

# KIC 001576115

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
001576115-01	OBS	No	0.970028	132.255540	447.1	5.104	16.7	17.4	2.00	8254	5.47	30899.18
001576115-02	OBS	No	0.970059	132.001147	688.6	9.684	19.4	19.1	2.00	8254	6.10	30897.85

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
001576115-01	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT
001576115-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_SKYE_ZUMA—LPP_DV—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—SAME_NTL_PERIOD—CENT_FEW_DIFFS

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

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

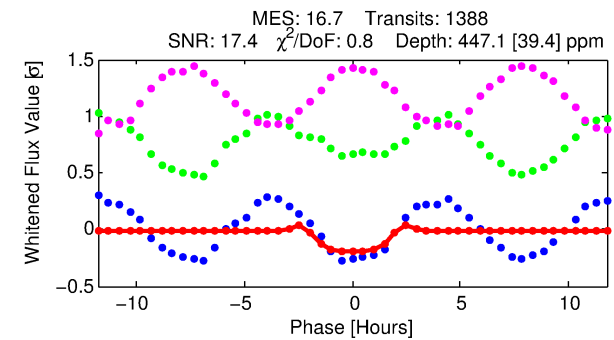
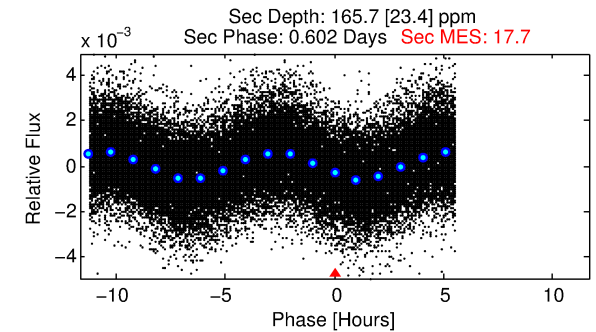
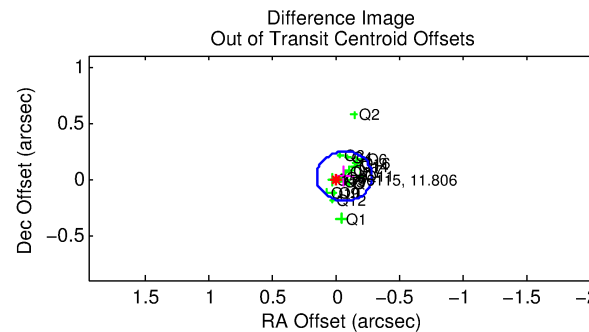
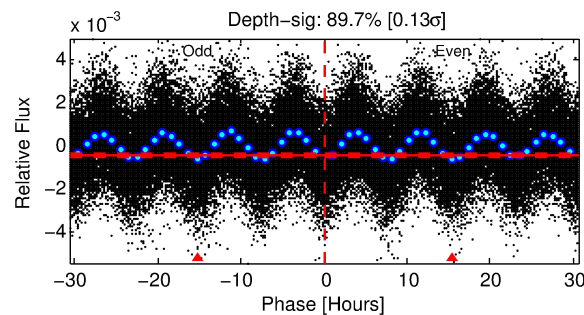
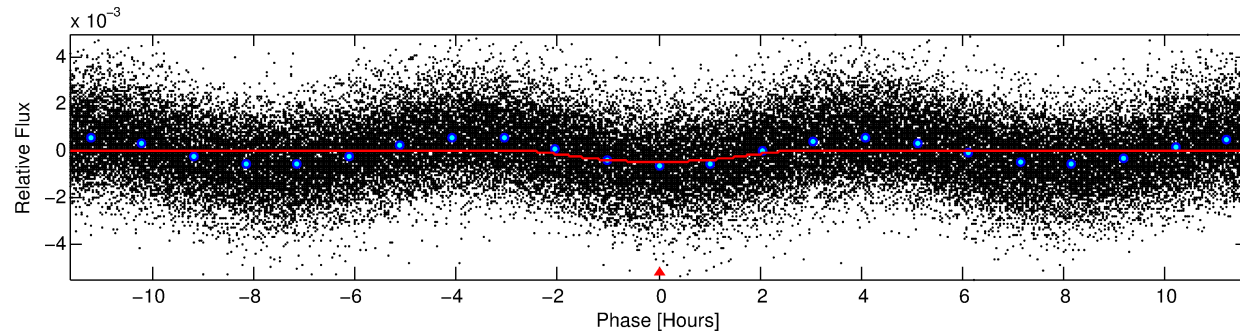
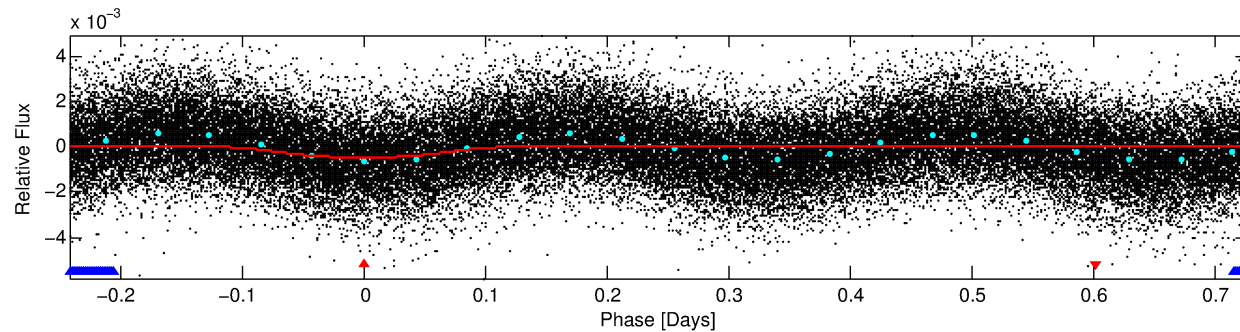
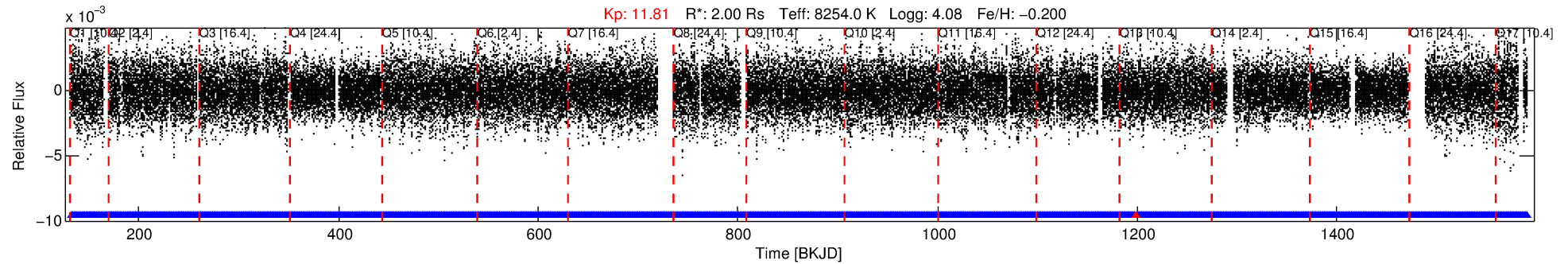
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 001576115-01

No Significant Match Found

# DV One-Page Summary

KIC: 1576115 Candidate: 1 of 2 Period: 0.970 d



## DV Fit Results:

Period = 0.97003 [0.00001] d  
Epoch = 132.2555 [0.0028] BKJD  
Rp/R\* = 0.0251 [0.0015]  
a/R\* = 1.09 [0.01]  
b = 0.98 [0.00]  
Seff = 30899.18 [10057.75]  
Teq = 3381 [275] K  
Rp = 5.47 [1.26] Re  
a = 0.0232 [0.0044] AU  
Ag = 1.63 [0.55] [1.16 $\sigma$ ]  
Teffp = 5908 [363] K [5.55 $\sigma$ ]

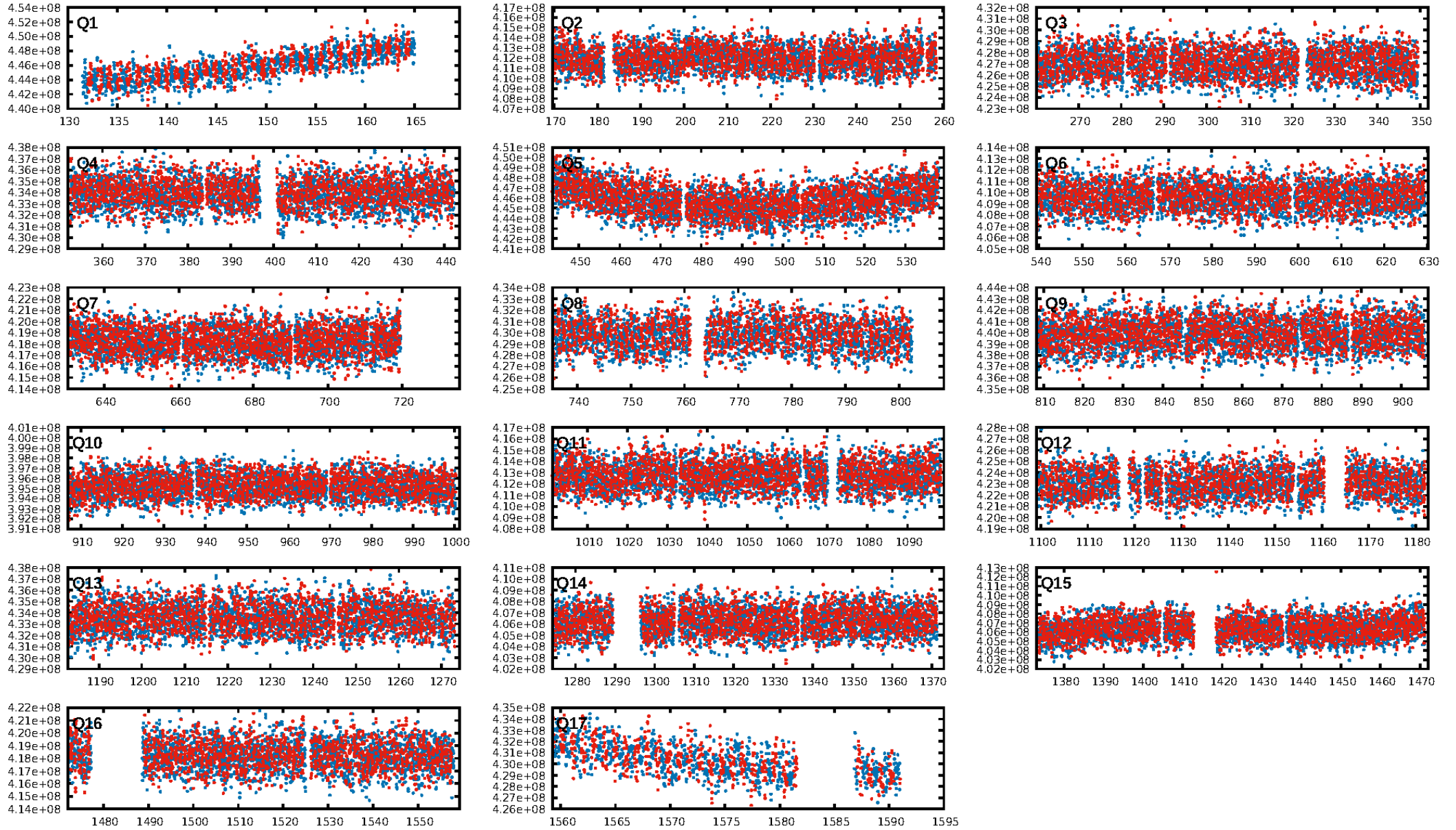
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 0.0% [0.00 $\sigma$ ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: N/A  
RollingBand-fgt: 1.00 [1325/1326]  
GhostDiagnostic-chr: -14.46  
Centroid-sig: 30.1%  
Centroid-so: 0.609 arcsec [7.93 $\sigma$ ]  
OotOffset-rm: 0.068 arcsec [0.93 $\sigma$ ]  
KicOffset-rm: 0.209 arcsec [2.63 $\sigma$ ]  
OotOffset-st: 4/4/4/5 [17]  
KicOffset-st: 4/4/4/5 [17]  
DiffImageQuality-fgm: 1.00 [17/17]  
DiffImageOverlap-fno: 0.00 [0/17]

Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 02-Feb-2016 00:23:08 Z

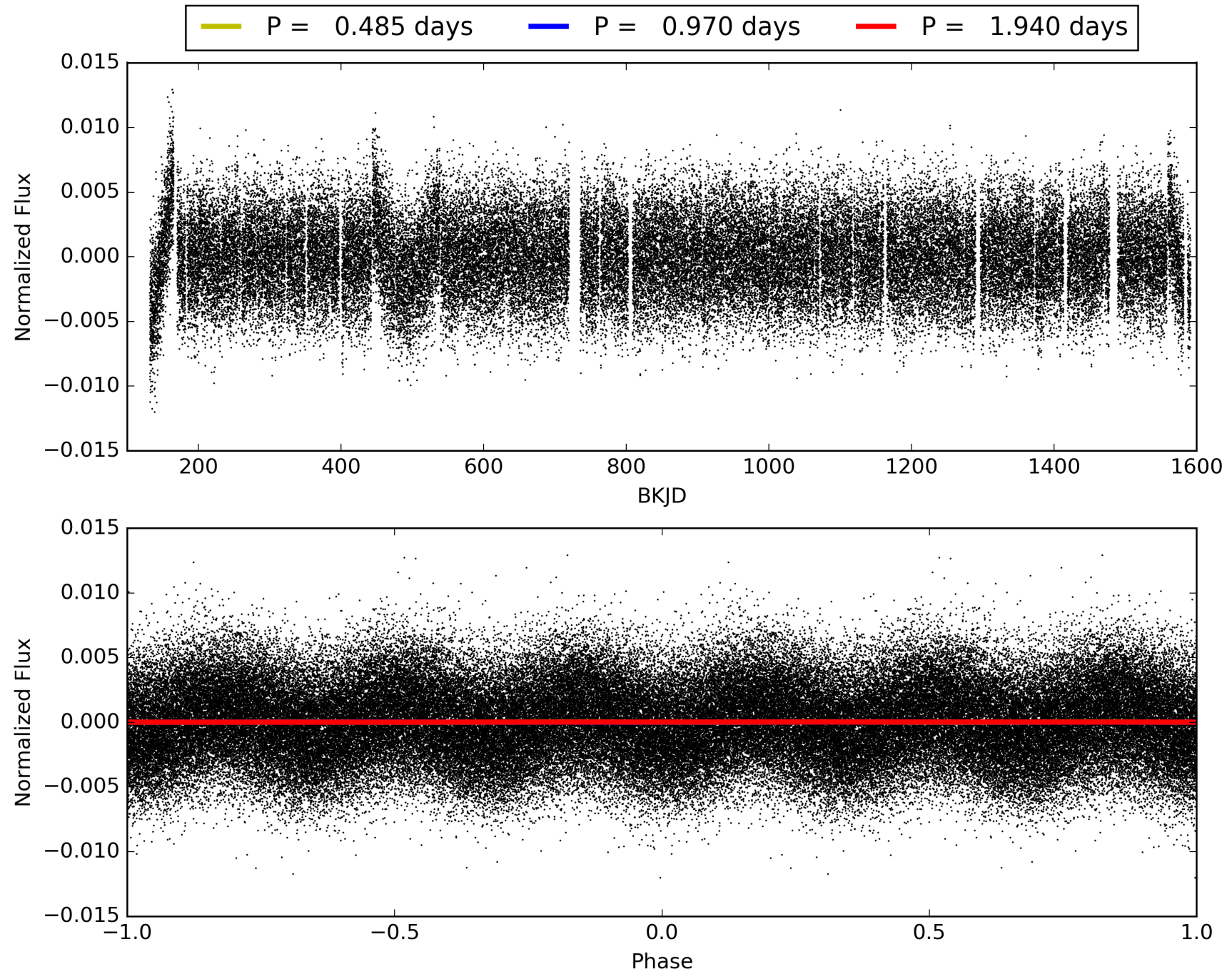
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

