MELT ON THE MARGINS: Calibrated Enhanced-Resolution Brightness Temperatures to Map Melt Onset near Glacier Margins & Transition Zones

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Abstract

Passive microwave (PM) observations from special sensor microwave imager (SSMI) (36/37 GHz) and advanced microwave Scanning Radiometer for EOS (AMSR-E) (18/19 GHz) have been reported sources of information about snow melt status in glacial environments, particularly in polar latitudes. PM data are vulnerable to changes in snow water content that occur within the sensor footprint. However, at most areas multiple PM observations per day are possible, providing the potential for determining the dynamic state of the snow pack during transition seasons. Contributions to the approach include glacier-marginal zones where pixels may be in transition between snow and ice and areas where the glacier is in direct contact with the ocean or atmosphere. Data are analyzed using enhanced-resolution (3.125 km) calibrated passive microwave daily data that provide an enhanced resolution of more than 25 km. A methodology using a time series approach can be used to map melt onset near glacier margins and transition zones. Altitude with respect to the surface of the ocean is a key factor to consider. The 3km data will enable new analyses in areas that are too small to resolve at the legacy resolution. This data can be used to map melt onset: the first day of daily values above the baseline and for the duration of melt season. The melt season identification from PM data is a key tool for monitoring the extent of the melt season and the likely impact of melt on ice sheet mass balance

Limitations of 25 km data: On small icecaps or near bodies of water, boundary pixels are compromised and in transition zones, changes are averaged out

Initial Findings: Comparisons of high and legacy resolutions show that minima and maxima can be better resolved in the near 25 km, as well as details in areas of relief and transition in state. Melt onset day 2.75 km resolution have tremendous potential to improve the spatial details for remote icecaps, especially in areas with topographic relief or irregular boundaries. The 3km data will enable new analyses in areas that are too small to resolve at the legacy resolution.

References


Acknowledgements

For information on accessing the prototype data, please contact Mary Jo Brodzik or Molly Hardman at the email addresses above. Data are being processed as part of a NASA MEaSUREs Grant,https:// earthdata.nasa.gov/community-data-system/programs/resources/projects). Glacier outlines come from Randolph Glacier Inventory. Coastlines come from GSHHG.