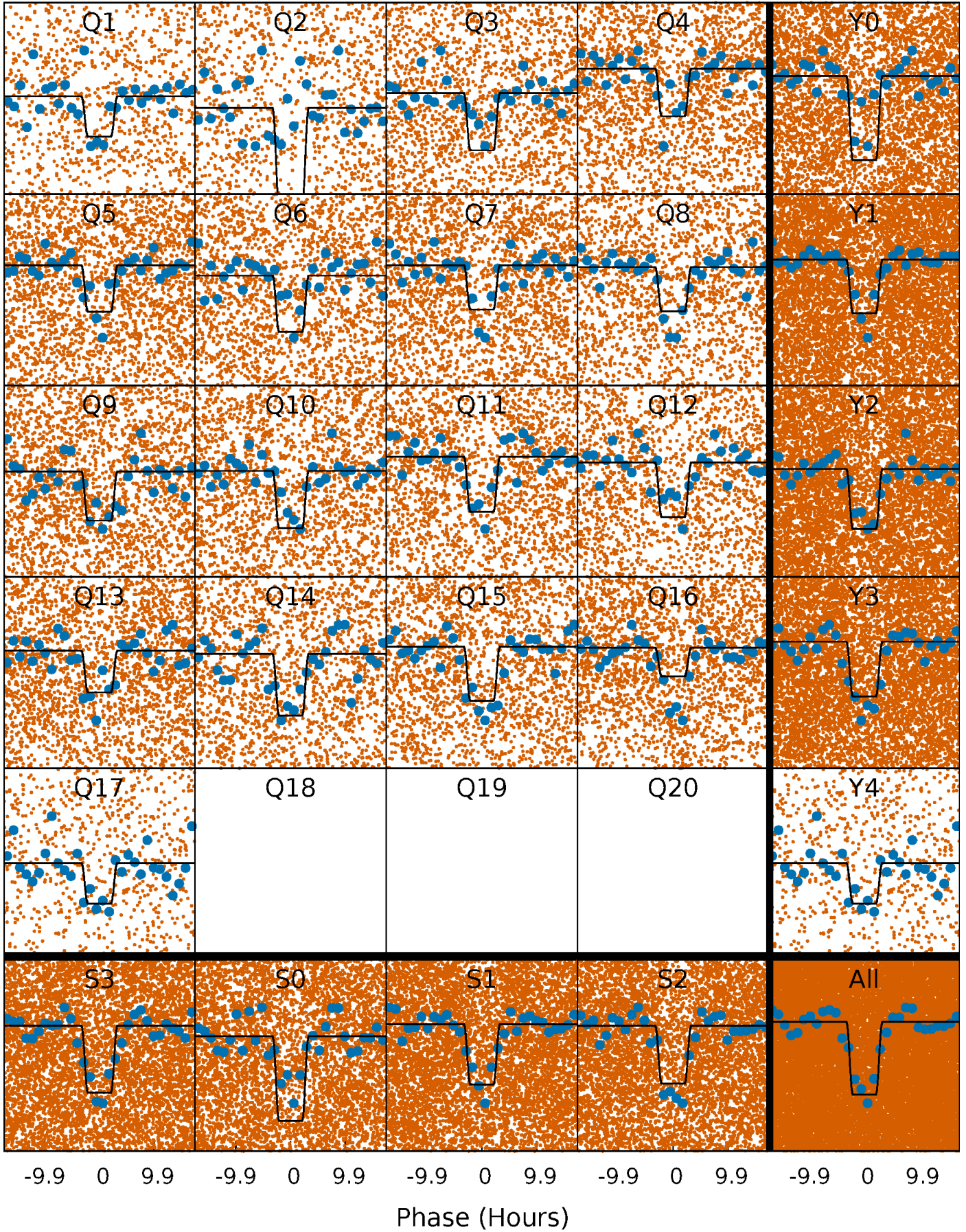
TCE 007431887-01 P= 1.553574 Days  $T_0=131.905139$  (BKJD)





# Alt. Detrend Quarter-Phased Transit Curves

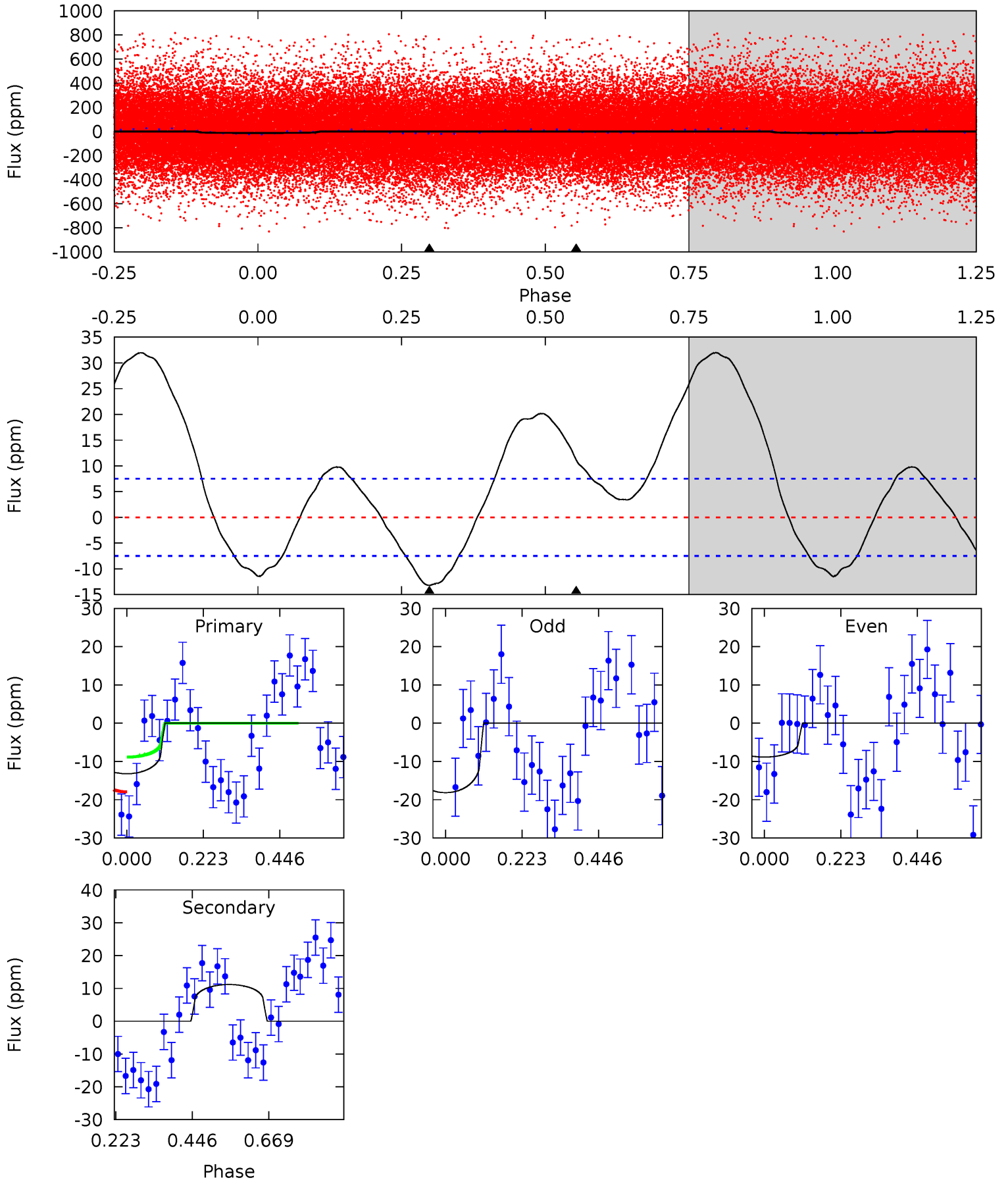
TCE 007431887-01 P= 1.553449 Days  $T_0=131.911372$  (BKJD)



# DV Model-Shift Uniqueness Test

007431887-01, P = 1.553574 Days, E = 130.351565 Days

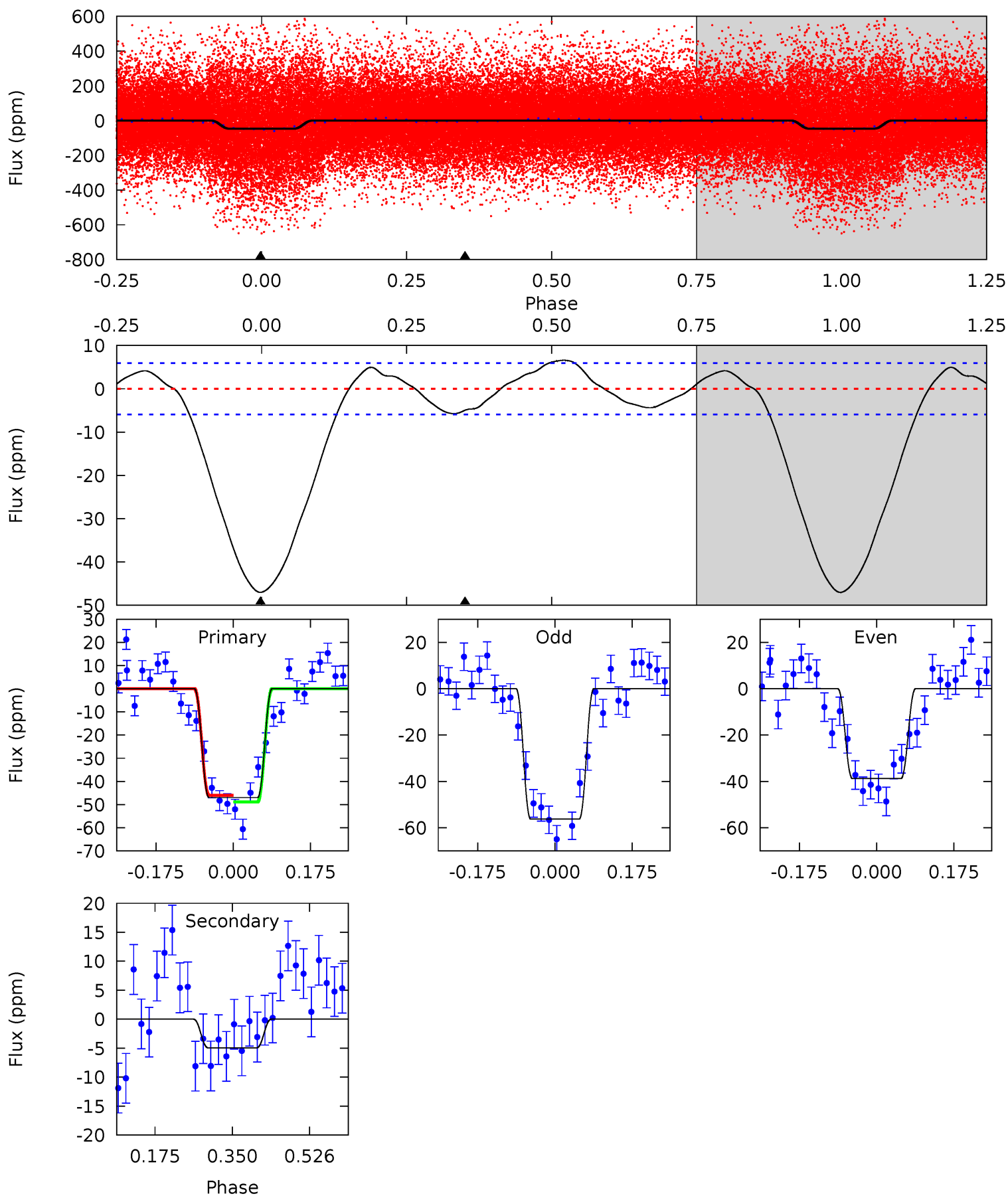
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
7.75	-6.56	0	0	4.39	1.22	9.48	7.75	7.75	-6.56	-6.56	2.73	1.13	0.71	2.72



# Alt Model-Shift Uniqueness Test

007431887-01, P = 1.553449 Days, E = 130.357923 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
35.3	3.71	0	0	4.45	1.36	2.46	35.3	35.3	3.71	3.71	6.55	0.97	0.12	1.06





### Stellar Parameters For KIC 007431887

	$T_{\text{eff}} (K)$	$\log(g)$	$[\text{Fe}/\text{H}]$	$R (R_{\odot})$	$M (M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$6267^{+169}_{-188}$	$4.334^{+0.132}_{-0.198}$	$-0.360^{+0.300}_{-0.300}$	$1.118^{+0.340}_{-0.183}$	$0.981^{+0.160}_{-0.107}$	$0.990^{+0.672}_{-0.488}$
	+3%/-3%	+3%/-5%	+83%/-83%	+30%/-16%	+16%/-11%	+68%/-49%
Source	PHO1	KIC0	KIC0	DSEP		

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

### Secondary Eclipse Parameters for KIC 007431887-01 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$11 \pm 2$	$0.65^{+0.39}_{-0.34}$	$2545^{+200}_{-149}$	$-5150^{+868}_{-2045}$	$-10.179^{+6.283}_{-29.162}$
Alt.	$-5 \pm 1$	$0.88^{+0.42}_{-0.37}$	$2537^{+199}_{-144}$	$3743^{+980}_{-548}$	$2.305^{+4.801}_{-1.335}$

$T_{\text{max}}$  = 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

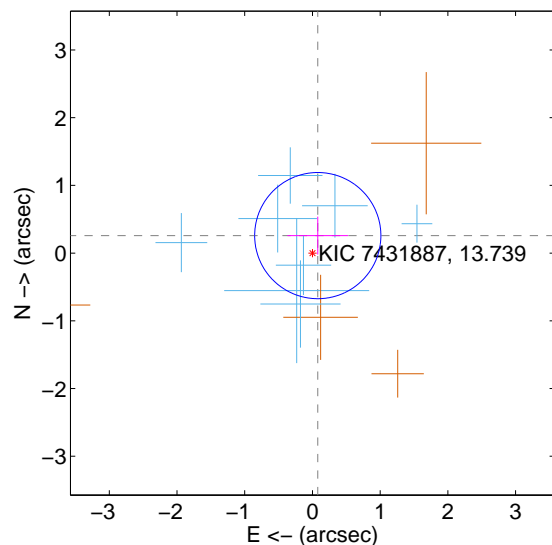
Supplemental centroid analysis for 007431887-01. Kepler magnitude: 13.74. Transit SNR 8.24

There are 8 quarters with good PRF difference image offsets

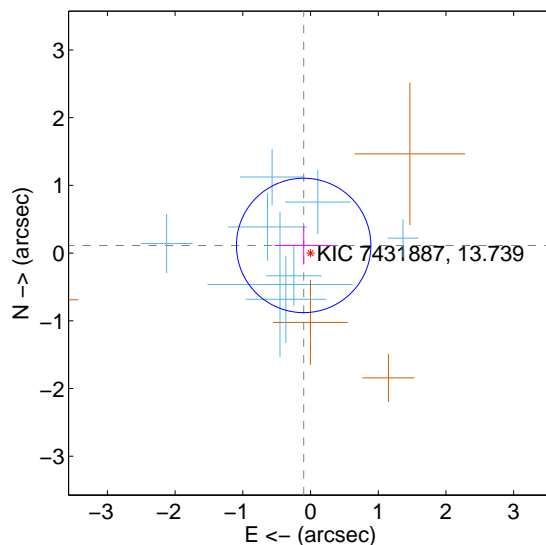
The direct PRF centroid is offset from the target star catalog position by about 0.20 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.270 \pm 0.311$	0.87	$-0.079 \pm 0.447$	$0.258 \pm 0.280$
PRF-fit source offset from KIC position	$0.152 \pm 0.331$	0.46	$0.101 \pm 0.429$	$0.113 \pm 0.279$
photometric centroid source offset	$0.68 \pm 0.77$	0.88	$0.14 \pm 0.72$	$0.66 \pm 0.77$

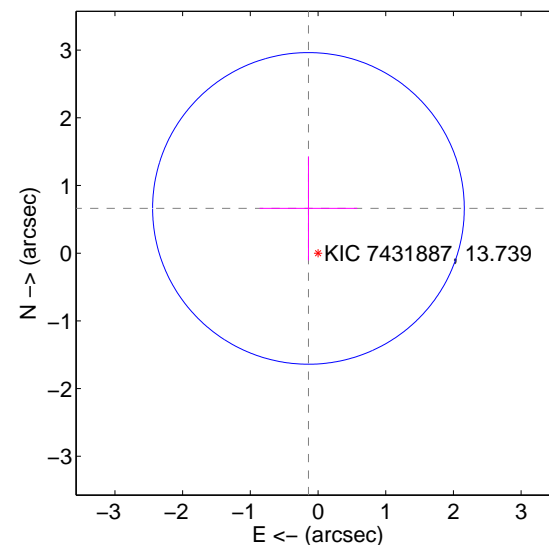
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position



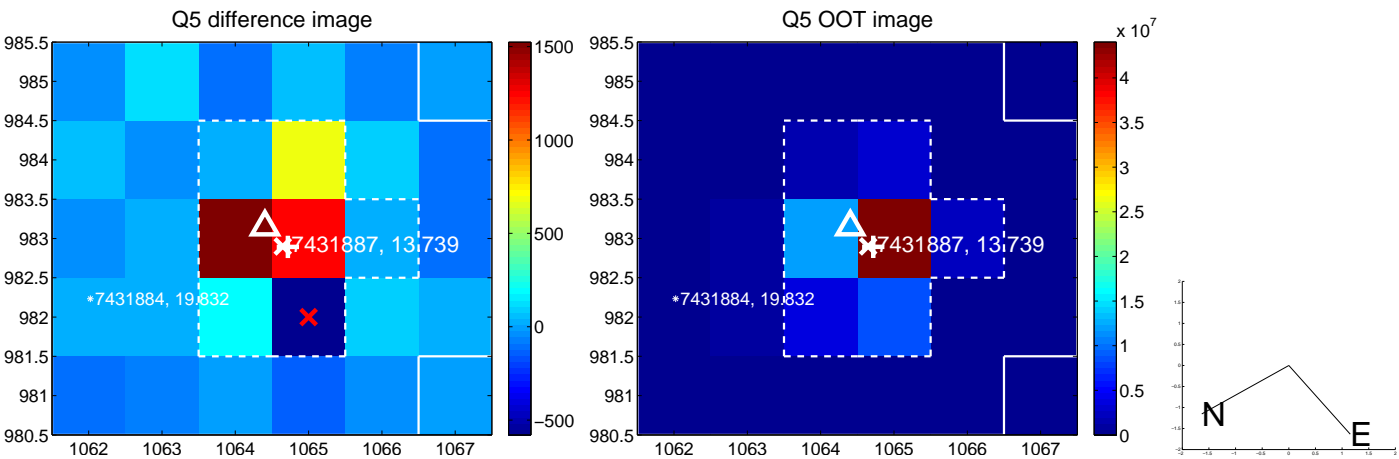
offset from photometric centroids



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.

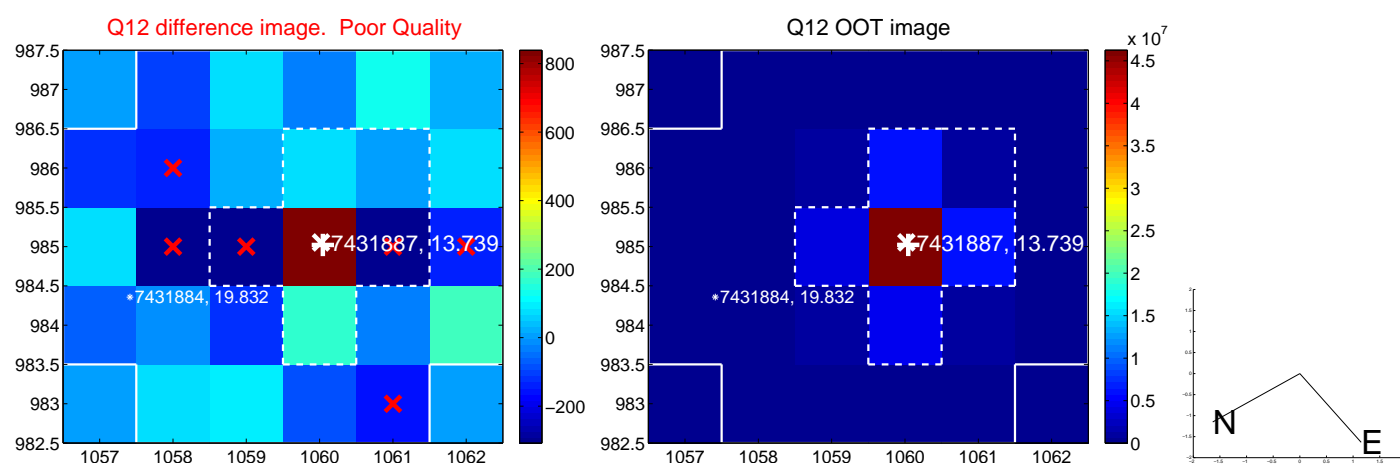
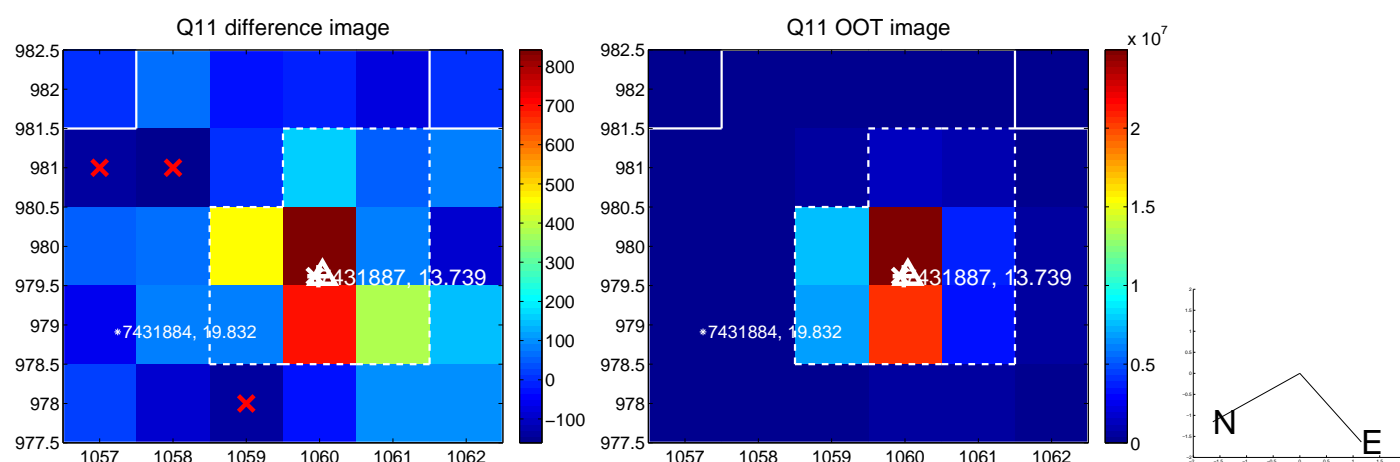
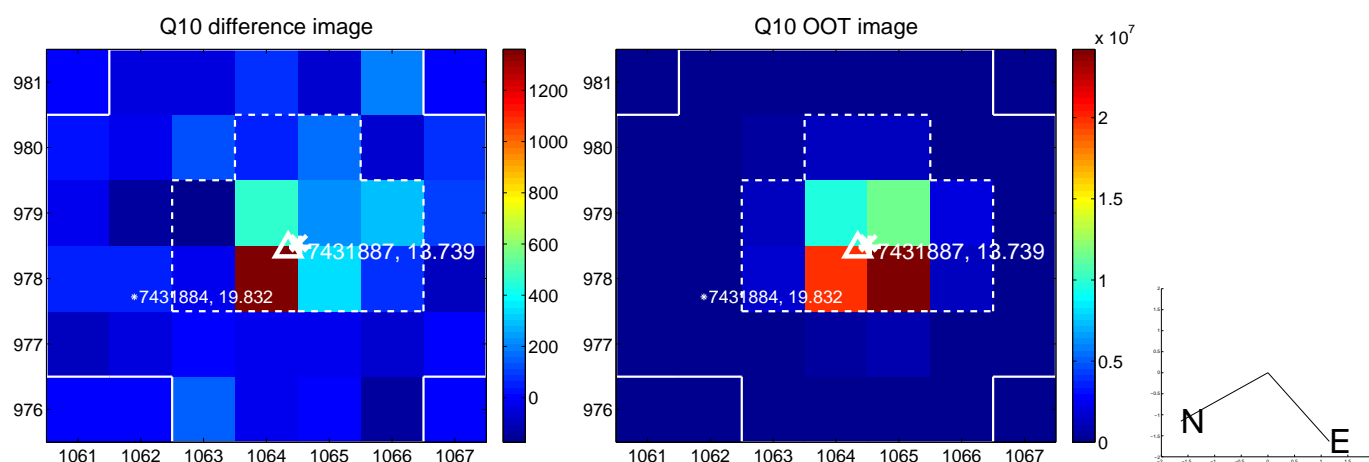
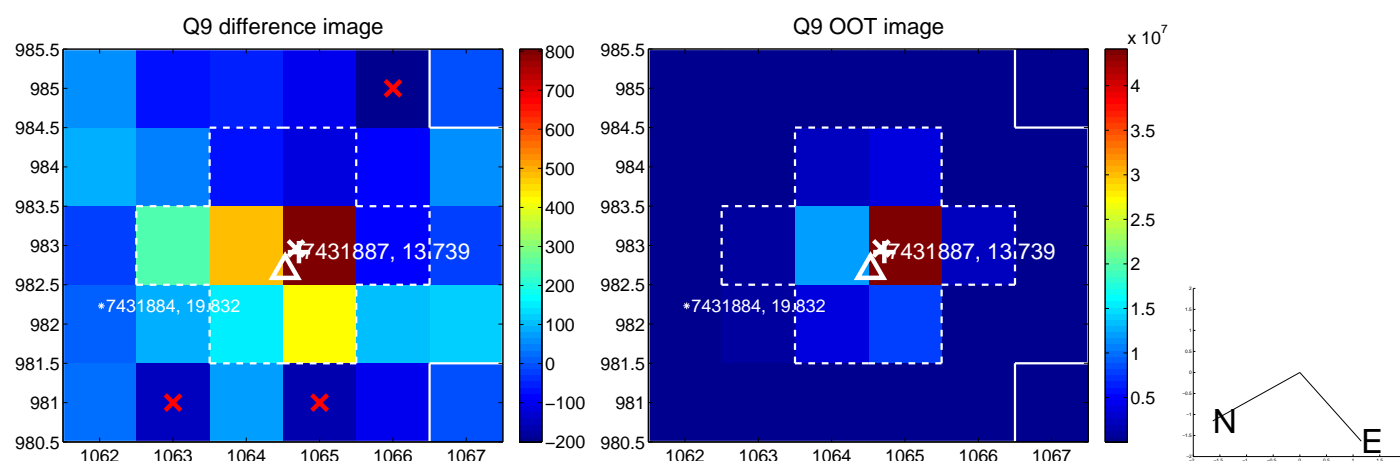


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

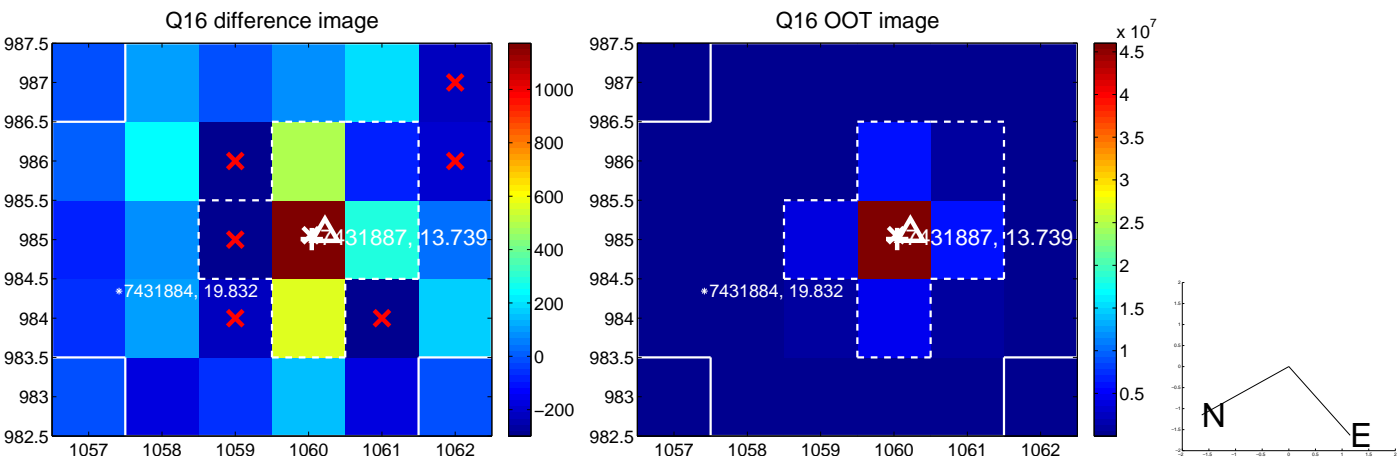
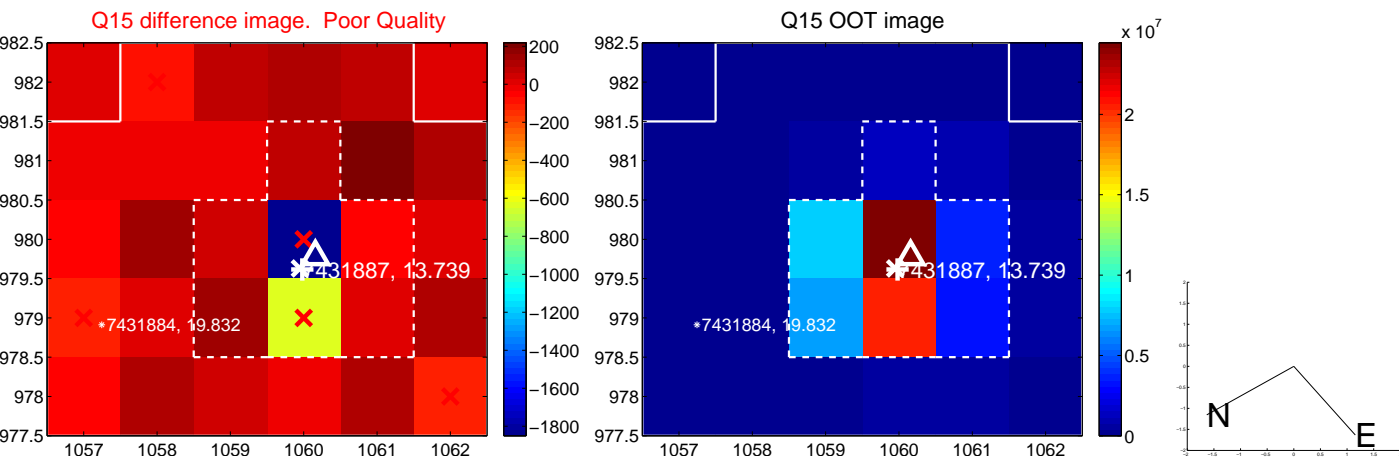
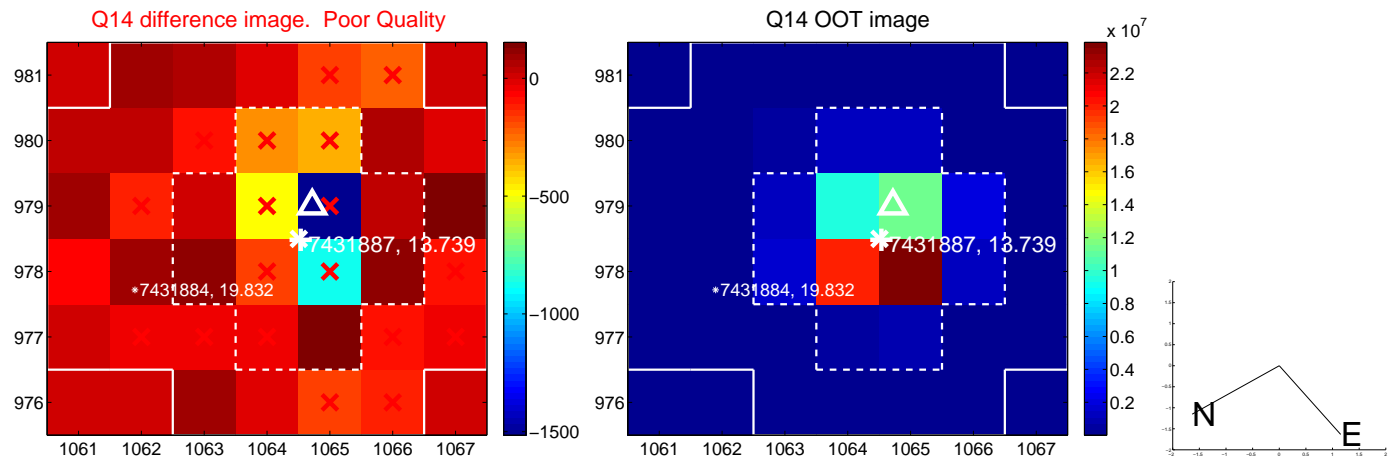
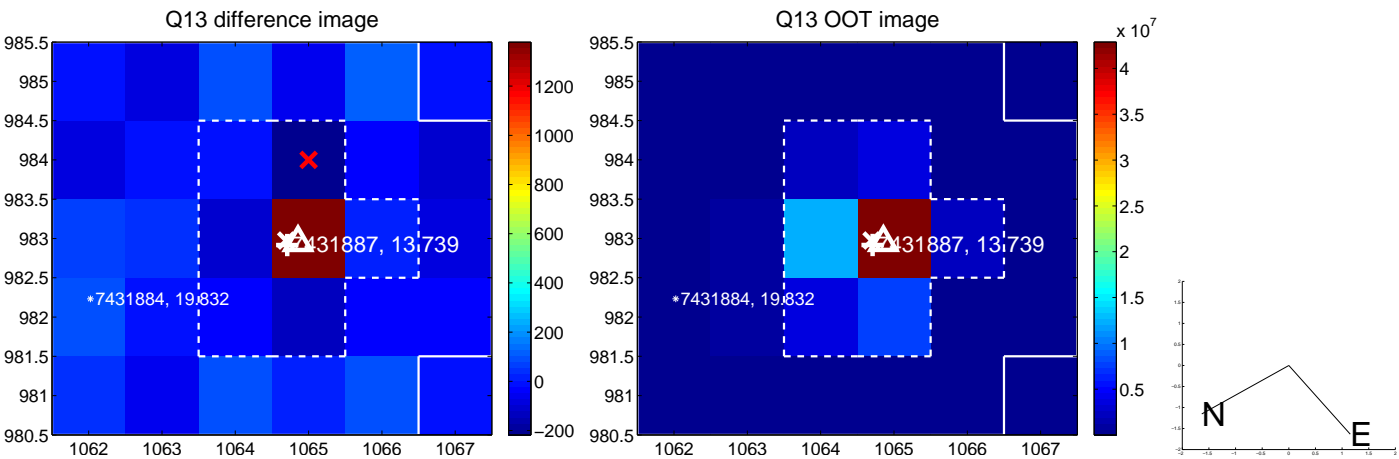




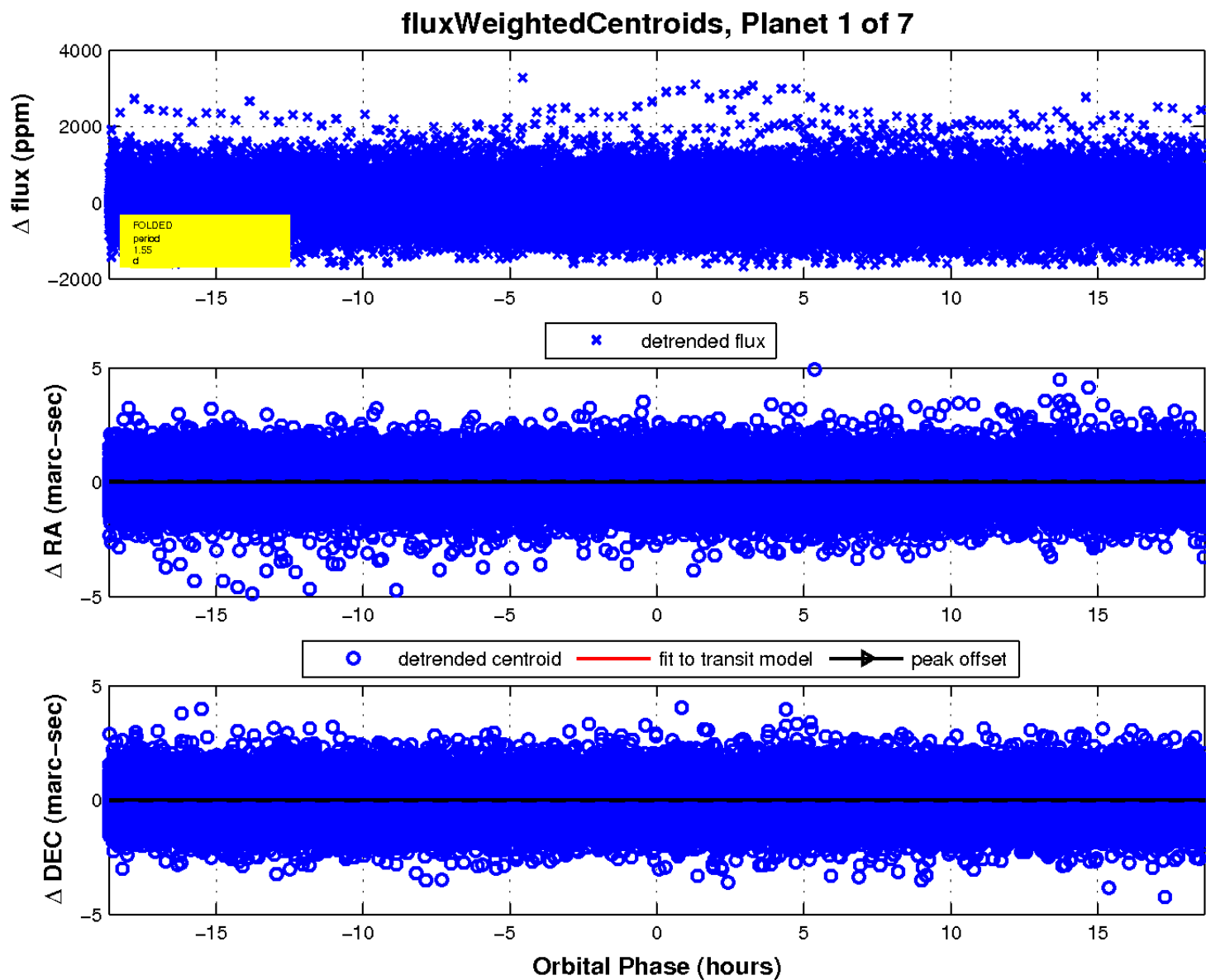
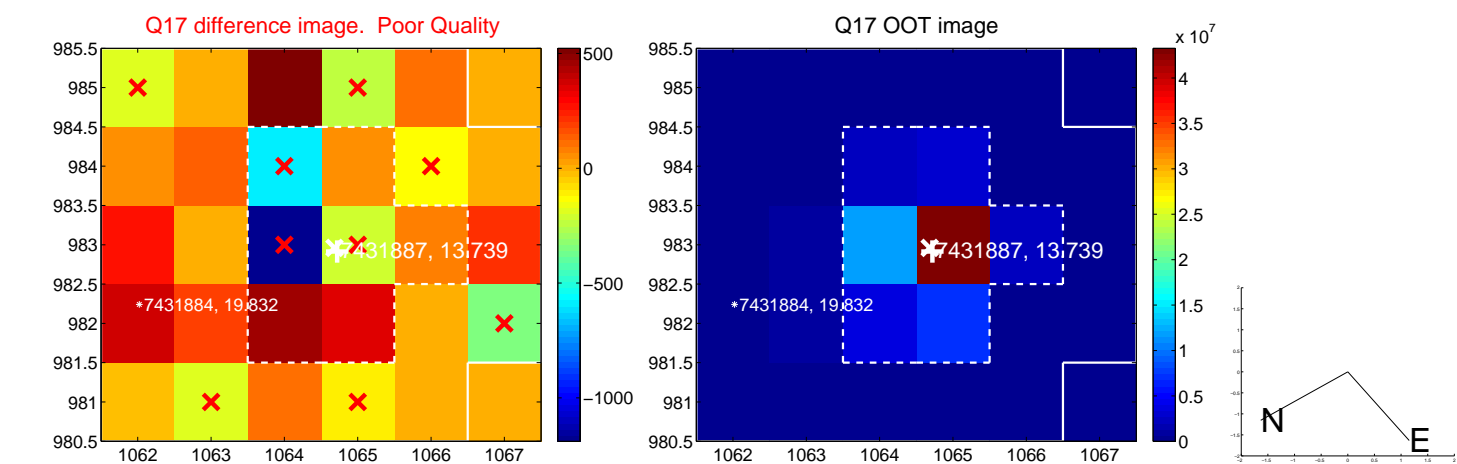
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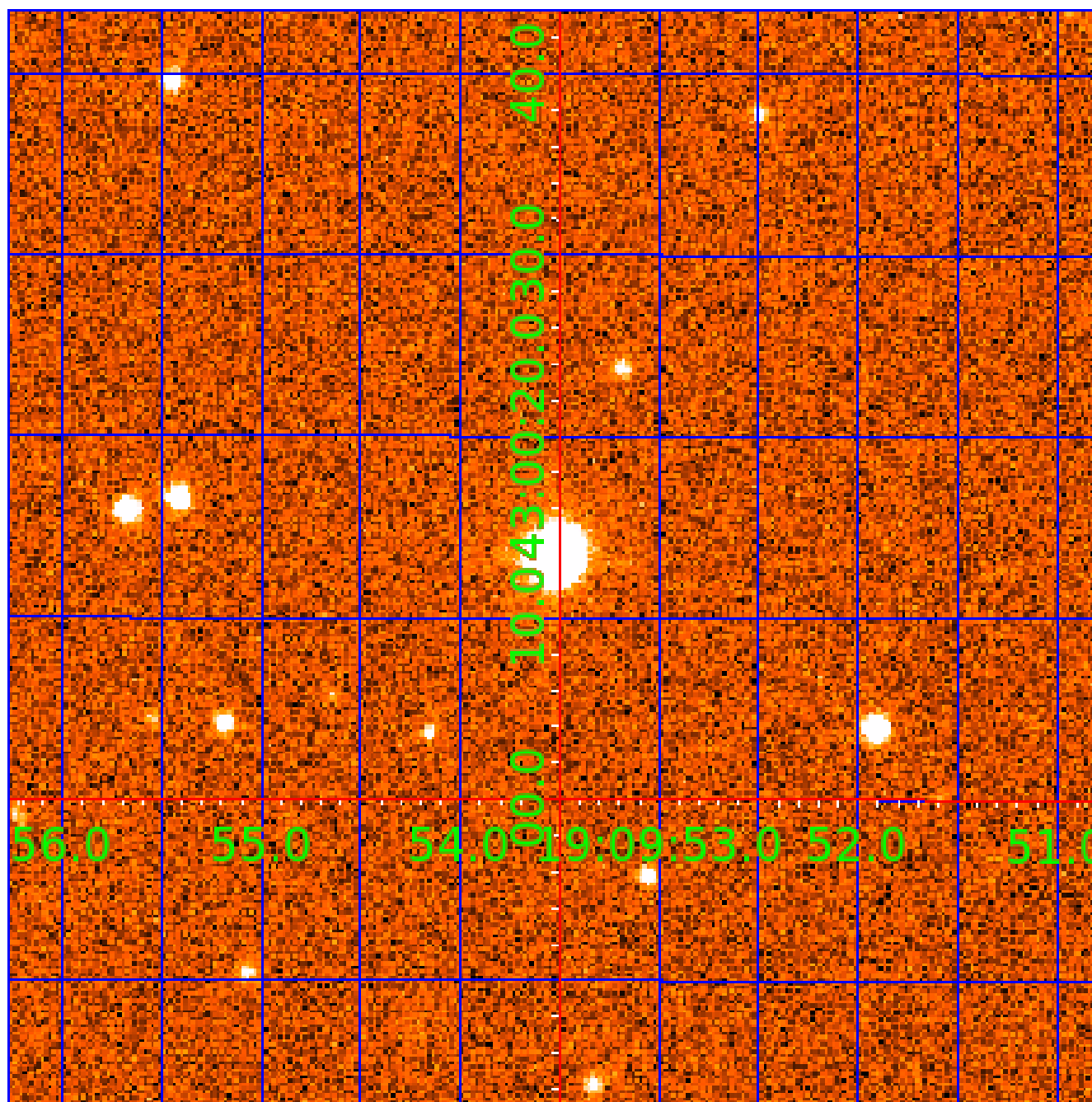


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# UKIRT Image

Declination





# KIC 007431887

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007431887-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_MARSHALL—LPP_DV—LPP_ALT—ALL_TRANS_CHASES
007431887-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_TRACKER—TRANS_GAPPED—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_ALT—MOD_POS_ALT—INCONSISTENT_TRANS
007431887-05	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_MARSHALL—TRANS_GAPPED—LPP_DV—ALL_TRANS_CHASES—INCONSISTENT_TRANS—CENT_FEW_DIFFS
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007431887-07	OBS	FP	0.00	1	0	1	0	INDIV_TRANS_RUBBLE_MARSHALL—TRANS_GAPPED—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—HALO_GHOST

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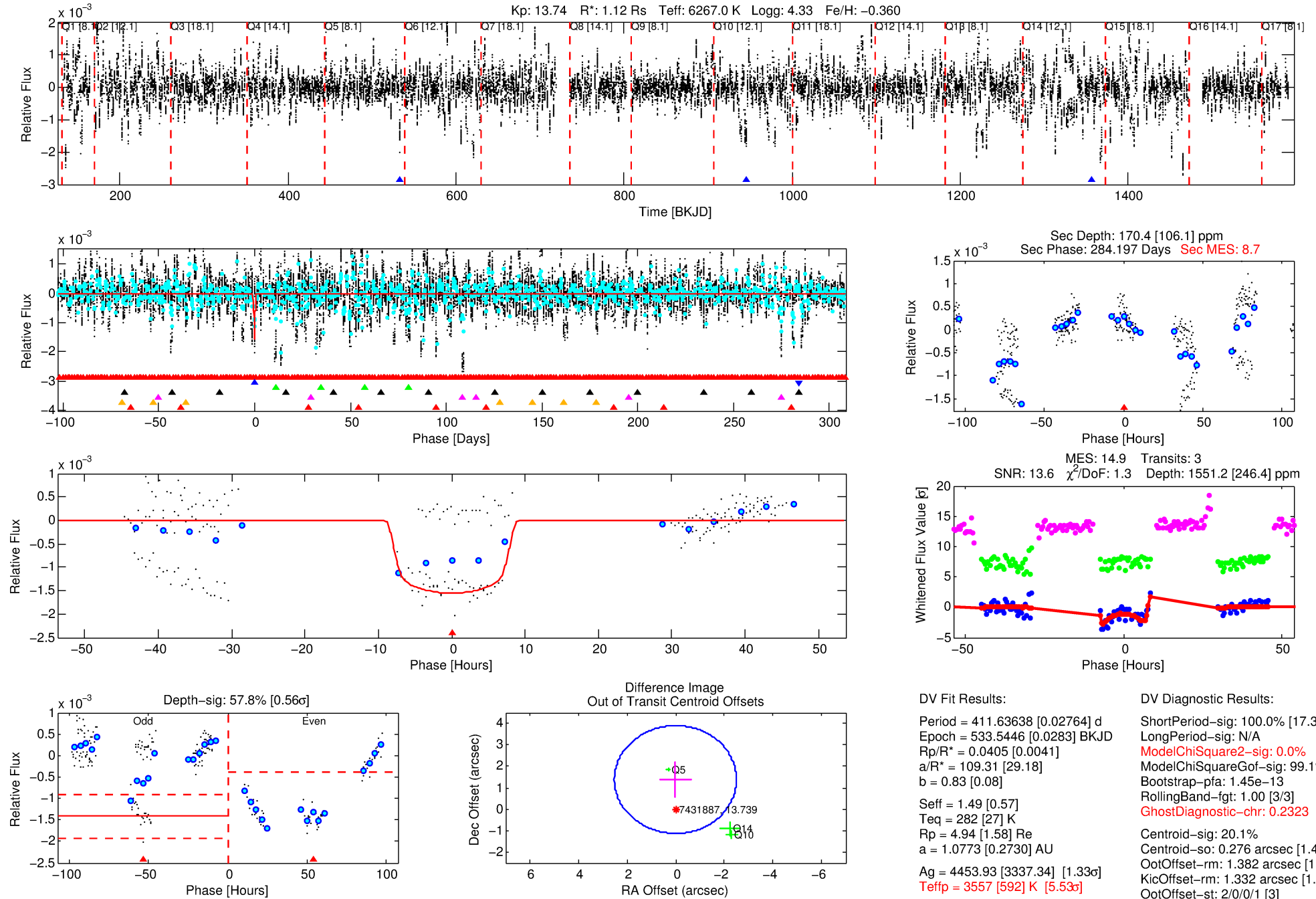
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 007431887-02

No Significant Match Found

# DV One-Page Summary

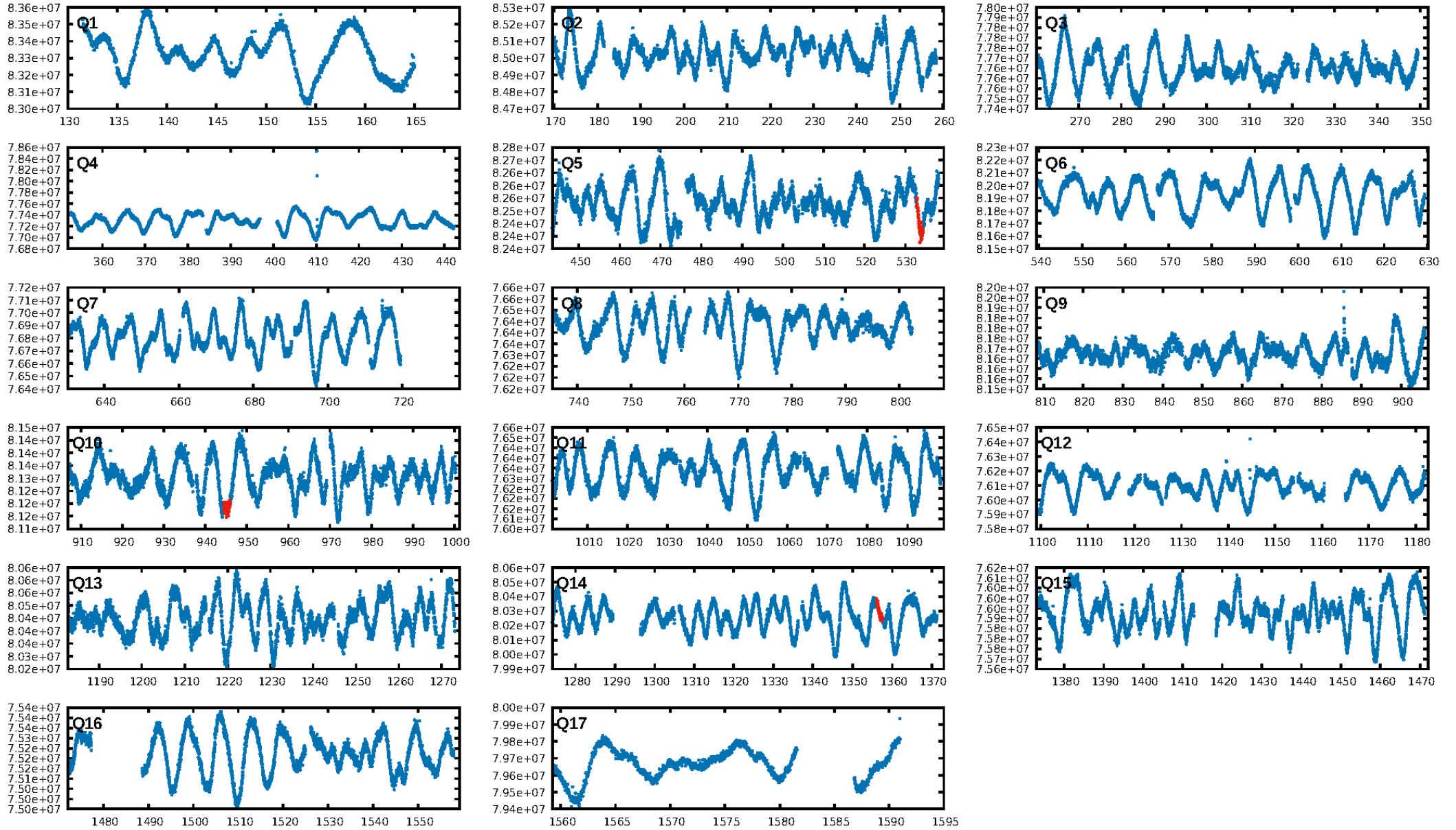
KIC: 7431887 Candidate: 2 of 7 Period: 411.636 d



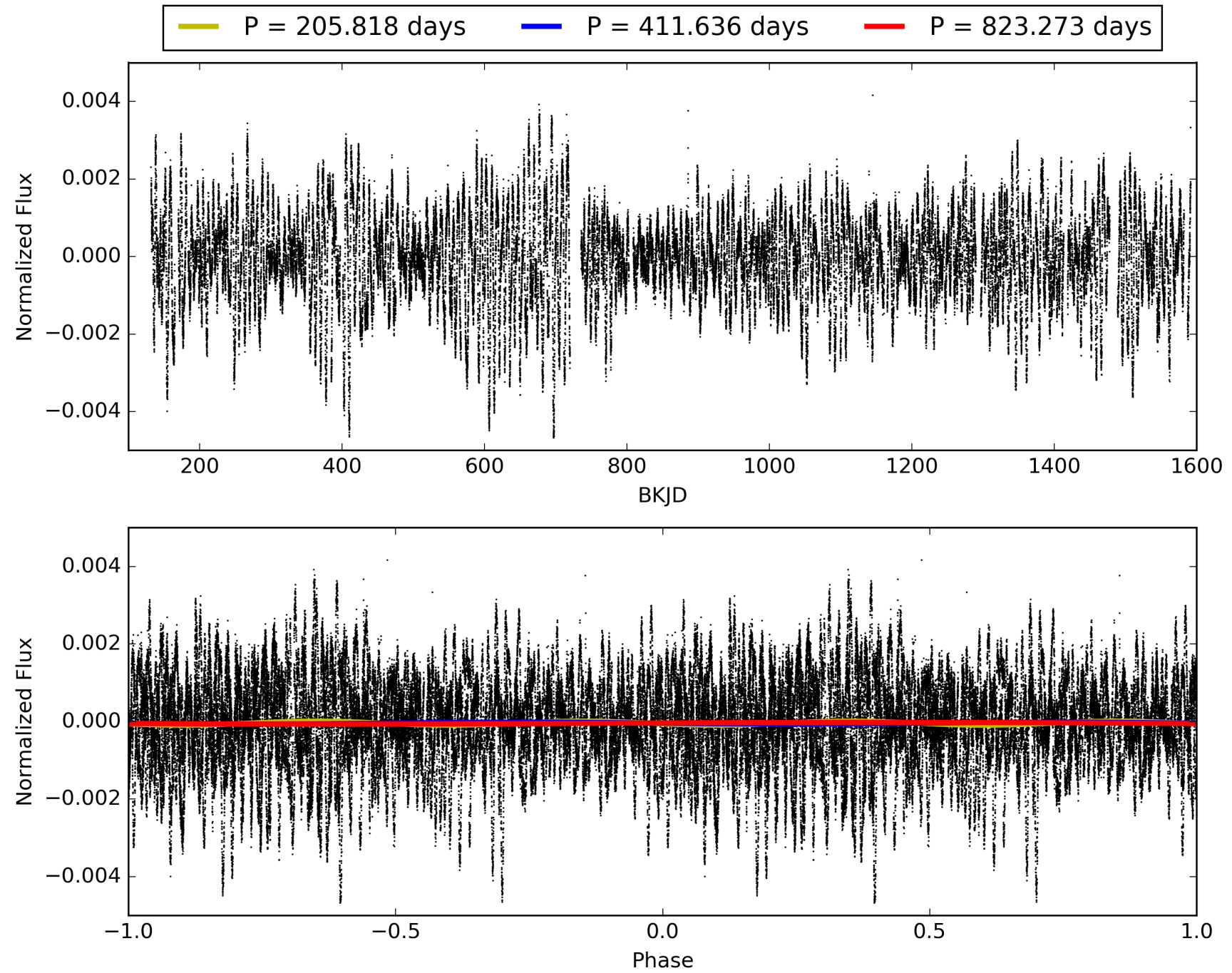
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 02-Feb-2016 01:56:40 Z

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# TCE 007431887-02, PDC Light Curves

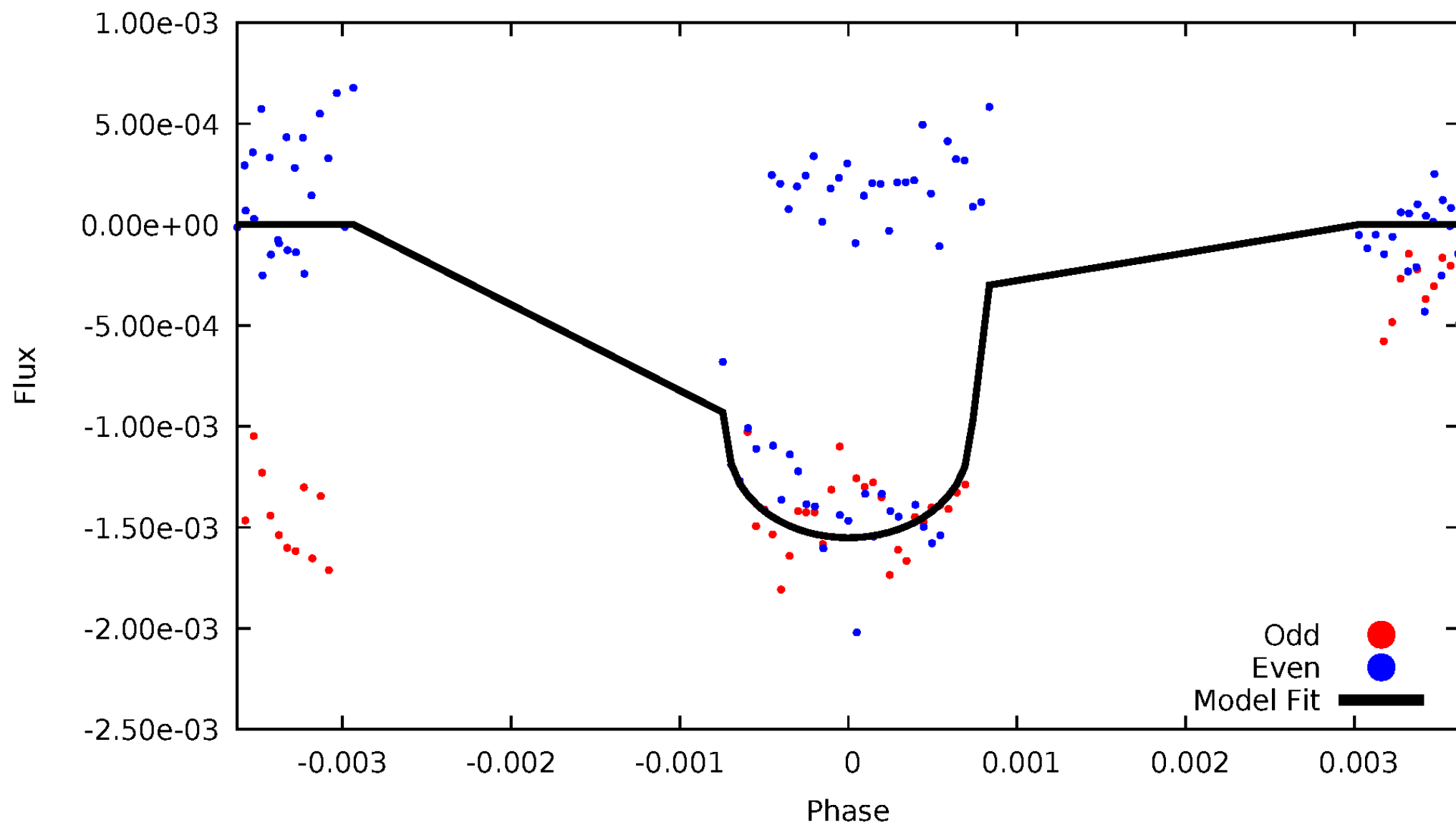


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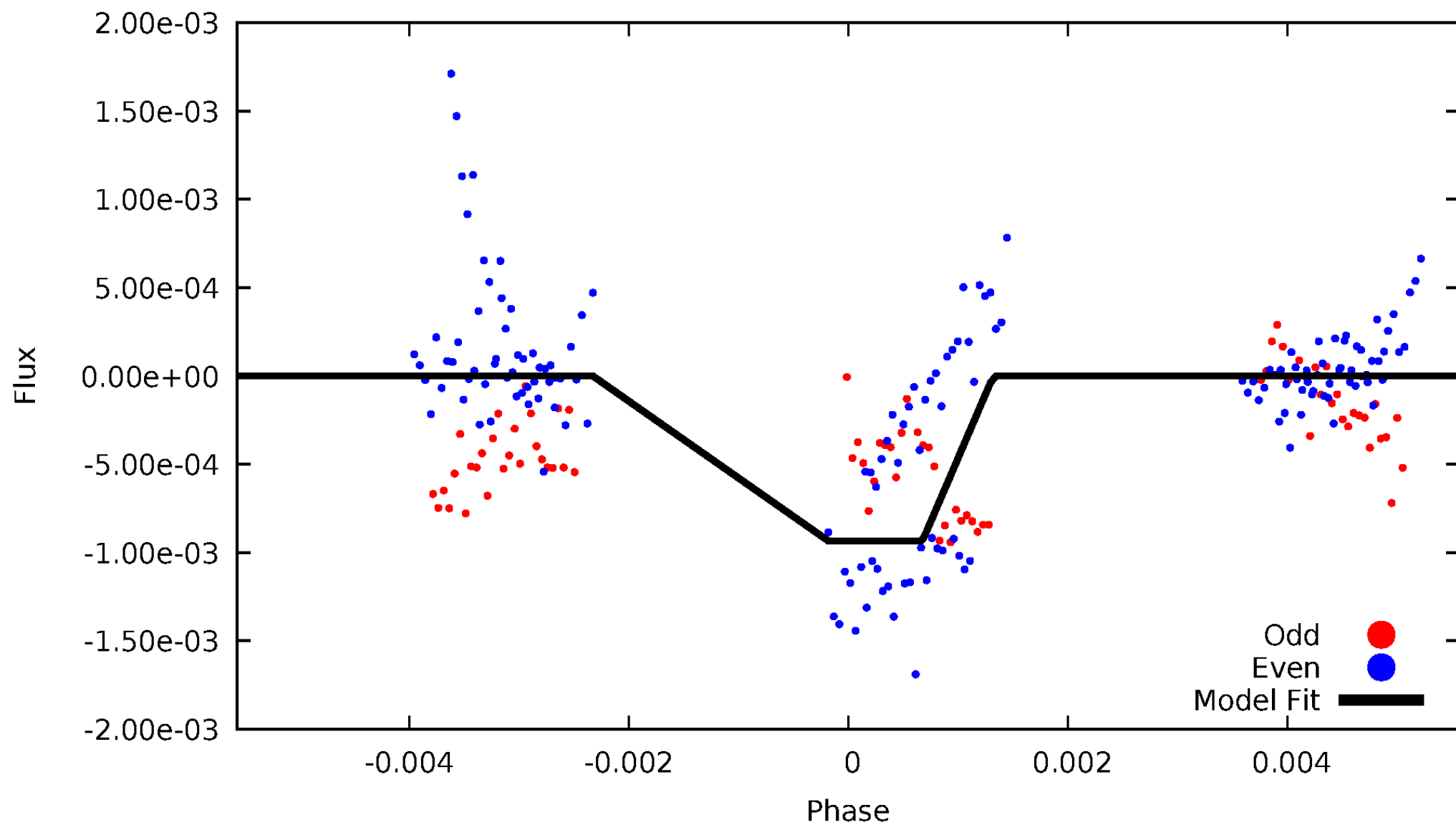
# DV Odd/Even

