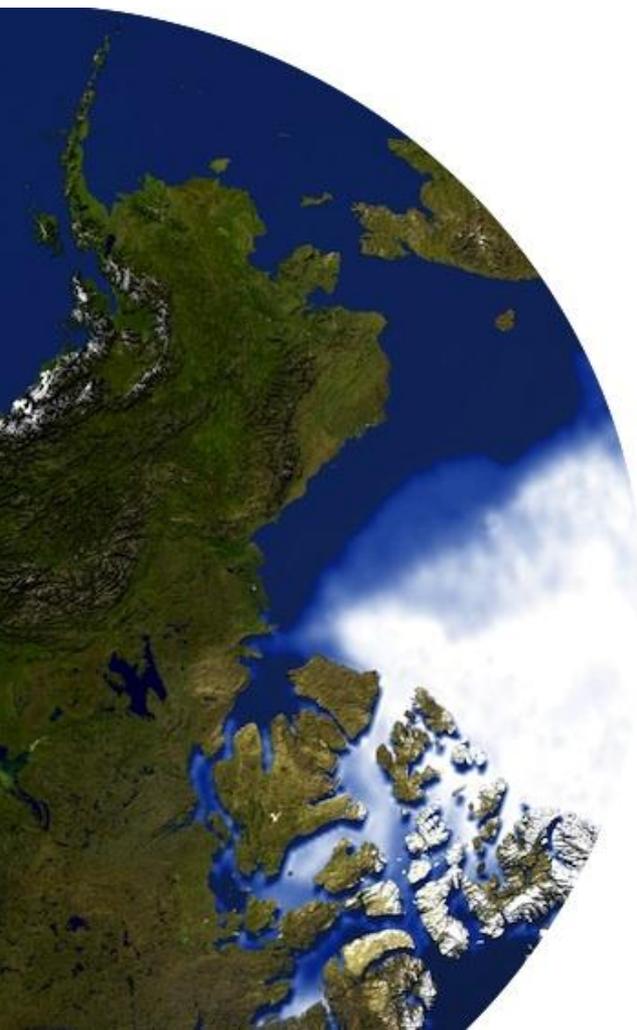


Ice, Snow, Winds, and Other Products for the High Latitude Proving Ground

Jeff Key

NOAA/NESDIS

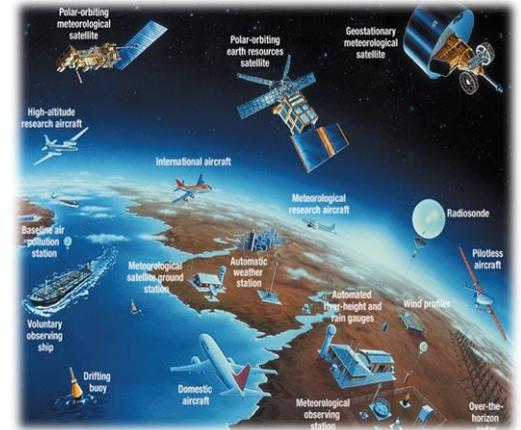
Madison, Wisconsin USA



Products of Interest

Microwave:

- There are many snow and ice products based on passive and active microwave, but they are not the focus here



GOES-R ABI:

- Fractional snow cover
- Snow depth (plains only)
- Ice cover
- Ice concentration
- Ice thickness/age
- Ice motion

NPP/JPSS VIIRS:

- Snow cover
- Ice concentration
- Ice thickness/age
- Ice surface temperature
- Polar winds

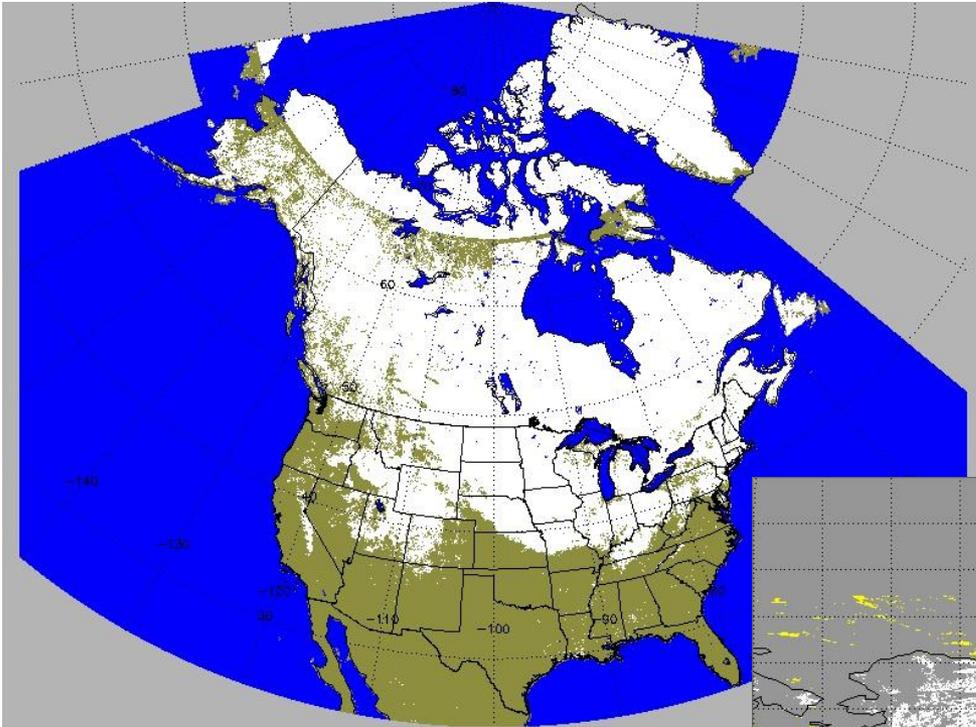
Other:

- LEO-GEO polar winds
- Arctic composite imagery
- Low-level temperature inversions

Current Data Sources

- AVHRR GAC
- MODIS via Lance (NASA)
- Direct broadcast/readout sites
- GEOs

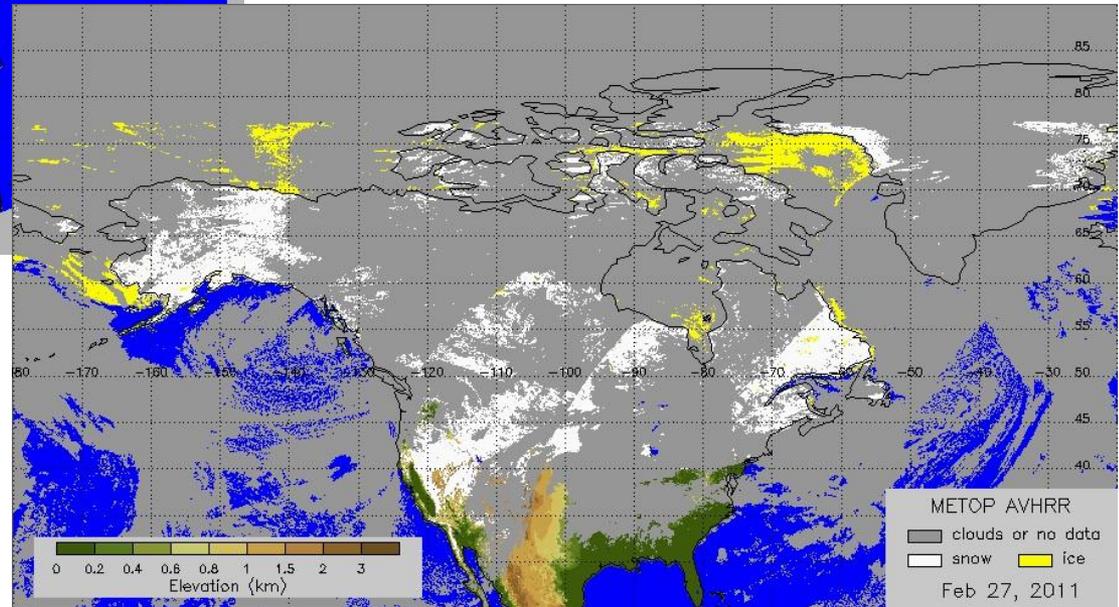
Snow Cover



Many snow products, from many sensors, are available.

