Our Common Future

共同的未来

Annual Report 2005/2006

Nansen-Zhu International Research Centre, Beijing, China

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 focussed 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 paleoenviron-mental 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*
- Jianqi 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
Weiwei Fu	20 Feb-20 May, 2006
Huijun Wang; Zifa Wang; Dabang Jiang; Ke Fan; Lixia Ju; Jie Li; Gan Luo; and Lingling Suo	11-23 Sep, 2006
Huijun Wang	20-27 Nov, 2006

- *Norwegian visitors to China*

Ola M. Johannessen	16-20 April, 2005
Sergej 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, 2006
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).

Beijing, 13 November 2006,

Ola M. Johannessen (Co-chairman)
Huijun Wang (Co-chairman)
Kåre Rommetveit
Benkui Tan
Eystein Jansen
Helge Drange

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.)
Haijun Yang
Jiang Zhu
Odd Helge Otterå
Mats Bentsen
Tianjun Zhou
Ke Fan
Ingo Bethke

Post doc (2)
Zhongshi Zhang
Xinqin An

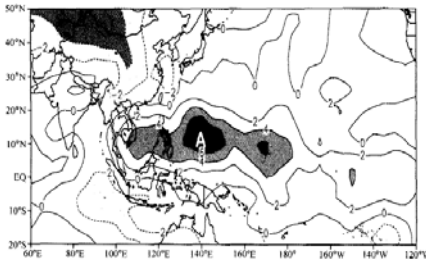
PhD students (18)
Chao Gao
Chengming Pang
Fengyun Wang
Fuyin Xie
Gan Luo
Jie Li
Jinping Han
Lei Yu
Lijuan Chen
Linming Cai
Mingfeng Su
Wenyuan Chang
Xu Yue
Yali Zhu
Ying Zhang
Youjiang He
Yuhong Guo

Jointly educated PhD student (1)
Alex Gbaguidi

SCIENTIFIC HIGHLIGHTS IN 2005 AND 2006

Real-Time Climate Prediction Experiment for the Typhoon Frequency

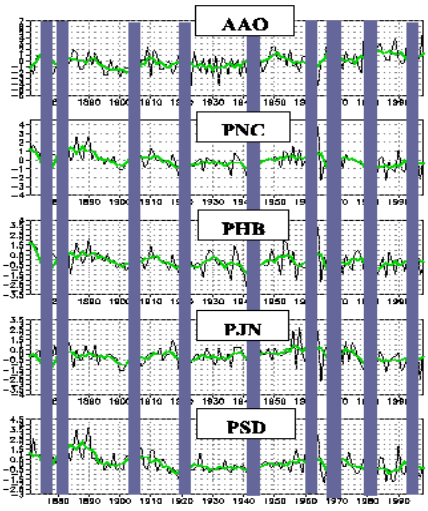
The first real-time climate numerical experiment aiming at predicting the typhoon frequency in the western North Pacific (WNP) in 2006 is presented. The prediction results show that the convective activities are reduced, the magnitude of the vertical zonal wind shear is increased, and there are anomalous 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 maybe 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.



The predicted outgoing longwave radiation anomalies for June-August. Areas with magnitudes larger than 2 W ·m^{-2} are shaded. From Wang et al., 2006, Clim. Environm. Res.

Central-North China precipitation reconstructed from the Qing Dynasty

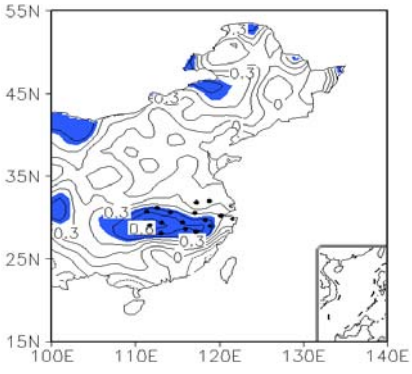
The long-term June-July relationship between Central-North China precipitation (CNCP) time series reconstructed from the Qing Dynasty Official Document and the Antarctic Atmospheric Oscillation (AAO) is examined. The analysis yields a (significant) negative correlation of −0.22. The signal of AAO in CNCP is further studied through analyses of the atmospheric general circulation variability related to AAO. It follows that AAO-related variability of convergence and convection over the tropical western Pacific can exert impact on the circulation and precipitation in North China and the Yangtze River Valley through the atmospheric East Asia-Pacific (or Pacific–Japan) teleconnection wave pattern. There is also an AAO-connected wave train in the vorticity field in the high troposphere over Eurasia, providing an anti-cyclonic circulation in Central-North China favourable to the decline of precipitation in positive phase of AAO.