# TCE 001576115-01, PDC Light Curves



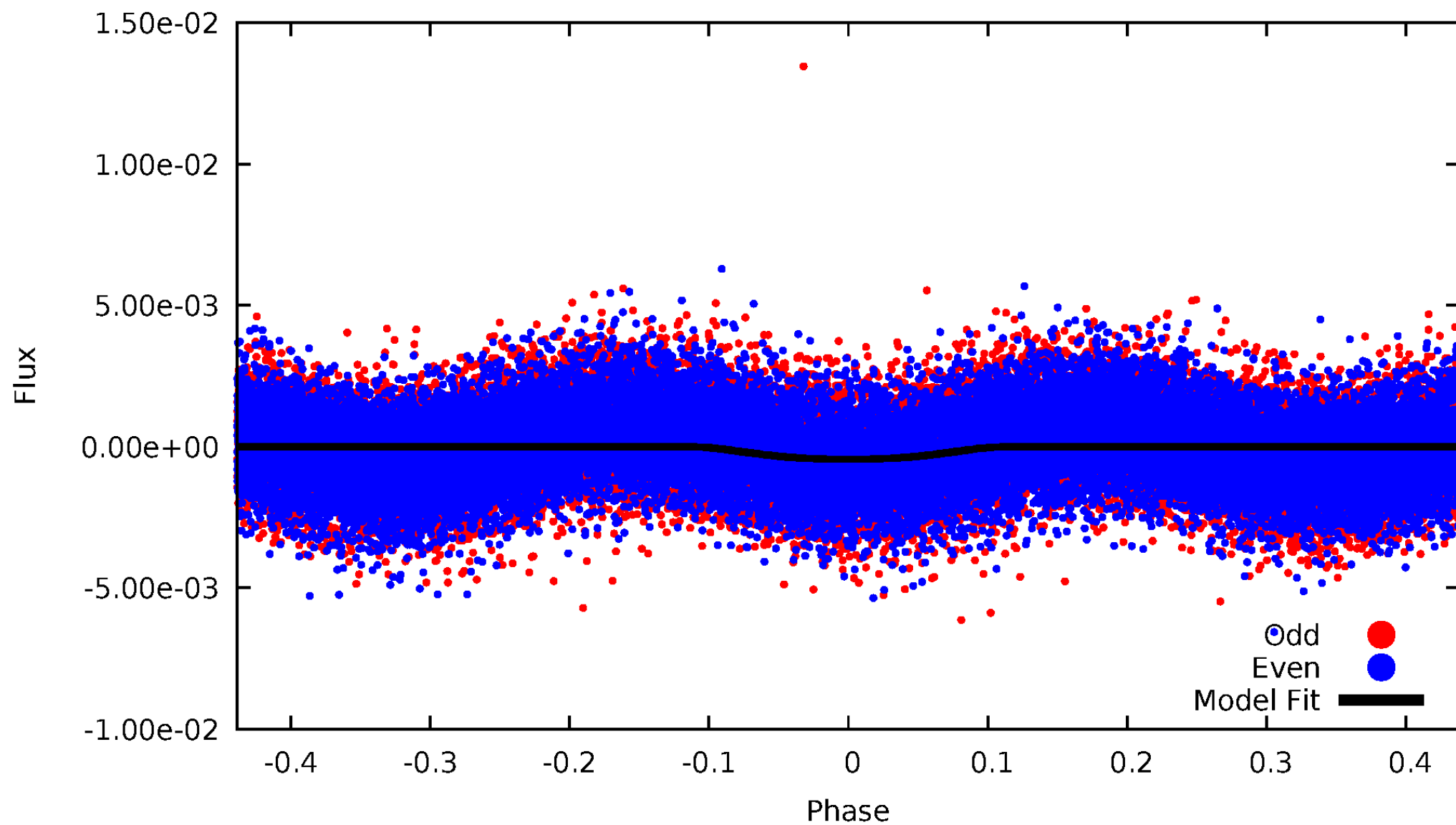


TCE 001576115-01



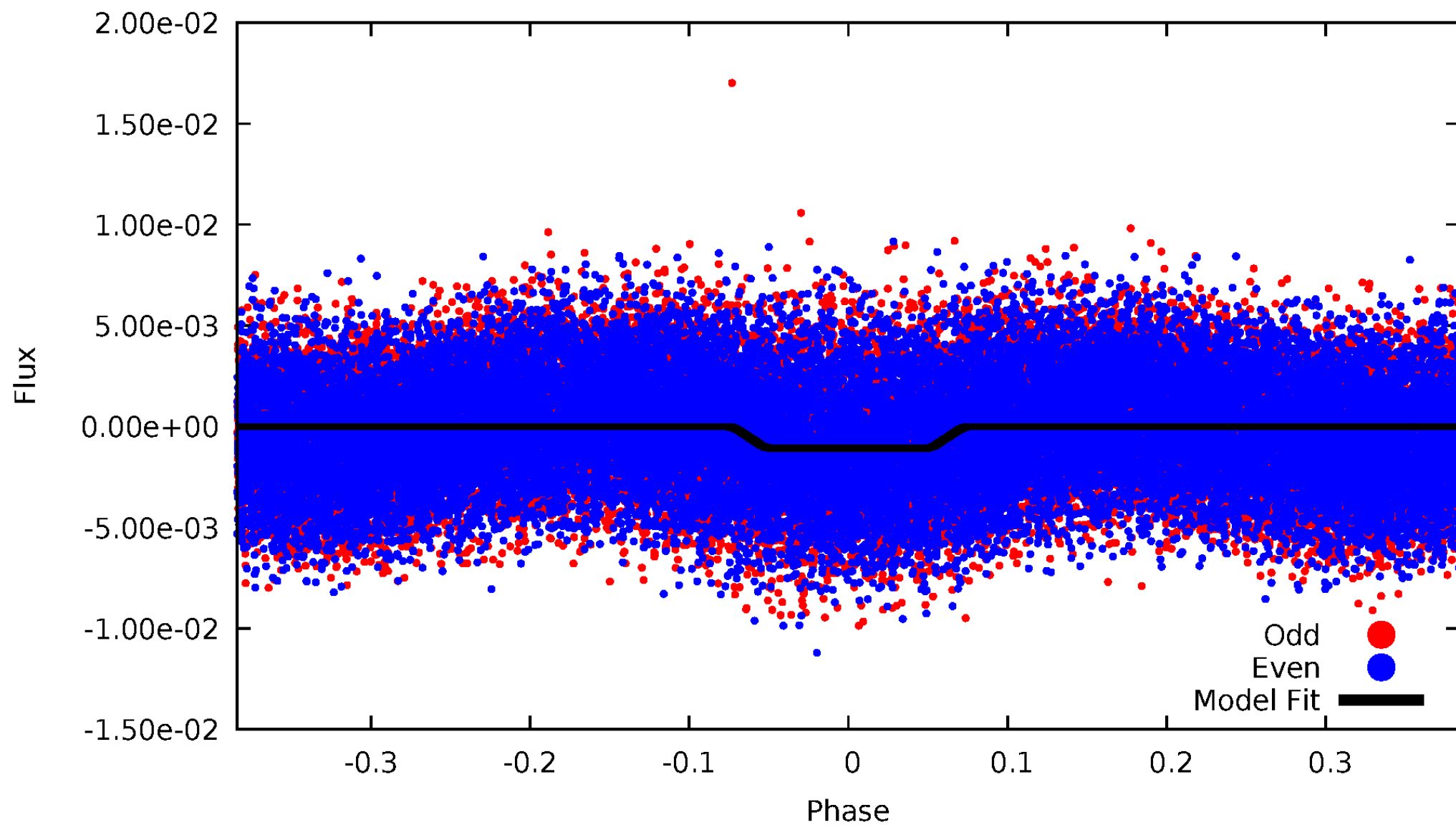
# DV Odd/Even

TCE 001576115-01



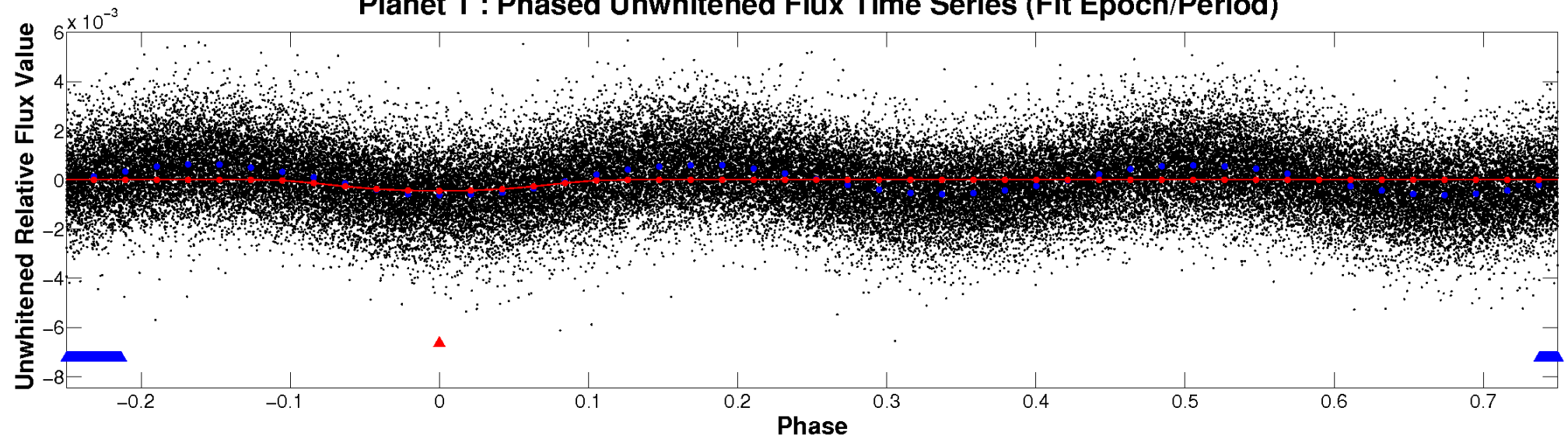
# ALT Odd/Even

TCE 001576115-01

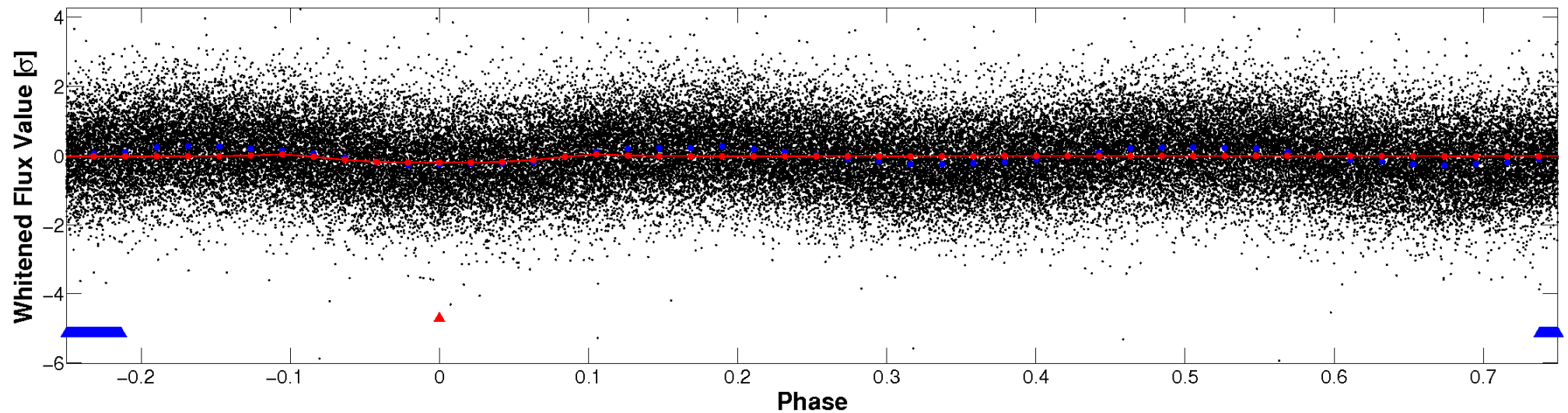


# Non-Whitened Vs. Whitened Light Curve

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



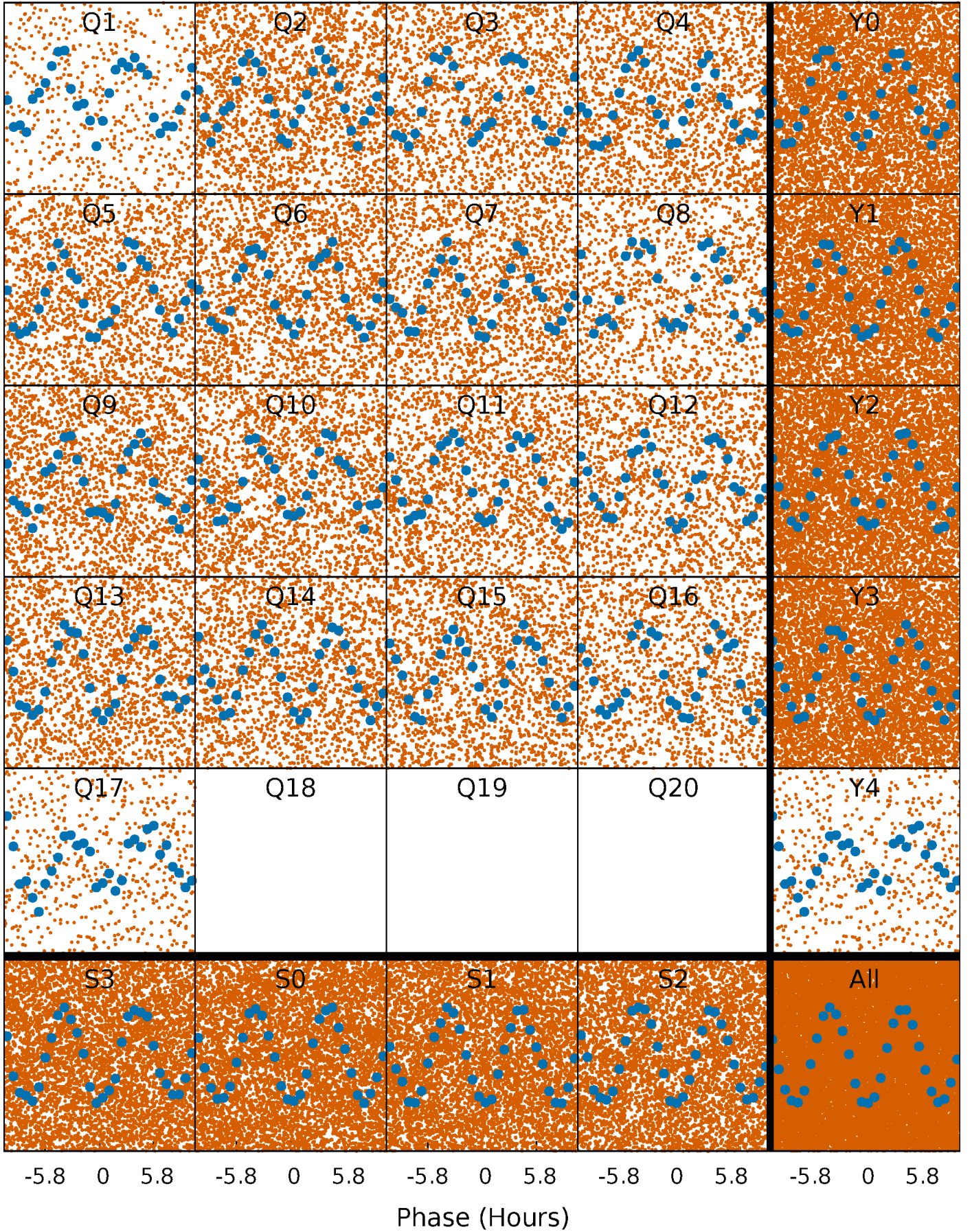
## Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)





# PDC Quarter-Phased Transit Curves

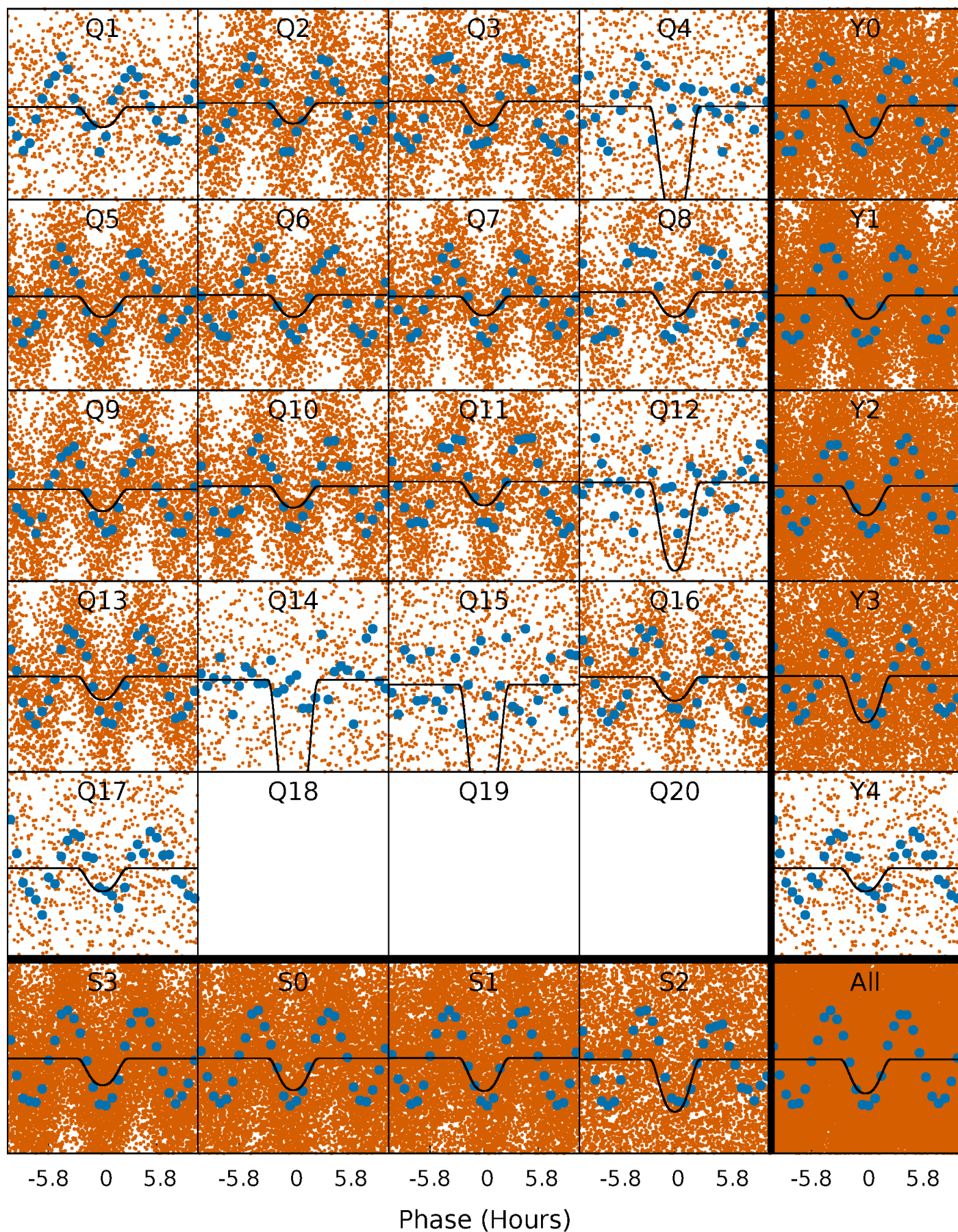
TCE 001576115-01 P= 0.970028 Days  $T_0=132.255540$  (BKJD)





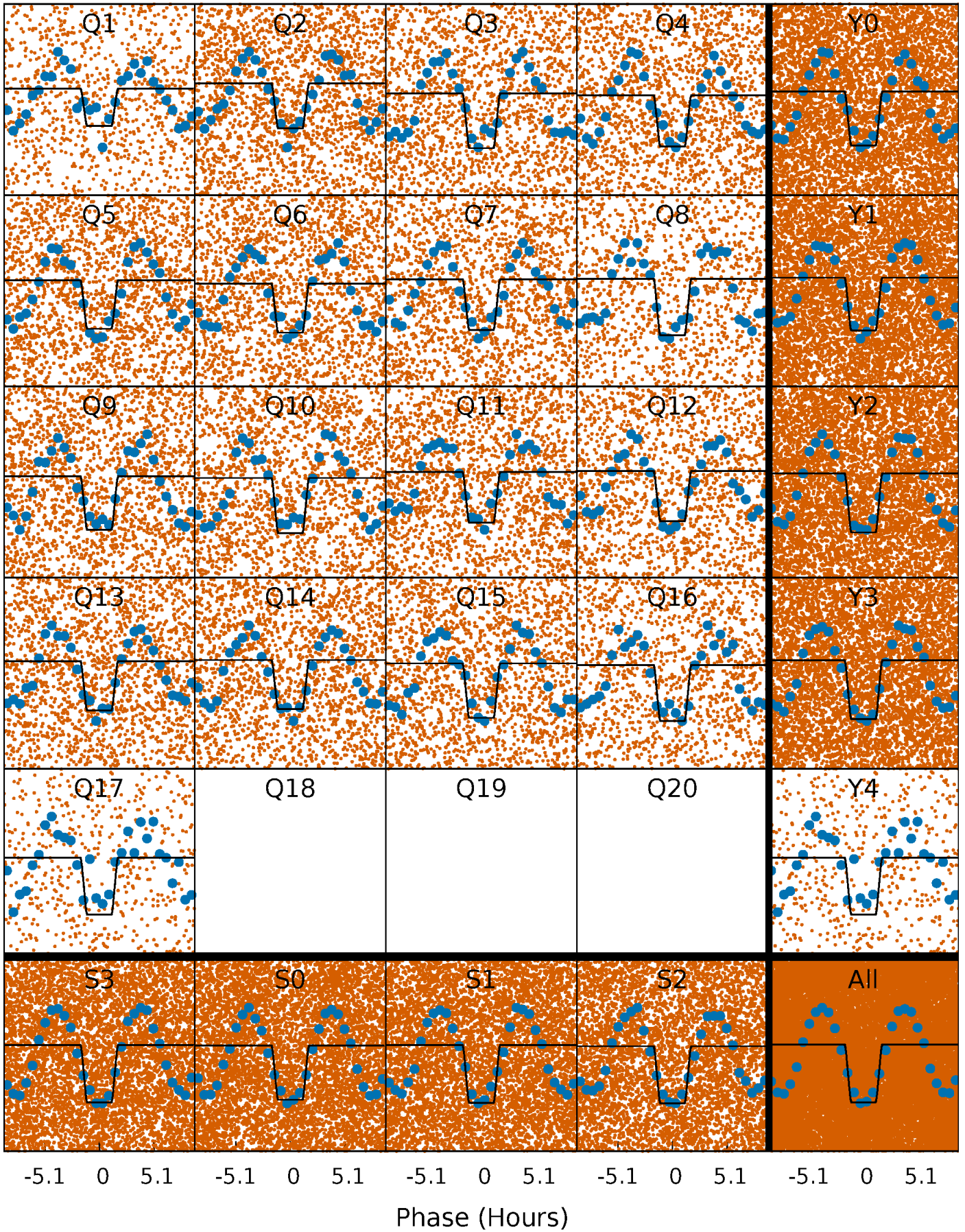
# DV Quarter-Phased Transit Curves

TCE 001576115-01 P= 0.970028 Days  $T_0=132.255540$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

TCE 001576115-01 P= 0.970077 Days  $T_0=132.230496$  (BKJD)

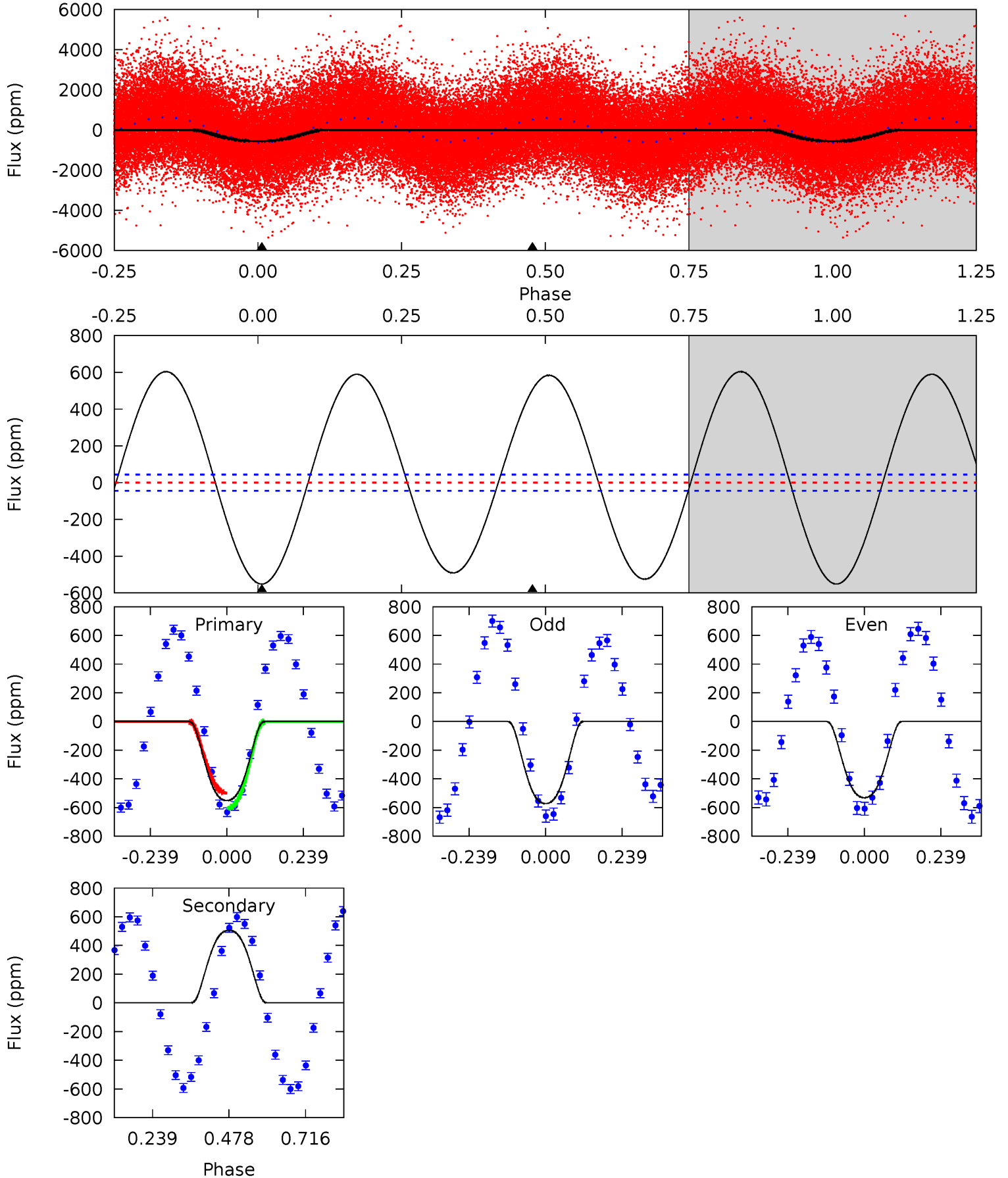




# DV Model-Shift Uniqueness Test

001576115-01, P = 0.970028 Days, E = 131.285512 Days

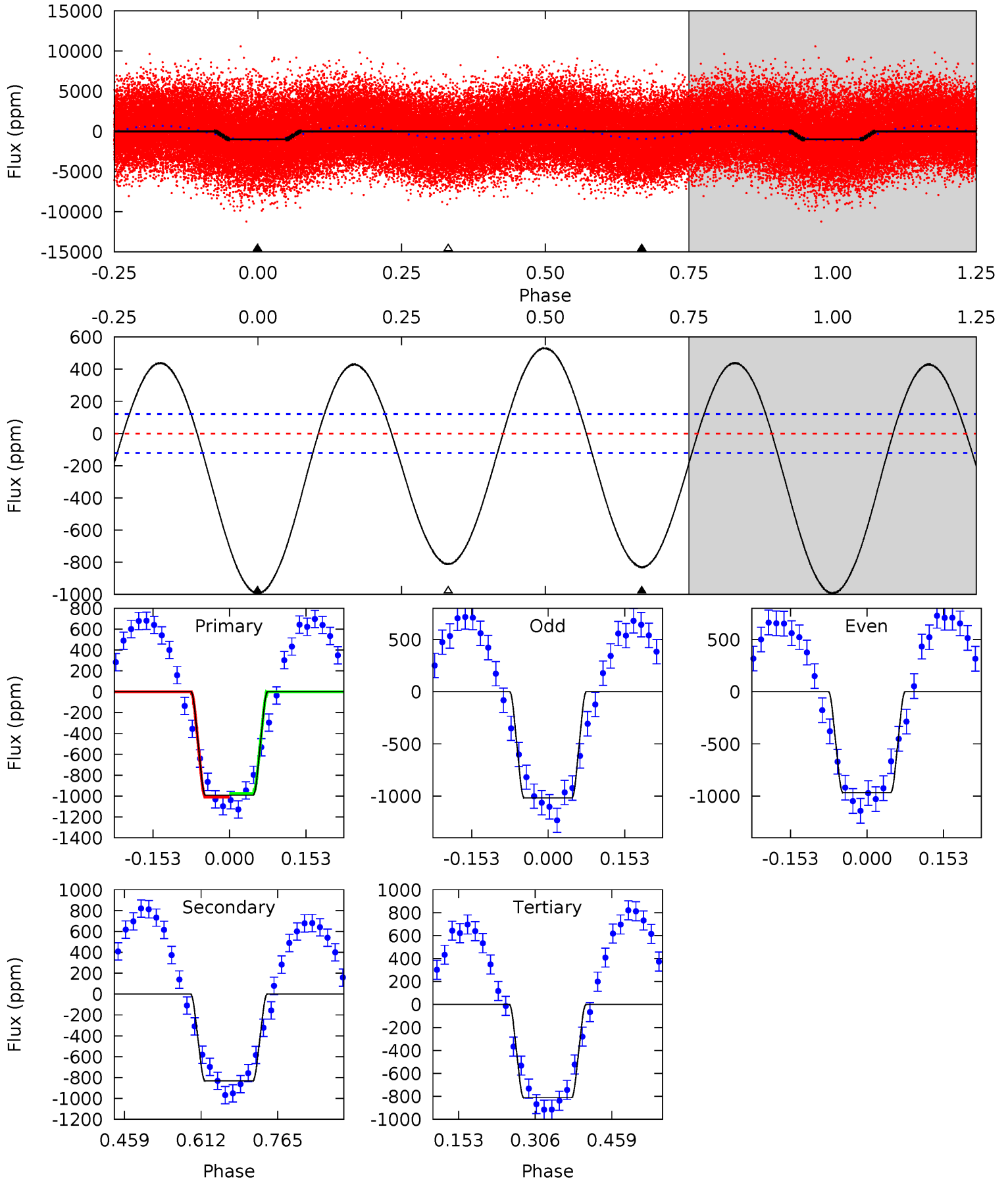
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
54.4	-49.8	0	0	4.38	1.18	22.7	54.4	54.4	-49.8	-49.8	2.02	0.98	0.52	5.30