TCE 007431887-02



# ALT Odd/Even

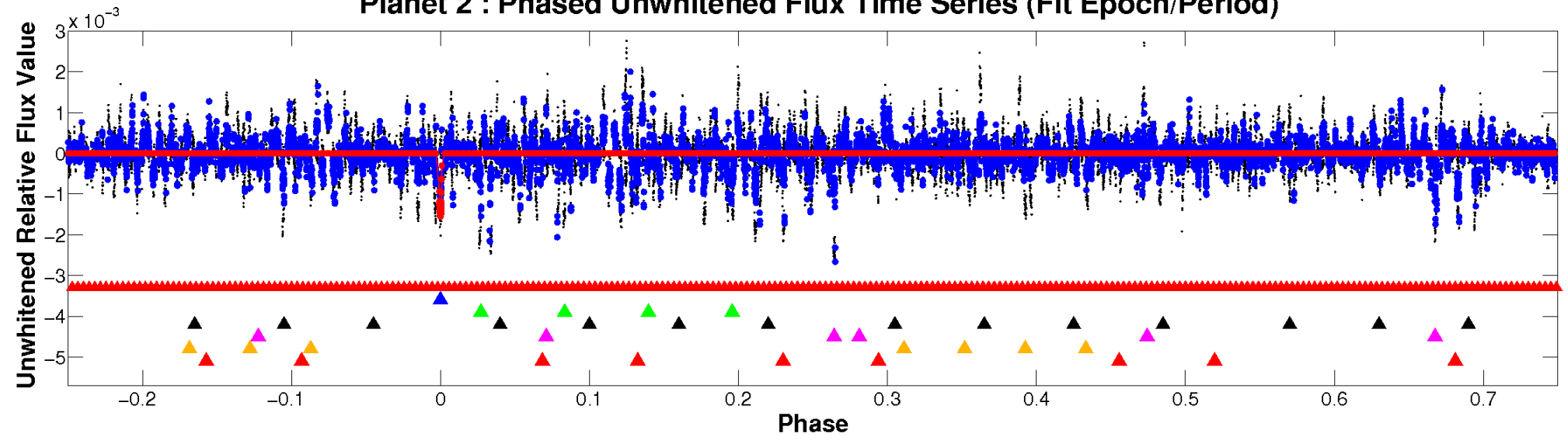
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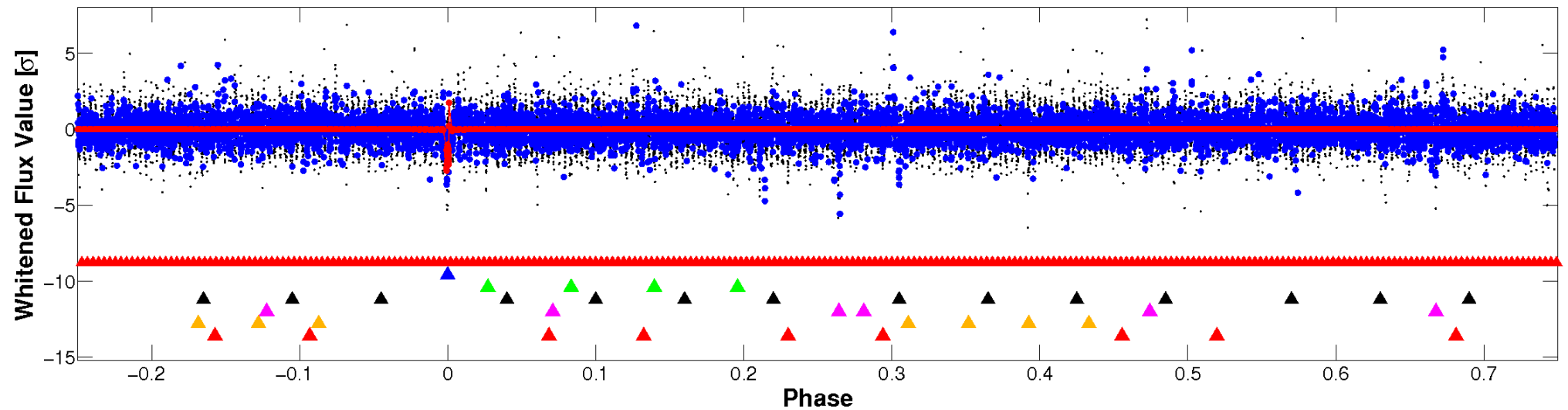


# Non-Whitened Vs. Whitened Light Curve

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

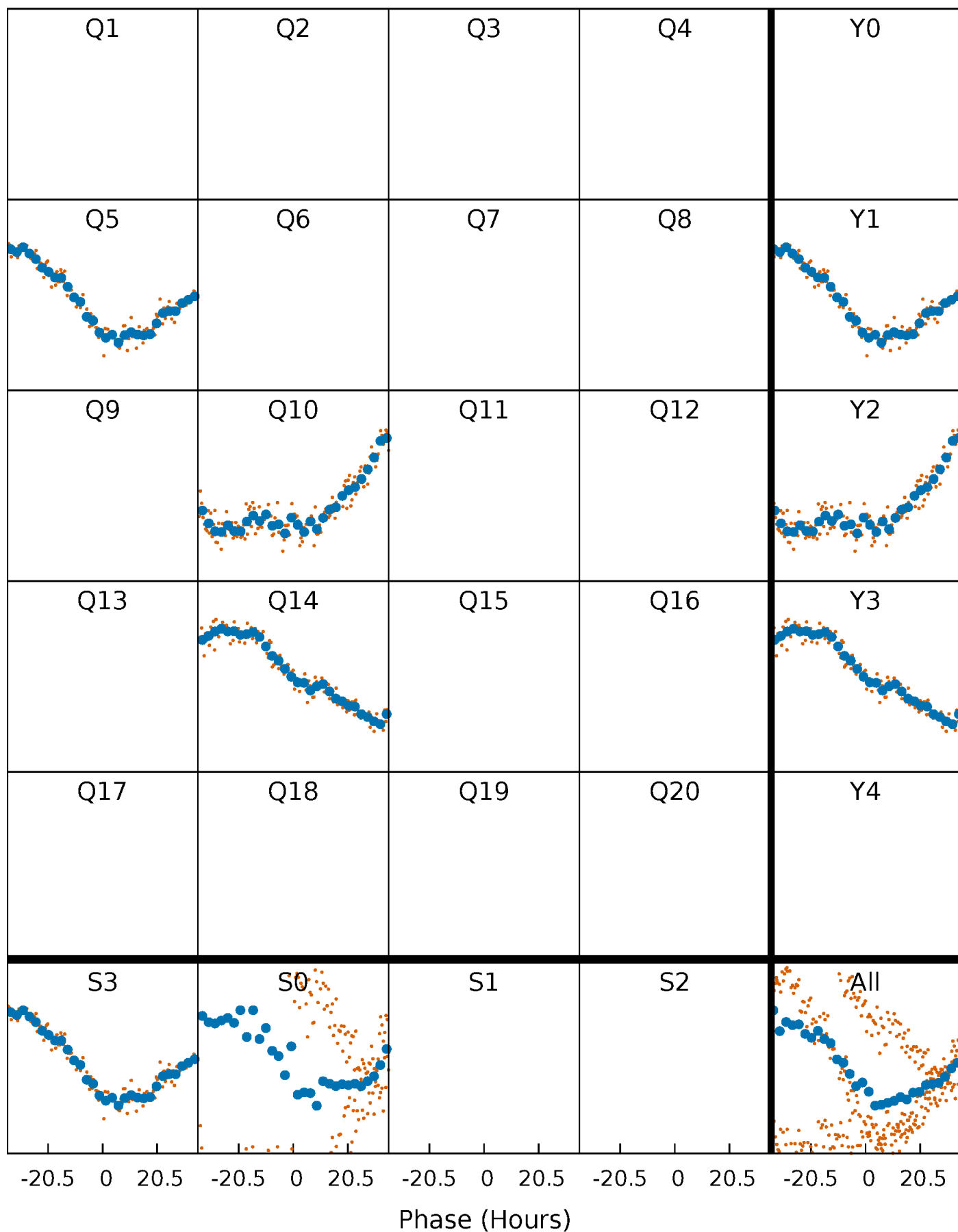


## Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



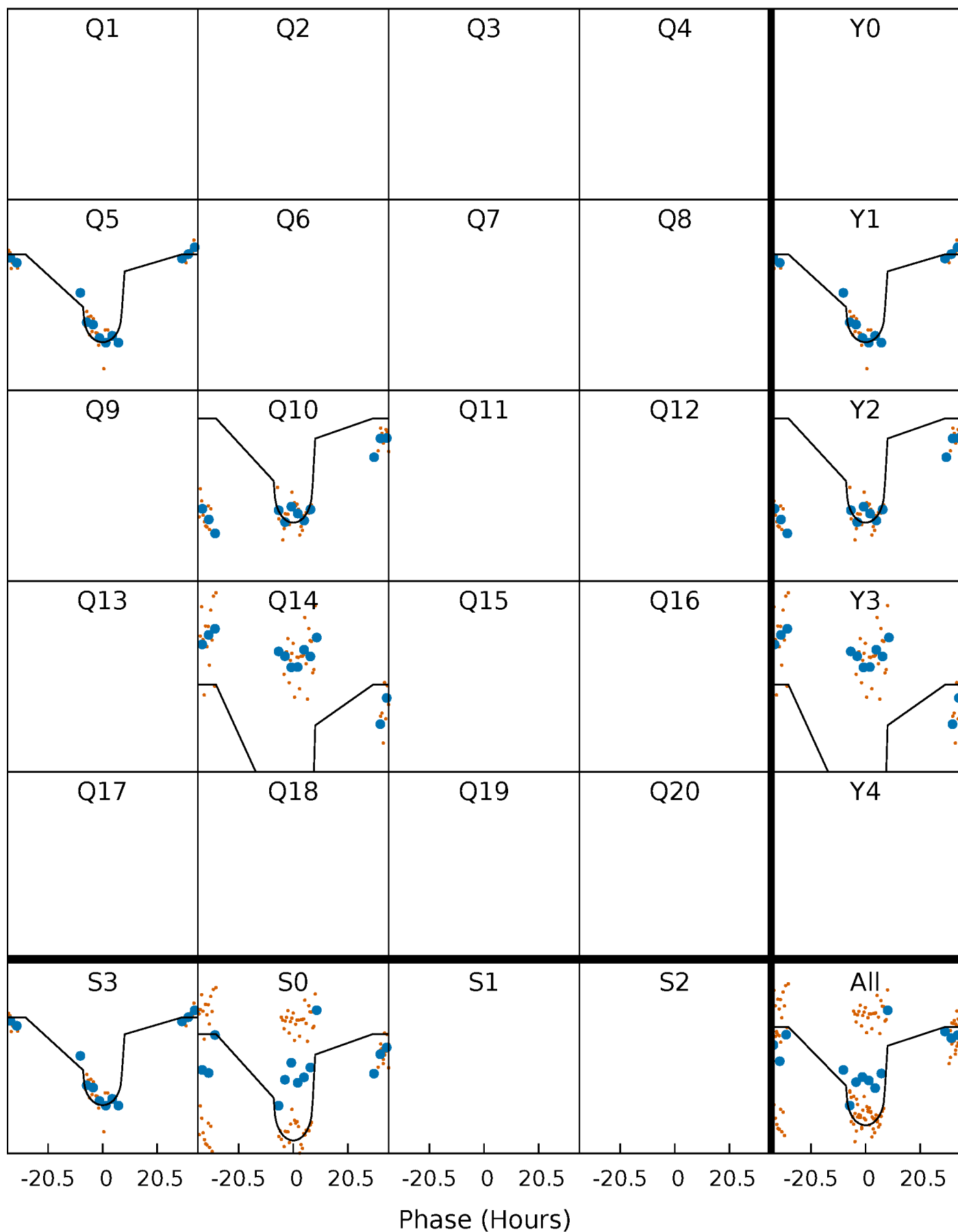
# PDC Quarter-Phased Transit Curves

TCE 007431887-02     $P=411.636384$  Days     $T_0=533.544629$  (BKJD)



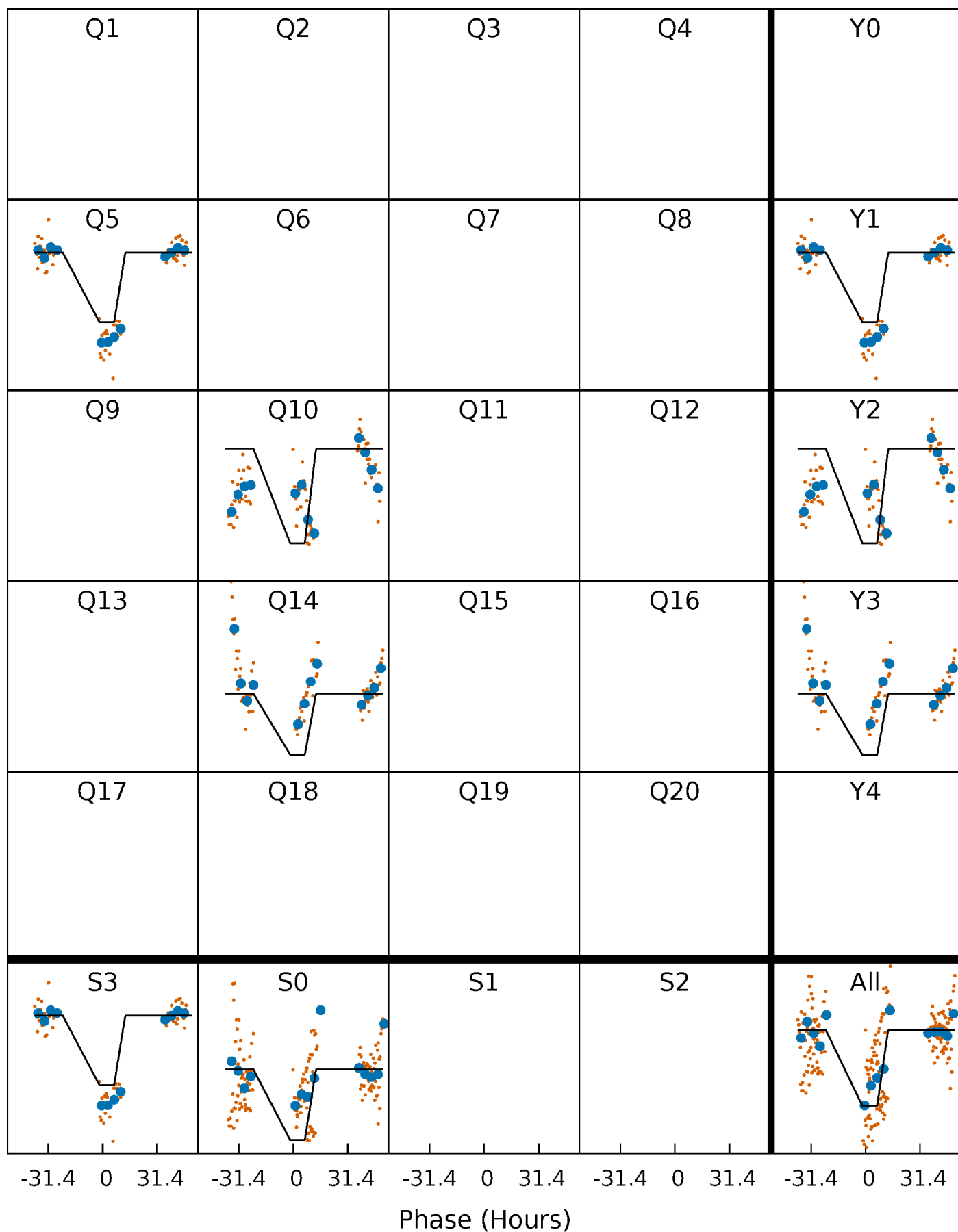
# DV Quarter-Phased Transit Curves

TCE 007431887-02 P=411.636384 Days  $T_0=533.544629$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

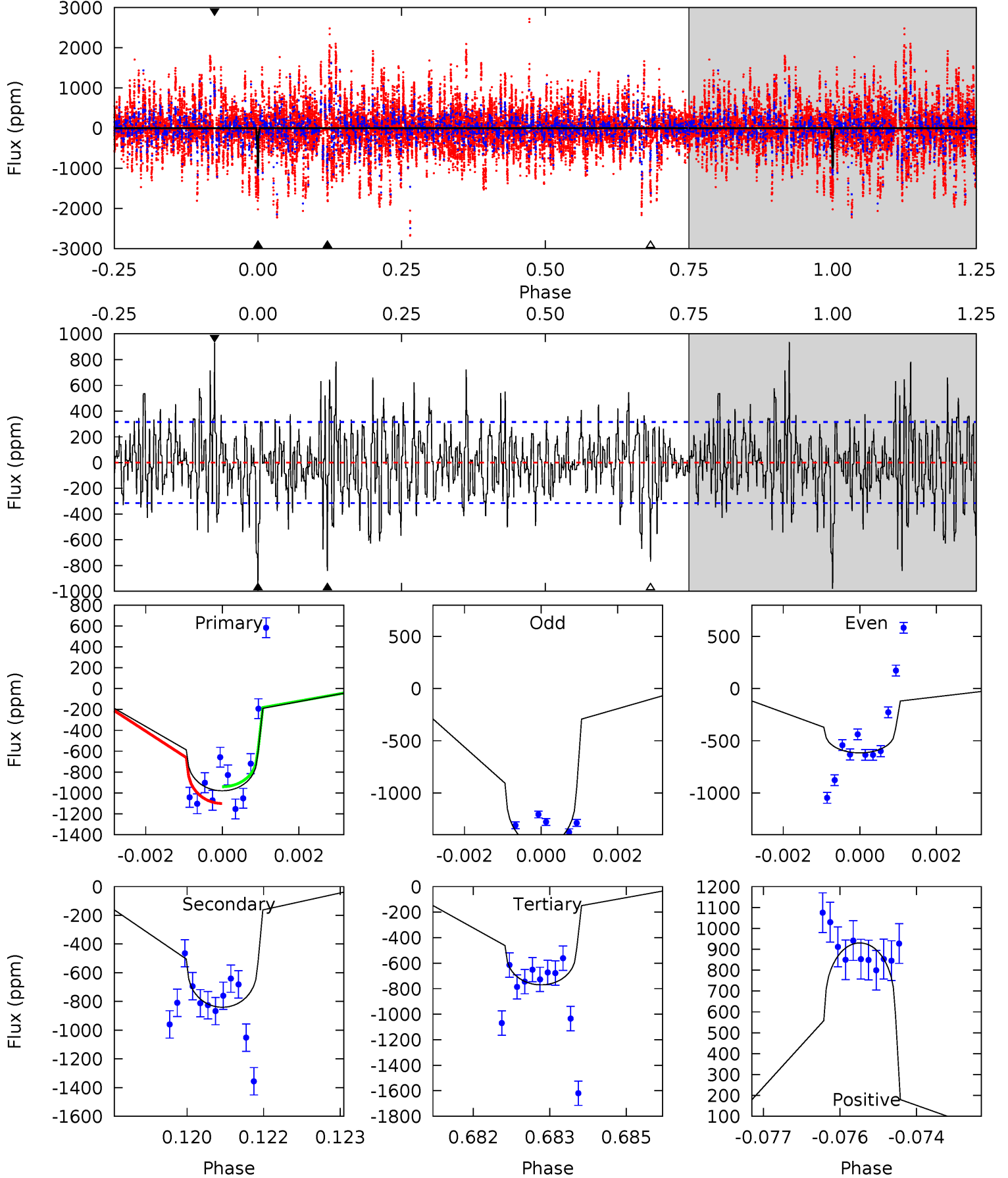
TCE 007431887-02 P=411.627255 Days  $T_0=533.312925$  (BKJD)



# DV Model-Shift Uniqueness Test

007431887-02, P = 411.636384 Days, E = 121.908245 Days

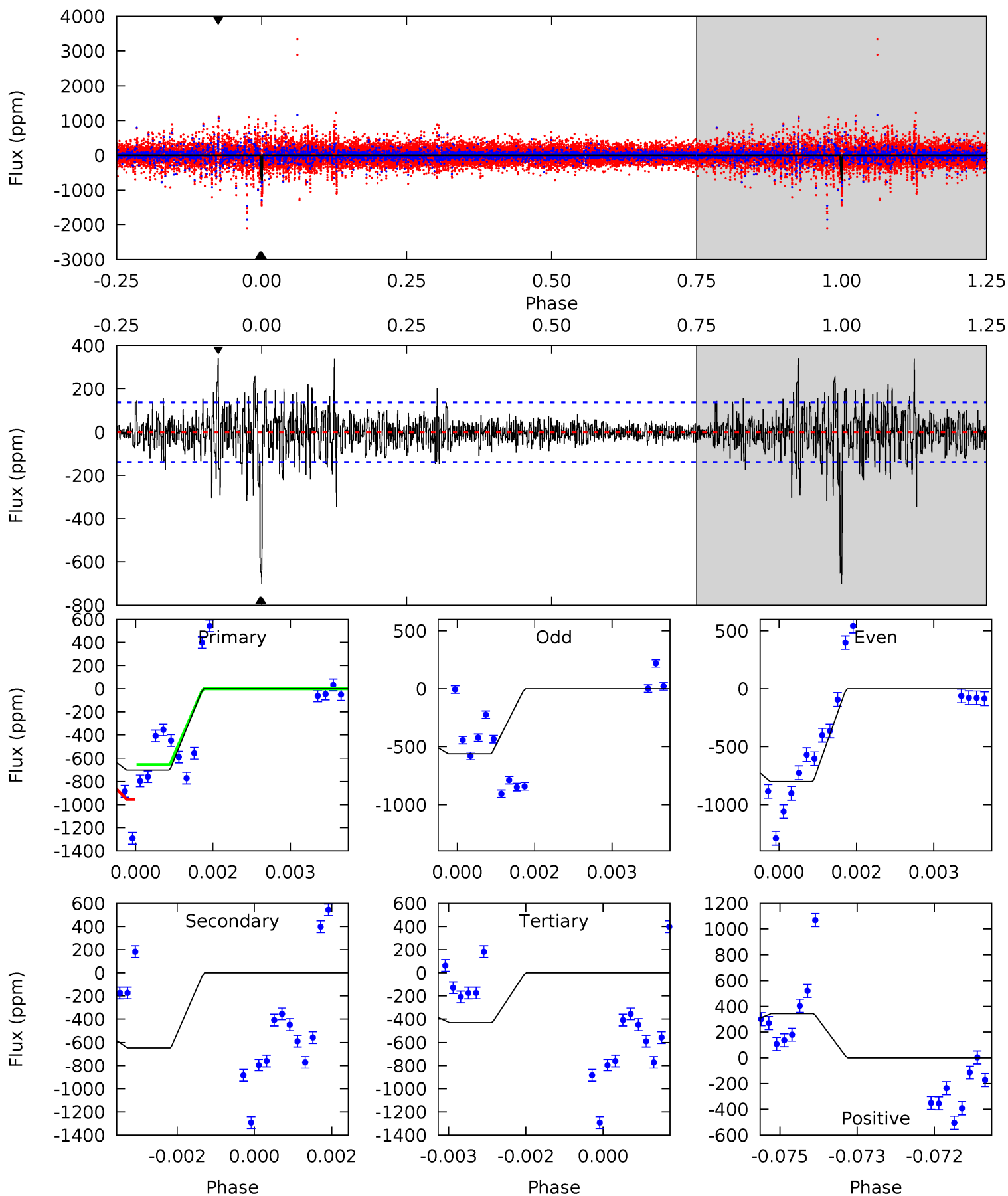
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
16.7	14.3	13.1	15.9	5.37	3.16	3.93	3.57	0.83	1.20	-1.53	7.27	0.63	0.49	1.36



# Alt Model-Shift Uniqueness Test

007431887-02, P = 411.627255 Days, E = 121.685670 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
27.4	25.3	16.7	13.3	5.38	3.17	2.43	10.6	14.0	8.57	12.0	4.28	1.22	0.33	2.61



### Stellar Parameters For KIC 007431887

	$T_{\text{eff}} (K)$	$\log(g)$	$[\text{Fe}/\text{H}]$	$R (R_{\odot})$	$M (M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$6267^{+169}_{-188}$	$4.334^{+0.132}_{-0.198}$	$-0.360^{+0.300}_{-0.300}$	$1.118^{+0.340}_{-0.183}$	$0.981^{+0.160}_{-0.107}$	$0.990^{+0.672}_{-0.488}$
	+3%/-3%	+3%/-5%	+83%/-83%	+30%/-16%	+16%/-11%	+68%/-49%
Source	PHO1	KIC0	KIC0	DSEP		

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

### Secondary Eclipse Parameters for KIC 007431887-02 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$-840 \pm 59$	$5.08^{+0.99}_{-0.75}$	$397^{+30}_{-23}$	$5322^{+343}_{-281}$	$20642^{+8042}_{-5844}$
Alt.	$-648 \pm 26$	$3.78^{+0.75}_{-0.65}$	$395^{+31}_{-23}$	$5738^{+456}_{-382}$	$28667^{+13171}_{-7979}$

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



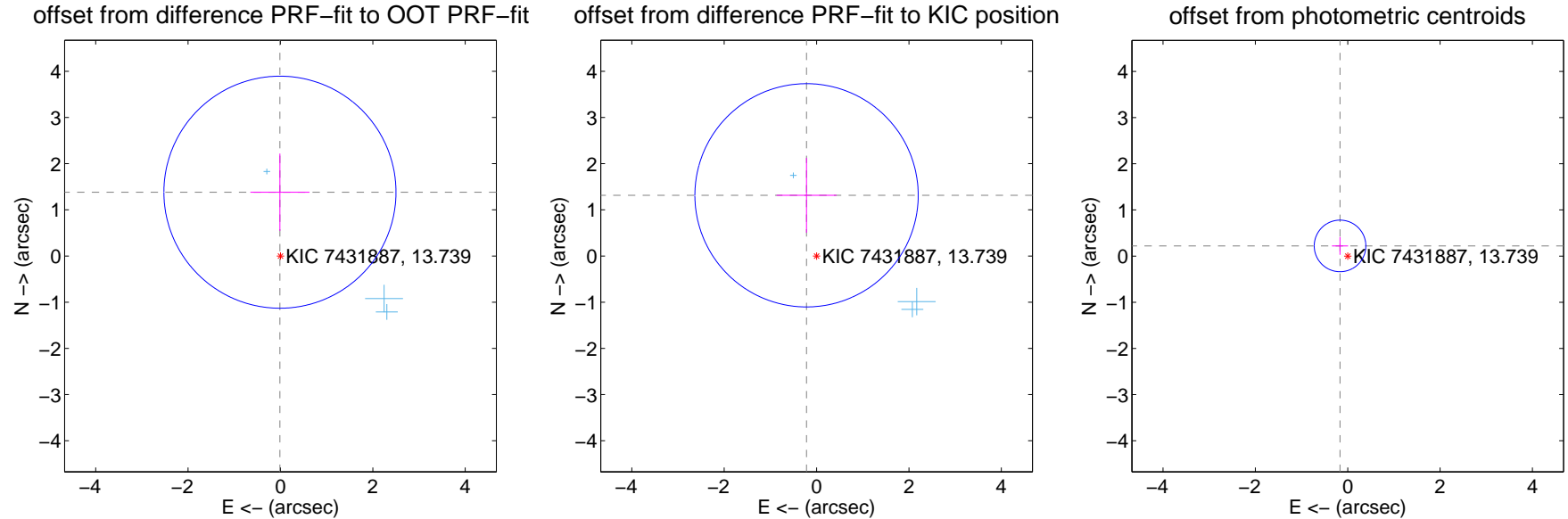
## DV Centroid Data

Supplemental centroid analysis for 007431887-02. Kepler magnitude: 13.74. Transit SNR 13.55

There are 3 quarters with good PRF difference image offsets

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

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$1.382 \pm 0.837$	1.65	$0.011 \pm 0.640$	$1.382 \pm 0.837$
PRF-fit source offset from KIC position	$1.332 \pm 0.806$	1.65	$0.217 \pm 0.649$	$1.315 \pm 0.810$
photometric centroid source offset	$0.28 \pm 0.19$	1.48	$0.17 \pm 0.17$	$0.22 \pm 0.19$

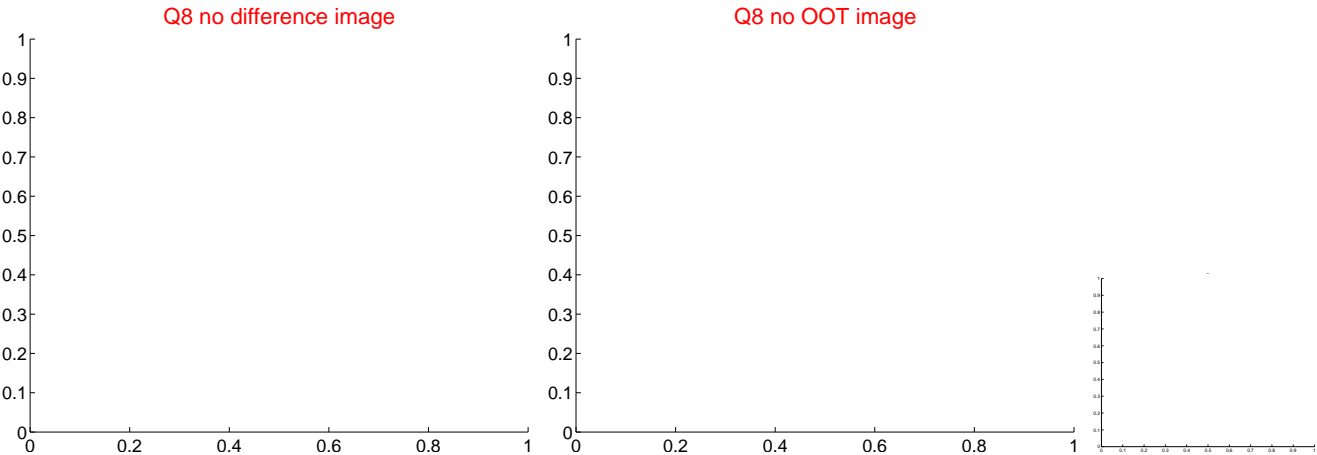
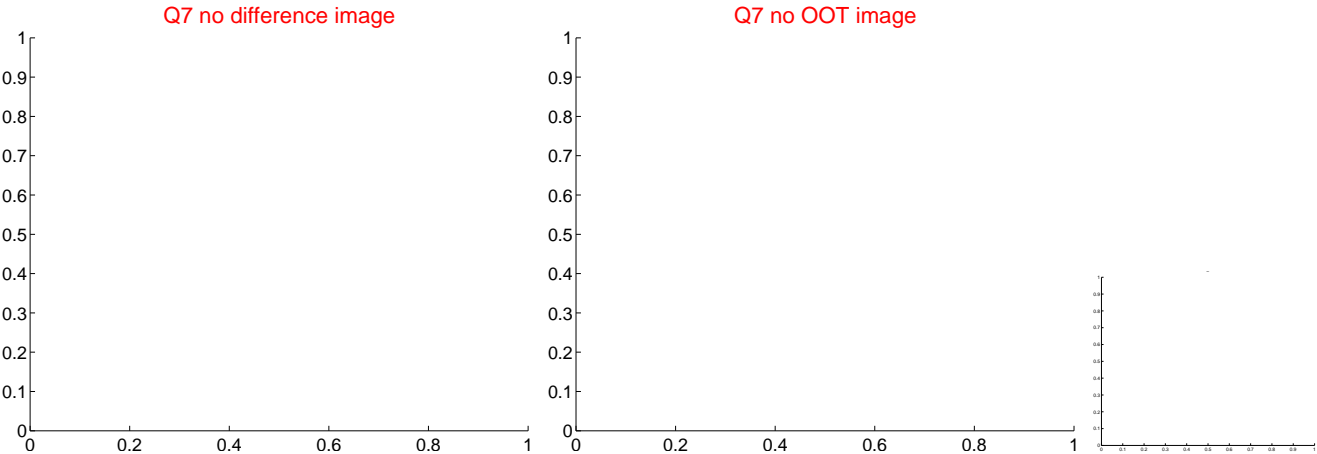
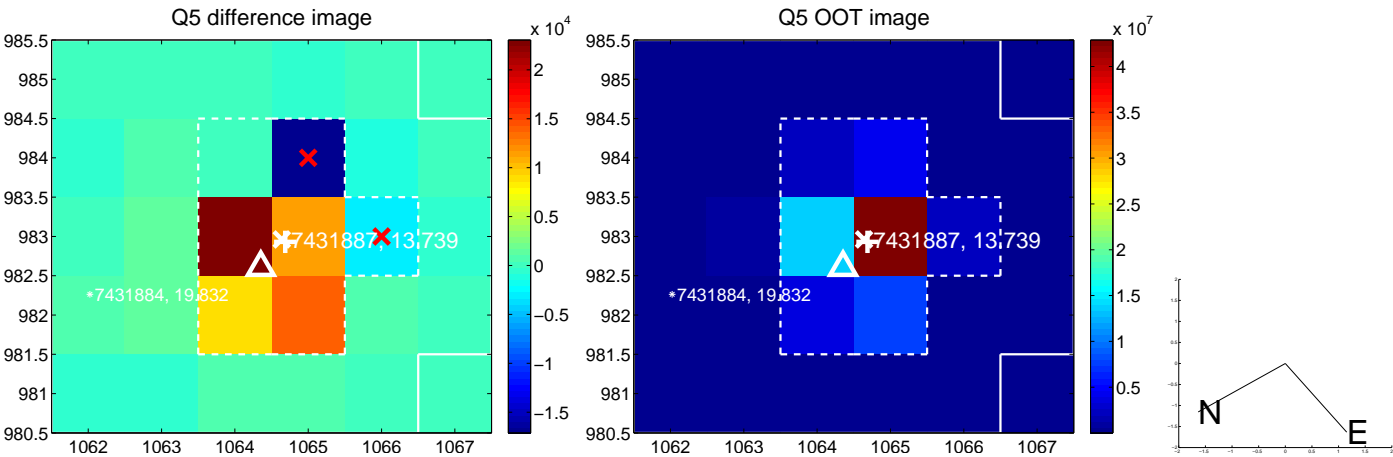


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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

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



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



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

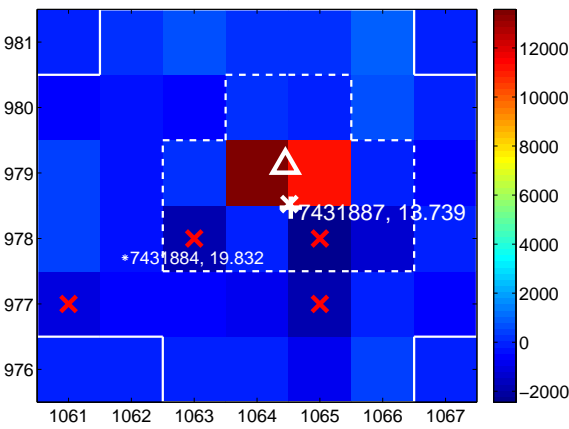
Q9 no difference image



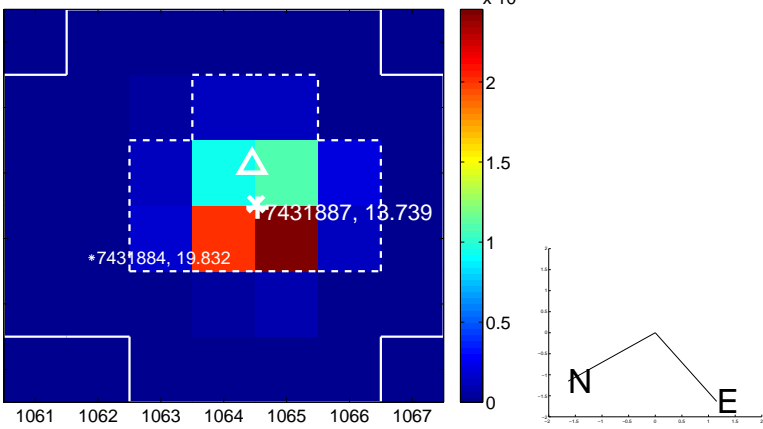
Q9 no OOT image



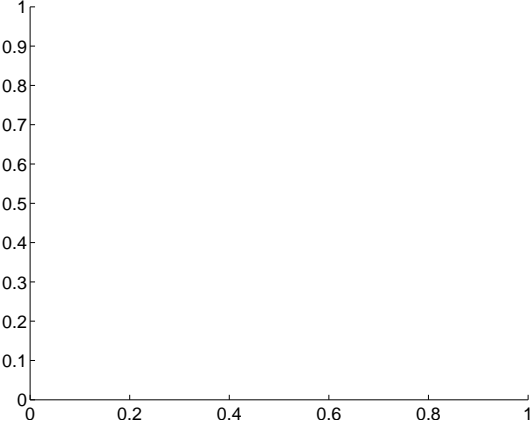
Q10 difference image



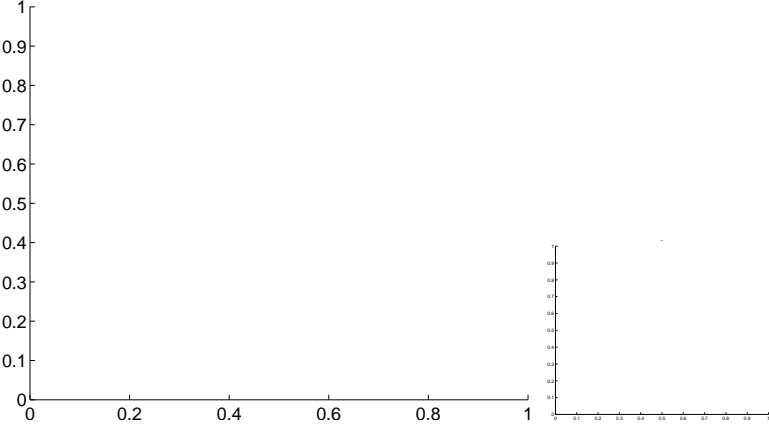
Q10 OOT image



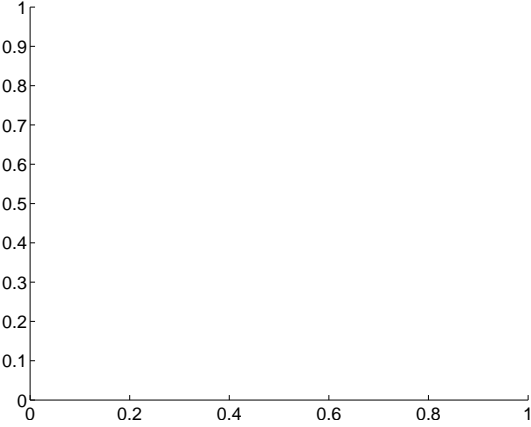
Q11 no difference image



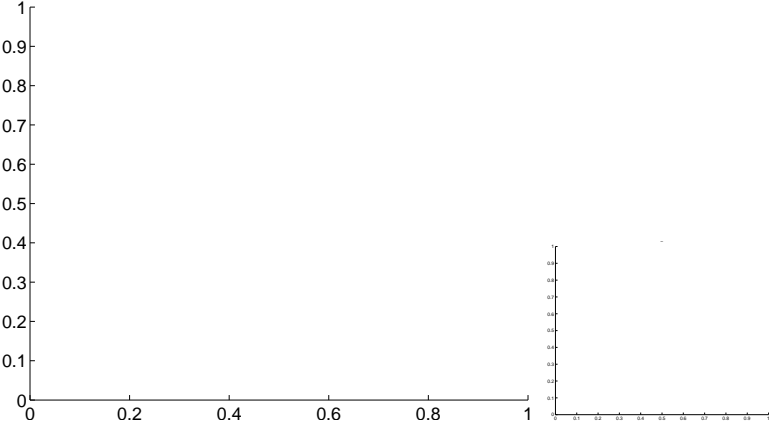
Q11 no OOT image



Q12 no difference image



Q12 no OOT image

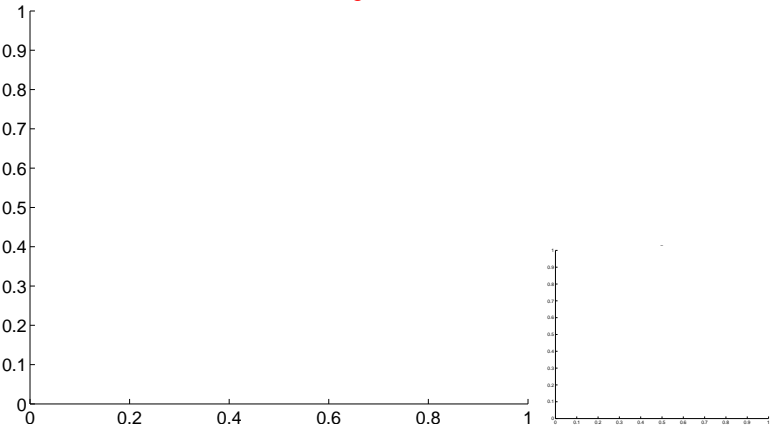


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

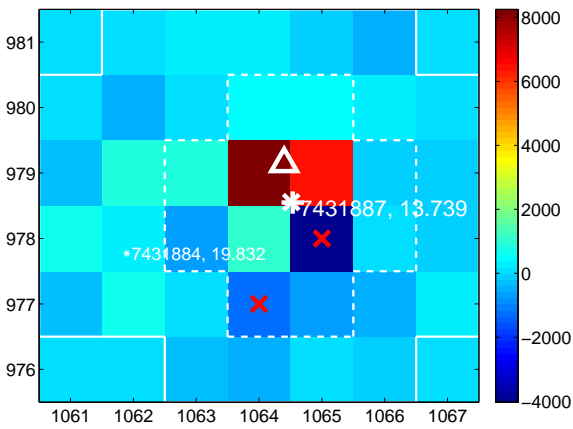
Q13 no difference image



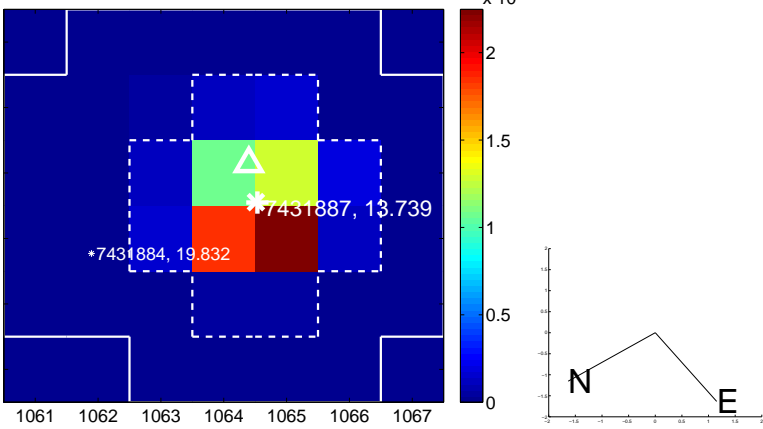
Q13 no OOT image



Q14 difference image



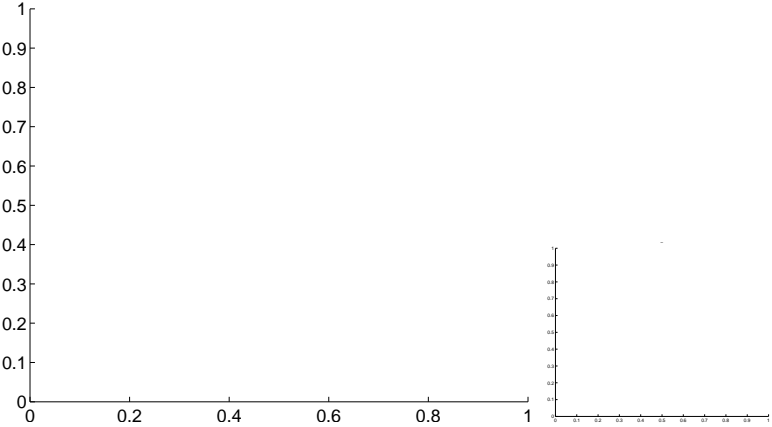
Q14 OOT image



Q15 no difference image



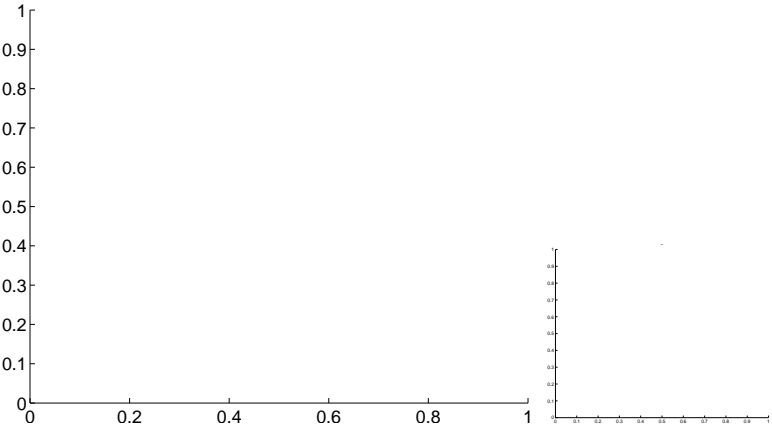
Q15 no OOT image



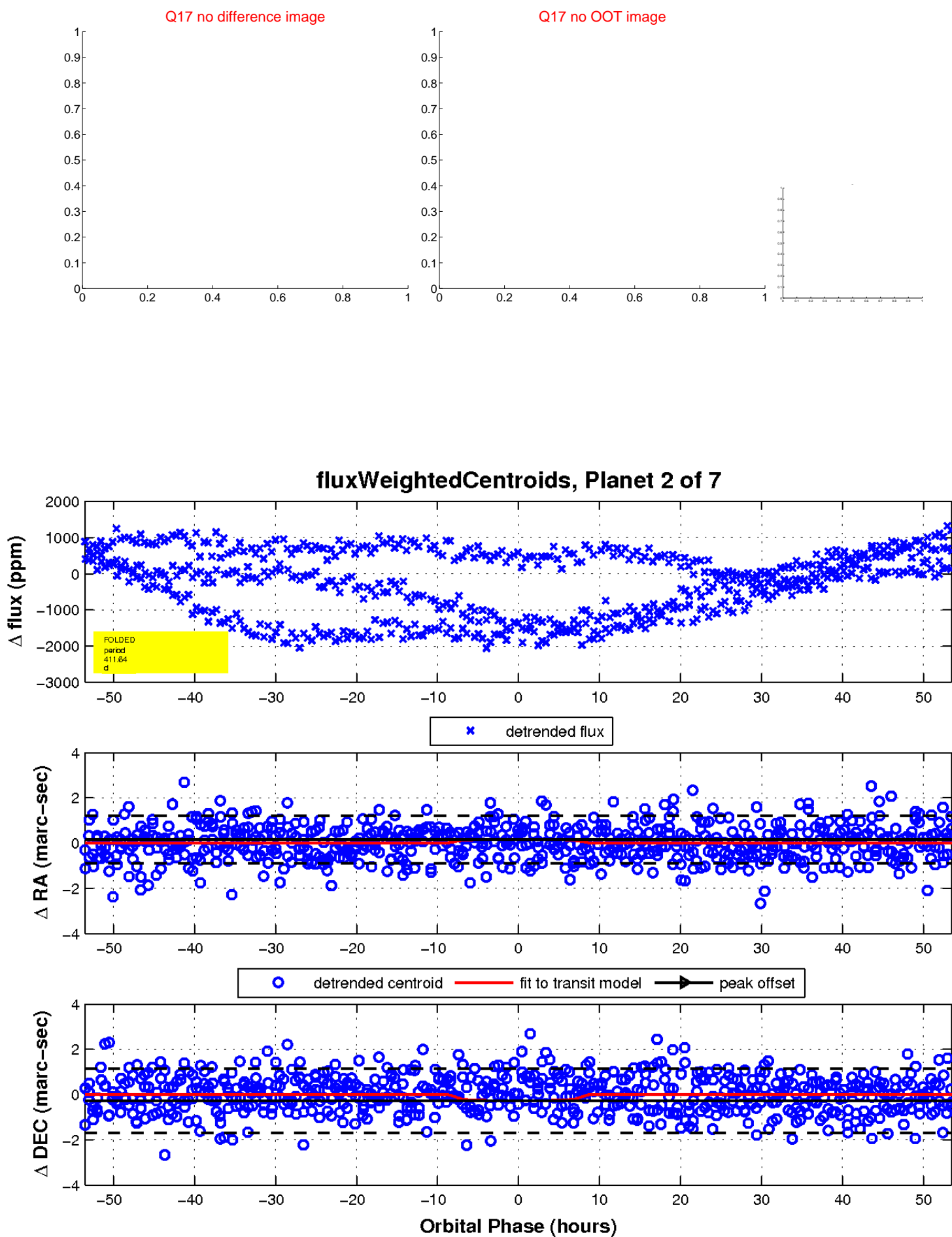
Q16 no difference image



Q16 no OOT image

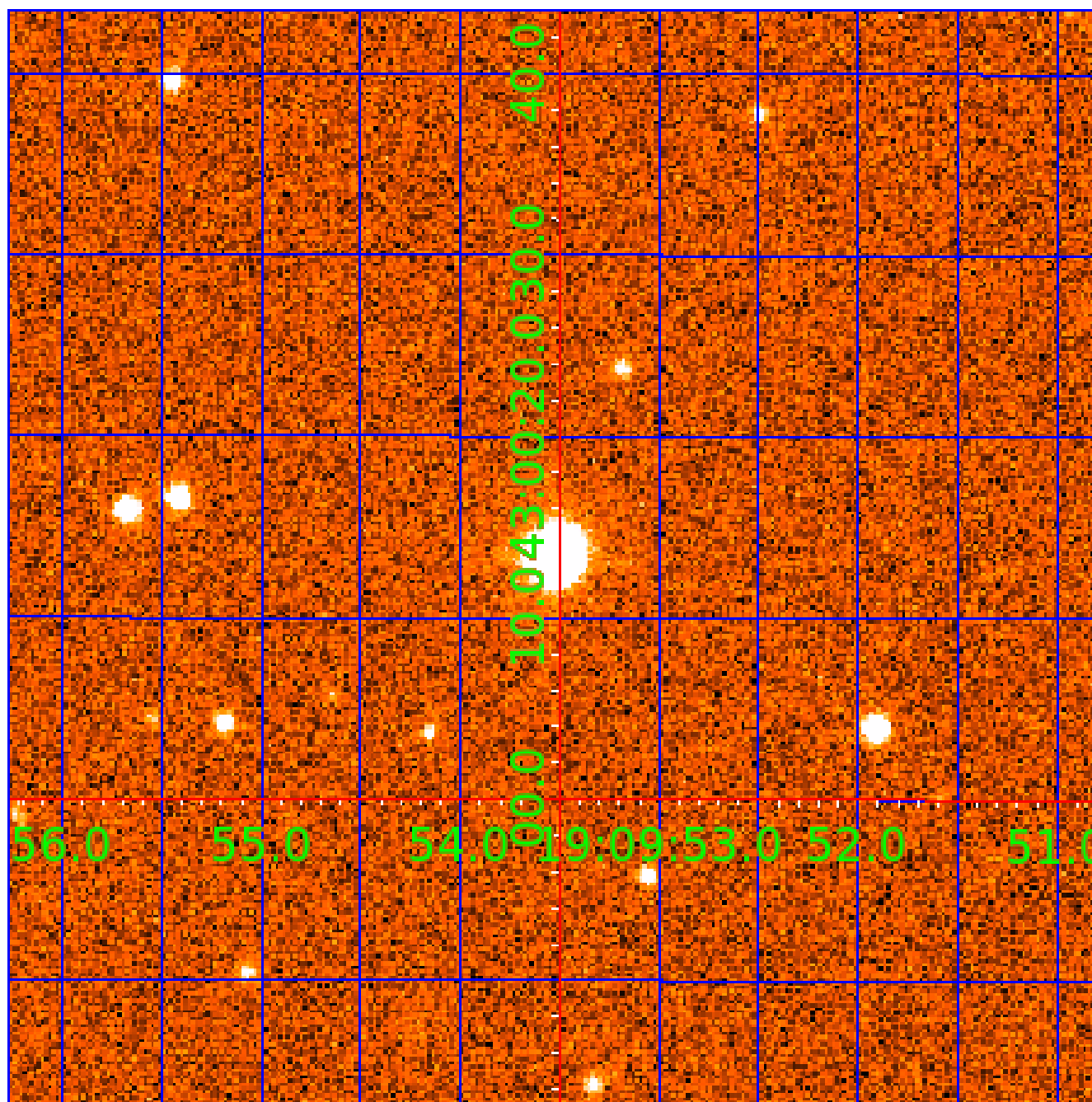


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



# UKIRT Image

Declination





# KIC 007431887

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
007431887-01	OBS	No	1.553574	131.905139	28.2	7.875	8.7	8.2	1.12	6267	0.61	2533.10
007431887-02	OBS	No	411.636384	533.544629	1551.2	17.901	14.9	13.6	1.12	6267	4.94	1.49
007431887-03	OBS	No	388.494382	202.519206	2367.5	26.549	12.1	10.7	1.12	6267	5.49	1.61
007431887-04	OBS	No	109.082765	138.385429	221.7	5.894	11.8	5.1	1.12	6267	1.90	8.74
007431887-05	OBS	No	245.597955	237.614415	2208.8	30.194	10.9	10.8	1.12	6267	9.72	2.96
007431887-06	OBS	No	214.190439	249.997276	695.2	22.274	9.8	6.1	1.12	6267	5.65	3.56
007431887-07	OBS	No	159.383586	176.419960	452.5	10.999	9.2	6.0	1.12	6267	2.78	5.27

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
007431887-01	OBS	FP	0.00	1	0	0	0	LPP_DV—MOD_NONUNIQ_DV
007431887-02	OBS	FP	0.00	1	0	1	0	INDIV_TRANS_RUBBLE_MARSHALL_ZUMA—LPP_DV—ALL_TRANS_CHASES—INCONSISTENT_TRANS—CENT_FEW_DIFFS—HALO_GHOST
007431887-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_MARSHALL—LPP_DV—LPP_ALT—ALL_TRANS_CHASES
007431887-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_TRACKER—TRANS_GAPPED—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_ALT—MOD_POS_ALT—INCONSISTENT_TRANS
007431887-05	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_MARSHALL—TRANS_GAPPED—LPP_DV—ALL_TRANS_CHASES—INCONSISTENT_TRANS—CENT_FEW_DIFFS
007431887-06	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_MARSHALL—TRANS_GAPPED—ALL_TRANS_CHASES—INCONSISTENT_TRANS
007431887-07	OBS	FP	0.00	1	0	1	0	INDIV_TRANS_RUBBLE_MARSHALL—TRANS_GAPPED—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—HALO_GHOST

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

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

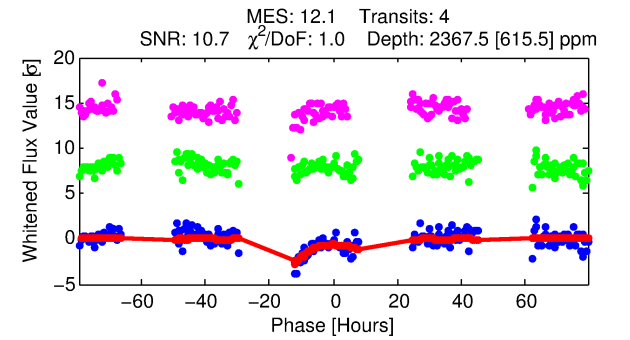
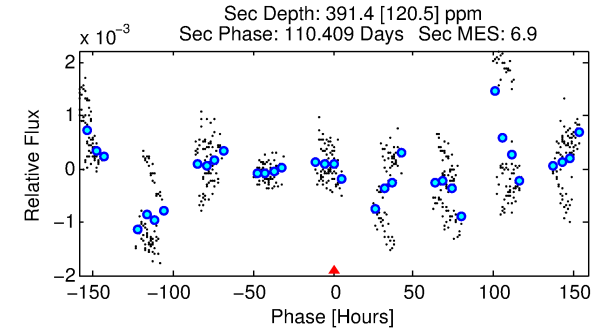
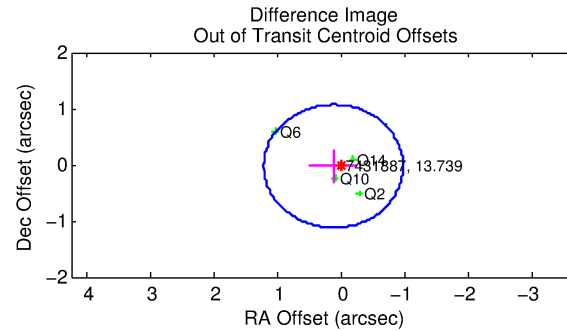
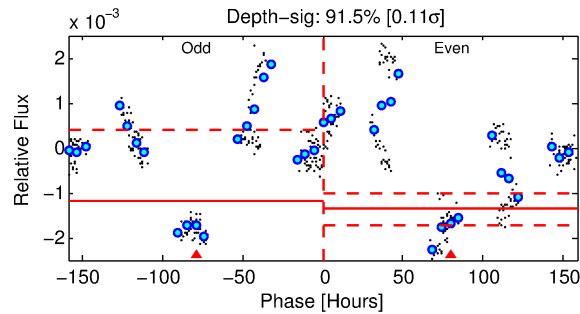
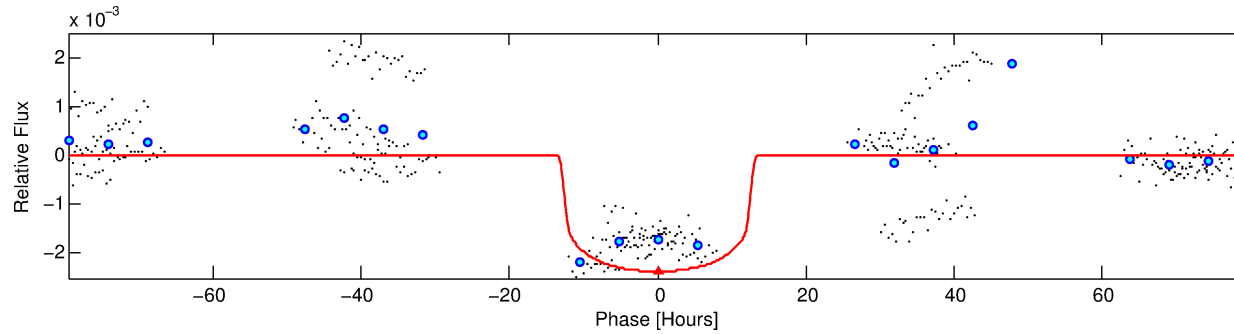
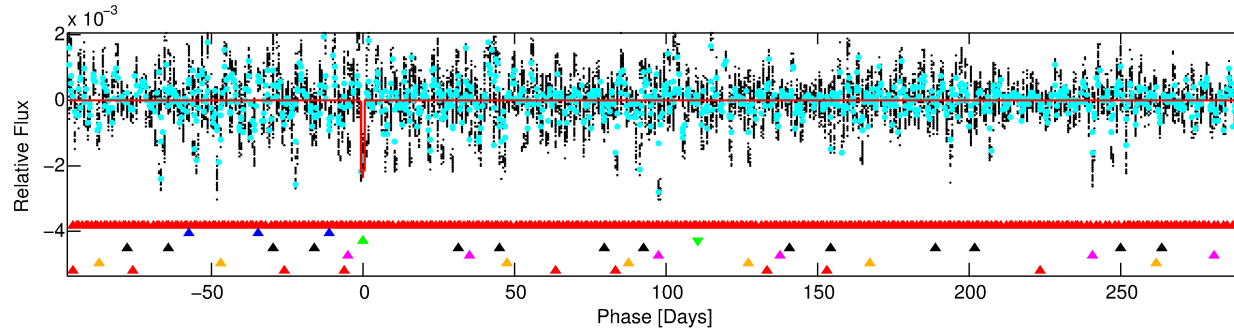
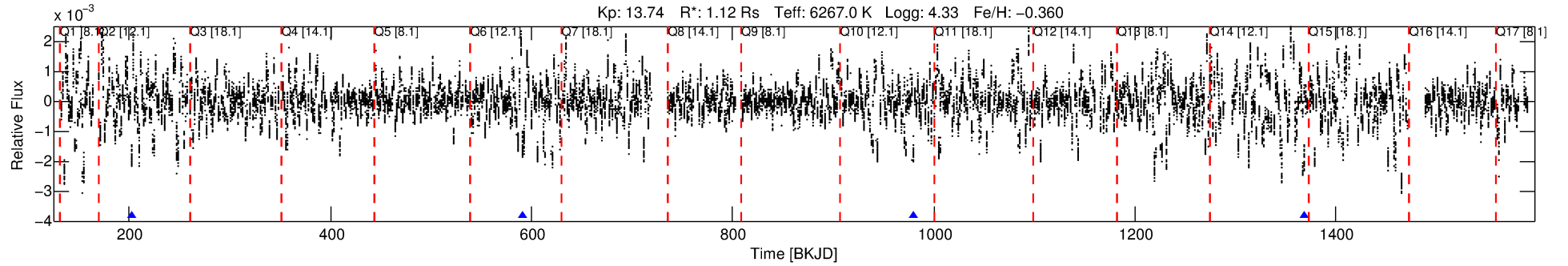
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 007431887-03

No Significant Match Found

# DV One-Page Summary

KIC: 7431887 Candidate: 3 of 7 Period: 388.494 d



## DV Fit Results:

Period = 388.49438 [0.03897] d  
Epoch = 202.5192 [0.0705] BKJD  
Rp/R\* = 0.0450 [0.0278]  
a/R\* = 113.11 [295.82]  
b = 0.26 [9.18]  
Seff = 1.61 [0.62]  
Teq = 287 [28] K  
Rp = 5.49 [3.78] Re  
a = 1.0365 [0.2626] AU  
Ag = 7667.96 [10155.43] [0.75 $\sigma$ ]  
Teff = 4154 [1328] K [2.91 $\sigma$ ]

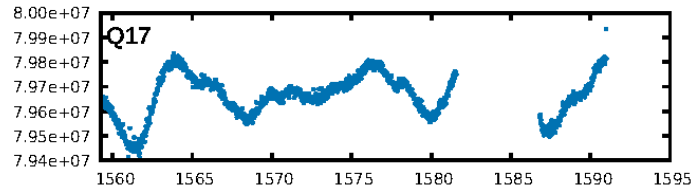
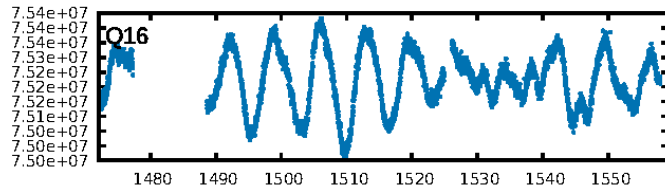
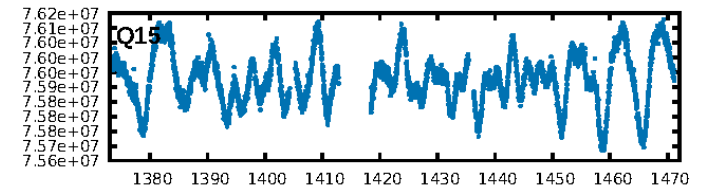
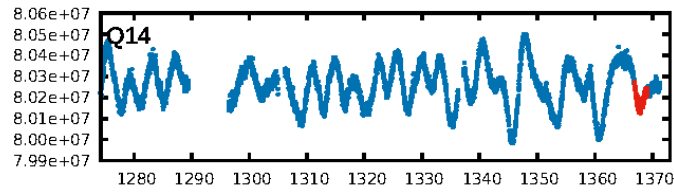
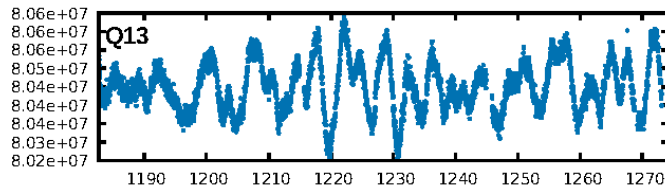
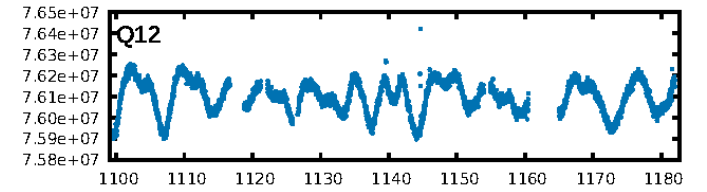
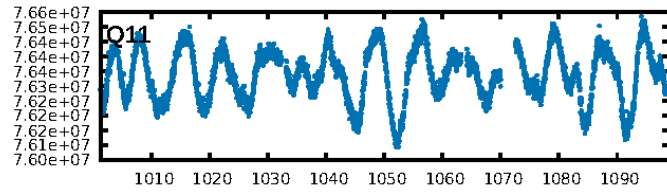
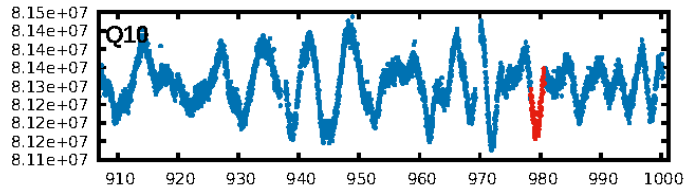
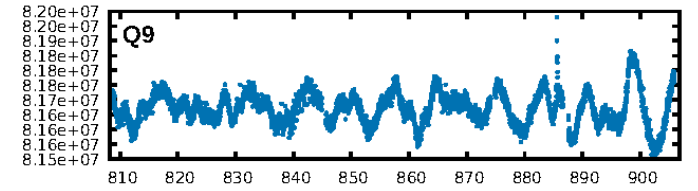
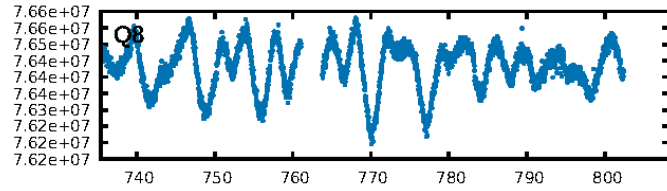
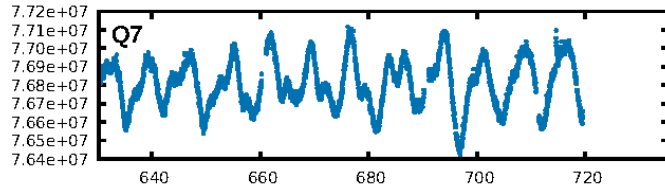
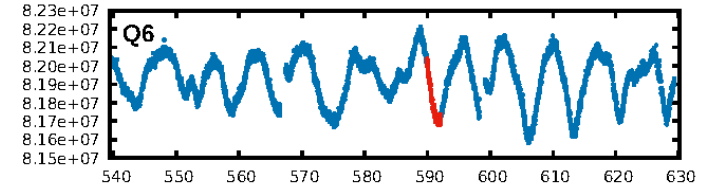
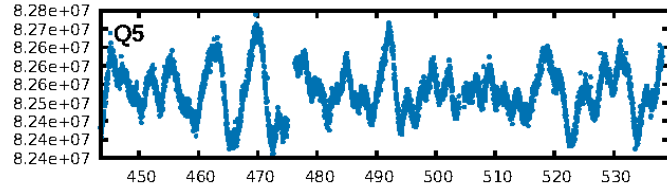
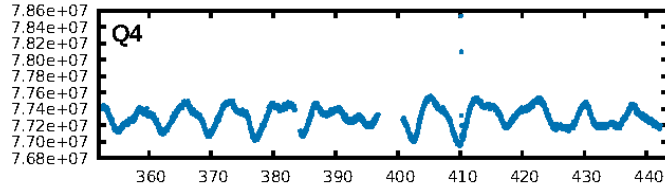
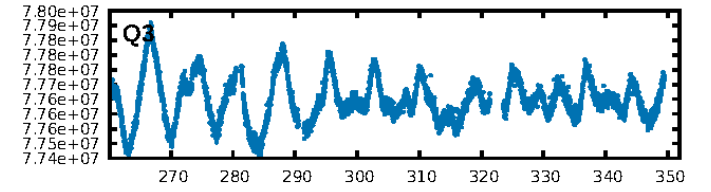
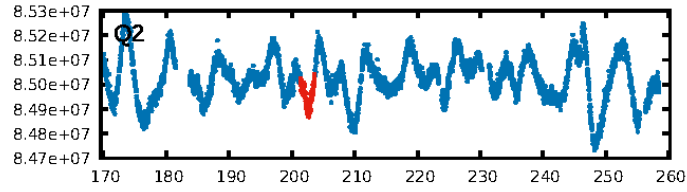
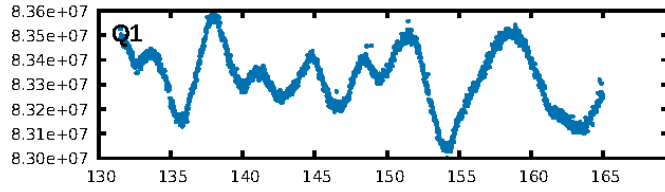
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [85.30 $\sigma$ ]  
LongPeriod-sig: 100.0% [17.35 $\sigma$ ]  
ModelChiSquare2-sig: 49.9%  
ModelChiSquareGof-sig: 100.0%  
**Bootstrap-pfa: 1.26e-10**  
RollingBand-fgt: 1.00 [4/4]  
GhostDiagnostic-chr: 1.879  
Centroid-sig: 49.1%  
Centroid-so: 0.223 arcsec [2.71 $\sigma$ ]  
OotOffset-rm: 0.130 arcsec [0.36 $\sigma$ ]  
OotOffset-st: 4/0/0/0 [4]  
KicOffset-rm: 0.305 arcsec [0.80 $\sigma$ ]  
KicOffset-st: 4/0/0/0 [4]  
DiffImageQuality-fgm: 1.00 [4/4]  
DiffImageOverlap-fno: 0.00 [0/4]

