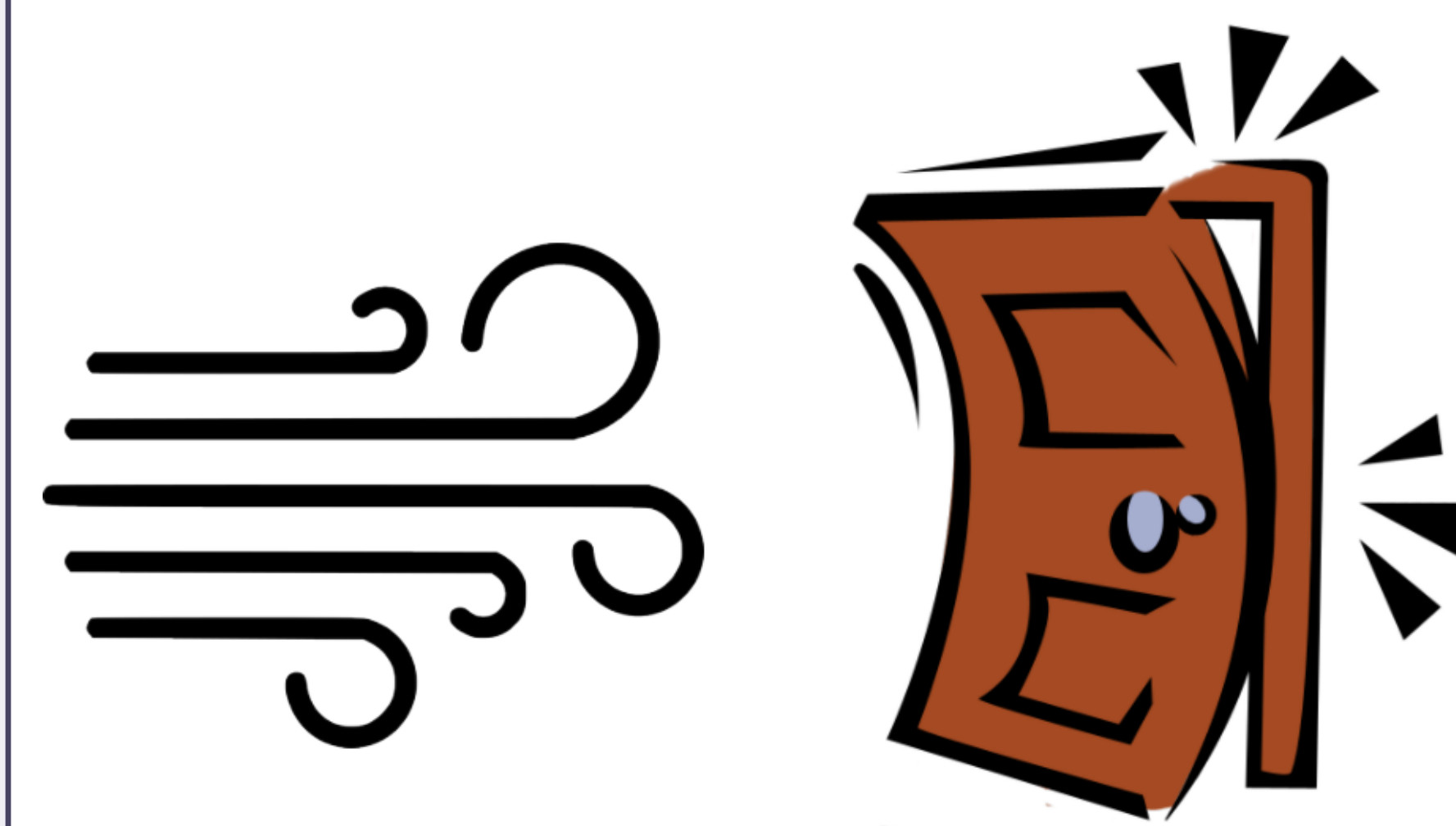


Wind-generated seismic noise at Sos Enattos

J. X. Ensing

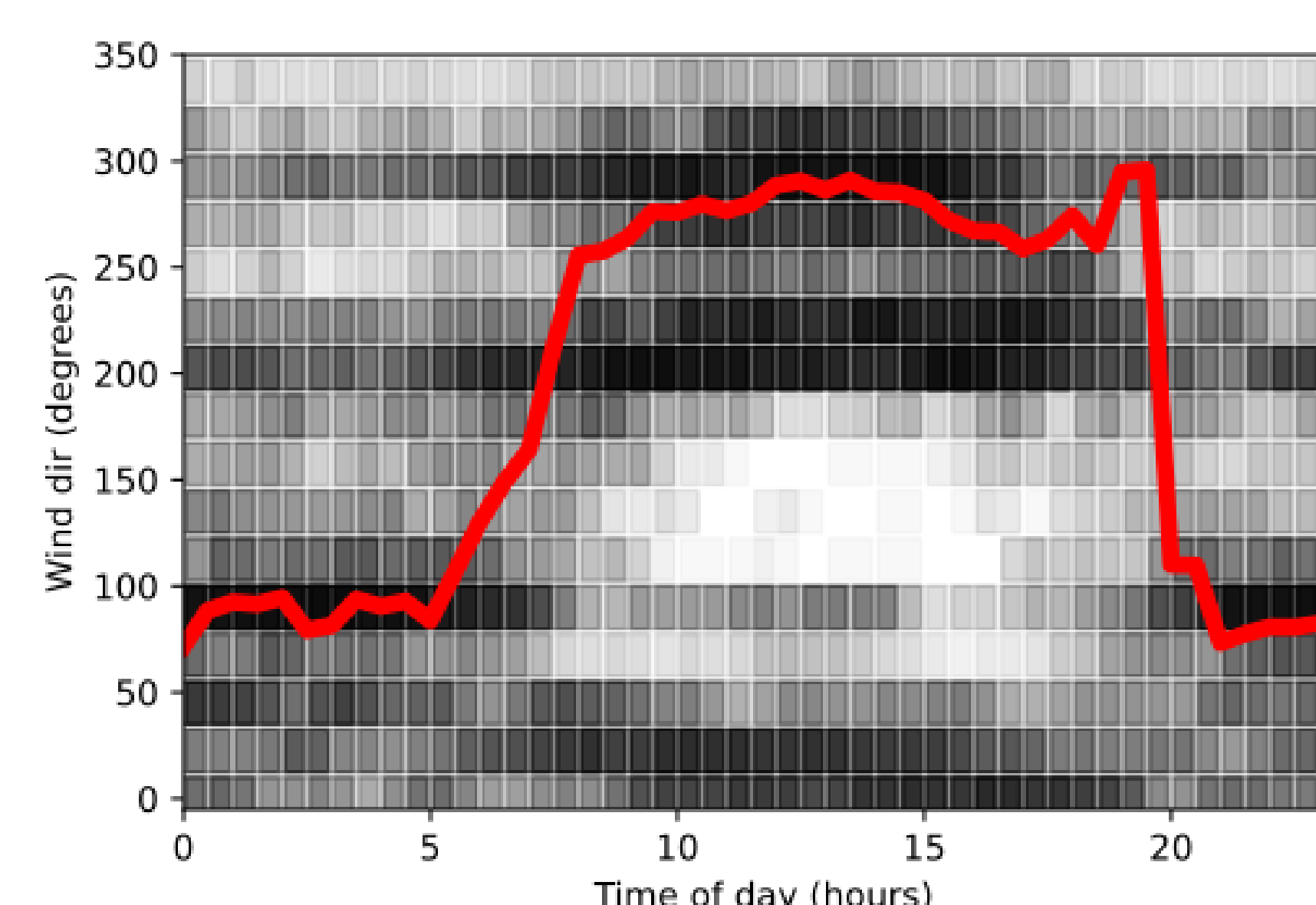
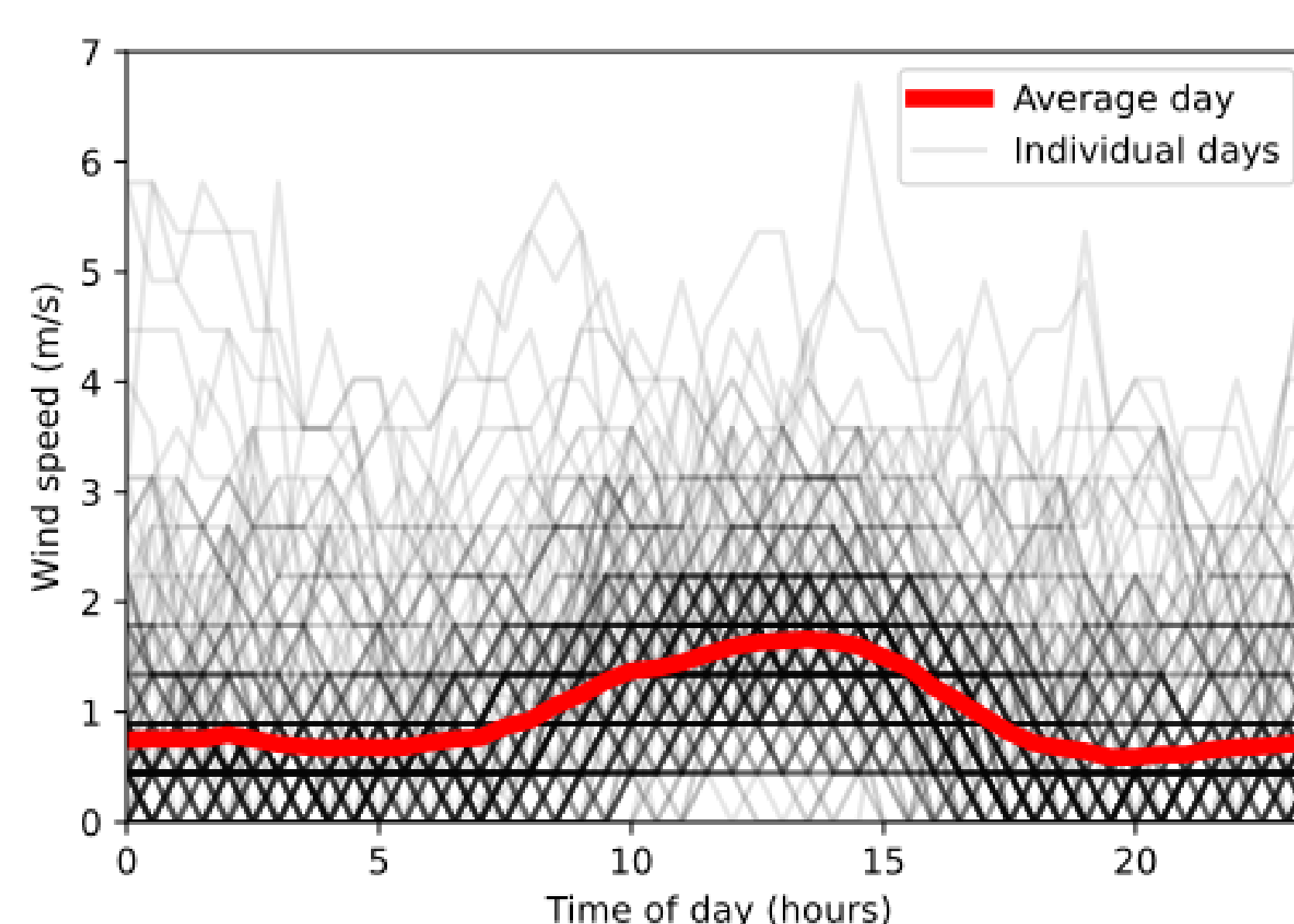
Analysis of data recorded at Sos Enattos shows connections between wind and seismic waveforms. Wind speeds are typically below 4m/s but seismic responses are still detectable at lower wind speeds. The power spectral density of seismic data reveals increased seismic energy for higher wind speeds over a broad range of frequencies.