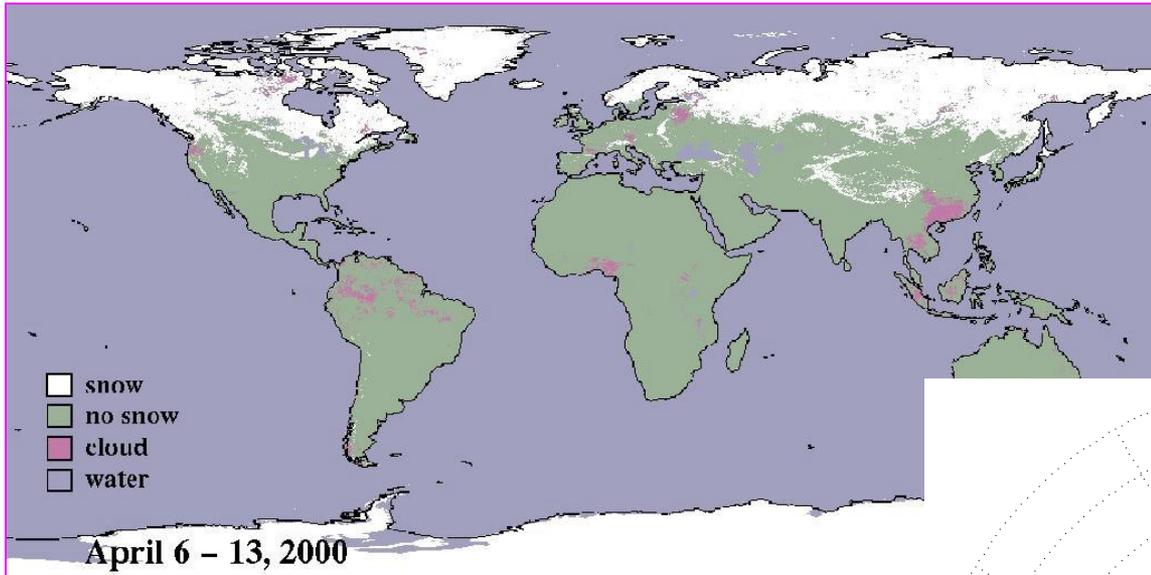
Above: NOAA's automated, blended AVHRR, GOES, and SSM/I snow analysis

Right: NOAA's Metop AVHRR snow cover



(Investigator: Peter Romanov)

Snow Cover, cont.

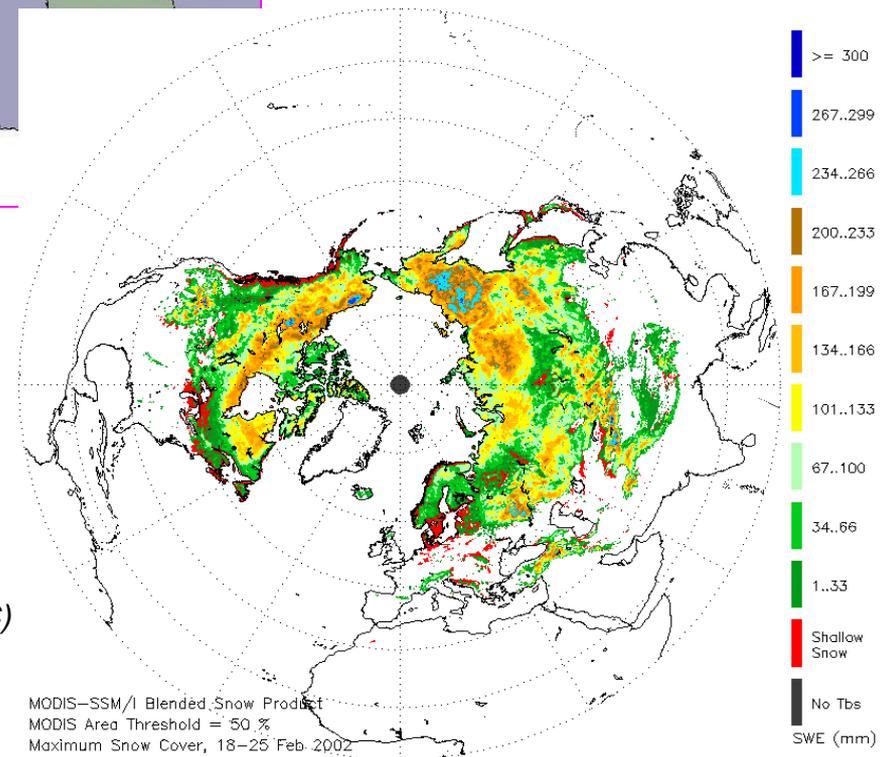


MODIS

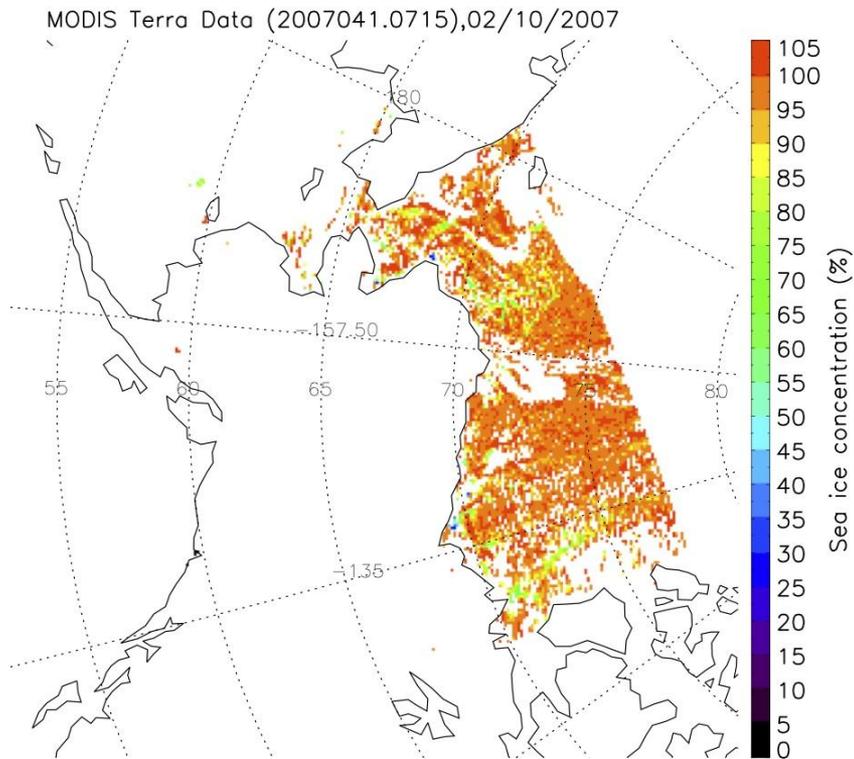
(Courtesy of D. Hall)

