CERN

Chinese Ecosystem Research Network

A Network of Scientists and Graduates Committed to Long-term Ecological Monitoring, Research and Demonstration

Human depends on the earth's ecosystems for living. These ecosystems provide various benefits that the society needs, including water, food, recreation and other services, through cropland, forests, grassland, lakes, rivers and oceans, etc.

In spite of this, the planet that we live today is increasingly under greater pressures, such as the frequent extreme events and disasters, depletion of natural resources and ecological degradation, due to natural and human-induced changes, and the society is facing a major problem on how to balance the economic development and ecological conservation. To help address this challenge, it is necessary to better understand the structures, functions and dynamics of these ecosystems on a long-term basis, with an objective of wisely using the natural resources and sustainably managing the ecosystems.

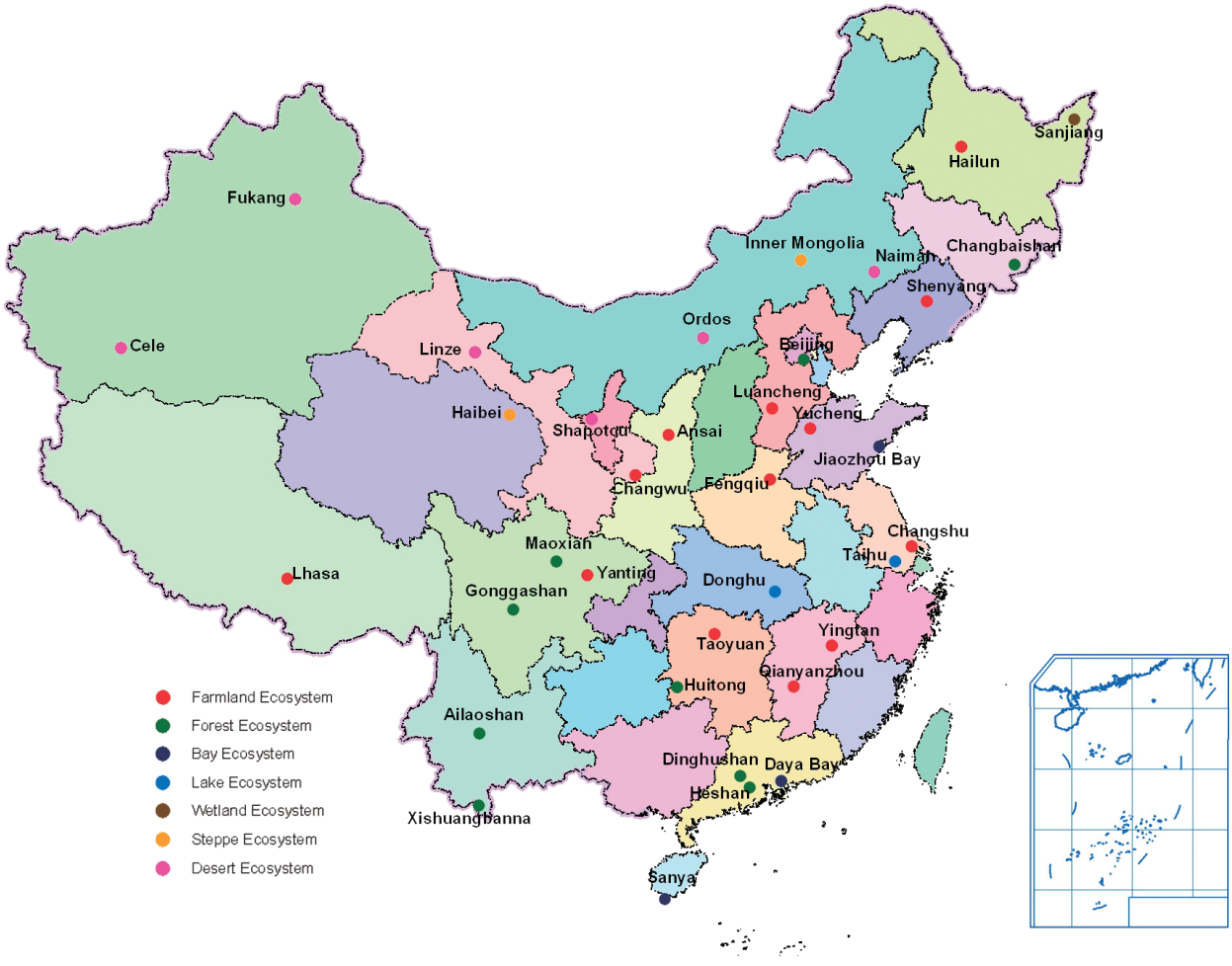
Among the long-term ecological research (LTER) networks that have been established, the Chinese Ecosystem Research Network (CERN), created by the Chinese Academy of Sciences (CAS), is one of the earliest networks in the world for that purpose.

