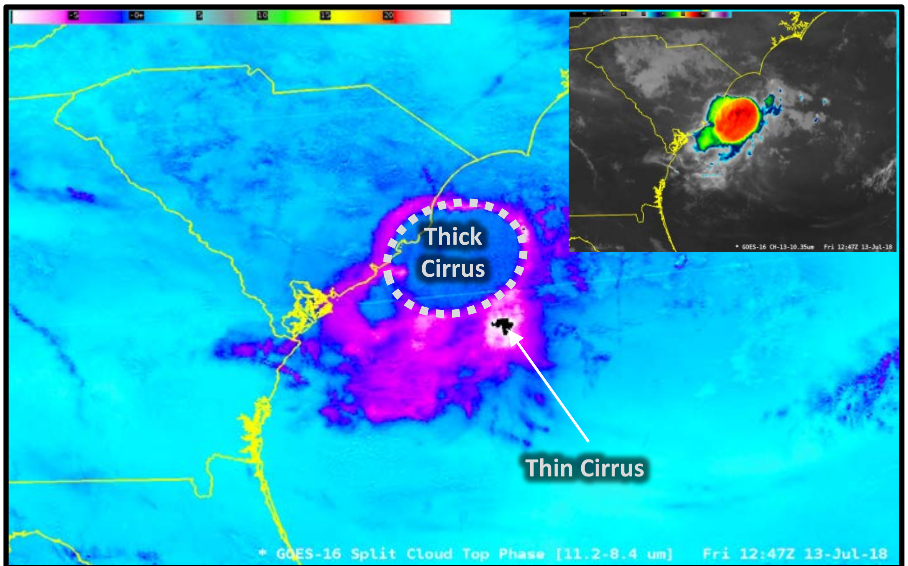
Split Cloud Phase Quick Guide

Why is the Split Cloud Phase Difference Important?

Cloud Phase Brightness Temperature Difference (BTD) (11.2 µm – 8.4 µm) can differentiate between thick and thin cirrus, and between clouds made of ice and those made of water. In the figure at right, the thickest cirrus has values that are small and negative; thin cirrus has large negative values. Clouds with water droplets have positive values. This BTD can also detect blowing dust. In addition, because the 8.4 µm has sensitivity to SO_2, this BTD can show a signal in volcanic plumes.



Cloud Phase Brightness Temperature Difference (11.2 µm – 8.4 µm) from GOES-16 ABI at 1247 UTC, 13 July 2018 (Inset: Clean Window 10.3 µm)

What does the Cloud Phase Brightness Temperature Difference show?

Positive or Negative?	Feature detected
Negative	Large Negative: Small Ice Crystals / Thin Cirrus Small Negative: Large Ice Crystals / Thick Cirrus
Positive	Dust; Water Droplets ; Volcanic Plume containing SO_2

Impact on Operations

Primary Application

Cloud Particle Type: Differentiate between thin and thick ice clouds. The emissivity of ice is related to particle size and the brightness temperature difference exploits that variability. In contrast, clouds made up of water droplets generally exhibit a positive brightness temperature difference

Dust Detection: Identify regions of low-level dust in the atmosphere. This brightness temperature difference is used in both the Ash and Dust RGB Products.

Limitations

Over Land: When clouds are over hot land, there is more transmissivity of upwelling 8.4 µm radiation than 11.2 µm radiation through the cirrus, increasing the brightness temperature difference (BTD). The BTD will be somewhat less over cooler land.

Limitation: Changes in the difference field over land can be affected by changes in surface moisture or changes in temperature – or both.

Limitation : Optically thin cirrus are hard to detect. Supercooled water clouds are difficult to interpret.

