

Temporal Reduction of the ECSU Ice Shelf in Pine Island Bay Antarctica: 1972 - 2003

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Abstract In an effort to determine whether the Antarctic ice sheet is growing or diminishing over long time intervals, Dr. Robert Bindschadler led an international team of glaciologists and computer scientists, including Elizabeth City State University (ECSU) students, to obtain an accurate measure of the area of the Antarctic ice sheet. Before the ice sheet's area was determined, the grounding line (GL), or boundary dividing the ice sheet resting on land from floating ice, was located by combining 2003 Landsat imagery and satellite-based laser altimetry.

Landsat image data contemporary with that used to create the grounding line was compared to earlier Landsat imagery of the same area. A small ice shelf—now known as the *ECSU Ice Shelf*—near the eastern entrance to Pine Island Bay was previously identified as having diminished over an approximate 31-year span and the progressive reduction of its area qualitatively characterized. Here, the area loss of the *ECSU Ice Shelf* is quantified over time from 1972 to its disappearance in 2003.

Departures from perfect geographic pixel registration in Landsat imagery of the *ECSU Ice Shelf* collected before 2003 was corrected with ITT's Visualization Information Solutions' ENVI image processing software using a 2003 Landsat 7 Enhanced Thematic Mapper (ETM) image as a reference. Older images from Landsat 4, 5 Thematic Mapper (TM) and Landsat 7 (ETM) were registered to conform to the common fixed geographic control points visible on both images. By overlaying the GL on the registered (warped) images, the area changes in the ice shelf were computed. An average ice shelf area was determined from four independent measurement trials for each of the pre-2003 Landsat image.

Landsat Images from 2003 used in creating the GL were obtained from the United States Geological Survey (USGS) archive. The older, cloud free Landsat 4, 5 TM and 7 ETM images of the Pine Island Glacier region were obtained from another USGS archive.

Results provided: 1. A quantitative description of the disappearance of the ECSU Ice Shelf from 1972 through 2003; 2. Validation of the grounding line's actual location; 3. A survey of Antarctic coastal features that may have experienced climate related change.

Figure 1. Grounding Line bordering ECSU Ice Shelf in 1986.

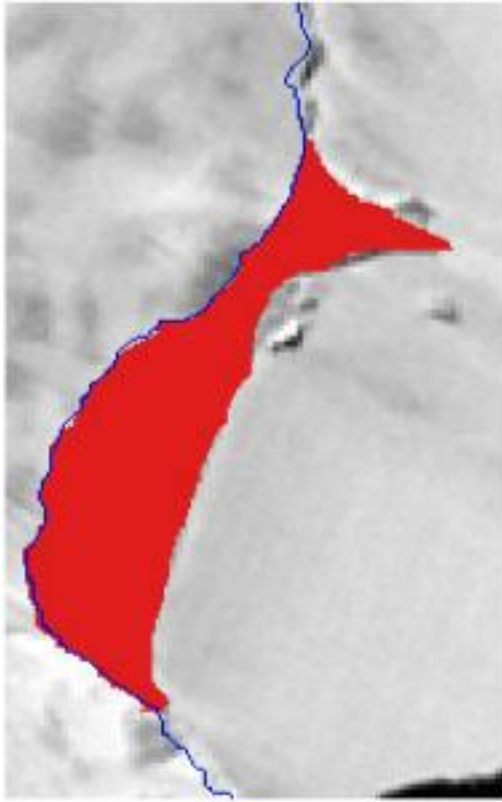


Figure 2. Grounding line bordering the ECSU Ice Shelf in 2001 (not to scale).