From top: Running means of June-July AAO, CNCP, and precipitation in three sub-regions Hebei, Jinnan, and Shandong. Bars indicate the presence of local maxima in the running mean time series. From Wang and Fan, 2005, Geophys. Res. Lett.

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.

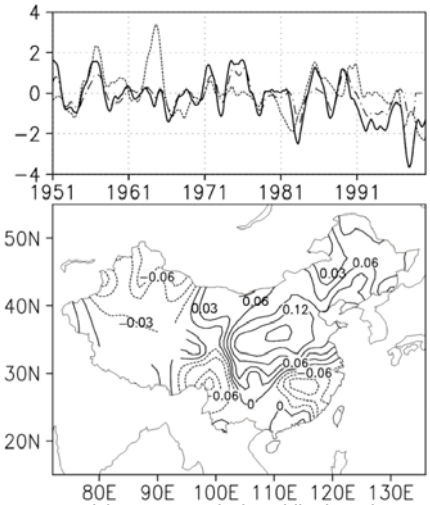


The correlation between spring HC and summer precipitation in China. Black dots show the chosen stations in the Yangtze River, and regions exceeding the 95% significance level are shaded. From Zhou and Wang, 2006, J. Geophys. Res.

The possible mechanism how boreal spring HC affects summer atmospheric circulations is also indicated: Analysis show that sea surface temperature anomalies in the Indian Ocean and South China Sea may play an important role in linking the spring HC and summer atmospheric circulation in the Yangtze river valley.

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.



Temporal (upper panel, doted line) and spatial (lower panel) patterns of the leading mode of the monthly PDSI in China during 1951-2000. Also shown in the upper panel are the Southern Ocean Index (SOI, dashed line) and the normalized Darwin sea level pressure index (solid line). Maximum correlation is found when the ENSO indices lag by one year. The correlations (r=0.38 with SOI and r=0.45 with the Darwin pressure index) are significant. From Su and Wang, Science in China, 2006.

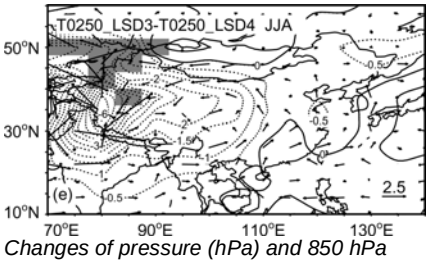
During the typical warm phase of ENSO, surface conditions are drier in most regions of China, especially North China, but wetter than normal in the southern regions of the Changjiang River, and in Northwest China. The reverse relationship holds for cold phases of ENSO. From 1951 to 2000, there are large 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.

It is furthermore revealed that the coherency between ENSO and Chinese variations in droughts and wet spells is high during 1951-1962 and 1976-1991, but low during 1963-1975 and 1992-2000.

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 decribing the Asian monsoon evolution. However, the sensitivity of the Paratethys retreat and Tibetian 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 the Tibetan plateau 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.



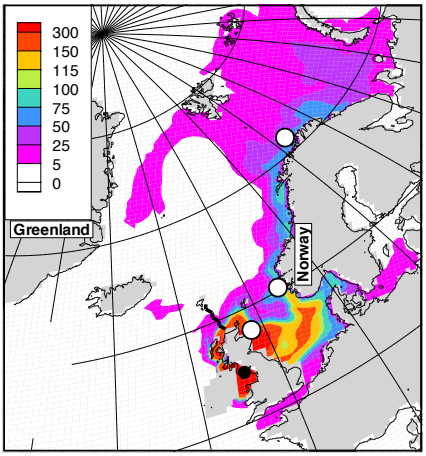
Changes of pressure (hPa) and 850 hPa wind (m/s) in summer when the Paratethys retreats from the south part of West Siberia to the Turan Plate. The areas where the sea turns to land are shaded. From Zhang et al., 2006, Palaeogeogr., Palaeoclim., Palaeoecol.

