FICH UNL

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RCEM 2009
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rcem 2009

River, Coastal and Estuarine Morphodynamics

CENEHA

CIEGRi

PROSUL

CSDMS

IAHR AIRH

Pre-conference Short Courses

Sept. 14th - 19th, 2009

Universidad Nacional del Litoral (UNL)
Santa Fe, Argentina

Pre-conference Short Courses

Morphodynamics is the evolution of landscape and seascape features in response to erosion, transport, and deposition of sediment by debris flows in mountain areas, flows in rivers, plumes in estuaries, and turbidity currents along sea bottoms. Morphodynamics explains the evolution of self-adjusting drainage basins, rivers longitudinal profiles or shorelines shapes, and rhythmic features such as beach cusps and river meanders. The River, Coastal and Estuarine Morphodynamics –RCEM– Symposium represents a successful series of conferences that has played a key role in promoting an interdisciplinary approach to river and coastal problems.

In tune with the RCEM goals, the Water Science and Engineering Faculty (FICH) is proud to announce the realization of several fast-paced, intensive courses in topics related to field and laboratory measurements, river, coastal, and landscape evolution during the previous week of the RCEM 2009 Symposium, i.e., from September 14th to 19th, 2009, in Santa Fe, Argentina.

These short courses, to be delivered by renowned specialists, are intended for graduate students and young researchers as they will provide comprehensive training on practical aspects that normally require the use of field and laboratory techniques, or theoretical analysis and computational modeling as well. They offer a unique opportunity for the participants to interact with senior scientists and meet peers. Courses offered are:

A. Fluvial Geomorphology with Emphasis on Large Alluvial Systems
B. Modeling of River Meandering and Streambank Erosion at Multiple Scales
C. Earth-surface Dynamic Modeling and Model Coupling
D. Characteristics of Morphology and Sediment Transport in Lowland Sand-bed Rivers
E. Hydroacoustic Laboratory and Field Measurements
F. Sediment-Turbulent Flow Interactions

Courses Coordinators
Dr. Carlos Vionnet, UNL & CONICET, Argentina
Dr. Marcelo García, Univ. of Illinois, USA, & UNL

Registration Fees and Financial Assistance
A small registration fee will be required to cover course materials and related costs. A web-based application system is available for online payments with credit card. Financial assistance for overseas/foreign students is available from sponsoring agencies. Please check the official web page of the conference regularly for the most up-to-date information at http://www.unl.edu.ar/rcem2009.

Applying Online
Students and young researchers wishing to apply for the courses are required to fill in an application form (go to http://info.rcem.serfe.com/pc_activities.php), with the understanding that each student/participant won't be able to take more than two out of the six courses offered. In other words, a prospective participant can choose two courses between A or B and C or D, or eventually take only E or F.

	Instructors \ Date	M 14th	T 15th	W 16th	Th 17th	F 18th	S19th
A	Latrubese E, & Ramonell C	✓	✓	✓	✓		
B	Abad J, & Langendoen E		✓	✓	✓		
C	Syvitski J, & Hutton E					✓	✓
D	Parker G					✓	✓
E	Oberg K, D Parsons, & García C			✓	✓	✓	✓
F	Villaret C, Davies A, & Abderrezzak K				✓	✓	✓

Courses Content
Below is a brief outline of the instructors and the courses content.

A

Fluvial Geomorphology with Emphasis on Large Alluvial Systems

Edgardo Latrubesse
Universidad Nacional de la Plata & CONICET, Argentina
Carlos Ramonell
Universidad Nacional del Litoral & CONICET, Argentina

This intensive course will be based over 4 days, 5 one hour lectures on the following specific topics, and 12 hours of field work on:

- Fluvial basin: a fundamental unit in geomorphology. Erosion, transport and runoff, as a changing variable from geological time scale to historical time. The organization of fluvial networks in time and space at a global scale.
- Routing of sediments: sources and sinks. Morphotectonic settings, climate and sediment production. The role of mega-alluvial traps in foreland basins and other geological settings.
- Channel patterns: classification, discrimination of channel patterns. Channel morpho-dynamics and landforms.
- Floodplains: classification systems, sedimentary architecture and facies models. Floodplain as an archive of fluvial history. Paleohydrological reconstructions.
- River engineering and geomorphology. Geomorphologic responses to the impact by dams, bridges, dredging and others.
- Environmental fluvial geomorphology: techniques and methods to assess direct and indirect impacts such as deforestation and mining. Flood hazards. Applied geomorphology to environmental projects, river ecology, river restoration. Quantification of budgets of erosion and deposition.

