EMS Annual Meeting Abstracts,
Vol. 6, EMS2009-209, 2009
9th EMS / 9th ECAM

9th EMS Annual Meeting
9th European Conference on Applications of Meteorology
High resolution meteorology
- applications and services

High-resolution precipitation mapping over Switzerland: A case study on the combination of radar and station data

R. Erdin (1), C. Frei (1), and W.A. Stahel (2)

(1) Federal Office of Meteorology and Climatology MeteoSwiss, Zürich, Switzerland, (2) Seminar for Statistics, Federal Institute of Technology ETH, Zürich, Switzerland

Combining measurements from radar and in-situ rain gauges into a high-resolution precipitation analysis attempts to merge the relative merits of the two measurement plattforms, i.e. the quantitative accuracy of gauges with the high spatial resolution of radar. Several combination approaches based on geostatistics have been proposed in the literature, yet their suitability in areas of complex terrain is unclear. In this study we present a thorough evaluation and inter-comparison of two such methods for a heavy precipitation case in Switzerland (August 2005). The five study days encompass predominantly convective, stratiform and topographic precipitation phases offering distinct but moderately challenging conditions.

The two combination methods examined are Universal Kriging and Ordinary Kriging of radar errors (OKRE). KED uses radar precipitation fields as external drift (KED) and a spatial random function for the residual field. OKRE models radar-gauge differences as a random function directly. The combination methods are compared to rainfall fields from rain-gauges only (Ordinary Kriging) and radar only. The dependence in the performance of these methods upon a range of factors was investigated formally in an Analysis of Variance using several cross-validation skill measures as target variables.

Main results of the study are: Combination methods perform consistently better than the gauge-only analysis. The improvement is particularly large for those study days with more convective rainfall activity and for analyses conducted from the coarse real-time gauge network only. The added value from radar is almost similar like that from a high-density climatological gauge network. The combination has largely eliminated systematic errors in the radar fields. KED is generally superior to OKRE, except in the distinction of dry/wet conditions. Possibilities for further methodological developments and implications for an operational application in Switzerland will be discussed in the presentation.