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June 28-30, 2004, Beijing, China

Chinese-American Oceanic and Atmospheric Association

COAA 2003 Annual Meeting

Celebrating 10 Years of Progress

Date: October 25, 2003 (Saturday) 9:30 am— 5 p.m.

Place: Scullen Room, Pangborn Hall
Catholic University of America
Washington D.C

For information about COAA, Please go to: http://www.coaaweb.org

--- *Direction to the Restaurant* ---

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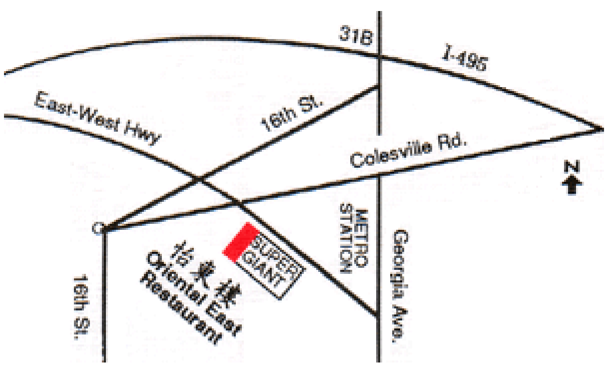

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301-614-6104 (NASA/GSFC) chao@bowie.gsfc.nasa.gov

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301-614-5141 (George Mason Univ) lchiu@gmu.edu

Dr. Xiaofeng Li ------ *Co-Chair*
301-763-8177 (NOAA/NESDIS) xiaofeng.li@noaa.gov

Dr. Frank H-P Pao
202-319-6142 (Catholic Unic. Of America) pao@cau.edu

Dr. Colin Y. Shen
(202) 767-2291 (NRL/GFD) shen@ccf.nrl.navy.mil

Dr. Chung-Lin Shie
(301) 614-6312 (UMBC/GEST) shie@agnes.gsfc.nasa.gov

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--- NOTES ---

with Java OceanAtlas and Ocean Data View). The clients will use a "Web browser" to browse the Argo CD-ROM discs and "Acrobat Reader ™" to view, navigate, and print documents in the Adobe Portable Document Format (PDF) within a web browser. The CDs will be platform and operating system independent and inter-operatable among browsers as well. It will provide assertive technology accommodations and services to persons with disabilities and ensure people with disabilities have equal access to Argo data and information.

Dr. William Y. Tseng

301-763-8142 x124 (NOAA/NESDIS) william.tseng@noaa.gov

Dr. Song Yang

301-763-8000 x 7012 (NOAA/NWS) song.yang@noaa.gov

Dr. Da-Lin Zhang

301405-2018 (UMD) dalin@atmos.umd.edu

Mr. Yuejian Zhu

301-763-8000 x7275 (SAIC at NOAA) yuejian.zhu@noaa.gov

CORPORATE MEMBERS

International Oceanic and
Atmospheric R&D Foundation
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Oral Session-O 4

GLOBAL ARGO DATA REPOSITORY: A GATEWAY TO ARGO DATA, INFORMATION, AND SERVICE

Charles Sun
NOAA/National Oceanographic Data Center
1315 East-West Highway, Silver Spring, Maryland 20910
E-Mail: Charles.Sun@noaa.gov Phone: 301-713-3272 ext. 111

A long-term archive for Argo data, developed at the U.S. National Oceanographic Data Center (NODC), is presented in this paper. Argo data include real-time and delayed-mode profiles of ocean temperature and salinity (and conductivity, if any) measured by the Argo profiling floats. The purpose of this paper is to describe the development of a system for acquiring, preserving, and disseminating Argo data and information to the public.

In the year 2000, a global array of approximately 3,000 free-drifting profiling floats, known as the Argo Ocean Profiling Network, was planned as a major component of the ocean observing system. Argo originated from the need to make climate predictions on both short and long time scales and has led to international participation and collaboration to ensure global coverage. Centers to handle the data collected by profiling floats have been established in a number of countries. All Argo data are publicly available in near real-time via the GTS (Global Telecommunications System) and in scientifically quality-controlled form with a few months delay.

Two Argo Global Data Assembly Centers (GDACs), the US GODAE (Global Ocean Data Assimilation Experiment) Argo server and the French IFREMER (Institute for Research and Exploitation of the Sea) Argo server, are established to assemble the near real-time Argo data and provide them to the Argo users in a timely manner. The U.S. National Oceanographic Data Center (NODC) operates the long-term archive, also known as the Global Argo Data Repository (GADR), for Argo data. The GADR has the responsibilities for (1) preserving the data passed to the US NODC, (2) managing updates to Argo data that are re-analyzed some time later and for which corrections may be applied and (3) providing high quality Argo data to a wide variety of users in a timely and useful manner.

Argo data are available both online to clients with high speed Internet access and on CD-ROM discs to those who have poor Internet connections. The data served by the GADR are in the NODC netCDF format (fully compatible with ncBrowse) and the tab-delimited spreadsheet text format (compatible channel in the Bay. These model results are consistent with the salinity data collected during hydrographic surveys. However, ROMS with Mellor-Yamada turbulence scheme produces a vertical stratification weaker than the observations. We have run the model using three other turbulence closure schemes and examined the sensitivity of estuarine dynamics to the mixing parameterization. Our sensitivity study highlights the need to develop new turbulence parameterization scheme in coastal ocean models.

Dr. Ming Li is an Associate Professor at Horn Point Lab, the University of Maryland Center for Environmental Science. He obtained a B.Eng. degree in Fluid Mechanics from Hohai University and a Ph.D. degree in Geophysical Fluid Dynamics from the University of Oxford. His research focuses on upper-ocean dynamics, estuarine/coastal circulations, turbulent mixing processes and biological/physical interactions. Before moving to Maryland in 2001, he was a Research Scientist at the Institute of Ocean Sciences on the West Coast of Canada.

Welcome

Dear Participants:

On behalf of the organizing committee, we welcome you to the COAA 2003 annual meeting. Over 20 papers will be presented, covering data analysis, modeling, remote sensor and algorithm development of atmospheric, oceanic and hydrologic research and applications, and system development. In celebration of COAA's tenth anniversary, we have invited the founding president to talk about the beginning and the current president to review past activities and developments. A number of corporate members will participate in a panel discussion "Industry Trends in Research and Application of atmospheric, oceanic and earth sciences" to keep us abreast of professional development opportunities.

