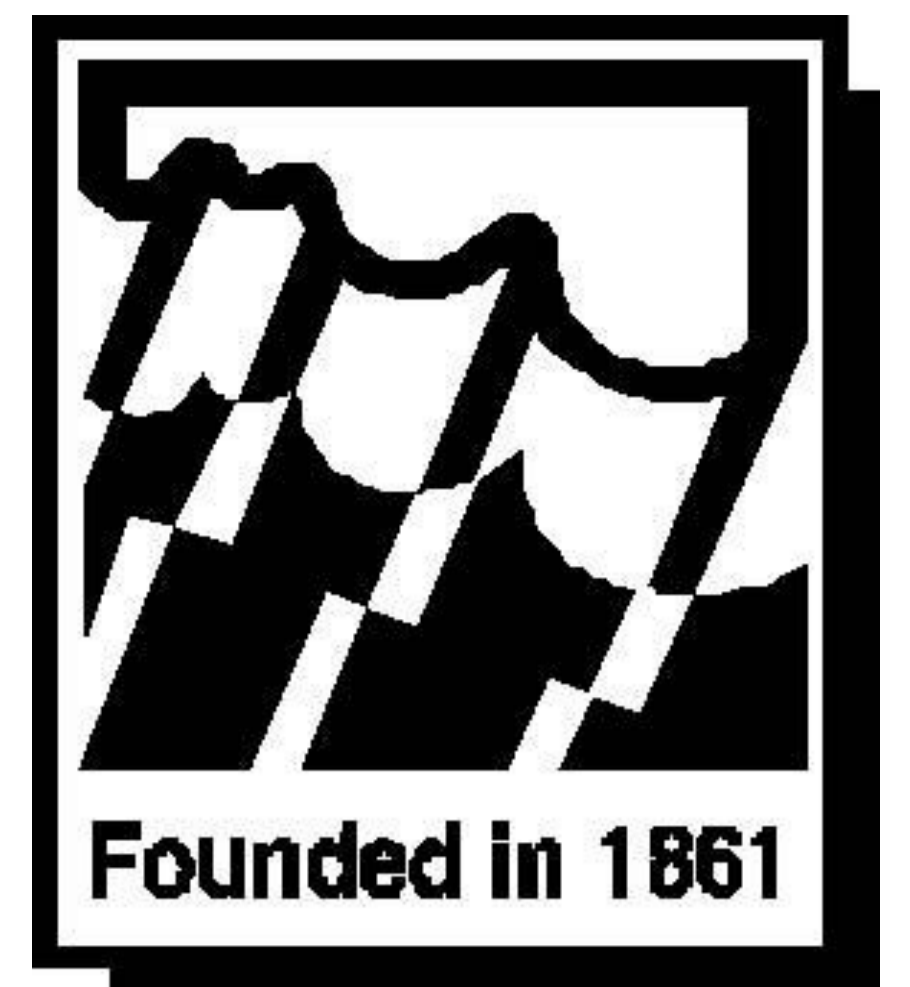# Sensitivitiy of turbulence integral length scales for bora flows on data filtering

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Founded in 1861

Figure 1. Zoomed surrounding area of the new Maslenica bridge, Croatia. Red circle denotes position of the 10-m meteorological tower.

1 Objectives

- to investigate the effect of data filtering on integral scale and Fourier spectrum maximum ratio

2 Introduction

- integral length scale is derived from integral time scale (T) available from measurements
- T – time over which the turbulence remains correlated
- connection between Fourier spectrum maximum (T_m) (Fig. 4) and T is $T_m/T = 2\pi$

3 Method

- 10 m high meteorological tower near Maslenica bridge (Fig. 2)
- Reynolds averaging (30 min intervals)
- high–pass (HP) filtering (30, 25, 20, 15, 10, 5 and 1 min)
- T determined from autocorrelation function as the transition time of 1/e

Figure 2. Left: Photo of assembled tower. Ultrasonic anemometers are mounted at 2, 5 and 10 m levels. Right: A photo of the tower base with solar panels in the foreground. Frontal panel facing SW while back panel faces SE.

