Visualizing DaRTS CTD data from two cruises

In the previous lesson we considered CTD data from one cruise - what about two cruises?

We will learn how to:

1. Plot profiles of CTD data for multiple cruises and stations.

Loading your data into R

First we want to load the R libraries we'll be using today:

```
library(tidyverse)
```

```
## -- Attaching core tidyverse packages ------------------------ tidyverse 2.0.0 --
## v dplyr     1.1.4     v readr     2.1.5
## v forcats   1.0.0     v stringr   1.5.1
## v ggplot2   3.5.2     v tibble    3.3.0
## v lubridate 1.9.4     v tidyr     1.3.1
## v purrr     1.1.0
## -- Conflicts ------------------------------------------ tidyverse_conflicts() --
## x dplyr::filter() masks stats::filter()
## x dplyr::lag()    masks stats::lag()
## i Use the conflicted package (<http://conflicted.r-lib.org/>) to force all conflicts to become errors
```

This loads all the functions we will need to load and plot our data.

Let's try to read in the file we shared with you. The function to do this is `read.csv`, and we need to provide the name of our data file, including the path to the file if it is in a different location than this markdown file.

Example 1: not including the file path

```
data <- read.csv("DaRTS_TwoCruise_CTDdata.csv", header = TRUE)
```

Example 2: including the path

In the below `"../"` indicates move up one directory

```
data <- read.csv("../DaRTS-data/DaRTS_TwoCruise_CTDdata.csv", header = TRUE)
```

Visualizing Data

Challenge 1: Plot temperature profiles at all stations for both cruises.

Let's think about the different options we could use to plot the data:

1. Plot everything on one graph
2. Plot one graph for each station, and both cruises on each graph
3. Plot one graph for each cruise, and all stations on each graph

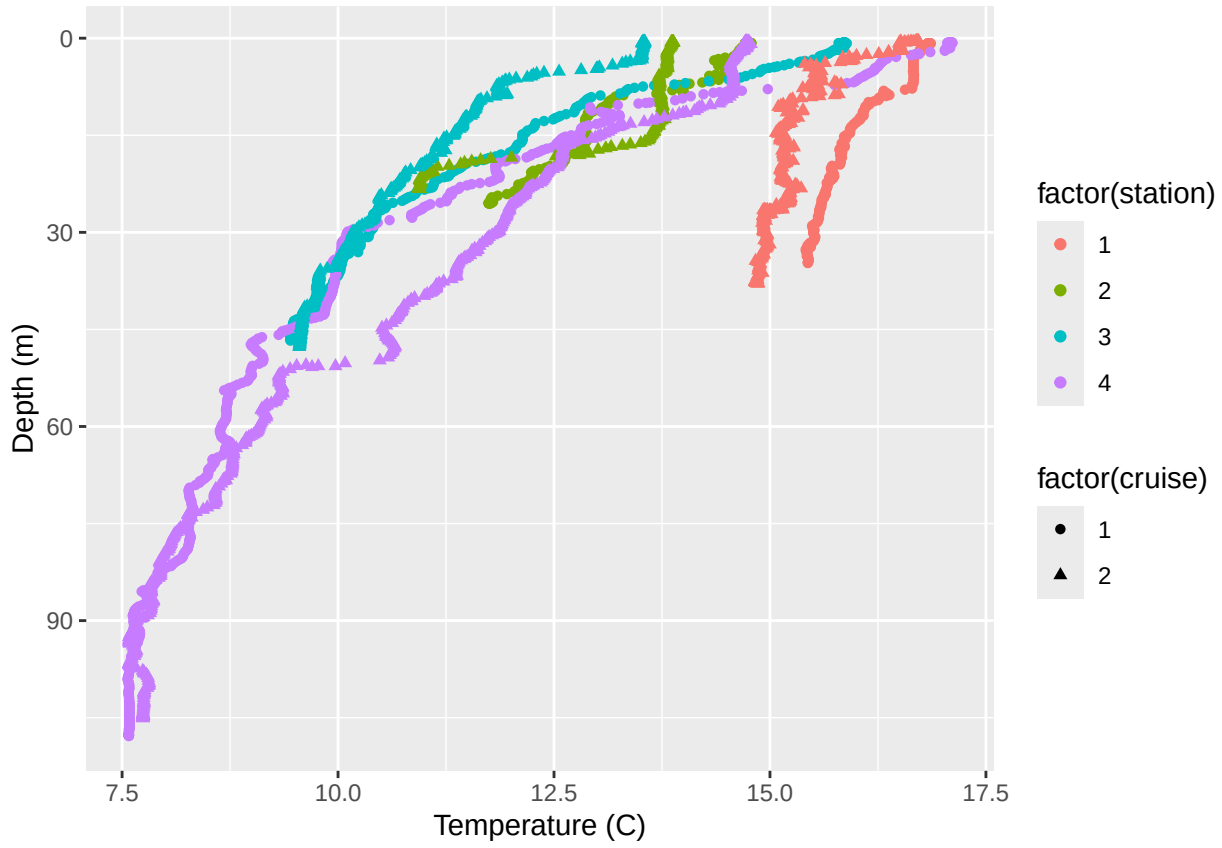
Do we need to do any data wrangling this time? **No!** We need to have access to ALL the stations and cruises.

