A screenshot of a computer

Description automatically generated

The result is similar to Stull (1988), durimg the day time, L is negative and night time is positive.

A graph with red dots

Description automatically generated

Fig 1.1 Obukhov length (L) diurnal cycle.

A screenshot of a white background with black text

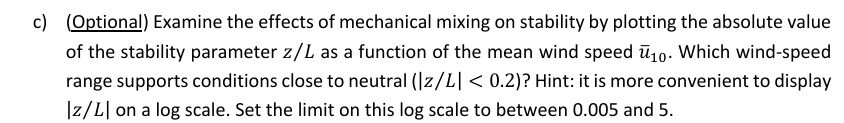
Description automatically generated

Around 6 a.m, the conditions switch from stable to unstable. Around 17.00 the conditions change from unstable to stable. This transition time is around sunrise and sunset. It is similar to the Fbv ig 1.2. It needs to sometime to accumulate the heat after sunrise, which is why the transition from stable to unstable is a little delay than sunrise.

A diagram of a layer of the atmosphere

Description automatically generated

Fig 1.2 daily cycle of the PBL

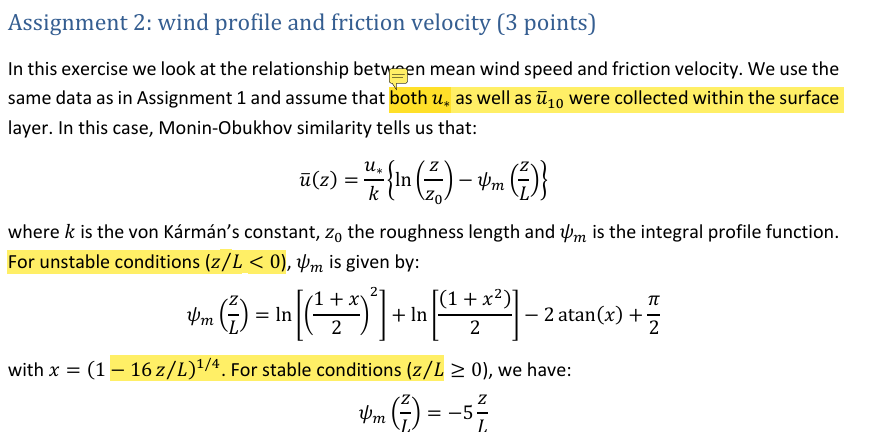


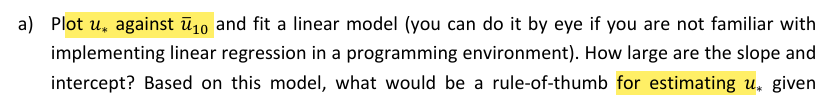
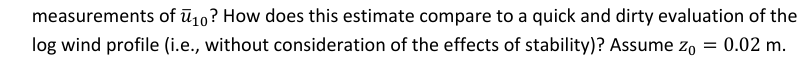
When the mean wind speed is larger than 4.3 m/s, it is neutral condition. When the mean wind speed is between 2.5 m/s and 4.3 m/s, it is could be neutral or unneutral conditions.

A graph with red dots

Description automatically generated

Fig 1.3 Mean wind speed at 10 m against |z/L|





The slope is 0.0802, and the intercept is -0.0691. u\* =0.0802 -0.0691 can be used to estimate friction velocity when the is known. From Fig 2.1 we can see that the modelled u\* is unestimated compared to the u\* obatained by log wind profile.

