

# KIC 005531953

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
005531953-01	OBS	1681.01	6.939074	138.342167	562.0	2.493	18.4	19.8	0.42	3638	1.18	9.31
005531953-02	OBS	1681.02	1.992865	131.693520	260.5	1.524	12.9	14.4	0.42	3638	0.81	49.11
005531953-03	OBS	1681.04	21.914109	148.512731	519.6	1.915	8.0	9.4	0.42	3638	1.05	2.01
005531953-04	OBS	1681.03	3.531047	134.320758	284.4	1.470	7.6	10.8	0.42	3638	0.88	22.91

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
005531953-01	OBS	PC	1.00	0	0	0	0	NO_COMMENT
005531953-02	OBS	FP	0.33	0	0	1	0	CENT_UNRESOLVED_OFFSET
005531953-03	OBS	PC	1.00	0	0	0	0	NO_COMMENT
005531953-04	OBS	PC	0.94	0	0	0	0	NO_COMMENT

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

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

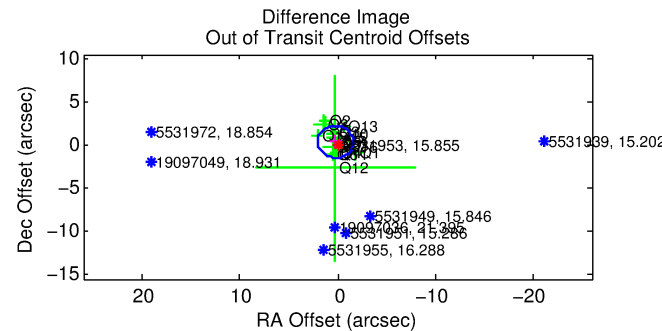
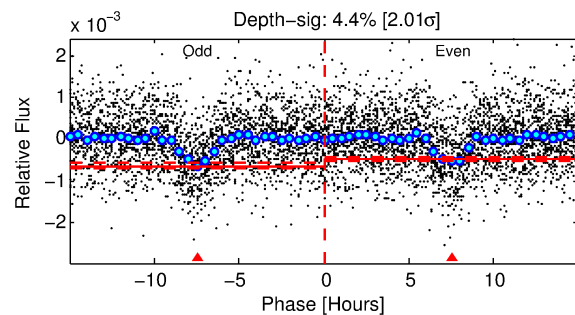
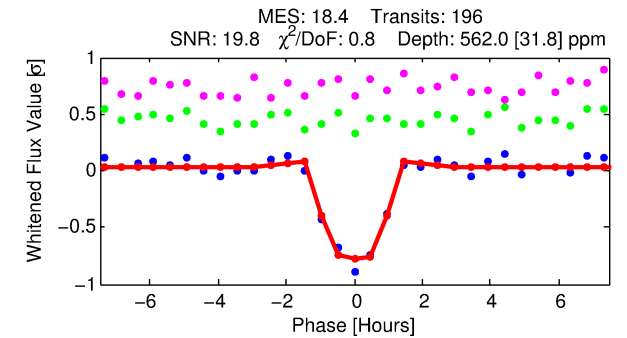
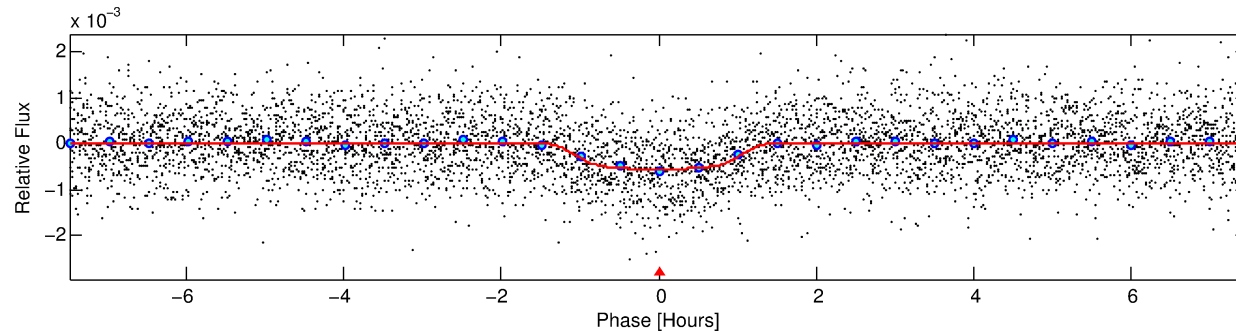
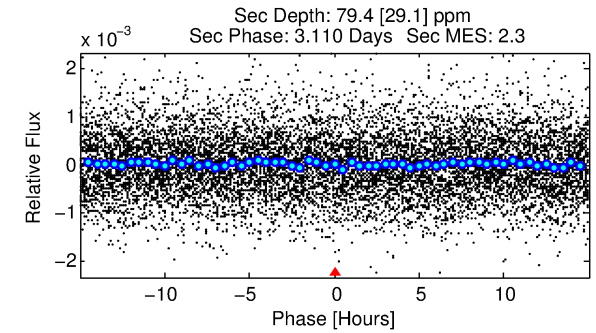
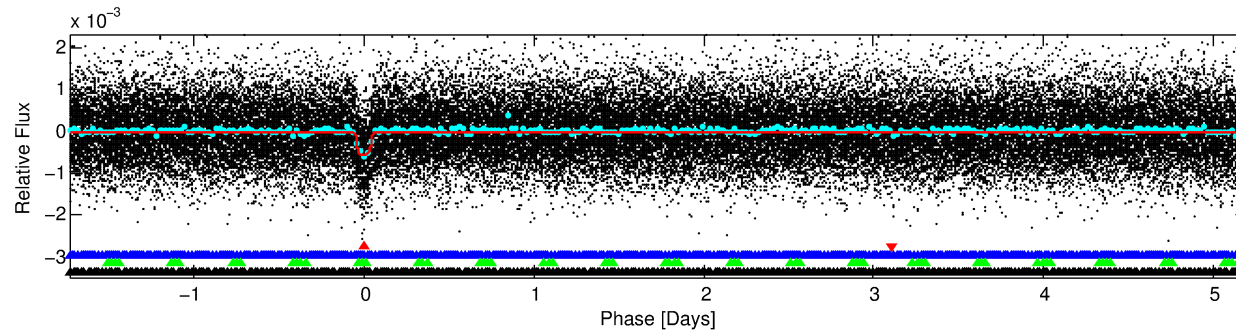
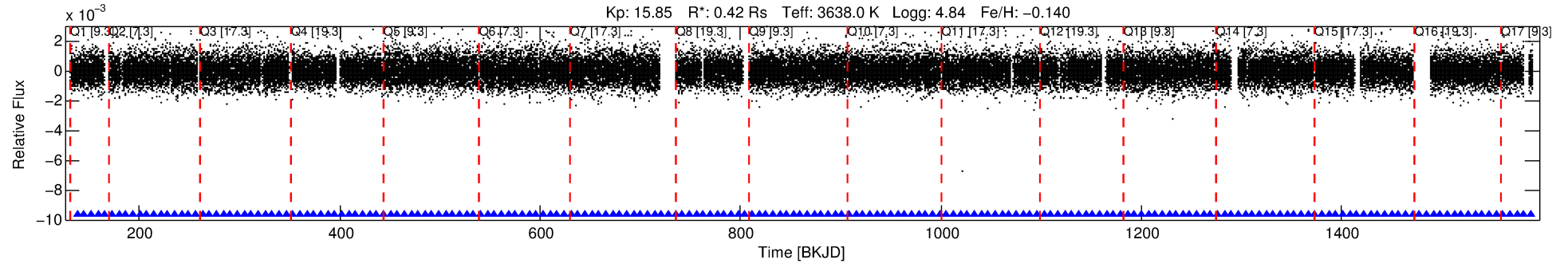
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 005531953-01

No Significant Match Found

# DV One-Page Summary

KIC: 5531953 Candidate: 1 of 4 Period: 6.939 d  
KOI: K01681.01 Corr: 0.949



## DV Fit Results:

Period = 6.93907 [0.00002] d  
Epoch = 138.3422 [0.0024] BKJD  
Rp/R\* = 0.0258 [0.0042]  
a/R\* = 10.49 [7.28]  
b = 0.90 [0.15]  
Seff = 9.31 [1.45]  
Teq = 445 [17] K  
Rp = 1.18 [0.25] Re  
a = 0.0545 [0.0054] AU  
Ag = 92.83 [46.71] [1.97σ]  
Teffp = 2137 [266] K [6.35σ]

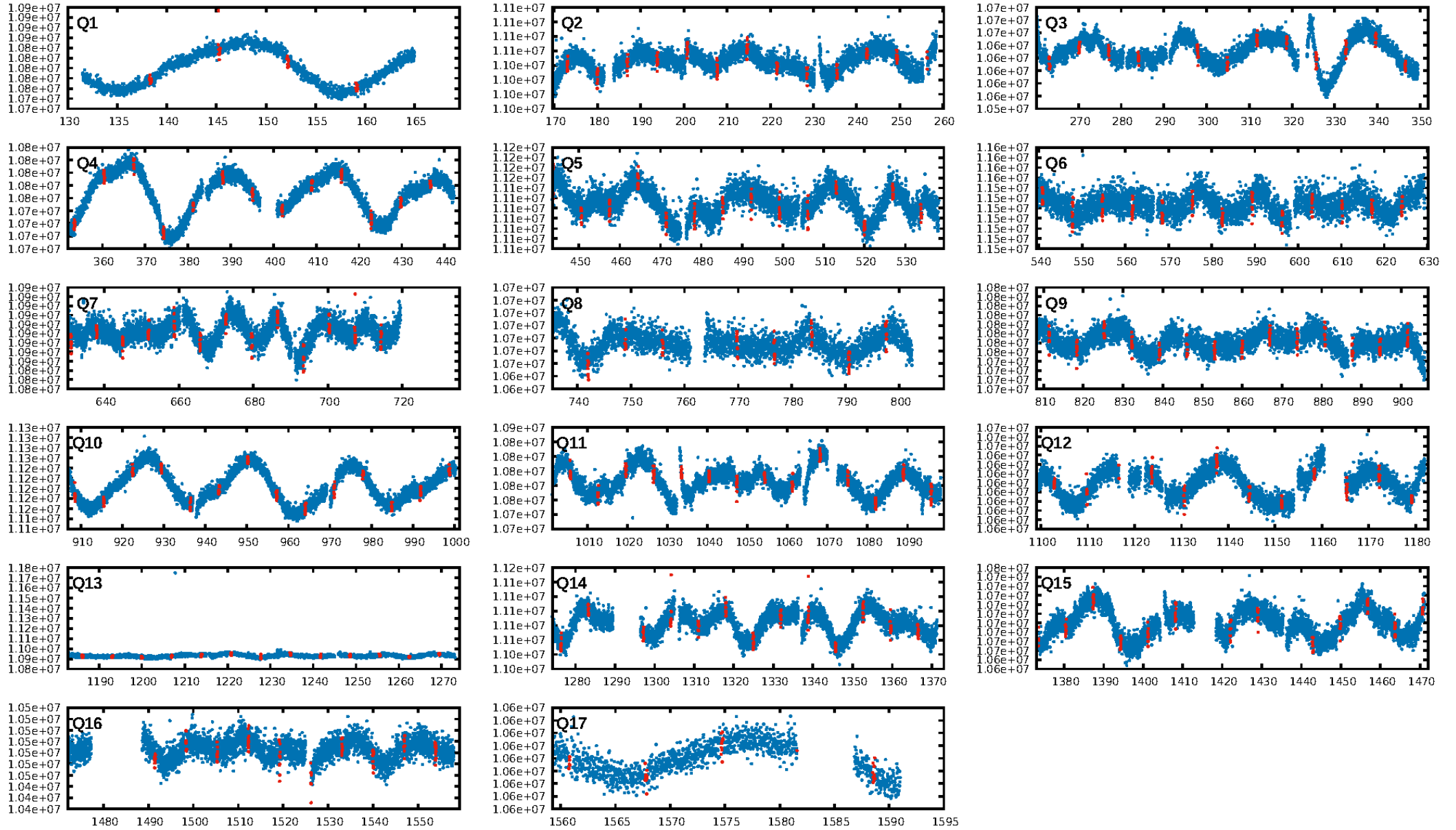
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [28.26σ]  
LongPeriod-sig: 100.0% [114.32σ]  
ModelChiSquare2-sig: 99.8%  
ModelChiSquareGof-sig: 100.0%  
Bootstrap-pfa: 1.38e-68  
RollingBand-fgt: 1.00 [188/188]  
GhostDiagnostic-chr: 4.533  
Centroid-sig: 0.0%  
Centroid-so: 0.799 arcsec [1.67σ]  
OotOffset-rm: 0.438 arcsec [0.71σ]  
KicOffset-rm: 0.386 arcsec [0.76σ]  
OotOffset-st: 4/4/4/5 [17]  
KicOffset-st: 4/4/4/5 [17]  
DiffImageQuality-fgm: 0.71 [12/17]  
DiffImageOverlap-fno: 0.94 [16/17]

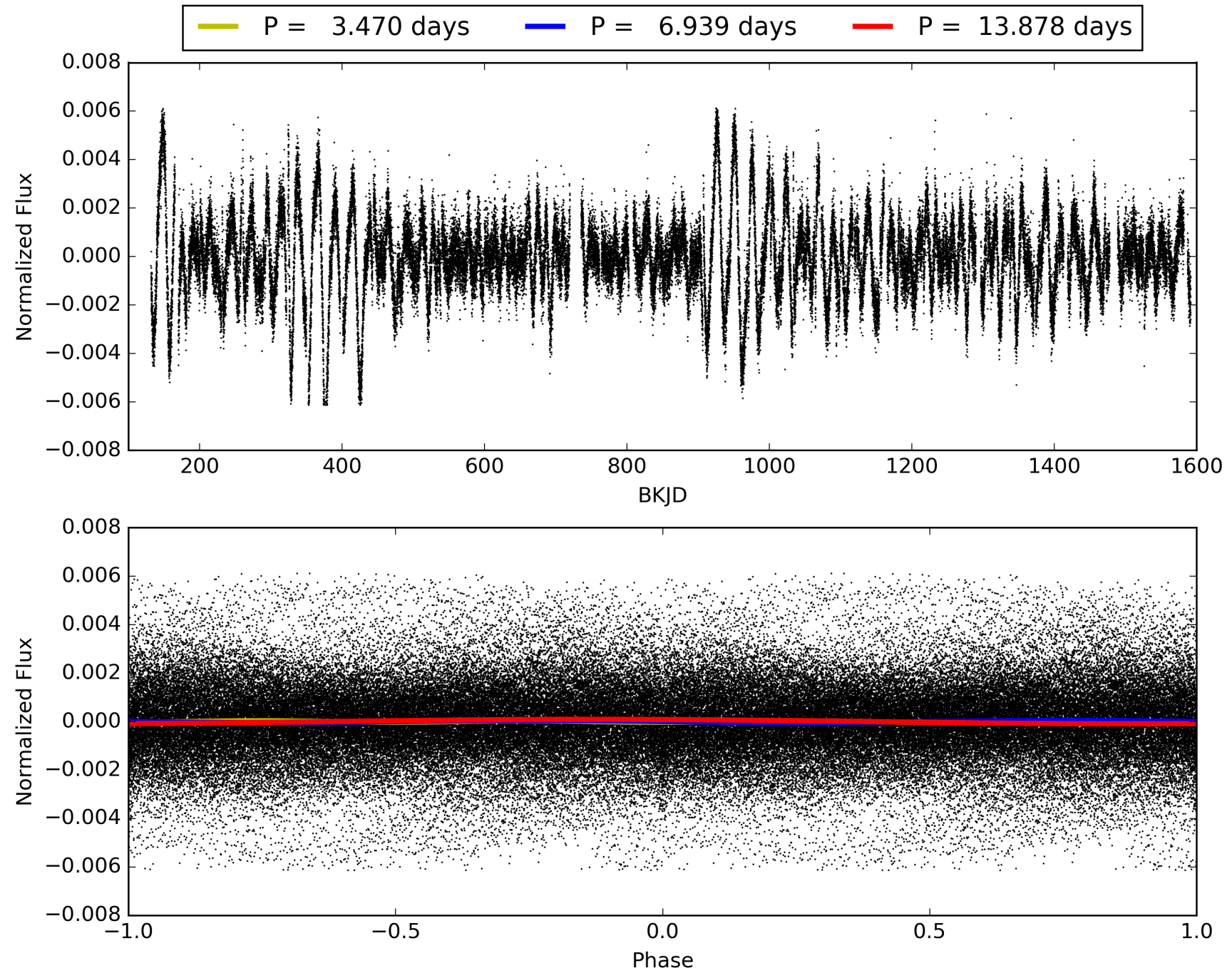
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 01-Feb-2016 01:27:47 Z

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

# TCE 005531953-01, PDC Light Curves



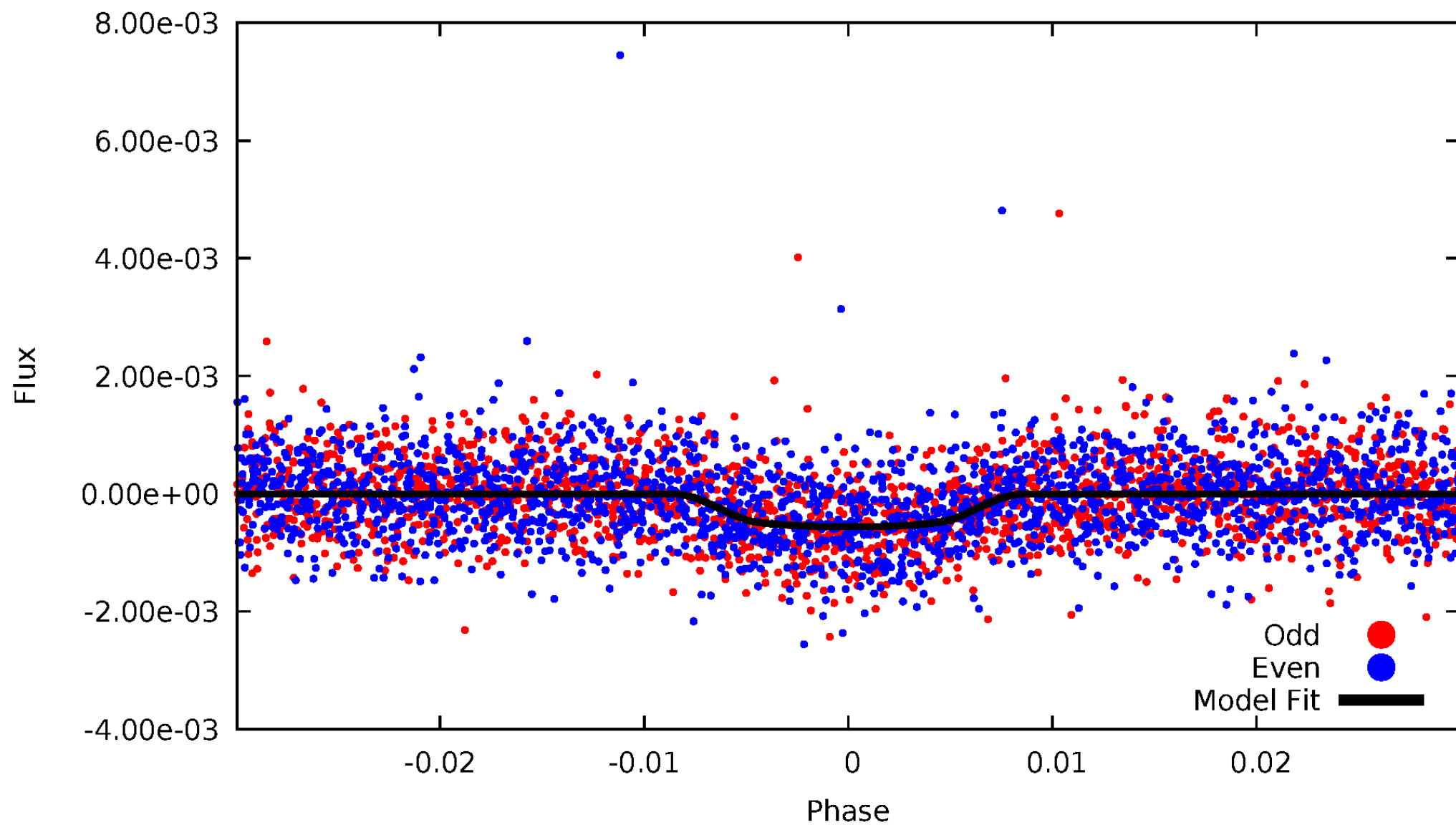
TCE 005531953-01





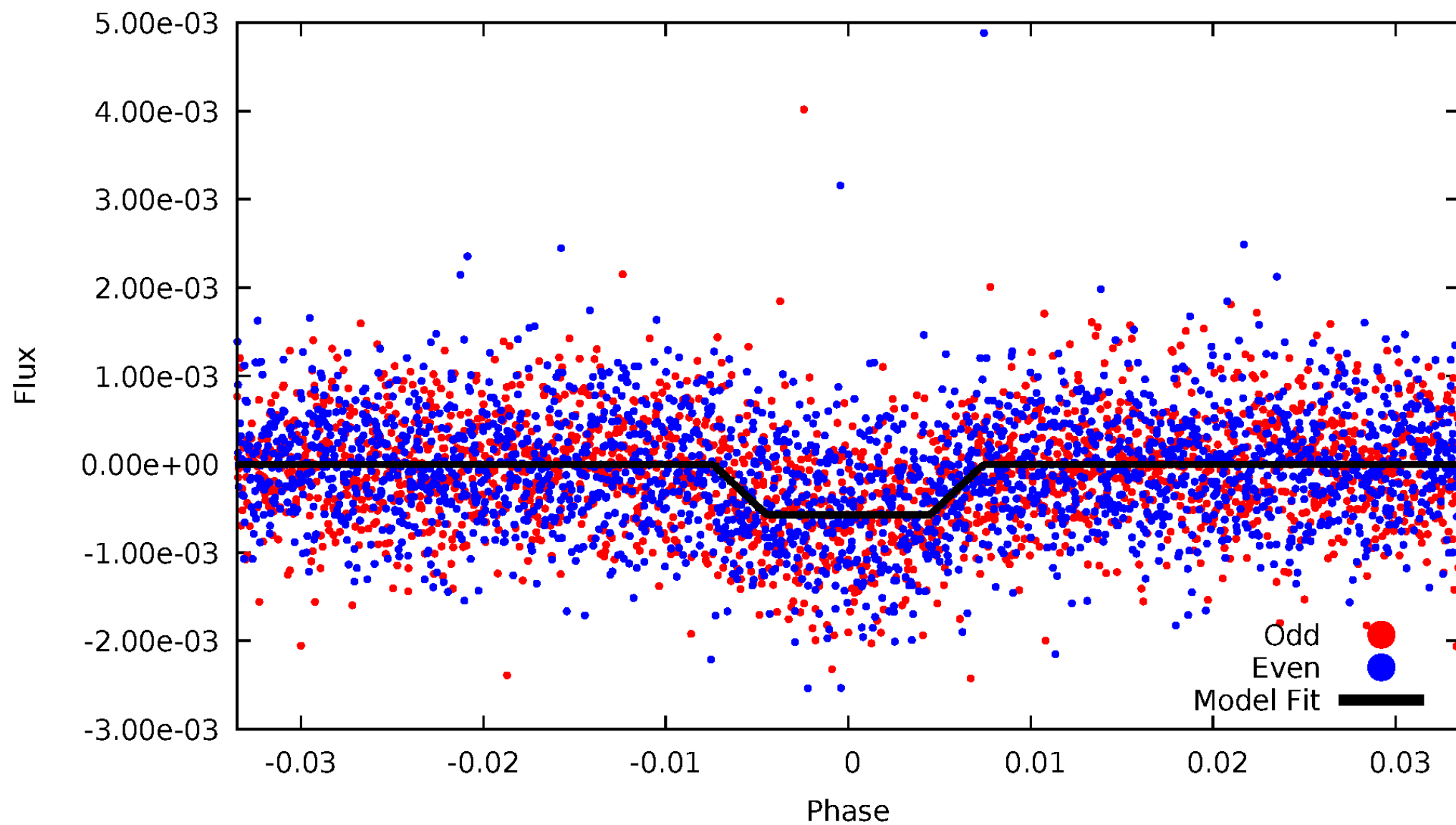
# DV Odd/Even

TCE 005531953-01



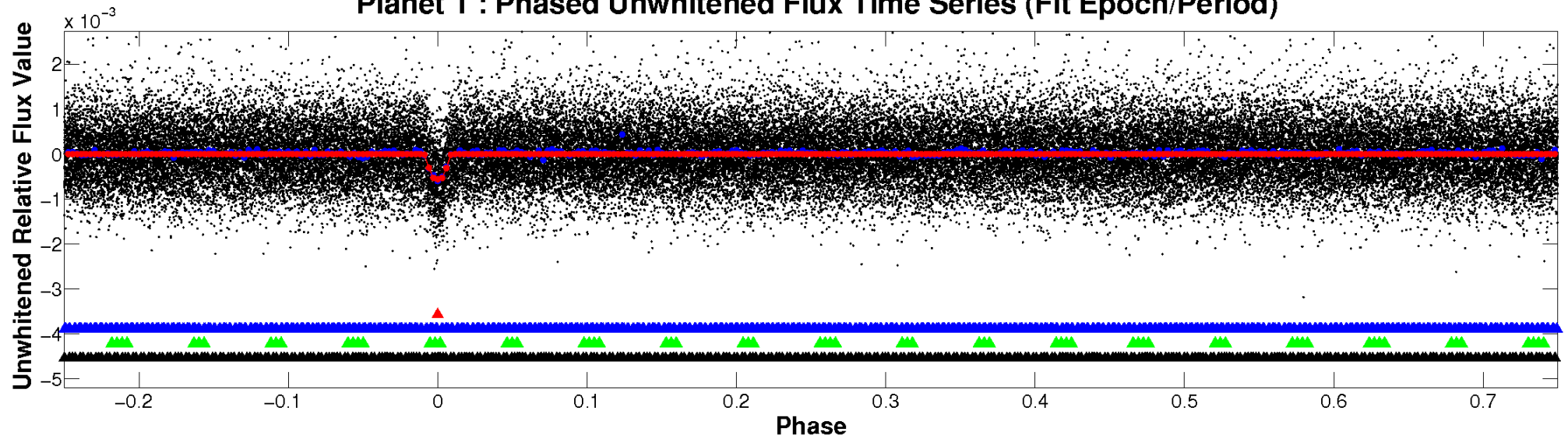
# ALT Odd/Even

TCE 005531953-01

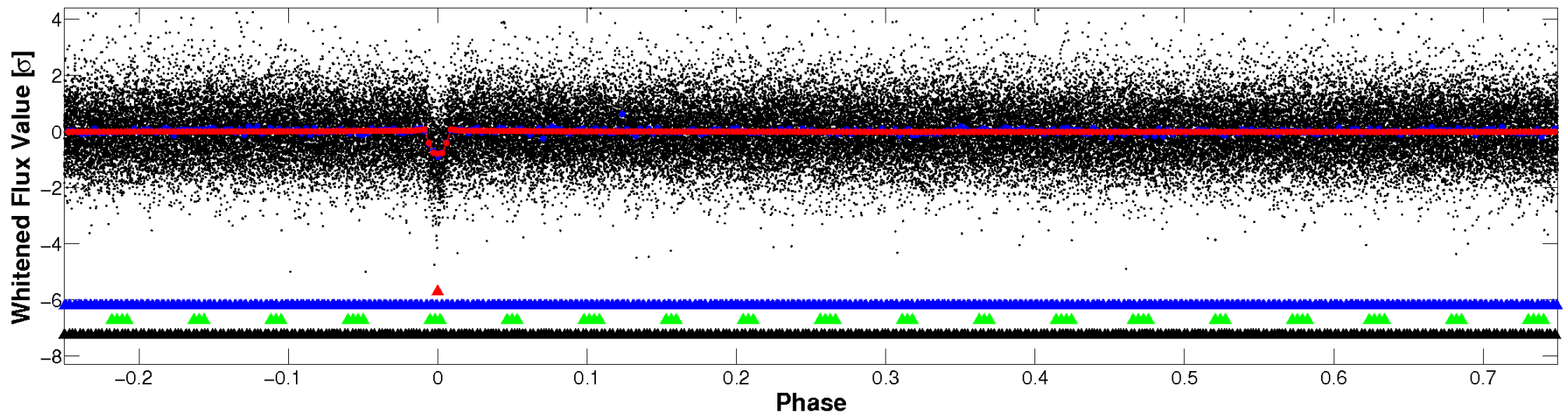


# Non-Whitened Vs. Whitened Light Curve

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

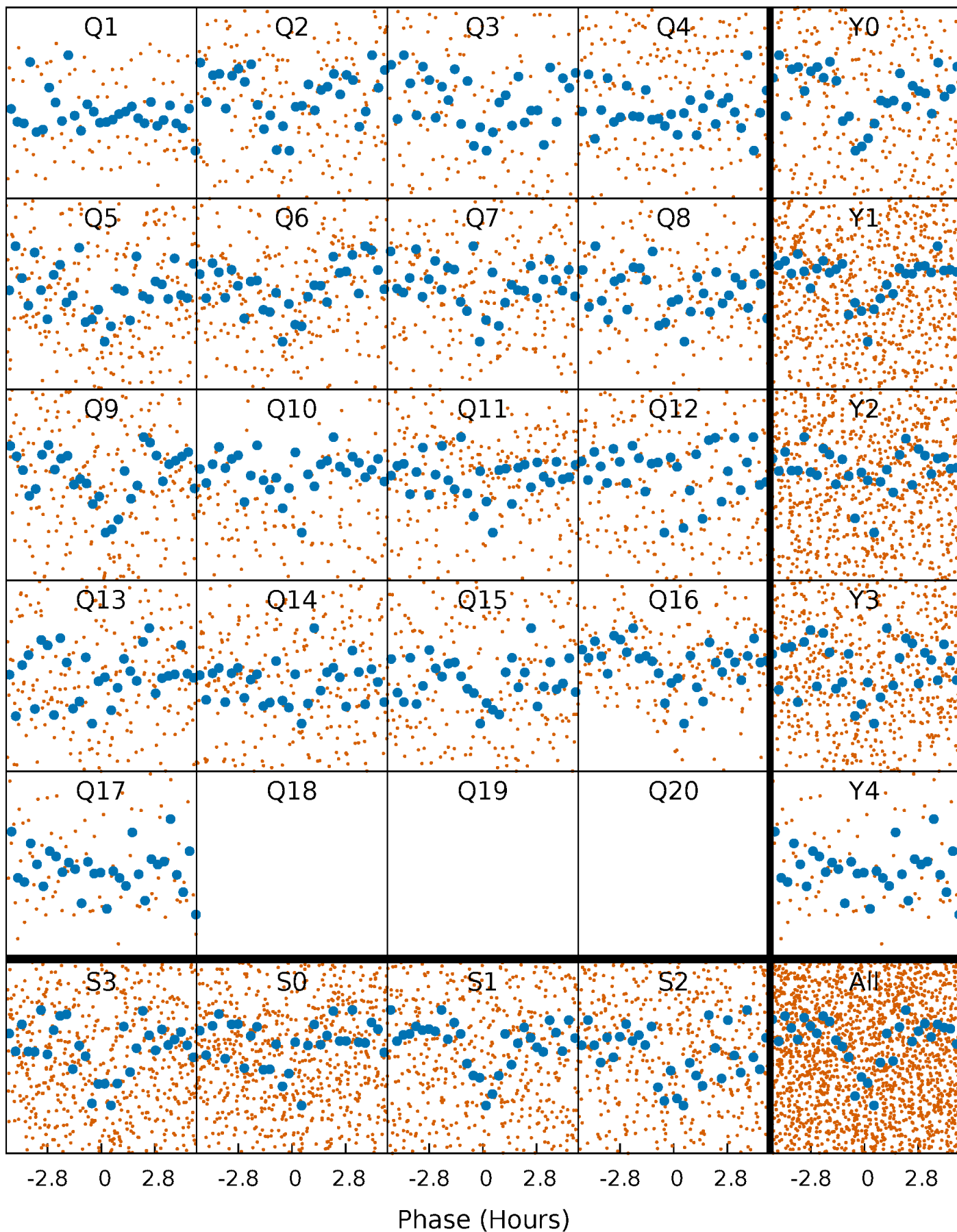


Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)



# PDC Quarter-Phased Transit Curves

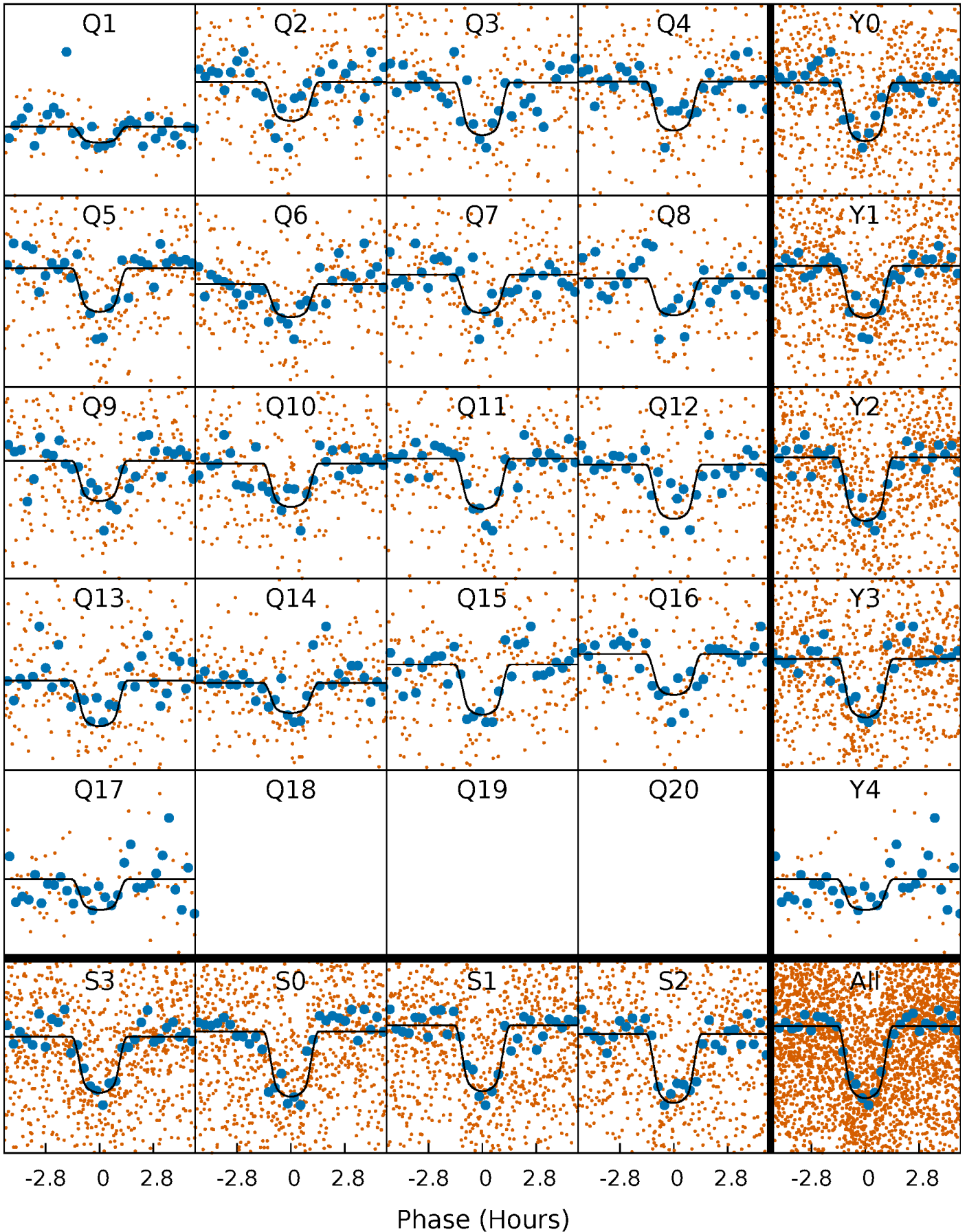
TCE 005531953-01 P= 6.939074 Days  $T_0=138.342167$  (BKJD)





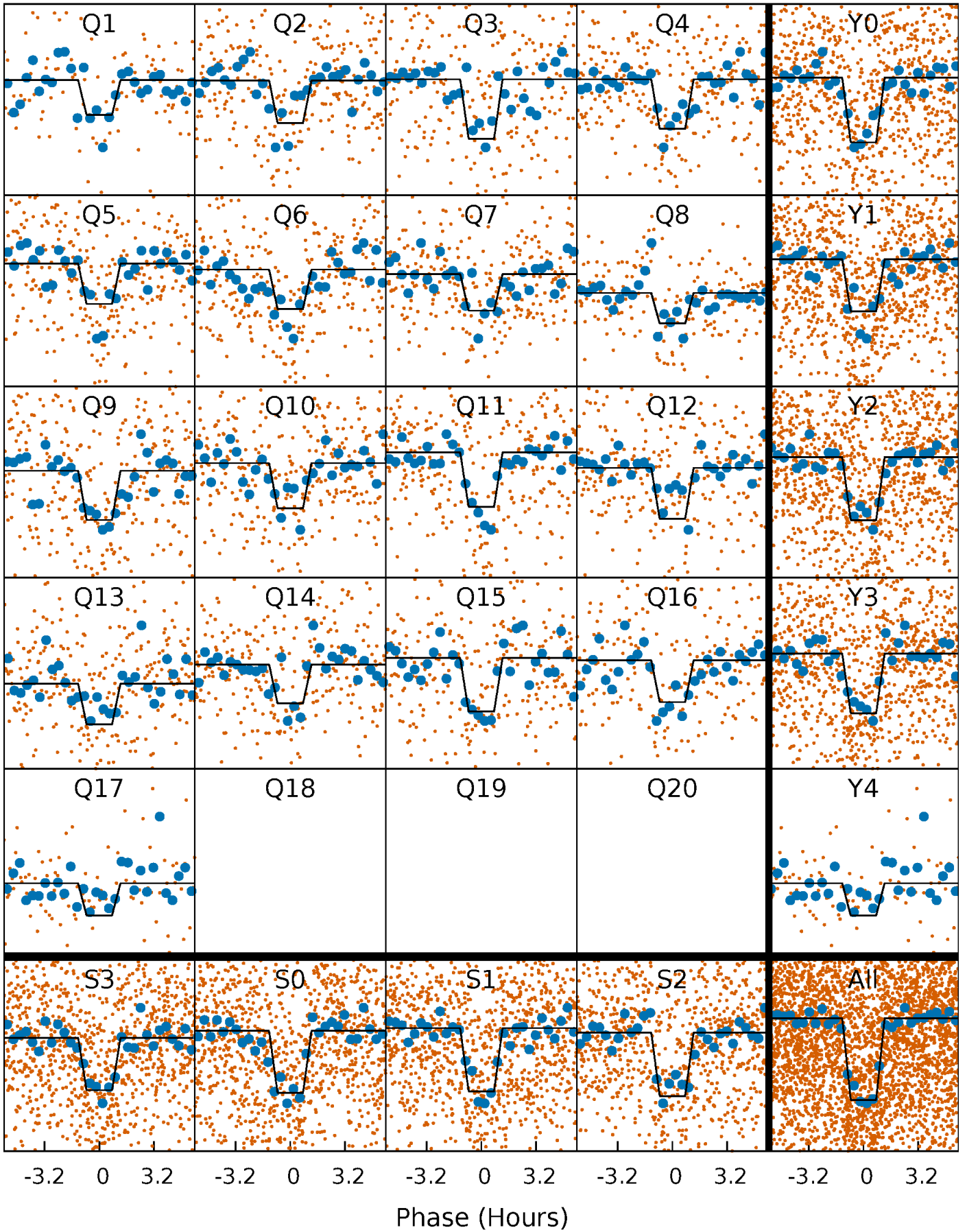
# DV Quarter-Phased Transit Curves

TCE 005531953-01 P= 6.939074 Days  $T_0=138.342167$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

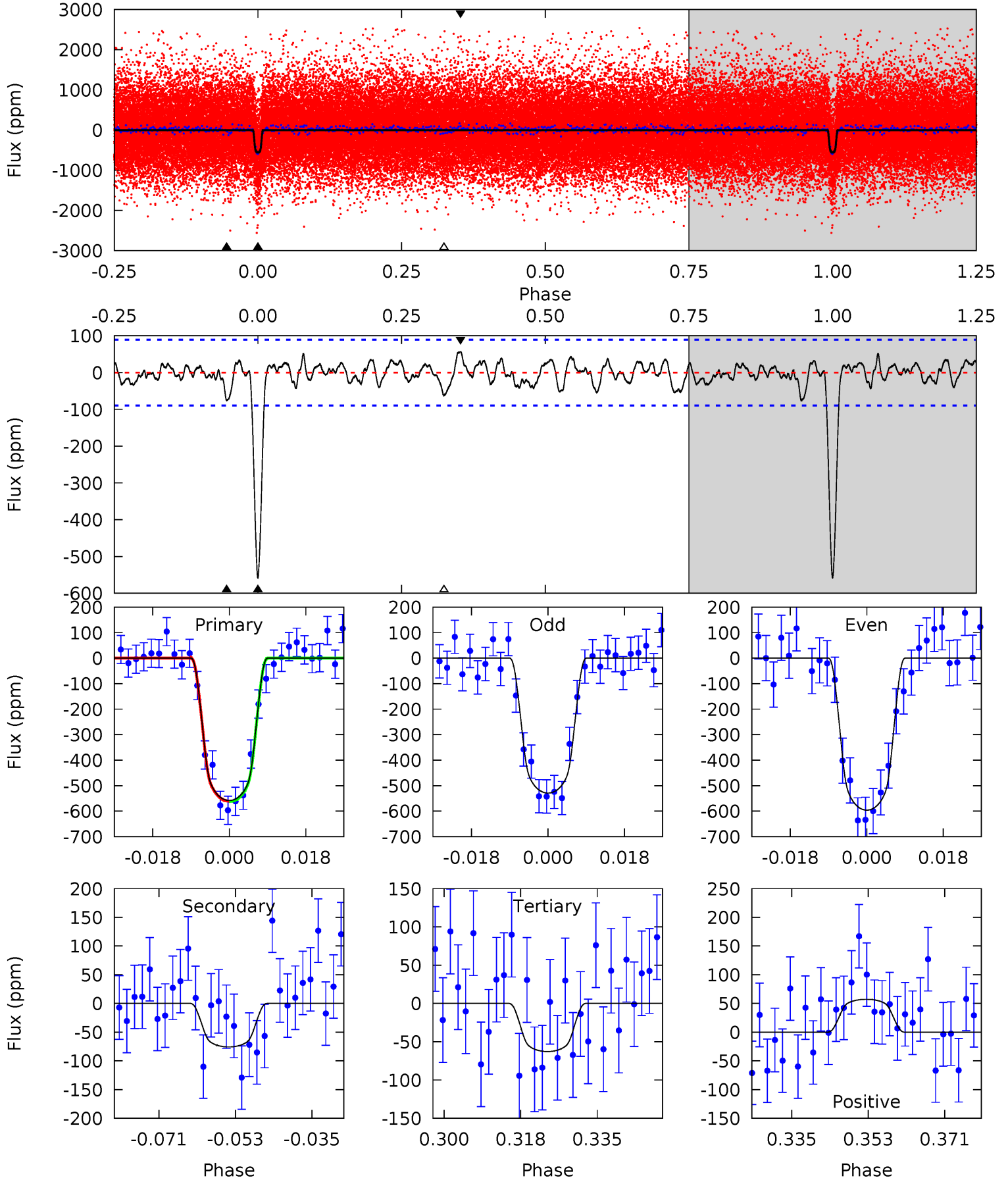
TCE 005531953-01   P= 6.939083 Days    $T_0=138.341149$  (BKJD)



