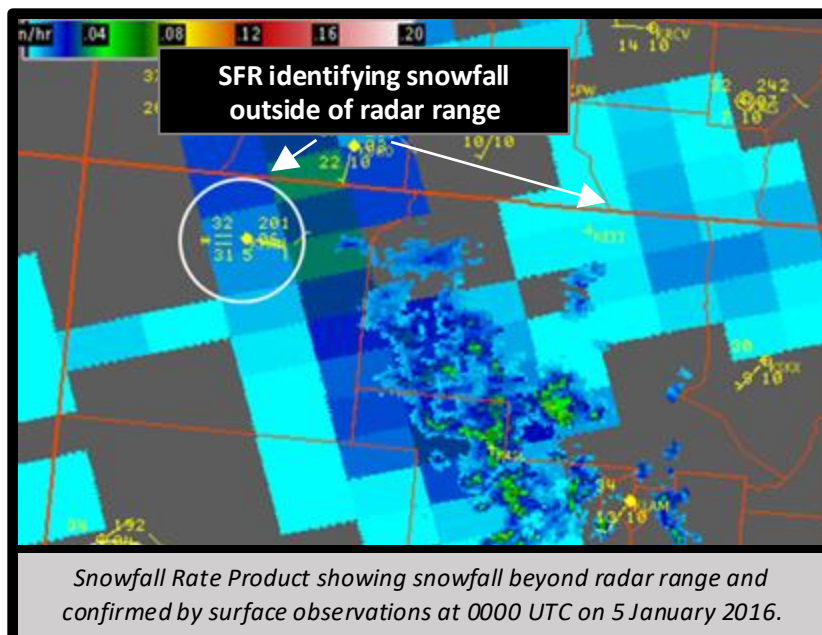


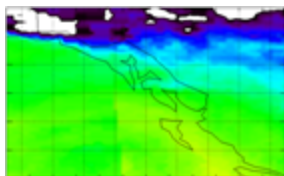
Why is the Snowfall Rate (SFR) Product Important?

The NESDIS snowfall rate product is a liquid equivalent, instantaneous snowfall rate derived from multiple passive microwave instruments on nine satellites. Since the passive microwave signal can penetrate clouds, the observations provide a signature of the snow within the clouds. The SFR quantifies snowstorms, including their extent and the locations of the most intense snowfall; features not readily apparent from traditional visible or IR imagery. The SFR is most valuable in filling observational gaps in radar poor regions such as mountains and remote locations.

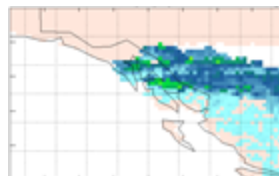


Snowfall Rate Product Creation and Attributes

Passive microwave observations from 9 instruments used (6-16 km resolution at nadir)



Observations converted to show snowfall rate (in/hr)



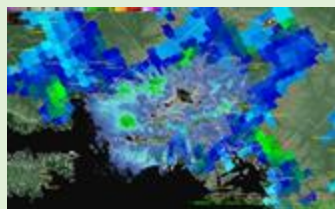
- ~18 retrievals per day (mid-lats), up to ~50 in polar regions
- ~9 overpasses every 12 hours, not evenly distributed
- ~ 20-50 min latency, but up to 2 hours for 2 DMSP satellites
- Min 7.9×10^{-4} in/hr, max = 0.39 in/hr (liquid equivalent)

Impact on Operations

Primary Application

Satellite perspective:

Identify extent and intensity of snow better than simple visible and IR, with earlier detection of precipitation production aloft.



Gap filling: Snowfall rate product fills in snowfall activity that would not otherwise be readily available due to limitations in radar coverage.

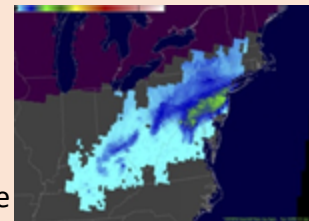
Event coverage: Ability to detect both light and intense snowfall in snow systems from non-shallow clouds across various scales.

Microwave: Penetrates clouds and algorithm is sensitive to different atmospheric layers to sample snowfall through the precipitation layer.

Limitations

Polar Orbiting Data:

Infrequent updates from polar-orbiting satellites in mid-latitudes



Overestimation: Mixed phase precipitation in transition zone may be taken as snow and may be overestimated.

Not ground snow: Observes snow in atmospheric column with ~30 minutes lag between SFR and best correlated radar observations. Does not detect sublimating snow that may occur in lower dry layers.

Lake effect snow: The current SFR product typically underestimates lake effect snow or may miss the snowfall for a few reasons: narrow snow bands, shallow clouds, and an abundance of cloud liquid water.

