



NESDIS Global Automated Satellite Snow Product: Current Status and Planned Upgrades

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- Overview of the system/product
- Performance in 2014-2015
- VIIRS snow
- Planned Improvements

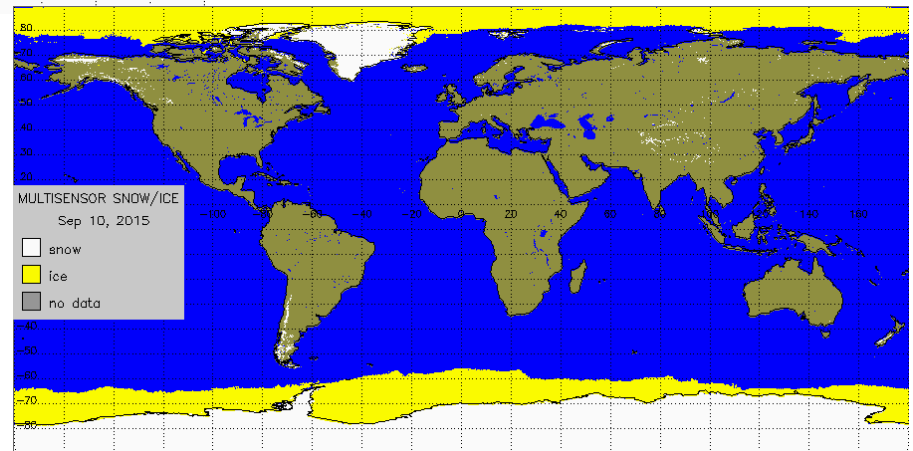
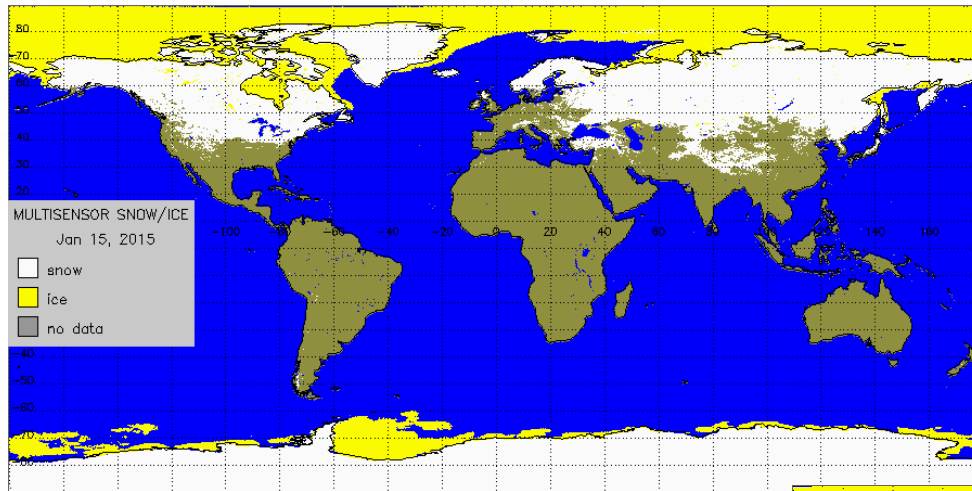
Global Multisensor Automated Snow/Ice (GMAI-Autosnow) Mapping System: Overview

Objective: Generate daily spatially-continuous global snow/ice cover product for use in NWP models and other operational applications

Approach:

- Synergy of satellite observations in the visible/infrared and in the microwave
 - Currently Metop-B AVHRR and SSMI/SSMIS on DMSP F-15 to F19
- Recurrent gap-filling if no valid retrieval is made on the current day

