The 13.3 μm “carbon dioxide” band is used for mean tropospheric air temperature estimation, tropopause delineation, and as part of quantitative cloud products for cloud opacity estimation, cloud-top height assignments of cloud-drift motion vectors, and supplementing Automated Surface Observing System (ASOS) observations. It has been possible to demonstrate products created with the 13.3 μm band using the GOES-12 through GOES-15 imagers (since GOES-12 launch in 2001), as well as the current GOES sounders (since GOES-8 launch in 1994). This band is also useful when generating Red-Green-Blue (RGB) composite imagery, to highlight the high, cold, and likely icy clouds. Source: Schmit et al., 2005 in BAMS, and the ABI Weather Event Simulator (WES) Guide by CIMSS.
The heritage sensors for the 13.3 μm band on the ABI are the CO₂ bands on the current GOES sounders as well as the GOES imagers since GOES-12.

The 13.3 μm band on the ABI is used in several of the GOES-R baseline products. These include cloud-top height, pressure, and temperature. This band is also an input to the legacy moisture and temperature profiles, and hence the products derived from the profiles, such as total precipitable water and stability indices. This band is also used in the quantitative volcanic ash detection and height algorithm.

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Meteorologists have had the 13.3 μm “carbon dioxide” band for several years now, but probably have not used it much, in part because this band is better for science products than visual interpretation.

Compared to the lower wavelength infrared window channels, the CO₂ band brightness temperatures will generally be cooler, especially in scenes absent clouds, due to the general homogeneous distribution of CO₂ in the troposphere (with the concentration of CO₂ slightly decreasing in the stratosphere). However, it is not possible to retrieve (explicitly measure) CO₂ with a single spectral band due to the variable temperature structure of the lower atmosphere (so do not expect to find any pollution from factories). In addition, the 13.3 μm band, like many other infrared bands, is sensitive to water vapor absorption, further complicating the interpretation of brightness temperatures and spatial patterns.

Yet this band is not opaque from water vapor or CO₂ absorption for all but extreme viewing angles, so surface emission will also impact the brightness temperature, at least to a limited extent.

Ken Johnson is the SSD Chief in the NWS Eastern Region. Jordan Gerth contributed to this segment.

<table>
<thead>
<tr>
<th>ABI Band</th>
<th>Approximate Central Wavelength (μm)</th>
<th>Band Nickname</th>
<th>Type</th>
<th>Nominal sub satellite pixel spacing (km)</th>
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<tr>
<td>16</td>
<td>13.3</td>
<td>“CO₂” longwave infrared band</td>
<td>IR</td>
<td>2</td>
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</table>

Further reading

ABI Bands Quick Information Guides: http://www.goes-r.gov/education/ABI-bands-quick-info.html
ABI Weighting Functions: http://cimss.ssec.wisc.edu/goes/wf/ABI/
GOES-R COMET training: http://www.goes-r.gov/users/training/comet.html
GOES-R acronyms: http://www.goes-r.gov/resources/acronyms.html
GOES-R spectral “web app”: http://cimss.ssec.wisc.edu/goes/webapps/bandapp/overview_goes-r.html
Near real-time RGB “web app”: http://cimss.ssec.wisc.edu/goes/webapps/satrgb/overview_near_realtime.html