# Improving Carter & Winn likelihood
# In progress

Bekki Dawson

- Carter & Winn likelihood assumes a combination of white noise and 1/f noise

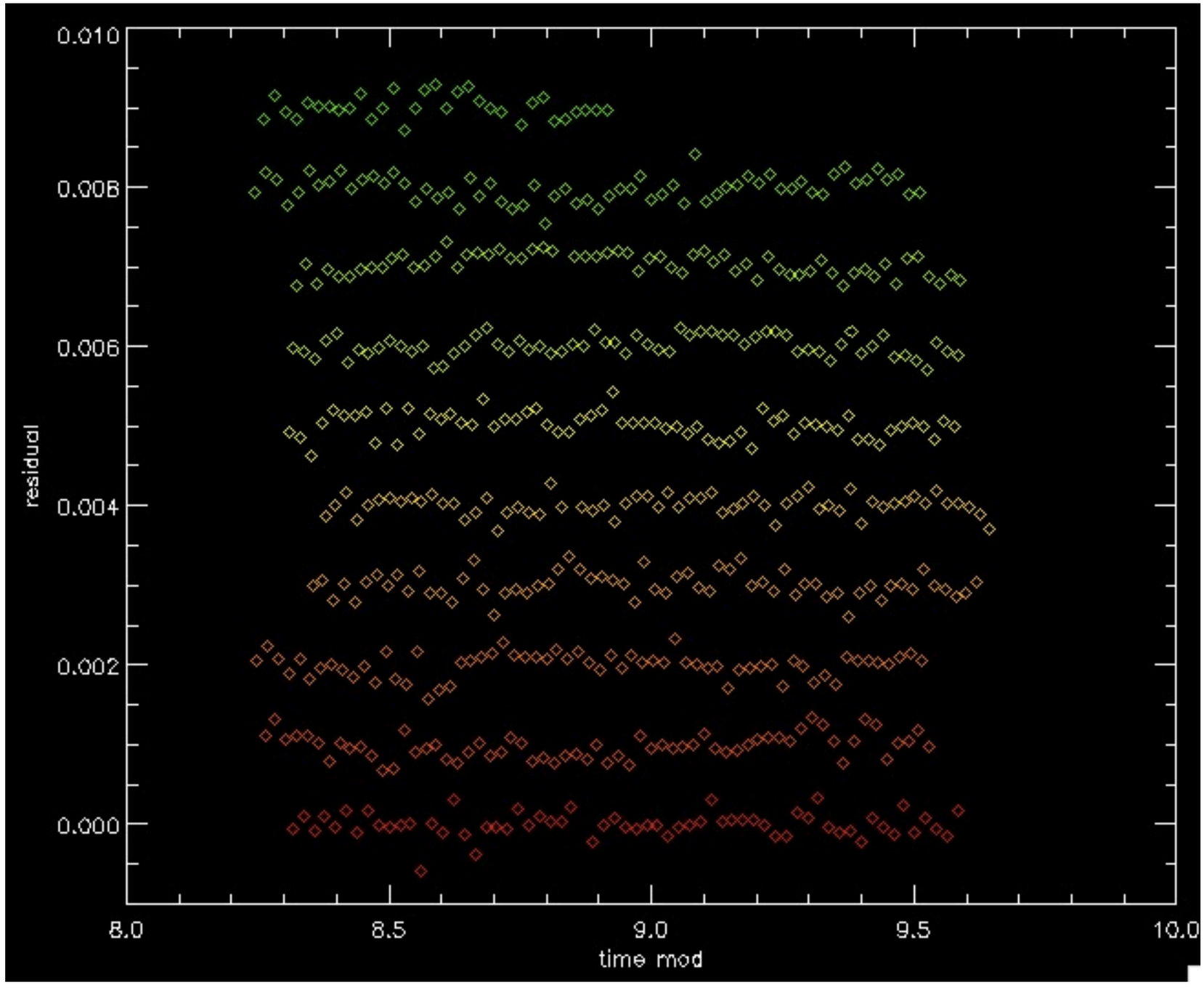
- Carter: If there's another type of noise, the likelihood model will try to absorb it, potentially making the uncertainties in the parameters too large

- Carter advised me to detrend before fitting because wavelet likelihood is not good for certain noise

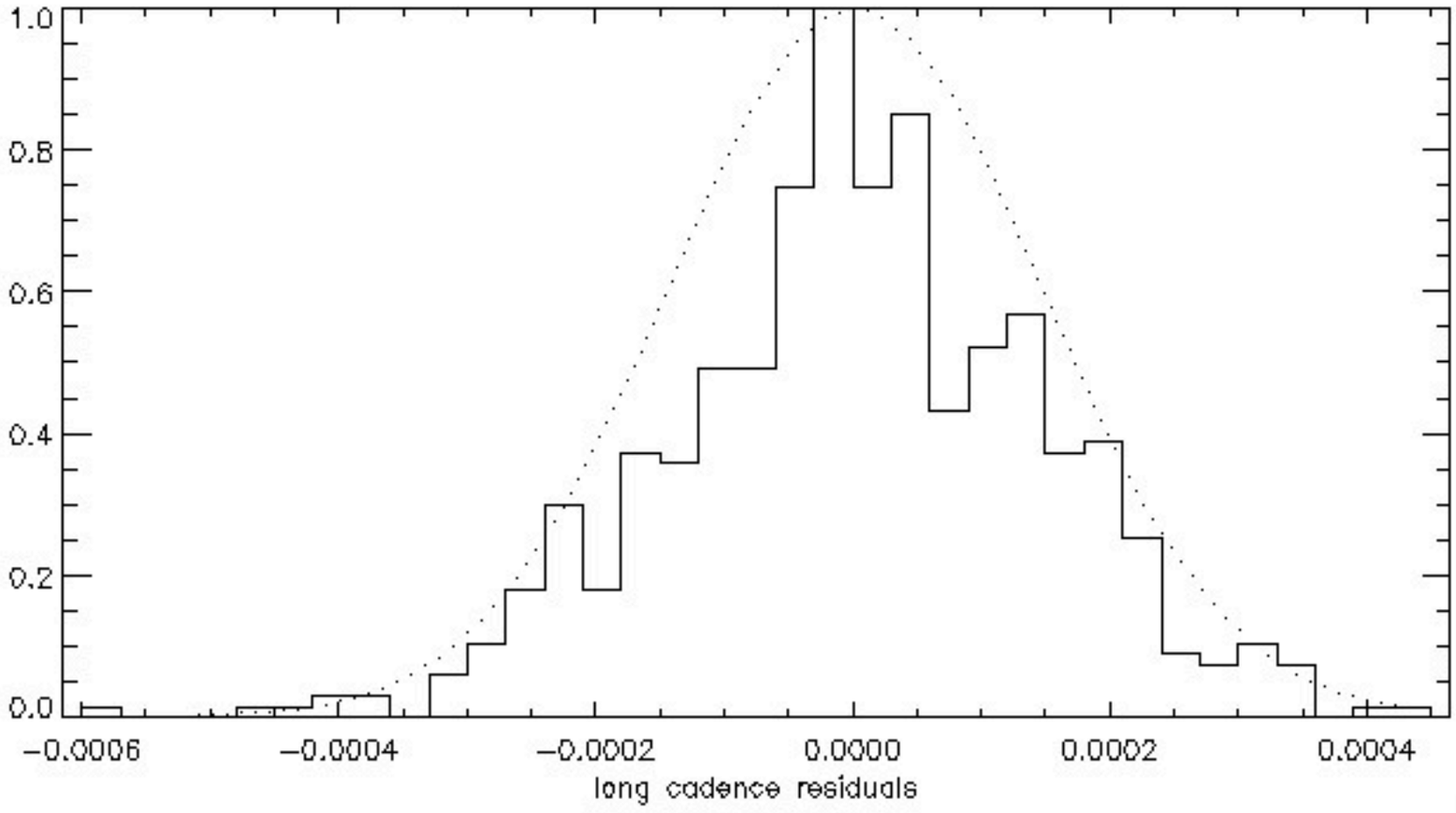
# Example: KOI 1474

- Start by detrending with median filter and linear fit (masking the transit); linear fit becomes part of light curve model (fit via MCMC)
- Red and white noise amplitude are also part of model (use different for short and long cadence data)
- After getting transit times from light curve fit, separately fit dynamical model

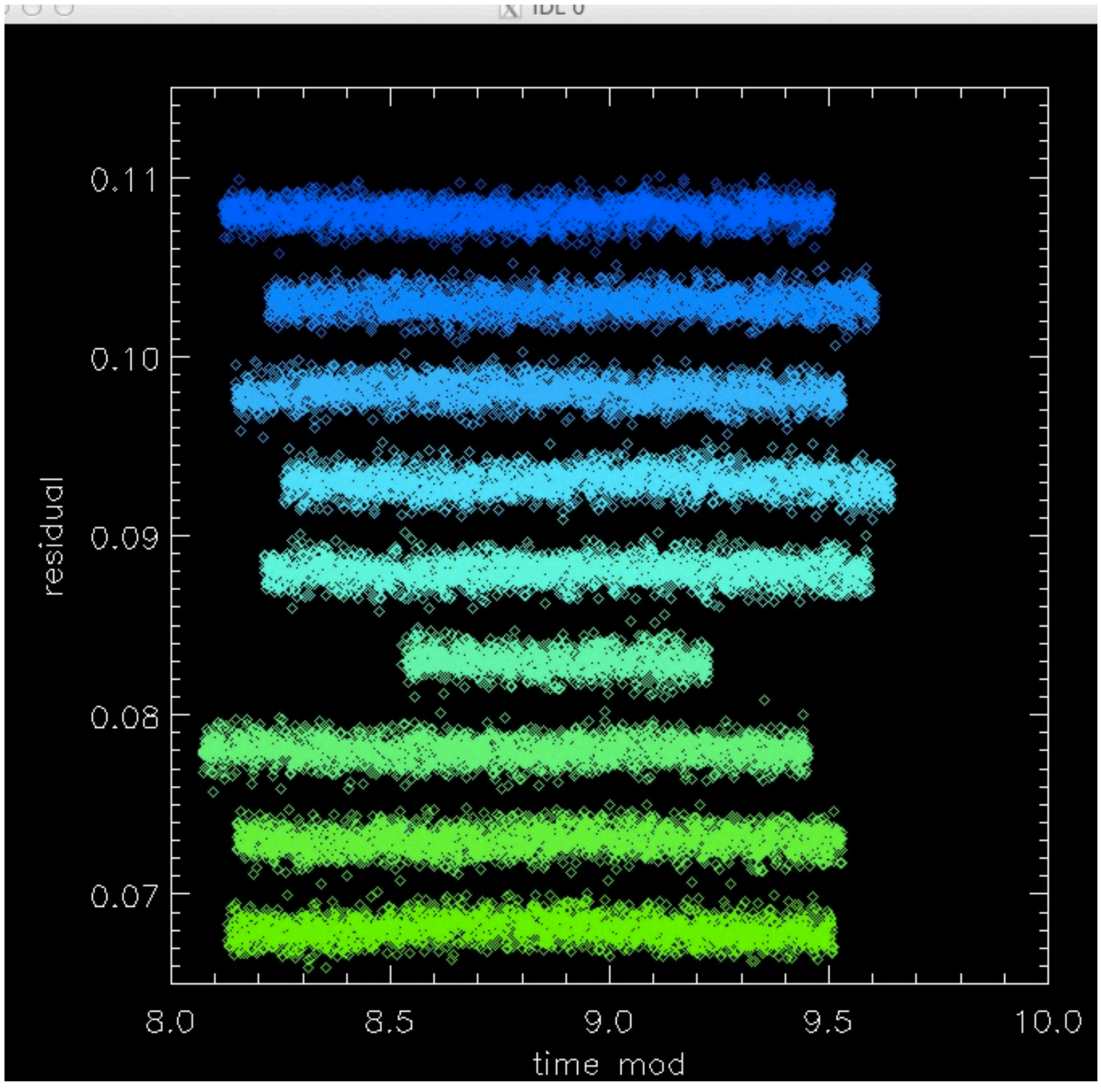
# KOI 1474 light curve residuals long cadence

