Using microwave backhaul links to optimize the performance of radar-based rainfall estimation and attenuation correction

Silke Trömel
Hans-Ertel Centre for Weather Research, Atmospheric Dynamics and Predictability Branch, University of Bonn, Germany

Ziegert, Michael (Meteorological Institute, University of Bonn, Germany)
Ryzhkov, Alexander V. (Cooperative Institute for Mesoscale Meteorological Studies, University of Oklahoma, Norman, Oklahoma, and NOAA/OAR/National Severe Storms Laboratory, Norman, Oklahoma)
Chwala, Christian (Institute of meteorology and climate research, Karlsruhe Institute of Technology, Garmisch-Partenkirchen, Germany)
Simmer, Clemens (Meteorological Institute, University of Bonn, Germany)

E-mail: silke.troemel@uni-bonn.de

The variability in rain drop size distributions and attenuation effects are the two major sources of uncertainty in radar-based quantitative precipitation estimation (QPE) even when dual polarization radars are used. New methods are introduced to exploit the measurements by commercial microwave radio links to reduce the uncertainties in both attenuation correction and rainfall estimation. The ratio α of specific attenuation A and specific differential phase KDP is the key parameter used in attenuation correction schemes and a recently introduced R(A) algorithm. We demonstrate that α can be estimated using microwave links at Ku band oriented along radar radials with an accuracy of about 20-30%. Arbitrary link orientations can not be used for α estimation, but they can be exploited to optimize radar-rainfall relations. In particular, the intercepts in the R(KDP) and R(A) relations can be estimated with an accuracy of about 25%. The performance of both methods (for radially and arbitrarily oriented microwave links) will be presented and illustrated in two study areas. The first study was performed in southern Germany using the polarimetric C-band radar operated by the German Weather Service (DWD) on Mount Hohenpeissenberg and two radially-oriented Ku-band microwave links from Ericsson GmbH as part of a German cell phone network accessible by KIT Campus Alpine. The second study area is in western Germany using the polarimetric X-band research radar of TR32 in Bonn. Within a pilot study starting in spring 2014 access to the data of arbitrarily-oriented Ku-band microwave links from the Ericsson GmbH located in Bonn is planned.