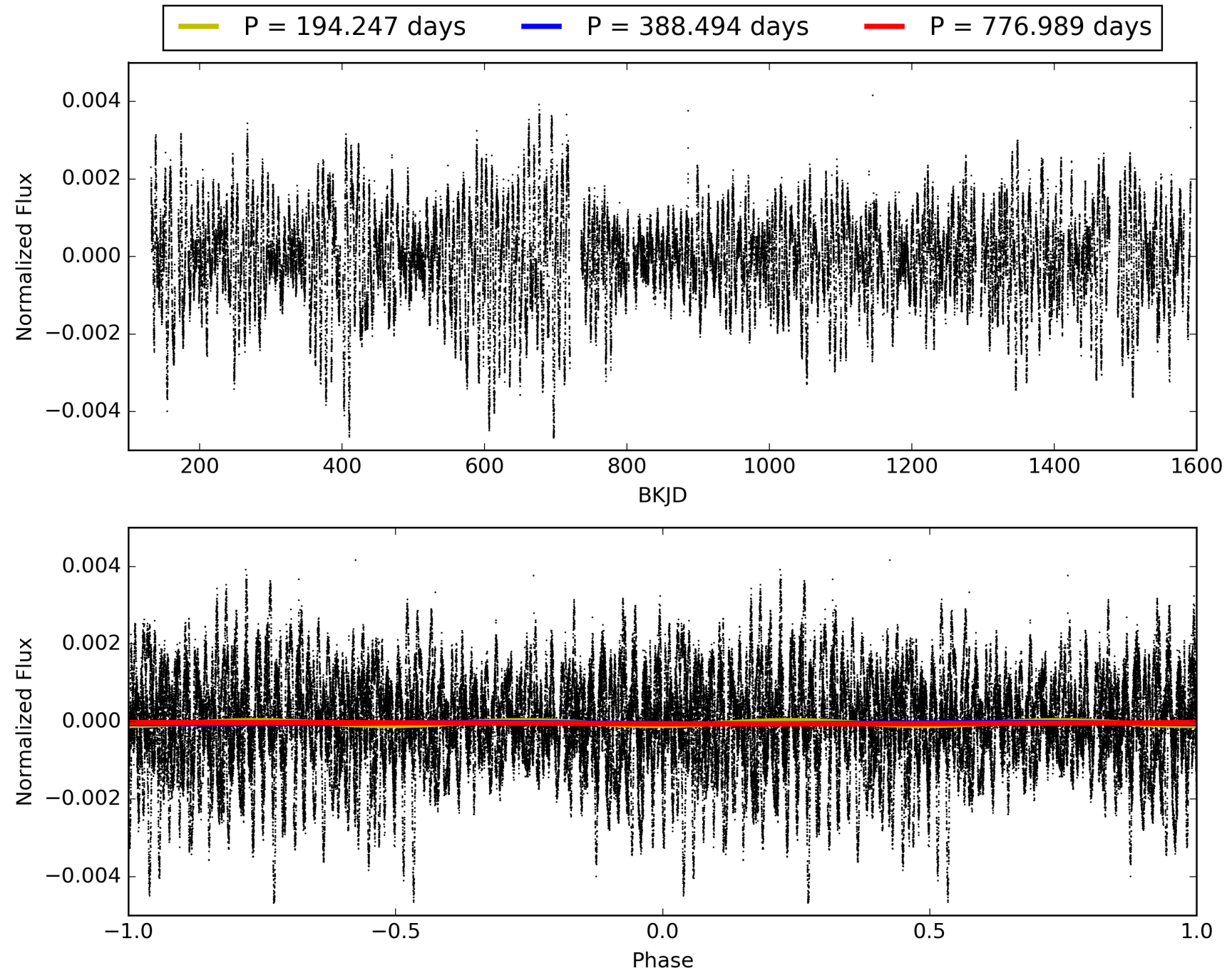
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 02-Feb-2016 01:56:44 Z

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

# TCE 007431887-03, PDC Light Curves

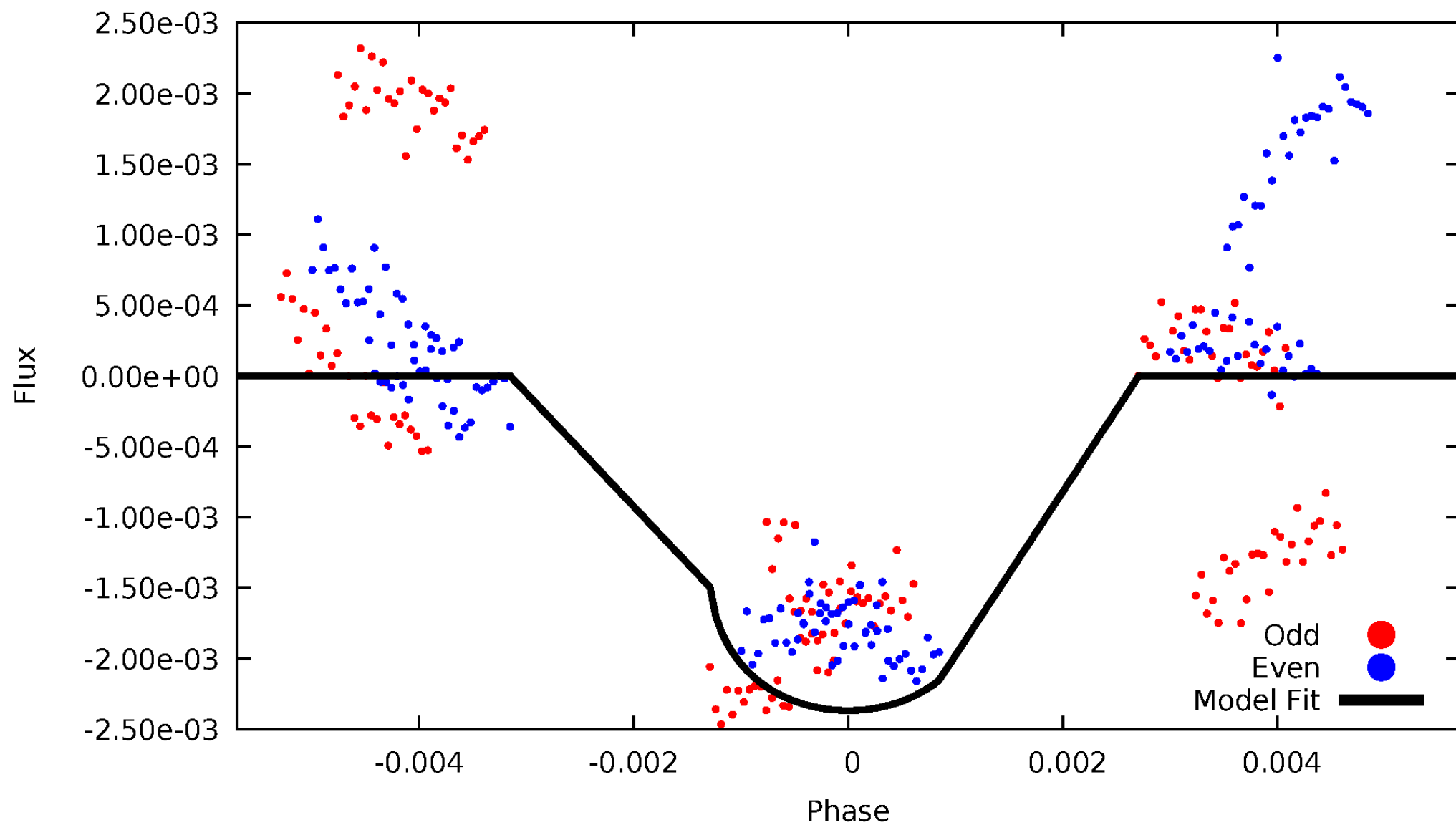


TCE 007431887-03



# DV Odd/Even

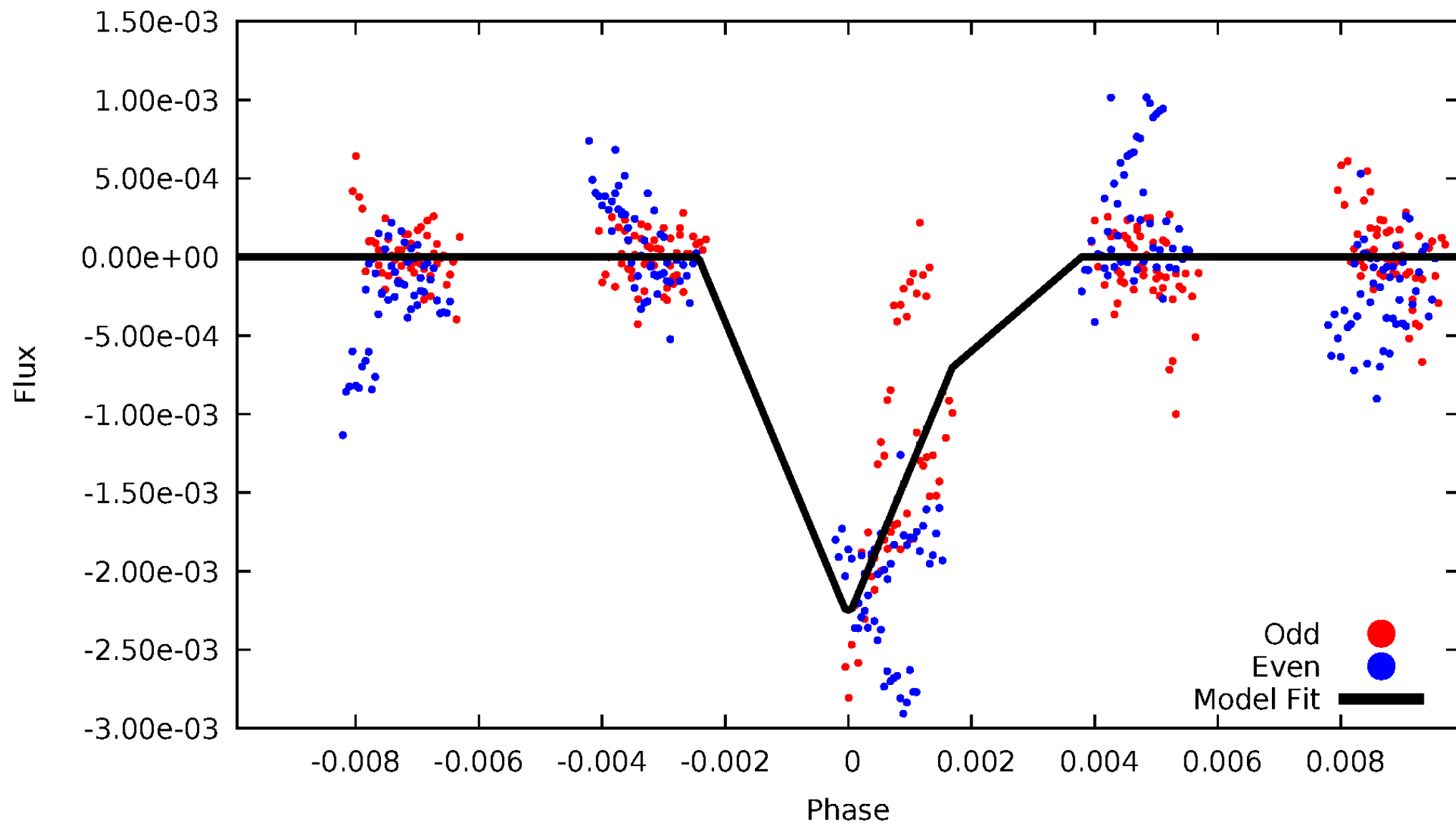
TCE 007431887-03





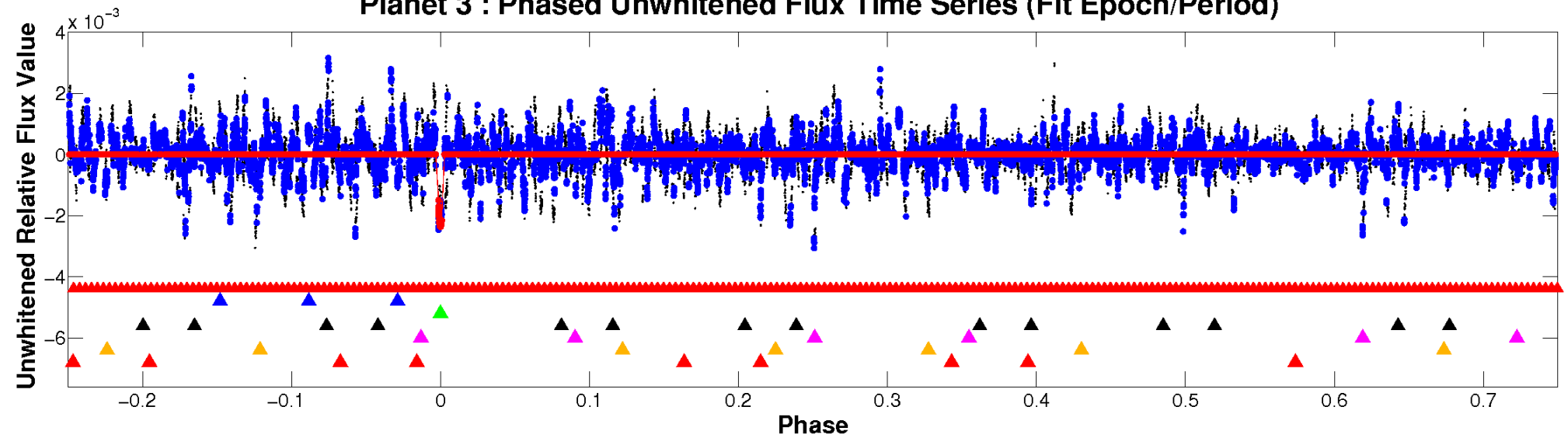
# ALT Odd/Even

TCE 007431887-03

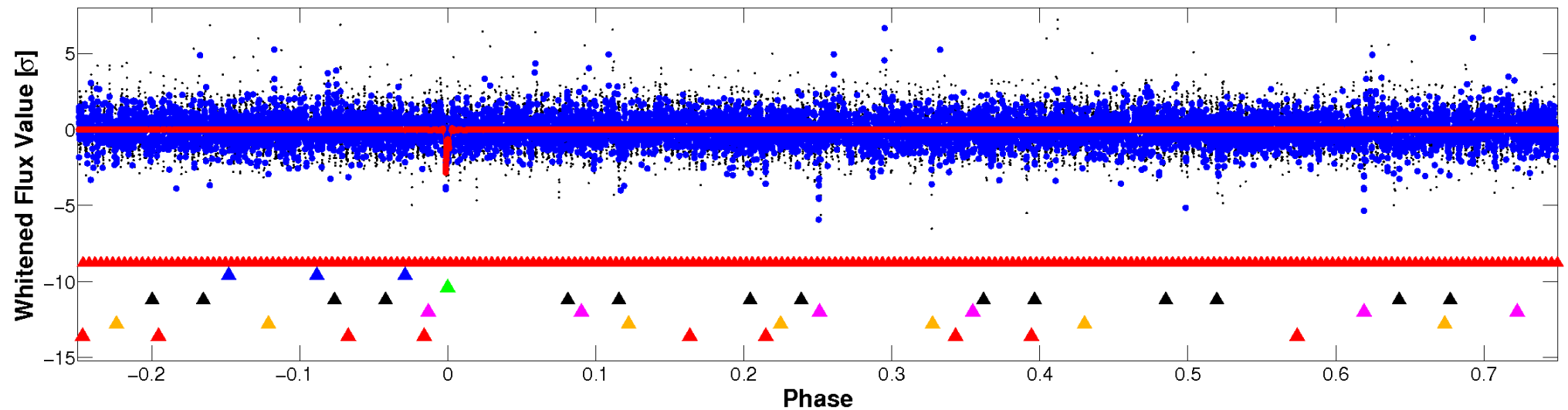


# Non-Whitened Vs. Whitened Light Curve

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

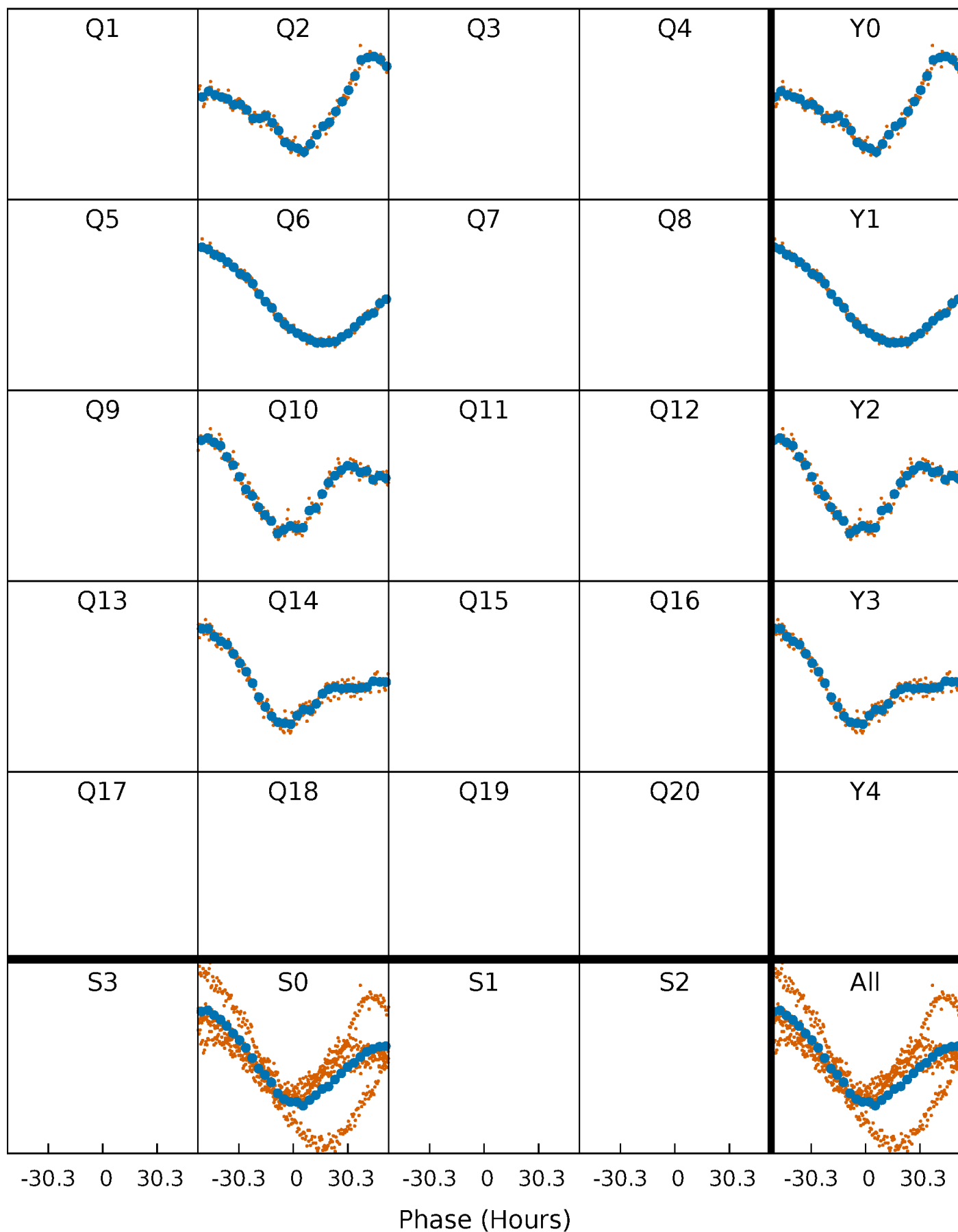


## Planet 3 : Phased Whitened Flux Time Series (Fit Epoch/Period)



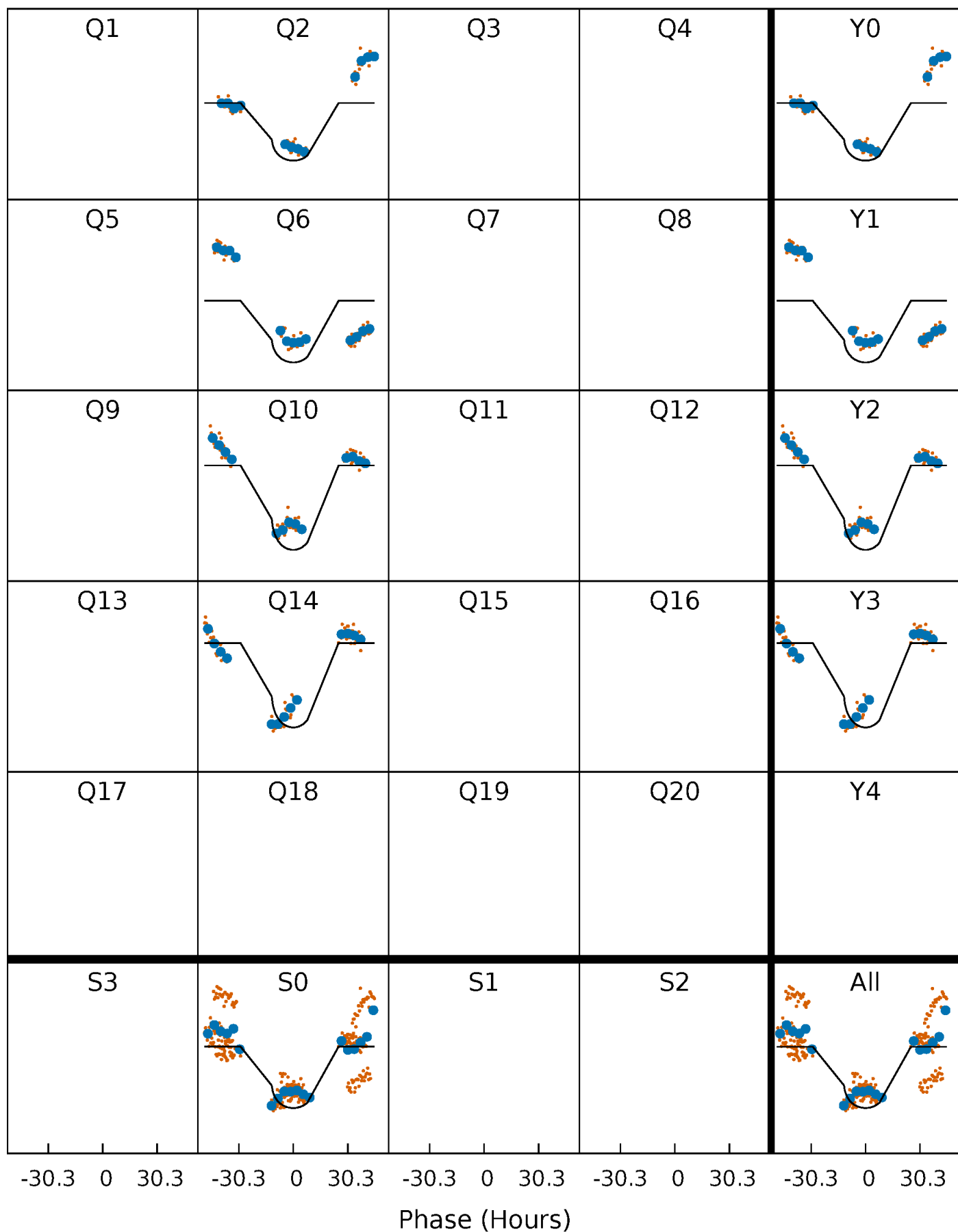
# PDC Quarter-Phased Transit Curves

TCE 007431887-03     $P=388.494382$  Days     $T_0=202.519206$  (BKJD)



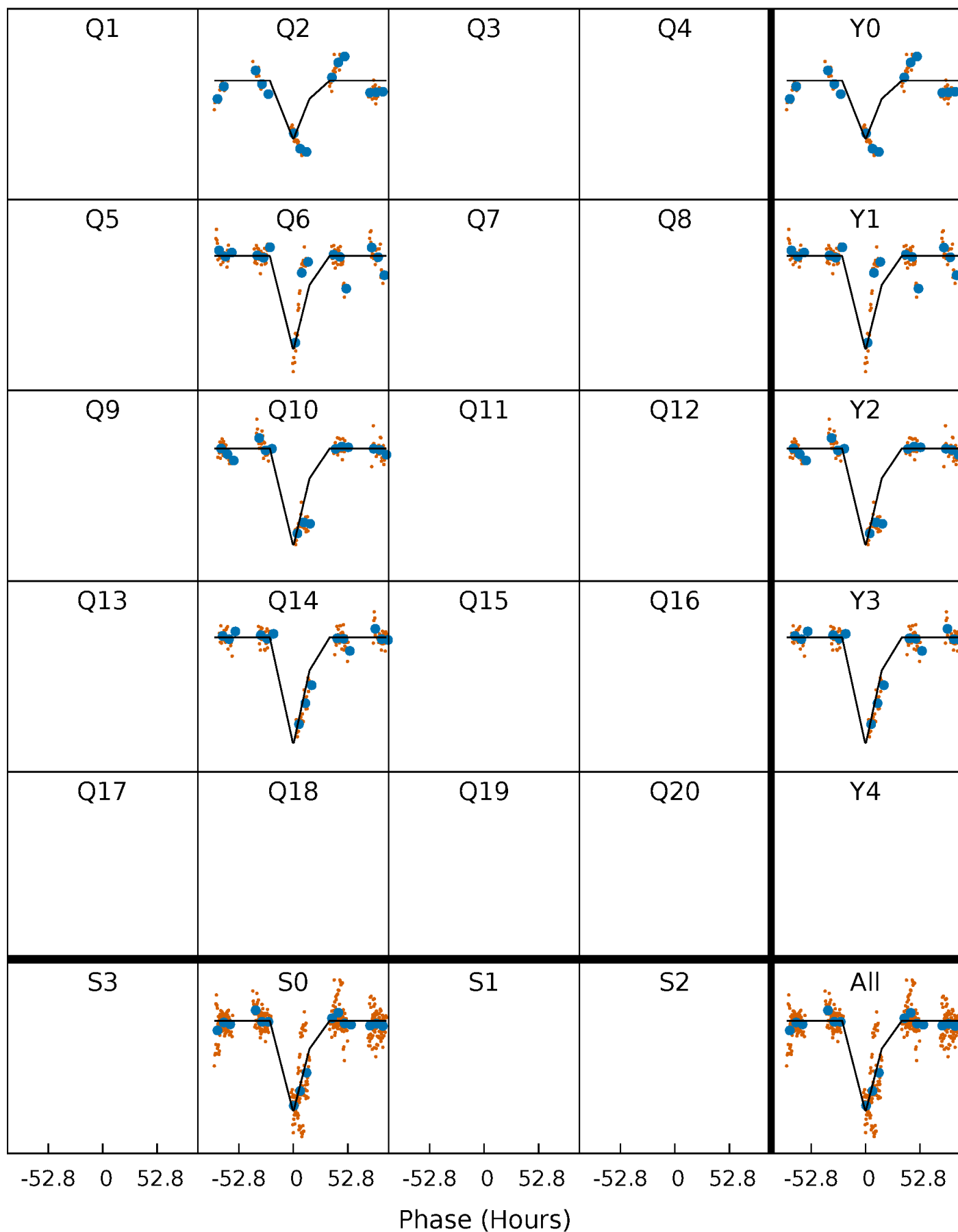
# DV Quarter-Phased Transit Curves

TCE 007431887-03 P=388.494382 Days  $T_0=202.519206$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

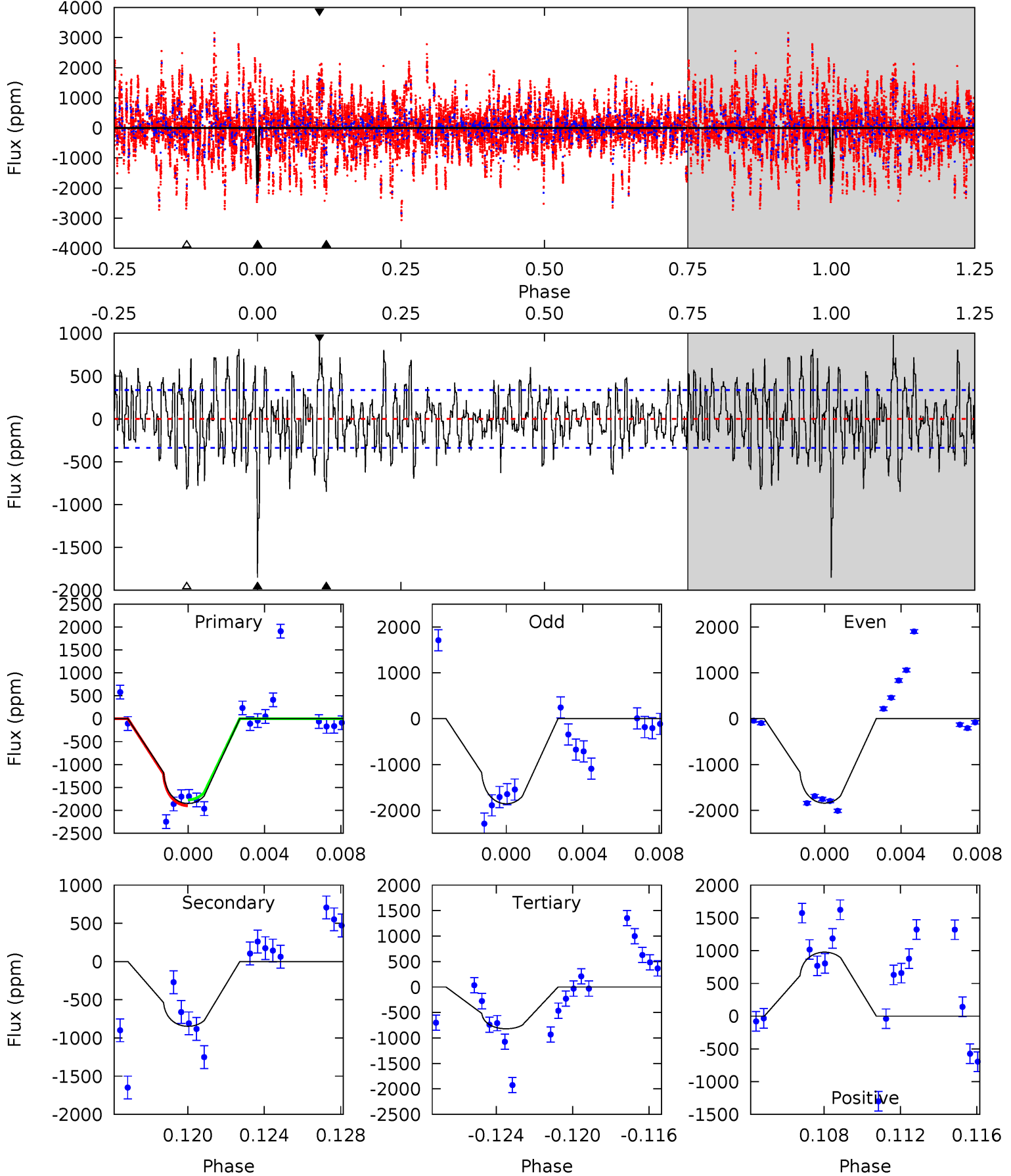
TCE 007431887-03 P=388.319374 Days  $T_0=202.418295$  (BKJD)



# DV Model-Shift Uniqueness Test

007431887-03, P = 388.494382 Days, E = 202.519206 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
28.5	13.1	12.6	15.0	5.20	2.88	4.38	15.9	13.5	0.42	-1.99	0.10	1.01	0.35	0.96

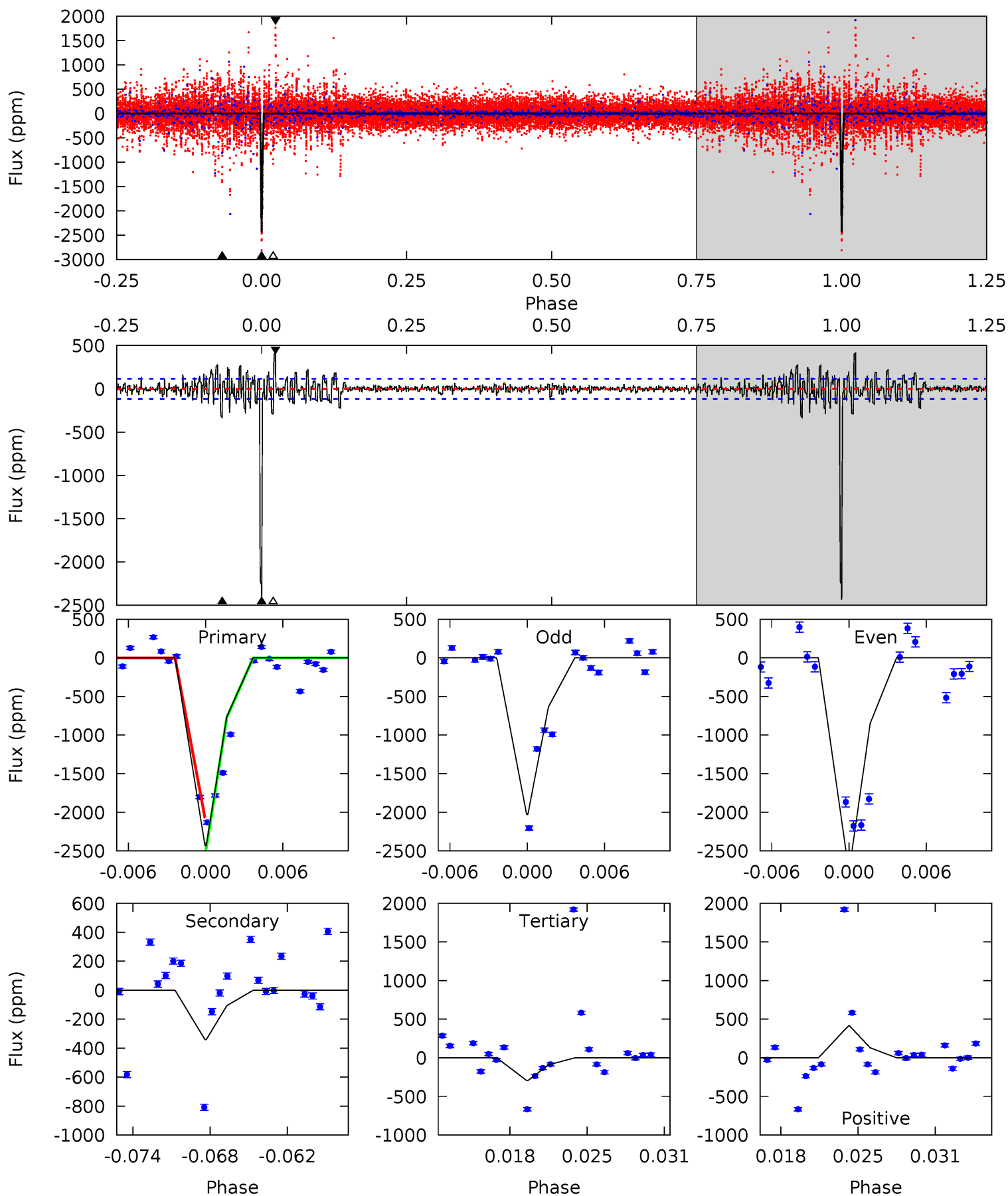




# Alt Model-Shift Uniqueness Test

007431887-03, P = 388.319374 Days, E = 202.418295 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
107.4	15.1	13.0	18.2	5.12	2.74	2.51	94.4	89.2	2.06	-3.15	16.1	0.93	0.14	4.35



### Stellar Parameters For KIC 007431887

	$T_{\text{eff}} (K)$	$\log(g)$	$[\text{Fe}/\text{H}]$	$R (R_{\odot})$	$M (M_{\odot})$	$\rho_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$6267^{+169}_{-188}$	$4.334^{+0.132}_{-0.198}$	$-0.360^{+0.300}_{-0.300}$	$1.118^{+0.340}_{-0.183}$	$0.981^{+0.160}_{-0.107}$	$0.990^{+0.672}_{-0.488}$
	+3%/-3%	+3%/-5%	+83%/-83%	+30%/-16%	+16%/-11%	+68%/-49%
Source	PHO1	KIC0	KIC0	DSEP		

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

### Secondary Eclipse Parameters for KIC 007431887-03 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$-847 \pm 65$	$5.90^{+3.45}_{-3.26}$	$406^{+30}_{-24}$	$5052^{+2500}_{-884}$	$14787^{+58923}_{-9253}$
Alt.	$-341 \pm 23$	$5.96^{+3.48}_{-3.14}$	$402^{+30}_{-21}$	$4174^{+1386}_{-631}$	$5786^{+19985}_{-3533}$

$T_{\text{max}}$  = 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

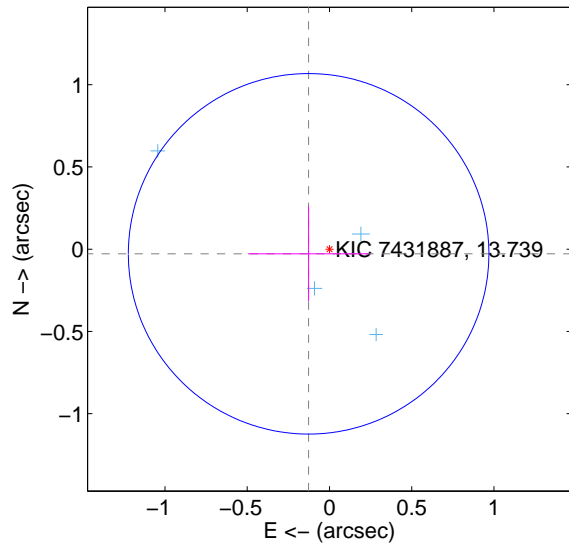
Supplemental centroid analysis for 007431887-03. Kepler magnitude: 13.74. Transit SNR 10.72

There are 4 quarters with good PRF difference image offsets

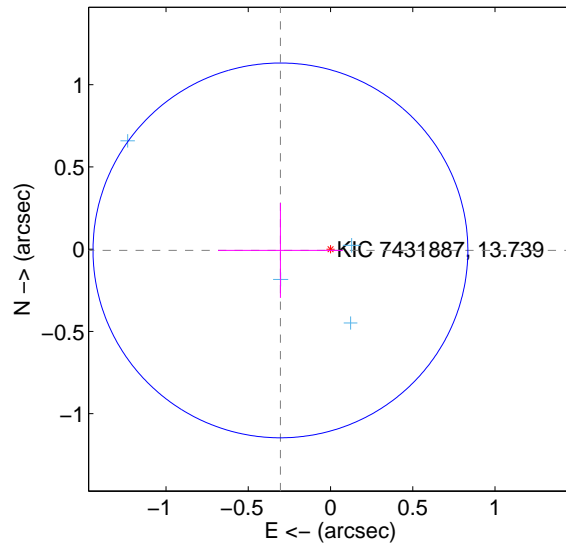
The direct PRF centroid is offset from the target star catalog position by about 0.09 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.130 \pm 0.365$	0.36	$0.127 \pm 0.369$	$-0.028 \pm 0.289$
PRF-fit source offset from KIC position	$0.305 \pm 0.380$	0.80	$0.304 \pm 0.380$	$-0.007 \pm 0.289$
photometric centroid source offset	$0.22 \pm 0.08$	2.71	$0.22 \pm 0.08$	$-0.01 \pm 0.09$

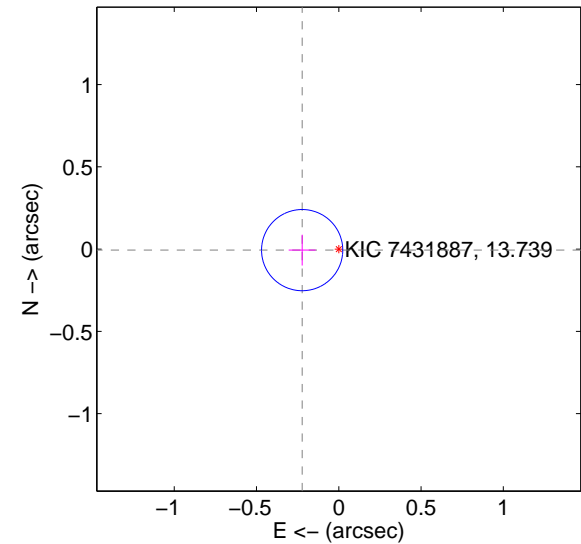
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position

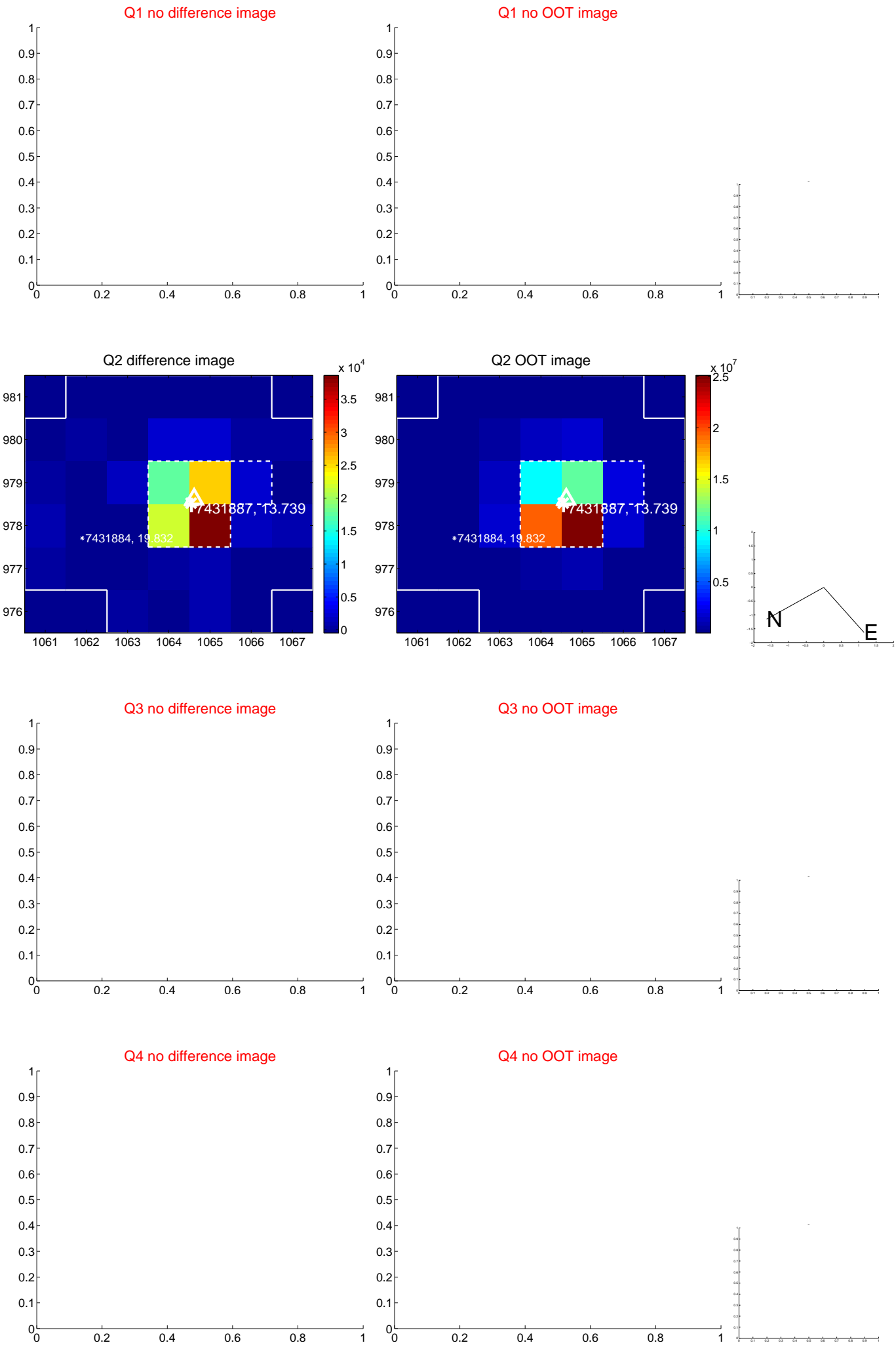


offset from photometric centroids



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.

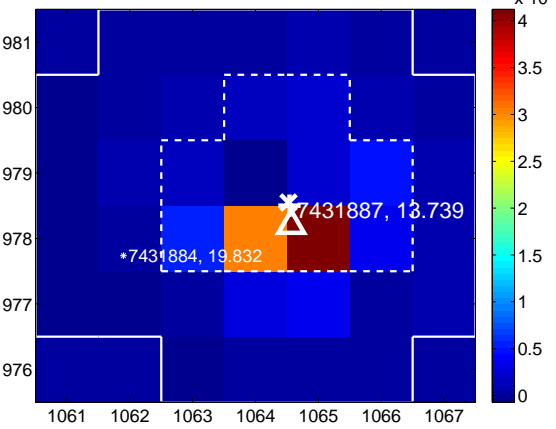
Q5 no difference image



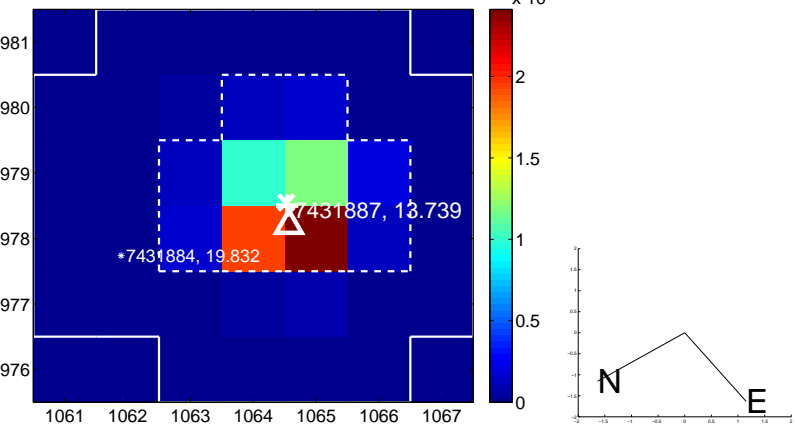
Q5 no OOT image



Q6 difference image



Q6 OOT image



Q7 no difference image



Q7 no OOT image



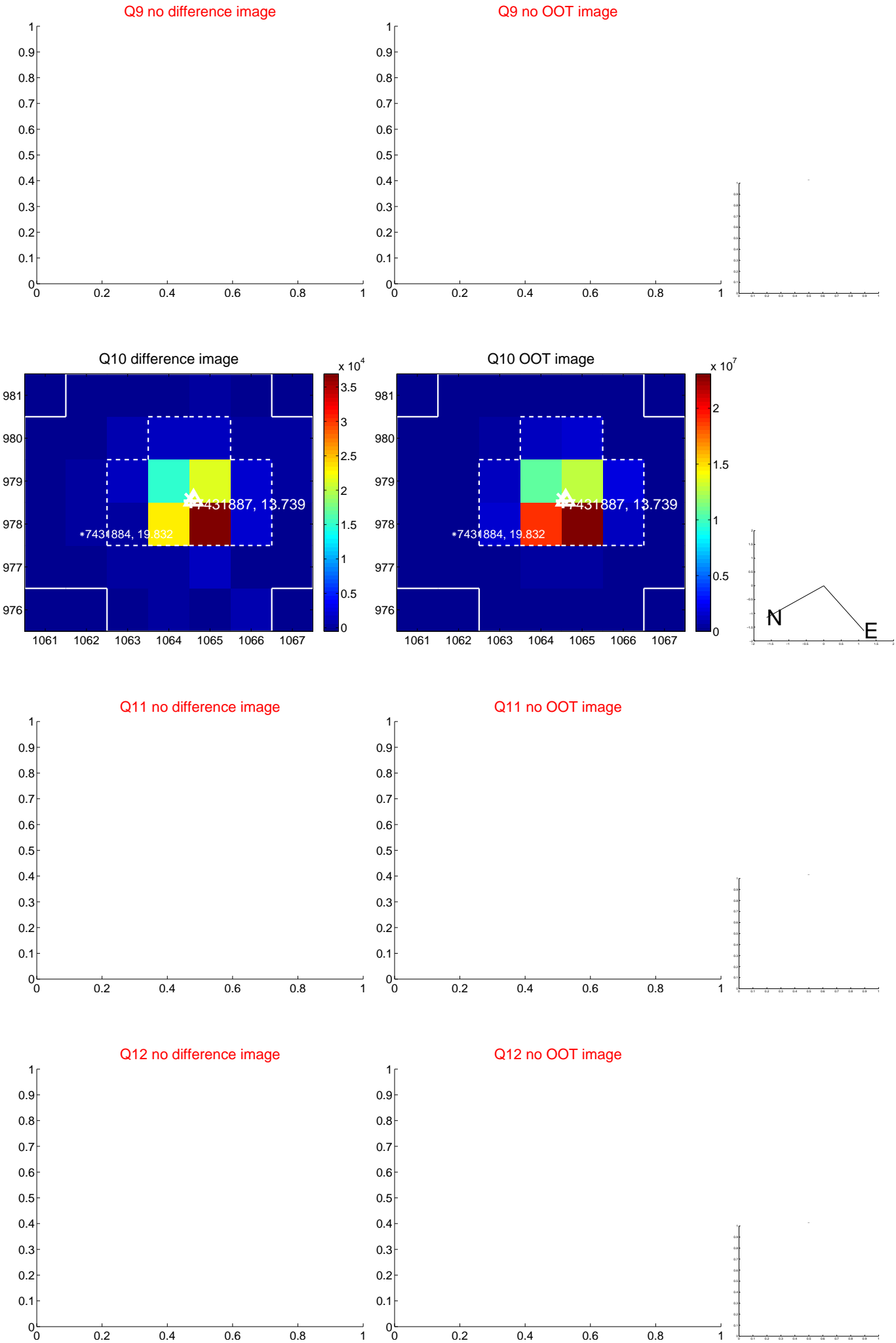
Q8 no difference image



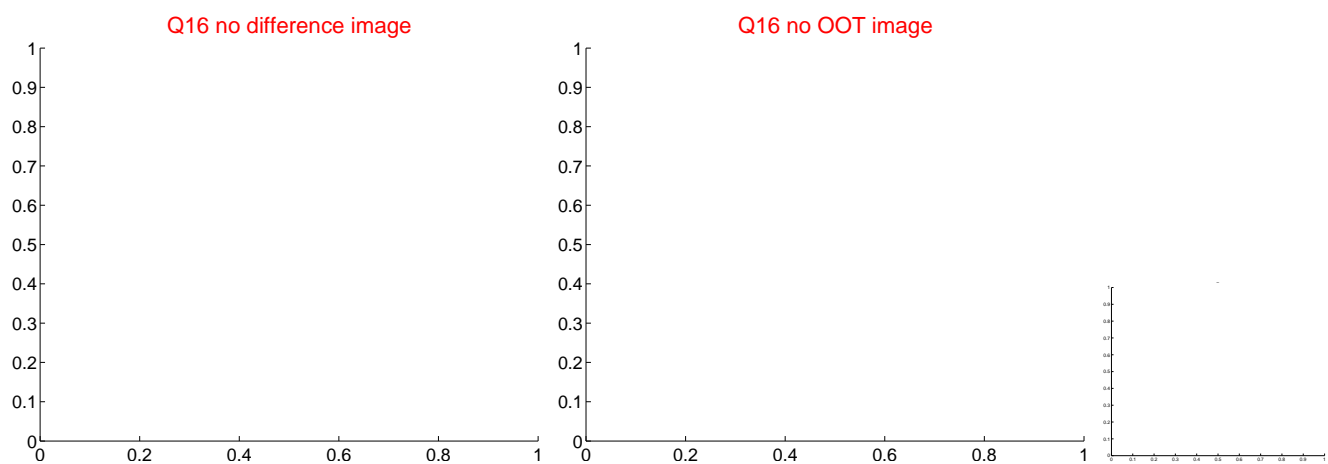
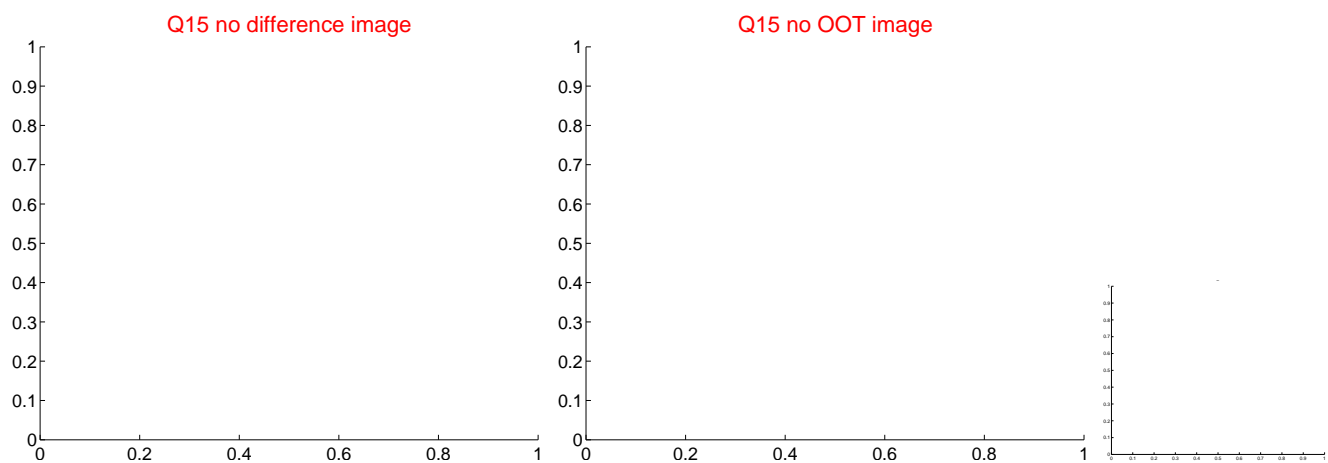
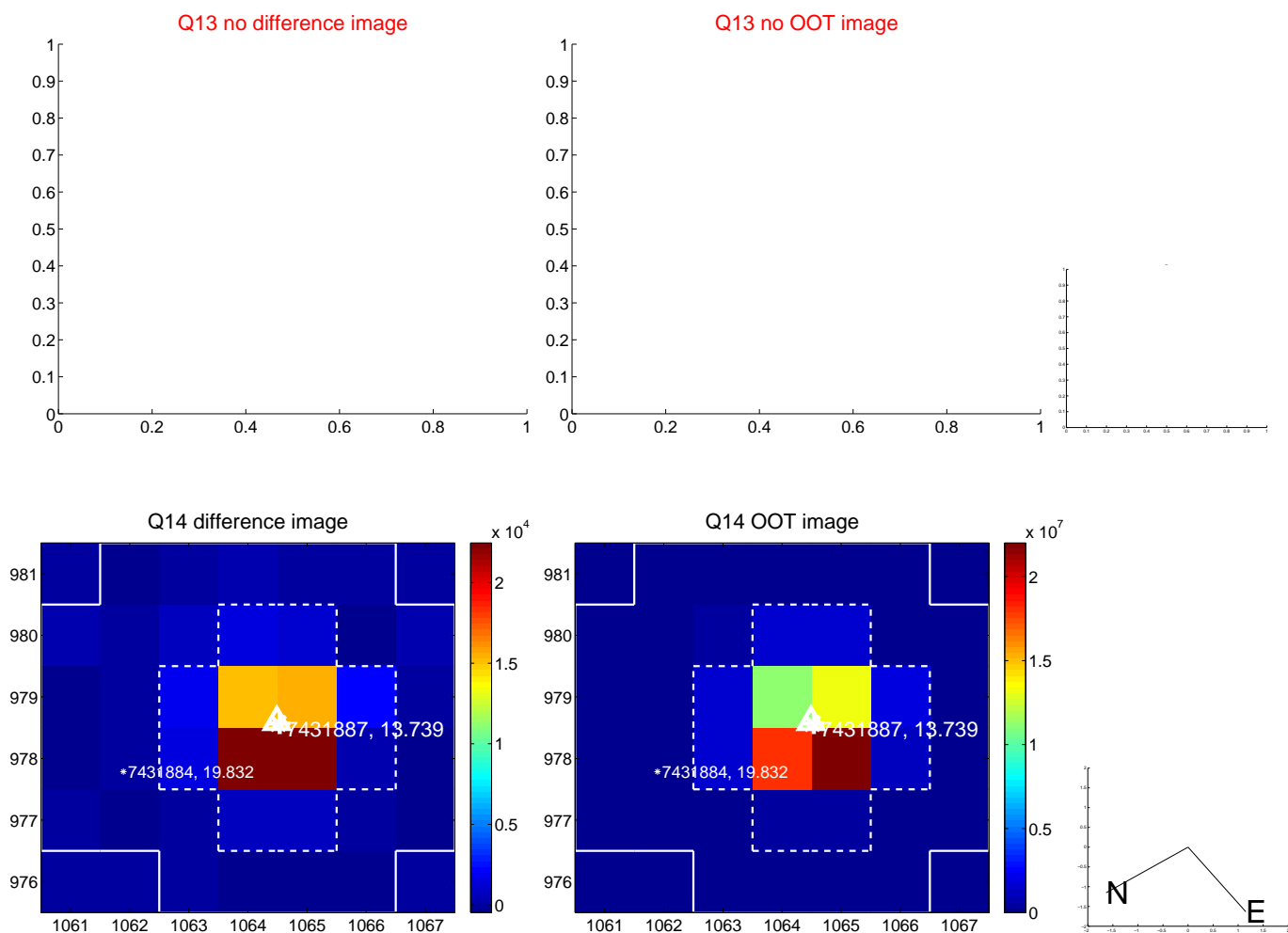
Q8 no OOT image



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

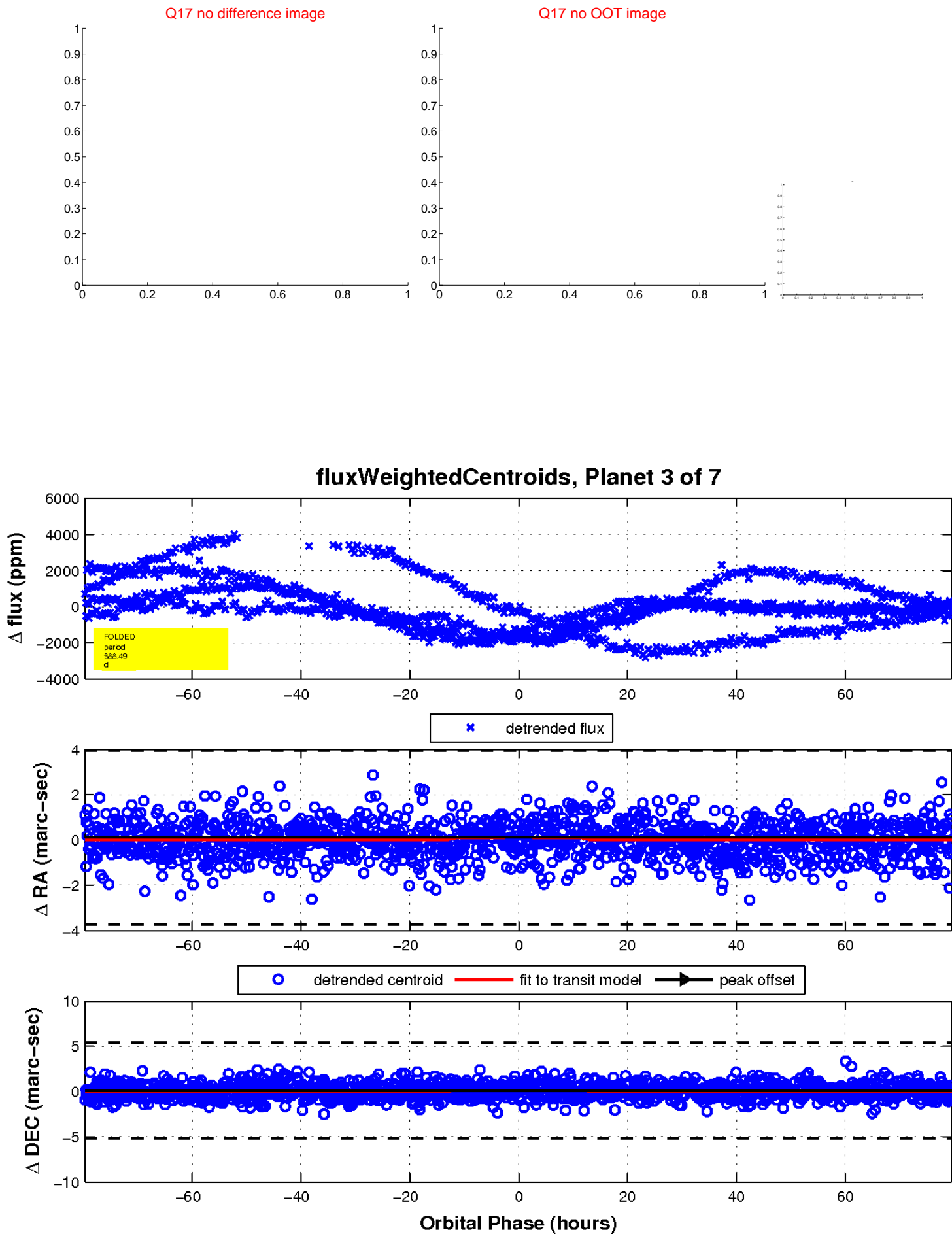


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value



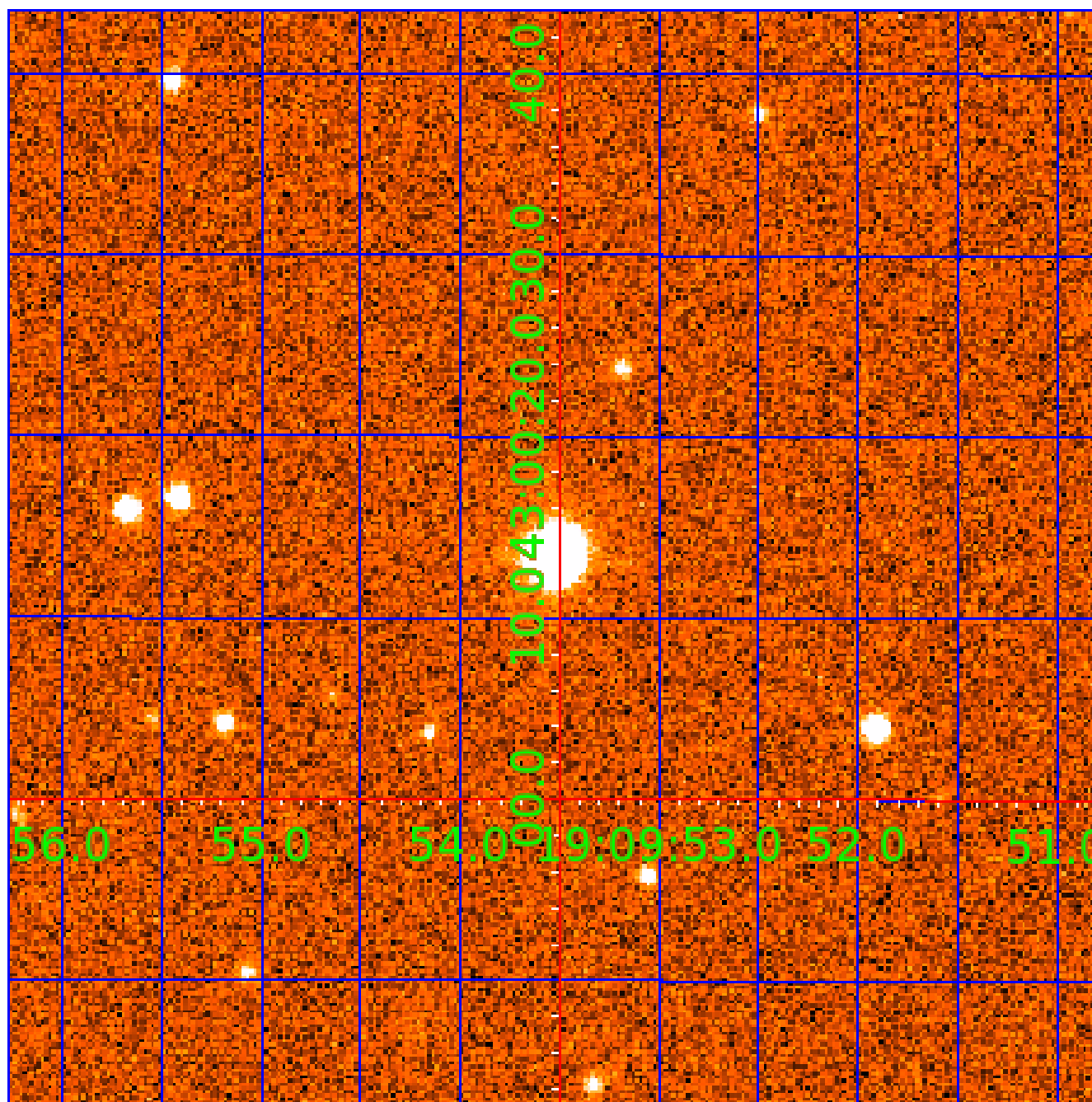


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



# UKIRT Image

Declination



# KIC 007431887

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
007431887-01	OBS	No	1.553574	131.905139	28.2	7.875	8.7	8.2	1.12	6267	0.61	2533.10
007431887-02	OBS	No	411.636384	533.544629	1551.2	17.901	14.9	13.6	1.12	6267	4.94	1.49
007431887-03	OBS	No	388.494382	202.519206	2367.5	26.549	12.1	10.7	1.12	6267	5.49	1.61
007431887-04	OBS	No	109.082765	138.385429	221.7	5.894	11.8	5.1	1.12	6267	1.90	8.74
007431887-05	OBS	No	245.597955	237.614415	2208.8	30.194	10.9	10.8	1.12	6267	9.72	2.96
007431887-06	OBS	No	214.190439	249.997276	695.2	22.274	9.8	6.1	1.12	6267	5.65	3.56
007431887-07	OBS	No	159.383586	176.419960	452.5	10.999	9.2	6.0	1.12	6267	2.78	5.27

