Flow Characteristics of Chimney Weir Under Submergence

Chatterjee, C., Singh, R., Kar, S.K., Panda, S.N., and Vohra, S.L.

Journal of Irrigation and Drainage Engineering, ASCE, Vol. 124, No.2, 96-101, 1998

A theoretical submerge flow equation for Chimney weir is developed. Based on experiments conducted with five different chimney weirs, it is found that the theoretical submerge flow equation, alongwith a parabolic equation relating to co-efficient of discharge and the ratio of upstream head to crest height, credits the discharge accurately. The performance of the developed equation is compared with the previously developed submergence formulas for sharp crested weirs, and it is seen that the developed equation performs better within the experimental range. Further, for simplicity, an empirical equation is also proposed, which is found to give reasonable prediction of submerged discharge.

Conjunctive Surface-Subsurface Modeling of Overland Flow

Singh, V. and S. Murty Bhallamudi

Advances in water Resources, Vol. 21, 567-579, 1998.

In this paper, details of a conjunctive surface-subsurface numerical model for the simulation of overland flow are presented. In this model, the complete one-dimensional Saint-Venant equations for the surface flow are solved by a simple, explicit, Essentially Non-Oscillating (ENO) scheme. The two-dimensional Richards equation in the mixed form for the subsurface flow is solved using an efficient strongly implicit finite-difference scheme. The explicit scheme for the surface flow component results in a simple method for connecting the surface and subsurface components. The model is verified using the experimental data and previous numerical results available in the literature. The proposed model is used to study the two-dimensionality effects due to non-homogeneous subsurface characteristics. Applicability of the model to handle complex subsurface conditions is demonstrated.

Assessment of Waterlogging in Sriram Sagar Command Area, India by Remote Sensing

Choubey V K

Water Resources Management (EWRA), Vol. 12(5), pp.343-357, 1998

Waterlogging is becoming a serious problem in irrigated command areas of India. The study area is the Sriram Sagar command, which is about 120 km north of Hyderabad. An attempt has been made to make an assessment of the water logged area and those areas sensitive to water

logging during the pre and post maonsoon periods in the Sriran Sagar command using remotely sensed and field data.

Indian Remore Sensing Satellite (IRS-1A-LISS-II) digital data of 12 April and 6 Oct. 1989, were analysed to assess the areas affected by waterlogging and those areas sensitive to water logging. The variation of the IRS-derived waterlogging areas, was done using available water table depth data and other field information. The results obtained from this study indicate that in April And Oct, 1989, areas of some 388 and 540 sq, km, were waterlogged and about 698 and 802 sq, km, respectively, wre sensitive to waterlogging (where the water table lies between 1 to 2 m, respectively, below the ground surface). It is suggested that periodic assessment of water logging, using remotely sensed data, should be carried out in Sriram Sagar command.

The IRS data have been proven to be very useful for the assessment of waterlogging. Density slicing and principal component analysis are useful techniques in making an assessment of waterlogged areas in irrigated command areas.

A Case Study of Longitudinal Dispersion in Small Lowland Rivers
S. A. Lowe and C. K. Jain,

Water Environment Research, 70(7), 1332-1333, 1998.

The paper showed longitudinal dispersion in small rivers. Estimated values of the longitudinal dispersion are apt to vary over the course of the river as a result of physical variability in small rivers. When calculating the velocity the authors use the time to peak concentration. This is suitable when the concentration versus time data is symmetrical, as was the case in Figure 2 of the article, but is it the best estimate if the data is skewed? In that case it may be more appropriate to use the time of the centroid, when the most data are skewed. The authors also use the peak concentration to estimate the dispersion coefficient. While this is a reasonable approach, it effectively means that both the estimation of velocity, and of dispersion, are reliant on just one data point at a station. An alternative method to calculating the dispersion using equation 3 from the paper, that is, the expression for maximum concentration is to work directly from equation 2. This method can be expanded to include all data from a reach as well.

