Past, recent, and future climate-change impacts on hydrologic and environmental variability in selected regions of Asia

This compilation of manuscripts is the outcome of a workshop held in 2007 in Nanjing, China, which focused on past environmental variability and water resources in arid and semi-arid regions. About forty-five participants from eight countries took part in the workshop. The majority of the scientific presentations centered on Asia, although sites in Africa, Australia, and the Americas also were included. The workshop was convened by a LIMPACS working group under the auspices of the PAGES (Past Global Change) program, which is an initiative under the International Geosphere Biosphere Program (IGBP). LIMPACS focuses on lake ecosystems, and this specific working group within LIMPACS considers how sediment records, monitoring, and modeling can be integrated to better understand lake ecosystems and climate variability in semi-arid regions, particularly the record and dynamics of saline lakes. The workshop was sponsored by PAGES, the Chinese Academy of Science (CAS), and the Chinese Natural Science Foundation and was hosted by the Nanjing Institute of Geography and Limnology (CAS).

The first set of papers reconstructs past environmental variability in various parts of Asia at time scales ranging from the last century to the Last Glacial Maximum (LGM). Wrožyna and colleagues reconstruct lake-level change during the last millennium in Tibet using isotopic measurements and species assemblages of ostracodes. Their analysis suggests the interaction of both direct precipitation variation and temperature impacts on meltwater inputs in affecting the water budget of the basin. Zhang and colleagues reconstruct the history of the last century or so and use organic chemical compounds to investigate the interacting effects of humans and climate on a lake in the Yunnan Province of China. In this study, instrumental climate data provide a context for interpretation of the geochemical record. The issues associated with dating Holocene sediments in saline lakes are the focus of the manuscript by Wu and colleagues, who compare radiocarbon ages of different components in sediments from two sites in Tibet. Finally, Ashai reconstructs the history of southwest monsoon variation in the Himalayas at the LGM based on measurements of equilibrium line altitude (ELA).

The second group of papers uses observations and modeling of both lake systems and climate variation to understand either contemporary processes or to project possible change in the future. Xu et al. describe measurements of the ion chemistry of rivers, groundwater, and rainwater in the Qinghai Lake watershed in Tibet, where geomorphic processes and paleoclimate have been studied

for many years. Their intent is to understand how these varied sources interact to affect the chemistry of the lake and ultimately the composition of the sedimentary record. Yu and Shen use Monte Carlo probability analysis to model lake-level response to future climate change in four lakes in northern China, including Lake Qinghai. Future climate scenarios also are the focus of the article by Liu and colleagues, who apply a global climate model to simulate climate during the last 50 years in different regions of China and then project trends 30 years into the future based on projected increases in greenhouse gas concentration. The final paper by Kumar and Jain is an analysis of 20th-century rainfall trends in Kashmir.

The PAGES emphasis on the integration of retrospective approaches with monitoring and modeling to understand past, recent, and future environmental dynamics is reflected in the papers included in this issue and was an active topic of discussion at the meeting. The extensive interest in the Asian monsoon system and the interactive effects of climate and humans in affecting Asian landscapes led to discussions on the last day of how the group might advance additional research on these topics. As a result, a subsequent workshop focused on Asian environmental change was scheduled and held in India in 2009. This continues the commitment of PAGES Focus IV (Dearing and Battarbee, 2007) to encourage syntheses of regional environmental and climatic reconstructions, both to identify the relative influence of the drivers of change and to inform sustainable management practices into the future.

Reference

Dearing, J., Battarbee, R., 2007. Past human-climate-ecosystem interactions (PHAROS). PAGES News 15 (1), 8–10.

Sherilyn C. Fritz*, Guest Editor
Department of Geosciences, University of Nebraska, 214 Bessey Hall,
Lincoln, NE 68588-0340, USA

* Corresponding author.
E-mail address: sfritz2@unl.edu

Peter Gell, Guest Editor
Centre for Environmental Management, University of Ballarat
(Mt Helen), PO Box 663, Ballarat, Victoria 3353, Australia