



Research

Scientists from IMHE investigate the Koshi River basin, Nepal

Located on the southern slopes of the Himalayas, Nepal is a typical mountainous country. With 83% of its area covered by mountains, Nepal's climate, vegetation, land use, economy, and even natural disasters are largely governed by this mountain environment. Due to its special natural and geographical characteristics, Nepal is an ideal place for researching the mountain environment, natural disasters, sustainable development, and livelihoods.

From 30 August to 3 September 2013, a group of scientists from the Institute of Mountain Hazards and Environment (IMHE), Chinese Academy of Sciences (CAS), led by Prof. Deng Wei, Director of IMHE, went on a five-day expedition to the Koshi River basin in conjunction with the Geography Institute of Tribhuvan University. The expedition focused on types of land use, water resource development, agricultural development, and mountain disasters in the basin.

The expedition members were divided into two groups. The first group travelled along the Sun Koshi River via Dhulikhel, Sindulimarhi, Dharan, and Hetaunda to investigate land use types, water utilization, and irrigation. This group visited three typical farmer families to learn more about local farmers' sources of income, demographic composition, grain yield, crop rotation, and farm land, and land tenure, among other things.

The second group studied mountain disasters, agricultural practices, and water distribution in the Sun Koshi River basin and Tama Koshi River mountainous area. This group travelled along the Dhulikhel-Kodari highway and Khadichaur-Manthali highway through Dhulikhel, Dolalghat, Barhabise, and Charikot from where they walked to two typical debris flows. The second group also conducted a survey on agricultural development and distribution and the use of water resources in the area.

In addition to providing first-hand comparative information about the mountain environment and disasters in the Koshi River basin, this expedition established a good working basis for bilateral cooperation between Nepal and China.

Scientists from IMHE investigate the Koshi River basin of Nepal



Seminar on the implementation of Koshi Basin programme

The Koshi River originates in the central Himalayas in the Tibet Autonomous Region of China, from where it flows through China to Nepal and India. There are five high mountains in the basin of more than 8,000 metres in elevation, including Mt Everest. The Koshi River is one of the most important transboundary rivers in South Asia. The Koshi Basin Project ('Water management and hazard risk reduction related policy and institutional analysis in China for Koshi River



Participants of the seminar on Koshi Basin programme



An international training on scientific data sharing for the Hindu Kush Himalayan region comes to a successful conclusion

basin management'), a joint programme between China, India, and Nepal, commenced in 2012 with funding from the Government of Australia. A kick-off meeting was held in Chengdu in May 2013.

To review progress in the implementation of the project and to plan the next implementation phase, a seminar was held in Chengdu from 11–14 November 2013. The Institute of Mountain Hazards and Environment (IMHE), CAS, and ICIMOD co-hosted the seminar, which was organized by the Chinese Committee on the International Centre for Integrated Mountain Development (CNICIMOD). Dr Chen Ningsheng from IMHE presided over the seminar. The seminar was attended by Dr Dong Qi from the Bureau of International Cooperation, CAS, Dr Hu Jinming from Yunnan University, and Dr Zhao Zhongnan from China Renewable Energy Engineering Institute.

Dr Dong Qi and Prof. Wei Fangqiang from IMHE delivered addresses at the opening ceremony. Dr Hu Jinming and Dr Zhao Zhongnan reported on water-related disasters and water resource management. Dr Arun Shrestha and Dr Shahriar Wahid from ICIMOD and Dr Chen Ningsheng and Fang Yingping from IMHE outlined the project progress and achievements so far and the work plan for the next phase. Group discussions were conducted on project tasks and requirements and a concrete scheme for implementation put forward for the next phase.

International training on Scientific Data Sharing for the Hindu Kush Himalayan Region

The Bureau of International Cooperation, CAS, funded an international training on Scientific Data Sharing for the Hindu Kush Himalayan Region. The course was hosted by the State Key Laboratory of

Resources and Environmental Information System and spanned three weeks ending on 22 November 2013. Seventeen trainees from nine countries – Afghanistan, Bangladesh, China, India, Mongolia, Myanmar, Nepal, Pakistan, and Russia – and representatives from ICIMOD participated in the course.

Lectures on progress in scientific data sharing at home and abroad, scientific data sharing policies, ID references and publishing, scientific data sharing technology and software systems, data production and plotting, e-science, and knowledge sharing were given by more than 30 experts from 15 institutions, including the Institute of Geographic Sciences and Natural Resources Research, CAS; Computer Network Information Center (CNIC), CAS; Institute of Remote Sensing and Digital Earth (RADI), CAS; Cold and Arid Regions Environmental and Engineering Research Institute, CAS; National Astronomical Observatories, CAS; Institute of Microbiology, CAS; Institute of Zoology, CAS; Tsinghua University; Beijing University of Aeronautics and Astronautics; Renmin University of China; China Science and Technology Information Institute; Beijing Municipal Science and Technology Commission; and Thomson Reuters. The trainees visited the Earth System Science Data Sharing Platform, the National Ecosystem Observation Research Network, key state laboratories for resources and environment information systems at the Institute of Geographic Sciences and Natural Resources Research, China Remote Sensing Satellite Ground Station, the land observation satellite data centre at RADI, the national science and technology basic conditions platform at the Beijing University of Aeronautics and Astronautics, and the data industrial base at Qinhuangdao (CAS).