Overview of CERN

Since early 1950s, CAS has begun to set up field stations on resources and environmental sciences to conduct observation, experiment and outreach activities in different regions of China. In 1988, a national network-CERN was formally founded, comprising the selected sites that represent the major ecosystems in China, as well as the sub-centers and a synthesis center.

The creation of CERN is a milestone for the ecosystem observation and research efforts in China, which makes it possible to conduct cross-site and comparative studies at the national level, and to provide science-based information to policy-makers on national socio-economic development and ecological conservation. The standard and integrated management of CERN also provides best practice for the operation of China National Ecosystem Observation and Research Network (CNEN), which was launched by the Ministry of Science and Technology (MOST) in 2005.

Distribution Map of Ecological Stations of CERN



Map by Qu Cuiyu

Vision

The vision of CERN is to conduct monitoring and research on the major ecosystems and their environmental conditions on a long-term basis by integrating ground-based networking observation and experiment with simulation and modeling, remote sensing, GIS and sensors, with an ultimate goal to advance the ecological research, and offer data and information to scientists and policy-makers which will contribute to ecosystem management, wise use of natural resources and sustainable socio-economic development in China.

Major Missions

CERN is defined with three major missions, which include :

● **Monitoring**

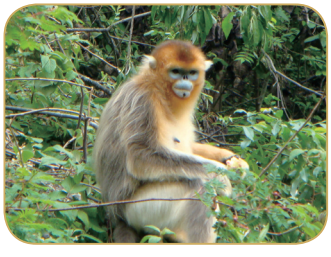
Implementing long-term monitoring on the major ecosystems and their ecological processes as per the uniform protocols, and providing updated information on the state of major ecosystem types in China at a regular basis.

● **Research**

Conducting studies on the structures, functions and dynamics of major ecosystems in China, as well as on the approaches and tools for sustainable ecosystem management.

● **Demonstration**

Disseminating the best practices of ecosystem management to a wider area, based on the results of long-term monitoring and research, for sustainable development of ecological conservation and socio-economic growth in China.

