GOES Multispectral Rainfall Algorithm (GMSRA)

The GOES Multispectral Rainfall Algorithm (GMSRA) uses combined information from visible (0.65 µm), near-infrared (3.9 µm) and infrared (6.7 µm, 11 µm, and 12 µm) GOES measurements. For daytime rainfall, the first step consists of identifying optically thick clouds having a visible reflectance greater than 0.40. Non-precipitating cirrus is screened empirically using a gradient temperature based on the 11 µm channel and the effective radius of cloud particles near their tops is derived from the reflected solar irradiance at 3.9 µm. Negative Brightness Temperature Difference (BTD) IR-WV(11 µm - 6.7 µm), which corresponds well with rainfall areas for very deep convective cores (Inoue, 1997), is also used for the identification of rain for cloud tops colder than 230K. The algorithm uses the effective radius to separate raining from non-raining warm clouds during daytime. The algorithm relies on IR and WV only during nighttime and rainfall is estimated for clouds having brightness temperatures lower than 240K.

For each pixel classified as containing raining clouds, the associated instantaneous rain rate is computed using a pre-calibrated mean rain rate for cloud top brightness temperature (11 µm). A cloud growth rate, defined as the difference between the current and the previous images, and a scaled factor (between 0 and 1) of the product of Integrated Precipitable Water and Relative Humidity from 500 mb - Surface, is used to adjust the rainfall estimates.

Spectral Intervals & applicable satellites:

0.65 µm, 3.9 µm, 6.7 µm, 10.7 µm, and 12 µm of GOES satellite

Spatial Scale:

4 km

Temporal Scale:

15 minutes

Ancillary Data (e.g., soundings):

Integrated Precipitable Water and Relative Humidity from 500 hPa - Surface.

Additional Comments:

Contact person: Dr. Accumulated hourly precipitation is computed from 15-minute instantaneous estimates.
Hourly, 6-hourly, and daily maps are available at:
http://orbit-net.nesdis.noaa.gov/arad/ht/ff/gmsra.html

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