# Alt Model-Shift Uniqueness Test

001576115-01, P = 0.970077 Days, E = 131.260419 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
36.9	30.9	30.2	0	4.47	1.43	17.7	6.72	36.9	0.73	30.9	0.92	0.92	0.35	0.62





### Stellar Parameters For KIC 001576115

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$8254^{+226}_{-340}$	$4.083^{+0.155}_{-0.139}$	$-0.200^{+0.250}_{-0.350}$	$1.996^{+0.446}_{-0.446}$	$1.757^{+0.146}_{-0.291}$	$0.311^{+0.282}_{-0.129}$
	+3%/-4%	+4%/-3%	+125%/-175%	+22%/-22%	+8%/-17%	+91%/-41%
Source	KIC0	KIC0	KIC0	DSEP		

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

### Secondary Eclipse Parameters for KIC 001576115-01 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$506 \pm 10$	$5.46^{+0.69}_{-0.70}$	$4699^{+302}_{-287}$	$-7809^{+388}_{-382}$	$-4.951^{+1.064}_{-1.408}$
Alt.	$-831 \pm 27$	$7.10^{+0.95}_{-0.97}$	$4675^{+328}_{-305}$	$7431^{+326}_{-353}$	$4.795^{+1.423}_{-1.081}$

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

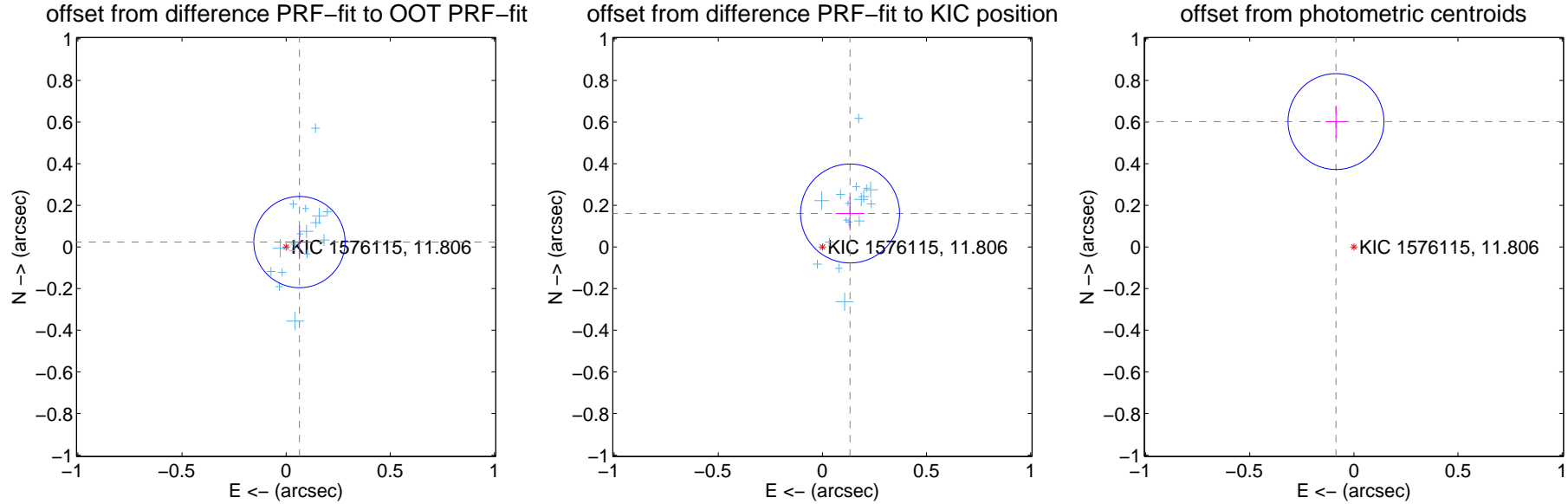
## DV Centroid Data

Supplemental centroid analysis for 001576115-01. **Kepler magnitude: 11.81.** Transit SNR 17.37

There are 17 quarters with good PRF difference image offsets

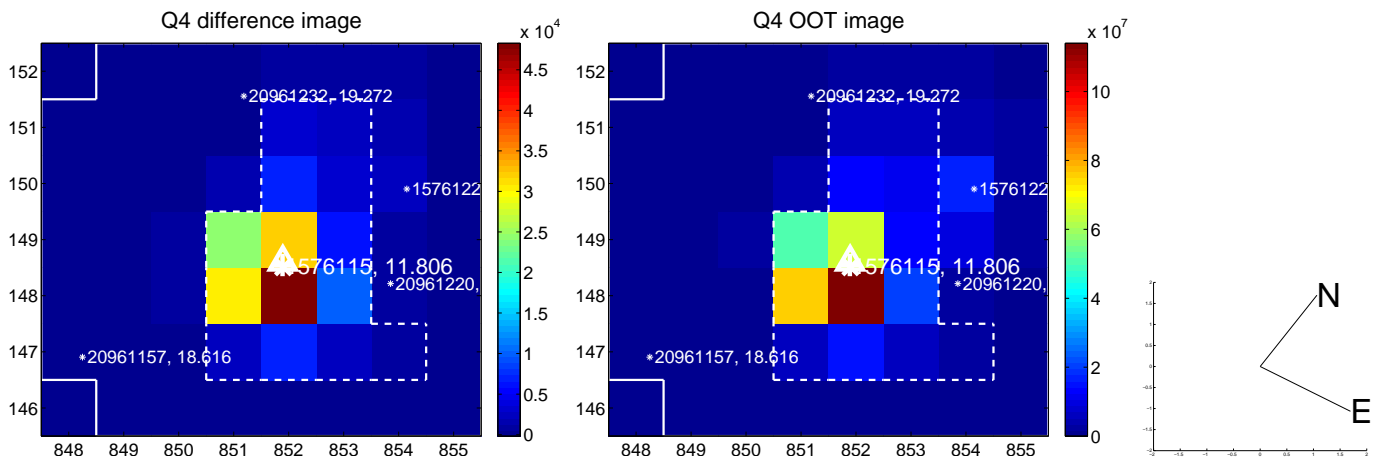
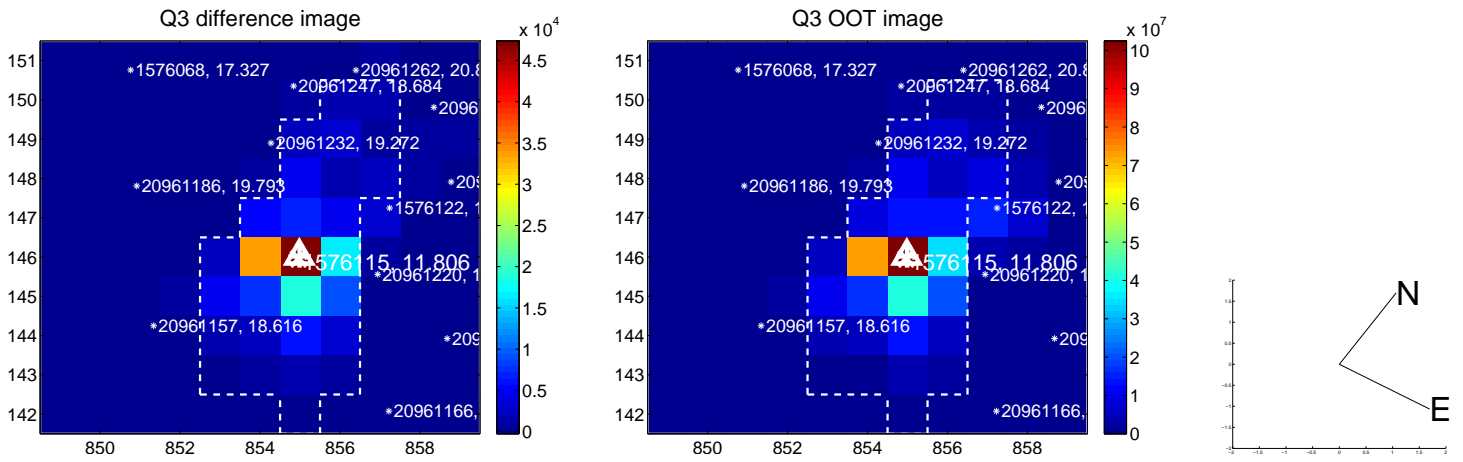
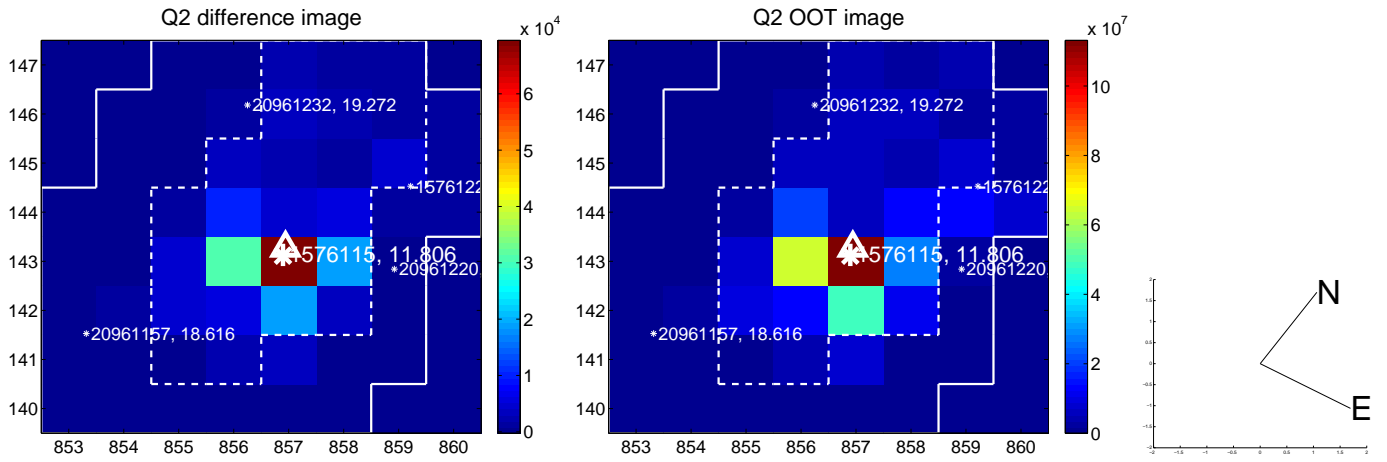
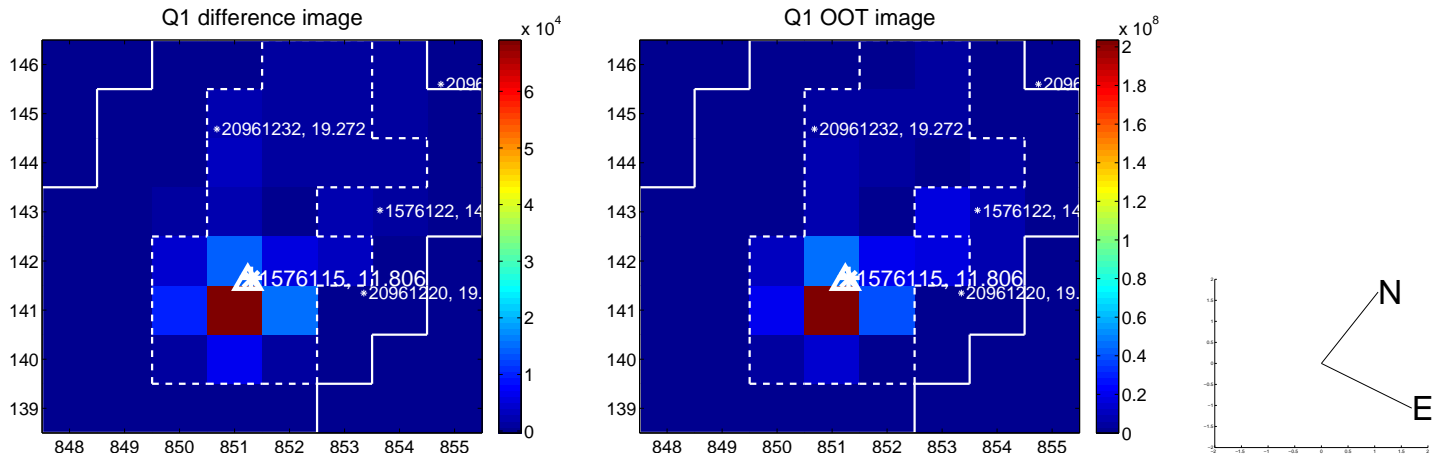
The direct PRF centroid is offset from the target star catalog position by about 0.18 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.068 \pm 0.073$	0.93	$-0.064 \pm 0.069$	$0.023 \pm 0.082$
PRF-fit source offset from KIC position	$0.209 \pm 0.079$	2.63	$-0.133 \pm 0.069$	$0.161 \pm 0.081$
photometric centroid source offset	<b><math>0.61 \pm 0.08</math></b>	<b>7.93</b>	$0.09 \pm 0.05$	$0.60 \pm 0.08$

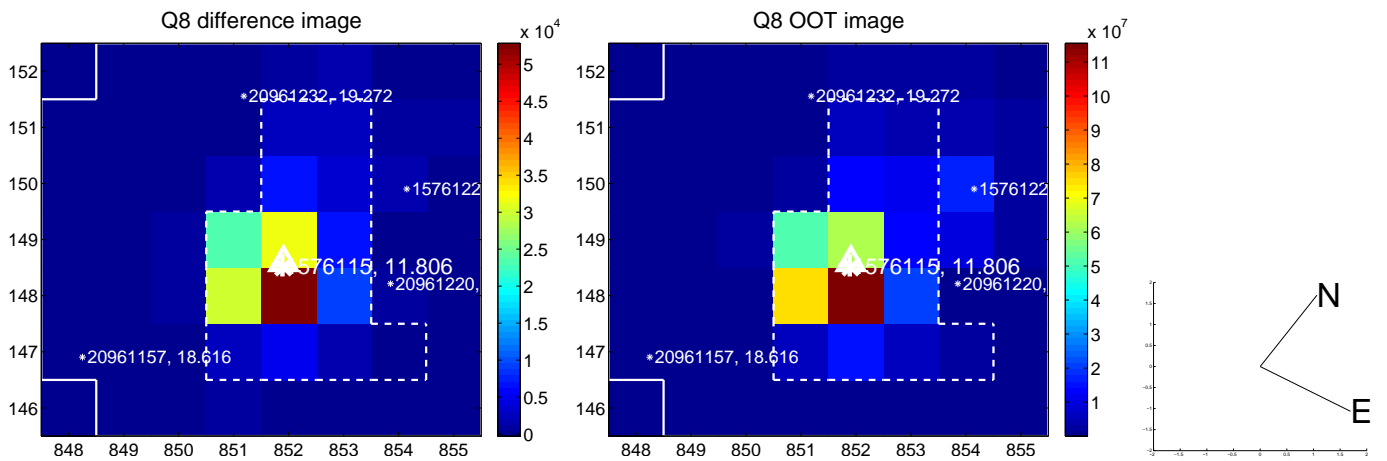
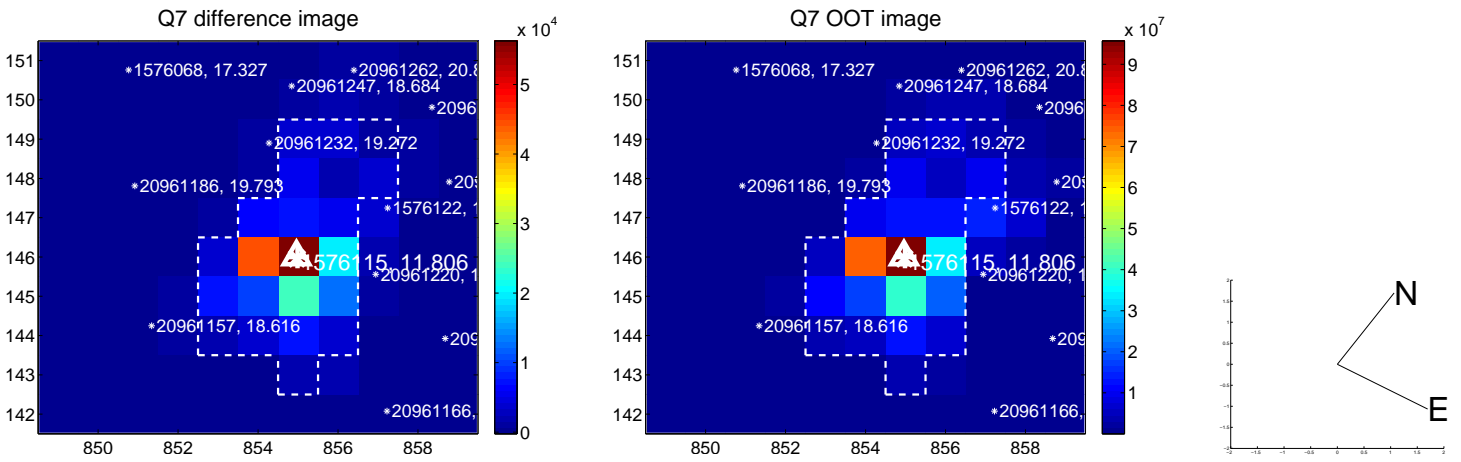
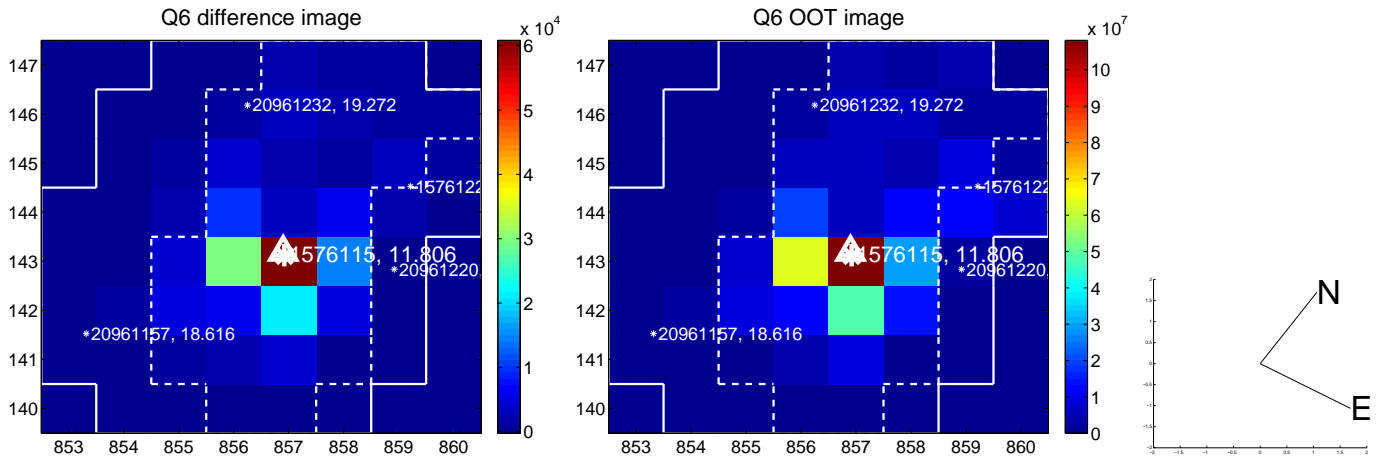
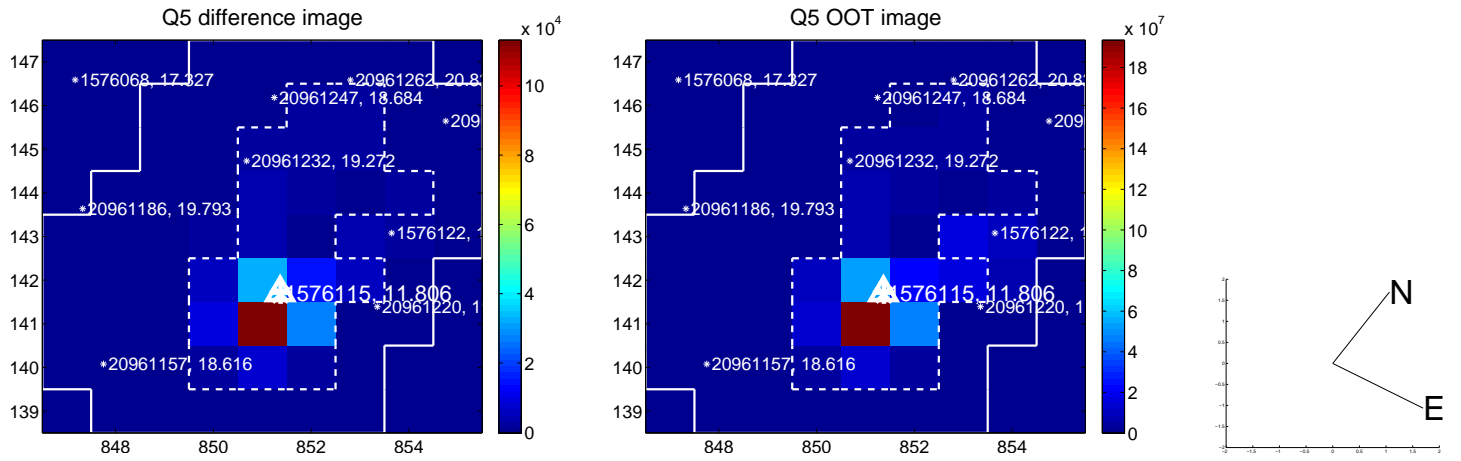