4 Results

- HP filtering decreases both integral time scale and the Fourier spectrum maximum
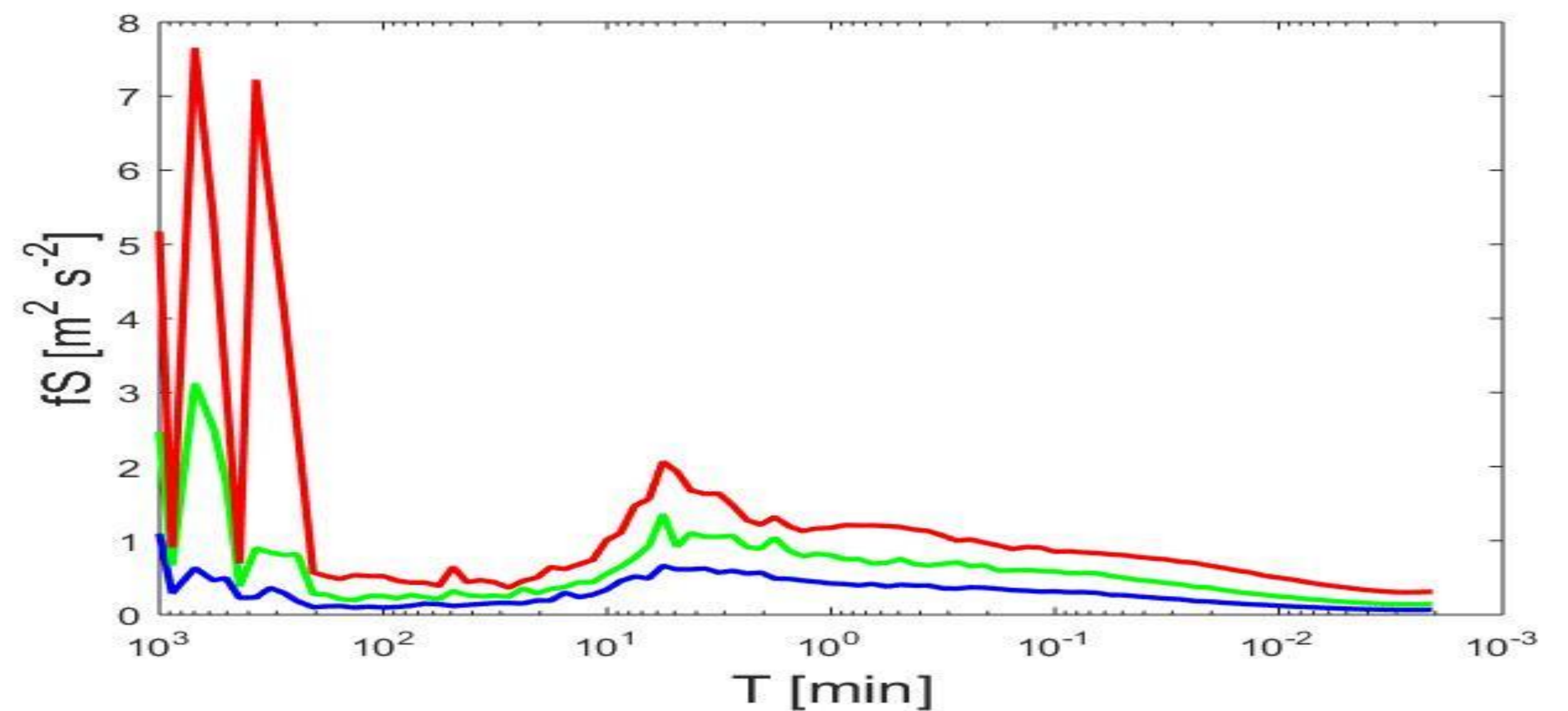