The committee has worked hard to produce a balance program, negotiated a good menu for the conference dinner, and most of all, have worked colleaguial and coming up to the challenge whenever needs arise, making the organizing of this meeting a truly enjoyable experience.

We thank the School of Engineering, the Catholic University of American for cosponsoring and hosting this meeting, Dean Charles Nguyen for his enthusiasm, Bridget Sheridan for her excellent logistics support and Yixiang Nie for producing the conference program in its present form.

Have a good meeting!

Long S. Chiu and Xiaofeng Li

Program Co-Chairs

AGENDA

9:00-9:30 AM:	Registration and Breakfast
9:30-9:35 AM:	Logistics: Frank Pao
9:35-9:40 AM:	Welcome from COAA President: Dalin Zhang
9:40-9:45 AM:	Welcome from CUA: Charles C. Nguyen, Dean of Engineering
9:45-10:00 AM	The Founding of COAA: Paul Hwang
10:00-10:15 AM	COAA: Ten years in retrospective: Dalin Zhang
10:15-10:30 AM	SCOOL Report: S. K. Yang
10:30-10:45: AM	--- Coffee Break and poster set up ---
10:45-11.45AM:	Panel Discussion: "Industry Trends in Research and Application of atmospheric, oceanic and earth sciences" Moderator: S. K. Yang Panelist: Michael Yeh, Caelum Research, Chieh-san Cheng, GST and Richard August, RSIS.
11:45- 12:30 PM	Poster Session summary, Chair: Dr. Xiaofeng Li
12:30-2:20 PM	--- Lunch and Poster Session ---
2:20-3:20 PM	Oral Session I: Atmosphere; Chair: Prof. Zhanqing Li
3:20–3:40 PM	--- Coffee Break ---
3:40-4:40 PM	Oral Session II: Ocean and Earth System; Chair: Dr. Dongliang Yuan
4:40 PM	Announcement of New board members
4:45 PM	Day Conference Adjourned
4:45-5:00 PM	Executive Session —— All board members

Dinner Banquet at Oriental East Restaurant, Silver Spring, MD (6:30-9:00 PM)

6:00-6:30 PM	Reception
6:30 PM	Dinner
6:45 PM	"Zheng-He: An Overview of His Excellent Accomplishments and What We Must Do about It" —— James Whang
7:30 PM-	President's report —— Dalin Zhang
7:45 PM-	Presentation of Awards —— Award committee
7:50 PM-	Remarks by Past COAA Presidents
8:20 PM	Lucky Draws
8:30 PM	Concluding Remarks —— New COAA President
9:00 PM	Adjourned

Oral Session-O 3

Development of a new hydrodynamic model for the Chesapeake Bay using ROMS

Ming Li[1] and Lijun Zhong[2]
Horn Point Lab., University of Maryland CES, Cambridge, MD 21613.
[1]Phone: 410-221 8420. Fax: 410-221 8490. Email: mingli@hpl.umces.edu
[2]Phone: 410-221 8232. Fax: 410-221 8490. Email: lzhong@hpl.umces.edu

The Chesapeake Bay is America's largest and most biologically diverse estuary. Because of an oversupply of nutrients, water quality and living resources in the Bay have been in a dramatic decline over the last few decades. Current efforts to predict the impact of nutrient loading to the Chesapeake Bay rely exclusively on a coupled hydrodynamic-water quality model developed by the U.S. Army Corp of Engineers. Since management decisions depend critically on model recommendations, we have initiated the development of a new coupled hydrodynamic and water quality/ecosystem model for the Chesapeake Bay estuary.

In this talk I will report on the development of the hydrodynamic model. We have adapted the state of the art Regional Ocean Modeling System (ROMS) to the Chesapeake Bay. ROMS is a free-surface, hydrostatic, primitive equation ocean model that uses stretched, terrain-following coordinates in the vertical direction and orthogonal curvilinear coordinates in the horizontal direction. We have designed a grid system that not only resolves complex coastlines but also a narrow deep channel in the Bay where most of estuarine return flow takes place. The model has 20 layers in the vertical direction.

Using the sea-level records obtained at tidal stations outside the Bay mouth and observations of stream flows at the heads of various tributaries, we have run the hydrodynamic model for the high runoff year of 1996. The ROMS model produces many gross features that are similar to those seen in observations. The model has produced accurate predictions for sea level heights and barotropic tidal currents in the Bay. Co-range and co-phase lines of the semi-diurnal M_2 tide are in excellent agreement with those constructed from tidal gauges and data-assimilative barotropic models. The ROMS model has also produced realistic-looking salinity and residual current fields. Tidally-averaged residual currents reveal a two-layer circulation with net seaward motion in the surface layer and net landward motion in the bottom layer. This two-layer estuarine circulation is however modified due to the effects of the Coriolis force. Isohalines at the sea surface show a lateral tilt. As the fresh water plume moves seaward along the western shore, the saline oceanic water moves landward along the eastern shore and through the deep

03/64-present	Professor, Department of Civil Engineering, CUA, Washington, DC
	Associate Professor, Department of Aerospace & Atmospheric Science, CUA
	Assistant professor, Department of Space Science & Applied Physics, CUA
06/63-02/64	Research Associate, Department of Mechanics, The Johns Hopkins Univ.

Areas of Research Interests:

Environmental fluid mechanics, water resources engineering, energy engineering, meteorology, physical and dynamical oceanography, clean combustion of solid fuels and wastes, and instrumentation

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Poster Session 1

Inhomogeneous Response of Tropical Tropospheric Pressure Surface to an ENSO Anomalous Forcing

Wilbur Y. Chen, CPC

The tropical troposphere is known to respond sensitively to an El Nino/Southern Oscillation (ENSO) anomaly. The zonal average of the response over the entire tropical strip has been used in a variety of analyses, based on the assumption that the atmosphere diffuses heat rapidly so as to eliminate pressure gradients and result in a rather homogeneous pressure surface. In contrast, this investigation reveals a rich zonal characteristics, which includes a three-time larger response over the region directly above the ENSO anomaly than over the nearby warm-pool region during the growing and decaying stages of the response. Most significantly, the much large response above the source region extends from November to the following May before realizing an appearance of a zonal homogeneity. Furthermore, the magnitude of the zonal difference in response is even larger than the response of the zonal mean to the same underlying anomalous forcing. Associated with this zonally non-uniformed response, numerous remarkable spatial and temporal characteristics can be found in the pressure surfaces of the tropical troposphere.

