



Annual Report of ICCES

(2011.5-2012.4)

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- Founded in 1991 with support from both CAS and Ministry of Science and Technology of China (MOST);
- Center Organization



ICCES currently has 46 staffs in total, with 40 research scientists, and 6 supporting staff. Besides, there are 7 Adjunct professors.

As for 2012, there are **1** Postdoc, and **33** graduate students studying in ICCES.



◆ 地球系统动力学模式研制和数值模拟

Development of Dynamical Earth System Model and Numerical Simulation

◆ 气象与环境预测及灾害评估理论和方法

Meteorological and Environmental Forecast and Related Disaster Assessment Theory and Technique

◆ 资料同化理论和方法

Data Assimilation Theory and Methodology

◆ 地球系统科学理论与自然控制论研究

Earth System Theories and Natural Cybernetics





- On-going Projects

• 61 on-going research porjects in total, including demestic research projects as well as international collabrative projects;

- Within the 61 projects, 14 are newly established in 2011-2012;
- Funds of the *new projects* are over 35,000,000 CNY in total





- National key Basic research Program for global change(973):Development of the ecological and environmental process model and its improvement (30,000,000 CNY, 2010-2014) (~4.6 Million USD)
- National Basic Research Program of China (973) : Development and evaluation of high-resolution climate model

(10,440,000 CNY,2010-2014) (~ 1.6 Million USD)

• Subproject of CAS Strategic Priority Research Program "Uncertainties for the climate simulation and projection using CAS Climate System Model"

(30,000,000 CNY, 2011-2015) (~ 4.6 Million USD)



• National key Supporting Project for Science and Technology development: Monitoring, prediction and warning system for the extreme weather and climate disasters

(2,000,000 CNY, 2010-2014)

• Development of the second-generation Short-Term Climate Prediction System in National Climate Center

(1,780,000 CNY,2010-2013)

• International Collaborative Project supported by MOST China: Characteristics and mechanism of the extreme climate events under the climate change background

(1,000,000 CNY, 2012-2015)

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- CAS Strategic Priority Research Program- Climate Change: Carbon Budget and Relevant Issues
- Total Budget: 800 Million CNY (~ 120 Million USD)

Progress of the Project



- Officially launched on April 26, 2011
- 5-year project during 2011.1-2015.12

2011 Annual Meeting







Changes of global averaged T for RCP8.5, RCP4.5 experiment



Scenario for CO2 concentration

Projected Temperature Change



Development of the CAS Earth System Model





The improvements of population dynamical parameterization in DGVM



In DGVM, establishment refers to a sequence of biological processes including flowering, fertilization, seed production, germination, and the establishment of new individuals. In addition, it leads to large uncertainties in DGVM:

- determining the balance of population density
- influencing the size of individual crown area
- the establishment rate distribution of different PFTs is a key factor leading to uncertainties

CLM-DGVM assumes that all the woody PFTs (trees and shrubs) have the same establishment rate (although some of them cannot survive);

$$\begin{cases} \Delta P_i = [\Delta P_{\max} (1 - e^{-5(1 - FPC_{woody})}) (1 - FC_{woody})] \cdot \frac{g_i}{\sum_{k=1}^{n_{est,woody}} g_k} \\ g_i = 1 \end{cases}$$

Actually, establishment rate should be relative to the current status of vegetation (e.g., fractional coverage, NPP etc.)

The improvements of population dynamical parameterization in DGVM



The variance in tree fractional coverage when PFT number decreasing

The variance in the gap between two dominant PFTs' fractional coverage when PFT number decreasing

In the default scheme, the removal of PFTs with small fractional coverage results in large variances in fractional coverage of dominant PFTs (i.e., the red line, the tree fractional coverage increases by about 8%, and the gap between two dominant PFTs' fractional coverage increases by about 1%);

In the new scheme, the variances of the two variables are slight (blue line).

New fire parameterization



(Li et al. 2012, BGD)

Li and Zeng, 2011, 16th Annual CESM Workshop

New fire parameterization in NCAR' s CLM

Advantages:

- 1. New basic function to improve burned area simulation in regions where fire occurs frequently
- 2. Parameters calibrated based on satellite data and field data
- 3. New fire spread scheme to remove unreasonable assumptions and functions in earlier fire schemes
- 4. Introduce the estimation of trace gas and aerosol emissions due to biomass burning

Global performance in IAP-DGVM

Evaluation period: 1997-2004

Mod-new: new fire parameterization **Glob-FIRM:** Thonicke et al. 2001 **Mod-old:** old fire parameterization in CLM-DGVM (Levis et al. 2004) •Cor: global spatial correlation between sim and obs



- Mod-new is good agreement with observations, and more skillful than Glob-FIRM and Mod-old.
- Ref: 1997-2004 CLM-CN simulations with CTEM-FIRE (300Mha/yr, Cor=0.19) and its revised version (182Mha/yr, Cor=0.52) (Kloster et al. 2010)

IAP Dust modeling and predcition system



Dust modelling system based on WRF/Chem

Multi dust emission schemes:

GOCART based(Ginoux et a., 2001) Marticorena &Bergametti (1995) Shao et al. (1996), Lu & Shao (1999), Shao (2001), Shao (2004)

GIS datasets:





IAP Seasonal Prediction System for real-time drought/flood predictions





Framework of IAP Seasonal Prediction System

IAP's Climate Forecast System





+

Updated prediction for 2012 – *Nino3.4 index*



Real-time prediction of Summer rainfall anomalies over China (2012)



More than normal rainfall over lower reach of Yellow river and huaihe River Basin