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
007431887-01	OBS	FP	0.00	1	0	0	0	LPP_DV—MOD_NONUNIQ_DV
007431887-02	OBS	FP	0.00	1	0	1	0	INDIV_TRANS_RUBBLE_MARSHALL_ZUMA—LPP_DV—ALL_TRANS_CHASES—INCONSISTENT_TRANS—CENT_FEW_DIFFS—HALO_GHOST
007431887-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_MARSHALL—LPP_DV—LPP_ALT—ALL_TRANS_CHASES
007431887-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_TRACKER—TRANS_GAPPED—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_ALT—MOD_POS_ALT—INCONSISTENT_TRANS
007431887-05	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_MARSHALL—TRANS_GAPPED—LPP_DV—ALL_TRANS_CHASES—INCONSISTENT_TRANS—CENT_FEW_DIFFS
007431887-06	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_MARSHALL—TRANS_GAPPED—ALL_TRANS_CHASES—INCONSISTENT_TRANS
007431887-07	OBS	FP	0.00	1	0	1	0	INDIV_TRANS_RUBBLE_MARSHALL—TRANS_GAPPED—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—HALO_GHOST

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

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

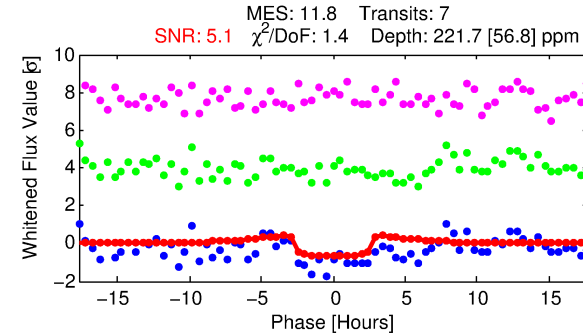
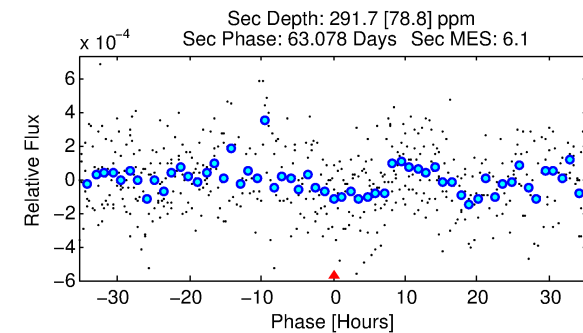
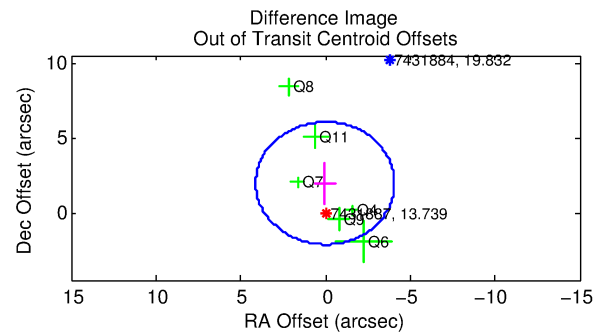
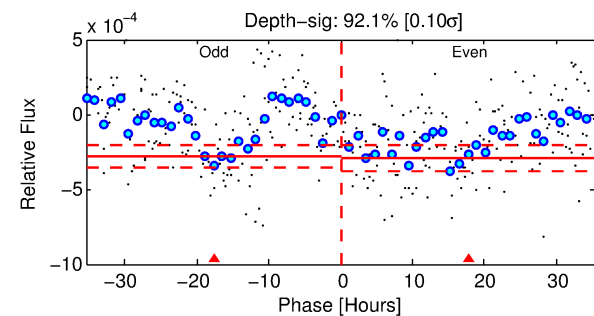
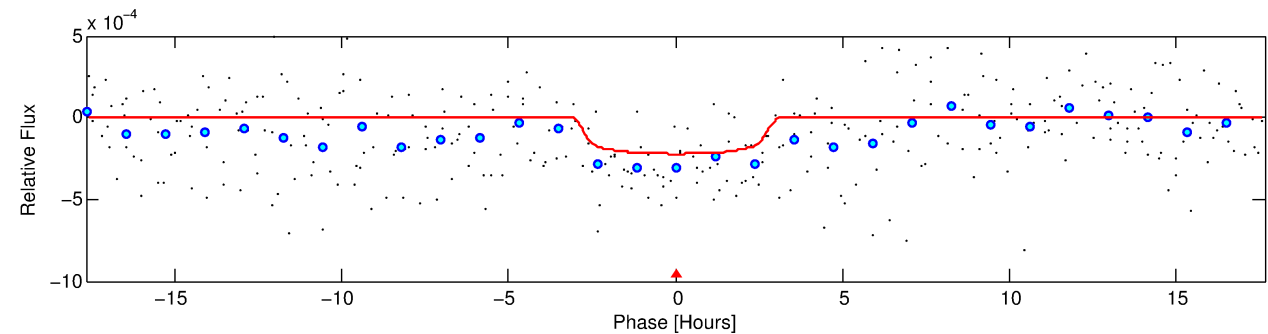
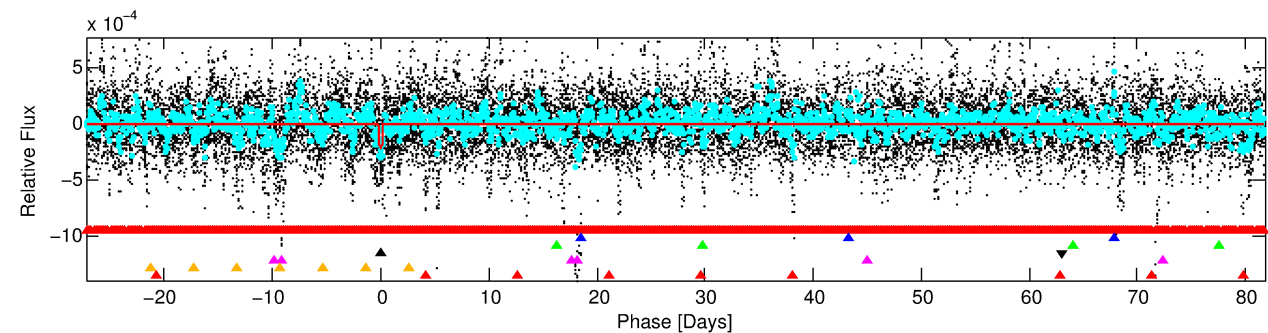
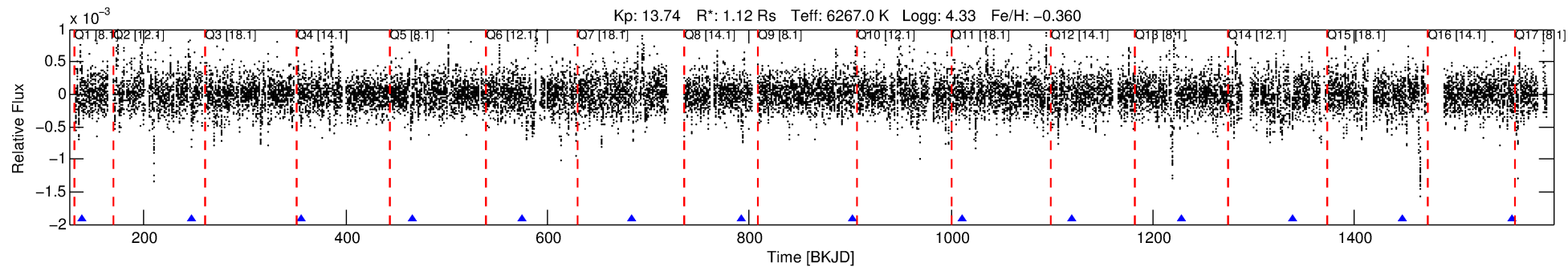
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 007431887-04

No Significant Match Found

# DV One-Page Summary

KIC: 7431887 Candidate: 4 of 7 Period: 109.083 d



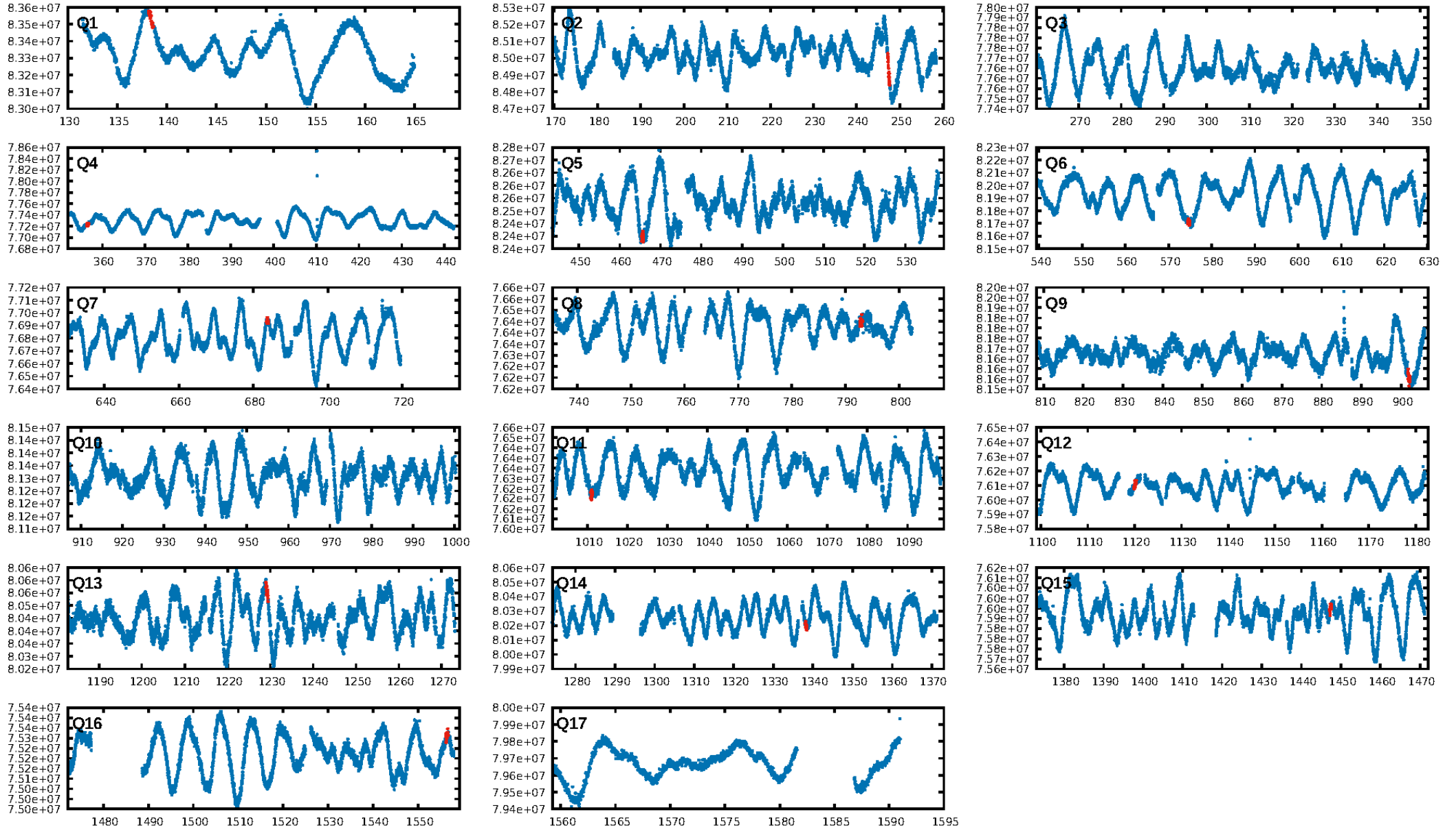
## DV Fit Results:

Period = 109.08276 [0.00242] d  
Epoch = 138.3854 [0.0200] BKJD  
Rp/R\* = 0.0155 [0.0084]  
a/R\* = 75.92 [213.72]  
b = 0.86 [0.84]  
Seff = 8.74 [3.36]  
Teq = 438 [42] K  
Rp = 1.90 [1.18] Re  
a = 0.4445 [0.1126] AU  
Ag = 8809.53 [10339.35] [0.85 $\sigma$ ]  
Teffp = 6568 [1842] K [3.33 $\sigma$ ]

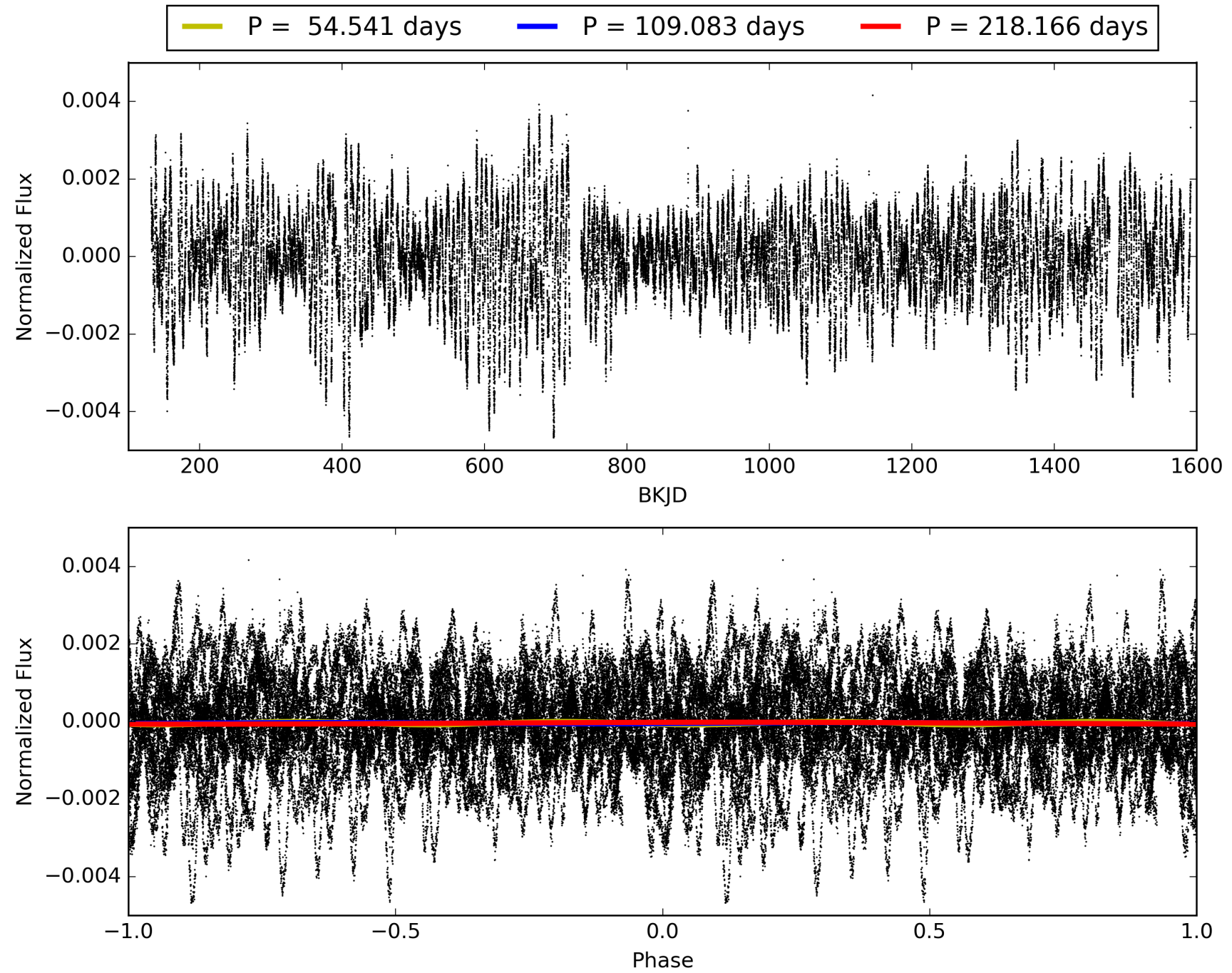
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [262.37 $\sigma$ ]  
LongPeriod-sig: 100.0% [96.74 $\sigma$ ]  
ModelChiSquare2-sig: 8.7%  
ModelChiSquareGof-sig: 99.7%  
Bootstrap-pfa: 1.67e-14  
RollingBand-fgt: 1.00 [7/7]  
GhostDiagnostic-chr: -2.475  
Centroid-sig: 25.8%  
Centroid-so: 0.842 arcsec [0.93 $\sigma$ ]  
OotOffset-rm: 1.957 arcsec [1.43 $\sigma$ ]  
KicOffset-rm: 1.901 arcsec [1.46 $\sigma$ ]  
OotOffset-st: 1/2/2/1 [6]  
KicOffset-st: 1/2/2/1 [6]  
DiffImageQuality-fgm: 0.33 [2/6]  
DiffImageOverlap-fno: 0.08 [1/12]

# TCE 007431887-04, PDC Light Curves

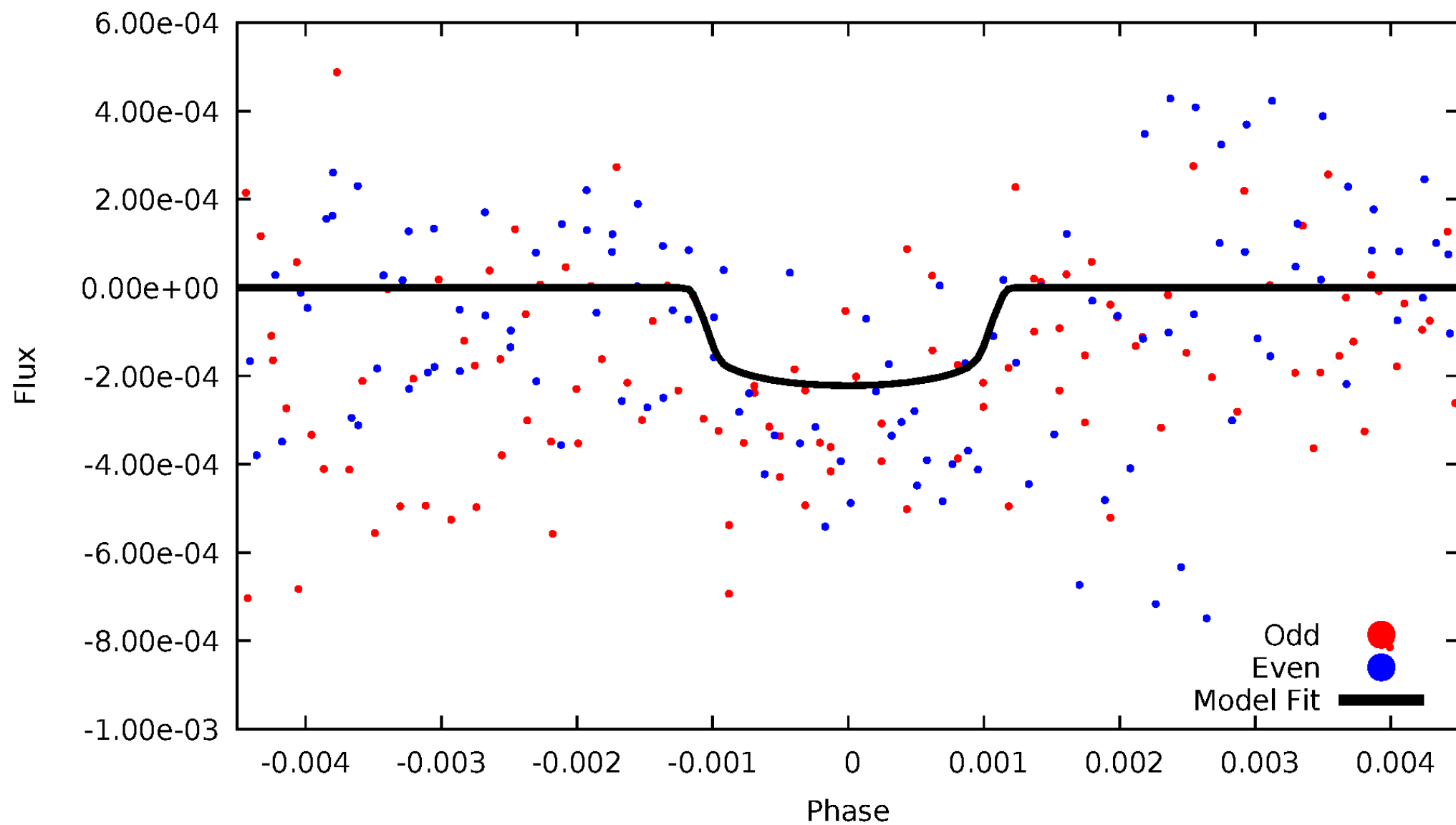


TCE 007431887-04



# DV Odd/Even

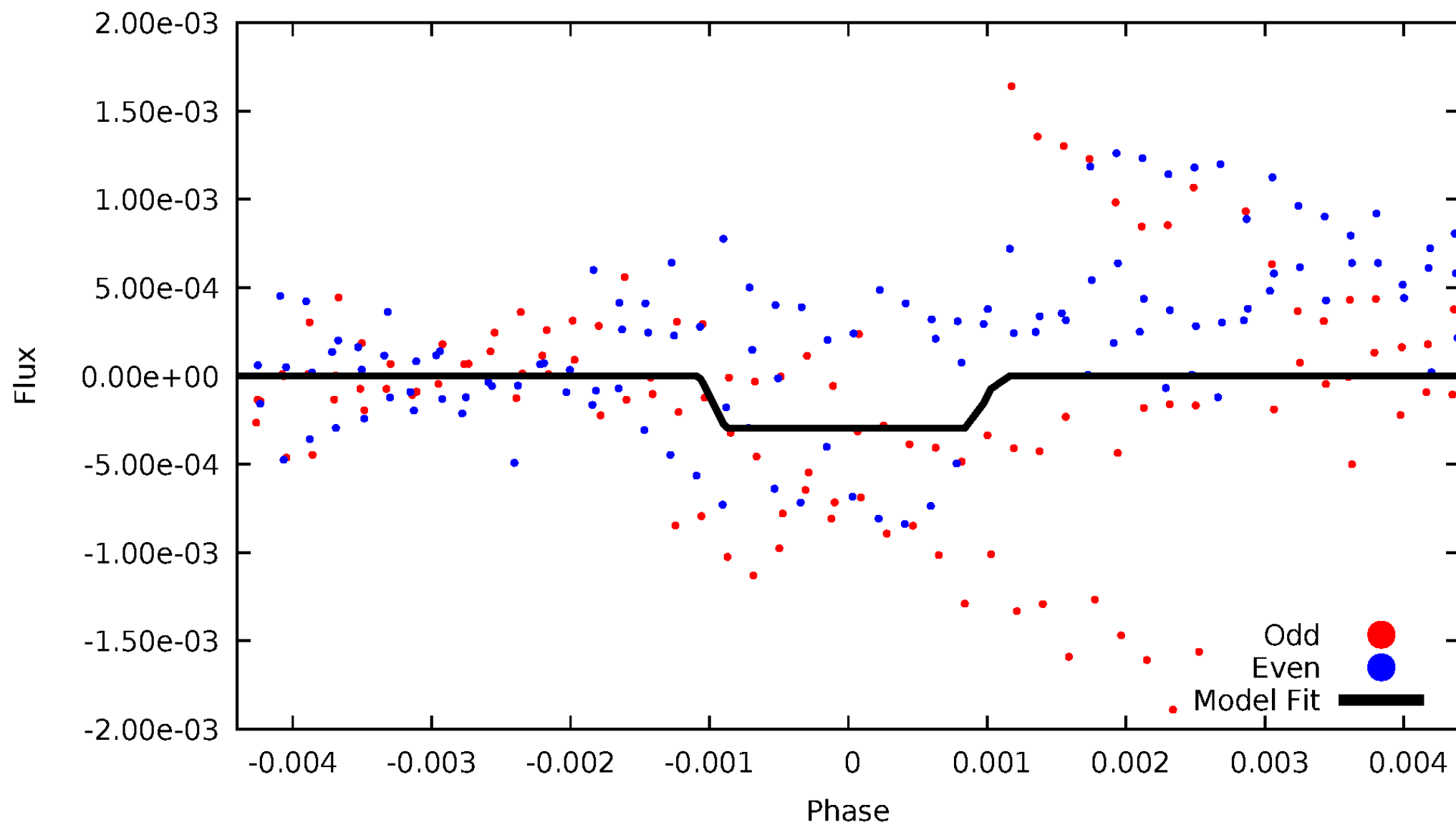
TCE 007431887-04





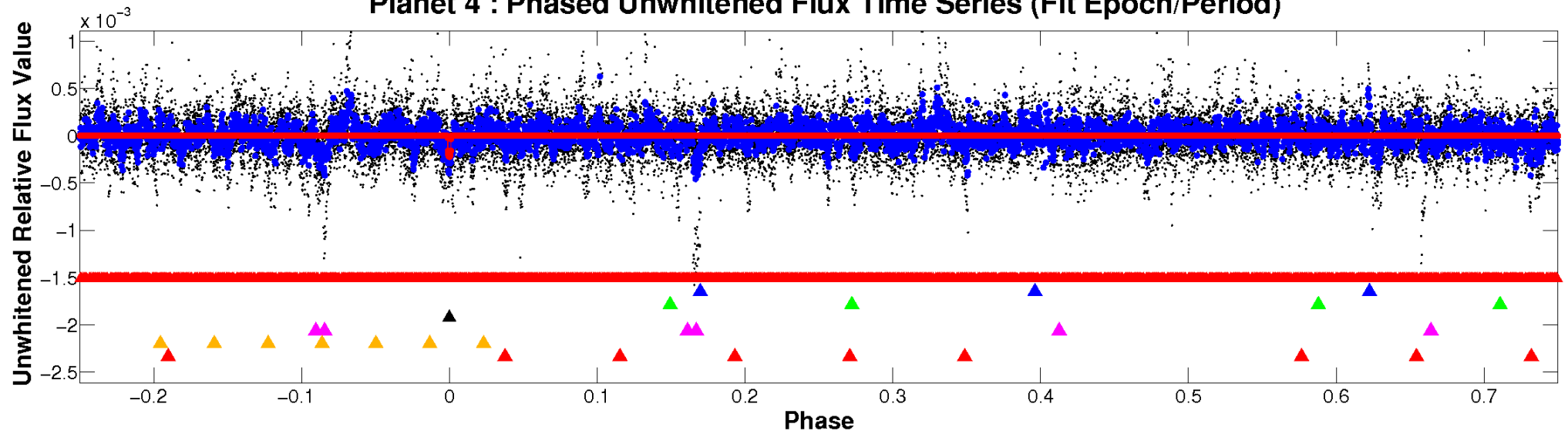
# ALT Odd/Even

TCE 007431887-04

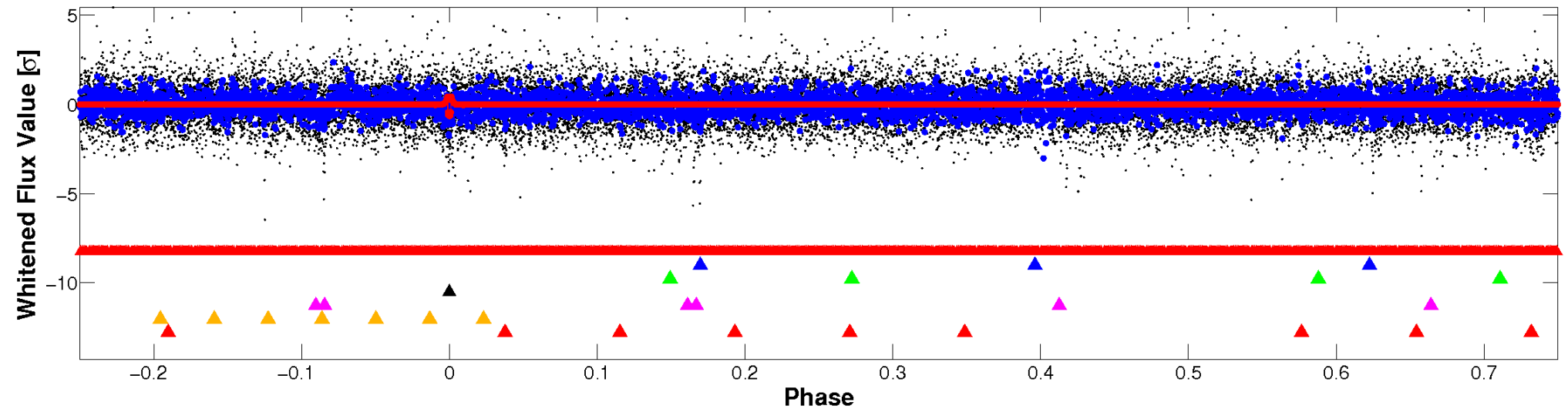


# Non-Whitened Vs. Whitened Light Curve

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

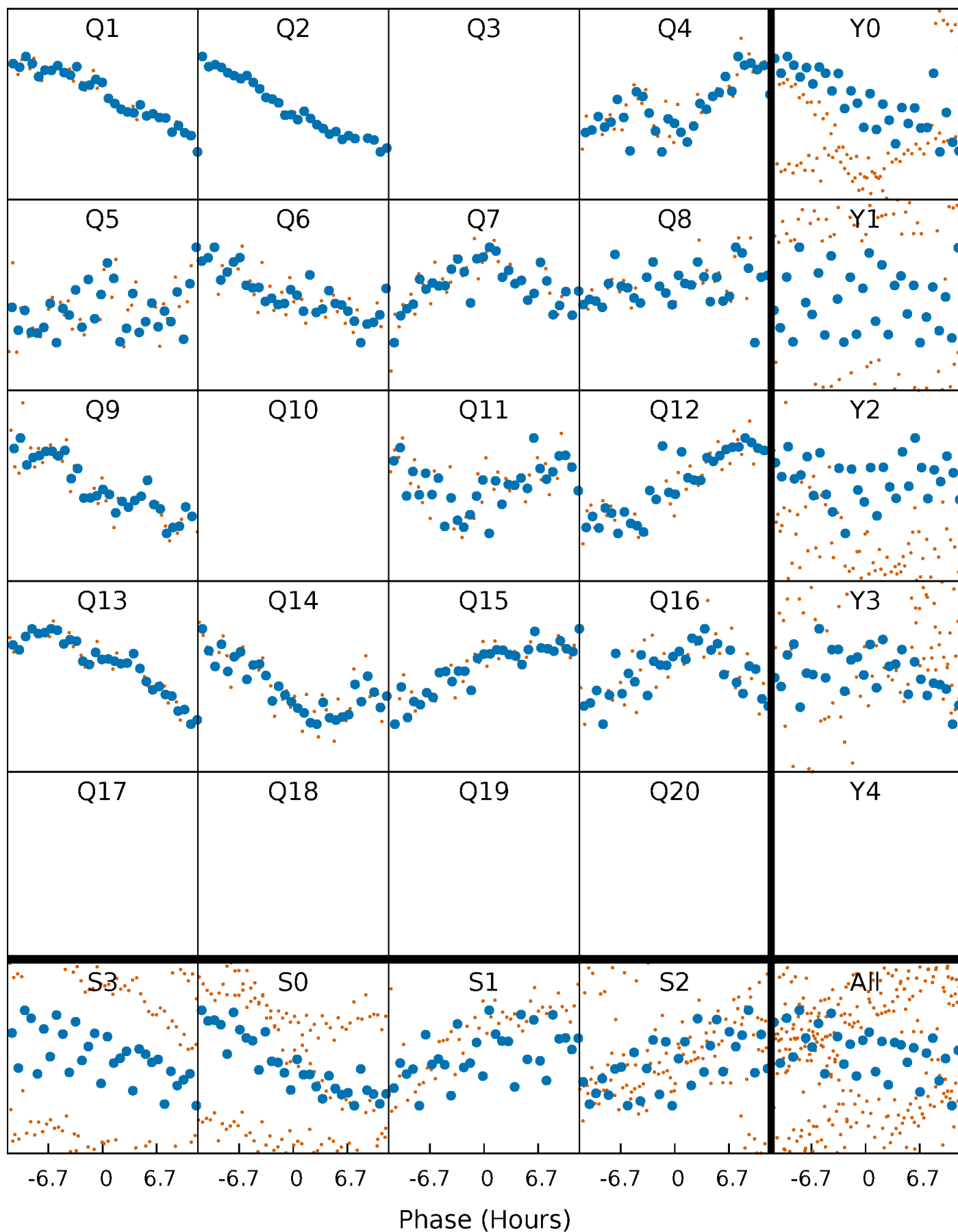


## Planet 4 : Phased Whitened Flux Time Series (Fit Epoch/Period)



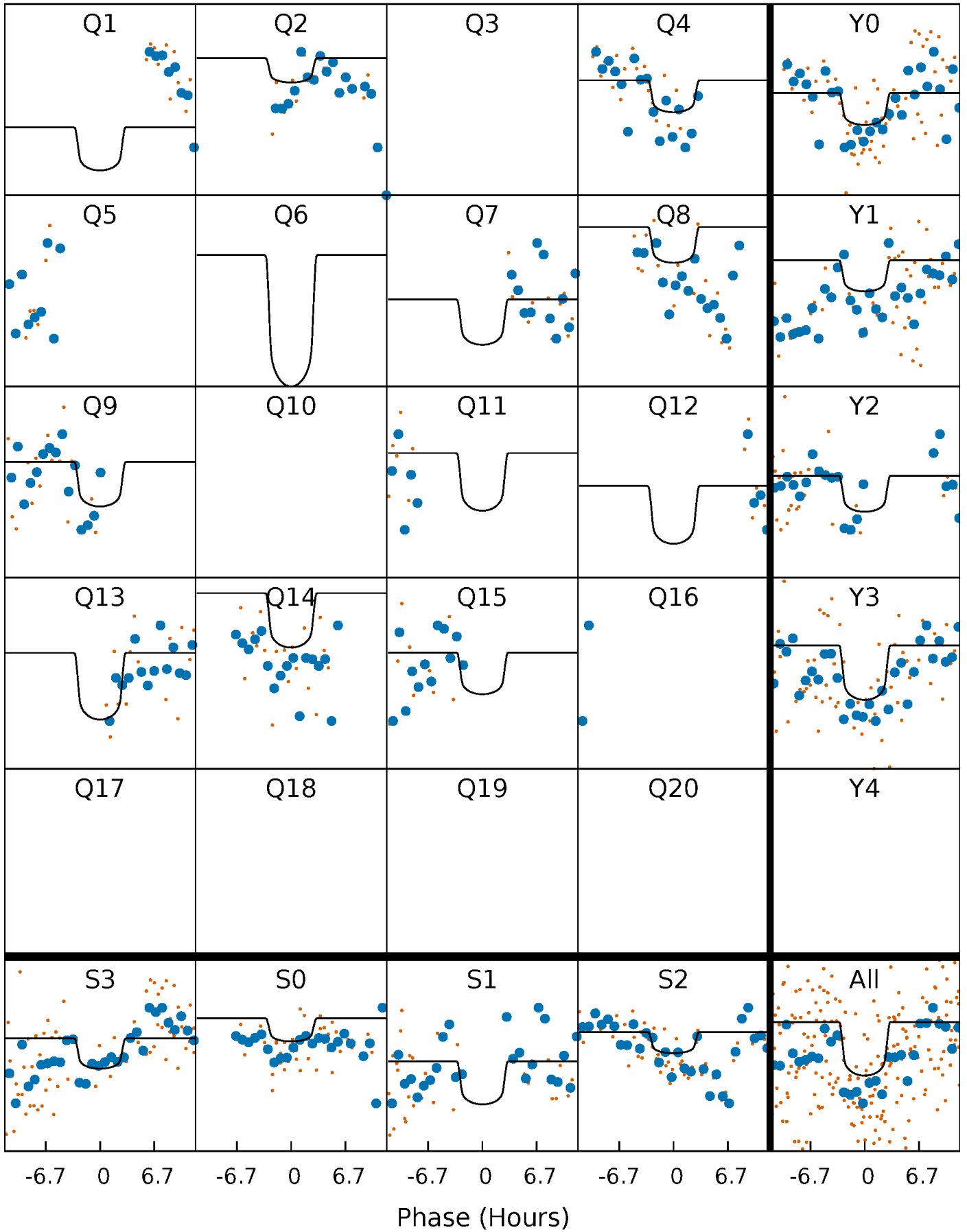
# PDC Quarter-Phased Transit Curves

TCE 007431887-04 P=109.082765 Days  $T_0=138.385429$  (BKJD)



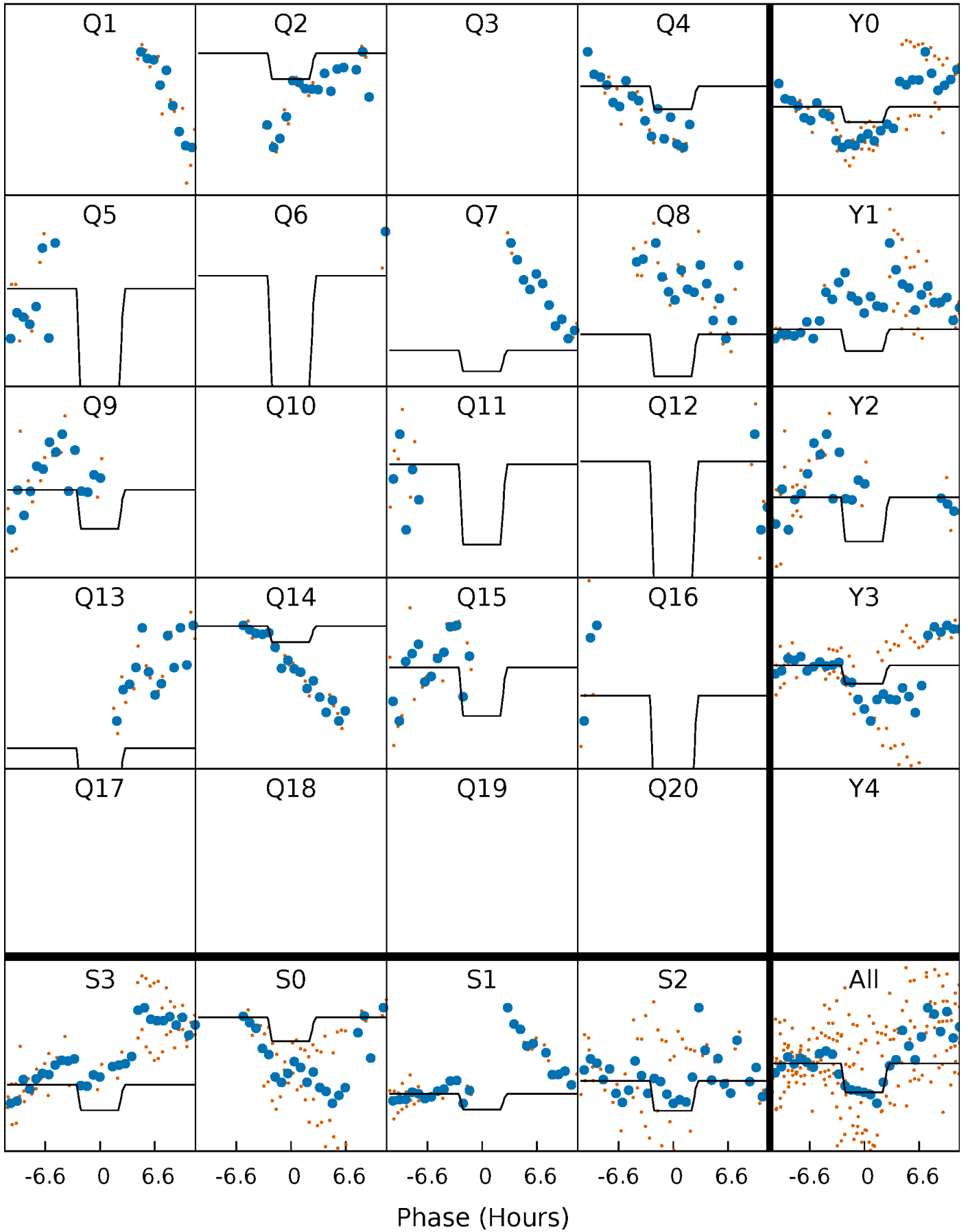
# DV Quarter-Phased Transit Curves

TCE 007431887-04 P=109.082765 Days  $T_0=138.385429$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

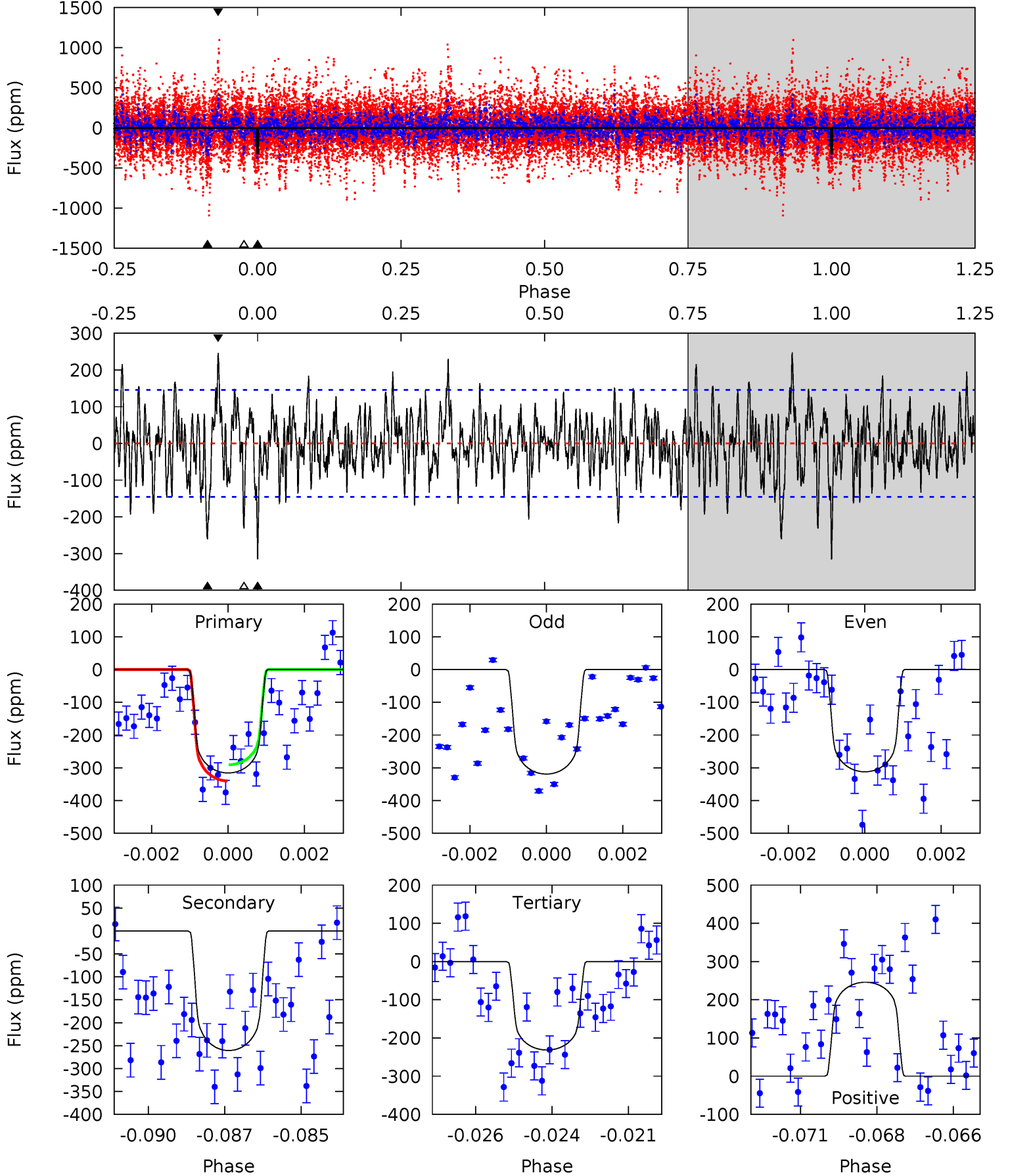
TCE 007431887-04 P=109.074343 Days  $T_0=138.433722$  (BKJD)



# DV Model-Shift Uniqueness Test

007431887-04, P = 109.082765 Days, E = 29.302664 Days

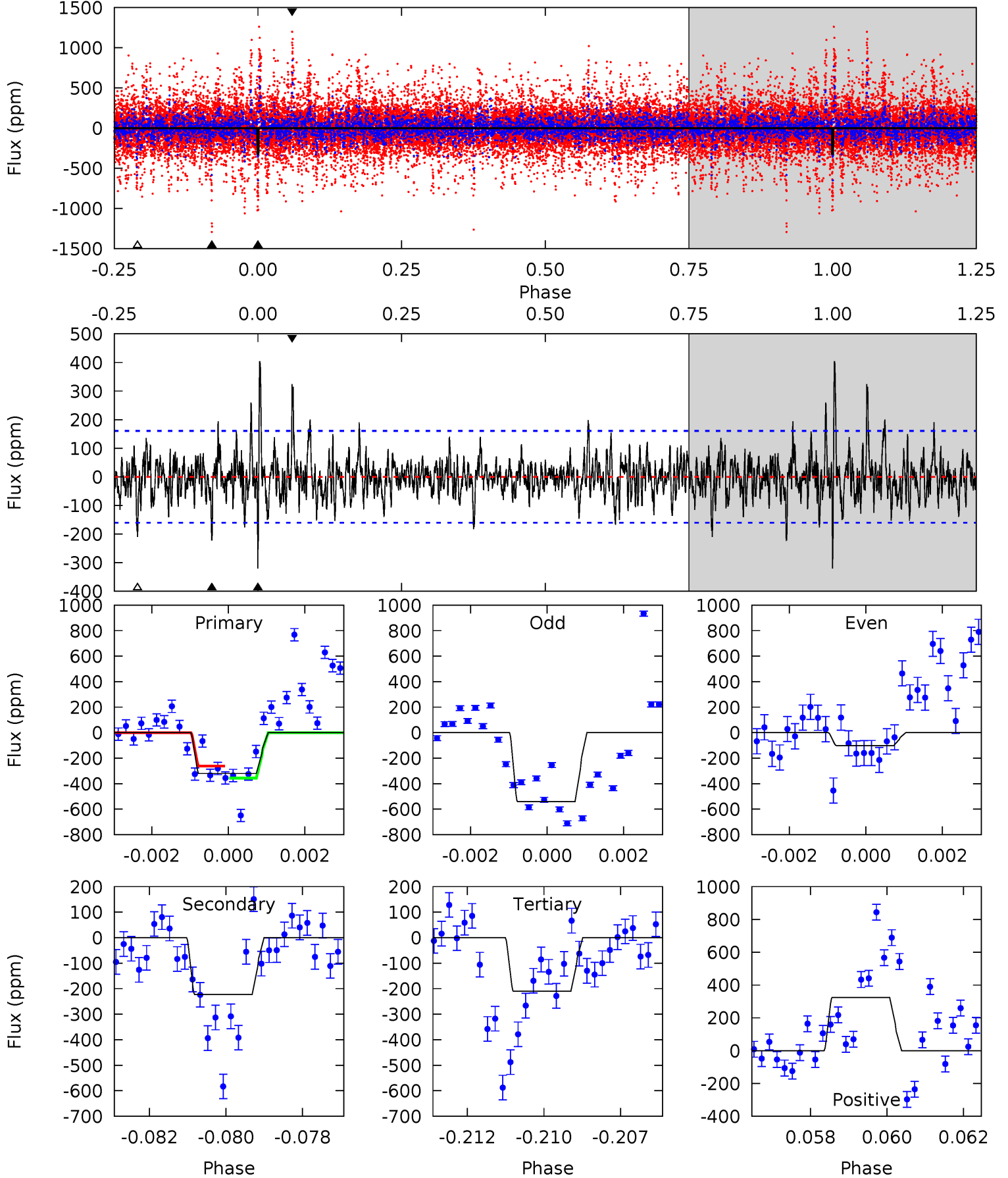
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
11.5	9.47	8.41	8.93	5.30	3.04	2.55	3.07	2.54	1.07	0.54	0.12	0.88	0.44	0.90



# Alt Model-Shift Uniqueness Test

007431887-04, P = 109.074343 Days, E = 29.359379 Days

Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
10.6	7.35	6.93	10.7	5.31	3.06	1.96	3.66	-0.13	0.42	-3.36	6.73	22.7	0.56	1.53





### Stellar Parameters For KIC 007431887

	$T_{\text{eff}} (K)$	$\log(g)$	$[\text{Fe}/\text{H}]$	$R (R_{\odot})$	$M (M_{\odot})$	$\rho_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$6267^{+169}_{-188}$	$4.334^{+0.132}_{-0.198}$	$-0.360^{+0.300}_{-0.300}$	$1.118^{+0.340}_{-0.183}$	$0.981^{+0.160}_{-0.107}$	$0.990^{+0.672}_{-0.488}$
	+3%/-3%	+3%/-5%	+83%/-83%	+30%/-16%	+16%/-11%	+68%/-49%
Source	PHO1	KIC0	KIC0	DSEP		

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

### Secondary Eclipse Parameters for KIC 007431887-04 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$-261 \pm 28$	$1.93^{+1.20}_{-0.97}$	$617^{+45}_{-36}$	$6373^{+3279}_{-1270}$	$7593^{+23757}_{-4740}$
Alt.	$-222 \pm 30$	$2.13^{+1.14}_{-1.02}$	$615^{+47}_{-33}$	$5833^{+2416}_{-981}$	$5468^{+14131}_{-3243}$

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

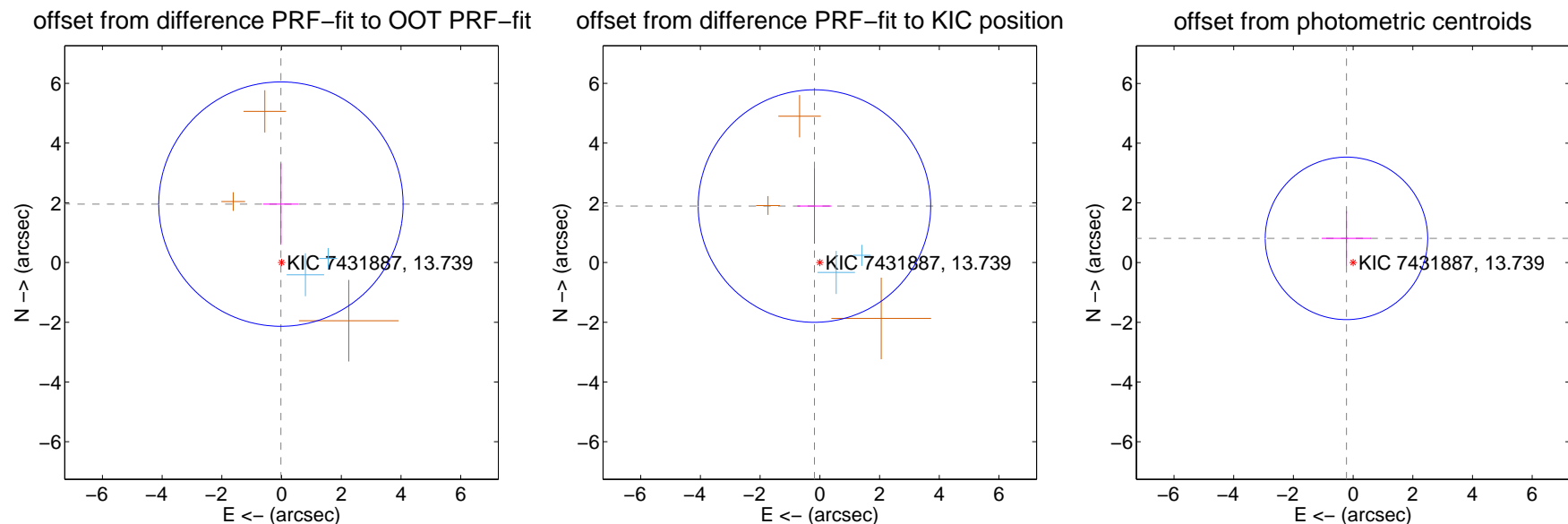
## DV Centroid Data

Supplemental centroid analysis for 007431887-04. Kepler magnitude: 13.74. Transit SNR 5.08

There are 2 quarters with good PRF difference image offsets

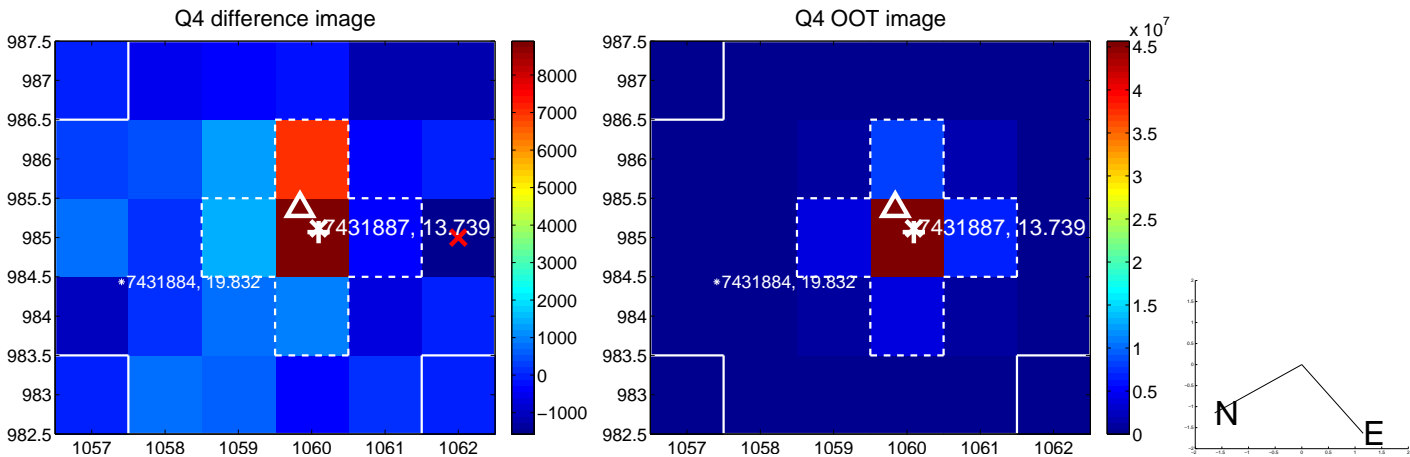
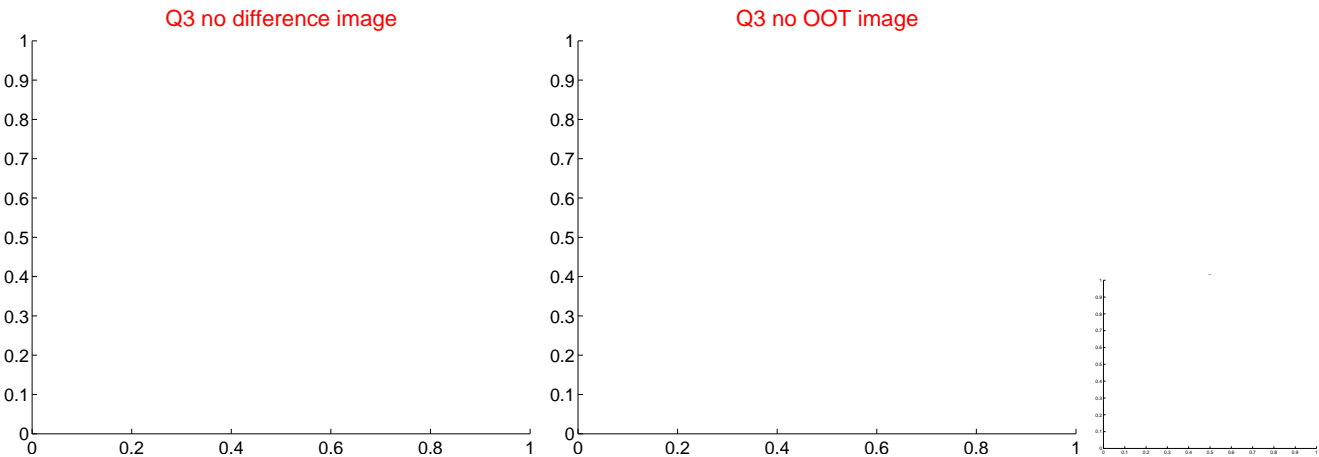
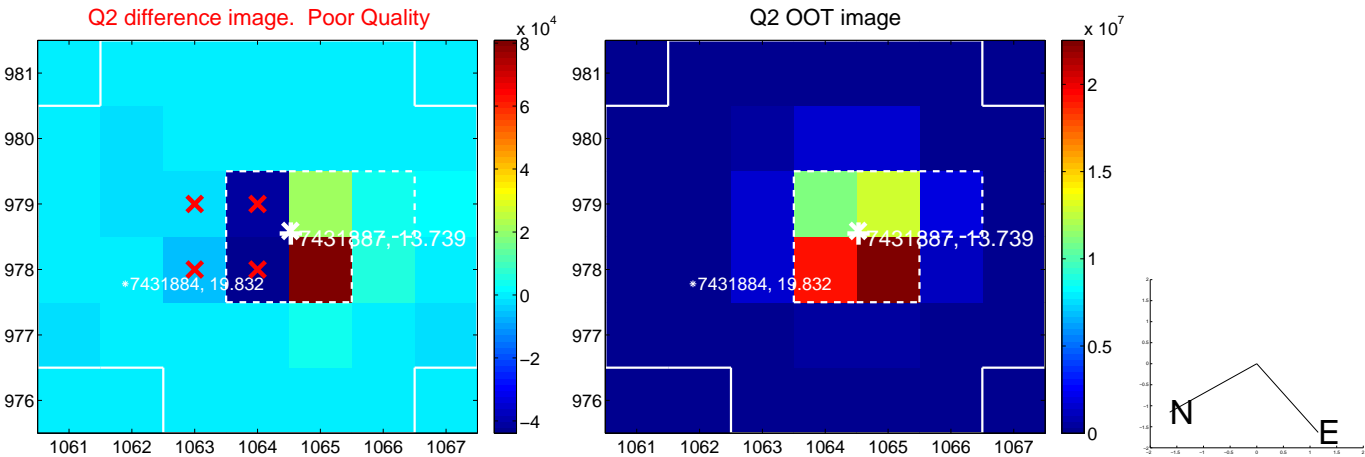
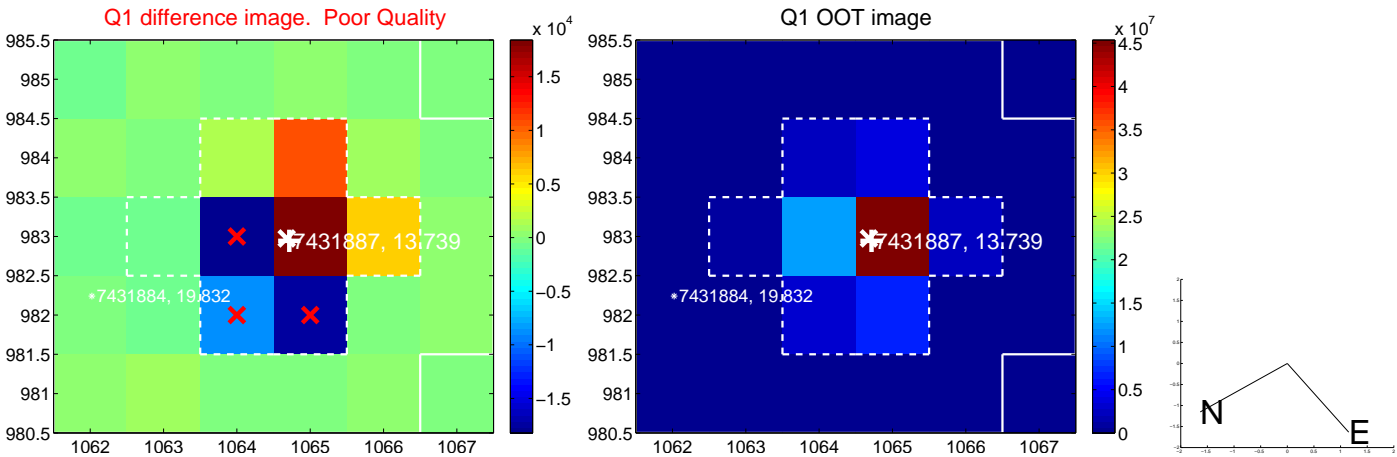
The direct PRF centroid is offset from the target star catalog position by about 0.20 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$1.957 \pm 1.364$	1.43	$0.021 \pm 0.593$	$1.957 \pm 1.359$
PRF-fit source offset from KIC position	$1.901 \pm 1.298$	1.46	$0.181 \pm 0.574$	$1.892 \pm 1.261$
photometric centroid source offset	$0.84 \pm 0.91$	0.93	$0.22 \pm 0.83$	$0.81 \pm 0.91$

