

# Automated Identification of Landsat 8 Scenes for Glacier Change Mapping in Greenland and Antarctica

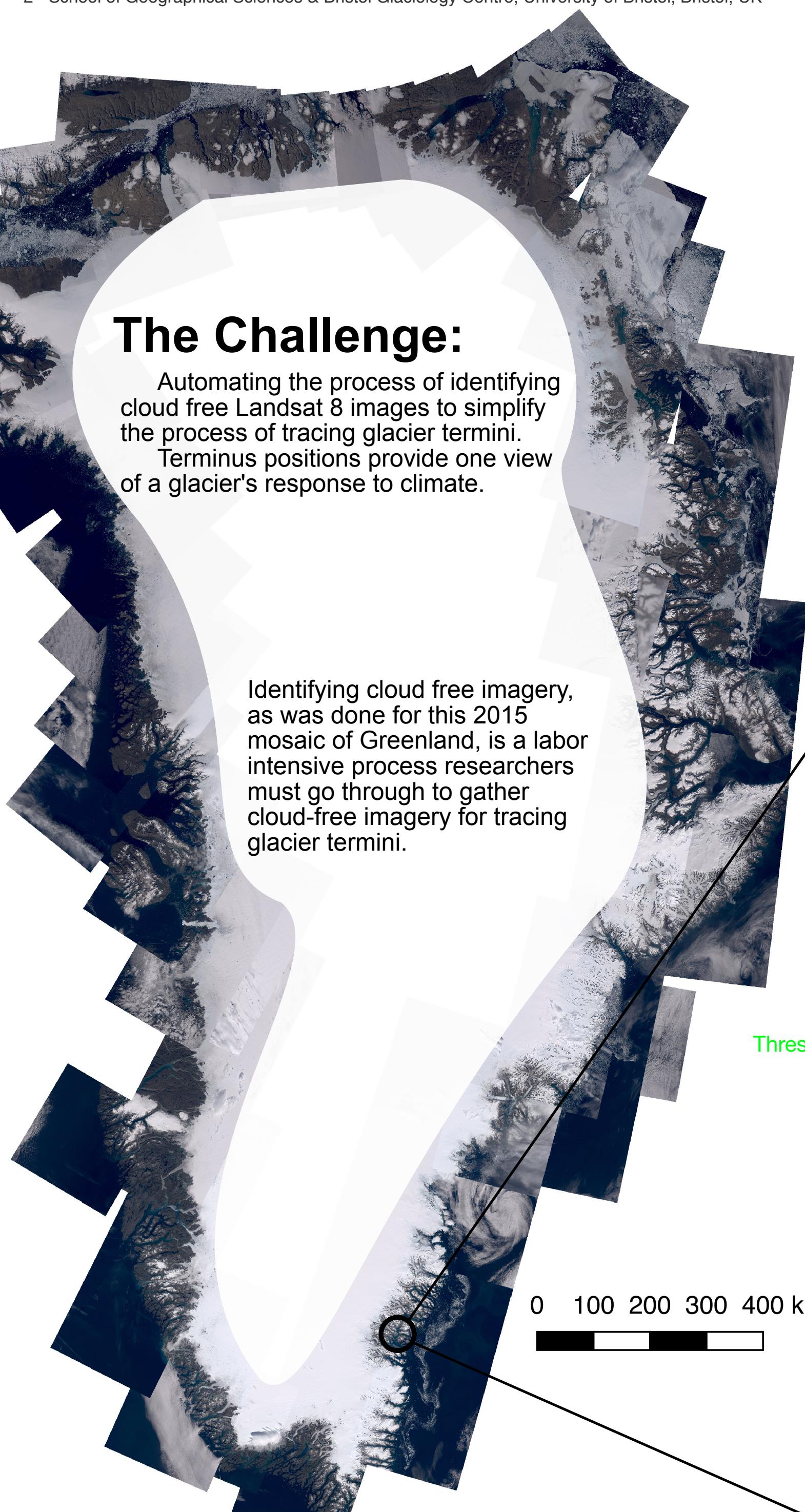


University of  
BRISTOL

Ethan Fahnstock<sup>1</sup>, Twila Moon<sup>2</sup>

1 - Oyster River High School, Durham, New Hampshire, USA

2 - School of Geographical Sciences & Bristol Glaciology Centre, University of Bristol, Bristol, UK