Introduction

Wind can generate seismic noise by generating a broadband source (such as slamming a door or window shut) or exciting structures (such as trees or buildings) at their resonant frequencies. Tree or building geometry is widely variable so wind generates a range of frequencies this way too.

We examine wind speed and direction at Sos Enattos and their influence on seismic noise. The figures to the right show the diurnal variation of wind speed and direction.



Data

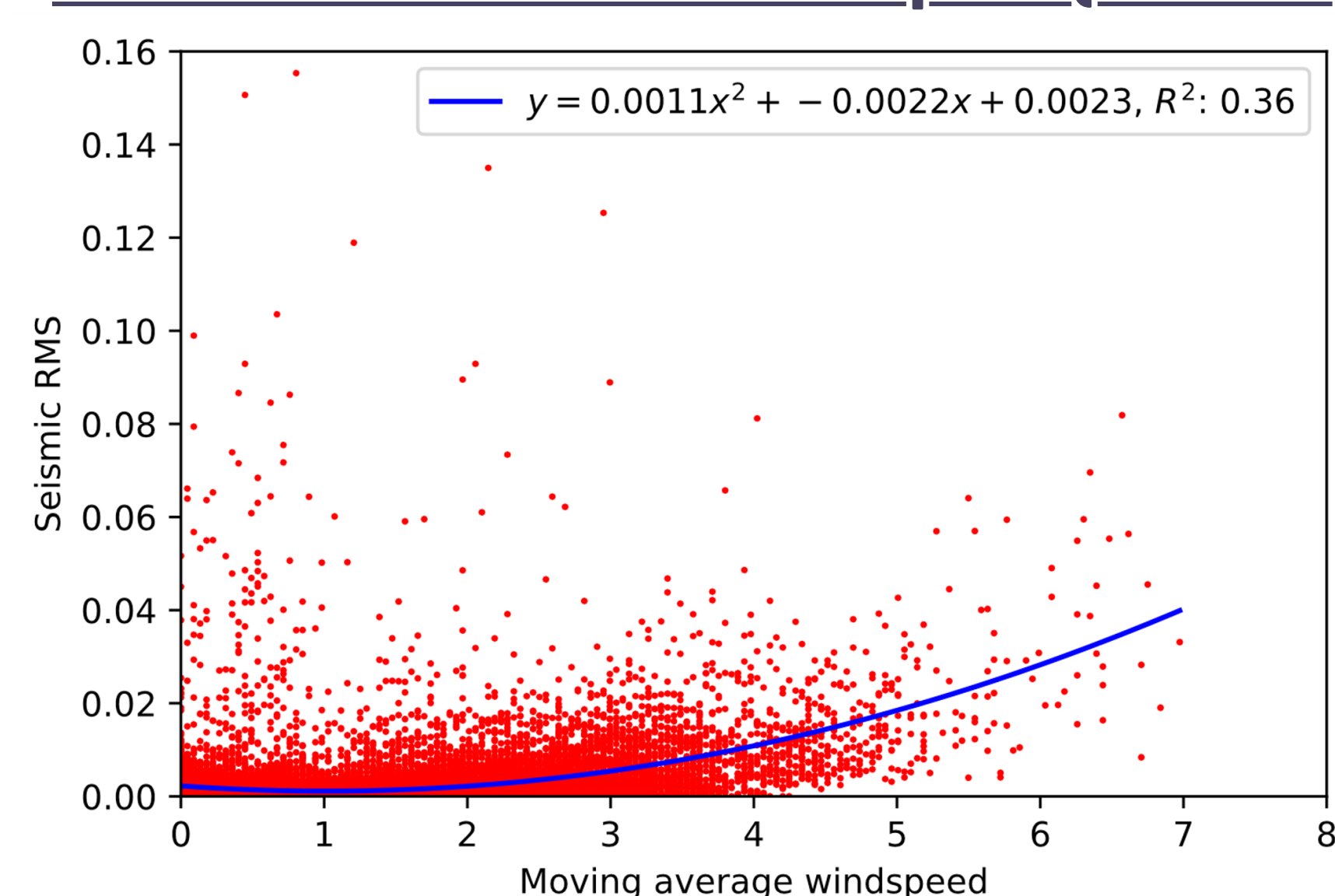
April 2016 to February 2017, April-August 2019

- Wind speed recorded every minute
- LGT 2.5-Hz seismometers
- 37 days for the surface seismometer

