Water Flow And Sediment Transport In The Lower Danube River

Completely updated and with three new chapters, this analysis of river dynamics is invaluable for advanced students, researchers and practitioners.

Historically, the flow of sediment in the Missouri River has been as important as the flow of water for a variety of river functions. The sediment has helped form a dynamic network of islands, sandbars, and floodplains, and provided habitats for native species. Further downstream, sediment transported by the Missouri and Mississippi Rivers has helped build and sustain the coastal wetlands of the Mississippi River delta. The construction of dams and river bank control structures on the Missouri River and its tributaries, however, has markedly reduced the volume of sediment transported by the river. These projects have had several ecological impacts, most notably on some native fish and bird species that depended on habitats and landforms created by sediment flow. Missouri River Planning describes the historic role of sediment in the Missouri River, evaluates current habitat restoration strategies, and discusses possible sediment management alternatives. The book finds that a better understanding of the processes of sediment transport, erosion, and deposition in the Missouri River will be useful in furthering river management objectives, such as protection of endangered species and development of water quality standards.

Chien (hydraulic engineering, Tsinghua University) and Wan (China Institute of Water Resources and Hydro-power) cover every essential phase of the mechanics of sediment transport by examining the processes of erosion, transportation and deposition of sediment particles under gravity, flowing water,

Sediment Transport and Hydraulics of Flow in the Kankakee River, Illinois

Mechanics of Sediment Transport

Flow of Water in a Curved Open Channel with a Fixed Uneven Bed, Report on Experimental and Theoretical Investigations

Sediment Transport in Irrigation Canals

Sediment Transport

Fully Coupled Robust Shallow Water Flow and Sediment Transport Model on Unstructured Grids

The field study was conducted in order to obtain a better understanding of the flow and sediment-transport mechanisms responsible for the recurrent shoaling that has been experienced in the vicinities of Fox Island (RM-355-6)and Buzzard Island (RM-349-50) in Pool 20 between Keokuk, Iowa, and Canton, Missouri, in the Mississippi River. Three sets of detailed data on transverse and streamwise distributions of flow velocity, suspended sediment discharge, bed-load discharge, bed-material properties, and flow depth were obtained for the high, intermediate, and low river stages during the period between May and September, 1976. The field data were used to establish empirical relationships between the sediment transport rates and hydraulic quantities in the study reaches. Based on the empirical sediment discharge formulas, closures of some side-channels to increase-transport capacity in the main channel of

the study reaches have been suggested. (Author).

Sediment refers to the conglomerate of materials, organic and inorganic, that can be carried away by water, wind or ice These particulates are typically small, with clay defined as particles less than 0.00195 mm in diameter, and coarse sand reaching up only to 1.5 mm in diameter. However, during a flood or other high flow event, even large rocks can be classified as sediment as they are carried downstream. Sediment is a naturally occurring element in many bodies of water, though it can be influenced by anthropogenic factors. Sediment transport is applied to solve many environmental, geotechnical, and geological problems. Measuring or quantifying sediment transport or erosion is therefore important for coastal engineering. Movement of sediment is important in providing habitat for fish and other organisms in rivers. Therefore, managers of highly regulated rivers, which are often sediment-starved due to dams, are often advised to stage short floods to refresh the bed material and rebuild bars. Geologists can use inverse solutions of transport relationships to understand flow depth, velocity, and direction, from sedimentary rocks and young deposits of alluvial materials.Sediment Transport - Flow and Morphological Processes provide information on basic and advanced flow mechanisms including turbulence and movement of particles in water. Examples of computational procedures for sediment transport and morphological changes are presented. This book put together recent developments on sediment transport and morphological processes. Sediment transport is important in the fields of sedimentary geology, geomorphology, civil engineering and environmental engineering. Knowledge of sediment transport is most often used to determine whether erosion or deposition will occur, the magnitude of this erosion or deposition, and the time and distance over which it will occur.

A unique, advanced textbook combining sedimentology and geomorphology in a comprehensive and integrated way.