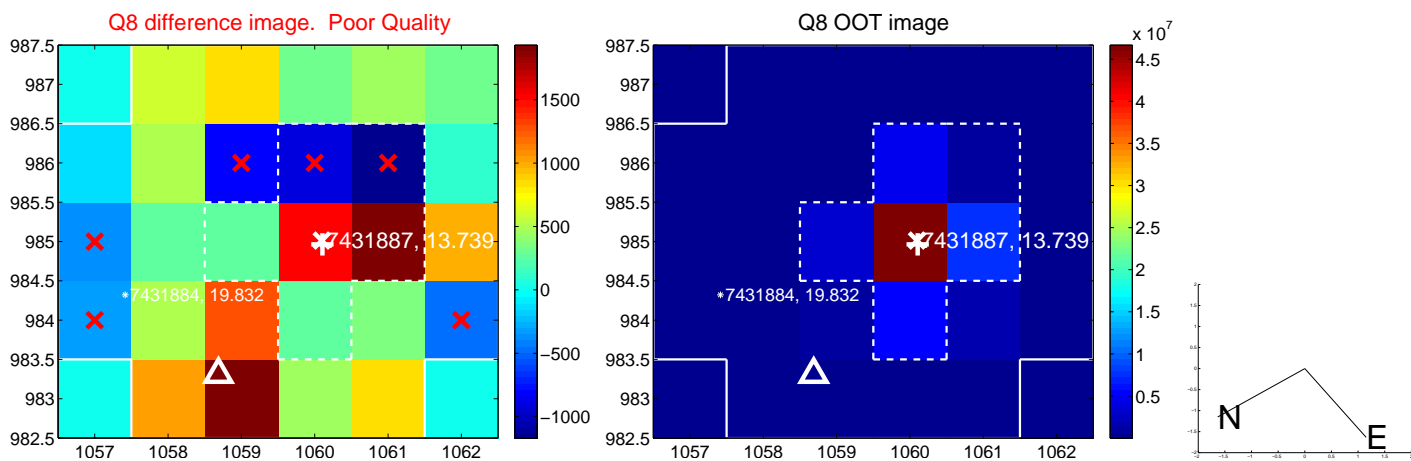
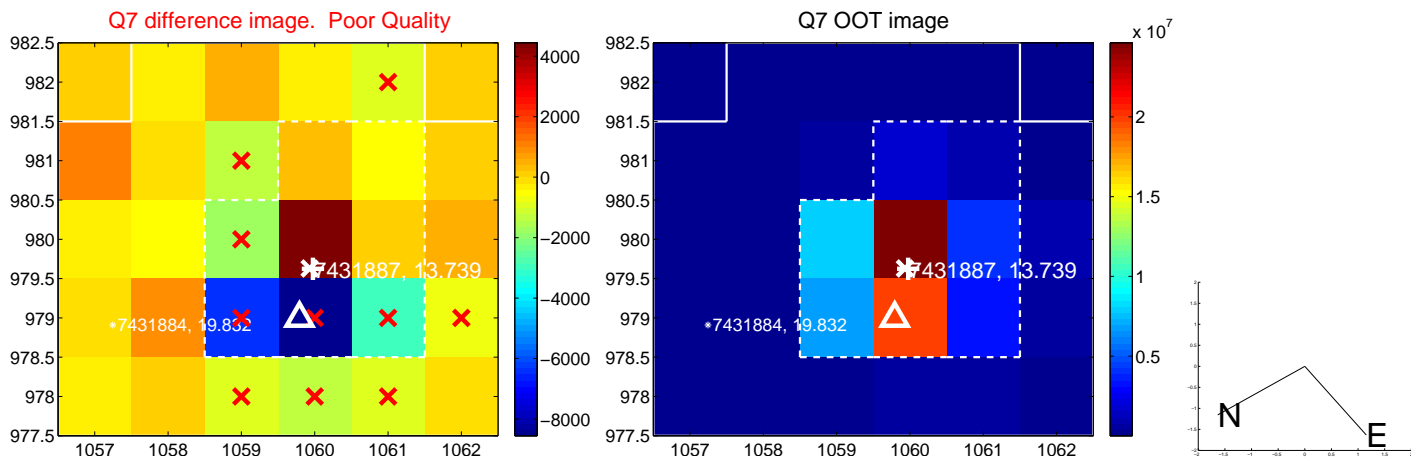
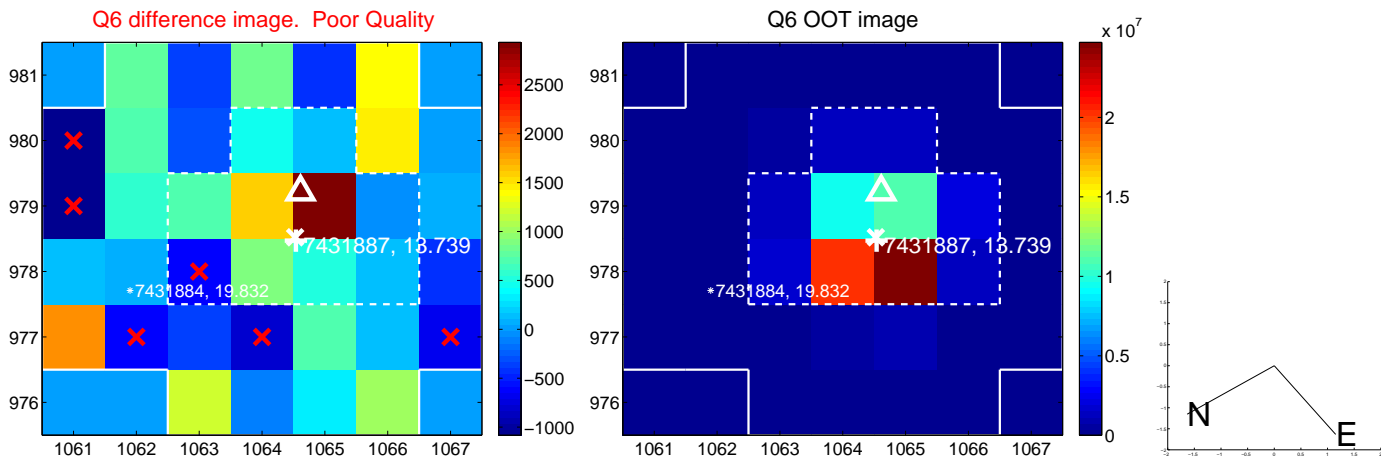
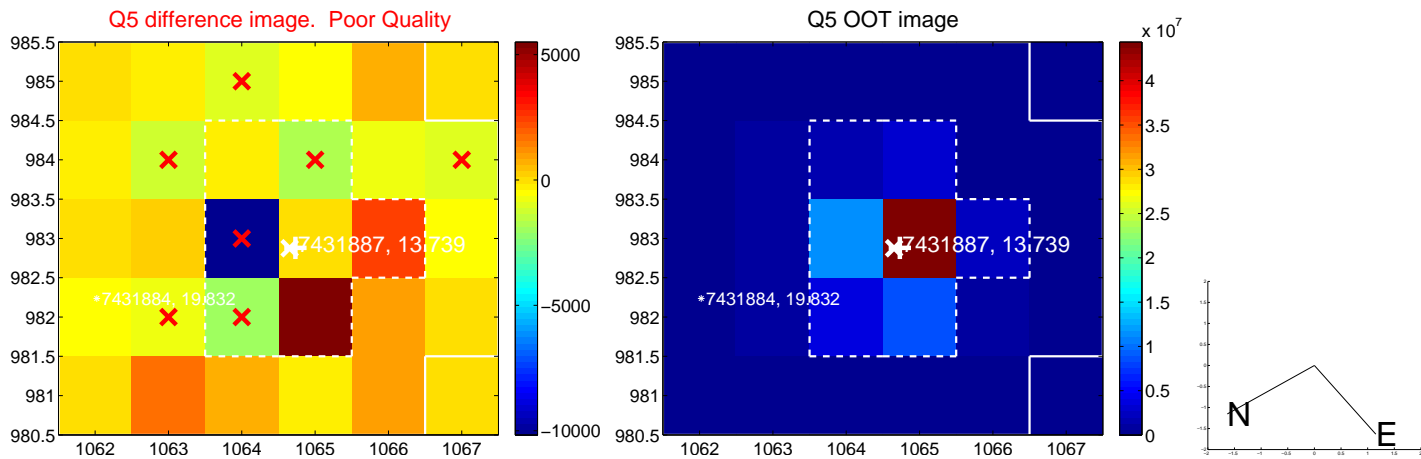


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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

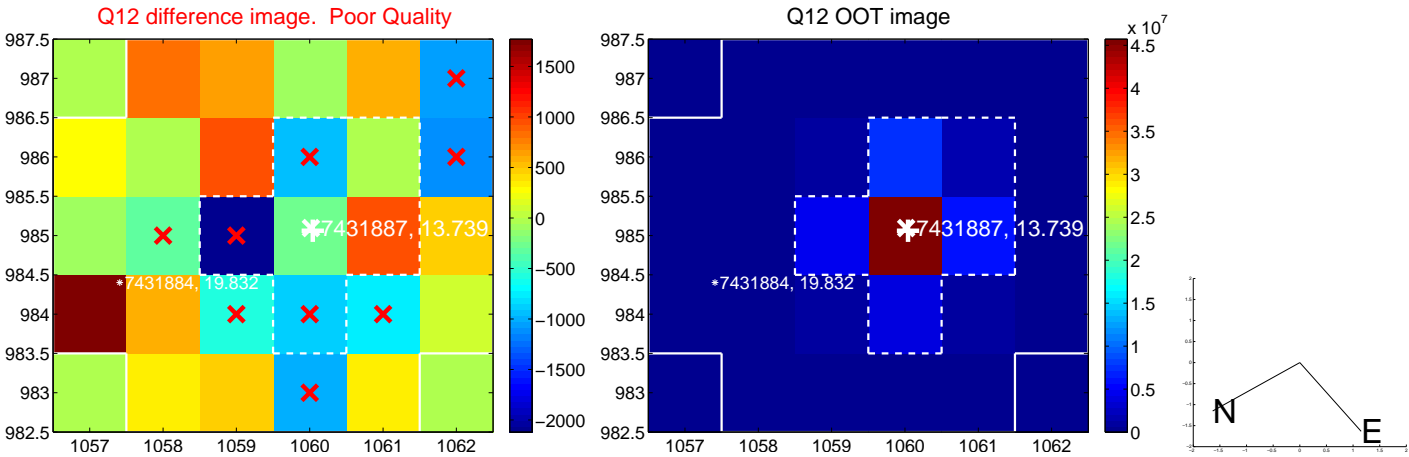
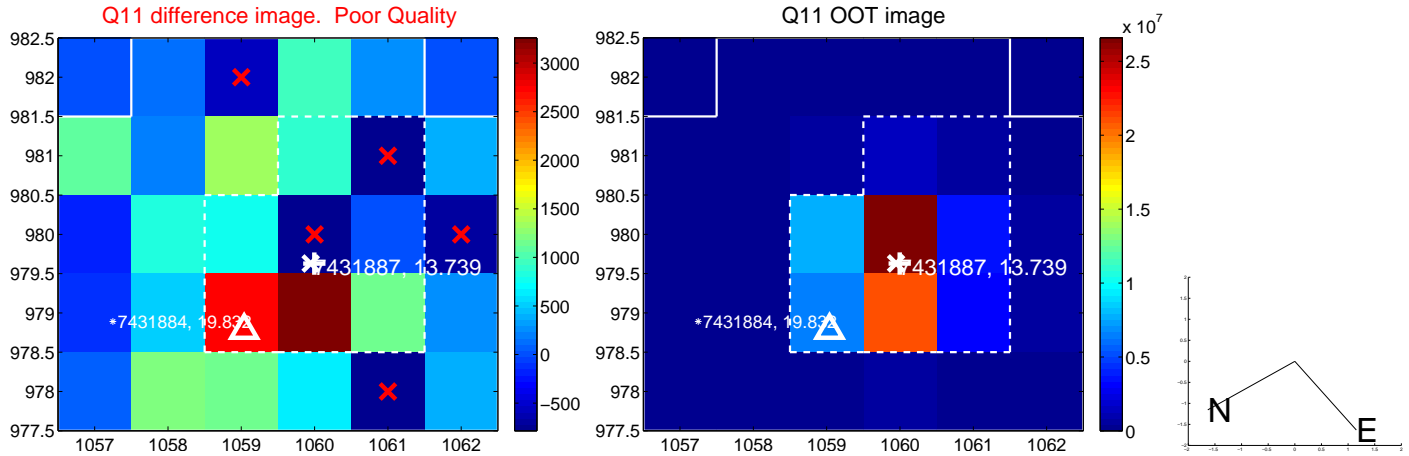
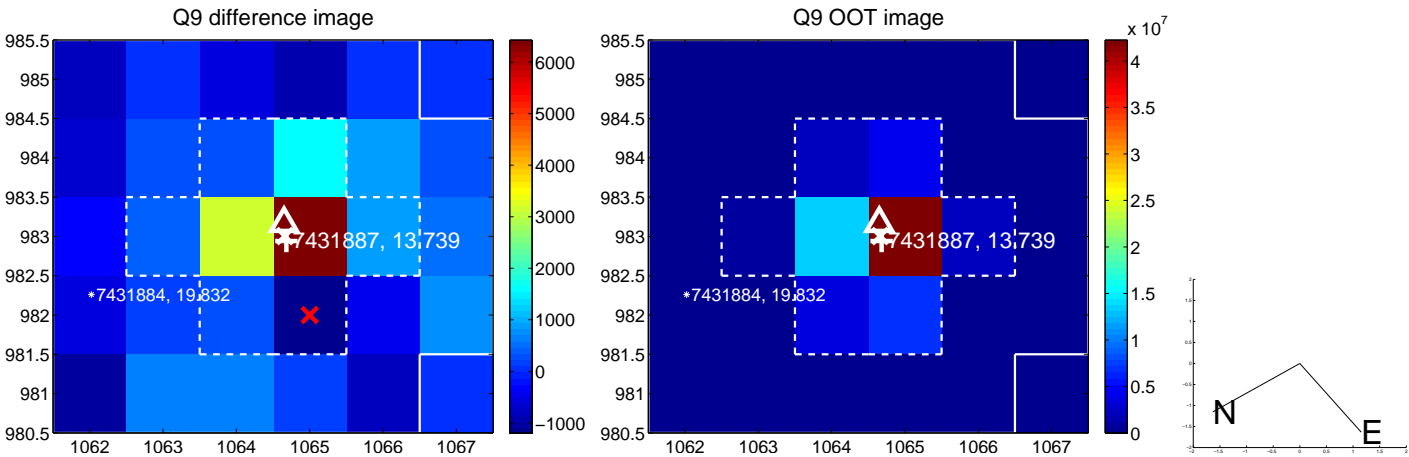
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



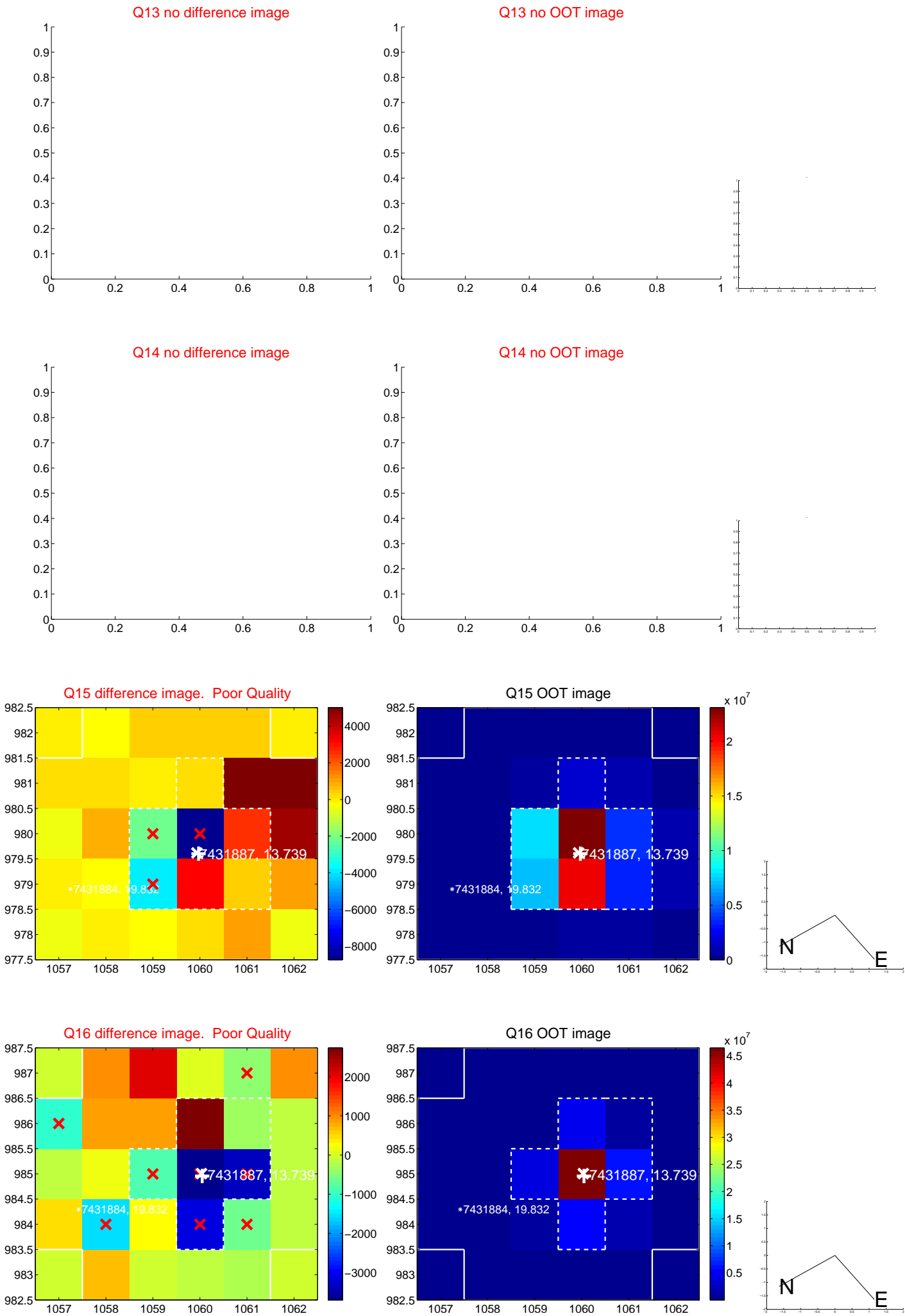
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



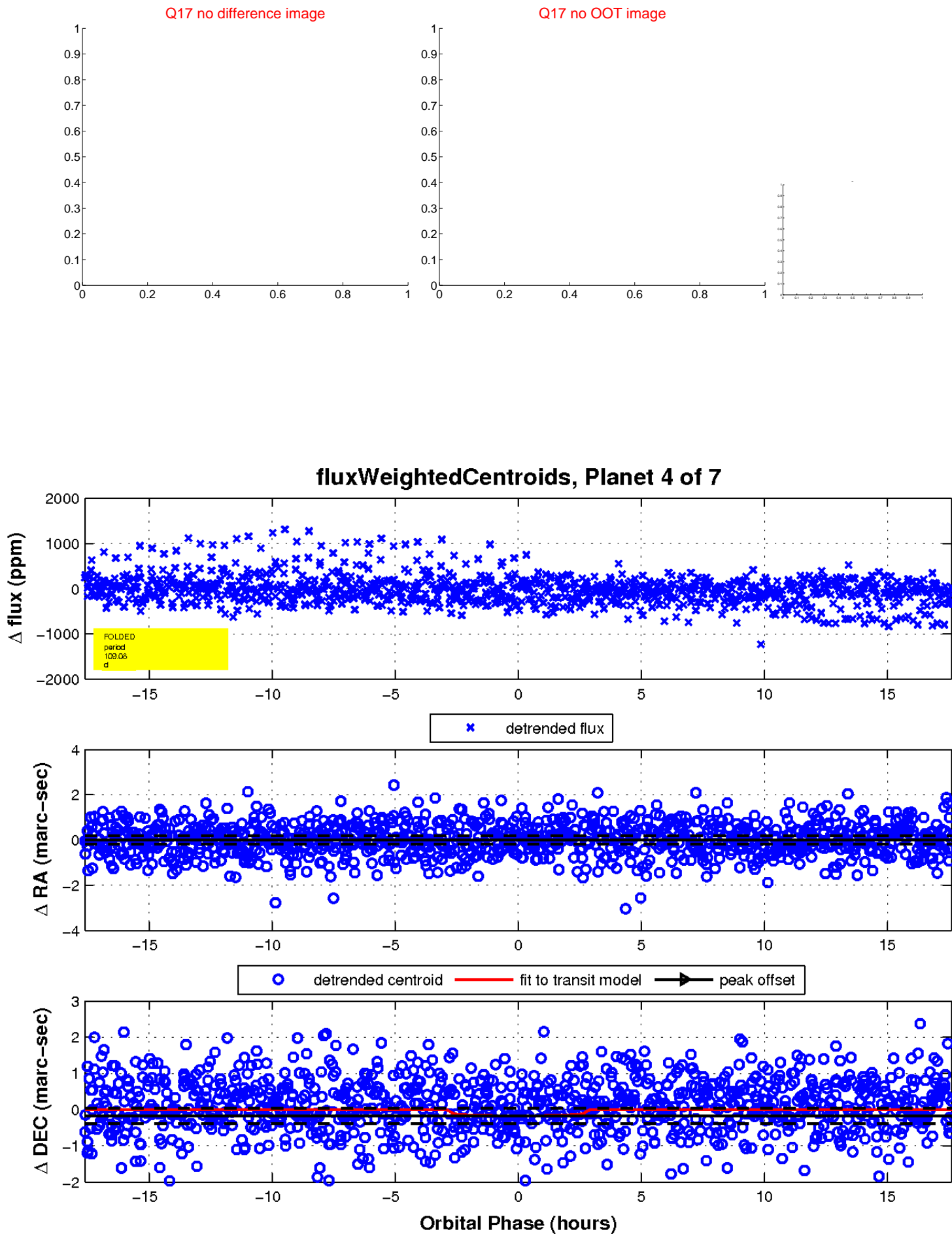
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

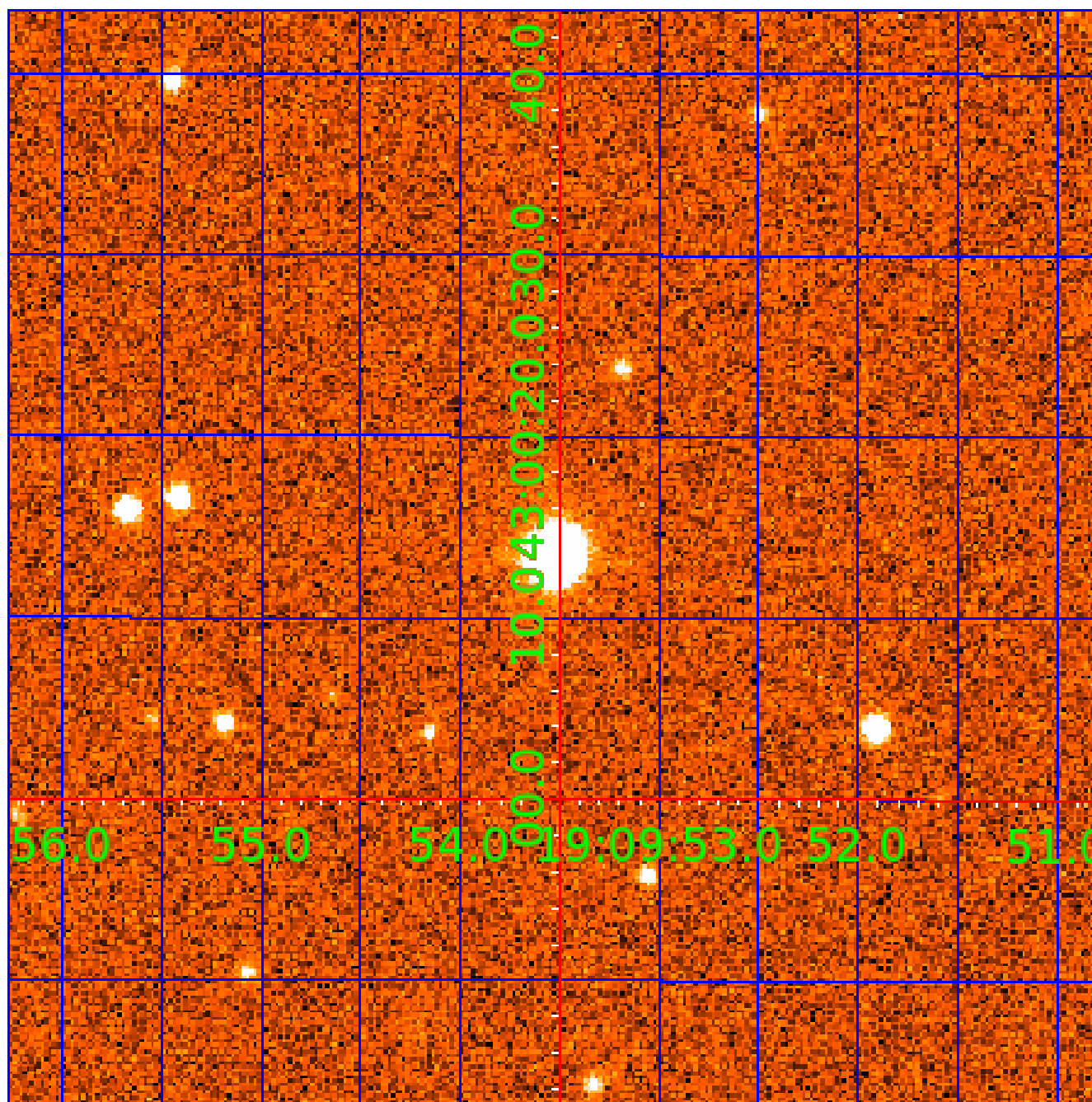


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



# UKIRT Image

Declination





# KIC 007431887

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
007431887-01	OBS	No	1.553574	131.905139	28.2	7.875	8.7	8.2	1.12	6267	0.61	2533.10
007431887-02	OBS	No	411.636384	533.544629	1551.2	17.901	14.9	13.6	1.12	6267	4.94	1.49
007431887-03	OBS	No	388.494382	202.519206	2367.5	26.549	12.1	10.7	1.12	6267	5.49	1.61
007431887-04	OBS	No	109.082765	138.385429	221.7	5.894	11.8	5.1	1.12	6267	1.90	8.74
007431887-05	OBS	No	245.597955	237.614415	2208.8	30.194	10.9	10.8	1.12	6267	9.72	2.96
007431887-06	OBS	No	214.190439	249.997276	695.2	22.274	9.8	6.1	1.12	6267	5.65	3.56
007431887-07	OBS	No	159.383586	176.419960	452.5	10.999	9.2	6.0	1.12	6267	2.78	5.27

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
007431887-01	OBS	FP	0.00	1	0	0	0	LPP_DV—MOD_NONUNIQ_DV
007431887-02	OBS	FP	0.00	1	0	1	0	INDIV_TRANS_RUBBLE_MARSHALL_ZUMA—LPP_DV—ALL_TRANS_CHASES—INCONSISTENT_TRANS—CENT_FEW_DIFFS—HALO_GHOST
007431887-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_MARSHALL—LPP_DV—LPP_ALT—ALL_TRANS_CHASES
007431887-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_TRACKER—TRANS_GAPPED—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_ALT—MOD_POS_ALT—INCONSISTENT_TRANS
007431887-05	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_MARSHALL—TRANS_GAPPED—LPP_DV—ALL_TRANS_CHASES—INCONSISTENT_TRANS—CENT_FEW_DIFFS
007431887-06	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_MARSHALL—TRANS_GAPPED—ALL_TRANS_CHASES—INCONSISTENT_TRANS
007431887-07	OBS	FP	0.00	1	0	1	0	INDIV_TRANS_RUBBLE_MARSHALL—TRANS_GAPPED—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—HALO_GHOST

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

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

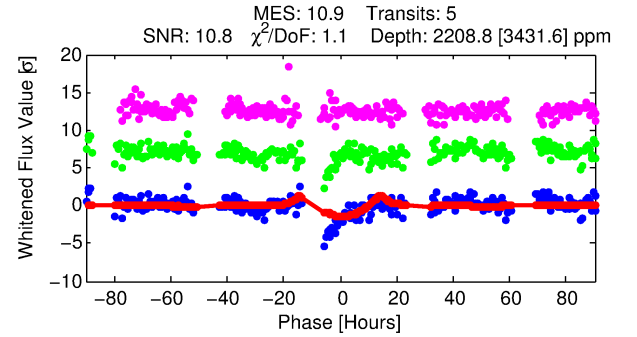
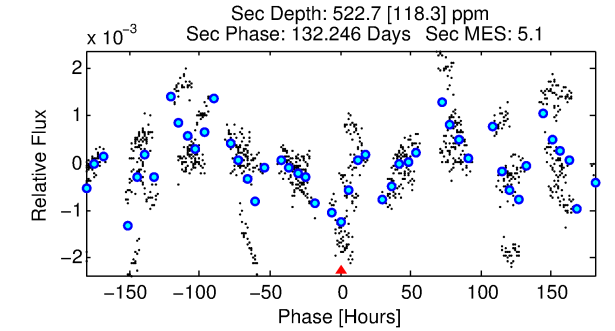
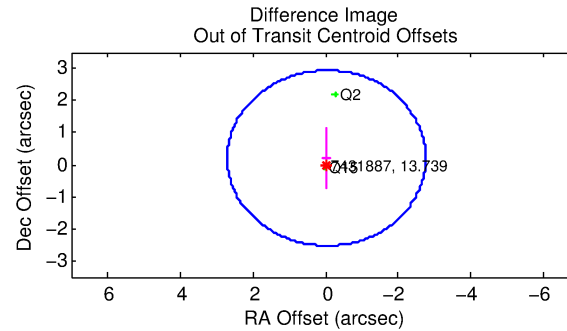
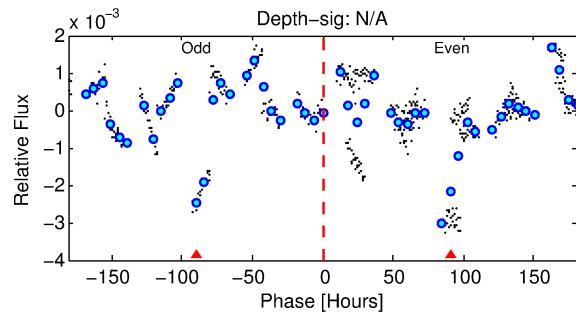
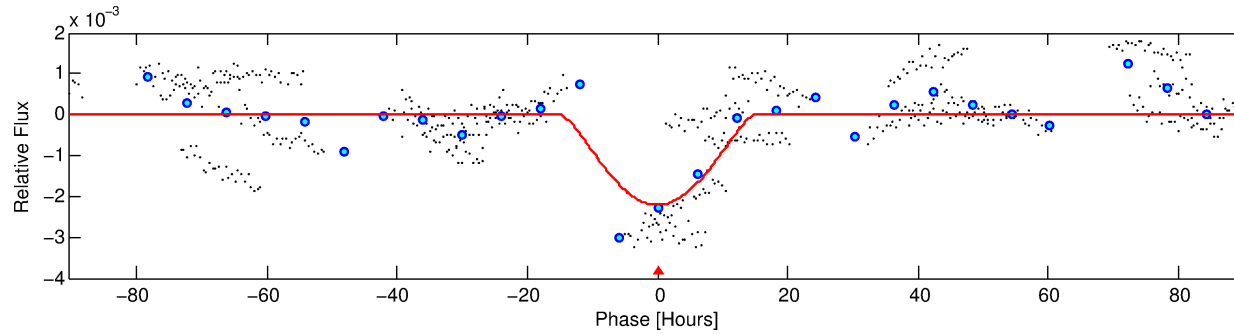
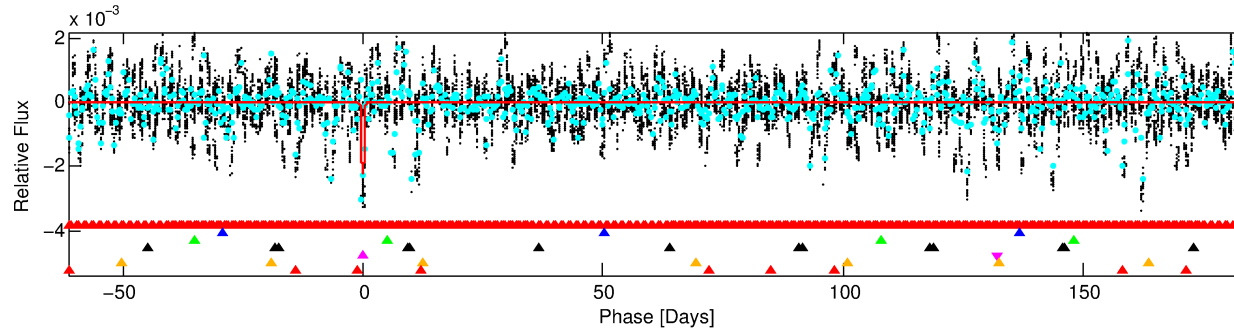
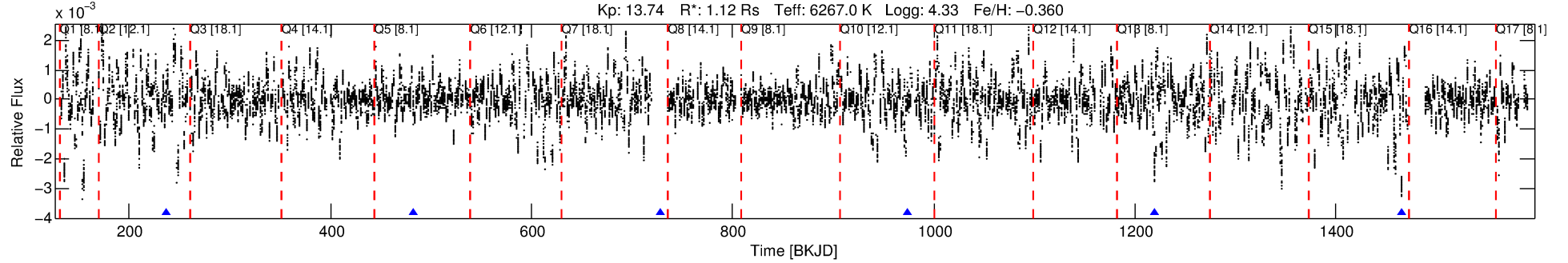
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 007431887-05

No Significant Match Found

# DV One-Page Summary

KIC: 7431887 Candidate: 5 of 7 Period: 245.598 d



## DV Fit Results:

Period = 245.59796 [0.01334] d  
Epoch = 237.6144 [0.0331] BKJD  
Rp/R\* = 0.0797 [0.0837]  
a/R\* = 25.32 [5.52]  
b = 1.00 [0.20]  
Seff = 2.96 [1.14]  
Teq = 335 [32] K  
Rp = 9.72 [10.63] Re  
a = 0.7635 [0.1935] AU  
Ag = 1773.87 [3803.64] [0.47σ]  
Teffp = 3357 [1776] K [1.70σ]

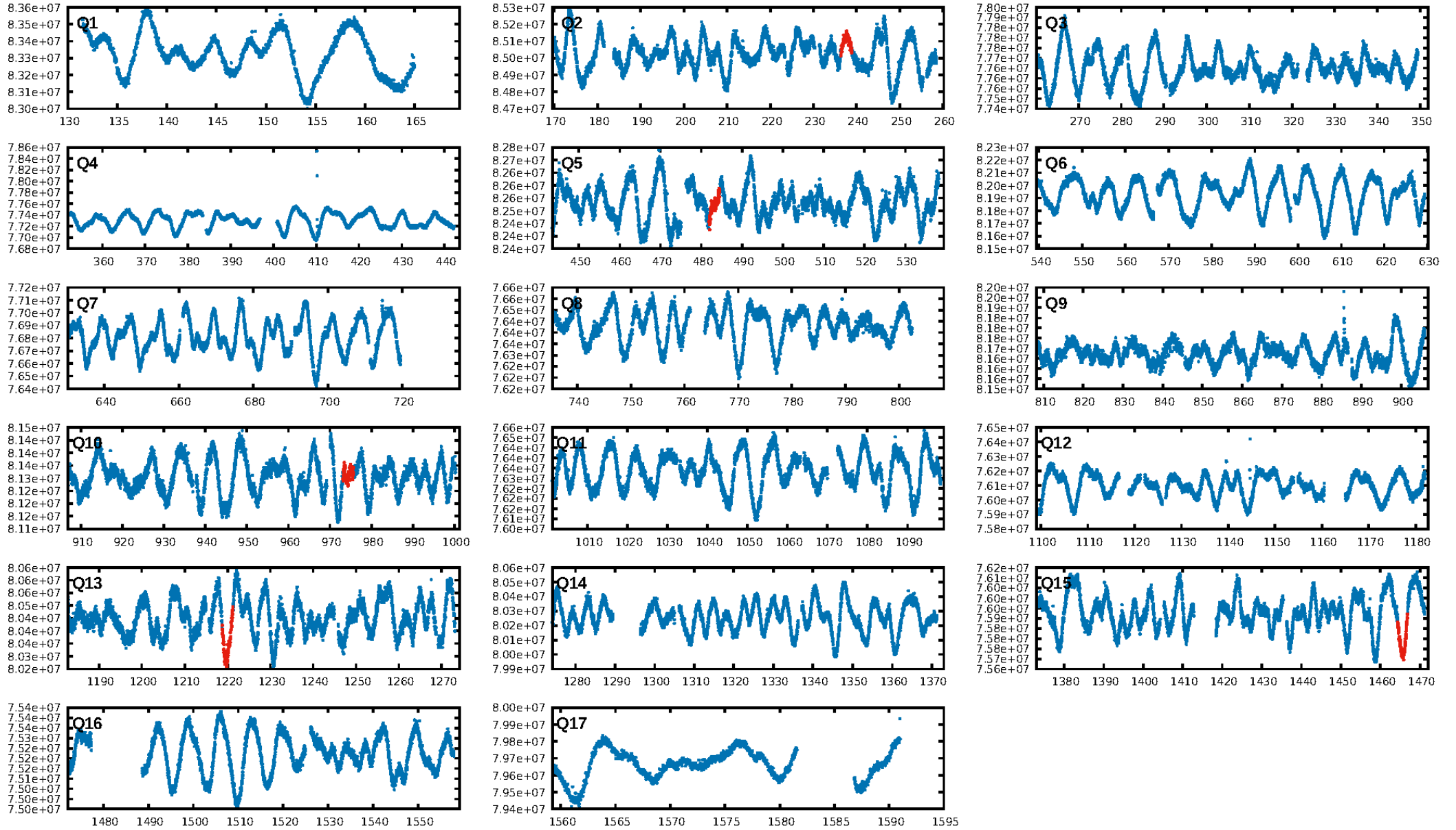
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [20.09σ]  
LongPeriod-sig: 100.0% [85.30σ]  
ModelChiSquare2-sig: 0.0%  
ModelChiSquareGof-sig: 100.0%  
Bootstrap-pfa: 4.02e-11  
RollingBand-fgt: 1.00 [5/5]  
GhostDiagnostic-chr: -1.721  
Centroid-sig: 62.8%  
Centroid-so: 0.266 arcsec [2.86σ]  
OotOffset-rm: 0.206 arcsec [0.23σ]  
KicOffset-rm: 0.183 arcsec [0.23σ]  
OotOffset-st: 1/1/0/0 [2]  
KicOffset-st: 1/1/0/0 [2]  
DiffImageQuality-fgm: 0.50 [1/2]  
DiffImageOverlap-fno: 0.00 [0/4]

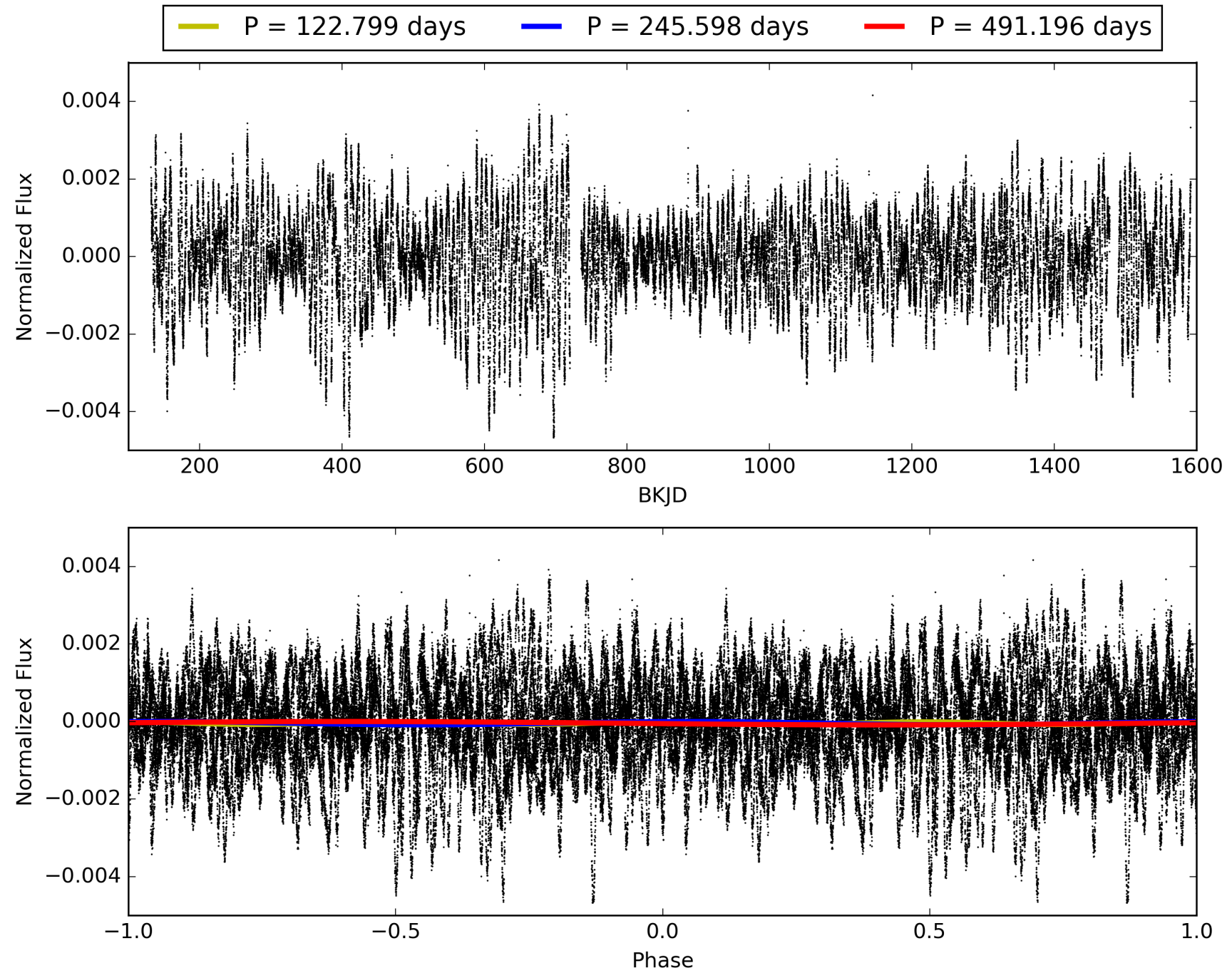
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 02-Feb-2016 01:56:53 Z

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

# TCE 007431887-05, PDC Light Curves

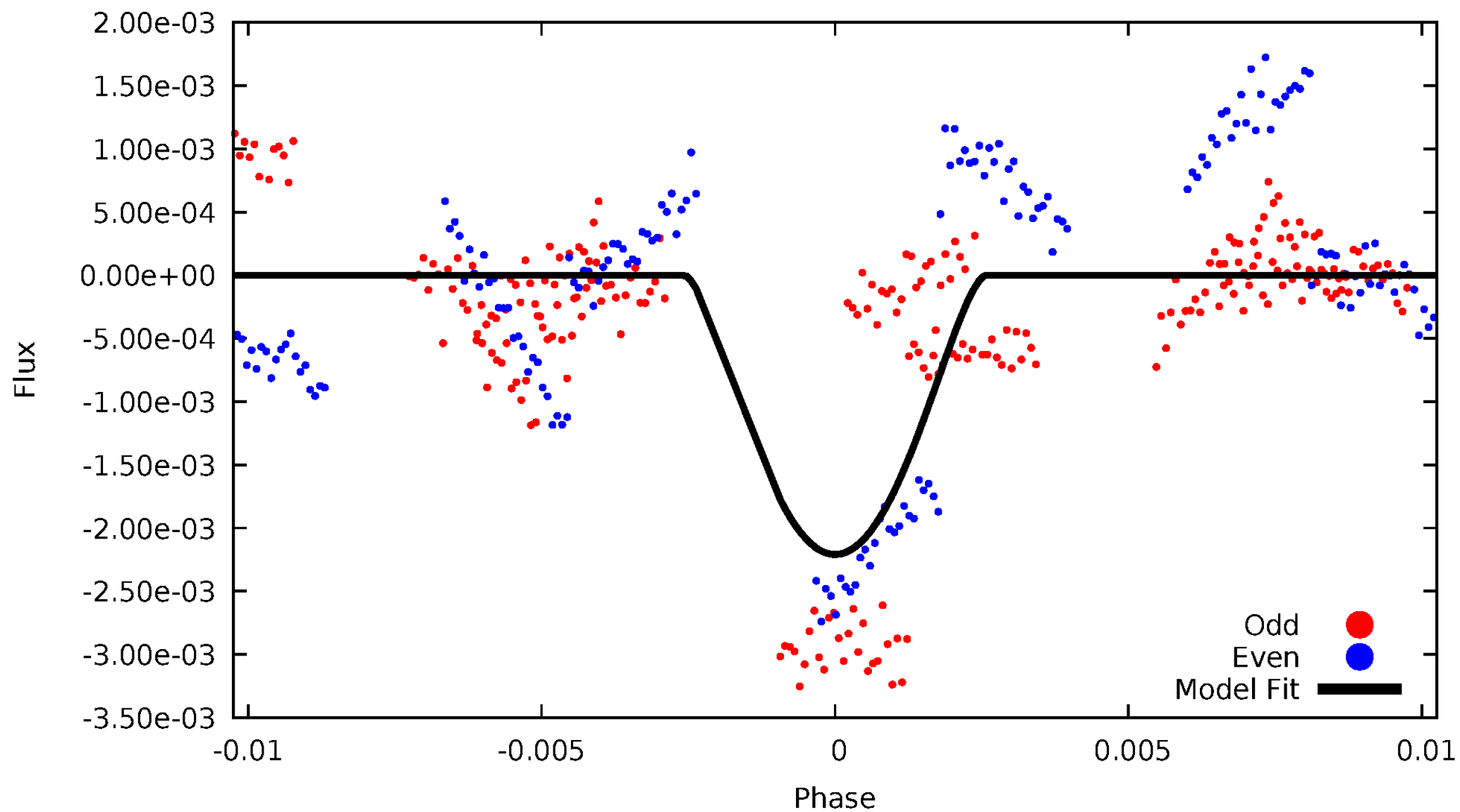


TCE 007431887-05



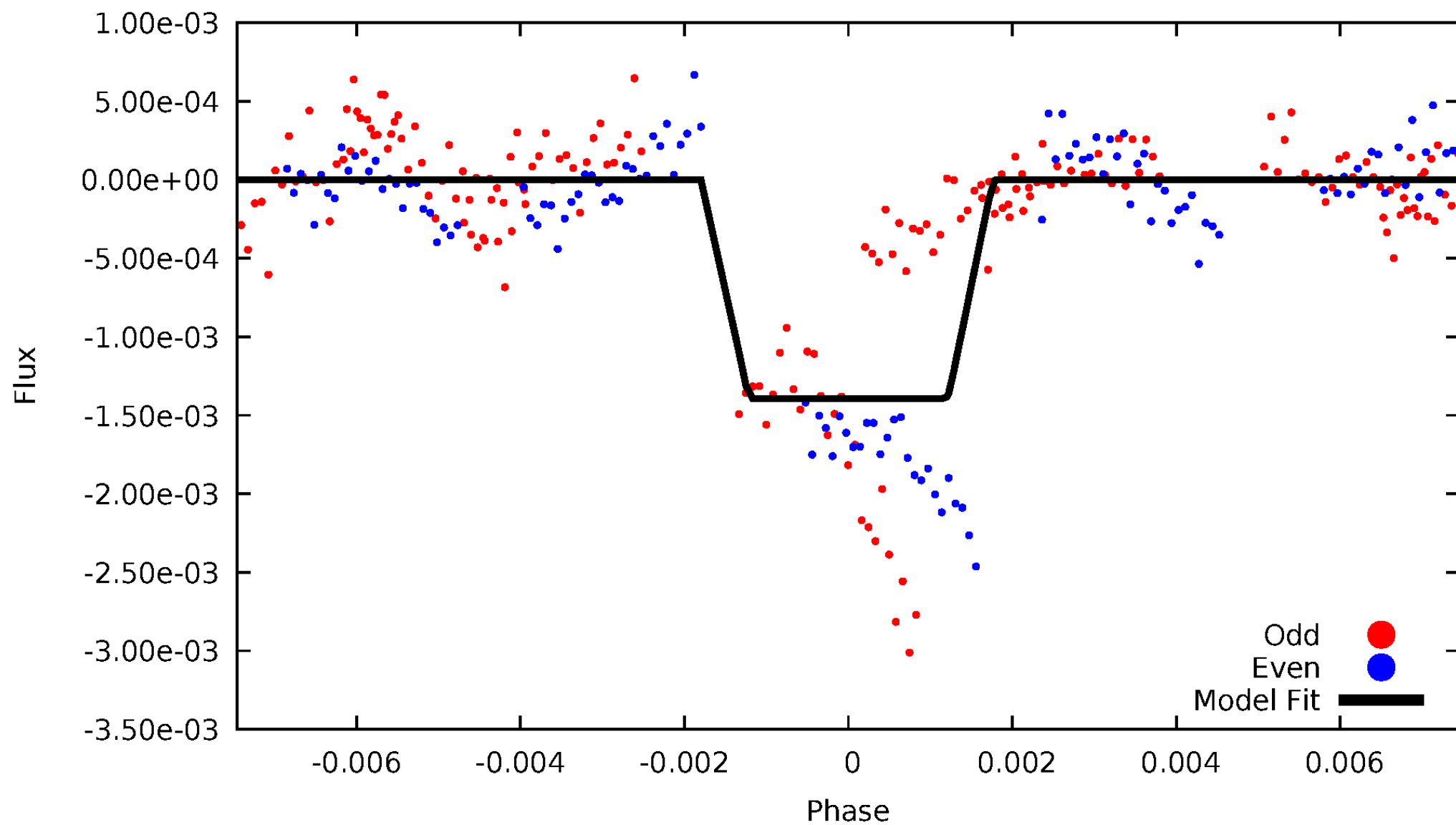
# DV Odd/Even

TCE 007431887-05



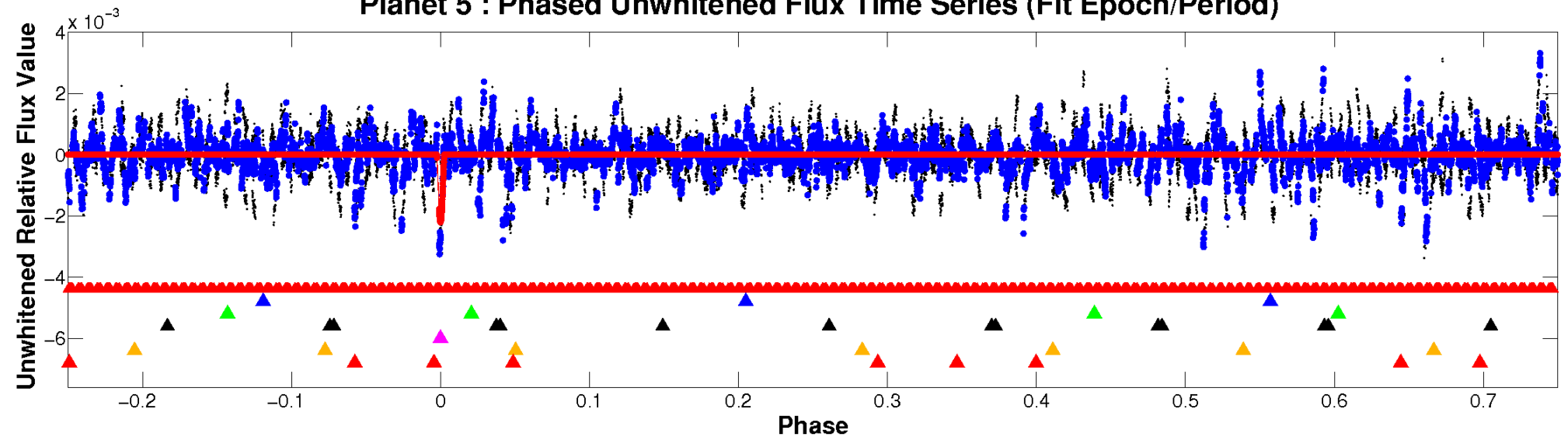
# ALT Odd/Even

TCE 007431887-05

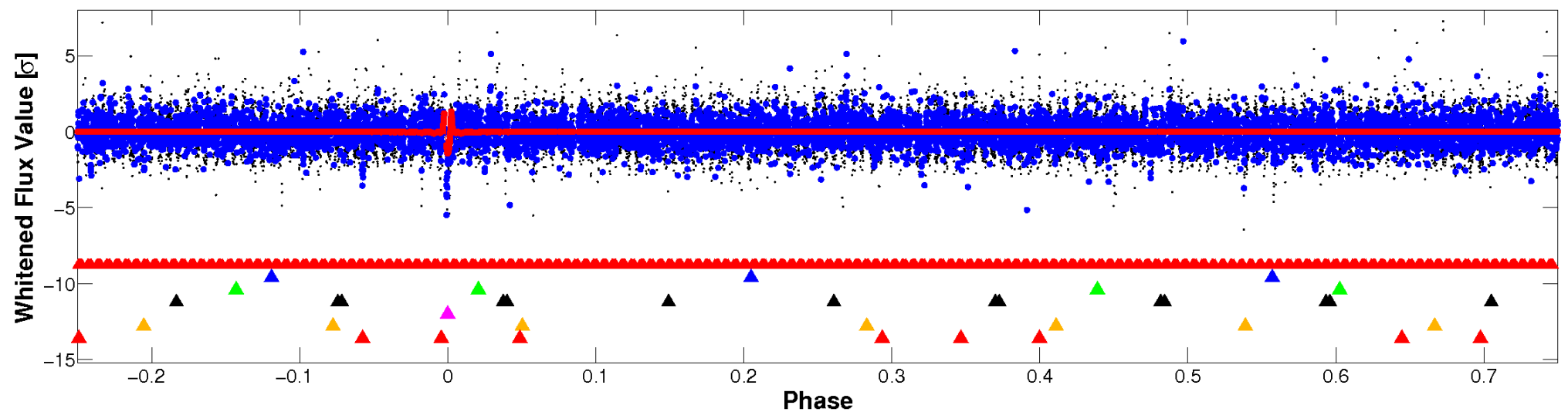


# Non-Whitened Vs. Whitened Light Curve

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



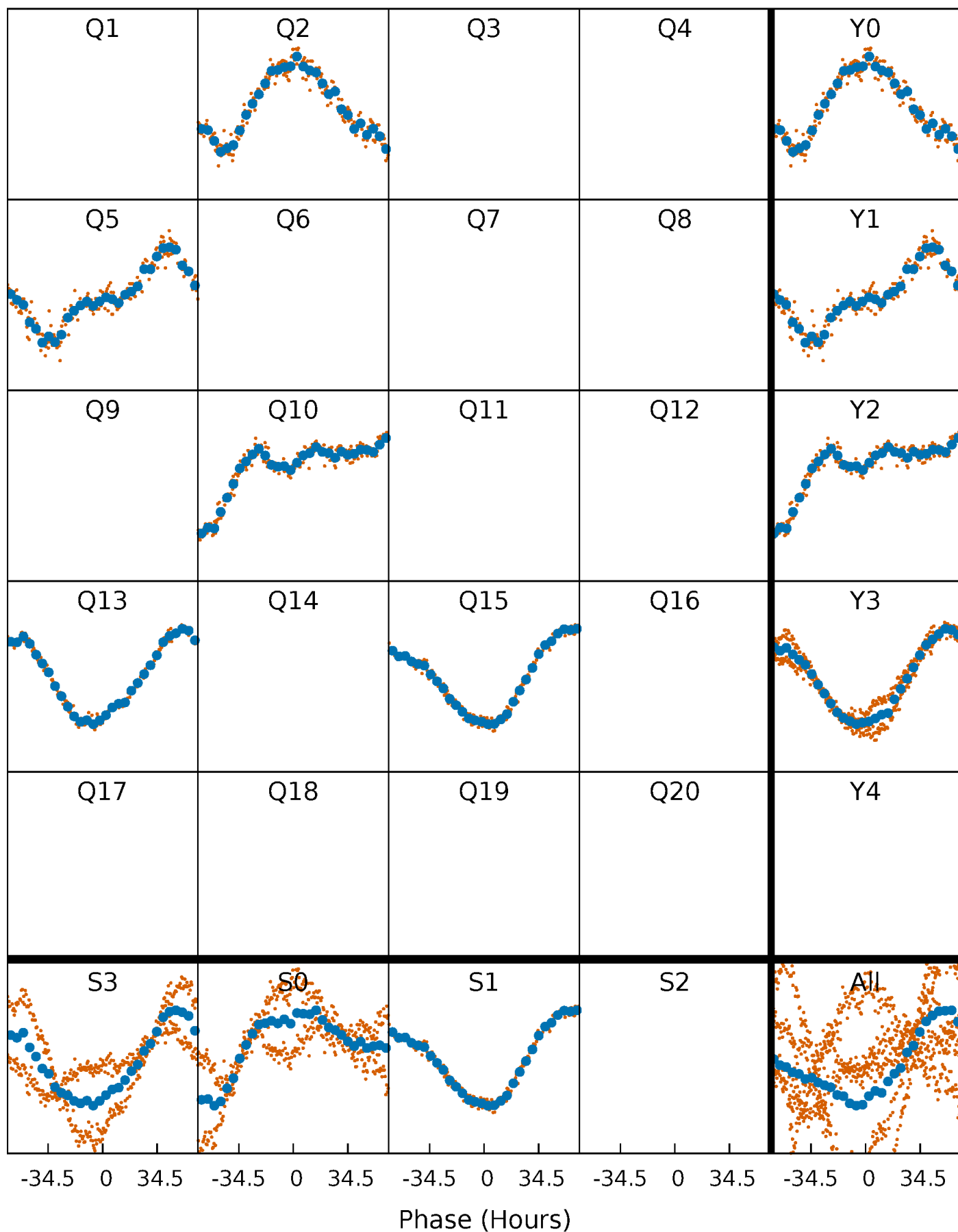
Planet 5 : Phased Whitened Flux Time Series (Fit Epoch/Period)





# PDC Quarter-Phased Transit Curves

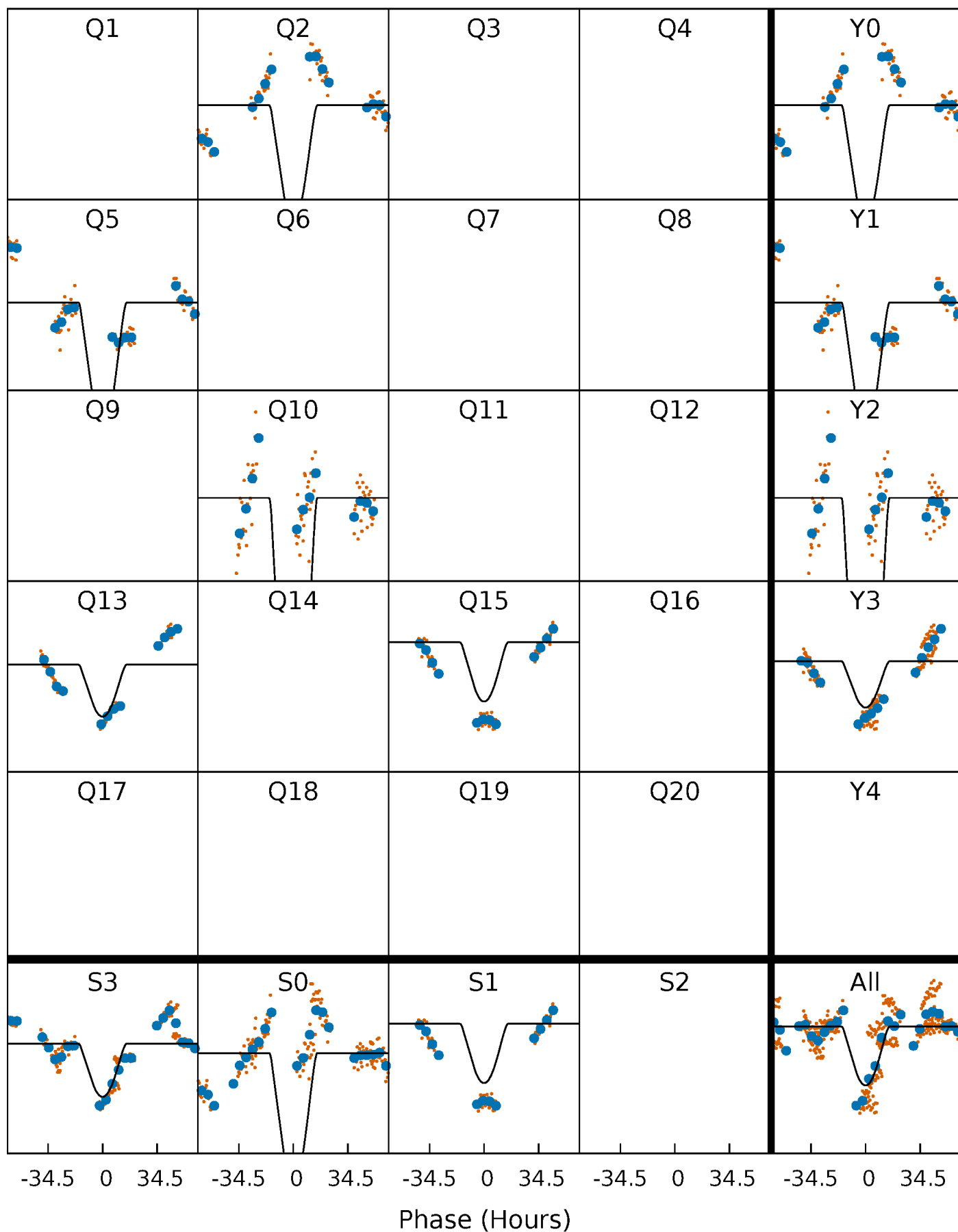
TCE 007431887-05     $P=245.597956$  Days     $T_0=237.614415$  (BKJD)





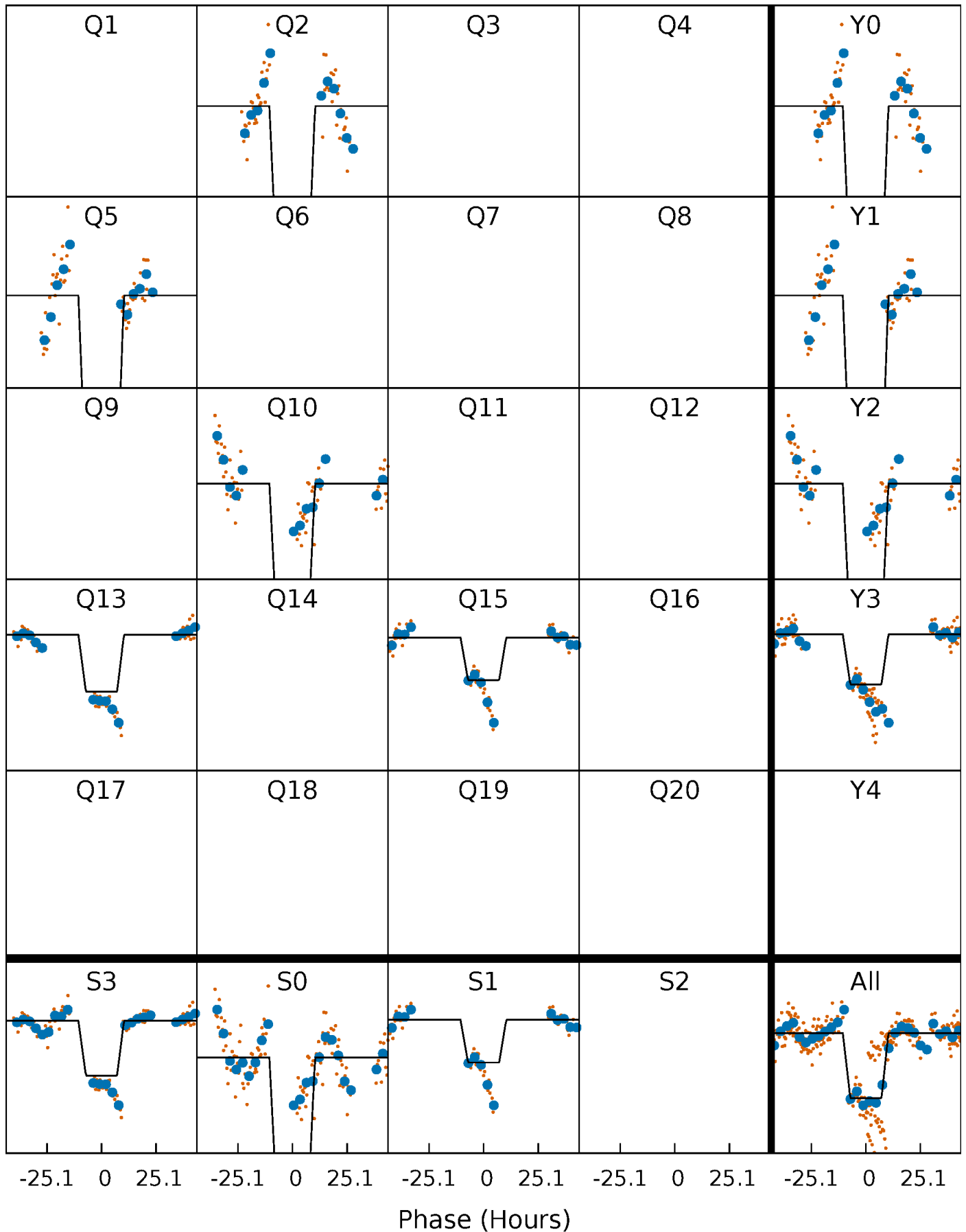
# DV Quarter-Phased Transit Curves

TCE 007431887-05     $P=245.597956$  Days     $T_0=237.614415$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

