Quality-based combination of multi-source precipitation data

Jan Szturc
Department of Ground-Based Remote Sensing, IMGW-PIB, Warszawa, Poland
Osrodka, Katarzyna (Department of Ground-Based Remote Sensing, IMGW-PIB, Warszawa, Poland)
Jurczyk, Anna (Department of Ground-Based Remote Sensing, IMGW-PIB, Warszawa, Poland)
Struzik, Piotr (Satellite Remote Sensing Centre, IMGW-PIB, Warszawa, Poland)
Otop, Irena (Branch of Wroclaw, IMGW-PIB, Warszawa, Poland)

E-mail: jan.szturc@imgw.pl

The ground quantitative precipitation estimation (QPE) is a key issue from operational hydrology perspective. Works on multi-source QPE are carried out in Polish national meteorological and hydrological service for a new hydrological platform in Poland. The QPE is a combination of data provided by: (i) weather radar network POLRAD: eight Doppler radars including two polarimetric ones, (ii) telemetric rain gauge network, and (iii) meteorological satellite Meteosat (visible and infrared observations). The data burdened with different error structures are generated with various spatial and temporal resolutions.

The data quality is characterized by means of quality index (QI) which is defined as a unitless number in a range from 0 (bad data) to 1 (excellent data). For each of the three data sources different algorithms for their quality determination are designed.

Radar data are quality controlled by RADVOL-QC software which corrects the data and characterizes their final quality due to the following quality factors: radar beam broadening, non meteorological echoes, spike-type echoes, noise (specks), beam blockage, and beam attenuation in rain. Spatially interpolated rain gauge data is characterized due to its quality mainly by distances to nearest gauges. Precipitation estimates based on Meteosat observations are less precise and burdened with parallax errors (that are significant in higher latitudes), however constitute a valuable supplement to other source data.

The quality-based QPE is generated with 1-km space resolution every 10 minutes (corresponding to radar data). The starting point for quality-based combination is conditional merging based on Sinclair and Pegram technique employing quality information. The method takes advantage of good points of each kind of data, i.e. high spatial resolution of radar observation, unbiased rain gauge data from relatively dense gauge network, and high availability of satellite images.

Developed algorithms will be presented with examples.