Atmospheric Teleconnection Patterns And Eddy Kinetic

Comprehensive and up-to-date information on Earth's most dominant year-to-year climate variation The El Niño Southern Oscillation (ENSO) in the Pacific Ocean has major worldwide social and economic consequences through its global scale effects on atmospheric and oceanic circulation, marine and terrestrial ecosystems, and other natural systems. Ongoing climate change is projected to significantly alter ENSO's dynamics and impacts. El Niño Southern Oscillation in a Changing Climate presents the latest theories, models, and observations, and explores the challenges of forecasting ENSO as the climate continues to change. Volume highlights include: Historical background on ENSO and its societal consequences Review of key El Niño (ENSO warm phase) and La Niña (ENSO cold phase) characteristics Mathematical description of the underlying physical processes that generate ENSO variations Conceptual framework for understanding ENSO changes on decadal and longer time scales, including the response to greenhouse gas forcing ENSO impacts on extreme ocean, weather, and climate events, including tropical cyclones, and how ENSO affects fisheries and the global carbon cycle Advances in modeling, paleo-reconstructions, and operational climate forecasting Future projections of

ENSO and its impacts Factors influencing ENSO events, such as inter-basin climate interactions and volcanic eruptions The American Geophysical Union promotes discovery in Earth and space science for the benefit of humanity. Its publications disseminate scientific knowledge and provide resources for researchers, students, and professionals.

This book contains articles presenting current knowledge about the formation and renewal of deep waters in the ocean. These articles were presented at an international workshop at the Naval Postgraduate School in Monterey in March 1990. It is the first book entirely devoted to the topic of deep water formation in which articles have been both selected and reviewed, and it is also the first time authors have addressed both surface and deep mixed layers. Highlighted are: past and recent observations (description and analysis), concepts and models, and modern techniques for future research. Thanks to spectacular advances realised in computing sciences over the last twenty years this volume includes a number of sophisticated numerical models. Observational as well as theoretical studies are presented and a clear distinction is established between open-ocean deep convection and shelf processes, both leading to deep- and bottom-water formation. The main subject addressed is the physical mechanism by which the deep water in the ocean can be renewed. Ventilation occurs at the surface in areas called the gills, where water is mixed and oxygenated before sinking and spreading

in the abyss of the deep ocean. This phenomenon is a very active area for both experimentalists and theoreticians because of its strong implications for the understanding of the world ocean circulation and Earth climate. This major theme sheds light on specific and complex processes happening in very restricted areas still controlling three quarters of the total volume of the ocean. All articles include illustrations and a bibliography. This book will be of particular interest to physical oceanographers, earth scientists, environmentalists and climatologists.

Advances in Geophysics

This book reviews the theory and applications of the normal-mode functions in numerical weather prediction and weather and climate dynamics. The normal-mode functions, the eigensolutions of the linearized primitive equations describing the evolution of atmospheric winds and mass variables, have been used for a long time. They have played an important role in the development of data assimilation schemes and the initialization of numerical weather prediction models. Chapters also present how the normal modes can be applied to many theoretical and numerical problems in the atmospheric sciences, such as equatorial wave dynamics, baroclinic instability, energy transfers, and predictability across scales.

One of the major experiments in earth science at the present time is about to begin: the World Climate Research Program (WCRP). The objectives of WCRP are to determine the extent to which climate change

can be predicted, and the extent to which human activities (such as increasing the level of CO) can influence our climate. 2 To understand and possibly to predict climate change, one needs a good understanding of the dynamics of the ocean, the atmosphere, and the processes by which they are coupled. Two major programs are being developed within WCRP: TOGA (Tropical Oceans, Global Atmosphere) and WOCE (World Ocean CirculatIon Experiment). The success of these programs will depend on many things, not least of which is the existence of a pool of active young researchers. This NATO Advanced Study Institute brought together students and young scientists from 13 countries, most of them from Europe and North America. The objective was to provide them with a background in the perceived state of knowledge of atmosphere and ocean dynamics, and to mediate a flavour of the problems presently concerning scientists active in climate related dynamics. In the past, the two disciplines of oceanography and meteorology have largely been carried out separately. But for climate research both disciplines must interact strongly, and another ob jecti ve of this school was to bring together both oceanographers and meteorologists. To promote an integrated approach, the lecture presentations were divided into two formats.