EDGARDO M. LATRUBESSE

He was born in Pergamino, Province of Buenos Aires, Argentina, in 1965. He got his bachelor degree in Geological Sciences at the Universidad Nacional de San Luis (San Luis, Argentina) in 1989, and completed his doctoral studies in Geological Sciences at the same university in 1992. He has been professor in different Brazilian universities for several years, and was recently honored as the T.W. Rivers Distinguished Professor in international Affairs at East Carolina University-USA. He worked extensively on some of the largest rivers of the continent, such as the Amazon, Negro, Madeira, Purús, Juruá, Araguaia, Paraná, Sao Francisco and others. Edgardo is chair of the GLOCOPH-Global Commission on Continental Paleohydrology working group on Large Rivers which organized field conferences in several of the largest fluvial basins of the world. His research interest includes geomorphology, hydrology of large rivers and the impacts of human activities on large fluvial systems and tropical biomass as well as quaternary paleohydrology. He is currently Professor of Geomorphology at the Universidad Nacional de La Plata, and director of the Laboratory of Tritium and Radiocarbon of CONICET, Argentina.

CARLOS RAMONELL

He is a geologist with the CONICET (National Council for Scientific and Technical Research of Argentina), serving as leading researcher in the Sedimentology Laboratory of the Engineering and Water Sciences Department (FICH) of the UNL. He is Adjunct Professor in Geology and Fluvial Hydraulics, and leads efforts to develop measuring techniques for field research at FICH. Carlos has been involved as principal investigator in an international project designed to study the human impact on large rivers of South America (Paraná, Paraguai, Orinoco and Madalena rivers, funded by the CNPq of Brazil). He is the author, or co-author, of several original works published in regional and international journals.

B

Modeling of River Meandering and Streambank Erosion at Multiple Scales

Jorge D. Abad
University of Illinois, Department of Civil and Environmental Engineering, Urbana-Champaign, USA
Eddy J. Langendoen
United States Department of Agriculture, National Sedimentation Laboratory, Oxford, Mississippi, USA

This intensive course will be based over 3 days, six one hour lectures on theory and modeling aspects of river meandering and streambank erosion at multiple scales. It's intended for students, engineers, and professors.

- Review of basic theory of the hydrodynamics and bed morphodynamics of meandering rivers, a) Hydrodynamics of meandering rivers (JA), b) Bed morphodynamics of meandering rivers (JA).
- State-of-the-art in modeling the hydrodynamics and bed morphodynamics of meandering rivers, a) Review of the governing equations and turbulence closures (2D and 3D) (JA), b) Applications using 2D depth-averaged models (JA), c) Applications using 3D models (JA)
- Review of theory and modeling of streambank erosion processes, a) Theory of streambank erosion processes (EL), b) Modeling of streambank erosion processes (EL), c) Applications using the 1D model concepts (EL)
- A physically-based model for river meandering and streambank erosion – RVR Meander + concepts, a) RVR Meander (JA), a1) Pre-processing tool, a2) Statistical tool, a3) Hydrodynamic model, b) Concepts (EL), b1) Relating near-bed and near-bank shear stresses, b2) Fluvial erosion, b3) Bank failure
- Sample applications, a) Effect of La Valle bridge: Bermejo River (Argentina), b) Restoration example: Trout Creek – Lake Tahoe (USA)

JORGE DARWIN ABAD

He finished his undergraduate studies in Civil Engineering at the Universidad Nacional de Ingeniería, in Perú, in 1997. Dr. Abad completed his postgraduate training at the Ven Te Chow Hydrosys tems Laboratory, University of Illinois at Urbana-Champaign, USA, obtaining both MSc. and PhD degrees in Civil Engineering (Fluid Mechanics) in 2002 and 2008, respectively. Its MSc Thesis entitles "2D River models for prediction of sediment transport and morphological variations" and his PhD Thesis "Hydrodynamics and Morphodynamics of high-amplitude meandering channels". In May 2008, he started to work as a Postdoctoral Research Associate at the Civil and Environmental Engineering Department of the University of Illinois. His research interests are Mechanics of Sediment Transport, Computational Fluid Dynamics, Hydraulics Laboratory, Environmental Hydrodynamics, Ecohydraulics, Tidal and Submarine meandering channels, and Near-shore processes.

