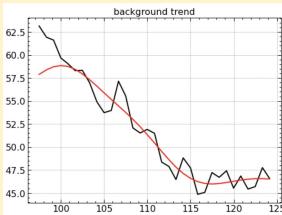
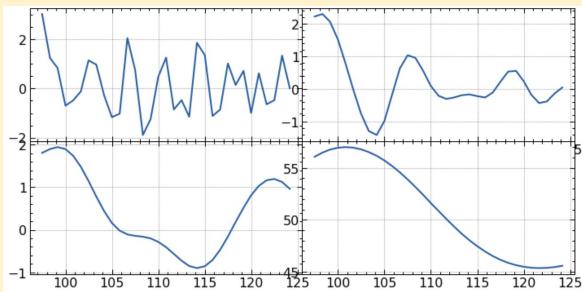


Pn_b50_03_0123720301_flare1_decay

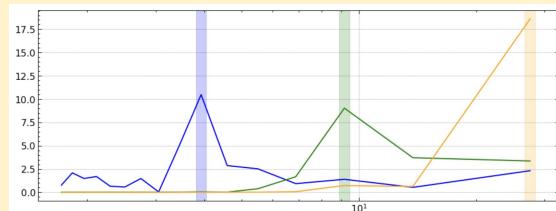


Light curve along with background is considered.
The trend is the sum of the last few IMFs.

IMFs are obtained, None of them show clear QPP.



Signal after trend removal

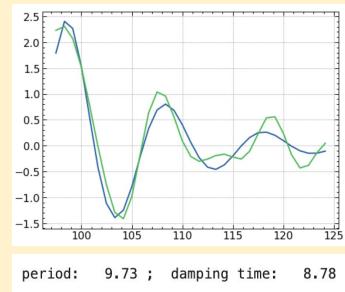


Left : shows periodogram of the individual IMFs. They are used to find the Periods of the IMFs.

We obtained only 3 IMFs as part of the signal. They all lie within the 99% confidence interval of the best fit line.

Damped Sine curve can only be fit to the 2nd IMF as it shows SUMER like oscillations. After fitting DS, we obtain its period to be ~10mins. (As marked by vertical red line in periodogram below). The periodogram is the PSD of the trend removed signal.

Clearly, the fitted period doesn't lie in the periodogram Peak.

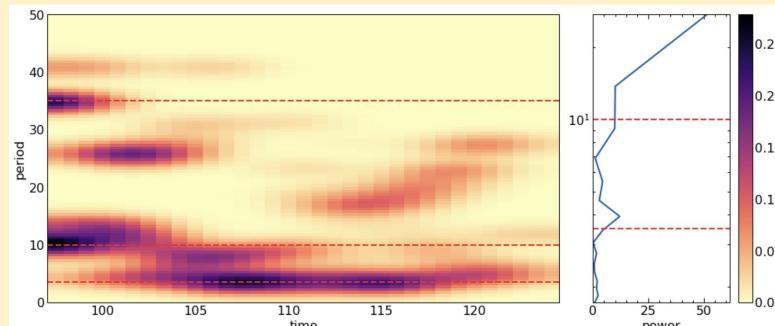
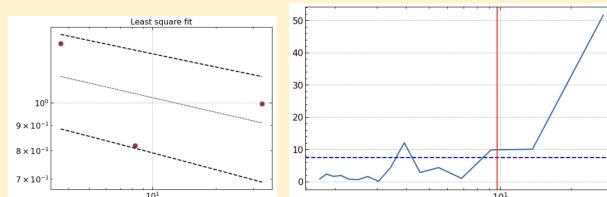


False Alarm Probability

The significance level in periodogram is given by

$$z_0 = -\ln[1-(1-p_0)^{1/N}]$$
 ;
 where $p_0 = 0.01$ for 99% confidence. (Scargle 1982)

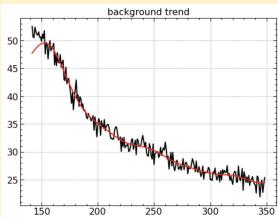
Pp	IF	Pm	HS
3.93	4.81	3.67	3.5
9.17	10.19	8.25	10
27.5	31.12	33.0	35



From the Hilbert Spectrogram, we however do detect periods of 3.5, 10, 35 mins. 3.5 mins does lie in the periodogram peak (it belongs to the first IMF).

