Estimation of Temporal Changes in Soil Moisture Using Resistivity Method

Goyal V C, P K Gupta, S M Seth and V N Singh

Hydrological Processes, Vol. 10, 1147-1154, 1996

The temporal variation in a soil moisture profile can be studied using resistivity sounding data acquired at different times. The layered earth model based estimation of soil moisture from apparent resistivity data is a two step non-linear inversion. Firstly, the apparent resistivity data are inverted to derive the layer resistivity variations and thicknesses and, secondly, the moisture content is estimated from these layer resistivity variations using a calibration equation. The soil moisture-resistivity problem was studied using the one-dimensional formulation of resistivity problem. A generalized geoelectric earth model was considered to simulate the soil moisture distribution and its temporal variation in the unsaturated zone. An algorithm (RESMOS) for the interpretation of the apparent resistivity data in terms of soil moisture variations through this two-step inversion process is reported.

Application of Chemical Mass Balance to Upstream /Downstream River Monitoring Data

Jain C K

Journal of Hydrology, 182, 105-115, 1996

The river Kali western Uttar Pradesh (India) has been heavily influenced by the discharge of untreated municipal, agricultural, and industrial effluents. In the main channel of the river, the metal contamination was found to be three to four times the background level. The concentration of iron, zinc, and copper was 0.41, 0.04, and 0.015 mg 1-1 , respectively, in the upstream section during October. The same were 0.56, 0.07, and 0.016 mg 1-1 , during December.

Comparisons between upstream and downstream monitoring sites reveal changes in the concentration and/or load to the river and can be used to discriminate between point and non-point sources of pollution for these elements in the river. The resulting differential loadings, if adjusted for uncharacterized non-point contribution to the load, may represent the total point source load to the river minus any losses due to volatilization, settling, and/or degradation. Mass balance calculations conducted for iron, zinc, and copper indicated that additional inputs are needed to account for the observed differences in load along the river. The sources may

include non-point sources of pollution due to agricultural activities, sediment remobilization or entrainment, groundwater intrusion or from a combination of these sources.

Hydrological Land Use Study of Ghataprabha Catchment Using IRS-1A Data
Purandara B K and V K Choubey

Asian-Pacific Remote Sensing and GIS Journal, 1996

An attempt was made to study the conjunctive use of surface and groundwater of a mountainous catchment. The Ghataprabha catchment (up to the Hidkal dam) with an area of 1434 km2 was selected for the study. Land use and soil maps were prepared using IRS-1A-LISS II images. Other relevant information such as hydrometeorological, ground water levels and other hydrological parameters was collected from various government agencies. The farmers of the region were contacted for information pertaining to crop patterns and usage of surface water and ground water. Based on the water requirements for various crops, cropping patterns are suggested to maximize the net return.

A Monthly Runoff Model for Snow Dominated Catchments in Western Himalayas
Rao S V N, K S Ramasastri and R N P Singh

Nordic Hydrology, Vol. 27, No. 4 pp. 255-274, 1996

The rivers originating from middle and greater Himalayas have significant part of their catchments under permanent snow cover and glaciers. Modelling runoff becomes difficult with almost no data from these parts. Even in the seasonal snow covered zones, the network is generally inadequate. However, precipitation characteristics show repetitiveness and snowline movement elevation wise by and large occurs the same pattern each year. The snow line movement is distinct on a monthly basis and the location of permanent snowline is also more or less constant at about 4,500 m.

A simple monthly snowmelt runoff model with relatively few parameters is proposed to take advantage of above mentioned characteristics, using the degree day method. The model uses monthly rain, snow (snow water equivalent), mean air temperature and snowline elevation as primary inputs. Model conceptualisation has been made in view of the data constraints. All parameters are estimated through few trial simulations, except the storage coefficient, which is optimised using Rosenbrock technique. The model was applied on two sub-catchments of

Chenab basin (of Indus river system) to evaluate the model capability. The results are encouraging.