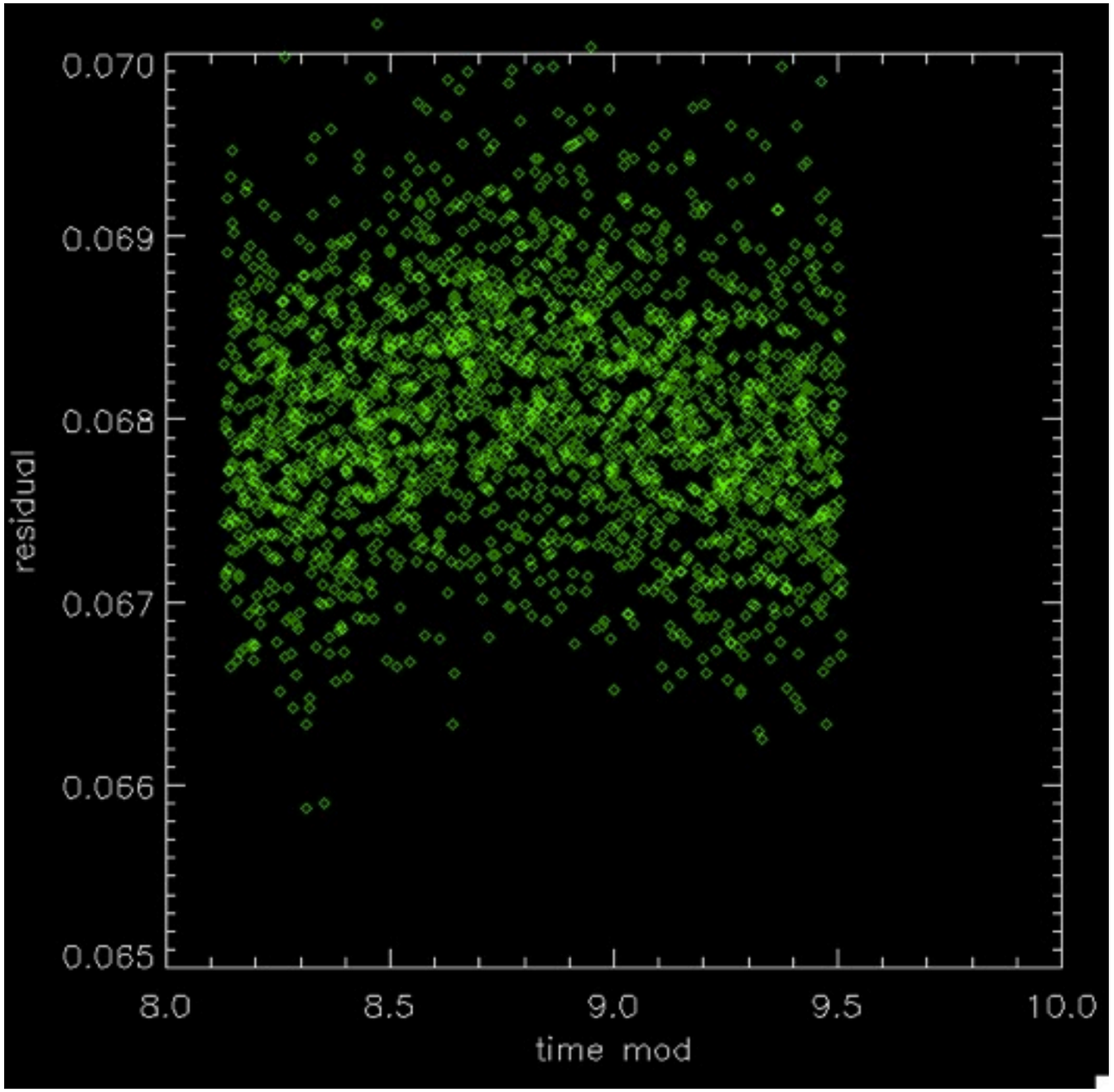


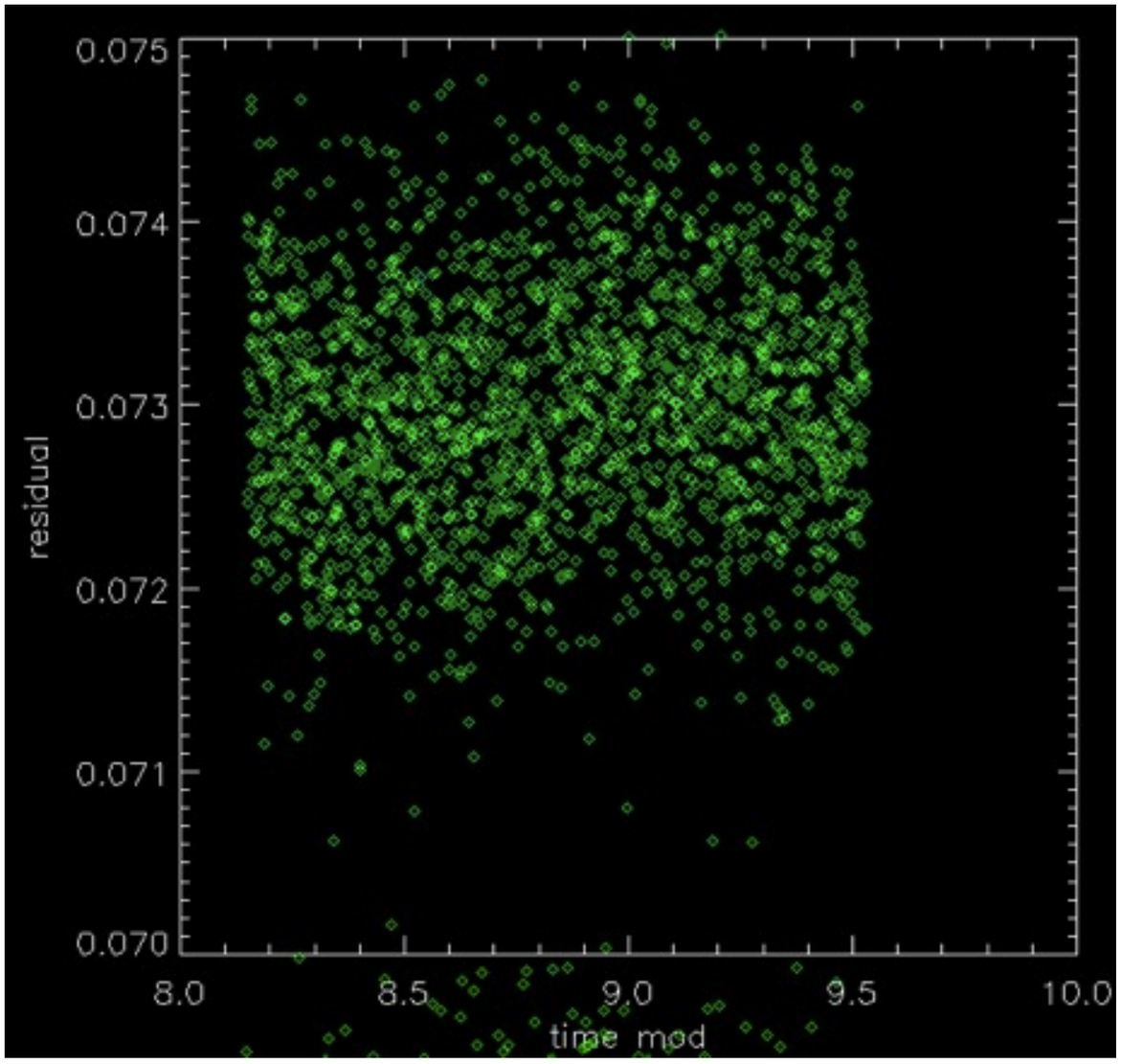
# long cadence residuals



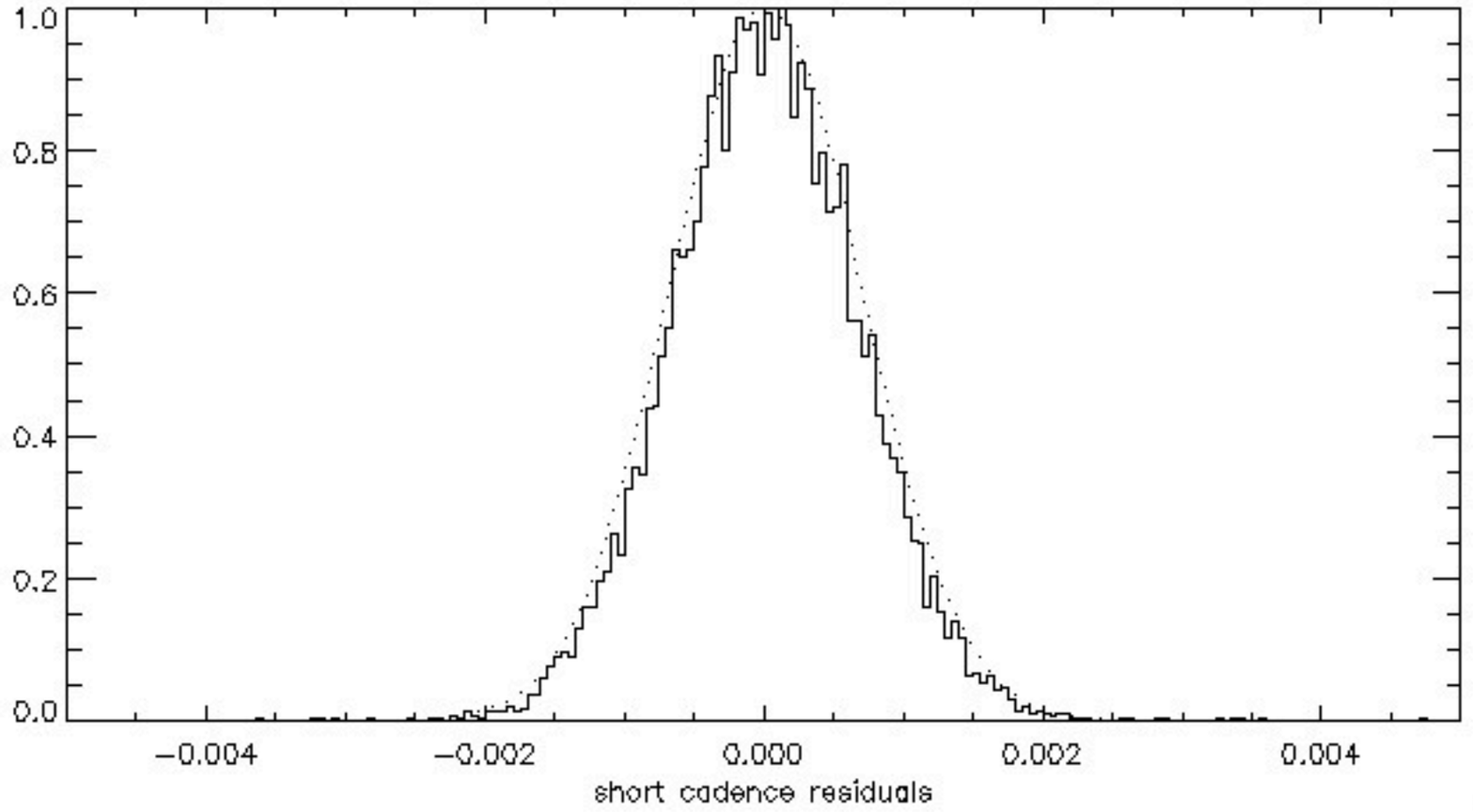
# KOI 1474 light curve residuals short cadence



