MODELLING SNOW WATER EQUIVALENT IN KARKONOSZE MOUNTAINS

Bartłomiej Luks[1], Krzysztof Migała[2], Marzena Osuch[1], Daniel Kępski[1] and Grzegorz Urban[3]

1. *Institute of Geophysics, Polish Academy of Sciences, Warsaw, Poland; luks@igf.edu.pl*
2. *University of Wrocław, Institute of Geography and Regional Development, Wrocław, Poland*
3. *Institute of Meteorology and Water Management – National Research Institute, Wrocław, Poland*

ABSTRACT

Snow water equivalent characterizes hydrological significance of snow cover. Despite this fact, snow water equivalent (*swe*) measurements are scarce. Measuring *swe* is time consuming thus alternative methods for snow water equivalent estimation are needed. Reliable method for *swe* estimation could save a lot of effort by sampling only snow depths instead of bulk density and would allow evaluation of hydrological models, when only snow depth measurements are available.

We present method for estimation of snow water equivalent in Karkonosze mountains using daily snow depth observations. Set of regression models was optimized and calibrated for consecutive stages of snowpack accumulation and ablation. Two different datasets were used for assessing parameters of each model. First 40 years long (1961-2000) record of snow depth, bulk density and *swe* measurements from Szrenica was provided by University of Wrocław. Second dataset covered 10 years (1991-2000) of snow depth, bulk density and *swe* at six meteorological stations is available from Institute of Meteorology and Water Management: Śnieżka, Jakuszyce, Karpacz, Szklarska Poręba, Paprotki and Jelenia Góra. Observation cover wide range of heights, starting with Paprotki at 342 m asl, ending with Śnieżka at 1603 m asl. Thus, tend to characterize snow conditions in Karkonosze in best available way. Datasets were divided into sets with varying snow depth – snow water equivalent dependencies. Models were validated on part of datasets that was not used for calibration. Proposed approach for estimation of snow water equivalent gave very promising results, with the coefficient of determination higher than 0.9 for both calibration and validation therefore that proposed method could be extended to other mountain ranges where snow water equivalent measurements are rare.

ACKNOWLEDGEMENTS

This study has been partially financed from the funds of the Leading National Research Centre (KNOW) received by the Centre for Polar Studies for the period 2014–2018.