Geophysical Research Abstracts
Vol. 13, EGU2011-13396, 2011
EGU General Assembly 2011

Spatial and temporal block conditioned rainfall simulation; an application using an hourly punctual raingauges network and an instantaneous 1km^2-pixel estimated precipitation from weather radar

Jean-Marie Lepioufle (1) and Kolbjørn Engeland (2)

(1) NTNU, Maths Department, Norway (jean-marie.lepioufle@sintef.no), (2) SINTEF Energy Research, Norway (kolbjørn.engeland@sintef.no)

Testing past hydrological events that last several hours requires providing hourly rainfall reanalysis scenarios. In the central region of Norway, two kinds of observation are available: an instantaneous 1x1 km^2 QPE recorded every 15 minutes from weather radar located in Rissa covering an area characterized by a 240km radius, and a raingauges network composed by 53 hourly recording tools over this same area.
Due to artifacts within radar data and to low spatial density of the raingauges network, many methods have been established based on the combination of these two signals. Nonetheless, one major limiting problem in this approach is the non-similar spatial and temporal support of the two signals. To bypass this problem, Todini (2001) used the block-kriging in order to turn the punctual signal recorded by raingauges network in a rainfall field with a 1x1 km^2 pixel spatial resolution. However, from kriging is resulting a smoothed signal which doesn't represent a realistic spatial variability. In order to avoid the alteration of both signals, the study has been based on one constraint: using raw instantaneous QPE from radar and hourly raingauges network without any support transformation. Block conditional simulation of a space-time rainfall field based on geostatistics enables to respect this constraint.
The first step of the study has been to free simulate a space-time rainfall field based on a space-time punctual and instantaneous variogram. Geostatistics enables to investigate the link between an instantaneous and punctual space-time structure and the evolution of space-time structure with spatial aggregation. Because of its high spatial density, the instantaneous QPE signal from radar with a spatial 1x1km^2 resolution and its signals spatially aggregated for different areas (9km^2, 25km^2, 49 km^2) have been used in order to estimate the parameters of the instantaneous and punctual space-time climatologic variogram. Thus, the simulation has been established using the estimated parameters as inputs and the turning bands method for generating values.
The second step has been to condition the free simulation with spatial and temporal block values from both radar and raingauges observations. A first conditioning has been done on the free simulated spatially mean values over each pixel area with radar data. Then, a second conditioning has been done on the simulated temporally mean values over one hour using raingauges observation.
From this space-time instantaneous and punctual conditioned rainfall field has been deduced the space-time punctual and hourly rainfall field used as input into the hydrological distributed model. The spatial resolution of the resulting simulated rainfall field is chosen according to the spatial resolution used within the hydrological distributed model.