# AIA 1700 helioseismology

Rachel Howe, April 2023

AIA 1700

- As discussed by Howe *et al.* (2011), the AIA 1600 Å and 1700 Å near-ultraviolet bands show a clear signature of the five-minute acoustic spectrum that – at least in the Sun-as-a-star case – is much less contaminated by granulation "noise" than the continuum intensity in HMI's visible 6173 Å line.

- The 1700 Å band is believed to be formed in the upper photosphere; Judge, Tarbell, and Wilhelm (2001) put it at 300 – 550 km, around the temperature minimum between the upper photosphere and lower chromosphere.

- The data go back to 2010, so only Cycle 24 and a bit of 25.

SDO AIA (1700 Å) 2-Jun-2022 23:26:28.739

SolarMonitor.org

X (arcsec)
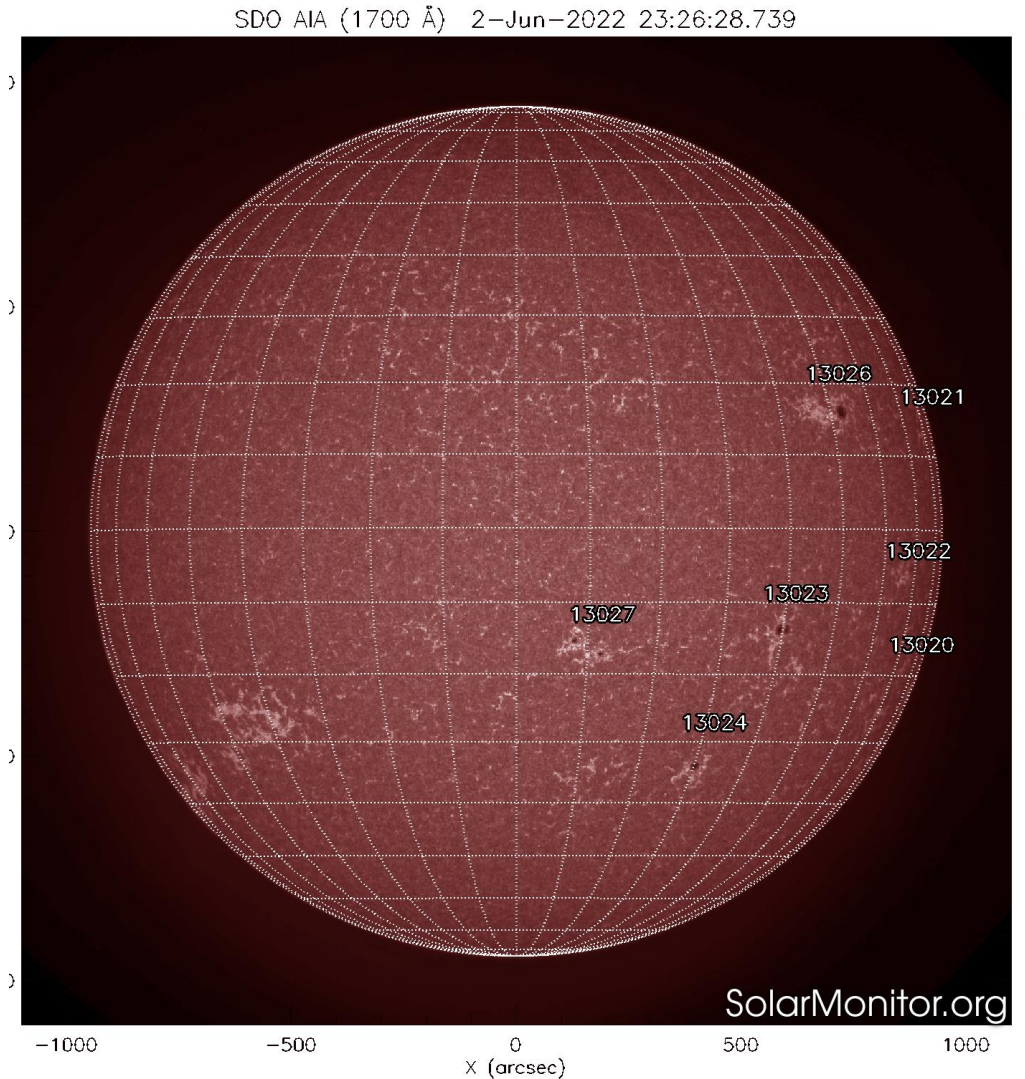
Power spectra from the Goettingen 2014 poster