The principal focus of this book is the physical processes in the World Ocean which regulate the interannual-to-multidecadal natural variability of the climate system, and some key atmospheric and

marine manifestations of this variability. It analyses a number of Atlantic and Indo-Pacific signals, and describes their regional atmospheric and marine manifestations. The role of the Ocean in the recent hiatus of global warming and the probability of abrupt climate change due to thermohaline catastrophe are also assessed. The book pays special attention to the change of parameters of synoptic atmospheric disturbances over the Northern Hemisphere and its sub-regions in different phases of the natural quasi-periodical climatic signals. It will appeal to oceanographers, climatologists, meteorologists, hydrologist, geographers and the general reader interested in the problem of climate change all over the globe, especially with regards to Eastern Europe and the Black Sea region.

This volume offers a comprehensive survey and a close analysis of efforts to develop actionable climate information in support of vital decisions for climate adaptation, risk management and policy. Arising from submissions and discussion at the 2011 Open Science Conference (OSC) of the World Climate Research Program (WCRP), the book addresses research and intellectual challenges which span the full range of Program activities.

It is now widely recognized that the climate system is governed by nonlinear, multi-scale processes, whereby memory effects and stochastic forcing by fast processes, such as weather and convective systems, can induce regime behavior. Motivated by

present difficulties in understanding the climate system and to aid the improvement of numerical weather and climate models, this book gathers contributions from mathematics, physics and climate science to highlight the latest developments and current research questions in nonlinear and stochastic climate dynamics. Leading researchers discuss some of the most challenging and exciting areas of research in the mathematical geosciences, such as the theory of tipping points and of extreme events including spatial extremes, climate networks, data assimilation and dynamical systems. This book provides graduate students and researchers with a broad overview of the physical climate system and introduces powerful data analysis and modeling methods for climate scientists and applied mathematicians.

Interacting Climates of Ocean Basins
Beiträge Zur Physik Der Atmosphäre
El Niño Southern Oscillation in a Changing Climate
Selected Papers of Nanjing Institute of Meteorology
Alumni in Commemoration of Professor Jijia Zhang
The Ocean's Role in Climate Change
Natural Climate Variability on Decade-to-Century Time Scales
Modal View of Atmospheric Variability
Applications to the Asia-Pacific Region
Frontiers In Turbulence And Coherent Structures - Proceedings Of The Cosnet/csiro Workshop On Turbulence And Coherent Structures In Fluids, Plasmas And Nonlinear Media

Large-Scale Transport Processes in Oceans and Atmosphere

Studies in Interdisciplinary History

In this thesis I present the results of a comprehensive assessment of the Pacific-North American (PNA) teleconnection pattern in general circulation models (GCMs) and a regional climate model (RCM). The PNA teleconnection pattern is a quasi-stationary wave field over the North Pacific and North America that has long been recognized as a robust feature of Northern Hemisphere atmospheric circulation, and directly affects the interannual variability of North American temperature and precipitation. The teleconnection is evaluated under present (1950-2000) and future (2050-2100) climate in a coupled GCM (MPI/ECHAM5) and a high-resolution regional climate model (RegCM3). I further assess the PNA in 27 atmosphere-ocean GCMs and earth system models (ESMs) from the ongoing fifth phase of the Coupled Model Intercomparison Project (CMIP5). The National Centers for Environmental Prediction and Atmospheric Research (NCEP/NCAR) Reanalysis serves a quasi-observational baseline against which the models are evaluated. For each analysis, changes in the spatial and temporal patterns of the PNA spatial are assessed for both the present and future climates, and these changes are then related to changes in climate and surface hydrology in North America. Coupling the NCEP and ECHAM5 GCMs with RegCM3 is very successful in that the PNA is resolved in both models with little loss of information between the GCMs and RegCM3, thereby allowing an assessment of high-resolution climate with an inherent skill comparable to that of the global models. The value of the PNA index

