

trial2

January 21, 2024

```
[ ]: from astropy.timeseries import LombScargle
from astropy import units as un
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
```

```
[ ]: data = pd.read_csv('./data/sksolartimevariation5804d.txt', skiprows=13,
    ↪ sep='\s+', names=['t_mean(s)', 't_mean-t_start(s)', 't_end-t_mean(s)',
    ↪ 'nu_flux(1e6cm-2s-1)', 'flux_up_error(1e6cm-2s-1)',
    ↪ 'flux_down_error(1e6cm-2s-1)'])
```

```
[ ]: data
```

```
[ ]:      t_mean(s)  t_mean-t_start(s)  t_end-t_mean(s)  nu_flux(1e6cm-2s-1)  \
0      833654760      170100      277380      2.74
1      834127080      175500      210060      2.83
2      834550800      213180      230160      2.30
3      834997020      199380      212640      1.79
4      835380420      170520      265680      3.15
...      ...      ...      ...      ...
1338  1525315550      172739      172774      2.36
1339  1525703838      215064      215054      2.26
1340  1526138206      216970      216028      1.88
1341  1526588224      232102      226109      1.90
1342  1527014775      199299      208324      2.60

      flux_up_error(1e6cm-2s-1)  flux_down_error(1e6cm-2s-1)
0              0.63              0.53
1              0.75              0.62
2              0.53              0.45
3              0.55              0.44
4              0.74              0.61
...      ...      ...
1338          0.36              0.33
1339          0.31              0.29
1340          0.33              0.29
1341          0.38              0.28
```

1342

0.35

0.33

[1343 rows x 6 columns]

```
[ ]: times = data['t_mean(s)'].values * un.s
flux = data['nu_flux(1e6cm-2s-1)'].values * un.cm**-2 * un.s**-1 * 1e6
flux_err_up = data['flux_up_error(1e6cm-2s-1)'].values * un.cm**-2 * un.s**-1 * 1e6
flux_err_down = data['flux_down_error(1e6cm-2s-1)'].values * un.cm**-2 * un.s**-1 * 1e6
```

```
[ ]: lsp = LombScargle(times, flux, dy=0.5*(flux_err_up+flux_err_down))
```

```
[ ]: freq, power = lsp.autopower(minimum_frequency=0/un.year, maximum_frequency=20/un.year)
```

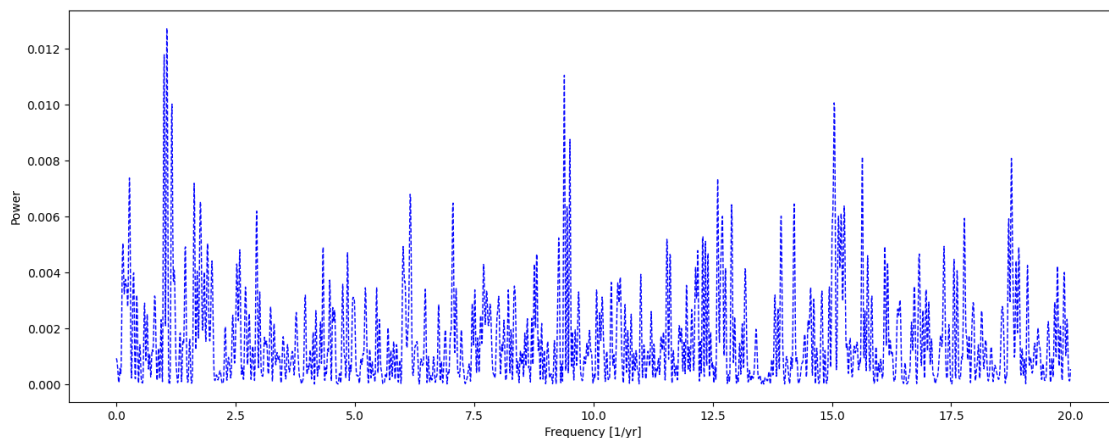
```
/home/darkwake/.local/lib/python3.10/site-packages/astropy/timeseries/periodograms/lombscargle/implementations/fast_impl.py:102: RuntimeWarning: invalid value encountered in divide
```

$$\tan_2\omega\tau = (S^2 - 2 * S * C) / (C^2 - (C * C - S * S))$$

```
[ ]: freq
```

```
[ ]: [0, 0.0091028035, 0.018205607, ..., 19.980654, 19.989757, 19.998859] 1/yr
```

```
[ ]: plt.figure(figsize=(16, 6))
plt.plot(freq, power, '--', lw=1, c='b')
plt.xlabel('Frequency [1/yr]')
plt.ylabel('Power')
plt.show()
```



```
[ ]: freq_943 = freq[np.argmin(np.abs(freq - 9.43/un.year))]  
     power_943 = power[np.argmin(np.abs(freq - 9.43/un.year))]
```

```
[ ]: lsp.false_alarm_probability(power_943, method='bootstrap')
```

```
[ ]: 1.0
```

```
[ ]: lsp.false_alarm_level(0.01, method='naive')
```

```
[ ]: 0.018804679040717698
```

```
[ ]: lsp.false_alarm_level(0.01, method='baluev')
```

```
[ ]: array(0.02076439)
```

```
[ ]: lsp.false_alarm_level(0.01, method='davies')
```

```
[ ]: array(0.020772)
```

```
[ ]:
```