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets;** magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

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

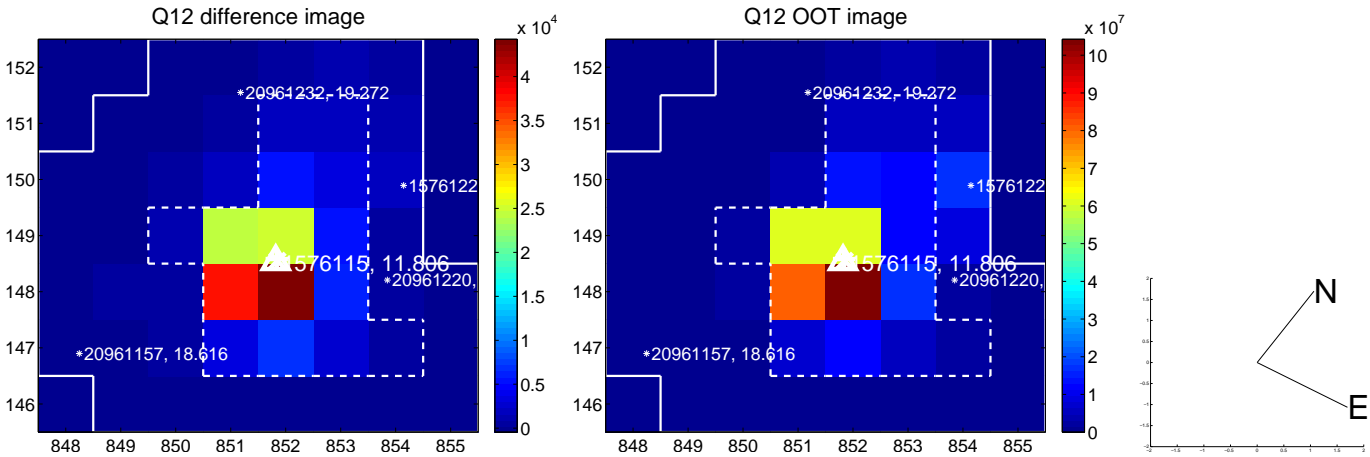
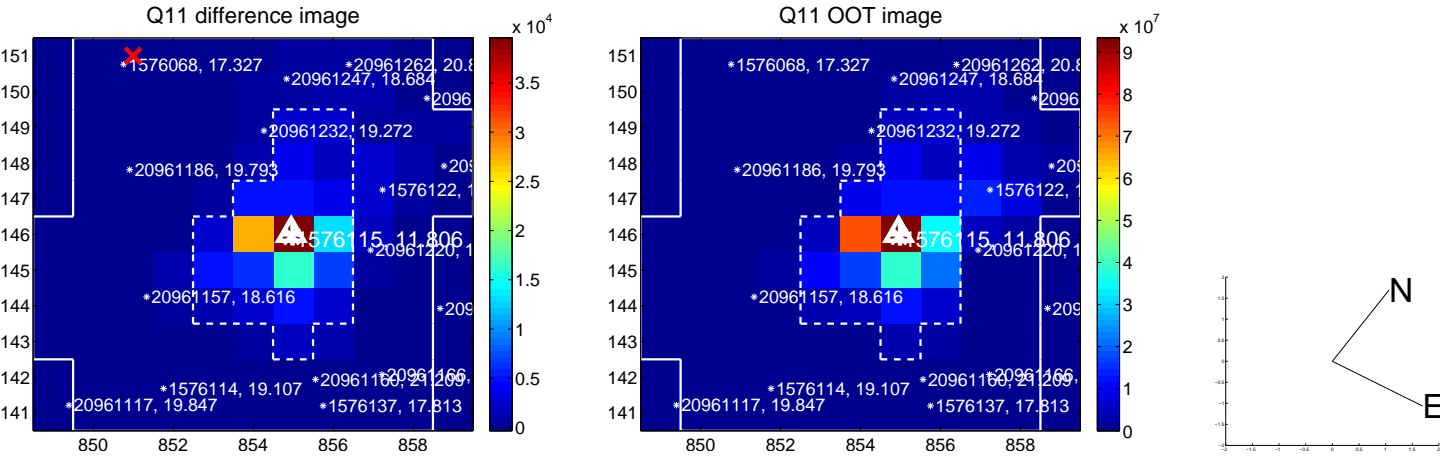
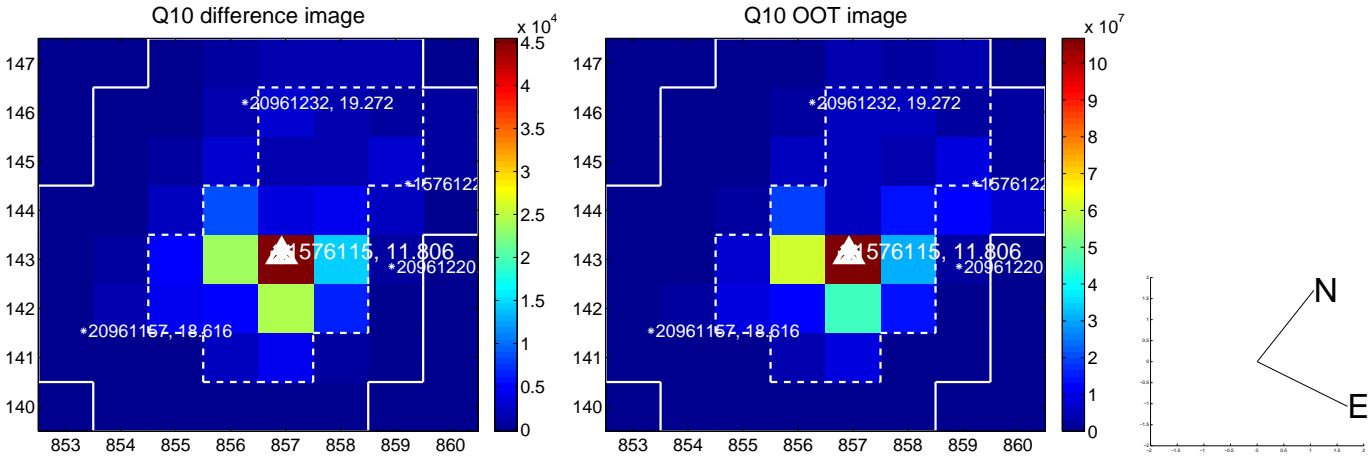
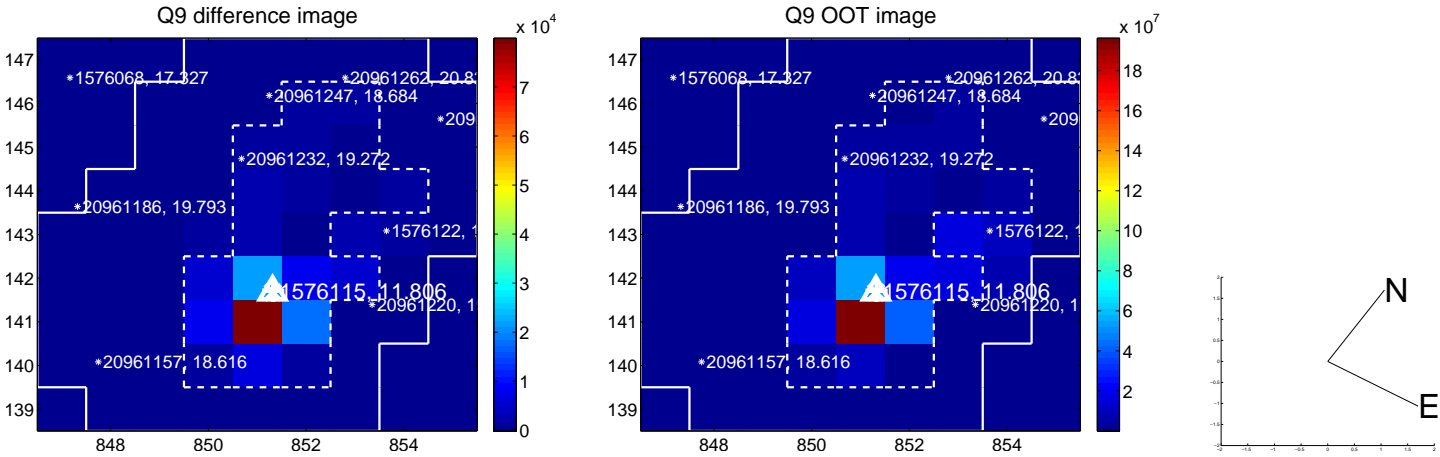


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

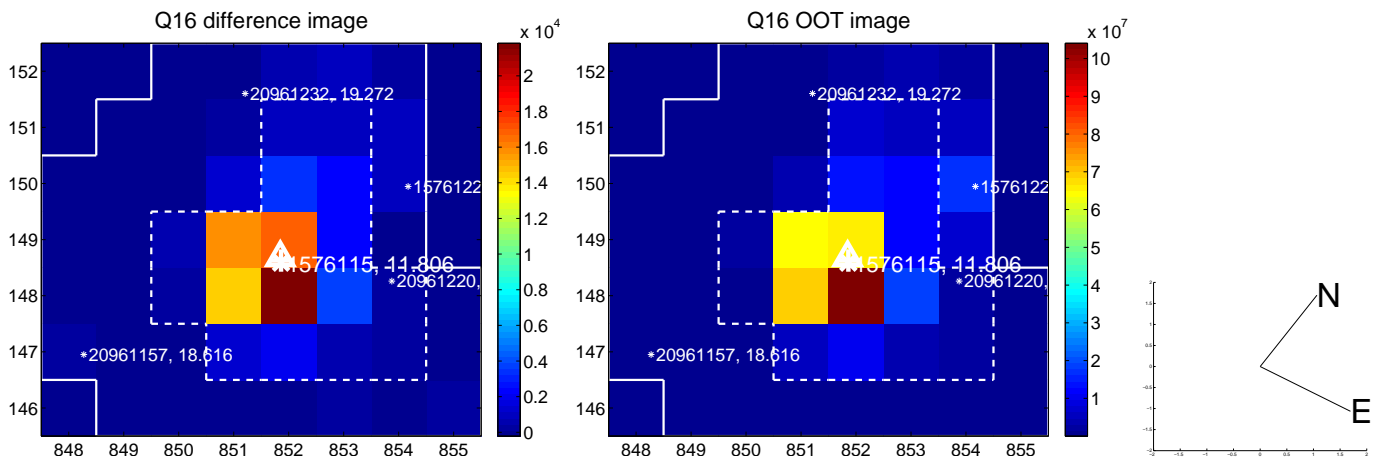
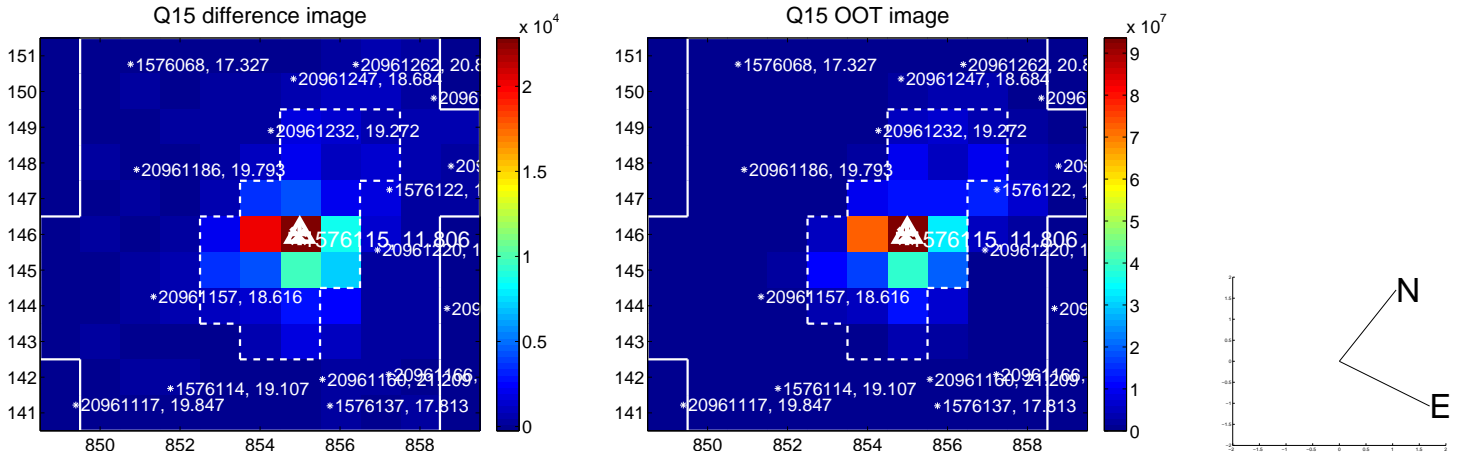
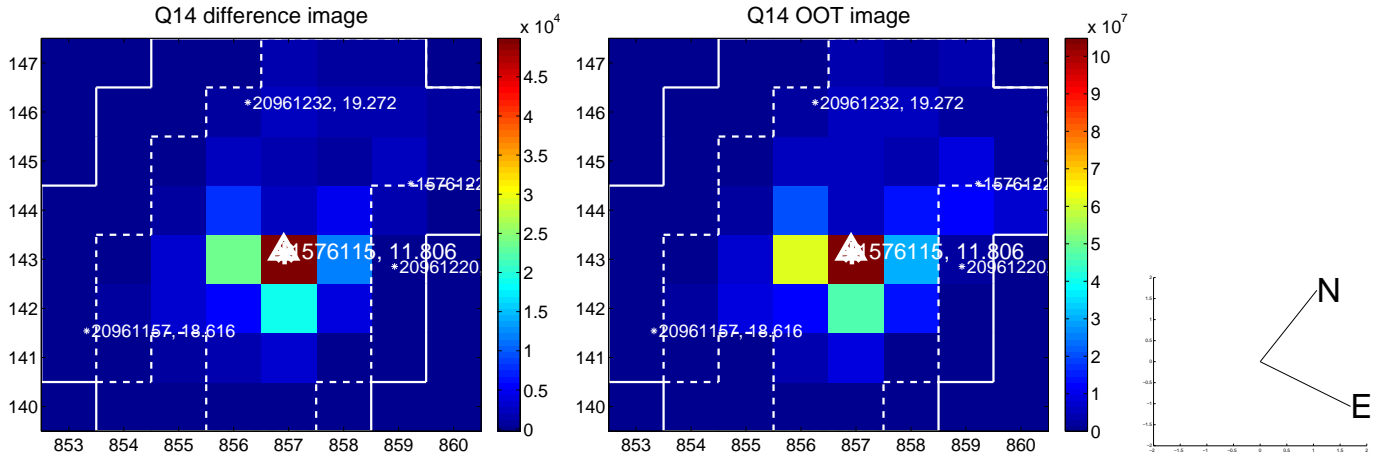
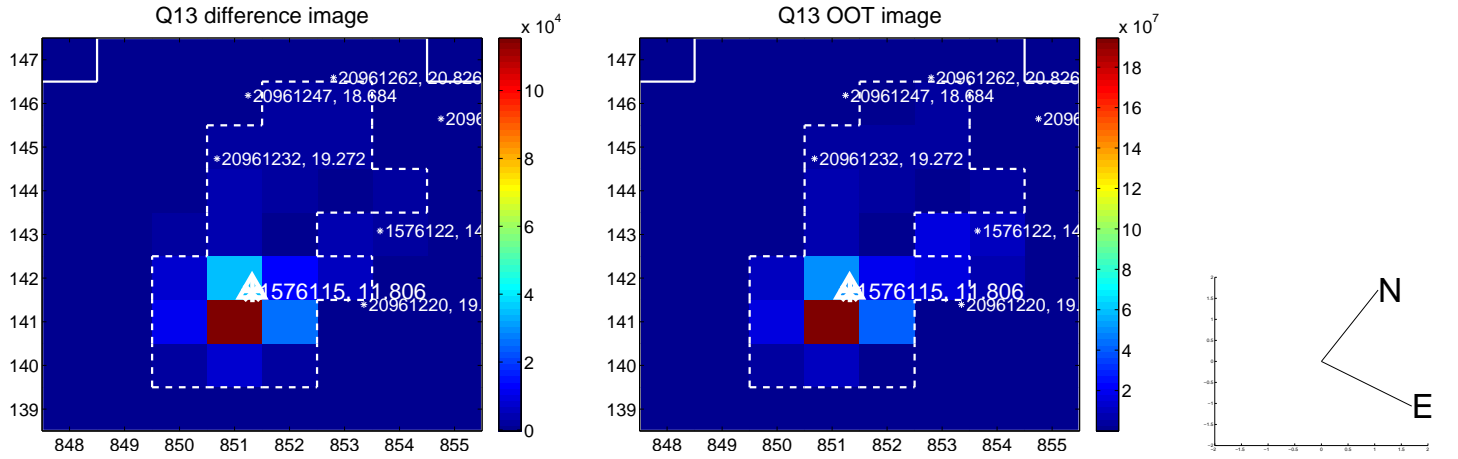




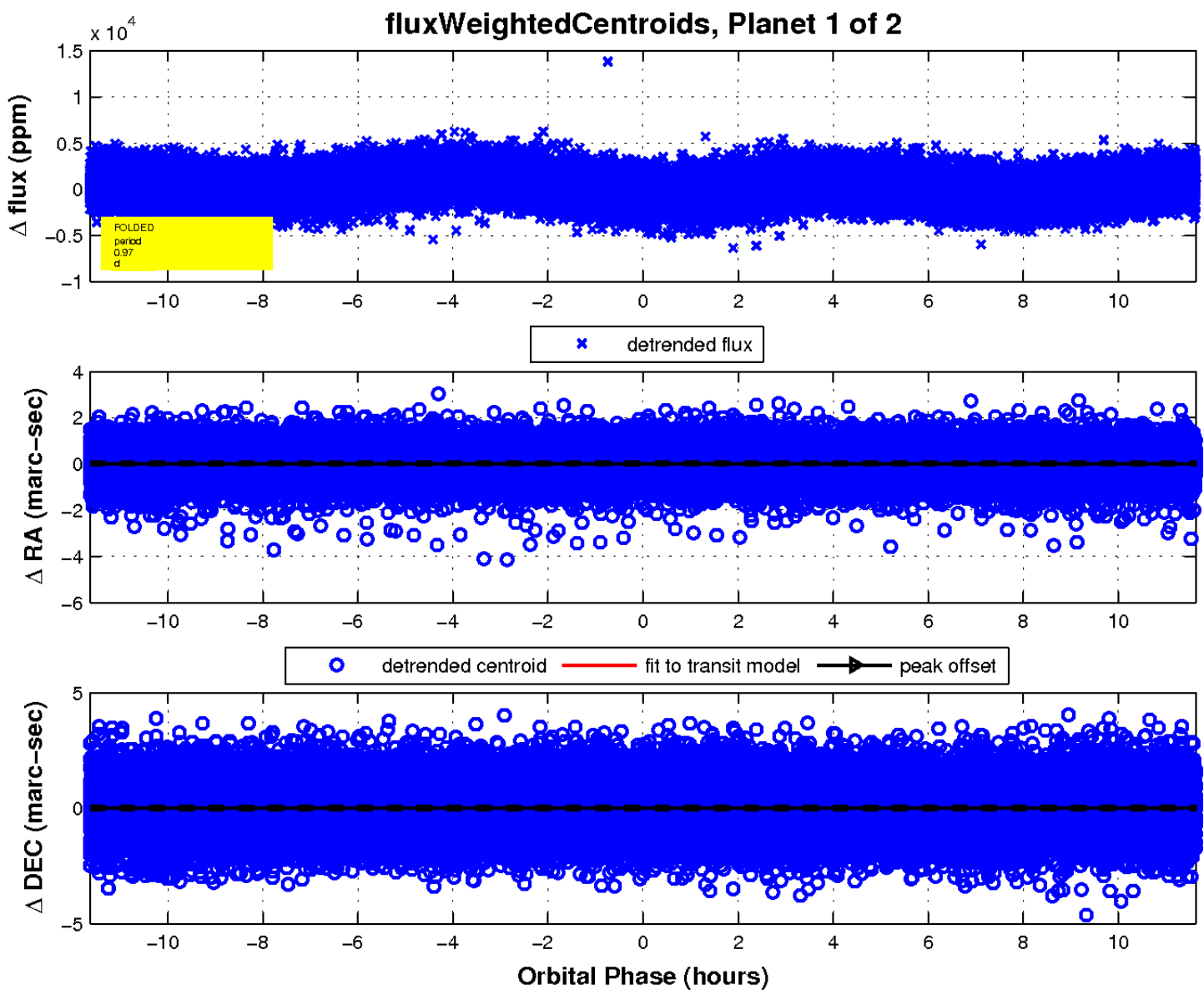
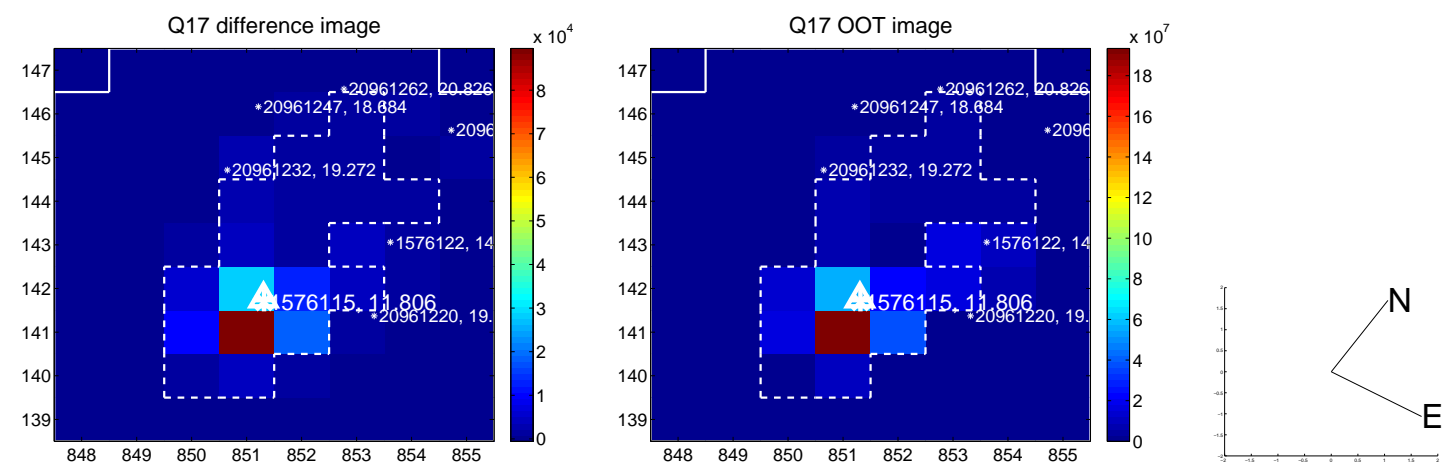
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