The Influence of Model Structure on the Efficiency of Rainfall-Runoff Models : A Comparative Study for Some Catchments of Central India
R. Mehrotra and R.D. Singh

Water Resources Management, 1998, Vol:12, pp:325-341

This paper examines relative performance of six monthly rainfall - runoff models on 12 catchments located in different agro-climate zones of Central India. Study indicates that a water balance type model can reproduce catchment behaviour in a better manner as compared to a statistical model and it is easier to model runoff for catchments with higher runoff factor. Also, a two parameter model is found sufficient to represent the rainfall-runoff relationship of a catchment on a monthly scale.

Water Quality Modelling of the Kali River, India
Ghosh N C and Edward A McBean, Water, Air and Soil Pollution Journal, No. 102, 1998

Water quality monitoring procedures effective in calibrating the QUAL2E model for the Kali River in India are described. The stability of the dry season conditions for the Kali River are utilized to consider the migration pathways, and hence the calibration efforts necessary for water quality models. Alternative procedures for calibrating values for the reaction rates are utilized for reinforcement of the findings. These alternatives include changes in stream turbidity which are shown to be a useful measure of benthic oxygen demand. Ratios of BOD to COD are reported between sugar mills, industrial inputs and municipal sources.

Reservoir Operation Studies for Sabarmati System, India
Jain S K, M K Goel and P K Agarwal

Journal of Water Resources Planning and Management, ASCE, Vol. 124, No. 1, pp. 31-38, 1998

In India reservoirs are usually constructed to serve multiple purposes, such as irrigation, municipal and industrial water supply, hydropower generation, and flood control. Because for the high temporal and geographical variability of rainfall in this country, reservoir operation occupies an important place in the utilization of water resources. The operation of the Sabarmati system, consisting of four reservoirs and three diversion structures was studied. The function of the system is to provide a municipal and industrial water supply, irrigation, and flood control. For conservation regulation of the system, rule curves were derived for the various reservoirs. Using the simulation analysis, the rule curves were fine-tuned to achieve the targets to the maximum possible extent. The operation procedure for flood regulation was developed for the Dharoi reservoir. Since the potential damage centre is located far downstream of the dam, the modeling of flow in the Sabarmati river at Ahmedabad was carried

out. Software was developed to assist the dam operator in determining the safe release from the Dharoi reservoir during floods.

Spatial Disaggregation of Rainfall Data

Mehrotra R and R D Singh

Hydrological Sciences Journal, Vol. 43, No. 1, pp. 91-102, 1998

Use of output from Global Circulation Models (GCMs) by regional or small-scale rainfall-runoff models necessitates the disaggregation of the hydrological information available from GCMs to smaller scales. The hydrological processes of interest commonly occur at much smaller scales than those being modelled by GCMs. The present work examines the disaggregation of areally averaged monthly rainfall values of a basin or a region into point rainfall values. It uses some statistical methods based on a frequency analysis approach, a correlation approach and a disaggregation approach. A total of ten different methods have been tried and their relative performances compared based on some error criteria evaluated from observed and disaggregated point rainfall and mean areal rainfall values and their statistics. The results show the superiority of methods based on disaggregation techniques over other methods. The methods presented and discussed in the paper may very well be applied to disaggregate mean areal rainfall values into point rainfall values and also for infilling missing rainfall records.

Assessment of Point and Non-point Sources of Pollution Using Chemical Mass Balance Approach

Jain C K, K K S Bhatia and S M Seth

Hydrological Sciences Journal, 43(3), 379-390, 1998

A survey of the River Kali in western Uttar Pradesh (India) has been carried out to assess the contribution of point and non-point sources of pollution to the river. The river shows strong seasonal dependence for various constituents and the water quality deteriorates sharply as it flows through Muzaffarnagar city. The important characteristic associated with the pollution of the river is the depletion of oxygen over a stretch of about 25 km. High values of BOD and COD indicate a high degree of organic pollution in the river. A chemical mass balance approach has been used for measuring changes in the concentration and/or load to the river, which develops an interesting concept to discriminate between point and non-point sources of pollution to the river. The resulting differential loading, 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 certain, water quality constituents 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 a combination of these sources. The difference may also be attributed to some point sources of pollution, which could not be identified in the course of these investigations.

