Examination of the Hiawatha Crater and the Surrounding Area for Evaluating the Impact of Climate Change

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ABSTRACT

The Hiawatha Crater is the site covered by the Hiawatha crater, the area that serves as the focus of this research. The Hiawatha glacier lies in Greenland, and is subject to similar effects of global warming that can be examined occurring with all other glaciers. Using GIS software, the Hiawatha glacier was examined to determine if it was being subjected to extreme effects of global warming.

INTRODUCTION

The overall research consisted of the students learning to use two specific software packages for the accomplishment of analyzing the area encompassing the Hiawatha Crater as well as its surroundings. The first software package being utilized was MultiSpec, the second being ENVI, both providing analysis tools for multispectral images.

MultiSpec

MultiSpec is a software produced by David Landgrebe and Larry Biehl for the purpose of making a software package that can be used for examining hyperspectral and multispectral images [4]. It is free to download for Mac operating systems as well as Windows operating systems [4]. The MultiSpec software package is free to download from the MultiSpec website [4]. MultiSpec is still being updated both in the software itself as well as the documentation that is associated with said software package [4].

ENVI

ENVI is commercial software for examining images that can be utilized through mobile electronics, desktops and the cloud [5]. ENVI provides instruments that can provide support for alterations of the software package to better adapt to the necessities of various endeavors [5]. Examples of said adaptability include "[allowing the addition of] proprietary algorithms, [extending] existing tools and models, automate high-frequency tasks, and [stringing] together multiple tools" [5] to buttress the skills and knowledge of the users. More can be read on the ENVI website: https://www.harrisgeospatial.com/Software-Technology/ENVI[5].

METHODOLOGY

MultiSpec was originally being used for examining multispectral images for the beginning of this research endeavor for training purposes. MultiSpec used mathematical functions to reconstruct the view of the image being opened through MultiSpec such as linear and gradient with other options for best accommodating for the peculiars of the data for the user's necessities. After specifying the parameters for loading the data the new rendering would be loaded with the processes of MultiSpec's software already applied. Colors differentiate the classification of values that appear in the newly developed MultiSpec rendering. The spectrum of colors to differentiate data can be expanded to allow for examination of minute details. The issue with using MultiSpec is whether a shorter or wider spectrum is necessary to view relevant details of a MultiSpec rendering. If the spectrum of colors is too short, details in the rendering may merge with the general landscape or surrounding visual noise. If the spectrum of colors is too wide, an enormous amount of visual noise can be rendered leaving other details obscured. Often the number of display levels, which determines the size of the spectrum, used was 32. There were other considerations, but 32 display levels was a suitable baseline unless there was a particular region of the rendering that prompted the use of more display levels for a more intense examination.

ENVI was acquired in the latter portion of the research endeavor with MultiSpec providing a background in multispectral images until ENVI was acquired. ENVI provided a much more fluid usage of instruments for examining various renderings loaded into the ENVI software. ENVI allowed arithmetic operations of different images for a single rendering, linking images to one another, and the use of different mathematical functions to enhance images.