# DV Model-Shift Uniqueness Test

005531953-01, P = 6.939074 Days, E = 131.403093 Days

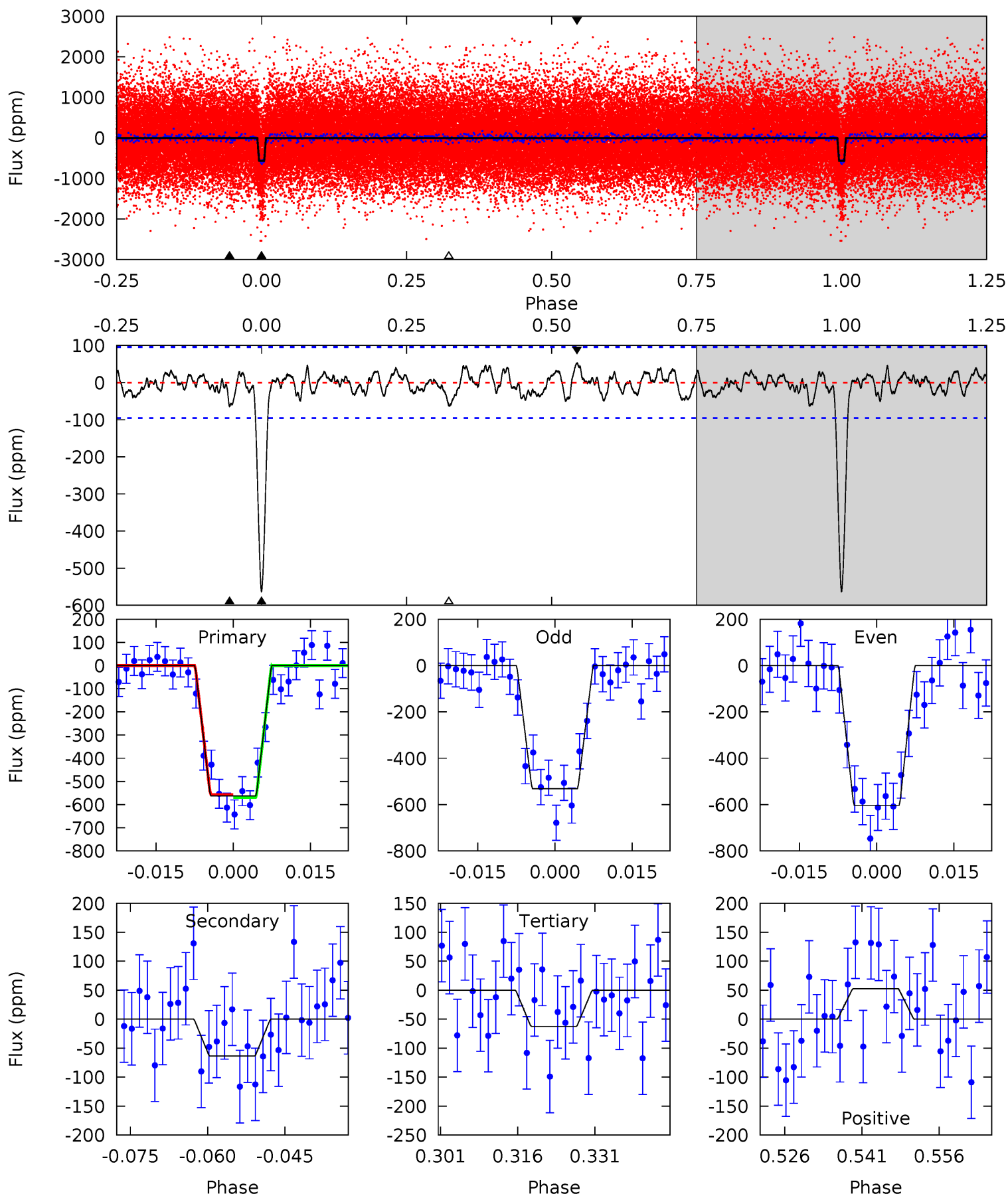
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
30.7	4.17	3.46	3.15	4.92	2.37	1.28	27.3	27.6	0.71	1.02	1.84	0.93	0.09	0.04



# Alt Model-Shift Uniqueness Test

005531953-01, P = 6.939083 Days, E = 131.402066 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
29.1	3.30	3.24	2.72	4.95	2.43	1.18	25.9	26.4	0.06	0.57	1.86	0.99	0.09	0.33





### Stellar Parameters For KIC 005531953

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$3638^{+72}_{-87}$	$4.844^{+0.049}_{-0.055}$	$-0.140^{+0.150}_{-0.150}$	$0.420^{+0.046}_{-0.056}$	$0.450^{+0.043}_{-0.059}$	$8.524^{+2.464}_{-1.743}$
	+2%/-2%	+1%/-1%	+107%/-107%	+11%/-13%	+10%/-13%	+29%/-20%
Source	SPE70	SPE60	SPE70	DSEP		

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

### Secondary Eclipse Parameters for KIC 005531953-01 / KOI 1681.01

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-76 \pm 18$	$1.17^{+0.21}_{-0.20}$	$621^{+21}_{-20}$	$2658^{+145}_{-146}$	$88^{+44}_{-29}$
Alt.	$-64 \pm 19$	$1.10^{+0.20}_{-0.19}$	$623^{+18}_{-19}$	$2647^{+163}_{-166}$	$87^{+47}_{-34}$

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

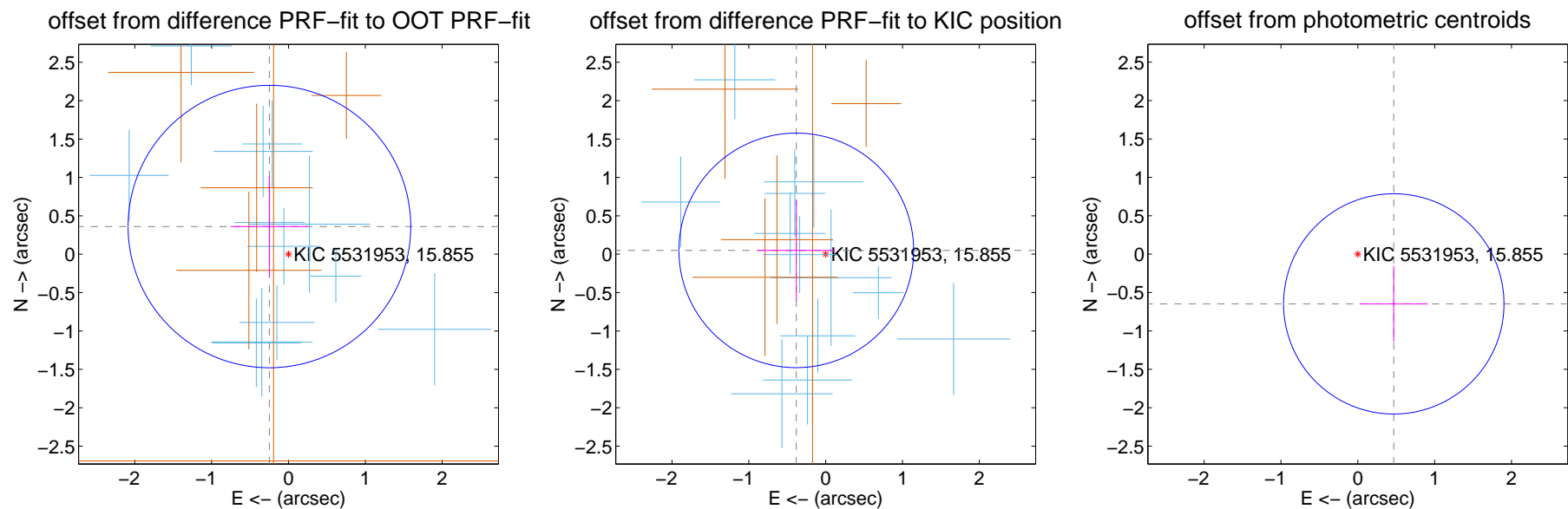
## DV Centroid Data

Supplemental centroid analysis for 005531953-01. Kepler magnitude: 15.86. Transit SNR 19.78

There are 12 quarters with good PRF difference image offsets

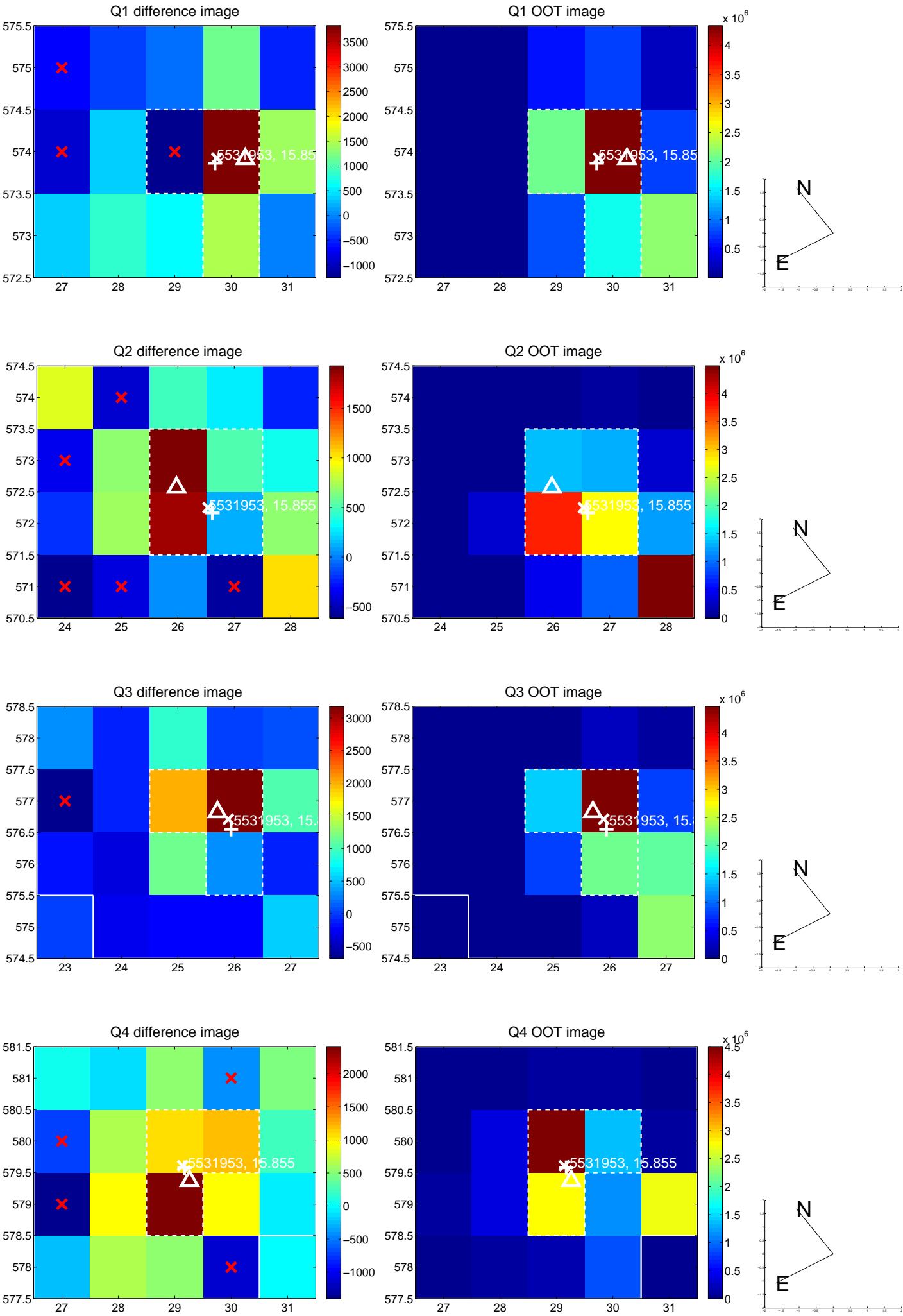
The direct PRF centroid is offset from the target star catalog position by about 0.29 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.438 \pm 0.613$	0.71	$0.249 \pm 0.506$	$0.361 \pm 0.658$
PRF-fit source offset from KIC position	$0.386 \pm 0.509$	0.76	$0.383 \pm 0.506$	$0.050 \pm 0.658$
photometric centroid source offset	$0.80 \pm 0.48$	1.67	$-0.47 \pm 0.44$	$-0.65 \pm 0.50$

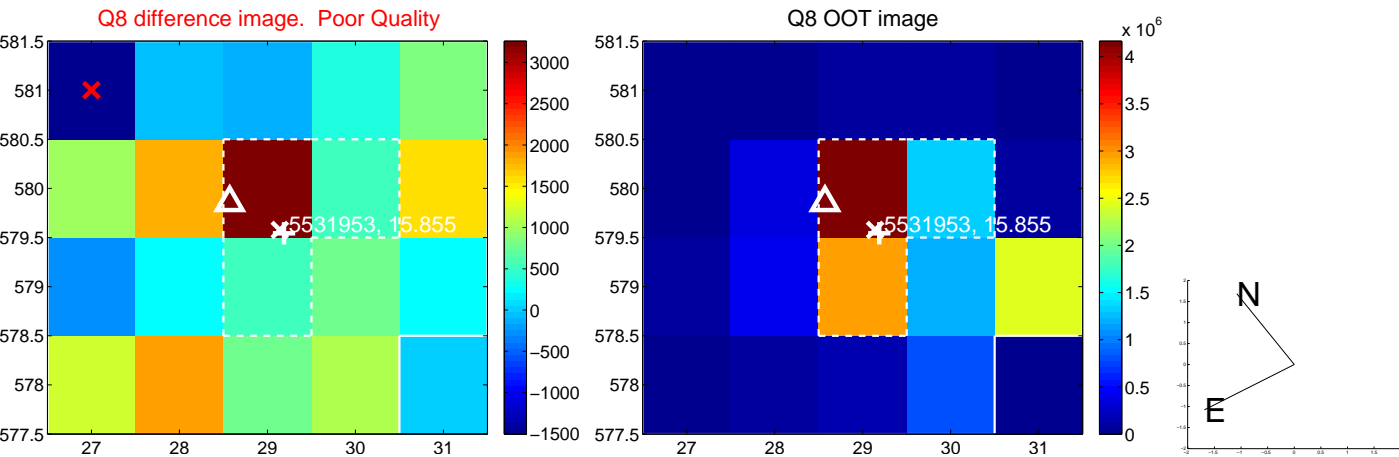
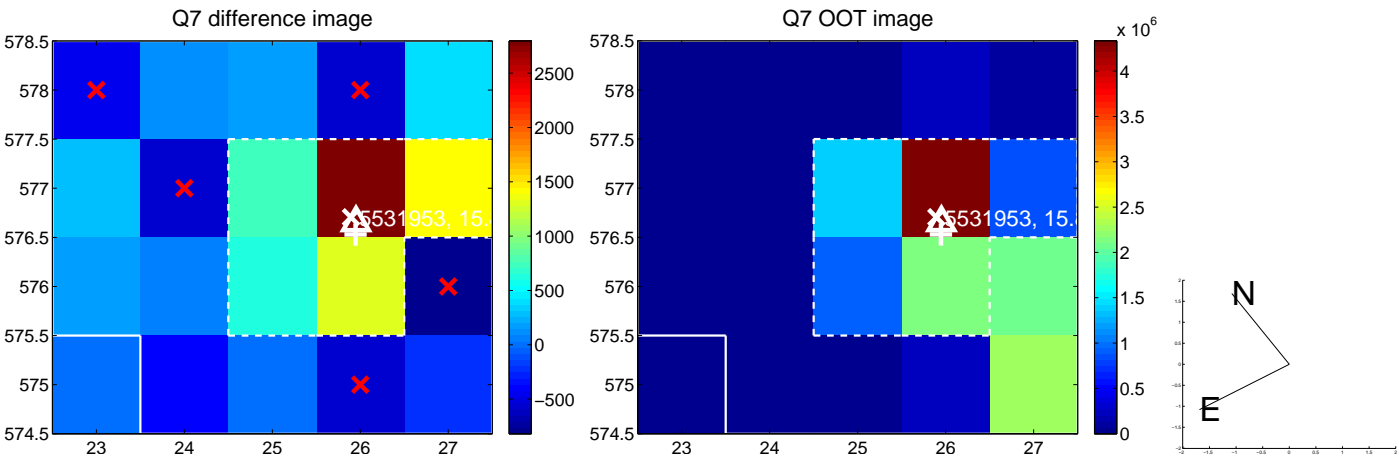
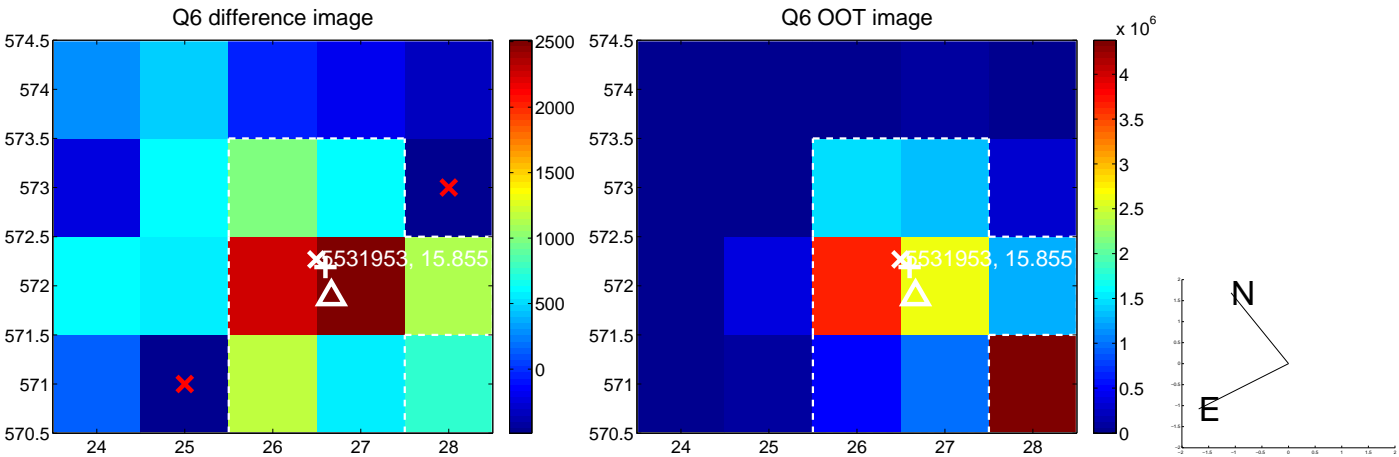
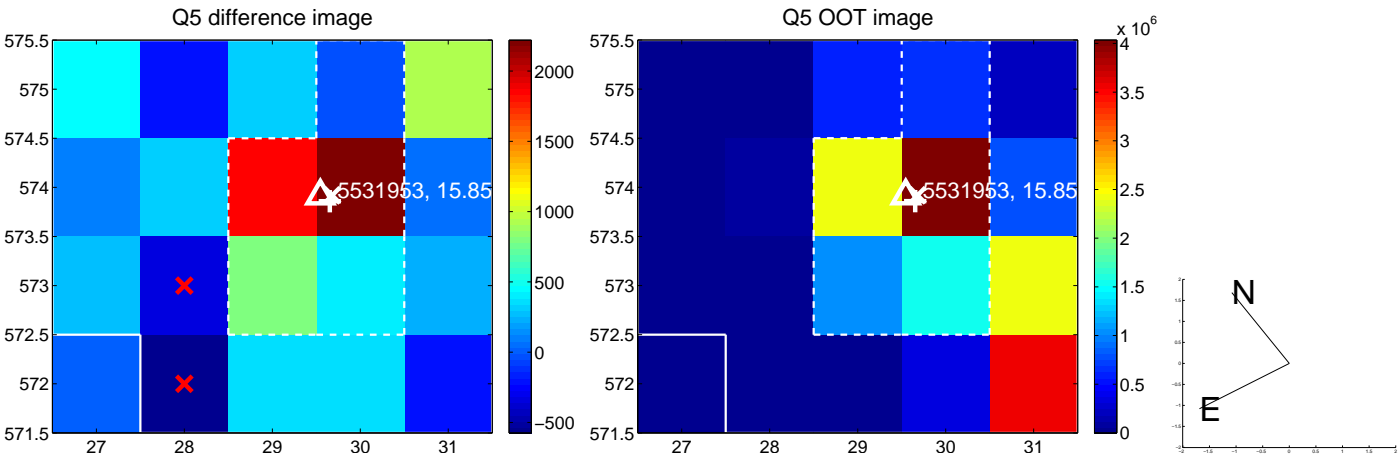


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses:** good quarterly centroid offsets; **Vermillion crosses:** bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

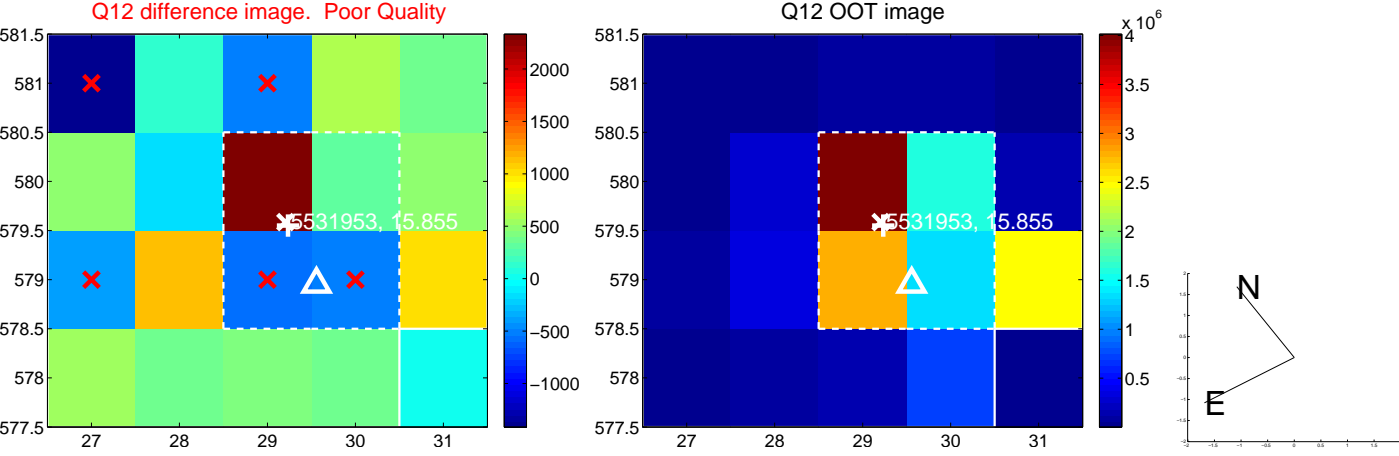
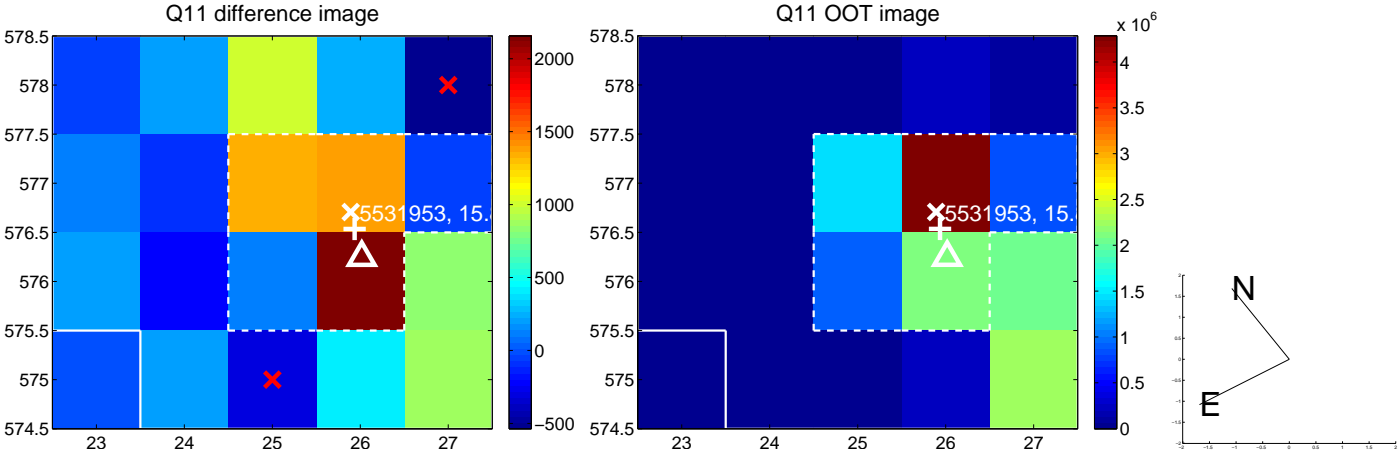
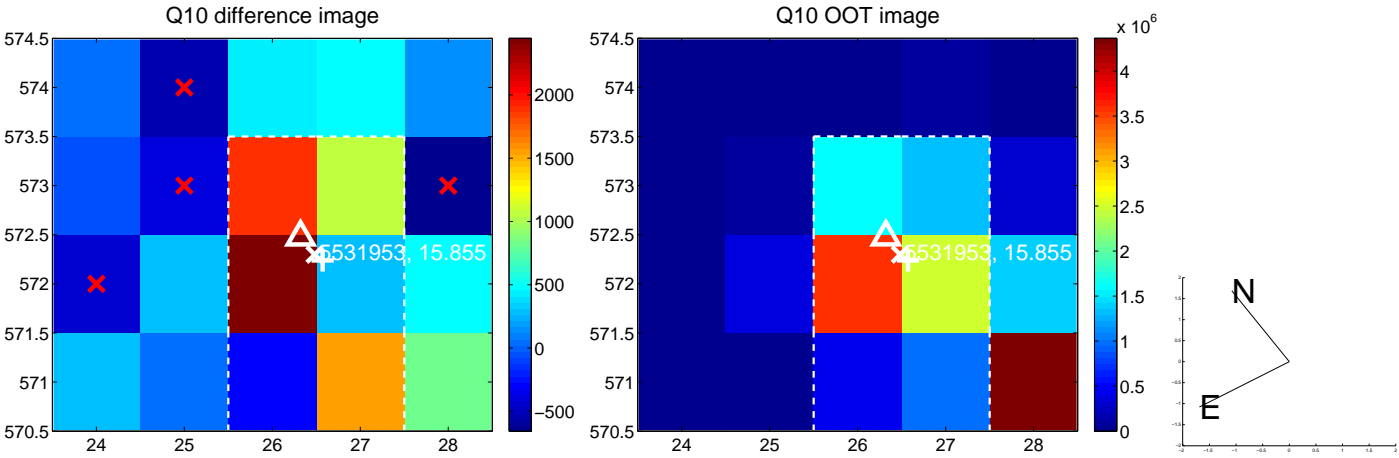
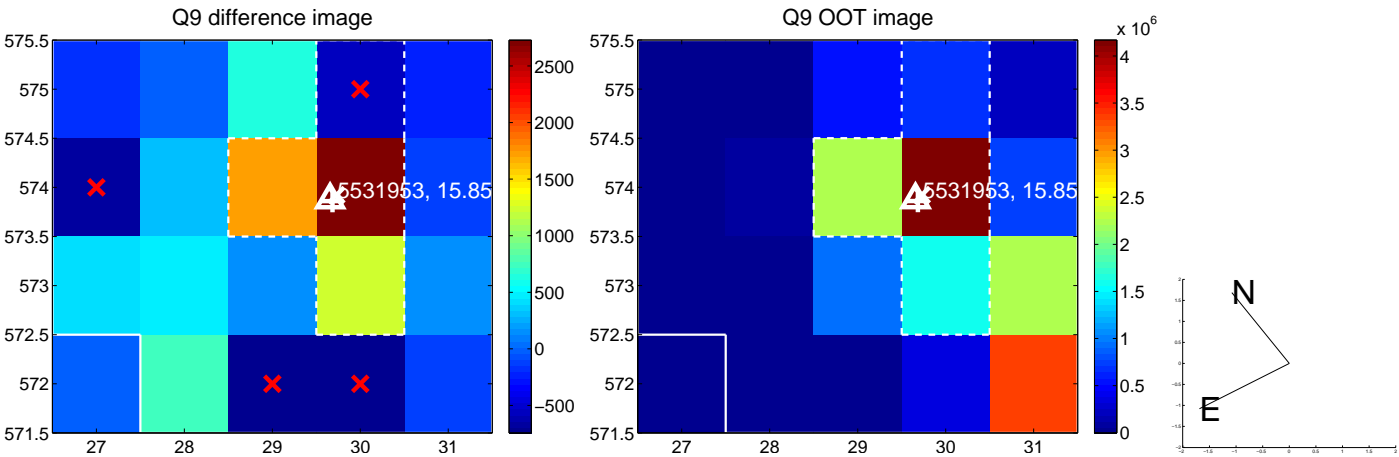


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

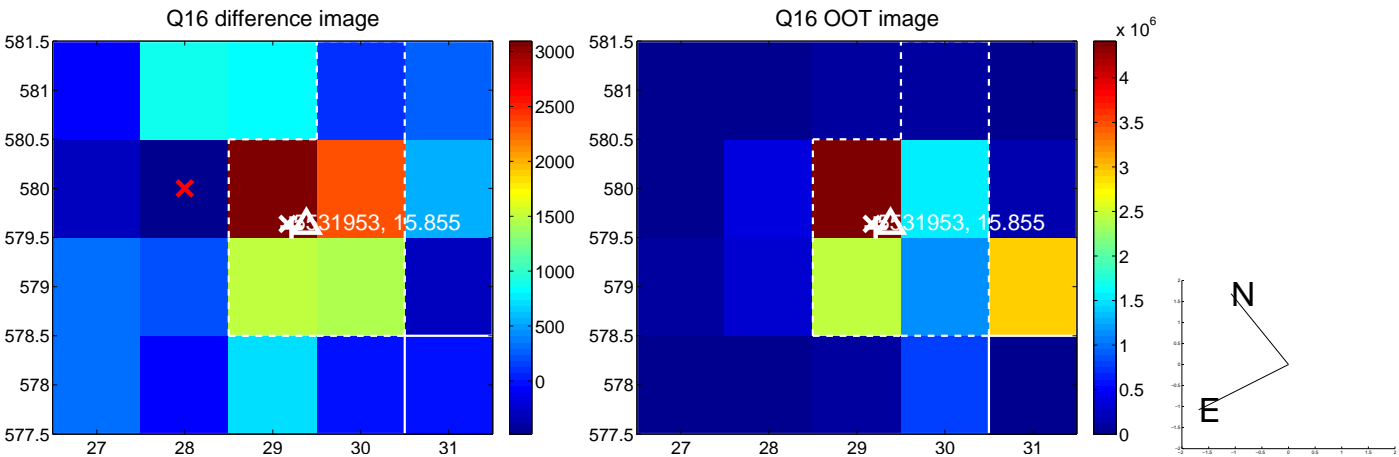
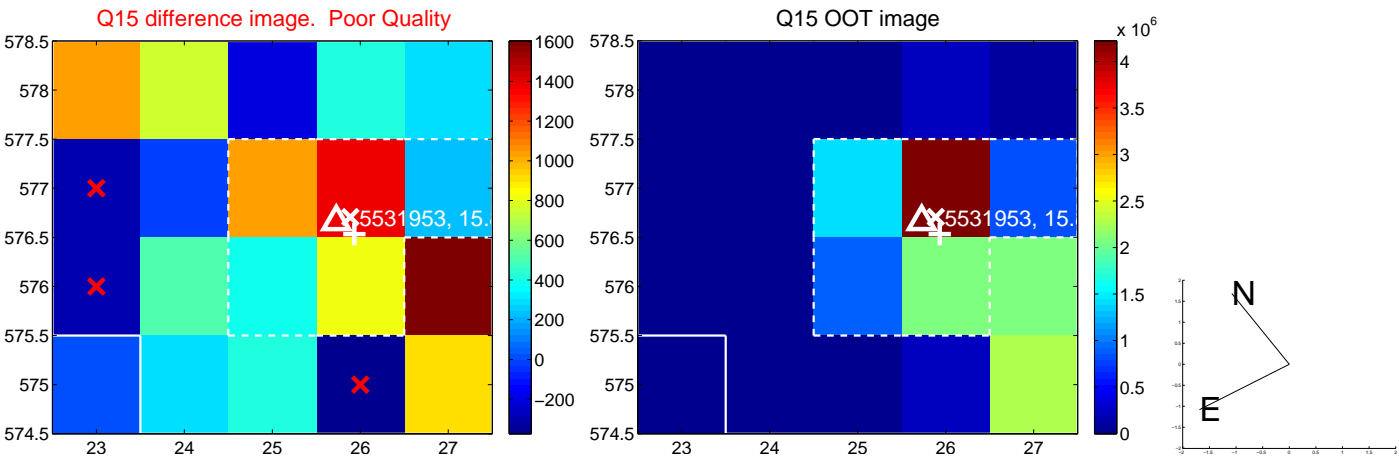
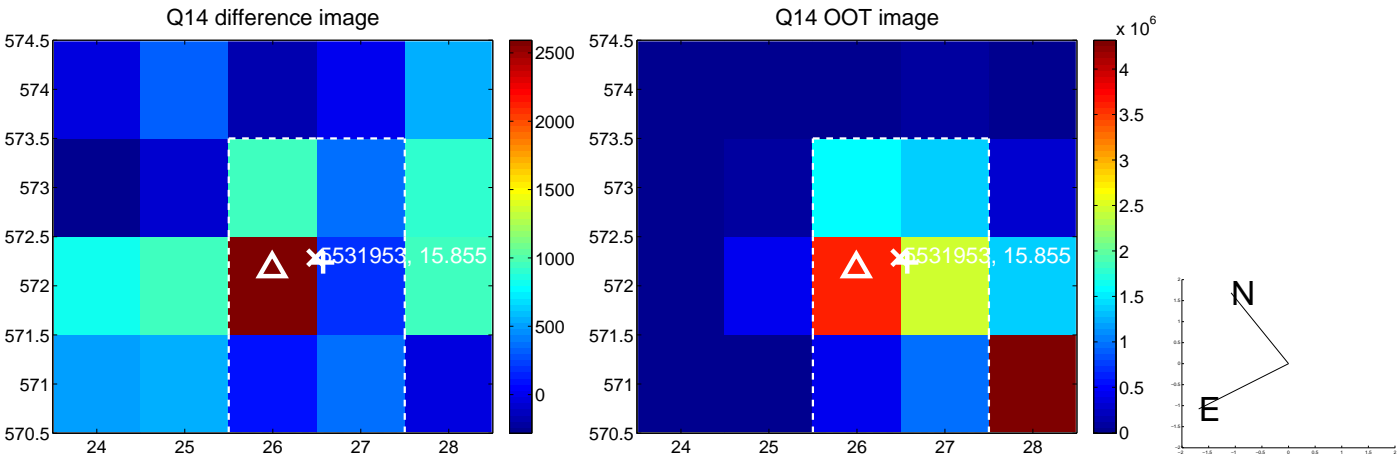
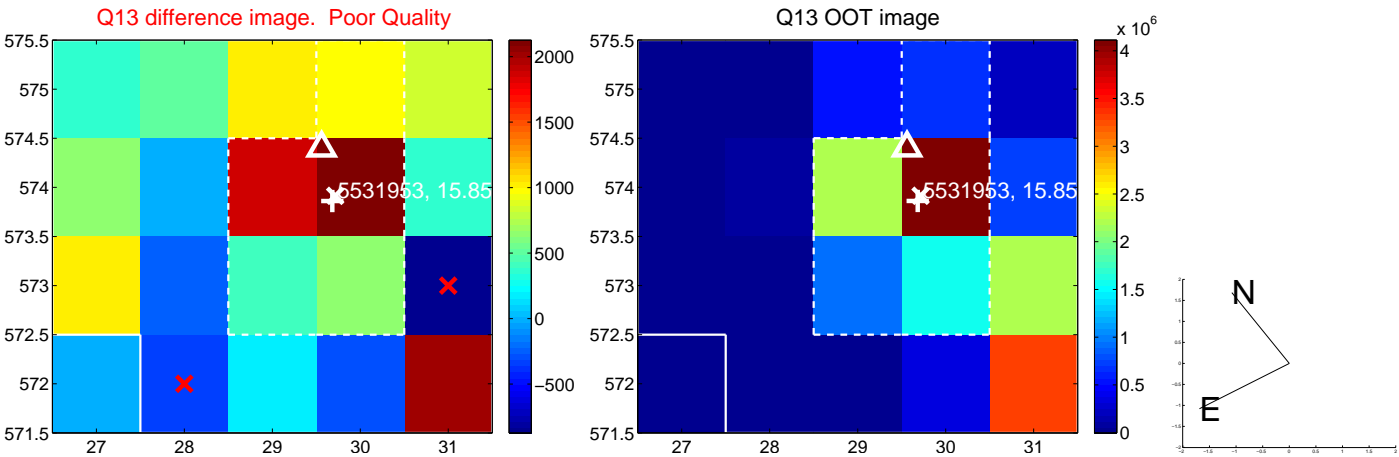




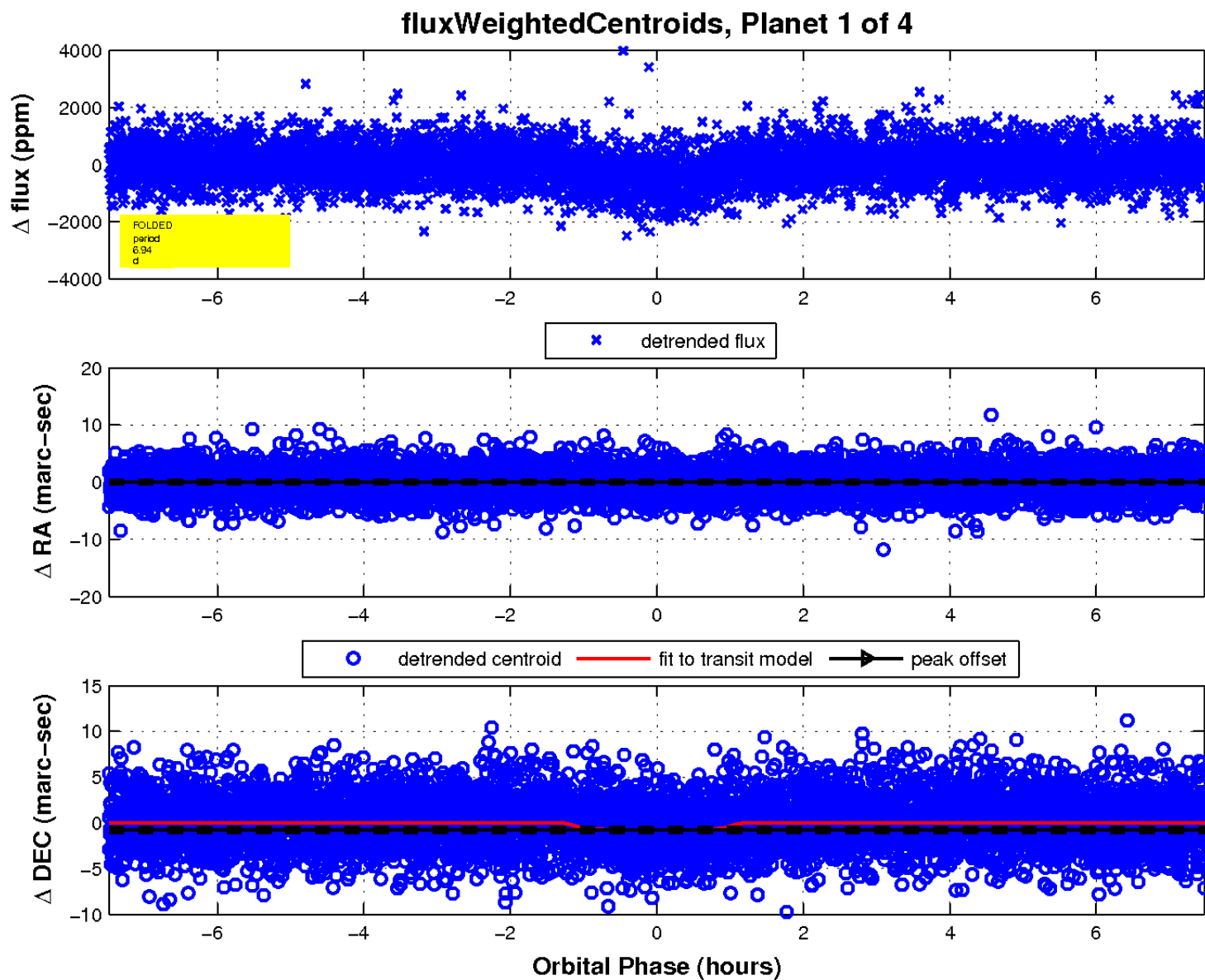
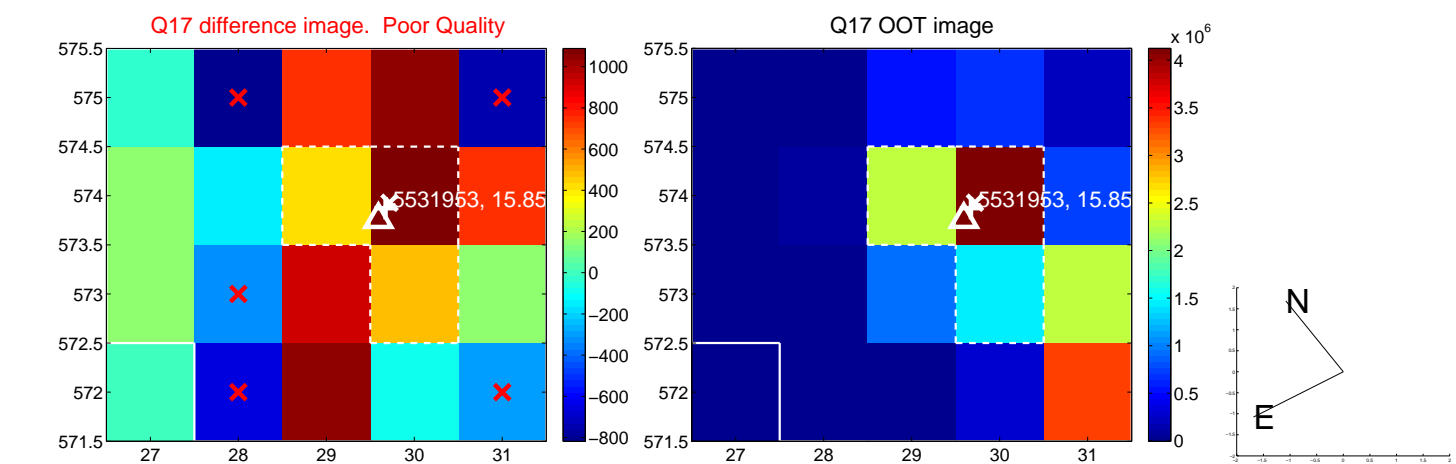
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

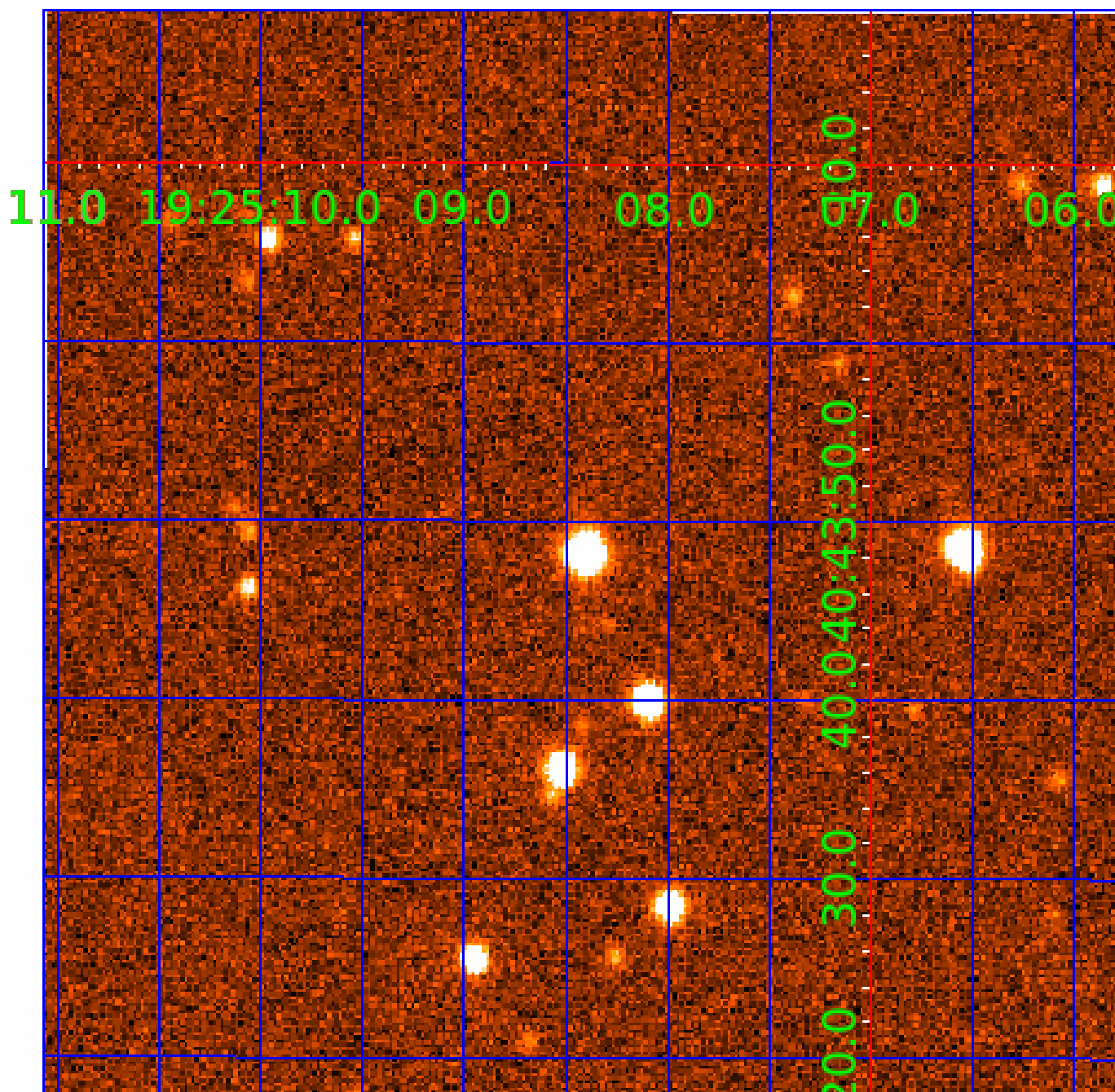


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination





# KIC 005531953

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
005531953-01	OBS	1681.01	6.939074	138.342167	562.0	2.493	18.4	19.8	0.42	3638	1.18	9.31
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005531953-03	OBS	1681.04	21.914109	148.512731	519.6	1.915	8.0	9.4	0.42	3638	1.05	2.01
005531953-04	OBS	1681.03	3.531047	134.320758	284.4	1.470	7.6	10.8	0.42	3638	0.88	22.91

