

**Validation of the Antarctic Snow Accumulation and Ice Discharge Basal Stress  
Boundary of the Southeastern Region of the Ross Ice Shelf, Antarctica**

***Abstract***—The largest ice shelf in Antarctica, Ross Ice Shelf, was investigated over the years of 1970-2015. Near the basal stress boundary between the ice shelf and the West Antarctic ice sheet, ice velocity ranges from a few meters per year to several hundred meters per year in ice streams. Ice velocity increases as the ice moves seaward, reaching more than 1 km yr<sup>-1</sup> in the central portions of the ice front. Most of the drainage from West Antarctica into the Ross Ice Shelf flows down two major ice streams, each of which discharges more than 20 km<sup>3</sup> of ice each year.

Along with velocity changes the warmest water below parts of the Ross Ice Shelf resides in the lowest portion of the water column because of its high salinity. Vertical mixing caused by tidal stirring can thus induce ablation by lifting the warm water into contact with the ice shelf. This process can cause melting over a period of time and eventually cause breakup of ice shelf.

With changes occurring over many years a validation is needed for the Antarctic Snow Accumulation and Ice Discharge (ASAID) basal stress boundary created in 2003. After the 2002 Larsen B Ice Shelf disintegration, nearby glaciers in the Antarctic Peninsula accelerated up to eight times their original speed over the next 18 months. Similar losses of ice tongues in Greenland have caused speed-ups of two to three times the flow rate in just one year. Rapid changes occurring in regions surrounding Antarctica are causing concern in the polar science community to research changes occurring in coastal zones over time. During the research, the team completed study on the Ross Ice Shelf located on the southwestern coast of the Antarctic. The study included a validation of the ABSB vs. the natural basal stress boundary (NBSB) along the Ross Ice Shelf. The ASAID BSB was created in 2003 by a team of researchers headed by National Aeronautics and Space Administration Goddard Space Flight Center (NASA GSFC), with an aim of studying coastal deviations as it pertains to the mass balance of the entire continent. The point data file was aimed at creating a replica of the natural BSB. Select cloud free Landsat satellite imagery from satellites 1 through 7 was used to detect changes occurring over the span of 19 years. The last major interest in the study included documenting the deviations or incorrect placements of the ABSB vs NBSB. ENVI 4.7 as well as ENVI 5.0 image manipulation software was used in the geo-rectifying and the geo-referencing process. Changes that occurred were documented in the form of a data table with the change that occurred along with the latitude and longitude geographic coordinates.

**The research team conducted validation of the ABSB vs. NBSB using three comparison sets of Level 1, Band 2 Landsat images: (1) years 1988 and 2014 of path 32 and row 115, (2) years 1999 and 2003 of path 30 and row 116, and (3) years 2000 and 2014 of path 32 and row 116. Selecting the aforementioned path and row combinations allowed the team to observe the Ross Ice Shelf at the line of equinox to the southwest-most border of the ice shelf. Observation of the ice shelf spanned a total of 25 years in select sections, and features images before and after the discovery of the natural basal stress boundary. By utilizing the standard zoom of ~x4 of the ENVI Classic zoom window feature, the research team concluded that there had been a misplacement of the NBSB along the Ross Ice Shelf.**

***Index Terms*—Ice Shelf, Antarctica, ENVI, GloVis, Landsat, Antarctic Snow Accumulation and Ice Discharge (ABSB), natural basal stress boundary (NBSB)**