Wilbur Chen
Affiliation: NOAA
Tel: 301 763 8000 ext 7520
Fax: 301 763 8395
Email Address: Wilbur.Chen@noaa.gov

Poster Session 2

Simulated SCSMEX & KWAJEX Convective Systems Using a Goddard Cumulus Ensemble (GCE) Model

Chung-Lin Shie[1,2], Wei-Kuo Tao[2], and Joanne Simpson[2]

[1]UMBC/Goddard Earth Sciences and Technology Center
[2]Laboratory for Atmospheres
NASA/Goddard Space Flight Center
Greenbelt, MD 20771

E-mail: shie@agnes.gsfc.nasa.gov
TEL: 301-614-6312 FAX: 301-614-5492

In recent years, increasing attention has been given to cloud resolving models (CRMs or cloud ensemble models-CEMs) for their ability to simulate the radiative-convective system, which plays a significant role in determining the regional heat and moisture budgets in the Tropics. The growing popularity of CRM usage can be credited to its inclusion of crucial and physically relatively realistic features such as explicit cloud-scale dynamics, sophisticated microphysical processes, and explicit cloud-radiation interaction. On the other hand, impacts of the environmental conditions (for example, the large-scale wind fields, heat and moisture advections as well as sea surface temperature) on the convective system can also be plausibly investigated using the CRMs with imposed explicit forcing.

In this paper, by basically using a Goddard Cumulus Ensemble (GCE) model, a handful of real tropical convective episodes occurring during two of several major TRMM (Tropical Rainfall Measuring Mission) field experiments, i.e., the 1998 South China Sea Monsoon Experiment -- SCSMEX, and the 1999 Kwajalein Atoll field experiment -- KWAJEX, have been studied. Our simulations include two SCSMEX episodes (one of the summer monsoon onset period during May 18-26, 1998, and one of the post-onset period during June 2-11, 1998), as well as three active KWAJEX episodes (Aug 7-12, Aug 17-21, and Aug 29-Sep 13, 1999). The focus of this paper is to study several major atmospheric characteristics such as the surface rainfall amount, the cloud structure, sensible/latent heat fluxes contribution, the Q1/heat and Q2/moisture structures (as well as their associated convective/stratiform distributions) that occur during these various episodes. These GCE-simulated fields have also been compared to radar and sounding observations. The comparison that generally shows a good agreement will be presented.

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Oral Session-O 2

High Precision Water Level Sensing System

H.P. Pao, S.C. Ling, L. Sun
The Catholic University of America
School of Engineering Washington, DC 20064

Edward W. Ling
Lintronic Systems Ltd.9 Newbury Street, London EC1A 7HU, U.K.
Tel: 202-319-6142, Fax: 202-319-6677, Email: pao@cua.edu

The current state-of-the-art sensing systems being used for water-level measurements are far from satisfactory. This paper will present a new precision water level sensing system. The most important advantage of the proposed water level sensing system is its accuracy with a unique capability of pre-filtering out the "noises" generated by wind waves, swells and other disturbances in rivers and coastal waters. Such advantage is uniquely benefited from the adoption of a traveling-wave filter in the design of the sensing system. The analog filter thus processes extremely low noise and allows accurate water level to be measured. The targeted goal of this new system shall achieve a 1-mm resolution for water level determination. The traveling-wave filter possesses a very good high frequency cutoff characteristic, which, in theory, is far superior to the traditional digital filter. A natural question arises: what would be the measurement accuracy, if one uses digital signal processing techniques to process the highly noisy signal. This leads to a proposed study to utilize the latest digital signal processing techniques to treat the directly measured highly noisy water-level signals, and the result will then be compared with the water level directly determined from the new sensing system with the analog traveling-wave filter. This comparison is of highly scientific importance. This will answer the puzzling question: whether an analog pre-filter is superior to the latest digital signal processing techniques.

Keywords: Water level sensing system, analog filter, digital filter, noisy signals.

Presenting author: Dr. H.P. Pao, Professor, Department of Civil Engineering
The Catholic university of America, Washington, DC 20064
Education:

Ph.D. Fluid Mechanics, The Johns Hopkins University, 1963
B.Sc. (Engr.) Civil Enginering, National Taiwan University, 1956

Professional Experience:

Oral Session-O 1

The Three-Gorges Dam Project: Status and Prospect

Benjamin F. Chao

Space Geodesy Branch, NASA Goddard Space Flight Center,
Greenbelt, Maryland, 20771, USA

China's Three-Gorges Reservoir has already started the process of water impoundment in phases. By 2009, 40 km3 of water will be stored behind one of the world's highest dams and spanning a section of middle Yangtze River about 600 km in length. I will give an update of the status and discuss the various issues related to the Project. These include the electric power generation, flood control, ecologic impacts, silting problems, seismic and the geological hazards, river navigation, archeological sites immersion, tourism, and none-the-least relocation of over 1 million people. Before one forms an opinion toward the Project, it is imperative for one to have a complete set of information and to realize and appreciate the relative significance of all the issues.

Benjamin F. Chao is currently Head, Space Geodesy Branch/Code 926 at NASA/GSFC.

1975-1981: Research Assistant, Scripps Institution of Oceanography, University of California, San Diego
1981-1983: NAS/NRC Research Associate, Geodynamics Branch, NASA GSFC
1983-1996: Geophysicist, Geodynamics Branch
1992-1994: On detail NASA Headquarters, NASA Geophysics Program Manager/Code YSG

He received his B.S. in 1973 in Physics from the National Taiwan University, ROC and his Ph.D. in1981 in Earth Sciences from the Scripps Institution of Oceanography, University of California, San Diego.

His research interests include Earth/Planetary rotation dynamics and gravitational variations, Global changes in geophysical fluids, Global geophysics and seismology, Digital data analysis and inverse/inference theories.

Dr. Chung-Lin Shie received his B.S., M.S., and Ph.D. in atmospheric sciences/meteorology from National Taiwan University, Pennsylvania State University, and Florida State University, respectively. He is currently an associate research scientist at UMBC/GEST, NASA/GSFC.

His current research interest mainly involves numerical simulations of Tropical radiative-convective systems, as well as the study of cloud interactions with large-scale environment, using 2- and 3-dimensional Goddard Cumulus Ensemble (GCE) models.