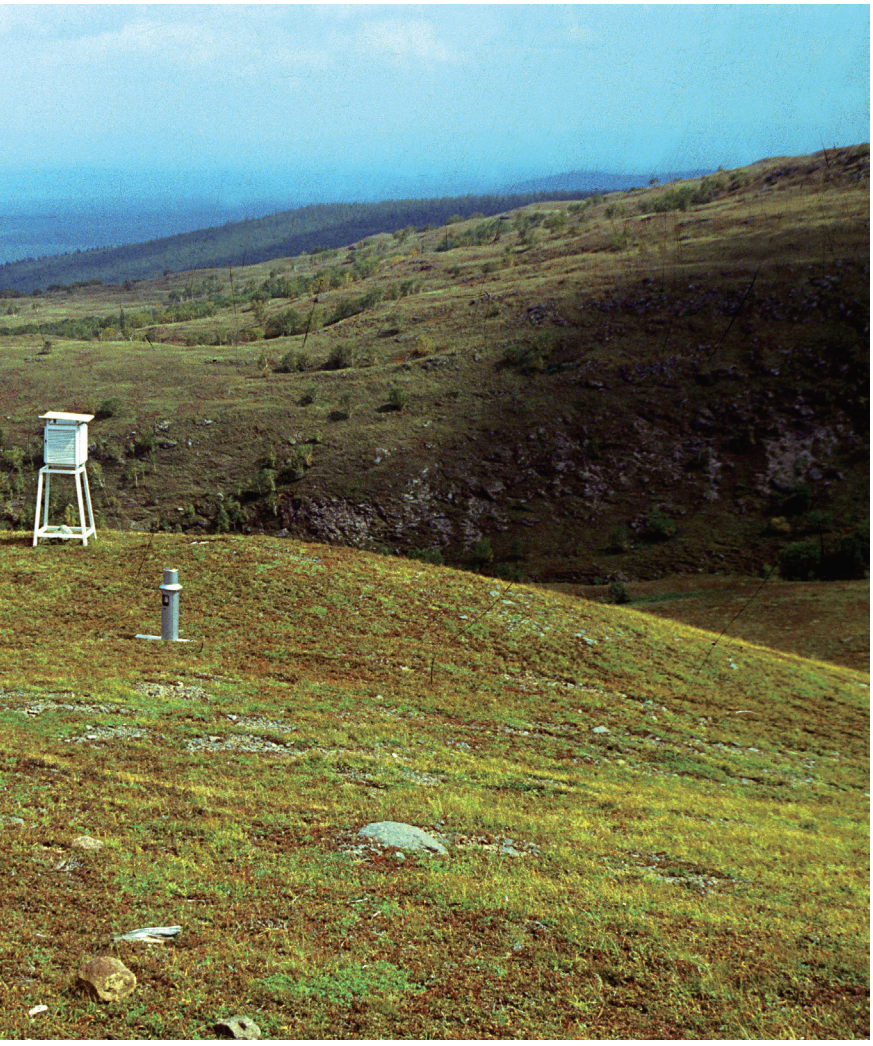


Golden Monkey © Yang Ping/CERN

© Zhang Yifei/CERN

Changbai Mountain © Zhao Shidong/CERN

Chlorophyll meter © Luancheng Field Station /CERN



Luosuo River flowing through Xishuangbanna Field Station © Zhao Shidong/CERN

Over the past two decades, CERN has grown to be an important research platform for the sites and its partners both at home and abroad, and a major component of GTOS and ILTER, thanks to the data measured and collected on long-term and continuous basis, in addition to the up-to-date facilities and instruments in the field stations that represent the major ecosystem types in China.

Up to now, it has become one of the largest national networks that consists of 36 field stations, 5 sub-centers and 1 synthesis center, while over 2000 scientists, technicians and graduate students are engaged in its activities.

Organizations

CERN Leading Group

As the authorized decision-making organization of CERN, the Leading Group is composed of the Vice President of CAS who is in charge of CERN, and Director of the Bureau of Science and Technology for Resources and Environment, as well as the bureau leaders dealing with CERN issues. It is responsible for making decisions on important issues about CERN development, coordination with other national agencies and nomination of the chair and the members of Scientific Advisory Committee and Scientific Committee.

Leading Group Office

The Leading Group Office, or Network Office, takes the responsibility of implementing decisions of the Leading Group, including organization, coordination and administrative activities. It is based in the Bureau of Science and Technology for Resources and Environment, CAS.

Scientific Advisory Committee (SAC)

The Scientific Advisory Committee is the academic advisory organization, which provides guidance to the strategic development, planning, major research topics and key research programs of CERN.

Scientific Committee (SC)

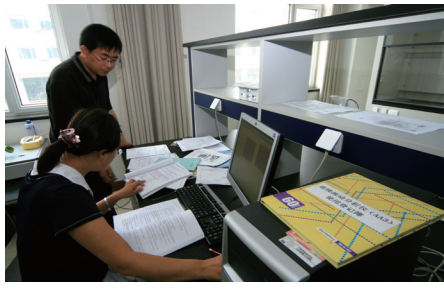
The Scientific Committee is a decision making organization on research directions and related issues, development strategies, planning, evaluation and performance assessment. It consists of the leading scientists in ecology and other relevant scientific background.

