

Parsimonious spatial representation of tropical soils within dynamic rainfall-runoff models

Abstract

Introduction Models are used increasingly to simulate hydrological processes within tropical regions. There is now a wealth of publications addressing evaporation modelling (particularly wet-canopy evaporation) of local areas of tropical forest in, for example, Niger (Gash et al., 1997), Guyana (Jetten, 1996), Puerto Rico (Schellekens et al., 1999), Columbia (Marin et al., 2000) and Indonesia (Asdak et al., 1999; van Dijk and Bruijnzeel, 2001). Elsewhere in this volume, Roberts et al. provide an overview of evaporation processes and modelling. Other modelling studies have addressed the impact of such tropical evaporation on regional climates and global circulation (e.g. Polcher and Laval, 1994; Zeng, 1999; Zeng and Neelin, 1999; Zheng et al., 2001). New studies using time-series models are highlighting the effects of cycles in the rainfall, such as the El Nino Southern Oscillation (ENSO) on tropical evaporation, riverflow and water quality (e.g. Zeng, 1999; Chappell et al., 2001; Krishnaswamy et al., 2001; Whitaker et al., 2001; Chappell, Tych et al., this volume). Similarly, models that simulate the generation of riverflow from the rainfall received by a tropical catchment are also beginning to be applied more frequently. These models include: Metric-conceptual models of waterflow, based upon transfer functions. For example, application of the DBM modelling approach to a nested catchment system in Malaysian Borneo (Chappell et al., 1999a) and the application of IHACRES to a large Thai basin (Scoccimarro et al., 1999). Conceptual models of waterflow based upon stores and pre-determined empirical relationships. For example, application of the Nash model to Kenyan catchments (Onyando and Sharma, 1995), the Modhydrolog model to a tropical catchment (Chiew et al., 1996), the Reservoir-Water-Balance-Simulation model to Namibian catchments (Hughes and Metzler, 1998), and the HBV-96 model (discussed in Barnes and Bonell, this volume) to catchments in Zimbabwe, Tanzania and Bolivia (Liden and Harlin, 2000).[&]. © UNESCO 2005 and Cambridge University Press, 2009.