The course promoted communication in scientific data sharing between China and surrounding countries and laid a solid foundation for carrying out scientific data sharing; it also created better relationships between related domestic research institutions and companies.

ITP article published in 'Reviews of Geophysics'

An article by Yao Tandong, Gao Jing, and ten other authors from the Institute of Tibetan Plateau Research, CAS, was published in 'Reviews of Geophysics', one of the most influential journals in the field of geosciences. The article described three interactive models between the Indian monsoon and Westerlies through rainfall stable isotopes in the Tibetan Plateau.

The stable oxygen isotope ratio ($\delta^{18}\text{O}$) in precipitation is an integrated tracer of atmospheric processes worldwide. Since the 1990s, an intensive effort has been made to study precipitation isotopic composition at more than 20 stations on the Tibetan Plateau located at the convergence of air masses between the Westerlies and the Indian monsoon. This paper established a database of precipitation $\delta^{18}\text{O}$ and used different models to evaluate the climatic controls of precipitation $\delta^{18}\text{O}$ over the Tibetan Plateau. The spatial and temporal patterns of precipitation $\delta^{18}\text{O}$ and their relationship with temperature and precipitation revealed three distinct domains associated with the influence of the Westerlies (northern Tibetan Plateau), Indian monsoon (southern Tibetan Plateau), and the transition in between. Precipitation $\delta^{18}\text{O}$ in the monsoon domain experiences an abrupt decrease in May and is mostly depleted in August, attributable to the shifting moisture origin between the Bay of Bengal and southern Indian Ocean. High-resolution atmospheric models capture the spatial and temporal patterns of precipitation $\delta^{18}\text{O}$ and their relationship with moisture transport from the Westerlies and Indian monsoon. Only in the Westerlies domain are atmospheric models able to represent the relationships between climate and precipitation $\delta^{18}\text{O}$. More significant temperature effects exist when either the Westerlies or Indian monsoon is the sole dominant atmospheric process. The observed and simulated altitude- $\delta^{18}\text{O}$ relationships strongly depend on the season and the domain (Indian monsoon or Westerlies).

The results of the study have significant implications for the interpretation of paleoclimate records and for the application of atmospheric simulations to quantifying paleoclimate and paleo-elevation changes. The article is available at: <http://onlinelibrary.wiley.com/doi/10.1002/rog.20023/abstract>.

Scientists predict changes in active layer thickness on the Qinghai-Tibet Plateau from climate warming

The 'active layer' is the layer of rock and soil on the Earth's crust that freezes in the cold season and thaws again in summer. Seasonal changes in the thickness of the active layer depend on the climate and are related to the altitude, latitude, and lithology of the active layer, its water content, and the soil heat flux, as well as the terrain and underlying surface. The change in active layer thickness, which affects the ecological environment in cold regions, is the most active factor. The active layer thickness and dynamic change processes of water and heat in permafrost regions affect the processes of biology, physics, and geochemistry in hydrological and ecological systems. An increase in active layer thickness will release the organic carbon and greenhouse gases deposited in the permafrost into the atmosphere, affecting the local area and global climate.

Based on the climate change scenarios A1B, A2, and B1, and using Stefan's Equation, researchers have predicted the changes in active layer thickness for the permafrost regions on the Tibetan Plateau in Southwest China. It is predicted that with rising air temperatures the active layer depth will increase radically outwards from the Qiangtang basin in the interior of the Tibetan Plateau. Changes in the active layer thickness under scenarios A1B and A2 will be more significant than under scenario B1, because of fewer anthropogenic impacts. In 2050, the mean active layer thickness will reach 3.07 m under Scenario A1B, about 0.3-0.8 m more than that in 2010. Under Scenario B1, the increment will be 0.2-0.5 m and under scenario A2 it will be 0.2-0.55 m. In 2099, the mean active layer thickness will reach 3.42 m under scenario A1B, 3.53 m under scenario A2, and 2.93 m under scenario B1. Climate warming will significantly deepen the active layer. One hundred years later, the spatial distribution of permafrost on the Tibetan Plateau will have changed greatly.

The study was co-funded by the National Major Scientific Research Project (2010CB951402) and the Important Direction Group Project of CAS. The results were published in the Journal of Glaciology and Geocryology.

Variation in the Qinghai-Tibet Plateau Index B (TPI_B) may be contributing to climate extremes

The arid zone of northwest China is located in the hinterlands of central Asia and is sensitive to global climate change. The influence of extreme value of climate change on the social, economic, and ecological systems is more important than the influence of average value.