Figure 3: Horizontal wind speed spectrum with mesoscale spectral gap. Green is median, red 75th percentile and blue 25th percentile.
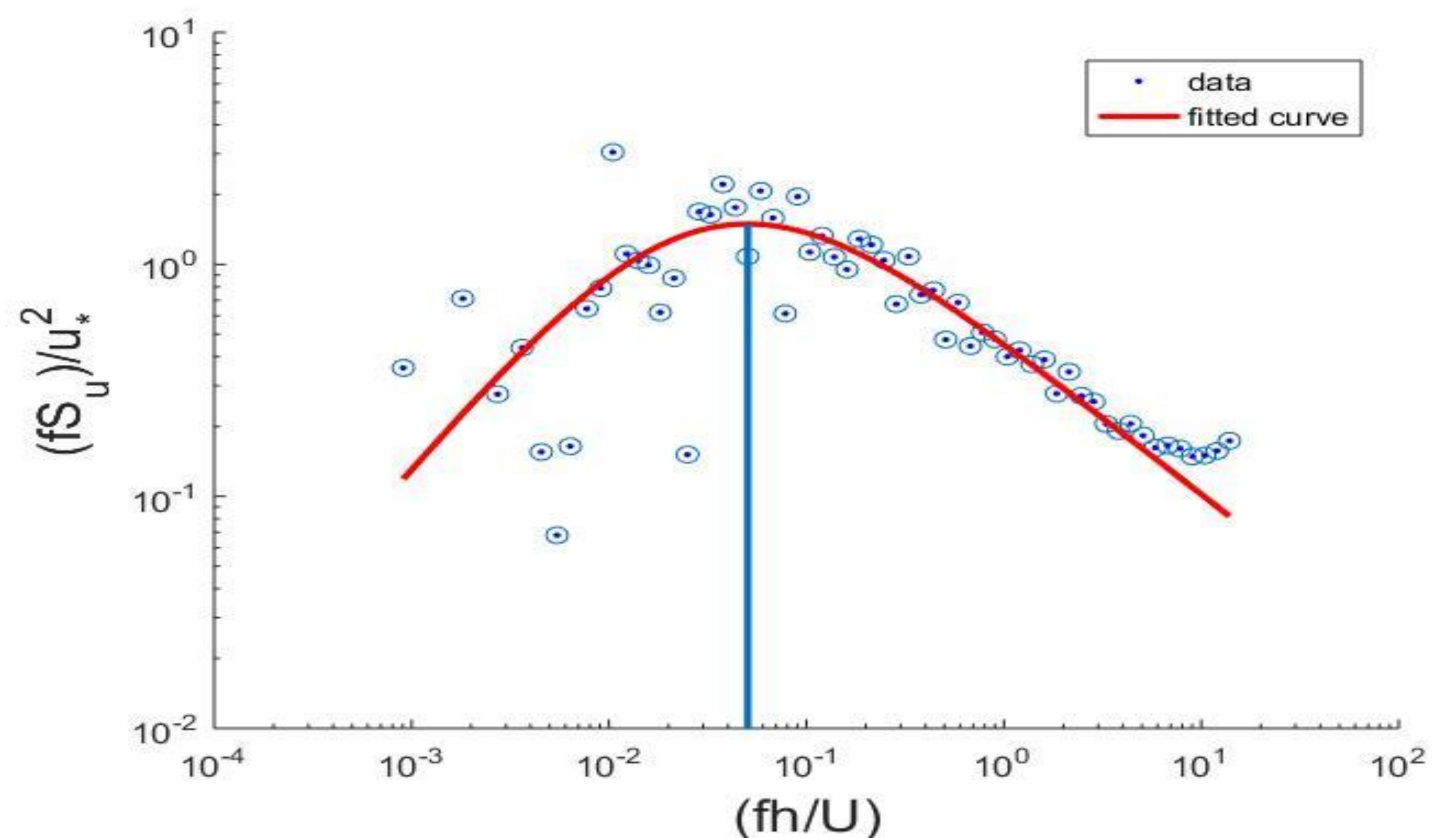

