

The Technical Summary for ISACS – 3

DING Yihui, ZHANG Qiang, ZHANG Cunjie, LI Yaohui

(Scientific Committee of ISACS, Gansu Provincial Meteorological Bureau, Lanzhou 730020, China)

Co – sponsored by China Meteorological Administration (CMA), People’s Government of Gansu Province of China, National Natural Science Foundation of China (NSFC) and World Meteorological Organization (WMO), the 3rd International Symposium on Arid Climate Change and Sustainable Development (ISACS – 3) is successfully held here in Lanzhou, the capital city of Gansu province of China. Thanks to the organization of Gansu Meteorological Bureau (GMB), so far, the conference has got valuable scientific outcomes through the past two days’ active discussions and deliberations.

There are about 200 scientists and researchers in the field of climate from home and abroad come to attend this conference. 11 famous research scientists have delivered quite good reports in the plenary sessions with their topics focusing on various hot issues today, such as the arid climate change, drought monitoring and assessment, land surface processes in arid areas, water resources management and social development, etc. And the whole program for this conference is divided into 6 over – arching theme categories, with 14 dedicated sessions for 56 oral presentations and 54 poster presentations. The ISACS – 3 is very successful. It provides an excellent opportunity to exchange scientific results during last year.

The six symposium themes cover almost all important aspects of arid climate change and sustainable development. They are:

1. Impacts of drought trend on ecological environment and social development
2. Technology of arid disaster monitoring and assessment
3. Prediction and diagnostic analysis of arid climate
4. Characteristics and modeling of land surface processes in arid regions
5. Impacts of sand – dust aerosol on arid climate
6. Rational utilization of climate and water resources in arid regions

Based on the presentations made in these two days, the major results are summarized as follows:

1. Impacts of drought trend on ecological environment and social development

Global warming is a widely recognized fact. With the latest studies on the temperature, precipitation, and soil moisture, the participants are trying to prove that in the context of global warming, arid climate change over the past century in different parts of the world have specific regional response features. There are 23 papers focusing on the first topic and among them, many papers focusing on the climate change and eco – environment in North and West China. Due to the geographical locations, the Northern and Western parts of China are the most sensitive climate and the most vulnerable ecological environment in China. With global warming, many events that impact the ecolog-

ical environment significantly are seen in these regions, e. g. the growing shortage of water resources, the degradation of natural vegetation, the land desertification, and the increase of weather and climate disasters. Currently, these problems have attracted the high attention of scientists studying climate change all over the world. An interdisciplinary program of internationally – supported earth systems and scientific research is introduced at the conference, which addresses large – scale and long – term manifestations of climate and environmental change over Northern Eurasia.

From the disaster management programs in Asia – Pacific region, it is realized that the development cannot be sustainable unless disaster mitigation program is built into the development process because the investment in mitigation is much more cost – effective than expenditure on relief and rehabilitation.

2. Technology of arid disaster monitoring and assessment

Twenty – two papers deals with the second topic, i. e. the technology of arid disaster monitoring and assessment. Many participants present the latest research results on drought index, identification technique for drought events, drought monitoring system, drought hazard assessment and spatial – temporal characteristics in China and Africa using meteorological analysis method, observational experiment, remote sensing and model simulation methods, etc.

It is well known that the severe long – persistent droughts have influenced the Sahel region since the early 1970' s, afterwards the western and middle African countries have done a lot of work on drought monitoring and assessment, and many of bilateral and multilateral collaborative activities have been initiated to provide direct assistance to farmers and herders so that they can optimize their production practices. These experiences should be learnt for better preparedness and mitigation of drought disasters.

3. Prediction and diagnostic analysis of arid climate

The third topic is composed of 20 papers, which can reflect the latest development of the researches on climate change, diagnostic analysis and prediction of drought events, variation of climate extremes in many countries and regions. Besides, the relations of general circulations, SST and land surface factors to droughts are also discussed in these papers.

The Third Pole region is home to thousands of glaciers in the tropical/sub – tropical region, especially the Tibetan Plateau have exerted a direct influence on climate, environment, social and economic development in the surrounding regions of China, India, Nepal, Tajikistan, Pakistan, Afghanistan and Bhutan. A series of environment observation and monitoring programs on the Third Pole region are introduced at the conference.

Oasis in Northwest China accounts for only about 5% of the total land area of the region, but they provide residential places in arid regions and feeds about 95% of the growing population. In desertification area in Northwest China, rapid economic development in the area will be unsustainable if the risk of destroying the oasis increases. Removal of vegetation in the model has shown how to affect within – watershed precipitation and soil water storage by reducing the exchange of water vapor from the land surface to the air, increasing the air' s lifting condensation level by intrusion of drier air conditions, and causing the high – intensity precipitation band in the Qilian Mountains to weaken and to be displaced upward in the watershed, leading to an overall reduction in soil water in the oasis.

Activities of northern edge of Asian summer monsoon exert direct influences on floods or severe

droughts over North China, which brings about relative “dry” or “wet” climate anomaly of the region. The definition and characteristics about northern edge of East Asian summer monsoon are discussed.

4. Characteristics and modeling of land surface processes in arid regions

The fourth topic includes 9 papers on land surface processes in arid and semi – arid regions, including Loess Plateau, Tibetan Plateau as well as Gobi Desert areas.

The Loess Plateau over Northwest China is a unique semi – arid land surface and part of a dust aerosol source. To improve understanding and capture the direct evidence of the impact of human activity on the semi – arid climate over the Loess Plateau, the Semi – Arid Climate and Environment Observatory of Lanzhou University was established in 2005. Based on observation data of this station, seasonal and annual variations of water, energy and CO₂ fluxes, dust aerosols, black carbon concentration have been investigated. Many other researches and experiments on the land surface process in Loess Plateau, Tibet Plateau and Gobi region are introduced.

5. Impacts of sand – dust aerosol on arid climate

There are 12 papers about the impacts of natural aerosols at the conference, carefully analyzing the causes and impacts of sand – dust aerosols, black carbon and ozone. The presentations and papers have covered diagnostic analysis of regional heavy dust storm, wind evolution in a dust – storm process, convective boundary layer, effects of dust aerosols on precipitation and cloud, properties of black carbon concentration, as well as decline and recovery of ozone.

6. Rational utilization of climate and water resources in arid regions

Sixteen papers are involved with rational utilization of water resources in arid regions. The researchers have conducted discussions on global and regional water cycle and drought events, atmospheric circulation changes, atmosphere moisture transport, water resources in arid areas, the impacts of climate change on agriculture, etc.

In an effort to better understand and predict regional water resources in mountain and agricultural regions, a physically based modular hydrological cycle model (CRHM) has been developed by Canadian scientists.

In order to analyze the water stress of winter wheat and irrigation strategy in Huanghe – huaihai Plain of China, EPIC (environmental policy integrated climate) crop growth model is developed and used to simulate the growth of winter wheat, and it is proved that this crop growth model is a useful tool for agricultural management.

The farming – pastoral transition zone, located in the arid and semi – arid regions in northern China, is one of the most sensitive areas to climate change in the world. Some researchers have studied the relations between soil moisture and climate change. They’ve found the increasing temperature can cause more water vapor to evaporate and more soil water content to decrease, which implies the climate and environment in this region will become drier and warmer.

Above all, ISACS – 3 has indeed witnessed a lot of important scientific findings. But arid climate and climate change are very complicated. Many difficult problems are still left to be studied. A two – day forum of exchanges and discussion is far from being enough to elucidate all the questions concerned. We believe that through further joint efforts of the climate scientists all over the world, the problems on the arid climate change and social development will be solved gradually.