Missouri River Planning

Encyclopedia of Sediments and Sedimentary Rocks

Hydraulics of Sediment Transport

Recognizing and Incorporating Sediment Management

Sediment Transport in the Lower Guadalupe and San Antonio Rivers

Geomorphology to Support Management

Fully Coupled Robust Shallow Water Flow and Sediment Transport Model on Unstructured GridsSediment Transport in Irrigation CanalsA New ApproachCRC Press

This report presents the development of a numerical model simulating water flow and contaminant and sediment transport in watershed systems of one-dimensional river/stream network, two-dimensional overland regime, and three-dimensional sub surface media. The model is

composed of two modules: flow and transport. Three options are provided in modeling the flow module in river/stream network and overland regime: the kinematic wave approach, diffusion wave approach, and dynamic wave approach. The kinematic and diffusion wave approaches are known to be numerically robust in terms of numerical convergency and stability; i.e., they can generate convergent and stable simulations over a wide range of ground surface slopes in the entire watershed. The question is the accuracy of these simulations. The kinematic wave approach usually produces accurate solutions only over the region of steep slopes. The diffusion wave approach normally gives accurate solutions over the region of mild to steep slopes. However, neither approach has the ability to yield accurate solutions over the region of small slopes, in which the inertial forces are no longer negligible compared to the gravitational forces. The kinematic wave approach cannot address the problems of backwater effects. On the other hand, a dynamic wave approach, having included all forces, can theoretically have the potential to generate accurate simulations over all ranges of slopes in a watershed. The subsurface flow is described by Richard's equation where water flow through saturated-unsaturated porous media is accounted for.

This book is divided into four parts: Part 1 is entitled "A Short History of Sediment Transport"; Part 2 deals with the "Hydrodynamics of Fluid-Particle Systems"; Part 3 is concerned with the "Sediment Transport in Open Channels"; and Part 4 describes the "Sediment Transport in Closed Pipes." The intent of this book was to make each part as self-contained as possible which has made this an exceptional and successful textbook. The brief introduction preceding each part will help the reader become familiar with the topic. This book has been used successfully both as a classroom textbook and as a reference book by consultants involved with sediment transport.

A Numerical Model Simulating Water Flow and Contaminant and Sediment Transport in WAterSHed Systems of 1-D Stream-river Network, 2-D Overland Regime, and 3-D Subsurface Media (WASH123D: Version 1.0)

Modeling Flow and Sediment Transport in the Rio Puerco Using a SWAT/GIS Interface

Earth Surface Processes, Landforms and Sediment Deposits

Phase II

River Dynamics

Hydraulics of Flow and Sediment Transport in the Kankakee River in Illinois

The second edition of this acclaimed, accessible textbook brings the subject of sedimentation and erosion up-to-date, providing an excellent primer on both fundamental concepts of sediment-transport theory and methods for practical applications. The structure of the first edition is essentially unchanged, but all the chapters have been updated, with several chapters reworked and expanded significantly. Examples of the new additions include the concept of added mass, the Modified Einstein Procedure, sediment transport by size fractions, sediment

transport of sediment mixtures, and new solutions to the Einstein Integrals. Many new examples and exercises have been added. Erosion and Sedimentation is an essential textbook on the topic for students in civil and environmental engineering and the geosciences, and also as a handbook for researchers and professionals in engineering, the geosciences and the water sciences.

This monograph provides a comprehensive state-of-the-art description of the work carried out in the UK and Japan on "Flow and Sediment Transport in Compound Channels". It therefore describes research which has been conducted, primarily over the last two decades, and which has yielded a fairly detailed picture of the important behaviours of compound channels and produced a number of engineering prediction methods which ought to be widely adopted in practice. The text will inevitably highlight areas where our knowledge is sparse and it will spur others on in the task of filling in such gaps. The concept of bi-national groups of researchers meeting together intermittently over period of some years, though not new, has drawn both inspiration and experience and the interaction has produced tangible outcomes in the form of this useful publication.