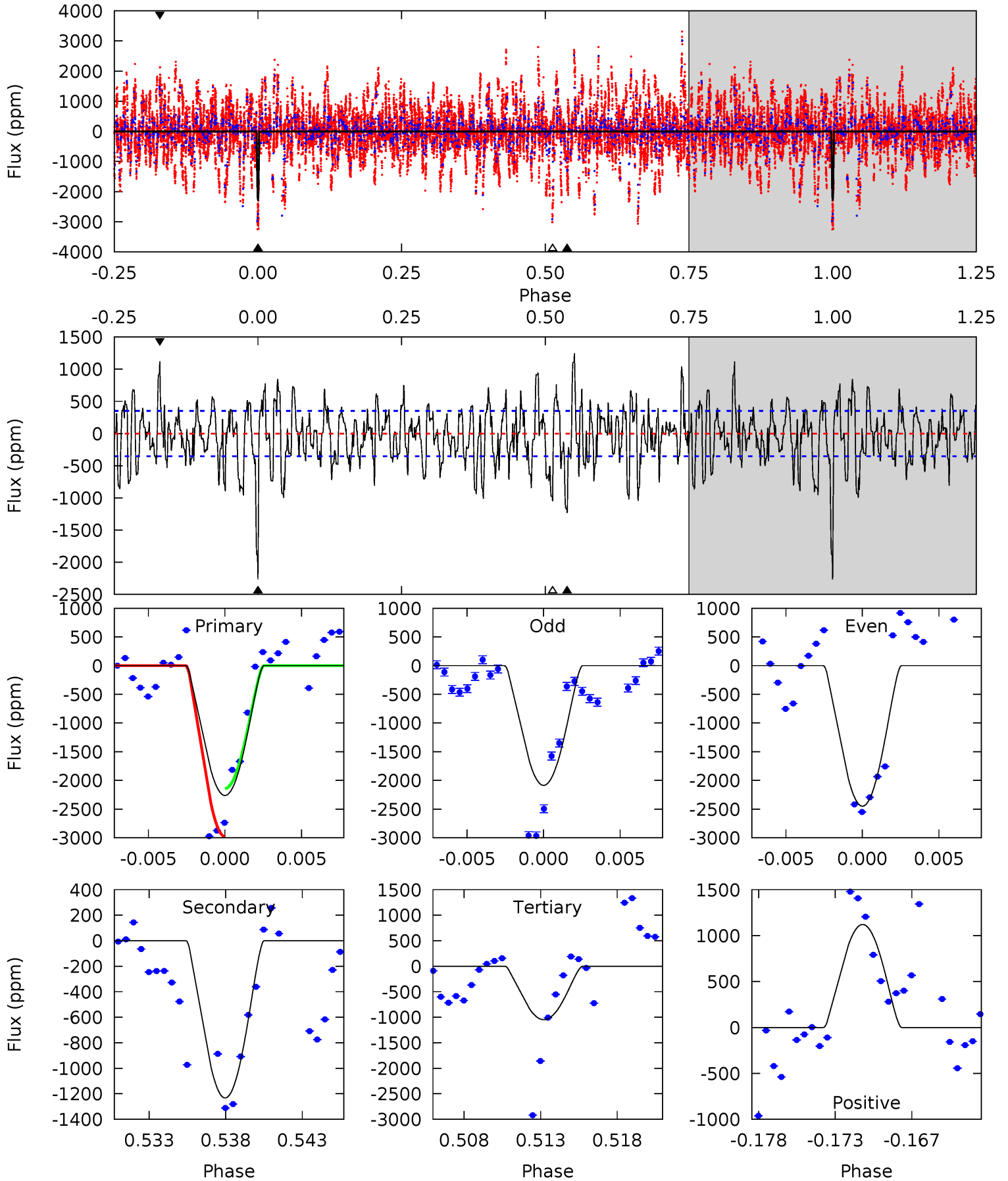
TCE 007431887-05     $P=245.645447$  Days     $T_0=237.474562$  (BKJD)



# DV Model-Shift Uniqueness Test

007431887-05, P = 245.597956 Days, E = 237.614415 Days

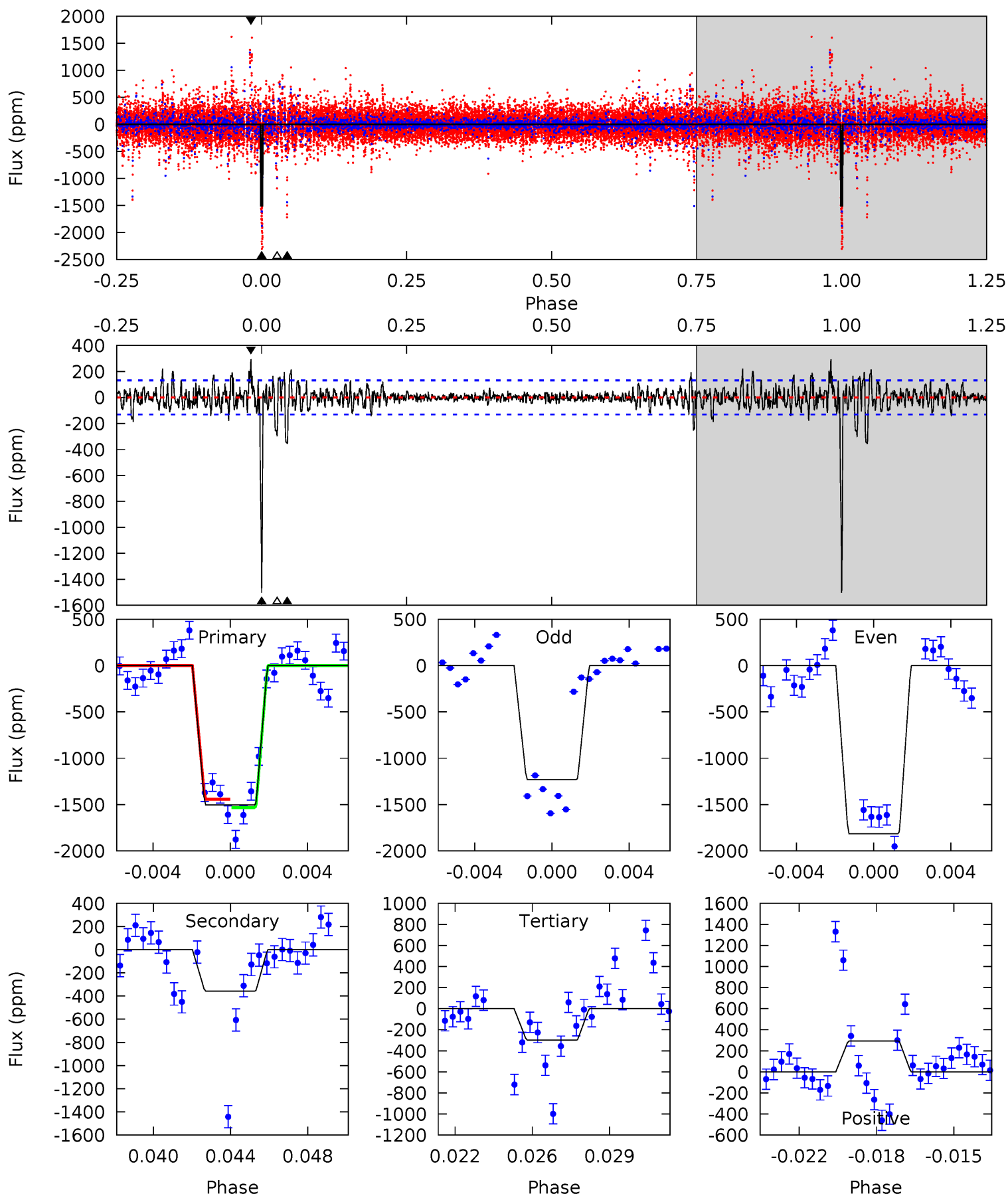
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
33.1	18.0	15.3	16.4	5.15	2.80	5.28	17.8	16.7	2.71	1.64	2.51	0.49	0.35	4.29



# Alt Model-Shift Uniqueness Test

007431887-05,  $P = 245.645447$  Days,  $E = 237.474562$  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
59.9	14.3	11.9	11.7	5.22	2.91	1.97	48.0	48.2	2.36	2.58	12.2	0.99	0.16	1.72



### Stellar Parameters For KIC 007431887

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (g \cdot \text{cm}^{-3})$
	$6267^{+169}_{-188}$	$4.334^{+0.132}_{-0.198}$	$-0.360^{+0.300}_{-0.300}$	$1.118^{+0.340}_{-0.183}$	$0.981^{+0.160}_{-0.107}$	$0.990^{+0.672}_{-0.488}$
	+3%/-3%	+3%/-5%	+83%/-83%	+30%/-16%	+16%/-11%	+68%/-49%
Source	PHO1	KIC0	KIC0	DSEP		

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

### Secondary Eclipse Parameters for KIC 007431887-05 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-1233 \pm 68$	$12.28^{+9.51}_{-8.29}$	$472^{+32}_{-28}$	$4043^{+2466}_{-679}$	$2637^{+21106}_{-1804}$
Alt.	$-358 \pm 25$	$9.06^{+8.49}_{-6.10}$	$469^{+37}_{-29}$	$3617^{+2027}_{-643}$	$1415^{+12446}_{-1028}$

$T_{max}$  = 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

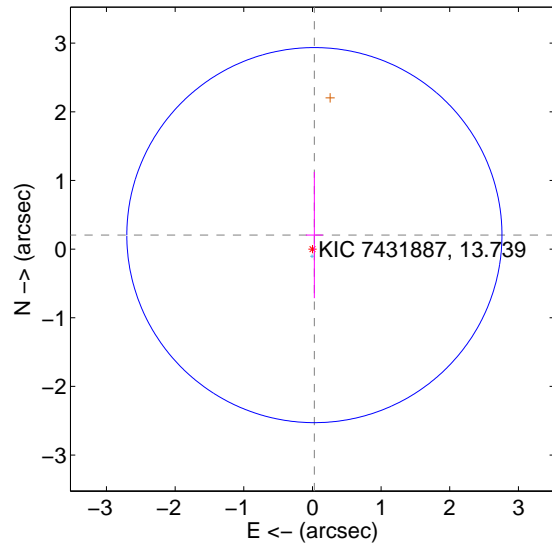
Supplemental centroid analysis for 007431887-05. Kepler magnitude: 13.74. Transit SNR 10.75

There are 1 quarters with good PRF difference image offsets

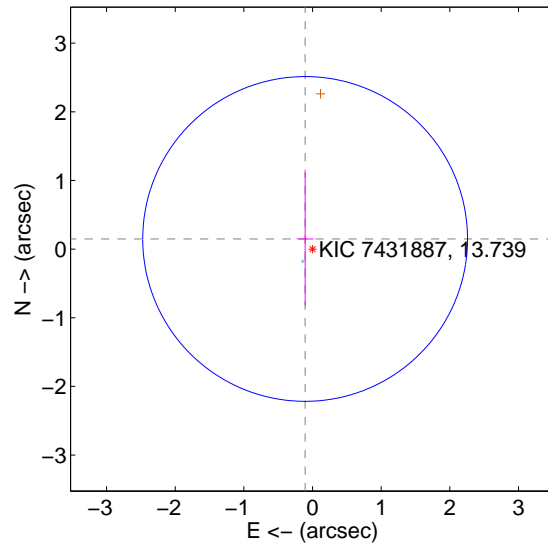
The direct PRF centroid is offset from the target star catalog position by about 0.15 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.206 \pm 0.911$	0.23	$-0.028 \pm 0.124$	$0.204 \pm 0.919$
PRF-fit source offset from KIC position	$0.183 \pm 0.789$	0.23	$0.108 \pm 0.121$	$0.148 \pm 0.972$
photometric centroid source offset	$0.27 \pm 0.09$	2.86	$0.25 \pm 0.09$	$0.09 \pm 0.10$

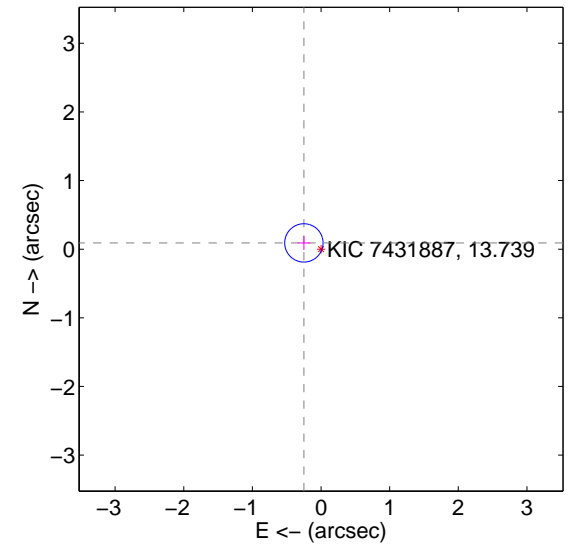
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position

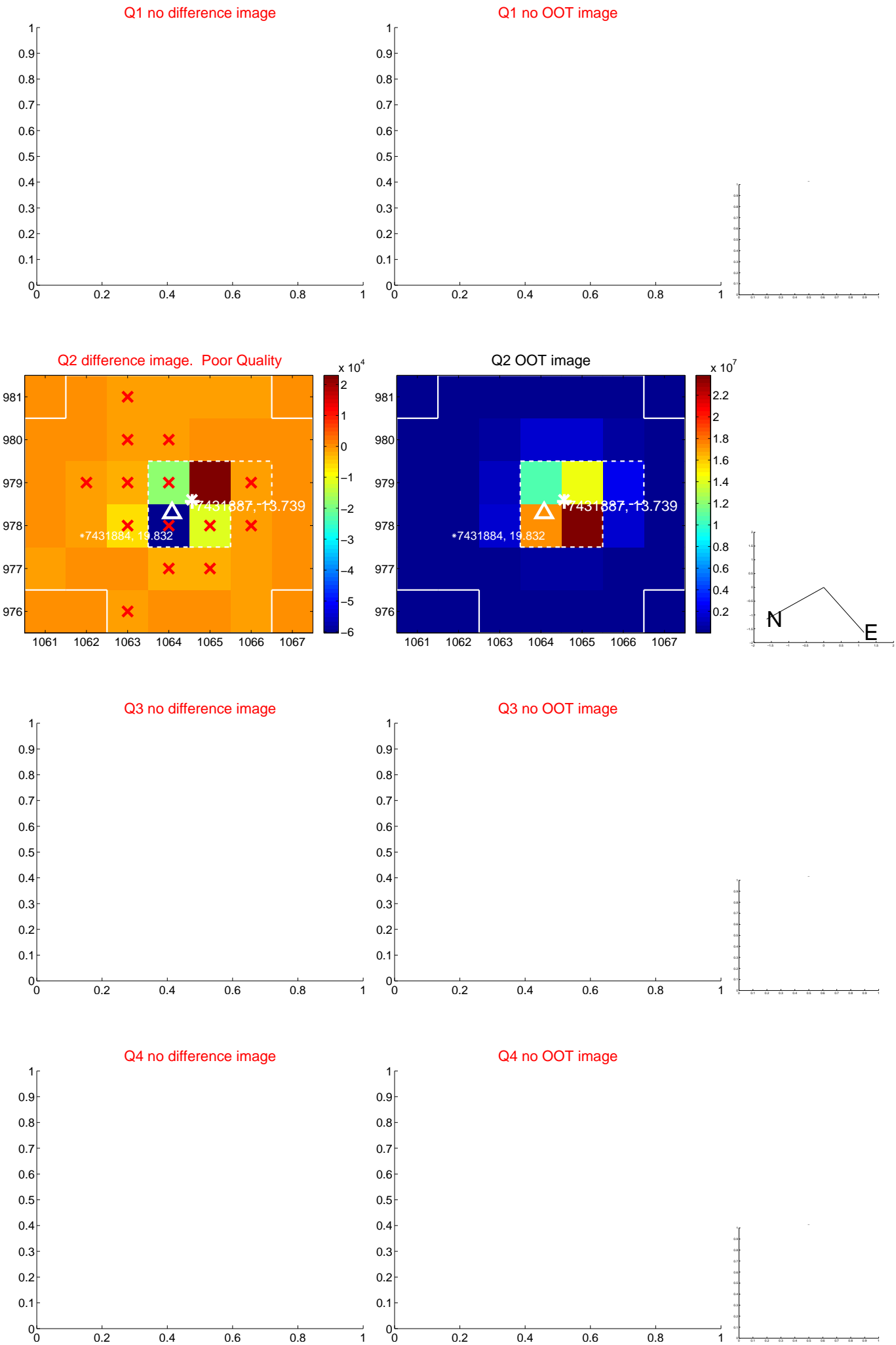


offset from photometric centroids

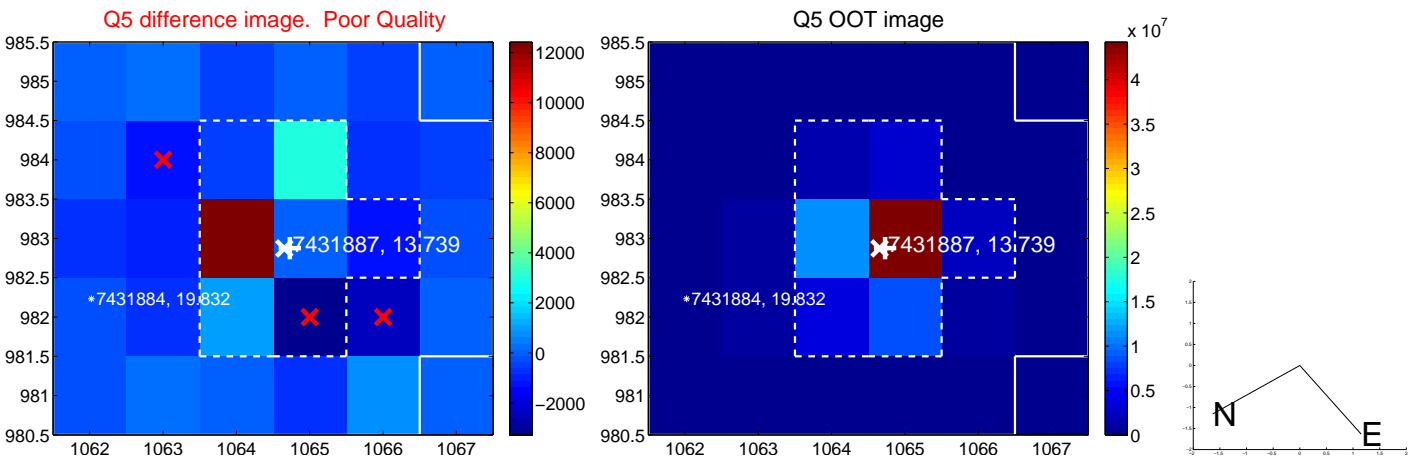


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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

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

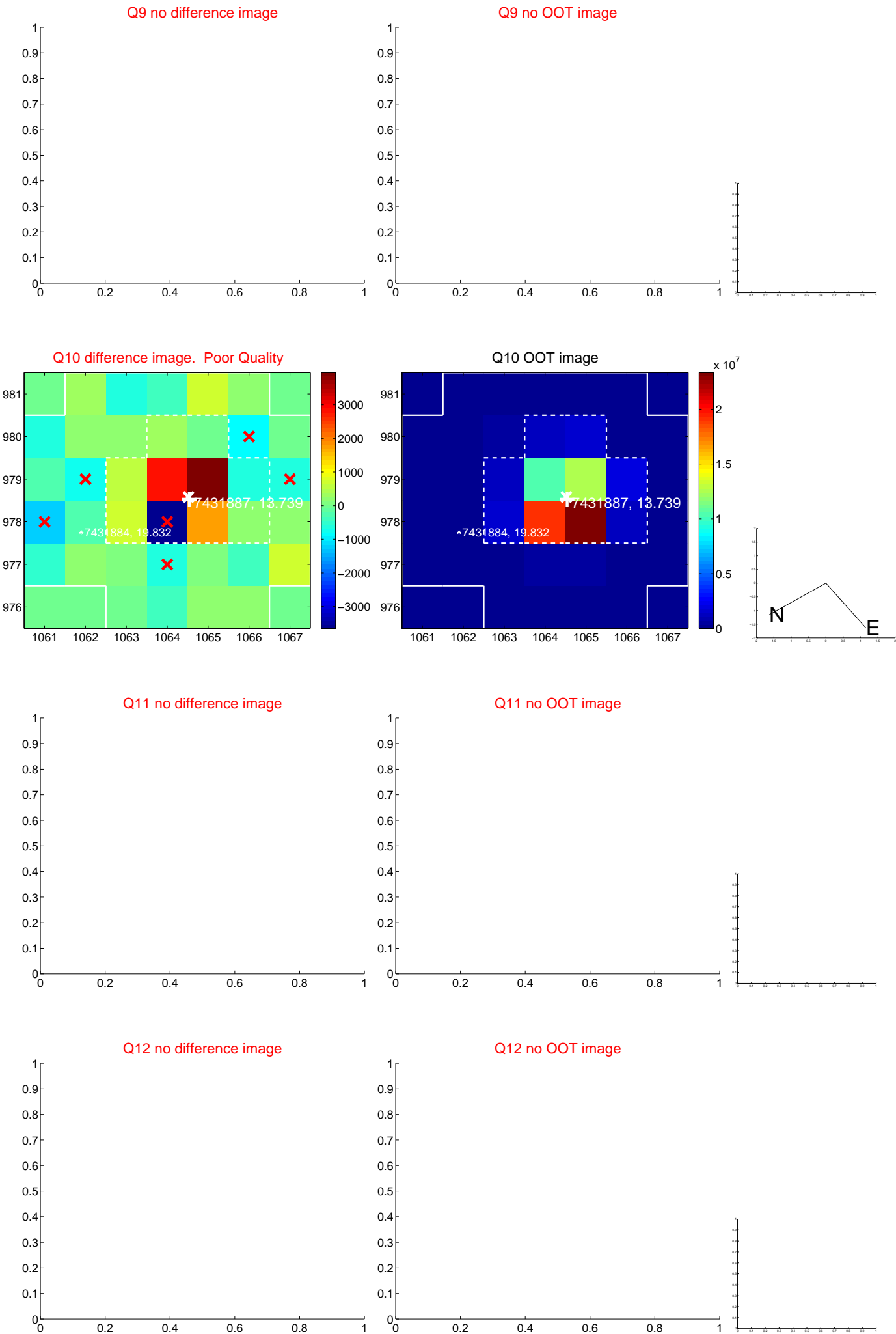


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



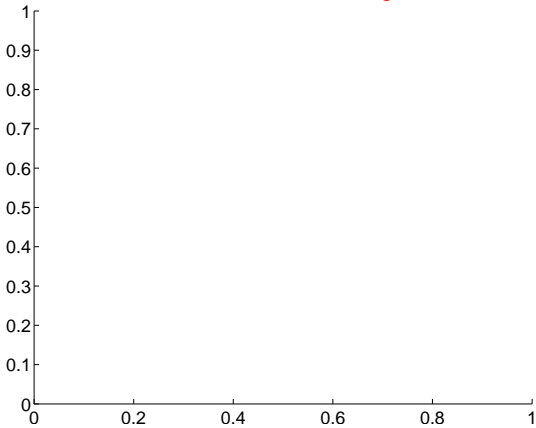


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

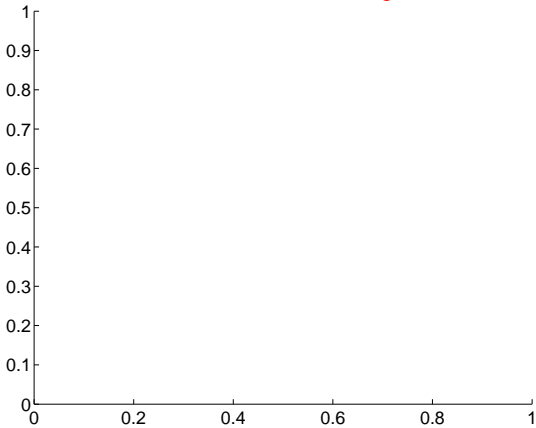
Q13 no difference image



Q13 no OOT image



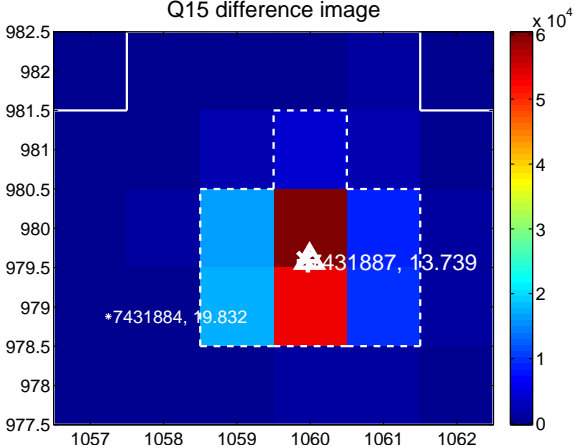
Q14 no difference image



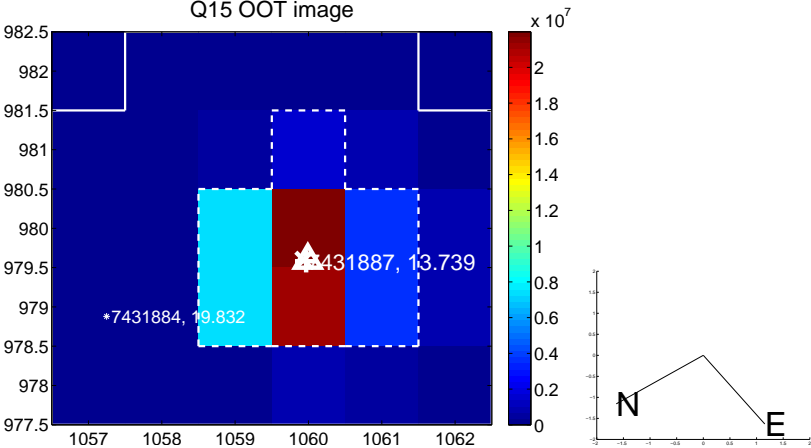
Q14 no OOT image



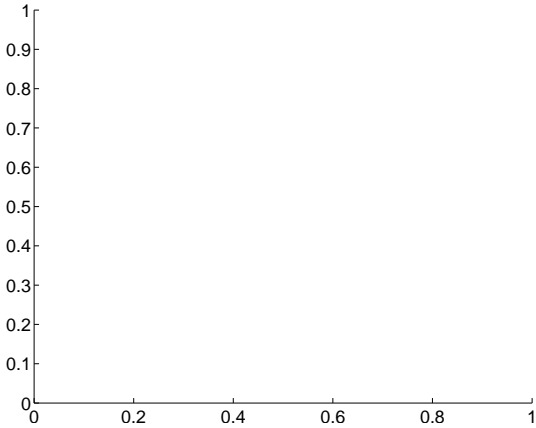
Q15 difference image



Q15 OOT image



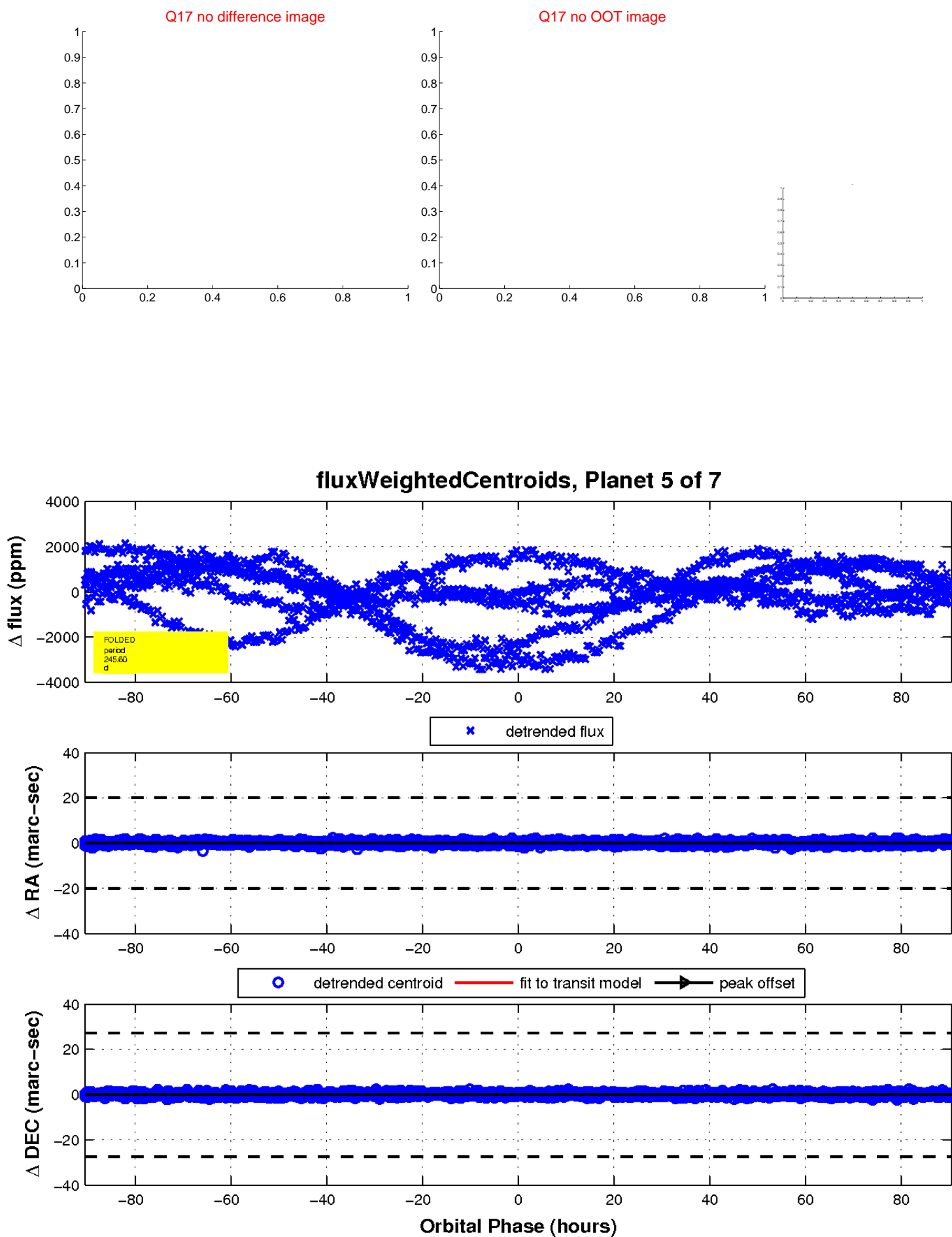
Q16 no difference image



Q16 no OOT image

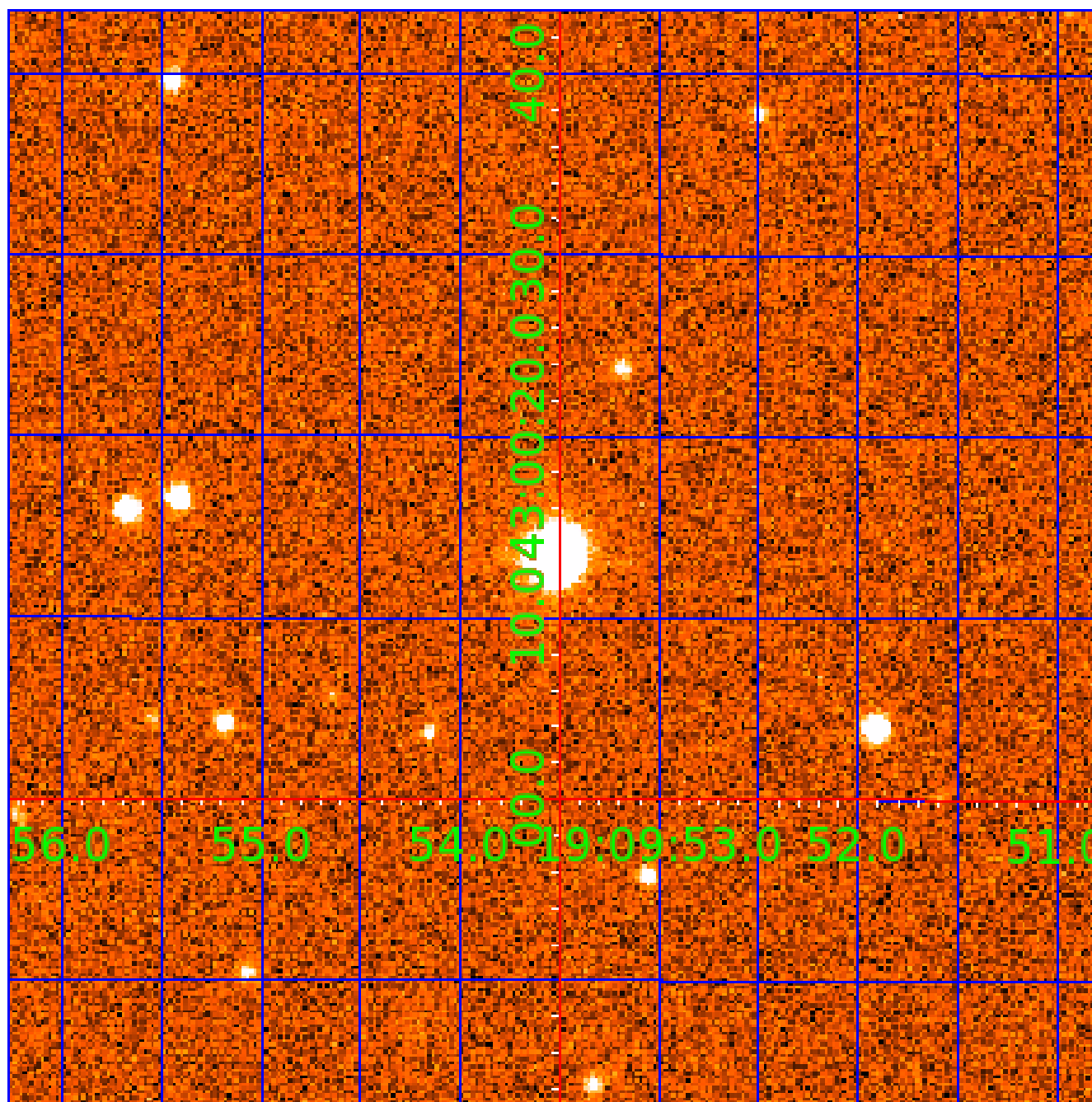


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



# UKIRT Image

Declination



# KIC 007431887

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
007431887-01	OBS	No	1.553574	131.905139	28.2	7.875	8.7	8.2	1.12	6267	0.61	2533.10
007431887-02	OBS	No	411.636384	533.544629	1551.2	17.901	14.9	13.6	1.12	6267	4.94	1.49
007431887-03	OBS	No	388.494382	202.519206	2367.5	26.549	12.1	10.7	1.12	6267	5.49	1.61
007431887-04	OBS	No	109.082765	138.385429	221.7	5.894	11.8	5.1	1.12	6267	1.90	8.74
007431887-05	OBS	No	245.597955	237.614415	2208.8	30.194	10.9	10.8	1.12	6267	9.72	2.96
007431887-06	OBS	No	214.190439	249.997276	695.2	22.274	9.8	6.1	1.12	6267	5.65	3.56
007431887-07	OBS	No	159.383586	176.419960	452.5	10.999	9.2	6.0	1.12	6267	2.78	5.27

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
007431887-01	OBS	FP	0.00	1	0	0	0	LPP_DV—MOD_NONUNIQ_DV
007431887-02	OBS	FP	0.00	1	0	1	0	INDIV_TRANS_RUBBLE_MARSHALL_ZUMA—LPP_DV—ALL_TRANS_CHASES—INCONSISTENT_TRANS—CENT_FEW_DIFFS—HALO_GHOST
007431887-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_MARSHALL—LPP_DV—LPP_ALT—ALL_TRANS_CHASES
007431887-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_TRACKER—TRANS_GAPPED—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_ALT—MOD_POS_ALT—INCONSISTENT_TRANS
007431887-05	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_MARSHALL—TRANS_GAPPED—LPP_DV—ALL_TRANS_CHASES—INCONSISTENT_TRANS—CENT_FEW_DIFFS
007431887-06	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_MARSHALL—TRANS_GAPPED—ALL_TRANS_CHASES—INCONSISTENT_TRANS
007431887-07	OBS	FP	0.00	1	0	1	0	INDIV_TRANS_RUBBLE_MARSHALL—TRANS_GAPPED—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—HALO_GHOST

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

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

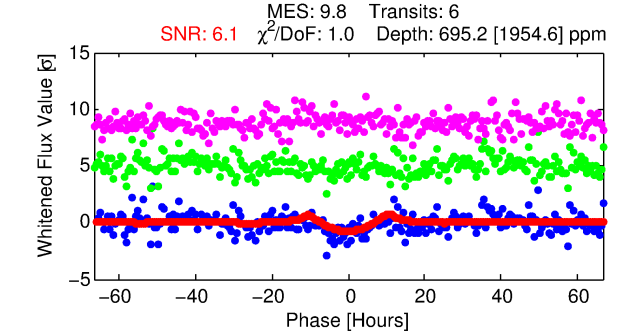
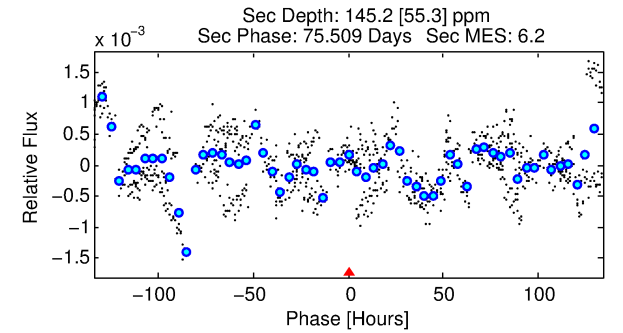
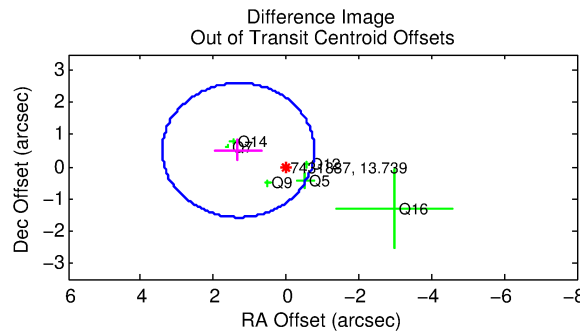
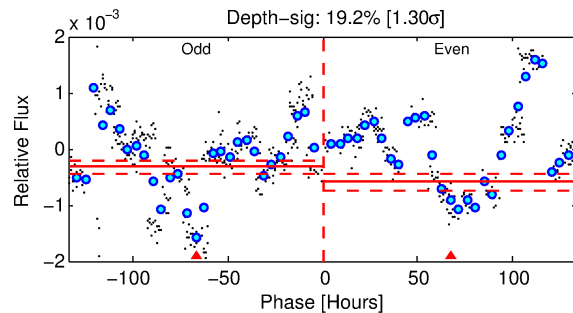
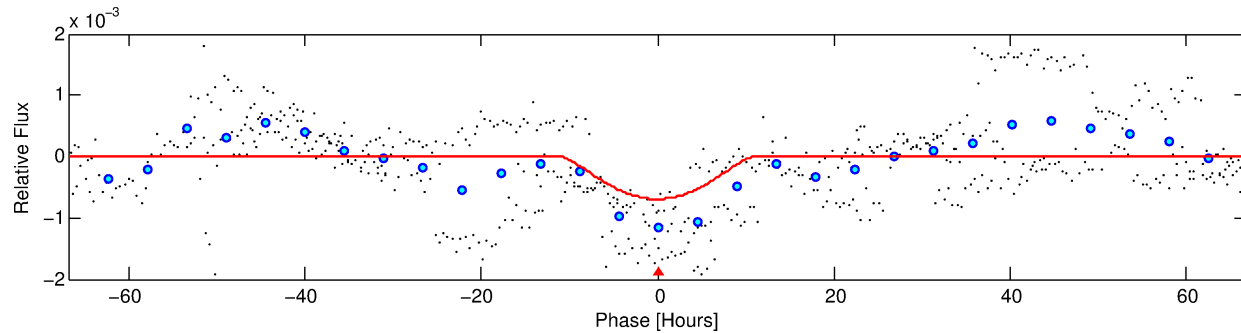
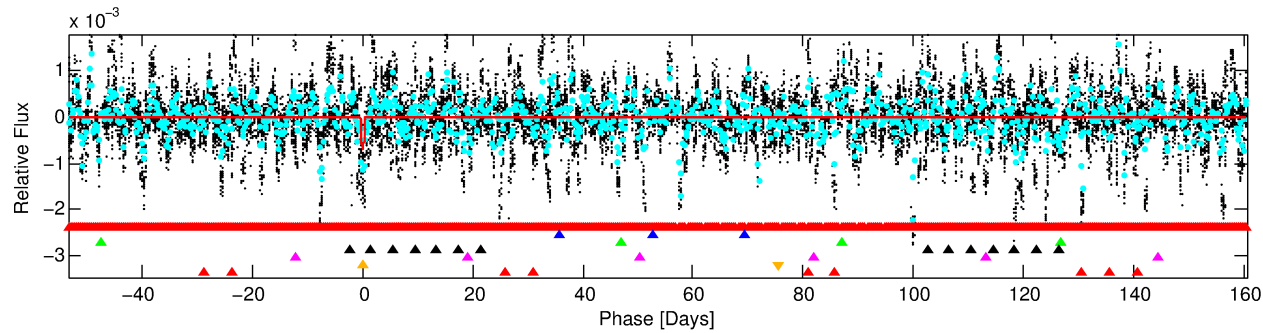
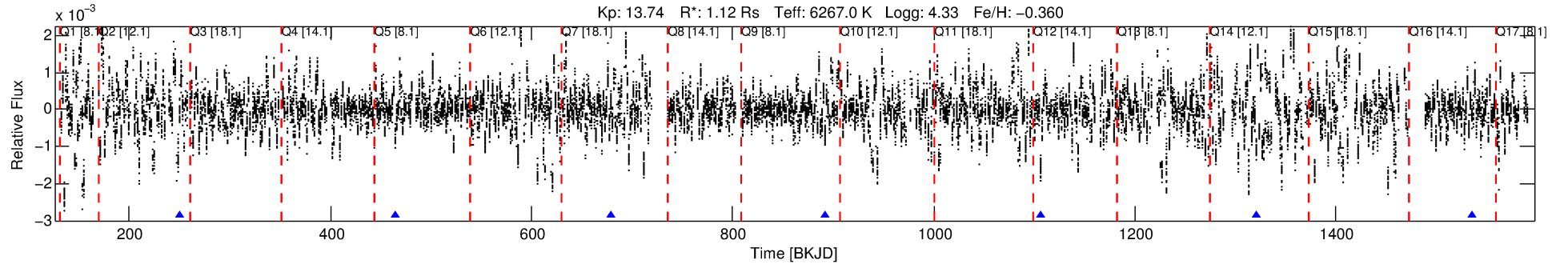
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 007431887-06

No Significant Match Found

# DV One-Page Summary

KIC: 7431887 Candidate: 6 of 7 Period: 214.190 d



## DV Fit Results:

Period = 214.19044 [0.02409] d  
Epoch = 249.9973 [0.0964] BKJD  
Rp/R\* = 0.0463 [0.0873]  
a/R\* = 22.63 [10.43]  
b = 1.00 [0.04]  
Seff = 3.56 [1.37]  
Teq = 350 [34] K  
Rp = 5.65 [10.79] Re  
a = 0.6969 [0.1766] AU  
Ag = 1217.11 [4635.52] [0.26 $\sigma$ ]  
Teffp = 3198 [3032] K [0.94 $\sigma$ ]

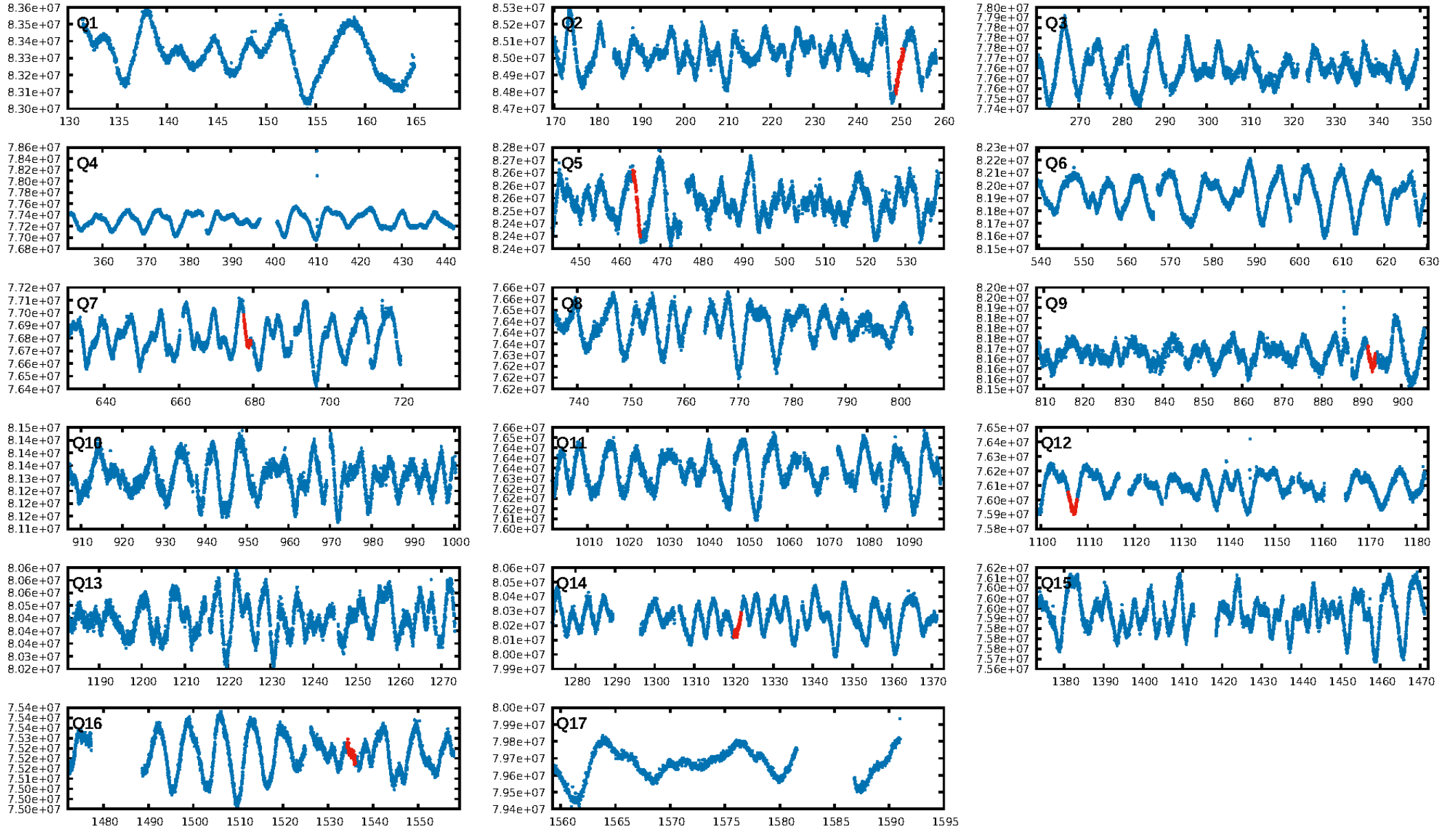
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [52.95 $\sigma$ ]  
LongPeriod-sig: 100.0% [20.09 $\sigma$ ]  
ModelChiSquare2-sig: 7.2%  
ModelChiSquareGof-sig: 100.0%  
**Bootstrap-pfa: 1.43e-09**  
RollingBand-fgt: 1.00 [6/6]  
GhostDiagnostic-chr: 1.52  
Centroid-sig: 99.4%  
Centroid-so: 0.292 arcsec [1.08 $\sigma$ ]  
OotOffset-rm: 1.413 arcsec [2.03 $\sigma$ ]  
OotOffset-st: 1/1/2/2 [6]  
KicOffset-rm: 1.537 arcsec [2.09 $\sigma$ ]  
KicOffset-st: 1/1/2/2 [6]  
DiffImageQuality-fgm: 0.67 [4/6]  
DiffImageOverlap-fno: 0.00 [0/7]

Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 02-Feb-2016 01:56:58 Z

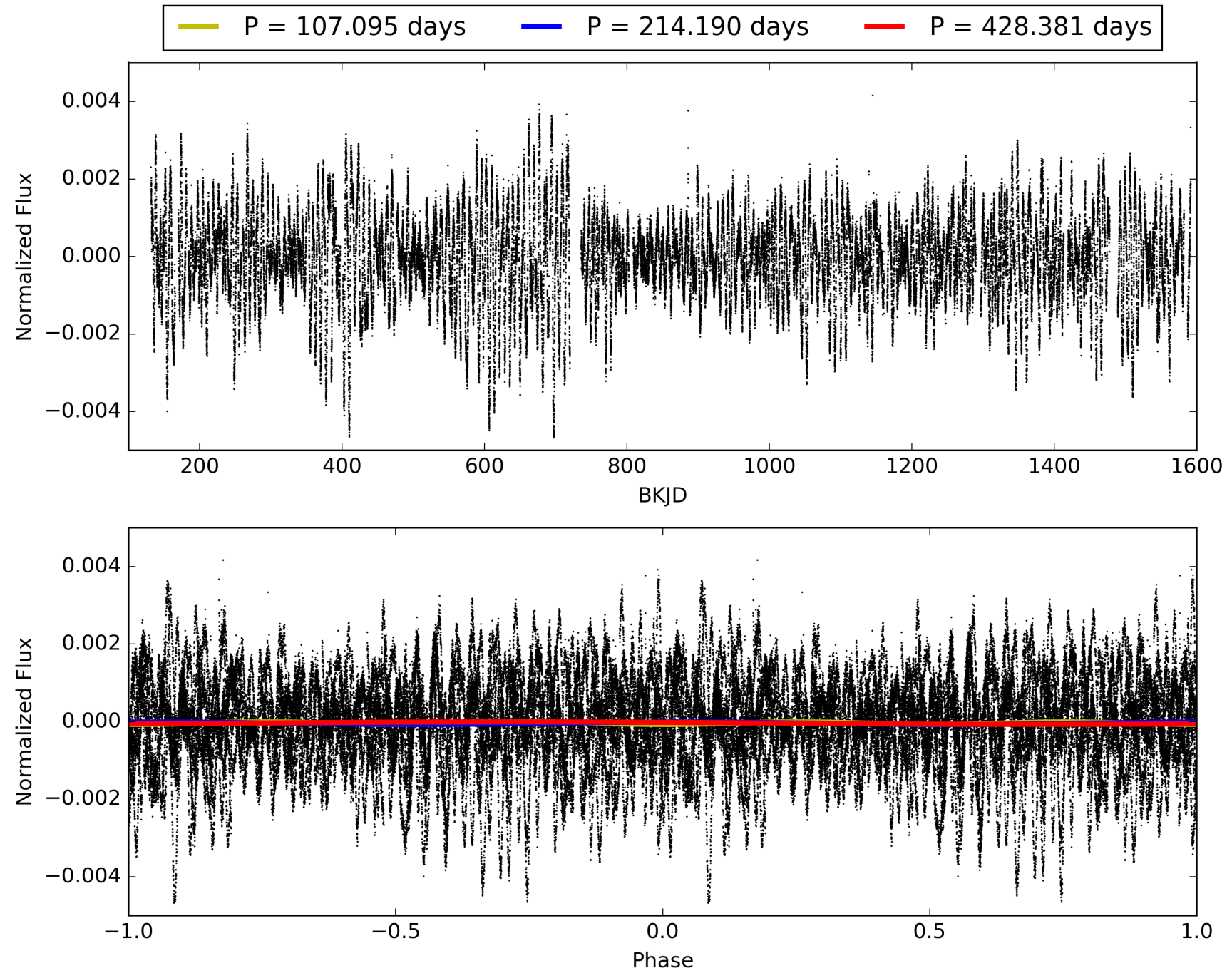
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

# TCE 007431887-06, PDC Light Curves





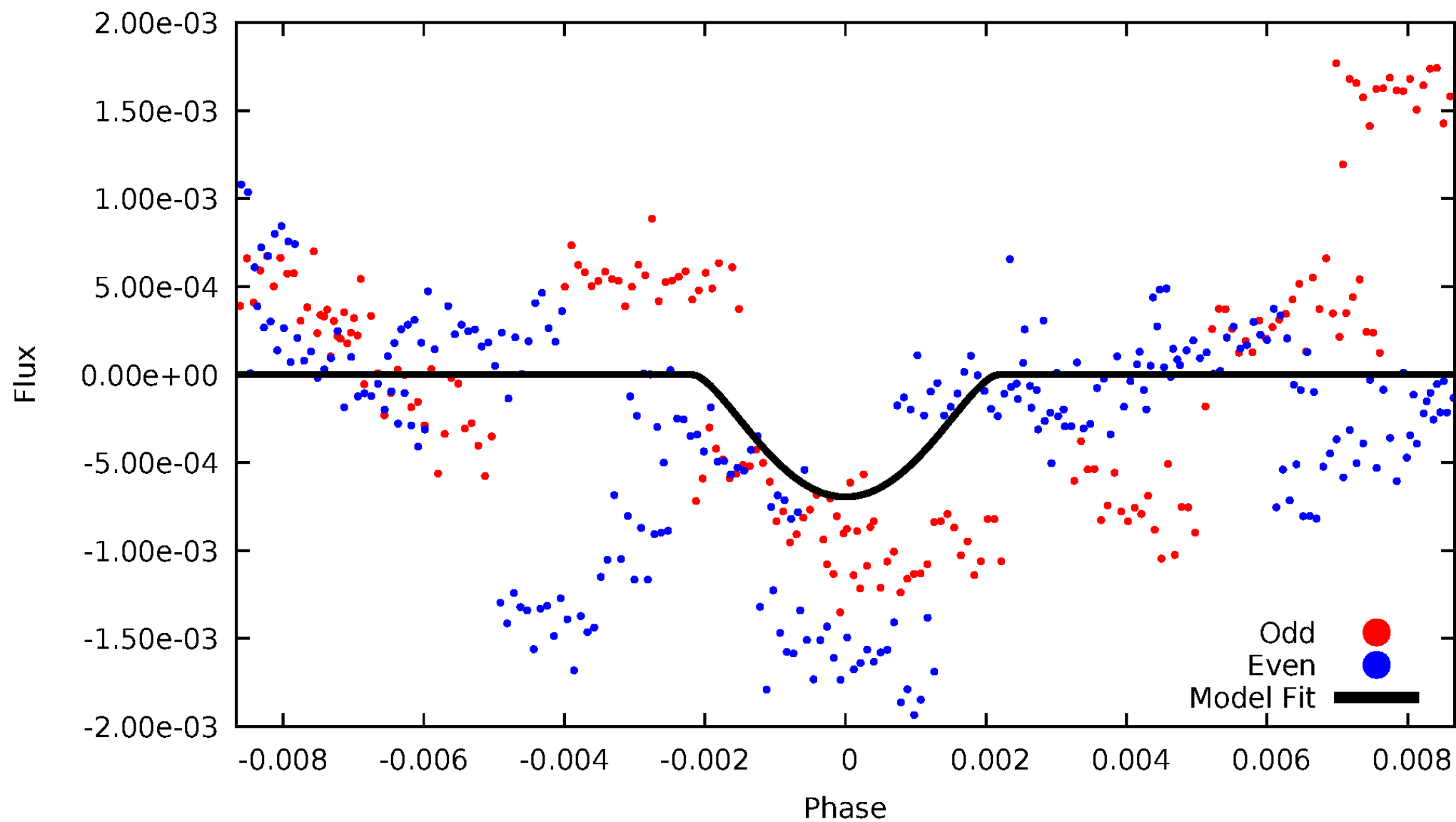
TCE 007431887-06





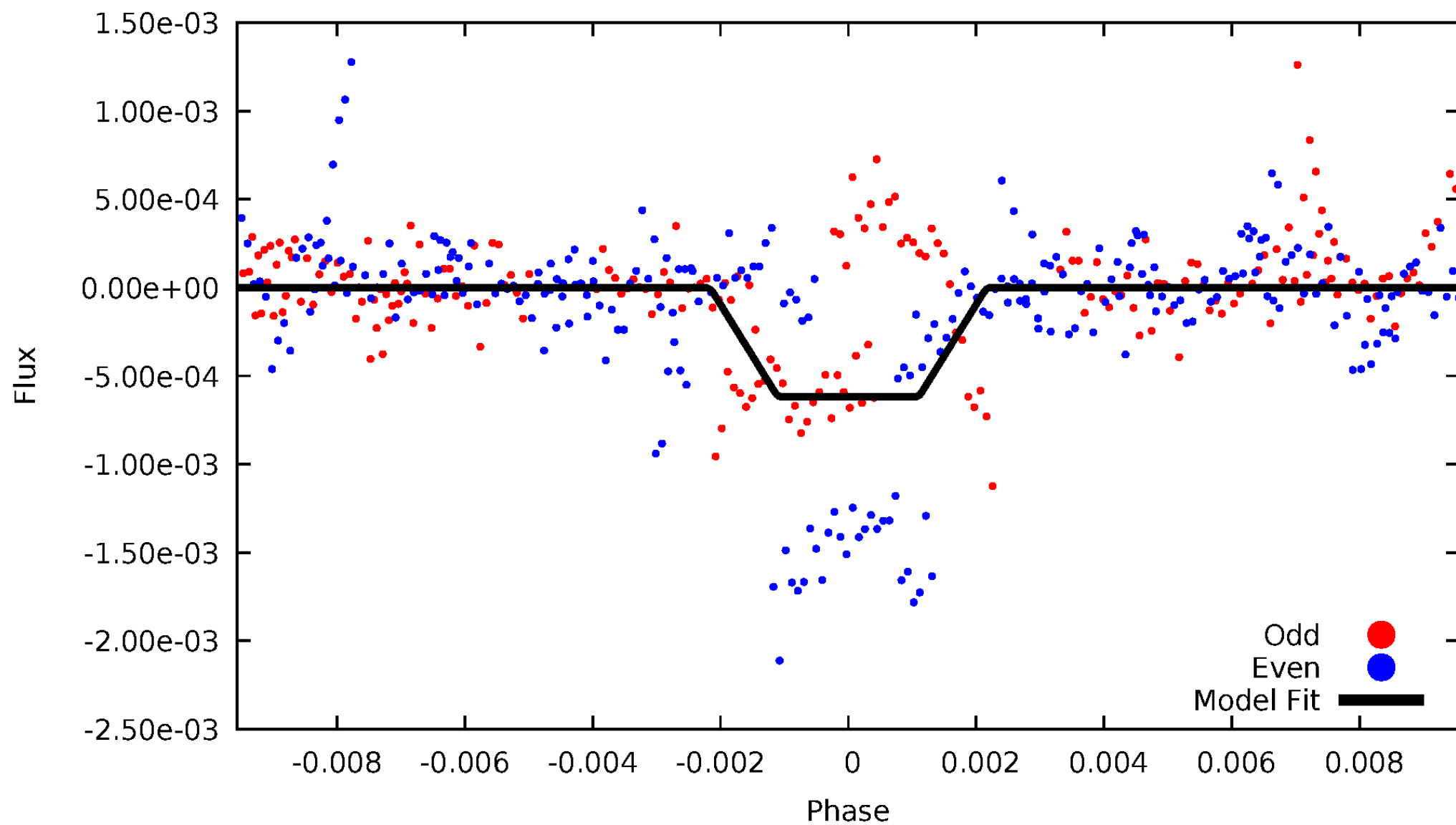
# DV Odd/Even

TCE 007431887-06



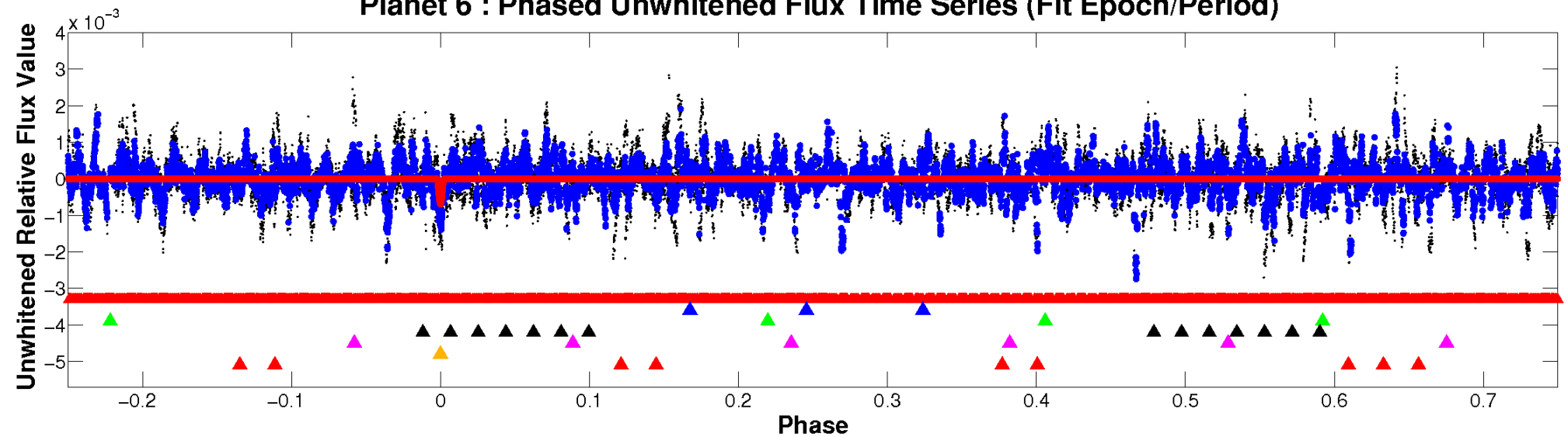
# ALT Odd/Even

TCE 007431887-06

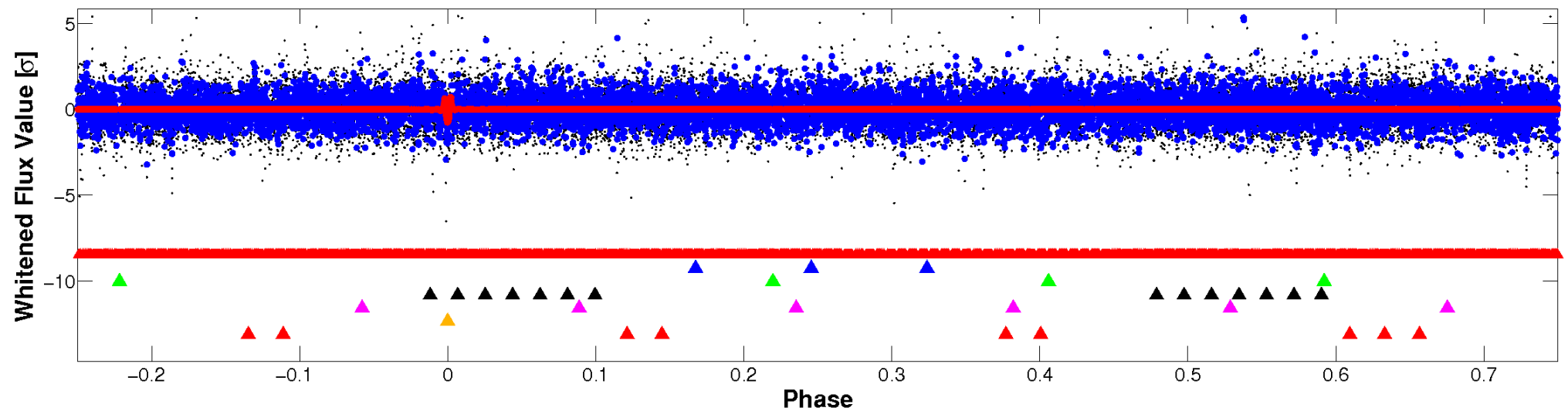


# Non-Whitened Vs. Whitened Light Curve

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

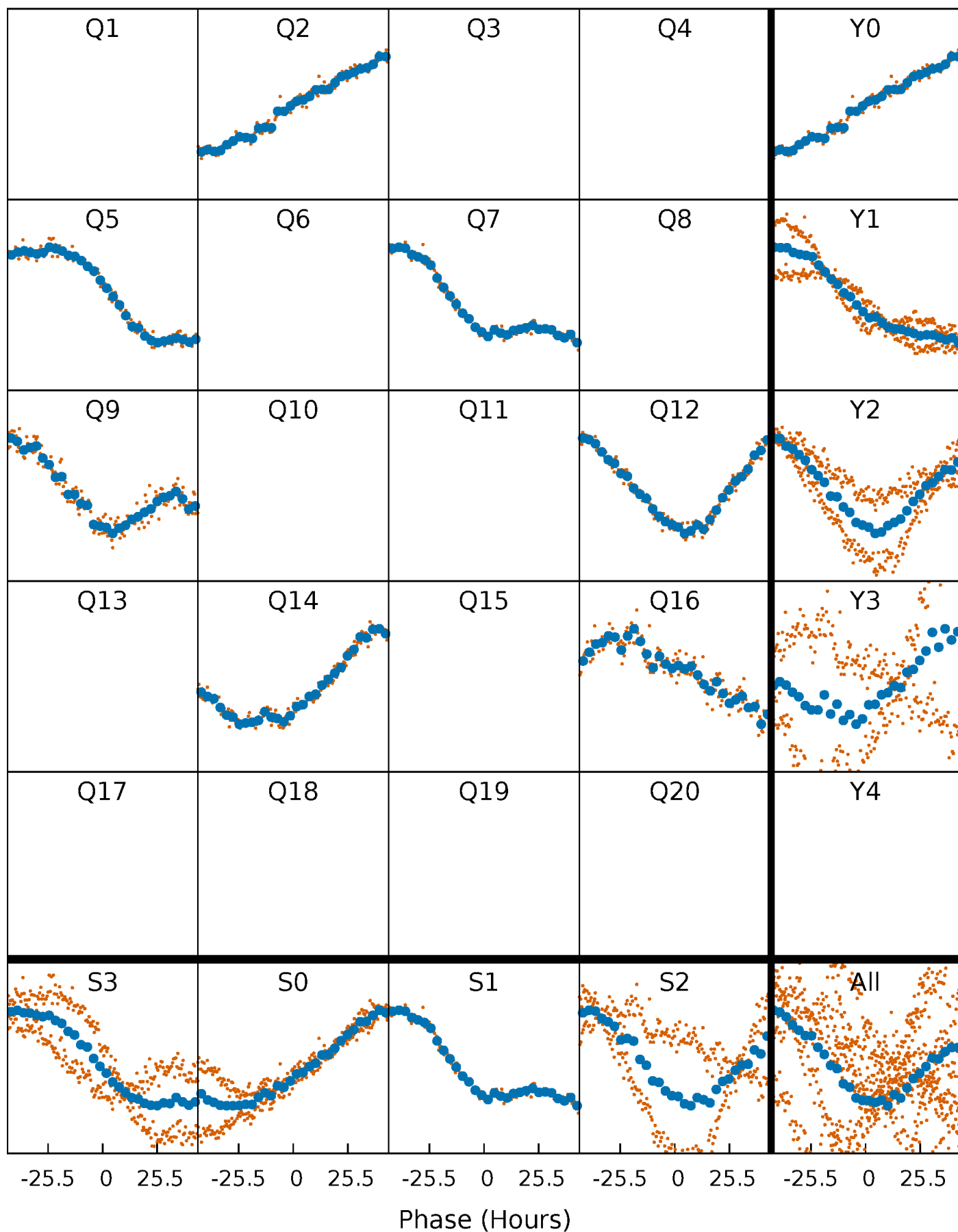


## Planet 6 : Phased Whitened Flux Time Series (Fit Epoch/Period)



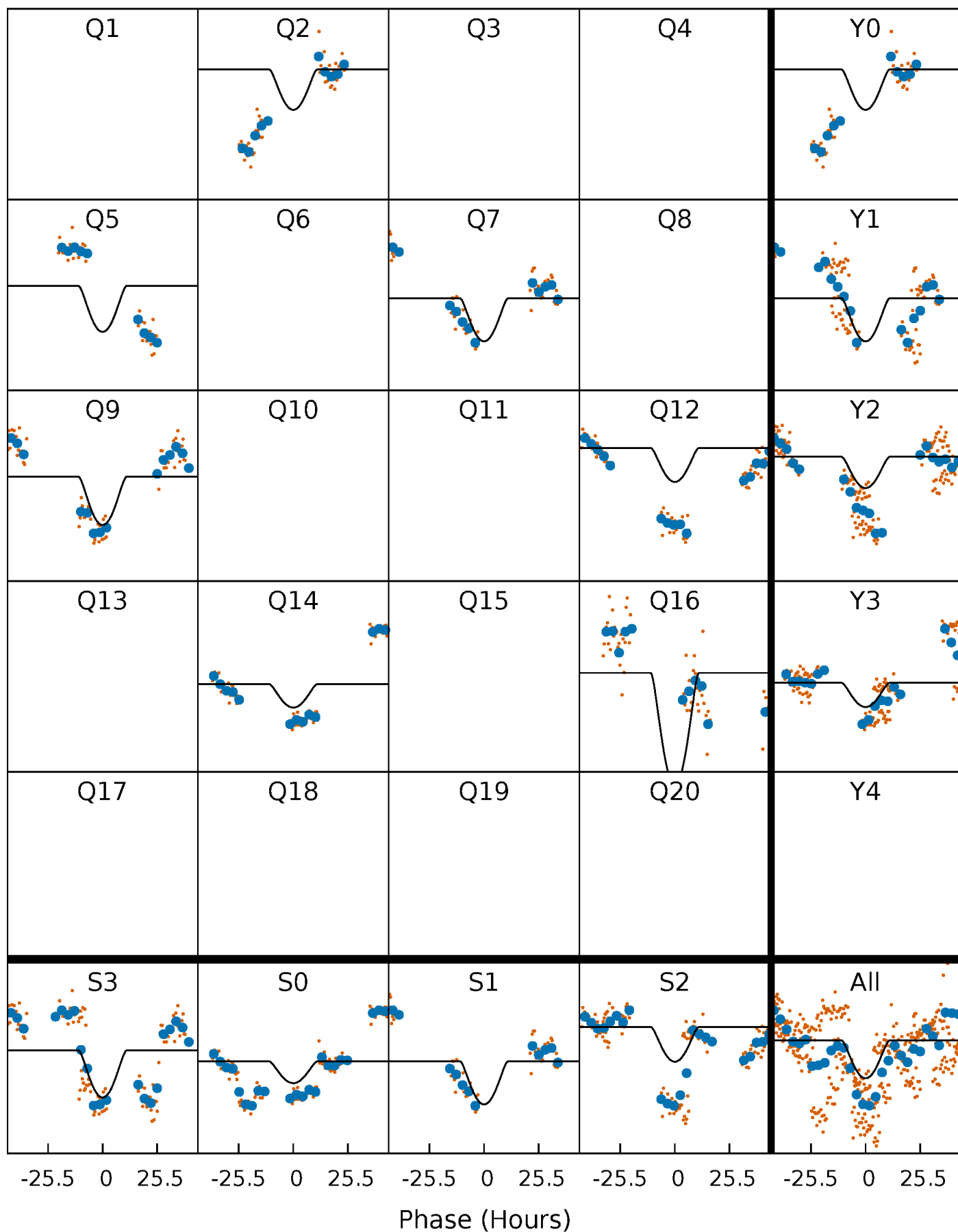
# PDC Quarter-Phased Transit Curves

TCE 007431887-06     $P=214.190439$  Days     $T_0=249.997276$  (BKJD)



