Report from the board

VISION

The overarching goal of the Nansen-Zhu International Research Center (NZC) is to become an internationally acknowledged climate research and training centre with emphasis on tropical and high-latitude regions, and the interactions between these regions, for past, present and future climate.

ORGANIZATION

The Nansen-Zhu Centre is a non-profit joint venture located at the Institute of Atmospheric Physics under the Chinese Academy of Sciences (IAP/CAS) in Beijing, China.

NZC has five founders: IAP/CAS; the Nansen Environmental and Remote Sensing Center (NERSC), Bergen, Norway; the University of Bergen (UoB), Bergen, Norway; the Bjerknes Centre for Climate Research (BCCR), Bergen, Norway; and the Peking University (PKU), Beijing, China.

HISTORY

Representatives from the Chinese and Norwegian authorities formally opened the Nansen-Zhu Centre on 4 November 2003. The center is based on an Agreement of Understanding between IAP/CAS, NERSC and UoB of 7 August 2001, and a Memorandum of understanding between IAP/CAS, NERSC, UoB and PKU of 5 November 2002.

BACKGROUND

NZC is set up based on the desire to establish and run an attractive and focused cutting edge climate research network bridging scientists from China, Norway and abroad.

Particularly, NZC aims to

- Exchange scientists and graduate students between the founding partners
- Initiate and develop joint research projects between the founding partners
- Co-ordinate and facilitate joint research proposals to be submitted to national and international funding bodies
- Stimulate and support joint publications in international peer-reviewed journals
- Develop co-operation in education and research programs

RESEARCH ACTIVITIES

NZC’s strategy is to integrate field observations, remote sensing products, theory and numerical modelling to develop cutting-edge research within four prioritised topics:

- Construction of past climate and climate variability based on low- and high-latitude paleoenvironmental reconstructions from tree rings, marine and lake sediments, and by use of modelling.
- Development and evaluation of seasonal, inter-annual and decadal time scale climate predictability systems, and identification of low- and high-latitude teleconnection patterns and mechanisms.
- Model and assess long-term climate effects of regional to global scale atmospheric events like dust storms and pollution emissions.
- Assess sources and sinks of carbon dioxide on seasonal to interdecadal time scales based on integrated use of observations and modelling.
- Model and analyse the ocean circulation and biogeochemistry by means of advanced data assimilation methods

STAFF

At the end of 2006, NZC employed a total staff of 45 persons, of which 8 persons are affiliated members.

The staff consists of 5 full-time research scientists, 3 part-time research scientist, 8 affiliated research scientists, 2 administration staff, 2 Post doc, 19 PhD students and 5 master students. The total number of 23 Master and PhD students includes 2 so-called jointly educated students.

PUBLICATIONS

During 2006, the NZC staff published (accepted) 48 papers in international referee journals. Of these papers, 20 were published in Scientific Citation Index (SCI) journals, 13 in SCI-Extended journals, and 15 in other journals.

For comparison, the number of papers published in 2005 is 24, 14 of which were published in SCI journals, 4 were in SCI-Extended journals and 6 in other journals.

FOUNDING PARTNERS

- Institute of Atmospheric Physics/Chinese Academy of Sciences (IAP/CAS), Beijing, China
- Nansen Environmental and Remote Sensing Center (NERSC), Bergen, Norway
- University of Bergen (UoB), Bergen, Norway
- Peking University (PKU), Beijing, China
- Bjerknes Centre for Climate Research (BCCR), Bergen, Norway

LEADER TEAM

- Director Professor Huijun Wang, IAP/CAS
- Co-Director Professor Helge Drange, NERSC/BCCR/UoB
- Deputy Director Professor Zifa Wang, IAP/CAS
- Co-Deputy Director Dr. Yongqi Gao, NERSC/IAP/BCCR

THE BOARD

- Professor Ola M. Johannessen, Director NERSC, Co-chairman NZC
- Professor Huijun Wang, Director IAP/CAS, Co-chairman NZC
- Mr. Kåre Rommetveit, Director General UoB
- Professor Benkui Tan, Dep. Director PKU
- Professor Eystein Jansen, Director BCCR
- Professor Helge Drange, Co-director NZC