Less than normal rainfall to the South of Yangtze river basin

More than normal rainfall over Southern part of Southeast China

Forecast was issued in the end of March, 2012

Research Outcome Distribution

- Series of News Letter of Climate Prediction



2011年梅雨开始日期预测意见 2011年6月1日,中国科学院大气物理研究所气候预测小组根据最新的海洋、大气临测,以及 大气环流形势的中期数值预报结果。分析了2011年南海夏季风爆发以来的大气、海洋状态、未来 亚洲中高纬度大气环流、东亚夏季风及西太平洋副热誉高压等环流系统的可能指变,综合中期数 值模式预报结果,对2011年梅雨开始日期进行会商,给出了预测意见。 一、预测意见: 预计2011年6月4~6日长江流域将有一次过程性降水,将缓解目前这一地区的早情。但在2011 年6月10日前梅雨环流形势尚不能建立,梅雨将于6月10日以后开始。 二、预测依据:

2011年第4期

二年---年六月二日

1. 根据美国全球预测系统(Global Forecast System, GFS)的中期预测结果(图 1), 6月 4~6 日,冷空气由南侵袭到32°N街近,西太平洋副热带高压脊线北跳到18°N射近,25°N射近的 南风加强。6月5日,30°N附近有切变线发展,有利于长红流域的降水。但6月6日后,西太平 洋斯林基塞压南语、不能稳定维持。

2. 根据 GFS 对中纬度期来高乐指数和 500hPs 高度场的预测(图 2),在6月4~8日,则加尔 湖地区有高压脊维持,我国东北地区为低压槽控制,有利于冷空气从低压槽后部南下到达长灯流 域。6月10日前, 極而期具型的末間(鄂羅次克海閉來高压)或西關(乌拉尔山關來高压)均未 建立,因此,4~6日的长江流域降水为过程性降水,而非梅雨开始。

Research Outcome for Public Consultation

Prediction results was adopted by the central government of China



Ocean Reanalysis Dataset (AIPOcean 1.0)

Model: HYCOM

Model domain (color shade): including Indian and West Pacific oceans with the horizontal resolution of 1/4x1/4 and with vertical 22 layers and nested in a large outer region with the resolution of 3/4x3/4.



Assimilation method: EnOI(ensemble optimal interpolation)

Reanalysis period: 1993-2006

sla variability over 1993-2006



Comparison with sea surface drifters

Observed sea surface drifters(red dot is the origin of drifer) and AIPOcean1.0 sea surface current stream in the Indian ocean in Nov. 2006





 Outstanding Science and Technology Achievement Prize of the Chinese Academy of Sciences 2011.

Dr. Tian from ICCES was awarded "CAS Lujiaxi Young Talent Award"in 2011.





Statistics:

- More than **20** foreign experts visited ICCES in 2011.
- ◆ 11 professors from ICCES went aboard as short-term visiting scholar.
- Researchers and professors from ICCES attended 24 international conferences covering more than 9 countries and regions.
- More than 60 experts from over 13 countries, mostly from developing countries attended 2011 CTWF in Beijing.



Big Events:

- ♦ Prof. Romain Murenzi, TWAS Executive Director, visited ICCES
- 2011 CTWF-COMSATS International Training Workshop was successfully held in Sep 26-29, Beijing, China, with the organization of ICCES and COMSATS.
- Princess Maha Chakri Sirindhorn from Thailand visited ICCES in April, 2012.
- CAS-CSIRO Cooperative Research Program between IAP and CSIRO from Australia, Researchers from ICCES participated in this project.

Prof. Romain Murenzi visited ICCES





Gave a talk on "TWAS and Importance of Science, Technology and Innovation for Development"

Agreed to serve as Chairperson of CAS-TWAS-WMO Forum on climate sciences in representative of TWAS



2011 CTWF-COMSATS International Training Workshop



Theme: "Climate and Environmental Change: Challenges for Developing Countries

More than 60 participants attended the 2011 CTWF, including 27 representatives from 13 oversea institutions and government departments.

Time: September 26-29, 2011 **Venue:** Beijing Friendship Hotel, China.



2011 CTWF-COMSATS International Training Workshop



Session	Lecturers	No. of Presentation	Rapporteur
Session I: Regional climate changes and the detection techniques	Prof. Guoyu Ren	5	Dr. Chandima Gomes Mr. Saleh Alsaleem
Session II: Impact of climate change on regional water resources	Prof. Qiuhong Tang	5	Dr. Rijan Bhakta Kayastha Dr. Thanapakpawin Porranee
Session III-1: Impact of climate change on agriculture	Prof. Yinlong XU	5	Dr. Shahina Tariq Mr. Ruba Ajjour
Session III-2: Impact of climate change on ecosystem	Prof. Xiaodong Zeng	3	Mr. Athula Kumara Karunanayake Mr. Shaofeng Shen
Session IV: Application of regional climate model on the regional climate change study	Prof. Xunqiang Bi	5	Dr. Surajate B. Aroonnet Mr. Waheed Iqbal

2011 CTWF-COMSATS International Training Workshop





Princess Maha Chakri Sirindhorn Visited ICCES



Princess Maha Chakri Sirindhorn Visited ICCES on April 5th, 2012



CAS-CSIRO Cooperative Research Program:

"Variability of East Asian-Australian Monsoon and Climate Change Impact on Water Resource"







Hydrological response to the projected climate change over Huaihe River basin during 2046~2065



Basic Information:

- 1. Tentative date: August 27-30, 2012,
- 2. Venue: Beijing, China
- 3. Theme: Terrestrial Ecosystems in a Changing World



Chinese Academy of Sciences (CAS)



The Academy of Sciences for the Developing World (TWAS)



World Meteorological Organization (WMO)



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