Efforts Toward Development Of A High Resolution Global Climatology Of Overshooting Cloud Top Detections Using MODIS and Geostationary Satellite Imager Data

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Researchers at NASA Langley Research Center have been developing an automated pattern recognition algorithm to identify overshooting convective cloud tops (OTs) in support of the GOES-R satellite program. This algorithm identifies regions of overshooting at the individual 1-4 km geostationary satellite pixel scale using visible (during daytime only) and infrared channel imagery and numerical weather analysis data. The algorithm has been developed based upon analysis of 0.25-1 km spatial resolution Aqua MODIS imagery, using a database of over 2000 manually identified OT features throughout the world in storms with varying intensity and morphology. The OT database includes storms ranging from small, warm topped storm cells over Alaska and Mongolia, tornadic supercells over the U.S. Central Plains and Europe, large tropical mesoscale convective systems, and overshooting in the eyewalls and spiral bands of intense tropical cyclones. The algorithm is designed to operate on data from any current and historical satellite imager, allowing for development of a highly accurate global OT detection climatology that extends back into the 1990's at up to a 15-30 min temporal resolution throughout the diurnal cycle. As members of the McIDAS Users Group, NASA LaRC has immediate access to the full global archive of geostationary imager data which would allows rapid development of OT climatologies and short-term databases. This type of capability has never been available within the weather and climate research community.

Regional geostationary OT databases have been already developed over periods ranging from 5-20 years over tropical regions such as Australia, Southeast Asia, and East Africa, and the eastern Caribbean Sea among many other non-tropical regions. Some of these datasets are being used by climate researchers and private industry to examine UTLS-penetrating storm spatial distributions and their temporal variability, in addition to weather hazards associated with these storms at unprecedented spatial detail. This presentation will describe the OT pattern recognition algorithm and highlight recent product applications.