During his early career, Dr. Shie had also worked on a remote-sensing project that involved the development of an EOF (Empirical Orthogonal Functions) model for surface humidity retrieval over the global oceans using the SSM/I (Special Sensor Microwave Imager) precipitable water data.

Dr. Shie is also an amateur Chinese Calligraphy teacher during his leisure time.

Poster Session 3

Rainfall Characteristics and Kinematic Structure of an MCS Observed During the Onset of South East Asia Monsoon

Jian-Jian Wang
Goddard Center for Earth Science and Technology,
University of Maryland Baltimore County
Mesoscale Atmospheric Processes Branch, Code 912,
NASA/GSFC, Greenbelt, MD 20771

The evolution and structure of a mesoscale convective system (MCS) in the South China Sea (SCS) region are documented for the first time mainly using the dual-Doppler radar dataset collected during the South China Sea Monsoon Experiment (SCSMEX) in 1998. In particular, this study focuses on the convection associated with the subtropical frontal passage during the early onset of South East Asian Monsoon (SEAM).

The onset of SEAM in 1998 started on 15 May when the two branches of southwesterly tropical airflow arrived in the northern SCS. At the same time, a southeastward moving frontal system from mainland China moved to the monsoon onset area. Different from the frontal rainband prior to the SEAM onset that dissipated rapidly after passing the coastal region, this frontal system was able to produce heavy rainfall in the SCSMEX radar observational domain with significant local intensification. The interaction between the tropical monsoon flow and the frontal circulation played an important role to the organization and structure of the mesoscale convection. In the pre-frontal region, the southwesterly monsoon flow converged with the original southwesterly frontal flow to generate a northeast-to-southwest oriented convective line. In the post-frontal region, the southwesterly monsoon flow converged with the northerly frontal flow to produce a wide convective line with an east-to-west orientation. In addition, the convergence between the southerly monsoon flow and the northerly post-frontal flow generated a deeper and stronger low-level convergence. Thus, the post-frontal convection was more intense and taller than the pre-frontal convection.

The precipitation and kinematic structure of the MCS are studied with special attention on their significant departures from the archetypal tropical oceanic MCS. On 15 May, both pre- and post-frontal convection showed a straight upward rainfall and updraft pattern with little tilt as a result of moderate vertical wind shear. In the pre-frontal region, the maximum low-

Oral Session-A 4

A New Intermediate Coupled Model for El Niño Simulation and Prediction

Rong-Hua Zhang
Earth System Science Interdisciplinary Center,
University of Maryland, USA

A new intermediate coupled model (ICM) is developed and used to simulate and predict sea surface temperature (SST) variability in the tropical Pacific. The ocean component is based on an intermediate complexity model developed by Keenlyside and Kleeman (2002) that is an extension of the McCreary (1981) baroclinic modal model to include varying stratification and partial nonlinearity effects, allowing realistic simulation of the mean equatorial circulation and its variability. An empirical procedure is developed to parameterize subsurface entrainment temperature (Te) in terms of sea surface pressure (SSP) anomalies. The ocean model is then coupled to a statistical atmospheric model. The coupled system realistically produces interannual variability associated with El Niño. Hindcasts are made during the period 1980-1997 for lead times out to 12 months. Observed SST anomalies are the only field to be incorporated into the coupled system to initialize predictions. Predicted SST anomalies from this model do not show obvious systematic biases. Another striking feature is that the model skill beats persistence at all lead times over the central equatorial Pacific.

Dr. Rong-Hua Zhang is an Associate Research Scientist at Earth System Science Interdisciplinary Center (ESSIC), University of Maryland, working on data analyses and modeling of earth system. He obtained his BS degree from Zhejian University (formerly Hangzhou University), and his MS and Ph.D. from the Institute of Atmospheric Physics/Chinese Academy of Sciences, (Beijing, China), respectively. His research intersts include modeling of large-scale ocean circulation and air-sea interaction associated with interannual and decadal climate variability and predictability, and has performed extensive and intensive studies in modeling and data analyses. Recently he has engaged in evaluating and improving ocean models for better simulation and prediction of sea surface temperature (SST). Currently, he is working on developing and improving a new intermediate and hybrid embedded coupled models for better El Nino prediction.

Oral Session-A 3

Regulation of the Atmospheric Temperature Over the Ocean

S.C. Ling and H.P. Pao

The Catholic University of America
School of Engineering, Washington, DC 20064
301-593-3026; 202-319-6142
Fax: 202-319-6729; 202-319-6677
E-mail: ling@cua.edu; pao@cua.edu

Since the ocean covers two thirds of the earth's surface, and the thermal capacity of the ocean is large with respect to that of the atmosphere, the regulation of the atmospheric temperature over the ocean is strongly affected by the ocean. Based on existing detailed knowledge of the mechanics of sea-air interface under all sea states, it is possible to find the first-order average magnitudes of heat transfer coefficients for various modes of radiative, convective and latent heat transfer processes. From this study, one finds that the earth's mean surface temperature should be regulated by storms at $288^{o}K$ $\pm$ a few percent, and the CO_2 content in the atmosphere plays no detectable role on this temperature.

Keywords: Atmosphere, ocean, temperature regulation.

Presenting author: Dr. S.C. Ling, Professor, Department of Biomedical Engineering
The Catholic University of America, Washington, DC 20064

Education:
Ms and Ph.D. in Engineering Mechanics and Electronics, University of Iowa, 1955.

Professional Experience:

Professor of Biomedical Engineering, 1963-present at The Catholic University of America; Past major contributions to the science of geo-electric fields, mechanics of blood flow in arteries and capillaries, mechanics of heat and vapor transport from ocean to the atmosphere under high sea states, and mechanics of turbulence in fluids. Present research is on clean combustion of solid fuels and wastes. Dr. Ling is the inventor of the hot-film anemometer for flow velocity measurements. He also holds numerous patents in connection with business machineries and electronic computer, fluxgate magnetometer and ultra-precision pressure-gradient measuring device for medical applications. He also holds a patent for fast-response conductivity sensor for use in rivers and oceans.

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level convergence and updraft of the pre-frontal convection was 20-30 km behind instead of within 1-2km to the leading edge. Although the convection was intense with maximum reflectivity over 50 dBZ, the stratiform region was very limited as a result of a dry environmental upper layer. The observed MCS had a tendency to form stratiform rain ahead of the convective rain, and two different modes of the leading stratiform structure were found separately in pre- and post-frontal convection.