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
005531953-01	OBS	PC	1.00	0	0	0	0	NO_COMMENT
005531953-02	OBS	FP	0.33	0	0	1	0	CENT_UNRESOLVED_OFFSET
005531953-03	OBS	PC	1.00	0	0	0	0	NO_COMMENT
005531953-04	OBS	PC	0.94	0	0	0	0	NO_COMMENT

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

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

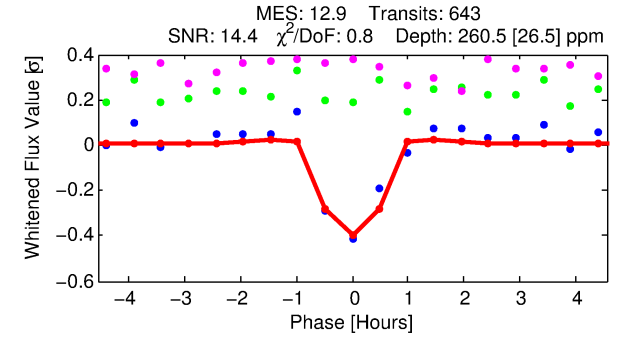
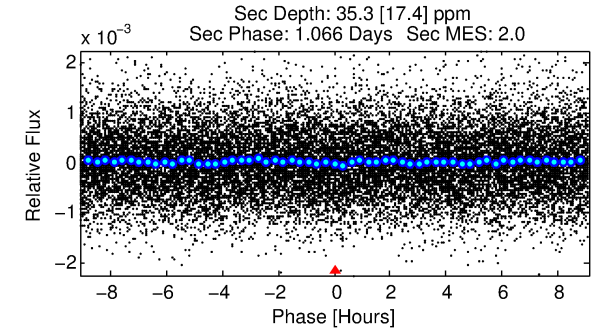
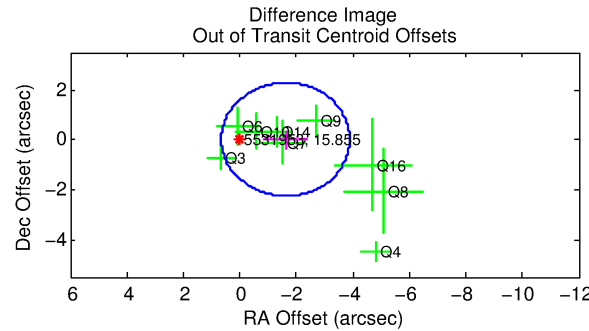
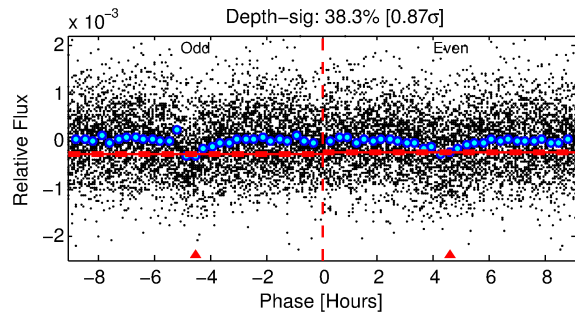
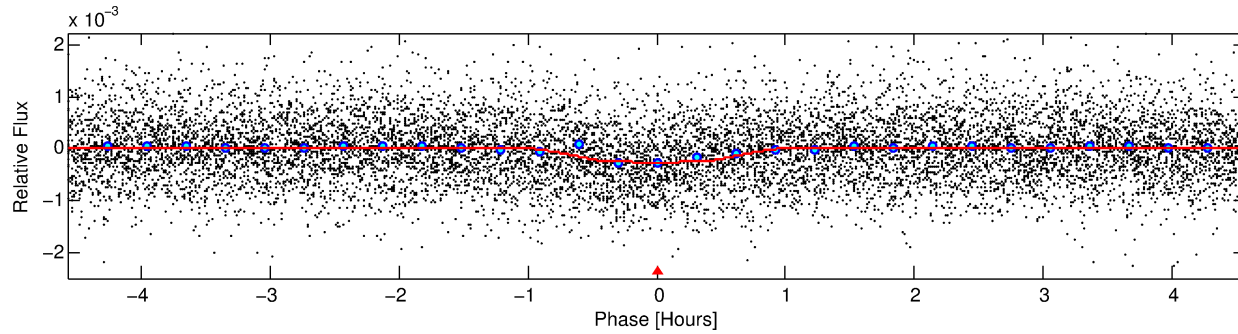
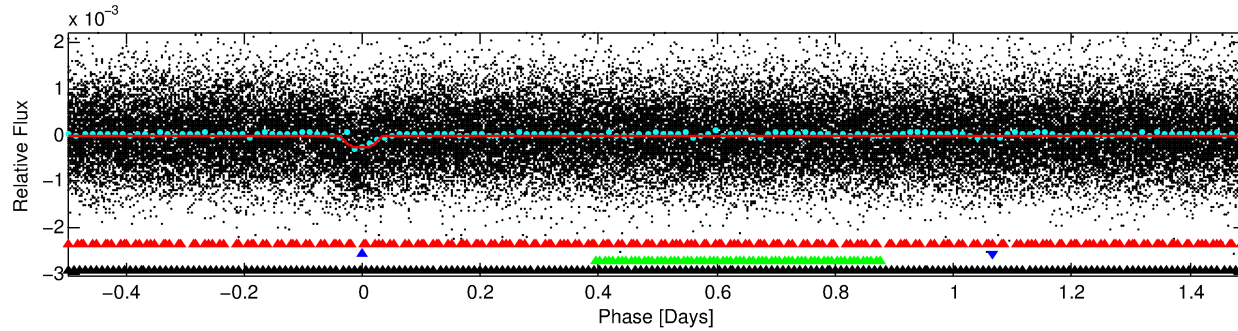
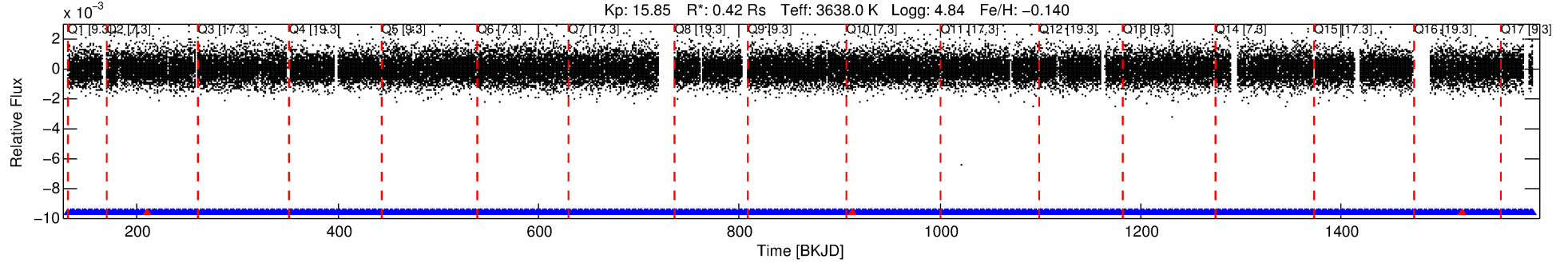
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 005531953-02

No Significant Match Found

# DV One-Page Summary

KIC: 5531953 Candidate: 2 of 4 Period: 1.993 d  
KOI: K01681.02 Corr: 0.822



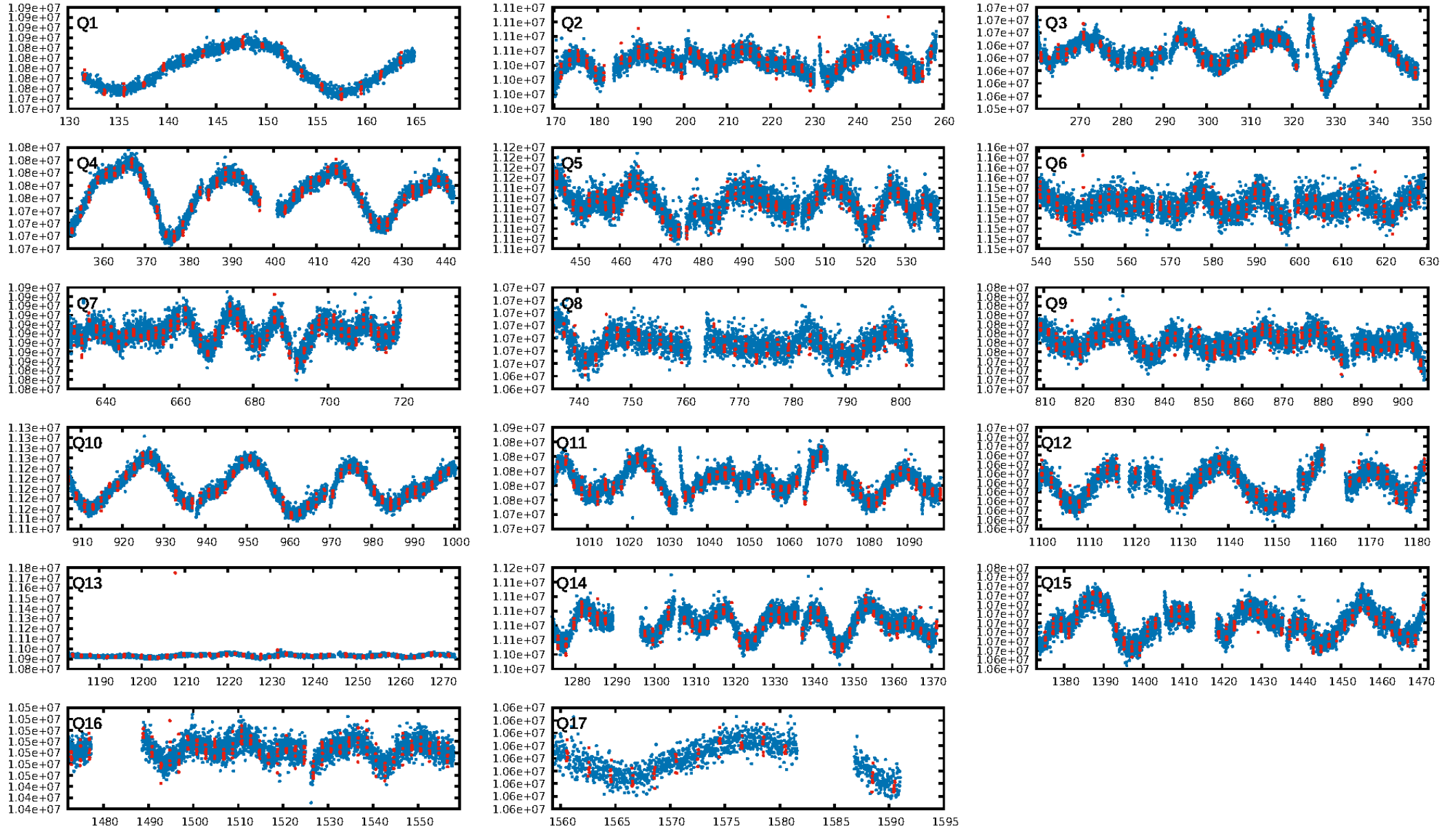
## DV Fit Results:

Period = 1.99286 [0.00001] d  
Epoch = 131.6935 [0.0016] BKJD  
Rp/R\* = 0.0176 [0.0089]  
a/R\* = 4.87 [10.68]  
b = 0.90 [0.50]  
Seff = 49.11 [7.64]  
Teq = 675 [26] K  
Rp = 0.81 [0.42] Re  
a = 0.0237 [0.0023] AU  
Ag = 16.88 [19.13] [0.83 $\sigma$ ]  
Teffp = 2115 [598] K [2.41 $\sigma$ ]

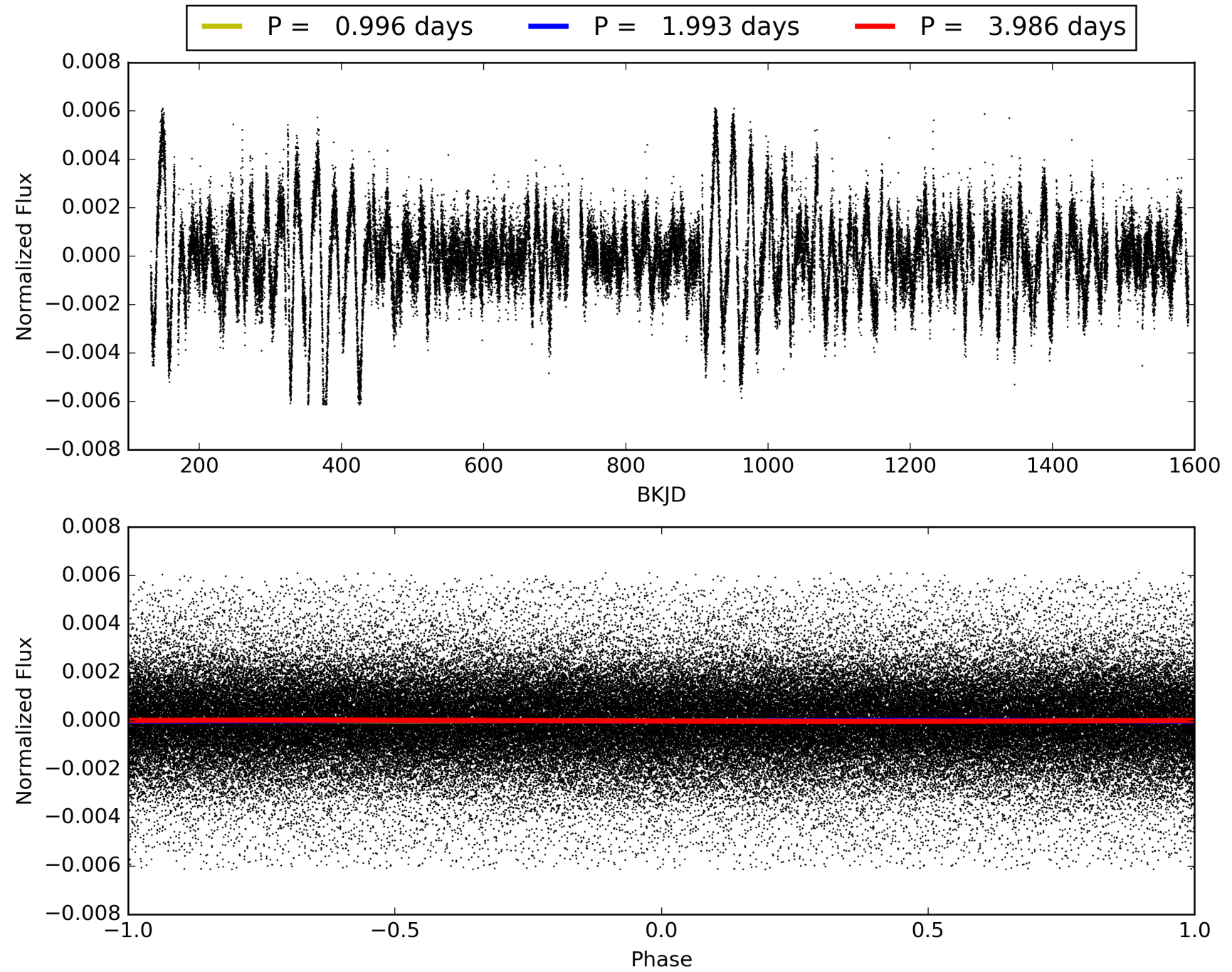
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 100.0% [17.44 $\sigma$ ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: 1.81e-120  
RollingBand-fgt: 1.00 [611/614]  
GhostDiagnostic-chr: 1.79  
Centroid-sig: 0.0%  
Centroid-so: 0.685 arcsec [1.01 $\sigma$ ]  
OotOffset-rm: 1.616 arcsec [2.14 $\sigma$ ]  
KicOffset-rm: 1.643 arcsec [2.20 $\sigma$ ]  
OotOffset-st: 3/2/3/1 [9]  
KicOffset-st: 3/2/3/1 [9]  
DiffImageQuality-fgm: 0.67 [6/9]  
DiffImageOverlap-fno: 1.00 [17/17]

# TCE 005531953-02, PDC Light Curves

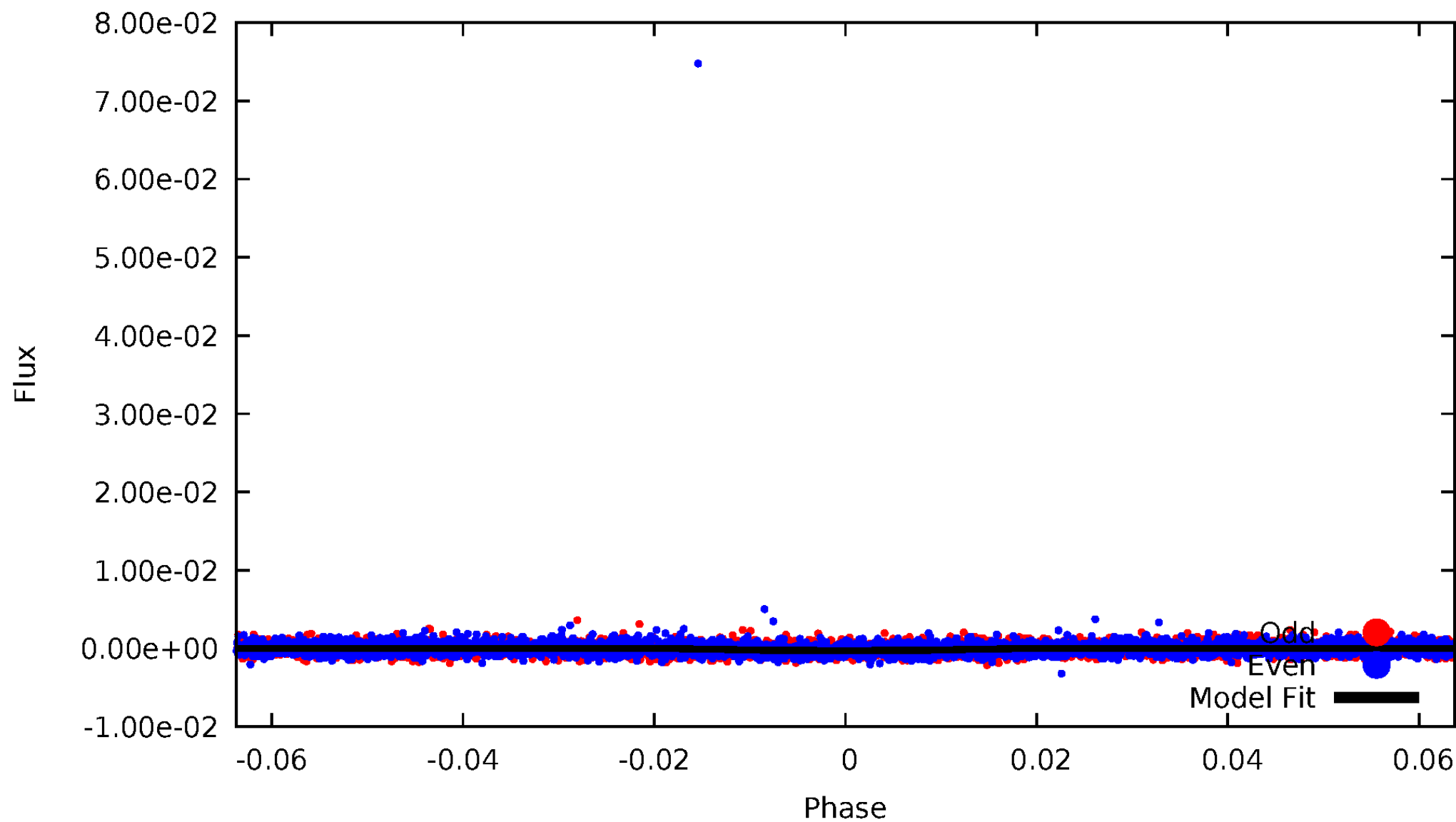


# TCE 005531953-02



# DV Odd/Even

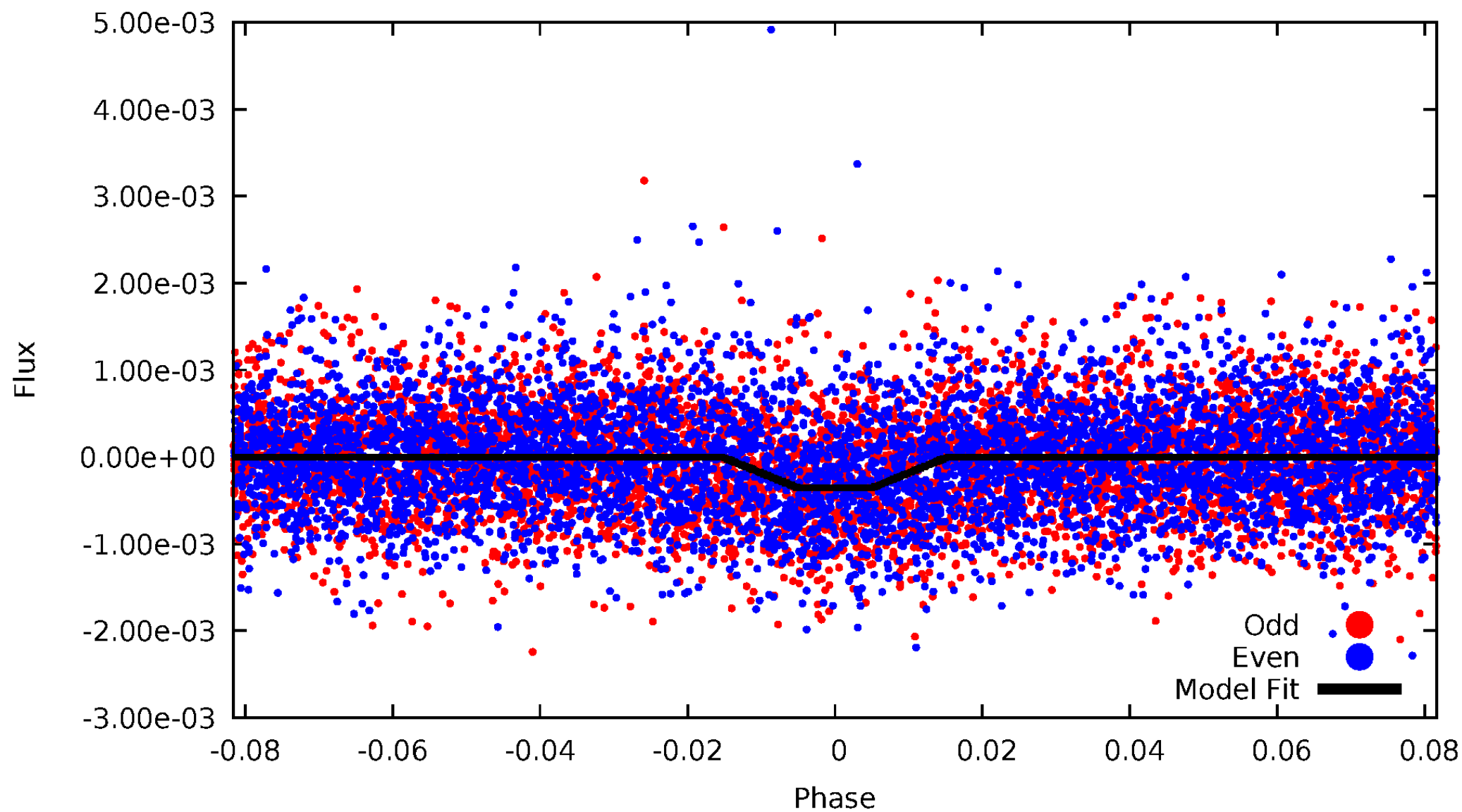
TCE 005531953-02





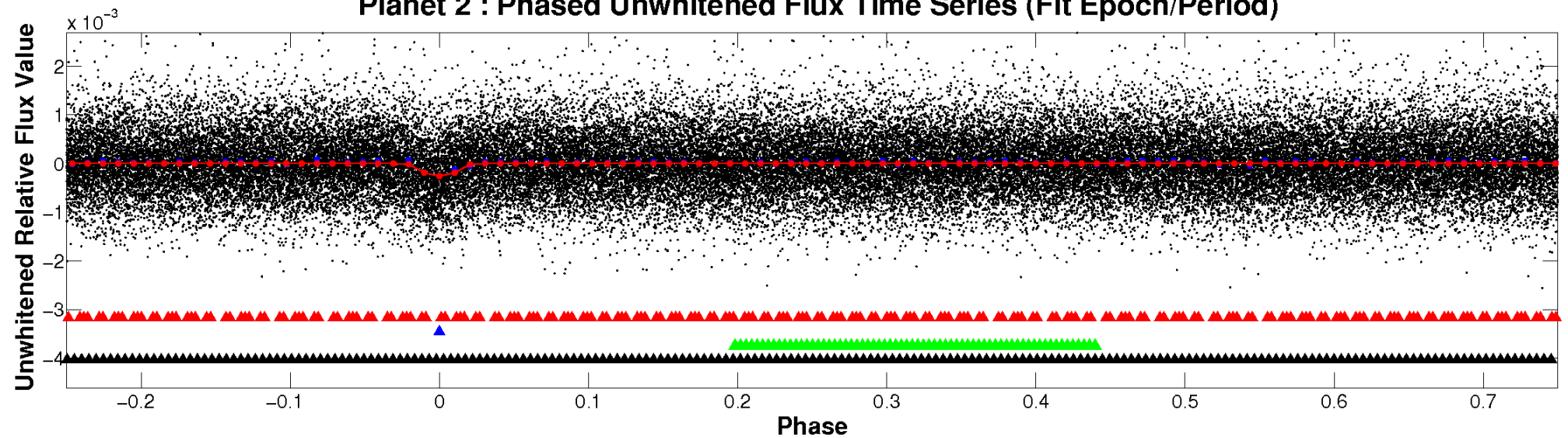
# ALT Odd/Even

TCE 005531953-02

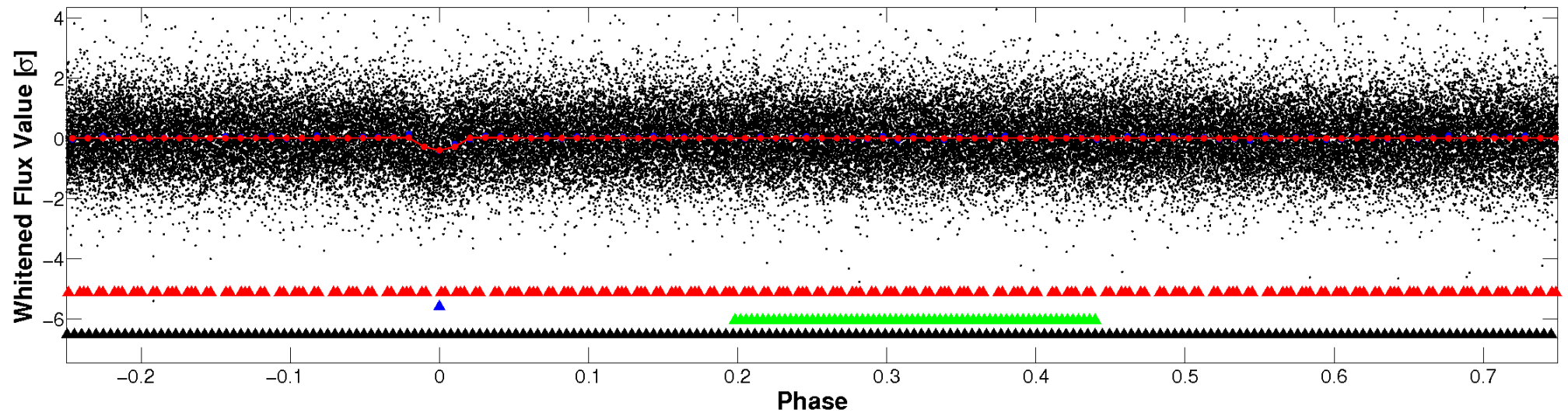


# Non-Whitened Vs. Whitened Light Curve

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



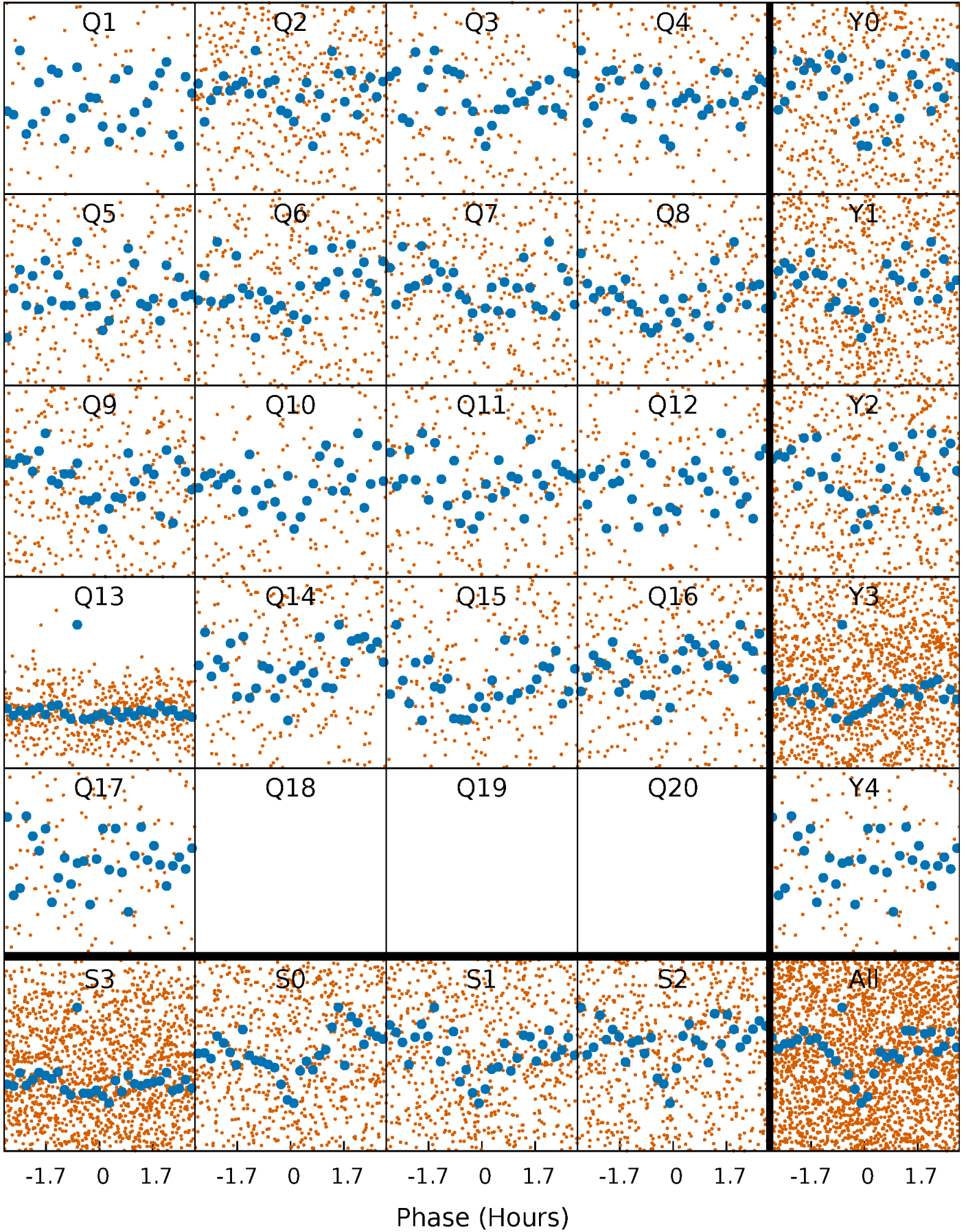
## Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)





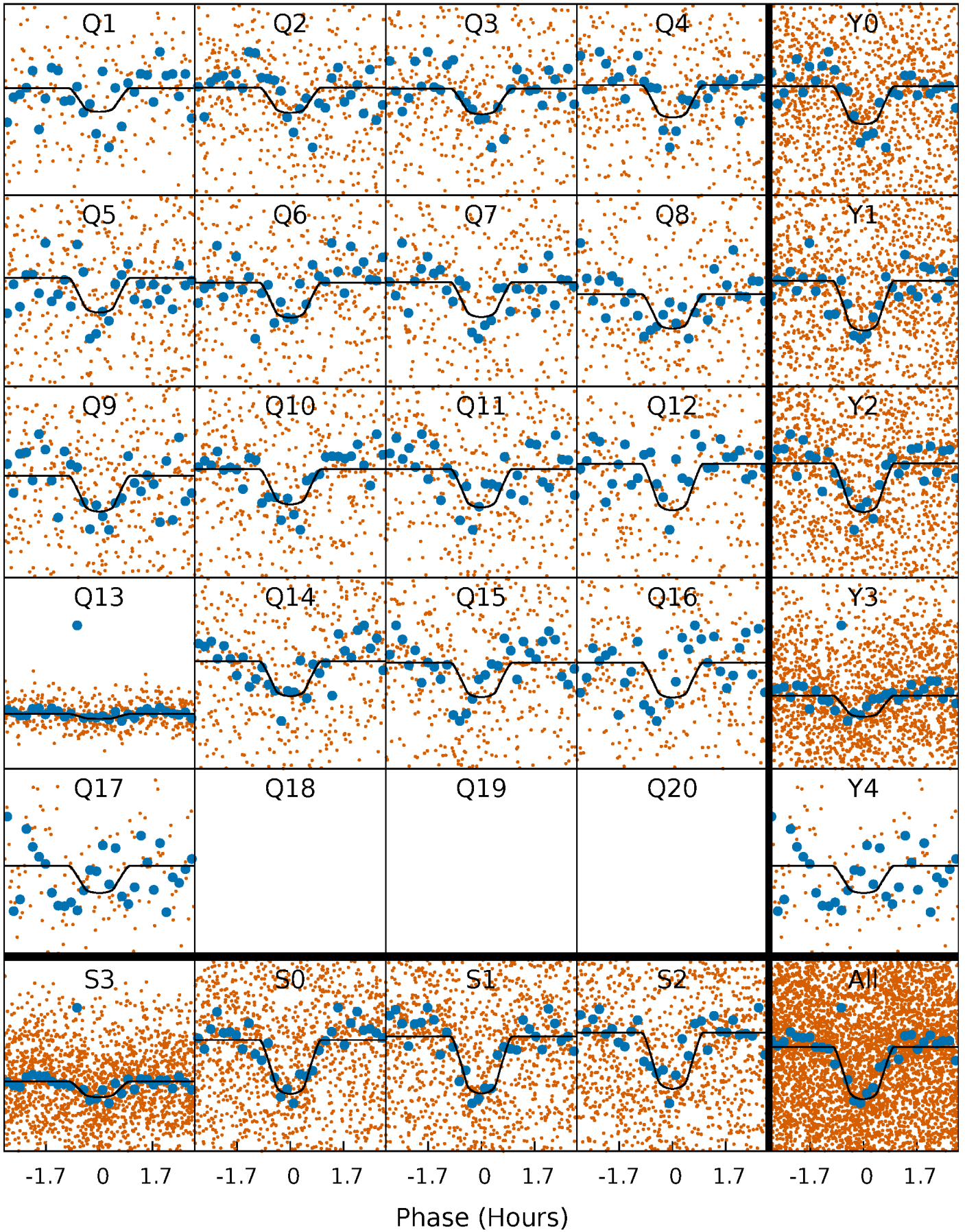
# PDC Quarter-Phased Transit Curves

TCE 005531953-02   P= 1.992865 Days    $T_0=131.693520$  (BKJD)



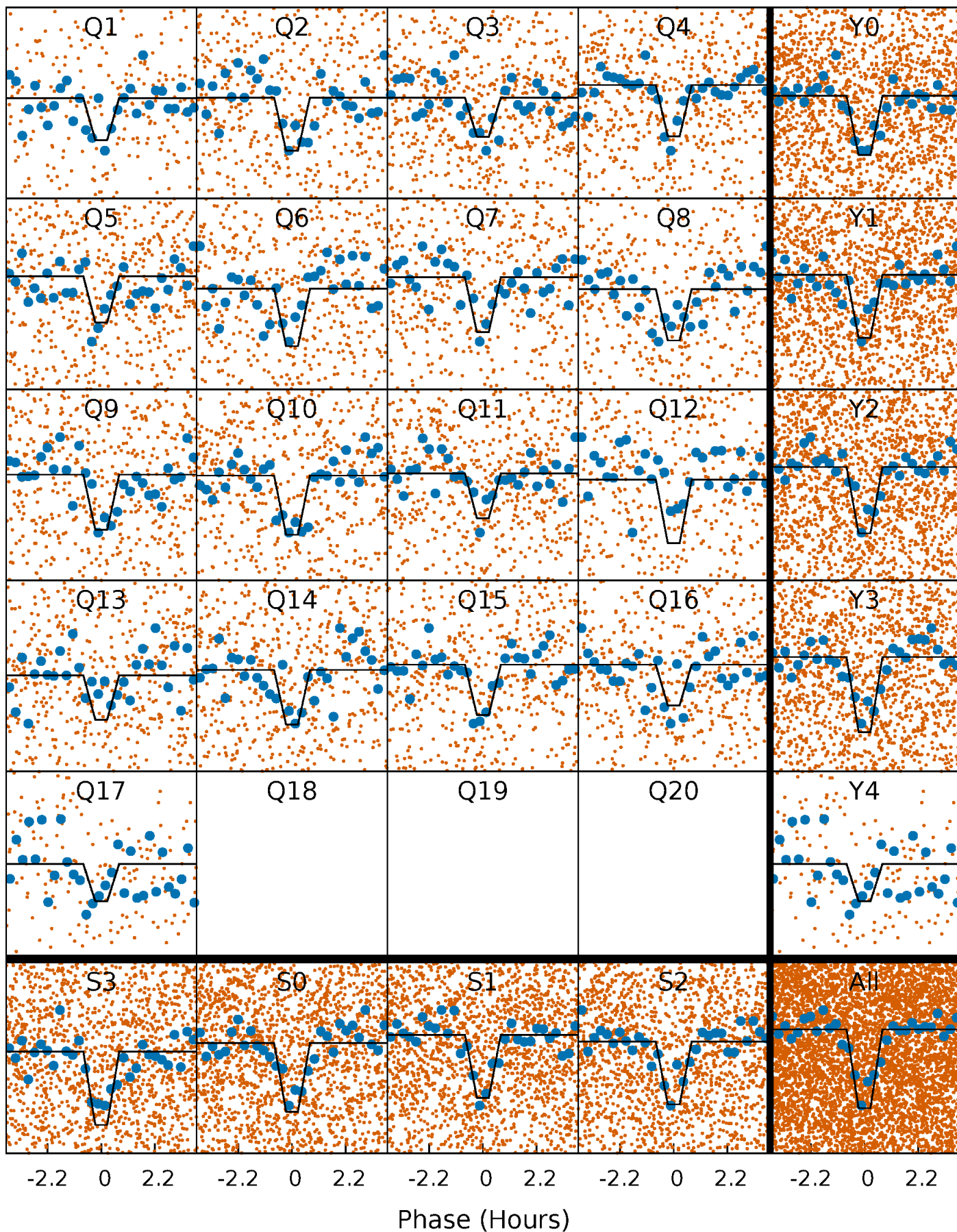
# DV Quarter-Phased Transit Curves

TCE 005531953-02   P= 1.992865 Days    $T_0=131.693520$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

TCE 005531953-02   P= 1.992819 Days    $T_0=131.703471$  (BKJD)

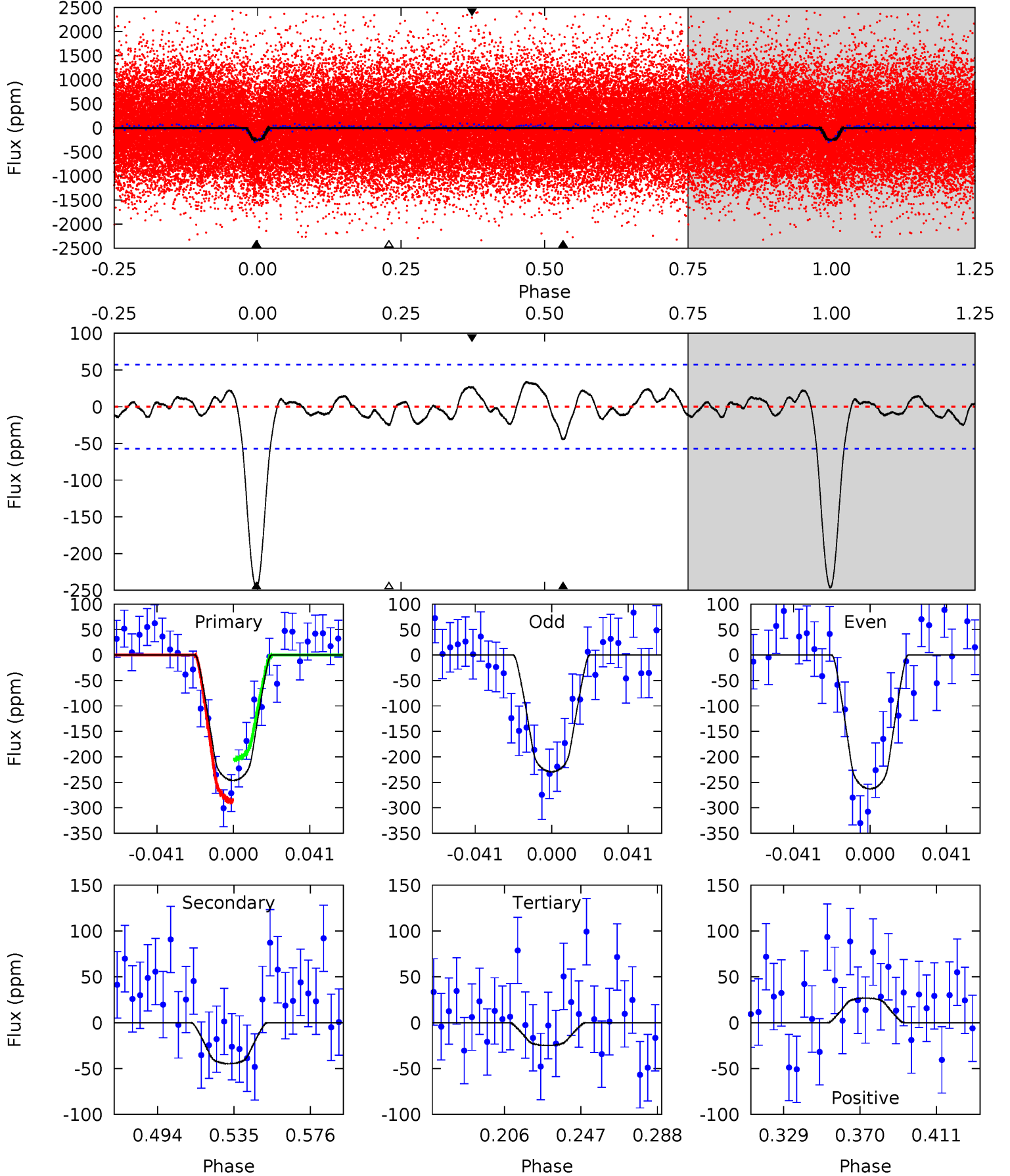




# DV Model-Shift Uniqueness Test

005531953-02, P = 1.992865 Days, E = 129.700655 Days

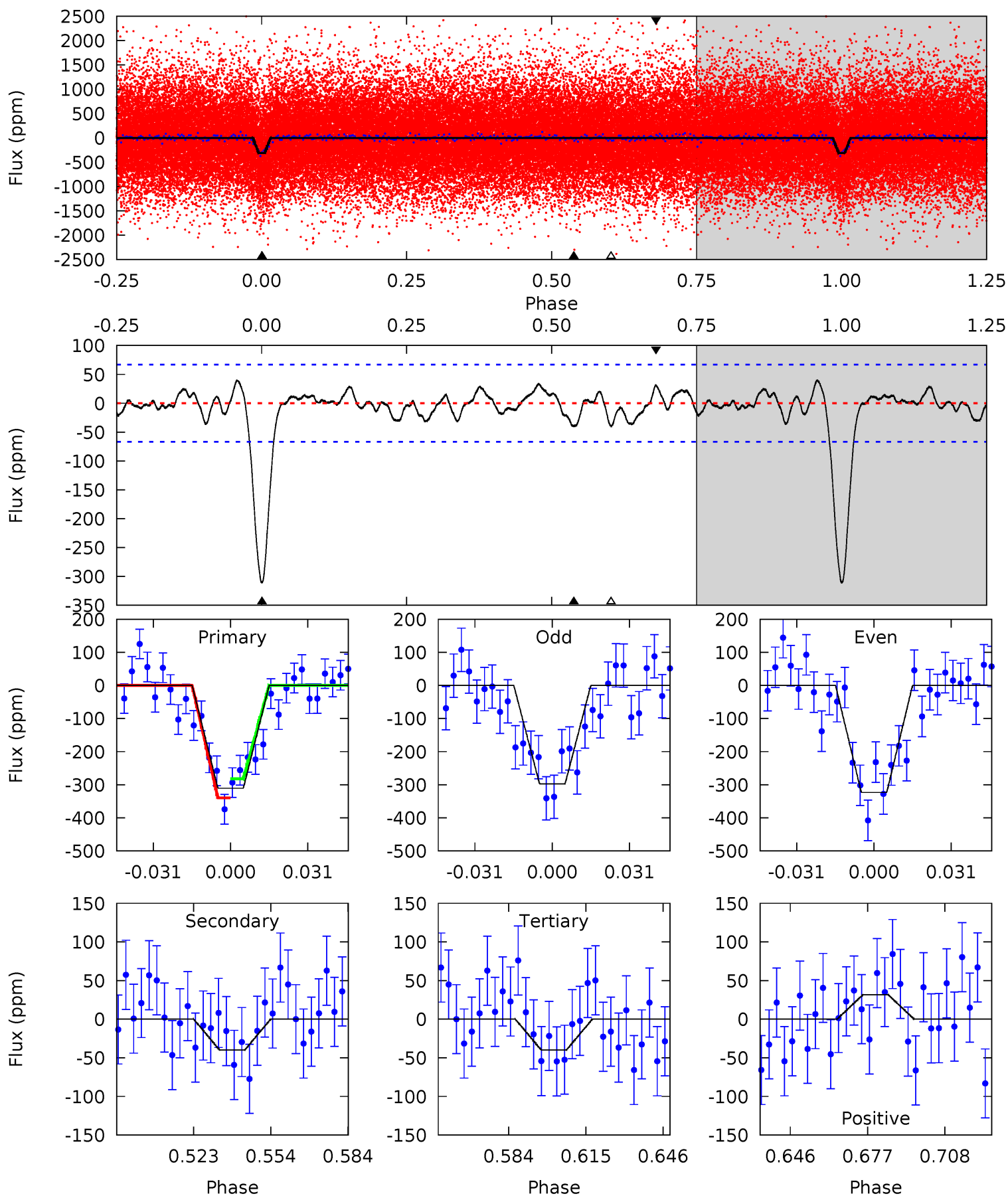
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
20.4	3.71	2.06	2.22	4.75	2.04	1.09	18.4	18.2	1.65	1.49	1.39	0.83	0.12	3.44



