



Precipitation measurement errors at high-elevation sites in the Italian Alps

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In this study we present the first results of an experimental campaign aimed at the estimation of the water equivalent of the precipitation in a couple of high-elevation pilot sites in the West Italian Alps. The study sites, initially instrumented with a heated rain gauge and a ultrasonic snow depth sensor (plus a meteorological station) were both equipped with a snow pillow station, with the aim to gather combined precipitation measures. Rain gauge precipitation measurements, in fact, are well known to be prone to undercatch of precipitation, due to wind-field deformation above the gauge orifice, snow overtopping of the gauge, evaporation of the accumulated water in the gauge, etc. On the other hand, snow depth measurements say little of the snow water equivalent of a snowfall. In addition, the two-year long experimental campaign revealed the difficulty to obtain reliable measurements even in the presence of a snow pillow measuring device. In this study, an error detection procedure is proposed, based on synthetic descriptors of the snowpack status in correspondence of critical threshold values of temperature and wind speed. The procedure allows one to reconstruct plausible values of snow water equivalent in correspondence of heavy snowfall events and in the presence of windy conditions. These values are used to assess the precipitation measurement errors in more general terms, revealing that the underestimation of precipitation in the presence of snow can assume values up to 60-70% of the total event volume. The method is also suitable to be transposed to less instrumented stations, e.g. equipped only with a snow depth sensor.