Research Interests:

Using remote sensing data collected from field experiments to investigate the characteristics of mesoscale precipitating systems and their interactions with environments; developing data analysis technique to integrate information and synthesize physical processes from varied datasets; establishing standardized procedure to process and analyze remote sensing data to examine the different mechanisms responsible for the formation and evolution of strong convection.

Education:

1990-1995 ------ Ph.D. in Meteorology, University of Hawaii, USA
1987-1990 ------ MS in Meteorology, Peking University, Beijing, China.
1983-1987 ------ BS in Meteorology, Peking University, Beijing, China.

Poster Session 4

Variations of the U.S. and China Precipitation: Regional Manifestations of Large-Scale Patterns of Climate Variability

Song Yang[1], Q. Li[2], R. W. Higgins[1], V. E. Kousky[1], K.-M. Lau[3], and P. Xie[1]

[1]Climate Prediction Center, NCEP/NWS/NOAA, Camp Springs, MD 20746
[2]National Meteorological Center, China Meteorological Administration, Beijing, China
[3]Laboratory for Atmospheres, GSFC/NASA, Greenbelt, MD 20771

Previous studies have shown that tropical North America and East Asia are both "classical monsoon" regions and that there exists a possible climate link between the regions in various seasons on intraseasonal-to-interannual time scales. We have analyzed the Climatic Research Unit precipitation, NCEP/NCAR reanalysis, and other data sets to reveal the difference, similarity, and connective relationship between the U.S. and China precipitation.

While the U.S. precipitation has larger annual total and long-term variability, the China precipitation has a much stronger seasonal cycle. In both U.S. and China, the largest seasonality occurs to the northern flank of monsoon regions. This study confirms the relationship between the U.S. and China precipitation and the large-scale patterns of natural variability especially those associated with El Niño-Southern Oscillation. It emphasizes the importance of Pacific Decadal Oscillation for the U.S. and China climate, especially in fall, and shows that the variability of China precipitation is more closely related to the Artic Oscillation than previously expected.

This study also emphasizes the mutual impact of multiple climate phenomena on the variability of U.S. and China precipitation. It demonstrates that appropriately-constructed indices combining multiple impact factors improve our dynamical understanding of precipitation variability and the skill of precipitation prediction.

Dr. Song Yang received a B.S. in Meteorology from Nanjing Institute of Meteorology in 1983, a M.S. in Tropical Meteorology from Zhongshan University in 1986, and a Ph.D. in Satellite Meteorology from Florida State University (FSU) in 1997. He worked as Postdoctoral scientist at FSU for two years. He took a research faculty position in the Joint Center for Earth Science and Technology (JCET) from 1999 to 2001 and in the Goddard Earth Science and Technology Center (GEST) from 2001-2003 in University of Maryland Baltimore County. He Joined George Manson University as a Research Associate Professor in October 2003. Dr. Yang has participated in many satellite-related projects, in particular, the Tropical Rainfall Measuring mission (TRMM) and the Global Precipitation Measurement (GPM) mission. His primary research interests are remote sensing of precipitation and latent heating, tropical convective systems and climate change, and applications of remote sensing on data assimilations.

Oral Session-A 2

Nucleation in synoptically forced cirrostratus

Ruei-Fong Lin[1,2], David O'C. Starr[2], Jens Reichardt[3] and Paul J. DeMott

[1]UMBC/Goddard Earth Sciences and Technology Center
[2]Laboratory for Atmospheres
NASA/Goddard Space Flight Center

[3]DWD-Meteorological Observatory Lindenberg, Germany
[4]Colorado State University
E-mail: lin@agnes.gsfc.nasa.gov TEL: 301-614-6225 FAX: 301-614-5492

Formation and evolution of a cirrostratus formed within a gentle updraft of 5 cm s^{-1}, is simulated using a one-dimensional numerical model with explicit microphysics, in which the particle size distribution of each grid box is fully resolved. For the cases that the upper troposphere is devoid of ice nuclei (IN) and homogeneous freezing of unactivated aqueous particles are the sole source of ice particle generation, except nucleation that responds to the initial moist layer, nucleation takes place at the cloud top and the nucleation zone is continuous, not pulse-like as some previous studies indicated. Model spatial resolution as high as 1 m is required for the nucleation region in order to get a good estimate of the ice crystal number concentration. For the cases the IN are present and sufficient enough to suppress homogeneous freezing, there are two distinct nucleation regions: at the cloud top, a continuous nucleation region, and in the mid-upper portion of the cloud, an intermittent nucleation region in which ice crystals are formed when RH is on the rise and there are available IN. The depth of both nucleation regions depends on the nucleation coefficients. Furthermore, the model resolution requirement is more relaxed. The effects of different nucleation modes and coefficients on microphysical and optical properties are evaluated.

Dr. Ruei-Fong Lin is currently an assistant research scientist in the Goddard Earth Science and Technology (GEST) Center of University of Maryland, Baltimore County (UMBC). Dr. Lin received her B.S. degree in atmospheric sciences from National Taiwan University (NTU), Taiwan in 1990, and M.S. and Ph.D. in meteorology from Pennsylvania State University in 1993 and 1997. Before joining UMBC, she spent 8 month in NTU working as a post-doctoral research scientist followed by 2 years in University Space Research Association (USRA) as a visiting scientist. Dr. Lin's research interest is cirrus.

Oral Session-A 1

TRMM Rainfall Intercomparison from Methodology Prospective

Song Yang
NASA/GSFC, Code 912.1

Since TRMM satellite was launched 5 years ago, TRMM rain products have been evolved from version 4 to 5 and soon to be version 6. A systematical analysis of TRMM rain products and ground radar measurements will be presented to demonstrate its evolution and validation efforts. The impacts of different methodologies on monthly rainfall will be reported. Results are mostly based on version 6 TRMM rain datasets. The key areas, such as convergence of TRMM rain products from different instruments, variances of rain estimates, the climate trend of precipitation, convective and stratiform rain separation, are the main topics of this presentation. In addition to discuss agreements and disagreements among different retrieval algorithms, efforts have been made to explain these results.