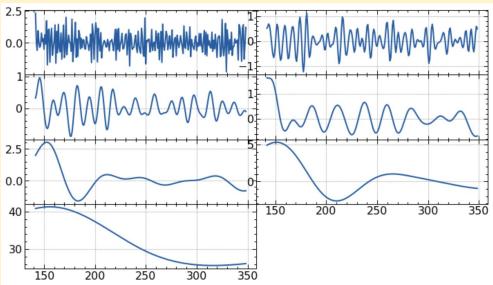
The 10 mins period is of the 2nd IMF.

Pn_b50_03_0123720301_flare2_decay

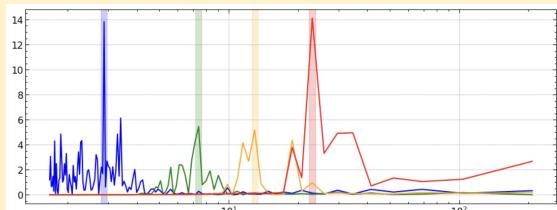
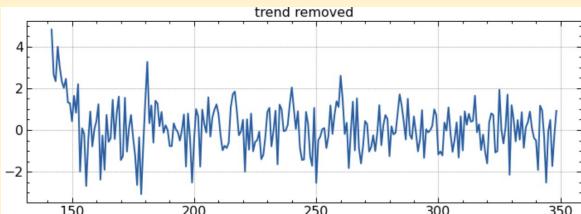


Light curve along with background is considered.
The trend is the sum of the last few IMFs.

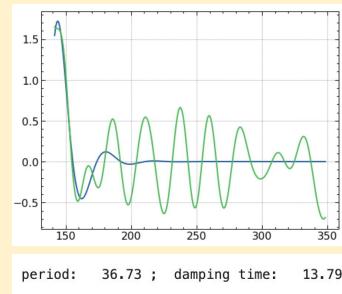
IMFs are obtained,



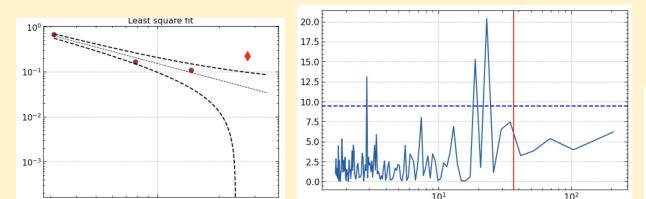
Signal after trend removal



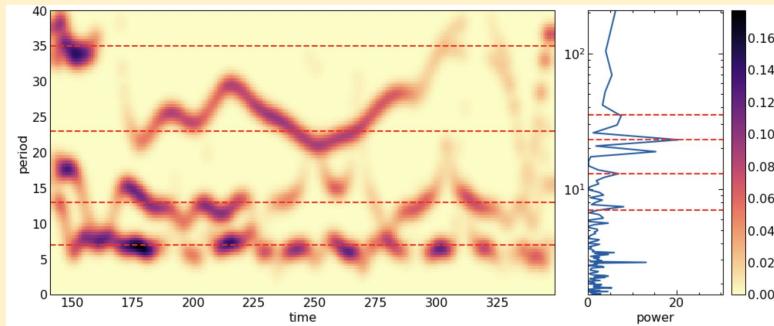
Left: from the periodograms, clearly 4th IMF is the most dominant one.