# Alt Model-Shift Uniqueness Test

005531953-02, P = 1.992819 Days, E = 129.710652 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
22.3	2.85	2.85	2.27	4.81	2.16	1.15	19.5	20.0	0.00	0.59	0.91	0.92	0.11	2.06



### Stellar Parameters For KIC 005531953

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$3638^{+72}_{-87}$	$4.844^{+0.049}_{-0.055}$	$-0.140^{+0.150}_{-0.150}$	$0.420^{+0.046}_{-0.056}$	$0.450^{+0.043}_{-0.059}$	$8.524^{+2.464}_{-1.743}$
	+2%/-2%	+1%/-1%	+107%/-107%	+11%/-13%	+10%/-13%	+29%/-20%
Source	SPE70	SPE60	SPE70	DSEP		

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

### Secondary Eclipse Parameters for KIC 005531953-02 / KOI 1681.02

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$-45 \pm 12$	$0.83^{+0.34}_{-0.41}$	$944^{+29}_{-29}$	$2717^{+533}_{-263}$	$20^{+55}_{-11}$
Alt.	$-40 \pm 14$	$0.87^{+0.42}_{-0.38}$	$945^{+29}_{-29}$	$2631^{+482}_{-280}$	$16^{+37}_{-9}$

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

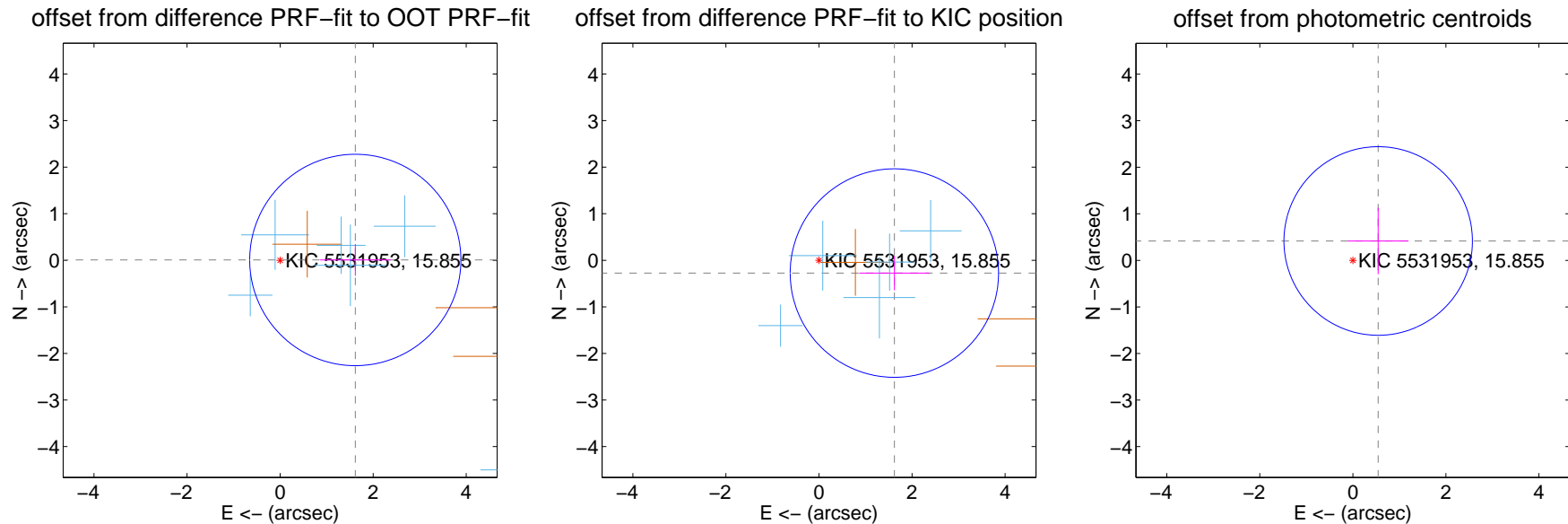
## DV Centroid Data

Supplemental centroid analysis for 005531953-02. Kepler magnitude: 15.86. Transit SNR 14.36

There are 6 quarters with good PRF difference image offsets

The direct PRF centroid is offset from the target star catalog position by about 0.25 arcsec

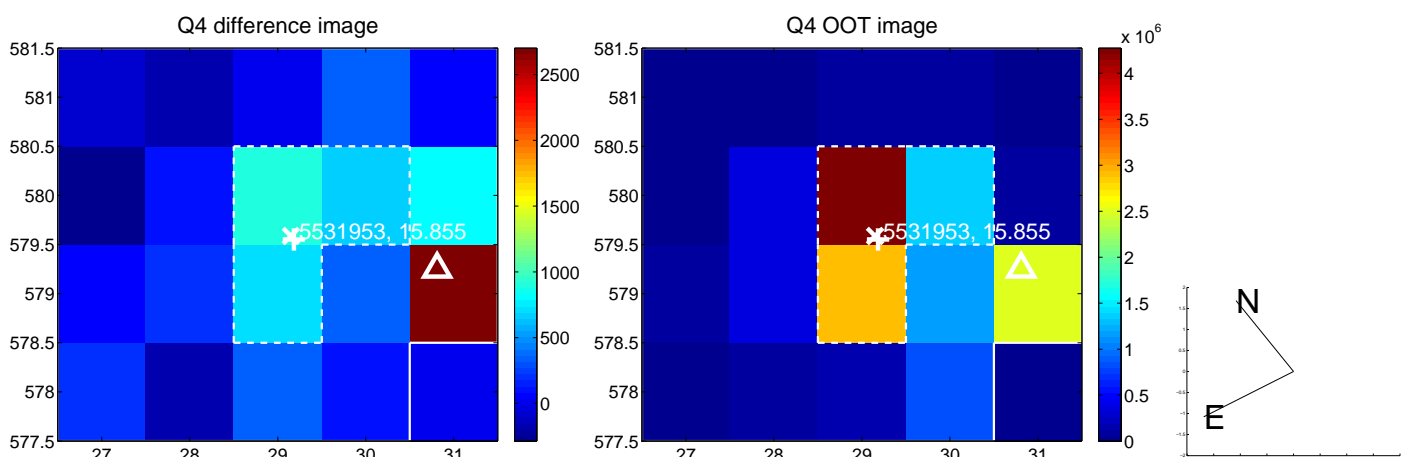
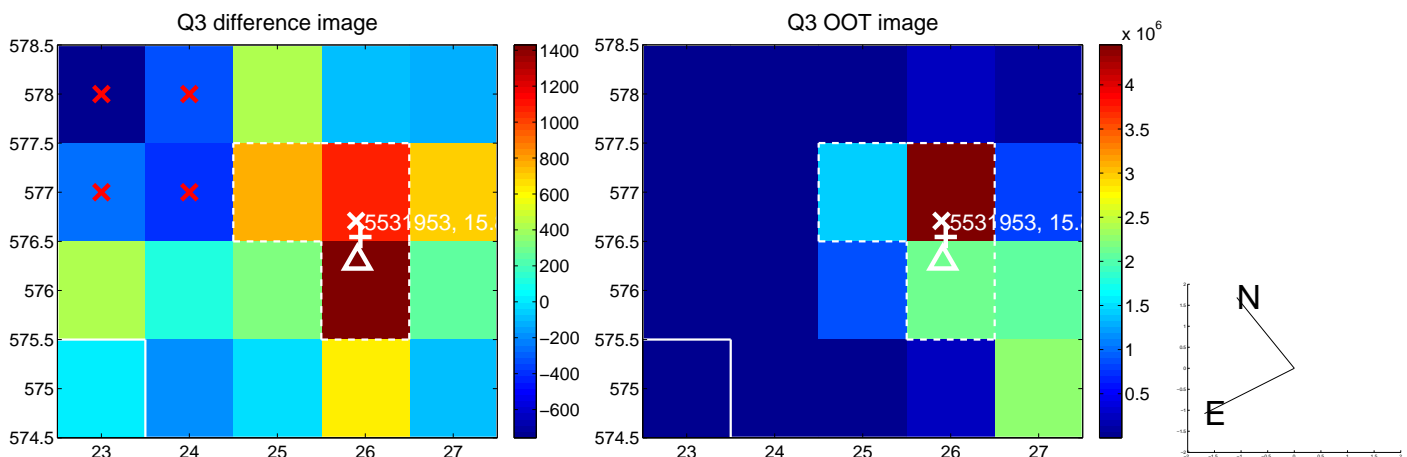
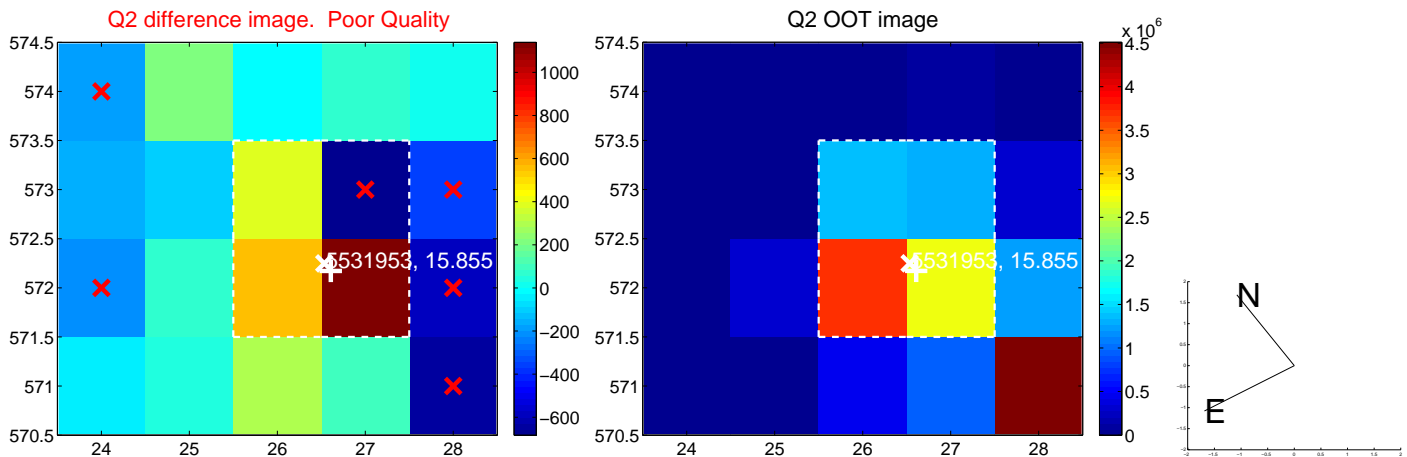
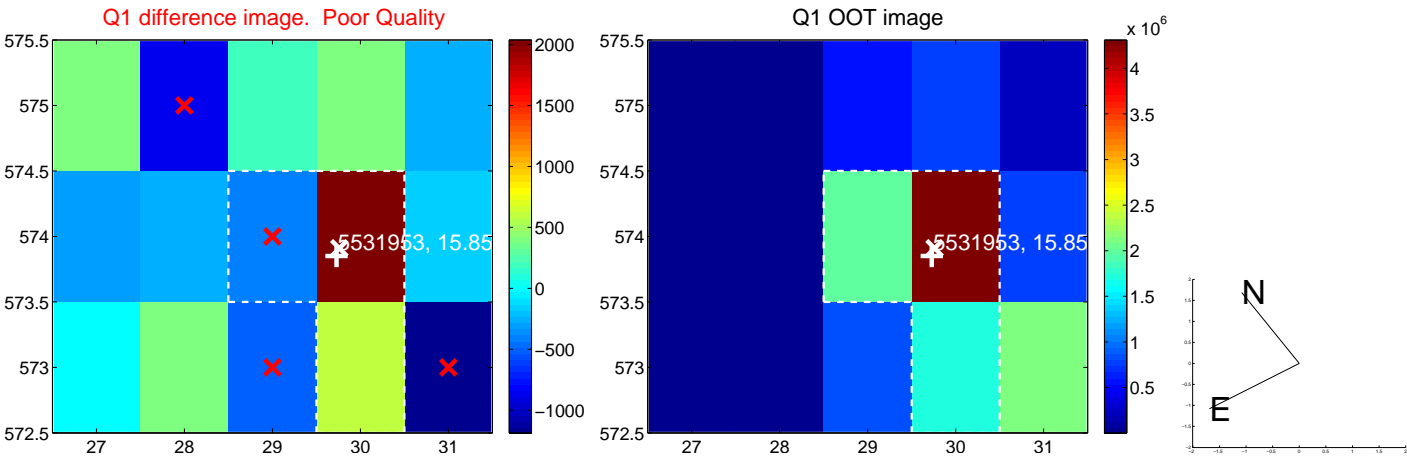
	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$1.616 \pm 0.756$	2.14	$-1.616 \pm 0.756$	$0.007 \pm 0.340$
PRF-fit source offset from KIC position	$1.643 \pm 0.746$	2.20	$-1.620 \pm 0.754$	$-0.274 \pm 0.369$
photometric centroid source offset	$0.69 \pm 0.68$	1.01	$-0.54 \pm 0.65$	$0.42 \pm 0.71$



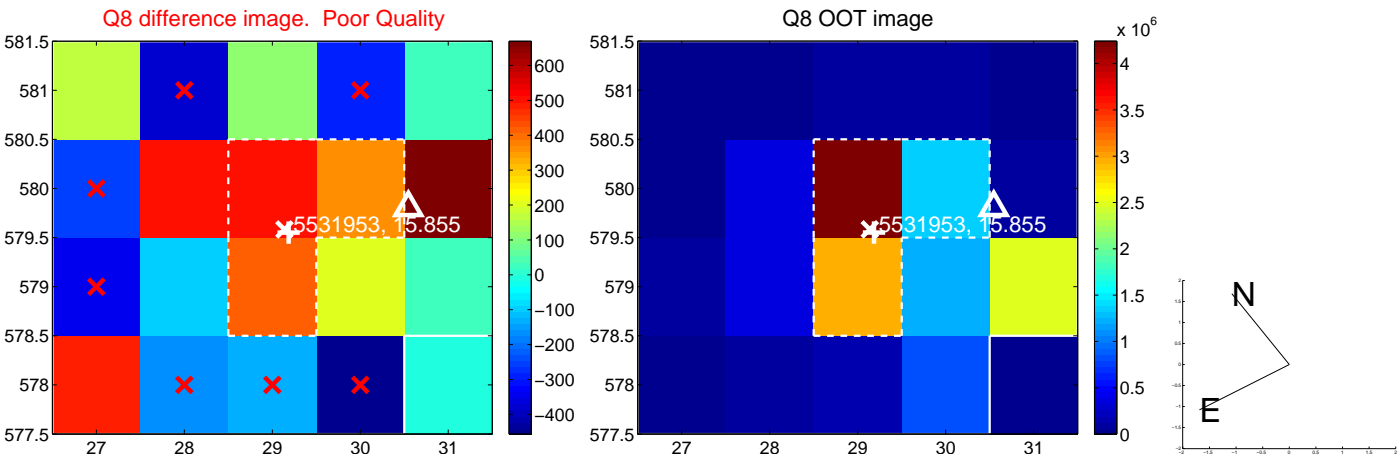
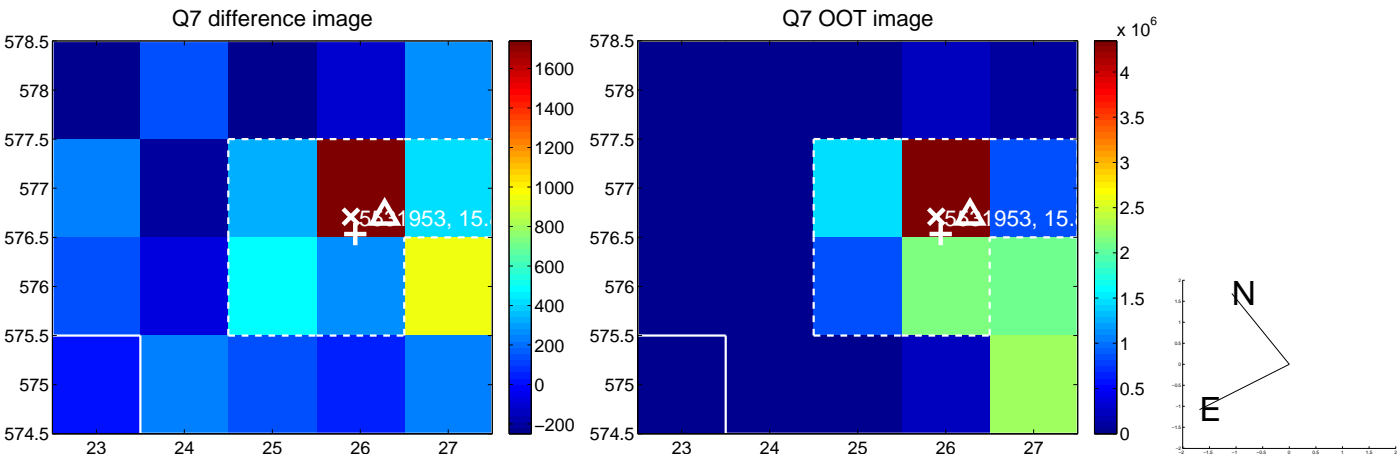
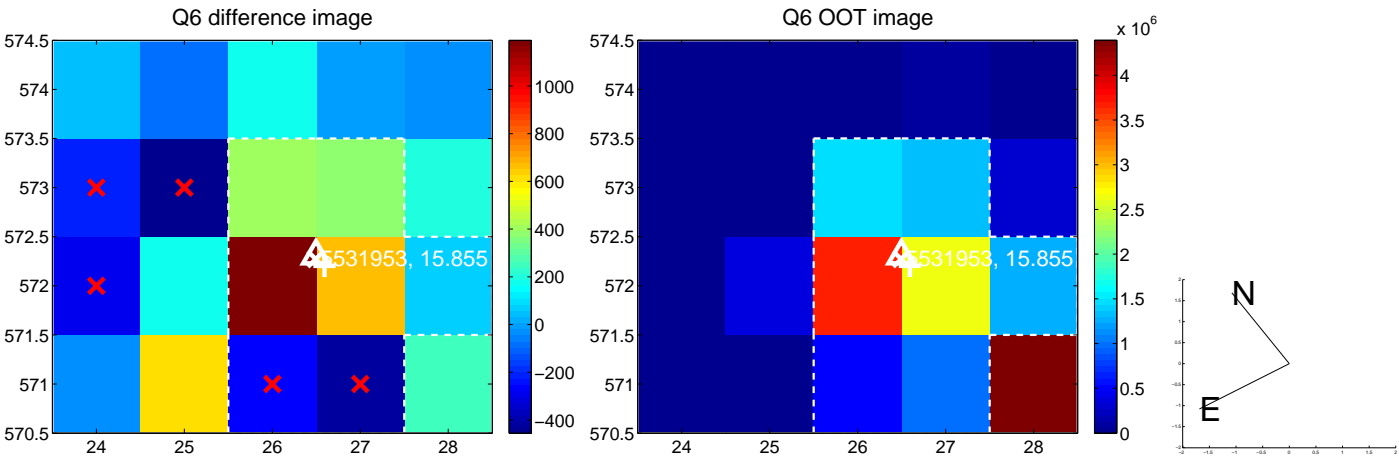
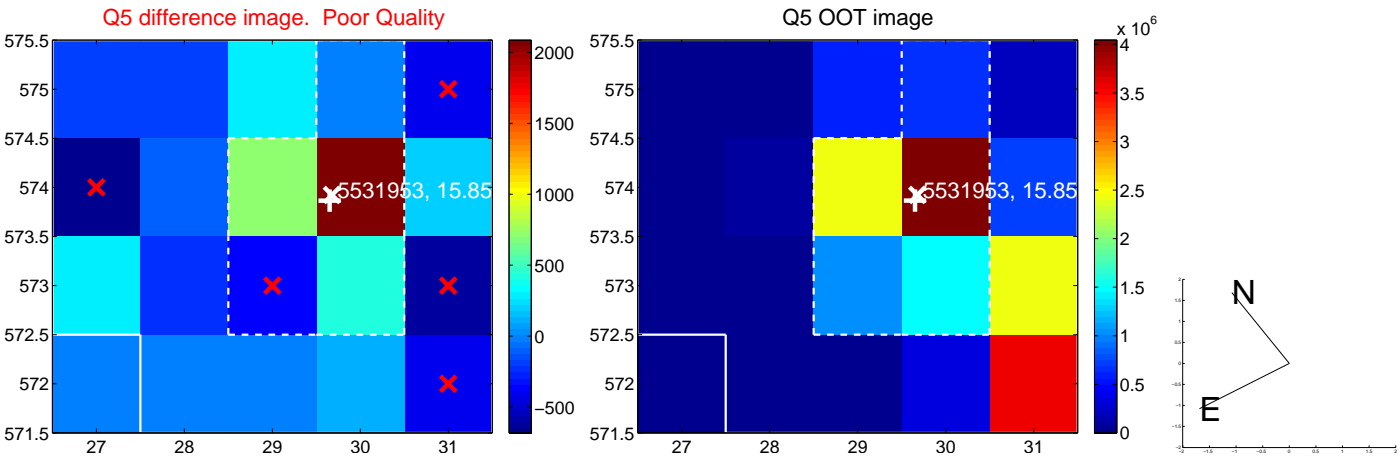
Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets**; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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



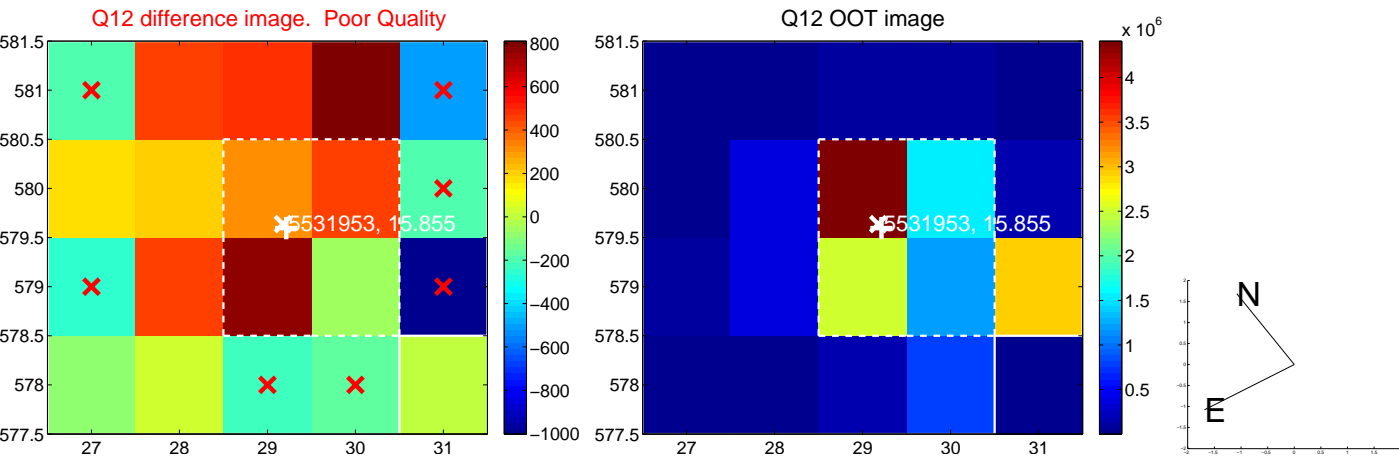
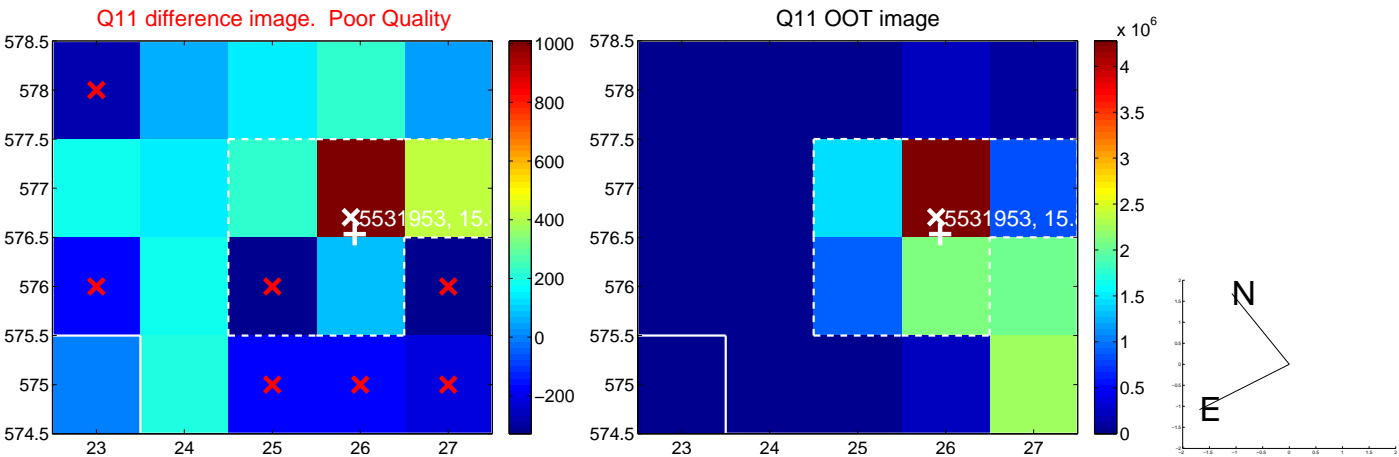
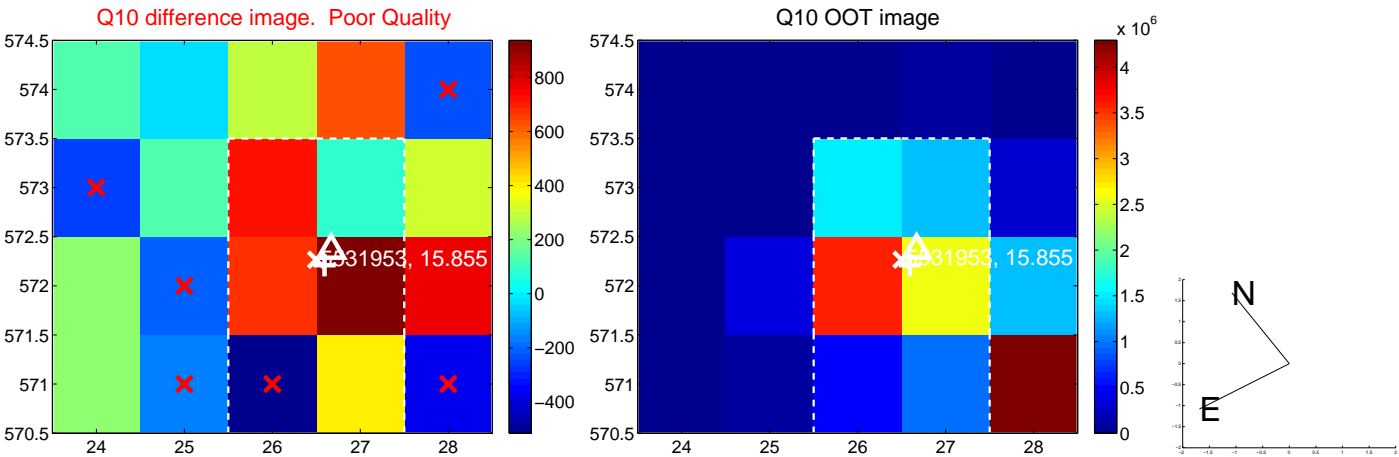
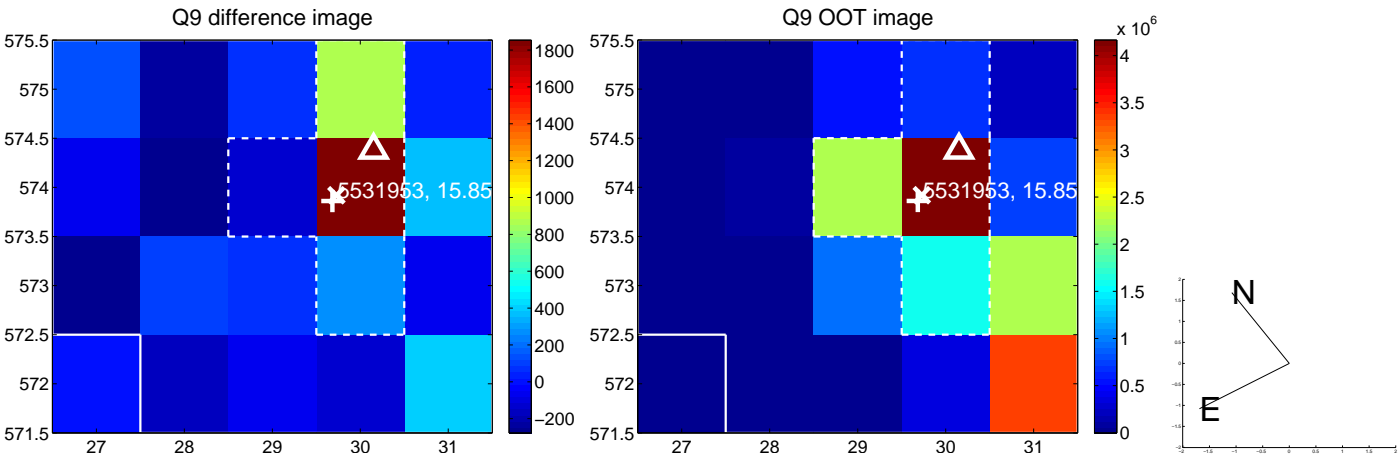
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



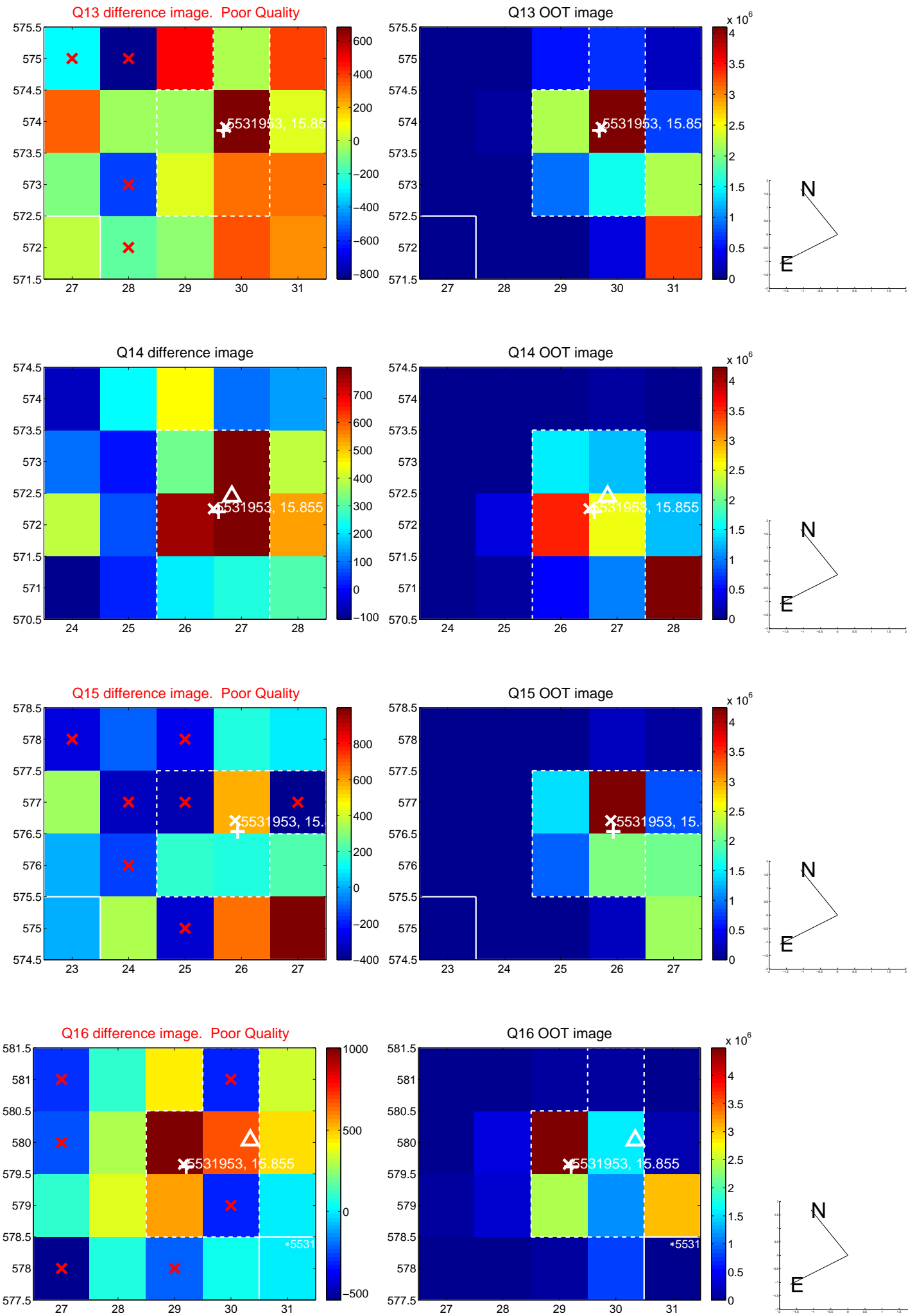
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



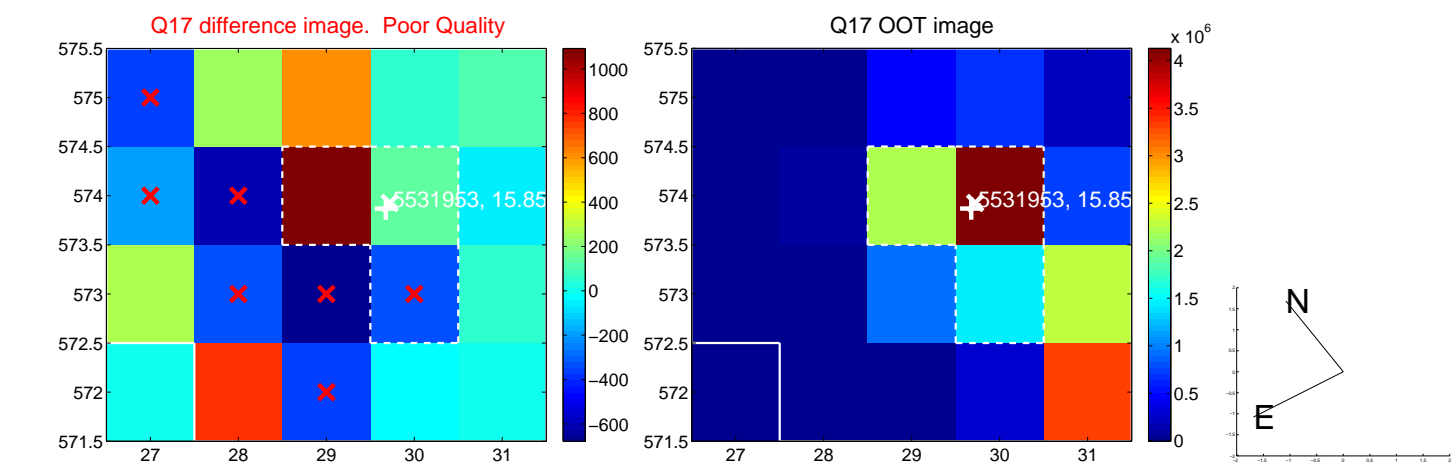
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



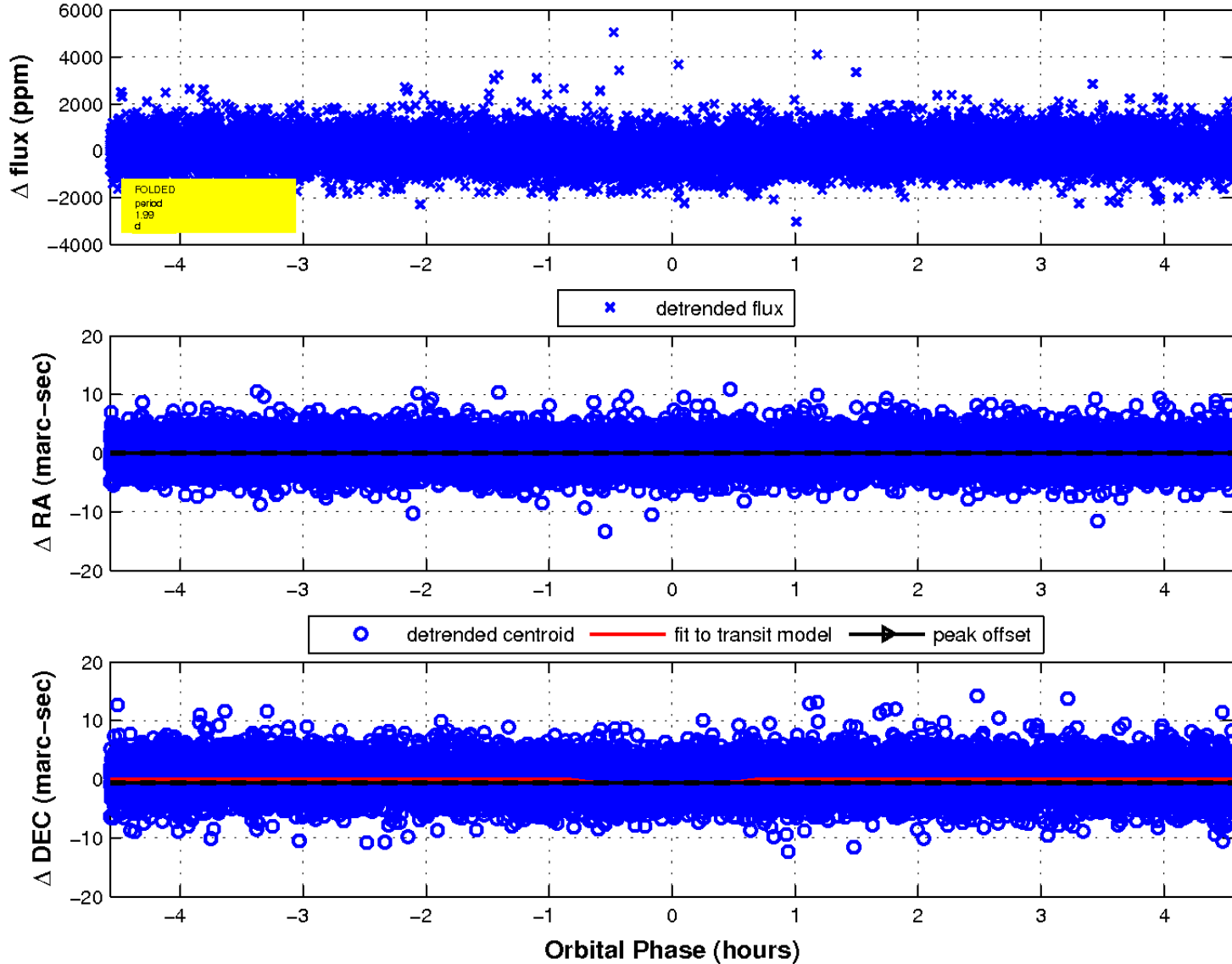
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

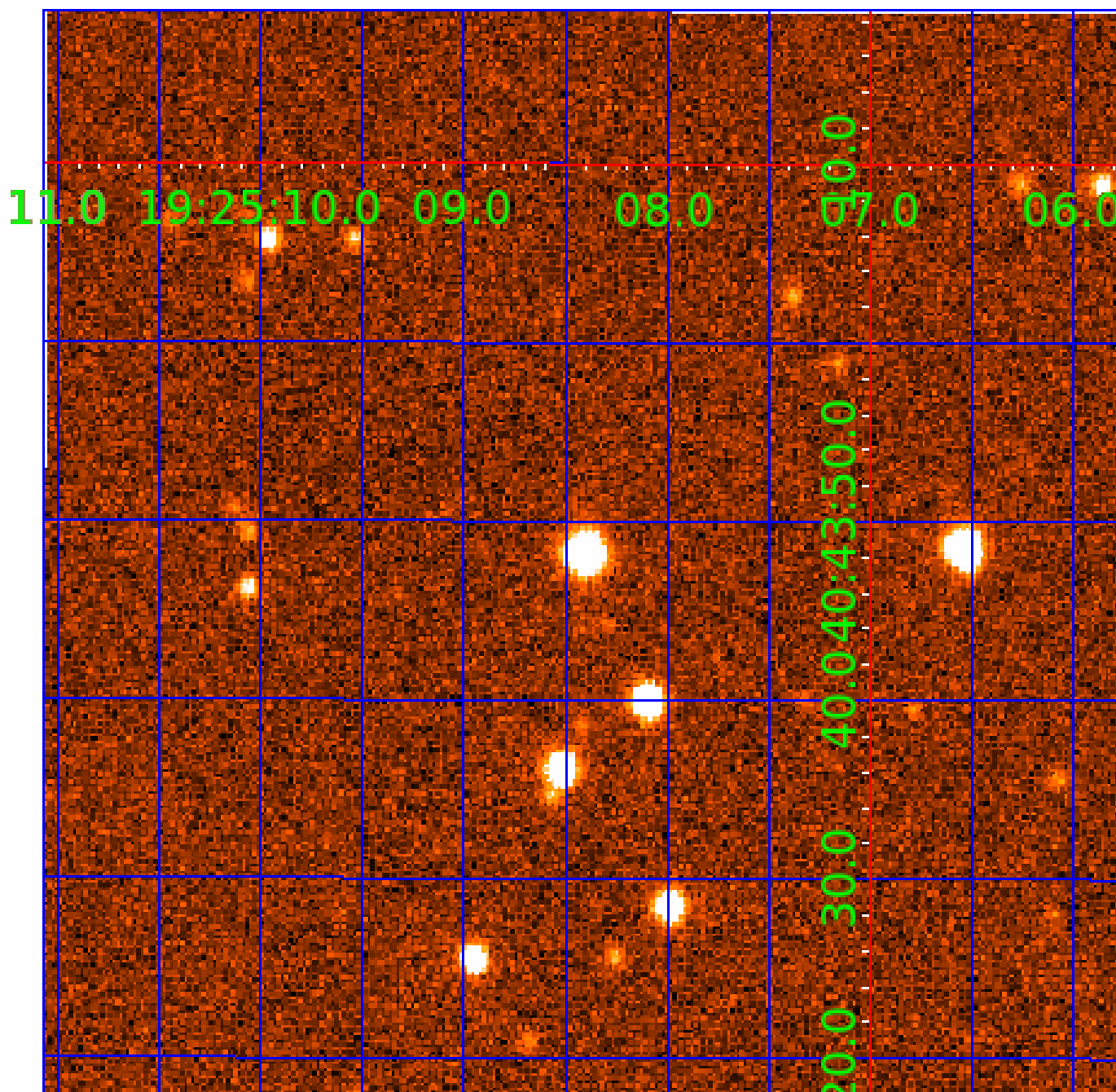


fluxWeightedCentroids, Planet 2 of 4



UKIRT Image

Declination



# KIC 005531953

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
005531953-01	OBS	1681.01	6.939074	138.342167	562.0	2.493	18.4	19.8	0.42	3638	1.18	9.31
005531953-02	OBS	1681.02	1.992865	131.693520	260.5	1.524	12.9	14.4	0.42	3638	0.81	49.11
005531953-03	OBS	1681.04	21.914109	148.512731	519.6	1.915	8.0	9.4	0.42	3638	1.05	2.01
005531953-04	OBS	1681.03	3.531047	134.320758	284.4	1.470	7.6	10.8	0.42	3638	0.88	22.91

