Chapter 6

Investigating the Impacts of DEM Type, Resolution, and Noise on Extracted Hydro-Geomorphologic Parameters of Watersheds via GIS

Vahid Nourani
University of Tabriz, Iran

Safa Mokhtarian Asl
University of Tabriz, Iran

Maryam Khosravi Sorkhkolaee
University of Tabriz, Iran

Aida Hosseini Baghanam
University of Tabriz, Iran

Masoud Mehrvand
University of Stuttgart, Germany

ABSTRACT

Water resources management is dependent on knowledge and understanding of water quantity and quality information with the latest developments in information technology such as geographic information system (GIS) to develop effective hydrological modeling within the water-based systems. The efficiency of such hydrological modeling relies on the accuracy of applied data. In this way, the application of low-quality data in developing models for integrated management

DOI: 10.4018/978-1-5225-5039-6.ch006
of water resources can impose irreparable financial and human resources and environmental costs in the catchment area. Thus, in regions that shortage of data is the issue, semi-distributed modeling is a useful tool. In this chapter, three aims are followed: (1) effect of digital elevation model (DEM) type and resolution on extracted hydro-geomorphologic parameters, (2) effect of wavelet-based de-noising method on extracted hydro-geomorphologic parameters, (3) determination of the optimal cell size to extract topographic attributes with good agreement to the real features.

**INTRODUCTION**

Within the past few years, the analysis of factors affecting the hydrological processes within basins has been one of the most significant areas of research in the field of hydrologic modeling. One of the most important prerequisites of developing the map of watersheds and knowing their hydrologic characteristics is the knowledge of rainfall–runoff simulating at the outlets of basins or sub-basins which is one of the most significant challenges of hydrologists, especially in the least developed countries that suffer from the lack of adequate data required for the hydrologic modeling.

Hydrologic models have been generally classified into two categories: lumped and physically-based models. Lumped models act as a black-box model and estimate runoff only at the catchment outlet. These models cannot provide any information about the distribution of saturated areas within the basin; therefore, they are unable to describe how saturated areas distributed within the basin and what their role in evapotranspiration and runoff production is, such as Stanford IV (Crawford & Linsley, 1966) and ARNO (Todini, 1996) models.

Since physically-based models have been developed based on spatially distributed digital and remotely sensed data sets of features such as precipitation, elevation, vegetation, etc., the quality of applied data plays an important role in obtaining efficient models. The application of low quality data in developing models for integrated management of water resources can impose irreparable financial and human resources and environmental costs in the catchment area. To overcome this problem, the physically-based models are applied. Physically-based models that are divided into two categories (i.e., distributed and semi-distributed models) can be utilized in regions that shortage of data or inapplicability of high quality data is the issue (Chen et al., 2004). Due to the various parameters involved in the distributed models, they are considered completely variable on the watershed area; these models require huge data quantities of watershed characteristics to have proper hydrological models such as WetSpa (Water and Energy Transfer between Soil, Plants and Atmosphere (Wang et al., 1996). In order to obviate the complexity of distributed models, semi-distributed models are posed. Since the parameters of semi-distributed models have relative spatial changes in the watershed area, so these models need
Mappings of MOF Metamodels and Object-oriented Languages
[www.igi-global.com/chapter/mappings-mof-metamodels-object-oriented/49181?camid=4v1a](www.igi-global.com/chapter/mappings-mof-metamodels-object-oriented/49181?camid=4v1a)

Reduction of the Transferred Test Data Amount
[www.igi-global.com/chapter/reduction-transferred-test-data-amount/51414?camid=4v1a](www.igi-global.com/chapter/reduction-transferred-test-data-amount/51414?camid=4v1a)