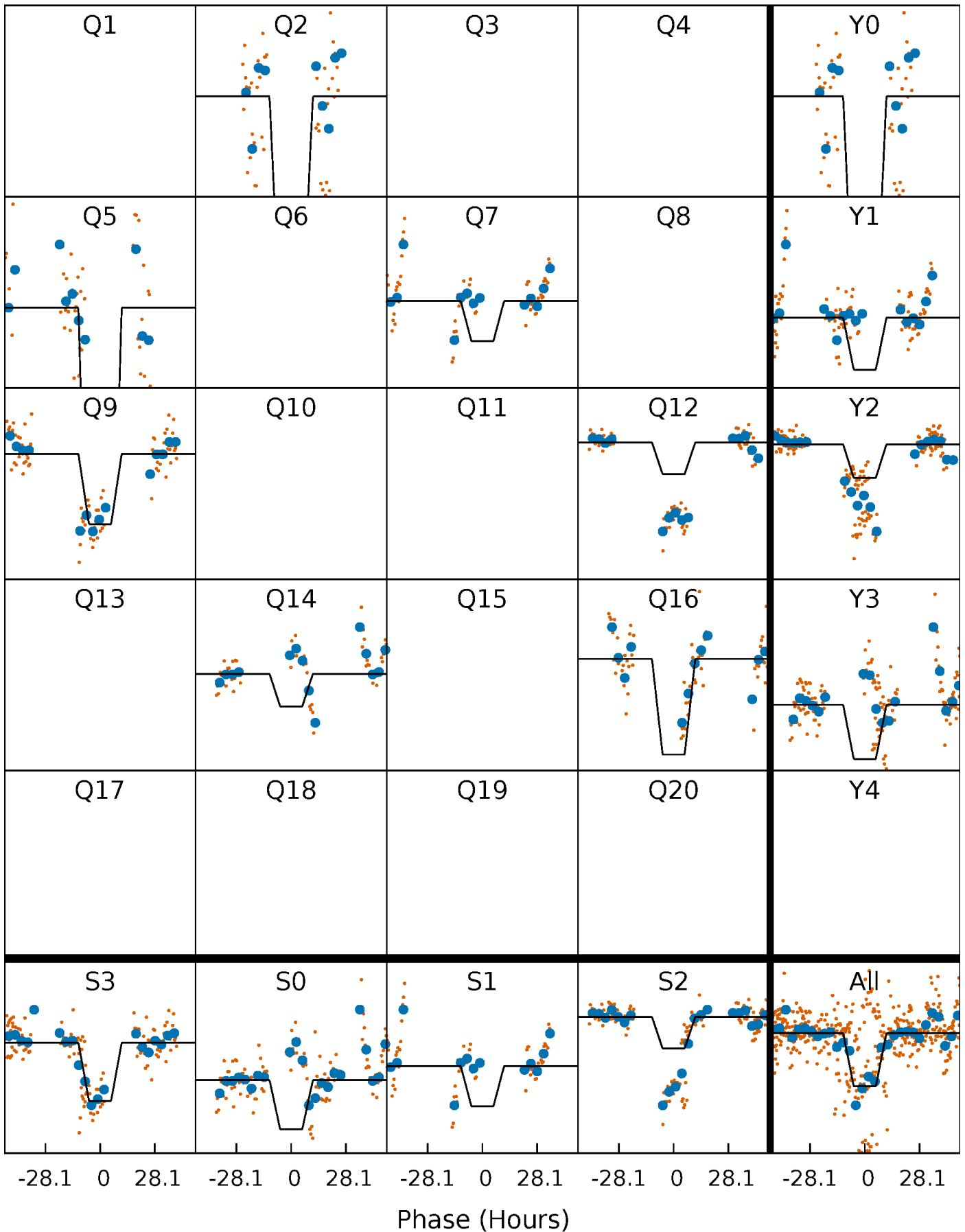
# DV Quarter-Phased Transit Curves

TCE 007431887-06 P=214.190439 Days  $T_0=249.997276$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

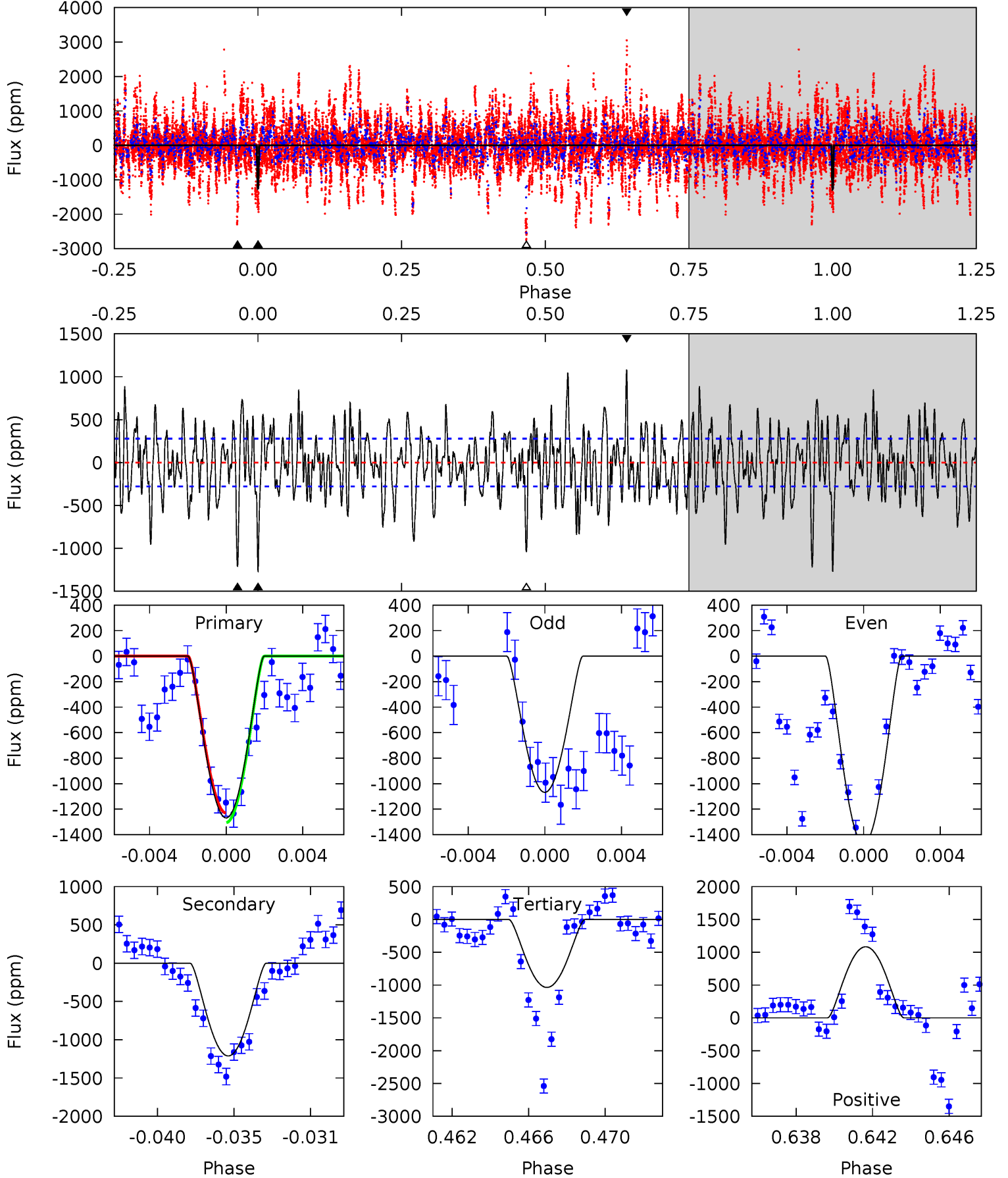
TCE 007431887-06 P=214.191387 Days  $T_0=249.983804$  (BKJD)



# DV Model-Shift Uniqueness Test

007431887-06, P = 214.190439 Days, E = 35.806837 Days

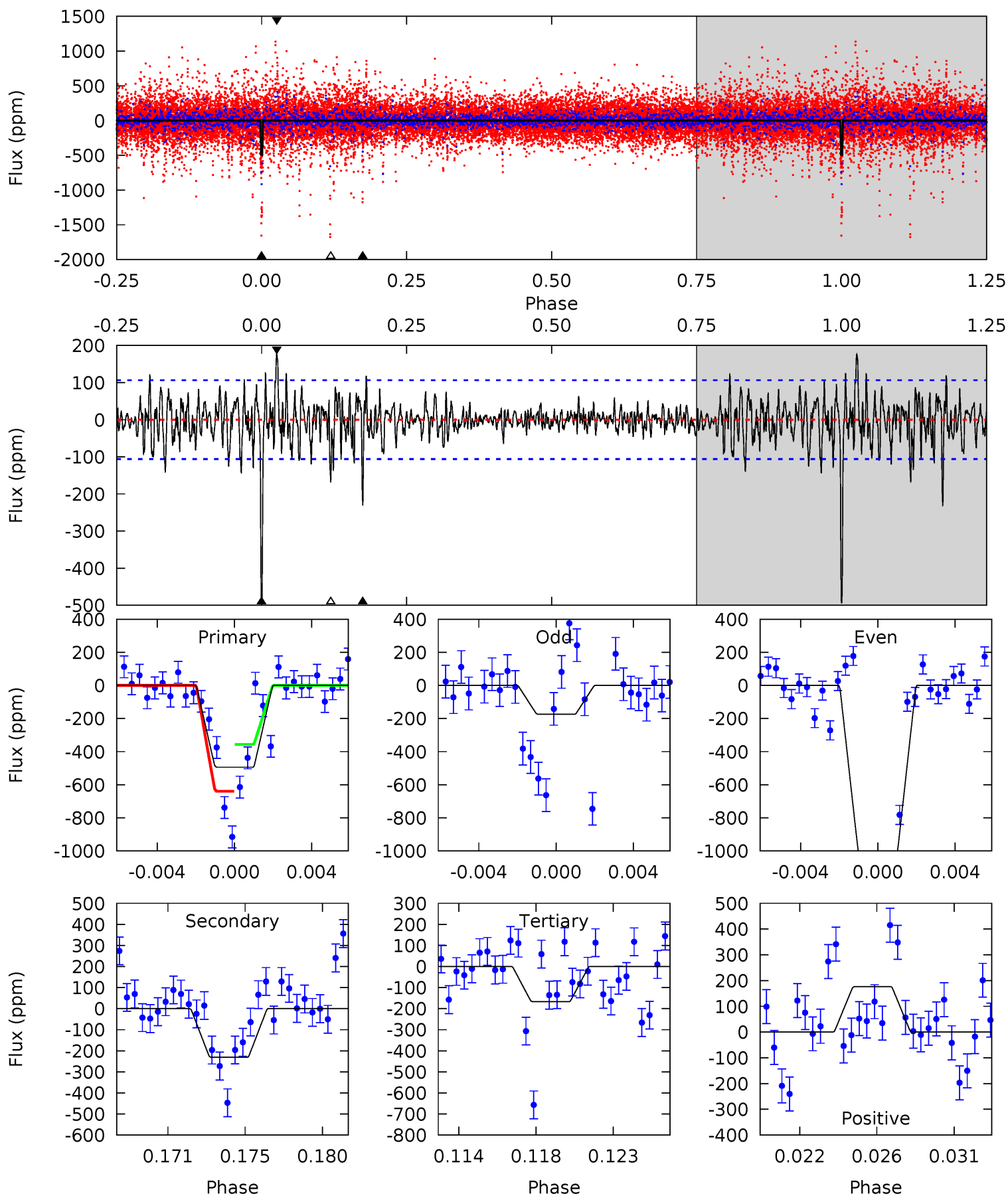
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
23.6	22.6	19.3	20.2	5.18	2.85	5.94	4.31	3.43	3.26	2.39	3.74	0.58	0.46	0.71



# Alt Model-Shift Uniqueness Test

007431887-06, P = 214.191387 Days, E = 35.792417 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
24.1	11.3	8.14	8.59	5.18	2.85	1.87	16.0	15.5	3.12	2.67	22.3	1.48	0.26	6.80





### Stellar Parameters For KIC 007431887

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} \text{ (g}\cdot\text{cm}^{-3}\text{)}$
	$6267^{+169}_{-188}$	$4.334^{+0.132}_{-0.198}$	$-0.360^{+0.300}_{-0.300}$	$1.118^{+0.340}_{-0.183}$	$0.981^{+0.160}_{-0.107}$	$0.990^{+0.672}_{-0.488}$
	+3%/-3%	+3%/-5%	+83%/-83%	+30%/-16%	+16%/-11%	+68%/-49%
Source	PHO1	KIC0	KIC0	DSEP		

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

### Secondary Eclipse Parameters for KIC 007431887-06 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} \text{ (K)}$	$T_{obs} \text{ (K)}$	$A_{obs}$
DV	$-1212 \pm 54$	$10.26^{+9.68}_{-6.73}$	$492^{+39}_{-29}$	$4353^{+2579}_{-904}$	$3067^{+22988}_{-2235}$
Alt.	$-231 \pm 21$	$8.92^{+8.83}_{-6.28}$	$491^{+39}_{-28}$	$3397^{+1993}_{-598}$	$814^{+8583}_{-613}$

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

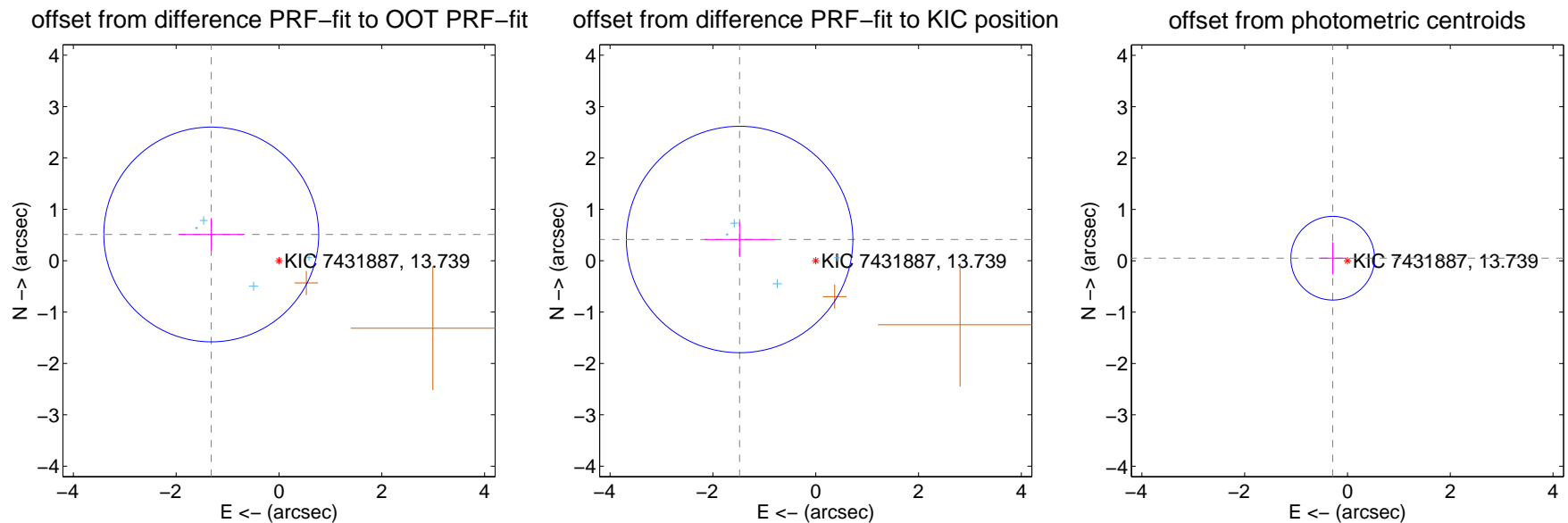
## DV Centroid Data

Supplemental centroid analysis for 007431887-06. Kepler magnitude: 13.74. Transit SNR 6.08

There are 4 quarters with good PRF difference image offsets

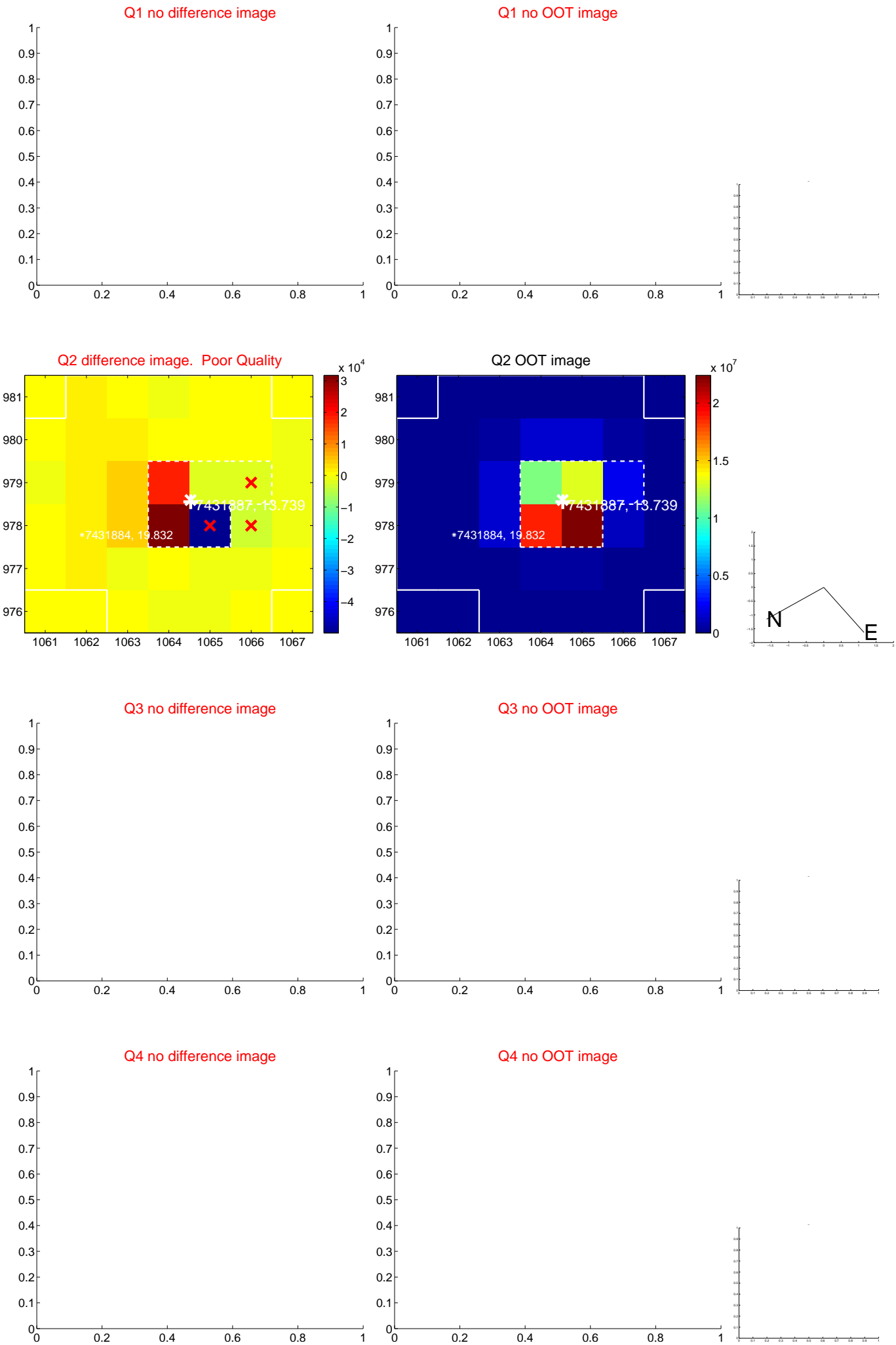
The direct PRF centroid is offset from the target star catalog position by about 0.20 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$1.413 \pm 0.697$	2.03	$1.318 \pm 0.634$	$0.511 \pm 0.316$
PRF-fit source offset from KIC position	$1.537 \pm 0.735$	2.09	$1.481 \pm 0.680$	$0.413 \pm 0.339$
photometric centroid source offset	$0.29 \pm 0.27$	1.08	$0.29 \pm 0.27$	$0.05 \pm 0.31$

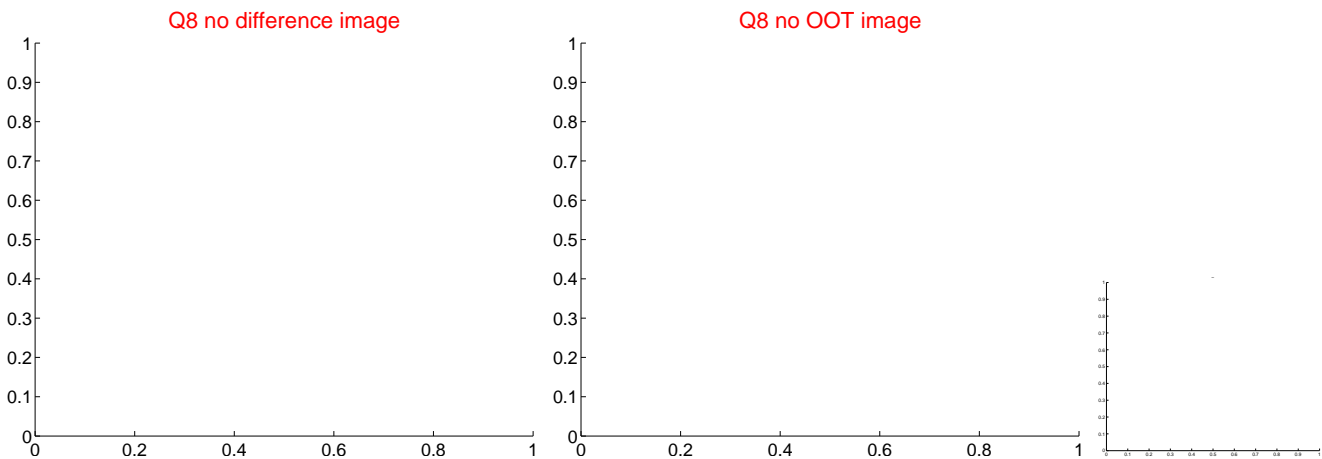
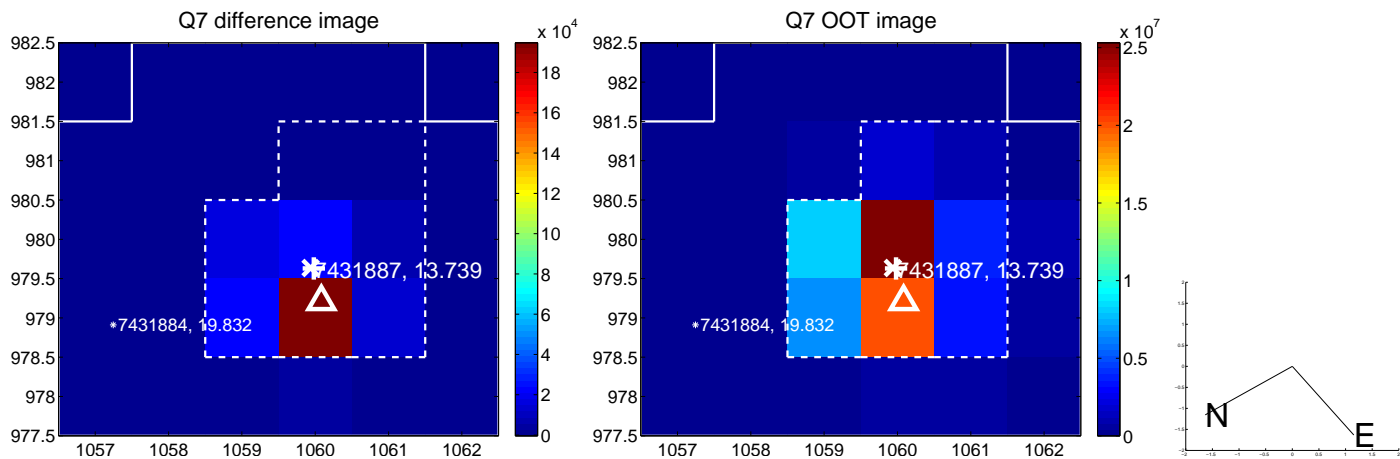
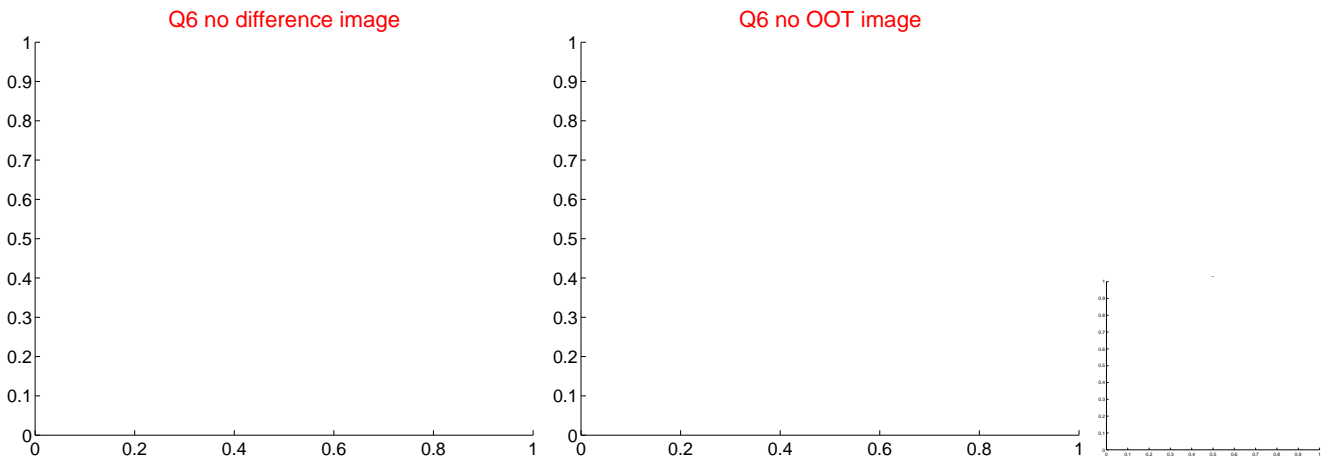
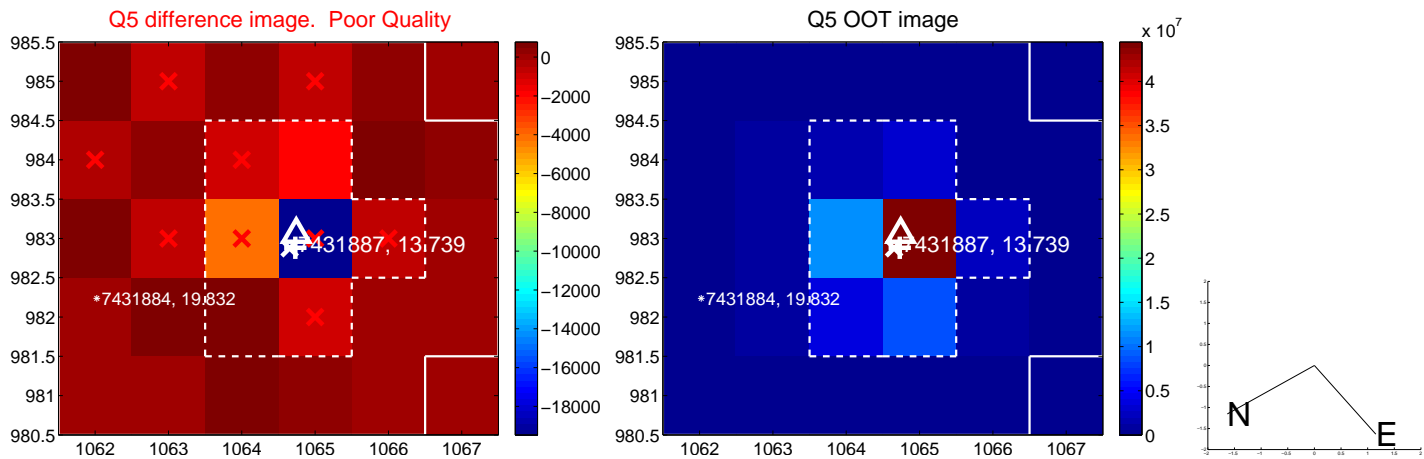


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses:** good quarterly centroid offsets; **Vermillion crosses:** bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

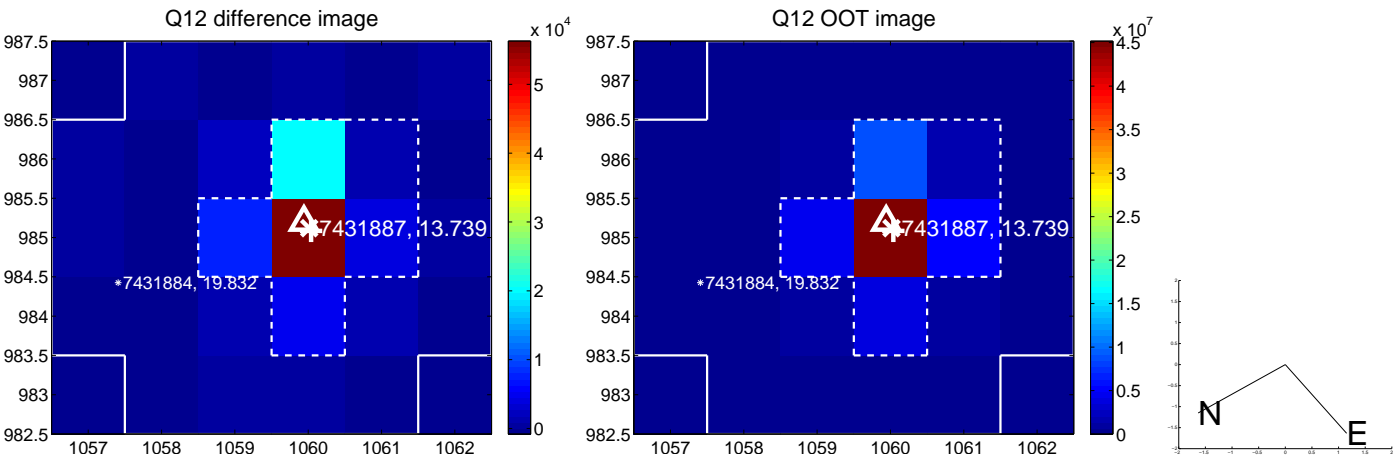
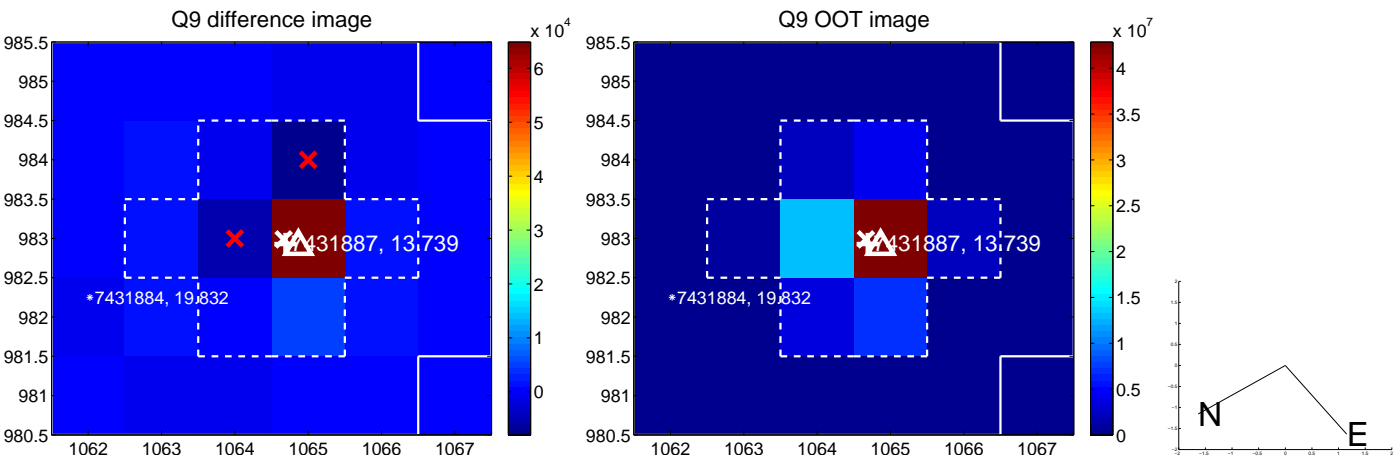
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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.



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

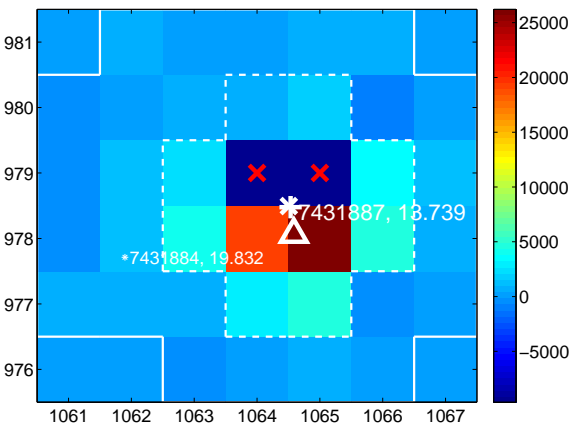
Q13 no difference image



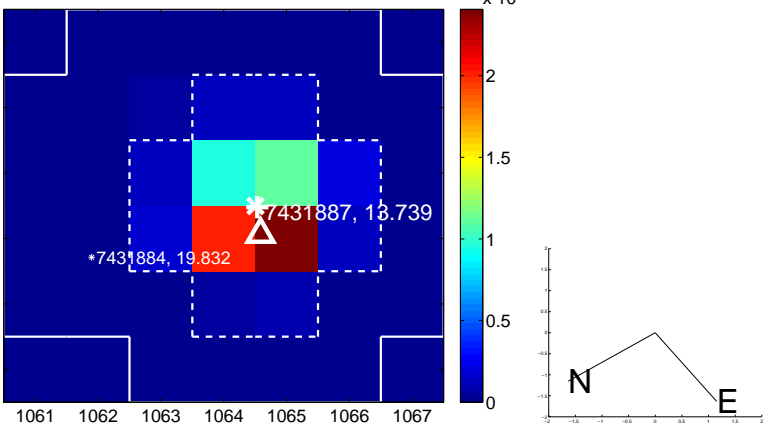
Q13 no OOT image



Q14 difference image



Q14 OOT image



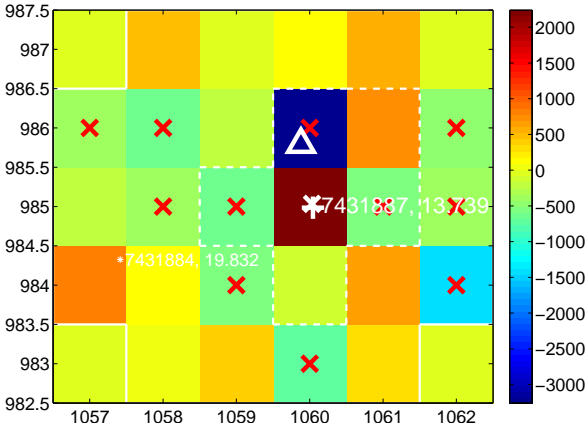
Q15 no difference image



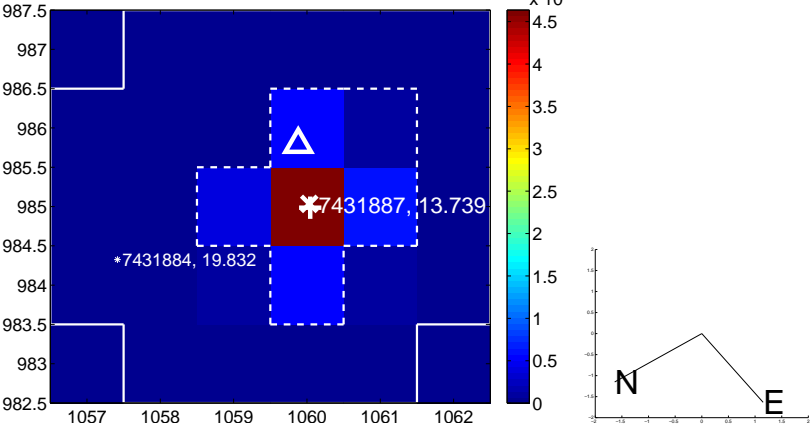
Q15 no OOT image



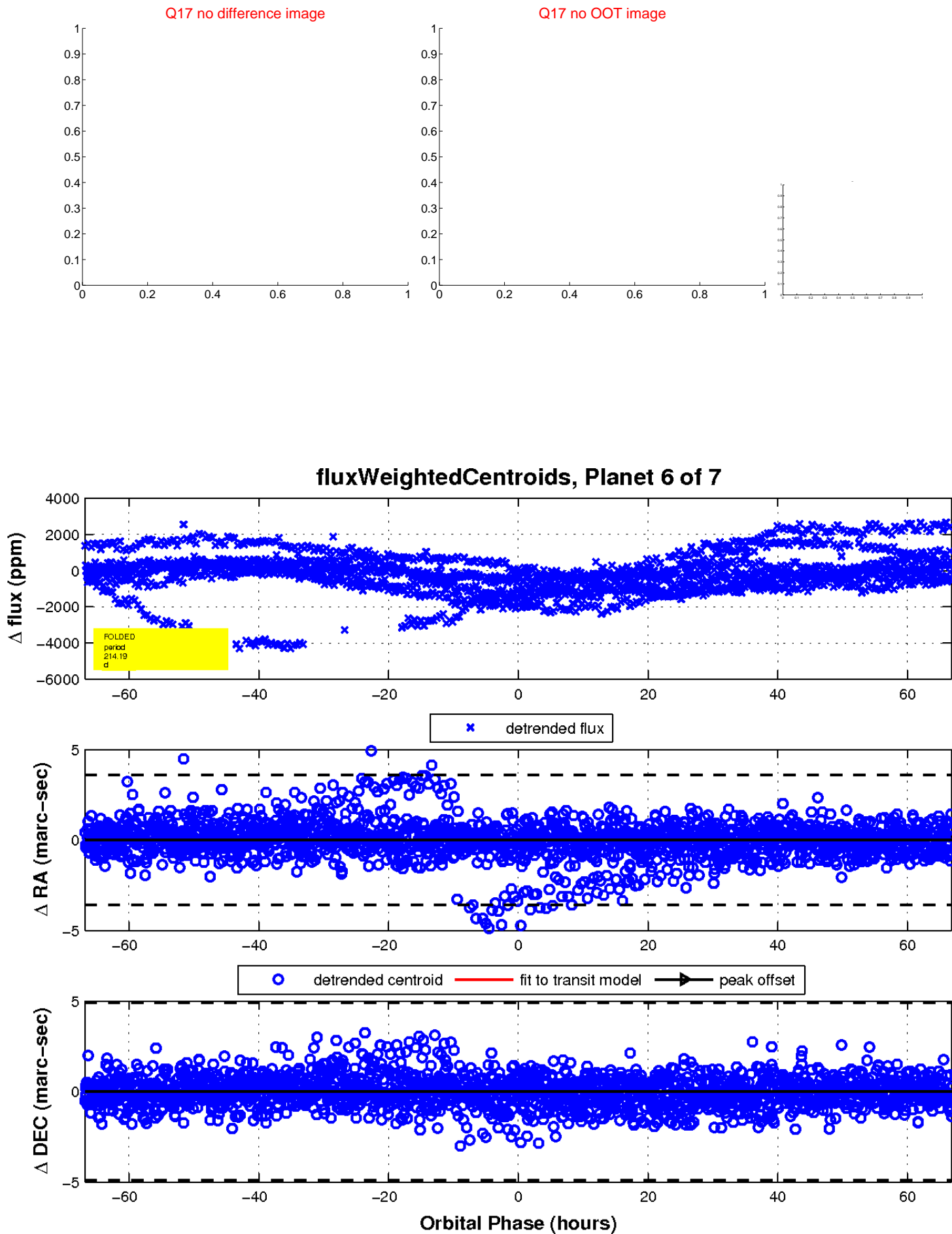
Q16 difference image. Poor Quality



Q16 OOT image

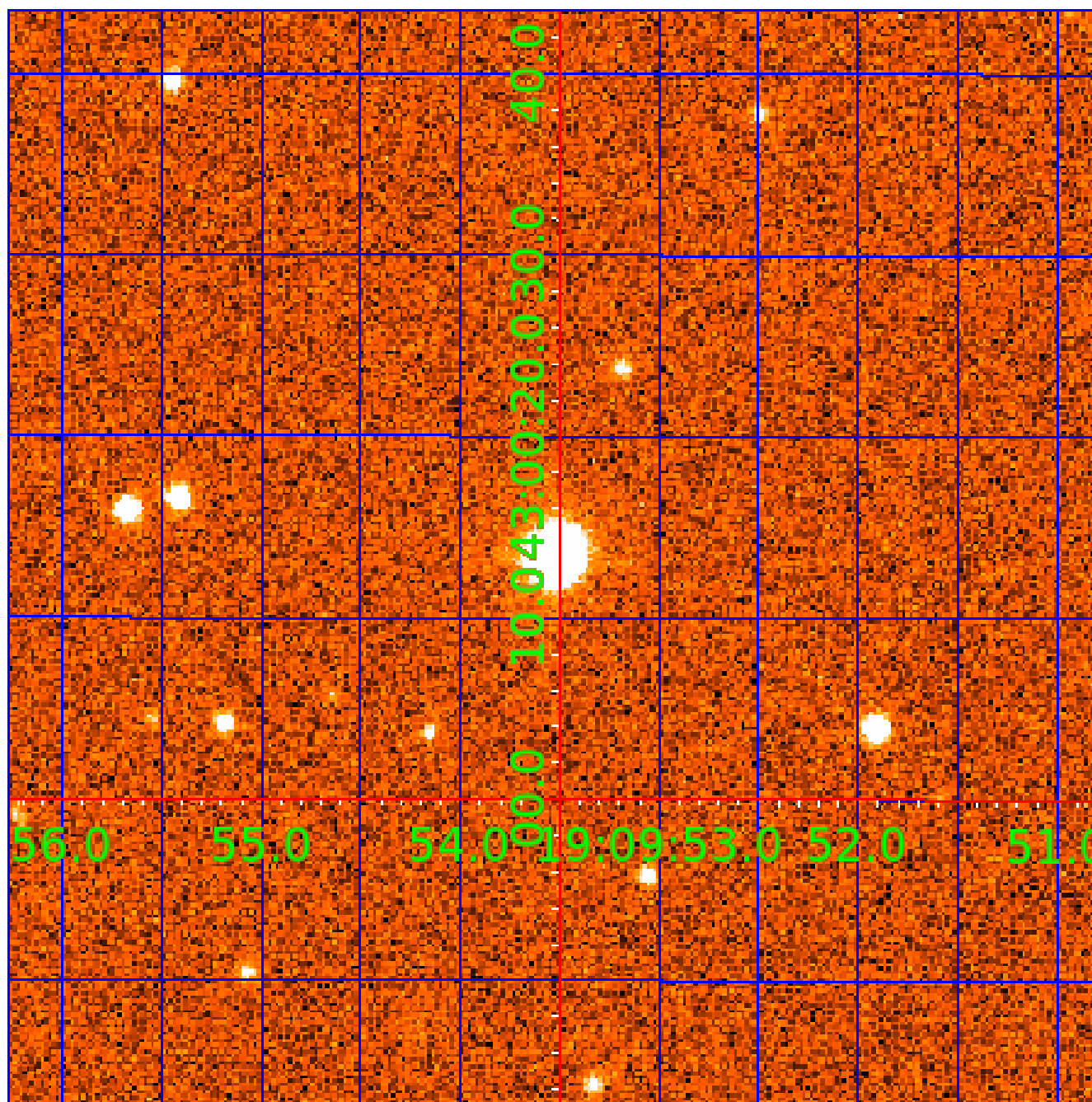


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



# UKIRT Image

Declination





# KIC 007431887

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
007431887-01	OBS	No	1.553574	131.905139	28.2	7.875	8.7	8.2	1.12	6267	0.61	2533.10
007431887-02	OBS	No	411.636384	533.544629	1551.2	17.901	14.9	13.6	1.12	6267	4.94	1.49
007431887-03	OBS	No	388.494382	202.519206	2367.5	26.549	12.1	10.7	1.12	6267	5.49	1.61
007431887-04	OBS	No	109.082765	138.385429	221.7	5.894	11.8	5.1	1.12	6267	1.90	8.74
007431887-05	OBS	No	245.597955	237.614415	2208.8	30.194	10.9	10.8	1.12	6267	9.72	2.96
007431887-06	OBS	No	214.190439	249.997276	695.2	22.274	9.8	6.1	1.12	6267	5.65	3.56
007431887-07	OBS	No	159.383586	176.419960	452.5	10.999	9.2	6.0	1.12	6267	2.78	5.27

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
007431887-01	OBS	FP	0.00	1	0	0	0	LPP_DV—MOD_NONUNIQ_DV
007431887-02	OBS	FP	0.00	1	0	1	0	INDIV_TRANS_RUBBLE_MARSHALL_ZUMA—LPP_DV—ALL_TRANS_CHASES—INCONSISTENT_TRANS—CENT_FEW_DIFFS—HALO_GHOST
007431887-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_MARSHALL—LPP_DV—LPP_ALT—ALL_TRANS_CHASES
007431887-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_TRACKER—TRANS_GAPPED—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_ALT—MOD_POS_ALT—INCONSISTENT_TRANS
007431887-05	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_MARSHALL—TRANS_GAPPED—LPP_DV—ALL_TRANS_CHASES—INCONSISTENT_TRANS—CENT_FEW_DIFFS
007431887-06	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_MARSHALL—TRANS_GAPPED—ALL_TRANS_CHASES—INCONSISTENT_TRANS
007431887-07	OBS	FP	0.00	1	0	1	0	INDIV_TRANS_RUBBLE_MARSHALL—TRANS_GAPPED—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—HALO_GHOST

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

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

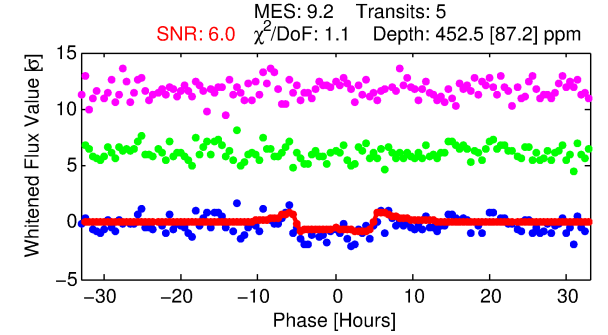
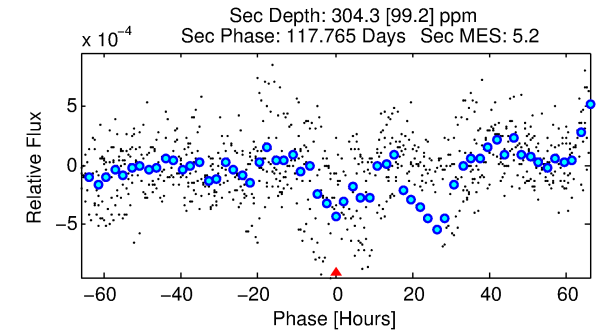
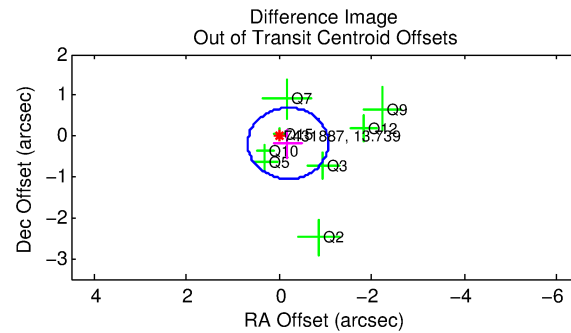
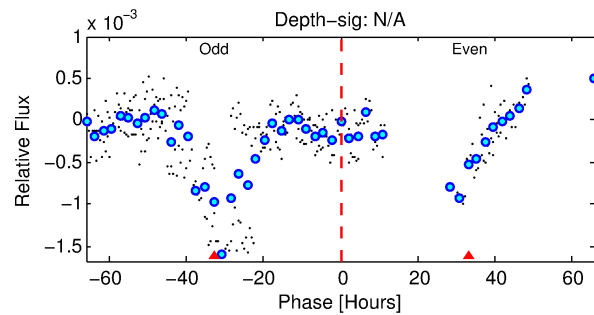
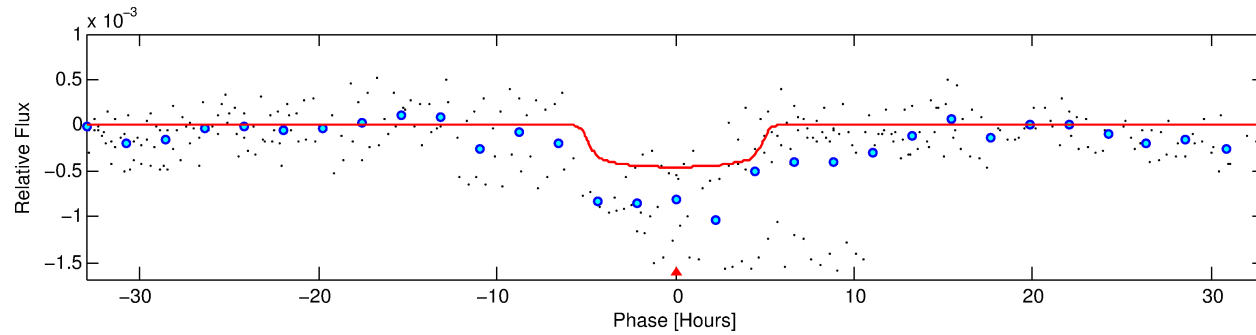
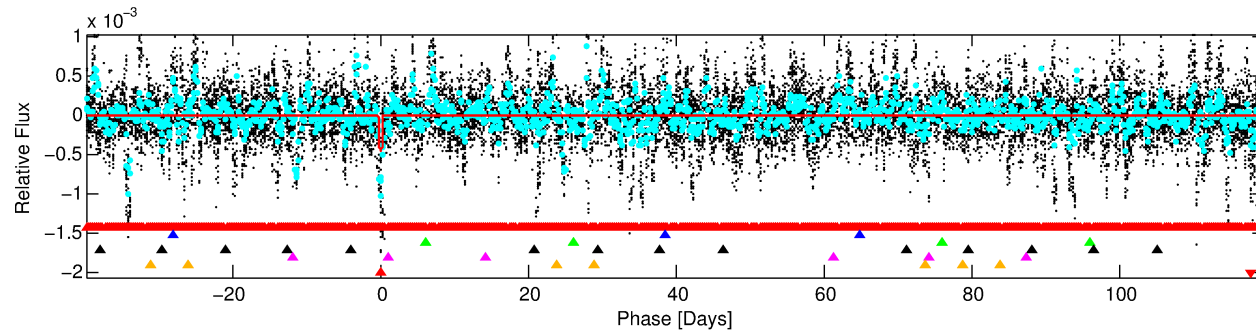
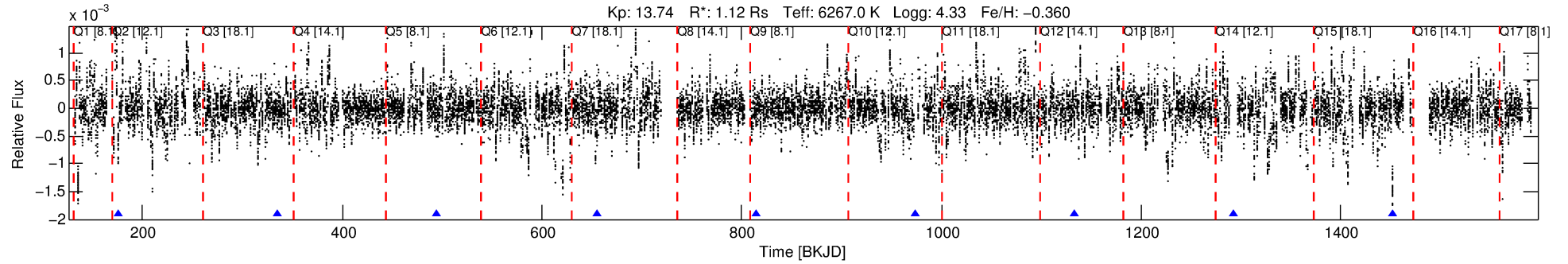
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 007431887-07

No Significant Match Found

# DV One-Page Summary

KIC: 7431887 Candidate: 7 of 7 Period: 159.384 d



## DV Fit Results:

Period = 159.38359 [0.00351] d  
Epoch = 176.4200 [0.0139] BKJD  
Rp/R\* = 0.0228 [0.0030]  
a/R\* = 54.27 [22.56]  
b = 0.90 [0.09]  
Seff = 5.27 [2.03]  
Teq = 386 [37] K  
Rp = 2.78 [0.92] Re  
a = 0.5723 [0.1450] AU  
Ag = 7100.16 [3958.19] [1.79 $\sigma$ ]  
Teff = 5484 [600] K [8.48 $\sigma$ ]

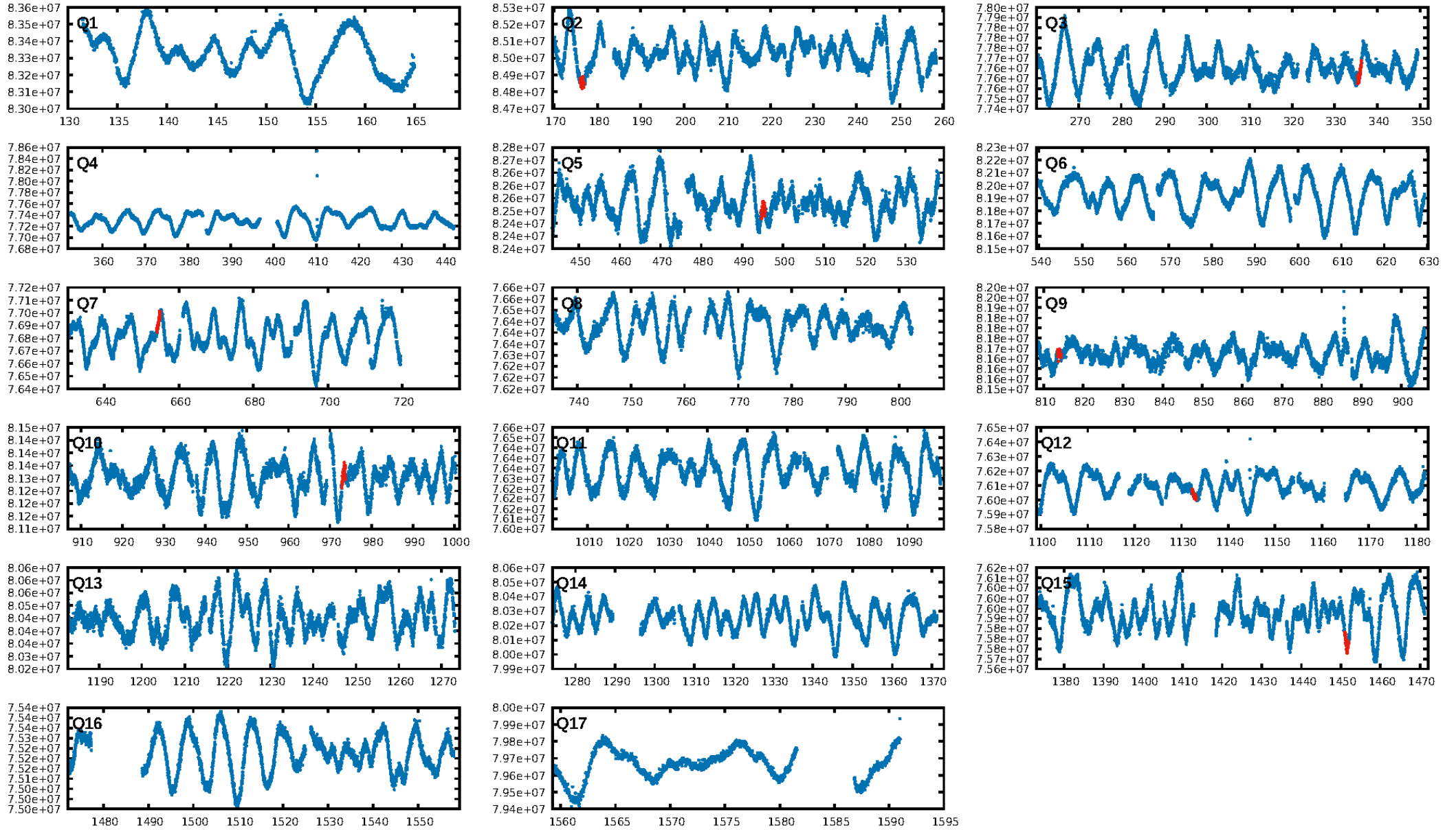
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [96.74 $\sigma$ ]  
LongPeriod-sig: 100.0% [52.95 $\sigma$ ]  
ModelChiSquare2-sig: 0.6%  
ModelChiSquareGof-sig: 100.0%  
**Bootstrap-pfa: 8.15e-10**  
RollingBand-fgt: 1.00 [5/5]  
**GhostDiagnostic-chr: 0.1788**  
Centroid-sig: 10.9%  
Centroid-so: 0.444 arcsec [1.04 $\sigma$ ]  
OotOffset-rm: 0.262 arcsec [0.90 $\sigma$ ]  
KicOffset-rm: 0.247 arcsec [0.72 $\sigma$ ]  
OotOffset-st: 2/3/1/2 [8]  
KicOffset-st: 2/3/1/2 [8]  
DiffImageQuality-fgm: 0.50 [4/8]  
DiffImageOverlap-fno: 0.00 [0/8]

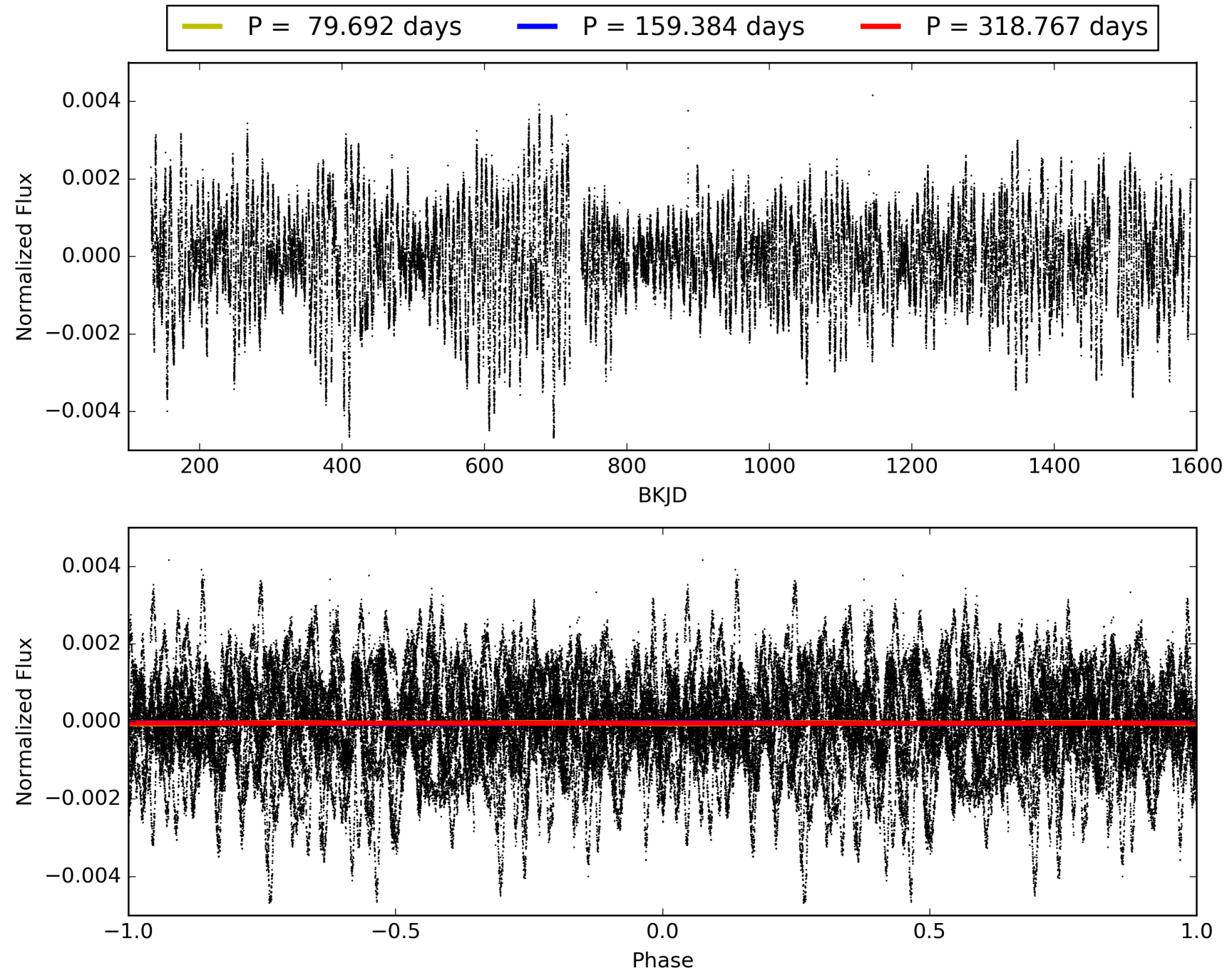
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 02-Feb-2016 01:57:02 Z