is generally independent of the method used to calculate it: three- and four-point modified linear pointwise calculations for both the RegCM3 and ECHAM5 model simulations produce very similar indices compared with each other, and compared with those extracted from a rotated principle component analysis (RPCA) which is also used to determine the PNA spatial pattern. The spatial pattern of the PNA teleconnection emerges as a leading mode of variability from the RPCA, although the strength of the teleconnections are consistently weaker than NCEP as defined by four main "centers of action". This discrepancy translates into the strength of the controls of the PNA on surface climate. Maps of the correlations between the GCM PNA indices and RCM surface climate variables are compared to the results from the NCEP/NCAR Reanalysis. I find that correlation patterns with temperature and precipitation are directly related to the positioning of the Aleutian low and Canadian high, the two main drivers of upper-atmospheric circulation in the PNA sector. The CMIP5 models vary significantly in their ability to simulate the quasi-observed features of the PNA teleconnections. The behavior of the models relative to NCEP is more definite than the trends within the models. Most models are unable to resolve the temporal variability of NCEP; however, on the other hand most of the models are able to capture the PNA as a low-frequency quasi-oscillation. Many of the models are unable to simulate the barotropic instability that initiates wave energy propagation through the 500-hPa geopotential height field, thereby leading to phase-locking and thus the positive and negative modes of PNA are indistinguishable. The behavior and the spatial patterns of the PNA throughout the 21st century are consistent

with other projections of future climate change in that most models exhibit a lengthening of the eddy length scale and a poleward shift of the mid-latitude jet stream associated with polar amplification of greenhouse-gas driven global warming. Finally, my analyses underscore the robustness of multi-model means, suggesting that the cumulative results of multiple climate models outperform the results from individual models because ensemble means effectively cancel discrepancies and hereby expose only the most robust common features of the model runs. While ensembles provide better representation of the average climate, they potentially mask climate dynamics associated with inter-annual and longer time scales. Relying on ensemble means to limit model spread and uncertainties remains a necessity in using models to project future climate.

Focusing on urban development and the influence of urbanization on industrialization, this volume reflects a radical rethinking of the traditional approaches to the development of cities. Originally published in 1981. The Princeton Legacy Library uses the latest print-on-demand technology to again make available previously out-of-print books from the distinguished backlist of Princeton University Press. These editions preserve the original texts of these important books while presenting them in durable paperback and hardcover editions. The goal of the Princeton Legacy Library is to vastly increase access to the rich scholarly heritage found in the thousands of books published by Princeton University Press since its founding in 1905.

Surveys American geographers' current research in their speciality areas and tracks trends and innovations in the subfields of geography. Based on a process of review and revision, it is both a 'state of the discipline'

assessment and a topical reference. The authors were chosen by their specialty groups of the American Association of Geographers.

Advances in Ecology Environment and Conservation Research and Application / 2012 Edition is a ScholarlyEditions™ eBook that delivers timely, authoritative, and comprehensive information about Ecology Environment and Conservation. The editors have built Advances in Ecology Environment and Conservation Research and Application / 2012 Edition on the vast information databases of ScholarlyNews.™ You can expect the information about Ecology Environment and Conservation in this eBook to be deeper than what you can access anywhere else, as well as consistently reliable, authoritative, informed, and relevant. The content of Advances in Ecology Environment and Conservation Research and Application / 2012 Edition has been produced by the world's leading scientists, engineers, analysts, research institutions, and companies. All of the content is from peer-reviewed sources, and all of it is written, assembled, and edited by the editors at ScholarlyEditions™ and available exclusively from us. You now have a source you can cite with authority, confidence, and credibility. More information is available at http://www.ScholarlyEditions.com/.

Based on the research findings of 60 years, the author describes the origins of the Agulhas Current, its behaviour, its influence on the adjacent continental shelf, its effect on local weather and its role in linking the Indian and Atlantic Oceans. The text is well-illustrated and includes asides on the history of research on the Current. An exhaustive bibliography gives easy access to present knowledge on this important current

system.

This book contains tutorial and review articles as well as specific research letters that cover a wide range of topics: (1) dynamics of atmospheric variability from both basic theory and data analysis, (2) physical and mathematical problems in climate modeling and numerical weather prediction, (3) theories of atmospheric radiative transfer and their applications in satellite remote sensing, and (4) mathematical and statistical methods. The book can be used by undergraduates or graduate students majoring in atmospheric sciences, as an introduction to various research areas; and by researchers and educators, as a general review or quick reference in their fields of interest. Contents:Dynamics of Atmospheric VariabilityClimate Modeling and Numerical Weather PredictionRadiative Transfer and Remote SensingMathematical Method Readership: Graduate students, academics and researchers in meteorology/climatology, as well as East Asian weather-forecasting services. Keywords:Atmospheric Variability;Climate Modeling;Numerical Weather Predication;Atmospheric Radiation;Satellite Remote Sensing