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
005531953-01	OBS	PC	1.00	0	0	0	0	NO_COMMENT
005531953-02	OBS	FP	0.33	0	0	1	0	CENT_UNRESOLVED_OFFSET
005531953-03	OBS	PC	1.00	0	0	0	0	NO_COMMENT
005531953-04	OBS	PC	0.94	0	0	0	0	NO_COMMENT

**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 005531953-03

No Significant Match Found

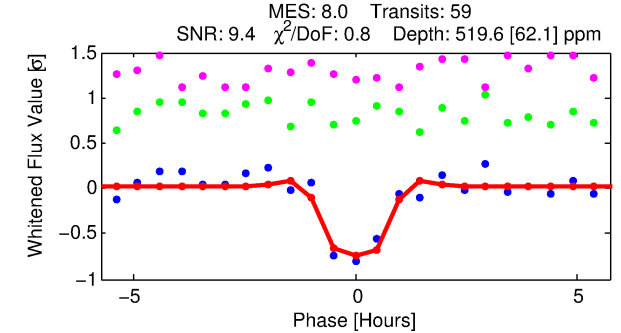
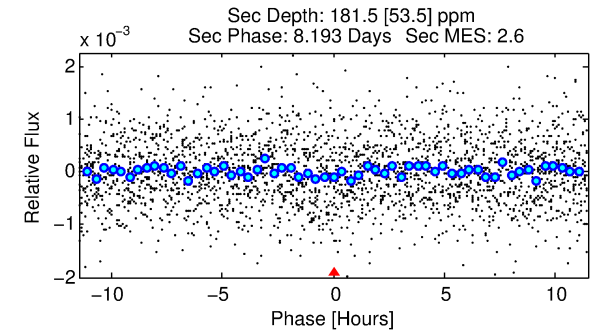
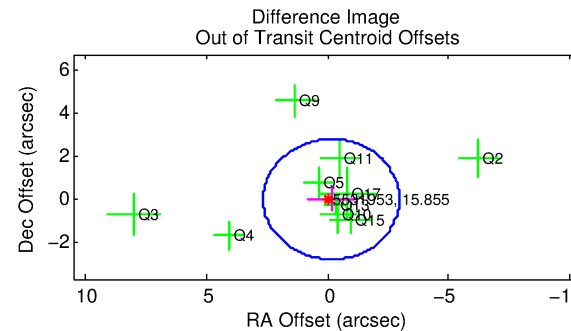
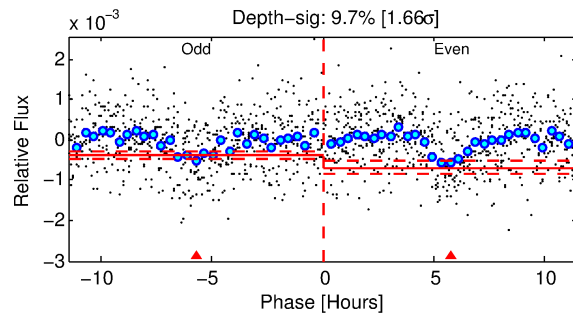
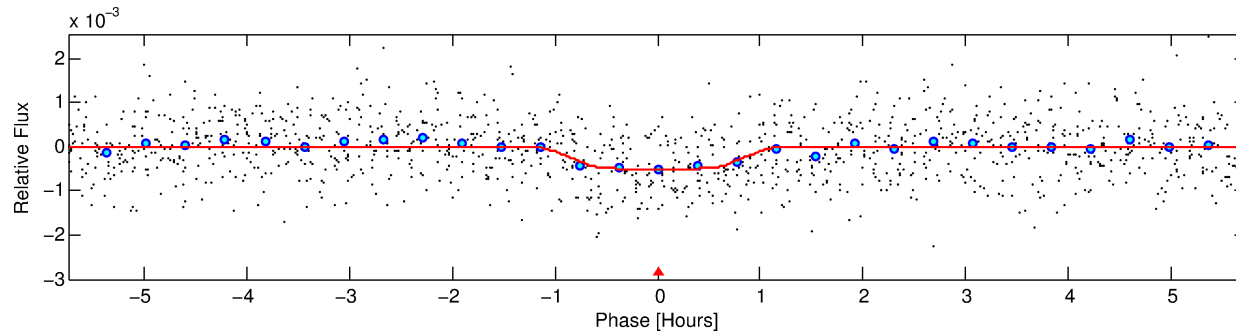
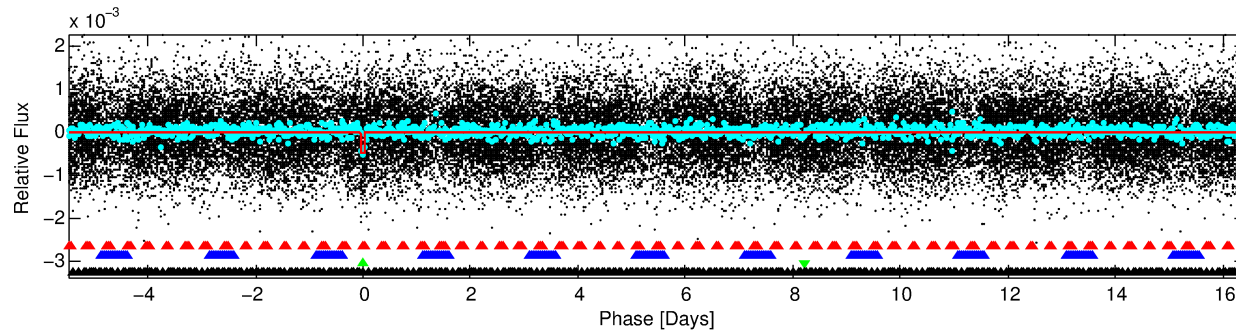
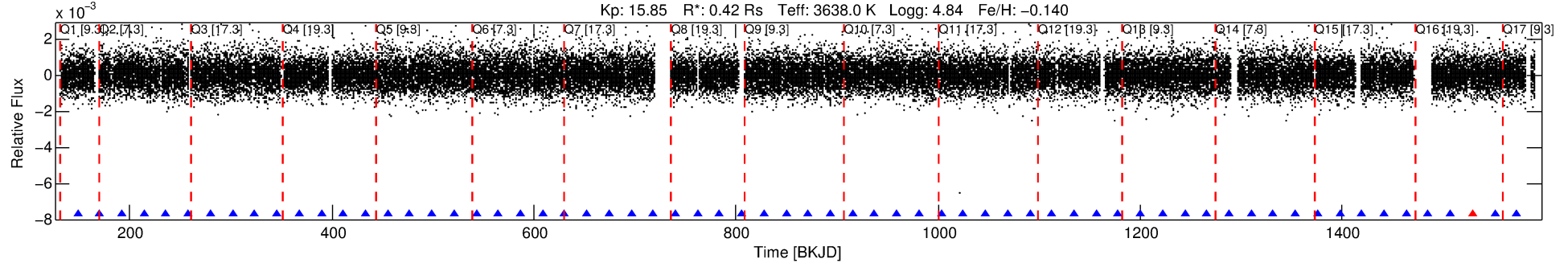


# DV One-Page Summary

KIC: 5531953 Candidate: 3 of 4 Period: 21.914 d

KOI: K01681.04 Corr: 0.972

Kp: 15.85 R\*: 0.42 Rs Teff: 3638.0 K Logg: 4.84 Fe/H: -0.140



## DV Fit Results:

Period = 21.91411 [0.00014] d  
Epoch = 148.5127 [0.0052] BKJD  
Rp/R\* = 0.0230 [0.0248]  
a/R\* = 57.49 [280.62]  
b = 0.78 [2.42]  
Seff = 2.01 [0.31]  
Teq = 304 [12] K  
Rp = 1.05 [1.15] Re  
a = 0.1174 [0.0116] AU  
Ag = 1238.49 [2704.12] [0.46σ]  
Teffp = 2784 [1519] K [1.63σ]

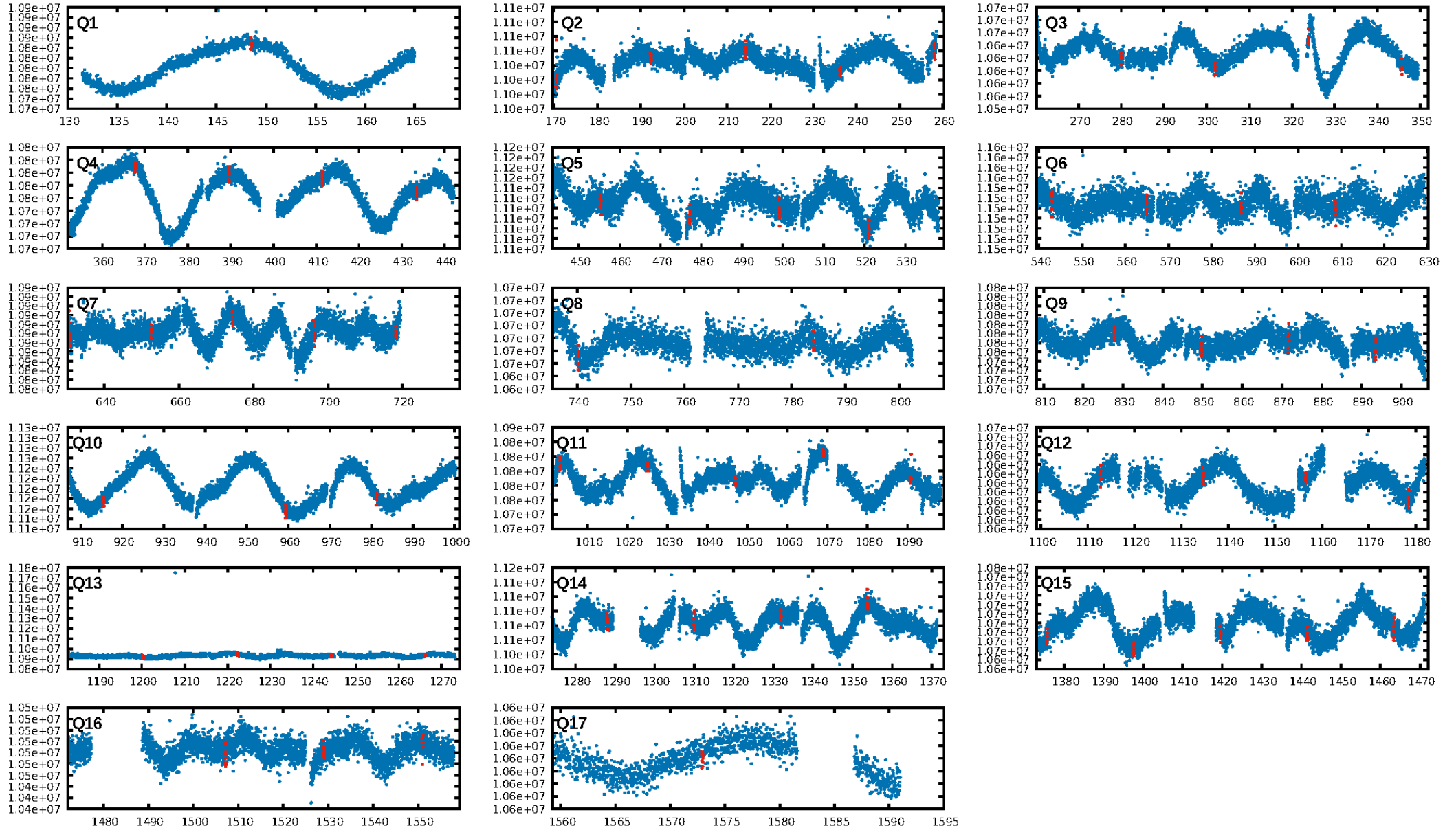
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [114.32σ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: 91.9%  
ModelChiSquareGof-sig: 100.0%  
Bootstrap-pfa: 1.67e-14  
RollingBand-fgt: 0.98 [56/57]  
GhostDiagnostic-chr: 15.17  
Centroid-sig: 0.8%  
Centroid-so: 3.058 arcsec [2.99σ]  
OotOffset-rm: 0.159 arcsec [0.17σ]  
KicOffset-rm: 0.276 arcsec [0.48σ]  
OotOffset-st: 2/3/1/4 [10]  
KicOffset-st: 2/3/1/4 [10]  
DiffImageQuality-fgm: 0.60 [6/10]  
DiffImageOverlap-fno: 0.94 [16/17]

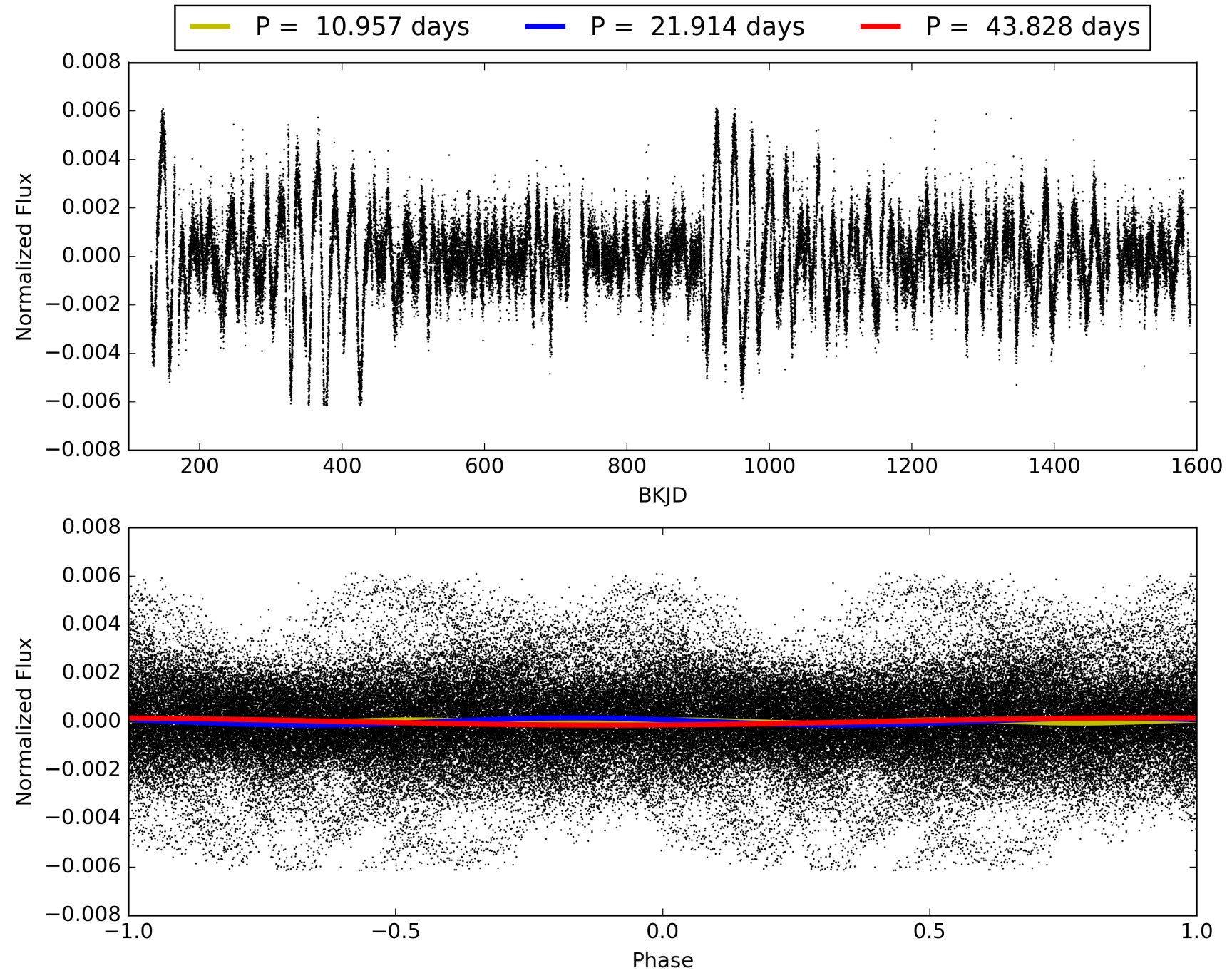
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 01-Feb-2016 01:28:02 Z

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

# TCE 005531953-03, PDC Light Curves

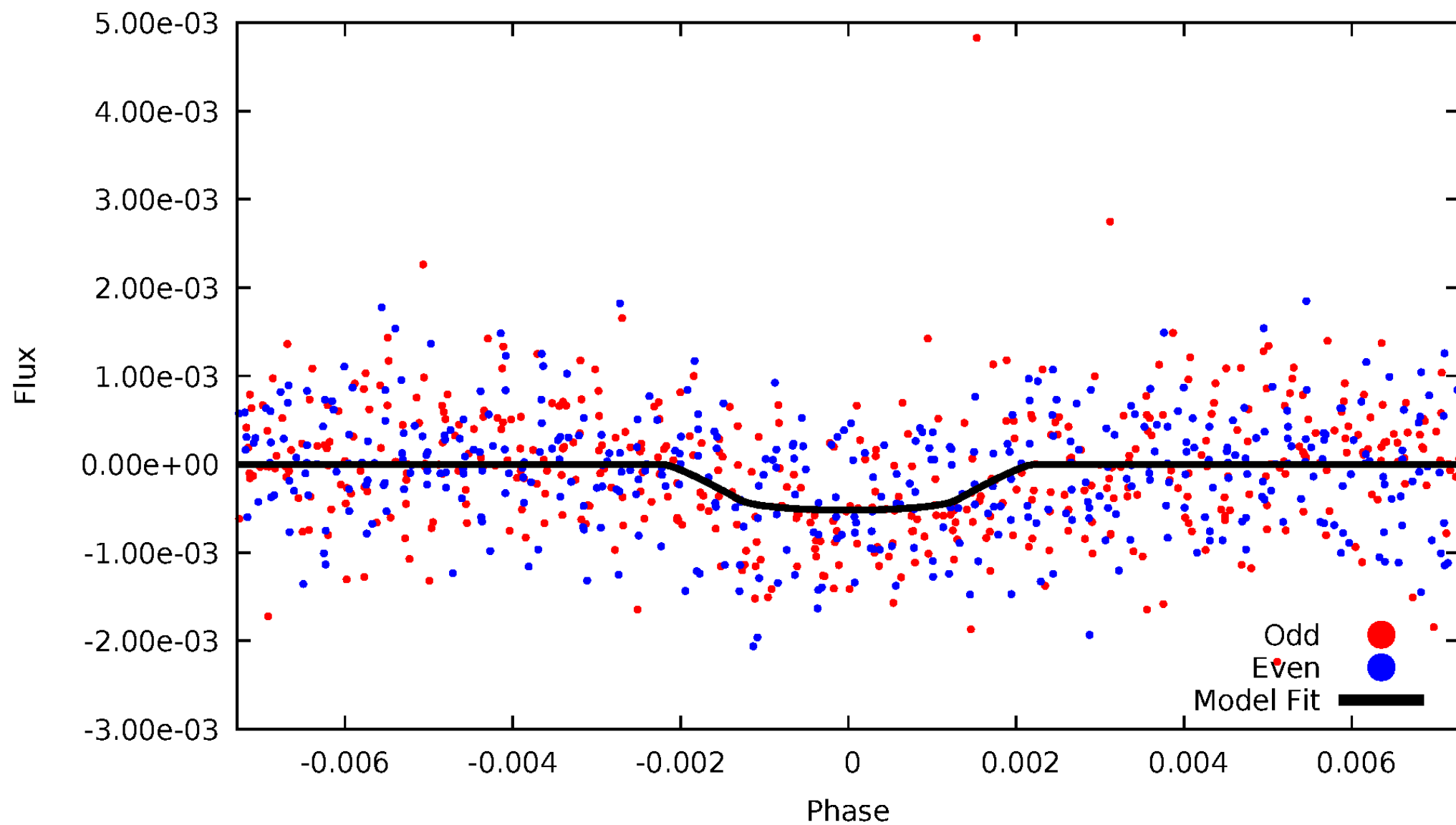


# TCE 005531953-03



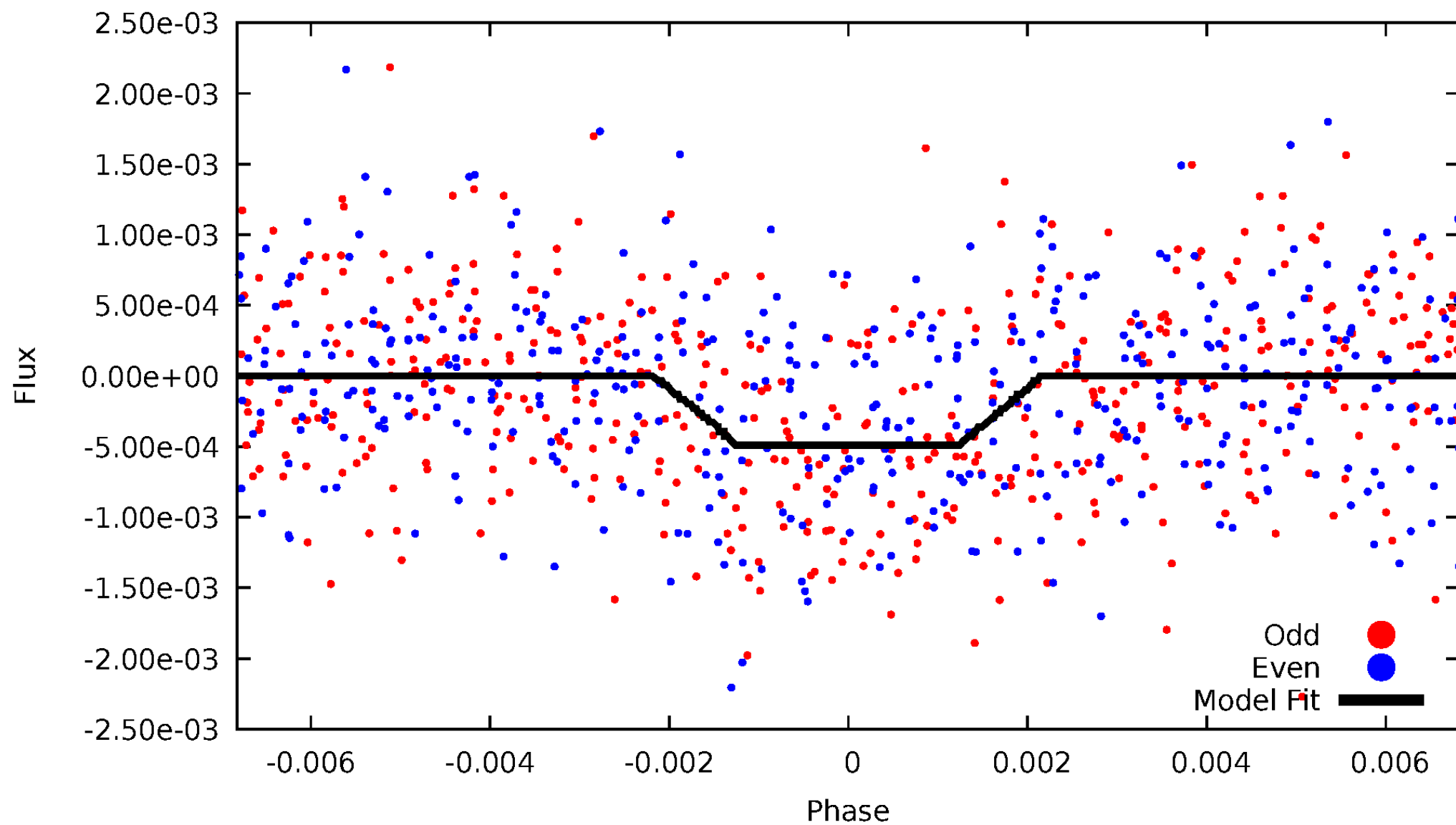
# DV Odd/Even

TCE 005531953-03



# ALT Odd/Even

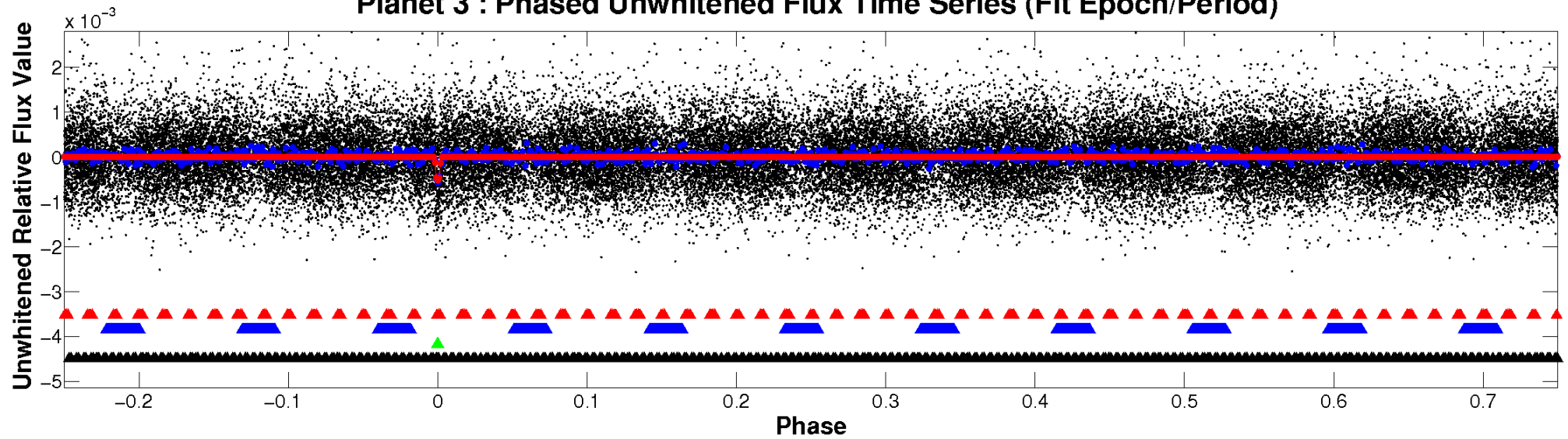
TCE 005531953-03



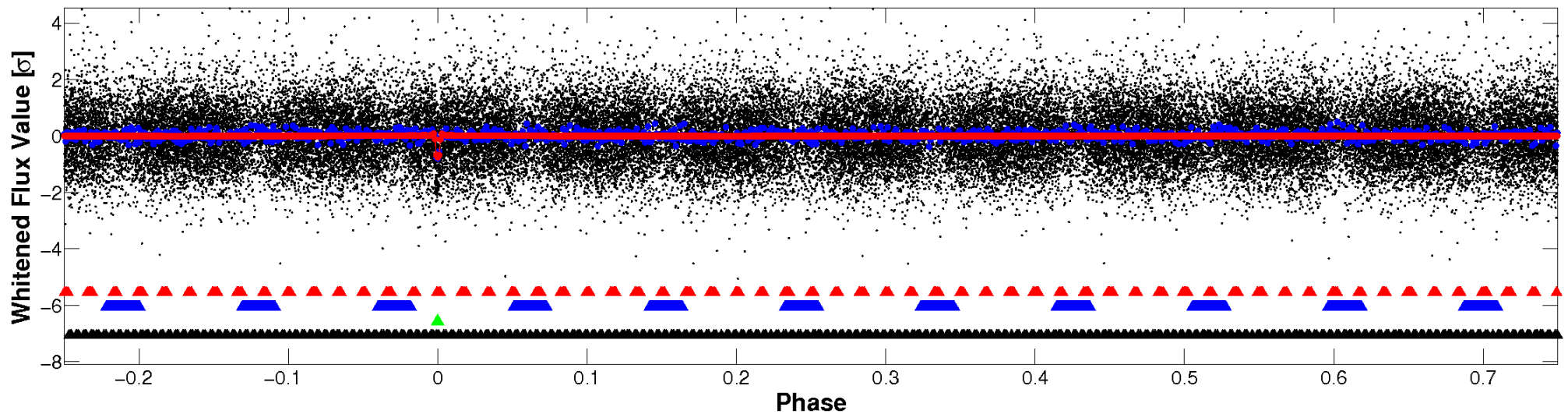


# Non-Whitened Vs. Whitened Light Curve

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

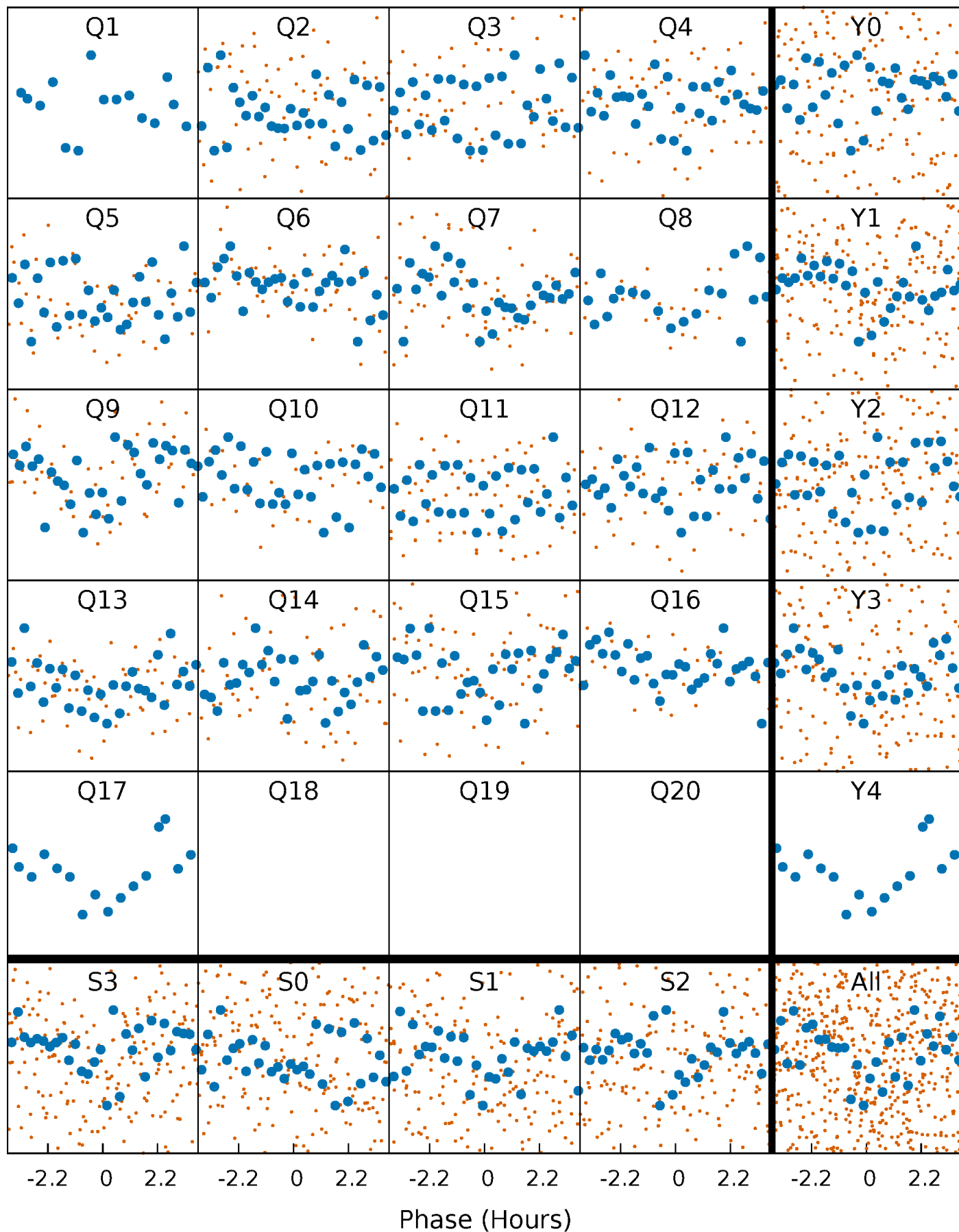


Planet 3 : Phased Whitened Flux Time Series (Fit Epoch/Period)



# PDC Quarter-Phased Transit Curves

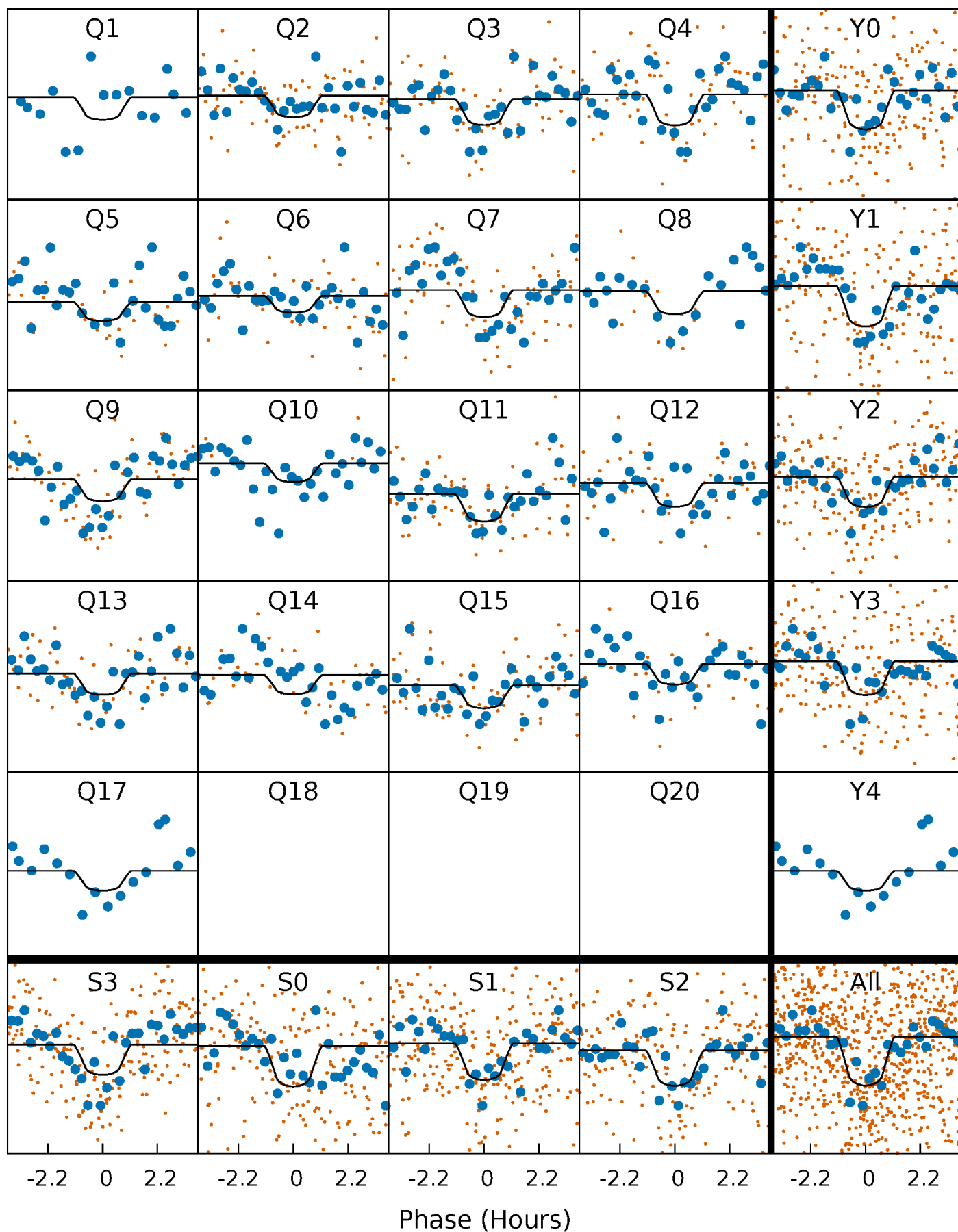
TCE 005531953-03   P= 21.914109 Days    $T_0=148.512731$  (BKJD)





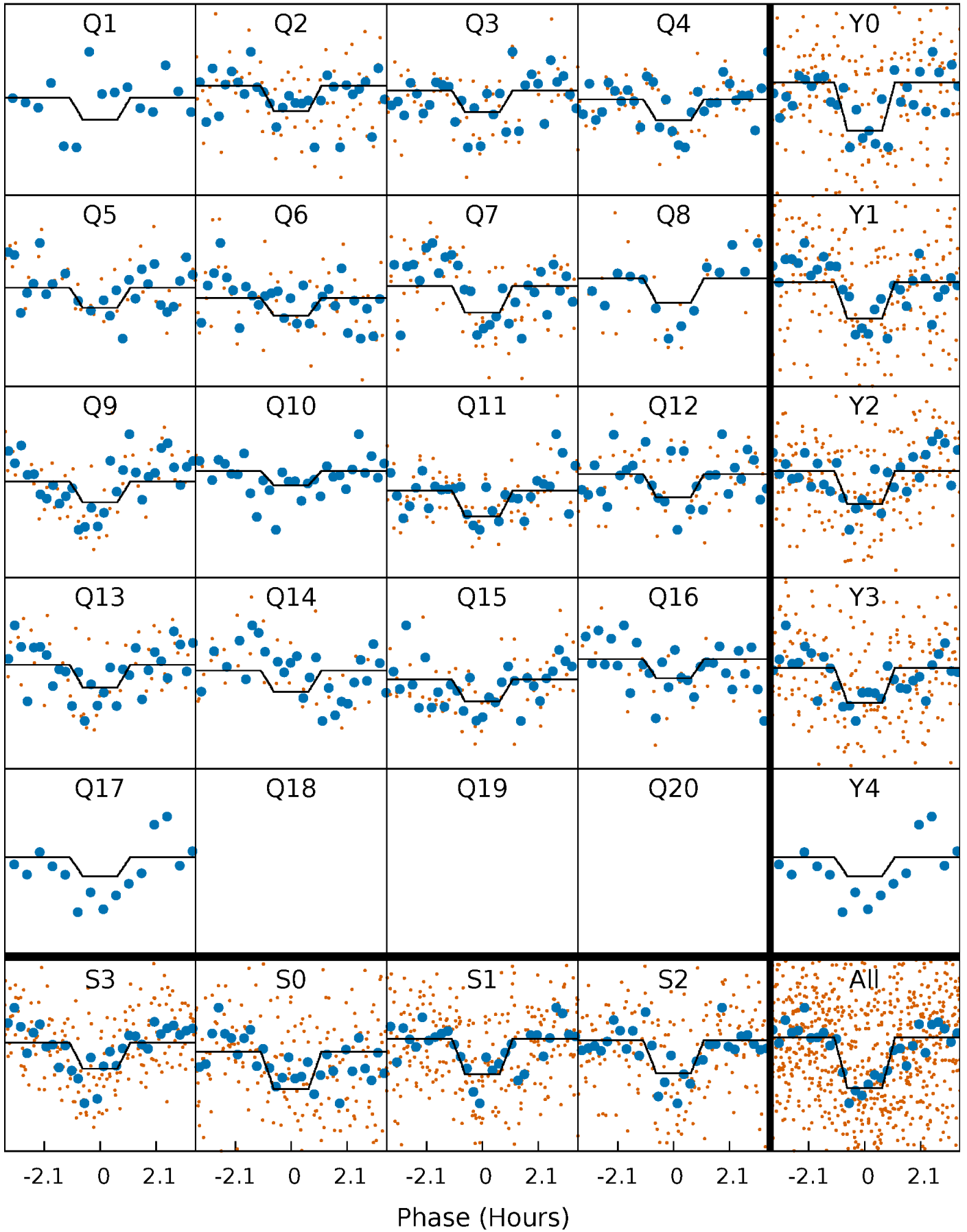
# DV Quarter-Phased Transit Curves

TCE 005531953-03 P= 21.914109 Days  $T_0=148.512731$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

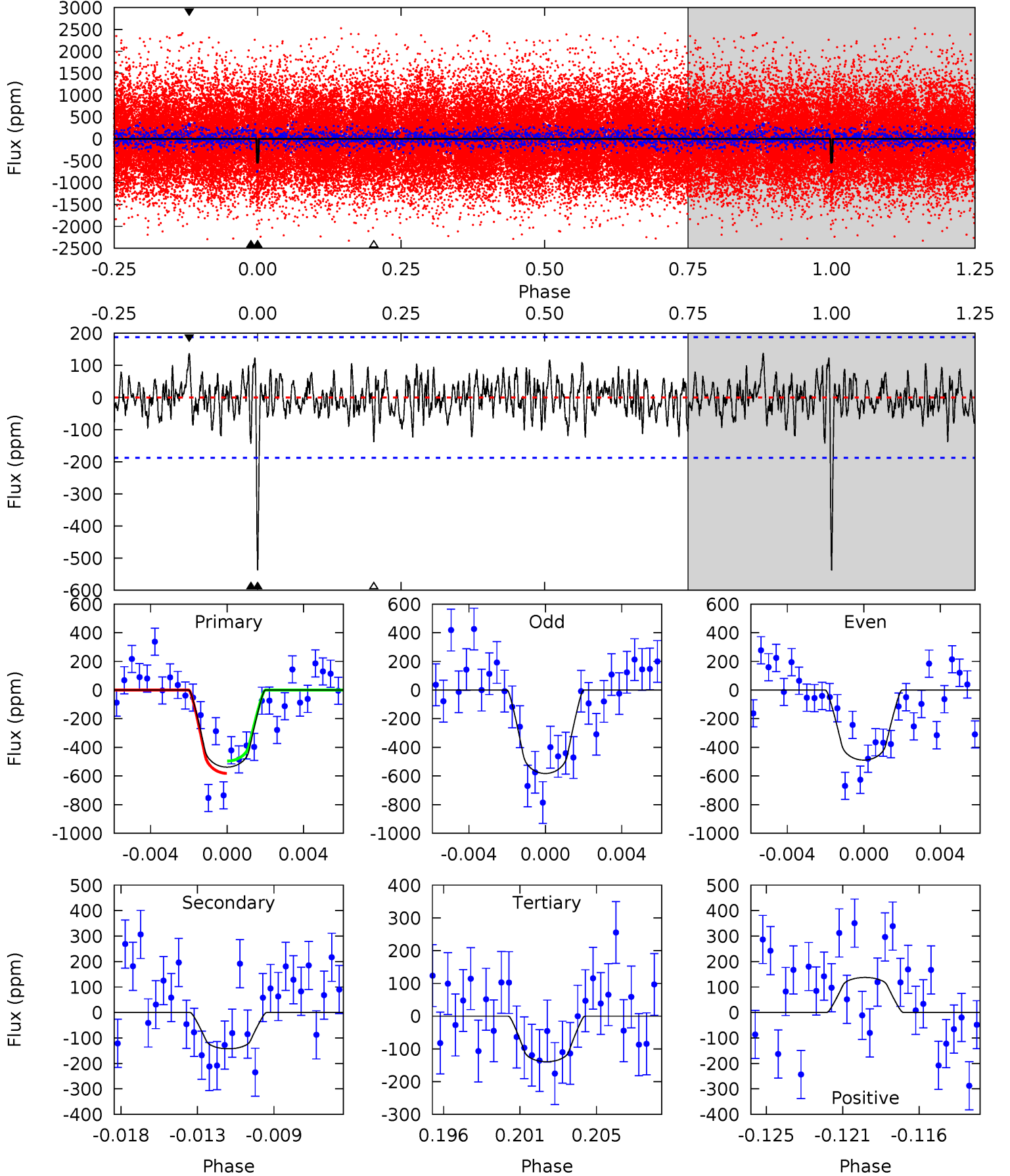
TCE 005531953-03 P= 21.914172 Days  $T_0=148.512491$  (BKJD)