- Quite flat at lower frequencies compared to the HMI line

HMI Continuum
HMI Line Core
AIA 1600
AIA 1700
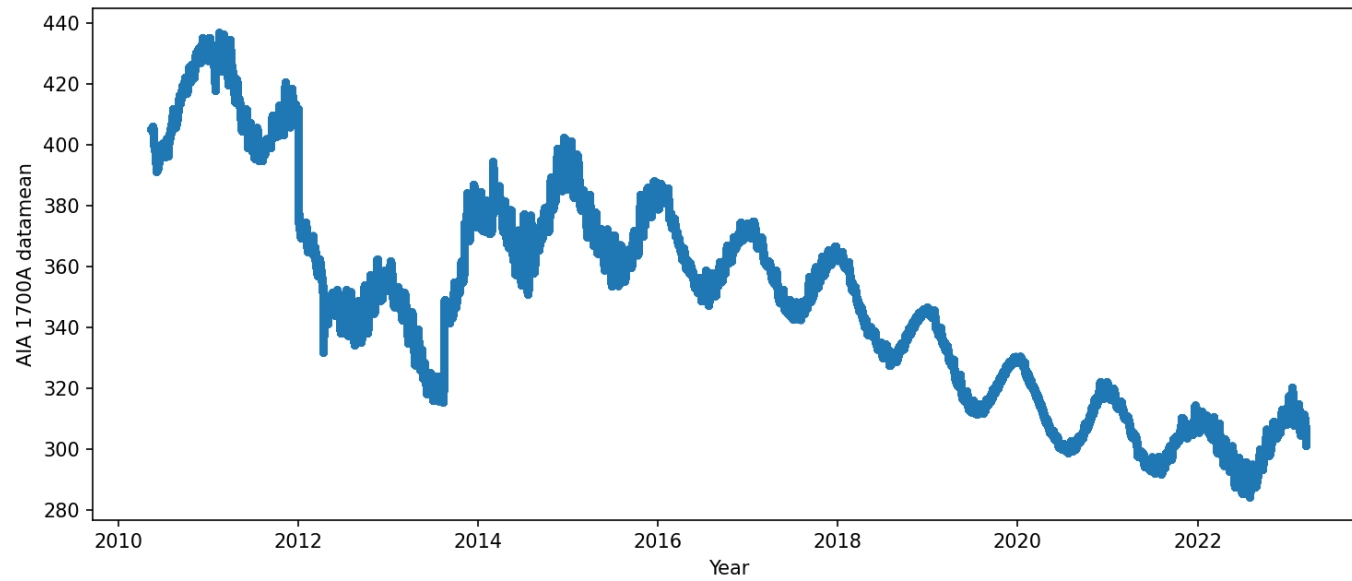
BiSON Velocity
HMI Velocity