SWE from blended MODIS
and SSM/I

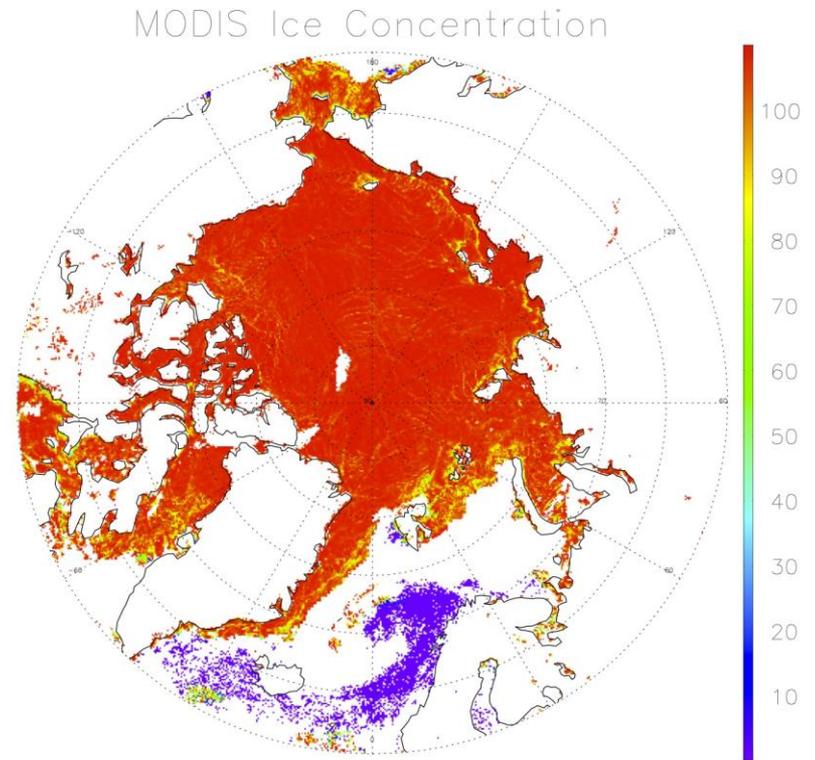
(Courtesy of NSIDC)



Ice Cover and Concentration



MODIS

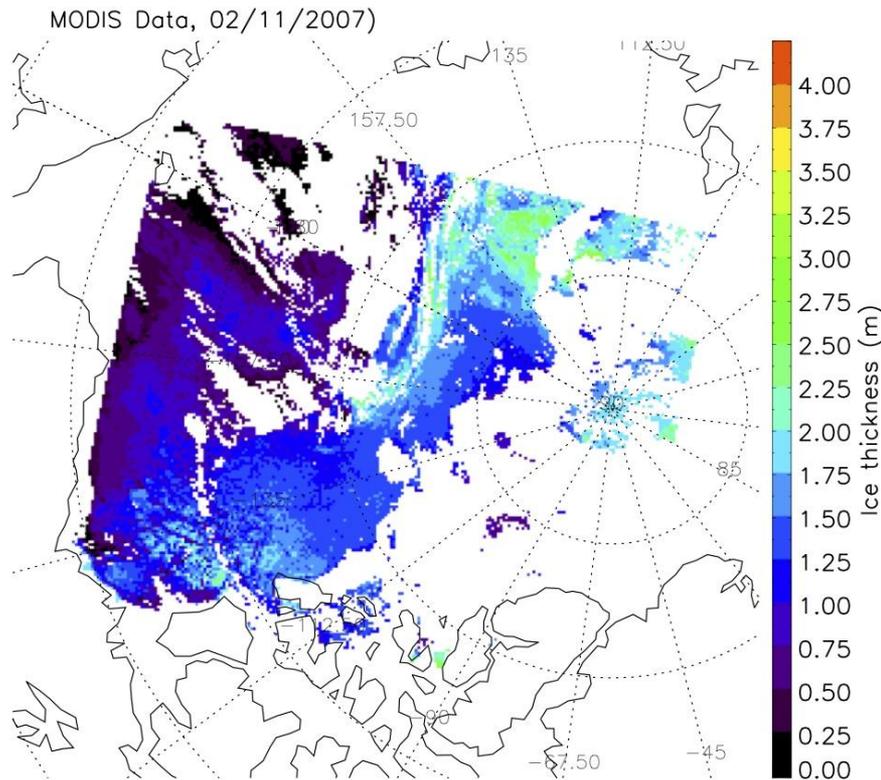


MODIS composite

This is a clear-sky only product from MODIS, AVHRR, VIIRS, ABI

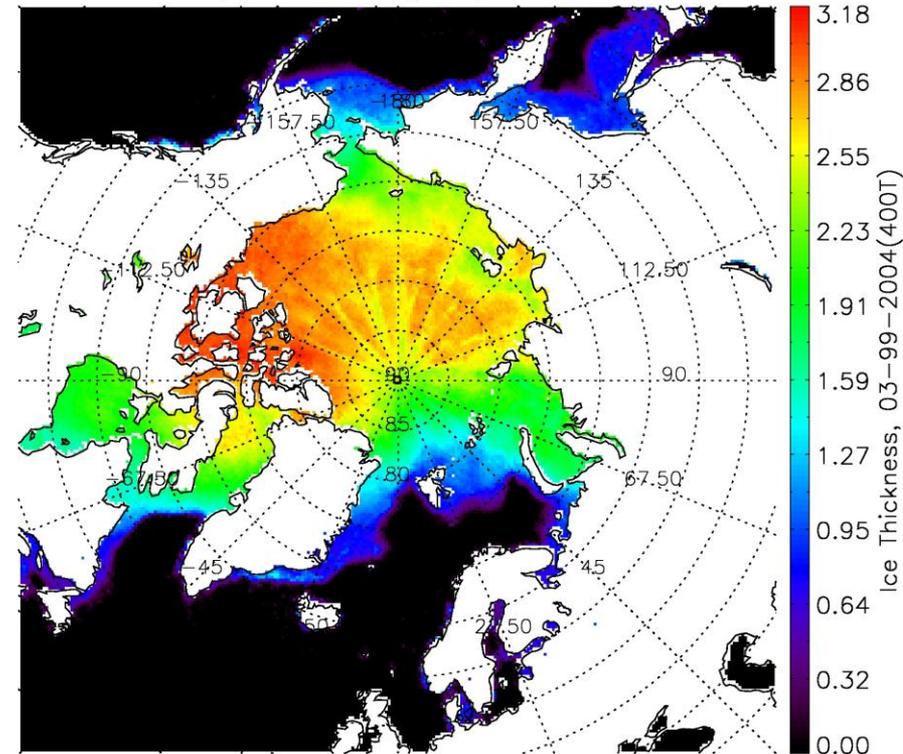
(Investigator: Yinghui Liu)

