

## Preface of Volume 325

Mankind is facing environmental changes of undetermined magnitude and speed in the 21st century, particularly in terms of predicted climate change. With ongoing research, we are increasing our understanding of the processes and the magnitudes of human impacts on the environment and the related risks for societies worldwide. This century will thus be one of changing environments. We have an opportunity to manage these changes by our present actions, and to quantify and to prepare for future global changes. As more scientific evidence accumulates about the magnitude and speed of past environmental changes, including sedimentary histories, we can use this information to manage present and future changes. This century must be a century of concerted research and actions in order to manage and adapt to environmental, economic and social changes. This has to involve scientists from all disciplines – in particular water-related and Earth surface process science.

*Sediment Dynamics in Changing Environments* was chosen as the underlying theme for the 2008 Symposium of the International Commission on Continental Erosion (ICCE) held in Christchurch, New Zealand, 1–5 December 2008 (the history of ICCE symposia is detailed at the end of the Preface). Authors from over 40 countries around the globe, with a large range of institutional and disciplinary backgrounds, met in Christchurch to:

- share their knowledge about sediment dynamics in changing environments;
- inspire and to be inspired to research erosion and sediment dynamics; and
- work together for a better future.

The 79 papers found in this book, which were presented at the Symposium, are a testimonial to the international extent and diversity of the IAHS organisation, and document the international research efforts going into the topics of sediment dynamics and global change. Over 50 additional posters presented at the conference further explored *Sediment Dynamics in Changing Environments* and enhanced the meeting by providing a stimulus to share research findings and to inspire future research.

To understand *Sediment Dynamics in Changing Environments*, we need to advance our knowledge of sedimentary **processes and systems** and in particular of **scaling issues** in sedimentary systems. This knowledge, derived from **information and analysis of historical sediment archives, and system analysis and modelling**, must enhance our abilities to assess impacts of **Global Change on sedimentary systems**. Finally, and most importantly, we need to find ways to link our understanding and our models of sedimentary systems with **impacts on human environments**, including hazard and risk assessment, improvement of management options, and feedback into policy frameworks. Thus, the scientific Symposium programme was organised around four themes.

**Unlocking the archives – dating and source tracing technologies** explores the utility of dating sediment sinks, such as flood-plain profiles, lake, and coastal-shelf sequences, to reconstruct long-term catchment erosion and sediment yield histories and budgets. Research on source tracing/fingerprinting for understanding catchment sediment generation and dispersal are also included. The papers presented in this theme range from evaluations and

improvements of techniques currently applied in the field of dating and tracing to applied studies

utilizing dating and tracing techniques to understand catchment sediment budgets and to design appropriate conservation techniques for sustainable management.

**Processes and scales in sedimentary systems – from point to continents** tackles problems of understanding and scaling erosion, transport, and deposition processes within sedimentary systems, including the transfer of local process understanding to larger scales; global changes and their local effects; coupling and decoupling of processes on different scales; complex system behaviour and changes in sedimentary systems, and contrasts between extreme events and long-term changes. The research presented in this section ranges from detailed studies on process behaviour at small scales (like soil armouring), to investigations into the connectivities of the sediment cascade components over a range of scales, and to analyses of the behaviour of large-scale and long-term sedimentary systems.

**Global change and erosion** deals with effects of climate and land-use changes on erosion and sedimentation processes, including issues like the relative importance of land-use and climate change for sedimentary systems; the sensitivity of sedimentary systems in different environments; and signatures of past environmental changes in current records and sedimentary systems. Subjects discussed in this section range from catchment and regional scale impact studies of past environmental changes to assessments of magnitudes of expected future changes in sedimentary systems on various scales.

Political and environmental management agendas often move independently of the science base. It is critical to improve linkages between science outcomes and decision making on various levels. Therefore, the theme **Linking erosion with environmental and societal impacts: sediment production, river regulation, depositional environments, hazards and risks, management and policy** was added to the programme. The theme includes important issues such as sediment production and its impacts on societies, sedimentary systems and catchment management, and hazard and risk (mitigation), and tools to meet policy targets in areas such as erosion-transfer of sediment-associated contaminants. The editors hope that the examples presented in this section, including topics relating to flood plain restoration, river management, and control of coastal erosion, will contribute to bridging the gap between research and practice for delivery of improved strategies for sustainable development.

The editors are grateful to all the 150+ scientists for contributing their work to generate a Symposium and an IAHS publication of high scientific quality. The task of reviewing, editing, and compiling this volume has proved to be a major challenge and our thanks go to all the authors who helped by providing manuscripts in a timely manner and by promptly responding to reviewers' and editors' comments and queries. A number of reviewers should be thanked for their willingness and timeliness of providing constructive criticisms – we do not name you all – you know who you are! The keynote speakers, Professor Andreas Lang, Dr James P. M. Syvitski, Professor Des Walling and Professor Michael Crozier provided the “backbone” for this volume and for the Symposium by presenting high quality evaluations of the state-of-the-art in *Sediment Dynamics in Changing Environments*. Finally, we wish to

express our gratitude to all the “support staff” indispensable for completing this project: to Penny Perrins and Cate Gardner from IAHS Press for supporting us in all the stages of planning and putting this publication and the Symposium together; and to Claire McConchie, Merrin McAuley, and Julia Simmons from The Conference Office, Canterbury University, for all the local support work and conference organisation.