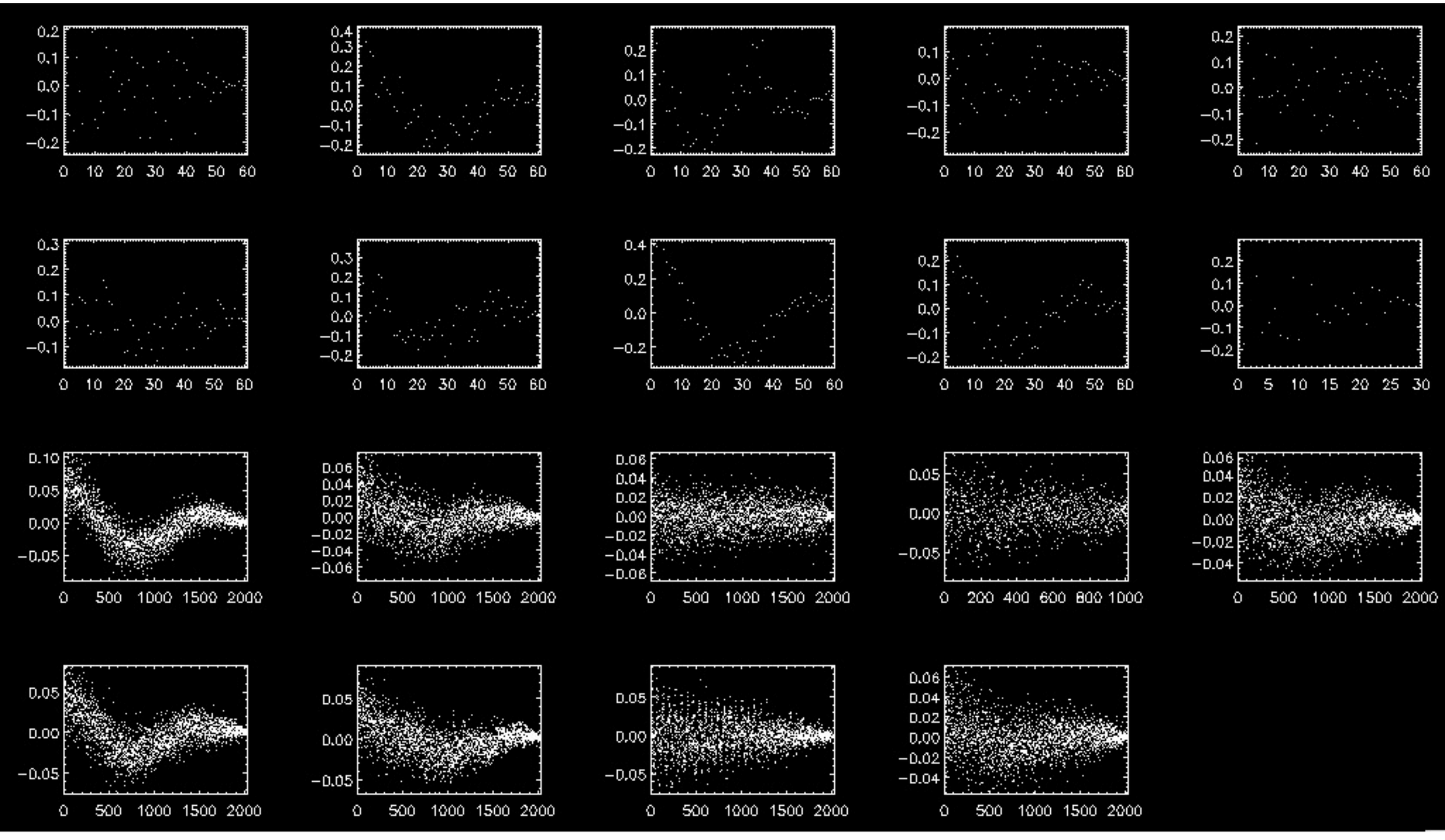

0.070
0.069
0.068
0.067
0.066
0.065
residual
8.0
8.5
9.0
9.5
10.0
time mod


0.075
0.074
0.073
0.072
0.071
0.070
8.0
8.5
9.0
9.5
10.0
time mod

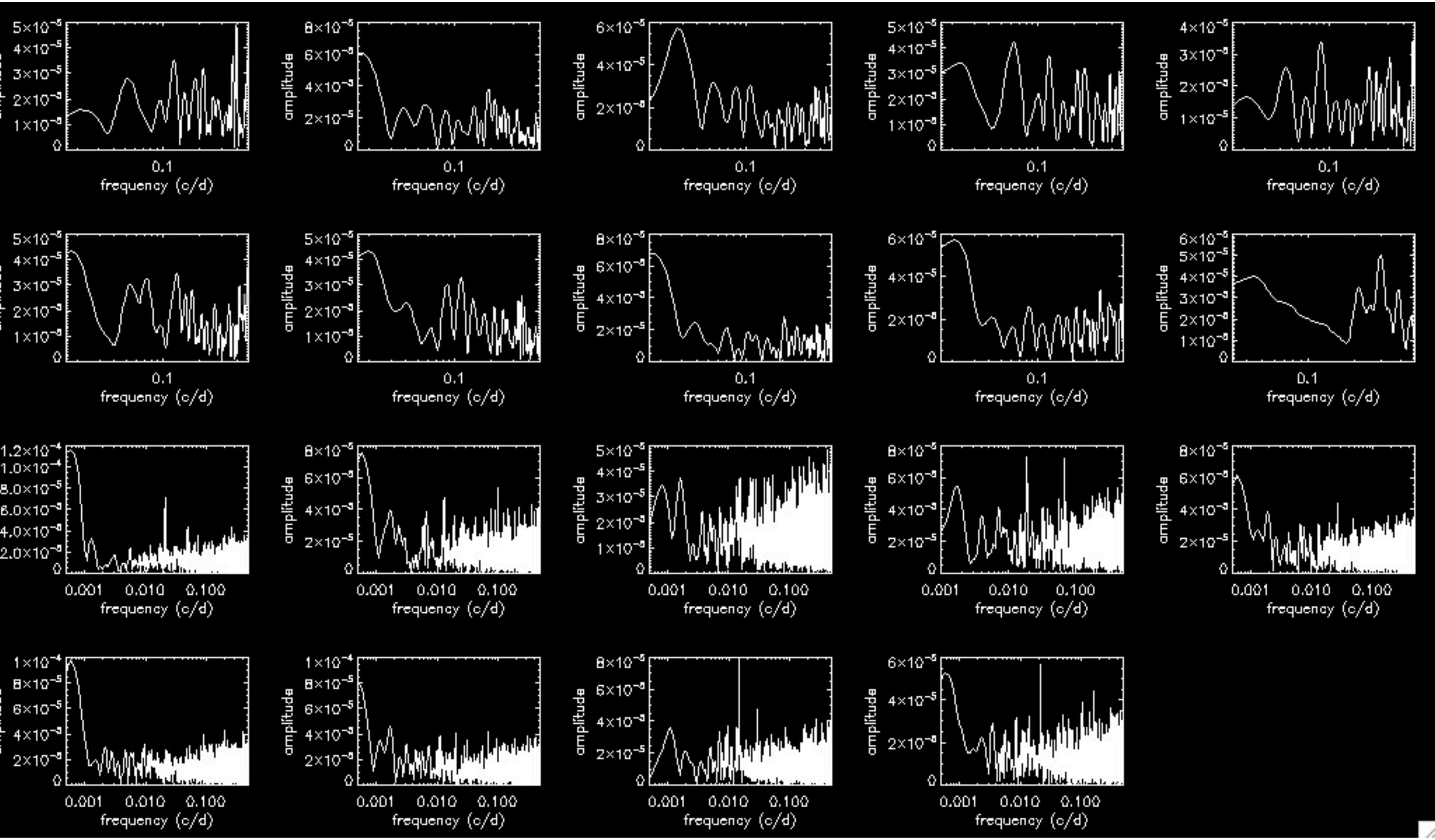
# short cadence residuals



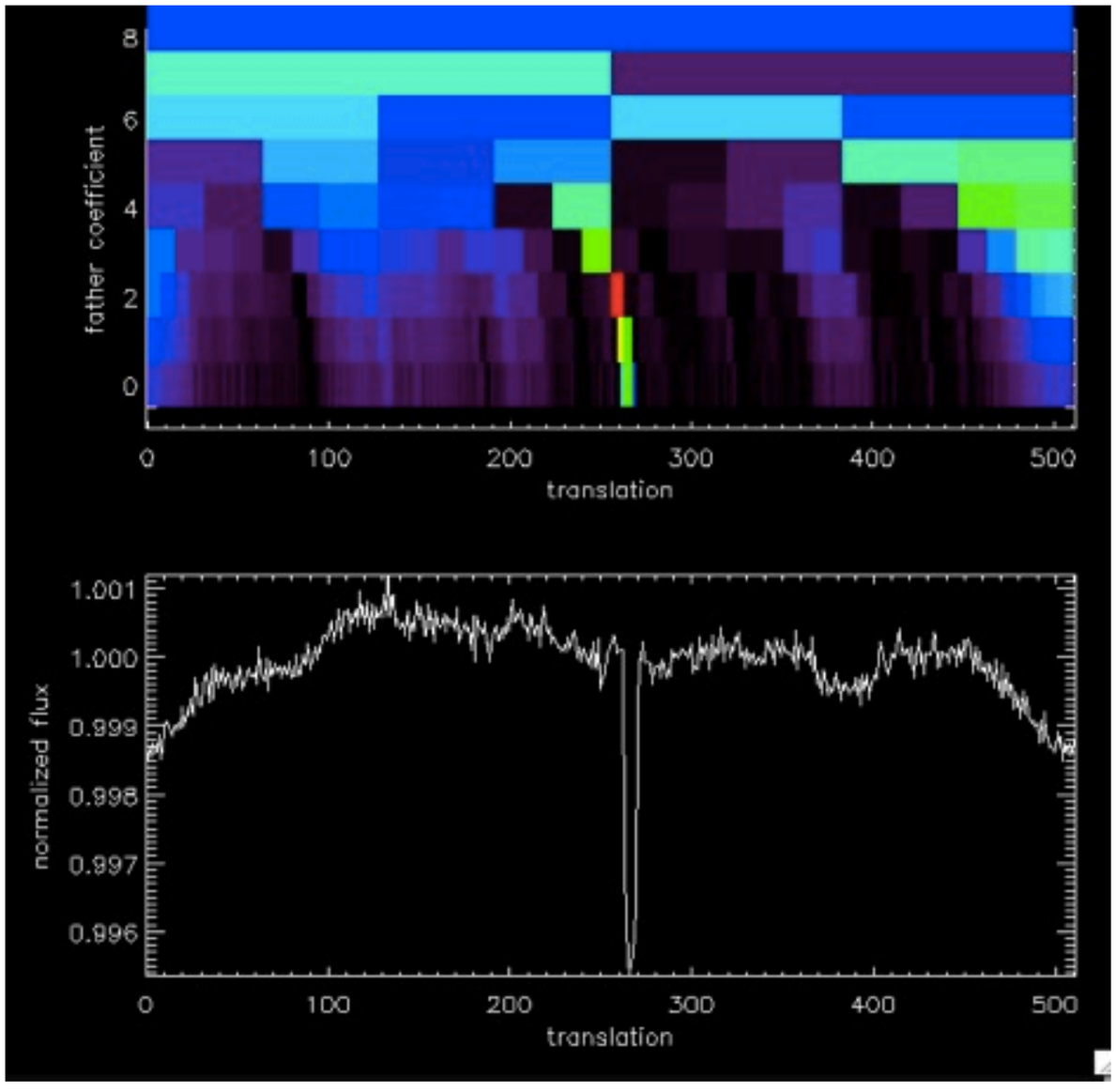
