Glaciology
EESCGU4220

Practical 1: Data analysis and solving equations in python

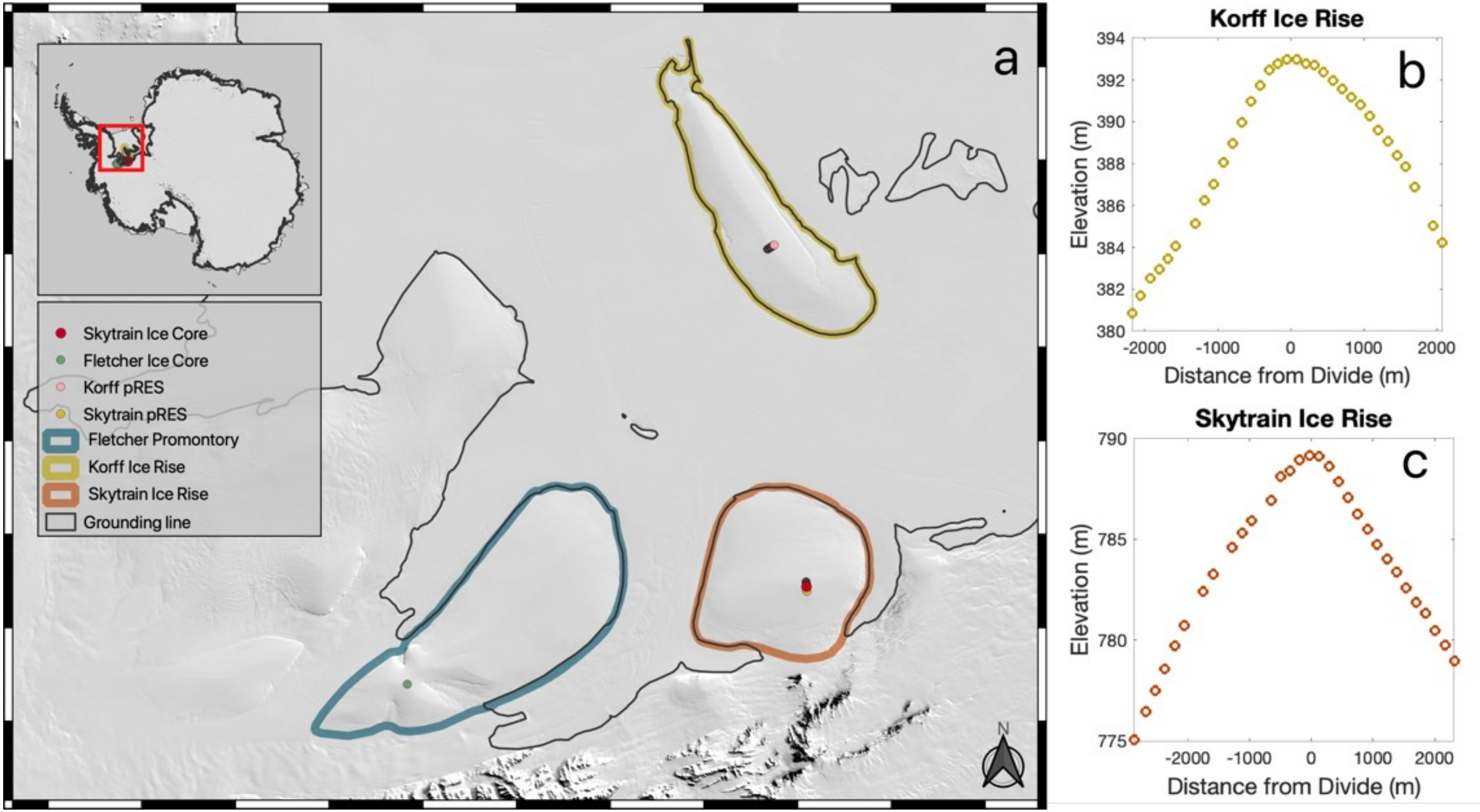
1. Download SIR_density.csv from canvas

2. Put in a folder you want to work in
(call it something like "P1")

3. Open the terminal at that folder and start jupyterlab.

4. Start a new jupyter notebook.

Skytrain Ice Rise, Antarctica



Case and Kingslake, *in review*

(actually a different field site, but the same people with the same equipment)