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.

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.

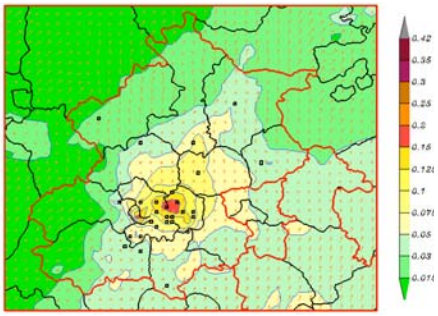


Simulated spreading of radio-waste released from the U.K. reprocessing plant close to Irish Sea. From Gao et al., Tellus B, 2005.

Real-Time Forecast for the Beijing Air Pollution Composite Observation Project

The nested air quality prediction modelling system (NAQPMS) is used to do real-time forecasting for the Beijing Air Pollution Composite Observation Project during the period from August 10th to September 10th, 2006. The NAQPMS is a fully modularized three-dimensional system with various options for representing the physical and chemical processes describing regional- and urban-scale atmospheric pollution. The NAQPMS has been developed at IAP/CAS and has been used for scientific studies and policy evaluation in East Asia since 1995 (*Huang et al*., 1995). The NCAR/Penn State Fifth-Generation Mesoscale Model (MM5) is used as the meteorological driver to NAQPMS. It includes a multiple-nest capability, nonhydrostatic dynamics and a four-dimensional data assimilation capability as well as more physics options, and portability to a wider range of computing platforms.

NAQPMS has previously been used to investigate sulphur deposition and transport in East Asia, long-range transport of yellow-sand, pollutant transport and ozone chemistry, and acid rain and yellow-sand neutralization in East Asia. In this study, a heavy air pollution transport event that started on August 23rd 2006 is successfully predicted by the model system and compares favourably with the Composite Observation Network. The details of the event are currently being studied.



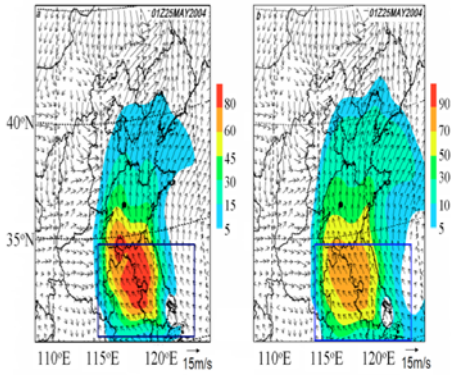
Forecast of small air-borne particles (PM10) in Peking.

Modeling of Regional High Ozone Episode Observed at Two Mountain Sites (Mt. Tai and Huang) in East China

A high ozone (O_3) episode was observed during 23–25 May 2004 at two high-mountain sites reflecting the regional pattern of air pollutants over East China. This episode lasted about three days with the maximum hourly O_3 mixing ratios reaching 111 and 114 ppbv at Mt. Tai and Huang, respectively. Backward trajectories and meteorological analysis indicate that regional transport, associated with a weak high pressure system over the East China Sea, played an important role in the formation of this high ozone episode.

The NAQPMS system was applied to investigate the formation and evolution of this high O_3 event. The comparison of model results with observations showed that NAQPMS successfully reproduced the main meteorological parameters and observed patterns of O_3 during the simulated period. Model experiments with and without emissions from the Yangtze Delta and

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 pollutant emissions at 01:00 (CST) on May 25, 2004. From Wang et al., J. Atm. Chem., 2006.

LIST OF PUBLICATIONS

Peer-reviewed publications (accepted) in English in 2006

SCI indexed (20 publications)

Chen, J.H., **Zifa Wang**, Shiro Hatakeyama, Wei Wang, Akinori Takami, Hong Li, Hongjie Liu, 2006, Zongshuang Wang, Xin Yue, Ling Lu, Hongmei Su, Dagang Tang, Intensive aircraft-based measurements of air pollutants over the eastern coast of China in spring 2002 (II) –The NOx distributions and ozone modeling studies, *Water, Air and Soil Pollution*, (accepted).

