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Pre-conference short course on
River Sedimentation and Modelling
International Symposium on River Sedimentation (ISRS 2010)
3 to 4 September 2010

Venue: Stellenbosch University

Friday 3 Sep 2010	7h30 to 8h30	Registration		
Friday 3 Sep 2010	8h30 to 13h00 (4h)	Prof C. Ted Yang	Colorado State Univ., USA	Sediment transport dynamics & GSTARS modelling
Friday 3 Sep 2010	14h00 to 17h00 (2.5 h)	Prof Zhao-yin Wang	Tsinghua University	River restoration
Saturday 4 Sep 2010	8h00 to 12h30 (4h)	Dr Kim Wium Olesen	DHI Group, Denmark	Recent trends in practical morphological modelling
Saturday 4 Sep 2010	13h30 to 16h00 (2 h)	Prof Gerrit Basson	Stellenbosch University, South Africa	Design of river abstraction works and reservoir sedimentation
Saturday 4 Sep 2010	16h00 to 17h00 (1h)	Prof Gerrit Basson	Stellenbosch University, South Africa	Visit Hydraulics Laboratory

1) Sediment transport dynamics & GSTARS modelling
Prof C. Ted Yang, USA
The presentation includes a brief review and evaluation of basic concepts and theories used in the development of sediment transport formulas. Reliable laboratory and field data will be used to test the accuracies and applicability of sediment transport formulas. Guidelines on the selection of formulas for engineering applications will be presented.

GSTARS is a semi-two-dimensional computer model based on the stream tube concept and the application of the theory of minimum stream power. GSTARS can simulate and predict morphologic changes of channel shape, width, depth, and profile due to natural and man-made events. Field examples of rivers and reservoirs will be used to illustrate the application of GSTARS. The User's Manual and executable code of GSTARS will be given to those who attend the short course. The theory of the presentation will be based on the book by Prof Yang: *Sediment Transport Theory and Practice*.

2) RIVER ECOLOGY AND RESTORATION STRATEGIES
Prof Zhao-Yin Wang, China
Ecology is the science of studying the relations between organisms and their environment. The biological diversity and species abundance in rivers depend on the diversity of available habitats. Ecological stresses are defined as the disturbances that bring changes to river

ecosystems. The ecological stresses are natural events or human-induced activities that occur separately or simultaneously. Either individually or in combination, the ecological stresses have the potential to alter the structure and impair the ability of the river ecosystem to perform key ecological functions. A stress occurring within or adjacent to a river typically produces a causal chain of effects, which may permanently alter one or more characteristics of a stable system. River bed incision, landslide and debris flows, intensive fluvial process and sediment transportation are natural stresses. Dam construction, flood defence structures, pollution, navigation and water diversion are human-induced stresses.

Selection of indicator species is the key for quantitative assessment of river ecology and ecological stresses. An indicator species is defined as a group of organisms whose characteristics (e.g., presence or absence, population density, dispersion, reproductive success) are used as an index of attributes or environmental conditions of interest, which are too difficult, inconvenient, or expensive to measure for other species. In many cases benthic macro-invertebrates are selected as indicator species for assessment of river ecology. The assumptions implicit in using indicators are that if the habitat is suitable for the indicator it is also suitable for other species and that wildlife populations reflect habitat conditions. According to the ecological functions benthic macro-invertebrates are classified into predators, filters, shredders, collectors and scrapers.

Various strategies have been applied to restore stream ecology i.e. return of a given ecosystem to a state approximating that in which it existed prior to human disturbances. The effects of these restoration strategies are discussed with case studies. Moreover, four river management principles are proposed for long-term maintenance and improvement of stream ecology and river-uses with the focal point on the river health.

3) Recent trends in practical morphological modelling

Dr Kim Wium Olesen, Denmark

There are many sources of uncertainty in morphological modelling such as for instance those arising from limited predictability of the sediment transport rates, the often limited availability of data for model calibration, and the uncertainty in future sediment load and hydrology due to land use and climate changes. Dealing with these inherent uncertainties often requires comprehensive sensitivity analyses using computational efficient modelling systems rather than the use of detailed (3D) models. The research and development of the recent decade within sediment transport, numerical modelling, and computer science have added significant advances to the modelling of sediment transport and morphology for practical engineering applications. In the short course various examples of morphological modelling of river training measures will be presented. The examples will cover spatial scales ranging from overall impact of huge guide buns to local impact of individual groynes and time scales ranging from the duration of single flood events to several decades. The various examples presented will illustrate the advances within morphological modelling.