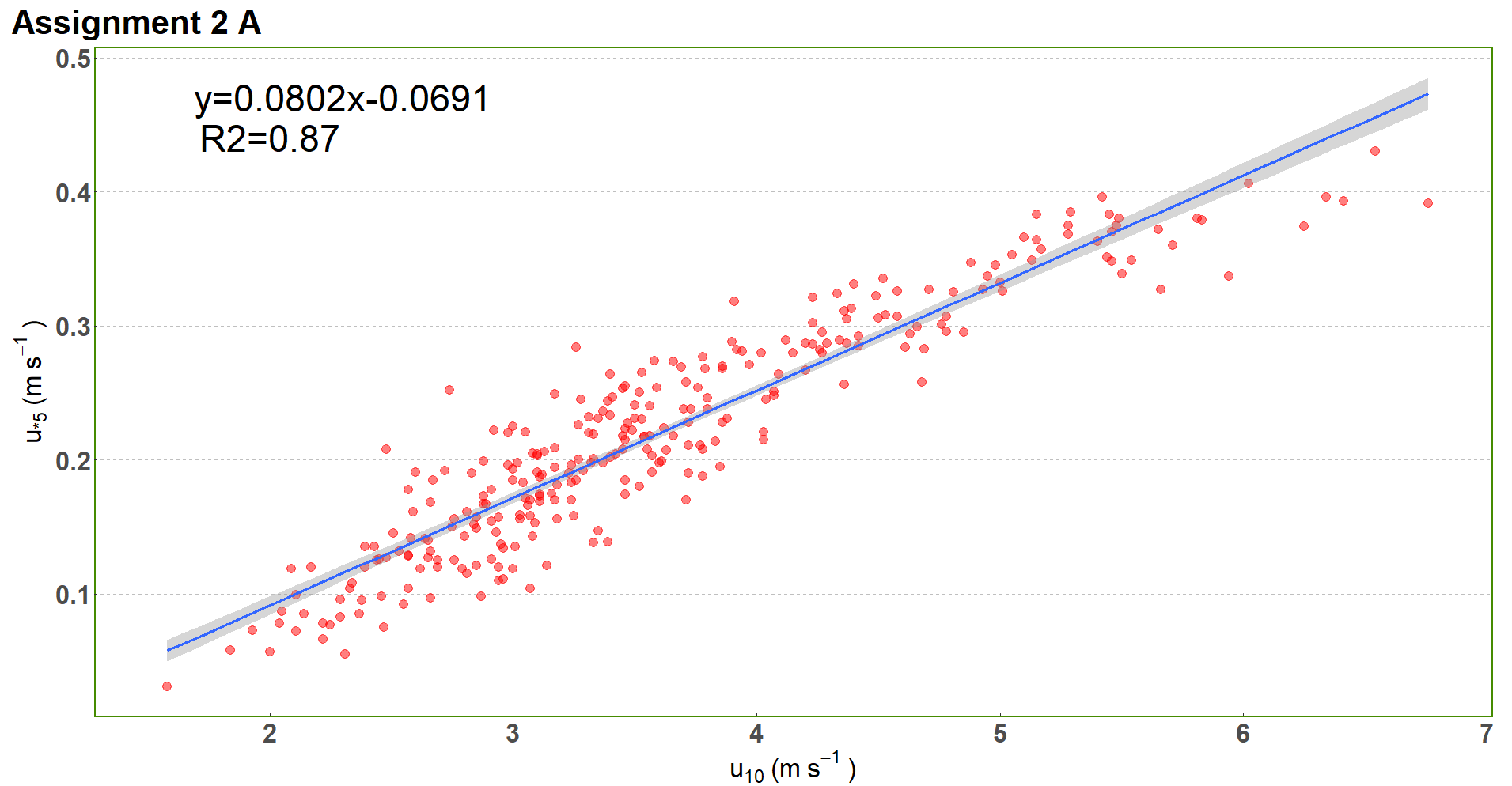


Fig 2.1 means wind speed at 10 meters against friction velocity at 5 meters

A graph with a red line

Description automatically generated

Fig 2.2 Y axis is the u\* at 5 meters based on the model: u\* =0.0802 -0.0691, and x axis is obatained by log wind profile.

When the u\*10 is smaller than 0.2 m/s, which is for stable condition, the data points scatter around the 1:1 line quite wel. However, the u\*10 is overestimated compared to measured friction velocity. This maybe is related to our assumption that the friction velocity is the same at 5 meter and 10 meter in the surface layer?