Daily Snow/Ice Map



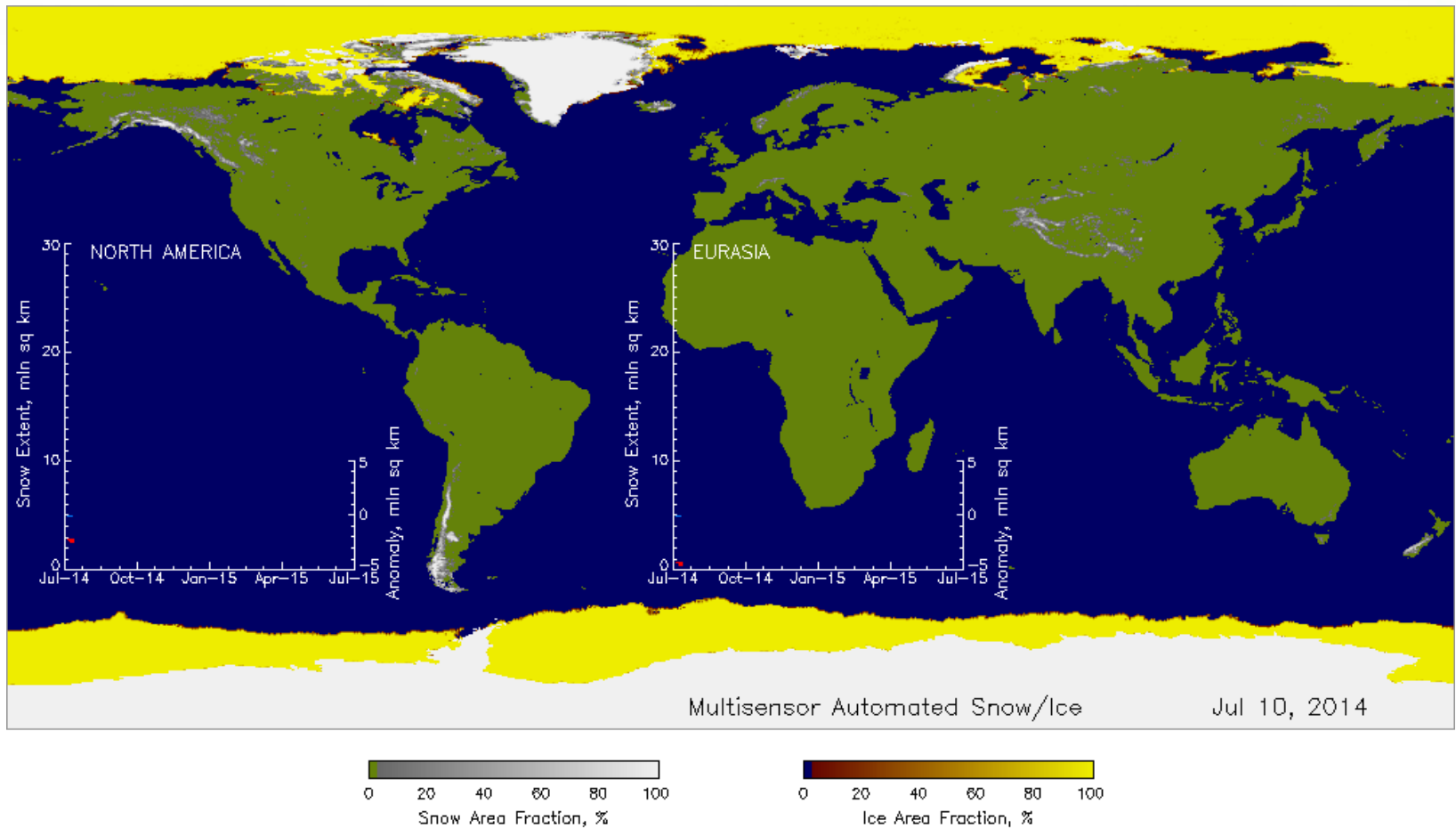
Current day snow/ice map becomes available at ~10AM UTC the next day

Projection: Plate Carree, $0.04^\circ \times 0.04^\circ$ (or about 4 km grid cell size)

Autosnow: Current Status

- No changes to the operational system since 2014
- Operational system maintained by NESDIS
- Routine validation and quality evaluation are ongoing
- Product application:
 - IMS
 - S-NPP IDPS (VIIRS and OMPS retrievals)
- Further development/improvement of the system is not funded

