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Applying volumetric weather radar data for rainfall runoff modeling: The importance of error correction.

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In the current study half a year of volumetric radar data for the period October 1, 2002 until March 31, 2003 is being analyzed which was sampled at 5 minutes intervals by C-band Doppler radar situated at an elevation of 600 m in the southern Ardennes region, Belgium. During this winter half year most of the rainfall has a stratiform character. Though radar and raingauge will never sample the same amount of rainfall due to differences in sampling strategies, for these stratiform situations differences between both measuring devices become even larger due to the occurrence of a bright band (the point where ice particles start to melt intensifying the radar reflectivity measurement). For these circumstances the radar overestimates the amount of precipitation and because in the Ardennes bright bands occur within 1000 meter from the surface, it's detrimental effects on the performance of the radar can already be observed at relatively close range (e.g. within 50 km). Although the radar is situated at one of the highest points in the region, very close to the radar clutter is a serious problem. As a result both nearby and farther away, using uncorrected radar results in serious errors when estimating the amount of precipitation.

This study shows the effect of carefully correcting for these radar errors using volumetric radar data, taking into account the vertical reflectivity profile of the atmosphere, the effects of attenuation and trying to limit the amount of clutter. After applying these correction algorithms, the overall differences between radar and raingauge are much smaller which emphasizes the importance of carefully correcting radar rainfall measurements.

The next step is to assess the effect of using uncorrected and corrected radar measurements on rainfall-runoff modeling. The 1597 km2 Ourthe catchment lies within 60 km of the radar. Using a lumped hydrological model serious improvement in simulating observed discharges is found when using corrected radar data. It is expected that these difference are even larger when a distributed hydrological model is used. Therefore, we apply the representative elementary watershed (REW) model which has already been calibrated using raingauge data and shows the ability of correctly estimating discharge values both at the outlet and upstream points.

The overall goal of this study is to make use of the benefits of the high spatial and temporal resolution of weather radar data compared to a conventional raingauge network in order to gain a better understanding of the hydrological behavior of the Ourthe catchment.