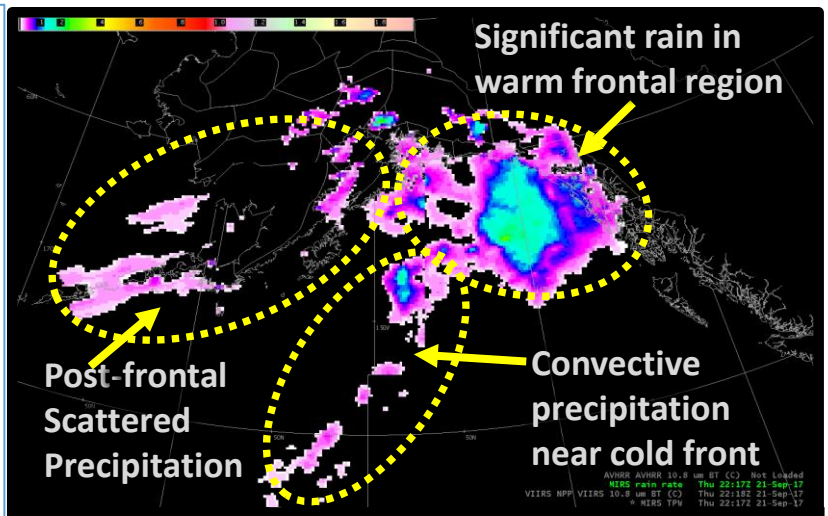
MIRS Rain Rate

Quick Guide

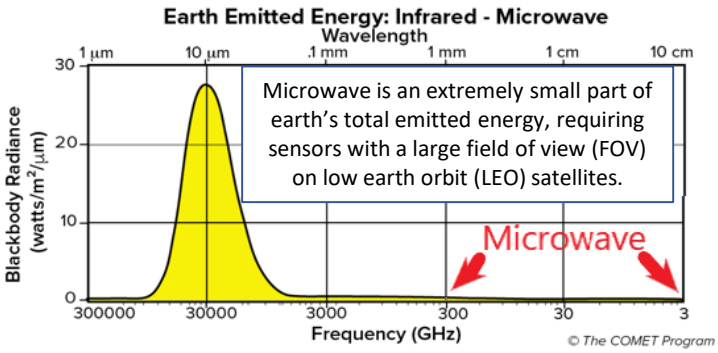
Estimating Rain Intensity

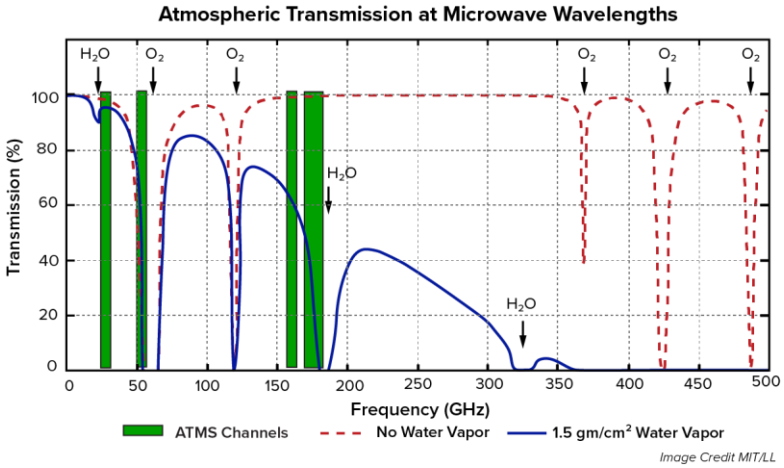
The Rainfall Rate product from the Microwave Integrated Retrieval System (MIRS) identifies the intensity of rain at the instant the satellite is passing over the area. It is derived from three vertically integrated MIRS products: Cloud Liquid Water (CLW), Rain Water Path (RWP), and Ice Water Path (IWP), taking advantage of the physical relationship found between atmospheric hydrometeor amounts and surface rain rate.

MIRS Rain Rates are valid day or night, in all weather conditions and over non-frozen surface types. They provide a more complete picture of precipitation patterns, especially where radar coverage is unavailable, and they can locate areas of heavy rain that might otherwise be obscured by high clouds.

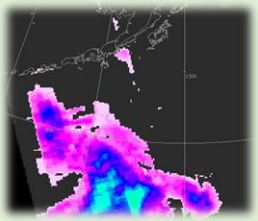


MIRS Rain Rate Gulf of Alaska from SNPP ATMS at 2117 UTC, 21 Sep 2018





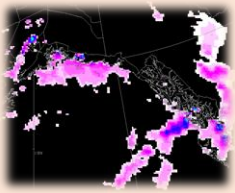
Impact on Operations



Rain pattern not obscured by high clouds: rain at the surface is often enhanced by moisture contributions from lower levels which is more apparent in microwave channels.

Fills gaps in radar coverage: a more complete spatial distribution of rainfall is provided. Heavier precipitation indicated in regions without radar coverage, such as oceans, can help assess the impact of atmospheric rivers, monsoon flow, and convective boundaries before reaching populated areas.

Limitations



Coarser resolution: microwave sensors require a much larger field of view than visible and infrared sensors.

More difficult to detect rain over land: emissivity between background land surfaces and cloud moisture is much less than over water.

Negatively affected by surface ice/snow: the strong scattering signal of ice and rain in the higher frequency channels reduces and/or masks the information on precipitation in the lower troposphere.