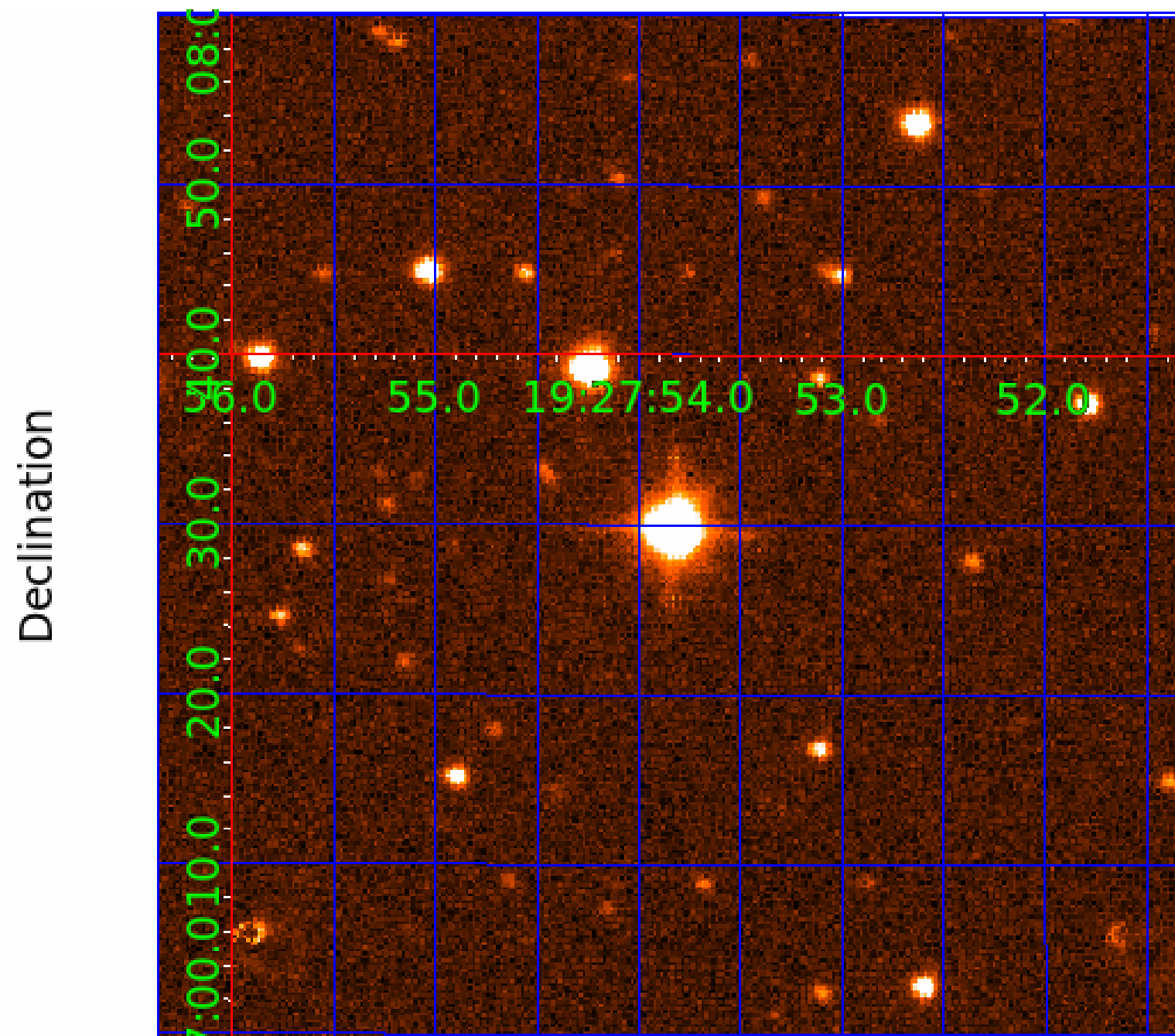
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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



UKIRT Image





# KIC 001576115

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
001576115-01	OBS	No	0.970028	132.255540	447.1	5.104	16.7	17.4	2.00	8254	5.47	30899.18
001576115-02	OBS	No	0.970059	132.001147	688.6	9.684	19.4	19.1	2.00	8254	6.10	30897.85

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
001576115-01	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT
001576115-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_SKYE_ZUMA—LPP_DV—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—SAME_NTL_PERIOD—CENT_FEW_DIFFS

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

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

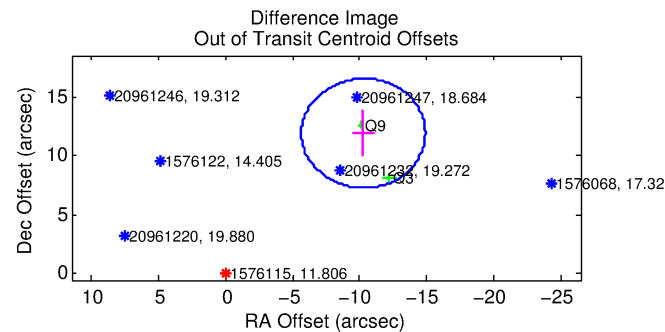
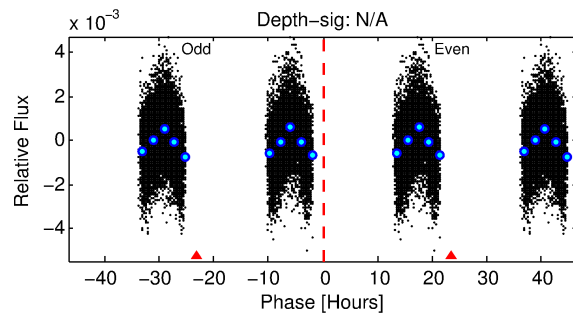
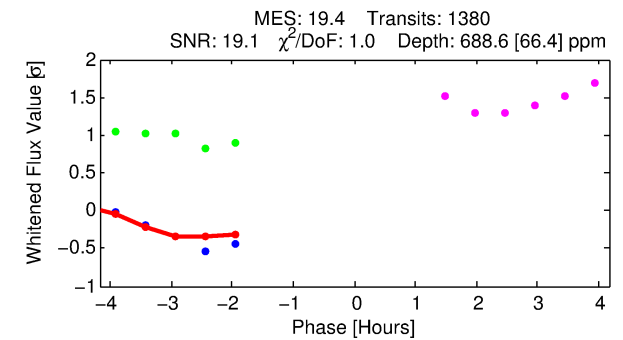
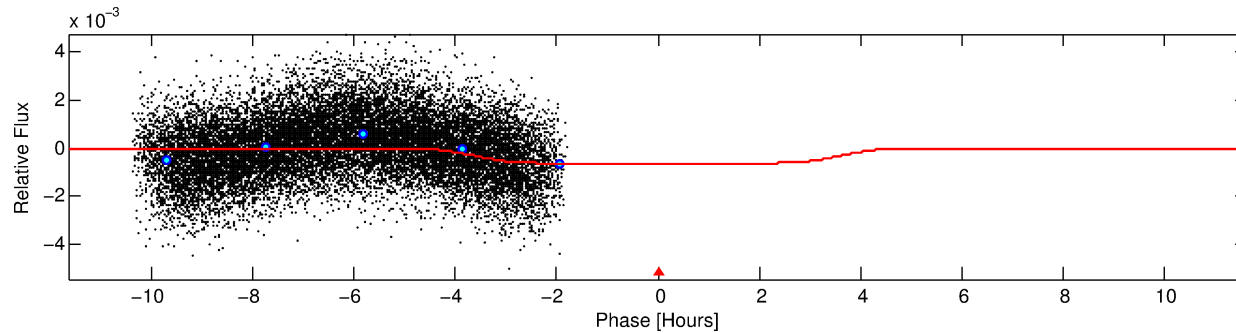
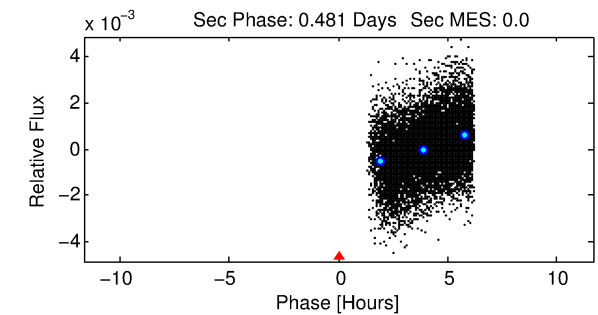
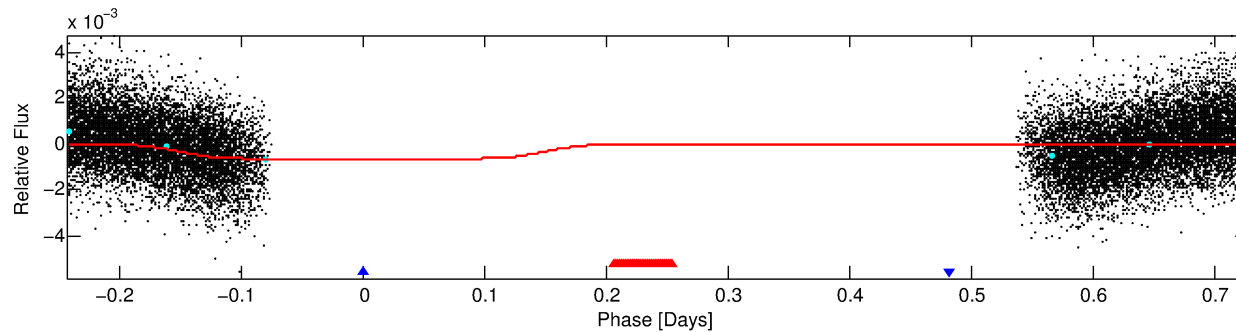
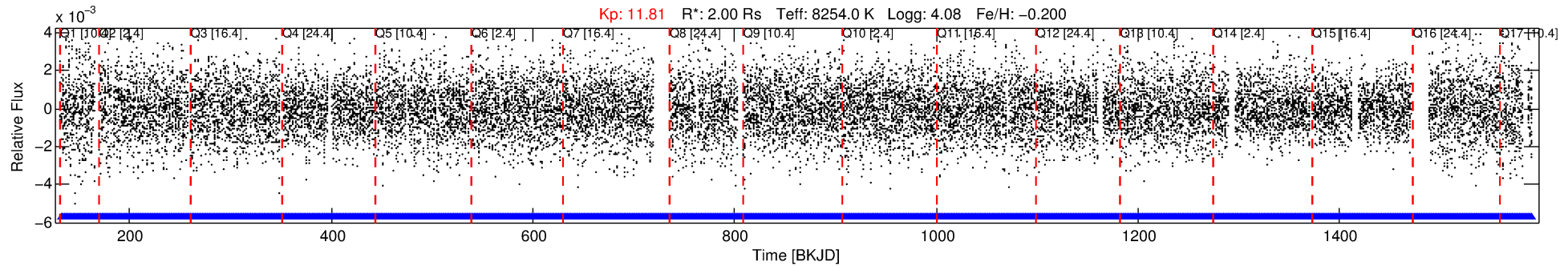
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 001576115-02

No Significant Match Found

# DV One-Page Summary

KIC: 1576115 Candidate: 2 of 2 Period: 0.970 d



## DV Fit Results:

Period = 0.97006 [0.00001] d  
Epoch = 132.0011 [0.0224] BKJD  
Rp/R\* = 0.0280 [0.0016]  
a/R\* = 1.04 [0.01]  
b = 0.90 [0.04]  
Seff = 30897.85 [10057.31]  
Teff = 3381 [275] K  
Rp = 6.10 [1.41] Re  
a = 0.0232 [0.0044] AU  
Ag = N/A  
Teffp = N/A

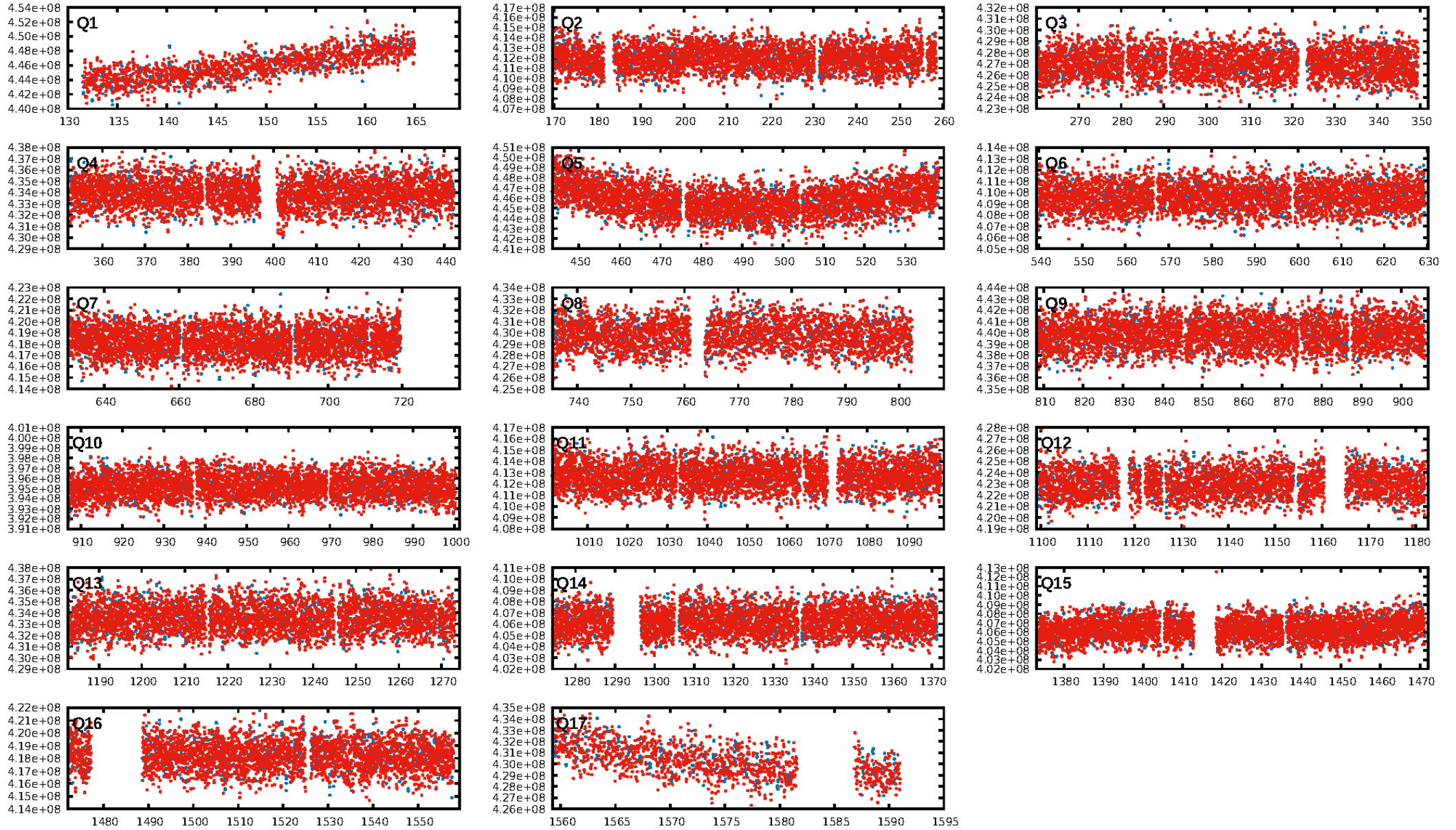
## DV Diagnostic Results:

ShortPeriod-sig: 0.0% [0.00σ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: N/A  
RollingBand-fgt: 1.00 [1317/1317]  
GhostDiagnostic-chr: -4.964  
Centroid-sig: 51.4%  
Centroid-so: 0.630 arcsec [19.22σ]  
OotOffset-rm: 15.726 arcsec [10.20σ]  
KicOffset-rm: 15.883 arcsec [10.46σ]  
OotOffset-st: 0/1/0/1 [2]  
KicOffset-st: 0/1/0/1 [2]  
DiffImageQuality-fgm: 0.00 [0/2]  
DiffImageOverlap-fno: 0.00 [0/17]

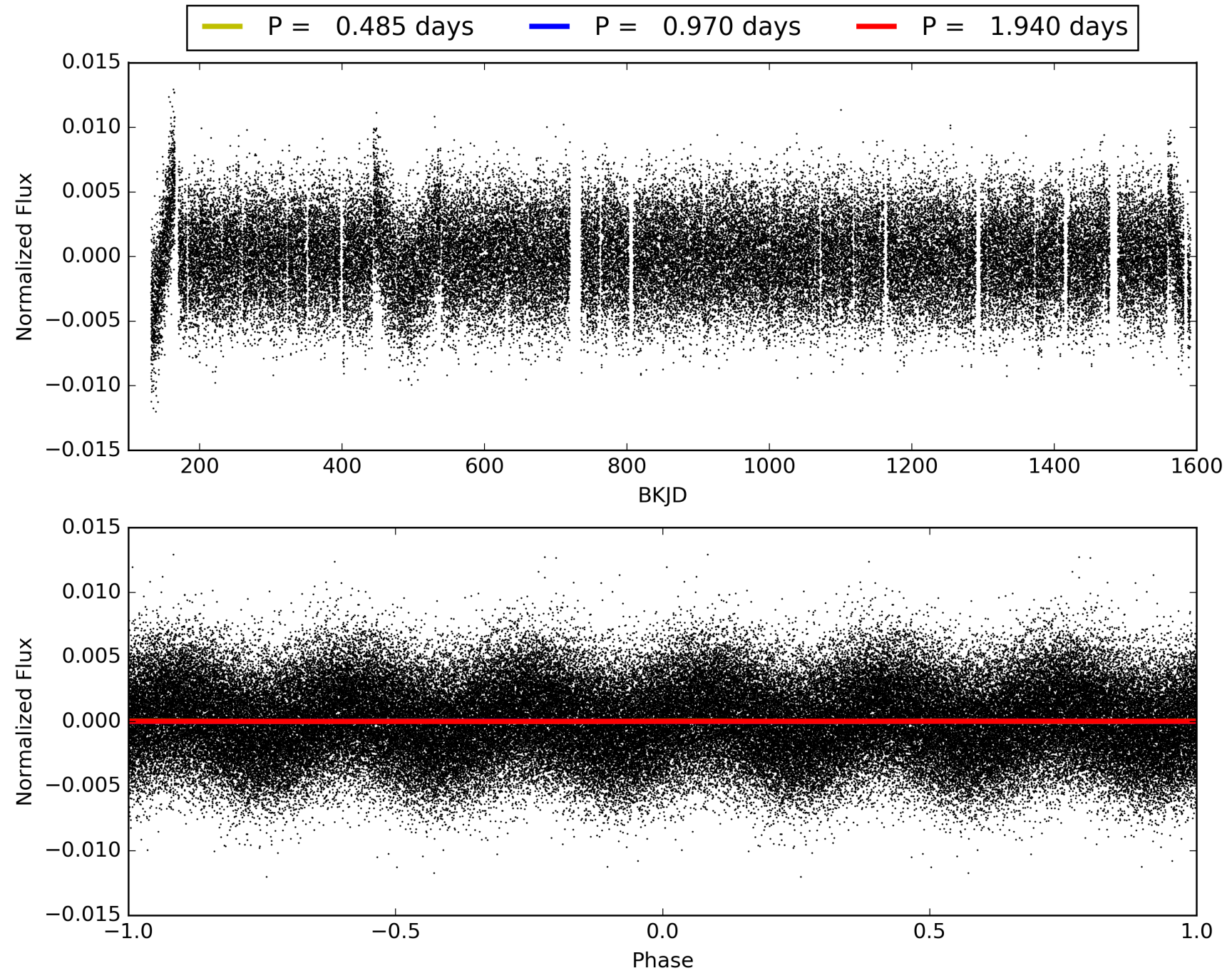
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 02-Feb-2016 00:23:24 Z

