Glacier Extent

Vital Signs Monitoring - Southwest Alaska Network

Importance / Issues

Glaciers are a significant landscape feature in the SWAN parks, especially KEFJ, KATM, and LACL. Glaciers in Alaska have been in widespread retreat and thinning since the Little Ice Age (1900). Although this ice loss has occurred at varying rates over time, it is generally understood to have significantly increased in the last few decades. This variation in glacial coverage is responsible for significant landscape change within these parks.

Glacier systems are primarily regulated by climate fluctuations and thus provide a record of long-term climate change. Glaciers act as huge ice reservoirs for freshwater storage in the SWAN parks, and much of the freshwater flow systems in the network are currently of glacial origin. The SWAN identified glacier extent as an important vital sign to monitor because of the direct effect of these changes on the landscape, freshwater flow systems and potential shifts in aquatic communities in KEFJ, KATM, and LACL.

Sampling Design and Objectives

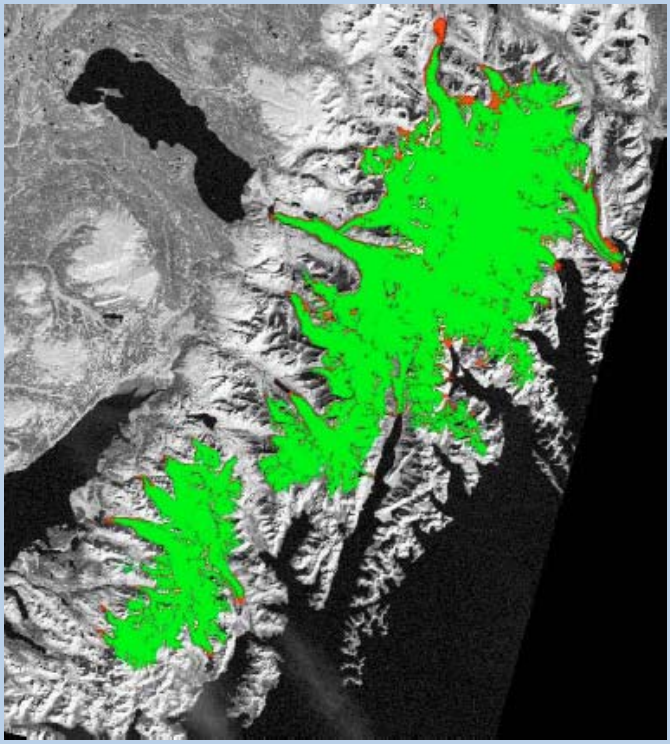
The use of satellite imagery, is recognized as a simple and effective means for documenting change in glacier extent. Landsat satellite imagery is available from the 1970s to the present. This imagery will be used to map glacier extent on a decadal scale in SWAN parks. Icefields and outlying glaciers will be outlined using a combination of automated and manual methods. Geographic information system analysis will quantify change in glacier extent and identify those areas that are changing anomalously.

KEFJ - Harding Icefield

????? Acres in 1986
????? Acres in 2000

KATM – Glacier Extent:

????? Acres in 1986-87
????? Acres in 2000



Changes in the Harding Icefield, red represents glacier ice in 1986 and green represents glacier ice in 2000 (Hall et al. 2005)***.***

Current and Future Work Efforts

Dr. Dorothy Hall (NASA-Goddard Space Flight Center) recently completed mapping glacial extent at KEFJ (Hall et al. 2005) and has recently finished mapping the glacier extent in KATM (in draft).

Efforts are currently underway to facilitate Dr. Hall's mapping of glacier extent in LACL.

Several issues complicate mapping efforts:

- debris covered ice (moraine and/or volcanic ash),
- seasonal snowfall
- shadows
- size of the area to be mapped (1+ million acres).

Debris covered ice, seasonal snowfall and shadows prevent automated mapping methods from accurately mapping glacier boundaries, thus requiring extensive and time-consuming manual editing.

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