Based on the STARDEX (Statistical and Regional Dynamical Downscaling of Extremes) climate extreme value index system, Dr Chen Yaning and his colleagues from Xinjiang Institute of Ecology and Geography, CAS, carried out a systematic study on temporal and spatial variation trends in climate extremum in China's northwest arid region. As part of the study, they discussed the appearing time of abrupt change in climate extremum and its possible reasons and calculated the rate of contribution of climate extremum to climate average value.

The results of the study show that the variation in climate extremum is the main factor contributing to climate average value in the northwest arid region of China in the last 50 years; that the climate extremum index underwent an abrupt change process in the late 1980s; and the Qinghai-Tibet Plateau Index B (TPI_B) may be an important factor in abrupt change in climate extremes in the northwest arid region. The results of the study will help us to understand the variation in climate extremum.

IGSNRR makes progress in the research of vegetation changes and their responses to climate change in the middle Himalayas

Over the past decades, considerable research has been conducted on monitoring changes in vegetation growth because of its important role in regulating the terrestrial carbon cycle and climate system. Taking vegetation dynamics in Eurasia as an example, the vegetation index value went through two obvious changes around 1997, firstly increasing then decreasing. Dr Zhang Yili and his group from the Institute of Geographic Sciences and Natural Resources Research (IGSNRR) found that the variation trend is obviously different in the middle Himalayas. They combined datasets of the satellite-derived

Normalized Difference Vegetation Index (NDVI) and climatic factors to analyse spatio-temporal patterns of vegetation growth from 1982–2006 in the Koshi River basin in the middle Himalayas. The dataset from the global land surface satellite sensor from SPOT-4's Vegetation instrument in 1998–2011 was used to further verify the results.

The results of the study show an increase in vegetation productivity in the Koshi River basin from 1982–1994, which is consistent with previous results across Eurasia. However, the study found a sudden drop in vegetation productivity in the Koshi River basin from 1994–2000 and a subsequent increase from 2000–2011, which did not agree with previous research.

Climate change probably played a major role in such trends in vegetation growth. This study found that the linear trend for the whole study period (1982–2006) did not accurately represent the actual temporal patterns of vegetation growth over the whole study period. The study also showed that the decrease in NDVI in the periods 1982–1994 and 1994–2000 was significantly and negatively correlated with the sudden increase in precipitation (except spring NDVI SPN in 1982–1994), which indicates that vegetation growth over this short period was very sensitive to the significant change in precipitation in the Koshi River basin. The study also found that, the first change in vegetation growth in the Koshi River basin in 1994 occurred three years earlier than that in other parts of Eurasia, which could be partly due to differences in vegetation growth as a result of climate change at high and low altitudes. In summary, the spatial patterns of vegetation growth in the Koshi River basin were variously and significantly affected by temperature and precipitation in different periods.

This study was financially supported by the National Basic Research Program of China (2010CB951704), the Strategic Priority Research Program of CAS (XDB03030501), the National Natural Science Foundation of China (40901057), and the External Cooperation Program of CAS (GJHZ0954).

Applicability of GLDAS and characteristics of climate change in Tibetan Plateau arid area

The Tibetan Plateau has long been known as the roof of the world, with about 56% of its area lying

at 4,000 metres above sea level or above. The dynamic effect and thermal action of the area have an important effect on the weather and climate of China and the world. The hydrological cycle on the Tibetan Plateau is particularly sensitive to the regional ecological environment. Because of its potentially global impact, variations in the hydrological cycle on the Tibetan Plateau and its surrounding arid area are important to study from the perspective of climate change.

Accordingly, scientists from the Cold and Arid Regions Environmental and Engineering Research Institute of CAS used the Global Land Data Assimilation System (GLDAS) to conduct research on variations in the hydrological cycle of the Tibetan Plateau. GLDAS represents the regional distribution of the surface hydrological cycle element and supports the regional scale study of changes in the hydrological cycle. The researchers divided the Qinghai-Xizang Plateau and its surrounding arid area into four climatic regions and analysed the variation characteristics of temperature and rainfall in each climate zone. They then tested the suitability of temperature and precipitation data from GLDAS's four land surface models for the period 1979–2007. The researchers then examined the spatial variation of evaporation and runoff and the change in key elements of the surface hydrological cycle in the different climate zones.

The study found that the average temperature in the four climate zones for the periods 2000–2007 and 1979–1994 ranged from 0.65 to 0.97°C, and increased markedly over time. Precipitation, however, changed differently from place to place and over time; the mean precipitation in arid and semi-arid areas from 2000–2007 was more than 14 mm and in 1979–1994 was 25 mm.

GLDAS temperature and precipitation data has high applicability for the Tibetan Plateau and its surrounding arid area for the period 1979–1994. The root-mean-square error between GLDAS temperature data and Chinese surface grid temperature data in extremely arid areas is only 0.41 °C. The differences between GLDAS data and APHRODITE precipitation data in the four climate zones are all less than 0.18 mm d⁻¹.