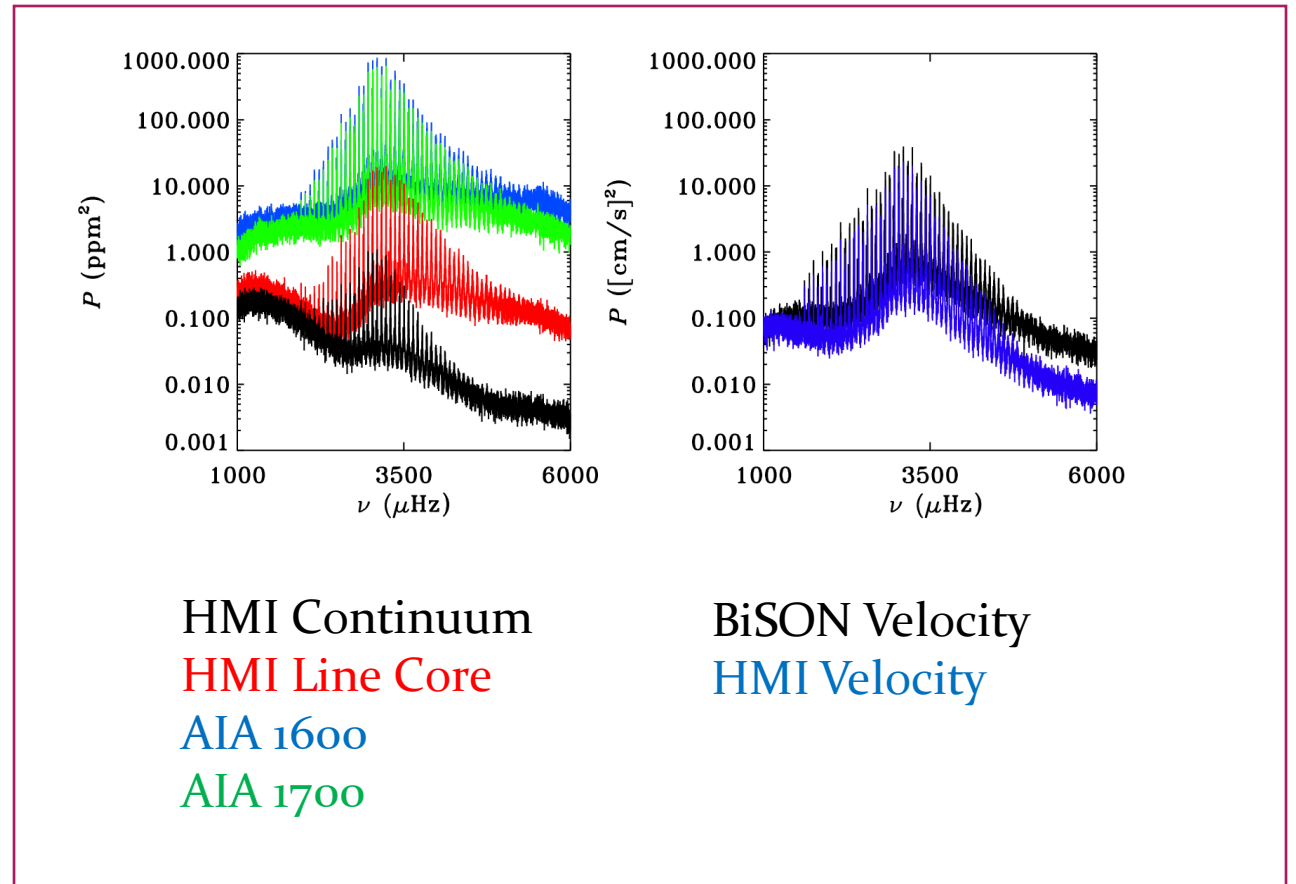
Coherence and phase for l_0 DATAMEAN time series from HMI (from poster for 2014 Goettingen meeting)
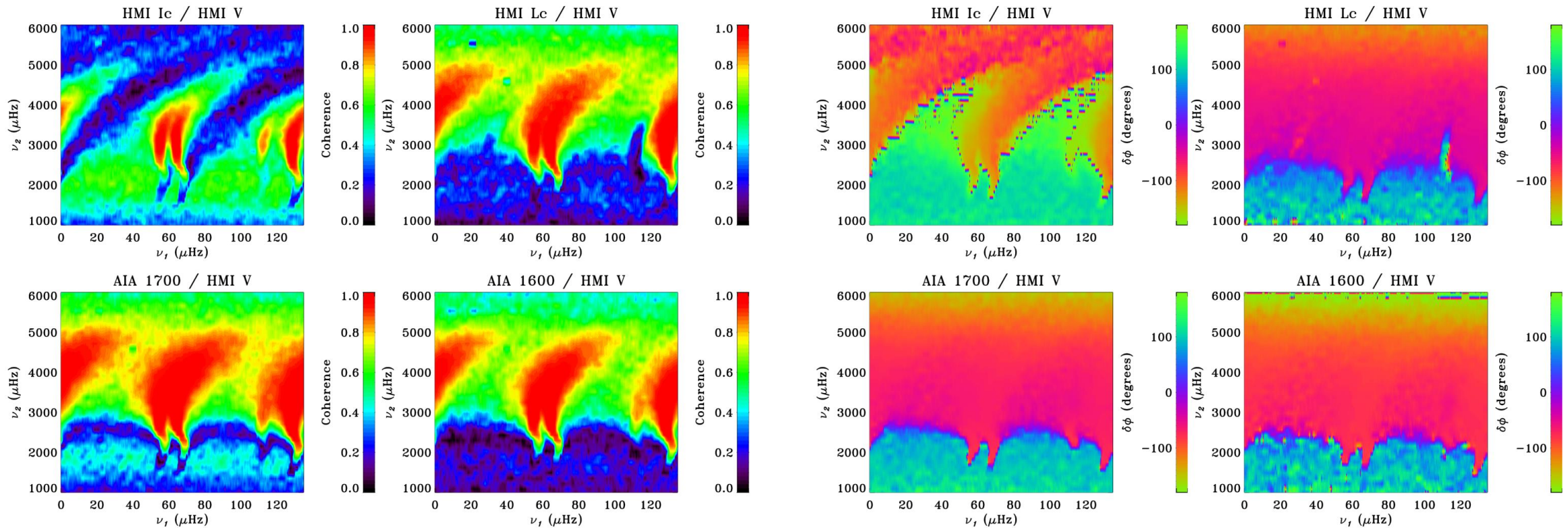