Plotting

Single plot with everything

Here we could use marker shape to distinguish different cruises and marker color to distinguish different stations. Note to do this, we need to use factors.

```
ggplot(data, aes(x = temp_C, y = depth_m, shape = factor(cruise), colour = factor(station))) +
  geom_point() +
  scale_y_reverse() +
  xlab('Temperature (C)') +
  ylab('Depth (m)')
```



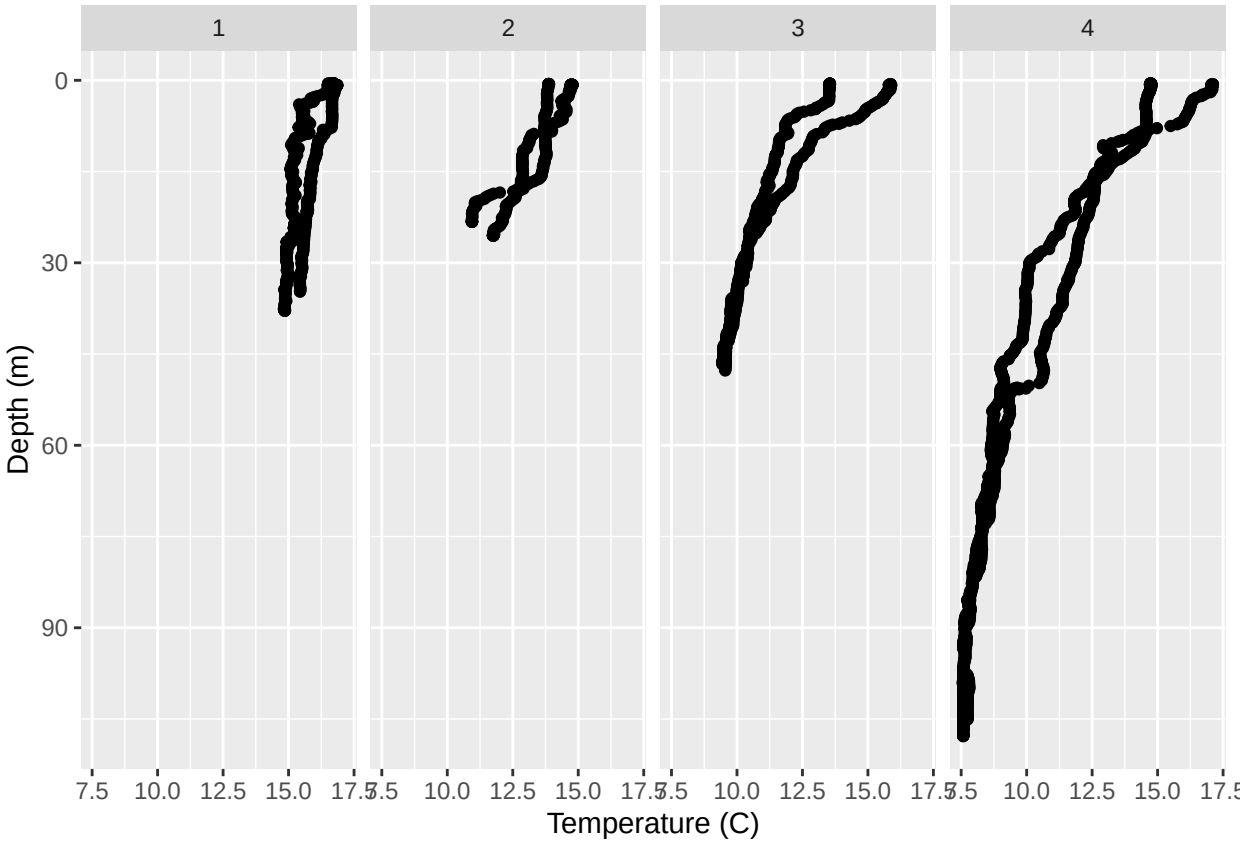
What do we think of this plot?