Clearly, we can see that the DS fits the IMF very poorly due to non SUMER like behaviour

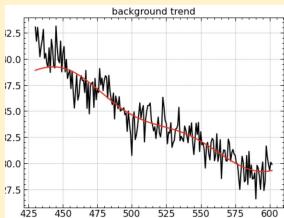


Pp	IF	Pm	HS
2.88	3.42	3.11	-
7.41	6.73	7.78	7
12.97	13.11	14.65	13
23.06	30.74	27.67	23
-	-	-	35



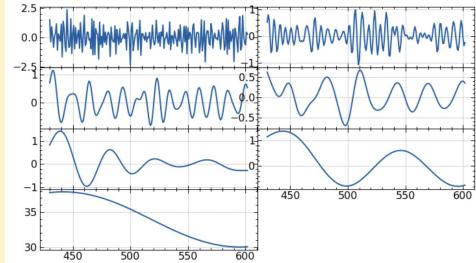
The periods of the IMFs obtained from Periodogram Peak, Instantaneous period, Modal period and hilbert spectrogram are in strong agreement. - Pp, IF, Pm and HS

Pn_b50_03_0123720301_flare3_decay

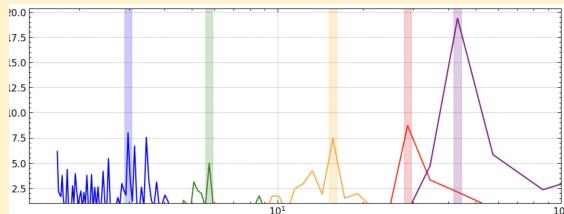
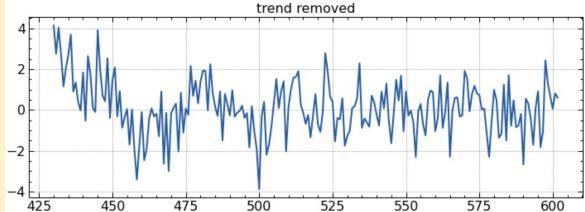


Last 2 IMFs are considered as trend

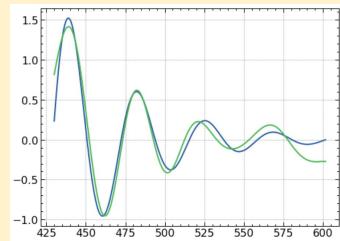
Visually, IMF-5 shows very strong QPP behaviour and SUMER oscillations



Trend removed signal

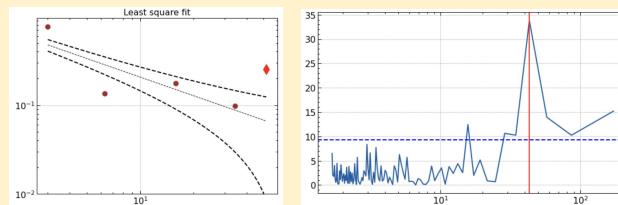


PSD of the individual IMFs. Clearly IMF4 is the significant IMF.

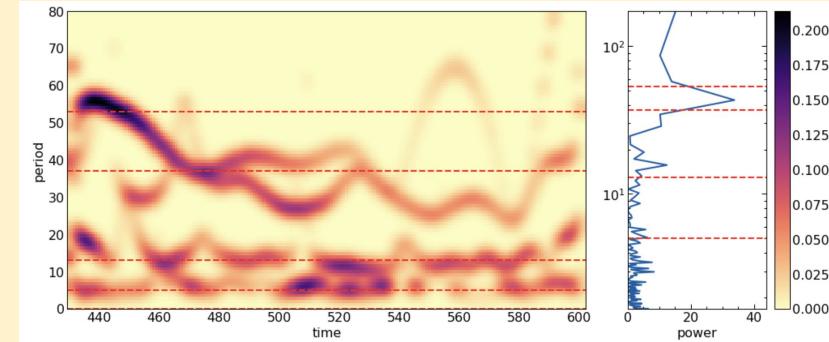


period: 43.19 ; damping time: 46.51

One can argue that IMF-1,2 and 4 are all significant. But 1 is clearly a noisy component and 2 lies below the lower significance level and is also not significant from the periodogram.