Multivariate Modeling of Flood Flows
Goel N K, S M Seth and Satish Chandra

Journal of Hydraulic Engineering, ASCE, Vol. 124, No. 2, 146-155, 1998

During the last two to three decades, flood frequency analysis mainly concentrated on the analysis of annual peak discharge series. It provides a limited assessment of the flood event, as risk of flooding is formulated in terms of flood peak magnitudes only. Hydrological phenomena like flood flows always appear as multivariate events that are characterized by various components such as volume, duration, and flood peak. In many aspects of water resources planning and management, information about the magnitude, duration and volume of the critical flood events is essential. This requires the probability of the whole flood event rather than the probability of only peak discharge. In spite of its importance, very limited attention has been paid in the past to the study of the flood event as a whole. The present work is another step in this direction.

Although a general multivariate modeling approach to the flood problem offers improved practical applications, it requires considerably more data and more complex mathematical analysis. For these reasons, the present study is limited to bivariate flood modeling only.

SLURP Model and GIS for Estimation of Runoff in a Part of Satluj Catchment, India
Jain S K, G W Kite, Naresh Kumar and Tanveer Ahmad

Hydrological Sciences Journal, 43(6), pp.875-884, 1998

The snow and rain in the Himalayas are the main sources of supply for the rivers in the Indo-Gangetic plains. Irrigation, hydropower generation, and water supply are very much dependent on the availability of water in the Himalayan rivers. Mathematical models serve as important aids for the estimation of water availability in rivers. In the present study the SLURP watershed

model is applied to a rainfed area of the Satluj catchment located in the western Himalayas, India. The SLURP model developed at NHRI, Canada, is a distributed conceptual model which simulates the behaviour of a watershed by carrying out vertical water balances for each element of a matrix of landcovers and subareas of a watershed and then routing the resulting runoff between subareas. The ILWIS geographic information system was used to prepare the input data required for SLURP and land use data were obtained from the IRS satellite LISS II visible and near infrared sensors. The simulated flows at the Bhakhra Dam outlet of the Satluj catchment were computed and found to compare well with the observed flows.

Rainfall Runoff Modeling Using GIUH and GIS
Jain S K, Sharad K Jain and Tanveer Ahmad

Asian-Pacific Remote Sensing & GIS Journal, Vol. 10, Jan. 1998

In the recent past, much research has been directed towards using a geographical information system (GIS) for input data management and parameter estimation of a hydrological model. A hydrology-specific GIS (ILWIS) which includes procedures for drainage network delineation and the ordering and identification of geomorphologic parameters was used in this study. The GIS was also used to handle remote sensing data. Rainfall losses were estimated using the Soil Conservation Services (SCS) run-off curve number (CN) method and the geomorphologic instantaneous unit hydrograph (GIUH) approach was used for transformation of rainfall into run-off. The data of an 820 sq. km. Catchment were used to test the methodology. The results of the modelling are encouraging.

Generalised Design of Single Profile (Self Basing) Weirs
Keshav Murthy K. and Rangaraj C.

Journal of Hydraulic Research, Vol.36, 1998, No.4

This paper presents a generalised theory and design of a new class of self basing weir of constant indication accuracy. Unlike in the earlier designed compound weirs, the weir is defined by a single profile throughout and a portion of the weir above the crest acts as a base. Single profile weirs eliminate the source of error associated with compound weirs arising from the assumption of single value of coefficient of discharge for both the base weir and their complementary weir.

The depth of the base weir can be reduced by altering certain parameters to suit the practical consideration. The problem ins approached by using a hyperbolic function as the discharge generation function. The generalised design presented in this paper allows balancing between the contradictory requirements of accuracy and reduction of afflux in the field.