Climate and anthropogenic changes impact the conditions of erosion and sediment transport in rivers. Rainfall variability and, in many places, the increase of rainfall intensity have a direct impact on rainfall erosivity. Increasing changes in demography have led to the acceleration of land cover changes in natural areas, as well as in cultivated areas, and, sometimes, in degraded areas and desertified landscapes. These anthropogenized landscapes are more sensitive to erosion. On the other hand, the increase in the number of dams in watersheds traps a great portion of sediment fluxes, which do not reach the sea in the same amount, nor at the same quality, with consequences on coastal geomorphodynamics. This book is dedicated to studies on sediment fluxes from continental areas to coastal areas, as well as observation, modeling, and impact analysis at different scales from watershed slopes to the outputs of large river basins. This book is concentrated on a number of keywords: “erosion” and “sediment transport”, “model” and “practice”, and “change”. The keywords are briefly discussed with respect to the relevant literature. The contributions in this book address observations and models based on laboratory and field data, allowing researchers to make use of such resources in practice under changing conditions.

River Confluences, Tributaries and the Fluvial Network

Hydraulic and Flow Studies Related to Sediment Transport, Kentucky River, Kentucky

Non-uniform Flow and Its Effects on River-channel Morphology
River Mechanics
Water and Sediment Dynamics
Sediment Transport in the Coastal Environment

Comprehensive text on the fundamentals of modeling flow and sediment transport in rivers treating both physical principles and numerical methods for various degrees of complexity. Includes 1-D, 2-D (both depth- and width-averaged) and 3-D models, as well as the integration and coupling of these models. Contains a broad selection of numerical methods for open-channel flows, such as the SIMPLE(C) algorithms on staggered and non-staggered grids, the projection method, and the stream function and vorticity method. The state-of-the-art in sediment transport modeling approaches is described, such as non-equilibrium transport models, non-uniform total-load transport models, and semi-coupled and coupled procedures for flow and sediment calculations. Sediment transport theory is discussed and many newly-developed, non-uniform sediment transport formulae are presented. The many worked examples illustrate various conditions, such as reservoir sedimentation; channel erosion due to dam construction; channel widening and meandering; local scour around in-stream hydraulic structures; vegetation effects on channel morphodynamic processes; cohesive sediment transport; dam-break fluvial processes and contaminant transport. Recommended as a reference guide for river and hydraulic engineers and as a course text for teaching sediment transport modeling, computational free-surface flow, and computational river dynamics to senior students.

Rivers are important agents of change that shape the Earth's surface and evolve through time in response to fluctuations in climate and other environmental conditions. They are fundamental in landscape development, and essential for water supply, irrigation, and transportation. This book provides a comprehensive overview of the geomorphological processes that shape rivers and that produce change in the form of rivers. It explores how the dynamics of rivers are being affected by anthropogenic change, including climate change, dam construction, and modification of rivers for flood control and land drainage. It discusses how concern about environmental degradation of rivers has led to the emergence of management strategies to restore and naturalize these systems, and how river management techniques work best when coordinated with the natural dynamics of rivers. This textbook provides an excellent resource for students, researchers, and professionals in fluvial geomorphology, hydrology, river science, and environmental policy.

field trips." --Book Jacket.

Alternatives in Regulated River Management

Sediment Transport in the Feather River, Lake Oroville to Yuba City, California

An introduction to fluvial dynamics

Three-dimensional Flow and Sediment Transport at River Mouths

Aspects of Flow Resistance and Sediment Transport, Rio Grande Near Bernalillo, New Mexico

Flow and Morphological Processes

Comprehensive text on the fundamentals of modeling flow and sediment transport in rivers treating both physical principles and numerical methods for various degrees of complexity. Includes 1-D, 2-D (both depth- and width-averaged) and 3-D models, as well as the integration and coupling of these models. Contains a broad selection

This comprehensive, one-volume encyclopedia covers the

sedimentological aspects of sediments and sedimentary rocks. It features more than 250 entries by some 180 eminent contributors from all over the world, excellent indices, cross references, and extensive bibliographies.