The hydrological cycle in the study area was found to be in dynamic balance during the research period. However, the quality of data from 2000–2007 has yet to be improved. The runoff and evaporation area

grew significantly and the amplitude of the change rose sharply, although the change in magnitude of the change is uncertain. The change characteristics of key elements of the hydrological cycle in most areas of Xinjiang Autonomous region are consistent with the scientific hypothesis of a climatic shift from warm-dry to warm-humid. The precipitation in this area is mainly used in evaporation. In recent years, the hydrological cycle has strengthened and multi-year average runoff coefficients are less than 0.2.

This research was co-funded by the '9-7-3' Program (2013CB956004) and 'Hundred Talent Program'. This paper ("Applicability of GLDAS and Climate Change in the Qinghai-Xizang Plateau and Its Surrounding Arid Area") was published in the Journal of Plateau Meteorology.

Cooperation

CAS delegation visits Laos and Myanmar

At the invitation of the Ministry of Science and Technology of Laos, Ministry of Environmental Protection and Forestry of Myanmar, and Geographic Society of Myanmar, a delegation from CAS visited Laos and Myanmar to strengthen ties and share information. The delegation, which was led by Dr Zhang Yaping, Vice President of CAS, visited relevant government departments and institutes in Laos and Myanmar from 19–25 December 2013.

While in Laos, Dr Zhang had a discussion with the leaders of the Ministry of Science and Technology. Dr Zhang outlined the achievements of CAS in terms of scientific research, talent development, and international cooperation in recent years. Both sides exchanged ideas on biological diversity

CAS delegation visits Laos and Myanmar



protection research and signed the minutes of their talk. Both sides agreed to enhance cooperation in fields of common interest such as education and training, environmental protection, and ecological restoration. After the meeting, the CAS delegation visited the Renewable Energy Sources and New Materials Institute of Laos and the Ecological and Biotechnology Research Institute of Laos.

While in Myanmar, Dr Zhang met with Dr Aye Myint Maung, Vice Minister of the Ministry of Environment Protection and Forestry of Myanmar. Dr Zhang introduced China's scientific cooperation plan for developing countries. Dr Aye Myint Maung said that the Ministry has signed a three-year memorandum of understanding for scientific and technological cooperation with Xishuangbanna Tropical Botanical Garden (XTBG), CAS, and launched a series of activities. Dr Nyi Nyi Kyaw, Director of Forestry Division, assured his full support and cooperation under the agreement. Dr Chen Jin, Director of XTBG, said both sides intend to develop more pragmatic cooperation in the future based on the existing work.

The CAS delegation then visited the Ministry of Science and Technology of Myanmar, University of Yangon, and Geographic Society of Myanmar. Mr Qiu Huasheng, Deputy Director of the Bureau of International Cooperation, CAS, Dr Chen Jin, Director of XTBG, Dr Gan Fanyuan, Deputy Director of Kunming Institute of Botany, CAS, and Dr Lai Ren from Kunming Institute of Zoology, CAS accompanied the delegation on this visit.

SDWDS signs agreement with ICIMOD

On behalf of the Faculty of Social Development and Western China Development Studies (SDWDS) of Sichuan University, Dr Luorong Zhandui signed a five-year international cooperative agreement with ICIMOD in March 2013. This is the first international cooperation project of SDWDS and will give SDWDS a strong advantage in international cooperation and ecological culture construction research.

Dr Luorong Zhandui has long been committed to research on economic society development in Tibet. He will take over two sub-projects, one on the development of heritage tourism in the Kailash Sacred Landscape and the other on the capacity building of local communities for participatory

development. An article titled 'A study on traditional ecologic knowledge and its positive significance to resource and environments in Kailash Sacred Landscape' and another titled 'Traditional ecological knowledge of Pan-Himalayas' were published in China Tibetology and Mountain Study respectively.

Scientists from IMHE visit Tribhuvan University

A six-person group led by Prof. Deng Wei, Director of the Institute of Mountain Hazards and Environment (IMHE), CAS, visited Tribhuvan University in Nepal on 29 August, 2013. The IMHE delegation met with the Tribhuvan University delegation led by Prof. Hira Bahadur Maharjan, Executive Vice President of Tribhuvan University, and a core discussion was held on the assistance project of the Ministry of Science and Technology, China.

As part of the project, Tribhuvan University will strengthen the construction and development of its Central Department of Geography, especially in relation to capacity building.

Both sides are hopeful that the project will promote transboundary cooperation in relation to geography as well as provide a scientific basis for addressing issues such as climate change, the rational use of land and water resources, mountain hazards prevention and risk management, protection of the ecology and environment, and national and regional development.

This visit is a new beginning for international cooperation in the field of mountain science between IMHE and Tribhuvan University, and could be a turning point for scientific and technological cooperation in South Asia.