# DV Model-Shift Uniqueness Test

005531953-03, P = 21.914109 Days, E = 126.598622 Days

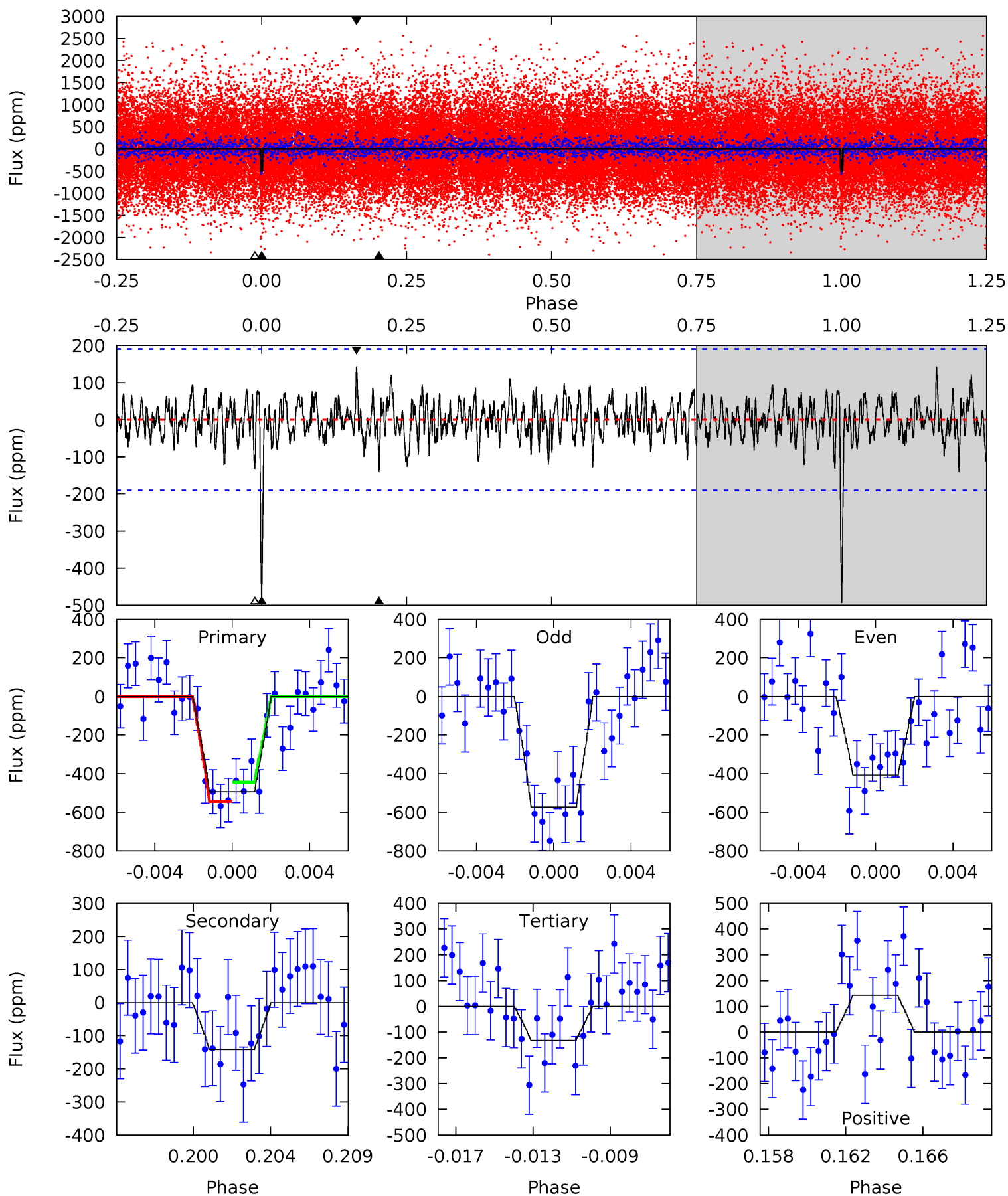
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
14.8	3.93	3.84	3.79	5.18	2.84	1.23	11.0	11.1	0.09	0.14	1.29	1.00	0.20	1.18



# Alt Model-Shift Uniqueness Test

005531953-03, P = 21.914172 Days, E = 126.598319 Days

Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
13.4	3.84	3.58	3.87	5.19	2.86	1.15	9.85	9.57	0.25	-0.04	2.25	1.02	0.22	1.37



### Stellar Parameters For KIC 005531953

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$3638^{+72}_{-87}$	$4.844^{+0.049}_{-0.055}$	$-0.140^{+0.150}_{-0.150}$	$0.420^{+0.046}_{-0.056}$	$0.450^{+0.043}_{-0.059}$	$8.524^{+2.464}_{-1.743}$
	+2%/-2%	+1%/-1%	+107%/-107%	+11%/-13%	+10%/-13%	+29%/-20%
Source	SPE70	SPE60	SPE70	DSEP		

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

### Secondary Eclipse Parameters for KIC 005531953-03 / KOI 1681.04

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$-142 \pm 36$	$1.40^{+1.02}_{-0.91}$	$425^{+13}_{-13}$	$2768^{+963}_{-372}$	$550^{+3811}_{-366}$
Alt.	$-141 \pm 37$	$1.22^{+1.10}_{-0.72}$	$424^{+14}_{-13}$	$2834^{+898}_{-439}$	$679^{+3503}_{-493}$

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

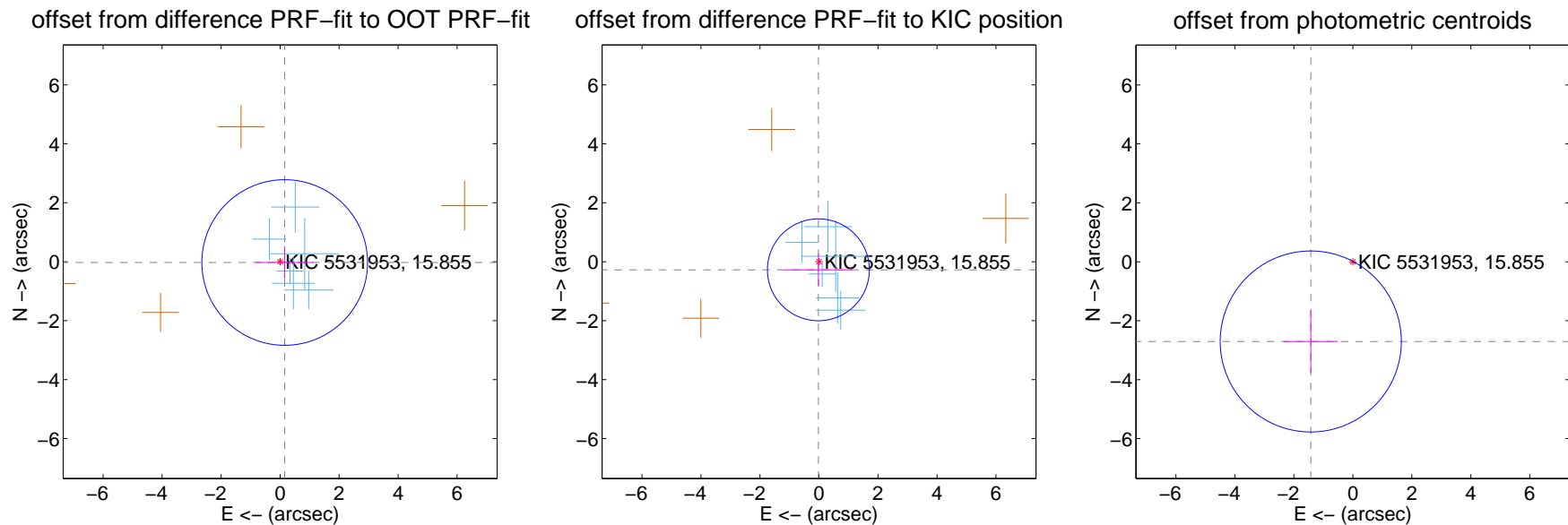
## DV Centroid Data

Supplemental centroid analysis for 005531953-03. Kepler magnitude: 15.86. Transit SNR 9.39

There are 6 quarters with good PRF difference image offsets

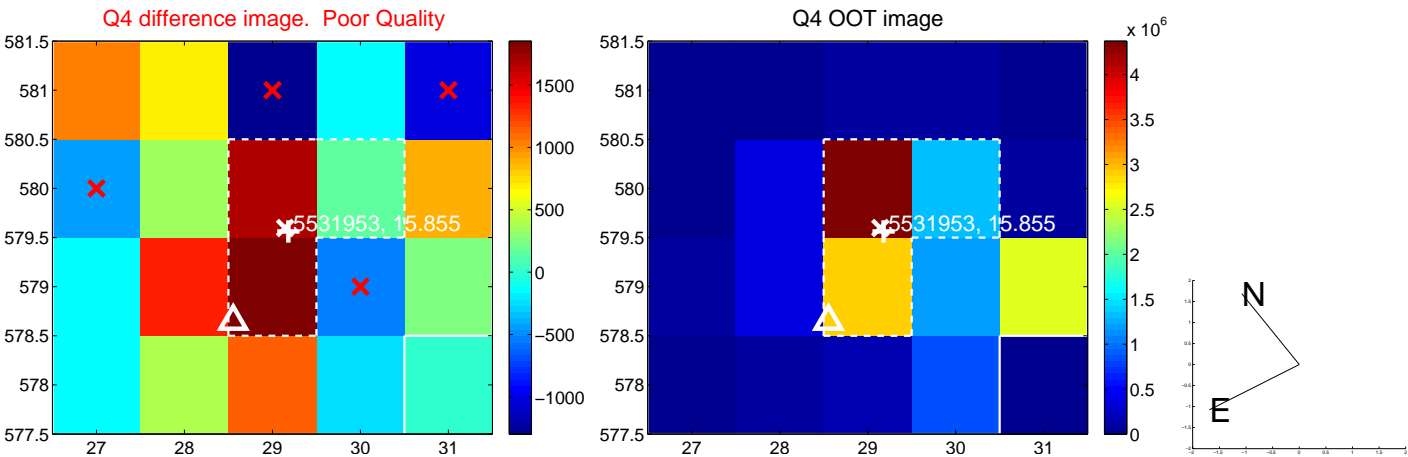
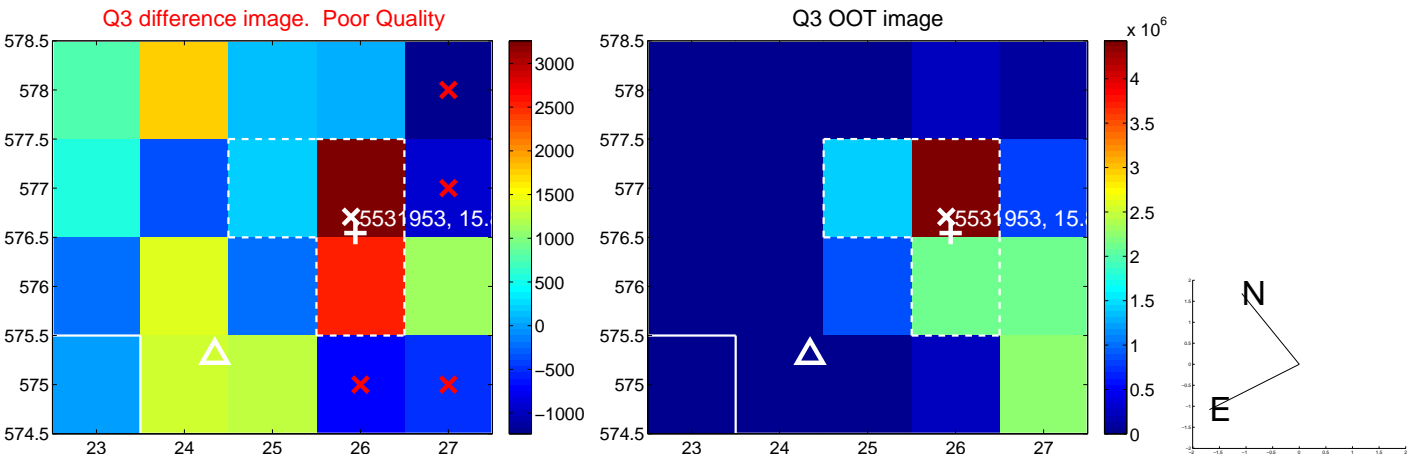
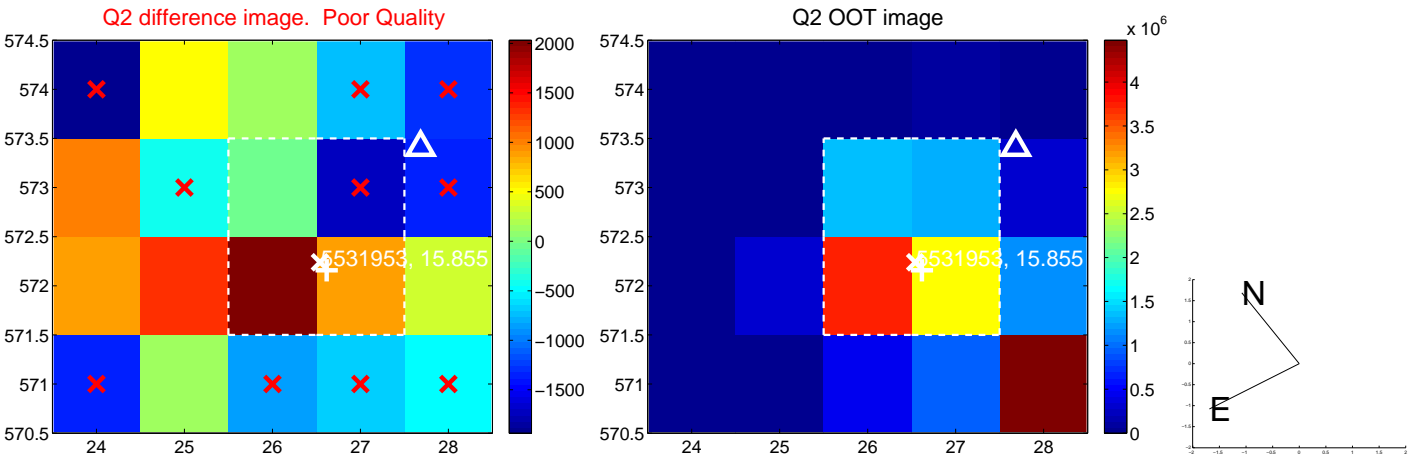
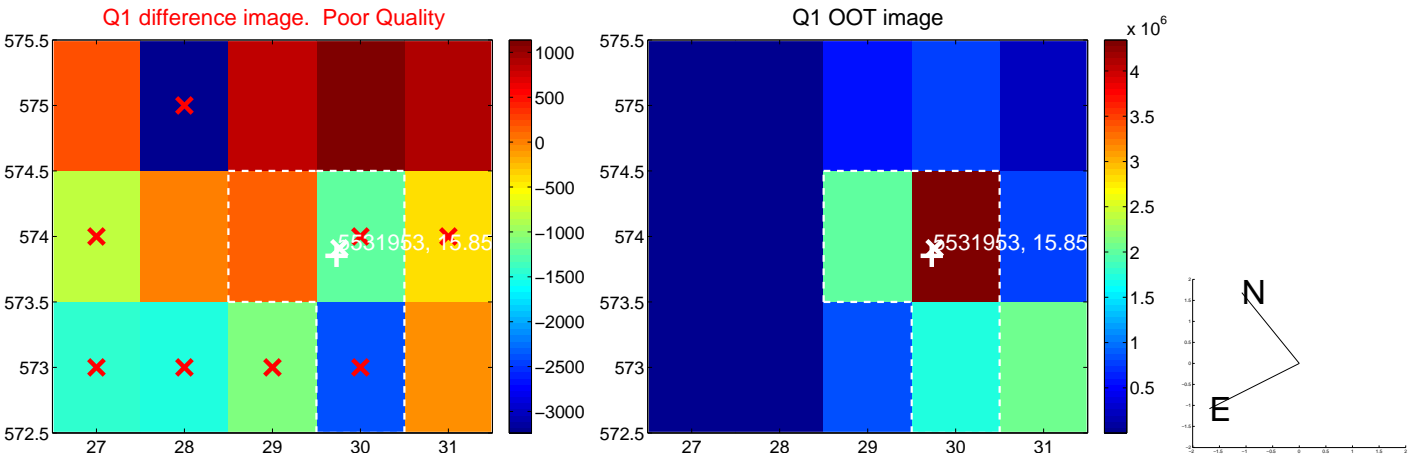
The direct PRF centroid is offset from the target star catalog position by about 0.28 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.159 \pm 0.936$	0.17	$-0.157 \pm 0.983$	$-0.028 \pm 0.546$
PRF-fit source offset from KIC position	$0.276 \pm 0.576$	0.48	$0.020 \pm 1.168$	$-0.275 \pm 0.544$
photometric centroid source offset	$3.06 \pm 1.02$	2.99	$1.43 \pm 0.92$	$-2.71 \pm 1.05$



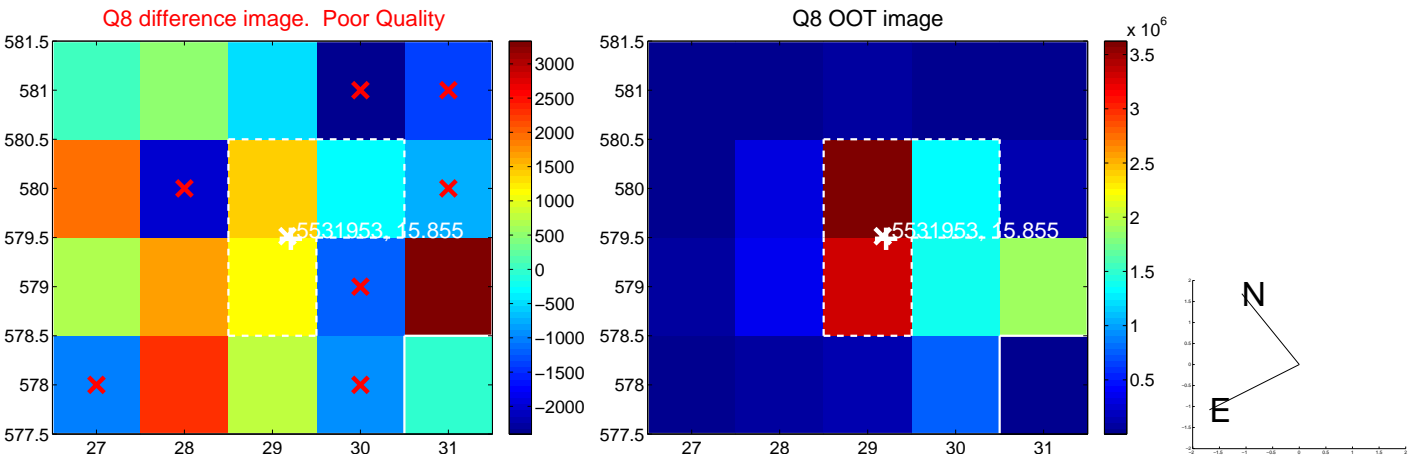
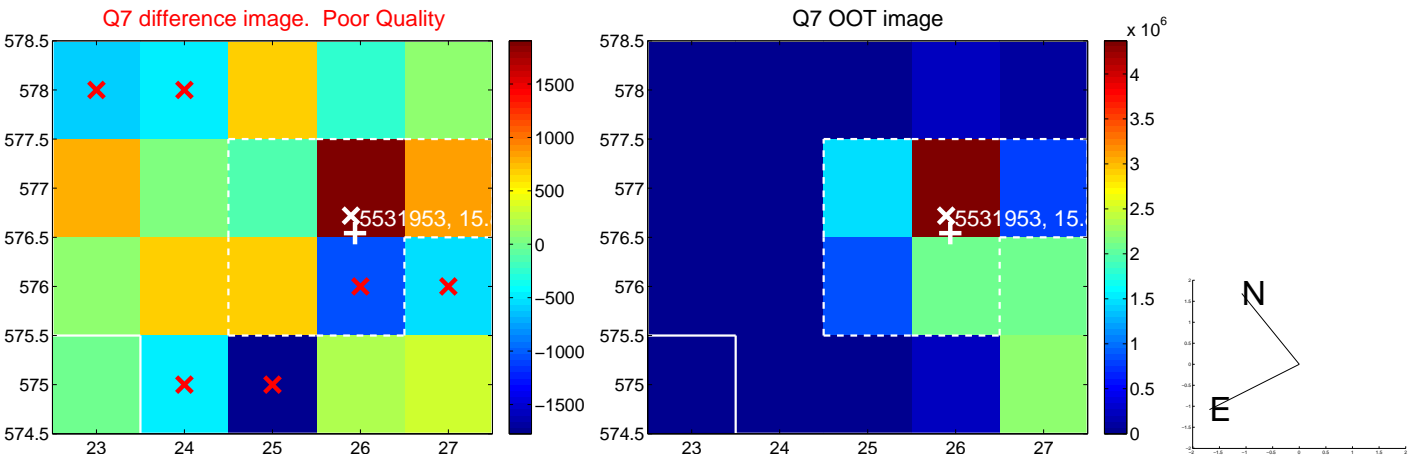
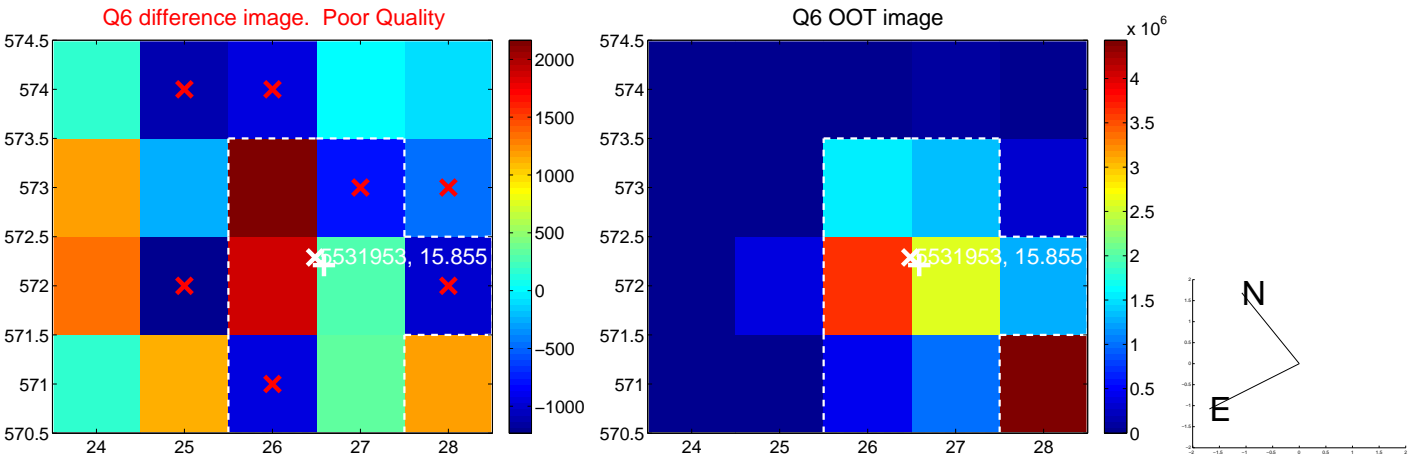
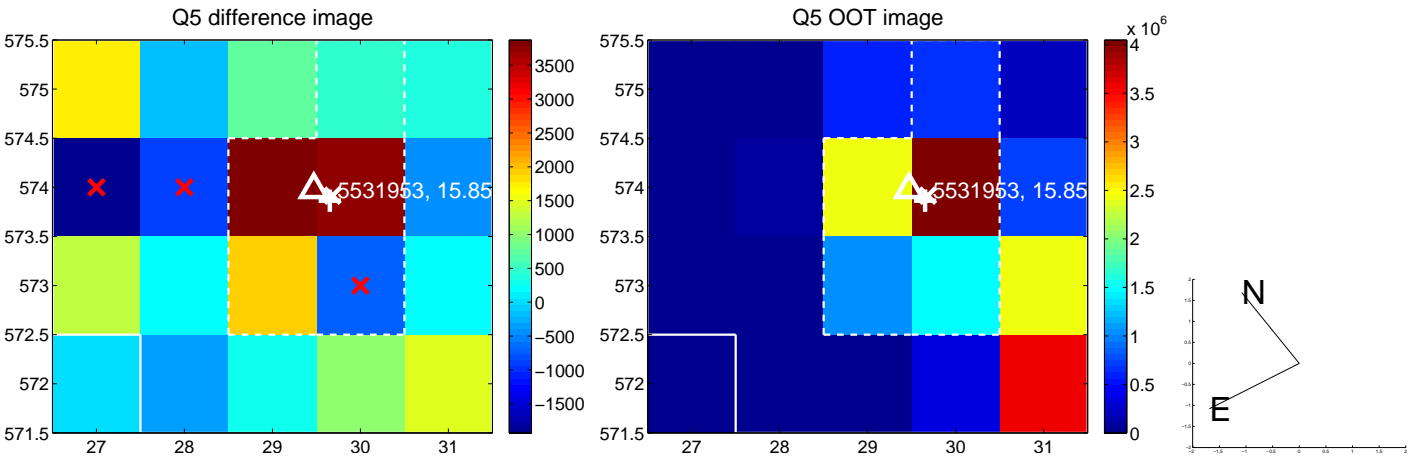
Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets**; **Vermillion crosses: bad quarterly centroid offsets**; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

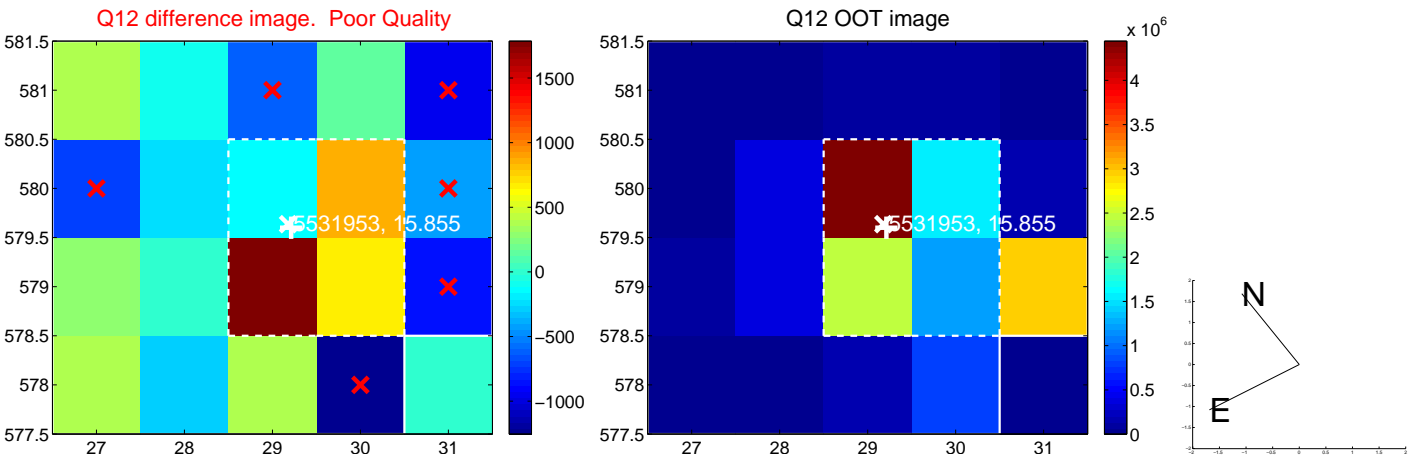
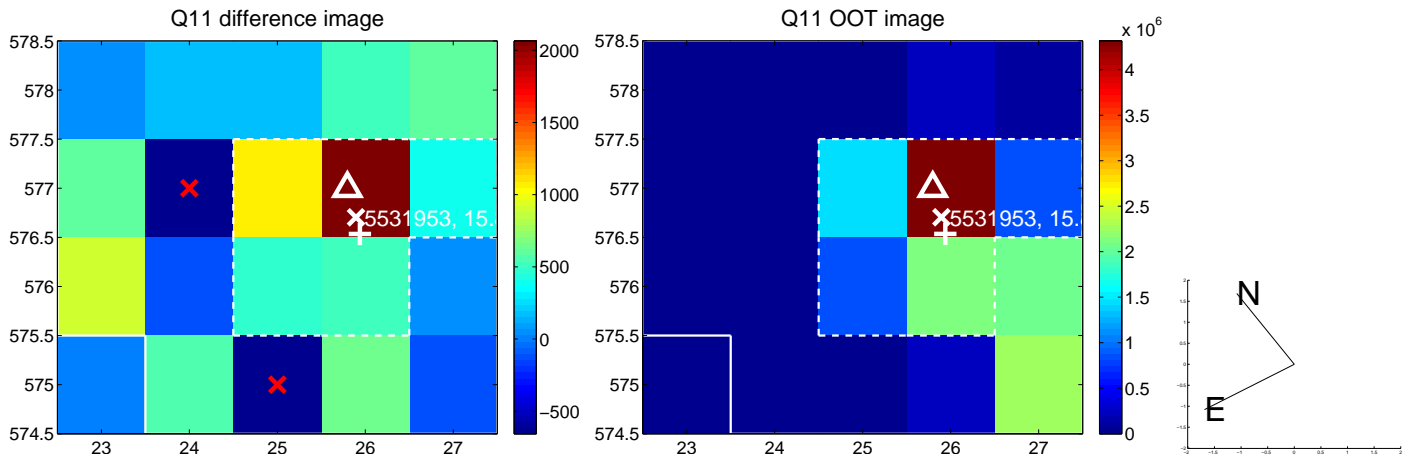
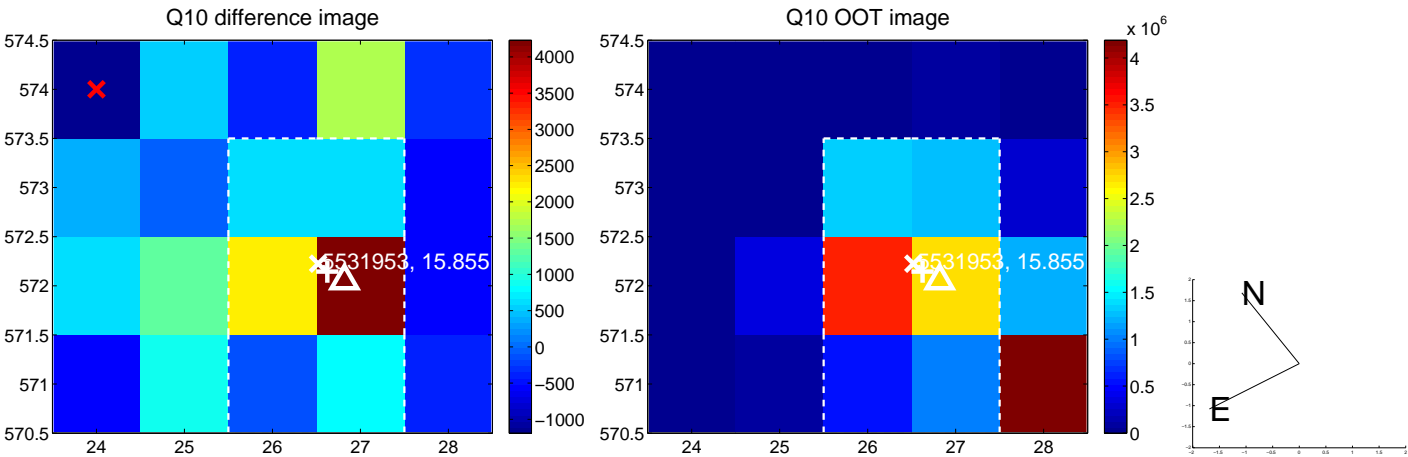
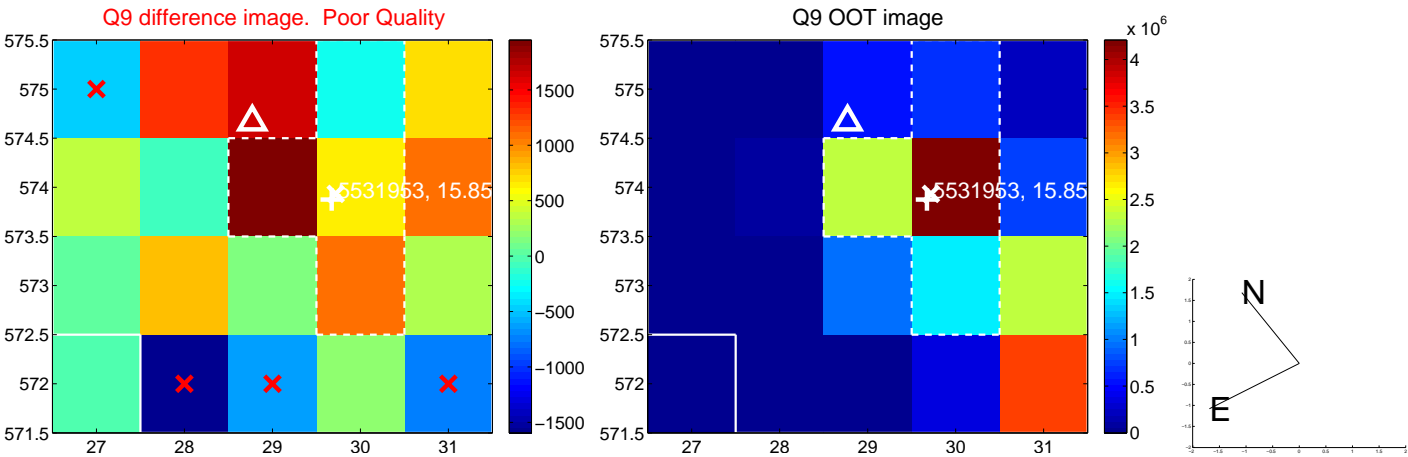




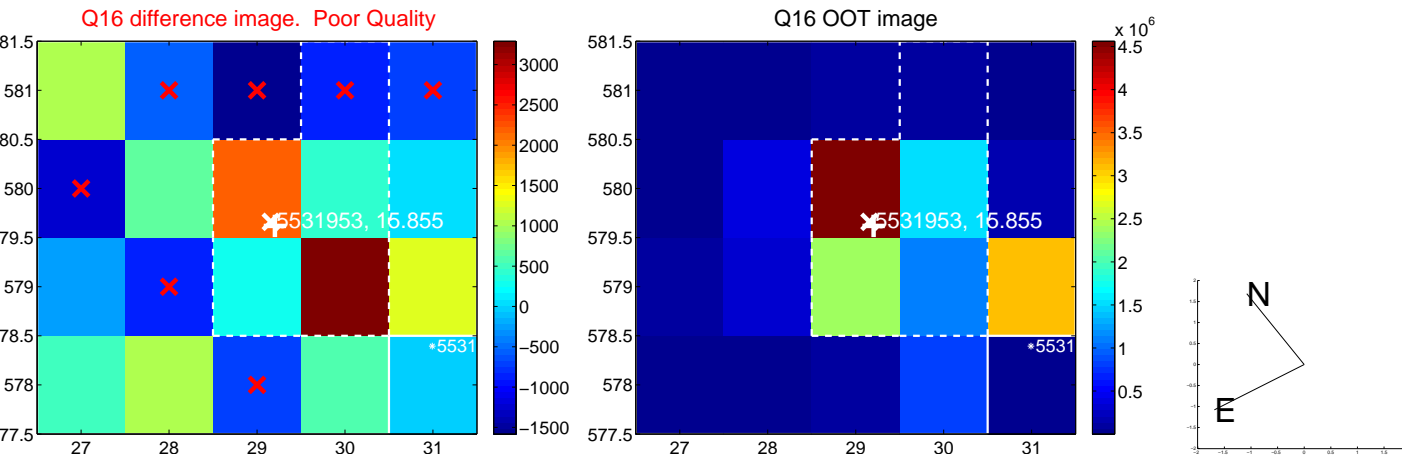
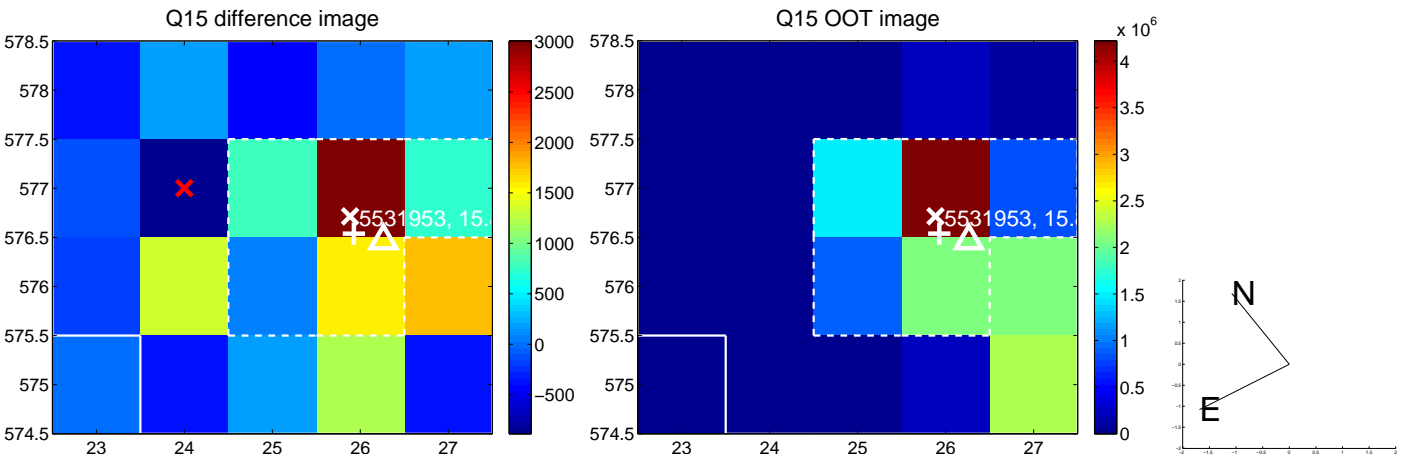
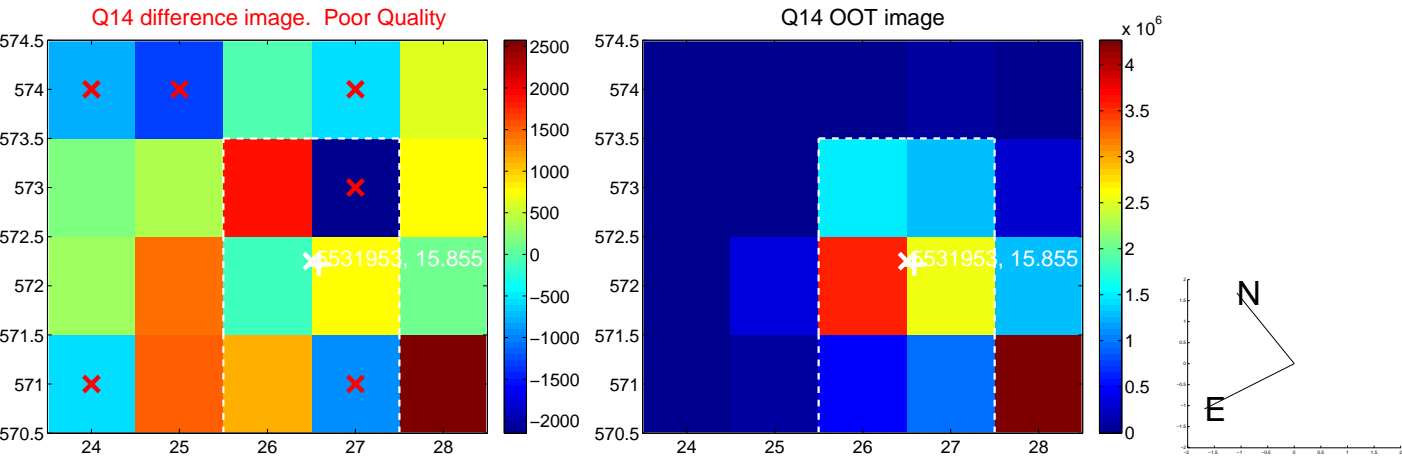
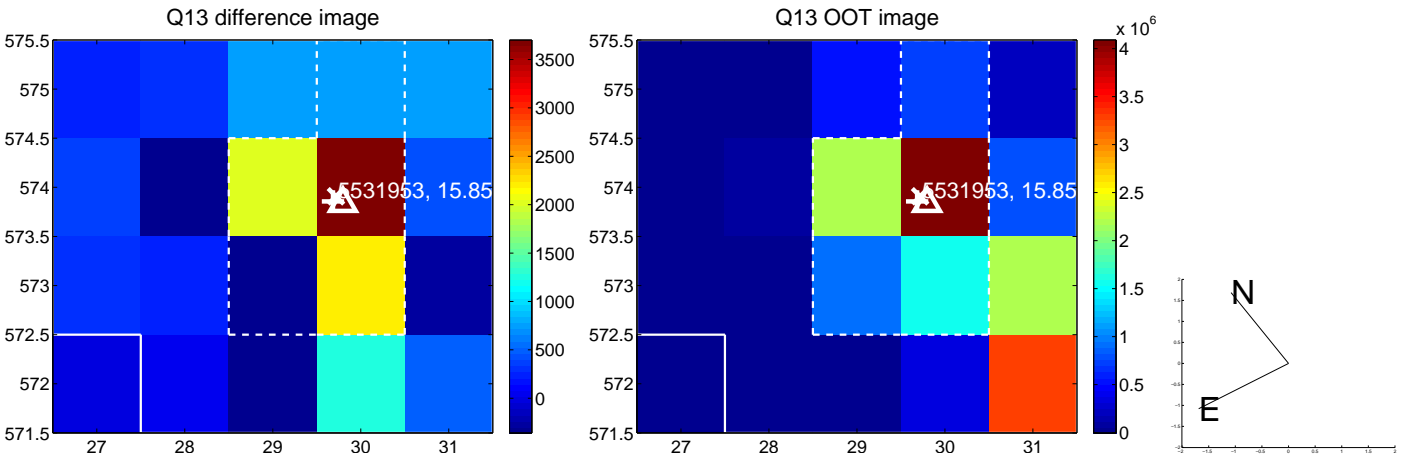
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



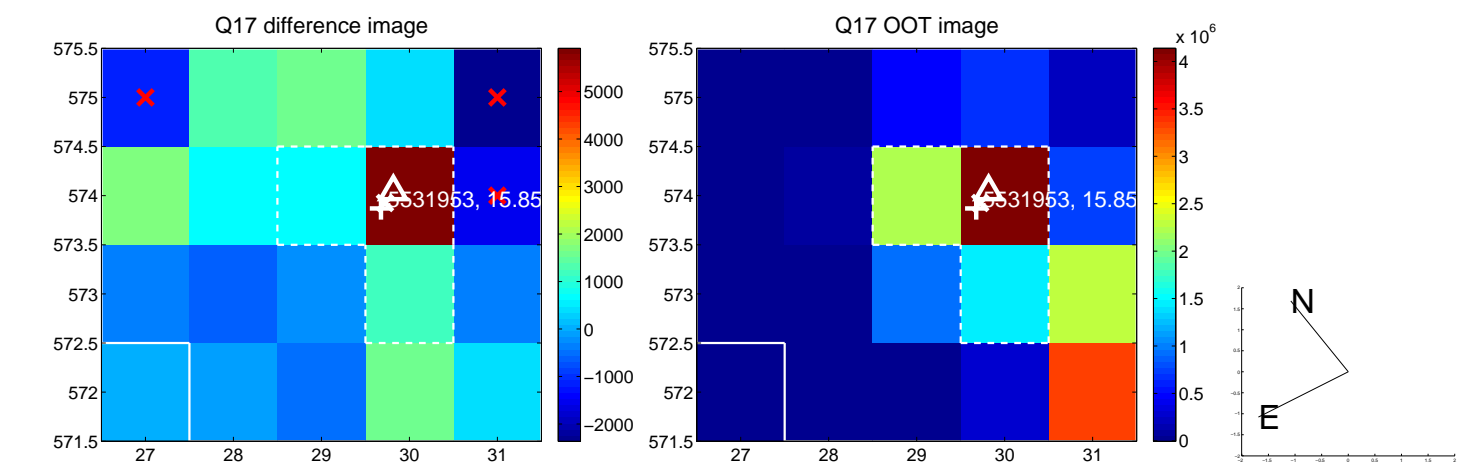
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