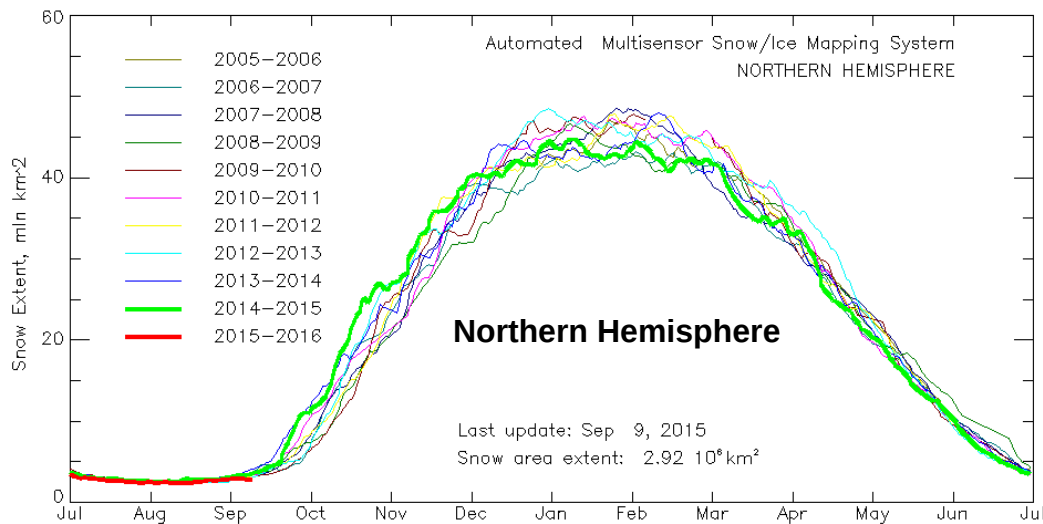
2014-2015 Season



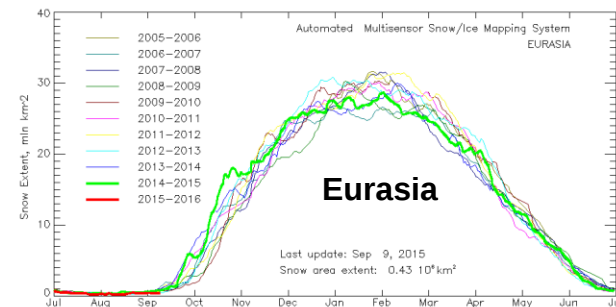
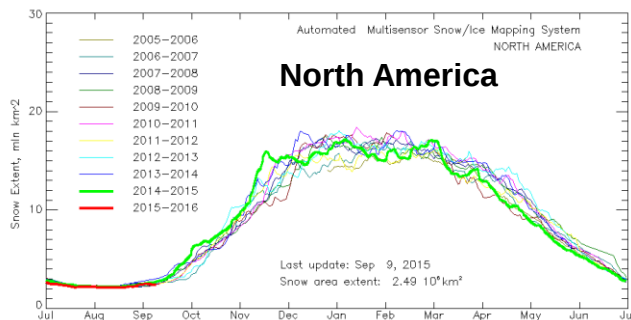
Snow and ice fraction is obtained by aggregating 4 km retrievals within 10x10 grid cell boxes

Snow Extent Monitor, NH

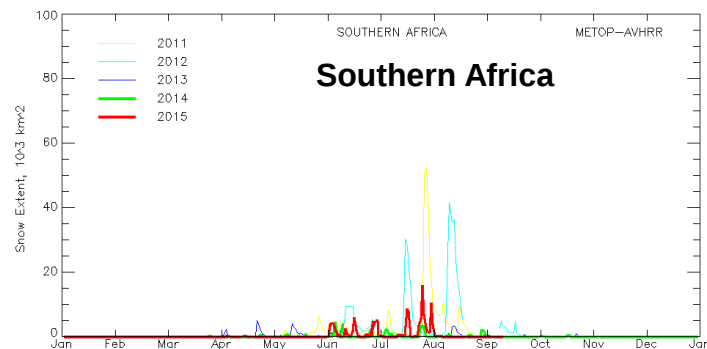
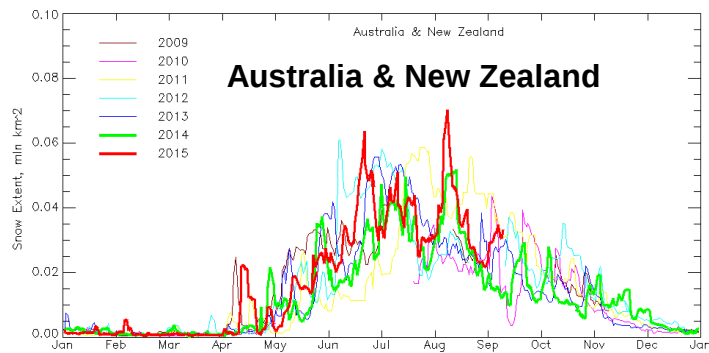
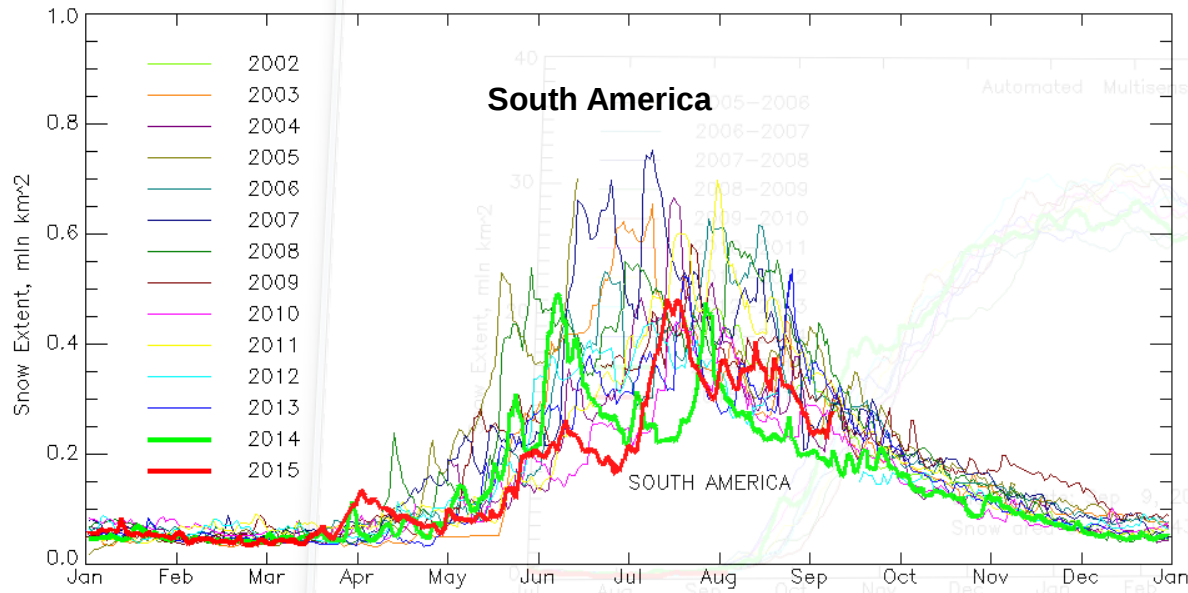
Daily snow extent