SCIENTIFIC ADVISORY BOARD

- Founding partners
- Professor Dengyi Gao, IAP/CAS
- Professor Lennart Bengtsson, Max-Plank-Institute for Meteorology, Germany

http://nzc.iap.ac.cn
DOCTORAL DISSERTATIONS

Six PhD-students defended their theses at IAP/CAS in 2005 and 2006:
- Ke Fan - Southern Hemisphere circulation and its linkage to both East Asian climate and dust weather during boreal spring
- Weiwei Fu - A high-resolution Tropical Pacific OGCM and its Coupling to a Global AGCM
- Jingzhi Su - The Role of the Atmospheric and Oceanic Circulation in the Interaction Between the Tropics and Extra-Tropics
- Botao Zhou - Interannual and Interdecadal Variability of the East Asian Climate
- Xianqi Sun - The role of the boreal spring Antarctic Oscillation in the East Asian and West African summer monsoon
- Xiujuan Zhao - Study of the long range transport, mixing and oceanic deposition of the dust aerosol in East Asia

In addition, four Master-students defended their theses at IAP/CAS in 2005 and 2006:
- Mingfeng Su - The configurable relationships between warm-old and dry-wet conditions in the climate change over China
- Wenshuai Xu - Numerical study of the air quality condition and heavy pollution events over Shanghai
- Youjiang He - The regional characteristics of the urban air pollution in China
- Yingjie Cui - Abecedarian study of atmospheric chemistry data assimilation

AWARDS

Five awards have been received in 2005 and 2006:
- Huijun Wang, National Natural Science Awards of 2005
- Zifa Wang: Tu Changwang Prize in Meteorology (2006)
- Ke Fan: Excellent Young Meteorologists Award by the Chinese Meteorological Association (2005)
- Weiwei Fu and Botao Zhou: Student Prize by the President of the Chinese Academy of Sciences (2006)
- Ke Fan: Fifty Excellent Doctoral Dissertations by the Chinese Academy of Sciences (2006)

INTERNATIONAL MEETINGS

- 11-22 September, 2006: The second NZC summer school, held in Finse/Bergen, Norway (10 participants from China)

INTERNATIONAL VISITS

NZC has close collaboration and frequent project-dependent exchange with students and researchers from NERSC, BCCR and UoB. The following visits took place in 2005 and 2006:
- Chinese visitors to Norway
  - Jingzhi Su 2 June-28 Aug, 2005
  - Jianqi Sun 1 July-28 Sep, 2005
- Norwegian visitors to China
  - Ola M. Johannessen 16-20 April, 2005
  - Sergei Zilitinkevich 17-20 April, 2005
  - Svetlana Kuzmina 17-20 April, 2005
  - Igor Ezau 17-20 April, 2005
  - Tore Furevik 17-20 April, 2005
  - Helge Drange 10-23 April, 2005
  - Helge Drange 22-30 June, 2005
  - Helge Drange 25 July-16 Aug, 2005
  - Eystein Jansen 11 August, 2005
  - Helge Drange 29 Oct-19 Nov, 2005
  - Mats Bentsen 29 Oct-13 Nov, 2005
  - Ingo Bethke 1 Aug-28 Dec, 2005
  - Ingo Bethke 29 Oct-24 Nov, 2005
  - Helge Drange 11-23 June
  - Helge Drange 1-18 Nov, 2006
  - Ola M. Johannessen 12-15 Nov, 2006
  - Eystein Jansen 13-17 Nov, 2006
  - Astrid Bårdgard, 13-17 Nov, 2006
  - Dag L. Aksnes, 12-14 Nov, 2006
  - Odd Helge Otterå, 13-20 Nov, 2006
  - Atle Nesje, 13-20 Nov, 2006
  - Carin Andersson, 13-20 Nov, 2006
  - Kerim Nisancioglu, 13-20 Nov, 2006

NZC has also frequent exchanges of students and researchers from Japanese institutes.

ECONOMY 2006

NZC received 3.000.000 RMB (310.000 EURO) in 2005 and received 4.000.000 RMB (410.000 EURO) in 2006, partly from the Chinese and Norwegian partners, and partly from national and international funding agencies.

PROSPECTS FOR 2007 AND 2008

The Board expect an expansion of the number of staff and the research activities in 2007 and 2008. This increase is partly due to the set-up of one new research group, and because of research grants and funding possibilities from the European Commission (EC), the National Sciences Foundation of China (NSFC), the Research Council of Norway (RCN), the Ministry of Science and Technology (MOST), the European Space Agency (ESA), and the Chinese Academy of Sciences (CAS).

STAFF MEMBERS

The NZC staff members by the end of 2006, split into the different employee categories, are:

Full-time (7 persons)
- Huijun Wang (Dir.)
- Zifa Wang (Dep. dir.)
- Xiquan Wang
- Huili Huang (admin)
- Pengyu Sun (admin)
- Dabang Jiang
- Jianqi Sun

Jointly
- Yongqi Gao (Co-dep. Dir.)