Snowfall Rate Interpretation

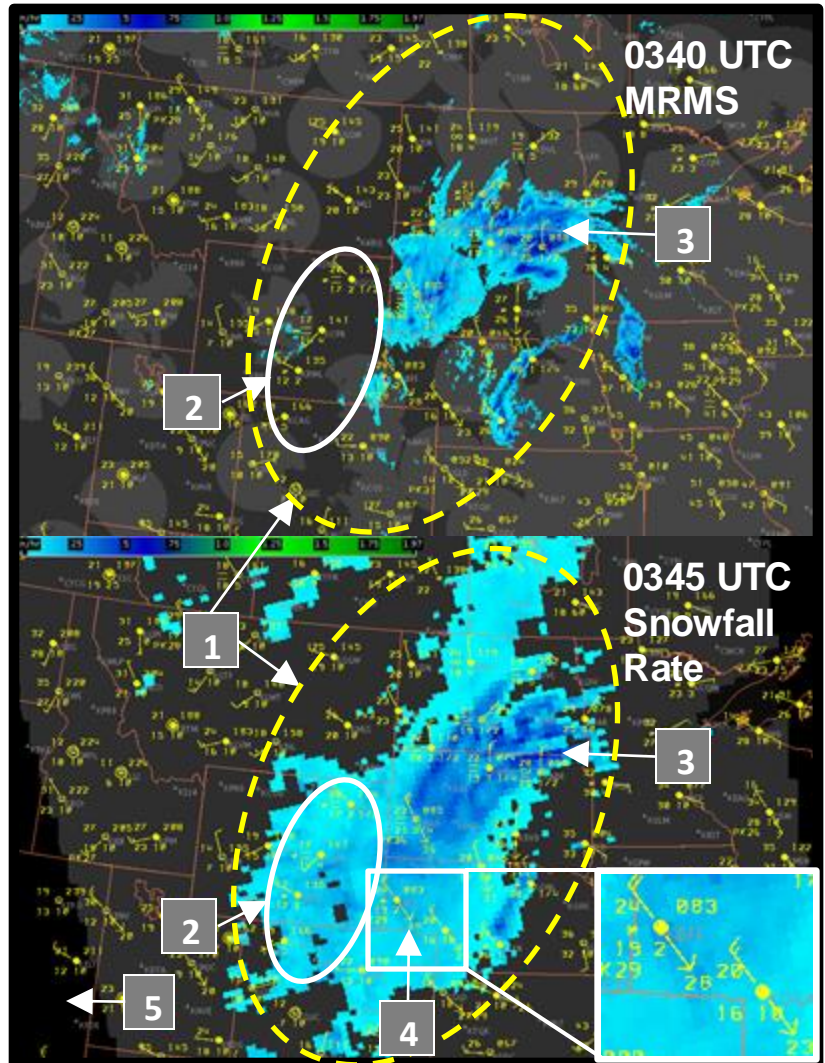
1 SFR swath data may show much broader extent of snowfall occurring aloft than radar data alone indicate (yellow dashed oval) as shown in this example.

2 SFR data show presence of snowfall occurring outside of the range of the ground based radar network for detecting snowfall in low to mid-level clouds, and thus fill gaps in areas in between radar coverage, as shown in this example from eastern Wyoming and northern Colorado.

3 SFR data typically have sufficiently high resolution to show banded mesoscale precipitation structures in TROWALs and frontogenesis events, and will often match closely with available radar data where available.

4 Surface observations may or may not indicate the presence of snow and corroborate the SFR observations. Remember, SFR detects precipitation aloft, which may have yet to fall to the surface, or may be experiencing sublimation.

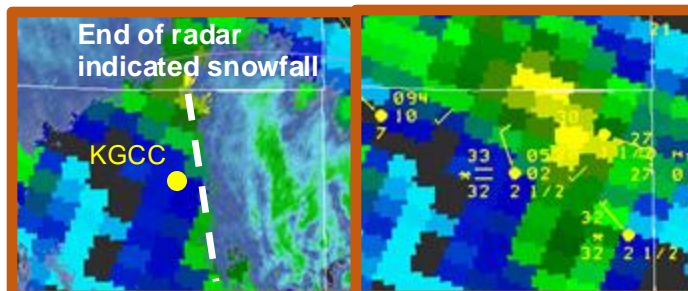
5 SFR is colored gray within the swath and black outside of the swath domain



MRMS precipitation (top) at 0340 UTC 16 Dec 2015 and Snowfall Rate (10:1 ratio, bottom) at 0345 UTC, 16 Dec 2015.

SFR Fast Facts

- Two main SFR products:
 - SFR (swath data only)
 - mSFR (CONUS only), SFR blended with MRMS instantaneous precipitation estimates (snowfall only)
- SFR and mSFR data output:
 - Liquid equivalent (in/hr)
 - 10:1 liquid to snowfall ratio
 - 18:1 liquid to snowfall ratio
 - 35:1 liquid to snowfall ratio



Comparison to other products:

Example from 16 March 2018 showing KUDX radar observations overlaying SFR data (left) and SFR data with observations (right). Note the differences in resolution and that KGCC is reporting snowfall observed by SFR but not radar.

Resources

[CISESS-MD Snowfall Rate Imagery and Archive](#)

[CISESS-MD Snowfall Rate Imagery](#)

[OSPO Snowfall Rate Imagery](#)
[Snowfall Rate Imagery](#)

[NASA SPoRT](#)
[NASA SPoRT JPSS Page](#)

Hyperlinks not available when viewing material in AIR Tool