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

# TCE 001576115-02, PDC Light Curves



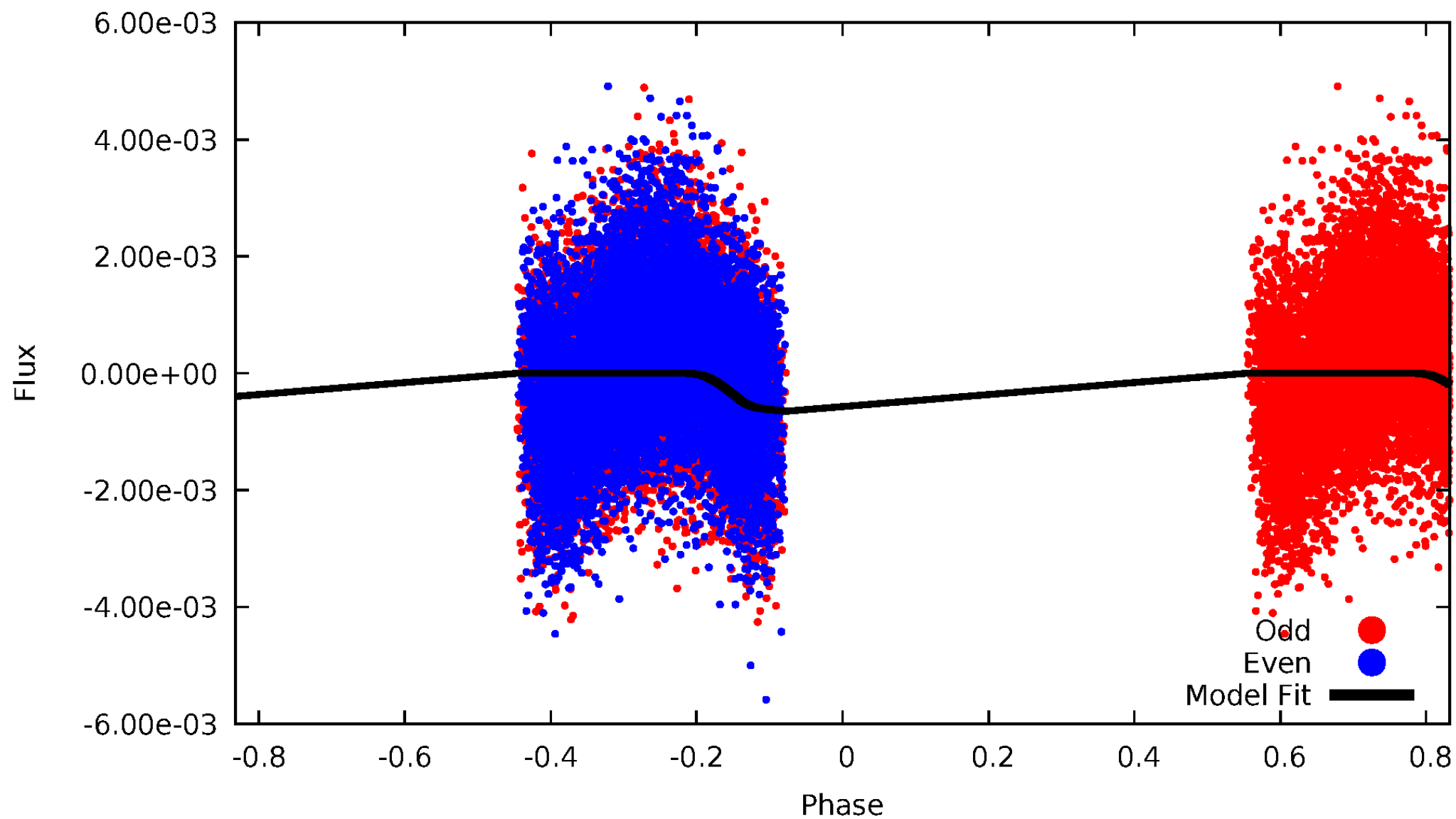
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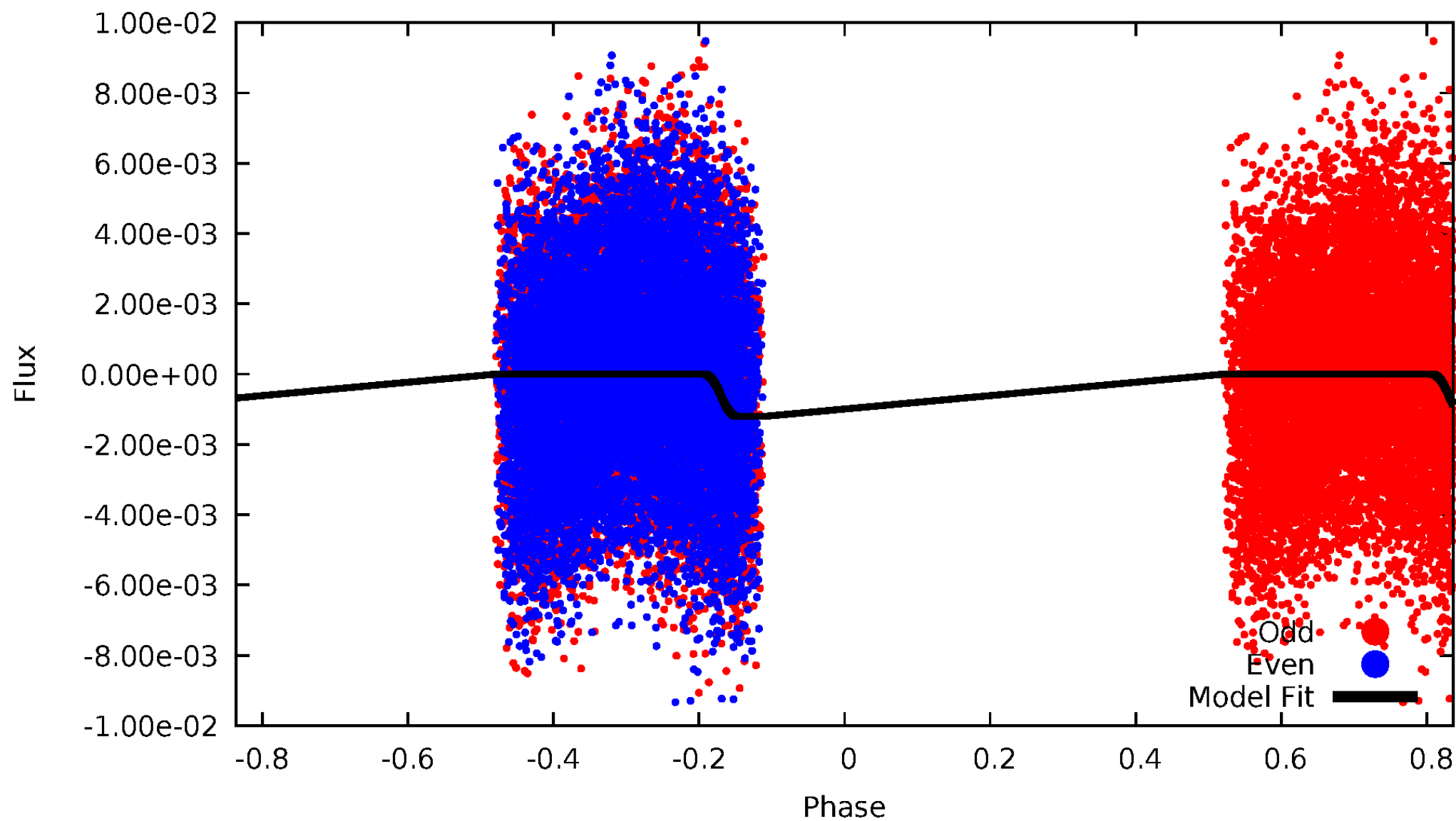
# DV Odd/Even

TCE 001576115-02



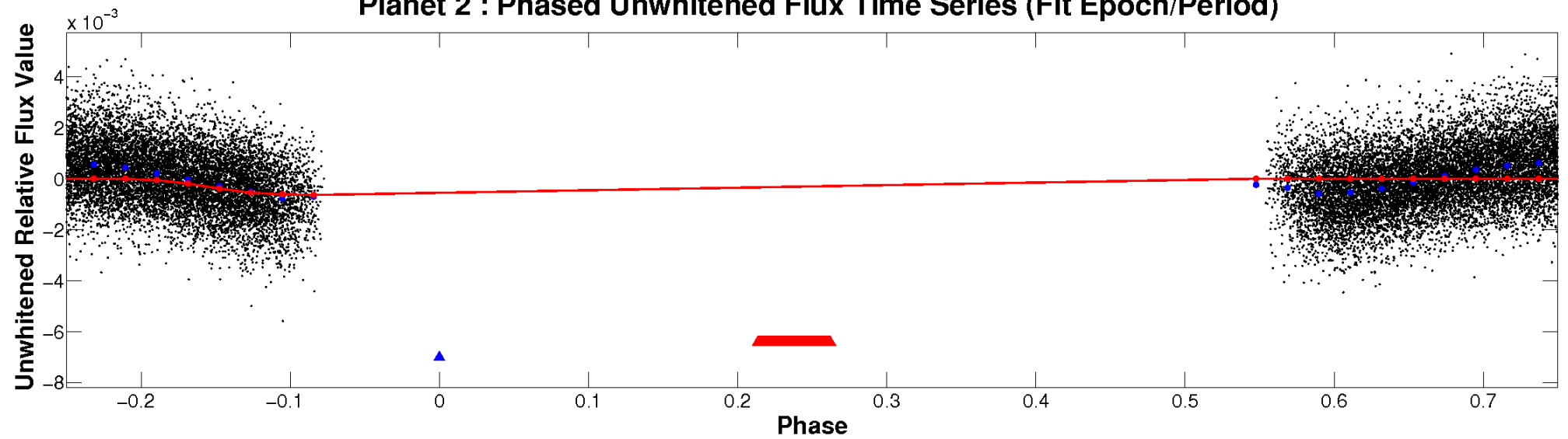
# ALT Odd/Even

TCE 001576115-02

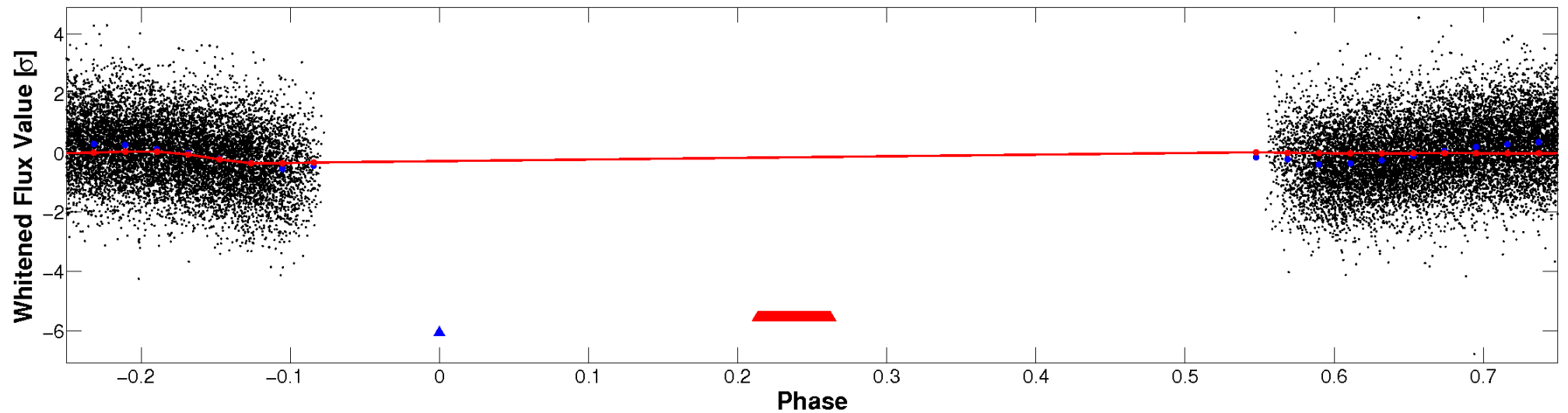


# Non-Whitened Vs. Whitened Light Curve

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

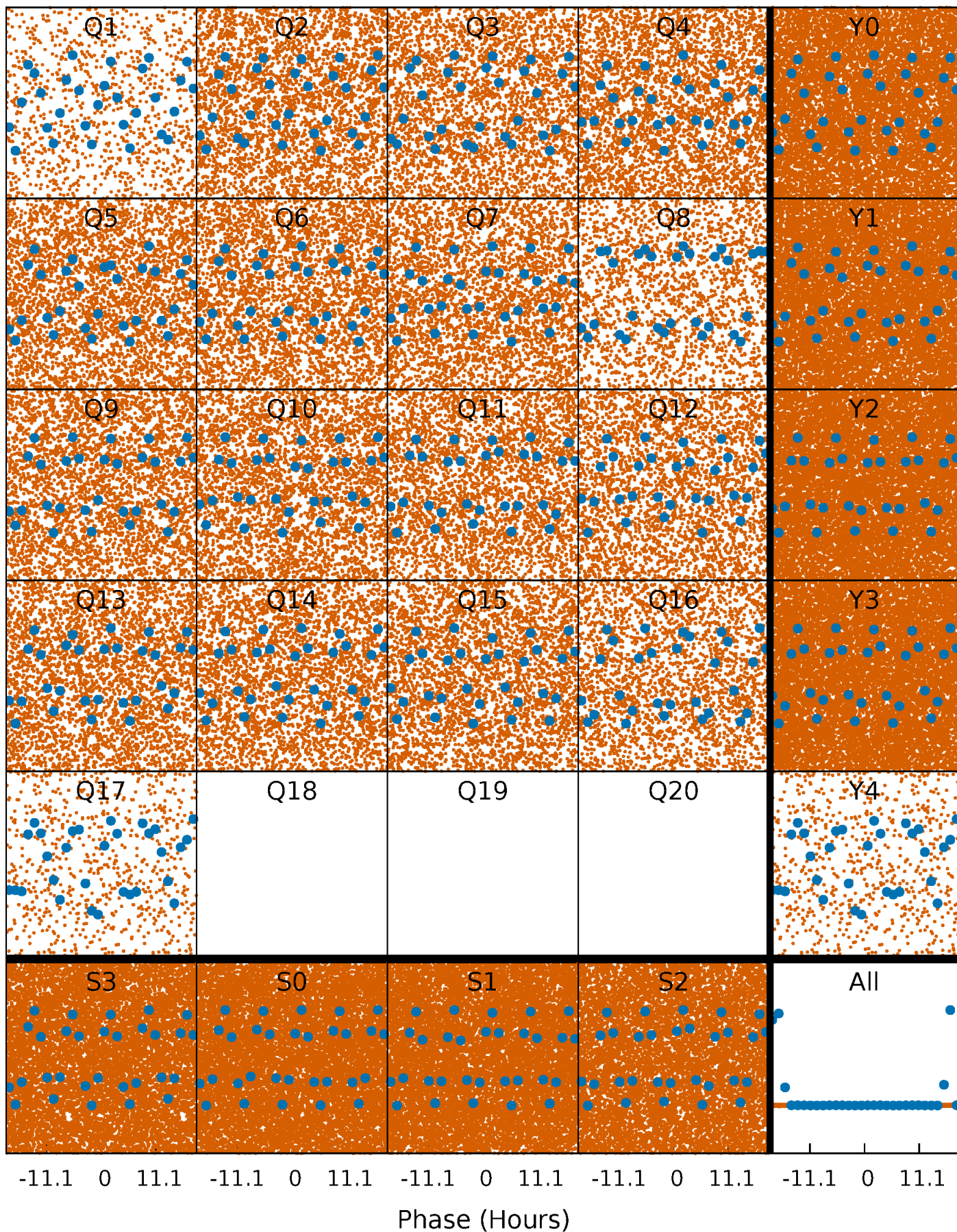


## Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



# PDC Quarter-Phased Transit Curves

TCE 001576115-02 P= 0.970059 Days  $T_0=132.001147$  (BKJD)



# DV Quarter-Phased Transit Curves

TCE 001576115-02 P= 0.970059 Days  $T_0=132.001147$  (BKJD)





# Alt. Detrend Quarter-Phased Transit Curves

TCE 001576115-02 P= 0.970059 Days  $T_0=132.033968$  (BKJD)

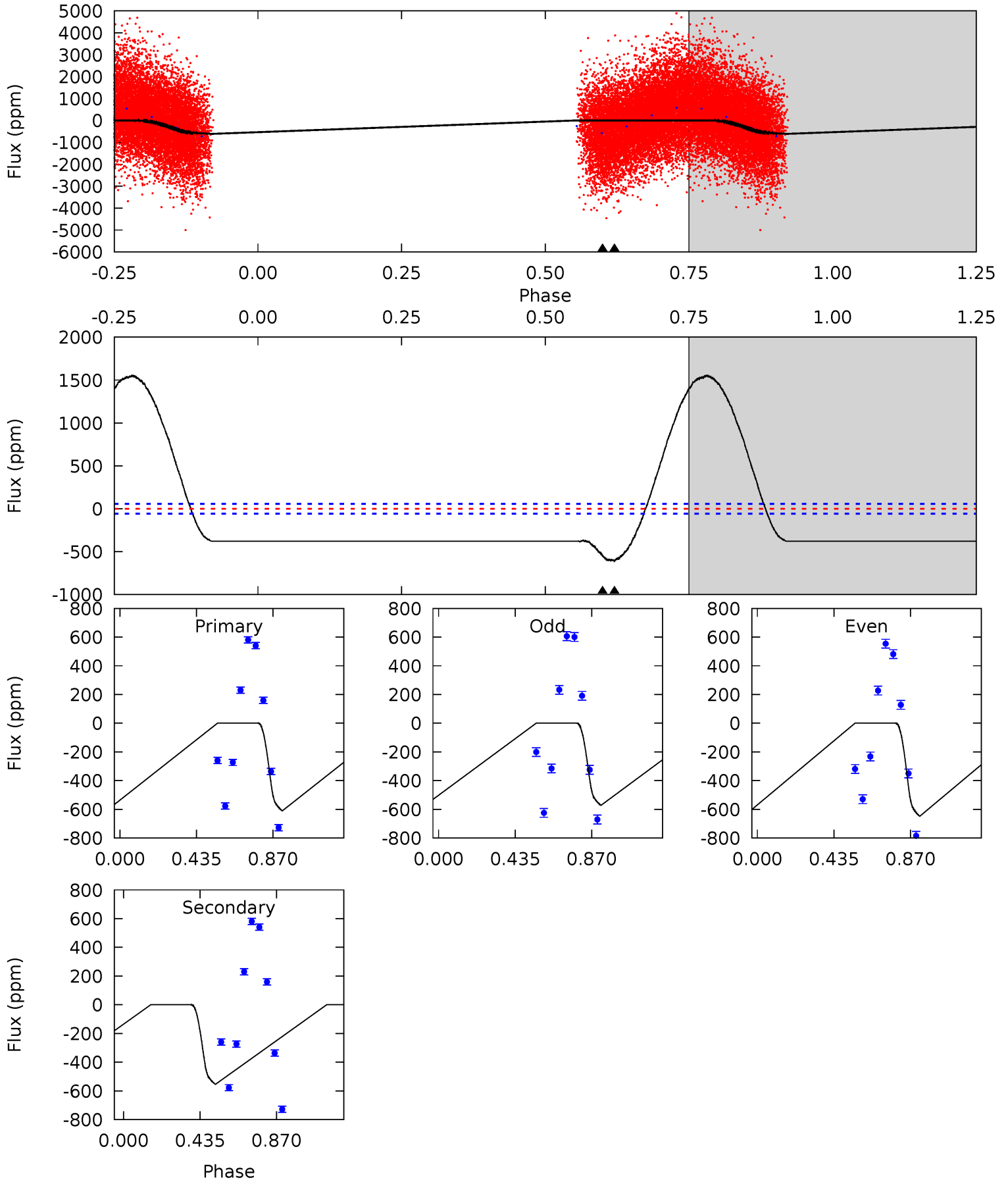




# DV Model-Shift Uniqueness Test

001576115-02, P = 0.970059 Days, E = 131.031088 Days

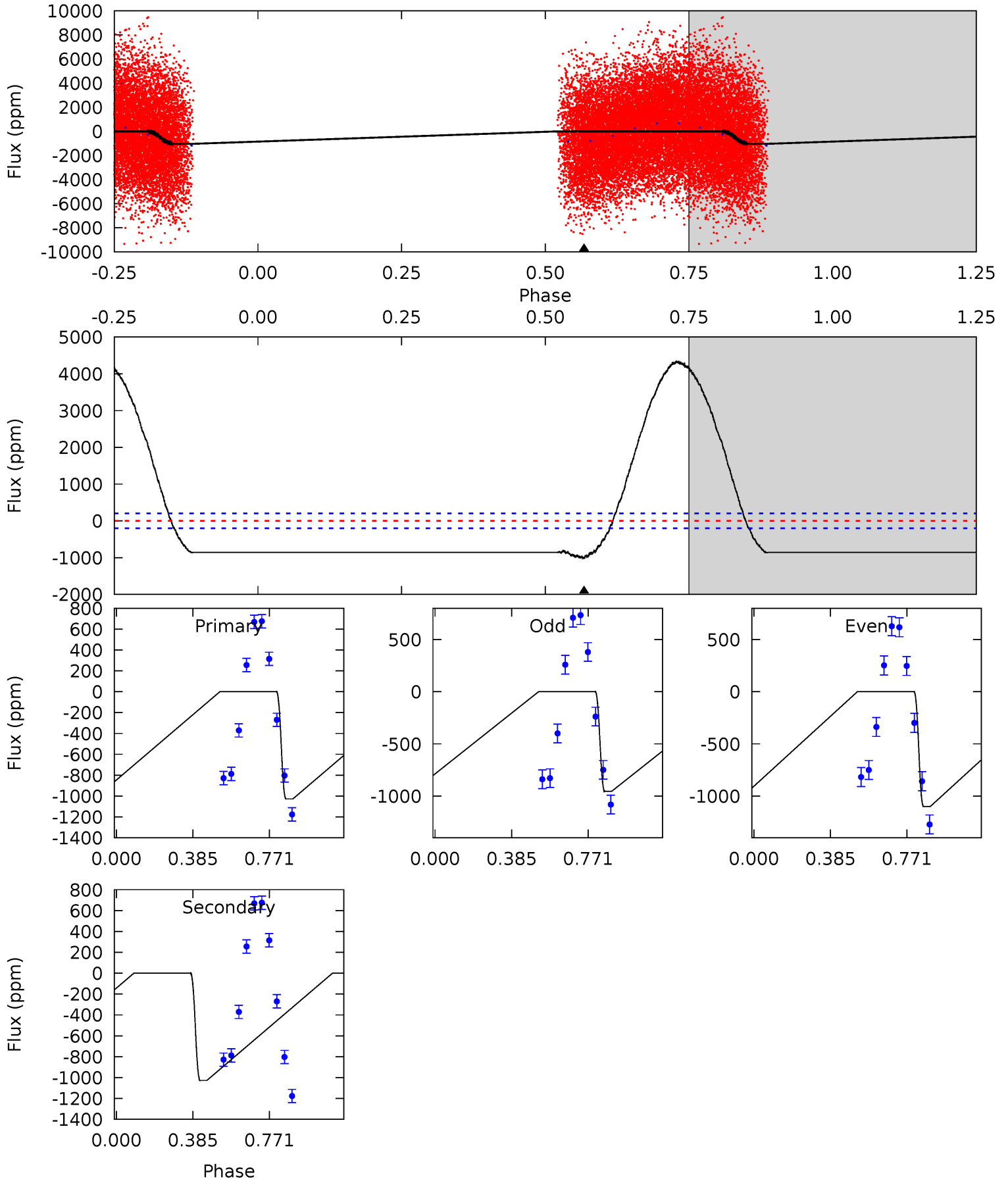
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
45.7	41.5	0	0	4.25	0.78	15.8	45.7	45.7	41.5	41.5	2.85	0	0.72	0