Fan K., and **H. J. Wang**, 2006: Interannual variability of Antarctic Oscillation and its influence on East Asian climate during boreal winter and spring, Science in China (series D), 49(5), 554-560, doi: 10.1007/s11430-006-0554-7

Gong D.Y., **H. Drange** and **Y. Gao** (2006), Reconstruction of northern hemisphere 500 hPa geopotential heights back to the late 19th century *Theor. Applied Climat.,* doi 10.1007/s00704-006-0271-3

Hara Yukari, Itsushi Uno and **Zifa Wang**, 2006, Long-term Variation of Asian Dust and Related Climate Factors, *Atmospheric Environment*, (accepted).

Lin, C.Y., **Zifa Wang**, Charles C.-K. Chou, Chih-Chung Chang, and Shaw C. Liu, 2006, A Numerical Study of Autumn High Ozone Episodes over Southwestern Taiwan, *J. Geophys. Res.*, (accepted).

Risebrobakken, B, Dokken T, **Otterå OH**, **Jansen E.**, **Y. Gao**, **H. Drange** (2006), Inception of the northern European ice sheet due to contrasting ocean and insolation forcing. *Quaternary Research,* doi: 10.1016/j.yqres.2006.07.007

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

Sun J. Q., and **H. J. Wang**, 2006: Relationship between Arctic Oscillation and Pacific Decadal Oscillation on decadal timescale, Chinese Science Bulletin, 51(1), 75-79, doi: 10.1007/s11434-004-0221-3

Uno Itsushi, **Zifa Wang**, et al., 2006, Dust model intercomparison (DMIP) study over Asia: Overview, J. Geophys. Res., 111, D12213, doi:10.1029/2005JD006575.

Wang H. J., and **K. Fan**, 2006: Southern Hemisphere mean zonal wind in upper troposphere and East Asian summer monsoon circulation, Chinese Science Bulletin, 51(12), 1508-1514, doi: 10.1007/s11434-006-2009-0

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)

Wang, W., Shiro Hatakeyama, **Zifa Wang**, hongjie Liu, Akiniri Takami, Hong Li, Jianhua Chen , Xian Yue, Lihong Ren, Dagang Tang, 2006, Intensive aircraft-based measurements of air pollutants over the eastern coast of China in spring 2002 (I) –The distribution of sulfur dioxide and transport flux, *Water, Air and Soil Pollution*, (accepted).

Wang, Z.F.,, Fuying Xie, T. Sakurai, H. Ueda, K. Matsuda, G. R. Carmichael, D. Streets, S. U. Park, C. Fung, A. Chang, M. Kajino, N. Thongboonchoo, M. Engardt, C. Bennet, H. Hayami, K. Sartelet, T. Holloway, Z. Han, M. Amann, 2006, Model Inter-comparison and Evaluation of Acid Deposition in MICS-Asia Phase II Study, *Atmospheric Environment*, 2006. (Accepted).

Yang, M. X., T. D. Yao, **H. J. Wang**, L. D. Tian, and X. H. Gou, 2006: Estimating the criterion for determining water vapour sources of summer precipitation on the northern Tibetan Plateau, Hydrological Processes, 20(3), 505-513

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).

Zhang Renjian, **Z.F**. **Wang** et al., 2006, Physicochemical Characterization and Origin of the 20 March 2002 Heavy Dust Storm, Aerosol and Air Quality, 2006.(in press)

Zhang, Z. S., **H. J. Wang**, Z. T. Guo, and **D. B. Jiang**, 2006: What triggers the transition of palaeoenvironmental patterns in China, the Tibetan Plateau uplift or the Paratethys Sea retreat? Paleogeography Paleoclimatology Paleoecology, doi: 10.1016/j.palaeo.2006.08.003

Zhao, X.J., **Zifa Wang**, Guoshun Zhuang, Chengming Pang, 2006, Model study on the transport and mixing of mineral dust with pollutants during Asian dust storm in March 2002, *Terrestrial, Atmospheric & Oceanic Sciences(TAO)*, (accepted).