# Auto-correlation

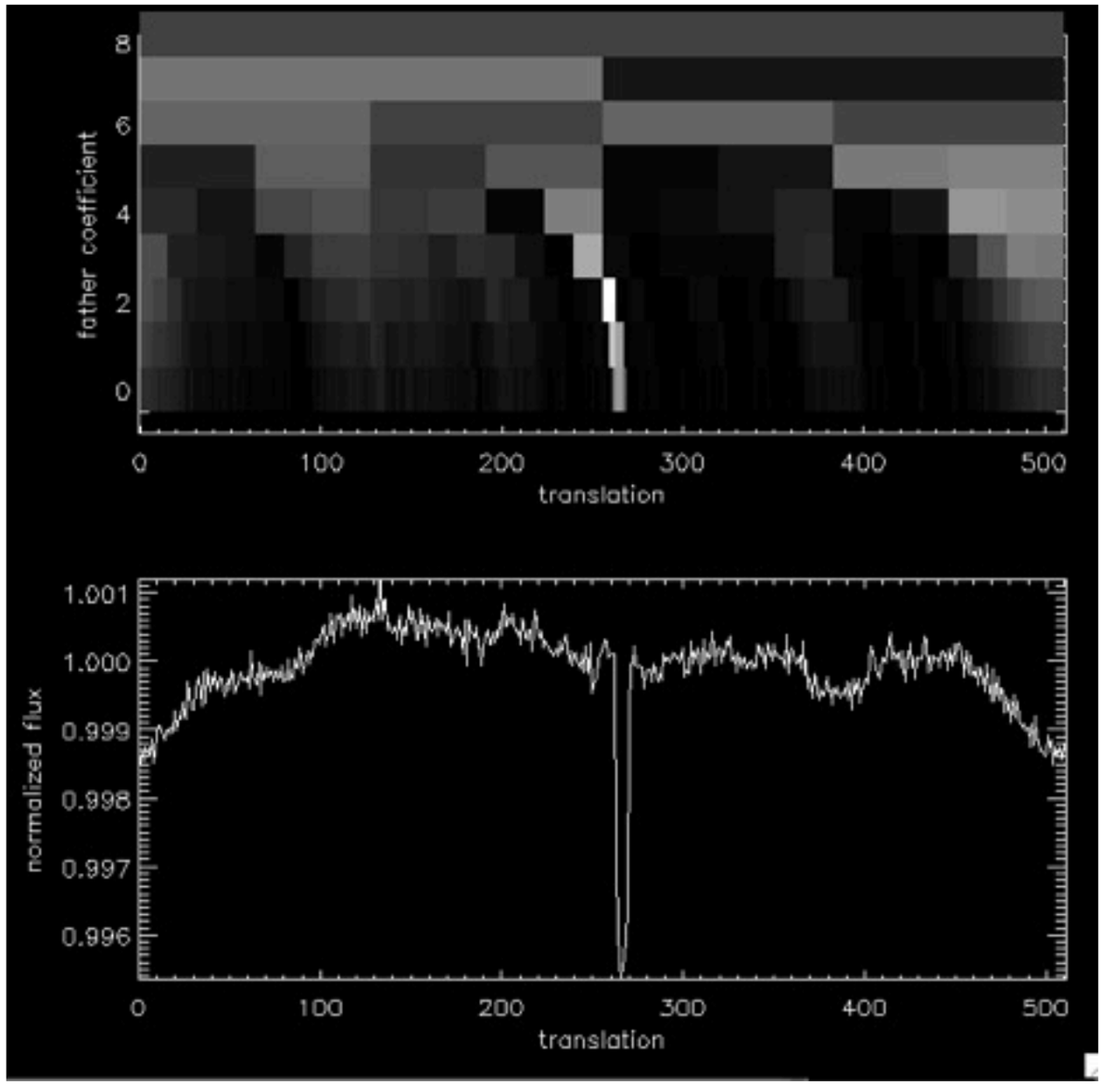


# FFT

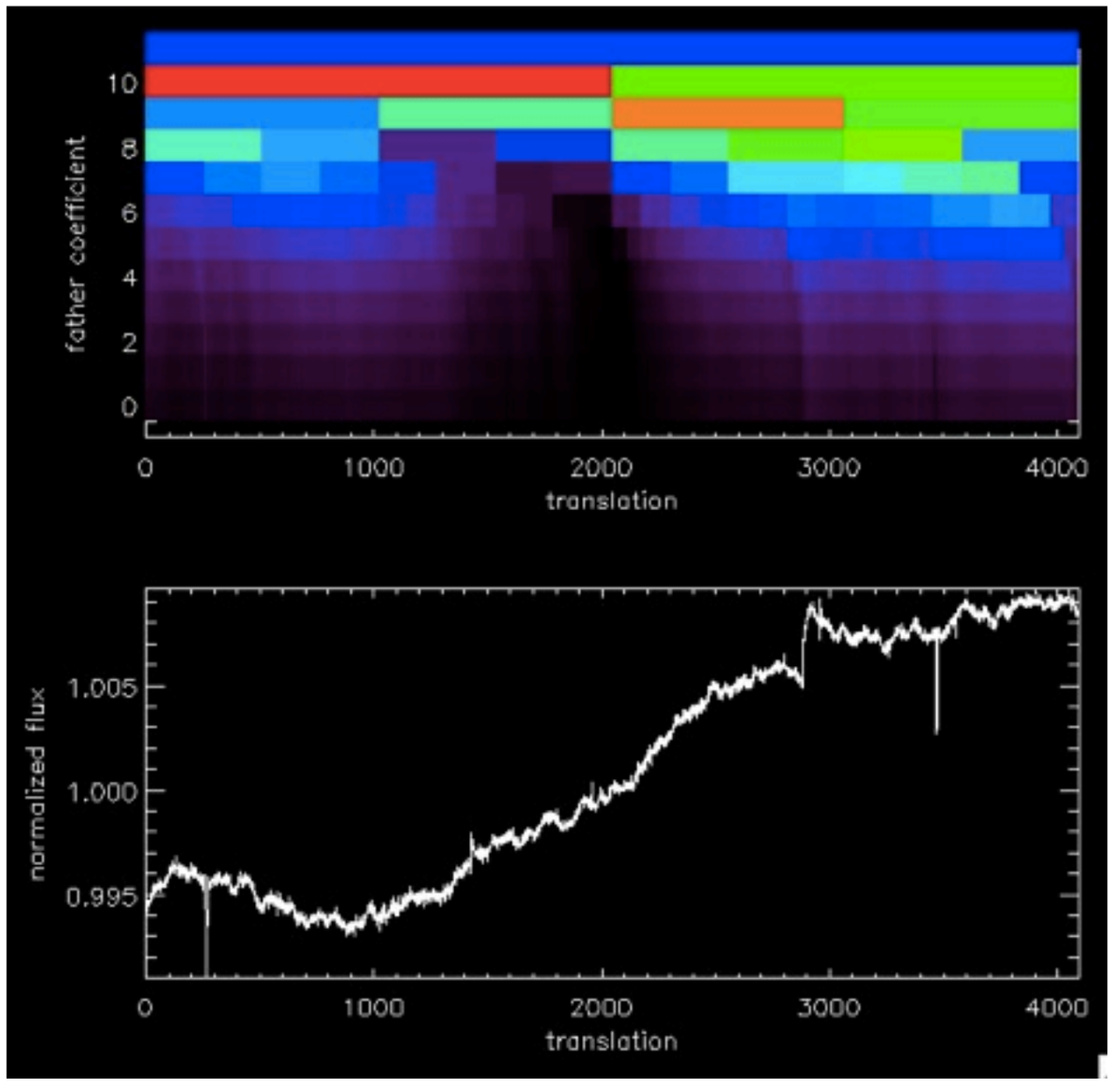


# Wavelet

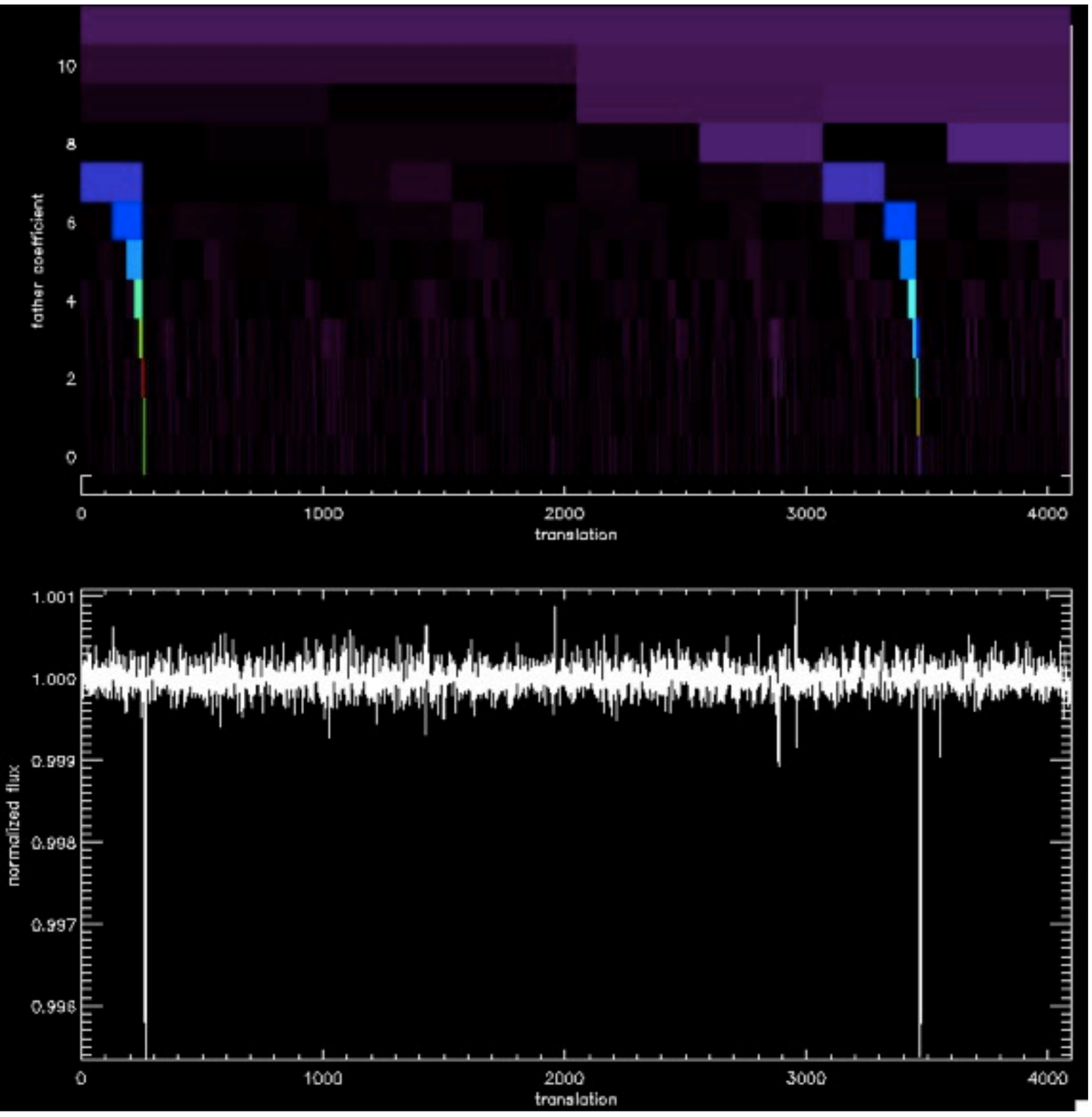

father coefficient
translation
normalized flux
translation