# Alt Model-Shift Uniqueness Test

001576115-02, P = 0.970059 Days, E = 131.063909 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
21.7	21.7	0	0	4.27	0.87	10.2	21.7	21.7	21.7	21.7	1.52	0	0.81	0



### Stellar Parameters For KIC 001576115

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$8254^{+226}_{-340}$	$4.083^{+0.155}_{-0.139}$	$-0.200^{+0.250}_{-0.350}$	$1.996^{+0.446}_{-0.446}$	$1.757^{+0.146}_{-0.291}$	$0.311^{+0.282}_{-0.129}$
	+3%/-4%	+4%/-3%	+125%/-175%	+22%/-22%	+8%/-17%	+91%/-41%
Source	KIC0	KIC0	KIC0	DSEP		

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

### Secondary Eclipse Parameters for KIC 001576115-02 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-554 \pm 13$	$6.06^{+0.84}_{-0.83}$	$4705^{+277}_{-318}$	$7258^{+379}_{-372}$	$4.425^{+1.314}_{-0.937}$
Alt.	$-1027 \pm 47$	$7.44^{+0.97}_{-0.99}$	$4685^{+285}_{-307}$	$7677^{+349}_{-375}$	$5.367^{+1.487}_{-1.077}$

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

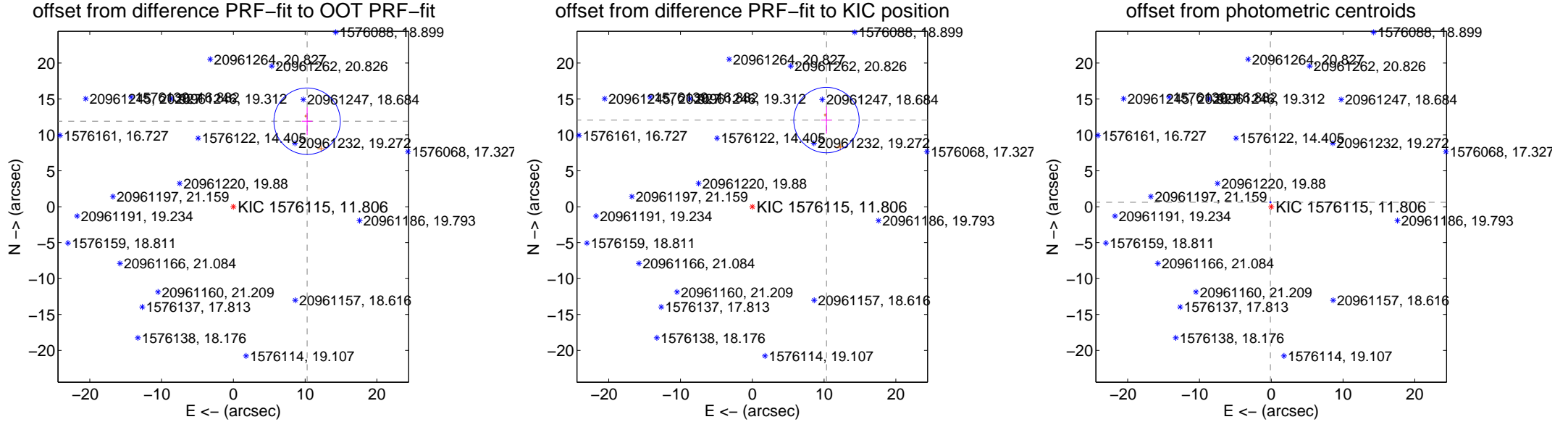
## DV Centroid Data

Supplemental centroid analysis for 001576115-02. **Kepler magnitude: 11.81.** Transit SNR 19.11

**There are 0 quarters with good PRF difference image offsets**

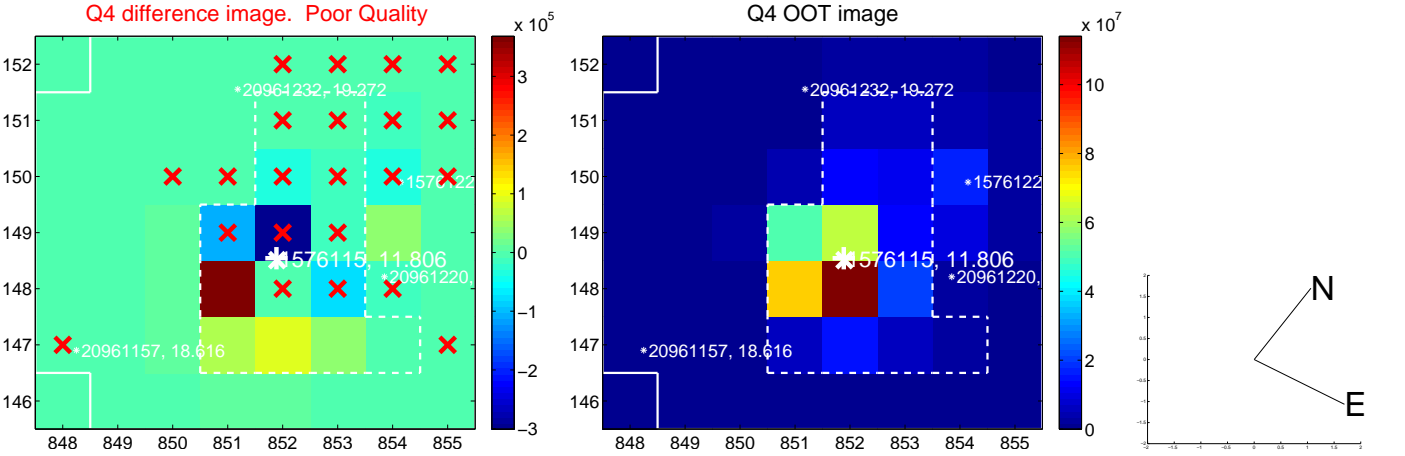
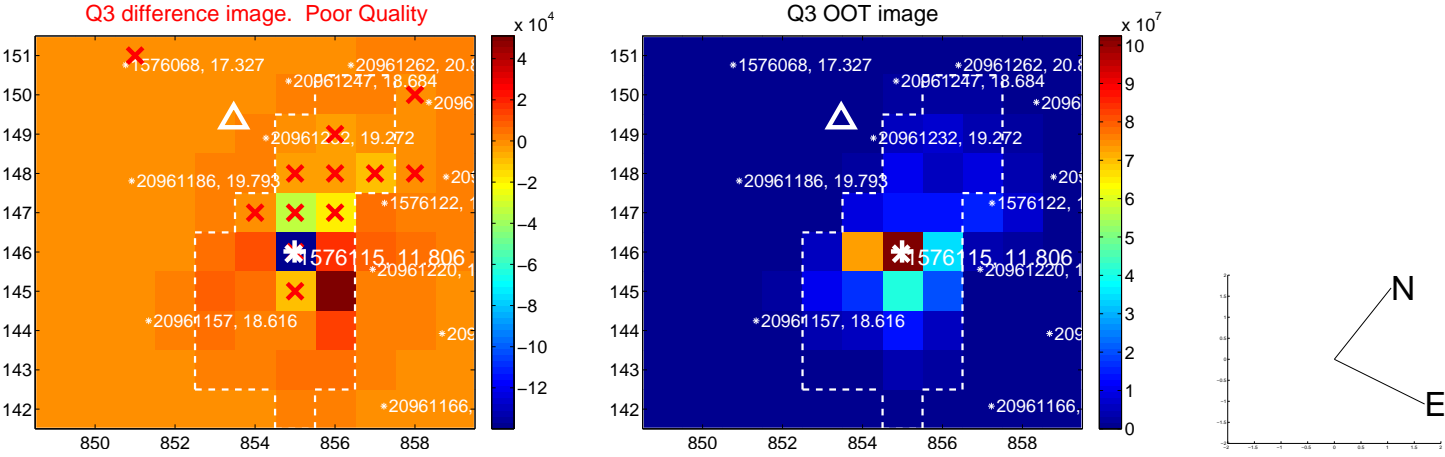
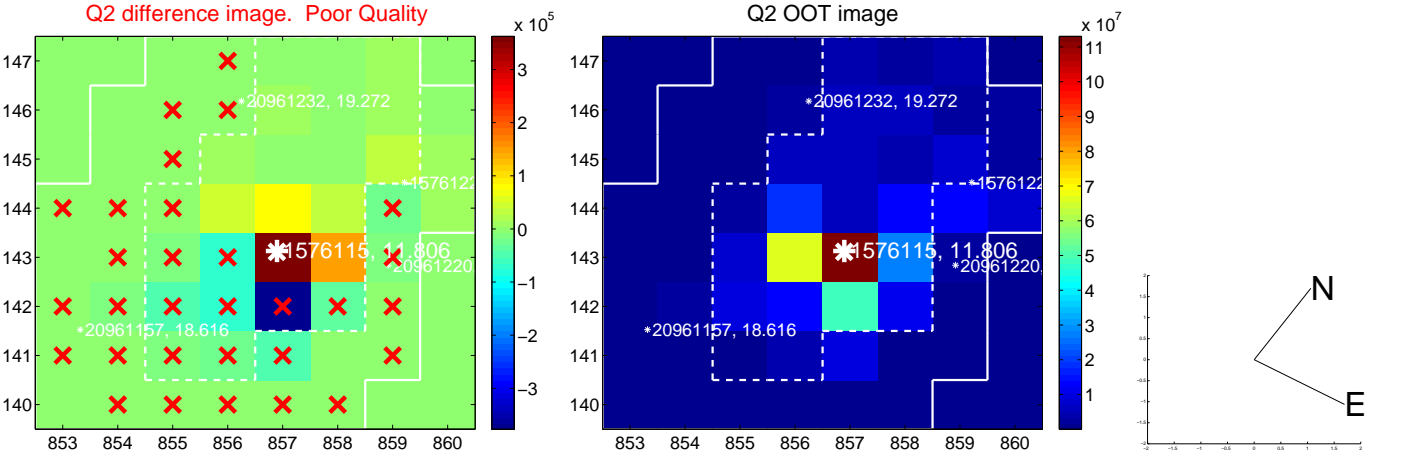
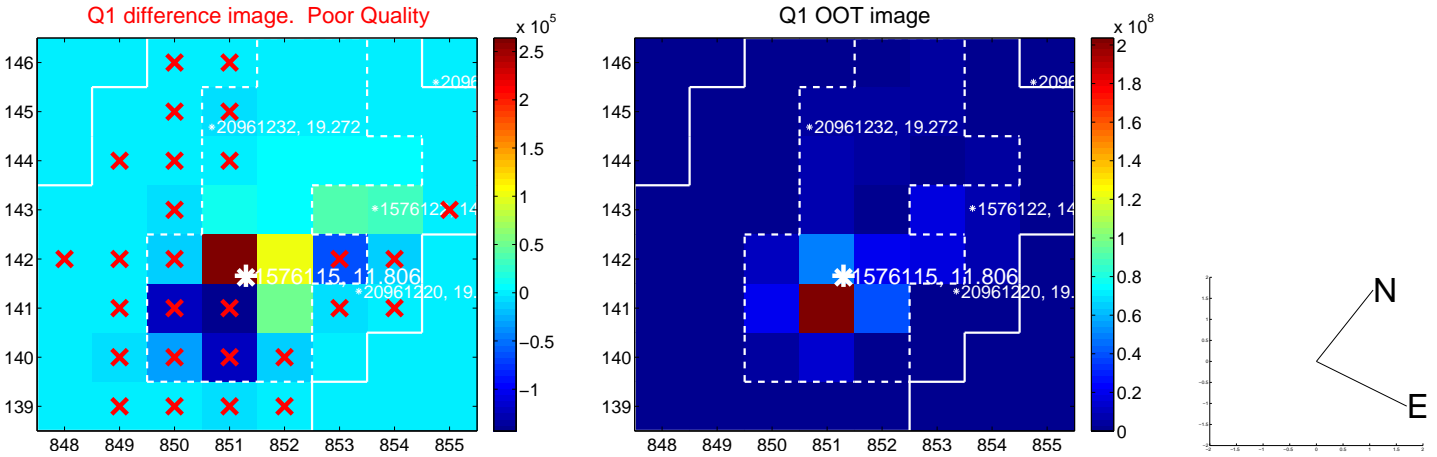
The direct PRF centroid is offset from the target star catalog position by about 0.16 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	<b><math>15.726 \pm 1.542</math></b>	<b>10.20</b>	$-10.280 \pm 0.735$	$11.901 \pm 1.936$
PRF-fit source offset from KIC position	<b><math>15.883 \pm 1.518</math></b>	<b>10.46</b>	$-10.333 \pm 0.732$	$12.062 \pm 1.898$
photometric centroid source offset	<b><math>0.63 \pm 0.03</math></b>	<b>19.22</b>	$0.12 \pm 0.02$	$0.62 \pm 0.03$

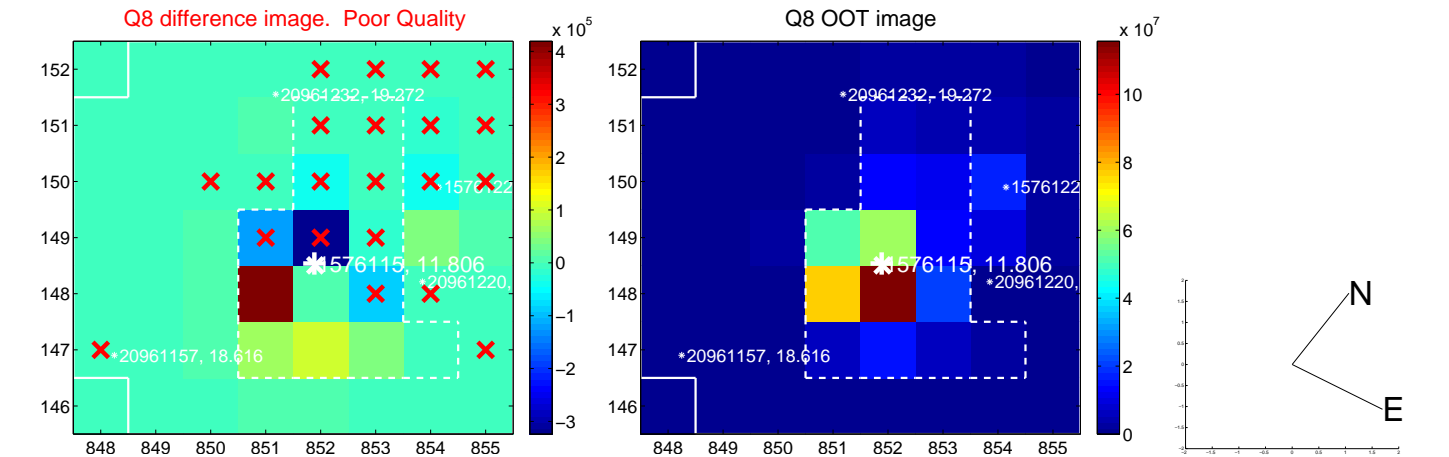
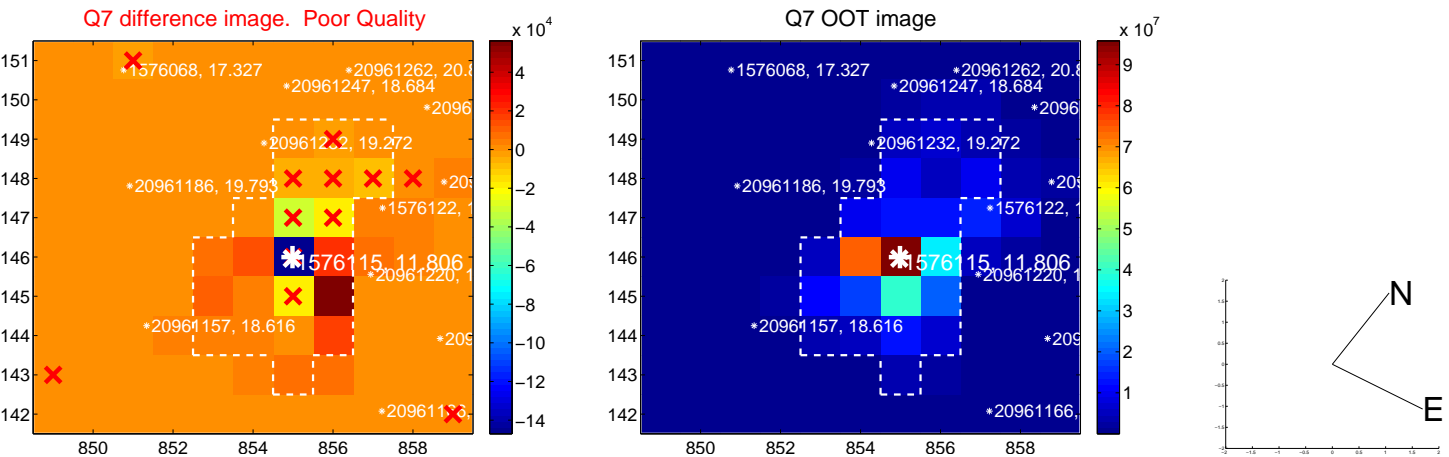
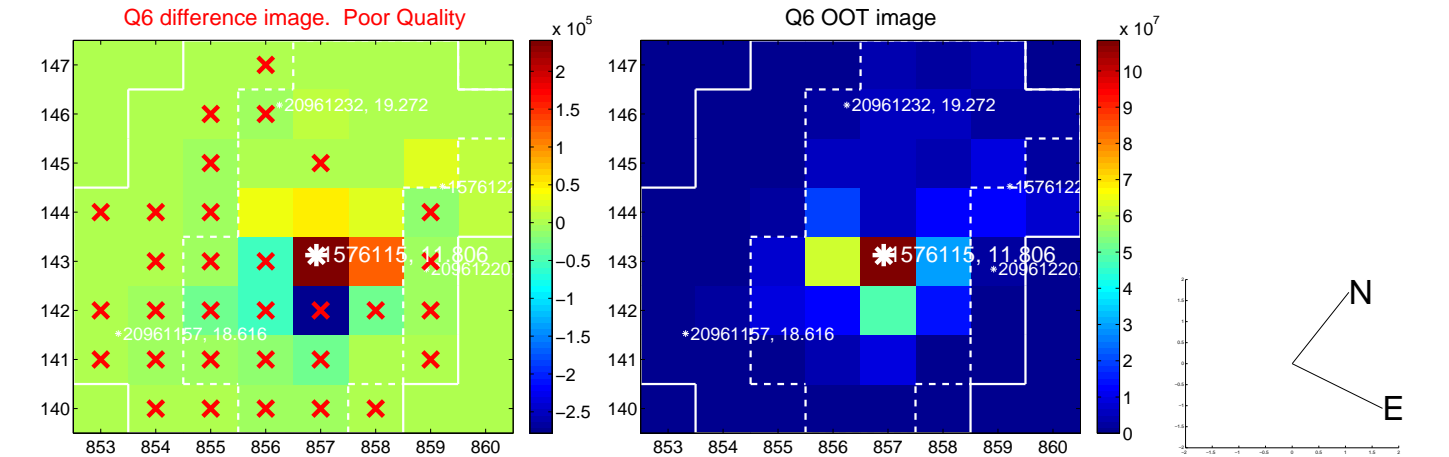
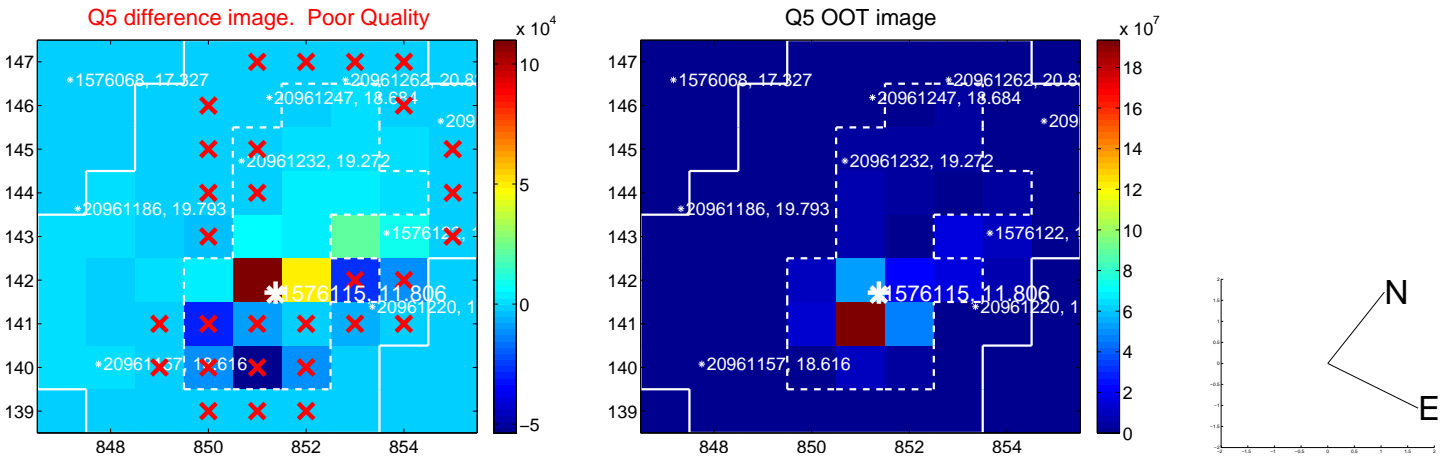


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets;** magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