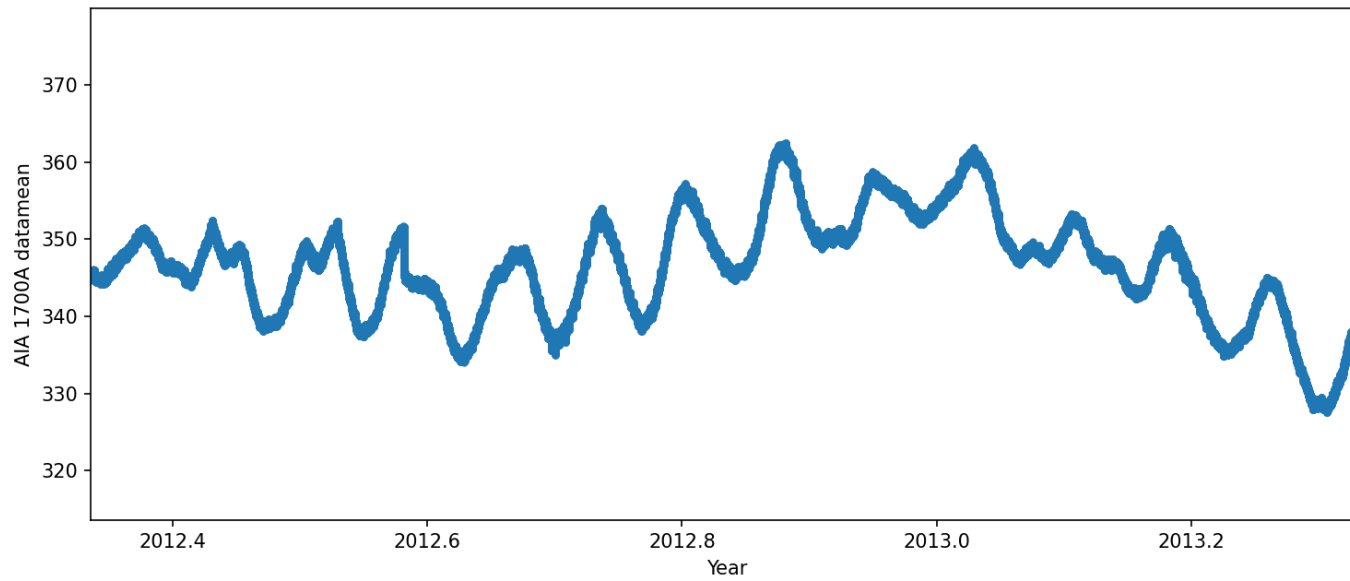
Despiked time series of DATAMEAN keyword
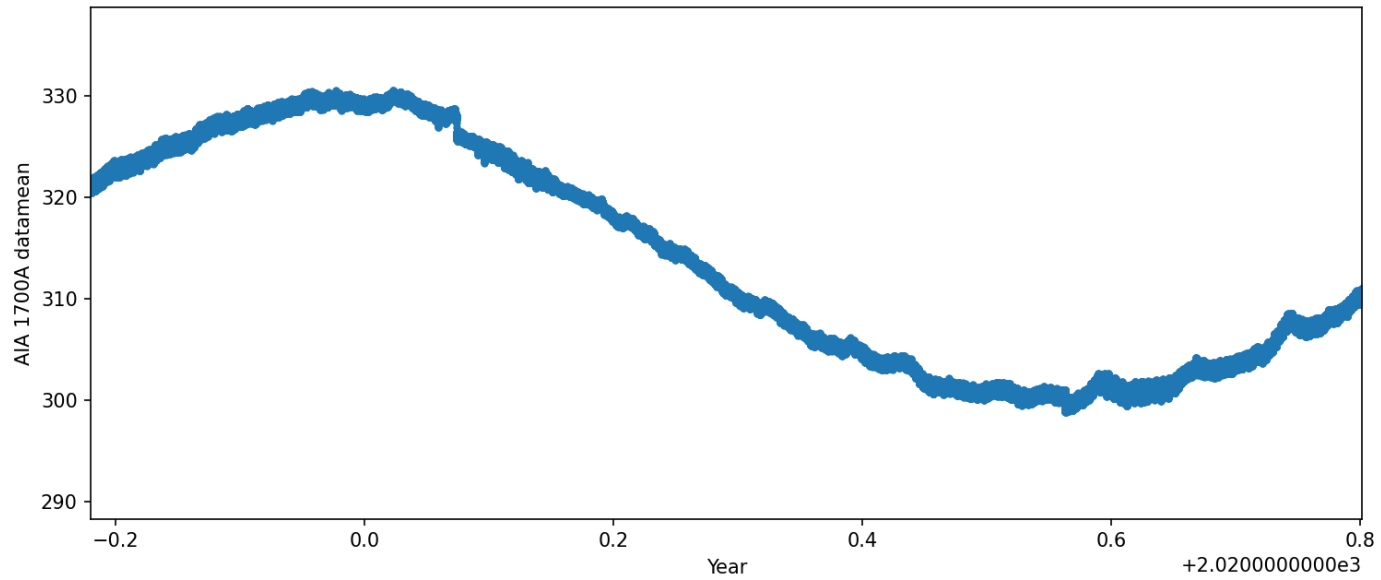
Note yearly variation and general downward trend