Ice Thickness



MODIS

Ice Thickness, 03-99-2004(400T)

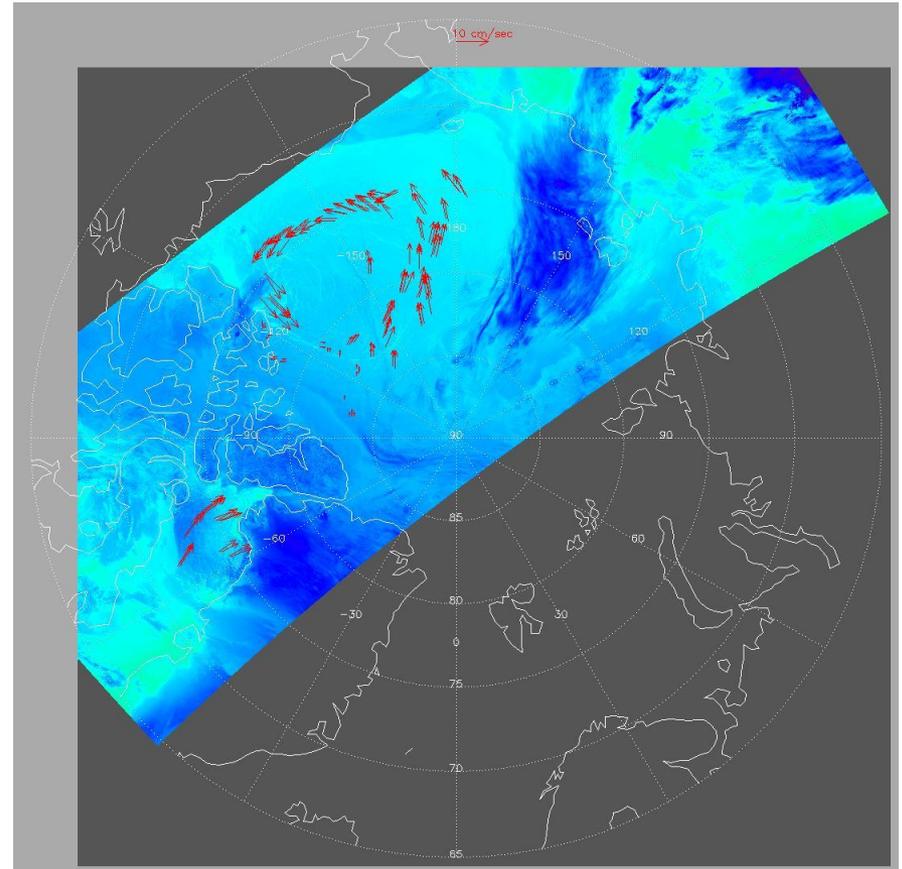
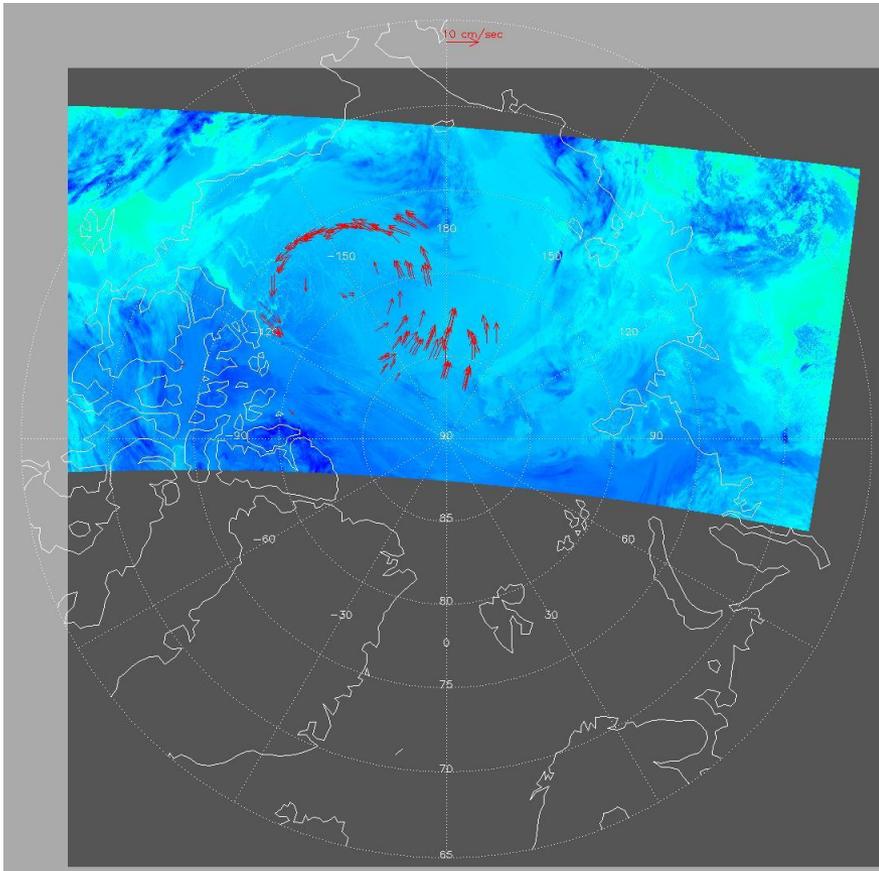


AVHRR composite

This is a all-sky product from
MODIS, AVHRR, VIIRS, ABI

(Investigator: Xuanji Wang)

