**NASA DEVELOP National Program**

****University of Georgia

**Fall 2015**

**Short Title: Antarctica Climate**

**Subtitle:** Applying NASA Earth Observations to Assess the Seasonal and Inter-annual Variability of Sea Ice Dynamics in McMurdo Sound, Ross Sea, Antarctica

**VPS Title:** Alien vs. DEVELOPer: Satellite Detection of Sea Ice Dynamics

**Project Team & Partners**

**Project Team:**

Elizabeth Benyshek (Project Lead), ebenyshek@gmail.com

Christopher Cameron

Caren Remillard

Eduardo Rendon

**Advisors & Mentors:**

Dr. Sally Walker (Department of Geology, University of Georgia)

Dr. Adam Milewski (Department of Geology, University of Georgia)

**Past or Other Contributors:**

Linli Zhu (Geoinformatics Fellow, NASA DEVELOP)

**Partner Organizations:**

The Wadsworth Center: New York's State Public Health Laboratory (End-User, POC: Samuel Bowser, Ph.D., Research Scientist)

University of Georgia (Collaborator, POC: Sally Walker, Ph.D., Professor of Geology and Marine Sciences)

**Project Details**

**Applied Sciences National Applications Addressed:** Climate

**Study Area:** McMurdo Sound, Ross Sea, Antarctica

**Study Period:** October 2003-October 2010

**Earth Observations & Parameters:**

Aqua, MODIS - historical sea surface temperature

ICESat, GLAS - Ice-sheet topography and extent

Terra, MODIS - historical land surface temperature, snow cover, and sea ice extent

**Ancillary Datasets Utilized:**

* Dr. Samuel Bowser- study area coordinates

**Models Utilized:**

* NASA GIOVANNI

**Software Utilized:**

ArcGIS – data processing/analysis, image enhancement & map creation

**Project Overview**

The objective of this project is to examine historical and current ICESat and MODIS data to characterize seasonal and inter-annual variability in sea ice parameters including sea ice thickness, sea surface temperature, snow depth on sea ice, and sea ice extent. Additionally, the project will evaluate potential spatio-temporal correlations between these parameters along the coast of western McMurdo Sound, Antarctica. Particular attention will be paid to project partner field sites in Explorers Cove, Bay of Sails, and Ferrar Glacier.

**Abstract:**

This project employed ICESat and MODIS datasets to derive sea ice and temperature measurements in McMurdo Sound, Antarctica over the past 12 years. Several time series maps were produced to illustrate both seasonal and inter-annual variability in sea ice characteristics within three partner-identified ecologically significant regions: Explorers Cove, Bay of Sails, and Ferrar Glacier. The team used parameters including sea ice thickness, sea surface temperature, snow depth on sea ice, and sea ice extent to improve understanding of local sea ice dynamics and evaluated potential spatio-temporal correlations between these parameters. These data were complemented by project partner knowledge attained from extensive field-based investigations. Remote sensing datasets enhanced project partner’s ability to assess sea ice characteristics on a larger spatial and temporal scale, broadening their limited study area and field season to the wider McMurdo Sound and the western Ross Sea throughout the entire year.

**Community Concerns:**

* The Antarctic coast of McMurdo Sound experiences important changes in ice dynamics throughout a calendar year as both glaciers and sea ice undergo melt-freezing cycles
* Long-term variability in sea ice conditions has focused on continental-scale trends
* Compounded changes in local ice regimes can affect vulnerable ecological communities in the Explorers Cove region

**Current Management Practices & Policies**:

Since 1990, project partner Dr. Samuel Bowser has made biannual trips to McMurdo Sound, Antarctica to conduct field-based research concerning foraminifera. Currently, field measurements are the only method project partners possess for surveying ecological populations in association with sea ice conditions. Although labor-intensive, scuba diving is the main field method for obtaining data concerning sea ice in McMurdo Sound.

**Decision Support Tools & Benefits:**

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| **End-Product** | **Earth Observations Used** | **Benefit & Impact** |
| Sea-Ice Topography Time Series Maps | ICESat, GLAS | For the first time, partners will have seasonal and inter-annual understanding of local sea ice conditions |
| Sea Surface Temperature Series Maps | Aqua/Terra, MODIS | Project partners will be able to visualize differences in sea surface conditions through the years |
| Composite Time Series Maps and Correlations | ICESat, GLAS; Aqua/Terra, MODIS | Spatial and temporal relationships of sea ice variables will help partners understand conditions in McMurdo Sound outside of the field season |

**Project Imagery**

**[Insert image here]**

**Caption:** [Insert Caption Here. Max of 25 words.] Image Credit: [Insert project short title] Team.

**Image:** File Name (Please submit your image as a separate .jpeg as well as inserting it in this document)

**Software Release Requirements**

What category do the tools your project is creating fall within? Category I