More accurate forecasts of climate conditions over time periods of weeks to a few years could help people plan agricultural activities, mitigate drought, and manage energy resources, amongst other activities; however, current forecast systems have limited ability on these time- scales. Models for such climate forecasts must take into account complex interactions among the ocean, atmosphere, and land surface. Such processes can be difficult to represent realistically. To improve the quality of forecasts, this book makes recommendations

about the development of the tools used in forecasting and about specific research goals for improving understanding of sources of predictability. To improve the accessibility of these forecasts to decision-makers and researchers, this book also suggests best practices to improve how forecasts are made and disseminated. A comprehensive review of interactions between the climates of different ocean basins and their key contributions to global climate variability and change. Providing essential theory and discussing outstanding examples as well as impacts on monsoons, it a useful resource for graduate students and researchers in the atmospheric and ocean sciences.

The Atmosphere and Climate of Mars
Climatic Change at High Elevation Sites
Sub-seasonal to Seasonal Prediction
Polar Lows
Research, Modeling and Prediction Priorities
Mesoscale Weather Systems in the Polar Regions
Monthly Weather Review
Fluid Dynamics of the Mid-Latitude Atmosphere
Climate Extremes
Geography in America at the Dawn of the 21st Century
Applications of Normal-Mode Function Decomposition in Weather and Climate Research

This book contains 22 peer-reviewed articles that cover a spectrum of contemporary subjects relevant to atmospheric sciences, with specific applications to the Asia-Pacific region. The majority of these papers consist of a review of a scientific sub-field in atmospheric sciences, while some contain

original contributions. All of the accepted papers were subject to scientific reviews and revisions.

A high-level edited volume about the small, high-latitude weather systems known as polar lows.

Interacting Climates of Ocean BasinsCambridge University Press

This book gives a coherent development of the current understanding of the fluid dynamics of the middle latitude atmosphere. It is primarily aimed at post-graduate and advanced undergraduate level students and does not assume any previous knowledge of fluid mechanics, meteorology or atmospheric science. The book will be an invaluable resource for any quantitative atmospheric scientist who wishes to increase their understanding of the subject. The importance of the rotation of the Earth and the stable stratification of its atmosphere, with their implications for the balance of larger-scale flows, is highlighted throughout. Clearly structured throughout, the first of three themes deals with the development of the basic equations for an atmosphere on a rotating, spherical planet and discusses scale analyses of these equations. The second theme explores the importance of rotation and introduces

vorticity and potential vorticity, as well as turbulence. In the third theme, the concepts developed in the first two themes are used to give an understanding of balanced motion in real atmospheric phenomena. It starts with quasi-geostrophic theory and moves on to linear and nonlinear theories for mid-latitude weather systems and their fronts. The potential vorticity perspective on weather systems is highlighted with a discussion of the Rossby wave propagation and potential vorticity mixing covered in the final chapter.

These documents summarize some of the recent studies of the relationships among climate, the aquatic environment, and the dynamics of fish populations. The studies are mostly from the North Pacific ocean, but there are reports of investigations from the North Atlatic Ocean and from fresh water. Various papers include numerous examples of the relationships between fish abundance trends and the environment.

The exchange of momentum, heat, moisture, gases (such as CO2 and O2) and salt between the atmosphere and the ocean is a phenomenon of paramount importance for the dynamics of the atmosphere and the ocean. With the pressing need for reliable

climate forecast (e.g. to deal with severe food and energy problems) interactive ocean-atmosphere models have become one of the main objectives of geophysical fluid dynamics. This volume provides the first state-of-the-art review of interactive ocean-atmosphere modelling and its application to climates. The papers are by active and eminent scientists from different countries and different disciplines. They provide a up-to-date survey of major recent discoveries and valuable recommendations for future research.

