Modelling and Simulation of Volumetric Rainfall for a Catchment in the Murray–Darling Basin

J. Boland[1], P. Howlett[1], J. Piantadosi[1]and R. Zakaria[2]

[1]Scheduling and Control Group (SCG), Centre for Industrial and Applied Mathematics (CIAM), School of Information Technology and Mathematical Sciences, University of South Australia, Mawson
[2]Faculty of Industrial Sciences and Technology, Universiti Malaysia Pahang, Lebuhraya Tun Razak, 26300 Gambang, Kuantan Pahang, Malaysia; e-mail: roslinazairimah@ump.edu.my.

ABSTRACT

We discuss modelling and simulation of volumetric rainfall in a catchment of the Murray–Darling Basin – an important food production region in Australia that was seriously affected by a recent prolonged drought. Consequently, there has been sustained interest in development of improved water management policies. In order to model accumulated volumetric catchment rainfall over a fixed time period, it is necessary to sum weighted rainfall depths at representative sites within each sub-catchment. Since sub-catchment rainfall may be highly correlated, the use of a Gamma distribution to model rainfall at each site means that catchment rainfall is expressed as a sum of correlated Gamma random variables. We compare four different models and conclude that a joint probability distribution for catchment rainfall constructed by using a copula of maximum entropy is the most effective.

2010 Mathematics subject classification: primary 62E17; secondary 62P12, 65C05,

65C20

Keywords and phrases: rainfall modelling, correlated Gamma distributions, copulas of

maximum entropy.