Sediment Transport Processes and their Modelling Applications is a book which covers a wide range of topics. The effective management of many aquatic environments, requires a detailed understanding of sediment dynamics. This has both environmental and economic implications, especially where there is any anthropogenic involvement. Numerical models are often the tool used for predicting the transport and fate of sediment movement in these situations, as they can estimate the various spatial and temporal fluxes. However, the physical sedimentary processes can vary quite considerably depending upon whether the local sediments are fully cohesive, non-cohesive, or a mixture of both types. For this reason for more than half a century, scientists, engineers, hydrologists and mathematicians have all been continuing to conduct research into the many aspects which influence sediment transport. These issues range from processes such as scour, erosion and deposition, to how sediment process observations can be applied in sediment transport modelling frameworks. This book reports the findings from recent research in applied sediment transport which has been conducted in a wide range of aquatic environments. The research was carried out by researchers who specialise in the transport of sediments and related issues.

The Numerical Modelling of Shallow Water Flow and Sediment Transport Over Bedforms in the Coastal Ocean

Computational River Dynamics

The Experience of Japanese and UK Research

Sediment Transport Technology

Sediment Transport Through Pipes

RIVER PROCESSES

The subject of sediment transport in the coastal zone is investigated and the answers to some of the basic questions of sediment transport in unsteady, oscillatory flow are presented. By adopting Jonsson's (1966) results for the bottom shear stress associated with a simple wave motion, it is shown that Shield's criterion for the initiation of sediment movement on a flat bed holds in unsteady as well as steady flow. A simplified analysis as well as experimental data show the side effects associated with the experimental procedure in which a tray containing sediment is oscillated in still water is generally insignificant and is, therefore, a valid procedure for studying certain aspects of wave sediment interaction. Also, Shields Parameter is identified as the physically important parameter quantifying the fluid sediment interaction. An empirical relationship between a non-

dimensional average sediment transport rate and Shields Parameter is found by reanalyzing the experimental data on the rate of sediment transport in oscillatory flow obtained by Einstein and co-workers at Berkeley. This relationship is similar to the Einstein-Brown sediment transport relationship in unidirectional, steady flow. By generalizing Jonsson's expression for the bottom shear stress associated with a sinusoidal wave motion, it is shown that the empirical sediment transport relationship may be derived from a quasi steady application of the Einstein-Brown sediment transport relationship. Also, it is demonstrated that the empirical relationship obtained using a friction factor based on grain roughness is capable of predicting sediment transport rates observed in experiments where bed forms were present. The general application of the derived sediment transport relationship for predicting net rates of sediment transport in the presence of second order effects such as bottom slope, wave asymmetry, mass transport currents and coastal currents is discussed. This discussion serves also to identify needed areas for future research. It is concluded that only the case of a small amplitude wave and a steady current seems to be understood to the extent that it is reasonable to evaluate the resulting sediment transport with any degree of confidence. Fortunately, this is a rather important situation in most offshore regions. A general numerical model is developed for the sediment transport and topographical changes resulting from spatially varying wave and current conditions. A simple numerical example of the evaluation of the topographical changes in the vicinity of the tip of a long straight breakwater is presented for periodic waves normally incident on the breakwater and a current parallel to the breakwater. This numerical example is chosen to resemble rather severe conditions for the Atlantic Generating Station (AGS) site with a maximum orbital wave velocity of 3.2 ft/sec (1 m/sec) and a current velocity 0.5 ft/sec (.15 m/sec). The results are.presented in a topographical relief map showing areas of scour and accretion of the order 0.78 inches/day (2 cm/day) at a maximum. Although the results of the example are somewhat more qualitative than-quantitative, it is felt that they provide a representative picture of the expected bottom changes in the vicinity of the AGS.

