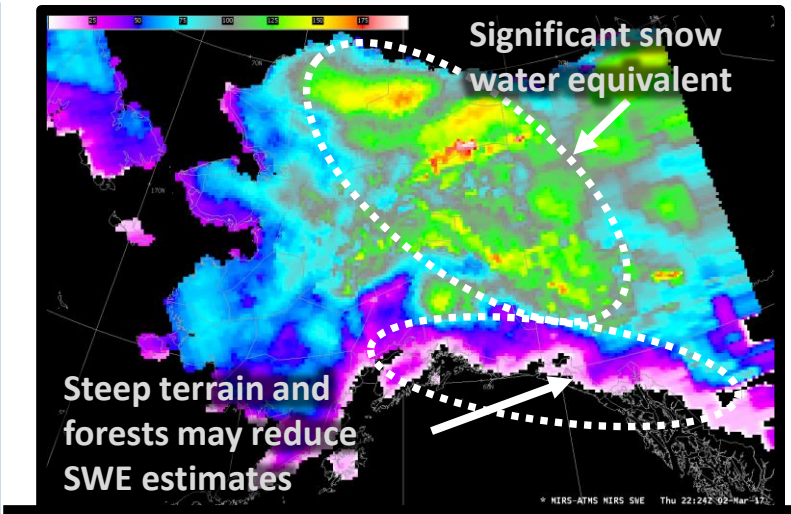
MIRS Snow Water Equivalent

Quick Guide

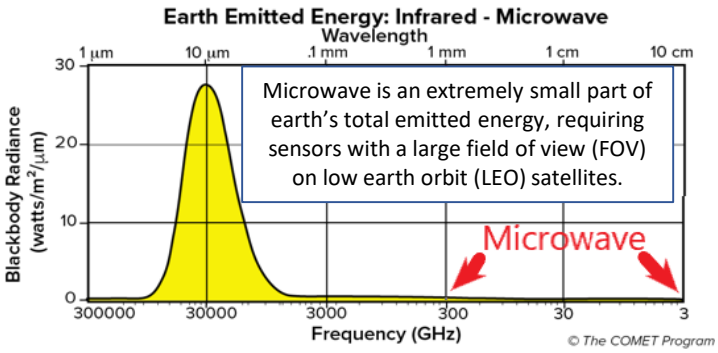
Water content in the Snowpack

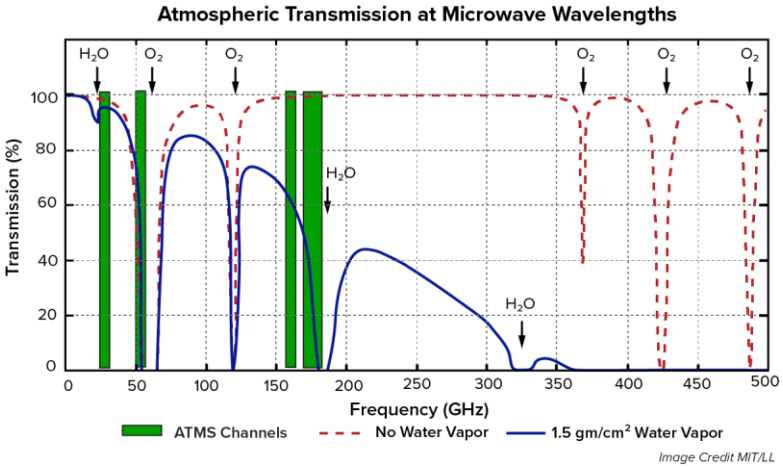
The Snow Water Equivalent (SWE) product from the Microwave Integrated Retrieval System (MiRS) estimates the potential water content in the snow pack at the time of the satellite overpass. It compares retrieved surface emissivity with a catalog of emissivity and snowpack properties to find the best match. Melted snow water is important for assessing the flood risk in a river basin.

The MiRS Snow Water Equivalent product is valid day or night, and in all weather conditions, however it can have variable results with changes to the snowpack that affect emissivity, such as melting or ponding on the surface. The coarse resolution may also may not be able to resolve detailed terrain differences such as forests and steep terrain.

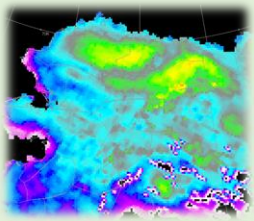


MIRS SWE from SNPP ATMS at 2224 UTC, 02 Mar 2017





Impact on Operations

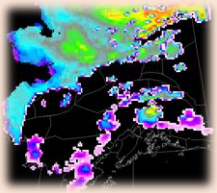


Surface snow not obscured by high clouds: the water content of snow at the surface can be estimated regardless of cloud cover.

Fills gaps in surface based snow observations: satellite SWE can provide more complete spatial distribution of the snowpack where surface snow information is sparse.

Available day or night : Many satellite products use visible (daytime only) bands for snow detection however microwave is also effective at night.

Limitations



Coarse resolution: sensor may not be able to resolve topographic details such as forests, mountains, rivers.

Melting or water on snow hides snowpack: emissivity of snow pack changes significantly with rain or melting snow on the surface.

Forested areas are not well represented: trees can obscure or complicate emissivity of snow at the surface.