Determination of Snowmelt Factors in the Himalayan Region
Singh Pratap and Naresh Kumar

Hydrological Sciences Journal, vol. 41, pp. 301-310, 1996

Information on the snowmelt factor (SMF) is required for the estimation of snow and glacier melt runoff. In the present study, SMF is computed for a normal snowpack over a glacier at an altitude of about 4000 m in the Garhwal Himalayas. The effect of natural dusting on SMF is also examined. For this purpose, natural dust available at the site of the experiment was uniformly spread over the snow surface to form a 2 mm thick layer. The melt runoff from the snow blocks and air temperature at 2 m above the snow surface were observed. Mean daily SMF values for normal and dusted snow blocks were computed to be 5.94 and 6.62 mm oC-1 day-1 respectively. Mean daily SMF for the dusted snow block was found to be always higher than that of the dust free snow block. Maximum hourly values of SMF for the normal and dusted snow blocks were obtained in the range of 0.583-0.632 and 0.785-0.824 mm oC-1 h-1 , respectively, while the minimum value was zero for all cases. Maximum hourly value of SMF occurred at about 1400 h for both blocks. A comparison of the daily SMF with information already available in the literature is presented.

Design of Class I Sedimentation Tanks
Prabhata, K. Swamee and Aditya TyagiJournal of Environmental Engineering, vol. 122, No. 1 : 71-71, 1996

The present practice for the design of primary settling tanks is based on the overflow rate corresponding to the percentage removal using iso-removal plots. The design procedure would be more rational if it were based on the removal efficiency and the score criterion of the deposited particles. This technical note presents closed form equations for the removal efficiency and score velocity of particles. The removal efficiency equation considers the size distribution of particles, and the score velocity equation is based on the Rouse equation. The removal efficiency equation yields the minimum particle size completely removed by the sedimentation tank. Using these equations, the design equations have been obtained for the length and the width of the settling tank. Besides other parameters, the design equations involve the completely removed minimum particle size, by specific gravity of the sediment

particles, and the kinematic viscosity of water. These equations will be useful for the design of grip chambers and settling basins undergoing Class I settling.

Optimal Design of Sloping Weir
Swamee P K, G C Mishra and Adel A S Salem

Journal of Irrigation & Drainage Engineering, ASCE, Vol. 122, No. 4,

248-255, 1996

Weirs are important hydraulic structures constructed across rivers for diverting water for irrigation and power generation. Optimal design of these structures has not been attempted earlier as it involved diverse fields like hydrology, free surface flow, seepage, economics, optimization, and so on. Furthermore, occurrence of a large number of state variables in the constraints is another hindrance in the optimization process. Presented herein is a methodology of optimal designs of pileless, and single-pile sloping floor weirs that are structurally safe. The methodology presented is useful to the design engineer.

Use of Hysteresis for Defining the Nature of Flood Wave Propagation in Natural Channels
Mishra S K and S M Seth

Hydrological Sciences Journal, 41(2), 153-170, 1996

The hysteresis (h ) of the non-dimensional site-specific rating curve is used to describe the occurrence of a kinematic wave (KW), a diffusion wave (DW) or a dynamic wave (DYW) in the downstream valley of the Teton dam, USA, and the Machhu dam II, India. Criteria are developed for the occurrence of these waves. The study reveals that the hysteresis is the energy loss occurring at a particular site and is related to the speed of travel, wave number, phase difference and attenuation characteristics of the flood wave. The role of h is shown to be of vital importance in: (i) choosing a suitable downstream boundary for improving the results; and (ii) identifying the wave zones where approximate models can substitute the complete DYW model.