EDDY LANGENDOEN

He received his MSc and PhD degrees in Civil Engineering (Fluid Mechanics) from Delft University of Technology, The Netherlands in 1987 and 1992, respectively. He worked as a Research Associate at the Delft University of Technology and as a Research Assistant Professor at the University of Mississippi studying shallow water flow transport problems and developing 3D shallow flow computer models. Since 1998, he is a Research Hydraulic Engineer at the National Sedimentation Laboratory of the U.S. Department of Agriculture studying the long-term evolution of disturbed channel systems. His research interests are Computer modelling of river morphological and riparian processes, River meandering, and Interactions between fluid turbulence, sediment transport, and bedforms.

C

Earth-surface Dynamic Modeling and Model Coupling

James P Syvitski
Institute of Arctic and Alpine Research (INSTAAR)
Community Surface Dynamics Modeling System (CSDMS)
University of Colorado at Boulder, USA
Eric Hutton
Institute of Arctic and Alpine Research (INSTAAR)
Community Surface Dynamics Modeling System (CSDMS)
University of Colorado at Boulder, USA

This intensive course will be based over 2 days, 7 one-hour lectures on source to sink (S2S) modeling:

- S2S process-response modeling: S2S Modelers checklist, example, definitions; From Concept to Model; Constraints, Sensitivity & Scaling
- Modeling discharge and Sediment Flux DEM to flow paths; Climate to discharge; Paleo-discharge; Hydrological Modeling; Sediment Delivery;
- Landscape Evolution Modeling Weathering Module, Mass Wasting Module, Fluvial Transport Module,
- Nearshore Modeling: Coastal modeling approaches; Delta lobe avulsion 2D & 3D; Littoral sediment transport modeling: along shore; off shore;
- Plume modeling: Hyperpycnal Models, Hypopycnal Models; Shelf Sediment Transport Modeling
- Sediment Failure and Sediment Gravity Flow Modeling (turbidity currents, debris flows)
- Whole Basin Modeling, and the CSDMS architecture

JAMES SYVITSKI

He received his graduate education in oceanography and geological sciences (PhD in both, 1978) at the University of British Columbia. He then worked as an Assistant Professor in Geology and Geophysics at the Univ. Calgary (1978-1981), and then as a Senior Research Scientist with the Geological Survey of Canada at the Bedford Institute of Oceanography (1981-1995). During the BIO period, he was appointed Adjunct Professor at Dalhousie U., U. Laval, Memorial U., and INRS-océanologie. In 1995 he joined the U. Colorado - Boulder as a Professor of Geological Sciences, and until the summer of 2007 served as Director of INSTAAR - an Earth and Environmental Systems Institute. Professor Syvitski has taken leadership roles in a variety of large International Projects, and served in a variety of advisory roles for petroleum, mining, and environmental companies. In 2007 Prof. Syvitski became the Executive Director of CSDMS - the Community Surface Dynamics Modeling System, a diverse community of experts promoting the modeling of Earth-surface processes by developing, supporting, and disseminating integrated software modules that predict the movement of fluids, and the erosion, transport, and deposition of sediment and solutes in landscapes and their sedimentary basins.

ERIC HUTTON

He received his university training in engineering geophysics (1997) at the Univ. of British Columbia, and in hydrological sciences and oceanography (PhD in both, 2007) at the University of Colorado-Boulder. He is presently employed as research scientist at INSTAAR and as a software engineer within CSDMS. Eric is widely respected for his understanding of computer simulations within the field of earth surface dynamics. He has written many models for the geoscience community, all open source software. His models include those dealing with rivers, deltas, alongshore and cross-shore transport, surface and subsurface (hyperpycnal) plumes, continental shelf sedimentation, sediment failures, turbidity currents and debris flows, isostasy, and geoacoustics. He is one of the leading architects developing the CSDMS Architecture and Framework, and has trained in the use of the Common Component Architecture (Babel, Bocca, Ccaffine), the Earth Systems Modeling Framework, and OpenMI.