Scientists from IMHE visit Tribhuvan University



Evaluation Training for Agricultural Research Projects in Tibet

Evaluation Training for Agricultural Research Projects was held in Tibet on 2–4 September 2013. The training was co-hosted by the Tibet Academy of Agricultural and Animal Husbandry Sciences (TAAAS) and the Australian Centre for International Agriculture Research (ACIAR). More than 20 technology and management personnel from the Department of Finance of Tibet and TAAAS attended the training. Dr Li Baohai, Vice-President of TAAAS, and Dr Jane Deborah Templeton from ACIAR addressed the participants at the opening ceremony. The training was led by Dr Templeton, who has more than 20 years of training experience in science and technology and management personnel.

The course gave participants a better understanding of the importance of project evaluation. Dr Templeton practically demonstrated the importance and application of project evaluation, and participants were required to report and evaluate their own project. After the training, all participants received a Certificate of Completion awarded by Dr Templeton.

The course strengthened the students' understanding of the concepts and tools used in agricultural research project valuation and allowed them to apply them to real world examples.



Valuation training for agricultural research projects in Tibet

International training on desertification and its control in developing countries held in Lanzhou

A one-week international training on desertification and its control in developing countries opened in Lanzhou on 25 September 2013. More than ten students from developing countries and three from the Union Nation University attended the course.

The course taught students about desertification and desertification control technology in China, the construction and management of oases in arid regions, the technology involved in ecological recovery in arid regions, sand prevention technology used to protect railways and highways, desert governance, and the exploitation of desert culture. After the training, students went on a field trip to Shapotou in Ningxia Hui Autonomous region. In addition, a seminar was held on desertification, which outlined the measures being taken to counter desertification in developing countries.

Wang Tao, Chairman of the International Desert Research Association and trainer, pointed out that global desertified land is spreading at a speed of 50,000 to 70,000 km² per annum, threatening nearly one-third of the land in the world and more than a billion people. He added that desertification has made many countries suffer from famine in successive years. If desertification isn't controlled effectively, global cultivated lands will decrease to two-thirds of current cultivated land by the end of the twenty-first century.

China is one of the most seriously affected countries in the world in terms of desertification, with desertification affecting 27.4% of its national territory. Wang pointed out that desertification control is relevant to China's development and even to its national existence. In the last ten years, desertified land was effectively controlled in the north of China through various programmes. As a result some areas have made remarkable progress. Wang also said that we need to balance the relationship between natural resources, the environment, and human activity so that we can control desertification. In order to strike this balance we need to construct a management mode for exploiting desert resources, while controlling desertification and protecting sustainable development.

Academic Activities

Second HKT-ISTP Joint Conference in Tuebingen, Germany

The 28th Himalayan Karakorum Tibet (HKT) workshop and 6th International Symposium on Tibetan Plateau (ISTP) Joint Conference was held in Tuebingen, Germany, from 22–24 August 2013. The conference was hosted by the University of



The second HKT-ISTP joint conference in Tuebingen, Germany

Tuebingen, Germany, and jointly sponsored by the Institute of Tibetan Plateau Research, CAS, and China Society on Tibet Plateau.

Over 200 participants from 15 countries attended the conference, which consisted of two major sessions. Session one mainly addressed geodynamics, with discussions and presentations revolving around themes such as the 'Early and pre-collisional plateau', 'India-Asia collision', 'Lithosphere structure and seismology', 'Large-scale deformation', and 'Crustal doming, exhumation and lateral extrusion', among other things. Session two covered topics such as climate, hydrology, the cryosphere, and ecosystems, with presentations and discussions on 'Pleistocene climate', 'Holocene climate and ecosystems', 'Lake systems', 'Cryosphere and hydrosphere', 'Landscape evolution and geomorphology', and 'Atmosphere and climate modelling'.

Public evening lectures were also given during the conference, at which Dr Solmaz Mohadjer, Director of Emergency Education in the programme Teachers Without Borders, talked about 'Lessons for life – From advancements in Earth sciences to practical geohazards awareness through schools in Central and South Asia', and Dr David Molden, Director General of ICIMOD, presented on 'Unravelling Himalayan mysteries – The role of science and cooperation'. This was the second HKT-ISTP joint conference, the first one being the HKT24th-ISTP5th Joint Conference in Beijing in 2009. The third joint conference will take place in 2017.

HICAP Workshop in Chengdu

A Himalayan Climate Change Adaptation Programme (HICAP) Workshop was held in Chengdu from 22–23 October 2013. Prof. Luorong

Zhandui and Prof. Andreas H Gruschke from the Faculty of Social Development and Western China Development Studies, Sichuan University, and Prof. Gaerrang from the Center for Tibetan Studies, Sichuan University, attended the workshop. The workshop was also attended by five experts from ICIMOD and five village heads from the Lhasa valley.

The workshop was held in English and Tibetan and focused on the impacts of global climate change and extreme climate on the production and living conditions of farmers and herdsmen on the Tibetan Plateau. Participants discussed the feasibility and necessity of carrying out large-scale joint research on this issue in the Lhasa valley. Such research will be conducted next year by Prof Luorong Zhandui with the support of ICIMOD and five village heads under a joint research agreement.

