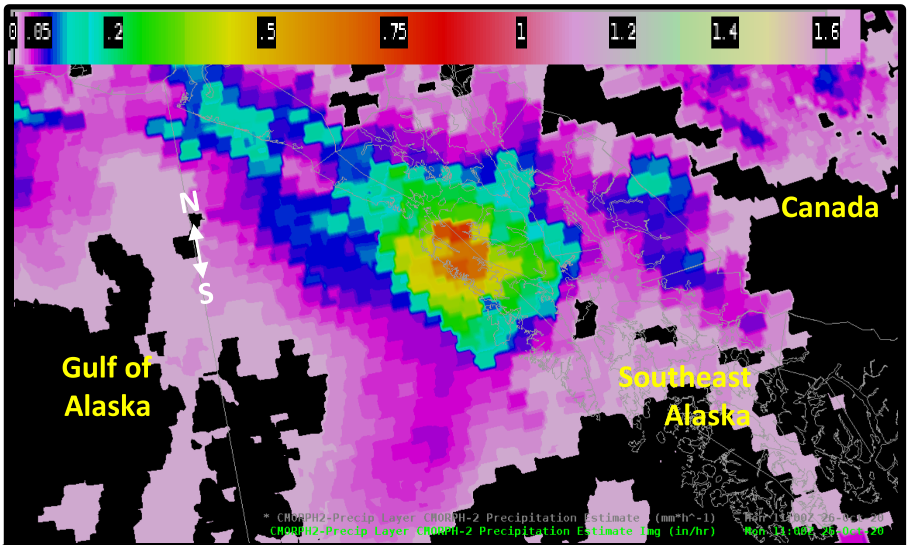
CMORPH-2 Precipitation Rates

Quick Guide

What are CMORPH-2 Precipitation Rates?

The second-generation Climate Prediction Center (CPC) MORPHing (CMORPH-2) technique employs microwave precipitation estimates that interpolate precipitation features from geostationary (i.e., GOES) and Low-Earth Orbiting (LEO) infrared data. The merged satellite product encompasses the magnitude guidance of precipitation rates from microwave sensors integrated with the movement of precipitation features from geostationary satellites. CMORPH-2 is a global product and is accessible in AWIPS for Alaska users.



CMORPH-2 observations of high rain rates (~1 inch per hour) along the southeastern Alaska coastline at 1100 UTC, 26 October 2020.

Algorithm: Microwave – LEO/GOES Morphing Process	Attributes & Resolutions
Microwave precipitation rates from all available satellites are combined into a single global field that governs the magnitude and shape of precipitation at each time step. Precipitation estimates derived from GOES and LEO infrared brightness temperatures are calibrated with the microwave data, and used to fill gaps where microwave retrievals are not available. GOES wind vectors are used to propagate this precipitation field in time.	***Unit:*** inches per hour ***Spatial:*** 0.05° ***Latency and Availability:*** AWIPS product latency is 1-4 hours and is available every 30 minutes.

Impact on Operations

Primary Application

Satellite Derived Precipitation: LEO and GEO satellites are combined together to estimate the shape, magnitude and movement of precipitation regions over land and offshore.

Satellite versus Radar Precipitation estimates: Satellite derived precipitation can be advantageous over radar-based precipitation estimates (i.e., Multi-Radar Multi-Sensor, MRMS). CMORPH-2 can provide better coverage of precipitation compared to MRMS since satellite sampling is more uniform, especially over areas of high terrain and data-sparse regions (e.g. offshore precipitation) where radar coverage and precipitation gauge networks are poor and or limited.

Limitations

Snow: Snow covered ground results in precipitation underestimation due to difficulty in differentiating cloud ice from surface snow.

Liquid Clouds: Microwave precipitation rates over land is dependent on the presence of ice clouds. Observations mainly comprised of liquid clouds (i.e., warm rain processes) increases likelihood of underestimates of precipitation.

Precipitation Mode: Stratiform, shallow convection, and deep convection precipitation modes can affect CMORPH-2 accuracy due to differences in cloud ice concentration that influence precipitation rates.

Bias Correction: The current CMORPH-2 version is not bias corrected. An updated version with magnitude of CMORPH-2 adjusted against gauge observations is coming soon.