This book is based on the proceedings of the COSNet/CSIRO Workshop on Turbulence and Coherent Structures held at the Australian National University in Canberra in January 2006. It codifies recent developments in our understanding of the dynamics and statistical dynamics of turbulence and coherent structures in fluid mechanics, atmospheric and oceanic dynamics, plasma physics, and dynamical systems theory. It brings together articles by internationally acclaimed researchers from around the world including Dijkstra (Utrecht), Holmes (Princeton), Jimenez (UPM and Stanford), Krommes (Princeton), McComb (Edinburgh), Chong (Melbourne), Dewar (ANU), Watmuff

(RMIT) and Frederiksen (CSIRO). The book will prove a useful resource for researchers as well as providing an excellent reference for graduate students working in this frontier area.
Although we are seeing more weather and climate extremes, individual extreme events are very diverse and generalization of trends is difficult. For example, mid-latitude and subtropical climate extremes such as heat waves, hurricanes and droughts have increased, and could have been caused by processes including arctic amplification, jet stream meandering, and tropical expansion. This volume documents various climate extreme events and associated changes that have been analyzed through diagnostics, modeling, and statistical approaches. The identification of patterns and mechanisms can aid the prediction of future extreme events. Volume highlights include: Compilation of processes and mechanisms unique to individual weather and climate extreme events Discussion of climate model performance in terms of simulating high-impact weather and climate extremes Summary of various existing theories, including controversial ones, on how climate extremes will continue to become stronger and more frequent Climate

Extremes: Patterns and Mechanisms is a valuable resource for scientists and graduate students in the fields of geophysics, climate physics, natural hazards, and environmental science. Read an interview with the editors to find out more: https://eos.org/editors-vox/how-does-changing-climate-bring-more-extreme-events

Deep Convection and Deep Water Formation in the Oceans
Decade-to-Century-Scale Climate Variability and Change
Annual Cycle for Large-scale Transient Eddy and Mean Flow Interactions in the Northern Hemisphere
Patterns and Mechanisms
Recent Progress in Atmospheric Sciences
Advances in Geophysics
Assessment of Intraseasonal to Interannual Climate Prediction and Predictability
Atmospheric Tidal and Planetary Waves
Industrialization and Urbanization
Synoptic and Dynamic Climatology
The Agulhas Current

The Gap Between Weather and Climate Forecasting: Sub-seasonal to Seasonal Prediction is an ideal reference for researchers and practitioners across the range of disciplines involved in the science, modeling, forecasting and application of this new frontier in sub-seasonal to seasonal (S2S) prediction. It provides an accessible, yet rigorous, introduction

to the scientific principles and sources of predictability through the unique challenges of numerical simulation and forecasting with state-of-science modeling codes and supercomputers. Additional coverage includes the prospects for developing applications to trigger early action decisions to lessen weather catastrophes, minimize costly damage, and optimize operator decisions. The book consists of a set of contributed chapters solicited from experts and leaders in the fields of S2S predictability science, numerical modeling, operational forecasting, and developing application sectors. The introduction and conclusion, written by the co-editors, provides historical perspective, unique synthesis and prospects, and emerging opportunities in this exciting, complex and interdisciplinary field. Contains contributed chapters from leaders and experts in sub-seasonal to seasonal science, forecasting and applications Provides a one-stop shop for graduate students, academic and applied researchers, and practitioners in an emerging and interdisciplinary field Offers a synthesis of the state of S2S science through the use of concrete examples, enabling potential users of S2S forecasts to quickly grasp the potential for application in their own decision-making Includes a broad set of topics, illustrated with graphic examples, that highlight interdisciplinary linkages This book provides a unique, in-depth view of past, present and potential future climatic change in mountain regions, and in particular on the mechanisms which are responsible for this change. Other books which focus on environmental change in mountains focus more generally on the impacts of this change on mountain systems, rather than on the regional features of climatic change itself. The book enters into a high level of detail concerning results of international investigations which

involve specialists from numerous climate-related disciplines. The book can be used in an academic and research context, for advanced graduate and doctoral students, as well as researchers working in various domains of relevance to climatic change issues. The book also has relevance in the context of future activities of the Intergovernmental Panel on Climate Change (IPCC), in terms of providing up-to-date knowledge of fundamental mechanisms and consequences of climatic change in mountain regions.

This volume reflects the current state of scientific knowledge about natural climate variability on decade-to-century time scales. It covers a wide range of relevant subjects, including the characteristics of the atmosphere and ocean environments as well as the methods used to describe and analyze them, such as proxy data and numerical models. They clearly demonstrate the range, persistence, and magnitude of climate variability as represented by many different indicators. Not only do natural climate variations have important socioeconomic effects, but they must be better understood before possible anthropogenic effects (from greenhouse gas emissions, for instance) can be evaluated. A topical essay introduces each of the disciplines represented, providing the nonscientist with a perspective on the field and linking the papers to the larger issues in climate research. In its conclusions section, the book evaluates progress in the different areas and makes recommendations for the direction and conduct of future climate research. This book, while consisting of technical papers, is also accessible to the interested layperson.