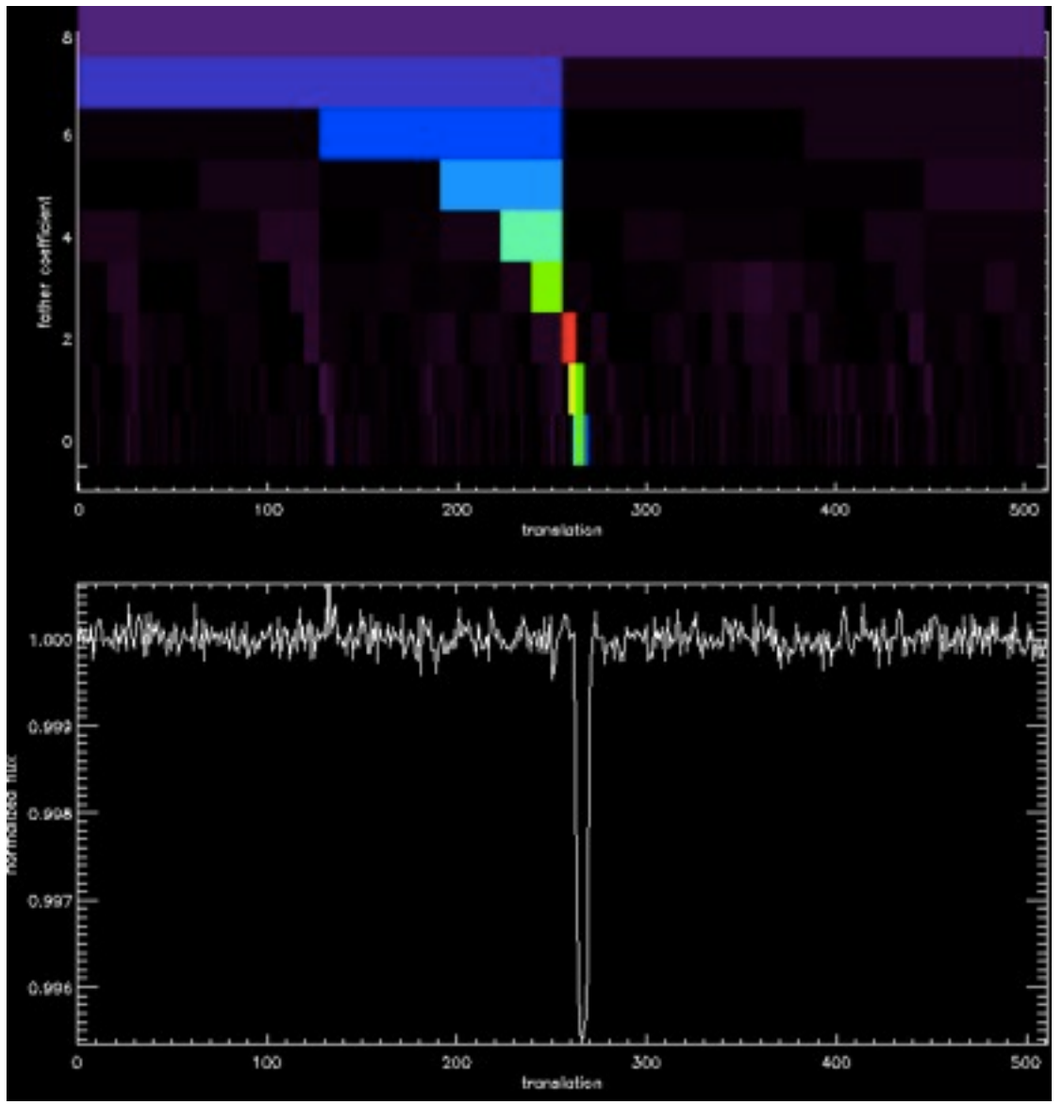

father coefficient
translation
normalized flux
translation

# Wavelet

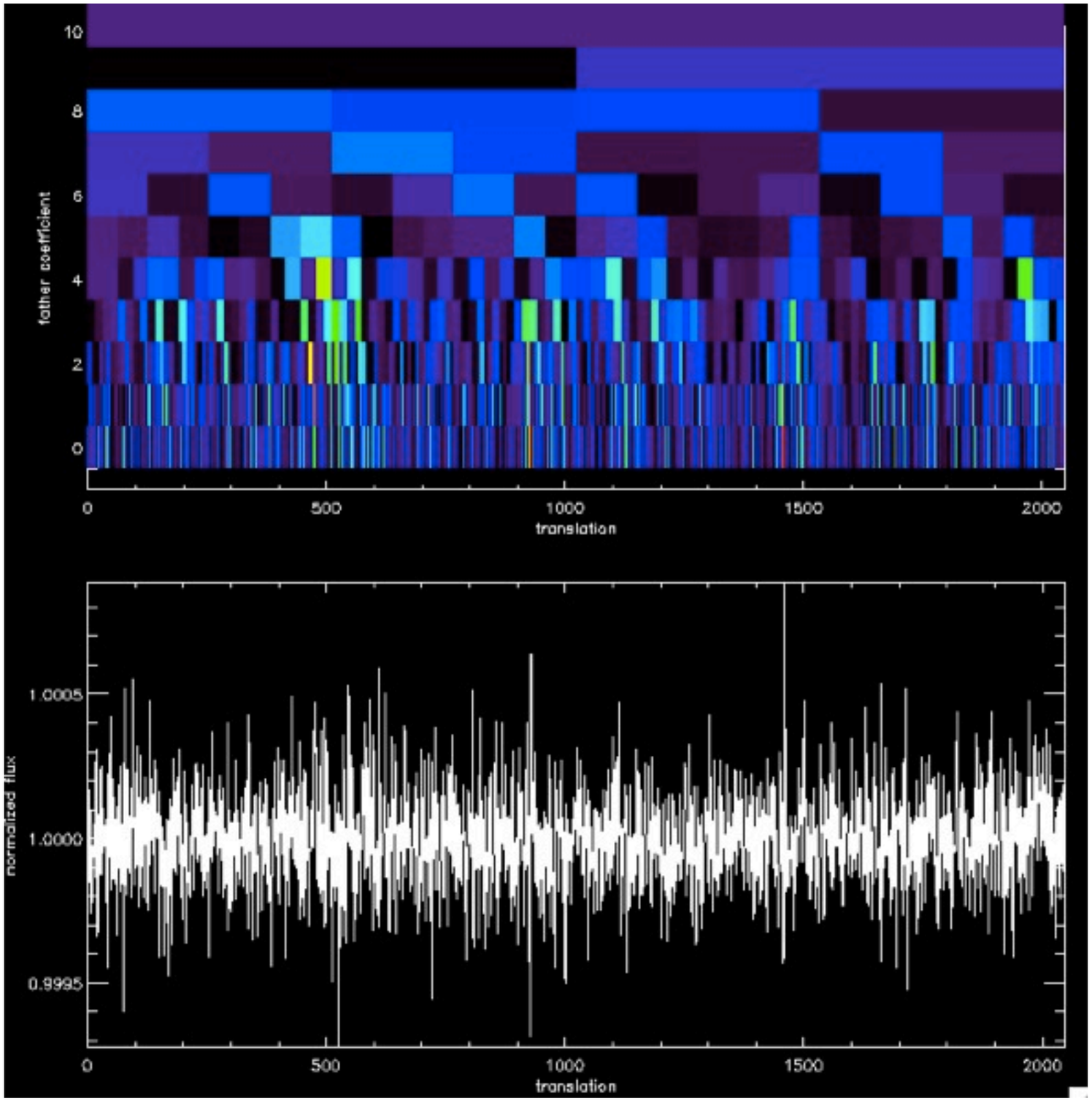

father coefficient
10
8
6
4
2
0
0
1000
2000
3000
4000
translation
normalized flux
1.005
1.000
0.995
0
1000
2000
3000
4000
translation