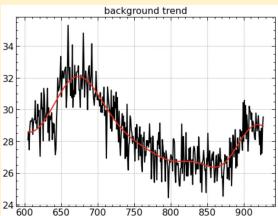


Pp	IF	Pm	HS
5.75	5.88	6.27	5
15.68	14.46	15.92	13
28.75	35.08	34.5	37
43.12	44.91	51.75	53



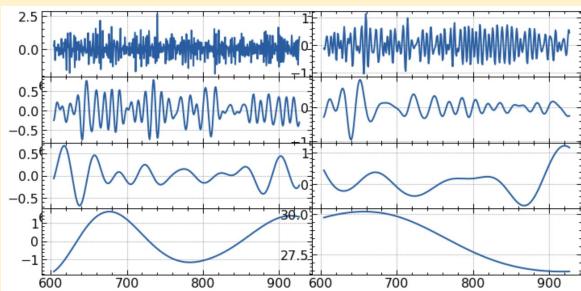
This is clearly a SUMER-like QPP and must be considered.

Pn_b50_03_0123720301_flare3_pf

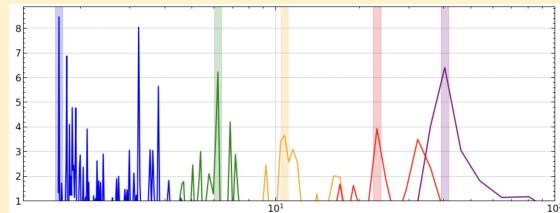
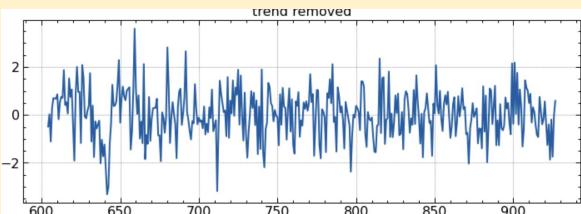


Last 3 IMFs considered for trend

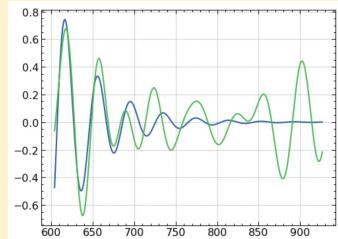
IMFs seem to have oscillatory signatures



Trend removed signal

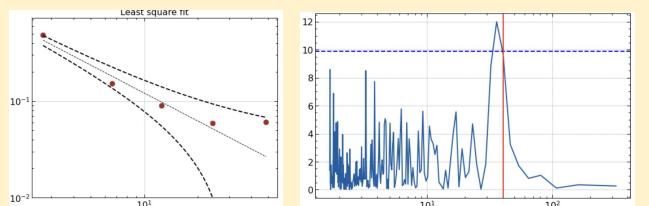


From periodogram,
IMF-4 is the most
significant.



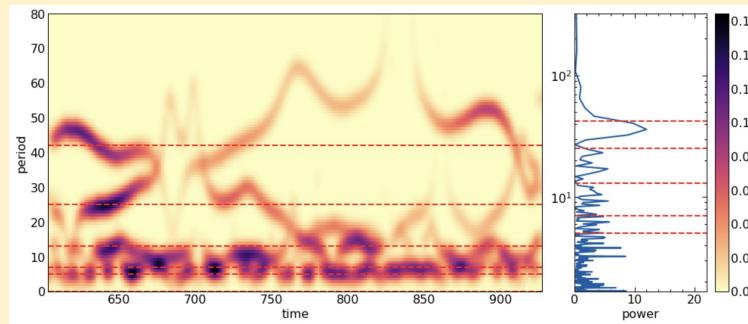
All IMFs are within the confidence levels of the EMD spectra,
hence no clear significant period.

