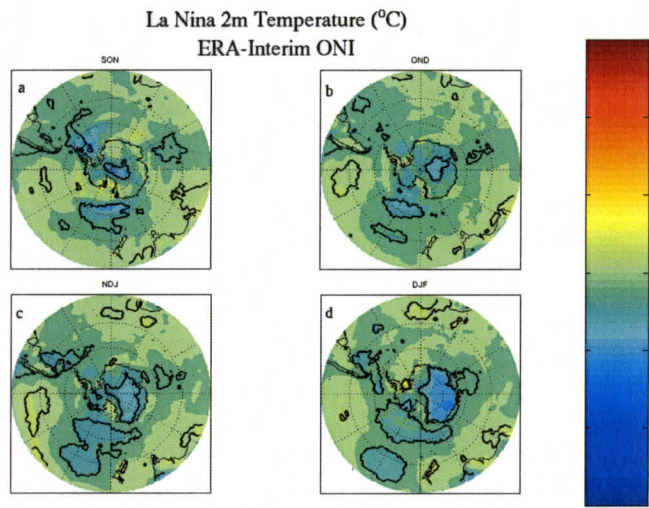


Annual Project Report: NSF-GEO-AGS Grant #ANT-1256215, April 1, 2013 to March 31, 2014

Sensitivity of Southern Hemispheric Atmospheric Structures to Tropical Forcing

An Annual Report to
Atmospheric and Geospatial Sciences, Geoscience Directorate, National Science Foundation



Dr. Matthew H. Hitchman, Principal Investigator
Dr. Matthew A. Lazzara, co-Principal Investigator

Department of Atmospheric and Oceanic Sciences
&
Antarctic Meteorological Research Center
Space Science and Engineering Center
University of Wisconsin-Madison

Submitted on February 24, 2014



Space, STKn
 UW SSEC Publication
 No. H.02.HI.
 C.1

Preview of Award 1256215 - Annual Project Report

Project Number: 4900
Federal Agency and Organization Element to Which Report is Submitted: 4900
Federal Grant or Other Identifying Number Assigned by Agency: 1256215
Project Title: Sensitivity of Southern Hemispheric Atmospheric Structures to Tropical Forcing
PD/PI Name: Matthew H Hitchman, Principal Investigator
 Matthew A Lazzara, Co-Principal Investigator
Submitting Official (if other than PD/PI): Matthew H Hitchman
 Principal Investigator
Submission Date: 02/13/2014
Recipient Organization: University of Wisconsin-Madison
Project/Grant Period: 04/01/2013 - 03/31/2016
Reporting Period: 04/01/2013 - 03/31/2014
Signature of Submitting Official (signature shall be submitted in accordance with agency specific instructions): Matthew H Hitchman

Accomplishments

What are the major goals of the project?

The primary goal of this project is to improve understanding of how tropical convective systems influence high latitude Southern Hemisphere (SH) climate. A second of this work is to integrate what is known about coupling between the tropics and Antarctica for dissemination to the public via images and videos. A third goal is to improve seasonal forecasting of the influence of ENSO on Antarctica, via a careful analysis of ENSO and Antarctic surface data sets.

What was accomplished under these goals (you must provide information for at least one of the 4 categories below)?

- Major Activities:**
 - In support of our first goal, we focused on inflow forcing technique development in the UWNMS and on analyzing planetary wave propagation. We had a personnel change, with graduate research assistant Marc Collins taking over responsibilities from Postdoc Marek Rogal for running the UWNMS inflow forcing experiments, due to Dr. Rogal taking a promotion into another job. Marc has done a careful, clear, and innovative job at refining the inflow forcing technique. Experiments with daily and climatological mean initial basic states have been carried out. He has performed five simulations with differing spatial pattern, geographical location, and amplitude of forcing. In addition, Dr. Takenari Kinoshita visited the AOS Department in Madison for the month of September 2013. He performed extensive calculations with his algorithm and collaborated with PI Hitchman in diagnosing 3D wave activity fluxes in the Southern Hemisphere by season, and phase of ENSO. This will likely lead to a publication.
 - In support of our second goal, graduate research assistant Shellie Rowe created three templates for our website to disseminate information. At a group meeting we selected one of them and she began incorporating text and figures.
 - In support of our third goal, at group meetings we have discussed particular case studies to focus on for simulation of Antarctic weather which can represent the challenges of El Nino versus La Nina conditions in different parts of Antarctica.

