

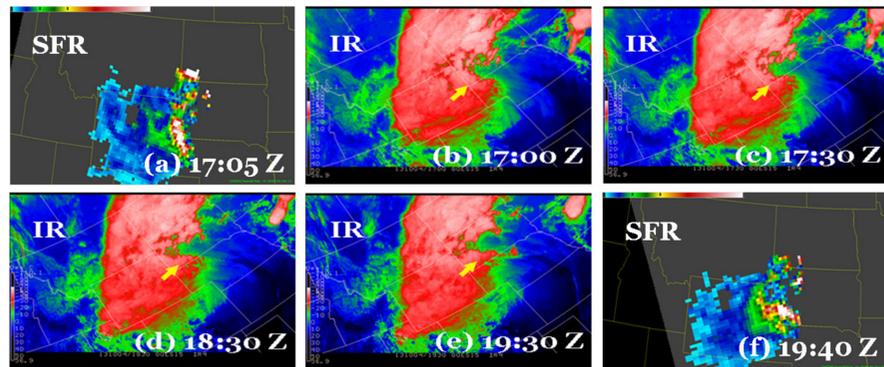
## Introduction

SNPP ATMS and POES and MetOp AMSU/MHS take passive microwave (MW) measurements at certain high frequencies (88.2~190.31 GHz) that are sensitive to the scattering effect of snow particles and can be utilized to retrieve snowfall properties. An AMSU/MHS liquid equivalent snowfall rate (SFR) product has been produced operationally at NOAA/NESDIS since 2012. An ATMS SFR algorithm has been developed based on the AMSU/MHS SFR. The combined SFR products are generated from five satellites (NOAA-18/19, MetOp-A/-B, and SNPP), and can provide up to ten snowfall estimates at any location over global land at mid-latitudes. There are more estimates at higher latitudes.

## Applications

The SFR products can be used to support weather forecasting

- fill in gaps where traditional snowfall data are not available to weather forecasters such as in mountains and remote regions where radar and weather stations are sparse or radar blockage and overshooting are common
- provide quantitative snowfall information to complement snowfall observations or estimations from other sources (stations, radar, GOES imagery data, etc.)
- to identify snowstorm extent and location of the maximum intensity within the storm
- Track storms and derive trending information (e.g., strengthening or weakening of the storm) by pairing with radar and/or GOES IR/VIS/WV images

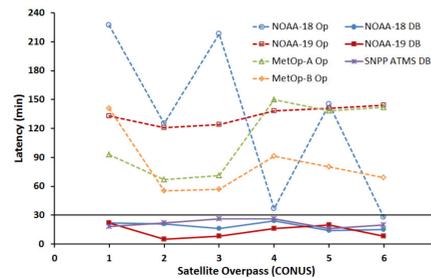


(Images are courtesy of M. Folmer and NASA/SPoRT)

Time sequence of a snowstorm in the Northern Plains. (a) and (f): the AMSU/MHS SFR product at around 17:05Z and 19:40Z, respectively; (b)-(e) GOES-15 IR images at 17:00Z, 17:30Z, 18:30Z, and 19:30Z, respectively. The yellow arrow points to the most intense snow in the IR images. The IR sequence indicates that the snow max rotated counter-clockwise and moved north between the two SFR observations. This is confirmed by the second satellite pass at 19:40Z. The snow max is in white color in the SFR images.