Ice Motion



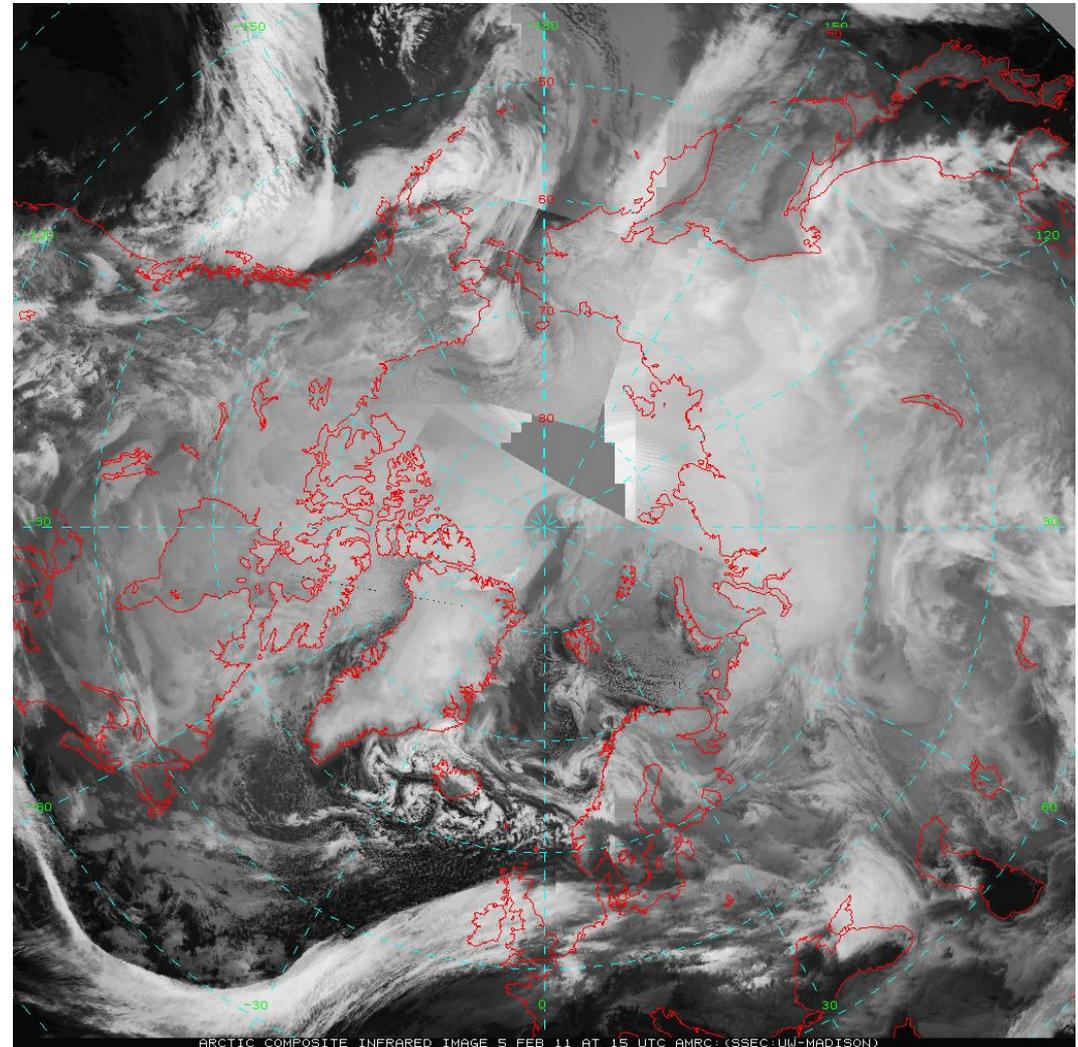
From MODIS (ideally this would be a blended microwave/vis-IR product)

(Investigator: Yinghui Liu)

Arctic Composite Imagery

The product is an hourly mosaic of geostationary and polar-orbiting satellite data over the Arctic region. A time series of images provides for animations, which can be used to examine the evolution of weather phenomena.

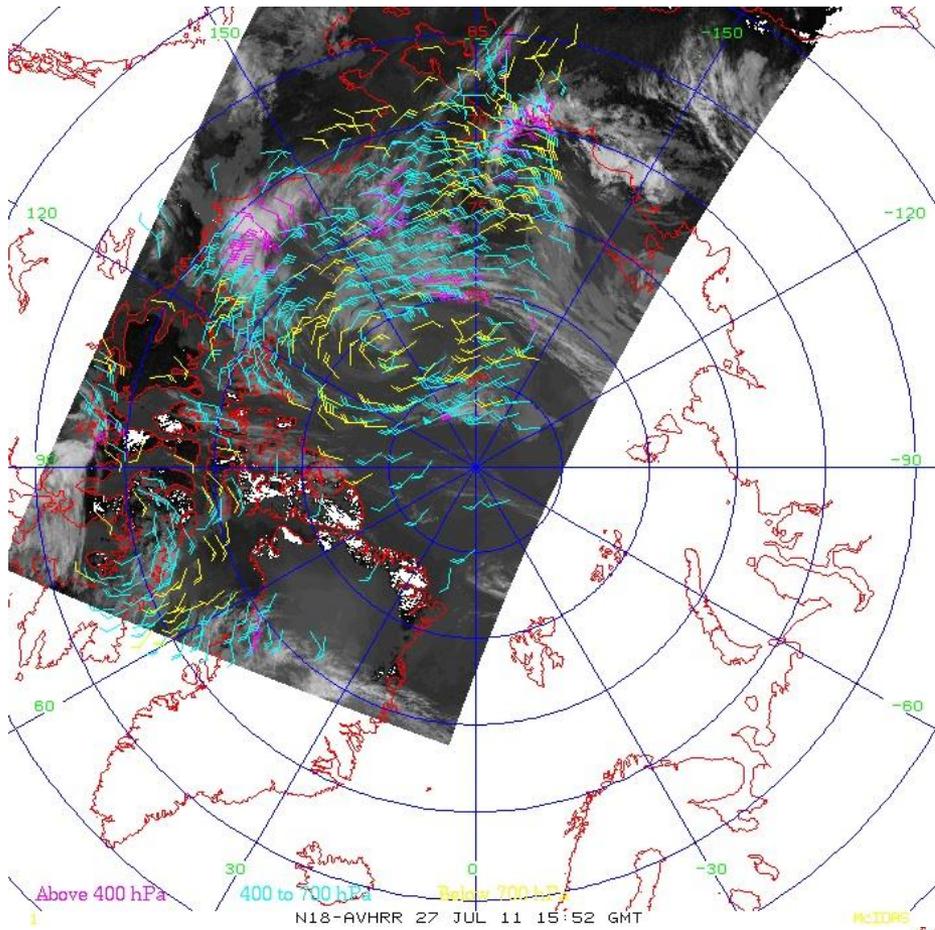
Arctic composites are currently generated with GOES, Meteosat, MTSAT, NOAA, and Aqua/Terra with plans to add Metop-A this spring. Metop-B, NPP, and future GOES & MTSAT satellites will be incorporated as available. NPP will launch in October 2011; Metop-B will launch in April 2012. Others used in research product but not yet operational in NESDIS: FY-2(D,E), INSAT.



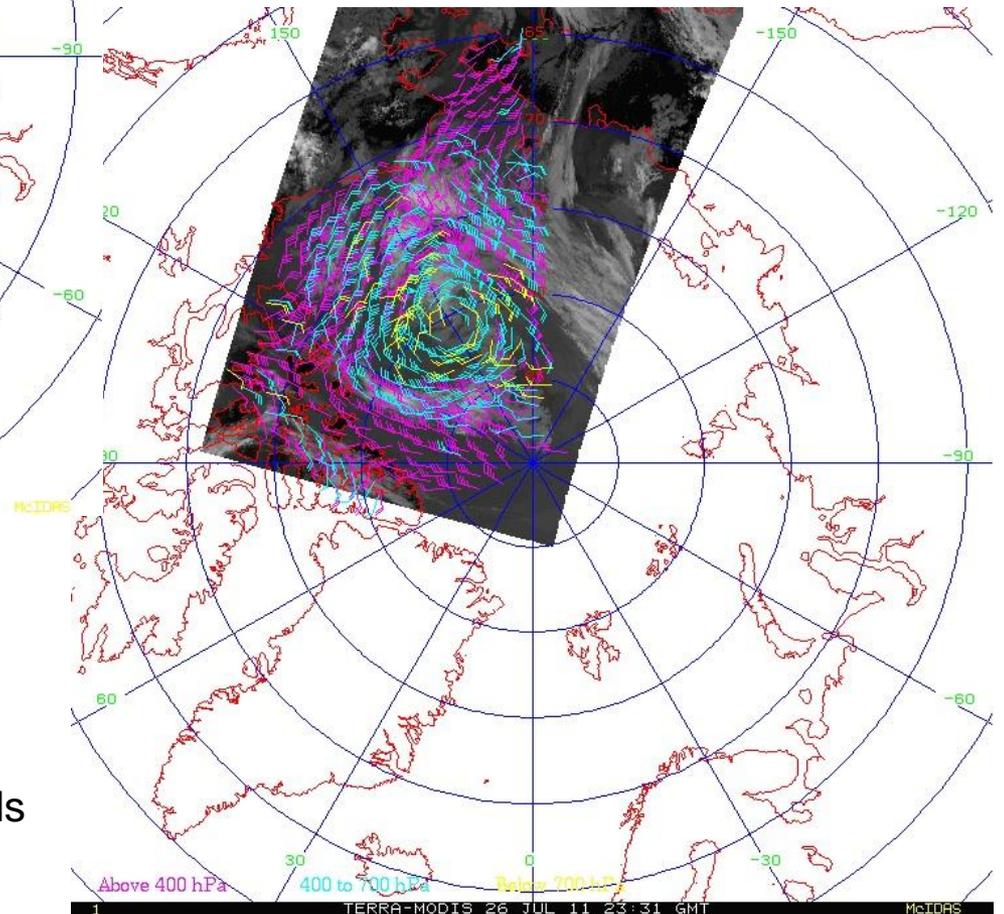
(animation)