The physics and dynamics of the atmosphere and atmosphere-ocean interactions provide the foundation of modern climate models, upon which our understanding of the chemistry and

biology of ocean and land surface processes are built. Originally published in 2006, Frontiers of Climate Modeling captures developments in modeling the atmosphere, and their implications for our understanding of climate change, whether due to natural or anthropogenic causes. Emphasis is on elucidating how greenhouse gases and aerosols are altering the radiative forcing of the climate system and the sensitivity of the system to such perturbations. An expert team of authors address key aspects of the atmospheric greenhouse effect, clouds, aerosols, atmospheric radiative transfer, deep convection dynamics, large scale ocean dynamics, stratosphere-troposphere interactions, and coupled ocean-atmosphere model development. The book is an important reference for researchers and advanced students interested in the forces driving the climate system and how they are modeled by climate scientists.

Synoptic and Dynamic Climatology provides the first comprehensive account of the dynamical behaviour and mechanisms of the global climate system and its components, together with a modern survey of synoptic-scale weather systems in the tropics and extratropics, and of the methods and applications of synoptic climate classification. It is unrivalled in the scope and detail of its contents. The work is thoroughly up to date, with extensive bibliographies by chapter. It is illustrated with nearly 300 figures and plates. *Part 1 provides an introduction to the global climate system and the space-time scales of weather and climate processes, followed by a chapter on climate data and their analysis *Part 2 describes and explains the characteristics of the general circulation of the global atmosphere and includes the nature and causes of global teleconnection patterns *Part 3 discusses synoptic weather

systems in the extratropics and tropics and satellite-based climatologies of synoptic features. It also describes the applications of synoptic climatology and summarises current climatic research and its directions.

This book is based on the proceedings of the COSNet/CSIRO Workshop on Turbulence and Coherent Structures held at the Australian National University in Canberra in January 2006.It codifies recent developments in our understanding of the dynamics and statistical dynamics of turbulence and coherent structures in fluid mechanics, atmospheric and oceanic dynamics, plasma physics, and dynamical systems theory. It brings together articles by internationally acclaimed researchers from around the world including Dijkstra (Utrecht), Holmes (Princeton), Jimenez (UPM and Stanford), Krommes (Princeton), McComb (Edinburgh), Chong (Melbourne), Dewar (ANU), Watmuff (RMIT) and Frederiksen (CSIRO).The book will prove a useful resource for researchers as well as providing an excellent reference for graduate students working in this frontier area.

Prior to the space age, meteorologists rarely paid particular attention to the height regions above the tropopause. What was known about the upper atmosphere above about 100 km came essentially from ionospheric and geomagnetic research. The region in between, presently known as the middle atmosphere, was almost terra incognita above the height reachable by balloons. It was space research that allowed for the first time direct access to middle and upper atmospheric heights. About 40 years ago, Sidney Chapman coined a new word 'aeronomy' to describe the study of these two height regions. When asked about the difference between aeronomy and meteorology, he allegedly replied: 'it is the same as between astronomy and

astrology' . This mild irony indicates the preferred prejudice of many ionospheric physicists and geomagneticians in those days toward meteorology as a descriptive rather than an exact science, in spite of the presence of such giants as Carl Rossby and Hans Ertel.

Society today may be more vulnerable to global-scale, long-term, climate change than ever before. Even without any human influence, past records show that climate can be expected to continue to undergo considerable change over decades to centuries. Measures for adaption and mitigation will call for policy decisions based on a sound scientific foundation. Better understanding and prediction of climate variations can be achieved most efficiently through a nationally recognized "dec-cen" science plan. This book articulates the scientific issues that must be addressed to advance us efficiently toward that understanding and outlines the data collection and modeling needed.