However from periodogram, we have a convincing peak at 40
min.

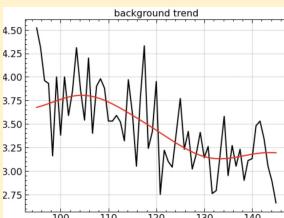


Pp	IF	Pm	HS
1.68	3.38	2.69	5
6.22	5.92	6.58	7
10.78	12.08	12.52	13
23.1	23.34	24.25	25
40.42	47.15	48.5	42

Fitted data, in very good agreement
with periodogram

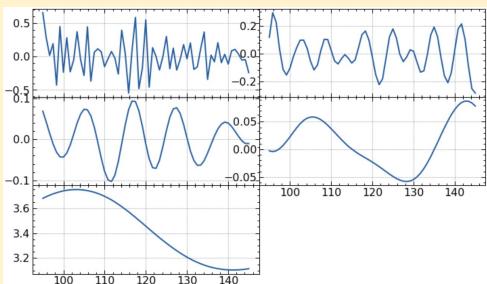


rgs_b50_04a_0133120701_decay

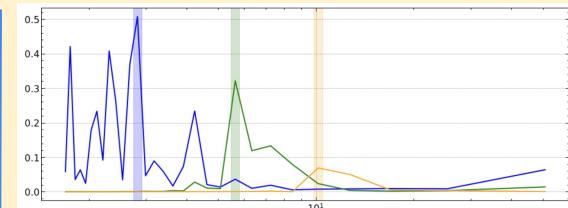
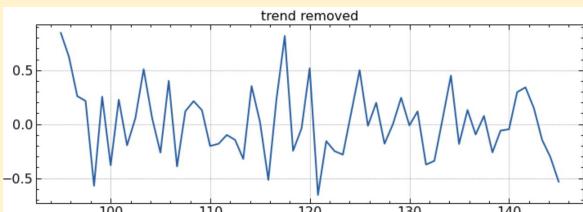


Last 2 IMFs are considered for trend

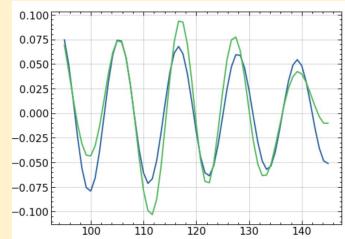
Not many IMFs are generated due to small size of data set



IMF-4,5 are clearly part of background trend, hence removed

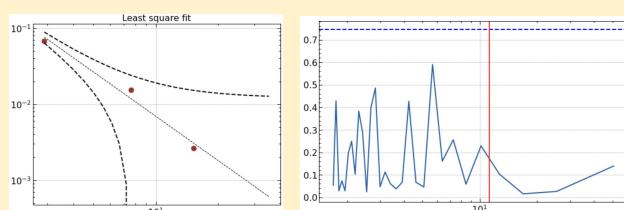


IMFs have distinct peak in periodogram.

