Preface

Water quality describes the chemical, physical, and biological characteristics of water. Water quality not only encompasses the myriad of naturally derived chemicals, but also several million human-derived chemicals and incorporates a broadening suite of biological components such as microbes and descriptions of habitats and biotic communities, i.e. plants and animals. The physical characteristics include temperature, dissolved gases, and specific conductance, which is a measure of the electrical transmissivity of water. In the absence of the effects of human activities, water quality is primarily controlled by climate (precipitation and temperature) and geology (lithology, geomorphology, soil). The understanding of basic processes affecting chemical transport and transformation, and related effects on biota continues to improve, but is orders of magnitude more complex than the understanding of the physical characteristics of water. Water quality is a rapidly evolving environmental science discipline, primarily due to the increasing demand on water resources and the intricate linkage between water quality and use, particularly with the highly deleterious impacts of degraded water quality on human and ecosystem health.

Water quality, when coupled with water quantity, determines the suitability of that water for a particular use, including natural ecosystems, fisheries, recreation, potable water, agriculture, and industry. The quantity and quality of freshwater reflect the combined effects of many processes operating along hydrological pathways. Primary drivers for the availability of water are landscape changes and patterns, and the processes affecting the timing, magnitude, and intensity of precipitation, including global climate change. Furthermore, temperature, another climate change characteristic, intricately affects chemical reactions and biological behaviours.

Although water quality is naturally linked to the lithosphere, water-quality characteristics are increasingly dependent on the effects of human activities. Human activities create multiple and competing pressures on land and water resources through agriculture, urbanization, mining, industry, energy production, water supply and transportation (water and land). Population growth and movement, e.g. urbanization, are two of the most important factors affecting water quality through the increasing demand for resources, e.g. changes in agriculture and industry, and waste management. These activities generally degrade water quality, while being very demanding for specific water-quality criteria. An increasing area of interest to hydrologists, with major consequences to resource managers, is the affects of climate change, another human-induced phenomenon. Understanding of potential changes in climate through complex modelling has advanced and provided downscaled estimates of changing temperature and precipitation. These projections are being evaluated further from suites of basin- to global-scale models to determine changes in water storage, particularly with respect to the distribution of snow and ice, and hydrological impacts of extreme events. Water quality effects from projected changes in climate have only recently been considered and evaluations are in progress. The research of climate change affects on water quality is extremely complex given the continually changing affects of human activities on air, land and water, but is urgently needed given the very high importance of water quality for resource management.

The objective of the *Water Quality: Current Trends and Expected Climate Change Impacts* symposium was to bring water quality scientists together for a dialogue on the evaluation of climate change impacts on a broad range of water quality issues. The authors of the papers of this symposium were asked to provide input regarding the effects of climate change on the

focal issue of their paper. To this end, the 27 papers included herein provide a broad spectrum of water quality issues and have been grouped accordingly. The sections include:

– Seasonality and Extreme Event Effects on Water Quality
– Effects on Groundwater Quality
– Climate Change and Water Quality Assessment
– Climate Change and Water Temperature, and
– Climate Change and Water Quality Modelling.

The symposium was jointly organized by the IAHS *International Commission on Water Quality* (ICWQ) and the *International Commission on Continental Erosion* (ICCE) and sponsored by the *United Nations Educational, Scientific and Cultural Organization* (UNESCO). This symposium proceedings volume is a contribution to the International Hydrological Programme (IHP) of UNESCO. Although ICWQ and ICCE provided direct input to the symposium, aspects of hydrology, climate, biology, and hydrochemistry represent topical interests of other IAHS Commissions and Committees.

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