GRAVEL-BED RIVERS

PROCESSES AND DISASTERS

EDITED BY

DAIZO TSUTSUMI AND JONATHAN B. LARONNE

WILEY Blackwell

Gravel-Bed Rivers

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Processes and Disasters

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This edition first published 2017
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Registered Office
John Wiley & Sons Ltd, The Atrium, Southern Gate, Chichester, West Sussex, PO19 8SQ, UK

Editorial Office
9600 Garsington Road, Oxford, OX4 2DQ, UK

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Library of Congress Cataloging-in-Publication Data applied for:

Hardback : 9781118971406

Cover Design: Wiley
Cover Image: Photograph by Daizo Tsutsumi

Set in 10/12pt Warnock by SPi Global, Pondicherry, India

Printed and bound by CPI Group (UK) Ltd, Croydon, CR0 4YY

10 9 8 7 6 5 4 3 2 1

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Preface

The *8th International Gravel-Bed Rivers (GBR) Workshop* was held in Kyoto (first day) and Takayama, Japan between 14 and 18 September 2015. Kyoto was the capital of Japan during the period AD 794–1869 and is the center of Japanese culture, with its many traditional Buddhist temples, Shinto shrines together with their unique gardens, and Zen gardens that are adorned with gravel that is as lovely as the plants. Kyoto University is among the oldest in Japan. Takayama is a small city surrounded by mountains. Due to its location and cultural uniqueness, tradition and cuisine are preserved in this city, which is traversed by gravel-bed rivers. The workshop was attended by 116 (of which, 17 were PhD students) gravel-bed river enthusiasts from Austria, Canada, Chile, China, France, Germany, Indonesia, Israel, Italy, Japan, Netherlands, New Zealand, Norway, Spain, Switzerland, Taiwan, United Kingdom, and United States.

In further keeping with the GBR tradition, the workshop was designed to present an authoritative review of recent progress in understanding the morphology of and processes operating in gravel-bed rivers. Accordingly, the workshop was constructed around a series of invited keynote presentations that tackled the principal themes selected for the meeting. Each theme included two presentations – the chapters comprising this book. Sessions for each theme incorporated considerable time for discussions. These discussions appear at the end of each chapter. The workshop included 61 posters (of which 15 were first-authored by PhD students). Ample time was given for questioning the poster presenters and exchanging information. Several among the poster presenters are preparing manuscripts for a special issue of the journal Earth Surface Processes and Landforms.

The workshop's main theme was Gravel-Bed Rivers and Disasters. In keeping with previous workshops, session topics covered a wide area, only some directly relevant to the workshop main theme of disasters. Because most measurements and data for gravel-bed rivers are available almost exclusively for small to intermediate (bankfull) flows, it is timely to pay more attention to large, often disastrous floods, more so in this age of climate change and urbanization. For instance, in Japan such floods accounted for 54% of the dead and missing in natural disasters during the period 2010–2014: altogether 5512 sediment disasters (landslides, slope failures, or debris flows) took place and 254 people were killed or missing in Japan (MLIT; http://www.mlit.go.jp/river/sabo/jirei/h26dosha/150331_H26saigai.pdf, 2015). We had chosen this theme because Japanese gravel-bed rivers cause many and frequent disasters (as in other tectonically and/or mountainous countries), but also because the Disaster Prevention Research Institute, Kyoto University played host to the workshop. The topics of this theme included gravel transport and deposition by large floods, sediment supply and availability, and integrated channel management.

Workshop themes included those that have become classics for the quinquennial meetings. So, gravel transport processes dealt with flow and transport near the river bed, theoretical considerations of bedload transport and bedload transport quantification by both direct and surrogate methods.

Represented were the two different approaches of physical and morphodynamic modeling. In demonstrating the continued awareness of the relevance of ecology to gravel-bed rivers, one session was devoted to in-stream habitat issues and the significance of vegetation. Dam removal and sediment flushing were included because these topics have gained interest and momentum by researchers and practitioners. As geomorphic, hydraulic and fluvial sedimentologic studies are often insufficiently interdisciplinary, the workshop included two other relevant issues: sediment porosity and modeling of deposit stratigraphy and bed cover. Also, for first time in the history of these meetings, the workshop hosted a topic on gravels away from Earth and explored evidence of past activity on Mars.

