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Experimental study of the woody debris trapping efficiency of a steel pipe, open sabo  
dam

Ryuhei TATEISHI, Toshiyuki HORIGUCHI, Yoshimi SONODA, Nobutaka  
ISHIKAWA

Pages 431-443

Response of nephelometric turbidity to hydrodynamic particle size of fine suspended  
sediment

Christina BRIGHT, Sarah MAGER, Sophie HORTON

Pages 444-454

Stable channel analysis with sediment transport for rivers in Malaysia: A case study of the Muda, Kurau, and Langat rivers

Mohd Afiq HARUN, Aminuddin AB GHANI, Reza MOHAMMADPOUR, Ngai Weng CHAN

Pages 455-466

Modeling the initiation of sediment motion under a wide range of flow conditions using a Geno-Mamdani Fuzzy Inference System method

Hussein BIZIMANA, Abd ü sselam ALTUNKAYNAK

Pages 467-483

A study on textural characteristics, heavy mineral distribution and grain-microtextures of recent sediment in the coastal area between the Sarada and Gosthani rivers, east coast of India

Ali MOHAMMAD, Parvathaneni BHANU MURTHY, Edupuganti Naga DHANAMJAYA RAO, Hari PRASAD

Pages 484-503

Comparison of different turbulence models in predicting cohesive fluid mud gravity current propagation

Seyed-Mohammad-Kazem EMAMI, Seyed-Farhad MOUSAVI, Khosrow HOSSEINI, Hesam FOULADFAR, Majid MOHAMMADIAN

Pages 504-515

A review of ecological risk assessment and associated health risks with heavy metals in sediment from India

Vinod KUMAR, Anket SHARMA, Shevita PANDITA, Renu BHARDWAJ, Ashwani Kumar THUKRAL, Artemi CERDA

Pages 516-526

Multicriteria to estimate the environmental risk of sediment from the Obedska Bog (Northern Serbia), a reservation area on UNESCO's list

Dejan KRČMAR, Nenad GRBA, Marijana Kragulj ISAKOVSKI, Nata š a VARGA, Jelena SPASOJEVIĆ, Jasmina AGBABA, Bo ž o Du š an DALMACIJA

Pages 527-539

Impact of land use changes on catchment soil erosion and sediment yield in the northeastern China: A panel data model application

Haiyan FANG

Pages 540-549

Long term sediment transport simulation of the Danube, Sava, and Tisa rivers

Mirjana HORVAT, Zoltan HORVAT

Pages 550-561

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1、 Author: Ryuhei TATEISHI, Toshiyuki Horiguchi, Yoshimi SONODA,

Nobutaka ISHIKAWA

Title: Experimental study of the woody debris trapping efficiency of a steel pipe, open sabo dam

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Abstract: In recent years, the damage caused to human settlements in Japan by large woody debris (LWD) has been increasing. For example, the 2013 Izu Oshima typhoon resulted in a large number of fatalities and missing persons, and the Kagoshima Typhoon Disaster and Northern Kyusyu torrential downpour caused vast infrastructure damage due to the associated LWD. Current countermeasures for preventing LWD are insufficient to maintain the safety of residential areas. One type of protective barrier, the open sabo dam, has been constructed in Japan during the past 30 years. The primary function of open sabo dams is to block the flow of boulders, thereby also reducing sediment flow by reducing the gap size. However, because Japanese open sabo dams are designed specifically for boulder-trapping, the ability of these dams to trap LWD remains uncertain. In particular, many problems have been reported with respect to sediment trapping by driftwood with roots in an open sabo dam setting. The objective of this study was to examine the trapping efficiency of open sabo dams for LWD and sediment. The experimental approach clarified the influence of driftwood, without and with roots, on sediment trapping for a straight-channel flume. The flexible roots of the driftwood were shown to have a

significant effect on the sediment trapping efficiency of the dam.