D

Characteristics of Morphology and Sediment Transport in Lowland Sand-bed Rivers

Gary Parker
Departments of Civil and Environmental Engineering & Geology
University of Illinois, Urbana IL 61801, USA

This short course will consist of eight one-hour lectures concentrating on aspects of lowland sand-bed rivers

- Lecture 1: Hydraulic Geometry of Lowland Sand-bed River: The Data
- Lecture 2: Hydraulic Geometry of Lowland Sand-bed Rivers: The Physics
- Lecture 3: Are Large, Sand-bed Rivers Different from Other Sand-bed Rivers?
- Lecture 4: Introduction to the Mechanics of Suspended Sediment
- Lecture 5: Effect of Self-Stratification by Suspended Sediment
- Lecture 6: Flow and Bedform Resistance in Large, Sand-bed Rivers
- Lecture 7: 1D Morphodynamic Modeling of Lowland Sand-bed Rivers
- Lecture 8: Downstream Fining in Large, Sand-bed Rivers

GARY PARKER

He has his Bachelor's degree (1971) from Johns Hopkins University, Department of Mechanics & Materials. He received his posgraduate education in the Department of Civil Engineering, University of Minnesota, where he completed his PhD in 1974. He worked as a Director (1995-1999) and then as a Professor (1985-2005) at the St. Anthony Falls Hydraulic Laboratory, U. Minnesota. In 2006 he joined the Civil and Environmental Engineering Department of the University of Illinois at Urbana-Champaign, where currently he is W.H. Johnson Professor of Geology and Professor of Civil & Environmental Engineering. During his career, Prof. Parker has conducted fundamental research into Morphodynamics of fans and deltas, density stratification effects due to suspended sediment in rivers, computational study of downstream fining and floodplain deposition in large, low-slope sand-bed rivers, depositional turbidity currents through fields of intraslope minibasins, modeling of vertical structure of deposits created by rivers, self-channelization of submarine turbidity currents, etc. Prof. Parker has been recognized for his professional work by numerous awards: IAHR M. Selim Yalin Lifetime Achievement Award (2007), National Academy of Science G. K. Warren Award (2002), Minnesota Erosion Control Society Innovation Award (2001), IAHR Schoemaker Award (best paper) (1999 & 2003), Institute of Technology Distinguished Prof., U. Minnesota (1996), IAHR Arthur Ippen Award (1995), ASCE Hans Albert Einstein Award (1994), ASCE Huber Research Prize (1994), ASCE Hilgard Prize (best paper) (1983), ASCE Stevens Award (best discussion) (1981).

E

Hydroacoustic Laboratory and Field Measurements

Kevin Oberg
USGS Water Science Centre, Illinois, USA
Daniel Parsons
University of Leeds, Leeds, UK
Carlos M García
Universidad Nacional de Córdoba, Córdoba, Argentina

This intensive course will be based over 4 days, which will include both classroom based theory and practical classes that will be held both in the laboratory and the field. Topics covered will include:

- Background and theory on flow measurements and characterisation
- Acoustic Doppler Current Profiling
- Acoustic Doppler Velocimetery
- Ultrasonic Doppler Profilers
- Flow field characterisation and analysis

KEVIN OBERG

Hydrologist with the U.S. Geological Survey (USGS), serving in the Office of Surface Water (OSW) as the national coordinator for hydroacoustics. He leads OSW's efforts to develop new methods in the application of acoustics to hydraulic and hydrologic measurements in the USGS Water Discipline. He also directs OSW efforts to provide technical training, technical support, and quality assurance of hydroacoustics methods within the USGS and internationally. Kevin also works on various research topics including the measurement and analysis of density currents using ADCPs, evaluation of sampling strategies for ADCP measurements, modeling of the flow disturbance created by ADCPs, and the application of acoustic profilers to mean flow and turbulence measurements. Kevin oversees the USGS hydroacoustics training program, which consists of 8-12 intensive courses annually. He has taught many classes on the application of hydroacoustics measurements in the US and around the world.