Secretariat of Scientific Committee

The Secretariat of Scientific Committee is a supporting organziation responsible for its routine work, implementing decisions of the Committee.

Experiment plots in Changbai Mt. Field Station © Han Shijie/CERN

Mr. Li Jiayang (middle), the Vice President of CAS visits CERN field station © Yang Ping/CERN



CERN information management © Zhang Yifei/CERN

Synthesis Research Center © Zhang Yifei/CERN

Synthesis Research Center

The major missions of the Synthesis Research Center of CERN are defined to : 1) conduct data integration, management and sharing of CERN; 2) implement synthesis studies on the state, trends and other key scientific issues concerning natural resources, ecological and environmental changes at local and national scales in China; 3) consolidate and produce publications on the research outputs of CERN, and release ecosystem assessment reports on a regular basis about the key areas and major ecosystems in China; and 4) provide information and recommendations on policy-making and planning of major issues related to national socio-economic development.

Sub-centers

The 5 disciplinary sub-centers of CERN deal with water, soil, atmosphere, biology and aquatic ecosystems respectively. They are responsible for developing monitoring protocols in each discipline, calibrating instruments, technicians training, data quality control and database development, in addition to disciplinary studies at local or national scales.

Field Stations

All the CERN field stations engage in monitoring work, research, experiment and demonstration. Currently, it consists of 36 field stations, including 13 for cropland, 9 for forest, 2 for grassland, 6 for desert, 1 for marsh, 2 for lake and 3 for marine ecosystems.

Gongga Mt. Field Station © Gongga Mt. Field Station/CERN

Long-term Ecosystem Monitoring

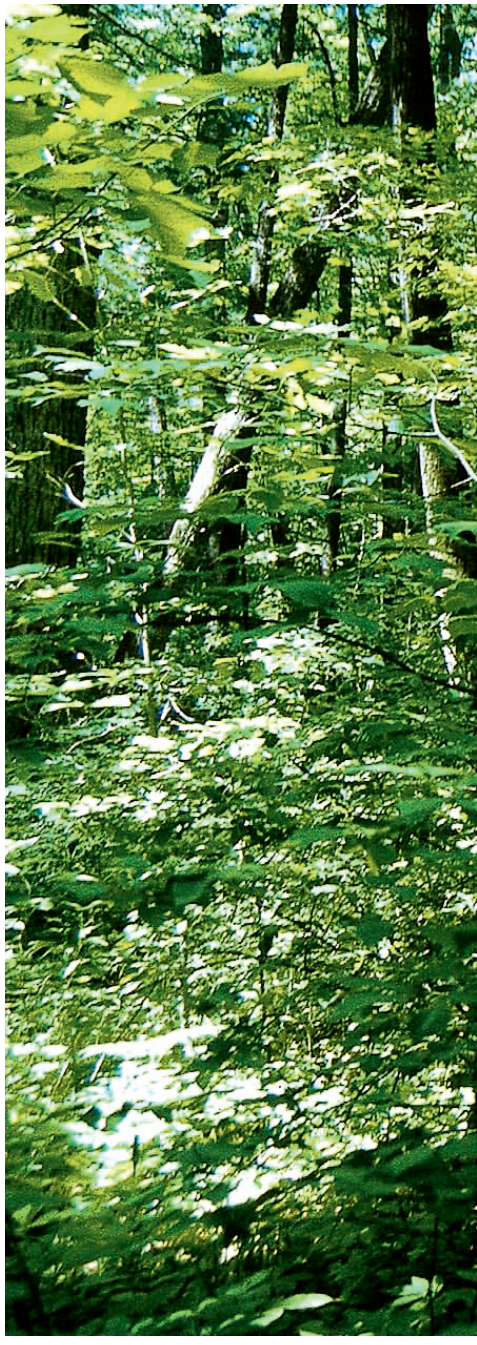
Implementing long-term monitoring on the water, soil, atmosphere and biological elements of major ecosystems in China, i.e. cropland, forest, grassland, desert, marshes, lakes, and bays, and their important ecological processes such as the energy and matter flows according to standard protocols.