Zhao, X.J., Guoshun Zhuang, **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).

Zhou B. T., and **H. J. Wang**, 2006: Relationship between the boreal spring Hadley circulation and the summer precipitation in the Yangtze River Valley, J. Geophys. Res., 111, D16109, doi: 10.1029/2005JD0070006

SCI Extended indexed (13)

Fan K., 2006: Atmospheric circulation in southern Hemisphere and summer rainfall over Yangtze River Valley, Chinese J. Physics., 49(3), 599-606

Fan K., and **H. J. Wang**, 2006: The Interannual Variability of Dust Weather Frequency in Beijing and Its Global Atmospheric Circulation, Chinese J. Geophysics. 49(4), 890-897

Fan K., and **H. J. Wang**, 2006: Simulation on the AAO anomaly and its influence on the Northern Hemispheric circulation in boreal winter and spring, Chinese J. Geophysics. (Accepted)

Fan K., and **H. J. Wang**, 2006: Dust Storms in North China in 2002: A Case Study of the Low Frequency Oscillation, Adv. Atmos. Sci. (Accepted)

Fu W. W., G. Q. Zhou, and **H. J. Wang**, 2006: Modeling the tropical Pacific Ocean using a regional coupled climate model, Adv. Atmos. Sci., 23(4), 625-638

Han J. P., and **H. J. Wang**, 2006: Numerical Simulation of the Impacts of Global Sea Surface Temperature and Sea ice on East Asian Summer Monsoon interdecadal variations. Chinese J. Geophys. (Accepted)

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.

Jin L. Y., **H. J. Wang**, F. H. Chen, and **D. B. Jiang**, 2006: A possible impact of cooling over the Tibetan Plateauon the Mid-Holocene East Asian monsoon climate, Adv. Atmos. Sci., 23(4), 543-550

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

Liao Q. H., S. Y. Tao, and **H. J. Wang**, 2006: Internal dynamics related to anomalies of seasonal evolution of summer circulations in East Asia during July-August, Chinese J. Geophys., 49(1), 28-36

Sun J. Q., and **H. J. Wang**, 2006: Regional difference of summer air temperature anomalies in Northeast China and its relationsjip to atmospheric general circulation and sea surface temperature, Chinese J. Geophys., 2006, 49(3), 662-671

Zhang Z. S., **H. J. Wang**, Z. T. Guo, and **D. B. Jiang**, 2006: Impact of topography and land-sea distribution on East Asian paleoenvironmental patterns, Adv. Atmos. Sci., 23(2), 258-266

Zhou B. T., and **H. J. Wang**, 2006, Interannual and Interdecadal variations of the Hadley Circulation and its Connection with Tropical Sea Surface Temperature, Chinese J. Geophys. (in press)

Non-SCI indexed (15)

Chang W. Y., X. G. Dai, and G. L. Feng, 2006: Feasibility of Goestatistical Method on Time Series Forecast, Chinese Journal of computational physics, 23(3), 335-342

Cui, Y.J., Zifa Wang and Jiang Zhu, 2006: Abecedarian study of atmospheric chemistry data assimilation, Clim. Environm. Res., accept. (in Chinese with English abstract)

Fan K., and **H. J. Wang**, 2006: The anomalous Antarctic Oscillation and the summer precipitation over Eastern China in 2006, Journal of Applied Meteorological Science, 17(3), 383-384 (in Chinese with English abstract)

Fan K., and **H. J. Wang**, 2006: Studies of the relationship between southern hemispheric atmospheric circulation and climate over East Asia, Chinese Journal of Atmospheric Sciences, 20(3), 402-412 (in Chinese with English abstract)

Fan K., and **H. J. Wang**, 2006: The weakening of the Antarctic Oscillation and the dust climate during spring in China in 2006, Climatic and Environmental Research (accepted) (in Chinese with English abstract)

Gan Luo and Zifa Wang, 2006: A Global Environmental Atmospheric Transport Model (GEATM):Model Description and Validation, CHINESE JOURNAL OF ATMOSPHERIC SCIENCES, Vol.30 No.3 P.504-518. (in Chinese with English abstract)