It is hoped that the research agreed upon in this workshop will play an important role in improving the living conditions of local farmers and herdsmen on the Tibetan Plateau.

UNESCO High-Level Panel Session in Paris

The United Nations designated the year 2013 as the 'International Year of Water Cooperation' to focus attention on the challenges involved in cooperation in water resource management through various activities and events for the public and professionals. As part of these activities, a High-Level Panel Session of the United Nations Educational, Scientific and Cultural Organization's (UNESCO's) International Hydrological Programme was held in Paris on 13 November 2013. The session was part of the 37th Conference of UNESCO, which ran from 5–20 November 2013. The major theme of the session was climate change impacts on water resources and adaptation policies in mountainous regions. Participants included distinguished scientists, policy makers, and administrators experienced in water resource management in mountainous regions under global climate change.

Presentations covered topics such as 'Global climate change, glacier retreat and threats to sustainable water supply', 'Impact of climate change on water resources in the mountains – The case of Tanzania', 'Hindu Kush Himalayas: Climate change impact on water resources and adaptation', 'Impact of climate change on the Third Pole water tower and flagship

station monitoring network', and 'Sustainable mountain development in a context of climate change and global change', respectively. An in-depth discussion was held by participants and officials from UNESCO's International Hydrological Programme and Division of Water Sciences. After the session, Prof. Zhang Fan discussed the latest progress in academic research and international cooperation on the Third Pole Environment with Madam Gretchen Kalonji, Assistant Director-General for Natural Science, UNESCO.

Working with nature to adapt to climate change

Ecosystem Based Adaptation (EBA) was introduced in 2008 as a new concept in the United Nations Framework Convention on Climate Change (UNFCCC) negotiations. In 2009, the United Nations Environment Programme (UNEP) initiated its EBA Flagship Programme. In 2012, the Global Environment Facility (GEF) released its Operational Guidelines on ecosystem-based approaches to adaptation. In January 2013, a UNEP-China joint global project, 'Enhancing capacity, knowledge and technology support to build climate resilience of vulnerable developing countries', was co-funded by the GEF Special Climate Change Fund and China South-South Cooperation Initiative on Climate Change. The project has been recognized as the 'first mover' on EBA under GEF and on South-South cooperation.

At the UNFCCC Conference of Parties 19 (COP 19) in Warsaw, a Ministerial Roundtable on Ecosystem Based Adaptation in the context of South-South cooperation was organized at the China Pavilion on 19 November 2013, which lauded the GEF EBA project as a pioneer of its kind. This event was

co-organized by the National Development and Reform Commission (NDRC) of China and UNEP-International Ecosystem Management Partnership (UNEP-IEMP) and was attended by over 100 participants. Participants shared knowledge, good practices, and policy options on EBA in order to promote South-South cooperation on climate change under the umbrella of UNFCCC and to mainstream EBA into National Adaptation Plans of Action.

EBA, an approach to working with nature in order to maximize ecosystem services for adaptation and build the resilience of vulnerable ecosystems and communities to climate change, has been well recognized as one of the most cost-effective, durable, and pro-poor solutions to adaptation to climate change. As such, EBA forms an integral part of national and international adaptation portfolios. As developing countries are more dependent on ecosystem services and face common challenges in relation to conservation and livelihoods, the Roundtable called for the enhancement of South-South cooperation on EBA as a new dimension of international cooperation for adaptation to increasing climate change impacts. This first GEF EBA project has been recognized as a collective effort of the United Nations in facilitating and promoting South-South cooperation on climate change. Meanwhile, the UNEP-International Ecosystem Management Partnership (UNEP-IEMP) based in Beijing was highly commended as an instrumental platform for such an endeavour.

In his welcoming speech, Mr Xie Zhenhua reconfirmed China's efforts to promote South-South cooperation with multi-partners and using different mechanisms, guided by China's newly released National Strategy for Adaptation on Climate Change. Mr Achim Steiner added that South-South cooperation was called for at the Rio+20 conference and an upgraded UNEP will continue to promote South-South cooperation on EBA in its Flagship Programme established in 2009.

GEF CEO, Ms Naoko Ishii, outlined various opportunities for developing countries to access GEF funds for effective adaptation and mainstreaming of EBA in their National Adaptation Plans of Action. Senior representatives from Nepal, the Seychelles, and Mauritania shared their rich and unique experiences and lessons in the implementation of EBA in their respective countries, together with their national policy framework for mainstreaming EBA in their National Adaptation Plans of Action.

Working with nature to adapt to climate change



Meetings

ITP's creative research group debuts at 2013 AGU Fall Meeting

The Annual American Geophysical Union (AGU) Fall Meeting was held in San Francisco from 9–13 December 2013. Prof. Fang Xiaomin and Prof. Zhao Junmeng from the Institute of Tibetan Plateau Research, CAS, joined hands with Dr Eric Kirby from the Oregon State University and Prof Rainer Kind from the GFZ German Research Centre for Geosciences in Potsdam to present a session entitled 'Evolution of the Northern Tibetan Plateau: Lithospheric Geodynamics, Plateau Uplift and Links to Climate Change'. This session was sponsored by the Institute of Tibetan Plateau Research's Creative Research Group led by Prof. Fang Xiaomin and focused on climate-tectonic interactions over the northern Tibetan Plateau.