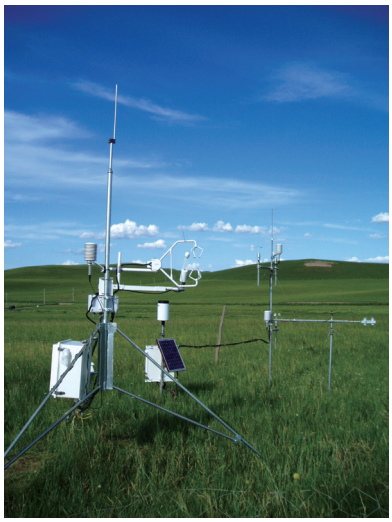
The monitoring datasets that are of high quality and collected on long-term and continuous basis provide foundation for the ecological research and demonstration activities. More than 800 ecological indicators are monitored on an annual basis at the 36 field stations under CERN.

Carbon flux tower © Dinghu Mt. Field Station/CERN

Observation plot in Ansai Field Station © Zhang Yifei/CERN

Experiment plots of agricultural ecosystem in Luancheng Field Station © Luancheng Field Station/CERN





Eddy covariance observation tower © Inner Mongolia Field Station/CERN

ChinaFLUX

As a major component of CERN, ChinaFLUX(www.chinaflux.org) is the only network in China that measures the water, carbon and energy fluxes, as well as the dynamics of micro-meteorological factors and eco-physiological process of plant communities on a long-term and continuous basis, using open-chamber and eddy-covariance methods. 8 field stations are now included in ChinaFLUX. It has not only become an important facility to conduct observation and research on the ecosystem status and global change in China, but an integral part of FLUXNET.

Changbai Mountain © Zhao Shidong/CERN

Long-term Ecological Research

A large number of significant outputs have been achieved at site and cross-site levels in CERN, based on the findings of long-term observation and experiment.

Core Research Areas

● **Ecosystem structures & functions, dynamics and biodiversity conservation**

It focuses on the study of structure and functions of various ecosystems, the role of biodiversity and its complexity to maintaining ecosystems, and the interactions between/among different ecosystem at cross-scales, based on long-term experiment and monitoring.

● **Cross-site observation and experiment on global change**

It is aimed to understand the temporal and spatial patterns of national and global environment change, reveal the response and adaptation mechanism of the ecosystems in China to global change, and advance the innovative studies of global change for the international community.

● **Mechanism and tools for ecosystem restoration**

The structures and functions of various ecosystems will be explored to understand the differences of mechanism and tools of ecological restoration for different ecosystems, and to provide guidelines on ecological restoration for the ecologically fragile areas.

● **Ecosystem assessment and optimal management**

The state and trends of different ecosystems in China will be evaluated to provide science-based ecological information to the policy-makers and the public with an objective to mitigate or eliminate the uncertainty in ecosystem management.

● **Ecological degradation and control in ecologically fragile areas**

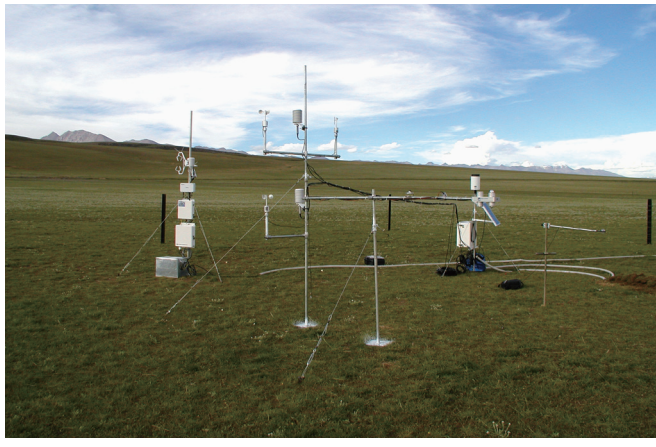
Long-term research on the ecosystems in the ecologically fragile areas such as the deserts, Karst areas, eco-tones between farmland and pastures, will be carried out to find solutions to control land degradation.