Investigator: Matthew Lazzara (SSEC)

MODIS and AVHRR Polar Winds



Above: AVHRR winds
from Barrow



Right: MODIS winds
from Fairbanks

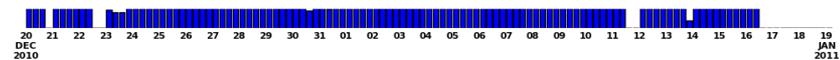
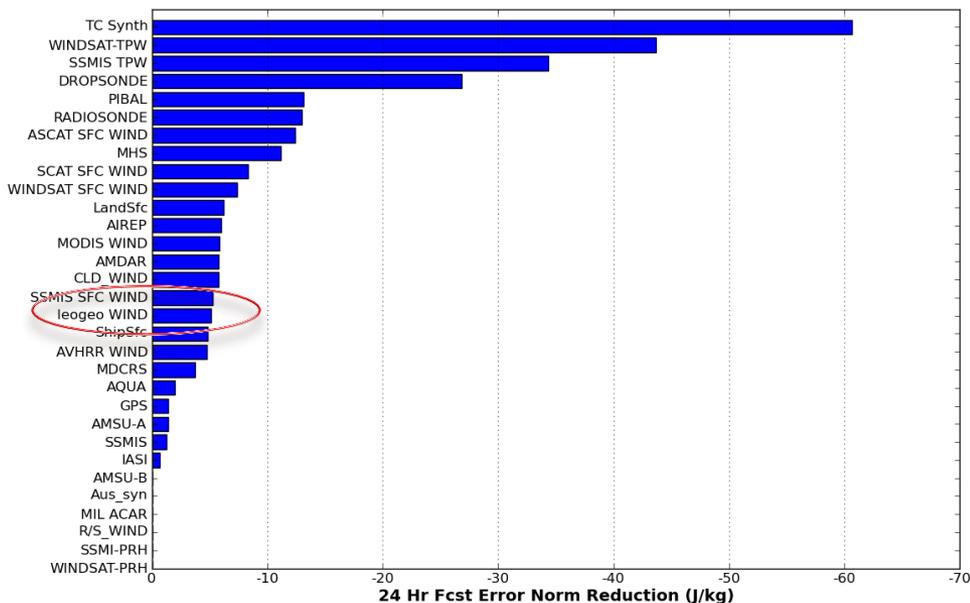
LEO-GEO Polar Winds

A combined polar-orbiting and geostationary polar winds product is being developed in the GOES-R Risk Reduction program.

By combining data from many GEO and LEO satellites into hourly composites, the product fills a gap in the 60-70 degree latitude zone.

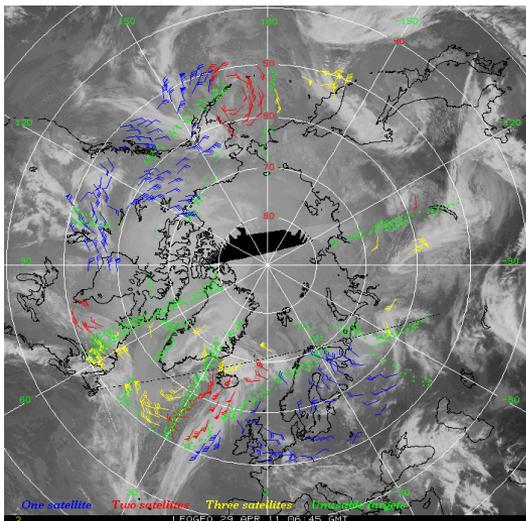
The U.S. Navy's Fleet Numerical Meteorology and Oceanography Center (FNMOC) is testing the impact of these winds on weather forecasts (indirectly through reduction in the observation error). The impact is positive, and similar to that provided by the MODIS polar winds.

NAVDAS-AR Per Ob Sensitivity (10⁻⁶)