It's a bit messy and difficult to tell what the different lines are. Maybe one of the other options will be better!

Individual plots for each station

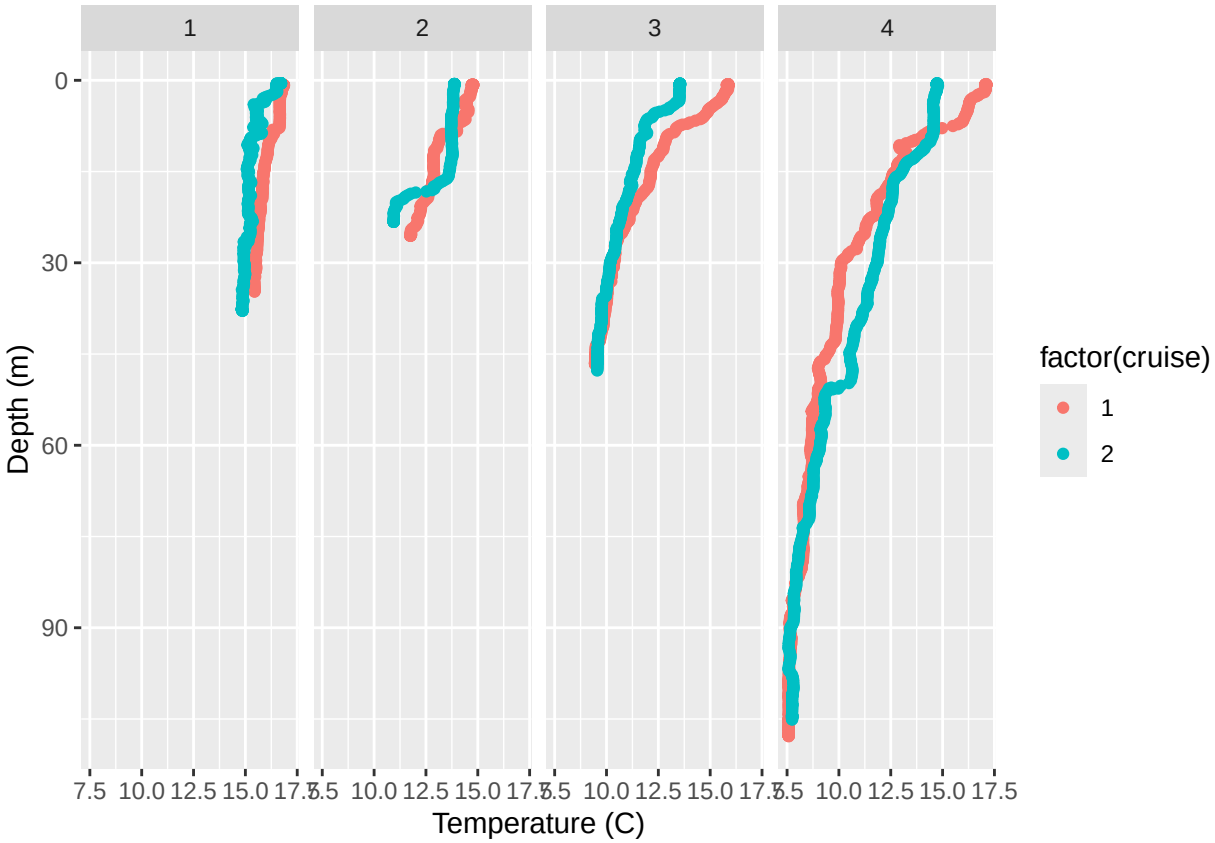
Here, we can use faceting.

```
ggplot(data, aes(x = temp_C, y = depth_m)) +
  geom_point() +
  facet_wrap(~station, ncol = 4) +
  scale_y_reverse() +
  xlab('Temperature (C)') +
  ylab('Depth (m)')
```