Keywords: Driftwood; Open sabo dam; Trapping efficiency; Woody debris

2、 Author: Christina BRIGHT, Sarah MAGER, Sophie HORTON

Title: Response of nephelometric turbidity to hydrodynamic particle size of fine suspended sediment

International Journal of Sediment Research,

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Abstract: Turbidity is used as a surrogate for suspended sediment concentration (SSC), and as a regulatory tool for indicating land use disturbance and environmental protection. Turbidity relates linearly to suspended material, however, can show non-linear responses to particulate organic matter (POM), concomitant with changes in particle size distribution (PSD). In the paper the influence of ultra-fine particulate matter (UFPM) on specific turbidity and its association with POM in suspended sediment are shown for alpine rivers in the Southern Alps of New Zealand. The approach was two-fold: a field-based investigation of the relations between SSC, POM, and turbidity sampled during event flow; and experimental work on hydrodynamic particle size effects on SSC, POM, PSD, and turbidity. Specific turbidity changes over event flow and are sensitive to increasing proportional amounts of sand, UFPM, and POM in suspension. Furthermore, the UFPM is the size fraction (<6  $\mu\text{m}$ ) where POM increases. The implications of the current study are that the slopes of turbidity-SSC relations are undesirable in locations that may be dominated by cyclic release of POM or distinct pulses of fine-grained material. At locations where the turbidity-SSC slopes approximate 2, the POM proportion is usually <10% of the total suspended load. However, when turbidity-SSC slopes are <1 this is likely caused by high amounts of side-scatter from UFPM concomitant with higher proportions of POM. Thus, the use of turbidity as a proxy for determining SSC may have serious consequences for the measurement of representative suspended sediment data, particularly in locations where POM may be a significant contributor to overall suspended load.

Keywords: Turbidity; Nephelometry; Suspended sediment concentration; Particle size distribution; Particulate organic matter

3、 Author: Mohd Afiq HARUN, Aminuddin AB GHANI, Reza MOHAMMADPOUR,  
Ngai Weng CHAN

Title: Stable channel analysis with sediment transport for rivers in Malaysia: A case study of the Muda, Kurau, and Langat rivers

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Abstract: Assessments of a stable channel were done to evaluate the conditions of three rivers in Malaysia, using an analytical method that modifies the stable channel flowchart developed by Chang (1988) and Ariffin (2004). The analytical approach was selected to calculate the suitable dimensions for a stable channel, using equations that describe the physical relation of sediment transport, flow resistance, and dynamic equilibrium. Measured field data were used as the input data for the stable channel program, which then processed the data until the input discharge was equal to the output discharge. However, this method depends on the accuracy of the sediment transport equation that is used in the stable channel design. Existing equations recommended by the Department of Irrigation and Drainage (DID), Malaysia, were found to be unsuitable because of their low discrepancy ratio (DR) values, which were below 42%. These are the equations of Engelund and Hansen (1967) and Yang (1979), as well as existing local equations from Ariffin (2004) and Sinnakaudan et al. (2006). Therefore, revised equations were developed in the current study to increase the accuracy of the total bed material load equations for use in Malaysian rivers. The newly revised Ariffin (2004) and Sinnakaudan et al. (2006) equations yielded better DRs of 66.34 and 64.49%, respectively. River assessments done on the Kurau River (a small river), the Muda River (a medium-size river), and the Langat River (a large river) show that these rivers have experienced different levels of erosion. Only the Kurau River was found to have minimal erosion and sedimentation levels. Conversely, stable channel assessments for the Muda River and the Langat River revealed that both rivers had experienced severe erosion, due to excessive sand mining. Almost all the cross section sampling points on the Muda River and Langat River were deeper than the suggested stable channel heights.