DAN PARSONS

He currently holds a prestigious Natural Environment Research Council Personal Research Fellowship at the University of Leeds, UK. His research concerns many aspects of fluvial sedimentology, but focuses on the interaction between fluid flows and mobile sediment, using a process based approach that combines fieldwork, laboratory experimentation and numerical modelling. Many of these approaches have involved novel deployment of acoustic technology for monitoring a range of fluid flow processes, including recent developments in Multibeam Sonar and Doppler based techniques. These have revealed insights on the functioning of large fluvial systems and implications for fluid mixing, modern fluvial system function and ultimately sedimentary deposits.

CARLOS MARCELO GARCÍA

He finished his undergraduate studies in Civil Engineering at the Universidad Católica de Córdoba, Argentina, in 1994. Dr. García completed his postgraduate training at the Universidad Nacional de Córdoba, Argentina, obtaining his M.Sc. degree in Civil Engineering-Water Resources, in 2000. He then pursued doctoral studies at the Ven Te Chow Hydrosystems Laboratory, University of Illinois at Urbana-Champaign, USA, obtaining his PhD in 2006. In June 2006, he joined the Hydraulic Department at the Universidad Nacional de Córdoba as a Full-time Assistant Professor. His research concerns many aspects on the characterization of flow turbulence induced by a bubble-plume in large-scale experiments, errors identification in acoustic Doppler profiler velocity measurements caused by flow disturbance, and on the characterization of the flow turbulence using water velocity signals recorded by Acoustic Doppler Velocimeters.

F

Sediment-Turbulent Flow Interactions (Coastal Process Models and Applications)

Catherine Villaret & Kamal El Kadi Abderrezzak
Laboraroty National of Hydraulics and Environment, France
Alan Davies
Bangor University, UK

This intensive 3-day course will give an overview of the physical processes that govern sediment turbulent flow interactions. It will describe the hierarchy of models that is used by coastal marine scientists and engineers to represent local sediment transport processes, and will go on to show how these local modelling concepts are used in coastal-area morphodynamic models. Mornings will be devoted to theory (3hrs) and afternoons to applications (4 hrs) using the finite element Telemac Modelling System.

Topics will include:
- Turbulence in a shear flow; boundary layer dynamics under steady flow; wave boundary layer and wave-current interactions.
- Sediment transport by bed load and suspended load; classical Rouse profile and transport formulae.
- Sediment-turbulent flow interactions; effects of stratification; sand grading effects; introduction to two-phase flow modelling.
- Large scale morphodynamics; coupling between hydrodynamics and sediment transport models.
- Role of bed roughness and bed roughness predictors.
- Application and intercomparison of 2D and 3D approaches; convection velocity (dune test case) and in-situ applications.

CATHERINE VILLARET
She obtained her PhD in 1987 at the University of Grenoble in the Department of Geophysical Fluid Mechanics and Environment. She spent two years at the Woods Hole Oceanographic Institute as a postdoctoral fellow. She has been working as a research engineer at EDF-R&D (Laboratoire National d'Hydraulique et Environnement). She joined the development team of the finite element Telemac hydro-informatic system and is responsible of the development of the sand transport and morphodynamics model. Her research topics cover different aspects of sediment-turbulent flow interactions from stratified flow, wave and current turbulent boundary layers, modelling approaches of different complexity from two-phase flow to large scale morphodynamics models, including sand transport and morphodynamics modelling for river, estuaries and coastal applications.

ALAN DAVIES
He obtained his PhD in Oceanography at the University of London in 1974 after which he worked until 1985 in the Sedimentation Group at the Institute of Oceanographic Sciences, Taunton, U.K. He then moved to the School of Ocean Sciences, Bangor University, North Wales, where he is now Professor of Physical Oceanography. He leads a small research team studying coastal processes ranging from the physical processes of local sediment transport through to morphodynamic modelling on area scales. Current research interests include morphodynamic change in estuaries against a background of sea-level rise and the associated risk of coastal flooding. Here the Telemac Modelling System has been used and developed in collaboration with EDF, Chatou, France. Alan has published 100 research papers and reports along 35 years career, and has been involved in various national and European research projects.

KAMAL EL KADI ABDERREZZAK
He got his PhD at Cemagref (Lyon, France) in the Hydrology and Hydraulic Research Unit in 2006, in collaboration with the University of Claude Bernard Lyon 1 (Laboratory of Fluid Mechanics and Acoustics). He stayed at Cemagref for 2 years working as research engineer, and then joined EDF-R&D at LNHE working since 2008 on the use of scale physical models to guide river restoration projects.