Snow area extent over N. Hemisphere and all continents is updated daily

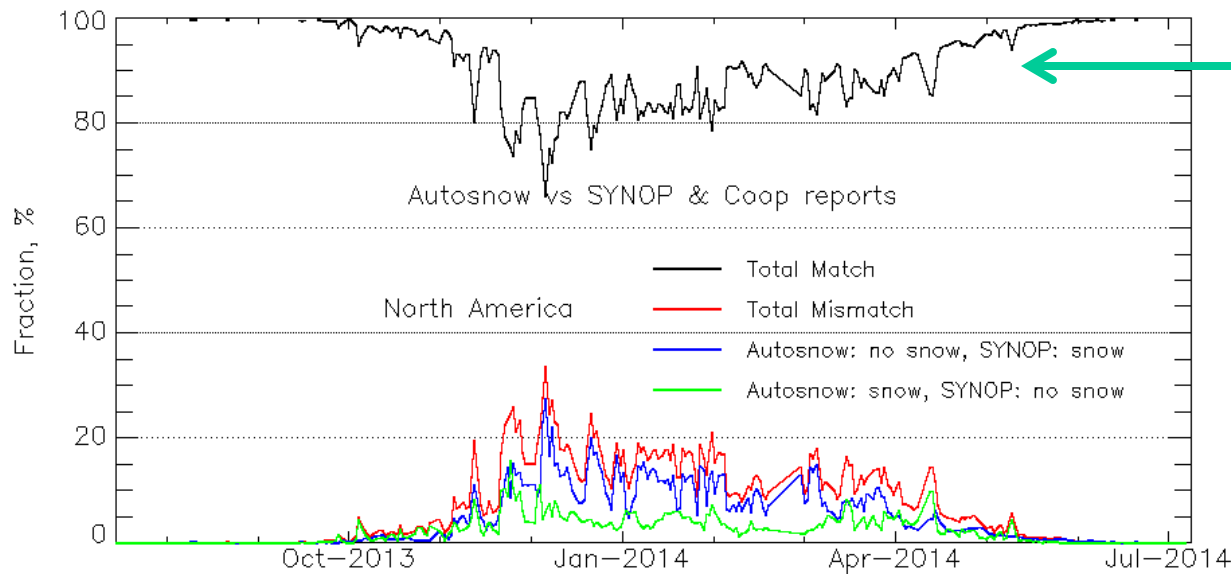
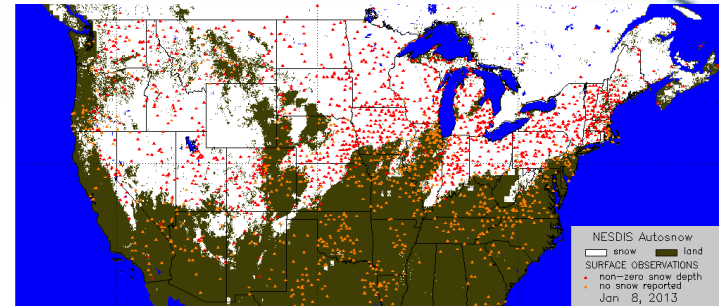