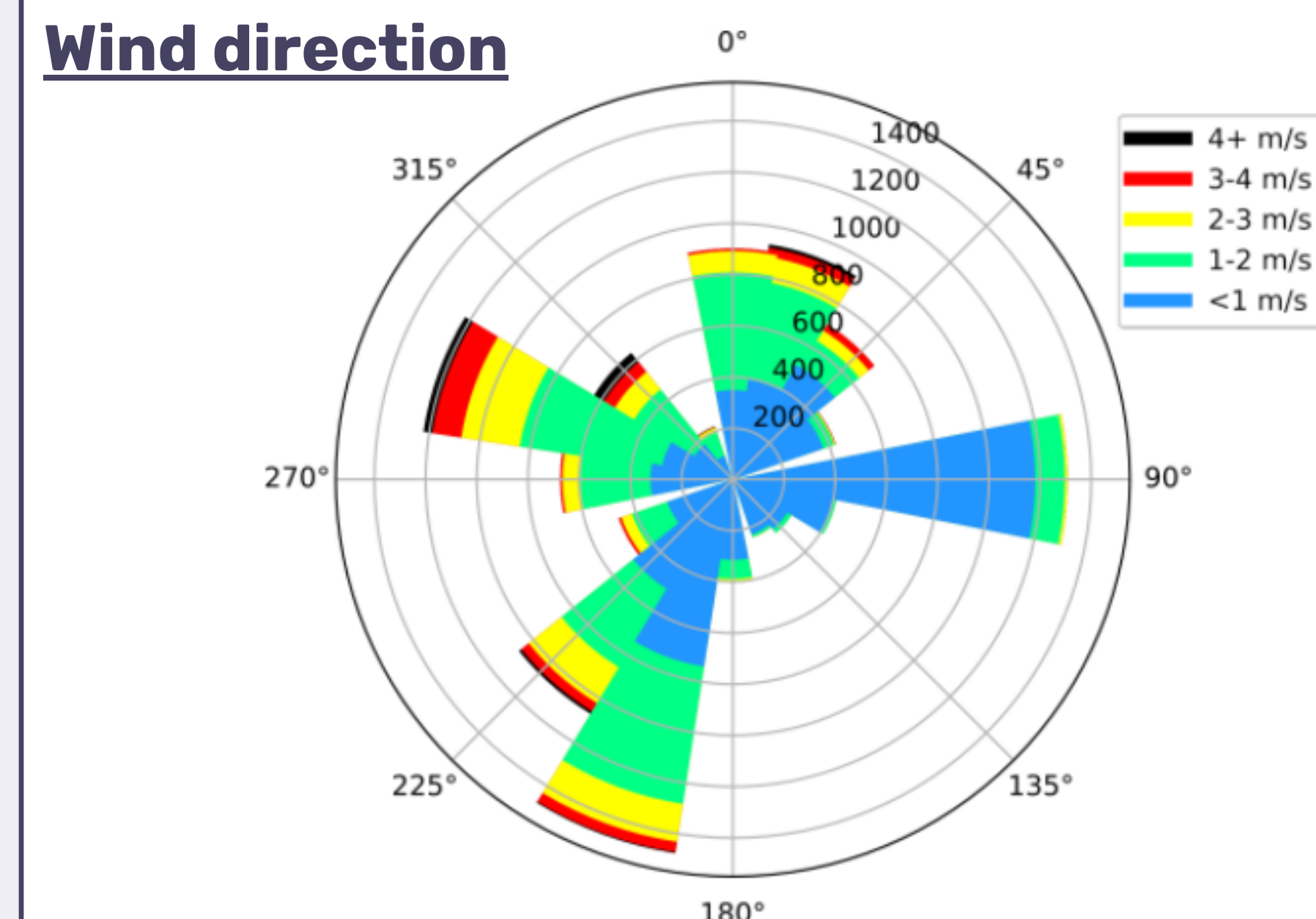
June 2020 - March 2021

- Wind speed & direction every 30 min
- 3 trilliums SOE0 (240s, at the surface), SOE1 (120 Horizon, 86~m below surface), and SOE2 (240s, 111~m below surface).
- 324 days for the surface seismometer

Seismic RMS vs mean wind speed (2016-17)