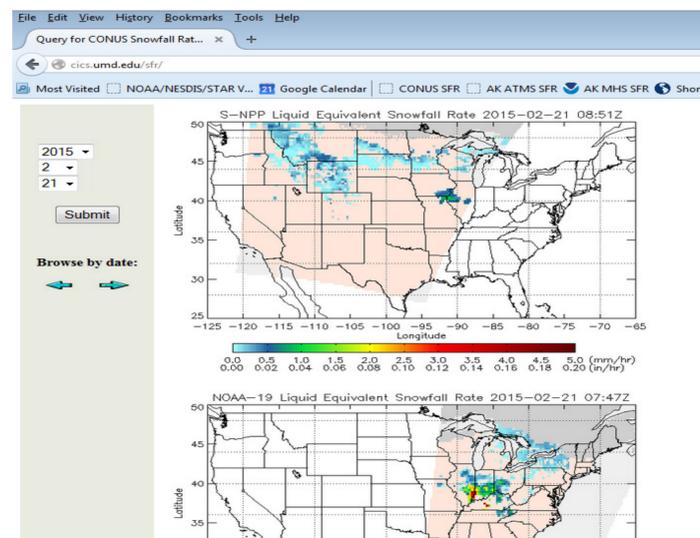
## Product Assessment

- NASA SPoRT led ATMS/AMSU SFR assessment in the 2014-2015 winter season. Several NWS Weather Forecast Offices (WFOs) from the Eastern Region, Front Range, Alaska and the NESDIS/Satellite Analysis Branch (SAB) participated in the evaluation.
- Direct Broadcast (DB) data from CIMSS at the University of Wisconsin and GINA at the University of Alaska Fairbanks were used to reduce product latency.

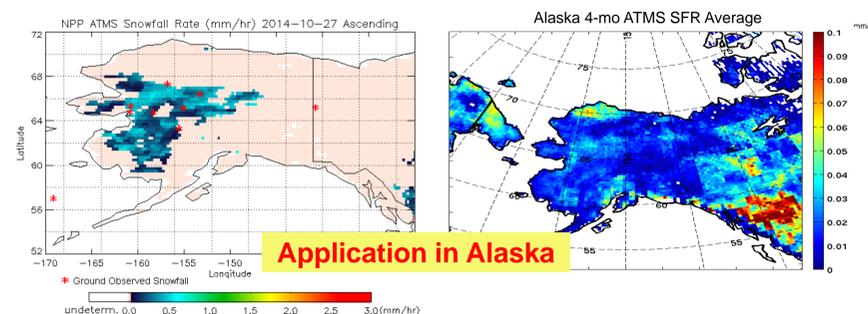


Left: Comparison of latency between operational (Op) and direct broadcast (DB) data streams from ATMS and AMSU respectively aboard SNPP, POES, and Metop satellites

### Near Real-Time SFR Webpage at CICS/UMD



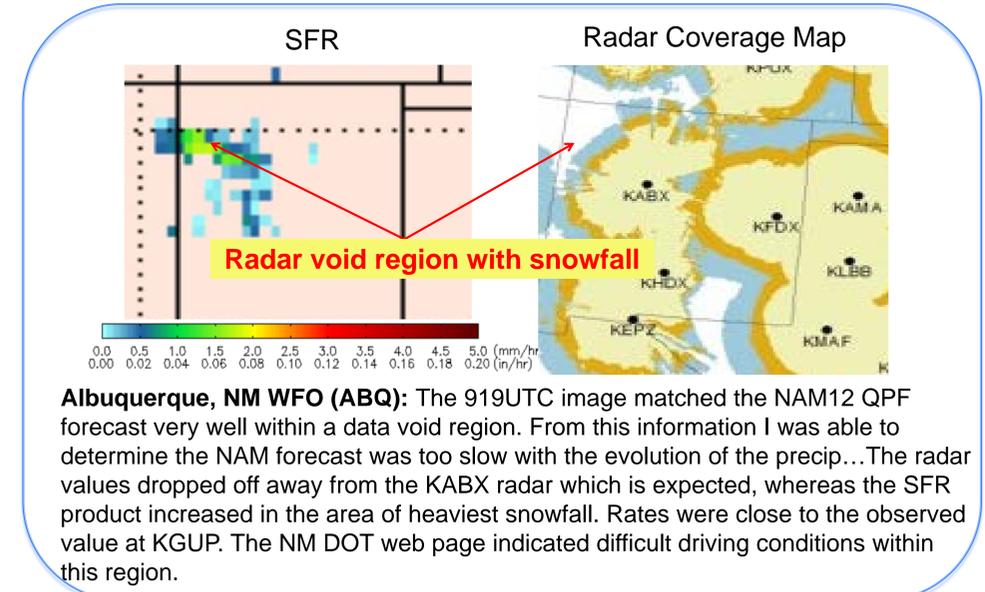
SPoRT near real-time SFR images in AWIPS II format are at <http://weather.msfc.nasa.gov/spoirt/>