A math equation with yellow text

Description automatically generated with medium confidence

A graph of a diagram

Description automatically generated with medium confidence

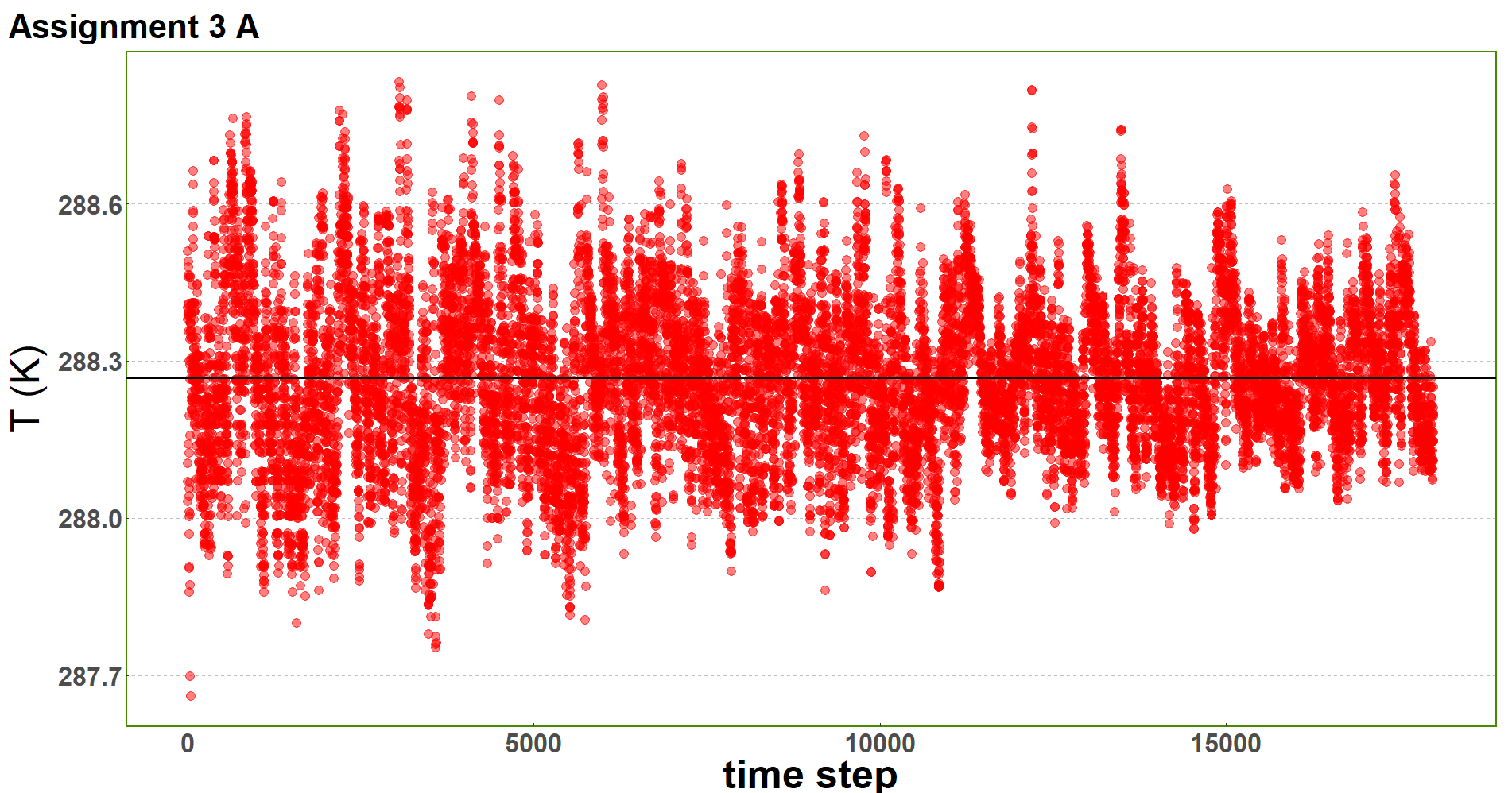
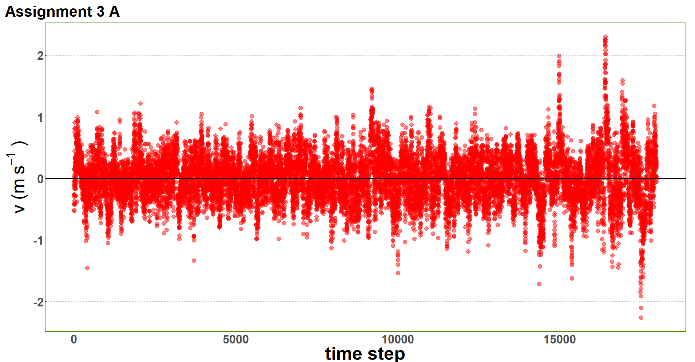
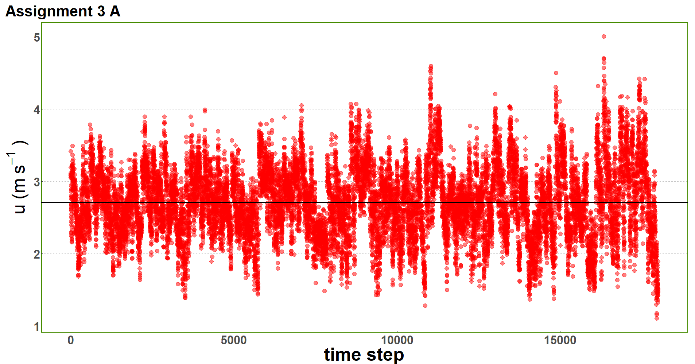
Fig 2.3 Y axis is the u\* at 5 meters measured, and x axis is obatained by a log wind profile considering the stratification conditions.