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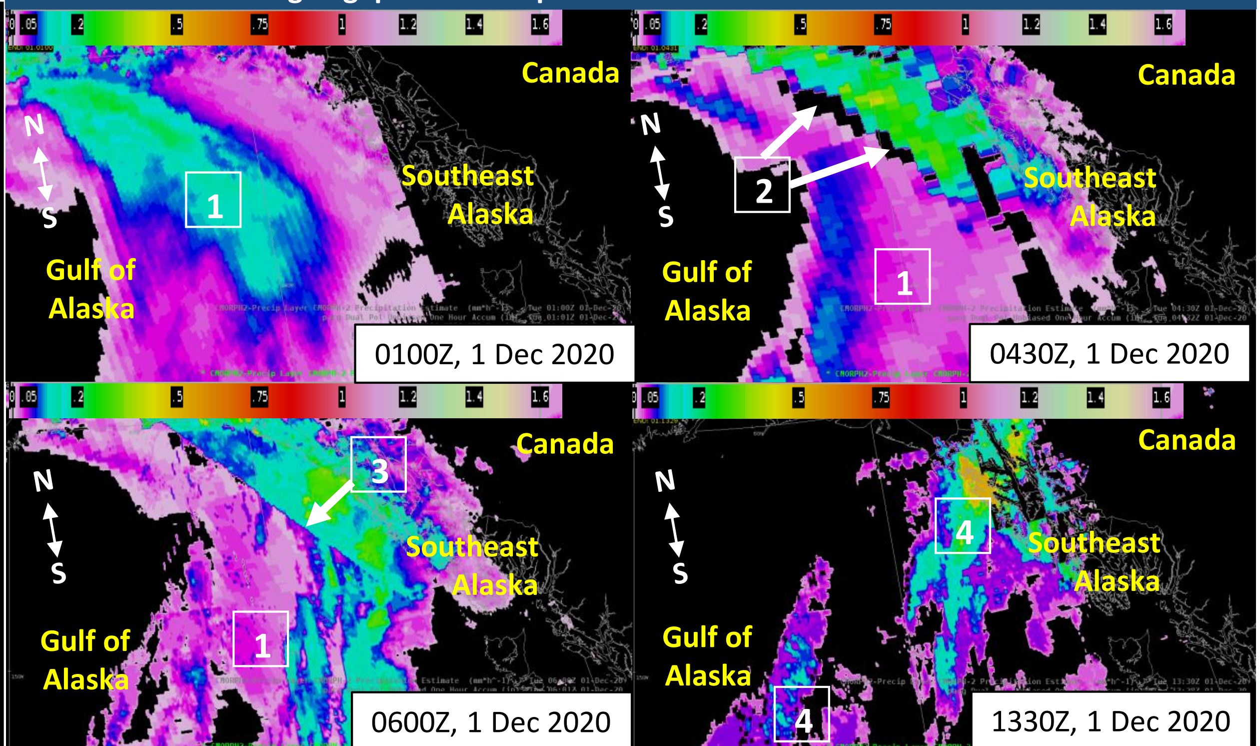
Image interpretation and features seen in the imagery.
(Refer to 4-panel)

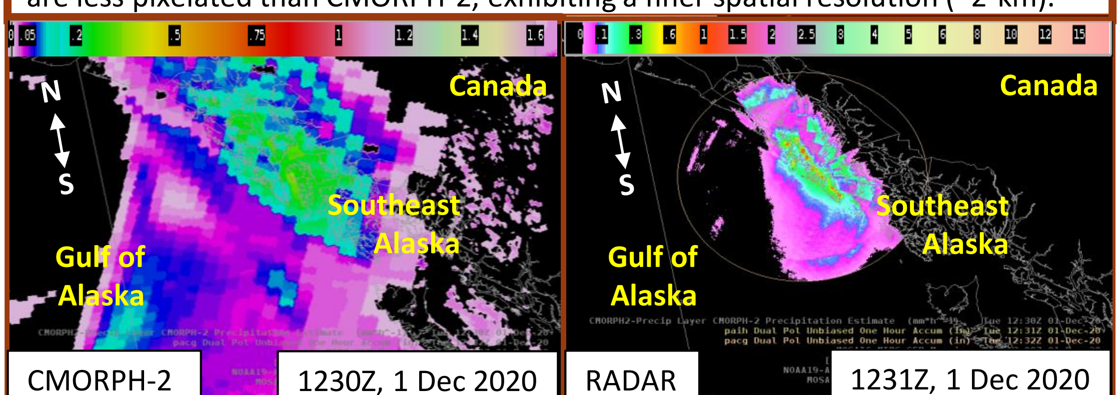
1. Precipitation observations in data sparse regions and/or fill gaps in radar coverage.
2. 'No data' between high/low rain rates from imported GPM datasets.
3. Edge discontinuities from multiple satellite pass contributions.
4. Occasional resolution and pattern changes between 30-min time steps; due to GOES datasets filling in gaps between polar swaths.

CMORPH-2 Latency and Viewing in AWIPS: Since CMORPH-2 is a global product produced every 30 minutes using multiple microwave and infrared data sources, precipitation will always be indicated somewhere. It is possible that a smaller sector being viewed in AWIPS may not have precipitation. In this case, the sector will contain no data.



The 4-panel observes the evolution of an atmospheric river event in southeast Alaska. CMORPH-2 precipitation observations can be seen on 1 December 2020 at 0100Z, 0430Z, 0600Z, and 1330Z.

CMORPH-2 and Radar precipitation estimates: In southeast Alaska, rain rates from CMORPH-2 (i.e., inches per hour, seen in greens, blues, and purples) correspond with moderate 1-hour precipitation accumulations from radar (i.e., inches, seen in greens, yellows, and reds). CMORPH-2 provides spatial coverage over land and water, where radar observations are limited within the southeast Alaska inner channels due to beam blockage. In the imagery, radar observations are less pixelated than CMORPH-2, exhibiting a finer spatial resolution (~2-km).



Resources:

COMET Training Module

Using Merged Satellite Precipitation (CMORPH and IMERG) Guidance

NOAA NESDIS STAR Imagery

CMORPH-2 Near-Real-Time Data

AMS 2021 Annual Meeting: Presentation

Satellite Precipitation Monitoring to Fill Radar Voids in Alaska

Hyperlinks not available when viewing material in AIR Tool