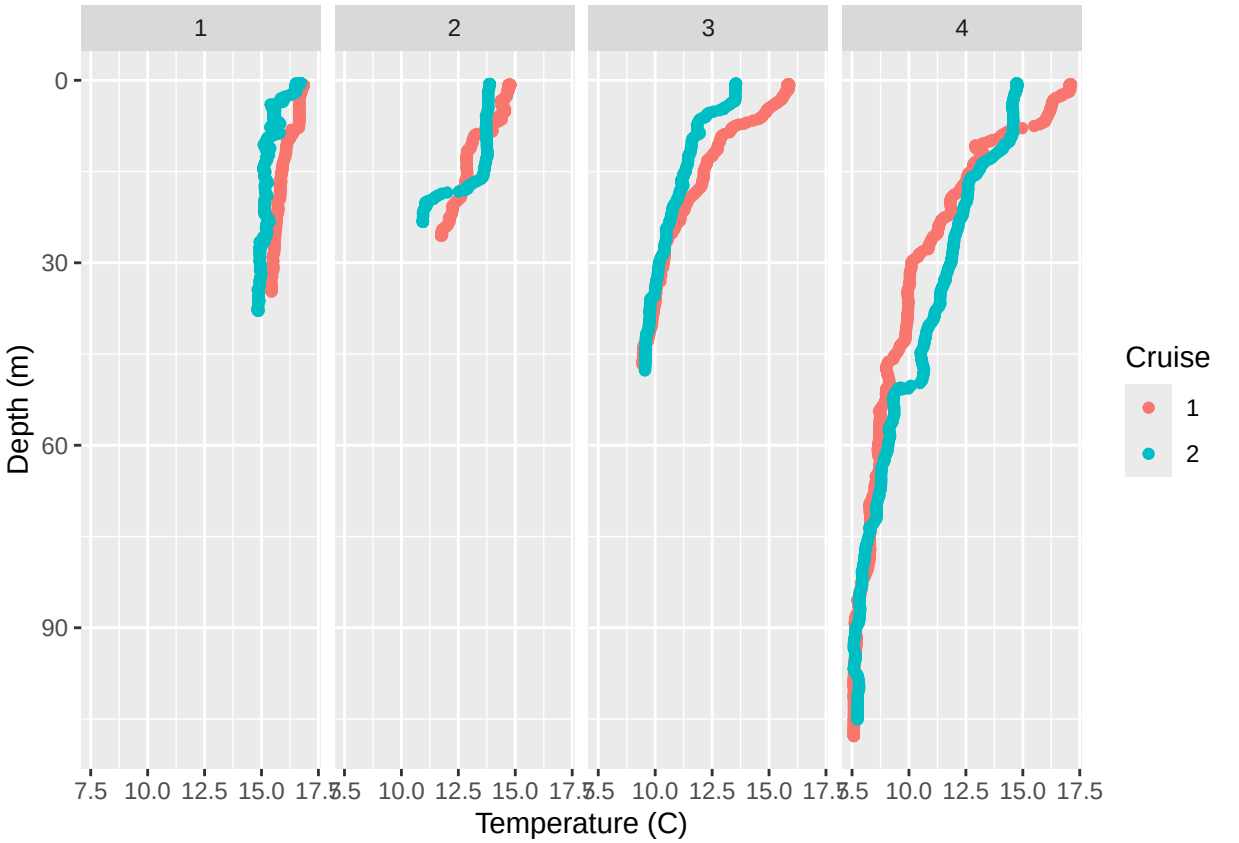
This gives us one plot for each station, but what about plotting each cruise in a different color?

```
ggplot(data, aes(x = temp_C, y = depth_m, colour=factor(cruise))) +
  geom_point() +
  facet_wrap(~station, ncol = 4) +
  scale_y_reverse() +
  xlab('Temperature (C)') +
  ylab('Depth (m)')
```



Finally, let's give the legend title a better name:

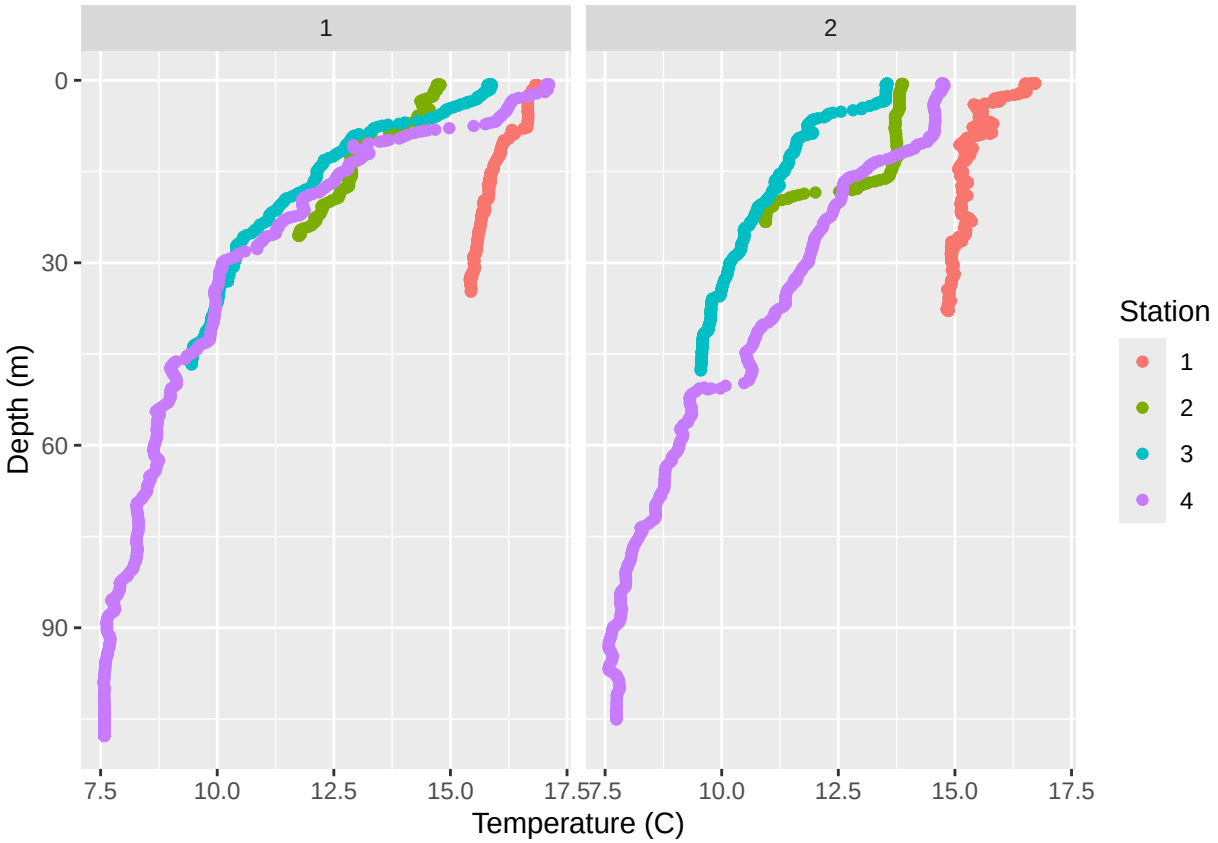
```
ggplot(data, aes(x = temp_C, y = depth_m, colour=factor(cruise))) +
  geom_point() +
  facet_wrap(~station, ncol = 4) +
  scale_y_reverse() +
  xlab('Temperature (C)') +
  ylab('Depth (m)') +
  labs(color="Cruise")
```



Individual plots for each cruise

Here, we can use faceting again. Let's start with the final block of code in the previous section, and adjust it for our needs here:

```
ggplot(data, aes(x = temp_C, y = depth_m, colour=factor(station))) +
  geom_point() +
  facet_wrap(~cruise, ncol = 2) +
  scale_y_reverse() +
  xlab('Temperature (C)') +
  ylab('Depth (m)') +
  labs(color="Station")
```



Which figure is the best? It depends what you are trying to show! The faceted plot with four plots (one per station) is really useful for comparing differences *at* each station *between* cruises, whereas the faceted plot with two plots (one per cruise) is really useful for comparing differences *between* stations for each cruise.

Practice Question

For each of the following variables, make either a four panel facet plot (i.e., one panel per station) OR a two panel facet plot (i.e., one panel per cruise) of profiles: salinity, density, pH profiles, PAR, fluorescence, turbidity and O2 percent saturation.

You can create both sets of facet plots for some (or all!) of the variables.