Keywords: Stable channel; Sediment transport; Total bed material load

4、 Author: Hussein BIZIMANA, Abd ü sselam ALTUNKAYNAK

Title: Modeling the initiation of sediment motion under a wide range of flow conditions using a Geno-Mamdani Fuzzy Inference System method

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<https://www.sciencedirect.com/science/article/pii/S1001627920300317>)

Abstract: The current study introduces a novel approach to estimate the incipient motion of sediments under a wide range of flow regimes by developing a fuzzy model with a fuzzy-band that refers to a transition from weak motion to general motion of sediment. The partial sediment entrainment is defined by fuzzy sets considering the uncertainty related to the individual ratio of inertia to viscous forces which is the definition of shear Reynolds number. In the current study, the Mamdani Fuzzy Inference System (Mamdani FIS) is used to develop a comprehensive fuzzy model of the incipient motion of sediment. The Mamdani FIS has a shortcoming regarding the training of the fuzzy model. To estimate the dimensionless shear stress, a new method is developed by combining a genetic algorithm with the fuzzy approach which is named the Geno-Mamdani Fuzzy Inference System (GMFIS) method. The performance of the GMFIS model is evaluated using experimental data by considering root mean square error (RMSE), Nash-Sutcliffe coefficient of efficiency (CE), degree of robustness (Dr), and concordance coefficient (CC) as evaluation criteria. The GMFIS model performed very well based on the RMSE, CE, Dr, and CC values and satisfactorily represented the three types of incipient motion. Finally, a new range of fuzzy, dimensionless, critical shear stress values is established in all flow conditions from weak to general sediment entrainment.

Keywords: Incipient motion; Dimensionless shear stress; Shear Reynolds number; Fuzzy logic; Genetic algorithms; Sediment

5、 Author: Ali MOHAMMAD, Parvathaneni BHANU MURTHY, Edupuganti Naga DHANAMJAYA RAO, Hari PRASAD

Title: A study on textural characteristics, heavy mineral distribution and grain-microtextures of recent sediment in the coastal area between the Sarada and Gosthani rivers, east coast of India

International Journal of Sediment Research,

Abstract: The current study aimed to describe textural characteristics, heavy mineral composition, and grain micro textures of the sediment from three micro-environments (foreshore, berm, and dune). A total of forty-one (41) representative surficial sediment samples have been collected from fifteen (15) locations along the beach area between the Sarada and Gosthani rivers on the east coast of India, where the length of the stretch is more than 100 km. The study reveals that most of the coastal sediment is medium to fine sand with relatively high ratios of coarse sand at Yarada beach, and the nature of the sediment is moderately to well sorted. These characteristics indicate a high energy environment. The heavy mineral analysis of the sediment in the current study was done for coarse (+60#) and fine (+230#) size fractions. Studying the weight percentage (WT%) reveals that a high percentage of heavy minerals is associated with fine fractions. Ilmenite, sillimanite, garnet, zircon, and rutile are the major heavy minerals identified in the current investigation. The concentrations of these heavy minerals show great variations from south to north of the study area. From an economic point of view, a considerable amount of heavy minerals (average 48.41%) are present on both sides (north and south) of the Gosthani River mouth. In the Sarada Estuary, the concentration of the economic heavy minerals was found under the minimum economic range. The grain micro textures of the major heavy minerals from the different locations along the study area demonstrate the variation in grain micro textures, which is controlled by the chemical and mechanical processes. These micro textures reflect moderate to high wave energy on the beach area, in addition to high mechanical impact on the grains from the estuary point.

Keywords: Textural characteristics; Heavy minerals; Grain micro texture; Coastal sediment; Visakhapatnam Coast

6、 Author: Seyed-Mohammad-Kazem EMAMI, Sayed-Farhad MOUSAVI, Khosrow HOSSEINI, Hesam FOULADFAR, Majid MOHAMMADIAN

Title: Comparison of different turbulence models in predicting cohesive fluid mud gravity current propagation

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<https://doi.org/10.1016/j.ijsrc.2020.03.010>