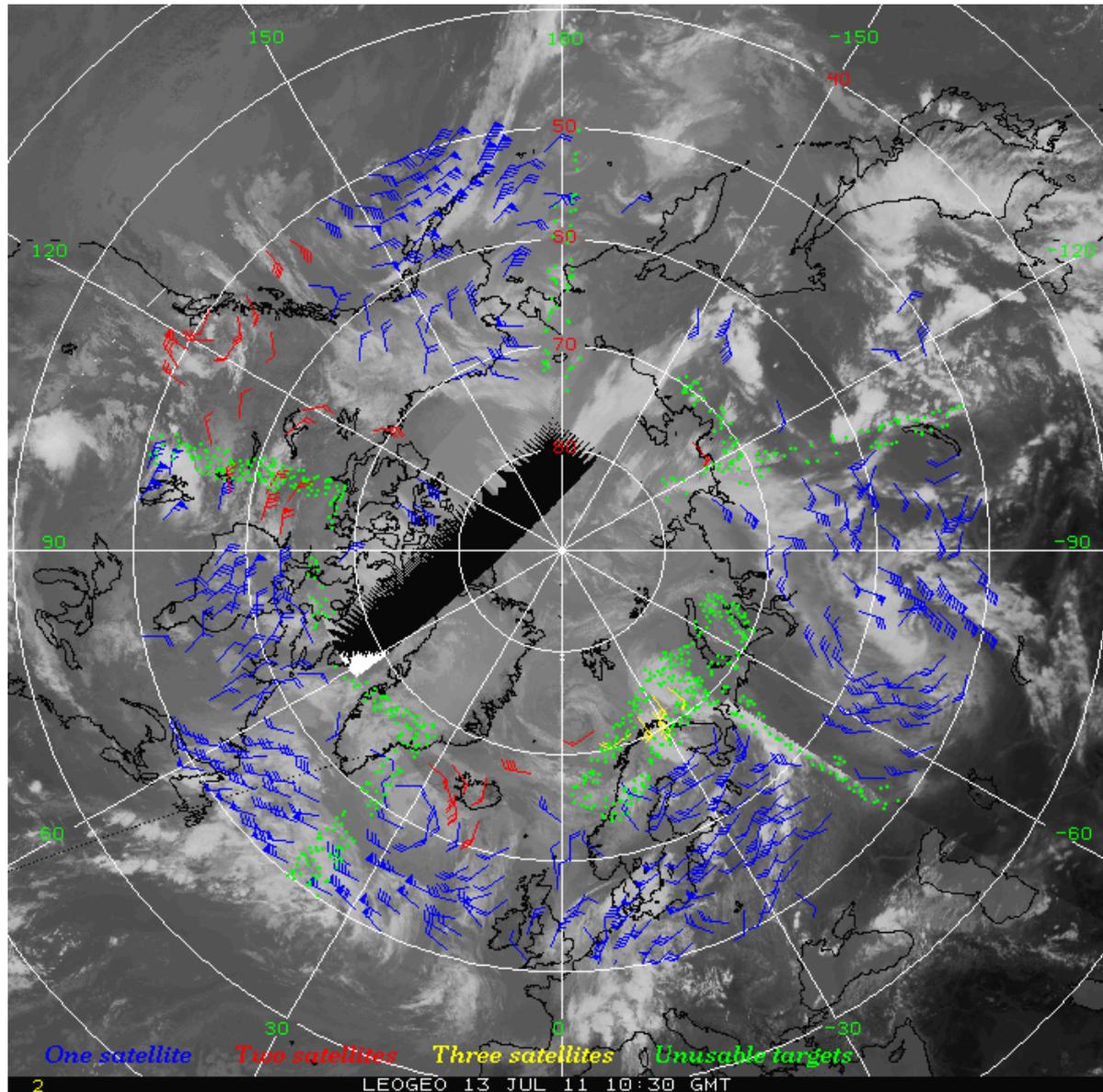


24-hr forecast error reduction in the FNMOC model for various observation types. The reduction in error resulting from the incorporation of the LEO-GEO wind product is circled. This wind product will be incorporated into FNMOC's operational system after further testing.

Investigators: Matthew Lazzara – PI (SSEC), Dave Santek (CIMSS), Chris Velden (CIMSS), Jeff Key (STAR), Jaime Daniels (STAR), Randy Pauley (FNMOC)



LEO-GEO Polar Winds animation

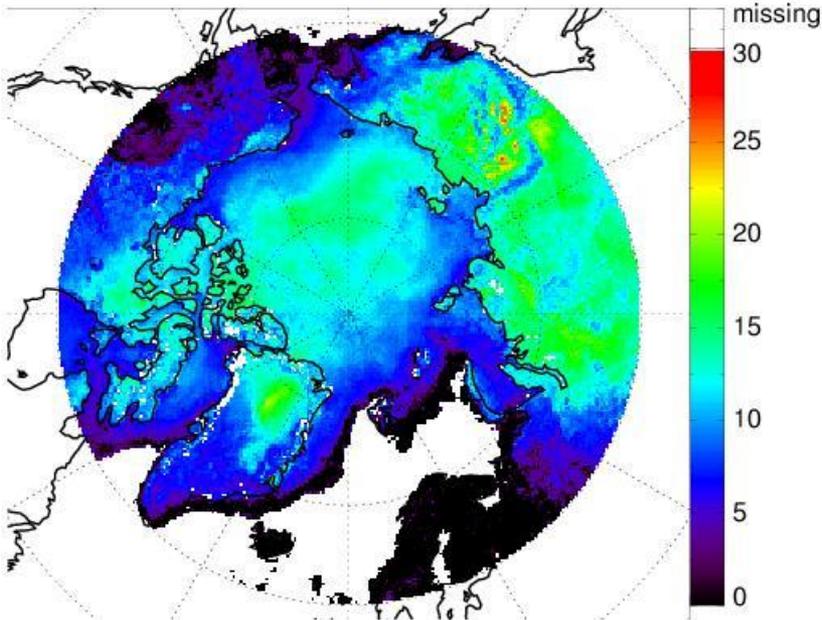


Low-Level Atmospheric Temperature Inversions (MODIS)

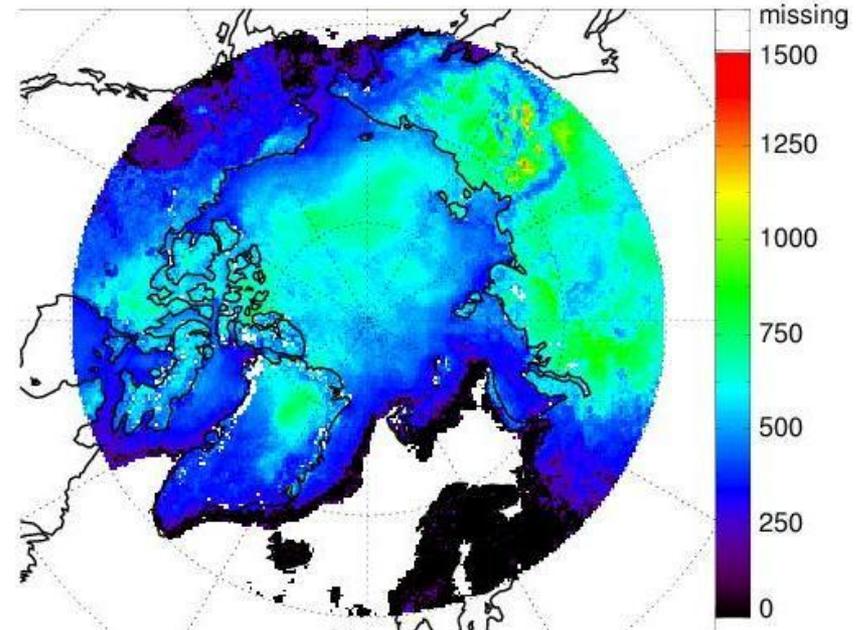
Strength (C)

Depth (m)

