Cayenne Overshooting Cloud Top Detection and High Ice Water Content (HIWC) Probability Products

Dates available: May 13th, 2015 through June 4th, 2015

The products available are:

GOES-13 satellite:

0.65 μm VIS
10.7 μm Brightness Temperature
0.65 μm VIS OT Overlay
10.7 μm BT OT Overlay
0.65 μm VIS HIWC Prob Overlay
10.7 μm BT HIWC Prob Overlay

Meteosat-10 (MSG-3):

10.8 μm Channel 9
0.75 μm Channel 1
10.8 μm BT OT Overlay
0.65 μm VIS HIWC Prob Overlay
10.8 μm BT HIWC Prob Overlay

HIWC Probability: Several field campaigns conducted In Australia and South America between 2010 and 2014 have collected valuable in-situ measurements of ice water content (IWC) within deep convective clouds. These aircraft measurements were matched in space and time to satellite-observed brightness temperatures in the infrared window and a water vapor absorption channel (TIR and TWV, respectively). An algorithm uses the fractional occurrence of high IWC (HIWC) as a function of TIR and TWV to compute the probability of IWC > 1.0 g m^-3. Given the overlap of the TIR and TWV-TIR populations for HIWC and non-HIWC producing clouds, HIWC probabilities typically maximize at values of ~0.5. Regions with these probability values are typically vigorous convective cores often featuring OT regions. Due to differences in viewing angle and IR and WV spectral channel differences between GOES and SEVIRI over French Guyana, the SEVIRI HIWC probability is typically a bit higher than the corresponding GOES-derived probability.

OT Detection: Overshooting tops (OTs) are the product of deep convective storm updraft cores of sufficient strength to rise above the local equilibrium level and cirrus anvil outflow layer near the tropopause and penetrate into the lower stratosphere. OTs continue to cool adiabatically as they ascend and exhibit infrared (IR) brightness temperatures (BTs) that are significantly colder than the surrounding anvil cloud. Turbulent motions within the OT region and the fact that the OT is higher than the surrounding anvil cause the cloud top to exhibit

enhanced texture and to produce shadows in satellite visible channel imagery. These satellite-observed characteristics of OTs can be automatically identified by a computer algorithm, resulting in a map of OT regions at the ~3-5 km satellite pixel scale. This new pattern recognition algorithm represents a significant improvement to a previous IR-channel only OT detection method described by Bedka et al. (JAMC, 2010).