Despiked time series of DATAMEAN keyword

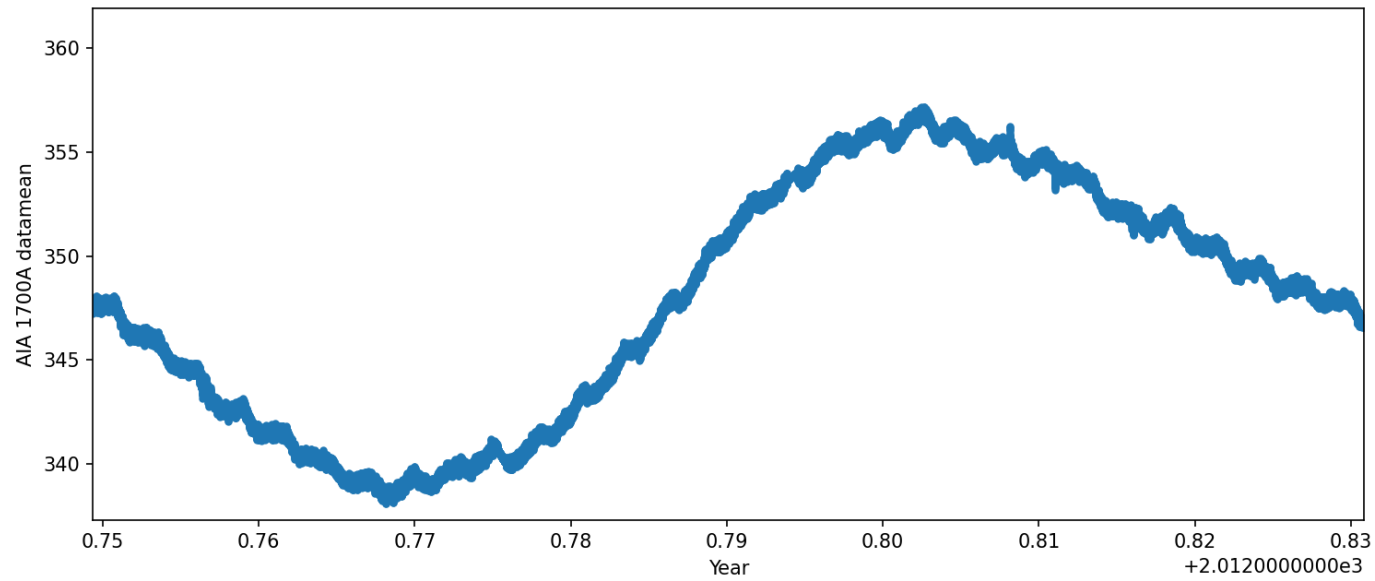A year at solar maximum shows solar rotation signal

