Holocene Climate Change in the Asian Region

LIMPACS Workshop – Chandigarh, India, 5-8 March 2009

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The 3rd meeting under the "Salinity, Climate Change and Salinisation" working group of LIMPACS (Human impacts on lake ecosystems), a PAGES Focus 4 Working Group, was held in Chandigarh from 5-8 March 2009. This meeting followed those from October 2004 in Mildura, Australia and April 2007 in Nanjing, China. The meeting was jointly organized by Kumaun and Panjab Universities and was supported by PAGES, the Indian Council of Scientific and Industrial Research, and the Indian Oil and Natural Gas Commission. Over 70 participants attended from Australia, USA, UK, France, Germany, Russia, Bulgaria, Poland and China, as well as a strong contingent of Indian scientists and early career researchers.

This meeting focused on key extreme climate events (particularly decadal scale climatic changes) through the Holocene, across the Indian subcontinent and China including Tibet, with other contributions from studies in Mongolia, Lebanon, Siberia, Bulgaria, Botswana, California and Australia. Clear evidence was provided for the widespread impact of the Younger Dryas, 8.2 and 4.2 ka events, Medieval Warm Period and Little Ice Ages across the region, which, while evident, produce differential outcomes in terms of available moisture (Fig. 1). Another key theme addressed was the response of people to climatic fluctuations as expressed by societal collapse, migrations or changing technologies and economies.

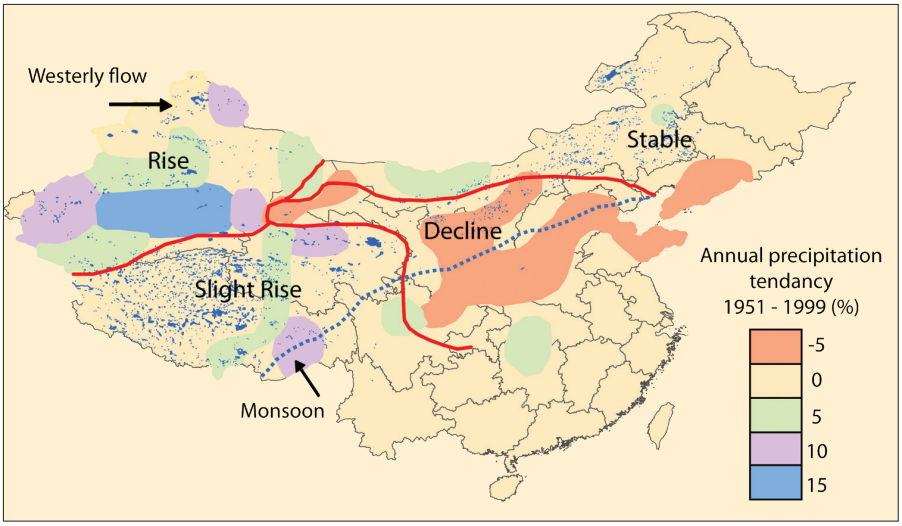

Figure 1: Water level changes across west China since the 1970s, based on topographic mapping and remotely sensed imagery. The levels of most lakes in western China fell through to the mid 1990s but have risen since due to increased rainfall.

Following the presentations, discussions were held that identified research priorities for the region. These comprised (1) stronger cooperation between climatologists and modelers, (2) improved dating techniques with better calibration, (3) an intention to generate better estimations of actual climatic parameters (temperature and humidity) through proxies and (4) a plan to develop a regional database of records of climate and water budgets for Asia, especially across the Indian subcontinent. It was also felt that a better understanding of the connection between climate change processes and civilization and culture would aid the prediction of climate-driven catastrophes and mitigate their impact in the future.

The proposal to develop a regional network, first tabled at the Nanjing meeting, was developed with a proposal to launch the "Across the Third Pole" (ATP) research network, to encourage the development of regional syntheses to explore the impact of recent climate change and human impact on lake ecosystems across the Himalayan slopes and Tibetan Plateau. It was agreed to meet again in Bulgaria in September/October 2011 to collate recent records of human impact, and to advance the aims of the ATP network by identifying sites and supporting research in key sites across the region.

East African Quaternary: Lessons from the past for the future

The 2nd Eastern African Quaternary Research Association (EAQUA) Workshop – Addis Ababa, Ethiopia, 21-24 May 2009

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The 2nd East African Quaternary Research Association (EAQUA) workshop was held in Addis Ababa, Ethiopia from 21-22 May 2009, followed by a post-workshop field trip to the Main Ethiopian Rift on 23-24 May. The workshop was organized by the Department of Earth Sciences, Addis Ababa University in collaboration with EAQUA; and was sponsored by PAGES, START, INQUA, the Paleo-Anthropology Scientific Trust, British Institute in Eastern Africa, the Revealing Hominid Origins Initiative, and local institutions (Addis Ababa University, Authority for Research and Conservation of Cultural Heritages, and Ministry of Science and Technology). The Workshop was officially opened by the State Minister of the Ministry of Culture and Tourism of Ethiopia.

