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EDITORIAL

Introduction to "Late Pleistocene and Holocene climate change in continental Asia"

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Most of the papers in this special issue on continental Asian lake sediment records represent palaeolimnological studies presented at the 18th International Union for Quaternary Research (INQUA) conference in Bern, Switzerland. INQUA members are all involved in investigating Quaternary geology. The meeting in Bern attracted more than 2,000 participants from 68 countries and glaciologist Christian Schlüchter presided over the conference.

A special session on Late Pleistocene and Holocene climate change in continental Asia was held on 22 July 2011. There were 16 oral presentations and 29 posters in the session. The region is of extraordinary climatic importance because large amounts of water are stored in the mountain ranges of High Asia, in snow, ice and frozen ground. These water resources support billions of people in the lower reaches of some of the world's largest rivers. In addition, these important water resources lie at high altitudes far from oceans, and have experienced large climate and environmental fluctuations on long-term, glacial-interglacial timescales (Kong et al. 2011). Recent global warming has already caused a significant temperature increase on the Tibetan Plateau (Wei and Fang 2013), and continued climate shifts in the region are anticipated for the future. Thus, a better understanding of the magnitude and timing of past environmental change is required to provide reliable predictions of future water availability. Palaeolimnological studies play an important role in addressing the issue of past regional water availability (Herzschuh 2006; Chen et al. 2008; Wang et al. 2010).

Papers in this special issue address environmental conditions during relatively warm climate periods in the early and middle Late Pleistocene (Marine isotope stages [MIS] 5 and 3), during the late glacial and Holocene, and in some cases, the last few centuries and decades. The order of presentation of the papers in the special issue follows the above temporal sequence. The issue begins with four papers on MIS 5 or 3 records. The first paper is on dated palaeolake shorelines from the Qaidam Basin on the northern Tibetan Plateau (Madsen et al.; Fig. 1). It is followed by a re-assessment of sediments from the same basin, previously regarded either as shoreline deposits or deep lake sediments (Mischke et al.). In the next paper, Lai et al. present new age determinations for this site. They review a suite of radiocarbon dates, mostly from MIS 3, which generally are younger than ages

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obtained by optically stimulated luminescence dating. Contributing to an emerging debate on climate conditions during MIS 3, the final paper of the first section (Liu et al.) reports evidence for wetter conditions at times during middle and late MIS 3 in north-central China.

The next four papers contribute to the growing number of late glacial and Holocene records needed to reconstruct the more recent history of the Indian and East Asian summer monsoons, and the influence of westerlies in different regions of continental Asia (Fig. 1). The paper on Lake Qinghai (Liu et al.) shows that a climate threshold was apparently surpassed at the beginning of the Holocene on the northeastern Tibetan Plateau, causing an abrupt lake response not seen in previous studies from the region. The next paper, by Zech et al., discusses a climate record from the southern margin of the Tibetan Plateau. Because of the lack of biogenic or authigenic carbonate precipitates for stable oxygen isotope analysis, $\delta^{18}O$ was measured on a promising new climate proxy, lacustrine sugar biomarkers. The next two records come from Lake Nam Co (Doberschütz et al.) and the Tangra Yumco Basin (Miehe et al.), and include a variety of sedimentological, geochemical and micropalaeontological analyses. The study from the Tangra Yumco Basin explores the striking discrepancy between climate-controlled, large shifts in lake stage during the Holocene, and the relatively unchanged vegetation cover in the region.

Finally, three papers address very recent environmental changes on the Tibetan Plateau or present-day distributions of bioindicators in a large, foreland-basin lake in northwestern China (Fig. 1). The first contribution (Wischnewski et al.) shows, perhaps surprisingly, that hydrological conditions in a small, sensitive mountain lake were stable during the last 600 years. This finding is supported by nearby tree-ring records. A record from another small mountain water body discusses the creation of the lake in the twentieth century as a result of a large earthquake-triggered landslide, and subsequent lake responses to human activities and environmental change (Wang et al.). The final paper of the special issue breaks new ground on environmental reconstructions in Central Asia by utilizing chironomid head capsules to make inferences (Chen et al.). Midge larvae assemblages show distinct relations to water depth in large, shallow Bosten Lake, Xinjiang.

Papers in this special issue highlight the importance and challenges of achieving better chronological

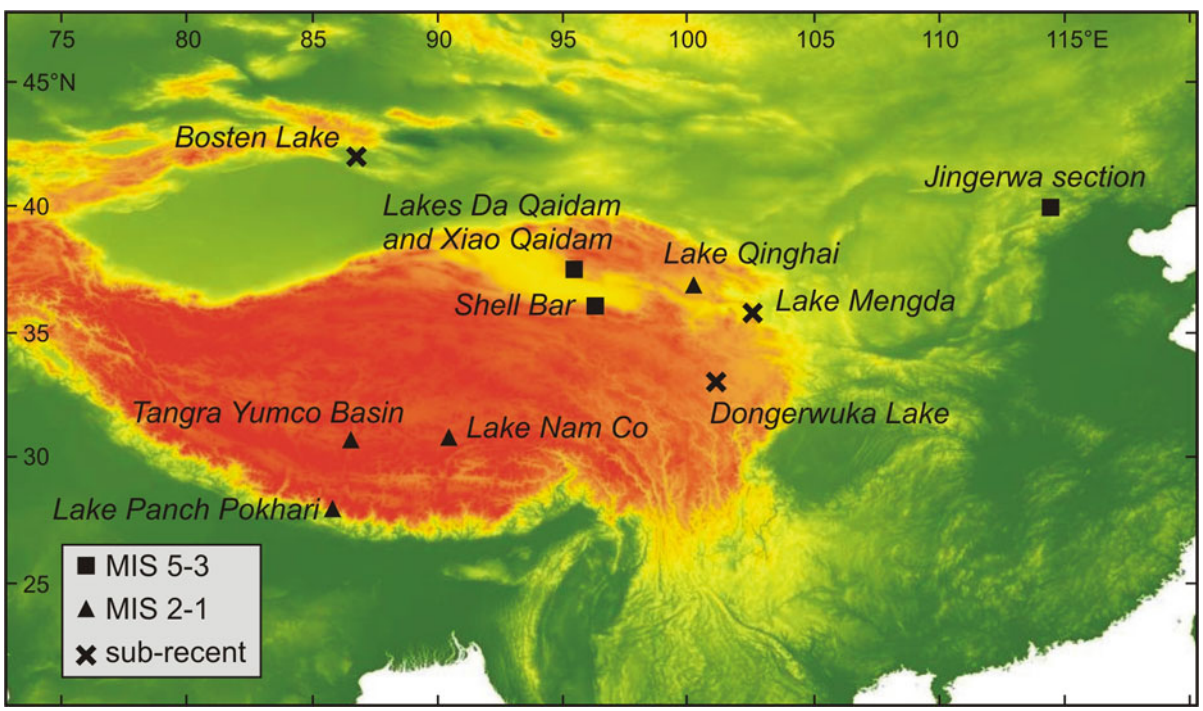

Fig. 1 Lake basins and sites discussed in the papers of the special issue. (Age assignments marked by *symbols*)

control on lacustrine sediment sequences from continental Asia. Multi-proxy studies, using new and well-established proxies, along with multi-archive studies, demonstrate the potential for making reliable palaeoenvironmental and palaeoclimate inferences. We hope this special issue will stimulate and encourage young and experienced researchers alike to pursue future paleolimnological studies on continental Asia's fascinating lakes.

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