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

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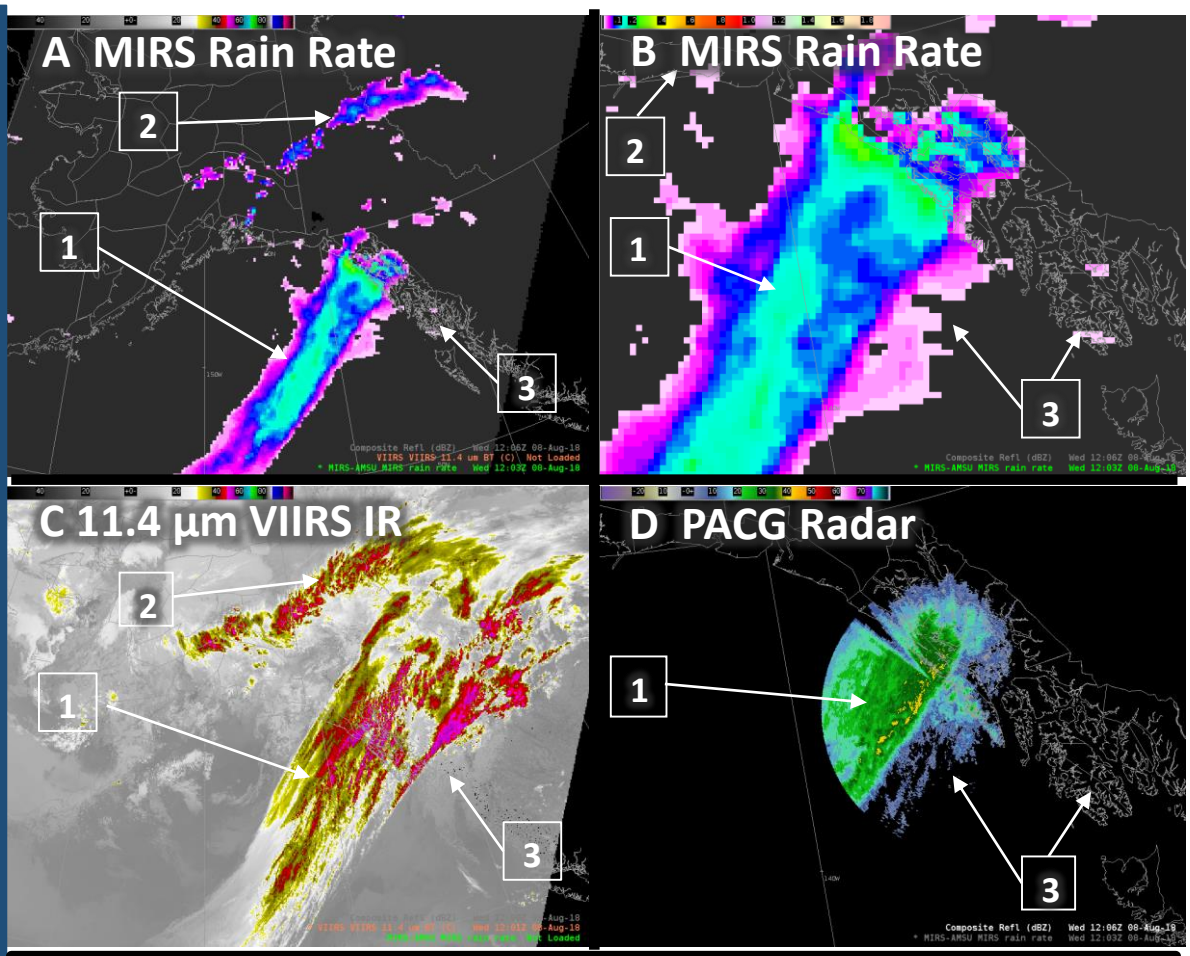
Rain Rate Interpretation

1 *Rain band from slow moving front.*
MIRS Rain Rate: Atmospheric River of continuous rain extends southwest. Front edge of heavy rain aligns with radar.
VIIRS IR: broad, scattered cold cloud tops obscures the location of heavier rainfall.
Radar: high detail but limited range.

2 *Line of convective cells over land.*
MIRS Rain Rate and VIIRS IR: Heavy rainfall aligns well with cold cloud tops.

3 *Patchy light precipitation precedes heavy rain.*
MIRS Rain Rate and Radar: show limited rainfall.
VIIRS IR: cold cloud tops imply more rain than is actually occurring.

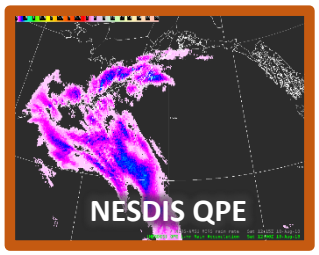


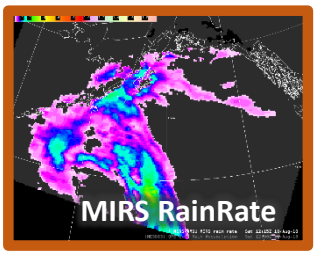
(A) MIRS Rain Rate 1203 UTC, 08 Aug 2018; (B) Close up of MIRS Rain Rate at 1203 UTC, 08 Aug 2018; (C) 11.4 um VIIRS IR at 1201 UTC, 08 Aug 2018; and (D) PACG Radar at 1206 UTC, 08 Aug 2018.

ATMS Instrument

Infrared vs Microwave Rainfall estimates:

Precipitation estimates from infrared satellite data is more frequent, but passive microwave is generally more accurate because of its ability to sense clouds and rain through the entire column and not just at the cloud top. Some infrared QPE algorithms blend microwave precipitation amounts to help calibrate rainfall estimates.





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