



Snow density observations during 1991 to 2016 in Estonia

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In Estonia the Estonian Environment Agency (ESTE) is the only institution in charge of operational snow observations. The snow observation station network contains snow depth and snow density measurements, as well as the observation of the presence of snow.

This study presents snow density manual observations - measurement method description and data analysis results - for period 1991-2016 in Estonia. Manual snow density measurements are performed applying the gravimetric method. A snow sample is extracted from the snowpack with BC-43 snow cylinder, with a length of 60 cm and a cross-sectional area of 50 cm². The sample is then weighted with the snow scale. The resulting snow depth and density are multiplied in order to calculate Snow Water Equivalent (SWE).

The number of field course measurement locations decreased from 79 stations in 1961/62 to 33 stations in 2000/01 and to 14 stations in 2016/17. Thus lots of discontinued historical long-term data series of snow depth and snow density exist, but digitally only since 1991. Therefore, only data for the period 1991-2016 is analyzed in present study.

The focus on the snow density observations in present study is two basic purposes: 1) to get an overview of manually measured snow density data in Estonia before installation of automatic SWE measurements (planned in Estonia in near future); 2) to improve our knowledge about snow depth and density trends at the regional scale in changing climate during the last decades.

Present study is motivated regarding to the European COST Action ES1404 called "Harmonsnow" project and regarding to subproject of the action called "European snow booklet". Between 2015-2018, the European COST Action ES1404 running for harmonize monitoring of snow for the benefit of climate change scenarios, hydrology and numerical weather prediction. The ongoing activities (included SWE field campaigns) in the Action ES1404 have shown that in order to give an overview on a European scale it is crucial to analyze snow depth and density measurement methods and data at the regional scale.

The results of Estonian snow-climate analysis and spatial distribution of data (depth, density, SWE, maximum loadings) are explained and presented here.