

Springer Earth System Sciences

Series editors

Philippe Blondel, Bath, UK

Eric Guilyardi, Paris, France

Jorge Rabassa, Ushuaia, Argentina

Clive Horwood, Chichester, UK

The Springer Earth System Sciences series focuses on interdisciplinary research linking the lithosphere (geosphere), atmosphere, biosphere, cryosphere, and hydrosphere that build the system earth. The series seeks to publish a broad portfolio of scientific books, aiming at researchers, students, and everyone interested in this extremely interdisciplinary field. It covers the entire research area of earth system sciences including, but not limited to, Earth System Modeling, Glaciology, Climatology, and Human-Environment/Earth interactions. Springer Earth System Sciences includes peer-reviewed monographs, edited volumes, textbooks, and conference proceedings.

More information about this series at <http://www.springer.com/series/10178>

Xiujun Wang · Zhitong Yu
Jiaping Wang · Juan Zhang
Editors

Carbon Cycle in the Changing Arid Land of China

Yanqi Basin and Bosten Lake

Editors

Xiujun Wang
College of Global Change and Earth System
Science
Beijing Normal University
Beijing
China

Jiaping Wang
Agricultural College
Shihezi University
Shihezi
China

Zhitong Yu
College of Global Change and Earth System
Science
Beijing Normal University
Beijing
China

Juan Zhang
College of Resources and Environment
Northeast Agricultural University
Harbin
China

ISSN 2197-9596

Springer Earth System Sciences

ISBN 978-981-10-7021-1

<https://doi.org/10.1007/978-981-10-7022-8>

ISSN 2197-960X (electronic)

ISBN 978-981-10-7022-8 (eBook)

Library of Congress Control Number: 2018932193

© Springer Nature Singapore Pte Ltd. 2018

This work is subject to copyright. All rights are reserved by the Publisher, whether the whole or part of the material is concerned, specifically the rights of translation, reprinting, reuse of illustrations, recitation, broadcasting, reproduction on microfilms or in any other physical way, and transmission or information storage and retrieval, electronic adaptation, computer software, or by similar or dissimilar methodology now known or hereafter developed.

The use of general descriptive names, registered names, trademarks, service marks, etc. in this publication does not imply, even in the absence of a specific statement, that such names are exempt from the relevant protective laws and regulations and therefore free for general use.

The publisher, the authors and the editors are safe to assume that the advice and information in this book are believed to be true and accurate at the date of publication. Neither the publisher nor the authors or the editors give a warranty, express or implied, with respect to the material contained herein or for any errors or omissions that may have been made. The publisher remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

Printed on acid-free paper

This Springer imprint is published by Springer Nature

The registered company is Springer Nature Singapore Pte Ltd.

The registered company address is: 152 Beach Road, #21-01/04 Gateway East, Singapore 189721, Singapore

Foreword

This book, “Carbon cycle in the changing arid land: Yanqi Basin and Bosten Lake,” comes at a time when countries are seriously looking for ways to offset CO₂ emissions. Arid and semiarid regions make up about one-third of the Earth’s land surface, yet these drylands are generally overlooked as places for carbon sequestration because (1) soil organic carbon is low compared to more humid soils and (2) soil inorganic carbon is widely considered to be an inert carbon reservoir rather than an active pool that can be manipulated by land management techniques.

This book provides examples suggesting that soil inorganic carbon is more dynamic and complicated than traditionally thought. In addition, readers of this book will learn about carbon in the interesting geological and climatic setting of northwest China. Perhaps its most important contribution, this book can stimulate carbon research in rangeland and irrigated agricultural settings in other arid land regions of the world.

Las Cruces, USA

H. Curtis Monger, Ph.D.
Professor Emeritus, New Mexico State University

Contents

The Carbon Cycle in Yanqi Basin and Bosten Lake: Introduction	1
Xiujun Wang, Jiaping Wang, Zhitong Yu and Juan Zhang	
Introduction of the Yanqi Basin and Bosten Lake	5
Changyan Tian, Lei Zhang and Shuai Zhao	
Climate Change Over the Past 50 Years in the Yanqi Basin	19
Fengqing Jiang, Junyi Wang and Xiujun Wang	
Characteristics of Soil Organic Matter and Carbon and Nitrogen Contents in Crops/Plants: Land Use Impacts	41
Juan Zhang, Xiujun Wang, Jiaping Wang and Qingfeng Meng	
Dynamics of Soil CO₂ and CO₂ Efflux in Arid Soil	55
Junyi Wang, Xiujun Wang, Jiaping Wang and Tongping Lu	
Land Use Impacts on Soil Organic and Inorganic Carbon and Their Isotopes in the Yanqi Basin	69
Jiaping Wang, Xiujun Wang and Juan Zhang	
Distribution of Pedogenic Carbonate and Relationship with Soil Organic Carbon in Yanqi Basin	89
Xiujun Wang, Jiaping Wang and Junyi Wang	
Spatial Distribution of Organic Carbon in Surface Sediment of Bosten Lake	103
Zhitong Yu, Xiujun Wang and Hang Fan	
Temporal Variability of Carbon Burial and the Underlying Mechanisms in Bosten Lake Since 1950	117
Zhitong Yu and Xiujun Wang	
Carbon Sequestration in Arid Lands: A Mini Review	133
Xiujun Wang, Jiaping Wang, Huijin Shi and Yang Guo	

Contributors

Hang Fan College of Global Change and Earth System Science, Beijing Normal University, Beijing, China

Yang Guo College of Global Change and Earth System Science, Beijing Normal University, Beijing, China

Fengqing Jiang State Key Laboratory of Desert and Oasis Ecology, Xinjiang Institute of Ecology and Geography, Chinese Academy of Sciences, Urumqi, Xinjiang, China

Tongping Lu College of Global Change and Earth System Science, Beijing Normal University, Beijing, China

Qingfeng Meng School of Resources and Environment, Northeast Agricultural University, Harbin, China

Huijin Shi College of Global Change and Earth System Science, Beijing Normal University, Beijing, China

Changyan Tian State Key Laboratory of Desert and Oasis Ecology, Xinjiang Institute of Ecology and Geography, Chinese Academy of Sciences, Urumqi, Xinjiang, China

Jiaping Wang College of Agriculture, Shihezi University, Shihezi, China

Junyi Wang College of Global Change and Earth System Science, Beijing Normal University, Beijing, China

Xiujun Wang College of Global Change and Earth System Science, Beijing Normal University, Beijing, China

Zhitong Yu College of Global Change and Earth System Science, Beijing Normal University, Beijing, China; Xinjiang Institute of Ecology and Geography, Chinese Academy of Sciences, Urumqi, China

Juan Zhang School of Resources and Environment, Northeast Agricultural University, Harbin, China

Lei Zhang State Key Laboratory of Desert and Oasis Ecology, Xinjiang Institute of Ecology and Geography, Chinese Academy of Sciences, Urumqi, Xinjiang, China

Shuai Zhao State Key Laboratory of Desert and Oasis Ecology, Xinjiang Institute of Ecology and Geography, Chinese Academy of Sciences, Urumqi, Xinjiang, China