Despiked time series of DATAMEAN keyword

A year at solar minimum shows very little solar rotation signal
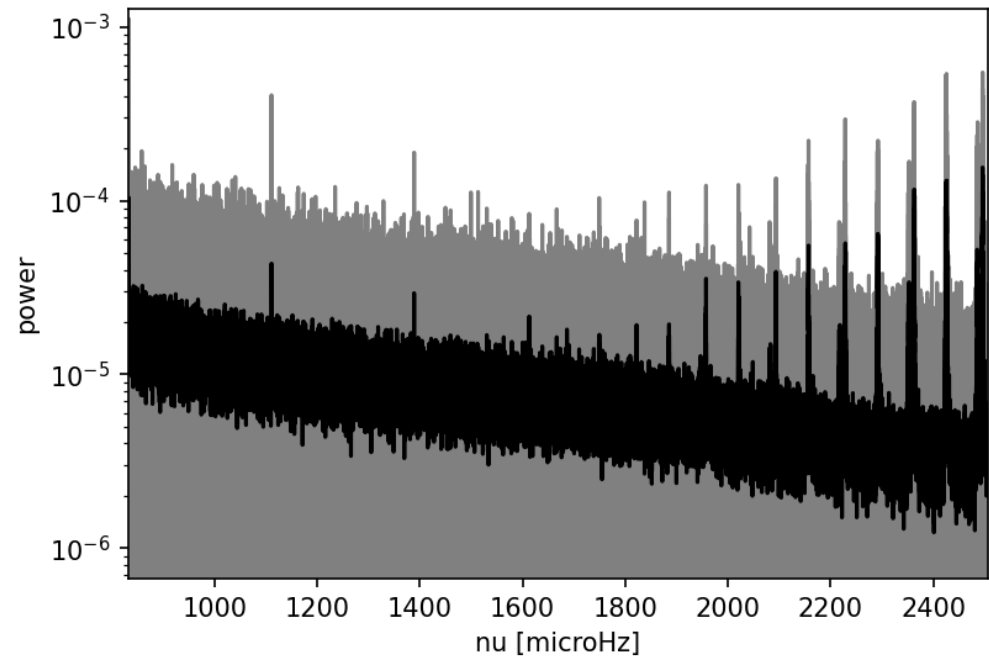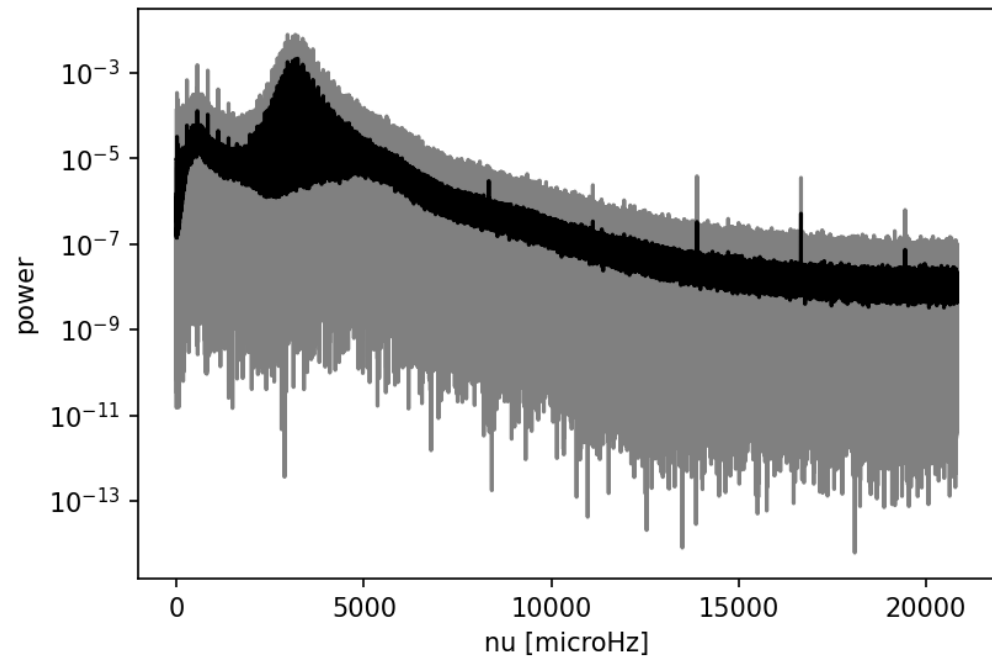