Snow Extent Monitor, SH



Autosnow vs *insitu* data

- Performed daily, mostly CONUS area
- Agreement on snow/no-snow
 - Mostly above 80% in winter
 - Over 90% yearly average



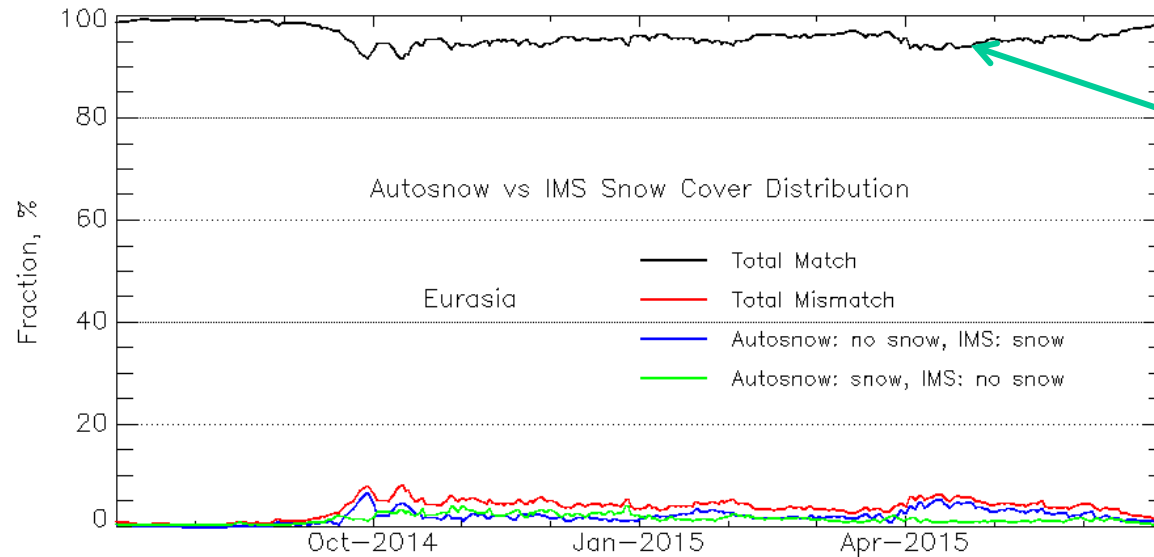
Percent of correct "snow" and correct "no-snow" identifications

Station data are not quality controlled ! Errors in the in situ dataset may reduce the agreement by 1-2%