The primary objectives of the workshop were to strengthen and enhance active communication on Quaternary research issues in the Eastern African region, and to serve as a forum for initiating new

Figure 1: Participants of the EAQUA Workshop

and strengthening existing collaborations and networking among the East African Quaternary community. Another objective was to bring together paleoscientists who work in the region under the PAGES science structure, in particular Focus 2 (Regional Climate Dynamics) and Focus 4 (Human-Climate-Ecosystem Interactions). The workshop also aimed to assess the opportunities and challenges in research, training and capacity building.

More than 50 researchers participated from the Eastern African region (Ethiopia, Kenya, Tanzania, Uganda) and other parts of Africa (South Africa and Nigeria), as well as from Belgium, France, Germany, Ireland, Switzerland, UK, and USA. Thirty oral papers and 8 posters were presented, organized in five major themes spread over two days.

During the first and second sessions, the climate of the last 2000 years, long-term monsoon variability and abrupt changes in East Africa were described using proxy rainfall data from many archives (lake and cave sediments, speleothems, tree rings, and pollen). Presentations in these sessions established the local and regional climate variations and emphasized the need for an integrated approach to understand the variations with respect to global climate forcings. Papers in the third session addressed the paleo-vegetation history of parts of Ethiopia, Kenya and Nigeria, using pollen, buried charcoal and soil organic matter, and related climate variations to societal development histories.

Archeological and fossil records in East Africa were presented in the fourth session. New, as well as published data from hominid, archeological and historical sites in Ethiopia, Kenya, and South Africa were presented. In the last scientific session, presentations addressed the impact of global and climate changes in East Africa, as well as assessment of adaptations and vulnerability. Studies from Kenya, Tanzania and Uganda showed the impacts of climate changes on biodiversity and hinted at adaptation mechanisms and mitigation measures.

The scientific presentations were followed by a discussion on potential workshop products, and plenary talks by representatives of INQUA, PAGES, and PAST, who presented brief program backgrounds. The final session of the workshop was dedicated to general discussion, EAQUA matters, and the way forward. The general discussion emphasized the need to strengthen EAQUA both in terms of membership and its institutional activities. To this effect, it was agreed that:

- Proceedings of the workshop should be published in four synthesis papers addressing the four major themes.
- Networking among EAQUA members and Quaternary researchers in East Africa should be strengthened.
- EAQUA should increase its visibility through webpages and other avenues.
- The draft EAQUA Constitution should be circulated among members for comments and be rectified during the next meeting.
- The next EAQUA workshop should be held in Zanzibar in 2011.

During the post-workshop field trip, participants visited archeological (Melka Kunture, and Tiya-World Heritage Site), geological (crater lakes, rift-plateau escarpment, the Main Ethiopian Rift, the Lakes region: lakes Awasa, Shala, Abijata, Langano and Ziway), and biodiversity sites (Munesa forest). The geological, environmental and vegetation histories of the sites were explained by experts in the group, followed by lively discussions.

The workshop participants also enjoyed a visit to the Ethiopian National Museum in Addis Ababa, where world-famous hominid fossils are on display.

Data-assimilation techniques for paleoclimate data

Vienna, Austria, 25 April 2009

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Paleoclimate modeling provides a means for formulating and testing hypotheses, for example, quantifying the response of the Earth System to different forcings. Moreover, Earth System models provide a comprehensive framework for exploring couplings and feedbacks between the various components of the system. This type of analysis is of special relevance for detecting thresholds in the Earth System. The joint utilization of paleoclimate reconstructions and paleoclimate modeling require methods for an objective comparison of proxy data and modeling results.

Data assimilation has become an important approach in this regard. It allows for estimation or forecast of the state of the atmosphere and oceans. However, this method is not readily available for paleodata due to their sparse spatial distribution and the uncertainties associated with proxy reconstructions. This led a group of 12 scientists from Europe, Japan and the United States to convene at a workshop to debate the applicability of the various techniques in a paleoclimate context.

Several data-assimilation techniques exist, including variational techniques, sequential filtering and statistical methods (e.g., Monte Carlo methods). All these techniques aim to reduce the model-data misfit that is summarized in a so-called "cost" function (a measure of the devia-