NASA/MSFC FY91 Global Scale Atmospheric Processes Research Program Review

Advances in Ecology Environment and Conservation Research and Application: 2012 Edition

Frontiers in Turbelence and Coherent Structures

Climate Science for Serving Society

The Gap Between Weather and Climate Forecasting

Nonlinear and Stochastic Climate Dynamics

A Science Strategy

Climate Change and Northern Fish Populations

Frontiers of Climate Modeling

Proceedings of a Workshop Held at NASA George C. Marshall Space Flight Center, Huntsville, Alabama, May 28-31, 1991

Proceedings of the COSNet/CSIRO Workshop on Turbelence and Coherent Structures in Fluids, Plasmas and Nonlinear Media, The Australian National University, Canberra, Australia, 10-13 January 2006

Large-scale atmospheric disturbances play important roles in determining the general circulation of the atmosphere during the North Pacific boreal winter. A number of scientific questions have been raised due to these disturbances' spatial and temporal complexity as well as the hydrological implication associated with them. In this dissertation, the principal goal is to further improve our understanding of the atmospheric high frequency (HF) and intermediate frequency (IF) disturbances active over the North Pacific. The study focuses on their energetics, intraseasonal and interannual variability, and the resulting hydrological impact over the eastern North Pacific and Western U.S. including extreme events. To delineate the characteristics of HF and IF disturbances in the troposphere, we first derive a new set of equations governing the local eddy kinetic energy (EKE), and assess the critical processes maintaining local budgets of the HF and IF EKE. The diagnosis assesses the 3-D patterns of energy flux convergence (EFC), barotropic conversion (BT), baroclinic conversion (BC), and cross-frequency eddy-eddy interaction (CFEI). The local EKE budget analysis is followed by an investigation of the modulation of HF and IF eddy activity by different modes of low frequency climate variability. On interannual timescales, the response of various local energetic processes to El Niñ?o-Southern Oscillation (ENSO) determines the HF and IF EKE anomalies and the role of CFEI process is important in producing these

anomalies. Also on interannual timescales, winter precipitation deficits associated with suppressed cyclonic activity, i.e., negative HF EKE anomalies, are linked to severe droughts over the U.S. Southern Great Plain (SGP) region. The suppressed cyclonic activity is, in turn, tied to phase changes in the West Pacific (WP) teleconnection pattern. On intraseasonal timescales, variations in HF disturbances (a.k.a. storm tracks) over the North Pacific are closely coupled with tropical convection anomalies induced by the Madden-Julian Oscillation (MJO), and partly drive larger scale intraseasonal flow anomalies in this region through eddy-eddy interactions. Anomalous HF eddy activity induces subseasonal transitions between "wet" and "dry" regimes over the west coast of North America. Also on intraseasonal timescales, the East Asian cold surge (EACS) is found to provide a remote forcing of the winter precipitation anomalies in the western U.S. This modulation is achieved through "atmospheric rivers" (ARs), which are narrow channels of concentrated moisture transport in the atmosphere and are responsible for over 70% of the extreme precipitation events in the western U.S. EACS effectively modulates the IF disturbance activity over the North Pacific, and the anomalous IF disturbances lead to the formation of an AR over the eastern North Pacific that ultimately induces precipitation anomalies in the western U.S. Analyses of the simulations from the NCAR Community Climate System Model version 4 (CCSM4) demonstrate that the connections among the EACS, AR and western U.S. precipitation are better captured by a model with higher spatial resolutions. The improved simulation of these connections is achieved mainly through a better representation of the IF

disturbances, and the associated scale-interaction processes in the higher resolution model.

Quantum Systems in Physics, Chemistry and Biology, Theory, Interpretation, and Results, Volume 78, the latest release in the Advances in Quantum Chemistry series presents surveys of current topics in this rapidly developing field that has emerged at the cross section of the historically established areas of mathematics, physics, chemistry and biology. It features detailed reviews written by leading international researchers. Presents surveys of current topics in this rapidly-developing field that has emerged at the cross section of the historically established areas of mathematics, physics, chemistry and biology Features detailed reviews written by leading international researchers