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Abstract: A numerical study of propagation of cohesive fluid mud gravity currents in the form of lock-exchange was done using the OpenFOAM open source toolbox. An Eulerian approach solution for three separate phases was developed by incorporating a rheological model to predict the front position of cohesive fluid mud gravity currents. The model also simulates features in the complete movement phases including slumping, self-similar, and viscous in which the dynamics of propagation are affected by the balance of viscous and buoyancy forces, and the inertia force is negligible. The influence of using different turbulence models containing sub-grid scale (SGS), modified SGS, detached eddy simulation (DES), delayed-detached eddy simulation (DDES), Launder-R eece-Rodi (LRR), and k- $\epsilon$  models on the accuracy of simulation results was evaluated by comparing with available experimental data. The results show that the selection of the proper turbulence model is one of the most important issues for this type of the numerical modeling. The more efficient turbulence model was suggested and tabulated for each stage of propagation and different selected concentrations of 1,045, 1,140, and 1,214 g/L. Although different turbulence models (except k- $\epsilon$ ) lead to front propagation dynamic simulation results that are in good agreement with the experimental measurements in the early stage of propagation for low concentrations, only DES, SGS, and modified SGS are able to capture the Kelvin-Helmholtz instability vortex shapes at the dense fluid interface, which is the main characteristic of the gravity current through the slumping phase. The calculated accuracies of SGS and modified SGS in predicting gravity current propagation for the both self-similar and viscous phases also are slightly better than DES, DDES, and LRR model results. The results of this study confirmed the performance and efficiency of the modified SGS model in which the interaction coefficients between phases are calibrated for the numerical modeling of fluid mud gravity current propagation.

Keywords: Gravity current; Turbulence model; Numerical simulation; Cohesive particles; Rheology



7、 Author: Vinod KUMAR, Anket SHARMA, Shevita PANDITA, Renu BHARDWAJ, Ashwani Kumar THUKRAL, Artemi CERDA

Title: A review of ecological risk assessment and associated health risks with heavy metals in sediment from India

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Abstract: Heavy metal (HM) pollution in sediment is a serious concern particularly in developing nations, warranting an extensive survey to understand the current situation and propose possible remedial measures. This paper compiles the data of HMs cadmium (Cd), iron (Fe), cobalt (Co), manganese (Mn), arsenic (As), lead (Pb), chromium (Cr), copper (Cu), zinc (Zn) and nickel (Ni) in aquatic sediment from India from 1979 to 2017. It was found that mean values of Cu, Co, Zn, Pb, As, and Cr in Indian sediment were high in comparison to the Australian Interim Sediment Quality Guidelines, World Surface Rock Average, and the Threshold Effect Level for freshwater ecosystems. Anthropogenic activities, lithogenic factors, and sand intrusion are the main factors associated with HM pollution as observed using cluster analysis and principal component analysis. The results of contamination indices indicate that HM contamination ranged from average to high, in the sediment. The ecological risk assessment results showed that 11% HMs present very high risk. The cancer risk, due to the high contents of Cd, As, and Cr the ingestion pathway, showed high risk of cancer through food/water contaminated with sediment. At source reduction of HMs in industrial effluents by effluent treatment plants, and plantation of phytoremediating rooted macrophytes in sediment may help in HM mitigation of the sediment.

Keywords: Sediments; Heavy metal pollution; Ecological risk assessment; Cancer risk; Health risk

8、 Author: Dejan KRČMAR, Nenad GRBA, Marijana Kragulj ISAKOVSKI, Nataša VARGA, Jelena SPASOJEVIĆ, Jasmina AGBABA, Božo Dušan DALMACIJA

Title: Multicriteria to estimate the environmental risk of sediment from the Obedska Bog (Northern Serbia), a reservation area on UNESCO's list