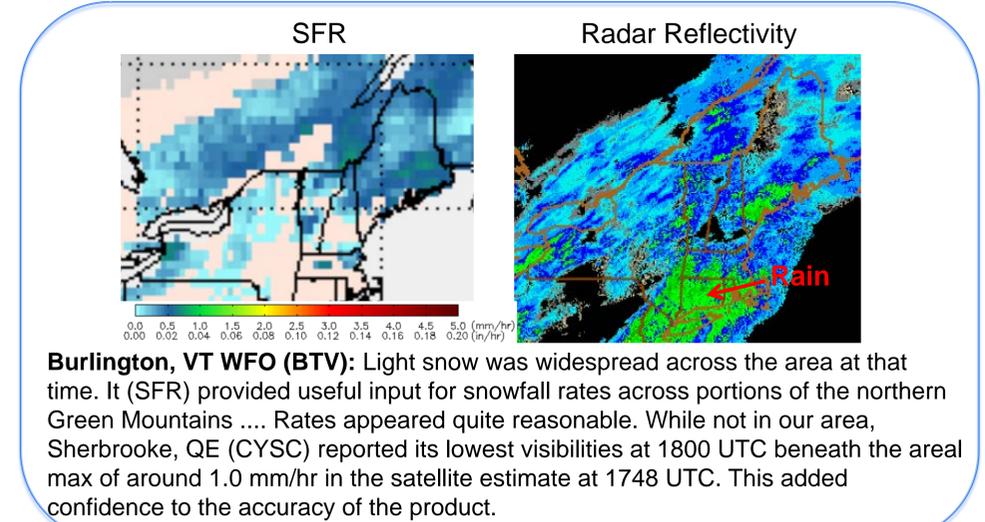
### Application in Alaska

This study was partially supported by NOAA grant NA09NES4400006 (Cooperative Institute for Climate and Satellites -CICS) at the University of Maryland/ESSIC.

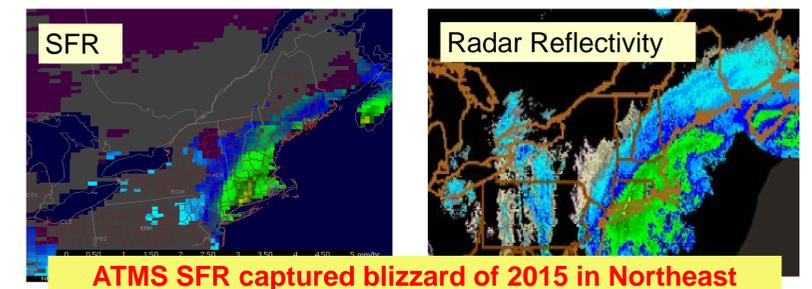
## Cases and Feedback



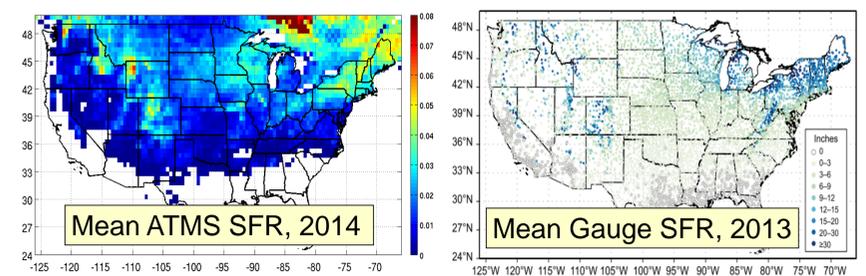
**Albuquerque, NM WFO (ABQ):** The 919UTC image matched the NAM12 QPF forecast very well within a data void region. From this information I was able to determine the NAM forecast was too slow with the evolution of the precip...The radar values dropped off away from the KABX radar which is expected, whereas the SFR product increased in the area of heaviest snowfall. Rates were close to the observed value at KGUP. The NM DOT web page indicated difficult driving conditions within this region.



**Burlington, VT WFO (BTV):** Light snow was widespread across the area at that time. It (SFR) provided useful input for snowfall rates across portions of the northern Green Mountains .... Rates appeared quite reasonable. While not in our area, Sherbrooke, QE (CYSC) reported its lowest visibilities at 1800 UTC beneath the areal max of around 1.0 mm/hr in the satellite estimate at 1748 UTC. This added confidence to the accuracy of the product.



### ATMS SFR captured blizzard of 2015 in Northeast



### ATMS SFR Climatology

(Durre, 2013)