# Split Window Difference (10.3µm – 12.3µm)

# Quick Guide

## Why is the Split Window Difference Important?

The Split Window Difference (SWD) is a Brightness Temperature Difference (BTD) field that highlights low-level moisture and dust. Moisture can be detected because there is more absorption by water vapor of energy at wavelengths in the 'Dirty Window' Channel (12.3 µm) than in the 'Clean Window' (10.3 µm). Dust can be detected because airborne silicates absorb more 10.3 µm energy than 12.3 µm energy. More absorption of energy leads to colder brightness temperatures. In the image at right, lighter grays highlight a greater SWD, *i.e.,* more moisture in the atmosphere. Convection later forms on the moist axis


*Split Window Difference, 1457 UTC on 5 September 2017. Note the enhancement in the value over northwest Kansas. Inset: 10.3 µm infrared imagery at 1957 UTC 5 September. Convection developed along the SWD axis.*

## What can the Split Window Difference tell you?

| Sign | Physically Relates to… | Wavelength of energy being absorbed | What is absorbing the energy? |
|---|---|---|---|
| Positive | Moisture in the Atmosphere | 12.3 µm | Water Vapor |
| Negative | Dust in the Atmosphere | 10.3 µm | Silicate Dust Particles |

## Impact on Operations

**Primary Application:** Identify gradients in moisture, or detect moistening in the atmosphere.

**Application:** Identify regions of low-level dust.

## Limitations

**Limitation:** If dust is occurring in a moist environment, the cooling effects of water vapor and silicates can balance each other.

**Limitation:** Changes in the difference field can be affected by changes in moisture or changes in temperature – or both. This is especially true as heating erodes inversions after sunrise.

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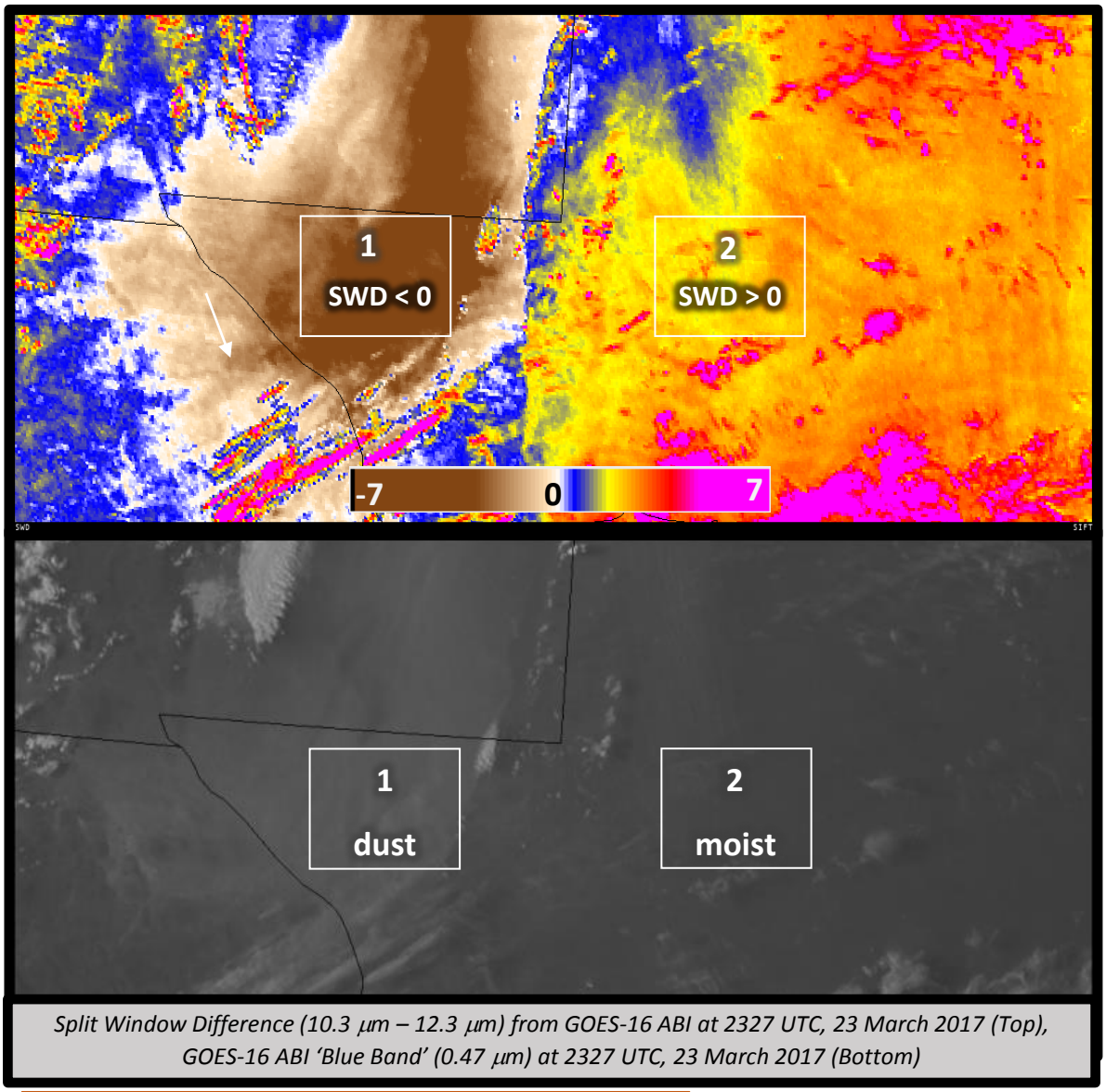
## Image Interpretation

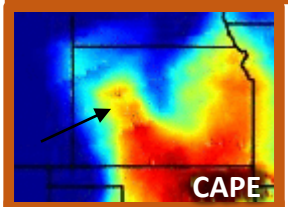
**1** The SWD shows negative values where dust exists, because the 10.3 µm Brightness Temperature (BT) is colder than the 12.3 µm BT: Silicates in dust absorb 10.3 µm radiation.

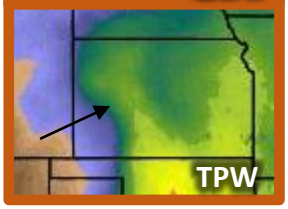
**2** The SWD shows positive values where a moist airmass exists, because the 10.3 µm Brightness Temperature (BT) is warmer than the 12.3 µm: water vapor absorbs energy at 12.3 µm. Gradients in the SWD can highlight moisture gradients.

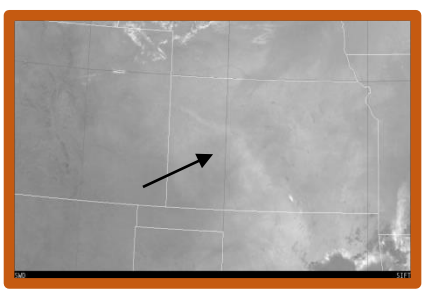



*Split Window Difference (10.3 µm – 12.3 µm) from GOES-16 ABI at 2327 UTC, 23 March 2017 (Top), GOES-16 ABI 'Blue Band' (0.47 µm) at 2327 UTC, 23 March 2017 (Bottom)*

The SWD (below right, from page 1) can describe low-level moisture; features in it will appear in other measures of moisture (Total Precipitable Water (TPW), for example, or Convective Available Potential Energy (CAPE)), as shown below.



## Resources

**Journal Article on SWD**

Use of the GOES-R Split-Window Difference to Diagnose Deepening Low-Level Water Vapor

**Training Recording**

FDTD GOES-16 Webinar on SWD

**Hyperlinks do not work in AWIPS but they do in VLab**