River Confluences and the Fluvial Network brings together state of the art thinking on confluence dynamics tributary impacts and the links between processes at these scales and river network functions. The book is unique in focus, content, scope and in bringing together engineering, ecological and geomorphological approaches to the three key areas of river system science. Taking a global approach this multi-authored text features a team of carefully selected, internationally renowned, experts who have all contributed significantly to recent ground breaking advancements in the field. Each chapter includes a comprehensive review of work to date

highlighting recent discoveries and the main thrust of knowledge, previously unpublished research and case studies, challenges and questions, detailed references as well as a forward looking assessment of the state of the science.

Three-dimensional flow processes of a river emptying into the sea were analyzed. The basic equations which were derived to describe this flow included the effects of buoyancy caused by density differences between fresh and salt water, inertia of river and coastal currents, and differences in hydrostatic head throughout the mixing region. Turbulence effects were included through an appropriate eddy viscosity model. Combinations of river stages and tidal currents were represented as systems of steady-state flow fields. A numerical procedure was developed and implemented on a digital computer for the solution of the equations. This numerical procedure is classified as an asymptotic time-dependent finite-difference technique but includes certain features of a relaxation technique. Computed flow fields were used to track a distribution of nominal particles representing the suspended load of the river as determined from field data. Deposition of these particles was primarily governed by convective processes and particle settling velocities, which included the effect of a local turbulence level. Deposition rates were used to compute deltaic growth. Results were compared to a delta for which experimental data were available. (Author).

Erosion and Sedimentation

Sediment Transport in Rivers

Introduction to Coastal Processes and Geomorphology

UNESCO-IHE Lecture Note Series

Modeling and Practice of Erosion and Sediment Transport under Change

Simulation Studies of Flow and Sediment Transport Using a Mathematical Model, Atchafalaya River Basin, Louisiana

Researchers and managers of regulated river systems will find this volume useful in acquiring information for deciding an integrated management plan for regulated river operations. Rather than the ecological theory of impacts of flow regulation, emphasis has been placed on methods to predict water quality and habitat alterations, as well as techniques to mitigate impacts from various operational scenarios. Although most chapters refer to impacts of riverine impoundments, these alternatives apply to any regulated situation in which changes in water quality or flow pattern occur. The predictive modeling techniques are explained primarily from a theoretical background. However, extensive bibliographies can guide the uninitiated to specific texts and software. Where controversial techniques have been presented, alternate methods are also described. Major topic areas include water quality problems, channel modification and management, ecological modeling and management, as well as a section on perspectives for ecological management and special problems in developing nations.

The transport of sediment greatly influences the sustainability of an irrigation system. Erosion and deposition not only increase maintenance costs, but may result in an inequitable and inadequate distribution of irrigation water. Understanding the behaviour and transport of

sediment allows efficient planning and reliable water delivery schedules, and ensures the controlled deposition of sediments, making maintenance activities more manageable. These lecture notes present a detailed analysis of sediment transport in irrigation canals, together with physical and mathematical descriptions of the behaviour. A mathematical model predicts the sediment transport, deposition and entrainment rate for various flow conditions and sediment inputs. The model is particularly suitable for the simulation of sediment transport in irrigation canals where flow and sediment transport are largely determined by the operation of flow control structures.

Sediment transport in irrigation canals influences to a great extent the sustainability of an irrigation system. Unwanted erosion or deposition will not only increase maintenance costs, but may also lead to unfair, unreliable and unequitable distribution of irrigation water to the end users. Proper knowledge of the characteristics, including behaviour and transport of sediment will help to design irrigation systems, plan effi cient and reliable water delivery schedules, to have a controlled deposition of sediments, to estimate and arrange maintenance activities, etc. The main aim of these lecture notes is to present a detailed analysis and physical and mathematical descriptions of sediment transport in irrigation canals and to describe the mathematical model SETRIC that predicts the sediment transport, deposition and entrainment rate as function of time and place for various flow conditions and sediment inputs. The model is typically suited for the simulation of sediment transport under the particular conditions of non-wide irrigation canals where the flow and sediment transport are strongly determined by the operation of the flow control structures. The lecture notes will contribute to an improved understanding of the behaviour of sediments in irrigation canals. They will also help to decide on the appropriate design of the system, the water delivery plans, to evaluate design alternatives and to achieve an adequate and reliable water supply to the farmers.