Field trips have continued to be central to successive workshops and that reported here was no exception. The pre-workshop trips took us to the urban Kamo River in Kyoto, guided by Yasuhiro Takemon, and to the Ujigawa Hydraulics Laboratory, Disaster Prevention Research Institute (DPRI), Kyoto University, where researchers from outside the university and the country are invited to take advantage of the flumes. The Gamada River (demonstrated by Michinobu Nonaka) and the Kamikoch area (guided by Hiroshi Suwa) were visited mid-workshop, demonstrating various devices used to monitor bedload and debris flows in DPRI's long-running Hodaka Observatory, only 4 km from the crater of the active Mount Yakedake volcano. The observatory invites researchers to collaborate or merely stay for short or extended periods at no cost. The post-workshop field trip was devoted to the Kurobe River, with its source in Mount Washiba (2924 m a.s.l.), part of the Hida Mountain Range of the Japanese Alps, carving the deep Kurobe gorge. It emerges from the mountains at Unazuki and forms an alluvial fan that debouches directly to the Sea of Japan. The guide (Tetsuya Sumi) demonstrated evidence of the ultra-high sediment yields from the Japanese Alps and the means by which dams are used to retain and flush the sediments.

Novelties of this workshop were the two-day special short-courses offered free to PhD students and postdoctoral fellows. Moreover, live web-streaming was accessible and presentations as well as discussions were recorded and uploaded to a freely available website (https://www.youtube.com/channel/UC8oW0AbmlhcJYwvtTBrAAsA).

There are many people to thank for the success of the workshop. First, our sponsors: the Japan World Exposition 1970 Commemorative Fund; Hida-Takayama Tourism and Convention Bureau; Sabo and Landslide Technical Center; Sabo Frontier Foundation; Association for Disaster Prevention Research; Nippon Koei; Civil Engineering and Eco-Technology Consultants Co. Ltd; the Kyoto University Foundation; and the DPRI, Kyoto University. We thank our supporters: Takayama City, the Jinzu and Matsumoto Sabo (meaning 'sand') offices, and Kurobe River office of the Japan Ministry of Land, Infrastructure, Transportation and Tourism.

Peer reviews of the invited papers were completed prior to the workshop. The papers were accepted between 17.03.2015 and 16.09.2015; the last reply to discussions was submitted on 1.03.2016. Special thanks go to more than 60 reviewers who helped to ensure the quality of the manuscripts. We thank the discussants of the papers and the presenters of the posters. Thanks go to Shusuke Miyata for organizing the workshop web site, the live videoconference and its recording, to Tatsuko Fujita for the workshop logo, to Harumi Miura for management of registration issues, preparation of the workshop, and tours for companions, to Cecilia Laronne Corrado for her help in the registration and support for attendees, to the staff of the Japan Travel Bureau for their assistance and management of the workshop, to the staff of the Hotel Associa Takayama Resort for their help in preparing the meeting place and accommodations, and to K. Lab Ltd for the booklet of the program and abstracts. Hiroshi Takebayashi and Joe Wheaton voluntarily offered short courses respectively on 'Modeling river flow, sediment transport and morphodynamics' and 'Introduction to geomorphic change,' to Ian Reid for English edits, to the PhD students and postdoctoral fellows, for which students Jun Nishiura and Satoru Masuda ensured a welcome. Appreciation goes to the excellent suggestions made by members

of the Scientific Advisory Board: Jochen Aberle, Peter Ashmore, James Brasington, Shinji Egashira, Chris Paola, Klement Tockner and Guido Zolezzi. Many thanks to Rachael Ballard, Shummy Metilda, Vinodhini Mathiyalagan, Delia Sandford, Audrie Tan, Teresa Netzler, Bella Talbot and Andrew Harrison, Lyn Nesbitt-Smith, staff at John Wiley & Sons, for their invaluable help during the entire editing process and to Mike Church for his suggestions and introduction to Wiley.

Professor Richard Hey (who could not participate), Professor James Bathurst and Professor Colin Thorne were guests invited and honored for their foresight in initiating the Gravel-Bed River series of workshops, beginning with the first in Newtown, Wales, in 1980. Thanks go to James and Colin, who, as banquet speakers, entertained everyone with the history of GBR workshops and their importance. Professor Takahisa Mizuyama was praised during the dinner for his central role in developing Japanese research on gravel bed rivers during the past two decades.

We trust that this book, like its predecessors, will become part of an authoritative record of advances in knowledge and understanding of gravel-bed rivers. And we wish the hosts of the next meeting, GBR9, to be held in Chile, as much success as we have enjoyed.

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