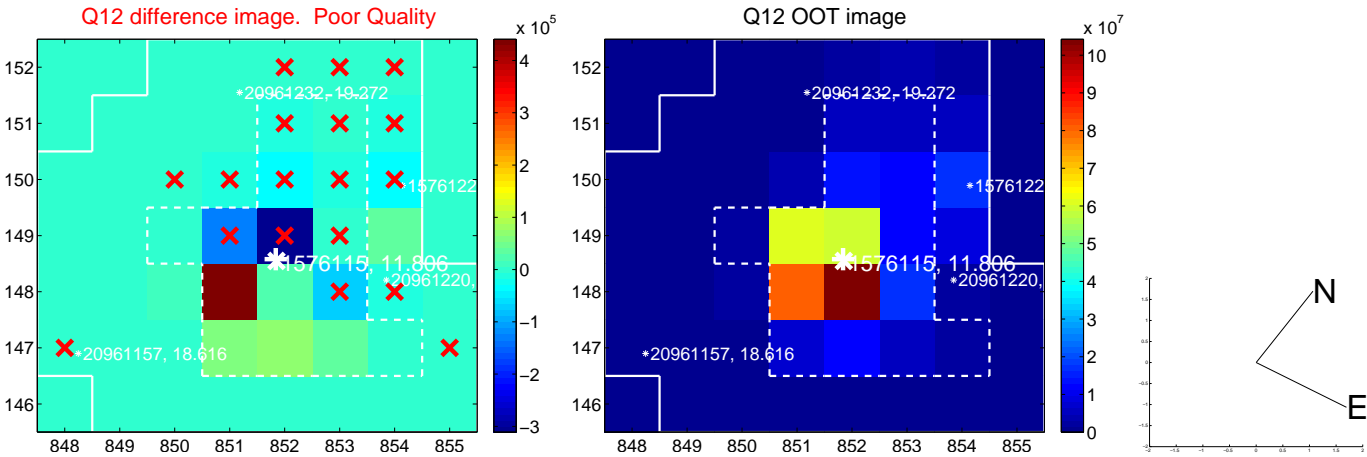
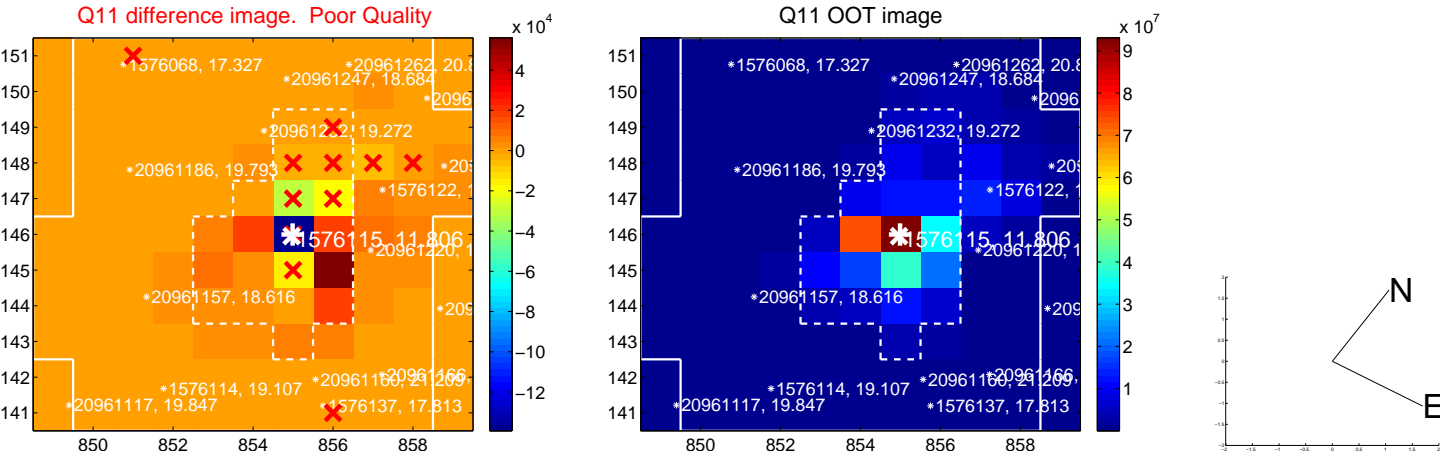
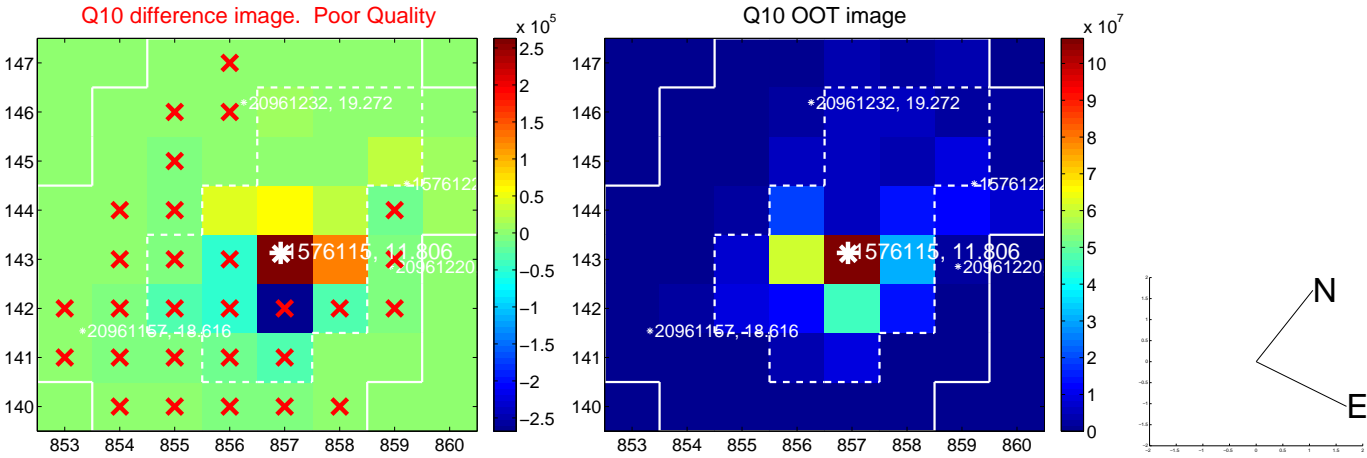
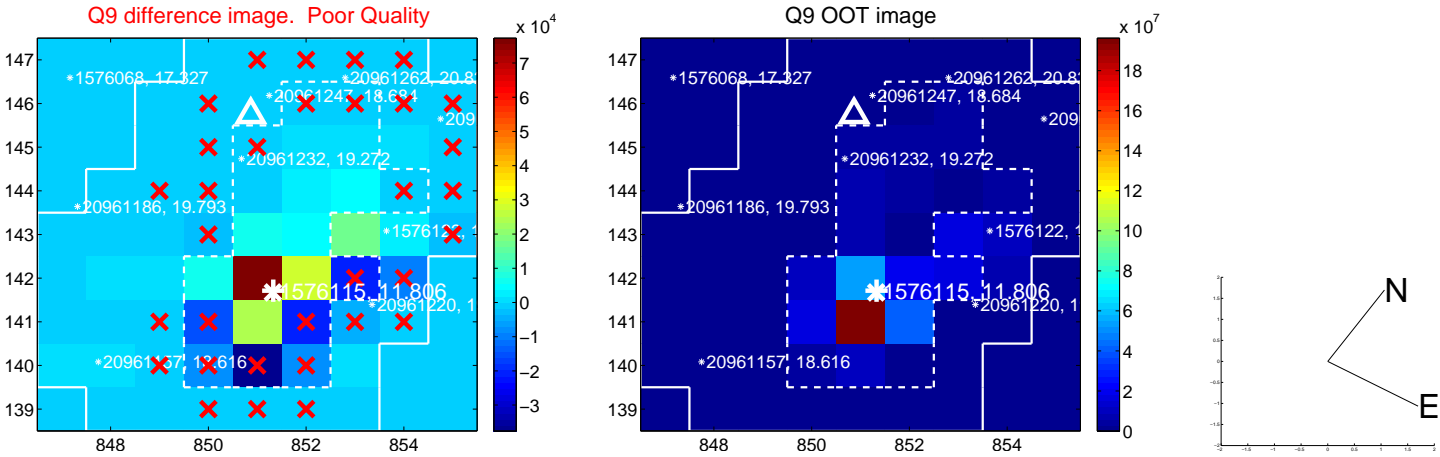


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

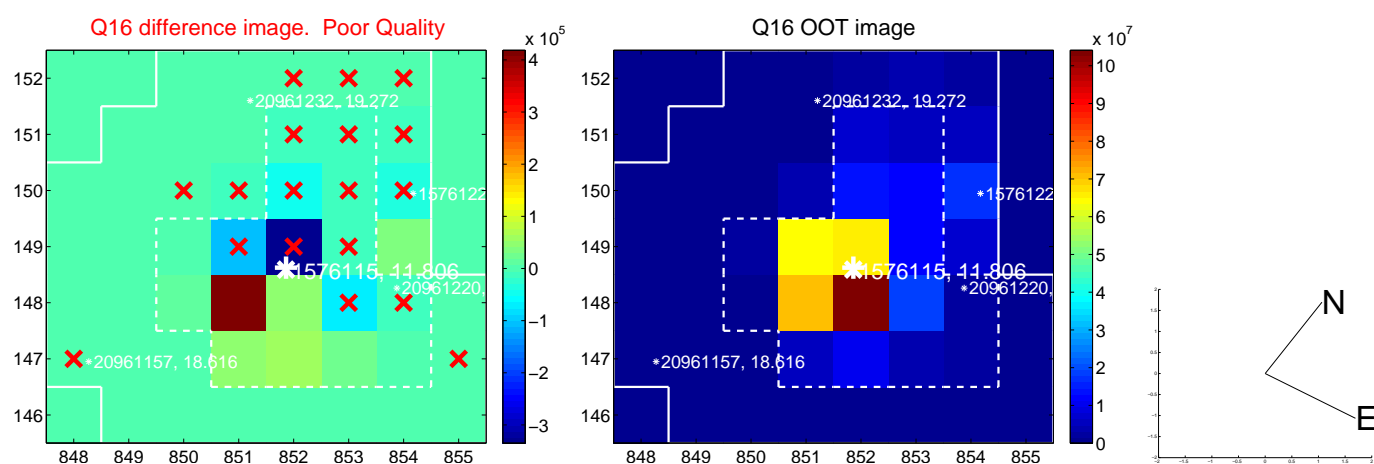
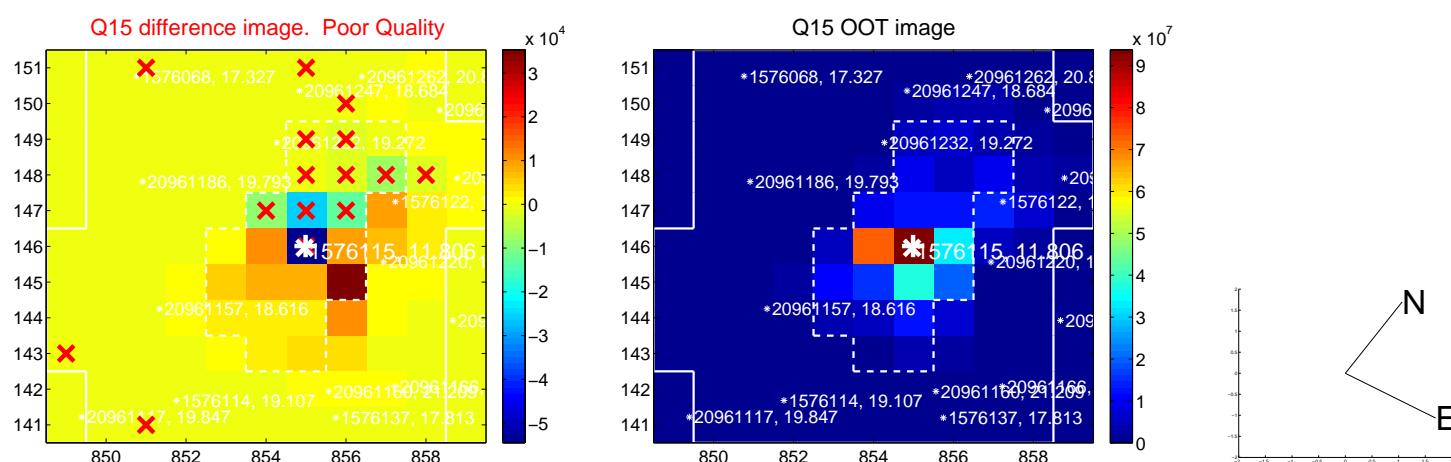
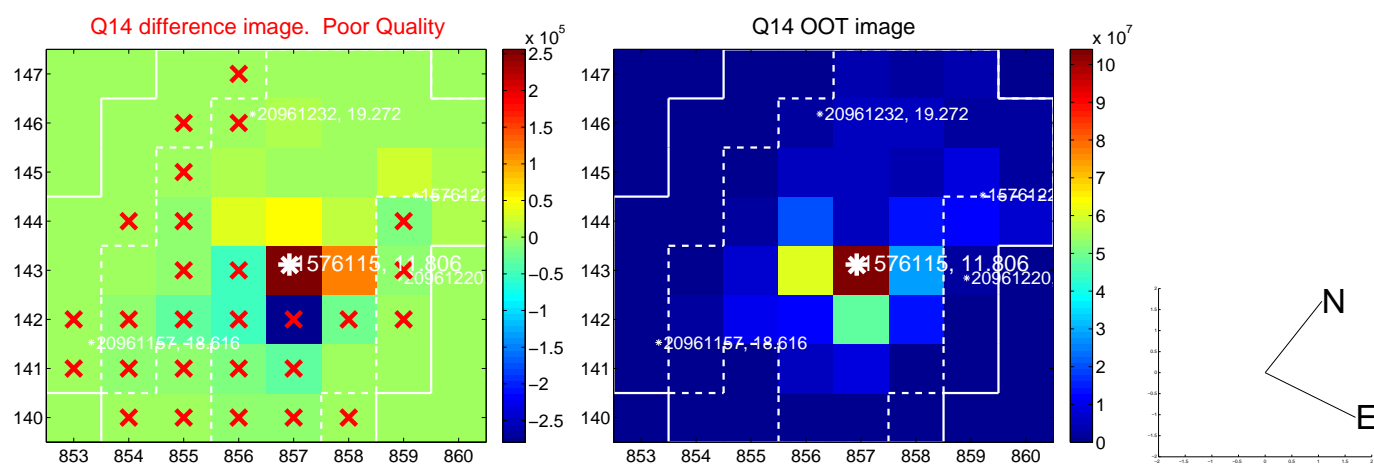
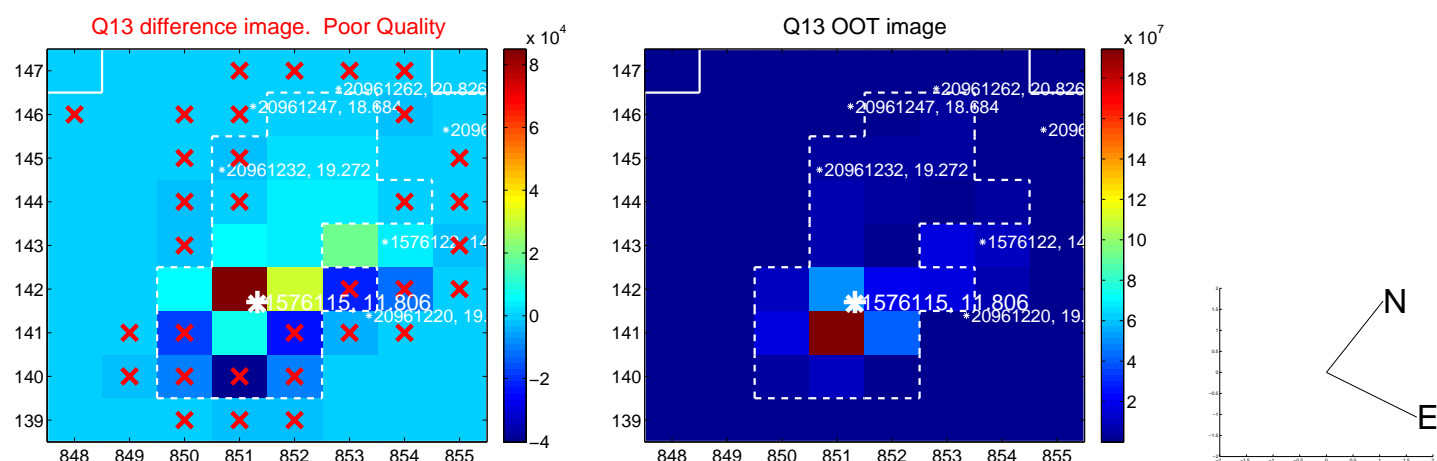




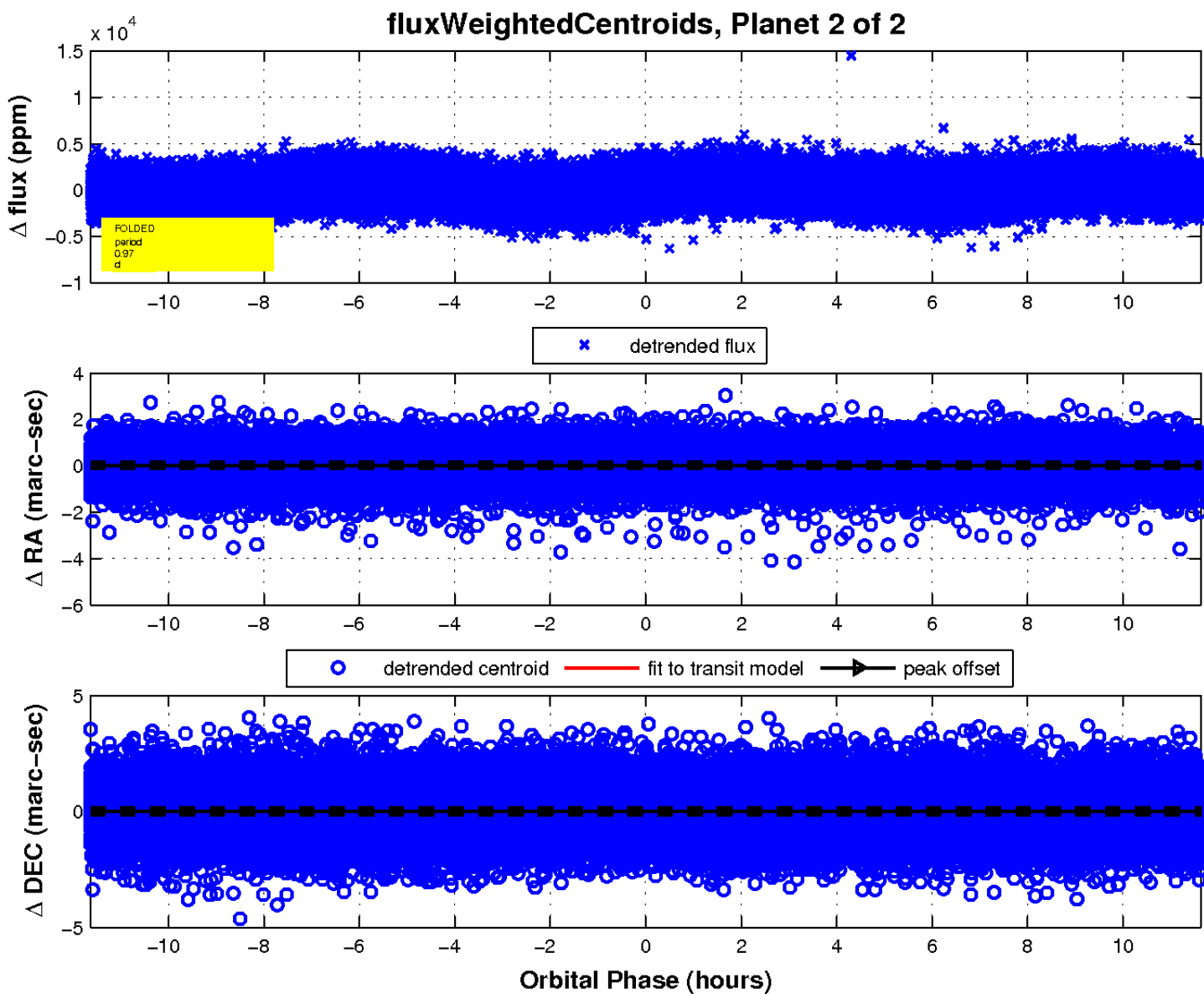
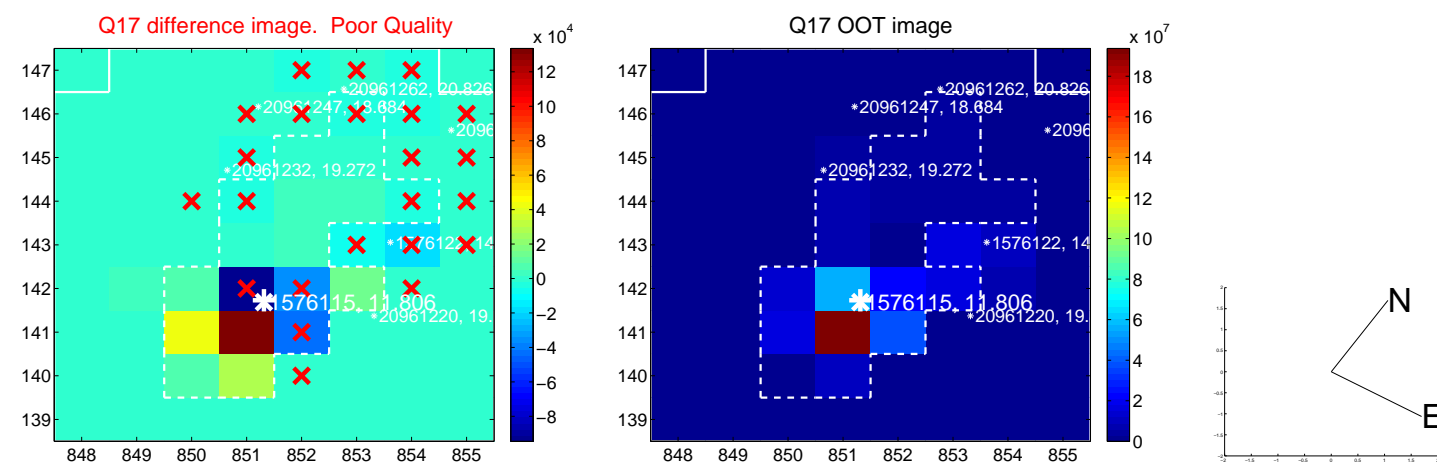
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UKIRT Image