Part-time (3)
- Xianmei Lang
- Lixia Ju
- Weiwei Fu

Associated (8)
- Helge Drange (Co-dir.)
- Huijun Yang
- Jiang Zhu
- Odd Helge Otterå
- Mats Bentsen
- Tianjun Zhou
- Ke Fan
- Ingo Bethke

Post doc (2)
- Zhongshi Zhang
- Xinqin An

PhD students (18)
- Chao Gao
- Chengming Pang
- Fengyun Wang
- Fuqin Xie
- Gan Luo
- Jie Li
- Jinping Han
- Lei Yu
- Lijuan Chen
- Liming Cai
- Mingfeng Su
- Wenyuan Chang
- Xu Yue
- Yali Zhu
- Ying Zhang
- Youjiang He
- Yuhong Guo

Jointly educated PhD student (1)
- Alex Gbaguidi
**Scientific Highlights in 2005 and 2006**

**Real-Time Climate Prediction Experiment for the Typhoon Frequency**

The first real-time climate numerical experiment aiming at predicting the typhoon frequency in the western North Pacific (WNP) in 2006 is presented. The prediction results show that the convective activities are reduced, the magnitude of the vertical zonal wind shear is increased, and there are anomalous high-level convergence and low-level divergence during June-October in the WNP. The predicted sea surface temperature anomalies in WNP are very small. Therefore, the results suggest that there may be less typhoon genesis in WNP compared to the normal years. However, there are uncertainties in the prediction because of the complexity in the typhoon genesis and development in the region.

**Central-North China precipitation reconstructed from the Qing Dynasty**

The long-term June-July relationship between Central-North China precipitation (CNCP) time series reconstructed from the Qing Dynasty Official Document and the Antarctic Atmospheric Oscillation (AAO) is examined. The analysis yields a (significant) negative correlation of -0.22. The signal of AAO in CNCP is further studied through analyses of the atmospheric general circulation and water vapour conditions related to the variation of preceding boreal spring HC. Summer situations of strengthened western Pacific subtropical high, intensified South Asian high, southward located East Asian jet and enhanced water vapour corresponding to strong spring HC provide favourable conditions for increasing precipitation in the Yangtze River valley, and vice versa.

**The relationship between the boreal spring Hadley circulation (HC) and the summer precipitation in the Yangtze River valley**

A significantly positive correlation between HC and the summer rainfall in the Yangtze River valley is documented. This relationship is well supported by changes in the atmospheric general circulation and water vapour conditions related to the variation of preceding boreal spring HC. Summer situations of strengthened western Pacific subtropical high, intensified South Asian high, southward located East Asian jet and enhanced water vapour corresponding to strong spring HC provide favourable conditions for increasing precipitation in the Yangtze River valley, and vice versa.

**Relationship and its instability of ENSO-Chinese variations in droughts and wet spells**

Monthly data of Self-Calibrated Palmer Drought Severity Index (PDSI) from 1951 to 2000 are calculated using historical precipitation and temperature data from 160 stations in China. It is found that changes in the temporal and spatial patterns of PDSI are similar to changes in ENSO-events over the same time period.

During the typical warm phase of ENSO, surface conditions are drier in most regions of China, especially North China, but wetter than normal in the southern regions of the Changjiang River, and in Northwest China. The reverse relationship holds for cold phases of ENSO. From 1951 to 2000, there are large multi-year to decadal variations in droughts and wet spells in China, which are all closely related to strong El Niño events. Analyses also suggest that during the last 2-3 decades climate changes over China, especially drying in North China and northwest China becoming wetter, are...
closely related to the shift in ENSO towards more warm events and global warming since the late 1970s.


Transition of palaeoenvironmental patterns in China

Geological studies indicate a transition at the early Miocene from a planetary-wind-dominant to a monsoon-dominant climate, indicating that the East Asian monsoon became markedly intensified at that time. From modelling, both the Tibetan Plateau uplift and the Paratethys Sea retreat are important for describing the Asian monsoon evolution. However, the sensitivity of the Paratethys retreat and Tibetan uplift on the East Asian climate is still unclear. Therefore, thirty numerical experiments with six Paratethys Sea and five Tibetan Plateau conditions have been carried out. The results confirm that both the Paratethys retreat and Tibetan uplift play important roles in the formation of the monsoon-dominant climate with greatly increased humidity and aridity in the monsoon areas and Northwest China, respectively. Furthermore, the fact that the Paratethys Sea retreated to the Turan Plate is found to be a key criterion for the climate transition in China.