The session consisted of 14 presentations, including lectures by invitees Prof. An Yin from the University of California, Los Angeles, a new AGU fellow, Prof. Wang Chengshan, of CAS, and Prof. Erwin Appel from the University of Tuebingen, Germany. In addition, there were 30 poster presentations. These presentations (both oral and in poster form) summarized recent international academic achievements in studying the deep and shallow tectonic structures of the northern Tibetan Plateau and their possible interactions with, and influences on, Plateau uplift and climate change.

The AGU session provided a good opportunity for the Creative Research Group to demonstrate its research achievements and exchange notes with the international academic community. Presentations made by members of the group aroused wide interest. Deeper communication with international

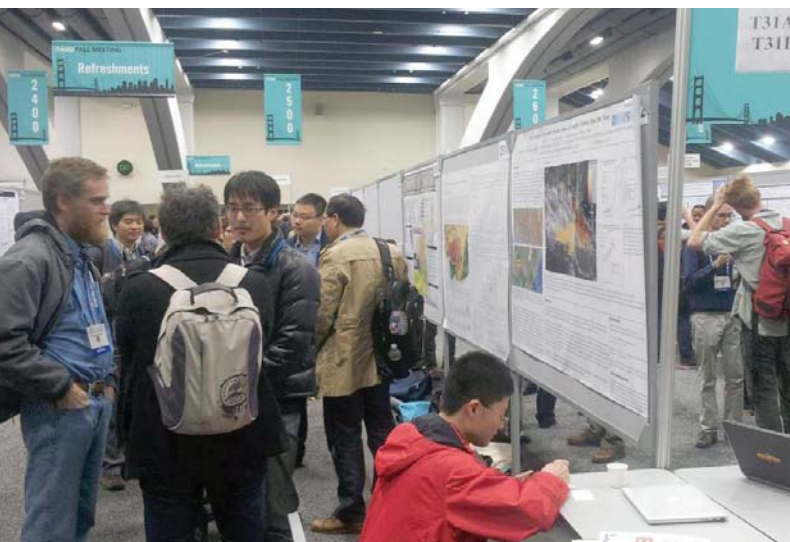
academic peers and more outcomes are expected from the research group in the coming years.

TPE-sponsored sessions at 2013 AGU Fall Meeting

The Third Pole Environment (TPE) sponsored a session at the Annual American Geophysical Union (AGU) Fall Meeting entitled 'Environmental and eco-system changes in the third pole and other mountain regions'. The sessions were convened by TPE co-chairs Yao Tandong (CAS), Lonnie Thompson (Ohio State University), and Volker Mosbrugger (Senckenberg Research Center for Nature Study), together with Prof. Zhang Fan (Institute of Tibetan Plateau Research, CAS).

In addition to 25 poster presentations, the session also included oral presentations by renowned scientists from institutions in the United States, Germany, and China including: 'Two extreme climate events of the last 1,000 years recorded in Himalayan and Andean ice cores' (by Lonnie Thompson), 'Different glacier status with atmospheric circulations in Tibetan Plateau and surrounding regions' (by Yao Tandong), 'Influences of climate changes and pollutants over the Asian Monsoon/Tibetan Plateau region on transport of ice, aerosols and water vapor to the upper troposphere and lower stratosphere' (by Rong Fu, University of Texas at Austin), 'Dynamical, thermo dynamical and hydrological effects of the third pole' (by Peter J Webster, Georgia

ITP's Creative Research Group makes a successful debut at the 2013 AGU Fall Meeting



TPE-sponsored sessions at the 2013 AGU Fall Meeting

Institute of Technology), and 'Contemporary Asian high mountain glacier mass balance estimates from GRACE gravimetry' (CK Shum, Ohio State University). More information, including abstracts and full presentations, is available on the TPE website (www.tpe.ac.cn).

International Mountain Day in China: Workshop on Mountain Development in the Yangtze River basin

International Mountain Day is an opportunity to create awareness about the importance of mountains to life, highlight the opportunities and constraints in mountain development, and build partnerships that will bring positive change to the world's mountains and highlands. The year 2013 marked the 11th International Mountain Day. This year, the theme was 'Mountains – Key to a sustainable future'. The focus in 2013 was on celebrating how mountains are crucial in moving the world towards sustainable economic growth in the context of poverty eradication



International Mountain Day in China-1

and on drawing attention to their generally sustainable and low-emission production models.

