

## Recommendations from HarmoSnow field campaigns

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### HarmoSnow field campaigns

1<sup>st</sup> field campaign: Erzurum, Turkey, 29.2-3.3.2016

2<sup>nd</sup> field campaign: Reykjavik, Iceland, 28.2-3.2.2017

3<sup>rd</sup> field campaign: Sodankylä, Finland, 20-22.2.2018

The following general recommendations are based on the observations and expertise gathered during all the above detailed HarmoSnow field campaigns. As general guidelines it can be noted again that in order to get accurate measurement with all SWE samplers, it is important that observers carefully follow the measurement protocol: inserting the cylinder or tube vertically into the snow surface, cleaning the cylinder or tube before using it again, and using scales well adapted to the shape and characteristics of the cylinder or tube. In order to avoid erroneous measurements, the observer must confirm that the excavated snow core corresponds approximately to the sampled snow depth and that no snow falls out from the snow tube during its removal. Special care must be taken to avoid getting extra snow inside the sampler during measurements in deeper snowpacks when measurements are made with a short cylinder or tube. Using a cylinder or tube longer than the maximum snow depth is recommended. The transparent plastic samplers are easier to fully empty than the not transparent ones. In addition, to achieve reliable results, it is recommended that observers use scales with a high precision and accuracy, and which work in a weight range suitable for the sampler used. Seasonal checks of weight repeatability in cold weather conditions are important, especially for electronic scales, which tend to give floating weight results with changing temperature. In addition, seasonal calibration of mechanical scales is recommended.

In the HarmoSnow field campaigns, samplers requiring a snow pit were not notably slower to use than the other samplers. However, the situation is different in deep snowpack or snow course measurements when measurements are repeated. Here, it is recommended to use snow tubes instead of cylinders. Under certain terrain conditions with a very irregular ground surface, or where the perception of reaching the ground is complicated by the existence of moss or shrub vegetation, a muddy ground surface, etc., the error in estimating snow depth could be comparable to the error associated with snow density and SWE sampling. In such cases it is recommended that rods with a sharp tip (e.g. avalanche rod) are avoided, as they might penetrate the ground and overestimate the snow depth.

Most of the tested samplers are designed for certain environments, and using them in different environments or under specific snow conditions could be more difficult and more time consuming. The 1<sup>st</sup> HarmoSnow field campaign showed that samplers that are made of dark material or difficult to clean are not suitable for sunny, wet-snow conditions, whereas the sharp edge of the tube is useful for penetrating hard layers. The 2<sup>nd</sup> field campaign confirmed that cutting teeth are important for penetrating hard crusts or layers formed by wind. The 3<sup>rd</sup> HarmoSnow campaign showed that samplers with a larger diameter are better suited than narrow cylinders or tubes for taiga snowpack. Using different SWE tubes during the same field campaign, or changing of instrument along the snow season may introduce inhomogeneity in the dataset that may affect subsequent spatial and temporal analyses. When choosing a sampler, the above points should be taken into account while also considering the anticipated snow conditions.