Geophysical Research Abstracts
Vol. 19, EGU2017-13649, 2017
EGU General Assembly 2017

Hydrological Applications of a High-Resolution Radar Precipitation Data Base for Sweden

Jonas Olsson, Peter Berg, Lars Norin, and Lennart Simonsson
SMHI, Norrköping, Sweden (peter.berg@smhi.se)

There is an increasing need for high-resolution observations of precipitation on local, regional, national and even continental level. Urbanization and other environmental changes often make societies more vulnerable to intense short-duration rainfalls (cloudbursts) and their consequences in terms of e.g. flooding and landslides. Impact and forecasting models of these hazards put very high demands on the rainfall input in terms of both resolution and accuracy. Weather radar systems obviously have a great potential in this context, but also limitations with respect to e.g. conversion algorithms and various error sources that may have a significant impact on the subsequent hydrological modelling.

In Sweden, the national weather radar network has been in operation for nearly three decades, but until recently the hydrological applications have been very limited. This is mainly because of difficulties in managing the different errors and biases in the radar precipitation product, which made it hard to demonstrate any distinct added value as compared with gauge-based precipitation products. In the last years, however, in light of distinct progress in developing error correction procedures, substantial efforts have been made to develop a national gauge-adjusted radar precipitation product – HIPRAD (High-Resolution Precipitation from Gauge-Adjusted Weather Radar). In HIPRAD, the original radar precipitation data are scaled to match the monthly accumulations in a national grid (termed PTHBV) created by optimal interpolation of corrected daily gauge observations, with the intention to attain both a high spatio-temporal resolution and accurate long-term accumulations. At present, HIPRAD covers the period 2000-present with resolutions 15 min and 2×2 km^2.

A key motivation behind the development of HIPRAD is the intention to increase the temporal resolution in the national flood forecasting system from 1 day to 1 hour. Whereas a daily time step is sufficient to describe the rainfall-runoff process in large, slow river basins, which traditionally has been the main focus in the national forecasting, an hourly time step (or preferably even shorter) is required to simulate the flow in fast-responding basins. At the daily scale, the PTHBV product is used for model initialization prior to the forecasts but with its daily resolution it is not applicable at the hourly scale. For this purpose, a real-time version of HIPRAD has been developed which is currently running operationally. HIPRAD is also being used for historical simulations with an hourly time step, which is important for e.g. water quality assessment. Finally, we will use HIPRAD to gain an improved knowledge of the short-duration precipitation climate in Sweden. Currently there are many open issues with respect to e.g. geographical differences, spatial correlations and areal extremes.

Here we will show and discuss selected results from the ongoing development and validation of HIPRAD as well as its various applications for hydrological forecasting and risk assessment. Further, web resources containing radar-based observation and forecasting for hydrological applications will be demonstrated. Finally, some future research directions will be outlined. Fast responding hydrological catchments require fine spatial and temporal resolution of the precipitation input data to provide realistic results.