Song Yang
Code 912.1 NASA/GSFC
Greenbelt Maryland 20771
ysong@agnes.gsfc.nasa.gov

Poster Session 5

The Role of Southern Indian Ocean SST on the Asian Monsoon, MJO, and ENSO-Monsoon Association (Abstract being submitted to the 28th Annual CDP Workshop for a poster presentation)

S.-H. Yoo[1]*, S. Yang[2], and C.-H. Ho[1]
[1]School of Earth and Environmental Sciences, Seoul National University, Seoul, Korea
[2]Climate Prediction Center, NCEP/NWS/NOAA, Camp Springs, MD 20746
*Currently visiting scientist to the NOAA's Climate Prediction Center

Email : Soo-Hyun.Yoo@noaa.gov, Tel : 301-763-8000 x7544, Fax : 301-763-8125
Email : Song.Yang@noaa.gov, Tel : 301-763-8000 x7012, Fax : 301-763-8395

The sea surface temperature (SST) in the southern Indian Ocean has been thought to play a weaker role in affecting the Indian summer monsoon than does the equatorial eastern Pacific SST. In this study, we show that the monsoon rainfall is positively and significantly correlated with the preceding spring SST pattern in which cold (warm) SST anomaly appears in southwestern (southeastern) Indian Ocean.

Based on this result, we investigate the role of southern Indian Ocean, where the maximum SST variance of the ocean occurs, in the variability of the Asian monsoon, the ENSO-monsoon association, and the Asia and western Pacific climate. The importance of the relationship between the spring Indian Ocean SST and the Asian summer monsoon becomes more apparent by taking it into account that the ENSO-related SST is only weakly correlated with the monsoon because of the spring predictability barrier. In this study, we also investigate another related issue: the importance of high-frequency SST variability for the variations of the monsoon, the Madden-Julian Oscillation, and the ocean-atmosphere interaction in the Indian and western Pacific oceans.

Song Yang
Climate Prediction Center, NCEP/NWS/NOAA
Camp Springs, MD 20746
Song.Yang@noaa.gov
301-763-8000 x7012

Poster Session 6

Variations of Oceanic Evaporation derived from SSM/I

Long S. Chiu[1] and Yukun Xing[2]
SCS/CEOSR, George Mason University, Fairfax VA 22030-4444
Tel: 703-993-1984; Fax: 703-993-3628 Email: lchiu@gmu.edu
Tel: 703-993-Email yxing@gmu.edu

Alfred T-C. Chang
[1]NASA/GSFC, Code 974, Greenbelt Maryland 20771

Variations of the oceanic water balance were examined using precipitation and evaporation data derived from Special Sensor Microwave Imager (SSM/I) measurements. Over the region 65^0S – 65^0N, oceanic precipitation estimated using the technique developed by Wilheit et al. shows no significant trends while evaporation data obtained from the version 2 of the Goddard Sea Surface turbulent Flux (GSSTF2) data set shows an increase of ~17% over the period July 1988-December 2000.

An Empirical Orthogonal Function (EOF) analysis shows that the first non-seasonal EOF, which explains 9.2% of the variance, is characterized by positive trends in most regions, in particular the subtropical oceanic dry regions, accompanied by small negative trends in the equatorial warm pool and the eastern equatorial Pacific. An Empirical Mode Decomposition (EMD) shows the long term trend as the dominate mode, followed by a Quasi-biennial mode with a period of 28-32 months. The positive trend started around 1990 and increases at a rate of ~1.5% per year. This pattern is consistent with the moistening of the regions of upward motion and drying of the subsidence regions in the tropics that are associated with the strengthening of the tropical Hadley and Walker circulations as suggested from satellite radiation budget analyses. The second EOF, explaining 5.7% of the variance, is characterized by an equatorial east-west and a mid ocean north-south dipole in the Pacific. This pattern is similar to the First EOF pattern of oceanic precipitation found in earlier studies, and is correlated to a Southern Oscillation Index at 0.74, which is significant at the 95% confidence level.

Key words: Global oceanic hydrologic cycle, Oceanic evaporation, GSSTF2, SSM/I

Long S Chiu received his B. S. in Physics from the University of Miami, Florida in 1974 and Sc. D. in meteorology from MIT in 1980. Currently, he is Associate Professor of Earth Observation and Remote Sensing at the Center of Earth Observing and Space Research,

Poster Session 13

Asian Dust, Pollution, and Biomass Burning and Their Impact on Regional Climate

Zhanqing Li[1] and S-C. Tsay[2]

[1]Dept. of Meteorology & ESSIC, University of Maryland, College Park, MD, USA
[2]Laboratory for Atmospheres, NASA GSFC, Greenbelt, MD, USA

Asia, especially the East and Southeast parts are experiencing rapid environmental changes due in part to high density of population and fast economic development. Air pollution, dust storm and biomass burning are among the most severe environmental events that could have a profound influence on the regional climate. Unraveling the relation and interaction between environmental and climatic changes has direct bearing on policy-making and the well-being of billions of people living in the region. To this end, two regional experiments will take place in China and Thailand that are led by the authors. They include EAST-AIRE (the East Asian Study of Tropospheric Aerosol, an International Regional Experiment) and BASE-ASIA (the Biomass-burning Aerosol in South East-Asia: Smoke Impact Assessment). This presentation will provide background information, the project plans and some preliminary results.

Dr. Zhanqing Li is a professor in the Dept. of Meteorology and ESSIC at the University of Maryland. He received his Ph.D. degree from McGill University in 1991 and MSc and BSc from the Nanjing Institute of Meteorology in 1986 and 1983 respectively. Before joining UMD in 2001, He worked at the China Meteorological Administration, the Canadian Meteorological Services, and the Canada Center for Remote Sensing.

His primary expertise is on remote sensing of atmospheric and surface variables and their applications in modeling for pursuing climate change and environmental studies. He has published about 100 peer-reviewed papers on cloud, radiation, aerosol, UV, biomass burning, etc., and has received 6 merit awards.

Currently, he is leading a team of 10 scientists including 7 Ph.D students working on various projects. Today, he will introduce a million-dollar project funded by NASA dealing with Asian aerosol problem.

Poster Session 12

Continuing Enhancement of the WSR-88D Precipitation Processing System

Tim O'Bannon, NOAA/NWS/Radar Operations Center, Norman, OK
Feng Ding, RS Information Systems/Hydrology Laboratory, Office of Hydrologic Development, NOAA-NWS, Silver Spring, MD

Significant enhancements are being planned for the Weather Surveillance Radar, 1988 Doppler (WSR-88D) Precipitation Processing System (PPS) in the near future. The Radar Operations Center (ROC) and NWS Office of Hydrologic Development (OHD) have collaborated in the development of PPS software that removes range dependent biases based on the vertical profile of radar reflectivity, more skillfully removes contamination from anomalous propagation (AP) ground clutter, refines the mitigation of radar beam blockage, removes biases caused by inadvertent operator interaction, and facilitates the operational application of new optimized radar scan strategies. The enhancements are scheduled to be deployed in the Spring of 2004. The authors will discuss and graphically illustrate the coming PPS enhancements.

