

CoCoRaHS in the Cold – Measuring in Snowy Weather

Winter measurements are a little bit harder and take more time, but they are well worth it. Users of the CoCoRaHS data are just as interested in the variations of snowfall as they are with rain and hail. The water supply that we get from melted snow is just as important as what we get from rainfall.

Snow measuring tools

A **snowboard** is a plywood or wafer board $\frac{1}{2}$ to $\frac{3}{4}$ of an inch thick, cut into a 16" X 16" square and painted white. Using a snowboard for measuring snowfall is a huge help. It is the best and most accurate way to measure snow, provided it is installed and maintained correctly. For measuring the liquid content of snow, the four inch CoCoRaHS rain gauge will be used. But it does require extra care. The inner tube and funnel must be removed and brought inside when temperatures will go below freezing. The gauge works well for moderate snowfall amounts up to about 6 or 8 inches, if the winds are light. In windy locations, or in very deep snowfall, special instructions may be necessary. Also, if wet snow builds up on the rim of the gauge, it will affect the accuracy of your measurements.

Types of Snowfall Measurements

There are four types of snowfall measurements that you can take during the winter. From easiest to most difficult, they are:

1. **Snowfall Only**: this is the measurement of snowfall accumulation with a standard ruler on a snowboard or equivalent surface.
2. **Total Snow Depth**: this is the measurement of the total amount of snowfall that is on the ground at your location, this includes new snow that fell and old snow that was already there.
3. **Liquid Equivalent of Snowfall**: this is the snow that falls into your rain gauge and you melt it down
4. **Snowfall Core Sample**: this is taking a sample of snow from the snowboard with the gauge in a "core sample" and melting the snow down.

You may choose not to perform all of these measurements. Any data you can and are willing to provide is useful. Taking the first two measurements is very easy, and you may have done such observations many times in the past.

Snowfall Only Measurement For this, you need a snowboard and a standard ruler. If the snow is very deep, a yardstick might be the better tool. If you do not have a snowboard, there are many other ways to measure snow. Try to find something that would be comparable to a snowboard. One of the most common surfaces used is a deck or other flat wooden surface. However, you must be careful when using a deck to measure snow. Most decks are close to the house, which could block the falling snow, or cause the wind to whip in different directions and create drifts or bare spots. To eliminate this, your ideal

measurement spot will be 2x the height of your house away from your house and at ground level. Avoid tall trees if possible. If you do not have a snowboard, and your deck is too close to the house, the last place is a piece of flat and level ground, away from obstacles like trees and buildings.

Snowfall measurement is done with a ruler. Official snowfall measurements are in tenths of an inch, but most rulers are calibrated in 1/8th or 1/16th of an inch increments. Just enter what you can. Here is a simple conversion chart:

Measurement on ruler	Measurement in tenths of an inch
3/4 th	0.8
1/2	0.5
1/4 th	0.3
1/8 th	0.1
1/16 th	0.1
Less than 1/16 th	Trace

Less than 0.1 inches of snowfall is considered a Trace of snow. Snow that falls and melts as it hits the measuring surface is considered a trace.

One of the difficulties with accurate and consistent snowfall measurements is related to the melting, settling, or the evaporation of snow before you have a chance to measure it. Please try to do a measurement in close in time to when the storm ends as possible. Don't wait until 7 AM if the storm ended mid-day on the previous day. During a long duration snowfall, you might want to choose to measure and clear the snowboard every six hours. The total snowfall for the storm would be the sum of the different measurements.

One of the most common difficulties that you will encounter when measuring snowfall here is the fact that snow is almost always accompanied by wind. This will commonly produce drifting. Do not measure a snow drift and report this as the snowfall! If you wish to note how deep drifts are, you may do so in the optional notes section. The correct way to measure snow when it is windy is to take several measurements from areas that you consider to be an accurate representation of what fell. Take these measurements and average them to get a more accurate measurement.

Total Snow Depth: For this, you will need a standard ruler or yardstick. The total snow depth is simply a measurement of how much snow is on the ground at your location, both new and old. Here again, it is important to not measure a drift and report this as the snow depth. You want a snow depth that is representative of the location. If there is no snow on the ground except for some left over piles, this is a snow depth of 0 inches. Snow depth is always reported to the nearest *whole inch*. This means you must round up or down accordingly. There is no such thing as a snow depth of 3.8 inches, this

would be rounded up to 4 inches. If your snow depth is less than 1 inch, but you would consider it to be a little greater than zero, you can report a snow depth of trace.

Liquid Equivalent of Snowfall: Always make sure that you have removed your inner funnel and tube in the winter time! Snow that falls into your outer cylinder of the rain gauge can be melted down to obtain the liquid equivalent of the snowfall. When you have melted the snow and ice, you can then use your funnel to pour it into the tube. When you have poured it into the tube, you can then measure it like you would measure rainfall.

There are two ways to melt the snow:

1. Using your inner tube, measure out a certain amount of hot water, say in this case 0.25 inches. **Be sure to record how much hot water you have in the tube** Pour the hot water from the inner tube into the snow filled outer cylinder, and swish it together until it is all melted. Pour this liquid back into the inner tube, using the funnel to help avoiding spillage. Now see how much total liquid is in the tube. From this total, subtract the amount of hot water you added. The number you come up with will be the liquid equivalent of the snow. Say that in this example, you added 0.25 inches of hot water and melted the snow. When you measured the total liquid, there was 0.38 inches in the tube. You would then subtract the 0.25 inches you added, to come up with a total of 0.13 inches of liquid equivalent for the snowfall.
2. Another way to measure the snow is to place the snow filled inner cylinder into a sink or tub filled with hot water. **Be sure that the cylinder does not tip over and fill with hot water!** After several minutes, the snow will begin to melt as the inner cylinder heats up through contact with the hot water. Pour the melted snow into your inner tube, using the funnel to prevent spillage. Measure the amount in the inner tube as you would any rainfall measurement. This method takes longer than the first method, but has the advantage of not contaminating the sample with hot water.

Snowfall Core Sample: This type of measurement is usually done as a last resort, and usually when the snow that has fallen into the gauge is not representative of the actual snowfall. This is done by taking the outer cylinder of your rain gauge and placing it upside down on the snowboard, pushing it down until the rim of the gauge is at the snowboard surface (like a cookie cutter). Turn the snowboard upside down as you slide the gauge off to the side, keeping the core sample of snow in the gauge. Melt and measure the snow core and record the liquid equivalent. Obviously, you must take a snowfall measurement prior to taking a core sample, because you must disrupt the snowboard to take the sample.