Han J. P., **H. J. Wang**, and **D. B. Jiang**, 2006: Interannual variation of spring precipitation and circulation in South China as simulated by a coupled model, Climatic and Environmental Research, 11(2), 194-202 (in Chinese with English abstract)

Wang H. J., **X. Lang**, **K. Fan**, **J. Q. Sun**, and G. Q. Zhou, 2006: Real time climate prediction experiment for the Typhoon frequency in the Western North Pacific for 2006, Climatic and Environmental Research, 11(2), 133-137 (in Chinese with English abstract)

WANG Xiquan, WANG ZiFa and GUO Hu, 2006: The study of the Urban Heat Island in Beijing City, Climatic Environm. Res, accepted (in Chinese with English abstract)

Wang Xiquan, Yu Tong et al., 2006: Key Meteorological Factors Resulting in PM10 Heavy Air Pollution in Beijing, Climatic Environm. Res, accept. (in Chinese with English abstract)

Wang Xiquan, Yu Tong et al., 2006: The effect of urban concentrated greenbelt on mitigating high temperature during summer season in Beijing City, Urban Environm. & Urban Ecology, accepted. (in Chinese with English abstract)

Wang, Z.F., Fuyin Xie et al., 2006: Development and application of Nested Air Quality Prediction Modeling System, Chinese J. Atm.Sci., accepted (in Chinese with English abstract)

Yang M. X., T. D. Yao, and **H. J. Wang**, 2006: Microparticle content records of the Dunde ice core and dust storms in northwestern China, Journal of Asian Earth Science, 27, 223-229 (in Chinese with English abstract)

Zhou, T.J., R.C. Yu, **Y. Gao**, **H. Drange** (2006), Air-sea Coupled Model Simulation of North Atlantic Interannual Variability II: Tropical tele-connection. *Acta Meteorologica Sinica*, Vol. 64, No.1

Zhou, T.J., R.C. Yu, **Y. Gao**, **H. Drange** (2006), Air-sea Coupled Model Simulation of North Atlantic Interannual Variability I: Local Air-sea Interaction. *Acta Meteorologica Sinica,* Vol. 64, No.1

Peer-reviewed publications in English in 2005

SCI indexed (14)

Drange H., R. Gerdes, **Y. Gao**, M. Karcher, F. Kauker, M. Bentsen (2005), Ocean general circulation modelling of the Nordic Seas, in *The Nordic Seas: An Integrated Perspective*, Drange H., T. Dokken, T. Furevik, R. Gerdes and W. Berger (Eds), AGU Monograph 158, American Geophys. Union, Wash. DC, 199-220.

Gao Y., **Drange H**., Bentsen M., Johannessen O.M. (2005), Tracer-Derived Transient Time of the Eastern Waters in the Nordic Seas. *Tellus*, 57B, 332-340

Gong, D., and **Drange, H.** (2005), A preliminary study on the relationship between Arctic Oscillation and daily SLP variance in the Northern hemisphere during wintertime, *Adv. Atm. Sci.*, **22**, 313-327

Han Lihui, Guoshun Zhuang, Yele Sun and **Zifa Wang**, 2005, Local and non-local sources of airborne particulate pollu-tion 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

Hátún, H., A. B. Sandø, **H. Drange**, B. Hansen, and H. Valdimarsson (2005), Influence of the Atlantic Subpolar Gyre on the Thermohaline Circulation, *Science*, **309**, 1841-1844

Jiang D., **H. J. Wang**, Z. L. Ding, **X. Lang**, and **H. Drange**, 2005: Modeling the middle Pliocene climate with a global atmospheric general circulation model, J. Geophys. Res., 110, D14107, doi: 10.1029/2004JD005639

Jiang D., and **H. J. Wang**, 2005: Natural interdecadal weakening of East Asian summer monsoon in the late 20th century, Chinese Science Bulletin, 50(17), 1923-1929

Jin L., A. Ganopolski, F. Chen, M. Claussen, and **H. J. Wang**, 2005: Impacts of snow and glaciers over Tibetan Plateau on Holocene climate change: Sensitivity experiments with a coupled model of intermediate complexity, Geophys. Res. Lett., 32, L17709, doi: 10.1029/2005GL023202

Kang D. J., and **H. J. Wang**, 2005: Analysis on the decadal scale variation of the dust storm in North China, Science in China (series D), 48(12), 2260-2266

Sun, Y., G. Zhuang, Y. Wang, X. Zhao, J. Li, **Z. Wang**, and Z. An, 2005, Chemical composition of dust storms in Beijing and implications for the mixing of mineral aerosol with pollution aerosol on the pathway, *J. Geophys. Res.*, 110, D24209, doi:10.1029/ 2005JD006054.