A screenshot of a computer

Description automatically generated

Fig 3.1 shows the fluctuation of u, w, v, and T time series. The order of magnitude of the fluctuation of each series is around 10-1 m/s or T

Fig 3.1 time series of u, w, v, and T. The black solid line represents the mean value.



(a)

(c)

(b)

(d)

A yellow rectangular sign with black text

Description automatically generated

The relavent numbers are listed in table 3.1. The result verifies that we are in a streamline coordinate and consists with the graphs from a.

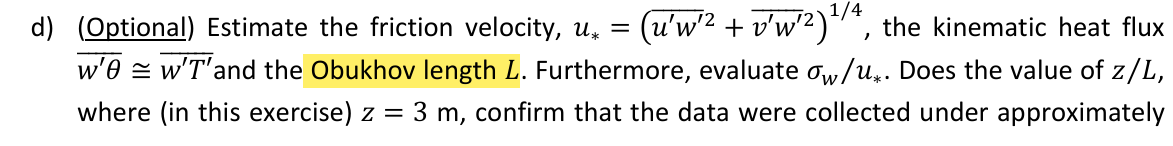
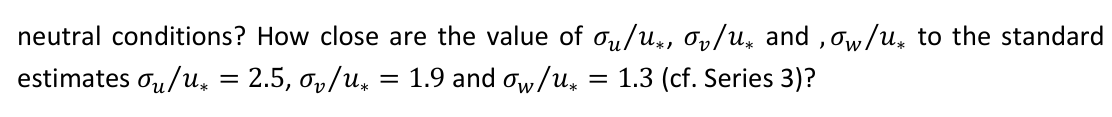
Table 3.1 The mean and standard deviation of the time series

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | u | v | w | T |
| Mean | 2.71 | 0.0005 | 0.0002 | 288.26 |
| Standard deviation | 0.50 | 0.39 | 0.26 | 0.15 |

A close up of text

Description automatically generated

Iu= 0.18, Iv= 0.14, Iw =0.098. TKE = 0.23 m2/s2. The TKE value is consistent with the Fig 6.1 in the lecture note considering the data are from early morning when transition from stable to unstable condition happens.



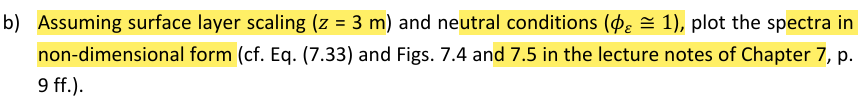
u\* = 0.21, σw/u\* = 1.27, z/L= 0.068, σu/u\*= 2.36, σv/u\*= 1.86. These numbers comfirm that the data were collected under approximately neutral conditions.

A screenshot of a math test

Description automatically generated

Integral\_Su = 0.23, Integral\_Sv = 0.14, Integral\_Sw = 0.068,

In the assignment 3b, σ2u=0.25, σ2v = 0.15, σ2w=0.07, so with 15% of error, we can draw a conclusion that Integral\_Su= σ2u, Integral\_Sw= σ2w, Integral\_Sv= σ2v



The results are shown in Fig4.1, Fig 4.2 and Fig 4.3. The x and y axis are in a logarithmic scale.

