Geophysical Research Abstracts
Vol. 13, EGU2011-13979, 2011
EGU General Assembly 2011

Review of spatial stochastic models for rainfall

Andrew Metcalfe
School of Mathematical Sciences, University of Adelaide, Adelaide, Australia, andrew.metcalfe@adelaide.edu.au

Stochastic models for rainfall are needed for the assessment of drainage systems, flood defences, and drought management plans under extreme conditions. Although there are many single site stochastic models for rainfall, realistic appraisal of spatially distributed systems requires models of rainfall over substantial areas and it is not adequate to assume a uniform distribution of the depth of rainfall at a single site. However, single site models can typically be extended to multi-site models by introducing a description of the spatial correlation. The alternative has been to develop spatial field models for rainfall. The development of multi-site and spatial field models for rainfall over the past sixty years is reviewed, and the advantages and limitations of the two modelling approaches are discussed. In particular there is a range of models based on transformations of Gaussian random fields for latent variables, dry periods being associated with latent variables less than some threshold. A different class of models is based on cylindrical rain cells embedded within clustered point processes, such as the Neyman-Scott process. There are more detailed models for individual storms, which explicitly allow for velocities, but corresponding models for the arrival of storms and the associated storm characteristics are less well developed. Another approach is to use empirical cascade models which exhibit the claimed fractal nature of rainfall. The calibration of models, in the context of both sparse arrays of rain gauges and weather radar images, is considered. The most recent spatial rainfall models and their applications will be highlighted. The scope for further research will be discussed. For example, models for rainfall over large areas and their integration with global and regional climatic models.