Despiked time series of DATAMEAN keyword
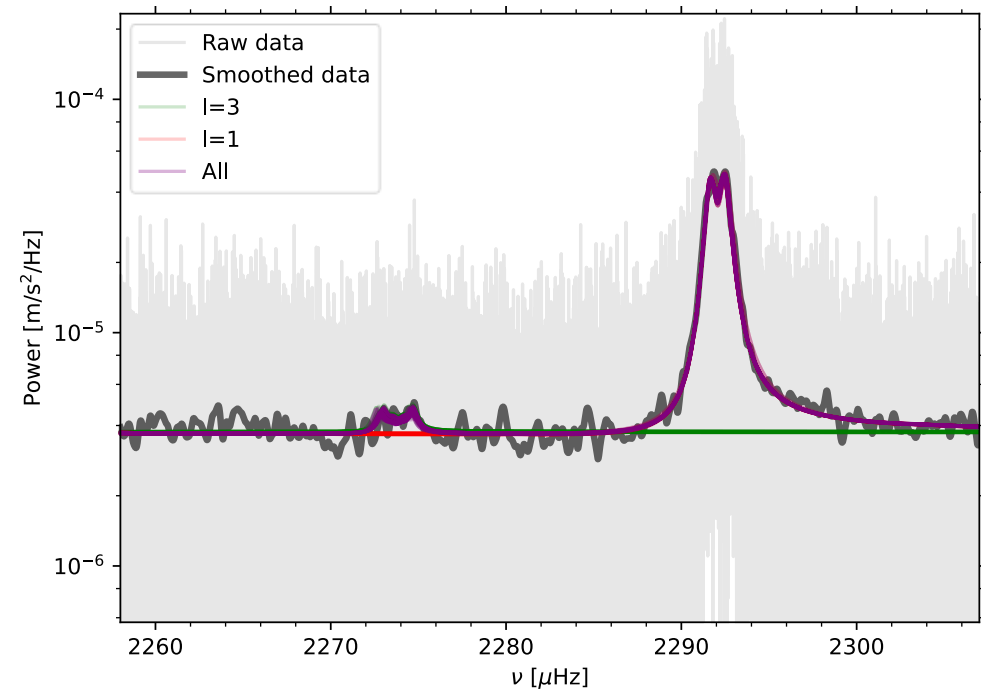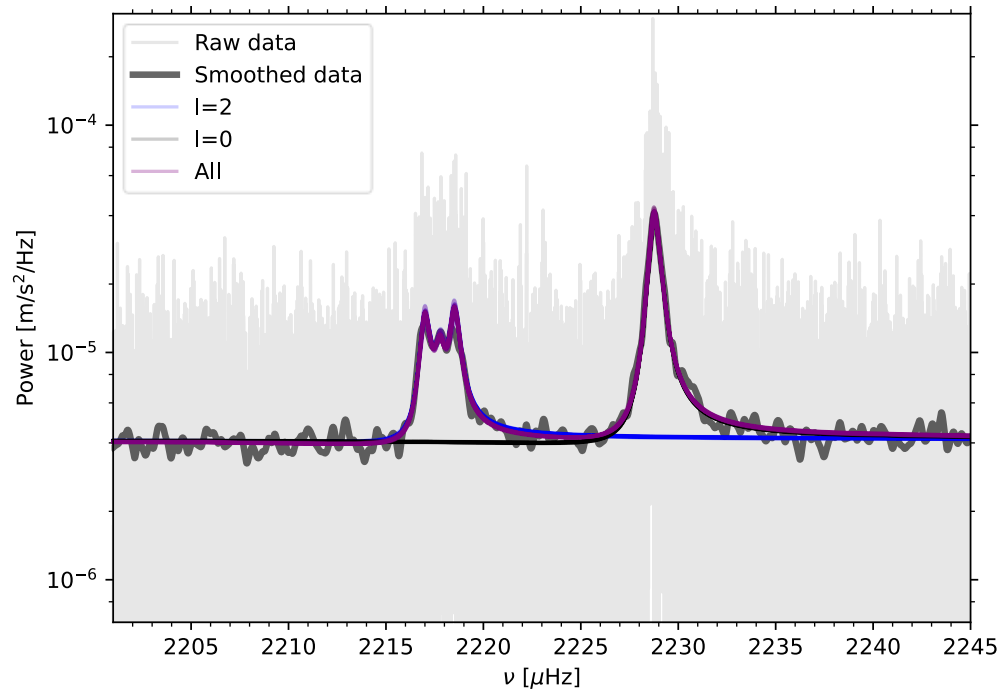
Some daily variation too.