The difference between snow versus snow free conditions is the most significant natural, seasonal change the land surface can experience. Snow affects all aspects of the surface energy balance including albedo, sensible and latent heat fluxes, and soil moisture. In addition, the presence or lack of snow plays an important role in modifying the overlying air temperature, propagating from local climate to neighboring regions and even globally through atmospheric teleconnections. Numerous studies to date have investigated the implications of snow forcing the atmosphere and associated circulation, however the cause and effect relationship or direction of forcing has not been decisively demonstrated from observed data alone. GCM studies investigating snow-atmosphere interaction have focused on interaction of Siberian or Eurasian snow cover anomalies with the atmospheric teleconnection modes such as the Arctic Oscillation. Although the tendency has been to

concentrate on Eurasia due to the magnitude of snowmass, North American snow cover also produces a weak relationship with downstream climate and an atmospheric teleconnection via enhanced North Atlantic storm track activity. Recent GCM studies of the effects of snow cover on overlying atmospheric conditions and large-scale circulation have primarily used a data ocean model with a fixed seasonal cycle of sea surface temperature (SST) and sea ice cover, based on historical SST records. We explore the influence of this SST boundary condition by comparing the data-forced model with a mixed-layer slab ocean model underneath the NCAR atmospheric GCM. Experimental runs consist of 40-year simulations where each experiment was run once with the data-forced model and once with the mixed-layer slab ocean model in scenarios of anomalously high and low snow cover patterns. Anomalous snow cover patterns were generated from historical snow cover data by choosing minimum and maximum depths observed on a particular day of the year for each grid point. Surface response results include significant SST cooling under maximum North American and Eurasian snow conditions. Locations of SST cooling include local coastal cooling directly downstream of each individual forcing region in addition to upstream centers of remote cooling; in the Pacific under anomalously high snow conditions in North America and in the Atlantic under anomalously high Eurasian snow conditions. Significant cooling of surface temperature at 2 m under maximum snow conditions local to each forcing region was evident from both experiments, however values were larger in magnitude and greater in spatial extent when using the slab model. Atmospheric responses to anomalous snow

conditions are dominated by a barotropic response under maximum snow conditions throughout much of the mid latitudes in both experiments. Consistent upstream anomalously lower geopotential height and sea level pressure over the Pacific during early winter in particular is evident from the North American Slab experiment, implying a reduced north-south gradient indicating a negative AO phase under maximum snow extent and depth. In contrast, the Data experiment is dominated by weaker and less significant downstream response in both atmospheric fields for both experiments. Areas of positive eddy kinetic energy (EKE) correlate well with steep geopotential height gradient differences between maximum and minimum snow experiments. A dipole of EKE in early winter over the Pacific in both experiments with positive values to the south and negative to the north is indicative of reduced poleward heat flux which may be contributing to a decrease in warm SST advection northwards and the ensuing mid Pacific SST cooling. This proposed pathway is supported by increased zonal wind at 250 hPa collocated with identified regions of sharpened geopotential height gradient, strengthened baroclinicity and positive EKE. The Eurasian experiment shows a similar pathway to the North American experiment, however circulation response is focused downstream of the forcing region in early winter for both Slab and Data experiments. A southward shift of the prevailing East Asia storm track is indicated from a dipole pattern of EKE in the Pacific during early winter when using the Slab model in contrast to strengthening alone with no southward shift under Data conditions. Reduced poleward heat transport associated with a southward shift in the prevailing storm

tracks of this region may be influencing the cooling SST trend through reduced warm SST advection to the Aleutian area of the North Pacific.

Humanity has long been fascinated by the planet Mars. Was its climate ever conducive to life? What is the atmosphere like today and why did it change so dramatically over time? Eleven spacecraft have successfully flown to Mars since the Viking mission of the 1970s and early 1980s. These orbiters, landers and rovers have generated vast amounts of data that now span a Martian decade (roughly eighteen years). This new volume brings together the many new ideas about the atmosphere and climate system that have emerged, including the complex interplay of the volatile and dust cycles, the atmosphere-surface interactions that connect them over time, and the diversity of the planet's environment and its complex history. Including tutorials and explanations of complicated ideas, students, researchers and non-specialists alike are able to use this resource to gain a thorough and up-to-date understanding of this most Earth-like of planetary neighbours.

Atlas of Southern Hemisphere 500 Mb Teleconnection Patterns Derived from National Meteorological Center Analyses

Coupled Ocean-Atmosphere Models

Understanding the Scale Interaction of Atmospheric Transient Disturbances and Its Coupling with the Hydrological Cycle Over the Pacific-North American Regions

Observation, Theory and Modeling of Atmospheric Variability

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An Investigation of Snowcover-atmosphere-ocean Interactions in the Northern Hemisphere with a Global Atmospheric Model Coupled to a Slab Ocean Model
Analyzing the Present and Future Pacific-North American Teleconnection Using Global and Regional Climate Models