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This document was prepared by Technical Committee ISO/TC 146, *Air quality*, Subcommittee SC 5, *Meteorology*.

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Introduction

Solid precipitation is one of the more complex parameters to be observed and measured by automatic sensors. The measurement of precipitation has been the subject of a multitude of studies, but there has been limited information regarding the procedures and performance criteria describing the ability and reliability of automatic sensors to accurately measure solid precipitation[13].

Recently, an increasing percentage of precipitation data used in a variety of applications have been obtained using automatic instruments and stations including the measurement of snow depth, and many new applications have emerged[13].Also, the modern data processing capabilities, data management, and data assimilation techniques provide the means for better assessment and error analysis.

For the past years, various automatic snow depth measurement systems or snow depth sensors have been deployed and tested at different places to take advantages of their efficiency and get more objective measurement results[6].

An ultrasonic snow depth sensor measures the time interval between transmission and reception of ultrasonic pulses reflected from a target surface. This measurement is used to determine the distance between the sensor and the surface. The performance of the acoustic snow depth measurement technique depends on air temperature. Therefore, the ultrasonic sensor requires correction for variations in the speed of sound in air due to temperature. The measurement uncertainty of sonic rangers (distance meters) is 0,5 % to 1 % of the distance, which leads under typical conditions to a measurement uncertainty for snow depth in the order of 1 cm[2].

Laser sensors for snow depth measurement were introduced a few years ago and have already been under test and in operational use in various places[11][14][18]. A laser snow depth sensor uses an optoelectronic distance measurement principle to measure the distance between the sensor and the surface of the snow. Most of the laser snow sensors today employ a single laser distance meter, and, this results in an important drawback of this type of snow sensors, the lack of spatial representativeness. To resolve this issue, there have been a few trials and products with multipoint measurements, including a fixed 3 points sensor and scanning laser snow depth sensors which scan multiple points along a circular path or a segment of line. Apart from the laser distance sensors, there are other optical techniques capable of measurement of the state of ground and snow depth[2].

In spite of some of the drawbacks and difficulties, automated snow depth measurement techniques are evolving to offer more objective results which can be made available continuously and in near real-time.

The procedures presented in this document define methods for performance test of snow depth sensors to be used for snow depth measurements. Minimum requirements for conformance with this document include successful completion of the basic functional test (see Clause 7), the temperature chamber test (see Clause 8), and the field test (see Clause 10).

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