**Jochen Schmidt**

*National Institute of Water & Atmospheric Research (NIWA)  
10 Kyle Street, Riccarton, Christchurch 8011, New Zealand*

**Tom Cochrane**

*Department of Civil and Natural Resources Engineering, University of Canterbury  
Civil/Mechanical Building, 67 Creyke Road, Ilam, Christchurch, New Zealand*

**Chris Phillips**

*Landcare Research  
Gerald Street, Lincoln 7608, New Zealand*

**Sandy Elliott**

*National Institute of Water & Atmospheric Research (NIWA)  
Gate 10 Silverdale Road, Hillcrest, Hamilton 3216, New Zealand*

**Tim Davies**

*Department of Geological Sciences, University of Canterbury  
Geology building, 67 Creyke Road, Ilam, Christchurch, New Zealand*

**Les Basher**

*Landcare Research  
16 Paru Paru Road, Nelson 7010, New Zealand*

**ICCE SYMPOSIA SERIES**

Since the early 1980s, the International Commission on Continental Erosion (ICCE) of the International Association of Hydrological Sciences (IAHS) has organized a series of highly successful symposia dealing with various aspects of erosion and sedimentation. (Volumes marked with \* are available for free download at <http://iahs.info/publications/redbooks>.)

In 1981, a Symposium was held in Christchurch, New Zealand, entitled:

*The Symposium on Erosion and Sediment Transport in Pacific Rim Steeplands*, Christchurch, New Zealand, 1981 (IAHS Publ. 132\*).

After that a series of Symposia followed:

*The Symposium on Erosion and Sediment Transport Measurement*, Florence, Italy, 1981 (IAHS Publ. 133\*)

*The Symposium on Recent Developments in the Explanation and Prediction of Erosion and Sediment Yield*, Exeter, UK, 1982 (IAHS Publ. 137\*)

*The Symposium on Dissolved Loads of Rivers and Water Quantity/Quality Relationships*, Hamburg, Germany, 1983 (IAHS Publ. 141\*)

*The Symposium on Drainage Basin Sediment Delivery*, Albuquerque, New Mexico, USA, 1986 (IAHS Publ. 159\*)

*The Workshop on Erosion, Transport and Deposition Processes*, Jerusalem, Israel, 1987 (IAHS Publ. 189\*)

*The Symposium on Sediment Budgets*, Porto Alegre, Brazil, 1988 (IAHS Publ. 174\*)

*The Symposium on Sediment and the Environment*, Baltimore, USA, 1989 (IAHS Publ. 184\*)

*The Symposium on Erosion, Debris Flows and Environment in Mountain Regions*, Chengdu, China, 1992 (IAHS Publ. 209\*)

*The Symposium on Erosion and Sediment Transport Monitoring Programmes in River Basins*, Oslo, Norway, 1992 (IAHS Publ. 210\*)

*The Symposium on Sediment Problems: Strategies for Monitoring Prediction and Control*, Yokohama, Japan, 1993 (IAHS Publ. 217\*)

*The Symposium on Variability in Stream Erosion and Sediment Transport*, Canberra, Australia, 1994 (IAHS Publ. 224\*)

*The Symposium on the Effects of Scale on the Interpretation and Management of Sediment and Water Quality*, Boulder, USA, 1995 (IAHS Publ. 226\*)

*The Symposium on Erosion and Sediment Yield: Global and Regional Perspectives*, Exeter, UK, 1996 (IAHS Publ. 236)

*The Symposium on Human Impact on Erosion and Sedimentation*, Rabat, Morocco, 1997 (IAHS Publ. 245)

*The Symposium on Modelling Soil Erosion, Sediment Transport and Closely Related Hydrological Processes*, Vienna, Austria, 1998 (IAHS Publ. 249)

*The Symposium on the Role of Erosion and Sediment Transfer in Nutrient and Contaminant Transfer*, Waterloo, Canada, 2000 (IAHS Publ. 263)

*The Workshop on Erosion and Sediment Transport Measurement in Rivers: Technological and Methodological Advances*, Oslo, Norway, 2002 (IAHS Publ. 283)

*The Symposium on the Structure, Function and Management Implications of Fluvial Sedimentary Systems*, Alice Springs, Australia, 2002 (IAHS Publ. 276)

*The Symposium on Erosion Prediction in Ungauged Basins: Integrating Methods and Techniques*, Sapporo, Japan, 2003 (IAHS Publ. 279)

*The Symposium on Sediment Transport through the Fluvial System*, Moscow, Russia, 2004 (IAHS Publ. 288)

*The Symposium on Sediment Budgets*, Foz do Iguaçu, Brazil, 2005 (IAHS Publs 291 and 292)

*The Symposium on Sediment Dynamics and the Hydromorphology of Fluvial Systems*, Dundee, Scotland, 2006 (IAHS Publ. 306).

And finally in 2008, 27 years after the 1981 Christchurch Symposium, Christchurch again hosted a Symposium:

*The Symposium on Sediment Dynamics in Changing Environments*, Christchurch, New Zealand, 2008 (IAHS Publ. 325).