Important sources of the radioactive contamination in the North Atlantic-Arctic region are the nuclear bomb testing in the 1950s and 60s, the Chernobyl accident in 1986, release from the European reprocessing plants Sellafield (UK) and Cap de La Hague (France), and discharges from the Arctic coastal rivers. There is concern about whether and how the latter have contaminated the Arctic Ocean and whether and how potential accidents can lead to further contamination.

The study demonstrates that the current generation of Ocean General Circulation Models is well suited to simulate the temporal and spatial distributions of man-made radioactive contamination. A series of experiments are carried out with realistic and idealized radioactive releases. The figure shows spreading of the radioactive signal released from the Sellafield nuclear reprocessing plant in the Irish Sea. The simulated pathway is broadly consistent with the known transport routes of the Atlantic Water into the Nordic Seas.

Ocean tracer and carbon cycle modelling

Radioactive contamination of the Arctic environment has received much attention in the last 10-15 years. This is caused by the fact that there are many actual and potential sources of radioactive sources within and near the Arctic region, and that the Arctic food chains are particularly vulnerable to radioactive exposure.

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the East Central China show that ozone and its precursors from these two regions enhanced the high ozone episode at the two mountain sites by 20-50%. In addition, based on process analysis studies with the model, chemical production and regional transport appeared to be the main causes of the high ozone episode involving large amounts of high-ozone air masses and precursors transported from the surrounding areas. The horizontal transport was more active during the period of high ozone episode than that during the non-episode at Mt. Tai as well as Mt. Huang.

The O$_3$ absolute (ppbv) (a) and percentage (b) changes between the cases with and without Yangtze Delta pollution emissions at 01:00 (CST) on May 25, 2004. From Wang et al., J. Air. Chem., 2006.

**LIST OF PUBLICATIONS**

**Peer-reviewed publications (accepted) in English in 2006**

**SCI indexed (20 publications)**


Su M. F., and H. J. Wang, 2006: Relationship and its instability of ENSO-Chinese variations in droughts and wet spells, Science in China (series D), 36(10), 951-958


Wang, Z.F., Jie Li, Xiquan Wang, Pakpong Pochanart, and Hajime Akimoto, 2006, Modeling of regional high ozone episode observed at two mountain sites (Mt. Tai and Huang) in East China, Journal of Atmospheric Chemistry, 2006 (accepted)


Zhang Meigen, Itsushi Uno, Renjian Zhang, Zhiwei Han, Zifa Wang, Yifen Pu, 2006, Evaluation of the Models-3 Community Multi-scale Air Quality (CMAQ) modeling system with observations obtained during the TRACE-P experiment: Comparison of ozone and its related species, Atmospheric Environment, (in press).


Zhao, X.J., Guoshun Zhang, Zifa Wang, Yele Sun, Ying Wang, Hui Yuan, 2006, Variation of sources and mixing mechanism of mineral dust with pollution aerosol --- revealed by the two peaks of a super dust storm in Beijing, Atmospheric Research, (accepted).


**SCI Extended indexed (13)**


Jiang, D. B., and Z. S. Zhang, Paleoclimate modelling at the Institute of Atmospheric Physics, Chinese Academy of Sciences, Advances in Atmospheric Sciences, 2006, 23(6), in press.


Ju L. X., and H. J. Wang, 2006: Modern climate over East Asia simulated by a regional climate model nested in a global gridpoint general circulation model, Chinese J. Geophys., 49(1), 52-60


Non-SCI indexed (15)

Peer-reviewed publications in English in 2005
SCI indexed (14)
Han Lihui, Gueshun Zhun, Yele Sun and Zifa Wang, 2005, Local and non-local sources of airborne particulate pollution at Beijing. -- The ratio of Mg/Al as an element tracer for estimating the contributions of mineral aerosols from outside Beijing, Science in China, B, 48(3), 253-264

Non-SCI indexed (6)
Participants at the China-USA-Norwegian Summer School on *Multidecadal Climate Variability and Teleconnection Dynamics* at Finse and in Bergen, Norway, 11-22 September 2006

The Nansen-Zhu International Research Center, Beijing, China
http://nzc.iap.ac.cn

Director: Prof. Huijun Wang (IAP/CAS, NZC)
Co-Director: Prof. Helge Drange (NERSC, NZC, BCCR, UoB)

Founding partners:

Institute of Atmospheric Physics/Chinese Academy of Sciences (IAP/CAS), Beijing, China
Nansen Environmental and Remote Sensing Center (NERSC), Bergen, Norway
Bjerknes Centre for Climate Research (BCCR), Bergen, Norway
University of Bergen (UoB), Bergen, Norway
Peking University (PKU), Beijing, China

Cover photo: From the Tibetan Plateau, H. Drange, 2006