Week 6 Homework

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Introduction

Today I am going to do my homework with the DepthData from Week 5.

DepthData has:

- Date (YYYY-MM-DD HH:MM:SS)
- Atmospheric Pressure (dbar)
- Depth (meters)

Load Libraries

These are the libraries I needed for this homework assignment.

```
library(tidyverse) #loads a bunch of data-science packages
library(here) #helps to call in data
library(knitr) #lets you run code chunks in Quarto and R Markdown
library(kableExtra) #For kbl() and kable_styling()
```

Read in data

I used the data from Week 5, but I put the data in my *Week 6* folder too. Dr. Nyssa Silbiger from UHM collected this data.

```
Depthdata<-read_csv(here("Week_06","Data","DepthData.csv")) #adding the data in
```

Look at the data

This was to get an idea of the format of the data.

```
glimpse(Depthdata) #look at the structure, types and first few rows of the data table
```

```
Rows: 1,429
Columns: 3
$ date        <dttm> 2021-01-15 09:54:30, 2021-01-15 09:54:40, 2021-01-15 09:5~
$ AbsPressure <dbl> 101.686, 101.617, 101.737, 101.772, 101.617, 102.219, 101.~
$ Depth       <dbl> -0.009, -0.015, -0.003, 0.000, -0.015, 0.044, -0.019, -0.0~
```

Organizing the Data for Data Analysis

For this data, I will summarize the data by minute so there isn't so many data points then
make a table and plot with that.

Rename columns

I wanted to rename the columns of the data set for my table below.

```
RenameDepthdata <- Depthdata %>%
  rename("Date (YYYY-MM-DD HH:MM:SS)" = date, #renaming the date column to have the date layo
         "Atmospheric Pressure (dbar)" = AbsPressure, #writing out the name and adding units
         "Depth (m)" = Depth) #adding units
```

Summarize the Data by Minute

Here I rounded the times to the nearest minute and took the mean there so there wasn't so
many data points.

```
Pressure_summary <- RenameDepthdata %>% #renaming it
  mutate(`Date (YYYY-MM-DD HH:MM:SS)` = ymd_hms(`Date (YYYY-MM-DD HH:MM:SS)`)) %>% # Change
  mutate(`Date (YYYY-MM-DD HH:MM:SS)` = floor_date(`Date (YYYY-MM-DD HH:MM:SS)`, "minute")) 
  group_by(`Date (YYYY-MM-DD HH:MM:SS)`) %>% # Group the data by each rounded mintue
  summarise( # Calculate mean values per minute
    `Atmospheric Pressure (dbar)` = mean(`Atmospheric Pressure (dbar)`),
    `Depth (m)` = mean(`Depth (m)`)
  )
```

Data Analysis

Data Table

Here is how I showed you the data in a table so I didn't have to rewrite each data measurement.

```
Pressure_summary  %>%
  kbl() %>% #making a kable table
  kable_styling(full_width = FALSE) #making the table not take the full width of the page
```

Plot

This is the code for looking at the relationship between **Atmospheric Pressure** and **Depth** over time to make a plot.

```
Pressure_long <- Pressure_summary %>%
  pivot_longer( # Convert to long data
    cols = c(`Atmospheric Pressure (dbar)`, `Depth (m)`), #Columns to change
    names_to = "Variable", #New column name
    values_to = "Value"#New column name
  )

ggplot(Pressure_long, aes(x = `Date (YYYY-MM-DD HH:MM:SS)`, y = Value, color = Variable)) +
  geom_line() + #Plot lines with connecting points
  facet_grid(rows = vars(Variable), scales = "free_y", switch = "y",
             labeller = labeller(Variable = label_wrap_gen(width = 15))) + # Separate graph
  labs(x = "Date", y = NULL, title = "Pressure and Depth Over Time") +  # Remove y-axis label
  theme(
    strip.placement = "outside", #puts the x-axis label outside
    legend.position = "none",  # Remove the legend
    plot.margin = margin(10, 30, 10, 10)) #making sure I can see the whole plot
```