Median Temperature Inversion Strength With MODIS in Arctic in Jan

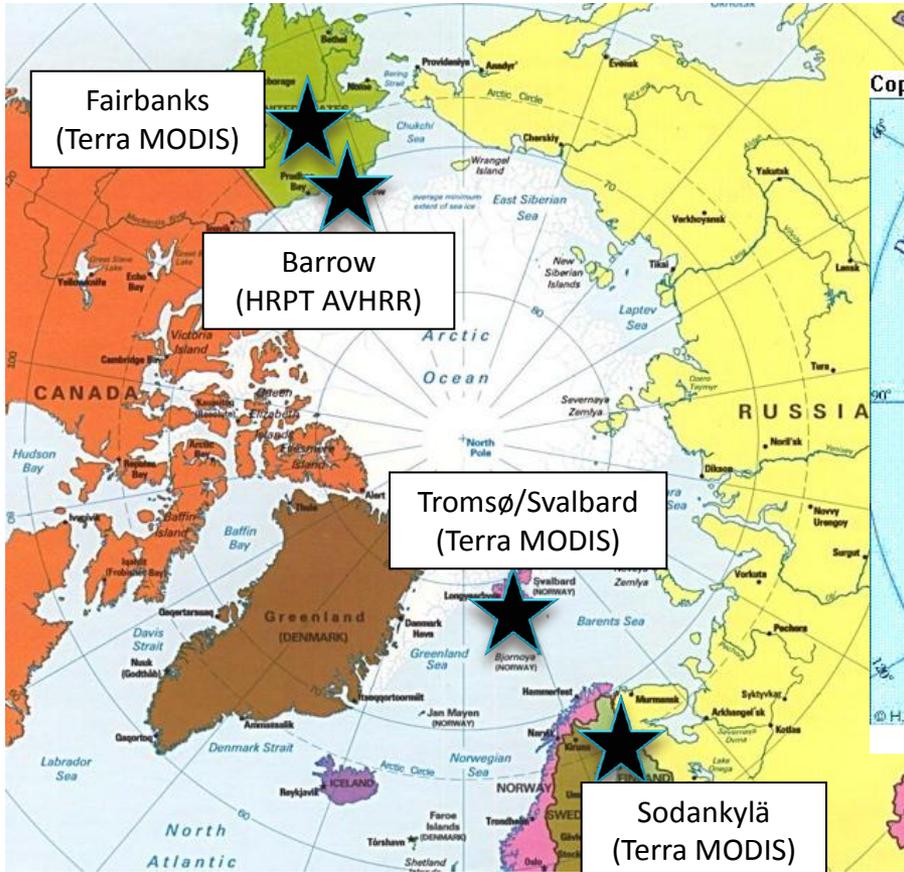


Median Temperature Inversion Depth With MODIS in Arctic in Jan

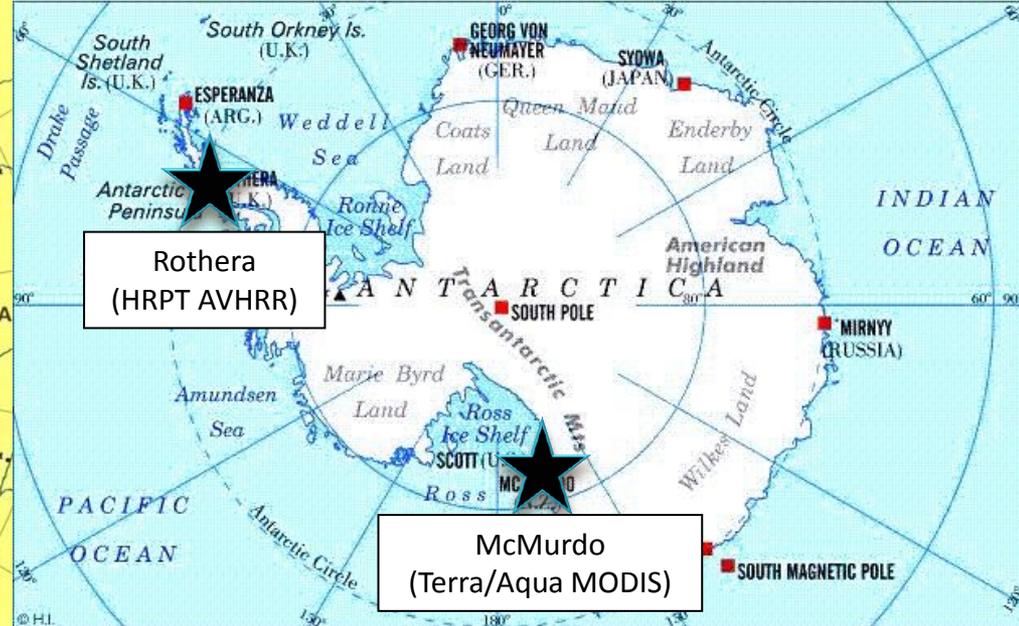


Unfortunately, this won't be available from VIIRS because it uses a low-peaking water vapor (or CO2) channel.

Direct Broadcast Sites for Polar Products



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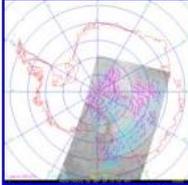
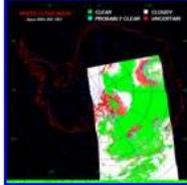
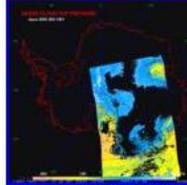
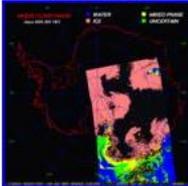
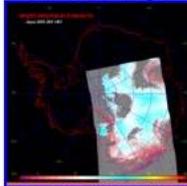
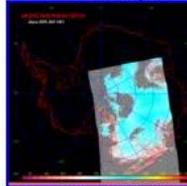
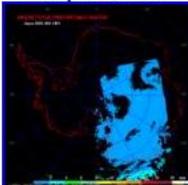
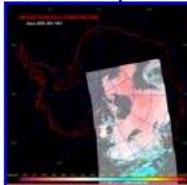
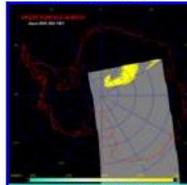
Mozilla Firefox Beta 1
http://stratus.ssec.wisc.edu/cgi-bin/db_main?site=mcmt
 SSEC webmail Netscape Mail Unisys MeteoStar CIMSS Weather Yahoo News BBC News
<http://stratus.s...in?site=mcmurdo> Bookmarks

NESDIS/STAR/ASPT Home Products Projects Scenes Links CIMSS

Real-Time MODIS Products from McMurdo

A number of MODIS products are generated on-site at McMurdo, Antarctica, using data from the National Science Foundation's direct broadcast system. Here are the most recent images for each product. **Click on the product links at left for more images of a specific product.** The purpose of this direct broadcast real-time system is two-fold: (1) to generate polar wind and other information more quickly than is done with our current system, so that numerical weather prediction centers can assimilate more polar data in their model runs, and (2) to provide an additional source of information, primarily winds, for weather forecasters in Antarctica.

AQUA:

 Winds Day 269, 12:22 UTC	 Cloud Mask Day 269, 14:01 UTC	 Cloud Pressure Day 269, 14:01 UTC
 Cloud Phase Day 269, 14:01 UTC	 Inversion Strength Day 269, 14:01 UTC	 Inversion Depth Day 269, 14:01 UTC
 Precipitable Water Day 269, 14:01 UTC	 Surface Temperature Day 269, 14:01 UTC	 Surface Albedo Day 269, 14:01 UTC

TERRA:
 Note: The McMurdo system is currently experiencing a problem with Terra MODIS acquisition.

Winds Cloud Mask Cloud Pressure

Current Products

(all MODIS):

Winds

Cloud mask*

Cloud pressure*

Cloud phase*

Total precipitable water*

Inversion strength

Inversion depth

Ice/snow surface temperature

Ice/snow albedo

Soon to be implemented:

Ice motion

Ice age

Cloud optical properties

* IMAPP/MODIS Science Team products

<http://stratus.ssec.wisc.edu/db/mcmurdo>

So...

The hourly Arctic composite imagery provides an excellent visual tool for large-scale circulation.

Single- and multi-satellite polar wind products are important for improving numerical weather prediction. Are they useful for forecasters?

VIIRS and ABI ice products complement passive and active microwave ice products. The ice thickness product would be particularly useful. These are of greatest interest to the ice centers.

There are a number of possibilities for snow cover products. Snow depth would require a significant effort.