Future Works

- Developing a robust collection of data for the purpose of analyzing the feaures of multispectral images to determine whether the Hiawatha crater or the surrounding landscape is being altered to any degree by climate change.
- Long term preparations for future teams to receive proper insight and training for the purpose of continuing this research endeavor.
- Developing programs to assist the teams long term in the analysis of images to make the entire process more efficient.
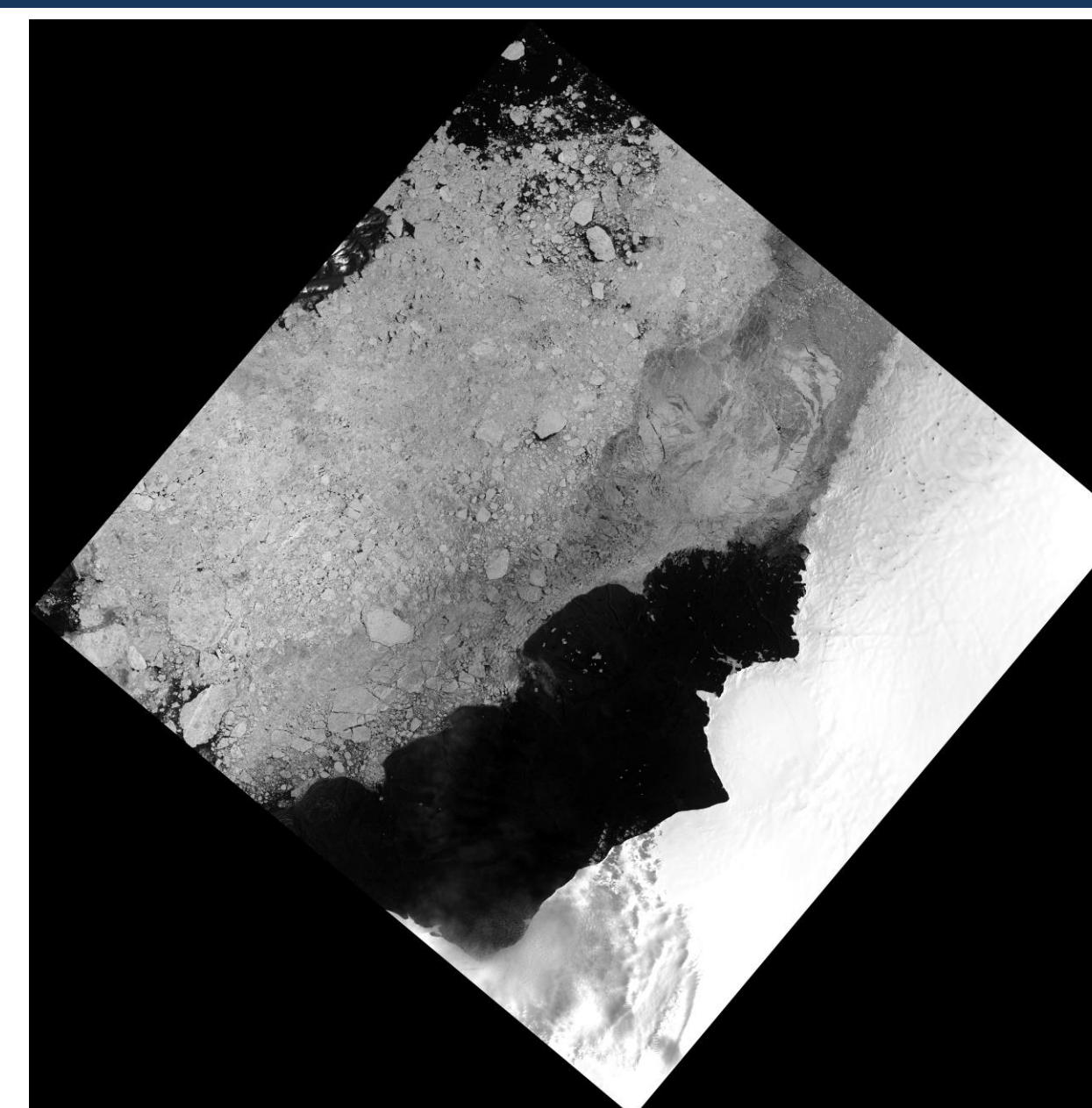
Aerial Views of Hiawatha Crater
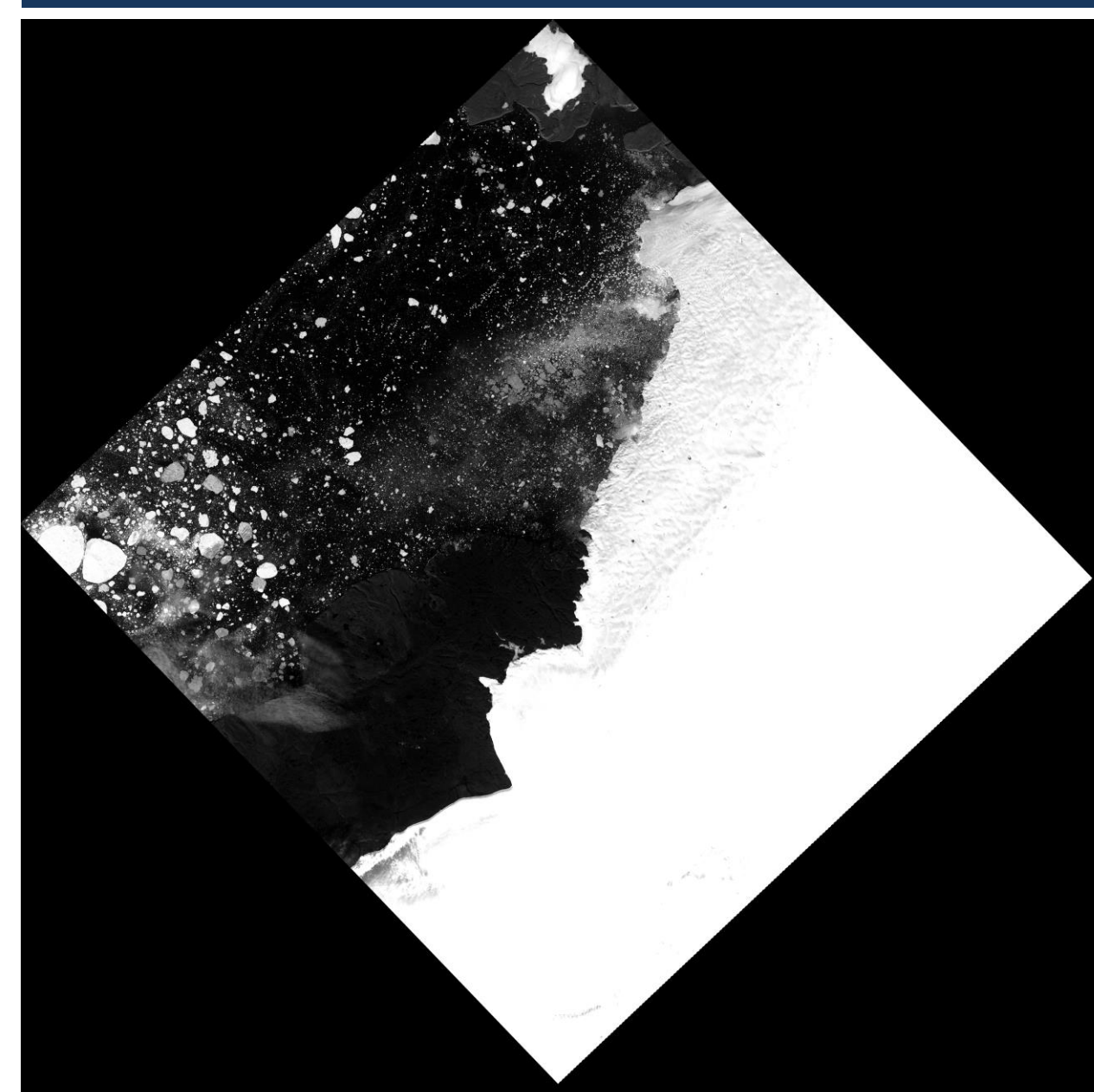
Emphasis on crater
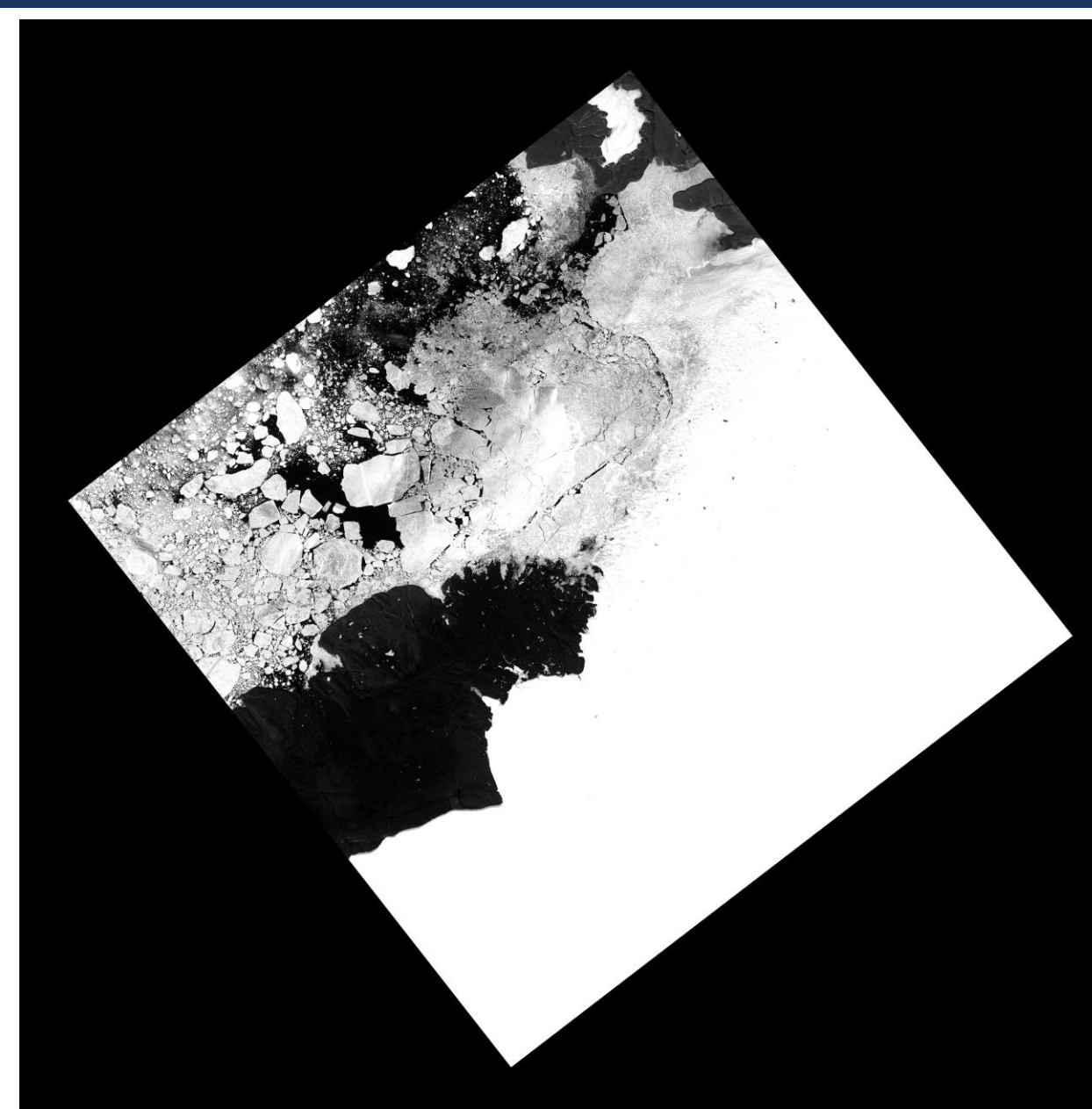
Emphasis on crater and surrounding region

Emphasis on surrounding region

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