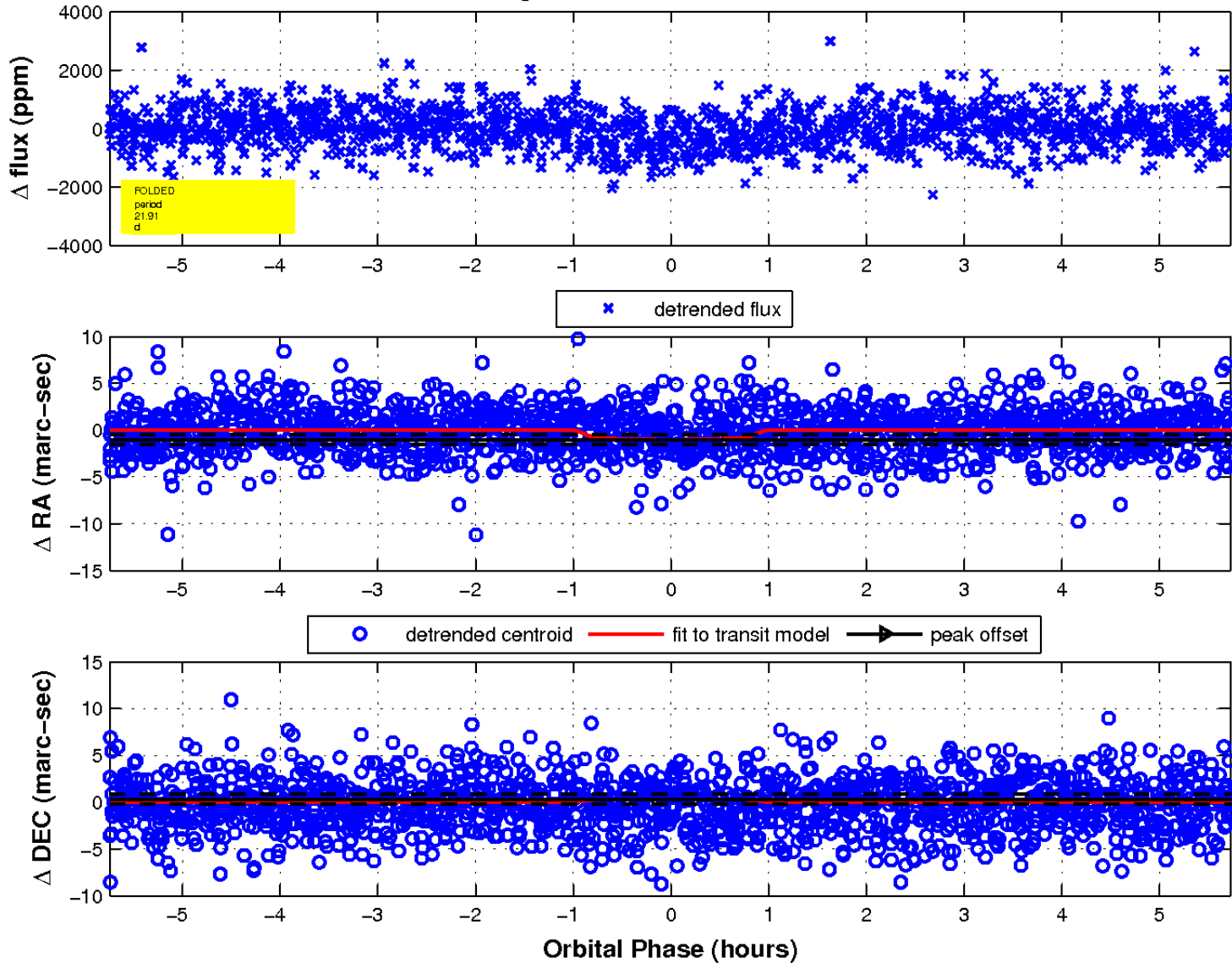
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

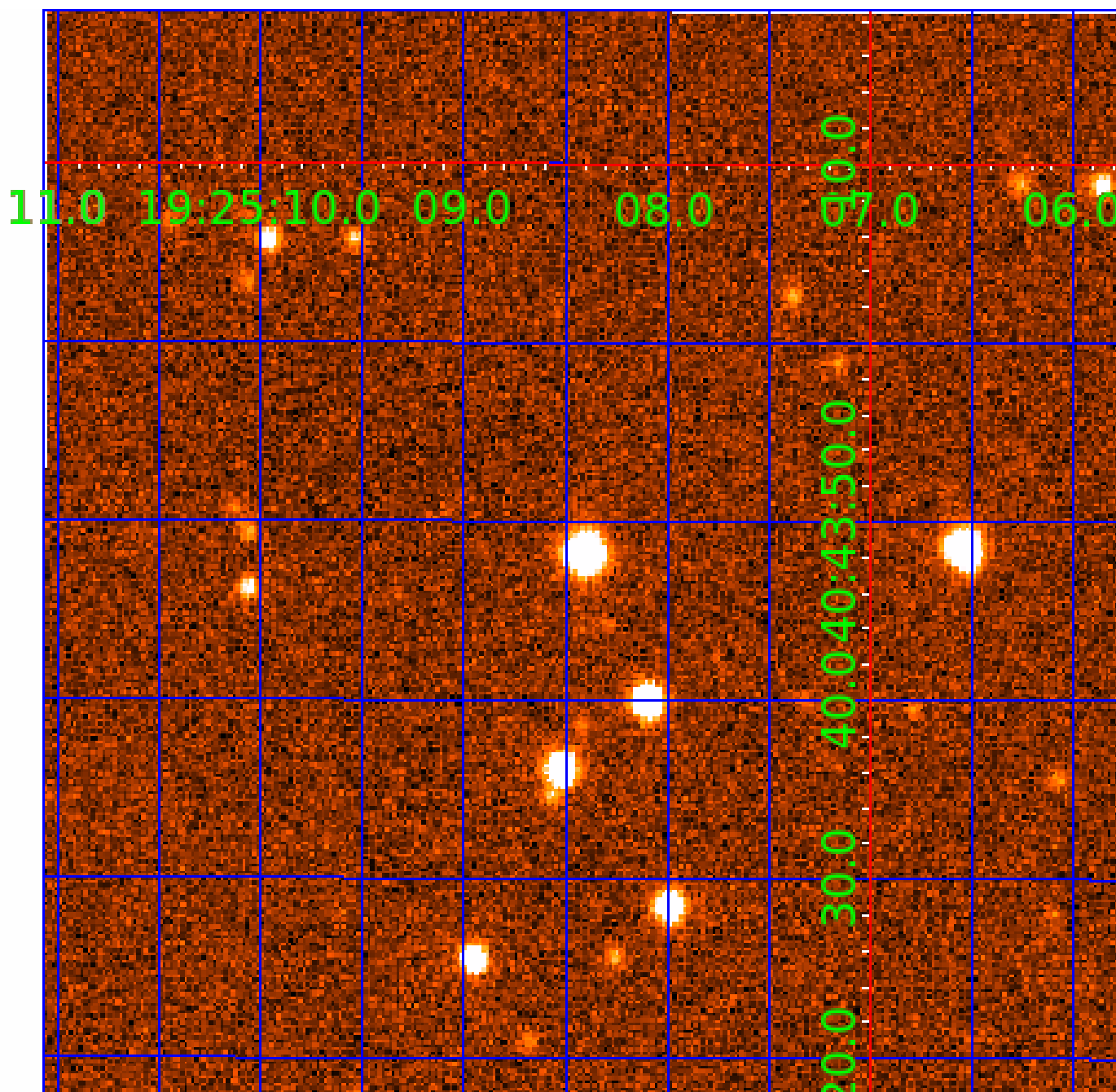


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UKIRT Image

Declination



# KIC 005531953

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
005531953-01	OBS	1681.01	6.939074	138.342167	562.0	2.493	18.4	19.8	0.42	3638	1.18	9.31
005531953-02	OBS	1681.02	1.992865	131.693520	260.5	1.524	12.9	14.4	0.42	3638	0.81	49.11
005531953-03	OBS	1681.04	21.914109	148.512731	519.6	1.915	8.0	9.4	0.42	3638	1.05	2.01
005531953-04	OBS	1681.03	3.531047	134.320758	284.4	1.470	7.6	10.8	0.42	3638	0.88	22.91

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
005531953-01	OBS	PC	1.00	0	0	0	0	NO_COMMENT
005531953-02	OBS	FP	0.33	0	0	1	0	CENT_UNRESOLVED_OFFSET
005531953-03	OBS	PC	1.00	0	0	0	0	NO_COMMENT
005531953-04	OBS	PC	0.94	0	0	0	0	NO_COMMENT

**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.

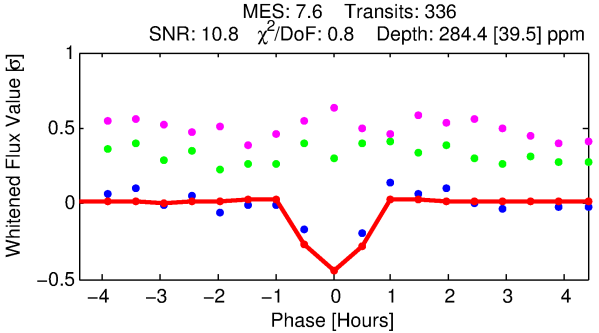
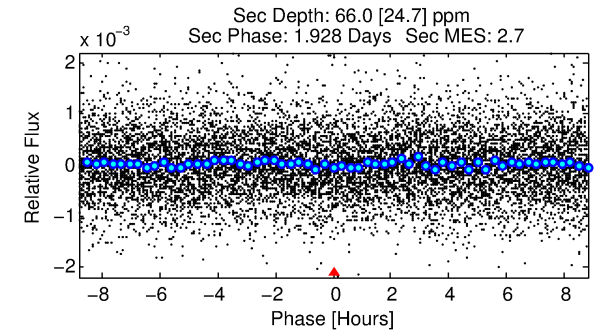
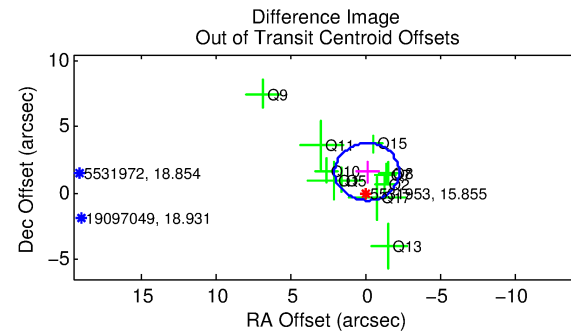
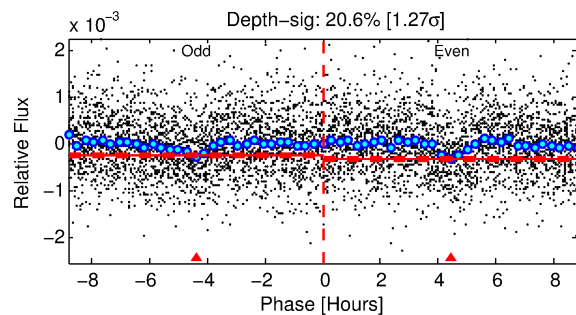
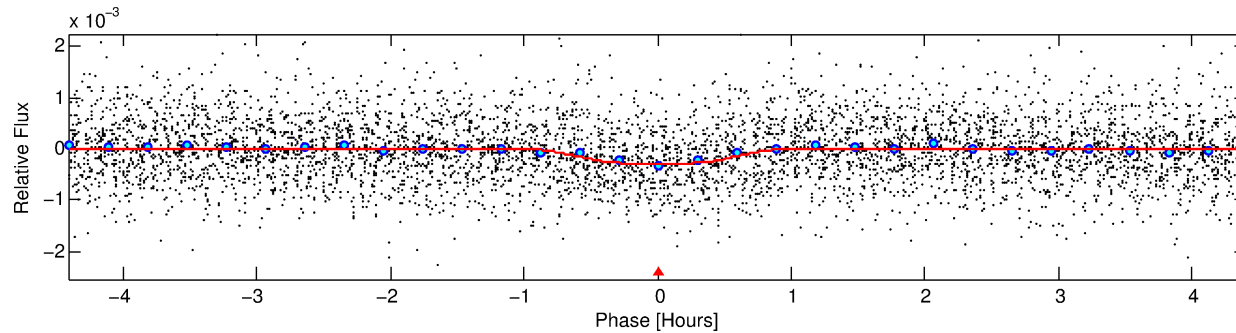
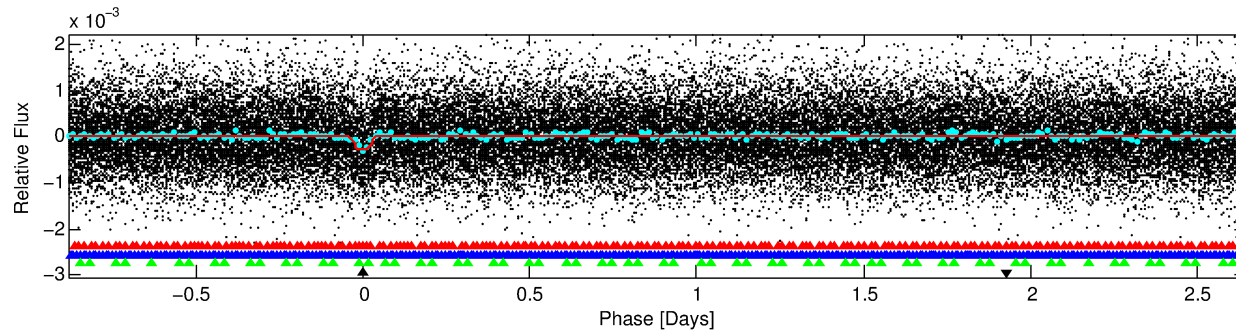
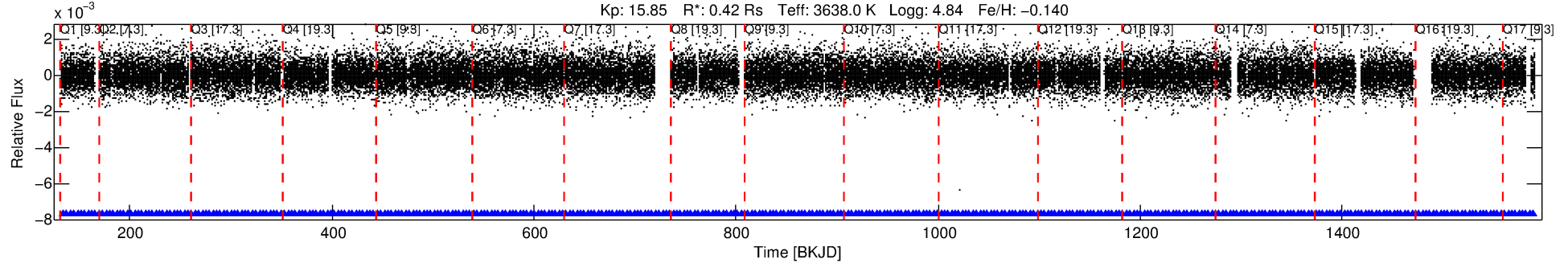
Ephemeris Match Information For 005531953-04

No Significant Match Found

# DV One-Page Summary

KIC: 5531953 Candidate: 4 of 4 Period: 3.531 d  
KOI: K01681.03 Corr: 0.965

Kp: 15.85 R\*: 0.42 Rs Teff: 3638.0 K Logg: 4.84 Fe/H: -0.140



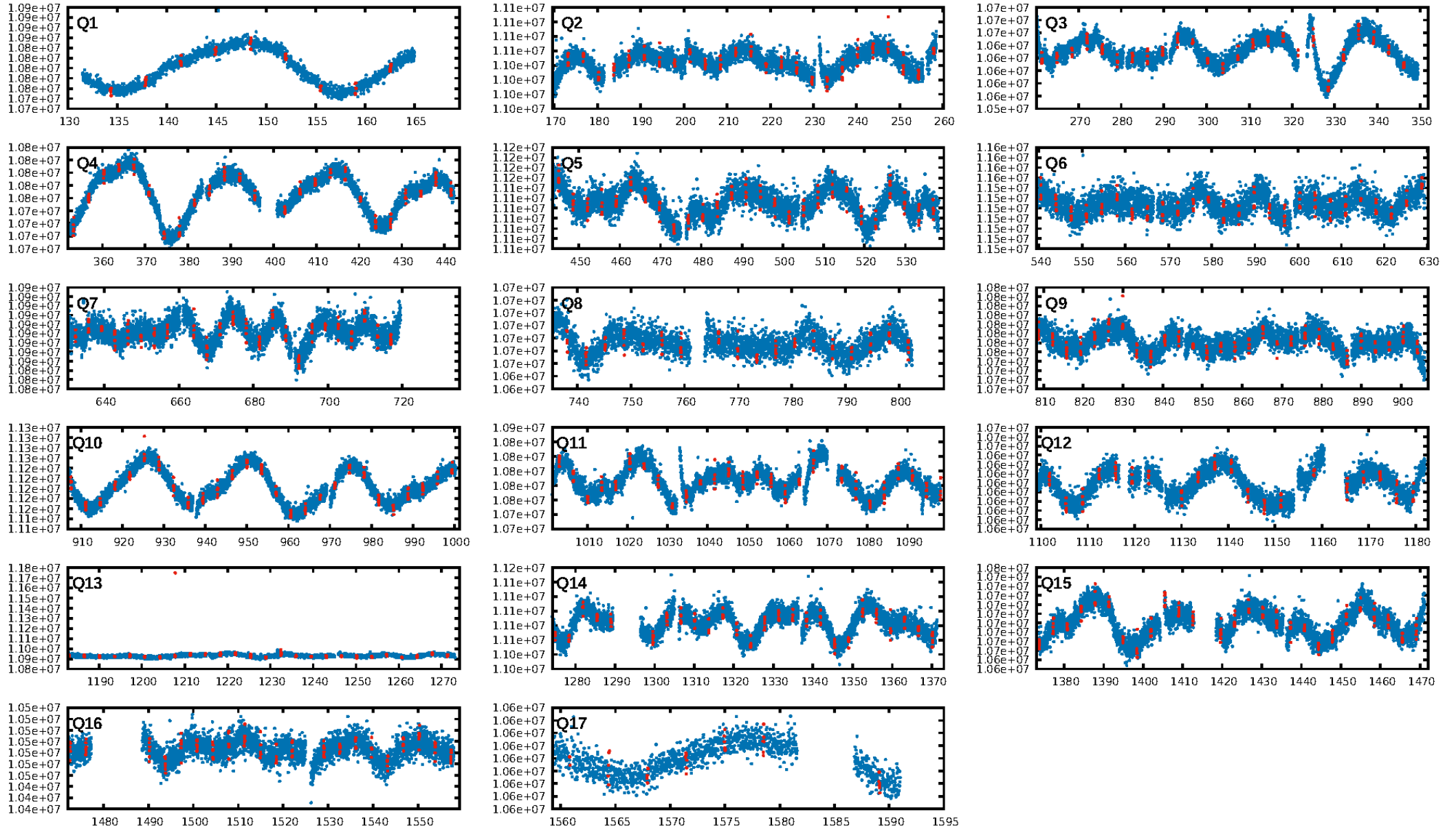
DV Fit Results:	DV Diagnostic Results:
Period = 3.53105 [0.00002] d	ShortPeriod-sig: 100.0% [17.44σ]
Epoch = 134.3208 [0.0024] BKJD	LongPeriod-sig: 100.0% [28.26σ]
Rp/R* = 0.0191 [0.0087]	ModelChiSquare2-sig: N/A
a/R* = 7.64 [14.96]	ModelChiSquareGof-sig: N/A
b = 0.93 [0.29]	Bootstrap-pfa: 7.14e-66
Seff = 22.91 [3.56]	RollingBand-fgt: 1.00 [325/325]
Teq = 558 [22] K	GhostDiagnostic-chr: 4.644
Rp = 0.88 [0.41] Re	Centroid-sig: 1.0%
a = 0.0348 [0.0034] AU	Centroid-so: 0.617 arcsec [0.68σ]
Ag = 57.03 [56.27] [1.00σ]	OotOffset-rm: 1.606 arcsec [2.23σ]
Teffp = 2370 [583] K [3.11σ]	KicOffset-rm: 1.020 arcsec [1.35σ]
	OotOffset-st: 2/3/1/5 [11]
	KicOffset-st: 2/3/1/5 [11]
	DiffImageQuality-fgm: 0.27 [3/11]
	DiffImageOverlap-fno: 1.00 [17/17]

Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 01-Feb-2016 01:28:08 Z

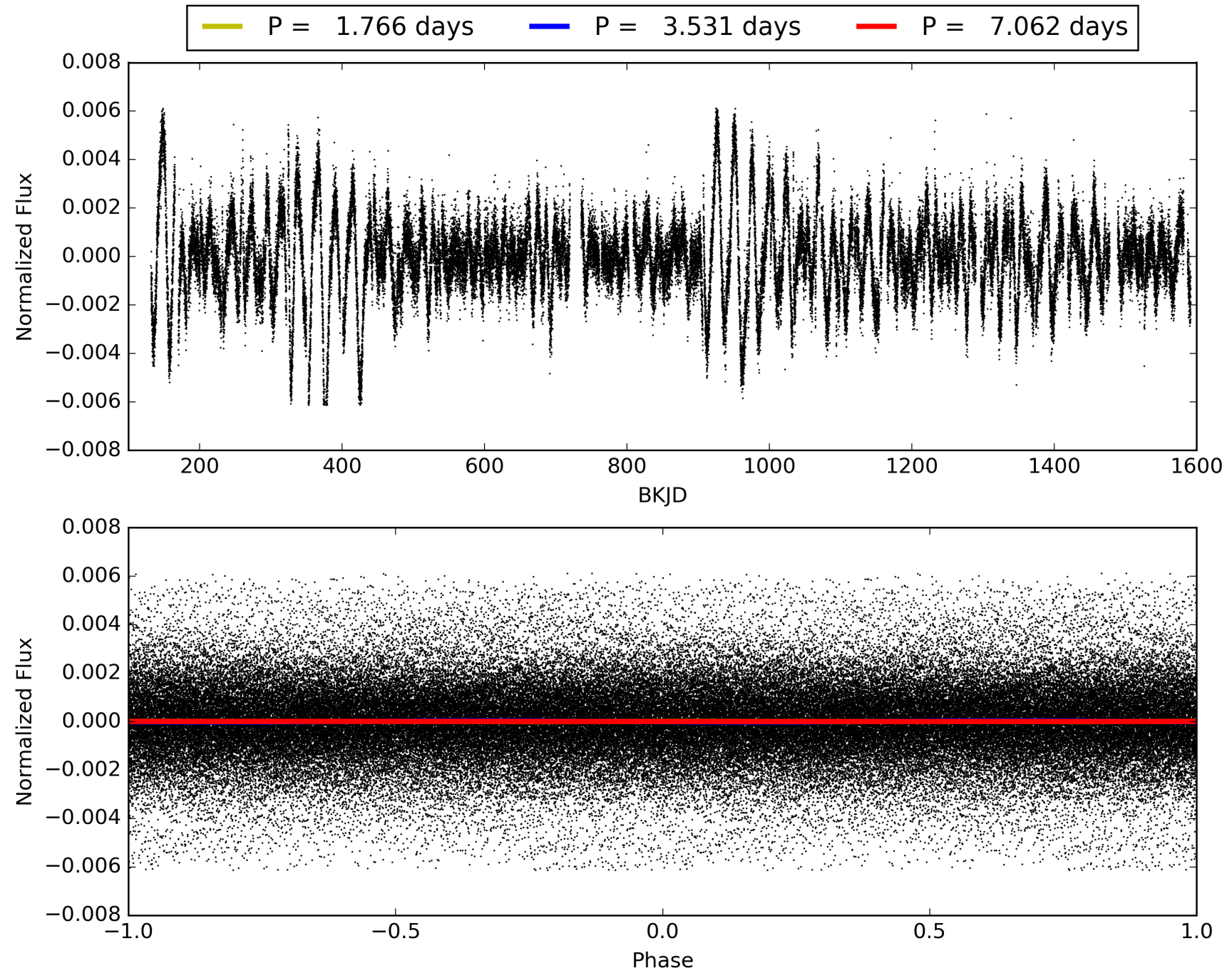
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center



# TCE 005531953-04, PDC Light Curves

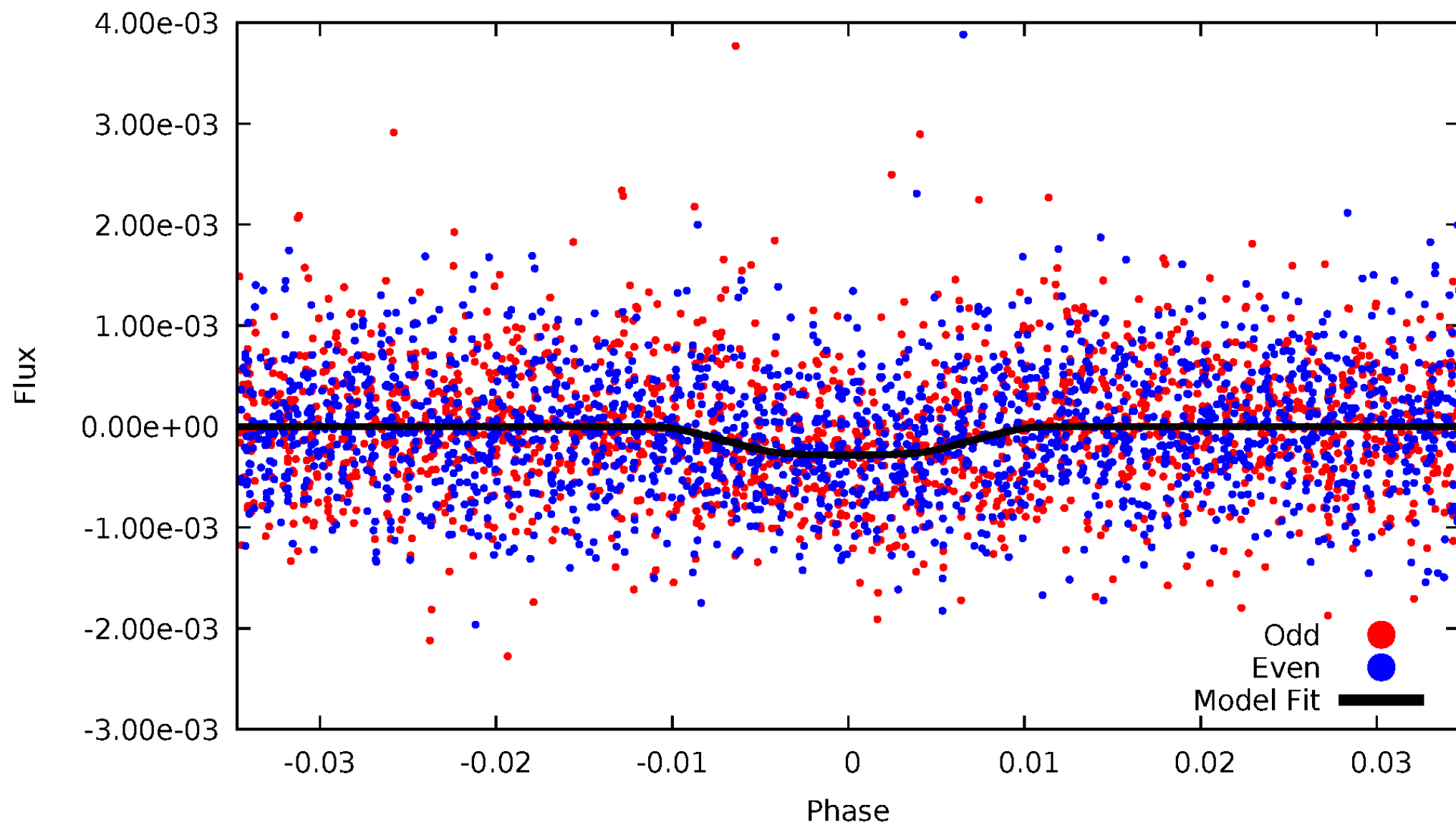


# TCE 005531953-04



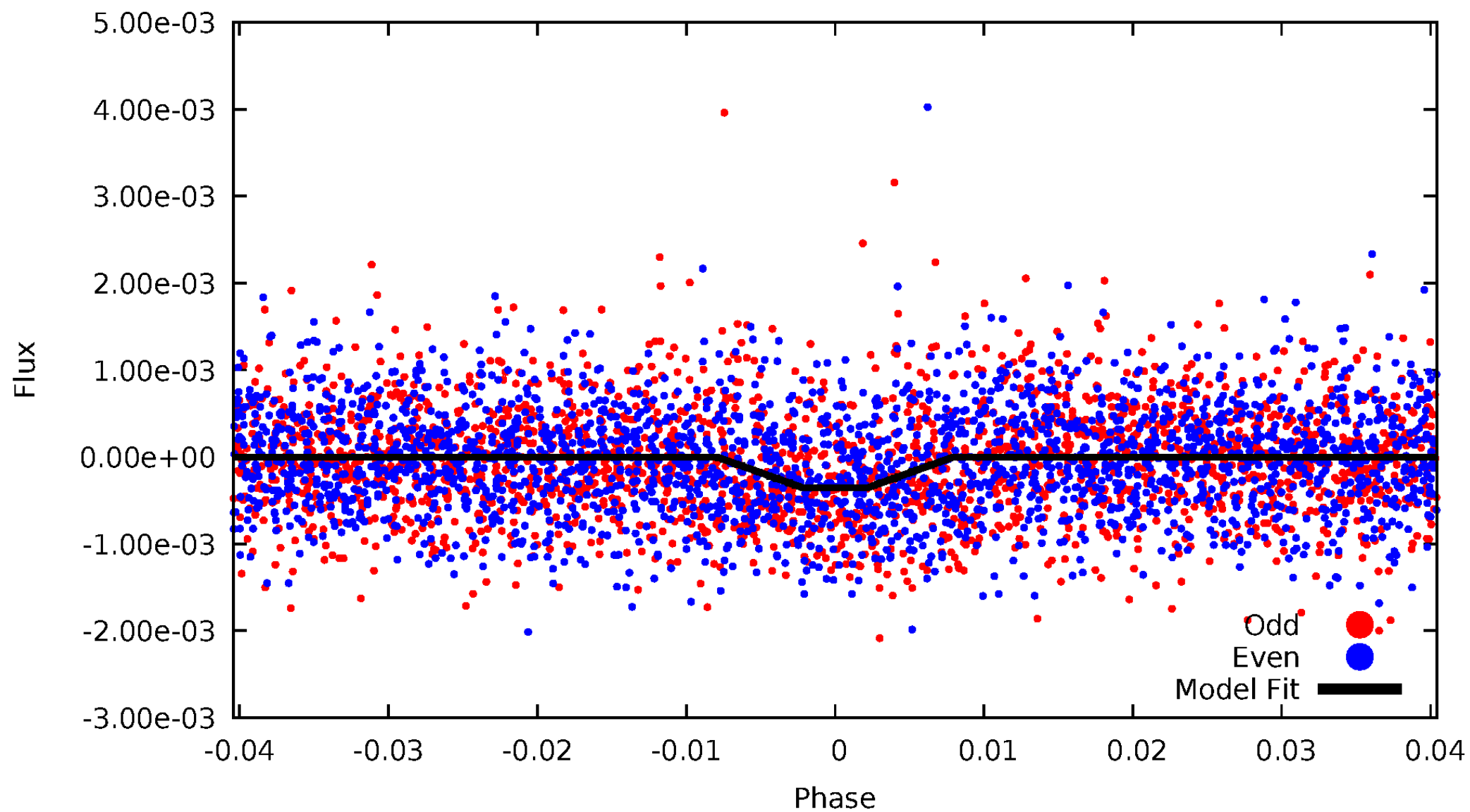
# DV Odd/Even

TCE 005531953-04



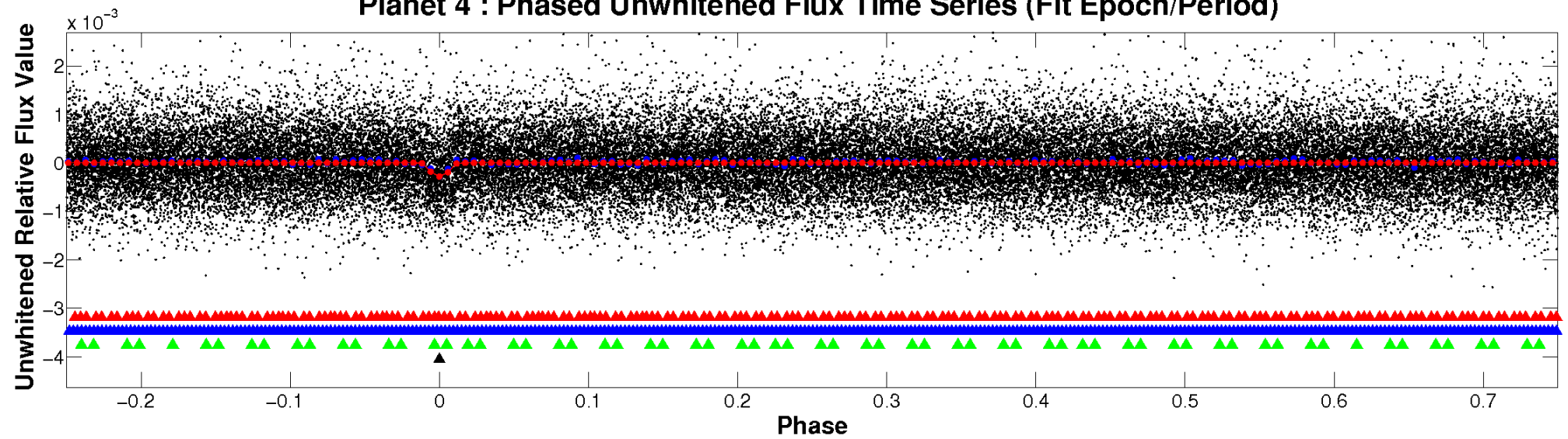
# ALT Odd/Even

TCE 005531953-04

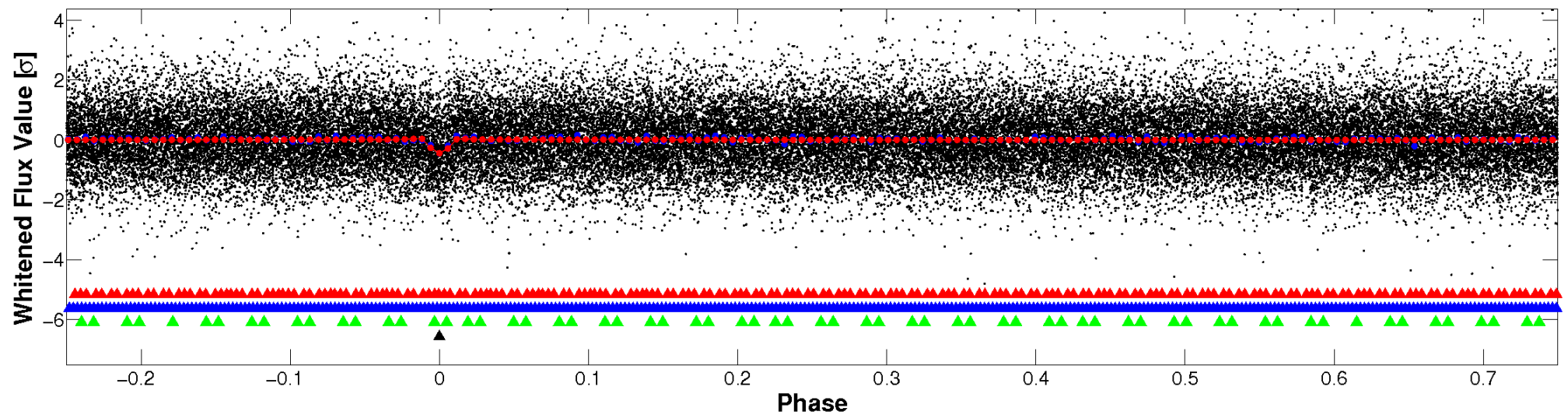


# Non-Whitened Vs. Whitened Light Curve

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



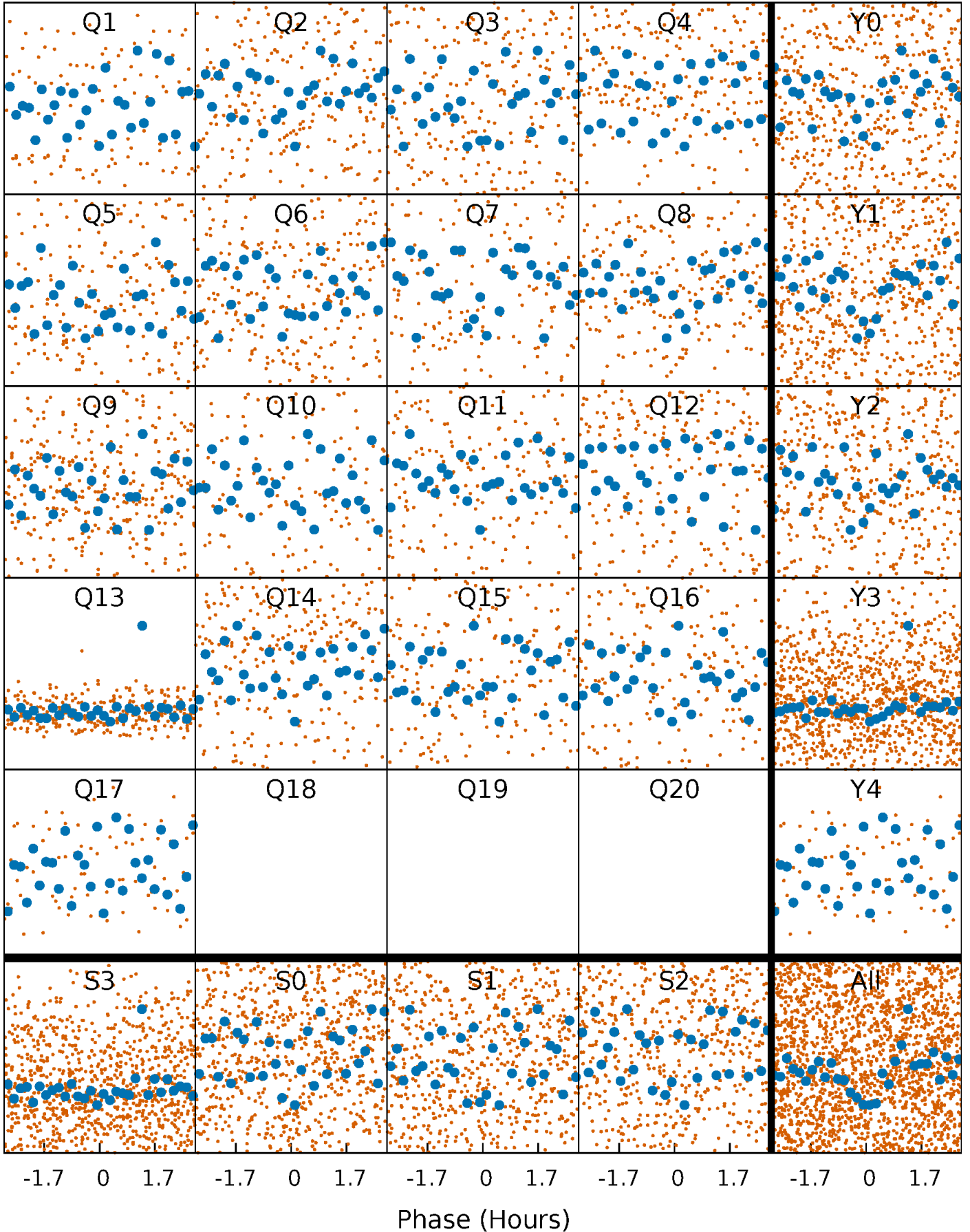
## Planet 4 : Phased Whitened Flux Time Series (Fit Epoch/Period)





# PDC Quarter-Phased Transit Curves

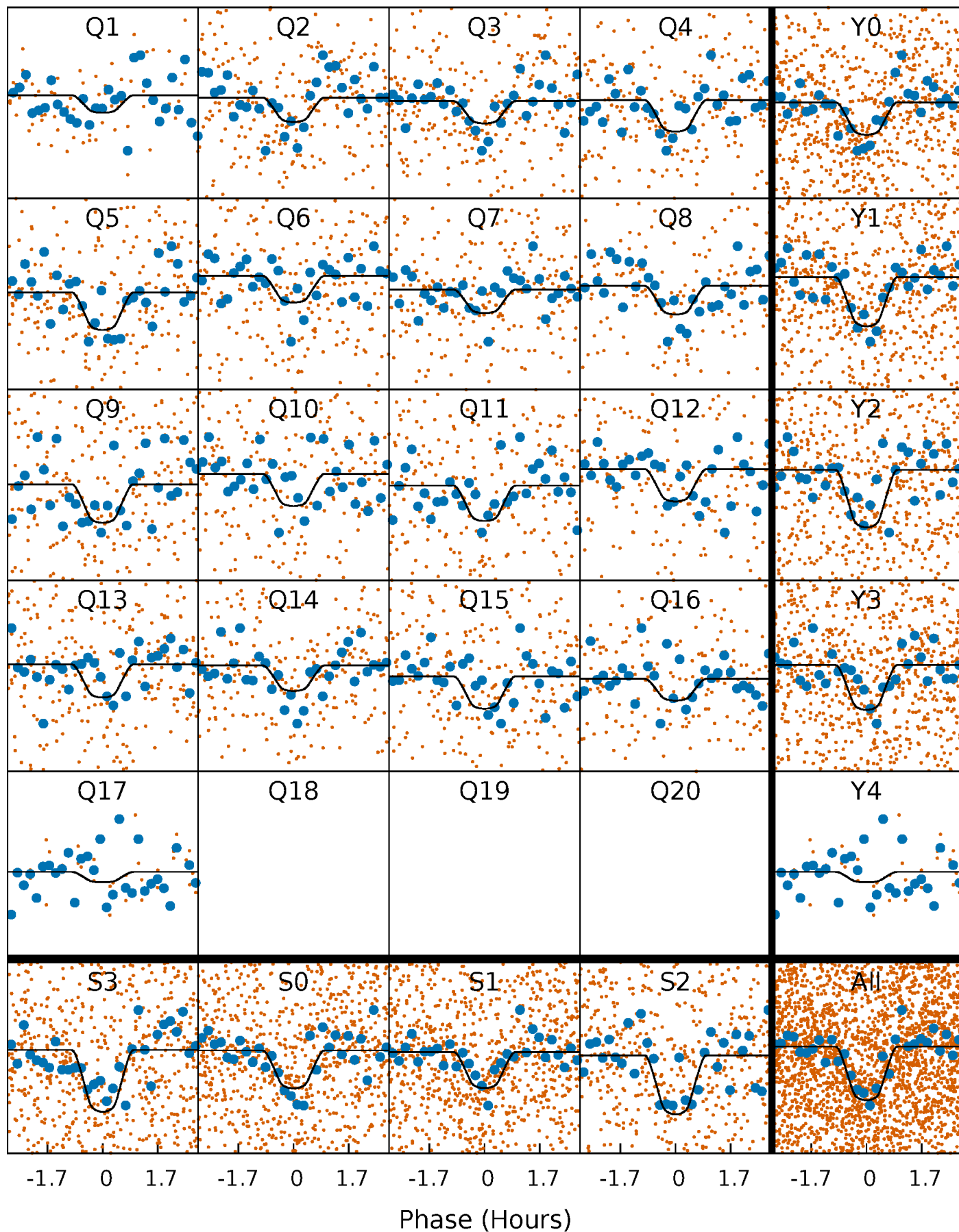
TCE 005531953-04 P= 3.531047 Days  $T_0=134.320758$  (BKJD)





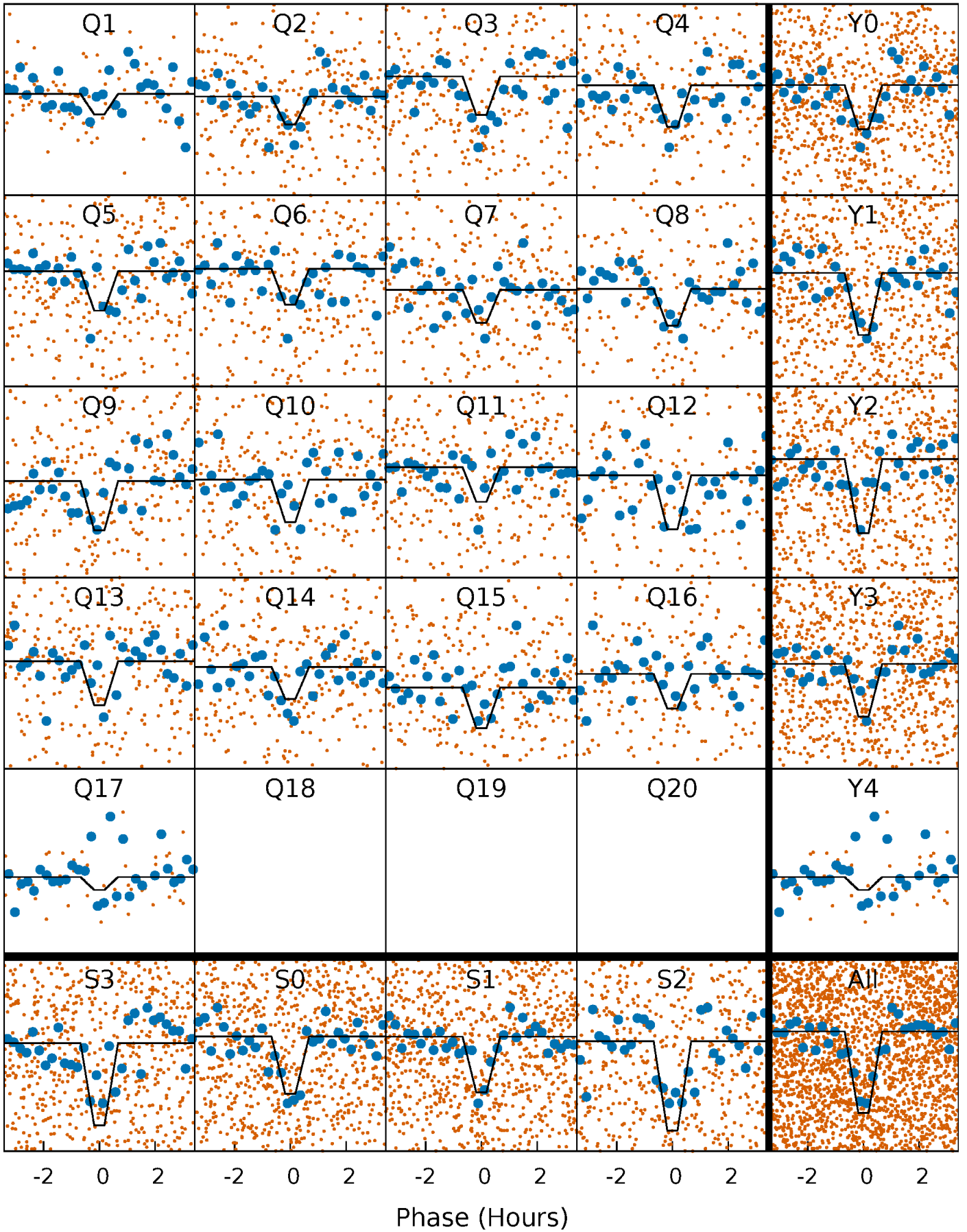
# DV Quarter-Phased Transit Curves

TCE 005531953-04   P= 3.531047 Days    $T_0=134.320758$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