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

# TCE 007431887-07, PDC Light Curves

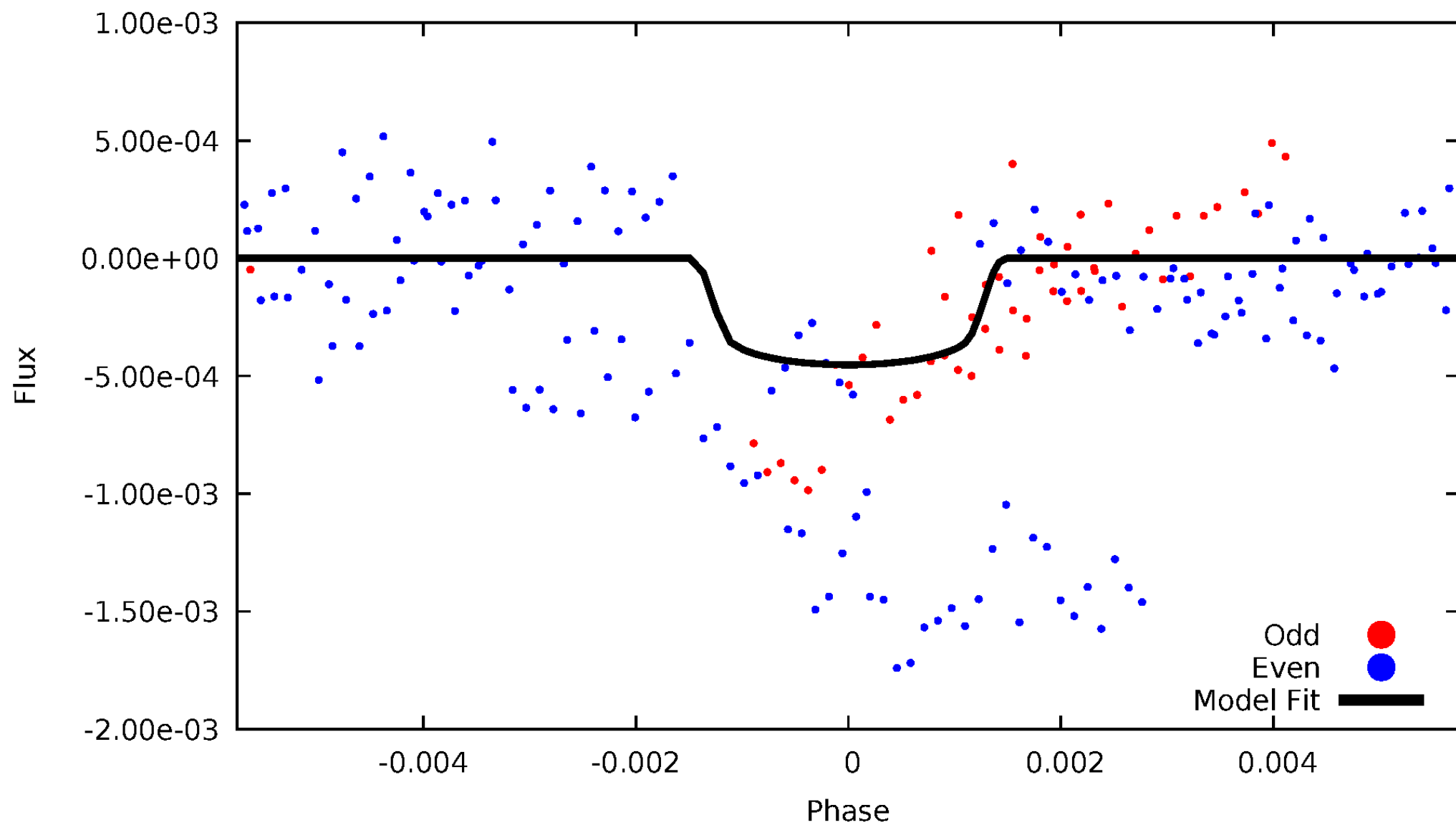


TCE 007431887-07



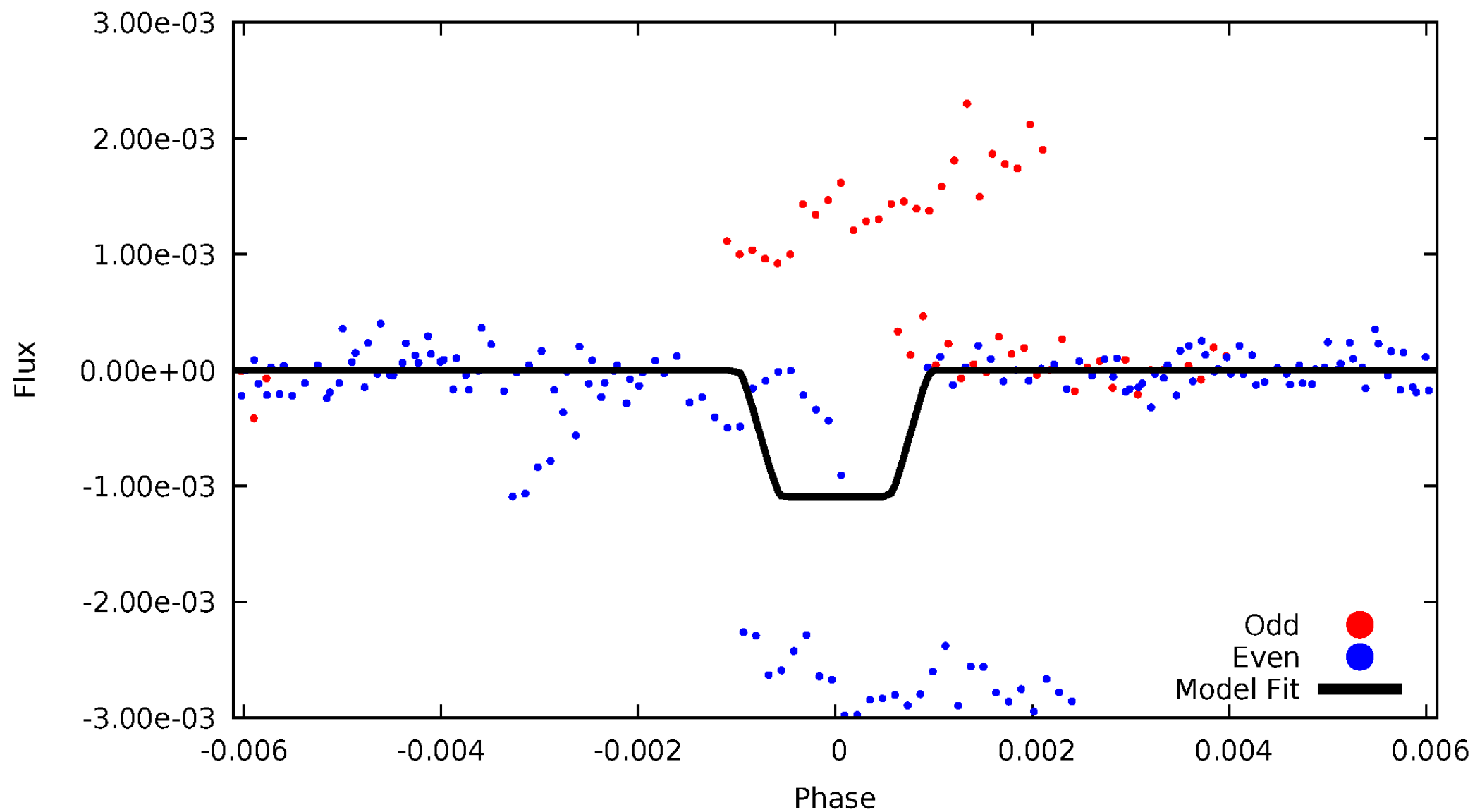
# DV Odd/Even

TCE 007431887-07



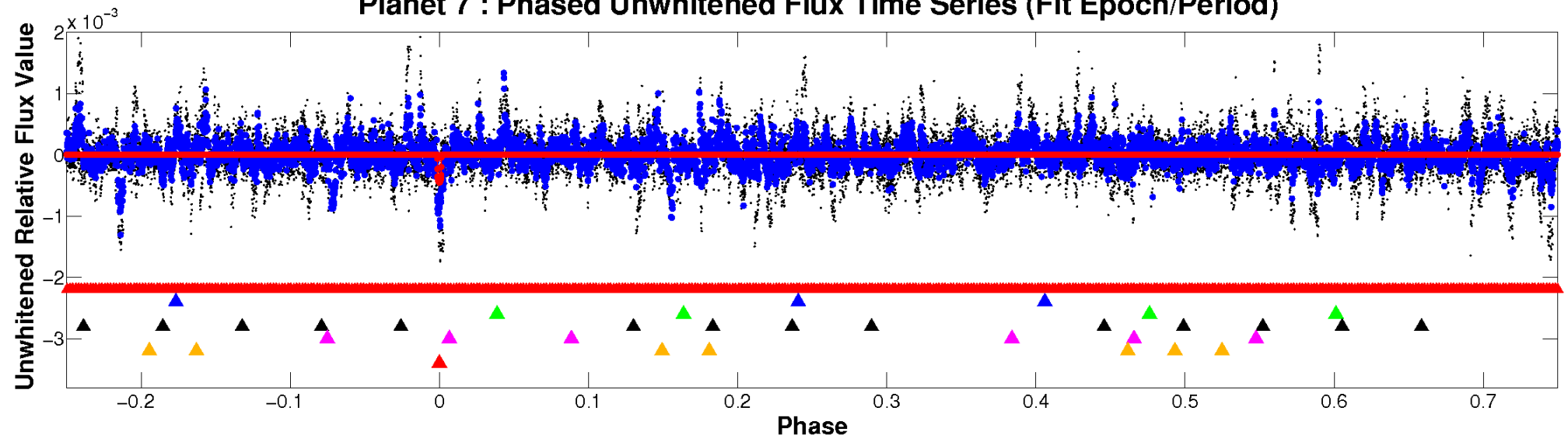
# ALT Odd/Even

TCE 007431887-07

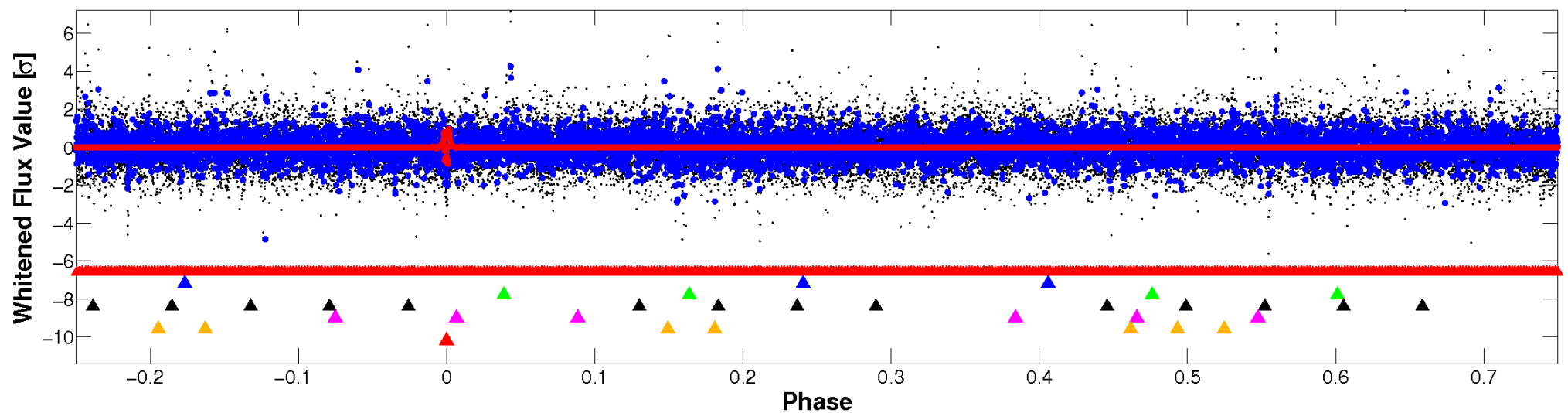


# Non-Whitened Vs. Whitened Light Curve

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



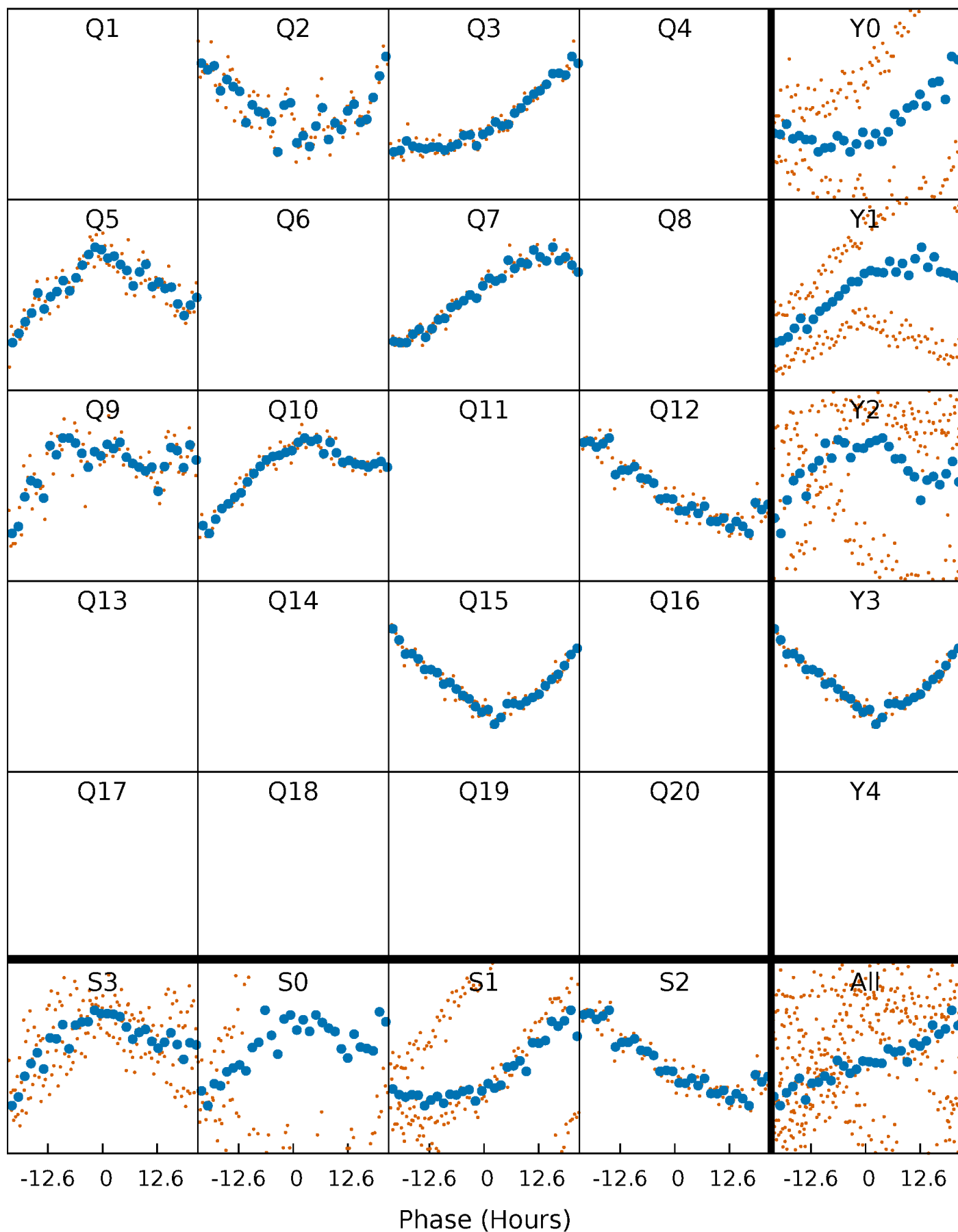
## Planet 7 : Phased Whitened Flux Time Series (Fit Epoch/Period)





# PDC Quarter-Phased Transit Curves

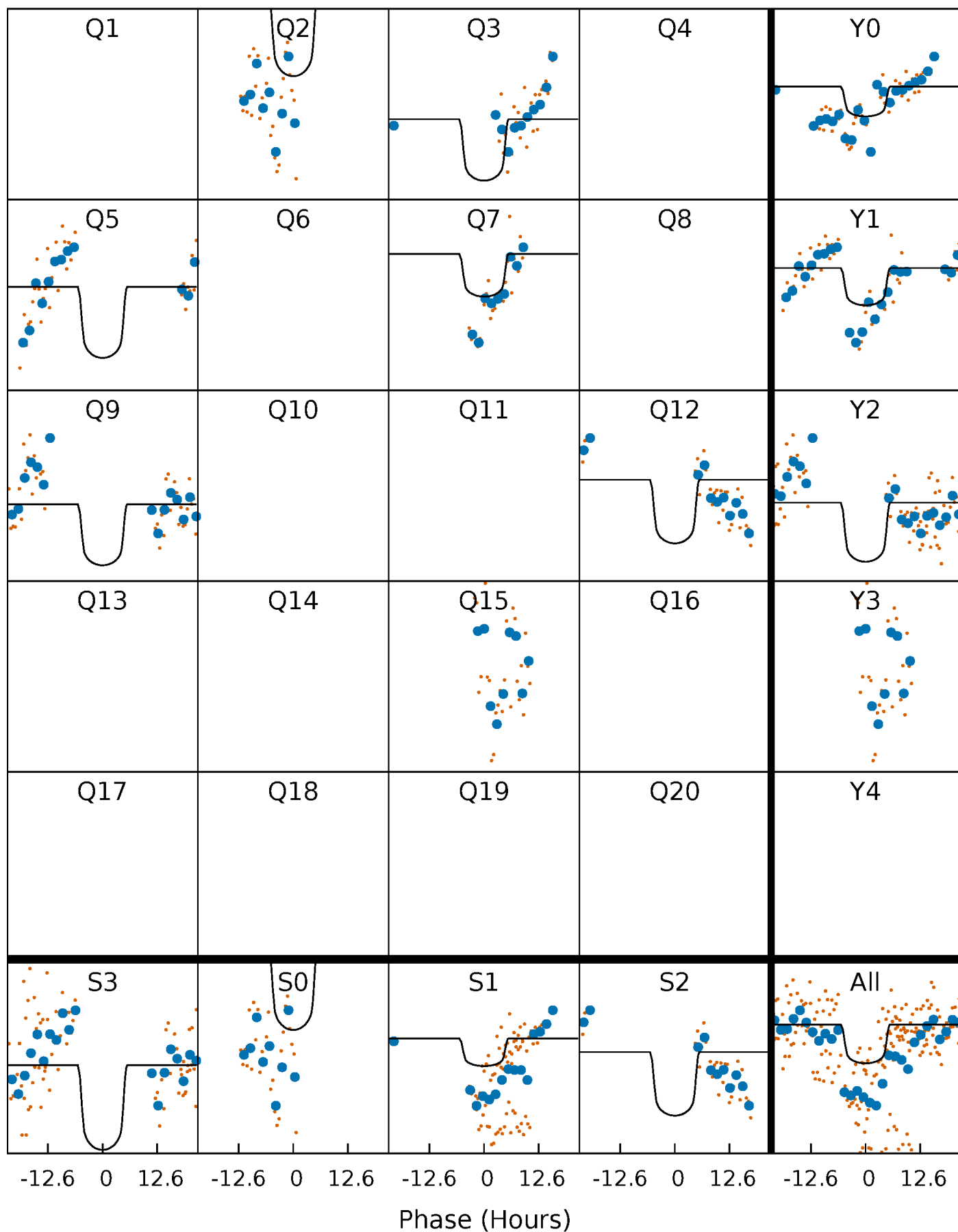
TCE 007431887-07     $P=159.383586$  Days     $T_0=176.419960$  (BKJD)





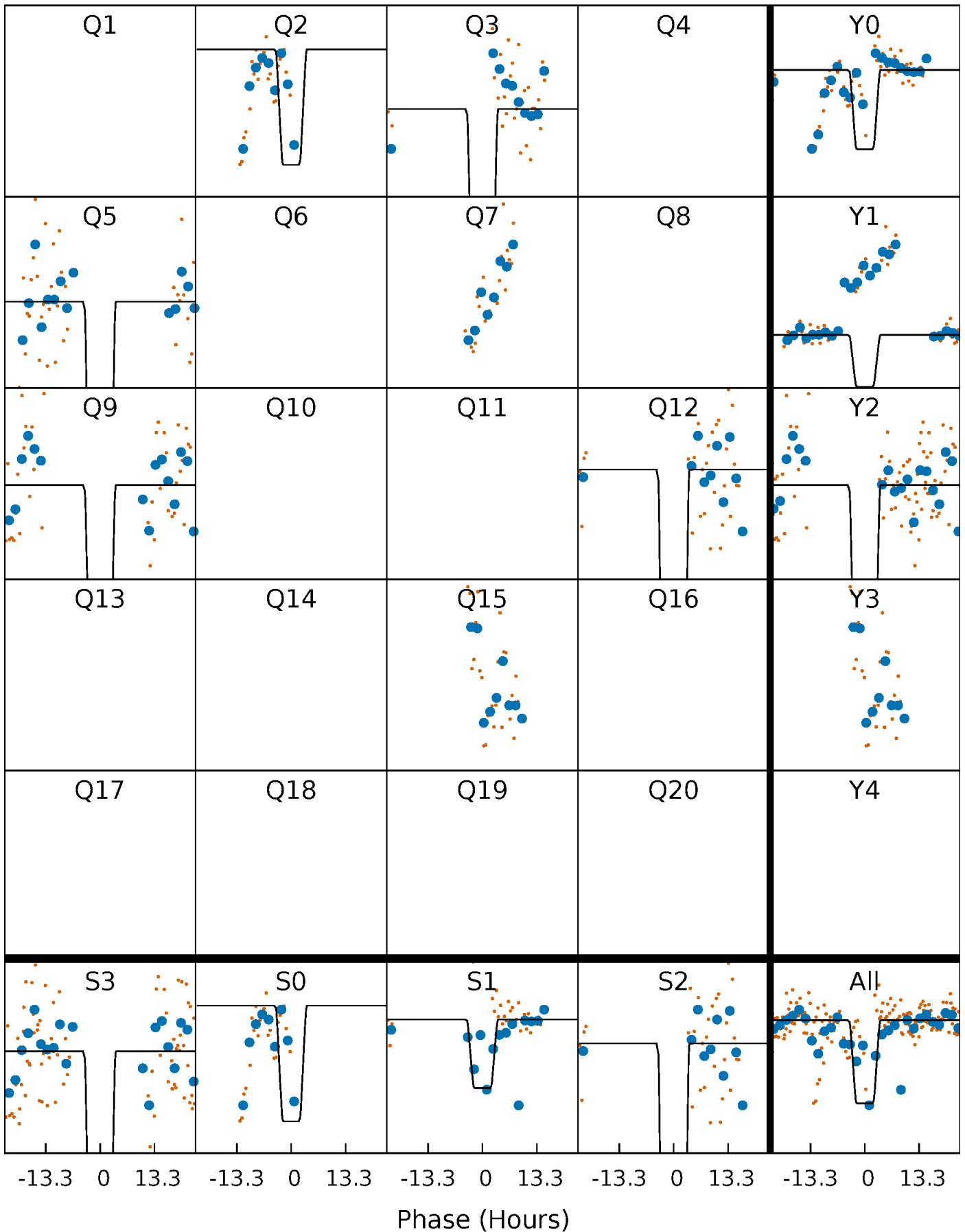
# DV Quarter-Phased Transit Curves

TCE 007431887-07     $P=159.383586$  Days     $T_0=176.419960$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

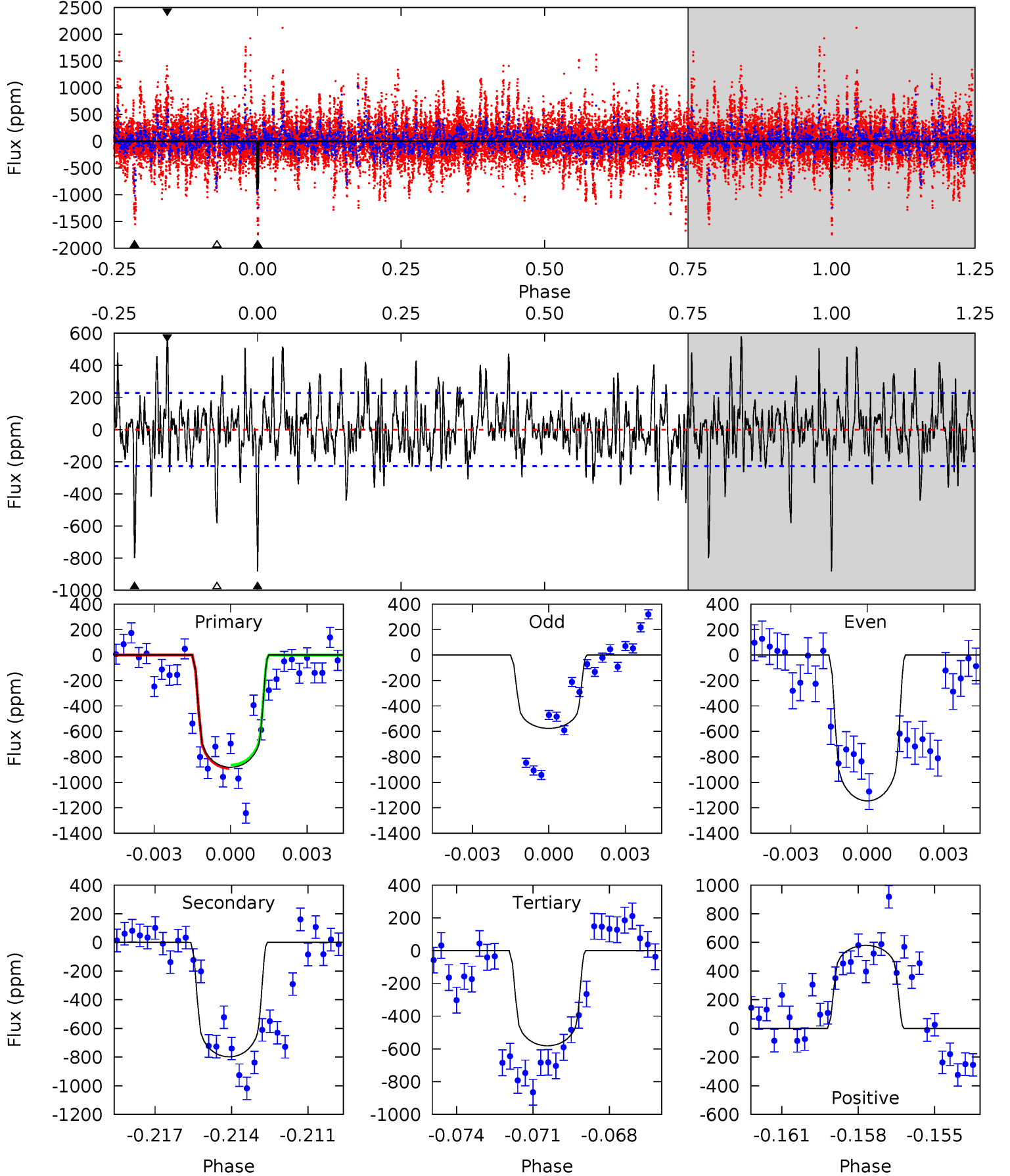
TCE 007431887-07     $P=159.388579$  Days     $T_0=176.437862$  (BKJD)



# DV Model-Shift Uniqueness Test

007431887-07, P = 159.383586 Days, E = 17.036374 Days

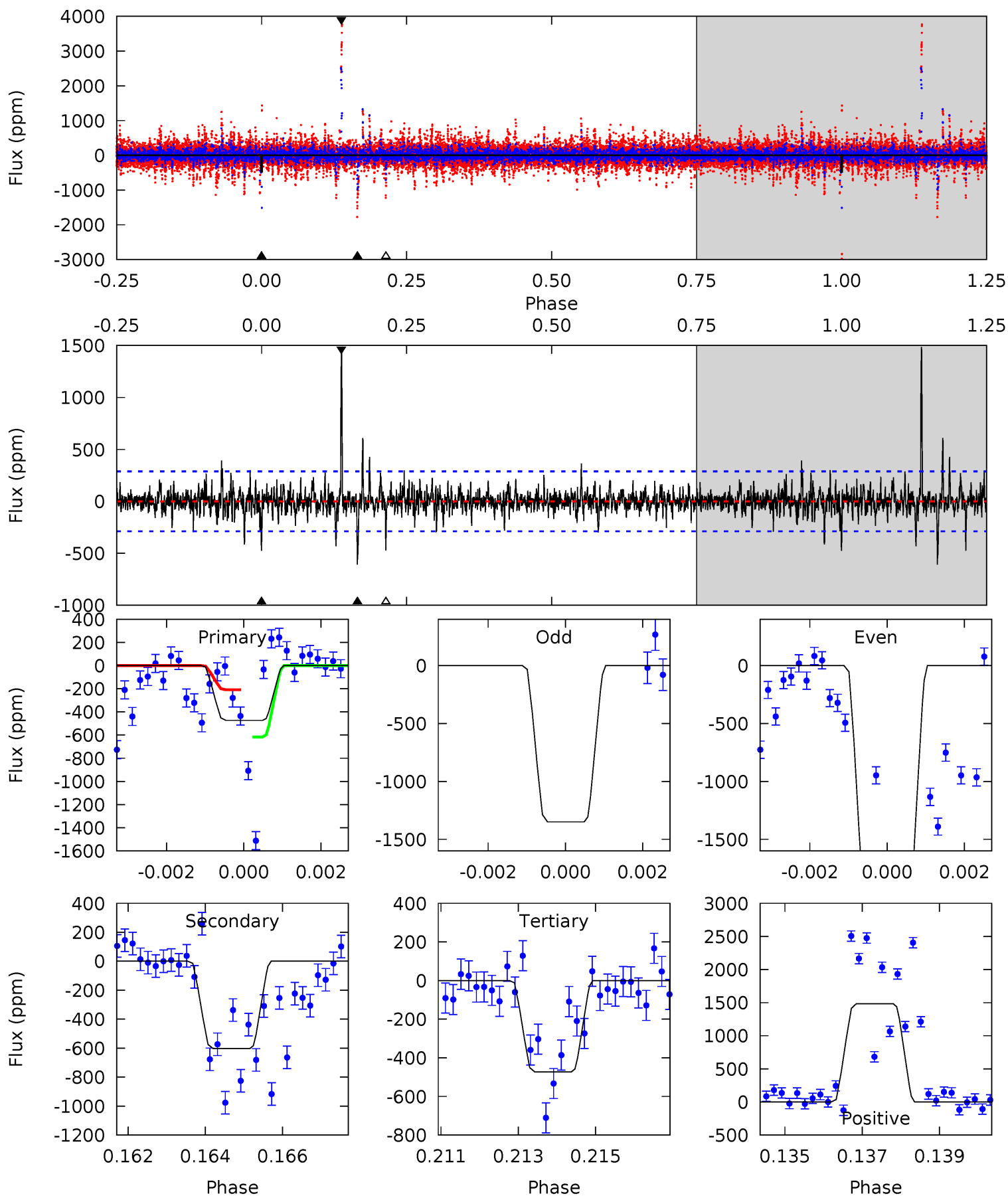
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
20.4	18.5	13.4	13.4	5.25	2.97	3.47	6.94	6.98	5.02	5.06	6.39	0.82	0.40	0.30



# Alt Model-Shift Uniqueness Test

007431887-07,  $P = 159.388579$  Days,  $E = 17.049283$  Days

Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
8.76	11.2	8.75	27.5	5.33	3.10	1.73	0.01	-18.7	2.41	-16.3	10.7	-6.66	0.71	0



### Stellar Parameters For KIC 007431887

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$6267^{+169}_{-188}$	$4.334^{+0.132}_{-0.198}$	$-0.360^{+0.300}_{-0.300}$	$1.118^{+0.340}_{-0.183}$	$0.981^{+0.160}_{-0.107}$	$0.990^{+0.672}_{-0.488}$
	+3%/-3%	+3%/-5%	+83%/-83%	+30%/-16%	+16%/-11%	+68%/-49%
Source	PHO1	KIC0	KIC0	DSEP		

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

### Secondary Eclipse Parameters for KIC 007431887-07 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$-798 \pm 43$	$2.83^{+0.56}_{-0.47}$	$542^{+43}_{-29}$	$7062^{+608}_{-570}$	$18192^{+7546}_{-5567}$
Alt.	$-603 \pm 54$	$4.08^{+0.72}_{-0.58}$	$541^{+42}_{-31}$	$5441^{+327}_{-288}$	$6556^{+2259}_{-1855}$

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

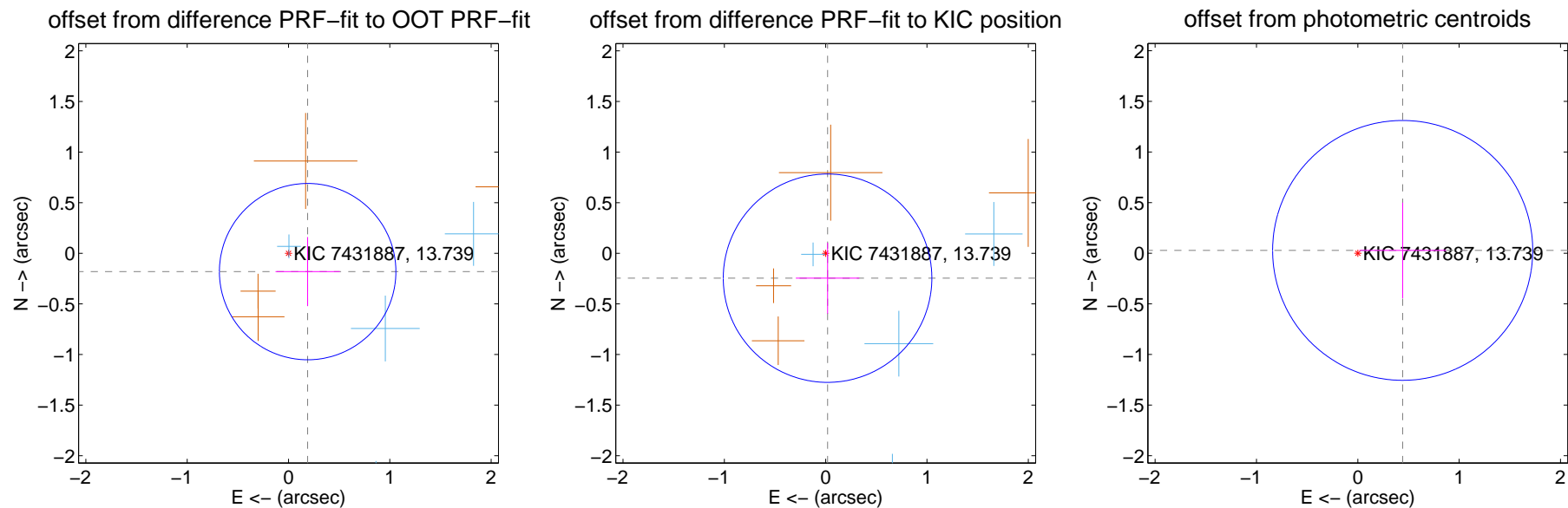
## DV Centroid Data

Supplemental centroid analysis for 007431887-07. Kepler magnitude: 13.74. Transit SNR 5.97

There are 4 quarters with good PRF difference image offsets

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

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.262 \pm 0.290$	0.90	$-0.189 \pm 0.317$	$-0.181 \pm 0.341$
PRF-fit source offset from KIC position	$0.247 \pm 0.343$	0.72	$-0.019 \pm 0.313$	$-0.246 \pm 0.350$
photometric centroid source offset	$0.44 \pm 0.43$	1.04	$-0.44 \pm 0.43$	$0.03 \pm 0.47$



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

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

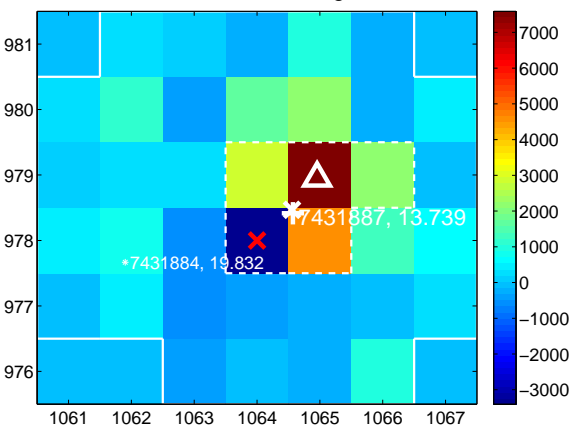
Q1 no difference image



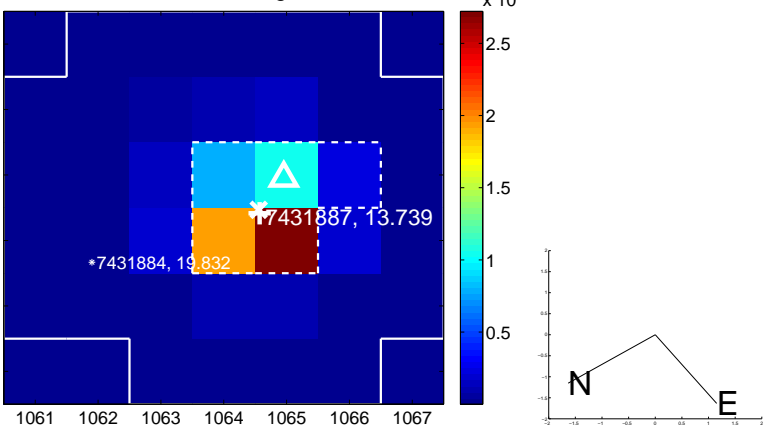
Q1 no OOT image



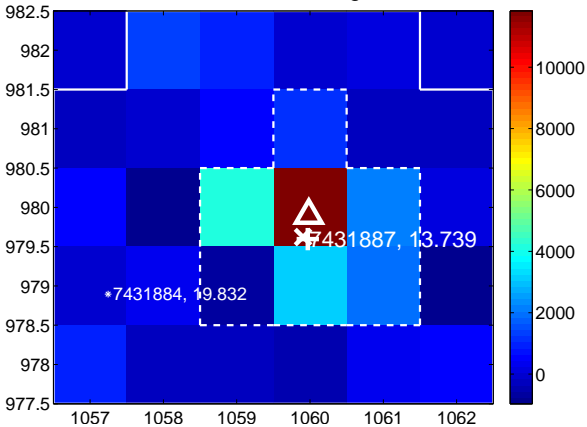
Q2 difference image



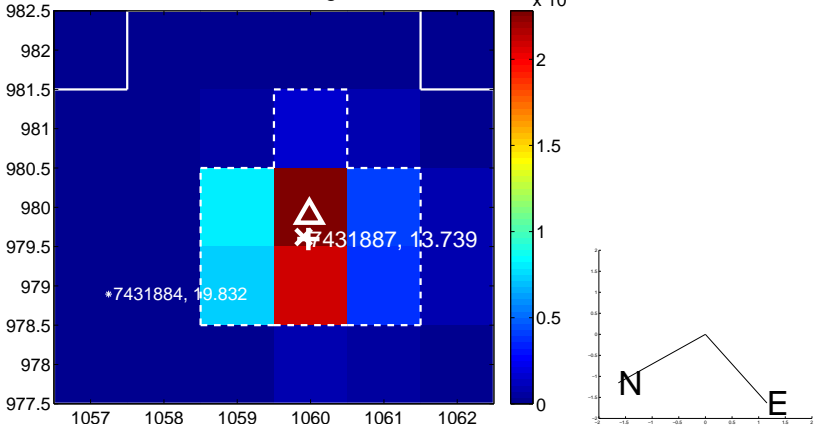
Q2 OOT image



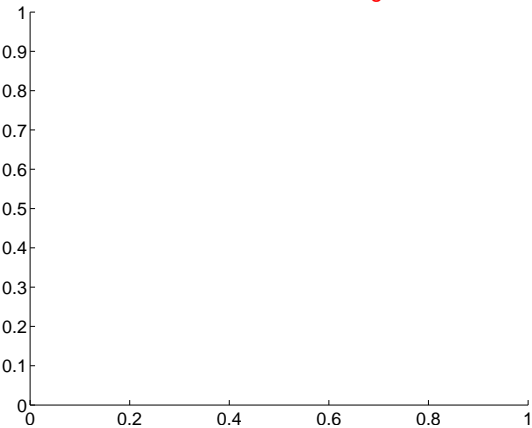
Q3 difference image



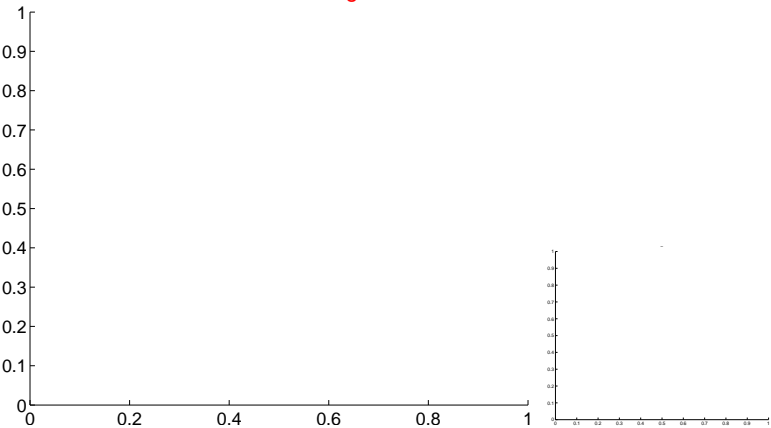
Q3 OOT image



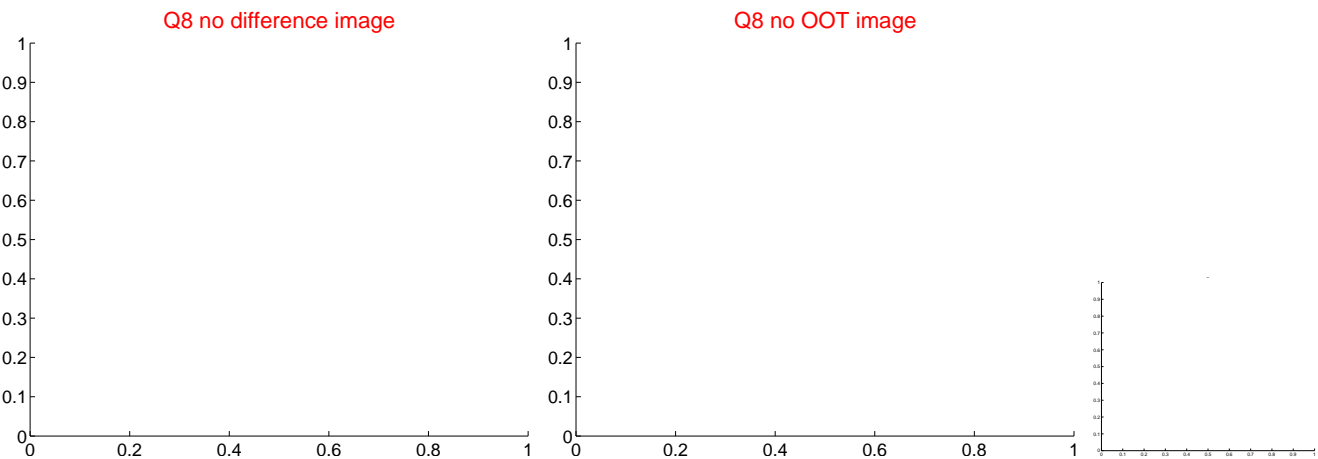
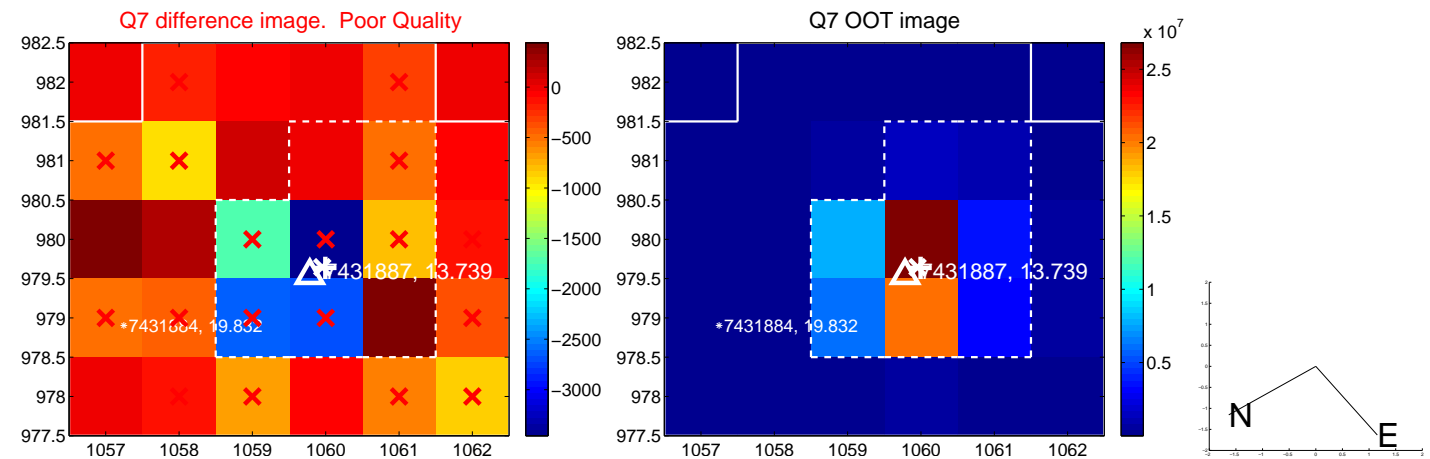
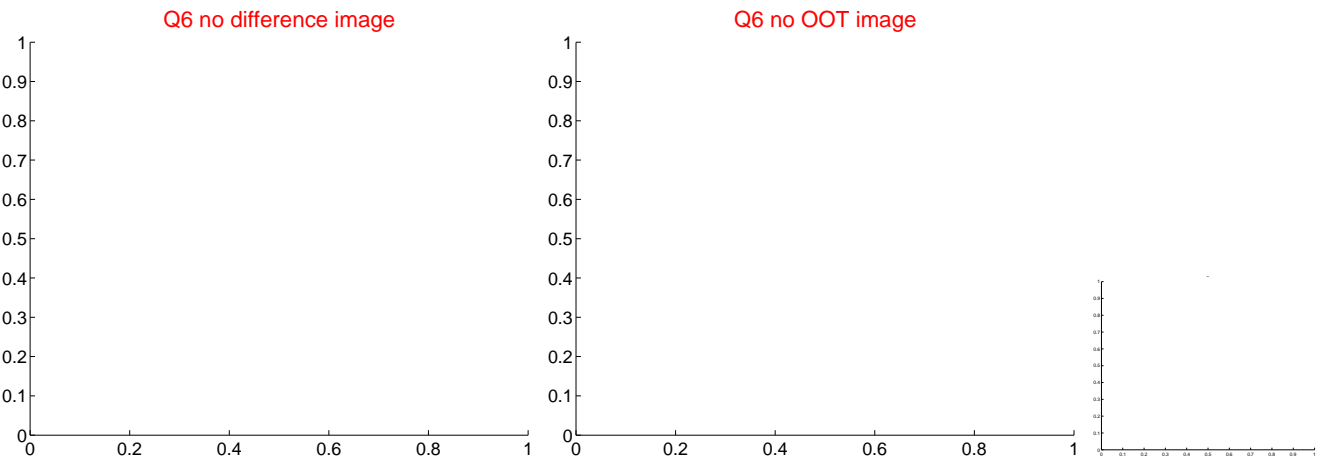
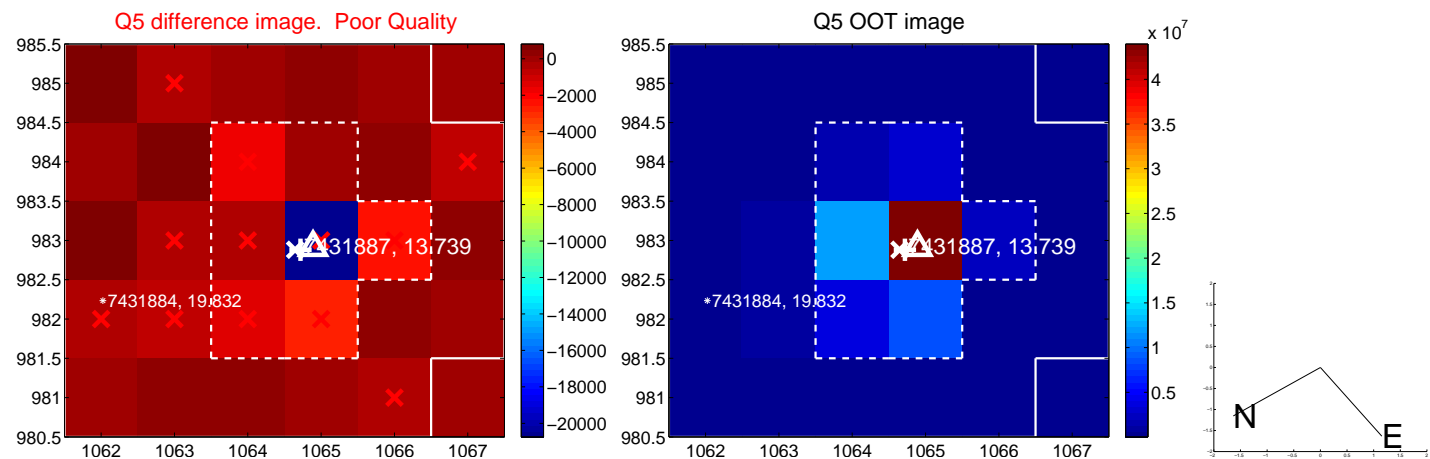
Q4 no difference image



Q4 no OOT image

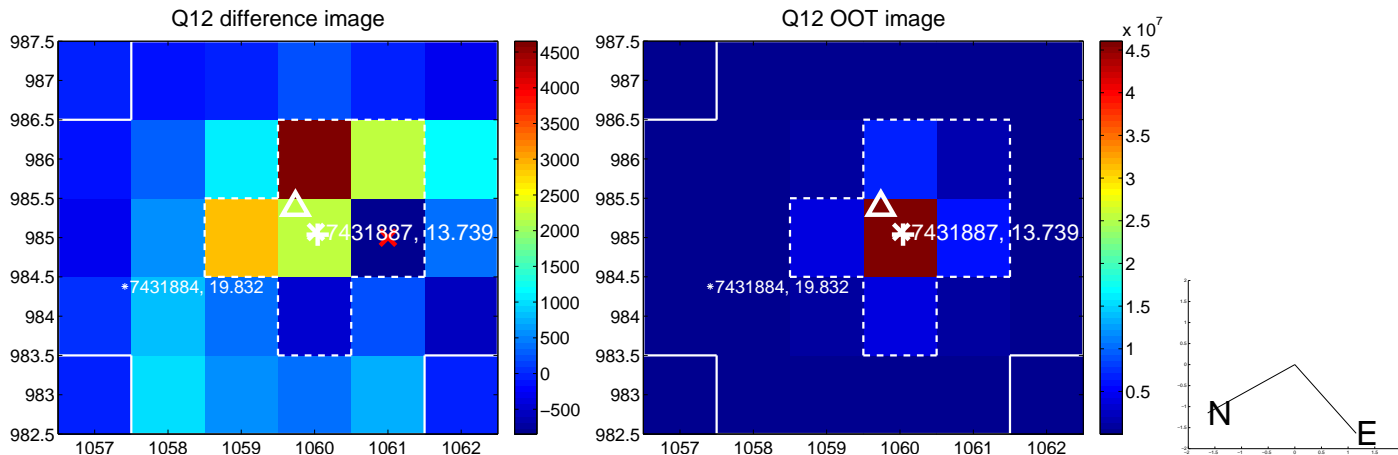
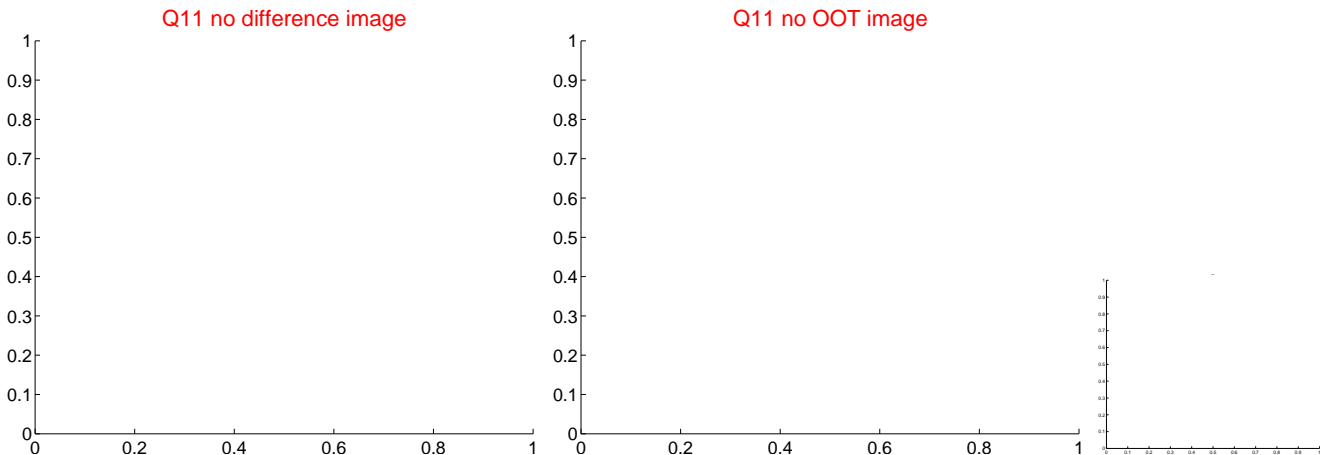
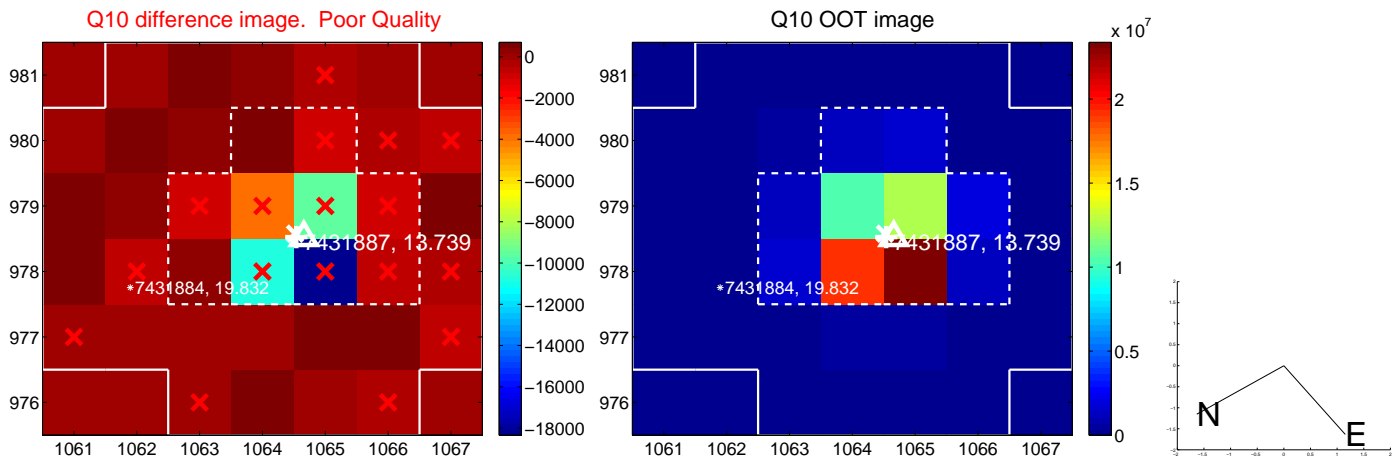
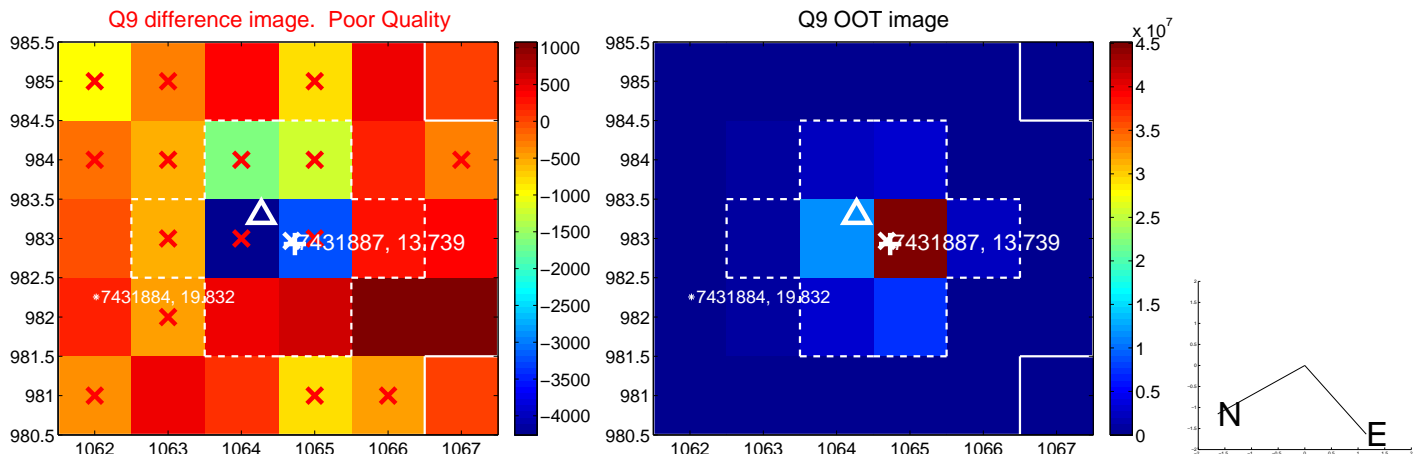


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.





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



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

Q13 no difference image



Q13 no OOT image



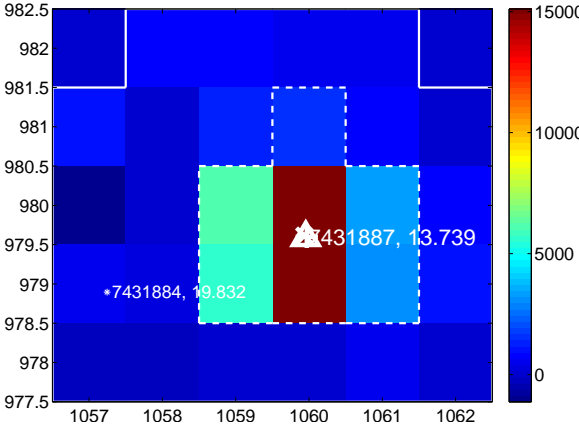
Q14 no difference image



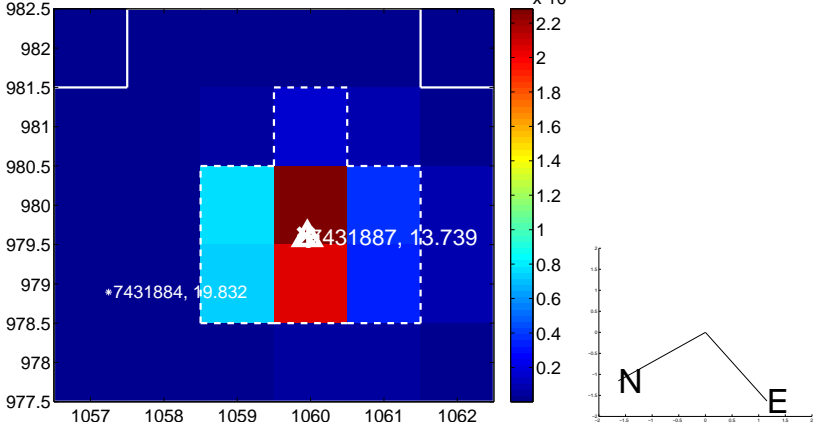
Q14 no OOT image



Q15 difference image



Q15 OOT image



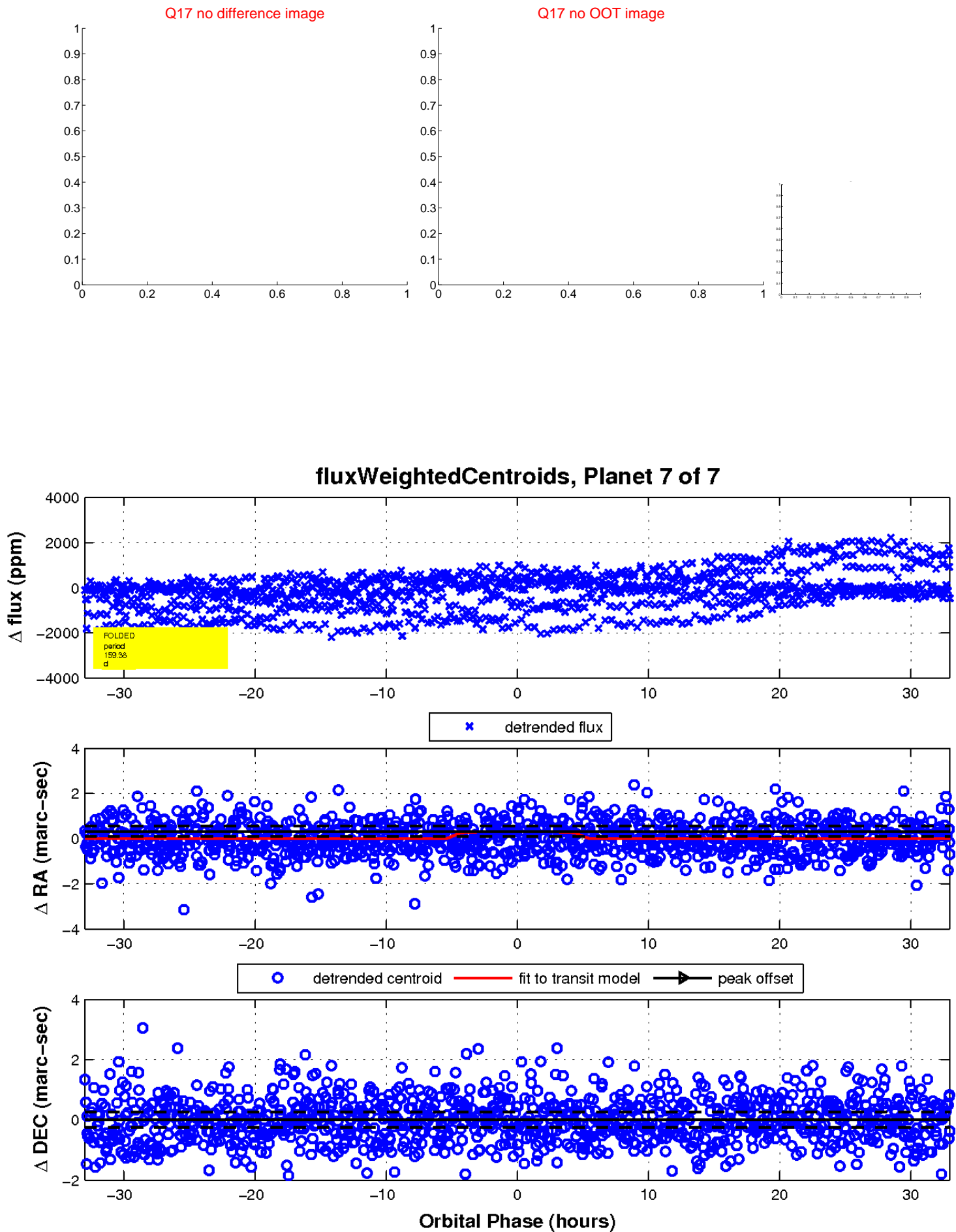
Q16 no difference image



Q16 no OOT image



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



# UKIRT Image

Declination

