EGU Leonardo Conference Series
on the Hydrological Cycle

Floods in 3D: Processes, Patterns, Predictions

EGU 2011 Leonardo Conference
23-25 November, 2011
Bratislava, Slovakia

Slovak University of Technology in Bratislava

EGU Leonardo Conference Series on the Hydrological Cycle

FLOODS IN 3D: PROCESSES, PATTERNS, PREDICTIONS

EGU Leonardo Conference
23-25 November 2011
Bratislava, Slovakia

Edited by: J. Szolgay, M. Danáčová, K. Hlavčová, S. Kohnová, V. Pišteková
Published by: Slovak University of Technology in Bratislava

Number of prints: 120 copies

Number of pages: 100

ISBN 978-80-227-3596-4

EGU Leonardo Topical Conference Series on the Hydrological Cycle

FLOODS IN 3D: PROCESSES, PATTERNS, PREDICTIONS

ORGANISED BY: Department of Land and Water Resources Management,
Faculty of Civil Engineering,
Slovak University of Technology in Bratislava.

INTERNATIONAL SCIENTIFIC COMMITTEE

Alberto Montanari	Università di Bologna, Bologna, Italy
Attilio Castellarin	Università di Bologna, Bologna, Italy
Bob Moore	Centre for Ecology & Hydrology, Wallingford, Oxfordshire, UK
Bruno Merz	The Helmholtz Research Centre for Geosciences GFZ, Potsdam, Germany
G. di Baldassarre	Institute for Water Education, Delft, The Netherlands
G.T. Aronica	University of Messina, Messina, Italy
Henrik Madsen	DHI, Hørsholm, Denmark
Marco Borga	University of Padua, Padova, Italy
Pierluigi Claps	Politecnico di Torino, Torino, Italy
Ralf Merz	The Helmholtz Centre for Environmental Research, Leipzig, Germany
Roger Moussa	Institut National de la Recherche Agronomique, Montpellier, France
Thomas Kjeldsen	Centre for Ecology & Hydrology, Wallingford, Oxfordshire, UK

CONFERENCE CHAIR

Jan Szolgay Slovak University of Technology in Bratislava, Bratislava, Slovakia

LOCAL ORGANINIZING COMITTEE AT FACULTY OF CIVIL ENGINEERING, SLOVAK UNIVERSITY OF TECHNOLOGY

Kamila Hlavčová
Silvia Kohnová
Michaela Danáčová
Jana Daneková
Katarína Juričeková
Silvia Stasselová
Viera Pišteková
Gabriela Babiaková

Editorial

This book of abstracts contains 100 contributions submitted by more than 90 registered authors from 19 countries. The authors take full responsibility for all content.

WOODY DEBRIS TRANSPORT DURING FLOODS: 2D HYDRODYNAMIC MODELLING APPROACH

Ruiz Villanueva, V.[1], Bladé Castellet, E.[2], Sánchez Juny, M.[2], Bodoque del Pozo, J.M.[3] and Díez Herrero, A.[1]

[1] *Geological Survey of Spain, Natural Hazards Division. Ríos Rosas Street, 23, 28003, Madrid, Spain.*
[2] *Flumen Institute, Universitat Politècnica de Catalunya. Jordi Girona Street, 31, 08034 Barcelona, Spain.*
[3] *Mining and Geological Engineering Department, University of Castilla La Mancha, Campus Fábrica de Armas, Avda. Carlos III, 45071, Toledo, Spain.*
E-mail: V.ruiz@igme.es, ernest.blade@upc.edu, marti.sanchez@upc.edu, Andres.diez@igme.es, Josemaria.bodoque@uclm.es.

Woody material mobilization in rivers has been studied during the last decades. Most of the research carried out so far has been focused on the morphological role of woody debris, the recruitment processes, and its spatial distribution in the streams. In addition to the ecological and hydro-geomorphic points of view, one of the most important topics is the potential hazard in communities adjacent to streams, since wood dramatically increases the destructive power of floods. However, very few studies have dealt with this phenomenon as a potential hazard during floods.

Models that predict when and where wood will be entrained or deposited could prevent and mitigate the risk of such destructive events, but to this purpose there are no models available for it so far. In this work a numerical model has been developed in order to simulate the hydrodynamics and other fluvial processes (turbulence, sediment transport, etc.) together with the woody debris transport. This model has been integrated as a new module into the IBER hydraulic bidimensional model.

IBER is a numerical model for simulating turbulent free surface unsteady flow and environmental processes in river hydraulics. Nowadays, IBER has 3 main computational modules: a hydrodynamic module, a turbulence module and a sediment transport module. All of them work in a finite volume non-structured mesh made up of triangular or quadrilateral elements. The hydrodynamic module solves the depth averaged Shallow Water Equations (2D-SWE), also known as the two-dimensional St. Venant Equations.

Wood entrainment is considered in relation to a force balance model acting on wood in streams. Furthermore, turbulence may affect the woody debris transport. To incorporate this effect an additional resistance to fluid deformation resulting from the internal chaotic fluid motions that characterize turbulent flow has been added. The interactions between logs and channel configuration and between logs each other have been also taken into account in the model. The influence of woody debris (deposits or individual logs) in hydrodynamics has been solved with an additional drag. To verify the model presented here, flume experiments were carried out. Thus, the behaviour of wood in rivers was simulated performing different flume configurations with different flow conditions and using several types of dowels as LWD.