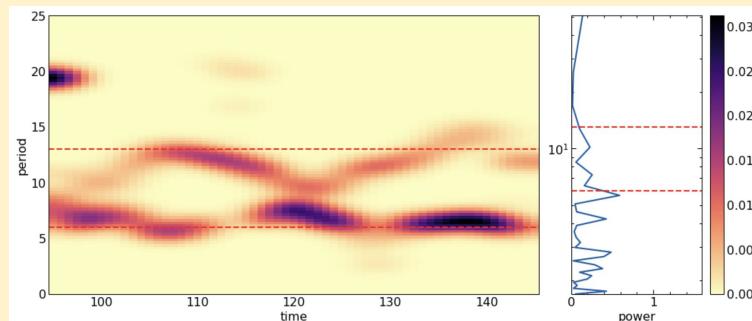


period: 11.26 ; damping time: 102.05

Also, there is no SUMER like decaying oscillations in the signal

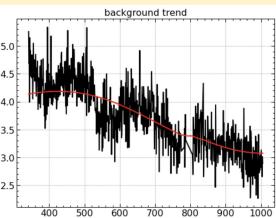


Pp	IF	Pm	HS
2.82	3.29	2.9	-
5.65	6.91	7.62	6
10.17	11.68	15.25	13

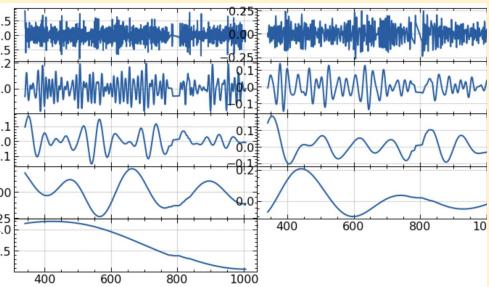


The fitted signal period doesn't even lie in the periodogram peak

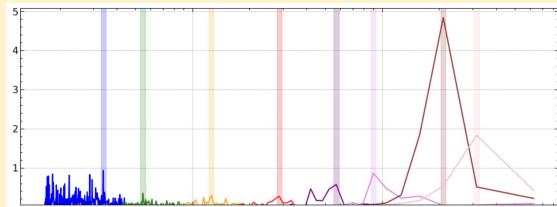
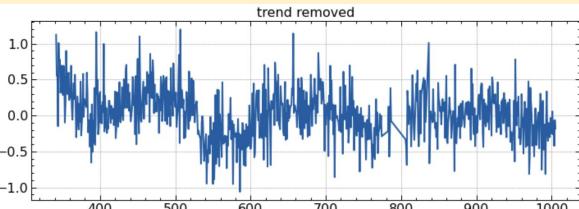
rgs_b50_04b_0133120101_decay



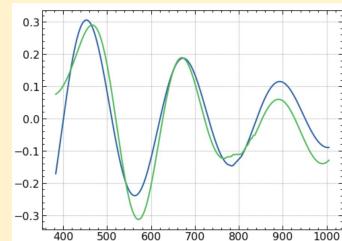
Only the last IMF is chosen as background trend, all the other IMF show oscillatory signatures



Trend removed signal



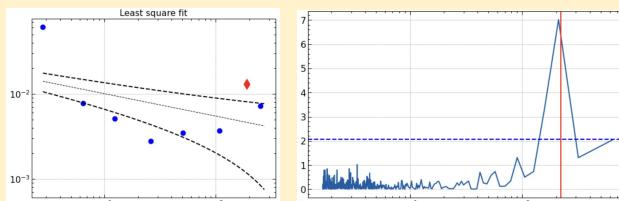
Left: IMF-7 (brown) is clearly the most dominant



period: 220.01 ; damping time: 449.6

The fitting is in very good agreement with periodogram peak

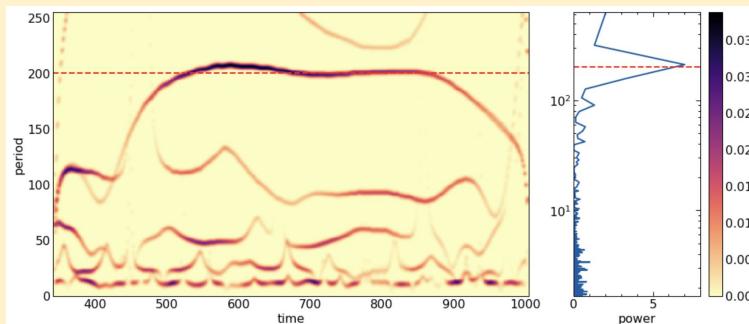
Here, sum of IMF-6 and 7 are considered as QPP**



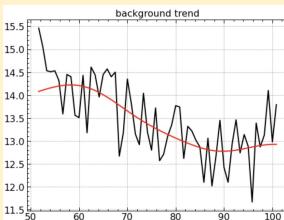
Pp	IF	Pm	HS
3.39	3.26	2.81	-
5.49	5.97	6.42	-
12.62	12.25	12.41	-
28.67	23.62	26.1	-
57.35	53.16	50.47	-
90.12	107.65	108.14	-
210.28	165.15	189.25	220

We get the period around ~ 200 mins.