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Abstract: The objective of this current study is to compare related sediment legislation standards and norms to the diversity and influence of anthropogenic and natural (geogenic) sources of pollution in the investigated fluvial relief test site region of the Obedska bog. All metals (nickel (Ni), zinc (Zn), cadmium (Cd), copper (Cu) and lead (Pb) except chromium (Cr)) and arsenic (As) have higher values than the Upper Continental Crust (UCC) for loess sediment. Several sharp leaps in the enrichment factor (r) suggested “indicators of anthropogenic metal pollution” for Cd, Cu ( $r > 5.0$ ) and Zn, Ni ( $r > 1.0$ ) for this region. In addition, the Chemical Proxy of Alteration (CPA, 60–95) from the unique Jadar block terrane and neighbouring representative catchment areas, confirmed moderate to higher intensity of alteration. Principal Component Analysis/Factor Analysis (PCA/FA) and cluster analysis suggest that Ni, Zn, Cu and Cd are derived from several anthropogenic sources, whereas As is convincingly of geogenic origin, and Pb and Cr exhibit dual origins. The sum of 16 U. S. Environmental Protection Agency Polycyclic Aromatic Hydrocarbons (EPA PAHs) indicated heterogenic sources, but minor effects to biota. The results of the current investigation indicated intensive and highly diffuse sources of pollution in this United Nations Educational, Scientific and Cultural Organization [UNESCO's] region. The outcomes indicate that Cu should be added to the European Union [EU] watch list of emerging contaminants.

Keywords: Priority substances in sediment; Contamination criteria; Multivariate statistical techniques; Heterogeneous sources

9、 Author: Haiyan FANG

Title: Impact of land use changes on catchment soil erosion and sediment yield in the northeastern China: A panel data model application

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Abstract: Land use is an important factor influencing soil erosion and sediment yield (SESY). Regressing soil erosion intensity (SEI) and sediment yield (SY) to land use characteristics can provide necessary information for controlling soil loss. However, current simple regression methods emphasize cross sectional parameters, with less emphasis on temporal variability of relevant land use parameters so that the derived effects of land use change on SESY can be biased. Here, a panel data method was applied to quantify the impact of land use change on SESY in 1954, 1975, and 2015, based on the WaTEM/SEDEM model and seven landscape metrics for 25 reservoir catchments in northeastern China. The results indicate that SEI and area-specific SY (SSY) continuously decreased from 1954 to 2015, which were significantly correlated with landscape metrics such as area-edge metrics of mean patch area (AREA\_MN), shape index of the mean related circumscribing circle (CIRCLE\_MN), aggregation index of effective mesh size (MESH), patch cohesion index (COHESION), and diversity metrics such as Shannon's diversity index (SHDI), patch richness density (PRD), and modified Simpson's evenness index (MSIEI). The results suggested that catchment SESY can be reduced through decreasing mean patch area, patch mesh size, and physical connectivity of patches, enriching landscape types, and elongating land use patches. These findings are helpful to effectively implement soil conservation measures in northeastern China and similar regions worldwide. The current study also implies that the panel data approach will have beneficial potential applications in earth-science research fields.

Keywords: WaTEM/SEDEM; Soil erosion; Sediment yield; Landscape metrics; Panel data model

10、 Author: Mirjana HORVAT, Zoltan HORVAT

Title: Long term sediment transport simulation of the Danube, Sava, and Tisa rivers

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Abstract: The aim of this paper is to evaluate a newly developed one dimensional unsteady flow, sediment transport and bed evolution model for a looped river network through a long term simulation of a real-life scenario. The model was assessed by verifying it for the Danube, Tisa, and Sava rivers in Serbia for a five year time interval.

The total length of the modeled domain was 741.94 km from which 486.48 km is the length of the modeled Danube River reach, 132.50 km the modeled section of the Sava and 122.96 km the length of the modeled Tisa River reach. The simulated domain included smaller tributaries such as the Kolubara, Mlava, Nera, Pek, Porecka, Tamis, and Great Morava rivers. Due to the size of the domain that was included in the model, the work also includes extensive research regarding the available measurements, issues with measurement errors, and suggestions on overcoming incomplete measurements by developing different types of correlations. The attained results were analyzed by comparing the simulation results with measured water levels, discharges, and suspended sediment concentrations. The implemented evaluation of the results confirmed the developed model's reliability.

Keywords: 1-D sediment transport; Looped river network; Long term simulation; Calibration; Verification