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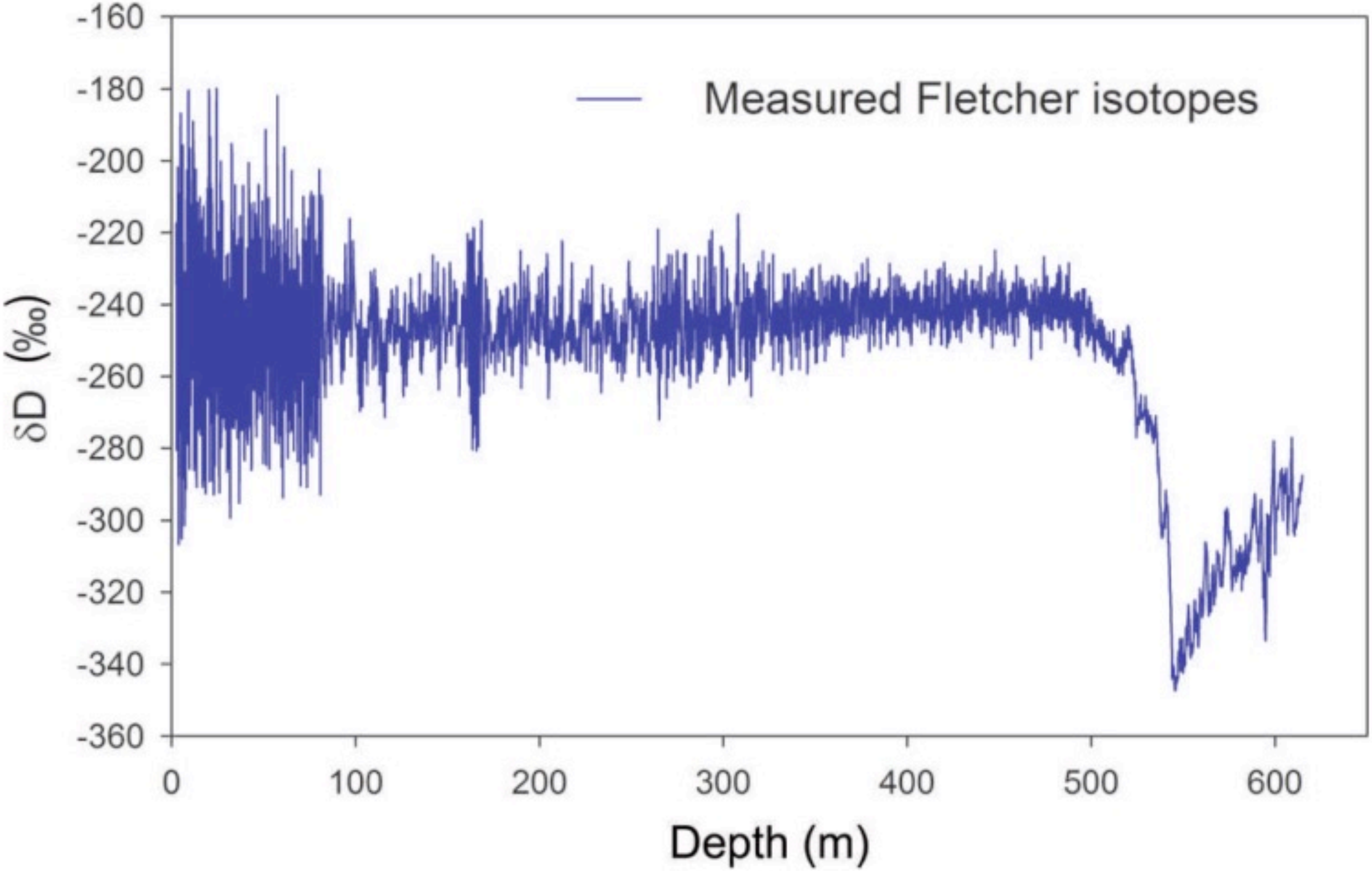


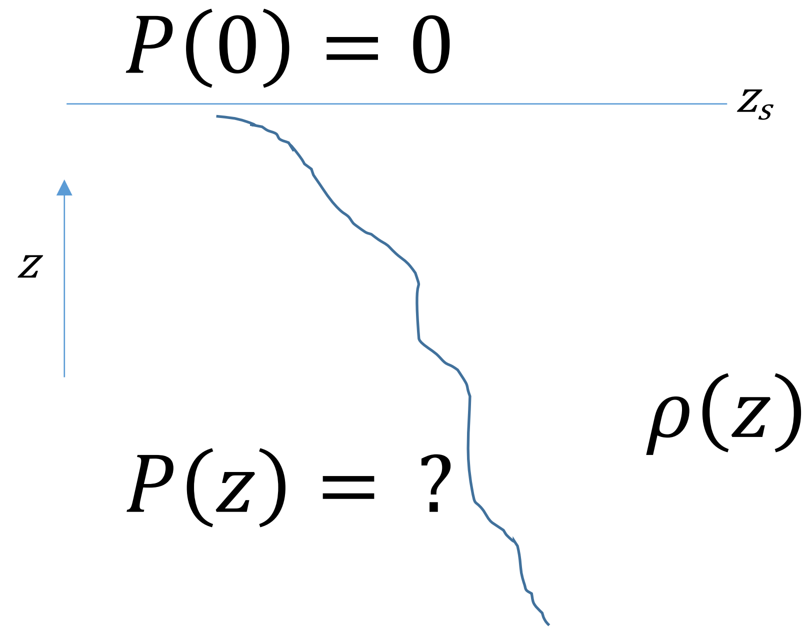
Measured Fletcher isotopes
δD (‰)
-160
-180
-200
-220
-240
-260
-280
-300
-320
-340
-360
0
100
200
300
400
500
600
Depth (m)

Discretization and numerical integration

Integrating the overburden pressure equation

$$\frac{dP}{dz} = -\rho(z)g$$

$$P_2 = P_1 + \Delta z \rho(z) g$$



Getting started

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SIR_density.csv has two columns, the first one is depth from the surface in meters. The second is the density in kg m^{-3}.

Write a python notebook to answer these questions/do these tasks

1. How many data points are there?
2. How deep was the ice core?
3. What is the density at the surface? What is the density at 30 m?
4. Plot density against depth.
5. What is the average density in the top 50 m and in the bottom 200m?
6. Compute and plot pressure as a function of depth *P*(z).
7. Indicate on the plot the approximate pressure a human hand is capable of producing.
8. When computing *P* in ice sheet models they usually use $P = \rho_i g z$ and assume a constant density $\rho_i = 918$ kg/m³.
   How inaccurate is this approximation?
9. How would your answer change if I told you the data do not reach the ice base and the ice is actually 660m thick in this location?

numpy functions and methods I used:

loadtxt

print

shape

interp

<

diff

mean

arange

concatenate

matplotlib functions and methods I used:

Plot

ylabel

Xlabel

Ylim

legend