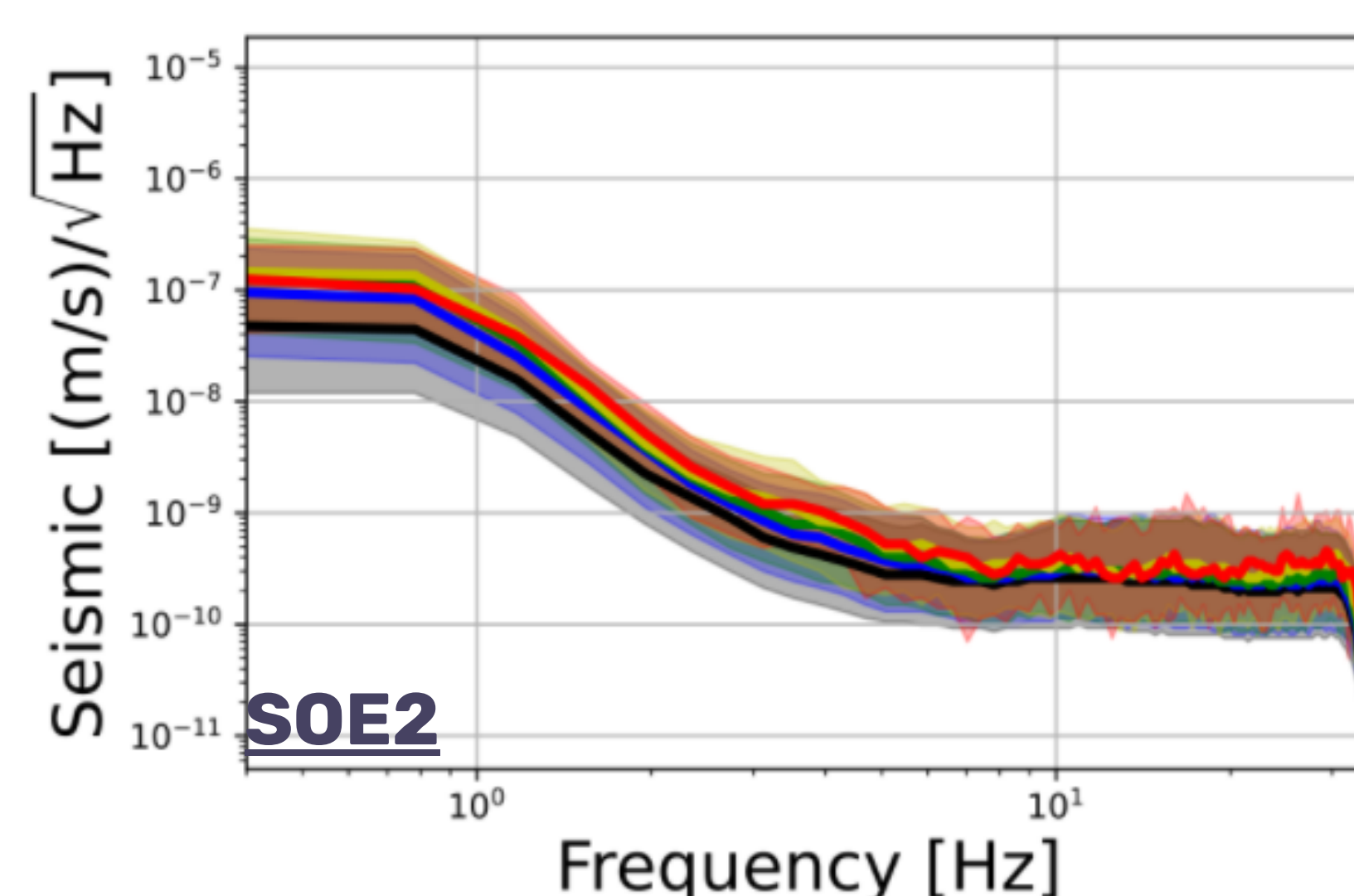
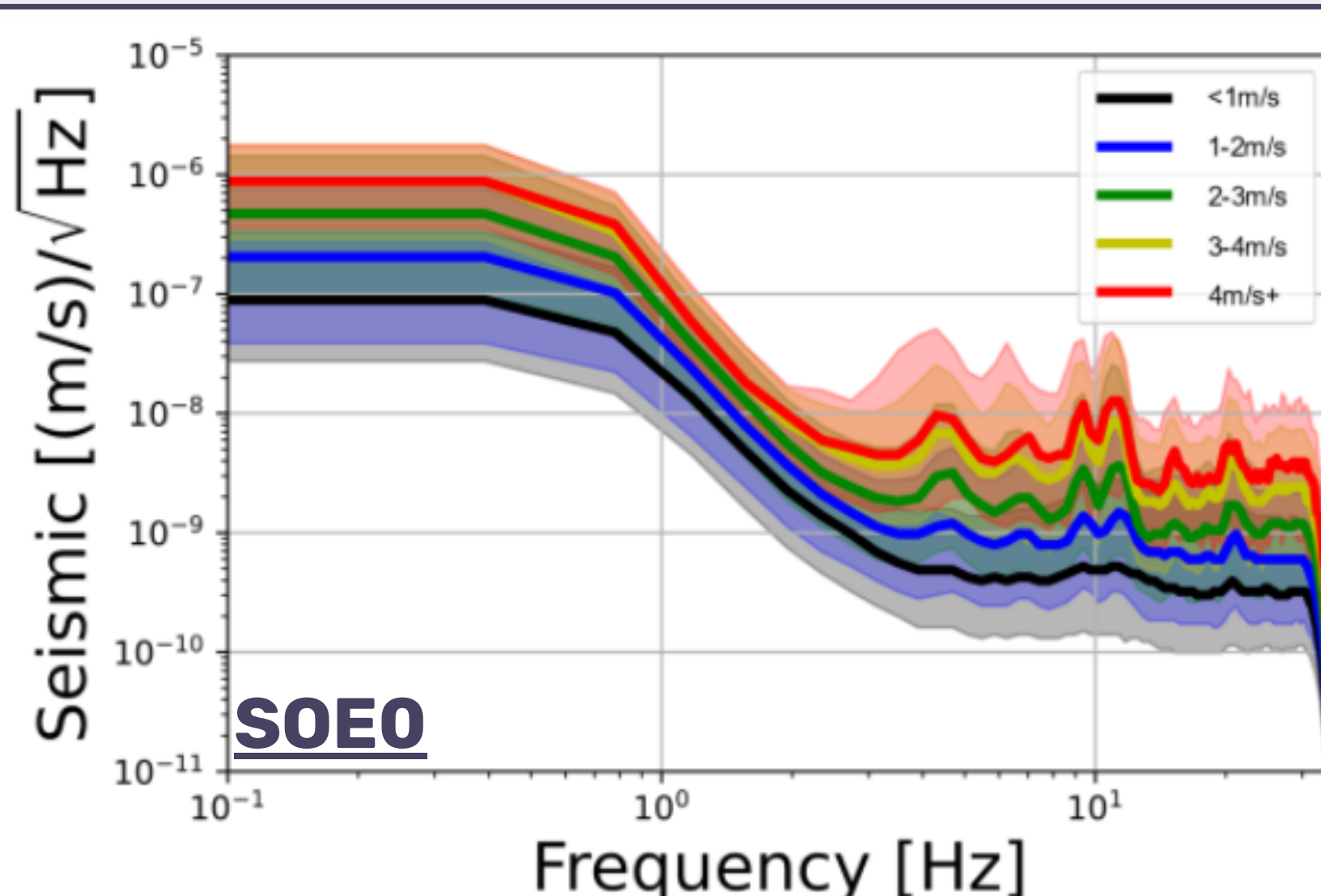
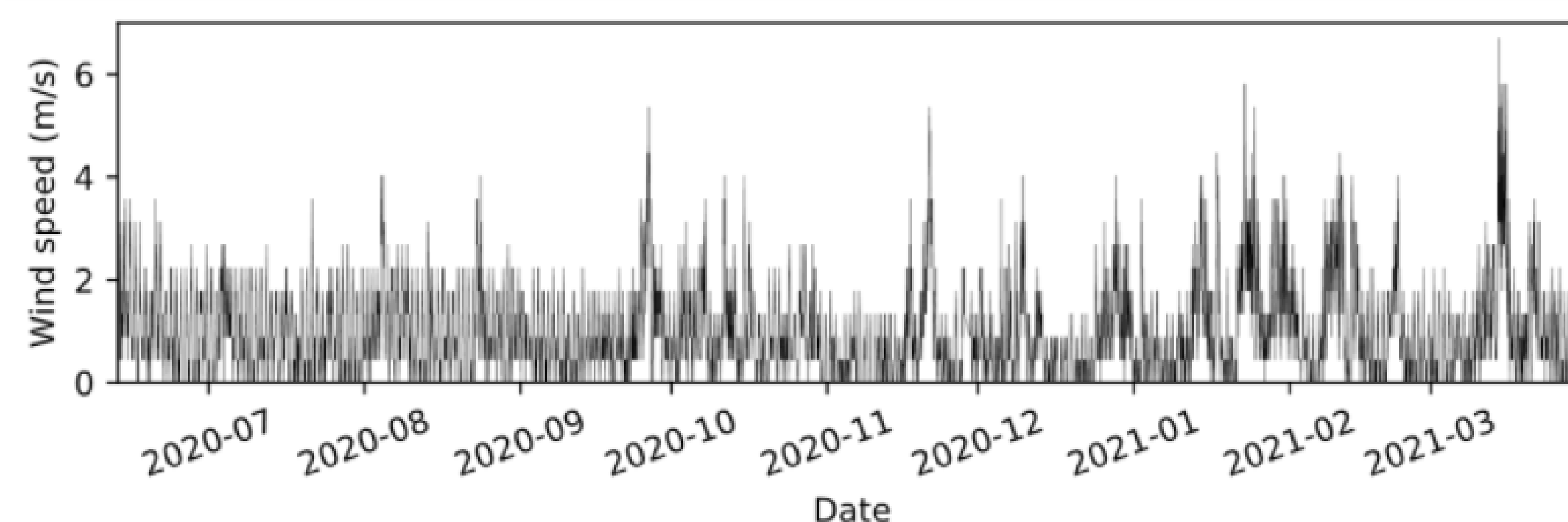
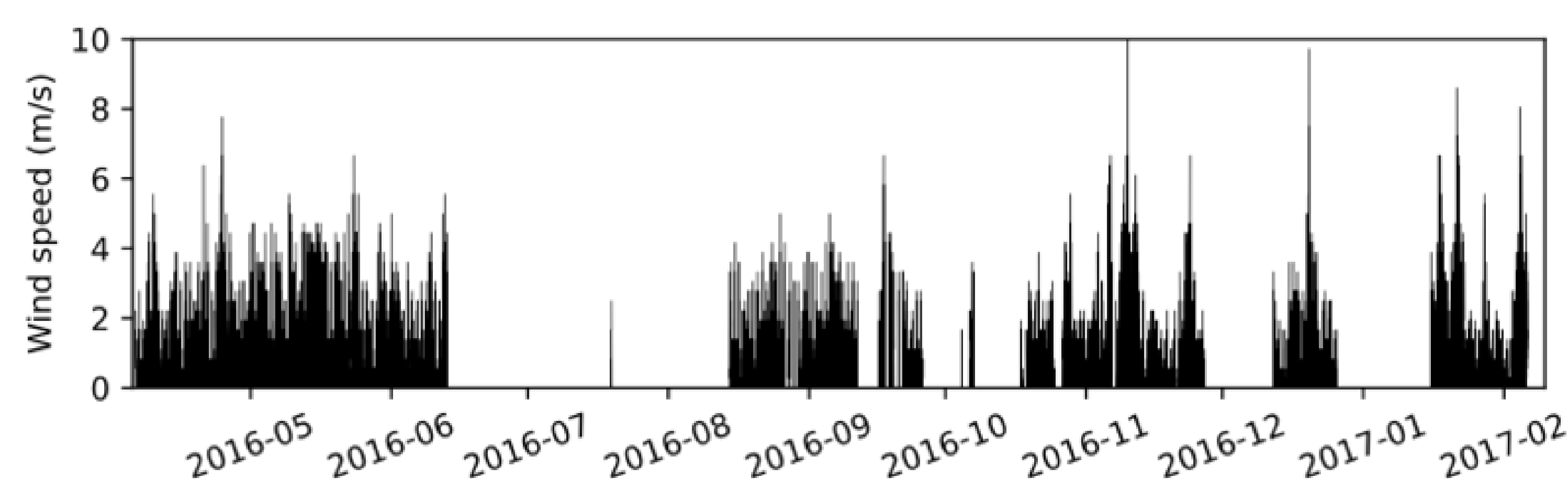
Wind direction



Seasonal variation in wind speed

Wind speeds higher than 4m/s tend to occur more frequently at Sos Enattos during the autumn and winter (mid-September through March) than in spring or summer (See figures to the left).

In the figures in the panel below, probabilistic power spectral densities show that mean power spectral density (PSD) of seismic waveforms in the minute following wind speed measurements. Higher wind speeds result in elevated PSD at the surface (SOE0) across a wide range of frequencies. By 111m deep (SOE2) the difference in PSDs for varied wind speed is significantly reduced, and there is no discernible difference at frequencies above 4-5Hz.



Conclusion

Higher wind speeds result in elevated seismic energy near the surface at Sos Enattos. Higher wind speeds occur more often in autumn and winter. Wind generated seismic noise reduces with depth and frequency.