A graph showing a red line

Description automatically generated

Fig 4.1 cospectra of S(u) in log scale

A graph with red lines

Description automatically generated

Fig 4.2 cospectra of S(v) in log scale

A red line graph

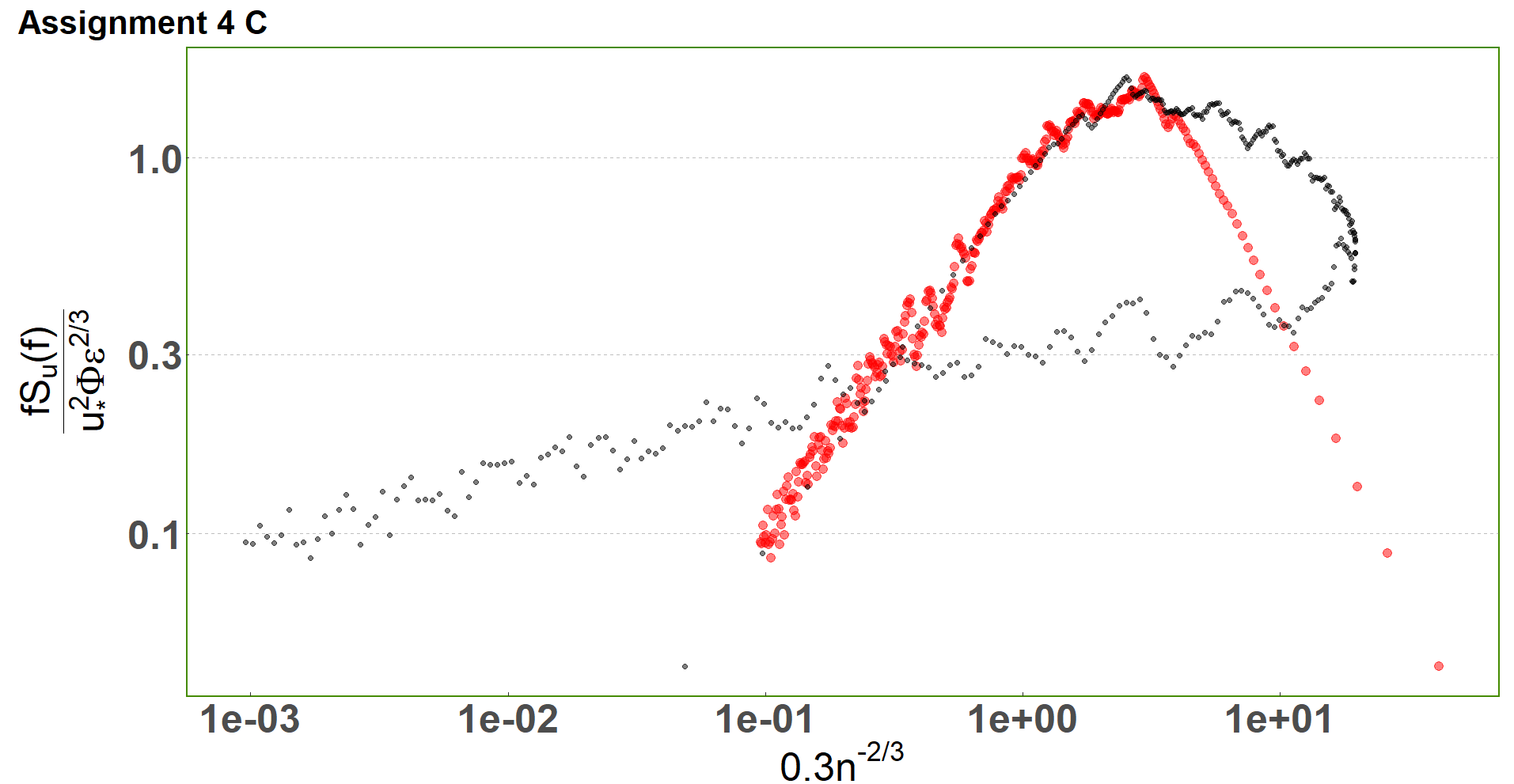
Description automatically generated

Fig 4.3 cospectra of S(w) in log scale

A math equations with numbers

Description automatically generated with medium confidence

Well, I have no cludes on how to arrage these graphs, bu I would say the largest departure is found at the inertial subrange???

