Simulating hourly rainfall occurrence within an equatorial rainforest, Borneo Island

Abstract

The ability to simulate characteristics of the diurnal cycle of rainfall occurrence, and its evolution over the seasons is important to the forecasting of hydrological impacts resulting from land-use and climate changes within the humid tropics. This stochastic modelling study uses a generalized linear model (GLM) solution to second-order Markov chain models, as these discrete models are better at describing binary occurrence processes on an hourly time-scale than continuous-time approaches such as stochastic state-space models. We show that transition probabilities derived by the Markov chain method need to be time-varying rather than stationary to simulate the evolution of the diurnal cycle of rainfall occurrence over a Southeast Asian monsoon sequence. The conceptual and pragmatic links between discrete diurnal processes and continuous processes occurring over seasonal periods are thereby simulated within the same model.