Figure 4: Normalized longitudinal velocity spectrum. Blue line represents maximum. For filtered data, maximum is reached on higher frequencies, which means T_m is decreased.
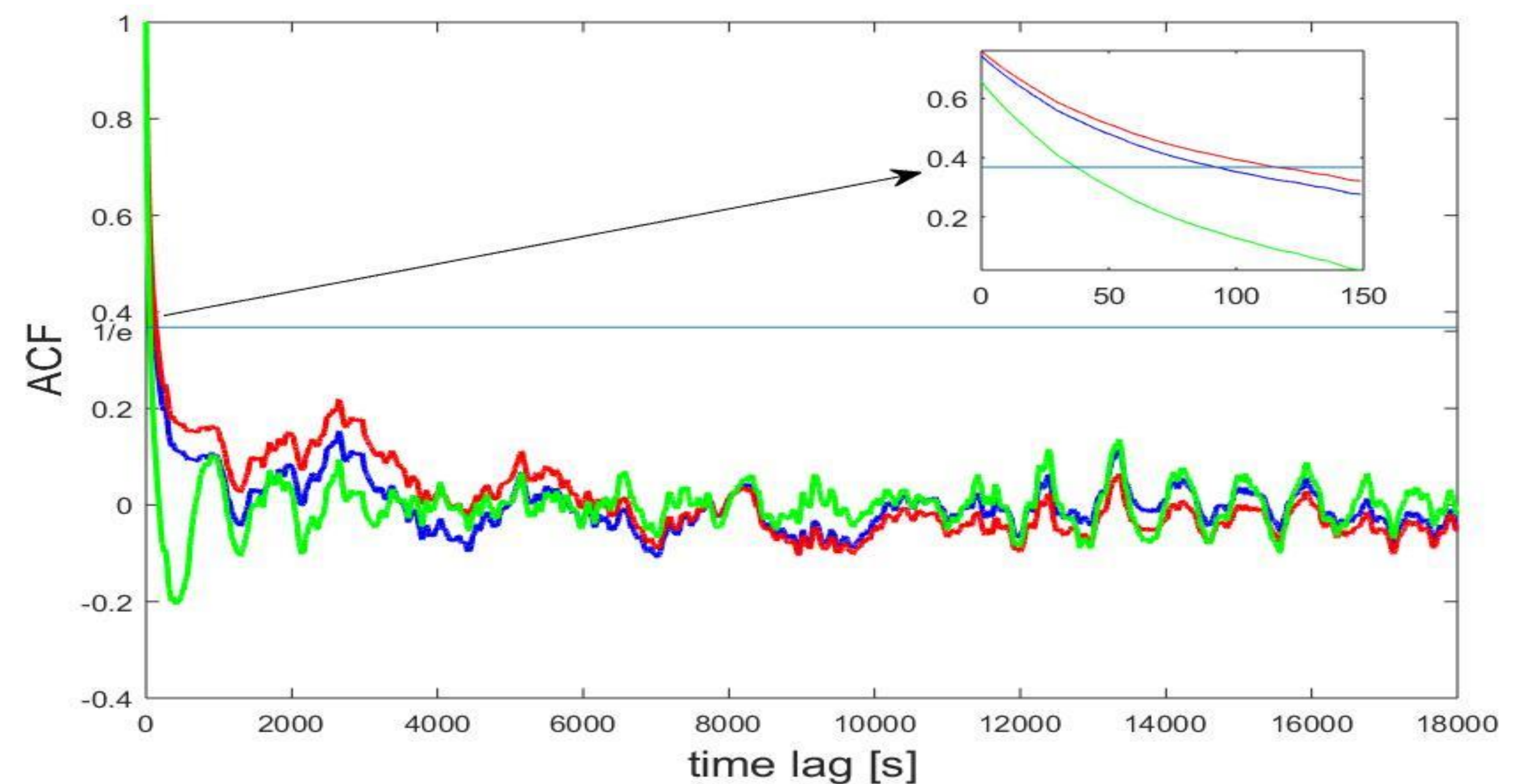

Figure 5: Autocorrelation function, red are raw data, blue 30min filtered data, green 1 min filtered data. Light blue line is showing 1/e. Zoomed graph shows that T is decreased by using HP filter.

This preliminary work shows that both T_m and T are decreased by filtering. Further analysis is planned to examine if their ratio (2π) is preserved.