Specific Objectives:

Significant Results:

Key outcomes or Other Achievements:

*** What opportunities for training and professional development has the project provided?**

This grant initially supported Postdoctoral Research Associate Marek J. Rogal and graduate research assistant Shellie M. Rowe. Partially as a result of the professional development in numerical modeling and data analysis, Dr. Rogal was offered and accepted a more permanent job as a scientist in the Space Science and Engineering Center. Dr. Rogal effectively transferred knowledge of how to run inflow forcing simulations to a new hire on this grant, graduate research assistant Marc Collins. Mr. Collins has expanded on our inflow forcing technique and is rapidly learning the UWNMS code. During this first year of the grant Ms. Rowe was given the opportunity to create the website for our second goal and she also began setting up high-resolution UWNMS simulations focusing on Antarctica. Ms. Rowe also completed her M.S. thesis (2014) at the University of Wisconsin - Madison entitled "On the Role of Inertial Instability in Stratosphere Troposphere Exchange and the Generation of Inertial Flare-Ups near Midlatitude Jets and Tropical Cyclones", 130 pp.

How have the results been disseminated to communities of interest?

Scientific Presentations:

- Matthew H. Hitchman, poster, "Seasonal and ENSO Influence of Tropical Convection on the Southern Hemisphere Ozone Distribution", WCRP Workshop on Stratosphere and Troposphere Coupling and Climate Change, Kyoto University, Japan, April 2, 2013.
- PI Matthew H. Hitchman, April 3, 2013, Panel Discussion on Climate Change Science in Service to Society, WCRP Workshop, Kyoto University, Japan.
- Matthew H. Hitchman, June 12, 2013, Invited talk, "Transport into the stratosphere via the summer Asian high", Workshop on Atmospheric Composition and the Asian Summer Monsoon (ACAM), Kathmandu, Nepal.
- PI Matthew H. Hitchman, June 19, 2013, Oral presentation, "Sensitivity of Southern Hemisphere Circulation to Tropical Convective Forcing: Modulation of Polar Regions via Planetary Wave Trains in UTLS", 17th Conference on the Middle Atmosphere, Newport, Rhode Island.

What do you plan to do during the next reporting period to accomplish the goals?

- 1) Hitchman and Kinoshita will collaborate on a publication regarding planetary wave activity flux.
- Collins and Hitchman will refine metrics and ensemble methods for analyzing statistical significance of inflow forcing experiments and carry out a range of experiments with the UWNMS.

3) Rowe, Hitchman, and Welhouse will carry out high resolution weather simulations with the UWNMS over Antarctica for particular case studies of unusual temperature anomalies identified in the surface station network.

Write and submit two manuscripts describing the climatological planetary wave patterns for each season and phase of ENSO.

5) Acquire data to create seasonal basic states for 2100 AD.

6) Attend Fall AGU meeting to report results.

Products

Journals

Nothing to report.

Books

Nothing to report.

Book Chapters

Nothing to report.

Thesis/Dissertations

Nothing to report.

Conference Papers and Presentations

Nothing to report.

Other Publications

Nothing to report.

Technologies or Techniques

Nothing to report.

Patents

Nothing to report.

Inventions

Nothing to report.

Software

Nothing to report.

Websites

Nothing to report.

Other Products

Nothing to report.

Participants

What individuals have worked on the project?

Name	Most Senior Project Role	Nearest Person Month Worked
Marek J Rogal	Postdoctoral (scholar, fellow or other postdoctoral position)	6
Shellie Marie Rowe	Graduate Student (research assistant)	6
Marc K Collins	Graduate Student (research assistant)	6
Matthew A Lazzara	Co PD/PI	0
Lee Welhouse	Other Professional	1
David Mikolajczyk	Other Professional	0
Linda Keller	Other Professional	0
Matthew H Hitchman	PD/PI	2

What other organizations have been involved as partners?

Nothing to report.

Have other collaborators or contacts been involved? N

Impacts

What is the impact on the development of the principal discipline(s) of the project?

This work will likely improve our understanding of teleconnections and provide climatological descriptions of the relationship among subtropical UTI

What is the impact on other disciplines?

Nothing to report.

What is the impact on the development of human resources?

This grant has helped train Postdoctoral Research Associate Marek Rogal, and graduate research assistants Shellie Rowe and Marc Collins.

What is the impact on physical resources that form infrastructure?

Nothing to report.

What is the impact on institutional resources that form infrastructure?

Nothing to report.

What is the impact on information resources that form infrastructure?

This outreach activity will help educate the public regarding how the tropics and Antarctica are coupled on seasonal, ENSO, and anthropogenic global

What is the impact on technology transfer?

Nothing to report.

What is the impact on society beyond science and technology?

This work has the potential to improve seasonal forecasting of the influence of ENSO on Antarctica, via a careful analysis of ENSO and Antarctic su

Changes

Changes in approach and reason for change

Nothing to report.

Actual or Anticipated problems or delays and actions or plans to resolve them

Nothing to report.

Changes that have a significant impact on expenditures

Nothing to report.

Significant changes in use or care of human subjects

Nothing to report.

Significant changes in use or care of vertebrate animals

Nothing to report.

Significant changes in use or care of biohazards

Nothing to report.