CNICIMOD and the Geographical Society of China have always attached great importance to mountain development research in the Yangtze River basin. In order to celebrate International Mountain Day 2013, create a platform to exchange research on mountain development in the Yangtze River basin, and summarize the work of CNICIMOD, the secretariat of CNICIMOD and Yangtze River Research Branch of the Geographical Society of China jointly organized a workshop in Chengdu, Sichuan province, from 10–14 December 2013. The topic of the workshop was 'Mountain development and ecological environmental protection in the Yangtze River basin'. Around 60 experts from ICIMOD and domestic research institutes and universities attended the workshop. Presentations were made on the following four subjects: 'Mountain development and capacity building in the Yangtze River basin', 'Mountain

ecological environmental protection in the Yangtze River basin', 'Mountain disasters and security in the Yangtze River basin', and 'Natural, social and economic harmonious development of mountain and plain in the Yangtze River basin'. Following the presentations a full discussion took place on the presentations and suggestions were put forward.

Annual Meeting of CNICIMOD held in Chengdu

CNICIMOD's Annual Meeting was held in Chengdu on 11 December 2013 and was attended by committee members and representatives. Dr Deng Wei, Secretary General of CNICIMOD hosted the meeting.

Dr Wu Ning, Ecosystem Services Theme Leader at ICIMOD, reviewed the history and current status of ICIMOD. Dr Wu Ning emphasized that ICIMOD treated China as a most important partner. He expressed hope that China will play a more significant and exemplary role in cooperation with ICIMOD in the future.

Dr Deng Wei then reported on ICIMOD's main work, progress, problems, and prospects since 2010. Discussions focused on CNICIMOD's working direction and approach, and how to expand working fields, communication, and interactions with ICIMOD. It also looked at how to link up with domestic partners more widely. Suggestions on these topics were put forward.

In his closing remarks, Dr Deng Wei thanked the Bureau of International Cooperation, CAS, and the participants for their support, participation, and practical recommendations. He said that CNICIMOD will implement these suggestions in its future work, develop a plan for 2014 for ICIMOD-China Day, strengthen exchange and feedback with ICIMOD, and use ICIMOD as a platform from which to connect Chinese partners with South Asia.

Annual meeting of CNICIMOD held in Chengdu



Focus

CAS member, Qin Dahe, awarded Volvo Environment Prize

The Volvo Environment Prize Foundation, which is located in Switzerland, awarded Chinese glaciologist and climate scientist, Dr Qin Dahe, the Volvo Environment Prize in recognition of his contribution to the study of climate change. The bulletin, which was issued by the judging panel on the same day, says that Dr Qin Dahe made an important contribution to the Intergovernmental Panel on Climate Change's assessment report on climate change. In addition, Dr Qin Dahe participated in the assessment report on global extreme disasters, which raised public concern for the issue. The assessment report on global extreme disasters, which was issued in 2012, has global significance as it reveals the relationship between extreme weather and climate change and puts forward the theory that extreme weather has become more and more frequent in the last 50 years.

Dr Qin Dahe is chief professor in the field of cryospheric sciences. He was the first to put forward a theoretical framework for cryospheric sciences in the world and used it to guide the study of cryospheric changes and their effects. One of his key research areas is the cryosphere in arid regions of Central Asia and its important influence on regional water resources and the ecosystem. Dr Qin Dahe is also a geographer of Cold and Arid Regions Environmental and Engineering Research Institute and co-chairman of the Intergovernmental Panel on Climate Change.

The Volvo Environment Prize was founded in 1988 and is awarded to people who have made outstanding contributions to environmental protection and sustainable development. It is regarded as the 'Nobel Prize' of sustainable development. The winner receives 1.5 million Swedish krona (about USD 200,000).

The 480th Session of Xiangshan Science Conference: Managing climate extremes and disaster risks

The 480th Session of the Xiangshan Science Conference (XSSC) took place in Beijing from 3–5 December with the theme 'Managing climate extremes and disaster risks'. The objectives of the session were to explore the evolution, trends, and characteristics of extreme climate events and disasters in the past, present, and future; review existing technologies for risk management and the assessment of extreme events and disasters; share experiences and lessons learned on the mechanisms underlying extreme events and disaster management; promote China's policies for dealing with disaster risks in different sectors including regional prevention and adaptation; and reduce the losses from such disasters in terms of national socioeconomic growth.

Extreme weather events and disaster risk management are not only an important scientific issue, but also a major concern of the international community. Against the background of global climate change, the number of extreme events and disaster risks are increasing, creating a grave situation in relation to disaster prevention and risk reduction. Accordingly, disaster risk management is a top priority for most countries. Over the past century, climate change has had tremendous effects on China, causing frequent extreme weather events and disasters and posing severe challenges to China's sustainable socioeconomic development.

During the conference, experts and scholars from different fields were invited to engage in in-depth discussions on the following three topics: facts and future trends in relation to extreme events and disasters; assessment technology for extreme events and disaster risks; and mechanisms for the management of disaster risks and experience.

China considers ICIMOD as a valuable platform for increasing scientific exchange and regional cooperation among countries of the Hindu Kush Himalayas.

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