Table 1: All Depth Data

| Date (YYYY-MM-DD HH:MM:SS)	Atmospheric Pressure (dbar)	Depth (m)
2021-01-15 09:54:00	101.6800	-0.0090000
2021-01-15 09:55:00	101.7175	-0.0053333
2021-01-15 09:56:00	104.3137	0.2528333
2021-01-15 09:57:00	104.4945	0.2710000
2021-01-15 09:58:00	104.7212	0.2935000
2021-01-15 09:59:00	104.4398	0.2655000
2021-01-15 10:00:00	104.4177	0.2630000
2021-01-15 10:01:00	104.6320	0.2845000
2021-01-15 10:02:00	104.3595	0.2575000
2021-01-15 10:03:00	104.2732	0.2488333
2021-01-15 10:04:00	104.6378	0.2851667
2021-01-15 10:05:00	104.4455	0.2661667
2021-01-15 10:06:00	104.4027	0.2618333
2021-01-15 10:07:00	104.4707	0.2683333
2021-01-15 10:08:00	104.6033	0.2815000
2021-01-15 10:09:00	104.3993	0.2611667
2021-01-15 10:10:00	104.4223	0.2636667
2021-01-15 10:11:00	104.4997	0.2713333
2021-01-15 10:12:00	104.4567	0.2670000
2021-01-15 10:13:00	104.4855	0.2698333
2021-01-15 10:14:00	104.3950	0.2610000
2021-01-15 10:15:00	104.5200	0.2733333
2021-01-15 10:16:00	104.3992	0.2613333
2021-01-15 10:17:00	104.6002	0.2813333
2021-01-15 10:18:00	104.5055	0.2718333
2021-01-15 10:19:00	104.4968	0.2710000
2021-01-15 10:20:00	104.5532	0.2768333
2021-01-15 10:21:00	104.3903	0.2605000
2021-01-15 10:22:00	104.3243	0.2540000
2021-01-15 10:23:00	104.4507	0.2665000
2021-01-15 10:24:00	104.2610	0.2476667
2021-01-15 10:25:00	104.4813	0.2695000
2021-01-15 10:26:00	104.5625	0.2775000
2021-01-15 10:27:00	104.3157	0.2530000
2021-01-15 10:28:00	104.3815	0.2596667
2021-01-15 10:29:00	104.7147	0.2925000
2021-01-15 10:30:00	104.5740	0.2790000
2021-01-15 10:31:00	104.2955	0.2511667
2021-01-15 10:32:00	104.4130	0.2626667
2021-01-15 10:33:00	104.5137	0.2726667
2021-01-15 10:34:00	104.3847	0.2598333
2021-01-15 10:35:00	104.3418	0.2556667
2021-01-15 10:36:00	104.5365	0.2750000
2021-01-15 10:37:00	104.3870	0.2601667
2021-01-15 10:38:00	104.2492	0.2463333
2021-01-15 10:39:00	104.4747	0.2690000
2021-01-15 10:40:00	104.4615	0.2675000
2021-01-15 10:41:00	104.2318	0.2445000
2021-01-15 10:42:00	104.3957	0.2611667
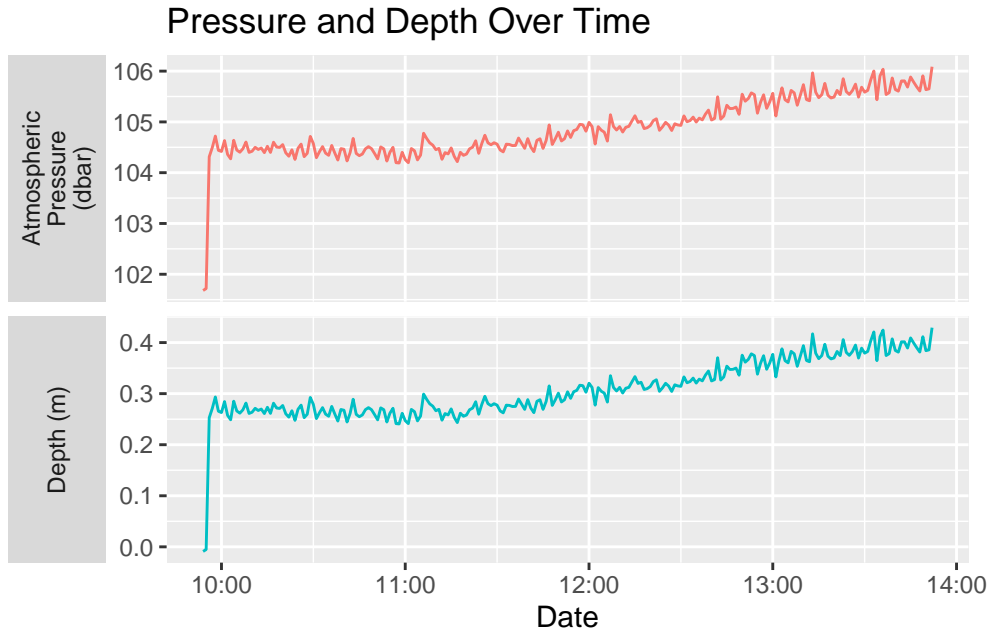
Figure 1: This is a plot of Atmospheric Pressure and Depth over time

Summary: @Pressure-Plot shows that as Depth increases, Atmospheric Pressure generally follows a similar pattern over time.