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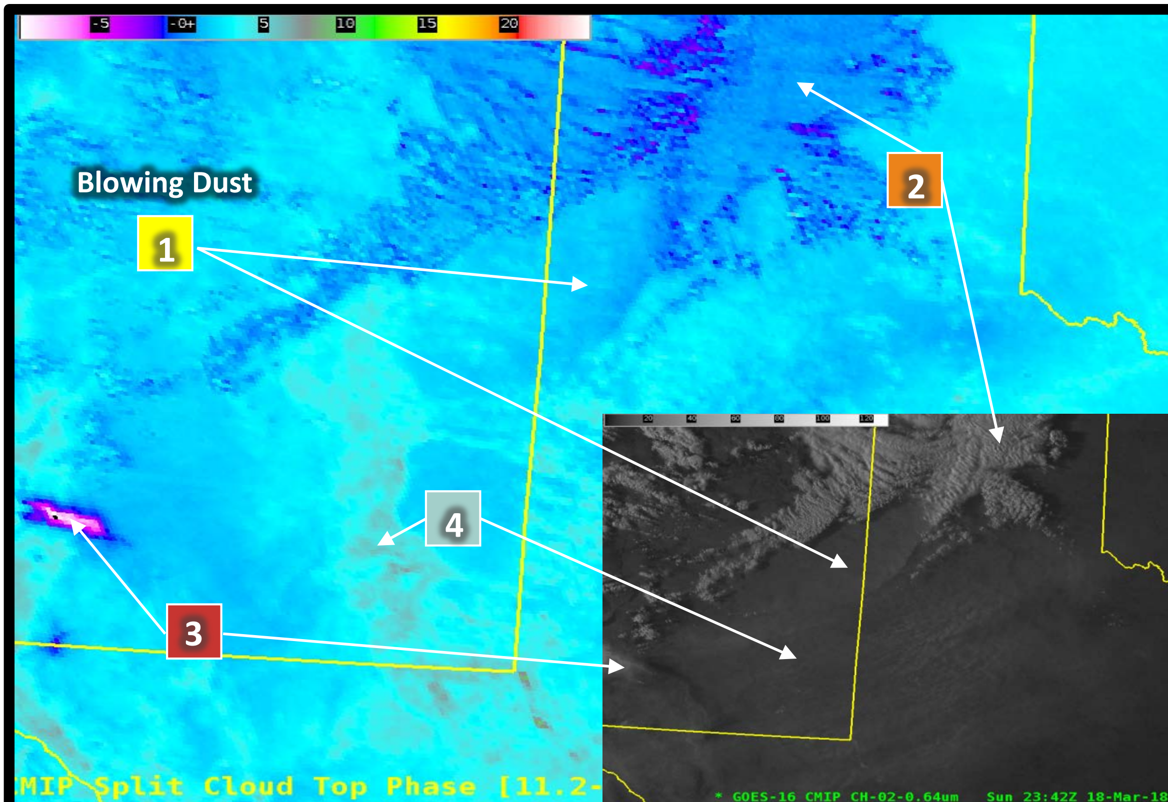
Image Interpretation

1 — Blowing Dust shows small positive values over New Mexico and the Texas panhandle

2 — Cumulus clouds are made up of water droplets and will have positive values.

3 — Ice clouds will have negative values

4 — Land surface emissivity varies depending on, for example, drought conditions or vegetation. This causes a stationary change in signal in the Brightness Temperature Difference in regions of clear skies.



Split Cloud Phase (11.2 µm – 8.4 µm), 2342 UTC, 18 March 2018; Inset: Visible Imagery (0.64 µm) at the same time

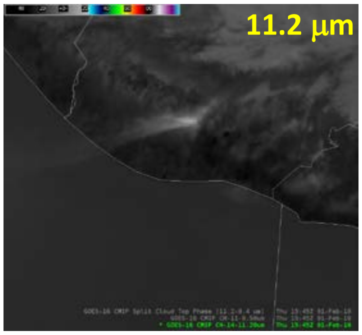
Because this product estimates Cloud Particle Size, it is used in some Baseline Products; compare this to "Cloud Particle Size" and "Cloud Top Phase" under the "Derived Products" menu. Additionally, you can compare this to visible, infrared, and cirrus channel scenes to make a better description of the scene being viewed.

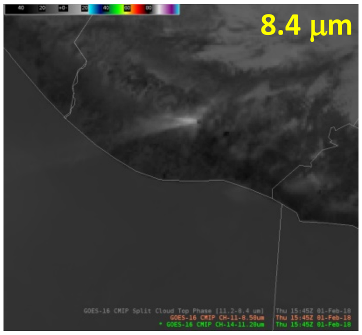
Resources

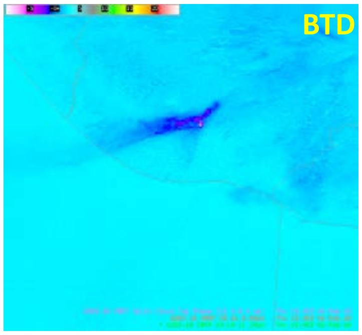
Journal of Appl. Met Article on Cloud Phase Brightness Temperature Difference
Cloud Properties Inferred from 8-12 *µm* data

Documentation
ATBD on Cloud particle Size Distribution at http://www.goes-r.gov

Hyperlinks do not work in AWIPS but they do in VLab







The Imagery above shows Volcan de Fuego erupting in Guatemala. However, plumes of negative BTD values can arise from non-volcanic events; don't use the BTD alone to identify eruptions.