The GOES Objective Overshooting Top and Enhanced-V Signature Detection Products: Algorithm Description, Validation, and Applications

NOAA Satellite Science Week
Kansas City, MO
April 30 – May 4, 2012

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Objective overshooting top (OT) and enhanced-V (EV) signature detection algorithms have been developed over the past several years in support of the GOES-R ABI Aviation Algorithm Working Group. These algorithms detect OT and EV features via recognition of IR brightness temperature patterns present within the thunderstorm anvil cloud in combination with tropopause temperature and upper-level wind direction information from an NWP model. While the algorithms have been shown to better detect OT and EV signatures in high temporal and spatial resolution MODIS, AVHRR, and synthetic proxy ABI imagery, they have been successfully applied to current generation geostationary imagery for use in diagnosis and nowcasting of hazardous convective weather at the present time.

The algorithms can process a GOES CONUS scan in under 45 seconds allowing for real-time product distribution to National Weather Service (NWS) forecast offices and National Centers and for climate studies. A 17-year GOES-East OT detection database has recently been produced using all available imagery from GOES-8, GOES-12, and GOES-13, highlighting the regional, diurnal, and seasonal distribution of hazardous convection across the Eastern U.S., Gulf of Mexico, and Atlantic Ocean offshore waters. OT detections have been directly compared with WSR-88D radar reflectivity to better understand how these signatures relate to a commonly used forecasting dataset. Large sample sizes of OT detections have been directly compared with 1) NLDN cloud-to-ground lightning, 2) total lightning from the Northern Alabama Lightning Mapping Array, 3) United Airlines Eddy Dissipation Rate turbulence observations, 4) severe storm reports collected by the Storm Prediction Center, and 5) National Weather Service severe weather warnings to demonstrate statistical relationships between the OT product and hazardous weather and to illustrate how this product can augment convective storm nowcasting especially in data-poor regions. EV detections are quite rare but are very highly correlated with severe weather based on comparison with ~625 known enhanced-V events.

This poster presentation will describe these algorithms, briefly touch on product validation, and focus on hazardous storm nowcasting applications and climatological behavior.