This is a very strong SUMER-like Qpp and must be considered.

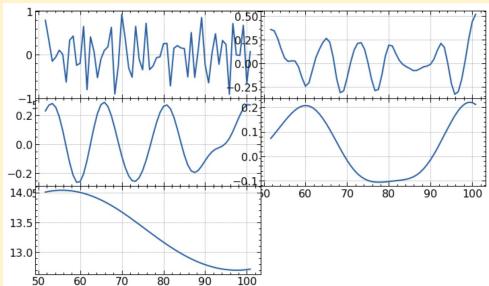


mos_b50_04c_0133120101_decay

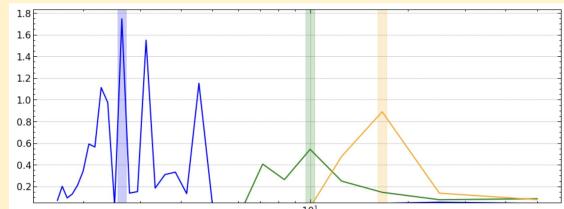
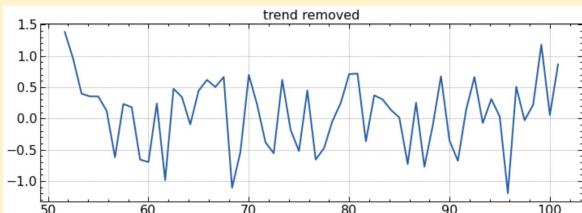


Last 2 IMFs are considered for trend

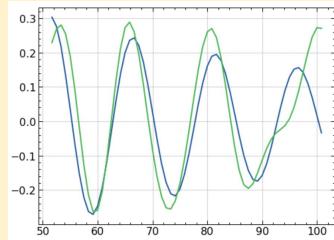
Not many IMFs are generated due to small size of data set



IMF-4,5 are clearly part of background trend, hence removed

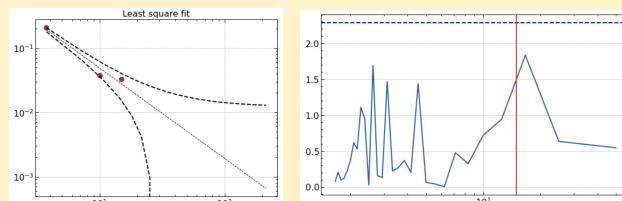


IMFs have distinct peak in periodogram.

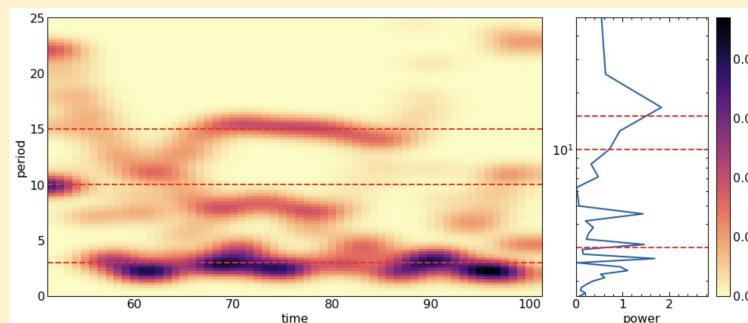


period: 14.99 ; damping time: 67.96

we can see from both EMD spectrum(left) and Fourier spectrum (right) that none of the IMFs have any statistical significance.



Pp	IF	Pm	HS
2.63	3.31	3.75	3
10.0	10.37	10.0	10
16.67	17.07	15.0	15



Also, there is no SUMER like decaying oscillations in the signal