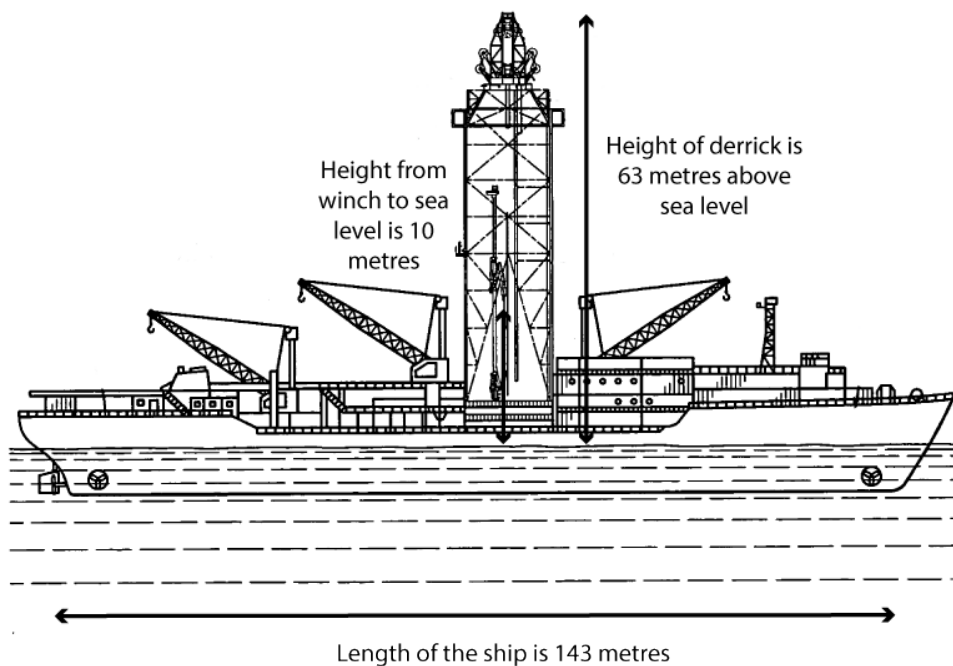


***JOIDES Resolution* downhole logging.**

This worksheet will help you practice your table and graphing skills by using real data from an Antarctic research vessel called the *JOIDES Resolution* (JR). These are the same calculations that scientists need to do.

The JR has a speaker in the water at sea level. It sends out sound waves to the hydrophones which are in the hole drilled below the sea floor. Complete this diagram showing where the sound waves travel:



You need to take the data measured on the JR and process it. This means you have to fill in the blank parts of the table below.

Here are 2 useful things to know first:

1. The wireline depth is the distance from the winch to the hydrophone sea and the depth below the sea floor.
2. The one-way time is the time it takes the sound to travel from sea level to the microphone. It's measured in milliseconds. There are 1000 milliseconds in a second.

To complete the table, you need to:

1. Calculate the **depth below sea level** by taking the wireline depth and subtracting the distance from the winch to the sea and write it in the table for each depth.
2. Convert the one-way time from milliseconds into seconds using the formula  $v = \frac{d}{t}$
3. Calculate the speed using the depth below sea level and the one-way time in seconds.

Wireline Depth (metres)	Depth below sea level (metres)	One-way time (milliseconds)	One-way time (seconds)	Speed (ms-1)
710		460		
780		500		
880		550		
940		580		
1000		610		
1080		640		
1120		660		
1200		700		

Once you have filled in the table,

4. Graph the depth below sea level compared to the speed. What happens to the speed of sound waves deeper under the sea floor?
5. What do you think causes the change in the speed of the sound waves beneath the seafloor? Hint: think about the density.