Modeling Flow and Sediment Transport in Water Bodies and Watersheds

Flow and Sediment Transport in Compound Channels

A New Approach

Sediment Transport Dynamics in the Lower Mississippi River

A New Approach to Sediment Transport in the Design and Operation of Irrigation Canals

Field Study of Sediment Transport Characteristics of the Mississippi River Near Fox Island (RM-355-6) and Buzzard Island (RM-349-50)

River Processes deals primarily with flow and sediment dynamics in alluvial channels. It emphasises water flows (basic principles and characterisation), fluvial sediment, processes of erosion and sediment transport, bedforms that result from flow-bed sediment interactions in sand and gravel, flow and sedimentary processes in curved, braided and confluent channels, as well as aquatic habits. River Processes provides a comprehensive synthesis of current knowledge about physical processes in alluvial channels, with an emphasis on the recent work on flow-bed-sediment transport interactions. It is intended primarily for undergraduate students interested in fluvial studies as part of physical geography, earth sciences, environmental sciences and ecology courses. The textbook is fully illustrated throughout with line drawings and photographs.

While most books examine only the classical aspects of hydrology, this three-volume set covers multiple aspects of hydrology, and includes contributions from experts from more than 30 countries. It examines new approaches, addresses growing concerns about hydrological and ecological connectivity, and considers the worldwide impact of

climate change. It also provides updated material on hydrological science and engineering, discussing recent developments as well as classic approaches. Published in three books, Fundamentals and Applications; Modeling, Climate Change, and Variability; and Environmental Hydrology and Water Management, the entire set consists of 87 chapters, and contains 29 chapters in each book. Students, practitioners, policy makers, consultants and researchers can benefit from the use of this text.

This dissertation examines the dynamics of sediment transport and channel morphology in the lower Mississippi River. The area of research includes the portion of the river where reach-averaged downstream flow velocity responds to the boundary condition imposed by the relatively uniform water-surface elevation of the receiving basin. Observational studies provided data that are used to identify channel-bed sediment composition, and measure bed-material sediment flux and the properties of the fluid-flow field over a variety of water-discharge conditions. The analyses demonstrate that a significant portion of the channel bed of the final 165 kilometers of the Mississippi River consists of exposed and eroding underlying relict sedimentary strata that qualify as surrogate bedrock. The exposed bedrock is confined to the channel thalweg, particularly in river-bend segments, and actively mobile bed-material sediments are positioned on subaqueous bars fixed by river planform. The analyses for sediment flux provides insight to the nature of sediment transport: during low- and moderate-water discharge, bed-material movement occurs primarily as minimal bedform flux, and so bed materials are not transferred between alluvial bars. During high-water discharge, bed-material transport increases one-hundred fold, and sands move as a part of both suspended and bedform transport. Physical models are used to show that skin-friction shear stress increases by a factor of ten for the measured water-discharge range. This change is not possible given conditions of uniform water flow, and therefore non-uniform flow in response to the Mississippi River approaching its outlet has a significant impact on the timing and magnitude of sediment flux through the lower river. In order to estimate the dynamics of bed material movement from the uniform to non-uniform segment of the river (lower 800 km), data for channel morphology are used to construct a model that predicts spatial changes in water-flow velocity and bed-material flux over a range of water-discharge conditions. The model demonstrates that non-uniform flow tends to produce a region of net channel-bed aggradation between 200-700 kilometers above the outlet, and a region of channel-bed degradation for the final 200. The implication for these results for the spatial variability of channel morphology and kinematics is explored.

Handbook of Engineering Hydrology (Three-Volume Set)

Processes and Their Modelling Applications