Last record: Jul 9, 2014 Agreement, %: 99.9

Mean Agreement, % Last year: 93.6 Last month: 99.9 Last week: 99.9

Autosnow vs IMS



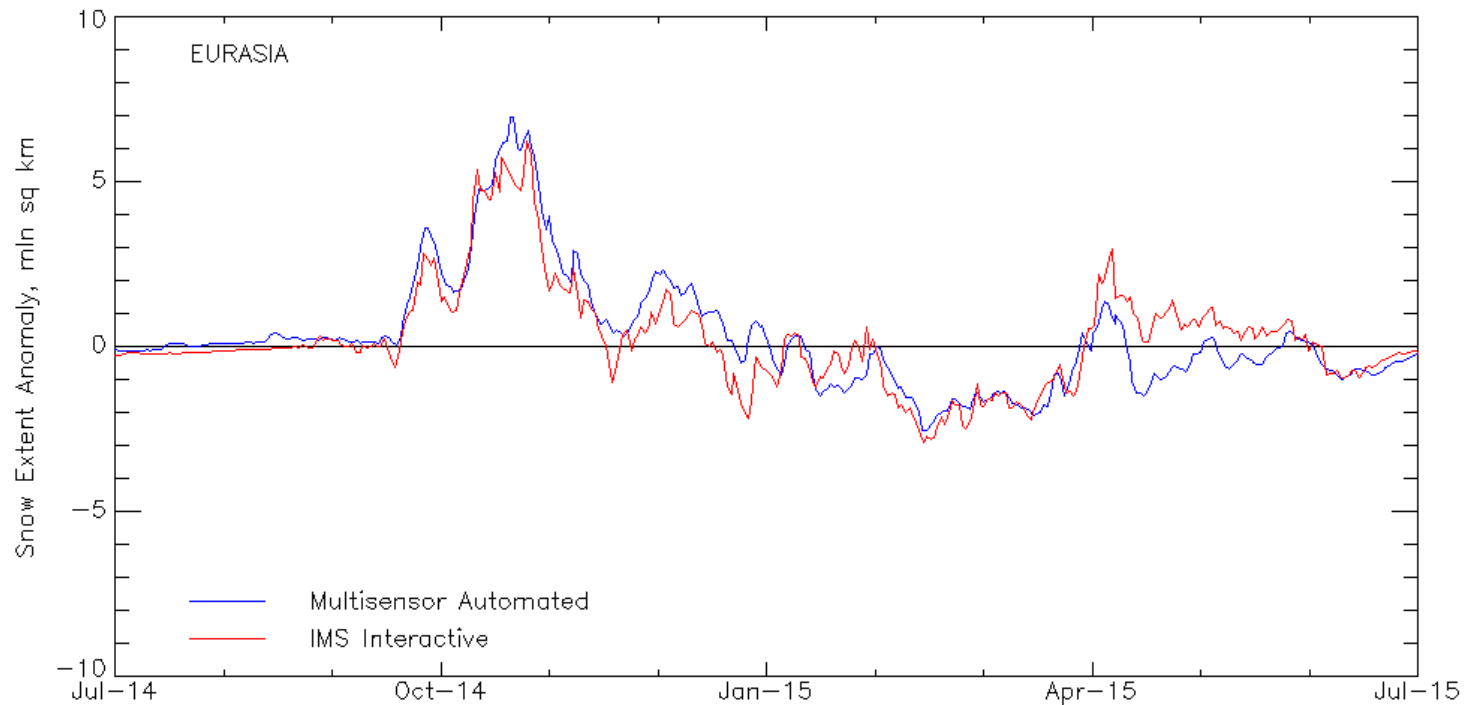
Percent of daily “snow” and “no-snow” identifications consistent with IMS

Last record: Jun 29, 2015 Agreement, %: 98.6
 Mean Agreement, % Last year: 96.3 Last month: 96.8 Last week: 98.1

- Products compared daily
- More snow mapped by IMS in late spring
- Agreement between products in NH
 - Over 90% in winter
 - Yearly mean: 96.2% (2013-2014), 96.0% (2014-2015)

Snow Extent Anomalies

Snow area extent daily anomalies, AutoSnow and IMS

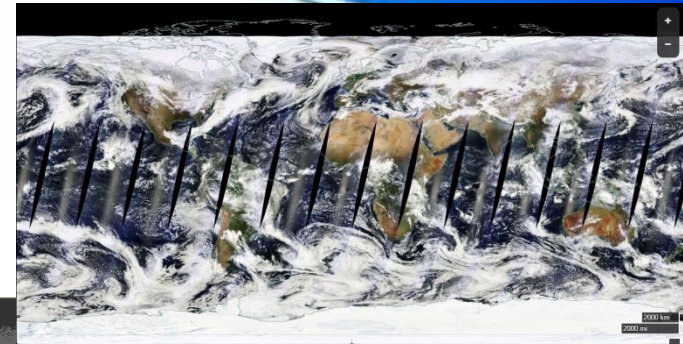


Correlation of daily snow extent anomalies, Autosnow vs IMS:

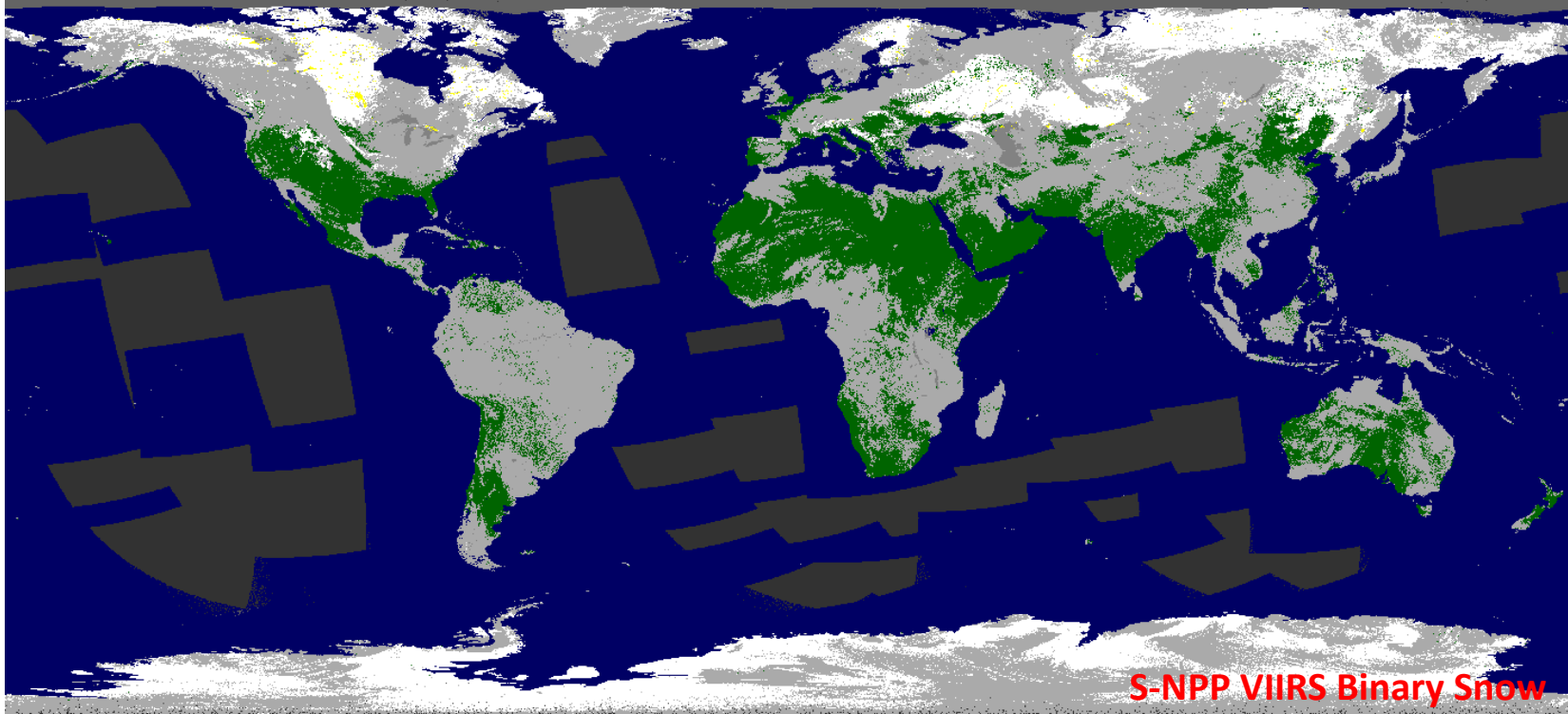
- 0.85 in North America
- 0.89 in Eurasia
- 0.86 in N. Hemisphere

VIIRS Snow Products

- Binary and Fractional Snow Cover Maps
- 375 m nominal spatial resolution
- Universal cloud mask applied to all products
- Snow Fraction: simplistic algorithm, will be replaced



Feb 19, 2015



S-NPP VIIRS Binary Snow



VIIRS Snow vs MODIS and AVHRR

Mean agreement to IMS and cloud-clear fraction
of daily automated snow products in 2013
Northern Hemisphere

	<i>Agreement to IMS (%)</i>	<i>Cloud-clear(%)*</i>
VIIRS	98.0	38.6
MODIS (T)	97.3	49.1
MODIS(A)	97.1	48.3
AVHRR	97.9	55.0

