# NESDIS GOES-R QPE Quick Guide by NASA-SPoRT and NESDIS

What is GOES-R QPE? What is it used for?

GOES-R QPE is a satellite-based precipitation estimation algorithm that uses both IR and microwave data to estimate rainfall rates and derive rainfall accumulations. GOES-R QPE is a GOES-R baseline product, and it currently runs on GOES-East and GOES-West as an experimental product. As a satellite product, its greatest utility might be found in data-deprived regions, like mountainous terrain, offshore, or over oceans. This guide will briefly explain how IR and microwave data are used to estimate rainfall, what products are derived from this algorithm, and what the possible strengths and weaknesses are of this product suite as you use it in operations.

What products are produced? When is GOES-R QPE data available?

Among the GOES-R QPE product suite is the 15-minute product, which is a rainrate product that is produced as often as GOES IR data is available. There are also several accumulation products available, which tell how much rain fell over the given period of time, such as the 1-hr accumulation, 6-hr accumulation, 24-hr accumulation, and so on.
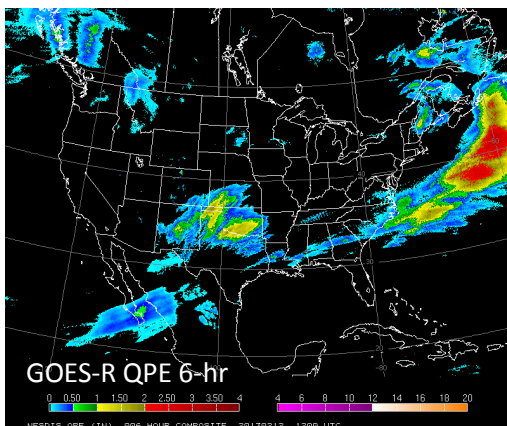
How are these products created?

The GOES-R QPE product suite uses IR data from the GOES satellites to infer cloud top temperatures and heights, and derives rainfall

rates from this information. The IR-derived rainfall rates are calibrated by microwave data from the Tropical Rainfall Measuring Mission satellite's TRMM Microwave Imager and METOP-A and NOAA 18/19's Microwave Humidity Sounder, resulting in as many as one microwave calibration every hour.

The IR-based portion of the algorithm is produced at a 4 km resolution for current GOES. It performs best in convective environments. The microwave calibrations perform well for both stratiform and convective environments, but are relatively infrequent compared to the IR product (1+ hour versus 15 minutes).

What do I need to look out for when using these products?

There are a few limitations of this algorithm, especially because in the current GOES era it is operating with fewer IR channels than it will in the GOES-R era. Some of the main caveats of this algorithm are as follows:

- Performs best in convective environments;
- Cannot "see" under thick cirrus clouds
- Cirrus sometimes incorrectly assigned a rain rate because the cirrus appears to be a cold cloud;
- Warm-topped, shallow convection is sometimes missed by the IR
- Spreads the rain over space and time, creating an overall "wet-bias", or over-estimation of rainfall rates;
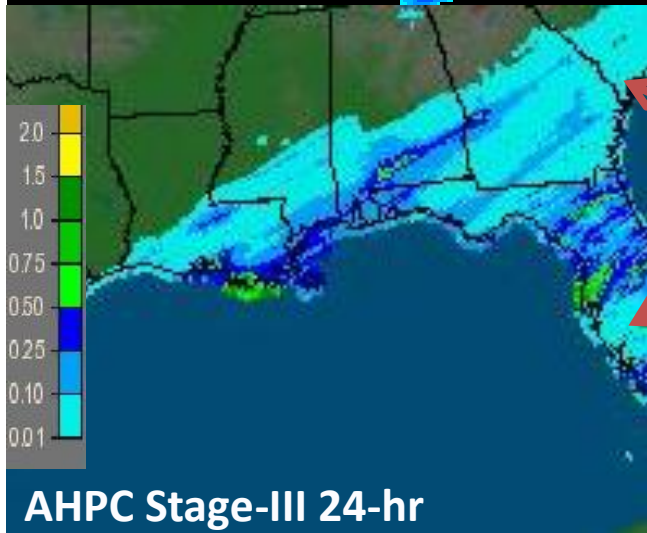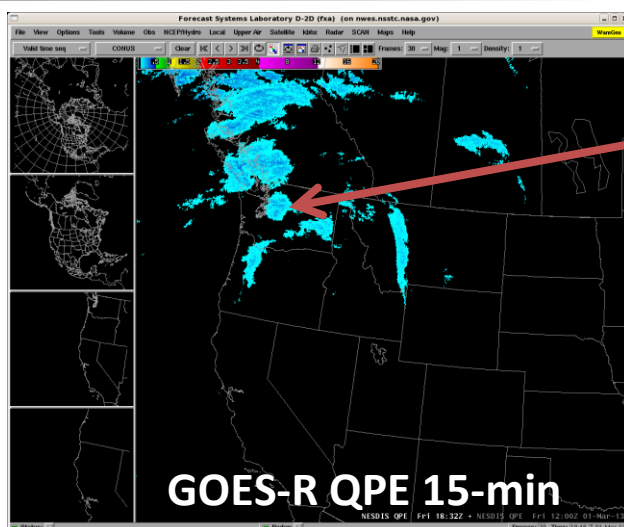- Not intended to estimate snow fall rates or other frozen precipitation.
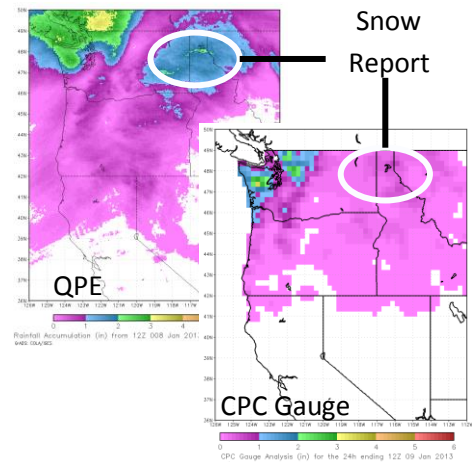
Application Examples
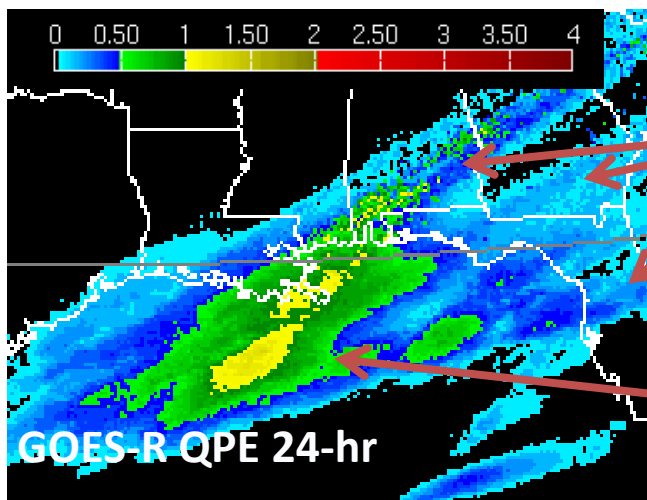
GOES-R QPE 24-hr

Bands of heavy precip. generally well matched in location and in amount.

Offshore coverage

AHPC Stage-III 24-hr

Some locations of light rain (<0.1 in.) are not seen in the GOES-R QPE 24-hr product.

GOES-R QPE 15-min

Shows localized heavier rain embedded within cells.

15-min rain rate product can also show rapidly changing conditions.

More information about NESDIS GOES-R QPE can be found at http://weather.msfc.nasa.gov/sport/.