H41A CC: 406 Thurs 0830h
Precipitation Measurement, Simulation, and Analysis I *(joint with A)*
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H41A-7 1100h INVITED

Real-Time Prediction of Small-Scale Spatio-Temporal Rainfall Using a Raingage Network System

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There are distinct needs to develop real-time prediction methods and models of spatio-temporal rainfall structures in urban areas for the on-line decision making process to optimize the operation of urban hydrological systems. Thus, the rainfall scale that is of main interest is small and a prediction time scale typically less than one hour and the space scale of a few square kilometers and smaller. The rainfall variation on this scale generally corresponds to the behavior of individual rain cells.

In this paper, a model methodology based on a two-dimensional stochastic convection-diffusion equation is developed to predict in real-time the spatial rainfall distribution on the aforementioned time and space scales using the observation in a raingage network system at ground level. The prediction is done by expanding the rainfall intensity field into Fourier series. The extended Kalman filtering procedure is effectively used to identify and continuously update parameters of the model and the Fourier coefficients.

Short-term (1-minute interval) high-intensive rainstorms have been observed during several years in a dense twelve-gage network system for rainfall observation in the city of Lund, Sweden. The aforementioned methodology is applied to ten rainfall events chosen from these observations for real-time prediction of the rainfall and for the identification of the unknown parameters of the model. The figure shows a part of the results of the 1 and 5-minute ahead prediction for one gage. Parameter alternatives and factors which affect the forecast accuracy are discussed. The model is especially suitable for raingage network systems. Since a Fourier domain shape method is used for the rainfall field and coupled Gaussian noise, the model domain needs not to be discretized. This has special advantages for irregularly spaced gaging systems.