PATTERN: Advantages of High-Resolution Weather Radar Networks

Katharina Lengfeld
Meteorological Institute, University of Hamburg, Germany
Clemens, Marco (Meteorological Institute, University of Hamburg, Germany)
Münster, Hans (Max-Planck-Institute for Meteorology, Hamburg, Germany)
Ament, Felix (Meteorological Institute, University of Hamburg, Germany)

E-mail: katharina.lengfeld@zmaw.de

Precipitation observations with radars operating in the X-band frequency range are essential to meet present and future requirements for flood forecasting, water management and other hydrometeorological applications. Besides higher resolution, these systems are cost-effective compared to S- or C-band radars because of smaller antenna size. Disadvantages of single X-band radars are the large influence of attenuation by liquid water and a relatively short range.

The project Precipitation and ATTenuation Estimates from a high resolution weather Radar Network (PATTERN) intends to demonstrate that a network of high-resolution weather radars can overcome this apparent drawback. Therefore, the University of Hamburg and the Max-Planck-Institute for Meteorology set up a network consisting of four modified ship navigation radars near Hamburg, Germany. Each radar has a maximum range of 20 km with 60 m spatial and 30 s temporal resolution. A large area in the network is covered by at least two radars at the border and up to four radars in the center. We developed a software package to derive precipitation estimates from raw reflectivity data including several clutter filters, estimation of background noise, radar calibration and attenuation correction.

The aim of this presentation is to identify advantages and disadvantages of the network as well as single X-band radars. The focus will be on clutter identification algorithms used in the PATTERN network for single radars and for the network. A long-term study shows that the clutter algorithm based on the network is more efficient compared to single radar algorithms. Additionally, the opportunity of replacing disturbed pixels by measurements from other radars instead of interpolating will be investigated. A comparison to measurements of the weather radar operating in C-band used by the German Meteorological Service will focus on the ability of high-resolution observations to give additional information about small scale structures of rain events.