Questions or comments: email GINA at satellite@gina.alaska.edu

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Snow Water Equivalent Interpretation

MIRS SWE:

- 1 — Higher SWE (4.0 + in)
- 2 — Lower SWE (0.5 – 3.5 in)
- 3 — No SWE detected

VIIRS DayLandCloud:

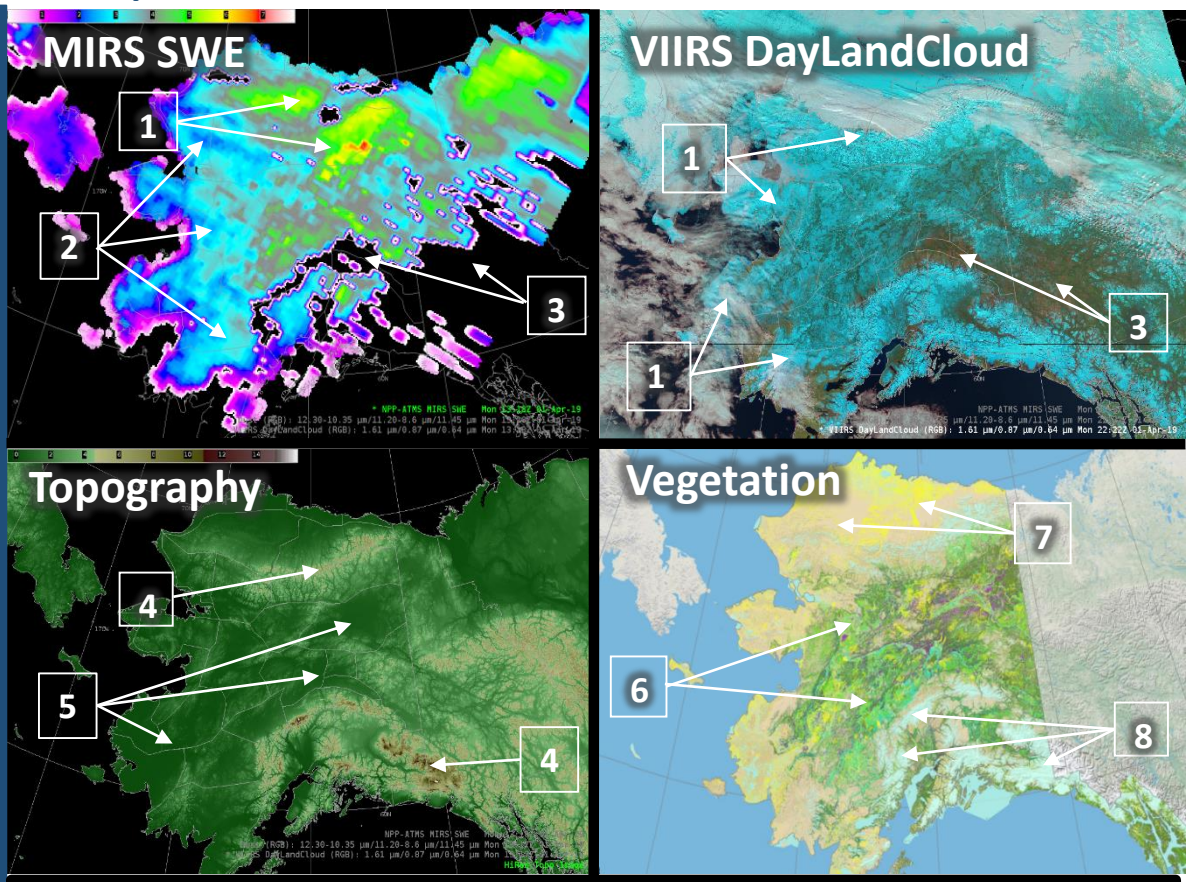
- 1 — Snow on ground
- 3 — Bare ground

AWIPS Topography:

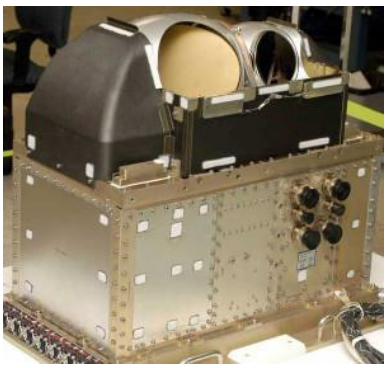
- 4 — High elevations (mountain ranges)
- 5 — Low elevations (valleys, deltas, plains, etc)

Vegetation:

- 6 — Forests
- 7 — Low shrub & tundra
- 8 — Non-vegetated



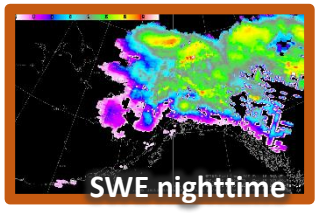
Snow Water Equivalent (SWE) should be used with other reference data to assess surface characteristics and changes that might affect SWE retrievals. In this example: (A) MIRS SWE 1318 UTC, 01 Apr 2019; is compared with: (B) VIIRS DayLandCloud RGB at 2222 UTC, 01 Apr 2019 for observed snow cover; (C) Alaska Topography for river basins and steep terrain; and (D) Vegetation Information (not an AWIPS product) for identifying heavily forested areas.

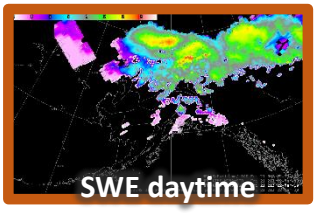


ATMS Instrument

Where did the Snow Go?

Increased liquid surface water from rain or melting snow can appear as if the snowpack has dramatically decreased during the day. This happens more often in spring and is due to emissivity changes. Compare temperatures and SWE trends over several days to assess the extent of this problem. Nighttime SWE will have less impact due to cooler temperatures.





Resources

NOAA OSPO MIRS Home Page
http://www.ospo.noaa.gov/Products/atmosphere/mirs/index.html

COMET/MetEd Microwave Remote Sensing Course
https://www.meted.ucar.edu/training_course.php?id=15

MIRS Algorithm Description
http://www.ospo.noaa.gov/Products/atmosphere/mirs/algo.html

Hyperlinks not available when viewing material in AIR Tool