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Manual measurement of snow water equivalent

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National foreword

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English Version

Manual measurement of snow water equivalent

Mesure manuelle de l'équivalent en eau de la neige

Manuelle Messung des Schneewasseräquivalents

This Technical Report was approved by CEN on 3 September 2013. It has been drawn up by the Technical Committee CEN/TC 318.

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Foreword

This document (CEN/TR 16588:2014) has been prepared by Technical Committee CEN/TC 318 “Hydrometry”, the secretariat of which is held by BSI.

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Introduction

Snow water equivalent (SWE) measurements

Snow water equivalent (SWE), also called “water equivalent of snow”, is the depth of water that would be obtained by melting the snowpack in a given area, and is normally expressed in millimetres. In other words, SWE corresponds to the mass of snow over a given area.

Measurements of SWE in snowpack, and new snow, improve the estimation of winter precipitation, especially in areas with a sparse network of meteorological stations. The measurements are mainly made for the purpose of estimating the spatial distribution of the total water content in catchment areas, as knowledge of the SWE in river basins is fundamental for estimating the expected snowmelt runoff.

Information about snow accumulation and daily melt rate is essential in flood forecasting during the snowmelt season. SWE is also used in avalanche theory and forecasting, as well as for risk assessment of heavy snow loads. Furthermore, the data is important in glaciological mass balance studies and climate monitoring. The melt from polar ice sheets is a major factor in sea level rise.

Methods and instruments, which have been developed for determination of SWE, are listed in Annex A.

Manual SWE measurements

The first station networks with manual SWE measurements were established in the early 20th century at meteorological institutes in North America and Europe. Today the measurements are made routinely at federal and national meteorological and hydrological institutes, within the hydropower industry, and by universities, in cold climate countries all over the world. Annex B shows a list of manual SWE measuring bodies in Europe.

Automized methods have been developed to be used in remote areas, as well as to enable continuous recording, but manual measurements are still more common, as they can provide high quality data for a relatively low capital cost. The importance of manual measurements is also reflected in their use as reference to other SWE measuring methods.

1 Scope

This Technical Report defines the requirements for manual measurements of SWE over land, see ice and glaciers, under natural environmental conditions, and shows methods for calculating the spatial distribution of the data. It includes measurements with snow tubes, core drills and density cutters.

2 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

Note 1 to entry Primarily 'The International Classification for Seasonal Snow on the Ground' (UNESCO), 'Cryospheric Glossary' (NSIDC) and 'Glossary of Meteorology' (AMS) has been used as reference.

2.1
ablation
removal of material from the surface of an object by vaporization, chipping, or other erosive processes. In this case the opposite of *snow accumulation*

2.2
blowing snow
an ensemble of snow particles raised by the wind to moderate or great heights above the ground; the horizontal visibility at eye level is generally very poor

Note 1 to entry See also *drifting snow*.

2.3
condensation
the change of the physical state of matter from gaseous phase into liquid phase (opposite of *evaporation*)

2.4
deposition
(1) a process by which water vapour is deposited as ice without first forming liquid water (opposite of *sublimation*)

(2) the process by which snow is deposited on the ground either with or without wind action

Note 1 to entry As a result, stationary snow deposits such as snow dunes, *snowdrifts*, or the *snow cover* itself may form.

2.5
drifting snow
snow raised from the *snow surface* by the wind to a height of less than 2 metres; it does not restrict horizontal visibility at 2 metres or more above the surface

Note 1 to entry See also *blowing snow*.

2.6
evaporation
vaporization of a liquid that only occurs on the surface of a liquid, at temperatures below the boiling point (opposite of *condensation*)

2.7
firn
well-bonded and compacted snow that has survived the summer season, but has not been transformed to *glacier* ice