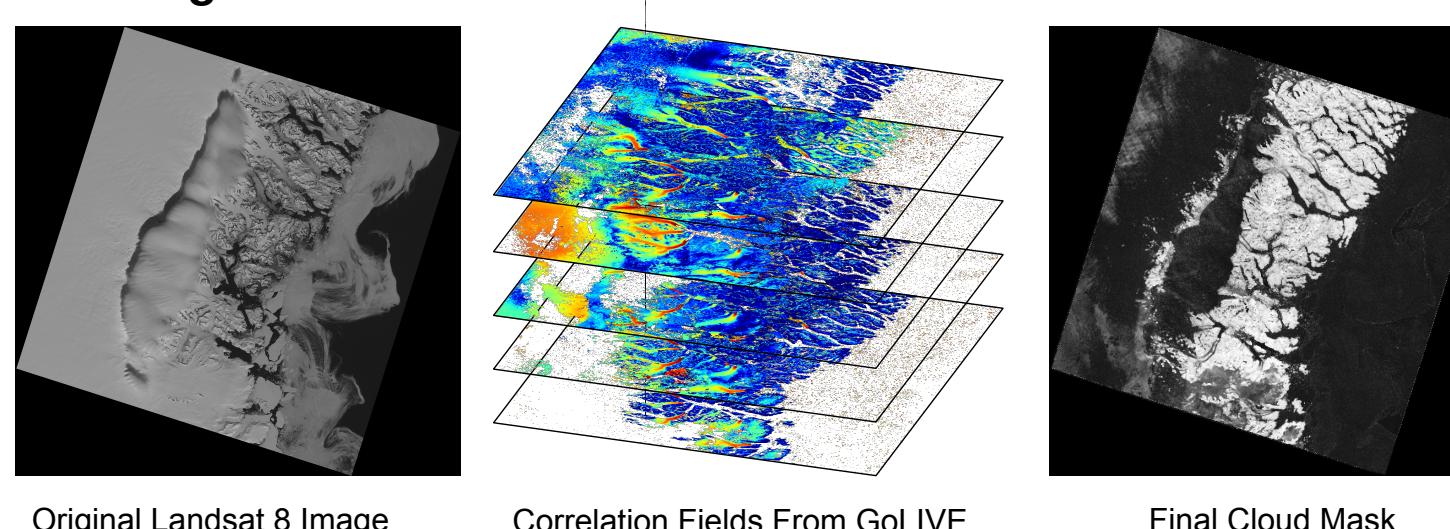


## The Approach

### GoLIVE Data Set

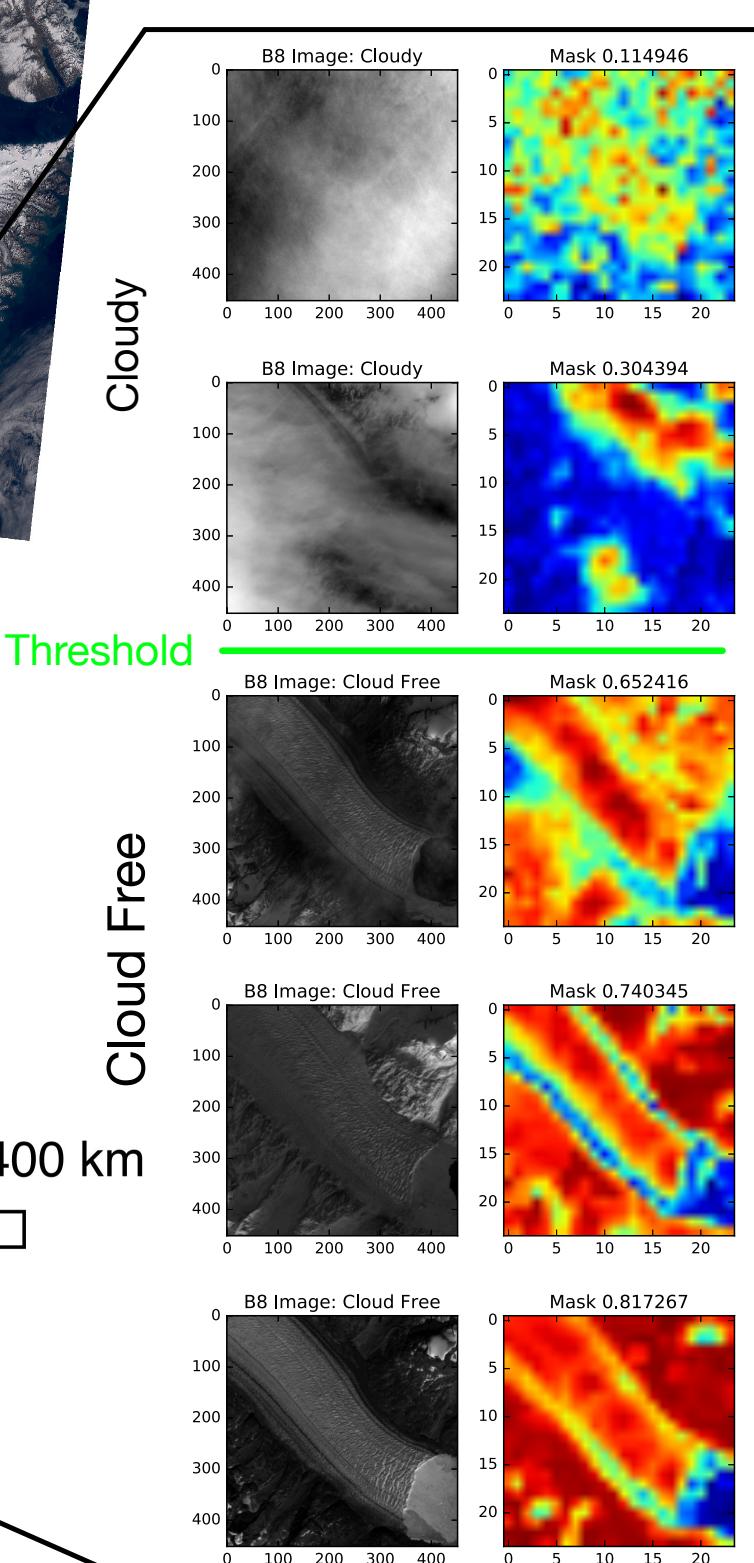
A NASA funded project at the National Snow and Ice Data Center is mapping the speed of the Earth's glaciers using Landsat 8 imagery. This is done by correlating features in one image with the same features in multiple earlier and later images. A byproduct of this is correlation maps between these pairs of images. We use these correlation fields to create a cloud mask for every Landsat 8 image over ice.

### Creating the Cloud Mask



By finding the maximum correlation value per pixel in a collection of correlation fields created with a single Landsat image, an accurate cloud map can be created because clouds cause low correlation values. The example below shows that a threshold can be found to automatically identify cloud free imagery.