Uno Itsushi, Kazuhiro Harada, Shinsuke Satake, Yukari Hara and **Zifa Wang,** 2005, Meteorological Characteristics and Dust Distribution of the Tarim Basin Simulated by the Nesting RAMS/CFORS Dust Model, *Journal of the Meteorological Society of Japan*, 83A,219-239.

Wang, H. J., and **K. Fan**, 2005: Central-north China precipitation as reconstructed from the Qing dynasty: Signal of the Antarctic Atmospheric Oscillation, Geophys. Res. Lett., 32, L24705, doi: 10.1029/2005GL024562

Zhou B. T., P. Zhao, Z. M. Jian, J. H. He, 2005: Modeling the impact of Australian Plate drift on Southern Hemisphere climate and environment, Chinese Science Bulletin, 50(14), 1495-1502

Zou, H., L. Zhou, **Y. Gao**, X. Chen, P. Li, C. Ji, S. Ma and D. Gao (2005), Total ozone variation between 50 and 60 N. *Geophysical Research Letters*, 32, L23812, doi:10.1029/2005GL024012

SCI Extended indexed (4)

Fu, W. W., J. Zhu, G. Q. Zhou, and **H. J. Wang**, 2005: A comparison study of Tropical Pacific Ocean State Estimation: Low-Resolution Assimilation vs. High-Resolution Simulation, Adv. Atmos. Sci, 22(2), 212-219

Jiang D., **H. J. Wang**, and **X. Lang**, 2005: Evaluation of East Asian climatology as simulated by seven coupled models, Adv. Atmos. Sci., 22(4), 479-495

Lang, X., and **H. J. Wang**, 2005:Seasonal differences of model potential predictability and the impact of SST anomaly in the Pacific, Adv. Atmos. Sci., 22(1), 103-113

Wang H. J., 2005: The circum-Pacific teleconnection pattern in meridional wind in the high troposphere, Adv. Atmos. Sci., 22(3), 463-466

Non-SCI indexed (6)

Chen L. J., X. Li, and Y. G. Wang, 2005: Application of superensemble to precipitation prediction in China during flood season, Meteorological Monthly, 31(5), 52-54 (in Chinese with English abstract)

Chen L. J., X. Li, and Y. Jiang, 2005: General circulation over the Northern Hemisphere in 2004 and its impact on the climate in China, Meteorological Monthly, 31(4), 27-31 (in Chinese with English abstract)

Chen L. J., B. M. Chen, W. J. Li, and J. G. Wang, 2005: Improved experiments for T63 potential heights by monthly dynamic extended-range forecast, Journal of Applied Meteorological Science, 16(appl.), 92-96 (in Chinese with English abstract)

Chen L. J., P. Q. Zhang, and Z. G. Zhao, 2005: An approach to a prognostic factor of basin rainfall in summer over the Songhuajiang-Nenjiang-Liaohe valleys, Journal of Applied Meteorological Science, 16(5), 663-669 (in Chinese with English abstract)

Ye, X.F., **Zifa Wang** et al., 2005, Analysis of the Spatial-Temporal Distribution and Ion Features of Components of Precipitation in East Asia, CLIMATIC AND ENVIRONMENTAL RESEARCH Vol.10 No.1 P.115-123. (in Chinese with English abstract)

Zhou, H., **Zifa Wang** et al., 2005, The Mechanism of Urban Air Pollution Persistence Part I: The Analysis of Air Pollution Persistence and its Relate Meteorology in Xi'an in 2002, CLIMATIC AND ENVIRONMENTAL RESEARCH Vol.10 No.1 P.124-131. (in Chinese with English abstract)

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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

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