# Medium filtered wavelet



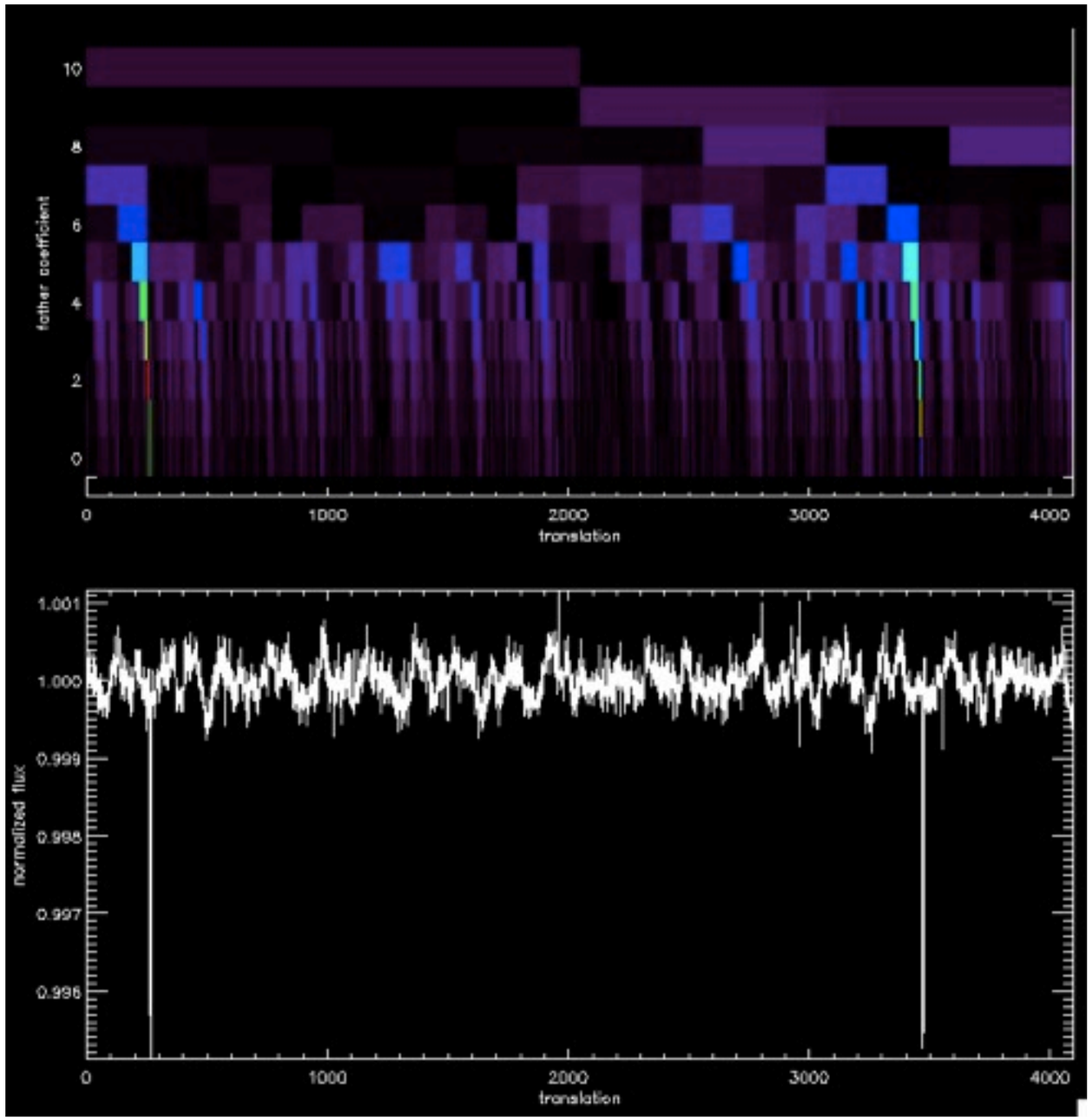



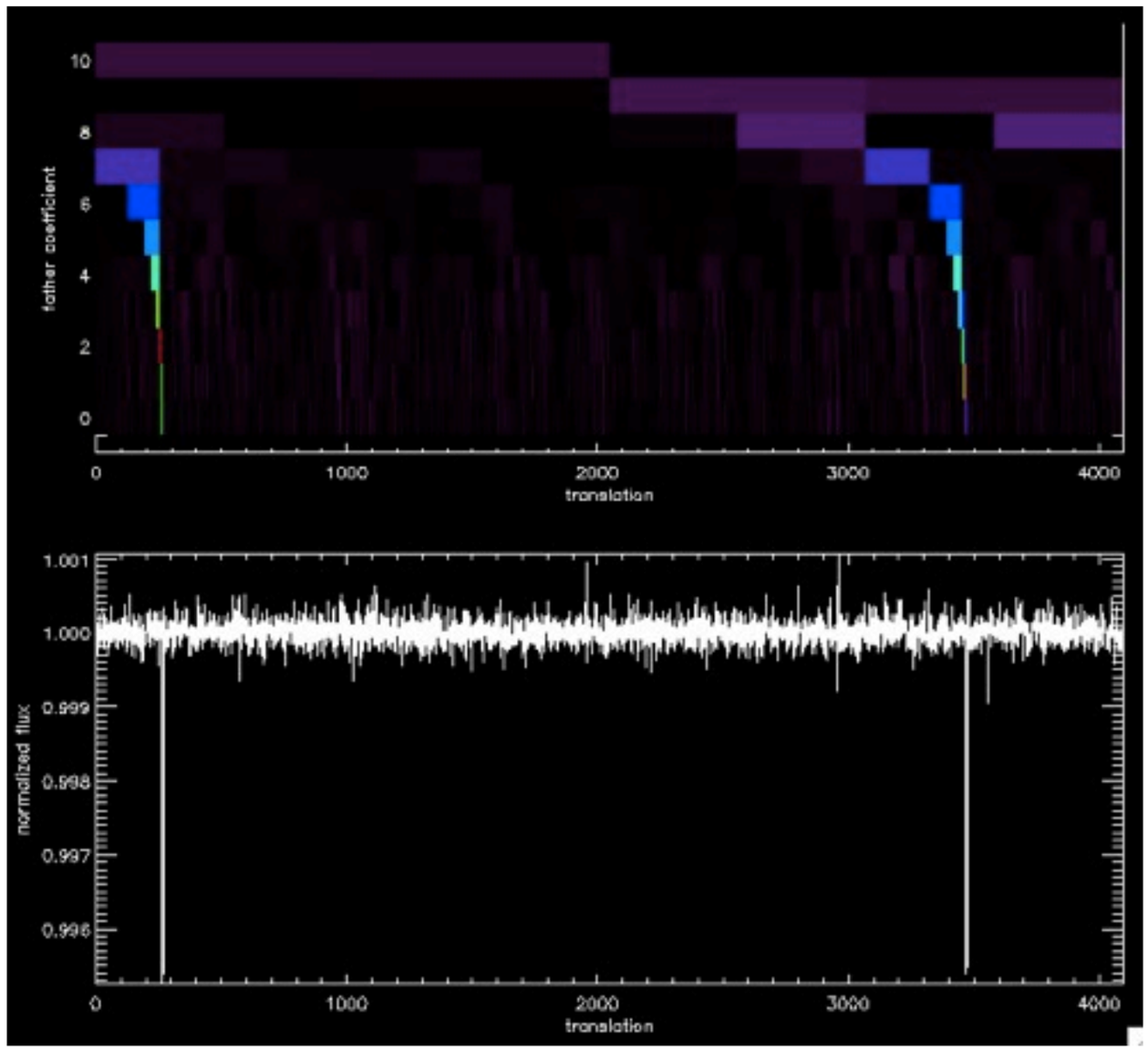
# Medium filtered wavelet OOT



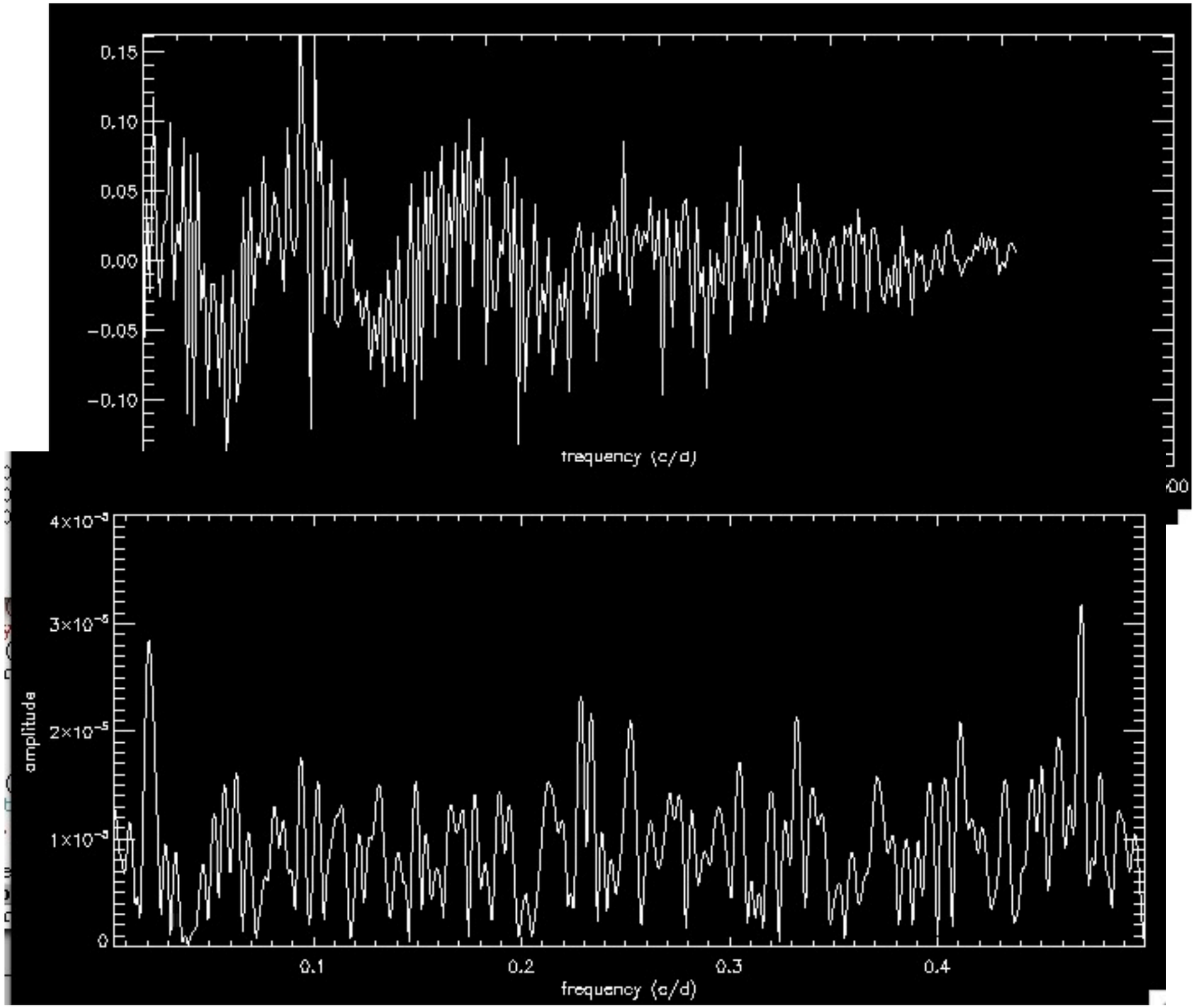
