

Spatiotemporal Runoff Features of Hydrological Modeling in Arabian Wadi Basins through Comparative Studies

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1. Introduction

In the Arabian regions for many urban and rural populations; Wadi hydrology has a direct and major impact on their security of life. It is characterized by scarcity of fresh water resources, an ever-increasing demand on water supplies, the paucity of data and flash flood threat. Thus, the sustainable management, development, and efficient utilization of their water resources are urgently needed in order to sustain a minimum resource base. This paper aim to apply the physical based, distributed hydrological model as comparative study among some Arabian Wadi basins.

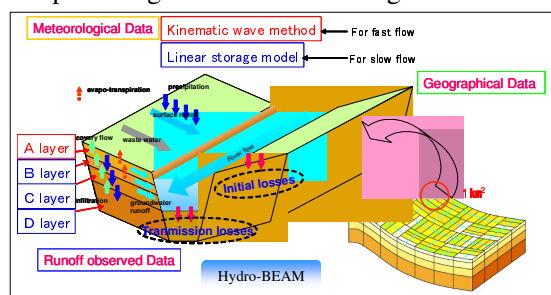
2. Objectives

The main purpose of this paper is to investigate the differences of runoff amounts in space and time due to the difference of degree of urbanization, the difference of basin's scales or shapes, the difference of total amounts of rainfall or rainfall duration in the upstream and mountainous areas, the difference of soil permeability on the river channels, and the difference of mitigation strategies for flash floods in Wadi basins. The target basins of our research are Wadi Assiut in Egypt, Wadi Ghat in Saudi Arabia (SA), and Wadi Al-Khoud in Oman. They were selected due to their importance not only as water resources but also as flash flood threat.

4. Methodology

A physically-based, distributed hydrological model (Modified Hydro-BEAM, Fig.1) was applied in the selected Wadis. GIS tool was used to process DEM data for Watershed delineation and topographical features investigation. Surface runoff and stream routing modeling were estimated using the Kinematic

wave approximation. Initial and transmission losses modeling were calculated based on SCS method (Soil conservation Service, 1985) and Walter's equation (Walters, 1990) respectively. Linear storage model was adopted for groundwater modeling.



4. Discussion and Conclusion

It is concluded that the simulation results of runoff hydrographs agree with the observed ones in Wadi Al-Khoud (Oman) and Wadi Ghat (SA). The climatic data show that the rainfall events in Oman and SA more frequent than in Egypt. It is obvious that land use, soil types, watershed areas and topographical features have a vital effect on the discharge hydrographs in the studied basins. The advantage of the proposed model is feasibility of its application in different Arabian Wadi basins to estimate the distributed runoff and thus it can be applied in the other arid regions.

References

1. SCS, 1985: National Engineering Handbook, section 4: hydrology, US Department of Agriculture, Soil Conservation Service, Engineering Division, Washington, DC.
2. Walters, M.O., 1990: Transmission losses in arid regions. J. of Hydraulic Engineering, ASCE 116,129-138

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