● **Eco-informatics**

With the help of eco-informatics, an automatic collecting and remote transferring system for the dynamic monitoring data, combined with an ecological modeling and fusion system, will be made available for the field stations of CERN and their affiliated research institutions to enable on-line service of data sharing and simulation.

Chinese Fir plantation in Huitong Field Station © Zhao Shidong/CERN

Desert in Fukang Field Station © CERN



Observation site in Tibet Plateau © Lhasa Field Station/CERN

Demonstration for Ecosystem Management

Some sustainable management models and tools have been developed by the field stations of CERN , on the basis of the results from long-term monitoring, experiment and research, and disseminated to wider areas that integrate the ecological protection and socio-economic development.

Case studies on the demonstration of ecosystem management

- **Restoration of degraded ecosystems**

A model that integrates the ecological development, natural resources exploitation and socio-economic development has been produced and applied in some field stations of CERN, i.e. Ansai, Yingtan, Maoxian, Fukang and Inner Mongolia, which contributed significantly to the ecological development and sustainable socio-economic development in these areas.

- **Sustainable agriculture**

The cropland stations under CERN, including Ansai, Yucheng and Fengqiu, have implemented the national S&T innovation programs over many years, producing and disseminating a series of cost-effective tools in fertilizers preparation, new breeds cultivation, water-saving irrigation and high-efficiency cropping structures. These practical tools have provided substantial support to the local agricultural development.

- **Protected areas establishment and management**

These nature reserves in China, such as Dinghu Mt., Changbai Mt., Xishuangbanna and Gongga Mt., which were established as early as from 1950s, are based in the relevant field stations of CERN. These research stations have played a critical role by providing concepts and technical service to these nature reserves on ecological protection.