### Results



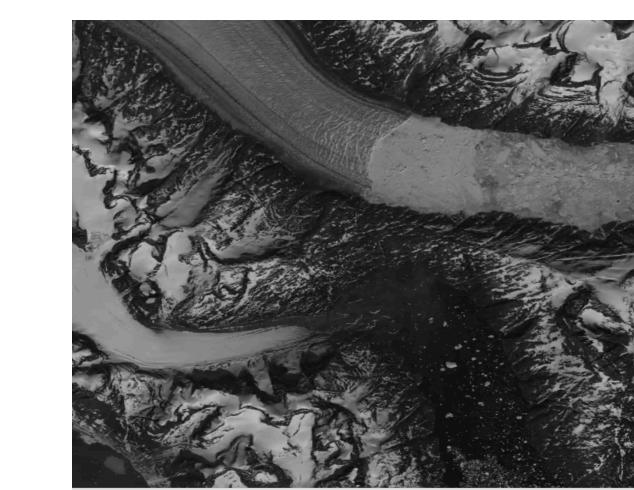
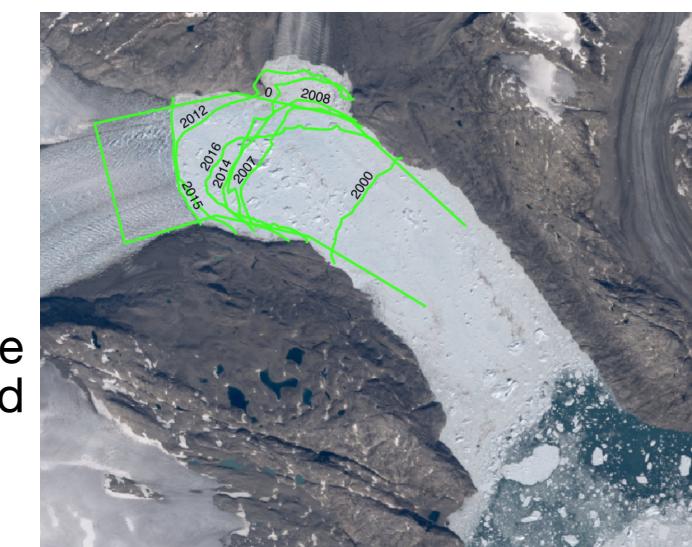
### Batch Processing

After the cloud masks have been created for a set of Landsat images they can be used to search through all of the processed images. Search queries can include location (in the L8 image), date range, and threshold correlation values.

## Uses

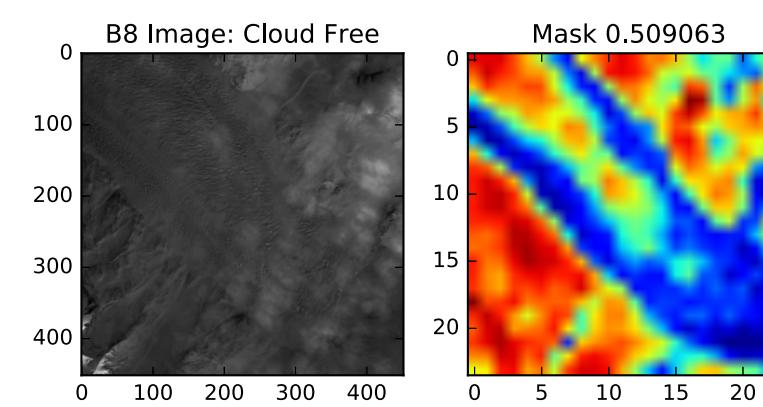
### Glacier Terminus Mapping

The original mission of this project was to ease the collection of cloud-free images for the purpose of terminus mapping. Using this tool, researchers will be able to specify the general area of a glacier terminus and receive a list of images to trace.



### Time-lapse Creation

Time-lapses of various glacial phenomena are easily created using cloud masks to remove cloudy images from the batch while the video is being compiled.



### Current Status

The cloud masks will be available for all Landsat 8 imagery of ice globally with less than 50% cloud cover reported by the USGS.

We were surprised to see that the cloud mask successfully identified the image to the right, where the glacier can be seen through a discontinuous cloud cover.

### Future Plans

#### User Interface

At the moment the application functions as a command line tool. To simplify the user experience a web-based tool is under development.

#### Tracing Assistant

After finding a cloud-free glacier terminus, the user interface will also provide predicted paths and other assistive tracing features.

#### Enhanced Thresholding

Additional thresholding methods will be created to better predict the presence of clouds.

## Acknowledgments

NASA support of the GoLIVE project which provided our correlation fields.

Twila Moon for mentoring the project and her undergraduate assistants who traced glacier termini.

Bright STaRS for supporting my participation in this session.