4) Design of river abstraction works and modelling of reservoir sedimentation

Prof Gerrit Basson, South Africa

The presentation will be in three parts: (a) Sustainable design of river abstraction works considering sedimentation. The use of boulder, gravel, sand and silt traps which could be flushed will be discussed. Several case studies which are operational in Africa will be presented, and include river diversion for irrigation or potable use, and pumpstations for urban water use. This work is based on a SA Water Research Commission Research and recent design studies.

(b) Sediment yield determination and modelling of reservoir sedimentation to determine long term sedimentation levels in a reservoir will be presented. The presentation is based on a recent bulletin by the International Commission on Large Dams (ICOLD).

(c) The Hydraulics Laboratory of the University of Stellenbosch will be visited to view models of river abstraction works.

The presentations will be by world renowned experts:
a) Prof Ted C Yang

Prof Yang is the Borland Professor of Water Resources and director of the Hydroscience and Training Center in the Department of Civil and Environmental Engineering at Colorado State University, USA. He is a world-renowned expert in sediment transport and river morphology. He developed and published two fundamental laws governing the formation and evolution processes of river systems due to erosion and sedimentation. Prof Yang has published three books, five computer model programs and user's manuals, and more than 100 technical papers.

Prior to joining the university in 2004, Yang served as manager of the Sedimentation and River Hydraulics Group, Technical Service Center, U.S. Bureau of Reclamation, from 1994-2003. Previously he had served as the International and Technical Assistance Program manager for the Bureau and as a hydraulic engineer for the U.S. Army Corps of Engineers North Central Division. Prof Yang received many prizes, of which a most recent one was the Prince Sultan Bin Abdulaziz International Prize for Water – First Branch: Surface Water Topic: Sedimentation Control in Surface Water System for “outstanding achievements in surface water, especially in sedimentation control of surface water systems”, Riyadh, Saudi Arabia, 2008.

b) Professor Zhao-Yin Wang

Zhaoyin WANG is professor of the Department of Hydraulic Engineering of Tsinghua University, China and the Chairman of the Advisory Council of the International Research and Training Center on Erosion and Sedimentation (UNESCO). He was the first secretary-general of the World Association for Sedimentation and Erosion Research (WASER) and council member of the International Association of Hydraulic Engineering Research (IAHR) and the vice-Chairman of IAHR China National Committee. Prof. Wang is the chief editor of the “International Journal of Sediment Research” and associate editor of “International Journal of River Basin Management”. He is a member of the steering committee of UNESCO International Sedimentation Initiative. His research interests include mainly sediment transportation, river ecology and integrated river management. He has published 280 papers in international journals and Chinese journals. He was invited and delivered 16 keynote lectures at international conferences, including IAHR congress and International Symposia on River Sedimentation.

c) Dr Kim Wium Olesen, DHI

Dr Olesen is heading the Water Resources Department of DHI. He has worked as engineer and manager at DHI for 25 years. Over the years has been assigned to numerous technical challenging river studies around the world. He has been team leader/project manager for many of these projects. Dr Olesen has pioneered detailed river morphological modelling through his PhD on river bed topography modelling in river bends. His experience covers amongst other work on a range of major projects on the river systems in Bangladesh and the Mekong River.

d) Prof Gerrit Basson

He has specialized in river and reservoir hydraulics and sedimentation, and the design of hydraulic structures. He is Head of the Water Division and Director of the Institute for Water and Environmental Engineering (IWESU), Department of Civil Engineering, University of Stellenbosch, South Africa.
Committees: ICOLD International Commission on Large Dams, Chairman of Reservoir Sedimentation committee (2004 to 2010); UNESCO-IHP-ISI International Sedimentation Initiative Task Force 2004 to date; WASER Council, World Association of Sedimentation and Erosion research 2004-2010. Also recently elected Vice President of WASER for 2011 to 2012; SANCOLD: South African National Committee on Large Dams.
He has more than 23 years work experience, with sedimentation projects carried out in 16 countries. The World Bank has also contracted him on reservoir sedimentation projects in the past. Professor is chairperson of the organizing committee of the 11th International Symposium on River Sedimentation (ISRS).

Registration

Registration details can be found at www.civeng.sun.ac.za/isrs