Bay


Marsh


Forest

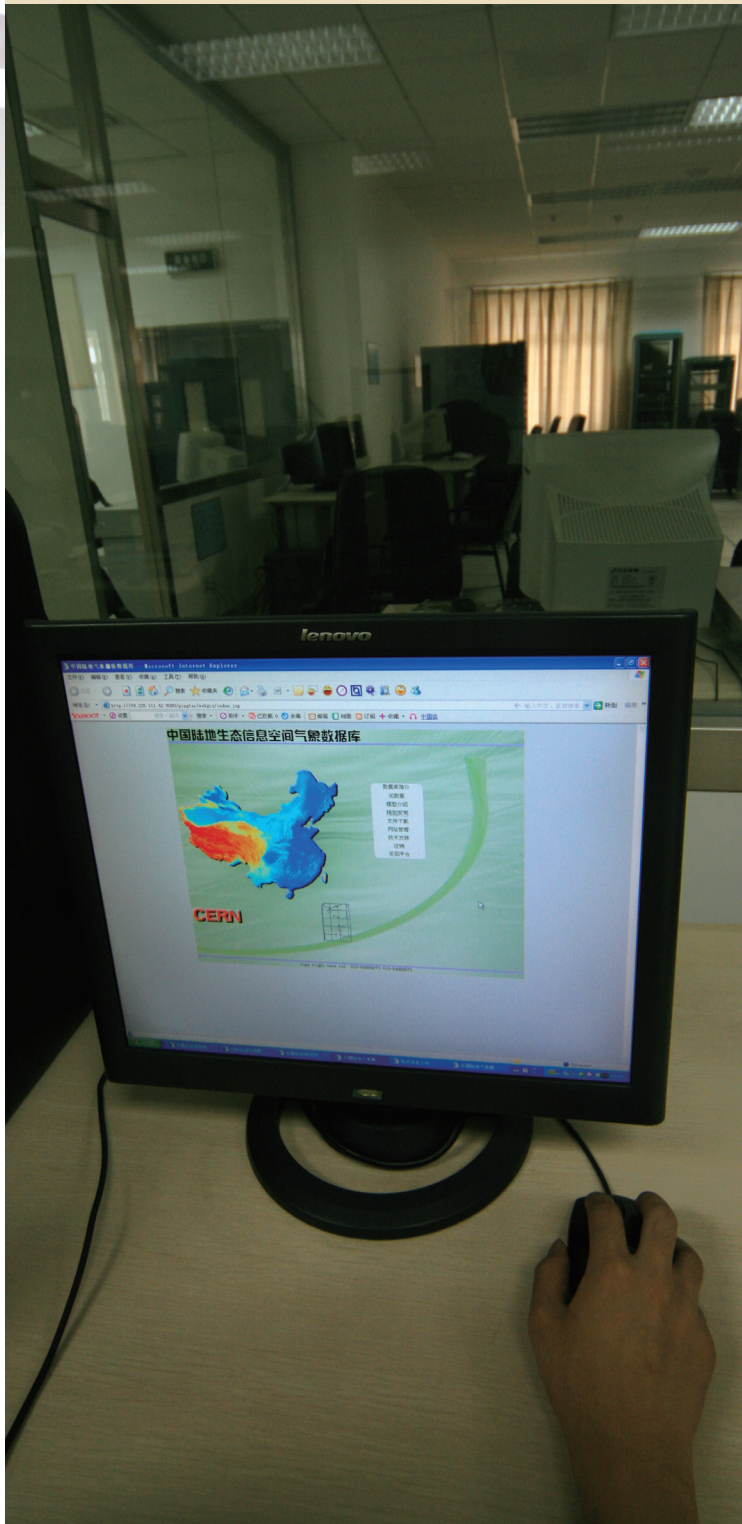

Grassland

Information Management and Sharing

Due to discrepancies of various ecosystems and the large amount of data obtained over long-term monitoring, it is of critical importance to integrate and standardize the data collected from various field stations of CERN. The data sharing across the network provides great support to the cross-site observation and research.

The information managers of CERN develop and implement technical criteria on data transfer, archiving, and analysis to ensure the effective management of ecological data. A three-tier data management and service system, i.e. the field stations-subcenter-synthesis center, is established in CERN. Under a portal of CERN, a three-tier, on-line information release platform is developed for the information managers at the field stations, sub-centers and the synthesis center respectively to manage their own database.

Currently, a series of database have been created and made available to the network and the public. These database include : 1) the long-term monitoring database; 2) spatial database of the ecological field stations; 3) observation database for the carbon budget of terrestrial ecosystems in China; 4) land resources database in China, and 5) 1km×1km meteorological grid database in China, among others.



Mr. Peter Bridgewater, Secretariat General of Ramsar Convention makes presentation at China Ecological Forum © Jiang Luguang/ CERN

Office of China-US Joint Research Center hosted by CERN Synthesis Research Center in China © CERN

Collaboration and Exchange

Since 1988 when it was established, CERN has been linking closely with the ILTER network and its member networks, particularly the US LTER and ECN. The Secretariat of EAP(East Asia and Pacific Regional Network) of ILTER is now based in the Synthesis Center of CERN.

CERN is open to the researchers both at home and abroad. Each year, a large number of guest researchers come to visit and conduct collaborative studies in the field stations, sub-centers and the synthesis center of CERN.

China Ecological Forum is a platform launched by CERN Synthesis Research Center for academic exchange and outreach. Some famous ecologists from China and other countries are invited to present their research findings on ecosystem monitoring, research and demonstration to the researchers and graduates at regular basis.

Contact of Field Stations and Centers

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Sub-Center for Soil
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Sub-Center for Atmosphere
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Sub-Center for Biology
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Sub-Center for Aquatic Ecosystems
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Research Stations for Agricultural Ecosystems

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Ansai Integrated Experiment Station on Water and Soil Conservation
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Changwu Agro-Ecological Experiment Station in Loess Plateau
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Research Stations for Marsh Ecosystems

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Research Stations for Desert Ecosystems

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