# PDC

# Medium PDC

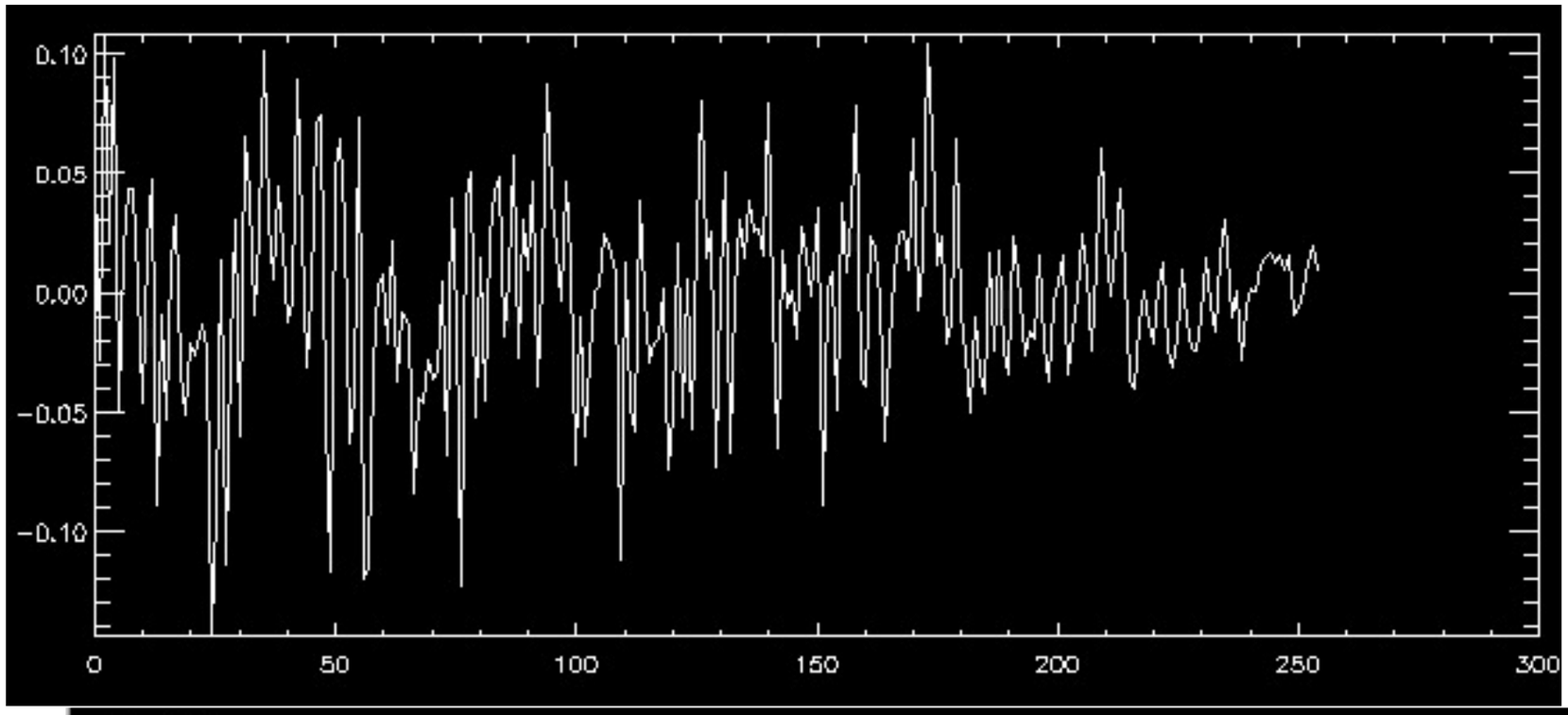


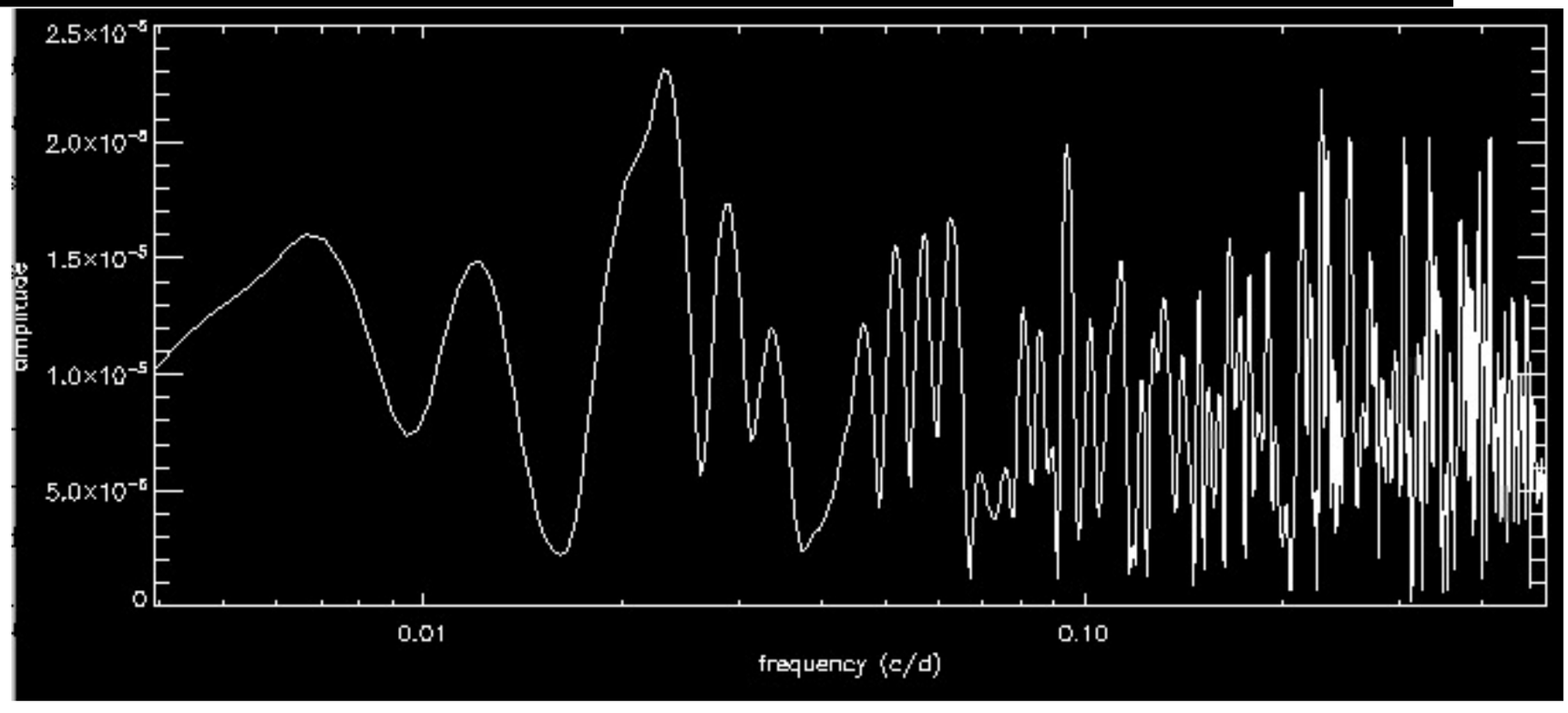



# OOT Medium SAP

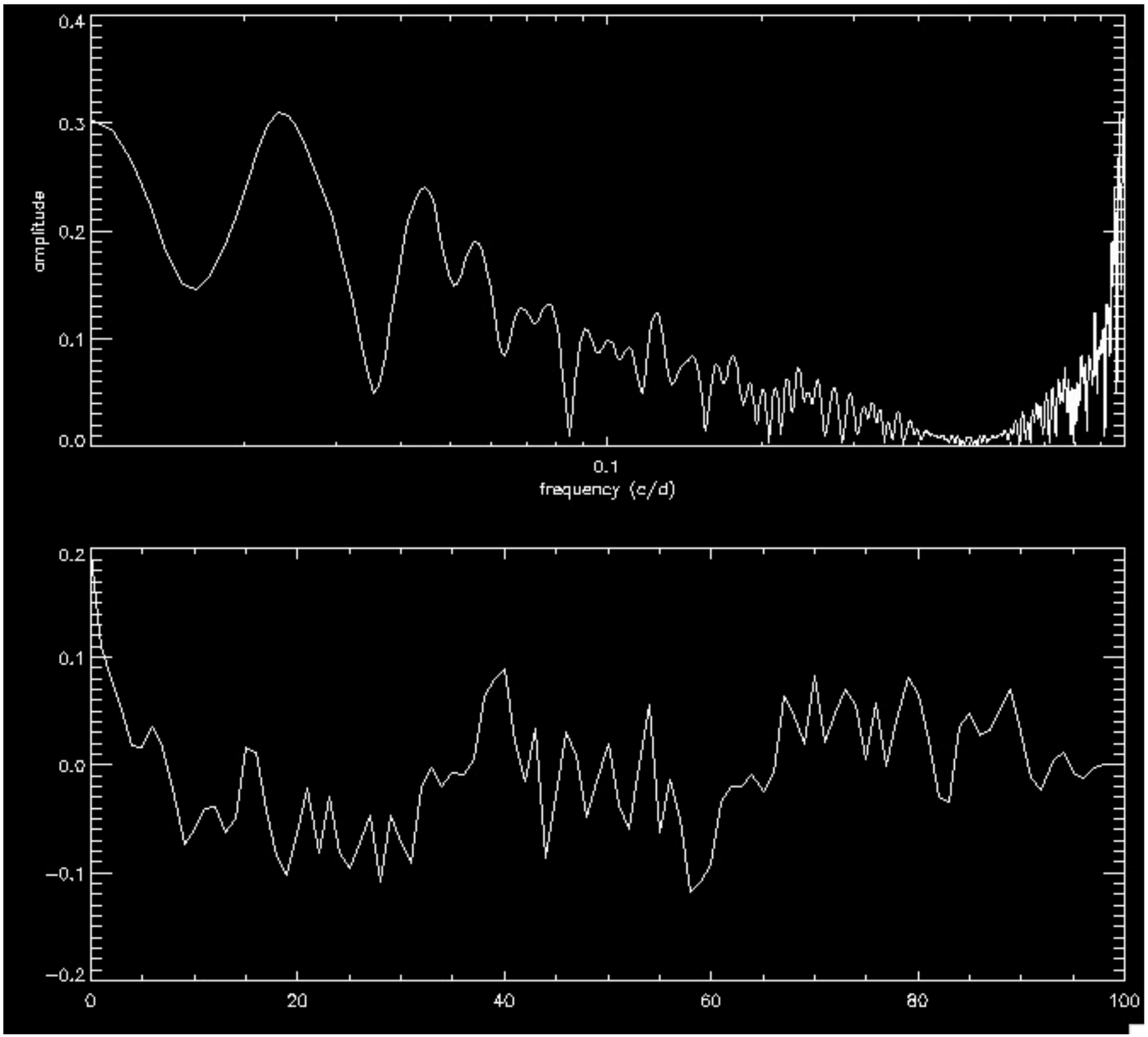


# OOT Medium PDC

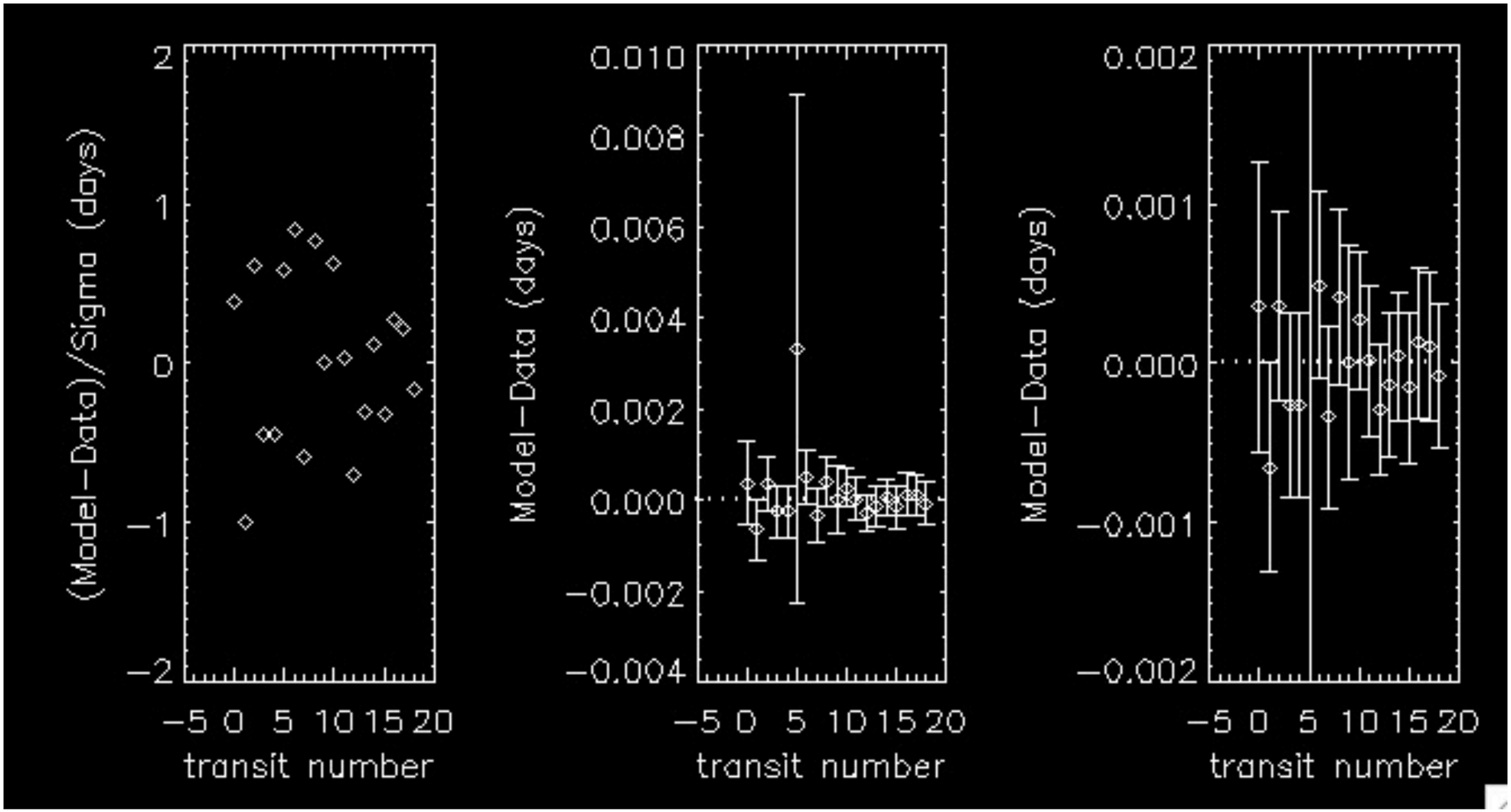


# 1/f noise


0.4
0.3
0.2
0.1
0.0
amplitude
0.1
frequency (c/d)
0.2
0.1
0.0
−0.1
−0.2
0
20
40
60
80
100

# Residuals from transit timing dynamical model are too small



# Residuals from transit timing dynamical model are too small