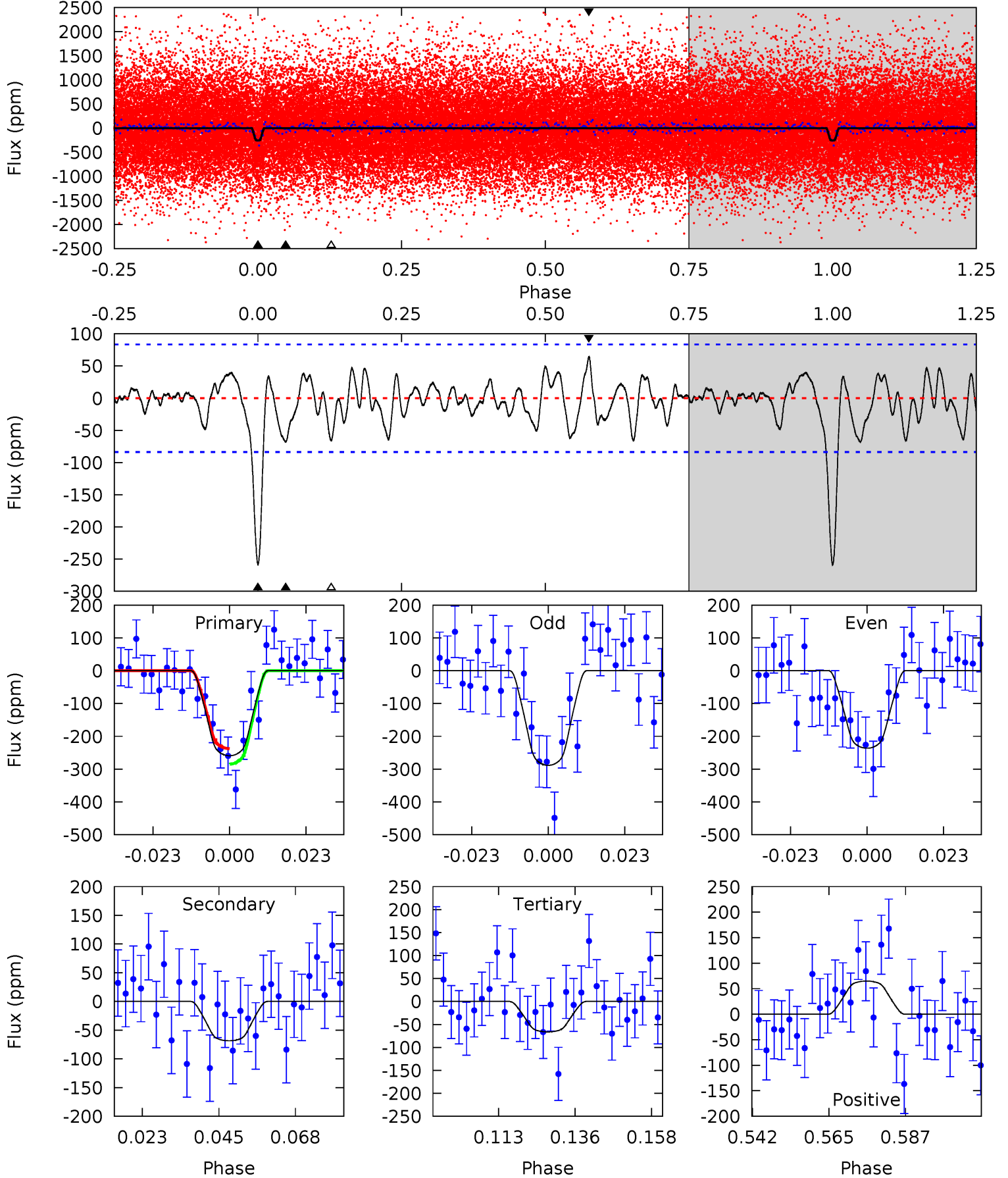
TCE 005531953-04 P= 3.531077 Days  $T_0=134.315161$  (BKJD)



# DV Model-Shift Uniqueness Test

005531953-04, P = 3.531047 Days, E = 130.789711 Days

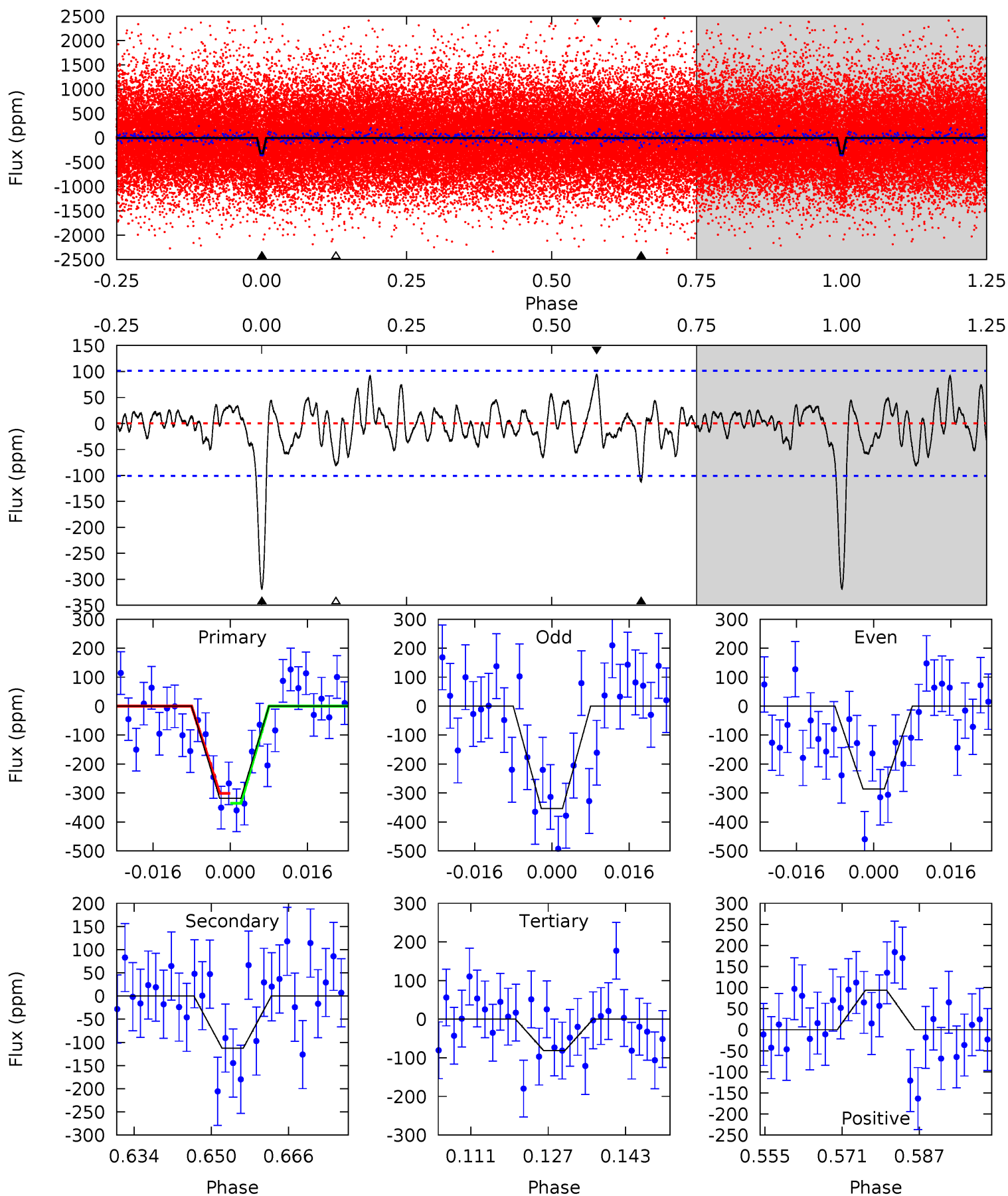
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
15.1	3.99	3.86	3.78	4.87	2.28	1.42	11.2	11.3	0.13	0.21	1.52	0.90	0.20	1.37



# Alt Model-Shift Uniqueness Test

005531953-04, P = 3.531077 Days, E = 130.784084 Days

Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
15.6	5.51	3.97	4.58	4.94	2.41	1.45	11.6	11.0	1.53	0.93	1.64	0.91	0.23	0.84



### Stellar Parameters For KIC 005531953

	$T_{\text{eff}} (K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M (M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$3638^{+72}_{-87}$	$4.844^{+0.049}_{-0.055}$	$-0.140^{+0.150}_{-0.150}$	$0.420^{+0.046}_{-0.056}$	$0.450^{+0.043}_{-0.059}$	$8.524^{+2.464}_{-1.743}$
	+2%/-2%	+1%/-1%	+107%/-107%	+11%/-13%	+10%/-13%	+29%/-20%
Source	SPE70	SPE60	SPE70	DSEP		

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

### Secondary Eclipse Parameters for KIC 005531953-04 / KOI 1681.03

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$-69 \pm 17$	$0.90^{+0.40}_{-0.39}$	$780^{+23}_{-25}$	$2827^{+500}_{-294}$	$58^{+125}_{-34}$
Alt.	$-113 \pm 20$	$0.87^{+0.43}_{-0.38}$	$782^{+24}_{-26}$	$3032^{+574}_{-308}$	$98^{+195}_{-54}$

$T_{\text{max}}$  = 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

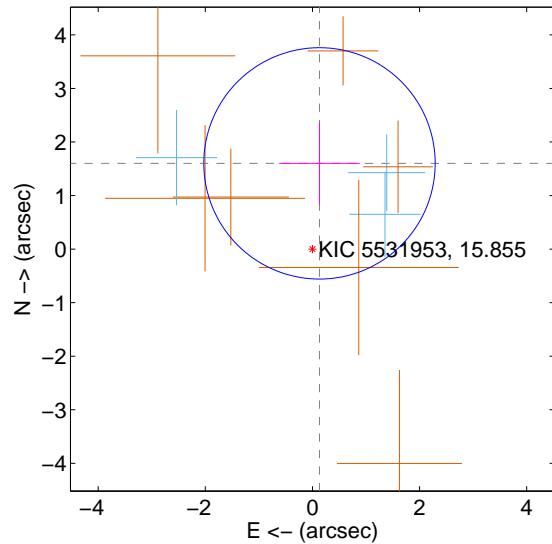
Supplemental centroid analysis for 005531953-04. Kepler magnitude: 15.86. Transit SNR 10.76

There are 3 quarters with good PRF difference image offsets

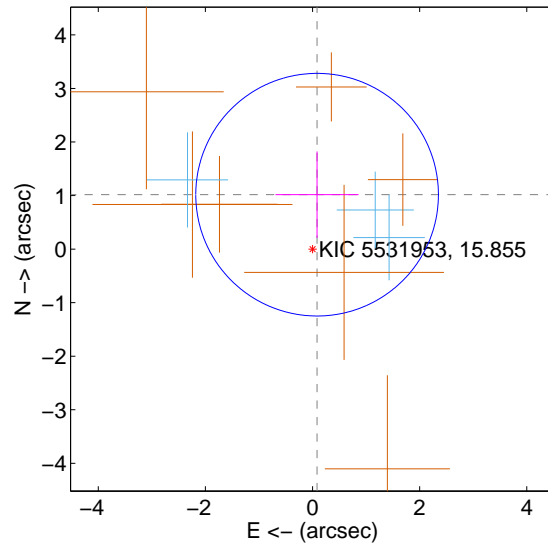
The direct PRF centroid is offset from the target star catalog position by about 0.29 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$1.606 \pm 0.720$	2.23	$-0.132 \pm 0.753$	$1.600 \pm 0.769$
PRF-fit source offset from KIC position	$1.020 \pm 0.755$	1.35	$-0.085 \pm 0.777$	$1.016 \pm 0.806$
photometric centroid source offset	$0.62 \pm 0.91$	0.68	$0.04 \pm 0.82$	$-0.62 \pm 0.91$

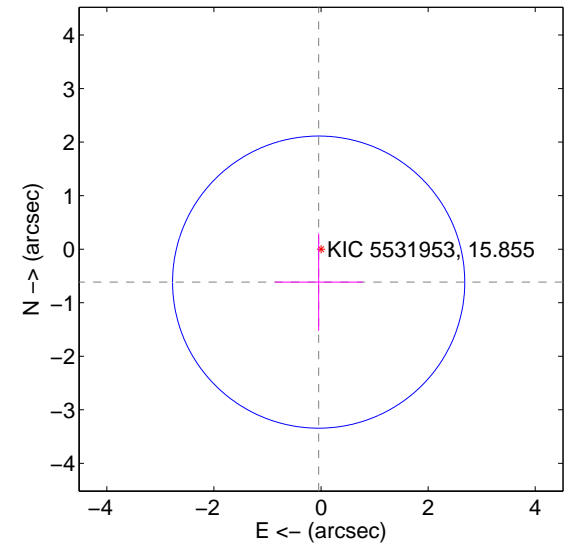
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position



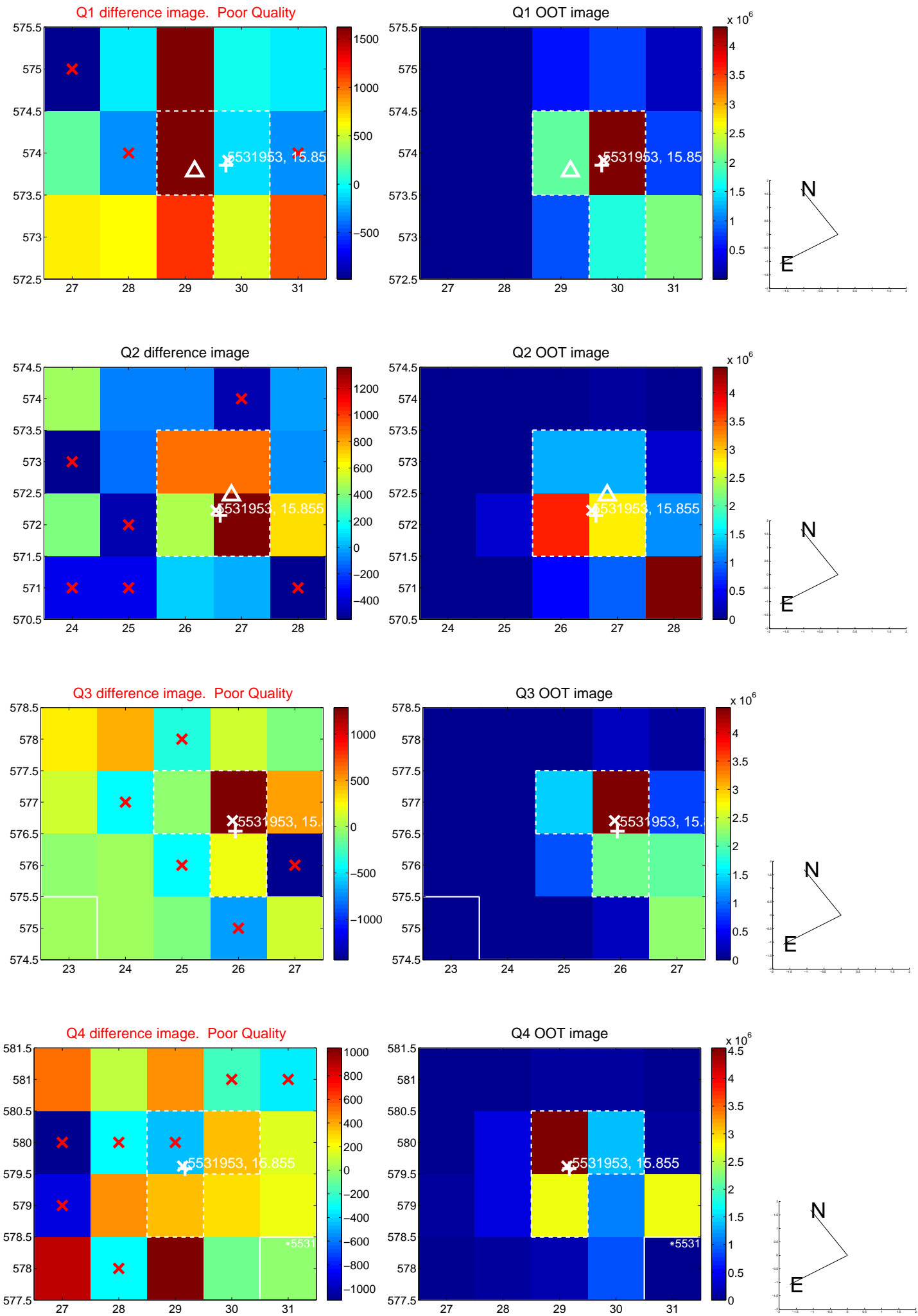
offset from photometric centroids



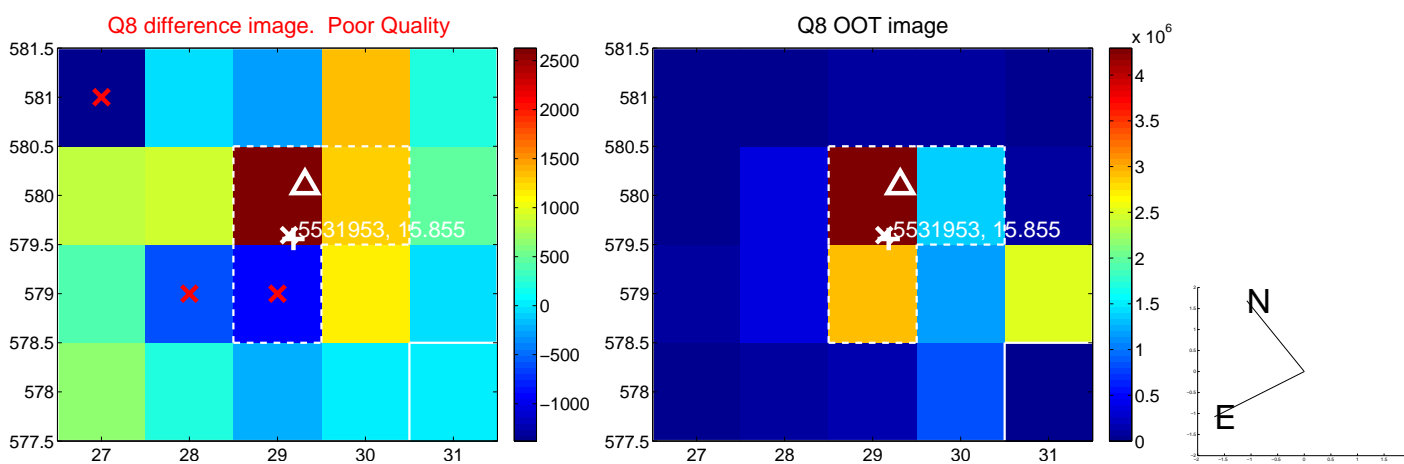
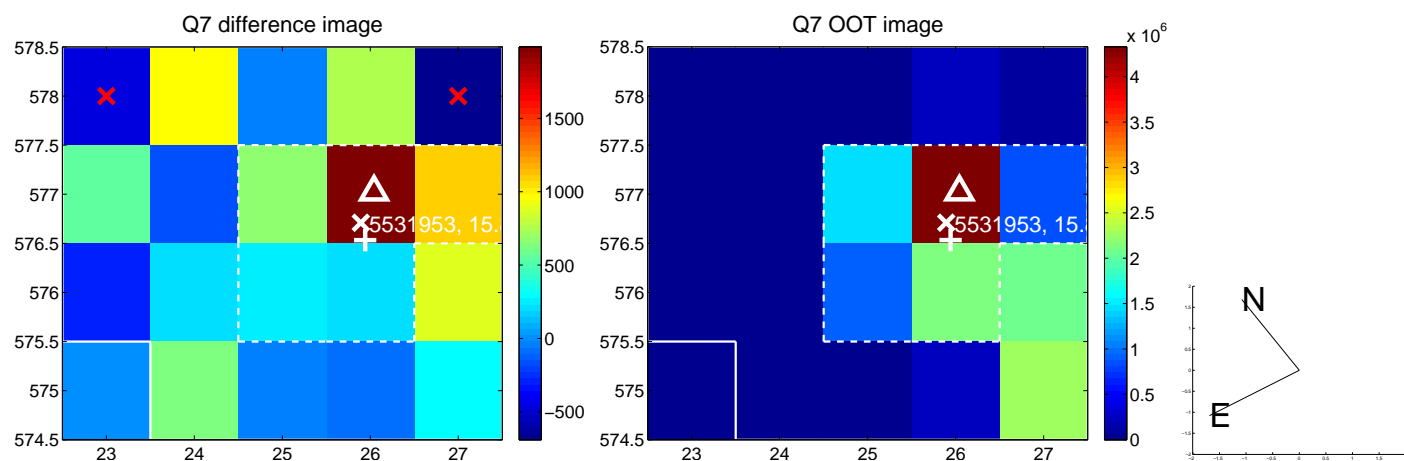
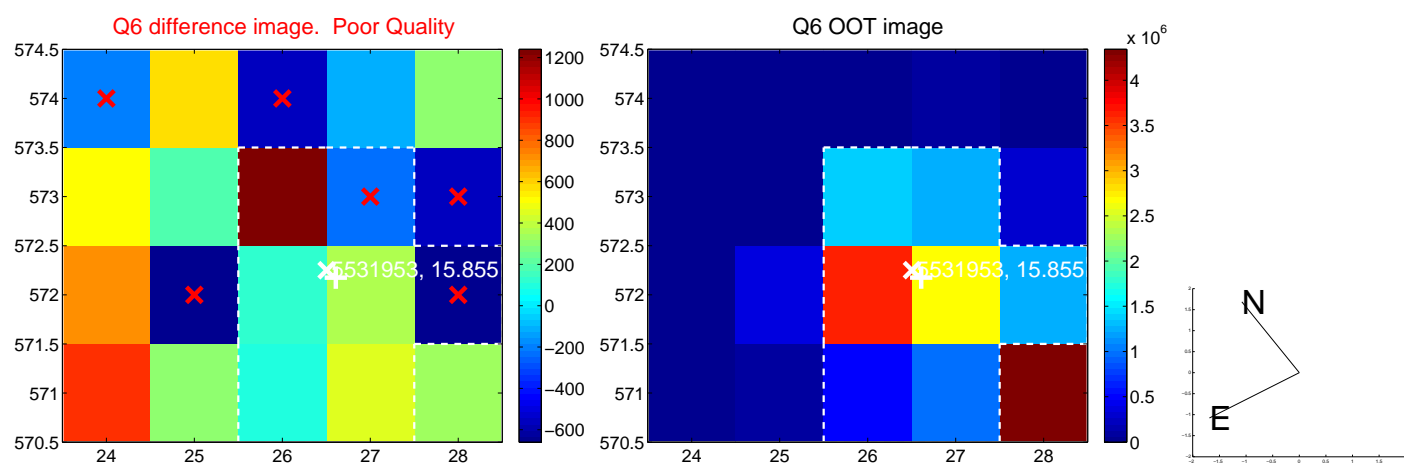
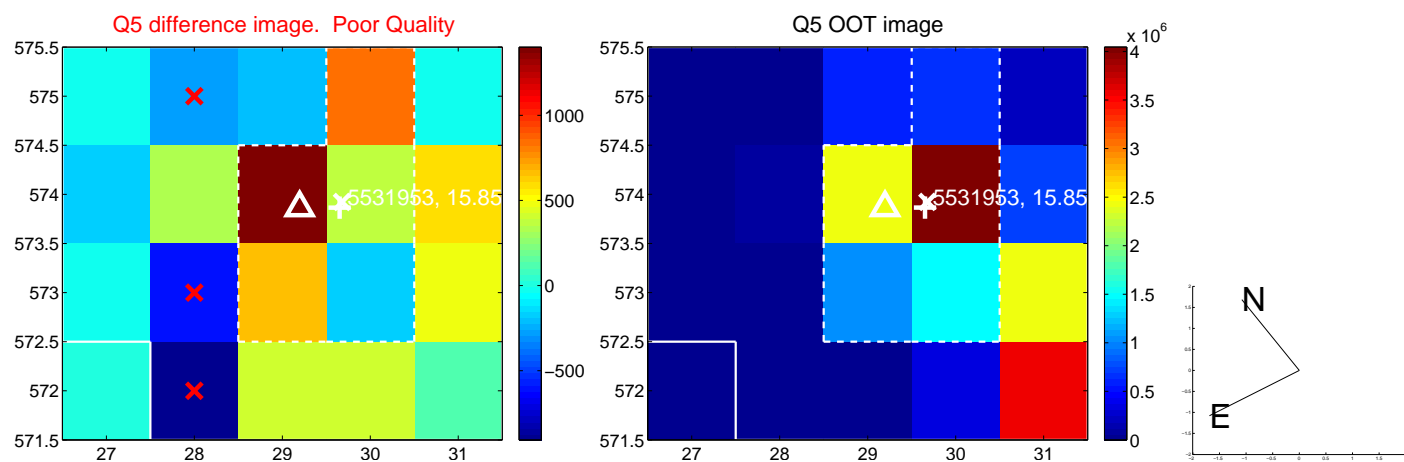
Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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



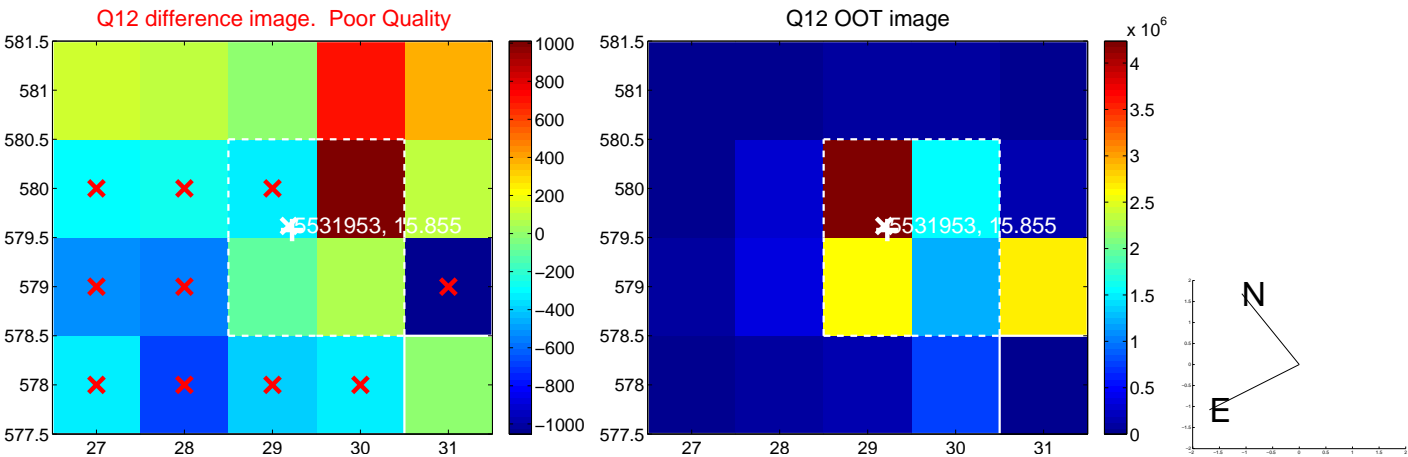
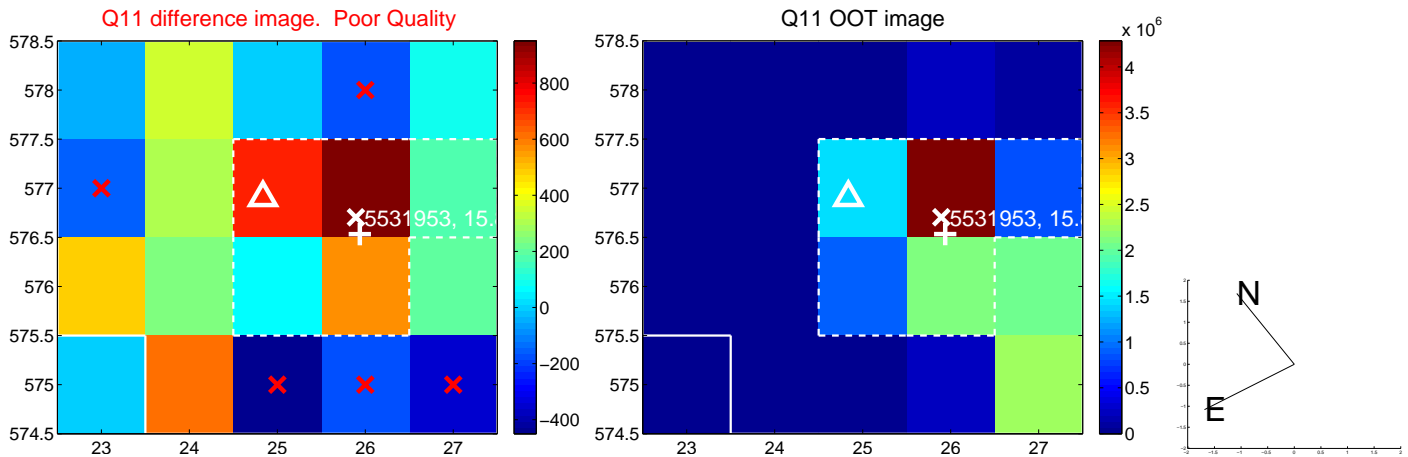
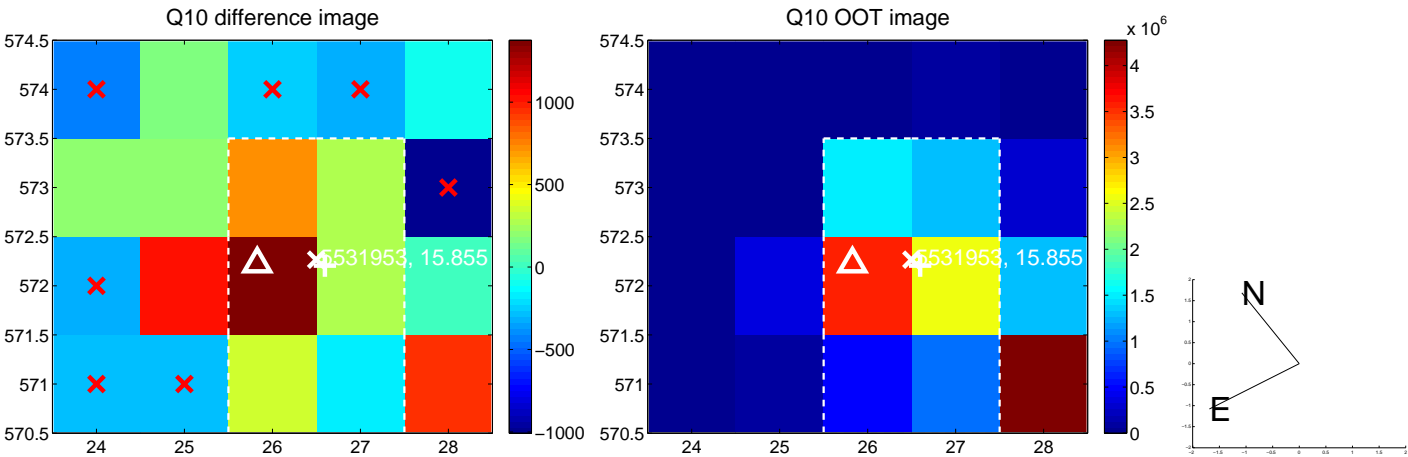
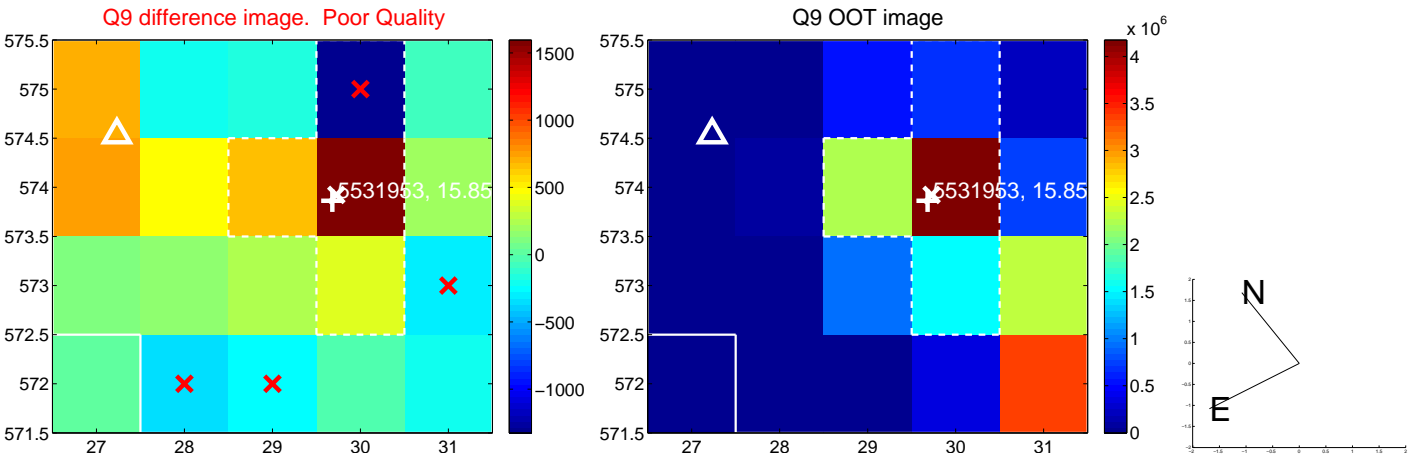
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



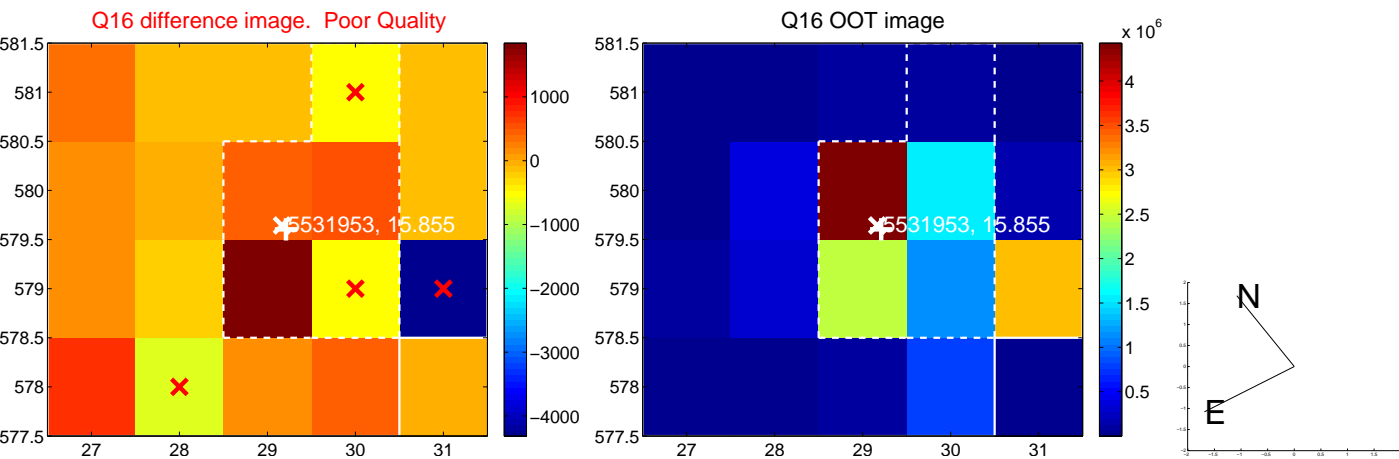
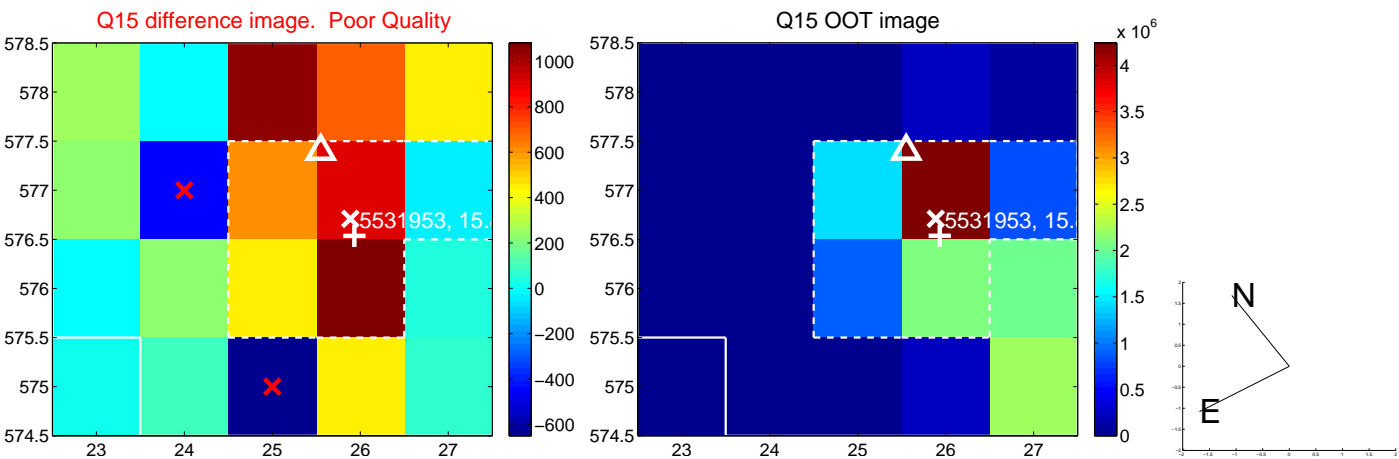
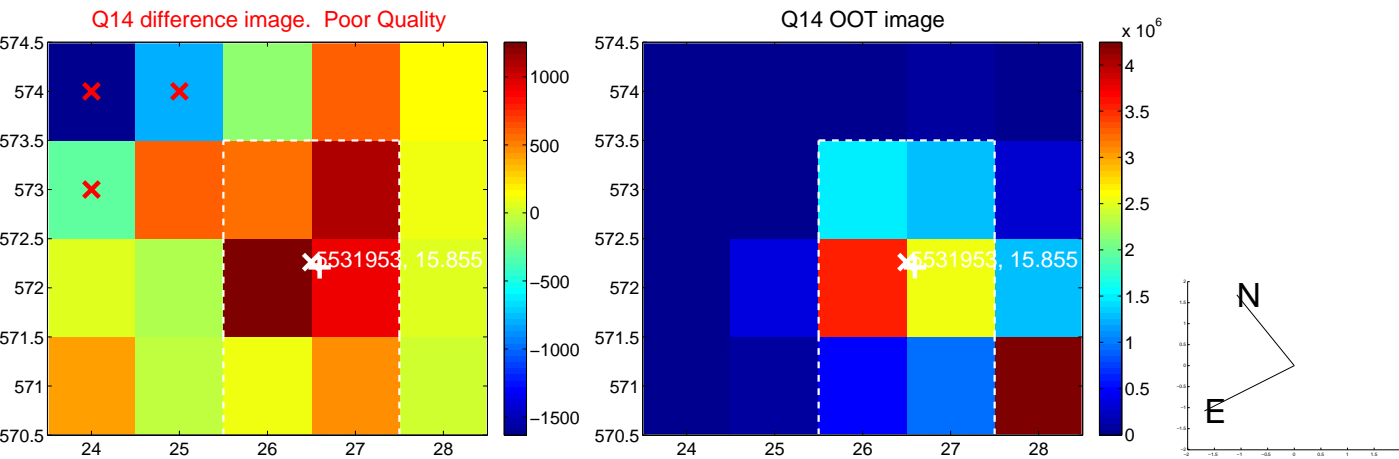
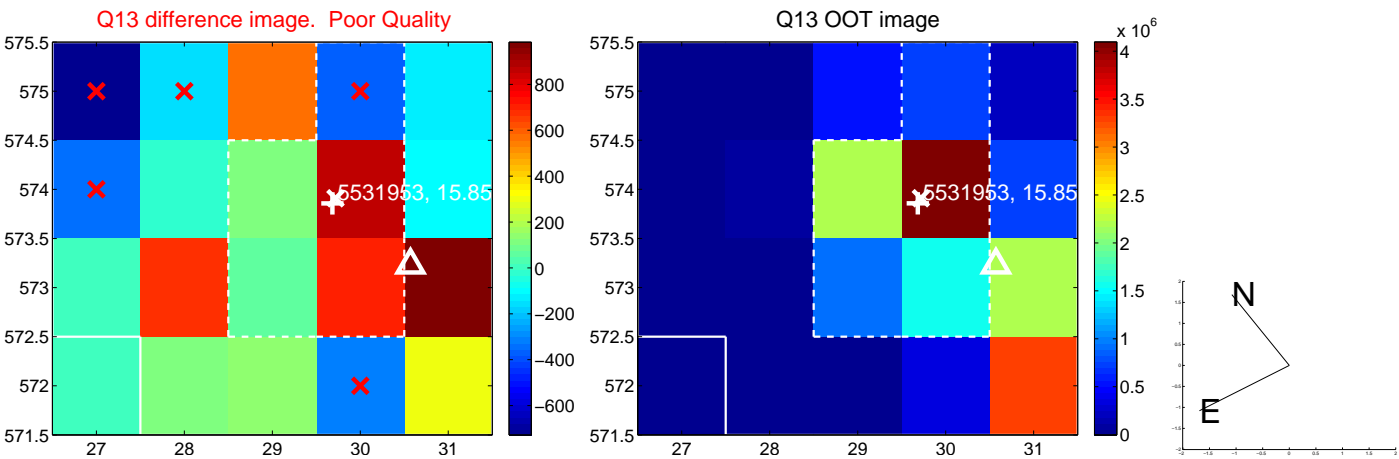
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



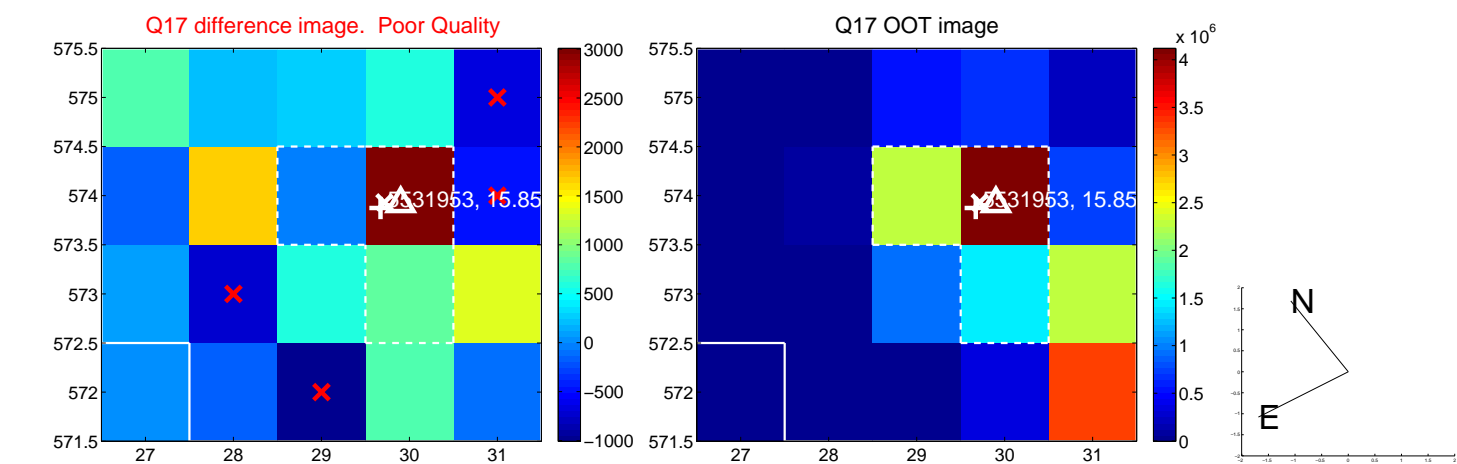
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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



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



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