الاية الكريمة

قال تعالى :

وَجَعَلْنَا مِنَ الْمَاءِ كُلَّ شَيْءٍ حَيٍّ

الأنبياء الآيه (30)

Dedication

The researcher dedicates this effort:

To my well – beloved mother

To my father

To my husband, brothers, sisters and extended family

Precious and beautiful daughters and son

To everybody who contributed to this thesis directly or indirectly

May Allah bless them all.

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Abstract

The quantification of runoff and need to estimate surface water resources in wadis systems is a major field of research. Multiple regression formula for annual stream flow was established using discharge gauged stations and catchment characteristics to calculate the flows in wadis within the homogeneous region for Dar Fur States. Using Geographic Information Systems (GIS) techniques produced digital-hydrological maps and formulated a useful tool for rainfall-runoff prediction equations. Produced maps were based on elevation data provided by Shuttle Radar Topography Mission, SRTM. Hydrological mapping was done through several sub-software tools such as Arc hydro, 3D analysis, and ArcScence in (GIS) program. For data analysis, the XLSTAT tools in Excel program was used. The aim was to determine the best distribution of rainfall data that was used as one of the parameters in the model. After distribution in layers by using Kringing Method, together with XLSTAT tools multiple regression equations were evaluated. Three multiple regression equations were developed for the three states West, North, and South Dar Fur. They were conducted in order to relate stream flow in the hydrometric stations and independent characteristics of the catchments upstream of the stations. These characteristics were mean areal precipitation, catchment area, catchment mean slope, and stream length.

These relations were summarized for three water resource regions in Dar Fur. They produced R^2 (correlation coefficient) values ranging from 0.995 to 0.999. Some stations were chosen to verify accuracy of relationship. Finally, the total annual flow was calculated for the three states based on major wadis flow. in the west Dar Fur State the available measured annual discharge for

wadi Azum was (487 M.cm) but the calculated done for two wadis Azum and Kaja were (2348 M.cm), and the measured and calculated annual discharge for two wadis Alku and Howar in North Dar Fur were (103.03 M.cm), (110.9 M.cm) respectively. and the measured and calculated annual discharge for five wadis were Nyala, Negeida, Ibra, Bulbul, and Kaya in South Dar Fur state were (1141 M.cm),(462.801 M.cm) respectively. These calculated results were compared and discussed with previous studies in Dar Fur, and found more accurate. The study highly recommended using XLSTAT tools in Excel with High resolutions DEMs, and other method of flow estimation in catchment should be used.

مستخلص البحث

تقدير كمية الجريان السطحي والحوجة لتقدير موارد المياه السطحيه في الاودية هو مجال واسع للبحوث . تم انشاء معادلات بطريقة الانحدار المتعدد للجريان السطحي السنوي باستحدام محطات قياس التصريف وخصائص المساحات وذلك لحساب كمية التصريف في الاوديه ذات الطبيعه المتجانسه لولايات دارفور الكبرى . استخدمت تقنية نظم المعلومات الجغرافيه لانشاء خرائط رقميه هيدرولجيه .وصياغة الطريقة المثلى للتنبؤ بمعادلات الجريان السطحي .الخرائط المتكونه اعتمدت على بيانات الارتفاعات الطبغرافيه لرادار ماكوك ناسا الفضائى لتخطيط الخرائط الهيدرولوجيه باستخدام بعض الادوات المبرمجيه مثل Arc hydro , التحليل ثلاثي الابعاد والرسم ثلاثي الابعاد في برنامج نظم المعلومات الجغرافيه. ولتحليل بيانات المطر استخدمت اداة XLSTAT في برنامج اكسل وكان الهدف تحديد افضل توزيع لبيانات المطر الذي استخدم كاحد معاملات النموذج وذلك بعد توزيعها في طبقات باستخدام طريقة كرنجن وايضا هذه الاداء استحدمت لتقدير معادلات الانحدار المتعدد.تم انشاء ثلاثه معادلات لولايات دارفوروبينت كمية الانسياب السطحي عند المحطات الهيدرومترولوجيه مع معاملات المتغيرات المستقله مساحة مستجمعات المياه وميلانها وكمية المطر بها وطول الوادي.هذه المعادلات لخصت لثلاثه مناطق دارفور واعطت قيمة معامل ارتباط يتراوح بين 0.995–0.999 .بعض المحطات تم اختيارها للتحقق من دقة العلاقه واخيرا تم حساب الانسياب السنوي للثلاثه ولايات اعتمادا على الاوديه الرئيسيه .فى ولاية شرق دارفور كانت القياسات المتوفره لوادى ازوم فقط هى 487 M.cm ولكن الحسابات اجريت لواديى ازوم وكجا وهى 2348 M.cm وكان التصريف السنوى المقاس والمحسوب لوادى الكو وهوار فى شمال دارفور هى 103.03 M.cm و 110.9 M.cm على الترتيب .اما التصريف السنوى المقاس والمحسوب لعدد خمسه اودية نيالا ,نجيدا ,ابرا,بلبل ,ووادي كيا فى ولاية جنوب دارفور هى 1141M.cmو 462.801M.cm على الترتيب. هذه النتائج قورنت ونوقشت بدراسات سابقه في دارفور ووجدت انها الاكثر دقة. وختمت الدراسة بالتوصية القوية باستعمال اداة XLSTAT فى برنامج Excel , استخدام نمازج ارتفاعات رقمية اكثر دقة DEMs ,واستخدام طرق اخرى لتقدير الجريان لمستجمعات المياه .

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List of Abbreviations

Acronym	Means
GIS	Geographic Information System
M.cm	Million Cubic Meter
cms	Cubic Meter per Second
cfs	Cubic feet per Second
Q	Discharge
A	Catchment Area
S	Mean Catchment Slope
L	longest flow path
b_o, b_1, b_2, b_3	Regression Model Coefficients
R	Correlation coefficient
P_{50}	Annual Precipitation for reliability 50%
SCS	Soil Conservation Service model
USDA	United States Department of Agriculture
CN	Curve Number
DEM	Digital Elevation Models
SRTM	Shuttle Radar Topography Mission
NGA	National Geospatial-Intelligence Agency
NASA	National Aeronautics and Space Administration
SIR-C	Space borne Imaging Radar-C
X-SAR	X-band Synthetic Aperture Radar
3 -D image	Three Diminutions image
N	North
S	South
JPL	Jet Propulsion Laboratory
ESRI	Economic and Social Research Institute
TIN	Triangulated Irregular Network
Fil	Fill Sinks
Fdr	Flow Direction
Fac	Flow Accumulation
Str	Stream Definition
Lnk	Stream Segmentation
σ	standard deviation of the data distribution
μ	mean of the data distribution
P	parameter of the distribution