How to detrend it?

- Rotation-timescale variations are nothing to do with oscillations, so arguably should be subtracted first?

- For now, just divide through by 151-point running mean and subtract 1.

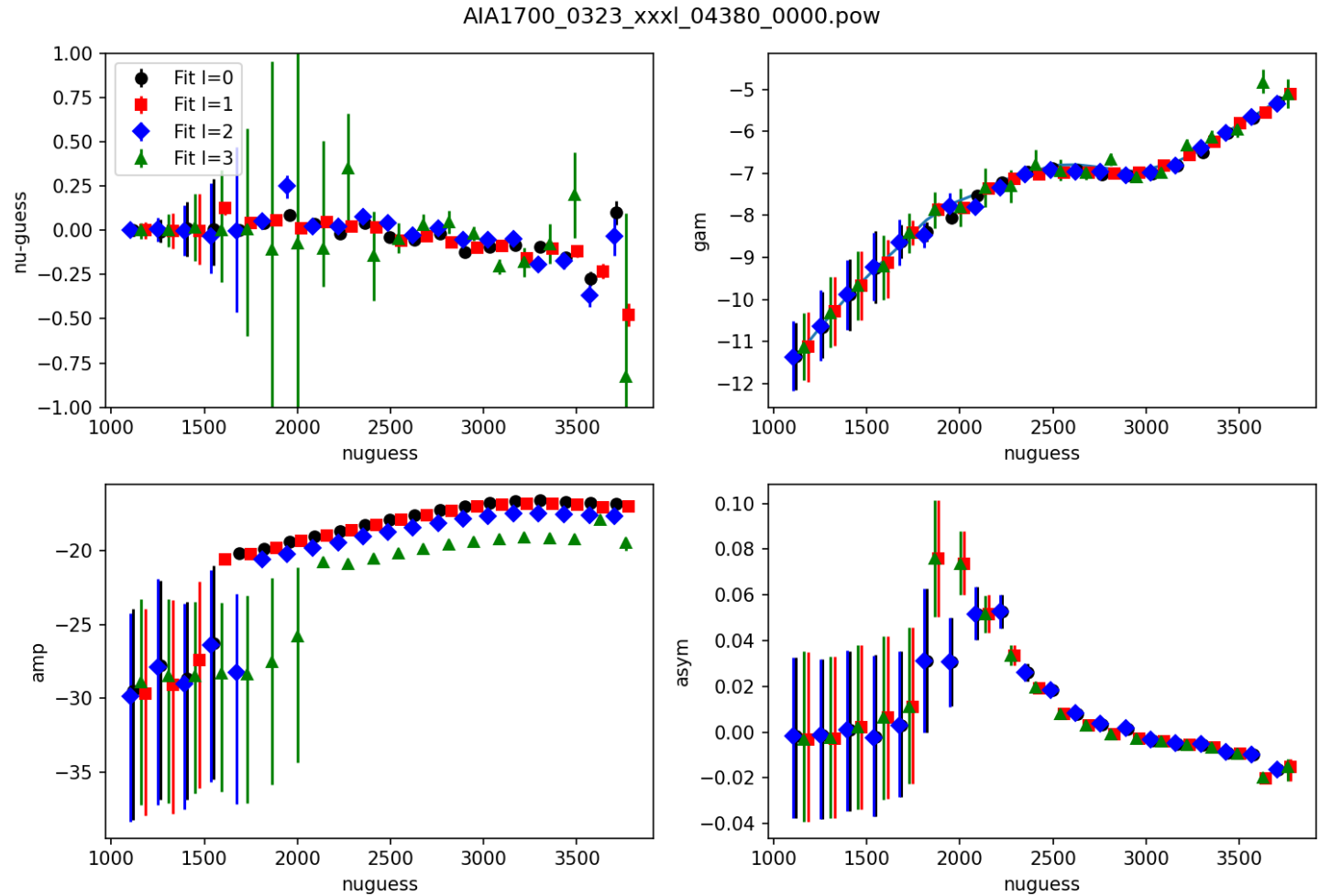# AIA 1700 13-year spectrum
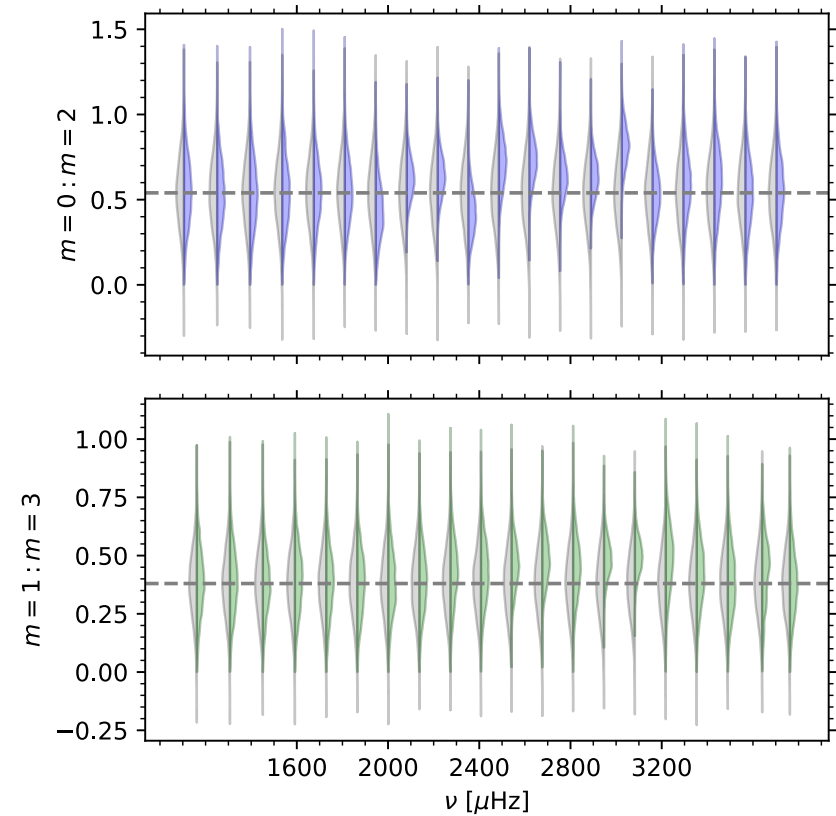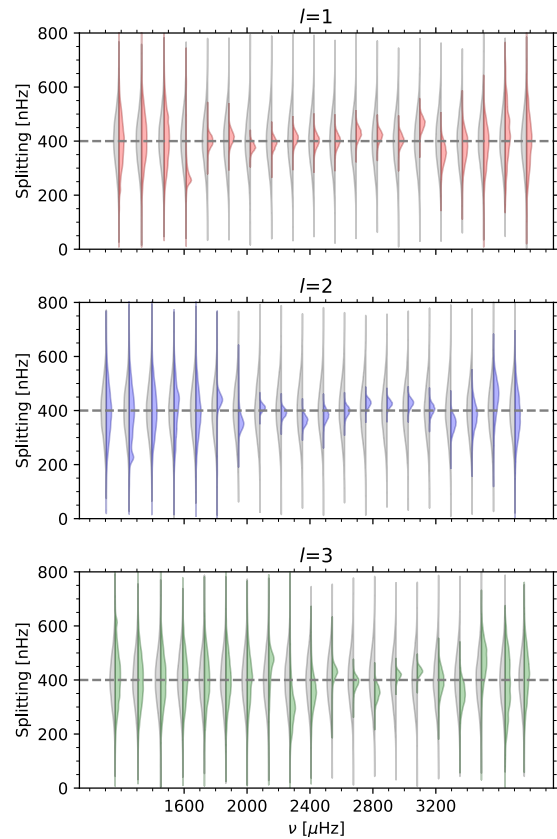
Fitting the 13-year AIA 1700 spectrum

Fitting the 13-year AIA 1700 spectrum

AIA1700_0323_xxxl_04380_0000.pow

I <= 3, 44 microHz window.

Fitting the 13-year AIA 1700 spectrum

Thoughts

- The normalization of the spectrum probably needs to be done a bit more carefully.

- It would be interesting to look for solar-cycle frequency, amplitude and linewidth changes, but amplitude is tricky because of the long-term trends.

- I could write a short paper on this fairly easily, but is it worth publishing?

- Can tie into BiSON via the coherence/phase relationships, but that's a different paper from fitting.

- Might also be worth looking at HMI 'line-core' intensity (the difference between the continuum and line depth, which behaves somewhat like the UV as far as oscillations are concerned.)