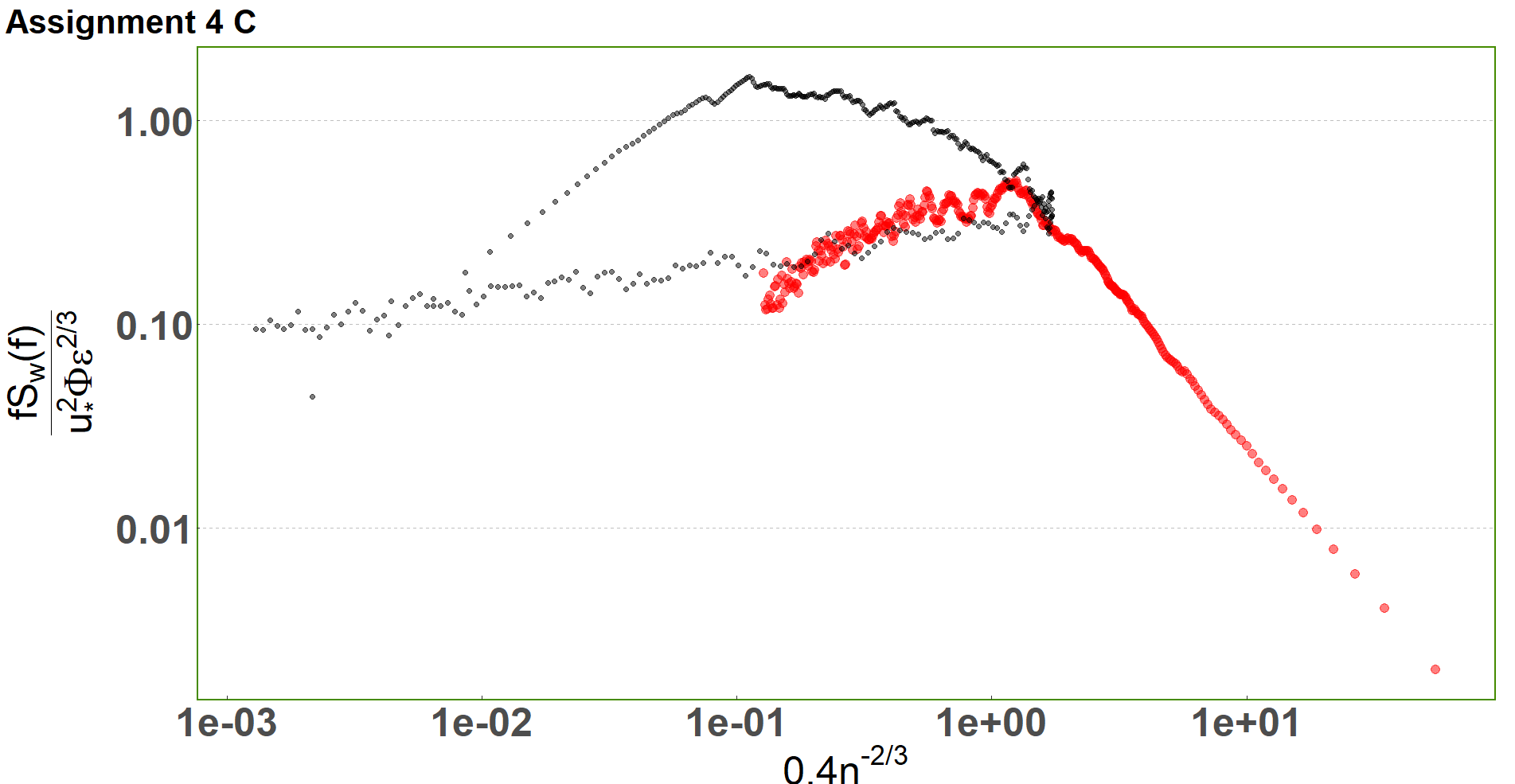


A black line with numbers

Description automatically generatedA graph with red line and black line

Description automatically generated

A black line with numbers

Description automatically generated

A screenshot of a computer

Description automatically generated

Lower limit of the inertial subrange would be 0.27 when n =0.3 if we assume z = 3m, u = 2.71m/s from assignment 3 a

A graph with red and blue dots

Description automatically generated

Sv/Su

Sw/Su

Fig 5.1 Sw,v/Su

A math equations and formulas

Description automatically generated

When n =0.3, f = 0.27, Su(f) = 0.086641, so the dissipation rate is 0.0065

A yellow text on a white background

Description automatically generated



Tau(k) = 0.0484 s , and 𝑓k= 20.64 /s, and the max f in our data is 5 /s, so our data does not extend into dissipation range