*Cloud-clear fraction is estimated in 25-60°N latitude band

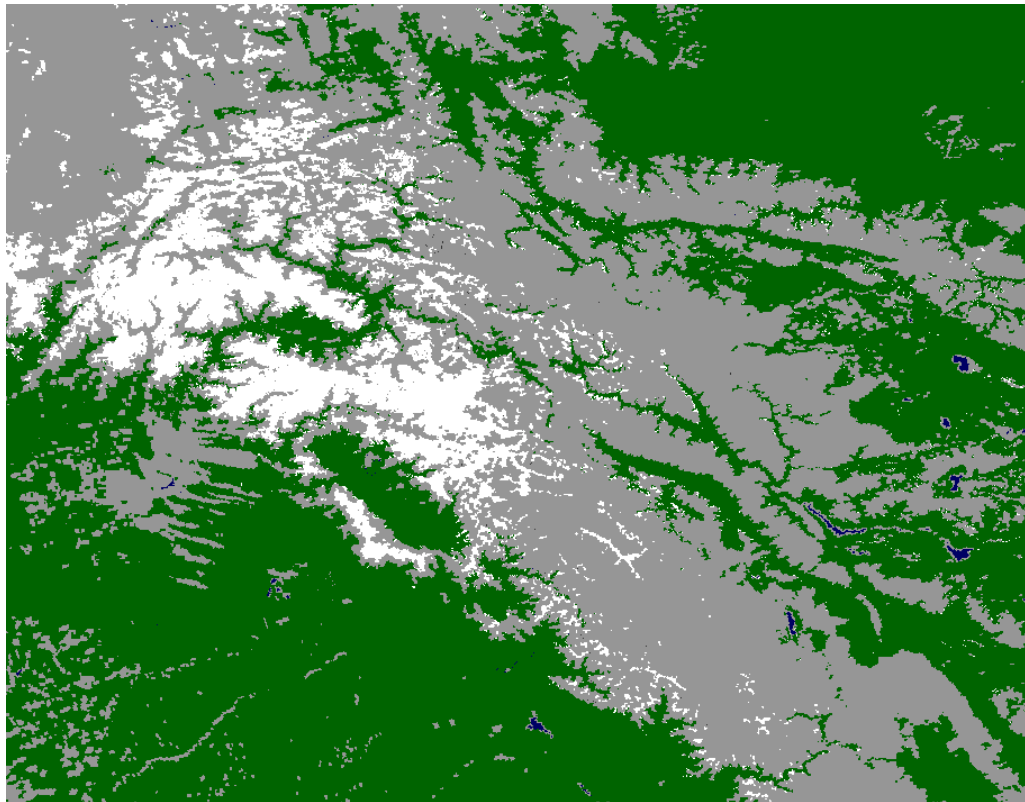
VIIRS: Marginally better accuracy but smaller effective clear-sky coverage

2014-2015: VIIRS cloud-clear fraction increased to 40.7% while the rate of agreement to IMS dropped to 97.8%

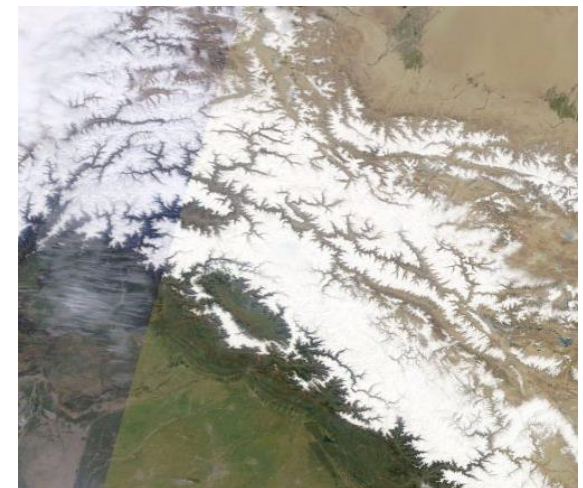
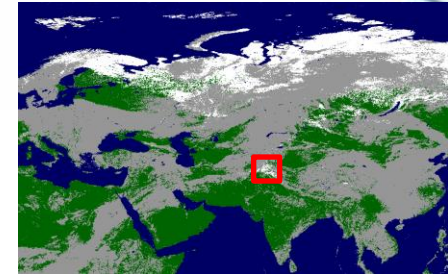
VIIRS: Too conservative cloud mask

Cloud cover is frequently overestimated

Snow/no-snow transition zones are typically mapped as “cloudy”



□ snow ■ land ■ cloud ■ No data



Further Plans

- Potential improvements
 - Improve resolution to 2 km globally (2 km SH map is operational)
 - Add topographic correction (available in SH)
 - Add AMSR2/GCOM-W1
 - Add VIIRS
 - This may introduce inhomogeneity/inconsistency to the time series
- Reprocess historical data, fill in existing data gaps
 - Request from the GPM group for time series back to 1998
- All plans are dependent on the future funding of the project

Links

NESDIS STAR Automated snow remote sensing page:

<http://www.star.nesdis.noaa.gov/smcd/emb/snow/HTML/snow.htm>

NESDIS OSDPD Operational Automated Snow Maps:

http://satepsanone.nesdis.noaa.gov/northern_hemisphere_multisensor.html

http://satepsanone.nesdis.noaa.gov/southern_hemisphere_multisensor.html

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THANK YOU