Analytical Verification of Muskingum-Cunge Routing
V.M. Ponce, A.K. Lohani, C. Scheyhing

Journal of Hydrology 174 (1996)

A verification of Muskingum-Cunge routing is accomplished by comparing theoretically calculated peak outflow and travel time with those generated using constant-parameter Muskingum-Cunge method of flood routing. The close agreement between analytical and numerical results underscores the utility of Muskingum-Cunge routing as a viable and accurate method for routing applications in flood hydrology.

Determination of Snowmelt Factor in the Himalayan Region
Pratap Singh & Naresh Kumar

Hydrological Sciences Journal 41(2),June 1996.

Information on the snowmelt factor (SMF) is required for the estimation of snow and glacier melt runoff. In the present study, SMF is computed for a normal snowpack over a glacier at an altitude of about 4000 m in the Garhwal Himalayas. The effect of natural dusting on SMF is also examined. For this purpose, natural dust available at the site of the experiment was uniformly spread over the snow surface to form a 2 mm thick layer. The melt runoff from the snow blocks and air temperature at 2 m above the snow surface were observed. Mean daily SMF for the dusted snow block was found to be always higher than that of the dust free snow block. Maximum hourly value of SMF occurred at about 1400 h for both blocks. A comparison of the daily SMF with information already available in the literature is presented.

Evaluation of Reservoir Sedimentation Using Multi-temporal IRS-IA LISS-II Data
Goel M K and S K Jain

Asian-Pacific Remote Sensing & GIS Journal, Vol. 8. No. 2, 39-43, 1996

Sedimentation is a major problem in the operation and maintenance of reservoirs. Sediments restrict water movement, occupy space and adversely affect the quality of water, aquatic organisms and the recreational potential of a reservoir. Present conventional techniques of sediment quantification in a reservoir are cumbersome, costly and time-consuming. Remote sensing, through its spatial, spectral and temporal attributes, can provide synoptic, repetitive and timely information regarding the sediment distribution and deposition pattern in a reservoir. This information can also be utilised to quantify the sedimentation rate in a reservoir.

The average sedimentation rate in the Dharoi reservoir, located on the river Sabarmati in Gujarat state, has been quantified. The sediment distribution pattern in the reservoir has also been analysed at different time periods of a "water" year. Multi-temporal LISS_II sensor data of

the Indian Remote Sensing satellite-1A was used for this purpose. Digital image processing and analysis was carried out using an ERDAS image processing system. Based on the analysis, revised elevation-area-capacity curves for the reservoir were calculated.

Holocene Landform and Soil Evolution of the Western Gangetic Plains:Implication of Neotectonics and Climate

Kumar Sudhir, B Prakash, M Manchanda, A Singhvi and P Srivastava

Z. Geomorph. N . F., Suppl. -Bd. 103, 283-312, Berlin-Stuttgart, 1996

Based on the degree of development, soils of the western Gangetic Plains have been grouped into five members of a soil-chronoassociation, QGN1 to QGN5, with probable ages of <500 B.P., >500 B.P., >2500 B.P., 8000 B.P. and 10000 B.P. Distribution of geomorphological features and soils helped to delineate six tectonic blocks bound by faults viz. Solani, Khoh, Ganga-Solani, Upper Ganga-Yamuna, Lower Ganga-Yamuna and Ganga-Ramganga Blocks. Neotectonic movements of these blocks have affected morphogenesis and pedogenesis significantly. A block subsided and became sites of deposition by rivers; got slightly uplifted or tilted so that the rivers shifted away and the soil development took place, and/or strongly uplifted so as to be subjected to erosion. These tectonic movements took place at different times for varied periods.

Soil development increases from north to south in the region west of the Ganga river and is related to a decrease in the overall rate of sedimentation and subsidence from north to south. Similarly the degree of soil development decreases in direction of tilting in the region east of the Ganga river.

Accumulation of pedogenic salts and calcrete took place from Early Holocene to about 6000 B.P. during a dry and cold climate. Subsequently warm and wetter climate and improved drainage leached down salts and carbonate from certain areas forming "relict soils".