Geophysical Research Abstracts
Vol. 18, EGU2016-7751-1, 2016
EGU General Assembly 2016

Do we have to correct winter precipitation for nowcast applications?

Kay Helfricht (1), Roland Koch (2), and Marc Olefs (2)

(1) Institute for Interdisciplinary Mountain Research, Austrian Academy of Sciences, Innsbruck, Austria (kay.helfricht@oeaw.ac.at), (2) Central Institute for Meteorology and Geodynamics (ZAMG), Vienna, Austria

In mountain regions like the Alps, a significant fraction of the annual precipitation falls as snow. There is an increasing demand for high-quality analysis, nowcast and short-range forecasts of snowfall. Operational services, such as traffic maintenance, real-time flood-warning systems of hydrological services and avalanche warning products, but also hydropower companies and ski resorts need reliable information on precipitation, snow depth and the corresponding snow water equivalent. However, producing accurate precipitation maps in complex terrain using only remote sensing techniques and uncorrected rain gauge data is a difficult task. In cold and windy conditions, conventional rain gauge measurements are prone to large errors when snow passes the rain gauge and sublimation occurs at heated devices. Empirical correction formulas are given by the WMO to compensate the potential undercatch (Goodison, 2008).

The project pluSnow aims to combine snow depth measurements and precipitation data to minimize the error of gauge undercatch on the basis of snow depth data from 63 automatic weather stations (TAWES), operated by the Austrian Central Institute for Meteorology and Geodynamics (ZAMG). These TAWES are equipped with SHM30 laser sensors to measure snow depth with high accuracy and temporal resolution of 0.01 m and 10 minutes, respectively. The pluSnow project will contribute to existing research efforts around the globe which focus on improving the precision of solid precipitation measurements.

Here we present a first study based on the original TAWES data between 2006 and 2015. The fraction of solid precipitation to total winter precipitation between November and April (NDJFMA) and the potential undercatch of measured precipitation following Goodison (2008) for all TAWES sorted by altitude are analysed. Examples of the TAWES data in the original high temporal resolution of 10 min are given.

The two main parameters used for the correction of precipitation measurement errors, i.e. wind and temperature, show different dependency on elevation. Wind is more evenly distributed and appears to be site-specific. In contrast, winter mean temperatures show no elevation dependency for TAWES elevated lower than 1000 m a.s.l. At these elevations, calculated catch ratios are between 85% and 95%, and 10% to 60% of total winter precipitation are supposed to be solid. The catch ratios decrease to values of about 75 % for stations between 1500 and 2000 m a.s.l., and solid fractions of the winter precipitation increase to more than 90%.

However, with respect to the area-elevation-distribution of Austria, an overall undercatch of winter precipitation of about 15 % can be expected, and between 50 and 60 % of total winter precipitation (NDJFMA) falls as snow. These values are also confirmed by climatological data from Austria.

Thus, corrections of solid precipitation are especially important at automatic weather stations located above 1000 m a.s.l., where additional measurements such as snow depth exist.

Goodison, B. E., P. Y. T. Louie, and D. Yang (1998), WMO solid precipitation measurement intercomparison. Instruments and Observing Methods Rep. 67 (WMO/TD 872), World Meteorological Organization, Geneva, Switzerland, 212 pp.