

SOFAR Student Worksheet

Effects of Temperature on the Speed of Sound

It's a fact of physics that the speed of sound in water decreases as the temperature decreases. So how do you think the change in temperature as you go deeper in the ocean affects the speed of sound? Use Figure 1 or BATS data for temperature at depth in the ocean.

How does temperature vary with depth? Does it change at the same rate the whole way down?

How does sound speed vary with temperature (taking pressure out of the equation)? Refer to Figure 2/BATS profile of sound speed vs. depth (where pressure was disregarded). How similar is this profile of sound speed vs. depth (where pressure was disregarded) to the previous profile of temperature vs. depth?

Do you think temperature is a major factor on the speed of sound in water? _____

Effects of Pressure on the Speed of Sound

Now let's look at how sound speed varies with pressure (taking temperature out of the equation). Refer to Figure 3/BATS profile of sound speed vs. depth (where temperature is disregarded).

What is the relationship between pressure and the speed of sound in the water?

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Effects of Both Temperature & Pressure on the Speed of Sound

Now let's examine a sound-speed profile when both pressure and temperature are considered. The speed of sound in water depends on both temperature and pressure. Refer to Figure 4/BATS data.

Describe how changes in temperature and pressure (due to going deeper in the ocean) each affect the speed of sound.

Find the region where the speed of sound is at a minimum. At what depth is this sound speed minimum found?

SOFAR Channel

Sound waves bend towards a region of minimum sound velocity due to refraction. Thus a sound channel forms where the speed of sound is at a minimum in the ocean. This is the "SOFAR" channel. "SOFAR" stands for SOund Fixing And Ranging.

What ways can you think of to use an underwater sound channel? List possible ways both people and animals might use the SOFAR channel.