Dr. Feng Ding is Meteorologist, RS Information Systems/Hydrology Laboratory, Office of Hydrologic Development, NOAA-NWS, Silver Spring, MD, (Jan. 2002 – present) specializing in radar meteorology, multi-sensor precipitation estimation, an Research Assistant, Dept. of Marine, Earth and Atmospheric Science, North Carolina State University, Raleigh, NC (Aug. 1996 - Jul. 2000) working on Large-eddy simulations of the atmospheric boundary layer and aircraft wake vortex and a Research Assistant, Chinese Academy of Meteorological Sciences, Beijing, China (Mar. 1990 - Aug. 1996) working on Satellite meteorology, radar meteorology and precipitation estimation.

He received his M.S., Computer Science, December 2001 from George Washington University, Washington, DC; his Ph.D., Atmospheric Science, July 2000. North Carolina State University, Raleigh, NC; M.S., Atmospheric Physics, March 1990 from Chinese Academy of Meteorological Sciences, Beijing, P. R. China and B.S., Atmospheric Physics, July 1987 from Peking University, Beijing, P. R. China.

School of Computational Sciences, George Mason University and member of the Hydrology Data Support Team at the DAAC and the GPCP/Polar Satellite Precipitation Data Center at GSFC. His research interests include satellite remote sensing and analysis of precipitation, diagnostic studies of the general circulation and hydrologic cycle, development of science data and information systems, and efficient and cost-effective dissemination of remote sensing data to research and application users.

Poster Session 7

What Has Caused the Water off the East Coast of the United States Extraordinarily Cold This Summer?

Dongliang Yuan and Andrey K.Savtchenko
DAAC, Goddard Space Flight Center, Greenbelt, MD 20771

2003-

The cold water event off the east coast of the United States this summer is investigated using Moderate Resolution Imaging Spectroradiometer (MODIS) measurements, combined with conventional coastal sea level and wind measurements. Several hypotheses are examined, including influence from the Gulf Stream and its eddies, excessive precipitation, cold water intrusion from the north, and coastal upwelling. It is suggested that the cold water is primarily due to strong coastal upwelling generated by the extraordinarily strong and persistent south-southwesterlies along the North Carolina-Florida coast this summer.

Dr. Yuan, Dongliang graduated from Beijing University Department of Mechanics in 1988 and received his M.S. degree in oceanography from Institute of Oceanology, Chinese Academy of Science in Qingdao, China. He got his Ph. D. degree from the Florida State University in 1995. His past experience includes studies of ocean circulation in the Asian marginal seas, in the Gulf of Mexico, and in the equatorial Pacific Ocean. His research interests are the dynamics and thermodynamics that control the variations of ocean circulation and sea surface temperature. His past position includes a postdoctoral position at Florida State University, a visiting scientist position at University Space Research Association, and an assistant research scientist position at University of Maryland, Baltimore County. He is currently holding a scientist position at Goddard DAAC to support the scientific use of MODIS data.

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Telephone: (301)405-8253 Fax: (301)314-9482 e-mail: quanan@atmos.umd.edu

EDUCATION
B.S., Microwave Spectroscopy Specialty, Department of Physics, Jilin University, China, 1966
Ph.D., Physical Oceanography, Institute of Oceanology, Academia Sinica 1987.

PROFESSIONAL EXPERIENCE
Before 1991 The First Institute of Oceanography, State Oceanic Administration, China
1991-2003 College of Marine Studies, University of Delaware
Senior Research Scientist, Department of Meteorology, University of Maryland, alsoAdjunct Senior Research Scientist, Lamont-Doherty Earth Observatory, Columbia University

RESEARCH EXPERIENCE AND INTERESTS
Satellite Oceanography, Physical Oceanography, Microwave Remote Sensing Physics, SAR Applications, Altimeter Applications, Equatorial Waves, Large-Scale Ocean-Atmospheric Coupling, Solitary Waves, Coastal and Estuarine Dynamics.

Poster Session 11

Satellite SAR Detection of Jet-Like Features of Delaware Bay Plumes

Quanan Zheng
Department of Meteorology, University of Maryland, College Park, MD

Pablo Clemente-Colón
NOAA/NESDIS, E/RA3, Room 102, WWBG, 5200 Auth Road,
Camp Springs, MD

W. Timothy Liu
Jet Propulsion Laboratory 300-323, California Institute of Technology,
Pasadena, CA

From the physics of radar imaging of ocean surface processes, we derived a theoretical model for the radar imaging of an ocean jet. The theoretical model predicts the jet current structure, $\operatorname{sech}^2\eta$, which constitutes a determining factor for the radar image. The modeled image intensity depends on the axial velocity, decreasing as x^{-1} along the jet axis, and is sensitive to the wind direction with respect to the jet axis. We used the model to interpret SAR (Synthetic Aperture Radar) images of Delaware Bay plumes taken by RADARSAT-1 (Canadian Radar Satellite) and ERS-2 (European Remote Sensing satellite) satellites during a period from summer 1996 to spring 1997. In all seasons, the low salinity plumes appear as relatively bright, jet-like patterns on SAR images. From a morphological interpretation of the image features, both summer and winter plumes can be divided into three sections along the axis: the source, jet, and dispersion region. Along the transverse direction, SAR image interpretations indicate that the plumes have a double jet structure, which conforms to decomposition of field measurements. In summer, the typical axial velocity is estimated at 6×10^{-1} m s^{-1} with a Reynolds number of 18. At about 5 km downstream from the source, the plume behaves like a turbulent jet, and beyond that range down to about 10 km downstream, like a laminar jet. In winter, the plumes become weaker than in summer. The typical axial velocity is estimated at 4×10^{-1} m s^{-1} with a Reynolds number of 3. The jet behaves like the laminar jet off the source down to about 4 km downstream. Unlike the summer and winter cases, in spring the plume appears as an integrated body with relatively uniform bright tunes on the SAR image. In all cases, the plume disperses within about 25 km downstream.

QUANAN ZHENG
Dept. of Meteorology, University of Maryland, College Park, MD 20742

Poster Session 8

Investigations of Anomalous Cold Water along Mid-Atlantic Coast during 2003 Mid-Summer

Menas Kafatos, Donglian Sun, Zhong Liu, Long Chiu
Ruixin Yang and Ramesh P. Singh

Center for Earth Observing and Space Research
School of Computational sciences
George Mason University, Fairfax, VA 22030 USA

Correlation analyses using multiple data sources, including remote sensing data sets of sea surface temperature (SST) from the Tropical Rainfall Measurement Mission and ocean surface vector winds from NASA's QuikSCAT, are used to study the cause of cold SST along the Mid-Atlantic coast, along with buoy observations and various weather parameters. The present analysis shows that along the Virginia coast, the coastal upwelling driven by weather influence is the dominant factor, with correlation between SST and an upwelling index of –0.53. River runoff is of secondary importance, with correlation of –0.39. Along the North Carolina coast, the river runoff is a major factor with correlation of –0.55, and coastal upwelling shows no significant correlation. The cold advection from the North Atlantic Ocean contributes to the frigid water along the Mid-Atlantic coast from 3 to 6 July 2003.

Donglian Sun
Research area: Satellite remote sensing, surface temperature, land surface temperature diurnal cycle, numerical models, climate change and climate variability, and coastal research.

EDUCATION:
Ph.D., May 2003, University of Maryland, College Park, MD
M.S., May 1998, University of Maryland, College Park, MD
M.S., May 1989, Chinese Academy of Meteorological Sciences, Beijing, China
B.S., July 1986, Nanjing Institute of Meteorology, Nanjing, China

Experience:
Sientist (06/01 Present), George Mason University
Senior Software Engineer (05/00 06/01), Titan/AverStar, Vienna, VA,
Senior Scientist (02/1998 05/00), Raytheon ITSS Corporation, Lanham, MD
Research Assistant (08/1996-12/2002), University of Maryland, College Park, MD
Assistant Research Scientist (05/1989-08/1996), National Satellite Meteorology Center, Beijing, China

Research interests: Remote sensing, data analysis, numerical modeling and visualization and analysis tools development

Poster Session 9

Monitoring of Air Pollution from Space

D. A. Chu, L. A. Remer, Y. J. Kaufman
NASA Goddard Space Flight Center

Jim Szykman, Fred Dimmick, Richard Wayland, David Williams
US Environmental Protection Agency

Jassim Al-Saddi, Bryan Baum
NASA Langley Reearch Center

MODIS sensors onboard the EOS Terra and Aqua satellites launched in 1999 and 2002 provide the revolutionized perspectives to study the Earth systems. MODIS ability to derive the first aerosol product over land has advanced our understanding of aerosols into the source regions. The analysis of MODIS-derived columnar aerosol loading has shown good correlation (correlation coefficient ~0.8-0.9) with EPA $PM_{2.5}$ (particulate matter with particle size less than 2.5 μm) at surface in metropolitan areas (e.g., New York City, Chicago, Houston, etc.) and also over broad regions including 11 states and Washington DC. At present, the EPA, along with Regional Planning Organizations, and state and local governments use a multitude of decision support tools to assess, control, and report the nature of air pollution related to PM (particulate matter). However, the current existing air quality decision processes solely rely on urban scale model and ground-based network. Using MODIS aerosol data can aid significantly in tracking the movement of pollutants, which can be used as a proxy of $PM_{2.5}$ for regions without ground measurements. NASA GSFC is collaborating with LaRC/EPA/NOAA in providing MODIS aerosol data to benchmark $PM_{2.5}$ forecast in the East US in September 2003. This activity is to prototype similar activities in the following years using MODIS direct broadcasting to study transport (national, international, or intercontinental) issues and to assess performance effectiveness of existing air quality regulations. Improvements of MODIS aerosol algorithm are also planned to achieve better spatial resolution for urban pollution and health-related studies.

Dr. Chu is a research scientist with SSAI supporting research at the Goddard Space Flight Center. Besides satellite aerosol retrieval, sensor analysis, and radiative transfer simulations, Dr. Chu's research is recently focus on the link between MODIS-derived columnar aerosol loading and PM mass concentration measured at surface for air quality application.

Poster Session 10

A Study of Internal Solitary Wave Converting Polarity using Satellite Images

Zhongxiang Zhao[1], Victor V. Klemas[2] and Quanan Zheng[3]

Graduate College of Marine Studies, University of Delaware,
Newark, DE 19716
[1]Tel: (302) 831-4697, Fax: (302) 831-6838, E-mail: zzhao@udel.edu
[2]Tel: (302) 831-8256, Fax: (302) 831-6838, E-mail: klemas@udel.edu
[3]Tel: (302) 831-4698, Fax: (302) 831-6838, E-mail:
zheng@newark.cms.udel.edu
(On leaving to: University of Maryland, College Park, MD)

Internal solitary waves (ISWs) may have two opposite polarities: either depression or elevation, depending on the sign of the quadratic nonlinearity coefficient. It was suggested that an ISW would reverse its polarity when passing through a turning point. In the northern South China Sea, ISWs of opposite polarities have been observed in a variety of satellite images. In this study, we present a SPOT-3 visible image that observes two contrasting signatures of ISWs: darker stripes leading brighter stripes in the lower part, and brighter stripes leading darker stripes in the upper part. We suggest that the contrasting patterns are caused by ISWs of different polarities. A packet of ISWs is observed in the process of converting polarity due to bottom shoaling, both in the propagation direction and in the transect direction. The evolution process can be obtained by transferring information from the spatial domain to the temporal domain. The conversion process starts with the original depression ISWs passing the 160 m isobath. The evolution process can be divided into two phases: the first is the broadening of the original depression waves and the second is the appearance of the new-born elevation waves. These two phases are simulated by a numerical model of the extended Korteweg-de Vries (EKdV) equation in two-layer ocean model.

Zhongxiang Zhao
Ph. D. candidate, Physical Oceanography, University of Delaware, 2000 ~ present
M. S., Physical Oceanography, The First Institute of Oceanography, National Ocean Administration, Qingdao, China, 1999
B. S., Physics, Shangdong University, Ji'nan, China, 1994

Research interests:
Oceanic internal wave and upper ocean dynamics
Continental shelf dynamics and modeling
Solitary wave dynamics
Satellite data processing and application
SAR image interpretation and application